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Dictionary

Industrial Automation and Control



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British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library



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eISBN 91-44-03282-X
ISBN 91-44-44-37561-1 Studentlitteratur
ISBN 0-86238-339-0 Chartwell Bratt Ltd
© Olle Bodestedt and Studentlitteratur 1993

Printed in Sweden
Studentlitteratur, Lund

Tryckning: 1 2 3 4 5 6 7 8 9 10 | 1997 96 95 94 93

Introduction

This dictionary has been prepared with the aim to give the reader a comprehensive reference guide in the field of *Industrial Automation* within the *Process Industries*, as well as within the *Manufacturing Industries*.

Great efforts have been spent to make this reference guide a useful tool mainly for the instrumentation and control professional in the way that it, besides instrumentation and control, also covers most related fields, such as data processing, communication, electrical and electronic terms, reliability, safety, quality, testing etc.

Fairly detailed descriptions of industrial processes in industries like pulp & paper, food chemical, petrochemical, refining, steel, textile, water & sewage, are also included.

This dictionary is the most comprehensive reference guide available in the fields of industrial automation and related areas. It contains more than 40 000 terms and definitions and gives the instrumentation and control professional access to this information in one single document.

Many of the very latest terms and definitions in the field of Industrial Automation and Control are included.

In cases where more extensive explanations are required than can be covered in a publication of this kind, references are always given to appropriate sources for further information.

Olle Bodestedt

Notes

1. Preference has been given to terms and definitions as already established by International, American and British Standards organizations in order to promote the use of standards.
2. Certain terms refer to the Honeywell TDC 3000 distributed process control system. However, some of these terms could have a broader meaning if applied freely.
3. Terms which are specific to a particular field are identified by subjects like control valves, numerical control, software etc, given in paranthesis in bold letters following the term.
4. The terms are listed in alphabetical order. In some cases cross references are given.
5. This dictionary follows the standards accepted by prominent lexicographers. All terms of more than one word are treated as one word.

A

A 1. Symbol for ampere, base unit for electric current (SI unit). Write A (or ampere), not “amp” or “amps”.

2. Abbreviation for angstrom unit, used in expressing wavelength of light.

a Symbol for prefix atto meaning 10^{-18} .

AACSR Aluminium Alloy Constructor Steel Reinforced.

AAEC Australian Atomic Energy Commission.

AAL Absolute Assembly Language.

ab The prefix attached to names of practical electric units to indicate the corresponding unit in the cgs (centimeter-gram-second) electromagnetic system e.g. abampere, abvolt, abcoulomb.

ABC 1. Automatic Bandwidth Control. **2.** Automatic Brightness Control.

ABCA American-British-Canadian-Australian Committee on Unification of Engineering Standards.

ABCB Air Blast Circuit Breaker.

abend (abbreviation), abnormal termination, abnormal end An unplanned cessation of processing.

aberration Deviation from ideal behavior by a lens, optical system, or optical component.

ABL Atlas Basic Language.

(to) abort (software) To terminate, in a controlled manner, a processing activity in a computer system because it is impossible or undesirable for the activity to proceed.

abrasion resistance A measure of the ability of a wire or wire covering to resist damage due to mechanical causes.

abrasion soldering Soldering difficult metals by abrading the surface oxide film beneath a pool of molten solder.

abrasive particle erosion (control valves) Caused by billions of tiny hard particles carried at high velocity in a fluid stream. Slurries have such a high concentration of abrasive articles. Abrasive erosion may be reduced by: **1.** Selecting trim material or trim with a facing which is harder than the abrasive particles; however it must not be so hard as to be brittle to impact. **2.** Streamlining flow to prevent direct particle impingement upon the trim. To do this, fluid flow should be parallel to the critical seat joint and plug contour surfaces.

ABS 1. American Bureau of Shipping. **2.** Acrylonitrile-Butadiene Styrene.

abscissa Horizontal, or x, axis on a chart or graph.

absence of offset, zero offset Property of a control system the control characteristic of which is horizontal, i.e. whose steady-state deviation is zero.

absolute Perfect in quality or nature; complete – not mixed; pure – note limited by restrictions, qualifications, or exceptions – positive, certain, absolute proof. Physics: Pertaining to measurements or units of measurement derived from fundamental relationships of space, mass, and time. Pertaining to a temperature scale where zero point is absolute zero.

absolute address An address which indicates the exact storage location where the referenced operand is to be found or stored in the actual machine code address numbering system. Synonymous with specific address and actual address and related to absolute code.

absolute addressing A method of addressing in which the address part of an instruction contains an absolute address.

absolute address, machine address (deprecated in this sense) An address in a computer language that identifies a storage location or a device without the use of any intermediate reference.

absolute alcohol One hundred percent ethyl alcohol.

absolute code Coding that uses machine instructions with absolute addresses. Same as specific code.

absolute command, absolute instruction See absolute instruction.

absolute co-ordinates, absolute dimension See absolute dimension.

absolute delay The real-time interval from the transmission to reception of a signal over a circuit. Also called transmission time or circuit delay.

absolute dimension, absolute co-ordinates (numerical control) The absolute distances or angles that specify the position of a point with respect to the datum of a co-ordinate system.

absolute error 1. The algebraic result of subtracting a true, specified, or theoretically correct value from the value computed, observed, measured or achieved. **2.** The algebraic difference between the indicated value and the comparison value: absolute error = indicated value-comparison value.

absolute error of measurement The result of a measurement minus the (conventional) true value of the measurand. Notes: **1.** The term relates equally to: the indication, the uncorrected result, the corrected result. **2.** The known parts of the error of measurement may be compensated by applying appropriate corrections. The error of the corrected result can only be characterized by an uncertainty. **3.** “Absolute error”, which has a sign, should not be confused with absolute value of an error which is the modulus of an error.

absolute feedback (numerical control) Assignment of a unique value to each possible position of machine slide or actuating member.

absolute frequency deviation Pertaining to signal generators, the greatest difference between the instantaneous frequency of the frequency modulated wave and the average frequency.

absolute instruction A computer instruction in its final, executable form.

absolute instruction, absolute command (computer graphics) A display command using absolute coordinates.

absolute language The language in which instructions must be given to the computer. Synonyms: machine language, machine code.

absolute loader A routine that uses absolute coding to load a program into memory at fixed numerical addresses.

absolute machine code (software) Machine language code that must be loaded into fixed storage locations at each use and may not be relocated. Contrast with relocatable machine code.

absolute maximum supply voltage The maximum supply voltage that may be applied without the danger of causing a permanent change in the characteristics of a circuit.

absolute measurement A measured value expressed in terms of fundamental standards of distance, mass and time.

absolute moisture measurement The simplest and most direct way to measure water content of a solid, liquid, or a gas is to compare the weights of a

sample before and after moisture has been removed. Heating is a common method for removing moisture from solids while a gas is passed through a drying agent. The latter technique is considered to be the current state of art for precision humidity instrumentation and is used for standardization and calibration. The gravimetric hygrometer developed and maintained by NBS (US) yields an absolute humidity measurement. A measured quantity of test atmosphere is passed through a tube containing a drying agent, and the increase in weight of the drying agent is measured.

absolute Peltier coefficient The product of the absolute temperature and the absolute Seebeck coefficient of a material.

absolute position sensor A sensor that gives directly the co-ordinate position of an element of a machine.

absolute power Power level expressed in absolute units (e.g., watts or dBm).

absolute pressure Pressure measured with respect to zero pressure. Gauge pressure: pressure measured with respect to that of atmosphere.

absolute pressure gage A common design of an absolute pressure gage measuring element includes a spring and bellows assembly, with an upper evacuated bellows, which is sealed at very nearly a perfect vacuum, and an opposed lower actuating bellows which is connected to the measured pressure.

absolute programming Programming using words indicating absolute dimensions (absolute co-ordinates).

absolute scale See Kelvin scale.

absolute Seebeck coefficient The integral from absolute zero to the given temperature of the quotient of the Thomson coefficient of a material divided by its absolute temperature.

absolute spectral response Output or response of a device, in terms of absolute power levels, as a function of wavelength.

absolute stability of a linear system For a linear single loop control system, the property such that there exists a limiting value of the static open loop gain such that the system is stable for all lower values of that gain and unstable for all higher values.

absolute temperature Temperature measured from absolute zero, a theoretical temp. level defined as -273.2°C or -459.7°F or 0 K .

absolute transistor thermometer The absolute transistor thermometer measures the short circuit collector current of a PNP silicon transistor.

absolute units A system of units based on physical principles, in which a small number of units are chosen as fundamental and all other units derived from them.

absolute value device A transducer that produces an output signal equal in magnitude to the input signal but always of one polarity.

absolute value of an error See note 3 under (absolute) error of measurement.

absolute viscosity A measure of internal fluid friction. The unit for expressing absolute viscosity in SI is the pascal-second (Pa·s).

absolute zero Lowest possible point on the scale of absolute temperature; the point at which all molecular activity ceases. Absolute zero is variously defined -273.2°C , -459.7°F or 0 K .

absorbance When used with spectrophotometry, the ability of a chemical bond to take up or absorb radiant energy. Energy can be reradiated, absorbed or transmitted.

absorbancy (of a paper board) The ability (of a paper or board) to take up or suck in liquid.

absorbed power (pumps) Power absorbed at the drive shaft of the pump at a given instant or under given load conditions.

absorbance The fraction of the incident light absorbed.

absorption (textile term) The uptake of liquids or gases within the pores of fibers or between fibers and yarns.

absorption (optical communication) In a propagation medium, the conversion of electromagnetic wave energy into another form of energy, for instance heat.

absorption attenuation Loss due primarily to impurities in an optical fiber, including metals, such as cobalt, chromium, and iron, as well as OH ions.

absorption circuit A tuned circuit that dissipates energy taken from another circuit or from a signal source.

absorption-emission pyrometer An instrument for determining gas temperature by measuring the radiation emitted by a calibrated reference source both before and after the radiation passes through the gas, where it is partly absorbed.

absorption hygrometer An instrument for determining water vapor content of the atmosphere by measuring the amount absorbed by a hygroscopic chemical.

absorption loss (data transmission) The loss of signal energy in a communication circuit that results from coupling to a neighboring circuit or conductor.

absorption plant An oilfield facility that removes liquid hydrocarbons from gas, especially casinghead gas. The gas is run through oil of a proper character that absorbs the liquid components of the gas. The liquids are then recovered from the oil by distillation.

absorption stripping process (coke-oven plants) A coke-oven gas desulphurization process which absorb and strip H_2S for subsequent conversion into sulphur or sulphuric acid. There are four principal absorption stripping processes in commercial use today: the vacuum-carbonate process, the Sulfiban process, the Carl Still or DIAMEX process and the DE-SULF process.

absorption tower A tower or column in which contact is made between a rising gas and a falling liquid so that part of the gas is taken up or absorbed by the liquid.

absorption wavemeter An instrument for measuring frequency.

absorptometer A turbidimeter. Measures light passing through the sample. Maximum signal at zero turbidity. Output signal decreases with increasing turbidity. Color sensitive.

abstraction (software) 1. A view of a problem that extracts the essential information relevant to a particular purpose and ignores the remainder of the information. 2. The process of forming an abstraction.

abstract machine (software) 1. A representation of the characteristics of a process or machine. 2. A module that processes inputs as though it were a machine.

abstract symbol A symbol whose meaning and use have not been determined by a general agreement but have to be defined for each application and of the symbol.

ABSW Air-Break Switch.

abutment, weir abutment A wall at the side of a channel, generally normal to the axis of the weir,

against which a weir terminates. Pertains to liquid flow measurements in open channels.

abvolt Centimeter-gram-second electromagnetic unit of potential difference.

ac, AC Alternating current.

ac analog computer An analog computer in which electrical signals are of the form of amplitude-modulated suppressed carrier signals where the absolute value of a computer variable is represented by the amplitude of the carrier and the sign of a computer variable is represented by the phase (0 to 180 degrees) of the carrier relative to the reference ac signal.

ac bias The alternating current, usually of a frequency several times higher than the highest signal frequency, that is fed to a record head in addition to the signal current. The ac bias serves to linearize the recording process.

ac cable A fabricated assembly of insulated conductors in a flexible enclosure.

ACCAR-process The Allis-Chalmers Controlled Atmosphere Reactor (ACCAR) produces highly metallized DRI (direct reduced iron) in a portlet rotary kiln. Liquid, solid and gaseous fuels, singly or in combination, are used directly in the kiln without an external reformer or gasifying plant.

ACCEL Automated (Automatic) Circuit Card Etching Layout.

accelerated test A test in which the applied stress level is chosen to exceed that stated in the reference conditions in order to shorten the time duration required to observe the stress response of the item, or to magnify the response in a given time duration. To be valid, accelerated test shall not alter, the basic fault modes and failure mechanisms, or their relative prevalence.

accelerating relay Pertaining to power switchgear, a programming relay whose function is to control the acceleration of rotating electrical equipment.

accelerating time The time in seconds for a change of speed from one specified speed to a higher specified speed while accelerating under specified conditions.

accelerating torque Difference between the input torque to the rotor (electromagnetic for a motor or mechanical for a generator) and the sum of the load and loss torques: the net torque available for accelerating the rotating parts.

acceleration 1. The SI unit for measurement of acceleration is meter per second squared, m/s^2 . The standard acceleration of free fall, is $9,80665 m/s^2$. That value was used in the definition of the units kilogram-force, kgf (in some countries called kilopond, kp), and pound-force, lbf. **2.** A vector quantity that specifies rate of change of velocity. **3.** Operation of raising the motor speed from zero or low level to a higher level (electric drive).

acceleration error Pertaining to electrical transducers, the maximum difference at any measured value within the specified range, between output readings taken with and without the application of specified constant acceleration along specified axes. See transverse sensitivity when supplied to acceleration transducers.

acceleration factor The ratio between the times necessary to obtain the same stated proportion of failures in two equal samples under two different sets of stress conditions involving the same failure modes and mechanisms.

acceleration misalignment 3 That portion of the misalignment which is proportional to the second rate of

change of the command signal, i.e. the acceleration of the input shaft.

acceleration misalignment coefficient The coefficient (having the dimension $time^2$) by which the second rate of change of the command signal is multiplied to give the acceleration misalignment.

acceleration time 1. The time between the interpretation of instructions to read or write on tape and the transfer of information to or from the tape into storage, or from storage into tape. **2.** The measurement of time for any object to reach a predetermined speed.

acceleration torque Numerical difference between motor torque produced and load torque demanded to any given speed during the acceleration period.

accelerometer A transducer used to measure linear or angular acceleration.

acceptance angle (optical communication) Half the vertex angle of that cone within which optical power may be coupled into bound modes of an optical fiber.

acceptance criteria 1. An acceptance data package describe the form, fit, manufacturing requirements, characteristics, and performance history of a piece of equipment. The package includes specifications, drawings, plans manufacturing orders, inspection data, test procedures, test data and other data required by the customer (SAMA). **2.** The criteria a software product must meet to successfully complete a test phase or meet delivery requirements.

acceptance test A contractual test to prove to the customer that the device meets certain conditions of its specification, as stated in the contract.

accepted stock (pulp and paper) Stock which has not been removed as reject during stock cleaning.

acceptor impurity (in a semiconductor) An impurity that may act as a source of mobile holes.

access Locating data or an instruction word in storage and transferring it to an arithmetic unit or vice versa.

access arm A part of a disc storage unit that is used to hold one or more readings and writing heads.

access control mechanism Hardware or software features, operating procedures, or management procedures designed to permit authorized access to a computer system.

access control system Hardware and or software features, operating procedures, or management procedures designed to permit authorized access and prevent unauthorized access to a computer system.

access coupler Pertaining to fiber optics, a device placed between two waveguide ends to allow signals to be withdrawn from or entered into one of the waveguides.

access fitting A fitting permitting access to the conductors in a raceway at locations other than at a box.

accessibility The extent to which software facilities selective use or maintenance of its components.

accessible part 1. A part which can be touched by the standard jointed test finger. **2.** A conduction part which can readily be touched and which is not normally live but which may become live under fault conditions.

access method Any of the data-management techniques available to the user for transferring data between main storage and input/output device.

access mode 1. The name of a technique used to obtain a record from, or to place a recording in a file containing in a storage device. **2.** The operation of alarm system such that no alarm signal is given when the protected area is entered; however a signal may be

given if the sensor annunciator, or control unit is tempered with or opened.

accessory hardware (auxiliary devices) Devices having secondary, supplementary or subordinate functions.

access procedures The procedure by which the devices attached to the network gains access to the medium. The access procedure typically includes provision to guarantee fairness in sharing the network bandwidth between attached devices. The most common access procedures for LANs are CSMA/CD, Token Bus, Token Ring and Slotted Ring.

access right The right granted to a user to access some data or programs and use them in a particular manner.

access scan A procedure for receiving data from files by searching each data item until the desired one is obtained.

access time 1. Time required to locate and transfer data. Examples: Random access time and serial access time. 2. The time it takes a computer to locate data or an instruction word in its storage section and transfer it to its arithmetic unit where the required computations are performed. 3. The time it takes to transfer information which has been operated on from the arithmetic unit to the location in storage where the information is to be stored. Synonymous with read time and related to write time and word time.

acclimation (water quality) The process of adaption of populations of organisms to specified environmental conditions modified for experimental purposes (contrast with acclimatization).

acclimatization (water quality) The process of adaption of populations of organism to natural environmental changes or to long-term changes imposed by man (such as those caused continued discharge of industrial waste or sewage).

ac communication Light, radio waves, sound and data transmission signals in alternating current form all expressed in frequencies (Hz).

accordion A type of contact.

accounting information Information that accounting has gathered and accumulated, such as the cost of labor, material, equipment, tools, and facilities and transformed into the cost of the product, overhead, operating costs, inventory, etc. Syn: Ledger.

ac coupled flip-flop The flip-flop made up of electronic circuits in which the active elements either tubes or transistors, are coupled with capacitors.

ac coupling Coupling of one circuit to another circuit through a capacitor or other device which passes the varying portion but not the static (dc) characteristics of an electrical signal.

accredite standard committee A standards committee accredited to ANSI.

accumulated down time The accumulated time during which item is in down state over a given time interval.

accumulated time The sum of time durations characterized by given conditions over a given time interval.

accumulation key In a calculator, it automatically accumulates products and totals of successive calculations.

accumulator 1. A part of the arithmetic logic unit which is used for storing data during arithmetic operations, at first containing an operand and then the result after the operation is executed. 2. A chemical cell able to store electrical energy. 3. A small tank or vessel to hold air or liquid under pressure for use in a hydraulic or air-actuated system. Accumulators in effect store a

source of pressure for use at a regulated rate in mechanisms or equipment in a plant or in drilling or production operations. 4. A chamber or vessel for storing lowside liquid refrigerant in a refrigeration system.

accuracy 1. In process instrumentation, degree of conformity of an indicated value, or recognized accepted standard value, or ideal value. 2. The measure of freedom from error; the degree of conformity of the indicated value to the true value of the measured quantity. 3. The closeness of agreement between the result of a measurement and the (conventional) true value of the quantity being measured. Note: The use of the term precision for accuracy should be avoided. 4. A qualitative assessment of freedom from error, a high assessment corresponding to a small error. 5. A quantitative measure of the magnitude of error, preferably expressed as a function of the relative error, a high value of this measure corresponding to a small error. 6. A quality of that which is free of error. 7. A quantitative assessment of freedom from error. Contrast with precision. Pertains to mathematics of computing. 8. The degree of exactness of an approximation or measurement. High accuracy thus implies low error. Accuracy normally denotes absolute quality of computed results. Precision usually refers to the amount of detail used in representing those results. Thus, four-place results are less precise than six-place results, nevertheless a four-place table might be more accurate than an erroneously computed six-place table. 9. For electrical transducers, the ratio of the error of the full-scale output or the ratio of the error to the output, as specified, expressed in percent. Accuracy may be expressed in terms of units of measurand, or as within \pm percent of full scale output. Use of term accuracy should be limited to generalized descriptions of characteristics. The term error is preferred.

accuracy class A class of measuring instrument which meet certain metrological requirements that are intended to keep errors within specified limits. Note: An accuracy class is usually denoted by a number or symbol adopted by convention and called the class index.

accuracy control character A specific character designed with a function to control a given block of data, to indicate if they are to be disregarded or whether they can or cannot be represented on a particular device.

accuracy of a measuring instrument The ability of a measuring instrument to give indications approaching the true value of a measurand.

accuracy of measurement The closeness of the agreement between the result of a measurement and the (conventional) true value of the measureand. Note: The use of the term precision for accuracy should be avoided.

accuracy rating In process instrumentation, a number or quantity that defines a limit that errors will not exceed when a device is used under specified operating conditions. Notes: 1. When operating conditions are not specified, reference operating conditions shall be assumed. 2. As a performance specification, accuracy (or reference accuracy) shall be assumed to mean accuracy rating of the device, when used at reference operating conditions. 3. Accuracy rating includes the combined effects of conformity, hysteresis, dead band and repeatability errors. The units being used are to be stated explicitly. It is preferred that a \pm sign precede the number or quantity. The absence of a sign indicates a + and a - sign. Accuracy rating can be expressed in a number of forms. Following example is typical: accuracy rating expressed in terms of the measured variab-

le. Typical expression: The accuracy is $\pm 1^\circ\text{C}$, or $\pm 2^\circ\text{F}$. See further ANSI/ISA publication S 51.1, 1979.

accuracy rating The limits within which the inaccuracy of a given model of a device can be guaranteed in its specification. Note: Accuracy rating includes the combined effects of conformity, hysteresis, dead band, repeatability errors and other pertinent details by the specification of the device.

ac dump The intentional, accidental, or conditional removal of all alternating current power from a system or component.

ac erasing head In magnetic recording, a device using alternating current to produce the magnetic field necessary for removal of previously recorded information.

ACET Advisory Committee on Electronics and Telecommunications, an advisory committee within International Electrotechnical Commission.

acetate pulp Dissolving pulp intended for the manufacture of cellulose acetate.

acetone A flammable, liquid compound used widely in industry as a solvent for many organic substances.

acetylene A colorless, highly flammable gas with a sweetish odor used with oxygen in oxyacetylene welding. It is produced synthetically by incomplete combustion of coal gas and also by the action of water on calcium carbide. Also can be made from natural gas.

ac generator **1.** A rotating electrical machine that converts mechanical power into alternating current. Also known as an alternator. **2.** A device usually an oscillator, designed for the purpose of producing alternating current.

acid A chemical compound which dissociates and forms hydrogen ions when in aqueous solution.

acid dyes (textile term) Any of a class of dyes with negative ions which when combined with a positive charge on the fiber form an ionic bond.

acid electric-furnace process Four major variations of steelmaking in the acid process are used: (1) partial oxidation; (2) double slag; (3) complete oxidation with silicon reduction; and (4) complete oxidation (with a single slag).

acid-free paper Paper which contains no acid which can have a detrimental effect on its aging resistance or on materials in contact with the papers.

acidity (water quality) The quantitative capacity of aqueous media to react with hydroxyl ions.

acid plant The department in a sulphite mill in which the sulphite cooking acid is prepared.

acid-recovery plant (petroleum industry) An auxiliary facility at some refineries where acid sludge is separated into acid oil, tar, and weak sulfuric acid. The sulfuric acid is then reconcentrated.

acid sludge (petroleum industry) The residue left after treating petroleum oil with sulfuric acid for the removal of impurities. The sludge is a black, viscous substance containing the spent acid and the impurities that the acid has removed from the oil.

acid tower Pertaining to the pulp and paper industry a tower filled with watered blocks of limestone with a stream of sulphur dioxide reacts to form a solution of calcium hydrogen sulphite and sulphur dioxide, so called tower acid.

acid treatment (petroleum industry) A refining process in which unfinished petroleum products such as gasoline, kerosene, diselfuels, and lubricating stocks are treated with sulfuric acid to improve color, odor, and other properties.

acid water The term acid water refers to natural waters that are contaminated by leaching from ore and coal and, as a result of their more acidic characteris-

tics are considerably more corrosive than neutral fresh water.

ACIS Association for Computing and Information Sciences.

ACK **1.** Acknowledge (character) in the ASCII code. **2.** Acknowledge.

Ackerman's function Recursive function used to test the ability of a compiler to cope with recursion.

acknowledgement character A transmission control character transmitted by a station as an affirmative response to the station with which the connection has been set up.

ACL **1.** Application Control Language. **2.** Association for Computational Linguistics.

ac line filter A filter designed to dissipate or bypass to ground any extraneous signals or electrical noise on an ac power line, while causing virtually no reduction of the power-line voltage or power.

ACM Asbestos Covered Metal.

ACM/GAMM Association for Computing Machinery/German Association for Applied Mathematics and Mechanics.

ACOS Advisory Committee on Safety.

acoustic absorptivity The ratio of sound energy absorbed by a surface to the sound energy arriving at the surface.

acoustic, acoustical Pertaining to sound or the science of sound.

acoustical efficiency factor (control valves) See ISA handbook of control valves.

acoustical-electrical transducer A device designed to transform sound energy into electrical energy and vice versa.

acoustical material Any material considered in terms of its acoustical properties; especially, a material designed to absorb sound.

acoustical ohm A measure of acoustic resistance, reactance, or impedance. One acoustical ohm is equal to a volume velocity of 1 cubic centimeter per second when produced by a sound pressure of 1 microbar.

acoustical phase constant The imaginary part of the acoustical propagation constant. The commonly used unit is the radian per section or per unit distance.

acoustical reflectivity See sound reflection coefficient.

acoustical transmittivity See sound transmission coefficient.

acoustic capacitance In a sound medium, a measure of volume displacement per dyne per square centimeter. The unit is centimeter to the fifth power per dyne.

acoustic compliance **1.** The measure of volume displacement of a sound medium when subjected to sound waves. **2.** That type of acoustic reactance which corresponds to capacitive reactance in an electrical circuit.

acoustic coupler, acoustical coupler Pertaining to data communication, a device which provides the facility to transmit and receive messages using the standard telephone handset as the coupling to the line.

acoustic cut-off frequency Pertaining to control valves, see ISA handbook of control valves.

acoustic delay line **1.** A delay line whose operation is based on the time of propagation of sound waves. **2.** A device used to store digital information cyclically in the form of sound pulses. **3.** A device which retards one or more signal vibrations by causing them to pass through a solid or liquid.

acoustic dispersion The change of the speed of sound with frequency.

acoustic filter A sound-absorbing device that selectively suppresses certain audio frequencies while allowing others to pass.

acoustic memory A computer memory using an acoustic delay line. The line employs a train of pulses in a medium such as mercury or quartz.

acoustic near field The region near a noise source where particle velocity and pressure are not in phase.

acoustic noise Spurious signals generated by external acoustic disturbances.

acoustic optic effect (optical communication)

A variation of refractive index caused by an acoustic wave. Note: The acoustic-optic effect is used in devices that modulate and deflect light.

acoustic radiometer An instrument that measures sound intensity by terminating unidirectional steady-state pressure when the sound wave is reflected or absorbed at a boundary.

acoustic ratio The differential pressure ratio divided by the isentropic exponent (compressible fluid).

acoustic resistance The real component of acoustic impedance.

acoustics 1. The technology associated with the production, transmission and utilization of sound, and the science associated with sound and its effects. **2.** The architectural quality of a room – especially a concert hall, theater or auditorium – that influences the ability of a listener to hear sound clearly at any location.

acoustics Fundamental terms and definitions in the German language are covered in DIN standard 1320.

acoustic spectrometer An instrument for analyzing a complex sound wave by determining the volume (intensity) of sound-wave components having different frequencies.

acoustic storage A storage device consisting of acoustic delay lines. Synonymous with acoustic memory. Based on propagation of sound waves in a given medium.

acoustic thermometers These thermometers all base their operation on the measurement of the velocity of sound in a particular material. The velocity of sound varies with temperature in most materials, decreasing with increased temperature in solids and increasing in gases. This temperature dependence is an intrinsic property of the materials and varies with composition and with pressure for gases.

acoustic wave A travelling vibration by which sound energy is transmitted in air, in water or in the earth. The characteristics of these waves may be described in terms of change of pressure, of particle displacement, or density.

acousto-optic effect (fiber optics) Pertaining to fiber optics, a periodic variation of refractive index caused by an acoustic wave. Note: The acousto-optic effect is used in devices that modulate and deflect light.

ACP Honeywell acronym defined as an Advanced Control Program.

ac power frequency The frequency variation is stated in percent deviation from the nominal value. See IEC publication 654-2 Part 2: Power.

ac power voltage classes Power voltages are classified in accordance with the percentage variation of the voltage from its nominal value. See IEC publication 654-2, Part 2.

ACPR 1. Advanced Core Performance Reactor. **2.** Annular Core Pulse Reactor.

acquisition time The interval time a sample-and-hold circuit needs to acquire the input signal to within the stated accuracy.

ACR 1. Advanced Cooled Reactor (mainly in UK). **2.** Automatic Compression Regulator.

ACRE Automatic Checkout and Readiness.

acronym A word made up of the initial letters of a long or complex technical term, e.g. RAM is the acronym for Random Access Memory.

across-the line starting The process of starting a motor by connecting it directly to the supply at rated voltage.

ACRS Advisory Committee on Reactor Standards (USA).

ACS 1. Accumulator Switch. **2.** Alternating Current Synchronous. **3.** American Chemical Society. **4.** Australian Computer Society. **5.** Automatic Checkout System. **6.** Auxiliary Core Storage. **7.** Auxiliary Cooling System.

ACSE Association Control Service Element. ACSE is one of the application protocols specified by MAP (Manufacturing Automation Protocol).

ac signalling Using ac signals or tones to transmit data and/or control signal.

ACSP Advisory Council on Scientific Policy (GB).

ACSR 1. Aluminium Cable (Conductor) Steel Reinforced. **2.** A composite conductor made up of a combination of aluminium wires surround the steel.

ACT 1. Algebraic Compiler and Translator. **2.** Automatic Code Translation.

actinic In radiation, the property of producing a chemical change, such as the photographic action of light.

actinodielectric A photoconductive dielectric.

actinoelectric Exhibiting a temporary rise in electrical conductivity during exposure of light.

actinoelectricity Electricity produced by the action of radiant energy on crystals.

action (control valves) See air-to-close, air-to-open.

action (automatic control) The effect on one variable by one or several other variables.

action line 1. When a cathode ray storage tube is operating in a serial mode, it refers to that line of the raster which is used during the active period. **2.** Graphical representation of the action path within the block diagram, the direction of action being indicated by arrows.

action of an element For an element, the way in which the input variable affects the output variable. Note: Distinction is made between persistent and intermittent action.

action path A directed path in a system through which actions are transmitted.

action spot The spot of the raster on the face of an electrostatic storage tube which stores the digits and holds a charge.

activate To start an operation, usually by application of an appropriate enabling signal.

activated carbon treatment (water quality) A process intended for the removal of dissolved and colloidal organic substance from water and waste water by absorption on activated carbon; for example for the amelioration of taste, odor or color.

activation (programming languages) The representation of a procedure created by the invocation of that procedure.

activation time In a cell or battery, the time interval from the moment activation is initiated to the moment the desired operating voltage is obtained.

active alkali See effective alkali.

active circuit A circuit that contains active elements such as transistors, diodes or ICs.

active component Those component in a circuit which have gain, or direct current flow, such as SCRs, transistors, thyristors, or tunnel diodes.

active computer The one of two or more computers in an installation that is on line and processing data.

active corrective maintenance time That part of the active maintenance time during which actions of corrective maintenance are performed on an item.

active current (rotating machinery) Pertaining to rotating machinery, the component of the alternating current that is in phase with the voltage.

active current In an alternating current, a component in phase with the voltage. The working component as distinguished from the idle or wattless component.

active device See active component.

active devices (fluid power systems) Devices which require a power supply independent of the value of input signals.

active electric network An electric network containing one or more sources of power. See network analysis.

active element 1. An element in use or in its excited state i.e. a tube, transistor or device which is on or alive rather than off, dead or in a ground state. **2.** A file, record, or routine which is being used contacted, or referred to. Computing components are active when they are directed by the control unit.

active energy meter, watt-hour meter An instrument intended to measure active energy by integrating active power with respect to time.

active fault (in a control system) Fault, which causes control actions without fulfilled conditions according to a program.

active filter 1. A device employing passive network elements and amplifiers. It is used for transmitting or rejecting signals in certain frequency ranges, or for controlling the relative output of signals as a function of frequency. **2.** A high-pass, low-pass, bandpass, or band-elimination filter that uses an active element, such as an operational amplifier, and relatively small capacitors, rather than larger inductors and capacitors that would be required in a conventional passive filter. **3.** A circuit whose gain depends on the frequency of the input signal. **4.** A filter, consisting of an amplifier and suitable tuning elements, usually inserted in a feedback path.

active laser medium, laser medium (optical communication) The material within a laser that emits the coherent optical radiation.

active maintenance time That part of the maintenance time during which a maintenance action is performed on an item, either automatically or manually, excluding logistic delays. A maintenance action may be carried out while the item is performing a required function.

active material 1. In the plates of a storage battery, lead oxide or some other active substance which reacts chemically to produce electrical energy. **2.** The fluorescent material, such as calcium tungstate, used on the screen of a cathode-ray tube.

active network 1. A network containing passive and active (gain) elements. **2.** An electrical network which includes a source of energy.

active output (fluid power systems) Output the power of which in all possible states of the device is derived from supply power.

active position In data processing, the position that is currently accessible in a process.

active power 1. A term used for power when it is necessary to distinguish among apparent power, complex power and its components, active and reactive

power. **2.** In metering, the time average of the instantaneous power over one period of the wave. Note: For sinusoidal quantities in a two-wire circuit, it is the product of the voltage, the current, and the cosine of the phase angle between them. For nonsinusoidal quantities it is the sum of all the harmonic components, each determined as above. In a poly-phase circuit it is the sum of the active powers of the individual phases.

active power meter, wattmeter An instrument intended to measure active power.

active preventive maintenance time That part of active maintenance time, during which actions of preventive maintenance are performed on an item.

active probe A test probe generally used with an oscilloscope that is so named because of the active components used within probe circuitry.

active redundancy That redundancy wherein all means for performing a required function are intended to operate simultaneously.

active sulphurs This group includes hydrogen sulphide, elemental sulphur and organic sulphur compounds such as the mercaptans. When present at low levels, they rapidly attack copper, silver and iron alloys. The presence of moisture and small amounts of inorganic chlorine compounds greatly accelerates sulphide corrosion. Note, however, that attack still occurs in low relative humidity environments. Active sulphurs rank alongside inorganic chlorides as the predominant cause of atmospheric corrosion in the process industries. (Extracted from IEC publication 654-4).

activity 1. In pH terminology, ratio of escaping tendency of the component in solution to that at a standard state. The ion concentration multiplied by an activity coefficient is equal to the ion activity. **2.** In a piezoelectric crystal, the magnitude of oscillation relative to the exciting voltage. **3.** The intensity of a radioactive source. **4.** Operations that result in the use or modification of the information in a computer file.

activity-based costing Alternative accounting method that costs products by the production activities performed during actual manufacture.

activity-based system An alternative accounting method that costs products by the production activities performed during actual manufacture.

activity ratio The ratio of the number of records in a computer file which have activity to the total number of records in the file.

action (in artificial intelligence) In a script-based knowledge representation, an operation performed by an actor.

actor An entity that fills a thematic role in a script. Examples: An agent, a co-agent, a beneficiary, a patient.

ac transducer A transducer which for proper operation, must be excited with alternating currents only. Also a device the output of which appears in the form of an alternating current.

actual address See absolute address.

actual argument See actual parameter.

actual conditions (fluid power systems) Conditions observed during operation.

actual cost system A cost system which collects direct costs as they are incurred during production, and allocates indirect costs based upon their specific costs and achieved volume.

actual discharge area (pressure relief valves) Actual discharge area is the measured minimum net area which determines flow through an valve.

actual instruction (deprecated), effective instruction An instruction that may be executed without modification.

actual parameter 1. An argument or expression used within a call to a subprogram to specify data or program elements to be transmitted to the subprogram. Contrast with formal parameter. **2.** A language object that appears in a procedure call and that is associated with the corresponding formal parameter for use in the execution of the procedure. Synonymous with (actual) argument.

actual value The value of a variable at a given instant.

actuated time Time during which the component is under the influence of the actuating forces.

actuating error signal In process instrumentation, the reference-input signal minus the feedback signal. See ANSI/ISA-S51. 1, 1979.

actuating signal 1. The setpoint minus the controlled variable at a given instant. **2.** A particular input pulse in the control circuitry of computers.

actuator (industrial robots) A power mechanism used to effect motion of the robot (e.g. a motor which converts electrical, hydraulic or pneumatic energy to effect motion of the robot.)

actuator 1. A device or mechanism which transforms a signal into a corresponding movement controlling the position of the internal regulating mechanism (closure member) of the control valve. The signal or energizing force may be pneumatic, electric, hydraulic, or any combination thereof. Most of the actuators in use to day for control valves are pneumatically operated piston (cylinder) or diaphragm type. See also under control valve actuators. **2.** An actuator is a fluid powered or electrically powered device which supplies force and motion to a valve closure member.

actuator effective area The net area of piston, the bellows, vane or diaphragm acted on by fluid pressure to generate actuator output thrust. It may vary with relative stroke position depending upon the actuator design.

actuator environment The temperature, pressure, humidity, radioactivity and corrosiveness of the atmosphere surrounding the actuator. Also, the mechanical and seismic vibration transmitted to the actuator through the piping or heath radiated toward the actuator from the valve body.

actuator power unit That part of the actuator which converts fluid, electrical, thermal or mechanical energy into actuator stem motion to develop thrust or torque.

actuator spring A spring to move the actuator stem in a direction opposite to that created by a diaphragm pressure.

actuator stem The component which transmits motion from the actuator power unit to the valve stem (or shaft).

actuator stem force Pertaining to control valves, the net force from an actuator that is available for actual positioning of the valve plug.

actuator travel characteristics (pneumatic control valves) Relation between percent rated travel and diaphragm pressure. This may be stated as an inherent or installed characteristic.

actuator travel time See stroke time.

ACU 1. Automatic Calling Unit. **2.** Address Control Unit. **3.** Arithmetic and Control Unit.

ACUI Automatic Calling Unit Interface.

ACV Alarm Check Valve.

ac voltage See alternating current.

A/D Analog to Digital.

ADA Automatic Data Acquisition.

Ada A PASCAL based, real time systems programming language developed by CII Honeywell Bull.

adamantine luster A brilliant mineral luster characteristic of minerals with a high index of refraction (deflects a ray of light with little change in the light ray's velocity). Diamonds have such a luster, as does cerussite.

adapt To change to fit.

ADAPT Adoption of Automatically Programmed Tools.

adaptability The ease with which software allows differing system constraints and user needs to be satisfied.

adapter 1. An interconnection unit that performs the control operations necessary to provide compatibility between units in a computer system. **2.** A fitting designed to change the terminal arrangement of a jack, plug, socket, or other receptacle, so that other than the original electrical connections are possible. **3.** An intermediate device that permits attachment of special accessories or provides special means for mounting.

adapting (self-adapting) Pertaining to the ability of a system to change its performance characteristics in response to its environment.

adaptive communication See self-adjusting communication.

adaptive control 1. Type of control with automatic modification of the structure or parameters of the controlling system to compensate for varying operating conditions and states. **2.** Control in which automatic means are used to change the type of control parameters or influence of control parameters, or both, in such a way as to improve the performance of the control system. **3.** A control system that adjusts the response from conditions detected during the work.

adaptive control (industrial robots) A control system that adjusts the control system parameters from conditions detected during the process.

adaptive controllers Controllers with automatic procedures for calculating and possibly updating controller coefficients.

adaptive control system, self-optimizing control system A system in which automatic means are used to change the system parameters in a way intended to achieve the best possible performance of the system at all times.

adaptive equalization In data transmission, a system that has a means of monitoring its own frequency response characteristics and a means of varying its own parameters by closed-loop action to obtain the desired overall frequency response.

adaptive gain control A control technique which changes a feedback controller's gain based on measured process variables or controller setpoints.

adaptive maintenance (software) Maintenance performed to make a software product usable in a changed environment.

adaptive routing Ability of a system to change its communication routes according to various events or situations, such as line failure.

adaptive system A system that has a means of monitoring its own performance and a means of varying its own parameters by closed-loop action to improve its performance.

adaptive telemetry Telemetry having the ability to select certain vital information or any change in a given signal.

adaptive tuning In a control system a way to change control parameters according to current process conditions; usually supplied as a subroutine.

adaptor bushing The part which attaches a close coupled diaphragm actuator to the bonnet of the diaphragm valve body.

ADAS Automatic Data Acquisition System.

ADC 1. Analog to Digital Converter. **2.** Automatic Data Collection.

ADCCP Acronym for Advanced Data Communication Control Protocol. A version of synchronous data link control (SDLC) modified by the American National Standards Institute (ANSI).

ADCL Advanced Data Link Control (type of data link protocol).

A/D converter See analog-to-digital converter.

ADD 1. See OR and false add. **2.** See sum.

add-and-subtract relay A stepping relay capable of being operated so as to rotate the movable contact arm in either direction.

ADDAR Automatic Digital Acquisition and Recording.

addend In an addition operation, a number or a quantity added to the augend.

adder 1. A device which forms, as output, the sum of two or more numbers presented as inputs. Often no data-retention feature is included, i.e. the output signal remains only as long as the input signals are present. **2.** A functional unit whose output data are a representation of the sum of the numbers represented by its input data.

adder (summer) A device the output of which is a representation of the algebraic sum of two or more of the quantities represented by its inputs.

adder – subtractor 1. A device whose outputs is a representation of either the arithmetic sum or difference, or both, of the quantities represented by its operand inputs. **2.** A functional unit that acts as an adder or subtractor, depending upon the control signal received. Note: An adder – subtractor may be constructed so as to yield the sum and the difference at the same time.

add-in memory Additional computer memory that is added to a computer system within the computer's physical housing. Typically the add-in memory is inserted, in board form, into an available card slot on the assembly.

addition agent Any of the materials added to molten steel for altering its composition or properties.

additional units Some non-SI units (The International System of Units) which have such standing that they are accepted for general use together with the SI units. They are called additional units. The unit bar for pressure is not officially an additional unit, but in many countries is used together with the SI units. Degree Celsius is an additional unit.

additive 1. Sometimes referred to as the key. A number, series of numbers, or alphabetical intervals added to a code to put it in a cipher. **2.** Chemical added to a fluid to impart new properties or to enhance those which already exist.

additive, auxiliary material An agent which is added in a small quantity to a substance or a process in order to introduce modifications without essentially changing the substance or the process. An additive may be chemically active; see filler.

additive process A printed circuit manufacturing process in which a conductive pattern is formed on an insulating base by electrolytic chemical deposition.

additron An electrostatically focused, beamswitching tube, used as a binary adder in high-speed digital computers.

address 1. A character or group of characters that identifies a register, a particular part of storage, or some other data source or destination. **2.** An identification, represented by a name, label or number, for a register or location in storage. Addresses also are part

of an instruction word along with commands, tags, and other symbols. **3.** The part of an instruction, which specifies an operand for the instruction.

address (in numerical control) A character, or group of characters, of the beginning of a word, that identifies the data following in the word.

(to) address To refer to a device or an item of data by its address.

addressability The number of addressable positions or storage locations within a specified unit of equipment.

address block format A block format in which each word contains an address.

address code Instruction code used to locate a specific item of data within the storage units of a computer.

address comparator In a computer, a device that assures that an address being read is the right one.

address constant See base address.

address conversation The translation of the relative or symbolic addresses into absolute addresses by use of a computer, or manually.

address field That part of an instruction or word containing an address or operand.

address format The arrangement of address part of an instruction.

address generation A number or symbol generated by instructions in a program and used as an address part, i.e. a generated address.

addressing The means whereby the originator or control station selects the unit to which it is going to send a message.

addressing level A determination of the number of steps of indirect address which have been applied to a particular program. First level is direct addressing, i.e. the address part of the instruction word has the address of the operand in storage. In second level addressing (indirect), the address part of the instruction word gives the storage location where the address of the operand may be found.

addressing mode Method for addressing a location used for data storage.

address modification The hardware action of computing an instruction's effective operand address by some sequence of the following operations as prescribed within the instruction: (A) Indexing, adding an index to the address; (B) Indirect addressing, using the intermediate computed address to obtain another address from memory.

address part A part of an instruction that usually contains only an address or part of an address.

address register A register in a computer where an address is stored.

address space The range of addresses available to a computer program.

address tabulation block format A tabulation block format in which each word contains an address.

address translator A functional unit that transforms virtual addresses to real addresses.

ADDS Applied Digital Data System.

add time The time required for one addition not including the time required to get and return the quantities from storage.

add time (in microseconds) The time required to acquire from memory and execute one fixed-point add instruction using all features such as overlapped memory banks, instruction look-ahead and parallel execution.

ADE 1. Automated Design Engineering. **2.** Automatic Drafting Equipment.

ADES Automatic Digital Encoding System.

adiabatic Referring to a process which takes place without any exchange of heat between the process system and another system or its surroundings.

adiabatic demagnetization A technique used to obtain temperatures within thousandths of a degree of absolute zero. It consists of applying a magnetic field to a substance at a low temperature and in good thermal contact with its surroundings, insulating the substance thermally and then removing the magnetic field.

adiabatic temperature The theoretical temperature that would be attained by the products of combustion provided the entire chemical energy of the fuel, and combustion air above the datum temperature were transferred to the products of combustion. This assumes: **a.** combustion is complete, **b.** there is not heat loss, **c.** there is no dissociation of the gaseous compounds formed, **d.** inert gases play no part in the reaction.

adjacent Which is near or next to something.

adjacent channel In data transmission, the channel whose frequency is adjacent to that of the reference channel.

adjacent channel interference The presence of undesirable energy in a channel caused by one or both sidebands of modulated carrier channels in close frequency proximity extending from one into another through electrostatic or electromagnetic coupling.

adjacent domains Two domains interconnected by means of equipment located to adjacent nodes.

adjacent nodes The nodes connected together by at least one path that contains no other node.

adjustable restrictor valve Valve in which the inlet and outlet ports are interconnected through a restricted passageway the cross-sectional area of which can be varied within limits.

adjustable-speed motor A motor the speed of which can be varied gradually over a considerable range, but when once adjusted remains practically unaffected by the load: such as a direct-current shunt-wound motor with field resistance control designed for a considerable range of speed adjustment.

adjustable varying-voltage control A form of armature-voltage control obtained by impressing on the armature of the motor a voltage that may be changed by small increments, but when once adjusted for a given load will vary considerably with change in load with a consequent change in speed, such as maybe obtained from a differentially compound-wound generator with adjustable field current or by means of an adjustable resistance in the armature circuit.

adjustable voltage control A form of armature-voltage control obtained by impressing on the armature of the motor a voltage that may be changed in small increments, but when once adjusted, it, and consequently the speed of the motor, are practically unaffected by a change in load. Note: Such a voltage may be obtained from an individual shunt-wound generator with adjustable field current, for each motor.

adjustable voltage divider A wire-wound resistor with one or more movable terminals that can slide along the length of the exposed resistance wire until the desired voltage values are obtained.

adjuster, adjustment device A device intended to modify the performance of a measuring instrument to cause it to have desired characteristics.

adjustment **1.** The operation of bringing the output of a device or instrument to comply as closely as possible with the desired specified characteristic curve. **2.** The operation intended to bring a measuring instru-

ment into a state of performance and freedom from bias suitable for its use.

adjustment device See adjuster.

ADL Automatic Data Link.

ADLD Asynchronous Data Link Drive.

administrative data processing (ADP), business data processing Automatic data processing used in accounting or in management. Usually of a financial nature, or the collection, retrieval or control of such items.

administrative delay (for corrective maintenance) The accumulated time during which an action of corrective maintenance on a faulty item is not performed due to administrative reasons.

administrative time The period of time during which maintenance actions are pending or prepared but not yet initiated or are suspended.

admissible control input set A set of control inputs that satisfy the control constraints.

admittance **1.** The ease with which an alternating current flows in a circuit. The reciprocal of impedance and usually expressed in siemens. **2.** The (sinusoidal) current in a circuit divided by the terminal voltage. The vector sum of a resistive component of conductance and a reactive component of susceptance.

ADP **1.** Automatic Data Processing. **2.** Ammonium Dihydrogen Phosphate. **3.** Avalanche Photodiode.

ADPCM **1.** Association for Data Processing and Computer Management. **2.** Adaptive Differential Probe Code Modulation.

ADP crystal Crystal-ammonium dihydrogen phosphate crystal, a piezoelectric crystal.

ADPE Auxiliary Data Processing Equipment.

ADPE/S Automatic Data Processing Equipment/System.

ADPS Automatic Data Processing System.

ADRAC Automatic Digital Recording and Control.

ADSC **1.** Automatic Data Service Center. **2.** Automatic Digital Switching Center.

adsorption The attraction exhibited by the surface of a solid for a liquid or a gas when they are in contact. Compare with absorption.

ADU **1.** Ammonium Diurante. **2.** Automatic Dialing Unit.

advanced data communication protocol See ADCCP.

advance wire An alloy of copper and nickel, used in the manufacture of electric heating units and some wire-wound resistors.

advisory system (expert systems) An expert system that emphasizes the use of advice rather than that of commands.

ADX Automatic Data Exchange.

AEA **1.** American Electronics Association. **2.** American Engineering Association. **3.** Association of Engineers and Associates. **4.** Atomic Energy Authority.

AEACII Atomic Energy Advisory Committee on Industrial Information.

AEC **1.** American Engineering Council. **2.** Atomic Energy Commission.

AECB Atomic Energy Control Board (Canada).

AECL Atomic Energy of Canada Ltd.

AEE Atomic Energy Establishment (GB).

AEI **1.** Associazione Elettrotecnica Italiana. **2.** Average Efficiency Index.

aerator Any device for injecting air into a material or process stream.

aerify To change into a gaseous form; to infuse with or force air into; gasify.

aerobic bacteria, facultative anaerobic bacteria Bacteria capable of multiplying in either the presence or absence of oxygen.

aerodynamic noise (control valves) Noise generated as a by-product of a turbulent gas stream, or noise produced without the inter-action of the fluid with vibrating boundaries or other external energy sources. See IEC publication 534-8-3, Part 8, Section Three: Prediction of noise generated by aerodynamic flow through control valves. See also ISA publication DS75.17. See also under noise predictions.

aerodynamics The science of the motion of air and other gases. Also, the forces acting on bodies such as aircraft when they move through such gases, or when such gases move against or around the bodies.

aerometer An instrument for determining the density of air or other gases.

aerosol A colloidal system, such as mist or fog in which the dispersion medium is a gas. Two common examples of aerosols are "oils in air" and "sea salt mists".

AES 1. Auger Electron Spectroscopy. **2.** American Electrochemical Society.

AFC See automatic frequency control.

affiliate To connect or join with.

affirm To declare or maintain to be true, to ratify or confirm.

afflux (liquid level measurement in open channels) The rise in liquid level immediately upstream of and due to, an obstruction.

AFIPS American Federation of Information Processing Societies.

AFNOR Association Française des Normes.

AFPA Automatic Flow Process Analysis.

AFRAL Association Française de Réélagé Atomatique.

afterglow 1. Also called phosphorescence. The light that remains in a gas-discharge tube after the voltage has been removed, or on the phosphorescent screen of a CRT after the exciting electron beam has been removed. **2.** The luminosity that remains in a rarefied gas after an electrodeless discharge has transversed the gas.

Ag Chemical symbol for silver.

AGA American Gas Association.

AGC Automatic Gain Control.

AGDS American Gage Design Standard.

age hardening (heat treatment) Hardening by aging, usually after rapid cooling or cold working.

agenda A prioritized list of pending activities. In artificial intelligence, such activities consist in the application of certain pieces of knowledge.

agglomeration (water quality) The coalescence of flocs or particles of suspended matter to form larger flocs or particles which settle or may be caused to float more readily.

agglomeration processes (blast furnaces) Four types of agglomerating processes have been developed: sintering, pelletizing, briquetting, and nodulizing. Their individual products are known as sinter, pellets, briquettes, and nodules.

aggregate A structured collection of data objects, forming a data type.

aggressive carbon dioxide Free carbon dioxide in excess of the amount necessary to prevent precipitation of calcium as calcium carbonate.

aggressive water (water quality) A water having a negative Langelier index. See Langelier index.

aggressivity (water quality) The tendency of a water to dissolve calcium carbonate. See Langelier index.

aging 1. A change in properties which is dependent on time and storage conditions; see maturing. The term aging in relation to paper board normally implies a deterioration. **2.** Pertaining to valve actuators, the cumulative effect of operating cycles and environmental and system conditions imposed on the actuator during a period of time.

aging factor In thermal classification of electric equipment and electrical insulation, a factor of influence that causes aging.

aging failure, wearout failure A failure whose probability of occurrence increases with the passage of time, as a result of processes inherent in the item.

agitator 1. A receptacle in which ore is kept in suspension in a leaching solution. See electrowinning. **2.** A device for mixing, stirring, or shaking liquids and liquid-solid mixtures to keep them in motion.

AGR Advanced Gas-cooled Reactor.

AGREE Advisory Group on Reliability of Electronic Equipment. (USA).

AH 1. Ampere Hour. **2.** Available Hours.

AHM Ampere-Hour Meter.

AI 1. Analog Input. **2.** Artificial Intelligence.

AI Artificial Intelligence. See this term.

AIChE American Institute of Chemical Engineers.

AIDE Automated Integrated Design Engineering.

AIEE American Institute of Electrical Engineers.

aiming circle See aiming field.

aiming field, aiming circle, aiming symbol (computer graphics) On a display surface, a circle or other pattern of light used to indicate the area in which the presence of a light-pen can be detected at a given time.

aiming symbol See aiming field.

AIMME American Institute of Mining and Metallurgical Engineers.

AIMS Automated Information and Management System.

AIR 1. American Institute for Research. **2.** American Institute of Refrigeration.

air The mixture of oxygen, nitrogen and other gases, which with varying amounts of water vapor, forms the atmosphere of the earth.

air atomizing oil burner A burner for firing oil in which the oil is atomized by compressed air which is forced into and through one or more streams of oil breaking the oil into a fine spray.

air bleed (fluid power systems) A device for purging air from a system or component containing hydraulic fluid.

air-bubbler liquid-level detector See purge method (of liquid level measurement).

air-bubbler specific-gravity meter Any of several devices that measure specific gravity by determining differential pressure between two air-purged bubbler columns; the devices ordinarily use either of two principles for determining specific gravity-comparison of sample density with density of a known liquid, or comparison of pressure between two bubbler columns immersed at different depths in the process liquid.

air capacitor A capacitor in which air is the only dielectric material between its plates.

air condenser 1. A heat exchanger for converting steam to water where the heat-transfer fluid is air. Also known as air-cooled condenser. **2.** A device for removing oil or water vapors from a compressed-air line.

air conditioned area A location with temperature at a nominal value maintained constant within narrow tolerance at some point in a specified band of typical

comfortable room temperature. Humidity is maintained within a narrow specified band. Note: Air conditioned areas are provided with clean air circulation used for instrumentation, such as computers or other equipment requiring a closely controlled environment.

air conditioned location (class A, IEC 654-1) A location where both air temperature and humidity are controlled within specified limits.

air conditioner unit (fluid power systems) Assembly comprising a filter, reducing valve with a pressure gage and a lubricator, intended to deliver fluid in suitable condition.

air consumption The maximum rate at which air is consumed by a device within its operating range during steady-state signal conditions. It is usually expressed in cubic feet per minute (ft³/min) or cubic meters per hour (m³/h) at a standard (or normal) specified temperature and pressure.

air cylinder Normally synonymous with piston or cylinder type double acting pneumatic actuator.

air discharge method A method of testing, in which the charged electrode of the test generator is approached to the equipment under test and the discharge actuated by a spark to the equipment under test. Pertains to electrostatic discharge test methods.

air dryer Device for reducing the moisture vapor content of the working medium.

air dry mass (of pulp) The mass of pulp in equilibrium with the moisture in the surrounding air.

air exhaust port (fluid power systems) Port which provides passage to the atmosphere.

air filter A device for removing solid particles such as dust or pollen from a stream of air, especially by causing the airstream to pass through layered porous material such as cloth, paper or screening. Also removal of free water.

air-fuel ratio The ratio of the weight, or volume, of air to fuel.

air furnace (iron-foundry melting methods) The air furnace is a type of reverberatory furnace somewhat similar to the puddling furnace. It has a fireplace at the end, the stack at the other end, and between them a hearth covered by a roof sloping toward the stack. Coal, fuel oil or gas are used as fuel, the liquid or gaseous fuels being preferred.

air hardening (heat treatment) Hardening by quenching in air.

air knife coating, air jet coating Pertaining to pulp and paper manufacturing, a roll coating procedure in which the applied coating slip is evened out and the excess removed by a stream of air (air knife).

air-line drain port Port which enables liquid to be drained from pneumatic circuits.

air look (relay) In pneumatic systems, a device used to lock-up the transmitted signal when the supply pressure fails, or falls below a given level. For example, an application that require a control valve to hold its position in the event that the plant air supply pressure falls below a given level.

air moisture The water vapor suspended in the air.

air motor An engine that produces rotary motion using compressed air or other gas as the working fluid.

air patenting (heat treatment) Patenting including quenching in air.

air permeance (of paper) (not porosity) Ability of a paper to permit the passage of air.

air preheater A heat exchanger for transferring some of the waste heat in flue gases from a boiler or furnace to incoming air.

air purge The removal of undesired matter by replacement with air.

air regulator A device for controlling airflow.

air release Ability of a fluid to release air bubbles dispersed therein.

air resistance (of paper) (not porosity) Ability of a paper to provide a resistance to the passage of air.

air roll, blow roll (pulp and paper) A paper guide roll designed to prevent the development of an cushion between the web, felt and press roll.

air set A device which is used to control the supply air to a pneumatic controller or to a valve actuator and its auxiliaries.

air-to-close or air-to-open (action) (control valves) Normally for pneumatically diaphragm actuated control valves, valve action can be described as either air-to-close or air-to-open. These terms mean that an increase in air pressure over the effective area of the diaphragm will either close or open the valve depending upon the type of actuator used and the plug-to-set-ring relationship. Action of an electrically actuated valve is usually described as normally open or normally closed. See also fail-open and fail-close.

air vent A valve opening in the top of the highest drum of a boiler or pressure vessel for venting air.

air volume booster A device which performs the conversation of a low flow signal to a higher flow output. A volume booster can be used to increase the speed of operation of a diaphragm control valve.

AISI American Iron and Steel Institute.

AIX Advanced Interactive Executive. The UNIX operating system delivered by IBM for its mainframe, workstation and PC hardware.

alacrized switch 1. A mercury switch treated to yield a low adhesional force between the rolling surface and mercury pool, resulting in a decreased differential angle. **2.** A mercury switch in which the tendency of the mercury to stick to the mating parts has been reduced.

alarm An audible or visible signal that indicates an abnormal or out-of limits condition in the plant or control system.

alarm condition A predefined change in the condition of equipment or the failure of equipment to respond correctly. Indication may be audible or visual or both.

alarm device See alarm unit.

alarm discrimination The ability of an alarm system to distinguish between those stimuli caused by an intrusion and those which are a part of the environment.

alarm event The occurrence, acknowledgement and return to normal of a process alarm.

alarm group A display that shows the alarm condition for all points within a given Alarm Group. Each Alarm Group typically represents a particular process area or operating section of the plant. Refers to Honeywell TDC 3000 control systems.

alarm hold A means of holding an alarm once sensed.

alarm limit The boundary point at which an abnormal or out-of-limits condition is indicated.

alarm relay A relay, other than an annunciator, used to operate, or to operate in connection with, a visual or audible alarm.

alarm scan An interrogation sent to devices on the Data Hiway to determine their alarm status. Refers to Honeywell TDC 3000 control systems.

alarm signal A signal for attracting attention to some abnormal condition.

alarm summary An alarm display that provides an overview display of a series of activated alarms ac-

companied by pertinent data related to each point tag name. Refers to Honeywell TDC 3000 control systems.

alarm switch (of a switching device) An auxiliary switch that actuates a signaling device upon the automatic opening of the switching device with which it is associated.

alarm system An assembly of equipment and devices designated and arranged to signal the presence of an alarm condition requiring urgent attention, such as unauthorized entry, fire, temperature rise etc.

alarm type A general classification of the alarm condition. For example, out of limits alarms or deviation alarms.

alarm unit A device with an audible and/or visible output which indicates an abnormal or out of limit condition in a plant or control system. See also annunciator.

albedo The reflecting ability of an object. It is the ratio of the amount of light reflected compared to the amount received.

ALC Automatic Load Control.

ALERT Programmable control system for food industry by Alfa-Laval AB.

algebraic adder In a computer, an adder that provides the algebraic rather than arithmetic sum of the entered quantities.

algebraic language An algorithmic language many of whose statements are structured to resemble the structure of algebraic expressions, e.g., ALGOL, FORTRAN.

algebraic logic A calculator mode that permits all calculations to be done in the order in which they are written.

algebraic sum The sum of two or more quantities combined according to their signs. (Compare with arithmetic sum).

ALGOL (ALGOrithmic Language) An international algebraic procedural language for a computer programming system. Has been the model for many new program languages.

algorithmic A step-by-step methodology; an exact answer; a systematic computation guaranteeing accurate solution.

algorithm A step-by-step procedure for performing a task, named for an Arab mathematician of the ninth century.

algorithm (for automatic control) A completely determined finite sequence of instructions by which the values of the output variables can be calculated from the values of the input variables. Note: The behaviour of a system with digital inputs and output variables (e.g. a switching system) can be described completely by an algorithm. For a system with continuous input and output variables, the algorithm is given by, or derived from, the mathematical relationship between the input and output variables.

algorithm analysis The examination of an algorithm to determine its correctness with respect to its intended use, to determine its operational characteristics, or to understand it more fully in order to modify, simplify, or improve it.

algorithmic Pertaining to calculating process usually assumed to lead to the solution of a problem in a finite number of steps. Contrast with heuristic and stochastic.

algorithmic language An artificial language established for expressing algorithms.

algorithmic routine The specific routine which directs the computer in a program to solve a problem in a finite or specified number of steps, but not rely on a

trial and error procedure. The solution and solution method are exact and must always reach the specific answer.

alias 1. An additional name for an item. 2. An alternate label. For example, a label and one or more aliases may be used to refer to the same data element or point in a computer program. 3. An alternate name for a member of a partitioned data set. 4. In pulse code modulation telecommunication links, a spurious signal resulting from beats between the signal frequencies and the sampling frequency.

aliasing A peculiar problem in data sampling, where data are not sampled enough times per cycle, and the sampled data cannot be reconstructed.

aliasing error (telemetry) An inherent error in time-shared telemetry systems where improper filtering is employed prior to sampling.

aligned bundle A bundle of optical fibers in which the relative spatial coordinates of each fiber are the same at the two ends of the bundle. Note: The term "coherent bundle" is often employed as a synonym, and should not be confused with phase coherent or spatial coherence.

alignment The process of adjusting components of a system for proper interrelationship.

alignment function character (numerical control) The character: used as the address character for a sequence number word that indicates a block in a control tape after which are recorded the data necessary for machining to be commenced or recommenced.

alignment pose (industrial robots) A specified pose of the mechanical interface coordinate system in relation to the base coordinate system.

alignment roll Pertaining to the pulp and paper industry an adjustable guide roll in the wire guide or felt guide.

aliphatics One of the two classes of organic petrochemicals; the other is the aromatics. The most important aliphatics are the gases ethylene, butylene, acetylene, and propylene.

alkaline cleaning Cleaning by means of alkaline solutions.

alkaline hardness, temporary hardness (water quality) That hardness which is removed by boiling. It is normally caused by presence of hydrogen carbonates.

alkaline storage battery A storage battery in which the electrolyte consists of an alkaline solution, usually potassium hydroxide.

alkalinity Represents the amount of carbonates, bicarbonates, hydroxides and silicates or phosphates in the water and is reported as grains per gallon, or p.p.m., as calcium carbonate.

alkalinity (water quality) The quantitative capacity of aqueous media to react with hydrogen ions.

alkali resistance Pertaining to the pulp and paper industry, the fraction of the dry solid material in bleached chemical pulp which is insoluble in a cold solution of sodium hydroxide of a given concentration.

alkali solubility (of pulp) The fraction of the dry solid material in bleached chemical pulp which is soluble in a cold solution of sodium hydroxide of a given concentration.

alkylation A refining process that, simply stated, is the reverse of cracking. The alkylation process starts with small molecules and ends up with larger ones. To a refining engineer, alkylation is the reaction of butylene or propylene with isobutane to form an isoparaffin, alkulate – a superior gasoline blending component.

all-diffused monolithic integrated circuit Also called monolithic integrated circuit. A microcircuit consisting of a silicon substrate into which all of the circuit parts (both active and passive elements) are fabricated by diffusion and related processes.

Allen screw A screw having a hexagonal hole or socket in its head. Often used as a setscrew.

all-glass fiber An optical fiber having core and cladding entirely of multicomponent glass.

allobar A form of an element having a distribution of isotopes that is different from the distribution in the naturally occurring form; thus an allobar has a different apparent atomic weight than the naturally occurring form of the element.

allocate storage To assign storage locations or areas of storage for specific routines, portions of routines, constants, working storage, data, etc.

allocation See storage allocation.

allocation technique The method of providing a process access to a shared resource.

alochromatic Exhibiting photoelectric effects due to the inclusion of microscopic impurities, or as a result of exposure to various types of radiation.

allotropy The phenomenon of one and the same substance occurring as different molecular structures. The different forms of the substances are called allotropes and usually constitute separate phases. Allotropes of a metal are often stable at different temperature intervals.

alloy A solid material having metallic properties and composed of two or more chemical elements.

alloy-diffused transistor A transistor in which the base is diffused and the emitter is alloyed. The collector is the semiconductor substrate into which alloying and diffusion are effected.

alloyed casting (kind of iron castings) Alloyed castings are used most extensively for applications where resistance to wear, to heat (including growth), and to corrosion, along with the high strength of the alloyed iron, rigidity, "damping" of vibrations and amenability to heat treatment are of prime importance.

alloy junction Also called fused junction. A junction produced by alloying one or more impurity metals to a semiconductor.

alloy process A fabrication technique in which a small part of the semiconductor material is melted together with the desired metal and allowed to recrystallize. The alloy developed is usually intended to form a pn junction or an ohmic contact.

alloy steel Steel with other essential constituents next to iron and carbon.

all-pass filter A network designed to produce a delay (phase shift) and an attenuation that is the same at all frequencies; a lumped-parameter delay line. Also called all-pass network.

all-plastic fiber (optical communication) An optical fiber having core and cladding entirely of multicomponent plastic.

all-rag paper Paper manufactured solely of rag pulp and which may, however accidentally contain a small amount of some other type of fiber.

all-silica fiber (optical communication) An optical fiber having core and cladding entirely of multicomponent silica.

alphabet An ordered character set, the order of which has been agreed upon.

alphabetic alphanumeric code A code whose application results in a code element set whose elements are formed from an alphabetic alphanumeric character set.

alphabetic binary code A code whose application results in a code element set whose elements are formed from an alphabetic binary character set.

alphabetic character set A character set that contains letters and may contain control characters, and special characters but not digits.

alphabetic code A code whose application results in a code element set whose elements are formed from a character set.

alphabetic numeric code A code whose application results in a code element set whose elements are formed from an alphabetic numeric character set.

alphabetic string A string consisting solely of letters from the same alphabet.

alphabetic word A word consisting of letters from the same alphabet.

alpha-cellulose Previously: the fraction of bleached chemical pulp which remains undissolved after treatment with a cold solution of sodium hydroxide followed by washing with water according to a specified procedure. The determination of alpha-cellulose is now carried out only rarely and has otherwise been replaced by the determination of alkali solubility or alkali resistance.

alpha factor (water quality) In an activated sludge plant, the ratio of the oxygen transfer coefficient in a clean water.

alphanumeric 1. A contraction of alphabetic-numeric. **2.** Pertaining to a character set that contains letters, numerals, and special characters.

alphanumeric character A single graphic selected from the coded character set consisting of 26 letters of the English alphabet, the decimal digits 0 through 9, and other selected symbols up to a total of 64, which can be represented by a 6-bit binary code.

alphanumeric character set A character set that contains both letters and digits and may contain control characters and special characters.

alphanumeric code A code whose application results in a code element set whose elements are formed from an alphanumeric character set.

alphanumeric data Data represented by letters and digits, perhaps with special characters and the space character.

alphanumeric keyboard A keyboard containing a set of data character keys capable of generating the characters of an alphanumeric character set.

alpha profile (deprecated), power-law index profile A graded index profile with the refractive index of the core decreasing according to a power law function.

ALS Advanced Lowpower Schottky. (Texas Instruments). A low-power, high-speed TTL logic family.

ALSTEP Microcomputer-based sequence controller for food industry processes by Alfa-Laval AB.

alterable memory A user-accessible storage medium.

alteration switch A manual switch on the computer console or on a program-simulated switch that can be set on or off to control coded machine instruction.

alternate code complement In a frame synchronization scheme, the frame synchronization pattern is complemented on alternate frames to give better synchronization.

alternate fuels Fuels-gas, gasoline, heating oil made from coal, oil shales, or tar sands by various methods. Alternate fuels also include steam from geothermal wells where superheated water deep in the earth is used to generate steam for electric power generation.

alternate route A secondary communication path used to reach a destination if the primary path is unavailable.

alternate standard keyboard See DVORAK keyboard.

alternating Applies to a periodic quantity of mean value zero.

alternating current (ac) An electric current which is constantly varying in amplitude and periodically reversing direction.

alternating-current (ac) circuit breaker A device that is used to close and interrupt an ac power circuit under normal conditions or to interrupt this circuit under fault or emergency conditions.

alternating-current commutator motor An alternating-current motor having an armature connected to a commutator and included in an alternating-current circuit.

alternating-current erasing head An erasing head, used in magnetic recording in which alternating current produces the magnetic field necessary for erasing. Alternating-current erasing is achieved by subjecting the medium to a number of cycles of a magnetic field of a decreasing magnitude. The medium is, therefore essentially magnetically neutralized.

alternating double filtration, ADF A process for treatment of sewage by biological filtration in two stages with intermediate separation of humus by settlement. At intervals the order of use of the filters, but not of the humus tanks, is reversed, allowing operation of the plant at higher BOD loadings than possible with single filtration or ordinary double filtration without troublesome accumulation of film at the surface of the filters, and ponding.

alternating voltage Also called ac voltage. Voltage that is continually varying in value and reversing its direction at regular intervals, such as that generated by an alternator or developed across a resistance or impedance through which alternating current is flowing.

alternation One-half of a cycle, either when an alternating current goes positive and returns to zero, or when it goes negative and returns to zero. Two alternations make one cycle.

alternation gate Same as gate, OR.

alternative box An element in a flow chart to signify where a decision is made. There is one entry and two or more exits. Synonymous with decision box, comparison box.

alternative control Type of control with two or more controllers acting on one final controlling element such that the controller output with either the maximum or the minimum absolute value determines the manipulated variable.

alternator A device for converting mechanical energy into electrical energy in the form of an alternating current.

alternator-rectifier exciter An exciter whose energy is derived from an alternator and converted to direct current by rectifiers. The exciter includes an alternator and power rectifiers which may be either noncontrolled, including gate circuitry. It is exclusive of input control elements. The alternator may be driven by a motor, prime mover, or by the shaft of the synchronous machine. The rectifiers may be stationary or rotating with the alternator shaft.

altigraph A recording pressure altimeter.

altimeter An instrument for determining height of an object above a fixed level or reference plane – sea level for example.

altitude The vertical distance above a stated reference level. Note: Unless otherwise specified this reference is mean sea level.

ALU See Arithmetic unit.

alum General: potassium aluminium sulphate. In the paper industry: aluminium sulphate.

alumina 1. A ceramic used for insulators in electron tubes or substrates in thin-film circuits. **2.** The oxide of aluminium.

aluminium – asbestos Type of packing for control valves composed of rings of an asbestos core wrapped with lubricated aluminium alloy foil.

aluminium chloride A chemical used as a catalytic agent in oil refining and for the removal of odor and color from cracking gasoline.

aluminium oxide impedance type dew point sensor A thin film aluminium oxide hygrometer sensor; a transducer that converts water vapor pressure into an electrical signal.

AM 1. See Amplitude Modulation. **2.** Ammeter.

3. Auxiliary Memory.

Am Chemical symbol for americium.

A/m Ampere per meter (unit of magnetic field strength).

AMA 1. Associates of Manufactures. Allied to the Electrical and Electronic Industries (UK). Part of BEAMA. **2.** Automatic Memory Allocation.

ambient conditions The conditions of the surrounding medium (pressure, temperature, noise etc.) See IEC publication 654–1 Operating conditions for industrial-process measurement and control equipment, Part 1: Temperature, humidity and barometric pressure. Other publications related to operating conditions for industrial-process measurement and control equipment are: 654–2, Part 2: Power; 654–3, Part 3: Mechanical influences; 654–4, Part 4: Corrosive and erosive influences.

ambient noise 1. Acoustic noise in a room or other location. Usually measured with a sound-level meter.

2. Unwanted background noise picked up by a microphone. **3.** Interference present (in a communication line) at all times. **4.** Background electrical noise in electrical measurements and operation.

ambient pressure The pressure of the medium surrounding a device.

ambient pressure error Pertaining to transducers, the maximum change in output, at any measurand value within the specified range, when the ambient pressure is changed between specified values.

ambient temperature The temperature measured at a representative point within the local environment, including adjacent heat generating equipment, in which the measurement and control equipment will normally operate, be stored or transported.

ambient temperature range The range of environmental temperatures in the vicinity of a component or device, over which it may be operated safely and within specifications.

ambient temperature time constant At a constant operating resistance, the time required for the change in (bolometer unit) bias power to reach 65 percent of the total change in bias power after an abrupt change in ambient temperature.

ambiguity error A gross error, usually transient occurring in the reading of digits of numbers and imprecise synchronism which causes changes in different digit positions, such as in analog-to-digital conversation. Guard signals can aid in avoiding such error.

AMDEA Association of Manufactures of Domestic Electrical Appliances (UK). Part of BEAMA.

amendment Improvement, a correction, a formal alteration.

American Institute of Electrical Engineers (AIEE) Now merged with IRE to form IEEE.

American National Standard control characters Control characters defined by American National Standard FORTRAN, ANSI X3, 9-1966. Synonymous with ASCII control character, FORTRAN Control character.

American National Standards Institute (ANSI) Develop and publish industry standards. Formerly American Standards Association (ASA) and United States of America Standards Institute (USASI).

American Standard Pipe Thread A series of specified sizes for tapered straight and dryseal pipe threads established as a standard in the United States.

American Standards Association (ASA) See American National Standards Institute.

American Wire Gage (AWG) A standard system used for designating wire diameter. Gage sized range from No 40, the smallest diameter wire to No 4/0, the largest. AWG sizes are used for specifying both solid and stranded wire. Gage numbers have an inverse relationship to size, i.e., larger numbers have smaller diameter.

ameripol The trade name for products made from a type of synthetic rubber.

AMIG Australian MAP Interest Group.

amine Organic base in refining operations to absorb acidic gases in process streams. Two common amines are monoethanolamine (MEA) and diethanolamine (DEA).

ammeter An instrument intended to measure the value of a current.

ammonia and derivatives Reduced forms of nitrogen (ammonia, amines, ammonium ions) occur mainly in fertilizer plants, agricultural applications, and chemical plants. Copper and copper alloys are particularly susceptible to corrosion in ammonia environments. Extracted from IEC 654-4 Operating conditions for industrial-process measurement and control equipment, Part 4: Corrosive and erosive influences).

ammonia stripping (water quality) A method of removing ammoniacal compounds from water by making it alkaline, and aerating.

ammonium sulfate A salt having commercial value which is obtained in the distillation of shale oils.

ammonium sulphate The ammonium sulphate recovered from coke-oven gas is used for admixture with phosphate and potash constituents to provide balanced agricultural fertilizers for the various requirements, or it may be used for direct application where nitrogen is the only requirement at the time of use.

amorphous A characteristic, particularly of a crystal determining that it has no regular structure.

amount of substance The SI base unit for the measurement of the amount of substance in mole, mol. The unit mole is a base unit, defined as the amount of substance containing the same number of elementary entities as there are atoms in 12g of the nuclide carbon 12. The number is $602 \cdot 10^{21}$. Note that the elementary entities must be specified. They may be atoms, molecules, electrons, group of particles or anything else.

amp See under letter symbol A.

ampacity Current-carrying capacity expressed in amperes.

amperage The number of amperes flowing in an electrical conductor or circuit.

ampere A unit of electrical current or rate of flow of electrons. One volt across 1 ohm of resistance causes

a current flow of 1 ampere. A flow of 1 coulomb per second equals 1 ampere.

ampere-hour A current of 1 ampere flowing for one hour. Multiplying the current in amperes by the time of flow in hours gives the total number of ampere-hours. One ampere-hour equals 3600 coulombs.

ampere-hour (AH) capacity All measurement of a storage battery's ability to furnish a steady current for a specified period. Battery capacity is usually specified on an 8-hour rate or a 10 hour rate, e.g., a 1000 AH battery can be expected to supply a steady 100 amps for 10 hours.

ampere-hour efficiency The number of ampere-hours obtained from a storage battery divided by the number of ampere-hours required to recharge the storage battery to its original condition.

ampere-hour meter An instrument intended to measure a quantity of electricity by integrating current with respect to time.

ampere per metre The SI unit of magnetic field strength; it equals the field strength developed in the interior of an elongated, uniformly wound coil excited with a linear current density in the winding of one ampere per metre of axial distance.

ampere rating The current that the fuse will carry continuously without deterioration and without exceeding temperature rise limits specified for that fuse.

amplidyne A special direct-current generator used extensively in servo systems as a power amplifier. The response of its output voltage to changes in field excitation is very rapid, and its amplification factor is high.

amplification 1. The strengthening of a weak signal. Contrasts with attenuation. **2.** The ratio between the output signal power and the input signal power of a device. **3.** Gain. **4.** For an element or system, the ratio of the steady state amplitude of the output signal from an element or system to the amplitude of a sinusoidal input signal of a given frequency, or the ratio of the same two signal amplitudes when the input signal has a constant unidirectional value. See also term "harmonic response". Note: The amplification is in general dependent upon the frequency of the input signal, which must therefore be stated. For a non-linear element or system the amplification also depends on the amplitude of the input signal which must therefore be stated.

amplification factor In any device, the ratio of output magnitude to input magnitude.

amplifier 1. In process instrumentation, a device that enables an input signal to control power from a source independent of the signal and thus be capable of delivering an output that bears some relationship to, and is generally greater than, the input signal. **2.** Device used to increase the level of a signal by taking the necessary energy from an auxiliary source. Note: One may distinguish voltage, power, torque, etc., amplifiers.

amplifier (used in control systems) Basically there are two types of amplifier used in control systems: **1.** A small-signal amplifier (or voltage amplifier) is one which linearly amplifies a small signal and is suitable for amplifying the error signal in control system. A typical small-signal amplifier is an operational amplifier. **2.** A power amplifier is one which controls a large amount of power and is therefore suitable for the control of the device at the output of the control system. If the output device is for example, a rolling mill motor, then the power amplifier contains thyristors.

amplifier servo An amplifier, used as part of a servo-mechanism, that supplies power to the electrical input terminals of a mechanical device.

amplify To increase in magnitude or strength usually said of a current or voltage.

amplitude **1.** The magnitude of variation in a changing quantity from its zero value. The word must be modified with an adjective such as peak, rms etc., which designates the specific amplitude in question. **2.** The extent to which an alternating or pulsating current or voltage swings from zero or from a mean value. The level of an audio or other signal in voltage or current terms.

amplitude-controlled rectifier A rectifier circuit in which a thyatron is the rectifying element.

amplitude distortion (In data transmission) distortion caused by a deviation from a desired linear relationship between specified measures of the output and input of a system.

amplitude locus (For a nonlinear system or element whose gain is amplitude dependent). A plot of the describing function in any convenient coordinate system.

amplitude modulated signal generator A source of amplitude modulated signals, the frequency, voltage and modulation factor of which can be fixed or variable within specified limits.

amplitude modulation (AM) Pertaining to signal generators, the process by which the amplitude of a carrier wave is varied following a specific law. Note: The result of that process is an amplitude modulated signal.

amplitude modulation distortion Pertaining to signal generators, the defects of the envelope of the amplitude modulated signal when compared with the waveform of the modulating signal.

amplitude modulation factor Where amplitude modulation is concerned, the ratio of half the difference of the maximum and minimum amplitudes to the mean value of the amplitude. Note: This definition does not apply to asymmetrical modulation and over-modulation.

amplitude ratio The ratio of peak height of an output signal to the peak height of a related input signal.

amplitude reference level In pulse techniques, the arbitrary reference level from which all amplitude measurements are made. Note: The arbitrary reference level normally is considered to be at absolute amplitude of zero but may, in fact, have any magnitude of either polarity. If this arbitrary reference level is other than zero, its value and polarity must be stated.

amplitude response, gain response The gain of the frequency response as a function of the angular frequency. Note: In graphical representation the gain of the frequency response is usually plotted as logarithmic gain versus the logarithmically represented value of the angular frequency.

amplitude selection A summation of one or more variables and a constant resulting in a sudden change in rate or level at the output of a computing element as the sum changes sign. See electronic analog computer.

AM rejection The removal of unwanted amplitude modulation of a signal, usually performed by using signal clipping or limiting circuitry.

AN **1.** Audible Noise. **2.** Army-Navy Nomenclature System (USA). **3.** Alteration Notice.

anaerobic Free of combined oxygen.

anaerobic sludge digestion (water quality) A controlled process of bacterial decomposition of sludge under anaerobic conditions which may be carried

out at ambient temperature, at between 25 and 40°C (mesophilic digestion) or at between 45 and 60°C (thermophilic digestion).

analog The representation of numerical quantities by means of physical variables, such as translation, rotation, voltage or resistance; contrasted with digital.

analog adder, summer A functional unit whose output analog variable is equal to the sum, or a weighted sum, of the input analog variables.

analog amplifier (fluid power systems) Amplifier the output of which is continuously variable with the applied control signal.

analog back-up An alternate method of process control by conventional analog instrumentation in the event of a failure in the computer system.

analog channel A channel on which the information transmitted can take any value between the limits defined by the channel.

analog communications A system of telecommunications employing a nominally continuous electrical signal that varies in frequency, amplitude etc., in same direct correlation to nonelectrical information (sound, light, etc.) impressed on a transducer.

analog computer **1.** A computer that processes analog data. **2.** A computer that operates on analog data by performing physical processes on these data. Contrast with digital computer. **3.** A calculator in which analog signals are handled internally in a continuous way to perform programmable mathematical functions on analog signals to produce analog output signals.

analog computing unit An analog device in which analog signals are handled internally in a continuous way to perform a predetermined mathematical function on analog signals to produce analog output signals.

analog conditioning/equalization In data communication, the analog signals loses strength as it travels along the transmission circuit. The loss is proportional to frequency. Likewise phase shift occurs also as a function of frequency. Attenuation and phase shift are components of distortion which can be compensated for by adding complementary filters. When the filters are added to the physical plant, the process is called conditioning. When provided within the modem enclosure, it is called equalization.

analog control Implementation of automatic control loops with analog (pneumatic or electronic) equipment. Contrast with direct digital control.

analog data Data represented in a continuous form as contrasted with digital data represented in a discrete, discontinuous form. Analog data are usually represented by means of physical variables, such as voltage, resistance, rotation etc.

analog data channel A one-way path for data signals which includes a voice-frequency channel and an associated data modulator and demodulator.

analog device A mechanism which represents numbers by physical quantities, e.g., or by voltage or currents as in a differential analyzer or a computer of the analog type.

analog/digital adapters When circuits designed for voice communication are used for data transmission, there must be a transformation between the domains. The adapter between the terminal and the transmission line provides modulation and demodulation. The name "modem" is a contraction of this functional description.

analog/digital converter See analog-to-digital converter.

analog direct current signal A direct current signal, which varies in a continuous manner within its ranges, used in industrial-process measurement and control systems to transmit information. The standard is defined in IEC publication 381-1.

analog direct voltage signal A direct voltage signal used for transmission or processing which varies in a continuous manner according to one or several physical quantities. The standard is defined in IEC-publication 381-1.

analog displays A family of optional equipment in the BASIC system that provides indication of the process variable, setpoint selection, output manipulation, alarm status and loop identification information. Refers to Honeywell TDC 3000 control systems.

analog divider A functional unit whose output analog variable is proportional to the quotient of two input analog variables.

analog input channel (in process control) The analog data path between the connector and the analog-to-digital converter in the analog input subsystem.

analog input channel amplifier An amplifier attached to one or more analog input channels that adapts the analog signal level to the input range of the succeeding analog-to-digital converter.

analog measuring instrument A measuring instrument in which the output or display is a continuous function of the value of the measurand. Note: This term relates to the form of presentation of the output or display, not to the principle of operation of the instrument. Examples: (a) moving coil voltmeter; (b) mercury-in-glass thermometer; Bourbon pressure gauge.

analog multiplier A functional unit whose output analog variable is proportional to the product of two input analog variables. Note: This term may also be applied to a device that can perform more than one multiplication for example a servo multiplier.

analog output module I/O module that converts a multiple-bit number calculated in the PC to a voltage or current output signal for use in control.

analog pneumatic signal for process control system IEC publication 382 specifies the international standard for analog pneumatic signals used in industrial-process measurement and control systems to transmit information between the elements of systems. This standard applies to a) pneumatic controllers; b) pneumatic transmitters and information transmission systems; c) current-to pressure transducer; d) air supply pressures (with limit values).

analog pneumatic transmission signal A signal in which the air pressure used for information transmission varies in a continuous manner according to one of several physical quantities.

analog point 1. A user-defined process variable that can take on continuous values representing a process condition such as flow, temperature, or pressure. **2.** An individual hardware connection to monitor or control the process, usually interfacing through relays and/or multiplexers in the BASIC system equipment. Refers to Honeywell TDC 3000 control systems.

analog recording A method of recording in which some characteristics of the record current, such as amplitude or frequency, are varied continuously in a manner analog to the time variations of the original signal.

analog representation A representation of the value of a variable by a physical quantity that is considered to be continuously variable, the magnitude of the physical quantity being made directly proportional to the variable or to a suitable function of the variable.

analog restoration The technique of sending digitized process variable information, stored in various devices, across the Data Hiway to the control center and restoring the process variable value to an equivalent electrical signal. Refers to Honeywell TDC 3000 control systems.

analog signal 1. A signal the information parameter of which may assume all values of a given range. **2.** An analog signal is a continuously variable representation of a physical quantity, property, or condition such as pressure, flow, temperature etc. The signal may be transmitted as pneumatic, mechanical, or electrical energy.

analog signals for process control system International standard for analog signals used in industrial-process measurement and control systems to transmit information between elements of systems are outlined in the following IEC publications: **1.** 381-1, Part 1: Direct current signals. **2.** 381-2, Part 2: Direct voltage signals. **3.** 382 Analog pneumatic signal for process control systems.

analog storage oscilloscope In an analog storage oscilloscope, the storage medium is the phosphor on the inside face of the screen. See also digital storage oscilloscope.

analog telemetering Telemetering in which some characteristic of the transmitter signal is proportional to the quantity being measured.

analog-to-digital (A/D) A circuit whose input is information in analog form and whose output is the same information in digital form.

analog-to-digital conversion The transformation of the value of an analog quantity into a digital representation of that quantity.

analog-to-digital converter, A/D converter, ADC (abbreviation) 1. A converter which changes an analog input signal into a digital output signal. **2.** A functional unit that converts data from an analog representation to a digital representation.

analog-to-frequency (A/F) converter A circuit whose input is information in an analog form other than frequency and whose output is the same information as a frequency proportional to the magnitude of the information.

analog transmission Transmission of a continuously variable signal as opposed to a discretely variable signal, such as digital data. Examples of analog signals are voice calls over the telephone network, facsimile transmission, and electrocardiogram information. See digital signal.

analog unit A device on the Data Hiway that provides analog inputs and outputs for use by either a process computer or a Basic Operator Station. Refers to Honeywell TDC 3000 control systems.

analog variable A continuously variable signal representing either a mathematical variable or a physical quantity.

analysis phase See requirement phase.

analytical model A representation of a process or phenomenon by a set of solvable equations. Contrast with simulation.

analyzer Any of several types of test instruments, ordinarily one that can measure several different variables either simultaneously or sequentially.

ANCS American Numerical Control Society.

AND A logic operator having the property that if P is an expression, Q is an expression, R is an expression ..., then the AND of P, Q, R ... is true if all expressions are true, false if any expression is false. Truth is normally expressed by the value 1, falsity by 0.

AND circuit Synonym for AND gate.

AND element, AND gate A gate that performs the Boolean operation of conjunction.

AND gate, AND element See under AND element.

AND negative gate Same as gate, NAND.

AND-NOT operation (deprecated) See under exclusion.

AND operation, conjunction, intersection, logical product (deprecated) The Boolean operation whose result has the Boolean value 1 if and only if each operand has the Boolean value 1. Note: See also table of Boolean operations in ISO publication 2382/11—1976.

anechoic Nonreflective, producing no echoes.

anemometer Any means used for measuring the velocity of air flow.

angle 1. A functional mathematical concept formed when two straight lines meet at a point. The lines are the sides of the angle, and the point of intersection is the vertex. **2.** A measure of the distance along a wave or part of a cycle, measured in degrees. **3.** The distance through which a rotating vector has progressed.

angle body Type of globe valve with special configuration to suit specific piping or flow requirements.

angled piston pump Axial piston pump in which the drive shaft is at an angle to the common axis.

angle modulation Pertaining to data transmission, the process of causing the angle of the carrier wave to vary in accordance with the signal wave. Phase and frequency modulation are two particular types of angle modulation.

angle of deviation In optics, the net angular deflection experienced by a light ray after one or more refractions or reflections. Note: The term is generally used in reference to prisms, assuming air interfaces. The angle of deviation is then the angle between the incident ray and the emergent ray.

angle of elevation The angle between a horizontal plane and the line of sight to an object lying above the plane of the observer.

angle of incidence (optical communication) The angle between an incident ray and the normal to a reflecting or refracting surface.

angle of retard unbalance Pertaining to thyristors, the load voltage/current unbalance due to unequal angles of retard either between positive and negative half cycles of a single ac wave or between two or more phases in a three-phase system.

angle type thermocouple assembly An angular type thermocouple assembly is an assembly consisting of a thermocouple element, a protecting tube, an angle fitting, a connection head extension, and a connection head.

angle valve A valve design in which one port is colinear with the valve stem or actuator, and the other port (usually the inlet) is at right angles to the valve stem.

angular acceleration The rate at which angular velocity changes with respect to time, generally expressed in radians per second.

angular frequency Frequency expressed in radians per second.

angular misalignment loss (optical communication) The extrinsic joint loss caused by angular deviation from the optimum alignment of source to optical fiber, fiber to fiber or fiber to detector.

angular momentum mass flowmeter A type of mass flowmeter, one of the more popular approaches to true mass flow measurement.

angular reflection type photoelectric switch A photoelectric switch in which the optical axis of the light emitter and light receiver form an angle.

anhydrous ammonia (coke-oven plants) The ammonia recovered from the coke oven gas and waste liquor as anhydrous ammonia liquid is a main source of nitrogen in making fertilizer. Ammonia is a major fertilizer in its own right being introduced directly into soils. Special high-purity ammonia is used in chemical synthesis, in refrigeration and steel plants for generating reducing atmospheres.

ANIM Association of Nuclear Instrument Manufacturer.

animate To make a series of drawings, which when filmed, will create moving images.

anionic iron-one flotation The main application of anionic flotation is to float iron-bearing minerals away from gangue material. See also under flotation.

anionic surface active agent (water quality) A surface active agent which ionizes in aqueous solution to produce negatively charged organic ions which are responsible for the surface activity.

anisochronous transmission A data transmission process in which there is always an integral number of unit intervals between any two significant instants in the same group; between two significant instants located in different groups, there is not always an integral number of unit intervals. In data transmission the group is a character.

anisotropic (optical communication) Pertaining to a medium whose electromagnetic properties at each point are different for different directions of propagation or different polarizations of a wave propagating in the medium.

annealing In everyday parlance annealing simply means to heat to the glowing state. In technology annealing implies complete heat treatment. In heat treatment context, the term annealing is best employed in conjunction with qualification such as full annealing, isothermal annealing etc.

annotate To add explanatory text to computer programming or any other instructions.

annular conductor A conductor consisting of a number of wires stranded in three reversed concentric layers surrounding a saturated hemp core.

annular resistance thermometer A special configuration of resistance thermometer with sensors made with annular elements that permit a tight fit against the inner wall of a thermowell. The tight fit and the small heat capacity of the sensor and attached components cause this sensor-thermowell combination to have a fast response.

annular transistor A mesa transistor in which the semiconductor regions are arranged in concentric circles about the emitter.

annunciator An indicating device that displays a legend illuminated internally on receipt of an initiating signal.

anode 1. The positive electrode such as the plate of a vacuum tube. **2.** In a cathode-ray tube, the electrodes connected to a source of positive potential. These anodes are used to concentrate and accelerate the electron beam for focusing. **3.** The less noble and/or higher-potential electrode of an electrolytic cell at which corrosion occurs.

anode cleaning Electrolytic cleaning in which the metal to be cleaned is made the anode.

anode terminal (of a semiconductor diode) The terminal which is positive with respect to the other terminal when the diode is biased in the forward direction.

anode voltage The potential difference existing between the anode and cathode.

anodization The formation of an insulating oxide over certain elements, usually metals, by electrolytic action. Anodization is particularly useful where protection of a conductor is required.

anoxic (water quality) A condition in which the concentration of dissolved oxygen is so low that certain groups of micro-organisms prefer oxidized forms of nitrogen, sulfur, or carbon as an electron acceptor.

ANSII American National Standard for Computer Information Exchange.

ANSI American National Standards Institute, Inc. (formerly called USASI). ANSI is established by law as the organization responsible for standards developed in the United States that will be used in international trade. ANSI is a consensus organization and generally draws from other consensus standards organizations such as the American Society for Testing and Materials (ASTM), the Instrument Society of America (ISA), the American Society of Mechanical Engineers (ASME), and others. ANSI standards have often been pioneering for international standards.

ANSI keyboard Abbreviation for American National Standards Institute keyboard. A typewriter standard unit that offers a choice of uppercase characters only or uppercase and lowercase combined.

ANSI standards A series of standards recommended by ANSI.

answerback 1. The response of a terminal to remote control signals. **2.** A signal sent by a data receiver to a data transmitter indicating that it is ready to receive data or is acknowledging the receipt of data. See also handshaking.

answerback, voice (VAB) This refers to an audio response unit which can link a computer system to a telephone network to provide voice responses to inquiries made from telephone-type terminals. The radio response is composed from a vocabulary prerecorded in a digital-coded voice or a disk-storage device.

answering The process of responding to a calling station to complete the establishment of a connection between data stations.

antenna A transducer which either units emits radio frequency power into space from a signal source or intercepts an arriving electromagnetic field, converting it into an electrical signal.

anti-cavitation trim A combination of plug and seat ring or plug and cage that by its geometry permits non-cavating operating or reduces the tendency to cavitate, thereby minimizing damage to the valve parts, and the downstream piping.

anticipatory control The term appears to be used loosely to describe any control strategy which has the effect of advancing controller response: e.g. some manufacturers use it to describe derivative action.

anticipatory paging The transfer of a page from auxiliary storage to real storage prior to the moment of need.

anticoincidence circuit 1. A specific logic element which operates with binary digits and is designed to provide input signals according to specific rules; one digit is obtained as output only if two different input signals are received. **2.** A circuit that produces a specified output pulse when one (frequency predesignated) of two inputs receives a pulse and the other receives no pulse within an assigned time interval.

anti-extrusion ring, back-up ring Device in the form of a ring which prevents extrusion of a seal into a clearance between the two parts being sealed.

antifoam, defoamer A substance which has the ability to prevent formation of foam.

anti-freeze (fluid power systems) Any substance introduced into the working fluid which depresses the freezing point, applicable only to fluids which contain water.

antilogarithm The number from which a given logarithm is derived. For example, the logarithm of 4261 is 3.6295. Therefore the antilogarithm of 3.6295 is 4261.

antinode In a space where a standing wave exists, a point or a locus at which the amplitude of a specified quantity has maximum value.

anti-noise trim (control valves) A combination of plug and seat ring or plug and gage that by its geometry reduces the noise generated by fluid flowing through the valve.

anti-overshoot The effect of a control function or a device that causes a reduction in the transient overshoot. Note: Anti-overshoot may apply to armature current, armature voltage, field current, etcetera.

antiplugging protection The effect of a control function or a device that operates to prevent application of counter torque by the motor until the motor speed has been reduced to an acceptable value.

antipump device (pump-free device) A device that prevents reclosing after an opening operation as long as the device initiating closing is maintained in the position for closing.

antireflection coating (optical communication) A thin, dielectric or metallic film (or several such films) applied to an optical surface to reduce the reflectance and thereby increase the transmittance.

anti-rust paper Anti-tarnish paper intended for articles of iron or steel.

antistatic material E.S.D.-protective material having a surface resistivity greater than 10^5 but not greater than 10^{11} ohms per square.

AOD process Argon Oxygen Decarburization. A bottom blowing process used primarily for the production of stainless and other grades of high alloy steel.

AOL Application Orientated language.

APC Automatic Phase Control.

APD See avalanche photodiode.

APEC All Purpose Electronic Computer.

aperiodic circuit A circuit in which it is not possible to produce free oscillations.

aperiodic damping A degree of damping so large that the system, after having been subjected to a single constant or instantaneous disturbance, tends to a state of equilibrium, without oscillating about it.

aperture 1. An opening in a data medium or device such as a card or magnetic core; e.g. the aperture in an aperture card combining a microfilm with a punched card or a multiple aperture core. **2.** A part of a mask that permits retention of the corresponding portions of data.

aperture card A processable card of standard dimensions into which microfilm frames can be inserted.

aperture time The time required, in a sample-and-hold-circuit for the switch to open after the hold command has been given.

aphotic zone (water quality) That part of a body of water in which there is insufficient light for effective photosynthesis.

API 1. The American Petroleum Institute. **2.** Automatic Program Interrupt. **3.** Application Programming Interface. An interface that enables programs written by users or third parties to communicate with certain IBM program products.

API gravity Gravity (weight per unit of volume) of crude oil or other liquid hydrocarbon as measured by

a system recommended by API. API gravity bears a relationship to true specific gravity but is more convenient to work with than the decimal fractions that would result if petroleum were expressed in specific gravity.

APL A Programming Language. A problem solving language designed for use at remote terminals; it offers special capabilities for handling arrays and for performing mathematical functions.

apparatus A general designation for large electrical equipment such as generators, motors, transformers, circuit breakers etc.

apparent density, bulk density Mass divided by bulk volume.

apparent power In an ac circuit, the power value obtained by simple multiplication of current by voltage with no consideration of the effect of phase angle. (Compare to true power). Unit for measurement of apparent power is voltampere, symbol VA (SI unit).

apparent power loss For voltage-measuring instrument, the product of nominal end-scale voltage and the resulting current. For current-measuring instruments, the product of the nominal end-scale current and the resulting voltage. For other types of instruments, (for example, wattmeters), the apparent power loss is expressed for a stated value of current or voltage. Also called volt-ampere loss.

apparent transmission loss Is defined as the difference between the internal sound-power level of the pipe crosssection and the power level radiated by a length of pipe of equivalent area. It includes the effect of structureborne vibrations.

apparent viscosity Viscosity of a non-Newtonian fluid under given conditions. Same as consistency.

appendix Supplementary material at the end of a book. Plural: Appendixes or appendices.

application Pertaining to computers, the system or problem to which a computer is applied. Reference is often made to computation, data processing, and control as the three categories of application.

application – orientated language 1. A computer-oriented language with facilities or notations applicable primarily to a single application area; for example, a language for statistical analysis or machine design. **2.** A problem-orientated language whose statements contain or resemble the terminology of the occupation or profession of the user.

application data storage Pertaining to programmable controller systems, the application data storage provides for memory locations to store I/O image table and data (e.g. set values for timers, counters, alarm conditions, parameters and recipes for the machine or the process) required during the execution of the application program.

application module (AM) A module in the Local Control Network (Honeywell TDC 3000 control systems) that processes data points to provide supervisory control. Standard algorithms and custom programs written in Control Language are used to process data points.

application process An element within a system that performs the information/data processing for a particular application.

application program Software generally prepared by the user, containing statements of control algorithms, references to other programs, and other special parameters required by the executive software.

application program (programmable controllers) A logical assembly of all the programming language elements and constructs necessary for the inten-

ded signal processing required for the control of a machine or process by a PC system.

application program storage (programmable controllers) Pertaining to programmable controller system, the application program storage provides for memory locations to store a series of instructions whose periodic or event driven execution determine the progression of the machine or the process.

application software Programs which are unique to a specific process control system installation or other specific installations, rather than general purpose and of broad applicability.

application software Software specifically produced for the functional use of a computer system.

approach channel An approach channel is the passage through which the fluid must pass to reach the operating parts of a pressure relief device.

approach channel (liquid level measurements in open channels) The reach of the channel immediately upstream of the gaging structure in which suitable flow conditions have to be established to ensure correct gaging.

approach velocity See velocity of approach.

approval An act of endorsing or adding positive authorization or both. Note: Approval ratifies the permission to use the qualification statements.

apron Pertaining to the pulp and paper industry, a cloth or plate of flexible material which provides a seal to prevent loss of stock as it flows onto the wire.

APT Atomatically Programmed Tools; a numerical control language.

AQL Acceptable Quality Level.

aqueous fluid (fluid power systems) Fluid which contains water as a major constituent besides the organic material. The fire resistant properties are derived from the water.

aquifer Water-bearing formation (bed or stratum) of permeable rock, sand, or gravel capable of yielding significant quantities of water.

Ar Chemical symbol for argon.

arbor 1. In machine grinding, the spindle for mounting and driving the grinding wheel. **2.** In machine cutting, such as milling the shaft for holding and driving a rotating cutter. **3.** Generically, the principal spindle or axis of a rotating machine which transmits power and motion to other parts. **4.** In metal founding, a bar, rod or other support embedded in a sand core to keep it from collapsing during pouring.

arc heating (electric furnaces) Arc heating can be applied through two methods (a) arcs pass between electrodes supported in the furnace above the metal. In this method known as indirect-arc heating, the metal is heated solely by radiation from the arcs. Or (b) arcs pass from the electrodes to the metal. In this method known as direct-arc heating, the current flows through the metal charge so that the heat developed by the electrical resistance of the metal, though relatively small in amount, is added to that radiated from the arcs.

architectural design 1. The process of defining a collection of hardware and software components and their interfaces to establish a framework for the development of a computer system. **2.** The result of the architectural design process.

architectural resources The integrating elements used to build a CIM (Computer Integrated Manufacturing) system. Resources can be categorized as interfaces, protocols or handlers and management tools.

architecture See program architecture, system architecture.

archive file A file out of a collection of files set aside for later research or verification, for security or for any other purposes.

archiving The storage of backup files and any associated journals, usually for a given period of time.

arcing The production of an arc, for example, at the brushes of a motor or at the contact of a switch.

arcing contacts Special contacts on which the arc is drawn after the main contacts of a switch or circuit breaker have opened.

area (in programming languages) A space together with a mechanism for inserting data objects into it, and for accessing and for deleting data objects from it.

area 1. A specific section of storage set aside for some particular purpose or use in data processing. **2.** For measurement of area in SI units see under square metre.

area flowmeters Area type of flow meters, are constructed such that the area of flow restriction varies so as to hold the differential pressure constant. The volume flow rate is inferred by the change in area. Common forms of the area meter are the tapered tube and float, the cylinder and piston, the orifice and plug, and the rotameter. See also variable area flowmeter.

areometer An instrument for measuring specific gravity of liquids; a hydrometer.

argand plane A graphical representation of a vector used in complex notation.

argon-oxygen decarburization (AOD) process See AOD process.

argument 1. An independent variable, e.g., in looking up a quantity in a table, the number or any of the numbers which identifies the location of the desired value; or in a mathematical function the variable which, when a certain value is substituted for it, determines the value of the function. **2.** An operand in an operation on one or more variables. See also parameter. **3.** An independent variable, or any value of an independent variable. **4.** Synonymous with input parameter or output parameter. This definition applies to IEC standard (draft) for programmable controllers, part 3 programming languages.

argument (in numerical control) Data which qualifies a command.

argument error The error caused when there is a difference between the true and actual value of an argument and the value used for the computation.

ARI Air-conditioning and Refrigeration Institute.

arithmetical instruction See arithmetic instruction.

arithmetic check An operation performed by the computer to reveal any failure in an arithmetic operation. Can also be used to ascertain whether the capacity of a register has been exceeded after an operation. Same as mathematical check.

arithmetic element See arithmetic unit.

arithmetic expression An expression containing any combination of data names, numeric literals, and named constants, joined by one or more arithmetic operators in such a way, that the expression as a whole can be reduced to a single numeric value.

arithmetic floating point Calculation that automatically accounts for location of radix point.

arithmetic instruction, arithmetical instruction An instruction in which the operation part specifies an arithmetic operation.

arithmetic logic unit (ALU) A functional unit of a computer which carries out arithmetic and/or logic operations with data.

arithmetic mean Usually, the same as average. It is obtained by first adding quantities together and then

dividing by the number of quantities involved. It also means a figure midway between two extremes and is found by adding the minimum and maximum together and dividing by two.

arithmetic operation 1. An operation that follows the rules of arithmetic. Contrasted with logical operation. **2.** Pertaining to test measurement and diagnostic equipment, operations in which numerical quantities form the elements of the calculation.

arithmetic organ See arithmetic unit.

arithmetic overflow The portion of a numeric word expressing the result of an arithmetic operation by which its word length exceeds the word length provided for the number representation.

arithmetic reactive factor The ratio of the reactive power to the arithmetic apparent power.

arithmetic register A register that holds the operands or the results of operations such as arithmetic operations or logic operations.

arithmetic shift A shift, applied to the representation of a number in a fixed radix numeration system and in a fixed-point representation system, in which only the characters representing the fixed point part of the number are moved. Note: **1.** An arithmetic shift is usually equivalent to multiplying the number by a positive or a negative integral power of the radix, except for the effect of any rounding. **2.** Compare the logical shift with the arithmetic shift, especially in the case of floating-point representation.

arithmetic sum The sum of two or more quantities regardless of their signs.

arithmetic underflow In an arithmetic operation, a result whose absolute value is so small to be represented within the range of the numeration system in use. Examples: **1.** The condition existing, particularly when a floating-point representation system is used, when the result is smaller than the smallest non-zero quantity that can be represented. **2.** The result may underflow because of the generation of a negative exponent that is outside the permissible range.

arithmetic unit, logic unit, arithmetic and logic unit, ALU (abbreviation) In a processor, the part that performs arithmetic operations (logic operations), (arithmetic operations and logical operations). Note: The term "arithmetic unit" is sometimes used for a unit that performs both arithmetic and logic operations.

ARL Acceptable Reliability Level.

arm (primary axes) (industrial robots) An interconnected set of links and powered joints comprising members of longitudinal shape which supports, positions and orientates the wrist and/or an end effector.

armature (of a relay) The moving element of an electromechanical relay that contributes to the designed response of the relay, and which usually has associated with it a part of the relay contact assembly.

armature The core and windings of the rotor in an electric motor or generator.

armature band A thin circumferential structural member applied to the winding of a rotating armature to restrain and hold the coils so as to counteract the effect of centrifugal force during rotation. Note: Armature bands may serve the further purpose of archbinding the coils. They may be on the end windings only, or may be over the coils within the core.

armature coil A unit of the armature winding composed of one or more insulated conductors. Pertains to rotating machinery.

armature core A core on or around which armature windings are placed.

armature voltage control A method of controlling the speed of a motor by means of a change in the magnitude of the voltage impressed on its armature winding.

armature winding Pertaining to rotating machinery, the winding in which alternating voltage is generated by virtue of relative motion with respect to a magnetic flux field.

Armco process A direct reduction process where fired iron-oxide pellets and lump ore are reduced in a continuous vertical-shaft furnace by reformed natural gas.

armed interrupt Interrupts may be armed or disarmed. An armed interrupt accepts and holds the interruption signal. A disarmed interrupt ignores the signal. An armed interrupt may be enabled or disabled. An interrupt signal for an enabled condition causes certain hardware processing to occur. A disabled interrupt is held waiting for enablement.

armed state The state of an interrupt level wherein it can accept and remember an interrupt input signal.

armour A braid or wrapping of metal, usually steel, placed over the insulation of wire or cable to protect it from abrasion or crushing.

Armstrong oscillator A oscillator in which feedback is achieved through coupled plate and grid circuit coils.

aromatics A group of hydrocarbon fractions that forms the basis of most organic chemicals so far synthesized. The name aromatics is derived from their rather pleasant odor. The unique ring structure of their carbon atoms makes it possible to transform aromatics into an almost endless number of chemicals. Benzene, toluene, and xylene are the principle aromatics and are commonly referred to as the BTX group.

arrangement drawing Assembly drawing simplified or supplemented to give information needed for a certain purpose.

array 1. An arrangement of elements in one or more dimensions. See also matrix and vector, definition. **2.** In a computer program a named ordered collection of elements all of which have identical data attributes.

array (in programming languages) An aggregate that consists of data objects, with identical attributes, each of which may be uniquely referenced by subscripting.

array processor A hardware device that processes data arrays; Fast-Fourier transform (FFT) and power spectral density (PSD) are typical processes.

array processor, vector processor A processor capable of executing instructions in which the operands can be arrays of data and not only single elements. Note: In a special case where the array processor works on single elements, such element are called "scalars".

ART Automated Reasoning Tool, is an expert system software development environment from Inference-Corporation. ART provides knowledge engineers with a comprehensive set of knowledge representation and storage techniques and graphics capabilities for building expert systems. (DEC).

artificial intelligence 1. The design of computer and other data processing machinery to perform increasingly higher-level cybernetic functions. **2.** The capacity of a device to perform functions that are normally associated with human intelligence such as reasoning, learning, judgement, pattern recognition, self-improvement, planning and problem solving.

artificial language 1. A language whose rules are explicitly established prior to its use. **2.** See formal language. **3.** A language specifically designed for ease

of communication in a particular area of endeavor, but one that is not yet natural to that area. This is contrasted with a natural language which has evolved through long usage.

artificial mains network A network inserted in the supply mains lead of the apparatus to be tested that provides a specified measuring impedance for interference voltage measurements and isolates the apparatus from the supply mains at radio frequencies. Pertains to electromagnetic compatibility.

artificial neural network See neural network.

art paper Coated normally wood free letterpress printing paper with a surface suitable for multi-color printing from blocks with fine screens.

artwork 1. A topological pattern of an integrated circuit, made with accurate dimensions so that it can be used in mask making. Generally it is a large multiple of the final mask size, and final reductions is accomplished through the use of a step- and repeat camera. **2.** Detailed, original drawing (often developed with the aid of a computer) showing layout of an integrated circuit. **3.** The images fomed by drawing, scribing, or by cutting and stripping on a film or glass support which are reduced and repeated to make a photomask or intermediate. **4.** Layouts and photographic films created to produce thick-film screens and thin-film masks.

As Chemical symbol for arsenic.

as – is plant A description of the subject entity of a CIM study at the current time or prior to CIM implementation.

ASA 1. Acoustical Society of America. **2.** American Standards Association. (Later USASI, now ANSI).

ASA control character See American National Standard control character.

asbestos board Board consisting of asbestos fibers and possibly binders and fillers.

ASC Accredited Standard Committee. A standards committee accredited to ANSI.

ASCII A contraction for "American Standard Code for Information Interchange". This standard defines the codes for a character set to be used for information interchange between equipments of different manufacturers. Also known as USASII.

ascender Part of a character that rises above the main line of printer characters.

ASEE 1. Association of Supervisory and Executive Engineering (in UK). **2.** Association of Supervising Electrical Engineers (in USA).

as-fabricated Describing the condition of a structure or material after assembly, and without any conditioning treatment such as a stressrelieving heat treatment; specific terms such as as-welded, as-brazed or as-polished are used to designate the nature of the final step in fabrication.

ash The noncombustible inorganic matter in the fuel.

ash content 1. The ratio of the weight of the residue after combustion to the weight before combustion. **2.** Percentage in weight of the residue after calcination of the fluid under defined conditions.

ASHRAE American Society, Heating Refrigerating and Air-Conditioning Engineers.

ASIC Application Specific Integrated Circuits.

ASME American Society of Mechanical Engineers.

ASN. 1 Abstract Syntax Notation One. An ISO standard (DIS 8824 and DIS 8825) that specifies canonical method of data encoding.

asphalt A solid hydrocarbon found as a natural deposit. Crude oil of high asphaltic content, when subjected to distillation to remove the lighter fractions such as naptha and kerosene, leave asphalt as a residue.

Asphalt is dark brown or black in color and at normal temperature is a solid.

aspirating burner A burner in which the fuel in a gaseous or finely divided form is burned in suspension, the air for combustion being supplied by bringing into contact with the fuel, air drawn through one or more openings by the lower static pressure created by the velocity of the fuel stream.

ASR 1. Automatic Send/Receive. 2. Automatic Speech Recognition.

assemble To translate a program expressed in an assembly language into a machine language and perhaps to link subroutines. Assembling is usually accomplished by substituting machine language operation codes for assembly language operation codes and by substituting absolute addresses, immediate addresses, relocatable addresses, or virtual addresses for symbolic addresses. Contrast with compile, interpret.

assemble duration The elapsed time taken for the execution of an assembler.

assembler, assembly program A computer program used to assemble. Contrast with compiler, interpreter.

assembling time The elapsed time taken for the execution of an assembler.

assembly 1. A number of basic parts or subassemblies, or any combination thereof, joined together to perform a specific function. The application, size, and construction of an item may be factors in determining whether and items is regarded as a unit, an assembly, a subassembly, or a basic part. 2. The output of an assembler. 3. A mid-level computer language.

assembly drawing Drawing representing the spatial position and shape of a group of assembled parts, normally drafted to scale.

assembly language 1. A computer-orientated language whose instructions are usually in one-to-one correspondence with computer instructions but facilities such as the use of macro instructions may be provided. Contrast with machine language, higher order language. See also assemble, assembler. 2. A machine-specific language whose instructions are usually in one-to-one correspondence with computer instructions.

assembly list A printed list which is the by-product of an assembly procedure. It lists in logical sequence all details of a routine showing the coded and symbolic notation next to the actual notations established by the assembly procedure. This listing is highly useful in the debugging of a routine.

assembly program See assembler.

assembly routine See assembler.

assertion A logical expression specifying a program state that must exist or a set of conditions that program variables must satisfy at a particular point during program execution; for example, A is positive and A is greater than B. See also input assertion, output assertion.

assessed failure rate The failure rate of an item determined by a limiting value or values of the confidence interval associated with a stated confidence level, based on the same data as the observed failure rate of nominally identical items.

assessed mean life The mean life of an item determined by a limiting value or values of the confidence interval associated with a stated confidence level, based on the same data as the observed mean life of nominally identical items.

assessed mean time between failures The mean time failures of an item determined by a limiting value

or values of the confidence interval associated with a stated confidence level, based on the same data as the observed mean time between failures of nominally identical items.

assessed mean time to failure The mean time to failure of an item determined by a limiting value or values of the confidence interval associated with a stated confidence level, based on the same data as the observed mean time to failure of nominally identical items.

assessed reliability The reliability of an item determined by a limiting value or values of the confidence interval associated with a stated confidence level, based on the same data as the observed reliability of nominally identical items.

assign The particular action which reserves portions of computing systems (usually memory units) for specific purposes.

assigned value The best estimate of the value of a quantity. The assigned value may be from an instrument reading, a calibration result, a calculation, or other.

assignment (programming languages) A mechanism to give a value to a variable. Note: This term also applies to the use of the mechanism.

assignment by name (programming languages) An assignment of a record value to a record variable pertaining only to those components with matching identifiers.

assignment display A display that provides a means to initiate on-line operational functions such as date setting, alarm scanning, clock adjustment, etc. Refers to Honeywell TDC 3000 control systems.

assignment list (programmable controllers) A list showing the correspondences between absolute or logical addresses and the symbolic addresses assigned to them.

assignment statement An instruction used to express a sequence of operations, or used to assign operands to specified variables, or symbols, or both.

association The combining of ions into larger ion clusters in concentrated solutions.

associative storage, content-addressed storage A storage device whose locations are identified by their contents, or by part of their contents, rather than by their names or positions.

assumed-size aggregate (programming languages) An aggregate formal parameter that takes some or all of its subscript ranges from a corresponding actual parameter.

asymmetrical input (output) A three terminal input (output) circuit where the nominal values of the impedances between the common terminal and each of the other two terminals are different. Note: The common terminals of the input and the output need not necessarily both be accessible, nor need they be at the same potential.

asymmetry The lack of symmetry between parts of a magnitude.

ASTA Abbreviation for The Association of Short Circuit Testing Authorities. Authorised testing society (in UK). Others are BASEC, BEAB and BSI.

astable Pertaining to a device that has two temporary states, alternating between those states.

astatic Without polarity; independent of the earth

astatic Without polarity; independent of the earth's magnetic field.

astatic control Type of control with zero-offset coefficient in every point of the control characteristic.

astatic measuring instrument An instrument in which the measuring element is so constructed as to

be unaffected by uniform magnetic fields of external origin.

ASTM American Society for Testing and Materials.

ASWG American Steel Wire Gage.

asymmetry potential The difference in potential between the inside and outside pH sensitive glass layers when they are both in contact with 7 pH solutions. It is caused by deterioration of the pH sensitive glass layers or contamination of the internal fill of the measurement electrode.

asymptote A line which comes nearer and nearer a given curve but never touches it.

asymptotic availability For modelling purposes, the limit, if this exists, of the instantaneous availability when the time tends to infinity.

asymptotic unavailability For modelling purposes, the limit, if this exists, of the instantaneous unavailability when the time tends to infinity.

asynchronous A mode of operation in which an operation is started by a signal before the operation on which this operation depends is completed. When referring to hardware devices, it is the method in which each character is sent with its own synchronizing information. The hardware operations are scheduled by "ready" and "done" signals rather than by time intervals. This implies that a second operation can begin before the first operation is completed.

asynchronous motor An ac motor whose speed is not proportional to the frequency of the supply voltage.

asynchronous procedure A procedure that can be executed concurrently with the calling part of the program.

asynchronous serial transmission The technique used by most electromechanical serial devices such as teletypewriters. With this technique, each character consists of three parts: a start bit, the data bits and a stop bit.

asynchronous transmission A mode of data transmission such that the time of occurrence of the start of each character, or block of character, is arbitrary; once started the time of occurrence of each signal representing a bit within the character, or block, has the same relationship to significant instants of a fixed time frame.

At Chemical symbol for astatine.

ATC Authorization to Copy.

ATE Automatic Test Equipment.

ATE (automatic test equipment) control software Software used during execution of a test program which controls the nontesting operations of the ATE. This software is used to execute a test procedure but does not contain any of the stimuli or measurement parameters used in the testing of the Unit Under Test (UUT). Where test software and control software are combined in one inseparable program, that program will be treated as test software not control software.

ATE (automatic test equipment) orientated language A computer language used to program an automatic test equipment to test units under test (UUT's), whose characteristics imply the use of a specific ATE system or family of ATE systems.

ATE (automatic test equipment) support software Computer programs which aid in preparing, analyzing, and maintaining test software. Examples are: ATE compilers, translation, analysis programs, and punch/print programs.

athermal transformation (heat treatment)

Transformation independent of the application or removal of heat. Compare with isothermal transforma-

tion. An athermal transformation does not imply any diffusion and is therefore generally not dependent on any particular time period.

ATLAS A standard abbreviated English language used in the preparation and documentation of test procedures or test programs which can be implemented either manually or with automatic or semiautomatic test equipment. The ATLAS language is defined in ANSI/IEEE Std 416-1978.

ATM See atmosphere.

atometer A generic name for any instrument that measures evaporation rates.

atmosphere 1. A unit of pressure defined as the pressure of 760 mm of mercury at 0°C. Approx. 14.7 pounds per square inch. **2.** The body of air surrounding the earth.

atmospheric communication Sending signals in the form of modulated light through the atmosphere, without the use of fiber optics to contain and direct the beam.

atmospheric corrosion Corrosion that occurs naturally due to exposure to climatic conditions.

atmospheric pressure The barometric reading of pressure exerted by the atmosphere.

atomic actions Actions which are either carried to completion or not carried out at all. These actions are required by many algorithms for maintaining the integrity of a database system.

atomic fission See nuclear fission.

atomic fuel A fissionable material, i.e., one in which the atomic nucleus may be split to release energy.

atomic mass unit A unit for expressing atomic weights and other small masses.

atomic migration The progressive transfer of a valence electron from one atom to another within the same molecule.

atomic number The number of protons (positively charged particles) in the nucleus of an atom. All elements have different atomic numbers, which determine their positions in the periodic table.

atomic theory A generally accepted theory concerning the structure and composition of substances and compounds. It states that everything is composed of various combinations of ultimate particles called atoms.

atomic weight The approximate weight of the number of protons and neutrons in the nucleus of an atom. The atom weight of oxygen, for example, is approximately 16 (actually 16.0044), it contains 8 neutrons and 8 protons. If expressed in grams, these weights are called gram atomic weights.

ATPG Automatic Test Pattern Generation.

attached equipment (control valves) The auxiliary equipment which must be located on the valve or actuator. Compare adjacent equipment.

attached jet Jet which is attached to a wall by Coanda effect.

attack time The interval required for an input signal, after suddenly increasing in amplitude, to attain a specified percentage (usually 63 percent) of the ultimate change in amplification or attenuation due to this increase.

attained pose (industrial robots) The pose achieved by the robot in response to the command pose.

attenuation Regulating the temperature of a substance.

attention key A function key on terminals that causes an interruption of execution by the central processing unit.

attenuate To reduce the amplitude of a signal.

attenuation (fiber optics) In an optical waveguide, the diminution of average optical power. Note: In optical waveguides, attenuation results from absorption, scattering, and other radiation. Attenuation is generally expressed in decibels (dB). However, attenuation is often used as a synonym for attenuation coefficient, expressed in dB/km. This assumes the attenuation coefficient is invariant with length.

attenuation The ratio of the output to the input values of quantities of the same kind in a device or system when less than unity.

attenuation along pipe Refers to the attenuation of internal sound power within the pipe due to external radiation and energy dissipation in the fluid.

attenuation coefficient (optical communication) 1. The real part of the propagation coefficient. 2. Limit of the quotient of attenuation between two points on the axis of a transmission line or wave guide by the distance between the points when this distance tends to zero.

attenuation compensation The use of networks to correct for varying attenuation, i.e. in transmission lines.

attenuation constant Pertaining to fiber optics, for a particular mode, the real part of the axial propagation constant. The attenuation coefficient for the mode power is twice the attenuation constant.

attenuation distortion Distorsion due to variation of loss or gain within a frequency.

attenuation equalizer A modem or peripheral device designed to compensate for undesired levels of signal strength.

attenuation loss (optical communication) 1. A decrease between two points of an electromagnetic power. 2. The quantitative expression of power decrease which may be expressed by the ratio of the values at two points of a quantity related to power in a well defined manner. Note: Attenuation is generally expressed in logarithmic units, such as decibels.

attenuation pad See pad.

attenuator A device for reducing the value of an electrical quantity according to a determined ratio.

attitude error (electrical transducers) The error due to the orientation of the transducer relative to the direction in which gravity acts upon the transducer (see acceleration error).

atto Prefix meaning 10^{-18} . Letter symbol is a.

attracted-armature relay The attracted-armature relay comprises an iron-cored electromagnet which attracts an armature which is pivoted, hinged or otherwise supported to permit motion in the magnetic field.

attribute A data fact about an entity or relationship.

AU Arithmetic Unit.

Au Chemical symbol for gold.

auctioneering device A device which automatically selects either the highest or the lowest input signals. Sometimes referred to as a signal auctioneer or high or low signal selector.

audible Capable of being heard, in most contexts by the average human ear.

audio communication line A line attached to an audio response unit. An audio communication line is always a switched line.

audio frequencies (af) Frequencies that can be heard by the human ear (usually 15 hertz to 20 000 hertz).

audio-frequency distortion The form of wave distortion in which the relative magnitudes of the different frequency components of the wave are changed on either a phase or amplitude basis.

audiogram (threshold audiogram) A graph showing hearing level as a function of frequency.

audiometer An instrument used to measure the ability of people to hear sounds.

audio response unit (ARU) An output device, that provides a spoken response to digital inquiries from a telephone or other device. The response is composed from a prerecorded vocabulary of words and can be transmitted over communication lines to the location from which the inquiry originated.

audio terminal A device associated with an audio response unit (ARU), at which keyed or dialed data is entered for transmission to the computer; an audio response is produced by the ARU.

audit 1. An activity to determine through investigation, the adequacy of an adherence to established procedures, instructions, specifications, codes and standards or other applicable contractual and licensing requirements, and the effectiveness of implementation.

audit programming Use of a program designed to enable use of the computer as an auditing tool.

augend In an addition operation, a number or quantity to which numbers or quantities are added.

augment (information processing) An independent variable, for example, in looking up a quantity in a table, the number or any of the numbers, that identifies the location of the desired value.

austempering Hardening (of steel) to produce a predominantly bainitic structure.

austenite Solid solution in gamma iron of one or more elements, usually including carbon.

austenitizing Heat treatment for the purpose of altering the structure to a more or less pure austenite state.

(data) authentication A process used to verify the integrity of transmitted data, especially a message. Not to be confused with user authentication.

auto-answer A machine feature that allows a transmission control unit or a station to respond to a call automatically that it receives over a switched line.

autoclave An airtight vessel for heating its contents and sometimes agitating them; it usually uses high pressure steam to perform processing, sterilizing or cooking steps using moist or dry heat.

autocode Use of the computer itself to develop the machine-coded program from macro codes; i.e., the conversion of symbolic codes for operations and addresses.

autocollimation photoelectric switch A photoelectric reflex switch in which the light emitter and light receiver have a common optical axis.

autocollimation photoelectric proximity switch A photoelectric proximity switch in which the optical axes of the light emitter and light receiver coincide.

AUTOFACT A yearly trade show sponsored by the Society of Manufacturing Engineers. It specializes in the technology of CAD/CAM.

automata A plural form of automation.

automate To convert a process or equipment to automatic operation.

automated design tool A software tool that aids in the synthesis, analysis, modelling, or documentation of a software design. Examples include simulators, analytic aids, design representation processors, and documentation generators.

automated management All types of management completed with the aid of data processing equipment but usually depicted in a more specialized terms as automated production management etc.

automated test case generator See automated test generator.

automated test generator A software tool that accepts as input a computer program and test criteria, generates test input data that meet these criteria, and, sometimes, determines the expected results.

automated verification system A software tool that accepts as input a computer program and a representation of its specification, and produces, possibly with human help, a correctness proof or disproof of the program. See also automated verification tools.

automated verification tools A class of software tools used to evaluate products of the software development process. These tools aid in the verification of such characteristics as correctness, completeness, consistency, traceability, testability, and adherence to standards. Examples include design analyzers, automated verification systems, static analyzers, dynamic analyzers, and standards enforcers.

automatic Pertaining to a process or device that, under specified conditions, functions without human intervention.

automatic answering Answering in which the called data terminal equipment (DTE) automatically responds to the calling signal.

automatic background control See automatic brightness control.

automatic brightness control Circuit used in some display devices (CRT) to keep average brightness level of screen constant.

automatic calling (in a data network) Calling in which the elements of the selection signal are entered into the data network contiguously at the full data signalling rate.

automatic check For digital computers, a check performed by equipment built into the computer specifically for that purpose, and automatically accomplished each time the pertinent operations is performed. Sometimes referred to as a build-in-check.

automatic circuit closer A self-controlled device for automatically interrupting and reclosing an alternating-current circuit, with a predetermined sequence of opening and reclosing followed by resetting, hold-closed, or lockout operation.

automatic closed-loop control system, automatic monitored control system A closed-loop control system which includes no human operator in the closed-loop. See figure in British Standard 1523.

automatic coding A technique by which a digital computer is programmed to perform a significant portion of the coding of a problem.

automatic control Control in which a direct or indirect human manipulation of the final controlling element is not needed.

automatic control engineering That branch of science and technology which deals with the design and use of automatic control devices and systems.

automatic controller A device that operates automatically to regulate a controlled variable in response to a command and a feedback signal.

automatic controller, automatic regulator A portion of an automatic controlling or regulating system in which a signal representing the controlled condition is compared with a signal representing the command signal and which operates in such a way as to reduce the deviation. Note: The two functions of the automatic controller or regulator, namely to determine the deviation and to generate the control signal dependent on the deviation, are in many devices carried out by two separate parts, the comparing element and the controlling element respectively.

automatic control panel A panel of indicator lights and switches on which are displayed an indication of process conditions, and from which an operator can control the operation of the process.

automatic control system A control system which operates without human intervention. It is subdivided into a controlling system and controlled system.

automatic crossover 1. A type of current-limiting circuit on a power supply provided with an adjustment for setting the short-circuit current to an adjustable maximum value. 2. A term applied to bimodal power supplies (constant voltage/constant current) that describes the transferral from one operating mode to the other at a predetermined value of load resistance.

automatic current limiting An overload-protection mechanism designed to limit the maximum output current of a power supply to a preset value. Usually it automatically restores the output when the overload is removed.

automatic cycle (fluid power systems) Cycle of operations which once started, repeats indefinitely until stopped.

automatic data processing (ADP) 1. Data processing performed by a computer system.

automatic data processing, computer science The branch of science and technology that is concerned with methods and techniques relating to data processing largely performed by automatic means.

automatic dialing unit (ADU) A device capable of generating dialing digits automatically.

automatic digital network Automatic communications network for end-to-end message-switched digital-data communication.

automatic error correction A technique, usually requiring the use of special codes or automatic retransmission, which detects and corrects errors occurring in transmission. The degree of correction depends upon coding and equipment configuration.

automatic extraction turbine Steam is extracted from one or more stages with means for controlling the pressure(s) of the extracted steam.

automatic felt guide See felt guide.

automatic frequency control (AFC) Electronic or mechanical means for automatically compensating (in a receiver) frequency drifts in transmission carrier.

automatic frequency correction See automatic frequency control.

automatic hold In an analog computer, automatic attainment of the hold condition through amplitude comparison of a problem variable, or through an overload condition.

automatic interrupt An automatic programmed-controlled interrupt system that causes a hardware jump to a predetermined location.

automatic learning See machine learning.

automatic line sectionalizer A self-contained circuit-opening device that automatically opens the main electrical circuit through it after sensing and responding to a predetermined number of successive main current impulses equal to or greater than a predetermined magnitude. It opens while the main electrical circuit is deenergized. It may also have provision to be manually operated to interrupt loads.

automatic load The effect of a control function or a device to automatically divide armature currents in a prescribed manner between two or more motors or two or more generators connected to the same load.

automatic machine control equipment An equipment that provides automatic control for functions related to rotating machines or power rectifiers.

automatic/manual station, a/m station A device which enables the process operator to switch between automatic to manual control and to manually control one or more final controlling elements.

automatic mode (industrial robots) The operating mode in which the robot control system can operate in accordance with the task program.

automatic mode of operation The mode of operation of a numerically controlled machine in which it operates in accordance with the control data until stopped by the program or the operator.

automatic opening The opening of a switching device under predetermined conditions without operator intervention.

automatic operation (of a switching device) The ability to complete an assigned sequence of operation by automatic control without the assistance of an attendant.

automatic operation Operating mode in which all functions of the process control system are performed without action of a human operator.

automatic polling See auto poll.

automatic programmed tools (APT) A computer-based numerical control programming system that uses English-like symbolic descriptions of part and tool geometry and tool motion.

automatic programming The process of using a computer to perform some stages of the work involved in preparing a computer program.

automatic regulating system An automatic closed-loop control system the purpose of which is to hold constant the value of the controlled condition or to vary it in a predetermined manner.

automatic reset See reset action.

automatic-reset thermal protector A thermal protector designed to perform its function by opening the circuit to or within the protected machine and then automatically closing the circuit after the machine cools to a satisfactory operating temperature.

automatic restart Circuitry which restarts the equipment after ac power has failed and then resumes. It is sometimes conditional upon the length of the power outage.

automatic reversing Reversing of an electric drive, initiated by automatic means.

automatic selective control or transfer relay A relay that operates to select automatically between certain sources or conditions in an equipment, or performs a transfer operation automatically.

automatic send/receive (ASR) A teletypewriter unit with keyboard, printer, paper tape, reader/transmitter, and paper tape punch. This combination of units may be used on-line, or off-line and, in some cases, on-line and off-line simultaneously.

automatic sequencing The ability of equipment to put information in order or in a connected series without human intervention.

automatic sequential operation, iterative operation The repetition of the algorithm for the solution of a set of equations with successive combinations of initial conditions or other parameters; each successive combination is selected by a subsidiary computation based on a predetermined set of iteration rules.

automatic shut-off valve, maximum flow control valve (fluid control systems) Valve designed to close automatically when the pressure drop across the valve, caused by increased flow, exceeds a predetermined amount.

automatic station A station that operates in automatic control mode. Note: An automatic station may go in and out of operation in response to predetermined

voltage, load, time, or other conditions, or in response to a remote or locally manually operated control device.

automatic storage allocation A mechanism for allocating space to data objects only for the duration of the execution of their scope. Note: Automatic storage allocation is one form of dynamic storage allocation; another form is program controlled storage allocation.

automatic test equipment (ATE) Equipment that is designed to conduct analysis of functional or static parameters to evaluate the degree of performance degradation and may be designed to perform fault isolation of unit malfunctions. The decision making, control, or evaluative functions are conducted with minimum reliance on human intervention.

automatic transfer switch Self-acting equipment for transferring one or more load conductor connections from one power source to another.

automatic voltage regulator A device or circuit which maintains a constant voltage, regardless of any variation in input voltage or load.

automatic zero-and full-scale calibration Zero and sensitivity stabilization by servos for comparison of demodulated zero-and full-scale signals with zero-and full-scale references.

automation 1. The theory, art, or technique of making a process more automatic. **2.** The investigation, design, development, and application of methods of rendering processes automatic, self-moving, or self-controlling. **3.** The conversion of a procedure, a process, or equipment to automatic operation. **4.** The implementation of processes by automatic means.

automation simulation A machine designed to simulate the operations of living things, or to respond automatically to predesigned programs, stimuli, or signals. An automatic or self-acting or reacting system, often with capability to form logic decisions on the basis of programmed criteria, guides, or rules of its designers.

automaton 1. A device that automatically follows predetermined operations or responds to encoded instructions. **2.** Any communication-linked set of elements. **3.** A machine which exhibits living properties. **4.** A mechanism, fixed or mobile, possessing the ability to manipulate objects external to itself under the constant of a programming routine previously supplied by an external intelligence.

automonitor 1. To instruct an automatic digital computer to produce a record of its information-handling operations. **2.** A program or routine for this purpose.

autonomous devices Processors, memories, and input/output devices. Since each device is autonomous (no device is dependent upon another for its timing), a system configuration can include memory modules of different speeds, processors of different types sharing the same memory modules, and standard unique input/output devices (available on some systems).

autopolarity A feature of a digital voltmeter or digital multimeter wherein the correct polarity (either negative or positive) for a measured quantity is automatically indicated on the display.

auto poll A machine feature of a transmission control unit that permits it to handle negative responses to polling without interrupting the central processing unit.

auto reboot Part of an automatic restart routine that transfers a small program (bootstrap) from mass memory (typically) to main memory. When the bootstrap program is executed, it transfers appropriate routines

to main memory for execution. Refers to Honeywell TDC 3000 control systems.

auto-restart A specific capability of a computer system designed to perform automatically various initialization functions usually required to resume operation following various equipment or power failures.

autotransformer A transformer in which at least two windings have a common section.

autotransformer starting The process of starting a motor at reduced voltage by connecting the primary winding to the supply initially through an autotransformer and reconnecting the winding directly to the supply at rated voltage for the running conditions.

autotrophic bacteria, chemolithotropic bacteria (water quality) Bacteria which are able to multiply by using inorganic matter as the only source of carbon and nitrogen.

auto-tuning controllers Continuous adaptive controllers utilizing tuning procedures based on an analysis of the process error response and not utilizing a process model.

AUTRAN Automatic Utility Translator. AUTRAN is a process control language and system offered by Control Data Corporation.

AUX Auxiliary.

auxiliaries A family of analog circuit cards that perform an array of computational and/or signal conditioning functions on input signals. Typically of these circuit cards are MV/I converters, integrators, alarms, square root extraction, scale and bias, and signal isolators. Refers to Honeywell TDC 3000 control systems.

auxiliary circuit Any circuit other than the main circuit.

auxiliary console As contrasted to main consoles, some computers or units have additional banks of controls, displays, switches, and other devices for operator manipulation or visual access to operations.

auxiliary device Generally, any device which is separate from a main device but which is necessary or desirable for effective operation of the system.

auxiliary function In automatic control of machine tools, a machine function other than the control of the motion of a workpiece or cutter, e.g., control of machine lubrication and cooling.

auxiliary memory See auxiliary storage.

auxiliary operation An operation performed by equipment not under continuous control of the computer central processing unit.

auxiliary or back-up pneumatic power supply See under back-up pneumatic power supply.

auxiliary power supply A power source supplying power other than load power as required for the proper functioning of a device.

auxiliary relay A relay whose function is to assist another relay or control device in performing a general function by supplying supplementary actions.

auxiliary storage 1. A storage device in addition to the main storage of a computer, e.g., magnetic tape, disk, magnetic drum or core. Auxiliary storage usually holds much larger amounts of information than the main storage, and the information is accessible less rapidly. Contrasted with main storage. **2.** Storage that is accessible to a processor only through input-output channels. Synonymous with external storage. Note: An external storage may sometimes be considered as peripheral equipment.

auxiliary switch A switch mechanically operated by the main device for signalling, interlocking, or other purposes.

auxiliary winding (single-phase induction motor) A winding that produces poles of a magnetic flux

field that are displaced from those of the main winding, that serves as a means for developing torque during starting operation, and that, in some types of design, also serves as a means for improvement of performance during running operation. An auxiliary winding may have a resistor or capacitor in series with it and may be connected to the supply line or across a portion of the main winding.

AUXS Auxiliaries.

availability 1. The probability that software will be able to perform its designated system function when required for use. **2.** The ratio of system up-time to total operating time. **3.** The ability of an item to perform its designated function when required for use.

availability (performance) The ability of an item to be in a state to perform a required function under given conditions at a given instant of time or over a given time interval, assuming the external resources are provided. Notes: **1.** This ability depends on the combined aspects of the reliability performance, the maintainability performance and the maintenance support of an item. **2.** Required external resources, other than maintenance resources do not affect the availability performance of the item. **3.** The term "availability" is used as an availability performance measure.

availability model A model used for predicting, estimating, assessing availability.

available chlorine, total available chlorine (water quality) Terms commonly used in characterizing strong solutions of sodium hypochlorite and chlorine water and dilutions of them used for chlorination.

available draft The draft which may be utilized to cause the flow of air for combustion or the flow of products of combustion.

available time The period during which a system has the power turned on, is not under maintenance, and is known or believed to be operating correctly or capable of operating correctly.

available time, uptime (deprecated in this sense) From the point of view of a user, the time during which a functional unit can be used.

avalanche breakdown (of a semiconductor device) A breakdown that is caused by the cumulative multiplication of charge carries through field-induced impact ionization.

avalanche current The high current through a semiconductor junction in response to an avalanche voltage.

avalanche impedance Obsolete. See breakdown impedance.

avalanche photodiode (APD) (optical communication) A photodiode operating with a bias voltage such that the primary photo current undergoes amplification by cumulative multiplication of charge carriers. Note: As the reverse bias voltage approaches the breakdown voltage, hole-electron pairs created by absorbed photons acquire sufficient energy to create additional hole-electron pairs when they collide with ions.

avalanche voltage The applied voltage at which avalanche breakdown occurs.

AVC Automatic volume control.

A_v, C_v, K_v See valve flow coefficient.

average See arithmetic mean.

average availability The ratio of the time during which the system is capable of performing its function to the total operating time expected.

average cladding diameter (optical communication) The mean value of the cladding diameters along a fiber.

average conditional information content (information theory) Refer to ISO publication 2382/XVI.

average core diameter The mean value of the core diameters along a fiber.

average current The arithmetic mean of the instantaneous currents of a complex wave, averaged over one half cycle.

average forward-current rating (rectifier circuit element) The maximum average value of forward current averaged over a full cycle, permitted by the manufacturer under stated conditions.

average inventory In an inventory system, this is the sum of one-half the lot sizes plus the reserve stock in formula calculations.

average power (in a waveguide) For a periodic wave, the time-average of the power passing through a given transverse section of the wave guide in a time interval equal to the fundamental period.

average reference surface diameter (optical communication) Pertaining to fiber optics, the mean value of the references surface diameters along a fiber.

average transformation rate (information theory) Refer to ISO publication 2382/XVI.

average transinformation (content) (information theory) Refer to ISO publication 2382/XVI.

average value of contamination A one hour mean value measured randomly once each day averaged over a complete year. See IEC publication 654.

“averaging bulb” A type of bulb (coiled) of a filled thermal system. The term averaging is used because the bulb measure the average temperature over their active portions.

averaging thermometer Resistance thermometer with long resistance elements (for example 15 ft) that measures the average temperature over the length of the sensor.

AVG Average.

AWG See American Wire Gage.

AWT Advanced Waste Treatment.

AWWA American Water Works Association. Have published standard C504–74 How to calculate the required torque for butterfly valve actuators.

axial compressor A gas compressor that takes in gas at the inlet and moves the charge axially over the compressor's long axis to the discharge port. This is accomplished by the action of a central impeller shaft studded with hundreds of short, fixed blades.

axial piston pump Pump having several with mutually parallel axis which are arranged around and parallel to a common axis. Pistons can be actuated by a washplate or cam.

axial propagation coefficient (optical communication) The propagation coefficient evaluated along the axis of a fiber in the direction of transmission.

axial propagation constant Pertaining to fiber optics, the propagation constant evaluated along the axis of a waveguide (in the direction of transmission). Note: The real part of the axial propagation constant is the attenuation constant while the imaginary part is the phase constant.

axial propagation wave number See axial propagation constant.

axial ray (optical communication) A light ray which is coincident with the fiber axis.

axial seal Sealing device which seals by axial contact pressure.

axis (industrial robots) A direction in which a part of a robot can move in a linear or rotary mode. The number of axes is normally the number of guided and mutually independently driven links. Note: Axis is also used to describe a mechanism of a robot.

axis (numerical control) A direction in which a part of a machine can move in a linear or rotary mode.

axle generator regulator A control device for automatically controlling the voltage and current of a variable-speed axle generator.

Ayrton shunt Also called universal shunt. A high-resistance parallel connection used to increase the range of a galvanometer without changing the damping.

azeotropic distillation A distillation technique in which one of the product streams is an azeotrope. It is sometimes used to separate two components by adding a third, which forms an azeotrope with one of the original two components.

AZERTY keyboard Method of arranging the keys on a keyboard where the first line begins AZERTY.

azimuth 1. The angular measurement in a horizontal plane and in a clockwise direction. **2.** In a tape recorder, the angle which recording and playback head gaps make with the line along which the tape moves. The head is orientated until this angle is 90°. **3.** The vertical settling (alignment) of the head in a tape recorder. **4.** Compass direction from due north measured in degrees clockwise.

B

B 1. Symbol for bel, unit for sound level and sound pressure level. Common multiple: decibel, dB. **2.** Buffer. **3.** Symbol for the base of a transistor. **4.** Magnetic flux. **5.** Photometric brightness. **6.** Chemical symbol for boron. **7.** Byte.

b Bit.

(type) B Designation for thermocouple and thermocouple extension wire with a certain temperature-emf relationship. Material identification: platinum – 30 percent rhodium versus platinum – 6 percent rhodium.

B.E.E. Bachelor of Electrical Engineering.

B & S gage Brown and Sharpe wire gage, where the conductor sizes rise in geometrical progression. Adopted as the American Wire Gage (AWG) standard.

Ba Chemical symbol for barium.

babbitt Any of the white alloys composed principally of lead or tin which are used extensively to make linings for sliding bearings.

BACE British Association of Consulting Engineers.

backbone The trunk media of a multimedia LAN separated into sections by bridges, routers, or gateways.

back drafting (blast furnace) A term pertaining to the operation of a blast furnace.

backend machine See data base server.

back flow gate A type of swing-check valve made so that the clapper's position may be changed from open to closed by an externally mounted handle. The handle is attached to the clapper's fulcrum shaft which protrudes through the side of the valve body. When the clapper is closed (resting on its seat in a normal position), fluid can flow in one direction only; when open (raised from its seat by the handle), fluid can flow in the opposite direction.

background image See static image.

background noise Undesired signal or other stimuli that are always present in a transducer output or electronic circuit, regardless of whether a desired signal or stimulus is also present.

background processing The automatic execution of lower-priority programs in a computer when the system resources are not being used for higher-priority (foreground) programs.

background program **1.** In multiprogramming, the program with the lowest priority. **2.** Under time-sharing option (TSO), a program executed in a region of main storage that is not swapped. Contrast with foreground program.

backlash **1.** In process instrumentation, a relative movement between interacting mechanical parts, resulting from looseness, when motion is reversed. **2.** The maximum distance or angle through which any part of a mechanical system may be moved in one direction without applying appreciable force to the next part in a mechanical sequence.

backplane Area of a computer or other equipment where various logic and control elements are interconnected. Often takes the form of wires interconnecting plug-in circuit cards in the back of computer racks or cabinets.

back-porch effect The continuation of collector current in a transistor for a short time after the input signal has dropped to zero. The effect is due to storage of minority carriers in the base region. It also occurs in junction diodes.

back pressure The static pressure existing at the outlet of a pressure relief device due to pressure in the discharge system.

back pressure valve See check valve.

backscattering (optical communication) The scattering of a light beam into directions generally reverse to the original one.

back seat (control valves) A seating surface in the bonnet area that mates with the closure member or valve stem in the extreme open position to provide pressure isolation of the stem seal.

backspace character (BS) A format effector that causes the location of the printing or display position to be moved backward one printing or display space.

backtalk Transfer of information to the active computer from a standby computer.

backtraining An element of a search process that involves returning the database or conditions in a system to a previous state in order to try all alternative solution paths.

backtracking (search tree) A search procedure in which the choice that leads to an unacceptable result causes the search to return to an earlier state to make another choice.

backup Provisions of alternate means of operation in case of a failure of the primary means of operation. See also analog, digital backup.

backup (software) Provisions made for the recovery of data files or software, for restart of processing, or for use of alternative computer equipment after a system failure or disaster.

backup control See redundancy.

backup duration withstand test For programmable controller system a type test is outlined in IEC draft. Programmable controllers, Part 2. Other tests and verifications for this type of equipment is specified in the same document.

backup file, job-recovery control file A copy of a file made for possible later reconstruction of the file.

back-up pneumatic power supply Because of the ease of storing pneumatic energy in pressurized tanks, it is quite possible to provide continuity of pneumatic power pressure, in the case of failure of a primary pneumatic power source. Where continuity of operation of a pneumatic system is important, it is recommended that one of the commonly accepted procedures, including on auxiliary pneumatic power supply, be provided with a storage tank of sufficient capacity so that a minimum power pressure can be maintained undisturbed over a defined period of time in case of failure of the primary power source.

backward (file) recovery The reconstruction of an earlier version of a file by using a newer version and data recorder in a journal.

backward chaining A type of system activity that attempts to solve a problem by stating a goal and looking into the database for the conditions that would cause that goal to come about, then reiterating this process, using those conditions as the goals while searching for their preconditions (DEC).

backward channel A channel associated with the forward channel, used for supervisory or error control signals, but with a direction of transmission opposite to that of the forward channel in which user information is being transferred.

backwashing Reversing the fluid through a filter to clean out sediment that has clogged the filter or reduced its efficiency.

backwater The afflux upstream from a given location on an open channel resulting from the impedances of-

ferred to flow. Note: Backwater is caused by channel storage for which the reservoir properties vary with the depth of flow at the given location.

back-water curve The profile of the liquid surface upstream when its surface slope is generally less than the bed slope. (The term is also used to denote all liquid surface profiles which are non-uniform with respect to distance upstream or downstream.) The back-water curve generally occurs upstream of an obstruction or confluence. Pertains to liquid level measurement in open channels.

bacteria bed See biological filter.

barrel **1.** An obstruction placed across the approach channel to improve the flow conditions. Pertains to liquid flow measurement in open channels. **2.** An orifice placed in a duct to reduce the duct size to the diameter size.

barrier piers, control blocks Blocks placed downstream of the weir in the stilling basin to dissipate energy. Pertains to measurement of liquid flow in open channels.

bar Number of elements in no particular order.

bauxite Structure produced by the transformation of austenite in a temperature range lying above the temperature of the formation of martensite but below that of pearlite; consists of ferrite and cementite. E.C. Bain, American physicist.

Bakelite A trademark of the Bakelite Corp. for its line of plastics and resins.

bakeout Subjecting an unsealed (hybrid) circuit package to an elevated temperature to bake out moisture and unwanted gases prior to final sealing.

balance Either a condition of symmetry in an electrical circuit or the condition of zero output from a device when properly energized.

balance bridge A bridge circuit with its components adjusted so that it has an output voltage of zero.

balance check (analog computers) The computer-control state in which all amplifier summing junctions are connected to the computer zero reference level (usually signal ground) to permit zero balance of the operational amplifiers. Integrator capacitors may be shunted by a resistor to permit the zero balance of an integrator. This control state may not be found in some analog computers.

balanced Electrical or electronic symmetry concerning ground, or to some specific characteristic, i.e., the loads of two parallel-operating generators are in balance when each is loaded equally or if they are identical, similarly applied to tubes, transmission lines, etc.

balanced amplifier An amplifier circuit with two identical signal branches, connected to operate in phase opposition and with their input and output connections each balanced to ground; for example, a push-pull amplifier.

balanced currents (on a balanced line) Current flowing in the two conductors of a balanced line which, at every point along the line, are equal in magnitude and opposite in direction.

balanced error A set of errors whose mean value is zero.

balanced line A grounded transmission line composed of two conductors in which the voltage of the two conductors are equal in magnitude and opposite in polarity and the current are equal in magnitude but opposite in direction.

balanced safety relief valve Incorporates means of minimizing the effect of back pressure on the operational characteristics (opening pressure, closing pressure, and relieving capacity).

balanced trim (control valves) An arrangement of ports and plug or combination of plug, cage, seals and ports that tends to equalize the pressure above and below the valve plug to minimize the net static and dynamic fluid flow forces acting along the axis of the stem of a globe valve.

balancing of an operational amplifier The act of adjusting the output level of an operational amplifier to coincide with its input reference level, usually ground or zero voltage.

balancing tank A tank designed to equalize the rate of flow of, for example, drinking or waste water to a treatment works, process or sewer.

Balco Name of resistance thermometer with resistance element consisting of an alloy of 70% nickel and 30% iron.

bale, paper bale Solid, pressed packaging unit for sheets of paper or board, often with a protective wrapping.

bale, pulp bale Solid, pressed packaging unit for pulp in the form of sheets or slabs.

bale room See finishing room.

baling press, packing press Press in which pulp in the form of sheets or slabs, sheets of paper or board, waste paper etc. are pressed together, strapped and often also provided with a protective wrapping.

ball 1. The valve closure member in a ball valve. **2.** In face bonding, a method of providing chips with contact.

ballast resistor A special type of resistor used to compensate for fluctuations in ac power-line voltage.

ball bushing A variation of ball bearing that permits axial motion of a shaft instead of rotating motion.

ballistic galvanometer A galvanometer intended to measure the value of a quantity of electricity by reading the amplitude of the first swing of its moving element.

ballistics A general term used to describe the dynamic characteristics of a meter movement most notably, response time, damping and overshoot.

ball valve A valve which modifies flow rates with rotary motion of the closure member, which is either a sphere with an internal passage or a segment of a spherical surface. The axis of the spherical surface is coincident with the axis of the shaft. Have high flow capacity, suitable for handling many types of slurries and fibrous material.

bamboo pulp Pulp produced from bamboo.

Banbury mixer A heavy-duty batch mixer with two counterrotating rotors; it is designed for blending doughy material such as uncured rubber and plastics.

band 1. A group of tracks on a magnetic disc or an magnetic drum. **2.** In communications, the frequency spectrum between two defined limits. **3.** The gamut or range of frequencies.

banded cable Two or more cables banded together by stainless steel strapping.

band overlap A part of the frequency range common to two adjacent frequency bands (thereby ensuring continuity of the measuring range).

bandpass A specific range of frequencies that will be passed through a device.

bandpass filter A process or device in which all signals outside a selected band are strongly attenuated, while the signal components lying within the band are passed with a minimum of change.

bandsplitting Also called split-streaming. A technique for combining several data channels onto one transmission facility by interleaving the data on a bit-by-bit basis. Also see multiplexing.

bandwidth 1. The range of frequency within which certain characteristics of the harmonic response (such as gain and phase) remain within specified limits. Note: For control systems and many of their components the lower frequency often approaches zero. **2.** The difference, expressed in the number of cycles per second, between the two limiting frequencies of a band.

bandwidth (of an optical fiber) That value numerically equal to the lowest frequency at which the magnitude of the baseband transfer function of an optical fiber decreases to a specified fraction, generally to one half, of the zero frequency value. Note: The bandwidth is mainly limited by several mechanisms: (a) in multimode fibers – mainly multimode distortion and material dispersion, (b) in single mode fibers—mainly material and waveguide dispersion.

bang-bang controller A discontinuity-type nonlinear system that contains time delay, dead space, and hysteresis.

bank An aggregation of similar devices (e.g. transformers, lamps etc.) connected and used together.

bank filtration (water quality) Induced infiltration of river water through bankside gravel strata (by pumping from wells sunk into the gravel strata to create a hydraulic gradient) with the intention of improving water quality.

banking Can mean banking a fire but the term can also apply to a blast furnace shutdown, planned or unplanned.

bankside storage Storage of raw river water in a reservoir on the river bank.

BAR One atmosphere. Give preference to the SI unit pascal. Especially, avoid the unit bar in calculations. 1 bar = 100 kPa.

bar code A code representing characters by sets of parallel bars of varying thickness and separation which are read optically by traverse scanning.

bar-code scanner An optical scanning device designed to read information printed in the form of bars of different size by detection and processing of the varying reflectivity of light in the bar code.

bare conductor A conductor not covered with any insulating material.

bar-graph display A display presenting an illuminated line or bar whose length varies in proportion to some parameter being measured.

bar-graph monitoring oscilloscope An oscilloscope of computed signals appearing as a series of bars with lengths proportional to channel modulation. The same oscilloscope is commonly used for setup and troubleshooting observations.

barium An element the oxide of which is used in the cathode coating of vacuum tubes.

bark A decarburized layer on steel just beneath oxide scale formed by heating the steel in air.

barker, debarker, barking machine Pertaining to the pulp and paper industry, machine for barking.

Barkhausen effect A succession of abrupt changes which occur when the magnetizing force acting on a piece of iron or other magnetic material is varied.

barking, debarking The removal of bark from wood.

barking drum A barking machine in the form of a horizontal, rotating drum with both ends open.

barking machine See barker.

barking plant effluent See wood room effluent.

Barkometer scale A specific gravity scale used primarily in the tanning industry.

barn A unit of measure of nuclear cross sections.

Barnett effect The magnetization resulting from the rotation of a magnetic specimen.

barometer An instrument for measuring atmospheric pressure.

barometric pressure The weight of the atmosphere per unit of surface. The standard barometer reading at sea level and 59°F (15°C) is 29.92 inches (760 mm) of mercury absolute.

barré A visual effect characterized by bars or stripes in woven or knitted fabric; generally classified as a fabric defect.

barrel 1. USA = 31,5 gallons = 199.237 liter. GB = 36 imperial gallons = 163.565 liter. **2.** The cylindrical portion of a solderless terminal, splice or contact in which the conductor is accommodated.

bar relay A relay in which a bar actuates several contacts simultaneously.

barrier 1. A partition for the insulation or isolation of electric circuits or electric arcs. **2.** In a semiconductor, the electric field between the acceptor ions and the donor ions at a junction. **3.** A part providing protection against directed contact from any usual direction of access. **4.** General: A boundary or limit, something that hinders or restricts.

(zener) barrier Used with electronic process instrumentation where explosive, hazardous atmospheres exist to ensure safe operations. These devices separate the safe area from the hazardous area. Electric energy is maintained at such low levels that ignition of the hazardous atmosphere cannot occur.

barrier height In a semiconductor, the difference in potential from one side of a barrier to the other.

barrier layer To make certain that the Fermi levels in two materials are the same and to more absolutely influence semiconductor and contact conductivity, electrical double layers are formed at the contact surface between a metal and a semiconductor or between two metals.

barrier layer (optical communication) A layer which prevents OH-ion hydroxyl diffusion into the core.

barrier-layer cell A type of photovoltaic cell in which light acting on the surface of the contact between layers of copper and cuprous oxide causes an electromotive force to be produced.

barrier liquid A liquid circulating in the space between the phases in explosion-protected and other hermetic separators to prevent leakage from one phase into the other and intermingling. Also used in gastight hermetics to prevent leakage of volatile liquids to the ambient room, as well as in peripheral equipment of explosion-protected machines. See sealing liquid.

barrier panel An assembly which contains zener barriers and is used to limit power transfer between input and output sides of barriers. Refers to Honeywell TDC 3000 control systems.

barrier shield A wall or enclosure shielding the operator from an area where radioactive material is being used or processed by remote-control equipment.

barrier strip 1. A terminal strip with protective barriers between adjacent terminals. **2.** A continuous section of dielectric material which insulates electrical circuits from each other or from ground.

barrier voltage The voltage necessary to cause electrical conduction in a junction of two dissimilar materials, such as PN junction diode.

base 1. The quantity of characters for each of the digital positions of a numbering system. **2.** A reference value. **3.** A number that is multiplied by itself as many times as indicated by an exponent. **4.** See radix number. **5.** On a printed-circuit board, the portion that supports the printed pattern. **6.** A thin, strong, and flexible material, usually a polyester or acetate film, on which

is deposited a magnetic formulation to make recording tape. **7.** For industrial robots, a platform or structure to which is attached the origin of the first member of the articulated structure.

base (deprecated in this sense), radix Of a digit place in a radix numeration system, the positive integer by which the weight of the digit place is multiplied to obtain the weight of the digit place with the next higher weight. Examples: **1.** In the decimal numeration system the radix of each digit place is 10. **2.** In a biquinary code the radix of each fives position is 2. The term "base" is deprecated in this sense on account of its mathematical use.

base (of a transistor) A region which lies between an emitter and a collector of a transistor and into which minority carriers are injected.

base address A numeric value that is used as a reference in the calculation of addresses in the execution of computer program.

base (address) register A register that holds a base address.

baseband response functions, baseband transfer functions (optical communication)

The transfer function of an optical fiber is the ratio of the complex quantities corresponding to the input and output modulated radiant powers.

base board See base paper.

BASEC British Approval Service for Electrical Cables Ltd.

base coordinate system (industrial robots) A coordinate system referenced to the base of the robot.

base-coupled logic A circuit configuration designed for subnanosecond propagation delays, rise and fall times.

base electrode An ohmic or majority-carrier contact to the base region of a transistor.

BASEFA Abbreviation for British Approvals Service for Electrical Equipment in Flammable Atmospheres. BASEFA issues certificates of conformance to standard. Approval certification body for products (systems) intended for installation in hazardous locations. Example: intrinsically safe application.

base film The plastic substrate supporting the coating of magnetic recording tape.

base impedance (ac rotating machinery) The value of impedance corresponding to the value of the base voltage divided by the value of the base current. Note: Base impedance is usually expressed in ohms, but any consistent set of units may be used.

baseline (software) (A) A specification or product that has been formally reviewed and agreed upon, that thereafter serves as the basis for further development, and that can be changed only through formal change control procedures. (B) A configuration identification document or a set of such documents formally designated and fixed at a specific time during a configuration item's life cycle. Baselines, plus approved changes from those baselines, constitute the current configuration identification. For configuration management there are three baselines, as follows: **1.** Functional baseline. The initial approved functional configuration. **2.** Allocated baseline. The initial approved allocated configuration. **3.** Product baseline. The initial approved or conditionally approved product configuration identification.

base load (power operations) The minimum load over a given period of time.

base metal **1.** The metallic element present in greatest proportion in an alloy. **2.** The type of metal to be welded, brazed, cut or soldered. **3.** In the welding joint, metal that was not melted during welding.

4. Any metal that will oxidize in air or that will form metallic ions in an aqueous solution. **5.** Metal to which a plated, sprayed or conversion coating is applied. Also known as basis metal.

base-minus-ones complement A number representation that can be derived from another by subtracting each digit from one less than the base. Nines complements and ones complements are base-minus-ones complement.

base number Same as radix number.

base page address (microprocessor assembly language) An address of reduced size which references a pre-specified portion of memory (which might be an on-board RAM).

base paper, base board, (body paper), (body board) Paper or board intended for further processing (coating, impregnation or lining).

base paper for diazotype Base paper for diazotype has a good tearing resistance and folding endurance, is made from bleached chemical pulp, is suitable for being coated with chemicals for diazotype and is free from substances which can have a deleterious effect on printing and developing.

base paper for waxing Paper with a permeance which makes it suitable for being impregnated or coated with wax or similar substance.

base point See radix point.

base quantity One of the quantities which, in a system of quantities, are conventionally accepted as independent of each other.

base, radix (deprecated in this sense) In the numeration system commonly used in scientific papers, the number that is raised to the power denoted by the exponent and then multiplied by the mantissa to determine the real number represented.

base unit (of measurement) A unit of measurement of a base quantity in a given system of quantities. In the International System of Units, SI, there are 7 base units and 2 supplementary units with the following names and symbols: metre (m), kilogram (kg), second (s), ampere (A), kelvin (K), candela (cd), mole (mol), supplementary units: radian (rad), steradian (sr). By combining these units according to simple laws of physics the derived units are formed. See under derived units (of measurement).

BASIC **1.** Beginners All-purpose Symbolic Instruction Code, a standard language on mini and microcomputers which is also widely used on large computers. **2.** A simplified computer language intended for use in engineering applications.

basic access method A method of computer access in which each input/output statement results in a corresponding machine input/output operation.

basic coding Computer instructions written in the computer's own language. Same as machine language.

basic control element The basic thyristor or thyristor/diode circuit configuration, or both, employed as the principal means of power control.

basic controller A microprocessor based BASIC System device. It measures the value of process variables and applies correction signals according to a control algorithm. The correction signals attempt to hold the process variable at a desired reference setting. Also, the device provides alarm outputs and square root linearization, and creates a corresponding data base by using the appropriate hardware, firmware, etc. Refers to Honeywell TDC 3000 control systems.

basic dyes (textile term) Any of a class of dyes with positive ions which when combined with a negative charge on the fiber form an ionic bond.

basic electric-furnace process The process of making steel in the basic-lined electric-arc furnace can be divided into: **1.** the meltdown period; **2.** the oxidizing period; **3.** the composition and temperature adjustment period; and **4.** the tapping period.

basic element (measurement system) A measurement component or group of components that performs one necessary and distinct function in a sequence of measurement operations. Note: Basic elements are single-purpose units and provide the smallest steps into which the measurement sequence can be classified conveniently. Typical examples of basic elements are: a permanent magnet, a control spring, a coil, and a pointer and scale.

basic insulation The insulation applied to live parts to provide basic protection against electric shock. (Per IEC 335-1.) See also supplementary insulation, double insulation and reinforced insulation.

basic linkage In a computer, a linkage that is used repeatedly in one routine, program, or system and that follows the same set of rules each time it is used.

basic mode link control Control of data links by use of the control characters of the ISO/CCITT 7 bit character set for information exchange.

basic oxygen process See BOP process.

basic part (electric and electronic parts and equipment) One piece, or two or more pieces joined together, which are not normally subjected to disassembly without destruction of designed use. The application, size and construction of an item may be factors in determining whether an item is regarded as a unit, an assembly, or subassembly, or a basic part. A small electric motor might be considered as a part if it is not normally subject to disassembly. Typical examples: electron tube, resistor, relay.

basic recipe (batch processes) A generic, transportable recipe consisting of header information, equipment requirements, formula and procedure.

basic station Data hiway-based, stand-alone micro-processor – driven operator interface consisting of video monitor, keyboard, electronics package, and a cassette transport. Refers to Honeywell TDC 3000 control systems.

BASIC system The system consists of Basic Stations and Basic Controllers plus other analog and digital devices. System modules are distributed throughout the process where they monitor and control various functions. A Basic Station communicates over coaxial cable with the distributed control modules to sample current values or status, or to redefine system parameters. Refers to honeywell TDC 3000 control systems.

basic weight See grammage.

batch 1. The product produced by one execution of a working recipe. **2.** A group of similar computer transactions joined together for processing as a single unit. **3.** An amount of material that undergoes some unit chemical process or physical mixing operation to make the final product homogenous or uniform.

batch carburizing, liquid carburizing Carburizing by a carbon-releasing agent in liquid form, usually a salt bath.

batch cooking (pulp and paper industry) Cooking of a limited quantity (batch) of fiber raw material in a closed digester.

batch digester (pulp and paper industry) A closed digester for batch cooking.

batch distillation A distillation process in which a fixed amount of a mixture is charged, followed by an

increase in temperature to boil off the volatile components. This process differs from continuous distillation, in which the feed is charged continuously.

batch header document A document that accompanies and identifies a batch of input documents and that may be used to validate them.

batch management (batch processes) The activity that: **1.** Selects a control recipe and transforms it into a working recipe. **2.** Manages resources necessary for batch execution. **3.** Initiates and supervises the execution of the batch. **4.** Collects and manages batch data.

batch process 1. A method of fabricating monolithic, resistors, capacitors, and diodes with the same process at the same time. **2.** Contrast to a continuous process. **3.** A production operation that does not operate continuously, but rather processes discrete quantities of material or a limited number of items at one time, then must be stopped for unloading and reloading, or some other purpose, before another quantity may be processed.

batch processing 1. Pertaining to the technique of executing a set of programs such that each is completed before the next program of the set is started. **2.** Loosely the execution of programs serially. **3.** In a computer, a method of processing in which a number of similar input items are grouped for processing during the same machine run.

batch reheating furnace (in steel production) Batch furnaces are those in which the charged material remains in a fixed position on the hearth until heated to rolling temperature. Batch furnaces are fired with either gaseous or liquid fuel, with preheated or cold air for combustion.

bath nitriding Nitriding by a nitrogen – releasing agent in liquid form, usually a cyanide bath. Compare with cyanide hardening.

bath patenting Patenting including quenching in a lead or salt bath.

Batten system A method developed by W.E. Batten for coordinating single words in a computer to identify a document. Sometimes called peck-a-boo system.

battery 1. A dc voltage source consisting of two or more cells which converts chemical, nuclear, solar, or thermal energy into electrical energy. **2.** In communications, a source (not necessarily a storage device) of direct current or the current itself.

battery acid A solution that serves as the electrolyte in a storage battery. In the common lead-acid storage battery, the electrolyte is diluted sulfuric acid.

battery backup unit A unit that provides supplementary dc power from a battery in the event of ac or dc power losses. Refers to Honeywell TDC 3000 control systems.

battery capacity The amount of energy obtainable from a storage battery, usually expressed in ampere-hours.

battery life The number of times that a battery can be charged and discharged.

baud A unit of data transfer rate; a unit of signalling speed. One baud corresponds to a rate of one unit-time interval per second. The speed in bauds is equal to the number of times the line condition changes per second.

baud rate Any of the standard transmission rates for sending or receiving binary coded data.

baud-rate generator Oscillator, usually adjustable, that provides clock signals for connection of a peripheral.

Baumé scale Either of two specific gravity scales devised by French chemist Antoine Baumé in 1768 and

often used to express the specific gravity of acids, syrups and other liquids.

bauxite A mineral, off-white, brown, yellow, or reddish brown in color, composed of a mixture of amorphous or crystalline hydrous aluminium oxides along with silica and clay minerals. Bauxite occurs in various forms: concretionary, oolitic, compact, or earthy. Bauxite is the main source of aluminium.

B-B Break-Break.

BBS Bulletin Board System Information and message database accessible by modem and computer link.

BCD Binary Coded Decimal Code.

BCF (textile term) Bulk Continuous Filament. A technique for adding covering power to nylon carpet fiber.

BCH Bose-Chaudhuri – Hocquenghem (cyclic code).

BCIP Belgium Centre for Information Processing.

BCL See base-coupled logic.

BCMA British Council of Maintenance Associations.

BCPL High level programming language.

BCS British Computer Society.

BD 1. Baud. **2.** Binary Decoder.

BDP Business Data processing.

Be Chemical symbol for beryllium.

Bé Abbreviation for Baumé specific gravity scale.

bead A course of molten metal laid down by a welder (electric or oxyacetylene) in joining two pieces of metal.

beaded coax A coaxial cable in which the dielectric consists of beads made of various insulating materials.

bead thermistor A thermistor consisting of a small bead of semiconducting material such as germanium placed between two wire leads. Used for microwave power measurement, temperature measurement, and as a protective device. The resistance decreases as the temperature increases.

BEAIRA British Electrical and Allied Industries Research Association.

beam 1. A flow of electromagnetic radiation concentrated in a parallel, converging, or diverging pattern. **2.** The unidirectional or approximately unidirectional flow of radiated energy or particles. **3.** A shaft or column of light, a bundle of rays that may, or may not, consist of parallel, converging, or diverging rays.

beam (textile term) A cylinder with flanged ends on which parallel yarns are wound prior to slashing weaving, dyeing, or warp knitting. The beams for dyeing are perforated to allow passage of the dye liquor from inside to outside and vice versa.

BEAMA British Electrical and Allied Manufacturer's Association.

beam-addressable technology The application of reversible writing with a laser beam on particular storage materials.

beam blanking Interruption of the electron beam in a CRT by the application of a pulse to the control grid or cathode.

beam current The current carried by the electron stream that forms the beam in a cathode-ray tube.

beam diameter, beamwidth (optical communication) The distance between two diametrically opposed points at which the irradiance is a specified fraction of the beam's peak irradiance. Note: Most commonly applied to beams that are circular or nearly circular in cross section.

beam divergence (optical communication)

1. The increase in the cross section of a beam with increasing distance from the source. **2.** The far-field angle subtended by two diametrically opposed points

in a plane perpendicular to the optical axis, of which points the irradiance is a specified fraction of the beam's peak irradiance. Note: Generally, only the maximum and minimum divergences (corresponding to the major and minor diameters of the far-field irradiance) need to be specified.

beam dyeing machine (textile term) A machine for dyeing warp yarns or delicate fabrics such as tricot knit. The material to be dyed is wound on the perforated beam and batch dyed by pumping the dye liquor inside out.

beam leads 1. A generic term describing a system in which flat metallic leads extend from the edges of a chip component. These are then used to interconnect the component to film circuitry. **2.** Techniques for attachment of lead frames to silicon chips, including vacuum and chemical deposition, diffusion, thermal-compression techniques, welding etc.

BEAMOS Beam Accessed MOS.

beam splitter A device which separates a light beam into two beams. Some types affect polarization of the beam.

beamwidth (optical communication) See beam diameter.

beat A periodic variation in the amplitude of an oscillation resulting from the superposition of two periodic oscillations of slightly different frequencies.

beatability (of pulp) Measure of the energy required in the beating of pulp suspension so as to reach the stock condition which gives the desired combination of properties in the resulting paper.

beater A hollander in which the beater roll, normally fitted with knives, works against a beater bed plate which is normally also fitted with knives. Pertains to pulp and paper manufacturing.

beater roll See roll.

beater room Stock preparation department in which the stock preparation is mainly carried out in hollanders. Pertains to pulp and paper manufacturing.

beat frequency The difference between the frequencies of the two beating oscillations.

beating The combining of two or more frequencies to produce sum and difference frequencies called beats.

beat method (of measurement) A differential method of measurement which uses the phenomenon of beating between the frequencies related to two compared quantities, one being the quantity to be measured and the other the reference quantity.

beats Periodic variations of amplitude which result when two periodic waves having different frequencies are superimposed.

beck (textile term) A batch dyeing machine for pieces of fabric either in rope form or openwidth, in the case of carpets. The fabric is immersed in the dye liquor and pulled from the liquor by an egg-shaped reel which deposits the fabric in folds at the back of the beck. A continuous loop is formed by tacking both the front and back ends of a cut of fabric together.

becqueret The activity of a radionuclide decaying at the rate of one spontaneous nuclear transition per second.

bed load The sediment in almost continuous contact with the bed, carried forward by rolling, sliding or hopping. Pertains to liquid flow measurement in open channels.

bed material The material the particle sizes of which are found in appreciable quantities in that part of the bed affected by transport. Pertains to liquid flow measurement in open channels.

bed material load The part of the total sediment transport which consists of the bed material and who-

se rate of movement is governed by the transporting capacity of the channel. Pertains to liquid flow measurement in open channels.

bed profile The shape of the bed in a vertical plane. The shape of the bed may be considered longitudinally or transversely which should be stated. Pertains to liquid flow measurement in open channels.

bed slope, bottom slope The difference in elevation of the bed per unit horizontal distance measured in the direction of flow. Pertains to liquid flow measurement in open channels.

beehive proces A process for manufacturing metallurgical coke. In the beehive process, air is admitted to the coking chamber in controlled amounts for the purpose of burning therein the volatile products distilled from coal to generate heat for further distillation. The beehive process has been replaced largely by the by-product process.

Beer's law The law relating the absorption coefficient to the molar density.

begin-end block (software) A sequence of design or programming statements bracketed by "begin" and "end" delimiters and characterized by a single entrance and a single exit.

beginning-of-file label, file header label, HDR (abbreviation) An internal label that identifies a file, marks its location, and contains data for use in file control.

beginning of sequence selection, sequence selection divergence Sets of links and transitions allowing to select one of several subsequent sequence chains.

beginning-of-tape marker, BOT marker A marker on a magnetic tape used to indicate the beginning of the recordable area. Example: A photoreflexive strip; a transparent section of tape.

beginning-of-volume label, volume (header) label, volume header An internal label that identifies the volume and indicates the beginning of its data.

behind tape reader system, BTR (abbreviation) A feature of a numerical control system that can accept control data from a control tape, or alternatively from a computer or other source.

bel, B Unit for measurement of sound pressure level and sound level. Common multiple: decibel, dB.

belief (in artificial intelligence) A statement about an entity of the real or conceptual world, whose validity is measured by a certainty factor. Notes: **1.** Beliefs help derive a conclusion from incomplete knowledge. **2.** A belief having a high certainty factor may be considered as a fact.

bellows See pressure sensing element.

bellows flow meter body A meter body utilizing a bellows unit as the differential pressure sensing element. In contrast, for example, to a diaphragm. Flow meters which have the meter body and instrument close-coupled together, are often referred to as "mechanical type" flow meters.

bellows seal bonnet Pertaining to valves, a bonnet which uses a bellows for sealing against leakage of controlled fluid around the valve plug stem. Bellows seals are of either internal pressurized or external pressurized design. In the internal pressurized version only the inner surface of the bellows is subjected to the fluid pressure. This saves cost in the case of corrosive fluids, because the outer-extension bonnet can be made of carbon steel. One basic disadvantage of bellows seals is their relatively-low pressure rating.

bellows sealed valve See bellows seal bonnet.

bellows stem seal (control valves) A thin wall, convoluted, flexible member which makes a seal bet-

ween the stem and bonnet or body and allows stem motion while maintaining a positive seal.

bellows-type actuator A fluid powered device in which the fluid acts upon a flexible concoluted member, the bellows, to provide linear motion to the actuator stem.

bell-type furnace A type of batch heat-treating furnace. The furnace has a removable shell or cover. The furnace is usually used for processing material which requires special surface protection from oxidation or decarburization. The furnace shell is removed by a crane and set aside while the hearth of the furnace is charged.

bell-type manometer A gage for measuring differential pressure which consists essentially of a cup inverted in a container of liquid; pressure from one source is fed to the inside of the cup while pressure from a second source is applied to the exterior of the cup; pressure difference is indicated by the position of the cup in relation to the liquid level.

belted-type cable A multiple-conductor cable having a layer of insulation over the assembled insulated conductors.

benchboard (power switchgear) A combination of a control desk and a vertical switchboard in a common assembly.

benchmark 1. A permanent mark, the elevation of which should be related where practicable, to a national datum. Pertains to liquid flow measurement in open channels. **2.** A standard by which something can be judged.

benchmark (test) A test that uses a representative set of programs and data designed to evaluate the performance of computer hardware and software in a given configuration.

benchmark problem A problem used in the evaluation of the performance of computers relative to each other.

bench set (control valves) The shop calibration of the actuator spring range of a control valve to account for the in service process forces.

bench test A test in which service conditions are approximated, but the equipment is conventional laboratory equipment and not necessarily identical with that in which the product will be employed in normal service.

bend A change in the direction of the longitudinal axis of a waveguide.

bending resistance The resistance exerted by e.g. paper towards a bending force. The bending resistance, determined by measuring the bending force on a rectangular test piece according to a standardized test procedure, is also called (paper) stiffness.

bend loss 1. A form of attenuation that is caused by bending an optical fiber at a restrictive radius. The term also applies to losses due to minute distortions in the fiber itself caused by bending it. **2.** A form of increased attenuation caused by allowing high-order modes to radiate from the side of an optical fiber.

bend radius The minimum radius an optical fiber can bend before breaking.

Bendtsen roughness number The volume of air per unit time which is pressed out between the surface of the paper and a plain metal ring pressed against the surface. The Bendtsen number is determined according to a test procedure.

beneficiation (of iron ores) The term "beneficiation" in regard to iron ores encompasses all of the methods used to process ore to improve its chemical or physical characteristics in ways that will make it a more desirable feed to the ironmaking furnace. Such

methods include crushing, screening, blending, concentrating, and agglomerating. Because of the differences in structure and mineral content of ores from different deposits, beneficiation methods vary considerably.

benzene **1.** See aromatics. **2.** A motor fuel.

benzol The general term that refers to commercial benzene that may contain other aromatic hydrocarbons.

B Equation A control algorithm in which the error caused by a change in setpoint provides only integral action to recognize the change. Refers to Honeywell TDC 3000 control systems.

BER Bit Error Rate. The ratio of bits received in error to total bits received.

Bernoulli box High capacity storage system using exchangeable 20 MB cartridges.

Bernoulli's theorem All formulas for the measurement of a fluid in a closed conductor are based on the theorem of Bernoulli, a Swiss mathematician. This theorem states that in a steady flow, without friction, the sum of velocity head, pressure head, and elevation head is a constant quantity along any stream line.

beryllia Beryllium-oxide (Be O) ceramics that have high thermal conductivity characteristics.

beryllium An elemental metal whose atomic number is 4. Beryllium is present in various dielectrics and alloys used in electronics.

BESA British Electrical System Association.

bessel The filter characteristic in which phase-linearity across the pass band, rather than amplitude linearity is emphasized; know also as "constant delay".

best-first search (search tree) A search that, at each step along the search sequence, evaluates all the possible branches from it toward the goal in terms of a predetermined set of criteria and, based on the evaluation results, selects the best search path.

best fit An algorithm for computer memory allocation that searches the memory-free list for the unused memory block that is closest in size to that needed by the requesting task.

"best straight line" A line midway between the two parallel straight lines closest together and enclosing all outputs vs measurand values on a calibration curve.

beta factor (water quality) In an activated sludge plant, the ratio of the oxygen saturation value in mixed liquor to the oxygen saturation value in clean water at the same temperature and atmospheric pressure.

beta particle A small electrically charged particle thrown off by many radioactive materials.

beta ratio The ratio of the diameter of the constriction to the pipe diameter. Pertains to flow measurement.

beta ray **1.** A stream of beta particles. **2.** Electrons or positrons given off by a radioactive nucleus in the process of decay.

beta site A users CAD/CAM site or facility selected by mutual agreement between the user and the vendor for testing out a new system, application package, hardware or software enhancement before its sale to other customers of the vendor.

BEV, Bev, BEV One billion electron volts. An electron possessing this much energy travels at a speed close to that of light.

bezels A holder designed to receive and position the edges of a lens, meter, window, or dial glass.

BFO Bunker fuel oil made from the heavy refinery residual oils and cut with a lighter flux stock.

B-H curve Curve plotted on a graph to show successive states during magnetization of a ferromagnetic material.

BHN Brinell Hardness Number.

BHP See brake horsepower.

Bi Chemical formula for bismuth.

bias **1.** The departure from a reference values of the average of a set value; thus, a measure of the amount of unbalance of a set of measurements or conditions; that is ... error having an average value that is non-zero. **2.** The average DC voltage or current maintained between a control electrode and the common electrode in a transistor. **3.** In teletype writer applications, the uniform shifting, of the beginning of all marking pulses from their proper positions in relation to the beginning of the start pulse. **4.** A systematic deviation of a value from a reference value.

bias current The current through the base-emitter junction of a transistor. It is adjusted to set the operating point of the transistor.

bias distortion In data transmission, a measure of the difference in the pulse width of the positive and negative pulses of a dotting signal. Usually expressed in percent of a full signal.

biased exponent Pertaining to binary floating-point arithmetic, the sum of the exponent and a constant (bias) chosen to make the biased exponent's range non-negative.

bias error A error due to bias. Examples: **1.** The error caused by a shrunken measuring tape. **2.** In computation, an error caused by truncation.

bias error (of a measuring instrument) The systematic component of the error of a measuring instrument.

bias oscillator An oscillator used in magnetic recorders to generate an ac signal in the range of 40 to 80 kHz for the purpose of magnetic biasing to obtain a linear recording characteristic. Usually the bias oscillator also serves as the erase oscillator.

bias port In a fluidic device, the port at which a biasing signal is applied.

biax Two-hole, orthogonal cubical ferrite computer memory elements.

BIBO-stability See transfer stability.

BICEPS A programming language used to write loop control equations for Honeywell 4500 and 45000 process computers.

bid To gain control of a network in order to transmit data.

bidirectional bus **1.** In computers, a data path over which both input and output signals are routed. **2.** In a computer, a bus that carries signals in either direction. The bus also carries special signals that tell the devices connected to it which way data is passing. **3.** A bus used by any individual device for two-way transmission of messages, that is, both input and output.

bidirectional diode-thyristor A two-terminal thyristor having substantially the same switching behavior in the first and third quadrants of the principal voltage-current characteristic.

bidirectional flow In flow charting, flow that can be extended over the same flowline in either direction.

bidirectional lines Links between devices in a system, which may carry information in either direction but not both simultaneously.

bidirectional load cell A column-type strain gauge load cell with female or male fittings at both ends for attaching load hardware.

bidirectional operation An operation in which reading, writing, and searching may be conducted in

either direction, thus saving time and providing easy access to stored information.

bidirectional pulses Pulses, some of which rise in one direction and the remainder in the other direction.

bidirectional relief valve Valve having two ports either of which can be used as the inlet when the other will become the outlet without making any physical change or adjustment to the valve.

bidirectional search A search that starts simultaneously by forward chaining and backward chaining and steps when the search paths meet in the solution space or when all possibilities have been exhausted.

bidirectional transducer See bilateral transducer.

bidirectional thyristor A thyristor which can be made conductive at any instant when the voltage between the main terminals is either positive or negative.

bidirectional transducer See bilateral transducer.

bidirectional triode thyristor A three-terminal thyristor having substantially the same switching behaviour in the first and third quadrants of the principal voltage-current characteristic.

BIE British Institute for Electrical Engineers.

bifet Linear circuit that combines bipolar transistors with junction field-effect transistors on the same silicon chip.

bifilar A winding made noninductive by winding two wires carrying current in opposite directions together, side by side, as one wire.

bifurcation System where there are only two possible results.

bilateral manipulator A master-slave manipulator with symmetric force reflection where both master and slave arms have sensors and actuators such that in any degree of freedom a positional error between the master and slave results in equal and opposing forces applied to the master and the slave arms.

bilateral transducer 1. Also bidirectional transducer. A transducer capable of transmission simultaneously in both directions between at least two terminations. **2.** A device capable of measuring stimuli in both positive and negative direction from a reference zero or rest position.

billet (in steel production) See bloom.

bill of resources A statement of the key resources required to manufacture one unit of a selected item. It is often used to predict the impact on an item in the master production schedule on the supply of resources (APIC).

BIM Beginning of Information Mark Symbol indicating the start of a data stream stored on a disk drive or tape.

bimetallic element A temperature sensing device which makes use of the difference in thermal expansion of two metals bonded together.

bimetallic instrument A thermal instrument in which the deformation of a bimetallic element, heated directly or indirectly by a current, produces the indication.

bimetallic thermometer Bimetallic thermometers use the differences in thermal expansion properties of dissimilar metals to provide temperature measurement capability. Strips of metals with different thermal expansion coefficients are bonded together. The metal strip with the larger temperature coefficient of expansion expands more than the other strip when temperature increases and causes the assembly to bend. The angular position versus temperature relation can be established by calibration so that the device can be used as a thermometer.

bimodal A distribution of values with two peaks.

binary 1. Characterized by a selection, choice or condition that has two possible different values of status. **2.** Of a fixed radix numeration system having a radix of two.

binary alloy A metallic material composed of only two chemical elements (neglecting minor impurities), at least one of which is a metal.

binary arithmetic operation, binary operation (deprecated) An arithmetic operation in which the operands and the result are represented in the pure binary numeration system. Note: The term binary operation is deprecated to avoid confusion with dyadic operation and with Boolean operation.

binary cell 1. An elementary unit of storage that can be placed in either of two stable states. Note: It is therefore a storage cell of one binary digit capacity, for example, a single-bit register. **2.** A storage cell that can hold one binary character.

binary character Each character of a binary character set.

binary character set A character set that consists of two characters.

binary code 1. A code in which each code element may be either of two distinct kinds or values, for example, the presence or absence of a pulse. **2.** A code that makes use of members of an alphabet containing exactly two characters, usually 0 and 1. The binary number system is one of many binary codes.

binary-coded decimal code (BCD), binary-coded decimal notation, binary-coded decimal representation A binary-coded notation in which each of the decimal digits is represented by a binary numeral. Example: In a binary-coded decimal notation that uses the weights 8-4-2-1, the number "twenty three" is represented by 0010 0011 (compare its representation 10111 in the pure binary numeration system).

binary-coded notation A binary notation in which each character is represented by a binary numeral. See also binary notation.

binary-coded set A coded set whose elements are formed from a binary character set.

binary control Control in which binary signals are transmitted, processed and stored.

binary counter See binary scaler.

binary digit, bit Either of the digits 0 or 1 when used in the pure binary numeration system.

binary digit string A string consisting solely of binary digits.

binary direct voltage signal A direct voltage signal, which varies in a discrete manner corresponding to two states, used in industrial-process measurement and control systems to transmit information corresponding to two logical states. The binary direct voltage signal which appears at the input/output terminals of an element has two logical states which are represented by the signal voltages U_H for the high level and U_L for the low level. Each of these signal voltages has a range defined by an upper and a lower limit.

binary distillation A distillation process that separates only two components.

binary dump A printout of the contents of a memory unit in a binary form onto some external medium such as paper tape or printout forms.

binary incremental representation Incremental representation in which the value of an increment is rounded to one of the two values of plus or minus one quantum and is represented by one binary digit.

binary-logic element, binary-logic gate Two-state element which performs a combinatorial logic operation.

ration, for instance: **1.** The complementation (it is then called NOT-gate). **2.** The logical product (it is then called an AND-gate). **3.** The complemented logical product (it is then called a NANO-gate). **4.** The logical sum (it is then called an OR-gate). **5.** The complemented logical sum (it is then called a NOR-gate).

binary logic system System in which binary signals are transmitted, processed or stored.

binary notation Any notation that uses two different characters, usually the binary digits 0 and 1. Example: The Gray code is a binary notation but not a pure binary numeration system. See also pure binary numeration system.

binary numeral A numeral in the pure binary numeration system. Example: 101 is the binary numeral equivalent to the Roman numeral V.

binary operation (deprecated) See under binary arithmetic operation and Boolean operation.

binary operator An operator that represents an operation on two and only two operands.

binary point That point in a binary number which separates the integral from the fractional part. It is analogous to the decimal point for a decimal number.

binary scaler Also called binary counter. **1.** A counter which produces one output pulse for every two input pulses. **2.** A counting circuit, each stage of which has two distinguishable states. **3.** A flip-flop having a single input (called T flip-flop). Each time a pulse appears at the input, the flip-flop changes state.

binary search 1. A dichotomizing search that processes sets of an equal number of data elements, or in case of an odd number of elements in the initial set, allows for one set to contain one additional element. **2.** An algorithm for searching an ordered table to find a particular item. Refers to Honeywell TDC 3000 control systems.

binary search, binary look up Various techniques designed for finding a particular item in an ordered (sequence) set of items by repeatedly dividing in half the portion of the ordered set containing the sought-for item until only the sought-for item remains. Binary searching is several times more efficient than sequential searching, even when the number of items is relatively small. Same as dichotomizing search.

binary signal Quantized signal with only two possible values.

binary synchronous communications (BI-SYNC) A character orientated protocol for managing the flow of information on a data communication link. Employs a defined set of control characters and control character sequences to synchronously transmit binary coded data between stations in a half-duplex manner. Implements a BBC (Block Check Character) error check algorithm.

binary synchronous transmission Data transmission in which synchronization of characters is controlled by timing signals penetrated at the sending and receiving stations.

binary system A system of mathematical computation based on powers of 2.

binary to decimal conversion Refers to the process designed to convert a number written to the base of two to the equivalent number written to the base of ten.

binary unit 1. A binary digit. **2.** A unit of information content, equal to one binary decision, or the designation of one of two possible and equally likely values or states of anything used to store or convey information. **3.** See check bit and parity bit. **4.** Same as bit.

binary unit of information content, shannon, bit (strongly deprecated in this sense) A unit

of logarithmic measure of information equal to the decision content of a set of two mutually exclusive events expressed as a logarithm to base two.

binary word A group of binary digits with place values in increasing powers of two.

(to) bind (of a variable), to set (of a variable) (GB) To assign a value to a variable; in particular, to assign a value to a parameter.

binder 1. In metal founding, a material other than water added to foundry sand to make the particles stick together. **2.** In powder metallurgy, a substance added to a powder mixture to bond particles together during sintering.

binding (software) The assigning of a value or referent to an identifier; for example, the assigning of a value to a parameter or the assigning of an absolute address, virtual address, or device identifier to a symbolic address or label in a computer program. See also dynamic binding, static binding.

Bingham viscometer A time-of discharge device for measuring fluid viscosity in which the fluid is discharged through a capillary tube instead of an orifice or nozzle.

bioaccumulation The process of accumulation of a substance in organisms or parts thereof.

bioassay (water quality) A technique for evaluating the biological effect either qualitatively or quantitatively, of various substances in water by means of changes in a specified biological activity.

biochemical conversion The use of bacteria to separate kerogen from oil shale. Certain bacteria will biodegrade the minerals in oil shale, releasing the kerogen from the shale in liquid or semiliquid form.

biochemical fuel cell An electrochemical generator of electrical power in which bi-organic matter is used as the fuel source.

biochemical oxidation The process whereby microorganisms oxidize matter (mainly organic) in water. See mineralization.

biochemical oxygen demand (BOD) The mass concentration of dissolved oxygen consumed under specified conditions by the biological oxidation of organic and/or inorganic matter in water.

biodegradability The ability of an organic substance to undergo biodegradation.

biodegradation Molecular degradation of organic matter resulting from the complex actions of living organisms, ordinarily in an aqueous medium.

bioelectricity Electric currents and potential differences which occur in living tissues.

bioelectronics 1. The application of electronic theories and techniques to the problems of biology. **2.** The integrated, long-term electronic control of various, impaired, physiologic systems by means of small, low power, electrical, and electromechanical devices. (The pacemaker is therefore a bioelectronic instrument.)

bioengineering The reduction of various life processes to mathematical terms to make possible duplication or simulation with systems hardware.

biofilm (of a sand filter) The film, consisting of living organisms, which forms on the surface of a slow sand filter and which is considered to provide an important part of the effective filtering zone.

biogalvic battery A device that makes use of reactions between metals and the oxygen and fluids in the body to generate electricity.

bioinstrumentation Instruments that can be attached to humans or animals to record biological parameters.

biological engineering The application of engineering principles to the solution of medical problems, including the design and fabrication.

biological filter, trickling filter, percolating filter A bed of fragments of inert material through which waste water is caused to percolate for the purpose of purification by means of an active biological film on the inert material.

biologic energi Energy that is produced by bodily processes and that can be used to supply electrical energy for implanted devices such as electronic cardiac pacemakers, bladder stimulators, etc.

biomass 1. Wood and other plant material used to make methanol as a supplement to petroleum. **2.** The total mass of living material in a given body of water.

biometrics A class of activity having to do with the measurement and systematic evaluation (especially statistical) of biological phenomena.

bionics A branch of technology relating the functions, characteristics, and phenomena of living systems to the development of hardware systems.

biota The living components of an aquatic system.

BIO THERM (trademark) Process for thermophilic biological treatment of industrial waste waters by Alfa-Laval.

biotic index A numerical value used to describe the biota of a water body serving to indicate its biological quality.

bi-phase A method of bit encoding for serial data transmission or recording whereby there is a signal transition every bit period.

BIPM International des Poids et Mesures-International Bureau of International Weights and Measures.

bipolar 1. Having two poles. **2.** Refers to transistors in which the working current flows through two types of semiconductor material, called N-type or P-type. In bipolar transistors, the working current consists of both positive and negative electrical charges.

biquinary code A notation in which a decimal digit *n* is represented by a pair of numerals, *a* and *b*, *a* being 0 or 1, *b* being 0, 1, 2, 3 or 4 and ($5a + b$) being equal to *n*. The two digits are often represented by a series of two binary numerals.

Birmingham wire gage A system of standard sizes in US for brass wire, and for strip, bands, hoops and wire made of ferrous and nonferrous metals.

bistable Binary circuit or device which has two stable states and which in each state requires and appropriate impulse to cause a transition to the other state.

bistable (trigger) circuit, flip-flop A trigger circuit that has two stable states.

bistable multivibrator (flip-flop) A circuit having two stable states; it will stay in either one indefinitely until appropriately triggered, after which it immediately switches to the other state.

bisulphite pulp Chemical pulp manufactured by cooking wood with a solution having a pH value of approximately 4 and containing hydrogen sulphite (bisulphite) ions.

bit 1. An abbreviation for binary digit. **2.** A single character in a binary number. **3.** A single pulse in a group of pulses. **4.** A unit of information capacity of a storage device.

bit, binary digit Either of the digits 0 or 1 when used in the pure binary numeration system.

bitbus A serial low speed network developed by Intel Corporation in 1983 for sensor and factory level controlling devices.

bit density, recorded density A measure of the number of bits recorded per unit of length or area.

bit diddling A method of increasing storage efficiency by packing extra information into unused parts of a computer word.

bit error See error rate.

bit error rate tester A system which measures the fraction of bits transmitted incorrectly by a digital communication system.

bit interleave A technique in time-division multiplexing in which bits of data are transmitted in one frame.

bit map A table that describes the state of each member of a related set; bit map is most often used to describe the allocation of storage space; each bit in the table indicates whether a particular block in the storage medium is occupied or free.

bit-parallel (696 interface devices) A set of concurrent data bits present on a like number of signal lines used to carry information. Bit-parallel data bits may be acted upon concurrently as a group or independently as individual data bits.

bit pattern A combination of *n* binary digits to represent 2 to the *n* possible choices, e.g., a 3-bit pattern represents 8 possible combinations, an 8-bit pattern represents 256 possible combinations etc.

bit position A character position in a word in a binary notation.

bit rate 1. The number of binary bits transmitted per unit time; for example, a bit rate of 80 means that 80 binary bits are transmitted per second. **2.** The rate at which binary digits, or pulses representing them, pass a given point in a communication line. **3.** The rate at which data bits (digital information) are transmitted over a communication path, normally expressed in bits per second. Not to be confused with the data signalling rate (baud), which measures the rate of signal changes transmitted.

bit-rate generators Devices that provide the reference frequencies required by serial interfaces and also furnish adjustment-free crystal stability with easily changed, multiple frequencies.

bit-slice microprocessor A microprocessor built-up in a modular way by its user with the design based on the use of (usually) 4-bit-wide "slices" of CPU circuitry, leading to 4-bit, 8-bit, 12-bit, etc., CPUs.

bits per inch (BPI) Used for measuring density of data on a recording medium.

bits per second (BPS) The unit of information rate. It expresses the number of binary digits passed through a channels per second.

bit stream 1. A binary signal without regard to groupings by character, word or other unit. **2.** A continuous series of bits transmitted on a line.

bit stream transmission The method of transmitting characters at fixed time intervals. No stop and start elements are used and the bits making up the characters follow each other without pause.

bit string A string of binary digits in which the position of each binary digit is considered as a independent unit.

bit synchronizer A hardware device that establishes a series of clock pulses in synchronism with an incoming bit stream and identifies each bit.

bit time 1. In serial binary computer, the time during which each bit appears. **2.** The amount of time that one bit of information in a digital pattern remains in its one or zero state.

bitumen Bitumen is defined as "any of various mixtures of hydrocarbons together with their nonmetallic derivatives": asphalts and tars.

black body, full radiator A thermal radiator which absorbs completely all incident radiation whatever the

wavelength, direction of incidence or polarization. The concept of black body is central to radiation pyrometry theory and practice. Few materials possess even approximate black body characteristics. Some of the better black body materials are carbon black, platinum black, zinc black, and carborundum. Fortunately, it is possible to fabricate good approximations to blackbodies using assemblies having cavities that can be viewed through an opening. The radiation within the cavity undergoes numerous reflections, and the resulting radiation from the cavity closely approximates black body radiation. For pyrometer calibration, standard tungsten filament lamps are used. These lamps are calibrated in terms of temperature versus lamp current. The lamp then can be used as a radiation source to calibrate pyrometers. A method for overcoming problems due to uncertainties in emittances in industrial applications is to use a sighting tube to create approximate black body conditions. A long tube with a sealed end provides a good approximation to a black body if the pyrometer is sighted at the closed end through the tube. The sighting tube is inserted into the medium whose temperature is to be measured. This can be done in applications in which suitable tube materials (usually refractory metals) are available.

blackboard model A problem solving model in which a shared working memory called a blackboard, accessible to several knowledge sources, is used to communicate intermediate results or new data.

black body radiation See black body.

black box A generic term used to describe a device which performs a certain function for which only the input and output signals are known.

black cook See burnt cook.

blackening Pertaining to the pulp and paper industry, on undesirable local darkening accompanied by changes in the opacity of the paper occurring during glazing in a calender and caused by too high a pressure or too high a moisture content in the paper.

black light An oil prospector's term for ultraviolet light used to detect fluorescence in a mineral sample.

black liquor The waste liquor from a completed sulphate pulp cook or soda pulp cook.

black oil 1. A term denoting residual oil; oil used in ship's boilers or in large heating or generating plants; bunker oil. **2.** Black-colored oil used for lubricating heavy, slow-moving machinery where the use of higher-grade lubes would be impractical. **3.** Asphalt-base crudes.

blackout Interruption of radio communication due to excess absorption caused by solar flares.

black water Waste water and excreta from water closets excluding waste water from baths, showers, hand-basins and sinks.

blade coating Pertaining to the pulp and paper industry, a method of coating a web where the quantity of coating slip applied is controlled by a flexible metal blade which presses against the web.

Bland Classes Used to group recipes whose properties behave similarly and therefore have similar blend models; Also known as fuel grades.

blank 1. A place of storage where data may be stored (synonymous with space). **2.** A character, used to indicate an output space on a printer in which nothing is printed. **3.** A condition of no information at all in a given column of a punched card or in a given location on perforated tape.

blank character A character used to produce a character space on an output medium.

blast cleaning Maybe described as the use of abrasives propelled through nozzles against the surface of

pipe, fittings or cavities to remove mill, scale, rust, varnish, paint or other foreign matters. Can be part of cleaning procedure for cleaning of control equipment for oxygen service. See IEC 877 for details.

blast furnace The blast furnace is a fall shaft-type furnace with a vertical stack superimposed over a crucible-like hearth. Iron-bearing materials (iron ore, sinter, pellets, mill scale, steel making slag, scrap, etc.) coke and flux (limestone and dolomite) are charged into the top of the shaft. A blast of heated air and also in most instances, a gaseous, liquid or powdered fuel are introduced through openings at the bottom of the shaft just above the hearth crucible. The heated air burns the injected fuel and most of the coke charged in from the top to produce the heat required by the process and to provide reducing gas that removes oxygen from the ore. The reduced iron melts and runs down to the bottom of the hearth.

blast furnace gas A by-product of the iron blast furnace.

bleacher A hollander intended for the bleaching of pulp.

bleaching department See bleach plant.

bleaching of pulp Removal or modification of the coloured components in pulp with the object of increasing its brightness.

bleaching stage A uniform chemical treatment of pulp during bleaching, usually including a subsequent washing.

bleaching tower A vertical, normally cylindrical vessel through which the pulp in continually fed (upwards or downwards) accompanied by simultaneous bleaching.

bleach plant, bleaching department The department in a pulp mill for the bleaching of pulp.

bleach range (textile term) A continuous installation of equipment for the removal of colored impurities in fabrics.

bleed To draw off a liquid or gas slowly. To reduce pressure by allowing fluid or gas to escape slowly; to vent the air from a pump.

bleeder A resistor connected across a power source to improve voltage regulation, provide a current path under no-load conditions, or dissipate stored energy on shut-off.

bleeder current The current drawn continuously from a power supply by a resistor. Used to improve the voltage regulation of the power supply.

bleeder valve A small valve on a pipeline, pump, or tank from which samples are drawn or to vent air or oil; sample valve.

bleed line (fluid power systems) Line through which air is purged from pipes containing liquid.

blending 1. A means of obtaining intermediate viscosities from materials of the same type but different viscosities. This term is also applied to resistive inks that can be blended with each other to achieve intermediate resistivities. **2.** The process of mixing two or more oils having different properties to obtain a lubricating oil of intermediate or desired properties. Certain classes of lube oils are blended to a specified viscosity. Other products, notably gasolines, are also blended to obtain desired properties. **3.** The process of physically mixing two or more lots of material to produce a homogeneous lot. Blends normally receive new identification and require retesting.

blending stock A quantity of lubricating oil, gasoline, or other liquid product that is used to mix or blend with other batches of the same product. Motor gasolines are a blend of several different gasolines, each having certain desirable properties.

Blend Law Subroutine used for property estimation.

Blend Values Used to estimate properties that blend linearly by volume or provide input data for blend laws.

blind flange A companion flange with a disc bolted to one end to seal off a section of pipe.

blind pressure transmitter A pressure transmitter not having an integral readout device.

blinking (computer graphic) An intentional periodic change in the intensity of one or more display elements or segments.

blip Any erratic signal on a computer screen.

blister (on a paper or board surface) A local deformation of the surface of a paper or board caused by a rapid evaporation of water.

block 1. A group of words or characters considered or transported as a unit, particularly with reference to input and output. The term is used sometimes as a synonym for record, or to refer to a group of records. **2.** To collect an assembly of data for some purpose. Refers to Honeywell TDC 3000 control systems. **3.** In programming languages, a compound statement that coincides with the scope of at least one of the declarations contained within it. Note: A block may also specify storage allocation or segment programs for other purposes. **4.** In data communication, a group of contiguous characters formed for transmissions purposes. The group are separated by interblock characters.

block-and bleed valve A heavy-duty mainline valve made up to hold bubble-tight against high pressure. The valve is made with a small bleeder line and valve that are tapped into the block valve's bonnet. When the block valve is closed, its effectiveness may be checked by opening the bleeder valve for evidence of any leakage from the upstream or high-pressure side.

block cancel character, block ignore character See block ignore character.

block check That part of the error control procedure used for determining that a data block is structured according to given rules.

block code A special code or character used to separate blocks of data.

block diagram 1. A diagram of a system, a computer, or a device in which the principal parts are represented by suitably annotated geometrical figures to show both the basic functions of the parts and their functional relationships. Contrast with flowchart. **2.** A symbolic representation of the actions in a system by internal functional blocks linked by action lines. Note: The action lines do not necessarily represent physical connections. **3.** A diagram in which a system, or part of a system, together with its internal functional relationships, is represented by functional blocks linked by orientated connections which represent the signal flow, but not necessarily showing all connections. A block diagram for a feedback control system contains at least: an input, an output, a comparing element, a forward path, a feedback path. It should not be confused with the term flow chart.

blocked impedance Of a transducer, the impedance at the input terminals when the impedance at the output terminals is infinite.

blocker-type forging A shape forging designed for easy forging and extraction from the die through the use of generous radii, large draft angles, smooth contours and generous machining allowances, used as a preliminary stage in multiple-die forging or when machining to final shape is less costly than forging to final shape.

block format The arrangements of the words, characters and data in a block.

block format specification (numerical control)

A specification identifying the block format and consisting of the three following parts: **1.** Format classification general, expressed in a coded form; **2.** Detailed format classification, expressed in a coded form; **3.** Itemized data for the format contents and machine specifications.

block gap 1. An area on a data medium used to indicate the end of a block or record. **2.** An absence of data along a specified length of magnetic tape between adjacent blocks of data.

block ignore character, block cancel character A character used to signify that the preceding portion of the block is to be disregarded.

blocking 1. Records are blocked, or grouped together in a buffer, in order to increase the average length of the physical records being written, thus reducing the process time per record, and increasing the total number of records that can be written on one unit. **2.** Application of an extremely high bias voltage to a transistor, vacuum tube, or metallic rectifier to prevent current from flowing in the forward direction.

blocking capacitor A capacitor, the function of which is to block the flow of direct current, it allows alternating current to pass.

blocking factor The number of records to be contained in a block.

blocking relay A device which initiates a pilot signal to block tripping on external faults in a transmission line or in other apparatus under predetermined conditions, or which cooperates with other devices to block tripping or to block reclosing on an out-of-step condition or on power swings.

block length The number of records, words, or characters in a block.

block length, block size The number of bytes (or any other appropriate unit) in a block.

block loading In a computer, a form of fetch in which the control sections of a load module are brought into continuous positions of main storage.

block mark A method of indicating the end of one block of data and the start of another on tape or in data transmission.

block multiplexer A device that receives blocks of data from various sources, combines them into a single transmission path, and distributes them to various destinations.

block sequence A welding sequence in which separated lengths of a continuous multiple-pass weld are built up to full cross section before gaps between the segments are filled in.

block size, block length The number of bytes (or any other appropriate unit) in a block.

block sort A computer sorting technique in which the file is first divided according to the most significant character of the key, and the separate portions are then sorted one at a time. It is used particularly for large files.

block-structured language A design or programming language in which sequences of statements are demarcated, usually with begin and end delimiters.

block transfer The process of transmitting one or more blocks of data in one operation. Note: A block transfer can be done with or without erasing data from the original location.

block valve A large, heavy duty valve on a crude oil or products trunk line placed on each side of a pipeline river crossing to isolate possible leaks at the crossing.

blooming 1. An increase in the size of the scanning spot on a CRT, caused by defocusing when the bright-

ness control is set to high. **2.** The defocusing of regions of the picture when the brightness is at an excessive level, due to enlargement of spot size and halation of the fluorescent screen of the CRT picture tube.

blooming or slabbing mills (in steel production) See under two-high reversing mill, two-high tandem mill, and three-high mill. There are many combinations and possible configurations of above conventional type mills.

bloom, slab, billet (in steel production) There is no widely accepted precise definition for the terms bloom, slab or billet and local applications of the terms are used somewhat on a traditional basis. The distinction between blooms and billets is principally a distinction of size. The distinction between blooms and slabs is principally one of cross-sectional dimensional proportion.

blotting paper An absorbed, unsized paper of low density, intended for absorbing excess ink in writing etc.

blow The opening of a circuit because of excessive current, particularly when the current is heavy and a melting or breakdown point is reached and a fuse blows.

blow (between paper or boardplies) A residual packet or air between two plies or glued webs.

blow(ing) In a batch cooker removal of the contents (pulp and spent liquor) through an exit at the base of the digester under the action of the digester pressure.

blowby Leakage of fluid through the clearance between a piston and its cylinder during operation.

blowdown **1.** The difference between actual popping pressure of a relief valve and actual reseating pressure expressed as a percentage of set pressure or in pressure units. **2.** In a steam boiler, the practice of periodically opening valves attached to the bottom of steam drums and water drums, during boiler operation, to drain off accumulations of sediment. **3.** The removal of liquids or solids from a process or storage vessel, or a line, by the use of pressure.

blowing in (a blast furnace) The process of starting a blast furnace.

blowing out (a blast furnace) When a furnace has reached the end of its campaign (lining worn out), it is usually blown out except under most unusual circumstances.

blowoff valve (gas turbines) A device by means of which a part of the air flow bypasses the turbine(s) and/or the regenerator to reduce the rate of energy input to the turbine(s). Note: It may be used in the speed governing system to control the speed of the turbine(s) at rated speed when the fuel flow permitted by the minimum fuel limiter would otherwise cause the turbine to operate at a higher speed.

blow refiner (pulp and paper industry) A refiner in the blow-off pipe from a continuous digester.

blow roll See air roll.

blue brittleness Conditions caused by embrittlement in connection with the precipitation of foreign phases in a material of given composition and given temperature.

bluing, bluing (US) Heat treatment, frequently in a controlled atmosphere, for the purposes of obtaining a layer of blue oxide serving to protect the material's surface and to improve its appearance. A prerequisite is that the surface of the object so treated is oxide-free prior to bluing.

blue-ribbon program An independently designed program that contains no mistakes or bugs. Same as star program.

blur Image where the edges or colours are not clear.

BMB British Metrification Board.

BMG Birmingham Metal Gauge.

BNC coax connector A twist-lock connector for various types of RG-type coaxial cables.

BNCS British Numerical Control Society.

BNES British Nuclear Energy Society.

BNF Backus Normal Form, Backus Natur Form.

BNI Bureau d'Orientation de la Normalisation en Informatique, the French national standards body for computer related standards.

BNOC British National Oil Corporation.

board **1.** Material in the form of sheets or reels, consisting mainly of randomly distributed natural fibers and/or artificial fibers with or without the addition of size, fillers, pigment, dyes etc. Sheets or reels of pulp intended for papermaking or for chemical dissolution are not board. Board may be impregnated, coated or treated in some other way either during or after manufacture. The distinction between paper and board is largely a question of properties and in certain cases of use. **2.** In spoken English normally same as printed wiring board (PWB) or printed circuit board (PCB). **3.** See problem board.

board for pressing Board which is suitable for being moulded in a press, e.g. for the taps or bottoms of boxes or jars.

board machine A machine for the manufacture of board or paperboard. The web on a board machine is normally formed on several coordinated forming units of the same or different types, e.g. fourdrinier wires, cylinder moulds.

board mill An industrial unit for the manufacture of board or paperboard.

bobbin **1.** A small insulated spool which serves as a support for a coil or wirewound resistor. **2.** Spool used for taking up drawn wire.

bobtail plant A gas plant that extracts liquid hydrocarbons from natural gas but does not break down the liquid product into its separate components.

BOD Biochemical Oxygen Demand.

Bode diagram In process instrumentation, a plot of log gain (magnitude ratio) and phase angle values on a log frequency base for a transfer function. (See ANSI/ISA-S51.)

Bode diagram, frequency response characteristics Graphical representation of logarithmic gain and phase angle as functions of the frequency, which is usually represented on a logarithmic scale.

body (valves) The part of the valve which is the main pressure boundary. The body also provides the pipe connecting ends, the fluid flow passageway, and may support the seating surfaces and the valve closure member.

body board See base paper.

body cavity (valves) The internal chamber of the valve body including the bonnet zone and excluding the body ends.

body end connections Pertaining to valve body end connections, end connections can be classified as; threaded, flanged, flangeless, welded i.e. either butt-weld or socket weld.

body paper See base paper.

BOF Basic Oxygen Furnace. See BOP process.

bogus bristol See imitation bristol.

boiler feedwater sensor See dissolved oxygen sensor (for boiler feedwater).

boiler horsepower The evaporation of 34 1/2 lbs of water per hour from a temperature of 212°F into dry saturated steam at the same temperature. Equivalent to 33, 475 Btu.

boiler house 1. A lightly constructed building to house steam boilers. **2.** To make a report without doing the work; to fake a report.

boilerplate 1. A full-size model that simulates the weight, size, and shape, but not all of the functional features, of the actual item. **2.** That part of the specifications of a component, piece of equipment, system, or the like that defines and describes the set of conditions of the sale.

boiler water 1. A term constructed to mean a representative sample of the circulating boiler water, after the generated steam has been separated and before the incoming feed water or added chemical becomes mixed with it so that its composition is affected. **2.** The water of adequate quality present in a boiler when steaming is, or has been, in progress.

boiling point See initial boiling point and endpoint.

boiloff The vaporization or gasification of liquefied natural gas (LNG) or other gas liquefied by applying high pressure and severe cooling. Boiloff occurs when the holding vessel's insulation fails to maintain the low temperature required to keep the gas in liquid form.

boiling point elevation In some cases, boiling point elevation can be calibrated in terms of liquid density. The temperature of the boiling sample is compared to that of water at the same pressure. For a particular liquid, boiling point elevation can be calibrated in terms of density at standard temperature.

bolometer An instrument that uses thermal effect to measure the intensity of thermal radiation over a wide wavelength range.

bomb calorimeter An apparatus for measuring the quantity of heat released by a chemical reaction.

bond Electrical interconnection made with a low-resistance material.

bonded Pertaining to electrical transducers, permanently attached over the length and width of the active element.

bonded (butterfly valve bodies) A liner vulcanized or cemented to the body bore.

bonded strain gage A pressure transducer that uses a pressure-sensing system consisting of strain-gage elements firmly bonded to a pressure-responsive member. Thermal stability and insensitivity to shock and vibration are improved by means of this bonded construction.

bonded transducer A transducer which employs the bonded strain-gage principle of transduction.

bonded washer, bonded seal Static gasket seal consisting of a flat metal washer bonded to a concentric elastometric sealing ring.

bonding 1. Soldering or welding together various elements, shields or housings of a device to prevent potential differences and possible interference. **2.** A method used to produce good electrical contact between metallic parts of any device. Used to prevent static buildup. **3.** The attachment of a wire to a circuit. **4.** The permanent joining of metallic parts to form an electrically conductive part. **5.** The means employed to obtain an electromagnetically homogenous mass having an equipotential surface.

bonding wire Fine gold or aluminium wire for making electrical connections in hybrid circuits.

bondroom location A controlled storeroom for configuration items such as material and parts (SAMA).

bone dry A papermaking term used to describe pulp fibers or paper from which all water has been removed. Also known as oven dry; moisture dry.

bonnet That portion of a valve which contains the stem seal. It may be integral with, or separable from, the valve body.

bonnet assembly (valves) An assembly including the part through which a valve plug stem moves and a means for sealing against leakage along the stem. It usually provides a means for mounting the actuator. Sealing against leakage may be accomplished by packing or a bellows. A bonnet assembly may include a packing lubricator assembly with or without isolating valve. Radiation fins or an extension bonnet may be used to maintain a temperature differential between the valve body and sealing means.

bonnet bolting (valves) A means of fastening the bonnet to the body. It may consist of studs with nuts for a flanged bonnet joint, studs threaded into the bonnet neck of the body, bolts through the bonnet flange.

bonnet gasket (valves) A deformable sealing element between the mating surfaces of the body and bonnet. It may be deformed by compressive stress or energized by fluid pressure within the valve body.

bonnetless Gate valve which has packing between the gate and body, such that the gate extends outside the pressure boundary in the open position.

bonnetted Gate valve having a bonnet which encloses the gate within the pressure boundary when in the open position. Packing is provided at the stem.

bonnet types (valves) Typical bonnets are bolted, threaded or welded to or integral with the body. Other types sometime used are extension bonnet and seal welded bonnet. It is a pressure-carrying part and is, therefore subject to the same design requirements as the valve housing.

Boolean Pertaining to logic quantities.

Boolean algebra A process of reasoning, or a deductive system of theorems using a symbolic logic and dealing with classes, propositions, or on-off circuit elements. It employs symbols to represent operators such as and, or, not, except, if ... then, etc., to permit mathematical calculation. Named after George Boole, a famous English mathematician.

Boolean calculus Boolean algebra modified to include time.

Boolean connective Symbol or character in a Boolean operation that describes the action to be performed on the operands.

Boolean data Data represented as a single binary digit.

Boolean equation Expression of relations between logic functions.

Boolean expression A quantity expressed as the result of Boolean operations such as and, or, and not upon Boolean variables.

Boolean function A switching function in which the number of possible values of the function and of each of its independent variables is two. Note: The adjective "BOOLEAN" is spelled with a capital B in the United Kingdom and with a small b in the United States of America.

Boolean operation Switching function for binary switching variables based on Boolean algebra operations. Note: The basic operations are OR, AND, and complementation.

Boolean operation, binary operation (deprecated) 1. Any operation in which each of the operands and the result take one of two values. Note: The term binary operation is deprecated to avoid confusion with dyadic operation and with binary arithmetic operation. **2.** An operation that follows the rules of Boolean algebra. Note: The term binary operation is deprecated.

ted to avoid confusion with dyadic operation and with binary arithmetic operation.

boolean operation table An operation table in which each of the operands and the result take one of two values.

Boolean operator An operator each of whose operands and whose result take one of two values.

Boolean variable See logical variable.

boost The act of increasing the power output capability of an operational amplifier by circuit modification in the output stage.

booster **1.** A power amplifier of which the signal gain is unity. **2.** An electric generator inserted in series in a circuit so that it either adds to or subtracts from the voltage furnished by another source.

boost pressure, charge pressure (fluid power systems) Pressure at which replenishing liquid is supplied (usually to closed loop transmissions or second stage pumps).

boot To execute a set of instructions automatically in order to reach a required state.

bootload The act of using the bootstrap load routine. Also, sometimes, the additional step of loading the main system program (hence the term "rebooting" the system). Refers to Honeywell TDC 3000 control systems.

boot loader See bootstrap.

bootstrap (loader) An input routine in which present computer operations are used to load a bootstrap.

bootstrap (software) **1.** A short computer program that is permanently resident or easily loaded into a computer, whose execution brings another, larger program, such as an operating system or its loader, into memory. **2.** A technique or device designed to bring itself into a desired state by means of its own action; for example, a machine routine whose first few instructions are sufficient to bring the rest of itself into the computer from an input device. **3.** That part of a computer program used to establish another version of the computer program. **4.** A set of instructions that cause additional instructions to be loaded until the complete computer program is in storage. **5.** To use a bootstrap. **6.** A short sequence of instructions, which when entered into the computer's programmable memory causes another device to load the programmable memory with a larger sophisticated program, usually a loader program. Refers to Honeywell TDC3000 control systems.

bootstrap program A routine used to start the reading of a computer program (into the computer) by means of its own action.

BOP process Steelmaking facilities employing the basic oxygen process commonly are referred to as BOP (or BOF for basic oxygen furnace) shops. There are numerous differences among BOP shops with respect to type and location of raw-materials-handling, steel-and slag-handling and gas-cleaning equipment.

BORAM Block Orientated RAM.

bore area The minimum cross-sectional flow area of a nozzle. Pertains to pressure relief valves.

boriding Raising of the boron content; in heat-treating practice usually the diffusion of boron into the surface part of surface hardening. Boriding produces a high degree of surface hardness.

borrow digit A digit that is generated when a difference in a digit place is arithmetically negative and that is transferred for processing elsewhere. Note: In positional representation system, a borrow digit is transferred to the digit place with next higher weight for processing there.

bort Industrial diamonds or diamond fragments.

BOS 1. Background Operating System. **2.** Basic Operating System.

boss (control valves) A localized projection on a valve surface provided for various purposes, such as attachment of drain connections, or other accessories.

BOT Beginning Of Tape.

BOT marker See beginning-of-type marker.

bottom To reach a point on an operating or characteristic curve where a negative change in the independent variable, as, for example, in input, no longer produces a constant change in the dependent variable, as, for example, output.

bottom-blown process, Q-BOP process A type of steelmaking oxygen process where oxygen is introduced through a number of tuyeres in the bottom of the converter. The oxygen is blown through tuyeres consisting of two concentric pipes. The oxygen passage is through the center of the inner pipe, and a hydrocarbon coolant is injected through the annulus between the two pipes. Most bottom-blown processes use methane or propane as the hydrocarbon coolant, while other bottom-blown processes use fuel oil. Also called the Q-BOP process.

bottom center-fired soaking pit See vertically-fired soaking pit.

bottom contraction The vertical distance from the crest to the floor of the weir box or channel bed.

bottom contraction, hump The reduction in the depth of the nappe downstream of a thin-plate weir due to the upward velocity component at the crest. Pertains to liquid flow measurement in open channels. See figure in ISO publication 722-1978.

bottom flange A part which closes a valve body opening opposite the bonnet opening. It may include a guide bushing and/or serve to allow reversal of the valve action. In the three-way valves it may provide the lower flow connection and its seat.

bottom slope, bed slope See bed slope.

bottom two-way fired soaking pit (in steel production) A type of continuous fired soaking pit. In this design the pits are fired by burners located at opposite endwalls. The wastegas ports are located in the same endwalls at each of the four pit corners and the gases on each end go directly to a recuperator.

bottom-up design The design of a system starting with the most basic or primitive components and proceeding to higher level components that use the lower level ones. Contrast with top-down design.

bottom withdrawal tube An instrument for analysis of sediment particles less than 0.5 mm diameter based on the principle that in a uniformly dispersed suspension, such as used in the bottom withdrawal tube, the sediment concentration at any level remains constant until the largest particle will have had time to settle from the surface to the level in question.

bound To be limited in speed by a particular component of a system. A system that is linebound, for example, is limited in performance by the speed at which information can be transmitted over the communications line. A printer-bound system has a printer as its slowest component under the specified circumstances.

boundable Designed to be permanently mounted to a surface by means of adhesives.

boundary layer In a flowing fluid, a low velocity region along a tube wall or other boundary surface.

boundary, P-N A surface in the transition region between P-type and N-type material of which the donor and acceptor concentrations are equal.

Boundary Point Represents a point at which product enters or leaves the tank farm; a point at which flow and volume can be measured.

bounded cables Cables consisting of preinsulated conductors or multiconductor components which are laid in parallel and bonded into a flat cable.

bound mode (optical communication) In an optical fiber, a mode whose field decays monotonically in the transverse direction everywhere external to the core and which does not lose power to radiation. Bound modes correspond to guided rays in the terminology of geometric optics. In a multimode fiber, the power in bound modes is predominantly contained in the core of the fiber.

Bourdon pressure sensor A specially formed tube closed at one end which undergoes a measurable physical deflection within its elastic limit when subjected to a pressure difference between the inside and the outside of the tube. The most common forms are the C, the spiral, and the helical elements. Also known as Bourdon element; Bourdon pressure gauge.

bowl (separation terminology) The rotary separator bowl is sometimes referred to as "rotor", especially in technical papers dealing with dynamics.

box 1. In connection with BASIC Systems, denotes any one of up-to-63 Data Hiway-compatible devices; e.g., Basic Controllers, Analog Units, Process Interface Units, are typical of these devices. Refers to Honeywell TDC 3000 control systems. **2.** A flow-chart symbol.

box address Unique Hiway number assigned to each device interfacing with the Data Hiway. Refers to Honeywell TDC 3000 control systems.

box annealing Box-annealing equipment consists of annealing bases on which to place the steel charge, furnaces to apply the heat, and generally, inner covers which fit over the charge in the furnace and contain the protective atmosphere that prevents oxidation of the steel. In most box-annealing equipment the bases are stationary and the portable furnaces are lowered by crane onto the loaded base and attached to fuel and control connections for the annealing operation. An alternative form of box annealing uses stationary furnaces.

box error On the Hiway Status Display, an error status code associated with an individual Hiway device. Refers to Honeywell TDC 3000 control systems.

box furnaces A type of batch heat-treating furnace that is constructed with a solid hearth. It is shaped, as the name implies, similar to a box and is charged through door openings by tongs or some mechanical charger.

box packing (valves) The chamber in the bonnet surrounding the stem and containing packing and other stem sealing parts.

box-point summary A display that permits you to select a particular box in the BASIC System and identify those point names associated with it. Refers to Honeywell TDC 3000 control systems.

BPC Blend Property Control; Package name that defines a system of recipe management, model-based product property control and blend reporting.

BPF See bandpass filter.

BPI 1. See bits per inch. **2.** Bytes Per Inch.

BPS 1. See bits per second. **2.** Basic Programming System.

Bq Symbol for becquerel. Unit for activity (of a radioactive substance).

BQL Basic Query Language.

BRA British Refrigeration Association.

braided asbestos A type of packing material (for control valves) which can be made as split rings, which can be wrapped around the valve stem; therefore, facilitating maintenance when the valve is installed. This type of packing usually employs additives, such as mica or graphite, for lubrication, particularly in high temperature service.

braided wire 1. A flexible wire made up of small strands woven together. **2.** Woven bare or tinned copper wire used as shielding for wires and cables and as ground wire for batteries or heavy industrial equipment. There are many different types of construction.

brake horsepower (BHP) The power developed by an engine as measured at the drive-shaft; the actual or delivered horsepower as contrasted to indicated horsepower.

braking torque (of an integrating instrument) The torque resulting from the interaction of the field of a fixed permanent magnet with the currents induced by it in the rotor of an integrating instrument and opposing its rotation.

branch 1. In a network, a path that connects two adjacent nodes and that has no intermediate nodes.

2. Hardware-One of the coaxial cables emanating from the Hiway Traffic Director. Refers to Honeywell TDC 3000 control systems. **3.** Software - A logical path in a program. Refers to Honeywell TDC 3000 control systems.

branch (deprecated in this sense), transfer (deprecated in this sense), jump In the execution of a computer program, a departure from the implicit or declared order in which instructions are being executed.

branch (in electronic computers) Same as: conditional jump.

(to) branch In the execution of a computer program, to select one from a number of alternative sets of instructions.

branch construct (programming languages) An language construct specifying a choice between different execution sequences by means of label references.

branching point A point in a block diagram from which the same variable is connected to more than one functional block. Note: The point may be emphasized by a dot.

branch instruction, decision instruction (USA) An instruction that controls branching.

branch line (pneumatic control) The air line from a controller to the controlled device.

branch line pressure (pneumatic control) A varying air pressure signal from a controller to an actuator, carried by the branch line. Can go from zero to full main line pressure.

branch order An instruction used, to link subroutines into the main program of a computer.

branchpoint A point in a computer program at which branching occurs, in particular the address or the label of an instruction.

branch voltage The voltage across a branch of a network.

brazing Joining metals by flowing a thin layer (of capillary thickness) of a lower melting point nonferrous filler metal in the space between them. Brazing is sometimes referred to as hard soldering.

BRC Blend Ratio Control; Package name that defines a system of ratio control pacing, equipment activation and deactivation and minor blend reporting.

breach Any successful and repeatable defeat of a computer's security controls which, could result in a penetration of the system.

breadboard 1. Developmental or prototype version of a circuit. **2.** Perforated substrates which facilitate trial positioning of circuit components and wiring arrangements leading to final circuit construction and packaging. They are used in design, construction, and assembly.

breadboard model An assembly in rough form to prove the feasibility of a circuit, device, system, or principle.

breadth-first search A search that proceeds from higher to lower levels of a search tree, checking the nodes across all the possible alternatives at one level before going to the next lower level until the goal or a predetermined state is reached.

break An interruption in computer processing.

break (communications) The receiving operator or listening subscriber interrupts the sending or talking subscriber and takes control of the circuit. The term is used especially in connection with halfduplex telegraph circuits and two-way telephone circuits equipped with voice-operated devices.

break alarm 1. An alarm condition signaled by the opening or breaking of an electrical circuit. **2.** The signal produced by a break alarm condition (sometimes referred to as an open-circuit alarm or trouble signal, designed to indicate possible system failure).

break-before make 1. The action of opening a switching circuit before closing another associated circuit. **2.** Movable contact that breaks one circuit before making the next circuit.

break-before-make contacts Contacts which interrupt one circuit before establishing another.

break contact 1. In a switching device, the contact which opens a circuit upon operation of the device (normally closed contact). **2.** Contacts which open when a key or relay is operated.

break distance The effective open-gap distance between the stationary and movable contacts.

breakdown (of a semiconductor) A phenomenon occurring in a reverse biased semiconductor diode, the initiation of which is observed as a transition from a region of high dynamic resistance to a region of substantially lower dynamic resistance for increasing magnitude of reverse current.

break down impedance (of a semiconductor diode) The small-signal impedance at a specified direct current in the breakdown region.

breakdown region (of a semiconductor-diode characteristic) That entire region of the volt-ampere characteristic beyond the initiation of breakdown for increasing magnitude of reverse current.

breakdown torque The maximum torque a motor will develop, without an abrupt drop in speed, as the rated voltage is applied at the rated frequency.

breakdown voltage 1. That voltage at which an insulator or dielectric ruptures, or at which ionization and conduction take place in a gas or a vapor. **2.** The voltage required to jump an air gap. **3.** The reverse bias voltage applied to a pn junction for which large currents are drawn for relatively small increases in voltage. **4.** The voltage at which the insulation between two conductors will break down.

breakdown voltage (of a semiconductor diode) The voltage measured at a specified current in the breakdown region.

breakdown voltage rating The dc or sinusoidal ac voltage which can be applied across specified insulated portions of a transducer without causing arcing or conduction above a specified current value across the insulating material. Note: Time duration of applica-

tion, ambient conditions and ac frequency must be specified.

breaker See breaker beater.

breaker beater, breaker Pertaining to the pulp and paper industry, a hollander intended for slushing having a beater rollfitted with blunt bars and with or without a bedplate.

breaker stack A calender with two polished steel rolls, placed in the drying section of a paper machine.

break frequency Another name for corner frequency.

breaking length The limiting length of a strip of uniform width of e.g. paper or board beyond which it breaks under its own weight if suspended from one end.

break-make (B-M) First breaking then closing contact function.

breakpoint 1. The junction of the extension of two confluent straight-line segments of a plotted curve. In the asymptotic approximation of a log-gain vs. log-frequency relation in a Bode diagram, the value of the abscissa is called the corner frequency. (See ANSI/ISA publication S 51.1-1979). **2.** A place in a computer program, usually specified by an instruction, where its execution may be interrupted by external intervention or by a monitor program. Breakpoint usually are used in debugging operations.

breakpoint chlorination (water quality) The addition of chlorine to water to the point where free available residual chlorine increases in proportion to the incremental dose of chlorine being added.

breakpoint switch A manually operated switch which controls conditioned operation at breakpoints; it is used primarily in debugging.

breakup See color breakup.

breast roll Pertaining to a paper machine, a guide roll supporting a wire and which changes the direction of movement of the wire immediately prior to the forming zone.

breather A device fitted in the wall of an explosion-proof compartment, or connected by piping thereto, that permits relatively free passage of air through it, but that will not permit the passage of incendiary sparks or flames in the event of gas ignition inside the compartment.

breather capacity (fluid power systems) Measure of air flow rate through an air breather.

breaching A duct for the transport of the products of combustion between parts of a steam generating unit or to the stack.

Brewster's angle (optical communication) For light incident on a plane boundary between two regions having different refractive indices, that angle of incidence at which the reflectance is zero for light that has its electric field vector in the plane defined by the direction of propagation and the normal to the surface.

bridge A network device that interconnects two local area networks that use the same LLC (Logic Link Control) but may use different MACs (Media Access Control). A bridge requires only OSI (Open System Interconnect). Level 1 and 2 protocols (also see Gateway and Router).

bridge annealing Heat treatment in controlled atmosphere to retain the material's non-oxidized surface or to remove any oxidized layers present.

bridge circuit A network arranged so that, when an electromotive force is present in one branch, the response of a suitable detecting device in another branch may be zeroed by suitable adjustment of the electrical constants of still other branches.

bridge control Apparatus and arrangement providing for direct control from the bridge or wheelhouse of the speed and direction of a vessel

bridge input circuit (in process control) An analog input circuit in which the sensing component of the technical process is in one branch of the bridge circuit and the reference components are in another branch.

bridge limiter A diode bridge used as a limiter.

bridge resistance See input impedance and output impedance.

bridgewall A wall in a furnace over which the products of combustion pass.

brightness pyrometer A brightness pyrometer measures the radiation power in a narrow band of wavelengths. A filter is used to obtain the desired range of wavelengths. For optical pyrometers, a red filter is often used. As with total radiation pyrometer, it is necessary to correct for a non-blackbody.

brightness reversion See yellowing.

bright stocks High-viscosity, fully refined and dewaxed lubricating oils used for blending with lower-viscosity oils. The name originated from the clear, bright appearance of the dewaxed lubes.

brimstone A common name for sulfur, especially native sulfur or that found free of other minerals.

brine (calcium chloride) 1. A salt solution. 2. Salt water; more specifically, liquids found in deep sedimentary basins; oilfield water.

Brinell hardness test In the Brinell hardness test, a spherical ball usually made of hardened steel, is forced into the specimen under a definite static load. The size of the resulting indentation provides a measurement of hardness as it is manifested under the particular conditions of the Brinell test.

brink (liquid flow measurement in open channels) The edge of an abrupt drop in the flow of a channel.

briquetting An old art that has been used to agglomerate or form small or large lumps of regular shape from a wide variety of materials including wood, coal, lignite, chars, cokes, ores, and flue dust.

British Standards Institution (BSI) A British institution corresponding somewhat to the American National Standards Institute.

British Standard Wire Gage A modification of the Birmingham Wire Gage and the legal standard of Great Britain for all wires. It is variously known as Standard Wire Gage (SWE), New British Standard (NBS), English Legal Standard, and Imperial Wire Gage.

British Thermal Unit (BTU) The energy required to raise the temperature of one pound of water one degree Fahrenheit.

brittleness The tendency of a material to fracture without apparent plastic deformation.

brittle transition temperature Temperature at which a change occurs in brittleness. In the testing of steel, the brittle transition temperature refers to the temperature range at which the nature of the fracturing changes from tough to brittle during the lowering of the temperature.

Brix scale A specific gravity scale used almost exclusively in sugar refining; the degrees Brix represent the weight percent pure sucrose in water solution at 17.5°C.

broadband Wide bandwidth greater than a voice-grade channel (4 kHz), equipment or systems which can carry a large proportion of the electromagnetic spectrum. A broadband communications system can accommodate broadcast and other services. Transmission using a bandwidth greater than a voice-grade channel

(4 kHz) and therefore capable of higher-speed data transmission. Sometimes referred to as "wideband".

broadband amplifier 1. An amplifier which has an essentially flat response over a wide frequency range. 2. An amplifier capable of amplifying a wide band of frequencies with minimal distortion.

broadband exchange (BEX) A public switched communication system of Western Union, featuring various bandwidth full duplex connections.

broadband pyrometer See total radiation pyrometer.

broadcast 1. The simultaneous dissemination of information to one or more stations, one way, with no acknowledgement of receipt. 2. A message addressed to all stations connected to a LAN (Local Area Network).

broadcast transmission (token ring access method) A transmission addressed to all stations.

broad-crested weir A weir of sufficient breadth (i.e. the crest dimension in the direction of the flow) such that critical flow occurs on the crest of the weir. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3580: Part 1: 1983.

broke (in the paper industry) Paper or board which is removed at same stage of the manufacturing process and which is normally returned to the process. There are two kinds of broke: wet broke which arises at the wet end of the paper machine and dry broke from some later stage of the manufacturing process.

broken loop amplification, (open) loop amplification For an element or system the ratio of the steady-state amplitude of the output signal on one side of a break at any point in a closed loop to the amplitude of the input signal applied to the other side of the break assuming that the output signal side of the break has been suitably terminated. Note: For a linear element or system, the amplification is in general dependent upon the frequency of the input signal, which must therefore be stated. For a non-linear element or system the amplification also depends on the amplitude of the input signal which must therefore be stated.

Brownian motion noise Also identified as thermal or Johnson noise. A random movement of microscopic particles, in organic or inorganic fluid suspension, caused by collision with surrounding molecules.

brown mechanical pulp Groundwood manufactured from steam-treated or water-boiled wood.

brown millboard Millboard manufactured from brown mechanical pulp and/or waste paper.

brownout Refers to low line voltage which can cause misoperation and possible damage of equipment. For example, a motor trying to start at low voltage can actually be in a lock-rotor condition and overheat.

brush coating Pertaining to paper manufacturing, a method of coating a web where the applied coating slip is spread out and evened out by means of brushes, some of which are fixed while others move across the web.

BS 1259 British Standards Institution Standard; Intrinsically safe electrical apparatus and circuits for use in explosive atmospheres.

BS 5345 British Standards Institution Standard; Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture): Part 1 through 8.

BS 5501 British Standards Institution Standard; Electrical apparatus for potentially explosive atmospheres, Part 1 through 9.

BSC Binary Synchronous Communications. A line-control procedure for communicating (expressed in 8-bit EBCDIC) 7-bit USASCII or 6-bit transcode. The data code selected must include the required line-control characters, used according to specified rules.

BSI British Standards Institute.

BSIRA British Scientific Instrument Research Association.

BSNDT British Society for Non-Destructive Testing.

BSP British Standard Pipe Thread Parallel.

B-spline surface The mathematical description of a three-dimensional surface which passes through a set of B-splines.

BSPTT British Standard Taper Pipe Thread.

BSW British Standard Whitworth Thread.

BSX See broadband exchange.

BT-cut crystal A piezoelectric plate that is cut from a quartz crystal at an angle of rotation (about the X-axis) of 49°. At approximately 25°C it has a zero temperature coefficient of frequency.

BTL Beginning Tape Level.

BTU, Btu British Thermal Unit. The amount of heat required to raise one pound of water one degree Fahrenheit.

BTX group See under aromatics.

bubble coated paper Coated paper where the coating contains cavities caused by small air bubbles which have intentionally been introduced into the coating slip.

bubblegas A gas selected to bubble from the end of a tube immersed in liquid for level measurement from the hydrostatic back pressure created in the tube. See also bubble-tube.

bubble logic A (developmental) form of magnetic logic.

bubble memory A magnetic storage that uses cylindrically shaped magnetized areas in thin film that are movable, nonvolatile and changeable.

bubble-point pressure The pressure at which gas, held in solution in crude oil, breaks out of solution as free gas; saturation pressure.

bubbler technique See under gas purge technique.

bubble tight (control valves) A nonstandard term. Refer to ANSI B16.104 for specification of leakage classifications. See also IEC publication 534-4, 1982 and Amendment No 1 August 1986 to 534-4.

bubble tower Any of the tall cylindrical towers at an oil refinery. See fractionator.

bubble-tube An auxiliary device used for liquid level or density measurement. Air or gas bubbling from the bubble tube into the liquid isolates the sensor from direct contact with the measured liquid which may be corrosive or viscous. The pressure in the bubble tube is virtually equal to the liquid head (the product of the length of bubble tube immersed in the liquid by the liquid density), since the excess pressure is released by bubbles leaving the tube.

bucket type process Same as batch process.

bucking voltage A voltage which is opposite in polarity to another voltage in the circuit and hence bucks, or opposes, the latter voltage.

Buckley gage A device that measures very low gas pressure by sensing the amount of ionization produced by a prescribed electric current.

buckling The warping of the plates of a battery due to an excessively high rate of charge or discharge.

buffer 1. An internal portion of a data processing system serving as intermediate storage between two storage or data-handling systems with different access time or formats; usually to connect an input or output device with the main or internal high-speed storage.

2. An isolating component designed to eliminate the reaction of a driven circuit on the circuits driving it, e.g., a buffer amplifier. **3.** A special purpose storage or storage area allowing, through temporary storage, the data transfer between two functional units having different transfer characteristics. Synonymous with buffer storage. Note: A buffer storage is used between non-synchronized devices, or where one is serial and the other is parallel or between those having different transfer rates.

buffered computer A computing system with a storage device which permits input and output data to be stored temporarily in order to match the slow speeds of input and output devices. Thus, simultaneous input-output and computer operations are possible. A data transmission trap is essential for effective use of buffering since it obviates frequent testing for the availability of a data channel.

buffered data channel (BDC) A device that provides high-speed parallel data interfaces into and out of the computer memory.

buffered I/O channel A computer I/O channel that controls the movement of data between an external device and memory, under the control of self-contained registers (i.e. independent of the operating program).

buffer memory The memory used to compensate for the difference in rate of flow of information or time of occurrence of events when transmitting information from one device to another.

buffer solution A solution usually of a mixture of weak acid, or a weak base, and its salt which is resistant to change in hydrogen ion concentration on addition of an acid or alkaline.

buffer storage 1. A storage device that is used to compensate for differences in the rate of flow of data between components of a data processing system, or for the time of occurrence of events in the components. **2.** Synonymous with buffer.

bug 1. An error in a program which causes improper operation. **2.** A mistake or malfunction. **3.** An integrated circuit.

bug seeding See fault seeding.

build An operational version of a software product incorporating a specified subset of the capabilities that the final product will include.

building block (software engineering) An individual unit or module that is utilized by higher-level programs or modules.

building management system A system which centralizes the monitoring, operations, and management of a building to achieve more efficient operations.

build-up time Length of time it takes the measured variable to first reach a new set-point when a small change in set-point is made with the controller turned to overshoot and cycle into the new value. Sometimes called rise time.

built-in (programming languages) See predefined.

built-in check (computers) See automatic check.

built-in test (BIT) A test approach using built-in test equipment (BITE) or self test hardware or software to test all or part of the unit under test.

built-up back pressure Built-up back pressure is pressure existing at the outlet of a pressure relief device occasioned by the flow through that particular device into a discharge system.

bulb 1. The glass envelope used in the assembly of an electron tube or an electric lamp. **2.** The glass component part used in a bulb assembly.

bulge 1. The difference between the actual characteristic and a linear characteristic of the attenuation-frequency characteristic of a transmission line. **2.** A local distortion of swelling outward by internal pressure on a tube wall or boiler shell caused by overheating. Also applied to similar distortion of a cylindrical furnace due to external pressure when overheated provided the distortion is of a degree that can be driven back.

bulk (of paper or board) An older term for the reciprocal of density.

bulk density See apparent density.

bulk density (of deposited sediment) The total dry mass of a unit volume (including pores) of undisturbed deposit.

bulking board, bulking paper See featherweight paper.

bulking thickness Pertaining to paper manufacturing, the thickness of a pack of sheets divided by the number of sheets in the pack. The thickness is determined according to a standardised test procedure.

bulk memory Same as secondary storage.

bulk modulus Relationship of applied stress and volumetric strain produced when stress is applied uniformly to all sides of a body. It is the reciprocal of compressibility.

bulk plant A distribution point for petroleum products. A bulk plant usually has tank car unloading facilities and warehousing for products sold in packages or in barrels.

bulk resistance The portion of the contact resistance which is due to the length, cross section, and material.

bulk resistivity Resistance measured between opposite faces of a cube or homogeneous material.

bulk storage memory Any non-programmed large memory. For example, discs, drums, or magnetic tape units.

bulk-storage plant A location where gasoline or other volatile flammable liquids are stored in tanks having an aggregate capacity of one carload or more, and from which such products are distributed (usually by tank truck).

bulletin board system (BBS) Information and database accessible by modem and computer link.

bullion A semirefined alloy containing enough precious metal to make its recovery economically feasible.

bull screen, coarse screen A screen which separates a coarse reject from a suspension of mechanical pulp.

Buna-N A nitrile synthetic rubber (trademark) known for resistance to oils and solvents. A typical liner material for butterfly valves.

bundle, fiber bundle An assembly of unbuffered optical fibers. Usually used to transmit together a single signal.

bundle deck (pulp and paper industry) A fixed platform where bundles of pulp wood are opened and from which the logs are transported onwards.

bunker C oil Residual fuel oil of high viscosity commonly used in marine and stationary steam power plants.

buoyance level measuring device A device which measures liquid level by sensing the buoyant force exerted on a vertical displacer element with a constant cross section over the level measuring range.

buoyancy The tendency of a fluid to lift any object submerged in the body of the fluid; the amount of force applied to the body equals the product of fluid density and volume of fluid displaced.

burdening (of a blast furnace) The regulation of the proportions of ore, pellets, sinter, flux, coke and

miscellaneous materials charged into the blast furnace is called burdening.

buried cable 1. A cable installed underground and not removable except by disturbing the soil. **2.** A cable installed directly in the earth without use of underground conduit. Also called direct burial cable.

burned steel (in steel production) A defect on ingots as the result of flame impingement.

burner A device for the efficient combustion of a mixture of fuel and air. There are many different designs of burners for liquid fuels. Burners designed for atomization by steam or air may be classified into two general types, the inside mixing and the outside mixing. In the inside-mixing type the fuel and atomizing agent are mixed inside the burner or burner system, while in the outside-mixing type the two fluids meet immediately outside the burner tip. The inside-mixing type is sometimes classified as an emulsion type or nozzle-mix type.

burn-in 1. A period, usually prior to on-line operation, during which equipment is continuously energized for the purpose of forcing infant mortality failures. **2.** In this screening test, devices are operated at high temperature for an extended period of time to accelerate failure mechanisms. Power-on-burn-in testing will uncover metallization defects such as intermittent shorts or opens, pinholes in the passivation layers beneath metallization, and corrosion or contamination defects. This test will also locate circuits that have crystal dislocations, diffusion anomalies, contamination in or on the oxide, improper doping levels, and cracked dice. The burn-in screen is also used to evaluate the quality of a lot.

burning Overheating at a temperature so high that partial melting or oxidation occurs. Burning is generally accomplished by property alternations that cannot be rectified by heat treatment or hot working or both.

burning point The lowest temperature at which a volatile oil in an open vessel will continue to burn when ignited by a flame. This temperature determines the degree of safety with which kerosene and other illuminants may be used.

burnishing Smoothing surfaces through frictional contact between the work and some hard pieces of material as hardened steel balls.

burnt cook, black cook Pertaining to the pulp and paper industry, a sulphite cook in which the chips have been burned by lignin condensation, i.e. have become dark brown and incapable of being pulped.

burr Hardened steel rolls or rings with needles or furrows which when pressed against a rotating grindstone expose new grits on the surface of the stone.

burr lathe, pulpstone dresser An apparatus fitted to a grinder to enable a burr to be brought into contact with a grindstone and moved sideways across the surface of the stone.

burst Repetitive pulses occurring during a fixed time interval.

burst mode A means of transferring data as a continuous block to or from a particular input/output (I/O) device on either the multiplexer or selector channel. All channel controls are monopolized for the duration of data transfer.

burst pressure Burst pressure is the value of inlet static pressure at which a rupture disk device functions. Pertains to pressure relief devices. Generally: The maximum pressure to which a device can be subjected without rupturing.

burst pressure rating The pressure which may be applied to the sensing element or the case (as speci-

fied) of a transducer without rupture of either the sensing element or transducer case as specified. Note **1.** Minimum number of applications and time duration of each application must be specified. **2.** In the case of transducers intended to measure a property of a pressurized fluid, burst pressure is applied to the portion subjected to the fluid.

burst strength The maximum pressure which may be exerted perpendicularly to the surface of a piece of e.g. paper or board before rupture occurs.

burst transmission Data transmission at a specific data signalling rate during controlled intermittent intervals.

bus 1. A circuit over which data or power is transmitted. Often one which acts as a common connection among a number of locations. (Synonymous with trunk.) **2.** A path over which information is transferred, from any of several sources to any of several destinations. **3.** A facility for transferring data between several devices located between two end points, only one device being able to transmit at a given moment. **4.** Pertaining to a field bus in industrial control systems, a common message transfer medium interconnecting a group of addressable entities such that all entities on the bus always receive, or listen to messages from all other entities on the same bus.

bus (in electronic computers) One or more conductors used for transmitting signals or power from one or more sources to one or more destinations.

bus access control The function which authorized devices to send messages on the bus.

bus average message rate Pertaining to a field bus in industrial control systems, this is the average number, per second, of all data messages sent or received by all devices on the bus.

bus driver A power amplifier used as a driver for many points such as inputs or devices by way of a conductor, usually low-impedance bus in a digital computer.

bushing (control valves) A fixed member which supports and/or guides the closure member, valve stem and/or actuator stem. The bushing supports the nonaxial loads on these parts and is subject to relative motion of the parts.

business data processing 1. Data processing for business purposes, e.g., recording and summarizing the financial transactions of a business. **2.** Same as administrative data processing.

business unit The lowest level of the company which contains the set of functions that carry a product through its life span from concept through manufacture, distribution, sales and service.

busing The joining of two or more circuits together.

bus length Pertaining to a field bus in industrial control systems, bus length includes the length of all spurs, connected to the bus.

bus organization The manner in which many circuits are connected to common input and output lines (buses).

bus request The DEC PDP-11 priority system for determining which external device will obtain control of the UNIBUS to interrupt the CPU for service.

bussback The connection, by a common carrier, of the output position of a circuit back to the input portion of a circuit.

busway A grounded metal enclosure containing factory mounted, bare or insulated, conductors which are usually, copper or aluminium, bars, rods or tubes.

butane A hydrocarbon fraction; at ordinary atmospheric conditions, butane is a gas but it is easily lique-

fied; one of the most useful LP-gases; widely used household fuel.

butt contacts An arrangement in which relative movement of the cooperating members is substantially in a direction perpendicular to the surface of contact.

butterfly valve A valve with a circular body, and a rotary motion disk closure member, pivotally supported by its shaft. Properly selected generally in sizes 4 inches and above, offers the advantages of simplicity, low cost, light weight, and space saving. For moderate temperatures and pressures the elastomer-lined valve includes the advantage of tight shut-off. Butterfly valves are manufactured in three grades: standard, medium and heavy duty. The heavy duty valve has a stronger shaft and vane construction than the standard valve.

butt joint A connection between two waveguides or transmission lines that provides physical contact between the ends of the waveguides in order to maintain electric continuity.

butt resistance welding thermocouples Method for joining of bare wire thermocouples. See ISA publication MC 96.1.

butt-welded pipe Pipe made from a rectangular sheet of steel that is formed on mandrels. The two edges of the sheet are butted together and welded automatically.

butt weld ends Type of end connections for valves. Can be either butt weld or socket weld. Welded ends are quite common where high pressure, high temperature fluids are encountered, particularly in steam and water service in power plants. Care should be taken to see that the valve body material specified is compatible with the adjoining pipe material.

butt-weld process The continuous butt-weld process is a true continuous process starting with coiled skelp and ending with finished pipe. The skelp mill rolls skelp to meet the requirements of a continuous butt-weld pipe mill.

butyl rubber seal Material composed of copolymer of isobutylene and isoprene exhibiting good chemical and ozone resistance and low permeability to gas. (Resistant to a number of phosphate ester fluids but not to petroleum-based fluids.)

buzz (electromagnetic compatibility) A disturbance of relatively short duration but longer than a specified value as measured under specified conditions.

BVC Black Varnish Cambric (insulation).

BWG Birmingham Wire Gauge.

BX cable Insulated wires enclosed in flexible metal tubing or flexible spiral metal armor used in electrical wiring.

bypass A passage for a fluid, permitting a portion or all of the fluid to flow around its normal pass flow channel.

bypass (flow ratio) technique A very convenient and economical flow measurement technique especially for large-line sizes, called bypass or flow-ratio technique. A small bypass flow leg is constructed on a larger flow line. Flow is initiated in the bypass because a pressure difference is generated across the bypass leg by the presence of the orifice in the main line. For this system, the ratio of the flow rate in the bypass leg to flow rate in the main line is a constant; consequently, a small flowmeter may be used in conjunction with the known constant of proportionality to establish the total flow rate in the main line.

bypass capacitor A capacitor required to provide a low-impedance path around resistors or similar circuit elements for high frequency alternating currents.

bypass current The current flowing through the bypass device or devices in parallel with the series capacitor.

bypass device A device such as a switch or circuit breaker used in parallel with a series capacitor and its protective device to shunt line current for some specified time, or continuously. This device may also have the capability of inserting the capacitor into a circuit and carrying a specified level of current.

bypass filter A filter providing a low-attenuation path around some other circuit or element.

bypass flow control valve (fluid power systems) Pressure-compensated flow control valve which regulates the working flow diverting surplus fluid to reservoir or to a second service.

bypassing **1.** Reducing high-frequency current in a high-impedance path by shunting that path with a bypass element (usually a capacitor). **2.** See bypass valve.

bypass/isolation switch A manually operated device used in conjunction with an automatic transfer switch to provide a means of directly connecting load conductors to a power source and of disconnecting the automatic transfer switch.

bypass manifold A connection block fitted with several apertures for making multiple physical connections. Usually fitted with valve(s) to close or bypass specified connections.

bypass valve A valve by which the flow of liquid or gas in a system may be shunted past a part of the system through which it normally flows; a valve that controls an alternate route for liquid or gas.

by-product Incidental or secondary output of a chemical production of manufacturing process that is obtained in addition to the principal product with little or no additional investment or allocation of resources.

by-product coke oven (by-product process for carbonizing coal) By-product coke ovens are those designed and operated to permit collection of the volatile material evolved from coal during the coking process, as opposed to beehive and other types of ovens that allow the volatile products to escape. Because of the physical dimensions of the coking chamber of by-product ovens (narrow, long and tall) they are sometimes referred to as slot ovens. They are called recovery-type ovens also, because their design permits recovery of the volatile products of the coking operation. While there are many modifications, these ovens consists essentially of three main parts, namely the cooking chambers, the heating flues, and the regenerative chambers – all constructed of refractory brick.

byte A group of consecutive bits operated as a unit. The number of bits in a byte is fixed within a system, often to the value 8. Bytes are often used to represent characters.

byte multiplexer A device that receives several bytes of data from various sources, combines them into a single transmission path, and distributes them to various destinations.

byte, octet A string that consists of 8 bits.

byte-serial (696 interface devices) A sequence of bit-parallel data bytes used to carry information over a common bus.

C

C1. Symbol for coulomb, unit for quantity of electricity, charge (SI unit). **2.** Centigrade or Celsius. **3.** Carbon.

c Prefix for centi, meaning 10^{-2} .

Ca Chemical symbol for calcium.

cabinet A closed, stand alone, mechanical structure provided with access doors and designed to receive assembled equipments inside and/or on the front.

cable (coaxial) A central wire surrounded by a cylinder-like shield of braided wires or metal to inhibit noise pickup and maintain uniform transmission characteristics.

cable armor In cable construction, a layer of steel wire or tape, or other extra strength material used to reinforce the lead wall.

cable assembly A cable with plugs or connectors on each end for a specific purpose. It may be formed in various configurations.

cable attenuation Reduction of signal intensity along a cable, usually expressed in decibels per foot, hundred feet, kilometer, mile etc.

cable bond An electric connection across a joint in the armor or lead sheath of a cable, or between the armor or lead sheath and earth, or between the armor or sheath of adjacent cables.

cable core That portion of an insulated cable lying under the protective covering or jacket.

cable coupler A device used to join lengths of similar or dissimilar cable having the same electrical characteristics.

cable diagram (or table or list) Diagram (or table or list) providing information on cables, such as identification of the conductors, the location of the ends and, if needed, the characteristics, routes and function.

cable fill The ratio of the number in use to the total number of pairs in a cable.

cable messenger A stranded cable supported at intervals by poles or other structures and employed to furnish frequency points of support for conductors or cables.

cable noise When digital equipment is cabled together, care must be taken to minimize crosstalk between the individual conductors in the cables. Because of the fast rise and fall times characteristic of digital signals, these individual conductors can often generate significant amounts of noise.

cable splice A connection between two or more separate lengths of cable. The conductors in one length are individually connected to conductors in the other length, and the protecting sheaths are so connected that protection is extended over the joint.

cable spreading room The cable spreading room is normally the area adjacent to the control room where cables leaving the panels are dispersed into various cable trays for routing to all parts of the plant.

cable tray A prefabricated metal raceway with or without covers consisting of siderails and bottom support sections.

cableway system (liquid flow measurements in open channels) An assembly of winches and ropes and a cradle for placing the current-meter at any desired point in the cross-section.

CAB process (in steelmaking) Capped Argon Bubbling. A secondary steelmaking process. Argon bubbling in practices are currently used for several purposes including rapid and uniform mixing of al-

loys, temperature homogenization, adjustment of chemical composition, and partial removal of nonmetallic inclusions.

CACD Computer Aided Circuit Design.

cache (memory) A special purpose buffer storage, smaller and faster than main storage, used to hold a copy of instructions and data obtained from main storage and likely to be needed next by the processor.

CAD 1. Computer Aided Design. The use of computers to assist in design. **2.** Computer-Aided Detection. **3.** Computer Access Device. **4.** Computer Activated Device. **5.** Containment Atmosphere Dilution.

CAD/CAM Computer Aided Design/Computer Aided Manufacturing. Two highly specialized technical applications of a computer to improve the productivity of the engineer.

CADM Computer-Aided Design and Manufacturing.

cadmium A metallic element widely used for plating steel hardware or chassis to improve its appearance and solderability and to prevent corrosion. It is also used in the manufacture of photocells.

cadmium cell A standard cell used as a voltage reference at 20°C its voltage is 1.0186 volts.

CAE 1. Computer Aided Engineering. **2.** Computer Aided Education.

cage (control valves) A hollow cylindrical trim element that is a guide to align the movement of a valve plug with a seat ring and also retains the seat ring in the valve body. Often the walls of the cage contain openings which determines the flow characteristics of the control valve.

cage guided balanced trim (control valves) Cage guided balanced trim achieves pressure balance across the plug by vent holes passing through it. The greatly improved throttling stability of cage guided, balanced trim, results in a much smaller actuator size than needed for either standard trim or cage guided trim.

cage guided trim (control valves) Cage guided trim (without balance) uses the cage as a massive plug guide, while excellent distribution of flow balances the horizontal side loads on the plug. The primary advantage of cage guided over regular trim is the improvement in flow stability.

cage valves So-called "top entry" or cage valves have the advantage of easy trim removal. Valves of this type usually have streamlined body passages to permit increased flow capacity. The cage is a cylindrical spool piece surrounding the plug. It has a number of flow parts which uniformly distribute flow around the plug and, in most designs, serves as a massive plug guide. It also may carry the seat joint. The two most common designs of cage trim are "cage guided" and "cage guided", balanced.

CAI 1. Computer Aided Instruction. **2.** Computer Aided Inspection. **3.** Computer Assisted Instruction.

CAL 1. Computer Aided Learning. **2.** Computer Assisted Learning. **3.** Computer Animation Language. **4.** Conversational Algebraic Language. **4.** Colorimeter.

cal Calorie.

calcining Calcining is the heating of a substance to drive off moisture and other gaseous impurities or to make it more friable or crushable. Petroleum coke is calcined, crushed, and heated to drive off any remaining liquid hydrocarbons and water.

calculated frequency response The frequency response of a transducer calculated from its transient response, its mechanical properties, or its geometry, and so identified.

calculating Computing a result by multiplication, division, addition, or subtraction or by a combination of these operations. A data-processing function.

calibrating action A type of control system action in which one or more feedback signals are combined with one or more actuating signals to provide an output signal which is some function of the combination.

calculator A device that is especially suitable for performing arithmetic operations but that requires human intervention to alter its stored program, if any, and to initiate each operation or sequence of operations.

calculator mode An interactive computer system that has a mode which allows the terminal to be used like a desk calculator. The user types an expression, and the computer evaluates it and returns the answer immediately. Also called fast answer-back.

calculus of variations The theory of maxima and minima of definite integrals whose integrand is a function of the dependent variables, the independent variables, and their derivatives.

calefaction 1. A warming process. 2. The resulting warmed condition.

calendar age Age of an item or object measured in terms of time elapsed since it was manufactured.

calender A machine in which a material such as paper or board is subjected to a mechanical treatment in a roll nip which changes its shape or surface. Paper or board can be subjected to glazing, thickness regulation, density adjustment or embossing in a calender.

calendring Treatment in a calender e.g. paper or board web.

calibrating quantity A quantity such as current, voltage or frequency, having known values with specified tolerances and intended to be used for calibration.

calibrating tank A liquid vessel of known capacity which is used to check the volumetric accuracy of positive-displacement meters.

calibration The set of operations which establish, under specified conditions, the relationship between values indicated by a measuring instrument or measuring system, or values represented by a material measure, and the corresponding known values of a measurand. The result of a calibration may be recorded in a document, sometimes called a calibration certificate or a calibration report.

calibration accuracy The limit of error in the finite degree to which a device can be calibrated. (Influenced by sensitivity, resolution, and repeatability of the device itself and the calibrating equipment.) Usually it is expressed in percent of full scale.

calibration certificate See under calibration.

calibration curve A representation of the relationship between the values of the quantity measured and the corresponding values actually given by the device, under defined conditions.

calibration cycle 1. The combination of two calibration curves, one obtained by ascending values of the measured values, the other by descending values of the measured values, within the limits of the calibrated range of the device. 2. The application of known values of the measured variable and the recording of corresponding values of output readings, over the range of the instrument in ascending and descending directions.

calibration data Data collected and/or used to carry out a calibration scheme and/or record the results of said calibration.

calibration factor of the primary device The number which enables the flow signal to be related to the flow-rate under defined reference conditions for a given value of the reference signal. Note: In some cases, the value of the reference signal may not necessarily be given by the manufacturer.

calibration procedure A document which outlines the steps and operations to be followed by standards and calibration laboratory activity personnel in the performance of an instrument calibration.

calibration record (electrical transducers) A record (e.g. table or graph) of the measured relationship of the transducer output to the applied measurand over the transducer range. Note: calibration records may contain additional calculated points so identified.

calibration report A table or graph of the measured relationship of an instrument as compared over its range against a standard.

calibration table The tabular form of a calibration curve.

calibration (rating) tank A tank containing still liquid through which the current-meter is moved of a constant velocity for rating the meter. Pertains to liquid flow measurement in open channels.

calibration traceability 1. The ability to relate the known value used in calibrating a device to an actual value which conforms with the universally recognized and accepted value of that quantity. 2. The relationship of the calibration of an instrument through a step-by-step process to an instrument and certified by a national standardizing laboratory.

calibrator A single or multi-purpose device or equipment, fixed or portable, which permits accurate signal generation and/or signal readout as required for the calibration of the equipment.

caliper profiler A device used to measure the thickness of paper or plastic sheet.

call The action of bringing a computer program, a routine or a subroutine into effect, usually by specifying the entry conditions and jumping to an entry point.

call-accepted signal A call control signal that is sent by the called data terminal equipment to indicate that it accepts the incoming call.

call control character Concerning data operations, a character that is used to control calls, used in conjunction with defined signal conditions on various interchange circuits.

call control procedure The implementation of a set of protocols necessary to establish and release a call.

calligraphic display device, directed beam display device A display device in which the display elements may be generated in any program-controlled sequence.

call in To transfer control of a digital computer temporarily from a main routine to a subroutine, which is inserted in the sequence of calculating operations to fulfill a subsidiary purpose.

calling The process of transmitting selection signals in order to establish a connection between data stations.

calling sequence 1. A sequence of instructions and parameters used to enter a subroutine. The subroutine uses these entry parameters in performing some action (e.g., to print, to input data, etc.) Refers to Honeywell TDC 3000 control systems. 2. An arrangement of instructions, and in some cases of data also, that is necessary to perform a call.

call-not-accepted signal A call control signal sent by the called data terminal equipment to indicate that it does not accept the incoming call.

call number In computer operations, a set of characters that identifies a subroutine and contains information with respect to parameters to be inserted in the subroutine or information related to the operands.

call sign Any combination of characters or pronounceable words which identifies a communication facility, a command, an authority, an activity, or a unit; used primarily for establishing and maintaining communications.

call up Command to Data Hiway device that previously responded to a Poll. The call up command specifically addresses the device and permits it to send a message on the Hiway. Refers to Honeywell TDC 3000 control systems.

call word A call number which is exactly the size of one machine word.

calomel electrode An electrode consisting of mercury in contact with a solution of potassium chloride saturated with mercurous chloride (calomel). See also glass electrode.

calorie The mean calorie is 1/100 of the heat required to raise the temperature of 1 gram of water from 0°C to 100°C at a constant atmospheric pressure. It is about equal to the quantity of heat required to raise one gram of water 1°C. A more recent definition is: a calorie is 3 600/860 joules, a joule being the amount of heat produced by a watt in one second.

calorimeter Calorimeters are used for measuring total heat transfer (radiant plus convective), while radiometers are used in measuring radiant heat transfer only.

calorimetric flowmeters Calorimetric flowmeters work on the principle of heat transfer by the flow of liquid and may be divided into three groups: Devices drawing constant power to the heater with simultaneous measurement of the amount of heat transferred to the flow, which is velocity dependent. Devices that heat the flow to a constant temperature with simultaneous measurement of the energy supplied to the heater, which is velocity dependent. Devices that vary the heater temperature sinusoidally with time, where the flow rate is measured by the signal-shift at the sensor compared to the input signal at the heater. Calorimeter flowmeters are often referred to as "heated grid" flowmeters.

calorize To produce a protective coating of aluminium and aluminium-iron alloys on iron or steel (or, less commonly, on brass, copper or nickel).

CAM 1. Computer Aided Manufacturing. The use of computers to assist manufacturing operations. This technique uses numerically controlled machine tools, data collection terminals and data communications to achieve automated control of a manufacturing facility.
2. Computer Aided Management.

CAMA Control and Automation Manufacturer's Association. British trade association associated with BEAMA.

CAMAC Computer Automated Measurement and Control, a standard modular instrumentation and digital interface system. See the following documents: ANSI/IEEE Stds. 583-1982, 595, 596, 758-1987 and EUR 4100-1972 and IEC publication 516-1975.

cam actuator An electromechanical device in which a switch is closed when the high spot of a rotating cam, or eccentric, is in a certain position.

CAMATIC (food industry) Continuous dosing and filling, by ultrafiltrations of pre-concentrated milk and rennet in moulds, continuous clogging, emptying and

cleaning of moulds. The equipment is especially for soft cheeses.

camber 1. Deviation from a straight line, most often used to describe a convex, edgewise sweep or curve.
2. The angle of deviation from the vertical for the steerable wheels of an automobile or truck.

cambered disk (control valves) See ISA publication S75.05 Control Valve Terminology.

cam follower The output link of a cam mechanism.

cammed disk (control valves) See ISA publication S75.05 Control Valve Terminology.

cam-operated switch A switch consisting of fixed contact elements and movable contact elements operated in sequence by a camshaft.

campaign (batch processes) The manufacturing of a number of batches to satisfy a production plan.

cam-programmed A programming technique that uses a rotating shaft, having specifically oriented, eccentric projections which control a series of switches.

can 1. See drying can. **2.** A metal shield placed around a tube, coil, or transformer to prevent electromagnetic or electrostatic interaction.

Canadian Standards Association See CSA.

candela Metric unit for luminous intensity. The unit used to express the intensity of light visible to the human eye. It corresponds to the emission from 1/60 th of a square centimeter of a black body operating at the solidification temperature of platinum, and emitting one lumen per steradian.

candle Unit for luminous intensity. Replaced by candela (cd) SI unit.

candlepower (cp) Luminous intensity expressed in terms of standard candles.

canned (rotating machinery) Completely enclosed and sealed by a metal sheath.

canned cycle, fixed cycle See under fixed cycle.

canning line A facility of a refinery where cans are filled with lubricating oil, sealed, and put in cases. Modern canning lines are fully automated.

canted disk See ISA-S75.05 Control Valve Terminology.

cantilevered fourdrinier, cantilevered wire part A fourdrinier former which is so firmly held by cantilevering on the drive side that the support on the operator side can be temporarily removed to permit the introduction of a wire from that side.

capability The ability of an item to meet service demand of given quantitative characteristics under given internal conditions. Internal conditions refer for example to any combination of faulty and not faulty sub-items. For telecommunication services this is called trafficability performance.

capability (microprocessor operating systems) A set of functions that are logically related by the common set of resources on which they operate.

capability (power operations) The maximum load-carrying capability expressed in kilovolt-amperes (kVA) or kilowatts (kW) of generating equipment, other electrical apparatus, or system under specified conditions for a given time interval.

capability module (microprocessor operating system) A set of functions within a capability that provide a class of support. Each module is intended to be provided in its entirety.

capacitance (control system) A property expressible by the ratio of the time integral of the flow rate of a quantity, such as heat, or electric charge to or from a storage, divided by the related potential change.

capacitance (of a process) The change in energy or material required to make a unit change in a measured variable, such as Btu per degree of temperature

rise, or cubic feet of contents per foot of increase in level. Capacitance is a dynamic quantity.

capacitance (C) **1.** Unit for measurement of capacitance is farad, symbol F (SI unit). $IF = IC/V$. **2.** The property of a system of conductors and dielectrics that permits the storage of electrically separated charges when potential differences exist between the conductors.

capacitance – coupled flip-flop Same as ac coupled flip-flop.

capacitance bridge A four-arm ac bridge for measuring capacitance by comparison against a standard capacitor.

capacitance detector See capacitance sensor.

capacitance meter An instrument for measuring capacitance. If the scale is graduated in microfarads, the instrument is usually designated microfaradmeter.

capacitance sensor A sensor which responds to a change in capacitance in a field containing a protected object or in a field within a protected area. Also called capacitance detector.

capacitance switch A keyboard switch where two pads on the circuit board under each keyswitch serve as capacitor plates connected to the drive and sense circuits. Depression of the key causes an increase in the series capacitance, coupling the two elements and creating an analog signal in the sense circuit.

capacitive coupling Also called electrostatic coupling. The association of two or more circuits with one another by means of mutual capacitance between them.

capacitive impedance (fluid power systems) Imaginary ratio of pressure drop and transient mass flow in which pressure drop leads flow.

capacitive load A predominantly capacitive load i.e. one in which the current leads the voltage.

capacitive type humidity sensors A type of hygroscopic sensor, which uses the change in the dielectric constant of a material due to the presence of water or water vapor. A desiccant material is used to isolate the plates of a capacitor. Water absorption changes the capacitance of the isolating material. Measurements are made using an ac bridge that reads directly.

capacitor **1.** A device consisting essentially of two conducting surfaces separated by an insulating material or dielectric such as air, paper, mica, glass, plastic film or oil. A capacitor stores electrical energy, blocks the flow of direct current, and permits the flow of alternating current to a degree dependent essentially upon the capacitance and frequency. **2.** Device capable of storing a signal of a specific point in a fluidic control circuit.

capacitor motor A single-phase induction motor with the mean winding arranged for direct connection to the power source, together with an auxiliary winding connected in series with a capacitor.

capacitor tissue paper Electrical insulating paper of low grammage for electrical capacitors.

capacitor voltage The voltage across the terminals of a capacitor.

capacity (data transmission) The maximum number of binary digits which can be transmitted by a communications channel in one second.

capacity (of a computer) See storage capacity.

capacity (of a lead-acid battery) Generally, the total number of ampere-hours that can be withdrawn from a fully charged battery at a specific discharge rate and electrolyte temperature, and to a specific cutoff voltage.

capacity (of a process) Maximum quantity of energy or material which can be stored within the confi-

nes of a stated piece of equipment, such as volume of liquid a tank will hold when full. Different from "Capacity". Capacity is a static quantity, capacitance (of a process) is a dynamic quantity.

capacity (of a valve) The rate of flow through a valve under stated test conditions. See IEC publication 534-2-3, part 2.

capacity lag See transfer lag.

capacity plan The capacity requirements plan determines how much labor and equipment are needed to accomplish the tasks of production. The capacity requirements plan translates the production orders into hours of work at a workcenter by time period.

capillarity The action by which a fluid is drawn up into small tubes or interstices as a result of the fluid's surface tension. Capillary action.

capillary rise The height to which a liquid rises in a vertically suspended strip of e.g. paper or board, the lower end of which is submerged in the liquid. The capillary rise is determined according to a standardised test procedure.

capillary tube **1.** A form of primary element for flowmeters designed to operate in the laminar flow regime. **2.** A tube sufficiently fine that capillary action is significant.

capillary viscometer A type of viscometer. Fluid is forced through capillary at constant flow rate. Capillary is maintained at constant temperature. Pressure drop across capillary is proportional to viscosity.

capped argon bubbling (in steelmaking) See CAB process.

capstan **1.** The driven spindle or shaft in a tape recorder, sometimes the motor shaft itself. **2.** A vertical-axis drum used for pulling or hauling; it may be power driven or it may be turned manually by means of a bar extending radially from a hole in the drum.

capsule A pressure sensing element consisting of two metallic diaphragms joined around their peripheries.

carbide tool A cutting tool whose working edges and faces are made of tungsten, titanium or tantalum carbide particles, compacted and sintered into a hard, heat-resistant and wear-resistant solid by powder metallurgy; the heat-resistant properties of the material are derived in part from a matrix alloy, usually cobalt, which cements the carbide particles together.

carboard See paperboard.

carbon An element; the principal combustible constituents of all fuels.

carbon adsorption/chloroform extraction A procedure in which materials, predominantly organic, are absorbed from water onto activated carbon under specified conditions, and are subsequently extracted into chloroform, prior to analysis.

carbonating, carbonation, (of green liquor)

Conversion of sodium carbonate (soda) and sodium sulphide in green liquor to sodium hydrogen carbonate by saturating the liquor with carbon dioxide. Do not use carbonizing in this sense.

carbon black A fine, bulky carbon obtained as soot by burning natural gas in large horizontal "ovens" with insufficient air.

carbon block protectors An assembly of two carbon blocks and an air gap designed to a specific breakdown voltage. These devices are normally connected to communication circuits to provide overvoltage protection and a current path to ground during such overvoltage.

carbon equivalent An empirical relationship that is used to estimate the ability to produce gray cast iron, or one that is used to rate weldability of alloy steels.

carbonitriding Heat treatment which comprises a rise in the contents of both carbon and nitrogen.

carbonization The process of converting coal to carbon by removing other ingredients.

carbonizing base paper A strong light-weight paper with uniform thickness and good flatness, suitable for being coated with a pigmented material in melted form.

carbon-pile regulator An arrangement of carbon discs the series resistance of which decreases as more pressure or compression is applied.

carbon plant A plant for the production of carbon black by burning natural gas in the absence of sufficient air. Carbon plants are located close to a source of gas and in more-or-less isolated sections of the country because of the heavy emission of smoke.

carbon potential Ability of a carbon-bearing substance to influence the carbon content of a contiguous material.

carbon resistor Also called composition resistor. A resistor consisting of carbon particles which are mixed with a binder molded into a cylindrical shape, and then baked. Terminal leads are attached to opposite ends. The resistance of a carbon resistor decreases as the temperature increases.

carbon restoration Carburizing of a material-usually the surface layer of steel - which has previously decarburized.

carbon steel An alloy of mainly carbon, iron and manganese. Cast carbon steel of different grades is, besides cast iron, one of the most common valve body materials for many industrial applications.

carbon tetrachloride A chlorinated industrial solvent.

carburetted water gas Water gas (blue gas) enriched with cracked fuel oil. Burns with a highly luminous flame. Have a high rate of flame propagation. Carburetted water gas is heavier than natural gas but lighter than producer gas.

carburizing, carbon cementation Raising of carbon content; in heat-treating practice usually the diffusion of carbon into the surface as part of case hardening.

carburizing depth Thickness of the carburizing layer. In practice, the carburizing depth is measured by determining the carbon content along a cross-section of the material.

carcinogen, carcinogenic substance (water quality) A substance capable of inducing malignant growth (cancer) in man, animals or plants.

card **1.** A machine-processable information storage medium of special quality paper stock. **2.** Non-preferred term for printed circuit board.

cardboard See paperboard

carding A process of opening and cleaning textile fibers by separating the fibers from each other, laying them parallel, making them into a thin web, and condensing into a continuous, essentially untwisted strand called a "sliver".

cardiology automation **1.** Electrocardiograms (EKG) processing represents the single most widely used automated analysis procedure currently in use in medicine. The analog EKG signal is converted to digital form and voltage, duration, and interval measurements tables are listed; interpretive messages are selected by reference to decision tables. **2.** Cardiac catheterization on-line acquisition and analyses of blood pressures, dye curves, and other parameters simplify report preparation and allow more effective procedural decisions during the tests to maximize diagnostic yield. **3.** Cardiac intensive care monitoring:

post myocardial infarction monitoring concentrates mostly on arrhythmia detection, offering generally better noise immunity than entirely analog systems.

card punch A device to record information in cards by punching holes in the cards to represent letters, digits, and special characters.

card reader A device designed to read information from punched cards.

card tester An instrument for testing and diagnosing printed circuit cards.

card-to-tape Having to do with equipment that transfers information directly from punched cards to punched tape or magnetic tape.

Carl Still or Diamox process (coke-oven plants) An absorption stripping process. Both the Carl Still and Diamox processes utilize aqueous ammonia as the absorbing solution to desulphurize coke-oven gas. See further under absorption stripping processes.

CAROSEL process Anode Radial One-Side Electroplating. A type of electroplating process. The process uses a zinc chloride electrolyte and the steel strip is passed around large-diameter conductor rolls rotating partially submerged in the electrolyte.

carriage **1.** A mechanism that moves along a predetermined path in a machine to carry and position another component. **2.** A mechanism designed to hold paper in the active portion of a printing and typing machine, and to advance the paper as necessary.

carriage return The operation that causes printing to be returned to the left margin with or without line advance. Sometimes used to signify completion of manual data entry.

carriage return character, CR A format effector that causes the location of the printing or display position to be moved to the left margin with or without line advance.

carriage tape A paper or plastic tape used to control carriage operation of some printing output devices. It is also called control tape.

carrier A non-radioactive isotope of the radioactive tracer element usually added to radioactive solutions when the concentration of the radioactive isotope of the element is so small that there is a danger of loss by adsorption on the walls of the recipient container.

carrier (data transmission) **1.** A wave having at least one characteristic that may be varied from a known reference value by modulation. **2.** That part of the modulated wave that corresponds in a specific manner to the unmodulated wave, having, for example, the carrier-frequency spectral components. Note: Examples of carriers are a sine wave and recurring series of pulses.

carrier (textile term) A chemical added to the dye liquor to promote the swelling of the fiber for easier penetration of the dye.

carrier band A single channel signaling technique in which the digital signal is modulated on a carrier and transmitted.

carrier circuit A transmission path used in a carrier system.

carrier-current The current associated with a carrier wave.

carrier-current communication The superimposing of a high-frequency alternating current on ordinary telephone, telegraph, and power-line frequencies for the telephone communication and control.

carrier frequency **1.** The frequency of a carrier wave. **2.** A frequency capable of being modulated or impressed with a second (information carrying) signal.

In frequency modulation, the carrier frequency also is referred to as the center frequency.

carrier liquid (separation terminology) A liquid heavy enough to carry solids or a heavy phase out of the separator bowl, to prevent it being blocked. (Example: Vegetable oil when phosphoric acid is used in connection with refining.)

carrier modulation (data transmission) A process whereby a high frequency carrier wave is altered by a signal containing the information to be transmitted.

carrier noise Often referred to as residual modulation, carrier noise is produced by undesired variations of a radiofrequency signal in the absence of any intended modulation.

carrier shift (frequency shift) The difference between the steady state, mark, and space frequencies in a system utilizing frequency shift modulation.

carrier system (data transmission) A means of obtaining a number of channels over a single path by modulating each channel on a different carrier frequency and demodulating at the receiving point to restore the signals to their original form.

carrier-to-noise ratio (data transmission) The ratio of the magnitude of the carrier to that of the noise after selection and before any nonlinear process, such as amplitude limiting and detection. The bandwidth used for measurement of the noise should be specified when using this ratio.

carrier transmission Transmission in which the transmitted electric wave results from the modulation of a single-frequency wave by a modulating (information-carrying) wave.

carrier velocity (semiconductor) The average velocity of the random thermal motion of electrons in n-type semiconductors and of holes in p-type semiconductors.

carrier wave The basic frequency or pulse-repetition rate of a signal bearing no intrinsic intelligence until it is modulated by another signal which does bear intelligence. A carrier may be amplitude, phase, or frequency modulated.

carry The action of transferring a carry digit.

carry digit A digit that is generated when a sum or a product in a digit place exceeds the largest number that can be represented in that digit place and that is transferred for processing elsewhere. Note: In a positional representation system, a carry digit is transferred to the digit place with next higher weight for processing there.

carrying cost The cost of carrying inventory is usually defined as a percent of the dollar values of inventory per unit of time. Carrying Cost depends on cost of capital invested as well as the costs of maintaining inventory, such as taxes and insurance, obsolescence, spoilage, and storage. Costs vary from 10 to 35 percent annually. Carrying Cost is an opportunity cost due to alternative uses found for funds tied up in inventory.

carry time The time required for a computer to transfer a carry digit to the next higher column and add it there.

cartridge Cassette-like container for computer tape, frequently used to record data input in data entry terminals and systems.

cartridge disk A relatively low-capacity data – or program – storage medium; generally removable.

cartridge tape Small magnetic tape for digital program storage; stores discrete records.

cartridge valve (fluid power systems) Valve working parts contained in a cylindrical body; the

parts of which coincide with parts in the containing housing.

CAS China Association for Standardization.

CASA/SME The Computer and Automated Systems Association of the Society of Manufacturing Engineers. CASA/SME is a professional engineering association dedicated to the advancement of engineering technology. CASA/SME sponsors both the MAP and TOP (Technical and Office Protocol) users groups.

cascade An arrangement of two or more similar circuits or amplifying stages in which the output of one circuit provides the input to the next. Also called tandem.

cascade amplifier A multiple-stage amplifier in which the output of each stage is connected to the input of the next stage.

cascade control 1. Control in which the output variable of a controller is the reference variable of another controller(s). **2.** Type of control in which the output variable of one controller is the reference variable of one or more secondary control loops. **3.** Control in which the output of one controller is the set point for another controller.

cascade control action Control action where the output of one controller is the setpoint for another controller.

cascaded carry (parallel addition) A carry process in which the addition of two numerals of results in a partial-sum numeral and a carry numeral that are in turn added together, this process being repeated until no new carries are generated.

cascade thyristor converter A thyristor converter in which two or more simple converters are connected in such a way that their direct voltages add, but their commutations do not coincide.

CASE 1. Computer Automated Support Equipment. **2.** Common Applications Service Elements. CASE is one of the application protocols specified by MAP. **3.** Computer Aided System Engineering.

case (frame) ground protection Overcurrent relay protection used to detect current flow in the ground or earth connection of the equipment or machine.

case (heat treatment) Surface layer with higher carbon content than rest of material brought about by case hardening. The term case stands in contrast to the term core.

case (software) A multi-branch conditional statement that allows for selective execution of bounded groups of program statements depending upon the value of a control expression. See also control structure.

case depth (heat treatment) Depth beneath the surface of an object to which (surface) hardening penetrates.

case hardened depth (heat treatment) Distance from the surface of a case-hardened object to the limit of a predetermined value of the hardness.

case hardening (heat treatment) Surface hardening by carburizing and subsequent hardening of the surface layer. The English term case hardening can refer to methods that employ other substances than carbon, e.g. nitrogen, though this is not true for the other languages; See nitriding.

case pressure See burst pressure rating, proof pressure, or reference pressure.

case temperature The temperature on the surface of the case at a designated point.

casinghead gas Gas produced with oil from an oil well as distinguished from gas from a gas well. The casinghead gas is taken off at the top of the well or at the separator.

casinghead gasoline Liquid hydrocarbons separated from casing head gas by the reduction of pressure at the wellhead or by a separator or absorption plant. Casinghead gasoline, or natural gasoline, is a highly volatile, water-white liquid.

CAS process (in steelmaking) Composition Adjustment by Sealed Argon Bubbling. A secondary steelmaking process where argon is introduced into a ladle of steel. The CAS is an excellent process for achieving composition control of the steel. The process uses a refractory-coated snorkel which is lowered into ladle of steel during argon stirring so that the steel inside the snorkel will be completely free of furnace slag. This allows steelmakers to add deoxidizers and ferroalloys in an inert atmosphere without any contact with the furnace slag.

cassette A self-contained package of reel-to-reel blank or recorded film, videotape, or electronically embossable vinyl tape for recording of sound of computer input signals, which is continuous and self-rewinding. Similar to a cartridge, but of slightly different design.

cassette recorder A magnetic tape recording and playback device for entering or storing programs.

cassette tape Magnetic tape for digital data storage.

cast coated board, cast coated paper See cast coating.

cast coating Coating followed by drying in contact with a polished metal cylinder or a polished endless metal band.

casting **1.** The process of making a solid shape by pouring molten metal into a cavity, or mold, and allowing it to cool and solidify. **2.** A nearest-shape object produced by this process; a rough casting, cylindrical, square or rectangular in cross section and intended for subsequent hot working or remelting, is called an ingot.

casting alloy An alloy having suitable fluidity when molten and having suitable solidification characteristics to make it capable of producing shape castings; most casting alloys are not suitable for rolling or forging and can only be shaped by casting.

casting slip A slurry of clay and additives suitable for casting into molds to make unfired ceramic products.

cast iron Iron in cast state with carbon content commonly 2–4%, at which level the carbon predominantly occurs as flaked graphite (grey cast iron), as spheroidal graphite (spheroidal graphite iron), as temper carbon (malleable cast iron) or as cementite (white cast iron).

cast steel Steel in cast form.

CAT **1.** Computer Aided Test. **2.** Computer Assisted Testing. **3.** Computer Aided Translation. **4.** Computer Aided Teaching. **5.** Computer Aided Tomography, Computer Assisted Tomography and Computerized Axial Tomography. Literally "section graphics" – the graphic display of a cross section of a piece of material or of the human body.

catagenesis The process by which the organic matter in inorganic sediments is altered or changed by increasing temperature and pressure; the thermal generation of hydrocarbons (oil and gas) from organic matter of sedimentary rock.

cataleptic failure, catastrophic failure A sudden failure which results in a complete inability to perform all required functions of an item.

catalog **1.** An ordered compilation of item descriptions and sufficient information to afford access to the items. **2.** The collection of all data set indexes that are used by the control program to locate a volume con-

taining a specific data set. **3.** To include the volume identification of a data set in the catalog. **4.** Under DOS and TOS, to enter a phase, module, or book into one of the system libraries. **5.** A directory of files and libraries with reference to their locations. **6.** To enter information about a file or a library into a catalog.

catalysis The increase or speeding up of a chemical reaction caused by a substance, a catalyst, that remains chemically unchanged at the end of the reaction. Any reaction brought about by a separate agent.

catalyst A substance that hastens or retards a chemical reaction without undergoing a chemical change itself during the process.

catalyst A substance that modifies and especially increases the rate of a chemical reaction without being consumed in the process (catalysis).

catalytic agent A catalyst.

catalytic analyzer Gas analyzer using catalytic combustion of gases in air or oxygen.

catalytic converter A device which enhances certain chemical reactions which help to reduce the levels of undesirable exhaust gases.

catalytic oxygen analyzer The catalytic oxygen analyzer mixes the gas sample with hydrogen, then passes the mixture over a coated, heated filament that acts as a catalyst to produce combustion. The filament is a noble metal catalyst filament that causes combustion of the gas sample by its initial temperature. Combustion raises the filament temperature, causing a change in its resistance. The resistance change is measured by a bridge-type instrument calibrated in percent oxygen. Application: Flue gas analysis, to assure adequate oxygen for combustion.

cataphoresis Movement of suspended solid particles in a liquid medium due to the influence of electromotive force.

catastrophic failure, cataleptic failure A sudden failure which results in a complete inability to perform all required functions of an item.

catchment area, catchment basin The area draining naturally to a water course or to a given point.

cat cracker A large refinery vessel for processing reduced crude oil, naphthas, or other intermediates in the presence of a catalyst. See fluid catalytic cracking unit.

catena A chain or connected series.

caterpillar grinder See chain grinder.

cathetometer An optical instrument for measuring small differences in height.

cathode **1.** Electron tube: the electrode through which a primary stream of electrons enters the interelectrode space. **2.** Electrolytic; the electrode where positive ions are discharged or negative ions are formed or where other reducing reactions occur. **3.** General name for any negative electrode.

cathode (thyristor) The electrode by which currents leaves the thyristor when the thyristor is in the ON state with the gate open-circuited. Note: This term does not apply to bidirectional thyristor.

cathode-coupled amplifier A cascade amplifier in which the coupling between two stages is accomplished by a common-cathode resistor.

cathode-current density The current per square centimeter of cathode area, expressed as amperes or milliampères per centimeter squared.

cathode pulse modulation Modulation produced in an amplifier or oscillator by applying externally generated pulses to the cathode circuit.

cathode-ray instrument See electron-beam instrument.

cathode-ray oscillograph An apparatus capable of producing, from a cathode-ray tube, a permanent record of the value of an electrical quality as a function of time.

cathode-ray oscilloscope (CRO) A test instrument which makes possible the visual inspection of alternating current signals. It consists of an amplifier, time-base generating circuits, and a cathode-ray tube for transformation of electrical energy into light energy.

cathode ray tube, CRT 1. An electric vacuum tube containing a screen on which information may be stored for visible display by means of a multigrig modulated beam of electrons from the thermionic emitter, storage is effected by means of charged or uncharged spots. **2.** A storage tube. **3.** An oscilloscope tube. **4.** A picture tube. **5.** A computer terminal using a cathode ray tube as a display device.

cathode resistor A resistance connected in the cathode circuit of a tube so that the voltage drop across it will supply the proper cathode-biasing voltage.

cathodic coating A mechanical plate or electrode-posit on a base metal, with the coating being cathodic to the underlying base metal.

cathodic corrosion An increase in corrosion of a metal by making it cathodic. See stray current corrosion.

cathodic protection An anticorrosion technique for metal installations – pipelines, tanks, buildings – in which weak electric currents are set up to offset the current associated with metal corrosion. Carbon or nonferrous anodes buried near the pipeline are connected to the pipe. Current flowing from the corroding anode to the metal installation controls the corrosion of the installation.

cathodoluminescence Luminescence induced by exposure of a suitable material to cathode rays.

catholyte The portion of an electrolyte in an electrolytic cell adjacent to a cathode. If a diaphragm is present, it is the portion of electrolyte on the cathode side of the diaphragm.

cation 1. A positive ion that moves toward the cathode in a discharge tube, electrolytic cell, or similar equipment. The corresponding negative ion is called an "anion". **2.** An atom with a deficiency of electrons and therefore having a positive charge.

cationic iron – ore flotation Cationic flotation is used to float siliceous gangue away from finely ground crude ore and to remove small amounts of gangue material from some magnetic concentrates.

cationic surface active agent (water quality) A surface active agent which ionizes in aqueous solution to produce positively charged organic ions which are responsible for the surface activity.

CATV Abbreviation for Community Antenna Television or Cable Television. A system of distributing signals to homes by cable.

Cauchy number The Cauchy number is the ratio of inertia force to the compressibility force of the fluid. See further ISA handbook of control valves relating to hydrodynamic noise prediction.

caustic embrittlement Stress-corrosion cracking in alkaline solutions. Also known as caustic cracking.

causticizing department, causticizing plant The department in a sulphate pulp mill or a soda pulp mill in which the green liquor undergoes causticizing.

causticizing of green liquor Treatment of green liquor with calcium hydroxide (slaked lime) in order to convert the sodium carbonate (soda) in the green liquor into sodium hydroxide. Calcium carbonate, lime sludge, is formed as a by-product of the causticizing.

caustic soda Common name for sodium hydroxide (Na OH). Used primarily in mercerization and scouring.

cavitation A two-stage phenomenon of liquid flow. The first stage is the formation of voids or cavities within the liquid system; the second stage is the collapse of implosion of these cavities back into an all liquid state. For cavitation considerations in control valve selection see ISA handbook of control valves.

cavitation noise (control valves) Cavitation noise is a function of the severity level of cavitation. It increases with pressure drop and flow to some maximum level and then decrease to a lower magnitude. This decrease is due to the reduction in downstream pressure recovery to a level near the fluid vapor pressure which results in reduced collapse of bubbles or cavitation. Thus the noise generated is similar to that of a pure flashing liquid.

CBASIC A version of BASIC that runs on CP/M operating system.

CBEMA Computer and Business Equipment Manufacturers Association (USA).

CBI Confederation of British Industry.

CBI Computer Based Training Use of a computer of train students.

CBL Computer Based Learning Learning mainly using a computer.

CCITT International Consulting Committee for Telephone and Telegraph.

CCR Control Complexity Ratio, a measure of the complexity of a particular control system's logic configuration.

CCS Continuous Commercial Service. Refers to the power rating of transformers, tubes, resistors, etc. Used for rating components in broadcasting stations and some industrial applications.

CCSR Copper Conductor Steel Reinforced.

CCT curve, continuous cooling transformation curve Temperature time diagram indicating the particular phases and structures produced by the transformation of material by continuous cooling. Apart from phases and structures, most CCT curves also show the hardness of the end-product and the proportion of material transformed after various time periods.

CCU See communications control unit.

Cd Chemical symbol for cadmium.

cd Symbol for candela, base unit for measurement of luminous intensity (SI unit).

CD-ROM Compact Disk Read Only Memory.

Ce Chemical symbol for cerium.

CEBELCORE Centre Belge d'Etude de la Corrosion, Belgium.

CEC Canadian Electric Code.

CECC CENELEC Electronics Committee.

CEIF Council of European Industrial Federations (French abbreviation CFIE).

cell 1. The storage for one unit of information, usually one character or one word. **2.** A single unit that produces a direct voltage by converting chemical energy into electrical energy. **3.** A single unit that produces a direct voltage by converting radiant energy into electrical energy; for example, a solar or photovoltaic cell.

cell constant (electrolytic cell) The resistance in ohms of that cell when filled with a liquid of unit resistivity.

cell line An assembly of electrically interconnected electrolytic cells supplied by a source of direct-current power.

cell model A graphic representation of a human – or machine – directed function, which has elements of input, activity and output.

cell potential (electrolytic cell) The dc voltage between the positive and negative terminals of one electrolytic cell.

cell potential, cell voltage The dc voltage between the positive and negative terminals of one electrolytic cell.

cellulose acetate An inexpensive transparent plastic film used as the backing material for many recording tapes.

cellulose wadding machine, soft tissue machine A rapidly operating Yankee machine on which a paper web of very low grammage is removed from the Yankee dryer with simultaneous creping.

Celsius temperature scale See degree Celsius.

cementation See diffusion.

CEN Commitee European de coordination des Normes – European Committee for Standardization.

CENELEC Comite European Normalisation Electro-technique – European Committee for Electrotechnical Standardisation. Responsible for harmonisation of national standards. Formed 1972 by merger of CENEL and CENELCOM.

center of gravity A point inside or outside a body and around which all parts of the body balance each other.

center of seismic mass The point within an acceleration transducer where acceleration forces are considered to be summed.

center-to-end dimension (valves) The distance from the center line of a valve body to the extreme plane of a specific end connection. See face-to-face dimension and end-to-end dimension.

center-to-face dimension (for angle pattern valves) The distance, expressed in millimeters, between the plane located at the extremity of either body end port and perpendicular to its axis and the other body end port axis.

center valve body A housing placed between the upper and lower valve bodies to provide another flow connection as in a three-way valve.

centigrade temperatue scale The old name for a Celsius temperature scale. See degree Celsius.

centimeter – gram – second (system of units) See cgs.

central control room (nuclear power generating station) A continuously manned protected enclosure from which actions are normally taken to operate the nuclear generating station under normal and abnormal conditions.

centralization The concentration of decision making in an organizational structure. Centralization frequently takes place to make optimum use of computer-based information system. Computers encourage centralization because centralized management can consider all the relevant data, whereas a fragmented system cannot.

centralized computer network A computer network configuration in which a central node provides computing power, control, or other services.

centralized cooling (marine application) In centralized cooling, circulating fresh water instead of seawater is used in the ship's engine room for all cooling requirements, in order to avoid corrosion, fouling and clogging of the cooling system. The freshwater is cooled in central coolers, where seawater is used as cooling medium. The seawater is thus confined to the central coolers, inlet and outlet pipes, seawater pumps and valves.

centralized process control computer A process computer which directly controls all process elements, including input/output data and peripheral equipment.

centralized test system A test system, which processes, records or displays at a central location, information gathered by test point data sensors at more than one remotely located equipment or system under test.

central processing element The major compound of the bipolar microcomputer.

central processing unit, CPU central processor A functional unit of a computer including the control unit and the arithmetic logic unit. See also processing unit.

central processor, central processing unit See central processing unit.

central station A power plant or steam heating plant generating power or steam for sale.

CENTRIBLOOD Name of Alfa-Laval process for coagulation and separation of proteins.

CENTRIBONE Name of Alfa-Laval process for rendering of bone fat (bone oil) and bone meal, or for the production of gelatine.

centrifugal force A force acting in a direction along and outward on the radius of turn for a mass in motion.

centrifugal relay An alternating-current frequency-selective relay in which the contacts are operated by a fly-ball governor or centrifuge driven by an induction motor.

centrifugal tachometer An instrument that measures the instantaneous angular speed of a rotating member such as a shaft by measuring the centrifugal force on a mass that rotates with it.

centrifugal type filter Filter in which separation contaminants occurs when the fluid is accelerated in a circular path.

centrifuge A motor-driven machine in which samples of oil or other liquids are rotated at high speed, causing suspended material to be forced to the bottom of a graduated sample tube so that the percent of impurities or foreign matter may be observed. Some centrifuges are hand-operated.

centripetal force The force which compels a rotating body to move inward toward the center of rotation.

Centronics Standard interface for parallel output from computer.

CEPT Conference europeenne des administrations des postes et des telecommunications – European Conference of Postal and Telecommunications Administrations.

ceramic A claylike material, consisting primarily of magnesium and aluminium oxides, which after molding and firing is used as an insulating material. It withstands high temperatures and is less fragile than glass. When glazed, it is called porcelain.

ceramic amplifier An amplifier that makes use of the piezoelectric properties of ceramics such as barium titanate and the piezoresistive properties of semiconductors such as silicon.

ceramic-based microcircuit A microminiature circuit printed on a ceramic substrate. Usually consists of combinations of resistive, capacitive, or conductive elements fired on a waferlike piece of ceramic.

ceramic dielectric 1. One of a great variety of ceramic materials used as a dielectric in capacitors: some typical materials are: barium titanate, barium strontium titanate, titanium dioxide. Different ceramic dielectrics provide the desired temperature coefficient of

capacitance and medium-to-dielectric constants. **2.** A ceramic such as isolantite, porcelain, steatite, used as an insulator.

ceramic filter Electrically coupled, two-terminal piezoelectric ceramic resonators in ladder and lattice configurations. Monolithic filters with ceramic substrates are also called ceramic filters.

ceramic grindstone, vitrified bond grindstone A grindstone with a core of reinforced concrete and grinding shell of ceramic segments in which hard grains of e.g. aluminium oxide or silicon carbide are embedded.

ceramic transducer See piezoelectric transducer.

CERDIP Ceramic Dual-Inline Package for ICs.

Cerenkov radiation **1.** Light emitted when charged particles pass through a transparent material at a velocity greater than that of light in that material. **2.** The radiation produced when a charged particle traverses a medium that has a refraction index considerably greater than unity.

cermet **1.** A metal-dielectric mixture used in making thick-film resistive elements. The first half of the term is derived from ceramic and the second half from metal. **2.** A solid homogeneous material usually consisting of a finely divided admixture of a metal and ceramic in intimate contact.

cermet potentiometer A potentiometer in which the resistive element is made by combining very fine particles of ceramic or glass with precious metals.

CERN Organisation Européenne pour la Recherche Nucléaire – European Organization for Nuclear Research.

CERT Character Error-Rate Testing. Checking a data line with test characters.

certainty factor, confidence factor A value attributed to the validity of a statement, such as a hypothesis, an inference rule, or a conclusion of an inference. The value may range from completely false to completely true.

CERTICO Certification Committee (ANSI).

certificate of conformity A document issued by an independent officially recognized body or organization stating that the pertinent specifications of a device or system comply with the specific requirements as laid down in an officially designated document.

certificate of control A document issued by an independent officially recognized body or organization stating that the properties as a whole and the pertinent specifications of a device or system obtain an equal or better performance or safety as would have been obtained if the device or system had complied with the specific requirements of officially designated documents.

certificate of performance A supplier's or contractor's written statement certifying that supplies or services comply with contract requirements.

certification The verification of a statement of truth by an independent officially recognized body or organization.

certification of conformance A supplier's or contractor's written statement certifying that supplies or services comply with contract requirements.

certified design A test performed on a production model specimen of a generic type of equipment to establish a specific performance parameter of that genre of equipment. The condition and results of the test are described in a document that is signed and attested to by the testing engineer and other appropriate, responsible individuals.

certified reference material A reference material one or more of whose property values are certified by

a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body.

certified solution A certified solution is a liquid radioactive filling material that has been calibrated by a laboratory (for the United States, the US National Bureau of Standards) recognized as a country's National Standardizing Laboratory for radioactivity measurements and has been so certified by the calibrating laboratory.

certified tape Computer tape that is checked on all tracks throughout each and every roll and is certified by the supplier to have less than a certain number of errors or, more usually, to have zero errors.

certified type Computer tape that is checked on all tracks throughout each and every roll and is certified by the supplier to have less than a certain number of errors or, more usually, to have zero errors.

CESI Italian approval certification body for products (systems) intended for installation in hazardous locations. Example: Intrinsically safe applications.

cesium A chemical element having a low work function. Used as a getter in vacuum tubes and in cesium – oxygen – silver photocell cathodes.

cesspool, cesspit An underground, watertight tank used for collecting sewage from premises not connected to the public sewer and which, unlike a septic tank, has no outflow. (See septic tank.)

cetane number A measure of the ignition quality of diesel fuel. The rating is based on a scale resembling those of octane numbers by matching the ignition delay of the fuel against blends of cetane, a fast burning paraffin, and methyl naphthalene, a slow burning aromatic material.

Cf Chemical symbol for californium.

CFM Cubic Foot per Minute.

CFS Cubic Foot per Second.

cgs electronic system of units A coherent system of units for expressing the magnitude of electrical and magnetic quantities. The most common fundamental units of these quantities are the centimeter, gram, second and abampere.

cgs electrostatic system of units A coherent system of units for expressing the magnitude of electrical and magnetic quantities. The most common fundamental units of these quantities are the centimeter, gram, second and statcoulomb.

CGS process In the CGS (Creative Gas and Steel) process coal and oxygen are injected into hot metal contained in an apparatus similar to a steelmaking converter.

cgs system of units A system in which the basic units are the centimeter, gram and second.

Ch. E. Chemical Engineer.

CHAD Code to handle angular data.

chad The circular piece of paper removed from tape where a hole is punched.

chadless tape A punched tape wherein only partial perforation is completed and the chad remains attached to the tape.

chad tape Tapes which have been completely perforated.

chain Any set of records or items linked together either physically or logically in a specified sequence.

chain-balanced float density transducer A density transducer with a weighted float inside a flow chamber. The float is connected to the chamber by chains. The effective chain weight acting on the totally submerged float varies as the float moves up and down, and for each density the float assumes a new position. Float position is then measured by a linear

variable differential transformer, which provides a millivolt output proportional to float position and thus density. Can handle wide range of liquids.

chained list, linked list A list in which the data elements may be dispersed in storage but in which each data element contains information for locating the next one.

chain grinder, caterpillar grinder A grinder with a vertical shaft in which pairs of endless chains are arranged so that during operation they continuously press the wood down against the grindstone.

chaining A system of storing records in which each record belongs to a list or group of records and has a linking field for tracing the chain.

chaining search A search technique in which each item contains an identifier for locating the next item to be considered.

chain printer A printer in which the type slugs are carried by the links of a revolving chain.

chain reaction A programming technique for automatic initiation of multiple levels of address modification and indirect addressing without addressing instruction.

chain structure A structural arrangement of functional blocks such that the output variable of one block is the input variable of the next block.

chamosite An iron-silicate mineral.

change control (software) The process by which a change is proposed, evaluated, approved or rejected, scheduled, and tracked.

change dump A selective dump for those storage locations whose content have changed.

changeover switch A switching device for changing electric circuits from one combination to another. Note: It is usual to qualify the term changeover switch by stating the purpose for which it is used, such as a series-parallel changeover switch, trolley-shoe changeover switch etcetera.

channel 1. A path along which information, particularly a series of digits or characters, may flow. **2.** One or more parallel tracks treated as a unit. **3.** In a circulating storage, a channel is one recirculating path containing a fixed number of words stored serially by word. **4.** A band of frequencies used for communications.

channel capacity (data transmission) The maximum possible information rate through a channel subject to the constraints of that channel. Note: Channel capacity may be either per second or per symbol.

channel command An instruction that directs a channel, control unit, or device to perform an operation or set of operations.

channel command word, CCW A doubleword at the location in main storage specified by the channel address word. One or more CCW's make up the channel program that directs channel operations.

channel conditioning The electrical balancing of a channel to reduce attenuation distortion, delay distortion, and the effects of noise.

channel controller A device which provides an independent data path to storage and assures multiprocessor systems maximum availability, allowing each processing unit to have access to every channel in the system.

channel failure alarm A circuit to give an alarm if a communication channel should fail.

channel frequency The band of frequencies which must be handled by a carrier system to transmit a specific quantity of information.

channel grade The grades of channels are wideband, voiceband, and narrowband.

channel group (data transmission) A number of channels regarded as a unit. Note: The term is especially used to designate part of a larger number of channels.

channelize To subdivide a channel into multiple channels of lesser bandwidth.

channel program One or more channel command words that control a specific sequence of channel operations. Execution of the specific sequence is initiated by a single start input/output (I/O) instruction.

channel pulse A telemetering pulse that, by its time or modulation characteristics, represents intelligence on a channel.

channel sampling rate The number of times a given data input is sampled during a specified time interval.

channel storage Generally, the volume of liquid flow contained in an open channel at a given instant.

channel subcarrier The channel required to convey telemetric data involving a subcarrier band.

channel supergroup A number of channel groups regarded as a unit. Note: The term is especially used to designate part of a larger number of channels.

channel-to-channel connection A device for rapid data transfer between two computers.

channel utilization index In a computer, the ratio of the information rate (per second) through a channel to the channel capacity (per second).

character Element of a finite set of different elements, called the character set, defined for representation of information, and usually represented by a letter, number or symbol.

character check Verification of the observance of rules for character formation.

character code The specific combination of elements (bits, holes in punched cards, etc.) used to represent characters in any system.

character density A measure of the number of characters recorded per unit of length or area.

character display (device) A display device that provides a representation of data only in the form of graphic characters.

character display panel An alternative display to the CRT featuring a thin panel in place of a conventional display tube.

character distortion (data transmission) The normal and predictable distortion of data bit produced by characteristics of a given circuit at a particular transmission speed.

character element 1. A basic information element as transmitted, printed, displayed etc. or used to control communications, when used as a code. **2.** Groups of bits, pulses, etc. occurring in a time period normally representing that for a character or symbolic representation.

character emitter An electromechanical device which emits a timed pulse or group of pulses to form a character in some code.

character fill To replace all data in a storage location or group of locations with the repeated representation of a specific character, usually zeros or Xs.

character form The printable character representation of binary information as opposed to bit pattern information.

character interleave Also byte interleave. A technique in time-division multiplexing in which bytes of data are transmitted in one frame.

character interval (data transmission) In start-stop operation the duration of a character expressed as the total number of unit intervals (including information, error checking and control bits, and the start and

stop elements) required to transmit any given character in any given communication system.

characteristic (control valves) See flow characteristic.

characteristic (in a floating point representation) In a floating-point representation, the numeral that represents the exponent in the floating-point representation.

characteristic (of a logarithm) The integer part, which may be positive or negative, of the representation of a logarithm.

characteristic (semiconductor device) An inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electromagnetic or nuclear and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

characteristic curve A line which shows the values, in steady-state, of an output variable of a system or device as a function of an input variable, the other input variables being maintained at specified constant values. Note: When the other input variables are treated as parameters, a set of characteristic curves is obtained.

characteristic curve (Hall generator) A plot of Hall output voltage versus control current, magnetic flux density, or the product of magnetic flux density and control current.

characteristic equation An equation obtained by setting equal to zero either the denominator of a transfer function of a closed loop system or the characteristic polynomial of a given linear transformation on a finite dimensional vector space, or of its matrix representation.

characteristic frequency The frequency which can be easily identified and measured in a given emission.

characteristic wave impedance The ratio of the transverse electric vector to the transverse magnetic vector at the point it is crossed by an electromagnetic wave.

characterized ball valve Type of ball valve that utilizes a hollowed out spherical segment or partial ball which is supported by stub shafts running in bearings. The characterized ball valve is so named because a simple segment of a sphere which forms a crescent-shaped flow path which produces flows approaching equal percentage for high capacity designs and essentially a linear characteristic for low capacity designs. See also full ball valve.

characterized plug (control valves) Plug with contoured face to provide various flow characteristics.

characterized sleeve (control valves) A part added to a plug valve to provide various flow characteristics.

character parity Adding an overhead bit to a character code to provide error-checking capability.

character printer, serial printer A device that prints a single character at a time.

character reader A specialized device which can convert data represented in one of the type fonts or scripts read by a user directly into machine language.

character read-out systems Photoelectrically controlled, alphanumeric reading devices that convert characters to audible or sorting signals which can be fed to a computer, electric typewriter, tapepunch or other machine.

character recognition Two primary methods used for machine recognition of characters: **1.** Optical character recognition (OCR). **2.** Magnetic into character recognition (MICR).

character repertoire The characters available in a particular code.

character set A defined set of representations, called characters, from which selections are made to denote and distinguish data. Each character differs from all others, and the total number of characters in a given set is fixed; e.g., letters A to Z, punctuation marks, and black (space) character.

character size The number of bit positions used to represent a character.

character string A string consisting solely of characters.

character subset A selection from a character set of all characters having a specified common feature; for example in the definition of a character set, the digits 0 through 9 are character subset.

character transfer rate The speed that data may be read or written, i.e., characters per second.

characteristic equation An equation obtained by setting equal to zero either the denominator of a transfer function of a closed loop system or the characteristic polynomial of a given linear transformation on a finite dimensional vector space, or of its matrix representation.

charge 1. The starting stock loaded into a batch process. **2.** Material loaded into a furnace for melting or heat treating. **3.** A defined quantity of an explosive.

4. The amount of substance loaded into a closed system, such as refrigerant into a refrigeration system. **5.** The electrical energy stored in a capacitor or battery or held on an insulated object. **6.** In electrostatics, the amount of electricity present on any substance which has accumulated electric energy.

charge amplifier 1. An operational amplifier with capacitive feedback. **2.** An amplifier whose output voltage is proportional to the input charge from a piezoelectric transducer.

charge-resistance furnace A resistance furnace in which the heat is developed within the charge acting as the resistor. See electrothermics.

charge stock Oil that is to be "charged" or treated in a particular refinery unit.

chart (recording instrument) The paper or other material upon which the graphic record is made.

chart driving mechanism A device for moving the chart in a way which is a function of a variable, generally time.

chart, graph Graphical presentation describing the behaviour of a system, for example, the relations between two or more variable quantities, operations or states. This term is used with two different meanings: for the form of presentation and for the document.

chart paper Chart paper is woofree, dimensionally stable paper suitable for being written on with recorder ink.

chart recorder A recorder that provides a record of the values of a physical parameter, in the form of a graph on a chart paper, either with respect to time or to some other variable.

chart recorder evaluation See IEC publication 873 (1986) Methods of evaluating the performance of electrical and pneumatic analog chart recorders for use in industrial-process control systems. Continuous and dotted line traces, multi-pen and multi-channel instruments are covered.

chart scale (recording instrument) The scale of the quantity being recorded, as marked on the chart. Note: Independent of and generally in quadrature with the chart scale is the time scale which is graduated and marked to correspond to the principal rate at which the chart is advanced in making the recording.

This quadrature scale may also be used for quantities other than time.

chase 1. A vertical passage in a building that contains the pipes, wires and ducts which provide heat, ventilation, electricity, running water, drains and other building services. **2.** The main body of a mold that contains one or more mold cavities.

chassis 1. A frame or box-like sheet-metal support for mounting the components of an electronic device. **2.** A frame for a wheeled vehicle.

chatter 1. Rapid closing and opening of contacts on a relay, which reduces their life. **2.** Abnormal rapid reciprocating motion of the movable parts of a pressure relief valve in which the disk contacts the seat.

check A process of partial or complete testing of the correctness of machine operations. The existence of certain prescribed conditions within the computer, or the correctness of the results produced by a program. A check of any of these conditions may be made automatically by the equipment or may be programmed. Related to marginal check. See also error-detecting code, self-checking code, test, verify. See automatic check, machine check, marginal check, mathematical check, parity check, programmed check, transfer check.

checkback signal A signal which confirms the fulfillment of a command.

check bit 1. A binary check digit. **2.** The bit that is automatically added to the computer to an item of data when it is necessary to make it either even or odd parity. Synonym: Parity bit.

check bits (data transmission) Associated with a code character or block for the purpose of checking the absence of error within the code character or block.

check character A check key consisting of a single character.

check digit A check key consisting of a single digit.

checker work An arrangement of alternately spaced brick in a furnace with opening through which air or gas flows.

checking A network of fine cracks in a coating or at the surface of a metal part; they may appear during processing but are more often associated with service, especially when it involves thermal cycling.

checking program A computer program that examines other computer programs or sets of data for mistakes of syntax.

check key One or more characters derived from and appended to a data item, that can be used to detect errors in the data item.

checkout The application of diagnostic or testing procedures to a routine or to equipment. Same as debug.

checkout routine A routine to aid programmers in the debugging of their routines. Some typical routines are: storage, print-out, tape print-out, and drum print out.

check-out time That part of active corrective maintenance time during which function check-out is performed.

checkpoint A place in a computer program at which a check is made or at which a recording of data is made for restart purposes.

checkpoint/restart facility A facility for restarting execution of a program at some point other than at the beginning, after the program was terminated due to a program or system failure. A restart can begin at a check-point or from the beginning of a job step, and uses checkpoint records to reinitialize the system.

checkpoint routine A computer routine in which information for a checkpoint is stored.

check problem A routine or problem that is designed primarily to indicate whether a fault exists in the computer, without giving detailed information on the location of the fault. Also called check routine. See also diagnostic test.

check routine Same as check problem.

check solution A solution to a problem obtained by independent means to verify a computer solution.

check sum (mathematics of computing) A sum obtained by adding the digits in a numeral or group of numerals, usually without regard to meaning, position, or significance. This sum may be compared with a previously computed value to verify that no errors have occurred.

checksum The sum of a group of data associated with the group and used for checking purposes.

check valve, non-return valve, back pressure valve A valve with a free-swinging tongue or clapper that permits fluid in a pipeline to flow in one direction only.

chemical A substance produced by or used in a chemical process.

chemical affinity 1. The relative ease with which two elements or compounds react with each other to form one or more specific compounds. **2.** The ability of two chemical elements to react to form a stable valence compound.

chemical analysis Determination of the principal chemical constituents.

chemical coagulation (water quality) The process of adding a chemical (the coagulant) which causes the destabilization and aggregation of dispersed colloidal material into flocs.

chemical deposition The process of depositing a substance on a surface by means of the chemical reduction of a solution.

chemical engineering A branch of engineering that deals with the design, operation and maintenance of plants and equipment for chemically converting raw materials into bulk chemicals, fuels and other similar products through the use of chemical reaction, often accompanied by a change in state or in physical form.

chemical feed pipe A pipe inside a boiler drum through which chemicals for treating the boiler water are introduced.

chemical oxygen demand (COD) (water quality) The mass concentration of oxygen equivalent to the amount of dichromate consumed by dissolved and suspended matter when a water sample is treated with that oxidant under defined conditions.

chemical pulp Pulp in which the fiber have been separated by chemical means, normally by cooking, so that substances other than cellulose are largely removed by dissolution.

chemical treatment A process involving the addition of chemicals to achieve a specific result.

chemi-mechanical pulp, mechano-chemical pulp Mechanical pulp manufactured by a mechanical defibration of chips or logs in the presence of or after treatment with chemicals; the yield shall be so high that the character of mechanical pulp is retained.

chemolithotrophic bacteria, autotrophic bacteria (water quality) Bacteria which are able to multiply by using inorganic matter as the only source of carbon and nitrogen.

chevron seal Radial seal comprising several mating elements with cross-sections of V form.

chief programmer (software) The leader of a chief programmer team.

chief programmer team A software development group that consists of a chief programmer, a backup programmer, a secretary/librarian, and additional programmers and specialists as needed.

CHIL Current-Hogging Injection Logic. A logic form which combines the input flexibility of current-hogging logic with the performance and packing density of injection logic.

chilled iron casting (kind of iron castings) Chilled iron castings are made by melting iron of certain compositions, and casting the molten metal in such a way that the parts to be hardened will be solidified on contact with a metal or graphite block capable of abstracting heat rapidly and thus causing quick cooling.

chillers Refinery apparatus in which the temperature of paraffin distillates in lowered preparatory of filtering out the solid wax.

chip Small piece of semiconductor material, normally silicon and typically less than 1/4 in square and 1/100 inch thick on which electronic components are formed. Integrated circuits are formed on chips.

chip bin, chip silo A storage container for chips, of wood.

chipboard Machine-made board manufactured primarily of waste paper. This material should not be confused with particle board which may also be called chipboard.

chip component A unpackaged circuit element (active or passive) for use in hybrid microelectronics. Besides ICs the term includes diodes, transistors, resistors, inductors, and capacitors.

chip distributor, chip packer A device for filling wood chips into a batch digester which ensures that the chips are evenly and closely packed within the digester.

chip enable (semiconductor memory) The inputs that when true permit input, internal transfer, manipulation, refreshing, and output of data, and when false cause the memory to be in a reduced power standby mode.

chipper A machine for chopping wood into chips.

chip refining Defibrillation of chips in a refiner in the manufacture of mechanical pulp.

chip screening, chip classification Separation from chips of material which is too fine (undersize chips) and sawdust or too coarse (oversize chips) for the production process concerned. Pertains to pulp manufacture.

chip select (semiconductor memory) The inputs that when false prohibit writing into the memory and disable the output of the memory.

chip sets The microprocessor chip in addition to RAMs, ROMs, and interface I/O devices. The chip sets mounted on a board are also referred to as the CPU portion of the microcomputer. Also called microcontroller.

chips, wood chips Wood which has been subdivided into pieces of a size suitable for e.g. pulp manufacture.

chip washer Pertaining to the pulp and paper industry, an installation in which the wood chips are separated by washing with a liquid, e.g. water, from impurities such as sand, stones, metal objects etc.

chirping A rapid change of the spectral lines emitted from an optical source.

chloride stress corrosion cracking Failure by cracking under the combined action of tensile stress and corrosion in the presence of chlorides in water.

chlorinated hydrocarbon fluid Aromatic or paraffinic hydrocarbon fluid in which certain hydrogen

atoms are replaced by chlorine. The fire resistance is derived from the chlorine present.

chlorination (water quality) The process of adding to water either gaseous chlorine or compounds from which hypochlorous acid or hypochlorite ions are formed, in order, for example, to arrest bacterial plant or animal growth, to oxidize organic matter, to assist coagulation or to reduce odour. The main purpose is usually disinfection.

chlorine consumption (of pulp) The quantity of active chlorine which is consumed by 100 g of pulp (dry matter) under specified conditions. For each type of pulp there is a characteristic relationship between the chlorine consumption and the lignin content.

chlorine demand, chlorine requirement (water quality) The difference between the amount of chlorine added to a sample of water or waste water and the amount of total residual chlorine remaining at the end of a specified contact period.

chlorine dioxide Chlorine dioxide is a yellow-green gas similar in appearance and odour to chlorine. Unlike chlorine, chlorine dioxide gas cannot be compressed and bottled. Consequently, chlorine dioxide must be generated on site. The use of chlorine dioxide is constantly increasing in the treatment of water because of its many unique characteristics as compared with other disinfectants and oxidants.

chlorine mixer An apparatus in a bleach plant in which a stream of chlorine gas is dispersed in a fiber suspension which is vigorously stirred.

choked flow The condition of maximum velocity at the minimum area section of a device corresponding to the speed of sound of the gas flowing through the device. See further IEC publication 534-2 re choked flow.

chopper 1. A device for interrupting a current or a light beam of regular intervals. **2.** An electromechanical switch for the production of modified square waves. **3.** An electromechanical or electronic device used to interrupt a dc or low-frequency ac signal at regular intervals to permit amplification of the signal by an ac amplifier. It may also be used as a demodulator to convert an ac signal to dc.

chopper stabilization 1. The addition of a chopper amplifier to the regulator input circuitry of a regulated power supply in order to reduce output drift. **2.** A method of improving the dc drift of an amplifier by utilization of chopper circuits.

chromatic color Perceived color possessing a hue. In everyday speech, the word color is often used in this sense in contradistinction to white, grey, or black.

chromatic distortion, intramodal distortion (optical communication) In an optical fiber, that distortion due to dispersion for a given mode.

chromaticity The color quality of light defined by the combination of its dominant wavelength and purity or by its chromaticity coordinates.

chromaticity coordinate The ratio of any of the three tristimulus values of a color sample to the sum of the tristimulus values.

chromaticity diagram A plane diagram formed when any one of the three chromaticity coordinates is plotted against another.

chromatography An instrumental procedure for separating components from a mixture of chemical substances which depends on selective retardation and physical absorption of substances by a porous bed of sorptive media as the substances are transported through the bed by a moving fluid.

chromel versus alumel Original name (trademark of Hoskins Mfg. Co.) for nickel-chromium versus

nickel-aluminium type K thermocouple. Developed especially for use in oxidizing atmospheres where there is an excess of free oxygen.

chromel-versus constantan Original name for nickel-chromium versus constantan (copper nickel) type E thermocouple.

chromium dioxide A type of recording-tape coating that produces very good quality at low recording speeds.

chronistor A subminiature elapsed-time indicator that uses electroplating principles to totalize the operating time of equipment up to several thousand hours.

chronograph An instrument for producing a graphical record of time as shown by a clock or other device.

chronoscope An instrument for measuring very small intervals of time.

Ci Curie.

CIGRE Conference Internationale des Grands Re-seaux Electrique a haute tension. An international organization concerned with large high voltage electric power systems.

CIM 1. Computer Integrated Manufacturing. 2. Computer Input Multiplexer. 3. Computer Input Microfilm. 4. Canadian Institute of Mining and Metallurgy.

CIM architecture A set of principles and rules for selecting and developing products and standards that can participate in a CIM system.

CIML Comité International de Metrologie Legale. Committee supervising work within OIML.

CIM system Refers to an implementation of the CIM architecture to integrate an enterprise. Proper selection of CIM products and standards as part of the system will require characteristics of the particular enterprise and attributes of its data requirements to be defined.

cinder A particle of gas borne partially burned fuel larger than 100 microns in diameter.

cinder patch (in steel production) A defect on the ingot as a result of pick-up of material from soaking-pit bottoms.

cipher Cryptographic system in which arbitrary symbols or groups of symbols represent units of plain text of regular length usually single letters, or in which units of plain text are rearranged, or both, according to certain predetermined rules.

CIPM International Committee of Weights and Measures.

Cipolletti weir (open-channel flow measurement) This is a trapezoidal type of weir in which the side slopes one horizontal to four vertical. This slope of the sides in a approximate correction for the side contractions of the nappe (overfalling sheet of water) and the flow is, therefore, proportional to the length of the weir crest. It has the same flow range as a rectangular weir.

circuit 1. A communication link between two or more points. See channel. **2.** The conductor or system of conductors through which an electric current is intended to flow. **3.** A complete closed path. Confusion between circuit and network is common. Circuit refers to a closed path within a network.

circuit analyzer Also called multimeter. Several instruments or instrument circuits combined in a single enclosure and used in measuring two or more electrical quantities in a circuit.

circuit breaker Device for opening an electric circuit under abnormal operating conditions; e.g. excessive current, heat, high ambient radiation level, etc.

circuit card A printed-circuit board containing electronic components.

circuit chip In microcircuitry, a single device, either a transistor or a diode that has been cut from a larger wafer of silicon.

circuit controller A device for closing and opening electric circuits.

circuit cycle The flow of electrons through a circuit.

circuit delay The time it takes a circuit to change state after receiving an input signal.

circuit density The number of equivalent transistors per unit area of an IC chip.

circuit diagram Conventional representation of wiring system of electrical or electronic equipment. Also called circuit schematic.

circuit diagram (fluid power systems) Drawing, using symbols, to represent the function of a fluid power circuit or part thereof.

circuit discriminator 1. Refers to a part of a circuit that extracts the desired signal from an incoming frequency-modulated wave by changing frequency variations into amplitude variations. **2.** A device which, when the input surpasses a given level, produces a voltage output. **3.** A device which responds only to a pair of frequencies which share some characteristic, such as amplitude.

circuit dropout A momentary interruption of a transmission because of the complete failure of a circuit.

circuit element A single active or passive functional item in an electronic circuit such as one diode, one transistor, one resistor etc., which when connected to another, forms an electrical current.

circuit grade The information-carrying capability in speed or type of signal. The grades of circuits are broadband, voice, subvoice, and telegraph. For data use, these grades are identified with certain speed ranges.

circuit insulation voltage The voltage with respect to frame or chassis of a circuit of an instrument and for which the circuit has been designed.

circuit interrupter A manually operated device designed to open under abnormal conditions a current-carrying circuit without damage to itself.

circuit noise level The ratio of the circuit noise at any point in a transmission to some arbitrary amount of circuit noise chosen as a reference. This ratio is expressed in decibels above reference noise.

circuitron A combination of active and passive components mounted in a single tube-type envelope and functioning as one or more complete operating stages.

circuit switch (data transmission) A communications switching system which completes a circuit from sender to receiver at the time of transmission (as opposed to a message switch).

circuit synthesis The development of a circuit by the use of the theoretical or practical knowledge of basic electronics principles and component parameters.

circular chart recorder A type of recording instrument where the input signal from a temperature, pressure, flow or other transducer moves a pivoted pen over a circular piece of chart paper that rotates about its center at a fixed rate with time.

circular interpolation (numerical control) A mode of contouring control that uses the information contained in a single block to produce an arc of a circle. Note: The velocities of the axes used to generate this arc are varied by the control.

circular interpolation (numerical control) A mode of contouring control that uses the information contained in a single block to produce an arc of a circle. Note: The velocities of the axes used to generate this arc are varied by the control.

circular list An ordered set of items contained within a memory in such a way that only two items are pre-

gram addressable. These items are the earliest appended (beginning item) and the most recently appended (ending item).

circular mil area The square of the diameter of a round conductor measured in thousandths of an inch. The circular mil area of a braid is the sum of the circular mil area of each of the wires that make up the braid.

circular notch thin-plate weir A thin plate weir with a notch of semicircular shape in the plane perpendicular to the direction of flow. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

circular shift (mathematics of computing) A variation of a logical shift in which the digits moved out of one end of a register, word, or numeral are returned at the other end. For example +231.702 shifted two places to the left becomes 3170.2+2. Note: A circular shift may be applied to the multiple precision representation of a number.

circular soaking pit (in steel production) A type of soaking pit that employs tangential firing from a series of recessed burners.

circulating register A register that retains data by inserting it into a delaying means, and regenerating and reinserting the data into the register.

circulating storage A device using a delay line to store information in a train or pattern of pulses. The pulses of the output end are sensed, amplified, reshaped, and reinserted into the input end of the delay line.

CISC Complex Instruction Set Computer CPU design whose instruction set contains a number of long, complex, instructions, that makes program writing easier, reduces execution speed. Compare with RISC.

city gate The measuring point at which a gas distributing utility receives gas from a gas transmission company.

CIU Communication Interface Unit.

CJR Cold Junction Reference.

Cl Chemical symbol for chlorine.

cladding 1. That dielectric material of an optical fiber surrounding the core. **2.** Coating one material with another; to cover one metal with another by bonding the two. **3.** A relatively thin layer or sheet of metal foil which is bonded to a laminate core to form the base material for printed circuits.

cladding diameter (optical communication) The length of the longest chord that passes through the fiber axis and connects two points on the periphery of the homogeneous cladding.

cladding mode (optical communication) A mode in which the electromagnetic field is confined in the cladding and the core by virtue of there being a lower refractive index medium surrounding the outmost cladding.

cladding mode stripper, mode stripper (optical communication) A device which encourages the conversion of cladding modes to radiation modes.

cladding ray In an optical waveguide, a ray that is confined to the core and cladding by virtue of reflection from the outer surface of the cladding. Cladding rays correspond to cladding modes in the terminology of mode descriptors.

clamp, clamping circuit, clamper 1. Circuit in which a waveform is adjusted and maintained at a definite level when recurring after intervals. **2.** A circuit which adds a fixed bias to a wave at each occurrence of some predetermined feature of the wave. This is done to hold the voltage or current of the feature at (clamp it to) a specified fixed or variable level.

clamped liner (for butterfly valves) For this type of liner a split clamp holds both liner and pipe ends together. Seat tightness may be adjusted by varying the split clamp bolting torque.

clamping A function by which the extreme amplitude of a wave form is maintained at a given level.

clamping (analog computers) A circuit used to provide automatic hold and reset action electronically for the purposes of switching or supplying repetitive operation in an analog computer.

clamping circuit A circuit which maintains either the maximum or minimum amplitude level of a waveform at a specific potential.

clamp valve, pinch valve A valve consisting of a flexible elastomeric tubular member connected to two rigid flow path ends whereby modulation and/or shut off of flow is accomplished by squeezing the flexible member into eventual tight sealing contact.

clarification – liquid/solids (separation terminology) Removal of solids from a liquid suspension.

clarifier, settling tank See sedimentation basin.

clarification This is a procedure used in the milk industry. The milk is clarified and homogenized at the same time and in the same machine.

class 1. A set of individuals, documents, data, etc., with similar characteristics. **2.** A subdivision of a category.

classical venturi tube Venturi tube the convergent portion of which is conical. The pressure tappings are located in the entrance cylinder and in the throat. The profile is defined in ISO 5167. (ISO) 87. See figure in ISO publication 4006-1977 or BS 5875:1980.

classified worker A person occupationally exposed to ionizing radiation. The person is registered as is under medical surveillance.

class index Conventional designation of an accuracy class by a number or symbol.

Claus process A process for the conversion of hydrogen sulfide (H_2S) to plain sulfur.

clay percolator Refinery filtering equipment employing a type of clay to remove impurities or to change the color of lubricating oils.

clay slip A slip of kaolin in water.

clean cargo Refined products – distillates, kerosene, gasoline, jet fuel – carried by tankers, barges, and tank cars; all refined products except bunker fuels and residuals.

cleaner See vortex cleaner.

cleanliness inspection, cleanliness test Different test methods used for testing the cleanliness of industrial-process measurement and control equipment to be used for oxygen service are outlined in IEC publication 877 (1986). The tests described are: Direct visual inspection (White light and ultraviolet light); Wipe test; Water break test; Solvent extraction test.

clean oil Crude oil containing less than one percent basic sediment and water; pipeline oil; oil clean enough to be accepted by a pipeline for transmission.

CLEANPAC, CLEANTRAP, (trademarks) Hydrocyclones/centrifugal cleaners for the pulp and paper industry.

clean room An area in which high standards of control of humidity, temperature, dust and all forms of contamination are maintained.

CLEANVAC (trademark) Process for deaeration of stock in the pulp and paper industry.

clear 1. In plain language, i.e., not in code or cipher. **2.** To repair a fault on a circuit. **3.** To give an on-hook signal and release a circuit from occupation. **4.** To empty a data storage device. **5.** To place one or more storage locations into a prescribed state, usually zero

or the space character. Contrast with set. Also called reset.

clearance distance (numerical control) The distance between the tool and the workpiece when the change is made from rapid approach to feed movement to avoid tool breakage.

clearance flow (control valves) That flow below the minimum controllable flow with the closure member not seated.

clear area In character recognition, a specified area that is to be kept free of printing or any other markings not related to machine reading.

clear instruction That specific instruction which replaces data or information in storage or in registers, accumulators, etc. with zeros or blanks.

clear signal (data communication) The original unscrambled, normal, unprocessed or uncoded signal.

clear terminal See reset terminal.

clear to send (data communication) A code designation (EIA RS-232) applied to a sense circuit used by a terminal or computer to detect that its modem is ready to send data.

cleaver A device used to cut or break optical fibers in a precise way so the ends can be connected with low loss.

clinging nappe A nappe held in contact with the downstream face of the weir. Pertains to liquid flow measurement in open channels.

clinker A hard compact congealed mass of fused furnace refuse, usually slag.

clipper (data communication) A specific circuit which removes the portion of a current waveform which would otherwise extend above or below a specified level.

clipping level The signal level at which clipping (distortion) just begins to occur.

CL list A tabulation of engineering drawings, specifications and other reference documents needed to fabricate and assemble a configuration item (SAMA).

clobbered When a program or data are lost because of a system malfunction.

clock (CLK) **1.** A master timing device used to provide the basic sequencing pulses for the operation of a synchronous computer. **2.** A register which automatically records the progress of real time, or perhaps some approximation to it, records the number of operations performed, and whose contents are available to a computer program. **3.** A data communications clock which controls the timing of bits sent in a data stream, and controls the timing of the sampling of bits received in a data stream.

clock cable Cable of specific impedance and electrical characteristics used to distribute the clock (master) frequency where needed in digital computers.

clocked Pertaining to the type of operation in which gating is added to a basic flip-flop to permit the flip-flop to change state only when there is a change in the clocking input or an enabling level of the clocking input is present.

clock frequency The master frequency of periodic pulses which schedules the operation of the computer.

clock generator A test-signal generator that supplies a chain of pulses identical with those supplied by the clock circuit of a digital computer.

clocking (data transmission) The generation of periodic signals used for synchronization.

clock mode A system circuit that is synchronized with a clock pulse, that changes states only when the pulse occurs.

clock pulse, clock signal A periodic signal used for synchronization or for measuring intervals of time.

clock pulse generator A specifically designed generator which generates pulses for purposes of timing or gating in a digital computer, i.e., pulses which are used as inputs to gates to aid in pulse-shaping and timing. Same as time pulse generator.

clock rate The time rate at which pulses are emitted from the clock. The clock rate determines the rate at which logical or arithmetic gating is performed with a synchronous computer.

clock register, timer A register whose contents are changed at regular intervals in such a manner as to measure time.

clock signal, clock pulse A periodic signal used for synchronization or for measuring intervals of time.

clock skew A phase shift between the clock inputs of devices in a single clock system; the result of variations in gate delays and stray capacitance in a circuit.

clock stagger **1.** Time separation of clock pulses in a multiphase clock system. **2.** Voltage separation between the clock thresholds in a flip-flop.

clockwise arc (numerical control) A circular path that is described by the reference of a tool that rotates in a negative angular direction about the centre of the path.

clotting Choking, progressive or not, of a porous or fibrous layer or of an apparatus by deposits of solid or liquid particles.

clone Computer or circuit that behaves in the same way as the original it was copied from.

close at and open at (control valves) Signal span (psi, volts, amps, etc.) at which a control valve shall be closed and open. Note: This is signal to valve operator and is not necessarily controller output signal if a positioner and/or transducer is used.

closed action flow Action flow in a closed action path of a system in which the output variable is continuously influencing the manipulated variable and thus continuously influencing itself. Note: A reset circuit has an open action flow in spite of the fact, that the structure has a closed action path.

closed action path Action path which connects the output to one of the inputs of the system.

closed array An array which cannot be extended at either end.

closed circuit (fluid power systems) Circuit in which return fluid is directed to the pump inlet.

closed-circuit communication system Certain communication system which are entirely self-contained and do not exchange intelligence with other facilities and systems.

closed instruction loop A group of instructions that can be repeated endlessly, there being no exit point.

closed loop **1.** In a feedback loop, a signal path which includes a forward path, a feedback path and a summing point, and forms a closed circuit. **2.** A loop that has no exit and whose execution can be interrupted only by intervention from outside the computer program in which the loop is included. **3.** Pertaining to a system with feedback type of control, such that the output is used to modify the input. Refers to Honeywell TDC 3000 control systems.

closed loop control, feedback control **1.** Control in which the controlled variable is compared with the reference variable, and the difference between them is used to adjust the controlled variable to the reference variable. **2.** Control in which control action is made to depend persistently on the measurement of the controlled variable. **3.** An operation where the computer applies control action directly to the process without manual intervention.

closed loop gain In process instrumentation the gain of a closed loop system, expressed as the ratio of the change of directly controlled variable as output to the change of reference variable as input at a specified frequency.

closed loop numerical control A type of numerical-control system in which position feedback, and often velocity feedback as well, is used to control the dynamic behaviour and successive positions of machine slides or equivalent machine members.

closed loop stabilization A mode of operation in which the value of an output is compared with a reference value so that the difference between those values controls directly or indirectly the output quantity at the desired value.

closed loop voltage gain The voltage gain of an amplifier with feedback.

closed position (control valves) The position of the closure member when a continuous surface or line of contact is established with the valve seat. For non-seating valves, the closed position is obtained when the flow passageway is minimum.

closed position (fluid power systems) 1. Valve position in which the inlet supply is not connected to an outlet. 2. Position of the valve member in which the flow path between inlet and outlet ports is closed.

closed routine A routine which is not inserted as a block of instructions within a main routine but is entered by basic linkage from the main routine.

closed subroutine A subroutine, one copy of which suffices to be linked by calling sequences for use at more than one place in a computer program.

closed type head box Pertaining to the pulp and paper industry, a head box in which the stock chamber is closed to the external atmosphere and where the pressure can be regulated independently of the atmospheric pressure; compare open head box. The closed type head box may or may not have an air cushion; compare hydraulic head box.

closed user group A group of specified users of a data network that is assigned a facility which permits them to communicate with each other but precludes communication with all other users of the service or services.

closed white water system See white water system.

close memory Part of a directly addressable computer memory which provides fast cycle time and is usually employed for frequently used accesses.

closing pressure (pressure relief devices) Closing pressure is the value of decreasing inlet static pressure at which the valve disk re-establishes contact with the seat or at which lift becomes zero.

closing relay A form of auxiliary relay used to control the closing and opening of the closing circuit of the device so that the main closing current does not pass through the control switch or other initiating device.

closure member (valves) A movable part of a valve which is positioned in the flow path to restrict the flow through the valve. A closure member may be a plug, ball, disk, vane, gate, diaphragm etc.

cloud-velocity (gaging) A method of determining the mean velocity by measuring the time taken for a cloud of injected liquid to travel between two sections. Pertains to liquid flow measurement in open channels.

CL specification The configuration item (CL). Specification establishes the functional, performance and design criteria for the design, development, testing and production of any combination of parts, subas-

semblies, units or groups that perform a specific function and is essential to the completeness of a system or subsystem (SAMA).

clustering In a computer, the process of grouping things with similar characteristics. A properly programmed computer can take a list of items and group them into clusters.

cm 1. Centimeter (SI unit). 2. Circular mil. A system for specifying wire size by conductor area. Circular mills are obtained by multiplying the conductor diameter in inches by 1 000 and squaring the result.

Cm Chemical symbol for curium.

cm² Square centimeter.

CMA 1. Cable Makers Association. British trade organisation. 2. Computer/Manual/Automatic.

CMC Certification Management Committee for electronic components. Committee for quality control within IEC.

CMIG Canadian MAP Interest Group.

CMOS See complementary metal-oxide semiconductor.

CMOS/SOS Complementary Metal Oxide Semiconductor/Silicon On Sapphire.

CMR See common mode rejection.

CMRR See common mode rejection ratio.

CM volt, CMV See common mode voltage.

CNC 1. Computerized Numerical Control. 2. Computer Numerical Control.

CO₂ Chemical formula for carbon dioxide.

coagulation See chemical coagulation.

coal chemicals A group of chemicals used to make antiseptics, dyes, drugs and solvents that are obtained initially as by-products of the conversion of coal to metallurgical coke.

coalescing type filter Filter in which separation of contaminants occurs due to the difference in wetting properties on a particular porous medium leading to liquid particles in suspension uniting into particles of greater volume.

coal gas Also referred to as town gas. An artificial gas produced by pyrolysis (heating in the absence of air) of coal.

coal gasification A process for producing natural gas from coal. Coal is heated and brought in contact with steam. Hydrogen atoms in the vapor combine with coal's carbon atoms to produce a hydrocarbon product similar to natural gas.

Coanda effect A phenomenon of fluid attachment to one wall in the presence of two walls. This phenomenon is utilized in some devices in the general class of flowmeters named: fluid-dynamic-type pulse-class flow meters. Like the vortex flowmeter, the fluidic flowmeter is insensitive to density and responds only to velocity changes.

coarse rejects, knots (of chemical pulp) Screen reject separated from a suspension of chemical pulp in a knoter and consisting essentially of undigested wood.

coarse rejects, slivers (of mechanical pulp) Screen reject separated from a suspension of mechanical pulp in a bull screen and consisting essentially of splinters and pieces of wood.

coarse screen See bull screen.

coarse vacuum An absolute pressure between about 1 and 760 torr.

coating (of paper or board surface) 1. In application of a layer of material in fluid form other than a coating slip. 2. The application of a layer of coating slip.

coating (optical communication) A layer of plastic or other material applied over the cladding of an

optical fiber to prevent environmental degradation and to simplify handling.

coating kitchen, color room Pertaining to the pulp and paper industry, a department for the preparation, proportioning and mixing of the ingredients in a coating slip and for cleaning (normally screening).

coating slip, coating color Slip for the coating of paper or board. A coating slip comprises a pigment, normally white, in a binder solution together with dyestuffs (if desired), dispersing agents, viscosity regulating agents etc.

coaxial cable A cable consisting of one conductor, usually a small copper tube or wire, within and insulated from another conductor of larger diameter, usually copper tubing or copper braid.

coaxial cylinder viscometer A type of viscometer sometimes also called a rotational viscometer. Coaxial cylinders or parallel disc is rotated at constant speed. Viscous drag incurs torque on rotating spindle. Torque to cause spindle to rotate is a measure of viscosity.

coaxial eccentricity Measure of the concentricity of conductors in a cable. This is especially important for coaxial cables that are to be used in wideband transmission systems.

coaxial filter A passive, linear, essentially nondissipative network that transmits certain frequencies and rejects others.

coaxial pair Consists of a central conductor surrounded by an insulator which in turn is surrounded by a tubular outer conductor, which is covered by more insulator.

coaxial relay A type of relay used for switching high-frequency circuits.

coaxial thermocouple element A coaxial thermocouple element consists of a thermoelement in wire form within a thermoelement in tube form and electrically insulated from the tube except at the measuring junction.

coaxial transmission line, coaxial line, concentric line A transmission line in which one conductor completely surrounds the other, the two being coaxial and separated by a continuous solid dielectric or by dielectric spacers. Such a line has no external field and is not susceptible to external fields from other sources.

Cobb number See water absorbency.

COBOL Common Business Orientated Language. A specific language by which business-data processing procedures may be precisely described in a standard form.

COBOL compiler A program that translates COBOL statements into assembler input or machine-language programs.

COBOL word One of a group of words having preassigned meanings in the Common Business Orientated Language (COBOL) system.

cock A valve or other mechanism that starts, stops or regulates the flow of liquid, especially into or out of a tank.

cockle Undesirable, local accumulations of very small crinkles in a paper surface, caused by uneven drying.

COD Chemical Oxygen Demand.

code, coding scheme 1. A collection of rules that maps the elements of one set on to the elements of a second set. Notes: a) The elements may be characters or character strings. b) The first set is the coded set and the second is the code element set. c) An element of the code element set may be related to more than one element of the coded set but the reverse is not true. **2.** An encryption of data for security purposes.

code audit (software) An independent review of source code by a person, team, or tool to verify compliance with software design documentation and programming standards. Correctness and efficiency may also be evaluated. See also audit, static analysis.

code converter A device or procedure which changes the digital input signal in one code into the digital output signal in another code. Related terms: encoder: A code converter in which the output signal goes to a computer. Decoder: A code converter in which the input signal comes from a computer.

coded-decimal code The decimal number system with each decimal digit expressed by a code.

coded decimal notation See binary-coded decimal notation.

coded program A program which has been expressed in the code or language of a specific machine or programming system.

coded representation See code element.

coded set A set of elements which is mapped on to another set according to a code. Example: A list of the names of airports which is mapped on to a corresponding set of three-letter abbreviations.

code element, code value, coded representation The result of applying a code to an element in a coded set.

code element set, code set The result of applying a code to all elements of a coded set. Example: All the three-letter international representations of air port names.

code-enforcing authority In USA the code-enforcing authority is the person responsible for approving a specific installation, may be a local inspector.

code extension character A control character used to indicate that one or more of the succeeding coded elements are to be interpreted according to a different code.

code generator A program or program function, often part of a compiler, that transforms a computer program from some intermediate level of representation (often the output of a parser) into a lower level representation such as assembly code or machine code.

code ID A unique number assigned to each company that builds or develops for the government (USA).

coden A specialized 5-character identification for periodical titles as developed and maintained by the American Society for Testing and Materials.

coder 1. A person who prepares instruction sequences from detailed flow charts and other algorithmic procedures prepared by others, as contrasted with a programmer who prepares the procedure and flow charts. **2.** A device which sets up a series of signals in code form.

codes In PMC telemetry, the manner in which ones and zeros in each binary number are denoted.

code set See code element set.

code, to encode To convert data by the use of a code in such a manner that reconversion to the original form is possible.

code value See code element.

CODIL Acronym for Control Diagram Language. CODIL is a process-orientated language and system offered by Leeds and Northrup Company.

coding 1. The ordered set of computer instructions required to perform a given action or solve a given problem. **2.** In communication, the process of transforming messages or signals in accordance with a definite set of rules.

coding check A test performed to determine whether a routine contains errors.

coding disk A disk with small projections that operate contacts to generate a predetermined code.

coding line A single command or instruction that directs a computer to solve a problem usually written on one line.

coding scheme See code.

codistor A multijunction semiconductor device which provides noise-rejection and voltage-regulation functions.

codl pressing See cold extrusion.

coefficient A number (often a constant) that expresses some property of a physical system in a quantitative way.

coefficient constant multiplier A device, such as a linear amplifier, that develops an output equal to an input multiplied by a constant.

coefficient of discharge The ratio of actual flow to theoretical flow. It includes the effects of jet contraction and turbulence.

coefficient of expansion The fractional change in dimension of a material for a unit change in temperature.

coefficient of heat transfer, over-all coefficient of heat transfer Heat flow per unit time across a unit area of a specified surface under the driving force of a unit temperature difference between two specified points along the direction of heat flow.

coefficient of stability Of an automatic control system. The change in the controlled condition for a given change within specified limits in any independent variable other than the command signal or load. Example: The change in temperature of a thermostatically-controlled system per unit change in the calorific value of the fuel.

coefficient of thermal expansion The average expansion per degree over a specified temperature range, expressed as a fraction of the original dimension. The coefficient may be linear or volumetric.

coercimeter An instrument for measuring the magnetic intensity of a magnet or electromagnet.

coextrusion 1. A process for bonding two metal or plastics materials by forcing them simultaneously through the same extrusion die. **2.** The bimetallic or bonded plastics shape produced by such a process.

cogeneration plant A coal- or gas-fired plant that generates both process (commercial) steam and electricity for in-plant use or for sale.

cognitive modeling The modeling of human perception, action, memory, and reasoning in terms of information processing.

coherence 1. The phenomenon related to the existence of a correlation between the phases of two waves or between the phases of one wave at two instants in time or two points in space. **2.** Opposite of randomness, especially with reference to radio, light and acoustic waves.

coherent (optical communication) Qualifying one or more waves or radiations characterized by the phenomenon of coherence.

coherent area (optical communication) The area in a plane perpendicular to the direction of propagation over which propagating light may be considered to be highly coherent radiation.

coherent bundle See aligned bundle.

coherent emitter A source of power which provides a high degree of spectral purity, near perfect beam collimation, and enormous power densities. Lasers are coherent emitters. See incoherent emitter.

coherent light communications Communications using amplitude or pulse-frequency modulation of a laser beam.

coherent networks A network in which input/output, signal levels, bit rates, digital bit stream structures, and signaling information are compatible, throughout the network.

coherent-pulse operation The method of pulse operation in which a fixed phase relationship is maintained from one pulse to the next.

coherent radiation (optical communication) Radiation characterised by the phenomenon of coherence.

coherent unit (of measurement) A derived unit of measurement which is expressed in terms of base units by a formula in which the proportionality factor is 1. Note: This term is an abbreviation of the more exact denomination "derived unit of measurement in a coherent system of units", for, with an isolated unit, the concept of coherence is meaningless. Example: the newton is the coherent unit of force in the SI.

cohesion (software) The degree to which the tasks performed by a single program module are functionally related. Contrast with coupling.

cohesion Requires that each module is designed to perform a single-well defined function, and the function is completely contained in the module.

coil impedance (fluid power systems) Complex ratio of coil voltage to coil current at specified conditions. It is important to note that the coil impedance may vary with signal frequency, amplitude and other operating conditions, for example, due to back e.m.f. generated by the moving armature.

coincidence Existence of two phenomena or occurrence of two events simultaneously in time or space, or both.

coincidence circuit A circuit which has two or more inputs and one output. An output signal is produced only when all the input circuits receive inputs of a specified level and within a specified time interval.

coincidence counting, coincidence setting The use of electronic devices to detect when two or more pulses from separate counters occur within a given time interval.

coincidence method of measurement A method of measurement in which a very small difference between the value of the measurand and a known value of a quantity of the same kind with which it is compared, is determined by observation of the coincidence of gage or scale marks or signals.

coincidence signal A signal circuit with two or more input wires in which the output wire gives a signal, if and only if, all input wires receive coincident signals.

coincident element A logic element in which the connection between two binary input signals and a single binary output signal is defined by the equivalence operation. The element produces an output signal of 1 when the two input signals are the same and 0 when they are different.

coke Coke is the residue from the destructive distillation of coal. Structurally, it is a cellular, porous substance which is heterogeneous in both physical and chemical properties. The physical properties of metallurgical coke, as well as its composition, depend largely upon the coal used and the temperature at which it is carbonized. Not all coals will form coke, and not all coking coals will give the same firm, cellular mass characteristic of coke suitable for metallurgical purposes.

coke drums Large, vertical, cylindrical vessels that receive their charge of residue at very high temperatures (1 000°F). Any cracked lighter products rise to the top of the drum and are drawn off. The remaining hea-

vier product remains and, because it is still very hot, cracks or is converted to petroleum coke, a solid coal-like substance.

coke-oven gas Coke oven gas is produced during the carbonization or destructive distillation of bituminous coal in the absence of air. Coke-oven gas burns with a non-luminous to semiluminous flame. Its rate of flame propagation is high, it has a low specific gravity, and it has a high theoretical flame temperature about 1 980°C (3 600°F).

coke-oven gas desulphurization processes (coke-oven plants) Commercial coke-oven gas desulphurization (hydrogen sulphide removal) can be divided into two categories those processes which use wet oxidation to produce sulphur and those which absorb and strip H₂S for subsequent conversion into sulphur or sulphuric acid. See wet oxidation processes and absorption stripping processes.

coking 1. The process of distilling a petroleum product to dry residue. With the production of lighter, distillable hydrocarbons, an appreciable deposit of carbon or coke is formed and settles to the bottom of the still. **2.** The undesirable building up of carbon deposits on refinery vessels.

COL Computer Orientated Language. Any computer programming language having terms, such as instruction codes and address, that apply to a specific computer or set of similar computers such as machine language programs.

cold Idiomatic term generally used to describe electrical circuits that are disconnected from voltage sources and are at ground potential. Opposite of the term "hot".

cold blow Pressure ejection from a continuous digester of the cooked pulp after it has been cooled, normally to between 80 and 100°C.

cold cathode gas tube A gas-filled tube in which the cathode is not heated.

cold cleaning An organic solvent cleaning process in which liquid contact accomplishes the solution and removal of residues after soldering.

cold deforming See cold working.

cold drawing Pulling rod, tubing or wire through one or more dies that reduce its cross section, without applying heat either before or during reduction.

cold extrusion Striking a cold metal slug in a punch-and-die operation so that metal is forced back around the die. Also known as cold forging; cold pressing; extrusion pressing; impact extrusion.

cold-finished Referring to a primary-mill metal product, such as strip, bar, tubing or wire, whose final shaping operation was performed cold.

cold forging See cold extrusion.

cold forming See cold working.

cold galvanizing Painting a metal with a suspension of zinc particles in a solvent, so that a thin zinc coating remains after the organic solvents evaporates.

cold grinding Grinding in an open groundwood mill system at a relatively low pit temperature, e.g. lower than 50°C.

cold joint In soldering, making a soldered connection without adequate heating, so that the solder does not flow to fill the spaces, but merely makes a mechanical bond.

cold junction See reference junction.

cold junction compensation Pertaining to thermocouples, cold junction compensation may be achieved by maintaining the connections between the thermocouple wires and the external circuit at the ice point or by incorporating temperature-sensitive elements in the readout instrument which add a voltage to the out-

put of the thermocouple equal to the voltage that thermocouple would produce at the reference junction temperature if its reference junction were at the ice point.

cold junction reference (CJR) See reference junction.

cold light Light that is produced without attendant heat, as from ionization of gas by high voltage (neon bulbs, fluorescent lamps), or by electroluminescence, bioluminescence, or cathodoluminescence.

cold light Light that is produced without attendant heat, as from the ionization of a gas by high voltage (neon bulbs, fluorescent lamps), or by electroluminescence, bioluminescence, or cathodoluminescence.

cold plate A mounting plate for electronic components which has tubing or internal passages through which liquid is circulated to remove heat generated by the electronic components during operation. Also known as liquid-cooled dissipator.

cold-pressure welding A method of making an electrical connection in which the members to be joined are compressed to the plastic range of the metals.

cold reducing See cold working.

cold reduction Cold reduction is a process in which the thickness of the starting material can be reduced by relatively large amounts in each pass through a single-stand reversing cold mill or in a series of passes through a tandem cold mill.

cold restart (programmable controllers) Restart of the programmable controller system and its application program after all dynamic data (variables such as I/O image, internal registers, timers, counters etc. and program contexts) are reset to a predetermined state. A cold restart may be automatic or manual.

cold rolling Cold rolling is a generic term applied to the operation of passing unheated metal through rolls for the purpose of reducing its thickness; producing a smooth, dense surface; and with or without subsequent heat treatment, developing controlled mechanical properties.

cold soda pulp Semi-chemical pulp manufactured by treating the fiber raw material, normally chips, with sodium hydroxide solution at a relatively low temperature (below 100°C) followed by mechanical treatment to separate the fibers.

cold test, cold commissioning, preliminary testing, passive test Test on a device or equipment carried out on site to prove the correctness of installation before power is applied. Further clarification required if term used.

cold trap A length of tubing between a vacuum system and a diffusion pump or instrument which is cooled by liquid nitrogen to help remove condensable vapors.

cold treatment Quenching to a low temperature, usually below -70°C, in order to achieve stabilization or to induce or complete a transformation. Cold treatment here refers to the measures taken to lower the temperature. The whole operation, including the attainment of desired property changes, is covered by the term heat treatment.

cold weld A joint between two metals (without an intermediate material) produced by the application of pressure only.

cold working Deforming metal plastically at a temperature lower than its recrystallization temperature.

cold working pressure The maximum pressure rating a valve or fitting coincident with ambient temperature, generally the range from -20°F to +100°F (-29°C to +38°C).

collate 1. To merge items from two or more similarly sequenced files into one sequenced file, without necessarily including all items from the original files. **2.** To arrange two or more sets of data into a single one according to a predetermined order.

collation 1. The Boolean operator that gives a truth table value of true only when both of the variables connected by the logical operator are true. **2.** The logical operation which makes use of the AND operator or logical product.

collective standard A set of similar material measures or measuring instruments fulfilling, by their combined use, the role of a standard. Notes: **a** A collective standard is usually intended to provide a single value of a quantity. **b** The value provided by a collective standard is an appropriate mean of the values provided by the individual instruments. Example: a collective voltage standard consisting of a group of Weston cells.

collector (of a transistor) A region through which a primary flow of charge carriers leaves the base.

collector junction (of a transistor) A junction normally biased in the high-resistance direction, the current through which can be controlled by the introduction of minority carriers.

collimate To make parallel.

collimation (optical communication) The process by which a divergent or convergent beam of radiation is converted and maintained into a beam of parallel rays.

colloidal suspension (water quality) A suspension containing particles often electrically charged which do not settle, but may be removed by coagulation.

Colmonoy Tradename for an alloy of very hard chromium boride crystals in a nickel base. One of the principal hard facing materials used for control valve trims to increase erosion and/or corrosion resistance (similar to inconel). Trademark of Walls Colmonoy Corp.

colony count (water quality) See plate count.

color The everyday term for hue.

color breakup Any fleeting or partial separation of a color picture into its display primary components because of a rapid change in the condition of viewing.

color code (electrical) A system of standard colors adopted for identification of conductors for polarity etc.

colorimetric method of pH measurement Uses substances that change color when subjected to acidic or alkaline environments.

colorimetry The technique of measuring color and interpreting the results.

color index A listing of dyes and pigments, with the chemical structure; published by the Society of Dyers and Colourists of Great Britain and the American Association of Textile Chemists and Colorists of United States.

color purity Freedom of a color from white light or any colored light not used to produce the desired color.

color room See coating kitchen.

color saturation The degree to which white light is absent in a particular color. A fully saturated color contains no white light.

color separation (textile term) The division of a composite mixture into the basic colors needed.

color temperature The temperature to which a perfectly black body must be heated to match the color of the source being measured. Color-temperature measu-

rements begin at absolute zero and are expressed in kelvins.

column 1. A vertical arrangement of characters or other expressions. **2.** Loosely, a digit place.

column – enable, CE The input used to strobe in the column address in multiplexed address random access memories (RAM).

column loading A factor that takes into consideration the quantity of liquid descending in the column and the quantity of vapor ascending in the column. If either the liquid or the vapor flow rate becomes too high, column flooding will occur.

COMAL Common Algorithmic Language The Structured programming language similar to BASIC.

comb In a magnetic disk unit, an assembly of access arms that moves as a unit.

combination automatic control A type of control system arrangement in which more than one closed loop are coupled through primary feedback or through any of the controller elements.

combination blowing process A type of oxygen steelmaking process. One general class of combination-blown processes utilizes oxygen through a top lance, and an inert gas through tuyeres or permeable elements in the furnace bottom to stir the bath. A second class of combined blowing process utilizes same of the oxygen through a top lance or tuyeres mounted in the top cone of the vessel, and the balance of the oxygen through Q-BOP type tuyeres mounted in the vessel bottom. See also bottom blown process and top blown process.

combination cable A cable in which the conductors are grouped in combinations such as pairs and quads.

combination diagram (fluid power systems) Drawing using a combination of graphical, cutaway and pictorial symbols with interconnecting lines.

combination resistance thermometer-thermocouple A sheathed sensor with both resistance thermometer and a thermocouple in the same sheath. This allows two simultaneous measurements based on completely independent measurement principles. This helps overcome concerns about degradation that could be common to sensors using the same principle, but which are implausible for diverse measurements.

combination Yankee machine A paper machine in which the drying section consists of a Yankee dryer and a number of normal drying cylinders.

combinatorial circuit Switching system in which the value of the output variable at a specific instant depends only on the values of the input variables at that instant.

combined chlorine (water quality) That portion of the total residual chlorine present in the form of chloramines, organic chloramines and nitrogen trichloride.

combined-gate IC A single IC chip in which several gate circuits are interconnected to form a more complex circuit.

combined sewerage system A system in which waste water and surface water run-off are carried in the same drains and sewers.

combined station In high level data link control (HDLC), the part of a data station that supports the combined control functions of the data link and that generates commands and responses for transmission and interprets received commands and responses.

combustible loss The loss representing the unliberated thermal energy occasioned by failure to oxidize completely some of the combustible matter in the fuel.

combustion The rapid chemical combination of oxygen with the combustible elements of a fuel resulting in the production of heat.

combustion (flame) safeguard A system for sensing the presence or absence of flame and indicating, alarming or initiating control action.

combustion chamber Any chamber or enclosure designed to confine and control the generation of heat and power from burning fuels.

combustion control The regulation of the rate of combination of fuel with air in a furnace.

combustion rate The quantity of fuel fired per unit of time.

comfort curve A line on the graph of dry-bulb temperature versus wet-bulb temperature or relative humidity that represents optimum comfort for the average person who is not engaged in physical activity.

COMIT A program language (high level) developed by MIT.

command 1. An input variable established by means external to, and independent of, the feedback (automatic) control system. It sets, is equivalent to, and is expressed in the same units as the ideal value of the ultimately controlled variable. **2.** Signal which causes a change in the state of a discrete system. **3.** An electronic pulse, signal or set of signals to start, stop or continue some operation. It is incorrect to use command as a synonym for instruction.

command (numerical control) An operative order which initiates a movement or a function. Note: The order may be: **1.** direct input to the machine in coded form; **2.** results from a logical interaction of instructions from an outside source with conditions sensed by the machine; **3.** outputs derived from the computing or comparing function.

command language A set of procedural operators with a related syntax, used to initiate the functions to be performed by an operating system. Synonymous with control language.

command mode (numerical control) A mode of operation of the command or data entry device in which entries are interpreted as functions to be executed.

command name The first term in a command, usually followed by operands.

command pose (industrial robots) A pose specified by teach programming, manual data input programming or explicit programming.

command processing The reading, analyzing, and performing of commands issued via a console or through an input stream.

command reference In a servo or control system, the voltage or current to which the feedback signal is compared. As an independent variable, the command reference exercises complete control over the system output.

command resolution The maximum change in the value of a command signal which can be made without inducing a change in the controlled variable.

command signal The quantity or signal which is set or varied by some device or human agent external to and independent of the control system and which is intended to determine the value of the controlled condition.

command statement A job control statement that is used to issue commands to the system through the input stream.

command word A message transferred over the Data Hiway that identifies the operation to be performed, the device that is to perform the operation, the hiway

address of the sender and sometimes other information. Refers to Honeywell TDC 3000 control systems.

comment Information embedded within a computer program, command language or set of data that is intended to provide clarification to human readers and that does not effect machine interpretation.

comment, (computer program) annotation, remark, note A description, reference or explanation, added to or interspersed among the statements of the source language, that has no effect in the target language.

comment field In a computer, an area in a record assigned for entry of explanatory comments about a program.

comment statement A statement used to include information that may be helpful in running a job or reviewing on output listing.

comminution 1. Size reduction is usually the first step in an iron – ore beneficiation process. Its purposes are to liberate iron minerals from waste prior to concentration step and/or to generate a particle-size distribution suitable for further processing. If the ore is to be concentrated it must be broken to a size at which the iron oxides may be separated from gangue material. Size reduction processes usually involve several stages in series and may include concentration equipment between stages. **2.** The mechanical shredding or grinding of gross solids in waste water to sizes more amenable to further treatment.

commissioning (fluid power systems) Act of operating, testing and adjusting a system or unit for the first time to ensure that it functions according to the specified performance. Functional tests will include the extremes of the required specification.

commissioning (industrial robots) Setting up, checking of the robot system and the verification of the robot functions following installation.

commissioning manual (fluid power systems) Document detailing the quantity and type of fluid, electrical or other services and procedures to be followed before starting equipment for the first time. It will also detail the sequence of operations and observations to be made to ensure correct function of the equipment when first operated.

commissioning test A test on a device or equipment carried out on site, to prove the correctness of installation and operation.

common 1. Shared by two or more circuits. Used to designate the terminal of a three-terminal device that is shared by the input and output circuits. **2.** A point that acts as the reference potential for several circuits to a ground.

common area A section in a memory that is set aside for common use by many separate programs or modules.

common block A block of storage locations in a digital computer which is associated with information or data required both in the main program and in a specific subprogram.

Common Business Orientated Language See COBOL.

common bus system A set of standard data, address, and control lines available to all computer modules. The use of bus interface circuits makes it possible for a user to tie in and communicate with other users.

common carrier Organizations licensed and regulated by the U.S. Federal Communications Commission and/or various public utility commissions and required to supply communications services to all users at published prices.

common hub A common connection such as a ground voltage that provides this voltage to other circuits that are connected.

common language A form representing information which a machine can read and which is common to a group of computers and data-processing machines.

common language optical readers (OCR) Universally acceptable language for OCR's adopted by most manufacturers and usually including commonly accepted character shapes.

common machine language A machine-sensible information representation which is common to a related group of data-processing machines.

common mode 1. In analog data, an interfering voltage from both sides of a differential input pair (in common) to ground. **2.** Signals that are identical with respect to both amplitude and time. Also used to identify the respective parts of two signals that are identical with respect to amplitude and time. **3.** A high-speed modem interface name.

common mode (general) The instantaneous algebraic average of two signals applied to a balanced circuit, both signals referred to a common reference.

common mode gain The ratio of the output voltage of a differential amplifier to the common-mode input voltage. The common-mode gain of an ideal differential amplifier is zero.

common-mode input That signal applied in phase (i.e. common mode) equally to both inputs of a differential amplifier.

common-mode interference A form of interference that appears between any measuring circuit terminals and ground.

common-mode output voltage The output voltage of an operational amplifier resulting from the application of a specified voltage common to both inputs.

common-mode radio noise Conducted radio noise that appears between a common reference plane (ground) and all wires of a transmission line causing their potentials to be changed simultaneously and by the same amount relative to the common reference plane (ground).

common mode range Maximum voltage that can be applied to differential inputs with respect to ground. The maximum difference between inputs is the full-scale input range.

common mode rejection The ability of a system or a device to suppress the effect of a common mode input signal on its output.

common mode rejection ratio, CMRR The ratio of a specified common voltage signal at the input of a system or device to the differential input signal with the same characteristic type required to produce the same output signal. Note: The common mode rejection ratio may depend upon frequency and amplitude, and may be expressed as a ratio or in decibels as 20 times the log of that numeric ratio.

common mode resistance The resistance between the input- and output-signal lines and circuit ground. In an isolated amplifier, this is its insulation resistance. (Common-mode resistance has no connection with common-mode rejection).

common mode signal A signal of the same amplitude and phase occurring simultaneously on both sides of a differential input relative to a common reference. For example: common mode voltage.

common mode voltage (electromagnetic flowmeters) The voltage which exists equally between each electrode and a reference potential.

common mode voltage, CMV 1. A voltage of the same polarity on both sides of a differential input relative to ground. **2.** In a differential amplifier, that unwanted part of the voltage, between each input connection point and ground, that is added to the voltage of each original signal.

common mode voltage gain The ratio of ac voltage with respect to ground at the output terminal of an amplifier (or between the output terminals of an amplifier with differential outputs) to the common-mode input voltage.

common port (valves) The port of a three-way valve that connects to the other two flow paths.

common pool A dedicated area of memory used as storage and shared by various processes.

common program See common software.

common software Programs or routines which usually have common and multiple applications for many systems, such as report generators, sort routines, and conversion programs which can be used for several routines in a language common to many computers.

common-user circuit A circuit shared by two or more services, either concurrently or on a time-sharing basis. It may be a unilateral, bilateral, or joint circuit.

communication The transmission of information from one point, person, or equipment to another.

communication The transfer of information and understanding from one point or person to another person. The basic elements in the process of communication are an information source, encoding, transmission, reception, and decoding.

communication band The band of frequencies due to the modulation (including keying) necessary for a given type of transmission.

communication channel Part of a radio or wire circuit, or a combination of wire and radio which connects two or more terminals.

communication common carrier A company whose business is to supply communication facilities to the public.

communication conductor In electrical communications, a conductor with relatively low electrical resistance, such as copper wire, to link sending and receiving points. These points use a translating device (e.g. telephone) to send and receive the intelligence of the signal.

communication control character Refers to a specific character which designates the operation to be performed by some peripheral device. As with other characters it is represented by a pattern of printed binary digits or holes in tapes or cards. Its execution usually causes control changes on printers.

communication element (field bus) Part of a field bus device which communicates with other elements via the bus.

communication function Pertaining to programmable controller system, the communication function provides the data exchange with other systems (third party devices), such as other programmable controller systems, robot controllers, computers etc.

communication line controller A hardware unit that performs line-control functions with a modem.

communication link 1. The means of connection one location to another for the purpose of transmitting and receiving information. **2.** A channel or circuit intended to connect other channels or circuits.

communications See communication.

communications computer A computer that acts as the interface between another computer or terminal

and a network, or a computer controlling data flow in a network.

communications control unit, CCU A small computer whose only purpose is to monitor and control the flow of data communications traffic to and from the CCU's larger, host computer. A CCU is sometimes known as a front end processor.

communications interface equipment A portion of a relay system which transmits information from the relay logic to a communications link, or conversely to logic, for example, audio tone equipment, a carrier transmitter-receiver when an integral part of the relay system.

communications link Any of the communications media, for example, microwave, power line carrier, wire line.

communications multiplexer channel A data processing and communications coordinator. Systems equipped with a communications multiplexer channel can manage the myriad data-transfer problems inherent in complex configurations.

communications net An organization of stations capable of direct communications on a common channel or frequency.

communications protocol A set of conventions used to govern the format and content of messages between processors.

communications signal Aggregate of electromagnetic waves propagated in a transmission channel that act on a receiving unit.

communications sink A device which receives information, control, or other signals from communications source(s).

communications source A device which generates information, control, or other signals destined for communications sink(s).

communications status word A special word location in storage that contains status information.

communications system A computer system which handles on-line, real-time applications. A typical communications system would consist of the following: A teletype, visual display, or audioanswer-back device connected to an ordinary telephone line through a communication multiplexer. Important elements of any communications system are the modems (modulator/demodulator).

communications traffic All messages that are transmitted and received.

communications trunk A telephone line between two central offices that is used to provide communications between subscribers.

communication switching unit A unit which allows any two processors to share a group of communications lines and enables one processor to switch between different group of communication lines.

communication theory The mathematical discipline dealing with the probabilistic features of the transmission of messages in the presence of noise and other disturbances.

commutation Cyclic sequential sampling on a time-division basis of multiple data sources.

commutation rate The number of commutator inputs sampled per specified time interval.

commutation switch A device controlling the sequential switching operators required for multichannel pulse communication systems.

commutator 1. A device used to accomplish time-division multiplexing (TDM) by repetitive sequential switching. **2.** The part of the armature to which the coils of a motor are connected. **3.** Device used in a direct current generator to reverse the direction of an

electric current and maintain a current flowing in one direction.

compact A powder-metallurgy part made by pressing metal powder, with or without a binder or other additives; prior to sintering it is known as a green compact, and offer sintering as a sintered compact or simply a compact.

compaction algorithm An algorithm for data compaction so that data will require fewer bits.

compact, to compress The reduce the space taken on a data medium by encoding or removing repetitive characters.

compandor (data transmission) A combination of a compressor at one point in a communication path for reducing the amplitude range of signals followed by an expander at another point for a complementary increase in the amplitude range.

comparator 1. In analog computing, a functional unit that compares two analog variables and indicates the result of that comparison. **2.** A functional unit that compares two items of data and indicates the result of the comparison.

comparator circuit A circuit which compares two signals (such as commands from tape and slide displacement from the transducer) and produces an output signal indicating agreement or disagreement of the two signals.

compare To determine whether a particular quantity is higher, equal to, or lower than another quantity, or to determine whether one piece of data is exactly like another.

comparing element Transfer element with two inputs and one output, the output variable being the difference between the two input variables.

comparison (method of) measurement A method of measurement based on the comparison of the value of a quantity to be measured with a known value of the same kind.

comparison bridge A type of voltage-comparison circuit resembling a four-arm electrical bridge. The elements are so arranged that if a balance exists in the circuit, a zero error signal is derived.

comparison standard A standard intended for the comparison among themselves of standards of the same order of accuracy.

comparison testing Real-time comparison between the actual output responses of the device under test and those of a known-good reference device when the same input stimulus patterns are applied to both devices in parallel.

comparison value Can be, as appropriate, the true value, the conventional true value or a value traced either to national standards or to standards agreed upon between the parties concerned.

compartmentalization The process whereby substances in the environment migrate to various environmental compartments such as water, air, biota, soil and sediments (see bioaccumulation).

compatibility 1. The capability of a functional unit to meet the requirements of a specified interface. **2.** The ability of two or more systems to exchange information. Compare with interoperability.

compatible A term applied to a computer system which implies that it is capable of handling both data and programs devised for some other type of computer system.

compensated control system An interconnected system that controls two or more variables (speed, load, pressure etc.) with compensation designed to minimize the interaction between the controlled variables.

compensated semiconductor A semiconductor in which one type of impurity or imperfection (e.g. donor) partially cancels the electrical effects of the other type of impurity or imperfection (e.g. acceptor).

compensating element, equalizer Element connected in the forward path or in an auxiliary feedback path of a feedback control system and whose transfer function is such that the overall performances of the feedback control system are improved. Note: Equalizers can be a lead-lag network, a lead-lag network, etc.

compensating extension wire See extension wire.

compensating feedforward or feedback Correcting feedforward of a function of the command signal or feedback of a function of the controlled condition, with the object of reducing steady state deviation.

compensating lead wire, lead wire The use of these terms are to be discouraged because they frequently are confused with the term lead (element). Correctly use the term thermocouple extension wire.

compensation Effect of a special construction, a supplementary device, circuit, or special materials to counteract sources of error due to variations in specified operating conditions.

compensation control A process of automatically adjusting the control point of a given controller to compensate for changes in a second measured variable (e.g., outdoor air temperature).

compensation signals In telemetry, a set of reference signals recorded on tape along with the data, and used during playback to automatically compensate for any nonuniformity in tape speed.

compensator, compensating element A device designed to counteract sources of error due to variations in specified operating conditions.

compile To translate a higher order language program into its relocatable or absolute machine code equivalent. Contrast with assemble, interpret.

compile duration The elapsed time taken for the execution of a compiler.

compile phase, compiling phase Of a run, the logical subdivision that includes the execution of the compiler.

compiled knowledge Declarative knowledge that has been translated into procedural knowledge so that it immediately can be processed by a computer.

compiler, compiling program A computer program used to compile. Contrast with assembler, interpreter.

compiler generator A translator or an interpreter used to construct compilers. Synonymous with meta-compiler.

compiler language A computer language system consisting of various subroutines that have been evaluated and compiled into one routine that can be handled by the computer. FORTRAN, COBOL and ALGOL are compiler languages.

compile time In general, the time during which a source program is translated into an object program.

compiling program See compiler.

compiling routine 1. Same as compiler. **2.** A routine by means of which a computer can itself construct the program used to solve a problem.

compiling time The elapsed time taken for the execution of a compiler.

complement In a fixed radix numeration system, a number that can be derived from a given number by operations that include subtracting each digit of the digital representation of the given number from the corresponding digit of the digital representation of a specified number.

complementary (method of) measurement A comparison method of measurement in which the value of the quantity to be measured is combined with a known value of the same quantity so adjusted that the sum of these two values is equal to a predetermined comparison value.

complementary metal-oxide semiconductor (CMOS) logic A logic circuit using CMOS transistors as logic functions. Complementary means that pairs of opposite types of transistors are used together on a push-pull basis, thus eliminating resistors and greatly reducing power consumption.

complement base In a fixed radix numeration system, the specified number whose digital representation contains the digits from which the corresponding digits of the given number are subtracted in obtaining a complement of the given number.

complement number A number which, when added to another number, gives a sum equal to the base of the numbering system. For example, in the decimal system, the complement of 2 is 8. Complement numbers are used in some computer systems to facilitate arithmetic operations.

complement on nine, nines complement The diminished radix complement in the decimal numeration system.

complement on one, ones complement The diminished radix complement in the pure binary numeration system.

complement on ten, tens complement The radix complement on the decimal numeration.

complementary operation Of a Boolean operation, another Boolean operation whose result, when it is performed on the same operands as the first Boolean operation, is the negation of the result of the first Boolean operation. Example: Disjunction is the complementary operation of non-disjunction.

complete carry 1. A carry process in which a carry resulting from addition of carries is allowed to propagate. Contrasted with partial carry. **2.** In parallel addition, a procedure in which each of the carries is immediately transferred.

complete combustion The complete oxidation of all the combustible constituents of fuel.

complete failure Failure resulting from deviations in characteristic(s) beyond specified limits such as to cause complete lack of the required function. Note: The limits referred to in this category are special limits specified for this purpose.

complete fault, function preventing fault A fault characterized by complete inability to perform all required functions of an item. Note: The criteria for a complete inability have to be stated.

completeness check A check to determine whether a value lies above or below, or has reached a stipulated limit.

complete oxidation method (in steelmaking) A variator of the acid electric-furnace process. See also acid electric-furnace process.

completion-date The completion date is the date that a task is actually completed.

completion network In a strain gage signal conditioner, the one to three resistors which must be added to make a four-arm bridge (the transducer being the active arm or arms).

complex components Indivisible and nonrepairable components having more than one function.

complex function An integrated device in which three or more circuits are integral to a single silicon chip. In addition, the circuits are interconnected on

the chip itself to form same electronic function at a higher level of organization than a single circuit.

complexity (software) The degree of complication of a system or system component, determined by such factors as the number and intricacy of interfaces, the number and intricacy of conditional branches, the degree of nesting, the types of data structures and other system characteristics.

complex plane (automatic control) A plane defined by two perpendicular reference axes, used for plotting a complex variable or function of this variable, such as a transfer function.

complex tone A sound wave produced by combining simple sinusoidal component waves of different frequencies.

complex variable (automatic control) A convenient mathematical concept having a complex value, that is having a real part and an imaginary part.

complex wave A periodic wave made up of a combination of several frequencies or several sine waves superimposed on one another.

compliance (industrial robots) The flexible behaviour of a robot or any associated tool in response to external forces exerted on it. When the behaviour is independent of sensory feedback it is passive compliance; if not it is active compliance.

compliance extension A form of master/slave interconnection of two or more current-regulated power supplies to increase their compliance voltage range through series connection. See compliance voltage.

compliance range The range of voltages needed to sustain a given value of constant current throughout a range of load resistances.

compliance test A test used to show whether or not a characteristic or a property of an item complies with the stated requirements.

compliance voltage The output voltage of a direct-current power supply operating in constant-current mode. Note: The compliance range is the range of voltages needed to sustain a given value of load resistances.

component 1. In vector analysis, one of the parts of a wave, voltage, or current considered separately.
2. Any of the basic parts used in building electronic equipment, such as resistor or capacitor, etc.

component A term used to identify a raw material, ingredient, part or subassembly that goes into a higher level assembly, compound or other item. It may also include packaging materials for finished goods.

component One of at least two streams that are added together to make a blend. These are not to be confused with an additive.

component density The number of components contained in a given volume or within a given package or chip. The quantity of components on a printed board per unit area.

component hazard The instantaneous failure rate of a component or its conditional probability of failure versus time.

component layout The physical arrangement of the components in a chassis or printed circuit.

component placement equipment Automatic system for sorting, and placing components onto hybrid circuit substrates or pcb's, consisting of indexing-conveyor, sorter, placement heads, missing component detector, programmable electropneumatic control, and options to handle special requirements.

component population The variety and number of components (transistors, resistors, transformers etc.) necessary to perform the desired electrical function.

component propellertype current-meter A propeller type current-meter whose rotor is designed to provide a cosine response; that is, angular flow components are resolved on an axis parallel to the axis of the meter. See figure in British Standard 3680: Part 1:1983.

Component Ratio The desired volume percentages of all components in the blend recipe.

component stress Those factors of usage or test, such as voltage, power, temperature, frequency etc. which tend to affect the failure rate of component parts.

component testing (software) Testing conducted to verify the implementation of the design for one software element (for example, unit, module) or a collection of software elements.

composite A material or structure made up of physically distinct components that are mechanically, adhesively or metallurgically bonded together.

composite action Additive combination of two or more types of continuous actions (PI, PD, PID, PIDD₂ etc.).

composite cable In communications use, a cable in which conductors of different gages or types are combined under one sheath.

composite circuit A circuit which can be used simultaneously for telephony and direct-current telegraphy or signaling, separation between the two being accomplished by frequency discrimination.

composite color sync The signal comprising all the sync signals necessary for proper operation of a color receiver. Includes the deflection sync signals to which the color sync signal is added in the proper time relationship.

composite conductor One in which strands of different metals are used in parallel.

composite filter Combination of a number of filter sections, or half sections, all have the same cutoff frequencies and specified impedance levels.

composite joint A connection between two parts that involves both mechanical joining and welding or brazing, and where both contribute to total joint strength.

composite sample (water quality) Two or more samples or subsamples, mixed together in appropriate known proportions (either discretely or continuously), from which the average result of a desired characteristic may be obtained. The proportions are usually based on time or flow measurement.

composite seal Sealing device having element of different materials.

composite subcarrier Two or more subcarriers that are combined in a frequency-division multiplexing (FDM) scheme.

composite video signal The video signal of a cathode-ray tube, consisting of picture signal, blanking pulses, and sync pulses.

composite waveform A waveform which is, or which for analytical or descriptive purposes is treated as, the algebraic summation of two or more waveforms.

composite wire clad A wire having a core of one metal to which is fused an outer shell of one or more different metals.

composition The conversion of computer files containing text and typesetting commands into a format for input to an imaging system, such as a phototypesetter.

composition deviation transmitter A device which transmits the information of a change in a physical or chemical property or a composition.

composition resistor See carbon resistor.

compound modulation Use of an already modulated wave as a further modulation envelope. Also called double modulation.

compound statement A statement constructed by sequencing statements.

compound weir A weir containing two or more sections, which may be of different types, each section having a different height. Pertains to liquid flow measurement in open channels.

compressibility Volumetric strain per unit change in hydrostatic pressure. See also bulk modulus.

compressibility factor (control valves) Pertaining to sizing equations for control valves, ratio of ideal to actual inlet specific mass. See IEC publication 534-2-2 and ISA handbook of control valves.

compressibility of liquids All liquids are compressible. This follows from the fact that a liquid, as it approaches its critical temperature, takes on some of the characteristics of a gas, since at the critical point it reaches a gaseous state. The true density of most liquids for various pressures and temperatures can be determined from chemical handbooks.

compressible Capable of being compressed. Gas and vapor are compressible fluids.

compressible flow Fluid flow under conditions which cause significant changes in density.

compression (data transmission) A process in which the effective gain applied to a signal is varied as a function of the signal magnitude, the effective gain being greater for small rather than for large signals.

compression (oscillography) An increase in the deflection factor usually as the limits of the quality area are exceeded.

compression failure Buckling, collapse or fracture of a structural member that is loaded in compression.

compression fitting Type of fitting in which the connection is made with the aid of a tubing nut and compression ring which does not require any sealing compound or other method of securing. Fittings may be threaded male or female.

compression ratio 1. The ratio of (1) the magnitude of the gain (or amplification) at a reference signal level to (2) its magnitude at a higher stated signal level. **2.** In an internal combustion engine, the ratio of cylinder volume with the piston at bottom dead center to the volume with the piston at top dead center. **3.** In powder metallurgy, the ratio of the volume of loose powder used to make a part to the volume of the pressed compact.

compression spring An elastic member, usually made by bending metal wire into a helical coil, that resists a force tending to compress it.

compression test A destructive test for determining fracture strength, yield strength, ductility and elastic modulus by progressively loading a short-column specimen in compression.

compressor A hardware or software process for removing redundant or otherwise uninteresting words from a stream, thereby "compressing" the data quantity.

compressor (control valves) The part of the stem assembly in a diaphragm valve such as the Saunders patent diaphragm valve which effects flow restriction by forcing the diaphragm toward an internal web.

compressor (data transmission) A transducer, which for a given amplitude range of input voltages, produces a smaller range of output voltages. One important type of compressor employs the envelope of speech signals to reduce their volume range by amplifying weak signals and attenuating strong signals.

compressor-stator-blade-control system A means by which the turbine compressor stator blades are adjusted by vary the operating characteristics of the compressor.

computational process An instance of execution of a segment by a processor using a data area.

computational slot One of eight user-accessible processing blocks within the Basic Controller. Each can be used to solve any of the auxiliary and control algorithms. Refers to Honeywell TDC 3000 control systems.

computational stability The degree to which a computational process remains valid when subjected to effects such as errors, mistakes, or malfunctions.

compute bound Concerns a restriction in a computer function or program that limits output rate because operations are delayed awaiting completion of a computation operation. Same as compute limited.

compute limited See compute bound.

compute mode The operating mode of analog computer during which the solution is in progress. Synonymous with operate mode.

computer A programmable functional unit that consists of one or more associated processing units and peripheral equipment, that is controlled by internally stored programs, and that can perform substantial computation, including numerous arithmetic operations or logic operations without human intervention during a run.

computer-aided design, CAD Refers to the capability of a computer to be used for automated industrial, statistical, biological etc., design through visual devices.

computer-aided engineering, CAE The use of computers to aid in engineering analysis and design. May include solution of mathematical problems, process control, numerical control and execution of programs performing complex or repetitive calculations.

computer-aided inspection, CAI The use of computers to inspect manufactured parts.

computer-aided instruction, CAI The use of computers to present instructional material and to accept and evaluate student responses.

computer-aided management, CAM The application of computers to business management activities.

computer-aided manufacturing, CAM The use of computers and numerical control equipment to aid in manufacturing processes. May include robotics, control and product assembly. Often used in combination such as CAD/CAM.

computer-aided manufacturing-International, CAM-I An organization of private companies and government agencies to develop a numerically controlled computer-aided programming language.

computer-aided typesetting The use of computers at any stage of the document composition process. This may involve text formatting, input from a word processing system, or computer-aided page makeup.

computer applications engineer An employee who provides primarily hardware-orientated technical sales support to sales personnel. Their work, in varying degrees, involves hardware configuration, special systems, peripheral equipment, modules, and instruments.

computer-assisted instruction, CAI A data processing application in which a computing system is used to assist in the instructions of students.

computer-assisted tester A test directly programmed by a computer but which operates in association with a computer by using some arithmetic functions of the computer.

computer assisted tomography See CAT.

computer auto-manual station A device in a direct digital control (DDC) loop between the computer and the final controlling element that has the capability of switching between DDC, automatic backup control, and manual control whereby this switching can be carried out automatically or manually.

computer-based instruction, CBI The use of computers to support any process involving human learning.

computer center A complex of computer equipment, peripheral equipment, program library, personnel and the office space containing it all.

computer code A machine code for a specific computer. Also called machine language.

computer control 1. Type of control in which a computer is used in the controlling system. **2.** A mode of control wherein a computer, using as input the process variables, produces outputs that controls the process.

computer control counter 1. A counter that stores the next required address. **2.** Any counter that provides information to the control unit.

computer data (software) Data available for communication between or within computer equipment. Such data can be external (in computer-readable form) or resident within the computer equipment and can be in the form of analog or digital signals.

computer-dependent language A relative term for a programming language whose translation can be achieved only by a specific model (or models) of computer.

computer dependent programs Programs specifically written using the language and/or features of a specific computer.

computer diagnosis The use of data processing systems for evaluation of raw data.

computer diagram A functional drawing showing interconnections between computing elements, such interconnections being specified for the solution of a particular set of equations.

computer efficiency Determined by the ratio of the number of hours of correct machine operation to the total hours of scheduled operation; on a 168 hours of week scheduled operation if 12 hours of preventive maintenance are required and 4.8 hours of unscheduled down time occurs, then the operation ratio is 168 to 16,8/168, which is equivalent to a 90% operation ratio.

computer equation (machine equation) An equation derived from a mathematical model for more convenient use on a computer.

computer gateway, CG A node that interconnects an upper-level processor to the Local Control Network in the Honeywell TDC 3000 control system.

computer-generated hologram A synthetic hologram produced using a computer plotter. The binary structure is formed on a large scale and is then photographically reduced. The holograms are finally etched into a medium.

computer graphics Computer output in the form of pictorial representation (graphs, charts, drawings, etc.) that is displayed visually, usually by a cathode-ray tube.

computer graphics A human-oriented system which uses the capabilities of a computer to create, transform, and display pictorial and symbolic data.

computer independent language A language in which computer programs can be created without regard for the actual computers which will be used to process the theory. Related to transportability.

computer instruction, machine instruction A machine instruction for a specific computer.

computer instruction code, machine code A code used to represent the instructions in an instruction set.

computer-integrated manufacturing, CIM The computer integrated enterprise of manufacturing including the management of required resources; people, organization, material, energy, data, computer technology and automation equipment.

computer integrated manufacturing (CIM) architecture A set of principles and rules for selecting and developing products and standards that can participate in a CIM system.

computer integrated manufacturing, CIM The computer integrated enterprise of manufacturing including the management of required resources; people, organization, material, energy, data, computer technology and automation equipment.

computer interfacing The synchronization of digital data transmission between a computer and one or more external I/O devices.

computerization Automation by means of computers.

computerize To automate by means of computers.

computerized axial tomograph See CAT.

computerized numerical control, CNC A numerical control system wherein a dedicated, stored program computer is used to perform some or all of the basic numerical control functions.

computerized robot A servo model run by a computer. The computer controller does not have to be taught by leading the arm-gripper through a routine; new instructions can be transmitted electronically. The programming for such "smart" robots may include the ability to optimize, or improve, its work-routine instructions.

computer language, machine language A computer-orientated language whose instructions consist only of computer instructions.

computer-limited Pertaining to a situation in which the time required for computation exceeds the time available.

computer-limited operation Operation of a peripheral device in a mode in which the device can receive or transmit information more rapidly than the computer can supply or accept it.

computer literacy The ability to use computer technology in a particular discipline.

computer logic The logical operations of the computer, consisting entirely of five operations – add, subtract, multiply, divide and compare. This simple processing logic is enough to allow the computer to accomplish its entire potential of tasks when properly programmed.

computer-managed instruction, CMI The use of computers for management of student progress. Activities may include record keeping, progress evaluation, and lesson assignment.

computer matrix Relating to computers, a logic network in the form of an array of input leads and computer logic.

computer mode See compute mode.

computer network 1. A network of data processing nodes that are interconnected for the purpose of data communication. **2.** A complex consisting of two or more interconnected computers or computing units.

computer numerical control, CNC A numerical control system wherein a dedicated, stored program computer is used to perform some or all of the basic numerical control functions.

computer operator A person who performs standard system operations such as adjusting system operation parameters at the system console, loading a tape transport, placing cards in a card reader, and removing listings from the line printer.

computer-orientated language, low level language A programming language that reflects the structure of a given computer or that of a given class of computers.

computer output microfilm The end result of a process that converts and records data from a computer directly to a microform.

computer-output, microfilm printer, COM-printer A microfilm printer that will take output directly from the computer thus substituting for line printer or tape output.

computer-part-programming In numerical control, the preparation of a part program to obtain a machine program using the computer and appropriate processor and post processor.

computer peripheral The auxiliary devices under control of a central computer, such as readers, printers, magnetic tape units, and optical character readers.

computer port The physical location where the communication line interfaces to the computer.

computer program A sequence of instructions suitable for processing. See also program.

computer program certification See certification.

computer program configuration identification See configuration identification.

computer programmer A person who designs, writes, debugs, and documents computer programs.

computer programming language A set of precisely defined structure and syntax (representation, conventions, and rules of use and interpretation) devised to simplify communication with a computer, such as BASIC, COBOL, ALGOL and FORTRAN.

computer program validation See validation.

computer program verification See verification.

computer run To process a batch of transactions while under the control of one or more programs, and against all the files that are affected to produce the required output.

computer science 1. The field of knowledge that involves the design and use of computer equipment, including software development. 2. The science of solving problems with computers.

computer simulation A logical-mathematical representation of a simulation concept, system, or operation programmed for solution on an analog or digital computer.

computer system audit An examination of the procedures used in a computer system to evaluate their effectiveness and correctness, and to recommend improvements.

computer system, computing system, data processing system A system, including computing equipment and associated personnel, that performs input, processing, storage, output, and control functions to accomplish a sequence of operations on data. In the English usage, "data processing system" is a preferred form for those systems which include personnel.

computer system fault tolerance, (computer system) resilience The ability of a computer system to continue to operate correctly even though one or more of its component parts are malfunctioning.

computer system security, data processing system security The technological and administra-

tive safeguards established and applied to a data processing system to protect hardware, software, and data from accidental or malicious modifications, destruction or disclosure.

computer tape A high-quality magnetic digital recording tape.

computer terminal Peripheral computer equipment for entering and retrieving data. Sometimes incorporates cathode-ray tube for display.

computer time See time.

computer utility A network of central computers linked through data communications facilities to remote terminal systems.

computer variable A dependent variable as represented on the computer.

computer vision The capability of a functional unit to acquire, process, and interpret visual data. Notes: 1. Computer vision involves the use of visual sensors to create an electronic or digital image of a visual scene. 2. Contrast with machine vision.

computer word, machine word A sequence of bits or characters treated as a unit, that is suitable for processing by a given computer.

computing element A computer component that performs the mathematical operations required for problem solution. It is shown explicitly in computer diagrams.

computing instrument A device in which the output is related to the input or inputs by a mathematical function such as addition, averaging, division, integration, lead/lag, signal limiting, squaring, square root extraction, subtraction etc.

computing module (CM) A computer system connected to the Local Control Network (Honeywell TDC 3000 control system), consisting of an upper-level processor plus a Computer Gateway (see this term), that provides user-developed high-level control and plant-wide information integration.

computing system See computer system.

concatenate To combine several files into one file, or several strings of characters into one string, by appending one file or string after another.

concatenation The process of linking a collection of facts together.

concatenation (of optical waveguides) The linking of optical waveguides, end to end.

CONCAWE The Oil Companies' European Organisation for Environmental and Health Protection.

concentrated waste liquor, thick waste liquor Pertaining to pulp and paper processes, spent liquor which has been concentrated by evaporation.

concentration Concentration is defined as the amount of substance of a component of a mixture divided by the total volume of the mixture. The SI unit for concentration is mole per cubic metre, mol/m³. Common multiples: mol/dm³ (usually written mol/l), kmol/l. Do not use "concentration" as an abbreviated name for mass concentration or molecular concentration. Use the additional unit mole per litre whenever convenient. The term "molar" refers to the unit mol/l. Example: A 0.5 molar solution contains 0.5 mole of the component per litre of solution.

concentration – liquid/liquid (separation terminology) As a rule, concentration of the heavy phase of a liquid. Therefore the heavy phase travels the longest distance in the separator bowl.

concentration processes (of iron ore) Methods for upgrading iron ore such as heavy – media separation, spirals, flotation and magnetic and electrostatic concentration.

concentrator (data communication) 1. A device that feeds the signals from several data terminals into a single transmission line for input to a computer, or vice versa. **2.** An analog or digital buffer switch used to reduce the required number of trunks. **3.** A device for combining many low-speed data lines into one high-speed data line.

concentricity error (fiber optics) When used in conjunction with a tolerance field to specify core/cladding geometry, the distance between the center of the two concentric circles specifying the cladding diameter and the center of the two concentric circles specifying the core diameter.

concentric orifice plate An orifice plate with a concentric location of the restriction. Compare segmental orifice plate.

concentric stranding A method of stranding wire in which the final wire is built up in layers such that the inner diameter of a succeeding layer always equals the outer diameter of the underlying layer.

concept phase (software) The initial phase of a software development project, in which user needs are described and evaluated.

conceptual design The result of the conceptual phase in defining the product. It begins with the broad product objectives and decomposes these objectives into concept formulation, general design approaches, feasibility evaluations, block diagrams and high-level layouts of the product design. Synonym: Functional Baseline.

conceptual model An abstract representation of an object or phenomenon that provides a common understanding.

conceptual schema Comprising the central description of the various information contents that may be in a database.

conservation of a measurement standard All the operations necessary to preserve the metrological characteristics of a measurement standard within appropriate limits. Note: The operations commonly include regular calibration, storage under good conditions and care in use.

concession, waiver (quality) Written authorization to use or release a quantity of material, components or stores already produced but which do not conform to the specified requirements. Note: Concessions (waivers) should be for limited quantities or periods, and for specified uses.

concordance An alphabetic list of words and phrases appearing in a document, with an indication of the place those words and phrases appear.

concurrent Pertaining to the occurrence of two or more events or activities within the same specified interval of time. Contrast with consecutive, sequential, simultaneous.

concurrent processes Processes that may execute in parallel on multiple processors or asynchronously on a single processor. Concurrent processes may interact with each other, and one process may suspend execution pending receipt of information from another process or the occurrence of an external event. Contrast with sequential control.

condensate 1. Liquid hydrocarbons produced with natural gas that are separated from the gas by cooling and various other means. Pertains to the petroleum industry. **2.** The liquid product of a condensing cycle. Also known as condensate liquid.

condensate pot A section of pipe installed horizontally at the orifice flange union to provide a large-area surge surface for movement of the impulse line fluid with instrument element position change to reduce

measurement error from hydrostatic head difference in the impulse lines.

condensate trap A device used to trap and retain condensate in a measurement impulse line to prevent hot vapors from reaching the instrument.

condensation The transformation of a vapor or gas to a liquid by cooling or an increase in pressure or both simultaneously.

condensation type dew point sensor A dew point sensor utilizing the chilled mirror technique. Gas containing water, vapor is cooled by contact with a mirror. A gas is cooled, a temperature will be found at which water vapor condenses on the mirror. The temperature at which condensation occurs is known as the dew point. Mirror temperature is detected by temperature sensor. Condensation is sensed by fog on the mirror.

condensed mercury temperature The temperature of a mercury-vapor tube, measured on the outside of the tube envelope, in the region where the mercury is condensing in a glass tube or at a designated point on a metal tube.

condenser A water-cooled heat exchanger used for cooling and liquefying vapors. For distillation, the common condenser cooling media are water, air and refrigerants such as propane.

condenser boiler A boiler in which steam is generated by the condensation of a vapor.

conditional 1. In a computer, subject to the result of a comparison made during computation. **2.** Subject to human intervention.

conditional command Command which is issued when the associated step is activated and the necessary condition is fulfilled. The conditional command is identified in IEC 848 by the conventional letter "C".

conditional control structure A programming control structure that allows alternative flow of control in a program depending upon the fulfillment of specified conditions; for example, case, if ... then ... else ...

conditional implication (operation), implication, IF-THEN operation See under implication.

conditional jump A jump that takes place only when the instruction that specifies it is executed and specified conditions are satisfied.

conditional stability of a linear system For a linear single-loop control system, the property of being stable for a certain interval of values of the static open-loop gain and unstable for certain lower and higher values of that gain.

conditional statement A statement that causes the computer to check something and use that as a basis for choosing among alternative courses of action. Some as a branch. Also called IF statement.

conditional transfer of control Same as conditional jump.

condition based maintenance A maintenance concept where maintenance is carried out in response to a significant deterioration in a unit as indicated by a change in a monitored parameter of the unit condition or performance.

conditioning (of paper or board) The treatment of paper or board in order to give the product a prescribed or a uniform moisture content and temperature.

conductance 1. A measure of the ability of a substance to conduct electricity. It is the reciprocal of resistance, and is expressed in siemens. **2.** The real part of admittance.

conducted emission Desired or undesired electromagnetic energy which is propagated along a conduc-

tor. Such an emission is called "conducted interference" if it is undesired.

conducted heat Thermal energy transferred by thermal conduction.

conducted interference See conducted emission.

conducted signals Electromagnetic or acoustic signals propagated along wire-lines or other conductors.

conductimeter Same as conductivity meter.

conduction Transfer through a medium, such as the conduction of electricity by a wire, or of heat by a metallic frame, or of sound by air.

conduction current The power flow parallel to the direction of propagation expressed in siemens per meter.

conduction error The error in a temperature transducer due to heat conduction between the sensing element and the mounting of the transducer.

conductive level detector A device with single or multiple probes. A change in level completes an electrical circuit between the container and/or probes.

conductivity 1. The ability of a material to conduct electric current. It is expressed in terms of the current per unit of applied voltage. It is the reciprocal of resistivity. **2.** The ability to conduct or transmit heat or electricity. **3.** Synonym for conductance.

conductivity – type moisture sensor An instrument for measuring moisture content of fibrous organic materials such as wood, paper, textiles and grain at moisture contents up to saturation.

conductivity measurement The measurement of conductivity, which is the reciprocal of electrical resistance provides a measure of the amount of dissolved ionized solids in a solution. The measurement is useful for the determination of chemical concentrations and the concentration of dissolved polluting solids in a stream or in the effluent from an industrial plant.

conductivity method A technique for determining the concentration of the tracer by means of the electrical conductivity. Pertains to measurement of liquid flow in open channels, dilution methods.

conductometer An instrument that measures thermal conductivity.

conductor Anything, such as a wire, which is suitable for carrying an electric current; that part of an electrical which carries the current, as opposed to the dielectric.

conductor Anything, such as a wire, which is suitable for carrying an electric current; that part of an electrical circuit which carries the current, as opposed to the dielectric.

conduit 1. A tubular raceway designed for holding wires or cables. It may be a solid or flexible tube in which insulated electrical wires are run. **2.** Metal sleeve through which electrical wires pass.

cone-plate viscometer An instrument for routinely determining the absolute viscosity of fluids in small sample volumes by sensing the resistance to rotation of a moving cone caused by the presence of the test fluid in a space between the cone and a stationary flat plate.

confidence 1. The likelihood, expressed in percent, that a measurement or statement is true. **2.** The degree of assurance that the stated failure rate has not been exceeded.

confidence factor See certainty factor.

confidence level The probability that the interval quoted will include the true value of the quantity being measured.

confidence test A test primarily performed to provide a high degree of certainty that the unit under test is operating acceptably.

configuration – Device (e.g., PIU, Basic Controller, etc.) – The selection, arrangement, and implementation of parameters associated with a particular box or its points so as to accomplish a control and/or monitoring task. – Hardware – The selection and arrangement of devices needed to implement a particular control system. Refers to Honeywell TDC 3000 control systems.

configuration 1. (Hardware) A step in system design: selecting modules, assigning their locations and defining their interconnection. **2.** (Software) In a system or a device in which logic modules are pre-loaded, selecting required modules, assigning them to appropriate logical locations (e.g. control loop, display point etc.) and linking them, mostly by keyboard operations. Contrasted with programming.

configuration The complete technical description required to build, test, accept, operate, maintain and logistically support a piece of equipment. It includes the physical and functional characteristics of the equipment.

configuration control (software) The process of evaluating, approving or disapproving, and coordinating changes to configuration items after formal establishment of their configuration identification.

configuration identification (software) 1. The process of designating the configuration items in a system and recording their characteristics. **2.** The approved documentation that defines a configuration item.

configuration item A collection of hardware or software elements treated as a unit for the purpose of configuration management.

configuration management The process of identifying and defining the configuration items in a system, controlling the release and change of these items throughout the system life cycle, recording and reporting the status of configuration items and change requests, and verifying the completeness and correctness of configuration items.

configuration word Numerical information that is inserted into the data base of process control devices. This information could define operational parameters, control functions, or alarm limits associated with a particular part of the system. Refers to Honeywell TDC 3000 control systems.

configuring Composition of a controlling system by selecting functional or modular units out of a given set and defining their interconnection.

confined flow Flow of a continuous stream of fluid within a process vessel or conduit.

confinement Prevention of unauthorized alteration, use, destruction, or release of data during authorized access. See also integrity.

conflict resolution Solving the problem of multiple matches in a rule-based system by selecting the most appropriate rule.

conformal coating A thin nonconductive coating, either plastic or inorganic, applied to a circuit for environmental and/or mechanical protection.

conformance See accuracy and error band.

conformance error The deviation of a calibration curve from a specified curve line.

conformance test Tests that are specifically made to demonstrate compliance with relevant standards. Note: Conformance tests may be type tests, routine tests, or individual tests.

conformity The closeness to which a calibration curve approximates a specified characteristic curve (which can be linear, logarithmic, parabolic etc.). Note: Conformity should be qualified. When expressed simply as conformity, it is assumed to be independent conformity.

conformity error The absolute value of maximum deviation between the calibration curve and the specified characteristic curve. Notes: **1.** This error is usually expressed as a percentage of the span. **2.** Conformity error should be qualified. When expressed simply as conformity error, it is assumed to be independent conformity error.

congestion theory A particular theory of mathematics which relates to the study of delays and losses which affect the traffic of items which move through a communications system.

conical entrance orifice plate Orifice plate for which the junction of the upstream face and the orifice has the shape of a straight circular truncated zone. See figure in ISO publication 4006-1977 or BS 5875:1980.

conical orifice An orifice having a 45° bevel on the inlet edge to yield more constant and predictable discharge coefficient at low flow velocity (Reynolds number less than 10,000).

conical refiner See refiner.

conjugate impedance An impedance the value of which is the conjugate of a given impedance.

conjunction, AND operation, intersection, logical product The Boolean operation whose result has the Boolean value 1 if and only if each operand has the Boolean value 1. Note: See also table of Boolean operations in ISO publication 2382/11-1976.

conjunctive search A search defined in terms of a logical product.

connate water Interstitial water of the same geological age as the surrounding rock or bed, often of poor quality and unfit for normal use (for example potable purposes, industrial and agricultural use).

connection The current-carrying junction which results when two conductors are clamped, wrapped, or wrapped and soldered into electrical contact. Also, on association of channels and other functional units providing means for the transfer of information between two or more terminal points.

connection diagram (or table) Diagram (or table) showing or listing the connections of an installation or equipment.

connection head Part of a thermocouple assembly consisting of a housing enclosing a terminal block for an electrical temperature sensing device and usually provided with threaded openings for attachment to a protecting tube and for attachment of conduit.

connection head extension Part of a thermocouple assembly consisting of a threaded fitting or an assembly of fittings extending between the thermowell or angle fitting and the connection head.

connection retainability (in telecommunication) The probability that a connection, once obtained, will continue to be provided for a communication under given conditions for a given time duration.

connector 1. A flowchart symbol that represents a break in a flowline and that indicates where the flowline is continued. **2.** A device for electrically coupling one or more conductors.

connector assembly The combination of a mated plug and receptacle. Multiple-contact connectors join two or more conductors with others in one mechanical assembly.

conoscope An instrument for determining the optical axis of a quartz crystal.

conscious error An error that was instantly recognized as such by an operator, but that his reflex actions were unable to prevent.

consecutive In a process, pertaining to two events that follow one another without the occurrence of any other event between them.

consecutive sequence computer A computer used to execute instructions individually and sequentially without any concurrent activities such as simultaneous reading, writing, and computing.

conservative substance, persistent substance, recalcitrant substance, refractory substance Substances whose chemical composition remains unchanged by natural processes or is changed only extremely slowly, for example one which is not biodegradable in a sewage treatment process.

consistency Resistance of a substance to deformation. It is the same as viscosity for a Newtonian fluid and the same as apparent viscosity for a non-Newtonian fluid.

consistency check A process designed to verify that a piece of data is consistent with the rules prescribed for its handling.

consistency transmitter A specialized device which transmits information about a combination of physical properties related to the characteristics of paper pulp.

console 1. A structure provided with panels slanting at different angles suitable to a sitting person. **2.** The man-interface with a computer or control equipment. **3.** See control panel, operator's console, process engineer's console, and programmer's console.

consonance Electrical or acoustical resonance between bodies or circuits not connected directly together.

consortium A conglomerate or partnership. Plural: Consortia.

constant 1. The quantity of messages which will be present in the machine and available as data for the program, and which usually are not subject to change with time. **2.** A value that remains the same throughout the distinct operation; opposite of variable. **3.** A character or group of characters usually representing a value. A key or standard, used by the computer to identify, locate, measure, or test in order to make a decision.

constantan Alloy containing copper and nickel. Tradename. See copper versus copper-nickel.

constant current power supply A regulated power supply which acts to keep its output current constant in spite of changes in load, line, or temperature.

constant-delay (filter) See Bessel.

constant failure rate period That possible period in the life of a non-repaired item during which the failure rate is approximately constant.

constant-head meter A flow measurement device that maintains a constant pressure differential by varying the cross section of a flowpath through the meter.

constant instruction An instruction not intended to be executed as an instruction, written in the form of a constant. Related to dummy instruction.

constant level tank A tank, the level of liquid in which is controlled for example by a weir, the length of which shall be as long as possible to ensure stable flow conditions in the circuit being supplied with liquid.

constant multiplier A computing element that multiplies a variable by a constant factor.

constant of a measuring instrument The factor or coefficient by which the indication must be multiplied to obtain the value of the measured quantity.

constant power motor (constant horsepower motor) A multispeed motor that develops the same related power output at all operating speeds. The torque then is inversely proportional to the speed.

constant-rate injection method 1. A method of measuring the discharge in which a tracer of known concentration is injected at a constant and known rate at one cross-section and its dilution is measured at another section downstream where complete mixing has taken place. Pertains to liquid flow measurement in open channels. Measurement of flow by dilution methods. **2.** A method of measuring the flow-rate in which a tracer of known concentration is injected at a constant and known flowrate at one cross-section and its dilution is measured at another cross-section downstream where adequate mixing has taken place. Pertains to measurement of fluid flow in closed conduits.

constant rate injection method A method of measuring the flow-rate in which a tracer of known concentration is injected at a constant and known flowrate at one cross-section and its dilution is measured at another cross-section downstream where adequate mixing has taken place. Pertains to measurement of fluid flow in closed conduits.

constant storage A part of storage designated to store the invariable quantities required for processing.

constant torque motor Multispeed motor that is capable of developing the same torque for all design speeds. The rated power output varies directly with the speed.

constant – voltage charge (storage battery) A charge in which the voltage at the terminals of the battery is held at a constant value.

constant – volume gasthermometer A device for detecting and indicating temperature based on Charles' Law – the pressure of a confined gas varies directly with absolute temperature; in practical instruments, a bulb immersed in the thermal medium is connected to a Bourdon tube by means of a capillary; changes in temperature are indicated directly by movement of the Bourdon tube due to changes in bulb pressure.

constant voltage power supply A regulated power supply which acts to keep its output voltage constant in spite of changes in load, line, or temperature. Thus, for a change in load resistance, the output current changes by whatever amount necessary to accomplish this.

constraint rule A rule that limits a search by a designated portion of the problem space. Note: Constraint rules may be effective control mechanisms in expert systems and rule-based systems.

constructional hardware Mechanical structures, or group of structures, for mounting measurement, control and monitoring equipments. For example, racks, panels, cabinets, shelves, etc.

consultation (in artificial intelligence) The online interaction between a knowledge-based system and a user seeking assistance, usually consisting of a question-answer dialog.

contact One of the current-carrying parts of a relay, switch, or connector that are engaged or disengaged to open or close the associated electrical circuits.

contact-actuation time The time required for any specified contact on the relay to function. When not otherwise specified, it is the initial actuation time. For some purposes, it is preferable to use either the final or effective actuation time.

contact alignment A term which refers to electrical contacts and the sidewise movement or play in mating contact pins or other devices for plugs or other contact insertions or surfaces.

contact arc The electrical (current) discharge that occurs between mating contacts when the circuit is being disestablished.

contact area The common surfaces between conductors or connectors of electricity flow.

contact arrangement 1. The combination of contact forms that make up the entire relay-switching structure. **2.** See contact configuration.

contact bifurcated Contacts used in printed circuits with slotted flat springs which increase flexibility of the spring and provide extra points of contact.

contact bounce An unwanted making and breaking of the connection while opening or closing a contact.

contact bounce time The time interval from initial actuation of a relay contact to the end of bounce brought about during pickup or dropout or from external causes.

contact chatter 1. The undesired vibration of mating contacts during which there may or may not be actual physical contact opening. If there is no actual opening but only a change in resistance, and it appears as "grass" on the screen of an oscilloscope having adequate sensitivity and resolution. **2.** A sustained rapid physical opening and closing of contact points caused by mechanical vibrations.

contact configuration A standard or designed arrangement of various contacts general multiple-contact connectors, i.e., including the spacing, number, orientation location of the contacts in the connector.

contact current-carrying rating of a relay The current that can be carried continuously or for stated periodic intervals without impairment of the contact structure or interrupting capability.

contact discharge method A method of testing, in which the electrode of the test generator is held in contact with the EUT (equipment under test), and the discharge actuated by the discharge switch within the generator. Pertains to electrostatic discharge test methods.

contact emf A small voltage established whenever two conductors of different materials are brought into contact.

contact force The amount of force exerted by one of a pair of closed contacts on the other.

contact gap Also called contact separation. The distance between a pair of mating relay contacts when they are open.

contact interrogation signal A signal whose value indicates whether a contact is open or closed.

contact pressure The amount of pressure holding a set of contacts together.

contact rating The electrical power-handling capability of relay or switch contacts under specified environmental conditions and for a prescribed number of operations.

contact resistance Total electrical resistance of a contact system, such as the resistance of a relay or a switch measured at the terminals. Usually this resistance is only a fraction of an ohm.

contact retention The minimum axial load a contact in a connector can withstand in either direction while remaining firmly fixed in its normal position in the insert.

contact sense module A device which monitors and converts program-specified groups of field-switch contacts into digital codes for input to the computer.

contact separation See contact gap.

contact stabilization (water quality) A modification of the activated sludge process whereby previously aerated activated sludge is brought into contact with raw sewage for a short period of time (for example 15 to 30 min.). The sludge, after contact, is settled out and returned to a separate tank where it is aerated for a longer period of time (for example 6 to 8 h.).

contact symbology diagram Commonly referred to as a ladder diagram, it expresses the user-programmed logic of the controller in relay-equivalent symbology.

contact thermography A method of measuring surface temperature in which the surface of an object is covered with a thin layer of luminescent material and then viewed under ultraviolet light in a darkened room; the brightness viewed indicates surface temperature.

contact-type membrane switch A disk-shaped momentary-contact switch of multilayer construction; the active element consists of two conductive buttons separated by an insulating washer; finger pressure on one face of the disk brings the buttons into contact, completing the electrical circuit; when the pressure is released, the contacts separate, breaking the electrical circuit.

contact wetting The coating of a contact surface with an adherent film of mercury.

contamination 1. Introduction or presence of contaminants or undesirable modifications to the composition of the liquid or gaseous medium. **2.** Destruction or impairment of the purity of the environment by man or nature with undesirable effects. For example, automobile gases, volcanic ash etc.

contamination classes Having arbitrarily defined the grades, a certain number of classes can be established and a numerical grid fixed for each class and for each grade a numerical limit of particles not to be surpassed by a unit of volume. Having established the numerical distribution of contamination, it is said that a sample of fluid is contained in a class if for any grade, the number of particles does not surpass the maximum number given for the limit.

content-addressable memory Memory in which information is retrieved by specifying the data rather than the address at which the data are stored.

content addressed storage See associative storage.

contention A condition arising when two or more data stations attempt to transmit at the same time over a shared channel, or when two data stations attempt to transmit at the same time in two-way alternate communication.

contention system A system in which one or more terminals and the computer compete for use of the line.

contents The information stored in any part of the computer memory.

context Words and phrases among which a word is used.

contiguous allocation An allocation method that assigns adjacent sectors to a file.

contiguous alphabet An alphabet (A through Z) assigned, by code, to a continuous binary sequence.

contiguous file A file consisting of physically adjacent blocks on a mass-storage device.

contingency procedure A procedure that is an alternative to the normal path of a process if an unusual but anticipated situation occurs. Note: A contingency procedure may be triggered by events such as an overflow or an operator intervention.

continuity check A check made to a circuit in a connection to verify that an acceptable path of transmission of data or speech exists.

continuous action Type of action in which a continuous variation between two limits can be imposed on the output variable. Notes: **1.** Sometimes this type of action is improperly called "modulating action" when one wants to stress the fact that the action is not a step action. **2.** An action where the variation between the limits is in such a large number of small steps that each step for practical reasons can be disregarded can also be considered as a continuous.

continuous adaptive controllers Adaptive controllers with a means of automatically calculating and adjusting controller coefficients either on a continuous or semi-continuous basis.

continuous annealing Full annealing (of strip or wire) whereby the material is drawn through a furnace for its entire length.

continuous billet mill (in steel production) A type of rolling mill consisting of a series of roll stands, arranged one after the other so that the piece to be rolled enters the first stand and travels through the mill, taking but one pass in each stand of rolls and emerging from the last set as a finished product.

continuous blowdown The uninterrupted removal of concentrated boiler water from a boiler to control total solids concentration in the remaining water.

continuous carrier A carrier over which transmission of information is accomplished by means that do not interrupt the carrier.

continuous casting process (in steel production) Essentially a casting machine for the continuous casting consists of: a liquid metal reservoir and distribution system (a tundish); a watercooled mold; secondary cooling zones in association with a containment section; bending rolls; a straightener; cutting equipment; and a runout table to cooling beds or directly to a product transfer area. Castings machines can be classified into four main groups depending on the section shape produced: billet, bloom, round and slab.

continuous control Type of control in which the reference variable and controlled variable are taken continuously in time to generate the manipulated variable by continuous action.

continuous cooking Cooking of fiber material which is continuously passed through the digester as the raw material is fed in and the cooked pulp is removed. Impregnation, washing etc. can also be carried out continuously in connection with continuous cooking.

continuous cooling transformation cure See CCT curve.

continuous current rating The designated rms alternating or direct current which a device can carry continuously under specified conditions.

continuous diffuser, continuous diffuser washer A cylindrical vessel in which fiber suspension moves vertically upwards between concentric, perforated, cylindrical, vertical suction surfaces at the same time as liquid is introduced through jets rotating in the space between the suction surfaces. When used for washing out black liquor from sulphate pulp, the continuous diffuser washer is known as a continuous diffuser.

continuous digester See continuous cooking.

continuous duty rating The rating applied to equipment if operated for an indefinite length of time.

continuous dying The application of dye to fabrics or tow in a continuous operation. Fabrics are usually dyed in an open-width form by passing through a pad-

der or in the case of carpets under a doctor blade which sluices dye from an applicator roll (Kusters).

continuous electrode A furnace electrode that receives successive additions in lengths at the end remote from the active zone of the furnace to compensate for the length consumed therein.

continuous floating action Floating action in which the rate of change of the output variable may have any value between two given limits.

continuous furnace A type of reheating furnace where the charge is loaded at one end, moves through the furnace to accomplish the intended treatment, and is discharged at the other end.

continuous gas analyzer Instrument measuring gas composition on a continuous basis. The output signal represents either one component concentration or a function of several concentrations (example: $\text{CO}+\text{CO}_2$).

continuous hot-dip galvanizing process The four most widely used designs of continuous hot-dip continuous lines are: **1.** Anneal with flame cleaning. **2.** Anneal with liquid cleaning. **3.** No anneal with liquid cleaning and flux. **4.** Anneal with no liquid cleaning and no flux. Although different steel producers may use variations of these processes, each process involves five basic steps. **1.** Cleaning, to prepare the surface for coating. **2.** Annealing to soften the steel for good formability. **3.** Coating with zinc, to make the steel resist corrosion. **4.** Chemical treating, to protect the coating from storage stains. **5.** Working, to insure uniform forming. Compare single-sheet galvanizing.

continuous line recorder A recording instrument in which the record is a continuous line.

continuous mixer A type of mixer in which starting ingredients are fed continuously and the final mixture is withdrawn continuously, without stopping or interrupting the mixing process.

continuous noise (electromagnetic compatibility) Noise, the effect of which is not resolvable into a succession of discrete impulses.

continuous operation A process that operates on the basis of continuous flow, as opposed to batch, intermittent or sequenced operations.

continuous optimization program, COP A continuous program using linear programming techniques.

continuous patenting See patenting.

continuous path operation The controlling of the motion of a machine tool in space, as a function of time, such that the machine travels through the designated path at the specified rate. (This generally requires the ability to simultaneously move more than one machine axis at coordinated rates).

continuous pickling line (in strip mills) The primary function of a continuous pickling line, as of other pickling processes, is the removal of oxide from the steel surface.

continuous pulse (thyristor) A gate signal applied during the desired conducting interval, or parts thereof, as a dc signal.

continuous rating (electrical transducers) The rating applicable to specified operation for a specified uninterrupted length of time.

continuous recorder See continuous line recorder.

continuous sampling (water quality) A process whereby a sample is taken continuously from a body of water.

continuous strand-type furnace (heat-treating furnaces) Continuous strand-type furnaces have been developed to reduce the extra handling and the long heating and cooling periods required in anneal-

ing sheet and tin plate in coil form. A special advantage of this furnace type is that other operations, such as cleaning, coating, temper-rolling and levelling may be combined with the heat-treating process to avoid duplicated handling equipment for separate lines. For this reason the modern continuous strand annealing lines for sheet are often called continuous annealing and processing lines.

continuous test (battery) A service test in which the battery is subjected to an uninterrupted discharge until the cutoff voltage is reached.

continuous update supervisory system A system in which the remote station continuously updates indication and telemetering to the master station regardless of action taken by the master station. The remote station may interrupt the continuous data updating to perform a control operation.

continuous variable In contrast to discrete variables, a variable is continuous if it can assume all values of a continuous scale. Such quantities as length, time, and temperature are measured on continuous scales and their measurements may be referred to as a continuous variable.

continuous waves, CW Electromagnetic waves, the successive oscillations of which are identical under steady-state conditions, which can be interrupted or modulated to convey information.

continuous weld A welded joint where the fusion zone is continuous along the entire length of the joint.

contour analysis In optical character recognition (OCR), a reading technique that employs a moving spot of light which searches out the character outline by bouncing around its outer edges.

contouring control system Numerical control in which: **a.** two or more numerically controlled motions operate in accordance with instructions that specify the next required position and the required feedrates to that position; **b.** these feedrates are varied in relation to each other so that a desired contour is generated.

contouring numerical control See continuous-path operation.

contract A legally binding document agreed upon by the customer and supplier.

contraction The narrowing of the stream of liquid passing through a notch of a weir.

contractual obligations Conditions/agreements/contacts with customers, and/or suppliers. By definition these are written and must be honored. Examples are blanket orders, terms and conditions for purchase orders or service requests, etc.

contrahelical In the wire and cable industry, the term is used to mean the direction of a layer with respect to the previous layer.

CONTRAN A computer-programming language in which instructions are written at a compiler level, thereby eliminating the need for translation by a compiling routine.

contrast 1. The range of light and dark values in a picture, or the ratio between the maximum and minimum brightness values. **2.** Pertaining to photoelectric proximity switches, the difference of the luminous power density factors of two target surfaces at the scanning rate. Note: The contrast of proximity switches is different from the contrast in the fields of photometry or radiometry.

contrast control A control, associated with a picture-display device, for adjusting the contrast ratio of the reproduced picture. Note: The contrast control is normally an amplitude control for the picture signal.

control 1. Purposeful action on or in a system, to meet specified objectives. Note: Control may include monitoring and safeguarding besides the control action itself. **2.** The part of a digital computer or processor which determines the execution and interpretation of instructions in proper sequence. **3.** In programming, instructions which determine conditional jumps are often referred to as control instructions, and the time sequence of execution of instructions is called the flow of control.

control action Type of action of a controller or a controlling system.

control action Of a controller or of a controlling system, the nature of the change of the output effected by the input. Note: The output may be a signal or a value of a manipulated variable. The input may be the control loop feedback signal when the set point is constant, an actuating error signal or the output of another controller.

control agent 1. The energy or material comprising the process element which is controlled by manipulating one or more of its attributes – the attributes(s) commonly termed the controlled variable(s). **2.** The medium in which the manipulated variable exists. In a steam heating system, the control agent is the steam and the manipulated variable is the flow of the steam.

control algorithm A mathematical representation of the control action to be performed.

control amplifier See preamplifier.

control area A storage area used by a computer program to hold control information.

control ball, track ball, tracker ball (computer graphics) See tracker ball.

control blocks Blocks placed downstream of the glaxis, designed to dissipate surplus energy. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978.

control board A mechanical structure bearing on its front instrument panels and/or control panels accessible to a standing operator.

control bus The data highway used for carrying control signals.

control cable A multiconductor cable made for operation in control or signal circuits, usually flexible, relatively small in size, and with relatively small current ratings.

control calculations Installation-dependent calculations that determine output signals from the computer to operate the process plant. These may or may not use generalized equation forms such as PID forms.

control card A card which contains input data or parameters for a specific application of a general routine.

control center An equipment structure, or group of structures, from which a process is measured, controlled and/or monitored.

control chain Set of interrelated elements or systems which act upon one another in a series structure.

control channel (fluid power systems) Channel through which the control or input signal enters the device.

control character A character whose occurrence in a particular context specifies a control function. Control characters are described in ISO 646 and 6629.

control characteristic (of a controlled system) For an automatic control system with fixed set-point, the data (formula or graph) showing the relationship, in steady-state, between the controlled variable and an input variable.

control circuit 1. A circuit in a control apparatus which carries the electrical signal used to determine

the magnitude or duration of control action; it does not carry the main power used to energize instrumentation, controllers, motors or other control devices. **2.** In a digital computer, the circuits which carry out the instruction in proper sequence, interpret each instruction, and apply the proper commands to the arithmetic element and other circuits in accordance with the interpretation.

control computer A process computer which directly controls all or part of the elements in the process. See process computer.

control console (fluid power systems) Frame containing control buttons, switches, levers, etc. and necessary instrumentation, usually in the form of a desk with a vertical rear panel for gages.

control counter In a computer, a device which records the storage location of the instruction word to be operated on following the instruction word in current use.

control current (Hall-effect devices) The current through the Hall plate that by its interaction with a magnetic flux density generates the Hall voltage.

control data (software) Data that selects an operating mode or submode in a program, directs the sequential flow, or otherwise directly influences the operation of software.

control designation symbol A symbol that identifies the particular manner, permissible or required, in which an input variable (possibly in combination with other variables) causes the logic element to perform according to its defined function.

control desk Desk-like console or group of panels from which operators or service personnel actually control the computing system or communicate with it.

control device An individual device used to execute a control function.

control element See final controlling element.

control flow An abstraction of all possible paths the execution sequence may take through a program. Note: The control flow can be represented by a control flow graph.

control flow (fluid power systems) Flow through the valve control ports.

control form See control mode.

control function See control operation.

control hierarchy 1. Schematic presentation of the relationships between different levels of control (automation) ordered in accordance with increasing degree of controlling system complexity. **2.** A structured representation of the relationships between different control levels.

control input/output (I/O) module Provide control signals, parity checks, time interface, and data transmissions for I/O devices.

control instruction A computer instruction that directs the sequence of operations.

control instruction register See instruction address register.

controllability The property of a system to change – by means of the input variables – its state variables from any given initial state to any given final state in a finite time.

controllable A property of a component of a state whereby, given an initial value of the component at a given time, there exists a control input that can change this value to any other value at a later time.

control language 1. See command language. **2.** A high-level programming language that is used with Honeywell TDC 3000 control systems. The control language is a powerful, easy-to-use language that is

designed specifically for controlling discontinuous and sequential processes.

control law A function of the state of a plant and possibly of time, generated by a controller to be applied as the control input to a plant.

control level The entirety of all control units of the same rank within a control hierarchy

controlled atmosphere Gas mixtures whose composition and other properties are controlled within pre-determined limits. Heat treatment in a controlled atmosphere is intended to induce or prevent reactions between the material and the constituents of the atmosphere. When the atmosphere is controlled only to prevent reactions, it can be termed a protective atmosphere.

controlled condition The physical quantity or condition of the controlled body, process or machine which it is the purpose of the system to control.

controlled cooling Cooling in accordance with a predetermined schedule.

controlled medium 1. The process fluid or other substance containing the controlled variable. **2.** The medium in which the controlled variable exists. In a space temperature control system, the controlled variable is the space temperature and the controlled medium is the air within the space.

controlled rectifier 1. A rectifier employing grid-controlled devices such as thyratrons or ignitrons to regulate its own output current. **2.** Also called an SCR (silicon controlled rectifier). A four-layer pnpn semiconductor which functions like a grid-controlled thyatron.

controlled system System on which control is exerted.

controlled variable Output variable of the controlled system.

controller 1. A device which operates automatically to affect a controlled variable by comparing the value of the controlled variable with the value of a reference variable in order to reduce the difference between them. Note: There are many self describing modifiers to use with controllers such as flow, temperature, pressure, level, pH. **2.** A functional unit, consisting of comparing element and controlling element, to perform a specified control function. In the process industries the word controller always means automatic controller. **3.** An assembly that converts instructions, usually in command form into an ordered arrangement of pulses or voltage levels so as to output information to, or to retrieve information from, the controlled device (e.g. printer, reader, etc.). See also Basic Controller. Refers to Honeywell TDC 3000 control systems. **4.** A device for interfacing a peripheral unit or subsystem to a computer, for example a tape controller or a disc controller. **5.** In fluid power system, a device which senses a change of fluid state and automatically makes adjustments to maintain the state of the fluid between predetermined limits, for example pressures/temperatures, etc.

control level The entirety of all control units of the same rank within a control hierarchy.

control limit An automatic safety control responsive to changes in liquid level, pressure or temperature or position for limiting the operation of the controlled equipment.

controlling equipment See controlling system.

controlling extensions A controller which derives its input from the motion of the float can be installed within the extension housing.

controlling means The components of an automatic controller that are directly involved in producing an output control signal or other controlling action.

controlling system, controlling equipment System comprising all the elements which control the controlled system. Note: In feedback control, this also includes any elements in the feedback path.

control link Apparatus for effecting remote control between a control point and remotely controlled station.

control locus A curve which shows the critical value of grid bias for a thyatron.

control logic The sequence of steps or events necessary to perform a particular function. Each step or event is defined to be either a single arithmetic or a single Boolean expression.

control loop Assembly of elements incorporated in the closed action flow of a closed loop control.

control mode 1. Pertaining to data communication, the state that all terminals on a line must be to allow line discipline, line control, or terminal selection to occur. **2.** A specific type of control action such as proportional, integral or derivative.

control operation An action performed by a single device, such as the starting or stopping of a particular process. Conventionally, carriage return, fault change, rewind, end of transmission etc., are control operations, whereas the actual reading and transmission of data are not.

control output module A device which stores commands from the computer and translates them into signals which can be used for control purposes. It can generate digital outputs to control on-off devices or to pulse setpoint stations, or it can generate analog output (voltage or current) to operate valves and other process control devices.

control panel 1. A part of a computer console that contains manual controls. **2.** See plugboard. **3.** See console and automatic control panel. **4.** An assembly of man/machine interface.

control part (fluid power systems) See pilot port.

control pen, light pen A pen-like device with a light on the tip used to communicate with a computer by "writing" on a CRT display.

control point The setpoint or other reference value that an automatic controller acts to maintain as the measured value of a process variable under a given set of conditions.

control positioning accuracy, precision, reproducibility (numerical control) Accuracy, precision or reproducibility of position sensor or transducer and interpreting system and including the machine positioning servo. Note: May be the same as machine positioning accuracy, precision, or reproducibility in some systems.

control precision The degree to which a given value of a controlled variable can be reproduced for several independent control initiations using the same control point and the same system operating conditions.

control pressure (fluid power systems) Pressure existing at either control port, which is normally variable between supply pressure and return pressure.

control pressure range (fluid power systems) Range between highest and lowest permissible control pressure.

control procedure (data communications) The means used to control the orderly communication of information between stations on a data link.

control program 1. Specific programs which control an industrial process. **2.** A computer program designed to schedule and to supervise the execution of pro-

grams in a computer system. **3.** The inherent set of control instructions which defines the capabilities, actions, and responses of a robot system. This type of program is fixed and usually not modified by the user.

control programming Writing a user program for a computer which will control a process in the sense of reacting to random disturbances in time to prevent impairment of yield, or dangerous conditions.

control range Range defined by the two extrem values within which the controlled variable can assume any value under specified operating conditions.

control read-only memory, CROM A major component in the control block of some microprocessors. It is a ROM which has been microprogrammed to decode control logic.

control recipe (batch processes) A master recipe which has been sized and made equipment specific; equipment choices may be made by dynamic scheduling.

control rectifier A silicon rectifier capable of switching or regulating the flow of a relatively large amount of power through the use of a very small electrical signal.

control register A register which stores the instruction currently governing the operation of the computer. Same as program register. Also called instruction register.

control relay An auxiliary relay whose function is to initiate or permit the next desired operation in a control sequence.

control rod A long piece of neutron-absorbing material that fulfills one or both of the functions of controlling the number of neutrons available to trigger nuclear fission or of absorbing sufficient neutrons to stop fission in case of an emergency.

control room area A location with heat and/or cooling facilities. Conditions are maintained within specified limits. Provisions for automatically maintaining constant temperature and humidity may or may not be provided.

control section See control unit.

control section of a weir or flume The section which induces critical flow. Pertains to liquid flow measurement in open channels.

control sequence The normal order of selection of instructions for execution.

control signal The actuating signal in automatic control systems.

control signal override device A device which overrides the effect of the control signal to the valve actuator to cause the closure member to remain stationary or assume a pre-selected position.

control statement A programming language statement that affects the order in which operations are performed.

control station In basic mode link control the data station that nominates the master station and supervises polling, selecting, interrogating, and recovery procedures.

control step (batch control) It is the lowest level term within a phase that describes an event or action which is of interest to the operator. It involves one or more control instructions.

control storage Monolithic storage, used primarily for microprograms.

control structure (software) A construct that determines the flow of control through a computer program. See also conditional control structure.

control switch (power switchgear) A manually operated switching device for controlling power-operated devices.

control switchboard (power switchgear) A type of switchboard including control, instrumentation, metering, protective (relays) or regulating equipment for remotely controlling other equipment. Control switchboards do not include the primary power circuit-switching devices or their connections.

control switching Type of control with several controllers acting on one final controlling element in which the switching from one control loop to another is determined by external conditions and secured to be performed bumpless.

control system (automatic control) **1.** A system in which deliberate guidance or manipulation of one or more variables is used to achieve a prescribed state. Note: It is subdivided into a controlling system and a controlled system. **2.** System constituted by a controlled system and its controlling system.

control system (numerical control) An arrangement of elements interconnected and interacting so as to maintain some condition of a machine or so as to modify it in a prescribed manner.

control systems (fluid power systems) Means whereby the fluid power system is controlled, linking that system to the operator and to control signal sources, if any.

control transfer instruction See jump instruction.

control transformers Step-down transformers generally used in circuits which are characterized by low power levels and which contribute to a control function, such as in heating and air conditioning, printing, and general industrial controls.

control unit A functional unit of a computer which interpretes and executes the instructions of a program in a prescribed sequence.

control utility console A computer console that is primarily used to control utility and maintenance programs.

control valve **1.** A power operated device which changes the fluid flow rate in a process control system. It consists of a valve connected to an actuator that is capable of changing the position of a closure member in the valve in response to a signal from the controlling system.

control valve actuators There is a wide variety of valve types used in control system. Each valve type (i.e. globe valve, butterfly valve, or ball valve) imposes varying problems with respect to actuation. The general types of actuators currently in widest use in the operation of control valves are: **1.** Pneumatically operated, diaphragm actuators; **2.** Piston (Cylinder) actuators; **3.** Electro-hydraulic actuators; **4.** High-performance servo actuator; **5.** Electromechanical actuators; and **6.** Manual handwheel actuators. In actual practice today, probable more than 90% of all control valve actuators in use are the pneumatically operated piston or diaphragm type.

control valve data sheet See IEC publication 534-7, and ISA specification form S20.50 Control Valves.

control valve gain The change in the flow rate as a function of the change in valve travel. It is the slope of the installed or of the inherent valve flow characteristic curve and must be designated as installed or inherent.

control valve leakage See under seat leakage and seat leakage test.

control valve material selection The selection of materials for the pressure containment parts for control valves are primarily dependent upon the following conditions of the fluid media: pressure, temperature, corrosion and erosion properties. Sometimes a compromise must be made in material selection. Pres-

sure and temperature ratings and recommended materials for specified physical and chemical requirements are given in standards for the more common materials. These standards are established by organisations like ANSI, ASTM, ASME (USA), BSI (UK), DIN (West Germany), JIS (Japan). It is considered good practice especially for the pressure containment part to specify materials by the applicable part to specify materials by the applicable and proper designation for example ASTM A 216 Grade WCB, DIN 17245 GS C25 etc.

control valve noise See under noise.

control valve port See under port (for valves).

control valve seat See valve seats.

control valve seat leakage See IEC publication 534-4, Amendment No 1.

control volume (fluid power systems) Volume of the input chamber, including the pilot line.

control winding In a saturable reactor, the winding used for applying a controlling magnetomotive pre-magnetization force to the saturable – core material.

control with fixed set-point Feedback control by which the controlled variable is made to remain substantially constant.

Contronic E The distributed and integrated system from Hartmann & Braun AG for control supervision for energy plants. In addition to CRT-based operator stations, the system also offers individual control directly from push-button sets in the operator desk. The hard- and software of Contronic E is especially adjusted to the demands and needs for the power station plants.

Contronic P The distributed and integrated system from Hartmann & Braun AG for control and supervision for process plants. The system is developed to meet the demands from the process industry regarding continuous processes as well as batching processes.

convection 1. The motion in a fluid as a result of differences in density and the action of gravity. **2.** The transfer of heat from a high-temperature region in a gas or a liquid as a result of movement of masses of the fluid.

convection cooling A method of heat transfer which depends on the natural upward movement of the air warmed by the heat dissipated from the device being cooled.

conventional true value (of a quantity) A value approximating to the true value of a quantity such that, for the purpose for which that value is used, the difference between the two values can be neglected.

conventions Standard and accepted procedures in program and systems analysis. The abbreviations, symbols and their meanings developed for particular systems and programs.

convergence 1. Intersection of beams in a multi-beam electron tube, such as color TV tube. **2.** In optics, the bending of light rays toward each other, as by a convex or positive lens.

convergence control A variable resistor in the high-voltage section of a color-television receiver. It controls the voltage applied to the three-gun picture tube.

converging reach A reach in which the cross-section gradually decreases in the direction of flow. Pertains to measurement of liquid flow in open channels.

conversational Pertaining to an interactive system that provides for interaction between a user and a system similar to a human dialog.

conversational language A language which facilitates communication between the computer and the user. Example: BASIC.

conversational mode A mode of operation of a computer system in which a sequence of alternating entries and responses between a user and the system takes place in a manner similar to a dialogue between two persons. Synonymous with interactive mode. Time sharing deprecated in this sense.

conversational system See interactive system.

conversion 1. Modification of existing software to enable it to operate with similar functional capability in a different environment; for example, converting a program from FORTRAN to Ada, converting a program that runs on one computer to run on another computer.

conversion (to engineering units) Scaling signals from their raw input to the form used internally, usually into floating point engineering units.

conversion loss The ratio of available input power to available output power under specified test conditions.

conversion rate The number of conversions of a value of an analog quantity into its digital representation or vice versa obtained per unit of time.

conversion time 1. The length of time required by a computer to read out all the digits in a given coded word. **2.** The time required for a complete conversion or measurement by an analog-to-digital converter, starting from a reset condition. **3.** Time required for an A/D converter to digitize on input signal.

conversion transducer Any transducer whose output-signal frequency is different from its input-signal frequency.

convert To change the representation of data from one form to another; without changing the information conveyed.

converter 1. A device which changes the representation of information. Note: There are five types of converters: analog – digital – converter, digital – analog – converter, code – converter, parallel – serial – converter, serial – parallel – converter. **2.** A type of refining furnace where impurities are oxidized and removed by blowing air or oxygen through the molten metal.

convex programming In operations research, a particular case of nonlinear programming in which the function to be maximized or minimized and the constraints are appropriately convex or concave functions of the controllable variables.

conveyance The carrying capacity of a channel expressed in terms of the discharge and the bed slope. See further British Standard 3680: Part 1:1983.

conveyor-type furnace A type of continuous heat-treating furnace constructed similarly to roller-hearth furnaces except that belt conveyors are used to carry the material through the furnace.

convolution integral A mathematical integral operation which is used to describe the time response of a linear element to an input function in terms of the weighting function of the element.

cooking Pertaining to pulp and paper manufacturing, treatment of fiber raw material with heat at a minimum temperature of 100°C and with water, normally with the addition of chemicals.

cooler (heat exchanger) A device used to transfer heat between two fluids without direct contact between them.

Coolidge tube An X-ray tube in which the electrons are produced by a hot cathode.

cooling Pertaining to heat treatment, departure of heat accompanied by a reduction in temperature; compare quenching. When necessary, a distinction can be made between free departure of heat into the air, un-

controlled cooling, and restrained departure as in an oven, slow cooling.

cooling fan (fluid power systems) Device which mechanically creates a flow of air over a hot surface, usually used with a radiator in order to increase the rate of heat exchange.

cooling rate Pertaining to heat treatment, quotient of temperature reduction and time in cooling; See critical cooling rate.

cooling tower A large louvered structure (usually made of wood) over which water flows to cool and aerate it. Although most cooling towers are square or rectangular in shape, some are cylindrical, open at the bottom and top, which produces strong air currents through the center of the structure for more rapid cooling.

cooling water Water which is used to absorb and remove heat.

coordinate digitizer A device that transcribes graphic information in terms of a coordinate system for subsequent processing.

coordinate dimension word (numerical control) A word defining an absolute dimension.

coordinate geometry A language useful for solving coordinate geometry problems in civil engineering.

copper-clad steel Steel with a coating of copper welded to it, as distinguished from copper-plated or copper-sheathed material.

copper corrosion (fluid power systems) Indicated by the change of appearance of an electrolytic copper plate immersed in the fluid under stated conditions.

copper versus copper-nickel Material identification for thermocouple type T. Normally suitable for relatively low temperature measurement, especially sub-zero temperatures. See ISA publication ANSI-M 96.1-1982.

coprocessor A device added to a CPU that performs special functions more efficiently than the CPU alone.

copy To read data from a source data medium, leaving the source data unchanged, and to write the same data on a destination data medium that may differ from that of the source. Example: To copy a file from a magnetic tape onto a magnetic disk.

Corbino effect A special case of the Hall effect that occurs when a disc carrying a radial current is placed perpendicularly into a magnetic field.

cord One or a group of flexible insulated conductors covered by a flexible insulation and equipped with terminals.

core (optical communication) The central region of an optical fiber through which most of the optical power is transmitted.

core array A rectangular grid of cores containing a given number of words each of a given number of bits making up the rectangular array.

core iron A grade of soft steel suitable for making cores used in electromagnetic devices.

core loss Also called iron loss. Loss of energy in a magnetic core as the result of eddy currents, which circulate through the core and dissipate energy in the form of heat.

core memory A storage device in which binary data is represented by the direction of magnetization in each unit of an array of magnetic material, usually in the shape of toroidal rings, but also forms such as wraps on bobbins.

core plane A horizontal network of magnetic cores that contains a core common to each storage position.

core resident A term pertaining to programs or data permanently stored in core memory for fast access.

core storage Same as core memory. See core memory.

core-type induction heater A device in which an object is heated by induction.

core wrap Insulation placed over a core before the addition of windings.

Coriolis-type mass flowmeter An instrument for measuring mass flowrate by determining the torque from radial acceleration of the fluid.

Corliss valve A type of valve used to admit steam to, or exhaust it from, a reciprocating engine cylinder.

corner (pressure) tapplings Wall pressure tapplings drilled on either side of an orifice plate or nozzle with the spacing between the axes of the pressure tapplings and the respective faces of the plate or nozzle equal to half the diameter of the tapplings themselves, so that the tapping holes break through the conduit wall flush with the faces of the plate or nozzle. Pertains to measurement of fluid flow in closed conduits. See figure in ISO publication 4006-1977 or BS 5875:1980.

corner frequency In the asymptotic form of Bode diagram, that frequency indicated by the junction of two confluent straight lines asymptotic to the logarithmic gain curve.

corona discharge A phenomena that occurs when an electric field is sufficiently strong to ionize the gas between electrodes and cause conduction.

coroutines Two or more modules that can call each other, but that are not in a superior to subordinate relationship.

corpus A body or mass of data, most often in unrecorded form and as selected for study or analysis.

corrected result The result of a measurement obtained after having made corrections to the uncorrected result in order to take account of assumed systematic errors.

correcting element The final control element in a process control system.

correcting range, manipulated range Interval defined by the two extreme values that the manipulated variable can assume.

correction The value which must be added algebraically to the uncorrected result of a measurement to obtain the corrected result. This value is minus the known part of the systematic error. Note: The uncorrected result of a measurement is often referred to as "indicated value" and the corrected result as "measured value". The use of both terms is not recommended.

correction factor The numerical factor by which the uncorrected result of a measurement is multiplied to compensate for an assumed systematic error. Note: Since the systematic error cannot be known exactly, the correction factor is subject to uncertainty.

correction for oblique flow The correction to be made to an observed velocity when the direction of flow at the place of measurement is not at right angles to the measuring section. Pertains to liquid flow measurement in open channels.

correction program See correction routine.

correction routine A routine used in or after a computer failure, malfunction, or program or operator error. It reconstitutes the routine executed before the error occurred and from the closest rerun point.

correction time See settling time.

corrective action The change produced in a controlled variable in response to a control signal.

corrective maintenance The maintenance carried out after fault recognition and intended to restore on item to a state in which it can perform a required func-

tion. Synonymous with emergency maintenance. Contrast with preventive maintenance.

corrective maintenance time That part of the maintenance time, during which corrective maintenance is performed on an item, including technical delays and logistic delays inherent in corrective maintenance.

corrective network Also called shaping network. An electric network designed to be inserted into a circuit to improve its transmission or impedance properties, or both.

correctness (software) 1. The extent to which software is free from design defects and from coding defects, that is, fault free. 2. The extent to which software meets its specified requirements. 3. The extent to which software meets user expectations.

correed A glass-enclosed miniature reed switch.

correlation 1. The relationship, expressed as a number between minus one and plus one, between two sets of data, etc. 2. A relationship between two variables; the strength of the linear relationship is indicated by the coefficient of correlation. 3. A measure of the similarity of two signals.

correlator A logic device which compares a series of bits in a data stream with a known bit sequence and puts out a signal when correlation is achieved.

Corrodekote test An accelerated corrosion test for electrodeposits in which a specimen is coated with a slurry of clay in a salt solution, and then is exposed for a specified time in a high-humidity environment.

corrosion The phenomena whereby living organisms, organic matter, inorganic solids, liquids or gases by themselves or as catalysts can cause or initiate gradual destruction of a material through chemical reaction.

corrosive and erosive influences IEC publication 654-4, Part 4 consider the corrosive and erosive influences which may affect the performance of industrial-process measurement and control equipment.

corrosive fluxes Fluxes consisting of inorganic acids and salts. Also called acid fluxes.

corrosivity (water quality) The ability of a water to attack various materials by means of chemical, physico-chemical or bio-chemical action.

COS Corporation for Open Systems. An organization of vendors formed in 1985 to coordinate member company efforts in the selection of standards and protocols, conformance testing, and the establishment of certification.

cosine emission law See Lambert's law.

COS/MOS See CMOS.

cost-effectiveness A designed measure of performance for distinct evaluations of systems, products, or endeavours.

couch 1. A pair of rolls on or after which the wet web leaves the fourdrinier wire part. 2. A roll on a cylinder-vat unit after which the wet web leaves the wire.

coulomb, C The quantity of electricity which passes any point in an electric circuit in one second when the current is maintained constant at one ampere. (A derived SI unit).

coulometric hygrometers These hygrometers are also called electrolytic hygrometers. They measure moisture in a gas by measuring the current (coulombs per unit time) needed to completely electrolyze the moisture.

counter Sequential circuit in which a number is stored and to which a constant integer number is added algebraically depending on a switching variable at the counter input.

counterbalance valve Pressure control valve which maintains back pressure to prevent load from falling.

counter-clockwise arc (numerical control) A circular path that is described by the reference point of a tool and rotates in a positive angular direction about the centre of the path.

countercurrent flow Flow of two fluids in opposite directions within the same device.

counterflow Flow of a single fluid in opposite directions in adjacent portions of the same device, such as a U-bend tube. Contrast with countercurrent flow.

coupled computers An installation in which computers are joined to carry out special applications, such as two computers operating in parallel and used as a check on one another, or when they are coupled or joined so that the off-line computer is programmed to watch the on-line computer and, if needed, switch operation to itself.

coupled control-element action A type of control system action in which two or more actuating signals or control element actions are used in concert to operate one control device.

coupled modes (optical communication) Modes whose energies are exchanged with each other.

coupler (field bus) Physical interface between trunk and spur or trunk and device.

coupling Interaction between circuits, transferring energy from one circuit to another.

coupling (software) A measure of the interdependence among modules in a computer program. Contrast with cohesion.

coupling loss (optical communication) The optical power loss suffered when light is coupled from one optical device to another.

Cr Abbreviation for chromium.

cracked residue The fuel residue obtained by cracking crude oils.

cracking The refining process of breaking down the larger, heavier, and more complex hydrocarbon molecules into simpler and lighter molecules. Cracking is accomplished by the application of heat and pressure and, in certain advanced techniques, by the use of a catalytic agent. Cracking is an effective process for increasing the yield of gasoline from crude oil.

cracking a valve To open a valve so slightly as to permit a small amount of fluid or gas to escape.

cracking pressure See start-to discharge pressure.

CRC See cycle redundancy check.

creep (electrical transducer) A change in output occurring over a specific time period while the measurand and all environmental conditions are held constant.

creepage distance The shortest path between two conductive parts, or between a conductive part and bounding conducting surface of the equipment, measured along the surface of the insulation.

creosote Creosote (from coal tar) constitutes a large part of the distillate from tar, and is a blend of different fractions. Practically all of it goes into the pressure impregnation of wood, such as piling, poles and railroad ties.

crest The line area defining the top of the weir. See figure in ISO publication 772-1978. Pertains to liquid flow measurement in open channels.

crevice corrosion, gap corrosion Crevice or gap corrosion occurs in narrow unventilated gaps. The reduced oxygen concentration in cracks, gaps and crevices etc. prevents the formation of a passivation protective coating. The best way to avoid this form of corrosion is to design so that there are no gaps or crevices.

crill Finely divided cellulosic material in the stock consisting mainly of loose fibrils liberated during the beating of chemical pulp.

critical cooling rate Pertaining to heat treatment, the lowest cooling rate at which undersidered transformation will not occur. For steel, the critical cooling rate refers especially to the lowest cooling rate at which transformation to neither pearlite nor bainite will occur.

critical damping The name given to that special case of damping that is the boundary between underdamping and overdamping.

critical differential pressure ratio (control valves) Pertaining to control valves, the maximum ratio of differential pressure to inlet absolute pressure that is effective in all valve sizing equations for compressible fluids. Choked flow (see definition of choked flow) occurs when this maximum ratio has been reached.

critical fault A fault which is assessed as likely to result in injury to persons, significant material damage or other unacceptable consequences.

critical flow 1. The flow in which the total energy head is a minimum for a given discharge; under this condition the Froude number will be equal to unity and surface disturbances will not travel upstream. Pertains to liquid flow measurement in open channels. **2.** A flow through a suitable differential pressure device such that the ratio of the downstream to upstream absolute pressures is less than a critical value below which the mass flow-rate remains constant when the upstream fluid conditions (density and velocity distribution) are unchanged. Pertains to measurement of fluid flow in closed conduits.

critical flow nozzle A nozzle of which the geometrical configuration is such that the mass flow rate remains constant irrespective of the fluid condition downstream of the nozzle.

critical frequency The frequency below which a traveling wave of a given mode cannot be maintained in a given waveguide.

critical piece first (software) Pertaining to an approach to software development that focuses on implementing the most critical aspects of a software system first. The critical piece may be defined in terms of services provided, degree of risk, difficulty, or some other criterion.

critical point Pertaining to heat treatment, temperature or combination of temperature and pressure, at which transformation occurs, the composition remaining constant.

critical pressure The equilibrium pressure of a fluid that is at its critical temperature.

critical pressure ratio The ratio of downstream pressure to upstream pressure which corresponds to the onset of turbulent flow in a moving stream of fluid.

critical pressure ratio (fluid power systems) Value of the absolute upstream and downstream pressure ratio in a pneumatic device, at which the flow becomes sonic.

critical temperature 1. The temperature of a fluid above which the fluid cannot be liquefied by pressure alone. **2.** That temperature below which, in the absence of current and external magnetic fields, a material is superconducting and above which it is normal.

critical velocity 1. For a given fluid, the average linear velocity marking the upper limit of streamline flow and the lower limit of turbulent flow at a given temperature and pressure in a given confined path. **2.** The velocity of critical flow.

crossbar A type of widely used control switching system using a crossbar or coordinate switch. Crossbar switching systems suit data switching because they have low noise characteristics.

crosscheck Pertaining to data processing, to check the computing by two different methods.

cross-compiler A compiler that executes on one computer but generates assembly code or object code for a different computer.

crosscorrelation function A measure of the similarity between two signals when one is delayed with respect to the other.

cross-country billet mills (in steel production) A type of rolling mill composed of several stands of rolls, so arranged that the piece to be rolled is never in more than one stand at the same time.

cross coupling Undesired transfer of interfering power from one circuit to another by induction, leakage, etc.

crosshatching 1. In a printed-circuit board, the breaking up of large conductive areas where shielding is required. **2.** Process of filling in an outline with a series of symbols to highlight part of a design.

crossover frequency The point of division between separated frequency bands of the crossover network.

crossover network The device between audio amplifier output and speakers which divides the high from the low audio frequencies.

cross-section of stream A specified section of the stream normal to the direction of flow bounded by the wetted perimeter and the free surface. Pertains to liquid flow measurement in open channels.

cross software Programs that permit a target system to be developed on a host computer with different CPU architecture.

crossstalk 1. The unwanted electrical energy transferred from one channel, called the disturbing channel, to another channel called the disturbed channel. This energy can be transferred, e.g. by electromagnetic or capacitive coupling or by leakage. Same as feedover.

crossstalk coupling, crossstalk loss Cross coupling between two speech communication channels or their component parts. Note: Crosstalk coupling is measured between specified points of the disturbing and disturbed circuits and is preferably expressed in decibels.

cross-tracking A crosslike array of bright dots on the display, used for locating points and lines and for drawing curves.

crowbar A voltage monitor circuit designed to overload and thus shut down the power system in case the voltages which it monitors should exceed maximum limits.

CRT See cathode ray tube.

CRT display See cathode ray tube.

crucible A pot or vessel made of a high-melting-point material, such as a ceramic or refractory metal, used for melting metals and other materials.

crude metal Metal that contains impurities in sufficient quantities to make it unsuitable for specified purposes or that contains more valuable metals in sufficient quantities to justify their recovery.

crude oil Oil as it comes from the well; unrefined petroleum.

crude still A primary refinery unit; a large vessel in which crude oil is heated and various components taken off by distillation.

crushing and screening Iron ore of merchantable grade must be properly sized prior to charging to the blast furnace. The fines produced in crushing require agglomeration, usually by sintering, prior to charging.

The sinter produced is crushed and screened to meet size specifications compatible with the other charge components.

crush strength The physical limit of an optical fiber or cable to withstand an applied force or weight perpendicular to the axis of the fibers.

cryogenic Any process carried out at very low temperature, usually considered to be -50°C or lower.

cryogenic air separation plant See oxygen plant.

cryogenic element Various high speed circuits which use the superconductivity characteristics of materials operating at or near absolute zero temperatures.

cryogenic fluid A liquid which boils below -123°C (-238°F , -150°C) at one atmosphere absolute pressure.

cryogenic memory Superconductive memory that operates at very low (or at near absolute zero) temperatures.

cryogenic storage Depends for its operation on the properties of specific materials, which can become superconductive when their temperatures and the magnetic fields in which they are situated fall below certain very low temperatures. Since superconductors have zero resistance, they can maintain or store a current permanently.

cryotron A device utilizing properties of metals at near absolute zero temperatures so that large current changes can be obtained by relatively small magnetic field changes.

crystal detector A mineral or crystalline material which allows electrical current to flow more easily in one direction than in the other. In this way, an alternating current can be converted to a pulsating current.

crystal oscillator Also called crystal-controlled oscillator. An oscillator in which the frequency of oscillation is controlled by a piezoelectric crystal.

crystal pulling A technique in which a monocrystalline "seed" is introduced into the top of a body of molten material and then withdrawn slowly to grow or "pull" a large single monocrystal. This technique is used in semiconductor manufacture to produce the uniformly doped monocrystal boules from which most devices are fabricated.

crystal transducer See piezoelectric transducer.

Cs Chemical symbol for cesium.

CSA Canadian Standards Association, a nonprofit nongovernment organization. Specific component and equipment requirements are spelled out in standards published by CSA. Approval certification body for products (systems) intended for installation in hazardous locations. This is the Canadian equivalent of Underwriters Laboratories in the United States.

CSEE Canadian Society for Electrical Engineers.

CSMA/CD Carrier Sense Multiple Access with Collision Detection, a method of assigning mastership in a communications network.

CTD Charge Transfer Device. Same as CCD charged coupled device.

CTMP Chemical Thermal Mechanical Pulp.

Cu Chemical symbol for copper.

cubature A numerical technique of computing discharges in a tidal channel of a cross-section from the rates of change in volume of water up to the tidal limit, with algebraic allowance for the fresh water discharges entering the channel. Pertains to liquid flow measurement in open channels.

cubicle 1. Any small room or enclosure. 2. An enclosure, usually free standing, that houses high-voltage electrical equipment.

cubic metre, (meter) m^3 Unit for measurement of volume. (SI unit.) Common multiples: mm^3 , cm^3 ,

dm^3 . In strict technical or scientific context, give preference to multiples of m^3 . For fluids, give preference to the additional unit litre, (liter) l, whenever convenient. Use l, cl and ml; avoid dl. Do not use units like pint, bushel or barrel.

cue See address.

cue circuit A one-way communication circuit for conveying program control information.

CUJT Complementary Unijunction Transistor.

cupro-solvent Descriptive of a water which is able to dissolve copper from pipes and fittings.

cup-type current-meter A current meter whose rotor is composed of a wheel fitted with cups turning on a vertical axis and perpendicular or nearly perpendicular to the flow. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3680: Part 1:1983.

Curie Abbreviated Ci. The standard unit of measure for radioactivity of a substance; it is defined as the quantity of a radioactive nuclide that is disintegrating at the rate of $3.7 \cdot 10^{10}$ disintegrations per second.

Curie point In ferroelectric dielectrics, the temperature or temperatures at which peak values of the dielectric constant occur. Also called Curie temperature. The temperature (critical) at which piezoelectric materials lose their polarization and therefore also their piezoelectric properties.

Curie temperature See Curie point.

current 1. The movement of electrons through a conductor. Current is measured in amperes, milliamperes, microamperes, nanoamperes, or picoamperes. 2. A movement of electrons, positive ions, negative ions or holes. 3. The rate of transfer of electricity from one point to another. 4. General term to designate the movement of liquid.

current amplification Ratio of output current to input current of valve amplifier, magnetic amplifier, transistor amplifier, or photomultiplier, often expressed in decibels.

current attenuation Ratio of output to input currents of a transducer, expressed in decibels.

current balance A form of balance in which the force required to prevent the movement of one current carrying coil in the magnetic field of a second coil carrying the same current is measured by means of balancing mass.

current-carrying capacity (contacts) The maximum current that a contact is able to carry continuously or for a specified period of time.

current-to-pressure transducer A device which receives an analog electrical signal and converts it to a corresponding air pressure.

current transformer One designed to be connected in series with the circuit, drawing predetermined current.

cursor A position indicator frequently employed in a display on a video terminal to indicate a character to be corrected or a position in which data is to be entered.

cursor and update Circuitry that allows a user to add new material into a video terminal's memory and display. The cursor, which locates the current entry location, is generally a blinking underline, although some are overlines or boxes.

curtain coating (paper manufacture) Coating of a horizontal web as it passes through a chamber from the ceiling of which a continuous curtain of coating material is extruded across the web.

curvature (coaxial transmission line) The radial departure from a straight line between any two points on the external surface of a conductor.

curve generator (computer graphics) A functional unit that converts a coded representation of a curve into the graphic representation of the curve display.

curve tracer An instrument capable of producing a display of one current or voltage as a function of a second voltage or current with a third voltage or current as a parameter.

cushioned check valve Check valve in which the movement of the check device is damped, for use in systems with pulsating pressures.

custom display A display designed and built by the user. It can be schematic, a set of emergency instructions, etc. Refers to Honeywell TDC 3000 control systems.

customer profile Information relating to a customer used to facilitate manufacturing activities. This includes such information as customer contact, specific product, product information requirements, shipping requirements and special instructions and anything else related to customer relations.

customize To modify a product or system to the customer's requirements.

custom LSI A large scale integrated circuit designed for a specific purpose and which hence has a dedicated function.

cut 1. A petroleum fraction; a product such as gasoline or naphtha distilled from crude oil. **2.** Crude oil contaminated with water so as to make an oil-water emulsion. **3.** To dilute or dissolve.

cut-out The opening in a panel, console or rack to allow the mounting of an instrument or an array of instruments.

cut point The temperatures at which various distilling products are separated out of the charge stock. One cut point is the temperature at which the product begins to boil or vaporize, the initial boiling point. The other cutpoint is the temperature at which the product is completely vaporized; this is the end point.

cutter compensation (numerical control) A displacement normal to the cutter path, to adjust for difference between actual and programmed cutter radii or diameters.

cutter tray, layboy A tray for the collection of pulp sheets in the splitter and cutter section of a pulp-drying machine.

C_v , A_v , K_v See valve flow coefficient.

CVT 1. Capacitive Voltage Transformer. **2.** Constant Voltage Transformer.

CVU Constant Voltage Unit.

CWT Hundredweight.

CYAM system (coke oven plants) A system for recovery of ammonia from coke oven plants developed by United States Steel. Consists of a highly efficient still system followed by a biological treatment plant. The combination can achieve a high degree of removal of ammonia, cyanides, sulphides and organics including phenols.

cyanide hardening See cyaniding.

cyaniding, cyanide hardening Pertaining to heat treatment, hardening comprising heating in a bath containing cyanide; compare bath nitriding.

cybernetics A branch of science which combines theory and studies on communication and control in living organisms and machines.

cyborg Abbreviation for cybernetic organism.

cycle The change of an alternating current from zero to a negative peak to zero to a positive peak and back to zero. The number of cycles per second (hertz) is called the frequency.

cycle (industrial robots) Execution of a task program.

cycle index The number of times a cycle has been executed, or the difference, or negative of the difference, between the number that have been executed and the number of repetitions desired.

cycle redundancy check (CRC) An error detection scheme, usually hardware implemented, in which a check character is generated by taking the remainder after dividing all the serialized bits in a block of data by a predetermined binary number. The remainder is then appended to the transmitted data and recalculated and compared at the receiving point to verify data accuracy.

cycles per second Same as hertz.

cyctic A condition of either steady-state or transient oscillation of a signal about the nominal value.

cyctic availability That specific time period during which stored information can be read.

cyctic redundancy check character A character used in a modified cyclic code for error detection and correction.

cyctic shift, end-around shift A logical shift in which the characters moved out of one end of a computer word or register are re-entered into the other end.

cyctic stabilized conditions (fluid power systems) Conditions in which the relevant parameters vary in a repetitive manner.

cyctic storage Same as circulating storage.

cyctic storage access A storage unit designed so that access to any location is only possible at specific, equally-spaced times; e.g., magnetic drums, delay lines, etc.

cycting 1. A rhythmic variation, near the desired value, of the factor under control. **2.** A periodic change from one value to another of the controlled variable in a automatic control system.

cycting life The specified minimum number of full scale excursions or specified partial range excursions over which a device will operate as specified without changing its performance beyond specified tolerances.

cycting life (control valves) The specified minimum number of full scale excursions or specified partial range excursions over which a control valve will operate as specified without changing its performance beyond specified tolerance.

cycting life (electrical transducers) Pertaining to electrical transducers (intended for use only in specifications), the specified minimum number of full range excursions or specified partial range excursions over which a transducer will operate as specified without changing its performance beyond specified tolerances.

cycting plant An oilfield installation that processes natural gas from a field, strips out the gas liquids, and returns the dry gas to the producing formation to maintain reservoir pressure.

cycting rate The number of cycles completed per time unit, typically cycles per hour for a heating or cooling system. The inverse of the length of the period of the cycle.

cycting vibration Sinusoidal vibration applied to an instrument and varied in such a way that the instrument is subjected to a specified range of vibrational frequencies.

cylinder 1. Pertaining to piston (cylinders) type actuators, the chamber in which the piston moves. **2.** Short for cylinder actuator.

cylinder actuator, piston actuator Type of pneumatic or hydraulic actuator. Cylinder actuators may be spring opposed although, in general, the cylinder actuators are usually used in proportioning or positioning control valves in conjunction with a valve positioner,

by use of air pressure alone. Because of its design it is capable of delivering more force than the diaphragm actuator.

cylinder and piston Type of area flowmeter using a spring to provide a restoring force, as opposed to the weight, of a float; therefore, they are not normally considered to have a constant pressure loss. However, the operation of the flowmeter is similar to the rotameter in that the force of the fluid acting on the piston drives it vertically until the spring counteracts the force. Then the fluid flows out through holes or slots in the cylinder and the height of the piston is proportional to the flow rate.

cylinder bore Internal diameter of the cylinder body.

cylinder capacity, cylinder displacement Volume absorbed or displaced per stroke or cycle.

cylinder control (fluid power systems) Form of pressure control in which a fluid cylinder is the operating member.

cylinder drying machine, for pulp A pulp-drying machine in which the drying section consists of heated cylinders.

cylinder machine See vat machine.

cylinder mould and vat See cylinder-vat unit.

cylinder mould, making drum Pertaining to pulp and paper manufacturing, a drum with a wire gauze stretched over it in a cylinder-vat unit.

cylinder pressure (cylinders) Static pressure at a stated point in actual operation.

cylinder stock A class of highly viscous oils so called because originally their main use was in preparation of products to be used for steam cylinder lubrication.

cylinder-vat unit, cylinder mould and wet Pertaining to pulp and paper manufacturing, a former in which the web is formed on a cylinder mould.

cylinder vat, vat Pertaining to pulp and paper manufacturing, the vat in which the cylinder mould rotates.

cylindrical plug (control valves) A cylindrical valve plug, with a flow passage through it or in the form of a partial cylinder.

cylindrical robot A robot whose mechanical structure of the arm comprises a rotary joint and two prismatic joints, whose axes are arranged in a cylindrical coordinate system.

D

D Symbol for electrostatic flux density.

d Prefix for deci meaning 10^{-1} .

D/A Digital-to-Analog.

DAC See digital-to-analog converter.

D/A converter See digital-to-analog converter.

DACS Data Acquisition Control System.

D-action, derivation action Type of continuous action in which the value of the output variable is proportional to the rate of change (first time derivative) of the input variable (i.e., in the case of a controller, of the system deviation).

D₂-action, second derivative action Type of continuous action in which the value of the output variable is at all times proportional to the second time derivative of the input variable (i.e., in the case of a controller, of the system deviation).

D/A decoder A device that changes a digital word to an equivalent analog value.

DAE Distributed Automation Edition. An IBM software solution to provide tools and techniques that will enable factory floor applications programs to be written that are independent of the distributed data, local area network protocol terminal.

daemon See demon.

daisy chain **1.** In a computer, a bus line which is interconnected with units in such a way that the signal passes from one unit to the next in serial fashion. **2.** A method for prioritizing interrupts. **3.** A method of propagating signals along a bus, often used in application in which devices not requesting a daisy-chained signal respond by passing the signal on.

daisy chain system A bus connection between units such that signals pass from one unit to the next.

Dalton's law A scientific principle that the total pressure exerted by a mixture of gases equals the sum of the partial pressures that would be exerted if each of the individual gases present were to occupy the same volume by itself.

DAM **1.** Data addressed Memory. **2.** Digital-to-Analog Multiplier. **3.** Direct Access Memory. **4.** Direct Access Method.

damped frequency The apparent frequency of a damped oscillatory time response of a system resulting from a non-oscillatory stimulus.

damped natural frequency The frequency of an oscillator following a transient input, usually a step function or pulse.

damped oscillation An oscillation the amplitude of which continually decreases due to damping.

dampen See damping.

dampened frequency See damped frequency.

damper A device for introducing a variable resistance for regulating the volumetric flow of gas or air. See also butterfly valve.

damping (of an oscillation) Progressive reduction with time of the amplitude of an oscillation.

damping coefficient The ratio of actual damping to critical damping.

damping constant The Napierian logarithm of the ratio of the first to the second of two values of an exponentially decreasing quantity separated by a unit of time.

damping pressure (cylinders) Pressure generated by the damping device to decelerate the total moving mass.

damping ratio For the free oscillation of a second order linear system, a measure of damping, expressed

(without sign) as the quotient of the greater by the lesser of a pair of consecutive swings of the output (in opposite directions) about an ultimate steady-state value.

damping torque A torque which tends to reduce unwanted oscillations of the moving element.

D and D/2 (pressure) tappings Wall pressure tappings drilled on either side of an orifice plate, the upstream and downstream tappings being respectively located at a distance of $1 D$ and $0.5 D$ from the upstream.

dandy roll A wire gauze covered roll resting on the paper web on the wire.

dark current (optical communication) The output current that flows in an optical detector when there is no incident radiation.

dark discharge In a gas, an electric discharge that has no luminosity.

dark resistance The resistance of a photoelectric device in total darkness.

dark trace tube CRT with a dark image on a bright background.

D'arsonval galvanometer A dc galvanometer consisting of a narrow rectangular coil suspended between the poles of a permanent magnet.

D'arsonval instrument See permanent-magnet moving-coil instrument.

DAS See data acquisition system.

dashpot (fluid power systems) Hydraulic damping device which acts as a variable speed regulator for a pneumatic cylinder.

dashpot (control valves) A mechanical damping device consisting of a cylinder and piston apparatus so as to dampen the movement of a valve stem. A less preferred term. See snubber.

data 1. A representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human beings or by automatic means. **2.** Characters or continuous functions representing information due to known or supposed arrangement.

data abstraction (software) The result of extracting and retaining only the essential characteristic properties of data by defining specific data types and their associated functional characteristics, thus separating and hiding the representation details. See also information hiding.

data acquisition and control systems Assemblies of electronic and mechanical components used to monitor and control complex processes. These systems include: **1.** Process sensors that measure such parameters as temperature, pressure etc. **2.** Transmitters that convert measurement data to electrical or pneumatic signals and controls. **3.** Digital computers that test set points, program sequential events, and perform calculations. **4.** Software that provides the computer with instructions and routines. **5.** Actuators, control valves, relays and motors that modify the process in response to computer-generated commands. **6.** Process interface devices, such as analog-to-digital converters, that link transmitters and actuators with digital computers. **7.** Human interface devices, such as printers, keyboards, CRT terminals, switches, alphanumeric displays, chart recorders and alarms, that facilitate human intervention.

data acquisition system 1. A system in which a computer at a central computing facility gathers data

from multiple remote locations. **2.** System for recording data, usually in digital form, from several sources; can also include computing functions.

data authentication A process used to verify the integrity of transmitted data, especially a message. Note: Not to be confused with user authentication.

data bank A set of data related to a given subject and organized in such a way that it can be consulted by users.

data base A data structure for accepting, storing and providing on demand data for multiple independent users.

data base (distributed) Physical distribution of digital memory throughout the system architecture. All data pertinent to the functioning of each device is stored within itself; however, when necessary, it is available through the Data Hiway to higher level devices requiring that data. Refers to Honeywell TDC 3000 control systems.

database management 1. A systematic approach to storing, updating and retrieval of information stored as data items, usually in the form of records in a file, where many users, or even many remote installations, will use common data banks. **2.** A program that enables a computer to store large amounts of information and then sort it in almost any manner. **3.** A set of rules about file organization and processing, generally contained in complex software, which controls the definition and access of complex, interrelated files which are shared by numerous application systems.

data base server In distributed computation, this accepts queries about the data base, analyzes them itself and returns the answers. Same as backend machine.

data block Typically, all the data for one item that is entered into a computer for processing, or the computer output that results from processing. An example of an input data block is an individual shipping list, and an example of an output data block is a check to be sent.

data bus See bus.

data capture Bringing in data from one or more points to a central point.

data carrier The selected medium used to transport (communicate) data or information.

data catalog A software tool used to list all of the data elements in a data base.

data channel A bidirectional data path between I/O devices and the main memory of a digital computer.

data characteristic (software unit testing) An inherent, possibly accidental trait, quality, or property of data (for example, arrival rates, formats, value ranges, or relationships between field values).

data check An operation used to verify data quality or data integrity.

data circuit A pair of associated transmit and receive channels that provide a means of two-way communication. See further figure in ISO publication 2382/9.

data circuit – terminating equipment In a data station, the equipment that provides the signal conversion and coding between the data terminal equipment (DTE) and the line. See further figure in ISO publication 2382/9.

data code A structured set of characters used to represent the data items of a data element. See also code element.

data code set See code element set.

data collection The process of bringing data together from one or more points for use in a computer. Example: To collect transactions generated at branch offices by a data network for use at a computer center.

data collection station See data input station.

data collision In a data transmission system, the situation that occurs when two or more demands are made simultaneously on equipment that can handle only one at any given instant.

data communication Transfer of information between functional units by means of data transmission according to a protocol.

data communication equipment, DCE The equipment that provides the functions required to establish, maintain, and terminate a connection, as well as the signal conversion, and coding required for communication between data terminal equipment and data circuit.

data communications processor A small computer used to control the flow of data between machines and terminals over communications channels. It may perform the functions of a concentrator, handshaking, and formatting, but does not include long-term memory or arithmetic functions.

data compression 1. The process of reducing the number of recorded or transmitted digital data samples through the exclusion of redundant samples. **2.** A technique that provides for the transmission of fewer data bits than originally required without information loss. The receiving location expands the received data bits into the original bit sequence.

data concentrator A functional unit that permits a common transmission medium to serve more data sources than there are channels currently available within the transmission medium.

data configuration display A display that permits the operator to choose one of several other types of displays, especially during the configuration process. Typical choices might be the Tag Name Display, the Library Display etc. Refers to Honeywell TDC 3000 control systems.

data contamination, data corruption A violation of data integrity.

data converter 1. Any of numerous devices for transforming analog signals to digital signals, or vice versa. **2.** A functional unit that transforms data from one representation to a different, but equivalent, representation.

data corruption, data contamination See data contamination.

data density The number of data characters stored per unit of length, area or volume. Notes: **1.** The data density is generally expressed in characters per millimeter (cpmm) or characters per radian (cprad). **2.** On disks, the total storage capacity of the disk, recorded on one or both sides, is generally specified rather than the data density.

data dictionary (software) A collection of the names of all data items used in a software system, together with relevant properties of those items; for example, length of data item, representation, etc.

data element 1. A unit of data that, in a certain context, is considered indivisible. Example: The data element "age of a person" with values consisting of all combinations of 3-decimal digits. **2.** A scalar, array or structure.

data entry device An electromechanical device to allow manual input of data to a display system. Examples of data entry devices are: alphanumeric keys, data tablet, function keys, joystick, mouse and trackball.

data entry panel An operator interface device. It allows the operator to configure slots in the Basic Controller and to observe a limited number of process values. Refers to Honeywell TDC 3000 control systems.

data error A deviation from correctness in data, usually an error, which occurred prior to processing the data.

data file A collection of related data records organized in a specific manner.

data flow The transfer of data between constants, variables and files accomplished by the execution of statements, procedures, modules or programs.

data flow chart See data flow diagram.

data flow diagram A graphic representation of a system, showing data sources, data sinks, storage, and processes performed on data as nodes, and logical flow of data as links between the nodes. Synonymous with data flow graph, data flow chart.

data flow graph See data flow diagram.

data flows These are like pipelines that carry data between processes, data stores or external agents.

data format Describes the way data is held in a file or record, whether in character form, a binary number, etc.

data gathering See data collection.

data generators Specialized word generators in which the programming is designed to test a particular class of device, in which the pulse parameters and timing are adjustable, and in which selected words may be repeated, reinserted later in the sequence, omitted, etc.

datagram In packet switching, a self-contained packet, independent of other packets, that carries information sufficient for routing from the originating data terminal equipment (DTE) to the destination DTE, without relying on earlier exchanges between the DTEs and the network.

data handling Same as data processing.

data handling capacity The number of bits of information which may be stored in a computer system at one time. The rate at which these bits may be fed to the input either by hand or with automatic equipment.

data hierarchy A data structure, made up of sets and subsets, in which every subset of a set is of lower rank than the data of the set.

data highway 1. The means of transmitting information between stations interconnected by at least one data transmission line. Examples of data highways are the system described in IEC publication 625 and "PROWAY" (process data highway). **2.** A coaxial cable connecting various distributed BASIC System devices. Refers to Honeywell TDC 3000 control systems.

data-hold (data processing) A device that converts a sampled function into a function of a continuous variable. The output between sampling instants is determined by an extrapolation rule or formula from a set of past inputs.

data identifier The means of establishing the identity of data by a classification method so that data with close resemblance can be related on a one-to-one or a category basis. Typical identifiers are names, titles, limit or boundaries, classes, and types.

data input station, data collection station A user terminal primarily designed for entering data into a computer.

data integrity The data quality that exists as long as accidental or malicious destruction, alteration, or loss of data does not occur.

data interchange format A standardized data file format allowing data interchange between software packages on personal computers.

data item The simplest type of information dealt with by a computer system (e.g., a name or employee number). A collection of data items constitutes a record

(e.g., payroll information on one employee) and a number of related records constitute a file (e.g., payroll information on all employees of a company).

data link Equipment which permits the transmission of information in data format. See figure in ISO publication 2382/9.

data link layer The conceptual layer of control or processing logic existing in the hierarchical structure of a station that is responsible for maintaining control of the data link. The data link layer, functions provide an interface between the station higher layer logic and the data link.

data logger A printer used to record information with respect to time-especially alarms and the return to normal; tabular logs of calculated averages or instantaneous readings; periodic reports of integrated or computed values, such as the total flows in and out of a unit.

data logging Recording of data about events that occur in time sequence. See also data collection.

data management A general term that collectively describes those functions of the control program that provide access to data sets, enforce data storage conventions and regulate the use of input/output devices.

data medium The material in or on which data may be recorded.

data migration The moving of data from an on-line device to an off-line or low-priority device, as determined by the system or as requested by the user.

data modem A modulation/demodulation device that enables computers and terminals to communicate over telephone circuits.

data multiplexer A functional unit that permits two or more channels to share a common transmission medium.

DATANET A General Electric model that can be used for production control. A message exchange which receives and transmits automatically.

data network An arrangement of data circuits and switching facilities for establishing connections between data terminal equipments.

data plate A plate bearing the name of the manufacturer and other information related to the product as may be required by various regulations or codes. See also nameplate.

data pointer A register holding the memory address of the data (operand) to be used by an instruction. Thus the register "points" to the memory location of the data.

data processing, information processing, DP The systematic performance of operations upon data. Examples: Handling, merging, sorting, computing, assembling, compiling. Note: Dataprocessing may be performed by human beings or automatic means; in the latter case, it is often referred to as "automatic data processing" or "ADP".

data processing node In a computer network, a node at which data processing equipment is located.

data processing system, computer system, computing system A system, including computing equipment and associated personnel, that performs input, processing, storage, output and control functions to accomplish a sequence of operations on data. In the English usage, "data processing system" is a preferred term for those systems which include personnel.

data protection The implementation of appropriate administrative, technical or physical means to guard against the unauthorized interrogation and use of procedures and data.

data quality The correctness, timeliness, accuracy, completeness, relevance, and accessibility that make data appropriate for their use.

data rate The speed at which digital information is transmitted, expressed in hertz per second or bits per second.

data reconstruction (data processing) The conversion of a signal defined on a discrete-time argument to one defined on a continuous-time argument.

data record A collection of facts, numbers, letters, symbols, etc., that a program can process or produce.

data reduction The process of transforming masses of raw test or experimentally obtained data, usually gathered by automatic recording equipment, into useful, condensed, or simplified intelligence.

data security The protection of data against unauthorized disclosure, transfer, modifications, or destruction, whether accidental or intentional.

data selector A decision-making type of digital building block that routes data from any one of several inputs to its output.

data-sensitive fault A fault that is revealed as a result of the processing of a particular pattern of data.

data sink 1. In data communication, the functional unit that accepts transmitted data. Contrast with data source. 2. A memory or recording device that can store information for future use. See also data source.

data skew Distortion of a signal due to lack of synchronization between the source of the signal and the receiver.

data source In data communication, the functional unit that originates data for transmission. Contrast with data sink. See also data sink.

data station The data terminal equipment (DTE), the data circuit-terminating equipment, and any intermediate equipment. The DTE may be connected directly to a data processing system, or may be part of it. See figure in ISO publication 2382/9-1984.

data terminal 1. A common point at which data from various sources is collected and transferred; it may include or connect with several types of data-processing equipment. 2. Equipment at the end of a transmission system for the transmission or reception of data.

data transfer Moving data from one (or more) registers (or memory locations) to another or interchanging data between registers (memory locations) in many different ways.

data transfer rate In data communication, the average number of bits per second transferred from a data source and received by a data sink.

data transmission The conveying of data from one place for reception elsewhere by signals transmitted over a channel.

data transmission channel, channel A means of one-way transmission. Note: A channel may be provided, for example, by frequency or time division multiplexing.

data type Any one of several different types of data, such as integer, real, double precision, complex, logical, and Hollerith. Each has a different mathematical significance and may have different internal representation.

data validation A process used to determine if data are inaccurate, incomplete, or unreasonable. Note: Data validation may include format checks, completeness checks, check key tests, reasonableness checks and limit checks.

data value The information contained in data formats. Normally prepared for the generation of specific packages from generic packages.

data word 1. A computer word that contains or represents the data to be manipulated. 2. As pertains to BASIC Systems, a message over the Data Hiway that contains the raw information required by a preceding command word. Refers to Honeywell TDC 3000 control systems.

data wrap The transmission of data through a communications system and the return of the data to its source to test the accuracy of the system.

datum error (of a measuring instrument) The error of a measuring instrument at a specified scale value or a specified value of the measurand, chosen for checking the instrument.

datum reference A defined point, line, or plane used to locate, the pattern or layer for manufacturing, inspection, or for both purposes.

daughter card Card or board interfaced with a motherboard or backplane.

dB See decibel.

dBa The term dBa means decibels to the A-weighted scale, which is an approximation to the human ear. Decibels progress logarithmically, that is, for each jump of 10 dB there is a tenfold increase. Thus a 100 dB sound is 10 times as intense as 90 dB and 100 times as intense as 80 dB. The human ear perceives each 10 dB increase as an approximate doubling of loudness.

dBk Decibels referred to 1 kilowatt.

dBm Abbreviation for decibels above (or below) one milliwatt. A level of power referred to an arbitrary one milliwatt standard.

dBm0 Noise power in dBm referred to or measured at OTLP (Zero Transmission Level Point).

dBm0p Noise power in dBm0 measured by a set with psophometric weighting.

dB meter A meter having a scale calibrated to read directly in decibel values at a specified reference level.

DBMS Database Management System. A software package that enables end users or application programmers to share data. DBMSs are generally also responsible for data integrity, data access control and automated rollback/restart/recovery.

dB_r Decibels relative level. Used to define transmission levels at a point in a circuit, with respect to the level at the zero transmission level reference point.

dB_{RAP} Decibels above reference acoustical power, which is defined as 10⁻¹⁶ watt.

dB_{RN} Decibels above reference noise.

dB_{RNC} Decibels above reference noise, C-message weighted.

dB_V The increase or decrease in voltage independent of impedance levels. A unit of electric pressure. Decibels referred to a standard of 1 volt.

dB_W Decibels referred to one watt, a unit of power measurement in communication.

dB_x Decibels above the reference coupling.

dc analog computer An analog computer in which computer variables are represented by the instantaneous values of voltages.

dc, DC Direct current.

DCD Data Carrier Defect RS232C signal from a modem to a computer indicating a carrier is being received.

dc dump The condition resulting when dc power is withdrawn from a computer which uses volatile storage, i.e., loss of stored information.

dc generator A rotating electric device for converting mechanical power into dc power.

dc power supply See IEC standard 654-2, Part 2: Power.

dc power supply impedance See IEC standard 654-2, Part 2: Power.

dc power voltage classes DC power voltages are classified in accordance with the percentage variation of the voltage from nominal value. See further IEC standard 654-2, Part 2: Power.

dc power voltage ripple The ripple voltage is defined as the ratio expressed in percentage of the peak-to-peak value of the total ac component of the power supply voltage to the measured (average) power supply voltage, as measured at rated load. For further details see IEC standard 654-2, Part 2: Power.

dc reclosing relay A device which controls the automatic closing and reclosing of a circuit interrupter, generally in response to load-circuit conditions.

DCS Distributed Control System.

dc signalling A transmission method which utilizes direct current.

dc test A general term for those tests that measure a static parameter such as leakage current.

DDC See direct digital control.

DDCMP Digital Data Communications Message protocol, a character-orientated communications protocol standard.

DDP Distributed Data Processing Operations to derive information from data which is kept in different places.

deactivation (corrosion) The process of removing active constituents from a corroding liquid (as removal of oxygen from water).

deactuate pressure The pressure at which an electrical contact opens or closes as the pressure approaches the actuation level from the opposite direction.

dead band 1. Finite range of values within which variation of the input variable does not produce any noticeable change in the output variable. Notes: 1. When this type of characteristic is intentional, it is sometimes called a neutral zone. 2. For a device with a digital output representation, the dead band is the smallest change in the analog input signal which always causes a change in the digital output. 3. An area or zone around a central point of operation (e.g., a setpoint) within which variation is allowed without any correction signal being produced. Refers to Honeywell TDC 3000 control systems. Dead band is usually expressed in percent of span. Dead band produces phase lag between input and output.

dead band (control valves) Pertaining to diaphragm actuated control valves, the amount the diaphragm pressure can be varied without initiating valve plug motion.

dead band (in numerical control) The maximum range of the input quantity that does not cause a detectable change in the value of the output quantity.

dead band error The maximum value of the span of the dead band (over the measuring range).

dead-beat Coming to rest without vibration or oscillation i.e., the pointer which a highly damped meter or galvanometer, moves to a new position without overshooting and vibrating about its final position.

dead break An unreliable contact made near the trip point of a relay or switch at low contact pressure. As a result, the switch does not actuate, even though the circuit is interrupted.

dead end shut off Pertaining to control valves, a nonstandard term.

dead-front Without live parts exposed to a person on the operating side of the equipment.

deadhead pressure Output pressure without flow (stagnation pressure).

deadman's release The effect of that feature of a semiautomatic or nonautomatic control system that acts to cause the controlled apparatus to assume a pre-assigned operating condition if the operator becomes incapacitated.

dead oil Crude oil containing no dissolved gas when it is produced.

dead range See dead band.

dead room 1. A room for testing the acoustic efficiency or range of electroacoustic devices such as speakers and microphones. The room is designed with an absolute minimum of sound reflection, and no two dimensions of the room are the same. 2. See anechoic.

dead short A short circuit having minimum resistance.

dead time 1. Time interval between the instant when a variation of an input variable is produced and the instant when the consequent variation of the output variable starts. Also named delay as per IEC publication 351, chapter 351, 1975. 2. Particularly in continuous processes, where it is necessary to transfer heat or other energy by means of a fluid flowing through some distance at a certain velocity a type of lag, dead time, often occurs. For example in a tubular type of furnace, oil is pumped at a constant rate through hundreds of feet of tubing which line the walls of the heater. It takes quite a long time for a given portion of the oil to pass through the heater.

dead-time correction A correction applied to an instrument reading to account for events or stimuli actually occurring during the instrument's dead time.

dead time element Linear transfer element whose output variable reproduces the input variable shifted by an interval equal to the dead time. The transportation lag of mass, energy or information is described by a dead time element.

dead volume The total volume of the pressure port cavity of a transducer with room barometric pressure applied.

dead weight tester An instrument used as a stand for calibrating pressure gages. Known fluid pressures are generated by means of freely balanced (dead) weights loaded on a calibrated piston.

dead zone 1. For a multi-position controller, a zone of input in which no value of output exists. It is usually intentional and adjustable. See figure in ANSI/ISA publication S51.1, 1979. 2. A predetermined range of input through which the output remains unchanged, irrespective of the direction of change of the input signal. See figure in ANSI/ISA publication S51.1, 1979. The notes apply to definition 2 only. Note 1: There is but one input-output relationship, as shown in figure in above publication. Note 2: Dead zone produces no phase lag between input and output.

de-aerater Equipment used to eliminate air or gas contained in the liquid in a hydraulic circuit.

de-aeration 1. The partial or complete removal of dissolved air from water. 2. The removal of air from the stock, normally in a vessel which is under vacuum. Pertains to the pulp and paper industry.

DEAP Diffused Eutectic Aluminium Process.

debarker See barker.

debarking See barking.

debouncing 1. A delay programmed into software that prevents false input from a keyboard due to the bouncing of the keys. 2. Debouncing may also be performed by hardware (latch).

(to) debug 1. To detect, to trace and to eliminate mistakes in computer programs or in other software. Note: In the English language, "trouble shoot" and

“trouble shooting” may be used in lieu of “debug” and “debugging”. Related to diagnostic routine.

debuggers System programs that enable computer programs to be debugged.

debugging aid routine A routine to aid programmers in the debugging of their routines. Some typical aid routines are storage print-out, tape print-out, and drum print-out routines.

debugging model See error model.

debugging on-line See on-line debugging.

debugging routine See debug program.

debug program A special program used to find errors in a program that is being run on a computer. A debug program allows a programmer to correct programming errors in the program being run.

decentralized computer network (data communication) A computer network, where some of the computing power and network control functions are distributed over several network nodes.

decentralized control Control of a multivariable system performed in subsystems in each of which the local control is based on measurement and feedback of local state or output variables.

dechlorination The partial or complete removal of residual chlorine from water by any chemical or physical process.

deci Prefix meaning one-tenth.

decibel (dB) A unit for measuring relative strength of a signal parameter, such as power, voltage, etc. The number of decibels is twenty (ten for power ratio) times the logarithm (base 10) of the ratio of the measured quantity to the reference level. The reference level must always be indicated, such as 1 milliamp for current ratio. See also power level.

decibel curve On a Bode plot, the curve of signal-size relationship (output to input) against signal frequency, the size ratio being expressed in decibels.

decibel meter Meter which has a scale calibrated uniformly in logarithmic steps and labelled with decibel units, used for determining the power levels in communication circuits, relative to a datum power level, now 1 mW in 600 ohms.

decibels above reference noise An expression used to describe the ratio of the circuit noise level in a transmission system, at any point, to some arbitrarily chosen reference noise. The expression signifies the reading of a noise meter.

decimal code A code in which each allowing position has one of ten possible states. The conventional decimal number system is a decimal code.

decimal coded digit A digit or character defined by a set of decimal digits, such as a pair of decimal digits specifying a letter or special character in a system of notation.

decimal digit A digit used in the decimal numeration system. Example: The Arabic digits 0 through 9.

decimal encoder An encoder having ten output lines for each decade of decimal numbers, one line representing each digit from 0 to 9.

decimal notation A notation that uses ten different characters, usually the decimal digits. Examples: **1.** The character string 196912312359 may be constructed to represent the date and time one minute before the start of the year 1970. **2.** The representation used in the Universal Decimal Classification (UDC). Note: These examples use decimal notation but neither satisfies the definition of the decimal numeration system.

decimal numeration (system) The fixed radix numeration system that uses the digits 0, 1, 2, 3, 4, 5, 6,

7, 8 and 9 and the radix ten and in which the lowest integral weight is 1.

decimal point The radix point in the decimal numeration system. Note: The decimal point may be represented by, according to various conventions, by a comma, by a period, or by a point at the mid-height of the digits.

decimal-to-binary conversion The process of converting a number written to the base ten, or decimal, into the equivalent number written to the base two, or binary.

decimal unit of information content See Hartley information unit.

decimetric waves **1.** Electromagnetic waves having wavelengths between 0.1 and 1 meter. **2.** Ultrahigh frequency band; 300 MHz to 3 GHz.

decineper One-tenth of a neper.

decinormal colomel electrode A colomel electrode containing a decinormal potassium chloride solution.

decision In a computer, the process of determining further action on the basis of the relationship of two similar items of data.

decision box The symbol used in flow-charting to indicate a choice or branching in the information processing path.

decision content (information theory) Refer to ISO publication 2382/XVI.

decision element A circuit that performs a logical operation on one or more binary digits of input information (represent “yes” or “no”) and expresses the result in its output.

decision instruction (USA), branch instruction An instruction that controls branching.

decision instruction, discrimination instruction An instruction of the class of instructions that comprises branch instructions and conditional jump instructions.

decision table A table of contingencies to be considered in the definition of a problem, together with the actions to be taken; sometimes used in place of a flow chart for program documentation.

declarative knowledge Knowledge represented by facts, rules, and theorems. Note: Usually declarative knowledge cannot be processed without first being translated into a procedural form (ISO/IEC).

DECNET DEC’s proprietary version of ETHERNET.

decode 1. To recover the original message from a coded form of the message. **2.** To convert data by reversing the effect of some previous encoding.

decoder 1. A code converter in which the input signal comes from a computer. See code converter. **2.** A functional unit that has a number of input lines such that any number may carry signals and a number of output lines such that not more than one at a time may carry a signal and such that the combination of input signals serves as a code to indicate which output line carries the signal.

decoding 1. The process of obtaining intelligence from a code signal. **2.** In multiples, a process of separating the subcarrier from the main carrier.

decoding matrix A device for decoding many input lines into a single output line.

decollimated light In fiber optics, light rays made nonparallel by striae and boundary defects.

DECOMMI DEC Open Manufacturing Network Interface. DEC’s version of the OSI MMS protocol to be used for control-level device communications.

decommutation A reversal of the commutation process; separation of information in a commutated data

stream into as many independent information channels as were originally commutated.

decommutator Equipment for the separation or demultiplexing of commutated signals.

decomposition Breaking down a software specification, in depth and breadth, to determine all required functions and their relationships.

decompression Any method for relieving pressure.

decontamination Removing or neutralizing an unwanted chemical, biological or radiological substance.

decoupler A circuit eliminating the effect of coupling in a common impedance.

decoupling **1.** The reduction of coupling. **2.** To isolate two circuits on a common line. **3.** The technique of reducing process interaction through coordination of control loops. **4.** Elimination of undesirable coupling between single system variables by suitable means.

decoupling circuit A circuit used to prevent interaction of one circuit with another.

decoupling control A technique in which interacting control loops are automatically compensated when any one control loop takes a control action.

decoupling network Electrical circuit for the purpose of eliminating interference from one circuit to another.

decrement **1.** The quantity by which a variable is decreased. **2.** In some computers, a specific part of an instruction word. **3.** To decrease the value of a number.

decremental hardening A surface-hardening heat treatment process. The process of increasing surface hardness without a change in the chemical composition of the surface involves heating the piece under conditions such that a large difference in temperature exists between the piece and the heating medium so that a step temperature gradient is developed in the piece.

decrometer An instrument for measurement of the logarithmic decrement (damping) of a wave train.

decor A circuit that extracts the meaningful signal from a carrier (audio or video).

dedicated **1.** Leased or private, usually referring to communications lines or equipment. **2.** Reserved or committed to a specific use or application.

deduction The process of reaching a conclusion by logical means.

deenergize **1.** To disconnect a device from its power source. **2.** To stop the current in a circuit or to remove electrical potential from a circuit, as by opening a switch.

de-energized (National Electrical Safety Code, USA) Free from any electrical connection to a source of potential difference and from electric charge; not having a potential different from that of earth. Note: The term is used only with reference to current-carrying parts which are sometimes energized (alive). Syn: dead.

deepwell pump An electrically driven pump located at the low point in the mine to discharge the water accumulation to the surface.

de facto Term refers to a standard not recognized by any official standardization body.

default **1.** The alternative assumed when an identifier has not been declared to have one of two or more alternative attributes. **2.** Pertaining to an attribute, value, or option that is assumed when none is explicitly specified. **3.** Configuration condition that exists when an entry isn't made during the configuration process. Refers to Honeywell TDC 3000 control systems.

defect (relates to quality systems) The nonfulfillment of intended usage requirements. Notes: **1.** This

definition covers the departure or absence of one or more quality characteristics from intended usage requirements. **2.** See note 2 under nonconformity.

Defense Electronic Supply Center See DESC.

deferred addressing A method of addressing in which one indirect address is replaced by another to which it refers a predetermined number of times or until the process is terminated by an indicator.

deferred entry In a computer, an entry into a subroutine as a result of a deferred exit from the program that passes control to the subroutine.

deferred exit In a computer, the transfer of control to a subroutine at a time controlled by the occurrence of an asynchronous event rather than at a predictable time.

deferred maintenance Such corrective maintenance which is not immediately initiated after a fault recognition but is delayed in accordance with given maintenance rules.

defibration, defibering Separation by mechanical means of the fibers in a fibrous material; see slushing, kneader pulping. Material for defibration may be raw or cooked chips, pulp, shives, broke, waste paper etc.

defibrator, laboratory fiberizer See laboratory fiberizer.

definite-purpose controller Any controller having ratings, operating characteristics, or mechanical construction for use under service conditions other than usual or for use on a definite type of application.

definition **1.** The resolution and sharpness of an image, or the extent to which an image is brought into sharp relief. **2.** The degree with which a communication system reproduces sound images or messages.

definition phase See requirements phase.

definitive method of measurement A method of measurement of a quantity in accordance with a definition of the unit of that quantity.

deflaking Separation of fibers in knots and bundles, small flakes of paper or pulp etc. which have resisted kneader pulping or slushing.

deflashing Removing fins or protrusions from the parting line of a die casting or molded plastics part.

deflecting force (direct-current recording instrument) At any part of the scale (particularly full scale), the force for that position, measured at the marking device, and produced by the electrical quantity to be measured, acting through the mechanism.

deflecting torque, driving torque Pertaining to electrical measuring instruments a torque resulting from e.g. electrostatic effects on the moving element.

deflection technique A flow measuring technique which, in principle, utilizes some energy source which is introduced to the fluid in a pipe or duct. At zero flow, the energy source crosses the pipe or duct and the location of the received source on the other side of the pipe is noted. When flow is initiated, the flowing fluid deflects the energy source and the location of the deflected source is monitored on the opposite pipe wall. The distance between the zero flow location and the flowing location of the detected energy source is the indication of flow rate.

deflection voltage The voltage applied to the electrostatic plates of a cathode-ray tube to control the movement of the electron beam.

DEF STAN Abbreviation for defence standard (England).

degauss To neutralize the existing magnetic field.

degenerate modes A set of modes having the same resonance frequency (or propagation constant). The members of a set of degenerate modes are not unique.

degeneration See negative feedback.

degenerative feedback A technique which returns part of the output of a machine, system or process to input it in a way as to cause a larger quantity to be deducted from the input with an increase of output results. See also under negative feedback.

degradation (electromagnetic interference) In susceptibility specification testing, degradation is an unwanted change in the operational performance of a specimen due to electromagnetic interference. This does not necessarily mean malfunction or catastrophic failure. The ESD test specification generally requires stating the criteria for degradation of performance.

degradation (of performance) An undesired departure in the operational performance of any device, equipment or system from its intended performance.

degradation failure A failure which is both a gradual failure and a partial failure.

degreasing Part of procedures for cleaning industrial-process measurement and control equipment to be used for oxygen service. The degreasing methods and procedures are outlined in IEC publication 877 (1986).

degree Celsius (°C) Unit for temperature according to the Celsius temperature scale based on the freezing point of water defined as 0°C and the boiling point as 100°C, both under conditions of normal atmospheric pressure (760 mm of mercury). Write degrees Celsius, not degrees centigrade. See also International System of Units and additional units.

dehumidification Reducing the moisture content of air, which increases its cooling power.

dehydrated air Air that has all traces of moisture removed; instrument air.

dehydration reaction The reverse of hydration; dehydration is the transfer of H₂O from a mineral into the fluid phase or into free water. See hydration reaction.

dehydrator A tank or tower through which gas is run to remove entrained water. A common method of gas dehydration is through the use of various glycols — diethylene, triethylene, and tetraethylene. Dehydration is accomplished by contact of the wet gas with a pure or lean glycol solution. Gas is fed into the bottom of a trayed or packed column in the presence of the glycol solution. As the gas percolates upward through the solution, the “lean” glycol absorbs the entrained water and dry gas is taken off at the top of the tower.

deicing Using heat, chemicals or mechanical rupture to remove ice deposits, especially those that form on motor vehicles and aircraft at low temperatures or high altitudes.

deinking The removal from waste paper of printing ink, dyestuffs, fillers and other additives.

deionization The process by which an ionized gas returns to its neutral state after all sources of ionization have been removed.

deionization (water quality) The substantial or complete removal of ionic species, particularly by the use of ion-exchange resins.

deionized water Water which has been treated to remove ions.

delay The amount of time by which a signal is delayed. It may be expressed in time (milliseconds, microseconds, etc.) or in number of characters (pulse times, word times, major cycles, minor cycles etc.).

delay coincidence circuit A coincidence circuit actuated by two pulses, one of which is delayed a specific amount with respect to the other.

delay counter In a computer, a device that can temporarily delay a program a sufficient length of time for the completion of an operation.

delay dispersion The change in phase delay over a specified operating frequency range.

delay distortion A form of distortion in a transmitted radio wave that occurs when the rate of change of phase shift with frequency is not constant over the transmission-frequency range.

delayed combustion A continuation of combustion beyond the furnace. See also secondary combustion.

delay element A device that yields, after a given time interval, an output signal essentially similar to a previously introduced input signal.

delay (D) flip-flop A flip-flop whose output is a function of the input which appeared one pulse earlier: For example, if a 1 appeared at the input, the output after the next clock pulse will be a 1.

delay-interval timer A timing device which is electrically reset to delay energization or deenergization of a circuit for an interval of time up to 10 min following a specific event such as restoration of power after a power failure or turning a manual switch off.

delay line A line or network designed to introduce a desired delay in the transmission of a signal.

(delay-line memory), delay-line storage A memory or storage device consisting of a delay line and means for regenerating and reinserting information into the delay line.

delay modulation A method of data encoding for serial data transmission and recording.

delay-on-make timer A timing device that holds its main contacts open for a preset period of time after it receives in initiating signal, then closes the contacts and allows current to flow in the main circuit; when the timer receives a stopping signal, the contacts open and after a short interval the timer automatically resets so it can repeat the cycle.

delay on break A term used to describe a mode of operation relative to timing devices. The delay begins when the initiate switch is opened (delay on break of initiate switch).

delayed command Command which is issued after a specified delay time after the associated step has been activated, and which ends as soon as the associated step is deactivated. The command will not be issued if the associated step is activated and deactivated within the specified delay time. The delayed command is identified in IEC 848 by the conventional letter “D”.

delete character A distinct operational character designed to be used to obliterate erroneous or undesired characters.

deletion record In a computer, a new record to replace or remove an existing record in a master file.

delignification Treatment intended to reduce the content of lignin in vegetable fiber raw materials.

delimiter One or more characters used to indicate the beginning or the end of a character string.

deliquescent type dryer Moisture is separated by using the absorptive properties of special hygroscopic compounds.

delivery (software) 1. The point in the software development cycle at which a product is released to its intended user for operational use. 2. The point in the software development cycle at which a product is accepted by its intended user.

Delphi technique A unique forecasting method for use when there is no directly relevant historical data available. It is an intuitive forecast mode after combining the views of many experts in the particular field.

delta The Greek letter delta represents any quantity which is much smaller than any other quantity of the same units appearing in the same problem.

delta circuit A three-phase circuit in which the windings of the system are connected in the form of a closed ring and the instantaneous voltage around the ring equal zero. There is no common or neutral wire, so the system is used only for three-wire systems or generators.

delta connection In a three-phase system, the terminal connections. So called because they are triangular like the Greek letter delta.

delta modulator A closed-loop sampled-data control system that transmits binary output pulses whose polarity depends on the difference between the input signal being sampled and a quantized approximation of the preceding input signal.

delta network A set of three branches connected in series to form a mesh.

delta P sizing Pertaining to specifications for control valves, pressure drop (inlet pressure minus outlet pressure with units; psi, inches w.c. etc.). For all flows for sizing of valve port(s).

demagnetization Partial or complete reduction of residual magnetism.

demagnetizing force A magnetizing force applied in such a direction as to reduce the remanent induction in a magnetized body.

demand An input/output coding technique in which a read or write order is initiated as the need to read a new block or write a new block of data occurs. Operations do not take place in parallel.

demand deviation (metering) The difference between the indicated or recorded demand and the true demand, expressed as a percentage of the full-scale value of the demand meter or register.

demand factor The ratio of the maximum demand of an electrical system, or part of a system, to the total connected load of a system or that part of a system under consideration.

demand failure rate The probability (per demand) of failure that a component will fail to operate upon demand when required to start, change state, or function.

demand load The load that is drawn from the source of supply at the receiving terminals, averaged over a suitable and specified interval of time, expressed in kilowatts, amperes, etc.

demand meter (metering) A metering device that indicates or records the demand, maximum demand, or both. Note: Since demand involves both an electrical factor and a time factor, mechanisms responsive to each of these factors are required, as well as an indicating or recording mechanism.

demand paging The transfer of a page from auxiliary storage to real storage at the moment of need.

demand register (metering) A mechanism, for use with an integrating electricity meter, that indicates maximum demand and also registers electric energy (or other integrated quantity).

DEM, DEMOD See demodulator.

demineralization The reduction of the content of dissolved salts or inorganic substances in water by a physical, chemical or biological process.

demineralized water Water which has been treated to remove the minerals that are normally present in hard water. Demineralized water is required in some electronic applications where extreme precautions must be taken to prevent contamination. See also deionized water.

DEMODO See demodulator.

demodulation The process of retrieving intelligence (data) from a modulated carrier wave. The reverse of modulation.

demodulator A functional unit that converts a modulated signal into the original signal.

demodulator probe A probe designed for use with an oscilloscope, for displaying modulated high-frequency signals.

demon, daemon A procedure that is invoked without being called explicitly whenever an alteration, an addition, or a deletion occurs.

DeMorgan's theorem An equivalence statement used in a logical truth table.

demultiplexer A device that recovers as output signals, each of the signals combined by a preceding multiplexer.

demultiplexing Dividing of information streams into a larger number of streams (contrasted with multiplexing).

denary, decimal 1. Characterized by a selection, choice or condition that has ten possible different values or states. 2. Of a fixed radix numeration system, having a radix of ten.

dendrite A semiconductor crystal with a heavily branched, treelike structure which grows from the nucleus as the metal becomes solidified.

denitrification (water quality) The reduction of nitrate or nitrite to liberate nitrogen or nitrous oxide, usually by the action of bacteria.

dense binary code A code in which all possible states of the binary pattern are used.

densimeter An instrument for determining the density of a substance in absolute units, or for determining its specific gravity – that is, its relative density with respect to that of pure water. Also known as densitometer; density gage; density indicator; gravitometer.

densitometer An instrument for measuring the optical density (photographic transmission, photographic reflection, visual transmission, and so forth) of a material.

density 1. The number of units of useful information contained within a linear dimension, usually expressed in unit per inch. 2. Amount per unit cross-sectional area e.g., current, magnetic flux, or electrons in a beam. 3. For computing systems see packing density. 4. The mass per unit volume. The specific gravity of a body is the ratio of a density to the density of a standard substance. Water and air are commonly used as the standard substances.

density current The phenomenon of gravity flow of a liquid relative to another liquid, or of a relative flow within a liquid medium due to difference in density. See also salt-water wedge. Pertains to liquid flow measurement in open channels.

density measurement For detailed information on the subject of density measurement refer to, for example, the ISA publication Process Analyzers and Recorders. For measurement of density in SI units see under kilogram per cubic metre.

density modulation Modulation of an electron beam by varying the density of the electrons in the beam with time.

density packing The number of magnetic pulses (representing binary digits) stored on tape or drum per linear inch on a single head.

density transmitter An instrument used to determine liquid density by measuring the buoyant force on an air-filled float immersed in a flowing liquid stream.

deoxygenation (water quality) The partial or complete removal of dissolved oxygen from water, either

under natural conditions or deliberately by physical or chemical processes.

dependability The collective term used to describe the availability performance and its influencing factors: reliability performance, maintainability performance and maintenance support performance. Note: Dependability is used only for general descriptions in non-quantitative terms.

dependent linearity Nonlinearity errors expressed as a deviation from a desired straight line of fixed slope and/or position.

deperming Another name for demagnetization.

depolarizer A chemical substance, usually manganese dioxide, added to a dry or primary cell to remove the polarizing chemical products resulting from discharge, and thus to keep the discharge rate constant; to prevent formation of hydrogen bubbles at the positive electrode.

deposit Protecting the contents of an area of memory by writing to a backing store.

deposit attack See deposition corrosion.

deposition The application of a material to a substrate through the use of chemical, vapor, electrical, vacuum, or other processes.

deposition corrosion, deposit attack Pitting corrosion resulting from deposits on a metallic surface.

depressants (flotation) See flotation.

depressed cladding (optical communication) A region of the cladding, immediately adjacent to the core, having a value of the refractive index less than that of outer cladding regions.

depropanizer A unit of a processing plant where propane, a liquid hydrocarbon, is separated from natural gas.

depth-first search (search tree) A search that first picks up one of the possible branches at the highest level of the search tree and proceeds along the chosen branch to the level immediately below until the goal or a predetermined depth is reached. Note: If the goal has not been reached, the search backtracks to a previously unevaluated branch and proceeds as before.

depth integration method A method of sampling suspended sediment in which, by traversing the depth of the stream at a uniform speed, the sampler takes, at every point in the vertical, a small specimen of the water/sediment mixture, each increment of which is proportional to the local sediment load. Pertains to liquid flow measurement in open channels.

derandomizer The circuit which removes the effect of data randomizing, thereby recovering data which had been randomized for tape storage.

derate Use of a device or component at a lower current, voltage or power level than it can handle, in order to give longer life or reduce occurrence of stress-related failures. Related terms: derating, derating factor.

derating factor The factor by which the ratings of component parts are reduced to provide additional safety margins in critical applications or when the parts are subjected to extreme environmental conditions for which their normal ratings do not apply.

deresination, depitching The reduction of the contents of extractive substances (resin acid, fat, wax etc.) in pulp.

derivation action, D-action Type of control action in which the value of the output variable is proportional to the rate of change (first time derivative) of the input variable (i.e. in the case of a controller, of the system deviation).

derivation action coefficient 1. For an element with pure derivative action, the ratio of the value of

the output variable to the rate of change (time derivative) of the input variable. 2. For a derivative element the ratio of the value of the output variable to the rate of change or time derivative of the input variable.

derivative action gain (rate gain) 1. The ratio of maximum gain resulting from proportional plus derivative control action to the gain due to proportional control action alone. See ISA publication S51.1, 1979. 2. For a proportional plus derivative element and additional first order delay, called PD-T1-element, the ratio of the maximum gain resulting from the proportional plus derivative control action with first order delay to the gain due to proportional control action alone.

derivative action time For an element with pure derivative action, the derivative action time constant is equal to the derivative action coefficient if the input and output variables have the same dimension. Note: The derivative action time can also be given as that time, which a rampwise variation of the input variable needs to reach the same value as the output variable.

derivative action time constant For an element with pure derivative action, the derivative action time constant is equal to the derivative action coefficient if the input and output variables have the same dimensions. See also ISA publication S 51.1, 1979.

derivative control See derivative control action.

derivative control action (rate) (D) In process instrumentation, control action in which the output is proportional to the rate of change of the input.

derivative controller A controller which produces derivative control action only.

derivative control mode A controller mode in which controller output is directly proportional to the rate of change of controlled variable error.

derivative element, D-element Transfer element in which the value of the output variable is proportional to the rate of change or time derivative of the input variable.

derivative time The time interval by which rate action advances the effect of proportional action on the final control element.

derivative unit A device the output of which is proportional to the rate of change of its input variable.

derived capacity (pump) Volume displaced at defined minimum working pressure calculated from two measurements at different speeds.

derived quantity A quantity defined, in a system of quantities, as a function of base quantities of that system.

derived unit (of measurement) A unit of measurement of a derived quantity in a given system of quantities. In the International System of Units, SI there are 17 derived units built up from the base units according to simple laws of physics. These derived units have been given special names and symbols as follows: hertz (Hz), newton (N), pascal (Pa), joule (J), watt (W), coulomb (C), volt (V), farad (F), ohm, siemens (S), weber (Wb), tesla (T), henry (H), lumen (lm), lux (lx), gray (Gy), becquerel (Bq).

desalination The removal of salts from water usually to make it drinkable or usable as process or cooling water.

desalting plant (petroleum industry) An installation that removes salt water and crystalline salt from crude oil streams. Some plants use electrostatic precipitation; others employ chemical processes to remove salt.

DESC 1. Defence Electronics Supply Command (USA), the agency which sets mil-specs for all electronic components and verifies performance to these

requirements. 2. Government agency that controls procurement policies and monitors quality for military electronic contracts.

descaling Removing adherent deposits from a metal surface.

describing function For a non-linear element in steady-state, with a sinusoidal input signal, the frequency response obtained by taking only the fundamental sinusoidal component of the output signal. Note: The describing function may depend on the frequency and on the amplitude of the input signal. In the new proposed definition input signal and output signal are substituted by the term input variable and output variable respectively.

descriptor A computer word used specifically to define characteristics of a program element.

descriptor word In Honeywell TDC 3000 control systems, a supplementary operator information displayed on the video display for each point.

desensitization The saturation of one component (an amplifier, for instance) by another so that the first cannot perform its proper function.

desiccant A substance used as a drying agent because of its affinity for water.

desiccant drying The use of a drying agent to remove moisture from a stream of air or gas.

design (software) The process of defining the software architecture, components, modules, interfaces, test approach, and data for a software system to satisfy specified requirements. See also logic design.

design analysis 1. The evaluation of a design to determine correctness with respect to stated requirements, conformance to design standards, system efficiency, and other criteria. 2. The evaluation of alternative design approaches.

design analyzer An automated design tool that accepts information about a program's design and produces such outputs as module hierarchy diagrams, graphical representations of control and data structure, and lists of accessed data blocks.

design failure A failure due to inadequate design of an item.

design fault A fault due to inadequate design of an item.

design language A language with special constructs and, sometimes, verification protocols used to develop, analyze, and document a design.

design methodology A systematic approach to creating a design, consisting of the ordered application of a specific collection of tools, techniques, and guidelines.

design phase (software) The period of time in the software life cycle during which the designs for architecture, software components, interfaces, and data are created, documented, and verified to satisfy requirements.

design pressure The pressure used in the design of a vessel or device for the purpose of determining the minimum permissible thickness or physical characteristics of the parts for a given maximum working pressure (MWP) at a given temperature.

design requirement Any requirement that impacts or constrains the design of a software system or software system component; for example, functional requirements, physical requirements, performance requirements, software development standards, software quality assurance standards. See also requirements specification.

design review A formal meeting at which the preliminary or detailed design of a system is presented to

the user, customer, or other interested parties for comment and approval.

design specification (software) A specification that documents the design of a system or system component; for example, a software configuration item. Typical contents include system or component algorithms, control logic, data structures, data set-use information, input/output formats, and interface descriptions. See also requirements specification.

design steam temperature The temperature of steam for which a boiler is designed.

design stress The maximum permissible load per unit area a given structure can withstand in service, including all allowances for such things as unexpected or impact loads, corrosion, dimensional variations during fabrication and possible underestimation of service loading.

design verification See verification.

desired value 1. The value of a variable wanted at a given instant, under specified conditions. 2. The value of the controlled variable wanted or chosen. Note: The desired value equals the ideal value in an idealized system.

desk checking The manual simulation of program execution to detect faults through step-by-step examination of the source code for errors in logic or syntax. See also static analysis.

despotic network Network synchronized and controlled by one single clock.

destaticization Treatment of a material to minimize the accumulation of static electricity.

destination A station which is the data sink of the message.

destination address In computer systems having a source-destination architecture, the destination address is the address of the device register or memory location to which data is being transferred.

destination code The name of a terminal or processing program to which a message is directed.

destination station A station to which a message is directed.

destratification The mixing of layers of subsurface and surface water in a lake or reservoir, for example by natural forces (turnover) or artificial means.

destructive – readout memory, DRO memory See destructive readout.

destructive cursor On a cathode-ray tube (CRT) display device, a cursor that erases any character through which it passes as it is advanced, backspaced or otherwise moved.

destructive distillation Distillation is heating to drive off the volatile components of a substance and condensing the gases to a liquid. In destructive distillation there is nothing left of the original substance except an ash, almost pure carbon, after driving off all gaseous components.

destructive read (computing systems) A read process that also erases data in the source.

destructive readout A characteristic of a memory. The memory is said to have a destructive readout if information retrieved from memory must be written back in immediately after it is used or else it is lost. A core memory has destructive readout. Computers with destructive readouts contain special circuits to write information back into memory after readout.

destructive test Any test resulting in the destruction or drastic deterioration of the test specimen.

DESULF process (coke-oven plants) A coke-oven-gas liquid-desulphurization process which uses ammonia water. This process is dominating in Europe. See also stripping processes.

detail display A display showing a single point-tag name with its associated tuning constants, operational values, configuration data and other pertinent parameters. Refers to Honeywell TDC 3000 control systems.

detectability The quality of a measured variable in a specific environment that is determined by relative freedom from interfering energy or other characteristics of the same general nature as the measured variable.

detectable failures Failures that can be identified through periodic testing or can be revealed by a larm or anomalous indication.

detecting device, sensor 1. Part of a measuring transducer which converts the input signal into a form suitable for measurement. Note: The relationship between the input and output variables of a sensor is fundamental and cannot be altered by external means other than physically or functionally modifying the device. **2.** See also sensor.

detecting instrument An instrument intended to detect a quantity without special regard to its value, in some cases showing the approximative value and/or the sign of the quantity.

detection threshold See sensitivity (optical communication).

detectivity (optical communication) The reciprocal of noise equivalent power.

detector 1. A device or substance which indicates the presence of a particular quantity without necessarily providing its value. Note: In some cases, an indication may be produced only when the value of the quantity reaches a given threshold. Examples: Halogen leak detector, temperature-sensitive point. **2.** See transducer.

detent (fluid power systems) Device which retains the valving element in position by means of artificially created resistance. Movement to a different position is achieved either by release of the detent, or by the application of sufficient force to overcome it.

detention time (water quality) See retention period.

detergent A natural material or synthetic substance having the soaplike quality of being able to emulsify oil and remove soil from a surface.

deterioration Decline in the quality of a device, mechanism or structure over time due to environmental effects, corrosion, wear or gradual changes in material properties; if allowed to continue unchecked, deterioration often leads to degradation failure.

determinant (circuits and systems) A square array of numbers or elements bordered on either side by a straight line. The value of the determinant is a function of its elements.

determinate fault For an item which produces a response as a result of an action, a fault for which the response is the same for all actions.

determination test A test used to establish the value of a characteristic or a property of an item.

deterministic Result of a process that depends on the initial state and inputs.

deterministic signal A signal the future behavior of which can be predicted precisely.

deterministic simulation A simulation in which a fixed relationship exists between input parameters and output results for each action, value, event etc., such that given input parameters will always result in the same output.

detritus In a biological context, organic particulate matter. In the context of sewage treatment practice, coarse debris denser than water but capable of being transported in moving water.

Deutsches Institut für Normung (DIN) The German standard-setting organization.

deuteron detector A type of specialized radiation detector used in some nuclear reactors to detect the concentration of deuterium nuclei present.

developed boiler horsepower The boiler horsepower generated by a steam generating unit.

developed lift (pressure relief valves) The developed lift is the actual travel of the disk from closed position to the position reached when the valve is at flow rating pressure.

development cycle See software development cycle.

development life cycle See software development cycle.

development methodology (software) A systematic approach to the creation of software that defines development phases and specifies the activities, products, verification procedures, and completion criteria for each phase.

development specification Synonymous with requirements specification in DOD usage.

deviation 1. Difference between the desired value and the actual value of a variable at a given instant. Note: This definition applies whether the desired value is constant or varies in time. **2.** The error or difference between the instantaneous value of the controlled variable and the setpoint. **3.** In frequency modulation, the difference between the instantaneous frequency of the modulated and unmodulated carrier. **4.** Any departure from a desired value or expected value or pattern.

deviation alarm An alarm caused by a variable departing from its desired value by a specified amount.

deviation alarm sensor A device that detects that a variable has departed from its desired value by more than a preset amount.

deviation controller A type of automatic control device which acts in response to any difference between the value of a process variable and the instrument setpoint, independent of their actual values.

deviation group display A display showing the deviation of the points assigned to a group. Refers to Honeywell TDC 3000 control systems.

deviation ratio 1. In a frequency-modulation system, the ratio of the maximum frequency deviation to the maximum modulating frequency of the system under specified conditions. **2.** The factor by which automatic control reduces the deviation resulting from sinusoidal disturbances in a process. For each frequency of disturbance, it compares the values of deviation with and without the controller. A ratio of over 1,0 means the deviation is larger with the controller.

deviation reduction factor Like deviation ratio, this is a factor evaluating how much the controller reduces the deviations caused by disturbances. The higher the deviation reduction factor, the smaller the controlled deviations. The value depends on the form and point of occurrence of the disturbance.

device 1. An apparatus or hardware element for performing a prescribed function. **2.** See storage device. **3.** Part of a programmable controller system.

device (field bus) Physical entity connected to the field bus composed of at least one communication element (the network element) and which may have a control element and/or a final element (transducer, actuator etc.).

device channel A dedicated channel associated with a device; connects a file variable to that device.

device complexity The number of circuit elements within an integrated circuit.

device control character A control character used to specify a control function for peripheral devices associated with a computer system. Note: Device control characters are described in ISO 646 and ISO 6429.

device control unit, device controller A hardware device that controls the reading, writing or display of data at one or more input/output devices or terminals. See also transmission control unit.

device driver A program/routine that controls the physical hardware activities on a peripheral device; a device driver is generally the device-dependent software interface between a device and the common, device-independent I/O code in an operating system.

device flags One-bit registers which record the current status of a device.

device handler A program/routine that drives or services an I/O device; a device handler is similar to a device driver but provides more control and interfacing functions than a device driver.

device independence The ability to request input/output operations without regard to the characteristics of the input/output devices.

dewatering 1. In treatment of sludge, the process whereby wet sludge, usually conditioned by a coagulant, has its water content reduced by physical means. 2. Removing water from solid or semisolid material – for instance, by centrifuging, filtering, settling or evaporation. 3. Removing water from a riverbed, pond, caisson or other enclosure by pumping or evaporation. 4. Pertaining to pulp and paper manufacturing, thickening on a wire.

dew cell See dewpoint-type sensors.

dewetting 1. Generally, loss of surface attraction between a solid and a liquid. 2. Specifically, flow of solder away from a soldered joint upon reheating.

dew point For a given pressure, the temperature at which water vapor begins to condense. Note: This is the temperature at which the partial pressure of the water vapor would be the same as the vapor pressure of water at that temperature.

dew point measurement Applications for dew point of air exist in industries involving air conditioning, warehouse storage, refrigeration, cargo handling, blast furnaces, food processing and many others where it might be desirable to indicate, record or control dew point temperatures.

dew-point temperature That temperature at which condensation of moisture from the vapor phase begins.

dewpoint-type sensors Three types of dewpoint sensors are in use: 1. Condensation type (for mirror method). 2. Aluminium oxide impedance type. The thin film aluminium oxide hygrometer sensor is a transducer that converts water vapor pressure into an electrical signal. 3. Heated lithium chloride. The sensor consists of a thin wall tube, generally metal, containing a platinum resistance temperature sensor. Full details about dewpoint sensors and moisture and humidity measurement in general are outlined in ISA publication Process Analyzers and Recorders.

DH process (in steelmaking) Dortmund – Horder – Huttererun Process. A recirculation degassing process.

diac 1. Two-lead alternating current switching semiconductor. 2. See three-layer diode. 3. A bidirectional breakdown diode which conducts only when a specified breakdown voltage is exceeded.

diad A group of two items used to express quaternary digits binary form.

diagnostic Pertaining to the detection and isolation of a malfunction or mistake. See also check problem.

diagnostic check A routine designed to locate a malfunction. Used in debugging a program.

diagnostic code An alphanumeric or word display that indicates a system condition such as a malfunction. The code is either self-explanatory, or used to refer to further instructions that are explained in an operator guide.

diagnostic factor A variable or fixed stress, which can be applied periodically or continuously during an accelerated test, to measure the degree of aging without in itself influencing the aging process.

diagnostic function The capability of the hardware to diagnose internal problems and indicate those errors as a status. Note: Diagnostic function may be available on-line or only when the hardware is operating in an off-line testing mode.

diagnostic program A computer program that recognizes, locates and explains either a fault in equipment or a mistake in a computer program.

diagnostic test The running of a machine program or routine for the purpose of discovering a failure or a potential failure of a machine element, and to determine its location or its potential location.

diagnostic trace program A particular type of diagnostic program for the performance of checks on other programs or for demonstrating such operations.

diagnositor In a computer, combined diagnostic and edit routine that questions unusual situations and makes note of the implied results.

diagram 1. Graphical presentation depicting, by the use of graphical symbols and outlines with inscriptions, the relations among the components and the parts of a system or of an equipment including interconnections. 2. See logic diagram.

dial The part of an indicating device, fixed or moving, which carries the scale or scales. Note: In some indicating devices, the dial takes the form of drums or discs bearing numbers and moving relative to a fixed index or window.

DIAL 1. Display Interactive Assembly Language (DEC). 2. Drum Interrogation, Alteration and Loading System (Honeywell).

dial indicator Any meter or gage with a graduated circular face and a pivoted pointer to indicate the reading.

dialing Establishing a connection, through common communication lines, between a central computing system and a remote terminal.

dial line See switched line.

diallyl phthalate A thermosetting resin that has excellent electrical insulation properties.

dialog component (in artificial intelligence) The component of a knowledge-based system that interfaces with the user in a conversational manner.

dialog control Corresponds to the session layer in the International Standard's Organization (ISO) model. The control of the direction of flow by the data flow control layer.

dialysis (water quality) A process by which small molecules or ions diffuse through a membrane thus causing their separation from larger molecules in solution and from suspended matter.

diamagnetic material A substance whose specific permeability is less than 1.00 and is therefore weakly repelled by a magnetic field.

diameter ratio (of a device used in a given conduit) The diameter of the orifice (or throat) of the primary device divided by the diameter of the conduit, upstream of the primary device.

diamond lattice The crystal structure of germanium and silicon (as well as a diamond).

diaphragm A flexible pressure responsive element. Pertaining to diaphragm type actuator the diaphragm transmits force to the diaphragm plate and actuator stem.

diaphragm (as in a diaphragm valve) The valve closure member in a diaphragm valve such as the Saunders patent diaphragm valve, which provides a variable restriction to flow.

diaphragm – lever actuator It is similar to the piston-lever actuator but instead of a piston, the force is transmitted by a diaphragm and lever. This type of actuator is usually used for control rather than on-off application. Positioners and fail safe devices along with other accessories may also be added.

diaphragm actuator An assembly utilizing fluid pressure acting on a diaphragm to develop a force to move the actuator stem. It may, or may not, have a spring for positioning and return of the actuator stem.

diaphragm box method (of liquid level measurement) A method of measuring liquid level in open vessels based on the static pressure method. The diaphragm box connected by a tube to a pressure gage, contains a relatively large amount of air which is retained by a flexible diaphragm. The pressure exerted by the head of liquid against the underside of the diaphragm compresses the air within the box until the air pressure on the upper side is equal to the liquid pressure. The gage measures the air pressure but is calibrated in terms of liquid level. There are two types of diaphragm boxes – the open type, which is immersed in the liquid in the vessel; and the closed type, which is mounted externally and connected to the vessel by a short length of piping.

diaphragm capsule gages The diaphragm capsule pressure measuring element is made up to a number of circularly formed diaphragms which are welded together at both their inner and outer edges around their complete periphery. The complete unit becomes a flexible sac or container, closed off at one end and open to a piece of connecting tubing at the other end. The process pressure is applied to the inside of the capsule through the connecting tube, which then expands the capsule with a resulting movement of the closed end.

diaphragm case Pertaining to diaphragm type actuator, a housing, consisting of top and bottom sections, used for supporting a diaphragm and establishing one or two pressure chambers.

diaphragm control valve A control valve that is actuated by a diaphragm or one having a spring-diaphragm actuator.

diaphragm gage An instrument in which the pressure is measured from the displacement of a diaphragm, only one side of which is subjected to the pressure to be measured.

diaphragm motor A diaphragm mechanism used to position a pneumatically operated control element in response to the action of a pneumatic controller or pneumatic positioning relay.

diaphragm plate Pertaining to diaphragm type actuator, a plate concentric with the diaphragm for transmitting force to the actuator stem.

diaphragm pressure span Pertaining to diaphragm actuated control valves, difference between the high and low values of the diaphragm pressure range. This may be stated as an inherent or installed characteristic.

diaphragm seal A device designed to protect a pressure measuring instrument (pressure gage) from corrosive process liquids or gases.

diaphragm type cylinder (fluid power systems) Cylinder in which the mechanical force is produced by fluid pressure acting on a diaphragm.

diaphragm valve 1. A valve in which a flexible closure member isolates the line fluid from the actuating mechanism and provides a seal to atmosphere. Two diaphragm valve designs are available. The Weir type with a raised bridge wall, and the straightway type where the diaphragm projects into approximately the full pipe bore. The latter design has a higher flow capacity and is better suited for fibrous slurry service but has half the differential pressure rating of the Weir type. The Weir type is also built in what is known as full bore design so as to pass line-cleaning balls used in food and brewery service. **2.** A valve with a flexible linear motion closure member that is forced into the internal flow passageway of the body by the actuator.

diathermal apparatus Apparatus for generating heat in body tissue by high frequency electromagnetic radiation.

diatoms (water quality) Unicellular algae of the class Bacillariacea.

dibit A group of two bits. In four-phase modulation each possible dibit is encoded in the form of one of four unique phase shifts of the carrier. The four possible states for a dibit are 00, 01, 10 and 11.

dichotomizing search A search in which an ordered set of data elements is partitioned into two mutually exclusive parts, one of which is rejected; the process is repeated on the accepted part until the search is completed.

dichroic filter (optical communication) An optical filter designed to separate optical radiation into two spectral bands. Note: Examples are high and low pass filters.

dichroic mirror (optical communication) A mirror designed to reflect light selectively according to wavelength.

dictionary 1. An alphabetic list of the words of a language, with their accepted meanings. **2.** A list of code names or keywords used in a routine or system and an indication of their intended meanings.

diddle Automatic transmission of letter or figure characters by the terminal unit if no characters are ready for transmission.

die body The stationary part of a powder pressing or extrusion die.

die bonding 1. The method by which a semiconductor die, or chip, is attached to a mechanical support. **2.** Attaching semiconductor chip to the substrate, with an epoxy, eutectic, or solder alloy.

die casting 1. A casting process in which molten metal is forced under pressure into the cavity of a metal mold. **2.** A part made by this process.

die forging The process of forming shaped metal parts by pressure or impact between two dies.

dielectric A non-conducting material through which induction of magnetic lines of force may pass.

dielectric amplifier Operates through a capacitor; the capacitance varies with applied voltage.

dielectric breakdown 1. An abrupt increase in the flow of electric current through a dielectric material as the applied electric field strength exceeds a critical value. **2.** A complete failure of a dielectric material characterized by a disruptive electrical discharge through the material due to a sudden and large increase in voltage.

dielectric coating An optical coating made up of one or more layers of dielectric (nonconductive) materials. The layer structure determines what fractions of incident light at various wave lengths are transmitted and reflected.

dielectric constant A dielectric material's ability to store electrostatic energy, compared to air. Symbol: K .

dielectric crystal A crystal that is characterized by its relatively poor electrical conductance.

dielectric process Also called electrographic process. A nonimpact printing technique specially treated paper consisting of a conductive base layer coated with a nonconductive thermoplastic material is used to hold an electric charge applied directly by a set of electrode styli. The electric charge corresponds to the latent image of the original.

dielectric strength See breakdown voltage rating and insulation resistance.

diesel fuel A fuel made of light gas-oil range of refinery products. Diesel fuel and furnace oil are virtually the same product.

difference 1. In a subtraction operation, the number or quantity that is the result of subtracting the subtrahend from the minuend. **2.** The output equals the algebraic difference between the two inputs.

difference amplifier See differential amplifier.

difference galvanometer A galvanometer intended to measure the difference of two currents.

differential In electronics, the difference between two levels. A method of signal transmission through two wires which always have opposite states.

differential (method of) measurement 1. A method of measurement in which the measurand is compared with a quantity of the same kind, of known value only slightly different from the value of the measurand, and in which the difference between the two values is measured. Example: Measurement of the diameter of a piston by means of gage blocks and comparator. **2.** A comparison method of measurement, based on comparing the quantity to be measured with a quantity of the same kind having a known value only slightly different from that of the quantity to be measured, and measuring the algebraic difference between the values of these two quantities.

differential aeration cell An oxygen concentration cell.

differential amplifier An amplifier that has two input circuits and that amplifies the difference between the two input signals.

differential analyzer A computer (usually analog) designed and used primarily for solving many types of differential equations.

differential angle The total angle from the operation to the releasing position in a mercury switch.

differential comparator 1. A circuit in which differential-amplifier design technique are applied to the comparison of an input voltage with a reference voltage. When the input voltage is lower than the reference voltage, the circuit output is in one state; when the input voltage is higher than the reference voltage, the output is in the opposite state. **2.** A differential circuit for indicating when two input signals are essentially equal, as in a differential pair.

differential control current (magnetic amplifier) The total absolute change in current in a specified control winding necessary to obtain differential output voltage when the control current is varied very slowly.

differential control voltage (magnetic amplifier) The total absolute change in voltage across the specified control terminals necessary to obtain differ-

ential output voltage when the control voltage is varied very slowly.

differential cooling A lowering of temperature which takes place at a different rate at various points on an object or surface.

differential delay The difference between the maximum and minimum frequency delays occurring across a band.

differential discriminator A discriminator that passes only pulses having amplitudes between two predetermined values, neither of which is zero.

differential equation An equation containing derivatives or differentials of an unknown function, i.e., the solution satisfies the equation identically throughout some interval of x . The general solution represents the set of functions that satisfy the equation. Related to physical problems, the arbitrary constants are determined from additional conditions which must be satisfied. Most differential equations result from mathematical relations and descriptions of motion and change.

differential gap 1. Difference between the upper and lower switching values of a transfer element with step action. **2.** Pertaining to control action, difference between the upper and lower switching values. Note: This should not be confused with "neutral zone". **3.** See neutral zone.

differential gap control Control in which the output of a controller remains at a maximum or minimum value until the controlled variable crosses a band or gap, causing the output to reverse. The controlled variable must then cross the gap in the opposite direction before the output is restored to its original condition.

differential generator A synchro differential generator driven by a servo system.

differential input The difference between the instantaneous values of two voltages both being biased by a common mode voltage.

differential input (to a signal conditioner) An input in which both sides are isolated from the chassis and power supply ground. The signal is applied as a differential voltage across the two sides.

differential linearity The measure of linearity among digital states in A/D and D/A converters.

differential mode interference See normal mode interference.

differential output current (magnetic amplifier) The ratio of differential output voltage to rated load impedance.

differential pressure The pressure difference generated by the primary device, when there is no difference in datum level between the upstream and downstream pressure tapings.

differential pressure device Device inserted in a conduit to create a pressure difference whose measurement, together with a knowledge of the fluid conditions and of the geometry of the device and the conduit, enables the flow rate to be calculated. See orifice plate, nozzle and venturi tube.

differential pressure (of a pilot tube) Difference between the pressures measured at the total and static pressure tapings of a Pitot static tube or between those measured at the pressure tapping of a total pressure Pitot tube and at a conduit wall pressure tapping.

differential pressure ratio The differential pressure divided by the absolute pressure at the centre of the cross-section of the conduit containing the upstream tapping. Pertains to measurement of fluid flow in closed conduits.

differential pressure switch Device incorporating an electrical switch or switches in which actuation of

the contacts is effected at predetermined values of differential pressure.

differential pressure transducer A pressure transducer that accepts simultaneously two independent pressure sources, and the output of which is proportional to the pressure difference between the sources.

differential pressure transmitter Any of several transducers designed to measure the pressure difference between two points in a process and transmit a standardized signal proportional to this difference.

differential pressure gage, differential pressure instrument Any of several instruments designed to measure the difference between two pressures.

differential pressure type liquid level meter Any of several devices designed to measure the head of liquid in a tank above same minimum level and produce an indication proportional to this value; alternatively, the head below some maximum level can be measured and similarly displayed.

differential relay A relay with multiple windings that functions when the voltage, current, or power difference between the windings reaches a predetermined value.

differential resolver A device used for zero shift or offset in numerical control systems that utilize resolver or flat type feedback. It is connected electrically between the reference and the feedback. When the shaft of the resolver is turned, it shifts the phase of the reference signal to the position feedback unit and creates the signal that tells the slide to move.

differential transducer A device capable of simultaneously measuring two separate stimuli and providing an output proportionate to the difference between them.

differential transformer Also called linear variable-differential transformer. **1.** A transformer used to join two or more sources of signals to a common transmission line. **2.** An electromechanical device which continuously translates displacement of position change into a linear ac voltage.

differential voltage gain **1.** The ratio of the change in output signal voltage at either terminal of a differential device to the change in signal voltage applied to either input terminal, all voltages measured to ground. **2.** The ratio of the differential output voltage of an amplifier to the differential input voltage of the amplifier. If the amplifier has one output terminal, the differential voltage gain is the ratio of the ac output voltage (with respect to ground) to the differential input voltage.

differential winding A coil winding so arranged that its magnetic field opposes that of a nearby coil.

differential-wound field A type of motor or generator field having both series and shunt coils connected so they oppose each other.

differentiate **1.** To find the derivative of a function. **2.** To deliver an output that is the derivative with respect to time of the input. **3.** To distinguish objects or ideas from others.

differentiating circuit A circuit whose output voltage is proportional to the rate of change of the input voltage. The output waveform is then the time derivative of the input waveform, and the phase of the output waveform leads that of the input by 90°. An RC circuit gives this differentiating action. Also called differentiating network and differentiator.

differentiating network See differentiating circuit.

differentiator A device whose output function is proportional to the derivative, i.e., the rate of change, of its input function with respect to one or more variables (usually with respect to time).

diffracted beam In x-ray crystallography, a beam of radiation composed of a large number of scattered rays mutually reinforcing one another.

diffracted wave The wave component existing in the primary propagation medium after an interaction between the wave and a discontinuity or a second medium; the diffracted wave coexists in the primary medium with incident waves and with waves reflected from suitable plane boundaries.

diffraction (optical communication) The phenomenon whereby the propagation of a wave differs from that predicted by geometric optics due to the influence on that wave of an opening, obstruction or inhomogeneity in the medium.

diffraction (general) A process that produces a diffracted wave.

diffuse blue reflectance factor, (ISO brightness), not whiteness The intrinsic reflectance factor at an effective wavelength of 457 nm. The diffuse blue reflectance factor is measured according to a standardized test procedure.

diffused junction (semiconductor) A junction which has been formed by the diffusion of an impurity within a semiconductor crystal.

diffused semiconductor strain gage A component used in manufacturing transducers, principally diaphragm-type pressure transducers, that consists of a slice of silicon about 2.5 to 22 mm in diameter into which an impurity element such as boron has been diffused; modern photo lithographic-masking techniques make it possible to simultaneously produce hundreds of full four-arm Wheatstone bridge patterns, complete with leadwire soldering pads, on a single slice of silicon about 50 to 75 mm (2 to 3 in.) in diameter.

diffuser **1.** A vertical, closed, cylindrical vessel with a screen plate at the bottom in which black liquor is washed out of batch-cooked sulphate pulp; see continuous diffuser washer. **2.** A device used to scatter or disperse light emitted from a source.

diffusion **1.** Migration of the atoms or molecules of one substance in another substance, usually from an area of high concentration to an area of low concentration. Diffusion of a substance into the outer layer of a metal object, especially of carbon in the surface of steel, was previously known as cementation. **2.** A process used in the production of semiconductors which introduces minute amounts of impurities into a substrate material such as silicon or germanium and permits the impurity to spread into the substrate. The process is very dependent on temperature and time.

diffusion firing furnace Systems designed for enclosed elevated temperature processing of solid-state devices and systems in gaseous atmospheres. Diffusion furnaces are operated at temperatures from 1 000 to 1 300°C to achieve doping of semiconductor substrates, by one of a number of processes.

diffusion transistor A transistor in which current depends on the diffusion of carriers, donors, or acceptors, as in a junction resistor.

digested sludge Sewage sludge which has been stabilized by the action of micro-organisms in either the presence or absence of oxygen.

digester A pressure vessel for the cooking of fiber raw material.

digester house The department in the pulp mill in which the digesters are housed.

digestion The stabilization, by biological processes, of organic matter in sludge, normally by an anaerobic process.

digit, numeric character A symbol that represents one of the nonnegative integers smaller than the radix, for example, in decimal notation, a digit is one of the characters from 0 to 9.

digit place, digit position In a positional representation, each site that may be occupied by a character and that may be identified by an ordinal number or by an equivalent identifier.

digit position See digit place.

digital Pertaining to data that consist of digits. Contrast with analog.

digital amplifier Amplifier the output of which varies in discrete steps related to the control signal.

digital-analog converter See digital-to-analog converter.

digital back-up An alternate method of digital process control initiated by use of special purpose digital logic in the event of a failure in the computer system.

digital circuit A circuit which has only two stable states, operating in the manner of a switch, that is, it is either "on" or "off" or "high" or "low".

digital clock A series of synchronized pulses that determine the bit times (data rate) of a digital pattern.

digital communication 1. The transmission of intelligence by the use of encoded numbers – usually uses binary rather than decimal number system. 2. A system of telecommunications employing a nominally discontinuous signal that changes in frequency, amplitude, or polarity.

digital communications interface equipment Line interface equipment include modems (adapters, data sets).

digital computer 1. A computer in which discrete representation of data is mainly used. 2. A computer that operates on discrete data by performing arithmetic and logic processes on these data. Contrast with analog computer.

digital controller (data processing) A controller that accepts an input sequence of numbers and processes them to produce an output sequence of numbers.

digital converter, code translator A device, or group of devices, that converts an input numerical signal or code of one type into an output numerical signal or code of another type.

digital data 1. Data consisting only of characters. 2. Data represented by digits, perhaps with special characters and the space character. 3. Data represented in discrete, discontinuous form, as contrasted with analog data represented in continuous form. Digital data is usually represented by means of coded characters, for example, numbers, signs, symbols, etc.

digital data-handling system The electronic equipment which receives digital data, operates on it in a suitable manner, records it in a suitable manner on a suitable medium, and presents it directly to a computer or a display.

digital delay generator An electronic instrument which can be programmed digitally to delay a signal by a specific interval-time delay generator.

digital device 1. Typically, an IC that switches between two exclusive states or levels, usually represented by logical 1 or 0. 2. An electronic device that processes electrical signals that have only two states, such as "on" or "off", "high" or "low" voltages, or "positive" or "negative" voltages. In electronics "digital" normally means binary or two-state.

digital differential analyzer, DDA 1. An incremental computer in which the principal type of computing unit is a digital integrator whose operation is similar to the operation of an integrating mechanism. 2. A

differential analyzer that uses digital representations for the analog quantities.

digital encoding Use of a digital code to encode an analog or digital signal.

digital filter 1. An algorithm which reduces undesirable frequencies in the signal. 2. A software technique used to eliminate undesired or irrelevant data. Refers to Honeywell TDC 3000 control systems.

digital filtering A computational process or algorithm by which a sampled signal or sequence of numbers, acting as input, is transformed into a second sequence of numbers called the output. The computational process may correspond to high-pass, low-pass, bandpass, or bandstop filtering, integration, differentiation, or something else. The second sequence can be used for further processing, as in a fast-Fourier transform analyzer, or it can be converted to an analog signal, producing a filtered version of the original analog signal.

digital fluidics That section of fluidics which deals with digital data.

digital frequency monitor A special purpose digital counter that permits a train of pulses to pass through a gate for a predetermined time interval, counts them and indicates the number counted.

digital IC 1. A switching type integrated circuit. 2. An IC that processes electrical signals that have only two states, such as "on" or "off", "high" or "low" voltages, or "positive" or "negative" voltages. In electronics "digital" normally means binary or two-state. 3. Digital integrated circuit (SSI, MSI, LSI), a monolithic group of logic elements. May be small-scale integration (e.g., SSI gates, flip-flops, latches); medium-scale integration (e.g., MSI decoders, adders, counters); large-scale integration (e.g., LSI memories, microprocessors).

digital image analysis Technology to measure and standardize the output of a computer-interfaced video system.

digital indication See indicating device.

digital information display The presentation of digital information in tabular form on the face of a digital information display tube.

digital integrator Device for summing or totalizing areas under curves that gives numerical readout. Also see integrator.

digital logic A signal level is represented as a number value with a most significant and least significant bit. Binary digital logic uses numbers consisting of strings of 1's and 0's.

digital logic modules Circuits which perform basic logic decisions AND/OR/NOT.

digital measuring instrument A measuring instrument which provides a digitized output and/or display. Note: This term relates to the form of presentation of the output or display, not to the principle of operation of the instrument. Examples: Digital voltmeter, digital ohmmeter.

digital motor See stepping motor.

digital multiplexer A data selection device that permits sharing a common information path between multiple groups of digital devices, such as from a computer CPU to any of several groups of digital output devices.

digital ohmmeter See digital measuring instrument.

digital optical disk See optical disk.

digital output (electrical transducers) Transducer output that represents the magnitude of the measurand in the form of a series of discrete quantities coded in a system of notation. Note: Distinguished from analog output.

digital point 1. A user-defined process variable that represents a device that has on/off or open/closed states (e.g., a switch). **2.** An individual hardware connection to monitor or control the process through pulses or logic levels. Refers to Honeywell TDC 3000 control systems.

digital positioner The digital positioner is a single acting, two stage, force balance instrument. It receives a digital electrical signal and positions a pneumatic control valve.

digital position transducer A device that converts motion or position into digital information.

digital readout Pertaining to measuring instruments, presentations of the values of the measured quantity by means of figures appearing discontinuously, forming a number which directly indicated each of those values. Opposed to analog readout.

digital representation A discrete representation of quantized value of a variable, i.e. the representation of a number, by digits, perhaps with special characters and the space character.

digital resolution The value of the least significant digit in a digitally coded representation; also used to denote that fraction of full scale represented by one quantum.

digital rotary transducer A rotating device utilizing an optical sensor that produces a serial binary output as a result of shaft rotation.

digital signal A signal the information parameter of which may assume any value out of a set of discrete values which are represented by numbers.

digital signature A numerical representation of a set of logic states, typically used to describe the logic-state history at one device under test output pin during the complete test program.

digital speech communications Transmission of voice signals in digitized or binary form.

digital speed transducer See digital tachometer.

digital status contact A logical (on/off) input used mainly to sense the status of remote equipment in process control systems.

digital storage oscilloscope In a digital storage oscilloscope, the data is stored in a memory inside the oscilloscope, the data being "read" and displayed on the face of the cathode ray tube as often as necessary to give the impression of a continuous display.

digital switch 1. A means to interconnect two or more circuits whose information is represented in digital form, using a time-divided network consisting of nonlinear elements. **2.** An automatic switching center capable of switching digital signals. It may be a "circuit switch" or a "message switch".

digital tachometer Any of several instruments designed to determine rotational speed and display the indication in digital form.

digital telemetering Telemetering in which a numerical representation is generated and transmitted; the number being representative of the quantity being measured.

digital telemeter receiver A device that receives the numerical signal transmitted by a digital telemeter transmitter and stores it or converts it to a usable form, or both, for such purposes as recording, indication or control.

digital telemeter transmitter A device that converts its input signal to a numerical form for transmission to a digital telemeter receiver over an interconnecting channel.

digital thermometer Electronic temperature measuring device that reads and/or prints out numerically.

digital-to-analog conversion The transformation of a digital representation of a quantity into the analog value of that quantity.

digital-to-analog converter, D/A or DAC A converter which changes a digital input signal into an analog output signal.

digital-to-analog multiplier, DAM A device which provides the means of obtaining the continuous multiplication of a specific digital value with a changing analog variable. The product is represented by a varying analog voltage. Syn: Multiplying – digital-to-analog converter (MDAC).

digital transmission 1. A mode of transmission in which all information to be transmitted over the facility is first converted into digital form and then sent down the line as a stream of pulses. (Such transmission may imply a serial bit stream, but parallel forms are also possible). When noise and distortion threaten to destroy the integrity of the pulse stream, the pulses are detected and generated. **2.** The transmission of a signal in which information is represented by a code of discrete elements. Compare with analog transmission.

digital valves With digital valves, the final control element in a closed loop control system may be more readily interfaced with a computer. One design consists of a series of on-off valve elements installed in a common body. These elements are a computer operated relay system. When open, each element offers a different orifice area, thus, by a binary bit code (on-off) the combination of orifice areas is made to give the desired flow.

digital voltmeter See digital measuring instrument.

digit compression Any of a number of techniques used to pack digits.

(to) digitize To convert an analog measurement of a physical variable into a numerical value, thereby expressing the quantity in digital form. See analog-to-digital converter.

digitized signal Representation of information by a set of discrete values, in accordance with a prescribed law. Every discrete value represents a definite range of the original undigitized signal. See analog-to-digital converter.

digitized speech A numerical representation of speech in which the amplitude of the speech waveform as been recorded at regular intervals. Speech is typically sampled from 8,000 to 12,500 times per second.

digitizer A device which converts an analog measurement into a digital form.

digitizers A purely graphical input device (i.e. a CAD/CAM/CAE) system digitizer for convening locations into storable electronic impulses) with a surface on which a location or a point is selected and then automatically converted into a digital x y coordinate suitable for transmission to a computer.

digitizing The process of converting an analog signal to a digital signal.

digitron display A type of display in which all digits appear in the same plane.

digit-transfer bus The main wire or wires used to transfer information (but not control signals) among the various registers in a digital computer.

dilatometer An apparatus for accurately measuring thermal expansion of materials.

dilution Adding solvent to a solution to lower its concentration.

dilution methods Methods in which the discharge is deduced from the determination of the ratio of the concentration of the tracer injected to that of the tracer

at the sampling cross-section. See also dilution ratio. Pertains to liquid flow measurement in open channels.

dilution ratio 1. The ratio of the concentration of tracer in the injected solution to that at the downstream sampling section. Pertains to liquid flow measurement in open channels. **2.** The ratio of the concentration of tracer in the injected solution to that in the sampling cross-section. Pertains to measurement of fluid flow in closed conduits.

dimensional stability (of paper or board) The ability (of paper or board) to maintain its size and shape when exposed to changes in moisture content or to mechanical stresses.

dimensionless quantity A quantity in the expression of which the exponents of the base quantities, in a given system, are zero. Examples: Linear strain, coefficient of friction, refractive index are dimensionless quantities in the system of quantities, *l*, *m*, *t*.

dimensionless velocity (relative velocity) The ratio of the flow velocity at a given point to a reference velocity measured at the same time which may be the velocity at a particular point (for example the centre-line velocity) or the discharge velocity.

dimension of a quantity An expression which represents a quantity of a system of quantities as the product of powers of the base quantities of the system.

diminished radix complement, radix-minus-one complement A complement obtained by subtracting each digit of the given number from the number that is one less than the radix of that digit place.

DIN Abbreviation for Deutsches Institut für Normung. Determines the standards for electrical and other equipment in Germany.

DIN jack A system of multipin jacks and plugs allowing several connections to be made at once. named after the German Institute for Standards (DIN).

diode 1. A device utilized to permit current flow in one direction in a circuit, and to inhibit current flow in the other direction. In computers, these diodes are primarily germanium or silicon crystals. **2.** A vacuum tube with two active electrodes.

diode function generator (analog computers) A function generator that uses the transfer characteristics of resistive networks containing biased diodes. The desired function is approximated by linear segments whose values are manually inserted by means of potentiometers and switches.

diode gate An AND gate that uses diodes as a switching element.

diode laser A laser in which stimulated emission is produced at a p-n junction in a semiconductor material.

diode photodetector (optical communication) An optical detector in which a photocurrent is generated by absorption of radiation in the neighbourhood of a PN junction between two semiconductors composition or of a junction between a semiconductor and a metal.

diode rectification The conversion of an alternating current into a unidirectional current by means of a two-element device such as crystal, vacuum tube, etc.

diode-transistor logic, DTL 1. A logic circuit that uses diodes at the input to perform the electronic logic function that activates the circuit transistor output. **2.** Any logic gate circuit that uses several diodes to perform the AND or OR function, followed by one or more transistors to add power to (and possibly invert) the output. Formerly very popular in digital systems, but now largely superseded by TTL circuits. **3.** Logic employing diodes at the input with transistors used as amplifiers and resistor pull-up on the output.

diopter 1. The unit of optical measurement which expresses the refractive power of a lens or prism. **2.** A measure of lens power equal to the reciprocal of the lens focal length in meters.

DI/OU Data Input/Output Unit, a device that interfaces to the process for the sole purpose of acquiring or sending data.

DIP See dual in-line package.

dip (electro plating) A solution used for the purpose of producing a chemical reaction upon the surface of a metal.

dip coating 1. Pertaining to pulp and paper manufacturing, a method of coating a web in which the web passes beneath a roll in a bath containing the coating material. **2.** A method of applying an insulating coating to a conductor by passing it through an applicator containing the insulating medium in liquid form. The insulation is then sized and passed through ovens to solidify.

dip needle A device for indicating the angle, in a vertical plane, between a magnetic field and the horizontal plane.

dipole An antenna consisting of a straight conductor (usually not more than half-wavelength long) divided at its electrical centre for connection to a transmission line.

dipping The process of impregnating or coating insulating materials or windings by the simple method of immersion in the liquid insulating material.

dip solder, dip soldered Process of making electrical connections, usually to a printed circuit board, by the use of dipping one side of the board in molten solder, thus soldering the projecting component leads to the circuitry printed on the board.

dip solder terminal The terminals on a connector which are inserted into holes in the pc board and then soldered in place.

dipstick Removable graduated rod for indicating the level of the contents of a reservoir.

dip tube See bubble type.

direct access device See random access device.

direct access storage Relates to storage device, such as magnetic disks and drums, that are capable of fast and direct access to storage locations. Also called random-access storage.

direct acting controller A controller in which the value of the output signal increases as the value of the input (measured variable) increases.

direct-acting diaphragm actuator A diaphragm actuator in which the pressure-tight chamber is above the diaphragm, and in which an increasing pressure within that chamber will result in a downward motion, is generally described as being a direct-acting diaphragm actuator.

direct acting instrument Pertaining to electrical measuring instruments, an instrument in which the indicating or recording device is mechanically connected to, and actuated by, the moving element.

direct action Control action in which the output increases with increasing input.

direct actuator See direct-acting diaphragm actuator.

direct addressing A method of addressing in which the address part of an instruction contains a direct address.

direct address, one level address An address that designates the storage location of an item of data to be treated as an operand.

direct-arc furnace An arc furnace in which the arc is formed between the electrodes and the charge.

direct-arc heating See arc heating.

direct-buried transformer A transformer designed to be buried in the earth with connecting cables.

direct call facility A facility that permits calling without requiring the user to provide address selection signals; the network interprets the call request signal as an instruction to establish a connection to one or more predetermined data stations.

direct code A code which specifies the use of actual computer command and address configuration.

direct-comparison method of measurement A method of measurement in which the measurand is compared directly with a quantity of the same kind having a known value. Example: Measurement of a length using a graduated rule.

direct cooking Pertaining to pulp and paper manufacturing, cooking in which heating is achieved by means of steam which is led directly into the cooking liquid.

direct-coupled transistor logic (DCTL) Logic employing only transistors as active circuit elements.

direct coupling The association of two or more circuits by means of self-inductance, capacitance, resistance, or a combination of these that is common to the circuits.

direct current (dc) **1.** An essentially constant-value current that flows in only one direction. **2.** A flow of continuous electric current in one direction as long as the circuit is closed (as opposed to alternating current). **3.** A current that flows in one direction only in an electric circuit. It may be continuous or discontinuous. It may be constant or varying.

direct-current amplifier, dc amplifier An amplifier capable of boosting dc voltages.

direct-current erasing head (magnetic recording) One that uses direct current to produce the magnetic field necessary for erasing. Note: Direct-current erasing is achieved by subjecting the medium to a unidirectional field. Such a medium is, therefore, in a different magnetic state than one erased by alternating current.

direct current signals International standard applicable to analog direct current signals used in industrial-process measurement and control systems to transmit information between elements of systems is outlined in IEC publication 381-1. For direct voltage signals IEC publication 381-2 refers. For pneumatic signals IEC publication 382 refers.

direct-current transmission (electric energy)

The transfer of electric energy by direct current from its source to one or more main receiving stations. Note: For transmitting large blocks of power, high voltage may be used such as obtained with generators in series, rectifiers, etc.

direct digital control, DDC **1.** Control in which the functions of a controller are performed by a digital device. Note: This does not exclude analog signals being used as input/output signals of the controller. **2.** Control in which the functions of a controller are performed by a process computer, which directly influences the final controlling element(s). **3.** A mode of control whereby a digital computer's outputs are used to directly control a process.

direct digital position control In a number of applications it is possible to use a microcomputer to directly control the rotation of a d.c. motor without the use of an analog amplifier.

direct disturbance The injection into an element of the control system of a disturbing signal of the same physical kind as the input control signal to that element.

directed beam display device, calligraphic display device See calligraphic display device.

direct hardening, direct quenching Hardening without deliberate heating, in direct combination with other heat treatment or hot working.

direct input – output matrix A matrix which describes the direct connections between the values of the input variables and the output variables.

direct instruction An instruction that contains the direct address of an operand for the operation specified.

directed links (in a function chart) The routes of the evolutions between steps are indicated by directed links connecting steps to transitions and transitions to steps.

directional control valve (fluid power systems) Device connecting or isolating one or more flow paths.

directional coupler (optical communication) A coupler such that the energy applied to certain input ports is only transferred to one or more defined output ports.

directional filter A combination highpass and low-pass filter with a common branching point; used to separate the higher and lower transmission bands of a bidirectional system.

directional microphone A microphone the response of which varies significantly with the direction of sound.

directional-overcurrent protection (power switchgear) A method of protection in which an abnormal condition within the protected equipment is detected by the current being in excess of a predetermined amount and in a predetermined band of phase relations with a reference input.

directional relay A relay which functions in conformance with the direction of power, voltage, current, pulse rotation, etc. See also polar relay.

directional separation filter See directional filter.

direction of action Direction in which action is transmitted in a block diagram. Note 1: In a functional block the direction of action goes from the input of the block to the output of the block; for an action line the direction of action is indicated by an arrow. Note 2: The direction of action need not be the same as the direction of mass or energy flow.

direction of polarization The direction of the electric field vector of an electromagnetic wave.

direction of propagation The direction of average energy flow with respect to time at any point in a homogeneous, isotropic medium.

directive An operator command that is recognized by computer software.

directive, declaration In a programming language, a meaningful expression that affects the interpretation of other expressions in that language.

directivity (electrical transducers) The solid angle, or the angle in a specified plane, over which sound or radiant energy incident on a transducer is measured within specified tolerances in a specified band of measurand frequencies.

directivity (of noise) (control valves) **1.** Directivity is defined as the way in which sound radiates from its source. Acoustical radiation is spherical from a ball or point, and cylindrical from a line source. A control valve can be considered to be a point source; however, a valve and its piping usually behaves more like a line source. **2.** At present, relatively little information has been published on the propagation of noise through fluid piping systems, but the information that is available indicates that pipe and fluid noise

transmission can not be ignored when analyzing valve noise problems. The ability of noise and vibration to travel through the piping and radiate to the air over large distances from the valve has a significant effect on the sound field around the system.

direct liquid cooling system (semiconductor rectifiers) A cooling system in which a liquid, received from a constantly available supply, is passed directly over the cooling surfaces of the semiconductor power converter and discharged.

directly controlled system Process or system element in a control system directly controlled by the final controlling element.

directly controlled variable Controlled variable, the value of which is sensed to originate a feedback signal.

directly proportional A condition in which two quantities either increase or decrease together in a manner such that their ratio is constant.

direct memory access, DMA 1. The ability to store or retrieve data from memory at the machine cycle speed. **2.** A technique for moving data directly between main storage and peripheral equipment without requiring processing of the data by the processing unit.

direct method of (suspended sediment) measurement A method in which, with the aid of one device, the time-average suspended sediment load at a point is measured directly. Pertains to liquid flow measurement in open channels.

direct method of measurement A method of measurement in which the value of a measurand is obtained directly, rather than by measurement of other quantities functionally related to the measurand. Note: The method of measurement remains direct even if it is necessary to make supplementary measurements to determine the values of influence quantities in order to make corresponding corrections.

direct numerical control, DNC A system connecting a set of numerically controlled machines to a common memory for part program or machine program storage, with provision for on-demand distribution of data to the machines. Direct numerical control systems typically have additional provisions for collection, display or editing of part programs, operator instructions, or data related to the numerical control process.

director Pertaining to digital communication terms, a station which can control a data network.

director (numerical control) A special purpose computer that accepts numeric data as input and produces, as output, data in a form suitable for direct use by a control system.

directory A table of identifiers and references to the corresponding items of data.

directory device A mass-storage retrieval device, such as a disk, that contains a directory of the files stored on the device.

directory service The network management function that provides all addressing information required to access an application process.

direct piezoelectricity A name sometimes given to the piezoelectric effect in which an electric charge is developed on a crystal by the application of mechanical stress.

direct power generation Any method of producing electric power directly from thermal or chemical energy without first converting it to mechanical energy; examples include thermopiles or storage batteries.

direct pressure control (fluid power systems) Control method in which the position of the moving

parts is controlled directly by alteration of the control pressure.

direct quenching See direct hardening.

direct reading See indication (of a measuring instrument).

direct-reading gage Any instrument that indicates a measured value directly rather than by interference – for instance, indicating liquid level by means of a sight glass partly filled with liquid from the tank or by means of a pointer directly connected to a float in the tank.

direct record In instrumentation tape, the mode in which tape magnetization is directly related to data voltage level.

direct-reduction processes (iron producing) To day, processes that produce iron by reduction of iron ore below the melting point of the iron produced are generally classified as direct-reduction processes and the products referred to as direct reduced iron (DRI).

direct-smelting processes Processes that produce a molten product (similar to blast-furnace hot metal) directly from ore. See pig iron electric furnace process, DLM process, KR process, Kawasaki steel process, and CGS process.

direct-steelmaking processes Processes that produce liquid steel directly from ore.

direct voltage A voltage which produces a current flowing in one direction only.

direct voltage signals International standard IEC 381-2 specifies analog direct voltage signals used in industrial-process measurement and control systems to transmit information between the elements of systems. For direct current signals IEC standard 381-1 refers, and for pneumatic signals IEC standard 382 refers.

direct wave A wave that is propagated through space without relying on the properties of any gas or other substance occupying the space.

direct-writing recorder A pen- and ink recorder in which the position of the pen on the chart is controlled directly by a mechanical link to the coil of a galvanometer, or indirectly by a motor controlled by the galvanometer.

DIS Draft International Standard. The second stage of an ISO Standard.

disable Disallow the processing of an established interrupt until interrupts are enabled. Contrasted with enable. See disarm.

disabled state, outage A state of an item characterized by its inability to perform a required function, for any reason.

disabled time The time interval during which an item is in a disabled state.

disarm Cause an interrupt to be completely ignored. Contrasted with arm. See disable.

disassemblers Programs that do the opposite of compiler programs. Given a machine-code program listing, the disassembler turns it back into an assembly listing, with mnemonic representations, for troubleshooting purposes.

disassembly Retranslation of machine language into mnemonics during debugging.

disc, disk Same as magnetic disc.

disc (valves) 1. The valve closure member in a slide valve which provides a variable restriction in a port. **2.** The valve closure member in a butterfly valve which provides a variable restriction in a port. Sometimes called vane. **3.** The pressure containing movable element of a pressure relief valve which effects closure.

disc directory Table for storing the location of files held on the disc.

disc drive, disk drive The mechanism which moves the disc in a disc storage unit, usually the spindle, drive motor, read-record heads, and head actuating mechanism. The term is sometimes used to include the logic control unit and other electronic circuits included in the disc.

discharge The volume of liquid flowing through a cross-section in a unit time. Pertains to liquid flow measurement in open channels.

discharge area See actual discharge area.

discharge coefficient Pertaining to measurement of liquid flow in open channels, a coefficient in the equation, in general, relating the actual discharge to a theoretical discharge.

discharge head The pressure at which a pump discharges freely to the atmosphere.

discharge hydrograph A graphical representation of changes in discharge with respect to time.

discharge measurement The operation of measuring the discharge of liquid in an open channel.

discharge velocity The volume flow-rate (the integral over a cross-section of the conduit of the axial components of the local fluid velocities) divided by the area of the cross-section.

disconnect 1. To disengage the apparatus used in a connection and to restore it to its ready condition when not in use. **2.** Disengaging the linkage between an interrupt and a designated interrupt servicing program.

disconnect See connect.

disconnect (DISC) command A protocol command that allows a machine to announce that it is going down.

disconnect switch, motor circuit switch A switch intended for use in a motor branch circuit. It is rated in horsepower, and is capable of interrupting the maximum operating overload current of a motor of the same rating at the rated voltage.

discontinuity 1. A broken connection, or the loss of a specific connection characteristic. **2.** The temporary interruption or variation in current or voltage.

discontinuous action The action of an element, regulator or control system whose output signal is a discontinuous function of its input signal. The discontinuous action may be of a variety of forms, for example on-off.

discontinuous action servo-mechanism A servo-mechanism in which power supplied to the servomotor changes in a discontinuous manner as the deviation changes continuously.

discontinuous amplifier An amplifier that reproduces an input waveform on some type of averaging basis.

disc pack, disk pack A large disk with very high storage capacity.

disc press A machine in which pulp undergoes thickening to a high dry solids content in the press nip between conical screen surfaces on two rotating discs pressed against each other.

disc recorder A recording instrument in which the chart is a disc which is rotated by the chart driving mechanism.

disc refiner See refiner.

discrete Pertaining to data that consist of distinct elements such as characters, or to physical quantities having distinctly recognizable values.

discrete circuits, discrete component circuits Electric circuits built of separate, individually manufactured, tested and assembled diodes, resistors, trans-

istors, capacitors and other specific electronic components.

discrete component, discrete device, discrete element 1. A component which has been fabricated prior to its installation (e.g., resistors, capacitors, diodes, and transistors). **2.** A circuit component having an individual identity, such as a transistor, capacitor, or resistor.

discrete control 1. A system whose signals are inherently discrete. **2.** See sampling control.

discrete control (batch control) Maintaining the outputs of a process to a target value chosen from a set of known stable state(s).

discrete data Data represented by characters.

discrete representation A representation of data by characters, each character or a group of characters designating one of a number of alternatives.

discrete sampling (water quality) A process whereby single samples are taken from a body of water.

discrete variable A variable that assumes only a whole number.

discretionary wiring The use of a selective metallization pattern in the interconnection of large numbers of basic circuits on a slice of semiconductor material to form complex arrays.

discrimination 1. The ability of a measuring instrument to respond to small changes in the value of the stimulus. **2.** The difference between the losses at specified frequencies, with the system or transducer terminated in specified impedances.

discrimination instruction, decision instruction An instruction of the class of instructions that comprises branch instructions and conditional jump instructions.

discrimination threshold The smallest change in the value of the input of a device which causes a perceptible response in its output.

discriminator 1. A hardware device used to demodulate a frequency-modulated carrier or subcarrier to produce analog data. **2.** A device in which amplitude variations are derived in response to frequency or phase variations.

disc storage, disk storage A storage device which uses magnetic recording on flat rotating discs.

disdrometer An apparatus capable of measuring and recording the size distribution of raindrops in the atmosphere.

disengaging surface The surface of the boiler water from which steam is released.

disinfectant A chemical agent that destroys microorganisms but not bacterial spores.

disinfection (water quality) The treatment of water intended to eliminate or inactivate all pathogens.

disjunction, OR operation, INCLUSIVE-OR operation, logical add The Boolean operation whose result has the Boolean value 0 if and only if each operand has the Boolean value 0. Note: See also table in ISO publication 2382/11-1976.

disk A rigid circular platter used for data storage.

disk (control valves) An essentially flat, circular shaped port which modifies the flow rate with either linear or rotary motion.

disk cam A flat cam with a contoured edge that rotates about an axis perpendicular to the plane of the cam, communicating radial linear motion to a follower that rides on the edge of the cam.

disk cartridge The flat, round, removable disk pack, containing programs and data, which is palced into a disk drive.

disk drive See disc drive.

diskette A small diameter disk usually 5,25 or 3,5 inches in diameter, also called a floppy disk.

disk meter A flow-measurement device that contains a nutating disk mounted in such a way that each time the disk nutates, a known volume of fluid passes through the meter.

disk pack See disc pack.

disk valve A valve with a closure member that consists of a disk which moves with a rotary motion against a stationary disk, each disk having flow passages through it.

dislocation In a crystal, a region in which the atoms are not arranged in the perfect crystal-lattice structure.

(to) dispatch To allocate time on a processor to jobs or tasks that are ready for execution.

dispatcher That program in an operating system, or another functional unit, the purpose of which is to dispatch.

dispatching system A system employing radio, telephone, and/or signals (audible or light) for orderly and efficient control of the movements of trains of cars in mines.

dispersants (flotation) See under flotation.

disperse A data processing operation in which input items or fields are distributed or duplicated in more than one output item or field.

disperse dyes (textile term) A class of dyes which has no water-solubilizing groups thus cannot form a true solution. The fine particles must be dispersed in the dye.

dispersing agent A substance which promotes the dispersion of one substance in another.

dispersing prism A prism designed to spread out the wavelengths of light to form a spectrum.

dispersion **1.** Any process that breaks up an inhomogeneous, lumpy mixture and converts it to a smooth paste or suspension where particles of the solid component are more uniform and small in size. **2.** Breaking up globs of oil and mixing them into water to make an emulsion. **3.** Intentionally breaking up concentrations of objects of substances and scattering them over a wide area. **4.** The process by which an electromagnetic signal is distorted because the various frequency components of that signal have different propagation characteristics. **5.** The relationship between refractive index and frequency (or wavelength).

dispersion medium A medium in which the phase velocity depends on frequency.

dispersive infra-red gas analyzer Gas analyzer in which the absorption of a specific wavelength of IR radiation is measured by dispersing the IR radiation from a source through a prism, grating, or filter before passing it through the gas, and detecting this radiation by a broad band sensor.

displacement bleaching A bleaching process in which the pulp is continuously impregnated with solutions of different bleaching chemicals, each of which acts for a short time and, without intermediate washing, is then displaced by the next chemical solution.

displacement-liquid A heavy liquid, generally water, fed into an ejector bowl before solids ejection in a quantity slightly exceeding the amount of solids to be ejected. A certain amount of valuable process liquid would otherwise escape together with the solids.

displacement meter A meter that measures the amount of a material flowing through a system by recording the number of times a vessel or cavity of known volume is filled and emptied.

displacement pump Pump in which the increase in fluid energy is derived from pressure energy (the

quantity of fluid delivered is related to the shaft speed).

displacement transducers A wide variety of displacement transducers are used in industrial applications. The parameter which changes to give an electrical output signal is either its resistance, its inductance, its capacitance, or its output voltage. It is a device which converts mechanical energy into electrical energy.

displacement-type density meter A device that measures liquid density by means of a float and balance beam used in conjunction with a pneumatic sensing system; the float is confined within a small chamber through which the test liquid continually flows, so that density variations with time can be determined.

displacer-type meter An apparatus for detecting liquid level or determining gas density by measuring the effect of the fluid on the buoyancy of a displacer unit immersed in it.

display **1.** A visual presentation of data. **2.** A visual presentation of information. **3.** A video monitor device.

display building In Honeywell TDC 3000 control systems, an activity whereby a user selects the shapes, colors etc. required for a particular display.

display command, display instruction See display instruction.

display console A visual display used with a computer to give access to the many elements of data as an array of points.

display element, graphic primitive, output primitive See output primitive.

display generator An electronic device that interfaces computer-graphics display information with a graphics-display device. In general, a display generator for a raster-scan display contains four subsystems: display controller, display processor, refresh memory, and video driver.

display image (computer graphics) A collection of display elements or segments that are represented together at any one time on a display surface.

display information processor A computer used in a combat operations center to generate situation displays.

display instruction, display command (computer graphics) A command that changes the state or controls the action of a display device.

display law (spectrum analyzer) The mathematical law that defines the input-output function of the instrument. **1.** linear. A display in which the scale divisions are a linear function of the input voltage. **2.** square law (power). A display in which the scale divisions are a linear function of the input power. **3.** logarithmic. A display in which the scale divisions are a logarithmic function of the input signals.

display modes Each display mode, such as vector, increment, character, point, vector continue, or short vector specifies the manner in which points are to be displayed on the screen.

display processor A component of a display generator used to add "intelligence". Typically, the device is a microcomputer with stored programs that perform high-level graphics functions.

display reference level (spectrum analyzer) A designated vertical position representing specified input levels. The level may be expressed in dBm, volts or other units.

display space, operating space (computer graphics) See operating space.

display-storage tube A special cathode-ray tube with a long and controllable image persistence and high luminescence.

display surface In a display device, that medium on which display images may appear. Example: The screen of a cathode ray tube; the paper in a plotter.

display tube A cathode-ray tube used to display information.

display unit A device which provides a temporary representation of data. Compare hard copy. See cathode-ray tube.

disruptive discharge The sudden, large current through an insulating medium when electrostatic stress ruptures the medium and thus destroys its insulating ability.

dissector In optical character recognition, a mechanical or electronic transducer that sequentially detects the level of light in different areas of a completely illuminated sample space.

dissipation The undesired loss of electrical energy by conversion into heat.

dissociation The process by which a chemical compound breaks down into simpler constituents, as the CO_2 and H_2O at high temperature.

dissolved air (fluid power systems) Air dispersed at a molecular level in a hydraulic fluid and apparently forming only a single phase.

dissolved chloride measurement (water quality) A water quality parametric system will generally include an electrochemical method of measuring the dissolved chloride in a water sample.

dissolved gases Gases which are "in solution" in water.

dissolved organic carbon, DOC That part of the organic in a water which cannot be removed by a specified filtration process. (See total organic carbon).

dissolved-oxygen curve (water quality) A graphically or mathematically derived curve that represents the profile of dissolved oxygen content along the course of a stream.

dissolved oxygen measurement (water quality) Dissolved oxygen is the amount of free oxygen in water available to sustain aquatic life. This is not to be confused with the oxygen combined with hydrogen to form water, nor oxygen combined with any of the solid materials in the water. The measuring system can consist of a sensor, signal conditioner and recorder or indicator.

dissolved oxygen sensor (for boiler feedwater) The dissolved oxygen sensor for feedwater service is based on the chemical reaction of oxygen with nitric oxide. The products of reaction increase the electric conductivity of the sample. The measurement of the change in conductance of the sample is then calibrated in terms of the amount of dissolved oxygen.

dissolved solids **1.** Those solids in water which are in solution. **2.** The substances remaining, after filtration and evaporation to dryness of a sample, under specified conditions. Note: Colloidal material may also be included.

dissolving pulp Chemical pulp intended primarily for the preparation of chemical derivatives of cellulose.

dissymmetrical transducer A transducer in which interchanging at least one pair of specified terminals will change the output signal delivered when the input signal remains the same.

distance hysteresis Pertaining to photoelectric proximity switches, the minimum change in the distance of an object in scanning plane that is still detected by the switch.

distance relay **1.** A protective relay, the operation of which is a function of the distance between the relay and the point of fault. **2.** A device which functions when the circuit admittance, impedance, or reactance increases or decreases beyond predetermined limits.

distance/velocity lag A delay attributable to the transport of material or the finite rate of propagation of a signal.

distillate **1.** The distilled product from a fractionating column. **2.** The overhead product from a distillation column.

distillate (in oil and gas industry) Liquid hydrocarbons, usually water-white or pale straw color and of high API gravity, recovered from wet gas by a separator that condenses the liquid out of the gas stream. (Distillate is an older term for the liquid; today, it is called condensate or natural gasoline). See condensate.

distillation **1.** A process of evaporation and condensation used for the preparation of water of high purity. **2.** The refining process of separating crude oil components by heating and subsequent condensing of the fractions by cooling. **3.** Vaporization of a substance with subsequent recovery of the vapor by condensation. **4.** A unit operation used to separate a mixture into its individual components.

distillation column A tall, cylindrical vessel of a refinery or fractionating plant where liquid hydrocarbon feedstocks are separated into component fractions rare gases, and liquid products of progressively lower gravity and higher viscosity.

distillation system A small, temporary "refinery" set up at a remote drilling site to make diesel fuel and low-grade gasoline from available crude oil for the drilling engines and auxiliary equipment.

distilled water Water produced by vaporization and condensation with a resulting higher purity.

distorsion **1.** Any undesired change in a specified signal pattern. **2.** Pertaining to electrical transducers, see harmonic content.

distributed **1.** Spread out over an electrically significant length, area, or time. **2.** In control system, refers to control achieved by intelligence that is distributed about the process to be controlled, rather than by a centrally located single unit.

distributed architecture Partitioning of the total control task among independent devices. In BASIC Systems, the distributed control devices communicate through the Data Hiway. Refers to Honeywell TDC 3000 control systems.

distributed computer control system A network of intelligent computerized stations whose purpose is the control of an industrial process or plant. The network distributes logic control, data access, and process-management.

distributed computing Computing performed within a network of distributed computing facilities. The processors for this type of system usually function with control distributed in time and space throughout the network. Associated with the distributed process are distributed storage facilities.

distributed data processing (DDP) Data processing in which some or all of the processing, storage, and control functions, in addition of input-output functions, are dispersed among data processing stations.

distributed feedback control Type of control in which one or more variables of the controlled system are used as feedback variables to the controller in addition to the controlled variable.

distributed joint (industrial robots) An assembly between two rigid members which enables one to rotate or translate and/or rotate in relation to the other about an axis linked to the translation.

distributed processing **1.** A multiprocessing computer technique where each processor has a specific task or set of tasks to perform. **2.** Performing a data processing task by performing the needed calculations in a distributed computer network. **3.** Dataprocessing tasks performed simultaneously in several interconnected processors of a computer network. **4.** A monitoring and control concept in which arithmetic and logical operations are performed by computing elements at remote points, under the coordination of a central control device. **5.** A data processing organization concept under which computer resources of a company are installed at more than one location with appropriate communication links. Processing is performed at the user's location generally on a minicomputer, and under the user's control and scheduling, as opposed to processing, for all users is done on a large, centralized computer system.

distributing valve (speed governing systems, hydraulic turbines) The element of the governor – control actuator which controls the flow of hydraulic fluid to the turbine-control servomotor(s).

disturbance **1.** Undesired and most frequently unpredictable change in an input variable, other than the reference variable. **2.** An undesired change in a monitored variable that therefore tends to adversely affect a control output.

disturbance resolution The minimum change caused by a disturbance in a measured variable which will induce a net change of the ultimately controlled variable.

disturbance variable **1.** A measured variable that is uncontrolled and that affects the operations of the process. **2.** Undesired, independent, and most frequently unpredictable input variable acting from the outside on the system.

dither A useful oscillation of small magnitude, introduced to overcome the effect of friction, hysteresis, or recorder pen clogging. See also hunting.

dithering Pertaining to electrical transducers, the application of intermittent or oscillatory forces just sufficient to minimize static friction within the transducer.

diurnal inequality **1.** The difference in heights and durations of the two successful high waters or two successive low waters of each day. **2.** The difference in speed and direction of the two flood currents or the two ebb currents of each day.

divergence The spreading out of a laser beam with distance measured as an angle.

divergence loss The part of the transmission loss that is caused by the spreading of sound energy.

diversion valve A type of fluidic control device that uses the Coanda effect to either switch flow from one outlet port to another or proportion flow between two divergent outlet ports.

diversity Coming from more than one source.

diversity factor (of an output module) Pertaining to programmable controllers, ratio of the permissible total current (total output current) to the sum of all maximum rated currents of multichannel output module operating at most adverse combination of normal service conditions.

diverting service (control valves) Three way valves with diverting or mixing trim have two plugs fixed to the stem and positioned so that, when one seat is closed, the other is full open, with throttling of flows through both seat orifices for in – between positions.

divided In a division operation the number or quantity to be divided.

dividing network See crossover network.

divisor In a division operation, the number or quantity by which the dividend is divided.

DLM process A direct smelting process. In the DLM or McDowell-Wellman process, the desired proportions of finely ground iron ore, flux, and coal are pelletized and the pelletized feed is then dried, preheated, and partially reduced on an in-line travelling grate, equipped with a recycle hot draught, and a gas afterburner to control pollution. The reduced pellets are then charged hot to a submerged-arc smelting furnace. The liquid iron produced in the smelting operation is equivalent of blast-furnace iron.

DMA See direct memory access.

DMC Dynamic Matrix Control Corporation multivariable controller.

DN See nominal size.

DNA Deoxyribonucleic Acid.

DNC See direct numerical control.

DNL See dynamic noise limiter.

D/O Decimal-to-Octal.

DO **1.** Data Output. **2.** Digital Output. **3.** Dissolved Oxygen.

double-break contacts A set of contacts in which one contact is normally closed and makes simultaneously connection with two other contacts.

document A data medium and the data recorded on it, that generally has permanence and that can be read by man or machine.

documentation **1.** Collection of documents. **2.** Processing of documents. **3.** See also user documentation, software documentation, system documentation.

documentation level See level of documentation.

domain **1.** In magnetic theory, that region of a magnetic material in which the spontaneous magnetization is all in one direction. **2.** That part of a computer network in which the data processing resources are under common control. **3.** An arbitrary boundary defined to limit the scope of an entity/relationship or other model.

domain expert A domain expert contains the raw knowledge that a knowledge engineer uses to structure the knowledge fuse and formulate the rule base.

domain (in artificial intelligence) A specific field of knowledge or expertise.

domain knowledge representation The knowledge representation that is specific to the application. These may be compound knowledge representations. The advantage of domain specific representations is that they represent knowledge in the most natural form for the knowledge engineer and domain expert.

domain model (expert systems) A model of a specific field of knowledge or expertise.

dongle Coded circuit or chip that has to be present in a system before a piece of copyright software will run.

donor impurity (in a semiconductor) An impurity that may act as a source of condition electrons.

dopants See dope.

dope To add impurities (called dopants) to a substance, usually a solid, in a controlled manner to cause the substance to have certain desired properties.

doped junction (semiconductor) A junction produced by the addition of an impurity to the melt during crystal growth.

doping Addition of an impurity to a semiconductor, or production of a deviation from stoichiometric composition, to achieve a desired characteristic.

doping agent An impurity element added to semiconductor materials used in crystal diodes and transis-

tors. Common doping agents for germanium and silicon include aluminium, antimony, arsenic, gallium, and indium.

doping compensation (semiconductor) Addition of donor impurities to a p-type semiconductor or of acceptor impurities to a n-type semiconductor.

Doppler effect (data transmission) The phenomenon changing the observed frequency of a wave in a transmission system caused by a time rate of change in the effective length of the path of travel between the source and the point of observation.

Doppler shift The magnitude of the change in the observed frequency of a wave due to the Doppler effect. The unit is in the hertz.

Doppler ultrasonic flowmeter A type of flowmeter in the sonic class of flowmeters. There are two important types: the time-of-flight (TOF) and the Doppler ultrasonic flowmeter. For both types, electrical energy is used to excite a piezoelectric crystal type of material to a state of mechanical resonance. As the crystal resonates, a sound wave traveling at the speed of sound of the media is generated and this sound wave is used to interrogate the flow field for the purpose of extracting the flow rate.

DOS Disk Operating System, commonly used in personal computers.

dosimeter Also called intensitometer or dosage meter. An instrument that measure the amount of exposure to nuclear or x-ray radiation.

dot matrix printer A high-speed printer that prints characterlike configurations of dots rather than conventional characters through the selection of type faces.

dot signal (data transmission) A series of binary digits having equal and opposite states, such as a series of alternate 1 and 0 states.

double acting An actuator in which the power supply acts both to extend and retract the actuator stem.

double acting (valve) positioner A positioner is double acting if it has two outputs, one with "direct" action and the other with "reversed" action. Compare single acting positioner.

double amplitude The peak-to-peak value.

double-base junction transistor Also called tetrode junction transistor. Essentially a junction triode transistor with two base connections on opposite sides of the central region of the transistor.

double bridge See Kelvin bridge.

double-buffered DAC (DAM) A digital-to-analog converter (DAC) or a digital-to-analog multiplier (DAM) with two registers in cascade, one a holding register, and the other the dynamic register.

double crucible technique (optical communication) A manufacturing process in which the core and the cladding materials are melted in two concentric crucibles and drawn to form an optical fiber.

double-faced tape Fabric tape finished on both sides with a rubber or synthetic compound.

double fourdrinier machine, twin fourdrinier machine A paper or board machine with two separate fourdrinier wire parts, the two webs from which are couched together to form two-layer paper or two-layer board.

double hardening Heat treatment (of steel) in two stages after carburizing. The first heat treatment produces a normalizing of the core and the dissolution of any stray grain-boundary cementite in the surface layer. The second heat treatment produces a hardening and begins from a lower temperature regulated to suit the carburized surface.

double insulation Insulation comprising both basic and supplementary insulation. (Per IEC335-1). See also basic insulation, supplementary insulation, reinforced insulation.

double length Pertaining to twice the normal length of a unit of data or a storage device in a given computing system. See also double precision arithmetic.

double operand An instruction type containing two address fields, source operand address field, and destination operand address field.

double packing box (for valves) This is an assembly having two stem packings in series. Any dangerous fluid, that leaks around the first set of packing rings, can be vented through the side connection to a special waste tank. Another approach is to pressurize the area between the two packings with inert gas at a pressure level, slightly higher than the fluid pressure inside the valve. In this case, the inert gas might leak into the valve, but no fluid is allowed to leak by the stem. This packing arrangement is more reliable and less expensive than a bellows seal.

double pole A term applied to a contact arrangement to denote that it includes two separate contacts forms (i.e., two single-pole contact assemblies).

double-pole, double-throw switch, DPDT A switch that has six terminals and is used to connect one pair of terminals to either of the other two pairs.

double-pole, single-throw switch, DPST A switch that has four terminals and is used to connect or disconnect two pairs of terminals simultaneously.

double-pole switch A switch that operates simultaneously in two separate electric circuits or in both lines of a single circuit.

double precision Characterized by the use of two computer words to represent a number in accordance with the required precision.

double-precision arithmetic The use of two computer words to represent a single number. This is done where it is necessary to obtain a greater accuracy than a single word of computer storage will provide. This effectively doubles the data word size.

double register Two registers that function as a single register.

double rod cylinder (fluid power systems) Cylinder with piston rod extending from both ends (double ended).

double sampling A type of sampling inspection in which the lot can be accepted or rejected based on results from a single sample, or the decision can be deferred until the results from a second sample are known.

double seated (control valves) Refers to the construction of the valve body in the way that the plug is guided at top and bottom in contrast to a single seated valve. Advantage of double seated construction lies in the reduction of required actuator forces, because the hydrostatic effects of the fluid pressure acting on each of the two seats, tend to cancel each other out.

double seated trunnion ball valves These types of valves are known as through conduit type, in that when the valve is in the open position, the body is isolated from the line to prevent particles from accumulating in the body cavity and jamming the valve operation. These types of valves are primarily used for pipe line, compressor stations and gas processing plant service; also on oil and petroleum products lines.

double sided A computer diskette that stores data on both sides.

double slag method (in steelmaking) The double slag method is a variation of the acid electric-furnace

process and is employed where it is desirable to have positive control to keep the FeO content of the finishing slag to a low value (about 10 percent). Silicon in the slag can be reduced to enter the metal in the acid electric-furnace process.

double tempering, multiple tempering Tempering (of martensite-hardened steel) in two (or more) heatings with intermediate cooling to the same, or nearly the same, temperature on each occasion in order to accomplish the desired property alterations and to stabilize the structure.

double throw A term applied to a contact arrangement to denote that each contact form included is a breakmate.

double-throw switch A switch which alternately completes a circuit at either of its two extreme positions. It is both normally open and normally closed.

douplet lens A lens with two components of different refractive indices – generally designed to be achromatic.

double trigger A trigger signal consisting of two pulses spaced by a fixed amount for coding.

double wall corrugated fiberboard, double-double corrugated fiberboard Corrugated fiberboard having two layers of fluted paper and three facings.

double window fibers Optical fibers which are designed for transmission at two wavelength regions, 0.8 to 0.9 micrometer and around 1.3 micrometers.

down line loading Loading of a hiway device with configuration data from a computer or an LCN-based system. Refers to Honeywell TDC 3000 control systems.

download 1. To transfer information stored in a remote computer system to the user's system. Upload means the reverse process. **2.** Program transfer from host to small computer.

down state, internal disabled state A state of an item characterized either by a fault, or by a possible inability to perform a required function during preventive maintenance.

downstream Refers to facilities or operations performed after those at the point of reference. For example, refining is downstream from production operations; marketing is downstream from refining.

downstream seating Pertaining to ball valves, seating is accomplished by pressure differential thrust across the ball in the closed position, moving the ball slightly downstream into tighter contact with the seat ring seal which is supported by the body.

downtime The time during which a device or system is not capable of meeting performance requirements.

downtimer A clock which counts time backward from a preset time.

downward multiplexing A system which leaves the transport layer open to multiple network connections, and distributes the traffic among them in a round-robin fashion.

downward reference In an overlay structure, a reference made from a segment to a segment lower in the path, that is farther from the root segment.

dowtherm A constant boiling mixture of phenyl oxide and diphenyl oxide used in high-temperature heat transfer systems (boiling point 257°C, 494°F).

DP See data processing.

DP cell A pressure transducer that responds to the difference in pressure between two sources. Most often used to measure flow by the pressure difference across a restriction in the flow line.

DPDT Double Pole Double Throw.

DPST Double Pole Single Throw (switch).

draft Also spelled draught. **1.** The side taper on molds and dies that makes it easier to remove finished parts from the cavity. **2.** The depth to which a boat or other vessel is submerged in a body of water; the value varies with vessel weight and water density. **3.** Drawing a product in a die. **4.** The small, positive pressure that propels exhaust gas out of a furnace and up the stack. **5.** The difference between atmospheric pressure and some lower pressure existing in the furnace or gas passages of a steam generating unit. **6.** A preliminary document.

draft differential The difference in static pressure between two points in a system.

draft gage 1. A type of manometer used to measure small gas heads, such as the draft pressure in a furnace. **2.** A hydrostatic indicator used to determine a ship's depth of submergence.

draft loss A decrease in the static pressure in a boiler or furnace due to flow resistance.

drag-body flowmeter A device that measures the net force on a submerged solid body in a direction parallel to the direction of flow, and converts this value to an indication of flow or flow rate.

drag cap generator A form of ac tachogenerator.

drag, friction The boundary shear resistance which opposes the flow of a liquid.

dragging (computer graphics) Moving one or more segments on a display surface by translating it along a path determined by a locator.

drain 1. The current supplied by a cell or battery when in service. **2.** A pipe that carries away waste solutions or effluent. **3.** To empty a tank or vessel by means of gravity flow into a waste system or auxiliary holding vessel.

drainage (corrosion) Conduction of current (positive electricity) from an underground metallic structure by means of a metallic conductor.

drainage area (water quality) The area drawing to one or more points, the boundaries of which are specified by a duly appointed authority.

drainage, dewatering (paper manufacturing) Thickening on a wire.

drainage equipment Equipment used to protect connected circuits from transients produced by the operation of protection equipment.

drain line (fluid power systems) Pipe which returns internal leakage fluid to the reservoir.

drain port (fluid power systems) Port at atmospheric pressure which provides passage to the reservoir.

DRAM Dynamic Random-Access Memory, a volatile memory with a smaller cell than the traditional static RAM.

draw (in a paper machine) 1. The difference in speed between two drive sections in a paper machine.

2. The degree to which the web is stretched when passing between two drive sections in a paper machine.

3. The manner in which the web is transferred from one drive section to another in a paper machine.

drawdown The curvature of the liquid surface upstream of the weir plate.

draw-down curve (liquid flow measurement in open channels) The profile of the liquid surface when its surface slope exceeds the bed slope.

drawing (technical) Document presenting information in a graphical manner, which includes annotations.

drawing back 1. A shop term for tempering. **2.** Reheating hardened steel below the critical temperature to reduce its hardness.

drawing tower Equipment for making optical fibers, in which optical fibers are drawn from heated glass preforms.

DRC process A direct reduction process of Davy/Direct Reduction Corporation (DRC). Ore, coal, recycled char, and flux if required are continuously metered into the rotary kiln. Passage of the through a preheat zone and a reducing zone in the kiln follows typical rotary-kiln operations.

DRI (iron producing) See direct reduction processes.

drift An undesired gradual change in the input-output relationship of a device over a period of time, not caused by external influences on the device.

drift (liquid flow measurement in open channels) This term is used in two different ways: **a.** The distance that a measuring boat travels during the time taken to make a velocity observation. **b.** The distance that a current-meter assembly is carried downstream when used with a flexible suspension.

drift failure, gradual failure A failure due to a gradual change in time of given characteristics of an item.

drift mobility (in a homogenous semiconductor) The ensemble average of the drift velocities of the charge carriers per unit electric field.

drift of pose accuracy (industrial robots) Slow variation of the attained pose over a specified time.

drift stabilization Any automatic method used to minimize the drift of a dc amplifier.

drift velocity (liquid flow measurement in open channels) Velocity due to drift.

drift velocity Net velocity of charged particles in the direction of the applied field.

drip gasoline Natural gasoline recovered at the surface from a gas well as the result of the separation of the liquid hydrocarbons dissolved in the gas in the formation; gasoline recovered from a drip in a field gas line; casinghead gasoline.

driptight Pertaining to control valves, a nonstandard term. Refer to ANSI B16.104 and IEC 534-4 for specification of leakage classes.

driptight enclosure An enclosure that is intended to prevent accidental contact with the enclosed apparatus and, in addition, is so constructed as to exclude falling moisture or dirt.

drive 1. See disc drive and tape drive. **2.** The signal applied to the input of a power amplifier, also called excitation. **3.** The equipment used for converting available power into mechanical power suitable for the operation of a machine.

drive pulse A pulsed magnetomotive force applied to a magnetic cell from one or more sources.

driver 1. A program that exercises a system or system component by simulating the activity of a higher level component. **2.** A program that controls external devices or executes other programs. Refers to Honeywell TDC 3000 control systems. **3.** An electronic circuit which supplies input to another electric circuit.

driver stage The amplifier stage preceding the power-output stage.

drive shaft coupling (fluid power systems) Device which connects two rotating shafts axially and transmits torque between them. (Usually permits a small degree misalignment and sometimes provides torsional flexibility.)

driving torque, deflecting torque Pertaining to electrical measuring instruments, a torque resulting from e.g. electrostatic or electromagnetic effects on the moving element.

DRO memory See destructive readout.

drop (data transmission) A connection made between a through transmission circuit and a local terminal unit.

DROP (textile term) Drug-Room Operators Panel; the control hardware located in the drug room and used by the operator to communicate with the control room.

drop leg The section of measurement piping below the process tap location to the instrument.

dropout 1. A memory loss in signal. **2.** A failure to read a binary character from a magnetic storage.

dropout value The maximum value of current, voltage, or power which will deenergize a previously energized relay.

dropping resistor 1. A resistor used to decrease a given voltage by an amount equal to the potential drop across the resistor. **2.** A resistor placed in series between a voltage source and a load to reduce the voltage supplied to the load.

drop tight (control valves) A nonstandard term. Refer to ANSI B 16.104 and IEC 534-4 for specification of leakage classes.

drosometer An instrument for measuring the amount of dew that condenses on a given surface.

dross Oxide and other contaminants which form on the surface of molten solder.

drowned flow, submerged flow The flow that is influenced by the level downstream of the measuring structure. Pertains to measurement of liquid flow in open channels.

drowned weir, submerged weir A weir in which the upstream water level is affected by the downstream water level. Pertains to liquid flow measurement in open channels.

drug room (textile term) The area in a dyehouse specifically set aside to mix dyes and chemicals; the mixing area and storage area are often located side by side on an elevated platform called a mezzanine.

drum See magnetic drum.

drum baffle A plate or series of plates or screens placed within a drum to divert or change the direction of the flow of water or water and steam.

drum controller A device in which electrical contacts are made on the surface of a rotating cylinder or sector.

drum filter Pertaining to pulp and paper manufacturing a machine with a rotating screen drum. A drum filter is used for thickening a pulp suspension to a continuous fiber web. The web is often washed on the filter which is then also called a washing filter.

drum head A plate closing the end of a boiler drum or shell.

drum memory A rotating cylinder or disk coated with magnetic material so that information can be stored in the form of magnetic spots.

drum operating pressure The pressure of the steam maintained in the steam drum or steam-and-water drum of a boiler in operation.

drum printer A type of printer that employs a rotating cylinder.

drum programmer An electromechanical device that provides stored-program logic for control of sequential operation such as batch processing or machine cycling.

drum recorder A recording instrument in which the chart is wrapped as a single turn around a cylindrical drum which is rotated by the chart driving mechanism.

drum sequencer Mechanical programming device that can be used to operate switches or valves.

drum storage A storage device in which information is recorded magnetically on a rotating cylinder; a type of addressable storage associated with some computers.

dry 1. A condition in which the electrolyte in a cell is immobilized. **2.** Said of circuits or contacts which do not carry direct current.

dry air Air with which no water vapor is mixed. This term is used comparatively, since in nature there is always some water vapor included in air, and such water vapor, being a gas is dry.

dry back, dry-back boiler The baffle provided in a firetube boiler joining the furnace to the second pass to direct the products of combustion, that is so constructed to be separate from the pressure vessel and constructed of heat resistant material.

dry basis A method of expressing moisture content where the amount of moisture present is calculated as a percentage of the weight of bone-dry material; used extensively in the textile industry.

dry broke See broke.

dry-bulb temperature The temperature of the air indicated by thermometer not affected by the water vapor content of the air.

dry cell A small portable battery. The cell operates on Leclanche' principles, with a central (positive) carbon electrode and a metal outer case for the negative electrode.

dry-charged battery A battery with the plates charged but lacking electrolyte. When ready to be placed in service the electrolyte is added.

dry circuit A circuit where current and voltage are so low that there is no arcing to roughen the contacts. As a result, an insulating film can develop that prevents an electrical closing of the circuit when contacts are brought together.

dry circuit contact A contact that carries current but neither makes nor breaks while its load circuit is energized.

dry contacts Contacts through which there is no direct current.

dry corrosion Atmospheric corrosion taking place at temperatures above the dew point.

dryer, drying cylinder Pertaining to pulp and paper manufacturing, a hollow, thin walled, steam heated, rotating cylinder from which heat is transferred to the web in contact with the shell surface.

dry flashover voltage The voltage at which the air surrounding a clean, dry insulator or shell completely breaks down between electrodes.

dry gas 1. Natural gas from the well free of liquid hydrocarbons; gas that has been treated to remove all liquids; pipeline gas. **2.** Gas containing no water vapor.

drying can (textile term) A polished metal cylinder supported by bearings and heated with high-pressure steam over which open-width fabrics are pulled and dried. The surface is often coated with Teflon to prevent sticking. A number of cans are often arranged in groups and set at various graduated temperatures.

drying oven A closed chamber for driving moisture from surfaces or bulk materials by heating them at relatively low temperatures.

drying section, of a pulp-drying machine or paper machine The section of a pulp-drying or paper machine in which the water remaining in the web after wet pressing is evaporated by the action of heat.

dry matter content See dry solids content.

dry pipe A perforated pipe in the steam space above the water level in a boiler which helps keep entrained liquid from entering steam outlet lines.

dry pulp Pulp which has been dewatered by pressing and drying to a dry solids content of normally more than 85 percent.

dry reed relay A relay that consists of one or more capsules containing contact mechanisms that are generally surrounded by an electromagnetic coil for actuation. The capsule consists of a glass tube with a flattened ferromagnetic reed sealed in each end. These reeds, which are separated by an air gap, extend into the tube so as to overlap. When placed in a magnetic field, they are brought together and close a circuit.

dry running Examination of the logic and coding of a program from a flowchart and written instructions.

dry shredding, fluffing Defibration of dry pulp by mechanical treatment (grinding, grating etc.) on either an industrial or a laboratory scale.

dry solids content, dry matter content The ratio of the mass after to the mass before drying; see moisture content, moisture ratio. The dry solid content is determined according to a standardized test procedure.

dry steam Steam containing no moisture. Commercially dry steam containing not more than one half of one percent moisture.

dry steam drum A pressure chamber, usually serving as the steam offtake drum, located above and in communication with the steam space of a boiler steam – and water drum.

dry suction box A suction box in a fourdrinier machine intended for dewatering with the simultaneous suction of air through the web; see wet suction box.

dry test meter A type of meter used extensively to determine gas flow rates for billing purposes and to calibrate other flow measuring instruments.

dry-type transformer A transformer which is cooled by the circulation of air and which is not immersed in oil.

dry vat machine Pertaining to pulp and paper manufacturing, a vat machine whose vat encloses only a minor portion of the circumference of the cylinder mould.

DS Distributed System. Refers to computer systems in multiple locations throughout an organization working in a cooperative fashion, with the system at each location primarily serving the needs of that location but also able to receive and supply information from other systems within the network.

DSC Double Silk Covered.

dual coding A development technique in which two functionally identical versions of a program are developed from the same specification by different programmers or different programming teams.

dual computer system Special configurations that use two computers to receive identical inputs and execute the same routines, with the results of such parallel processing subject to comparison. Exceptional high-reliability requirements usually are involved.

dual in-line package, DIP A type of housing for integrated circuits.

dual ramp ADC Technique for converting analog data into digital form.

dual sealing valve A valve which uses a resilient seating material for the primary seal and a metal-to-metal seat for a secondary seal.

dual slope converter An integrating A/D converter in which the unknown signal is converted to a proportional time interval which is then measured digitally.

dual system See dual computer system.

dual-use line A communications link that normally is used for more than one mode of operation (e.g., for voice and data).

duct An enclosed fluid-flow passage, usually constructed of galvanized sheet metal and not intended to sustain internal pressures of more than a few psi; the term is most often applied to passages for ventilating air, and to intakes and exhausts for engines, boilers and furnaces.

ductile iron The term preferred in the United States for cast iron containing spheroidal nodules of graphite in the as-cast condition. Also known as nodular cast iron; nodular iron; spherulitic-graphite cast iron.

ductility The property of a metal that indicates its relative ability to deform without fracturing.

dumb terminal A terminal without a built-in processor for handling input.

dummy 1. An artificial address, instruction, or record of information inserted solely to fulfill prescribed conditions, such as to achieve a fixed word length or block length, but without itself affecting machine operations except to permit the machine to perform desired operations. **2.** A device constructed physically to resemble another device, but without the operating characteristics.

dummy argument A variable such as the one which appears in the argument list of a function definition but which is replaced by the actual argument when the function is used.

dummy instruction An artificial instruction or address inserted in a list to serve a purpose other than for execution as an instruction.

dummy parameter See formal parameter.

dummy variable In a computer program, a symbol inserted at definition time, which will later be replaced by the actual variable.

(to) dump To write the contents of a storage, or a part of a storage, usually from an internal storage onto an external medium, for a specific purpose such as to allow other use of the storage, as a safeguard against faults or errors, or in connection with debugging.

dump valve A large valve in the bottom of a tank or container that can quickly empty the tank in an emergency.

Dunmore cell See lithium chloride sensor.

duodecimal number A number, consisting of successive characters, representing a sum, in which the individual quantity represented by each character is based on a radix of twelve. The characters used are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, T (for ten) and E (for eleven). Related to number systems.

duotricenary notation Notation using the base 32.

duplex (austenitic/ferrite) stainless steel A stainless steel whose microstructure at room temperature consists primarily of austenite and ferrite.

duplex cable A cable composed of two insulated stranded conductors twisted together. They may or may not have a common insulating covering.

duplex channel See duplex transmission.

duplex control A control in which two independent control elements share a common input signal for the operation of separate final control elements both of which influence the value of the controlled condition.

duplex controller A controller having two independent control elements sharing a common input signal, for the operation of separate final controlling elements both of which influence the value of the controlled condition.

duplex cylinder (fluid power systems) Unit comprising two cylinders with independent control, mechanically connected on a common axis to provide

three or four positions depending on the method of application.

duplexed computer system Two computers used in a special configuration: one is on-line and the other is standing by ready to be used if a malfunction of the on-line computer occurs. The stand-by computer may or may not be used to perform off-line functions.

duplex process Any integrated process in which a manufacturing operation is carried out by two procedures in series – for example, refining steel by the Bessemer process followed by producing ingots or continuously cast slabs by the basic oxygen or electric furnace process.

duplex pump A reciprocating or diaphragm pump having two parallel flow paths through the same housing, with a common inlet and a common outlet.

duplex system A system with two distinct and separate sets of facilities, each of which is capable of assuming the system function while the other assumes a standby status. Usually both sets are identical in nature.

duplex system bridge A duplex system based on the Wheatstone bridge principle in which a substantial neutrality of the receiving apparatus to the sent current is obtained by an impedance balance.

duplex transmission Data transmission over a data circuit in both directions at the same time. Sometimes referred to as full duplex. Contrast with half duplex.

(to) duplicate To copy from a source data medium to a destination data medium that has the same physical form.

duplication check Same as redundancy check.

durability The ability of an item to perform required functions under stated conditions of use, and under stated conditions of maintenance, until a limiting state is reached.

durable Which will not be destroyed easily.

duration (general) The amount of time taken by an event, action etc.

durimet 20 An alloy with 20% Cr, 29% Ni as major alloying elements. Trademark, Durion Co.

dust Particles of gas borne solid matter larger than one micron in diameter.

dust-ignition proof (class II locations) (National Electrical Code, USA) Enclosed in a manner that will exclude ignitable amounts of dusts or amounts that might affect performance or rating and that, where installed and protected in accordance with this Code, will not permit arcs, sparks, or heat otherwise generated or liberated inside of the enclosure to cause ignition of exterior accumulations or atmospheric suspensions of a specified dust on or in the vicinity of the enclosure.

dusting See linting.

dustproof (general) So constructed or protected that the accumulation of dust will not interfere with successful operation.

dust-tight (National Electrical Code, USA) So constructed that dust will not enter the enclosing case under specified test conditions. See ANSI C19.4-1973 for test conditions.

dutch oven A furnace that extends forward of the wall of a boiler setting. It usually is of all refractory construction, although in some cases it is water cooled.

duty (general) A statement of loads including no-load and rest and de-energized periods, to which the machine or apparatus is subjected including their duration and sequence in time.

duty cycle (general) The time interval occupied by a device on intermittent duty in starting, running, stopping, and idling.

duty factor 1. In pulse techniques, the ratio of the pulse duration to the pulse period of a periodic pulse train. **2.** Ratio of average to peak power. **3.** Same as duty cycle except it is expressed as a decimal rather than a percentage. Usually calculated by multiplying pulses per second times pulse width. **4.** In automatic control, the ratio of working time to the time taken for the complete sequence of a duty cycle.

duty ratio (pulse system) The ratio of average to peak pulse power.

DVORAK keyboard Endorsed by the American National Standards Institute (ANSI) as the Alternate Standard to the QWERTY keyboard.

dwell (numerical control) A programmed time delay of variable duration, not cyclic or sequential, not an interlock.

dwell phase Phase where the specified action is stopped for a predetermined length of time.

dwell time In any variable cycle, the portion of the cycle when all controlled variables are held constant – for example, to allow a parameter such as temperature or pressure to stabilize, or to allow a chemical reaction to go to completion.

DWG Drawing.

D-W process Fractional distillation process for heavy water concentration.

DWT Deadweight ton; a designation for the size or displacement of a ship.

Dy Chemical symbol for dysprosium.

dyadic (N-adic) operation An operation on two and only two (on N and only N) operands. Note: The term binary operation is deprecated to avoid confusion with binary arithmetic operation and with Boolean operation.

dyadic processor A type of computer architecture in which two processors simultaneously execute identical programs and compare results to determine errors.

dye penetrant test This system detects surface defects. Penetrant is freely applied to a clean surface and allowed to work into any tight cracks. The penetrant is removed from all surface areas and the material is then sprayed with a developer. The developer dries as a white coating while the penetrant bleeds up from any flaws through the developer. This is a type of certification and nondestructive test that can be provided for materials used in control valves. For further details see international standard ISO 3879 and ISO 3452 or DIN 54152.

dye stuff (textile term) The common term for a dye. **dynamic** Of, concerning, or dependent on conditions or parameters that change, particularly as functions of time.

dynamic (programming languages) Pertaining to properties that can only be established during the execution of a program. Example: The length of a varying length data object is dynamic.

dynamic accuracy Accuracy determined with a time-varying output.

dynamic allocation (software) The allocation of addressable storage and other resources to a program while the program is executing.

dynamic amplification (coefficient) The power amplification of an element divided by its time constant.

dynamic analogies The similarities in form between the differential equations that describe electrical, acoustical, and mechanical systems that allow acoustical and mechanical systems to be reduced to equivalent electrical networks, which are conceptually simpler than the original systems.

dynamic analysis 1. Study of control system performance at times of disturbance in the controlled variable or in conditions which affect that variable. **2.** The process of evaluating a program based on execution of the program. Contrast with static analysis. Pertains to software engineering terminology.

dynamic analyzers for gases See under thermal conductivity gas analyzer.

dynamic behaviour How a control system or an individual unit behaves with respect to time.

dynamic binding (software) Binding performed during execution of a program.

dynamic burn-in High-temperature test with devices subject to actual or simulated operating conditions.

dynamic cell A memory cell that stores data as a charge (or absence of charge) on a capacitor.

dynamic characteristics Pertaining to electrical transducers, those characteristics of a transducer which relate to its response to variations of the measurand with time.

dynamic check A check used to ascertain that the correct performance of some or all components of equipment or a system under dynamic operating conditions.

dynamic compensation A technique used in control to compensate for dynamic response differences to different input streams to a process. A combination of lead and lag algorithms will handle most situations.

dynamic contact resistance 1. In a relay, a change in contact electrical resistance due to a variation in contact pressure on mechanically closed contacts. **2.** A varying contact resistance on contacts mechanically closed.

dynamic densitometer A density measuring device. The dynamic densitometer measures the hydraulic coupling between a rotating impeller and restrained stator or turbine in the flow pipe line. If the impeller rotation is at a constant angular velocity, the coupling between impeller and turbine will be directly proportional to the density of the flowing fluid.

dynamic dump A dump that is performed during the execution of a program.

dynamic error The error or part of an error related to frequency such as the inadequate dynamic response of some computing device or unit.

dynamic error (analog computers) An error in a time-varying signal resulting from imperfect dynamic response of a transducer.

dynamic flow diagram A diagram that shows the operational aspects of a computer program as a function of time.

dynamic gain The magnitude ratio of the steady-state amplitude of the output signal from an element or system to the amplitude of the input signal to that element or system, for a sinusoidal signal.

dynamic image See foreground image.

dynamic input (in discrete systems) An input which is only effective if its input variable changes from 0 to 1 or from 1 to 0. Note: Dynamic inputs can be combined with static inputs.

dynamicizer, parallel-serial converter, serializer A functional unit that converts a set of simultaneous signals into a corresponding time sequence of signals.

dynamic measurement The determination of the instantaneous value of a quantity and, where appropriate, its variation with time. Note: The qualifier “dynamic” applies to the measurand and not to the method of measurement.

dynamic model A model in which the variables are functions of time. Contrast with static model and steady-state model.

dynamic noise limiter (DNL) A compatible circuit designed primarily for use with tape recorders.

dynamic optimization A type of control, frequently multivariable and adaptive in nature, which optimizes some criterion function in bringing the system to the setpoints of the controlled variables. The sum of the weighted, time – absolute errors is an example of a typical criterion function to be minimized. Contrast with steady-state optimization.

dynamic parameter, program generated parameter A parameter that is bound during the execution of a computer program.

dynamic pressure For an element of fluid in a conduit, the dynamic pressure is the increase in pressure above the static pressure which would result from the complete isentropic transformation of the kinetic energy of the fluid into pressure energy. See further ISO publication 4006-1977 or BS 5875:1980.

dynamic printout In a computer, a printout of data which occurs as one sequential operation during the machine run.

dynamic programming In operations research, a procedure for optimization of a multi-stage problem wherein a number of decisions are available at each stage of the process. Contrast with convex programming, integer programming, linear programming, mathematical programming, nonlinear programming, and quadratic programming.

dynamic RAM **1.** Main-memory system of large computers, minicomputers, and even some large microcomputer memory systems. **2.** Random access memory that needs to be refreshed at regular time intervals.

dynamic range In a transmission system, the difference in decibels between the noise level of the system and its overload level.

dynamic register A memory in which the storage takes the form of capacitively charged circuit elements and therefore must be continually “refreshed” or recharged at regular intervals.

dynamic relocation The ability to move computer programs or data from auxiliary memory to any convenient location in the memory. Normally the addresses of programs and data are fixed when the program is compiled.

dynamic resistance Incremental resistance measured over a relatively small portion of the operating characteristic of a device.

dynamic response The behavior of the output of a device as a function of the input, both with respect to time.

dynamic storage The storage of data on a device or in a manner that permits the data to move or vary with time, and thus the data is not always available instantly for recovery, e.g., acoustic delay line, magnetic drum, or circulating of information in a medium. Synonymous with dynamic memory.

dynamic storage allocation The system used in multiprogramming whereby an executive program allocates areas of memory to a program as and when the program is loaded.

dynamic support system (DSS) An interactive debugging facility that allows authorized maintenance personnel to monitor and analyze events and alter data.

dynamic toxicity test See toxicity test.

dynamic unbalance (control valves) The net force produced on the valve plug in any stated open position by the fluid forces acting upon it.

dynamic variable Process variables that can change from moment to moment due to unspecified or unknown sources.

dynamic viscosity The SI unit for measurement of dynamic viscosity is pascal second, Pa·s. Common multiple: mPa·s.

dynamic weighing Method in which the net mass of liquid collected is deduced from weighing made while fluid flow is directed into the weighing tank. (A diverter is not required with this method.)

dynamolectric Pertaining to the relationship between mechanical force and electrical energy or vice versa.

dyne The unit of force in the cgs (centimeter-gram-second) system. The dyne is 10^{-5} newton.

dyne per square centimeter The unit of sound pressure. One dyne per square centimeter was originally called a bar in acoustics, but the full expression is used in this field now because the bar is defined differently in other applications. Also called microbar. Also see sound pressure level.

dynistor A nonlinear semiconductor having the characteristics of a small current flow as voltage is applied. As the applied voltage is increased a point is reached at which the current flow suddenly increases radically and will continue at this rate even though the applied voltage is reduced.

dystrophic water Water which is poor in nutrients and contains a high concentration of humic substances.

E

(type E) Designation for thermocouple and thermocouple extension wire with a certain temperature-emf relationship. Material identification: nickel – 10% chromium versus copper-nickel. See ISA publication ANSI – MC 96.1-1982; and/or IEC publication 584-2. **E** Symbol for exa, meaning 10^{18} .

EAES European Atomic Energy Society.

early failure period That early period, if any, in the life of an item, beginning at a given instant of time and during which the instantaneous failure intensity for a repaired item or the instantaneous failure rate for a non-repaired item is considerably higher than that of the subsequent period.

EAROM See electrically alterable read – only memory.

earth 1. The conductive mass of earth whose electrical potential at any point is conventionally taken as zero. Synonymous with protective earth. **2.** Term used in Great Britain for ground.

earthed input, grounded input, single-ended input An input circuit in which one input terminal is directly connected to measuring earth. In many cases, this is the common point terminal.

earthed output, grounded output, single-ended output An output circuit in which one output terminal is directly connected to measuring earth. In many cases, this is the common point terminal.

earth ground A connection from an electrical circuit or equipment to the earth.

easy-bleaching pulp Pulp with a high degree of delignification which can be bleached to an acceptable brightness with a low consumption of bleaching chemicals.

EBCDIC Extended Binary Coded Decimal Interchange Code. An 8-bit code that represents an extension of a 6-bit BCD code.

EBR Electron Beam Recording Recording the output from a computer directly onto microfilm using an electron beam.

ebullition The act of boiling or bubbling.

ECA Electrical Contractor's Association (UK).

ECC 1. See error correcting code. **2.** Electronic Calibration Center.

eccentric cylindrical plug valves This valve design is a modification of the plug cock widely used for shut-off service. The eccentric shaped cylindrical plug cooperates with an off-axis, seating-face within the body, permitting good shut-off, but easy operation, because there is no rubbing contact in the body. An elastometer facing is required for the shut-off feature.

eccentric orifice plate Thin orifice plate, the orifice of which is eccentric to the conduit axis. See figure in ISO publication 4006-1077 or BS 5875:1980.

eccentric plug (control valves) Plug face is not concentric with plug stem centerline and moves into seat when closing.

eccentric-rotating plug valve A recently introduced valve of interest. The normal rotary stroke is 50° and an essentially linear, inherent flow characteristic is obtained with a C_V rating similar to that in the modern, high-capacity, top-entry, cage-guided globe valve. The eccentric motion of the spherical face of the plug reduces the operating torque requirements. See further ISA handbook of control valves.

eccentric spherical disk (control valves) Disk is spherical segment, not concentric with disk stem. Type of a valve plug.

echelon (calibration) One of a series of levels of accuracy of calibration, the highest of which is represented by an accepted national standard.

echo (data transmission) (general) A wave which has been reflected or otherwise returned with sufficient magnitude and delay to be perceived in some manner as a wave distinct from that directly transmitted. Note: Echos are frequently measured in decibels relative to the directly transmitted wave.

ECHO The immediate update and display of additions, deletions or data entry for review (i.e., to ECHO-repeat video text on a printer automatically and/or simultaneously).

echo check, loop check A check to determine the correctness of the transmission of data in which the received data are returned to the source for comparison with the originally transmitted data.

echosonogram A graphic display, such as an echocardiogram, determined with ultrasonic pulse-echo techniques.

echo sounder An instrument using the reflection of an acoustic signal from the bottom to determine the depth.

echo suppressor A line device used to prevent energy from being reflected back (echoed) to the transmitter. It attenuates the transmission path in one direction while signals are being sent in the other direction.

ECL bipolar memories Very high-speed cache, writable-control stores, and processing sections of large computers.

ECMA The European Computer Manufacturers Association.

ECMC Electric Cable Maker's Confederation (England).

ecology The study of the interrelation of living organisms and their environment.

ecology The study of the interrelation of living organisms and their environment.

economizers Heat exchangers used to recover excess thermal energy from process streams. Economizers are used for feed preheat and as column reboilers. In some systems the reboiler for one column is the condenser for another.

ecosystem A system in which, by the interaction of the different organisms present and their environment, there is a cyclic interchange of materials and energy.

ECQAC European Commission for Quality Assurance for Electrotechnical Components.

ECT See edgewise crush resistance.

EDC 1. Enamel Double Cotton. **2.** Electronic Digital Computer. **3.** Electronic Desk Calculator. **4.** Error Detection and Correction.

eddy A whirlpool of gas.

eddy current Current that circulates in a metallic material as a result of electromotive forces induced by a variation of magnetic flux. Also called Foucault current. Eddy currents represent loss of energy and cause heating.

eddy-current braking (rotating machinery) A form of electric braking in which the energy to be dissipated is converted into heat by eddy currents produced in a metallic mass.

eddy-current clutch A device that permits connection between a motor and a load by electrical (magnetic) means – no physical contact is involved.

eddy-current heating Synonym for induction heating.

eddy-current methods (inspection of steel)

Eddy-current methods are used to measure physical and mechanical parameters and for the detection of surface imperfections in steel products. Eddy-current are so named because their path often resemble the circular eddies in water. The eddy-current method measures the electromagnetic interaction between a transducer or test coil and the part being inspected.

Eddy thermometer The Eddy current thermometer is one of several thermometers that utilize magnetic induction to detect the temperature – dependent resistance changes in a conductor, usually metal.

EDF Electricite de France.

edge-board connector A connector that mates with printed-wiring leads running to the edge of a printed-circuit board. Also called card-edge connector.

edge-board contact A series of contacts printed on or near any edge of a printed board and intended for mating with an edge connector.

edge connector A connector designed to mate with printed-circuit boards. May be equipped with a polarizing pin or a key to ensure correct polarity.

edge cutter Spray nozzle movable in the paper machine's cross direction and used for cutting the wet web in the longitudinal direction. Edge cutters are arranged in pairs and determine the width of the web.

edge-emitting light emitting diode (ELED) (optical communication) A light emitting diode which emits its optical radiation parallel to the plane of the junction.

edge runner, kollergang A machine with two heavy stone wheels united on a single axis, which roll around the bottom of a circular basin. The edge runner is used for beating or kneader pulping, the heavy stone wheels pressing and kneading the fiber material on the bottom of the basin.

edgewise crush resistance, ECT, (of corrugated fiberboard) The maximum compressive force per unit length which a plane, rectangular test piece standing on its edge can withstand without failure.

EDI Electronic Data Interchange. Technology that permits the transfer of electronic information between different parts of an organization or different organizations. EDI uses a variety of protocols and standards depending upon the application and the industry.

Edison base Standard screw-thread base used for ordinary electric lamps.

Edison storage battery An alkaline storage battery in which the positive active material is nickel oxide and the negative an iron alloy.

edit To rearrange data or information. Editing may involve the deletion of unwanted data, the selection of pertinent data, the application of format techniques, the insertion of symbols such as page numbers and type writer characters, the application of standard processes, such as zero suppression, and the testing of data for reasonableness and proper range.

editing (in programming languages) Transforming values to the representations specified by a given format.

editor (software) A computer program that permits selective revision of computer-stored data.

EDP See electronic data processing.

EDT Ethylene Diamine Tartrate.

educator 1. A device that withdraws a fluid by aspiration and mixes it with another fluid. 2. Using water, steam or air to induce the flow of other fluids from a vessel. See injector.

EEA Electronic Engineering Association (UK).

EEB Eastern Electricity Board. Part of CEBG (UK).

EEG 1. Electroencephalogram. 2. Electroencephalograph.

EEI Edison Electric Institute (USA).

EEIA Electrical and Electronic Insulation Association (UK).

EEIBA Electrical and Electronical Industries Benevolent Association (UK).

EEPROM Electrically Erasable Programmable Read – Only Memory, a chip which can be programmed while in the printed circuit-board socket.

EEUA Engineering Equipment User's Association (UK).

effective address The contents of the address part of an effective instruction.

effective alkali An expression for the concentration of alkaline in alkaline cooking liquor.

effective ampere That alternating current which, when flowing through a standard resistance, produces heat at the same average rate as one ampere of direct current flowing in the same resistance.

effective area In a diaphragm actuator, the effective area is that part of the diaphragm area which is effective in producing stem force.

effective area of the light beam The area in which the photoelectric or proximity switch is affected. Using photoelectric switches, this area is perpendicular to the light beam axis at any point within the operating range. Using photoelectric proximity switches, this area is located within the scanning plane.

effective bandwidth The bandwidth of an ideal (rectangular) band-pass filter, which would pass the same proportion of the signal energy as the actual filter.

effective capacitance The total capacitance existing between any two given points of an electric circuit.

effective conductivity The conductance between the opposite parallel faces of a portion of a material having unit length and unit cross section.

effective current That value of alternating current which will give the same heating effect as the corresponding value of direct current.

effective cutoff frequency A transducer characteristic expressed as the frequency where the insertion loss between two terminating impedances exceeds the loss at some reference frequency in the transmission band by a specified value.

effective data transfer rate The average number of bits, characters, or blocks per unit time transferred from a data source to a data sink and accepted as valid. Note: The rate is expressed in bits characters, or blocks per second, minute, or hour.

effective dead time The time interval between the change in a signal to an element or system and the build up of the response to a specified proportion, say until 5 percent of the final change has taken place.

effective filtration area Total area of the porous medium exposed to flow in a filter element.

effective ground Connection to ground through a medium of sufficiently low impedance and adequate current carrying capacity to prevent voltage build-up which may be hazardous to equipment or personnel.

effective instruction An instruction that may be executed without modification.

effective irradiance to trigger The minimum effective irradiance required to switch a light activated SCR from the off-state to the on-state.

effectiveness (performance) The ability of an item to meet a service demand of given quantitative characteristics.

effective pressure The difference between the local absolute pressure of the fluid and the atmospheric pressure at the place and time of the measurement.

effective range, measuring range The range defined by two values of the measured quantity, or quantity to be supplied, within which the limits of error of the measuring instrument are specified.

effective resistance 1. The average rate of dissipation of electric energy during a cycle divided by the square of the effective current. **2.** The equivalent pure dc resistance which, when substituted for the winding of a motor being checked, will draw the same power.

effective rod end area piston (cylinders) Effective annulus area between the bore and the piston rod diameter.

effective series resistance A resistance considered to be in series with an assumed pure capacitance.

effective sound pressure The root-mean-square value of the instantaneous sound pressure at one point over a complete cycle.

effective thermal resistance Of a semiconductor device, the effective temperature rise per unit power dissipation of a designated junction above the temperature of a stated external reference point under conditions of thermal equilibrium.

effective value Also called rms (root mean square) value. The value of alternating current that will produce the same amount of heat in a resistance as the corresponding value of direct current. For a sine wave, the effective value is 0.707 times the peak value.

effector A device used to produce a desired change in an object in response to its input energy.

efficiency 1. The extent to which software performs its intended functions with a minimum consumption of computer resources. **2.** The ratio of output to the input. The efficiency of a steam generating unit is the ratio of the heat absorbed by water and steam to the heat in the fuel fired. **3.** In manufacturing, the average output of a process or production line expressed as a percent of its expected output under ideal conditions. **4.** The ratio of useful energy supplied by a dynamic system to the energy supplied to it over a given period of time.

efficiency (fluid power systems) Ratio of an output to the corresponding input.

effluent The discharge or outflow from a manufacturing or processing plant; outfall, drainage. See influent.

effluent polishing Tertiary treatment employing either further physical or biological processes.

effluvium Waste by-products of food or chemical processing.

egoless programming An approach to software development based upon the concept of team responsibility for program development. Its purpose is to prevent the programmer from indentifying so closely with his or her output that objective evaluation is impaired.

EHF Extremely High Frequency (30–300 GHz).

EIA 1. Electronic Industries Association (USA). **2.** Engineering Industries Association (GB).

EIAC Electronic Industries Association of Canada.

EIA interface standard RS-232 B or C A standardized method adopted by the Electronic Industries Association to insure uniformity of interface between data communication equipment and data processing terminal equipment.

EIAJ Standards of Electronic Industries of Japan.

EIC Engineering Institute of Canada.

EIEMA Electrical Installation Equipment Manufacturer's Association (UK).

eight-level code A code in which eight impulses are utilized for describing a character.

Einhoven string galvanometer A moving-coil type of galvanometer in which the coil is a single wire suspended between the poles of a powerful electromagnet.

EIRMA European Industrial Research Managers Association.

ejector A device which utilizes the kinetic energy in a jet of water or other fluid to remove a fluid or fluent material from tanks or hoppers.

ejector condenser A direct-contact condenser in which vacuum is maintained by a jet of high-velocity injection water, which simultaneously condenses the steam and discharges water, condensate and noncondensable gases to the atmosphere or to the next stage ejector.

ejector half The movable portion of a diecasting or plastics-forming mold.

EKG, ECG 1. Electrocardiograph. **2.** Electrocardiogram.

elapsed time The total time taken by a process, as measured between the apparent beginning and the apparent end of the process. See real time clock.

elastic banding Method of defining the limits of an image on the computer screen by stretching a boundary around it.

elastic chamber The portion of a pressure-measuring system that is filled with the medium whose pressure is being measured, and that expands and collapses elastically with changes in pressure; examples include Bourdon tube, bellows, flat or corrugated diaphragm, springloaded piston, or a combination of two or more single elements, which may be the same or different types.

elastic collision A collision between two or more bodies in which the internal energy of the participating bodies remains constant, and in which the kinetic energy of translation for the combination of bodies is conserved.

elastic scattering A collision between two particles, or between a particle and a photon, in which total kinetic energy and momentum are conserved.

elastomer 1. A material that has the ability to recover from extreme deformation, in the order of hundreds of percent. **2.** A material which at room temperature stretches under low stress to at least twice its lengths and snaps back to the original length on release of stress. Elastomers are used in control valves as O-ring seals and soft seats when tight shutoff is required. Temperature is one of the major limitations of elastomers.

elastomeric energized liner (butterfly valves) A resilient elastomeric ring under the main liner is compressed by the disk acting through the main liner, thus generating a resilient sealing action between the disk and the main liner.

elbow 1. A fitting that connects two pipes at an angle, usually 90° but may be any other angle less than 100°. **2.** Any sharp bend in a pipe.

elbow meter A pipe elbow meter that is used as a flow measurement device by placing a pressure tap at both the inner and outer radius and measuring the pressure differential caused by differences in flow velocity between the two flow paths.

electret A permanently polarized piece of dielectric material produced by heating the material and placing it in a strong electric field during cooling.

electric Containing, producing, arising from, actuated by, or carrying electricity, or designed to carry electricity and capable of so doing. Examples: Electric eel,

energy, motor, vehicle, wave. Note: Some dictionaries indicate electric and electrical as synonymous but usage in the electrical engineering field has in general been restricted to the meaning given in the definitions above. It is recognized that there are borderline cases wherein the usage determines the selection.

electric air-compressor governor A device responsive to variations in air pressure that automatically starts or stops the operation of a compressor for the purpose of maintaining air pressure in a reservoir between predetermined limits.

electrical (general) Related to, pertaining to, or associated with electricity, but not having its properties or characteristics. Examples: Electrical engineer, handbook, insulator, rating, school, unit. Note: Some dictionaries indicate electric and electrical as synonymous but usage in the electrical engineering field has in general been restricted to the meaning given in the definition given above. It is recognized that there are borderline cases wherein the usage determines the selection.

electrical anesthesia (medical electronics) More or less complete suspension of general or local sensibility produced by electric means.

electrical angle A quantity that specifies a particular instant in a cycle of alternating current. One cycle is considered to be 360° , so a half cycle is 180° and a quarter cycle is 90° . If one voltage reaches its peak value of quarter cycle after another, the phase difference, or electrical angle between the voltages, is 90° .

electrical bias An electrically produced force tending to move the armature of a relay toward a given position.

electrical bridging The formation of a conductive path between conductors.

electrical capacitance level measuring device A device which measures the level of a material (liquid or solid) by sensing the electrical capacitance of two electrodes between which the material is located. Note: One of the electrodes could be the wall of a tank.

electrical center The point approximately midway between the ends of an inductor or resistor. This point divides the inductor or resistor into two equal electrical values (e.g., voltage, resistance, inductance or number of turns).

electrical codes (general) A compilation of rules and regulations covering electric installations. In USA: **1.** Official electrical code, one issued by a municipality, state, or other political division, and which may be enforced by legal means. **2.** Unofficial electrical code, one issued by other than political entities such as engineering societies and the enforcement of which depends on other than legal means.

electrical conductance level measuring device A device which measures the level of a conductive liquid by sensing the electrical resistance between two electrodes separated by the liquid.

electrical conductivity The reciprocal of the resistance in ohms measured between opposite faces of a centimeter cube of an aqueous solution at a specified temperature. The property of a fluid or solid that permits the passage of an electrical current as a result of an impressed emf. It is measured by the quantity of electricity transferred across unit area per unit potential gradient per unit time. For water quality examination, see specific conductance.

electrical connector Any device among thousands which is designed or used to either terminate or connect electrical conductors.

electrical control Control method operated by a change of electrical state.

electrical control equipment Any apparatus, instrument or device which controls one or more output quantities, to specific values, each value being determined by manual setting, local or remote programming, or by one more input variables. This definition applies to electrical equipment mainly for industrial process and/or laboratory use.

electrical coupling Coupling discrete elements with either electrical conductors or reactances.

electrical engineering A branch of engineering that deals with practical applications of electricity, especially the generation transmission and utilization of electric power by means of current flow in conductors.

electrical filter Device for rejecting or passing a specific band of signal frequencies.

electrical flow transducer Device which converts fluid to an electrical signal.

electrical ground The zero voltage reference for the power supply in an electronic device, usually connected to the equipment chassis. May also be connected to the power mains or earth ground.

electrical inertia Inductance that opposes any change in current through an inductor.

electrical insulating material A substance in which the electrical conductivity is very small (approaching zero) and provides electric isolation.

electrical insulating board, electrical insulating paper Electrical insulating paper is durable, free from electrolytes and metallic particles, and has a uniform thickness and good formation.

electrical interface Electrical interconnection between system elements.

electrical laboratory equipment Any apparatus, instrument or device which measures, indicates, records or analyzes substances; or which is used to prepare materials. Such equipment may also be used outside the laboratory.

electrical length Length expressed in wave lengths, radians or degrees.

electrical load Electric power used by devices connected to an electrical generating system.

electrically alterable read-only memory, EARAM A memory unit made up in such a way that electrical pulses on appropriate pins can erase some or all of the stored data so that new information can then be written in. This type of memory is referred to as word programmable, i.e. one word can be erased and re-written without affecting the rest of the contents.

electrically erasable programmable read-only memory, EEROM A field-programmable read-only memory in which cells may be erased electrically and each cell may be reprogrammed electrically.

electrical measuring instrument A measuring instrument intended to measure an electrical or non-electrical quantity using electrical means.

electrical noise (control systems) Unwanted electrical signals, which produce undesirable effects in the circuits of the control systems in which they occur.

electrical power consumption The maximum power used by a device within its operating range during steady-state signal condition. Notes: **1.** For a power factor other than unity, power consumption shall be stated as maximum volt-amperes used under the above stated condition. **2.** For a device operating outside of its operating range, the maximum power might exceed that which is experienced within the operating range.

electrical pressure transducer Device which converts pressure to an electrical signal.

electrical pumping Deposition of energy into a laser medium by passing an electrical current or discharge, or a beam of electrons through the material.

electrical quiescent power (fluid power systems) Power dissipation required for differential operation when the current through each coil is equal and opposite in polarity.

electrical ratings The combinations of voltage and current under which a device or component will operate satisfactorily in specified circuits under standard atmospheric conditions.

electrical reset A term applied to a relay to indicate that it is capable of being electrically reset after an operation.

electrical resistivity The resistance of a material to passage of an electric current through it. Usual units are ohm-m (SI) or ohm per circular-mil foot (U.S. customary); it is the reciprocal of electrical conductivity.

electrical resonance method (for consistency measurement) The theory of measurement for this unit is that fluids will vary in frequency dependent upon amount of solid material in mixture. Method of measurement: **1.** Body of pure water in high-frequency circuit (250 megacycles). **2.** Addition of fibrous material will change resonant frequency. **3.** Amount to frequency shift will determine consistency measurement. Application within pulp and paper industry.

electrical schematic diagram A specific representation in graphics of an electrical circuit in which symbols are used for each circuit element.

electrical shielding Copper screen, a wire braid, or any conducting material which surrounds a circuit or cable conductors to exclude electrostatic or radio-frequency noises.

electrical steel Low carbon steel that contains 0.5 to 5% Si or other material; produced specifically to have enhanced electromagnetic properties. Contrast with electric steel.

electrical system The organized arrangement of all electrical and electromechanical components and devices in a way that will properly control the particular machine tool or industrial equipment.

electrical zero For a measuring instrument which needs an auxiliary supply, the position to which the indicating device tends to return when the instrument is in service and when the measured quantity is zero. Note: The electrical zero does not necessarily coincide with the mechanical zero.

electrical zero adjuster A device by means of which the electrical zero can be set to its required position.

electric boiler A boiler in which electric heating means serve as the source of heat.

electric chart drive A clocklike mechanism driven by an electric motor which advances a circular or strip chart at a preset rate.

electric contact The junction of conducting parts permitting current to flow.

electric controller (electric installations on shipboard) A device, or group of devices, which serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

electric coupler A group of devices (plugs, receptacles, cables etc.) that provides for readily connecting or disconnecting electric circuits).

electric current The SI base unit for measurement of electric current is ampere, A. Write A or ampere, not "amp" or "amps".

electric drive (industrial control) A system consisting of one or several electric motors and of the entire electric control equipment design to govern the performance of these motors. The control equipment may or may not include various rotating electric machines.

electric/electronic point gauge (gage) A point gauge (gage) provided with an electrical/electronic device to indicate the instant when the point touches the water surface. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3680:Part 1:1983.

electric field 1. The region about a charged body. Its intensity at any point is the force which would be exerted on a unit positive charge at that point. **2.** A condition detectable in the vicinity of an electrically charged body such that forces act on other electric charges in proportion to their magnitudes. **3.** Field of force which exists in the space around electrically charged particles.

electric field strength 1. The magnitude of an electric field in an electromagnetic wave. **2.** The magnitude of an electric field vector.

electric furnace See electric-furnace steelmaking.

electric-furnace steelmaking Numerous types of furnaces using electric current as the source of heat have been developed, but relatively few have survived as practical steelmaking tools. Electric current can be used for heating steel in three ways; **1.** by passing electric current through an ionized gaseous medium and using the heat radiated by the generated arc (arc heating); **2.** by passing current through solid conductors and using the heat generated as a result of the conductors inherent resistance to the flow of current (resistance heating); and **3.** by bombarding the steel surface with a high intensity electron beam and using the heat generated by the conversion of energy at the relatively small area of electron impingement.

electric generator A machine that transforms mechanical power into electrical power.

electric heating Any method for converting electric energy into heat, but especially those methods involving resistance to the passage of electric current.

electric hygrometer method Accurate direct reading measurement of relative humidity are obtained by utilizing the property of certain moisture-sensitive compounds which alter their electrical conductivity in relation to the amount of moisture absorbed. In one design the sensing element is a plastic form upon which two gold leaf grids are stamped, and the overall form finally coated with moisture-sensitive lithium chloride. This element is a transducer, since it converts relative humidity into electrical units. Because the electrical resistance of the transducer will change when it is exposed to variations in humidity, this effect can be sensed by the measuring circuit of an instrument.

electric hysteresis Internal friction in a dielectric field (e.g., the paper or mica dielectric of a capacitor in an ac circuit). The resultant heat generated can eventually break down the dielectric and cause the capacitor to fail.

electric lock A device to prevent or restrict the movement of a lever, a switch, or a movable bridge unless the locking member is withdrawn by an electric device such as an electromagnet, solenoid, or motor.

electric moment For two charges of equal magnitude but opposite polarities, a vector equal in magnitude

to the product of the magnitude of either charge by the distance between the centers of the two charges. The direction of the vector is from the negative to the positive charge.

electric pipe heating system A system of components and devices consisting of electric heaters, controllers, sensors, dedicated power system components such as transformers, panelboards, cables and systems alarm devices (as required), which, when taken together as a system, is used to increase or maintain the temperature of fluids in mechanical pipes, valves, pumps, tanks, instrumentation etc. Syn: Heat tracing system; trace heating system.

electric port (optoelectronic device) A port where the energy is electric. Note: A designated pair of terminals may serve as one or more electric ports.

electric potential The potential difference between the point and some equipotential surface, usually the surface of the earth, which is arbitrarily chosen as having zero potential (remote earth). Note: A point which has a higher potential than a zero surface is said to have a positive potential; one having a lower potential has a negative potential. Unit for measurement of electric potential or tension is volt, symbol V (SI unit).

electric power distribution panel A metallic or nonmetallic, open or enclosed, unit of an electric system. The operable and the indicating components of an electric system, such as switches, circuit breakers, fuses, indicators etc., usually are mounted on the face of the panel. Other components such as terminal strips, relays, capacitors etc., usually are mounted behind the panel.

electric probe A rod inserted into an electric field during a test to detect dc, audio, or rf energy.

electric propulsion system A system providing transmission of power by electric means from a prime mover to a propeller shaft with provisions for control, partly or wholly by electric means, of speed and direction.

electric reset A qualifying term indicating that the contacts of a relay must be reset electrically to their original position following an operation.

electric reset A qualifying term indicating that the contacts of a relay must be reset electrically to their original positions following an operation.

electric-resistance-type liquid-level detector A device for detecting the presence of liquid at a given point; it consists of an electric probe which is insulated from the side of a vessel and positioned so that the end of the probe is at the desired liquid level; in operation, a small electric voltage is impressed between the probe and the vessel; if liquid exists at the probe level, current flows in the circuit, but does not flow if the liquid is below probe level.

electric resistance-type temperature indicator A device that indicates temperature by means of a resistance bridge circuit.

electric shield A housing, usually aluminium or copper, placed around a circuit to provide a low-resistance path to ground for high-frequency radiations and thereby prevent interaction between circuits.

electric soaking pit (in steel production) Electric soaking pits were developed to meet special requirements, such as control of scaling and the maintenance of controlled atmospheres during the heating of stainless-steel and alloy-steel ingots.

electric steel Any steel melted in an electric furnace, which allows close control of composition. Also known as electric-furnace steel. Contrast with electrical steel.

electric strain gage A device which detects the change in shape of a structural member under load and causes a corresponding change in the flow of current through the device.

electric strength The maximum electric charge a dielectric material can withstand without rupturing.

electric stroboscope An instrument for observing or for measuring the speed of rotating or vibrating objects by electrically producing periodic changes in the intensity of light used to illuminate the object.

electric tachometer A tachometer (rpm indicator) that utilizes voltage or electrical impulses.

electric tape gage (gage) A gage (gage) consisting essentially of a graduated tape, weighted and lowered to make contact with the surface of the liquid. The contact with the liquid is indicated by an electrical device.

electric telemeter An apparatus for remotely detecting and measuring a quantity – including the detector intermediate means, transmitter, receiver and indicating device – in which the transmitted signal is conducted electrically to the remote indicating or recording station.

electric thermometer An instrument that utilizes electric means to measure temperature.

electric transducer A type of transducer in which all input, output and intermediate signals are electric waves.

electric vector 1. A component of the electromagnetic field associated with electromagnetic radiation. The component is of the nature of an electric field. The electric vector is supposed to coexist with, but act at right angles to, the magnetic vector. **2.** The electric field associated with an electromagnetic wave and thus with a light wave. The electric vector specifies the direction and amplitude of this electric field.

electric-wave filter Also called electric filter. A device that separates electric waves of different frequencies.

electroanalysis The process of determining the quantity of an element or compound in an electrolyte solution by depositing the element or compound on an electrode by electrolysis.

electrobiological The science concerned with electrical phenomena of living creatures.

electrochemical cell An electrochemical system consisting of an anode and a cathode in metallic contact and immersed in an electrolyte. The anode and cathode may be different metals or dissimilar areas on the same metal surface.

electrochemical cleaning See electrolytic cleaning.

electrochemical corrosion See electrolytic corrosion.

electrochemical deterioration A process in which autocatalytic electrochemical reactions produce an increase in conductivity and in turn ultimate thermal failure.

electrochemical device A device that operates on both electrical and chemical principles, e.g., a lead-acid storage battery.

electrochemical potential Also called electrochemical tension. The partial derivative of the total electrochemical free energy of the system with respect to the number of moles of the constituent except that it includes the electrical as well as the chemical contributions to the free energy.

electrochemical recording A recording made by passing a signal-controlled current through a sensitized sheet of paper.

electrochemical tension See electrochemical potential.

electrochemical transducer A device which uses a chemical change to measure the input parameter, and the output of which is a varying electrical signal proportional to the measurand.

electrochemical valve Electric valve consisting of a metal in contact with a solution or compound, across the boundary of which current flows more readily in one direction than in the other direction and in which the valve action is accompanied by chemical changes.

electrochemistry That branch of science concerned with reciprocal transformation of chemical and electrical energy.

electrode 1. In electrochemistry, an electric conductor for the transfer of charge between the external circuit and the electroactive species in the electrolyte.

2. For an electron tube, a conducting element that performs one or more of the functions of emitting, collecting, or controlling by an electric field the movements of electrons or ions.

electrode bias (electron tubes) The voltage at which an electrode is stabilized under operating conditions with no incoming signal, but taking into account the voltage drops in the connected circuits.

electrodeless conductivity cell A type of conductivity sensor. Electrodeless conductivity is applicable to the higher conductivity ranges such as 50 to 1 000 millimhos per centimeter.

electrode method (of liquid level measurement) See electric-resistance-type liquid-level detector.

electrodeposition Any electrolytic process that results in deposition of a metal from a solution of its ions; it includes processes such as electroplating and electroforming. Also known as electrolytic deposition.

electrode signal (electromagnetic flowmeters) The total potential difference between the electrodes consisting of the flow signal and signals not related to flow such as in-phase, quadrature and common mode.

electrode voltage The voltage between an electrode and the cathode or a specified point of a filamentary cathode.

electrodiagnosis The study of functional states of parts of the body either by studying their response to electric stimulation or by studying the electric potentials (or currents) that they spontaneously produce.

electrodialysis (water quality) A process used for the deionization of water in which ions are removed, under the influence of an electric field, from one body of water and transferred to another across an ion-exchange membrane.

electrodynamical instrument An instrument which operates by the interaction of a current in a movable coil with a current in one or more fixed coils. Note: This term is generally reserved for instruments which do not have ferromagnetic material in the magnetic circuit.

electrodynamics 1. The science dealing with the various phenomena of electricity in motion, including interactions of currents with each other, with their associated magnetic fields, and with other magnetic fields. **2.** The study of the generation of electromagnetic power by radiation from high-energy beams.

electrogalvanizing process In the process of electrogalvanizing, the furnaces, galvanizing pot, and cooling tower of the hot-dip process are replaced by a series of electrolytic cells through which steel strip passes. Electrical current, in each of the cells, flows through a zinc solution from anode to conductor roll, bonding zinc to the steel strip.

electrograph 1. A tracing produced on prepared sensitized paper or other material by passing an electric current or electric spark through the paper. **2.** A plot or graph produced by an electrically controlled stylus or pen.

electro-hydraulic actuator A self-contained device which responds to an electrical signal, positioning an electrically operated hydraulic pilot valve to allow pressurized hydraulic fluid to move an actuating piston, bellows, diaphragm or fluid motor to position a valve stem.

electro-hydraulic servo-valve Hydraulic servo-valve in which the input command is electrical.

electrokinetic potential, zeta potential (medical electronics) A set of four electric or velocity potentials that accompany relative motion between solids and liquids.

electroless plating Deposition of a metal from a solution of its ions by chemical reduction induced when the basis metal is immersed in the solution, without the use of impressed electric current.

electroluminescence (fiber optics) Nonthermal conversion of electrical energy into light.

electroluminescent display device An optoelectronic device with a multiplicity of electric ports, each capable of independently producing an optic output from an associated electroluminator element.

electrolysis The destructive chemical action caused by stray or local electric currents to pipes, cables, and other metalwork.

electrolyte A conducting medium in which the flow of electric current takes place by migration of ions. Note: Many physical chemists define electrolyte as a substance that when dissolved in a specified solvent, usually water, produces an ionically conducting solution.

electrolytic 1. Pertaining to or made by electrolysis; deposited by electrolysis; pertaining to or containing an electrolyte. **2.** Said of an electrical device which contains an electrolyte. **3.** Describes a type of capacitor with permanent polarity markings.

electrolytic capacitor A capacitor consisting of two conducting electrodes, with the anode having a metal oxide film formed on it. The film acts as the dielectric or insulating medium. The capacitor is operable in the presence of an electrolyte, usually an acid or salt. Generally used for filtering, bypassing, coupling, or decoupling.

electrolytic cell In a battery, the container, two electrodes, and the electrolyte.

electrolytic cleaning A process of removing soil, scale, or corrosion products from a metal surface by subjecting it as an electrode to an electric current in an electrolytic bath.

electrolytic conductivity Also called specific conductance. A measure of the ability of a solution to carry an electric current. Defined as the reciprocal of the resistance in ohms of a 1-cm cube of the liquid at a specified temperature. The units of specific conductance are the reciprocal ohm - cm (or siemens/cm) and on millionth of this.

electrolytic corrosion Corrosion by means of electrochemical erosion.

electrolytic deposition See electrodeposition.

electrolytic dissociation The breaking up of molecules into ions in a solution.

electrolytic hygrometers See coulometric hygrometers.

electrolytic iron Iron obtained by an electrolytic process. The iron possesses good magnetic qualities and is exceptionally free of impurities.

electrolytic oxygen analyzer The electrolytic oxygen analyzer requires scrubbing of the gas sample to remove impurities, further scrubbing by potassium hydroxide to remove acid gases, and humidifying the sample. The sample then flows to a galvanic cell consisting of two electrodes immersed in an electrolyte. An electrochemical reaction takes place at the interface of the cathode and the electrolyte, whereby the oxygen is converted into hydroxyl ions. The ions then flow to the cadmium plate. The combination of the hydroxyl ions with the cadmium produces electrons, which flow as a current through a microammeter calibrated in units of parts per million of oxygen. Applications: measurement of traces of oxygen in a gas.

electrolytic pickling Removal of scale and surface deposits by electrolytic action in a chemically active solution.

electrolytic potential The difference in potential between an electrode and the immediately adjacent electrolyte, expressed in terms of some standard electrode difference.

electrolytic rectifier A rectifier consisting of metal electrodes in an electrolyte, in which rectification of alternating current is accompanied by electrolytic action. The polarization film formed on one of the electrodes permits current in one direction but not in the other.

electrolytic refining The refining or purifying of metals by electrolysis.

electromagnet A temporary magnet consisting of a solenoid with an iron core. A magnet field exists only while current flows through the solenoid.

electromagnetic 1. Having both magnetic and electric properties. **2.** Pertaining to the relationship between currents and magnetic fields.

electromagnetic compatibility, EMC 1. The ability of a device, equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment. (Definition as per IEC publication 50, chapter 161). See further IEC publication 801-1, Part 1: General introduction.

electromagnetic compatibility level The specified value of an electromagnetic disturbance for which electromagnetic compatibility with a very high degree of probability exists for the equipment operating within a given system or part of a system. (Definition as per IEC publication 50, Chapter 161).

electromagnetic compatibility for industrial-process measurement and control equipment New electronic systems containing more sensitive electronic circuits (e.g. micro and minicomputers) have come into service in the industrial environment in recent years. The equipment is exposed to electromagnetic interference generated by various types of industrial equipment. The following IEC publications deal with this subject: 801-1 Part 1: General introduction; 801-2, Part 2: Electrostatic discharge requirements; 801-3: Radiated electromagnetic field requirements; 801-4, Part 4: Electrical fast transient/burst requirements.

electromagnetic crack detector An instrument for detecting hidden cracks in iron or steel objects by magnetic means.

electromagnetic disturbance 1. An electromagnetic phenomenon that may be superimposed on a wanted signal. **2.** Any electromagnetic phenomenon which may degrade the performance of a device, equipment or system.

electromagnetic emission The phenomenon by which electromagnetic energy emanates from a source.

electromagnetic field 1. The field of influence produced around a conductor by the current flowing through it. **2.** The field associated with radio or light waves, consisting of a magnetic and an electric field at right angles to each other and to the direction of wave propagation.

electromagnetic flowmeter A flowmeter which creates a magnetic field perpendicular to the flow so enabling the flow-rate to be deduced from the induced electromotive force (emf) produced by the motion of a conducting fluid in the magnetic field. The electromagnetic flowmeter consists of a primary device and a secondary device.

electromagnetic induction The voltage produced in a coil as the number of magnetic lines of force (flux linkages) passing through the coil changes.

electromagnetic instrument Any instrument in which the indicating means or recording means is positioned by mechanical motion controlled by the strength of an induced electromagnetic field.

electromagnetic interference, EMI, electrostatic interference Any spurious effect produced in the circuits or elements of a device by external electromagnetic fields. Note: A special case of interference from radio transmitters is known as Radio Frequency Interference (RFI).

electromagnetic noise (electromagnetic compatibility) An unwanted electromagnetic disturbance that is not of a sinusoidal character.

electromagnetic radiation Most electronic equipment is in some manner affected by electromagnetic radiation. This radiation is frequently generated by the small handheld radio transceivers that are used by operating, maintenance and security personnel, or any other device that will generate continuous wave radiated electromagnetic energy. IEC standard 801-3. Electromagnetic compatibility for industrial-process measurement and control equipment, Part 3: Radiated electromagnetic field requirements is applicable to the susceptibility of industrial-process measurement and control equipment to radiated electromagnetic energy. This standard additionally establishes severity levels and the required test procedures. Other IEC standards related to electromagnetic compatibility are 803-1, Part 1: General introduction and 801-2, Part 2: Electrostatic discharge requirements.

electromagnetic relay An electromagnetic switching device having multiple electrical contacts that are operated by an electrical current through a coil.

electromagnetic tester That nondestructive test method for engineering materials, including magnetic materials, which use electromagnetic energy having frequencies less than those of visible light to yield information regarding the quality of the tested materials.

electromagnetic wave The radiant energy produced by the oscillation of an electric charge characterized by oscillation of the electric and magnetic fields.

electromagnetism 1. The magnetic field around a wire or other conductor when, and only when, current passes through it. **2.** Magnetism caused by an electric current in a conductor.

electromechanical actuator A device which uses an electrically operated motor driven gear train or screw to position the actuator stem. Such actuators may operate in response to either analog or digital electrical signals. The electro-mechanical actuator is also referred to as a motor gear train actuator.

electromechanical transducer A type of transducer in which the input signal is an electric wave and the output mechanical oscillation, or vice versa.

electrometallurgy That branch of science concerned with the application of electrochemistry to the extraction or treatment of metals.

electrometer An instrument for measuring electric charge, usually by means of the forces exerted on one or more charged electrodes in an electric field.

electrometric or potentiometric method of pH measurement This method is almost universally used in the processing industries. The pH is determined by measuring the voltage developed by two electrodes in contact with the electrolytic solution. A chemical reaction takes place between the electrodes and the ionized solution (electrolyte), producing an electrical potential. The measuring system consists of three major elements: the measuring electrode, the reference electrode, and an instrument to sense and amplify the very small voltage developed between the two electrodes.

electromotive force, EMF See under thermocouple.

electromotive force series A list of elements arranged according to their standard electrode potentials, with noble metals, such as gold, being positive and active metals, such as zinc, being negative.

electromotive series A list of metals arranged in decreasing order of their tendency to pass into ionic form by losing electrons.

electron A stable elementary particle with a negative charge which is responsible for electrical conduction. Electrons move when under the influence of an electric field. This movement constitutes an electric current.

electron – beam recording, EBR A means of using an electron beam to write computer-generated data direct to microfilm.

electron beam A beam of electrons emitted from a source, e.g., a cathode-ray tube (CRT) has a thermionic cathode electron gun which produces the beam.

electron-beam instrument Also called a cathode-ray instrument. An instrument in which a beam of electrons is deflected by an electric or magnetic field (or both).

electron emission The liberation of electrons from an electrode into the surrounding space. Note: Quantitatively, it is the rate at which electrons are emitted from an electrode.

electron flow The movement of electrons from a negative to a positive point in a metal or other conductor, or from a negative to a positive electrode through a liquid, gas, or vacuum.

electron gun The device in writing tube or CRT which generates the electron beam.

electronic Pertaining to that branch of science dealing with the motion, emission, and behavior of currents of free electrons, especially in vacuum, gas, or phototubes and special conductors or semiconductors. This is contrasted with electric, which pertains to the flow of large currents in metal conductors.

electronic analog computer An automatic computing device that operates in terms of continuous variation of some physical quantities, such as electric voltages and currents, mechanical shaft rotations, or displacements, and that is used primarily to solve differential equations.

electronic blackboard Means of transmitting handwritten text and diagrams over a telephone line.

electronic calculator Electronic device for arithmetic and logarithmic computations; may also include digital printer and computer.

electronic circuit A circuit containing one or more electron tubes, transistors, magnetic amplifiers, etc.

electronic communications The specialized field concerned with the use of electronic device and systems for the acquisition or acceptance, processing, storage, display, analysis, protection, and transfer of information.

electronic computer originated mail, ECOM The U.S. Postal Service's version of electronic mail.

electronic control The control of a machine or condition by electronic devices.

electronic counter An instrument capable of counting up to several million electrical pulses per second.

electronic crowbar An electronic switching device generally used in a power supply to divert a fault current from more delicate components until a fuse, circuit breaker or the like has time to respond.

electronic data processing Data processing performed largely by electronic equipment.

electronic differential analyzer A form of analog computer using interconnected electronic integrators to solve differential equations.

electronic direct-current motor drive The combination of an electronic direct-current motor controller with its associated motor or motors.

electronic engineering A branch of electrical engineering that applies the principles of electronics to the solution of practical problems.

electronic gate A device in which diodes and/or transistors provide input-output relations that correspond to a Boolean-algebra function (AND, OR, etc.).

electronic hash Electrical interfering noise arising from vibrators or commutators.

electronic heating Also called high-frequency heating. A method of heating a material by inducing a high-frequency current in it or having the material act as the dielectric between two plates charged with a high-frequency current.

Electronic Industries Association, EIA A trade association of the electronics industry (USA). Some of its functions are the formation of technical standards, dissemination of marketing data, and the maintenance of contact with government agencies in matters relating to the electronics industry.

Electronic Industries Association (EIA) standard code A code or coding system conforming to any one of the standards established by the EIA.

electronic instrument Any instrument which depends for its operation on the action of either one or more electron devices.

electronic integrator In an electronic integrator, the instantaneous value of the rate of change of the amplitude of the output signal from an integrator is proportional to the amplitude of the input signal.

electronic interference Electrical or electromagnetic disturbances that result in undesired response in electronic equipment.

electronic keyboard A keyboard that is used to generate characters through electronic means rather than through mechanical linkages.

electronic mailbox System for holding messages sent by electronic mail until the person to whom they were sent is ready to accept them.

electronic measuring instrument A measuring instrument intended to measure on electrical or non-electrical quantity using electronic means.

electronic packaging The coating or surrounding of an electronic assembly with a dielectric compound.

electronic part A basic circuit element that cannot be disassembled and still perform its intended func-

tion. Examples of electronic parts are capacitors, connectors, filters, resistors, switches, relays, transformers, crystals, electron tubes and semiconductor devices.

electronic power converter Electronic devices for transforming electric power.

electronic profilometer An electronic instrument for measuring surface roughness.

electronic rectifier A rectifier using electron tubes or equivalent semiconductor elements as rectifying elements.

electronic relay An electronic circuit that provides the functional equivalent of a relay, but has no moving parts.

electronics (adjective) Of, or pertaining to, the field of electronics. Examples: Electronics engineer, electronics course, electronics laboratory, and electronics committee.

electronic smog Excessive stray electromagnetic fields and static electricity generated by large numbers of electronic equipment.

electronic speed control A system whereby a motor's speed is controlled by feedback from a frequency-sensing circuit attached to the device being powered; changes from the desired speed cause corrective signals to speed up or slow down the motor.

electronic surge arrester A device used to switch high-energy surges to ground so as to reduce the transient energy to a level that is safe for secondary protectors (e.g. zener diodes, silicon rectifiers etc.).

electronic switch A circuit element causing a start and stop action or a switching action electronically, usually at high speeds.

electronic thermal conductivity The part of the thermal conductivity due to the transfer of thermal energy by means of electrons and holes.

electronic transition A transition in which an electron in an atom or molecule moves from one energy level to another.

electron metallography Using an electron microscope to study the structure of metals and alloys.

electronmicroprobe analysis A technique for determining concentration and distribution of chemical elements over a microscopic area of a specimen by bombarding the specimen with high-energy electrons in an evacuated chamber and performing x-ray diffraction analysis of secondary x-radiation emitted by the specimen.

electron microscope Any of several designs of apparatus that use diffracted electron beams to make enlarged images of tiny objects.

electron tube Any device whose operation depends on conduction by the flow of electrons through a vacuum or gasfilled space within a gastight envelope.

electron volt A unit of energy equal to the work done in accelerating one electron through an electric potential difference of one volt.

electro-optic detector Any device capable of detecting transmitted light by converting the received radiation into some form of electrical signal.

electro-optic effect (optical communication) A change in the optical characteristic of a material under the influence of an electric field. Notes: **1.** Pockels and Kerr effects are examples of electro-optic effects. **2.** Electro-optic is often erroneously used as a synonym for optoelectronic. **3.** The most common effect results in a change in refractive index.

electro-optic material A material having refractive indexes that can be altered by an applied electric field.

electro-optics The study of the effects of electric fields on optical phenomena.

electroplate 1. To deposit a metal on the surface of certain materials by means of electrolysis. **2.** To effect the transfer of one metal to another by means of electrolysis.

electropneumatic contactor A contactor actuated by air pressure.

electropneumatic controller An electrically powered controller in which some or all of its basic functions are performed by pneumatic devices.

electropneumatic positioner A force-balance device which positions a control valve in accordance with the current signal from a controller.

electropneumatic transducer Electropneumatic transducers convert the electrical output signals from electric into pneumatic signals which may be used to operate diaphragm control valves. They may be either current-to-pressure (I/P) transducers or voltage-to-pressure (E/P) transducers.

electroscope An electrostatic instrument intended to detect a potential difference or an electric charge.

electroslag remelting furnace (in steel making) A type of furnace developed for melting special alloys that are difficult to produce in conventional arc furnaces.

electrostatic discharge The transfer of electrostatic charge between bodies of different electrostatic potential.

electrostatic discharge requirement IEC standard 801-2, Part 2 deals with electrostatic discharge requirements applicable to industrial-process measurement and control equipment. This part of the standard defines the immunity requirements and test methods for equipment which must withstand electrostatic discharges, from operators directly, and to adjacent objects. See also IEC standard 801-1 Part: General introduction and IEC 801-3 Part 3: Radiated electromagnetic field requirement.

electrostatic discharge test See ESD test generator.

electrostatic energy The energy contained in electricity at rest, such as in the charge of capacitor.

electrostatic field interference See electromagnetic interference.

electrostatic field interference A form of interference induced in the circuits of a device due to the presence of an electrostatic field. It may appear as common-mode or normal-mode interference in the measuring circuits. See also electromagnetic interference.

electrostatic instrument An instrument intended to determine potential difference which operates by means of electrostatic forces between fixed and movable charged electrodes.

electrostatic memory See electrostatic storage.

electrostatic potential The voltage which can be measured between any two objects which have different static charges.

electrostatic precipitation The process of removing smoke, dust, and other particles from the air by charging them so that they can be attracted to and collected by a properly polarized electrode.

electrostatic relay A relay in which two or more conductors that are separated by insulating material move because of the mutual attraction or repulsion produced by electric charges applied to the conductors.

electrostatics The branch of physics concerned with electricity at rest.

electrostatic separation An iron-ore concentrating process in which high voltage (about 30 000 volts) is applied to impose surface charge on dry iron oxides

and gangue passing over an electrically grounded drum called a rotor. The iron oxides, which are electrical conductors, bleed their charge to the grounded rotor and fall into a pocket at the bottom of the rotor.

electrostatic shield A metal mesh used to screen one device from the electric field of another.

electrostatic storage A storage device that uses electrically charged areas on a dielectric surface layer.

electrostatic voltmeter A voltmeter depending for its action on electrostatic forces. Its scale is usually graduated in volts or kilovolts.

electrostriction transducer A device which consists of a crystalline material that produces elastic strain when subjected to an electric field, or that produces an electric field when strained elastically. Also known as ceramic transducer.

electrothermal The heating effect of electric current, or the electric current produced by heat.

electrothermal instrument, thermal instrument An instrument which operates by the heating effect of one or more currents.

electrothermic element A power absorber and a thermocouple (or thermopile) which are either two separate units or where the thermocouple (or thermopile) is also the power absorber.

electrothermic instrument See electrothermal instrument.

electrothermics The branch of science concerned with the direct transformation of electric energy into heat.

electrowinning The electrodeposition of metals or compounds from solutions derived from ores or other materials using insoluble anodes.

element (chemical) One of the 104 known chemical substances that cannot be divided into simpler substances by chemical means. A substance the atoms of which all have the same atomic number (e.g., hydrogen, lead, uranium).

element 1. Logic element, sequential logic element.
2. A component of a device or a system.

element (of a semiconductor device) Any integral part of the semiconductor device that contributes to its operation.

elemental semiconductor A semiconductor containing only one element in the undoped state.

elements of industrial-process measurement and control systems Functional units which transduce, process or transmit measured values of controlling, controlled and reference variables.

elevated span See suppressed-zero range.

elevated-zero range A range for which the zero value of the measured variable is greater than the actual lower measuring range value. Notes: **1.** The zero may be between the actual lower and higher range-values, at the actual higher range-value, or above the actual higher range-value. Example: -10 V to 0 to $+10\text{ V}$, -100°C to 0°C , -100°C to -20°C . **2.** Terms suppression, suppressed range or suppressed span should be avoided. The term elevated-zero range is preferred.

elevation 1. See suppressed-zero range. **2.** The angular position perpendicular to the earth's surface.

elevation error A type of error in temperature-measuring or pressure-measuring systems that incorporate capillary tubes partly filled with liquid, the error is introduced when the liquid-filled portion of the system is at a different level than the instrument case, the amount of error varying with distance of elevation or depression.

ELEX Process for Lithium Isotope Separation.

eliminator Also called a battery eliminator. A device operated from an ac or dc power line and used for

supplying direct current and voltages to a battery-operated circuit.

elinvar An iron-nickel-chromium alloy that also contains varying amounts of manganese and tungsten and that has low thermal expansion and almost invariable modulus of elasticity; its chief uses are for chronometer balances, instrument springs and other gage parts.

elliptically polarized wave Any electromagnetic wave whose electric or magnetic field vector, or both, at a given point describes an ellipse.

elliptic filter A filter having an equiripple pass band and an equiminima stop band.

elongation Axial plastic strain, usually expressed as a percent of the original gage length in a uniaxial tension test to fracture.

ELRED process The ELRED process (ASEA/Stora, Sweden) comprises the prereduction of fine grained iron ore concentrated with pulverized coal in a fast fluidized bed, followed by final reduction and smelting to liquid iron of the prereduced concentrate with associated char in the plasma beneath the electrode in a dc arc furnace operating with an open bath.

ELSE operation Disjunction, OR Operation, Inclusive OR operation.

elutriation A conditioning process by which sludge is washed with either fresh water or plant effluent to reduce the alkalinity of the sludge, particularly by removing ammoniacal compounds, thereby reducing the amount of coagulant required.

embedded computer system A computer system that is integral to a larger system whose primary purpose is not computational; for example, a computer system in a weapon, aircraft, command and control, or rapid transit system.

embedded software Software for an embedded computer system.

embedding A general term for all methods of surrounding or enclosing components and assemblies with a substantial thickness of electrically insulating solid or foam material that substantially fills the voids or interstices between parts.

embedment The complete encasement of a part or assembly to some uniform external shape.

embossing Pressing e.g., a paper web in an embossing calender, or a sheet of paper between patterned materials (engraved plates, linen fabric etc.) in a plate glazing calender.

embossing calender A calender with two rolls, one or both of which has a pattern engraved or etched on its surface.

embossment As related to optical character recognition, the distance between the nondeformed part of a document surface and a specified point on a printed character.

embrittlement Pertaining to heat treatment, increase in brittleness. The cause of embrittlement can be a chemical or physical change in the material; compare blue brittleness, temper brittleness, hot shortness.

embrittlement cracking A form of metal failure that occurs in steam boilers at riveted joints and at tube ends, the cracking being predominantly intercrystalline.

EMC See electromagnetic compatibility.

EMCA European Computer Manufacturer's Association.

EMEB East Midland Electricity Board (UK).

emergency control (fluid power systems) Device, usually manual, fitted to a valve or circuit providing an alternative method of control in the case of failure of the normal method of control.

emergency maintenance See corrective maintenance.

emergency stop (industrial robots) A condition which overrides all other robot controls, removes drive power from robot axis actuators, and initiates the stopping of all moving parts, and removes power from other dangerous functions controlled by the robot.

emergency throttling Pertaining to control valves, the valve is usually open for long periods and is required to throttle only a few minutes.

EMF Electromotive Force. See under thermocouple.

EMI See electromagnetic interference.

emission level (of a disturbing source) The level of a given electromagnetic disturbance emitted from a particular device, equipment or system, measured in a specified way.

emissive power The emissivity of a body times the emissive power of a black body at the same temperature. For a blackbody, it is the total radiation per unit area of radiating surface.

emissivity (optical communication) The ratio of the radiant emittance of a substance to the radiant emittance of a black body of the same temperature. Note: Emissivity is a function of wavelength and temperature.

emittance An alternate term for emissivity.

emitter In fiber optics, the source of optical power. Also called source. See coherent emitter and incoherent emitter.

empire cloth A cotton or linen cloth coated with varnish and used as insulation on coils and other parts of electrical equipment.

empirical Pertaining to a statement or formula based on experience or experimental evidence, rather than on deduction or theory.

empirical propagation model (electromagnetic compatibility) A propagation model that is based solely on measured path-loss data.

empiric function generator A computer program or device capable of generating a mathematical function, curve, or set of values from given values, such as test data or laboratory measurements.

EMSC Electrical Manufacturers Standards Council.

empty medium A data medium that contains only marks of reference but no user data.

empty set, null set A set that has no elements.

EMUG Acronym for European MAP Users Group.

emulate To imitate one with another such that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated system.

emulation The imitation of all or part of one system by another, primarily by hardware, so that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated system.

emulator Hardware, software, or firmware that performs emulation.

emulsifier A substance that can be mixed with two immiscible liquids to form an emulsion. Also known as disperser; dispersing agent.

emulsion A light-sensitive chemical coat on materials. Most commonly photographic film.

emulsion-laser storage A digital data storage medium which uses a controlled laser beam to expose very small areas on a photosensitive surface.

emulsion treater, heater treater Pertaining to the petroleum industry, a tall cylindrical vessel, a type of oil heater for "breaking down" oil-water emulsions with heat and the addition of certain chemicals. Emul-

sion treaters have a gas-fired furnace at the bottom of the vessel to heat the stream of oil piped through from the well to the stock tanks.

enable A command or condition which permits some specific event to proceed.

enabled 1. Pertaining to a state of the central processing unit that allows the occurrence of certain types of interruptions. **2.** In communications, pertaining to the state in which a transmission control unit can accept incoming calls on a line.

enabling gate A circuit which determines the start and length of a generated pulse.

enabling signal A signal that permits the occurrence of an event.

enameled wire Wire coated with a layer of baked-enamel insulation.

encapsulate To embed electronic components or other entities in a protective coating, usually done when the plastic encapsulant is in fluid state so that it will set in solid form as an envelope around the work.

encapsulated body (butterfly valves) Pertaining to butterfly valve bodies, all surfaces of the body are covered by a continuous surface layer of a different material usually an elastomeric or plastic material. A soft elastomer behind a harder encapsulating material may be used to provide interference for disk and stem sealing areas.

encapsulation (Ex m) A type of protection in which an enclosure is moulded around electrical components with casting resins in such a way that an explosive atmosphere will not be ignited by these electrical components when operating under normal and specified abnormal conditions.

encapsulation (type) (software) 1. The technique of isolating a system function within a module and providing a precise specification for the module. See also information hiding. **2.** A module representing an abstract data type. Note: An encapsulated type hides the representation of its values but permits operations on the values by other modules.

encipher Same as encode.

enclosed equipment Equipment which is enclosed on all sides with the possible exception of its mounting surface to prevent personnel from accidentally touching live or moving parts contained therein and to protect the equipment against ingress of medium size solid foreign bodies, and meet requirements of mechanical strength, flammability, and stability (where applicable). (Refer to IEC 529)

encoder 1. A code converter in which the output signal goes to a computer. **2.** A functional unit that has a number of input lines such that not more than one at a time may carry a signal and a number of output lines such that any number may carry signals, and such that the combination of output signals serves as a code to indicate which input line carries the signal.

(to) encode, to code 1. To convert data by the use of a code in such a manner that reconversion to the original form is possible.

encoding 1. Translation of information from an analog or other easily recognized form to a coded form without a significant loss of information. **2.** The process of converting an event such as a switch closure into a form suitable for transmission over a communication channel.

encrustation The buildup of slag, corrosion products, biological organisms such as barnacles, or other solids on a structure or exposed surface.

end-around borrow The action of transferring a borrow digit from the most significant place to the least significant digit place.

end-around carry A carry from the most significant digit place to the least significant digit place.

end-around shift, cyclic shift A logical shift in which the characters moved out of one end of a computer word or register are re-entered into the other end.

end connection (valves) Pertaining to valves, the configuration provided to make a pressure tight joint to the pipe carrying the fluid to be controlled. End connections can be classified as follows: threaded; welded, i.e. either butt-weld or socket weld; and flanged; or flangeless.

end device, end instrument See transducer.

end-effector (industrial robots) A device specifically designed for attachment to the mechanical interface to enable the robot to perform its task (e.g. gripper, nutrunner, welding gun, spray gun).

endodyne reception A British term applying to reception of unmodulated code signals.

end of block character (numerical control) A control character that indicates the completion of a block of input data.

end of file, EOF Termination or point of completion of a quantity of data. End-of-file marks are used to indicate this point.

end of message The end of data to be transmitted. It can be indicated by a special control code, as in the ASCII code set.

end of program (numerical control) A miscellaneous function indicating completion of a program. Cancels spindle and coolant function after completion of all commands in the block. Used to reset control and/or machine. Resetting control may include rewind of tape to the program start character or progressing a loop tape through the splicing leader.

end of tape (numerical control) A miscellaneous function which cancels spindle and coolant after completion of all commands in the block. Used to reset control and/or machine. Resetting control will include rewind of tape to the program start character, progressing a loop tape through the splicing leader or transferring to a second tape reader.

end of transmission, EOT A unique character or group of characters used to denote the end of a data transmission to or from a remote terminal.

endogeneous variable A variable whose value is determined by relationships included within the model. Also see exogeneous variable.

endothermic Refers to a process or chemical reaction that requires the addition of heat to keep it going. Exothermic is the reverse; a process or reaction that once begun gives off heat.

end point The point at which a product or a fraction (hydrocarbon) has totally boiled off or been completely vaporized. The initial boiling point is the temperature at which a product being distilled starts to boil. See cut point.

end point control 1. Quality control by means of continuous, automatic analysis. 2. The exact balancing of process inputs required to satisfy its stoichiometric demands.

end point line (electrical transducers) The straight line between the end points.

endpoint linearity The linearity of the object taken between the end points of calibration.

endpoint node, peripheral node A node that is at the end of only one branch.

end points (electrical transducers) The outputs at the specified upper and lower limits of the range.

end scale value The value of an actuating electrical quantity that corresponds to the high end of the indicating or recording scale on a given instrument.

end-to-end dimension (valves) See face-to-face dimension and center-to-end dimension.

endurance test A test carried out over a time interval to investigate how the properties of an item are affected by the application of stated stresses and by their time duration or repeated application.

end user A person, device, program, or computer system that utilizes a computer network for the purpose of data processing and information exchange.

ENEA European Nuclear Energy Agency. Formed 1957/58. Transferred to OEDC.

energy The capacity of a body for doing work or its equivalent – it may be classified as potential or kinetic, depending on whether it is associated with bodies at rest or bodies in motion; or it may be classified as chemical, electrical, electromagnetic, electrochemical, mechanical, radiant, thermal or vibrational, or any other type, depending on its source or nature. For measurement of energy in SI units see under joule.

energy and torque The vector product of force and moment arm is widely designated by the unit newton meter. This unit for bending moment of torque results in confusion with the unit of energy, which is also newton meter. If torque is expressed as newton meter per radian, the relationship to energy is clarified, since the product of torque and angular rotation is energy: $(N \cdot m/rad) \cdot rad = N \cdot m$.

energy balance A mathematical representation of all the energy streams in a process; the balance can be summed over one machine, one process, or an entire plant. See material balance.

energy density Light energy per unit area, expressed in joules per square meter – equivalent to the radiometric term "irradiance".

energy loss (transmission and distribution) The difference between energy input and output as a result of transfer of energy between two points.

energy loss, head loss The difference in total (energy) head between two cross-sections. Pertains to liquid flow measurement in open channels.

energy management system A system that optimizes the operation, temperatures, and processes of a HVAC (Heating, Ventilating, and Air Conditioning) system within a building.

energy sources Petroleum, coal, hydropower, nuclear, geothermal, synthetic fuels, tides, solar, wind.

engineering A profession in which a knowledge of the natural sciences is applied with judgment to develop ways of utilizing the materials and forces of nature.

engineering change A revision to a parts list, Bill of Materials drawings, authorized by the engineering department. Changes are usually identified by a control number and are made for "safety", "cost reduction", or "functionality" reasons.

engineering time The total machine downtime necessary for routine testing, good or bad, for machine servicing due to breakdowns, or for preventive servicing measures. This include all test time, good or bad, following breakdown and subsequent repair of preventive servicing. Synonymous with servicing time.

engineering units Units of measure as applied to a process variable, e.g., psi, degrees F, degrees C etc.

engine-room control Apparatus and arrangement provided for control in the engine room, on order from the bridge, of the speed and direction of a vessel.

Engler viscosity A standard time-based viscosity scale used primarily in Europe.

engraved roll (textile term) A type of printing which uses a metal roll with the design cut into the roll surface. print paste fills the depression and is scraped off the unengraved surface with a doctor blade.

enhance Term used in connection with changed performance – usually caused by an evolutionary process of adding features, improving compatibility, etc.

ENQ Enquiry (character). In the ASCII code.

enquiry character, ENQ A special control character designed to elicit a response from some remote station, usually for station identification or for the description of the station equipment status.

ENS European Nuclear Society.

ensemble A collection of sample functions of a random process, all of which start from the same zero time.

enterprise A set of functions that carry a product through its entire life span from concept through manufacture, distribution, sales and service, an undertaking; venture, initiative, a business organization.

enthalpy See total heat.

entity 1. Is a thing (e.g., a person or a device), a concept, an organization, or an event of interest about which the business cares enough to keep data. Usually expressed as nouns in English. **2.** An active element within an OSI layer (e.g., Token Bus MAC is an entity in OSI Layer 2).

entity, item Any part, component, device, subsystem, functional unit, equipment or system that can be individually considered.

entrained air Air (or gas) forming an emulsion with the liquid in which the bubbles tend to separate from the liquid phase.

entrainment The conveying of particles of water or solids from the boiler water by the steam.

entrance, entry, entry point The address of the label of the first instruction executed upon entering a computer program, a routine or a subroutine. Note: A computer program a routine or a subroutine may have a number of different entry points, each perhaps corresponding to a different function or purpose.

entrepreneur One who organizes, operates, and especially assumes the risk of a business venture.

entropy 1. The measure of unavailable energy in a system. **2.** The unavailable information in a set of documents. **3.** An inactive or static condition (total entropy).

entropy (information theory) Refer to ISO publication 2382/XVI.

entry See entrance.

entry conditions The conditions to be specified on entering a computer program, a routine or a subroutine. Example: The addresses of those locations from which the program, routine or subroutine will take its operands and of those locations with which its entry points and exits will be linked.

entry data The initial data required for successful execution of a given routine. See entry conditions.

envelope 1. The glass or metal housing of a vacuum tube. Also referred to as a bulb. The glass housing that encloses an incandescent source. **2.** The curve passing through the peaks of a graph and showing the waveform of a modulated radio-frequency carrier signal.

envelope of an amplitude modulated signal (signal generators) The upper and lower boundary lines of the area which is swept by the carrier wave when plotted against time while the phase of the modulating signal varied continuously through 360°.

environment The universe within which the system must operate. All the elements over which the design-

er has no control and that affect the system or its inputs and outputs.

environmental area A basic qualified location in a plant with specified environmental conditions dependent on severity. Note: Environmental areas include: air conditioned areas; control room areas, heated and/or cooled; sheltered areas (process facilities); outdoor areas (remote field sites). See specific definitions.

environmental chambers Test chambers designed to expose the subject being tested to external conditions, such as heat, shock, pressure, and moisture, for the study of their effects on the subject.

environmental condition A specification of surrounding parameter values necessary for the protection or proper operation of function unit. Notes: **1.** Examples for surrounding parameters are temperature, humidity, vibration shock, explosively hazardous areas, and dust. **2.** An environmental condition is usually specified as a nominal value and a tolerance range. **3.** For a certain device, there may be more than one set of environmental conditions, e.g. one each for transport, storage, and operation.

environmental engineering A branch of engineering that deals with the technology related to control of the surroundings which humans live in, especially the control or mitigation of contamination or degradation of natural resources such as air quality and water purity.

environmental error 1. The maximum change of the inaccuracy due to influence of the change of one parameter (temperature, power supply etc.) of the environmental conditions while other parameters of the environmental conditions are maintained at the reference values. Note: For example: Temperature error in %/°C, Supply voltage error in %/V, Supply frequency error in %/Hz. **2.** Error caused by a change in a specified operating condition from reference operating condition. See operating influence.

environmental influence The change in the output of an instrument caused solely by the departure of one of the specified environmental conditions from its reference value, all other conditions being held constant. See also operating influence.

environmental loss time, external loss time Down time due to a fault outside the functional unit.

environmental testing The testing of a system or component under controlled environmental conditions, each of which tends to affect it operation or life.

environment description A language construct for the description of features that are not part of a program but are relevant to its execution. Examples: Machine characteristics, special properties of files, interfaces with other programs.

EOQC European Organisation for Quality Control.

EPA 1. Environmental Protection Agency (USA).

2. Enhanced Performance Architecture. EPA, is an extension to MAP that provides for low delay communication between nodes on a single segment. See MAP/EPA and MINI-MAP.

epilimnion (type of water) The water above the thermocline in a stratified body of water. See thermocline.

epitaxial Pertaining to a single crystal layer on a crystalline substrate, orientated the same as the substrate.

EP lubricant Extreme Pressure lubricant – an oil or grease containing additives that enhance the ability of the lubricant to adhere to a surface and reduce friction under high bearing loads.

epoxy adhesive An adhesive made of epoxy resin.

Epper effect (measurement of liquid flow in open channels) The effect of the Epper phenome-

non in which the wave crest produced by a current-meter and its suspension, moving forward, causes an increase in the height of the wetted cross-section and a consequential reduction of the relative velocity.

Eppley pyrhelimeter A thermoelectric device for measuring direct and diffuse solar radiation.

EPP process In the EPP (Expanded Precessive Plasma) process developed by Foster Wheeler Telectronics, England, a dc constricted-arc plasma gun is rotated to form a cone of very high temperature in which endothermic reactions can take place.

EPR Ethylene Propylene Rubber.

EPRI Electric Power Research Institute. (USA)

EPROM Erasable programmable read-only memory. A PROM that can be erased by a special process and reused.

equilibrium reaction potential The minimum voltage at which an electrochemical reaction can take place.

equalization (data transmission) The process of reducing frequency and/or phase distortion of a circuit by the introduction of networks to compensate for the difference in attenuation and/or time delay at the various frequencies in the transmission band.

equalizer A device that connects parts of a boiler to equalize pressures.

equalizer, compensating element Pertaining to automatic control, element connected in the forward path or in auxiliary feedback path of a feedback control system and whose transfer function is such that the overall performances of the feedback control system are improved.

equalizing pulses (pulse terms) Pulse trains in which the pulse-repetition frequency is twice the line frequency and that occur just before and just after a vertical synchronizing pulse.

equal percentage characteristic (control valves) The inherent flow characteristic which, for equal increments of rated travel, will ideally give equal percentage changes of the existing flow coefficient (C_V).

equals function (calculators) The function that allows the disengagement of a printing mechanism on a calculator.

equal vectors Two vectors are equal when they have the same magnitude and the same direction.

equation function As applied to microelectronic circuitry, a combination of electronic elements or circuits capable of solving the electronic-counter portion of a mathematical or Boolean equation. In obtaining the solution, it performs the necessary function within an electronic or electromechanical system.

equation solver A computer, usually of the analog type, designed to solve systems of linear simultaneous (nondifferential) equations or to find the roots of polynomials.

equilibrium air For paper with a given moisture content and temperature, air having the same temperature as the paper and with a relative humidity such that the air does not affect the moisture content to the paper.

equilibrium diagram, phase diagram Graphic representation of the range of occurrence for a balanced system's phases expressed as a function of temperature, pressure and composition; see CCT curve, TTT curve.

equilibrium electrode potential A static electrode potential when the electrode and the electrolyte are in equilibrium with respect to a specified electrochemical reaction.

equilibrium mode distribution (fiber optics) See under steady-state condition.

equilibrium mode simulator (fiber optics) A device or optical system used to create an approximation of the equilibrium mode distribution.

equilibrium pH The thermodynamically stable pH value of a solution, or body of water, when equilibrium is attained, not only within the aqueous phase itself, but also between it and any other phases with which it may be in contact.

equilibrium potential The electrode potential at equilibrium.

equipment A generic term for any apparatus, mechanism or machine, or for a group of units constructed similarly, or for a group of units performing similar functions.

equipment compatibility The characteristic of computers by which one computer may accept and process data prepared by another computer without conversion or code modification.

equipment failure A fault in the equipment, excluding all external factors, which prevents continued performance.

equipment ground A connection from earth ground to a noncurrent carrying metal part of a wiring installation of electric equipment. It reduces shock hazard and provides electrostatic shielding.

equipment life The arithmetic mean of the cumulative operating times of identical pieces of equipment beginning with the time of acceptance by the ultimate consumer and ending when the equipment is no longer serviceable.

equipment module (bach processes) One functional group of equipment typically centered around a major piece such as a vessel, heat exchanger, filter, scale, etc., including loops, devices, and elements, to accomplish a task in the operation of the process.

equipment under test A single unit, a subsystem or a total system of interconnected units which is tested. Note: A device under test is referred as DUT.

equipotential 1. A conductor having all parts of a single potential. **2.** Applies to a set of points all of which have the same potential.

equipotential line An imaginary line in space having the same potential at all points.

equivalence A logic operator having the property that if P is a statement, Q is a statement, R is a statement, ..., then the equivalence of P, Q, R, ..., is true if and only if all statements are true or all statements are false.

equivalence element A unique logic element which has two binary input but only one binary output signal; variance or variable of the output symbol signal is the equivalence of the variables represented by the input signals, i.e., a two-input element whose output signal is 1 when its input signals are alike.

equivalence operation, IF-AND-ONLY IF operation, IFF The dyadic Boolean operation whose result has the Boolean value 1 if and only if the operands have the same Boolean value. See also table of Boolean operations in ISO publication 2382/11-1976.

equivalence point Point on the titration curve where the acid ion concentration equals the base iron concentration.

equivalent absorption The rate at which a surface will absorb sound energy, expressed in sabins. Defined as the area of a perfect absorption surface that will absorb the same sound energy as the given object under the same conditions.

equivalent binary digits The number of binary digits required to express a number in another base to the same precision, e.g., approximately 3 1/3 binary digits are required to express in binary form each digit

of a decimal number. For the case of binary coded decimal notation, the number of binary digits required is usually four times the number of decimal digits.

equivalent circuit (general) An arrangement of circuit elements that has characteristics, over a range of interest, electrically equivalent to those of a different circuit or device. Note: In many useful applications, the equivalent circuit replaces (for convenience of analysis) a more complicated circuit or device.

equivalent circuit diagram Function diagram showing equivalent circuits, used as an aid for the analysis and calculation of characteristics or behaviour.

equivalent dead time Time interval between the step change of an input variable and the intersection point of the tangent of the step response at the time axis. This definition applies only to systems without overshoot of the step response.

equivalent equations Two equations or equation system (the same unknowns) which have the same set of solutions.

equivalent four – wire system A transmission system using frequency division to obtain full-duplex operation over only one pair of wires.

equivalent input noise sensitivity (spectrum analyzer) The average level of a spectrum analyzer's internally generated noise referenced to the input.

equivalent time In random-sampling oscilloscope operation, the time scale associated with the display of signal events.

equivocation (information theory) The conditional entropy of the occurrence of specific messages at the message source given the occurrence of specific messages at a message sink connected to the message source by a specific channel.

equivocation In a computer, the conditional information contained in an input symbol given an output symbol, averaged over all input-output pairs.

Er Chemical symbol for erbium.

ERA Electrical Research Association (GB).

erasable programmable read-only memory (EPROM) **1.** This is an ultravioletlight-erasable PROM, sometimes called a metal-oxid semiconductor (MOS) PROM. An advantage of using these, is that reprogramming can be done in the field to keep up with software update. **2.** See also EPROM.

erasable storage **1.** A storage device whose data can be altered during the course of a computation, e.g., magnetic tape, drum and cores. **2.** An area of storage used for temporary storage. **3.** A storage device in which different data can be written successively at the same storage location.

(to) erase To remove data from a data medium. Note: Erasing is usually accomplished by overwriting the data or deleting the references.

erase character Same as delete character.

erase head See erasing head.

erasing head That unit or part of various reading or writing devices which is designed and used to remove magnetic fields, spots, i.e., bits of data on storage media such as tapes, disks, drums etc.

erasure **1.** A process by which a signal recorded on a tape is removed and the tape made ready for rerecording. **2.** The neutralization of the magnetic pattern stored on tape.

erg The unit of work and energy in the centimeter – gram – second system (CGS). The erg is 10^{-7} joule.

ergodic noise A random noise with identical time and statistical mean values.

EROM Electrically Alterable ROM. Same as EA-ROM.

erosion The phenomena whereby living organisms, organic matter, inorganic solids, liquids or gases by their physical properties and their condition they are in, can mechanically break down or modify the structure of a variety of materials. Note: Erosion can take place due to a variety of causes, e.g. sand blasting by wind blow sand, pitting in control valves due to cavitation of the fluid stream or living creatures nibbling insulating material.

erosion resistant trim (control valves) Valve trim which has been faced with very hard material or manufactured from very hard material resist the erosive effects of the controlled fluid flow.

error 1. The algebraic difference between the measured value and the true value of the measured variable.

Notes: **1.** The error is positive when the measured value is greater than the true value. Error = (measured value) – (true value). **2.** When giving the error in the data sheet of an instrument or device, the kind of calibration of the instrument or device has to be specified. **2.** A discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition.

error analysis (software) The process of investigating an observed software fault with the purpose of tracking the fault to its source.

error band (electrical transducers) The band of maximum deviations of output values from a specified reference line or curve due to those causes attributable to the transducer.

error burst In data transmission, a sequence of signals containing one or more errors but counted as only one unit in accordance with some specific criterion or measure.

error category One of a set of classes into which an error, fault, or failure might fall. Categories may be defined for the cause, criticality, effect, life cycle phase when introduced or detected, or other characteristics of the error, fault, or failure.

error checking Data quality assurance usually attempted by calculating some property of the data block before transmission. The resulting property or check character is also sent to the receiver, where it may be inspected and compared with a recalculated value based on the received data.

error code 1. A specific character that may be punched into a card or tape to indicate that a conscious error was made in the associated block of data. Machines reading the error code may be programmed to throw out the entire block automatically. **2.** Illegal control code on a binary code.

error control That part of a protocol controlling the detection, and possibly the correction of errors.

error control commands The ideal communication computer will have special commands for generating longitudinal redundancy check characters, cyclic redundancy checks, and vertical redundancy checks. These special commands will perform these functions in a fraction of the time that would be required with a general purpose instruction set.

error control restart procedure Checkpoints and restart procedures make it possible, in the event of an error in interruption, to continue processing from the last checkpoint rather than from the beginning of the computer run.

error control software Software that monitors a computer system to detect, record and possibly to correct errors.

error correcting code An error-detecting code designed to allow for the automatic correction of certain types of error.

error correction A method used to correct erroneous data produced during data transmission, transfer, or storage.

error-correction routine A series of computer instructions programmed to correct a detected error condition.

error curve See calibration curve.

error detecting and feedback system A system employing an error-detecting code and so arranged that a character or block detected as being in error automatically initiates a request for retransmission of the signal detected as being in error.

error-detecting code, self-checking code A code in which each coded representation conforms to specific rules of construction so that their violation indicates the presence of errors.

error detection **1.** System which detects errors occasioned by transmission equipment or facilities. **2.** A method of determining whether data has been transmitted or transferred incorrectly. **3.** A method of processing data such that if transmission or processing errors occur, false results are discovered. Refers to Honeywell TDC 3 000 control systems.

error detection routine A routine used to detect whether or not an error has occurred, usually without special provision to find or indicate its location.

error dump The dumping onto tape, etc. by a priority program of information and core storage so that the cause of an equipment or program error interrupt may be assessed by the analysts.

error list A list created by a compiler indicating incorrect or invalid instructions in a source program.

error message An indication that an error has been detected.

error model A mathematical model used to predict or estimate the number of remaining faults, reliability, required test time, or similar characteristics of a software system. See also error prediction.

error (of indication) of a measuring instrument The indication of a measuring instrument minus the (conventional) true value of the measurand. Note: For a material measure, the indication is its nominal or marked value.

error variable Difference between the reference variable and the feedback variable.

(absolute) error of measurement The result of a measurement minus the (conventional) true value of the measurand. Notes: **1.** The term relates equally to: the indication, the uncorrected result, the corrected result. **2.** The known parts of the error of measurement may be compensated by applying appropriate corrections. The error of the corrected result can only be characterized by an uncertainty. **3.** "Absolute error", which has a sign, should not be confused with absolute value of an error which is the modulus of an error.

error prediction A quantitative statement about the expected number or nature of software problems, faults, or failures in a software system. See also error model.

error prediction model See error model.

error range **1.** The set of values that an error may take. **2.** See error span.

error rate The ratio of the total number of errors detected to the total amount of data transmitted or transferred.

error-rate damping A damping method in which a signal proportional to the rate of change of error is added to the error signal for anticipatory purposes.

error ratio **1.** The ratio of the number of data units in error to the total number of data units. **2.** Same as deviation ratio.

error recovery The process of correcting or bypassing the effect of a fault to restore a computer system to a prescribed condition.

error seeding See fault seeding.

error signal Output signal of a comparing element of a closed loop control system.

error span (error range deprecated in this sense) The difference between the highest and the lowest error values.

error squared The technique of squaring the error in a linear control action to produce a nonlinear correction.

error voltage A voltage which is present in a servo system when the input and output shafts are not in correspondence. The error voltage, which actuates the servo system, is proportional to the angular displacement between the two shafts.

Es Chemical symbol for Einsteinium.

escutcheon, escutcheon plate A decorative shield, flange, or border around a panel-mounted part such as a dial or control knob.

ESD Static Electricity Discharge = Electrostatic Discharge. See electrostatic discharge.

ESDI Enhanced Small Device Interface. An interface against hard disks.

ESD test generator Instrument used in electrostatic discharge testing. See further IEC standard 801-2; Part 2: Electrostatic discharge requirements.

ESF European Science Foundation.

ESITB Electricity Supply Industry Training Board (GB).

ESONE European Standards of Nuclear Electronics. Part of IEC.

esparto pulp Pulp manufactured from esparto grass or similar steppe grass.

ESR See electroslog remelting furnace.

ESRIN European Space Research Institute (Italy). Part of ESRO.

ESRO European Space Research Organization.

essential loads Those loads that must be served to keep plant operations at an acceptable level during a prolonged commercial power outage. Such loads might be interruptible for periods of a few seconds to several minutes.

ESTEC European Space Technology Centre (Holland). Part of ESRO.

estuary A partially enclosed body of water in the lower reaches of a river which is freely connected with the sea and which receives fresh water supplies from upland drainage areas.

etalon, measurement standard A material measure, measuring instrument or system intended to define, realize, conserve or reproduce a unit or one or more known values of a quantity in order to transmit them to other measuring instruments by comparison. Examples: **a.** 1 kg mass standard; **b.** standard gage block; **c.** 100 ohm standard resistor; **d.** saturated Weston standard cell; **e.** standard ammeter; **f.** caesium atomic frequency standard.

etch cracks Shallow cracks in the surface of hardened steel due to hydrogen embrittlement that sometimes occurs when the metal comes in contact with an acidic environment.

etched circuit Refers to integrated circuits and the particular construction in a geometric design or pathing arrangement to form active elements by an etching process on a single piece of semiconducting material.

ETFE Ethylene tetrafluoroethylene.

ethane A simple hydrocarbon associated with petroleum. Ethane is a gas at ordinary atmospheric conditions.

ethanol Alcohol; one component of gasohol.

ethernet A coaxial cable network in which all stations monitor the cable (the ether) during their own transmission, ending transmission immediately if a collision is detected.

ETHERNET A baseband LAN developed by Xerox Corporation and supported by Intel, DEC, Hewlett-Packard and others. It uses a bus topology with CSMA/CD access control.

ethylene propylene rubber seal Copolymer of ethylene and propylene. Resistant to phosphate ester fluid but not to mineral oils.

ETSU Energy Technology Support Unit (UK).

Eu Chemical symbol for Europium.

eukaryotic Descriptive of organisms whose cells have a visible and definite nucleus.

Euler number The Euler number is the ratio of inertia forces to the pressure forces affecting the flow stream. See further ISA handbook of control valves relating to hydrodynamic noise prediction.

euphotic zone The upper layer of a body of water where light penetration is sufficient to support effective photosynthesis.

EUROCAI European Organisation for Civil Aviation Electronic Industries.

Euro-net European packet switching network. Euro-net is sponsored by the European Economic Community.

EUROSPACE European Industrial Space Research Group.

EUT Equipment Under Test.

eutectic Material, predominantly one of regular structure, made up to one or more phases formed simultaneously during solidification; see eutectoid, peritectic, peritectoid. An eutectic has a definite composition and is formed from the liquid phase at a definite temperature, the so-called eutectic temperature (where two phases are concerned).

eutectic alloy An alloy with a low and sharp melting point which converts from a solid to a liquid state at a specified recurring point. Used in thermal overload devices.

eutectoid Material of such composition that at a certain temperature during cooling it is transformed from one solid phase to a mixture of two solid phases; see eutectic, peritectic, peritectoid. The best known eutectoid is undoubtedly pearlite, which consists of fine, alternating layers of ferrite and cementite formed by the transformation of austenite.

eutrophication (water quality) The enrichment of water both fresh and saline, by nutrients, especially compounds of nitrogen and phosphorus, that will accelerate the growth of algae and higher forms of plant life.

eV Electron volt.

evaluating Determination of characteristic values of relationships of a process from measured values of process variables.

evaluation standard A standard on the methods and procedures of how to obtain the functional and performance characteristics of a specific type of equipment. No requirements are stated as to the values to be obtained.

evaporated make-up Distilled water used to supplement returned condensate for boiler feed water.

evaporation The change of state from a liquid to a vapor.

evaporation deposits Percentage to residue obtained after evaporation of the product in free air.

evaporation plant (for waste liquor) Pertaining to pulp and paper manufacturing, an installation in which water and other substances are driven off from the waste liquor by heating, so that the dry solids content is increased.

evaporative cooling 1. Lowering the temperature of a mass of liquid by evaporating part of it, using the latent heat of vaporization to dissipate a significant amount of heat. **2.** Cooling ambient air by evaporating water into it. **3.** See vaporization cooling.

evaporator Any of several devices where liquid undergoes a change of state from liquid to gas under relatively low temperature and low pressure.

even parity check A parity check in which the number of zeros (or of ones) in a group of binary digits is expected to be even.

event The occurrence of some programmed action within a process which can affect another process.

event-driven Computer program or process where each step of the execution relies on external actions.

event flag In a computer, an easily implemented synchronization mechanism that can be used for passing messages and data buffers between two cooperating tasks.

event orientated Pertaining to a physical occurrence.

event recorder A recording instrument which records the presence or absence of a quantity or the state of a two-state device as a function of time.

event tree analysis, ETA A method of representing and evaluating the possible sequences of events following from a failure in a part of a system.

EWICS European Workshop in Industrial Computer Systems, the European industrial computer control standards group.

EXACT International Exchange of Authenticated Electronic Component Performance Test Data.

executive mode A central processor mode characterized by the lack of memory protection and relocation by the normal execution of all defined instruction codes.

exception An event that causes suspension of normal program execution.

exception In a computer, a condition which is out of the ordinary in normal task execution; e.g., arithmetic overflow.

exception reporting An information system which reports on situations only when actual results differ from planned results. When results occur within a normal range they are not reported.

excess air Air supplied for combustion in excess of that theoretically required for complete oxidation.

excess fifty In a computer, a representation in which a number N is denoted by the equivalent of (N plus 50).

excess insertion loss (fiber optics) In an optical waveguide coupler, the optical loss associated with that portion of the light which does not emerge from the nominally operational ports of the device.

excess sound pressure The total instantaneous pressure at a point in a medium containing sound waves, minus the static pressure when no sound waves are present. The unit is the dyne per square centimeter.

excess three code The binary-coded decimal notation in which a decimal digit n is represented by the binary numeral that represents (n+3).

exchange To remove the contents of one storage unit of a computer and place it in a second, at the same

time placing the contents of the second storage unit into the first.

exchange network The public switched telephone system. Often referred to as the message network, the toll system, or the telephone network.

exchange register See memory register.

excitability (electrobiology) The inherent ability of a tissue to start its specific reaction in response to an electric current.

excitation 1. The operating ac voltage fed to synchro motors and generators. **2.** The electrical voltage and/or current applied to an electrical transducer for its proper operation. **3.** Also called stimulus. An external force or other input applied to a system to cause it to respond in some specified way.

excitation energy The external electrical energy required for proper operation of a transducer.

exclusion, NOT-IF-THEN operation The dyadic Boolean operation whose result has the Boolean value 1 if and only if the first operand has the Boolean value 1 and the second has the Boolean value 0. Note: See also table of Boolean operations in ISO publication 2382/11-1976.

EXCLUSIVE – OR operation, non-equivalence operation The dyadic operation whose result has the Boolean value 1 if and only if the operands have different Boolean values. See also table of Boolean operations in ISO publication 2382/11.

EXCO Executive Committee (of ISO's governing council).

execute To perform the execution of an instruction or of a computer program.

execution The process of carrying out an instruction or the instructions of a computer program by a computer.

execution sequence The order of the execution of statements and parts of statements of a program.

execution time 1. Time required to execute a program. **2.** See instruction time. **3.** The time at which execution of a program is initiated.

execution time theory A theory that uses cumulative execution time as the basis for estimating software reliability.

executive control program A main system program designed to establish priorities and to process and control other routines.

executive instruction Similar to supervisory instruction, this instruction is designed and used to control the operation or execution of other routines or programs.

executive program (in numerical control) In computer-based numerical control system, the instruction sequence which establishes the operating capabilities of the system.

executive program, supervisor, supervisory program A computer program, usually part of an operating system, that controls the execution of other computer programs and regulates the flow of work in a data processing system. See also supervisory program.

executive software That portion of the operational software which controls on-line, response-critical events, responding to urgent situations as specified by the application program. This software is also known as real-time executive.

exerciser module A type of test program used in SUPERVISORY/TOTAL systems to check for interaction between parts of the system. Usually, several exerciser modules (programs) are run together (under control of an executive program) as a system test. Refers to Honeywell TDC 3 000 control systems.

exfoliation corrosion A type of corrosion that proceeds parallel to the surface of a material, causing thin outer layers to be undermined and lifted by corrosion products.

exhaust 1. Discharge of working fluid from an engine cylinder or from turbine vanes after it has expanded to perform work on the piston or rotor. **2.** The fluid discharged. **3.** A duct for conducting waste gases, fumes or odors from an enclosed space.

exhaust dying (textile term) A batch dyeing which is continued until all available dye in the bath moves onto the yarn or fabric.

exhaust gas-analyzer An instrument that measures the concentrations of various combustion products in waste gases to determine the effectiveness of combustion.

exhaust valve A valve in the headspace of a cylinder that opens during the exhaust stroke to allow working fluid to pass out of the cylinder.

exit The point beyond which control is no longer exercised by a routine.

exit angle The exit angle is the angle between the output radiation vector and the axis of the fiber or fiber bundle.

exjunction A reasonable element applied to two operands that will create a result depending on the bit patterns of the operands.

exogeneous variable A variable whose values are determined by considerations outside the model in question. Also see endogeneous variable.

exoskeleton An articulated mechanism whose joints correspond to those of a human arm and, when attached to the arm of a human operator, will move in correspondence to his. Exoskeleton devices are sometimes instrumented and used for master-slave control or manipulators.

exothermic Refers to a process or chemical reaction that gives off heat. Endothermic is the reverse; a process or reaction that requires the addition of heat to keep it going.

exotic fuels High-energy fuels, especially the hydroborons, which have higher calorific values than the corresponding hydrocarbons, and which at one time were proposed for use in high-performance aircraft and missiles.

(to) expand To return compressed data to their original form.

expanded scale A scale in which part of the scale range occupies a disproportionately large part of the scale length.

expanding pilot A pilot that normally burns at a low turn-down throughout the entire time the burner is in service whether the main burner is firing or not. Upon a call for heat, the pilot is automatically expanded so as to reliably ignite the main burner. This pilot may be turned down at the end of the trial-forignition period for the main burner.

expanding reach A reach in which the cross-section gradually increases in the direction of flow. Pertains to measurement of liquid flow in open channels.

expansibility (expansion) factor In the case of a low of compressible fluid, see formula in ISO publication 4006-1977 or BS 5875:1980.

expansion factor Correcting for the change in density between two pressure-measurement stations in a constricted flow.

experimental model An equipment model that demonstrates the technical soundness of a basic idea but does not necessarily have the same form or parts as the final design.

experimental standard deviation See this term in International Vocabulary of Basic and General Terms in Metrology published by ISO or BS 5233 Glossary of Terms used in Metrology published by British Standards Institution.

experimental standard deviation of the mean See note under same reference as for the term "experimental standard deviation".

expert system 1 Knowledge-based system that provides for expertly solving problems in a particular domain or application area by drawing inferences from a knowledge-base developed from human expertise. The term expert system is sometimes loosely used synonymously with knowledge-based systems but would be taken to emphasize expert knowledge. Some expert systems are able to improve their knowledge base and develop new inference rules based on their experience with previous problems.

explanation facility A feature of many expert systems that tells what steps were involved in the process by which the system arrived at a solution. These facilities can be simple traces of steps, or they can be more complex, supplying encoded reasons why the solution uses one alternative rather than another (DEC).

explicit programming (industrial robots) Programming method in which the poses of the end-effector or the desired path are explicitly defined (e.g. CAD/CAM).

explicit self-tuning controllers Self-tuning controllers in which the process model estimation procedures and the controller design procedures are separated and typically using a fixed structure controller algorithm.

exploratory programming A set of techniques developed to deal with problems for which the design of a solution cannot be known in advance. Supporting techniques include interactive and debugging integrated programming environments, and graphics oriented user interfaces (DEC).

explosion proof Pertaining to equipment that will neither explode nor cause explosion.

explosion-proof switch A switch that can withstand an internal explosion of a specified gas without causing ignition of surrounding gases.

explosion welding A solid-state process for creating a metallurgical bond by driving one piece of metal rapidly against another with the force of a controlled explosive detonation.

explosive atmosphere The condition where air is mixed with dust, metal particles, or inflammable gas in such proportion that it is capable of igniting or exploding.

exponent A number placed at the right and above a symbol in typography to indicate the number of times that symbol is a factor, e.g., 10 to the 4th power equals $10 \times 10 \times 10 \times 10$, or 10,000.

exponential Pertaining to exponents or to an expression having exponents. A quantity that varies in an exponential manner increases by the square or some other power of a factor, instead of linearly.

exponential curve A curve representing the variation of an exponential function.

exponential damping Damping which follows an exponential law.

exponential equation A name given to an equation in which the unknown quantity enters as an exponent.

exponential quantity A single quantity which increases or decreases at the same rate as the quantity itself (e.g., the discharge current of a capacitor through a noninductive resistor).

exponential sweep An electron-beam sweep which starts rapidly and slows down exponentially.

exponential waveform A waveform which is characterized by smooth curves but which possesses pulse properties because it contains numerous constituent frequencies. The exponential waveform undergoes at rate of amplitude change which is either inversely or directly proportional to instantaneous amplitude.

exponentiation A mathematical operation that denotes increases in the base number by a previously selected factor.

extended addressing An addressing mode in a computer that can reach any place in memory. See also direct addressing.

extended aeration An activated sludge sewage treatment process where the aeration step is extended with the aim of reducing the amount of solids produced for further treatment. Sludge produced in this process is usually stable.

extender board A special board used in troubleshooting which enables the technician to "extend" the troubled board for easier access.

extension bonnet (control valves) A bonnet with a packing box that is extended above the bonnet joint of the valve body so as to maintain the temperature of the packing above or below the temperature of the process fluid.

extension furnace See dutch oven.

extension wire Extension wire is a pair of wires having such temperature – emf characteristics relative to the thermocouple with which the wires are intended to be used that, when properly connected to the thermocouple, the reference junction is transferred to the other end of the wires. Note: Extension wires which are basically different in chemical composition from the thermocouple wires with which they are to be used are sometimes referred to as compensating extension wire.

external loss time, environmental loss time Downtime due to a fault outside the functional unit.

external memory Same as external storage.

external-mix oil burner A burner having an atomizer in which the liquid fuel is struck, after it has left an orifice, by a jet of high velocity steam or air.

external party line (XPL) A logic level from telemetry equipment that causes the buffered data channel to switch input ports (to merge time, for example).

external storage 1. The storage of data on a device which is not an integral part of a computer but in a form prescribed for use by the computer. **2.** A facility or device, not an integral part of a computer, on which data usable by a computer is stored, such as, off-line magnetic tape units, or punch card devices. Synonymous with external memory and contrasted with internal storage. **3.** See auxiliary storage.

external treatment Treatment of boiler feed water prior to its introduction into the boiler.

extract To select and remove from a group of items those which meet specific criteria.

extraction liquor The solvent used in hydrometallurgical processes for extraction of the desired constituents from ores or other products.

extractive distillation A distillation technique (employing the addition of a solvent) used when the boiling points of the components being separated are very close [within 3°C (5°F)] or the components are constant boiling mixtures. In extractive distillation, which is a combination of fractionation and solvent extraction, the solvent is generally added to the top of the column and recovered from the bottoms product,

by means of subsequent distillation. The chemical added is a solvent only to the less-volatile components.

extra high performance macros Computers that have a throughput of 160 gigabits per second, and a memory size of 256 megabytes of memory.

extra high voltage, EHV A term applied to voltage levels which are higher than 230 000 volts.

extra large scale integration, ELSI More than one million logic gates or bits of memory in one device.

extramural absorption The absorption of light, transmitted radially through the cladding of an optical fiber, by means of a dark or opaque coating placed over the cladding.

extrapolate As regard curve characteristics, to extend a curve beyond the limits of known points by continuing the trend established over known points, as, for example, the extension of time-based data into future time-periods following trends, averages, or other measurements.

extrapolated failure rate Extension of a defined extrapolation or interpolation of the observed or assessed failure rate for durations and/or conditions different from those applying to the observed or assessed failure rate. Note: The validity of the extrapolation shall be justified.

extrapolated mean life Extension by a defined extrapolation or interpolation of the observed or assessed mean life for stress conditions different from those applying to the observed or assessed mean life. Note: The validity of the extrapolation shall be justified.

extrapolated mean time between failures Extension by a defined extrapolation or interpolation of the observed or assessed mean time between failures for duration and/or conditions different from those applying to the observed or assessed mean time between failures. Note: The validity of the extrapolation shall be justified.

extrapolated reliability Extension by a defined extrapolation or interpolation of the observed or assessed reliability for durations and/or conditions different

from those applying to the observed or assessed reliability. Note: The validity of the extrapolation shall be justified.

extrapolation Estimating the future value of some data series based on past observations. Statistical forecasting represents a common example.

extra spring temper A level of hardness and strength for nonferrous alloys and some ferrous alloys corresponding to a cold worked state above full hard beyond which hardness and strength can not be measurably increased by further cold work.

extremely high frequency 1. The frequency band extending from 30 to 300 GHz. **2.** Any of the radio frequencies in the band 30,000 MHz–300,000 MHz.

extremely low frequency Radio signals with frequencies below 300 Hz, i.e., wavelengths longer than 1 000 km. Used for radio communications with submerged submarines.

extrinsic joint loss, misalignment loss (optical communication) That coupling loss of optical power caused by imperfect jointing.

extruded cables Cables with conductors which are insulated and formed in a uniform configuration by the application of a homogeneous insulation material in a continuous extrusion process.

extrusion A method of forcing plastic, rubber or elastomer material through an orifice in a more or less continuous fashion to apply insulation or jacketing to a conductor or cable.

extrusion billet A slug of metal, usually heated into the forging temperature range, which is forced through a die by a ram in an extrusion process.

extrusion coating A method of coating a web with a thin film of molten resin, plastic etc. which is applied through a die placed above the nip between a backing roll and a chill roll.

eye pattern (data transmission) An oscilloscope display of the detector voltage waveform in a data modem. This pattern gives a convenient representation of cross over distortion which is indicated by a closing of the center of the eye.

F

F 1. Farad. Unit for electric capacitance (SI unit).
2. Chemical symbol for fluorine.

f Symbol for prefix femto meaning 10^{-15} .

fA Letter symbol for femtoampere (10^{-15} ampere).

faceplate controller An electric controller consisting of a resistor and a faceplate switch in which the electric contacts are made between flat segments, arranged on a plane surface, and a contact arm.

face-to-face dimension (valves) The dimension from the face of the inlet opening to the face of the outlet opening of a valve or fitting. The following ANSI/ISA and IEC documents apply to face-to-face dimension for control valves: S 75.03: Flanged globe style; S 75.04: Flangeless; S 75.16: Flanged globe style; S 75.08: Flanged clamp or pinch valves; S 75.12: Socket weld-end and screwed globe style; S 75.14 and S 75.15: Butt-weld end, globe style. IEC 534-3-1: Flanged globe style, two-way; IEC 534-3-2: Flangeless except wafer butterfly valves.

faceted code Code which indicates various details of an item by assigning each one a value.

facimile, FAX A system for the transmission of images. The image is scanned at the transmitter, reconstructed at the receiving station, and duplicated on some form of paper.

facing 1. The flat layer of paper or board in corrugated fiberboard. **2.** Paper intended for use as the facing of corrugated fiberboard; see liner.

facsimile, FAX A system for the transmission of images. The image is scanned at the transmitter, reconstructed at the receiving station, and duplicated on some form of paper.

fact (in artificial intelligence) A statement about an conceptual world, whose validity is generally accepted. A fact may be viewed as a belief having a high certainty factor.

factor In a multiplication operation, any of the numbers or quantities that are the operands.

factorial The product of the natural numbers 1, 2, 3, ... up to and including a given integer.

factorize To break down a number into two whole numbers which when multiplied will give the original number. Examples: When factorized, 15 gives the factors 1, 15 or 3, 5.

Factory Mutual Research Corp. (FM) American test lab approved by OSHA. Formerly Factory Mutual Engineering. Approval certification body for products (systems) intended for installation in hazardous locations. Example: Intrinsically safe applications.

fact retrieval The automatic recognition, selection, interpretation, and manipulation of words, phrases, sentences, or any data in any form, but particularly in a textual structure, and the relating of these data for conclusions and useful results.

fade 1. The gradual lowering in amplitude of a signal. **2.** A gradual change of signal strength. **3.** Reducing signal level until it is largely attenuated or completely inaudible (faded away).

fading The fluctuation in intensity of any or all components of a received radio signal due to changes in the characteristics of the propagation path.

Fahrenheit temperature scale A temperature scale in which the freezing point of water is defined as 32°C and the boiling as 212° under normal atmospheric pressure (760 mm of mercury).

fail-close (control valves) A condition wherein the valve closure member moves to a closed position

when the actuating energy source fails. See "Normally Closed".

fail-open (control valves) A condition wherein the valve closure member moves to an open position when the actuating energy source fails. See "Normally Open".

fail-safe (control valves) A characteristic of a particular valve and its actuator, which upon loss of actuating energy supply, will cause a valve closure member to fully close, fully open or remain in fixed position. Fail-safe action may involve the use of auxiliary controls connected to the actuator.

fail safe (general) Designing so that failure of power, control circuits, structural members, or other components, will not endanger the process under control or people operating the system or other people in the vicinity.

fail-safe circuit A circuit that has an output state which indicates that either a circuit input or the circuit itself has failed. Finds circuit application in complex systems where self-healing subsystems exist. When a subsystem failure is detected, a backup subsystem is automatically inserted.

failsafe shutdown (programmable controllers) The ability of a programmable controller system to have its output assume a predefined state within a specified delay after detecting the occurrence of a power supply voltage drop or an internal failure.

fail-soft system A system in a computer which continues to process data despite the failure of parts of the system. Usually accompanied by a deterioration in performance.

failure 1. The termination of the ability of an item to perform a required function. Notes: **1.** After failure the item has a fault. **2.** "Failure" is an event, as distinguished from "fault", which is a state. **3.** This concept as defined does not apply to items consisting of software only. **2.** A departure of program operation from program requirements.

failure analysis The logical, systematic examination of an item to identify and analyze the probability, causes and consequences of potential faults.

failure category See error category.

failure cause The circumstances during design, manufacture or use which have led to a failure.

failure criteria Rules for failure relevancy such as specified limits for the acceptability of an item.

failure distribution The manner in which failures occur as a function of time; generally expressed in the form of a curve with the abscissa being time.

failure intensity acceleration factor In a time interval of a given duration, whose beginning is specified by a fixed age of a repaired item, the ratio of the number of failures obtained under two different sets of stress conditions.

failure mode The effect by which a failure is observed. Note: For example, an open or short-circuit condition or a gain change.

failure mode and effects analysis A qualitative method of system reliability analysis which involves the study of the failure modes which can exist in any item of the system and the determination of the effects of each failure mode on other items of the system, and on the operational functions of the system.

failure modes, effects and criticality analysis, FMECA Failure modes and effects analysis with a

consideration of the probability of occurrence and for a ranking of the seriousness of the effects.

failure rate 1. The ratio of the number of failures to a given unit of measure; for example, failures per unit of time, failures per number of transactions, failures per number of computer runs. **2.** In reliability modeling, the ratio of the number of failures of a given category or severity to a given period of time; for example, failures per second of execution time, failures per month. Synonymous with failure ratio.

failure rate acceleration factor The ratio of the accelerated testing failure rate to the failure rate under stated reference test conditions. Both failure rates refer to the same time period in the life of the tested items.

failure ratio See failure rate.

failure report A report describing the failure of a piece of equipment or item, its cause, and the corrective action taken to prevent the recurrence of the failure (SAMA).

failure state The condition of an item characterized by the lack of ability to perform required functions.

fallback procedure A procedure to circumvent all equipment faults. The fallback may give degraded service and may include switching to an alternate computer or to different output devices.

falling-ball viscometer A type of viscometer. High precision ball falls through liquid contained in high-precision glass tube. Densities of ball and liquid are known. Time for ball to fall length of tube is measured. Viscosity is proportional to difference in density and time.

falling film plasma reactor In the falling-film plasma reactor (Bethlehem Steel), an arc is struck between a tungsten cathode and a water-cooled copper cylinder that serves as the anode. A rotating jet of gas (argon or nitrogen) stabilizes the arc. Solid reactant particles are injected into the stabilizing gas and are then centrifuged onto the inner walls of the anode and form a molten film. The falling film plasma reactor has been used to produce iron and steel alloys, ferrovanadium, molybdenum, and ferro-chromium.

falling piston viscometer A type of viscometer. Sample solenoid valve opens to raise the piston. Piston travels up in 3 seconds. Sample solenoid valve closes when piston reaches top of travel. Time for piston to fall is a measure of viscosity.

fall stage-discharge relation, slope stage-discharge relation A family of curves that expresses the relationship between water surface slope, stage and discharge in an open channel in a given reach subject to variable backwater.

fall time The time required for the output voltage of a digital circuit to change from a logical high level (1) to a logical low level (0).

fall velocity, settling velocity The limiting velocity reached asymptotically by a particle falling under the action of gravity in a still water.

false add To form a partial sum, that is to add without carries.

false alarm An alarm signal transmitted in the absence of an alarm condition.

false set Rapid hardening of freshly mixed cement, mortar or concrete with a minimum evolution of heat; plasticity can be restored by mixing without adding more water.

false statement A statement having a value of zero in Boolean algebra.

family In mathematics, a set of functions curves etc., which can be generated by varying one or more of the parameters of a general form.

FAMOS Abbreviation for floating-gate avalanche-injection MOSFET. A type of MOSFET capable of long-term memory storage; used in EPROMs.

fan dryer, fan drying section (for pulp, paper or board) A drying section or part of a drying section in which the web is dried in direct contact with hot air, superheated steam or other hot gas which is circulated with aids of fans.

fan-in ratio (fluid power systems) Number of control inputs available on a device.

fan-out ratio (fluid power systems) Number of identical devices which can be controlled by the output of a device.

fan performance curves The graphical presentation of total pressure, static pressure, power input, mechanical and static efficiency as ordinates and the range of volumes as abscissa, all at constant speed and air density.

fan pump (on a paper machine) A pump in which the white water is mixed with the stock before the mixture is fed to the head box of the paper machine.

farad, F The derived SI unit of capacitance: the capacitance of a capacitor between the plates where there is a potential difference of 1 volt when charged by a quantity of electricity of 1 coulomb. This is a very large unit; microfarads (10^{-6}) and picofarads (10^{-12}) are used most commonly.

faraday A unit equal to the number of coulombs (96,500) required for an electrochemical reaction involving one electrochemical equivalent. In an electrolytic process, 1 gram equivalent weight of matter is chemically altered at each electrode for 1 faraday of electricity passed through the electrolyte.

Faraday cage Wire or metal screen connected to ground, that completely encloses sensitive equipment to prevent any interference from stray electromagnetic radiation.

Faraday's law 1. The mass of a substance liberated in an electrolytic cell is proportionate to the quantity of electricity passing through the cell. **2.** When the same quantity of electricity is passed through different electrolytic cells, the masses of the substances liberated are proportionate to their chemical equivalent. **3.** Also called the law of electromagnetic induction. When a magnetic field cuts a conductor, or when a conductor cuts a magnetic field, an electric current will flow through the conductor if a closed path is provided over which the current can circulate.

faradmeter An instrument for measuring electric capacitance.

fast-Fourier transform, FFT A type of frequency analysis on data that can be done by computer using special software, or by an array processor, or by a special purpose, hardware device.

fast-release relay A high-speed relay designed specifically for short-release but not short operate time.

fast select (data communication) An option of a virtual call facility that allows the inclusion of data in call-set-up and call-clearing packets.

fast storage High speed input or access storage usually in a hierarchy of storage units and related to these relatively. An imprecise term.

fatal error An error that renders further execution if any to produce meaningless results.

fatigue The weakening of a material under repeated stress.

fat oil The absorbent oil enriched by gasoline fractions in an absorption plant. After absorbing the gasoline fractions, the gasoline is removed by distillation, leaving the oil "lean" and ready for further use to absorb more gasoline fractions from the natural gas stream.

fault 1. An accidental condition that causes a functional unit to fail to perform its required function. **2.** A manifestation of an error in software. A fault if encountered, may cause a failure. Synonymous with bug.

fault analysis The logical, systematic examination of an item to identify and analyze the probability, causes and consequences of potential faults.

fault bus (fault ground bus) A bus connected to normally grounded parts of electric equipment, so insulated that all the ground current passes to ground through fault detecting means.

fault bus protection (relaying) A method of ground fault protection which makes use of a fault bus.

fault category See error category.

fault coverage The proportion of faults of an item that can be recognized under given conditions.

fault diagnosis Actions taken for fault recognition, fault localization and cause identification.

fault diagnosis time The time during which fault diagnosis is performed.

fault insertion See fault seeding.

fault isolation 1. The process of identifying and locating failures in a unit under test. **2.** Determining the cause of a test failure, typically by identifying a defective component or process failure on a board.

fault localization Action taken to identify the faulty sub-item or sub-items at the appropriate indenture level. (Fault location deprecated in this sense).

fault mode One of the possible states of a faulty item, for a given required function. Note: The use of the term "failure mode" in this sense is now deprecated.

fault recognition The event when a fault is recognized.

fault seeding The process of intentionally adding a known number of faults to those already in a computer program for the purpose of estimating the number of indigenous faults in the program. Synonymous with bug seeding.

fault signature 1. Data representing the outputs of a known good unit and used to compare against outputs of a unit under test. **2.** A particular output response or set of responses generated when a test program is executed on a device containing a fault.

fault threshold A prescribed limit to the number of faults in a specified category which, if exceeded, requires appropriate action.

fault tolerance That property of a system which permits it to carry out its assigned function even in the presence of one or more faults in the hardware or software components.

fault-tolerant circuits Circuits that are designed so that they could continue to function properly even though part of the circuit failed.

fault trace A record of faults, obtained by a monitor, that reflects the sequence of states that immediately preceded the occurrence of the faults.

fault tree A logic diagram showing which fault modes of subitems or external events, or combinations thereof, result in a given fault mode of the item.

fault tree analysis, FTA An analysis to determine which fault modes of the subitems or external events, or combinations thereof, may result in a stated fault mode of the item, presented in the form of a fault tree.

Faure plate A storage-battery plate, consisting of a conductive lead grid filled with active paste material.

FAX See facsimile.

FBFO Final Bunker Fuel Oil.

fc Footcandle.

FCC See Federal Communication Commission.

FCI Flux Changes per inch.

FCMM Flux changes per mm.

FACT See flat crush resistance.

FDM See frequency division multiplex.

FD or FDX See full-duplex.

FE See format effector.

Fe Chemical symbol for iron.

FEANI European Federation of National Engineering Associations.

feasibility study A study in which a projection of how a proposed computer system might work is made to provide the basis for a decision to develop and implement the system.

featherweight board, featherweight paper, bulking board, bulking paper Paper or board with a particularly low density.

FEB See functional electronic block.

FEC Forward Error Correction. A system of data transmission in which redundant bits generated at the transmitter are used at the receiving terminal to detect, locate, and correct any transmission errors before delivery to the data sink.

Federal Communication Commission, FCC Established in 1934 to regulate interstate and foreign communications by wire and radio (USA).

Federal Energy Agency, FEA The government agency that administers the Federal Energy Law (USA).

feed 1. Crude oil or other hydrocarbons that are the basic materials for a refining or manufacturing process; feedstock. **2.** To supply the material to be operated upon to a machine.

feedback The part of a closed-loop system which automatically brings back information about the condition under control.

feedback (fluid power systems) Means whereby the state of the controlled element is signalled.

feedback amplifier Specific amplifiers often used in analog computers using the feedback principle to perform operations on signals, i.e., feeding some function of the output signal as part of the input signal to produce some performance and execute desired operations on the input signal.

feedback compensation The placement of a device, or an additional circuit, into a feedback control system to improve its response in relation to a specific characteristic of a system.

feedback control Control in which a measured variable is compared to its desired value to produce an actuating error signal which is acted upon in such a way as to reduce the magnitude of the error.

feedback control, closed loop control Control in which the control action is made to depend persistently on the measurement of the controlled variable.

feedback controller A device which operates automatically to affect a controlled variable by comparing the value of the controlled variable with the value of a reference variable in order to reduce the difference between them. Note: There are many self describing modifiers to use with controllers such as flow, temperature, pressure, level, pH.

feedback elements 1. Elements in the feedback path of a control system. Those elements in the controlling system which act to change the feedback signal in response to the directly controlled variable.

feedback impedance (analog computers) In an analog computer, a passive network connected between the output terminal of an operational amplifier and its summing junction.

feedback loop See closed loop (feedback loop).

feedback loop (numerical control) The part of a closed-loop system that provides controlled response information allowing comparison with a referenced command.

feedback node (branch) (network analysis) A node (branch) contained in a loop.

feedback oscillator An oscillating circuit, including an amplifier, in which the output is coupled in phase with the input.

feedback path 1. Functional chain linking the output of a comparing element to the output of the controlled system. **2.** Path connecting on output of the controlled system to one of the inputs of the relevant comparing element.

feedback ratio In control system, the ratio of the feedback signal to a corresponding reference input.

feedback regulator A feedback control system which tends to maintain a prescribed relationship between certain system signals and other predetermined quantities.

feedback signal Signal depending on the controlled variable and returned to a comparing element.

feedback transfer function In a feedback control loop, the transfer function of the feedback path.

feedback winding In a saturable reactor the control winding to which a feedback connection is made.

feeder 1. A conveyer or adapted to control the rate of delivery of bulk materials, packages or objects to a specific point or operation. **2.** A conductor or group of conductors connecting two generating stations, two substations, a generating station and a substation or feeding point, a substation and a feeding point, or a transmitter and antenna. **3.** A transmission line between an antenna and a radio transmitter or receiver.

feedforward A frequency-compensation technique in operational amplifiers.

feedforward control 1. Control in which the information about one or more influencing conditions on the controlled variable is converted into additional action outside a feedback loop. This additional control action is taken in such a way as to minimize the deviation of the controlled variable from a desired value. This additional control action can be applied to open or closed loop control. Note: The use of feedforward control does not change system stability because it is not part of the feedback loop which determines the stability characteristics. **2.** Type of control in which the manipulated variable, while still depending on the controller output variable, is also made to depend on the measured value of one or more input variable.

feedforward control action See feedforward control.

feedforward signal See feedforward control.

feed function (numerical control) A specification of feed rate. See ISO 6983/1 and 2.

feed function (numerical control) The relative velocity between the tool or instrument and the work due to motion of the programmed axis (axes).

feedhead A reservoir of molten metal that extends above a casting to supply additional molten metal and compensate for solidification shrinkage. Also known as riser; sinkhead.

feedover (crosstalk) The unwanted electrical energy transferred from one channel called the disturbing channel, to another channel called the disturbed channel. Note: This energy can be transferred, e.g. by electromagnetic or capacitive coupling or by leakage.

feed pipe A pipe through which water is conducted into a boiler.

feedrate bypass (numerical control) A manual function that directs the control system to ignore the

programmed feedrate and to substitute a selected value.

feedrate override (numerical control) A facility enabling the feedrate to be modified.

feedstock The raw or semifinished material that is processed in a refinery or other processing plant; charge stock; to charge a still or other processing unit is to pump in a charge of feedstock to be treated or further refined; feed.

feed-through connector One of many electrical connectors, terminal blocks, etc. most often with dual-ended terminals to permit simple distribution and bus-ing of electrical circuits.

feedwater Process water supplied to a vessel such as a boiler or still, as opposed to circulating or cooling water.

feed-water treatment The treatment of boiler feed-water by the addition of chemicals to prevent the formation of scale or eliminate other objectionable characteristics.

FEICRO Federation of European Industrial Cooperative Research Organizations.

felt Pertaining to pulp and paper manufacturing, an endless textile cloth which supports or carries the web in the vat section or during wet pressing or drying.

felt board Board with loose soft texture containing textile fibers.

female connection A pipe, rod or tubing coupling with the threads on the inside.

female thread Connection with internal thread.

femto prefix meaning 10^{-15} . Letter symbol: f.

femtoampere A unit of current equal to 10^{-15} ampere. Letter symbol fA.

femtosecond 10^{-15} second, or 0,001 picosecond (1 picosecond is 1 trillionth of a second).

femtovolt A unit of voltage equal to 10^{-15} volt. Letter symbol: fV.

FEP 1. See front end processor. **2.** Fluorinated ethylene propylene (sometimes called Teflon, DuPont trade name).

ferric oxide The magnetic constituent of practically all present-day tapes, in the form of a dispersion of fine particles within the coating.

ferric percentage Actual ferric iron in slag, expressed as percentage of the total iron calculated as ferric iron.

ferrite 1. Alpha iron, usually with one or more elements in solid solution. The term ferrite is derived from ferrum, the Latin word for iron. The metallographic name for iron in steel is ferrite. **2.** A chemical compound which consists of iron oxide and other metallic oxides often combined with ceramic material to form storage devices. Ferrite has characteristics of high magnetic flux properties.

ferrite core A core composed of various types of magnetic materials (usually toroidal in shape) which are pulsed or polarized by electric currents carried in a wire or wires wound around the core.

ferritic The body-centered cubic crystal structure of ferrous metals.

ferritic steel A steel whose microstructure at room temperature normally consists of ferrite.

ferroalloy An alloy, usually a binary alloy, of iron and another chemical element which contains enough of the second element for the alloy to be suitable for introducing it into molten steel to produce alloy steel, or in the case of ferrosilicon or ferroaluminium to produce controlled deoxidation.

ferrodynamical instrument An instrument which operates by the interaction of a current in a movable coil with a current in one or more fixed coils and

which incorporates soft ferromagnetic material in the magnetic circuit.

ferroelectric Pertaining to a phenomenon exhibited by certain materials in which the material is polarized in one direction or the other, or reversed in direction by the application of a positive or negative electric field of magnitude greater than a certain amount.

ferroelectric crystal A crystal which can be polarized in the opposite direction by applying an electric field weaker than the breakdown strength of the material.

ferromagnetics The science which deals with the magnetic polarization properties of materials.

ferromanganese An alloy of iron and manganese.

ferrometer An instrument for making permeability and hysteresis tests of iron and steel.

ferroresonant circuit A resonant circuit in which one of its elements is a saturable reactor.

FERROSTAN process A process for the production of electrolytic tin plate. The process is based on the use of a sulphonic-acid electrolyte in which tin is reduced from the stannous state.

ferrous metal A metal in which the major constituent is iron.

ferrule (optical communication) A mechanical fixture, generally a rigid tube, used to confine the stripped end of a fiber bundle or an optical fiber.

FF, F/F See flip-flop.

FFT Fast Fourier Transform, a type of frequency analysis on data that can be done by computer using special software or by an array processor or by a special-purpose, hardware device.

FHDM (of a pulse), full duration half maximum The time period over which a pulse has a level greater than 50% of its maximum value.

fiber See (optical) fiber.

(optical) fiber A filament shaped optical waveguide made of dielectric materials.

fiber axis, optical axis (optical communication) The locus of the core centers along the length of an optical fiber.

fiber bandwidth (fiber optics) The lowest frequency at which the magnitude of the fiber transfer function decreases to a specified fraction of the zero frequency value. Often, the specified value is one-half the optical power at zero frequency.

fiberboard Fiberboard is the generic term for highly pressed stiff grades of millboard e.g. jacquard board, coachwork board, suitcase board and shoe board.

fiber buffer (optical communication) A material or assembly of materials used to protect the optical fiber against physical damage.

fiber bundle, bundle (optical communication) An assembly of unbuffered optical fibers. Note: Usually used to transmit together a single signal.

fiber cable See optical fiber cable.

fiber composition The weight proportions of different types of fibers in e.g. pulp, paper or board.

fiber fractionation Pertaining to pulp and paper manufacturing, a procedure for separating fibers into groups according to size.

fiber harness In equipment interface applications, an assembly of a number of multiple fiber bundles or cables fabricated to facilitate installation into a system.

fiber jacket, secondary coating (optical communication) A coating applied directly to the primary coating to reinforce the protection of the optical fiber during handling and cabling.

fiber metal A material composed of metal fibers which have been pressed or sintered together, and which may also have been impregnated with resin,

molten metal or other material that subsequently hardened.

fiber metallurgy The growing of superfine crystal whiskers whose characteristic is relatively great strength in their length to diameter ratio.

fiber optics, FO The branch of optical technology concerned with the transmission of optical radiations through fibers made of transparent materials such as glass, fused silica, or plastic.

fiber-optics computer interconnection A means of connecting a computer with a terminal or another computer to transmit electrical signals via fiber-optics cable instead of wire.

fiber-optics multiport coupler An optical unit, such as a scattering or diffusion solid "chamber" of optical material that has at least one input and two outputs, or at least two inputs and one output, that can be used to couple various sources to various receivers.

The ports are usually optical fibers. If there is only one input and one output port, it is simply a connector.

fiber-optics probe A flexible probe made up of a bundle of fine glass fibers optically aligned to transmit an image, light or both.

fiber-optics splice A nonseparable junction joining one optical conduction to another.

fiber-optics system 1. A light source and light detector; transmitter and receiver; and fiber optic cable with connectors. **2.** A relatively new method of data transmission. Light transmitting fibers are used for connecting sensors to the computer.

fiber reactive dye (textile term) A dye which has a reactive chemical group such as dichlorotriazinyl attached to the molecule and can react with a group on the fiber such as the hydroxyl group on cellulose.

fiber-resistant Resistant to combustion and to heat of standard intensity for a specified time without catching fire or failing structurally.

fiber scattering In an optical fiber that part of the total scattering attributable to variations of geometry and index profile of the fiber.

Fibonacci number An integer in the Fibonacci series.

Fibonacci search A dichotomizing search in which the number of data elements in the set is equal to a Fibonacci number or is assumed to be equal to the next higher Fibonacci number and then at each step in the search the set of elements is partitioned in accordance with the Fibonacci series. Notes: **1.** The series 0, 1, 1, 2, 3, 5, 8, etc. in which each element is the sum of the two preceding terms, is a Fibonacci series. **2.** Fibonacci search has an advantage over binary search in slightly reducing average movement of a sequentially accessed data medium such as a magnetic tape.

Fibonacci series A number series in which each number is equal to the sum of the two preceding numbers.

fibril Long, slender structural elements in the fiber wall (pertaining to pulp and paper) which in turn consist of still finer thread-like elements, microfibrils. Fibrils can be seen in a normal microscope, but the resolving power of an electron microscope is necessary to reveal the microfibrils.

fiche See microfiche.

fidelity, repeatability (of a measuring instrument) The ability of a measuring instrument to give, under defined conditions of use, closely similar responses for repeated applications of the same stimulus.

FIDIC International Federation of Consulting Engineers.

fiducial error (of a measuring instrument) The error of a measuring instrument divided by a value specified for the instrument. Note: The specified value is generally called the fiducial value, and may be, for example, the span or the upper limit of the nominal range of the measuring instrument.

field On a data medium or in storage, a specified area used for a particular class of data elements.

field accelerating relay A relay that functions automatically to maintain the armature current within limits, when accelerating to speeds above base speed, by controlling the excitation of the motor field.

field alterable read-only memories (ROMs) These work with many popular minicomputers. They are packed on a single printed circuit board. Some field alterable ROMs can be programmed at the single-bit level. With capacitive type units, the alteration is almost as simple as a pencil erasure. Any discrete bit in storage can be reprogrammed repeatedly.

Fieldata A family of automatic dataprocessing equipment designed and built to be used in the field by the U.S. Army.

Fieldata code 1. The U.S. Military code used in data processing as a compromise between conflicting manufacturer's code. **2.** A standardized military data transmission code.

field bus A field bus is a digital, serial, multidrop, data bus for communication with low level industrial control and instrumentation devices such as transducers, actuators and local controllers. An IEC/ISA International Standard is in development. See also WorldFIP and ISP.

field butanes A raw mix of natural gas liquids; the product of gas processing plants in the field. Raw mix streams are sent to fractionating plants where the various components – butane, propane, hexane, and others – are separated.

field control (motor) A method of controlling a motor by means of a change in the magnitude of the field current.

field decelerating relay A relay that functions automatically to maintain the armature current or voltage within limits, when decelerating from speeds above base speed, by controlling the excitation of the motor field.

field-effect transistor (FET) A transistor whose internal operation is unipolar in nature. The metal oxide semiconductor (MOSFET) is widely used in integrated circuits because the devices are very small and can be manufactured with few steps.

field emission Electron emission from a surface due directly to high-voltage gradients at the emitting surface.

field excitation current (Hall-effect devices) The current producing the magnetic flux density in a Hall multiplier.

field-failure protection The effect of a device, operative on the loss of field excitation, to cause and maintain the interruption of power in the motor armature circuit.

field-failure relay A relay that functions to disconnect the motor armature from the line in the event of loss of field excitation.

field maintenance, on-site maintenance Maintenance performed at the premises where the item is used.

field of view 1. Pertaining to electrical transducers, the solid angle, or the angle in a specified plane, over which radiant energy incident on a transducer is measured within specified tolerances. **2.** Pertaining to photoelectric and proximity switches, a section of the

surrounding field of a light receiver within which luminous radiation can be evaluated.

field reliability test A reliability compliance or determination test made in the field where operating, environmental, maintenance and measurement conditions are recorded.

field test A compliance test or determination test made in the field where operating, environmental and measurement conditions are recorded.

field weakening The introduction of a resistance in series with the shunt field of a motor to reduce the voltage and current and increase the motor speed.

field winding A winding on either the stationary or the rotating part of a synchronous machine whose sole purpose is the production of the main electromagnetic field of the machine.

FIFO See first-in, first-out.

figurative Data item which is descriptive of its own magnitude, value, or size, such as, $\cos 40^\circ$ or simply, 100.

figurative constant A data name that is reserved for a specific constant in a specified programming language. See also literal.

figure (numerical) An arithmetic value expressed by one or more digit.

figure of merit 1. The property or characteristic which makes an electronic device suitable for a particular application. **2.** For a thermoelectric material, the quotient of the square of the absolute Seebeck coefficient divided by the product of the electrical resistivity and the thermal conductivity.

filament 1. Also known as a filamentary cathode. The cathode of a thermionic tube, usually a wire or ribbon, which is heated by passing a current through it. **2.** A slender thread of material such as carbon or tungsten which emits light when raised to a high temperature by an electric current (as in an incandescent light bulb).

filamentary display A numerical or alphanumeric display whose segments are composed of individual incandescent-type filament wires, which emit white light when energized.

file 1. A named set of records stored or processed as a unit. **2.** (Hardware) An enclosure that holds electronic cards and aligns them with electrical connectors. Refers to Honeywell TDC 3000 control systems. **3.** (Software) A collection of records or other information organized toward some purpose. Refers to Honeywell TDC 3000 control systems.

file addressing A procedure designed for those data records which have a particular key or code designed to identify the data. When the program is given this key it can locate and use the data of the particular file address.

file clean-up The removal of superfluous or obsolete data from a file.

file gap (computing systems) An interval of space or time associated with a file to indicate or signal the end of the file.

file handling The manipulation of data files by various methods. It generally involves read, write, and compare.

file layout The organization and structure of data in a file, including the sequence and size of the components.

file maintenance The activity of updating or reorganizing a file.

file management A designed procedure or set of processes for the creation of files and their maintenance.

file processing The periodic updating of one or more master files to reflect the effects of current data, often from a transaction file. For example a monthly run updating the inventory file.

file section That part of a file which is recorded on any one volume.

file separator, FS The information separator intended to identify a logical boundary between files.

file set A collection of one or more related files, recorded consecutively on a volume set

FILES IV (trademark) A software package for Honeywell 4500 and 45000 process computers that allows file building, editing, manipulation, sequencing, packing operations and information storage. It is designed to operate as a background function in a real-time process control environment.

file specification A name that uniquely identifies a file maintained by any operating system. A file specification generally consists of at least three components; a device name identifying the volume on which the file is stored, a file name, and a file name extension.

file updating The activity of updating or reorganizing a file.

filiform corrosion See underfilm corrosion.

fill (token ring access method) A bit sequence that may be either 0 bits, 1 bits, or any combination thereof.

filled-core annular conductor A conductor composed of a plurality of conducting elements disposed around a nonconducting supporting material that substantially fills the space enclosed by the conducting elements.

filled thermal system An all metal assembly consisting of a bulb, capillary tube, and pressure sensing element, containing a temperature responsive fluid. Note: The temperature responsive fill is commonly classified in the following way: 1. Liquid (class I). 2. Liquid in equilibrium with its vapour (class II). 3. Gas (class III). Also called filled-system thermometer or filled thermometer. See also gas thermometers and vapor pressure thermometers.

filler (loading) (In the paper industry) finely divided, normally white pigment which is added to the stock in order to e.g. raise the opacity and smoothness of the paper.

fill-in-the-blank A nonprocedural programming language in which programs are developed by filling out data sheets for an existing program. Examples: BICEPS, PROSPRO, CODIL.

filling compound (power cable joints) A dielectric material poured or otherwise into the joint housing. Filling compounds may require heating or mixing prior to filling. Some filling compounds may also serve as the insulation.

film circuits Microelectronic circuits in which the passive components and their metallic interconnections are formed directly on an insulating substrate and the active semiconductor devices are added subsequently.

film integrated circuit A circuit made up of elements that are films all formed in place upon an insulating substrate. Also called film microcircuit. To further define the nature of a film integrated circuit, additional modifiers may be prefixed. Examples are: thin-film integrated circuit, thick-film integrated circuit.

film microcircuit See film integrated circuit.

filter 1. A device used in a frequency transmission circuit to exclude unwanted frequencies and to keep the channels separate. **2.** A device to suppress interference

which would appear as noise. **3.** A machine word that specifies which parts of another machine word are to be operated upon. **4.** See digital filter.

filter attenuation A loss of power through a filter as a result of absorption in resistive materials, of reflection, or of radiation. Usually expressed in decibels.

filter efficiency Measure of the ability of a filter to remove a specified test contaminant from a fluid at a given contaminant concentration under specified test conditions, expressed quantitatively in terms of the probability of a particle of a specified size being retained by the filter.

filter press A filtration device with compartments formed by filter cloths clamped between a series of recessed drainage plates or flat plates and frames, into which sludge is pumped under pressure. Water is expressed from the sludge through the filter cloths and drainage system and the pressed sludge is removed after each filtration cycle (see sludge cake).

filtrability, filterability Relating to sludge processing, it is an indication of the ease with which the liquid can be separated from the solids by filtration.

filtration (water quality) The removal of suspended particles from a body of water by passing it through a layer of porous material, or through a suitably sized mesh.

fin A metal disc or a thin, projecting metal strip attached to a semiconductor to dissipate heat.

final control element See final controlling element.

final controlling element 1. Element of the forward path which directly changes the manipulated variable. **2.** The forward controlling element which directly changes the value of the manipulated variable.

final relief A reduction of the excess pressure in the digester in the final stages of the cook. The extent of the final relieving is determined by the manner of emptying the digester, i.e. blowing or flush dumping.

fine paper A general name for writing and printing paper of high quality, manufactured from bleached chemical pulp and for rags.

finger plate (control valves) A plate used to restrict the upward motion of the diaphragm and prevent diaphragm extrusion into the bonnet cavity in the full open position.

finish (textile term) A chemical or mixture of chemicals applied to the fabric to impart desired characteristics such as water repellancy, flame retardancy, and permanent press.

finishing room, baleroom The department in a pulp mill or paper mill where the final product (pulp, paper, board) is packed.

finite automaton Sequential circuit described by input variable, output variable, and state variable as well as transition function and output function.

finite loading Conceptually, the term means putting no more work into a factory than the factory can be expected to execute. The specific term usually refers to a computer technique that involves automatic shop priority revision to level load operation by operation.

finite state machine (software) A computational model consisting of a finite number of states, and transitions between these states.

finned-tube heat exchanger Small-diameter pipe or tubing with metal fins attached to the outer circumference for cooling water or other liquids or gases. Finned-tube exchangers cool by giving up heat from the surface of the fins to the atmosphere in a manner similar to an automatic radiator. Heat exchangers are not only for cooling but for heat-recovery systems as well.

FIOR process The FIOR (Fluid Iron Ore Reduction) process is a continuous direct-reduction process developed by Esso Research and Engineering Company (ERE), a subsidiary of Standard Oil Company of New Jersey (renamed Exxon Corporation in 1973).

FIP Factory Instrumentation Protocol. FIP is an open, non-proprietary fieldbus communication protocol, widely available in Europe since 1989. Developed principally by Telemecanique and Cegelec. See also under WorldFIP.

FIPS Federal Information Processing Standards.

fire (a rule) To initiate the action specified by a rule when the condition stated by the rule is satisfied.

fire crack A crack starting on the heated side of a tube, shell, or header resulting from excessive temperature stresses.

fire damper A thermally actuated damper arranged to automatically restrict the passage of fire and/or heat at a point where an opening violates the integrity of a fire partition or floor.

fire point Temperature to which a fluid shall be heated to ignite and burn for 5 s in the presence of air when a small flame is applied under controlled conditions.

fireproof Resistant to combustion or to damage by fire under all but the most severe conditions.

fire resistant (FR) fluid Fluid difficult to ignite which shows little tendency to propagate flame.

fire retardant Treated by coating or impregnation so that a combustible material – wood, paper or textile, for instance – catches fire less readily and burns more slowly than untreated material.

fire trimmed A designation for valves, flanges or other fittings made to withstand an accidental fire in a plant or process unit.

fire tube boiler A boiler with straight tubes, which are surrounded by water and steam and through which the products of combustion pass.

firing The heavy flow of electrons from cathode to plate in a gas tube.

firing potential The potential applied to the plate of a gas diode or the grid of a thyatron at which firing occurs.

firing rate control A pressure temperature or flow controller which controls the firing rate of a burner according to the deviation from pressure or temperature set point.

firmware Hardware that contains a computer program and data that cannot be changed in its user environment. The computer programs and data contained in firmware are classified as software; the circuitry containing the computer program and data is classified as hardware.

first (last) transition duration (pulse term) The transition duration of the first (last) transition waveform in a pulse waveform.

first generation The period of technology in computer design utilizing vacuum tubes, off-line storage on drum or disk, and programming in machine language.

first-in, first out, FIFO A queuing technique in which the next item to be retrieved is the item that has been in the queue for the longest time. Compare LIFO.

(the) first law of thermodynamics The first law of thermodynamics states that, if no energy is lost through the boundaries of the system in the form of work, or heat, the total energy level will remain constant at every point along a given datum plane in the system.

first level address Same as direct address.

first-order log A term used to describe the signal-delaying and signal-size-changing effects of a part of the control loop. The name comes from the form of the equation which represents the relation between output and input.

first-order system A system definable by a first-order differential equation.

Fisher loop test One of several Wheatstone bridge test arrangements commonly used to determine the distance to a fault (grounded or crossed wires) in a communications cable.

fisheye An area on a fracture surface having a characteristic white crystalline appearance, usually caused by internal hydrogen cracking.

fission Also called atomic fission or nuclear fission. The splitting of an atomic nucleus into two parts. Fission reactions occur only with heavy elements such as uranium and plutonium and are accompanied by large amounts of radioactivity and heat.

fission products The elements which result from atomic fission. They may consist of more than forty different radioactive elements such as arsenic, silver, cadmium, iodine, barium, tin, cerium, and others.

FITs The measure of a semiconductor's reliability is often expressed in failure units (FITs) – the number of failures per 10^9 device-hours.

five layer device A semiconductor, as a diac, triac, etc., in which there are four pn junctions.

fix 1. To convert data from floating-point number representation to fixed-point representation. **2.** A position determined without reference to any former position.

fixed-bed catalyst A catalyst in a reactor vessel through which the liquid being treated drips or percolates through the bed of catalyst material. In other methods, the catalyst is mixed thoroughly with the feedstock as it is pumped into the reactor vessel.

fixed bias A constant value of bias voltage.

fixed block format (numerical control) A block format in which: **1.** the number of words in a block is constant; **2.** the words in a block occur in a constant order; **3.** the number of characters in a word in any one position in the block is constant.

fixed carbon The carbonaceous residue less the ash remaining in the test container after the volatile matter has been driven off in making the proximate analysis of a solid fuel.

fixed coefficient controllers Controllers without automatic procedures for calculating controller coefficients, i.e. coefficients can only be adjusted by user action. Pertains to adaptive and self-tuning controller types.

fixed composition (carbon composition) resistor Resistive element consists of a carbon composition which is molded under extreme pressure, then enclosed in an insulating sleeve.

fixed connector Used in flowcharting to indicate that only the result indicator can exist after process completion.

fixed costs An expenditure that does not vary with production volume, such as rent, property tax, administrative salaries, etc.

fixed crystal A crystal detector with a nondefinite contact position.

fixed cycle, canned cycle (numerical control) A preset series of operations which directs machine axis movement or causes spindle operation to complete such actions as boring, drilling, tapping, or combinations there of.

fixed cycle operation 1. A type of computer performance whereby a fixed amount of time is allocated to

an operation. 2. Synchronous or clock-type arrangement in a computer in which events occur as functions of measured time.

fixed decimal mode A mode in which the number of decimal places to be shown in the result of a calculation is preselected.

fixed displacement pump Pump in which the fluid volume displaced per cycle (capacity) cannot be varied.

fixed-form coding Specific coding instructions with a fixed field assigned to particular labels, operations code, and operand parts of the instruction.

fixed function generator A function generator in which the function it generates is set by construction and cannot be altered by the user.

fixed head A term which relates to the use of stationary, rigidly-mounted reading and writing heads on a bulk memory device. Each head reads or writes a particular track.

fixed instruction computer A computer having an instruction set that is fixed by the manufacturer. Users must design application programs using this instruction set. Contrasted with microprogrammable computer.

fixed logic Circuit logic computers or peripheral devices that cannot be changed through operation of external controls. Connections must be physically changed to rearrange the logic.

fixed (measuring) instrument A measuring instrument designed to be permanently mounted and which is intended to be connected to (an) external circuit(s) by means of permanently installed conductors.

fixed memory A memory into which information normally can be written only once. The ROM is a fixed program memory.

fixed output An output from a computational slot configured for a signal-conditioning algorithm such as a summer or divider. The output of the specified slot is a predetermined value based upon the input values. Refers to Honeywell TDC 3000 control systems.

fixed point arithmetics A method of calculation in which operations take place in an invariant manner, and in which the computer does not consider the location of the radix point. This is illustrated by desk calculators or slide rules with which the operator must keep track of the decimal point, and similarly with many automatic computers, in which the location of the radix point is the programmer's responsibility. Contrasted with floating-point arithmetic.

fixed-point calculation A calculation made with fixed-point arithmetic.

fixed-point data In data processing, the representation of information by means of the set of positive and negative integers. It is faster than floating point data and requires fewer circuits to implement.

fixed-point number A number which is represented in fixed-point form in contrast to floating-point form.

fixed-point part, mantissa (in a floating point representation) In a floating-point representation, the numeral that is multiplied by the exponentiated implicit floating-point base to determine the real number represented.

fixed-point representation system A radix numeration system in which the radix point is implicitly fixed in the series of digit places by some convention upon which agreement has been reached.

fixed program computer See fixed instruction computer.

fixed programmed control Programmed control, which is not allowing changes in the program.

fixed radix notation, fixed radix numeration system A radix numeration system in which all the digit places, except perhaps the one with the highest weight, have the same radix.

fixed radix numeration system See fixed radix notation.

fixed restrictor valve Valve in which the inlet and outlet ports are interconnected through a restricted passageway the cross-sectional area of which cannot be altered.

fixed sequence manipulator (industrial robots) A manipulator which performs each step of a given operation according to a predetermined motion pattern which cannot be changed without physical alteration.

fixed set-point control Closed loop control by which the controlled variable is made to remain substantially constant.

fixed-tolerance-band compaction A specific type of data compaction for storage or transmission of data, where data becomes significant only when the data deviates beyond present limits of a range.

fixed word length Data are treated in units of a fixed number of characters or bits (as contrasted with variable word length).

fixture A special holder that positions the work in a machining operation but does not guide the tool.

fL Letter symbol for footlambert.

flag bit An information bit which indicates some form of demarcation has been reached such as overflow or carry. Also an indicator of special conditions such as interrupts.

flag register, condition codes register Indicates processor status information such as sign, zero, carry parity etc.

flag, switch indicator An indicator that determines or shows the setting of a switchpoint.

flame arrester Flame arresters are commonly used in industrial applications to prevent transmission of a combustion wave from one location to another. The subject of flame arresters is closely related to the subject of explosionproof housings, i.e. both can be defined in the same way – to prevent transmission of an explosion from one location to another.

flameproof enclosure (Exd) A type of protection in which the parts which can ignite an explosive atmosphere are placed in an enclosure which can withstand the pressure developed during an internal explosion of an explosive mixture and which prevents the transmission of the explosion to the explosive atmosphere surrounding the enclosure.

flange (pressure) tappings Wall pressure tappings drilled on either side of an orifice plate with the axes being 25 mm from the upstream and downstream faces of the plate respectively.

flanged body Valve body with full flanged end connections.

flanged connection Connection consisting of a pair of flanges one on each component to be connected.

flanged ends (valves) Valve and connections incorporating flanges which allow pressure seals by mating with corresponding flanges on the piping.

flanged seal Seal with a radial base integral with an axial cylindrical projection at its inner diameter.

flange facing (valves) The finish on the end connection gasket surfaces of flanged or flangeless valves. The flange facing is determined by the type of joint required. In U.S. a raised face requiring a flat gasket is the most popular joint for service up to 600 16 ANSI. Ring-joint facing are more popular above these ratings.

flangeless control valve A valve without integral line flanges, which is installed by bolting between companion flanges, with a set of bolts, or studs, generally extending through the companion flanges.

flange rating (for control valves) The flange rating is determined by the type of service, required material, pressure and the maximum fluid temperature. In contrast to certain European standards, an ANSI flange rating defines the maximum working pressure at an elevated temperature, i.e. 265 psi at a temperature of 850°F for carbon steel, 300 lb. ANSI rating. Such a flange is rated at 740 psi at room temperature and is tested at 1125 psi hydrostatic pressure. See also nominal pressure.

flange retaining liner (butterfly valves) A liner retained in the body of a butterfly valve by the pipe flanges or by a continuous or segmented ring. The segmented ring provides a means of adjusting the liner to disk interference to achieve improved sealing. The bore of the pipe flanges is smaller in diameter than the body bore, therefore the flanges retain the liner in the body.

flange taps 1. See orifice flange taps. 2. See flange (pressure) tappings.

flareback A burst of flame from a furnace in a direction opposed to the normal flow, usually caused by the ignition of an accumulation of combustible gases.

flared fitting (fluid power systems) Type of fitting in which the connection is made with the aid of a tubing nut and a special tool which expands the end of the tubing to provide a seal against the end of the fitting which does not require any sealing compound and may be threaded male or female.

flaring Increasing the diameter at the end of a pipe or tube to form a conical section.

flash chamber A refinery vessel into which a process stream is charged or pumped and where lighter products flash off or vaporize and are drawn off at the top. The remaining heavier fractions are drawn off at the bottom of the vessel.

flash dryer (for pulp) A drying unit in which wet pulp, finely divided into flakes, is dried in a supporting stream of hot air, superheated steam or other hot gas.

flashing 1. For flashing effects pertaining to control valves see ISA handbook of control valves. 2. The application of a high-frequency electromagnetic field to an electron tube through the envelope to flash its getter during evacuation.

flashover (general) A disruptive discharge through air around or over the surface of solid or liquid insulation, between parts of different potential or polarity, produced by the application of voltage wherein the breakdown path becomes sufficiently ionized to maintain an electric arc.

flash point Temperature at which a given substance will ignite.

flash tank (for sulphite waste liquor) A vessel in which sulphur dioxide is liberated from hot sulphite waste liquor through a rapid reduction in pressure.

flatbed plotter A plotter that draws a display image on a display surface mounted on a flat surface.

flat cable A cable containing flat metallic ribbon conductors, all lying side-by-side in the same plane and imbedded in a material which insulates and binds them together.

flat-card resolving potentiometer A particular type of potentiometer which has an element which is a square slab or card wound with resistance wire.

flat conductor Wire manufactured in flat form.

flat crush resistance (FCT) of corrugated fiberboard The maximum pressure which corrugated fiberboard can withstand when the pressure is applied in a direction normal to the surface of the board before the layer of fluted paper collapses; see edgewise crush resistance, ring crush resistance.

flat-rolled steel products Flat-rolled steel products fall into two major categories: hot rolled and cold rolled. Hot-rolled products are reduced to final thickness by heating and rolling at elevated temperatures. Cold rolling is carried out on products which have not been heated immediately prior to the cold-rolling operation in which they are reduced to final thickness.

flat slide valve (fluid power systems) Valve in which the flow paths are connected or isolated by means of a flat-faced valve member which slides on a flat seat.

flat-V weir A long-base weir with a triangular longitudinal profile. The height of the triangle increases linearly from the middle of the channel to the abutment of the weir. See figure in British Standard 3680:Part 1:1983.

flaw A discontinuity or other physical attribute in a material that exceeds acceptable limits; the term flaw is nonspecific, and more specific terms such as defect, discontinuity or imperfection are often preferred.

flaw detector, void detector A device which is affected by a fault in a material and then operates an alarm signal or registers and marks the position of the fault etc. The flaw detector can be affected by cracks, holes, stains or other visible faults in the moving paper web.

flexible coupling A device for connecting two shafts end to end so that they can be rotated even though not exactly aligned.

flexible disk A magnetic storage medium constructed of thin plastic. See floppy disk.

flexible hose Flexible pipeline (conductor) usually of wire reinforced rubber or plastic.

flexible lip seal (butterfly valves) A seal ring retained in the body bore with raised flexible lip which contacts an offset disk in the closed position yet is clear of the disk in the other positions.

flexible resistor A wirewound resistor that looks like a flexible lead. It is made by winding Nichrome or any other type of resistance wire around asbestos or other heat-resistant cord. The wire is then covered with braided insulation, which is color coded to indicate the resistance value.

flexitallic Brand name for a spiral-wound stainless steel gasket with asbestos or Teflon filler.

flexivity Temperature rate of flexure for a bimetal strip of given dimensions and material composition.

Flexscan Name for a special type of monitor.

flicker An undesirable pulsation of a display image on a cathode ray tube. Note-Flicker occurs when the regeneration rate is too slow with respect to the phosphor characteristics.

finching In quality control inspection, failure of an inspector to call a borderline defect a defect.

flint glass An optical glass which contains lead or other elements which raise its refractive index to 1.6 to 1.9 higher than other types of optical glass.

flip-flop 1. A bistable device, i.e. a device capable of assuming two stable states. 2. A control device for opening or closing gates, i.e., a toggle.

flip-flop storage A bistable storage device which stores binary data as states of flip-flop elements.

flip-flop string An important computer property is that the state of one flip-flop can be transferred to another by means of special triggering circuits.

flippies Floppy disks that flip over; two-sided diskettes.

flippy A double-sided diskette.

float Any natural or artificial body which is supported by and partly immersed in a liquid.

float and cable level measuring device A device which measures the level of a material (liquid or solid) directly by float position the latter being mechanically transmitted by cable and pulley or gear/cams to an indicator and/or transmitter.

floatation, flotation The raising of suspended matter in water to the surface, for example by the entrainment of a gas.

float-charging Charging a storage battery at about the same rate it is being discharged by the load.

float control A type of control apparatus in which the control signal is regulated by a float riding up and down with liquid level. Contrast with floating control.

float gauge (gage) A gauge (gage) consisting essentially of a float which rides on the liquid surface and rises or falls with it, its movement being transmitted to a recording or indicating device.

float gauging (gaging) Measurement of velocity of a stream by means of a float or velocity rod.

floating 1. A condition of a line in a logic circuit that is not grounded or tied to any established potential. **2.** Keeping a storage battery connected in parallel with an electric supply to serve as a standby in case of supply failure and to assist in handling peak loads.

floating action Type of control action in which the rate of change of the output variable is a predetermined function of the input variable (i.e., in the case of a controller, the system deviation).

floating address See symbolic address.

floating ball Pertaining to type of ball valve, a full positioned within the valve that contacts either of two seat rings and is free to move toward the seat ring opposite the pressure source when in the closed position to effect tight shutoff.

floating charge Continuous charging of a storage battery with a low current to keep the battery fully charged while idle or on light duty.

floating control action In process instrumentation, control in which the rate of change of the output variable is a predetermined function of the input variable. Note: The rate of change may have one absolute value, several absolute values or any value between two predetermined values.

floating controller A controller in which the rate of change of the output is a continuous (or at least a piecewise continuous) function of the error signal. Note: The output of the controller may remain at any value in its operating range when the actuating error signal is zero and constant. Hence, the output is said to float. When the controller has integral control action only, the mode of control has been called "proportional speed floating". The use of the term "integral control action" is recommended as a replacement for "proportional speed floating control".

floating control mode A controller mode in which an error in the controlled variable causes the output of the controller to change at a constant rate. The error must exceed preset limits before controller change starts.

floating decimal Puts no restriction on the position of the decimal point.

floating-decimal arithmetic See floating-point arithmetic.

floating gate A technique used for ultraviolet-erasable EPROMs, where a silicon gate is isolated inside the silicon dioxide.

floating ground A reference ground that is not earthed. A reference point or voltage in a circuit that is not tied to an actual external ground.

floating input An input circuit which is isolated from the frame, from the supply source and from any of the externally accessible circuit terminals.

floating output 1. An output circuit which is isolated from the frame, from the supply source and from any of the externally accessible circuit terminals. **2.** An output from a computational slot configured for a PID algorithm whose output is not always a predetermined value based upon the input values. Refers to Honeywell TDC 3000 control systems.

floating point arithmetic Arithmetic used in a computer where the computer keeps track of the decimal point (contrasted with fixed-point arithmetic).

floatingpoint calculation In a computer, a calculation taking into account the varying location of the decimal point (if base 10) or binary point (if base 2). The sign and coefficient of each number are specified separately.

floating-point routine A set of subroutines which cause a computer to execute floating-point arithmetic.

floating rate The rate of motion of the final (control) element in a proportional-speed floating-control system which corresponds to a given deviation.

floating siphon Equipment for injection of the concentrated solution at a constant rate. Pertains to measurement of liquid flow in open channels, dilution methods.

floating voltage Voltage in a network or device that has no related ground or reference plane.

floating zero (numerical control) A characteristic of a numerical control system that permits the origin of the numerical control measuring system to be placed in any position relative to the machine datum, the location of a permanent origin not necessarily being stored in the numerical control system.

float level measuring device A device which measures liquid level by detecting the position of a float. Note: The float position can be detected mechanically, magnetically, optically, ultrasonically, by radiation or other means.

float switch, liquid level switch A switch, in which actuation of the contacts is effected when a float reaches a predetermined level.

float-type viscometer A type of viscometer where the weight of a float is balanced by the drag of the fluid through a tapered tube. If the flow is precisely controlled, float displacement indicates viscosity.

float valve A valve whose stem is actuated by an arm attached to a float; an automatic valve operated, through linkage to a float mechanism, by the change in liquid level in a tank or other vessel.

floc Macroscopic particules which are formed in a liquid by flocculation, usually separable by gravity or flotation.

flocculation The formation of large separable particles by aggregation of small particles; the process is usually assisted by mechanical physical, chemical or biological means.

flocculation aid A substance, often a polyelectrolyte, which is added in conjunction with a coagulant to increase the effectiveness of flock formation.

flong Paper or board for stereotyp printing dies and moulds.

floppy disc, floppy disk A small removable platter for magnetic recording of digital information, typically programs on a system. Also called a diskette.

flotation 1. An iron-ore concentrating process. Flotation processes depend on the fact that certain reagents added to water suspensions of finely ground iron ore selectively cause either iron-oxide minerals or gangue particles to exhibit an affinity for air. The minerals having this affinity attach to air bubbles passing through the suspension and are removed from the suspension as a froth product. The reagents added to induce the preferential affinity for air are commonly called collectors or promoters. **2.** See also flotation.

flow 1. The movement of a volume of liquid. Note: This term should not be confused with "rate of flow" or "discharge".

flowability A general type describing the ability of a slurry plasticized material or semisolid to behave like a fluid.

flow amplification (fluid power systems) Ratio between the output flow and the input (control) flow.

flow amplifier (fluid power systems) Device which amplifies flow by use of a small valve which acts as a pilot for a larger one.

flow capacity See measured relieving capacity.

flow capacity (of control valves) The following IEC publications apply: 534-2-1, Part 2, Section One – Sizing equations for incompressible fluid flow under installed conditions; 534-2-2, Part 2, Section Two – Sizing equations for compressible fluid under installed conditions; 534-2-3, Part 2, Section Three – Test procedures; 534-2-4, Part 2, Section Four – Inherent flow characteristics and rangeability.

flow capacity testing (of control valves) (type testing) For the purpose of evaluating control valve capacity, testing shall follow the procedures given in IEC publication 534-2-3. These tests provide the information necessary for the determination of flow coefficients and related factors for both compressible and incompressible fluids which, in turn, permit prediction of gas, vapor or liquid flow rates under installed conditions.

flow characteristic Indefinite term. See inherent flow characteristic and installed flow characteristic.

flow characteristic (design requirements) When an inherent flow characteristic is specified, the design shall be such that it meets the requirement of IEC publication 534-2-4. Pertains to control valves.

flowchart, flow diagram A graphical representation in which symbols are used to represent such things as operations, data, flow and equipment, for the definition, analysis, or solution of a problem.

flowcharting A means of illustrating the steps required to solve a computer problem. It helps to clearly visualize each step in the solution of a problem.

flowchart symbol A symbol used to represent operations, data, flow direction, or equipment in a flowchart.

flow coefficient Coefficient given in the case of a flow of fluid considered as incompressible by the formula in ISO publication 4006-1977 or BS 5875:1980.

flow coefficient (control valves) A basic coefficient used to state the flow capacity of a control valve under specified conditions. Flow coefficients in current use are A_v , K_v , and C_v , depending upon the system of units. See IEC documents 534-2-1 Flow Capacity, 534-2-2 Flow Capacity section 2, 434-2-3 Flow Capacity part 2, 534-2-4 Flow Capacity, and IEC publication 534-1.

flow coefficient A_v (control valves) See IEC publication 534-1.

flow coefficient C_v (control valves) 1. The flow coefficient C_v is a non-SI control valve flow coefficient which is in widespread use worldwide. Numerically,

C_v can be represented as the number of U.S. gallons of water, within a temperature range of 40°F to 100°F, that will flow through a valve in 1 min when a pressure drop of 1 psi exists. **2.** A constant (C_v), related to the geometry of a valve, for a given valve opening, that can be used to predict flow rate. See ANSI/ISA publication S75-01 Flow Equations for Sizing Control Valves and ANSI/ISA S75.02 Control Valve Capacity Test Procedure.

flow coefficient K_v (control valves) The flow coefficient in cubic metres per hour is a special volumetric flow rate (capacity) through a valve at a specified travel and condition as outlined in IEC publication 534-1.

flow-combining valve Pressure-compensated valve which combines two input flow rates maintaining a preselected output.

flow compensation Using secondary signals to correct flow values for changes in density or viscosity.

flow control 1. In data communication, control of the data transfer rate. **2.** Any method for controlling the flow of a material through piping, ductwork or channels.

flow control orifice (control valves) The part of the flow passageway that, with the closure member, modifies the ratio of flow through the valve. The orifice may be provided with a seating surface, to be contacted by or closely fitted to the closure member, to provide tight shutoff or limited leakage.

flow control valves Valves the main function of which is to control the flow rate.

flow corrector A device that changes a signal representing volumetric flow at operating conditions to a volumetric flow at nominated standard conditions.

flow diagram A pictorial representation describing an industrial process.

flow direction An indication of the antecedent-to-successor relationship between the symbols in a flowchart.

flow divider valve (fluid power systems) Pressure-compensated valve which divides input flow rate into two separate output flow rates of selected ratio.

flow elbow A flow sensor producing a differential pressure by means of a curved part in a closed conduit changing the direction of the fluid flow through it which causes a centrifugal force.

flow factor Characterizes the conductance of a pneumatic or hydraulic device, flowline or connection.

flow gain (servo-valves) Mean slope of the control flow versus input signal curve in any specific operating region. Three operating regions are usually significant with flow control servo-valves: the null region; the normal region of flow control; the region where flow saturation effects may occur. Where this term is used without qualification, it is assumed to mean normal flow gain.

flow indicator Device employing a ball, vane or other means inside a transparent cover. Motion of the ball or vane indicates that fluid is flowing through the pipeline.

flow limit (fluid power systems) Conditions where control flow no longer increases with increasing input signal.

flow line A line representing a connecting path between the symbols in a flowchart to indicate a transfer of data or control.

flow linearity (fluid power systems) Deviation which exists between the normal flow curve and an idealized flow curve of slope equal to normal flow gain. Linearity is defined as the maximum deviation and expressed as a percentage of rated signal.

flowlines (fluid power systems) Pipelines (conductors) for transferring the working fluid.

flow marker technique See tagging technique.

flow measurement Flow measurements play a significant and vital role in today's industrial world. Existing flow measuring instruments operate on a great variety of basic principles. Of the many types of flow meters in use to day, the most widely encountered by far is the differential type meter. All differential pressure meters operate on the same fundamental principle. A restriction is installed in the flow line to create a pressure drop. The flow rate is directly proportional to the square root of the differential. The restriction in the flow line may be an orifice plate, a venturi tube or a flow nozzle depending on application. Other groups of flowmeters are turbine meters and electromagnetic flowmeters.

flow measurement calibration device A device which enables the establishment of the flow rate through the flowmeter to be calibrated by measuring, under specified conditions, the volume or mass of fluid passing through the flowmeter during a measured time interval.

flow measuring device A device which measures mass or volume per time unit of a fluid passing through an open or closed conduit (flow rate). Note: Historically, the word "flowmeter" has acquired a very wide meaning. For the sake of consistency of terminology, it is recommended to use "flowmeter" only where the two functions of flow measurement and flow indication are performed. The term "flow transmitter" should only be used where a standardized signal is transmitted. Where the output signal is not standardized, the term "flow transducer" should be used.

flowmeter A flow measuring device which also indicates the measured flow rate and/or total amount over a selected time interval. See also flow measuring device.

flowmeter primary device The device mounted internally or externally to the fluid conduit which produces a signal with a defined relationship to the fluid flow in accordance with known physical laws relating the interaction of the fluid to the presence of the primary device. See also flow measuring device.

flowmeter secondary device The device that responds to the signal from the primary device and converts it to a display or to an output signal that can be translated relative to flow rate or quantity. Note: The secondary device may consist of one or more elements as needed to translate the primary device signal into standardized or nonstandardized display or transmitted units.

flow nozzle A flow sensor producing a differential pressure, by means of a plate with a specified hole, it being installed in the fluid flowing through a closed conduit. The flow nozzle will handle about 60 percent more flow than an orifice plate under the same given conditions, and its permanent pressure loss will vary from 30 to 80 percent of the differential pressure, depending on the diameter ratio.

flow of control (software) The sequence of operations performed in the execution of an algorithm.

flow rate 1. Actual velocity of the fluid medium. **2.** The quantity of fluid which moves through a pipe or channel within a given period of time.

flow rate recovery (fluid power systems) Ratio of no-load flow at the output port to the supply flow.

flow recorder Instrument which provides a permanent record of fluid flow usually on paper, film or tape.

flow relay A relay that responds to a rate of fluid flow.

flow signal (electromagnetic flowmeters) That part of the electrode signal which is proportional to flow-rate, magnetic field strength and depends upon geometry of meter tube and of electrodes.

flow soldering, wave soldering A method of soldering printed circuit boards by moving them over a flowing wave of molten solder in a solder bath.

flow straightener General term used to describe various devices which have the following functions: swirl remover, profile regulator. See these terms.

flow switch 1. A switch which operates on given values, or on a given rate of change, of flow. **2.** Device incorporating an electrical switch in which actuation of the contacts is effected at a predetermined instantaneous flow rate.

flow temperature See pour point.

flow-through toxicity test, dynamic toxicity test (water quality) A toxicity test with constant flow or continuous flow of test solution.

flow trace A debugging device which prints out contents of various registers and memory location in a particular program segment specified by the user.

flow transmitter See flow measuring device.

flucculant, flocculation agent A substance which causes or facilitates the formation of loose aggregates of light particles with a weak mutual adhesion. Pertains to pulp and paper manufacture.

flucculation 1. An aggregation in flocs of fibers etc. **2.** The distribution of fibers etc. in an aggregation of flocs.

fluctuations Unwanted non-periodic of relatively long duration of the measured or supplied value around an average value, which occur more or less randomly. Fluctuations are determined under specified conditions.

flue A conduct or duct for conveying combustion products from a furnace chamber or firebox to the point of discharge to the atmosphere.

flue dust The particles of gas-borne solid matter carried in the products of combustion.

flue-gas analyzer An instrument that monitors the composition of flue gas as it passes out of a boiler or heating unit; the readout is used to guide adjustment of combustion controls to achieve maximum combustion efficiency or heat output. The gaseous products of combustion in the flue gas to the stack.

fluff A product consisting of unbonded pulp fibers and fiber flocs. Fluff is produced by dry shredding of pulp in either web or sheet form.

fluffing 1. See dry shredding. **2.** See linting.

fluid A gas or liquid, both of which have the property of undergoing continuous deformation when subjected to any finite shear stress as long as the shear stress is maintained.

fluid capacitance Ratio of mass flow to rate of change of pressure drop.

fluid catalytic cracking unit A large refinery vessel for processing reduced crude, naphthas, or other intermediates in the presence of a catalyst. Catalytic cracking is regarded as the successor to thermal cracking as it produces less gas and highly volatile material.

fluid conductance Ratio between steady-state mass flow and pressure drop (reciprocal value of fluid resistance).

fluid-dynamic-type flowmeter Two basic physical phenomena are employed in the fluid-dynamic-type flowmeter. They are vortex formation and the Coanda effect. Both phenomena produce a digital or pulse output arising from the natural physics and dynamics of the fluid.

fluidic amplifier Amplifier which is designed for use in fluidic systems.

fluidic deflection flowmeter A unique flow measuring device using the basic principles of deflection (see deflection technique).

fluidic motor type actuator A fluid powered device which uses a rotary motor to position the actuator stem.

fluidics Pertains to the use of fluids (and air) in instrumentation. Fluidics is defined as "engineering science pertaining to the use of fluid-dynamic phenomena to sense, control, process information, and actuate".

fluidic thermometer The fluidic thermometer utilizes the temperature dependence of the velocity of sound in gas to produce sonic vibrations (in a whistle) whose frequency indicates its temperature; a materials dependent property.

fluid impedance Complex ratio between pressure drop and transient mass flow.

fluid inductance Ratio pressure drop to rate of change of mass flow.

fluidity Reciprocal of absolute viscosity; unit in cgs system is the rhe.

fluidized bed furnace, fluidized bed roaster A pyrites furnace in which finely crushed iron pyrites is roasted on a bed of pyrites cinder which is kept stirred (fluidized) by the combustion air pressed through the bed from below.

fluid logic Branch of fluid power associated with digital signal sensing and information processing, using components with or without moving parts.

fluid meter See flowmeter.

fluid power Means whereby energy is transmitted, controlled and distributed using a pressurized fluid as the medium.

fluid power system Arrangement of interconnected components which transmits and controls power by the use of pressurized fluid within an enclosed circuit.

fluid resistance Ratio between pressure drop and steady-state mass flow.

flume An artificial channel with clearly specified shape and dimensions which may be used for measurement of flow. Generally speaking, the flume is an adaptation of the venturi concept of flow constriction applied to open-channel flow measurement. Three types of flumes most commonly used are the Parshall flume, the Palmer-Bowlus flume and the parabolic discharge flume.

fluorescence The emission of light in the visible spectrum resulting from absorption from another source, such as ultraviolet.

fluorescence spectroscopy The study of materials by light which they emit when irradiated by other light. Many materials emit visible light after they have been illuminated by ultraviolet light. The intensity and wavelengths of the emitted light can be used to identify the material and its concentration.

fluorescent whitening Addition to pulp, stock, surface sizing both or coating layer of a fluorescent whitening agent. Fluorescent whitening increases the brightness of paper or board.

fluoridation The addition of a compound containing fluorine to a drinking water supply to maintain the fluoride ion concentration within agreed limits.

fluorinated rubber (VITON) seal Fluorinated rubber having outstanding chemical and fluid resistance. Resistance to high temperature is excellent. Low temperature characteristics are poor.

fluorometer An instrument for measuring fluorescence.

fluoroscopy X-ray examination similar to radiography, but in which the image is produced on a fluorescent screen instead of on radiographic film.

fluorotrichloromethane A fluorochlorinated industrial solvent. Often used for solvent washing, a cleaning procedure for cleaning industrial-process measurement and control equipment to be used for oxygen service. See IEC publication 877 (1986) for further details.

flush dumping Emptying into a pulp dumping pit from the bottom exit of a digester of the cooked pulp together with residual spent liquor, dilution water and rinsing water. In contrast to blowing, flush dumping is carried out without the help of an applied gas pressure.

flushing connection A connection on the instrument, manifold or piping to permit periodic back-flow of an external fluid for clearing purposes.

flush-type instrument An instrument designed to be mounted with its face projecting only slightly from the front of the panel.

fluted-rotor flowmeter A type of flow-measurement device in which fluid is trapped between two fluted rotors which are dynamically balanced but hydraulically unbalanced so that they turn at a rate proportional to the volume rate of fluid flow.

flutter In recording and reproducing, deviation of frequency which results from irregular motion during recording, duplication or reproduction.

flutter bridge An instrument for measuring the irregularities in a constant-speed device such as a film, disc, or tape recorder.

flutter echo A rapid succession of reflected pulses resulting from a single initial pulse.

flux changes per inch The number of polarity reversals possible in 1 inch (2.54 mm) of magnetic tape.

flux density 1. A measure of the strength of a wave; flux per unit area normal to the direction of the flux; number of photons passing through a surface per unit time per unit area. Expressed in watts/cm² or lumens/ft². **2.** The number of lines or maxwells per unit area in a section normal to the direction of the flux.

fluxing To soften a substance with heat so that it will flow; to lower a substance's fusing point.

flux meter An instrument intended to measure magnetic flux.

fly A fan with two or more blades that is used in time-pieces or light machinery to control rotational speed by means of air resistance.

flyback Also called retrace. As applied to a cathode-ray tube, the return of the spot to its starting point after having reached the end of its trace. This portion of the wave is usually not seen because of blanking circuits or the shortage of time.

flyback power supply The high voltage circuit in cathode-ray terminals.

flyback tester An instrument that tests flyback transformers and sometimes also deflection yokes.

flyback time The period during which the electron beam is returning from the end of a scanning line to begin the next line.

flyback transformer Also called horizontal-output transformer. A transformer used in the horizontal-deflection circuit of a television receiver to provide the horizontal-scanning and accelerating-anode voltages for the cathode-ray tube. It also supplies the filament voltage for the high-voltage rectifier.

flying head, floating head, air-floating head A magnetic head floating on a layer of air away from the recording surface.

Flying Switch This type of switch changes the product which is delivered to a pipeline without stopping flow in the pipeline. It is accomplished by starting the flow of the second product before the first product flow is stopped. For example, a task can be defined from four boundary points to a tank (as would be common for a rundown). All product movements in the tank farm are represented by a task.

flywheel effect The effect of a resonant circuit in which an input electrical pulse of less than one cycle produces a complete output cycle.

flywheel ring (rotating machinery) A heavy ring mounted on the spider for the purpose of increasing the rotor moment of inertia.

FM Factory Mutual Research Corp. (USA). Formerly Factory Mutual Engineering. Approval certification body for products (systems) intended for installation in hazardous locations. Example: intrinsically safe applications.

FM See frequency modulation.

Fm Chemical symbol for fermium.

FM discriminator A device that converts frequency variations to proportional variations in voltage or current.

FMEA Fault modes and effects analysis.

FMECA Fault modes and criticality analysis.

FM recording See frequency modulation recording.

FMS Flexible Manufacturing Systems.

foam, aeration More or less stable extended air-liquid interface arising when bubbles persist at the surface of a fluid.

foam finishing technique, FFT The process developed by Union Carbide and Gaston County Dyeing Machine Co. for dispersion of a gas in the liquid chemical finish.

F₀ calculation A F₀ calculation is a time/temperature calculation which determines the amount of heat exposure needed to kill the most stubborn microorganisms. Typically it describes the duration of time an object must be held at a fixed temperature in order to render it sterile. F₀ calculations are used to control autoclaves engaged in manufacturing sterile medical products.

fog quenching (heat treatment) Quenching in a sprinkle of minute particles of water; see spray quenching. The water particles can combine with the air or other gases to form aerosol.

foil Very thin metal sheet, usually less than 0.006 in. (0.15 mm) thick.

foil strain gage A type of metallic strain gage usually made in the form of a back- and forth grid by photoetching a precise pattern on foil made of special alloy having high resistivity and low temperature coefficient of resistivity.

foldback current limiting **1.** An overload protection method whereby the output current of a power supply is decreased as the load approaches short circuit. **2.** A protective circuit in a power supply that monitors the output current drain, and automatically reduces the output voltage to very low levels when the drain current exceeds a preset level.

follower bridge See movement measurement.

follower drive, slave drive (industrial control) A drive in which the reference input and operation are direct functions of another drive, called the master drive.

follower operation Control operation with the load fixed and set-point variable; the follower acts to make the variable follow the set-point.

following error in servo system (uncompensated) In numerical control contouring system, while

the machine is mowing under servo control, the instantaneous machine position lags the instantaneous command position. This lag can be calculated and is expressed in thousandths per inch per minute.

follow-up control Closed loop (feedback) control by which the controlled variable is made to vary according to the changes of the reference variable.

food industry valves These valves are built in angle, offset, Y and three-way body patterns having internally polished, smooth, and full draining features. The body materials are thin wall stainless steel and other non-corroding alloys. The trim parts are all polished.

footcandle The unit or measure of illumination when the foot is taken as the unit of length one footcandle is one lumen per square foot.

foot valve A type of check valve used on the foot or lower end of a suction-pipe riser to maintain the column of liquid in the riser when the liquid is being drawn upward by a pump.

force and weight measurement Strain gages are a large class of devices which convert forces like weight, gas pressure, liquid flow, torsion etc. into voltage. The output is generally stated as a millivolt per volt figure which does not change for a given strain gage bridge design. Instrument measuring circuits can be designed to accept this signal. Force can also be measured using pressure – sensitive semiconductor devices including special types of diodes and transistors. For measurement of force in SI units see under newton.

force balans transmitter A transmitter design technique utilizing feedback of the output signal to balance the primary input signal from the measuring element. The balanced output signal is proportional to the measured variable.

forced circulation Using a pump or fan to move fluid through a conduit or process vessel – for instance, air or gases through a furnace or combustion chamber (often referred to as forced draft), ambient or conditioned air through ductwork (often referred to as forced ventilation), or a mixture of water and steam through tubes in a boiler.

forced-draft burner Crude-oil disposal equipment on offshore platforms. The burner, burns crude oil during testing operations. Gas, air, and water manifolded with the test crude stream result in complete combustion of the oil. A platform burner.

forced oscillation An oscillation produced by an external excitation.

force feedback Sensing technique using electrical or hydraulic signals to control a robot end effector.

Ford cup viscometer A time-to-discharge apparatus used primarily for determining the viscosity of paints and varnishes.

forecast An estimate of the future demand. A forecast can be determined by mathematical means using historical data and it can be created from informal techniques or both. A forecast is an extrapolation of the past into the future. It is an objective computation involving data as opposed to a predication of changes and new factors influencing demand.

forecasting Various types of plans and determinations concerning potential future situations.

foreground/background technique Automatic execution of programs on a priority basis, allowing the lower priority programs to execute when higher priority programs are not utilizing the system.

foreground image, dynamic image (computer graphics) That part of a display image that can be changed for every transaction.

foreground program A time-dependent program initiated via request, whose urgency preempts operation of a background program. Contrast with background program.

foreground routine Same as foreground program.

forging 1. Using compressive force to plastically deform and shape metal; it is usually done hot, in dies or between rolls. **2.** A shaped part made by impact, compression or rolling; if by rolling, the part is usually referred to as a roll forging.

forging stock A piece of semifinished metal used to make a forging. Also known as forging billet.

formal language A language whose rules are explicitly established prior to its use. Synonymous with artificial language. Examples include programming languages, such as FORTRAN and Ada, and mathematical or logical languages, such as predicate calculus. Contrast with natural language.

formal logic The study of the structure and forms of valid argument without regard to the meaning of the terms in the argument.

formal parameter (software) A variable used in a subprogram to represent data or program elements to be transmitted to the subprogram by a calling routine. Synonymous with dummy parameter. Contrast with actual parameter.

format (software) The arrangement of the elements comprising any field, record, file, or volume.

format (telemetry) The basis parameters of a telemetry/data acquisition sample plan; for example: number of words-per-frame, frames-per-subframe in the same plan.

format classification (numerical control) A means, usually in an abbreviated notation, by which the motions, dimensional data, type of control system, number of digits, auxiliary functions, etc., for a particular system can be denoted.

format detail (numerical control) Describes specifically which words and of what length are used by a specific system in the format classification.

format effector, layout characters (GB) A control character used to position printed, displayed, or recorded data. Note format effectors are described in ISO 646 and ISO 6429.

formatter A hardware or software process of arranging data on tape or disk, or in a buffer.

formatting 1. The arranging in a predefined order of code character within a record. **2.** The division of tracks into sections to make it easier to retrieve and update data. In each sector, the block of data is preceded by an identifying header.

Formica Trade name for a phenolic compound having good insulating qualities.

forming Applying pressure to shape a material by plastic deformation without intentionally altering its thickness.

forming (of a web or sheet) The process whereby the stock through dewatering is transformed to a coherent web or a coherent sheet.

formulation The product of a formula, i.e. a plastic, blended oils, gasolines; any material with two or more components or ingredients.

formula translation See FORTRAN.

FORTH A computer programming language.

FORTRAN (FORmula TRANslating system) A procedure-oriented language for solution of arithmetic and logical programs. The most popular higher-level language for scientific purposes. There are several forms FORTRAN II, FORTRAN IV, etc.

FORTRAN compiler A processor program for FORTRAN.

fortuitous conductor Any conductor which may provide an unintended path for intelligible signals; for example, water pipe, wire or cable, metal structural members, and so forth.

forward-acting code An error-control code that contains redundancy added in such a way that one or more characters received in error can be reconstructed at the receiving end without additional information from the source.

forward breakever (thyristor) The failure of the forward breaking action of the thyristor during a normal OFF-state period.

forward chaining A type of system activity that applies operators to a current state in order to produce a new state until the solution is reached. In an expert system, a forward-chaining rule detects certain facts in the database and takes action because of them.

forward channel A channel in which the direction of transmission is the direction in which user information is being transferred.

forward controlling elements 1. The elements of the controlling system in the forward path. **2.** Those elements in the controlling system which act to change a variable in response to the actuating error signal.

forward path 1. Functional chain linking the output of a comparing element to the output of the controlled system. **2.** Path connecting the output of a comparing element to the output of the controlled system.

four-address Pertaining to an instruction code in which each instruction has four address parts. In a typical four-address instruction the addresses specify the result, and the location of the next instruction to be interpreted.

Fourier analysis The determination of the harmonic components of a complex waveform either mathematically or by a wave analyzer device.

Fourier optics Optical components used in making Fourier transforms and other types of optical processing operations.

Fourier series A mathematical analysis that permits any complex waveform to be resolved into a fundamental, plus a finite number of terms involving its harmonics.

Fourier transform A mathematical relation between the energy in a transient and that in a continuous energy spectrum of adjacent component frequencies. See also IEC publication 902, 1987.

four-layer transistor A junction transistor that has four conductivity regions, but only three terminals. A thyristor is an example.

four-loop standby A device that provides four hard manual outputs during the instances in which it is desired to bypass the Basic Controller or Analog Unit output circuitry. Refers to Honeywell TDC 3000 control systems.

four-plus-one address An instruction containing four operand addresses and one control address.

four-quadrant multiplier In analog computers, a multiplier in which operation is not restricted with regards to the signs of the input variables.

four-way valve Multi-orifice variable flow control valve with supply, return and two control ports arranged so that the valve action in one direction throttles supply to control port A (2) and throttles control port B (4) to return. Reversed valve action throttles supply to control port B, and throttles control port A to return.

four-wire modem A modem, using two pairs of wires, capable of simultaneous data transmission in both directions (i.e., full duplex modem).

FPLA Field Programmable Logic Array. A PLA which can be programmed by the user.

F-PROM Field Programmable PROM.

fraction A separate, identifiable part of crude oil; the product of a refining or distillation process.

fractional arithmetic units Arithmetic units in a computer that is operated with the decimal point at the extreme left so that all numbers have a value less than 1.

fractionation The separating of hydrocarbons into fractional components in a fractionating tower by the action of heating to drive off the light ends, the light gases, then progressively heavier fractions, and condensing those fractions or cuts by cooling.

fractionation tower, fractionator A tall cylindrical refining vessel where liquid feedstocks are separated into various components or fractions.

frame In time-division multiplexing, one complete commutator revolution that includes a single synchronizing signal or code.

frame A knowledge representation technique based on the idea of a frame or reference. A frame carries with it a set of slots which can represent objects that are normally associated with the frame's subject, allowing frame-based systems to support inferences.

frame (textile term) To stretch a fabric to a predetermined width on a tenter.

frame frequency 1. The frame frequency is the number of times per second that a frame of pulses is transmitted or received. **2.** In a computer the number of frames per unit time.

frame-grounding circuit A conductor which is electrically bonded to the machine frame and/or to any conduction parts which are normally exposed to operating personnel. This circuit may further be connected to external grounds as may be required by applicable code.

frame synchronizer, FSY Telemetry hardware that recognizes the unique signal that indicates the beginning of a frame of data.

framework system A type of artificial intelligence systems – building tool designed to reduce the amount of time required to develop an expert system. A knowledge engineer customizes a framework system for a specific application by building a knowledge base for the problem domain of interest.

framing The process of selecting the bit groupings representing one or more characters from a continuous stream of bits.

free carbon dioxide Carbon dioxide dissolved in water.

free chlorine Chlorine present in the form of hypochlorous acid, hypochlorite ions or dissolved elemental chlorine.

freedom from bias error The ability of a measuring instrument to give indications free from bias error.

free flow A condition in which the liquid surface downstream of the weir plate is far enough below the crest so that air has free access beneath the nappe. Pertains to liquid flow measurement in open channels.

free jet Jet not influenced by its surroundings.

free machining steel Steel to which elements such as sulfur, selenium, and lead have been intentionally added to improve machinability.

free mode access Ability to change control mode regardless of the keylock position at the BASIC Operation Station or Data Entry Panel. Refers to Honeywell TDC 3000 control systems.

freeness value A measure of the drainability. The freeness value, CSF-number (Canadian Standard

Freeness) is determined according to standardized test procedures.

free net A net in which any station may communicate with any other station in the same net without first obtaining permission from the control station.

free oscillation 1. An oscillation, a frequency of which is dependent only on the internal characteristics of the oscillating system. **2.** The oscillating current and voltages which continue to flow in a circuit after the voltage (impressed) has been removed. **3.** A damped oscillation produced solely by energy previously stored in a system.

free running frequency The frequency at which a normally synchronized oscillator operates in the absence of a synchronizing signal.

free-running time base (oscilloscopes) A time base running periodically even in the absence of a signal.

free space Empty space, or space with no free electrons or ions. It has approximately the electrical constant of air.

free time The period of non-required time during which an item is in a condition to perform the required function.

FREETIME IV (trademark) A software package for Honeywell 4500 and 45000 process computers that permits on-line compilation and assembly, on-line program testing, and library maintenance and provides mass storage operations all during computer time that isn't being otherwise used.

free water Water entrained in a fluid power system forming two distinct phases with the fluid and having a tendency to separate as a result of their densities.

freeze To hold the contents of a register (time for example) until they have been transferred to another device.

freeze-seal packing box (control valves) A special stem seal employed with valves for molten metal. A fine annular clearance passage is placed between the stem and bonnet (inside diameter), ahead of the packing, and long enough to allow sufficient heat absorption to freeze liquid sodium. Solid sodium, of course cannot leak through the packing box.

freezing point The temperature at which equilibrium is attained between liquid and solid phases of a pure substance; the term also is applied to compounds and alloys that undergo isothermal liquid-solid phase transformation.

french coupling A coupling with a right and left hand thread.

freon A trademark applied to a group of halogenated hydrocarbons having one or more fluorine atoms in the molecule; a refrigerant.

frequency response method A method of tuning a process control loop for optimum operation by proper selection of controller settings. This method is based on a study of the frequency response of the open process control loop.

frequency (f) The number of times an electromagnetic signal repeats an identical cycle in a unit of time, usually one second. One hertz (Hz) is one cycle per second. A KHz (kilohertz) is one thousand cycles per second; a MHz (megahertz) is one million cycles per second; a GHz (gigahertz) is one billion cycles per second. See also under hertz.

frequency band A continuous range of frequencies extending between two limits.

frequency bias A constant frequency purposely added to the frequency of a signal.

frequency changer See frequency converter.

frequency compensation 1. The technique of modifying an electronic circuit or device for the purpose of improving or broadening the linearity of its response with respect to frequency. **2.** The compensation required in feedback amplifiers to ensure stability and prevent unwanted oscillations.

frequency converter Also called frequency changer. A circuit, device, or machine that changes an alternating current from one frequency to another, with or without a change in voltage or number of phases.

frequency-deviation meter An instrument that indicates the number of hertz a transmitter has drifted from its assigned carrier frequency.

frequency discrimination The operation of selecting a desired frequency (or frequencies) from a spectrum of frequencies.

frequency distortion The peak difference between the instantaneous frequency of a modulated wave and the frequency of the unmodulated carrier wave.

frequency division multiplex (FDM) 1. A multiplex system in which the available transmission frequency exchange range is divided into narrower bands, each band used for a separate channel. **2.** In the signaling process each signal channel modulates a separate subcarrier which has a frequency spaced to avoid overlapping of the subcarrier sidebands. The selection and demodulation of each signal channel is accomplished on the basis of its frequency.

frequency drift Change in frequency of oscillation because of internal (aging, change of characteristic or emission) or external (variation in supply voltages, or ambient temperature) causes.

frequency droop The absolute change in frequency between steady-state no load and steady-state full load.

frequency influence In a measuring instrument other than a frequency meter, the change, expressed as a percentage of the full-scale value, in the indicated value as a result of a departure of the measured quantity from a specified reference frequency.

frequency modulated output (electrical transducers) An output in the form of frequency deviations from a center frequency, where the deviation is a function of the applied measurand.

frequency modulation, FM The process by which the frequency of a carrier wave is varied following a specified law. Note: The result of that process is a frequency modulated signal.

frequency modulation recording, FM recording Non-return-to-zero recording in which there is a change in the condition of magnetization at each cell boundary, and a further change in the center of the cell to represent a one.

frequency multiplex A technique for the transmission of two or more signals over a common path. Each signal is characterized by a distinctive reference frequency or band of frequencies.

frequency multiplier A device for delivering an output wave whose frequency is a multiple of the input frequency (e.g. frequency doublers and triplers).

frequency output (electrical transducers) An output in the form of frequency which varies as a function of the applied measurand (e.g., angular speed and flow rate).

frequency range (general) A specifically designated part of the frequency spectrum.

frequency regulator A regulator that maintains the frequency of the frequency-generating equipment at a predetermined value or varies it according to a predetermined plan.

frequency response For a linear system, the ratio of the Fourier transform of the output signal to the Fourier transform of the corresponding input signal. Notes: **1.** The frequency response coincides with the transfer function taken on the imaginary axis of the complex plane. **2.** The frequency response is the frequency-dependent relation, in both amplitude and phase between steady-state sinusoidal inputs and the resulting fundamental sinusoidal outputs.

frequency response (fluid power systems) Complex ratio of control flow to input signal as the current is varied sinusoidally over a range of frequencies. Frequency response is normally measured with constant input signal amplitude and zero load pressure drop, expressed as amplitude ratio and phase log. Valve frequency response may vary with the input signal amplitude, temperature, supply pressure and other operating conditions.

frequency response (optical communication) See transfer function (optical communication).

frequency response (electrical transducer) The change with frequency of the output/measurand amplitude ratio (and of the phase difference between output and measurand) for a sinusoidally varying measurand applied to a transducer within a stated range of measurand frequencies.

frequency response analyzer An instrument that analyzes the output amplitude of a signal waveform passing through a circuit over a specified band of frequencies.

frequency response characteristics, Bode diagram Graphical representation of logarithmic gain and phase angle as functions of the frequency, which is usually represented on a logarithmic scale. See fig. in IEC publication 902, 1987. See also ANSI/ISA publication S 51.1.

frequency response method A method of tuning a process control loop for optimum operation by proper selection of controller settings. This method is based on a study of the frequency response of the open process control loop.

frequency run A series of tests for determining the frequency-response characteristics of a transmission line, circuit or device.

frequency shift keying, FSK Most common form of frequency modulation in which two possible states (one and zero) are transmitted as two separate frequencies.

frequency spectrum The entire range of frequencies of electromagnetic radiations.

frequency standard A stable low-frequency oscillator used for calibration.

frequency swing In communication, the frequency above and below the carrier frequency.

frequency telemetering A system for transmitting measurements where the information values are represented by frequencies within a specified band, the specific frequency being determined by the percent of full scale equivalent to the current value of the measured variable.

Fresnel reflection method (optical communication) The method for measuring the index profile of an optical fiber by measuring the reflectance as a function of position on the end face.

fretting (corrosion) Deterioration resulting from repetitive slip at the interface between two surfaces. Note: When deterioration is further increased by corrosion, the term fretting-corrosion is used.

friction 1. See friction error. **2.** See drag.

friction coefficient A coefficient used to calculate the energy gradient caused by friction.

friction error (electrical transducer) The maximum change in output at any measurand value within the specified range, before and after minimizing friction with the transducer by dithering.

friction free error band (electrical transducer) The error band applicable at room conditions and with frictions within the transducer minimized by dithering.

friction oxidation See fretting.

friction tube viscometer A device for measuring viscosity by determining the pressure drop across a friction tube as the fluid is pumped through it.

frigorimeter A thermometer for measuring low temperatures.

frit seal A hermetical seal for enclosing integrated circuits and other electronic components.

fritting A type of contact erosion in which an electrical discharge makes a hole through the contact film and produces molten matter that is drawn through the hole by electrostatic forces and then solidifies and forms a conducting bridge.

FROM Fusible Read Only Memory PROM that is made up of a matrix of fusible links which are selectively blown to program it.

front-end computer (data communication) A communications computer associated with a host computer. It may perform line control, message handling, code conversion, error control and applications functions such as control and operation of special purpose terminals.

frost plug A device for determining liquid level when the contents of a tank are at a temperature below 0°C; a side tube resembling a sight glass but having a series of closed tubes (plugs) at different levels instead of the glass; the tubes below liquid level are cooled so that moisture from the atmosphere forms frost on them, while the tubes above liquid level remain frost free.

frost point Temperature at which gas is saturated with respect to ice.

frothing Production of a layer of relatively stable bubbles at an air-liquid interface; it can be accomplished by any of several methods, including aeration, agitation or chemical reaction; in many instances it is an undesired side effect of an operation, but sometimes it is an essential element of the operation, as in froth flotation to separate a mineral from its core.

Froude number A dimensionless parameter expressing the ratio between the inertia and the gravitational forces in a liquid. See formula in ISO publication 772, 1978.

FSK See frequency shift keying.

FTA Fault tree analysis.

FTAM File Transfer Access and Management Protocol (ISO DP 8571). FTAM is one of the application protocols specified by MAP and TOP.

FTAM File Transfer Access and Management Protocol (ISO DP 8571). FTAM is one of the application protocols specified by MAP and TOP. (Draft Proposal).

fuel-air ratio The ratio of the weight, or volume, or fuel to air.

fuel cell An electrochemical cell which produces electrical energy from the chemical energy of a fuel and an oxidant.

fuel oil Any oily hydrocarbon liquid having a flash point of at least 38°C (100°F) which can be burned to generate heat.

fuel oil atomizer A nozzle or spraying device used to break up fuel oil into a fine spray so that the oil may be brought into more intimate contact with the air in the combustion chamber.

fulchronograph An instrument for recording lightning strikes electromagnetically.

fulgurator An atomizer used in flame analysis to spray the salt solution to be analyzed into the flame.

full annealing, soft annealing Heat treatment to render a material soft, to improve the machinability or the cold-working properties and to impart the desired structure.

full ball (valve) See full port ball valve.

full bore safety valve A full bore safety valve is a safety valve which has no protrusions in the bore and wherein the valve disk lifts to an extent sufficient for the minimum area at any section at or below the body seat to become the controlling orifice. See bore area.

full duplex, FD, FDX Simultaneous communication between two points in both directions.

Fuller's earth A highly absorbent, claylike material formerly used to remove grease from woolen cloth, but now used principally as a filter medium.

full face gasket A flat gasket which contacts the entire flat contact surface of two mating flanges, extending past the bolt holes. This term applies to flat face flanges only.

full flow filter Filter which provides no alternative flow path around the filter element.

full-flow filter with bypass Full-flow filter which provides an alternative flow path around the filter element when a preset differential pressure is reached.

full/full duplex A protocol for a multidrop line that permits transmission from a master location to a slave site; the master location can also simultaneously receive a transmission from another slave site on that line.

full hard temper A level of hardness and strength for nonferrous alloys and some ferrous alloys corresponding to a cold worked state beyond which the material can no longer be formed by bending.

full impuls voltage An aperiodic transient voltage that rises rapidly to a maximum value and falls, usually less rapidly to zero.

full lift safety valve A full lift safety valve is a safety valve in which the disk lifts automatically such that the actual discharge area is not determined by the position of the disk. See actual discharge area.

full load speed (electric drive) The speed that the output shaft of the drive attains with rated load connected and with the drive adjusted to deliver rated output at rated speed.

full port ball valve A ball valve design (normally in full ball valve construction) where the diameter of the ball waterway is identical to the bore of the pipe. This type is seldom used as a modulating device. See under waterway for definition of this term.

full radiator, black body A thermal radiator which absorbs completely all incident radiation whatever the wavelength, direction of incidence or polarization.

full scale The total interval over which an instrument is intended to be operated. Also, the output from a transducer when the maximum rated stimulus is applied to the input.

full scale flow rate The flow rate corresponding to the maximum output signal.

full scale output The algebraic difference in electrical output between the maximum and minimum values of measurand over which an instrument is calibrated.

full scale value 1. The largest value of a measured quantity that can be indicated on an instrument scale. **2.** For an instrument whose zero is between the ends of the scale, the sum of the absolute values of the me-

asured quantity corresponding to the two ends of the scale.

full subtractor Capable of forming a representation of the difference between two numbers represented by signals applied to its input.

full system differential pressure element Filter element which will withstand a pressure differential at least equal to the maximum system operating pressure without structural or filter medium failure.

full voltage starter A starter that connects the motor to the power supply without reducing the voltage applied to the motor.

full-width weir, suppressed weir A weir whose sides are in the same plane as the open channel, thus eliminating (suppressing) side contractions of the stream. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978.

fully aerated nappe A nappe springing clear of the downstream face of the weir and forming a pocket in which atmospheric pressure is maintained. Pertains to liquid flow measurement in open channels.

fully bleached pulp Pulp which has been bleached to a high brightness.

fully connected network A network in which there is a branch between any two nodes. See ISO 2382-18 for network configurations.

fully developed contraction of a nappe The contraction that occurs when further increase in the depth or width of the approach channel no longer affects the nappe. Pertains to measurement of liquid flow in open channels.

fully-developed velocity distribution A velocity distribution that does not change between two cross-sections of a flow. It is generally obtained at the end of a sufficient straight length of a conduit.

fully ventilated nappe, fully aerated nappe See under fully aerated nappe.

fulvic acids That part of humic substances which is soluble in both acid and alkaline solution.

Fumaric process (coke-oven plants) See under wet oxidation processes.

fume-resistant So constructed that it will not be injured readily by exposure to the specified fume.

function 1. A specific purpose of an entity or its characteristic action. **2.** In communications, a machine action such as a carriage return on line feed. **3.** A closed subroutine which returns a value to the calling routine upon conclusion.

function-affecting maintenance Such a maintenance action that interrupts or degrades one or more of the required functions of a maintained item.

functional block 1. Delimited part of a system, comprising at least one function, characterized by its having well-defined and a minimal number of input and output signals. **2.** A system or element with one or more input variables and one or more output variable, symbolized primarily by a rectangle in which the functional relationship between the input and output variables is given. Note: The functional relation can be given by an arithmetic instruction, a transfer function, a differential or difference equation, a characteristic curve or a family of characteristic curves, or a switching function.

functional decomposition (software) A method of designing a system by breaking it down into its components in such a way that the components correspond directly to system functions and subfunctions. See also hierarchical decomposition.

functional design The specification of the working relations between the parts of a system in terms of their characteristic actions.

functional designation Letters, numbers, words, or combinations thereof, used to indicate the function of an item or a circuit, or of the position or state of a control of adjustment. Compare with: letter combination, reference designation, symbol for a quantity.

functional diagram A diagram that represents the functional relationships among the parts of a system.

functional earth A low impedance path between electrical circuits and earth for non-safety purposes such as noise immunity improvement.

functional electronic block, FEB Another name for a monolithic integrated circuit or thick film circuit.

functional layout Layout method wherein the symbols for the components or their parts are placed in the diagram so that the functional relations can easily be recognized. Pertains to diagram layout methods in electrotechnology.

functional mode A subset of the whole set of possible functions of an item.

functional parts Discrete items defined by functional characteristics and dimensions which are not repairable with the use of spare parts (e.g. resistors, capacitors, diodes, potted transformers permanently sealed batteries etc).

functional program A routine, or group of routines which, when considered as a whole, completes some task with a minimum of interaction of other functional programs other than to obtain data and signal completion of its task.

functional requirements A specification of required functional behaviour, operation, performance, or purpose. See also performance specification.

functional unit An entity of hardware, software, or both capable of accomplishing a specified purpose.

function block diagram (FBD) language A programming language using function block diagrams for representing the application program for a programmable controller system.

function chart Chart describing the functions and behaviour of a control system, using steps and transitions. For examples see IEC publication 848.

function check-out Actions taken after fault correction to verify that the item has recovered its ability to perform the required function.

function codes Codes which appear in tape or cards to operate machine functions, such as carriage returns, space, shift, skip, tabulate, etc.

function-degrading maintenance Such a maintenance action, that degrades one or more of the required functions of a maintained item, but not to such extent as to cause complete loss of all the functions.

function diagram Diagram representing a system by means of theoretical or ideal circuits without necessarily taking into account the means used for implementation.

function diagram (fluid power systems) Graphical representation of the sequence of operations and control signals of a fluid power circuit, generally for a complete cycle.

function generator A function unit whose output analog variable is equal to some function of its input analog variables.

function generator 1. A computing element designed with an output of a specified nonlinear function of its input or inputs. Normal usage excludes multipliers and resolvers. **2.** A device capable of generating one or more desired waveforms.

function key Any of specific keys on a keyboard (for example, CR, LF, LTRS, FIGS, etc.) which, when operated, causes a receiving device to perform a cer-

tain action so that a message will be received in proper form.

function-preventing maintenance Such a maintenance action that prevents a maintained item from performing a required function by causing complete loss of all the functions.

function switch A circuit having a fixed number of inputs and outputs designed such that the output information is a function of the input information, each expressed in a certain code, signal configuration, or pattern.

function test A test for correct logical operation of the device. Basically, a function test is a device truth table verification.

function unit A device which can store a functional relationship and release it continuously or sporadically.

fundamental frequency The principal component of a wave; i.e., the component with the lowest frequency or greatest amplitude. It is usually taken as a reference.

fundamental method of measurement A method of measurement in which the value of a measurand is determined by measurement of the appropriate base quantities.

fundamental mode A type of sequential circuit in which there is only one input change at a time and no further change occurs until all states are stabilized.

fundamental natural frequency The lowest frequency in a set of natural frequencies.

furnace An apparatus for liberating heat and using it to produce a physical or chemical change in a solid or liquid mass; most often, the heat is produced by burning a fossil fuel, passing electric current through a heavy-duty resistance element, generating and sustaining an electric arc, or electromagnetically inducing large eddy currents in the charge.

furnace draft The draft in a furnace measured at a point immediately in front of the highest point at which the combustion gases leave the furnace.

furnace oil No. 2 heating oil; light gas oil that can be used as diesel fuel and for residential heating.

fused fiber optics A number of separate fibers which are melted together to form a rigid fused bundle to transmit light. Fused fiber optics may be used for transmitting images or simply illumination; they are not necessarily coherent bundles of fibers.

fused quartz Glass made by melting material quartz crystals. Note: Fused quartz is not as pure as vitreous silica.

fused silica, vitreous silica Glass consisting of almost pure silicon dioxide (SiO_2).

fusible plug device A non-reclosing pressure relief device designed to function by the yielding or melting of a plug of suitable melting temperature material.

fusion Also called atomic fusion or nuclear fusion. The melting of atomic nuclei, under extreme heat, to form a heavier nucleus. The fusion of two nuclei of light atoms is accompanied by a tremendous release of energy.

fusion splice (optical communication) A splice accomplished by the application of localised heat sufficient to fuse or melt the ends of two lengths of optical fiber, forming a continuous single optical fiber.

fuzzy control A type of control in which the control algorithm is expressed by nonclassical logic using facts, inference rules and quantifiers based on experience and intuition.

fuzzy logic, fuzzy-set logic A non-classical logic in which facts, inference rules and quantifiers are given certainty factors.

fuzzy set A non-classical set having the property that each member is associated with a number, usually from 0 to 1, that indicates the degree to which it belongs to the set.

fuzzy-set logic See fuzzy logic.

fV Letter symbol for femtovolt (10^{-15} volt).

FWPCA 1. Federal Water Pollution Control Act. **2.** Federal Water Pollution Control Administration.

G

G 1. Symbol for conductance. 2. Symbol for prefix giga meaning 10^9 .

g Also called G-force. Symbol for the acceleration of a freefalling body due to the earth's gravitational pull.

Ga Chemical symbol for gallium.

GaAs Gallium arsenide, another competing technology for semiconductors.

gage 1. A system for specifying wire size. The American Wire Gage also known as Brown Sharp Gage. Used for instance in specifying thermocouple wire size. **2.** A device for determining dimensions such as thickness or length. **3.** The thickness of metal sheet, or the diameter of rod.

gage cock A valve attached to a water column or drum for checking water level.

gage datum The permanent plane to which the level of the liquid surface is related. The elevation of the zero of the gage and of bench marks in the vicinity of the gaging station are related to this plane. Pertains to liquid flow measurements in open channels.

gage factor A measure of the ratio of the relative change of resistance to the relative change in length of a resistive strain transducer (strain gage).

gage glass A glass, plastic or metal tube for measuring liquid level in a tank or pressure vessel, usually by direct sight; it is usually connected directly to the vessel through suitable fittings and shutoff valves.

gage guard A device designed to protect control gages from either sudden or gradual increases in pressure.

gage height liquid level, stage The elevation of the free surface of a stream relative to a datum. Pertains to liquid flow measurement in open channels.

gage isolator A device designed to isolate pressure gages from corrosive process liquids or gases. Also called diaphragm seal.

gage numbers In the metal industries, the word gage formerly was used in various systems, or scales, for expressing the thickness or weight per unit area of thin plates, sheet and strip, or the diameters of rods and wire, for example No 12 gage, No 20 gage or simply 12 gage or 20 gage. With the general acceptance of SI, weights and dimensions are now expressed either in absolute units of that system, or in English units. It is anticipated that eventually all weights and dimensions will be in absolute units of SI.

gage pressure 1. A differential pressure measurement using the ambient pressure as a reference. **2.** The difference between the local absolute pressure of the fluid and the atmospheric pressure at the place of measurement.

gage pressure Pressure measured with respect to that of the atmosphere. Absolute pressure, pressure measured with respect to that of zero pressure.

gage pressure transducer A pressure transducer that uses ambient pressure as the reference pressure. The sensing element is normally vented to the ambient pressure.

gage protector Device inserted in the pipeline to a pressure gage and arranged to isolate the pressure gage from the fluid pressure if this exceeds a predetermined limit. The device can usually be adjusted to suit the range of the pressure gage.

gage pulsation damper Device employing a fixed or variable restrictor inserted in the pipeline to a pressure gage, to prevent damage to the gage mechanism caused by rapid fluctuations of fluid pressure.

gaging station The complete installation at a measuring site where water level and/or discharge records are regularly maintained. Pertains to liquid flow measurement in open channels.

gain For a linear system in sinusoidal steady-state, the ratio of the amplitude of the output signal to the amplitude of the corresponding input signal. Note: The gain is the absolute value of the frequency response. In new proposed definition the terms output signal and input signal are substituted by the terms output variable and input variable.

gain (of a measuring instrument) The ratio of the output to the input values of quantities of the same kind in a device or system when equal to or greater than unity.

gain control A device for varying the gain of a system or component.

gain-crossover frequency 1. Frequency at which the gain becomes unity. See figure in IEC publication 902, 1987 and ANSI/ISA S 51.1. **2.** That frequency at which the value of amplitude response or of gain response is unity.

gain margin The reciprocal of the open loop gain for a stable feedback system at the frequency at which the phase angle reaches -180° .

gain scheduling controllers Continuous adaptive controllers utilising tuning procedures based on a pre-defined schedule of controller coefficients which vary as a function of one or more process or external signals.

Gal A unit of acceleration equal to 1 cm/s^2 . The milligal is frequently used because it is about 0.001 times the earth's gravity.

gallon A unit of capacity (volume) usually referring to liquid measure in the British or U.S. Customary system of units. The capacity defined by the British (Imperial) gallon equals 1.20095 U.S. gallons; one U.S. gallon equals four quarts or $3.785 \times 10^{-3} \text{ m}^3$.

galvanic corrosion Galvanic corrosion occurs when two dissimilar metals in contact with each other are exposed to a conductive solution (electrolyte). Galvanic corrosion can often be recognized by the larger amount of corrosion near the junction of the two metals.

galvanic series A list of metals and alloys arranged in the order of relative potentials (ability to go into solution) in a given environment.

galvanizing Zinc coatings are commonly applied by dipping or passing the article to be coated through a molten bath of the metal. This operation is called "galvanizing", "hot galvanizing" or "hot-dip galvanizing" to distinguish it from zinc electroplating processes which are termed "cold" or "electrogalvanizing".

galvanometer An instrument intended to detect or measure a very small current.

galvanometer constant The factor by which a certain function of a galvanometer reading must be multiplied to obtain the current in ordinary units.

gamma A unit of magnetic intensity, equal to 10^{-5} oersted.

gamma-cellulose The fraction of bleached chemical pulp which is dissolved in a determination of alpha-cellulose and which is not reprecipitated on acidification.

gamma iron Allotrope of iron with a face-centred cubic lattice.

gamma ray level measuring device A device which measures the level of a material (liquid or solid) by the gamma ray absorption when the material is interposed between the source and the detector.

gap 1. An interval of space or time used as an automatic sentinel to indicate the end of a word, record, or file of data on a tape. **2.** The absence of information for a specified length of time or space on a recording medium. **3.** The space between the reading or recording head and the recording medium such as tape, drum or disk.

gap azimuth In multi-channel digital magnetic record/playback heads, the angle between the parallel lines measuring gap scatter and the nominal direction of tape motion over the head assembly.

gap coding A means for inserting periods of no transmission in a system in which transmission is normally continuous.

gap corrosion, crevice corrosion See under crevice corrosion.

gap digit Included in a machine word for various technical reasons; but not used to represent data or instructions.

gap loss, longitudinal offset loss (fiber optics) The intrinsic joint loss caused by a space between axially aligned fibers in a splice, or the deviation from the optimum spacing between an optical fiber and a source or a detector.

gap scanning In ultrasonic examination, projecting the sound beam through a short column of fluid produced by pumping couplant through a nozzle in the ultrasonic search unit.

gap scatter In multi-channel digital magnetic tape record/playback heads, the distance expressed in micro-inches between the closest pair of parallel lines which bound all gap trailing edges of a stack.

gap width The distance between the poles in a magnetic head.

garbage Unwanted and meaningless information in input, storage, or output.

garbage collection Technique for collecting empty spaces in a mass memory and then compacting them.

gas analyzer A device which analyses the composition of a gaseous mixture with two or more components.

gas burner A burner for use with gaseous fuel.

gas carburizing Carburizing by a carbon-releasing agent in gas form.

gas chromatograph Gas analyzer where the components of the sample are separated in an analytical absorption column and then detected consecutively.

gasdynamic pumping The production of a population inversion by a gasdynamic process, in which a hot, dense gas is expanded into a near vacuum, causing the gas to cool rapidly. If the gas cools faster than energy can be redistributed, a population inversion is generated.

gas-filled cable A coaxial or other type of cable containing gas under pressure which serves as insulation and prevents moisture from entering.

gas filled thermal system A type of filled thermal system (see under filled thermal system). The small internal volume of the element virtually eliminates ambient temperature errors. The scale or chart of the instrument is evenly graduated over its entire range. Elevation of the bulb or instrument case does not affect calibration.

gasification Converting a solid or a liquid to a gas; converting a solid hydrocarbon such as coal or oil shale to commercial gas; the manufacture of synthetic gas from other hydrocarbons. See synthetic natural gas.

gas lift A method of lifting oil from the bottom of a well by the use of compressed air.

gas liquids See liquefied petroleum gas.

gas-loaded accumulator (fluid power systems) Hydraulic accumulator with or without separator in which the fluid is pressurized using the compressibility of an inert gas, nitrogen for example. Fluid and gas may be separated by bladder, diaphragm or piston.

gas-loaded transfer type accumulator (fluid-power systems) Gas-loaded accumulator for use with additional gas capacity contained in one or more supplementary gas bottles connected to the gas side of the transfer accumulator by a common pipeline.

gas lock A condition that can exist in an oil pipeline when elevated sections of the line are filled with gas.

gas nitriding Nitriding by a nitrogen-releasing agent in gas form; normally ammonia.

gasohol A mixture of 90 percent gasoline and 10 percent alcohol; a motor fuel.

gas oil A refined fraction of crude oil, somewhat heavier than kerosene.

gasoline Motor gasoline is a blend of different cuts or fractions in the gasoline range.

gasoline plant A compressor plant where natural gas is stripped of the liquid hydrocarbons usually present in the wellhead gas.

gasometer A piece of apparatus typically used in analytical chemistry to hold and measure the quantity of gas evolved in a reaction; similar equipment is used in some industrial applications.

gas phase bleaching Bleaching of finely divided pulp or high dry solids content with bleaching chemicals in gaseous form.

gasproof So constructed or protected that the specified gas will not interfere with successful operation.

gas purge technique, bubbler technique A method of transmitting liquid pressure in which a small discharge of non-corrosive gas or compressed air is allowed to bleed through a tube to an immersed fixed orifice. The measured pressure sensed by a pressure sensor is directly proportional to the liquid head.

gassing The evolution of gases from one or more of the electrodes during electrolysis.

gas stirring – arc reheating process (in steel-making) A variation of the ladle refining furnace process, also known as the Finkl-Mohr VAD degassing system, is designed for desulphurization and additional steelmaking refinement purposes, as well as degassing of liquid steel. Heat is supplied to the steel before or after the degassing operation by electric arcs provided by electrodes.

gas sweetening The process of removing hydrogen sulfide (H_2S), carbon dioxide (CO_2) and other impurities from sour gas. Both gases are contaminants that must be removed from sour gas to make it marketable.

gas thermometers Gas thermometers are very important for industrial applications and for establishing the thermodynamic temperature scale. Constant volume gas thermometers are used for industrial and laboratory measurements, and constant pressure gas thermometers are sometimes used for laboratory work. The ideal gas law is an approximation at normally encountered temperatures and pressure, but it is exact at low temperatures and pressures. For a constant volume ideal gas thermometer with a fixed volume, the relation between pressure and temperature is linear. Since the relation is not exact for real gases at common temperatures and pressures, calibration must be used to provide suitable temperature-pressure relationships for practical thermometers.

gastight So constructed that the specified gas will not enter the enclosing case under specified pressure conditions.

gas tube An electron tube into which a chemically inactive gas has been injected.

gas-tube surge arrester A gap, or gaps, in an enclosed discharge medium, other than air at atmospheric pressure, designed to protect apparatus or personnel, or both, from high transient voltages.

gate 1. A flat or wedge-shaped sliding element that modifies flow rate with linear motion across the flow path. **2.** Short for gate valve. See gate valve.

gate, logic element A combinational circuit that performs an elementary logic operation.

gate circuit An electronic circuit with one or more inputs and one output, with the property that a pulse goes out on the output line if some specified combination of pulses occurs on the input lines. Gate circuits provide much of the hardware by means of which logical operations are built into a computer.

gate-controlled delay time (thyristor) The time interval, between a specified point at the beginning of the gate pulse and the instant when the principal voltage (current) has dropped (risen) to a specified value near its initial value during switching of a thyristor from the OFF state to the ON state by a gate pulse.

gate-controlled rise time (thyristors) The time interval between the instants at which the principal voltage (current) has dropped (risen) from a specified value near its initial value to a specified low (high) value, during switching of a thyristor from the OFF state to the ON state by a gate pulse. Note: This time interval will be equal to the risetime of the ON state current only for pure resistive loads.

gate-controlled switch Also called gate turn-off switch. A three-junction, three terminal, solid-state device, constructed very much like a silicon controlled rectifier except that it has a turn-off ability, which is controlled by a negative current pulse applied to the gate.

gate nontrigger current (thyristor) The maximum gate current that will not cause the thyristor to switch from the OFF state to the ON state.

gate nontrigger voltage (thyristor) The maximum gate voltage that will not cause the thyristor to switch from the OFF state to the ON state.

gate time A transducer that gives output only during chosen time intervals.

gate trigger current (thyristor) The minimum gate current required to switch a thyristor from the OFF state to the ON state.

gate trigger voltage (thyristor) The gate voltage required to produce the gate-trigger current.

gate turn-off current (gate turn-off thyristor) The minimum gate current to switch a thyristor from the ON state to the OFF state.

gate turn-off thyristor A gate turn-off thyristor (GTO) has a characteristic similar to that of the reverse blocking thyristor. That is, it blocks the flow of anode current when it is reverse-biased and, depending on the gate current, it can, when forward-biased, either block current flow or it can conduct.

gate turn-off voltage (gate turn-off thyristor) The gate voltage required to produce the gate turn-off current.

gate valve A valve whose closure member is a flat or wedge-shaped gate that is moved linearly across the seat.

gate voltage 1. The voltage across the gate-winding terminals of a magnetic amplifier. **2.** The instantaneous voltage between gate and cathode of a silicon

controlled rectifier with anode opening. **3.** Thyristor: The voltage between a gate terminal and a specified main terminal.

gateway 1. A functional unit that interconnects two computer networks with different network architectures. **2.** Pertaining to a field bus in industrial control system, the station which acts as the gateway connection to other buses such as IEC 955 PROWAY. **3.** In Honeywell TDC 3 000 control systems, a specific type of module on the Local Control Network that converts the communication protocol of other devices to that used by the Local Control Network.

gateway A network device that interconnects two networks that may have different protocols.

gating Selection of part of a wave on account of time or magnitude. Operation of a circuit when one wave allows another to pass during specific intervals.

gating circuit A circuit that operates as a selective switch and allows conduction only during selected time intervals or when the signal magnitude is within specified limits.

gating signal (keying signal) A signal that activates or deactivates a circuit during selected time intervals.

gating techniques (thyristor) Those techniques employed to provide controller (thyristor) gating signals.

gauss (G) The centimeter-gram-second electromagnetic unit of magnetic induction. One gauss represents one line of flux (one maxwell) per square centimeter, or 10^{-4} webers per square meter. The SI unit tesla is preferred.

Gaussian beam (optical communication) A beam of light whose electric field amplitude distribution is Gaussian when measured across a cross section.

Gaussian curve (random-error concept) A random error of sampling is a variation to chance alone. If the sample is truly random, small errors will be more numerous than large errors and the positive errors, thus giving rise to the symmetrical, bell-shaped "normal curve of error".

Gaussian distribution Also called normal distribution. A density function of a population which is bell-shaped and symmetrical and which is completely defined by two independent parameters, the mean and the standard deviation.

Gaussian filter (circuit and systems) A polynomial filter whose magnitude-frequency response approximates the ideal Gaussian response, the degree of approximation.

Gaussian function A mathematical function used in designing a filter to pass a step function with zero overshoot and minimum rise time (similar to a Bessel-function filter).

Gaussian noise Noise where the particular voltage distribution is specified in terms of probabilities related to a "normal" curve.

Gaussian process A random process with a Gaussian probability distribution.

Gaussian pulse (optical communication) A pulse that has the waveform of a Gaussian distribution.

gaussmeter An instrument that provides direct readings of magnetic field density (flux density) by virtue of the interaction with an internal magnetic field.

gauze 1. A sheer, loosely woven textile fabric; one of its widest uses is for surgical dressings, but it also has some industrial uses such as for filter media. **2.** Plastic or wire cloth of fine to medium mesh size.

gb Gilbert (unit of magnetomotive force).

G code A command in manufacturing process control changing the mode of operation of the control such as from positioning to contouring or calling for a fixed cycle of the machine.

GCWM General Conference of Weights and Measures.

Gd Chemical symbol for gadolinium.

Ge Chemical symbol for germanium.

gearbox An industrialized personel computer developed by IBM that is configured much like a programmable logic controller.

gear level To arrange a gear train so that the driving and driven shafts rotate at the same speed.

gear meter A positive-displacement fluid meter in which two meshing gear wheels provide the metering action.

gear motor (fluid power systems) Motor in which two or more gears act in engagement as working members.

gear pump 1. A pump in which fluid is fed to one side of a set of meshing gears, which entrain the fluid and discharge it on the other side. **2.** A gear pump supplied with pressurized fluid which converts fluid flow to rotary motion.

gear pump with pressure loading Pump in which the side clearance of the gears is controlled as a function of the outlet pressure.

gear train A combination of two or more gears, arranged to transmit power and motion between two rotating shafts or between a rotating shaft and a member that moves linearly.

Geiger counter Also called Geiger-Mueller or G-M counter. A radiation detector that uses a Geiger-Mueller counter tube, an amplifier and an indicating device. The tube consists of a thin-walled gas-filled metal cylinder with a projecting electrode. Nuclear particles enter a window in the metal cylinder and temporarily ionize the gas, causing a brief pulse discharge. These pulses, which appear at the projecting electrode, are amplified and indicated visibly or audibly.

Geiger-Mueller counter See Geiger counter.

generalized network A set of elements, commonly called nodes, that are interconnected in some way. In some cases it is sufficient to assign some meaning to the nodes and interconnections for the network to have some useful purpose. For example, a PERT network is simply a planning model of a complex set of tasks to be performed. Each node represents the completion of a task.

generalized simulation language, GSL A FORTRAN-like language which provides facilities for both continuous and discrete simulation.

general numerical language processor A computer program developed to serve as a translating system for a parts programmer to develop a mathematical representation of a geometric form with the use of symbolic notation.

general processor (numerical control) See general-purpose processor.

general-purpose computer A computer designed to solve a large variety of problems, e.g., a stored program computer which may be adapted to any of a very large class of applications.

general-purpose instrument bus (GPIB) See GPIB.

general-purpose language Combined programming languages which often use English words and statements where they are convenient as mathematical notation for procedures conveniently expressed mathematically. COBOL, FORTRAN and ALGOL are

widely used general purpose programming languages in both science and business.

general-purpose motor Any motor designed, listed and offered in standard ratings with operating characteristics and mechanical construction suitable for use under usual service conditions.

general-purpose processor (numerical control) A computer program which carries out computations on the part program and prepares the cutter location data (CL data) for a particular part without reference to machines on which it might be made.

general-purpose relay A term which covers a wide variety of electromechanical relays which typically are of the common coil-and-armature type, the most common styles having the ability to switch either ac or dc ratings from 2 to 10 amperes. They may be plug-in, bracked, stud or screw mounted.

general-purpose simulation system, GPSS A generic class of discrete, transaction-orientated simulation languages based on a block (diagramming) approach to problem statement.

generate (computing systems) To produce a program by selection of subsets from a set of skeletal coding under the control of parameters.

generate and test Problem solving based on generation of possible solutions, and elimination by pruning of those solutions that fail to meet given criteria.

generated address, synthetic address An address that has been formed as a result during the execution of a computer program.

generating function Of a given series of functions or constants, a mathematical function that, when represented by an infinite series, has those functions or constants as coefficients in the series. For example see ISO 2382/11.

generating station An installation that produces electric energy from chemical, mechanical hydraulic or some other form of energy.

generation system (SYSGEN) A process that creates a particular and uniquely-specified operating system i.e., set of control and utility programs.

generator 1. A controlling routine that performs a generate function, for example, report generator, input/output generator. **2.** A device which transforms mechanical energy into electrical energy.

generator field control Regulation of the output voltage of a generator by control of the voltage that excites the field winding of the generator.

generator program A large detailed program which permits a computer to write other programs automatically.

generic 1. Of, applied to, or referring to a kind, class or group. **2.** Inclusive or generally – opposed to specific and special.

generic Of, including or indicating an entire group, not protected by a trademark or trade name; a generic drug.

generic package (software) A collection of software items from which more than one installation – dependent specific package may be generated by a software manufacturing process. Generic packages may be in source-code form (generic source package) or in object-code form (generic object package).

geochemistry The science of chemistry applied to oil and gas exploration.

geodesic The shortest line between two points on a given surface.

geodesy The branch of science concerned with the determination of the size and shape of the earth and the location of points on its surface; also the gravita-

tion field of the earth and the study of its tides, polar motion, and rotation.

geometric efficiency The ratio of the number of particles or photons that enter the sensitive volume of a detector to the total number of particles or photons emitted by a radioactive source.

geometric mean The square root of the product of two quantities.

geometric near field Is the region near a pipe where the measuring distance is small in relation to the pipe dimensions. Sound energy is then arriving at the measuring point over a wide solid angle.

geometric optics (fiber optics) The treatment of propagation of light as rays. Note: Rays are bent at the interface between two dissimilar media or may be curved in a medium in which refractive index is a function of position.

geophones Sensitive sound-detecting instruments used in conducting seismic surveys.

geophysical cable Cable used in exploring for underground oil deposits.

geophysics The application of certain physical principles-magnetic attraction, gravitational pull, speed of sound waves, the behavior of electric currents - to the science of geology.

germanium (Ge) A brittle, grayish-white metallic element having semiconductor properties. Widely used in transistors and crystal diodes.

germanium detector A type of photoinductive detector where germanium doped with other elements acts as a semiconductor in the range of 600 to 1 000 nm.

getter A material exposed to the interior of a vacuum system in order to reduce the concentration of residual gas by absorption or adsorption.

gettering A semiconductor manufacturing process that aims to remove defects from the neighborhood of the devices, either removing them completely from the silicon wafer or transporting them into regions where they will have no effect on device performance.

getter-ion pump A type of vacuum pump that produces and maintains high vacuum by continuously or intermittently depositing chemically active metal layers on the wall of the pump, where they trap and hold inert gas atoms which have been ionized by an electric discharge and drawn to the activated pump wall. Also known as sputter-ion pump.

ghost point A term used in boiler water testing with soap solution. A lather appears to form but will disappear upon the addition of more soap solution. This point represents total calcium hardness and the final lather total hardness.

giga (G) A prefix for one billion, i.e., 10^9 , times a specific unit.

gigacycle Same as kilomegacycle (1 billion cycles per second). An obsolete term. The current preferred term is gigahertz.

gigahertz (GHz) A term for 10^9 cycles per second used to replace the more cumbersome and obsolete term kilomegacycle.

gigahertz circuit A computer logic circuit, or other electronic circuits, which have gradient pulse raise or fall times measured in billionths of seconds or less. A nanosecond is 1 billionth of a second.

gigawatt (GW) One thousand megawatts (10^9 watts).

gigo An acronym formed from the phrase garbage in, garbage out. It is used to describe a computer whose operation is suspect.

gigohm One thousand megaohms (10^9 ohms).

gilbert (centimeter-gram-second electromagnetic system) The unit of magnetomotive force.

The gilbert is one oersted-centimeter. The SI unit, the ampere (or ampere-turn) is preferred.

gimbal A mechanical frame having two perpendicularly intersecting axes of rotation.

girbitrol process A process used to "sweeten" sour gas by removing the hydrogen sulfide (H_2S).

glacis The sloping face of a weir block downstream and in continuation of the crest. Pertains to liquid flow measurement in open channels.

gland Pertaining to valves see under packing follower or lantern ring.

glass In fiber optics, an amorphous transparent or translucent brittle material usually made by fusion of silica, soda ash, lime and salt cake or similar material. Used as a fiber-optic cable, glass offers resistance to high temperatures.

glass electrode In electronic pH measurement, an electrode used for determining the potential of a solution with respect to a reference electrode. The calomel type is the most common.

glass fiber A glass thread less than 0.001 in (0.025 mm) thick; it is used in loose, matted or woven form to make thermal, acoustical or electrical insulation; in matted, woven or filament-wound form to make fiber-reinforced composites; or in loose, chopped form to make glassfilled plastics parts.

glassine A thin, dense, transparent, supercalendered paper made from highly refined sulfite pulp; it is used industrially as insulation between layers of iron-core transformer windings.

glass paper 1. An abrasive material made by bonding a layer of pulverized glass to a paper backing. **2.** Paper made of glass fibers.

glass sand The raw material for glassmaking; it normally consists of high-quartz sand containing small amounts of the oxides of Al, Ca, Fe and Mg.

glassy alloy A metallic material having an amorphous or glassy structure. Also known as metallic glass.

glazed millboard Pressed and glazed, stiff, smooth and waterresistant millboard.

glazed substrate Ceramic substrate with a glass coating to effect a smooth and nonporous surface.

glazing The act of imparting to paper or board an increased surface smoothness or gloss.

G-line Coated wire used to transmit microwave energy.

glitch Undesirable electronic pulses that cause processing errors.

global 1. Any name that is declared global has as its scope the entire system in which it resides. **2.** Pertaining to the relationship between a language object and a block such that the language object has a scope extending beyond that block but contained within an encompassing block.

global array A set of data listings that can be referenced by other parts of the software.

global common An un-named data area that is accessible by all programs in the system. Sometimes referred to as blank common.

global variable Any variable available to all programs in the system. Contrast with reserved variable.

globe valve A valve with a linear motion closure member, one or more ports and a body distinguished by a globular shaped cavity around the port region. Typical globe valve types are illustrated in ISA publication S75.05.

globe valve trim The internal parts of a valve which are in flowing contact with the controlled fluid. Examples are the plug, seat ring, cage, stem and the parts used to attach the stem to the plug. The body, bonnet,

bottom flange, guide means and gaskets are not considered as part of the trim.

glossimeter An instrument for measuring the “glossiness” of a surface – that is, the ratio of light reflected in a specific direction to light reflected in all directions – usually by means of a photoelectric device. Also known as glossmeter.

glycol dehydrator A facility for removing minute particles of water from natural gas not removed by the separator.

GM C4 The General Motors program that look to set a variety of standards for all levels of manufacturing applications. The two parts of the program that are most developed include standards for communications technology, as well as CAD/CAM software and hardware.

G-M counter Abbreviation for Geiger-Mueller counter.

GMT (or Gmt) Greenwich Mean Time.

GND Ground.

goal directed programming (industrial robots) Programming method in which the task to be carried out is defined but the path of the end – effector is not prescribed.

goal-setting Use of the computer in economic and financial planning and control. Modern computer communication networks provide corporate and governmental planners with the database, mathematical tools, and simulation capabilities necessary for effective planning.

goethite A mineral. See under hydrous oxides limonite.

Golay cell An infrared detector in which the incident radiation is absorbed in a gas cell, thereby heating the gas. The temperature induced expansion of the gas deflects a diaphragm, and a measurement of this deflection indicates the amount of incident radiation.

goniometer Generally, any instrument for measuring angles.

go/no-go gage A composite gaging device that enables an inspector to quickly judge whether specific dimensions or contours are within specified tolerances.

governor 1. A motor attachment that automatically controls the speed at which the motor rotates. **2.** The equipment which controls the gate or valve opening of a prime motor.

GPIB General Purpose Instrument Bus. The standard interface hardware used in computer system. It has been adopted by the IEEE as the IEEE-488 instrument bus standard, which is intended to define standard interface techniques for limited transmission distances (up to 20 meters). It is an 8-bit wide digital interface applicable for both programmable and nonprogrammable components.

GPM Gallons Per Minute.

GPS Gallons Per Second.

GPSS See general-purpose simulation system.

graceful degradation 1. A computer programming technique the purpose of which is to prevent catastrophic system failure by permitting the machine to operate, although in a degraded mode, in spite of failures or malfunctions in several integral units or subsystems. **2.** A characteristic of Honeywell TDC 3 000 Systems that provides partial rather than total loss of control capability when one or more parts fail.

grade (quality) An indicator of category or rank related to features or characteristics that cover different sets of needs for products or services intended for the same functional use.

graded-core-glass optical fiber For most applications of high information rate (bandwidth) a fiber that

has a core in which the highest optical density is at the center. Optical density decreases with distance from the center until it is the same as the cladding.

graded index optical waveguide (fiber optics)

A waveguide having a graded index profile in the core.

graded insulation A combination of insulation proportioned so as to improve the distribution of the electric field to which the combination is subjected.

gradient 1. The instantaneous direction of a curve at any point is the direction in which the curve tends to rise or fall. This is indicated by the tangent to the curve at the point. A usual measure of this direction of the curve is the gradient of the tangent. This gradient varies as the tangent varies from point to point on the curve. **2.** The rates of increase or decrease of temperature or pressure are defined as gradients; the rate of regular or graded ascent or descent.

gradual failure, drift failure A failure due to a gradual change in time of given characteristics of an item. Note: A gradual failure may be anticipated by prior examination or monitoring and can sometimes be avoided by preventive maintenance.

graduation Any of the major or minor index marks on an instrument scale.

grafoil packing Type of packing used, for instance, in valve packing boxes. Laminated construction provides rapid dissipation of frictional heat. This is essentially, chemically-inert, except when strong oxidizers are handled. The coefficient of friction is low and the packing can be used for quite – high temperature applications. Tradename of Union Carbide Corp.

grain boundaries Metals generally consist of regions called crystals or grains where the atoms are arranged in more or less regular, geometrical patterns, bounded by transition regions of irregular pattern called grain boundaries.

grain growth An increase in the average grain size in a metal usually as a result of exposure to high temperature.

grains (water) A unit of measure commonly used in water analysis for the measurement of impurities in water (17.1 grains = 1 part per million-ppm).

grain size For metals, the size of crystallites in a polycrystalline solid, which may be expressed as a diameter, number of grains per unit area, or standard grain size number determined by comparison with a chart such as those published by ASTM.

gram (g) The CGS unit of mass; it equals 0.001 kilogram, which has been adopted as the SI unit of mass.

grammage Mass divided by area. The term “basis weight” and “substance” are older terms for the same property, but they are no longer considered acceptable by ISO.

grammer The word order in a communication or a portion of a communication.

grand-scale integration, GSI See GSI.

granular structure Non uniform appearance of milled or compressed material due to the presence of particles of varying composition.

granularity A characteristic of the output data of a measuring instrument. The measure of granularity is the smallest increment of the output data when it is in a digital form. The smallest increment is also called least count.

graph (software) A model consisting of a finite set of nodes having connections called edges or arcs.

graphic Pertaining to a pictorial representation of displayed information or material, usually legible to humans, such as, the printed or written form of data, mathematical curves, or a cathode-ray tube display.

graphical analysis The use of diagrams and other graphic methods to obtain operating data and answers to scientific or mathematical problems.

graphical diagram, schematic Drawing using graphical symbols and interconnecting lines, generally drawn according to a standard or other code.

graphical language A programming language based upon graphical representation.

graphical representation Diagrammatic means of conveying information about the function of components and circuits.

graphical symbol (schematic) Formal, abstract design which represents the function of a component or group of components according to a standard or code.

graphic character A character, other than a control character, that has a visual representation and is normally produced by writing, printing or displaying.

graphic data reduction A process of converting physical representations such as plotter output, graphs, or engineering drawings into digital data.

graphic display (device) A hardware device (crt, plasma panel, arrays of lamps, or light emitting diodes) used to present pictorial information.

graphic display program A program designed to display information, in graphic or alphanumeric form, on the face of a television – like display tube.

graphic instrument See recording instrument.

graphic panel A panel on which the controlling, measuring and signalling devices are inserted in a simplified graphic representation of the process.

graphic primitive, display element, output primitive See output primitive.

graphic printer A device that prints diagrams as well as characters by forming images with electrostatic, laser, dot, impact or other printing methods.

graphics The use of diagrams or other graphical means to obtain operating data and answers. The use of written symbols and visual displays.

graphic solution A solution which is developed and obtained with graphs or other pictorial devices, as contrasted with solutions obtained by the manipulation of numbers.

graphic tablet A surface through which coordinate points can be transmitted by identification with a cursor or stylus.

graphite A mineral, a naturally occurring crystalline form of carbon.

graphite-asbestos Type of packing for valve packing boxes. Composed of die-formed split rings of asbestos fibers impregnated with dry graphite and soft lead particles.

graphite flake A form of graphite present in gray cast iron which appears in the microstructure as an elongated, curved inclusion.

graphite rosette A form of graphite present in gray cast iron which appears in the microstructure as graphite flakes extending radially outward from a center of crystallization.

graphitic carbon Free carbon present in the microstructure of steel or cast iron; it is an essential feature of most cast irons, but is almost always undesirable in steel.

graphitic corrosion Corrosion of gray cast iron in which the iron matrix is slowly leached away, leaving a porous structure behind that is largely graphite but that may also be held together by corrosion products; this form of corrosion occurs in relatively mild aqueous solutions and on buried pipe and fittings.

graphitization Formation of graphite; with steel, especially from carbon derived from cementite. Deliberate

graphitization in white cast iron is referred to as malleablizing; compare temper carbon.

graphitizing Annealing a ferrous alloy in such a way that at least some of the carbon present is converted to graphite.

graph plotter 1. A visual display or board on which a dependent variable is graphed by an automatically controlled pen or pencil as a function of one or more variables. **2.** A device that inscribes a visual display of a dependent variable.

grap sample, snap sample, spot sample (water quality) A discrete sample taken randomly (with regard to time and/or location) from a body of water.

grate-kiln system (pelletizing) The grate-kiln pelletizing system for producing pellets consist of a straight grate for drying and preheating the pellets to about 1040°C (1900°F), a rotary kiln for heating to the final induration temperature of 1315°C (2400°F), and a horizontal rotary hearth for cooling and heat recuperation. Hot gases produced in the kiln are used for downdraft drying and preheating of the pellets. hot air from the cooling zone is used for combustion.

grating A device for spreading out light or other radiation.

gravimeter, gravity meter A device for measuring the relative force of gravity.

gravimetric method A method for estimating the total sediment by allowing the sediment to settle in a container, with a suitable additive to quicken settlement, siphoning off the supernatant water, and carefully transferring all the sediment from the container to a breaker and from the breaker on to a filter paper, then drying the sample and determining the mass of total sediment.

gravitational constant A dimensionless conversion factor in English units which arises from Newton's second law when mass is expressed in pounds-mass.

gravitometer See densimeter.

gravity 1. The attraction of the earth's mass for bodies or objects at or near the surface. **2.** Short for specific gravity. **3.** To flow through a pipeline without the aid of a pump; to be pulled by the force of gravity. **4.** Weight index of fuels; liquid, petroleum products expressed either as specific, Baumé or A.P.I. gravity; weight index of gaseous fuels as specific gravity related to air under specified conditions; or weight index of solid fuels as specific gravity related to water under specified conditions.

gravity disc (separation terminology) Disc with an orifice functioning like the weir of a dam at the top of the bowl hood, where the liquid phase can escape. In purifiers and concentrators it is usually the heavy phase. Here the diameter of the orifice is decisive for the location of the interface between the liquids in the bowl (U-tube principle).

gravity segregation The separation of water from oil or heavy from lighter hydrocarbons by the force of gravity, either in the producing zone or by gravity in the separators after production; the stratification of gas, oil, and water according to their densities.

gray The absorbed dose when the energy per unit mass imparted to matter by ionizing radiation is one joule per kilogram. Note: The gray is also used for the ionizing radiation quantities; specific energy imparted, kerma, and absorbed dose index, which have the SI unit joule per kilogram.

gray body A radiating body whose spectral emissivity remains the same at all wavelengths. It is in constant ratio of less than unity to the radiation of a blackbody radiator at the same temperature.

gray cast iron See under cast iron.

gray code A generic name for a family of binary codes which have the property that a change from one number to the next sequential number can be accomplished by changing only one bit in the code for the original number.

gray filter Gray filters are optically clear filters which transmit light, regardless of the wavelength or the position on the surface.

gray millboard Millboard manufactured primarily of unsorted waste paper.

gray scale **1.** A series of regularly spaced tones ranging from white to black through intermediate shades if gray used as a reference scale for control purposes in photography or tv. **2.** The discrete levels of the video signal between reference-black and reference-white levels.

gray water (sullage) Waste water from household baths and showers, handbasins and kitchen sinks but excluding waste water and excreta from water closets.

grease **1.** A lubricating substance (solid or semisolid) made from lubricating oil and a thickening agent. **2.** Colloquial for crude oil.

greaseproof Grease-resistant paper manufactured from chemical pulp, the resistance to grease being achieved by extensive beating.

green liquor A aqueous solution of the residue consisting largely of sodium carbonate and sodium sulphide obtained in the burning of black liquor or other sodium-based spent liquor.

green oil A paraffin-base crude oil.

greenware Unfired ceramic ware.

grey cast iron, gray cast iron See cast iron.

grid **1.** A thin wire mesh between cathode and plate in a triode. **2.** In optical character recognition, two mutually orthogonal sets of parallel lines used for specifying or measuring character images.

grid current The current flowing between the summing junction and the grid of the first amplifying stage of an operational amplifier. Note: Grid current results in an error voltage at the amplifier output.

grid emission Emission of electrons or ions from the grid electrode with respect to the cathode.

gridistor A field-effect transistor which uses the principle of centripetal striction and has a multichannel structure, combining advantages of both field-effect transistors and minority-carrier injection transistors.

grid-spaced contacts Specific types of electrical contacts, usually surfaces, spring types, or pins arranged in parallel or equally-spaced rows and columns on any type connector, or edges of printed circuit boards.

grinder, pulp grinder A machine for grinding pulpwood logs.

grinding (of wood) Procedure for the manufacture of mechanical pulp (groundwood pulp) in which wood fibers and fiber bundles are separated from debarked pulpwood logs which are pressed against a rotating grindstone while being sprayed with water.

gripper (industrial robots) An end-effector designed for seizing and holding.

grit (As an impurity in a groundwood pulp:) particles which have become detached from a grindstone.

grommet An eyelet of rubber or neoprene placed in a hole in sheet metal, such as a terminal entrance, to insulate and protect wires which pass through.

grooving See scouring.

gross porosity In weld metals or castings, large or numerous gas holes, pores or voids that are indicative of substandard quality or poor technique.

ground A point considered to be at nominal zero potential and to which all other potentials in the circuit

are referred, often, but not always, connected to the actual surface of the earth; as a verb to connect to a ground. Also called earth.

ground absorption The loss of energy during transmission because of the radio waves dissipated to ground.

ground bus A conductor, usually large-diameter wire, that connects a number of points to one or more ground electrodes.

ground clamp, grounding clamp A clamp used for connecting a grounding conductor (ground wire) to a grounded object such as a water pipe.

ground conductor A conductor in a transmission cable or line that is grounded.

ground conduit A conduit used solely to contain one or more grounding conductors.

ground-data highway A ground system that carries off noise from the coaxial cable shields. Isolated from other ground rods to eliminate noise from other circuits. Refers to Honeywell TDC 3 000 control systems.

ground detector **1.** An instrument or equipment that indicates the presence of a ground on a normally ungrounded system. **2.** Device that indicates ground faults in electrical circuits.

grounded input (output) earthed input (output), single-ended input (output) An input (output) circuit in which one input (output) terminal is directly connected to measuring earth. In many cases, this is the common point terminal.

grounded neutral The neutral wire in an electrical power system metallically connected to ground.

grounded system A system of electrical conductors in which at least one conductor or point (usually the middle wire or neutral point of transformer or generator windings) is intentionally grounded, either solidly or through a current-limiting device.

ground fault **1.** An unintentional electrical path between a part operating normally at some potential to ground, and ground. **2.** A current leak from the hot side of the line through a path that bypasses the load to ground.

grounding conductor A conductor which, under normal conditions, carries no current but serves to connect exposed metal surfaces to earth ground, to prevent hazards in case of breakdown between current-carrying parts and the exposed surfaces.

grounding connection A connection used to establish a ground, consisting of grounding conductor, a grounding electrode, and the earth surrounding the electrode.

grounding plate An electrically grounded metal plate on which a person stands in order to discharge any static electricity that may be picked up by his or her body.

grounding switch A form of air switch for connecting a circuit or apparatus to ground.

grounding transformer A transformer intended primarily for the purpose of providing a neutral point for grounding purposes.

ground-lightning A ground system that safely dissipates lightning energy to protect personnel and the structure. Lightning energy is intercepted by lightning rods and/or the building frame and conducted to ground rods or a grid.

ground loop A potentially detrimental loop formed when two or more points in an electrical system, nominally at ground potential, are connected by a conducting path.

ground-master reference (signal common) The ground reference point for all signals. All common-le

ads terminate at this point. Refers to Honeywell TDC 3 000 control systems.

ground reference plane, GRP A flat conductive surface whose potential is used as a common reference.

ground reflected wave (data transmission) The component of the ground wave that is reflected from the ground.

ground-return circuit (ground system) A circuit in which the earth is utilized to complete the circuit.

ground-return circuit (data transmission) A circuit which has a conductor (or two or more in parallel) between two points and which is completed through the ground or earth.

ground-return system A system in which one of the conductors is replaced by ground.

ground rod A rod that is driven into the ground to serve as a ground terminal, such as copper-clad rod, galvanized iron rod or galvanized iron pipe.

ground wire A conductor leading to an electric connection with ground.

groundwood mill An installation for the manufacture of mechanical pulp by grinding.

groundwood pulp Mechanical pulp manufactured by grinding wood against e.g. a grindstone.

group control level Control level of all control units acting respectively on a specific section of the individual control level. Note: The group control level can be subdivided in more than one control level.

group display A display showing up-to-eight digital and/or analog points. These points are typically associated with one process unit and provide the required operator interface information. Refers to Honeywell TDC 3 000 control systems.

grouping Combining two or more computer records into one block of information to conserve storage space or disk or tape. Also known as blocking.

grouping departments by process An organizational structure where the main departments of the organization are grouped by distinctly different production process – for example, by technology, flow, or parallel processes.

grouping departments by products An organizational structure where the main departments of the organization are grouped by major product lines.

group loop (analog computers) A potentially detrimental loop formed when two or more points in an electrical system that are nominally at group potential are connected by a conducting path such that either or both points are not at the same ground potential.

group number A numerical identification associated with a particular display group. Group numbers are found on the Overview and Group displays. Refers to Honeywell TDC 3 000 control systems.

group standard, series of standards A set of standards of specially chosen values which individually or in suitable combination reproduce a series of values of a quantity over a given range. Examples: Set of weights, Set of hydrometers covering contiguous ranges of density.

group technology data A means of coding parts or processes based on the similarities of the parts or grouping parts into product families or grouping production equipment together to produce a family of parts. It provides for rapid retrieval of existing designs and anticipates a cellular-type equipment layout.

group title Descriptive name assigned to each group display. Refers to Honeywell TDC 3 000 control systems.

group title summary A display that presents a list of the assigned group titles and their associated group

numbers in the system. Refers to Honeywell TDC 3 000 control systems.

grunerite An iron-silicate mineral.

GSA Geological Society of America.

GSI Grand Scale Integration. Monolithic integrated circuits with a typical complexity in excess of 1000 or more gates or gate-equivalent circuits.

GSL See generalized simulation language.

guard 1. Signal which prevents accidental operation by spurious signals or avoids possible ambiguity. **2.** A mechanism to terminate program execution (real or simulated) upon access to data at a specified memory location. (Used in debugging.) **3.** Safety device, usually of sheet metal or wire mesh, which protects personnel from injury by moving machine parts, for example, pump drive shafts, cylinder rods.

guard bands (data transmission) Unused frequency bands between two used frequencies, which provides protection against mutual interference or disruption.

guard bit A bit contained in each word or groups of words of memory which indicates to computer hardware or software whether the content of that memory location may be altered by a program.

guard signal 1. A signal which allows values to be read or converted only when the values are not in a changing state. **2.** An extra output, which is generated when all values are complete, to be used as a guard signal. Used in digital-to-analog or analog-to-digital converters or other converters or digitizers.

guard vacuum An enclosed evacuated space between a primary vacuum system and the atmosphere whose primary purpose is to reduce seal leakage into the primary system.

guidance system A system which measures and evaluates flight information, correlates it with target data, converts the resultant into the parameters necessary to achieve the desired flight path and communicates the appropriate commands to the flight-control system.

guide bushing (control valves) A bushing in a bonnet, bottom flange, or body to align the movement of a valve plug with a seat ring. Guiding of a valve plug may be accomplished by an internal part of a bonnet or bottom flange or by a seat ring or seat ring extension or by a cage.

guided probe A hand-held probing device (single-point or multipin clip) guided by an operator with instructions from a computer-controlled algorithm.

guided ray (fiber optics) In an optical waveguide, a ray that is completely confined to the core.

guideline (nuclear power assurance) A suggested practice that is not mandatory in programs intended to comply with a standard. The word "should" denotes a guideline; the word "shall" denotes a requirements.

guide vane See under straightening vane.

guide wavelength The wavelength in a waveguide, measured in the longitudinal direction.

gulp A small group of bytes, similar to a word or instruction.

guy A wire, rope or rod used to secure a pole, derrick, truss or temporary structure in an upright position, or to hold it securely against the wind.

Gy Symbol for gray. Unit for dose (of ionizing radiation). (SI-unit).

gypsum board liner, plaster board liner Board for lining of gypsum board.

gyro Abbreviation for gyroscope.

gyromagnetic The magnetic properties of rotating electric charges, such as electrons spinning within atoms.

gyroscope A rotating device the axle of which will maintain a constant direction, even though the earth is turning under it. It consists of a wheel mounted so that

its spinning axis is free to rotate around either of two other axes perpendicular to itself and each other. When its axle is pointed north, it can be used as a gyrocompass.

gyroscopic mass flowmeter A type of mass flowmeter using the effect of Coriolis acceleration.

H

H 1. Symbol for henry. Unit for inductance (SI-unit).
2. Chemical symbol for hydrogen.

h Abbreviation for hour; has largely replaced hr as the preferred abbreviation.

hairpin heat exchanger A type of shell-and-tube exchanger with tubes inside a 12- to 18-inch diameter shell that may extend 20 or 30 feet and then double back the same distance like a hairpin. Hairpin exchangers may have bare or finned tubes inside the shell.

half-add A computer instruction that performs bit-by-bit half additions (i.e. logical EXCLUSIVE OR without carry) up on its operands.

half-adder A combinational logic element that has two input and two output channels for binary digits and whose output digits represent the sum of the input digits. Two half-adders can be used to make one binary adder that is capable of adding two binary digits and the carry from the preceding digit place.

half-adjust To round a number so that the least significant digit(s) determines whether or not a "one" is to be added to the digit next higher in significance than the digit(s) used as criterion for the determination. After the adjustment is made, if required, the digit(s) used as criterion will be dropped, e.g., 432.784 as the half-adjusted value. The number 432.785 half-adjusts to 432.79, since the terminal digit is "one half or more".

half cell An electrode, submerged in an electrolyte, for measuring single electrode potentials.

half cycle The time interval required for the operation frequency to complete one-half, or 180°, of its cycle.

half-digit In digital meters provided with 100 percent overranging, an additional most-significant digit provided at the left of the readout, capable of displaying the numeral 1 when the measurement exceeds the full-scale range.

half-duplex, HD or HDX In communications, pertaining to an alternate, one way at a time, independent transmission.

half-duplex channel A channel capable of transmitting and receiving signals, but in only one direction at a time.

half-duplex modem A modem with a single-wire pair that can transmit in both directions but not simultaneously.

half duplex transmission Data transmission over a data circuit in either direction, one direction at a time; the choice of direction is controlled by the data terminal equipment.

half life period The period of time after which the concentration or mass of a substance, undergoing degradation or decay, has fallen to half of its initial value.

half-shift register Another name for certain types of flip-flop when used in a shift register. It takes two of these to make one stage in a shift register.

half-sinusoid The entire positive or negative portion of a single cycle of a sine wave.

half-thickness The thickness of an absorbing medium that will depreciate the intensity of radiation beam by one-half.

half wave A wave with an electrical length of half a wavelength.

half-wave power supply A power supply using a single diode which draws current during one phase of the input alternating voltage.

half-wave rectifier A rectifier utilizing only one-half of each cycle to change alternating current into pulsating direct current.

half-wave transmission line A piece of transmission line having an electrical length equal to half the wavelength of the signal being transmitted or received.

halfword A contiguous sequence of bits or characters which comprises half a computer word and is capable of being addressed as a unit.

Hall analog multiplier A Hall multiplier specifically designed for analog multiplication purposes.

Hall effect In a current-carrying semiconductor bar located in a magnetic field that is perpendicular to the direction of the current, the production of a voltage perpendicular to both the current and the magnetic field.

Hall effect generator Also called Hall sensor. A magnetic sensor using the Hall effect to give an output voltage proportional to magnetic field strength.

Hall modulator A Hall effect device that is specifically designed for modulation purposes.

Hall plate A three-dimensional configuration of any material in which the Hall effect is utilized.

Hall probe A Hall effect device specifically designed for measurement of magnetic flux density.

Hall sensor See Hall effect generator.

halocline A layer in a stratified body of water in which the salinity gradient is at a maximum.

haloforms, trihalomethanes, THM Compounds in which three of the hydrogen atoms of the methane molecule have been substituted by chlorine, bromine or iodine atoms. Note: They may be formed from organic matter in water which has been treated or disinfected by halogens (excluding fluorine) or oxidants capable of releasing halogens.

halogen Any one of the four chemical elements; chlorine, fluorine, bromine or iodine.

halogenated fluid Fluid composed of halogenated (chlorine, fluorine, bromine, iodine) organic compounds. It may contain other constituents and is found in industry usually as a chlorinated hydrocarbon fluid.

halt instruction, pause instruction An instruction that specifies the suspension of the execution of a computer program. Note: A pause instruction is usually not an exit.

hammer code, Hamming code 1. An error-correcting code system that was named after the inventor, R.W. Hamming of Bell Telephone Laboratories. A Hamming code contains four information bits and three check bits. **2.** A data code capable of being corrected automatically.

Hamming distance (mathematics of computing) The number of digit positions in which two binary numerals, characters, or words of the same length are different. For example, the Hamming distance between 100101 and 101001 is two.

handler 1. A section of a computer program used to control or communicate with an external device. **2.** Also called device handler. A software routine that controls the operation of a peripheral.

hand operation Actuation of an apparatus by hand without auxiliary power.

handshake A protocol which allows the CPU to sense that the data source is ready to send data.

handshaking 1. The required sequence of signals to enable communication to take place between system

functions. **2.** The exchange of predetermined signals between devices or parts of a device when a connection is established or when data is sent or received. Refers to Honeywell TDC 3 000 control systems.

handwheel operators (control valves)

Handwheel operators (for instance top-mounted and side-mounted) are actually designed to override the control signal that is positioning the valve and to give operating personnel the option to override the control system. They can also be used to facilitate the start up of a control system, for example, to preposition a valve to a given flow. Can also be used as devices to shut off the valve eliminating costly by-pass valve arrangements.

hard automation Production technique where equipment is engineered specifically for a unique manufacturing sequence. Hard automation implies programming with hardware in contrast to soft automation, which uses software or computer programming.

hard banding See hard facing.

hard clad silica fibers Silica optical fibers which are coated with hard plastic material, not with the soft materials typically used in plastic clad silica.

hard contacts Any type of physical switch contacts. Contrasted with electronic switching devices, such as triacs and transistors.

hard copy A document that can be read without magnification or other technical aids and that is usually portable. Note: Hard copies are commonly used to reproduce the image displayed.

hard detergent A detergent containing a surface active agent, which is resistant to primary biodegradation, and whose surfactant properties are not substantially reduced in the biological treatment of sewage.

hard disk A fixed magnetic disk.

hardening Producing increased hardness in a metal by quenching from high temperature, such as hardening steel, or by precipitation-hardening (aging) a dilute alloy, such as hardening certain aluminium or other nonferrous alloys.

hard error A permanent error that always recurs on successive attempts to read data.

hard facing (control valves) A material harder than the surface to which it is applied. Used to resist fluid erosion and/or to reduce the chance of galling between moving parts, particularly at high temperature. Hard facing is not to be confused with "hard plating" which means an electro plated, or thin metal deposit, or induced surface hardening which is many orders of magnitude thinner than hard facing.

hardfacing A material harder than the surface to which it is applied. Used to resist fluid erosion and/or to reduce the chance of galling between moving parts, particularly at high temperature.

hard firing A condition in which the gate signal of an SCR is several times the dc triggering current and in which the rise time of the gate current is short relative to the turn-on time.

hardline The intelligence link between two objects, consisting of a wire or wires, as opposed to a radio or radar link.

hard magnetic materials Magnetic materials that are not easily demagnetized.

hard mineral A mineral that is as hard or harder than quartz, ranking 7 or higher on the Mohs scale.

hardness 1. Ability (in materials) to resist permanent deformation upon the intrusion of a foreign body. **2.** A measure of the amount of calcium and magnesium salts in boiler water.

hardness (water quality) A property of water manifesting its resistance to the development of a lather

with soap. Hardness of water is an old concept used to describe the content of calcium and magnesium in waters. There are different kinds of hardness (total hardness, carbonate hardness and others) and various countries have adopted different definitions of the concept.

hardness tester Equipment for determining the force required to penetrate the surface of a solid.

hard sectoring The physical marking of boundaries on a magnetic disk.

hard soldering Process of joining two metals by utilizing an alloy with a melting temperature higher than 427°C (800°F). See soft soldering.

hardware 1. Physical equipment, as opposed to programs, procedures, rules and associated documentation. Contrast with software. **2.** Parts made of metal such as fasteners, hinges etc.

hardware buffer A register or set of registers used to store information temporarily, usually to act as a transition medium between a fast and a slow device.

hardware priority interrupt See priority interrupt.

hard water Water which contains calcium or magnesium in amounts which require an excessive amount of soap to form a lather.

hardwire (telemetry) Describes a system of communication or information transmission using electric wire from point to point instead of electronic or wireless transmission.

hardwired Electrical devices interconnected through physical wiring.

hardwired logic A group of solid state logic modules mounted on one or more circuit boards and interconnected by electrical wiring. The logic control functions are determined by the way in which the modules are interconnected. Hardwired logic is essentially unalterable.

hardwired numerical control A numerical control system wherein the response to data input, data handling sequence, and control functions is determined by the fixed and committed circuit interconnections of discrete decision elements and storage devices.

hard-wired programmed control Programmed control of which the program is given by the type of functional units included and their interconnections.

harmonic A sinusoidal component of a periodic wave or quantity having a frequency that is an integral multiple of the fundamental frequency. For example, a component, the frequency of which is twice the fundamental frequency is called a second harmonic.

harmonic analyzer A mechanical device for measuring the amplitude and phase of the various harmonic components of a period function from its graph.

harmonic content (electrical transducers) The distortion in a transducer's sinusoidal output, in the form of harmonics other than the fundamental component. In specifications it is usually expressed as a percentage of rms output.

harmonic content of an ac power supply Harmonic content is defined as the ratio expressed in percentage of the square root of the sum of the squares of the harmonic voltages to the fundamental power supply frequency voltage (r.m.s.). Only voltages which are true harmonics (integral multiples of nominal frequency) less than ten times nominal frequency are considered. For further details see IEC publication 654-2, Part 2.

harmonic distortion (data transmission) Nonlinear distortion of a system or transducer characterized by the appearance in the output of harmonics other than the fundamental component when the input

wave is sinusoidal. Note: Subharmonic distortion may also occur.

(total) harmonic distortion The ratio of the r.m.s. value of the harmonic content of the r.m.s. value of the alternating quantity.

harmonic response (fluid power systems) Changes, under steady state conditions, in the output variable which are caused by a sinusoidal input variable.

harmonic series A series in which each component has a frequency that is an integral multiple of a fundamental frequency.

harmonic-wave analyzer See harmonic analyzer.

HART Highway Addressable Remote Terminal. An open system communication protocol developed by Rosemount Inc.

Hartley information unit In information theory, a unit of logarithmic measurement of the decision content of a set of 10 mutually exclusive events, expressed as the logarithm to the base 10; for example, the decision content of an eight-character set equals $\log 8$, or 0.903 Hartley.

Hartley oscillator An oscillator circuit in which the coil of the resonant circuit is tapped.

hash 1. Electrical noise generated within a receiver by a vibrator or a mercury-vapor rectifier. **2.** A completely random interfering signal usually caused by arcing and occasionally by natural environmental disturbances.

hash addressing (hashing) A calculation of the approximate address of a record in a file by some semiempirical function (related to address calculation access).

hash table search A search in which the storage location of a desired data element is derived from a hash table, and an appropriate procedure is followed in case of an address collision.

hash total The result obtained by applying an algorithm to a set of heterogeneous data for checking purposes. Example: A summation obtained by treating items of data as numbers.

hastelloy B An alloy with 60% Ni, 30% Mo as major alloying elements. ASTM specification A494-N-12M-1. Trademark, Union Carbide Stellite Co.

hastelloy C An alloy with 50% Ni, 16% Cr, 16% Mo as major alloying elements. ASTM specification A494-CW-12M-1. Trademark, Union Carbide Stellite Co.

hat To arrange a fixed number of symbols or groups of symbols in a random sequence, as if they had been drawn from a hat.

Hay bridge A four-arm, alternating current bridge used for measuring inductance in terms of capacitance, resistance and frequency.

Hayes A command language for modem.

hazard and operability studies, HAZOP A form of failure mode and effects analysis (FMEA) which has been developed for the chemical industries. The analyst studies the instrumented flow diagram (sometimes called the piping and instrument line diagram) and considers the effect on the plant of deviations in the normal parameters of the substances contained by every pipe and vessel. The analyst uses guide words to ensure that every possible deviation is considered. Examples of guide words are: high flow, low flow, no flow, reverse flow, high temperature, low temperature, high pressure, low pressure. The effects of each of these deviations are considered in each phase of operation including maintenance, commissioning, testing, start-up, shutdown and failure of services.

hazardous area An area in which explosive gas/air mixtures are, or may be expected to be, present in

quantities such as to require special precautions for the construction and use of electrical apparatus.

hazardous area classification A classification system classifying and defining the hazardous areas in a plant in accordance with the nature of the hazard and the degree of hazard. Refer to national and/or international standards for details.

hazardous live part A part which is capable of rendering an electric shock or electric burn under normal or fault conditions.

Hazen number A number used to indicate the color of water.

HAZOP See hazard and operability studies.

HCL Chemical formula for hydrochloric acid.

HDLC High Level Data Link Control. **1.** A packet transmission protocol developed by ISO derived from IBM's Synchronous Data Link Control (SDLC). **2.** A CCITT standard data-communication line control.

HD or HDX See half-duplex.

He Chemical symbol for helium.

head 1. Height of a column or body of fluid above a datum expressed in linear terms (often used to express gage pressure). **2.** A device that reads, writes, or erases data on a storage medium.

head alignment Positioning the record-playback head on a tape recorder so that its gap is perpendicular to the tape.

head box Pertaining to pulp and paper manufacturing, the chamber from which the stock is caused to flow at the desired speed and under constant pressure onto the wire with a uniform distribution over the whole machine deckle.

head crash An accidental contact of a magnetic head with the surface of a rotating data medium.

header 1. Data (usually for identification) placed at the top of a page. **2.** The part of a message which contains the data necessary to guide the message to its destination(s). **3.** A large diameter pipe into which a number of smaller pipes are perpendicularly welded or screwed; a collection point for oil or gas gathering lines. See manifold.

header card A card containing information about the data in other cards that follow.

header label (HDR), beginning-of-file label An internal label that identifies a file, marks its location, and contains data for use in file control.

head gap 1. The space between the reading or recording head and the recording medium, such as tape, drum or disk. **2.** The space or gap intentionally inserted into the magnetic circuit of the head in order to force or direct the recording flux into the recording medium.

heading In ASCII and communications, a sequence of characters preceded by the start of heading character used as a machine sensible address or routing information.

head loss Pressure loss in terms of a length parameter such as inches of water or millimeters of mercury.

head over (on) the weir Elevation of the water above the lowest point of the crest, measured at a point upstream. The points of measurement depend on the type of weir used. Pertains to liquid flow measurement in open channels.

head pressure Expression of pressure in terms of the height of fluid.

heat Energy that flows between bodies because of a difference in temperature; same as thermal energy.

heat balance An accounting of the distribution of the heat input and output.

heat content The amount of heat per unit mass that can be released when a substance undergoes a drop in temperature, a change in state or a chemical reaction.

heated and/or cooled enclosed location (class B, IEC 654-1) A location where only air temperature is controlled within specified limits.

heated lithium chloride dew point sensor Two parallel wires are wound on a lithium chloride impregnated sleeve that covers a hollow tube. The two wires are not connected, but current flows from one to the other through the lithium chloride coating. The resistance of the lithium chloride varies with its water vapor until it reaches equilibrium with its surroundings. At equilibrium, the temperature of the lithium chloride is a measure of ambient dew point.

heater (petroleum industry) 1. An installation used to heat the stream from high-pressure gas and condensate wells (especially in winter) to prevent the formation of hydrates, a residue that interferes with the operation of the separator. 2. A refinery furnace.

heater treater See emulsion treater.

heat exchanger Device which lower, maintain or raise the temperature of the working medium by heat exchange with another fluid.

heat flux A difference in voltage will cause electron flow, called current. Similarly, a difference in temperature will cause heat to flow, and the flow is called heat flux. The two major categories of heat flux transducers are calorimeters and radiometers.

heating (heat treatment) Application of heat accompanied by a rise in temperature; see holding.

heating furnaces (in steel production) A heating furnace is utilized to rise the temperature of steel to prepare it for hot working shaping. Heating furnaces may be divided into two general classes. 1. Soaking-pit furnaces. 2. Reheating furnaces.

heatless regeneration Air, previously dried at pressure, is expanded to atmospheric pressure and allowed to flow through the saturated compound to drive off collected moisture.

heat of adsorption This process is used in the thermal hygrometer, in which the heat evolved in the adsorption and desorption of moisture on a desiccant material is used as a measure of humidity. The adsorption and desorption processes release and absorb heat, respectively, and the temperature change is indicative of the moisture content of the sample. Note: Adsorption is the adherence of the molecules of a fluid to the surface of another substance.

heat release The total quantity of thermal energy above a fixed datum introduced into a furnace by the fuel, considered to be the product of the hourly fuel rate and its high heat value, expressed in Btu per hour per cubic foot of furnace volume.

heat setting (textile term) The process of heating a fabric containing fibers under tension above the highest expected temperature of its life in order to give dimensional stability and crease and wrinkle resistance.

heat sink 1. An agent or condition that dissipates heat – from the earth, from a process, or from a heat exchanger. 2. Any device, usually a static device, used primarily to absorb heat and thereby protect another component from damage due to excessive heat.

heat tape An electrical heating element made in the form of an insulated wire or tape used as a tracer line to provide heat to a pipeline or instrument piping. The heat tape is held in direct contact with the piping by a covering of insulation.

heat tracing The paralleling of instrumentation, product, or heavy crude oil lines with small-diameter

steam piping or electrical heat tape to keep the lines from freezing or to warm the product or instrument fluid sufficiently to keep them flowing freely. Heat tracing lines, whether steam or electrical tape, are attached parallel to the host piping and both are covered with insulation.

heat-treating furnaces Heat-treating furnaces are grouped into either batch or continuous furnaces. There are many different types in each group. The most common heat treatments performed in furnaces are annealing, normalizing, spheroidizing, hardening, tempering, carburizing and stress relieving. The five general types of batch furnaces are: Box furnaces, bell-type furnaces, pit furnaces, salt bath or lead-bath furnaces. The continuous furnaces may be classified according to the way the material is moved, such as the rotary hearth, the roller-hearth, the pusher, the conveyer, the walking-beam, the tunnel, the continuous-strand and the monorail types.

heat treatment Application of a combination of heating, holding and quenching (or cooling, holding and heating) to a solid material below its melting point in order to affect the properties of the material in the manner desired. Heating to enable hot working or surface treatment is not considered as heat treatment.

heat treatment (of sludge), thermal conditioning Heating of sludge, often under pressure, to condition it so that it is more readily dewatered by a static or dynamic dewatering process.

heavy contamination An environment in which there is a high probability that corrosive attack will occur. These harsh levels should prompt further evaluation resulting in environmental controls or specially designed and packaged equipment. For examples see IEC publication 654-4 operating conditions for industrial-process measurement and control equipment, Part 4: Corrosive and erosive influences.

heavy crude oil Crude oil of 20° API gravity or less.

heavy ends In refinery parlance, heavy ends are the heavier fraction of refined oil-fuel oil, lubes, paraffin and asphalt-remaining after the lighter fractions have been distilled off. See light ends.

heavy fraction The final products retrieved by distilling crude oil.

heavy fuel oils A residue of crude oil refining processes. The product remaining after the lighter fractions – gasoline, kerosene, lubricating oils, wax and distillate fuels – have been extracted from the crude; residual fuel oil.

heavy hydrogen Another term for deuterium or tritium.

heavy-media separation (for iron-ore concentration) Heavy-media separation processes operate on the "sink-and-float" principle. When a mixture of particles of two minerals of different specific gravities is placed in a fluid having a specific gravity intermediate between the specific gravities of the two minerals, the less dense mineral will float and the more dense will sink.

heavy oil A viscous fraction of petroleum or coal-tar oil having a high boiling point.

heavy water (deuterium) A liquid compound having two atoms of each hydrogen and oxygen. Used as a heat exchange fluid in nuclear reactor systems for better heat transfer than common water.

hectare A metric unit of land measurement equal to 10,000 square meters.

hecto A prefix meaning 100.

hectometric wave An electromagnetic wave between the wavelength limits of 100 and 1000 meters,

corresponding to the frequency range 300 kHz to 3 MHz.

height of weir The height from the upstream bed to the lowest point of the crest. Pertains to liquid flow measurement in open channels.

helical Spiral-shaped.

helix pressure gages The pressure sensing element consists of a tube which has been flattened on both sides and then formed into a helix. When the pressure being measured is admitted to the inside of the tube, the helix tends to uncoil.

hematite Hematite is one of the most important iron minerals.

HEM-wave See hybrid electromagnetic wave.

Henry, H The inductance of a closed circuit in which an electromotive force of one volt is produced when the electric current in the circuit varies uniformly at a rate of one ampere per second. Henry is a SI unit.

heptane A liquid hydrocarbon of the paraffin series. Although heptane is a liquid at ordinary atmospheric conditions, it is sometimes present in small amounts in natural gas.

hermetically sealed enclosure (Ex h) An enclosure into which no gas, vapor or liquid can penetrate from the outside and usually filled with an inert gas or air.

hermetic motor A stator and rotor without shaft, end shields, or bearings for installation in refrigeration compressors of the hermetically sealed type.

hermetic refrigerant motor – compressor A combination consisting of a compressor and motor, both of which are enclosed in the same housing, with no external shaft or shaft seals, the motor operating in the refrigerant.

hertz A generalized expression referring to all radio waves or oscillations of electricity in a conductor producing electromagnetic radiation. Named after H. Hertz a German physicist.

Hertz effect The ionization and spark emission due to exposure to ultraviolet radiation.

hertz, Hz Unit for measurement of frequency (SI unit). Do not use “cycles per second” or “cycles” for frequency.

heterodyne Also called beat. To mix two frequencies together in a nonlinear component in order to produce two other frequencies equal to the sum and difference of the first two.

heterodyne conversion transducer A transducer in which output frequency is the sum and difference of the input frequency and the local oscillator frequency.

heterodyne principle See heterodyne.

heterodyning Mixing two signals in a detector to obtain the beat frequency. See also heterodyne.

heterogeneity A state or condition of being unlike in nature, kind or degree.

heterogeneous Composed of different materials (opposite of homogeneous).

heterogeneous computer network A computer network in which computers have dissimilar architecture but nevertheless are able to communicate.

heterotrophic bacteria Bacteria which require organic matter as a source of energy, in contrast to autotrophic bacteria.

heuristic A process that may help in the solution of a problem, but that does not guarantee the best solution, or any solution.

heuristic method Any exploratory method of solving problems in which an evaluation is made of the progress towards an acceptable final result using a se-

ries of approximate results, for example by a process of guided trial and error.

heuristic program A program by which a computer tries each of several methods of solving a problem and judges after each trial whether the result is closer to fulfilling the solution criteria than before.

heuristic rule An ad hoc-rule written to formalize the knowledge and experience an expert uses to solve a problem.

heuristic search Problem solving based on experience and judgement, used to improve the efficiency of a search in order to obtain acceptable results without guarantee of success.

HEVAC Heating Ventilating and Air Conditioning Manufacturer's Association.

Hewlett-Packard Interface Bus (HB-IB) The Hewlett-Packard implementation of the IEEE-488 bus used to interface multiple devices by a well-defined hardware protocol. See GPIB.

hex The hexadecimal numbering system. Since 16 is a power of 2, binary numbers are easily converted into hex, so machine-language computer programs are often written in hex to save space. For example, binary 11010110 (decimal 214) could be written in hex as D6.

hexadecimal, sexadecimal 1. Characterized by a selection, choice or condition that has sixteen possible different values or states. **2.** Of a fixed radix numeration system, having a radix of sixteen.

hexadecimal display A solid-state display capable of exhibiting numbers 0 through 9 and alphabet characters A through F.

hexane A hydrocarbon fraction of the paraffin series. At ordinary atmospheric conditions hexane is a liquid but often occurs in small amounts of natural gas.

hexode A vacuum tube containing six electrodes: an anode; a cathode; a control electrode; and three additional electrodes, usually grids.

HF An abbreviation for high frequency, i.e. frequencies between 3 and 30 megahertz.

Hf Chemical symbol for hafnium.

Hg Chemical symbol for mercury.

HIB process The HIB (for high iron briquette) process is a continuous direct-reduction process developed by United States Steel Corporation.

HIC Abbreviation for hybrid integrated circuit.

hidden lines (computer graphics) A line segment that represents an edge obscured from view in a two-dimensional projection of a three dimensional object.

hierarchical computer network A computer network in which the control functions are organized in a hierarchical manner and may be distributed among data processing stations.

hierarchical configuration (building management) A system in which the processors and controllers are arranged in levels or tiers, with each tier having a definite rank or order in accessing and processing data. In a building management system, a typical arrangement includes, in descending order, management-level processors, operations-level processors, system-level controllers, and zone-level controllers.

hierarchical control Control of a multivariable system performed in subsystems, which generally are assigned to different control levels.

hierarchical decomposition A method of designing a system by breaking it down into its components through a series of top-down refinements.

hierarchical distributed control A hierarchy of computer systems in which one computer acting as supervisor controls several lower level computers.

hierarchical planning Planning that refines the vague parts of a plan into more detailed subplans by generating a hierarchical representation of it.

hierarchy Specified rank or order of items, thus, a series of items classified by rank order.

hierarchy (software) A structure whose components are ranked into levels of subordination according to a specific set of rules.

high One of two distinct states in digital logic elements. The two states are called true and false, high and low, on and off or "1" and "0". In computers they are represented by two different voltage levels.

high-alloy steel An iron-carbon alloy containing at least 5% by weight of additional elements.

high brass A commercial wrought brass containing 65% copper and 35% zinc.

high-carbon steel A plain carbon steel with a carbon content of at least 0,6%.

high consistency vortex cleaner A vortex cleaner designed for the treatment of fiber suspensions which have a high pulp concentration and intended primarily for the removal of coarse or heavy impurities.

higher actual measuring range value The highest value of the measured variable to which a device is actually adjusted to measure within a specified accuracy.

higher order language (software) A programming language that usually includes features such as nested expressions, user defined data types, and parameter passing not normally found in lower order languages, that does not reflect the structure of any one given computer or class of computers, and that can be used to write machine independent source programs. Contrast with machine language, assembly language.

high frequency Any frequency above the audible range; i.e., above 15 kHz, but especially those used for radio communication.

high frequency band The band of frequencies extending from 3 to 30 MHz.

high-frequency furnace (corelesstype induction furnace) An induction furnace in which the heat is generated within the charge, or within the walls of the containing crucible, or in both, by currents induced by high-frequency flux from surrounding solenoid.

high-frequency heating See electronic heating.

high-frequency resistance Also called rf or ac resistance. The total resistance offered by a device in a high-frequency ac circuit. This includes the dc and all other resistances due to the effects of the alternating current.

high-frequency transformer One designed to operate at high frequencies, taking into account self-capacitance, usually with bandpass response.

high-gain amplifier (analog computers) A special voltage amplifier in analog computers having the characteristic of arbitrary feedback. Same as dc amplifier.

high heat washing Washing of cooked chips in continuous digester at a temperature higher than 100°C.

high-K ceramic A ceramic dielectric composition which exhibits large dielectric constants and nonlinear voltage and temperature response characteristics.

high level In BASIC Systems, a term that is used with equipment intended for 4–20 mA or 1–5 volt analog signals. Digital input sense power can be up to 125 V. Refers to Honeywell TDC 3 000 control systems.

high-level language A programming language that does not reflect the structure of any one given compu-

ter or that of any one given class of computers. Synonymous with higher order language.

high level process interface unit, HLIPIU An intelligent device that is often located at a remote site for processing high level analog and digital I/O signals. Refers to Honeywell TDC 3 000 control systems.

high limiting control A type of control the action of which only takes effect if a given process variable exceeds a predetermined high limit.

high-low action Two-step action in which both steps have the same sign.

high-low bias test, high-low bias check Same as marginal check.

high-low signal selector A device which automatically selects as its output either the highest or lowest input signal.

high noise immunity logic, HNIL A special type of logic designed specifically to provide very high resistance to electrical noise. Sometimes called HTL (high threshold logic).

high order Pertaining to the weight or significance assigned to the digits of a number, e.g. in the number 123456, the highest order digit is 1, the lowest order digit is 6. One may refer to the three higher-order bits of a binary word, as another example.

highpass (lowpass) filter Freely passes signals of all frequencies above (or below) a reference value, known as the cutoff frequency.

high-pass filter A filter passing frequency components above some limited frequency and rejecting components below that limit.

high performance servoactuators A variation of the electro-hydraulic actuator has been developed by a number of companies, for service where extremely high pressures and pressure drops within a valve are encountered and which may be accompanied by high shut-off or opening speed requirements, extremely swift valve stem movement requirements, or extremely high frequency response characteristics. Their chief disadvantage is that they do require a very powerful external hydraulic source. The market is chiefly in the aerospace field.

high power silicon rectifiers A group of rectifiers with continuous ratings exceeding 50 average amperes per section in a single-phase, half-wave circuit.

high resolution Descriptive of a camera or monitor capable of displaying a great number of scanning lines (1000–2000) which produces a picture that is very detailed, defined and sharp.

high speed carry In parallel addition, any procedure for speeding up the processing of carries. Example: Standing-on-nines carry.

high-speed data rate Data transmission at a rate between 2401 bauds and 500 kilobauds.

high-speed dc circuit breaker A device which starts to reduce the current in the main circuit in 0,01 seconds or less, after the occurrence of the dc overcurrent or the excessive rate of current rise.

high-speed excitation system An excitation system capable of changing its voltage rapidly in response to a change in the excited generator field circuit.

high-speed printer A signal-responsive alpha/numeric printer capable of printing computer output signals at rates on the order of 300 characters per second or greater.

high-speed reader A reading device that can be connected to a computer so as to operate on-line without seriously slowing the operation of the computer.

high-speed storage See rapid storage.

high-strength alloy A metallic material having a strength considerably above that of most other alloys of the same type or classification.

high-temperature alloy A metallic material suitable for use at 500°C (930°F) or above. This classification includes iron-base, nickel-base and cobalt-base superalloys, and the refractory metals and their alloys.

high temperature dyeing Usually with reference to batch piece dyeing; where the vessel is pressurized in order to attain temperatures in excess of 130°C or 260°F.

high-threshold logic (HTL) **1.** Logic with a high noise margin, used primarily in industrial application. **2.** Logic that allows for higher degree of inherent electrical noise immunity.

high velocity fluid impingement erosion (In control valves) Extremely high velocity fluid jets sometimes occur in the flow path, causing the fluid to turn abruptly, bouncing off one surface to impinge and erode the adjacent part. Average fluid velocity through the seat-to-plug flow area must exceed several hundred feet per second for impingement erosion to occur. Boiler feedwater pump bypass valves are a typical example of high velocity erosion. See further ISA handbook of control valves regarding relative erosion resistance of various plug types and body combinations.

high-voltage probe A probe with a high internal resistance, for measuring extremely high voltages. It is used with a voltmeter having an internal resistance of 20,000 ohms per volt or more.

hiway In a process computer system, the means for interconnection between the computer system and the process interface system. Note: A bus may be used as a hiway.

hiway status display In Honeywell TDC 3 000 control systems, a display describing the operation condition of the boxes connected to the Data Hiway. Information shown on the display indicates the hiway address, type of equipment, and status for each box on the hiway.

hipot tester A high-potential test instrument that applies a high-voltage source to the insulating material of a device or cable to determine the ability of the unit to withstand the voltage without breakdown.

histogram Represents the measurements or observations constituting a set of data on a horizontal scale and the class frequencies on a vertical scale. The graph of the distribution is then constructed by drawing rectangles, the basis of which are determined by the corresponding class frequencies.

historical trend (multipoint graphics) Graphic printout of historical trend data for process variables associated with a particular group (Honeywell TDC 3000 control systems).

history module, HM In Honeywell TDC 3000 control systems, a module on the Local Control Network that provides mass storage for process history, graphic display abstracts, journals, configuration information, module personality images, and other software.

hit-on-the fly printer A printer in which the paper and/or the printing mechanism are in constant motion so that starts and stops are not needed.

hit ratio The percentage of data references found in high-speed memory; e.g., a cache memory.

hiway box In Honeywell TDC 3000 control systems, any of the unique devices interfacing with the Data Hiway.

hiway exerciser In Honeywell TDC 3000 control systems, a diagnostic device that troubleshoots the Data Hiway and the hiway boxes.

hiway gateway, HG In Honeywell TDC 3000 control systems, a module on the Local Control Network that connects the data highway to the Local Control Network, and translates between their communication protocols.

hiway traffic director, HTD In Honeywell TDC 3000 control systems, a unit that directs communication on the Data Hiway to avoid message conflicts among devices. HTD functions may be performed by the Hiway Gateway.

HMF Her Majesty's Factory Inspectorate.

HNDT See holographic nondestructive testing.

H network A network composed of five branches, two connected in series between an input terminal and output terminal, two connected in series between another input terminal and output terminal, and the fifth connected from the junction point of the first two branches to the junction point of the second two branches.

Ho Chemical symbol for holmium.

Hoganas process The E. Sieurin, or Hoganas, process was developed at Hoganas, Sweden. Alternate layers of fine-grained high-grade iron ore, dry coke breeze, and limestone are charged into cylindrical ceramic containers called saggars. The saggars are then heated to a maximum temperature of 1260°C (2300°F) in a furnace of the tunnel-kiln type used for burning brick. The containers are cooled in the furnace, removed, and the reduced iron is separated and cleaned. Most of the sponge iron produced is sold as iron powder.

hold 1. The function of retaining information in one storage device after transferring it to another device.

2. In a digital computer untimed delay in the program, terminated by an operator or interlock action. **3.** For industrial robots a state in which the robot operation is interrupted but can be resumed without special procedure.

hold-closed mechanism A device that holds the contacts in the closed position following the completion of a predetermined sequence of operations as long as current flows in excess of a predetermined value.

hold-closed operation An opening followed by the number of closing and opening operations that the hold-closed mechanism will permit before holding the contacts in the closed position.

hold electrode In a mercury switch, the electrode that remains in contact with the mercury pool while the circuit is being closed or opened.

holding (heat treatment) Application or removal of heat as compensation for heat loss or heat gain; compare heating.

holding action Type of sampling action in which the output variable is held constant during the time intervals between samples (zero-order hold) or varied by a definite law in accordance with preceding samples of the input variable (high-order hold).

holding circuit Also called a locking circuit. An alternate operating circuit which, when completed, maintains sufficient current in a relay winding to keep the relay energized after the initial current has ceased.

holding current 1. That value of average forward current (with the gate open) below which a silicon controlled rectifier returns to the forward blocking state after having been in forward conduction. **2.** The minimum current that must pass through a device such as a silicon controlled rectifier, thyatron, neon glow tube etc., to maintain it in a conducting condition. **3.** The minimum current which will hold a relay in its operated position.

holding element Transfer element in which the output variable is held constant during the time intervals between sampling instants of the input variable. Note: The time variation of the output variable is a step-wise function.

holding register The register, in a double-buffered digital-to-analog converter (DAC) or a digital-to-analog multiplier (DAM), that holds the next digital value to be transferred into the dynamic register.

holding temperature Temperature at which a material receiving heat treatment is maintained for a protracted period to allow for a proposed transformation or for stabilization of composition, stress etc.; see soaking time. The term holding temperature is only used in a generic sense. In everyday speech it is more usual to employ special terms for various types of holding temperature, thus austenitizing temperature, tempering temperature, hardening temperature, annealing temperature etc.

holding time (data transmission) The length of time a communication channel is in use for each transmission. Includes both message time and operating time.

hold instruction A computer instruction which causes data called from storage to be retained in storage after it is called out and transferred to its new location.

hold mode In integrators or other charge-storage circuits, a condition or time interval in which input(s) are removed and the circuit is commanded (or expected) to maintain a constant output.

hold time In any process cycle, an interval during which no changes are imposed on the system. Hold time is usually used to allow a chemical or metallurgical reaction to reach completion, or to allow a physical or chemical condition to stabilize before proceeding to the next step.

hole (semiconductor) A vacancy in the electronic band structure of a semiconductor which acts like a positive electronic charge with a positive mass.

hollander Machine for the treatment of fibrous material in water, consisting of a trough in which a fiber suspension is circulated and mixed by the action of a rotating beater roll fitted with driving and beating organs. A hollander normally works batchwise.

Holmes-Stretford process (coke-oven plants) See under wet oxidation processes.

holocellulose A product which essentially comprise the total content of polysaccharides (cellulose and hemicellulose) in wood. Holocellulose is prepared by the selective removal of extractive substances and lignin.

holographic nondestructive testing, HNDT The application of coherent wavefront techniques to the determination of the physical state of a system without appreciably altering that state.

home In personal computers, a key which places the cursor at the upper left-hand position on the screen or the upper left-hand position of the entire file.

home heating oil A light gas oil that is similar to diesel fuel in gravity, viscosity and other properties.

home position (numerical control) A fixed point along an axis referenced with respect to a machine datum. Typically used for tool change and pallet change.

homing Location the source of a transmitted signal or data item.

homing relay A stepping relay that returns to a specified starting position prior to each operating cycle.

homogeneity The state or condition of being similar in nature, kind or degree.

homogeneous Of the same nature (the opposite of heterogeneous).

homogeneous computer network A computer network in which computers have a similar or the same architecture.

homogenization (separation terminology) Splitting of fat globules in milk or cream to avoid cream rising.

homogenizing Heat treatment for the purpose of redressing segregation by diffusion.

homopolar Electrically symmetrical i.e., having equally distributed charges.

homostasis The dynamic condition of a system wherein the input and output are balanced precisely, thus presenting an appearance of no change, hence a steady state.

hook Hidden capacitance between conductors on a printed-wiring board.

Hookean behavior A condition in liquid expansion when the fractional change in volume is proportional to the hydrostatic stress, if under such stress it evidences ideal elastic behavior.

hookup 1. To make a pipeline connection to a tank, pump or pipeline. The arrangement of pipes, nipples, flanges and valves in such a connection. **2.** Method of connection between the various units in a circuit.

hookup wire 1. The wire used in coupling circuits together. **2.** Wire used for point-to-point connection within electronic equipment, usually carrying low voltages and currents.

hopper An area in a temporary memory unit, such as call store, used to record a list of items for subsequent communications with processing programs or input-output programs sent to central control.

horizontal automatic frequency control, AFC The automatic frequency control in the horizontal sync circuit of a cathode-ray tube (CRT).

horizontal boiler A water tube boiler in which the main bank of tubes are straight and on a slope of 5 to 15 degrees from the horizontal.

horizontal continuous casting process (in steel production) An alternative to the vertical continuous casting process.

horizontal-convergence control In a color television receiver, the control which adjusts the amplitude of the horizontal dynamic convergence voltage.

horizontal definition See horizontal resolution.

horizontal display The width, in inches, of the display area of the cathode-ray tube.

horizontal drive control In an electromagnetically deflected television receiver, the control which adjusts the ratio of the pulse amplitude to the linear portion of the scanning-current wave.

horizontal dynamic convergence Convergence of the three electron beams in a color picture tube at the aperture mask during scanning of a horizontal line.

horizontal hold control A synchronization control which varies the free-running frequency of the horizontal deflection oscillator so it will be in step with the scanning frequency at the transmitter.

horizontal lock The circuit that maintains horizontal synchronization in a television receiver.

horizontal oscillator The relaxation oscillator in the cathode-ray tube (CRT).

horizontal output stage The power amplifier stage in the cathode-ray-tube (CRT) receivers horizontal sync circuits.

horizontal output transformer See flyback transformer.

horizontal raster count The number of coordinate positions addressable across the width of the cathode-ray tube.

horizontal repetition rate Also called horizontal scanning frequency. The number of horizontal lines per second (15,750 hertz in the United States).

horizontal resolution Also called horizontal definition. The number of individual picture elements that can be distinguished in a horizontal scanning line.

horizontal return-tubular boiler A fire-tube boiler consisting of a cylindrical shell, with tubes inside the shell attached to both end closures. The products of combustion pass under the bottom half of the shell and return through the tubes.

horizontal ring-induction furnace A furnace for melting metal. It comprises an open trough or melting channel, a primary inductor winding, and a magnetic core which links the melting channel to the primary winding.

horizontal-scanning frequency See horizontal repetition rate.

horizontal sync signal The signal which instructs the television set to return its beam to the left hand side of the screen and begin a new scan line.

horsepower, HP A unit of power, or the capacity of a mechanism to do work. It is the equivalent of raising 33,000 pounds one foot in one minute. One horsepower equals 746 watts.

hortonsphere A spherical tank for the storage, under pressure, of volatile petroleum products, e.g. gasoline and LP-gases; also Hortospheroid, a flattened spherical tank, somewhat resembling a tangerine in shape.

host computer 1. A computer which provides compilation, assembly, or systems initialization for another computer. 2. In a computer network, a computer that provides end users with services such as computation and database access and that may perform network control functions.

host node A node at which a host computer is located.

hot 1. Connected, alive, energized; pertains to a terminal or any ungrounded conductor. 2. Excited to a relatively high energy level.

hot acid system An installation for strengthening and heating of sulphite cooking acid with hot gas and steam from the pressure control relief or final relief of a sulphite pulp digester.

hot (stock) refining Defibrillation at an elevated temperature (above 90°C) of a fibrous material which has been softened in a cooking process, e.g. semichemical pulp.

hot-blast valve (in blast furnaces) Between the stove and the hot-blast main is a water-cooled hot blast valve that prevents the high pressure air in the main from entering the stove when the stove is being heated. Most of the hot-blast valves are of the gate type or of the mushroom type.

hot dip galvanizing A process for rust-proofing iron and steel products by the application of a coating of metallic zinc.

hot dipping A process for coating parts by briefly immersing them in a molten metal bath, then withdrawing them and allowing the metal to solidify and cool.

hot line Communications channel between two points available for immediate use without patching or switching.

hot restart (programmable controller systems) Restart after power failure which occurs within the process dependent maximum time allowed for the programmable controller system to recover as if there had been no power failure. All I/O-information and other dynamic data as well as the application program context are restored or unchanged. Restart capability

requires a separately powered real time clock or timer to determine elapsed time since the power failure was detected and a user accessible means to program the process dependent maximum time allowed.

hot rolling Hot working a metal through dies or rolls to obtain a desired shape.

hot shortness, red shortness Pertaining to heat treatment, condition caused by embrittlement in the red-hot state.

hot wire flow sensor A device which measure the velocity of gas flow by the resistance change of an electrically-heated wire filament in the gas stream. The wire filament resistance change is due to the cooling effect of the gas flow.

hot wire instrument An electrothermic instrument operated by expansion of a wire heated by the current it is carrying.

hot-wire relay A form of linear-expansion time – delay relay in which the longitudinal expansion of a wire, when heated, provides the mechanical motion to open or close contacts. The time required to heat the wire constitutes the delay.

hot wires In an electrical system those wires which carry the live current through the electrical system.

hot working Deforming metal plastically at a temperature above the recrystallization temperature.

hourly average display A display providing tabulated historical data of 10 1-hour process variable averages for each point in a group display where the corresponding Basic Controllers have the memory option. Refers to Honeywell TDC 3000 control systems.

housekeeping Pertaining to administrative or overhead operations or functions which are necessary in order to maintain control of a situation, e.g., for a computer program, housekeeping involves the setting up of constants and variables or the allocation of memory and peripheral equipment to be used in the program.

HPGL Hewlett Packard Graphic Language.

HSLA steels High Strength Low Alloy steels.

HTL See high threshold logic.

hue Often used synonymously with the term “color” but does not include gray.

hum Unwanted roughly sinusoidal low frequency deviations around an average measured or supplied value occurring at frequencies related to that of the mains supply. Hum is determined under specific conditions.

human engineering 1. The science and art of developing machines for human use, giving consideration to the abilities, limitations, habits and preferences of the human operator. 2. The study of the behavioral properties of humans in interaction with machines, and of total human-machine systems; the structuring of human-machine systems to enhance system performance.

human error, mistake A human action that produces an unintended result.

human factors The application of psychology and related social sciences to systems involving humans and human behavior.

human factors The field of effort and body of knowledge devoted to the adaption and design of equipment for efficient and advantageous use by people considering physiological, psychological and training factors.

human frequency range The human ear can detect sounds over a range of frequencies; it can hear sounds of different pitch. Although the nominal range is 20–20,000 Hz most people can hear a range smaller than

this (especially at the high frequency range) depending on age, state of health, and so on.

human interface A tool able to intercept, interpret and guide the interaction of the end user with the system.

human intervention Acting of human operator upon the controlling system or the final controlling elements.

human-machine redundancy Extent to which operators should be involved in tasks performed by machines as a check on machine operation.

humanoid Robot form of a person.

human relations skills The ability to communicate, engage in group interaction, and coordinate with others to solve problems.

humic acids That part of humic substances which is soluble in dilute alkaline solution but is precipitated by acidification.

humic substances Amorphous, complex polymeric organic substances produced on decomposition of plant and animal materials in soils and sediments, and which give a characteristic yellow/brown colouration to many surface waters.

humidification Artificially increasing the moisture content of a gas.

humidistat An instrument for measuring and controlling relative humidity.

humidity (absolute humidity) The mass of water vapor present in unit volume of moist air. Note: The humidity can be expressed in several way; whichever way chosen must be specified.

humidity element The part of a hygrometer that senses the amount of water vapor in the atmosphere.

humidity test A corrosion test for comparing relative resistance of specimens to a high humidity environment at constant temperature.

humidity transducer A layer of hygroscopic (moisture-absorbing) substance deposited between two metal electrodes. These electrodes establish electrical contact with the hygroscopic chemical, which serves as a resistance element. Since the chemical coating tends to absorb moisture from the surrounding air, its resistance decreases as the humidity increases. In this manner, humidity variations are converted to resistance variations.

hump, bottom contraction The reduction in the depth of the nappe downstream of a thin-plate weir due to the upward velocity component at the crest. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772.

humus sludge The microbial film which sloughs off from a biological filter and is normally separated in a final settling tank.

hunting An undesirable sustained oscillation of appreciable magnitude. Note: In a linear system, hunting is evidence of operation at or near the stability limit; non-linearities may cause hunting of well-defined amplitude and frequency. See also dither.

hybrid circuit Any circuit made using a combination of the following component manufacturing technologies: Monolithic IC, thin film, thick film and discrete components.

hybrid computer 1. A computer for data processing using both analog representation and discrete representation of data. **2.** A computing system using an analog computer and a digital computer working together.

hybrid control system A control system with mixed digital and analog techniques.

hybrid electromagnetic wave, HEM wave A wave in the electromagnetic spectrum that has both

electric and magnetic field vectors in the direction of propagation.

hybrid integrated circuit, HIC 1. A class of integrated circuits where in the substrate is a passive material such as ceramic and the active chips are attached to its surface. **2.** An integrated circuit combining parts made by a number of techniques, such as diffused monolithic portions, thin-film elements and discrete devices.

hybrid microelectronics The entire body of electronic art which is connected with or applied to the realization of electronic systems using hybrid circuit technology.

hybrid mode (optical communication) A mode possessing components of both electric and magnetic field vectors in the direction of propagation. Note: Such modes correspond to skew (non-meridional) rays.

hydration reaction A reaction (metamorphic) that results in the transfer of water from the fluid state into the structure of a mineral. See dehydration reaction.

hydraulic The term that pertains to movement or action by water or more commonly to any fluid, especially liquids in motion and doing work.

hydraulic actuator A fluid powered device which converts the energy of an incompressible fluid into motion.

hydraulic amplifier (fluid power systems) Fluid device which acts as an amplifier. Hydraulic amplifiers may utilize sliding spools, flapper-nozzles, jet pipes, etc.

hydraulic circuit A fluid-flow circuit that operates somewhat like an electric circuit.

hydraulic control (fluid power systems) Pressure control using liquid in a pilot control line.

hydraulic engineering A branch of civil engineering that deals with the design and construction of such structures as dams and other flood-control devices, sewers and sewage-disposal plants, water-driven electric power stations, and water treatment and distribution systems.

hydraulic feedback Feedback using a hydraulic circuit.

hydraulic filter Device the primary function of which is the retention of insoluble contaminants from a fluid.

hydraulic fluids Fluids suitable for use in hydraulic systems. They are produced from either petroleum products or aqueous or organic materials.

hydraulic head box In pulp and paper manufacturing, a closed head box with no air cushion.

hydraulic jump The sudden change of flow from super-critical flow to sub-critical flow. See figure in ISO publication 772-1978 or BS 3680 Part 1: 1983.

hydraulic lock (fluid power systems) Situation in which a quantity of trapped fluid prevents movements of a piston.

hydraulic operation Power operation by movement of a liquid under pressure.

hydraulic radius The quotient of the wetted cross-sectional area and the wetted perimeter. Note: For a circular conduit running full, the hydraulic radius is half the radius of the conduit. Pertains to liquid flow measurement in closed conduits.

hydraulics Science and technology which deals with the laws governing liquid flow and pressure.

hydraulic servo-valve (fluid power systems) Valve which modulates hydraulic output.

hydraulic silencer Device to reduce liquid borne noise by attenuation of hydraulic pulsations.

"hydraulic snubber" Device installed on a control valve stem to reduce throttling instability.

hydraulic stepping motor (fluid power systems) Hydraulic motor which follows the commands of a stepped input signal to achieve positional accuracy.

hydraulic systems Hydraulic systems have been used for many decades in industrial and military applications. They find a wide use in machine tools, speed governing systems, and position control systems. The largest range of hydraulic fluids comprises oils with a petroleum base, with or without additives.

hydrocarbons Organic chemical compounds of hydrogen and carbon atoms. There are a vast number of these compounds and they form the basis of all petroleum products. They may exist as gases, liquids, or solids. An example of each is methane, hexane, and asphalt.

hydrocrackate The main product from the hydrocracking process; gasoline, blending components.

hydrocracking A refining process for converting middle-boiling or residual material to high-octane gasoline, reformer charge stock, jet fuel, and/or high-grade fuel oil. Hydrocracking is an efficient, relatively low-temperature process using hydrogen as a catalyst. The process is considered by some refiners as a supplement to the basic catalytic cracking process.

hydrodynamic losses Losses due to motion of the fluid.

hydrodynamic noise In control valves, a flow noise whose major source is cavitation. The noise is caused by the implosion of vapor bubbles that are formed in the cavitation process.

hydrodynamics A branch of science that deals with the cause and effect of regional subsurface migration of fluids.

hydroelectric plant An electric power generating station where the power is produced by generators driven by hydraulic turbines.

hydrogen damage Any of several forms of metal failure caused by dissolved hydrogen, including blistering, internal void formation, and hydrogen-induced delayed cracking.

hydrogen fluoride This compound is a member of the halogen family and reacts like inorganic chloride compounds.

hydrogen ion concentration See pH.

hydrogen sulfide (H₂S) An odorous and noxious compound of sulfur found in "sour gas". See sour gas.

hydrography The applied science concerned with the study and measurement of seas, lakes, rivers and other waters. Note: In some countries, this term is synonymous with physical and chemical oceanography.

hydrological cycle The natural cycle in which water is evaporated from the earth's surface, particularly from the oceans, to the atmosphere and returns by precipitation to the earth. It includes the uptake of water by plants followed by evapotranspiration and release of water as vapor to the atmosphere prior to its precipitation to earth.

hydrology The applied science concerned with the water cycle of precipitation, run-off or infiltration and storage, evaporation and re-precipitation.

hydrolysis The chemical decomposition of a substance in the presence of water.

hydrometer A device based on Archimedes principle, used for determining the relative density of a liquid.

hydrometry The measurement and analysis of the flow of water.

hydropneumatic Referring to a device operated by both liquid and gas power.

hyroscopic Refers to any material that easily absorbs and retains moisture.

hydrostatic column, hydrostatic head The height of a column of liquid; the difference in height between two points in a body of liquid.

hydrostatic pressure The pressure exerted by a column of water or other fluid.

hydrostatics Science and technology which deals with the laws governing the equilibrium condition of liquids and the resulting pressure distribution.

hydrostatic testing Filling a pipeline or tank etc. with water under pressure to test for tensile strength, its ability to hold a certain pressure without rupturing.

hydrous oxides limonite Limonite is the name commonly given to hydrous iron oxides that mineralogically are composed of various mixtures of the minerals goethite or lepidocrocite.

hygro-instability (of paper and board) The tendency to change its dimensions and flatness as a result of moisture and content changes caused by changes in the atmospheric humidity.

hygrometer An instrument for measuring the relative humidity of the atmosphere.

hygrothermograph An instrument that records both temperature and humidity on the same chart.

HYL process A direct reduction shaft furnace process.

hypolimnion (type of water) The water below the thermocline in a stratified body of water.

hypsoneter An instrument that determines elevation above a reference plane (such as sea level) by measuring the boiling point of a liquid and from that measurement finding atmospheric pressure.

hysteresis The property of a device or instrument whereby it gives different output values in relation to its input values depending on the directional sequence in which the input values have been applied.

hysteresis (fluid power systems) 1. Difference in controlled parameters, at the same control setting, when adjusting the quantity upwards and then downwards or vice versa. 2. Difference in the valve input signals required to produce the same valve output during a single cycle of valve input signal when cycled at a rate below that at which dynamic effects are important; it is expressed as a percentage of the rated signal. Maximum hysteresis is normally indicated and is the maximum difference in input signal occurring in a cycle shown as a percentage of rated signal.

hysteresis error The maximum deviation between the two calibration curves of the measured variable as obtained by an upscale going traverse and a downscale going traverse over the full range and subtracting the value of dead band.

hysteresis loop A graphical representation centered around the origin of rectangular coordinates, depicting the two values of magnetic induction for each value of magnetizing force – one when the magnetizing force is increasing, and one when the magnetizing force is decreasing.

hysteresis meter An instrument for determining the hysteresis loss in a ferromagnetic material.

hysteresis motor A synchronous motor without salient poles or direct-current excitation. It is started by the hysteresis losses induced in its secondary by the revolving field.

hysteretic error See hysteresis error.

Hz Symbol for hertz. A unit for frequency. (SI-unit). Do not use "cycles per second" or "cycles" for frequency. See also under hertz.

I

I 1. Symbol for current. **2.** Abbreviation for luminous intensity. **3.** Chemical symbol iodine.

IACS International Annealed Copper Standard. A standard copper conductivity by specifying resistivity and temperature.

IAEA International Atomic Energy Agency.

IAMTCT Institute of Advance Machine Tool and Control Technology.

I/A-series The Foxboro I/A-series systems introduced 1987. In the Intelligent Automation offering, the I/A-Series combines information handling capabilities, and the multivendor interoperability with general-purpose computers and workstations.

IBFO Intermediate Bunker Fuel Oil. Product made from heavy refinery residual oils and cut with a lighter flux stock.

IBG See interblock gap.

IBP See initial boiling point.

IBWM International Bureau of Weights and Measures.

IC memory See integrated circuit memory.

ICO International Commission for Optics.

iconographic model A pictorial representation of a system and the function relations within the system.

ICONS Information Center on Nuclear Standards.

I controller See integral (reset) (I) controller.

ICPS International Conference on the Properties of Steam.

ICRU International Commission on Radiological Units and Measurements.

ICWM International Committee on Weights and Measures.

ideal damper system A system with a linear relationship between the percent open damper position and the percent of full airflow.

ideal inherent equal percentage flow characteristic (control valves) One in which equal increments of relative travel, yield equal percentage increments of the relative flow coefficient. See further IEC publication 534-1.

ideal inherent linear flow characteristic (control valves) One in which equal increments of relative travel, yield equal increments of relative flow coefficient. See further IEC publication 534-1.

idealized system An imaginary system whose ultimately controlled variable has a stipulated relationship to a specified set point. Note: It is a basis for performance standard.

ideal transducer A hypothetical passive transducer which produces the maximum possible output for a given output.

ideal value In process instrumentation, the value of the indication, output or ultimately controlled variable of an idealized device or system. Note: It is assumed that an ideal value can always be defined even though it may be impossible to achieve.

IDEF ICAM DEFinition Language, a systems modeling technique using a specific graphical structure.

identification (of a system) The procedures for deducing a mathematical model representing the static and transient behaviour of a system from its response to a well-defined input signal e.g. a step function, an impulse, or white noise.

identification plate See data plate.

identifier One or more characters used to identify or name a data element and possibly to indicate certain properties of that data element.

identify In a computer, to attach a unique code or code name to a specific unit of information.

identity element, identity gate A gate that performs an identity operation.

identity operation The Boolean operation whose result has the Boolean value 1 and only if all the operands have the same Boolean value. Note: An identity operation on two operands is an equivalence operation.

ideochromatic Having photoelectric properties characteristic of the pure crystal itself and not due to foreign matter.

ideogram, ideographic character In a natural language, a graphic character that represents an object or a concept and associated sound elements. Example: A Chinese ideogram or a Japanese Kanji.

idle character Control characters interchanged by a synchronized transmitter and receiver to maintain synchronization during non-data periods.

idle noise 1. Noise which exists in a communication system when no signals are present. **2.** Unwanted, random electrical energy present in a transmission system under unmodulated conditions.

idle state, free state A non-operating up state during non-required time.

idle time, free time The time interval during which an item is in a free state.

idling current Also called quiescent current. The zero-signal power supply current drawn by a circuit or by a complete amplifier.

IDP 1. See integrated data processing. **2.** Industrial Data processing.

IDPI International Data Processing Institute.

ID synchronization A count contained in one word of a telemetry frame to indicate which subframe is being sampled at any given time.

IEA International Energy Agency.

IEC The International Electrotechnical Commission, an international standards development and certification group in the area of electronics and electrical engineering, including industrial process measurement and control.

IEEE Institution of Electrical Engineers (GB).

IEEE Institute of Electrical and Electronic Engineers (USA). A professional organization of scientists and engineers whose purpose is the advancement of electrical engineering, electronics and allied branches of engineering and science. Also acts as a standardization body.

IEEE-488 bus 1. An interface standard that defines digital data exchange between up to 15 instruments; a bus widely used to connect test instrumentation. Also known as the general purpose interface bus (GPIB). **2.** An industry standard bus that defines a digital interface for programmable instrumentation.

IEEE 802 One of the standards committees working on LAN standards. IEEE 802 has produced standards for CSMA/CD, Token Bus, Token Ring, and Logical Link Control (LLC).

IEEE P1118 A standards committee working on the development of a "Microcontroller Serial Control Bus". This standard is to be technology-based, not application-based and is intended to be suitable for many different application types, including (but not limited to) instrumentation, process control, and RS232-type peripherals.

IEV International Electrotechnical Vocabulary.

I/F Interface.

IFAC International Federation of Automatic Control.

IF-AND-ONLY-IF operation, equivalence operation, IFF The dyadic Boolean operation whose result has the Boolean value 1 if and only if the operands have the same Boolean value. See also table in ISO document 2382/11.

if-then rule, if-then statement (knowledge-based systems) A formal logic rule which consists of an if-part representing the premise or condition and a then-part representing the goal or action to be taken when the if-part is true.

IFF See under IF-AND-ONLY-IF operation.

IFIP International Federation for Information Processing.

IFMBE International Federation for Medical and Biological Engineering.

IFT 1. Institute of Food Technologists. **2.** International Foundation of Telemetering.

IF-THEN operation, implication, conditional implication (operation) The dyadic Boolean operation whose result has the Boolean value 0 if and only if the first operand has the Boolean value 0 and the second has the Boolean value 1. See also table of Boolean operations in ISO publication 2382/11.

IGFET Insulated (Isolated) Gate Field Effect Transistor. Though a less popular term than MOS, it more precisely defines devices made by various MOS processes.

ignition interference Noise produced by sparks or other ignition discharges in a car, motor, or furnace ignition, or by equipment with loose contacts or connections.

ignition temperature Lowest temperature of a fuel at which combustion becomes self-sustaining.

ignitor A flame or high energy spark which is utilized to ignite the fuel at the main burner.

ignitor intermittent An electric-ignited pilot which is automatically lighted each time there is a call for heat. It burns during the entire period that the main burner is firing.

ignitor interrupted An electric-ignited pilot which is automatically lighted each time there is a call for heat. The pilot fuel is cut off automatically at the end of the trial-for-ignition period of the main burner.

ignore In a computer, a character code indicating that no action is to be taken.

IHP Se indicated horsepower.

IIR International Institute of Refrigeration.

illegal operation The process which results when a computer either cannot perform the instruction part or will perform with invalid and undesired results. The limitation is often due to built-in computer constraints.

illuminance The SI unit measurement of illuminance is lux, symbol lx. 1 lux = 1 lumen per square meter.

illumination An alternate, but deprecated, term for illuminance. It is frequently used since illuminance is subject to confusion with luminance and illuminants, especially when not clearly pronounced. Note: The term illumination also is commonly used in a qualitative or general sense to designate the act of illuminating or the state of being illuminated. Usually the context will indicate which meaning is intended, but occasionally it is desirable to use the expression "level of illumination" to indicate that the quantitative meaning is intended.

illustrative diagram A diagram whose principal purpose is to show the operating principle of a device or group of devices without necessarily showing actual connections or circuits. Illustrative diagrams may

use pictures or symbols to illustrate or represent devices or their elements.

ilmenite A mineral. Generally mined as a source of titanium rather than as an ore of iron, iron may be recovered as a by-product.

image An exact duplicate array of information or data stored in, or in transit to, a different medium.

image converter An optoelectronic device capable of changing the spectral characteristics of a radiant image. Note: Examples of such changes are infrared to visible and X-ray to visible.

image digitizer A device which measures light intensity at each point in an image and generates a corresponding digital signal which indicates that intensity. It converts an analog image to a digital data set.

image dissector In capital character recognition, a mechanical or electronic transducer that sequentially detects the level of light intensity in different areas of a completely illuminated sample space.

image impedances Of a transducer, the impedances that will simultaneously produce equal impedances in both directions at each of its inputs and outputs.

image intensifier An optoelectronic amplifier capable of increasing the intensity of a radiant image.

image interpretation, image understanding The production by a functional unit, of a description for both a given image and what the image represents.

image inverter A fiber-optic device that rotates an image through a predetermined angle.

image processing A wide variety of techniques exist for processing pictorial information by computer. The information to be processed is usually input to the computer by sampling and analog-to-digital conversion of video signals obtained from some type of two-dimensional scanner device. Initially the information is in the form of a large array in which each element is a number representing the brightness (and perhaps color) of a small region in the scanned image. A digitized image array is sometimes called a digital picture, its elements are called "points", "picture elements", or "pixels".

image processing The examination by a computer of digitized data about a scene and the features in it in order to extract information.

image processor Selects and interprets data to determine an object's position, location, shape and size.

image recognition Perception and analysis by a functional unit, of an image, its constituent objects, their properties, and their spatial relationships.

image sensors Sensors known as charge-coupled devices (CCD), and nickel-size silicon chips containing over 120,000 electronic elements. When an image is focused on the CCD, the sensor's electronic elements transform the picture into individual electrical charge packets. These packets are then read out very rapidly by charge transfer techniques. The resulting information then can be processed and displayed as a television picture.

image table An area in PC memory dedicated to I/O data. Ones and zeros (1 and 0) represent on and off conditions, respectively. During every I/O scan, each input controls a bit in the input image table; each output is controlled by a bit in the output image table.

image understanding See image interpretation.

imbedded layer A conductor layer deposited between insulating layers.

IMEKO International Measurement Confederation.

Imhoff cone Conical transparent vessel, usually of capacity 1 litre and graduated near its apex, used for determining the volume of settleable matter in waters.

immediate address, zero-level address The contents of an address part that contains the value of an operand rather than an address.

immediate data Data which immediately follows an instruction in a memory, and is used as an operand by that instruction.

immediate instruction An instruction that contains within itself an operand for the operation specified, rather than an address of the operand.

immersion hardening Hardening by heating and subsequent rapid quenching in a metal or salt bath.

immersion length The immersion length of a thermowell, protecting tube, or thermocouple element is the length from the free end to the point of immersion in the medium which is being measured. See figure in ISA publication ANSI-MC 96.1-1982. Compare insertion length.

immersion plating A method of metal deposition that depends on a galvanic displacement of the metal being plated by the substrate.

immiscible Incapable of mixing; said of two fluids that under normal conditions or in their normal state cannot dissolve completely in one another. See miscible.

immittance A term that denotes both impedance and admittance. It is commonly applied to transmission lines, networks and certain kind of measuring instruments.

immunity (to a disturbance) The ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.

immunity An inherent or induced electrochemical condition that enables a metal to resist attack by a corrosive solution.

immunity level The maximum value of a given electromagnetic disturbance incident on a particular device, equipment or system for which it remains capable of operating at a required degree of performance.

immunity type test For programmable controller systems, a type test verifying that the basic programmable controller system operation is not altered by the application of specified influencing quantities which are intended to approximate normal service conditions. During the test, the basic programmable controller system executes appropriate test programs to be provided by the manufacturer.

impact amplifier (fluid power systems) Amplifier the operating principle of which is based on the control of the impact plane position of opposing power jets to control output power.

impact extrusion See cold extrusion.

impact pressure The pressure a moving stream of gas produces against a surface which brings part of the moving stream abruptly to rest; it is approximately equal to the stagnation pressure for subsonic flow in the gas medium.

impact printer Any type of printer that generates characters by using some form of stamping or inking through a ribbon by some sort of character slug, element or hammer-needle.

impact resistance Resistance to fracture under shock force.

impact temperature The temperature of a gas, after impact with a solid body which converts some of the kinetic energy of the gas to heat and thus raises the gas temperature above ambient.

impedance 1. The total opposition (i.e., resistance and reactance) a circuit offers to the flow of alternating current at a given frequency; the ratio of the potential difference across a circuit or element of a cir-

cuit to the current through the circuit or element. It is measured in ohms, and its reciprocal is called admittance. Symbol: *Z*. **2.** The combination of resistance and reactance.

impedance angle Angle of the impedance vector with respect to the resistance vector. Represents the phase angle between voltage and current.

impedance ground An earth connection made through an impedance of predetermined value usually chosen to limit the current of a short-circuit to ground.

impedance sensor A type of sensor for measuring relative humidity. Element of hygroscopic material exhibits large change in impedance with change in moisture content. Resistance varies with moisture content. Resistance change is detected by an ac bridge circuit. These sensors will usually take the form of a thin film of hygroscopic material over a pair of intermeshing electrodes on a plastic base.

impedance to earth, impedance to ground Pertaining to electronic measuring instruments, the impedance measured between a specified terminal and earth.

impeller 1. The wheel-like fan inside a centrifugal pump that impels or propels the fluid toward and out of the discharge opening. **2.** As applied to pulverized coal burners, a round metal device located at the discharge of the coal nozzle in circular type burners, to deflect the fuel and primary air into the secondary air stream. As applied to oil burners, same as diffuser.

imperfect debugging (software) In reliability modelling, the assumption that attempts to correct or remove a detected fault are not always successful.

implement To carry out or to put something into action.

impingement attack A form of accelerated corrosion in which a moving corrosive liquid erodes a protective surface layer, thus exposing the underlying metal to renewed attack.

implementation phase (software) The period of time in the software life cycle during which a software product is created from design documentation and debugged. See also installation and checkout phase, test phase.

implication See IF-THEN operation.

implicit self-tuning Self-tuning controllers in which the process model estimation procedures and the controller design procedures are combined and typically using a generalised controller algorithm.

implied addressing A method of addressing in which the operation part of an instruction implicitly addresses operands.

implied AND Also called dot AND or wired AND. A logic element in which the combined outputs are true if and only if all outputs are true.

implied OR Also called wired OR. A logic element in which the combined outputs are true if one or more of the outputs are true.

impressed voltage The voltage applied to a circuit or device.

impulse excitation A method of producing oscillations in which the duration of stimulus is relatively short in relation to the duration of oscillation.

impulse generator (fluid power systems) Device so arranged that, if a continuous pneumatic signal is applied to the input port, a single pulse is produced at the output port.

impulse line The conduit that transfers the pressure signal from the process to the measuring instrument.

impulse noise A form of noise characterized by high amplitude and short duration, sometimes occurring as a group of impulses, or burst.

impulse, pulse A variation in the value of a magnitude, short in relation to the time schedule of interest, the final value being the same as the initial value.

impulse relay **1.** A relay that stores enough energy from a brief impulse to complete its operation after the impulse ends. **2.** A relay that can distinguish between different types of impulses, operating on long or strong impulses, and not operating on short or weak ones. **3.** An integrating relay.

impulse response The time response of a system produced by the application of an impulse function on one of the inputs. Note: For a linear system the unit impulse response (weighting function) is the time derivative of the unit step response.

impulse timer A timing device electrically powered by a synchronous motor, featuring a mechanical stepping device which enables it to advance a predetermined number of degrees within a predetermined time interval, controlling a multiple number of circuits.

impulse withstand voltage The highest peak value of impulse voltages, of prescribed form and polarity which does not cause breakdown under specified conditions of test.

impurity An imperfection that is chemically foreign to the perfect crystal.

impurity ions An alien, electrically charged atomic system in a solid; an ion substituted for a constituent atom or ion in a crystal lattice, or located in an interstitial site in the crystal.

IMS Information Management System.

inaccuracy The maximum positive and negative deviations from the specified characteristic curve observed in testing a device under specified conditions and by a specified procedure. Notes: **1.** It is typically expressed in terms of the measured variable, percentage of span, percentage of upper range-value, percentage of scale length or percentage of actual output reading. The particular method of presentation must be specified. **1.** The term inaccuracy is sometimes referred to as measured accuracy. This term should be deprecated.

inactive (passive) output (fluid power systems) Output the power of which in one or more states of the devices is derived solely from the input signals.

inactive catalyst See spent catalyst.

inching See jogging.

incidental time, miscellaneous time That part of operating time that is not system production time, system test time or rerun time. Note: Miscellaneous time is typically used for demonstrations, operator training or other such purposes.

in-circuit emulation, ICE A development aid for testing the software in computer hardware. It involves an umbilical link between a development system and the target hardware being plugged into the microprocessor socket.

inclination error The change in output caused solely by an inclination of the device from its normal operating position.

inclined gage A gage on a slope, generally graduated directly to indicate vertical heights. Pertains to liquid flow measurement in open channels.

inclined-tube manometer A glass-tube manometer having one leg inclined from the vertical to give precise readings.

inclusion See IF-THEN operation.

inclusion (fiber optics) Denoting the presence of extraneous or foreign material.

INCLUSIVE-OR operation, disjunction, OR operation, logical add The Boolean operation

whose result has the Boolean value 0 if and only if each operand has the Boolean value 0. See also table of Boolean operations in ISO publication 2382/11.

incoherent (fiber optics) Characterized by a degree of coherence significantly less than 0.88.

incoherent emitter A fiber-optic source of radiation which has been used for short-length optical transmission lines. Light-emitting diodes are incoherent emitters. See coherent emitter.

incoherent fiber optics A bundle of fibers in which the fibers are randomly arranged at each end. The pattern may be truly random to achieve uniform illumination, or the manufacturer may simply not bother to align individual fibers. In either case, the fiber bundle cannot transmit an image along its length.

incoherent radiation (optical communication) Radiation characterized by a very low degree of coherence.

incoherent source A fiber-optic light source which emits wide, diffuse beams of light of many wavelengths. The light waves emitted from an incoherent source are out of phase. Contrast coherent source.

incomplete sequencer relay A device which returns the equipment to the normal, or off, position and locks it out if the normal starting, operating or stopping sequence is not properly completed within a predetermined time.

incompressible Liquids are referred to as being incompressible since their change in volume due to pressure is negligible.

incompressible flow Fluid flow under conditions of constant density.

Inconel A series of International Nickel Co. high-nickel, chromium and iron alloys characterized by inertness to certain corrosive fluids.

inconnector A flow chart symbol which illustrates continuation of a broken flowline.

increased safety electrical apparatus (Ex e)

Electrical apparatus which does not, under normal operating conditions, produce arcs, sparks or heating likely to cause ignition of the explosive atmosphere for which it is designed and in the construction of which measures have been taken to avoid, with a major degree of security, the occurrence of these phenomena under normal operating conditions or recognized overload conditions.

increment A small change, either positive or negative, in the value of a variable quantity.

increment (network) starter A starter that applies starting current to a motor in a series of increments of predetermined value and a predetermined time intervals in closed-circuit transition for the purpose of minimizing line disturbance.

incremental See incremental representation.

incremental computer **1.** A computer in which the use of incremental representation of data is predominant. **1.** A special-purpose computer designed specifically to process changes in the variables as well as absolute values of the variables.

incremental coordinate (computer graphics) A relative coordinate where the previously addressed point is the reference point.

incremental cost The cost of the next increment of output from a process.

incremental digital recorder A magnetic tape recorder that advances the tape across the recording head step by step, as in a punched-tape recorder.

incremental encoder An electronic or electro-mechanical device which produces a coded digital output based on the amount of movement from an arbitrary starting position; the output for any given posi-

tion with respect to a fixed point of reference is not unique.

incremental feed (numerical control) A manual or automatic input of preset motion command for a machine axis.

incremental feedback (numerical control) Assignment of a value for any given position of machine slide or actuating member based on its last previous stationary position.

incremental plotter A discrete X–Y plotter.

incremental position sensor (numerical control) A sensor that directly measures the movement of an element of a machine in terms of its change in position.

incremental programming (numerical control) Programming using words indicating incremental dimensions (incremental co-ordinates).

incremental range The width of the band of values covered by incremental control around the value preset by the main control.

incremental representation 1. A method of representing a variable in which changes in the values of the variable are represented, rather than the values themselves. **2.** See binary incremental representation.

incremental sweep (oscilloscopes) A sweep that is not a continuous function, but that represents the independent variable in discrete steps.

incremental tape Magnetic tape written one character at a time instead of the usual method of continuous recording.

incremental transducer Rotary or linear feedback device with discrete on-off pulses. All pulses are the same, and there is always the same number of signals per unit length or per revolution. Direction is determined by special logic circuits.

incremental vector, (computer graphics) A vector whose end point is specified as a displacement from its start point.

increment size (computer graphics) The distance between adjacent addressable points on the display surface.

indenture level (for maintenance) A level of subdivision of an item from the point of view of a maintenance action. Notes: **1.** Examples of indenture levels could be a subsystem, a circuit board, a component. **2.** The indenture level depends on the complexity of the item's construction, the accessibility to subitems, skill level of maintenance personnel, test equipment facilities, safety considerations, etc.

independent conformity The maximum deviation of the calibration curve (average of upscale and downscale readings) from a specified characteristic curve so positioned as to minimize the maximum deviation. See figure in ISA publication S 51.1.

independent events Two events are said to be independent if the occurrence of either in no way effects the occurrence of the other.

independent failure A failure which has no significant relationship to other failures in a given device and can occur without interaction with other component parts in the equipment.

independent ground electrode A ground electrode or system such that its voltage to ground is not appreciably affected by currents flowing to ground in other electrodes or systems.

independent linearity The maximum deviation of the calibration curve (average of upscale and downscale readings) from a straight line so positioned as to minimize the maximum deviation. See figure in ISA publication S 51.1. and section for test procedures related to this term.

independent modularity The property of a system which allows it to accept changes and adjust processing according to yield maximum utilization on all modules without reprogramming. This system is used in multiprocessing. To achieve this objective, the computer system incorporates master control programs to exercise at an unprecedented degree of automatic control.

independent pole tripping (power switchgear) The application of multipole circuit breakers in such a manner that a malfunction of one or more poles or associated control circuits will not prevent successful tripping of the remaining.

independent verification and validation 1. Verification and validation of a software product by an organization that is both technically and managerially separate from the organization responsible for developing the product. **2.** Verification and validation of a software product by individuals or groups other than those who performed the original design, but who may be from the same organization.

indeterminate fault For an item which produces a response as a result of an action, a fault such that the error affecting the response depends on the action applied. Note: An example would be a datasensitive fault.

index 1. A list of the contents of a file or of a document, together with keys or references for locating the contents. **2.** The fixed or movable part of an indicating device whose position with reference to the scale marks enables an indicated value to be determined. Examples: a) Pointer; b) Luminous spot; c) Liquid surface; d) Recording pen.

index (in programming) A subscript, of integer value, that identifies the position of an item of data with respect to some other item of data.

index (of an indicating device) Pertaining to measuring instruments, the fixed or movable part of the indicating device such as pointer, luminous spot or window, whose position, in relation to a scale, permits the value of the measured quantity to be determined.

index dip (optical communication) A depression in the refractive index at the centre of the core. Note: An index dip is an imperfection which occurs only in certain fabrication techniques.

indexed sequential files Collection of related computer records stored on discs. The records are arranged in the same sequence as the key number and an index or table is used to define the actual location of these records on the disc.

index hole A hole punched in a floppy disk to indicate the beginning of the first sector

indexing In a computer, a technique of address modification often implemented by means of index registers.

index matching material (optical communication) A material, often a liquid or cement, whose refractive index is nearly equal to the core refractive index, used to reduce Fresnel reflections from a fiber endface.

index profile (fiber optics) In an optical waveguide, the refractive index as a function of radius.

index register (computing systems) A register whose contents can be used to modify an operand address during the execution of computer instructions; it can also be used as a counter. Note: An index register may be used to control the execution of a loop, to control the use of an array, as a switch, for table look up, or as a pointer.

index track A track whose contents are needed to locate data on other tracks on the same data medium.

index word An instruction modifier applied to the address part of an instruction.

indicated horsepower (IHP) Calculated horsepower; the power developed within the cylinder of an engine that is greater than the power delivered at the drive shaft by the amount of mechanical friction that must be overcome. See brake horsepower.

indicated value For a measuring instrument: the indicated or recorded value. For a material measure: the nominal or stated value. For a supply device: the set or nominal value. See also under uncorrected result.

indicating Perceptible presentation of variables or switching conditions.

indicating (measuring) instrument 1. A measuring instrument which displays at any time the value of the measured quantity without recording it. **2.** An indicating instrument which displays the value of a measurand or a related value. Examples: a) Analog voltmeter; b) Digital voltmeter; c) Micrometer.

indicating device For a measuring instrument, the set of components which displays the value of a measurand or a related value.

indicating scale On a recording instrument, a scale that allows a recorded quantity to be simultaneously observed.

indication 1. The display to the human senses of information concerning a quantity being measured. **2.** In nondestructive testing, any visible sign or instrument reading that must be interpreted to determine whether or not a flaw exists.

indication (of a measuring instrument) The value of the measured quantity indicated by the measuring instrument.

indicator 1. An item of data that may be interrogated to determine whether a particular condition has been satisfied in the execution of a computer program. Examples: A switch indicator; an overflow indicator. **2.** A device that gives a visual or other indication of the existence, of a defined state. **2.** A device which gives a visual indication of a measured variable.

indicator chart One used by a programmer during the logical design and coding of a program to record items about the use of indicators in the program. A portion of program documentation.

indicator diagram A graphic representation of work done by or on the working fluid in a positive-displacement device such as a reciprocating engine.

indicator symbol (logic diagrams) A symbol that identifies the state or level of an input or output of a logic symbol with respect to the logic symbol definition.

indicator travel The length of the path described by the indicating means or the tip of the pointer in moving from one end of the scale to the other.

indigenous fault A fault existing in a computer program that has not been inserted as part of a fault seeding process.

indirect acting instrument An instrument in which the indicating or recording device is driven by a motor or other device, controlled by the quantity to be measured and using electromechanical, electrical or electronic means. Note: Indirect acting instruments may make use of any method of comparison, but this is usually electrical or mechanical.

indirect address, multilevel address An address that designates the storage location of an item of data to be treated as the address of an operand, but not necessarily as its direct address.

indirect application (electrostatic discharge tests) This describes the application of the test to a coupling plane in the vicinity of the EUT (equipment

under test), and simulates personnel discharge to objects which are adjacent to the EUT. Pertains to electrostatic discharge test methods as outlined in IEC standard 801-2, part 2: Electrostatic discharge requirements.

indirect arc furnace An arc furnace in which the arc is formed between two or more electrodes.

indirect-arc heating See arc heating.

indirect commands In data processing, commands to the system from previously recorded inputs, rather than from the operator terminal; the operator can call a sequence of indirect commands by file name.

indirect cooking Cooking where the heat from the heating steam is transferred to the cooking liquor indirectly by means of a heat-exchanger.

indirect cost Costs that are not incurred by a particular job or operation, such as utilities, management salaries, material handling, data processing etc.

indirect cost effectiveness That cost effectiveness related to the benefit accrued primarily by the consumer rather than the provider; i.e., a shorter hospital stay, a tool which may accomplish a task more quickly. Note that the unit cost may increase.

indirect disturbance A change of some physical quantity external to the control system itself that affects a physical parameter of any element of the control system. Note: Where the parameters of the control element are changed intentionally e.g. in adaptive systems, this change is not regarded as a disturbance.

indirect fired water-bath heaters A type of fluid heater using hot water to heat gas and oil or to vaporize propane or cryogenic liquids. Conventional heaters are direct-fired. Indirect-fired heaters warm a circulating liquid that in turn heats the charge.

indirect instruction An instruction that contains the indirect address of an operand for the operation specified.

indirect light Light from an object which has no self-luminous properties. Instead, it reflects light from another source.

indirectly controlled system The portion of the controlled system in which the indirectly controlled variable is changed in response to changes in the directly controlled variable. See figure in ISA publication S 51.1.

indirectly controlled variable Controlled variable which does not originate a feedback signal, but which is related to, and influenced, the directly controlled variable.

indirect method of measurement 1. Pertaining to liquid flow measurement in open channels, a method in which the time – average concentration of the sediment and the time-average current velocity at a point are measured practically simultaneously with the aid of separate devices and multiplied to obtain the sediment load. **2.** A method of measurement in which the value of a measurand is obtained by measurement of other quantities functionally related to the measurand. Examples: a) Measurement of a pressure by measurement of the height of a column of liquid; b) Measurement of a temperature using a resistance thermometer.

indirect piezoelectricity The production of a mechanical strain in a crystal by applying a voltage to it (as opposed to the more common piezoelectric effect of applying a strain to the crystal in order to produce a voltage).

indirect pressure control (fluid power systems) Control method in which the position of the moving parts is controlled by a change of the control pressure to a pilot device.

indirect stroke (surge arresters) A lightning stroke that does not strike directly any part of a network but that induces an overvoltage in it.

individual axis acceleration (industrial robots) Acceleration when generating the movement of one individual axis.

individual axis velocity (industrial robots) Velocity when positioning with the movement of one individual axis.

individual control level Control level of all control units acting directly on the final controlling elements.

induced Produced by the influence of an electric or magnetic field.

induced charge 1. An electrostatic charge produced in one object by the electric field surrounding a nearby object. **1.** An electrostatic charge produced on a conducting body when it is brought near to or connected to another body which bears an electric charge.

induced draft fan A fan exhausting hot gases from the heat absorbing equipment.

induced electromotive force Represented by E and is proportional to the rate of change of magnetic flux through the circuit.

induced failure A failure that is basically caused by a condition or phenomenon external to the item that fails.

inductance Property of a circuit that tends to oppose any change of current because of a magnetic field associated with the current itself. Whenever an electric current changes in value – rises or falls – in a circuit, its associated magnetic field changes, and when this links with the conductor itself an emf is induced which tends to oppose the original current change. Self-inductance is the full name for this, but the term inductance only is usually used. The unit of inductance is the henry.

inductance bridge An instrument, similar to a Wheatstone bridge, for measuring an unknown inductance by comparing it with a known inductance.

inductance-type pressure transducer Any of several designs of pressure sensor where motion of the primary sensor element, such as a bourdon tube or diaphragm, is detected and measured by a variable-inductance element and measuring circuit.

induction 1. The establishment of an electric charge or a magnetic field in a substance by the proximity of an electrified source, a magnet or a magnetic field. **2.** The setup of an electromotive force and current in a conductor by variation of the magnetic field affecting the conductor.

induction brazing The electric brazing process in which heat is produced by an induced current.

induction coil An apparatus for transforming a direct current by induction into an alternating current.

induction density See flux density.

induction field 1. The electromagnetic field of a coil carrying alternating current, responsible for the voltage induced by that coil in itself or in a nearby coil. **2.** See IEC-standard 801-3, Part 3: Radiated electromagnetic field requirements.

induction furnace A furnace heated by electromagnetic induction.

induction hardening Pertaining to heat treatment, surface hardening by induction heating.

induction heating Heating of material by immediate electromagnetic induction.

induction, inductive inference An inference which starts with given facts and concludes with general hypothesis.

induction instrument An instrument which operates by the interaction of the alternating magnetic

field(s) of (a) fixed electro-magnet(s) with the magnetic field(s) due to currents which they induce in (a) movable conductive element(s).

induction meter An energy meter which operates by the rotation of the disc of an induction measuring element.

induction relay Induction relays operate on the same principle as the induction motor. Torque is produced by subjecting a moving conductor to two alternating fields which are displaced in both space and time. The moving conductor is typically a metal disc which is pivoted so as to be free to rotate between the poles of two electromagnets. Torque is produced by the interaction of upper electromagnet flux and eddy currents induced in the disc by the lower electromagnet flux, and vice versa.

induction-resistane welding Welding in which electromagnetic induction alone causes the heating current to flow in the parts being welded.

induction ring heater A form of core-type induction heater adapted principally for heating electrically conducting charges of ring or loop form, the core being open or separable to facilitate linking the charge.

induction soldering A method of soldering in which the solder is reflowed or supplied by preforms. If the work is moved slowly through the energy field, the induction process may be made continuous.

induction stirring-arc reheating process (in steelmaking) This system is commonly known as the ASEA-SKF ladle refining furnace process. The equipment can be arranged in different ways: in one method suggested for large heat-size units, it consists of a ladle furnace, a mobile induction coil stand, a vacuum cover with an exhaust line, a steam-ejector system, and a cover fitted with three carbon electrodes. The ladle-furnace is unique in that it serves as a tapping and teeming ladle, a heating furnace, and a vacuum vessel.

induction stirring process (in steelmaking) A vacuum ladle degassing process. Induction coils are used to induce eddy currents in the molten steel to produce a stirring effect.

inductive assertion method (software) A proof of correctness technique in which assertions are written describing program inputs, outputs, and intermediate conditions, a set of theorems is developed relating satisfaction of the input assertions to satisfaction of the output assertions, and the theorems are proved to be true.

inductive bridge position transducer A device for measuring linear position by means of induction between a fixed member slightly longer than the limits of motion and a movable member approximately half as long; position is determined by selecting appropriate taps from the longer member that are connected in a successive decade with external inductors to form a bridge circuit, and relating the configuration that balances the bridge with actual position of the movable member.

inductive coupled circuit A network with two meshes having only mutual inductance in common.

inductive coupling Using common or mutual inductance to cause signals in one circuit to vary in accordance with signals in another.

inductive inference See induction.

inductive level detector A level-measuring system incorporating an oscillator and electromagnetic field.

inductive load Also called lagging load. A load that is predominantly inductive, so that the alternating load current lags behind the alternating voltage of the load.

An electrical load that has a significant inductive reactance.

inductive plate position transducer A device for measuring rotary position by means of induction between a stationary and rotary plate, each having an etched winding projected onto a nonconductive surface, or for measuring linear motion by means of induction between a stator plate and a sliding member, each also having etched windings.

inductive potentiometer Inductive potentiometers of the form of precision wound toroidal autotransformers are sometimes used in control systems. Their main disadvantages over resistive potentiometers are their cost and weight, but they do show an improved lifetime and their linearity is relatively unaffected by loading.

inductive reactance The opposition to the flow of alternating or pulsating current by the inductance of a circuit. It is measured in ohms.

inductive transducer A transducer in which changes in inductance convey the stimulus information.

inductive winding A coil through which a varying current is sent to give it an inductance.

inductor Also called inductance or retardation coil. A conductor used for introducing inductance into an electric circuit. The conductor is wound into a spiral, or coil, to increase its inductive intensity.

inductor – type synchronous motor A type of synchronous motor having field magnets that are fixed in magnetic position relative to the armature conductors, the torques being produced by forces between the stationary poles and salient rotor teeth.

industrial clear air An environment sufficiently well controlled that corrosion is not a factor in determining equipment reliability. (IEC 654-4, Operating conditions for industrial-process measurement and control equipment, Part 4: Corrosive and erosive influences. See this publication for examples.)

industrial computer A computer used on-line in various areas of manufacturing including process industries (chemical, petroleum etc.), numerical control production lines, etc. See also process computer and numerical control.

industrial computer language A computer language for industrial computers. A language used for programming computer control applications and system development, e.g., assembly language FORTRAN, RTL, PROSPRO, BICEPS, and AUTRAN.

industrial contaminants Pertaining to operating conditions for industrial-process measurement and control equipment, see IEC publication 654-4, Part 4 which gives information re prevalent contaminants present in different types of process plants.

industrial controls A collective term for control instrumentation used in industry.

industrial data processing Data processing for industrial purposes, most often related to numerical control of machines, or management reporting and planning.

industrial engineering A branch of engineering that deals with the design and operation of integrated systems of personnel, equipment, materials and facilities.

industrial-grade IC Typically, an IC whose performance is guaranteed over the temperature range 0 to 70°C.

industrial process A set of operations which basically perform a physical or chemical transformation or a series of such transformations. Note: Other processes such as transportation and/or temporary storage

of matter or energy, transmission of information, may be considered as a part of industrial processes.

industrial process control Some applications are: (a) precious metals production, (b) cement production, (c) environmental control, (d) pilot plants, (e) chemical processes, (f) petroleum refining and many others. The data acquisition and control system provides maximum flexibility in the types of process data that it can accept, and the variety of output signals and data format that a computer may exercise.

industrial television The cameras and related instrumentation of a closed-circuit television system. Such equipment is designed to function in the different environments found in industrial processes. Used to monitor areas that are hazardous to personnel, such as high-radiation areas, areas that do not require steady supervision, industrial processes for surveillance or quality control, or areas requiring security measures.

industrial water Any water used for, or during, an industrial process.

inequivalence Logical function whose output is true if either of two inputs is true, and false if both inputs are the same.

inertance Acoustical equivalent of inductance.

inert gas Any of six gases that, under normal conditions, are not inclined to react with any of the other elements. The inert or inactive gases are neon, helium, argon, krypton, xenon, and radon.

inert gaseous constituents Incombustible gases such as nitrogen which may be present in a fuel.

inertia 1. The tendency of an object at rest to remain at rest or of a moving object to continue moving in the same direction and at the same speed, unless disturbed by an outside force. Resulting from mass and inhibiting change in velocity. **2.** The resistance to change in speed or velocity.

inertia switch A switch capable of sensing acceleration, shock or vibration. It is designed to actuate upon an abrupt change in velocity.

inertia-type timer Any of several types of relay devices that incorporate extra weights or flywheels to achieve brief time delay in normal relay action by providing additional inertia to be overcome.

INFCO Information Committee (ISO).

inference Reasoning by which conclusions are derived from known premises. Notes: **1.** A premise is either a fact or a rule. **2.** Interference refers both to the process and its result.

inference engine Component of an expert system that applies principles of reasoning to draw conclusions from representations of information stored in a knowledge base.

infiltration (into a sewer) The process of groundwater entering a drain or sewer through cracks or defective joints. Note: Infiltration can also take place into mains under conditions of negative pressure.

infiltration (into the ground) The natural or artificial introduction (recharge) of water into the ground.

infinite Boundless; having no limits whatsoever.

infinite resolution The capability of a device to provide continuous output over its entire range.

infinitesimal Immeasurably small, approaching zero.

infinity 1. A hypothetical amount larger than any assignable amount. **2.** A number larger than any number a computer can store in any register. **3.** Any distance of a subject from a lens for which the image no longer moves when the subject moves along the optical axis.

inflation pressure, pre-charged pressure (fluid power systems) Gas pressure in an accumulator prior to admission of liquid.

inflection point The point where a curve changes direction.

influence coefficient The quotient of the change of the error due to an influence quantity to the change of the influence quantity causing it. Note: The influence coefficient is only used when, over the whole rated range of use, a substantially linear relationship exists between the influence of error and the effect causing it.

influence quantity A quantity which is not the subject of the measurement but which influences the value of the measurand or the indication of the measuring instrument. Examples: Ambient temperature; frequency of an alternating measured voltage.

influent The flow of liquids or gas into a vessel or equipment. See effluent.

infobond An automated system of point-to-point wiring on the back of a two-sided printed wiring board (the components are on the front, or other side).

informatics Science and study of ways and means of information processing and transmission. Note: no plural.

information 1. In computing, the basic data and/or program entered into the system. **2.** That property of a signal or message whereby it conveys something meaningful and unpredictable to the recipient, usually measured in bits. **3.** Data that has been organized into a meaningful sequence.

information bits In telecommunications, bits that are generated by the data source and which are not used for error-control by the data-transmission system.

information center (IC) (computer applications) A user-orientated computer system that provides nontechnical users direct access to data and software for information processing tasks such as report generation, data modeling and manipulation, and word processing.

information channel The transmission and intervening equipment involved in the transfer of information in a given direction between two terminals.

information console (in petroleum industry) A bank of indicators, counters, and display dials showing weight of the drill string, weight on the drill bit, mud pump speed, mud pressure, engine speed, etc., to keep the driller informed of all aspects of the drilling operation.

information content Refer to ISO publication 2382/XVI.

information feedback system In telecommunications, an information transmission system that uses an echo check to verify the accuracy of the transmission.

information function A special mathematical function which describes a source of information.

information gate A circuit that permits information or data pulses to pass when the circuit is triggered by an external source.

information handling The storing and processing of information and its transmission from the source to the user. Information handling excludes the creation and use of information.

information hiding The technique of encapsulating software design decisions in modules in such a way that the module's interfaces reveal as little as possible about the module's inner workings; thus each module is a "black box" to the other modules in the system. The discipline of information hiding forbids the use of information about a module that is not in the module's interface specification. See also encapsulation.

information parameter That characteristic quantity of a signal which carries the information in accordance with a known or supposed relationship. Note 1: For

many signals the value of the physical quantity is simultaneously the characteristic value (information parameter) and therefore, it is usual, for the sake of simplicity, to speak of the "value of a signal". Note 2: For an amplitude-modulated sinusoidal carrier, the instantaneous amplitude is the information parameter of the signal; for a duration – or position – modulated pulse signal, the duration or width of each pulse respectively is the information parameter of the signal.

information processing, (data) processing, DP See data processing.

information rate (from a source, per second) The product of the average information content per symbol and the average number of symbols per second.

information retrieval, IR Actions, methods and procedures for recovering stored data to provide information on a given subject.

information source That part of a communication system from which messages are considered to originate. Synonymous with message source.

information system A group of computer-based systems and data required to support the information needs of one or more business processes.

information theory 1. The branch of learning concerned with the study of measures of information and their properties. **2.** The branch of learning concerned with the likelihood of accurate transmission or communication of messages subject to transmission failure, distortion, and noise.

information transfer (data transmission) The final result of data transmission from a data source to a data sink. The information transfer rate may or may not be equal to the transmission modulation rate.

information word An ordered set of characters that have at least one meaning and are handled by the computer as a unit.

infrared (IR) That portion of the radiation spectrum having a wavelength in the range which adjoins the visible ray spectrum and extends to the microwave radio frequency.

infrared absorption moisture detector An instrument for determining moisture content of a material such as sheet paper.

infrared detector A transducer which is sensitive to invisible infrared radiation between 0.75 and 1000 micrometers.

infrared instruments Any of the photoelectric and thermal detectors, spectrographs and monochromators, thermographs, scanners, amplifier tubes, snooperoscopes and related equipment especially developed for use with infrared radiation.

infrared light Light rays just below the red end of the visible spectrum.

infrared optics Lenses, prisms and other optical elements for use with infrared radiation (radiation with a wavelength between 0.75 and 1000 micrometers).

infrared ovens Units that dry, cure and preheat parts directly (i.e., without heating the oven air) via infrared energy.

infrared radiation 1. Invisible radiation with wavelengths in the range between 7500 angstroms (red) and about 1,000,000 angstroms (microwaves). **2.** The electromagnetic wavelength region between approximately 0.75 and 1000 micrometers, longer than the wavelength of visible light.

infrared radiation absorption Infrared spectrometers detect moisture in a liquid sample by measuring the energy absorbed in the water vapor band (between wavelengths of 0.1 and 1.9 microns). The spectrometer is a complex and expensive instrument.

infrared spectroscopy A technique for determining the molecular species present in a material, and measuring their concentrations, by detecting the characteristic wavelengths at which the material absorbs infrared energy and measuring the relative drop in intensity associated with each absorption band.

infrared spectrum That portion of the electromagnetic spectrum between the wavelengths of 0.75 and 1000 micrometers.

infrared thermometer A temperature measuring device that detects infrared radiation from an object and converts that measurement into a reading representing the temperature of the object.

infrasonic Pertaining to frequencies below the range of human hearing, hence below about 15 hertz. Formerly called subsonic.

infrasonic frequency A sound-wave frequency lower than the audio-frequency range.

ingot (in steel production) After a heat of steel is refined either in an oxygen – steelmaking furnace, an open – hearth furnace, or an electric furnace, the liquid steel is tapped into a refractory-lined vessel called steel ladle. The ladle is moved by an overhead crane to a pouring platform where the steel is then poured or teemed into a series of molds of the desired dimensions. The steel solidifies in each of the molds to form a casting called an ingot.

ingrating flowmeter Instrument which indicates the total quantity of the fluid that has flowed past the measuring point.

inherent characteristic of a system Characteristic curve showing the relationship in steady-state between an output variable, practically the controlled variable, and one of the input variables of the system, with any controlling equipment disconnected and for fixed values of the other input variables.

inherent diaphragm pressure range (control valves) The high and low values of pressure applied to the diaphragm to produce rated plug travel with atmospheric pressure in the valve body.

inherent error The error in quantities that serve as initial conditions at the beginning of a step in a step-by-step set of operations. Thus, the error carried over from the previous operation from whatever source or cause.

inherent flow characteristic (control valves) 1. The relationship between the relative flow coefficient and the corresponding relative travel. It is independent of the means of actuation. **2.** The relationship between the flow rate through a valve and the travel of the closure member as the closure member is moved from the closed position to rated travel with constant pressure drop across the valve. See further IEC publication 534-2, section four: Inherent flow characteristics and rangeability and/or ISA publication S 75.11.

inherent rangeability (control valves) 1. The ratio of the largest flow coefficient to the smallest flow coefficient within specified deviations. See further IEC publication 534-2-4, section four: Inherent flow characteristics and rangeability. **2.** Ratio of maximum to minimum flow within which the deviation from the specified inherent flow characteristic does not exceed some stated limits.

inherent regulation See self-regulation.

inherent weakness failure Failure attributable to weakness inherent in the item itself when subjected to stresses within the stated capabilities of the item.

inherited error In a computer, the error in the initial values, especially that error accumulated from prior steps in a step-by-step integration.

inhibit 1. To prevent an event from taking place. **2.** To prevent device or logic element from producing a specified output.

inhibited oil Mineral transformer oil to which a synthetic oxidation inhibitor has been added.

inhibiting signal A signal that prevents the occurrence of an event.

inhibitor 1. In a digital computer, a logic circuit that clamps a specified output to the zero level when energized. Also called inhibition gate. **2.** Any substance that when added to an electrical insulating fluid retards or prevents undesirable reactions.

in-house System development or operation performed by an organization's own staff, as opposed to contracting the work to an outside organization.

INIEX Belgian approval certification body for products (systems) intended for installation in hazardous locations. Example: Intrinsically safe applications.

initial boiling point, IBP The temperature at which a product (a cut or a fraction) begins to boil. See end point.

initial contact chatter That chatter caused by vibration produced by opening or closing the contacts in a relay themselves, as by contact impact in closure.

initial failure The first failure that occurs in use.

initial flow data A flowchart that represents the path of data in the solving of a problem, and that defines the major phases of the processing as well as the various data media used.

initial instruction A procedure stored within a computer to ease the loading of programs.

initialization 1. Originating or establishing basic conditions or starting state. **1.** The setting of various counters, switches and addresses to zero, or other starting values. **1.** Automatic balancing of computational slot outputs and setpoint inputs in cascade loops during manual mode to ensure bumpless transfer to full automatic or cascade mode. Refers to Honeywell TDC 3000 control systems.

initial position (numerical control) A fixed point along an axis and which may be referenced with respect to a machine datum. Typically used for start-up.

initial position (fluid power systems) Position of the valving element after main pressure is admitted and before the intended operating cycle begins under the influence of the actuating forces.

initial program loader, IPL 1. The procedure that causes the initial part of an operating system or other program to be loaded such that the program can then proceed under its own control. **2.** A bootstrap loader used in a computer to load that part of an operating system needed to load the remainder of the operating system.

initial starting (fluid power systems) Specified sequence of operations for starting a unit or system for the first time or re-starting after maintenance, repair or long period of shut-down. Includes functional verification.

initiator The station which can nominate and ensure data transfer to a responder over a data highway.

injection fiber See launching fiber.

injection locked laser (optical communication) A laser whose peak intensity wavelength of emission is controlled by the injection of a separate optical signal from a different source or a reflected optical signal from an external mirror.

injector Any nozzle or nozzle-like device through which a fluid is forced into a chamber or passage.

inking (computer graphics) Creating a line by moving a locator over the display surface leaving a trail

behind the locator in the manner of a pen drawing a line on paper.

ink-vapor recording A type of electromechanical recording in which the trace is produced by depositing vaporized particles of ink directly on the chart paper.

inlet (valves) The body end opening through which fluid enters the valve.

inlet port (valves) The port which is connected directly to the upstream side of a fluid system. See also supply port.

in-line 1. Centered on an axis. **2.** Having several features, component or units aligned with each other.

in-line analysis (water quality) See *insitu analysis*.

in-line equipment Pumps, separators, heat exchangers etc. integral to a process chain; in the line, not auxiliary or supporting.

in-line processing The processing of data in random order, not subject to preliminary editing or sorting.

in-line valve A valve having a piston actuated closure member shaped like a globe valve plug which moves to seat axially in the direction of the flow path. In-line valves are normally operated by a fluid energy source but may be operated mechanically.

INMETCO process A rotary hearth process developed by INCO. The process uses pellets of iron oxide and coke or coal mixture with modest green strength. The pellets are fed into a rotary-hearth furnace which is separated by curtains into oxidizing, reducing and neutral discharge zones.

inoperable time That part of down time with all environmental conditions satisfied, during which a functional unit would not yield correct results if it were operated.

inorganic chlorine compounds This group contains both strong oxidants (chlorine, chlorine dioxide) and compounds such as hydrogen chloride, so reactivity will depend upon the specific gas composition. In the presence of moisture, these gases generate chloride ions which react readily with copper, tin, silver and iron alloys. Particular care shall be given to equipment which is exposed to atmospheres which contain chlorinated contaminants. See IEC publication 654-4 Operating conditions for industrial-process measurement and control equipment, Part 4: Corrosive and erosive influences.

inorganic electrolyte A solution that conducts electricity due to the presence of ions of substances not of organic origin.

in phase Two waves of the same frequency that pass through their maximum and minimum values of like polarity at the same instant are said to be in phase.

in phase rejection See common mode rejection.

in phase voltage (electromagnetic flowmeters)

That part of the electrode signal in phase with the flow signal but which does not vary with flow rate.

in-plant system A system whose parts, including remote terminals, are all situated in one building or localized area.

in-processing 1. Same as on-line. **2.** Data being received or to be received by any component part of a computer.

input Pertaining to a device, process, or channel involved in an input process, or to the associated data or states. Note: The word "input" may be used in place of "input data", "input signal", "input process" when such a usage is clear in a given context.

input (output) impedance The impedance of the input (output) circuit looking into the device, measured between the input (output) terminals of the device under operating conditions.

input and output with isolated common point

An arrangement of circuits in which one of the input and one of the output terminals are connected together and isolated from the frame and from the supply source.

input area An area of storage reserved for input. Synonymous with input block.

input assertion A logical expression specifying one or more conditions that program inputs must satisfy in order to be valid.

input block 1. An area of storage reserved for input.

2. An input buffer. **3.** A block of computer words considered as a unit and intended or destined to be transferred from an external source or storage medium to the internal storage of the computer.

input-buffer register A device that receives data from input devices (tape, disk) and then transfers it to internal computer storage.

input channel A channel for impressing a state on a device or logic element. Same as input.

input common-mode range The maximum input that can be applied to either input of an operational amplifier without causing damage or abnormal operation.

input common-mode rejection ratio 1. The ratio of the change in input voltage to the corresponding change in output voltage, divided by the open-loop voltage gain. **2.** The ratio of the full differential voltage gain to the common-mode voltage gain.

input device 1. The device or collective set of devices used for conveying data into another device. Include input data. **2.** A device by which data can be entered into a computer.

input formatting The technique a system uses to put all entered data into a standard (or intelligible) format.

input impedance (electrical transducers) Impedance (presented to the excitation source) measured across the excitation terminals of a transducer. In specifications, unless otherwise specified, input impedance is measured at room conditions, with no measuring applied, and with the output terminals open-circuited.

input interface Any device that connects computer hardware or other equipment for the input of data.

input matrix A matrix which, at a given time, describes the connections between the values of the input variables and the rate of change of the system state variables.

input-output, I/O Pertaining to a device, process, or channel involved in an input process and in an output process, concurrently or not, or to their associated data or states. Note: The phrase "input-output" may be used in place of "input-output data", "input-output signals", "input-output process" when such a usage is clear in a given context.

input-output (I/O) software That portion of the operational software which organizes efficient flow of data and messages to and from external equipment.

input-output channel A functional unit that handles the transfer of data between internal storage and peripheral equipment.

input-output controller, IOC A functional unit that controls one or more input-output channels.

input-output control system, IOCS A set of flexible routines that supervises the input and output operations of a computer at the detailed machine-language level.

input-output device, input-output unit A device by which data can be entered into or conveyed out of a computer.

input-output unit See input-output device.

input port (fluid power systems) See supply port.

input ports In computer hardware, terminals for connection in external devices which input data to the computer.

input power rating Also called coil rating. A statement of the allowable voltage, current or power to the actuating element of a relay beyond which unsatisfactory performance will occur.

input primitive An item of data obtained from an input device such as a keyboard, choice device, locator, pick device, or valuator.

input program A utility program that organizes the input process of a computer. Note: Computer programs and routines are distinguished in this context by the form and frequency of their use.

input protection For analog input channels, the protection against overvoltages that may be applied between any two input connectors or between any input connector and ground.

input recorder Any device which makes a record of an input electrical signal.

input register In a computer, the register of internal storage able to accept information from outside the computer at one speed and supply the information to the computer calculating unit at another, usually much greater, speed.

input routine A utility routine that organizes the input process of a computer.

input signal A signal applied to the input of a device, element or system.

input signal (fluid power systems) Effective current to the valve which produces a given output.

input state The state occurring on a specified input channel.

input stream, job stream, run stream The sequence of representations of jobs or parts of jobs to be performed, as submitted to an operating system.

input subsystem That part of a process interface system that transfers data from the technical process to the process computer system.

input transformer A transformer that transfers energy from an alternating-voltage source to the input of a circuit or device.

input unit 1. In a computer, the unit that takes information from outside the computer into the computer. **2.** See also input device.

input variable Variable applied to a system and which is independent of the other variables of the system.

input winding See signal winding.

input work queue A queue of summary information of job-control statements maintained by the job scheduler, from which it selects the jobs and job steps to be processed.

inquiry A technique whereby the interrogation of the contents of a computer's storage may be initiated at a local or remote point by use of a keyboard, touchtone pad, or other device.

inquiry and transaction processing A type of teleprocessing application in which inquiries and records of transactions received from a number of terminals are used to interrogate or update one or more master files maintained by the central system.

inquiry station A user terminal primarily for the interrogation of a computer.

inquiry unit A device used to extract a quick reply to a random question regarding information in a computer storage.

INRED process Developed by Boliden AB, Sweden, the INRED process reduces iron ore concentrates to molten iron in two stages in a single reactor.

inrush The initial surge of current through a load when power is first applied. Lamp loads, inductive motors, solenoids, contactors, valves and capacitive load types all have inrush or surge currents higher than the normal running or steady state currents. Resistive loads, such as heater elements, have no inrush.

inrush current limiting Protective circuit in a power supply that prevents excessively large currents through a rectifier to charge the filter capacitors. To prevent unnecessary power loss, the circuit is usually inhibited after the capacitors attain full charge.

inscribe The action of reading the data recorded on documents and writing the same data on the same document. The document thus becomes available and suitable for the application of automatic reading by optical character readers or other reading devices.

insertion gain The ratio of the power delivered to the portion of a transmission system following a transducer to the power delivered to the same portion without the transducer in place.

insertion length The insertion length of a thermowell, protecting tube or thermocouple element is the length from the free end to, but not including, the external threads or other means of attachment to a vessel. See figure in ISA publication ANSI-MC 96.1-1982. Compare immersion length.

insertion loss (of an optical component) The extra optical attenuation caused by the insertion of an extra optical component into an optical system.

insertion switch A process by which information is inserted into a computer by the manual operation of switches.

inside-out flow element Filter element designed for normal flow outward from and perpendicular to its longitudinal axis.

insitu analysis (water quality) A system of automatic analysis in which at least the analytical sensor is sited in the body of water.

insitu maintenance, field maintenance, on-site maintenance Maintenance performed at the premises where the item is used.

inspection (quality) Activities such as measuring, examining, testing gaging one or more characteristics of a product or service and comparing these with specified requirements to determine conformity.

inspection and routine testing of industrial process control valves See IEC publication 534-4, with Amendment No 1.

instability 1. Tendency for a circuit to break into unwanted oscillation. **2.** The measure of the fluctuations or irregularities in the performance of a device, system or parameter.

installation and checkout phase The period of time in the software life cycle during which a software product is integrated into its operational environment and tested in this environment to ensure that it performs as required.

installation category (overvoltage category) Classification of parts of installation systems or circuits with standardized limits for transient overvoltage, dependent on the nominal line voltage to earth.

installation diagram Installation drawing showing the connections between items.

installation drawing (or plan) Drawing (or plan) showing the location of the components of an installation.

installation manual (fluid power systems) Document detailing all materials and services required, mounting facilities, relative disposition of units and means of connecting equipment in preparation to

commissioning and starting up of a new installation or piece of equipment.

installation time Time spent in installing and testing either hardware, or software, or both, until they are accepted.

installed diaphragm pressure range (control valves) The high and low values of pressure applied to the diaphragm to produce rated travel with stated conditions in the valve body.

installed flow characteristic (control valves) The relationship between the flow rate through a valve and the travel of the closure member as the closure member is moved from the closed position to rated travel when the pressure drop across the valve varies as influenced by the system in which the valve is installed.

instantaneous The value, at a given instant of time, of a time dependant variable quantity.

instantaneous availability The probability that an item is in a state to perform a required function under given conditions at a given instant of time, assuming that the required external resources are provided.

instantaneous conditions Conditions which exist at a specified point in time.

instantaneous frequency The instantaneous rate of change of phase with respect to time (expressed in radians per seconds) divided by two.

instantaneous overcurrent relay Also called rate-of-rise relay. A device which functions instantaneously on an excessive value of current, or on an excessive rate of current rise, thus indicating a fault in the apparatus of the circuit being protected.

instantaneous sampler An instrument that attempts to trap instantaneously a sample of sediment-water mixture.

instantaneous sampling The process of obtaining a sequence of instantaneous values of a wave. These waves are called instantaneous samples.

instantaneous sound pressure The total instantaneous pressure at a certain point, minus the static pressure at that point. The most common unit is the microbar.

instantaneous suppression with automatic current regulation (thyristor) A combination of instantaneous trip or suppression and current regulation in which suppression is followed immediately by a regulated current.

instantaneous-transmission rate A rate at which data is transmitted through its channel, but measured during the time data is actually being transmitted.

instantaneous trip (as applied to circuit breakers) A qualifying term indicating that no delay is purposely introduced in the tripping action of the circuit breaker.

instantaneous trip or suppression (thyristor) The means to sense on overload and reduce the output current to zero, as fast as practicable.

instantaneous unavailability The probability that an item is not in state to perform a required function under given conditions at a given instant of time, assuming that the required external resources are provided.

instantaneous value The magnitude, at any particular instant, of a varying value.

instant of time A single point on a time scale. Note: The time scale may be continuous as calendar time, or discrete e.g. number of use cycles.

instantiation (in artificial intelligence) The substitution of a value for a variable, or the creation of an example from a class. Example: A specific sick person is an instantiation of the generic object "patient". No-

te: In a rule-based system, one instantiation is the result of successfully matching a rule against the contents of the knowledge base.

instruction A statement that specifies an operation and the values or locations of its operands. In the context, the term instruction is preferable to the terms command or order which are sometimes used synonymously.

instruction address register, program register, instruction pointer register A special purpose register used to hold the address of the next instruction to be executed.

instruction area 1. A part of storage allocated to receive and store the group of instructions to be executed. **2.** The storage locations used to store the program.

instruction buffer An eight-bit byte buffer in the computer processor that is used to contain bytes of the instruction currently being decoded and to prefetch instructions in the instruction system.

instruction code See operation code.

instruction control unit In a processor, the part that retrieves instructions in proper sequence, interprets each instruction, and applies the proper signals to the arithmetic and logic unit and other parts in accordance with this interpretation.

instruction counter A counter that indicates the location of the next computer instruction to be interpreted.

instruction cycle The process of fetching an instruction from memory and executing it.

instruction fetch That portion of a computer cycle during which the location of the next instruction is determined. The instruction is taken from memory and modified if necessary, and it is then entered into the control register.

instruction format The layout of an instruction showing its constituent parts.

instruction length The number of words needed to store an instruction.

instruction list (IL) language A textual programming language using instructions for representing the application program for a programmable controller system.

instruction modifier A word or a part of a word that is used to alter an instruction.

instruction pointer register See instruction address register.

instruction register 1. A register that stores an instruction for execution. **2.** A register that is used to hold an instruction for interpretation.

instruction set The set of instructions of a computer, of a programming language, or of the programming languages in a programming system.

instruction storage The storage medium that contains basic machining instructions in coded form.

instruction time The portion of an instruction cycle during which the control unit is analyzing the instruction and setting up to perform the indicated operation.

instruction word A word that represents an instruction.

instrument A device capable of measuring, recording and/or controlling.

instrument air Dehydrated air; air from which all moisture has been removed to prevent any condensation that would harm the delicate mechanism of air-actuated instrument.

instrumental analysis Any analytical procedure that uses an instrument to measure a value, detect the presence or absence of an attribute, or signal a change or end point in a process.

instrumental hysteresis See under backlash.

instrumentation A collection of instruments or their application for the purpose of observation, measurement or control.

instrumentation amplifiers High precision amplifiers with high noise rejection capabilities.

instrumentation tape Analog magnetic tape, unappended, for continuous data.

instrumentation tool (software) A software tool that generates and inserts counters or other probes at strategic points in another program to provide statistics about program execution, such as how thoroughly the program's code is exercised.

instrument chopper A vibrating switch used for modulating, demodulating and switching dc or low-frequency ac information in instrumentation. It is driven synchronously from an ac or pulsating-dc source.

instrument correction A quantity added to, subtracted from, or multiplied into an instrument reading to compensate for inherent inaccuracy or degradation of instrument function.

instrument driver Software module that converts the parameters in the object code to the specific instruction sequence needed to stimulate an instrument.

instrument error The inaccuracy of an instrument.

instrument front The portion of an instrument located on the front of the panel and not passed through the cut-out. Flanges are considered to be part of the instrument front.

instrument reading time The time lag between an actual change in an attribute and stable indication of that change on a continuous-reading instrument.

instrument response (dynamic) The behavior of the instrument output as a function of the measured signal, both with respect to time.

instrument response (forced) The total steady-state plus transient time response resulting from an external input.

instrument shunt An internal or external resistor connected in parallel with the circuit of an instrument to extend its current range.

instrument system See instrumentation.

instrument transformer A precision transformer capable of reproducing a signal in a secondary circuit that is suitable for use in measuring control or protective devices.

instrument with optical index An indicating instrument in which the indications are given by the displacement of an optical index over a scale which may be a part of the instrument or may be separate from it.

insulated Separated from other conducting surfaces by a nonconductive material offering a high, permanent resistance to the passage of current and disruptive discharge.

insulating strength The measure of the ability of an insulating material to withstand electrical stress without breaking down. It is defined in terms of the voltage per unit thickness necessary to initiate a disruptive discharge and usually is measured in volts per centimeter. See also dielectric and electric strength.

insulation See under basic insulation, supplementary insulation, double insulation, reinforced insulation.

insulation rating The dielectric-strength and insulation resistance values required to ensure satisfactory performance.

insulation resistance 1. The resistance measured between specified insulated portions of a device when a specified direct current voltage is applied, at reference operating conditions unless otherwise stated. **2.** Pertaining to electrical transducers and for use in specifications only, the resistance measured between spe-

cified insulated portions of a transducer when a specified dc voltage is applied at room conditions unless otherwise stated.

insulation resistivity The insulation resistance per unit volume of insulation.

insulation voltage breakdown The voltage at which a disruptive discharge takes place through or over the surface of the insulation.

insulator A nonconducting material.

insulator arcing ring A circular or oval metal part placed at one or both ends of an insulator to prevent current from arcing over and damaging it and/or the conductor.

insulator arc-over The flow of power current over an insulator in the form of an arc following a surface discharge.

insulelectrics The science encompassing insulating materials in electrical insulation.

intake 1. An opening where a fluid enters a chamber or conduit; an inlet. **2.** The amount of fluid entering through the opening.

intake valve The valve in a reciprocating pump or a four-stroke-cycle internal combustion engine through which a charge of fluid or a mixture of fuel and air is drawn into pump or engine. The intake valves are one-half of the set of pump or engine valves; the other half of the set are the discharge valves.

integer, integer number One of the numbers zero, plus one, minus one, plus two, minus two, ...

integral 1. The result of integration either of a function or of an equation; an expression whose derivative is the integrand. **2.** An expression which after being differentiated will produce a given differential.

integral absolute error A measure of controller error defined by the integral of the absolute value of a time-dependent error function; used in tuning automatic controllers to respond properly to process transients. See also integral time absolute error.

integral action (I-action) Type of control action in which the rate of change (time derivative) of the output variable is proportional to the concomitant value of the input variable (i.e., in the case of a controller, of the system deviation). Note: Integral action is a special type of floating action.

integral action coefficient 1. For an element with pure integral action, the ratio of the rate of change (time derivative) of the output variable to the concomitant value of the input variable. **2.** For an integral element the ratio of the rate of change or time derivative of the output variable to the corresponding value of the input variable.

integral action limiter A device which prevents the integral control action from going above a predetermined limit (wind-up, saturation).

integral action rate (reset rate) 1. Of proportional plus integral or proportional plus integral plus derivative control action devices; for a step input, the ratio of the initial rate of change of output due to integral control action to the change in steady-state output due to proportional control action. Note: Integral action rate is often expressed as the number of times per minute that the proportional response to a step input is repeated by the initial integral response. **2.** Of integral control action devices; for a step input, the ratio of the initial rate of change of output to the input change.

integral action time For an element with pure integral action, the reciprocal of the integral action coefficient, if the input and output variables have the same dimensions. Note: The integral action time can also be given as that time, which the output variable needs to

reach the same value as a stepwise variation of the input variable.

integral action time constant For an element with integral action, the reciprocal of the integral action coefficient, if the input and output variables have the same dimension. See also ISA publication S 51.1.

integral circuit packages Microcircuits assembled from discrete components and all circuits created essentially in an active or passive substrate.

integral control Action that produces a corrective signal proportional to time integral of the signal. Also known as reset action.

integral (reset) control action (I) Control action in which the output is proportional to the time integral of the input; i.e. the rate of change of output is proportional to the input. See further ISA publication S 51.1.

integral (I) controller A controller which produces integral control action only.

integral (reset) (I) controller A controller which produces integral control action only. Note: It may also be referred to as controller, proportional speed floating.

integral element, I-element Transfer element in which the rate of change or time derivative of the output variable is proportional to the corresponding value of the input variable.

integral flange A flange on a length of pipe, a nozzle or a pressure vessel which is cast or forged with the item itself, or is permanently attached to it by welding.

integral orifice A differential pressure measuring technique for small flow rates in which the fluid flows through a miniature orifice plate integral with a special flow fitting.

integral seat (control valves) A flow control orifice and seat that is an integral part of the body or gage material or may be constructed from material added to the body or gage.

integral stem (control valves) A design in which the stem is either physically a part of the ball or mechanically made part of the ball. Some integral stems are designed to perform a turning and then lifting action.

integral time In reset action of a controller the reciprocal of repeats per minute.

integral time absolute error, ITAE A measure of controller error defined by the integral of the product of time and the absolute value of a time-dependent error function; whereas the absolute value prevents opposite excursions in the process variable from cancelling each other, the multiplication by time places a more severe penalty on sustained transients. See also integral absolute error.

integral windup See reset windup.

integrated circuit, IC Complete modules of components manufactured as single, solid units made by either a film deposition or a diffusion process. Integrated circuits may be used as logic circuitry or as storage modules capable of recording many individual bits of information. Integrated circuits are broadly classified into: 1. Film circuits. 2. Monolithic semiconductor circuits. 3. Hybrid circuits.

integrated circuit array Multiple integrated circuits formed on a common substrate and electrically interconnected during fabrication.

integrated circuit memory A storage device composed of transistors, diodes and other circuit elements all fabricated on a chip of crystalline material.

integrated circuit package The combined mounting and housing for an integrated circuit; the package

protects the integrated circuit and permits external connections to be made to it.

integrated circuit piezoelectric A type of pressure-sensitive sensor that combines a piezoelectric element with isolation amplifier and signal conditioning microelectronics inside the sensor housing so that the output signal can be transmitted over ordinary two-wire cable instead of special low-noise cable.

integrated communication system Communication system on either a unilateral or joint basis in which a message can be filed at any communications center in that system and be delivered to the addressee(s) by any other appropriate communication center in that system without reprocessing en route.

integrated data processing, IDP A system that treats as a whole all data processing requirements to accomplish a sequence of data processing steps, or a number of related data processing sequences, and which strives to reduce or eliminate duplicating data entry or processing steps.

integrated demand (power operations) The demand integrated over a specified period.

integrated dyehouse A dyehouse which is under the control of one computer or computer system.

integrated electronics That portion of electronic art and technology in which the interdependence of material, device, circuit and system-design considerations is especially significant; more specifically that portion of the art dealing with integrated circuits.

integrated heating system A complete system consisting of components such as pipelines, vessels, heating elements, heat transfer medium, thermal insulation, moisture barrier, nonheating leads, temperature controller, safety signs, junction boxes, conduit and fittings.

integrated monolithic circuit Several logic circuits, gates, and flip-flops are etched on single crystals, ceramics, or other semiconductor materials and designed to use geometric etching and conductive ink deposition techniques all within a hermetically sealed chip. Some chips with many resistors and transistors are extremely tiny, others are in effect "sandwiches" of individual chips.

integrated optical circuit, IOC (optical communication) A circuit, either monolithic or hybrid, composed of active and passive electrical, optical and/or optoelectronic elements used for signal processing functions.

integrated system A system in which separate programs perform separate functions with communication and data-passing between functional programs performing standardized I/O routines and a common database. Such systems allow flexibility in addition/revision/deletion of various processing functions without disrupting the entire system.

integrated terminal equipment, ITE Provides voice features simultaneously with data transmission, using common two-pair telephone wire.

integrated transducers Semiconductor components that change the form of energy (e.g. piezoelectric devices, photogenerators, thermistors, etc.) and that are integrated into multifunction chips.

integrating (measuring) instrument A measuring instrument which determines the value of a measurand by integrating a quantity with respect to another quantity. Example: Electrical energy meter.

integrating accelerometer A device that measures acceleration of an object, and converts the measurement to an output signal proportional to speed or distance travelled.

integrating amplifier An analog computer amplifier whose output voltage is proportional to the time integral of the input voltage.

integrating circuit A device whose output function is proportional to the integral of the input function with respect to a specified variable; e.g., a watt-hour meter.

integrating relay A relay that sums up the inputs of voltage or current supplied to it and opens or closes its contacts in response to the input so integrated.

integration (software) The process of combining software elements, hardware elements, or both into an overall system.

integration method 1. A method of measuring the discharge (flow-rate) in which a known quantity of a tracer is injected over a short time at one cross-section and its dilution is measured at another cross-section downstream where complete mixing has taken place, over a period sufficient to allow all the tracer to pass the cross-section so that the mean concentration of tracer during the sampling time can be determined. Pertains to liquid flow measurement in open channels and in closed conduits respectively.

integrator A device whose output is proportional to the integral of its input variable with respect to time.

integrity The extent to which unauthorized access to or modification of software or data can be controlled in a computer system. See also security.

integrity card A printed circuit card used in troubleshooting to check for damaging or improper voltages before replacing a defective board with a new one.

intellectronics The use of electronics to extend man's intellect. For example, the use of a computer to recall facts and formulas, and by applying logic to a situation, to arrive at the logical conclusion.

intelligence signal Any signal which conveys information (e.g., voice, music, code or television).

intelligent 1. Pertaining to a device or a functional unit that is partially or totally controlled by one or more integral processors. **2.** A device that can perform specific logical or sequential functions as a stand-alone unit using its own processor, instruction set, and memory.

intelligent controller Device controller equipped with local interpreting functions, such as editing input validity checks and complex command decoding.

intelligent instruments Devices that possess capabilities that raise them above the level of instruments that merely sense and display analog information. The following list presents one instrument intelligence from the lowest order of intelligence to the highest: **1.** The ability to sense and display information. **2.** Conversion of analog information into digital. **3.** Mathematical manipulation of digital data. **4.** Interpretation of results of mathematical manipulation. **5.** Making of decisions on the basis of interpretation.

intelligent robot A robot which can make decisions by itself through its sensing and recognizing capabilities.

intelligent station A station which includes application units capable of initiating and controlling transactions through a data highway.

intelligent terminal A computer terminal with some local processing capability.

intelligent time-division multiplexer See ITDM.

intelligent voice terminal Intelligent terminal operated by the human voice, software resident in terminal is user-programmable.

intensity 1. The brilliance of an image on the screen of a cathode-ray tube. **2.** The strength of light or other electromagnetic energy being radiated or reflected per

steradian. **3.** The flux per unit solid angle radiating (diverging) from a source of finite area.

intensity level Ratio of the intensity of the sound to a reference intensity of a free plane wave of 1 microwatt per square centimeter under normal conditions. Commonly expressed in decibels.

interacting control algorithm Specific control action which is produced by an algorithm whose various terms are interdependent.

interaction 1. A phenomena, characteristic of a multivariable process, in which the effect of a manipulative variable change in one control loop not only affects its own controlled variable, but also the controlled variable in another loop. **2.** The effects two or more parts, components, etc., have on each other while each is performing a function.

interaction analysis A technique used in determining the pairing of manipulative and controlled variables in a control loop.

interactive Pertaining to a system in which each user entry causes a response from the system. See also conversational.

interactive debugger A computer system software utility that permits a user to examine his or her task while it executes by stopping it at given points (usually called breakpoints) and displaying and changing memory/register contents.

interactive graphics Graphics where the viewer can manipulate or change the display in some way.

interactive mode See conversational mode.

interactive system Specific computer capability relating to direct communication between man and machine with real-time rapidity; i.e., the thought process of humans remains uninterrupted by machine delays.

interblock gap, IBG The space between two consecutive blocks on a data medium.

interchannel interference (modulation system)

In a given channel, the interference resulting from signals in one or more other channels.

intercom See intercommunication system.

intercommunication system Also called intercom. A two-way communication system without a central switchboard, usually limited to a single vehicle, building or plant area. Stations may or may not be equipped to originate a call, but can answer any call.

interconnection diagram Diagram showing the identity of all units in a piece of electronic equipment and the connections between them.

interconnection system The electrical and mechanical interconnection of any one or all of the six levels of interconnections generally common to electronic equipment. The six levels of interconnections are: intramodule, module to motherboard, intramotherboard, motherboard to back panel, backpanel wiring and input/output.

interconnector A flowchart symbol which illustrates continuation of a broken flowline.

intercooler A heat exchanger in the path of fluid flow between stages of a compressor to cool the fluid and allow it to be further compressed at lower power demand.

intercoupler The connection of two or more hardware units, usually electronically or electrically.

interdendritic corrosion Corrosive attack that progresses differentially along interdendritic paths. Note: This type of attack results from local differences in composition, that is, coring commonly encountered in alloy castings.

interface A common boundary between ports of a system across which communication takes place.

interface (separation terminology) Sharp contact boundary between two phases, either or both of which may be solid, liquid or gaseous. In a separator bowl, it is generally the interface between two liquids that is of interest. In a concentrator, it is on a smaller diameter, the heavy phase travels a longer distance. In a concentrator, it is on a smaller diameter, the heavy phase travels a longer distance. In a purifier, it is on a larger diameter, the light phase travels a longer distance in the bowl.

interface (petroleum industry) For instance pertaining to the petroleum industry, the point or area where two dissimilar products or grades of crude oil meet in a pipeline as they are pumped, one behind another.

interface card A device that converts a computer I/O bus into same standard I/O configuration (8- or 16-bit parallel bcd, R 232, IEEE 488, etc.).

interface CCITT The world recommendation for interface requirements between data processing terminal equipment and data communication equipment. The CCITT recommendation resembles very closely the American EIA Standard RS-232-B or C. This standard is considered mandatory in Europe and on the other continents.

interface device (fluid power systems) Device which converts information between different types or levels of energy.

interface-EIA standard RS 232-C (data transmission) A standardized method adopted by the Electronic Industries Association to ensure uniformity of interface between data communication equipment and data processing terminal equipment. The standard interface has been generally accepted by a great majority of the manufactures of data transmission and business equipment.

interface function to sensors and actuators (programmable controllers) The interface function to sensors and actuators converts: the input signals and/or data obtained from the machine/process to appropriate signal levels for processing, the output signals and/or data from the signal processing function to appropriate signal levels to drive actuators and/or displays.

interface MIL STD 188B (data transmission) The standard method of interface established by the Department of Defence in USA. This standard provides the interface requirements for interconnection between data communication security devices, data processing equipment, or other special military terminal devices.

interface module Pertaining to data communication, makes the necessary conversion between the electrical operating levels of the communication terminals and the particular, external circuit.

interface requirement A requirement that specifies a hardware, software, or data base element with which a system or system component must interface, or that sets forth constraints on formats, timing or other factors caused by such an interface.

interface unit A device that translates incoming signals that are incompatible with the electrical characteristics of the computer without changing the information content. Also translates outgoing signals for the benefit of associated equipment that is designed to different electrical standards.

interfacing The joining of members of a group (people, instruments and so on) in such a way that they are able to function in a compatible (synchronized) and coordinated fashion.

interference 1. Any spurious voltage or current rising from external sources and appearing in the circuits of a device. See noise. **2.** In optics, the interaction of two or more beams of coherent or partially coherent light.

interference field strength Field strength produced by a radio disturbance.

interference filter (optical communication) An optical filter consisting of one or more thin layers of dielectric or metallic material and operates by means of interfering effects.

interference pattern The resulting space distribution when progressive waves of the same frequency and kind are superposed.

interference source suppression Techniques applied at or near a source of radiation to reduce its emission of undesired signals.

interference testing A type of on-line testing that requires disruption of the normal operation of the unit under test.

interferometer (optical communication) An instrument that employs the interference of light waves for purposes of measurement.

interferometric pressure transducer A type of pressure sensor developed to read pressure differentials on the order of 200 Pa (.030 psi) with a resolution of 1 Pa (0.00015 psi) by detecting very small deflections of a fragile diaphragm through optical interferometry.

intergranular corrosion Intergranular corrosion appears as a localized attack at the grain boundaries. Some chromium-nickel stainless steels are subject to this corrosion when they are improperly heat treated or welded.

interlace To assign successive storage location numbers to physically separated storage locations in order to reduce access time.

interlaced memory A memory with sequentially addressed locations occupying physically separated positions in the storage media.

interlace operation A type of computer operation in which data can be read out of or copied into the memory without causing interference to the other activities of the computer. See also interrupt and time sharing.

inter language A modification of common languages suitable for automatic translation by the equipment into machine or computer usable language.

interleave 1. In a computer to insert segments of one program into another program so that the two programs can be executed essentially simultaneously. **2.** See interlace. **3.** To arrange parts of one sequence of things or events so that they alternate with parts of one or more other sequences of the same nature and so that each sequence retains its identity.

interleaving 1. The act of accessing two or more bytes or streams of data from distinct memory banks simultaneously. **2.** The alternating of two or more operations or functions through the overlapped use of a computer facility.

interlisp A general purpose environment for building and using artificial intelligence applications based on the LISP programming language.

interlock To arrange the control of machines or devices so that their operation is interdependent in order to assure their proper coordination.

interlock circuit A circuit in which a given action cannot occur until one or more other actions have taken place. The interlocking action is generally obtained through the use of relays.

interlocking The forcing of a voltage of one frequency to be in step with a voltage of another frequency.

interlock relay A relay in which one armature cannot move or its coil be energized unless the other armature is in a certain position.

interlock signal A signal which blocks the transmission of a signal, the action of an element, or the execution of a command.

interlude A small initial routine at the start of a program that carries out housekeeping tasks.

intermediate Refined products in the middle range of a refinery's output, e.g., straight-run gasoline, naphtha, kerosene, and light gas oil. On either side of the intermediates are the light ends (upper end) and heavy gas oil, lube oil and residuals (the lower end).

intermediate annealing, process annealing Full annealing between other heat-treating or working operations.

intermediate code Machine input in a form between source and machine code; for example, pseudo code.

intermediate frequency **1.** The signal in a superheterodyne which appears at the output of the first sector. **2.** A frequency to which a signal wave is shifted locally as an intermediate step in transmission or reception.

intermediate means In an instrumentation or control system, all system elements between the primary detector and the end device which transmit or modify the output of the former to make it compatible with input requirements of the latter.

intermediate mode Method of operating a computer, with interpretive languages such as BASIC, whereby an individual instruction or a small number of instructions not forming part of a program, are executed.

intermediate node A node that is at the ends of more than one branch.

intermediate phase Phase that cannot exist without containing at least two components.

intermediate repeater (data transmission) A repeater for use in a trunk of line at a point other than an end.

intermediate storage The portion of the computer storage facilities in which information in the processing stage usually is stored.

intermediate subcarrier A carrier which may be modulated by one or more subcarriers and used as a modulating wave to modulate a carrier.

intermediate zone Any zone not bounded by a range-limit.

intermetallic compound A compound of two or more metals that has a characteristic crystal structure that may have a definite composition corresponding to a solid solution, often refractory.

intermittent **1.** Occurring at intervals. **2.** Electrical connections when conducting paths alternately open and close at some essentially uncontrolled rate. (Intermittents are undesirable since continuous connections are normally required.) **3.** Not continuously present; disappearing and reappearing.

intermittent blowdown The blowing down of boiler water at intervals.

intermittent board machine, wet lap machine Machine for the forming of wet sheets of board. The web from a fourdrinier wire or from one or more cylinder-vat units is wrapped round a making roll in an intermittent board machine where it forms a mat consisting of several plies. When the desired thickness has been attained, the mat is cut off and removed.

intermittent-duty rating The output rating of a device operated for specified intervals rather than continuously.

intermittent failure See intermittent fault.

intermittent fault, volatile fault, transient fault

A fault of an item which persists for a limited time duration following which the item recovers the ability to perform a required function without being subjected to any action of corrective maintenance. Note: Such a fault is often recurrent.

intermittent firing A method of firing by which fuel and air are introduced into and burned in a furnace for a short period, after which the flow is stopped, this succession occurring in a sequence of frequent cycles.

intermittent pulsing The transmission of short bursts of radiation at irregular intervals.

intermittent rating (electrical transducers) The rating applicable to specified operation over a specified number of time intervals of specified duration; the length of time between these time intervals must also be specified.

internal bond strength, z-strength The maximum tensile force per unit area which e.g. paper or board can withstand when the force is applied in a direction perpendicular to the plane of the test piece.

internal calibration Calibration by an internal voltage source (provided with the instrument) rather than an external standard.

internal disabled state, down state See down state.

internal furnace A furnace within a boiler consisting of a straight or corrugated flue, surrounded with water.

internal input impedance The actual impedance at the input terminals of a device.

internal label A machine-readable label, recorded on a data medium, that provides information about data recorded on the medium.

internal leakage Leakage between internal cavities of a device.

internally fired boiler A fire tube boiler having an internal furnace such as a Scotch, Locomotive Fire Box, Vertical Tubular, or other type having a water-cooled plate-type furnace.

internal memory See internal storage.

internal-mix oil burner A burner having a mixing chamber in which high velocity steam or air impinges on jets of incoming liquid fuel which is then discharged in a completely atomized form.

internal output impedance The actual impedance at the output terminals of a device.

internal oxidation See subsurface corrosion.

internal pressure Pertaining to electrical transducers, see burst pressure, proof pressure or reference pressure.

internal resistance **1.** The effective series resistance in a source of voltage. **2.** The resistance of a voltage source, such as a generator, battery or power supply, which acts to reduce the terminal voltage of the source as current is drawn.

internal sound-power level A measure of the acoustic energy transmitted into the pipe system from the source.

internal spring An internal spring safety relief valve incorporates the spring and all or part of the operating mechanism within the pressure vessel.

internal standard In chemical analysis, especially instrumental analysis, a material present in or added to a sample in known amounts to serve as a reference in determining composition.

internal storage Storage that is accessible by a processor without the use of input-output channels. Synonymous with internal memory.

internal synchronization Pertaining to oscilloscopes, the synchronization obtained when the signal

which controls the time base is supplied by an internal circuit affected by the observed quantity.

internal timer In a computer, the internal clock equipped with multiple registers which can monitor the duration of external events or generate a pulse after a fixed time.

internal treatment The treatment of boiler water by introducing chemicals directly into the boiler.

internal triggering Pertaining to oscilloscopes, the triggering obtained when the signal which controls the time base is supplied by an internal circuit affected by the observed quantity.

International Algebraic Language, IAL The language which preceded ALGOL.

International Electrotechnical Commission See IEC.

International Organization for Standardization, ISO An organization established to promote the development of standards to facilitate the international exchange of goods and services, and to develop mutual cooperation in areas of intellectual scientific, technological, and economic activity.

International Practical Temperature Scale of 1968 (IPTS-68) An international standard for temperature-emf relationships for temperature measurement thermocouples. See further American National Standard MC 96.1. Temperature Measurement Thermocouples published by ISA, publication no. ANSI-MC 96.1-1982. This standard also deals with letter designations for thermocouple and thermocouple extension wires, material identification, color, coding, calibration tolerances, fabrication methods and installation considerations. Corresponding IEC publications are 584-1, Thermocouples, Part 1: Reference tables; 584-2 Thermocouples, Part 2: Tolerances. The IPTS-68 has been replaced by the International Temperature Scale of 1990 (ITS-90) as of January 1990. The changes are small enough to cause few problems in most process measurements, but important for applications where critical standards must be met.

international standard A standard recognized by an international agreement to serve internationally as the basis for fixing the value of all other standards of the given quantity.

International System of Units, SI The coherent system of units adopted and recommended by the General Conference on Weights and Measure (CGPM). Note: The SI is based at present on the following seven base units: The metre, unit of length; the kilogram, unit of mass; the second, unit of time; the ampere, unit of electric current, the kelvin, unit of temperature; the mole, unit of amount of substance; the candela, unit of luminous intensity. Two supplementary units are radian, unit of plane angle and steradian, unit of solid angle. By combining these units according to simple laws of physics the derived units are formed as follows: hertz, newton, pascal, joule, watt, coulomb, volt, farad, ohm, siemens, weber, tesla, henry, lumen, lux, gray, bequerel. A limited number of non-SI units are accepted for use together with the SI units. They are called additional units (see under additional units). An SI unit or and additional unit can be combined with a prefix, which indicates multiplication by a certain power of 10. A unit containing a prefix is called a multiple unit. The preferred prefixes are: exa, peta, tera, giga, mega, kilo, milli, micro, nano, pico, femto, atto.

International Telecommunication Union, ITU The United Nations specialized agency that deals with telecommunications.

International Temperature Scale of 1990 (ITS-90) A new temperature scale replacing the International Practical Temperature Scale of 1968 (IPT S-68). See also International Practical Temperature Scale of 1968.

internode Communication paths that originate in one node and terminate in another.

interoperability The ability of two or more systems to exchange information and to mutually use the information that has been exchanged. Compare with compatibility.

interpolation (in numerical control) The determination of points intermediate between known points on a desired path or contour in accordance with a given mathematical function, for example linear, circular or higher order functions.

interpolation parameters (numerical control) parameters defining the portion of the cutter path that is to be interpolated.

interposing relay A device which enables the energy in a high-power circuit to be switched by a low-power control signal.

(to) interpret, interpret (software) To translate and to execute each source language statement a computer program before translating and executing the next statement. Contrast with assemble, compile.

interpreter Software, hardware, or firmware used to interpret computer programs. Contrast with compiler, assembler.

interpretive program, interpreter (in computer programming) A computer program used to interpret.

interrogate 1. To determine the state of a device or circuit. **2.** Retrieve information from computer files by use of predefined inquiries or unstructured queries handled by a high-level retrieval language.

interrogating The process whereby a master station requests a slave station to indicate its identity or its status.

interrupt 1. A suspension of a process such as the execution of a computer program, caused by an event external to that process, and performed in such a way that the process can be resumed. Synonymous with interruption. **2.** A break in the normal flow of a system or program occurring in such a way that the flow can be resumed from that point at a later time. **3.** An occurrence which transfers control from one operation to another.

interrupted ageing, interrupted aging Pertaining to heat treatment, aging at elevated temperatures on two or more occasions with intermittent quenching to atmospheric temperature.

interrupter (power switchgear) An element designed to interrupt specified currents under specified conditions.

interruption See interrupt.

interrupt priority system An interrupt system in which each class of interrupts is assigned a priority and interrupts of a given class inhibit all interrupts of lower priorities until the higher priority interrupt is completely processed.

interrupt register A special purpose register that holds data necessary for handling interrupts.

interrupt request A signal to a computer that temporarily suspends the normal sequence of a routine and transfers control to a special routine.

intersection, AND operation, conjunction The Boolean operation whose result has the Boolean value 1 if and only if each operand has the Boolean value 1. Note: See also table in ISO publication 2382/11.

interstage Between stages.

interstage coupling Coupling between stages.

interstitial solution Solid solution of one substance in another without any significant change in the structure of the second substance.

interstitial water The water which is retained in the interstices (or spaces) between solid particles.

interval 1. The spacing between two sounds in pitch or frequency, whichever is indicated by the context. Note: The frequency interval is expressed by the ratio of the frequencies or by a logarithm of this ratio.

2. The algebraic time difference calculated by subtracting the time of a first specified instant from the time of a second specified instant.

interval circuit A circuit which is energized during timing only. This can be accomplished by using a timer with interval contacts; or by using a timer with delayed contacts in series with the start switch, or one with instantaneous contacts in series with delayed contacts.

interval timer 1. A pulse-counter module into whose buffer a predetermined total count is loaded by program control and which, when decremented to zero or when overflow occurs, causes an interrupt to be sent to the system. It can be simply a buffer location in storage rather than a special module. **2.** A timer which switched electrical circuits on or off for the duration of the preset time interval. **3.** A hardware or software clock which generates an interrupt after a specified period has elapsed.

intramodel distortion, chromatic distortion In an optical fiber, that distortion due to dispersion for a given mode.

intrinsic, inherent Qualifies a value determined when maintenance and operational conditions are assumed to be ideal.

intrinsically safe circuit (Exi) A circuit in which any spark or thermal effect produced either in normal operating conditions or in specified fault conditions is incapable, under the test conditions specified in the relevant standard, of causing ignition of a specified explosive atmosphere.

intrinsic electric strength The characteristic electric strength of a material.

intrinsic error The error of a measuring instrument when used under reference conditions.

intrinsic safety Design methodology for a circuit or an assembly of circuits in which any spark or thermal effect produced under normal operating and specified fault conditions is not capable under prescribed test conditions of causing ignition of a given explosive atmosphere.

intrinsic safety barrier (Exi) A device which can limit the flow of electrical energy from a safe area into an explosively hazardous area in such a way that the circuit in the explosively hazardous area becomes an intrinsically safe circuit.

intrinsic safety standards Intrinsic safety standards for electrical instrumentation including world wide aspects is very well covered in the following books: *Intrinsic Safety* (ISBN 0-87664-635-6) and *Electrical Instruments in Hazardous Locations* (ISBN 0-87664-376-4). The following ISA publications also apply: RP 12.1: *Electrical Instruments in Hazardous Atmospheres*; S 12.4: *Instrument Purging for Reduction of Hazardous Area Classification*; RP 12.6: *Installation of Intrinsically Safe Instrument System in Class 1 Hazardous Locations*; S 12.10: *Area Classification in Hazardous Dust Locations*; S 12.11: *Electrical Instruments in Hazardous Dust Locations*; S 12.12: *Electrical Equipment for use in Class 1, Division 2 Hazardous (classified) Locations*. British Stan-

dards Institution Standards BS 5345, BS 5501 and European Standards EN 50014, 50016, 50018, 50020 and EN 50039 also apply in full or partly.

intrinsic semiconductor A semiconductor whose charge-carrier concentration is substantially the same as that of the ideal crystal.

intrinsic thermocouple Intrinsic thermocouples are a form of grounded junction thermocouples which are used either as absolute temperature measuring thermocouples or as differential thermocouples. They are formed by attaching two thermocouple wires individually to a metal object or immersing them in a molten conductor. They have the advantage of extremely fast response, since the material whose temperature is to be measured forms part of the thermocouple circuit.

intrinsic viscosity The extrapolation to zero concentration of the quotient of the relative viscosity increase when a substance is dissolved in a solvent divided by the concentration of the dissolved substance.

Invar An alloy containing 63.8 percent iron, 36 percent nickel and 0.2 percent carbon. Has a very low thermal coefficient of expansion.

inventory Parts and material on hand. Inventory is items that are in a stocking location or work in process and that serve to decouple successive operations in the process of manufacturing a product and distributing it to the consumer. Inventories may consist of finished goods ready for sale; they may be parts or intermediate items; they may be work in progress; or they may be raw materials.

inverse feedback See negative feedback.

inverse Fourier transform A mathematical operation that synthesizes a time-domain signal from its complex spectrum components. If a time-domain signal is Fourier-transformed and then inverse Fourier-transformed, the original time function is reconstructed.

inverse piezoelectric effect Contraction or expansion of piezoelectric crystal under the influence of an electric field.

inverse ratio The seesaw effect whereby one value increases as the other decreases or vice versa.

inverse response The dynamic characteristic of a process by which its output responds to an input change by moving initially in one direction but finally in the other.

inverse transfer function The reciprocal of a transfer function.

inverse transfer locus The locus of the inverse transfer function.

inversion See negation or NOT operation.

inversion temperature In a thermocouple, the temperature of the "hot" junction when the thermoelectric emf of the circuit is equal to zero.

invert 1. To place in a contrary order. To invert the terms of a function is to put the numerator in place of the denominator, and vice versa. **2.** The lowest part of the cross-section of a natural or artificial channel. Pertains to liquid flow measurement in open channels.

inverter 1. A circuit which takes in a positive pulse and puts out a negative one, or takes in a negative pulse and puts out a positive one. The physical meaning of positive and negative depends on the specific circuit and the conventions established for it. **2.** A functional unit whose output analog variable is equal in magnitude to its input analog variable but is of opposite algebraic sign. **3.** A machine, device, or system that changes direct-current power to alternating-current power.

inverter circuit See NOT circuit.

inverting amplifier An amplifier whose output voltage is equal in magnitude to the input voltage but opposite in sign.

inverting connection The closed-loop connection of an operational amplifier when the forward gain is negative for dc signals. A 180° phase shift.

inverting input An input terminal of a differential amplifier that produces an output signal of opposite phase (shifted 180°) than that of the input signal.

inverter 1. An electronic or electromechanical device which changes dc to ac (or vice versa). **2.** A circuit used for this purpose.

INX Technique for concentration of low-grade pitch-blende by ion exchange.

I/O Input-Output. Any equipment that introduces data into or extracts data from a data communications system.

I/O bound A state of program execution in which all operations are dependent on the activity of an I/O device; for example when a program is waiting for input from a terminal.

I/O buffer The temporary storage area for input and output of a computer.

I/O device The hardware of the computer by which data is entered into a computer, or by which the finished computations are recorded for immediate or future use.

I/O electrical isolation Separation of the field wiring circuits from the logic level circuits of the PC, typically done with optical isolation.

I/O equipment Specific units of the total computing system designed to accept data and output the results of computing and processing in a form readable either by humans or other processing units.

I/O instructions Computer instructions which operate input-output devices like card readers, printers, and terminals.

I/O modules General purpose circuit modules that interface a microprocessor to relays switches and transducers.

ion An atom or group of atoms with an electric charge.

ion deflection flowmeter A form of deflection-technique (see this term) flowmeter using ions as the energy source. This flowmeter is further discussed in ISA publication Fundamentals of Flow Measurement.

ion exchange A chemical process for removing unwanted dissolved ions from water by inducing an ion-exchange reaction (either cation or anion) as the water passes through a bed of special resin containing the substitute ion.

ion-exchange resin A synthetic organic compound (resin) that can remove unwanted ions from a dilute solution by combining with them or by exchanging them for ions that produce desirable or neutral effects.

ion exchange technique (optical communication) A manufacturing process in which a graded index fiber is fabricated by means of an ion exchange process.

ionic balance An ionic balance is the algebraic sum of the changes of the cations and anions present. In all waters this sum must be equal to zero. Any deviation from zero, of the balance calculated from the actual analytical results, is an indication either of the incompleteness of the determination (some ions not determined) or errors in analysis.

ionic strength Effective strength of all ions in a solution that is equal to the sum of one half of the product of the individual ion concentration and their ion valence or charge squared for dilute solutions.

ionization Since the atom is electrically neutral to begin with, the loss of an electron will endow it with a

positive charge. Such a charged atom is called "ion", and the process which creates it is known as ionization.

ionization (hot filament) gages for ultra-high vacuums Operation of the ionization gage is based on the ability of electrons emitted from a hot filament to bombard the molecules of the residual gas in an evacuated system and thereby form an electric current flow from the resulting ions. The amount of this current flow is directly proportional to the number of ions formed; hence, it is an indication of the amount of residual gas present and is a measure of the vacuum.

ionization smoke detector A smoke detector in which a small amount of radioactive material ionizes the air in the sensing chamber, thus rendering it conductive and permitting a current through the air between two charged electrodes. This effectively gives the sensing chamber an electrical conductance. When smoke particles enter the ionization area, they decrease the conductance of the air by attaching themselves to the ions, causing a reduction in mobility. When the conductance is less than a predetermined level, the detector circuit responds.

ionization vacuum gage A vacuum gage that depends for its operation on the current of positive ions produced in the gas by electrons that are accelerated between a hot cathode and another electrode in the evacuated space.

ion-selective electrode Element of a sensor producing an electric signal which is a function of the activity of a specific ion in a solution.

ion spot (cathode-ray-tube screen) An area of localized deterioration of luminescence caused by bombardment with negative ions.

I/O rack A chassis which contains I/O modules.

I/P Current to Pressure.

I/P converter A device that linearly converts electric current into gas pressure (for example 4–20 mA into 3–15 psi).

IPT Internal Pipe Thread.

IPTS-68 See under International Practical Temperature Scale of 1968. Earlier IPTS 48. Now ITS-90.

Ir Chemical symbol for irridium.

IRIG Inter-Range Instrumentation Group (USA). The telemetry working group of IRIG specifies standards and practices of telemetry.

iron-bearing minerals A large number of minerals contain iron, however only a few are used commercially as sources of iron. Minerals containing important amounts of iron may be grouped according to their chemical composition into oxides, carbonates, sulphides and silicates.

iron carbide Intermediate phase in the iron-carbon system.

iron-sulphide minerals Principal minerals are: pyrite, pyrrhotite, marcacite.

iron-vane instrument An indicating instrument the operating portion of which consists of two iron bars, one fixed, one pivoted, placed parallel to each other inside a signal coil. Current through the coil magnetizes the bars in the same direction, and they repel each other, causing the pointer to pivot against the force of a hairspring.

iron versus copper-nickel Material identification for type J thermocouple and extension wire. See ISA publication ANSI-MC 96.1-1982 and/or IEC publication 584-1, 584-2.

irradiance (fiber optics) Radiant power incident per unit area upon a surface, expressed in watts per square meter. "Power density" is colloquially used as a synonym.

irregularity A change from normal.

irrelevance, prevarication, spread (information theory) The conditional entropy of the occurrence of specific messages at a message sink given the occurrence of specific messages at the message source connected to the message sink by a specified channel.

irreversible process An electrochemical reaction in which polarization occurs.

irrigation water (water quality) Water which is applied to soils or plant growth substrates in order to increase their moisture content, to provide the necessary water for normal plant growth and/or to prevent the accumulation of excess salts in the soil.

IRSI Institute for the Encouragement of Scientific Research in Industry (Belgium).

IS International Standard. The third (and highest) stage of an ISO Standard. Prospective ISO standards are balloted three times. The first stage is as a Draft Proposal has been in use a period of time (typically 6 months to a year) the standard, frequently with corrections and changes, is re-balloted as a Draft International Standard. After the Draft International Standard (DIS) has been in use for a period of time (typically 1 to 2 years) it is re-balloted as an International Standard.

ISA Instrument Society of America, a US society of instrument and controls professionals.

ISA 1932 nozzle Nozzle the upstream face of which consists of a flat surface perpendicular to the axis, a convergent section defined by two arcs of circumference, a cylindrical throat and a recess. ISA 1932 nozzles always have corner pressure tapings. The profile is defined precisely in ISO 5167. See figure in ISO purification 4006-1977 or BS 5875:1980.

ISA SP50 A standards committee working on a standard of a communications bus for interconnecting control device to sensors and actuators (Field Bus).

ISA SP72 A standards committee working on a standards for use in process control. These standards include PROWAY, Process Control Architecture, and Process Messaging.

ISDN Integrated System Data Network. International Standard for Digital Networks.

ISDN Integrated Systems Digital Network. ISDN is a suite of protocols being defined by CCITT to provide voice and data services over wide area networks (WANs).

isentropic exponent Ratio of the relative variation of pressure to the corresponding relative variation of mass density under elementary reversible adiabatic (isentropic) transformation conditions. For an ideal gas, the isentropic exponent is equal to the ratio of the specific heat capacity at constant pressure to the specific heat capacity at constant volume, this ratio being considered as constant in the chosen integration interval.

ISEP International Standard for Electronic Packaging.

ISHM International Society of Hybrid Microelectronics.

ISI 1. Iron and Steel Institute. **2.** Israel Standards Institute.

ISM equipment A Federal Communications Commission designation for industrial, scientific and medical equipment (USA).

ISO 1. See International Organization for Standardization. **2.** A prefix denoting similarity.

ISO 9000 standard Quality management and quality assurance standards – Guideline for selection and use.

ISO 9001 standard Quality systems – Model for quality assurance in design/development, production, installation and servicing.

ISO 9002 standard Quality systems – Model for quality assurance in production and installation.

ISO 9003 standard Quality systems – Model for quality assurance in final inspection and test.

isobaric Proceeding at constant pressure.

ISO-brightness, diffuse blue reflectance factor See diffuse blue reflectance factor.

isochronous 1. Equal in length of time. **2.** Occurring at equal intervals of time. **3.** Describes modems, terminals and transmissions in which all bits are of equal duration. There are no start or stop bits as in "asynchronous" and no clocking signals as in "synchronous".

isochronous circuits Circuits having the same resonant frequency.

isochronous governor A device that maintains rotational speed of an engine constant, regardless of load.

isochronous transmission A data transmission process in which there is always an integral number of unit intervals between any two significant instants.

isoelectric Uniformly electric throughout, or having the same electric potential, and therefore producing no current.

isoelectronic Having the same number of electrons outside the nucleus of the atom.

isokinetic sampling (water quality) A technique in which the sample from a water stream passes into the orifice of a sampling probe with a velocity equal to that of the stream in the immediate vicinity of the probe.

isolated (devices, circuits) Devices, circuits are said to be isolated where there is no galvanic connection between them.

isolated amplifier An amplifier without an electrical connection between the input circuit and the output circuit, and between both circuits and ground.

isolated analog input Analog input channel, of which the terminals are electrically isolated from all other terminals.

isolating valve A hand operated valve between the packing lubricator assembly and the packing box assembly to shut-off the fluid pressure from the lubricator assembly.

isolation and insulation According to IEC standard 654-2, Part 2 the following three classes for earthing d.c. power can be specified: 1. Positive to-earth. 2. Negative-to-earth. 3. Floating. Note: Local codes and the work of IEC sub-committee 31 G and IEC technical committee no. 64 deal with the subject in detail.

isolator (optical communication) A two part device having much greater attenuation in one direction of propagation than in the opposite direction. Note: An isolator is often used to prevent reflexions along a transmission path.

isolator/regulator A device that combines the characteristics of isolation devices and voltage regulators, providing protection against voltage spikes, noise and fluctuations.

isomer Compounds having the same composition and the same molecular weight but differing in properties.

isomerization A refinery process for converting chemical compounds into their isomers, i.e., rearranging the structure of the molecules without changing their size or chemical composition.

isomorphic "Isomorphic" is the name of a series of flow pressure gate valves of a specified shape, having, for each nominal size the minimum wall thickness meeting the foundry or manufacturing requirements (in contrast to "isobaric" series, i.e. having the same maximum operating pressure at a temperature of 20°C).

isopotential point Point on the millivolt versus pH plot at which change in temperature has no effect. It is at 7 pH and zero millivolts unless shifted by the standardization and meter zero adjustments or an electrode asymmetry potential.

isothermal At constant temperature. When a gas is expanded or compressed at a constant temperature, the expansion or compression is isothermal. Heat must be added to expanding gas and removed from compressing gas to keep it isothermal.

isothermal annealing Heat treatment in two stages with intermediate reasonable reduction in temperature in order to give rise to isothermal transformation; compare pearlitizing.

isothermal hardening See martempering.

isothermal heat treatment Heat treatment including holding at a constant temperature and for example the transformation of supercooled austenite.

isothermal transformation Transformation at a constant temperature; see athermal transformation, TTT curve. The length of time of an isothermal transformation depends on the temperature.

isotones A group of atoms the nuclei of which have the same number of neutrons.

isotope Any of two or more nuclides that have the same number of protons in their nuclei but different numbers of neutrons; such atoms are of the same element, and thus cannot be separated from each other by chemical means, but because they have different masses can be separated by physical means.

isotropic material **1.** A material having the same magnetic characteristics along any axis. **2.** A substance whose properties are similar when tested in any direction.

ISP InterOperable Systems Project. A consortium formed in September 1992 to develop an interim fieldbus specification. The ISP approach is much based on the PROFIBUS technology.

ISR Information Storage and Retrieval.

IST International Standard Thread (metric).

ITDM Intelligent Time Division Multiplexer. A multiplexer that assigns time slots on demand rather than on a fixed subchannel-scanning basis. Also called statistical multiplexer.

ITE See integrated terminal equipment.

item A collection of related characters, treated as a unit.

item, entity See entity.

iterate To execute a loop or series of steps repeatedly, e.g., a loop in a routine.

iteration (software) **1.** The process of repeatedly executing a given sequence of programming language statements until a given condition is met or while a given condition is true. **1.** A single execution of a loop.

iterations per second The number of approximations per second in iterative division in a computer; the number of time a cycle of operation can be repeated in one second.

iterative Describing a procedure or process which repeatedly executes a series of operations until some condition is satisfied. An iterative procedure can be implemented by a loop in a routine.

iterative division In computers, a method of performing division by use of addition, subtraction and multiplication operations.

iterative routine A computer routine composed of repetitive computations, so that the output of every step becomes the input of the succeeding step.

ITF: basic A simple algebra-like language designed for ease of use at a terminal.

ITF: PL/1 A conversational subset of PL/1 designed for ease of use at the terminal.

ITI Industrial Technology Institute. A non-profit organization founded by the University of Michigan dedicated to computer integrated manufacturing. ITI offers MAP conformance testing and certification.

ITI Industrial Technology Institute. A nonprofit organization founded by the University of Michigan and sponsored by the State of Michigan dedicated to computer integrated manufacturing. ITI offers MAP conformance testing and certification.

ITS-68 See International Temperature Scale of 1990 and International Practical Temperature Scale of 1968.

ITU International Telecommunications Union (UNO).

IUPAC The International Union for Pure and Applied Chemistry.

IUPAP The International Union for Pure and Applied Physics.

ivory board A well-sized paper or board, normally with a grammage higher than 150 g/m², suitable for writing or printing and consisting of one or more plies of fully bleached chemical pulp.

J

(type) J Designation for thermocouple and thermocouple extension wire with a certain temperature – emf relationship. Material identification: Iron versus copper-nickel. See ISA publication ANSI-MC 96.1 – 1982 and IEC publication 584-1.

J Symbol for joule, unit for energy. See under joule.

JAAC Joint Automatic Control Conference (organized by ISA yearly).

jack A connecting device to which a wire of a circuit may be attached and which is arranged for the insertion of a plug.

jacket A plastic layer applied over the coating of an optical fiber, or sometimes over the bare fiber. Used for color coding in optical cables, to make handling easier, or for protection of the fiber against mechanical stress and strain.

jacketed valves A valve body cast with a double wall or provided with a double wall by welding material around the body so as to form a passage for a heating or cooling medium. Also refers to valves which are enclosed in split metal jackets having internal heat passageways of or electric heaters. Also referred to as “steam jacketed” or “vacuum jacketed”.

jack panel An assembly composed of a number of jacks mounted on a board or panel.

jackplug An electronic connector at the ends of wires designed to fit into particular type hubs.

Jackson candle turbidimeter A special candle and a flat-bottomed glass tube graduated in Jackson turbidity units. Compares the strength of the transmitted light with that scattered or reflected.

jackup rig A barge-like, floating platform with legs at each corner that can be lowered to the seafloor to rise or jack up the platform above the water. Towed to location offshore, the legs of the jackup rig are in a raised position, sticking up high above the platform. When on location, the legs are run down hydraulically or by individual electric motors.

jacquard (textile term) A system of weaving which uses a sophisticated pattern mechanism to permit the production of large, intricate designs. The woven pattern is achieved by a series of punched cards which control each warp (lengthwise) yarn individually. A similar device is used to produce intricate knitted patterns.

jacquard board, jacquard paper Dimensionally stable board or paper which can be punched without being deformed and which is sufficiently abrasion resistant for use in a jacquard loom. Josef-Marie Jacquard – French textile technologist.

jamming Deliberate interference of a transmission on one carrier by transmission on another approximately equal carrier, with wobble or noise modulation.

jam transfer The transfer operation, in a double-buffered digital-to-analog converter (DAC) or digital-to-analog multiplier (DAM), in which the digital value is simultaneously loaded into both the holding and dynamic registers.

JAN specification Joint Army-Navy specification. The forerunner of present Military Specifications, which are generally superseded by the designation MIL (USA).

Japanese Map Users Group See World Federation.

jar (storage cell) The container for the element and electrolyte of a lead-acid storage cell and unattached by the electrolyte.

jargon The technical vocabulary of a special trade group or scientific group.

J-box (textile term) A continuous storage device which, when viewed from the side, is shaped like the letter “J”. Fabric is deposited in rope or open-width form at the top of the “J” and withdrawn from the bottom after the required storage time. Usually installed in preparation ranges to allow time for chemicals and enzymes to work on the goods.

JCL See job control language.

JEDEC Joint Electron Device Engineering Council (USA). An industry-sponsored organization whose function is to provide a means of standardization for the industry. This encompasses numbering systems, testing methods and techniques, specification uniformity and similar attempts on the part of the component manufacturers to assist the users to electronic components.

jeeping Refers to the operation of inspecting pipe coating with the aid of electronic equipment. An indicator ring is passed over the pipe that carries an electric charge. If there is a break or holiday in the protective coating, a signal is transmitted through the indicator ring to an alarm.

JEIDA Japan Electronic Industry Development Association.

jerk A sudden, abrupt motion.

jet Rapid flow of fluid from a nozzle or orifice.

jet dyeing (textile term) A piece-dye process in which the fabric is transported by a jet of dye liquor in a venturi.

jet pump A type of pump that uses a jet of fluid to induce flow in another fluid.

jet recorder A recording instrument in which the record is made by directing a jet of link on to the chart.

jewel bearing A natural or synthetic jewel, usually sapphire, used as a bearing for a pivot or other moving parts of a delicate instrument.

JFET Junction Field Effect Transistor.

JHG Joule Heat Gradient. The rate at which the thermal heat produced by the Joule effect increases or decreases.

JIB Joint Industry Board for the Electrical Contracting Industry (UK).

jig (textile term) A dyeing machine which passes open-width fabric from one roll to another through a small or low-liquor dye bath. The dyeing actually takes place during the wound-up storage portion of the process. Jigs may also be used for scouring, bleaching, finishing, and stripping or correction of previous dyeings.

jigging (of iron ore) Jigging is a more complex form of beneficiation than simple washing and involves the stratification of ore particles and gangue by subjecting the ore to alternating upward and downward pulsations of water. The gangue overflows the jig, while the iron oxide particles are removed as an underflow product, either periodically or continuously.

JIS Japanese Industrial Standards.

JISC Japanese Industrial Standards Committee.

jitter A shift in the time or phase position of individual pulses, causing difficulty in synchronization and/or detection. Also called peak distortion.

JMUG Japanese MAP Users Group.

job A specified group of tasks prescribed as a unit of work for a computer. By extension, a job usually includes all necessary programs, linkages, files and instructions to the operating system.

job batch A succession of job definitions that are placed one behind another to form a batch. Each job batch is placed on an input device and processed with a minimum of delay between one job or job step and another.

job control A program is called into storage to prepare each job or job step to be run. Some of its functions are to assign input/output (I/O) devices to certain symbolic names, set switches for program use, log (or print) job control statements, and fetch the first program phase of each job step.

job control language (JCL) A language for identifying a job and requesting action from an operating system.

job input file A data file (or data set) consisting of a series of job definitions and accompanying data.

job library A related series of user-identified, partitioned data sets that serve as the primary source of load modules for a given job.

job management Functions performed by special programs such as job schedulers or master schedulers.

job output file A data file (or a data set) consisting of output data produced by a series of jobs.

job processing system Composed of a series of individual programs that work together to form a complete operating system. The system also contains a complete description of the primary operating system routines – the monitor program, executive program, system loader, system-preparation routine, and input/output routines.

job queue Same as input work queue.

job-recovery control file, backup file A copy of a file made for possible later reconstruction of the file.

job run A performance of one or more jobs.

job scheduler The control program function that controls input job streams and system output, obtains input/output recourses for jobs and job steps, attaches tasks corresponding to job steps, and regulates the use of the computing system by jobs.

job stream 1. The set of computer jobs in an input queue awaiting initiation and processing. **2.** See input stream.

jogging Also called inching. Quick and repeated opening and closing of a motor starting circuit to produce slight movements of the motor.

Johnson noise thermometer, JNT The Johnson noise thermometer (JNT) is an absolute thermometer that determines temperatures of resistive sensors by measuring the spontaneous electrical noise voltages (or currents) produced by the agitation of electrons in thermal equilibrium with a host lattice.

join Same as logical sum, union, EITHER-OR operation, OR-ELSE operation, disjunction.

joint A connection between two or more conductors.

joint information content (information theory) Refer to ISO publication 2382/XVI.

joint probability The probability that both A and B will occur. If A and B are independent, neither influencing the other, joint probability is the product of their separate probabilities.

Jones plug A type of polarized connector designed in the form of a receptacle and having several contacts.

Josephson effect The phenomenon described by Brian Josephson to explain the action of currents through and voltages across hairlike gaps in superconductors.

joule, J Unit for measurement of energy. (SI unit). $1 \text{ J} = \text{Nm} = \text{Ws}$. Common multiples: mJ, kJ, MJ, GJ, TJ. Use J for all forms of energy, whether thermal, mechanical, chemical (including energy in food), or electrical. For generation and sales of electrical energy, the unit Wh and multiples may be used. To distinguish between different forms of energy or power, an index may be added to the quantity symbol. Use the following indexes: acoustic: a or ac; electrical: e or el; chemical: ch or chem; magnetic: m or mag; mechanical: m or mec; thermal: th or therm.

Joule effect In a circuit, electrical energy is converted into heat by an amount equal to I^2R . Half of this heat flows to the hot junction and the other half to the cold junction.

Joule heat The thermal energy produced as a result of the Joule effect.

Joule heat gradient See JHG.

Joules law of electric heating The amount of heat produced in a conductor is proportional to the resistance of the conductor, the square of the current, and the time.

journal, log A chronological record of data processing operations. Note: The journal may be used to reconstruct a previous or an updated version of a file.

JOVIAL Jules Own Version of International ALgorithmic Language. A language containing facilities for numerical computations and some data processing. Most widely used for command and control applications. A compiler language based on the International Algorithmic Language, ALGOL.

joystick A device by which an individual can communicate with an information system through a cathode ray tube.

joystick (industrial robots) A manually controlled device whose variable position and orientation or applied forces are measured and result in commands to the robot control system.

julian date The day of the year, e.g., February 1 st would be day 32 (contrasted to calendar date). Widely used in computer notation.

jumbo burner A flare used for burning waste gas produced with oil when there is no ready market or the supply is too small or temporary to warrant a pipeline.

jumbo roll, mill roll A reel of paper or board from the reel-up, covering the full width of the machine.

jump In the execution of a computer program, a departure from the implicit or declared order in which instructions are being executed.

jumper An electrical conductor of relative short length used to permanently or temporarily complete a circuit or bypass an existing circuit.

jumper tube A short tube connection for bypassing, routing, or directing the flow of fluid as desired.

jumping mill (in steel production) A type of three-high type rolling mill.

jump instruction An instruction that specifies a jump.

jump operation The computer departs from the regular sequence of instruction executions and jumps to another routine or program, or even some preceding or forward instructions to alter control, repeat a process or loop, etc.

jump phenomenon Phenomenon occurring in nonlinear systems characterized by sudden jumps of the output variable upward or downward through either of two values when the input variable is varied.

junction 1. Connection between two or more conductors or two or more sections of a transmission line. **2.** A contact between two dissimilar metals or materi-

als (e.g., in a rectifier or thermocouple). **3.** Optical interface.

junction box **1.** A box for joining different runs of raceway or cable, plus space for connecting and branching the enclosed conductors. **2.** An enclosed distribution panel for connecting or branching one or more corresponding electric circuits without the use of permanent splices.

junction diode The basic element of an injection laser where the semiconductor diode has the property of essentially conducting current in one direction.

junction panel Connector device used to connect and distribute wiring throughout the system. Refers to Honeywell TDC 3 000 control systems.

junction point Also called node. Branch point, or vertex. A terminal of any branch of a network, or a terminal common to two or more branches.

junction resistance (thermoelectric device) The difference between the resistance of two joined materials and the sum of the resistances of the unjoined materials.

junction transistor A transistor having a base and two or more junctions.

junk A garbled or otherwise unintelligible sequence of signals or other data, especially as received from a communications channel, i.e., hash or garbage.

jury rig A makeshift or temporary assembly.

justification The act of adjusting, arranging, or shifting digits to the left or right, to fit a prescribed pattern.

justify To shift the contents of a register so that the character at the specified end of the data is at a particular register position.

just-in-time A method of controlling and reducing direct and work-in-process inventory by having suppliers deliver material "just-in-time" to manufacturing.

just-operate value Also called dropout value. The measured functioning value at which a particular relay operates. Contrast: just-release value.

just-release value The measured functioning value at which a particular relay releases.

jute-protected cable A cable having its sheath covered by a wrapping of tarred jute or other fiber.

juxtaposition The positioning or placing of items adjacent to each other or side by side.

K

k Symbol for prefix kilo. Example: The prefix kilo, k, combined with the unit watt, W, gives the multiple, kW, i.e. 1 000 watts. Do not write "kilo" for kilogram or kilometre.

K 1. Symbol for kelvin, base unit for temperature. See under kelvin. **2.** Symbol for 10^3 . When referring to bits or words, K = 1 024. A 4K chip is a 4K-bit chip. A 4K memory is a 4K-word memory (typically 4K bytes).

(type) K Designation for thermocouple and thermocouple extension wire with a certain temperature – emf relationship. Material identification: nickel – 10 percent chromium versus nickel – 5 percent (aluminum, silicon). This combination was originally called chromel-alumel, a trademark of Hoskins Mfg. Co. See ISA publication ANSI-MC 96.1 – 1982.

kA Letter symbol for kiloampere.

KACHINA Advanced computer program to serve as a test bed for computer simulation of complex components.

Kalman filter A technique for calculating the optimum estimates of process variables in the presence of noise; the technique, which generates recursion formulas suitable for computer solutions, also can be used to design an optimal controller.

kappa number The quantity of potassium permanganate consumed by one gram of pulp (dry weight) under specified conditions. The kappa number is used primarily to describe the extent of lignin removal in the cooking of chemical pulp.

Karnaugh map A rectangular diagram of a logic function of variables drawn with overlapping sub-rectangles such that each intersection of overlapping rectangles represents a unique combination of the logic variables and such that an intersection is shown for all combinations.

Kawasaki steel process The Kawasaki Steel direct reduction process uses fine ore, low grade coke, pulverized coal, air and oxygen. The main smelting – reduction furnace is a shaft furnace with two levels of tuyeres. The prerduced iron ore is blown into the furnace through the upper tuyeres while hot air, oxygen and nonmetallurgical coal are injected through the lower tuyeres. Low grade coke is loaded at the top of the furnace. Molten iron accumulates at the bottom of the furnace.

kayser Unit for wave number, the reciprocal of a wave length (in cm).

kb Kilobit.

kc See kilocycle.

kcal Kilocalorie.

KEE An artificial intelligence language that emphasize objects as the basic component of an expert system.

Kel-f Polymonochlorotrifluoroethylene, a plastic used as a high-temperature insulation (-55°C to $+135^{\circ}\text{C}$).

Kelvin (double) bridge, Thomson (double) bridge A six arm measuring bridge intended to measure the value of a four-terminal resistor by comparison with a four-terminal standard resistor, all of the arms being resistors, at least one of which is adjustable.

Kelvin, K Base SI unit for measurement of temperature. The base unit kelvin can be used for all forms of temperature, and must always be used for thermodynamic (absolute) temperature. The unit degree Celcius, $^{\circ}\text{C}$, is an additional unit (see this term). In everyday life and in most technical applications, degree

Celcius is more convenient than kelvin. When degree Celcius is used use the quantity symbol t for temperature. Do not write "degrees centigrade" instead of degrees Celsius.

Kelvin scale Also called absolute scale. A temperature scale using the same divisions as the Celsius scale, but with the zero point established at absolute zero.

Kelvin-Varney voltage divider A resistive-type voltage divider used in some d-c bridge circuits to provide greater sensitivity at low values of the unknown resistance.

Kennison nozzle A specially shaped nozzle designed for measuring flow through partially filled pipes; because of its self-scouring, non-clogging design, it is especially useful for measuring flow of raw sewage, raw and digested sludge, final effluent, trade wastes, and other liquids containing suspended solids or debris.

Kern counter, dust counter A photoelectric instrument that measures the number and size of dust particles in a known volume of air.

kernel (software) 1. A nucleus or core as in the kernel of an operating system. **2.** An encapsulation of an elementary function. Kernels can be combined to form some or all of an operating system or set of firmware. **3.** A model used in computer selection studies to evaluate computer performance.

keV Kiloelectronvolt.

key 1. An identifier within a set of data elements. **2.** A lever or switch on a computer console for the purpose of manually altering computer action.

keyboard 1. A device for the encoding of data by key touch, which causes the generation of the selected code element. **2.** An interface device containing an assortment of lights and push buttons used during setup time for system definition and to implement various control strategies. Refers to Honeywell TDC 3000 control systems.

keyboard entry and inquiry The use by an operator of a keyboard to provide a computer with information and to establish what is stored in any specific location.

keyboard function keys These make it possible to strike one or two keys to call out strings of characters and formats, send a distinct code to the computer which may represent any amount of data, and easily activate the terminal peripherals (in some systems).

keyboard lockout An interlock feature which prevents sending from the keyboard while the tape transmitter of another station is sending on the same circuit. To avoid breaking up the transmission by simultaneous sending.

keyboard monitor A computer program that provides and supervises communication between the user at the system console and an operating system.

keyboard punch, keypunch A keyboard-actuated punch that punches holes in a data medium.

keyboard send/receive, KSR A combination teletypewriter transmitter and receiver with transmission capability from keyboard only.

key click Transient pulses or surges on a transmission line set up by the opening or closing of contacts.

key-click filter A filter that attenuates the surges produced each time the keying circuit contacts of a transmitter are opened or closed.

keying The forming of signals, such as those employed in telegraph transmission, by the interruption of a

direct current or modulation of a carrier between discrete values of some characteristics.

keylock A type of lock on the equipment entry consoles and panels to prevent unauthorized personnel from making entries into the operating system. Refers to Honeywell TDC 3000 control systems.

key matching The technique of comparing the keys of two or more records to select some of them for a particular stage of processing and to reject the other ones.

key punch A keyboard machine for manually punching information into paper tape or cards.

keypunch A keyboard-actuated device that punches holes in a card to represent data.

keystroke verification The verification of the accuracy of data entry by the re-entry of the same data through a keyboard.

keyword A lexical unit that, in certain contexts, characterizes some language construction. Example: In some contexts, IF characterizes an if-statement. Note: A keyword normally has the form of an identifier.

keyword parameter A parameter that consists of a keyword, followed by one or more values.

kg See kilogram.

kHz Kilohertz.

kickback power supply See flyback power supply.

kier (textile term) A large storage or processing vessel, usually used as the receptacle for a carrier holding yarn packages or a warp beam.

kill To erase a file or stop a program during execution.

killed steel (in steel production) The term "killed steel" indicates that steel has been deoxidized sufficiently for it to lie perfectly quiet when poured into an ingot mold. There is no evolution of gas in the mold, and the top surface of the ingot solidifies with relative rapidity.

kilo, k 1. A prefix representing 10^3 , or 1 000. Letter symbol k. **2.** In statements involving size of computer storage, a prefix indicating 2^{10} or 1 024. Letter symbol K.

kiloampere, kA 1 000 amperes. Letter symbol kA.

kilobaud One thousand bits per second.

kilobauds New and higher capacity data channels. For special applications, some data channels capable of 20 kilobauds have been placed in service.

kilobit, kb 1 000 bits.

kilocycle A thousand cycles per second, or 10^3 cycles per second. See also megacycle, gigacycle, and teracycle. Now obsolete. Replaced by kHz.

kiloelectronvolt, keV 1 000 electron volts. The energy acquired by an electron that has been accelerated through a voltage difference of 1 000 volts. Letter symbol: keV.

kilogauss 1 000 gauss.

kilogram, kg Base SI unit for measurement of mass. Note that kilogram is the base unit. Multiples are formed of the unit gram, g. (The kilogram has its name for historical reasons). The unit tonne, t, is an additional unit. $1\text{ t} = 1\,000\text{ kg}$. Use t whenever convenient. Do not write "metric ton" instead of tonne. Do not confuse the non-SI units (long) ton and short ton with tonne. Do not use (long) ton or short ton. Do not confuse mass and weight. Weight is a force.

kilogram per cubic metre, kg/m³ Unit for measurement of density. (SI unit). Do not use specific gravity instead of density. The units g/cm³ and g/ml may be used. However give reference to kg/m³.

kilohertz, kHz 1 000 hertz. Letter symbol kHz.

kilomegacycle Now called gigahertz. One billion cycles per second.

kilomega, kM Obsolete prefix for giga (G), representing 10^9 .

kilometer, km One thousand metres, or approximately 3 280 feet.

kilosecond 1 000 seconds.

kilovar – hour 1 000 reactive voltamperehours.

kilovar, kvar One reactive kilovoltampere, or 1 000 reactive voltamperes.

kilovoltampere, kVA 1 000 voltamperes.

kilovolt, kV 1 000 volts.

kilovoltmeter A voltmeter which reads thousands of volts.

kilowatthour, kWh The equivalent energy supplied by a power of 1 000 watts for one hour. Letter symbol kWh.

kilowatt, kW A unit of electrical power equal to 1 000 watts. Letter symbol: kW.

kinematic viscosity The SI unit for measurement of kinematic viscosity is square metre per second, m²/s. Common multiple: mm²/s. 1 stokes, St = 200 mm²/s. 1 centistokes, cSt = 1 mm²/s. Kinematic viscosity relates to the time for a fixed amount of a fluid to flow through a capillary tube under the force of gravity.

kinetic energy Energy which a system possesses by virtue of its motion.

kinetic energy coefficient See ISO publication 4006-1977 or BS 5875:1980 under dynamic pressure.

Kinglor-Metor process The Kinglor-Metor process is based on the concept of producing iron continuously by heating a mixture of ore and coal in externally-fired rectangular shaft or retort.

Kipp relay A monostable multivibrator, i.e., a circuit which has one stable or quasistable state and one unstable state and which undergoes a complete cycle of change in response to a single triggering excitation.

Kirchoff's current law This law states that the sum of the currents leaving a junction must be equal to the current entering the junction.

kit A prepared package of parts with instructions for assembly and/or wiring a component or chassis (also a small accessory item).

kitting The process of removing components of an assembly from the stock room and sending them to the assembly floor as a kit of parts. This action may take place automatically whenever a full set of parts is available and/or it may be done only upon authorization by a designated person.

kluged Temporarily repaired.

klystron A uhf oscillator tube containing its own cavity resonator, which depends on the bunching of electrons for its operation.

km Kilometer (1 km = 0.621 miles).

kM Kilomega. An obsolete term. Replaced by giga.

kMc Kilomegacycle. Now replaced by gigahertz. (GHz).

kneader pulping Defibration of moist pulp or moistened paper by a kneading action.

knife-edge pointer (of a meter) End of pointer is flattened and turned edgewise so smallest dimension or edge is seen. Usually used with mirror-backed scales to eliminate parallax and increase the accuracy of reading.

knife switch 1. A form of air switch in which a moving element is sandwiched between two contact clips. The moving element is usually a hinged blade; when it is not, it is removable. **2.** A form of switch in which the moving element, usually a hinged blade, enters or embraces stationary contact clips.

knit fabric (textile term) A structure formed by the interlooping of one or more ends of yarn.

knitting (textile term) A method of constructing fabric by interlocking series of loops of one or more yarns. The two major classes are weft knitting and warp knitting. In weft knitting, one continuous yarn runs crosswise in the fabric, forming all the loops in one course; in warp knitting, the yarns generally run lengthwise in the fabric.

knockout A removable portion in the side of a box or cabinet. During installation it can be readily taken out with a hammer, screwdriver or pliers so the raceway, cables or fittings can be attached.

knotter pulp Pulp prepared by refining the screen reject from the screening of chemical pulp, often mixed with fiber material recovered from the white water.

knowledge (in artificial intelligence) A collection of facts, events and beliefs, organized for systematic use.

knowledge base The part of an artificial intelligence system that contains structured, codified knowledge and heuristics used to solve problems.

knowledge-based system, KBS An information processing system that provides for solving problems in a particular domain or application area by drawing inferences from a knowledge base. Notes: **1.** The term knowledge-based system is sometimes used synonymously with expert system, which is usually restricted to expert knowledge. **2.** Some knowledge-based systems have learning capabilities.

knowledge engineer A person who implements an expert system.

knowledge engineering The discipline concerned with acquiring knowledge from domain experts and other knowledge sources and incorporating it into a knowledge base. Knowledge engineering sometimes refers particularly to the art of designing, building, and maintaining expert systems and other knowledge-based systems.

knowledge representation A structure in which knowledge can be stored in a way that allows the system to understand the relationships among pieces of knowledge and to manipulate those relationships.

knowledge tree A hierarchical semantic network such as a tree-like directed graph.

Knudsen flow Gas flow in a long tube at pressures such that the mean free path of a gas molecule is significantly greater than the tube radius.

kohm Kiloohm.

kollergang See edge runner.

kilovolt ampere rating (voltage regulator) The product of the rated load amperes and the rated range of regulation in kilovolts. Note: The kilovolt-ampere rating of a three-phase voltage regulator is the product of the rated load amperes and the rated range of regulation in kilovolts multiplied by 1.732.

koniscope An indicating instrument for detecting dust in the air.

Koppers vacuum carbonate process (coke-oven plants) A process for hydrogen sulphide removal from coke-oven gas and recovers it in the form of a concentrated acid gas stream from which the hydrogen sulphide can readily be converted to either elemental sulphur or sulphuric acid.

kort nozzle A type of ship's propeller that rotates within a cylindrical cowling that concentrates the thrust of the propeller. This produces a nozzle effect as the water is jetted from the cowling. Kort nozzles are installed on some tugboats and drilling – tender vessels because of their maneuverability and response.

Kovar An iron-nickel-cobalt alloy with a coefficient of expansion similar to that of glass and silicon and thermal characteristics similar to those of alumina.

kPa Kilopascal.

Kr Chemical symbol for krypton.

kraft faced liner, test liner A liner with an outer ply of kraft pulp, the remainder of which is manufactured from some other material, e.g. waste paper.

kraft liner A facing manufactured almost entirely of kraft pulp.

kraft paper Paper manufactured almost entirely of kraft pulp. The term "kraft paper" is sometimes used to describe paper manufactured primarily of unbleached softwood sulphate pulp.

kraft pulp Sulphate pulp for kraft paper and other products with high strength. In a strict technical sense, the term "kraft pulp", is more limited than the term "sulphate pulp" and in some countries this difference is observed even in a commercial context. In many countries, however, the terms are considered to be synonymous. The term "kraft pulp" is then preferred to avoid the risk that the term sulphate pulp be confused with the term sulphite pulp.

kraft sack paper Kraft paper for paper sacks.

KR process The KR process produces hot metal directly from untreated raw coal and without the blast furnace requirement of coke. The process comprises a two-stage operation in which DRI (direct-reduced iron) from a shaft furnace is charged without cooling into a connected melter gasifier. Partial combustion of coal with oxygen in the fluidized bed of the melter gasifier produces reducing gas for the shaft furnace.

Krupp-CODIR process The Krupp-CODIR process of Krupp Industries, West Germany stems from the original Krupp-Renn process. The process operates at a lower temperature than the Krupp-Renn thus producing a standard DRI (direct reduced iron) product. Furthermore, limestone or dolomite in the furnace charge absorbs a substantial part of the sulphur introduced with fuel.

Krupp-Renn process A direct reduction process. In this process, a mixture of ore and fine-grained carbonaceous reducing agent (e.g., coke breeze or bituminous-coal fines) is fed continuously into a rotary kiln. The reduced iron welds into nodules called "luppen" which become embedded in the pasty slag.

KSR See keyboard send/receive.

kurtosis The degree of curvature of the peak of a probability curve.

kV Kilovolt.

kVA Kilovoltampere.

kvar Kilovar.

kW Kilowatt.

kWh Kilowatthour.

Kynar Tradename of Polyvinylidene fluoride, by Pennwalt Corp.

L

L Symbol for coil, lambert, inductance or part of battery coding system according to IEC.

La Chemical symbol for lanthanum.

labeled In US, equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials and by those labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

label, flag A group of characters used as a symbol to identify an item of data, an area of memory, a record or a file.

label group A collection of continuous label sets of the same label type.

laboratory fiberizer, defibrator A laboratory machine for the defibration of previously undefibrated fiber.

laboratory instrument computer, LINC Performs several of the functions that normally external devices or people are required to perform. Data recording, analog-digital conversion, experiment monitoring, control, and analysis are built in capabilities of the computer. LINC gives direct assistance to the research worker in many ways.

laboratory noise testing (of control valves) (type testing) Laboratory testing for the purpose of determining sound pressure levels shall follow the procedures given in IEC publication 534-8-1 for gases and IEC publication 534-8-2 for liquids. These tests provide the basis necessary for the prediction of noise levels under installed conditions. ANSI/ISA publication S 75.07 Laboratory measurement of aerodynamic noise generated by control valves also refers.

laboratory reference standards Standards that are used to assign and check the values of laboratory secondary standards.

laboratory secondary standards Standards that are used in the routine calibration tasks of the laboratory.

laboratory test A compliance test or a determination test made under prescribed and controlled conditions which may or may not simulate field conditions.

labor grade A classification of labor into separate groupings of those whose capability makes them unique in terms of their particular skill level or craft.

lactometer A hydrometer designed for measuring the specific gravity of milk.

ladder diagram (LD) language A programming language using ladder diagrams for representing the application program for a programmable controller system (PC-system).

(relay) ladder diagram One or more networks of contacts, coils, graphically represented functions, functions, function blocks, data elements, labels and connective elements, delimited on the left and (optionally) on the right by power rails.

ladle (in steelmaking) Liquid steel is always tapped from a primary furnace into a tapping ladle. From there it may be poured into molds, other ladles, vessels or special furnaces, or it may undergo treatments in the tapping ladle itself.

ladle-injection process (in steelmaking) A secondary steelmaking process for injecting powdered

metals or slags into a ladle of steel to attain rapid and efficient desulphurization of steel in the ladle.

ladle metallurgy (in steelmaking) Ladle metallurgy is a secondary step of the steelmaking process often performed in a ladle after the initial refining process in a primary is completed. Also referred to as secondary steelmaking. The purpose of secondary steelmaking is to produce "clean" steel, steel which satisfies stringent requirements of surface, internal and microcleanliness quality and of mechanical properties.

ladle refining furnace (in steelmaking) A ladle refining furnace has the ability to reheat the liquid steel. This allows the steelmakers to add greater amounts of alloys to the liquid steel. Heat is supplied to the process through electrodes, a process called arc reheating.

lag 1. A relative measure of the time delay between two events, states, or mechanisms. **2.** In control theory, a transfer function term in the form, $1/(Ts+1)$. **3.** Lag in a communications system is the time lapse between the operation of the transmitting device and the response of the receiving device.

lagging 1. In an ac circuit, a condition where peak current occurs at a later time in each cycle that does peak voltage. **2.** A thermal insulation, usually made of asbestos and magnesia plaster, that is used to prevent heat transfer through the walls of process equipment, pressure vessels or piping systems.

lagging extension A lagging extension is that portion of a thermowell or thermometer well above the threads, intended to extend through the lagging of a vessel.

lagging load A predominantly inductive load, i.e., one in which the current lags the voltage.

lag-lead (lead-lag) A circuit the response of which includes lag components and their derivatives.

lag module A device or algorithm which applies a first-order capacitive lag to a signal, thereby both attenuating the signal and shifting its phase to a maximum of -90° , as a function of signal frequency.

lambda Greek letter, used to designate wavelength measured in meters.

lambert A unit of luminance; it equals the uniform luminance of a perfectly diffusing surface emitting or reflecting light at one lumen per square centimeter.

Lambert's cosine law, cosine emission law (optical communication) The statement that the radiance of certain idealised surfaces, is independent of the angle from which the surface is viewed.

lambertian emitter An optical light source where the transmitted radiation is distributed uniformly in all directions.

laminar boundary layer A layer of a moving turbulent stream adjacent to the wall of a pipe or other conduit, where the motion approximates streamline flow.

laminar flow 1. Flow under conditions where forces due to viscosity are significant in comparison to the forces due to inertia. Note: Laminar flow may be unsteady but is completely free from turbulent mixing. Poiseuille flow is an example of steady laminar flow in a circular pipe. **2.** Flow state characterized by parallel or laminar movement of particles.

lamination, laminating Joining together of two or more layers of material to a multiply product; see lining.

LAN Local Area Network, a communications mechanism by which computers and peripherals in a limited geographical area can be connected.

LAN Local Area Network. Local area networks are a communications mechanism by which computers and peripherals in a limited geographical area can be connected.

land treatment Treatment (and usually disposal) of waste water, by irrigation on to land.

Langelier index (water quality) The value obtained by subtracting the saturation pH (pHs) from the measured pH of a water sample. pHs is the calculated pH that would be obtained if the water were in equilibrium with solid calcium carbonate.

language 1. A set of representations, conventions, and rules used to convey information. **2.** See algorithmic language, artificial language, machine language, natural language, object language, problemorientated language, procedure-orientated language, programming language, source language and target language.

language converter A data-processing device designed to change one form of data, i.e., microfilm, strip chart, etc., into another (punch card, paper tape etc.)

language translator A general term for any assembler, compiler, or other routine that accepts statements in one language and produces equivalent statements in another language.

lantern ring (control valves) A rigid spacer assembled in the packing box with packing normally above and below it and designed to allow lubrication of the packing or access to a leak-off connection.

lanyard A device which is attached to certain quick-disconnect connectors and which permits uncoupling and separation of connector halves by a pull on a wire or cable.

lap (fluid power systems) In a sliding spool valve, the relative axial position relationship between the fixed and movable flow metering edges with the spool at null.

lap joint The connecting of two conductors by placing them side by side so that they overlap.

Laplace's law The strength of the magnetic field at any given point due to any element of a current-carrying conductor is directly proportional to the strength of the current and the projected length of the element, and is inversely proportional to the square of the distance of the element from the point in question.

Laplace transform In control theory, a mathematical method for solution of differential equations.

Laplacian (of a vector field) A vector quantity equal to the gradient of the divergence of the vector field minus the curl of the curl of this vector field.

lapped-in Mating contact surfaces that have been refined by grinding and/or polishing together or separately in appropriate fixtures.

lapping 1. Bringing quartz crystal plates up to their final frequency by moving them over a flat plate over which a liquid abrasive has been poured. **2.** Grinding and polishing such products as semiconductor blanks in order to obtain precise thicknesses or extremely smooth, flat, polished surfaces.

laps (in steel production) Laps are the result of overfilling in the mill passes that causes fins or projections which turn down as the material rolls through succeeding stands in the mill train.

LAPUT Light Activated Programmable Unijunction Transistor.

large capacity storage, LCS An optional extension to processor storage.

large core fiber An optical fiber with a comparatively large core, usually a step index type. There is no standard definition of "large" but for the purpose here, diameters of 400 micrometers or more are designated as "large".

large-scale integration, LSI The accumulation of a large number of circuits (say 500 or more) on a single chip of a semiconductor.

LASCR Light Actuated Silicon Controlled Rectifier. A pnpn device in which incident light performs the function of gate current; three of the four semiconductor regions are available for circuit connections. A photoswitch.

laser (optical communication) A device that produces coherent optical radiation by stimulated emission and amplification in an optical resonant cavity providing positive feedback when external energy is used to maintain a population inversion. Note: Laser is an acronym for Light Amplification Stimulated Emission of Radiation.

laser beam printer See laser printer.

laser bonding A process which forms a metal-to-metal fastened union, using a laser heat source to join conductors.

laser diode coupler A coupling device that enables the coupling of light energy from a laser diode (LD) source to an optical fiber or cable at the transmitting end of an optical fiber data link. The coupler may be an optical fiber pigtail expoxied to the LD. Synonym: LD coupler.

laser doppler flowmeter An apparatus for determining flow velocity and velocity profile by measuring the Doppler shift in laser radiation scattered from particles in the moving fluid stream; contaminants such as smoke may have to be introduced into a gas stream to provide scattering centers.

laser dyes Class of organic dyes that emit coherent radiation over a wide spectral range.

laser-emulsion storage A digital data storage medium which uses a controlled laser beam to expose very small areas on a photosensitive surface, producing desired information patterns.

laser fiber – optic transmission system A system consisting of one or more laser transmitters and associated fiber-optic cables.

laser head A module containing the active laser medium, resonant cavity, and other components within one enclosure, not necessarily including a power supply.

laser linewidth In the operation of a laser, the frequency range over which most of the laser beam's energy is distributed.

laser memory Experiments over the last five or six years have indicated the feasibility of using extremely fine laser beams to produce and to read optical patterns (films or holes) so small that an entire telephone directory would be contained on an area the size of a postage stamp.

laser printer, laser beam printer A nonimpact printer that creates, by means of a laser beam directed on a photosensitive surface, a latent image which is then made visible by a toner and transferred and fixed on paper.

laser pulse length The time duration of the burst of electromagnetic energy emitted by a pulsed laser. It is usually measured at the half-power points, i.e., on a plot of pulse power developed versus time, the time interval between the points that are at 0.5 of the peak of the power curve. Also called laser pulse width.

laser pulse width See laser pulse length.

laser scanner A hardcopy output device that uses photographic film and a laser to create images. Laser scanners are used in application where high resolution and high precision is essential, such as satellite shots.

laser simulator A light source which simulates the output of a laser. In practice, the light source is a 1,06 micrometer LED which simulates the output of a neodymium laser at much lower power levels.

laser soldering A selective soldering technique employing a programmable laser system.

laser welding Process in which thermal energy released by a laser impinging on the surface of a metal is conducted into the bulk of the metal workpiece by thermal conduction, bonding component leads to highly conductive materials, such as copper printed circuitry.

lasing threshold (optical communication) The lowest excitation input power level at which the output of a laser is dominated by stimulated emission rather than spontaneous emission.

last-in, first-out, LIFO An ordered pushdown stack. A discipline wherein the last transaction to enter a stack is also the first to leave it. Contrast with first-in, first-out.

latch (fluid power systems) Moving parts are retained in a fixed position by means of a locking device which cannot be released until certain specified conditions are fulfilled.

latching A technique for storing an event such as the momentary breaking of a perimeter circuit. The fact that the event has occurred will be available until the latched circuit has been reset. See alarm hold.

latching current (thyristor) The minimum value of principal current required to maintain a thyristor in the "on" state after switching from the "off" state to the "on" state has occurred and the trigger signal has been removed.

latching digital output A contact closure output that holds its condition (set or reset) until changed by later execution of a computer program. See momentary digital output.

latching relay 1. A relay with contacts that lock in either the energized or deenergized position or both, until reset either manually or electrically. **2.** Also called bistable relay. A relay that includes a means of holding the state of the relay in the last or latched position. In effect, the relay has a memory, because the contacts remain open or closed when the coil is not actuated. To change state, the latching relay coil must be reenergized.

latch-in relay See locking relay.

latch mode A mode of operation for a storage circuit in which all encoder contact closures are latched "on".

latency (electronic computation) The time between the completion of the interpretation of an address and the start of the actual transfer from the addressed location. Latency includes the delay associated with access to storage devices such as drums and delay lines.

latency (biological electronics) The condition in an excitable tissue during the interval between the application of a stimulus and the first indication of a response.

latency time The time required to shift to any given bit (word) in a serial memory, such as in CCDs and bubble memories.

latent fault An existing fault that has not yet been recognized.

latent fault An existing fault that has not yet been recognized.

latent heat 1. Heat that does not cause a temperature change. **2.** Heat that changes water to vapor (steam) without a change in temperature or pressure of the moisture. Latent heat is also called the heat of vaporization or condensation. When water is vaporized, it absorbs heat which becomes latent heat. When the vapor condenses, latent heat is released, usually becoming sensible heat.

latent period (electrobiology) The time elapsing between the application of a stimulus and the first indication of a response.

lateral forced-air cooling A method of heat transfer which employs a blower to produce side to side circulation of air through or across the heat dissipators.

lateral loss A power loss, expressed in decibels, due to the deviation from optimum coaxial alignment of the ends of separable optical conductors.

latex Rubber material used for insulation of wire.

lath breast box, lath head box Pertaining to pulp and paper manufacturing, an open head box with two or more restraining, vertical, and vertically adjustable plates (laths), the last of which determines the height of the slice.

lath head box See lath breast box.

lattice The geometrical arrangement of atoms in a crystalline material.

lattice network A network composed of four branches connected in series to form a mesh. Two nonadjacent junction points serve as input terminals, and the remaining two as output terminals.

launch angle (fiber optics) In an optical fiber or fiber bundle, the angle between the input radiation vector, i.e., the input light chief ray, and the axis of the fiber radiation vector, i.e., the axis of the fiber or fiber bundle. If the ends of the fibers are perpendicular to the axis of the fibers, the launch angle is equal to the angle of incidence when the ray is external and the angle of refraction when initially inside the fiber.

launching The transferring of energy from a coaxial cable or shielded paired cable in a waveguide.

launching fiber, optical fiber pigtail (optical communication) A short length of an optical fiber, permanently attached to a component and intended to facilitate jointing between that component and another optical fiber or component.

Lauritsen electroscope An electroscope in which the sensitive element is a metallized quartz fiber.

law of electric charges Like charges repel; unlike charges attract. See also Coulomb's law.

law of electrostatic attraction See Coulomb's law.

law of magnetism Like poles repel; unlike poles attract.

law of normal distribution The Gaussian law of the frequency distribution of any normal, repetitive function. It describes the probability of the occurrence of deviants from the average.

law of reflection The angle of reflection is equal to the angle of incidence, i.e., the incident, reflected, and normal rays all lie in the same plane.

laws of thermoelectric circuits Various treatments of thermoelectricity give laws that describe the behavior of thermocouple circuits in a general way. Law of Homogeneous Metals: "A thermoelectric current can not be sustained in a circuit of a single homogeneous material, however varying in cross-section, by the application of heat alone." Law of Intermediate Materials: "The algebraic sum of the thermoelectromotive forces in a circuit comprised of any number of dissimilar materials is zero if all of the circuit is at a uniform temperature."

layboy See cutter tray.

layer 1. In network architecture, a group of services, functions and protocols that is complete from a conceptual point of view, that is one out of a set of hierarchically arranged groups, and that extends across all systems that conform to the network architecture. See ISO publication 2382-18 for an example. **2.** The consecutive turns of a coil lying in a single plane. **3.** One of several films in a multiple film structure on a substrate.

layer A subdivision of the OSI architecture.

layout The overall plan or design such as flowcharts of diagrams, format for card columns or fields, outline of the procedure, makeup of a book or document, etc.

layout character (GB), format effector A control character used to position printed, displayed or recorded data. Note: Format effectors are described in ISO 646 and ISO 6429.

layout wiring diagram A type of circuit diagram, made to show explicitly each wire, its gage, color coding and terminations.

lay-up The technique of registering and stacking layers of a multilayer board before the laminating cycle.

LB/LB Pound per pound (/lb/lb). In a refining process, the ratio of ingredients to be mixed or introduced to the process.

LC coupling Inductance-capacitance coupling.

LCD Liquid Crystal Display. A 7 segment display device consisting basically of a liquid crystal hermetically sealed between two glass plates.

LCIE French approval certification body for products (systems) intended for installation in hazardous locations. Example: intrinsically safe applications.

LCN Local Control Network. The local area network that interconnects the node in the Honeywell TDC 3000 control system.

LCP Link Control Procedure Rules defining the transmission of data over a channel.

LC product Inductance (L) in henrys multiplied by capacitance (C) in farads.

L/C ratio Inductance in henrys divided by capacitance in farads.

LCS 1. See large-capacity storage. **2.** Liquid Crystal Shutter. An alternative to laser printers.

LCSR Loop Current Step Response. A method developed to obtain the response of a thermocouple or a resistance thermometer that would occur because of a change in the temperature of the surrounding liquid, vapor, or gas by processing the transient response due to Joule heating induced by passing an electric current through the sensor leads. For further information refer to ISA publication: Industrial Temperature Measurement.

LCU Local Control Unit, a control device that performs closed-loop control and interfaces directly with the process.

LD coupler See laser diode coupler.

leaching The dissolving out or separation of soluble material from a rock or ore body by the action of percolating water, rainwater, or irrigation. The removal in solution of nutritive elements from the soil by water washing.

lead In control theory, a transfer function term in the form, $(Ts+1)$.

lead-acid cell Also called lead cell. A cell in an ordinary storage battery. It consists of electrodes (plates) immersed in an electrolyte of dilute sulfuric acid. The electrodes contain certain lead oxides that change their composition as the cell is charged or discharged.

lead-bath furnace See salt-bath furnace.

leader, tail end Pertaining to paper manufacturing, a strip which is separated from the web at the wet end

ahead of the press section in order to facilitate the threading of the web.

leading edge That transition of a pulse which occurs first.

leading-edge pulse time The time required by a pulse to rise from its instantaneous amplitude to a stated fraction of its peak amplitude.

leading end That particular end of a wire, tape, ribbon, line or document that is processed first.

leading load A predominantly capacitive load, i.e., one in which the current leads the voltage.

leading zeros Zeros preceding the first non-zero integer of a number. Leading zeros may be employed in the numeric fields of numerical control input blocks to indicate the assumed position of the decimal point within the field.

lead/lag compensator A dynamic compensator combining lead action (the inverse of lag) with lag.

lead/lag module A device or algorithm which applies both a first-order capacitive lead and lag to a signal thereby changing both its amplitude and phase as a function of frequency. The amplitude of the output of the lead/lag module may be either greater or less than its input, and be shifted in phase either positively or negatively, depending on signal frequency relative to the time constants of lead and lag.

lead network A network, either ac or dc, designed to provide error-rate damping in the controlling device of a servo system.

lead patenting Bath patenting including quenching in a lead bath.

lead time 1. The period of time between the actual ordering of parts or equipment and the delivery of same.

lead time A span of time required to perform an activity. In a logistics context, it is the time between recognition of the need for an order and the receipt of goods. Individual components of lead time can include order preparation time, and receiving and inspection time.

lead wire, compensating lead wire The use of these terms are to be discouraged because they frequently are confused with the term lead (element). Correctly use the term thermocouple extension wire.

leak A condition that causes current to be shunted away from its destination through a low resistance.

leakage 1. The quantity of fluid passing through a valve when the valve is in the fully closed position under stated closure forces, with the pressure differential and temperature as specified. Leakage is usually expressed as a percentage of the valve capacity at full rated travel. See leakage class (control valves). **2.** The current that flows through or across the surface of insulation and defines the insulation resistance at the specified direct-current potential. **3.** In fluid power systems, flow leaking past seals doing no useful work.

leakage class (control valves) Pertaining to industrial process control valves, a number of classes (I-VI) with a specified maximum seat leakage for each leakage class under given test procedure and test medium. See IEC publication 534-4, Amendment no. 1. Also refer to ANSI publication B16.104.

leakage coefficient Ratio of total to useful flux produced in the neutral section of a magnet.

leakage current See under leakage.

leakage factors Pertaining to control valves see IEC publication 534-4 with Amendment No 1.

leakage flux The flux which does not pass through the air gap, or useful part, of the magnetic circuit.

leakage inductance A self-inductance due to the leakage flux generated in the winding of a transformer.

leakage radiation Spurious radiation in a transmitting system, i.e., radiation from other than the system itself.

leakage rate The maximum rate at which a fluid is permitted or determined to leak through a seal. Pertaining to electrical transducers and intended for use in specifications only: The type of fluid, the differential pressure across the seal, the direction of leakage and the location of the seal must be specified.

leakage resistance The normally high resistance of the path over which leakage current flows.

leakance The reciprocal of insulation resistance.

leak detector An instrument such as a helium mass spectrometer used for detecting small cracks or fissures in a vessel wall.

leak-off gland (control valves) A packing box with packing above and below the lantern ring so as to provide a sealed low pressure leak collection point for fluid leaking past the primary seal (lower packing).

leak pressure The pressure at which some discernible leakage first occurs in a device.

leak test pressure Leak test pressure is the specified inlet static pressure at which a quantitative seat leakage test is performed in accordance with a standard procedure. Pertains to pressure relief device.

lean gas Natural gas containing little or no liquefiable hydrocarbons. See wet gas.

lean oil The absorbent oil in a gasoline absorption plant from which the absorbed gasoline fractions have been removed by distillation. Before distillation to remove gasoline fractions, the oil is referred to as "fat oil".

leapfrog test A routine to test the internal operation of a computer which consists of a series of arithmetic or logical operations on one section of storage, a transfer to another section, including a check on the transfer, and then a repetition of the operations.

learning curve The improvement that occurs in manufacturing processes with experience.

learning process (for reliability) Growth in experience by personnel which improves the reliability performance of an item.

learning system An adaptive system with memory.

lease condensate Liquid hydrocarbons produced with natural gas and separated from the gas at the well or on the lease. See condensate.

leased line A communication channel leased for the exclusive use from a common carrier, and frequently referred to as a private line.

leased-line network A network reserved for the exclusive use of one customer.

least maximum deviation A manner of expressing nonlinearity as a deviation from a straight line for which the deviations for proportional or normal linearity are minimized.

least mechanical equivalent of light The radiant power that is contained in one lumen at the wavelength of maximum visibility. It is equal to 1.46 milliwatts at a wavelength of 555 nanometers.

least significant bit, LSB The digit with the lowest weighting in a binary number.

least significant digit, LSD The right-most digit of a number.

leatherfibre board Board normally millboard, containing at least 50 percent leather pulp.

leather pulp Pulp manufactured from leather waste.

leather seal Leather for hydraulic duty is usually chrome tanned and impregnated with waxes, rubbers or resins to reduce fluid permeability.

LEB London Electricity Board.

Le Chatelier's element Same as type S platinum – 10 percent rhodium versus platinum thermocouple.

LED See light emitting diode.

ledeburite Eutectic in the metastable iron-carbon system, consisting of austenite and cementite of the temperature of formation, and of ferrite and cementite after cooling.

Ledoux bell meter A type of manometer whose reading is directly proportional to flow rate sensed by a head producing measuring device such as a pitot tube.

left justified A field of numbers (decimal, binary etc.) which exists in a memory cell, location or register, possessing no zeroes to its left. See also normalize.

length The SI basic unit for measurement of length is metre, m. See under metre.

length (in electronic computers) 1. A measure of the magnitude of a unit of data, usually expressed as a number of subunits, e.g., the length of a record is 32 blocks, the length of a word is 40 binary digits etc.

2. The number of subunits of data, usually digits or characters, that can be simultaneously stored linearly in a given device, e.g., the length of the register is 12 decimal digits or the length of the counter is 40 binary digits. See also storage capacity. **3.** A measure of the amount of time that data is delayed when being transmitted from point to point, e.g., the length of the delay line is 384 microseconds. See double length.

length of scale division The part of the scale length between two consecutive marks.

lens joint ends (control valves) Valves with the ends prepared for lens ring gaskets.

Lenz's law The current in a conductor as a result of an induced voltage is such that the change in magnetic flux due to it is opposite to the change in flux that caused the induced voltage.

lepidocrocite A mineral. See hydrous oxides.

LEROM Light Erasable Read Only Memory.

LES Liliput Edison screw.

lethal concentration (LC 50) (water quality) The concentration of a toxic substance which kills one half of a group of test, organisms. Usually the exposure to the substance is continuous and the LC 50 is defined by reference to a specified exposure period. Note: The term median lethal concentration is used in some countries.

letter A graphic character that, when appearing alone or combined with others, is primarily used to represent a sound element of a spoken language. Note: Diacritical marks used alone and punctuation marks are not letters.

letters shift In the Baudot code, a control character following which all characters are interpreted as being in the group containing letters (lower case).

let-through current The current that actually passes through a circuit breaker under short-circuit conditions.

level (software) 1. The degree of subordination of an item in a hierarchical arrangement. **2.** A rank within a hierarchy. An item is of the lowest if it has no subordinates and of the highest level if it has no superiors.

level The power relationship between different circuits, or different parts of the same circuit. The level at particular point is the gain or loss of power, expressed in decibels (dB) between that point and some arbitrary reference point. The level at the reference point is zero.

level above threshold Also called sensation level. The pressure level of a sound in decibels above its threshold of audibility for the individual listener.

level indicator 1. An indicating instrument for determining the position of a liquid surface within a vessel. **2.** An instrument containing a meter, neon lamp or CRT which shows audio voltage level in an operating sound-recording system.

level number, rank A reference number that indicates the position of an item in a hierarchic arrangement.

level of documentation (software) A description of required documentation indicating its scope, content, format, and quality. Selection of the level may be based on project cost, intended usage, extent of effort, or other factors.

level of maintenance The type of maintenance actions to be carried out at a stated indenture level of an item. Note: The criteria for deciding a level of maintenance can be the complexity of the item's construction, accessibility to parts of the item, skill level of maintenance personnel, test equipment facilities, safety considerations, etc.

level translator A circuit that accepts digital input signals at one pair of voltage levels and delivers output signals at a different pair of voltage levels.

level-triggered flip-flop A flip-flop that responds to the voltage level rather than the rate of change of an input signal.

lever switch Commonly referred to as a key lever or lever key. A hand-operated switch for rapidly opening and closing a circuit.

lexical analysis Stage in program translation when the compiling or translating software replaces program keywords with machine code instructions.

lexical token, lexical unit A language construct that, by convention, represents an elemental unit of meaning. Examples: A literas such as "2G5", a keyword such as PRINT, a separator such as a semicolon.

Li Chemical symbol for lithium.

Liapunov's second method A method analogous to the rate-of-change-of energy method for mechanical systems whereby stability or instability of a process control system can be determined. Also referred to as the indirect method.

liberation See heat release.

LIBOFRAC Name of Alfa-Laval process for fractionation of fat.

library 1. Groups of proven or standard routines, used to solve problems with or without modification to adopt to particular individual provisions. **2.** See software library, system library.

(program) library An organized collection of computer programs.

library automation The application of automated techniques to library operations such as processing of documents, interlibrary communication, and on-line catalog access.

library program A computer program in or from a library.

LIF Low Insertion Force connector. Type of printed circuit board connector in which mating and unmating forces are reduced 70 to 90%.

life cycle 1. See software life cycle. **2.** A test that indicates the time span before failure; the rest occurs in a controlled, usually accelerated environment.

life expectancy (fluid power systems) Predicted working period during which a component or system will maintain a specified level of performance under specified conditions. Sometimes expressed in statistical terms as probability.

life test The test of a component or unit under the conditions which approximate or simulate by acceleration, a normal lifetime of use. The test is performed

to determine life expectancy or reliability throughout a predetermined life expectancy.

LIFO See last-in, first out.

LIFO-FIFO-FILO Pertaining to the petroleum industry; last in first out; first in first out; first in last out. Acronyms that designate the sequence of movement in and out or the handling of crude oil and products in inventory or held in storage.

lift 1. Lift is the actual travel of the disk away from closed position when a valve is relieving. Pertains to pressure relief valves. **2.** Pertaining to control valves, a nonstandard term according to ISA S 75.05. Control Valve Terminology. See travel.

light absorption coefficient (of pulp or paper) Measure of the ability of a fiber layer to absorb light.

light-activated silicon controlled rectifier See LASCR.

light beam For photoelectric and proximity switches, the light beam includes all individual rays of light coming from the light emitter.

light-beam cathode-ray-tube recorder Recorder using electron beam to make multiple traces on CRT screen. Traces are reflected from a fixed plane mirror onto moving photosensitive paper via an optical system.

light beam cross-section For photoelectric and proximity switches, within the light beam cross-section which is perpendicular to the light beam axis the luminous power density of each unit area is greater than half the maximum value. The light beam cross-section may vary within the operating or scanning range.

light-beam galvanometer A modified form of the D'Arsonval meter movement in which a small mirror is cemented to a moving coil mounted in the field of a permanent magnet. Current through the coil causes the coil to be deflected angularly, and the mirror reflects a beam of light onto a moving strip of photographic paper. The developed chart shows the waveform of the current through the coil.

light-beam instrument A measurement device that indicates measured values by means of the position of a beam of a light beam.

light beam path For photoelectric and proximity switches, the distance from the light exit area to the light receiving area.

light button (computer graphics) Display elements used to simulate a function key by means of a pick device.

light crude Crude oil that flows freely at atmospheric temperatures; a light-colored crude oil. See heavy crude oil.

light current, photocurrent The currents that flow through an optical detector as the result of exposure to radiant power.

light duty cable Generally a type of fiber optic cable designed to withstand conditions encountered in a building – not outdoor conditions.

light emitter The light emitter of a photoelectric or proximity switch always includes a light emitting part. In general it consists of one or several light sources and optical means. The light emerges through the light exit area.

light emitting diode, LED A PN junction semiconductor device that, by spontaneous emission, emits incoherent optical radiation by injecting electrons and/or holes across the PN junction.

light-emitting diode coupler, LED coupler A coupling device that enables the coupling of light energy from a light-emitting diode (LED) source to an optical fiber or cable at the transmitting end of an op-

tical fiber data link. The coupler may be an optical fiber pigtail epoxied to the LED.

light ends The more volatile products of petroleum refining, e.g., butane, propane, gasoline.

light exit area For photoelectric and proximity switches, the area of the light emitter through which the light beam is transmitted.

light guide An assembly of optical fibers and other optical elements mounted and finished in a component that is used to transmit light.

light gun A photoelectric cell used by computer operators to take specific actions in assisting and directing computer operation. So called because of its gun-like case.

light key The component in multicomponent distillation that is removed in the overhead stream and that has the lowest vapor pressure of the components in the overhead. If the reboiler head is decreased or the reflux flow increased, the light key component is the first component to fall into the bottoms products.

light microsecond The unit for expressing electrical distance. It is the distance over which light travels in free space in one microsecond (about 983 feet, or 300 meters).

lightning arrester A device to prevent damage to electrical equipment by transient overvoltages whether from lightning or switching. Spark gaps which can only be bridged by voltages above those used in the equipment allow the higher voltages to be discharged to ground.

lightning generator A generator of high-voltage surges (e.g. for testing insulators).

lightning surge (surge arrester) A transient electric disturbance in an electric circuit caused by lightning.

lightning surge The current surge in a communication system resulting from a lightning discharge.

light oil Any oil whose boiling point is in the temperature range 110 to 210°C, especially a coal for fraction obtained by distillation.

light-oil recovery processes (coke-oven plants) The removal of light oil from coal gas is generally the last step in the coal-chemical recovery process. There are three general methods used for the recovery of light oil. **1.** Refrigeration an compression involving temperatures below -70°C (-94°F) and pressures of 10 atmospheres (7 600 millimetres Hg). **2.** Adsorption by solid adsorbents involving the removal of light oil from the gas by passing it through a bed of activated carbon and recovering the light oil from the carbon by heating with direct or indirect steam. **3.** Absorption by solvents involving washing the coal gas with a petroleum wash oil, a coal-far fraction, or other absorbent, followed by steam distillation of the enriched absorbent to recover the light oil.

light pen A device by which an individual can communicate with an information system through a cathode-ray tube.

light pipe 1. A bundle of transparent fibers which can transmit light around corners with small losses. Each fiber transmits a portion of the image through its length, reflection being caused by the lower refractive index of the surrounding material, usually air. **2.** Transparent matter that usually is drawn into a cylindrical or conical shape through which light is channeled from one end to the other by total internal reflections. Optical fibers are examples of light pipes.

light ray (optical communication) The path which is tangential at each point to the direction of propagation of the radiant energy at this point.

light receiver The light receiving part of a photoelectric or proximity switch consisting of one or more photoelectric components and optical means. The light receiver produces an electrical quantity as soon as light from the emitter strikes the light receiving area.

light receiving area The surface on the light receiver through which light can strike the photoelectric component.

light receiving scanning path The path of the light receiving area when using a moving light receiver. Pertains to photoelectric and proximity switches.

light relay A photoelectric device that opens or closes a relay when the intensity of a light beam changes.

light-scattering coefficient Measure of the ability of a material to scatter light.

light-sensitive Describes thin surfaces of which the electrical resistance, emission of electrons, or generation of a current depends on incidence of light.

light source Any object capable of emitting light. (In fiber optics, the light source is normally either a LED or a laser).

light stability In optical character recognition, the resistance to change of color of the image when exposed to radiant energy.

light stylus See light pen.

light valve A device the light transmission of which can be varied in accordance with an externally applied electrical quantity such as voltage, current, an electric or magnetic field, or an electron beam.

lightwave communications 1. In fiber optics communications using light, instead of an electric current, to carry the information. Also called optical communications. **2.** That aspect of communications and telecommunications devoted to the development and use of equipment that uses electromagnetic waves in or near the visible region of the spectrum for communication purposes.

lignin A polymeric compound built up mainly of irregularly linked phenylpropane units and which acts as a stiffening substance in the woody structures of higher plant life.

lime The oxide of calcium, a white caustic solid (unslaked lime) prepared by calcining limestone. When treated with water it produces calcium hydroxide or slaked lime.

lime (sludge), lime mud A sludge consisting mainly of calcium carbonate which is formed in the causticizing of green liquor.

lime (sludge) reburning Heating to a temperature of approx. 1 100°C of lime sludge, the calcium carbonate in which is thus converted to calcium oxide, calcined lime. Lime(sludge) reburning is normally carried out in a tubular, rotary kiln, lime sludge reburning kiln.

lime kiln A kiln for making lime by calcining limestone.

limit 1. A boundary of a controlled variable. **2.** The designated quantity is controlled so as not to exceed a prescribed boundary condition.

limit alarm sensor A device that detects that a variable has departed from its desired value by more than a preset amount.

limitation, limiting The intentional imposition or inherent existence of a boundary on the range of a variable, e.g., on the speed of a motor.

limit check A check to determine whether a value lies above or below, or has reached a stipulated limit.

limit control A sensing device that shuts down an operation or terminates a process step when a prescribed limiting condition is reached.

limit cycle A sustained oscillation of finite amplitude.

limited A word often attached to another word or term to indicate the particular machine activity which needs the most time, i.e., tape-limited, input-limited, etc.

limited breathing enclosure, restricted breathing enclosure An enclosure into which the surrounding atmosphere has only limited access. This limited access is expressed as the time necessary for an explosive atmosphere surrounding the enclosure to enter it by diffusion and barometric pressure variations until the Lower Explosive Limit (L.E.L.) is reached inside the enclosure. Note: These enclosures may only be used in areas in which an explosive atmosphere is normally not present such as zone - 2 areas.

limiter 1. In analog computing, a functional unit used to prevent an analog variable from exceeding specified limits. **2.** A device in which some characteristic of the output is automatically prevented from exceeding a predetermined value.

limiting ambient temperature (electric equipment) The highest or (lowest) ambient temperature at which electric equipment is expected to give specified performance under specified conditions, for example, rated load.

limiting conditions The extreme conditions which a measuring instrument can withstand without damage and without degradation of its metrological characteristics when it is subsequently operated under its rated operating conditions. Notes: **1.** The limiting conditions for storage, transport and operation may be different. **2.** The limiting conditions generally specify limiting values of the measurand and of the influence quantities.

limiting control Additional closed loop control which only takes effect if a given variable reaches its predetermined limits.

limiting feedforward or feedback Modifying feedforward or feedback with the object of restricting the absolute value or the excursion of any signal, including the controlled condition.

limiting load (industrial robots) The maximum load which can be applied to the mechanical interface without any damage or failure to the robot mechanism, under restricted operating conditions in comparison to rated load conditions.

limiting temperature The maximum temperature at which a component or material may be operated continuously with no sacrifice in normal life expectancy.

limiting values See note under limiting conditions.

limiting values for operation See limiting conditions.

limiting values for storage and transport See limiting conditions.

limit monitor Two step element which compares the input variable with a limit value to produce a binary limit signal.

limit of detection In any instrument or measurement system, the smallest value of the measured quantity that produces discernible movement of the indicator.

limit of measurement In any instrument or measurement system, the smallest value of the measured quantity that can be accurately indicated or recorded.

limit priority A priority specification associated with every task in a multitask operation, representing the highest dispatching priority that the task may assign to itself or to any of its subtasks.

limit ratio The ratio of peak value to limited value.

limits of error (of a measuring instrument) The extreme values of an error permitted by specifications, regulations etc. for a given measuring instrument.

limit signal The binary output signal of a limit monitor.

limit switch 1. A switch the contact status of which changes when a control element moves up to or past a positional limit setting. Note: Precision "snap action" (toggle) switches with dustproof, weatherproof, or explosionproof housings are frequently used as limit switches. **2.** Pertaining to control valves, see position switch.

limit value That value of the input signal of a limit monitor, at which its binary output signal changes.

limonite A mineral. Limonites are important sources for iron throughout the world. See under hydrous oxides.

line See delay line.

line (in numerical control) A portion of machine program or subprogram equivalent to one block of NC data. Lines are separated by NEW LINE (LINE FEED) code. Sequence numbers contained in NC data are not necessarily equivalent to line numbers. The definition of line numbers in a given situation is a function of control implementation.

(transmission) line The portion of a data circuit external to data-circuit terminating equipment (DCE), that connects the DCE to a data switching exchange (DSE), that connects a DCE to one or more other DCE's, or that connects a DSE to another DSE. See figure in ISO publication 2382/9-1984.

linear 1. The order in an algebraic equation in which all of the variables are present in the first degree only, i.e., an equation in which none of the variables are raised to power other than unity or multiplied together. **2.** Having an output that varies in direct proportion to the input.

linear acceleration The rate of change in linear velocity.

linear amplifier One for which the output signal level is a constant multiple of the input level.

linear circuit A circuit whose output is an amplified version of its input or whose output is a predetermined variation of its input.

linear control system See linear system.

linear conversion A conversion for which the quotient of each change in the output value of the corresponding change in the input is intended to be constant.

linear differential transformer A type of electro-mechanical transducer that converts physical motion into an output voltage, the phase and amplitude of which are proportional to position. See also linear motion transducer.

linear displacement transducer, LVDT An electromechanical device which produces an electrical output proportional to the displacement of a separate movable core.

linear distortion Distortion independent of the signal amplitude.

linear element (fiber optics) A device for which the output electric field is linearly proportional to the input electric field and no new wavelengths or modulation frequencies are generated. A linear element can be described in terms of a transfer function or an impulse response function.

linear equation Graphed as a straight line. Since a straight line is determined by two points, to plot the graph of a linear equation, plot two points and draw a straight line through them.

linear flow characteristic (control valves) An inherent flow characteristic which can be represented by a straight line on a rectangular plot of flow coefficient (C_v) versus percent rated travel. Therefore, equal increments of travel provide equal increments of flow coefficient (C_v) at constant pressure drop.

linear function Describes a condition in which the relationship between two interdependent variables is constant.

linear integrated circuit, LIC An integrated circuit the output of which remains proportional to the input level.

linear interpolation (numerical control) A mode of machine tool contouring control that uses the information contained in a block to produce constant velocities proportional to the distance moved in two or more axes simultaneously.

linearity 1. The closeness to which a calibration curve approximates a specified straight line. Note: Linearity should be qualified. When expressed simply as linearity, it is assumed to be independent linearity. **2.** Maximum deviation between ideal linear and measured linear characteristic.

linearity (of a measuring instrument) The ability of a measuring instrument to provide an indication or output quantity having a linear relationship to a defined quantity other than an influence quantity. Note: The method of expression of lack of linearity is different for different kinds of instrument.

linearity error 1. The absolute value of the maximum deviation between the calibration curve and the specified straight line. Note: Linearity error should be qualified. When expressed simply as linearity error, it is assumed to be independent linearity error.

linearity of a multiplier The ability of an electro-mechanical or electronic multiplier to generate an output voltage that varies linearly with either one of its two inputs, provided the other input is held constant.

linearity of a potentiometer The accuracy with which a potentiometer yields a linear but not necessarily a proportional relationship between the angle of rotation of its shaft and the voltage appearing at the output arm, in the absence of loading errors.

linearization 1. The approximation of a nonlinear system by a linear mathematical model with a specified accuracy within a specified working range around a stable operating point. **2.** Conversion of nonlinear measurement into proportional linear engineering units (e.g., PSI, Degrees C. etc.). Square root extraction of a differential transmitter signal to obtain flow value is typical. Refers to Honeywell TDC 3000 control systems.

linear list A linearly ordered set of data elements whose order is preserved in storage by using sequential allocation.

linear meter An instrument whose indicated output is proportional to the quantity measured.

linear motion transducer A device that translates straightline (linear) mechanical motion into an ac analog which is usable as a feedback signal for control or display.

linear motor (fluid power systems) Cylinder with built-in control unit by which the piston rod is automatically reciprocated.

linear polarization Light in which the electric field vector points in only a single direction.

linear position sensing detector An optical detector which can measure the position of a light spot along its length.

linear potentiometer A potentiometer in which the voltage at a movable contact is a linear function of the displacement of the contact.

linear power amplifier A power amplifier in which the signal output voltage is directly proportional to the signal input voltage.

linear programming, LP A method of solution for problems in which a linear function of a number of variables is subject to a number of constraints in the form of linear inequalities.

linear pulse amplifier (pulse techniques) A pulse amplifier in which the peak amplitude of the output pulses is directly proportional to the peak amplitude of the corresponding input pulses, if the input pulses are alike in shape.

linear region Region of a given control characteristic over which the linearity remains within specified limits.

linear regression A statistical function used when handling experimental data. It is especially used when using an experiment to find a mathematical relationship between two variables.

linear scale A scale in which each scale spacing is related to the corresponding scale interval by a coefficient or proportionality which is constant throughout the scale. Note: A linear scale having constant scale intervals is called a regular scale.

linear search, sequential search A search in which a set of data is scanned in a sequential manner.

linear system System which can be described by a set of linear equations. Note: A linear system has a transfer function with constant coefficients for any value of inputs within a specified range. Its time response to several simultaneous inputs is the sum of the time responses to each individual input. A system not meeting these conditions is described as "nonlinear".

linear transducer A type of transducer for which a plot of input signal level versus output signal level is a straight line.

linear variable differential transformer See differential transformer.

line-class valve A valve qualified by its design characteristics to be used as the first valve of the process line.

line coding A single command or instruction for a computer to solve.

line control unit A special-purpose computer used to control input and output from communications lines that are not connected directly to the main computer.

line coordination (data transmission) The process of ensuring that equipment at both ends of a circuit are set up for a specific transmission.

line current (thyristor) The current in the lines of the supplying power system.

lined body (control valves) A body having a lining which makes an interference fit with the disk in the closed position thus establishing a seal.

line display (spectrum analyzer) The display produced on a spectrum analyzer when the resolution bandwidth is less than the spacing of the individual frequency components.

line driver A circuit specifically designed to transmit digital information over long lines, that is, extended distances.

line drop A potential drop between any two points on a data transmission line due to resistance, leakage, or reactance.

lined valve body A valve body to which a protective coating or liner has been applied to internal surfaces of pressure containing parts or to the surfaces exposed to the fluid.

line editor (computer applications) A text editor that allows the user to change text, with cursor control, on only one line at a time. Multiple lines may be viewed or changed through editing commands.

line equalizer An inductance and/or capacitance inserted into a transmission line to correct its frequency – response characteristics.

line feed The movement of the print or display position to the corresponding position on the next line.

line feed character, LF A format effector that causes the printing or display position to be moved to the next printing or display line.

line frequency 1. Also called horizontal line frequency or horizontal frequency. In television, the number of times per second the scanning spot crosses a fixed vertical line in the picture in one direction, including vertical-return intervals. **2.** The nominal operating frequency of the power-line voltage used to supply operating power to instruments or equipment.

line-frequency line current (thyristor) The root-mean-square (rms) value of the fundamental component of the line current, the frequency of which is the line frequency.

line-frequency line voltage (thyristor) That sine wave component of the line voltage, whose frequency is the line frequency. The root-mean-square (rms) value of that component.

line-frequency regulation The change in output (current, voltage or power) of a regulated power supply for a specified change in line frequency.

line graphics, coordinate graphics Computer graphics in which display images are generated from display commands and coordinate data.

line group A set of one or more communication lines of the same type, over which terminals with similar characteristics can communicate with the computer.

line hit An electrical interference causing the introduction of spurious signals on a communications circuit.

line impedance The impedance of a transmission line. It is a function of the resistance, inductance, conductance and capacitance of the line, and the frequency of the signal. Same as characteristic impedance.

line integral An integral along a directed path whose differential element is a product of a scalar or vector quantity and the vector line element. Note: This integral may be a scalar or a vector quantity according to the kind of product.

line level The signal level in decibels at a particular point on a transmission line.

line loop An operation performed over a communication line from an input unit at one terminal to output units at a remote terminal.

line loss The total of the various energy losses in a transmission line.

line motion control system (numerical control) Numerical control in which **a.** each numerically controlled motion operates in accordance with instructions which specify both the next required position and the required feedrate to that position; **b.** the movements in the different axes of motion are not co-ordinated with each other; **c.** the movements in the different axes of motion take place only parallel to linear, circular or other machine ways.

line pack The volume of gas or barrels of oil maintained in a trunk pipeline at all times in order to maintain pressure and provide uninterrupted flow of gas or oil.

line parameters Those necessary (series impedance and shunt admittance) to specify the electrical characteristics of a transmission line.

line power (thyristor) The total power delivered from the line to the controller.

line pressure See reference pressure.

line printer A printing device which prints an entire line of data at a time and then advances to the next line.

line protocol A control program used to perform data-communication functions over network lines. Consists of both handshaking and line-control functions that move the data between transmit and receive locations.

liner Paper or board intended for covering by lining the surface of another paper or board material; see pasting.

(elastometer) liner anchored to body (for butterfly valves) This type of liner is anchored by a metal or rubber retaining ring that projects into a groove in the valve body. Other liner design types for butterfly valves are: liner bonded to body, liner wrapped around faces, push-in liner, clamped liner and, special liners.

liner bonded to body (for butterfly valves) This type of liner is not replaceable in the field. It is generally used in small size valves and on some large valves only when the application is critical. Other liner design types for butterfly valves are: liner anchored to body, liner wrapped around faces, push-in liner, clamped liner and special liners.

line side (data transmission) Data terminal connections to a communications circuit between two data terminals.

line source (fiber optics) 1. In the spectral sense, an optical source that emits one or more spectrally narrow lines as opposed to a continuous spectrum. **2.** In the geometric sense, an optical source whose active (emitting) area forms a spatially narrow line.

line spectra Spectra that originate from atoms; they are composed of lines having irregular spacing and intensity.

line spectrum 1. An emission or absorption spectrum consisting of one or more narrow spectral lines, as opposed to a continuous spectrum. **2.** A spectrum composed of discrete frequency components.

line speed (data communication) The maximum rate of which signals may be transmitted over a given channel.

line stretcher An impedance matching device for coaxial transmission lines.

line switching Also called circuit switching. A communications switching system which completes a circuit from sender to receiver at the time of transmission, as opposed to message switching.

line triggering Triggering from the power-line frequency.

line turn-around In half-duplex communication, the switching of modems and communication channels from transmission in one direction to transmission in the opposite direction.

line type photoelectric proximity switch A photoelectric proximity switch in which the effective area of the light beam scans across the target surface at the scanning plane in line form.

line-voltage 1. The voltage existing in a cable or circuit such as at a wall outlet or other terminals of a power line system. **2.** The voltage supplied by an electrical power line or source, measured at the point of supply or sometimes at the point of utilization.

line voltage regulator A device that counteracts variations in the power-line voltage and delivers a constant voltage to the connected load.

line voltage transient protection A device, or circuit, generally located on the line side of the control, which will divert or dissipate the energy contained in an abnormal line voltage spike.

lining **1.** Lamination of paper or board whereby some type of surface layer is pasted onto one or both sides. **2.** The material used on the furnace side of a furnace wall. It is usually of high grade refractory fire or brick or plastic refractory material.

(to) link **1.** In computer programming to provide a link. **2.** See communication link.

link, linkage In computer programming, a part of a computer program, in some cases a single instruction or an address, that passes control and parameters between separate portions of the computer program.

linkage **1.** See link. **2.** A term used to describe an arrangement of interconnecting parts – rods, levers, springs, joints, couplings, pins – that transmit motion and power or exert control.

linkage editor A computer program used to create one load module from one or more independently translated object modules or load modules by resolving cross – references among the object modules, and possibly by relocating elements. Note that not all object modules require linking prior to execution.

linked list, chained list A list in which the data elements may be dispersed in storage but in which each data element contains information for locating the next one.

linting, dusting, fluffing The separation of particles from the surface of paper or board during e.g. printing.

lip seal Seal which has a flexible sealing projection. Fluid pressure acting on one side of the lip holds the other side in contact with a suitable surface against which to make the seal.

LIPS Logical Inferences Per Second Standard for the measurement of processing power of an inference engine. Note: One inference often requires thousands of computer instructions.

liquefiable hydrocarbons The light ends separated from crude oil in the refining process that are gaseous at atmospheric pressure. Examples are butane, propane, and pentane. These gaseous fractions are cooled and subjected to pressure, which condenses the to clear liquids. When stored or transported, the liquefied hydrocarbons are stored in pressure vessels. See LPG.

liquefied natural gas See LNG.

liquefied natural gas carrier See LNGC.

liquefied petroleum gas See LPG.

liquid barometer A simple device for measuring atmospheric pressure, which can be constructed by filling a glass tube having one closed end with a liquid such as mercury, then temporarily plugging the open end, inverting the tube into a container partly filled with the liquid, and unplugging the open end.

liquid-borne noise Undesired sound characterized by fluctuations of pressure of a liquid about the static pressure as a mean.

liquid contamination (of pneumatic supply) Contamination in liquid form expressed in terms of mass per mass of supplied air or gas.

liquid cooled dissipator See cold plate.

liquid-core fiber An optical fiber consisting of optical glass, quartz or silica tubing filled with a higher-refractive-index liquid, such as tetrachloroethylene.

liquid-core optical fibers Multimode straight fibers capable of transporting linearly polarized light with any incident polarization angle, and in which no form of internal stress can develop that could lead to birefringence.

liquid-crystal display See LCD.

liquid-filled thermometer Any of several designs of temperature-measurement devices that depend for their operation on predictable devices that depend for their operation on predictable change in volume with temperature of a liquid medium confined in a closed system.

liquid flow The movement of a volume of a substance that is neither a solid nor a gas, that is practically incompressible, that offers insignificant resistance to change of shape and that flows freely, e.g. water or water with sediment.

liquid-in-glass thermometer The operation of a liquid-in-glass thermometer depends on the difference in thermal expansion of the fluid and the glass. For example, the volume coefficient of expansion of mercury is about eight times that of glass.

liquid level (stage) recorder A device which records automatically, either continuously or at frequent time intervals, the liquid level as sensed by a float or some other device.

liquid level measurement With liquid level, as with several other process variables, measurement can be made directly or can be inferred. Examples of direct measurements are those made by means of floats or by conductivity electrodes. Inferential methods of measuring level are by: **1.** Pressure gages. See static pressure measurement of level in open vessels. **2.** Diaphragm boxes. See diaphragm box method. **3.** Purge systems. See purge method. **4.** Meter bodies. See meter body method. **5.** Displacement transmitters. **6.** Radiation detectors. See radiation type method. See also electrode method and electrical capacitance and electrical conductance level measuring device.

liquid level switch See float switch.

liquid-penetrant method (inspection of steel) The liquid-penetrant method is an aid to visual inspection that is characterized by its simplicity and low cost. It is designed to enhance the visibility of surface imperfections in solid, nonporous materials. It relies upon the ability of certain substances (dyes) to flow uniformly over the surface of a material and penetrate into surface cavities. The liquid-penetrant method may be divided into several general categories that pertain to the kinds of dyes, developers, and solvents used.

liquid pressure recovery factor (control valves) The ratio (F_1) of the valve flow coefficient (C_V) based on the pressure drop at the vena contracta, to the usual valve flow coefficient (C_V) which is based on the overall pressure drop across the valve in non-vaporizing liquid service. These coefficients compare with the orifice metering coefficients of discharge for vena contracta taps and pipe taps, respectively. See ANSI/ISA-S75.01 "Control Valve Sizing Equations".

liquid surface profile A plot of the liquid surface in the direction of flow. Pertains to liquid flow measurement in open channels.

liquor inventory (in a sulphate pulp mill) The total quantity of liquor (white liquor, black liquor, green liquor etc.) in a sulphate pulp mill expressed as the quantity of active or activatable cooking liquor components.

liquor ratio (textile term) The ratio of the amount of liquid used to the amount of fabric treated; used in conjunction with jet dye machines, package dye machines, beam dye machines, and jigs.

liquor side relief The removal of part of the cooking liquor from a pulp cook for re-use in the digester house system.

LISP A programming language (LIST Processing) designed specifically to manipulate symbols rather than numeric data.

LISP machine A single-user workstation with a dedicated LISP programming architecture.

list (software) 1. An ordered set of data elements. 2. To print or otherwise display items of data that meet specified criteria. 3. See chained list.

listing (software) 1. A computer output in the form of a human-readable list. 2. A human-readable, textual computer output.

list processing A method of processing data in the form of lists. Note: Chained lists are usually used so that the order of the data elements can be changed without altering their physical locations.

literal 1. In a source program, an explicit representation of the value of an item, which value must be unaltered during any translation of the source program. 2. A lexical unit that directly represents a value.

lithium An alkali metal used in the construction of photocells and batteries.

lithium chloride sensor A hygroscopic element that has fast response, high accuracy, and good long-term stability, and whose resistance is a function of relative humidity. Also called Dunmore cell.

litmus A blue, water-soluble powder derived from lichens and used as an acid-base indicator; it is blue at pH 8.3 and above, and it is red at pH 4.5 and below.

litre Also spelled liter. The SI unit for volume.

littoral zone The shallow marginal zone of a body of water where light penetrates to the bottom; usually colonized by rooted vegetation.

live 1. A term applied to a circuit through which current is flowing. 2. Connected to a source of an electrical voltage.

live front An assembly arrangement which has all moving or energized parts exposed on the front of the panel, framework or cabinet.

live part Any conductor or conductive part which is at a voltage in normal use.

live steam Steam which has not performed any of the work for which it was generated.

live voltage detector An instrument intended to show whether or not a conductive component is live.

LLC Logical Link Control. The upper sublayer of the Data Link Layer (Layer 2) used by all types of IEEE 802 Local Area Networks. LLC provides a common set of services and interfaces to higher layer protocols.

LLC Logical Link Control. The upper sublayer of the data link layer (Layer 2) used by all types of IEEE 802 LANs. LLC provides a common set of services and interfaces to higher layer protocols.

LLEI Low-Level Engineering Interface, a type of LLHI designed for use by an instrumentation engineer.

LLHI Low-Level Human Interface, a device that allows a human to interact with a local control unit.

LLOI Low-Level Operator Interface, type of LLHI designed for use by a process operator.

lm Lumen, unit for luminous flux (SI unit).

LNG Liquefied Natural Gas. Natural gas that has been liquefied by severe cooling (-160°C) for the purpose of shipment and storage in high-pressure cryogenic tanks. To transform the liquid to a usable gas, the pressure is reduced and the liquid is warmed.

LNGC Liquefied Natural Gas Carrier. A specially designed oceangoing vessel for transporting liquefied natural gas.

load 1. To fill the internal storage of a computer with information from auxiliary or external storage. 2. The conditions which determine the amount of energy or

material which must be supplied to a process to maintain the variable at the desired level. A change in load results in use of a different amount of material or energy to produce the same value of the variable. 3. In a heating or cooling system, the heat transfer that the system will be called upon to provide. Also, the work that the system must perform.

load (industrial robots) The load is a function of mass, moment of inertia, static and dynamic forces supported by the robot and is expressed as the force and torque at the mechanical interface which can be exerted along the various axes of motion under specified conditions of velocity and acceleration.

load-and-go An operating technique in which there are no stops between the loading and execution phases of a program, and which may include assembling or compiling.

load cell A device which produces a signal with a defined relationship to the force applied to it. Note: Many types of load cells exist utilizing a great variety of physical phenomena such as hydraulic or pneumatic pressure, piezoelectricity elasticity, electromagnetic induction etc.

load characteristic Pertaining to electronic measuring instruments, the linear or non-linear relationship, for a specified load, between the value of the output voltage and the value of the output current for a fixed setting of the control. Notes: 1. The load may be complex and/or non-linear. 2. The term include the effects of overload.

load circuit A circuit or a branch of a network which carries the main portion of current flow.

load coil (induction heating usage) A electric conductor that, when energized with alternating current, is adopted to deliver energy by induction to a charge to be heated.

load control flow (fluid power systems) Flow through the valve control parts when there is load pressure drop.

loaded impedance In a transducer, the impedance at the input when the output is connected to its normal load.

loader 1. A routine that reads an object program into main storage prior to its execution. 2. A routine, commonly a computer program, that reads data into main storage.

load factor Ratio of average load to peak load over a period.

load impedance 1. Impedance presented to the output of a device by the source. 2. For electrical transducers, the impedance presented to the output terminals of a transducer by the associated external circuitry. 3. The resultant of the impedances of all connected receiving elements and connecting lines within the signal circuit. Definition as per IEC standard 381-1 for direct current signals. 4. The resultant of the impedances of all connected receiver. Definition as per IEC standard 831-2 for direct voltage signals.

loading Act of transferring energy into or out of a system.

loading coil An inductor inserted into a circuit to increase its inductance and thereby improve its transmission characteristics.

loading error 1. The error introduced when data are incorrectly transferred from one medium to another. 2. For electrical transducers, an error due to the effect of the load impedance on the transducer output.

loading routine In a computer, a routine which, when in the memory is able to read other information into the memory from cards, tape, etc.

load line (fluid power systems) Curve expressing output pressure as a function of output flow. The derivative of this curve is the expression of the output impedance.

load module A program unit that is suitable for loading into main storage for execution; it is usually the output of a linkage editor.

load power (thyristor) The total power delivered from the controller to the load.

load pressure drop (fluid power systems) Differential pressure between the control points. This is denoted as a positive pressure if the higher of the two values is connected to supply pressure and the lower to return. A negative value implies that the highest of the load pressures is connected to return pressure and the lower to supply. Thus a positive pressure drop denotes an opposing load implying a flow of energy to the actuator while a negative load pressure drop denotes an assisting load implying absorption of energy from the actuator.

load regulation The change in output (usually speed or voltage) from no-load to full-load or other specified load limits. See offset.

load sharing A scheduling technique in multiprocessing systems whereby a task is executed by the next available processor.

load voltage (thyristor) The voltage across the load.

load voltage regulation A change in output voltage of a power source for a specified change in the load. This is often expressed as the percentage ratio of the voltage change from no-load to rated load divided by the non-load voltage.

lobed impeller and gear meter A form of rotating impeller-type positive-displacement flow meter

local 1. In assembler programming, pertaining to that part of a program that is either the body of any macro definition called from a source module or the open code portion of the source module. **2.** Pertaining to the relationship between a language object and a block such that the language object has a scope contained in that block.

local area network, LAN A data-communications system, usually owned by a single organization, that allows similar or dissimilar digital devices to talk to each other over a common transmission medium. A local network provides such communications over a limited geographical area.

local control (programmable instrumentation) A method whereby a device is programmable by means of its local (front or rear panel) controls in order to enable the device to perform different tasks. Syn: manual control.

local control network See LCN.

localized corrosion The various forms of localized corrosion are: galvanic, crevice, pitting, selective leaching, intergranular, stress corrosion cracking. See these terms.

local reference bar Copper bus bar that acts as a signal reference point. Refers to Honeywell TDC 3000 control systems.

location Loosely, any place in which data may be stored.

location counter 1. A section register which contains the address of the instruction currently being executed. **2.** A register in which the address of the current instruction is recorded. Synonymous with instruction counter and program address counter.

locator (computer graphics) An input device that provides coordinates of a position. Example: A mouse, a tablet.

lock byte An entity used to represent a resource in synchronization schemes; also termed semaphore.

lock-in amplifier An amplifier which selects signals at one prespecified frequency and amplifies them, while discriminating signals at other frequencies.

locking 1. Pertaining to code extension characters that change the interpretation of an unspecified number of following characters. Contrast with nonlocking. **2.** Controlling the frequency of an oscillator by means of an applied signal of constant frequency.

locking circuit See holding circuit.

locking-in (data transmission) The shifting and automatic holding of one or both of the frequencies of two oscillating systems which are coupled together, so that the two frequencies have the ratio of two integral numbers.

locking-out relay An electrically operated hand or electrically reset device which functions to shut down and hold an equipment out of service on the occurrence of abnormal conditions.

locking relay Contacts made or broken when the relay is energized are unaffected by de-energization.

lockout 1. Any condition which prevents any or all senders or receivers from communicating. **2.** See protection.

lock-up relay A relay that locks in the energized position by means of permanent magnetic bias (requiring a reverse pulse for releasing) or by means of a set of auxiliary contacts that keep its coil energized until the circuit is interrupted.

lodestone Also spelled loadstone. A natural magnet consisting chiefly of a magnetic oxide of iron called magnetite.

log, journal A chronological of data processing operations. Note: The journal may be used to reconstruct of previous or an updated version of a file.

logarithm The exponent of a number indicating the power to which it is necessary to raise a given number, called the base, to produce the original number.

logarithmic amplifier An amplifier the output of which is a logarithmic (as opposed to linear) function of its input.

logarithmic curve A curve on which one coordinate of any point varies in accordance with the logarithm of the other coordinate of the point.

logarithmic gain The value of $20 \log G$, in decibels, where G is the gain.

logarithmic scale See note under non-linear scale.

logger A device which automatically records physical processes and events, usually chronologically.

logic 1. The science dealing with the criteria or formal principles of reasoning and thought. **2.** The systematic scheme which defines the interactions of signals in the design of an automatic data processing system. **3.** The basic principles and application of truth tables and interconnection between logical elements required for arithmetic computation in an automatic data processing system. See also symbolic logic.

logical add See INCLUSIVE-OR operation.

logical address A station identification as represented by name, label or number.

logical block An arbitrarily – defined, fixed number of contiguous bytes used as the standard I/O transfer unit throughout a computer operating system.

logical cells Consists of a set of Specified Components and support a set of Enterprise Activities.

logical choice In a computer, the correct decision where alternatives or different possibilities are open.

logical comparison The examination of two strings to discover if they are identical.

logical connectives The operators or words such as AND, OR, OR ELSE, IF THEN, NEITHER, NOR, and EXCEPT, which make new statements from given statements and which have the property that the truth or fallacy of the new statements can be calculated from the truth or fallacy of the given statements and the logical meaning of the operator.

logical decision 1. The choice or ability to choose between alternatives. Basically, this amounts to an ability to answer yes or no with respect to certain fundamental questions involving equality and relative magnitude. **2.** The utilization of a logic instruction, q.v.

logical diagram In logical design, a diagram that represents logical elements and the interconnection between them, without necessarily including construction or engineering details.

logical element The smallest building block in a computer or data processing system, which can be represented by logical operators in an appropriate system of symbolic logic.

logical expression A logical expression consists of logical constants, variables, array elements, function references, and combinations of those operands, separated by logical operators and parentheses.

logical file A file independent of its physical environment. Portions of the same logical file may be located in different physical files, or several logical files or parts of logical may be located in one physical file.

logical flowchart A detailed, graphical presentation of work flow in its logic sequence.

logical manipulation Performing functions of AND, OR, Exclusive-OR, complementing or rotating data in registers or in memory.

logical operation See logic operation.

logical product See conjunction.

logical record A set of related data elements considered to be a record from a logical viewpoint.

logical shift A shift that affects all positions in a register, word or numeral, including the sign position. For example, +231.702 shifted two places to the left becomes 3170.200. Note: A logical shift may be applied to the multipleprecision representation of a number. See arithmetic shift.

logical state Signal levels in logic devices are characterized by two stable states, the logical 1 state and the logical 0 state. The designation of the two states is chosen arbitrarily. Commonly the logical 1 state represents an "on" signal and the 0 state represents an "off" signal.

logical sum See INCLUSIVE-OR operation.

logical threshold voltage At the output of a logic device, the voltage level at which the following logic device switches states.

logical unit number A number associated with a physical device unit during a task's I/O operations; each task in the system can establish its own correspondence between logical unit numbers and physical device units.

logical variable A variable that may have only the value true or false. Also called Boolean variable.

logic analyzer 1. An instrument to monitor a number of test points to aid in troubleshooting. **2.** An instrument that displays data or timing diagrams for designing, debugging and troubleshooting digital equipment.

logic array An integrated device in which 50 or more circuits are integral to a single silicon chip. In addition, the circuits are interconnected on the chip to form some electronic function at a higher level of organization than a single circuit.

logic card A grouping of electrical components and wiring circuitry mounted on a board allowing easy withdrawal and replacement from a socket in the equipment. Each card is related to a basic machine function and on discovery of a bug in that function, the card can be replaced.

logic circuit One of many types of switching circuits such as AND, OR, NAND etc.; gates that perform various logic operations or represent logic functions.

logic control Control in which binary output signals are generated from binary input signals by Boolean operations.

logic design 1. The specification of the working relation between the parts of a system in terms of symbolic logic and without primary regard for hardware implementation. **2.** A functional design that uses formal methods of description, such as symbolic logic.

logic diagram A diagram representing the logic elements and their interconnections without necessarily expressing construction or engineering details.

(pure) logic diagram Function diagram that predominantly uses symbols for binary logic elements.

logic element, gate A combinational circuit that performs an elementary logic operation. Note: The term "gate" generally involves one output.

logic family Group of digital integrated circuits sharing a basic circuit design with standardized input-output characteristics.

logic function (deprecated) See switching function.

logic ground A level that is used as a reference for digital signals in a system. Not necessarily at the same potential as earth or safety ground.

logic instruction An instruction in which the operation part specifies a logic operation.

logic levels 1. Nominal voltages which represent binary conditions in a binary circuit. **2.** One of two possible states, zero or one.

logic manager (LM) In Honeywell TDC 3000 control systems the Logic Manager provides high-speed logic functions on the Universal Control Network for applications requiring fast logic program execution, extensive digital, Boolean, or interlock logic and ease of ladder logic programming.

logic module Circuit element comprising logic gates (AND, OR, NOT) and variations (NAND, NOR). Used in the design of binary arithmetic circuits, Boolean logic arrangements, etc.

logic operation, logical operation 1. An operation that follows the rules of symbolic logic. **2.** An operation in which each character of the result depends only on the corresponding character of each operand.

logic shift, logical shift A shift that equally affects all the characters of a computer word.

logic state One of two possible abstract states that may be taken on by a logic (binary) variable.

logic state analyzer 1. A test instrument that synchronously captures and displays data valid at a system's clock edge. It traces the flow of digital data and, hence, is said to work in the data domain. **2.** An instrument used to track state flow and record state sequences occurring during program execution. It can reveal errors in software execution.

logic swing The difference in voltage between the voltage levels for 0 and 1 in a binary logic circuit.

logic switch A diode matrix or other switching arrangement that can direct an input signal to a selected one of several outputs.

logic symbol A symbol that represents an operator, a function, or a functional relationship.

logic system 1. A group of interconnected logic elements that act in combination to perform a relatively complex logic function. **2.** Programming-recording system constructed of solid-state modules based on series of binary logic (go/no go) components.

logic threshold Minimum number of signals required at the inputs of a multi-input device to change the output condition.

logic unit See arithmetic unit.

logic variable (deprecated) See switching variable.

logistic delay That accumulated time during which a maintenance action can not be performed due to the necessity to acquire maintenance resources, excluding any administrative delay. Note: Logistic delays can be due to e.g. travelling to unattended installations, pending arrival of spare parts, specialists, test equipment, information and suitable environmental conditions.

logistics documents Documents to support field operations, such as instructions manuals, training information, spares modification and maintenance information.

log on A mechanism by which a computer system user identifies himself or herself and gains access to system facilities.

long dimension (numerical control) Incremental dimensions whose number of digits is one more to the left of the decimal point than for a normal dimension, and the digit shall be zero, that is, XX.XXX0 for the example under normal dimension.

long flame burner A burner in which the fuel emerges in such a condition, or one in which the air for combustion is admitted in such a manner, that the two do not readily mix, resulting in a comparatively long flame.

longitudinal drum boiler A sectional header or box header boiler in which the axis on the horizontal drum or drums is parallel to the tubes in a vertical plane.

longitudinal interference See common mode interference.

longitudinal magnetic recording A technique of magnetic recording in which magnetic polarities representing data are aligned along the length of the recording track.

longitudinal parity check A parity check on a row of binary digits that are members of a set forming a matrix. Example: A parity check on the bits of a track in a block on a magnetic tape.

longitudinal redundancy check, LRC A system of error control based on the formation of a block check following preset rules. The check formation rule is applied in the same manner to each character.

longitudinal testing Interactive tests to compare earlier performance with later performances.

longitudinal wave A wave in which the direction of displacement at each point of the medium is the same as the direction of the propagation.

long radius nozzle Nozzle the upstream face of which consists of a flat surface perpendicular to the axis, a convergent section whose shape is a quarter ellipse, a cylindrical throat and possibly a recess or a bevel. The profile is defined precisely in ISO 5167. See figure in ISO publication 4006-1977 or BS 5875:1980.

long space disconnect A feature of some modems which causes the modem to terminate a telephone call in response to the receipt of a spacing signal for an extended period of time.

long wave Wavelengths longer than about 1 000 meters. They correspond to frequencies above 3 000 kHz.

loom A flexible nonmetallic tubing placed around insulated wire for protection.

loop 1. Synonymous with control loop. See closed loop and open loop. **2.** A process control method whereby significant undesired changes in the process cause corrective signals that either adjust the process or alert an operator to do so. Refers to Honeywell TDC 3000 control systems.

loop (software) 1. A set of instructions that may be executed repeatedly while a certain conditions prevails. See also iteration. **2.** A set of instructions repeatedly executed by a processor until some control mechanism allows an exit from the loop. Refers to Honeywell TDC 3000 control systems.

loop (in communications) A communications circuit between two private subscribers or between a subscriber and the local switching center.

loop (batch control) A combination of two or more elements or control functions arranged so that signal pass from one to another for the purpose of measurement and/or control of a process variable.

loop (initialization) Instructions that immediately precede the loop proper, that set addresses, counters or data to initial values.

loop check, echo check A check to determine the correctness of the transmission of data in which the received data are returned to the source for comparison with the originally transmitted data.

loop construct A language construct that specifies an iteration in the execution sequence. Examples: DO loops in FORTRAN; FOR loops in ALGOL; PERFORM loops in COBOL; DO WHILE loops in PL/I.

loop control The maintaining of a specified loop of material between two sections of a machine by automatically adjusting the speed of at least one of the driven sections.

loop converter (data transmission) A device used for conversion of dc loop current pulses to relay contact closures and thereby provide circuit isolation.

loop current step response (for thermocouples and resistance thermometers) See under LCSR.

loop diagram A schematic representation of a complete hydraulic, electric, magnetic or pneumatic circuit.

loop gain 1. In process instrumentation, the ratio of the absolute magnitude of the change in the feedback signal to the change in its corresponding error signal at a specified frequency. Note: The gain of the loops elements is frequently measured by opening the loop, with appropriate termination. The gain so measured is often called the open loop gain. **2.** In data communication, the sum of the gains which are given to a signal of a particular frequency in passing around a closed loop. The loop may be a repeater, carrier terminal, or a complete system.

loop gain characteristics In process instrumentation, of a closed loop, the characteristic curve of the ratio of the change in the return signal to the change in the corresponding error signal for all real frequencies.

looping Repetition of instructions at delayed speeds until a final value is determined. The looping repetitions are usually frozen into a ROM memory location and then jumped when needed. Looping also occurs when the CPU of a computer is in a wait condition.

loop input signal An external signal applied to a feedback control loop.

loop manual mode Manual control of the output from the Analog Dispaly. Refers to Honeywell TDC 3000 control systems.

loop resistance The total resistance of two conductors measured at one end (conductor and shield, twisted pair, conductor and armor etc.).

loop structure A structural arrangement of functional blocks such that the output variable of one block is an additional input variable to a preceding block.

loop test Insulation test on a transmission line or cable made by connecting the conductors to form a closed loop.

loop transfer function Of a closed loop, the transfer function obtained by taking the ratio of the Laplace transform of the return signal to the Laplace transform of its corresponding error signal.

loose stem (ball valves) A design in which the stem is not physically or mechanically attached to the ball, but drives the ball through intimate contact of surfaces. Typical loose stem drives are: tang, pin, splined.

Lorentz force The force exerted by an electric field and a magnetic field on a moving electric charge.

loss angle The complement of the phase angle of an insulating material.

loss factor The characteristic which determines the rate at which heat is generated in an insulating material. It is equal to the dielectric constant times the power factor.

lot A grouping of material to be processed. In package dyeing, all the packages exposed to the same dye bath; in continuous dyeing, all pieces of fabric assigned to one customer's order.

lot A quantity of items produced together and sharing the same production costs and resultant specification.

loudness 1. A measure of the sensitivity of human hearing to the strength of sound. Scaled in zones, it is an overall single evaluation resulting from calculations based on several individual band-index values. **2.** Generally synonymous with volume, which is the intensity of perceived sound.

loudness level A measurement of sound intensity numerically equal to the sound pressure, in decibels, relative to 0.0002 microbar, of a simple tone whose frequency is 1 000 Hz and which is judged by the listeners to be equivalent in loudness; the units of measure determined in this way are called phons.

low alloy steel See under alloy steel.

low brass A binary copper-zinc alloy containing about 20% zinc.

low-carbon steel An iron-carbon alloy containing about 0,05 to 0,25% C, and up to about 0,7% Mn.

low draft switch A control to prevent burner operation if the draft is too low. Used primarily with mechanical draft.

low-energy circuit Also called a dry circuit. A circuit application that functions at low voltage (i.e. approximately 10 volts or less) and low current (i.e. approximately 1 mA or less).

low energy process interface unit (LEPIU) An intelligent hiway device that scans analog inputs through remote low-energy multiplexer boxes. Exceptions to normal operation are reported to the operator or to a computer. An intrinsically safe barrier panel is optional for hazardous installations. Refers to Honeywell TDC 3000 control systems.

lower actual measuring range value The lowest value of the measured variable to which a device is actually adjusted to measure within a specified accuracy.

lower critical temperatures The temperatures at which austenite begins to form during heating or at which the transformation of austenite is completed during cooling.

lower limit 1. For direct current signals: The specified lowest value of the range. Note: The lower limit may be either zero or a finite value; when zero is used, this is called "true zero"; when a finite value is used, this is called "live zero". **2.** For direct voltage signals: The signal voltage corresponding to the minimum value of the direct voltage signal. **3.** Pertaining to analog pneumatic signal for industrial-process measurement and control systems, the pneumatic signal corresponding to the minimum value of the transmitted input. IEC standard 382 specifies 0,2 bar (preferred value) as lower limit and 1,0 bar (preferred value) as upper limit; span 0,8 bar.

lower range-limit The lowest value of the measured variable that a device can be adjusted to measure. Note: The following compound terms are used with suitable modifications to the units: measured variable lower range-limit, measured signal lower range limit, etc. See tables in ISA publication S 51.1.

lower range-value The lowest of the measured variable that a device is adjusted to measure. Note: The following compound terms are used with suitable modifications to the units: measured variable lower range-value, measured signal lower range-value, etc. See tables in ISA publication S 51.1.

lower valve body A half housing for internal valve parts having one flow connection. For example, the half housing of a split body valve.

low-fire start The firing of a burner with controls in a low-fire position to provide safe operating condition during light-off.

low flow control valves There is no sharp line for definition of a low flow valve but normally the term low-flow is used for C_V ratings of 0,05 or less. The theoretical C_V in the literature ranges upward from 0,00001. C_V ratings become more and more theoretical as they become smaller.

low frequency Radio frequencies between 30 and 300 kHz.

low-frequency furnace (core-type induction furnace) An induction furnace that includes a primary winding, a core of magnetic material, and a secondary winding of one short-circuited turn of the material to be heated.

low-frequency induction heater or furnace A heater or furnace in which the charge is heated by inducing a current at the power-line frequency through it.

low-frequency withstand voltage (insulator) The root-mean-square value of the low-frequency voltage that, under specified conditions, can be applied without causing flashover or puncture.

low gas pressure switch A control to stop the burner if gas pressure is too low.

low head boiler A bent tube boiler having three drums with relatively short tubes in a vertical plane.

low-heat value The high heating value minus the latent heat of vaporization of the water formed by burning the hydrogen in the fuel.

low-level analog signal cable Cable used for transmitting variable current or voltage signals for the control or instrumentation of plant equipment and systems, or both.

low-level digital signal circuit cable Cable used for transmitting coded information signals, such as those derived from the output of an analog-to-digital converter, or the coded output from a digital computer or other digital transmission terminals.

low-level language, computer orientated language A programming language that reflects the struc-

ture of a given computer or that of a given class of computers.

low level process interface unit (LLPIU) An intelligent highway-based device that enables low-level process information to be accessible to the Data Highway. This device is typically used for millivolt, thermocouple, RTD, and milliamp requirements. Refers to Honeywell TDC 3000 control systems.

low limiting control A type of control the action of which only takes effect if a given process variable is below a predetermined low limit.

low noise control valves Control valves designed for quit operation are of special and rapidly growing interest. Most control valve noise is generated on compressible fluid service as a result of the conversion, into sound, of a portion of the energy dissipated in the throttling process. See ISA handbook of control valves or the control valve manufacturer's literature for valves designed for low noise.

low oil temperature switch, cold oil switch A control to prevent burner operation if the temperature of the oil is too low.

low order That which pertains to the weight or significance assigned to the digits farthest to the right within a number; e.g., in the number 123456, the low order digit is six.

low-order digit A digit that holds the low weighted position in a numeral in a positional notation system.

low or high selector A specific device designed to select automatically either the highest or the lowest input signal from among two or more input signals. Also referred to as low or high signal selector.

low-pass filter 1. A filter network which passes all frequencies below a specified frequency with little or no loss but discriminates strongly against higher frequencies. 2. Wave filter having a single transmission band extending from zero frequency up to some critical or cutoff, frequency not infinite. 3. Filter which passes all frequencies below a certain cutoff point and attenuates all frequencies above that point.

low radiation threshold Pertaining to photoelectric and proximity switches, the luminous power at the light receiver at which a transition from light to dark state occurs.

low speed Pertaining to data transmission, usually speed of 600 bits per second (bps) or less.

low temperature control valves Cryogenics is the term applied to processes operating at temperatures below -150°F , where a number of additional factors must be considered. Special attention must be paid to the material of construction of the valve's pressure containing parts and the design of the extension bonnet. The process equipment piping and valves in the cold section of the plant are often installed in a "cold box".

low-temperature hygrometry The measurement of water vapor at low temperatures; requires special techniques because of the small amounts of moisture typically present and because of unusual instrument operating characteristics at such temperatures.

low tension British term for low voltage. Generally refers to heater or filament voltage.

low water The state of the tide when water is lowest for any given tidal cycle.

low water cutoff A device to stop the burner on unsafe water conditions in the boiler.

Lp Sound pressure level, dBA.

LPG Liquefied Petroleum Gas. Butane, propane, and other light ends separated from natural gasoline or crude oil by fractionation or other processes. At at-

mospheric pressure, liquefied petroleum gases revert to the gaseous state. LPG; LP-Gas.

LPM Lines Per Minute.

Lpo Sound pressure level at a point four feet downstream of a valve and three feet from the surface of the pipe.

Lr Chemical symbol for Lawrencium.

LRC See longitudinal redundancy check.

LRQA Lloyds Register Quality Assurance Ltd.

LSI See large-scale integration.

LS-RIOR process The LS-RIOR process direct-reduction process has been developed on a pilot scale by the Lummus Company and Sumifomo Heavy Industries, Ltd. The process controls sulphur pickup by the DRI (direct-reduced iron) and thus can utilize high sulphur fuels.

Lu Chemical symbol for lutetium.

lubricated packing box (control valves) A packing arrangement consisting of a lantern ring with packing rings above and below with provision to lubricate the packing.

lubricator See packing lubricator assembly.

lubricator isolating valve (control valves) In a control valve, an isolating valve is a small hand operated valve located between the packing lubricator assembly and the packing box assembly. It shuts off the fluid pressure from the lubricator assembly.

lubricity, anti-wear properties Ability of a fluid to prevent metal-to-metal contact by maintaining a film of material between moving surfaces under known operating conditions.

lugged valve See single flange.

Lukasiewicz notation, parenthesis-free notation, Polish notation, prefix notation A method of forming mathematical expressions in which each operator precedes its operands and indicates the operation to be performed on the operands or the intermediate results that follow it.

lumen, lm Unit of luminous flux. The luminous flux emitted within unit solid angle (one steradian) by a point source having a uniform intensity of one candela (SI unit).

lumen-hour A unit of the quantity of light delivered in one hour by a flux of one lumen.

lumen-second The unit quantity of light equal to one lumen of luminous flux emitted for one second.

lumerg A unit of luminous energy; e.g., one erg of radiant energy which has a luminous efficiency of 1 lumen per watt is equal to 1 lumerg of luminous energy.

luminance Measure of brightness of a surface: The SI unit for measurement of luminance is candela per square metre, cd/m^2 .

luminance meter A type of photometer calibrated in luminance units.

luminance signal The signal controlling light values in the color cathode-ray tube receiver.

luminosity Ratio of luminous flux to the corresponding radiant flux at a particular wavelength. It is expressed in lumens per watt.

luminous emittance The luminous flux emitted per unit area of the source; normal units of measurement are the lumen/ cm^2 and the lumen/ ft^2 .

luminous energy A measure of the time-integrated amount of flux. It has units of lumenseconds and could be used to describe such things as the radiant energy that the eye would receive from a photographic flash.

luminous flux Also called light flux. Time rate of flow of light (the total visible energy produced by a source per unit time). The SI unit for measurement of luminous flux is lumen, symbol (lm).

luminous flux intensity Luminous flux per unit solid angle (steradian).

luminous gain (optoelectronic device) The ratio of the emitted luminous flux to the incident luminous flux. Note: The emitted and incident luminous flux are both determined at specified ports.

luminous intensity The ratio of luminous flux emitted by a source to the solid angle in which the flux is emitted. The SI base unit for measurement of luminous intensity is candela, symbol cd.

luminous power density factor Pertaining to photoelectric proximity switches, the ratio of luminous power density of a target surface in the scanning plane to that of a totally mat white surface which is illuminated and evaluated in the same manner.

luminous transmittance The ratio of the luminous flux transmitted by an object to the incident luminous flux.

lumped Relates to elements of electrical impedance concentrated in discrete units rather than being distributed over transmission lines or through space.

lumped parameter Any circuit parameter which, for purposes of analysis, can be considered to repre-

sent a single inductance, capacitance, resistance etc., throughout the frequency range of interest.

lurgi process A process for the commercial gasification of coal that originated in Germany.

lux, lx SI unit for illuminance. One lux equals one lumen per square meter.

LVDT 1. Linear Variable Differential Transformer. Measures displacement by conversion to a linearly proportional voltage. **2.** Linear Velocity Displacement Transformer.

Lx Abbreviation for factor in sound-prediction formula.

Lyapunov function A function of a vector and of time which for non-zero vectors is positive-definite and has a negative-definite derivative with respect to time, which is identically zero for the zero vector, and approaches infinity as the norm of the vector approaches infinity. Note: The Lyapunov function is used for determining the stability of a multivariable control system.

lysimeter A bed or columnar container of soil adapted for measurement of evapo-transpiration, percolation and leaching losses under controlled conditions.

M

M Symbol for the prefix mega 10^6 . (SI unit).

m **1.** Symbol for metre, base unit for length (SI unit). On engineering drawings, mm is always used. In commercial and everyday life use cm whenever convenient. Avoid dm. **2.** Symbol for the prefix milli, 10^{-3} . (SI unit).

M. Eng Master of Engineering.

m² Square metre (SI unit). Common multiples: mm², km². Use cm² whenever convenient, but use cm² restrictively. For land areas use the unit hectare, ha, whenever more convenient than the units m² or km². Do not use the units acre or are.

m³ Cubic metre (SI unit). Common multiples: mm³, cm³, dm³. In strict technical or scientific context, give preference to multiples of m³. For fluids give preference to the unit litre, l, whenever convenient. Use l, cl and ml; avoid dl. Do not use units like pints, bushel or barrel.

mA Milliampere (SI unit).

MA Megaampere (SI unit).

MAC **1.** Multiple Access Computer. **2.** Media Access Control. The lower sublayer of the Data Link Layer (Layer 2) unique to each type of IEEE 802 Local Area Networks. MAC provides a mechanism by which users access (share) the network.

machine **1.** Synonymous with computer or processor (trade jargon). **1.** Any device capable of performing useful work, especially a device for producing controlled motion or for regulating the effect of a given force.

machine address See absolute address.

machine-aided Pertaining to a process or function performed with the assistance of one or more computers.

machine-available time In a computer, power-on-time less maintenance time.

machine check **1.** An automatic check. **2.** A programmed check of machine functions.

machine code, instruction code **1.** A code directly meaningful to the hardware logic of the CPU. **2.** A code used to represent the instructions in an instruction set.

machine cycle The basic CPU cycle. In one machine an address may be sent to memory and one word (data or instruction) read or written, or in one machine cycle a fetched instruction can be executed.

machine datum (numerical control) The built-in zero positions of the machine elements.

machine deckle The total width of the wet web when it leaves the forming zone of a paper machine. The term is sometimes used incorrectly to indicate the width of the web at the dry end of the paper machine.

machine equation See computer equation.

machine error A deviation from correctness in data resulting from an equipment failure.

machine fill The trimmed width in a given run on a paper machine. The term deckle is sometimes used incorrectly for machine fill.

machine-finished board, machine-finished paper Board or paper which has been glazed in a machine stack in order to improve its smoothness.

machine-glazed board, machine glazed paper Board or paper having one side smooth and glossy as a result of having been dried on a Yankee cylinder, the other side being relatively rough.

machine head box See head box.

machine home (numerical control) A condition in a machine co-ordinate system where all machine elements are at the home position.

machine-independent Pertaining to procedures or programs created without regard for the actual devices which will be used to express them.

machine instruction, computer instruction An instruction that can be recognized by the central processing unit of the computer for which it is designed.

machine-language code Same as computer code.

machine language, computer language **1.** A computer-oriented language whose instructions consist only of computer instructions. See also machine code. **2.** A set of rules for the formulation of instructions in machine code which can be immediately obeyed by a computer without translation.

machine-language programming The term basically means programming using machine language.

machine learning The ability of equipment to modify performance based on past experience stored in memory. Related to artificial intelligence.

machine-made board Board which, in contrast to millboard, is manufactured in the form of a continuous web.

machine operator The person who manipulates the computer controls, places information media into the input devices, removes the output and performs other related function.

machine-orientated language A language designed for interpretation and use by a machine without translation. Synonymous with machine language, computer language.

machine positioning accuracy, precision, reproducibility (numerical control) Accuracy, precision, or reproducibility of position sensor or transducer and interpreting system, the machine elements, and the machine positioning servo. Note: Cutter, spindle, and work deflection, and cutter wear are not included. (May be the same as control positioning accuracy, precision, or reproducibility in some systems.)

machine program (numerical control) An ordered set of instructions in automatic control language and format and based on the port program, recorded on appropriate input media and sufficiently complete to effect the direct operation of an automatic control.

machine program data Data conforming to the format and interpreted according to the provisions of ISO 6983.

machinery One or a group of machines; an apparatus or system constructed of machines.

machine stack A calendar placed at the end of a paper or board machine, having a number of smooth steel rolls lying stacked one upon the other, only one of which is driven.

machine tool control Machine tool control systems enable the position of a tool or workpiece to be controlled during the machining process. Numerical, or digital, control is very popular and may be divided into two groups: **1.** Point-to-point. **2.** Continuous path. Point-to-point systems are employed where specific operations have to be carried out at a series of points, or between two points in a given plane, e.g. drilling and plain milling operations. Continuous-path control requires the use of a general purpose computer to produce a magnetic tape. A small dedicated computer is also required in association with the machine

tool to decode the information into tool or workpiece position and speed.

machine tool reference position (numerical control) The physically predetermined positions of the machine tool axes used with incremental control systems to set the initial position.

machine vision The application of computer vision to machine, robot, process or quality control. Note: Contrast with computer vision.

machine word, computer word A word usually treated as a unit, that is suitable for processing by a given computer.

Mach number The ratio of the mean fluid velocity to the velocity of sound in the fluid at the considered temperature and pressure.

macro A predefined sequence of instructions that is inserted into a program during assembly or compilation at each place that its corresponding macroinstruction appears in the program. Synonymous with macroinstruction.

macro assembler An assembler which allows the use of macros and converts them to machine code.

macrobending (optical communication) In an optical fiber all macroscopic deviations of the axis from a straight line, distinguished from microbending.

macro bend loss (optical communication) In an optical fiber, that loss attributable to macrobending.

macrocode **1.** A coding system that assembles groups of computer instructions into single code words and which therefore requires interpretation or translation so that an automatic computer can follow it. **2.** An instruction in a source language which is equivalent to a specified sequence of machine instruction.

macrodeclaration, macrodefinition A declaration that provides the skeletal code which a macrogenerator uses in replacing a macroinstruction.

macrodefinition See macrodeclaration.

macroelement An ordered set of two or more elements used as one data element with one data use identifier.

macro generating program, macrogenerator A computer program that replaces macroinstructions in the source language with the defined sequence of instructions in the source language.

macro generator See macro generating program.

macroinstruction, macro(instruction) An instruction in a source language that is to be replaced by a defined sequence of instructions in the same source language. Note: The macroinstruction may also specify values for parameters in the instructions that are to replace it.

macro language The representations and rules for writing macroinstructions and macrodefinitions.

macrophytes Large water plants.

macroprogram A computer program in the form of a sequence of instructions written in a source language.

macroprogramming Programming with macro instructions.

macros Computers that have a throughput of 2 gigabits (2×10^9 bits) per second and a memory size of 2 megabytes.

macrosonics The utilization of high-amplitude sound waves for performing functions such as cleaning, drilling, emulsification, etc.

MAD Mean Administrative Delay.

madistor A semiconductor device that makes use of the effects of a magnetic field on a plasma current. The strength of a magnetic field determines the conductivity of the madistor material. A small change in

the magnetic field produces a large change in the madistor current.

MADT Mean Accumulated Down Time.

MAGAMP See magnetic amplifier.

magazine grinder Pertaining to pulp and paper manufacturing, a pocket grinder in which the wood pockets are filled in batches from magazines connected to the grinder.

magazine paper Calendered, uncoated or coated, normally wood-containing paper with in general a lower content of mechanical pulp than newsprint, intended for weekly journals, magazines, catalogs etc.

magnaflux A magnetic method of determining surface and subsurface defects in metals.

magnetite pulp Chemical pulp manufactured by coating wood with magnesium bisulphite solution with a pH-value of about 4.

magnet A body that has the property of attracting or repelling magnetic materials. In its natural form it is called a lodestone.

magnetic aging The normal change in the metallurgical change in the material. The term also applies when the metallurgical changes are accelerated by an increase or decrease in temperature.

magnetic air gap The air gap, or nonmagnetic portion, of a magnetic circuit.

magnetic amplifier **1.** A device in which one or more saturable reactors are used, either alone or with other circuit elements to obtain power gain. Often called magamp. **2.** A device in which a control signal applied to a system of saturable reactors modulates the flow of an alternating current in a power circuit. **3.** Amplifier in which use is made of the saturation properties of a magnetic core.

magnetic analysis The separation of a stream of electrified particles by a magnetic field, in accordance with their mass, charge or speed. This is the principle of the mass spectrograph.

magnetic anisotropy The dependence of the magnetic properties of some materials on direction.

magnetic azimuth Azimuth measured from magnetic north.

magnetic bias A steady magnetic field applied to the magnetic circuit of a relay.

magnetic biasing Simultaneous conditioning of a magnetic recording medium by superimposing a second magnetic field on the magnetic signal being recorded.

magnetic blowout switch A switch that contains a small permanent magnet which provides a means of switching high dc loads. The magnet deflects the arc to quench it.

magnetic bubble memory A type of memory made of cylindrically shaped magnetic domains, called magnetic bubbles, formed in a thin-film layer of single-crystal synthetic ferrite or garnet when a magnetic field is applied perpendicular to the film's surface. A separate, rotating, magnetic field moves the bubbles through the film in shift register fashion. The presence of a bubble represents a digital one and the absence of a bubble, a digital zero.

magnetic core **1.** A magnetic material, usually toroidal in shape, which is pulsed or polarized by electric currents carried in a wire or wires wound around it. **2.** A piece of magnetic material, usually torus-shaped, used for storage.

magnetic damping **1.** The damping of a mechanical motion by means of the reaction between a magnetic field and the current generated in a conductor moving through that field. The resistance of this conductor converts excess kinetic energy to heat. **2.** The slowing

down of mechanical motion by the reaction between two magnetic fields.

magnetic delay line (computing systems) A computer delay line in which magnetic energy is propagated consisting in essence of a metallic medium along which the velocity of propagation of magnetic energy is small when compared to the speed of light.

magnetic density The number of lines of magnetic force passing through a magnet or magnetic field per unit area of cross section.

magnetic detecting device A device for detecting cracks in iron and steel.

magnetic detector for lightning currents An instrument intended to detect a lightning stroke and to give an estimate of the value of the current due to this lightning stroke by means of changes in the magnetic characteristics of some of its components.

magnetic disc A flat circular plane with a magnetic surface on which data can be stored by selective magnetization of portions of the flat surface, e.g. floppy disc.

magnetic disk storage A magnetic storage in which data are stored by magnetic recording on the flat surfaces of one or more disks, which, in use, rotate around a common spindle.

magnetic disk unit A device that contains magnetic disks, a disk drive, one or more magnetic heads, and associated controls.

magnetic dissipation factor (magnetic material) The cotangent of its loss angle or the tangent of its hysteretic angle.

magnetic drum A right circular cylinder with a magnetic surface on which data can be stored by selective magnetization of portions of the curved surface.

magnetic drum unit A device that contains a magnetic drum, the mechanism for moving it, magnetic heads, and associate controls.

magnetic element Filter element which extracts only ferro-magnetic particles.

magnetic field (electromagnetic flowmeters) The magnetic flux generated by the electromagnet in the primary device which passes through the meter tube and through the fluid.

magnetic field gradient A magnetic field which changes in strength in a certain given direction.

magnetic field interference A form of interference induced in the circuits of a device due to the presence of magnetic field. It may appear as common mode or normal mode interference in the measuring circuits. See also electromagnetic interference.

magnetic float gage Any of several designs of liquid-level indicator that use a magnetic float to position a pointer or change the orientation of bicolor wafers.

magnetic float switch A device for operating a mercury switch by repositioning a magnetic piston with respect to a small permanent magnet attached to the pivoting mercury switch capsule; in the usual configuration, a float attached to the piston positions it near the small magnet when liquid level is high, and drops the piston out of proximity when the level is low, allowing a light spring to retract the magnet and pivot the mercury capsule.

magnetic flow transducer A transducer which measures the mean velocity of an electro-conducting fluid in a non-magnetic tube. The velocity is determined by measuring the electromotive force (emf) produced at two electrodes perpendicular to the axis of flow and caused by the effect of a magnetic field perpendicular to both the axis of flow and the electrodes. The elec-

tromotive force is proportional to the mean velocity of the fluid.

magnetic flux A condition in a medium, produced by a magnetomotive force such that, when altered in magnitude, a voltage is induced in an electrical circuit linked with the flux. The cgs unit of magnetic flux is called the maxwell.

magnetic flux density See magnetic induction.

magnetic freezing In a relay, sticking of the armature to the core due to residual magnetism.

magnetic gap The nonmagnetic part of a magnetic circuit.

magnetic gate A gate circuit used in a magnetic amplifier.

magnetic head An electromagnet that can perform one or more functions of reading, writing and erasing data on a magnetic data medium.

magnetic hysteresis In a magnetic material, the property by virtue of which the magnetic induction for a given magnetizing force depends on the previous conditions of magnetization.

magnetic induction 1. Also called magnetic flux density. The flux per unit area perpendicular to the direction of the flux. The cgs unit of induction is called the gauss (plural, gausses). The SI unit name for magnetic induction or flux density is tesla, symbol T. **2.** The process of generating currents or voltages in a conductor by means of a magnetic field.

magnetic ink Ink containing particles of magnetic substance which can be detected or read by automatic devices, i.e., the ink used for printing on some bank checks for magnetic ink character recognition.

magnetic ink character recognition, (MICR) Machine recognition of characters printed with magnetic ink. Contrast with optical character recognition.

magnetic integrated circuit An integrated component that utilizes one or more magnetic elements inseparably associated to perform all or at least a major portion of its intended function.

magnetic link See magnetic detector for lightning currents.

magnetic memory A computer memory (or any portion) in which information is stored in the form of magnetism.

magnetic particle test This method locates surface and subsurface discontinuities in ferro magnetic material. The procedure involves magnetizing the material being tested, applying ferro magnetic particles over the surface and then observing the pattern of the particles which will form an outline of any discontinuity. A certification and nondestructive test that can be provided for the materials used in control valves.

magnetic permeability Pertaining to operating conditions for industrial-process measurement and control equipment, magnetically permeable substances can accumulate in magnetic fields; for example the movement can be severely restricted if not entirely demobilized by the magnetic substances accumulating in air gaps of the permanent magnets. Likewise electrical motors can be seriously damaged by magnetic materials accumulating between rotor and stator.

magnetic printing Permanently transferring a recorded signal from one magnetic recording medium to another magnetic recording medium (or to another portion of the same medium) by bringing the two sections into close proximity.

magnetic proximity sensor Any of several devices that are activated when a magnetized or ferromagnetic object passes within a defined distance of the active element; there are four types – variable- reluctance

sensors, hermetically sealed dry-reed switches, Hall-effect switches, and Weigand-effect sensors.

magnetic read-write head A small electromagnet used for reading, recording or erasing polarized spots on a magnetic surface.

magnetic recording A technique of storing data by selectively magnetizing a magnetizable material.

magnetic separation Magnetic separation of magnetite-bearing iron ore and taconite is usually accomplished by low-intensity, drum-type separators having a field strength less than 200 gauss.

magnetic shielding Means to confine the region of strong magnetic field surrounding a magnet; most commonly the use of material with high permeability.

magnetic shift register A register in which magnetic cores are used as binary storage elements. By means of pulses, the pattern of binary digital information can be shifted one position to the left or right in the register.

magnetic shunt A piece of iron used during instrument calibration to divert a portion of the magnetic lines of force passing through an airgap in the instrument.

magnetic speed measuring system Usually three separate pieces of hardware are required in the magnetic speed measuring system. First, a magnetic discontinuity, such as a toothed gear made of ferromagnetic material mounted on the shaft whose speed is to be measured. Second, a magnetic pick-up head which will recognize the disturbance in the flux path as the discontinuity passes under its sensitive tip. Third, a frequency-to-current converter which amplifies and converts the alternating pulses from the pick-up into a dc signal which, in turn, is fed to a potentiometer type receiver.

magnetic storage A device or devices which utilize the magnetic properties of materials to store information.

magnetic susceptibility Measure of the ability of a substance to become magnetized.

magnetic tape (homogeneous or coated) **1.** A tape with a magnetic surface on which data can be stored by selective polarization of portions of the surface. **2.** A tape of magnetic material used as the constituent in some forms of magnetic cores.

magnetic tape cartridge A container holding magnetic tape, driven by friction, that can be processed without separating it from the container. Note: When the driving mechanisms are not of concern the words "cassette" and "cartridge" are sometimes used interchangeably.

magnetic tape cassette A container holding magnetic tape, driven on axes, that can be processed without separating it from the container.

magnetic tape handler A device which handles magnetic tape and usually consists of a tape transport and magnetic tape reader with associated electrical and electronic equipments.

magnetic-tape reader A computer device capable of converting the information recorded on magnetic tape into corresponding electric pulses.

magnetic-tape storage A storage system based on the use of magnetic spots (bits) on metal or coated-plastic tape; the spots are arranged so that the desired code is read out as the tape travels past the read-write head.

magnetism A property possessed by certain materials by which these materials can exert mechanical force on neighboring masses of magnetic materials and can cause voltages to be inducted in conducting bodies moving relative to the magnetized bodies.

magnetite A mineral which exists in a magnetized condition in its natural state. It consists chiefly of a magnetic oxide of iron.

magnetization The magnetic polarization of a material produced by a magnetic field (magnetic moment per unit volume).

magnetization curve A curve plotted on a graph to show successive states during magnetization of a ferromagnetic material.

magnetizing current The current through the field windings of a generator. Also called exciting current.

magnetizing field The magnetomotive force per unit length at any given point in the magnetic circuit. In the cgs system the unit is the oersted.

magnetizing field strength, magnetizing force A related to magnetic tape, the instantaneous strength of the magnetic field applied to a sample of magnetic material.

magnetolectric The property of certain materials (e.g. chromium oxide) of becoming magnetized when placed in an electric field. Conversely, they are electrically polarized when placed in an magnetic field.

magnetolectric transducer A transducer which measures the emf generated by the movement of a conductor relative to a magnetic field.

magnetofluidynamics See magnetohydrodynamic power generation.

magnetofluidmechanics See magnetohydrodynamic power generation.

magnetogasdynamics See magnetohydrodynamic power generation.

magnetohydrodynamic power generation The generation of electric current by the motion of an ionized gas.

magnetometer An instrument intended to measure the value of a magnetic flux density in a given direction.

magnetomotive force The force by which a magnetic field is produced, either by a current flowing through a coil of wire or by the proximity of a magnetized body. The amount of magnetism produced in the first method is proportional to the current through the coil and the number of turns in it. The cgs unit of magnetomotive force is called the gilbert.

magneto-optic effect A change in a material's optical characteristics under the influence of a magnetic field.

magnetoplasmdynamic generator A device that generates an electric current by shooting an ionized gas (plasma) through a magnetic field.

magnetostriction A phenomenon wherein certain materials increase in length in the direction of the magnetic field when subjected to such a field, and return to their original length when demagnetized.

magnetostrictive transducer Sensor using contraction or expansion of an iron or nickel rod due to a magnetic field.

magnetron **1.** An ultra high frequency (uhf) diode oscillator containing its own cavity resonator in which electrons are whirled in a circular path by a magnetic field. **2.** An electron tube characterized by the interaction of electrons with the electric field of a circuit element in crossed steady electric and magnetic fields to produce alternating-current power output.

magnification ratio The ratio of the size of an image produced by a lens to the size of the source.

magnitude-controlled rectifier A type of rectifier circuit in which a thyatron is used as the rectifying element. The load current is controlled by varying the basis on the grid of the thyatron.

magnitude ratio See gain (magnitude ratio).

mag-slip Same as synchro. Mag-slip is a British term.
mag tape In computer systems, the nine-track (seven-track in some cases) 1/2-inch medium on which data can be stored and transferred to other computers.

Mahoney map A diagram used in logic design, simplification, or optimization; invented by Matthew V. Mahoney.

mail box 1. A set of computer locations in a common RAM storage area reserved for data addressed to specific peripheral devices as well as other microprocessors in the immediate environment. (Such an arrangement enables the coordinator CPU and the supplementary microprocessors to transfer data among themselves in an orderly fashion with minimal hardware.) **2.** A system data structure that handles task communication. Tasks send messages to and receive messages from mailboxes.

main control unit In a processor with more than one instruction control unit, that instruction control unit to which, for a given interval of time, the other control units are subordinated.

main feedback path Feedback path linking the output of the controlled system to one input of the comparing element nearest the input of the controlling system.

main fractionator A large, multiproduct distillation column used to separate the effluent from a reacting system. Some of these products streams will go on to further distillation processing.

mainframe See processing unit.

mainframe computer A large computer, traditionally with 32 bits per word.

main jet, power jet Laminar or turbulent flow of fluid emitted from the supply channel or nozzle of a fluidic device.

main line 1. Pertaining to the petroleum industry, trunk line; a large-diameter pipeline into which smaller lines connect; a line that runs from an oil-producing area to a refinery. **2.** In pneumatic control systems, the air line from the air supply system to controllers and other devices. Usually plastic or copper tubing.

main memory, main storage That part of internal storage into which instructions and other data must be loaded for subsequent execution or processing. Note: In large computing systems, the term "main storage" is preferred to "memory".

main processing unit, MPU The portion of the programmable controller system which interprets or executes the (main part of the) application program. The MPU may include power supply, memory, and I/Os.

main program The module of a program that contains the instructions at which program execution begins; normally, the main program exercises primary control over the operations performed and calls subroutines or subprograms to perform specific functions.

mains line British term for ac power line.

main storage 1. Program-addressable storage from which instructions and data can be loaded directly into registers for subsequent execution or processing. **2.** See also main memory.

maintainability 1. The ease with which software can be maintained. **2.** The ease with which maintenance of a functional unit can be performed in accordance with prescribed requirements.

maintainability model A mathematical model used for prediction or estimation of maintainability performance measures of an item.

maintained contact switch A switch which remains in a given condition until actuated to another condition, which is also maintained until further actuation.

maintenance The combination of all technical and administrative actions, including supervision actions, intended to retain an item in, or restore it to, a state in which it can perform a required function. Note: Maintenance may include a modification of the item.

maintenance action, maintenance task A sequence of elementary maintenance activities carried out for a given purpose. Note: Examples are fault diagnosis, fault localization, and function check-out or combinations thereof.

maintenance engineering analysis A process performed during the development stage to derive the required maintenance resources such as personnel, technical data, support equipment, repair parts, and facilities.

maintenance entity Any sub-item of a given item which can have a fault and which, by alarm or any other means, can be unambiguously identified for replacement or repair.

maintenance level The level at which maintenance is to be accomplished, that is, organizational, intermediate, and depot.

maintenance man-hours, MMH The accumulated durations of the individual maintenance times, expressed in hours, used by all maintenance personnel for a given type of maintenance action or over a given time interval.

maintenance manual (fluid power systems) Document detailing the disciplines and procedures to be followed to maintain an item of equipment, complete machine or system in good working order. It will detail periodic checks and replacement of parts, type of lubricant and protective processes and the period of time between each check. It will include instructions on how to locate faults, carry out repairs and the replacement of components.

maintenance panel A part of a unit of equipment that is used for interaction between the unit of equipment and a maintenance engineer.

maintenance phase See operation and maintenance phase.

maintenance philosophy A system of principles for the organization and execution of the maintenance.

maintenance plan (software) A document that identifies the management and technical approach that will be used to maintain software products.

maintenance time The time interval during which a maintenance action is performed on an item either manually or automatically, including technical delays and logistic delays.

maintenance tree A logic diagram showing the pertinent alternative sequences of elementary maintenance activities to be performed on an item and the conditions for their choice.

major cycle (electronic computation) In a storage device that provides serial access to storage positions, the time interval between successive appearances of a given storage position.

major failure Failure, other than a critical failure, which is likely to reduce the ability of a more complex item to perform its required function.

major fault A fault which affects a function considered to be of major importance.

major graduations Intermediate graduation marks on a scale which are heavier or longer than other graduation marks but which are not index graduations.

majority element, majority gate A gate that performs a majority operation.

majority operation A threshold operation in which each of the operands may take only the values 0 and 1, and that takes the value 1 if and only if the number of operands having the value 1 is greater than the number of operands that have the value zero.

major loop A continuous network consisting of all the forward elements and the primary feedback elements of the feedback control system.

make 1. The closing of a relay, key or other contact.

2. A closed circuit or off-hook condition as determined by the dial of a telephone set.

make-before-break The action of closing a switching circuit before opening another associated circuit.

make-before-break contacts 1. Movable contact that makes the next circuit before breaking the first contact. **2.** A set of three contacts on a key or relay, so arranged that contact A makes with contact C before breaking from contact B.

make-before-break switch See shortning switch.

make-break contacts Also called continuity-transfer contact. A contact form of a relay, in which one contact closes connection to another contact and then opens its prior connection to a third contact.

make-break operation (data transmission) Used to describe a method of data transmission by means opening and closing a circuit to produce a series of current pulses.

make contact Contact which closes when a key or relay is operated. See also normally open contact.

make-up chemicals Chemical which are added to a chemical system within a manufacturing process in order to replace losses e.g. sodium sulphate in the production of sulphate pulp.

make-up line, replenishing line (fluid power systems) Pipeline (conductor) to supply working fluid to a circuit to make up losses as required.

make-up liquid (Normally) a continuous small operating water supply to compensate for operating water losses (by evaporation etc) between ejections.

make-up time That portion of available time used for reruns made necessary by malfunctions or mistakes that occurred during a previous operating time.

making drum See cylinder mould.

making roll The upper roll in a wetpress on an intermittent boardmachine.

malconizing Tradename Chapman Valve Co.

male connection A pipe, rod, or coupling with threads on the outside circumference.

malfunction The effect of a fault.

malfunction routine Same as diagnostic routine.

malleability Ability (in materials) to allow plastic deformation at a temperature above that of recrystallization.

malleable castings (kind of iron casting) Malleable castings while not strictly malleable, are soft and can be bent without breaking. They are of two kinds, known as white heart, or European, and black heart, or American, these terms indicating differences in the process and the products and countries of origin.

malleable iron A somewhat ductile form of cast iron made by heat treating white cast iron to convert the carbon-containing phase from iron carbide to nodular graphite.

malleablizing Heat treatment including prolonged holding and causing the disintegration of cementite into austenite and temper carbon, occasionally followed by decarburization.

management information system, MIS Management performed with the aid of automatic data processing.

management-level processor In building management systems, a PC or minicomputer used by management personnel to collect, store, and process data for reports on energy use, operating costs, and alarm activity. This processor can access points or data in all the lower level processors and controllers. (In most cases a separate, management-level processor is not used. Many of the functions of the management-level processor can be combined into the operations-level processor, see this term.)

manchester encoding Means by which separate data and clock signals can be combined into a single, self-synchronising data stream, suitable for transmission on a serial channel.

mandatory standard A standard the application of which has been made mandatory by a regulation.

manganin An alloy wire used in precision wirewound resistors because of its low temperature coefficient of resistance.

manifold Pertaining to the petroleum industry, an area where pipelines entering and leaving a pumping station or tank farm converge and that contains all valves for controlling the incoming and outgoing streams.

manifold (instrumentation) Any configuration of valves which can be manipulated to create zero differential pressure at the measuring instrument.

manifold equalizing line The conduit within a manifold which connects the high and low differential pressure impulse lines.

manifold ignition test Method used for determining the relative flammability of a liquid in contact with a hot surface.

manifold variable A quantity or condition which is varied so as to change the value of the controlled variable.

manipulated range, correcting range Interval defined by the two extreme values that the manipulated variable can assume.

manipulated variable 1. Output variable of the controlling system, which is also an input variable of the controlled system. **2.** In a control loop, the variable that is used by the controller to regulate the controlled variable.

manipulating Acting of human operator upon the final controlling element in order to change the flow of mass, energy or information in the controlled system.

manipulating industrial robot An automatically controlled, reprogrammable, multi-purpose, manipulative machine with several degrees of freedom, which may be either fixed in place or mobile for use in industrial automation applications.

manipulators Mechanical devices for the remote handling of hazardous materials; they are usually hand operated, often from behind a shield, and may or may not be power assisted.

man/machine dialog A specialized form of interactive processing between man and machine in which the human operator carries on a dialog with the computer through a console or some other input/output device.

man/machine interface (programmable controller systems) A manufacturer's catalogued peripheral equipped with pushbuttons, lamps, keyboards, displays or equivalent, intended as operator interface, such as AXIS or loop control/monitor panel, general purpose operator interface etc. MMIs may be part of the permanent installation (e.g. mounted on front panels, doors, boards etc.) or not.

man/machine interface (MMI) function (programmable controller systems) The MMI function provides for interaction between the operator, the signal processing function and the machine/process.

man/machine simulation Includes models of systems in which human beings participate (operational or behavioral models). However, the possibility also exists of incorporating people within the model. In other words, the model is no longer completely computer based but requires the active participation of a human.

man-made interference A type of electromagnetic interference generated by electric motors, communication and broadcast transmitters, fluorescent lighting, and other electrical and electronic systems that radiate spurious signals.

manometer An instrument used to measure the pressure of a gas or liquid. The simplest form consists of a U-tube containing a liquid (water, oil or mercury), one limb being connected to a point in the enclosure of which the pressure is to be measured, while the other limb is either open to the atmosphere or is closed or is otherwise connected to another point in an enclosure at different pressure.

manometric equivalent The length of a vertical column of a given liquid at standard room temperature which indicates a pressure differential equal to that indicated by a 1-mm-long column of mercury at 0°C.

mantissa (in a floating point representation), fixed point part See fixed point part.

mantissa (of a logarithm) The non-negative fractional part of the representation of a logarithm.

manual Acting of a human operator within a well-defined task.

manual actuators Manual operators are not strictly speaking, proportioning actuators, however they are used in control systems. Control valve body assemblies with manual actuators can be used when flow must be passed through valves precisely, even though not in conjunction with an automatic control system.

manual analysis Also called manual test programming. The generation of input and output test patterns by a test engineer or technicians who study the function or structure of a logic circuit.

manual backup **1.** An alternate method of process control by means of manual adjustment of final control elements in the event of a failure in the computer system. **2.** A method of control in which final control elements are manually adjusted in the event of a primary system failure. Refers to Honeywell TDC 3000 control systems.

manual calling (in a data network) Calling that permits the entry of selection signals from a calling data station into the line at an undefined character rate.

manual checkout A checkout system which relies completely on manual operation, operator decision and evaluation of results.

manual closed-loop control system, manual monitored control system A closed-loop control system which includes a human operator as an element of the closed loop. See figure in British Standard 1523.

manual control **1.** Control in which a direct or indirect human manipulation of the final controlling element is carried out. Note: In the process industry, this is generally done via a standardized signal. **2.** The direction of a computer by means of manually operated switches.

manual controller A control device whose output signals, power or motions are all varied by hand.

manual cycle (fluid power systems) Cycle which is always under human control.

manual data entry module A device which monitors a number of manual input devices from one or more operator consoles and/or remote data entry devices and transmits information from them to the computer.

manual data input (numerical control) A means for the manual insertion of numerical control commands.

manual data input programming (industrial robots) Program generation and entry directly into the robot control system by means of switches or plugboards or keyboards.

manual input (computing systems) **1.** The entry of data by hand into a device at the time of processing. **2.** The data entered as in definition.

manual mode (industrial robots) The operating mode in which the robot can be operated by, for example, push buttons or joystick.

manual mode of operation (numerical control) Non-automatic operation of a machine in which the operator controls it without the use of numeric data, for example by push-button or joystick control.

manual monitored control system, manual closed-loop control system See manual closed-loop control system.

manual oil shutoff valve A manually operated valve in the oil line for the purpose of completely turning on or shutting off the oil supply to the burner.

manual operation **1.** Processing of data in a system by direct manual techniques. **2.** Operating mode in which all functions of the controlling system are performed by a human operator.

manual override (control valves) A device to manually impart motion in either one or two directions to the valve stem. It may be used as a limit stop. See also handwheel operators.

manual part programming (numerical control) The manual preparation of a machine program for a part. Note: It is possible to use the computer processor to produce co-ordinate values and then prepare the machine program manually.

manual reset (relays) A qualifying term used to indicate that a relay may be reset manually after an operation.

manual reset safety shut-off valve A manually opened, electrically latched, electrically operated safety shut-off valve designed to automatically shut off fuel when de-energized.

manual switch **1.** The hand operated device designed to cause alternate actions contrasted with electronic switch. **2.** A switch which is actuated by an operator.

manual test equipment Test equipment that requires separate manipulations for each task (for example, connection to signal to be measured, selection of suitable range and insertion of stimuli).

manual test programming See manual analysis.

manual word unit A device that an operator can use to set up a word of information for direct entry into memory.

manufactured gas Fuel gas manufactured from coal, oil, etc., as differentiated from natural gas.

manufacturer software A complex program package that develops the user's application and organizes computer procedures to obtain efficient response to the application program. Often this software is referred to as an operating system.

manufacturing failure A failure due to non-conformity during manufacture to the design of an item or to specified manufacturing processes.

manufacturing fault A fault due to non-conformity during manufacture to the design of an item or to specified manufacturing processes.

manufacturing lead-time The total time required to manufacture an item. Included here are order preparation time, queue time, setup time, run time, move time, inspection time and put-away time.

manufacturing technology The development of new technologies for processes and manufacturing methods.

manuscript 1. An ordered list of numerical control instructions. **2.** A form of storage medium, such as programming charts, in which is contained raw information in a sequential form suitable for translation.

map 1. A set of values having defined correspondence with the quantities or values or another set. **2.** Graphical presentation of an installation on a topographical map. The term is used with two different meanings: for the form of presentation and for the document.

(to) map (over) To establish a set of values having a defined correspondence with the quantities or values of another set. Example: To evaluate a mathematical function, i.e. to establish the values of the dependent variable, for those values of the independent variable or variables that are of immediate concern.

MAP Manufacturing Automation Protocol. A specification for a suite of communications standards for use in manufacturing automation developed under the auspices of the General Motors Corporation. The development of this specification is being taken over by the MAP/TOP Users Group under the auspices of CASA/SME (The Computer and Automated Systems Association of the Society of Manufacturing Engineers).

MAP/EPA Part of the EPA architecture, a MAP/EPA node contains both the MAP protocols and the protocols required for communication to Mini-MAP. It can communicate with both Mini-MAP nodes on the same segment and full MAP nodes anywhere in the network.

MAPICS Manufacturing, Accounting and Production Information and Control System. An IBM MRP system that runs on the AS/400 minicomputer and includes 18 modules of applications.

mapped system A system that uses the computer hardware memory management unit to relocate virtual memory addresses.

mapping See page addressing.

map program (software) A compiler or assembler feature that generates a load map.

MAP/TOP Users Group United States and Canada's MAP/TOP Users Group. See CASA/SME.

MAP users group An organization comprising manufacturing users seeking a manufacturing - specific implementation of OSI networking technology.

marageing, maraging (US) Ageing whereby steel with martensitic structure tends to assume hardness through precipitation. The term marageing is relevant only in connection with the so-called marageing steels, which usually contain a high proportion of nickel, some cobalt and very little carbon, c. 0,03 %.

marcacite A principal iron-sulphide mineral. Commonly associated with limestones, clays, and lignite deposits.

marginal The derivatives or rate of change of a function with respect to quantity. Incremental and variable are often used in a synonymous sense. Thus the composite terms (a) marginal cost (of production), (b)

marginal revenue (from sales), (c) marginal value (of a capacity, of sales, of supplies, etc.). The coefficients of a linear programming module are themselves all marginal figures, for example, the cost coefficient of an activity is the marginal cost of performing the activity; the coefficient in a material-balance row is the marginal consumption or production of the material.

marginal checking Also called marginal testing. Preventive maintenance in which certain operating conditions (e.g., supply voltage or frequency) are varied from normal in order to locate defects before they become serious.

marginal check, marginal test A preventive maintenance procedure in which certain operation conditions are varied about their normal values in order to detect and locate incipient defective units, e.g., supply voltage or frequency may be varied. Synonymous with marginal test and high-low bias test, and related to check.

marginal relay A relay that functions in response to predetermined changes in the value of the coil current or voltage.

marginal test Same as marginal check.

marginal testing See marginal checking.

margin of safety The ratio between maximum service load (allowable design load) for a structure and the load that would cause the structure to deform, collapse or break.

marine engineering A branch of engineering that deals with the design, construction and operation of shipboard propulsion systems and associated auxiliary machinery.

marine oil Petroleum found by wells offshore or on the continental shelf.

mark A sign or symbol used to signify or indicate an event in time or space, e.g., end of word or message mark, a file mark, a drum mark, or an end of tape mark.

marker A symbol used to indicate the beginning or the end of some set of data, e.g., the end of a record, block, field, file, etc.

market research Study of market conditions and future behavior based on market trends, marketing data and customer preferences.

mark field A symbol used to indicate the beginning or the end of some set of data, e.g., group, file, record, block ... in this case a particular field.

marking (of control valves) See IEC publication 534-5 Industrial process control valves, Part 5: Marking.

marking pointer An adjustable stationary pointer, usually of a color different from that of the indicating pointer, that can be positioned opposite any location on the scale of interest to the user.

Markov chain A probabilistic model of events, in which the probability of an event is dependent only on the event that precedes it.

mark scanning, optical mark reading The automatic optical sensing of marks recorded on a data medium.

marshalling The gathering of circuits into a methodical arrangement. A single panel can be used to organize the circuits in a local area or they can be channeled through a multiconductor cable to other terminal panels in a distant area. Refers to Honeywell TDC 3000 control systems.

martempering, isothermal hardening Martensite hardening with step quenching which is interrupted at a temperature just above M_s to equalize the core and surface temperatures.

martensite Product of a transformation without diffusion at which the atoms are partly displaced through shear; e.g. ferrite as a transformation of product of austenite or the corresponding transformation product in carbon steel, namely ferrite, which, by being supersaturated with carbon, is deformed into a tetragonal lattice. A Martens (1850–1914), German engineer.

martensite hardening Hardening to produce a martensitic structure; see martempering.

martensite tempering Tempering of steel in martensitic state.

MASER Microwave Amplification by Stimulated Emission of Radiation; the microwave equivalent and predecessor of the laser. It produces coherent microwaves.

mask 1. A machine word or register that specifies which parts of another machine word or register are to be operated on. **2.** A filter.

mask-programmable ROM Form of ROM (read-only memory) programmed during the manufacturing process, and cannot be altered subsequently. They are used for large production runs, once the program has been “de-bugged”.

Masonite Trade name of the Masonite Corp. Fiberboard made from steam-exploded woodfiber.

mass 1. The quantity of matter in an object. It is equal to the weight of a body divided by the acceleration due to gravity. **2.** The bulk of matter though not necessarily equal to its weight. A mechanical unit whose electrical analog is inductance.

mass balance The relationship between input and output of a specified substance in a defined system, for example in a lake, river or sewage treatment works, taking into account the formation or decomposition of that substance in the system.

MASSBUS The thirty-two-bit direct-memory-access bus on the PDP 11/70 and VAX-11 computers.

mass data A relative amount of data, usually larger than can be stored in the central processing unit of a computer at any one time.

mass discharge curve, cumulative volume curve A curve in which the cumulative volume of flow is plotted against time.

mass flow The amount of fluid measured in mass units, that passes a given location or reference plane per unit time.

mass-flow bin A bin with steep, smooth sides which allow its contents to flow, without stagnant regions, whenever some of the contents are withdrawn.

mass flow computer A computer which calculates the mass flow of gas from measurements of differential pressure, static pressure, temperature and/or density.

mass flowmeter An instrument for measuring the rate of flow in a pipe, duct or channel in terms of mass per unit time.

mass flow rate The product of fluid density, full closed conduit area, and fluid velocity.

mass flow-rate through a cross-section of a conduit The mass of fluid flowing through the cross-section of a conduit in unit time. The quantity mass flow rates is simply the product of fluid density, full closed conduit area and fluid velocity.

mass index of contamination Mass (weight) of particles contained in a unit volume of fluid.

mass memory Disk, drum, or tape memory. See also bulk memory.

mass number The sum of the number of protons and the number of neutrons in the nucleus of a specific nuclide.

mass spectrograph An electronic device based on the action of a constant magnetic field on the paths of ions, used to separate ions of different masses.

mass spectrometer An instrument that permits rapid analysis of chemical compounds. It consists of a vacuum tube into which a small amount of the gas to be studied is admitted. The gas is ionized by the electrons emitted from the cathode and speeded up by an accelerating grid. An electric field draws the ions out of the ionizing chamber. They are then sent through electric and magnetic fields that sort them according to their ratios of mass to charge.

mass spectrum The spectrum obtained by deflecting a beam of electrons with an electric or magnetic field as they emerge from a tube containing a small quantity of the gas being investigated. The amount a particle is deflected depend on the ratio of its mass to its atomic charge. Hence, every element has a characteristic mass-spectrum line.

mass storage Storage having large capacity. See also secondary storage.

mass velocity Mass flow per unit cross-sectional area.

master 1. A file of data considered permanent or semi-permanent; i.e., an arrangement or ordering of a series of records; also, a single record from such a file. **2.** An element of a system that controls or initiates the action or responses of the other elements of the system.

(ABB) Master An Asea Brown Boveri integrated and distributed control and supervision system for process automation. The system consists of operator stations, process stations, communication networks and programming units.

master clock A very accurate timer with an absolute time reference, providing controlled power to drive slave or auxiliary timers and display units.

master console In a system with multiple consoles, the basic console used for communication between the operator and the system.

master control An application-orientated routine usually applied to the highest level of a subroutine hierarchy.

master drawing A drawing showing the dimensional limits or grid locations applicable to any or all parts of a printed circuit including the base.

master drive (industrial control) A drive that sets the reference input for one or more follower drives.

master element The initiating device, such as a control switch, voltage relay, float switch, etc., which serves either directly or through such permissive devices as protective and time-delay relays to place an equipment in or out of operation.

master file A file used as an authority in a given job and relatively permanent, even though its contents may change.

master instruction tape A computer magnetic tape on which are recorded all programs for a system of runs.

master layout The original layout of a circuit.

master library (software) A software library containing formally released versions of software and documentation. Contrast with production library.

master processor The main processor in a master-slave configuration.

master program Controls all phases of the job setup: (a) directs program compiling and debugging, (b) allocates memory, (c) assigns input/output activity schedules, (d) interleaves multiple programs for simultaneous processing, (e) directs all equipment functions and the flow of all data, (f) provides for error de-

tection and correction, and (g) communicates with the operator.

master recipe (batch processes) A basic recipe which has been made site-specific.

master scheduler The control-program function that responds to operator commands, initiates requested actions, and returns information that is requested or required; the overriding medium for control of the use of the computing system.

master-slave 1. Terms used to describe the relationship between redundant slot selectors and their Data Entry Panels. Computational slots in a Basic File accessed by the master slot selector, cannot be simultaneously accessed by the slave slot selector. Refers to Honeywell TDC 3000 control systems. **2.** See master-slave system.

master slave A mode of operation where one data station (the master) control the network access of one or more data stations (the slaves).

master-slave flip-flop A circuit that contains two flip-flops, a master and a slave. The master flip-flop receives information on the leading edge of a clock pulse, and the slave (output) flip-flop receives information on the trailing edge of the clock pulse.

master-slave manipulator A remote manipulator which mechanically, hydromechanically or electromechanically reproduces hand or arm motions of an operator.

master-slave system A special system or computer configuration in which one computer, usually of substantial size or capability, rules with complete control over all input/output and schedules and transmits tasks to a slave computer.

master station A station that has accepted the nomination to ensure a data transfer to one or more slave stations.

master switch A switch that dominates the operation of contactors, relay or other remotely operated devices.

master synchronization pulse A pulse distinguished from other telemetering pulses by its different amplitude and/or duration and used to indicate the end of a sequence of pulses.

master terminal unit The master station of a supervisory control system.

master time 1. The primary source of timing signals used to control the timing of pulses. **2.** The electronic or electric source of standard timing signals, often called "clockpulses", required for sequencing computer operation.

material balance A mathematical representation of all the material streams in a process. The balance can be summed over one machine, one process, or an entire plant. See energy balance.

material control The function of maintaining a constantly available supply of raw materials, purchased parts and supplies that are required for the production of products.

material flow The progressive movement of material parts of products toward the completion of a production process between work stations, storage areas, machines, departments and the like.

material management A term to describe the grouping of management functions related to the complete cycle of material flow, from the purchase and internal control of production materials to the planning and control of work-in-process to the warehousing, shipping and distribution of the finished product. Differs from materials control in that the latter term, traditionally, is limited to the internal control of production materials.

material measure A device intended to reproduce or supply in a permanent manner during its use, one or more known values of a given quantity. Note: The quantity concerned may be called the supplied quantity. Examples: A weight; a measure of volume (of one or several values, with or without a scale); an electrical resistor; a gage block; a standard signal generator.

materials science The study of materials used in research, construction and manufacturing; includes the fields of metallurgy, ceramics, plastics, rubber and composites.

mathematical check A check which uses mathematical identities or other properties, occasionally with some degree of discrepancy being acceptable, e.g., checking multiplication by verifying that $A \cdot B = B \cdot A$. Same as arithmetic check. Sometimes called a control.

mathematical induction A method of proving a statement concerning terms based on natural numbers not less than N by showing that the statement is valid for the term based on N and that, if it is valid for an arbitrary value of n that is greater than N , it is also valid for the term based on $(n + 1)$.

mathematical logic, symbolic logic The discipline in which valid argument and operations are dealt with using an artificial language designated to avoid the ambiguities and logical inadequacies of natural languages.

mathematical model The general characterization of a process, object, or concept, in terms of mathematics, which enables the relatively simple manipulation of variables to be accomplished in order to determine how the process, object, or concept would behave in different situations.

mathematical model A mathematical representation of a process, device, or concept.

mathematical programming In operations research, a procedure for locating the maximum or minimum of a function subject to constraints. Contrast with convex programming, dynamic programming, integer programming, linear programming, nonlinear programming, and quadratic programming.

mathematical simulation The use of a model of mathematical equations generally solved by computers to represent an actual or proposed system.

mating face Synonymous with interface.

matrices Plural of matrix.

matrix 1. In mathematics, an n dimensional rectangular array of quantities. Matrices are manipulated in accordance with the rules of matrix algebra. **2.** In computers, a logic network in the form of an array of input leads and output leads with logic elements connected at some of their interconnections.

matrix printer, dot (matrix) printer A printer that prints characters or images represented by dots. Note: When a dot printer is used for graphics only, it may be called a dot plotter.

matrix storage Storage in which the elements are arranged in such a way that access to any location requires the use of two or more coordinates, as, for example, in cathode-ray-tube storage and core storage.

mat structure The steel platform placed on the sea-floor as a rigid foundation to support the legs of a jackup drilling platform.

matter Any physical entity, i.e., having mass.

Matteucci effect The ability of a twisted ferromagnetic wire to generate a voltage as its magnetization changes.

maturation pond A large shallow basin used for the further treatment of sewage which has already received

ved biological treatment and from which the solids formed in biological treatment have been removed.

maturing Ageing which leads to favourable changes in properties. Paper and board may mature during storage.

maximum (minimum) ambient temperature (electrical transducers) The value of the highest (lowest) ambient temperature that a transducer can be exposed to, with or without excitation applied, without being damaged or subsequently showing performance degradation beyond specified tolerances.

maximum (minimum) fluid temperature Pertaining to electrical transducers and intended for use only in specifications, the value of the highest (lowest) measured-fluid temperature that a transducer can be exposed to, with or without excitation applied, without being damaged or subsequently showing a performance degradation beyond specified tolerances. Note: When a maximum or minimum fluid temperature is not separately specified it is intended to be the same as any specified maximum or minimum ambient temperature.

maximum allowable working pressure The highest gage pressure that can be safely applied to an internally pressurized system under normal operating conditions. It is usually well below the design bursting pressure and the hydrostatic test pressure for the system, and is the pressure at which relief valves are set to lift.

maximum capacity See note under specified measuring range, specified working range.

maximum excitation The maximum value of excitation parameter that can be applied to a device at rated operating conditions without causing damage or performance degradation beyond specified tolerances.

maximum flow-rate The highest flow-rate at which the meter is required to operate in a satisfactory manner for a short period of time without deterioration. Pertains to water meters.

maximum overshoot The maximum amplitude deviation from the average of the steady-state values that exist immediately before and after the transient.

maximum pointer A movable pointer that is repositioned as the indicating pointer of an instrument moves upscale, but remains stationary at the highest point reached when the indicating pointer moves downscale.

maximum power supply voltage The value of the power supply voltage which may occur under steady state minimum load conditions.

maximum pulse rate (metering) The number of pulses per second at which a pulse device is nominally rated.

maximum sound pressure (for any given cycle of a periodic wave) The maximum absolute value of the instantaneous sound pressure occurring during that cycle. Note: In the case of a sinusoidal sound wave this maximum sound pressure is also called pressure amplitude.

maximum theoretical deviation from a sine wave For a nonsinusoidal wave, the ratio of the arithmetic sum of the amplitudes of all harmonics in the wave to the amplitude of the fundamental.

maximum thermometer A thermometer that indicates maximum temperature reached during a given interval of time.

maximum thrust (torque) (industrial robots) The maximum thrust (torque) that can be continuously applied to the mechanical interface (excluding any inertial effect), assuming no permanent damage to the robot mechanism.

maximum working pressure; MWP The maximum total pressure permissible in a device under any circumstances during operation, at a specified temperature. It is the highest pressure to which it will be subjected in the process. It is a designed safe limit for regular use.

Maxwell The cgs electromagnetic unit of magnetic flux, equal to 1 gauss per square centimeter, or one magnetic line of force.

Maxwell's law A movable portion of a circuit will always travel in the direction that gives maximum flux linkages through the circuit.

Maxwell bridge A four-arm ac bridge normally used for measuring inductance in terms of resistance and capacitance (or capacitance in terms of resistance and inductance).

Maxwell equations The modern theory of electricity and magnetism is based on a group of four interrelated formulas known as the Maxwell equations. These formulas describe the way in which charges produce electric fields and how charges in motion – that is electric currents – produce magnetic fields. They also show that magnetic fields that vary with time produce electric fields and vice-versa. Developed by J. C. Maxwell.

Maxwellian distribution The velocity distribution of the moving molecules of a gas in thermal equilibrium, as determined by applying the kinetic theory of gases.

MBit Million bits per second.

Mbit Million Bits Per Second.

MByte 1,048,576 (2²⁰) bytes.

Mc See megacycle.

MC cable (metal-clad cable) A factory assembly of one or more conductors, each individually insulated and enclosed in a metallic sheath of interlocking tape, or a smooth or corrugated tube.

McDowell-Wellman process See DLM process.

MCF and MMCF Thousand cubic feet (Mcf). MMcf is one million cubic feet.

McLeod vacuum gage A device used to measure vacuum by measuring the height of a column of mercury supported by a calibrated volume of gas whose pressure is to be measured, when this volume of gas is trapped and compressed into a capillary tube.

Mc/s Megacycle/second.

MDT See mean down time.

MDT See mean down time.

me Megacycle (obsolete). Use MHz.

MEA Short for monoethanolamine, an organic base used in refining operations to absorb acidic gases in process streams. Also DEA, diethanolamine, another common organic base with an uncommon name.

mean 1. The arithmetic middle point of a range of values, obtained by adding the smallest value to the largest value and dividing that sum by two. **2.** The arithmetic average of a group of values.

mean absolute deviation Abbreviated MAD. The average of the absolute values of the deviations of some observed value from some expected value. MAD can be calculated based on observations and the arithmetic mean of those observations.

mean access delay (in telecommunication) The expectation of the time duration between the first call attempt made by a user of a telecommunication network to reach another user or a service and the instant of time the user reaches the wanted other user or service, within specified tolerances and under given operational conditions.

mean access time An average access time resulting from normal operation of a device.

mean availability The mean of the instantaneous availability over a given time interval.

mean conditional information content (information theory) Refer to ISO publication 2382/XVI.

mean depth The depth obtained by dividing the cross-sectional area of the stream by the width of the free surface. Pertains to liquid flow measurement in open channels.

mean direction of flow The direction in which the summation of the component velocity elements in a cross-section is a maximum when the components are taken along that direction. Pertains to measurement of flow by velocity-area method.

mean down time, MDT The expectation of the down time.

mean effective pressure The average net pressure difference across a piston in a positive displacement machine such as a compressor, engine or pump. It is commonly used to evaluate performance of such a machine.

mean entropy (per character) (information theory) Refer to ISO publication 2382/XVI.

mean failure rate The mean of the instantaneous failure rate over a given time interval.

mean free path (acoustics) For sound waves in an enclosure, the average distance sound travels between successive reflections in the enclosure.

mean Hall plate temperature The value of the temperature averaged over the volume of the Hall plate.

mean information content (per character) (information theory) Refer to ISO publication 2382/XVI.

mean life The arithmetic mean of the times to failure of a group of nominally identical items. See also reliability.

mean logistic delay, MLD The expectation of the logistic delay.

mean operating time between failures, MTBF The expectation of the operating time between failures.

mean output curve (electrical transducers) The curve through the mean values of output during any one calibration cycle or a different specified number of calibration cycles.

mean rate accuracy Error margin, excluding errors cause by noise at input, which should not be exceeded when a device is used under normal operating conditions.

mean repair time, MRT The expectation of the repair time.

mean suspended concentration (time) The time-average ratio of the mass or volume of the dry sediment in a water-sediment mixture to the total mass or volume of the suspension. Pertains to liquid flow measurement in open channels.

mean temperature coefficient of output voltage (Hall effect devices) The arithmetic average of the percentage changes in output voltage per degree Celsius taken over a given temperature range for a given control current magnitude and a given magnetic flux density.

mean time between failures, MTBF For a stated period in the life of a functional unit, the mean value of the length of time between consecutive failures under stated conditions.

mean time between maintenance, MTBM The mean of the distribution of the time intervals between maintenance actions (preventive, corrective or both).

mean time to failure, MTTF The average time the system or component of the system works without failing.

meantime to first failure, MTTFF The expectation of the time to first failure.

meantime to repair, MTTR The average time required for corrective maintenance.

mean transinformation (content) (per character) (information theory) Refer to ISO publication 2382/XVI.

mean unavailability The mean of the instantaneous unavailability over a given time interval.

mean up time, MUT The expectation of the up time.

mean value The arithmetic mean of the instantaneous values of a quantity taken over a specified time interval. For a periodic quantity the time interval equal to a period.

mean velocity at a cross-section The velocity at a given cross-section of a stream, obtained by dividing the discharge by the cross-sectional area of the stream at that section. Pertains to liquid flow measurement in open channels.

mean velocity of a reach The velocity calculated by dividing the discharge by the average cross-sectional area of the stream along the reach. Pertains to liquid flow measurement in open channels.

means-ends analysis, means-end analysis Problem solving that, at every step, searches for operations that maximally lower the difference between the existing state and a known goal state.

measurable quantity 1. An attribute of a phenomenon, body or substance, which may be distinguished qualitatively and determined quantitatively. Notes: The term "quantity" may refer to a quantity in a general sense [see example a)] or to a specific quantity [see example b)]. **2.** Quantities which are mutually comparable may be grouped together into categories of quantities, for example: work heat, energy; thickness, circumference, wavelength. **3.** Symbols for quantities are given in ISO 31.

measurand A quantity subjected to measurement. Note: As appropriate, this may be the measured quantity or the quantity to be measured.

measured accuracy The maximum positive and negative deviation observed in testing a device under specified conditions and by a specified procedure. See figure in ISA publication ISA-S 51.1, 1979. Notes: 1. It is usually measured as an inaccuracy and expressed as accuracy. 2. It is typically expressed in terms of the measured variable, percent of span, percent of upper range-value, percent of scale length or percent of actual output reading.

measured fluid Pertaining to electrical transducers, the fluid which comes in contact with the sensing element. Note: The chemical and/or physical properties of this fluid may be specified to insure proper transducer operation.

measured mean velocity on a vertical The velocity obtained by measuring velocity at one or more depths on a vertical and applying a coefficient either directly or following some averaging process, to derive the mean velocity at that vertical. Pertains to liquid flow measurement in open channels. Measurement of flow by velocity-area method.

measured quantity See note under measurand.

measured relieving capacity The relieving capacity of a pressure relief device measured at the flow rating pressure, expressed in gravimetric or volumetric units.

measured signal The electrical, mechanical, pneumatic or other variable applied to the input of a devi-

ce. It is the analog of the measured variable produced by a transducer (when such is used). Examples: 1. In a thermocouple thermometer, the measured signal is an emf which is the electrical analog of the temperature applied to the thermocouple. 2. In a flowmeter, the measured signal may be a differential pressure which is the analog of the rate of flow through the orifice.

measured value The numerical quantity expressed by a number and a unit of measurement resulting from the information obtained by a measuring device, at the instant considered under specified conditions.

measured value of an analog direct voltage signal The mean value during a stated duration.

measured variable A quantity, property, or condition which is measured. Notes: 1. It is sometimes referred to as the measurand. 2. Common measured variables are temperature, pressure, rate of flow, thickness, speed etc.

measurement 1. A set of operations for the purpose of determining a value of a variable. **2.** The set of operations having the object of determining the value of a quantity.

measurement device An assembly of one or more basic elements with other components and necessary parts to form a separate self-contained unit for performing one or more measurement operations.

measurement energy The energy required to operate a measurement device or system.

measurement equipment A general term applied to any assemblage of measurement components, devices, apparatus, or systems.

measurement hardware Specific elements and/or devices which gather information from the process. Note: There are many different hardware devices which can be listed by function such as sensor, transducer, transmitter, converter, meters, indicators, and recorders. They can be further identified by the variables to be measured such as temperature, pressure, flow, level, position and motion, composition (analytical), etc.

measurement of dew point See dew point measurement.

measurement of dissolved chloride See dissolved chloride measurement.

measurement of dissolved oxygen See dissolved oxygen measurement.

measurement of oxidation-reduction potential See oxidation-reduction potential.

measurement of thermal radiation Requires the use of a radiometer which has been previously calibrated with reference either to an absolute radiometer or to a full radiator source which is maintained as a standard.

measurement procedure The set of theoretical and practical operations, in detailed terms, involved in the performance of measurements according to a given method.

measurement process All the information, equipment and operations relevant to a given measurement. Note: This concept embraces all aspects relating to the performance and quality of the measurement; it includes for example the principle, method, procedure, value of the influence quantities and the measurement standard.

measurement range See measuring range.

measurement signal A representation of a measurand within a measuring system. Note: The input signal to a measuring system may be called the stimulus; the output signal may be called the response.

measurement standard A material measure, measuring instrument or system intended to define, reali-

ze, converse or reproduce a unit of one or more known values of a quantity in order to transfer them to other measuring instruments by comparison. Examples: a) 1 kg mass standard b) standard gage block c) 100 ohms standard resistor d) saturated Weston standard cell e) standard ammeter f) caesium atomic frequency standard.

measurement system One or more measurement devices and any other necessary system elements interconnected to perform a complete measurement from the first operation to the end result.

measure of information A suitable function of the probability of occurrence of an event or of a sequence of events from a set of possible events. Note: In information theory, the term event is to be understood as used in the theory of probability. For instance, an event may be: – the presence of a given element of a set; – the occurrence of a specified character or of a specified word in a given position of a message.

measuring Procedure for determination of a specific value of a physical variable as a multiple of a unit or a reference value.

measuring accuracy, precision, reproducibility (numerical control) Accuracy, precision or reproducibility of position sensor or transducer and interpreting system.

measuring bridge A measuring equipment consisting of at least four branches (arms) or groups of circuit elements (resistors, inductors, capacitors, etc.), connected in a quadrilateral, one of whose diagonals is supplied by a source and the other is connected to a null detector or a measuring instrument.

measuring chain A series of elements of a measuring instrument or system which constitutes the path of the measurement signal from the input to the output.

measuring cross-section The cross-section in which discharge measurements are taken. Pertains to liquid flow measurement in open channels.

measuring element (of an electromechanical measuring instrument) That part of a measuring instrument which transforms the quantity to be measured into a mechanical movement.

measuring installation See note under measuring system.

measuring instrument 1. A device intended to detect or measure a quantity or to supply a quantity for measurements purposes. **2.** A measuring device intended to transform the measured quantity or a related quantity into an indication or equivalent information. **3.** A device for ascertaining the magnitude of a quantity or condition presented to it.

measuring junction The electrical connection between the two legs of a thermocouple which is attached to the body, or immersed in the medium, whose temperature is to be measured.

measuring means The components of an automatic controller which determine the value of a controlled variable and communicate that value to the controlling means.

measuring modulator A component in a measuring system which modulates a direct-current or low-frequency alternating-current input signal to produce an alternating-current output signal whose amplitude is related to the measured value, usually as a preliminary step to producing an amplified output signal.

measuring range Range defined by two extreme values within which a variable can be measured within the specified accuracy. See also effective range.

measuring range higher limit The highest value of the measured variable to which a device can be adjusted to measure within a specified accuracy.

measuring range lower limit The lowest value of the measured variable to which a device can be adjusted to measure within a specified accuracy.

measuring reach A reach of open channel selected for measurement of hydraulic parameters.

measuring section A length of conduit between two measurement cross-sections or between an injection and a measurement cross-section. Pertains to measurement of fluid flow in closed conduits. See also under gaging section.

measuring span 1. Difference between the upper and the lower range values. 2. Difference between the two extremes of the measuring range.

measuring system A complete set of measuring instruments and other equipment assembled to carry out a specified measurement task. Note: The term measuring installation is reserved for measuring apparatus, usually of the larger kind, which is permanently installed.

measuring transducer 1. Device which accepts information in the form of a physical quantity (its input variable) and converts it to information in the form of the same or another physical quantity, according to a definite law. Note: There are many different types of measuring transducers, with different names, according to the nature of the physical phenomenon on which they are based. 2. A measuring device which provides an output quantity having a given relationship to the input quantity.

measuring transmitter See transmitter.

mechanical atomizing oil burner A burner which uses the pressure of the oil for atomization.

mechanical compliance Displacement of a mechanical element per unit force; it is the mechanical equivalent of capacitance in an electrical circuit.

mechanical control (fluid power systems) Control method which is operated by mechanical elements, such as, shaft, cam, lever, etc.

mechanical cushioning Cushioning achieved by friction or by use of a resilient material.

mechanical damping Attenuating a vibrational amplitude by absorption of mechanical energy.

mechanical efficiency The ratio of power output to power input.

mechanical engineering A branch of engineering that deals with the generation and use of thermal and mechanical energy, and with the design, manufacture and use of tools and machinery.

mechanical feedback (fluid power systems) Feedback using a mechanical transmission.

mechanical hydraulic servo-valve Hydraulic servo-valve in which the input command is mechanical.

mechanical hygrometer A hygrometer that uses an organic material, such as a bundle of human hair, to sense changes in humidity.

mechanical impedance The complex quotient of alternating force applied to a system divided by the resulting alternating linear velocity in the direction of the force at its point of application.

mechanical interface (industrial robots) The mounting surface at the end of the articulated structure adjacent to the end-effector.

mechanical interface coordinate system (industrial robots) A coordinate system referenced to the mechanical interface.

mechanical limit stop (control valves) A mechanical device to limit the valve stem travel.

mechanically timed relay A relay that is mechanically timed by such means as a clockwork, escapement, bellows or dashpot.

mechanical noise (control valves) Noise generated due to vibration of valve internals. The most prevalent source of noise resulting from mechanical vibration is the lateral movement of the valve plug relative to the guide surfaces. A second source of mechanical vibration noise is a valve component resonating at its natural frequency. See also aerodynamic noise and hydrodynamic noise.

mechanical ohm The magnitude of a mechanical resistance, reactance or impedance for which a force of 1 dyne produces a linear velocity of 1 centimeter per second (dyn -s/cm). When expressed in newton-seconds per meter it is called the mks mechanical ohm.

mechanical pulp Pulp consisting of fibers which have been liberated entirely by mechanical means.

mechanical pulp board Board manufactured primarily from mechanical pulp.

mechanical reactance The imaginary component of mechanical impedance.

mechanical rectifier A rectifier in which action is done mechanically (e.g., by making and breaking the electrical circuit at the correct times with a rotating wheel or vibrating reed).

mechanical seal (fluid power systems) Sealing device in which the sealing action is aided by mechanical force and which comprises contact surface having relative movement. These surfaces can be in various materials such as metal, carbon, ceramics, etc.

mechanical shock The momentary application of an acceleration force to a device, it is usually expressed in units of acceleration of gravity (g).

mechanical splice (optical communication) A fiber splice accomplished by fixtures or materials, rather than by thermal fusion.

"mechanical type" flow meters Flow meters which have the meter body and instrument close-coupled together, are almost always referred to as "mechanical type" flow meters.

mechanical zero The equilibrium position to which the indicating device of a measuring instrument tends to return due only to mechanical restoring forces, when the measuring element is not energized. Notes: 1. In instruments with a mechanically suppressed zero, the equilibrium position is outside the scale marks. 2. In certain instruments such as fluxmeters and quotient-meters, the mechanical zero is indeterminate. See also under zero of a measuring instrument.

mechanical zero adjuster A mechanism by which the mechanical zero can be set to its required position.

mechano-chemical pulp See chemi-mechanical pulp.

media 1. Printed matter. 2. Plural form of medium. 3. Recording devices from which data is read or to which data is written, e.g., magnetic tape, a spinning disc, etc.

media bed A filter bed; the filtering material through which a fluid gravitates or is pumped to remove impurities or suspended material. Filter beds can consist of sand, charcoal, walnut shells, or special clays.

median 1. The middle, or average, value in a series (e.g., in the series 1, 2, 3, 4 and 5, the median is 3). 2. The middle value in a set of measured values when the items are arranged in order of magnitude. If there is no middle value, the median is the average of the two middle values. Compare mode and mean.

medical electronics 1. The branch of electronics concerned with its therapeutic or diagnostic applications in the field of medicine. 2. The application of the tools, techniques and methods of electronic technology to the problems of medicine.

medium (field bus) Cable, optical fiber, or other means by which communication signals are distributed. Note: Plural media.

medium The physical substance upon which data are recorded, e.g. magnetic tape, punch cards and paper. See also data medium.

medium (token ring access method) The material on which the data may be represented. Twisted pairs, coaxial cables, and optical fibers are examples of media.

medium frequency, mf Frequencies between 300 and 3000 kilohertz.

medium-power silicon rectifiers Rectifiers with maximum continuous rating of 1 to 50 average amperes per section in a single-phase, half-wave circuit.

medium-scale integration, MSI The accumulation of several circuits (usually less than 100) on a single chip of semiconductor.

medium speed Data transmission speed between 600 bits per second (bps) and the limit of a voicegrade facility.

medium speed data rate Data transmission at a rate between 151 and 2400 bauds.

medium wave The band of frequencies found on a regular am radio dial, 540 to 1600 kHz.

meet The Boolean operator that gives a truth table value of true only when both of the variables connected by the logical operator are true.

meg Megaohm.

mega 1. 1,000,000 or 1024 K for memory devices. 2. Prefix denoting 10^6 (one million). Letter symbol: M.

megaampere, MA One million amperes.

megabar The absolute unit of pressure equal to one million bars.

megabit, Mbit One million binary bits.

megabyte One million bytes.

megacycle, Mc One million cycles. Obsolete terms replaced by megahertz (mHz).

megahertz, MHz One million hertz.

megavoltampere, MVA One million voltamperes.

megavolt, MV One million volts.

megawatthour, MWh One million watt-hours.

megawatt, MW One million watts.

megger A high-range ohmmeter having a built-in hand-driven generator as a direct voltage source, used for measuring insulation resistance values and other high resistance. Also used for continuity ground and short-circuit testing in general electrical power work.

megohm One million ohms. Abbreviated meg.

megohm-farads See megohm-microfarad.

megohm-microfarad A term used to indicate the insulation resistance of capacitors. It is equal to the product of the insulation resistance in megohms and the capacitance in microfarads. For larger high-voltage capacitors, megohm-farads are used.

Meissner effect The sudden loss of magnetism in superconductors as they are cooled below the temperature required for superconductivity. As a result, they become diamagnetic, i.e., the self-induced magnetization opposes the applied magnetic field to such an extent that there is no longer a magnetic field.

melting channel The restricted portion of the charge in a submerged horizontal ring induction furnace. The induced currents are concentrated here to effect high energy absorption and thereby melt the charge.

membrane filtration A technique for removing or concentrating particles, including micro-organism (but not free viruses) from fluids by filtration through a filter of known pore size. The technique has various physico-chemical and micro-biological applications,

such as the "sterilization" of liquids and gases and the separation of micro-organisms from free viruses for their separate examination and/or quantitative assessment.

membrane switch A thin, flat, lightweight panel containing one or more individual touch-activated switches.

memory 1. All of the addressable storage space in a processing unit and other internal storages that is used to execute instructions. Note: In calculators, and some microcomputers, the term "memory" is preferred to the term "main storage". 1. Same as storage. Memory may be classified under two main headings, namely "volatile" – the contents of which will be lost if the power is switched off; "non-volatile" – the contents will be retained if the power is switched off.

memory access time See access time.

memory action (of a relay) A method of retaining an effect of an input after the input ceases or is greatly reduced, so that this input can still be used in producing the typical response of the relay.

memory address The address in memory of the location containing an instruction or operand.

memory address register 1. The CPU register in a computer, which holds the address of the memory location being accessed. 2. The multiple-bit register that keeps track of where instructions are stored in the main memory.

memory addressability A measure of capability and ease of programming used in evaluating computers. The maximum number of locations specifiable by a nonindexed instruction using the instructions minimum execution time.

memory addressing modes The method of specifying the memory location and an operand. Common addressing modes are direct, immediate, relative, indexed and indirect. (These modes are important factors in program efficiency.)

memory allocation In a computer, a technique of allocating memory to processes or devices.

memory array In a computer, the memory cells arranged in a rectangular geometric pattern on a chip and organized in rows and columns.

memory buffer register In a computer, a register in which word is stored as it comes from memory (reading) or just prior to its entering memory (writing).

memory bus The computer bus (or buses) which interconnects the processor, memory, and peripherals on a high-speed data processing highway.

memory capacity Same as storage capacity.

memory cell Basic storage unit in a semiconductor or magnetic data store.

memory circuit A circuit which, having been placed in a particular state by an input signal, will remain in that state after the removal of the input signal.

memory core A programmable random access memory consisting of many ferromagnetic toroids strung on wires in matrix arrays. Each toroid acts as an electromagnet to store a binary digit.

memory cycle The operations required for addressing, reading, writing and/or reading and writing data in memory.

memory cycle time The minimum time between two successive data accesses from a memory.

memory dump Same as storage dump.

memory fill In a computer, the placing of a pattern of characters in the memory registers not in use in a particular problem to stop the computer if the program, through error, seeks instructions taken from forbidden registers.

memory hierarchy A set of computer memories with differing sizes and speeds and usually having different cost-performance ratios. A hierarchy might consist of a very high-speed, small semiconductor memory, a medium-speed core memory and a large, slow-speed core.

memory image A replication of the contents of a storage device, or selected parts of it.

memory latency time See latency.

memory map A tabulated allocation of all available storage.

memory module A processor module consisting of memory storage and capable of storing a finite number of words (e.g., 4096 words in a 4 K memory module). Storage capacity is usually rounded off and abbreviated with K representing each 1024 words.

memory partitioning, storage partitioning In calculators, the subdividing of a storage device into independent sections.

memory protection A feature of multiprogramming computers, in which a hardware device is used to protect each program, and its data from being mutilated by any other program that may be operating in the system at the same time.

memory register Also called high-speed bus, distributor or exchange register. In some computers, a register used in all data instruction transfers between the memory, the arithmetic unit and the control register.

memory relay A relay in which each of two or more coils may operate independent sets of contacts, and another set of contacts remains in a position determined by the coil last energized. The term is sometimes erroneously used for polarized relay.

meniscus The concave or convex surface, caused by surface tension, at the top of a liquid column, as in a manometer tube.

menu 1. List of items or functions. 2. A list of options available for selection by the user of a computer system.

Mercalli scale Local effects of an earthquake on houses and buildings are expressed by the intensity scale of Mercalli-Cancani. The scale runs from 1 to XII. It is suggested to use the figures of the Mercalli scale to describe the conditions of an industrial location. See further IEC publication 654-3 Operating conditions for industrial-process measurement and control equipment, Part 3 Mechanical influences. See also Richter scale.

mercaptans Chemical compounds containing sulphur, present in certain refined products that impart objectionable odor to the product.

mercerization (textile term) A process for treating cotton fibers in yarn or piece form with a concentrated NaOH solution. During treatment, the collapsed lumen of the cellulose swells to a circular cross-section giving a higher luster and dye absorption.

mercury A silver-white metal that becomes a liquid above -38.87°C . When it is vaporized, mercury ionizes readily and conducts electricity.

mercury battery A type of battery characterized by extremely uniform output throughout its life.

mercury filled thermal system Type of filled thermal system. See under filled thermal system.

mercury memory Also called mercury storage and mercury delay line. Delay lines using mercury as the medium for storage of a circulating train of waves or pulses.

mercury meter A differential pressure measuring device utilizing mercury as the seal between the high and low chambers.

mercury number A measure of the free sulphur in a sample of naphtha.

mercury relay A relay in which the energized coil pulls a magnetic plunger into a tube containing mercury. The plunger moves the mercury in order to make connection between the contacts.

mercury storage A storage device that utilizes the acoustic properties of mercury to store data (related to mercury delay line).

mercury switch An electric switch comprising a large globule of mercury in a metal or glass tube. Tilting the tube causes the mercury to move toward or away from the electrodes to make or break the circuit.

mercury tank In a computer, a container of mercury holding one or more delay lines for storing information.

mercury-wetted relay A device using mercury as the relay contact closure substance.

merge To combine the items of two or more sets of data that are in the same given order into one set in that order.

merge-match The comparison and possible merging of two files.

merging (sorting) See merge.

meridional ray (optical communication) A ray that passes through the fiber axis of an optical fiber.

MESA Mining Enforcement and Safety Administration.

MESG Maximum Experimental Safe Gap. MESG is measured by igniting a gas mixture inside the test enclosure and observing whether the atmosphere surrounding the enclosure ignites. The MESG is the largest gap size in a series of tests that does not permit ignition outside the enclosure.

mesh A set of branches forming a closed path in a network, provided that if any one branch is omitted from the set, the remaining branches of the set do not form a closed path. Note: The term loop is sometimes used in the sense of mesh.

mesh current The current assumed to exist over all cross sections of a closed path in a network. It may be the total current in a branch included in the path, or a partial current which, when combined with the others, forms the total current.

mesh network A network in which there are at least two nodes with two or more paths between them.

mesophilic digestion Anaerobic digestion of sludge at a temperature of from 20 to 40°C , thereby encouraging the growth of micro-organisms which grow best in this temperature range, for example mesophilic micro-organisms.

mesotrophic water A water of intermediate nutrient status, naturally occurring or due to nutrient enrichment, between oligotrophic and eutrophic states.

message In information theory and communication theory, an ordered series of characters intended to convey information.

message A collection of one or more sentences and/or command statements to be used as an information exchange between applications or users.

message control program A program used to control the sending or receiving of messages to or from remote terminals.

message retrieval The capability to retrieve a message after it has entered an information system.

message sink That part of a communication system in which messages are considered to be received.

message source, information source That part of a communication system where messages are assumed to originate.

message switching In a data network, the process of routing messages by receiving, storing, and forwarding complete messages.

metacompiler See compiler generator.

metadyne British term for amplidyne. A direct-current machine used for voltage regulation or transformation. It has more than two brushes for each pair of holes.

metaknowledge Knowledge about the structure, use and control of knowledge. Note: Metaknowledge may be an effective control mechanism in expert systems and knowledge-based systems.

metalanguage A language that is used to specify a language or languages.

metal detector Also called metal locator. An electronic device for detecting concealed metal objects.

metalimnion See thermocline.

metallic circuit A circuit in which the earth itself is not used as ground.

metallic glass See glassy alloy.

metallized board, metallized paper Board or paper which has been covered with a thin layer of metal (normally with vaporized metal in vacuum).

metallurgical coke Coke is used for production of iron in blast furnaces and the coke breeze as a fuel for sintering plants and for steam generation in boiler houses.

metallurgy Study of metals, their production and purification as well as their forming and treatment before use.

metal oxide semiconductor, MOS A type of transistor for large-scale integrated (LSI) components for computer memory units.

metal physics The department of physics that studies metals.

metal piston type seal (butterfly valves) A self-expandable metal seal ring installed in a groove on the disk circumference to block the clearance between the disk outer diameter and the liner bore with the disk in closed position.

metarule A rule that prescribes the conditions, order and manner in which another rule or a given set of rules should apply. Note: Metarules may be effective control mechanisms in expert systems and rule-based systems.

metastable state, quasistable state, unstable state In a trigger circuit, a state in which the circuit remains for a finite period of time at the end of which it returns to a stable state without the application of a pulse.

meteorological instrumentation Equipment for measuring weather data.

meter A device used for measuring and indicating the measured value. Note: the word meter has three connotations: 1. Measurement. 2. Indication. 3. SI unit of length, metre (m). When connotation 1 and 2 are intended, the word meter must be further qualified.

meter body method (of liquid level measurement) A method for measuring liquid level in open or closed vessels based on the static pressure method. Using standard type differential actuated flow meter bodies. For open vessels the minimum level tap is connected to the high-pressure side of the meter body and the low pressure side of the meter body is left open to atmospheric pressure. For static pressure measurement of level in closed (pressure) vessels it is necessary to use a differential type of meter body, instead of a single pressure element (as in a pressure gage) for the fact that the pressure in the vessel is not atmospheric.

metercandle See lux.

meter electrodes (electromagnetic flowmeters) The two contacts by means of which the induced voltage is detected.

meter factor 1. A constant used to multiple the actual reading on a scale or chart to produce the measured value in actual units. **2.** A correction factor applied to a meter's indicated value to compensate for variations in ambient conditions such as a temperature correction applied to a pressure reading.

meter-in circuit (fluid power systems) Speed control circuit in which the control is achieved by regulating the supply flow to the actuator.

metering 1. Regulating the flow of a fluid so that only a measured amount is permitted to flow past a given point in the system. **2.** Measuring any variable (flow rate, electrical power, etc.).

meter-kilogram-second-ampere system of units See MKSA Electromagnetic System of Units.

meter-out circuit (fluid power systems) Speed control circuit in which the control is achieved by regulating the exhaust flow from the actuator.

meter proving tank See calibrating tank.

meter run A flowmeter installed and calibrated in a section of pipe having adequate upstream and downstream length to satisfy standards of flowmeter installation.

meter tube (electromagnetic flowmeters) The pipe section of the primary device through which the fluid to be measured flows; its inner surface is electrically insulated.

methane A colorless, odorless, flammable gas (CH₄). Methane is the main constituent of natural gas, which is produced as free gas and also associated with crude oil as it comes, from the well. The simplest saturated hydrocarbon.

methane-rich gas process See MRG process.

methanole Methyl alcohol; a colorless, flammable liquid derived from methane (natural gas).

method of measurement The set of theoretical and practical operations, in general terms, involved in the performance of measurements according to a given principle.

methodology A collection of methods based on a common philosophy that fit together in a framework called the system development life cycle.

methylene chloride A chlorinated industrial solvent. Often used for solvent washing, a cleaning procedure for cleaning industrial-process measurement and control equipment to be used for oxygen service. See IEC publication 877 (1986) for further details.

methyl red end-point alkalinity An arbitrary measurement of the total alkalinity of water obtained by titration to the methyl red indicator end-point (pH 4,5); often used in conjunction with phenolphthalein end-point alkalinity (see phenolphthalein end-point alkalinity) to assess the equivalent hydrogen carbonate, carbonate and hydroxide concentration of water.

metre, m SI base unit for measurement of length. Common multiples: mm, km. On engineering drawings, mm is always used. In commercial and everyday life, use cm whenever convenient. Avoid dm. Note that the spelling metre is predominant in English speaking countries.

metre per second, m/s Unit for measurement of velocity, speed (SI unit). Common multiples mm/s, km/s. For the speed of vehicles, use the additional unit km/h. Note that the quantity mach is dimensionless. Give preference to speed.

metre per second square See acceleration.

metric system See International System of Units, SI.

metrology The field of knowledge concerned with measurement. Note: Metrology includes all aspects both theoretical and practical with reference to measurements, whatever their level of accuracy, and in whatever fields of science or technology they occur.

metron A unit which expresses a quantity of metrical information.

MeV Mega-electron-volts; a unit of energy equivalent to the kinetic energy of a single electron accelerated through an electric potential of 1 million volts.

mezzanine (textile term) An elevated platform or room set aside for the mixing of dyes and chemicals.

Mg Chemical symbol for magnesium.

MgO Chemical symbol for magnesiumoxide.

mH Millihenry.

MHO, mho The unit of conductance of a conductor when a potential difference of 1 volt between its ends maintains an unvarying current of 1 ampere. This term is now replaced by siemens (SI unit).

MHz Letter symbol for megaheerz (SI unit).

mica A transparent mineral which can be split into thin sheets.

micro 1. In the metric system a prefix meaning one millionth. **2.** A prefix meaning something very small.

microampere Equal to 10^{-6} ampere. One millionth of an ampere.

microbalance A small analytical balance for weighing masses of 0.1 g or less.

microballons A foam blanket that floats on the liquid in storage tanks to reduce losses from evaporation. The blanket is composed, of billions of hollow, balloonlike plastic spheres containing a sealed-in gas – usually nitrogen. The spheres are almost microscopic in size. When poured in sufficient quantity on top of crude oil or refined products in a tank, they spread across the surface, forming a dense layer that is effective in reducing evaporation.

microbar A unit of pressure formerly in common usage in acoustics. One microbar is equal to 1 dyne per square centimeter and equals 0.1 newton per square meter. The newton per square meter is now the preferred unit.

microbending Sharp curvatures of an optical fiber involving local axial displacement of the order of a few micrometers and spatial wavelengths of the order of a few millimeters. Notes: Such bends may result from fiber coating, cabling, packaging, installation etc.

microbend loss In an optical fiber that loss attributable to microbending.

microcircuits Miniaturized circuitry components common to the third generation of computer equipment.

micro code 1. A system of coding making use of suboperations not ordinarily accessible in programming, e.g., coding that makes use of parts of multiplication or division operations. **2.** A list of small program steps; combination of these steps, performed automatically in a prescribed sequence form a macro-operation like multiply, divide, and square root.

microcomputer A complete small computing system whose mainprocessing blocks are made of semiconductor integrated circuits. In function and structure, it is similar to a minicomputer.

microcontroller See chip sets.

micro DCI A family of Fischer & Porter process control stations with integrated display. The control stations can be connected via a datalink to PC based operator stations.

microdensitometer An instrument used in spectroscopy to measure lines in a spectrum by light transmission measurement.

microelectronic Discrete electrical components assembled and connected in extremely small and compact form.

microelectronic device An alternate term for “integrated circuit”.

microelectronics The entire body of electronic art together with, or applied to, the realization of electronic systems by using small electronic parts. Also called microsystems electronics.

microelement A resistor, capacitor or transistor, diode, inductor, transformer or other electronic element or combination of elements mounted on a small ceramic wafer.

microfarad, μ F One millionth of a farad; the unit of electrical capacitance.

microfaradmeter See capacitance meter.

microfiche A microfilm mounted on a card.

microfilm Microphotographs on film.

micrographics The use of microfilm and microfiche for filing basic documents that must be retained and made available for infrequent use. Special computer software can be used to maintain an index of such documents and to aid in their retrieval.

microhenry One millionth of a henry.

microinstruction An instruction of a microprogram.

micrologic elements Semiconductor networks used in computer and other critical circuits.

micrometer A meter, having a scale that reads in microamperes, for measuring extremely small currents.

micromho One millionth of a mho or of a siemens. Replaced by microsiemens.

micromicro An obsolete prefix meaning one millionth of a millionth, or 10^{-12} . Now called pico.

micromicrofarad Obsolete term for 10^{-12} farad. Now called picofarad.

micromicrowatt Obsolete term for 10^{-12} watt. Now called picowatt.

micromodule A tiny electronic device with standardized dimensions (usually fabricated using semiconductor techniques) capable of performing one or more functions in a circuit.

micron 1. A unit of length equal to one thousandth of a millimeter, i.e., one millionth of a meter or 39 millionths of an inch. **2.** A unit used in the measurement of very low pressures. It is equivalent to 0.001 mm (10^{-6} meter) of mercury at 32°F or 0°C.

micropollutant A substance which pollutes even in trace concentrations.

microprocessor The central processing unit (CPU) of a computer. It houses the control functions and the arithmetic and logic unit (ALU) that perform all the computations and logic decisions. When instruction and data memory are added along with input and output (I/O) circuitry, the microprocessor becomes a microcomputer.

microprogram (software) A sequence of elementary instructions that corresponds to a specific computer operation, that is maintained in special storage, and whose execution is initiated by the introduction of a computer instruction into an instruction register of a computer. Microprograms are often used in place of hard-wired logic. See also firmware.

microprogrammable computer A computer in which the internal CPU control sequence for performing instructions is generated from a ROM. By changing the ROM contents, the instruction set can be changed (as contrasted with a fixed-instruction computer).

microprogramming The preparation or use of microprograms.

microprogram store See control storage.

microradiometer Also called a radio micrometer. A thermosensitive detector of radiant power. It consists of a thermopile supported on and connected directly to the moving coil of a galvanometer.

microroutine See microprogram.

microsecond μs One-millionth of a second: 1×10^{-6} or 0.000001 second.

microstrainer A rotating cylindrical frame covered with a very fine mesh, usually of stainless steel wire. It rotates about a horizontal axis, is largely submerged in the water being screened and is backwashed to remove solids.

microsyn A precise and sensitive pickoff device for converting angular displacement within a small range to an electrical signal.

microsystems electronics See microelectronics.

microvolt μV One millionth of a volt.

microvoltmeter A highly sensitive voltmeter, which measures millionths of a volt.

microwafer A basic microcircuit building block generally made of beryllia, alumina or glass. Terminations on the edges are usually of gold on top of chromium, with a heavy nickel overlay for welding.

microwatt μW One millionth of a watt.

microwave **1.** All electromagnetic waves in the radio frequency spectrum above 890 megahertz. **2.** Line-of-sight, point-to-point transmission of signals at high frequency. **3.** Ultra high frequency waveforms used to transmit voice or data messages.

microwave filter A filter built into a microwave transmission line to pass desired frequencies but reject or absorb all other frequencies.

microwave hygrometers Radio frequency power is applied through metallic electrodes in the microwave moisture sensor. The microwaves are transmitted through the sample under test. Rotational relaxation, a spectrographic phenomenon, causes water to strongly absorb microwaves. The absorption causes a change in the amplitude and phase of the waves. Moisture analysis is by the electronic measurement of wave amplitude and phase.

microwave transmission Transmission of voice, television, or data signals by means of highly directional, high-frequency radio waves.

middle distillates The term applied to hydrocarbons in the so-called middle range of refinery distillation, e.g. kerosene, light diesel oil, heating oil, and heavy diesel oil.

middleware System software that has been customized by dealer for a particular user.

Midrex EDR process In the Midrex EDR (Electrothermal Direct Reduction) process, the energy for the reduction of iron oxide with coal is supplied by electrical-resistance heating of the charge between electrodes in the walls of a shaft furnace.

migration **1.** Spontaneous or induced movement of dissolved or particulate matter or organisms in a body of water. **2.** The movement of ions from an area of the same charge to an area of opposite charge.

mil One thousandth of an inch.

MIL **1.** Milliradian. **2.** Abbreviation for military.

MIL Military specification (followed by a single capital letter and numbers).

milestone A scheduled event for a project that is used to measure progress; for example, a formal review, issuance of a specification, product delivery.

military grade IC Typically, an IC whose performance is guaranteed over the temperature range from -55°C to $+125^{\circ}\text{C}$.

military specifications Documents issued by the Department of Defense that define materials, products or services used only or predominately by military activities (USA).

military standardization handbooks Detailed handbooks describing a specific subject that is critical to military design. The title is comprised of the prefix letters MIL-HDBK followed by an assigned serial number (USA).

military standards Procedures for design, drawing, writing and testing of components or equipment rather than giving a particular specification (USA).

milk carton board, mill stock board Board for the manufacture of drink packages e.g. for milk, or the base board for such board.

milk disk Disk used to transfer data from a small machine onto a larger computer, which provides greater processing power.

millboard Soid board, more than 1 mm thick, manufactured in an intermittent board machine.

milli Prefix meaning one thousandth. Letter symbol: m.

milliammeter, milliamperemeter An electric current meter calibrated in milliamperes.

milliampere **mA** One thousandth (.001) of an ampere. Letter symbol: mA.

millihenry **mH** One thousandth (.001) of a henry.

millilambert A unit of brightness equal to one thousandth (.001) of a lambert.

millimeter Also spelled millimetre. A unit of length equal to 0.001 meter.

millimicro Obsolete prefix for nano, representing 10^{-9} .

millimicrometer A unit of length equal to one ten-millionth of a centimeter (10^{-7} cm), or one thousandth of a micrometer.

millimicro second Same as nanosecond; one billionth of a second.

milliohm One thousandth of an ohm.

millisecond, ms One thousandth of a second: 10^{-3} or 0.001 second.

millivoltmeter A sensitive voltmeter calibrated in millivolts.

millivolt, mV One thousandth of a volt.

milliwatt, mW One thousandth of a watt. The reference level used for dB measurements.

millimaxwell One thousandth of a maxwell.

mill scale (corrosion) A thin layer or incrustation of oxide that forms on the surface on iron and steel when it is heated during processing. Pipelines, for example, must be cleaned of mill scale before being put in service.

MIL-STD Military Standard (book).

MIMI Manager for Interactive Modelling Interface used for production scheduling from Chesapeake Decision Sciences.

mineral-insulated, metal sheathed cable A factory assembly of one or more conductors insulated with a highly compressed refractory mineral insulation and enclosed in a liquidtight and gastight continuous copper sheath.

mineralization The breakdown of organic matter to carbon dioxide, water and the hydrides, oxides or mineral salts of any other elements present.

mineralogy The study of minerals: their formation, occurrence, properties, composition, and classification.

mineral spirits Common term for naphthas (solvents), those used for dry cleaning and paint thinners.

mini In data processing, a term used to describe a smaller computer of 12- to 32 bit word length and memory sizes of 16 K–8 M bytes.

miniaturization Size reduction to increase packing density of magnetic, electromechanical parts, or components of circuits.

minicomputer A general purpose digital computer in the low-to-medium price range. Traditionally with sixteen bits per word.

MINI-MAP A subset of MAP protocols extended to provide higher performance for applications whose communications are limited to a single LAN. A Mini-MAP node contains only the lower two layers (Physical and Link) of the MAP protocols. It can only communicate directly with MAP/EPA or MINI-MAP nodes on the same segment.

mini-micro In data processing, a very small microcomputer containing a CPU, memory, and I/O interfaces for data exchange and timing circuits to control the flow of data.

minimum delay programming A method of programming in which storage locations for instructions and data are chosen so that access time is reduced and minimized.

minimum flashover voltage The crest value of the lowest voltage impulse, of a given wave shape and polarity that causes flashover.

minimum flow-rate (water meters) The flow-rate above which any meter shall remain within the maximum permissible error limits. It is determined as a function of the nominal flow-rate.

minimum power voltage The value of the power supply which may occur under steady state minimum load conditions.

minmax Method used in artificial intelligence to solve problems.

minnesotaite An iron-silicate mineral.

minor failure Failure, other than a critical failure, which does not reduce the ability of a more complex item to perform its required function.

minor fault A fault which does not affect a function considered to be a major importance.

minor graduations The shortest or lightest division marks on a graduated scale, which indicate subdivisions lying between successive major graduations or between an index graduation and an adjacent major graduation.

MINOS Modular In-core Non-linear Optimization System.

minuend In a subtraction operation, the number or quantity from which another number or quantity is subtracted.

mirror galvanometer A suspended-coil instrument which instead of using a pointer to indicate the reading employs a light beam reflected from a mirror attached to the moving coil.

mirror image switch (numerical control) A switch the operation of which causes the programmed coordinates applied to one or several axes to be multiplied by -1 .

mirroring (computer graphics) One hundred and eighty degrees of rotation of display elements about an axis in the plane of the display surface.

mirror scale Meter scale with a mirror arc, used to align the eyeball perpendicular to the scale when taking a reading. By eliminating this human error in reading accuracy can be improved by half.

MIS Management Information System.

misalignment loss, extrinsic joint loss That coupling loss of optical power caused by imperfect jointing.

miscellaneous function (numerical control) A command which controls discrete functions of machine or control systems.

miscellaneous time, incidental time That part of operating time that is not system production time, system test time, or rerun time. Note: Miscellaneous time is typically used for demonstrations, operator training or other such purposes.

miscibility Capacity of fluids to be mixed together without detrimental results.

miscible Mixable; fluids that are capable of dissolving in one another.

mishandling failure A failure caused by incorrect handling or lack of care of the item.

mishandling fault A fault caused by incorrect handling or lack of care of the item.

mismatch The condition in which the impedance of a load does not match the impedance of the source to which it is connected.

mission The operating objective for which the system was intended.

mission time That element of uptime during which the item is performing its designated mission.

mist Small, almost microscopic droplets of water entrained in natural gas. Such gas must be treated to remove the water before it will be accepted by a gas transmission pipeline.

mistrigger (misfire) (thyristor) The failure of a thyristor to conduct at the correct instant of time.

mixed base notation, mixed base numeration system A numeration system in which a number is represented as the sum of a series of terms each of which consists of a mantissa and a base, the base of a given term being constant for a given application but the bases being such that there are not necessarily integral ratios between the bases of all the terms.

mixed bed (ion exchange) An intimate physical mixture of anion-exchange material and cation-exchange material.

mixed liquor A mixture of sewage and activated sludge undergoing circulation and aeration in the aeration tank or channel of an activated-sludge plant.

mixed media filtration A water treatment process whereby the water is passed through two or more layers in a downward or upward direction. The upper layer consists of large particles of low density. In each following layer the particles are smaller, but the density of the particles is higher.

mixed radix notation, mixed radix numeration system A radix numeration system in which the digit places do not all necessarily have the same radix.

mixing length The minimum distance downstream of the injection cross-section beyond which the injected solution is sufficiently distributed over a cross-section to enable the flow-rate to be measured to the accuracy required. Pertains to measurement of fluid flow in closed conduits, tracer methods.

mixing length The minimum distance downstream of the injection cross-section beyond which the injection solution is uniformly distributed over the cross-section. Pertains to liquid flow measurement in open channels, tracer methods.

mixing ratio Ratio of weight of water to weight of dry carrier gas.

mixing service (for control valves) Three-way valves with diverting or mixing trim have two plugs fixed to the stem and positioned so that, when one seat is closed, the other is full open, with throttling of flows through both seat orifices for in-between positions. For mixing service, the plugs are set back-to-

back in order for the flow direction of each stream to be under its plug.

mixing valve See mixing service.

MKSA Meter-Kilogram-Second-Ampere.

MKSA electromagnetic system of units Also called the Giorgi system. A system in which the fundamental units are the meter, kilogram, second and ampere.

MLD See mean logistic delay.

mm Letter symbol for millimeter (SI unit).

MM&S Material Movement and Storage.

MM BTU/HR Million Btu (British thermal units) per hour; rated used for large industrial heaters and other large thermal installations.

MMFS Manufacturing Messaging Format Standard. The application protocol specified by older versions of MAP to do manufacturing messaging. This protocol has been replaced by MMS.

MMH See maintenance man-hours.

mm Hg Millimeters of mercury. A measurement of absolute pressure being the height of a column of mercury that the air or other gas will support. Standard atmospheric pressure will support a mercury column 760 millimeters high (760 mm Hg). Any value less than this represents some degree of vacuum.

MMS Manufacturing Messaging Specification. MMS is one of the application protocols specified by MAP.

Mn Chemical symbol for manganese.

mnemonic Pertaining to assisting, or intending to assist a human memory. Thus a mnemonic term, usually an abbreviation, that is easy to remember, e.g., mpy for multiply and acc for accumulator.

mnemonic code A pseudo code in which information, usually instructions, is represented by symbols or characters which are readily identified with the information.

mnemonic language A programming language that is based on easily remembered symbols and that can be assembled into machine language by the computer.

Mo Chemical symbol for molybdenum.

mobility See drift mobility.

mock dyeing (textile term) A dyeing performed in a bath containing all chemicals and additives except the dyes. Used to prepare information for computer color matching and to assess chemical interactions and physical running problems such as foaming.

mockup A model of a piece of equipment or a system, frequently full size, used for experiments, performance testing or training.

modal Referring to modes.

modal control Type of control in which the state variables are chosen in the state space defined by the system eigenvectors.

modal dispersion (fiber optics) A fiber bandwidth-limiting factor caused by differences in the propagation characteristics of the various modes in a multimode fiber.

mode 1. A computer system of data representation, e.g., the binary mode. **2.** A selected method of computer operation. **3.** Real or complex (number system).

mode distortion Same as modal distortion.

mode filter (optical communication) A device designed to accept or reject a certain mode or modes. **mode hopping, mode jumping** In lasers the transfer of power from one mode to another in a laser.

model 1. A set of identical industrial products manufactured according to a specific common design pattern of a given type. **2.** A representation of a real world process, device, or concept. See also analytical model, availability model, debugging model, error model, reliability model, simulation, statistical test model. See also mathematical model.

model-based (expert) system An expert system that integrates the structure and function of a domain model.

model dispersion That component of pulse spreading caused by differential optical path length in multimode fiber.

modeling Technique of system analysis and design using mathematical or physical idealizations of all or a portion of the system. Completeness and reality of the model are dependent on the questions to be answered, the state of knowledge of the system, and its environment.

modem 1. Acronym for MODulator DEModulator unit. A modem is a device that converts data from a form which is compatible with data-processing equipment to a form that is compatible with transmission facilities, and vice-versa. Note: Modems may be designed to operate in three modes: 1. Simplex. 2. Half-duplex. 3. Full duplex. **2.** A functional unit that modulates and demodulates signals.

moderate contamination An environment in which the effects of corrosion are measurable and may be a factor in determining equipment reliability. For examples see IEC publications 654-4 Operating conditions for industrial-process measurement and control equipment, Part 4: Corrosive and erosive influences.

mode stripper, cladding mode stripper See under cladding mode stripper.

mode transducer Also called mode transformer. A device that transforms an electromagnetic wave from one mode of propagation to another.

mode transformer See mode transducer.

mode volume (optical communication) The number of bound modes that an optical fiber is capable of supporting.

modification (of an item) The combination of all technical and administrative actions intended to change an item.

modified parabolic flow characteristic (control valves) An inherent flow characteristic which provides fine throttling action at low valve plug travel and approximately a linear characteristic for upper portions of valve travel. It is approximately midway between linear and equal percentage.

modifier A device that alters an instruction but does not change the form of energy (for example, the changing of electrical input signals into electrical output signals).

modular 1. Made up of modules. **2.** Dimensioned according to a prescribed set of size increments.

modular decomposition (software) A method of designing a system by breaking it down into modules. See also hierarchical decomposition.

modular flow A flow that is not influenced by the level of water downstream of the measuring device.

modularity The property of functional flexibility built into a system by assembling discrete units which can be easily joined to or arranged with other parts or units.

modularization Designing a series of components, subassemblies or devices for interchangeability of physical location, so that different assemblies can be easily constructed on a standard frame or mounted in standard enclosures.

modular limit, point of submergence The submergence ratio when the flow just begins to be affected by the downstream level. Pertains to liquid flow measurement in open channels.

modular programming A technique for developing a system or program as a collection of modules.

modular system A system design methodology that recognizes that different levels of experience exist in organizations and, thereby, develops the system in such a way so as to provide for segments or modules to be installed at a rate compatible with the users' ability to implement the system.

modulate **1.** The adjusting to a required standard such as conversion of signals emitted by output to a signal standard required for transmission. **2.** To vary the amplitude, frequency or phase of a wave by impressing one wave on another wave of constant properties.

modulating **1.** The actions to keep a quantity or quality in proper measure or proportion. Also see "throttling". **2.** An action that adjusts by minute increments and decrements.

modulating action Type of action in which the output variable results from modulation of a carrier by the input variable.

modulating signal See modulating wave.

modulating wave Also called modulating signal, or simply signal. A wave which varies some characteristic (i.e., frequency, amplitude, phase) of the carrier.

modulation **1.** The process of impressing information on a carrier for transmission (AM, amplitude modulation; PM, phase modulation; FM, frequency modulation. **2.** Regulation of the fuel-air mixture to a burner in response to fluctuations of load on a boiler. **3.** The process, or result of the process, whereby some characteristic of one wave is varied in accordance with some characteristic of another wave.

modulation code A code used to cause variations in a signal in accordance with a predetermined scheme; normally used to alter or modulate a carrier wave to transmit data.

modulator A functional unit that converts a signal into a modulated signal suitable for transmission.

module **1.** A language construct that consists of procedures or data declarations and that can interact with other such constructions. Synonymous with program unit. **1.** A packaged functional hardware unit designed for use with other components. **1.** Pertaining to Honeywell TDC 3000 control systems, a TDC 3000 component that connects to the Local Control Network or Universal Control Network to perform a specified set of TDC 3000 functions. A gateway is a special type of module.

module strength See cohesion.

modulo A mathematical operator which yields the remainder function of division; thus, 39 modulo 6 equals 3.

modulo-N check, residue check A check in which a number is divided by a number N to generate a remainder that is compared with the remainder previously calculated.

modulus of elasticity For measurement of modulus of elasticity in SI units see under pascal.

mohs scale A standard by which the hardness of minerals can be rated. The scale includes ten minerals listed from softest to hardest.

moisture and humidity measurement For detailed information on the subject of moisture and humidity measurement including dewpoint sensors, relative humidity sensors and absolute moisture measurement refer to, for example, the ISA publication Process Analyzers and Recorders.

moisture content The ratio of the mass of water in a moist material to the total mass of the material: see moisture ratio, dry solids content.

moisture-free See bone dry.

moisture in steam Particles of water carried in steam usually expressed as the percentage by weight.

moisture loss The loss representing the difference in the heat content of the moisture in the exist gases and that at the temperature of the ambient air.

moisture ratio The ratio of the mass of water in a moist material to the mass of the dry matter.

mol, mole The unit mole is a base unit in the SI system defined as the amount of substance containing the same number of elementary entities as there are atoms in 12 g of the nuclide carbon 12. Note that the elementary entities must be specified. They may be atoms, molecules, electrons, groups of particles or anything else.

molality Molality is defined as the amount of substance of a solute component divided by the mass of the solvent. The SI unit for measurement of molality is mole per kilogram, mol/kg.

molal units Pertaining to pH terminology, concentration units defined as the number of gm-moles per 1000 gm of solvent.

molar units Concentration units defined as the number of gm-moles of the component per liter of solution.

moletronics Acronym for molecular electronics.

molecular attrition See fretting.

molecular circuitry See morphological circuitry.

molecular electronics Abbreviated moletronics.

1. The science of making a single block of matter to perform the function of a complete circuit. This is done by merging the function with a material, using solid-state functional blocks. **2.** Electronics on a molecular scale, dealing with the production of complex circuitry in semiconductor devices with integral elements processed by growing multizoned crystals in a furnace for the ultimate performance of electrical functions.

molecular flow Gas flow in a tube at a pressure low enough that the mean free path of the molecules is greater than the inside diameter of the tube.

molecular integrated circuit An integrated circuit such that the identity and location of specific electric elements cannot be determined even by microscopic disassembly of the material of which the circuit is formed.

molecular sieve A bed of desiccant (a drying agent) that absorbs water from a refinery or hydrocarbon recovery plant's feedstock. The superabsorbent material (usually in pellet form) is in layers in a bed. The feedstock is passed through the sieve, at which time it gives up its molecules of water.

molecular weight See relative molecular mass.

molecule **1.** The smallest division of a unique chemical substance which maintains its unique chemical identity. **2.** In any substance, the smallest particle that still retains the physical and chemical characteristics of that substance. A molecule consists of one or more atoms of one or more elements. Sometimes two entirely different substances may have similar chemical elements, but their atoms will be arranged in a different order.

Moll thermopile radiometer A type of thermopile radiometer consisting of thermopile detecting elements mounted in a casing. See also under thermopile.

momentary contact Closure of a normally open switch for a brief period.

momentary digital output A contact closure, operated by a computer, that holds its condition (set or reset) for only a short time. See latching digital output.

momentary switch 1. A switch which returns to its normal circuit condition when the actuating force is removed. **2.** A spring-loaded contact which, when pressed, closes two contacts. When pressure is removed, contacts open.

moment of force For measurement of moment of force in SI units. See under newton metre.

momentum The product of a body's mass and its linear velocity.

momentum amplifier (fluid power systems) Amplifier the operating principle of which is based on the interaction of momentum of the power-and-control-jets.

MON Motor Octane Number; Octane number for a gasoline component or product.

monadic operation, unary operation An operation on one and only one operand. Example: Negation.

Monel An alloy with 65% Ni, 30% Cu as major alloying elements. ASTM specification A494-M35. Trademark, International Nickel Co.

monitor 1. In data processing, a high-resolution viewing screen. **2.** To measure a quantity continuously or at regular intervals so that corrections to a process or condition may be made without delay if the quantity varies outside of prescribed limits. **3.** A device that observes and records selected activities within a data processing system for analysis.

monitor (program, monitoring program) A computer program that observes, regulates, controls or verifies the operations of a data processing system.

monitored control system See closed loop control.

monitoring Observation of the operation of a system or part of a system to verify correct functioning and detect incorrect functioning.

monitor routine See executive program.

monitor system Same as operating system.

monoboard microcomputer See single-board microcomputer.

monobrid A method of manufacturing an integrated circuit by using more than one monolithic chip within the same package.

monochromatic (fiber optics) Consisting of a single wavelength or color. In practice radiation is never perfectly monochromatic but, at best, displays a narrow band of wavelengths.

monochromatic 1. Pertaining to or consisting of a single color. **2.** Radiation of a single wavelength.

monochromatic emissivity See total emissivity.

monochromatic light Light consisting of just one wavelength. No light is completely monochromatic.

monochromatic sensitivity The response of a device to light of a given color only.

monochromator (optical communication) An instrument for selecting narrow portions of the optical spectrum.

monoclinic A crystal structure in which two of the three axes are perpendicular to the third, but not to each other.

monocrystalline Material made up of a single continuous crystal.

monolithic The single silicon substrate in which an integrated circuit is constructed.

monolithic IC See monolithic integrated circuit.

monolithic integrated circuit A type of integrated circuit where in the substrate is an active material, such as the semiconductor silicon.

monolithic microcircuit See monolithic integrated circuit.

monomer A single molecule which can join with another monomer or molecule to form a polymer or molecular chains.

monomial An algebraic expression consisting of one term. For example, xy , $3ab$, and $2y$ are monomials.

monopod platform A type of offshore drilling platform with a single supporting leg. The design of the monopod platform makes it effective in arctic regions where thick, moving bodies of ice present serious problems for more conventional platforms.

monostable Pertaining to a device that has one stable state.

monostable (trigger) circuit A trigger circuit that has one stable state and one unstable state.

monotonic DAC A digital-to-analog converter that has an analog output that is a continuously increasing function of the input.

Monte Carlo method, MCM A trial and error method of repeated calculations to discover the best solution of a problem. It is used when a great number of variables are present, with interrelationships so extremely complex as to forestall straightforward analytical handling.

Monte Carlo simulation A subset of digital simulation models based on random or stochastic processes.

MOP (textile term) Machine Operators Panel, the control hardware located in close proximity to the machine being controlled and used by the operator to communicate with the control room and operate the manual aspects of the machine.

morphological circuitry Also called molecular circuitry. A circuit made from a material in which the molecular structure has been arranged to perform a certain electrical function.

MOS See metal oxide semiconductor.

MOSFET Metal Oxide Semiconductor Field Effect Transistor.

MOST Metal Oxide Semiconductor Transistor.

most probable number, MPN (water quality) A statistical estimate of the number of specified microorganisms in a specified volume of water, derived from the combination of positive and negative results in a series of columns of the sample examined by standard tests using the multiple tube method.

most significant bit, MSB 1. The highest-order bit or the bit with the greatest weight. **1.** The bit in the leftmost position.

most significant digit, MSD The significant digit contributing the largest quantity to the value of a numeral; i.e. the leftmost digit.

motherboard 1. A relatively large piece of insulating material on which components, modules or other electronic subassemblies are mounted and interconnections made by welding, soldering or other means, using point-to-point or matrix wire or circuitry fabricated integrally with the board. **2.** A circuit board that accommodates plug-in cards or daughterboards and makes appropriate interconnecting terminations between them. **3.** See also backplane.

motion balanced instrument An instrument design technique utilizing the motion of the measuring element against a spring to reach a balance of forces representing the magnitude of the measured variable.

motion conversion mechanism (control valves) A mechanism between the valve and the power unit of the actuator to convert between linear and rotary motion. The conversion can be from linear actuator action to rotary valve operation or from rotary actuator action to linear valve operation.

motion space (industrial robots) The space which can be swept by the moving parts of the robot, excluding the end-effector and the workpiece.

motion transmitter A device that typically senses valve stem position and transmits a proportional pneumatic or electric signal to a remotely located receiver. Generally yoke mounted and attached to the valve stem through a linkage.

motive power (valve actuators) The electric, fluid, air, nitrogen or mechanical energy required to operate the actuator.

motor circuit switch See disconnect switch.

motor controller A device or group of devices which serves to govern, in a predetermined manner, the electrical power delivered to a motor.

motor driven reset safety shut-off valve An electrically operated safety shut-off valve designed to automatically shut off fuel flow upon being de-energized. The valve is opened and reset automatically by integral motor device only.

motor-field control The method of controlling the speed of a motor by changing the magnitude of its field current.

motor-start capacitor A capacitor which is in the circuit only during the starting period of a motor. The capacitor and its auxiliary winding are disconnected automatically by a centrifugal switch or other device when the motor reaches a predetermined speed, after which the motor runs as an induction motor.

motor starter A device arranged to start an electric motor and accelerate it to normal speed; a motor starter has no running position other than fully on.

(to) mount To place a data medium in a position to operate.

mounting error Pertaining to electrical transducers, the error resulting from mechanical deformation of the transducer caused by mounting the transducer and making all measurand and electrical connections.

mounting strain error Error resulting from mechanical deformation of an instrument caused by mounting the instrument and making all connections. See also inclination error.

MOV Motor Operated Valve.

movable heads Movable reading and writing heads on bulk memory devices.

(to) move, (to) transfer To send data from one storage location to another.

movement A movement is the physical delivery of oil into out of or within the tank farm.

movement differential The distance or angle from the operating position to the releasing position of a momentary contact switch.

movement measurement Movement, such as rotary, angular, transverse, etc. is a basic variable that can be measured by a modified Wheatstone bridge type of measuring circuit sometimes called a "follower" circuit. A slidewire is mechanically attached to the moving member, either rotary or transverse, so that the slider moves from one end to the other of the available motion.

moving-coil galvanometer A galvanometer in which a coil carrying a current moves in the field of a permanent magnet.

moving-coil instrument See moving-magnet instrument.

moving-coil relay The moving-coil relay consists of a light coil which when energized moves in a strong permanent magnetic field. Very little energy is required to produce operating force.

moving-drum indicator A type of indicator where a circular member (drum) with a scale along its periph-

ery revolves in relation to a fixed pointer to indicate changing values of a measured variable.

moving head disk A multitrack disk with a single head which moves to access any read/write track.

moving-iron instrument An instrument comprising a movable piece of soft magnetic material which is actuated either by a current in a fixed coil or by one (or more) fixed piece(s) of soft magnetic material, magnetized by a current in the fixed coil.

moving-magnet instrument An instrument which operates by the interaction of the field of a movable permanent magnet with a current in a fixed coil. Also known as moving-coil instrument and permanent magnet moving-coil instrument.

moving part logic Fluid logic using components with moving parts.

moving-scale instrument An indicating instrument in which the scale moves relative to a fixed index. Note: An instrument in which the scale is projected is a particular type of moving-scale instrument.

moving-vane movement A meter movement consisting of fixed and movable iron vanes, surrounded by a field coil. A magnetic field produced by current in the field coil causes repulsion between the two vanes. Deflection of the movable vane is proportional to the current. Also known as moving-iron movement.

MPL A high level language suitable for the development of microprocessor application software.

MPX Multiplexer.

mR Milliroentgen.

MRG process Methane-Rich Gas process. MRG is a patented process (Japan Gasoline Co.) to make synthetic natural gas from propane. Liquid propane is hydrodesulfurized and gasified with steam at temperatures between 900° and 1000°F. The resulting gas mixture is methanated, scrubbed to remove CO₂, dried, cooled and fed to distribution lines.

MRP Material Resource Planning.

MRPII (Manufacturing Resource Planning). A method for effective planning of all the resources of a manufacturing company. Ideally, it addresses operational planning in units, financial planning in dollars and has a simulation capability to answer "what if" questions. It is made up of a variety of functions, each linked together: Business Planning Production Planning, Master Production Scheduling, Material Requirements Planning (MRP), Capacity Requirements Planning and the execution systems for capacity and priority. Outputs from these systems would be integrated with financial reports such as the business plan, purchase commitment report, shipping budget, inventory projections in dollars, MRPII is a direct outgrowth and extension of MRP.

MRT See mean repair time.

ms Millisecond, one thousandth of a second (SI-unit).

MSB Most Significant Bit. The largest value bit in a binary number.

MSD Most Significant Digit.

MSDOS Operating system from Microsoft.

MSHA Mine Safety and Health Administration (USA).

MSI See medium scale integration.

MSS Manufacturers Standardization Society of the Valves and Fittings Industry, Inc. (USA).

MTBF See mean time between failures.

MTBM See mean time between maintenance.

MTCF Mean Time To Catastrophic Failure.

MTE Mean Time Between Errors.

MTL British manufacturer of zener barriers.

MTTA Machine Tool Trade Association (UK).

MTTD Mean Time To Diagnosis.

MTTF See mean time to failure.

MTTFF See mean time to first failure.

MTTPO Mean Time To Planned Outage.

MTTR See mean time to repair.

MTTUO Mean Time To Unplanned Outage.

mu Greek letter used as symbol for amplification factor; micro-; micron; permeability.

multi-access A multiprogramming system which permits a number of users to simultaneously make on-line program changes.

multi-address Same as multiple address.

multiaddress instruction, multiple address instruction An instruction that contains more than one address part.

multi-bus Intel's proprietary link between single board systems used for industrial systems.

multi-channel module (programmable controllers) A module containing multiple input and/or output user signal interfaces, multi-channel module may or may not be a multi-circuit module. Pertains to programmable controllers.

multi-circuit module (programmable controllers) A module containing multiple isolated circuits. With respect to I/O modules, a module containing multiple isolated user signal interfaces. Pertains to programmable controller systems.

multiconductor More than one conductor within a single cable complex.

multicylinder machine A paper machine in which the drying section consists of a number of normal drying cylinders.

multidrop A line or circuit interconnecting several stations.

multidrop circuit A communication system configuration using a single channel or line to serve multiple terminals.

multi-element (multi-variable) control system A control system utilizing input signals derived from two or more process variables for the purpose of jointly affecting the action of the control system. Examples are input signals from pressure and temperature or from speed and flow etc. See also multivariable control.

multifiber cable An optical cable that contains two or more optical fibers, each of which transmits independent signals.

multifiber joint An assembly designed to permit the connection between two or more multifiber cables.

multifunction Pertaining to an integrated device containing two or more circuits integral to a single silicon chip. Typical multifunction devices are quadruple gates and dual flip-flops.

multi-function (measuring) instrument A measuring instrument having a single indicating device intended to measure more than one kind of quantity.

multifunctional data transmission The integration of asynchronous and synchronous circuit switched data transmission.

multifunction multiloop controller A type of microprocessor based controller that combines the process control functions of a dedicated loop controller with many of the logic functions of a programmable logic controller to provide the control strategy of an entire unit operation.

multilayer A type of printed-circuit board, which has several layers of circuit etch or pattern, one over the other and interconnected by electroplated holes.

multilayer board or paper Board or paper consisting of more than three furnish layers which have been couched together.

multilayer interconnection pattern A technique used for the interconnection of arrays performing large, complicated electronic functions.

multileaving A technique for allowing simultaneous use of a communications line by two or more terminals.

multileaving A technique for allowing simultaneous use of a communications line by two or more terminals.

multilevel address Same as indirect address.

multilevel security A mode of operation permitting data at various security levels to be concurrently stored and processed in a computer system when at least some users have neither the clearance nor the need-to-know for all data contained in the system.

multimedia Referring to several forms of media.

multimeter A multi-range multi-function measuring instrument intended to measure voltage, current and sometimes other electrical quantities such as resistance.

multimode fiber An optical fiber in the core of which the radiation of two or more bound modes can propagate at the wavelength of interest.

multimode optical waveguide (fiber optics) An optical waveguide that will allow more than one bound mode to propagate. Note: May be either a graded index or step index waveguide.

multimoding The simultaneous generation of many frequencies instead of one discrete frequency.

multi-pass sort A computer program for sorting more data than can be contained by the internal computer storage. Intermediate storage, such as disk, tape or drum, is required.

multiple access Pertaining to a computer system in which a number of on-line communication channels provide concurrent access to the common system.

multiple-action A control-system action that is a composite of the actions of two or more individual controllers.

multiple address Same as multi-address.

multiple address instruction, multiaddress instruction An instruction that contains more than one address part.

multiple of a unit (of measurement) A larger unit of measurement which is formed from a given unit according to scaling conventions. Examples: **a.** One of the decimal multiples of the metre is the kilometre; **b.** One of the non-decimal multiples of the second is the hour.

multiple orifice valve A patented orifice valve with two orifice plates or disks in pressure-tight contact. One disk can be rotated through 90°C. For full flow through the valve, the orifices in the two disks are in perfect alignment. To reduce the flow, the movable disk is rotated a certain number of degrees, which partially covers the orifice in the fixed disk, thus restricting the flow through the valve.

multiple-output system A system which manipulates a plurality of variables to achieve control of a single variable.

multiple processing Configuring two or more processors in a single system, operating out of a common memory. This arrangement permits execution of as many as there are processors.

multiple programming In computer programming, simultaneous execution of two or more arithmetical or logical operations.

multiple-speed floating controller A floating controller in which the output may change at two or more rates, each corresponding to a definite range of values of the actuating error signal.

multiple speed floating action Floating action in which the rate of change of the output variable may have several absolute values.

multiple system (electrochemistry) The arrangement in a multielectrode electrolytic cell whereby in each cell all of the anodes are connected to the positive bus bar and all of the cathodes to the negative bus bar.

multiple tempering See double tempering.

multiplex, mux 1. The concurrent transmission of more than one information stream on a single channel.

2. To carry out several functions simultaneously in an independent but related manner.

multiplexed line A data-communication line equipped with multiplexers at each end.

multiplexer A device which samples input channels and interleaves signals in frequency or time and/or discriminates combined incoming signals into separate output channels.

multiplexing In data transmission, a function that permits two or more data sources to share a common transmission medium such that each data source has its own channel.

multiplexing The time-shared scanning of a number of data lines into a single channel. Only one data line is enabled at any instant.

multiplexor Same as multiplexer.

multiplex transmission The simultaneous transmission of two or more signals within a single channel.

multiplicand The quantity multiplied by each digit of the multiplier to form the product in the operation of multiplication.

multiplier 1. A device in which the output represents the product of the magnitudes represented by the two or more input signals. **2.** A fixed resistance, connected in series with the moving coil of a voltmeter, to enable measurements over a larger voltage range.

multiplier, multiplier factor In a multiplication operation, the factor by which the multiplicand is multiplied.

multiplier servo An electromechanical multiplier in which one variable is used to position one or more ganged potentiometers across which the other variable voltages are applied.

multiplying – digital-to-analog converter, MDAC See digital-to-analog multiplier.

multiplying factor The number by which the reading of a meter must be multiplied to obtain the true value.

multiport burner A burner having a number of nozzles from which fuel and air are discharged.

multiport circuit (data communication) A configuration in which more than two stations are connected to a shared communications channel.

multiport recorder A recorder with a printer assembly which records the values of each input signal as a series of printer symbols.

multipolar Having more than one pair of magnetic poles.

multiport Refers to the capability of communications equipment to accept more than one input/output data line.

multi-position action A type of controller action in which the final control element is positioned in one of three or more preset configurations, each corresponding to a definite range of values for the controlled variable.

multi-position controller A controller having two or more discrete values of output.

multi-position controller A controller having two or more discrete values of output. See figure in ISA publication S51.1, 1989.

multi-position cylinder (fluid power systems)

Arrangement of at least two pistons on the same axis, moving within a common cylinder body divided into several independently controlled chambers, to permit the selection of a variety of positions.

multi-position relay A relay having more than one operate or nonoperate position, e.g., a stepping relay.

multi precision (mathematics of computing) Characterized by the use of two or more computer words to represent a number in order to enhance precision.

multiprecision arithmetic A form of arithmetic similar to double precision arithmetic except that two or more words may be used to represent each number.

multiprocessing A mode of operation that provides for parallel processing by two or more processors of a multiprocessor.

multiprocessor A computer including two or more processors that have common access to a main storage.

multiprogramming Pertaining to the concurrent execution of two or more programs by a single computer.

multi-range (measuring) instrument A measuring instrument having more than one measuring range.

multi-rate meter An energy meter provided with a number of registers, each becoming operative at specified time intervals corresponding to different tariffs.

multi-scale (measuring) instrument A measuring instrument having more than one scale.

multi-speed floating controller See multiple-speed floating controller.

multistage Occurring in a sequence of separate steps.

multi-stage bleaching Bleaching carried out in a sequence of successive bleaching stages.

multi-step action Step action with more than two steps.

multi-step controller A controller having two or more discrete values of output.

multi-step control servo-mechanism A discontinuous action servo-mechanism in which the power supply to the servo-motor is taken through a multi-contact switch.

multitasking, multi-tasking A mode of operation that provides for the concurrent performance, or interleaved execution of two or more tasks.

multivariable control Type of control with more than one input variable and one or more output variables depending on more than one input variable. See also multi-element (multivariable) control system.

multivariable control system See multi-element (multi-variable) control system and multivariable control.

multivariable system System with more than one input variable and one or more output variables if at least one output variable depends on more than one input variable.

multivibrator A type of relaxation oscillator used for the generation of nonsinusoidal waves in which the output of each of its two tubes is coupled to the input of the other to sustain oscillations. Used in a cathode-ray tube's sync circuits.

MUM Methodology for Unmanned Manufacturing. A Japanese program established to develop an unmanned factory by the mid – 1980s, a facility that depends heavily on robots.

Mumetal A metallic alloy with high permeability and a low hysteresis loss. It is excellent for magnetic shielding.

Munsell system A color-specification system used principally in photography and color printing.

Murray loop test A method of localizing a fault in a cable. This is done by replacing two arms of a Wheatstone bridge with a loop formed by the cable under test and a good cable connected to the far end of the defective cable.

MUT Mean Up Time.

mutagen A substance capable of causing genetic change in living organisms.

mutation See program mutation.

muting Suppression of an output of electronic equipment unless there is adequate signal/noise ratio.

MUX Multiplexer. Hardware used to transmit several signals over a single conductor.

mV Millivolt. (SI unit).

MV Megavolt (SI unit).

MVA Megavoltampere. (SI unit)

MVER Pertaining to digital instruments, maximum value of effective range.

MW Megawatt (SI unit).

mW Milliwatt (SI unit).

MWh Megawatthour (SI unit).

MWT Mean Waiting Time.

Mx Maxwell.

Mylar A Dupont trademark for polyester film used as a base for magnetically coated or perforated information media.

myrlametric waves Very-low frequency band; 3 kHz to 20 kHz (100 km to 10 km).

N

N Symbol for newton, unit for force (SI unit). Do not confuse force and mass. Previously, the unit for mass, kg or lb, was often also used for force. In fact, the weight of the mass unit was meant – more properly written as kgf (in some countries, kp) or lbf. Weight is a force. Do not express a force as the weight of a certain mass. Example: write “the force 500 N”, not “the weight of 50 kg”.

(type) N Letter designation for Nickel-Chromium-Silicon/Nickel-Silicon thermocouple. (Not to be confused with nickel versus nickel + 18% molybdenum thermocouple.)

n Prefix nano, 10^{-9} (SI unit).

“N” stamp Designates equipment qualified for use in nuclear installations: pipe, fittings, pumps, valves etc. (USA).

nA Nanoampere (SI unit).

NACE National Association of Corrosion Engineers (USA).

N-adic operation See dyadic (N-adic) operation.

NAK See negative acknowledgment.

nameplate A plate attached, for instance, to a control valve bearing the name of the manufacturer. It may also contain specification and limitation information. See also Data Plate.

NAND element, NAND gate A gate that performs the Boolean operation of nonconjunction.

NAND operation, non-conjunction, NOT-BOTH operation The dyadic Boolean operation whose result has the Boolean value 0 if and only if each operand has the Boolean value 1. See table of Boolean operations in ISO publication 2382/11.

nano, n Prefix for 10^{-9} (a billionth) times a specified unit. (SI unit).

nanoampere, nA One thousandth of a microampere (10^{-9} ampere). (SI unit).

nanocircuit An integrated microelectronic circuit in which each component is fabricated on a separate chip or substrate.

nanofarad, nF One billionth of a farad, equal to 10^{-9} farad, 0.001 microfarad and 1 000 picofarads. (SI unit.)

nanohenry, nH One thousandth of a microhenry, equal to 10^{-9} henry and 1 000 picohenrys.

nanosecond circuit A computer logic circuit, or another electronic circuit, which has gradient pulse rise or fall times measured in billionths of seconds or less.

nanosecond, ns One-billionth of a second (SI unit). One nanosecond is to 1 second as 1 second to 32 years. (SI unit).

nanovoltmeter A voltmeter sufficiently sensitive to give readings in thousandths of microvolts.

nanovolt, nV One thousandth of a microvolt (10^{-9} volt). (SI unit).

naphtha A volatile, colorless liquid obtained from petroleum distillation used as a solvent in the manufacture of paint, as dry-cleaning liquid, and for blending with casinghead gasoline in producing motor gasoline.

naphthalene A large percentage of the naphthalene produced from coal is converted to phthalic anhydride. The principal use of the anhydride is in plasticizers, such as dioctyl phthalate and disoctyl phthalate, for use in synthetic resins. In addition, polyester resins, dyes, agricultural chemicals, pharmaceuticals, insect repellents, beta-naphthol, surface-active agents,

tanning agents, and insecticides consume large volumes of phthalic anhydride.

nappe 1. The jet formed by the flow over a weir. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983. 2. A sheet of liquid passing through the notch and falling over the weir crest.

NARM National Association of Relay Manufacturers (USA).

narrative Explanatory notes or comments to help a user operate a program.

narrowband radiation thermometer A type of temperature-measuring instrument that responds accurately only over a given, relatively narrow band of wavelengths, often a band chosen to meet a special requirement of the intended application.

N-ary (software) 1. Characterized by a selection, choice or condition that has n possible different values or states. 2. Of a fixed radix numeration system, having a radix of n.

NAT See natural unit of information content.

NATA National Association of Testing Authorities (Australia).

National Electrical Code, NEC See NEC.

National Electrical Manufacturer's Association, NEMA See NEMA.

National Electrical Safety Code, NESC A set of safety rules for the installation and maintenance of electric supply and communication lines, published as National Bureau of Standards Handbook and approved by the American Standards Association. It has the force of law only if enforced by municipalities or states (USA).

national standard A standard recognized by an official national decision as the basis for fixing the value, in a country of all other standards of the given quantity. Note: Generally, in a country, the national standard is also the primary standard.

natural ageing, natural aging Aging at normal atmospheric temperature. The word natural implies the absence of mechanical or similar forces.

natural binary A number system to the base (radix) 2, in which the ones and zeroes have weighted value in accordance with their relative position in the binary word.

natural circulation The circulation of water in a boiler caused by differences in density.

natural draft Convective flow of a gas – as in a boiler, stack or cooling tower – due to differences in density. Warm gas in the chamber rises toward the outlet, drawing in colder, more dense gas through inlets near the bottom of the chamber.

natural frequency 1. See undamped frequency. 2. A frequency of free oscillation.

natural function generator An analog device or a specific program based on some physical law, such as one used with a digital computer to solve a particular differential equation.

natural gas Gaseous forms of petroleum consisting of mixtures of hydrocarbon gases and vapors, the more important of which are methane, ethane, propane, butane, pentane, and hexane; gas produced from a gas well.

natural gas dehydrator See dehydrator.

natural gasoline Drip gasoline; a light, volatile liquid hydrocarbon mixture recovered from natural gas.

natural interference Electromagnetic interference caused by natural terrestrial phenomena (atmosphere

interference) or by natural disturbances outside of the atmosphere of the earth (galactic and solar noise).

natural language A language whose rules are based on current usage without being explicitly prescribed. Examples include English, Chinese, and French. Contrast with formal language and artificial language.

natural language A person's native tongue. Natural language systems attempt to make computers capable of processing language the way people normally speak.

natural logarithm Also called Napierian logarithm or hyperbolic logarithm. A logarithm to the base 2.7128.

natural noise Noise caused by natural phenomena such as thermal emission, static etc.

natural number, nonnegative integer One of the numbers zero, one, two ... Note: Some people define natural numbers as starting at one rather than zero.

natural radioactivity Spontaneous radioactive decay of a naturally occurring nuclide.

natural resonance See periodic resonance.

natural unit of information content, NAT A unit of logarithmic measure of information expressed as a Napierian logarithm.

NAVMAT Prefix to numbered series issued by office of Naval Material (USA).

Nb Chemical symbol for columbium (niobium).

NBS Formerly National Bureau of Standards (USA). Now NIST, National Institute of Standards and Technology.

NBS-A NBS atomic time scale.

NC 1. See numerical control. **2.** No Connection. **3.** Normally Closed. **4.** National Coarse (thread).

NC contacts Contacts which are normally closed when the control circuit is not energized.

NCMRP Net Change MRP. An approach via which the material requirements plan is continually retained in the computer. Whenever there is change in requirements, open order to inventory status or engineering usage, a partial explosion is made only for those parts affected by the change. NC systems may be continually and totally transaction-oriented, or done in a periodic (often daily) batch.

NCRP National Committee on Radiation Protection (USA).

NCS Numerical Control Society (USA).

NC system See numerical control.

NC value See noise-criteria value.

ND Earlier designation for nominal pressure according to DIN. Now designated by PN. See under nominal pressure.

NEA Nuclear Energy Agency (part of OECD).

neap tide Tide of small amplitude occurring twice during a lunar month, near the time of quadrature of the moon with the sun i.e. when the resultant tractive force acting upon the earth is at a minimum.

near field The acoustic radiation field close to the speaker or some other acoustic source.

near field diffraction pattern, Fresnel diffraction pattern (optical communication) The diffraction pattern observed in the near field region.

near field region (optical communication) The region close to a source, or aperture where the radiation pattern varies with distance from the source.

near field scanning (optical communication) The technique for measuring the refractive index profile of an optical fiber by illuminating the entrance face with an extended source and measuring the point-by-point radiance of the exit face.

NEC In the United States most electrical installation practices are based either directly or indirectly on the National Electrical Code (NEC). Although states, mu-

nicipalities, or insurance companies may have their own codes for electrical installation, they are frequently based on NEC requirements.

NECS National Electrical Code Standards.

NEEB North Eastern Electricity Board (UK).

needle coke A form of petroleum coke that gets its name from its microscopic, elongated, crystalline structure. Needle coke is of a higher quality than the more ordinary sponge coke.

needle valve A valve used on small, high-pressure piping where accurate control of small amounts of liquid or gas is desired.

NEF National Extra Fine. Same as UNEF (thread).

neg Negative.

negate To perform the operation of negation.

negation, NOT operation The monadic Boolean operation whose result has the Boolean value opposite to that of the operand. See also table of Boolean operations in ISO publication 2382/11.

negative acknowledgement, NAK In binary synchronous communications, a line control character sent by a receiving terminal to indicate that an error was encountered in the previous block and that the receiving terminal is ready to accept another transmission of the erroneous block.

negative charge A condition in a circuit when the element in question retains more than its normal quantity of electrons.

negative conductance The conductance of a negative – resistance device.

negative conductor A conductor connected to the negative terminal of a source of supply. Such a conductor is frequently used as an auxiliary return circuit in a system of electric traction.

negative feedback Automatic control systems embody the principle of negative feedback, in which the measured value is subtracted from the reference value. Correcting action is taken, depending on the magnitude of the error and whether or not the measured value is less or greater than the desired figure, i.e., if the error is positive or negative.

negative-feedback amplifier An amplifier in which negative feedback is employed to improve the stability or frequency response, or both.

NEITHER-NOR operation, non-disjunction, NOR operation The dyadic Boolean operation whose result has the Boolean value 1 if and only if each operand has the Boolean value 0. See also table of Boolean operations in ISO publication 2382/11.

NEMA National Electrical Manufacturer's Association (USA). An industry association which standardizes specifications for cables, wires and electrical equipment.

NEMA standards Consensus standards for electrical equipment approved by the majority of the members of the National Electrical Manufacturer's Association (NEMA) (USA).

NEN Prefix to standards issued by NNI (Netherlands).

neoprene A rubber-like product derived from petroleum and compounded with natural rubber to produce a substance highly resistant to chemicals and oils. Often used as liner material for butterfly valves.

NEPA National Environment Policy Act (USA).

neper Also called napier. The fundamental division of a logarithmic scale for expressing the ratio between two currents, or voltages. The number of nepers denoting such a ratio is the natural (Napierian) logarithm of this ratio. One neper equals 0.8686 bels or 8.686 decibels.

nephelometer The nephelometer is a turbidimeter that measures the right-angle light scatter by a fluid

and, thus, is highly sensitive to low turbidities. Zero signal at zero turbidity. Output signal increases with increasing turbidity.

nephelometry The application of photometry to the measurement of the concentration of very dilute suspensions.

nephometer A general term for instruments that measure the degree of cloudiness.

Nernst-Ettinghausen effect A thermoelectric effect describing the combined effects of temperature, applied current, and magnetic fields on the voltage produced in thermocouple circuits.

NESC National Electrical Safety Code (USA).

nest (software) **1.** To incorporate a structure or structures of some kind into a structure of the same kind. Example: To nest one loop (the nested loop) within another loop (the nesting loop). **2.** To place subroutines or data in other subroutines or data at a different hierarchical level so that subroutines can be executed as recursive subroutines or so that the data can be accessed recursively.

nested subroutine In a computer program the subroutine called within another subroutine.

net oil analyzer A well testing installation that separates the oil flow and water content of individual wells on a lease. The analyzer automatically determines net oil and net water in a liquid stream.

net positive suction head The minimum difference between the static pressure at the inlet to a pump and vapor pressure of the liquid being pumped. Below that pressure, fluid is not forced far enough into the pump inlet to be acted upon by the impeller.

network **1.** An arrangement of nodes and interconnecting branches. **2.** For programmable controller systems, a maximal interconnected group of graphical elements of a ladder diagram program excluding the left and right power rails.

network analog The expression and solution of a mathematical relationship between variables through the use of a circuit or circuits to represent those variables.

network analysis (network) The derivation of the electrical properties, given its configuration and element values.

network analyzer **1.** A group of electric-current elements which can readily be connected to form models of electric networks. **2.** Also called network calculator. An analog device designed primarily for simulating electrical networks. **3.** An instrument that evaluates the impedance characteristics of linear networks over a range of frequencies.

network architecture The logical structure and operating principles of a computer network. Note: The operating principles of a network include those of services, functions, and protocols.

network calculator An analog device designed primarily for simulating electric networks.

network capacity Network capacity can be measured in the maximum number of bits transmitted on the network in a second.

network constant Any one of the resistance, inductance, mutual inductance or capacitance values in a circuit or network. When these values are constant, the network is said to be linear.

network filter A transducer for separating waves on the basis of their frequency.

networking Consists of software/hardware in combination systematically linking a number of devices (computers, workstations, printers) into a network (system) for the purpose of sharing resources.

network interface module, NIM In Honeywell TDC 3000 control systems, a Local Control Network module that provides the interface between the Local Control Network and the Universal Control Network.

network management The facility by which network communication and devices are monitored and controlled.

network management, NMT (token ring access method) The conceptual control element of a station which interfaces with all the layers of the station and is responsible for the setting and resetting of control parameters, obtaining reports of error conditions, and determining if the station should be connected to or disconnected from the medium.

network map System diagram showing a network on a map, for example generating and transforming stations and power lines, telecommunication equipment and transmission lines.

network structure A type of alloy microstructure in which one phase occurs predominantly at grain boundaries, enveloping grains of second phase.

network transfer function A frequency – dependent function, the value of which is the ratio of the output to the input voltage.

neural network, neural net, artificial neural network A network of primitive processing elements connected by weighted links with adjustable weights, in which each element produces a value by applying a non-linear function to its input values, and transmits it to other elements or presents it as an output. Notes: **1.** Neural networks are modeled on the functioning of neurons in the nervous system. **2.** The non-linear function is usually a threshold function.

neutral atmosphere An atmosphere which tends neither to oxidize nor reduce immersed materials.

neutral filter A light-beam filter which exhibits constant transmittance at all wavelengths within a specified range.

neutral ground A ground connection to the neutral point or points of a circuit, transformer, rotating machine or system.

neutralization value Measure of the acidity and basicity of a fluid. It is expressed as an equivalent of an acid or alkali required to neutralize the fluid.

neutral phase Initial and ultimate phase of a cycle.

neutral point **1.** Point on the titration curve where the hydrogen ion concentration equals the hydroxyl ion concentration. **2.** The point which has the same potential as the point of junction of a group of equal nonreactive resistances connected at their free ends to the appropriate main terminals or lines of the system.

neutral relay Also called a nonpolarized relay. A relay in which the armature movement does not depend on the direction of the current in the controlling circuit.

neutral sulphite cooking liquor Cooking liquor for the manufacture of neutral sulphite pulp.

neutral sulphite pulp, NSSC-pulp Semi-chemical pulp manufactured by cooking with a neutral sulphite solution.

neutral zone **1.** In a positive-negative three-step action, domain between the two switching values. **2.** For a three step element the range between the two switching values.

neutral zone control Type of control where a change of the controlled variable over a welldefined and adjustable portion of the control range does not cause any change in the manipulated variable.

neutron One of the three elementary particles (the electron and proton are the other two) of an atom. It has approximately the same mass as the hydrogen

atom, but no electric charge. It is one of the constituents of the nucleus (the proton is the other one).

newsprint Unsized paper manufactured mainly from mechanical pulp and intended for daily newspapers and similar printed matter.

Newtonian flow Fluid characteristics adhering to the linear relation between shear stress, viscosity and viscosity distribution.

newtonian fluid (fluid power systems) Fluid having a viscosity that is always independent of the rate of shear.

newton metre See Nm.

Newton, N **1.** That force which, when applied to a body having a mass of one kilogram, gives it an acceleration of one meter per second squared. **2.** Unit for measurement of force (SI unit). Do not confuse force and mass. Previously, the unit for mass, kg or lb, was often also used for force. In fact, the weight of the mass unit was meant – more properly written as kgf (in some countries, kp) or lbf. Weight is a force. Do not express a force as the weight of a certain mass. Example: write “the force of 500 N”, not “the weight of 50 kg”. In some cases, load may be expressed as a mass (for example, the maximum load of a crane). 1 kilogram force, kgf (or kilopond, kp) = 9,81 N. 1 pound force, 1 bf = 4,45 N.

nexus A connection or interconnection.

nF Nanofarad (SI unit).

NFPA National Fire protection Association (USA).

NGL Natural Gas Liquid.

nH Nanohenry.

Ni Chemical symbol for nickel.

nibble A word with four bits, or half a byte.

nibbling Contour cutting of sheet metal by a rapidly reciprocating punch which makes numerous, successive small cuts.

NICEIC National Inspection Council for Electrical Installations (UK).

Nichols plot A diagram showing gain and phase angle contours of the closed loop transfer function plotted in the rectangular coordinates of logarithmic gain and phase angle of the open transfer function.

nickel A metal that offers combination of corrosion resistance, formability and tough physical properties.

nickel – 10 percent chromium versus copper-nickel Material identification for type E thermocouple and extension wire. See ISA publication ANSI-MC 96.1-1982 and IEC publications 584-1, 584-2.

nickel – 10 percent chromium versus nickel – 5 percent (aluminium, silicon) Material identification for type K thermocouple and extension wire. See ISA publication ANSI-MC 96.1-1982 and/or IEC publications 584-1, 584-2.

nickel-cadmium cell The most widely used rechargeable sealed cell, nickel-cadmium gives a flat voltage discharge characteristic, nominal cell voltage of 1,25 volts, and good low-temperature operation.

nicrosil/nisil An alternative base-metal thermocouple developed to compete with type K (chromel/alumel). Nicrosil/Nisil differs from the chromel/alumel thermocouple mainly in the chromium content of the wires; it contains 15,5% chromium in the nicrosil leg instead of 9,3% chromium found in chromel. It also differs in minor element composition.

nines complement A base-minus-ones complement with a base of ten.

NIOSH National Institute for Occupational Safety and Health (USA).

nip (textile term) The line of contact between two squeeze rolls in a padder or at the exit of an immersion device such as a wash box.

Ni-Resist Tradename of International Nickel Company.

nit **1.** In a computer, a choice among events that are equally probable. One nit equals 1,44 bits. **2.** The unit of luminance equal to one candela per square meter.

nitriding Raising of the nitrogen content; in heat-treating practice usually the diffusion of nitrogen into the surface as part of surface hardening.

nitrification The oxidation of ammonium salts by bacteria. Usually, the end product of such an oxidation is nitrate.

nitrile rubber seal Material composed of copolymers of butadiene and acrylonitrile (resistance to petroleum base fluids varies according to the acrylonitrile content of the polymer).

nitrogen balance See mass balance.

nitrogen oxide NO_x compounds (NO, NO₂, N₂O₄) are formed as combustion products of fossil fuels and have a critical role in the formation of ozone in the atmosphere. They are also believed to have a catalytic effect on corrosion of base metals by chlorides and sulphides. In the presence of moisture, these gases form nitric acid which, in turn, attacks most common metals. (Extracted from IEC 654-4 Operating conditions for industrial-process measurement and control equipment, Part 4: Corrosive and erosive influences.)

nixie tube A glow tube which converts a combination of electrical pulses including binary numbers, as a pattern of pulses, into visual numbers.

n-level address An indirect address that specifies n level of addressing.

n-level logic Pertaining to a collection of gates so connected that not more than n gates appear in series.

Nm Symbol for newton metre, unit for moment of force (SI unit). Do not confuse the unit Nm for moment of force and the unit for energy, J, which also can be written N · m.

NMOS N-channel Silicon Gate MOS, the workhorse for VLSI memories.

NMR **1.** See normal mode rejection. **2.** Nuclear Magnetic Resonance.

NMRR Normal Mode Rejection Ratio.

NMTBA National Machine Tool Builders Association (USA).

NNI Netherlands Standards Institution.

NO Normally Open (contacts, relays etc.).

no-bit The absence of a bit, pulse or data.

noble Chemically inert. A term often used to describe metals such as gold, platinum, etc.

noble gas Also called inert gas or rare gas. One of the chemically inert gases, including helium, neon, argon, krypton and xenon.

noble metal (catalyst) A metal used in petroleum refining processes that is chemically inactive with respect to oxygen.

noble metal thermocouple A thermocouple whose elements are made of platinum (Pt) or platinum-rhodium (Pt-Rh alloys), and that resist oxidation and corrosion at temperatures up to about 1 550°C (2 800°F), three standard alloy pairs are in common use – Pt vs Pt – 10% Rh, Pt vs Pt – 13% Rh vs Pt – 30% Rh.

node **1.** In a data network, a point where one or more functional units interconnect channels or data circuits. **2.** The representation of a state or an event by means of a point on a diagram. **3.** In Honeywell TDC 3000 control systems, the individual components connected to the Local Control Network and Universal Control Network are called nodes, and sometimes modules.

nodular iron See ductile iron.

nodular-iron casting (kind of iron castings) Nodular iron, also called ductile iron and spheroidal

graphite iron. Castings of this kind have relatively high strength and better ductility than ordinary gray iron.

nodulizing In this agglomerating process, fine iron-bearing materials moving through a rotary kiln are formed into nodules or lumps by the rolling of the charge heated to incipient fusion temperature. The process is now of very little importance due to the developments in sintering and pelletizing.

noise 1. Unwanted disturbances superimposed upon a signal that tend to obscure its information content. Note: Noise may be expressed in units of the output or as a percentage of output span. **2.** Loosely any disturbance tending to interfere with the normal operation of a device or system.

noise (control valves) Control valve noise can be caused by: **1.** Turbulent flow of liquid. **2.** Aerodynamic flow. **3.** Liquid cavitation flow. **4.** Mechanical vibration. See further ISA handbook of control valves related to this subject. See also under sound power (level) and sound pressure level.

noise analyzer An instrument used for determining the amplitude versus frequency characteristics of noise.

noise-criteria value A measure of background noise; it is a single overall value determined from the greatest level of sound pressure of several individual frequency bands. Sometimes values are stated for each band. Also called NC value.

noise-current generator A current generator in which the output is a random function of time.

noise digit A digit, usually zero, produced during the normalizing of a floating point number, and inserted during a left shift operation into the fixed point part.

noise figure A calculated or measured mathematical figure that denotes the inherent noise in a unit, system or link.

noise generator In an analog computer, a computing element used purposely to introduce noise of specified amplitude distribution, spectral density, or root-mean square value, or appropriate combination therefore into other computing elements.

noise level 1. The strength of extraneous audible sounds at a given location. **2.** The strength of extraneous signals in a circuit. Noise level is referred to a specified base and usually measured in decibels. **3.** A volume of noise energy, specified as so many decibels above a reference level.

noise levels (control valves) The sound pressure level to be expected at a point adjacent to an individual control valve when operating under specified conditions of pressure and temperature shall be determined using the procedure given in IEC publication 534-8-3 for compressible fluids and IEC publication 534-8-4 for incompressible fluids.

noise limiter A circuit that cuts off all noise peaks stronger than the highest peak in the received signal.

noise peak A spurious signal of short duration that occurs during reproduction of magnetic tape, of a magnitude considerably in excess of the average peak value of the ordinary system noise.

noise predictions (control valves) Pertaining to prediction of noise generated by aerodynamic and liquid flow through control valves see IEC publication 534-8-3 and IEC publication 534-8-4 respectively. For laboratory measurement of noise generated by aerodynamic and liquid flow through control valves see IEC publication 534-8-1 and IEC publication 534-8-2 respectively. See also ISA publication S 75.17. Concawe report no 87/58 describes: Test method for the

measurement of noise emitted by pipes in the petroleum and petrochemical industries.

noise quantization Inherent noise that results from the quantization process.

noise ratio, NR The ratio of the available noise power of the output of a circuit divided by the noise power at the input.

no-load break connector A connector designed to be separated and engaged on de-energized circuits.

no-load control flow (fluid power systems) Flow through the valve control ports when there is zero load pressure drop.

nominal pressure, PN A numerical designation which is a convenient round number for reference purposes. All equipment of the same nominal size (DN) designated by the same PN number shall have compatible mating dimensions. Notes: **1.** The maximum allowable working pressure depends upon materials, design and working temperatures and should be selected from the pressure/temperature rating tables in the appropriate standards. **2.** It is designated by PN followed by the appropriate reference number from the following series: 2, 5, 6, 10, 16, 20, 25, 40, 50, 100, 150, 250, 420. **3.** The PN ratings are based on recommendations of the ISO. PN 2.5, 6, 10, 16, 25 and 40 ratings are based on the flange system designated in ISO standard 2084. PN 20, 50, 100, 150, 250 and 420 ratings are based on the flange system designated in ISO standard 2229 (see IEC publication 534-5). **4.** The definition of nominal pressure is in accordance with ISO standard 7268.

nominal range For each scale range, the set of values of the measurand for which a measuring instrument gives values within that scale range at a particular setting of its controls. Note: The nominal range is expressed in units of the measurand, regardless of the units market on the scale, and is normally stated in terms of its lower and upper limits, for example 100°C to 200°C. Where the lower limit is zero, the nominal range is commonly stated solely in terms of its upper limit, for example a nominal range of 0 V to 100 V is expressed a "100 V".

nominal size (DN) (control valves) A numerical designation of size which is common to all components in a piping system other than components designated by outside diameters or by thread size. It is a convenient round number (corresponding approximately to the internal diameter of the connection to the pipework expressed in millimeters) for reference purposes and is only loosely related to manufacturing dimensions. Notes: **1.** It is designated by DN followed by a number from the following series 10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, etc. **2.** The nominal size DN cannot be subject to measurement and shall not be used for purposes of calculation. **3.** Some older international standards refer to nominal size as nominal diameter. **4.** The definition of nominal size is in accordance with ISO Standard 6708.

nominal value A value used to designate a characteristic of a device or to give a guide to its intended use. Note: The nominal value may be a rounded value of the characteristic concerned and is often an approximate value of the quantity realized by a standard.

nominal testing Standard of performance established for the testing of both quantitative and qualitative system performance.

nomogram A computational aid consisting of two or more scales drawn and arranged so that the results may be found by the linear connection of points on them. Also called an alignment chart.

nomograph A device used by engineers and scientists for making rapid calculations; a graph that enables one, with the aid of a straightedge, to find the value of a dependent variable when the values of two or more independent variables are given.

nonalkaline (permanent) hardness (water quality) That hardness not removed by boiling; it is caused mainly by the presence of the sulphates, chlorides and nitrates of calcium and magnesium.

nonalloy steel See carbon steel.

nonarithmetical shift A shift in which the digits dropped off at one end of a word are returned at the other in a circular fashion.

nonautomatic Action requiring personal intervention for its control. As applied to an electric controller, nonautomatic control does not necessarily imply a manual controller, but only that personal intervention is necessary.

nonblackbody A term used to describe the thermal emittance of real objects, which emit less radiation than blackbodies at the same temperature, and which may reflect radiant energy from other sources, and which may have their emitted radiation modified by passing through the medium between the body and a temperature-measuring instrument.

noncoherent radiation Radiation in which the waves are out of phase with respect to space and/or time.

noncombustible See nonflammable.

noncondensable gas The portion of a gas mixture (such as vapor from a chemical processing unit or exhaust steam from a turbine) that is not easily condensed by cooling. It normally consists of elements or compounds that have very low, often subzero, boiling points and vapor pressures.

nonconformity (quality) The nonfulfilment of specified requirements. Notes: 1. The definition covers the departure or absence of one or more quality characteristics or quality system elements from specified requirements. 2. The basic difference between "nonconformity" and "defect" is that specified requirements may differ from the requirements for the intended use. See also "defect". Definitions according to ISO 8402.

nonconjunction, NAND operation, NOT-BOTH operation The dyadic Boolean operation whose result has the Boolean value 0 if and only if each operand has the Boolean value 1. See also table in ISO publication 2382/11.

noncontacting tachometer Any of several devices for measuring rotational speed without physical contact between a sensor and the rotating element – for example, stroboscopes or eddy – current tachometers.

noncontiguous allocation An allocation method that assigns physically non-adjacent sectors to a file.

noncorrosive flux A flux that does not contain acid and other substances which might corrode the surfaces being soldered.

non-critical failure A failure which is assessed as not likely to result in injury to persons, significant material damage or other unacceptable consequences.

non-critical fault A fault which is assessed as not likely to result in injury to persons, significant material damage, or other unacceptable consequences.

nondestructive penetrant testing See dye penetrant test.

nondestructive testing Testing of a nature which does not impair the usability of the item.

nondisjunction, NEITHER-NOR operation, NOR operation The dyadic Boolean operation whose result has the Boolean value 1 if and only if each

operand has the Boolean value 0. See also table of Boolean operations in ISO publication 2382/11.

non dispersive infrared gas analyzer, NDIR Gas analyzer in which the absorption of a specific wavelength of IR radiation is measured by radiating broadband IR through the gas and selecting the specified band by using a wavelength selective sensor.

nonequivalence operation, EXCUSIVE-OR operation The dyadic Boolean operation whose result has the Boolean value 1 if and only if the operands have different Boolean values. See also the table of Boolean operations in ISO publication 2382/11.

nonerasable storage A storage device whose information can not be erased during the course of computation.

nonfatal error An error in a computer program that does not substantially affect the progress of the program.

nonferrous metal A metal in which the major constituent is not iron.

nonflammable Also called noncombustible. Term applied to material which will not burn when exposed to flame or elevated temperatures, e.g., asbestos, ceramics and structural metals.

nonhazardous area An area in which explosive gas/air mixtures are not expected to be present so that special precautions for the construction and use of electrical apparatus are not required.

nonhierarchical planning Planning that selects skeleton plans from a predetermined set of plans and instantiates them by means of problem solving operation for a particular problem context.

non-identity operation The Boolean operation whose result has the Boolean value 1 if and only if all the operands do not have the same Boolean value. Note: A non-identity operation on two operands is a nonequivalence operation.

non-identity operation The Boolean operation whose result has the Boolean value 1 if and only if all the operands do not have the same Boolean value. Note: A non-identity operation on two operands is a nonequivalence operation.

nonimpact printing Printing processes in which characters are transferred to paper by means other than physically striking the paper with a key-driven hammer; in nonimpact printing, characters are created by ink jets, thermal devices and lasers.

nonincendive equipment Equipment which in its normal operating condition would not ignite a specific hazardous atmosphere in its most easily ignited concentration.

noninductive Having practically no inductance.

noninductive load A load that has no inductance. It may consist entirely of resistance or capacitance.

noninteracting control A multi-input multi-output control which any given input-output pair is operating independently of any other input-output pair. Note: This does not preclude interaction within the process.

noninterference testing A type of on-line testing that may be carried out during normal operation of the unit under test without affecting the operation.

nonionic surface active agent (water quality) A surface active agent which does not produce ions in an aqueous solution.

nonisolated amplifier An amplifier that has an electrical connection between the signal circuit and another circuit including ground.

nonisolated analog input Analog input channel, of which the terminals are internally electrically connected with other terminals.

nonlinear 1. Having an output that does not rise or fall in direct proportion to the input. **2.** Characteristic of any device in which the output is not related to the input by a simple constant. Not proportional.

nonlinear conversion A conversion for which the quotient of each change in the output to the corresponding change in the input value is not constant. Note: Logarithmic conversion is a typical kind of nonlinear conversion.

nonlinear distortion Distortion that occurs when the output does not rise and fall directly in proportion to the input.

nonlinear feedback control system Feedback control system in which the relationships between the pertinent measures of the system input and output signals cannot be adequately described by linear means.

nonlinear network A network (circuit) not specifiable by linear differential equations with time as the independent variable.

nonlinear parameter A parameter dependent on the magnitude of one or more of the dependent variables or driving forces of the system. Note: Examples of dependent variables are current, voltage, and analog quantities.

nonlinear scale A scale in which each scale spacing is related to the corresponding scale interval by a coefficient of proportionality which is not constant throughout the scale. Note: Some nonlinear scales are given special names such as logarithmic scale, square-law scale.

nonlinear scattering Scattering accompanied by a change of optical radiation from one wavelength to one or more other wavelengths.

nonlinear system Any system whose operation cannot be represented by a finite set of linear differential equations.

nonlocking Pertaining to code extension characters that change the interpretation of one or a specified number of characters. Contrast with locking.

nonlocking key Key or relay which returns to its unoperated condition when the hand is removed, or the current ceases.

nonlubricated teflon (for control valve packing box) Often called shredded teflon is composed of die-formed pure shredded teflon rings with no binder or lubricant.

nonmagnetic Material which is not attracted by a magnet and cannot be magnetized (e.g., paper, plastic, tin, glass). In a strict sense, having a permeability equal to that of air or 1.

nonnegative integer, natural number One of the numbers zero, one, two, ... Note: Some people define natural numbers as starting at one rather than zero.

non-operating time The time interval during which an item is in a non-operating state.

nonpoint source, diffuse source A source of pollution of surface or groundwaters which does not arise from a single point but rather in a widespread manner, for example leaching from the land.

nonpolar crystals Crystals having the property that each lattice point is identical.

nonprocedural programming language A computer programming language used to express the parameters of a problem rather than the steps in a solution.

nonprocessor request The system for accomplishing data transfers between two devices without involving the CPU.

nonreclosing pressure relief device A nonreclosing pressure relief device is a pressure relief device designed to remain open after operation. A manual resetting means may be provided.

non-relevant failure A failure that should be excluded in interpreting test or operational results or in calculating the value of a reliability performance measure. Note: The criteria for the exclusion should be stated.

nonrepetitive peak line voltage (thyristor) The highest instantaneous value of any nonrepetitive transient line voltage.

nonrepetitive peak OFF-state voltage (thyristor) The maximum instantaneous value of any nonrepetitive transient OFF-state voltage that occurs across the thyristor.

nonrepetitive transient reverse voltage (reverse-blocking thyristor) The maximum instantaneous value of any unreplicative transient reverse voltage that occurs across a thyristor.

nonreset timer A timer which cannot be reset by electrical means.

nonresident routine A routine that does not reside permanently in main memory.

nonresonant line A transmission line with a neutral resonant frequency different from that of the transmitted signal.

non-return-to-reference recording, non-return-to-zero recording, NRZ The magnetic recording of binary characters such that the patterns of magnetization used to represent zeros and ones occupy the whole storage cell, with no part of the cell magnetized to the reference condition.

non-return-to-zero (change) recording, NRZ (C) Non-return-to-reference recording in which the zeros are represented by magnetization to a specified condition, and ones by another condition; the magnetization changes only when the value to be represented changes. Note: The two conditions may be saturation and zero magnetization, but are more commonly saturation in opposite senses.

non-return-to-zero change-on-zeros recording, NRZ-O Non-return-to-zero recording in which the zeros are represented by a change in the condition of magnetization, and the ones are represented by the absence of a change.

non-return-to-zero change on-ones recording, NRZ-1, non-return-to zero (mark) recording, NRZ (M) Non-return-to-reference recording in which the ones are represented by a change in the condition of magnetization, and the zeros are represented by the absence of a change. Note: This method is called "mark recording" because only the one or mark signals are explicitly recorded.

non saturated logic A type of logic circuit in which short delay times are achieved by preventing transistors from saturating.

nonscheduled downtime The idle machine time during which the hardware is being repaired because of failures or unforeseen circumstances other than normal servicing or maintenance time. Usually, it is expressed as a percent of total available time.

non-shorting switch Switch in which the width of the movable contact is less than the distance between contact clips so that one circuit is broken before another is completed.

non simultaneous transmission Transmission in only one direction at a time.

non sinusoidal wave Any wave that is not a sine wave.

nonstorage display Display of nonstored information in the storage tube without appreciably affecting the stored information.

nonswitched line A connection between a remote terminal and a computer that does not have to be established by dialing.

nonsynchronous Not related in frequency, speed or phase to other quantities in a device or circuit.

nonsynchronous transmission (data transmission) A transmission process so that between any two significant instants in the same group, there is always an integral number of unit intervals. Between two significant instants located in different groups, there is not always an integral number of unit intervals. Note: In data transmission, this group is a block or a character. In telegraphy, this group is a character.

nonthermal radiation The radiation given off by energetic particles not in thermal equilibrium.

nontrip-free circuit breaker A breaker that can be maintained closed by manual override action while a tripping condition persists.

nonventilated enclosure An enclosure so constructed as to provide no intentional circulation of external air through the enclosure.

nonversing A control function that provides for operation in one direction only.

nonvolatile storage A storage device whose contents are not lost when power is cut off. Contrast to volatile storage.

NOR circuit A circuit that has an output only when all inputs are down.

NOR element, NOR gate A gate that performs the Boolean operation of non disjunction.

norm 1. The mean or average. **2.** A customer condition or degree.

normal (state of a superconductor) The state of a superconductor in which it does not exhibit superconductivity. Example: Lead is normal at temperatures above a critical temperature.

normal contact A contact that is closed when the operating unit is in the normal position.

normal depth The depth from the water surface to the bottom grade line of a channel, for uniform flow. Note: It is a function of the geometry, slope and roughness of the channel, and of the rate of discharge.

normal direction flow A flow in a direction from the left to right or top to bottom on a flowchart.

normal distribution The most common frequency distribution in statistics. The probability curve is bell-shaped, and the greatest probability occurs at the arithmetical average (i.e., at the top of the curve). The probability of occurrence of a particular value is shown by the areas between two abscissa values on the curve. See also Gaussian distribution.

normal flow curve (fluid power systems) Locus of the mid-points of the complete cycle flow curve.

normality Concentration units defined as the number of gram-ions of replaceable hydrogen or hydroxyl groups per liter of solution. A shorter notation of gram-equivalents per liter is frequently used.

normalization The transformation of signals to a common basis e.g., adjusting two signals, representing the same spoken word, but differing in loudness, to the same loudness.

(to) normalize (in a floating point representation), (to) standardize To make an adjustment to the fixed point part and the corresponding adjustment to the exponent in a floating-point representation to ensure that the fixed-point part lies within some prescribed range, the real number represented remaining unchanged.

normalized admittance The reciprocal of normalized impedance.

normalized device coordinates (computer graphics) A device coordinate specified in an intermediate coordinate system and normalized to some range, typically 0 to 1. Note: A display image expressed in normalized device coordinates lies in the same relative position on any device space.

normalized form (in a floating point representation), standard form The form taken by a floating-point representation when the fixed-point part lies within some prescribed range, so chosen that any given real number is represented by a unique pair of numerals.

normalized impedance An impedance divided by the characteristic impedance of a waveguide.

normalized transimpedance (magnetic amplifier) The ratio of differential output voltage to the product of differential control current and control winding turns.

normalizing 1. Heat treatment to bring about a double phase transformation whereby a usually fine-grained structure of pearlite and ferrite or of pearlite and cementite is produced. Normalizing can be accompanied by stress relieving. **2.** Heating a ferrous alloy to a suitable temperature above the transformation range (austenitizing), holding at temperature for a suitable time, and then cooling in still air to a temperature substantially below the transformation range.

normal linearity A manner of expressing linearity as the deviation from a straight line in terms of a given percentage of the output at a certain stimulus value, usually the full-scale value.

normally closed, NC Specific pairs of contacts on relays which are open only when the relay coil is energized. Symbolized by NC.

normally closed valve A valve with means provided to move to and/or hold in its closed position without actuator energy supply. See fail-safe.

normally high A device in which the output is high in voltage in the rest condition.

normally low A device in which the output is low in voltage in the rest condition.

normally open, NO Designation applied to the contacts of a switch or relay when they are connected so that the circuit will be broken when the switch is not activated or the relay coil is not energized. Symbolized by NO.

normally open valve A valve with means provided to move to and/or hold in its wide-open position without actuator energy supply. See fail-open.

normal mode The expected or usual operating conditions, such as the voltage that occurs between the two input terminals of an amplifier.

normal mode interference A form of interference which appears between measuring circuit terminals.

normal mode rejection 1. The ability of a circuit to discriminate against a normal mode voltage, usually expressed as a ratio or in decibels. **2.** The capability of an amplifier to suppress the effect of the normal mode voltage.

normal mode voltage 1. A voltage induced across the input terminals of a device. **2.** That unwanted part of the voltage, between the two input connection points of an amplifier, that is added to the voltage of the original signal.

normal operating conditions The range of operating conditions within which a device is designed to operate within specified accuracy limits.

normal operating state (automatic operation) (industrial robots) The robot state in which the robot is performing its programmed tasks through continuous program execution without fault.

normal stress For measurement of normal stress in SI units see under pascal.

normal velocity distribution The distribution of velocities peculiar to the flow in a channel over a long uniform straight reach. Pertains to liquid flow measurement in open channels.

NOR operation, non-disjunction, NEITHER-NOR operation The dyadic Boolean operation whose result has the Boolean value 1 if and only if each operand has the Boolean value 0. See also table of Boolean operations in ISO publication 2382/11.

(Det) Norske Veritas Norwegian classification society. Approval certification body for equipment intended for installation on board ships.

NOT A logic operator having the property that if P is a statement, then the NOT of P is true if P is false, false if P is true.

NOT-AND Same as NAND.

notation 1. The act, process, or method of representing facts or quantities by a system or set of marks, signs, figures, or characters. **2.** A system of such symbols or abbreviations used to express technical facts or quantities, as mathematical notation. **3.** An annotation; note. **4.** See positional notation.

NOT-BOTH operation, NAND operation, non-conjunction The dyadic Boolean operation whose result has the Boolean value 0 if and only if each operand has the Boolean value 1. See also table of Boolean operations in ISO publication 2382/11.

notch 1. On a graph (a graph of frequency response, in particular), a point where a curve dips sharply and returns equally sharply to its original value. **2.** A thin-plate weir of any defined shape producing side contractions. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983. Pertains to liquid flow measurement in open channels.

notch filter A band-elimination filter used to prevent the passage of specific frequencies.

notching A term indicating that a predetermined number of separate impulses is required to complete operation of a relay.

NOT circuit A binary circuit with a single output that is always the opposite of the single input. Also called inverter circuit.

note, comment, computer program annotation, remark A description, reference or explanation, added to or interspersed among the statements of the source language, that has no effect in the target language.

NOT element, NOT gate A gate that performs the Boolean operation of negation.

NOT-IF-THEN element, NOT-IF-THEN gate A gate that performs the Boolean operation exclusion.

NOT-IF-THEN operation, exclusion, AND-NOT operation The dyadic Boolean operation whose result has the Boolean value 1 if and only if the first operand has the Boolean value 1 and the second has the Boolean value 0. See also table of Boolean operations in ISO publication 2382/11.

NOT majority A logic function in which the output is false if more than one half the number of inputs are true; otherwise the output is true.

NOT operation, negation The monadic Boolean operation whose result has the Boolean value opposite to that of the operand. See also table of Boolean operations in ISO publication 2382/11.

NOVRAM Nonvolatile random-access memory (one type of nonvolatile semiconductor computer memory).

noys A measure of perceived noisiness; the noys scale is linear.

nozzle Convergent device having curved profile without discontinuities which may blend into a cylindrical throat. Pertains to measurement of fluid flow in closed conduits.

nozzle area, nozzle throat area See bore area.

nozzle efficiency The efficiency of a nozzle in converting potential energy to kinetic, commonly expressed as the ratio of actual to ideal change in kinetic energy of a specified pressure ratio.

nozzle/flapper A fundamental part of pneumatic signal processing and pneumatic control operations. Basically, the device converts a displacement of the flapper to a pressure signal.

NP National Pipe (thread).

n-plus-one address instruction An instruction that contains n+1 address parts, the "plus-one" address being that of the instruction that is to be executed next unless otherwise specified.

NPO A commonly used code that is synonymous with EIA code COG.

NPT National Pipe Taper (thread).

NRC 1. National Research Council (USA). **2.** Nuclear Regulatory Commission (USA).

NR-element Negative Resistant element.

NRZ See non-return-to-reference recording.

NRZ(C) See non-return-to-zero (change) recording.

NRZ(M) See non-return-to zero mark recording.

NRZ-1 See non-return-to-zero change on-ones recording.

NRZI Non Return to Zero Inverted. A recording technique using only negative and positive magnetic saturation states.

NRZL Non Return to Zero Level.

NRZ-O See non-return-to-zero-change on-zeros recording.

ns Nanosecond (SI unit).

NS National Standard.

NSA Netherlands Society for Automation.

NSC process A shaft-furnace direct reduction process developed by the Nippon Steel Corporation (NSC).

NSEIP Norwegian Society for Electronic Information Processing.

NSHEB North of Scotland Hydro-Electric Board.

NSIA National Security Industrial Association (USA).

NSS Navy Secondary Standards (USA).

NSSC-pulp See neutral sulphite pulp.

NTC thermistors See thermistor.

N-type Various semiconductor crystals doped to provide excess electrons.

N-type conductivity In a semiconductor, conductivity due to electron movement.

n-type crystal rectifier A crystal rectifier in which forward current flows when the semiconductor is more negative than the metal.

n-type material A crystal of pure semiconductor material to which has been added an impurity (an electron donor such as arsenic or phosphorous) so that its characteristics are altered and electrons serve as the majority charge carriers.

nuclear fluorescence thickness gage A device for determining the weight of an applied coating by exciting the coated material with gamma rays and measuring low-energy fluorescent radiation that results.

nuclear magnetic resonance NMR analyzers can be used to determine the moisture content of materials.

nuclear magnetic resonance flow meters NMR flowmeters utilize a tagging technique (see tagging) by which the marker's fluid nuclei are magnetized and

subsequently traced between two stations a known distance apart.

nuclear radiation absorption sensor (for moisture measurement) Nuclear radiation absorption depends on the retarding effect of the hydrogen atoms in water on the speed of the neutrons to sense the moisture. Since the flow of neutrons from source to detector is also retarded by the mass of the material, simultaneous density measurement must be made and used as compensation. The sensor will typically consist of a high-energy neutron source and a detector to measure moisture, plus a gamma ray source and a detector for the density measurement.

nucleon Generic term for a neutron or proton.

nucleonics The application of nuclear science in physics, chemistry, astronomy, biology, industry and other fields.

nucleus counter An instrument that measures the number of condensation or ice nuclei in a sample volume of air.

nucleus, resident control program That part of a control program that is resident in main storage.

nuclide A species of atom characterized by a unique combination of charge, mass number and quantum state of its nucleus.

nude contact A contact with a locking member that remains in the insert at all times.

nude vacuum gage A hot-filament ionization gage mounted entirely within the vacuum system whose pressure is being measured.

null 1. A condition such as of balance, which results in a minimum absolute value of output. **2.** In a computer, a lack of information as opposed to a zero or blank for the presence of no information. **3.** In fluid power systems, this relates to geometric null which is the zero control flow at zero load pressure drop.

null balance A condition in which two or more signals are summed and produce a result that is essentially zero.

null balance system A system in which the input is measured by producing a null with a calibrated balancing voltage or current.

null bias (fluid power systems) Input signal required to bring the valve to null, excluding the effects of valve hysteresis, expressed as percent of rated signal.

null character, NUL A control character that serves to accomplish media fill or time fill. Null characters may be inserted into or removed from, a sequence of characters without affecting the meaning of the sequence, but control of equipment or the format may be affected.

null character string Same as null string.

null cycle The time necessary to cycle through a program without introducing data. This establishes the lower bound for program processing time.

null indicator A device that indicates when current, voltage or power is zero.

null instruction One which performs no action during the operation of a program.

null (quiescent) leakage (fluid power systems) Total internal leakage from the valve in the null (quiescent) position.

null method of measurement A method of measurement in which the value of the measurand is determined by balancing, adjusting one or more quantities, of known values, to which the measurand has a known relationship at balance. Note: The measurand and the adjusted quantities may be of different kinds. Example: Measurement of an electrical impedance by means of a bridge circuit and a null detector.

null pressure (fluid power systems) Equalized pressure existing at both control ports at null.

null region (fluid power systems) Region about null where the flow gain is effected by parameters such as lap and internal leakage.

null set, empty set A set that has no element.

null shift (fluid power systems) Change in null bias expressed as a percentage of rated signal. Null shift may occur with changes in supply pressure, temperature and other operating conditions.

null string A string that contains no element.

null suppression The bypassing of all null characters in order to reduce the amount of data to be transmitted. Same as data compaction.

null triggering, zero crossing triggering (thyristor) A method of triggering the controller circuit elements such that the associated angle of retard is zero.

number 1. A mathematical entity that may indicate quantity or amounts of units. **2.** Loosely, a numeral. **3.** See binary number and random numbers.

number crunching The act of performing complex numerical operations.

number representation A representation of a number in a numeration system.

number representation system, numeration system, numeral system Any notation for the representation of numbers.

numeral A discrete representation of a number.

numeration Same as number representation.

numerator In a fraction, the number which is understood to be divided by the other.

numerical analysis The study of methods of obtaining useful quantitative solutions to mathematical problems, regardless of whether an analytic solution exists or not, and the study of the errors and bounds on errors in obtaining such solutions.

numerical control, NC Automatic control of a process performed by a device that makes use of numeric data usually introduced while the operation is in progress. Note: The term numerical control is commonly used in machine tool applications.

numerical data Data expressed in terms of a set of numbers or symbols that can assume only discrete values or configurations.

numerical, numeric Pertaining to data that consist of numerals.

numerical reliability (software) The probability that an item will perform a required function under stated conditions for a stated period of time.

numeric character, digit A character that represents a non negative integer. Example: One of the characters 0 through F in the hexadecimal numeration system.

numeric character set A character set that contains digits and may contain control characters, and special characters, but normally not letters.

numeric code A code whose application results in a code element set whose elements are formed from an numeric character set.

numeric coded set A coded set whose elements are formed from an numeric character set.

numeric control See numerical control.

numeric data Data represented by numerals.

numeric representation A discrete representation of data by numerals.

numeric word A word that consists of digits and possibly space characters and special characters. Example: In the Universal Decimal Classification, the numeric word 61 (03) = 20 is used to identify any medical encyclopedia in English.

nutating disc flowmeter A device which measures the volumetric flow of liquid through a chamber by counting the number of nutations of a disc housed in the chamber. Liquid flow through the chamber moves the disc with a nutating motion, and each cycle of the disc motion displaces a fixed volume of liquid.

nutatation Rocking back and forth, or periodically repeating a circular, elliptical, conical or spiral path, usually involving relatively small degrees of motion.

nutrient removal Biological, physical and chemical processes used in water and waste-water treatment specifically for the removal of compounds of nitrogen and phosphorus.

nV Nanovolt (SI unit).

NVRAM Non Volatile RAM.

NW Earlier designation for nominal size according to DIN standard. Now DN. See nominal size.

nW Nanowatt (SI unit).

NWEB North Western Electricity Board.

NWG National Wire Gage.

nybble Also nibble. Half a byte (4 bits). Bcd data packed into nybbles.

nylon A plastics material used to make filaments, fibers, fabric, sheet and extrusions; a generic name for a

type of long-chain polymer containing recurring amide groups within the main chain.

nylon ribbon hygrometer method A direct reading measurement of relative humidity where the hygroscopic element is a preconditioned nylon unit which responds to a change in relative humidity by a change in length. A suitable linkage connects the element to a recording and/or indicating instrument.

Nyquist frequency One-half of the sampling frequency in a sampled data system.

Nyquist interval A special interval of time occupied by each code element when a communication channel is being used at the Nyquist rate.

Nyquist limit (or rate) Maximum rate of transmitting pulse signals through a system. If B is the effective bandwidth in hertz (Hz), then 2 B is the maximum number of code elements (bands) per second which can be received with certainty, 1/2 B is known as the Nyquist interval.

Nyquist plot Frequency response locus of the open loop.

Nyquist rate See Nyquist limit.

Nyquist theorem See sampling theorem.

NZSI New Zealand Standards Institute. Now SANZ.

O

O Chemical symbol for oxygen.

object An energy or information sink within a system.

object The expert systems equivalent of a record. In a case frame-knowledge representation it is a case frame. In a semantic net-knowledge representation it is a node.

object (in artificial intelligence) A physical or conceptual entity that may have one or more attributes. Note: An object is usually associated with other stored objects by means of symbolic inferences or relations.

object code Output from a compiler or assembler, which is itself executable machine code or is suitable for processing to produce executable machine code.

objective evidence Any statement of fact, information, or record, either quantity of an item or service based on observations, measurements, or tests which can be verified.

objective variable A quantity or condition that is not measured directly for the purpose of controlling it, but rather is controlled through its relation to another, controlled variable.

object language, target language A language into which statements are translated.

object machine The computer on which the object program is to be executed. Same as target computer.

object module A program unit that is the output of an assembler or a compiler and that is suitable for input to a linkage editor.

object-oriented programming Programming that focuses on individual program units (objects) consisting of instruction and data rather than on procedures.

object program, target program A computer program in a target language that has been translated from a source language.

object time system The collection of modules called by the compiled code to perform various utility or supervisory operations; for example, an object time system usually includes I/O and trap-handling routines.

obo vessel A specially designed vessel for carrying ore and crude.

observability The property that its initial state may be calculated based on the values of the input and output variables during a finite time period.

observable A property of a component of a state whereby its value at a given time can be computed from measurements on the output over a finite interval.

observation oscilloscope An oscilloscope which is only suitable for the qualitative observations of varying quantities, with unspecified error limits.

observed data Values related to an item or a process obtained by direct observation.

observed failure rate For a stated period in the life of an item, the ratio of the total number of failures in a sample to the cumulative observed time on that sample. The observed failure rate is to be associated with particular and stated time intervals (or summation of intervals) in the life of the items, and with stated conditions.

observed instantaneous availability At a stated instant of time the proportion of occasions when an item can perform a required function.

observed mean active maintenance time The ratio of the sum of the active maintenance times to the

total number of maintenance actions. Note: The maintenance conditions applied shall be stated.

observed mean availability The ratio of the cumulative time for which an item can perform a required function to the cumulative time under observation, or at instants of time (chosen by a sampling technique), the mean of the proportion of a number of nominally identical items which can perform their required function.

observed mean life The mean value of the lengths of observed times to failure of all items in a sample under stated conditions. Note: The criteria for what constitutes a failure shall be stated.

observed mean time between failures For a stated period in the life of an item, the mean value of the length of time between consecutive failures, computed as the ratio of the cumulative observed time to the number of failures, under stated conditions.

observed mean time to failure For a stated period in the life of an item, the ratio of the cumulative time for a sample to the total number of failures in the sample during the period, under stated conditions.

obsolescent Lower in physical or functional value due to changes in technology rather than to deterioration.

obsolete No longer suitable for the intended use because of changes in technology or requirements.

OCR See optical character recognition.

OCR-paper, (optical character recognition paper) Woodfree paper suitable for automatic optical scanning.

octal 1. Characterized by a selection, choice or condition that has eight different values or states. **2.** Of a fixed numeration system, having a radix of eight.

octal debugging technique Also called on-line debugging technique (ODT). A system program designed to help the user debug object programs interactively. All addresses, register and memory location contents are expressed in octal notation. Letters and symbols make up the command set for ODT.

octal digit The symbol 0, 1, 2, 3, 4, 5, 6, or 7 used as a digit in the system of notation which uses 8 as the base or radix.

octal fraction A shorthand expression of the binary contents of a half word.

octal fractional A quantity less than a whole number referenced to a numbering system that has the radix eight.

octal loading program A computer utility program with provision for making changes in programs and tables that are in core memory and drum storage, reading in words that are coded in octal notation on punched cards or tapes.

octal number A number of one or more figures, representing a sum in which the quantity represented by each figure is based on a radix of eight. The figures used are 0, 1, 2, 3, 4, 5, 6, and 7. Clarified by octal.

octal numbering system A numbering system based on powers of eight. See also octal number.

octal tube A tube with a standard eight-pin base.

octane number, octane rating A performance rating of gasoline in terms of antiknock qualities. The higher the octane number, the greater the antiknock quality. The rating is made by matching the fuel in a test engine with a mixture of normal heptane, which detonates very easily and has an octane rating of zero, and iso-octane, which has exceptionally high anti-

knock characteristics and is rated at 100. A fuel knock that matches a mixture of say 60 percent octane and 40 percent heptane would have an octane rating or number of 60.

octave A frequency span whose upper limit is twice its lower limit.

octave band A band of frequencies the limit of which have the ratio 2 to 1.

octave band analyzer A portable sound analyzer which amplifies a microphone signal, feeds it into one of several band-pass filters selected by a switch, and indicates signal amplitude on a logarithmic scale; except for the highest and lowest band, each band spans an octave in frequency.

octave-band pressure level Also called octave pressure level. The pressure level of a sound for the frequency band corresponding to a specified octave.

octave pressure level See octave-band pressure level.

octaves A specific area or array of data segregated from the other area.

octet A group of eight bits treated as a unit.

octet, byte A string that consists of eight bits.

octode A eight-electrode electron tube containing an anode, a cathode, a control electrode and five additional grids.

octonary Same as octal.

octonary signaling A mode of communication in which information is represented by the presence or absence, or plus and minus variations, of eight discrete levels of a parameter of the signaling medium.

ODA Office Document Architecture. An international standard for the interchange of documents that may contain text, graphics, image and data material.

ODBMS Object-Oriented DBMS. A Database Management System that takes the concepts of object-oriented programming and applies them to the management of persistent object on behalf of multiple users, with capabilities for security, integrity, recovery and contention management, while also providing acceptable performance.

odd-even check Same as parity check.

Oden theory The principle of uniformly dispersed sediment system which postulates that the sediment concentration at any level remains constant until the largest particle in suspension will have had time to settle from the surface to the level in question.

ODETTE Organization for Data Exchange by Tele Transmission in Europe.

odorant A chemical compound added to natural gas to produce a detectable, unpleasant odor to alert householders should they have even a small leak in the house piping. Odorant are also used in liquids or gases being stored or transported to detect leaks.

ODT See octal debugging technique.

oe Oersted (ampere per meter).

OECD Organization for Economic Cooperation and Development.

OECD/NEA OECD Nuclear Energy Agency.

OEM Original Equipment Manufacturer, a vendor who purchases basic components and assembles a package for final sale.

Oersted The CGS unit for magnetic field strength; the SI unit, ampere per metre, is preferred.

off Describing the nonoperating state of a device or circuit.

off-delay A circuit that retains an output signal some definite time after the input signal is removed.

off-delay timer 1. A function block delaying a boolean input a specified duration when changing from one

to zero. **2.** A reset timer which is started by the opening of a circuit. Does not reset on power interruption.

off-gas analysis (for oxygen steelmaking processes) This system takes a sample of the off-gas and produces a readout of the carbon level by continuously recomputing the carbon balance. This is achieved by monitoring the carbon monoxide and carbon dioxide contents of the exhaust gases and relating the carbon removal to the carbon level in the charge.

off-ground The voltage above or below ground at which a device is operated.

officially recognized standard A standard referred to in a government decree recognizing its legal use.

off-impedance (thyristor) The differential impedance between the terminals through which the principal current flows, when the thyristor is in the OFF-state at a stated operating point.

off-line cipher Method of encryption which is not associated with a particular transmission system and in which the resulting cryptogram can be transmitted by any means.

off-line equipment The peripheral equipment or devices not in direct communication with the central processing unit of a computer.

off-line memory Any memory medium capable of being stored remotely from the computer, which can be read by the computer when placed into a suitable reading device.

off-line, offline 1. When equipment or devices operate off-line to an industrial process they are associated with this industrial process, but do not act on the process or are not acted upon by this process during the actual time in which the process takes place. **2.** Pertaining to the operation of a functional unit when not under the direct control of the computer.

off-line storage Storage not under control of the central processing unit.

off-line system That kind of system in which human operations are required between the original recording functions and the ultimate dataprocessing function. This includes conversion operations as well as the necessary loading and unloading operations incident to the use of point-to-point or datagathering systems. Compare on-line system.

off-line unit In a computer, the input/output device or auxiliary equipment not under direct control of the central processing unit.

offset 1. The steady-state deviation when the set point is fixed. See also steady-state deviation. Note: The offset resulting from a no-load to a full-load change (or other specified limits) is often called "droop" or "load regulation". **2.** The count value output from an A/D converter resulting from a zero input analog voltage. Used to convert subsequent nonzero measurements. **3.** (Pulse term). The algebraic difference between two specified magnitude reference lines.

offset coefficient Absolute value of the slope of the tangent to a control characteristic at a given point. Note: The offset coefficient and the steady-state deviation are expressed by the same number when the same units are used for the input variable and the controlled variable in both cases.

offset error The analog value by which the transfer function of D/A or A/D converter fails to pass through zero; it is generally specified in millivolts or in percent of full scale.

offshade Deviation in color from that of a reference sample.

off-site-maintenance Maintenance performed at a location different from where the item is used. Note:

An example of off-site maintenance is the repair of a sub-item at a maintenance centre.

off-site maintenance Maintenance performed at a place different from where the item is used. Note: An example is the repair of a sub-item at a maintenance centre.

offsites A general term for facilities built off the immediate site of a refinery, chemical, or processing plant but that are necessary to the efficient operation of the plant. Examples of offsites are tankage, rail spurs, material sheds, fire-water ponds, etc.

OFF-state (thyristor) The condition of a thyristor corresponding to the portion of the principal characteristic between the origin and the breakover point or points.

OFF-state current (thyristor) The principal current when a thyristor is in the OFF-state.

OFF-state voltage (thyristor) The principal voltage when a thyristor is in the OFF-state.

off-system unit (of measurement) A unit of measurement which does not belong to a given system of units. Examples: **a.** The electronvolt is an off-system unit of energy with respect to the SI. **b.** Day, hour, minute are off-system units of time with respect to SI.

off-the-shelf **1.** Production items available from current stock that do not need to be either newly purchased or immediately manufactured. **2.** Computer software equipment used by customers with little or no adaptation, thereby saving them from the time and expense of developing their own software or equipment.

ohm The unit of resistance (and of impedance) in the International System of Units (SI). The ohm is the resistance of a conductor such that a constant current of one ampere in it produces a voltage of one volt between its ends.

Ohm's law The voltage across an element of a dc circuit is equal to the current in amperes through the element, multiplied by the resistance of the element in ohms. Expressed mathematically as $E = IR$.

ohmic contact A purely resistive contact; i.e., one which has a linear voltage-current characteristic throughout its entire operating range.

ohmic resistance Resistance to direct current.

ohmic value The resistance in ohms.

ohmmeter, resistance meter An instrument intended to measure electric resistance.

ohms per volt A sensitivity rating for voltage-measuring instruments.

OHSA Occupational Safety and Health Act (Williams-Steiger Act) (USA).

oil circuit breaker A circuit breaker in which the interruption occurs in oil to suppress the arc and prevent damage to the contacts.

oil filled enclosure (Ex o) A type of protection in which the enclosure of an electrical device is filled with oil in such a way that the electrical parts are sufficiently immersed in oil so that the specified explosive atmosphere above the oil and around the enclosure will not be ignited under normal and specified abnormal operating conditions.

oil gas A combination of cracked petroleum and water gas made by passing oil and steam through hot refractory checker work.

oil hardening Hardening by quenching in oil.

oil immersed Having the coils immersed in an insulating liquid. Note: The insulating liquid is usually (though not necessarily) oil.

oil-in-water emulsion Dispersion of oil in a continuous phase of water.

oil-mist system A lubricating system that pneumatically conveys droplets of a special oil from a central source to the points of application.

oil patch A term referring broadly to the oil field, to areas of exploration, production, and pipelining.

oil proof enclosure An enclosure constructed so that oil vapors, or free oil not under pressure, which may accumulate within the enclosure will not prevent successful operation of or cause damage to, the enclosed equipment.

oil remover Separator which removes oil from compressed air.

oil switch A switch in which the interruption of the circuit occurs in oil to suppress the arc and prevent damage to the contacts.

oil tempering Tempering in oil, usually a mineral or synthetic oil.

oiltight enclosure An enclosure constructed so that oil vapors, or free oil, not under pressure, which may be present in the surrounding atmosphere, cannot enter the enclosure.

OIML Organisation Internationale de Metrologie Legale – International Organisation of Legal Metrology.

olemeter **1.** A device for measuring the specific gravity of oil. **2.** A device for measuring the proportion of oil in a mixture.

oligosaprobic A description of the zone in running water where mineralization is complete. The zone has abundant dissolved oxygen and can support a wide range of plants and animals, primarily photoautotrophic plants and oxygenous animals.

Olsen memory A specific fixed or permanent storage device designed to store coded data in the form of an array of cores and wires. The wiring holds the information rather than the cores.

OM&S Oil Movement and Storage; an overall philosophy for handling oil storage and blending.

ombroscope An instrument for indicating when precipitation occurs. A heated water-sensitive surface is exposed to the weather; when it rains or snows, an electrical or mechanical output trips an alarm or records the occurrence on a time chart.

omission factor In information retrieval (IR), the ratio obtained in dividing the number of nonretrieved relevant documents by the total number of relevant documents in the file. Ideally, the omission factor should be close to zero, as it is a measure of the efficiency of the system.

omnidirectional Also called nondirectional. **1.** All-directional; not favoring any one direction. Having no particular direction of maximum emission or sensitivity. **2.** Responding equally to sounds arriving from any direction. **3.** Emitting sound equally in all directions.

on 1. Said of an electronic element that is conducting current. **2.** Describing the operating state of a device or circuit.

on-call channels Similar to allocated channels except that full-time exclusive use of the channel is not warranted.

on-delay A circuit that produces an output signal some definite time after an input signal is applied.

on-delay timer A function block delaying a Boolean input signal a specified duration when changing from zero to one.

on-demand system A system from which the desired information or service is available at the time of request.

ondograph An instrument for drawing alternating voltage waveform curves.

one-address Single address; a system of machine instruction such that each complete instruction explicitly describes one operation and one storage location.

one-address code See instruction code.

one-address instruction An instruction that contains one address part.

one digit adder A logic element which has two input channels to which signals may be applied, which respect to input digits, the addend and the augend. The two output channels from which the signals may emerge are those which represent the sum and carry digit.

one-fluid cell A cell having the same electrolyte in contact with both electrodes.

one-level address, direct address An address that designates the storage location of an item of data to be treated as an operand.

one-line diagram (single line) A diagram which shows, by means of single lines and graphic symbols, the course of an electric circuit or system of circuits and the component devices or parts used therein.

one-plus-one address instruction An instruction that contains two address parts. The plus-one address being that of the instruction that is to be executed next unless otherwise specified.

one-quadrant multiplier A multiplier in which operation is restricted to a single sign of both input variables.

ones complement A base-minus-ones complement with a base of two.

ones-complement arithmetic A binary arithmetic system in which negative numbers are created by inverting individual bits in the binary representation of the positive number.

one-shot adaptive controllers Adaptive controllers with a means of automatically calculating and adjusting controller coefficients on a one-off basis. This procedure being invoked either automatically at start up or in response to a user action.

one-to-partial-select-ratio In a computer, the ratio of a 1 output to the 0 output.

one-to-zero ratio In a computer, the ratio of a 1 output to the 0 output.

one-way communication Data communication such that data is transferred in one preassigned direction.

one-way fired soaking pit A type of one-way top-fired soaking pit. Instead of the horizontal flow of gases through the pit as in the regenerative type, the flow in this type is vertical in accordance with hydrostatic principles.

one-way restrictor valve (fluid power systems)

Valve which allows free flow in one direction and restricted flow in the other direction. Restricted flow path may be fixed or variable.

one-way trip Mechanism which will allow movement in one direction only of the actuating force.

on-board Feature or circuit which is contained on a motherboard or main PCB.

ON-impedance (thyristor) The differential impedance between the terminals through which the principal current flows, when the thyristor is in the ON state at a stated operating point.

on-line analysis (water quality) A system of automatic analysis in which the sample is taken from the body of water through a probe to the analyzing equipment by means of an appropriate conduit.

on-line computer A computer which is actively monitoring or controlling a process or operation.

on-line data reduction The processing of information as rapidly as information is received by the com-

puting system or as rapidly as it is generated by the source.

on-line debugging The act of debugging a program while time sharing its execution with an on-line process program.

on-line debugging technique See octal debugging technique.

on-line diagnostics The running of diagnostics on a system while it is on-line but off-peak to save time and to take corrective action without closing down the system.

on-line equipment A computer system and the peripheral equipment or devices in the system in which the operation of such equipment is under control of the central processing unit, and in which information reflecting current activity is introduced into the data processing system as soon as it occurs. Thus, directly in-line with the main flow of transaction processing.

on-line implicit calculations Process variables which cannot be measured directly but can be calculated continuously from implicit relationships by relatively simple analog circuits. Calculated quantities, such as composition or the variance of a key variable, are helpful as operator guides or may even be used as inputs to conventional control systems.

on-line memory Any media directly accessible by the computer system. Also see internal storage.

on-line, online 1. When equipment or devices operate on-line to an industrial process, they act upon the industrial process and/or are acted upon by this process in the actual time in which the process takes place. **2.** Pertaining to the operation of a functional unit when under the direct control of the computer. **3.** A programmable controller system is said to be "on-line" when it is in active control of a machine or process.

on-line pluggable equipment (programmable controllers) Equipment which can be plugged or unplugged from the programmable controller system at any time including when the programmable controller system is operating, without disturbing or disrupting the normal operation of the programmable controller system and without any increased risk to the operator and the application.

on-line process gas chromatograph A gas chromatograph able to measure the concentration of one or several components of a chemical mixture repetitively, by regularly sampling the process mixture and transmitting this information for control purposes.

on-line processing 1. A data processing approach where transactions are entered into the computer directly as they occur. **2.** Same as on-line.

on-line system 1. Synonymous with on-line. **2.** A system in which the input data enters the computer directly from the point of origin and/or in which output data is transmitted directly to where it is used. Compare off-line.

on-line testing 1. Testing during production on a manufacturing line, e.g. on a moving paper or board web or on a pumped fluid. On-line testing during production is the opposite of laboratory testing. **2.** Testing of the unit under test in its operational environment.

on-load factor (thyristor) The ratio of the controller ON-state interval to the operating period in the ON-OFF control mode, often expressed as a percentage.

on-off action Two-step action in which one of the steps is assigned the value zero.

on-off air relay (control valves) An on-off air relay may be used in some applications where the maxi-

mum output (20 psig) of the controller is insufficient to operate a diaphragm control valve. The relay applies 35 psig or 0 psig to the diaphragm control valve to open or close the valve. The 35 psig pressure allows the single-seated diaphragm control valve to close against higher line pressure than would be possible with the 20 psig output from the controller.

on-off control A control system in which the controller has only two choices.

on-off control (thyristor) The starting instant may be synchronous or asynchronous with respect to the line voltage. The controller on-state interval is equal to or greater than half a line period.

on-off controller A two position controller of which one of the two discrete values is zero.

on-off control servo-mechanism A discontinuous action servo-mechanism in which the power supply to the servo-motor is taken through either an on-off switch or a reversing switch having a central "off" position. The switch operates at predetermined values of the deviation.

on-off element Two-step element in which one of the two discrete values is assigned the value zero. Note: In practical realization the change in the output variable is associated with a differential gap.

on-off ratio Ratio of the duration (on) of a pulse to the space (off) between successive pulses.

on-off switch See power switch.

on-off test A test conducted by repeatedly switching on and off either the signal, power, or load connected to the unit under test while observing the reaction or performance of some parameter of that unit under test.

on-site maintenance, in situ maintenance, field maintenance Maintenance performed at the premises where the item is used.

on-state (thyristor) The condition of a thyristor corresponding to the low-resistance low-voltage portion of the principal characteristic in the switching quadrant(s).

on-state current (thyristor) The principal current when a thyristor is in the on state.

on-state voltage (thyristor) The principal voltage when a thyristor is in the on state.

on stream Term used for a processing plant, a refinery or pumping station that is operating.

on voltage The voltage with respect to ground or the minus supply at a switch output when it is in the conducting or on state.

opacimeter Also called turbidimeter. A photoelectric instrument for measuring the turbidity (amount of sediment) of a liquid. It does this by determining the amount of light that passes through the liquid.

opacity 1. The degree of nontransparency of a substance i.e., its ability to obstruct, by absorption, the transmission of radiant energy such as light. Opacity is the reciprocal of transmission. 2. The ratio of incident flux to transmitted flux. The inverse of transmission factor. 3. The characteristic of an object that prevents light from passing through.

opacity (paper backing) The ratio of the light flux reflected from a single sheet of paper placed over a black background to that reflected from the same sheet placed over an opaque pad of the paper.

OP amp Operational amplifier.

opaque The optical quality of a substance whereby light cannot pass through it. The meaning is directly opposite to that of transparent. Thus steel is opaque to visible light.

opcode The pattern of bits in an instruction that indicates the addressing mode.

open A condition in which conductors are separated so that current cannot pass.

open action flow Action flow in an open action path of a system or in a closed action path, if the output variable is only influencing the corresponding manipulated variable under certain non permanent conditions.

open action path Action path with no feedback path connecting the output variable to one of the input variables.

open channel The longitudinal boundary surface consisting of the bed and banks or sides within which the liquid flows with a free surface.

open circuit 1. In fluid power systems, circuit in which return fluid is directed to the reservoir before re-circulation. 2. A circuit which does not provide a complete path for the flow of current.

open-circuit control A method of controlling motors employing the open-circuit method of transition from series to parallel connections of the motors.

open circuit potential The measured potential of a cell from which no current flows in the external circuit.

open circuit saturation curve The saturation curve of a machine with an open-circuited armature winding.

open circuit signaling (data transmission) That type of signaling in which no current flows while the circuit is in the idle condition.

open-circuit transition A method of changing the connection of motors from series to parallel in which the circuits of all motors are open during the transfer.

open circuit voltage, source e.m.f. Pertaining to electronic measuring instruments, twice the value of the matched output voltage.

open ended Pertaining to a process or system that can be augmented.

open-end protecting tube A tube extending from a physical boundary into the body of a medium to surround and protect a thermocouple yet allowing direct contact between the thermocouple's measuring junction and the medium.

open-end spinning (textile term) The production of yarns, directly from sliver or roving by opening the sliver or roving and then reassembling it in a spinning element (usually a rotor using centrifugal force) to form a yarn in a single continuous operation.

open equipment Equipment which may have live electrical part accessible, e.g. a main processing unit. Open equipment is to be incorporated into other assemblies manufactured to provide safety.

opener, plug separator A slightly conical, horizontal drum in which rods on a horizontal rotating axis subject soft chip pieces and fiber bundles in sulphite pulp to a mild defibration prior to screening.

open-flow nozzle See Kennison nozzle.

open head box In pulp and paper manufacturing a head box in which the stock chamber is open to the surrounding atmosphere.

opening (fluid power systems) Distance between the fixed and movable flow metering edges, i.e., in considering the valve opening, account shall be taken of the lap.

opening (textile term) A preliminary operation in the processing of stable fiber that separates the compressed masses of stable fiber into loose tufts and removes the heavier impurities.

opening pressure (pressure relief devices) Opening pressure is the value of increasing inlet static pressure of a pressure relief valve at which there is a measurable lift, or at which the discharge becomes

continuous as determined by seeing, feeling, or hearing.

open loop A signal path without feedback.

open loop control 1. Control in which the output variable does not influence the control action taken on itself persistently. Note: In addition to analog open loop control there are other types such as binary logic and sequential control. **2.** Control in which one or more input variables influence the output variable(s) in accordance with the laws and characteristics of the system, whereby the output variables only influence the corresponding manipulated variables under certain non permanent conditions. **3.** A form of control without feedback.

open loop frequency response The product of the frequency response of the forward path and the feedback path. Note: The open loop frequency response can be represented graphically either as frequency response characteristic (Bode diagram) or as frequency response locus.

open loop gain The ratio of the absolute magnitude of the change in the feedback signal to the change in its corresponding error signal at a specified frequency.

open loop gain (power supplies) The gain measured without feedback, is the ratio of the voltage appearing across the output terminal pair to the causative voltage required at the (input) null junction.

open loop gain characteristics The characteristic curve of the open loop gain as a function of frequency.

open loop numerical control system A control system in which there is no feedback of the position value in the form of a signal from a transducer.

open loop stabilization A mode of operation in which the value of an output is set at a desired value by external means without taking into account the difference between the actual and the desired values.

open loop system A control system that has no means for comparing the output with input for control purposes.

open loop transfer function The transfer function relating the feedback signal to the corresponding error signal.

open loop voltage gain The ratio of the output signal voltage of an operational amplifier to the different input signal voltage producing it with no feedback applied.

open-phase relay A relay which functions when one or more phases of a polyphase circuit open and sufficient current is flowing in the remaining phase or phases.

open relay An unclosed relay.

open routine In a computer a routine which can be inserted directly into a larger routine without a linkage or calling sequence.

open seal An impulse line filled with a seal fluid open to the process.

open shop The operation of a computer facility where computer programming, coding and operation can be performed by any qualified employee of the organization, not necessarily by the personnel of the computing center itself and where the programmer may assist in or oversee the running of his program on the computer.

open subroutine, direct insert routine A subroutine, one copy of which must be inserted at each place, the subroutine is used in a computer program.

open system A system that complies with the requirements of the OSI reference model in its communication with other open systems.

open system A system that obeys public standards in its communication with other systems and/or between layers.

open systems interconnection, OSI The aim of open systems interconnection is to allow, with a minimum of technical agreement outside the interconnection standards, the interconnection of information processing systems: **a.** from different manufacturers; **b.** under different management; **c.** of different levels of complexity; **d.** of different evolutionary implementations.

open white water system See white water system.

operable time, uptime The time during which a functional unit would yield correct results if it were operated.

operand 1. An entity on which an operation is performed. An operand is usually identified by an address part of an instruction.

operate current The minimum current required to trip all the contact springs of a relay.

operate mode See compute mode.

operate time The phase of computer operation during which an instruction is being executed.

operating center Consoles used by the operator as the man-machine interface to the process. Various configurations of BASIC, SUPERVISORY, and TOTAL Stations can be found in the operating area. Refers to Honeywell TDC 3 000 control systems.

operating code Abbreviated op code. Source statement which generates machine codes after assembly.

operating conditions Conditions to which a device is subjected, not including the variables handled by the device. Examples of operating conditions include: ambient pressure, ambient temperature, electromagnetic fields, power supply variations etc. The following IEC publications consider the operating influences which may directly effect performance of process measurement and control systems: 654-1 Temperature, humidity and pressure. 654-2 Power. 654-3 Mechanical Influence. 654-4 Corrosive and erosive influences. See also IEC 354.

operating duty (of a switching device) A specified number and kind of operations at stated intervals.

operating experience Verifiable service data for equipment.

operating failure rate The probability (per hour) of failure for those operating components required to operate or function for a period of time.

operating frequency (thyristor) The operating frequency is the reciprocal value of the operation period.

operating frequency line current (thyristor) The root-mean-square (rms) of the fundamental component of the line current, whose frequency is the operating frequency.

operating frequency load voltage (thyristor) The root-mean-square (rms) value of the fundamental component of the load voltage, whose frequency is the operating frequency.

operating influence The change in a performance characteristic caused by a change in a specified operating condition from reference operating condition, all other conditions being held within the limits of reference operating conditions. For further details see ANSI/ISA publication S 51.1-1979.

operating instruction A step-by-step description of the activities to be performed by an operator.

operating level The nominal position or output at which a system or process operates. Typical examples are water level in a boiler, production rate of a manufacturing process, or acoustical output (volume) of a loudspeaker system.

operating life The minimum length of time over which the specified continuous and intermittent rating of a device, system or transducer applies without change in performance beyond the specified tolerance.

operating limits The range of operating conditions to which a device may be subjected without permanent impairment of operating characteristics.

operating liquid (separation terminology) A liquid (usually water) filling the space under the sliding bowl bottom in an ejector-type separator bowl. The hydraulic pressure created by centrifugal force holds the sliding bowl bottom in the closed position. To bring about an ejection of solids, the operating water is simply drained off.

operating manual Document detailing the sequence of operations, adjustments and observations to be made ensuring correct use and operation of equipment, following satisfactory installation and commissioning.

operating mode 1. Characterization of the way and the extent to which the human operator undertakes the functions of the controlling system. **2.** A state of the robot control system.

operating period (thyristor) The time between starting instants of successive controller on-state intervals in on-off control mode.

operating point A point of a characteristic curve or of a set of characteristic curves at which a system is operating. Note: By linearization of characteristic curves the coefficients of the linear substitution function depend on the operating point around which the linearization is done.

operating pressure The actual pressure at which a device operates under normal conditions. This pressure may be positive or negative with respect to atmospheric pressure.

operating space, display space (computer graphics) That portion of the device space corresponding to the area available for displaying images.

operating state The state when an item is performing a required function.

operating station (fluid power system) Location of operator's controls.

operating system 1. Software which controls the execution of computer programs and which of computer programs and which may provide scheduling, debugging, input/output control, accounting compilation, storage assignment, data management and related services. **2.** The master control program of a computer which controls all hardware activity.

operating system, OS 1. An integrated collection of service routines for supervising the sequencing of programs by a computer. **2.** A group of programming systems operating under control of a data processing monitor program. **3.** For programmable controller systems, manufacturer's provided functions intended to management of internal programmable controller system interdependent functions (configuration control, diagnostics, memory management, application program execution management, communication with peripherals and with the interface functions to sensors and actuators).

operating temperature The temperature or range of temperatures at or over which a device is expected to operate within specified limits of error.

operating temperature range The interval of temperatures in which a component device or system is intended to be used, specified by the limits of this interval.

operating time That part of operable time during which a functional unit is operated.

operating time between failures Total time duration of operating time between two consecutive failures of a repaired item.

operating voltage (power switchgear) The voltage of the system on which a device is operated. Note: This voltage, if alternating, is usually expressed as a root-mean-square (rms) value.

operation (mathematics of computing) The action specified by an operator on one or more operands. For example, in the expression $A=B+3$, the process of adding B to 3 to obtain the result A.

operation 1. Combination of all technical and administrative actions intended to enable an item to perform a required function. **2.** See logical operation. **3.** For programmable controllers a defined action, namely, the act of obtaining a result from one or more operands in accordance with a rule that completely specifies the result for any permissible combinations of operands. **4.** For batch processes an independent production activity within a procedure, consisting of phases which is carried to completion in a single unit.

operational The status of a computer or program when it has been running correctly, using line data, for some time.

operational amplifier A differential amplifier with high-gain, high input impedance and low output impedance. Note: By adding external elements to an operational amplifier, one can realize summing circuits, integrating circuits and more generally any linear transfer function or any nonlinear transformation law.

operational character Characters used as code elements to initiate, modify, or stop a control operation. Characters may be used, for example, to control the carriage return, etc.

operational instruction halt, operational-stop instruction An instruction that can stop the computer either before or after the half instruction is obeyed, depending on the governing criterion.

operational maintenance influence (instruments) The effect of routine operations that involve opening the case, such as to inspect or mark records, change charts, add ink, alter control settings etc.

operational programming The process of controlling the output voltage of a regulated power supply by means of signals (which may be voltage, current, resistance, or conductance) that are operated on by the power supply in a predetermined fashion. Operations may include algebraic manipulations, multiplication, summing, integration, scaling, and differentiation.

operational programs The application program, the processor, and the programs that do the work as against the supervisory program and the service program.

operational readiness The probability that, at any point in time and under stated conditions, a system will be either operating satisfactory or ready to be placed in operation.

operational relay A relay that may be driven from one position or state to another by an operational amplifier or a relay amplifier.

operational reliability (software) The reliability of a system or software subsystem in its actual use environment. Operational reliability may differ considerably from reliability in the specified or test environment.

operational statement (numerical control) A command consisting of a function mnemonic followed by one or more arguments or groups of arguments that qualify the command.

operational-stop instruction See operational instruction halt.

operational testing software Testing performed by the end user on software in its normal operating environment.

operation analysis An evaluation process in industrial engineering that assesses design, materials, equipment, tools, working conditions, methods and inspection standards, usually for the purpose of improving production output or decreasing cost.

operation and maintenance phase (software)

The period of time in the software life cycle during which a software product is employed in its operational environment, monitored for satisfactory performance, and modified as necessary to correct problems or to respond to changing requirements.

operation by exception Method of presenting information to the operator or to the computer so that attention is drawn to only points deviating from normal.

operation code, order code A code used to represent the operations of a computer.

operation cycle Relates specifically to that portion of a machine cycle during which the actual execution of the instruction takes place. Same as execution cycle.

operation decoder A device that selects one or more control channels according to the operation part of a machine instruction.

operation factor The ratio of the duration of actual service of a machine equipment to the total duration of the period of time considered.

operation influence (electrical influence) The maximum variation in the reading of an instrument from the initial reading, when continuously energized at a prescribed point on the scale under reference conditions over a stated interval of time, expressed as a percentage of full scale value.

operation overhead See housekeeping.

operation part, operator part, function part A part of an instruction that usually contains only an explicit specification of the operation to be performed.

operation register In a computer, the register that stores the operation – code portion of an instruction.

operations analysis See operations research.

operations-level processor In building management systems, a PC or other device used primarily by building operation personnel for everyday building operations. This processor can access points or data in all the lower level controllers. See also management-level processor.

operations research, OR The use of analytic methods adopted from mathematics for solving operational problems. The objective is to provide management with a more logical basis for making sound predictions and decisions. Among the common scientific techniques used in operations research are the following: linear programming, probability theory, information theory, game theory, Monte Carlo method, and queuing theory.

operation table A table that defines an operation by listing all appropriate combinations of values of the operands and indicating the result for each of these combinations.

operative limits The range of operating conditions to which a device may be subjected without permanent impairment of operating characteristics.

operator 1. The person who initiates and monitors the operation of a technical process and/or its controlling system, which may be computer(s). Actuators are sometime referred to as operators. **2.** A symbol that represents the action to be performed in an operation.

operator 1. In the description of a process, that which indicates the action to be performed on operands. **2.** A person who operates a machine.

operator's console 1. A console designed and provided with equipment suitable to operate a process. **2.** A device which enables the operator to communicate with the computer. **3.** In Honeywell TDC 3000 control systems, a set of one or more Universal Stations grouped together physically. Operator software is usually loaded into each Universal Station. This can differ significantly from the way a "console" is defined during configuration of a system.

operator's station 1. An intelligent station in a distributed control system acting as an operator's console. **2.** A general term applied to the keyboard/video display consoles and supporting elements found in the BASIC, SUPERVISOR, or TOTAL systems. Refers to Honeywell TDC 3000 control systems.

operator command A statement to the control program, issued via a console device, which causes the control program to provide requested information, alter normal operations, initiate new operations, or terminate existing operations.

operator control panel A functional unit that contains switches used to control a computer or part of it and possibly indicators giving information about its functioning. Note: An operator control panel may be part of an operator console or other operated-controlled device.

operator part, operation part, function part A part of an instruction that usually contains only an explicit specification of the operation to be performed.

opportunistic planning Planning that includes opportune problem solving actions in a plan under development.

opposed blade damper A damper constructed so adjacent blades rotate opposite to each other.

optical attenuation meter A device which measures the loss or attenuation of an optical fiber, fiber optic cable, or fiber optic system. Measurements are usually made in decibels.

optical axis, fiber axis The locus of the core centres along the length of an optical fiber.

optical cable See optical fiber cable.

optical cable assembly An optical cable that is terminated with connectors.

optical cavity, resonant cavity (optical communication) A region bounded by two or more reflecting surfaces, whose elements are aligned to provide multiple reflections and in which a standing wave can exist at particular wavelengths.

optical cement A permanent and transparent adhesive, usually epoxy or methacrylate, capable of handling extreme temperatures.

optical character A printed character frequently used in utilities billing which can be read by a machine without the aid of magnetic ink.

optical character reader, OCR An input unit that reads characters by optical character recognition.

optical character recognition, OCR Character recognition that uses optical means to identify graphic characters. Contrast with magnetic ink character recognition.

optical character recognition paper See OCR-paper.

optical combiner A passive directional coupler in which power from several input ports is distributed among a smaller number of output ports.

optical communications 1. Communications through the use of beams of visible, infrared or ultraviolet radiation, or, over much longer distances th-

rough the use of laser beams. See also coherent light communications. **2.** The transmission and reception of information by optical devices and senses. See also lightwave communication.

optical coupler, coupler, optical fiber coupler

A device whose purpose is to transfer optical power between two or more ports in a predetermined manner.

optical coupling In fiber optics, light leakage from one fiber to another by evanescent boundary wave interaction. Sometimes called crosstalk.

optical damping A damping ratio slightly less than unity in which the overshoot is less than the specified uncertainty of the instrument.

optical data bus An optical fiber network, interconnecting terminals, in which any terminal can communicate with any other terminal.

optical data link A system consisting of a transmitter, i.e., a light source, a fiberoptic cable and a receiver, i.e., a photodetector, all connected together in such a manner that light waves from the source can be received at the receiver. Light from the transmitter is usually modulated by an intelligence-bearing signal.

optical density The negtív logarithm of the percent transmittance (or reflectance) or a transparent (or opaque) material.

optical detector (optical communication) A transducer that generates an electrical output signal when irradiated with optical power.

(digital) optical disk A disk that contains digital data readable by optical techniques.

optical distortion An aberration of spherical surface optical systems due to the variation in magnification with distance from the optical axis.

optical encoder A device designed to accurately measure linear or rotary motion by detection of the movement of markings on a transparent medium past a fixed point of light.

optical encoder tachometer A type of instrument that combines a sensor (optical encoder) with a microprocessor to convert sensor impulses into a measurement of rotational velocity.

optical fiber A filament shaped optical waveguide made of dielectric materials.

optical fiber bundle Many optical fibers in a single protective sheath or jacket. The number of fibers could range from a few to several hundred.

optical fiber cable A fiber, multiple fibers or fiber bundle in a cables structure fabricated to meet optical, mechanical and environmental specifications. Note: May also contain metallic conductors.

optical fiber link Any transmission link consisting of a light emitting unit, an optical fiber, a receiving unit, connecting elements and, if necessary, optical repeaters.

optical fiber pigtail See launching fiber.

optical fiber splice, optical splice, splice A permanent joint whose purpose is to couple optical power between two optical fibers.

optical fiber waveguide See optical waveguide.

optical filter A device used to modify the optical radiation passing through it, generally be altering the spectral distribution.

optical fluid-flow measurement Any method for measuring the density of a fluid in motion which depends on measuring refraction and phase shift among different rays of light as they pass through a flow field of varying density.

optical flux, optical power, radiant flux, radiant power The time rate of flow of radiant energy.

optical gage A gage that measures the image of an object without touching the object itself.

optical glass Glass free of imperfections, such as bubbles, chemical inhomogenety or unmelted particles, which degrade its ability to transmit light.

optical incremental display A powerful new general purpose incremental cathode-ray tube display which permits rapid conversion of digital computer data into graphic and tabular form.

optical mark recognition, OMR An information-processing technology that converts data into another medium for computer input.

optical maser See laser.

optical memory See optical storage.

optical microphone Laser-powered telephone device for analog communications that employs vibrating plastic membrane as transmitter to modulate laser light piped via optical fibers from a central exchange, omitting the need for transducers or modulators.

optical mosaic Grouping of fibers to form a cross-section area that will make light pattern for acceptance by detector or other receiving element.

optical plastic Any plastic material which is transparent to light and can be used in optical devices and instruments to take advantage of physical or mechanical properties where the plastics material is superior to glass, or to take advantage of the lower cost of the plastics material.

optical power, optical flux, radiant flux, radiant power The time rate of flow of radiant energy.

optical pyrometer A temperature-measuring device comprising a standardized comparison source of illumination, together with some convenient arrangement for matching this source, either in brightness or in color, against the source whose temperature is to be measured. The comparison is usually made by the eye.

optical radiation Electromagnetic radiation at wavelengths between the region of transition to X-rays and the region of transition to radio waves, that is approximately between 1 nm och 0,1 mm.

optical reader A device that reads handwritten or machine printed symbols into a computing system.

optical receiver An electro-optical module which converts an optical input signal to an electrical output signal.

optical recording Making a record of an instrument reading by focusing a tiny beam of light on photosensitive paper, the position of the light along one axis of the resulting orthogonal plot being directly related to the value of the quantity being measured.

optical repeater In an optical waveguide communication system, an optoelectronic device or module that receives a signal, amplifies it (or in the case of a digital signal, reshapes, retimes, or otherwise reconstructs it) and retransmits it.

optical rotation Rotation of the plane of polarization about the axis of a beam of polarized light.

optical scanner A scanner that uses an optical process for examining patterns. Note – Optical scanners are often used in pattern recognition or character recognition.

optical scanning A technique for machine recognition of characters by their images.

optical spectrometer An instrument with an entrance slit, a dispersing device, and one or more exit slits, with which measurements are made at selected wavelengths within the spectral range, or by scanning over the range. The quantity detected is a function of radiant power.

optical spectrum The range of wavelengths of optical radiation.

optical splice, optical fiber splice, splice A permanent joint whose purpose is to couple optical power between two optical fibers.

optical storage A storage device that uses optical techniques.

optical thickness The product of the physical thickness of a homogeneous isotropic optical element, and its refractive index.

optical time domain reflectometry, OTDR See backscattering technique.

optical transmitter An electro-optical module which converts an electrical input signal to an optical output signal.

optical type consistency meter A unit for consistency measurement based on the theory of measurement that the amount of radiant energy that will pass through a fluid determines its consistency. The unit is made up of: continuous sampling chamber, light source, photocell, amplifier, and indicator. Application: pulp consistency measurement.

optical waveguide A transmission line designed to guide optical power.

optical waveguide connector A device whose purpose is to transfer optical power between two optical waveguides or bundles, and that is designed to be connected and disconnected repeatedly.

optical waveguide coupler See optical coupler.

optical waveguide splice See optical splice.

optical waveguide termination A configuration or a device mounted at the end of a fiber or cable which is intended to prevent reflection.

optic amplifier An optoelectronic amplifier whose signal input and output ports are electric. Note: This is in accordance with the accepted terminologies of other electric-signal input and output amplifiers such as dielectric, magnetic, and thermionic amplifiers.

optic axis (optical communication) In an anisotropic medium, a direction of propagation in which the two waves having orthogonal polarisations have the same phase velocity. Note: In English the term "optic axis" should be distinguished from "optical axis".

optics That branch of physical science concerned with the nature and properties of the electromagnetic radiation known as light, including the infrared, visible and ultraviolet regions.

optimal control Control in which the performance index reaches a maximum or a minimum under specified limitations.

optimization **1.** A process whose object is to make one or more variables assume, in the best possible manner, the value best suited to the operation in hand, dependent on the values of certain other variables which may be either predetermined or sensed during the operation. **2.** The procedure used in the design of a system to maximize or minimize some performance index. May entail the selection of a component, a principle of operation, or a technique.

optimize **1.** To establish control parameters so as to make control as effective as possible. **2.** To rearrange the instructions or data in storage so that the program can be run in minimum time. **3.** To establish control parameters that maximize or minimize the value of a performance index. Refers to honeywell TDC 3000 control systems.

optimizing Procedure in design or adjustment of a control system such that a performance index reaches a maximum or a minimum under specified conditions.

optimizing control Control that automatically seeks and maintains the most advantageous value of a speci-

fied variable, rather than maintaining it at one set value.

optimum damping The value of damping that permits fast response with some overshoot; this value is about 65 percent of critical damping.

optional pause instruction, optional stop instruction An instruction that allows manual suspension of the execution of the computer program.

optional stop (numerical control) A miscellaneous function command similar to a program stop except that the control ignores the command unless the operator has previously pushed a button to validate the command.

optional stop instruction See optional pause instruction.

optocoupler A light source (input) and a light detector (output) where both the light source and detector are housed in a single package, sealed against outside light. An electrical signal applied to the light source changes the amount of light emitted. The emitted light falls upon, and is collected by, the detector. These input electrical signals are thus "coupled" to the output. From the output, the signals perform normal electronic functions, such as driving amplifiers, triggering a thyristor power supply or switching logic levels.

optoelectronic An optoelectronic device is any device that functions as an electrical-to-optical or optical-to-electrical transducer.

optoelectronic amplifier An optoelectronic device capable of power gain, in which the signal ports are either all electric ports or all optic ports.

optoelectronic integrated circuit An integrated component that uses a combination of electroluminescence and photoconductivity in the performance of all or at least a major portion of its intended function.

optoisolator **1.** A coupling device consisting of a light sensor. Used for voltage and noise isolation between input and output while transferring the desired signal. **2.** Any device which uses a light emitter and a photodetector to couple signals without any electrical connection.

order (in electronic computation) **1.** Same as instruction. **2.** Same as command. **3.** Loosely; same as operation part. Note: The use of "order" in the computer field as a synonym for terms similar to the above is losing favour owing to the ambiguity between these meanings and the more common meanings in mathematics and business.

ordering In a computer, the process of sorting and sequencing.

order of merge The number of files that can be combined into a consolidated file during a merging operation.

orders of logic A measure of the speed with which a signal can propagate through a logic network (commonly referred to as orders-of-logic capability).

OR device A device the output of which is logical zero if and only if all the control signals are logical zero.

ordinate Vertical or Y distance on a graph.

organ In a computer subassembly, the portion which accomplishes some operation or function (e.g., arithmetic organ).

organic dye laser A laser having a lasing material that is a fluorescing organic dye.

organic substance A material that is or has been part of a living organism. Oil, although classified as a mineral, is an organic substance derived from living organisms.

organoleptic (water quality) Descriptive of those attributes of water, for example color, taste, odour and appearance, that are perceptible by the sense organs.

OR gate, OR circuit (electronic computation) A gate whose output is energized when any one or more of the inputs is in its prescribed state. An OR gate performs the function of the logical OR.

orient To place an instrument, particularly one for making optical measurements, so that its physical axis is aligned with a specific direction or reference line.

orientated spindle stop (numerical control) A miscellaneous function that causes the spindle to stop at a predetermined angular position.

orientation Alignment with a specific direction or reference line.

orifice An opening or window specifically, in a side or end wall of a waveguide or cavity resonator, an opening through which energy is transmitted.

orifice, throat Opening of minimum cross-sectional area in a primary device.

orifice and plug Type of area flowmeter comprised of a tapered plug which rides vertically within the bore of an orifice. With increasing flow, the plug rises, thereby increasing the area of the orifice and allowing more flow to pass. When the mass of the plug is balanced by the force of the flow, the height of the plug becomes an indication of the flow rate.

orifice fitting A specially designed orifice plate holding device.

orifice flange taps The 1/2 in. or 3/4 in. pipe taps in the edge of an orifice flange union.

orifice flange union Two unique flanges used to hold an orifice plate primary element with specific design dimensions established by the American Gas Association.

orifice meter See under orifice plate and flow measurement.

orifice mixer A piece of equipment for mixing two or more liquids by simultaneously directing them, under pressure, through a constriction where the resulting turbulence blends them together.

orifice plate A flow sensor producing a differential pressure, by means of a plate with a specified hole, if installed in the fluid flowing through a closed conduit. See also under flow measurement. The thin-plate, concentric orifice can be used for any steady flow of clean, homogeneous fluid (liquid, vapor or gas).

orifice ratio Orifice-to-pipe diameter ratio (d/D).

orifice run The differential pressure producing arrangement consisting of selected pipe, orifice flange union and orifice plate. An orifice run has rigid specifications defined by the American Gas Association.

orifice-typ variable-area flowmeter A flow-measurement device consisting of a tube section containing an orifice and a guided conically tapered float that rides within the orifice; flow of a fluid through the meter positions the float in relation to flow rate, with float position being determined magnetically or by other indirect means.

originator The station which is the source of this message.

O ring A toroidal sealing ring made of synthetic rubber or similar material. The cross section through the torus is usually round or oval, but may be rectangular or some other shape.

orometer A barometer for measuring elevation above sea level.

OR operation, disjunction, INCLUSIVE-OR operation, logical add The Boolean operation whose result has the Boolean value 0 if and only if

each operand has the Boolean value 0. See also table of Boolean operation in ISO publication 2382/11.

ORP See oxidation-reduction potential.

orsat A gas-analysis apparatus in which certain gaseous constituents are measured by absorption in separate chemical solutions.

orthocore A completely closed flux memory device designed to almost duplicate the geometry of the ferrite core memory, eliminate the wiring of memory cores, and provide a plurality of wires through the memory element.

ortho cresol Ortho cresol is also used in the production of synthetic resins to control the plasticity of the resin. It is nitrated to produce insecticides and weed killers. It is used in various organic syntheses and in the production of artificial flavours and perfumes.

orthometric correction A systematic correction that must be applied to a measured difference in elevation to compensate for the fact that level surfaces at different elevations are not exactly parallel.

OS 1. See operating system. **2.** Operational Sequence.

OS/2 Operating System 2. Operating system from Microsoft and IBM specially developed for Intel's 80286 and 80386 processors.

oscillating Coriolis flowmeter A type of mass flowmeter based on generating the Coriolis force through vibration or oscillation of the flow tube.

oscillating gyroscopic mass flowmeter A type of mass flowmeter.

oscillating-piston flowmeter A flow measurement device similar to a nutating-disk flow meter but in which motion of the piston takes place in one plane only; rotational speed of the piston is directly related to the volume of fluid passing through the meter.

oscillation 1. The state of a physical quantity when, in the time interval under consideration, the value of the quantity is continually changing in such a manner, that it passes through maxima and minima (e.g. oscillating pendulum, oscillating electric current and oscillating electromotive force). **2.** See hunting.

oscillator 1. A generator of an alternating signal, continuous, sinusoidal or pulsed. **2.** An electronic device which generates alternating-current power at a frequency determined by the values of certain constants in its circuits.

oscillogram The recorded trace produced by an oscillograph.

oscillograph An instrument intended to record, in the form of a permanent trace, instantaneous values of a quantity.

oscillometer An instrument for measuring oscillations (periodic variations) of any kind.

oscilloscope An instrument intended to record, in the form of a transitory trace, instantaneous values of a quantity.

oscilloscope differential amplifier A device that amplifies and displays the voltage difference that exists at every instant between signals applied to its two inputs.

OSHA 1. Occupational Safety and Health Administration (USA). **2.** Occupational Safety and Health Act (USA).

OSI Open System Interconnect. A logical structure for network operations using seven layers as defined by the ISO. It defines network protocol standards to enable any OS, compatible computer or device to communicate with any other OSI compliant computer or device for information exchange.

OSI reference model A seven layered model of communications networks defined by ISO.

outage 1. Loss of signal in a channel, usually the result of a dropout or a hit. **2.** Status of equipment when it is out of service. Outages are termed "forced" when due to undesired occurrences, and "planned" when prescheduled, as for routine maintenance.

outage, disabled state A state of an item characterized by its inability to perform a required function, for any reason.

outage duration The period from the initiation of an outage until the affected component once again becomes available to perform its intended function.

outconnector In flowcharting, a connector that indicates a point at which a flowline is broken for continuation at another point.

outdoor area See outdoor location.

outdoor enclosure An enclosure for outdoor application designed to protect against weather hazards such as rain, snow, or sleet. Note: Condensation is minimized by use of space heaters.

outdoor location (Class D, IEC 654-1) A location where neither air temperature nor humidity are controlled. The equipment is exposed to outdoor atmospheric conditions such as direct sunshine, rain, hail, sheet, snow, icing, wind and blown sand.

outfall See effluent.

outgassing 1. A phenomenon in which a substance in a vacuum spontaneously releases absorbed and occluded constituents as vapors or gases. **2.** De-aeration or other gaseous emission from a printed-board assembly (printed board, component or connector) when exposed to a reduced pressure or heat, or both.

outlet port Pertaining to valves, the port which is connected directly to the downstream side of fluid system. See also output port.

outlet pressure, output pressure (fluid power systems) Pressure at the apparatus outlet port measured under specified conditions.

outline drawing A drawing showing approximately overall shape but no details.

output (when it does not mean output signal) For a process element or equipment in the control loop, an outflow which takes material or energy away from the equipment, like heat loss or liquid flow. (Sometimes the output signal does this, too).

output Pertaining to a device, process or channel involved in an output process, or to the associated data or states. Note: The word "output" may be used in place of "output data", "output signal", "output process" when such a usage is clear in a given context.

output (data) Data being produced or to be produced by any component part of a computer.

output (process) The process that consists of the production of data from any component part of a computer.

output angle See radiation angle.

output area An area of storage reserved for output.

output assertion A logical expression specifying one or more conditions that program outputs must satisfy in order for the program to be correct.

output channel Channel through which the output signal leaves the device.

output control characteristics (thyristor) Output operating characteristics which can be deliberately selected or controlled, or both.

output control range (thyristor) The continuous range over which the output of a power controller can be changed by control signal input.

output equations A set of equations required to express the output variables as functions of the state variables, the input variables, the system parameters and the time.

output equipment The equipment used for transferring information out of a computer.

output feedback control Type of control with proportional feedback of the measured output variables only.

output flow, outlet flow Flow rate discharged at the outlet port.

output function Set of relations which determines the value of the output variable from a given state of a system and the simultaneous value(s) of the input variable(s).

output impedance 1. Impedance presented by a device to the load. **2.** Pertaining to electrical transducers, the impedance across the output terminals of a transducer presented by the transducer to the associated external circuitry. **3.** See also input (output) impedance.

output limits Boundary points that limit the output. Refers to Honeywell TDC 3000 control systems.

output matrix A matrix which, at a given time, describes the connections between the values of the system state variables and the output variables.

output module A circuit in an interface module of a BASIC System's barrier panel. It converts a voltage output signal to a current output signal. Refers to Honeywell TDC 3000 control systems.

output noise (electrical transducers) The rms, peak, or peak-to-peak (as specified) ac component of a transducer's dc output in the absence of measurand variations. Note: For use only in specifications, unless otherwise specified, output impedance is measured at room conditions and with the excitation terminals open/circuited, except that nominal excitation and measurand between 80 and 100 percent-of-span is applied when the transducer contains integral active output-conditioning circuitry.

output port, outlet port Port which provides a passage for the outlet flow.

output power The power which a system or component delivers to its load.

output pressure, outlet pressure (fluid power systems) Pressure at the apparatus outlet port measured under specified conditions.

output primitive (computer graphics) A basic graphic element that can be used to construct a display image. Examples: A dot, a line segment.

output program A utility program that organizes the output process of a computer.

output record 1. A record written to an output device. **2.** The current record stored in the output area prior to being output.

output register A specific register which holds data until it can be outputted to an external device.

output regulation (electrical transducers) The change in output due to a change in excitation. Note: For use only in specifications, unless otherwise specified, output regulation is measured at room conditions and with the measurand applied at its upper range limit.

output routine A utility that organizes the output process of a computer.

output signal 1. A signal delivered by a device, element or system. **2.** The output from the secondary device which is proportional to flow-rate. Pertains to electromagnetic flowmeters.

output stage The final stage in any electronic equipment.

output state Pertaining to electronic measuring instruments, the whole information (electrical or visual) which is available during the readout time.

output stream Output data issued by an operating system or a processing program on output devices activated by the operator. Same as job output stream.

output transformer A transformer used to couple the output stage of an amplifier to a load.

output unit 1. A computer unit that transfers data from the computer to an external device or from internal storage to external storage. **2.** A device capable of recording data coming from the internal storage unit of a computer.

output variable A variable delivered by a system.

output voltage regulation (power supply) The change in output voltage, at a specified constant input voltage, resulting from a change of load current between two specified values.

output voltage stabilization (power supply) The change in output voltage, at a specified constant load current, resulting from a change of input voltage between two specified values.

output winding The winding of a saturable reactor, other than a feedback winding, through which power is delivered to the load.

outturn sheet A sheet of paper or board withdrawn during manufacture which is a representative sample of the quality of the manufactured product.

oval wheel flowmeter A device which measures the volumetric flow liquid or gas through a cylindrical chamber by counting the number of rotations of two oval wheels housed in the chamber.

oven A heated enclosure for baking, drying or heating.

oven dry See bone dry.

overaging, overaging Pertaining to heat treatment, aging at such high temperatures or for so long time that a precipitated phase tends to become coarser or even to disintegrate.

overall loudness level A measure of the response of human hearing to the strength of a sound. It is scaled in phons and is an overall single evaluation calculated for the levels of sound pressure of several individual bands.

over-centre pump Pump in which the direction of flow may be reversed without changing the direction of rotation of the drive shaft.

overcurrent In a circuit, the current which will cause an excessive or even dangerous rise in temperature in the conductor or its insulation.

overcurrent protection See overload protection.

overcurrent relay A relay that operates when its input current exceeds a predetermined value.

overdamped See damping.

overflow That portion of a word expressing the result of an operation by which its word length exceeds the storage capacity of the intended storage device.

overflow indicator A bi-stable trigger which changes state when overflow occurs in the register with which it is associated.

overflow pipe A pipe with its open end protruding above the liquid level in a tank; it limits the height of liquid in the tank by carrying away any liquid entering the open end, usually to a drain or sewage system.

overflow storage Additional storage provided in a store and forward switching center of a computer to prevent the loss of messages (or parts of messages) offered to a completely filled line store.

overfractionation Operation of a distillation column to produce a purer product than required.

overglazed Coated with a layer of printed and fired glass paste. Overglazing may be a solder barrier, a protective coating for resistors or an insulator to pre-

vent possible short circuits, as in the case of a wire bond crossing over a printed conductor.

overhead A product or products taken from a processing unit in the form of a vapor or a gas; a product of a distillation column.

overhead costs Costs incurred in the operation of a business which cannot be directly related to individual products or services.

overhead operation, housekeeping operation An operation that facilitates the execution of a computer program without making a direct contribution.

overheating Heating to a temperature so high that an undesired alteration of properties occurs, e.g. grain coarsening; see burning.

overlap 1. To perform one operation at the same time that another operation is being performed.

overlap (fluid power systems) Condition where the fixed and movable flow metering edges do not coincide with the spool at null in such a way that a relative displacement between the metering edges shall occur before a flow path is created.

overlapping contacts Combinations of two sets of contacts actuated by a common means, each set closing in one of two positions, and so arranged that the contacts of one set open after the contacts of the other set have been closed.

overlay (software) 1. In a computer program, a segment that is not permanently maintained in internal storage. **2.** The technique of repeatedly using the same areas of internal storage during different stages of a program.

overload (electrical transducers) The maximum magnitude of measurand that can be applied to a transducer without causing a change in performance beyond specified tolerance.

overload capacity The level of current, voltage, or power beyond which a device will be ruined. It is usually higher than the rated load capacity.

overload protection 1. A device which automatically disconnects the circuit whenever the current or voltage becomes excessive. **2.** A device or circuit that protects a power supply from damage due to excessive current demand by the load. Some schemes are also designed to protect the load.

overpressure 1. Overpressure is a pressure increase over the set pressure of a pressure relief valve, usually expressed as a percentage of set pressure. **2.** Pressure greater than the full-scale rating of a pressure transducer.

overrange 1. The condition of a system or element in which the value of the input signal is outside the measuring range to which the system or element is adjusted. **2.** In process instrumentation, of a system or element, any excess value of the input signal above its upper range value or below its lower range-value.

overrange limit The maximum input that can be applied to a device without causing damage or permanent change in performance.

override (numerical control) A manual control function that enables the operator to modify programmed values (for example, of feedrates or spindle speeds).

override control Generally, two control loops connected to a common final control element – one control loop being normally in control with the second being switched in by some logic element when an abnormal condition occurs.

override pressure (fluid power systems) For a pressure control valve, the pressure increase from a specified minimum flow to a specified operating flow.

overscanning In a cathode-ray tube, the deflection of the electron beam beyond the normal limits of the screen.

overshoot 1. The maximum amount that a process controlled variable exceeds its desired value after a step increase of input. See also transient overshoot. **2.** A distortion which follows a major transition. **3.** For a step response, the maximum transient deviation from the final steady-state value of the output variable, expressed in percent of the difference between the final and the original steady-state values.

overtravel (control valves) The displacement of the actuator stem, or shaft, beyond the closed position. For some specific valve designs, overtravel may be necessary to obtain the specified seat leakage class.

overview display A display that summarizes the operation of several control groups to show deviations from setpoints, alarms, etc. Refers to Honeywell TDC 3000 control systems.

overview scaling index A means of scaling the maximum permissible deviation from the normal operating point, as viewed on the Overview Display, before setting a group alarm. Refers to Honeywell TDC 3000 control systems.

overvoltage protector A device or circuit that protects the load by automatically shutting down a supply when its output voltage exceeds a preset level. A crowbar is one form of overvoltage protection.

overwrite To place information in a location and destroy the information previously contained there.

oxidant A chemical element or compound that is capable of being reduced.

oxidation 1. Commonly known as rust when ferrous material is involved. The increase in oxygen or in an acid-forming element or radical in a compound. **2.** The process of combining with oxygen. More generally, the process by which atoms lose valence electrons or begin to share them with more electronegative atoms.

oxidation pond, stabilization pond A basin used for the retention of waste water before final disposal, in which biological oxidation of organic material is effected by transfer of oxygen from air to the water, either naturally or artificially accelerated.

(measurement of) oxidation reduction potential, ORP, redox potential Certain processes, whether they are classified as industrial applications or water management applications, involve chemical ions which exchange electrical charges as the reaction proceeds. A measure of the extent to which a certain ion has gained or lost its electrical charge (has been "reduced" or "oxidized") serves as a guide to how the reaction has progressed and can also be used to control the addition of reagents. This measurement can be obtained by the use of electrometric equipment quite similar to the pH system, which detects the potential due to the relative amounts of oxidizing and reducing agent in solution.

oxidation stability Ability of a fluid to resist permanent change in its properties due to reaction with the atmosphere.

oxide isolation Electrical isolation of a circuit element by a layer of silicon oxide formed between the element and the substrate.

oxide scale Thick layer of oxide formed on metal in the hot state; see scaling.

oxidizing (electrotyping) The treatment of a graphited wax surface with copper sulfate (sulphate) and iron filings to produce a conducting copper coating.

oxidizing atmosphere An atmosphere which tends to promote the oxidation of immersed material.

oxygen analysis The principles by which oxygen analyzers are designed and applied are as follows: **1.** magnetic susceptibility, **2.** catalytic, **3.** electrolytic, and **4.** solid state. See further under each of these terms.

oxygen balance See mass balance.

oxygen bleaching Oxygen delignification of pulp.

oxygen-concentration cell A galvanic cell resulting primarily from differences in oxygen concentration.

oxygen cooking Oxygen delignification of chips.

oxygen deficit The difference between the actual dissolved oxygen concentration of a aqueous system and its oxygen saturation value.

oxygen delignification Treatment of lignin-containing material with oxygen at a temperature of normally 80–130°C, under pressure and in the presence of alkali and stabilising substances such as magnesium salts. Oxygen delignification can be either oxygen cooking or oxygen bleaching.

oxygen plant Gaseous oxygen of the desired purity is produced from atmospheric air by fractional distillation processes carried out at very low temperatures and elevated pressures; for instance, temperatures and pressures of the order of -185°C (-300°F) at 483 kPa (70 lb per sq inch) gage pressure are employed in United States although there are oxygen plants in US and other countries that operate at much higher pressures.

oxygen reduction potential The oxygen-reduction potential (commonly termed ORP or Redox) is a non-specific or inferential measurement and is distinctly similar to the pH measurement. Many chemical reactions takes place by the transfer of electrons from one substance to another. In each case, one substance is reduced by gaining one or more electrons, while the other is oxidized by losing the same electrons. Thus, the available electrons from the oxidized substance are taken up by the reduced substance until some equilibrium condition is reached.

oxygen sag curve (water quality) The curve resulting from plotting the concentration of dissolved oxygen against distance or time of flow in a river downstream from a source of pollution that has an oxygen demand.

oxygen saturation value The concentration of dissolved oxygen in equilibrium, either with air (natural systems) or with pure oxygen (oxygen waste-water treatment systems); it varies with temperature, partial pressure of oxygen and salinity.

oxygen service IEC publication 877 (1986) outlines the procedures for cleaning industrial-process measurement and control equipment to be used for oxygen service, verifying this cleanliness and ensuring that the cleanliness of the equipment will be maintained up to the stage where the equipment is installed.

oxygen steelmaking processes Oxygen steelmaking processes are concerned mainly with the refining of a metallic charge consisting of hot metal (molten pig iron) and scrap through the use of high-purity oxygen to rapidly produce steel of the desired carbon content and temperature. Various steelmaking fluxes are added during the refining process to reduce the sulphur and phosphorus contents of the metal bath to the desired level. High-purity oxygen is blown under pressure through, onto, or over a bath containing hot metal, steel scrap, and fluxes to produce steel.

ozonization, ozonation The addition of ozone to water or waste water for the purpose of, for example, disinfection, oxidation of organic matter, or the removal of unpleasant taste and odour.

P

p Prefix pico (10^{-12}).

P 1. Poise, the CGS unit for dynamic viscosity. **2.** Chemical symbol for phosphorous. **3.** Symbol for prefix peta, 10^{15} .

P & ID Piping and Instrumentation Drawing which is the primary schematic drawing used for laying out a process control installation.

pA Picoampere (SI unit).

Pa Symbol for pascal, unit for pressure and stress (SI unit). See pascal.

PABX See private automatic exchange.

pachymeter An instrument used to measure the thickness of material such as paper.

pack A removable disk.

(to) pack To convert data to a compact form in a storage medium by taking advantage of known characteristics of the data and of the storage medium, in such a way that the original form of the data can be recovered.

packaged boiler A packaged steam or hot water fire-tube boiler is defined as a modified Scotch unit engineered, built, fire tested before shipment, with material, workmanship and performance warranted by manufacturer. Components include, but are not limited to, burner, boiler and controls.

packaged steam generator See packaged boiler.

package dyeing (textile term) The dyeing of yarn after the yarn is wound on a perforated tube or support, usually made from stainless steel or plastic.

packaging The physical process of locating, connecting, and protecting devices, components, etc.

packaging density **1.** The number of devices or equivalent devices per unit volume in a working system or subsystem. **2.** In a computer, the number of units of information per dimensional unit. **3.** Quantity of functions (components, interconnection devices) mechanical devices) per unit volume, usually expressed in qualitative terms, such as high medium or low.

pack carburizing See powder carburizing.

packed column A distillation column filled with packing (commonly Raschig rings) to mix the descending liquid with the ascending vapors. Packing is often used instead of trays in columns for certain applications (such as gas adsorption) or very-low-pressure drop systems.

packed data Information that has been compressed to make optimal use of memory.

packet (data communication) A sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole.

packet mode terminal Data terminal equipment that can control, format, transmit and receive packets.

packet sequencing (data communication) A process of ensuring that packets are delivered to the receiving data terminal equipment (DTE) in the same sequence as they were transmitted to the sending DTE.

packet switching (data communication) The process of routing and transferring data by means of addressed packets so that a channel is occupied only during the transmission of a packet; upon completion of the transmission, the channel is made available for the transfer of other packets.

(valve) packing A sealing system consisting of deformable material of one or more mating and deformable elements contained in a packing box which may have an adjustable compression means to obtain

or maintain an effective pressure seal. The most popular valve packing material is Teflon, because of its excellent chemical inertness and its good lubricating properties. Teflon can be used in solid-molded or turned forms (chevron rings).

packing The operation performed when data are packet.

packing box (for valves) The chamber, in the bonnet, surrounding the stem and containing packing and other stem sealing parts. The most popular packing box assembly consists of a packing flange, packing follower, lantern ring and a number of equally spaced packing rings. See also double packing box and freeze-seal packing box.

packing density See data density.

packing factor The number of units (words, bits, characters, etc.) that can fit into a defined size (per inch, per record, etc.).

packing follower (control valves) A part which transfers mechanical load to the packing from the packing flange or nut.

packing fraction (of a fiber bundle) In a fiber bundle, the ratio of the aggregate fiber cross-sectional core area to the total cross-sectional area (usually within the ferrule) including cladding and interstitial areas.

packing gland A stuffing box; a chamber that holds packing material firmly around or against a moving rod or valve stem to prevent the escape of gas or liquid.

packing lubricator assembly (valves) An optional part of the valve bonnet assembly used to inject lubricant into the packing box.

packing seal Sealing device consisting on one or more mating deformable elements usually subject to adjustable axial compression to obtain effective radial sealing.

packless valve A special kind of valve that uses a welded bellows rather than soft packing around the valve stem. The stem of the packless valve does not rotate; it is raised and lowered into the valve body by a connecting stem outside the fluid cavity. Packless or packingless valves usually are for small-diameter piping (one quarter to 2-inch) and are used on piping carrying hazardous or toxic fluids or gases and for high-pressure steam.

P-action, proportional action Type of continuous action in which the variations of the output variable are proportional to the concomitant variations of the input variable.

pad Device which introduces transmission loss into a circuit. It may be inserted to introduce loss or match impedances.

pad, attenuating pad A nonadjustable passive network that reduces the power level of a signal without introducing appreciable distortion.

padder (textile term) The device containing two or more parallel rolls in contact with one another through which fabric is passed after immersion in a liquid. The rolls squeeze excess liquid evenly from the fabric.

padding A technique that incorporates fillers in data.

paddle-wheel level detector A device for detecting the presence or absence of bulk solids at the device location.

pad-mounted equipment A general term describing enclosed equipment, the exterior of which encl-

sure is at ground potential, positioned on a surface-mounting pad.

page 1. A full screen of information. **2.** A block of information that can be stored as a complete unit in the computer memory.

page addressing, mapping A memory addressing technique utilized with certain computers, the addressing capability of which are limited to less than total memory capacity available. Using page addressing, memory is divided into segments (pages), each of which can be addressed by the available addressing capability.

page copy Same as hard copy.

page frame In real storage, a storage location having the size of a page.

page printer A printer which prints a full page of characters at a time and then advances to the next page.

page reader A character reader whose input data is a printed text.

paging The transfer of pages between real storage and auxiliary storage.

paging technique A real storage allocation technique by which real storage is divided into page frames.

PAH See polynuclear aromatic hydrocarbons.

pair Two like conductors employed to form an electric circuit.

paired cable Cables which have individually insulated conductors.

PAL **1.** Pedagogic Algorithmic Language. **2.** Process Assembly Language. **3.** Phase Alteration Line (West German television system). **4.** Programmable Array Logic.

Palmer-Bowlus flume A flume used for flow measurement in partially filled circular pipes. The Palmer-Bowlus flume is applied to unusual flow situations and particularly to flows in circular conduits such as storm drains or sanitary sewers.

PAM/FM Frequency modulation of a carrier by pulse amplitude modulated information.

pancake motor A motor that is specially designed to have an axial length that is shorter than normal.

panel A flat rigid surface or structure suitable for mounting instruments, controlling and signalling devices. Various types with modifiers are: instrument, plug and jack, alarm, remote control, relay and terminal, pneumatic loading.

panel-frame mounting (of a switching device) Mounting on a panel frame in the rear of a panel with the operating mechanism on the front of the panel.

panning (computer graphics) Progressively translating the display image to give the visual impression of lateral movement of the image.

paper bale See bale.

paperboard, cardboard Stiff paper or thin board, often with fibre material of high quality.

paper machine, paper making machine A machine for the manufacture of paper as a continuous web.

paper machine room (in a paper mill) A department in the mill in which one or more paper machine are placed.

paper mill An industrial unit for the manufacture of paper.

paper tape A strip of paper capable of storing or recording information. Storage may be in the form of punched holes, partially punched holes, carbonization or chemical change of impregnated material, or by imprinting. Some paper tapes, such as punched paper tapes, are capable of being read by the input device of a computer or a transmitting device, by sensing the pattern of holes which represent coded information.

paper tape punch A device capable of punching information on a paper tape in the form of a series of holes.

paper tape reader A device capable of sensing information punched on a paper tape in the form of a series of holes.

paper tape speed A rate in character per second that a paper unit reads or punches.

parabolic discharge flume A type of flume for flow measurement in partially filled circular pipes. The discharge from this flume must fall free from the end of the conduit. The flume is formed by constricting the sides to form a parabola whose apex is in line with the bottom of the pipe.

paraboloid A reflecting surface of paraboloid shape (the shape of a surface formed by rotating a parabola about its axis of symmetry).

paraffin A white, odorless, tasteless, and chemically inert waxy substance derived from distilling petroleum; a crystalline, flammable substance composed of saturated hydrocarbons.

paraffin-base crude Crude oil containing little or no asphalt materials; usually has lower nonhydrocarbon content than an asphalt-base crude.

parallax An optical illusion which makes an object appear displaced when viewed from a different angle. Thus, a meter pointer will seem to be at different positions on the scale, depending from which angle it is read.

parallel 1. Pertaining to a process in which all events occur within the same interval of time, each one handled by a separate but similar functional unit. Example: The parallel transmission of the bits of a computer word along the lines of an internal bus. **2.** Also called shunt. Connected to the same pair of terminals, so that the current can branch out over two or more paths.

parallel access See simultaneous access.

parallel adder An adder in which addition is performed simultaneously on all corresponding digits of the operands.

parallel arithmetic unit In a computer, a unit in which separate equipment operates (usually simultaneously) on the digits in each column.

parallel buffer An electronic device (for example, magnetic cores or flip-flops) used for temporary parallel storage of digital data.

parallel communication Transmission of data simultaneously on separate lines to speed up operation (as opposed to serial communication).

parallel computer 1. A computer, some specified characteristic of which is parallel. For example, a computer that manipulates all bits of a word in parallel. **2.** A computer having multiple arithmetic or logic units that are used to accomplish parallel operations or parallel processing. Contrast with serial computer.

parallel connection Also called shunt connection. Connection of two or more parts of a circuit to the same pair of terminals, so that current divides between the parts, as contrasted with a series connection.

parallel I/O The simultaneous input/output of all bits.

parallel mode See simultaneous sequences.

parallel operation (stabilized supply apparatus) A mode of operation of stabilized supplies in which all similar output terminals are connected together so that the total load is shared by all the supplies.

parallel output An output arrangement in which two or more bits, channels or digits are available simultaneously.

parallel padding (power supplies) A method of parallel operation for two or more power supplies in

which their current limiting or automatic crossover output characteristic is employed so that each supply regulates a portion of the total current, each parallel supply adding to the total and padding the output only when the load current demand exceeds the capability or limit setting of the first supply.

parallel plate arrester Type of flame arrester.

parallel port A data communication channel which uses one wire for each bit in a single byte.

parallel processing Pertaining to the concurrent or simultaneous execution of two or more processes in multiple devices such as channels or processing units. Contrast with serial processing.

parallel programming (power supplies) A method of parallel operation of two or more power supplies in which the feedback terminals (voltage control terminals) of the units are also connected in parallel.

parallel search storage A storage device in which one or more parts of all storage locations are queried simultaneously. Contrast with associative storage.

parallel-serial converter See dynamicizer.

parallel-series circuit Also called shunt-series circuit. Two or more parallel circuits connected together in series.

parallel storage Storage in which all bits, characters, or words are equally available in space. When words are in parallel, the storage is said to be parallel by words. When characters within words (or binary digits within words or characters) are dealt with simultaneously, the storage is parallel by characters (or parallel by bits, respectively).

parallel structure A structural arrangement of functional blocks such that they are connected in parallel through two or more action lines.

parallel task execution Concurrent execution of two or more programs. Also, simultaneous execution of one program and I/O. Also, sometimes impossible without two processors.

parallel thyristor converter A thyristor converter in which two or more simple converters are connected in such a way that their direct currents add and their commutations coincide.

parallel-T network Also called twin-T network. A network composed of separate T-networks (usually two), the terminals of which are connected in parallel.

parallel transfer A method of data transfer in which the characters of an element of information are transferred simultaneously over a set of paths.

parallel transmission The simultaneous transmission of a group of bits constituting a byte or other entity of data.

parallel-wire line A transmission line consisting of two wires a fixed distance apart.

paramagnetic A substance with a small but positive magnetic susceptibility (magnetizability).

paramagnetic oxygen analyzer Gas analyzer making use of the magnetic property of oxygen to measure its concentration. Note: Oxygen is paramagnetic, meaning that it is attracted by a magnetic field.

parameter (control systems) **1.** A quantity describing the relation of variables within a given system. Note: A parameter may be a constant or depend on the time or the magnitude of some system variables. **2.** A quantity or property treated as a constant but which may sometimes vary or be adjusted.

parameter (water quality) A property of water used to characterize it.

parameter (software) **1.** A variable that is given a constant value for a specified application and that may denote the application. **2.** A variable that is used to

pass values between program routines. See also actual parameter, formal parameter.

parameter association (programming languages) The association of formal parameters with the corresponding actual parameters that are specified by a procedure call.

parameter identification Determination of system parameters from measurement of time varying variables of the system.

parametering Setting of the parameters of a controlling system and adjusting them to get a desired behaviour.

parameterize To set up variable execution depending on run-time parameters.

parameter word A word that directly or indirectly provides or designates one or more parameters.

parametric amplifier An inverting parametric device used to amplify a signal without frequency translation from input to output. Note: In common usage, this term is a synonym for reactance amplifier.

parametric frequency converter A frequency converter that utilizes the variation of the reactance parameter of an energy-storage element for frequency conversion.

parametron A unique device composed of two stable states of oscillation, one is twice the frequency of the other and has the capability of storing one binary digit.

paramistor A digital logic-circuit module containing several parametron elements.

parasitic An undesired low- low or high-frequency signal in an electronic circuit.

parasitic components In a monolithic integrated circuit, the capacitors and diodes which are formed between the planned circuit elements and the substrate during processing. The circuit design must allow for the functional effects of these parasitic components.

parasitic oscillation Unwanted oscillation of an amplifier, or oscillation of an oscillator at some frequency other than that of the main resonant circuit. Generally of high frequency, it may occur during a portion of each cycle of the main oscillation.

parasitic suppressor A parallel resistance, or a parallel combination of inductance and resistance, inserted into a grid or plate circuit to suppress parasitic oscillations.

paraxial ray (optical communication) A ray that is close to and nearly parallel with the fiber axis.

parenthesis-free notation, prefix notation, Polish notation, Lukaasiewicz notation A method of forming mathematical expressions in which each operator precedes its operands and indicates the operation to be performed on the operands or the intermediate results that follow it.

paring disc, paring tube (separation terminology) A disc or a tube used for "paring" a liquid or a slurry out of the separator bowl. In a purifier or concentrator it can be used with a gravity disc for the other liquid phase, or two paring devices can be used for the liquids. In principle a "centripetal pump" where the impeller is stationary and the pump housing and liquid rotate (compare gravity disc).

parity (mathematics of computing) **1.** An error detection method in which the total number of ones in a binary word, byte, character, or message is set to an odd or even number by appending a redundant bit. This number is subsequently checked to ensure that it remains odd or even. **2.** The property of oddness or evenness possessed by a word, byte, character, or

message. This property is determined by the total number of ones.

parity bit A binary digit appended to a group of binary digits to make the sum of all the digits, including the appended binary digit, either odd or even as predetermined.

parity check A redundancy check by which a recalculated parity bit is compared to the predetermined parity bit.

parity error An error caused by incorrect parity detected as a result of a parity check.

parity interrupt An interrupt signal that indicates a parity error.

parity tree A group of exclusive OR gates that can be used to check a number of input bits for either odd or even parity. Parity trees are used both to check and generate parity wherever a redundant bit is added to a word in order to check for error.

Parr turbidimeter A device for determining the cloudiness of a liquid by measuring the depth of the turbid suspension necessary to extinguish the image of a lamp filament of fixed intensity.

parse To break a command string into its elemental components for the purpose of interpretation.

Parshall flume A primary device for liquid flow measurement in open channels. The Parshall flume consists of a converging upstream section, a throat, and a diverging downstream section. The complete unit has vertical side walls and the floor, or bottom, of the throat is inclined downward. The Parshall flume is normally employed on those applications where a weir is not always suitable. The flowing liquid may carry excessive solids or sediment, or it may be impossible to construct a large enough stilling section upstream. Where any of these conditions exist, a Parshall flume will usually suffice.

parsing Operation to break down high-level language code into its element parts when translating into machine code.

partial 1. A physical component of a complex tone.
2. A component of a sound sensation that can be distinguished as a simple tone which cannot be further analyzed by the ear and which contributes to the character of the complex sound.

partial carry In parallel addition, a procedure in which some or all of the carriers are temporarily stored instead of being immediately transferred.

partial differential equation An differential equation which contains more than one independent variable and/or derivatives (differentials) of more than one independent variable.

partial failure A failure which results in the inability to perform some, but not all, required functions.

partial fault A fault of an item other than a complete fault.

partial full-duplex A method of operation of a communication circuit in combination with a datacommunications terminal in which information may be transmitted full-duplex.

partial oxidation method (in steelmaking) A variation of the acid electric-furnace process chiefly used to produce low-priced steel casting that do not require any acceptance tests other than superficial surface inspection. See also under acid electric-furnace process.

partial pressure In a mixture of gases, each component exerts the pressure which it would exert if present alone at the same temperature in the total volume occupied by the mixture. The partial pressure of each component is equal to the total pressure multiplied by its mol fraction in the mixture.

partial-read pulse In a computer, any one of the applied currents which cause selection of a core for reading.

partial-write pulse In a computer, any one of the applied circuits which cause a core to be selected for writing.

particle An infinitesimal subdivision of matter, e.g., a molecule, atom or electron.

particles 1. Also known as domains. Small bits of oxide that are on the recording media on the tape.
2. Small portion of solid (or liquid) matter present in the fluid, for example dust, fibers, metal etc.

particle size A measure of dust size, expressed in microns or percent passing through a standard mesh screen.

particle size distribution, grain size distribution Proportion by mass of each particle size present in a given sediment sample.

particle velocity The velocity of a given infinitesimal parts of a sound wave. The most common unit is centimeter per second.

particulate matter Minute particles of solid matter – cinders and fly ash – contained in stack gases.

parting (corrosion) The selective corrosion of one or more components of a solid solution alloy.

parting limit (corrosion) The maximum concentration of a more-noble component in an alloy, above which parting does not occur within a specific environment.

partitioned data set (PDS) A data set that is divided internally into parts.

partition See segment.

part program In numerical control, an ordered set of instructions in a language and format required to cause operations to be effected under automatic control which then is either written in the form of a machine program on an input medium or stored as input data for processing in a computer to obtain a machine program.

part programming language A set of symbols, codes, format, and syntax (grammar) definitions used to describe machining operations which are understandable to computers or controls.

part programming manual The manual preparation of a manuscript in Electronic Industries Code and format to define a sequence of commands for machining a part on a numerical control (NC) machine.

parts density The number of parts in a unit volume.

parts list List specifying the items (parts, components, software, equipment, etc.) that constitutes an assembly (or sub-assembly) and, if necessary, reference documents.

parts per million by volume Ratio of volume of water of dry carrier gas, times 10^5 .

parts per million by weight Ratio of weight of water vapor to weight of dry carrier gas, times 10^5 .

PASCAL A high level programming language derived from ALGOL. A language designed to enable teaching of programming as a systematic discipline. Developed by Nicholas Wirth and named for the mathematician Blaise Pascal.

pascal, Pa 1. Unit for measurement of pressure (SI unit). Use the SI unit pascal for absolute pressure as well as for gage pressure. Gage pressure is the difference between the measured pressure and a reference pressure, normally that of the surrounding atmosphere. In several countries the non-SI unit bar is used together with the SI unit pascal. 1 bar = 100 kPa. Give preference to the SI unit pascal. Especially, avoid the unit bar in calculations. **2.** Unit for measurement of normal stress, shear stress, modulus of elasticity, and

shear modulus. (SI unit). $1 \text{ Pa} = 1 \text{ N/m}^2$. Common multiples: kPa, MPa for stress. MPa, GPa for modulus. In specifications for metals N/mm^2 is often used. $\text{N/mm}^2 = 1 \text{ MPa}$. In calculations always use Pa.

Paschen's law The sparking potential between two terminals in a gas is proportional to the pressure times the spark length. For a given voltage, this means the spark length is inversely proportional to the pressure.

pass 1. One phase of a computer run which may comprise several phases. A pass is a logical distinct group of operations in a run with several such groups. **2.** A single circuit through a process, such as gases through a boiler, metal between forging rolls, or a welding electrode along a joint.

passband 1. The band of frequencies which will pass through a filter with essentially no attenuation. **2.** The frequency range in which a filter is intended to pass signals.

passband filters Filters used in modem design to allow only the frequencies within the communication channel to pass, while rejecting all frequencies outside the channel.

passband ripple In a filter, the difference, in decibels, between the minimum loss point and the maximum loss point in a specified bandwidth.

pass/fail criteria Decision rules used to determine whether a software item or a software feature passes or fails a test.

passivating A process for the treatment of stainless steel in which the material is subjected to the action of an oxidizing solution which augments and strengthens the normal protective oxide film providing added resistance to corrosive attack.

passivation (corrosion) The process or processes (physical or chemical) by means of which a metal becomes passive.

passivator (corrosion) An inhibitor that changes the potential of a metal appreciably to a more cathodic or noble value.

passive 1. An inert component which may control, but does not create or amplify energy. **2.** Pertaining to a general class of device that operates on signal power alone. **3.** Incapable of generating power or amplification. A nonpowered device which generally presents some loss to a system. **4.** Describing a device which does not contribute energy to the signal it passes.

passive-active cell (corrosion) A cell composed of passive and active areas.

passive AND gate An electronic or fluidic device which generates an output signal only when both of two control signals appear simultaneously.

passive component 1. A nonpowered component generally presenting some loss (expressed in decibels). **2.** A component which has no gain characteristics, such as a capacitor or a resistor.

passive decoder A device that is set so that only one specific reply code will pass a decoder and give an output from one decoder for display.

passive device, passive element 1. A device which exhibits no transistance. It has no gain or control and does not require any input other than a signal to perform its function. Examples of passive devices are conductors, resistors and capacitors. **2.** For fluid power systems devices without power supply. Output power is delivered solely from the input signals.

passive electric network An electric network containing no source for energy.

passive fault (in a control system) Fault which is blocking control actions in spite of fulfilled conditions according to a programme.

passive metal A metal which has a natural or artificially produced surface film that makes it resistant to electrochemical corrosion.

passive station (data transmission) On a multi-point connection or a point-to-point connection using basic mode link control, any tributary station waiting to be polled or selected.

passive system A system that emits no energy and therefore does not reveal its position or existence.

passive test A test conducted upon an equipment or any part thereof when the equipment is not energized.

passivity (chemical) The condition of a surface that retards a specified chemical reaction at that surface.

password A character string that enables a user to have full or limited access to a system or to a set of data.

paste In batteries, the medium, in the form of a paste or jelly, containing an electrolyte.

pasteboard See pasted paper.

pasted lined board Board on one or both sides of which a liner has been pasted; see lining.

pasted paper, pasted board Paper or board manufactured by a process in which two or more webs or sheets of the same or different constitution are combined by pasting.

pasteurization A process, involving the elevation of temperature for an appropriate period of time, for the purpose of either inactivating micro-organisms, particularly pathogens, or decreasing their number for a limited period of time, to a specified level or to a value below the infective dose.

pasteurizing column A column that purges either a lighter-than-light key impurity through a purge stream at the top of the column or heavier-than-heavy key impurity through a purge stream at the bottom of the column.

pasting (of sheets or webs) Joining of one or more sheets or webs of paper board or other material to the whole surface of another sheet or web of paper or board by the application of an adhesive paste.

past mode recall Denotes the ability to configure the Basic Controller to return to the proper computational slot mode after a power failure. The computational slot can return to the previously existing mode or be forced to manual. Refers to Honeywell TDC 3000 control systems.

patch 1. A section of coding inserted into a routine to correct a mistake or alter the routine. **2.** To make an improvised modification.

patch board A board or panel where circuits are terminated in jacks for patch cords.

patch cable A cable with plugs or terminals on each end of the conductor or conductors used to temporarily connect circuits of equipment together.

patch cord A handy flexible connector conductor with connectors at each end and used to interconnect sockets or plugboards.

patching Connecting two lines or circuits together temporarily by means of a patch cord.

patching jack A jack for interconnection of circuit elements.

patch panel 1. An interconnection device, usually removable, that employs removable wires to control the operation of computing equipment. **2.** The group of displays, manual buttons, and switches which are used by the operators, engineers and maintenance personnel.

patenting Heat treatment (especially of steel wire and strip with a high or medium-high carbon content) comprising quenching from a temperature above the transformation range down the range that produces la-

melliform pearlite. Patenting can be performed as continuous patenting or as immersion patenting. In patenting the quenching is performed in a lead bath, salt bath or air; see air patenting, bath patenting, lead patenting, resistance patenting.

path (industrial robots) Special locus drawn by the movement of any point on the robot or the workpiece, along which orientation of the robot end-effector may or may not be variable.

path In a network, any route between any two nodes.

path acceleration (industrial robots) The resultant acceleration obtained under continuous path control which generates the acceleration along several axes in such way that the mechanical interface or specified tool centre point (TCP) reaches the desired velocity along required path.

path accuracy (industrial robots) Ability of a robot to have its mechanical interface following the command path in the same direction n times.

path analysis (software) Program analysis performed to identify all possible paths through a program, to detect incomplete paths, or to discover portions of the program that are not on any path.

path condition (software) A set of conditions that must be met in order for a particular program path to be executed.

pathogen A organism capable of producing disease in a susceptible plant or animal, including man.

path repeatability (industrial robots) Closeness of the agreement between the attained paths for the same command repeated.

path treatment Path treatment is one approach to noise control. Sound is transmitted via longitudinal waves through the elastic medium or media that separate the source from the receiver. The speed of efficiency of sound transmission is dependent on the properties of the medium through which it is propagated. Path treatment consists of regulating the impedance of the transmission path to reduce the acoustic energy that is communicated to the receiver. See further ISA handbook of control valve, pertaining to this and other approaches for control valve noise attenuation.

path velocity (industrial robots) The velocity along a specified path obtained under continuous path control which generates the velocity components along several axis.

path velocity accuracy (industrial robots) The error between the command velocity and the mean value of n replications of the attained velocity measured at the mechanical interface.

patina (corrosion) A green coating consisting principally of basic sulfate (sulphate) and occasionally containing small amounts of carbonate or chloride, that forms on the surface of copper or copper alloys exposed to the atmosphere a long time.

pattern The description of something for which a system should search either in a knowledge base or rule base.

pattern matching A process performed by an expert system during a search through its knowledge base.

pattern recognition The identification of shapes, forms or configurations by automatic means.

pattern sensitive fault A fault that appears in response to some particular pattern of data.

pause instruction, halt instruction An instruction that specifies the suspension of the execution of a computer program. Note: A pause instruction is usually not an exit.

pattern (in artificial intelligence) A set of features and their relationships used to recognize an entity within a given context. Note: These features could include

de a geometrical shape, a sound, a picture, a signal or written text.

PAX See private automatic exchange.

Pb Chemical symbol for lead.

P band In telemetry, the portion of the radio frequency spectrum from 215 to 250 MHz; generally a narrow section of that band near 225 MHz is available for telemetry application.

PBB Polybrominated Biphenyl.

P-bit Parity bit.

PBX See private branch exchange.

pC 1. Picocoulomb. **2.** Picocurie.

PCA Process Communications Architecture. An architecture for a three layer (Physical, Data Link and Application) open communications system being developed by ISA SP72. It can provide communications functions that are needed in control and automation applications. PCA uses OSI protocols and provides a transparent application interface to 7-layer MAP networks.

p chart A type of data display in quality control which charts the fraction defective in a sample or over a production period against time or number of units of production.

PCM See pulse code modulation.

PC-MOS Operating system compatible with MSDOS.

PCM serial recording The technique of recording a train of bits on a single track of magnetic tape.

P controller See proportional controller.

PC-program (programmable controllers) Synonymous with application program.

PCS-fiber, plastic clad silica fiber An optical fiber having silica core and plastic cladding.

PC system See programmable controller system.

PCTFE Polymonochlorotrifluoroethylene.

PD control Proportional plus derivative control.

PD controller See proportional plus derivative controller.

PDEP control form A control form dedicated to electrically heated processes. A power balance feature recognizes the need for different power levels at different set points and resets the proportional band as a function of set point. Power compensation corrects for line voltage variations by modifying the cycling of the output relay, thus ensuring a constant power to the load. (Honeywell source).

PDU Protocol Data Unit. Each of the seven OSI layers accepts data SDUs (SubData Unit) from the layer above, adds its own header PCI (Protocol Control Information) and passes the data to the layer below as a PDU. Conversely, each of the layers also accepts data from the layer below, strips off its header, and passes it up to the layer above.

peak Also called crest. **1.** A momentary high amplitude level occurring in electronic equipment. **2.** The maximum instantaneous value of a quantity. **3.** To increase or sharpen the peaks of a waveform.

peak amplitude The maximum deviation (e.g., of a wave) from an average of mean position.

peak current 1. The maximum current during a complete cycle. **2.** Maximum amplitude of current an ionized device can pass without permanent change in breakdown ratings or published life specifications.

peak data transfer rate The maximum rate that data is transmitted through a channel.

peak discharge energy The maximum amount of energy a device can withstand during operation without permanent change in breakdown ratings or published life specifications.

peak distortion The largest total distortion of signals noted during a period of observation.

peak factor The ratio of the peak value to the r.m.s. value of a periodic quantity.

peak flux density The maximum flux density in a magnetic material.

peak frequency On a Bode plot, the frequency of a high point of the magnitude curve before the curve drops downward.

peaking 1. Adjusting a component so as to increase the response of a circuit at a desired frequency or band of frequencies. **2.** To tune a circuit for a very sharp response at a particular frequency.

peak intensity wavelength (optical communication) The wavelength at which the radiant intensity of a source in a given direction is maximum.

peak load (general) The maximum load consumed or produced by a unit or group of units in a stated period of time. It may be the maximum instantaneous load or the maximum average load over a designated interval of time.

peak pulse power The maximum power of a pulse, excluding spikes.

peak response The maximum response of a system to an input.

peak sound pressure The maximum absolute value of instantaneous sound pressure for any specified time interval. The most common unit is microbar.

peak stage The maximum instantaneous stage during a given period. Pertains to measurement of liquid flow in open channels.

peak-to-peak 1. Abbreviated p-p. The algebraic difference between the positive and negative maximum values of a waveform. **2.** The amplitude (voltage) difference between the most positive and the most negative excursions (peaks) of an electrical signal.

peak-to-peak output ripple The periodic variations present in the output of a power supply. They have little effect on the average dc output but can clutter operation of circuits being powered.

peak-to-valley value The difference between the peak and valley values during a specified time interval. For a periodic quantity, the time interval equal to a period.

peak transient regulation Of a system. The maximum excursion of a characteristic output quantity from the initial steady-state value following a specified step-function change of load.

peak value The greatest value of a time-dependent quantity during a specified time interval. Note: For a periodic quantity, the time interval equal to a period.

peak voltage The maximum value present in a varying or alternating voltage. This value may be either positive or negative.

pearlite Lamelliform eutectoid composed of ferrite and cementite; see bainite. The term pearlite alludes to the pearl-like lustre of a piece of steel with this structure after etching.

pearlitzing Isothermal annealing at a temperature suitable for the formation of lamelliform pearlite; see normalizing.

pedal Control device foot-operated in one direction only.

peer-to-peer protocol Communication protocol between two entities.

pelletizing (for blast furnace charging) Pelletizing differs from sintering in that a "green" unbaked pellet or ball is formed and then hardened by heating. In general, the pelletizing process is desirable for agglomeration of finely divided concentrates because they are normally of such fine size that they will form into a green ball with little difficulty. The major pelle-

tizing systems are: traveling grate, grate-kiln system and vertical-shaft furnaces.

Peltier coefficient The quotient of the rate of Peltier heat absorption by the junction of two dissimilar conductors divided by the current through the junction. The Peltier coefficient of a couple is the algebraic difference between either the relative or absolute Peltier coefficients of the two conductors making up the couple.

Peltier effect One of the three (besides the Seebeck and Thomson effect) thermoelectric effects found in thermocouples. The Peltier effect creates a transport of thermal energy by the application of a current to a thermoelectric circuit.

Peltier electromotive force 1. The component of voltage produced by a thermocouple after being heated by the Peltier effect at the junction of the different metals. It adds to the Thomson electromotive force to produce the total voltage of the thermocouple. **2.** The boundary emfs produced across the junctions of two different metals. Associated with the heating and cooling effects of the two junctions.

Peltier heat The thermal energy absorbed or produced as a result of the Peltier effect.

permittivity See dielectric constant.

pen The device that contacts the chart and scribes a line with ink.

pendant The type of plug and/or receptacle that is not mounted in a fixed position or attached to a panel or side of equipment.

pendular robot A robot whose mechanical structure of the arm includes a universal joint pivoting assembly.

penetrant testing (nondestructive) See under dye penetrant test.

penetration depth In induction heating, the effective depth of the induced current.

penetration number A measure of the consistency of materials such as waxes and greases expressed as the distance that a standard needle penetrates a sample under specified ASTM test conditions.

pen plotter A recorder specifically designed for computer graphics. The plotter will yield reproducible records of graphs, charts and drawings on plain paper annotated with alphanumerics.

pen recorder A recording instrument in which the record on the chart is made by a pen supplied with ink.

pentode An electron tube containing five electrodes – an anode, a cathode, a control electrode, and two others which usually are grids.

pen travel The length of the path described by the pen in moving from one end of the chart scale to the other. The path may be an arc or a straight line.

penumbral The specific headings that are relevant to the data being sought.

PER See program event recording.

perceived noise level An empirical measure that includes allowance for the subjective reaction of people to noise in the various frequency ranges. It is expressed in decibels (PNdB).

percentage – differential relay A differential relay which functions when the difference between two quantities of the same nature exceeds a fixed percentage of the smaller quantity. This term includes relays formerly known as ratio-balance relays, biased relays and ratio-differential relays.

percent flash (control valves) Percent of maximum flow that will flash to vapor state due to pressure drop across the valve.

percent of actual Same accuracy value applies over the entire flow rate range. Pertains to flow measurement.

percent of span Accuracy values applies only at the maximum rated flow. Pertains to flow measurement.

percent steady-state deviation (control) The difference between the ideal value and the final value, expressed as a percentage of the maximum rated value of the directly controlled variable (or another variable if specified).

percent system deviation (control) At any given point on the time response, the difference between the ideal value and the instantaneous value, expressed as a percentage of the maximum rated value of the directly controlled variable (or another variable if specified).

percent transient deviation (control) The difference between the instantaneous value and the final value, expressed as a percentage of the maximum rated value of the directly controlled variable (or another variable if specified).

perceptron A system capable of, either in theory or in practice, performing knowledgeable functions such as recognition, classification and learning.

perchloroethylene A chlorinated industrial solvent. Often used for solvent washing, a cleaning procedure for cleaning industrial-process measurement and control equipment to be used for oxygen service. See IEC publication 877 (1986) for further details.

percolating filter See biological filter.

perfect combustion The complete oxidation of all the combustible constituents of a fuel, utilizing all oxygen supplied.

perfective maintenance (software) Maintenance performed to improve performance, maintainability, or other software attributes. See also adaptive maintenance, corrective maintenance.

perfect vacuum A reference datum analogous to a temperature of absolute zero that is used to establish scales for expressing absolute pressures.

perforated Punched.

perforated tape See punched tape.

perforator A keyboard device for punching paper tape.

performance **1.** Pertaining to electronic measuring instruments, the degree to which the intended functions of an instrument are accomplished. **2.** The ability of a computer system or subsystem to perform its functions.

performance characteristics The tabulation of those pertinent parameters and their quantification which define the functions and capabilities of a device under static or dynamic conditions or as a result of a specific test.

performance chart A graphic representation of some aspect of operation of a piece of equipment or a system.

performance evaluation The technical assessment of a system or system component to determine how effectively operating objectives have been achieved.

performance index **1.** Mathematical expression which characterizes the quality of control specified conditions. **2.** In industrial engineering, the ratio of standard hours to hours of work actually used to produce a given output.

performance number Any of a series of numbers used to rate aviation gasolines with octane values greater than 100; the performance number (PN) compares fuel antiknock values with those of a standard reference fuel in terms of an index which indicates relative engine performance.

performance requirement A requirement that specifies a performance characteristic that a system or system component must possess.

performance specification A specification that sets forth the performance requirements for a system or system component. Synonymous with requirements specification.

periodic current Oscillating current, the values of which recur at equal time intervals.

periodic damping Also called underdamping. Damping in which the pointer of an instrument oscillates about the final position before coming to rest. The point of change between periodic and aperiodic damping is called critical damping.

periodic duty A type of intermittently duty involving regularly repeating load conditions.

periodic electromagnetic wave A wave in which the electric field vector is repeated in detail, either at a fixed point, after a lapse of time known as the period; or at a fixed time, after the addition of a distance known as the wavelength.

periodic electromotive force An oscillating electromotive force that repeats its sequence of values over equal intervals of time.

periodic function An oscillating quantity whose values repeatedly recur for equal increments of the independent variable.

periodic resonance Also called natural resonance. Resonance in which the applied agency maintaining the oscillation has the same frequency as the natural period of oscillation in a system.

periodic tests, periodic testing Tests performed at scheduled intervals to detect failures and verify operability.

periodic wave **1.** Wave in which the displacement has a periodic variation with time, distance or both. **2.** A wave which repeats itself at regular intervals of time.

period of an underdamped instrument Also called periodic time. The time required, following an abrupt change in the measurand, for the pointer or other indicating means to make two consecutive transits in the same direction through the rest position.

period of pulsation The average period of a cycle of pulsation during which the velocity at a point in the cross-section fluctuates between limiting high and low values. Pertains to liquid flow measurement in open channels.

peripheral controls Regulates the transfer of data between the central processor and peripheral devices.

peripheral device, peripheral equipment With respect to a particular processing unit, any equipment that provides the processing unit with outside communication. Examples: Input/output units, auxiliary storage.

peripheral flow The flow-rate of fluid in the area between the conduit wall and the contour defined by the velocity measuring points which are the closest to the wall. Pertains to measurement of fluid flow in closed conduits.

peripheral limited A system in which the overall processing time is dictated by the speed of the peripheral units.

peripheral node, endpoint node A node that is at the end of only one branch.

peripheral units Equipment that works in conjunction with a data terminal or computer but is not part of that unit.

peritectic Material of such composition that at a certain temperature during cooling it is transformed from

a mixture of one solid and one liquid phase to a new solid phase; compare eutectic, eutectoid, peritectoid.

peritectoid Material of such composition that at a certain temperature during cooling it is transformed from a mixture of two solid phases to a new solid phase; compare eutectic, eutectoid, peritectic.

Permalloy A high-permeability magnetic alloy composed mainly of iron and nickel.

permanent fault, persistent fault, solid fault A fault of an item that persists until an action of corrective maintenance is performed.

permanent-field synchronous motor A synchronous motor similar in construction to an induction motor in which the member carrying the secondary laminations and windings carries also permanent-magnetic field poles that are shielded from alternating flux by the laminations. It starts as an induction motor but operates normally at synchronous speed.

permanent hardness See non-alkaline hardness.

permanent magnetic material Ferromagnetic material which, once having been magnetized, resists external demagnetizing forces.

permanent magnet motor A direct-current motor which has a permanent magnet field (stationary member) and a wound armature (rotating member). Its speed can be changed by varying the armature voltage.

permanent-magnet moving-coil instrument An instrument which operates by the interaction of a current in a movable coil with the field of a fixed permanent magnet. Note: The movable part of these instruments can have more than one coil, measuring the sum or ratio of the currents in them. Also called D'Arsonval instrument.

permanent-magnet moving-iron instrument, polarized-vane instrument An instrument that depends for its operation on the action of an iron vane in aligning itself in the resultant magnetic field produced by a permanent magnet and the current in an adjacent coil of the instrument.

permanent magnet, PM A magnet whose magnetic field originates from permanently magnetized material.

permanent magnistor A saturable reactor which has the properties of memory and the ability to handle appreciable power.

permanent memory Storage of information which remains intact when the power is turned off.

permanent press (textile term) A chemical treatment applied to, usually, a blend of polyester/cotton which, after curing at an elevated temperature, gives a lasting memory of flatness or other desired configuration.

permanent pressure drop The unrecoverable reduction in pressure that occurs when a fluid passes through a nozzle, orifice or other throttling device.

permanent storage A storage device that is non-erasable.

permeability 1. In water quality terminology, the property of a membrane or other material characterizing its ability selectively to permit substances to pass through it. 2. A measure of how much better a given material is than air as a path for magnetic lines of force. (Air is assumed to have a permeability of 1).

permeameter Equipment intended for the determination of the magnetic characteristics of substances.

permeance 1. The ratio of the flux through any cross section of a tabular portion of a magnetic circuit bounded by the lines of force and by two equal potential surfaces to the magnetic potential of the difference between the surfaces, taken within the portion under

consideration. Permeance is the reciprocal of reluctance and can be considered analogous to electrical conductance. In the cgs system it is equal to the magnetic flux (in maxwells) divided by the magnetomotive force (in gilberts). 2. Property (of paper or board) of permitting the penetration of gas or liquid.

permissive (relay system) A general term indicating that functional cooperation of two or more relays is required before control action can become effective.

permissive control device Generally a two-position, manually operated switch which in one position permits the closing of a circuit breaker or the placing of an equipment into operation, and in the other position prevents the circuit breaker or the equipment from being operated.

permutation An ordered arrangement of a given number of different elements selected from a set.

perpendicular magnetization In magnetic recording, magnetization that is perpendicular to the line of travel and parallel to the smallest cross-sectional dimension of the medium.

persistence In a cathode-ray tube the period that a phosphor continues to glow after excitation is removed.

persistent current (superconducting material) A magnetically induced current that flows undiminished in a superconducting material or circuit.

persistent fault, permanent fault, solid faults See permanent fault.

persistent substance See conservative substance.

persistor A bimetallic circuit used for storage or readout in a computer. It is generated near absolute zero, and changes from a resistive to a superconductive state at a critical current value.

personal computer A single-user microcomputer designed for personally controllable applications.

PERT 1. Program Evaluation and Review Technique. A management control tool for managing complex projects; project milestones are defined and interrelated, then using a flowchart or computer progress is measured against the milestones; deviations from the integrated plan are used to trigger decisions or preplanned alternative actions to minimize adverse effects on the overall goal. 2. Program Evaluation Research Task.

PES See programmable electronic system.

PESA Petroleum Equipment Suppliers Association (USA).

Petri net An abstract, formal model of information flow, showing static and dynamic properties of a system. A Petri net is usually represented as a graph having two types of nodes (called places and transitions) connected by arcs, and markings (called tokens) indicating dynamic properties. See also state diagram.

petrochemicals Chemicals derived from petroleum; feedstocks for the manufacture of a variety of plastics and synthetic rubber.

petrochemistry The study of the chemical composition of rocks. Petrochemistry is one part or aspect of the broader science of geochemistry and is not to be confused with petroleum chemistry, which is the science of synthesizing substances derived from crude oil, natural gas and natural gas liquids.

petroleum In its broadest sense, the term embraces the whole spectrum of hydrocarbons-gaseous, liquid, and solid. In the popular sense petroleum means crude oil.

petroleum coke Solid or fixed carbon that remains in refining processes after distillation of all volatile

hydrocarbons; the hard, black substance remaining after oils and tars have been driven off by distillation.

petroleum engineering A branch of engineering that deals with drilling for and producing oil, natural gas and liquidifiable hydrocarbons.

petroleum fluid, mineral oil (fluid power systems) Fluid composed of petroleum hydrocarbons which may contain other constituents.

pF Picofarad.

PFA Perfluoroalkoxy.

PFBC Pressurized Fluid Bed Carbon. A coal based power generation process developed by ABB Carbon.

pH A symbol used in expressing both acidity and alkalinity on a scale whose values run from 0 to 14, with 7 representing neutrality; numbers less than 7, increasing acidity; greater than 7, increasing alkalinity. Definition of pH-effective acidity or alkalinity of a solution. Two practical methods of pH measurement are in use. One of these is the colorimetric method. The second technique is the electrometric or potentiometric method. See under these terms.

phantom circuit (data transmission) A superposed circuit derived from two suitably arranged pairs of parallel wires, called side circuits. Each pair of wires is a circuit itself, and at the same time acts as one conductor of the phantom circuit.

phantom signals Signals appearing on the screen of a cathode-ray-tube indicator; their cause cannot readily be determined, and they may be due to circuit fault, interference, propagation anomalies, jamming, etc.

phase 1. For batch processes an independent process-orientated action within an operation. The phase is defined by boundaries that constitute safe or logical points where processing can be interrupted. **2.** The relative timing of a signal in relation to another signal; if both signals occur at the same instant, they are in phase; if they occur at different instants, they are out of phase. **3.** Pertaining to heat treatment, homogenous portion of a system, separated from the other parts by boundary surfaces; see solution, structure.

phase angle For a linear system in sinusoidal steady-state, phase difference between the output variable and the corresponding input variable.

phase angle firing A method of operation for a SCR stepless controller in which power is turned on for the proportion of each half cycle in the ac power supply necessary to maintain the desired heating level.

phase-angle meter See phase meter.

phase angle of a polyphase ac power supply Polyphase systems are classified in terms of maximum departure from nominal value of the angle between any two consecutive vectors representing voltages either simple or between lines of the system. The nominal value is established by a symmetrical system; this angle is 120° for a three-phase system. See further IEC publication 654-2.

phase characteristics A graph of phase shift versus frequency, assuming sinusoidal input and output.

phase-controlled rectifier A rectifier circuit in which the rectifying element is a thyatron having a variable-phase, sine-wave grid bias.

phase control range (thyristor) The range over which it is possible to adjust the angle of retard expressed in electrical degrees.

phase converter A converter that changes alternating-current power of one or more phases to alternating-current power of a different number of phases but of the same frequency.

phase crossover frequency In a Bode diagram or a polar plot, the frequency at which the phase angle becomes ± 180 degrees.

phase curve On a Bode plot, the curve showing the time-relationship between output and input signals as measured by the frequency-response method, in terms of phase angle.

phase deviation In phase modulation, the peak difference between the instantaneous phase angle of the modulated wave and the phase angle of the sine-wave carrier, both expressed in radians or degrees.

phase diagram See equilibrium diagram.

phase difference The time in electrical degrees by which one wave leads or lags another.

phase discriminator A device that detects the phase relationship of a signal to that of a reference.

phase encoding, phase modulation recording A magnetic recording in which each storage cell is divided into two regions which are magnetized in opposite senses; the sequence of these senses indicates whether the binary digit represented is zero or one.

phase-frequency distortion Also called phase distortion. Distortion that occurs when the phase shift is not directly proportionate to the frequency over the range required for transmission or the effect of such departure on a transmitted signal.

phase hits Abrupt shifts in the phase of a transmitted carrier.

phase inversion The condition whereby the output of a circuit produces a wave of the same shape and frequency but 180° out of phase with the input.

phase jitter A type of unwanted random distortion which results in the intermittent shortening or lengthening of the signals.

phase lag The angle by which the cycling output lags behind a sinusoidal input.

phase lead The angle by which the cycling output is advanced with respect to a sinusoidal input.

phase margin For an absolutely stable feedback system, the difference between π rad and the absolute value of the open-loop phase angle at the frequency at which the open-loop gain is unity.

phase meter An instrument intended to measure the phase angle between two alternating electrical quantities of the same frequency, one of which is accepted as the phase reference. Also called a phase-angle meter.

phase-modulated wave A wave whose phase angle has been caused to deviate from its original (no-signal) angle by an amount proportional to the modulating signal amplitude.

phase modulation, PM The process by which the phase of a carrier wave is varied relative to a reference sine function, following a specified law. Note: The result of that process is a phase modulated signal.

phase modulation recording See phase encoding.

phase modulation telemetering A type of telemetering in which the phase difference between the transmitted voltage and a reference voltage varies as a function of the magnitude of the magnitude of the measured quantity.

phase noise A measure of the random phase instability of a signal.

phase response The phase angle of the frequency response as a function of the angular frequency. Note 1: In graphical representation the phase angle of the frequency response is usually plotted versus the logarithmically represented value of the angular frequency. Note 2: The phase response is the argument of the frequency response.

phase reversal A 180° change in phase (or one half cycle) such as a wave might undergo upon reflection under certain conditions.

phase-sensitive amplifier A servoamplifier the output signal polarity or phase of which is dependent upon the polarity or phase relationship between an error (input) voltage and a reference voltage.

phase shift **1.** The time difference between the input and output signal or between any two synchronized signals, of a control unit system, or circuit, usually expressed in degrees or radians. **2.** Of a transfer function, a change of phase angle with test frequency, as between points on a loop phase characteristic.

phase shifter (data transmission) A device in which the output voltage (or current) may be adjusted to have some desired phase relationship with the input voltage (or current).

phase simulator A precision test instrument which generates reference and data signals on the same frequency but precisely separated in phase.

phase splitter (data transmission) A means of producing two or more waves which differ in phase from a single input wave.

phase velocity (fiber optics) For a particular mode, the ratio of the angular frequency to the phase constant.

phasing Causing two systems or circuits to operate in phase or at some desired difference from the in-phase condition.

pH electrode assembly A sensor generally comprising a measuring electrode and a reference electrode, producing electrical signal which is a function of the activity of the H⁺ ions in an aqueous solution.

Phelps vacuum gage A modified hot filament ionization gage useful for measuring pressures in the range 10⁻⁵ to 1 torr.

phenol Phenol, sometimes called carboric acid, is recovered from both coal tar and ammonia liquor. Its most important use is in the manufacture of resinous condensation products by reaction with formaldehyde, e.g., "Bakelite".

phenolic material Any one of several thermosetting plastic materials available which may be compounded with fillers and reinforcing agents to provide a broad range of physical, electrical, chemical and molding properties.

phenolphthalein end-point alkalinity (water quality) The measurement by titration to the phenolphthalein end-point (pH 8.3) of that portion of alkalinity arbitrarily attributed to all the hydroxyl and half the carbonate content of a water; often used in conjunction with methyl red end-point alkalinity (see methyl red end-point alkalinity).

Philips gage An instrument that measures very low gas pressure (vacuum) indirectly by determining current flow from a glow discharge device.

pH meter An instrument for electronically measuring electrode potential of an aqueous chemical solution and directly converting the reading to pH (a measure of hydrogen ion concentration, or degree of acidity).

phon The subjective unit for measuring the apparent loudness of a sound.

phoneme The basic phonological element of speech.

phonons Packets of sound energy vibrating in a solid at ultrahigh frequencies, so high that the energy is commonly thought of as heat.

PHOSAM process (coke-oven plants) A development of United Steel Corp. for recovery of the ammonia in coke-oven gas and gas liquor as high-quality anhydrous ammonia.

phosphate ester fluid Fluid composed of phosphate ester which may contain other constituents. Its fire resistant property is derived from the molecular structure of the fluid.

phosphatizing Forming an adherent phosphate coating on metal by dipping or spraying with a solution to produce an insoluble, crystalline coating of iron phosphate which resists corrosion and serves for a base for paint.

phosphor The fluorescent material which coats the screen of a CRT.

phosphor bronze A frequently used connector contact material with good corrosion resistance and fair conductivity.

phosphorescence A property of emitting light for a period of time after the source of excitation is taken away, e.g., in electrostatic storage tubes and cathode-ray tubes (CRTs).

phosphorus balance See mass balance.

phot (pt) The unit of illumination when the centimeter is taken as the unit of length; it is equal to one lumen per square centimeter. The SI unit, lux is preferred.

photocell See photoelectric cell.

photochemical radiation Energy in the ultraviolet, visible and infrared regions used to produce chemical changes in materials.

photochemical species The atmosphere contains a wide variety of unstable, reactive species which are formed by the reaction of sunlight with moisture and other atmospheric constituents. Because of the transient nature of most of these species, their primary effect is on outdoor installations and enclosures. In general, plastics and elastomers are more susceptible to photochemical effects than metals. (Extracted from IEC 654-4 Operating conditions for industrial-process measurement and control equipment.)

photoconduction An increase in the electrical conduction capability resulting from the absorption of electromagnetic radiation by the material.

photoconductive detector A detector used in the region from the optical to the far infrared. It is based on photoconductive effects in semiconductors that are sensitive to photons from light to lower energies of microwave quanta.

photoconductivity, internal photoelectric effect A photoelectric effect characterized by a variation of electrical conductivity.

photoconductor A type of conductor which changes its resistivity when illuminated by light.

photocoupled solid-state relay A relay in which the control signal activates the load circuit via a light source and photosensitive semiconductors; electrical isolation between input and output is complete.

photocurrent, light current The currents that flow through an optical detector as the result of exposure to radiant power.

photodetector **1.** A device that senses incident illumination. **2.** Any device that utilizes the photoelectric effect to detect the presence of light. **3.** Device which converts absorbed optical radiation into electrical output signals.

photodiode See diode photodetector.

photoelectric Pertaining to the electrical effects of light or other radiation, i.e., emission of electrons, generation of a voltage or a change in electrical resistance upon exposure to light.

photoelectric cell Also called photocell. A cell, such as a photovoltaic or photoconductive cell, the electrical properties of which are effected by illumination. The term should not be used for a phototube, which is a vacuum tube and not a cell.

photoelectric conductivity The increased conductivity exhibited by certain crystals when struck by light.

photoelectric control (industrial control) Control by means of which a change in incident light effects a control function.

photoelectric cutoff control A photorelay circuit used in machines for cutting long strips of paper, cloth, metal or other material accurately into predetermined lengths or at predetermined positions.

photoelectric flame-failure detector An industrial electronic control employing a phototube and amplifier to actuate an electromagnetic or other valve that cuts off the fuel flow when the flame is extinguished and light no longer falls on the phototube.

photoelectric hydrometer A device for measuring specific gravity of a continuously glowing liquid.

photoelectric liquid level indicator A level indicator in which the rising liquid interrupts the beam of light in a photoelectric control system.

photoelectric material Any material that will emit electrons when illuminated in vacuum (e.g., barium, cesium, lithium, potassium, rubidium, sodium and strontium).

photoelectric proximity switch The directed light strikes a target surface; the transmitted or reflected light then produces the output signal. Compare photoelectric switch. Different types of photoelectric proximity switches are available depending on their component configuration.

photoelectric pyrometer An instrument for measuring high temperatures from the intensity of the light given off by the heated object.

photoelectric reflex switch A photoelectric switch in which reflectors return the light to the emitter/receiver unit.

photoelectric register control A photoelectric device used for controlling the position of a strip of paper, cloth, metal, etc., with respect to the machine through which it is being passed.

photoelectric scanner A light source, lens system and one or more phototubes in a single, compact housing. It is mounted a few inches above a moving surface, where it actuates control equipment when the amount of light reflected from the surface changes.

photoelectric smoke detector A photoelectric instrument used to measure the density of smoke and to sound an alarm when a predetermined smoke density is exceeded.

photoelectric sorter An industrial electronic control employing a light beam, phototube and amplifier to sort objects according to color, size, shape or other characteristics.

photoelectric switch A change of transmission of the directed light between the light emitter and light receiver generates an output signal. Different types of photoelectric switches are available depending on their component configuration.

photogalvanic cell A cell which generates an electromotive force when light falls on either of the electrodes immersed in an electrolyte.

photomagnetic effect The direct effect of light on the magnetic susceptibility of certain substances.

photometer 1. An instrument for measuring the intensity of a light source or the amount of illumination, usually by comparison with a standard light source. 2. A device used to compare the luminous intensities of two sources by comparing the illuminance they produce.

photometric Related to measurements of light.

photometric analyzer A device for detecting and analyzing the changes in properties and quantities of a plants stack gases.

photometry The techniques for measuring luminous flux and related quantities (e.g., luminous intensity, illuminance, luminance, luminosity, etc.).

photon A particle whose energy is the quantum of electromagnetic energy.

photon coupling Coupling between circuits by a beam of light.

photon noise, quantum noise Noise attributable to the discrete particle nature of light.

photo-optic memory A specific memory or storage unit that uses an optical medium.

photo-optics The combination of an input light source and a photoreceiver producing an output signal and assembled separately or in a single package.

photoresistor A semiconductor resistor when illuminated, drops in resistance.

photosensor The light-sensitive device in a photoelectric control that converts a light signal into an electric signal.

photoswitch A solid-state device that functions as a high-speed power switch activated by incident radiation.

photosynthesis The synthesis of organic matter from carbon dioxide and water in the presence of light by living organisms, employing photochemically reactive pigments.

photothyristor A thyristor whose switching action is controlled by light applied to the thyristor gate.

phototransistor A junction transistor with its base exposed to light through a lens in the housing. The collector current increases as the light intensity increases, because of the amplification of the base current by the transistor structure.

photovoltaic cell A type of photovoltaic cell in which a voltage is generated in a layer of selenium during exposure to visible or other radiation.

phototypesetting The setting of type via electronic or electromechanical optical systems onto photographic paper or film. Input to such devices can be by direct keyboard entry, paper tape or magnetic media.

photovaristor A varistor in which the current-voltage relation may be modified by illumination. Cadmium sulfide (sulphide) and lead telluride exhibit such properties.

photovoltaic Capable of generating a voltage when exposed to visible or other light radiation.

photovoltaic power system, terrestrial photovoltaic power system A system that converts sunlight directly into electric energy and processes it into a form suitable for use by the intended load.

photovoltaic transduction Conversion of the measurand into a change in the voltage generated when a junction of dissimilar material is illuminated.

physical optics, wave optics The treatment of propagation of light as a wave phenomenon rather than a ray phenomenon, as in geometric optics.

physical system A part of the real physical world that is directly or indirectly observed or employed by mankind.

physical system simulation A development representation of physical systems, e.g., a chemical process in which information provided to the computer is represented by the process variables. The processing completed by the computer is a representation of the process itself and the output of the computer represents the results of the process simulated.

physico-chemical treatment (water treatment) A combination of physical and chemical treatment to achieve a specific result.

PI The designation of a controller operating in the proportional-integral mode combination.

P/I A pressure to current transducer linearly converts a signal pressure range into a signal current range (for example, 3–15 psi into 4–20 mA).

piano wire Carbon steel wire (0.75 to 0.85% C) cold drawn to high tensile strength and uniform diameter.

PIK Programmable Interface Controller.

picker (textile term) 1. A machine that opens stable fibers and forms a lap for the carding process in the production of spun yarns. In many new installations, no lap is formed and the fiber is fed by air flow through chutes directly to cards. **2.** A mechanical apparatus in a loom which strikes the shuttle to propel it across the loom during weaving.

picking Separation of particles from the surface of paper or board during manufacture or printing as the result of tensile forces acting on the surface.

picking resistance, surface bonding strength The ability of e.g. paper to resist picking.

pickling (chemical) The removals of oxides or other compounds from a metal surface by means of a solution that acts chemically upon the compounds.

pick list A document that lists the material to be picked for manufacturing or shipping orders. Picking is the process of withdrawing from stock the components to make products or the finished goods to be shipped to the customer.

picoampere, pA One millionth of a microampere.

picocoulomb, pC One millionth of a microcoulomb.

picofarad One millionth of a farad which is a unit of electrical capacitance. Also equal to one-thousandth of the formerly micromicrofarad.

PI control Proportional plus integral (reset) control.

PI controller See proportional plus integral controller.

pico, p Prefix meaning 10^{-12} . (Formerly micromicro).

picosecond, ps One thousandth of a nanosecond.

picowatt, pW One millionth of a microwatt. Formerly called micromicrowatt.

pictorial diagram Drawing using pictorial symbols and interconnecting lines.

picture In a programming language, a description of a character string in which each position has associated with it a symbol representing the properties of the character that may occupy it. Example: In COBOL, 9999 is used as a picture of any 4-digit numeric word.

picture element See pixel.

picture frequency The number of complete pictures scanned per second in a television system.

picture size The usable viewing area on the screen of a television receiver.

PID Proportional, Integral, Derivative.

PID action A mode of controller action in which proportional, integral, and derivative action are combined.

PID control Proportional plus integral plus derivative control.

PID controller See proportional plus integral plus derivative controller.

piece dyeing (textile term) The application of dye after weaving, knitting, or tufting of the piece of fabric; a batch discontinuous process.

piezodielectric Pertaining to a change in dielectric constant under mechanical stress.

piezoelectric The property of certain crystals that produce a voltage when subjected to a mechanical stress, or undergo mechanical stress when subjected to a voltage.

piezoelectric crystal A crystal which converts mechanical pressure into an electrical signal, or converts a signal into pressure.

piezoelectric crystal densitometer Utilizes the sensitivity of a piezoelectric crystal at its resonant frequency to the density of a fluid surrounding the crystal. Thus output voltage is proportional to density. Unfortunately, output voltage is also proportional to the velocity of sound in the liquid. Compensation is required for the change in the velocity of sound with temperature and pressure.

piezoelectric pressure transducer A pressure measuring device that uses a piezoelectric material to develop a charge when subjected to pressure change.

piezoelectric sorption humidity sensor The frequency of oscillation of a hygroscopically coated quartz crystal is decreased when the crystal gains weight due to water sorption on the surface coating. The piezoelectric crystal is used as a sensing element to detect humidity changes. When exposed to air flow, it produces oscillations related to the moisture content of air.

piezoelectric transducer Also called ceramic or crystal transducer. A transducer that depends for its operation on the interaction between the electric charge and the deformation of certain asymmetric crystals having piezoelectric properties.

piezoid The finished crystal product.

piezometer 1. An instrument for measuring fluid pressure. **2.** An instrument for measuring compressibility of materials.

piezometer ring A pressure equalisation enclosure linking together two or more pressure tappings installed on one cross-section, and to which a secondary device can be connected. It can either lie outside or to be integral with the conduit or the primary device. See figure in ISO publication 4006-1977 or BS 5875:1980.

pig iron electric furnace process A low-shaft electric furnace is used in this process to reduce iron ore and produce molten pig iron. The original furnace of electric furnace process was operated in Norway and was known as the Tysland-Hole process.

pigment (textile term) A finely divided colorant used in printing or to color fibers permanently during extrusion.

pigtail 1. A 270° or 360° loop in pipe or tubing to form a trap for vapor condensate. Used to prevent high temperature vapors from reaching the instrument. Used exclusively in static pressure measurement. **2.** A short length of optical fiber, permanently fixed to a component, used to couple power between it and the transmission fiber.

pile See thermopile.

pilot circuit That portion of a control circuit or system which carries the control signal from the signal-generating device to the control device.

pilot control line (fluid power systems) Pipe through which control fluid is supplied for the operation of a pilot control system.

pilot flame establishing period The length of time fuel is permitted to be delivered to a proved pilot before the flame-sensing device is required to detect pilot flame.

pilot operated pressure relief valve A pilot operated pressure relief valve is a pressure relief valve in which the major relieving device is combined with and is controlled by a self-actuated auxiliary pressure relief valve.

pilot plant A small model of a future processing plant used to develop and test processes and operating techniques before investing in full-scale plant.

pilot stabilization period A timed interval synonymous on most systems today with timed trial for pilot ignition. Today's programmers prevent main valve

operation for a specified number of seconds after commencement of trial for pilot ignition even though pilot is immediately proved.

pilot tube A fluid velocity sensor producing a differential pressure by means of two straight tubes mounted in line with the direction of the fluid movement. The two tubes may be mounted coaxially as one unit. One tube is open ended and measures the stagnation pressure of the fluid. The other tube is closed in front but has openings along the tube to measure the static pressure of the fluid.

pilot valve (pressure relief devices) A pilot valve is an auxiliary valve which actuates a major relieving device.

pilot wire An auxiliary conductor used in connection with remote measuring devices or for operating apparatus at a distant point.

pinboard 1. A type of control panel which uses pins rather than wires to control the operation of a computer. On certain small computers which use pinboards, a program is changed by the operator removing one pinboard and inserting another. **2.** See plugboard.

pinch effect (induction heating) The result of an electromechanical force that constricts, and sometimes momentarily ruptures, a molten conductor carrying current at high density.

pinching a valve Closing a valve partway to reduce the flow of liquid or gas through a pipeline. See cracking a valve.

pinch valves Pinch valves are straight-through valves. They are lined with an elastomer or TFE tube which is collapsed by a pinch bar or clamp for throttling and closure. A segmented metal body may surround the tube or the tube may be exposed. They handle slurries well since any build-up of material in the seat is broken up and washed out on closure.

pin control A male type contact used to mate with a socket, i.e., a female contact.

pi network A network consisting of three branches connected in series to form a closed mesh; one of the three junctions is an input terminal, one is an output terminal and the third is a common terminal connected to both the input and output circuits.

ping A sonic or ultrasonic pulse of predetermined width.

pinhole detector A photoelectric device that detects extremely small holes and other defects in moving sheets of material, and often actuates sorting equipment that automatically rejects defective sheets.

pinouts The external wires or pins on a module (generally having a circuit function).

pins The leads emerging from an IC package.

pipe elbow (as flow device) A pipe elbow can be used as a primary flow device in conjunction with a differential pressure type of meter body, since the velocity along the inner edge is greater than that along the outer edge.

pipeline 1. A processor design approach whereby instruction execution takes place in a series of units arranged so that several units can be simultaneously processing the appropriate parts of several instructions. **2.** A length of pipe including pumps, valves, flanges, control devices, strainers and/or similar equipment for conveying fluids.

pipeline oil Clean oil; oil free of water and other impurities to be acceptable by a pipeline system.

pipeline processor A processor in which instruction execution takes place in a series of units, arranged so that several units can be simultaneously processing the appropriate parts of several instructions.

pipe still A type of distillation unit in which oil to be heated passes through pipes or tubes in the form of a flat coil, similar to certain kinds of heat exchangers. There are two main chambers in a pipe still: one where the oil is preheated by flue gases (the convection chamber); the other where the radiant-heat chamber raises the oil to the required temperature. No distillation or fractionation takes place in the still proper.

pipe tap A small hole in the wall of a pipe for sampling its contents or for connecting a control device or pressure measuring instrument.

pipette method The analysis of very fine particles of sediment less than 0.032 mm in diameter by means of sampling with a pipette.

PIPO Parallel In/Parallel Out (registers).

pipping pressure The pressure at which a safety valve opens.

Pirani vacuum gage A thermal conductivity gage which measures the pressure of the gas by the resistance change caused by the density-dependent (thus pressure-dependent) cooling effect of the gas.

PISO Parallel In/Serial Out (registers).

piston 1. A movable, pressure responsive element which transmits force to the actuator stem. Pertains to control valves. **2.** In high-frequency communications, a conducting plate that can be moved along the inside of an enclosed transmission path to short out high-frequency currents.

piston-lever actuator (control valves) The movement of a piston is transmitted by means of a lever attached to the valve stem. This actuator is normally used for on-off applications and is usually restricted to 90 degree rotation. May be single or double acting, with spring return, and used with other devices such as time delays, solenoids etc.

piston meter A type of fluid flow meter; it is a variable-area, constant-head device in which the flow rate is indicated by a pointer attached to a piston, which in turn is positioned by the buoyant force of the fluid.

piston type actuator A fluid powered device in which the fluid acts upon a movable cylindrical member, the piston, to provide linear motion to the actuator stem. Also called cylinder actuator.

piston type cylinder See piston type actuator.

piston-type variable-area flowmeter Any of several flowmeter designs in which fluid passing through the meter exerts force on a piston such that the piston moves against a counterbalancing force to expose a portion of an exit orifice, the amount exposed being directly related to volume flow.

pit A small surface cavity in a metal part or coating usually caused by corrosion or formed during electroplating.

pitch 1. Asphalt; a dark brown to black bituminous material found in natural beds, also produced as a black, heavy residue in oil refining. **2.** An auditory sensation of tone that is directly related to sound-wave frequency.

pit furnaces A type of batch heat-treating furnace. Pit furnaces are furnaces of cylindrical or rectangular shape in which the material is charged and withdrawn through an opening in the furnace top. Pit furnaces are used for normalizing, hardening, annealing, tempering, and carburizing.

pitot-venturi tube A combination of a venturi device and a pitot tube.

pitting (corrosion) Type of localized corrosion. Pitting is a local phenomenon which forms holes while leaving most of the surface area unaffected. The shape of the pit is often responsible for its continued growth, since a pit can be considered to be a crevice. Pitting is

usually attributed to the attack of halogen ions (fluorine, chlorine, bromide, iodine) which break down the surface passivation layer.

pitting factor (corosion) The depth of the deepest pit resulting from corrosion divided by the average penetration as calculated from weight loss.

pivot-friction error Error caused by friction between the pivots and the jewels: it is greatest when the instrument is mounted with the pivot axis horizontal.

pixel Short for picture element. The smallest distinguishable area of a display device which can be individually illuminated.

PL/1 Programming Language/1, a high level programming language. Spoken as "P-L-one".

plain conductor A conductor consisting of one metal only.

planar 1. Lying essentially in a single plane. **2.** Constructed in layers or planes. **3.** A semiconductor fabrication technique.

planar network A network in which no branches cross when drawn on the same plane.

planar silicon photoswitch Essentially a complementary SCR. Like the LASCR, it can be triggered by light. In addition, a negative signal (with reference to the anode) at the anode gate terminal can trigger the device.

Planck's radiation law An expression representing the spectral radiance of a blackbody as a function of the wavelength and temperature.

plane angle For measurement of plane angle in SI units see under radian. Use of the degree and its decimal submultiples is permissible when the radian is not a convenient unit. Use of the minute and second is discouraged except for special fields such as cartography.

plane wave (fiber optics) A wave whose surfaces of constant phase are infinite parallel planes normal to the direction of propagation.

planimeter A device which measures the area of a plane figure as a mechanically coupled pointer traverses the figure's perimeter.

planning (in artificial intelligence) The process of deciding beforehand the manner and order of applying actions in order to reach a desired goal. Note: Planning is performed with a view toward enhancing search efficiency and solving goal conflicts.

plant 1. Sometimes means all of the process equipment; occasionally used interchangeably with "process" but generally distinguished from the process by applying to hardware rather than to energy and material relationships. **2.** Installation in which a process is carried out.

plant dynamics Equations which describe the behaviour of the plant.

plasma 1. A wholly or partially ionized gas in which the positive ions and negative electrons are roughly equal in number. **2.** The region in which gaseous conduction takes place between the cathode and anode of an electric arc. **3.** An electrically conductive gas comprised of neutral particles, ionized particles and free electrons but which, taken as a whole, is electrically neutral. **4.** A gas at an extremely high (20,000 kelvins) temperature and completely ionized. It is therefore conductive and affected by magnetic fields.

plasma-arc welding A welding process gaining in importance for welding thermocouple junctions.

plasma etching An etching process using a cloud of ionized gas as the etchant.

plasma physics The study of highly ionized gases. Many phenomena not exhibited by uncharged gases are associated with plasma physics.

plasma processes In plasma smelting for direct reduction, gases and solids are passed through an arc, much like a welding arc, and are heated. This electric heating replaces oxygen in conventional systems that use oxy-fuel burners.

Plasmared process The Plasmared process, developed by SKF, Sweden produces DRI (direct-reduction iron) in a shaft furnace with a moving bed. However, the process is unique in that a plasma gasifier produces the reducing gas for the reduction furnace.

Plasmasmelt process The SKF Plasmasmelt process produces molten iron from prerduced iron ore. The prerduced iron is reduced to molten iron in a low-shaft reactor similar in some respects to a low-shaft blast furnace.

plasma thermocouple An electronic device in which the heat from nuclear fission is converted directly into electric power.

plaster board liner See gypsum board liner.

plastic An imprecise term generally referring to any polymeric material, natural or synthetic. Its plural, plastics, is the preferred term for referring to the industry and its products.

plastic ball valves Polyvinyl chloride (PVC) and fiber glass valves are available for chemical and corrosive service. They are compatible with PVC and fiber glass piping. Some designs incorporate continuously wound glass fibers for added strength. These valves should not be subjected to severe mechanical impact.

plastic clad silica fiber, PCS fiber An optical fiber having silica core and plastic cladding.

plastic flow The flow of liquid (through a pipeline) in which the liquid moves as a column; flowing as a river with the center of the stream moving at a greater rate than the edges, which are retarded by the friction of the banks (or pipe wall). See turbulent flow.

plasticorder A laboratory device for measuring temperature, viscosity and shear-rate in plastics material which can be used to predict its performance.

plastometer An instrument for determining flow properties of a thermoplastic resin by forcing molten resin through a fixed orifice at specified temperature and pressure.

plate count, colony count (water quality) An estimate of the numbers of viable micro-organisms (comprising bacteria, yeasts and moulds) in a given volume of water, obtained from the number of colonies which form in, or on, a given culture medium under specified conditions.

plated-wire memory A memory consisting of wires which are coated with a magnetic material. The magnetic material may be magnetized in either of two directions to represent ones and zeros.

plate glazing calender A machine with two cast iron or steel rolls, backwards and forwards between which a pile of paper or board sheets may be passed, each sheet being placed between thin, polished plates – normally metal plates – under high nip load.

plate heat exchanger A relatively low-pressure heat exchanger that uses thin-walled plates as its heat transfer elements. Because of its thin walls plate exchangers exhibit a much higher heat transfer coefficient than the more conventional shell-and-tube exchangers.

plate-rolling mills Plate-rolling mills are generally considered in two very broad classifications: **1.** Universal mills. **2.** Sheared-plate mills.

platform burner See forced-draft burner.

platformer A catalytic reforming unit that converts low-quality, straight-chain paraffins or naphthenes to low-boiling, branched-chain paraffins or aromatics of

higher octane; a refinery unit that produces high-octane blending stock for the manufacture of gasoline.

plating The deposition of a metal layer on a substrate surface by electrolytical or certain chemical means.

platinum – 10 percent rhodium versus platinum Material designation for type S thermocouple and extension wire. See ISA publication ANSI-MC 96.1-1982 and/or IEC publications 584-1, 584-2.

platinum – 13 percent rhodium versus platinum Material identification for type R thermocouple and extension wire. See ISA publication ANSI-MC 96.1-1982 and/or IEC publications 584-1, 584-2.

platinum – 30 percent rhodium versus platinum – 6 percent rhodium Material identification for type B thermocouple and extension wire. See ISA publication ANSI-MC 96.1-1982 and IEC publications 584-1, and 584-2.

platinum resistance thermometer sensor A temperature-responsive device consisting of a sensing resistor within a protective sheath, internal connecting wires and external terminals to permit connection of electrical measurement devices. Mounting means or connection heads may be included. See further IEC standard 751 which specifies requirements for industrial platinum resistance thermometer sensors. This standard deals with resistance thermometers of 100 ohm nominal resistance value at 0°C.

(record) playback robot A robot that can repeat a task program which is entered through teach programming.

PLC Programmable Logic Controller, microcomputer based control devices used to replace relay logic.

plenum A room or enclosed area where the atmosphere is maintained at a pressure greater than the outside air. Central control rooms at refineries are usually kept at pressures of a few ounces above the surrounding atmosphere to prevent potentially explosive gases from seeping into the building and being ignited by electrical equipment.

plex structure Network structure or data structure in which each node is connected to all the others.

piotron A hot-cathode vacuum tube having one or more grids. Note: This term is used primarily in the industrial field.

PL/M A high-level language designed for system and applications programming for the Intel 8080 microprocessor.

plot 1. To map or diagram. **2.** To connect the point-by-point coordinate values.

plotter An output unit that directly produces a hard copy record of data on a removable medium, in the form of a two-dimensional graphic representation.

plotting head That part of a plotter used to create marks on a display surface.

PLT Power Line Transients. One kind of conducted noise generally caused by switching inductive loads measured on the power line.

plug (control valves) A cylindrical part which moves in the flow stream with linear motion to modify the flow rate and which may or may not have a contoured portion to provide flow characterization. It may also be a cylindrical or conically tapered part, which may have an internal flow path, that modifies the flow rate with rotary motion.

plugboard A perforated board that accepts manually inserted plugs to control the operation of equipment. See pinboard.

plug cock valves with cage trim This type of valve has a hollow cylindrical plug with a rectangular slot in it. The plug slips down around the cage, and is the rotating member. The cage is concentric to the

plug while being internal, and having its position fixed. A TFE insert sleeve is locked into grooves in the valve body and this serves as the plug seal. Rotary plug valves characteristically have very high flow capacities and high rangeability. Flow capacities are often more than double those of globe pattern valves.

plug compatible A term used to indicate when devices may be effectively interchanged without any modifications.

plug-flow system (water quality) A system which achieves complete mixing in the cross-section of a channel but allows for no diffusion in the direction of flow.

plugging 1. Physically stopping the flow of fluid, either intentionally or unintentionally especially by the buildup of material. **2.** A control function that provides breaking by reversing the motor line voltage polarity or phase sequence so that the motor develops a counter-torque that exerts a retarding force.

plug-in Any device to which connections can be completed through pins, plugs, jacks, sockets, receptacles or other ready connectors.

plug meter A device for measuring flow rate in which a tapered rod extends through an orifice; when the rod is positioned so that the effective area of the annulus is just sufficient to handle the fluid flow, the rate of flow is read directly from a scale.

plug, unplug (programmable controllers) Make, break a physical connection (e.g. use a physical connector for interfacing a peripheral or a module to the rest of the programmable controller system).

plug valve A valve with a closure member that may be cylindrical, conical or a spherical segment in shape. It is positioned open to close with rotary motion.

plumb-bob gage 1. A device for determining liquid level in which a weighted plummet is lowered on a calibrated tape or cable until it just touches the liquid surface. **2.** A device for detecting solids level in a storage bin or hopper by lowering a plummet until the lowering cable slackens, which is usually detected by an electrical or mechanical triggering device.

plumbo-solvent Descriptive of a water which is able to dissolve lead from pipes and fittings.

plummet gage See plumb-bob gage.

plunger relay A relay consisting of a movable core or plunger surrounded by a coil. Solenoid action causes the plunger or core to move and thus energize the relay whenever current flows through the coil.

plutonium A heavy element which undergoes fission when bombarded by neutrons. It is a useful fuel in nuclear reactors.

ply (of paper or board) A fiber web manufactured on a single web-forming unit (fourdrinier wire, cylinder-vat unit etc.) and constituting an element in a multi-ply structure.

PL/Z A high-level language for Zilog microprocessors.

PMMA Polymethyl methacrylate.

PN See nominal pressure.

P-N-P A transistor composed of two P-type crystals separated by a N-type.

pneumatic Pertaining to or operated by a gas, especially air.

pneumatic actuator A device which converts the energy of a compressible fluid, usually air, into motion.

pneumatic amplifier assembly Device which converts low-level pneumatic control signals into pneumatic output signals of a higher energy level.

pneumatic controller A device which compares the value of a variable quantity or condition to a selected

reference and operates by pneumatic means to correct or limit the deviation.

pneumatic control valve A spring-loaded valve that regulates the area of a fluid-flow opening by changing position in response to variable pneumatic pressure opposing the spring force.

pneumatic delivery capability The rate at which a pneumatic device can deliver air (or gas) relative to a specified output pressure change.

pneumatic exhaust capability The rate at which a pneumatic device can exhaust air (or gas) relative to a specified output pressure change.

pneumatic limit operator A device which receives one or two pneumatic signals, compares the signal, or difference between the two signals, with a preset calibrated value, and causes an output contact or signal to change state when the preset value is exceeded. See also limiting control.

pneumatic motor assembly (fluid power systems) Combination of pneumatic motor, pressure relief valve and control valve.

pneumatic power classification pneumatic power pressure classes See IEC standard 654-2, Part 2: Power.

pneumatic programmer Calibrated device so arranged that, if a continuous pneumatic signal is applied to the input port, one or more output signals will be produced. The duration of and interval between the outputs can be predetermined.

pneumatics Science and technology which deals with the laws governing compressed air flow.

pneumatic silencer Device to reduce the noise level of intake or exhaust.

pneumatic system A system which makes use of air for operating control valves and actuators (cylinders, motors).

pneumatic time delay unit, pneumatic timer Device so arranged that, if a continuous pneumatic signal is applied to or removed from the input port, a signal will be produced at the output port after a predetermined time has elapsed. The time delay may be fixed or variable.

pneumatic volume booster A volume booster can be used to increase the speed of operation of a diaphragm control valve. The controller applies its output signal to the booster instead of to the control valve. Only about one cubic inch of air is required to position the pilot in the booster, thus, the volume of air moved through the connecting tubing is small. The air that operates the valve comes through the pilot in the booster and since this pilot has a large capacity, the stroking time for the control valve is substantially reduced.

Pockel's effect The alternation in the refractive properties of a transparent piezoelectric crystal by the application of an electric field.

pocketgrinder A grinder in which the wood is pressed against the grindstone from radially arranged wood chambers or pockets.

point 1. A process variable derived from an input signal or calculated in a process calculation. **2.** See analog point or digital point.

point display A display showing tag name and PV magnitude expressed in engineering units of a selected point. Point display information is presented in the upper-right corner of certain other major displays. Refers to Honeywell TDC 3000 control systems.

point drift The change in output over a specified period of time for a constant input under specified reference operating conditions. Note: Point drift is frequently determined at more than one input, as for

example: at 0%, 50% and 100% of range. Thus, any drift of zero or span may be calculated. Typical expression: The mid-scale drift at ambient temperature ($20 \pm 1^\circ\text{C}$) over a period of 48 hours was within 0.1% of output span. For test procedures see ISA publication S51.1, 1979.

pointer An identifier or indicator of the location of data; for example, an address, an algorithm for generating an address, a keyword, a code for generating an address, or destination or source designator.

pointer instrument An indicating instrument in which the index is a pointer moving over a fixed scale.

pointer register A register which contains the absolute address of an item of data in its memory. Data can be accessed at this address or relative to it via the pointer register.

point group summary A display that presents a list of all tag names and their assignment to operating groups and alarm groups. Refers to Honeywell TDC 3000 control systems.

point ID An alphanumeric designation of a point used by the system to identify each point in the process. Refers to Honeywell TDC 3000 control systems.

point-integrating sampler An instrument that obtains a sample of sediment-water mixture at a given point over a fixed period of time.

point method A method of measuring the velocity in a vertical by exposing a current meter at a number of designated points on the vertical.

point of incipient submergence, modular limit The condition of flow where a rising downstream level just begins to affect the discharge. Pertains to measurement of liquid flow in open channels.

point source pollution Pollution arising from an identified single point, for example effluent from a factory.

point tag configuration A procedure that allows the user to define various parameters associated with a point tag name, and to activate the point in the system. Refers to Honeywell TDC 3000 control systems.

point-to-point control system A control system which is concerned only in going from one point to another without regulating the path it takes to arrive at the second point.

point-to-point numerical control See positioning control system.

point-to-point transmission Transmission of data between two points without the use of any intermediate terminal or computer.

point-to-point wiring Wiring done in a direct path from one point to another without dressing wiring in parallel runs. Crosstalk is thus reduced.

poise The CGS unit of dynamic viscosity, which equals one dyne-second per square centimeter; the centipoise (cP) is more commonly used.

Poiseuille flow Laminar flow of gases in long tubes at pressures and velocities such that the flow can be described by Poiseuille's equation.

POL 1. Problem Orientated language, a type of high-level computer language used in process applications. **2.** Process Orientated Language.

polar A situation in which a binary 1 is represented by current flow in one direction and binary 0 is represented by current flow in the opposite direction.

polar (spherical) robot A robot whose mechanical structure of the arm comprises two rotary joints and a prismatic joint whose axes are arranged in a polar coordinate system.

polar contact A part of a relay against which the current-carrying portion of the movable polar member is held so as to form a continuous path for current.

polar coordinates A mathematical system of coordinates for locating a point in a plane by the length of its radius vector and the angle this vector makes with a fixed line.

polar diagram A diagram in which the magnitude of quantity is shown by polar coordinates.

polarimetry 1. The measurement of the rotation of plane of polarization of radiant energy. **2.** Chemical analysis in which the amount of substance present in a solution is estimated from the amount of optical rotation (polarization) that occurs when a beam of light passes through the sample.

polarity 1. A distinction between positive and negative electric charges. **2.** A distinction between positive (north) and negative (south) magnetic poles of an electromagnet or permanent magnet; these poles do not exist, but describe locations where magnetic flux leaves or enters magnetic material.

polarity indicator A detecting instrument intended to indicate the polarity of one conductor with reference to another.

polarization maintaining fiber A single-mode optical fiber which maintains the polarization of the light which entered it, normally by including some birefringence within the fiber itself. Normal single-mode fibers, and all other types, allow polarization to be scrambled in light transmitted through them.

polarized double-biased relay Also called magnetic-latch relay. A relay whose operation depends on the polarity of the energizing current and which is magnetically biased, or latched, in either of two positions.

polarized plug A plug so constructed that it may be inserted in its receptacle only in a predetermined position.

polarized return-to-zero recording, RZ(P) Return to zero recording in which the zeros are represented by magnetization in one sense and the ones are represented by magnetization in the opposite sense.

polarizer 1. A substance that when added to an electrolyte increases the polarization. **2.** A filter which transmits light of only a single polarization.

polarographic analysis A method of determining the amount of oxygen present in a gas by measuring the current in an oxygen-depolarized primary cell.

polarography A method of chemical analysis that involves automatically plotting the voltage-current characteristic between a large, non-polarizable electrode and a small polarizable electrode immersed in a dilute test solution.

polar relay, polarized relay A relay in which the armature movement depends on the direction of the current.

pole assignment Design procedure by which the poles or eigenvalues of a given time-invariant linear system are allocated to a specified set of locations in the s-plane or z-plane by means of state or output feedback.

poleface In a relay, the end of the magnetic core nearest the armature.

poling 1. The adjustment of polarity. **2.** A stage in fire-refining of copper during which green-wood poles are thrust into the bath of molten metal; the wood decomposes and forms reducing gases that react with oxygen in the bath.

Polish notation, prefix notation, parenthesis-free notation, Lukasiewicz notation See parenthesis-free notation.

poll (data transmission) A flexible, systematic method, centrally controlled, that permits stations on

a multipoint circuit to transmit without contending for the line.

poll In general, a process used to interrogate individual remote devices in a network so as to determine if service is required. In BASIC Systems, a method used by the Hiway Traffic Director or Hiway Interface Module to interrogate nonpreferred access devices such as Process Interface Units to determine if they have need to originate messages on the Data Hiway. Refers to Honeywell TDC 3000 control systems.

polled access (data communication) A media access method by which the node that has the right to use the network medium delegates that right to other stations on a per message basis.

polling (data communication) On a multipoint connection or a point-to-point connection, the process whereby data stations are invited one at a time to transmit.

polling character A set of characters peculiar to a terminal and the polling operation. Response to these characters indicates to the computer whether or not the terminal has a message to send.

polling supervisory system A system in which the master interrogates each remote to ascertain if there has been a change since the last interrogation. Upon detection of a change the master may request data immediately.

poll train (poll list) A list of the stations in a polled network showing the sequence in which they are to be polled.

pollution (water quality) The impairment of the suitability of water for some considered purpose. Definition established by the World Health Organization (WHO).

pollution load (water quality) The quantity of a specified pollutant entering a treatment plant or discharged into a receiving water during a given period.

polyacrylic rubber seal Copolymer of acrylate or ethyl. Good resistance to mineral oils. Resistance to heat is better than that of nitrile rubbers.

polyamide (NYLON) seal Polyamide thermoplastic material characterized by their high strength and resistance to abrasion.

polycarbonate An amorphous thermoplastic used in the connector industry and offering high impact strength over a broad temperature range.

polychloroprene See neoprene.

polycrystalline material Material, typically an element like silicon or germanium, made up of many single crystals having a random orientation.

polyester Polyethylene glycol terephthalate, the material most often used as a base film for precision magnetic tape.

polyester fiber (textile term) A man-made fiber composed of at least 85 percent by weight of substituents formed by combining dihydric alcohols and diacids to form an ester linkage with the elimination of water; most commonly used in staple form with blends of cotton or as textured continuous filament.

polyethylene A petroleum-derived plastic material used for packaging, plastic housewares, and toys. The main ingredient of polyethylene is the petrochemical gas ethylene.

polyglycol solution Fluid in which the major constituents are water and one or more glycols or polyglycols.

polymer A long-chain molecular structure of many parts (Greek, poly-many; meros parts).

polymerization A refining process of combining two or more molecules to form a single heavier molecule;

the union of light olefins to form hydrocarbons of higher molecular weight. Polymerization is used to produce high-octane gasoline blending stock from cracked gases.

polymorphic system A system which can take on various forms ideally suited to the problems at hand, usually by altering, under its own control, its interconnections and the functions of its component parts, i.e., it may occur with respect to logic construction or organization.

polynuclear aromatic hydrocarbons, PAH Organic compounds composed of two or more benzene rings where the adjacent rings share two carbon atoms; non-aromatic rings may also be present.

polyphase motor An induction motor wound for operation on two- or three phase alternating current.

polypropylene A thermoplastic with good electrical characteristics, high tensile strength and resistance to heat. It is used as a dielectric in film capacitors.

polysilicon A multicrystalline form of silicon used in silicon-gate MOS technology that is electrically conductive and optically transparent.

polystyrene A clear thermoplastic material having excellent dielectric properties, especially at ultrahigh frequencies.

polysulfones Plastics that are transparent and have high dimensional stability and high heat-deflection temperature.

polysulphide pulp Chemical pulp prepared by cooking with an aqueous solution of sodium hydroxide sodium sulphide and sodium polysulphide.

polytetrafluoroethylene (PTFE) seal Thermoplastic polymer which is virtually immune to chemical attack and which may be used over a very wide temperature range. Coefficient of friction is very low but flexibility is limited and recovery characteristic only moderate.

polyurethane seal Material comprising mainly isocyanate having good resistance to petroleum-base fluids and to abrasion, liable to degradation in the presence of water at moderate temperatures.

polyvalence The property of being interrelated in several ways.

polyvinyl chloride, PVC A general-purpose thermoplastic used for insulations and jackets on components, wire and cable.

POM Polyoxymethylene.

POMS Process Operations Management System. An IBM- and customer-sponsored software initiative to link MRPII applications running on AS/400 minicomputers and shopfloor data collection systems running on PS/2 computers. It is not an IBM product, though IBM founded its development.

PONA analysis Determination of amounts of paraffins (P), olefins (O), naphthalenes (N) and aromatics (A) in gasoline in ASTM standard tests.

pop In an instruction to a computer to read and remove the last piece of data from a stack.

Pope cell A type of relative humidity sensor that employs a bifilar conductive grid on an insulating substrate whose resistance varies with relative humidity over a range of approx. 15 to 99% RH.

pop-off valve See relief valve.

poppet valve A type of check valve installed in a riser or a downhole packer to prevent fluid from rising vertically in the pipe or wellbore. A springloaded vertical valve that permits downward flow as fluid pressure opens the valve. Pressure from below moving upward is blocked by the valve's clapper. Pertains to the petroleum industry.

popping pressure (pressure relief devices)

Popping pressure is the value of increasing static pressure at which the disk moves in the opening direction at a faster rate as compared with corresponding movement at higher or lower pressures. It applies only to safety or safety relief valves.

porous plug A form of primary element for flowmeters designed to operate in the laminar flow regime. Porous plugs are made by packing a pipe or tube with porous material and providing for a pressure-differential measurement across the plug. Important factors influencing the pressure drop are the compactness of the porous material and the length of the porous plug.

port A functional unit of a node through which data can enter or leave a data network.

port (control valves) The flow control orifice of a control valve. It is also used to refer to the inlet or outlet openings of a valve.

portability (software) The ease with which software can be transferred from one computer system or environment to another.

portable computer A personal computer that is designed and configured to permit transportation as a piece of handheld luggage. Note: Federal regulations (in USA) limit use of the term "portable" to objects weighing no more than 21 pounds.

port guide (control valves) A valve plug with wings or a skirt fitted to the seat ring bore.

port guided (control valves) A design on which the valve plug is aligned by the body port or ports only.

port selector A switching device that extends the capability of a computer to handle more data traffic without additional ports.

pose (industrial robots) Combination of position and orientation of a part of a robot (e.g. its mechanical interface) or of a workpiece in a coordinate system.

pose repeatability (industrial robot) Closeness of agreement between the positions and orientations of the attained poses after n repeat visits to the same command pose in the same direction.

pose-to-pose control (industrial robots) A control procedure whereby each motion operates in accordance with instructions which specify only the next pose. The movements of the different axes may not be coordinated with each other and may be executed simultaneously or consecutively. Velocities may not be specified by the input data.

posistor A thermally sensitive resistor which has a positive temperature characteristic of resistance.

position Of a multi-position controller, a discrete value of the output signal.

positional notation, positional representation (system) Any numeration system in which a real number is represented by an ordered set of characters in such a way that the value contributed by a character depends upon its position as well as upon its value.

position algorithm A computer control algorithm, which calculates the required value of the input variable of the final controlling element for each sampling period.

position-control system (numerical control) A control system that attempts to establish and/or maintain an exact correspondence between the reference input and the directly controlled variable, namely physical position.

position encoder A transducer which converts linear or rotational position (linear encoder or shaft encoder, respectively) to a digital signal. Note: Encoder include contacting types using commutators and non-contacting types using photo optics or electromagne-

tic induction. Encoders work either absolutely or incrementally.

positioner A position controller, which is mechanically connected to a moving part of a final control element or its actuator, and automatically adjusts its output pressure to the actuator in order to maintain a desired position that bears a predetermined relationship to the input signal. The positioner can be used to modify the action of the valve (reversing positioner), extend the stroke/controller signal (split range positioner), increase the pressure to the valve actuator (amplifying positioner) or to modify the control valve flow characteristic (characterized positioner).

positioner characterization (control valves)

This method may be used to attain a special characteristic not available in a standard valve plug. The positioner cam is shaped to modify the lift for a given controller signal to accomplish the special characteristic.

position error The change in output resulting from mounting or setting an instrument in a position different from that at which it was calibrated. See also inclination error.

positioner types Positioners characterized by their input and output are available as: **a.** pneumatic/pneumatic; **b.** electric/pneumatic; **c.** electric/hydraulic; **d.** electric/electric.

position feedback A feedback signal which is proportional to the position or deflection of some object.

position indicating switches (control valves)

For remote, two-position indication of control valve stem position, either plunger or roller-actuated switches can be mounted directly on the actuator yoke.

position indicator (control valves) The device, such as a pointer and scale, which indicates the position of the closure member.

position influence The change in the indication of an instrument that is caused solely by a position departure from the normal operating position.

positioning Manipulating a workpiece in relation to working tools.

positioning action Controller action in which the final position of the control element has a predetermined relation to the value of the controlled variable.

positioning control system (numerical control)

Numerical control in which: **a.** each numerically controlled motion operates in accordance with instructions which specify only the next required position; **b.** the movements in the different axes of motion are not co-ordinated with each other and may be executed simultaneously or consecutively; **c.** velocities are not specified by the input data.

positioning time, seek time The time required for the access arm of a direct access storage device to be positioned on the appropriate track.

position sensor, position transducer (numerical control) A device for measuring a position and converting this measurement into a form convenient for transmission.

position switch (control valves) A pneumatic, hydraulic or electrical device which is linked to the valve stem to detect a single, preset valve stem position.

position telemeter A remote-reading instrument for indicating linear or angular position of an object or machine component.

position transmitter (for control valves) A device that is mechanically connected to the valve stem and generates and transmits a pneumatic or electrical signal representing the valve stem position.

positive Any point to which electrons are attracted, as opposed to negative from where they come.

positive charge An electrical charge with fewer electrons than normal.

positive conductor A conductor connected to the positive terminal of a source of supply.

positive displacement Referring to any device that captures or confines definite volumes of fluid or purposes of measurement, compression or transmission.

positive displacement flowmeter A device introduced into a closed conduit consisting of enclosures of known volume and a mechanism driven by the pressure of the fluid flow whereby these enclosures are repetitively filled and emptied of fluid. Note: By counting the number of discrete volumes passing through the device the volume flow of a fluid can be established.

positive displacement pump A pump that displaces or moves a measured volume of liquid on each stroke or revolution; a pump with no significant slippage; a plunger or rotary pump.

positive draft Pressure in a furnace, gas chamber or duct that is greater than ambient atmospheric pressure.

positive feedback Pertaining to an automatic control system, the output signal is added to the input signal. In general, this has the opposite effect of negative feedback.

positive feedback regeneration The process by which a part of the power in the output circuit of an amplifying device reacts upon the input circuit in such a manner as to reinforce the initial power, thereby increasing the amplification.

positive-going edge The edge of a pulse going from a low to a high level.

positive ion An atom which has lost one or more electrons and thus has an excess of protons, giving it a positive charge.

positive logic A form of logic in which the more positive logic level represents 1 and the more negative level represents 0.

positive-negative action Two-step action in which the steps have opposite signs.

positive-negative three-step action Multi-step action with three steps of which normally one is assigned the value zero and the other two have opposite signs.

positive plate (storage cell) The grid and active material from which current flows to the external circuit when the battery is discharging.

positive temperature coefficient The condition whereby the resistance, capacitance, length or other characteristic of a substance increases as the temperature does.

positive terminal (battery) The terminal from which the positive electric charge flows through the external circuit to the negative terminal when the cell discharges. Note: The flow of electrons in the external circuit is to the positive terminal and from the negative terminal.

positive-true logic A logic system in which the voltage representing a logic one has a higher or more positive value than that representing a logic 0.

POSIX Portable Operating System for Computer Environments. A UNIX-based standard under development by the IEEE.

post-chlorination Chlorination following water or waste-water treatment.

postconversion bandwidth In a telemetry receiver, the bandwidth presented to the detector.

postedit In a computer, to edit output data resulting from a previous computation.

postfix notation, suffix notation, reverse Polish notation A method of forming mathematical expressions in which each operator is preceded by its operands and indicates the operation to be performed on the operands or the intermediate results that precede it.

post guide (control valves) Guide bushing or bushing fitted to posts or extensions larger than the valve stem and aligned with the seat.

postmortem dump Dumping that is performed at the end of a run, usually for purposes of debugging, auditing and documentation.

postmortum (computing systems) Pertaining to the analysis of an operation after its completion.

post processor (numerical control) In numerical control, a computer program which adapts the output of a processor, applicable to a piece part, into a machine program for the production of that part on a particular combination of machine tool and controller.

postprocessor A computer program that effects some final computation or organization.

pot 1. A reserved area of storage for accumulating certain data. **2.** To embed a component in a liquid resin within a casing that becomes part of the product. **3.** Short for potentiometer.

potassium An alkali metal having photosensitive characteristics, especially to blue light.

potcher, washer A hollander designed for the washing and bleaching of a pulp suspension. A perforated cylinder immersed in the pulp makes possible a continuous removal of liquid.

potential 1. The difference in voltage between two points of a circuit. Frequently one point is assumed to be ground, which has zero potential. **2.** In general, the electrical voltage difference between two bodies. When bodies of different potentials are brought into communication, a current is set up between them.

potential difference Algebraic difference between voltages at two points in an electrical circuit.

potential divider See voltage divider.

potential drop The difference in potential between the two ends of a resistance with a current through it.

potential energy Energy related to the position or height above a place to which fluid could possibly flow.

potential gradient The rate of change of potential with distance. Units such as volts per meter or kilovolts per centimeter may be used.

potential transformer Also called a voltage transformer. An instrument transformer, the primary winding of which is connected in parallel with the circuit whose voltage is to be measured or controlled.

potentiometer 1. A transducer, commonly used in position control systems to convert angular displacement (position of shaft) into an electrical voltage. **2.** A voltage divider which has a variable contact arm that permits the selection of any portion of the potential applied across its total resistance.

potentiometer circuit A network arranged so that when two or more electromotive forces (or potential differences) are present in as many branches, the response of a suitable detecting device in any branch can be made zero by adjusting the electrical constants of the network.

potentiometer multiplier A multiplying unit which has a position control and the capability of multiplying each of several different variables by a single variable, represented by analog voltages.

potentiometer recorder A null-balance type of recorder using a servo-operated voltage-balancing device. The sliding contact of a precision measuring po-

tentiometer is adjusted automatically by a servomechanism so that the difference in voltage of the circuit becomes zero.

potentiometric or electrometric method of pH measurement See under electrometric method of pH measurement.

potentiometric titration A technique of automatic titration where the end point is determined by measuring a change in the electrochemical potential of the sample solution.

potentiometric transduction The conversion of the measurand into a change in the position of a contact on a resistance element across which excitation is applied, the output usually being given as a voltage ratio.

pot furnace See salt-bath furnace.

pothead A device that seals the end of a cable and provides insulated egress for the conductor or conductors.

Potier diagram A vector diagram showing the voltage and current relationships in an ac generator.

pot still A closed vessel in which crude was heated and the vapors piped to cooling coils where the gases condensed into products such as kerosene and light oils. The pot still evolved into the shell still that did the same work but on a larger and more sophisticated scale. See shell still and pipe still.

pot strainer An inline strainer used to catch and hold debris being pumped through a pipeline in a products line, a refinery or processing plants. The strainer is flanged and is bolted into a pipeline.

potted circuit A circuit which has been encapsulated in a nonconductive material.

pound The British or US unit of mass or weight and is equal to 0.45 kilograms.

pour point 1. The lowest temperature at which oil will pour or flow when chilled without disturbance under specified condition. **2.** Temperature at which molten metal is cast. **3.** Lowest temperature at which a fluid will flow under specified conditions.

pour-point depressant A chemical agent added to oil to keep it flowing at low temperatures.

pour test Chilling a liquid under specified conditions to determine its ASTM pour point.

powder carburizing Carburizing by a carbon-releasing agent in powder form.

powder filled enclosure (Ex q) A type of protection in which the enclosure of an electrical device is filled with a non-burning powdered material (e.g. sand) in such a way that under the operating conditions for which it was designed, no ignition of the surrounding explosive atmosphere can take place due to arcs, sparks, flame transmission or hot spots on the surface of the powdered material or enclosure.

power 1. IEC publication 654-2, Part 2 outlines the standard to provide users and suppliers of industrial-process measurement and control systems and parts of such systems with a uniform listing and classification of the listed operating conditions related to power. Both electrical and pneumatic power classifications are considered. **2.** For measurement of power in SI units see under watt.

power amplification (general) The ratio of the power level at the output terminals of an amplifier to that at the input terminals. Also called power gain.

power amplifier A device whose output signal has the same physical nature as the input signal but with higher energy content supplied by an external power source. Note: For example, electronic, magnetic, pneumatic, hydraulic, and mechanical power amplifiers exist.

power consumption The maximum amount of electrical power used by a device during normal steady-state operation.

power density spectrum (electromagnetic compatibility) A plot of power density per unit frequency as a function of frequency.

power derating Use of computed curves to determine the correct power rating of a device or component to be used above its reference ambient temperature.

power dissipation The dispersion of the heat generated within a device or component when a current flows through it. This is accomplished by convection to the air, radiation to the surroundings or conduction.

power dump The removal of all power accidentally or intentionally.

power factor The ratio of total watts to the total root-mean-square (rms) volt-amperes i.e. the active power to the apparent power.

power-factor influence (electric instruments) The change in the recorded value that is caused solely by a power-factor departure from a specified reference power factor maintaining constant power (or vars) at rated voltage, and not exceeding 120 percent of rated current. It is to be expressed as a percentage of the full-scale value.

power-factor meter An instrument intended to measure the ratio between the active and the apparent power in an electrical circuit.

power-factor regulator A regulator which maintains the power factor of a line or apparatus at a predetermined value, or varies it according to a predetermined plan.

power fail circuit A logic circuit that protects an operating program if primary power fails. Typically, power-fail circuits inform the computer when power failure is imminent. This initiates routine that saves all volatile data. After restoration of the power, the circuit is designed to initiate a routine that restores the data and restarts the computer operation.

power failure The removal of all power accidentally or intentionally.

power failure interrupt A signal that occurs on many machines for the purpose of informing the machine that the external power is failing.

power frequency The frequency of the power supply as presented to an industrial-process measurement and control system or elements of the system.

power gain 1. Also called power amplification. 2. The ratio of the signal power developed at the output(s) of a device to the signal power applied at the input(s).

power ground The ground between units which is part of the circuit for the main source of power to, or from, these units.

power influence IEC publication 654-2, Part 2 consider the influence of power on the performance of industrial-process measurement and control equipment.

power injection function Pertaining to a field bus in industrial control systems, the function which supplies power onto the bus for use by stations containing power receiver functions.

power junction assembly A device that serves as distribution point from power supplies to one or more bus bars that comprise a branch power circuit. Refers to Honeywell TDC 3000 control systems.

power level, dBm The ratio of the power at a point to some arbitrary amount of power chosen as a reference. This ratio is usually expressed either in decibels based on 1 milliwatt (abbreviated dBm) or in decibels based on 1 watt (abbreviated dBW). See also decibel.

power loss 1. In a power transmission system or circuit, the difference between input power and output power, often expressed as a percent of input power. 2. In a current or voltage measuring instrument, the active power at its terminals when the pointer is at the end of the scale.

power operation Operation by other than hand power.

power outage Complete absence of power at the point of use.

power pack A unit for converting power from an alternating – or direct – current supply into alternating – or direct – current power at voltages suitable for supplying the proper operating power to an electronic device.

power pressure The pressure of the power supply as presented to an industrial-process measurement and control system or elements of the system. Pertains to pneumatic power.

power rail (programmable controllers) Vertical lines bounding and connected to ladder diagrams on the left and, optionally, on the right.

power receiver function Pertaining to a field bus in industrial control systems, the function which transfers power from the bus to stations which are powered through the bus.

power recovery (fluid power systems) Maximum ratio of power recovered at the output port to the supply power.

power relay A relay that responds to a suitable product of voltage and current in an electric circuit.

power source See power supply.

power spectrum The distribution of the power of a signal as a function of frequency, equal to the Fourier transform of the auto correlation function in the case of a stationary random signal of finite power.

power supply 1. Power source or power supply device from which the industrial-process measurement and control system or element of the system receive the energy in order to be able to operate. Pertains to both electrical and pneumatic power supply. 2. For fluid power systems, energy source which generates and maintains a flow of fluid under pressure.

power supply device A separate unit which can convert, rectify, regulate or otherwise modified the form of energy from the power source to provide suitable energy for a system or elements of a system for measurement and control.

power supply frequency The frequency of the power supply as presented to an industrial process measurement and control system or system element. Note: These frequencies can be from dc to any desired higher frequency, as used for magnetic amplifiers for example.

power supply functions (programmable controller systems) The power supply functions provide for conversion and isolation of the programmable controller system power from the mains supply.

power supply voltage The voltage of the power supply as presented to an industrial measurement and control system or system element.

power switch Often called an on-off switch. The switch that connects or disconnects a radio receiver, transmitter or other equipment from its power line.

power train The connecting mechanical elements that transmit the power generated by an engine to the driven item of equipment, i.e., pump, generator, feed mill, automobile. The power train may include crankshaft, transmission, clutch, drive shaft, differential, and axles.

power transformer In electronics, a transformer introduces the energizing supply into an instrument or system (distinct from a signal transformer).

power transistor A transistor capable of being used at high power ratings.

power type relay A term for a relay designed to have heavy-duty contacts usually rated 15 amperes or higher. Sometimes called a contactor.

power unit (control valve actuators) The portion of the actuator which converts fluid, electrical or mechanical energy into stem motion to develop thrust or torque.

power unit, powerpack (fluid power systems) Assembly of motor-driven pump, with or without a reservoir, and the necessary accessories (sometimes including controls, pressure relief valve etc.).

power voltage The voltage of the power supply as presented to an industrial-process measurement and control system or elements of system.

power winding (saturable reactor) A saturable-reactor winding to which the power to be controlled is supplied.

ppb Parts per billion.

PPE Polyphenylether.

ppm Parts per million; a measure of the concentration of foreign matter in air or a liquid.

PPM (pulse-position modulation) A pulse modulation method whereby the position of the pulse follows the modulating function.

PPR (pulse repetition rate) The number of electric pulses per unit of time experienced by a point in a computer; usually the maximum, normal or standard pulse rate.

practical salinity (water quality) A dimensionless value which, for the purposes of checking water quality, may be regarded as an estimate of the concentration, in grams per kilogram, of the dissolved salts in seawater.

practical system of electrical units A system in which the units are multiples or submultiples of the units of the centimeter-gram-second electromagnetic system.

praetersonic The higher region of the sonic spectrum.

pragmatics The relationships of characters or groups of characters to their interpretation and use.

pre-aeration (water quality) Aeration of settled sewage for a short period of time immediately before biological treatment, and also the aeration of sewage prior to sedimentation.

preamplifier An amplifier connected to a low-level signal source to present suitable input and output impedances and provide gain so that the signal may be further processed without appreciable degradation in the signal-to-noise ratio.

pre-charge pressure See inflation pressure.

precipitate To separate material from a solution by the formation of insoluble matter by chemical reaction. The material which is removed.

precipitation (heat treatment) Phase transformation in which the newly formed phase constitutes particles in the original phase. As a rule, a precipitation augments the hardness of the material. This effect is more pronounced at more minute particles; see precipitation hardening.

precipitation The removal of solid or liquid particles from a fluid.

precipitation hardening, age hardening Hardening by precipitation of minute particles produced by dissolution and ageing; see solution heat treatment.

precipitator An ash separator and collector of the electrostatic type.

precision 1. A measure of the ability to distinguish between nearly equal values. Example: Four-place numerals are less precise than six-place numerals; nevertheless a properly computed four-place numeral may be more accurate than an improperly computed six-place numeral. **2.** The degree of discrimination with which a quantity is stated; for example, a three-digit numeral discriminates among 1 000 possibilities. Contrast with accuracy. **3.** See accuracy and accuracy of measurement. **4.** Or repeatability, a random error caused by numerous small independent influences which prevent a measurement system from delivering the same reading when supplied with the same input value of the quantity being measured. Pertains to measurement of fluid flow.

precompiler (software) A computer program that preprocesses source code, part of which may be unacceptable to a compiler, to generate equivalent code acceptable to the compiler; for example, a preprocessor which converts structured FORTRAN to ANSI-standard FORTRAN.

preconditioning A control-function that provides for manually or automatically establishing a desired condition prior to normal operation of the system.

pre-conditioning time The time between the instant when a specified value of the measured quantity is applied to the internal measuring circuit and the instant when the instrument is intended to comply with the accuracy requirements.

precursor Also called undershoot. The initial transient response to a unidirectional change in input. It precedes the main transition and is opposite in sense.

predefined process A named process that consists of one or more operation or program steps that are specified in another part of a routine.

predetection In instrumentation tape recorders, the process of recording a "low" intermediate frequency from the telemetry radio receiver rather than the demodulated output of the receiver.

predetection recording The recording of telemetry receiver intermediate-frequency signals.

predicate To affirm or deny, in mathematical logic, one or more subjects.

predicted Qualifies a value assigned to a quantity, before the quantity is actually observable, computed on the basis of earlier observed or estimated values of the same quantity or of other quantities using a mathematical model. Note: A predicted value may also be designated by the term "prediction".

predicted failure rate For the stated conditions of use, and taking into account the design of an item, the failure rate computed from the observed, assessed or extrapolated failure rates of its parts.

predicted mean life For the stated conditions of use, and taking into account the design of an item, the mean life computed from the observed, assessed or extrapolated mean life of its parts.

predicted mean time of failure For the stated conditions of use, and taking into account the design of an item, the mean time to failure computed from the observed, assessed or extrapolated mean times to failure of its parts.

predicted meantime between failures For the stated conditions of use, and taking into account the design of an item, the mean time between failures computed from the observed, assessed or extrapolated failure rates of its parts.

predicted reliability For the stated conditions of use, and taking into account the design of an item, the

reliability computed from the observed, assessed or extrapolated reliabilities of its parts.

prediction The process of computation used to obtain (a) predicted value(s) of a quantity. Note: The term "prediction" may also be used to denote the predicted value(s) of a quantity.

predictive control **1.** A type of computer control which allows a digital computer to include a dynamic control loop for repetitive comparison of pertinent factors. **2.** A type of automatic control in which the current state of a process is evaluated in terms of a model of the process and controller actions modified to anticipate and avoid undesired excursions.

preferred access device An intelligent stand-alone device that is capable of requesting use of and communicating over the Data Hiway. Refers to Honeywell TDC 3000 control systems.

prefixes and symbols See International System of Units, SI.

prefix notation See parenthesis-free notation.

preheater air Air at temperature exceeding that of the ambient air.

preheating Heating as a preparatory part of heat treatment etc. The purpose of preheating can be to avoid deformation or cracking resulting from a large temperature difference between the surface and the interior of the object undergoing heat treatment.

prehydrolysed sulphate pulp Sulphate pulp manufactured by cooking chips which have been treated under pressure with steam or dilute acid with the intention of achieving a higher content of cellulose in pulp.

preignition purge An acceptable method of scavenging the furnace and boiler passes to remote all combustible gases before the ignition system can be energized.

preliminary adjustments Adjustments, specified by the manufacturer, that must be made before using the instrument so that it will operate with the specified accuracy.

premodulator filter A lowpass filter at the input to a telemetry transmitter; its purpose is to limit modulation frequencies and thereby limit radiated frequencies outside the desired operating spectrum.

preparatory function (numerical control) A command which establishes a functioning mode of machine or control system. Note: For example, interpolation type, fixed cycle, threading, or dimensional units.

preprocessor A computer program that effects some preliminary computation or organization.

preserve The function or procedure designed to retain information in one storage device after transferring it to another device.

preset parameter A parameter that is bound when the computer program is constructed, for example when it is flowcharted, coded or compiled.

press (in the paper industry) A machine in which a web is subjected to pressure between opposing parallel rolls. The web may be led through the press together with a felt and also a wire.

press-button switch Same as push-button switch.

pressed density The density of a powder-metal compact after pressing and before sintering.

presspahn, transformer board Strong, hard, flexible multi-layer board with a high and uniform density and good electrical insulating properties.

press quenching (heat treatment) Quenching simultaneously with application of pressure. The pressure is intended to prevent deformation of the object

treated and is usually applied by a press in which the quenching is performed by a gas stream or a liquid jet.

press section A part of the wet end of a paper machine consisting of one or more wet presses.

press tempering (heat treatment) Tempering in combination with the application of external forces during such a long period of time that the internal stresses in the material are reduced or relieved and the shape is corrected; see stress ageing, stress relieving, press quenching.

pressure Force per unit area. Measured in pounds per square inch (psi), or by the height (in feet, inches or centimeters) of a column of water or mercury which the force will support. Absolute pressure is measured with respect to zero pressure. Gage pressure is measured with respect to atmospheric pressure. For the measurement of pressure in SI units see under Pascal.

pressure (solderless) connection A device that establishes a connection between two or more conductors or between one or more conductors and a terminal by means of mechanical pressure and without the use of solder.

pressure booster Pressure boosters are generally also volume boosters; however, their main function is to increase the pressure from the controller to above 20 psig in certain valve application. For instance a single-seated, air-to-open valve with a 6-30 psi spring can close the valve against a high upstream pressure; however the normal controller output (20 psi maximum) cannot open the valve. A 2:1 booster makes the system operational.

pressure cable An oil-impregnated paper-insulated cable in which positive gage pressure is maintained on the insulation under all operating conditions.

pressure compensator A mechanism which automatically corrects a measurement for errors which would be induced due to variations in pressure.

pressure control (fluid power systems) Control method operated by a change of fluid pressure in a pilot control line.

pressure control relief, top relief The release of gas and water vapor from a digester during the cooking of pulp in order to control the pressure; compare final relief.

pressure control system A system that maintains the pressure, for instance, in a vessel at desired pressure. Typically, it includes the pressure, sensing element, the controller, the control mechanism, and the controlled valve(s).

pressure control valve Valve the essential function of which is to regulate pressure.

pressure differential Differential pressure.

pressure drop The difference in pressure between two points in a system caused by resistance to flow.

pressure dyeing (textile term) The application of dye liquor through forced circulation via pumps at pressures above 14.7 psia; commonly at 40 psia (25 psig).

pressure elements The portions of a pressure-measuring gage that move or are temporarily deformed by the system pressure, the amount of movement or deformation being proportional to the pressure.

pressure energized liner (butterfly valve liners) A pressure source, either internal fluid pressure or an external fluid pressure source, energizes the liner forcing it into tighter contact with the disk.

pressure energized seal (butterfly valves) A seal energized by interference fit between the disk groove and valve liner and also by differential pressure

re acting across the seal. The seal may be a solid section or have internal pressure ports.

pressure energized stem seal (control valves)

A part and/or packing material deformable by fluid pressure that bears against the stem to make a tight seal.

pressure filtration A water treatment process, similar to rapid sand filtration, except that water is passed through an enclosed system under pressure.

pressure gage A generic term for any pressure measuring instrument. More specific the term often refers to a pressure indicating device for direct measurement with an indicating scale in circular or strip gage form.

pressure gain (servo-valve) (fluid power systems) Change in load pressure drop per unit input signal with zero control flow (control ports blocked). Pressure gain is specified as the average slope of the curve of load pressure drop versus input signal in the defined region.

pressure gain Ratio of output pressure change to control pressure change at a given point.

pressure head Equivalent head of the liquid required to produce a given pressure.

pressure intensifier (fluid power systems) Device which converts the working pressure in one fluid (primary) system into a higher working pressure in a separate fluid system (secondary). The two fluid systems may employ similar or different fluids.

pressure level measuring device A device which measures liquid level by sensing the pressure difference between two points – one below and one above the surface of the liquid. Note: Where the pressure above the surface of liquid is at atmospheric pressure, the pressure produced by the head of liquid only is often used.

pressure loss (caused by a primary device)

The irrecoverable pressure loss caused by the presence of a primary device in the conduit. Pertains to measurement of fluid flow in closed conduits.

pressure measurement Any method of determining internal force per unit area in a process vessel, tank or piping system.

pressure microphone An acoustic transducer which converts instantaneous sound pressure of impinging sound waves into an electrical signal that directly corresponds in both frequency and amplitude.

pressure piling "Pressure piling" is an increase in explosion pressure caused by precompression of the gas before ignition.

pressure rating **1.** See nominal pressure. **2.** The maximum allowable internal force per unit area of a pressure vessel, tank or piping system during normal operation.

pressure recorder Instrument which provides a permanent record of pressure usually on paper, film or tape.

pressure recovery (fluid power systems) Ratio of output pressure to the supply pressure.

pressure regulator, pressure reducing valve Valve in which, with varying inlet pressure or outlet flow, the outlet pressure remains substantially constant. Inlet pressure shall, however, remain higher than the selected outlet pressure. The valve is often operated by a self-contained regulating mechanism.

pressure relief device (arrestor) A means for relieving internal pressure in an arrestor and preventing explosive shattering of the housing, following prolonged passage of follow current or internal flashover of the arrestor.

pressure relief device A pressure relief device is designed to open to prevent a rise of internal fluid

pressure in excess of a specified value due to exposure to emergency or abnormal conditions. It may also be designed to prevent excessive internal vacuum. It may be a pressure relief valve, a non-reclosing pressure relief device or a vacuum relief valve. Refer to ANSI standard B 95.1-1977.

pressure repeater A device generating an output pressure signal which is equal to its input pressure signal and isolated from it. Note: Often a repeater is used to obtain a pneumatic pressure signal from the pressure of a corrosive fluid.

pressure seal A device that isolates the process fluid from the transmitter body without altering the measurement of pressure (pressure, differential pressure, liquid level).

pressure-sealed reservoir Reservoir sealed for storing fluids at above atmospheric pressure.

pressure-sensing element In a pressure transducer, the part which converts the measured pressure into mechanical motion.

pressure snubber See pulsation dampener.

pressure switch A switch actuated by variations in applied pressure.

pressure tappings, pressure taps See under corner (pressure) tappings, flange (pressure tappings), and vena – contracta pressure tappings.

pressure transducer An instrument which converts a static or dynamic pressure input into the proportionate electrical output.

pressure-vacuum gage An instrument for measuring pressure both above and below atmospheric.

pressurized enclosure (Ex p) Enclosure in which a protective gas (may also be air) is maintained at a pressure higher than that of the surrounding explosive atmosphere so as to prevent the entry of the latter into the enclosure.

pressurized screen A closed screen working under pressure (e.g. pump pressure) which is used for pulp cleaning or stock cleaning.

(to) prestore To store, before a computer program, routine or subroutine is entered, data that are required by the computer program, the routine or the subroutine.

prestrike current (lightning) The current that flows in a lightning stroke prior to the return stroke current.

pretersonic Ultrasonic and with frequency higher than 500 megahertz.

pretravel (actuators) The distance or angle through which the actuator moves from the actuator free position to the operating position.

prevarication (information theory) See irrelevance.

preventive maintenance The maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning of an item.

preventive maintenance time That part of the maintenance time during which preventive maintenance is performed on an item, including technical delays and logistic delays inherent in preventive maintenance.

primary 1. Also called a primary winding. A transformer winding that carries current and normally sets up a current in one or more secondary windings. **2.** Pertaining to the high-voltage conductors of a power-distribution system. **3.** A transformer winding which receives energy from a supply source and uses it to create a magnetic flux in the transformer core.

primary degradation (water quality) Degradation of the molecular structure of a substance to an extent sufficient to remove some characteristic property.

primary detector See primary element.

primary device (of a differential pressure device) Differential pressure device with its pressure tapping.

primary device (electromagnetic flowmeters)

This device contains the following elements: an electrically insulated meter tube through which the conductive fluid to be metered flows, a pair of diametrically opposed meter electrodes across which the signal generated in the fluid is measured and an electromagnet for producing a magnetic field in the meter tube. The primary device develops a signal proportional to the flow-rate and in some cases the reference signal.

primary element The system element that quantitatively converts the measured variable energy into a form suitable for measurement. Note: For transmitters not used with external primary elements, the sensing portion is the primary element.

primary element, primary detector Pertaining to electrical transducers see sensing element.

primary failure A failure of an item, not caused either directly or indirectly by a failure or a fault of another item.

primary feedback A signal which is a function of the controlled variable and which is used to modify an input signal to produce an actuating signal.

primary insulation The layer of material which is designed to do the electrical insulating, usually the first layer of material applied over the conductor.

primary loop The outer loop in a cascade system.

primary measuring element A component of a measuring or sensing device that is in direct contact with the substance whose attributes are being measured.

primary mill (in steel production) The primary function of the primary mill is the conversion of a steel casting (the ingot) into rolled steel product; the secondary function of the rolling operation is to produce this rolled product into pieces of the desired cross-sectional dimensions and weights.

primary production (water quality) Ecologically, the rate of photosynthesis of algae or plants in a community.

primary standard A standard of a particular quantity which has the highest metrological qualities in a specified field. Note: The concept of primary standard is equally valid for base units and for derived units.

primary station (data communication) In high level data link control (HDLC), the part of the data station that supports the primary control functions of the data link, generates commands for transmission, and interprets received responses. Note: Specific responsibilities assigned to the primary station include initialization of control signal interchange, organization of data flow, and actions regarding error control and error recovery functions.

primary storage The main internal storage. Most often the fastest storage device of a computer and the one from which instructions are executed (contrasted with auxiliary storage).

primary treatment (of sewage) The stage of treatment usually involving the removal of the bulk of solids capable of settling. In the case of sewage it follows immediately after preliminary treatment.

primary voltage 1. The voltage applied to the terminals of the primary winding in a transformer. 2. The voltage produced by a primary cell.

prime mover (fluid power systems) Device which serves as the source of mechanical power for the fluid power system; i.e. that which drives the pump or compressor (electric motor, internal combustion engine).

priming The discharge of steam containing excessive quantities of water in suspension from a boiler, due to violent ebullition.

primitive A basic or fundamental unit, often referring to the lowest level of a machine instruction or lowest unit of language translation.

principal power (thyristor) The power which is consumed in the load circuit plus the losses in the power circuit elements including switches losses.

principal voltage (thyristor) The voltage between the main terminals of a bidirectional thyristor or between the anode and cathode terminals of a reverse blocking or a reverse conducting thyristor.

principle of measurement The scientific basis of a method of measurement. Examples: a. The thermoelectric effect applied to the measurement of temperature; b. The Josephson effect applied to the measurement of voltage; c. The Doppler effect applied to the measurement of velocity.

principle of shifting The principle that, if the input function is displaced in time, then the time response of the system remains unchanged except that it is also displaced by the same amount of time.

principle of superposition The principle that the time response of a system to several input functions is the same as the sum of their independent time responses.

printed board The general term for completely processed printed-circuit or printed wiring configurations. It includes single, double and multilayer boards, both rigid and flexible.

printed-board assembly A printed-circuit board to which separable components have been attached. Also an assembly of one or more printed-circuit boards which may include several components.

printed-circuit assembly 1. A printed circuit board to which separate components have been attached. 2. An assembly of one or more printed-circuit boards, which may include several components.

printed-circuit card, printed-circuit board, PCB A card, usually of laminate or resinous material of the insulating type, which is used for the mounting of an electrical circuit. Together the base and circuit make up the card. Double-sided: A board having printed circuits on both sides. Single-sided: A board having printed circuits on one side only.

printed circuit, PC A circuit in which the interconnecting wires have been replaced by conductive strips printed, etched, etc., onto an insulating board. It may also include similarly formed components on the baseboard.

printed wiring A pattern of conductors printed (screened) onto the surface of an insulating base to provide interconnection of active and passive devices to make an electronic circuit.

printer An output device which converts data into printed form.

print format Describes the manner information is to be printed on a printer, most often provided as part of a program specification.

printout The output of a device which is printed on some type of printer. See also hard copy.

print wheel In a wheel printer, the single element providing the character set at one printing position.

priority A label allocated to each of several parallel actions on an object, determining at each decision in-

stant the action to be performed when requested simultaneously.

priority interrupt The temporary suspension of a program currently being executed in order to execute a program of higher priority.

priority modes The organization of the flow of work through a computer.

prismatic joint, sliding joint (industrial robots)

An assembly between two rigid members enabling one to have a linear motion in contact with each other.

private automatic exchange, PAX The specific feature of various programs which restrict the use of input/output devices to special sets of instructions.

private branch exchange, PBX A manual or dial exchange which is connected to the telephone network, located on a customer's premises and operated by his employees.

privileged instruction An instruction that may only be used by a supervisory program.

probability distribution 1. A mathematical model showing a representation of the probabilities for all possible values of a given random variable. **2.** A table of numbers or a mathematical expression which indicates the frequency with each of all possible results of an experiment should occur.

probable error The amount of error which, according to the laws of probability, is most likely to occur during a measurement.

probe An input device of an instrument, in general made as a separate unit and connected to it by means of a flexible cable, which transmits in a suitable form the quantity to be measured.

probe-type consistency sensor A device in which forces exerted on a cylindrical body in the direction of flow are detected by a strain-gage bridge circuit; if the fluid is water, circuit output is a measure of flow rate, but if a solution or suspension is flowing at a steady flow rate, the output varies with changes in viscosity (or consistency).

problem See check problem.

problem definition The art of compiling logic in the form of general flow charts and logic diagrams which clearly explain and present the problem to the programmer in such a way that all requirements involved in the program are presented.

problem description In information processing, a statement of a problem. The statement also may include a description of the method of solution, the procedures and algorithms.

problem diagnosis Analysis that results in identifying the precise cause of a hardware, software, or system failure.

problem orientated language A programming language which has the facilities or notations useful for solving problems in one or more specific classes of applications, such as numerical, scientific, business data processing, civil engineering, simulation. Example: FORTRAN, COBOL, COGO, SIMSCRIPT.

problem reduction Problem solving in which operations are used to decompose a single problem into several subproblems which are usually easier to solve than the original problem.

problem solving language A language which can be used to specify a complete solution to a problem.

problem space A conceptual or formal area defined by all of the possible states that can be used in the analysis of interactions between elements and operations that are considered when solving a specific problem.

procedural Using a procedure (to solve a problem).

procedural knowledge Knowledge which explicitly indicates the steps to be taken in order to solve a problem or to reach a goal.

procedural language See procedure orientated language.

procedural programming language A computer programming language used to express the sequence of operations to be performed by a computer (for example, COBOL).

procedure 1. A portion of a computer program which is named and which performs a specific task. Compare with subprogram, function, module. **2.** The course of action taken for the solution of a problem.

procedure (batch processes) The part of a recipe that defines the generic strategy for producing a batch of product.

procedure orientated language A programming language that allows the user to express the solution to a problem as an explicit algorithm. Example: FORTRAN, ALGOL, COBOL, PL/1.

process 1. A set of interacting operations by which material, energy or information is transformed, transported or stored. **2.** In a computer system, a unique, finite course of events defined by its purpose or by its effect achieved under given conditions.

(technical) process A set of operations performed by equipment in which physical variables are monitored or controlled. Examples: Distillation and condensation in a refinery; autopiloting and automatic landing in an aircraft.

process analysis Analytical examination of a process for the purpose of documenting and understanding the phenomena which occur in/within the process.

process annealing See intermediate annealing.

process block valve The first valve off the process line or vessel used to isolate the measurement piping.

process chart Same as flow chart.

process computer 1. A computer which, by means of inputs from and/or outputs to a process, directly controls and/or monitors the operation of elements in the process. See control computer and industrial computer. See also on-line. **2.** Computer directly coupled to a technical process through process interface for data communication in real time.

process control The regulation or manipulation of variables influencing the behaviour of a process in order to meet specified objectives. Contrasted with numerical control.

process control block The data structure that defines a software process and its status.

process control chart A table or graph of test results or inspection data for each unit of production, arranged in chronological sequence for the entire assembly or production lot.

process control computer See process computer.

process control engineering A branch of engineering that deals with ways and means of keeping process variables as close as possible to desired values, or keeping them within specified ranges.

process control equipment Equipment that measures the variables of a technical process, directs the process according to control signals from the process computer system, and provides appropriate signal transformation. Examples: sensors, transducers, actuators.

process control level The control level of all control units acting upon the group control level. Note: The process control level is the highest control level in the control in the control hierarchy.

process control loop A system of control devices linked together to control one phase of a process.

process control system The complete system to control a process including all equipment, programmes and technical regulations. Note: The process control console is included in the equipment, and the instruction manuals are included in the technical regulations.

(to) process data To perform operations on data in a process.

process data Data collected from a process.

process database Organized collection of data relating to the operation of a process.

process data highway, type C (PROWAY C) A process data highway for distributed process control system as per IEC standard 955.

process descriptor A descriptive message shown at the bottom of the Group Display when a particular tag name is selected. Refers to TDC 3000 control systems.

process dynamics A set of dynamic interactions among process variables in a complex system, as in a petroleum refinery or chemical process plant.

process engineer's console A console designed and provided with equipment suitable to be used by the person responsible for the performance of an industrial process, to adjust the external behaviour of the process controller. See also operator's console and programmer's console.

process engineering An element of production engineering that involves selecting processes and equipment to be used, establishing the sequence and method of controlling all operations, and acquiring the tools needed to make a product.

process equipment Apparatus with which physical or chemical changes in a material are produced. Syn: plant.

process function Collective functions performed in and by the equipment in which variables are controlled.

process gateway, PG A gateway on the Local Control Network that integrates a Honeywell 45000 process computer with PMX or PMC software into the TDC 3000 system.

processing The manipulation, preparation, and handling, of information or data equipment designed with programs to achieve desired results. See data processing, information processing, multiprocessing, and parallel processing.

processing platform (petroleum industry) A production platform.

processing unit A functional unit that consists of one or more processors and their internal storages. Central processing unit, CPU and main frame deprecated according to ISO.

process interface Interface between a process computer and a technical process to perform the data communication between them.

process interface system A functional unit that adapts process control equipment to the computer system in a process computer system.

process interface unit, PIU An intelligent device that provides analog and digital input/output (I/O) capability to the Data Highway. PIU modules read the status of process variables from process system devices such as switches, valves, relays, motors, transmitters, and thermocouples and make the information available to BASIC, SUPERVISORY, and/or TOTAL Stations. See also by type (High Level, etc.). Refers to Honeywell TDC 3000 control systems.

process interrupt signal A signal that originates from a technical process and that causes an interrupt in the process computer system.

process I/O Input and output operations directly associated with a process, as contrasted with I/O operations not associated with the process. For example, in a process control system, analog and digital inputs and outputs would be considered process I/O whereas input and outputs to bulk storage would not be process I/O.

process I/O bus 1. A circuit over which data or power is transmitted; often one which acts as a common connection among a number of locations.

process I/O network A communication system. A set of OSI subnetworks interconnected by OSI intermediate systems and sharing a common network protocol.

process library A file consisting of words created by the user, which he then draws on by assigning numbers to specific point tags during point configuration. Refers to Honeywell TDC 3000 control systems.

process load See load.

process manager, PM In Honeywell TDC 3000 control systems, a process-connected data acquisition and control device that resides on the Universal Control Network.

process measurement The acquisition of information that establishes the values of process variables.

processor 1. Hardware: A data processor that is capable of execution program statements. **2.** Software: A computer program that includes the compiling, assembling, translating and related functions for a specific programming language – for example, COBOL processor, FORTRAN processor. **3.** In a computer, a functional unit that interprets and executes instructions. Note – A processor consists of at least an instruction control unit and an arithmetic and logic unit.

process-orientated sequential control A type of sequential control in which most of the actions of the sequential program are initiated by signals from the process.

process parameter A characteristic of a process which can be monitored and measured to provide information on the process.

process plan A detailed plan for the production of a piece part or assembly. It includes a sequence of steps to be executed according to the instruction in each step and consistent with the controls indicated in the instructions.

process pressure The pressure at a specified point in the process medium.

process reaction curve See signature curve.

process reaction method A method of determination of optimum controller settings when tuning a process control loop. The method is based on the reaction of the open loop to an imposed disturbance.

process signature curve See signature curve.

process steam Steam produced in an industrial plant's boilers to heat a process stream or for use in a process itself.

process temperature The temperature of the process medium at the sensing element.

process time The time at which a source program is translated into an object program through the action of a processor.

process variable See measured variable.

procurement document Purchase requisitions, purchase orders, drawings, contracts, specifications, or instructions used to define requirements for purchase.

producer gas Gaseous fuel obtained by burning solid fuel in a chamber where a mixture of air and steam is passed through the incandescent fuel bed. The process results in a gas, almost oxygen free containing a large percentage of the original heating value of the solid fuel in the form of CO and H₂.

producibility requirements An evaluation of the product's design with respect to how the design can be changed to improve the producibility of the product.

producing platform An offshore structure with a platform raised above the water to support a number of producing wells.

product The number or quantity that is the result of a multiplication operation.

product area An area in main storage to store results of multiplication operations, specifically (in some systems).

product certification See certification.

product definition data Data that describes the product definition, such as CAD data.

product family A group of products having a common classification criteria. Design engineering may classify items by function, size, shape or material in order to retrieve all items having common characteristics when required for a specific design purpose.

product gas End product gas; gas resulting from a special manufacturing process; synthetic natural gas.

production Output of a process or manufacturing facility.

production baseline The resulting state of product after preliminary design, detail design, and qualification and prototype testing are complete.

production engineering An element of industrial engineering that deals with planning and control of manufacturing processes, especially for the purpose of improving efficiency and reducing costs associated with mechanical equipment.

production planning An activity that accepts inputs such as customer orders and, based on a manufacturing strategy, develops a production plan that typically includes the following: **1.** What is to be produced. **2.** How much is to be produced. **3.** Where it is to be produced. **4.** When it is needed. **5.** How it is to be packaged.

production planning 1. The systematic scheduling of workers, materials, and machines by using lead times, time standards, delivery dates, work loads, and similar data for the purpose of producing products efficiently and economically and meeting desired delivery dates. **2.** Routing and scheduling.

production platform An offshore structure built for the purpose of providing a central receiving point for oil produced in an area of the offshore. The production platform supports receiving tanks, treaters, separators, and pumping units for moving the oil to shore through a submarine pipeline.

production rate The rate at which a particular operation produces output.

Production rule And if-then rule for representing knowledge in a rule-based system.

production schedule A plan which authorizes the factory to manufacture a certain quantity of a specific item. Usually initiated by the production planning department. The rate at which a particular operation produces output.

production scheduling (batch control) An activity that accepts inputs such as the production plan, and based on a scheduling algorithm, develops a production schedule.

production testing (for control valves) Minimum requirements for production test routines are gi-

ven in IEC publication 534-4 which also delineates a basis for inspecting control valves at a manufacturer's premises.

productivity 1. Production output per unit of input, such as number of items per labor manhour. **2.** Generically, the effectiveness with which labor, materials and equipment are used in a production operation.

productivity shell A combination of underlying knowledge representations and user interfaces that is highly domain-specific. It includes objects, decision making processes and interface representations that are user, rather than artificial intelligence dependent.

product liability, service liability (quality) A generic term used to describe the onus on a producer or others to make restitution for loss related to personal injury, property damage or other harm caused by a product or service. Note: The limits on liability may vary from country to country according to national legislation.

product specification 1. The tabulation of performance and other characteristics which describe a specific product. Note: Examples of such characteristics are: accuracy, dimensions, color. Some of them are self-explanatory. **2.** Synonymous with design specification.

products pipeline A large-diameter pipeline that transports, from refinery to distributor's terminal, various refined products, e.g., gasoline, kerosene, heating oil, and diesel fuel. Products in the line are separated by inflated synthetic rubber spheres. In the case of fungible products, diesel fuel and light gas oil or heating oil, no mechanical separators are used. As the products are pumped down the line, one behind the other, there is very little mixing at the interface.

product strategy A strategy on how to produce or market a product. It includes product mix, etc.

product structure The definition of the way components go into a product during its manufacture. A typical product structure would show the relation of one component to another; i.e. the relationship of the raw material being converted into fabricated components, components being put together into subassemblies, subassemblies going into assemblies, etc.

product technology Technologies that are introduced in the development of new or existing products.

product yield From a 42-gallon barrel of crude oil the average yield is as follows: gasoline 49,6%; jet fuel and kerosene, 6,6%; gas oil and distillates, 21,2%; residual fuel oil, 9,3%; lubricating oil, 7,0%; other products, 6,3%. With modern-day refining methods, these product percentages can be changed, depending upon market demand.

PROFIBUS Process Fieldbus. A German national standard related to digital field communication.

profile regulator Device inserted in a conduit to reduce the straight length required to achieve a regular velocity distribution. Note: The difference between these two functions is not always clearly made in respect of particular flow straighteners, and indeed some devices may perform both functions to a greater or lesser extent.

profundal zone (water quality) The lower region of a deep water body characterized by light insufficient to promote primary production (photosynthesis).

program 1. A series of actions proposed in order to achieve a certain result. **2.** Loosely, a routine. **3.** To design, write and test a program as in definition 1. **4.** In programming languages, a logical assembly of one or more interrelated modules. **5.** See computer program, object program, source program, and target program.

program address counter Same as location counter.

program architecture (software) The structure and relationships among the components of a computer program. The program architecture may also include the program's interface with its operational environment.

program assembly Also called a translator. A process which translates a symbolic program into a machine-language program before the working program is executed. It can also integrate several sections or different programs.

program control Descriptive of a system in which a computer is used to direct an operation or process and automatically to hold or to make changes in the operation or process on the basis of a prescribed sequence of events.

program controller A controller which automatically holds or changes set point to follow a prescribed program for process.

program control unit The unit in a central processor that executes computer instructions.

program correctness See correctness.

program design language See design language.

program evaluation and review technique, PERT Critical path analysis using computer technique.

program event recording, PER A hardware feature used to assist in debugging programs by detecting program events.

program flowchart A flowchart designed for the representation of the sequence of operations within a program.

program halt See program stop.

program input/output buffer A portion of main storage into which data are read, or from which they are written.

program instrumentation (software) 1. Probes, such as instructions or assertions, inserted into a computer program to facilitate execution monitoring, proof of correctness, resource monitoring, or other activities.

program language A language which is used by programmers to write computer routines.

program library (software) An organized collection of computer programs. See also software library, system library. Same as partitioned data set.

program linkage In a computer, efficient use of all registers and development of subroutines so that there is smooth, economical transition from one program segment to another, and memory capacity is conserved.

program load A feature that allows the operator to implement a small bootstrap loader program in memory. Refers to Honeywell TDC 3000 control systems.

programmable That characteristic of a device that makes it capable of accepting data to alter the state of its internal circuitry to perform a specific task(s).

programmable controller, PC A digitally operating electronic system, designed for use in an industrial environment, which uses a programmable memory for the internal storage of user-orientated instructions for implementing specific functions such as logic, sequencing, timing, counting, and arithmetic, to control, through digital or analog inputs and outputs, various types of machines and processes. Both the PC and its associated peripherals are designed so that they can be easily integrated into an industrial control system and easily used in all their intended functions.

programmable controller system, PC system A user's built configuration consisting of a programmable controller and associated peripherals, that is necessary for the intended automated system.

programmable digital computer A device that can store instructions and is capable of the execution of a systematic sequence of operations performed on data that is controlled by internally stored instructions.

programmable electronic system, PES The term programmable electronic systems (PES) is used to cover systems incorporating a wide range of programmable electronic devices and includes systems incorporating: microprocessors, programmable controllers (PCs), programmable logic controllers (PLCs) and other computer based devices.

programmable logic array, PLA Uses a standard logic network programmed to perform a specific function. PLAs are implemented in either metal-oxide semiconductors or bipolar circuits and are an alternative to read-only memories.

programmable logic controller, PLC Special purpose computer for sequential control, the sequence control logic of which is changeable by mostly Boolean logic or relay – ladder types of programming language through its programming panel or host computer.

programmable logic level Digital data with high and low levels capable of being varied under computer control.

programmable memory A memory whose locations are addressable by the computer's program counter, i.e., a program within this memory may directly control the operation of the arithmetic and control unit.

programmable read-only memory, PROM A read-only memory (ROM) that can be programmed by the user but only once. After a PROM is programmed it becomes a ROM.

programmable robot A servorobot directed by a programmable controller that memorizes a sequence of arm-and-gripper movements; this routine can then be repeated perpetually. The robot is reprogrammed by leading its gripper through the new task.

programmatics The study of the techniques of programming and programming languages.

programmed check A check procedure designed by the programmer and implemented specifically as a part of his program.

programmed control A control system in which the operations are determined by a predetermined input program from cards, tape, plug, boards, cams etc.

programmed logic array, PLA An orderly arrangement of logical AND and logical OR functions. Its application is very much like a glorified ROM. It is primarily a combinational logic device.

programmer 1. A person who designs, writes, and tests computer programs. 2. A device for timed switching of several interrelated functions or set of functions. 3. A machine or interface which will allow the programming of PROMs.

programmer (industrial robots) A competent person designated to prepare the task program.

programmer's console A man-machine interface, consisting of various information entry/retrieval devices, arranged as a packaged unit. It is used by the programmer of a computer control system for a manufacturing process, to monitor, modify, and control the internal behaviour of the digital controller. See also operator's console, process engineer's console.

programming The designing, writing, and testing of programs. See convex programming, dynamic programming, linear programming, mathematical pro-

gramming, quadratic programming, macroprogramming, microprogramming, and multiprogramming.

programming and maintenance console A panel with switches and display devices used by an operator to communicate with the computer even in the absence of higher level software. This console is usually mounted on the CPU cabinet and used to observe registers, initiate bootstrap loading, and control processor operations. Refers to Honeywell TDC 3000 control systems.

programming control panel A panel made up of indicator lights and switches by which a programmer can enter or change routines in the computer.

programming flowchart A flowchart representing the sequence of operations in a program.

programming language An artificial language designed to generate or to express programs.

programming module A discrete identifiable set of instructions, usually handled as a unit by an assembler, a compiler, a linkage editor, a loading routine, or other type of routine or subroutine.

programming relay A relay whose function is to establish or detect electrical sequences.

program module A set of programming instructions which is treated as a unit by an assembler, compiler, loader, or translator.

program mutation (software) A program version purposely altered from the intended version to evaluate the ability of program test cases to detect the alteration. Synonymous with program mutant.

program protection (software) The application of internal or external controls to preclude any unauthorized access or modification to a computer program.

program register 1. Also called program counter, or control register. The computer control-unit register into which is stored the program instruction being executed, hence controlling the computer operation during the cycles required to execute that instruction. 2. See also instruction address register.

program segment That part of a program that is contained in a program deck.

program-sensitive fault A fault that is revealed as a result of the execution of some particular sequence of instructions.

program set station A device which provides time scheduling of set point values.

program specification (software) 1. Any specification for a computer program. See design specification, performance specification, requirements specification. 2. Synonymous with design specification.

program step A phase of one instruction of command in a sequence of instructions. Thus, a single operation.

program stop (numerical control) A miscellaneous function command to cancel the spindle and coolant functions and terminate further processing after the completion of other commands in the block.

program storage A portion of the internal storage reserved for the storage of programs, routines, and subroutines. Contrasted with working storage.

program synthesis (software) The use of software tools to aid in the transformation of a program specification into a program that realizes that specification.

program test system, PTS A system that automatically tests programs and produces diagnostics.

program unit See module.

program validation Synonymous with computer program validation. See validation.

progressive ageing, progressive aging Ageing under a gradational or continual rise in temperature; see interrupted ageing.

project engineering 1. Engineering activities associated with designing and constructing a manufacturing or processing facility. 2. Engineering activities related to a specific objective such as solving a problem or developing a product.

project plan (software) A management document describing the approach that will be taken for a project. The plan typically describes the work to be done, the resources required, the methods to be used, the configuration management and quality assurance procedures to be followed, the schedules to be met, the project organization etc.

PROM See programmable read-only memory.

prompting In a system with time sharing, a function that helps a terminal user by requesting him to supply operands necessary to continue processing.

proof pressure The maximum pressure which a diaphragm, capsule or element can withstand without permanent deformation. Expressed in terms of input pressure.

prop An entity taking no action of its own during the execution of a script.

propagating fractures Fractures or tears in a ruptured, high pressure pipeline that travel almost instantaneously longitudinally (along the length of the pipe) driven by the pressure of the gas or liquid escaping through the initial rupture or break.

propagation Also called wave propagation. The travel of electromagnetic waves or sound waves through a medium. Propagation does not refer to the flow of current in the ordinary sense.

propagation delay The time period between the input of a logic signal to a device and a valid output from that signal at the output of the device.

propagation loss The loss of energy suffered by a signal while passing between two points.

propagation model An empirical or mathematical expression used to compute propagation path loss.

propagation velocity See velocity of propagation.

propane A petroleum fraction; a hydrocarbon, gaseous at ordinary atmospheric conditions but readily converted to a liquid. When in a liquid state propane must be stored in a high-pressure metal container. Propane is odorless, colorless, and highly volatile.

proportional A linear (straight line) relationship between two variables.

proportional (P) control action Control action in which there is a continuous linear relation between the output and the input.

proportional (P) controller A controller which produces proportional control action only.

proportional action coefficient, proportional gain The ratio of the change in output due to proportional control action to the change in input. See proportional band.

proportional action, P-action Type of control action in which the variations of the output variable are proportional to the concomitant variations of the input variable. Note: Proportional action can be combined with integral action and derivative action.

proportional band (of a controller) 1. For a controller the change in input required to produce a full range change in the output caused by the proportional element only. Note: The proportional band is the reciprocal of the gain of the controller expressed as a percentage of the measuring span. 2. The change in input required to produce a full range change in output due to proportional control action.

proportional control A control mode in which there is a continual linear relationship between the deviation computer in the controller, the signal of the controller, and the position of the final control element.

proportional control mode A controller mode in which the controller is directly proportional to the controlled variable error.

proportional element, P-element Transfer element of which the variation of the output variable is proportional to the corresponding variation of the input variable.

proportional gain, proportional action coefficient The ratio of the change in output due to proportional control action to the change in input. See proportional band.

proportional plus derivative (rate) action, PD-action Control action in which the output is proportional to a linear combination of the input and the time rate-of-change of input. Note: The definition is valid for an ideal PD-action element, but for a real PD-action element only approximately. See further IEC publication 902 (1987) and ISA publication S51.1 (1979).

proportional plus derivative (rate) (PD) controller A controller which produces proportional plus derivative (rate) control action.

proportional plus derivative element, PD-element Transfer element created by the combination of a proportional element and a derivative element.

proportional plus integral (reset) control action, PI-action Control action in which the output is proportional to a linear combination of the input and the time integral of the input. See further ISA publication S 51.1 (1979), and IEC publication 902 (1987).

proportional plus integral (reset) (PI) controller A controller which produces proportional plus integral (reset) control action.

proportional plus integral (reset) plus derivative (rate) control action, PID-action Control action in which the output is proportional to a linear combination of the input, the time integral of input and the time rate-of-change of input. See further ISA publication S 51.1 (1979) and IEC publication 902 (1987).

proportional plus integral (reset) plus derivative (rate) (PID) controller A controller which produces proportional plus integral (reset) plus derivative (rate) control action.

proportional plus integral element, PI-element Transfer element created by the combination of a proportional element and an integral element.

proportional plus integral plus derivative element, PID-element Transfer element created by the combination of a proportional element, an integral element and a derivative element.

proportional position action A type of control-system response where the position of the final control element has a continuous linear relation to the value of the controlled variable.

proportional pressure reducing valve Valve in which the outlet pressure is maintained at a fixed ratio to the inlet pressure.

proportional sampling (water quality) A technique for obtaining a sample from flowing water in which the frequency of collection (in the case of discrete sampling), or the sample flow rate (in the case of continuous sampling), is directly proportional to the flow rate of the sampled water.

proportional speed floating controller See integral (reset) (I) controller.

proportioning probe A probe used in leak testing in which the ratio of air to tracer gas can be changed without changing the amount of flow transmitted to the detector.

propulsion – control transfer switch Apparatus in the engine room for transfer of control from engine room to bridge and vice versa.

protected location A storage location reserved for special purposes, in which data cannot be stored without undergoing a screening procedure to establish suitability for storage therein. May be indicated by a set guard bit.

protecting tube A protecting tube is a tube designed to enclose a temperature sensing device and protect it from the deleterious effects of the environment. It may provide for attachment to a connection head but is not primarily designed for pressure-tight attachment to a vessel. A bushing or flange may be provided for the attachment of a protecting tube to a vessel.

protection An arrangement for restricting access to or use of all, or part, of a computer system. Also lock-out, lock-out.

protective atmosphere See controlled atmosphere.

protective device Any device for keeping an undesirable large current, voltage or power out of a given part of an electric circuit.

protective earth, protective earthing connection A low impedance path under fault conditions including high voltage and/or current between the electrical circuit and earth to minimize the risk to the operator.

protective gap A spark gap provided between a conductor and the earth by suitable electrodes. High-voltage surges due to lightning are thus permitted to pass harmlessly to earth through the gap.

protective impedance Component or assembly of components, the impedance, construction and reliability of which are such that when connected between live parts (or parts which may become live in case of a fault) and accessible conductive parts, it provides protection against electric shock not less than that provided by double insulation.

protective resistance A resistance placed in series with a device to limit the current to a safe value.

protocol 1. A set of rules specifying the interactions between stations of a communication system and governing the format and relative timing of the frames exchanged between these stations. **2.** A formal definition (semantic or syntax) that describes how data is to be formatted for communication between a data source and a data sink.

protocol data unit (token ring access method) Information delivered as a unit between peer entities which contains control information and, optionally data.

proton One of the three basic subatomic particles, with a positive charge equivalent to the negative charge of the electron, but with approximately 1845 times the mass. The proton is the positive nucleus of the hydrogen atom.

prototype 1. Original design or first operating model. **2.** A development or first production model of a circuit, device or system.

prover (ball or piston) A device which measure the volume of a liquid by displacing a mechanical sealing element along a calibrated pipe between two position detectors.

proving Determination of flowmeter performance by establishing the relationship between the volume actually passed through the meter and the volume indicated by the meter.

PROVOX PLUS Fisher Controls distributed control system consists of 4 levels of hardware: Control I/O, with connection to the field via termination terminal, Multifunction Controllers in 3 models UOC, IFC and MUX, Operator Station named Provue, and Host Computer for special application control strategy. The system configuration can support continuous as well as batch processes.

PROWAY A standard for a process control highway based on IEEE 802.4 token bus immediate acknowledged MAC (Media Access Control), a physical layer utilizing a phase-contiguous signaling technique. Developed by ISA SP72.

proximity switch A device that reacts to the proximity of an actuating means without physical contact or connection.

pruning, cut-off A problem solving optimization technique for ignoring one or more branches in a search tree.

ps Pico second (SI unit).

pseudo-application program An operational program that is written to test the supervisory program.

pseudocode A code that requires translation prior to execution.

pseudoprogram A program that is written in a pseudocode and may include short coded logical routines.

psi Pounds per square inch.

psia Pound per square inch, absolute.

psig Pounds per square inch, gage.

psophometer An instrument for measuring noise in electric circuits.

psychrometer A device consisting of two thermometers, one of which is covered with a water-saturated wick, used for determining relative humidity; for a given set of wet-bulb and dry-bulb temperature readings, relative humidity is read from a chart. Also known as wet-and-dry bulb thermometer.

PTB Physikalisch-Technische Bundesanstalt (Germany). Approval certification body for products (systems) intended for installation in hazardous locations. Example: intrinsically safe application.

PTC thermistor See under thermistors.

PTFE Polytetrafluoroethylene. See this term.

publication language All well-defined form of programming language suitable for printing.

pull-in current (or voltage) The maximum current (or voltage) required to operate a relay.

pulp Fiber material, normally of vegetable origin, used for manufacturing of paper or board (papermaking pulp) or cellulose derivatives (dissolving pulp). The term cellulose should not be used as a synonym for pulp.

pulp (dumping) pit An open container for the collection of pulp after batch-wise sulphite cooking, normally fitted with a rectangular drainer bottom, through which spent liquor and washing water can drain.

pulp bale See bale.

pulp broke Pulp which has been rejected at some stage of the manufacturing process. Pulp broke is normally slushed and re-used in the pulp mill where the broke has arisen; compare slushing.

pulp chest, stuff chest A container for a pulp suspension, normally fitted with a stirrer or other means of maintaining circulation.

pulp cleaning Removal by mechanical means, e.g. by sedimentation, centrifugation or screening of undesirable particles from pulp.

pulp consistency, pulp concentration The mass of fiber material (dry solids) divided by the volume of the fiber suspension. Pulp consistency should be given in kilograms per cubic metre.

pulp-drying machine, pulp dryer A machine in which a pulp suspension is formed into a web of wet pulp in the first section of the machine, the wet end, and is then dried to a web of dry pulp in a subsequent drying section.

pulped broke Pulp prepared by the defibration of broke from the papermaking process.

pulp elevator See pulp excavator.

pulper, slusher A machine for the slushing of pulp or paper.

pulp excavator, pulp elevator A machine for the continuous withdrawal of dewatered pulp from a pulp (dumping) pit.

pulp grinder See grinder.

pulp mill An industrial unit for the manufacture of pulp.

pulpstone dresser See burr lathe.

puls, impulse Any variation in the value of a magnitude, short in relation to the time schedule of interest, the final value being the same as the initial value.

pulsating flow A flow rate that varies with time, but for which the mean flow rate is constant when obtained over a sufficiently long period of time.

pulsating flow of mean constant flow-rate Flow in which the flow-rate in a measuring section is a function of time but has a constant mean value when averaged over a sufficiently long period of time. Note: Two types of pulsating flows are found: periodic pulsating flow; fluctuating (random) pulsating flow.

pulsating pressure Pressure whose magnitude alternately rises and falls in a regularly recurring pattern, and whose variation exceeds 1% per second, or 5% per minute, of the scale on the measuring instrument.

pulsation Rapid fluctuations in furnace pressure.

pulsation damper Various devices for absorbing the transient, rhythmic surges in pressure that occur when fluid is pumped by reciprocating pumps.

pulsation damper, "hydraulic stubber" Device installed on control valve actuator stem to reduce throttling instability.

pulsation welding A form of resistance welding in which the power is alternately applied and removed.

pulse amplitude The maximum instantaneous value of a pulse.

pulse amplitude modulation, PAM The coding of a continuous or analog signal onto a uniformly-spaced sequence of constant width pulses by amplitude-modulating the intensity of each pulse, i.e., similar to AM radio broadcasts except that the carrier is a pulse and not a sine wave.

pulse analyzer Equipment for analyzing pulses to determine their time, amplitude, duration, shape etc.

pulse-average time The duration of a pulse, measured between two points at 50 percent of the maximum amplitude on the leading and trailing edges.

pulse broadening (fiber optics) An increase in pulse duration. Note: Pulse broadening may be specified by the impulse response, the root-mean-square pulse broadening, or the full-duration-half maximum pulse broadening.

pulse carrier A carrier wave composed of a series of equally spaced pulses.

pulse code modulation, PCM 1. The form of modulation in which the modulating signal is sampled and the sample quantized and coded so that each element of the information consists of different kinds and/or numbers of pulses and spaces. 2. In telemetry, serial transmission (generally, a series of binary-coded words).

pulse count telemetering A method of transmitting information that involves an "off-on" switching signal whose number of signal pulses per unit time represents the transmitted value.

pulse demoder A circuit which responds only to pulse signals with a specified spacing between them. Also called a constant delay discriminator.

pulse discriminator A device that responds only to pulses having a particular characteristic (e.g., duration, amplitude, period). One that responds to period is also called a time discriminator.

pulse dispersion, pulse broadening See pulse broadening.

pulse duration modulation, PDM The process of sampling a signal and encoding each sample into a series of pulses whose duration or widths are proportional to the amplitude of the sample.

pulse equalizer A circuit that produces output pulses of uniform size and shape when driven by input pulses that vary in size and shape.

pulse frequency modulation, PFM (data transmission) Modulation in which the pulse-repetition frequency of the carrier is varied in accordance with the amplitude and frequency of the modulating signal.

pulse generator 1. A device for generating a controlled series of electrical pulses. 2. Device so arranged that, if a continuous pneumatic signal is applied to the input port, repetitive pulses are produced at the output port.

pulse group See pulse train.

pulse interleaving A process in which pulses from two or more time-division multiplexers are systematically combined in time division for transmission over a common path.

pulse interval See pulse spacing.

pulse length (fiber optics) Often erroneously used as a synonym for pulse duration.

pulse mode Coded group of pulses which selects a particular communication channel from a common carrier. A pulse mode multiplex controls these channels by means of pulse demoders.

pulse modulation The use of a series of pulses designed to convey the information contained in the modulating function. The characteristics of a train of pulses may be modified in one of several ways to convey information, including amplitude (PAM), position (PPM), and duration (PDM).

pulse motor See stepping motor.

pulse rate The rate at which pulses are fed to a drive of a stepper motor. In most cases, the pulse rate equals the stepping or running rate.

pulse rate telemetering A type of telemetering in which the number of unidirectional pulses per unit time is varied as a function of the magnitude of the measured quantity.

pulse ratio Ratio of the length of any pulse to its total period.

pulse repetition frequency, PRF The number of electric pulses per unit of time.

pulse selector A circuit or device that selects the proper pulse from a sequence of (telemetering) pulses.

pulse soldering Soldering a connection by melting the solder in the joint area by pulsing current through a high-resistance point applied to the joint area and the solder.

pulse spacing The time interval from one pulse to the next, i.e., between the corresponding times of two consecutive pulses.

pulse spike A relatively short duration pulse superimposed on the main pulse.

pulse string See pulse train.

pulse telemetering Any system for transmitting information in terms of electric pulses that are independent of electrical variations in the transmission channel; they can be classified as pulse duration, pulse count or pulse code systems.

pulse train, pulse string A series of pulses having similar characteristics. Also called pulse group or impulse train.

pulse transmitter A transmitter used to generate and transmit pulses over a telemetering or pilot-wire circuit to the remote indicating or receiving device.

pulse width In a pulse, the position between two specified maxima.

pulse width modulation See pulse-duration modulation.

punched card A card punched with hole patterns.

punched tape Tape, usually paper which handles punched paper tape.

puncture A disruptive discharge of current through insulation, which breaks down under electrostatic stress and permits the flow of a sudden large current through the opening. (See also breakdown).

pure binary notation See pure binary numeration system.

pure binary numeration system The fixed radix numeration system that uses the digits 0 and 1 and the radix two.

purge 1. To remove unwanted records from a file. 2. To cause a liquid or gas to flow from an independent source into the impulse line(s). 3. To introduce air into the furnace and the boiler flue passages in such volume and manner as to completely replace the air or gas-air mixture contained therein.

purged packing box (control valves) A packing arrangement consisting of a lantern ring inside the packing rings to permit introducing of a purge fluid to continually flush the space between the stem and body. It is usually used to purge, admit cooling fluid or detect stem seal leakage.

purge meter A device designed to measure small flow rates of liquids and gases used for purging measurement piping.

purge method (of liquid level measurement) A method of measuring liquid level in open vessels based on the static pressure method. A tube is immersed in the tank to the minimum level of the liquid. From a pressure and volume regulator a small flow of purge air or gas is fed into the tube, so that slow bubbling occurs even when the tank is full. The pressure in the air line is then equal to the back pressure exerted by the head of liquid. Measurement of this air pressure is, therefore, equivalent to measurement of the static pressure of the liquid – i.e. the liquid level.

purge post An acceptable method of scavenging the furnace and boiler passes to remove all combustible gases after flame failure controls have sensed pilot and main burner shutdown and safety shut-off valves are closed.

purification – liquid/liquid (separation terminology) A centrifugal separation of two liquid phases and a solids phase, if any, where the lightest liquid has the largest volume and is required as pure as possible. Thus the light phase travels the longest distance in the separator bowl. Usually purification of oils from water.

Purofer process A direct reduction for reduction of iron ore, utilizing a shaft furnace as the reduction reactor.

push-button control Control of equipment by means of push buttons, which in turn operate relays etc.

pushdown list, (pushdown) stack A list that is constructed and maintained so that the next data element to

be retrieved is the most recently stored. Note: This method is characterized as "last in, first out" (LIFO).

pusher-type furnace (in steel production) A type of continuous reheating furnace. The steel is moved through the furnace by pushing the last piece charged with a pusher at the charging end. As each cold piece is pushed into the furnace against the continuous line of material, a heated piece is removed. Also used in heat-treating operations.

push-in liner (for butterfly valves) This type of liner is made from an elastometer ring that is bonded to a metal insert. This type of construction will provide stiffness for vacuum service and will prevent extrusion by differential pressure across the disc. This liner is readily replaceable in the field. Other liner designs for butterfly valves are: liner bonded to body, liner wrapped around faces, liner anchored to body, clamped liner and, special liners.

push-pull amplifier See balanced amplifier.

pushup list, queue A list that is constructed and maintained so that the next data element to be retrieved is the one stored first. Note: This method is characterized as "first in, first out" (FIFO).

putrefaction The uncontrolled decomposition of organic matter due to anaerobic microbial action, with the production of offensive odour.

PV Process Variable.

PVC Polyvinyl Chloride; a commercial resin derived from petroleum; the principal ingredient of PVC is ethylene.

PVDC Polyvinylidene chloride.

PV tracking A technique whereby the local setpoint of a controller follows the process variable when in the manual mode.

pW Picowatt (SI unit).

PWA **1.** Printed Wire Assembly. **2.** Printed Wiring Assembly.

PWB **1.** Printed Wire Board. **2.** Printed Wiring Board.

pycnometer A container of precisely known volume that is used to determine density of a liquid by weighting the filled container and dividing the weight by the known volume. Also spelled pyknometer.

pycnocline (water quality) A layer in a stratified body of water in which the density gradient is at a maximum.

pyranometer, solarimeter An instrument used to measure the combined intensity of solar radiation and diffuse sky radiation.

pyrite A principal iron-sulphide mineral.

pyrites furnace A furnace for the preparation of sulphur dioxide by atmospheric oxidation (burning, roasting) of pyrites.

pyroelectric effect Also called pyroelectricity. The redistribution of the charge in a crystal that has been heated.

pyroelectric infrared detector A current source with an output proportional to the rate of change of its temperature. Widely used in radiometric systems from industrial temperature measuring systems to environmental satellite instruments to the analysis of infrared lasers.

pyrometer An instrument which measures the temperature of an object by measuring the spectral intensity of the thermal radiation emitted by the object. Note: Examples include the total-radiation, optical, and ratio or two color pyrometers. Also known as radiation (radiant energy) thermometer.

pyrrhotite A principal iron-sulphide mineral.

Q

Q Symbol for quantity of electric charge.

QA Quality Assurance

QAM Quadrature Amplitude Modulation. A high-speed modem modulation technique employing both differential phase modulation and amplitude modulation.

QAR 1. Quality Assurance Representative at Vendor Plant. **2.** Quality Assurance Requirements.

Q-BOP (oxygen steelmaking) See bottom-blown process

QCB See queue control block.

Q factor 1. A rating factor for electronic components such as coil, capacitors and resonant circuits that equals reactance divided by resistance. **2.** In a periodically repeating mechanical, electrical or electromagnetic process, the ratio of energy stored to energy dissipated per cycle.

Q switch (laser-maser) A device for producing very short, intense laser pulses by enhancing the storage and dumping of electronic energy in and out of the lasing medium, respectively.

quaded cable A particular cable in which some or all of the conductors are arranged in groups of four.

quadrant edge orifice plate The quadrant edge type of orifice plate (also called quarter circle and round edge) has a concentric opening with a rounded upstream edge rather than the sharp, square edge normally used. Yields more constant and predictable discharge coefficient at low velocity (Reynolds number less than 10,000).

quadrant electrometer An electrometer in which the moving element is actuated by electrostatic forces between that element and fixed elements shaped like quadrants.

quadratic Another name for second-order, based on the form of equation which represents the second-order response.

quadratic programming In operation research, a particular case of nonlinear programming in which the function to be maximized or minimized and the constraints are quadratic functions of the controllable variables. Contrast with convex programming, and mathematical programming.

quadrature The state or condition of two related periodic functions or two related points separated by a quarter of a cycle, or 90 electrical degrees.

quadrature component The reactive component of a current or voltage due to inductive or capacitive reactance in a circuit.

quadrature modulation The modulation of two carrier components 90° apart in phase by separate modulating functions.

quadrature voltage (electromagnetic flowmeters) That part of the electrode signal which is 90° out of phase with the flow signal.

quadrupole network See two-terminal-pair network.

quadrupontal Four random punches on a punch card. This term is used in determinative documentation.

quadrupole mass spectrometer A type of mass spectrometer employing a filter consisting of four conductive rods electrically connected in such a manner that, by varying the absolute potential applied to the rods, all ions except those possessing a specific mass-to-charge ratio are prevented from entering the detector.

quadrupole network See two-terminal-pair network.

qualification Acknowledgement of the conformity of a model or system to all the requirements of a predetermined set of specifications making it possible to recognize that this model or system is able to assume a specified service.

qualification standard A combination of a set of standardized values assigned to the functional and performance characteristics of a specific type of model and the specifically designated standardized test methods and procedures to be used.

qualification testing (software) Formal testing, usually conducted by the developer for the customer, to demonstrate that the software meets its specified requirements. See also acceptance test, system testing.

qualified products list, QPL A listing of manufacturers qualified by test and performance verification to produce items listed in the Mil-Specs. (USA).

qualitative repeatability The closeness of agreement between the results obtained by the same method on identical test material under the same conditions (same operator, same laboratory, same apparatus and short intervals of time).

qualitative reproducibility The closeness of agreement between individual results obtained with the same method on identical test material but under different conditions (different operators, different apparatus, different laboratories and/or different times).

quality 1. The totality of features and characteristics of a product, process or service or implied needs. (ISO definition), **2.** See software quality.

quality assurance All those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality (ISO definition).

quality control The operational techniques and activities that are used to fulfil requirements for quality. Notes: **1.** In order to avoid confusion, care should be taken to include a modifying term when referring to a sub-set of quality control such as "manufacturing quality control," or when referring to a broader concept, such as "company-wide quality control". **2.** Quality control involves operational techniques and activities aimed both at monitoring a process and at eliminating causes of unsatisfactory performance at relevant stages of the quality loop (quality spiral) in order to result in economic effectiveness. (ISO definition).

quality engineering An engineering program the purposes of which are to establish suitable quality tests and quality acceptance criteria and to interpret quality data.

quality loop, quality spiral Conceptual model of interacting activities that influence the quality of a product or service in the various stages ranging from the identification of needs to the assessment of whether these needs have been satisfied. (ISO definition).

quality of service The collective effect of service performance which determine the degree of satisfaction of a user of the service.

quality plan A document setting out the specific quality practices, resources and sequence of activities relevant to a particular product, service, contract or project. (ISO definition).

quality spiral See quality loop.

quality surveillance The continuing monitoring and verification of the status of procedures, methods, conditions, processes, products and services, and analysis

of records in relation to stated references to ensure that specified requirements for quality are being met. (ISO definition).

quanta 1. The intervals of a set or group used to quantize a function. **2.** Units of time in a queue.

quantitative analysis A study which determines how well a system performs.

quantitative repeatability The value below which the absolute difference between two single test results obtained under the above conditions may be expected to lie value with a specified probability.

quantitative reproducibility The value below which the absolute difference between two single test results on identical material obtained by operators in different laboratories using the standardized test method may be expected to lie with a specified probability. In the absence of other indications the probability is 95%.

quantitative testing Testing that monitors or measures the specific quantity, level or amplitude of a characteristic to evaluate the operation of an item. The outputs of such tests are presented as finite or quantitative values of the associated characteristics. (Definition as per Mil. Std. 1309B).

quantity A positive or negative real number.

quantity meter A flowmeter in which the flow is separated into known isolated quantities which are separately counted to determine the total volume passed through the meter.

quantization Process by which the range of a variable is divided into a finite number of distinct sub-ranges not necessarily equal, each of which is represented by an assigned value named the quantized value.

quantization distortion Inherent distortion introduced when a range of values for a wave attribute is divided into a series of smaller subranges.

quantization error A measure of uncertainty which occurs as a result of the quantization of a function in a continuous interval.

quantization level A particular subrange in quantization.

(to) quantize To divide the range of a variable into a finite number of non-overlapping intervals that are not necessarily of equal width, and to designate each interval by an assigned value within the interval. Example: A person's age is for many purposes quantized with a quantum (interval) of 1 year.

quantized pulse modulation Pulse modulation which involves quantization (e.g., pulse numbers or pulse code modulation).

quantized signal Signal having a quantized information parameter.

quantized system One in which at least one quantizing operation is present.

quantizer 1. A device which partitions a continuum of analog values into discrete ranges to be represented by a digital code. An analog-to-digital converter. **2.** A device with a restricted quantity of possible output values that will assimilate any range of input values into its limited range.

quantizing Expressing an analog value as the nearest one of a discrete set of prechosen values.

quantizing error The maximum deviation from a straightline transfer function of a perfect A/D converter.

quantizing error 1. The basic uncertainty associated with digitizing an analog signal, due to the finite resolution of an A/D converter. **2.** A measure of the ability of a digital meter to discriminate between an incremental value and values slightly above or below this value.

quantum 1. A unit of processing time in a time-sharing system that may be allocated for operating a program during its turn in the computer. **2.** A discrete portion of energy of a definite amount. **3.** The angular increment of input-shaft rotation of an encoder, subtended by one code position. **4.** The smallest amount into which the energy of a wave can be divided. The quantum is proportional to the frequency of the wave.

quantum efficiency (fiber optics) In an optical source or detector, the ratio of output quanta to input quanta. Input and output quanta need not both be photons.

quantum electronics Amplification or generation of microwave power in solid crystals, governed by quantum mechanical laws.

quantum limited operation, quantum-noise-limited operation (optical communication) The condition prevailing in an optical fiber link when quantum noise is the predominant mechanism limiting the system performance.

quantum mechanics 1. The study of atomic structure and other related problems, in terms of quantities that can actually be measured. **2.** The science of all complex elements of atomic and molecular spectra, and the interaction of radiation and matter.

quantum-noise-limited operation (optical communication) See quantum limited operation.

quantum noise, photon noise (optical communication) Noise attributable to the discrete particle nature of light.

quantum number Any set of numbers assigned to the particular values of a quantized quantity in its discrete range. The state of a particle or system may be described by a set of compatible quantum numbers.

quantum theory The theory that an atom or molecule does not emit or absorb energy continuously. Rather, it does so in a series of steps, each step being the emission or absorption of an amount of energy called the quantum. The energy in each quantum is directly proportionate to the frequency.

quarter amplitude A process-control tuning criteria where the amplitude of the deviation (error) of the controlled variable, following a disturbance, is cyclic so that the amplitude of each peak is one quarter of the previous peak.

quarter circle orifice plate (quadrant edge orifice plate) Orifice plate for which the junction of the upstream face and the orifice has the profile of a quarter circle. See figure in ISO publication 4006-1977 or BS 5875:1980.

quarter wave One-quarter cycle of a wave.

quartet (mathematics of computing) A group of four adjacent digits operated upon as a unit.

quartz An important rock-forming mineral; crystalline silica. Next to feldspar, quartz is the most common mineral that occurs either in transparent six-sided (hexagonal) crystals or in crystalline masses. Quartz is very hard, a 7 on the Mohs scale (diamond is 10), and will scratch glass.

quartz crystal A piezoelectric crystal which regulates an oscillator frequency.

quartz crystal thermometer The quartz crystal measures the temperature – dependent vibrational frequency of a quartz crystal, which is determined by the velocity of sound in quartz.

quartz delay line A sonic delay line using a length of quartz crystal as an acoustical medium and with sound waves representing digital data being propagated over a fixed distance.

quartz plate A crystalline-quartz section completely finished to specifications, with its two major faces essentially parallel.

quartz resonator A piezoelectric resonator with a quartz plate.

quasi-analog signal (data transmission) A digital signal after conversion to a form suitable for transmission over a specified analog channel. The specifications of an analog channel includes the frequency of range, frequency of bandwidth, signal-to-noise ratio (snr), and envelope delay distortion. When this form of signaling is used to convey message traffic over the public dial-up network telephone systems, it is often referred to as voice data.

quasi instruction Same as pseudo instruction.

quasi-optical waves Electromagnetic waves of short wavelength so that their laws of propagation are similar to those of visible light.

quasi-random code generator A high-speed pcm information source that provides a means of closed-loop testing for use in designing and evaluating wide-band communications links.

quasi-rectangular wave A wave nearly but not quite, rectangular in shape.

quasistable state, unstable state, metastable state In a trigger circuit, a state in which the circuit remains for a finite period of time at the end of which it returns to at stable state without the application of a pulse.

quaternary code (information theory) A code whose output alphabet consists of four symbols.

quaternary signaling An electrical communications mode in which information is passed by the presence or absence, or plus and minus variations, of four discrete levels of one parameter of the signaling medium.

quech hardening Hardening a ferrous alloy by austenitizing and then cooling rapidly enough so that some or all of the austenite transforms to martensite.

quech oil A specially refined oil with a high flash point used in steel mills to cool hot metal.

quench (textile term) The wet-out of fabric immediately after singeing to prevent sparks from burning the fabric.

quench and temper Quench hardening followed by tempering.

quenching Loss of superconductivity of the current carrying coil that may occur unexpectedly in a superconducting magnet. As the magnet becomes resistive, heat will be released that can result in rapid evaporation of liquid helium in the cryostat.

quenching (in heat treatment) Removal of heat; see cooling. The rate of quenching is determined by, for instance, the properties of the quenching agent (cooling agent) employed.

query (data transmission) The process by which a master station asks a slave station to identify itself and to give its status.

query station A specific unit of equipment which introduces requests or queries for data, states of processing, information etc. while the equipment is computing or processing or communicating.

queue, pushup list A list that is constructed and maintained so that the next data element to be retrieved is the one stored first. Note: This method is characterized as "first in, first out" (FIFO). Contrast with stack.

queue control block, QCB A control block that is used to regulate the sequential use of a programmer-defined facility among requesting tasks.

queued access method Any access method that automatically synchronizes the transfer of data bet-

ween the program using the access method and input/output devices, thereby eliminating delays for input/output operations.

queue discipline A method that determines which of several items awaiting processing should receive service.

queued sequential access method, QSAM A method which forms queues of input data blocks that await processing or queues of output data blocks that have been processed and await transfer to auxiliary storage or to an output device.

queued telecommunications access method, QTAM A method which transfer data between main storage and remote terminals.

queuing An ordered progression of items into and through a system or process, especially when there is waiting time at the point of entry.

queuing discipline The rules or priorities for queue formation within a system of "customers" and "servers" as well as the rules for arrival time and service time.

queuing list A list frequently used for scheduling actions in real-time on a time-priority basis.

Quevenne scale A specific gravity scale used in determining the density of milk; a difference of 1° Quevenne is equivalent to a difference of 0.001 in specific gravity, and therefore 20° Quevenne expresses a specific gravity of 1.020.

quibinary code A binary-coded decimal code for representing decimal numbers in which each decimal digit is represented by seven binary digits which are coefficients of 8, 6, 4, 2, 0, 1, and 0, respectively.

quick-access memory A part of memory that has a short access time, as compared to the main memory of the central processing unit.

quick-acting valve A quarter turn valve; butterfly, ball, and plug valves are called quick-acting valves because a 90-degree turn of the handle closes or opens them.

quick-break A characteristic of a switch or circuit breaker, whereby it has a fast contact-opening speed that is independent of the operator.

quick-change trim (control valves) Quick-change trim is defined as trim which may be removed and replaced by simply opening the bonnet joint; the valve body remains in the pipe line and the unscrewing of seat rings with a special clamp on lug wrench is eliminated. The seat is sealed to the body bridge wall by either a gasket or an O-ring, and a "flow cage", which holds down the seat, is in turn loaded by the bonnet. Another design enables removal of the seat supporting cage by opening the bottom cover, then the seat, plug, and stem follow. The actuator is not disturbed in this design.

quick disconnect A type of connector shell which allows for very quick locking and unlocking of two connector parts.

quick exhaust valve (fluid power systems) Valve in which, when air pressure falls at the inlet, the outlet is automatically opened to exhaust.

quick-look Essentially, an "instant reply" of data, generally at the same rate at which it was recorded.

quick-make A term used to describe a device which has a high contact closing speed independent of the operator.

quick opening flow characteristic (control valves) An inherent flow characteristic in which there is a maximum flow with minimum travel.

quick release coupling Connection which may be joined or separated without the use of tools.

quick return A device that makes the return stroke of a reciprocating machine element faster than the power stroke.

quick start See system restart.

quiescent **1.** A system that is waiting to be operated. **2.** The state of a transistor amplifier with no signal applied. **3.** The operating condition that exists in a circuit when no input signal is applied to the circuit

quiescent carrier transmission One for which the carrier is suppressed in the absence of modulation.

quiescent current See idling current.

quiescent dissipation The power dissipated by a component or circuit in the absence of dynamic activating signals applied to the input or outputs.

quiescent state The time during which a tube or other circuit element is not performing its active function in the circuit.

quiescing The stopping of a multiprogrammed system by means of the rejection of new jobs.

quinary See biquinary code.

quinary notation Notation using the base 5.

quire A twentieth part of a ream, i.e. 25 sheets.

quotient The number or quantity that is the value of the dividend divided by the value of the divisor and that is one of the results of a division operation.

quotient meter An instrument intended to measure the quotient of the values of two quantities of different kinds.

quotient relay A relay that operates in response to a suitable quotient of two alternating electrical input quantities.

QWERTY keyboard The most common type of typing keyboard.

R

(type) R Letter designation for thermocouple and thermocouple extension wire with a certain temperature – emf relationship. Material identification: platinum – 13 percent rhodium versus platinum. See ISA publication ANSI-MC 96.1–1982 and IEC publication 584-1.

R & D Research and Development.

R & E Research and Engineering.

race The condition that exists when a signal is propagated through two or more memory elements during the same clock period.

raceway Any channel designed and used solely for holding wires, cables or bus bars.

rack A mechanical structure intended to receive a number of basically standardized modular equipments.

rad Symbol for radian. See radian.

radiac set Equipment for detecting, identifying and measuring the intensity of nuclear radiation. Also called radiac instrument or radiac meter.

radial piston pump Pump having several pistons arranged to operate radially.

radial seal Sealing device which seals by radial contact pressure.

radian frequency See angular velocity.

radian, rad Unit for measurement of plane angle (SI unit). On drawings etc. use the additional unit degree, °. Avoid the subdivisions minute, ', and second, ", except in navigation. Use, instead, decimal subdivisions of the degree. Example: write 22.5°, not 22°30'.

radiant energy (optical communication) Energy that is emitted, transmitted or received via electromagnetic waves.

radiant exitance, radiant emittance The total power emitted by a unit area of a source.

radiant fluxmeter A device which measures the amount of radiant flux emitted or absorbed. The units typically would be watts per unit area.

radiant flux, radiant power, optical power, optical flux The time rate of flow of radiant energy.

radiant gain (optoelectronic device) The ratio of the emitted radiant flux to the incident radiant flux.

radiant heat Infrared radiation from a body not hot enough to emit visible radiation.

radiant reflectance The ratio of reflected radiant power to incident radiant power.

radiant transmittance The ratio of transmitted radiant power to incident radiant power.

radiated emission Radiation and induction field components in space.

radiated interference Interference which is transmitted through the atmosphere according to the laws of electromagnetic wave propagation.

radiation 1. The propagation of a signal or interference from a source other than by conduction. **2.** Emission or transfer of energy in the form of electromagnetic waves.

radiation angle, output angle (optical communication) Half the vertex angle of the cone incorporating a specified proportion of the divergent light beam emitted by the end of a fiber.

radiation detector Any of the many devices used to detect the presence of radiation from a specific region of the electromagnetic spectrum.

radiation dosimetry The detection and measurement of the presence of nuclear and x-ray radiation.

radiation fin bonnet (control valves) A bonnet with fins to reduce heat transfer between the valve body and packing box assembly.

radiation flux density (irradiance) The total incident radiation energy measured in power per unit area (e.g. milliwatts per square centimeter).

radiation hard The characteristic of a material which is insensitive to nuclear or x-ray radiation.

radiation hardening Manufacturing techniques applied to a device so that its performance is not degraded significantly by exposure to high gamma and neutron radiation environments. Examples are the use of dielectric isolation techniques and nichrome thin-film resistors.

radiation hysteresis Pertaining to photoelectric and proximity switches, the difference between the upper and lower radiation threshold referred to the lower radiation threshold. See upper and low radiation threshold.

radiation loss A comprehensive term used in a boiler-unit heat balance to account for the conduction, radiation, and convection heat losses from the settings to the ambient air.

radiation pyrometer Also called radiation thermometer. **1.** A pyrometer which uses the radiant power from the object or source whose temperature is being measured. The radiant power impinges on a suitable detector, usually a thermocouple, thermopile or a bolometer responsive to the heating effect to the radiant power. **2.** A temperature measuring device that uses an optical system to focus radiant energy from an object onto a detector. The detector converts this energy into an electrical signal that varies with the temperature of the object.

radiation temperature 1. The temperature to which an ideal blackbody must be heated so it will have the same emissive power as a given source of thermal radiation. **2.** The temperature of a complete radiator that has a total radiant emittance identical with that of an unknown source.

radiation thermometer See radiation pyrometer.

radiation transfer index, RTI A parameter that describes the transmission performance of optical fiber cables. It measures cable performance and includes both coupling and propagation losses.

radiation type method (of liquid level measurement) This method of liquid level measurement make use of radiation with gamma rays, since these rays must penetrate through the material. The source of the gamma rays is usually a minute quantity of radioactive material such as radium salts. The rays penetrate the layer of liquid and as the level (layer) increases, the number of rays decrease. This method requires locating the radiation source at or below the minimum level and a Geiger counter at or above the maximum level to be measured. The level varies in proportion to the number of rays.

radiator (fluid power systems) Device, usually of honeycomb or multitubular construction which transfers heat from a liquid to air, thereby acting as a liquid/air heat exchanger.

radiator Any device which emits radiation.

radioactivity Any particulate or electromagnetic radiation emanating from a mass of material due to spontaneous emission from unstable atomic nuclei.

radio frequency heating The process of heating a substance by subjecting it to a high-frequency energy field.

radio frequency interference, RFI Used interchangeably with EMI. EMI is a later definition which includes the entire electromagnetic spectrum, whereas RFI is more restricted to the radio-frequency band, generally considered to be between 10 kHz and 10 GHz.

radio frequency, RF A frequency residing above the audio range and below the frequency of visible light.

radiography (for control valves) This technique of x-raying castings detects internal defects in castings as well as examines the quality of welds. It is an expensive procedure and is usually limited to very critical areas. This is a type of certification and nondestructive tests that can be provided for the materials used in control valves.

radioisotope 1. A radioactive isotope of a chemical element. **2.** A nonpreferred synonym for radionuclide.

radioisotope tracer flowmeter A device for determining flow rate by injecting a radioactive substance into the fluid stream.

radiology The application of radiation science to the study of medicine, especially the diagnosis and treatment of injury and disease.

radioluminescence Luminescence produced by radiant energy (e.g., by X-rays, radioactive emissions, alpha particles, or electrons).

radiometallography X-ray examination of the crystalline structure and other characteristics of metals and alloys.

radiometer A transducer which converts radiant flux into an electric signal. The transducer may be calibrated in terms of irradiance, radiant flux or radiant energy.

radiometric analysis A method of quantitative chemical analysis based on measuring the absolute disintegration rate of a radioactive substance of known specific activity.

radiopaque Not penetrable by x-rays or other radiation.

radioparent Penetrable by x-rays or other radiation.

radio station A device in which an input signal is multiplied by a factor adjustable by an operator.

radix See base.

radix-50 A storage format in which three ASCII characters are packed into a sixteen-bit word.

radix complement A complement obtained by subtracting each digit of the given number from the number that is one less than the radix of that digit place, then adding one to the least significant digit of the result and executing any carries required. Example: 830 is the tens complement i.e. the radix complement, of 170 in the decimal numeration system using three digits.

radix-minus-one complement, diminished radix complement A complement obtained by subtracting each digit of the given number from the number that is one less than the radix of that digit place.

radix notation, radix numeration system A positional representation system in which the ratio of the weight of any one digit place to the weight of the digit place with the next lower weight is a positive integer.

radix number Synonymous with base and base number.

radix point In a representation of a number expressed in a radix numeration system, the location of the separation of characters associated with the integral part from those associated with the fractional part.

raffinate In solvent-refining practice, raffinate is that portion of the oil being treated that remains undissolved and is not removed by the selective solvent.

rag paper Paper in which the fiber material consists of at least a certain amount of rag pulp and the remainder bleached chemical pulp. The lowest content of rags which is permitted if the paper is to be designated "rag paper" varies from country to country.

rag pulp Pulp manufactured from cotton, hemp, flax or ramie in the form of raw material, textile waste or textile returns.

RAM The volatile memory used in microcomputers is known as "Random Access Memory" (RAM). Because data can be read out of, or written into such memory it is sometimes referred to as "read/write" memory. There are two types of RAM, namely "static" or "dynamic". With static RAM the stored data is maintained as long as the power is on, but with dynamic RAM the data must be refreshed periodically.

ram (petroleum industry) A closure mechanism on a blowout-preventer stack; a hydraulic operated type of valve designed to close in a well as with a conventional valve or to close on tubing or drillpipe and maintain high-pressure contact.

ramp A voltage or current that varies at a constant rate; for example that portion of the output waveform of a time/linear sweep generator used as a time base for scope display.

ramp encoder An analog-to-digital conversion process whereby a binary counter is incremented during the generation of a ramp voltage; when the amplitude of the ramp voltage is equal to the amplitude of the voltage sample, the counter clock is inhibited. The counter contents therefore contain the binary equivalent of the sampled data.

ramp gage, inclined gage See under inclined gage.

ramp generator An electrical power supply which generates a voltage that increases at a constant rate.

ramp input A change, in an input signal, which varies at a constant rate.

ramp response The time response resulting from a stepwise increase from zero to some finite value in the rate of change of one of the input variables.

ramp response time The time interval beginning at the application of ramp input, necessary for the output variable to remain in a specified tolerance band around values, which are the input values multiplied by the static gain minus steady-state deviation of first order of the output variable.

ramp signal A signal which changes linearly with time – a straight-line increase or decrease in value.

random 1. A condition not localized in time or frequency. **2.** Irregular; having no set pattern.

random access (computing systems) Accessing data independently of the location of the data most recently obtained.

random access device A device in which the access time is effectively independent of the location of the data. Synonymous with direct access device.

random access memory See RAM.

random access storage A form of a storage where information can be recovered immediately, regardless of when it was stored.

random error A component of the error of measurement which, in the course of a number of measurements of the same measurand, varies in an unpredictable way. Note: It is not possible to correct for random error.

random failure Any failure whose cause and/or mechanism make its time of occurrence unpredictable.

ble, but which is predictable only in a probabilistic or statistical sense. Also called chance failure.

random function generator A device which generates nonrepetitive signals which are distributed over a broad frequency range.

randomizer A hardware device to inject a pseudo-random bit sequence into an NRZ wavetrain, thereby guaranteeing frequent data transitions so that the low-frequency component is too low for transmission or recording. A "derandomizer" removes the sequence and restores data to the original form; a form of data enhancement.

random number A number selected from a known set of numbers in such a way that each number in the set has the same probability of occurrence.

random number table A table of random numbers used in statistical calculations.

random pard Pertains to that portion of the total pard in an electric power supply which is not periodic. This phenomenon is frequently referred to as noise.

random processing 1. The treatment of data without respect to its location in external storage, and in an arbitrary sequence governed by the input against which it is to be processed. **2.** The processing of data that are in no predetermined order when they enter the computer system.

random sample A sample in which every item in the population has an equal chance of being included in the sample. This definition implies that the selection of the sample should be left to chance.

random sequential memory A memory in which one reference can be found immediately; the other reference is found in a fixed sequence.

random variable 1. A discrete or continuous variable which may assume any one of a number of values, each having the same probability of occurrence. **2.** Also called stochastic variable. Any signal the amplitude or phase of which cannot be predicted by a study of previous values of the signal.

random walk The path followed by a particle which makes random scattering collisions with other particles in a gaseous or liquid medium.

random walk method In operations research, a variance-reducing method of problem analysis in which experimentation with probabilistic variables is traced to determine results of a significant nature. No interesting walks add only to the variance of the process and thus contribute nothing. An interesting walk tends to lead toward a predictive solution.

range The region between the limits within which a quantity is measured, received, or transmitted, expressed by stating the lower and upper range - values. Notes: **1.** For example: **a.** 0-150°F, **b.** -20 to +200°F, **c.** 20-150°C. **2.** Unless otherwise modified, input range is implied. **3.** The following compound terms are used with suitable modifications in the units: measured variable range, measured signal range, indicating scale range, chart scale range, etc. See tables in ISA publication S51.1, 1979.

range (computing systems) 1. The set of values that a quantity or function may assume. **2.** The difference between the highest and lowest value that a quantity or function may assume.

range (electrical transducers) The measurand values, over which a transducer is intended to measure, specified by their upper and lower limits.

rangeability 1. The ratio of the maximum span to the minimum span to which an instrument or device can be calibrated within the specified accuracy rating. Example: If the span of a device is adjustable from 10-90, rangeability is 90/19=9. **2.** The ratio of the maxi-

mum flow rate to the minimum flow rate of a meter. Pertains to flow measurement.

range check A combination of two limit checks, one of which applies to an upper limit, and the other to a lower limit.

range of analog pneumatic transmission The region of the values between the lower limit and the upper limit of the signal pressure. See IEC publication 382 for standardized ranges.

range of disturbance variable Range within which the disturbance variable may vary without adversely affecting the functioning of the control system.

range of final controlled variable Range within which the final controlled variable may vary, assuming full functional capability of the control system.

range of the manipulated variable Range within which the manipulated variable can vary.

range of the reference variable Range within which the reference variable can vary.

range oil Kerosene-type product used in oil or kerosene stoves or cooking ranges.

ranges of analog direct current signals For international standard of direct current signals used in industrial-process measurement and control systems to transmit information between elements of systems see IEC publication 381-1.

ranges of analog direct voltage signals For international standard of direct voltage signals used in industrial-process measurement and control systems to transmit information between the elements of systems see IEC publication 381-2.

rank, level number A reference number that indicates the position of an item in a hierarchic arrangement.

Rankine An absolute temperature scale where the zero point is defined as absolute zero (the point where all spontaneous molecular motion ceases) and the scale divisions are equal to the scale divisions in the Fahrenheit system; 0°F equals approximately 459.69°R.

rapid access loop In internal memory machines, a small section of memory which has much faster accessibility than the remainder of the memory.

rapid memory, rapid storage Computer memory in which the access time is very short; rapid access usually is gained by limiting the storage capacity. Also called rapid memory, fast-access storage and high-speed storage.

rapid traverse A machine tool mechanism that quickly moves the workpiece to a new position while the cutting tool is retracted.

rare gas See noble gas.

raster The bright white glow which covers the cathode-ray tube when no signal is received.

raster display device (computer graphics) A display device in which display images are generated by raster graphics.

raster graphics Computer graphics in which a display image is composed of an array of pixels arranged in rows and columns.

rastergrid On a display device, the grid of addressable coordinates on the display surface.

raster plotter (computer graphics) A plotter that generates a display image on a display surface using a line-by-line scanning technique.

raster scan The type of scan used in television and some computer CRT's where the electron beam always moves left to right, and top to bottom into horizontal.

raster unit (computer graphics) The unit of measure equal to the distance between adjacent pixels.

Note – This term has been used in the past to denote increment size.

ratched relay A stepping relay actuated by an armature-driven ratchet.

rate See derivative control action.

rate action Same as derivative control action.

rate amplitude The ratio of the maximum output of proportional-plus-rate action to the steady output of proportional action alone, after a step-increase in deviation, both outputs being measured from the same baseline – the controller output before the step.

rate control See derivative control.

rate control action See derivative control action.

rated A qualifying term that, applied to an operating characteristic, indicates the designated limit or limits of the characteristic for application under specified conditions. Examples: rated maximum voltage, rated frequency range etc.

rated (value) A value assigned by a manufacturer, for a specified operating condition of the equipment. Rated values may apply to the complete equipment or to parts or components of it.

rated apparent efficiency (thyristor) Rated output volt-amperes divided by rated input power, generally expressed as percent.

rated capacity (large lead storage batteries) The ampere-hour capacity assigned to a lead storage cell by its manufacturer for a given discharge time, at a specified electrolyte temperature and specified gravity, to a given end-of-discharge voltage.

rated continuous controller current (thyristor) The rated root-mean-square (rms) value of the maximum controller current which can be carried continuously without exceeding established limitations under prescribed conditions of operation.

rated controller current (thyristor) Rated root-mean-square (rms) value of the controller current which is specified by the manufacturer under the prescribed operation mode as a basis of declaring the duty cycles and overcurrent capability.

rated current, rated signal (fluid power systems) Specified input current of either polarity to produce rated flow. Rated current shall be specified for a particular coil connection (differential, series, or parallel) and does not include null bias current.

rated C_V (control valves) The value of C_V at the rated full open position of the valve plug.

rated efficiency (thyristor) Rated output power divided by rated input power, generally expressed as percent.

rated flow 1. Design flow rate for a piping system or process vessel. **2.** Normal operating flow rate for a fluid passing through a piping system.

rated flow coefficient (control valves) The value of the flow coefficient at the rated travel.

rated horsepower The maximum or allowable power output of an engine, turbine or other prime mover under normal, continuous operating conditions.

rated input volt-amperes (thyristor) The product of rated line voltage and current.

rated line current (thyristor) Rated root-mean-square (rms) value of the current in the lines at rated controller current for the specified controller connection.

rated line voltage (thyristor) Rated root-mean-square (rms) value of the line voltage.

rated load The maximum design load for a machine, structure or vehicle.

rated load (industrial robots) The maximum load that can be applied to the mechanical interface in normal operating conditions without degradation of any

advertised performance specification. The rated load includes the inertial effects of the end-effector, accessories and workpiece (where applicable).

rated load torque, rated torque (rotating machinery) The shaft torque necessary to produce rated power output at rated-load speed.

rated load voltage (thyristor) The root-mean-square (rms) voltage delivered at the controller load terminals with rated line voltage and rated continuous controller current.

rated minimum displacement factor (thyristor) The minimum ratio of input power to the input volt-amperes (at fundamental line frequency) at which a controller might be operated.

rated operating conditions Condition of use giving the ranges of the measurand and of the influence quantities, and other important requirements, for which the metrological characteristics of a measuring instrument are intended to lie within specified limits.

rated output power (thyristor) The total real power available to the controller load at rated controller current and rated load voltage.

rated output voltamperes (thyristor) The product of rated load voltage and current.

rated relieving capacity (pressure relief devices) That portion of the measured relieving capacity permitted by the applicable code or regulation to be used as a basis for the application of a pressure relief device.

rated source impedance (thyristor) The equivalent impedance of the line voltage source, including the connections to the terminals of the converter.

rated supply voltage The main voltage (for three-phase supply, the line to line voltage) for which the manufacturer has designed the apparatus.

rated travel (control valves) The displacement of the closure member from the closed position to the designated full open position.

rated valve capacity The rate of flow of a fluid (compressible or incompressible) that will pass through a valve at the rated travel under stated conditions.

rated voltage The voltage at which a device or component is designed to operate under normal conditions.

rate generator A proportional element which converts angular speed into a constant-frequency output voltage. See also angular velocity.

rate-of-rise timer A percentage timer as applied in temperature control system for controlling the rate of temperature rise. Usually a standard percentage timer with a dial marked in various scales of degrees per hour rise.

rate of change limiting control Type of control in which the rate of change of a controlled variable is prevented from exceeding a predetermined high limit.

rate of decay The rate at which the sound-pressure level (velocity level or sound-energy density level) is decreasing at a given point and at a given time. The practical unit is the decibel per second.

rate response A relationship describing the output of a control system as a function of its input signal.

rate time For an element with proportional and derivative action (PD-action) the input variable of which is given a rampwise variation, the rate time is the time required for the output variable variation to reach twice the value of the variation that occurred immediately after the ramp was applied.

ratio The value obtained by dividing one number by another. This value indicates their relationship to each other.

ratio arms Two adjacent arms of a Wheatstone bridge, both having an adjustable resistance and so arranged that they can be set to have any of several fixed ratios to each other.

ratio controller A controller which maintains a predetermined ratio between two variables.

ratio control system A control system that maintains two or more variables at a predetermined ratio by making the value of one variable (usually uncontrolled) adjust the controller set-point for another variable. Note difference from cascade control system.

rational number A real number that is the quotient of an integer divided by an integer other than zero.

ratio of specific heat Specific heat at constant pressure divided by specific heat at constant volume.

ratio pyrometer The ratio pyrometer (sometimes called a two-color pyrometer) measures the radiation power around two fixed wavelengths.

ratio thermometer A device consisting essentially of two radiation thermometers in the same housing, the output of each thermometer having a separate wavelength response; the output is a ratio signal that is a function of temperature, but that is relatively insensitive to target size and therefore is as accurate for small radiating bodies as it is for larger ones.

ratio-type telemeter A telemeter that translates data in terms of the relative phase relation between two electrical quantities, or their relative magnitudes.

raw acid, tower acid See under acid tower.

raw data Data which has not been processed. Such data may or may not be in machine-sensible form.

raw gas (petroleum industry) Gas straight from the well before the extraction of the liquefied hydrocarbons (gasoline, butane); wet gas.

raw gasoline (petroleum industry) The untreated gasoline cut from the distillation of crude oil.

raw mix (petroleum industry) A stream of mixed components: butane, propane, hexane, and others; the product of gas processing plants that is sent on to fractionating plants for the separation of the various components. See field butanes.

raw sewage Untreated sewage.

raw sludge Sludge removed from primary sedimentation tanks. It may include primary sludge, co-settled with recycled secondary sludge.

raw tape Also called virgin tape or blank tape. A term sometimes used to describe tape that has not been recorded.

raw water Water supplied to the plant before any treatment.

Rayleigh scattering (optical communication) Light scattering in a medium due to inhomogeneities in material density or composition of that medium which are small with respect to wavelength. Note: The scattered power is inversely proportioned to the fourth power of the wavelength.

RC coupling See resistance-capacitance coupling.

RC network A circuit containing resistances and capacitances arranged in a particular manner to perform a specific function.

RC oscillator Any oscillator whose frequency is determined by the interaction between resistors and capacitors in an electronic circuit.

RCT See ring crush resistance.

RDX Cyclotrimethylene Trinitroamine.

Re Reynolds number.

reach A length of open channel between two defined cross-sections. Pertains to liquid flow measurement in open channels.

reactance A component in an electrical circuit which is due to the presence of capacitive or inductive ele-

ments and not resistive elements, and which opposes the flow of electric current.

reactance drop The voltage drop 90° out of phase with the current.

reaction A chemical transformation or change brought about by the interaction of two substances.

reactive Pertaining to either inductive or capacitive reactance. A reactive circuit has a higher reactance than resistance.

reactive energy meter, var-hour meter An instrument intended to measure reactive energy by integrating reactive power with respect to time.

reactive factor The ratio of reactive power to total power in a circuit.

reactive load A load having reactance (i.e., a capacitive or inductive load), as opposed to a resistive load.

reactive mode A condition of communication between one or more remote terminals and a computer, in which each entry causes certain actions to be performed by the computer, but not necessarily including an immediate reply. Contrasts with mode, conversation.

reactive power The reactive voltage times the current, or the voltage times the reactive current, in an ac circuit. Unit of measurement is the var (SI unit).

reactive power meter, varmeter An instrument intended to measure reactive power.

reactive volt-ampere meter See reactive power meter.

reactor 1. A circuit element that introduces capacitive or inductive reactance. **2.** A vessel in which a chemical reaction takes place. **3.** An enclosed vessel in which a nuclear chain reaction takes place.

reactor vessel Any of the large vertical vessels at a refinery in which chemical reactions or changes in the feedstock take place. Catalytic crackers, regenerators, and fractionators are broadly speaking, reactor vessels.

read (write) cycle time The minimum time interval between the starts of successive read (write) cycles of a storage device that has separate reading and writing cycles.

(to) read To obtain data from a storage device, from a data medium or from another source.

readability The smallest fraction of the scale on an instrument which can be easily read-either by estimation or by use of a vernier.

read head A magnetic head capable of reading and writing.

read in To place data in storage at a specified address.

reading 1. The acquisition or interpretation of data from a storage device, from a data medium, or from another source. **2.** The indicated value determined from the scale of an indicating instrument, or from the position of the index on a recording instrument with respect to an appropriate indicating scale.

reading time (storage tubes) The time during which stored information is being read.

read-mainly memory See RMM.

read-mostly memory An integrated array of amorphous and crystalline semiconductor devices that is capable of being programmed, read, and reprogrammed repeatedly. Once reprogrammed, this type of memory retains data unless it is altered intentionally.

read-only memory, ROM See read-only storage. Related abbreviations: PROM: Programmable read-only memory. EPROM: Erasable programmable read-only memory. EEPROM: Erasable electrically-reprogrammable read-only memory.

read-only storage A storage device whose content cannot be modified, except by a particular user, or when operating under particular conditions.

read out **1.** The act of removing and recording information from a computer or an auxiliary storage. **2.** The information that is removed from computer storage and recorded in a form that the operator can interpret directly.

read pulse **1.** A pulse applied to one or more binary cells to determine whether a bit of information is stored there. **2.** A pulse which causes information to be read out of a memory cell.

read time Same as access time.

read/write cycle The sequence of operations required to read and write (restore) memory data.

read/write head A magnetic head capable of reading and writing.

read/write memory A memory whose contents can be continuously changed quickly and easily during system operation. It differs from a ROM, whose contents are fixed and not subject to change, and a programmable ROM whose contents can be changed, but only periodically.

re-aeration (water quality) A process whereby air is re-introduced to increase the concentration of dissolved oxygen after the oxygen has been depleted by some chemical or biological process.

real address The address of a storage location in real storage.

real estate Slang for the area on a printed-circuit board or the surface of a wafer on which circuits can be built.

real number A number that may be represented by a finite or infinite numeral in a fixed radix numeration system.

real power The component of apparent power that represents true work in an ac circuit. It is expressed in watts and is equal to the apparent power times the power factor.

real storage The main storage in a virtual storage system.

real time Pertaining to the processing of data by a computer in connection with another process outside the computer according to time requirements imposed by the outside process. This term is also used to describe systems operating in conversational mode, and processes that can be influenced by human intervention while they are in progress.

real time **1.** Pertaining to the actual time during which a physical process transpires. **2.** Pertaining to computations performed while the related physical process is taking place so that results of the computation can be used in guiding the physical process.

real time clock A clock that develops readable digits or periodic signals for the computer to allow computation of elapsed time between events, and to initiate the performance of time-initiated processing.

real time computer Many computers used in conjunction with control systems are real-time computers, in which the primary function of the computer is to carry out calculations and to make logical decisions which synchronize with the operation of the remainder of the plant; i.e. the computer must process data at a rate which keeps pace with the "real" system.

real time control System control of events as they occur.

real time data processing The processing of transactions as they occur, rather than batching them.

real time executive An operating system which runs the system in a real-time mode, typically requi-

red by on-line data communications or process control systems.

real time language, RTL A computer language designed to work on problems of a time-critical nature.

real time multiprogramming operating system, RTMOS An executive program used by the Honeywell 4500 and 45000 computers. RTMOS supervises program interaction with all the computer peripherals and the Data Hiway. All of the 4500/45000 on-line programs operate under control of RTMOS.

real time operating system Operating system capable of real-time task management. Includes event scheduling, interrupt management, real-time event counters.

real time processing The processing of information or data in a sufficiently rapid manner so that the results of the processing are available in time to influence the process being monitored or controlled.

real time program A program which operates concurrently with an external process which it is monitoring or controlling, meeting the needs of that process with respect to time.

real time spectrum analyzer A device in which analysis of the spectrum of the incoming signal is performed continuously with the same sequence of events preserved between input and output.

real time system See real-time processing.

real time system Always provides responses (both periodic, time initiated responses and input or interrupt driven responses) within a specified window of time. The time is determined by the time constant of the dynamic process. Example time constants for external processes are milliseconds for machining or electric power systems, seconds for flow processes, minutes for thermochemical compositions and weeks for social/economic processes.

real time trend A display of process variable magnitude displayed against a time base. Refers to Honeywell TDC 3000 control system.

ream A unit consisting of 500 identical sheets.

reasoning The process by which a person or a computer performs analysis, classification or diagnosis, makes assumptions, solves problems, or draws inferences.

Réaumur scale A temperature scale having 0° as the ice point and 80° as the steam point; the scale is little used outside the brewing, winemaking and distilling industries.

reblock To return a stored block of data to its original form (of individual records).

reboiler A refinery heater that reheats or reboils a part of a process stream drawn off a distilling column and then reintroduced to the column as a vapor. Reboiling is a process of reworking a part of the charge in a distilling column to ensure more complete fractionating.

recalescent point (metal) The temperature at which heat is suddenly liberated as the temperature of a heated metal drops.

receiver, collector (fluid power systems) Nozzle located downstream of a free-flowing jet, normally used to catch the energy of the flowing medium of the jet.

receiver element That portion of a device that receives incoming signal information and converts it to a form suitable for the intended purpose.

receiver gage A gage, calibrated in engineering units, which receives the output of a pneumatic transmitter.

receivers (fluid power systems) Vessels for storing air or gas under pressure.

receptacle Usually the fixed or stationary half of a two-piece multiple-contact connector.

recipe (batch control) The complete set of data and procedure that defines the control requirements of a particular product.

recipe Information including component names and properties, additive names and concentrations, desired flow rate, desired blend volume and other information required to define a blend.

recipe management (batch processes) The activity that includes creating, editing, storing and retrieving basic, master, and control recipes and interfaces with the production planning, production scheduling, and batch management activities.

reciprocal kelvin, K⁻¹ Unit for measurement of reciprocal kelvin (SI unit).

reciprocal second ("per second") Unit for measurement of rotational frequency (SI unit). For rotational frequency of machines etc., use r/s (for revolutions per second). Use the unit r/min restrictively. Do not write "rev." or "revs." instead of r.

reciprocal transducer A transducer in which the output signal is proportional to the reciprocal of the level of the stimulus.

reciprocating piston meter A type of positive-displacement flowmeter.

reciprocating pump A pump with cylinders and pistons or plungers for moving liquids through a pipeline; a plunger pump. The pistons or plungers move forward and backward, alternatively drawing in fluid into the cylinders through the suction valves and discharging the liquid through discharge valves into a pipeline.

recirculation degassing (in steelmaking) A method in which the liquid metal in a ladle is forced by atmospheric pressure into an evacuated degassing chamber where it is exposed to low pressure and then flows back into the ladle. The metal may recirculate through the chamber 40 to 50 times to achieve the desired levels of degassing. The vacuum environment is used to recirculate the steel as well as to serve as the means by which the degassing is accomplished.

RECMF Radio and Electronic Component Manufacturer's Federation (UK).

reconstitute To return a file to a previous state.

reconstruction (of data) The restoration of data to a previously known or specified state.

record A set of data elements treated as a unit. See also logical record.

record (noun) The smallest addressable element of a magnetic tape recording; records are separated by inter-record gaps.

recorder, recording (measuring) instrument A measuring instrument which records on a recording medium information corresponding to the values of the measured quantity. Note: Some recording instruments may incorporate an indicating device.

record format The contents and organization of a record, ordinarily a portion of a program specification.

record gap See record mark.

recording 1. The inscriptions made on the recording chart or the change of state of the recording medium. **2.** Storing the values of variables for later data processing or documentation.

recording (measuring) instrument See recorder.

recording channel One of a number of independent tracks on a recording medium or recorders in a recording system.

recording chart See note under recording medium.

recording density 1. The number of bits in a single linear track measured per unit of length of the recording medium. **2.** See bit density.

recording device For a recording instrument, the set of components which records the value of a measurand or a related value.

recording head The device, in tape or disc equipment, which contains the electrical recording device.

recording medium A strip, disc, sheet or other structure on which is recorded the value of a measurand or a related value. Notes: **1.** A recording medium bearing pre-printed coordinate lines is generally called a recording chart. **2.** An electronic or magnetic recording medium may be called a memory.

recording stylus See stylus.

record layout The arrangement and structure of data in a record, including the sequence and size of its components.

record length, record size The number of bytes (or any other appropriate unit) in a record.

record mark A means of marking the separation between adjacent records: on magnetic tape, a record gap; on paper tape, a record code; in data transmission, a record pause.

record separator, RS A character designed to demarcate records within a record group.

record size See record length.

recoverable error An error condition that allows continued execution of a program.

recovery type ovens See by product coke ovens.

recovery, restoration That event when the item regains the ability to perform a required function, after a fault.

recovery time (electrical transducers) The time interval after a specified event (e.g., overload, excitation transients, output shortcircuiting) after which a transducer again performs within its specified tolerances.

recrystallization Rearrangement of the structure in a material in which the formation and growth of nuclei replace the original, often deformed crystals with new, tension-free crystals with reduced hardness but otherwise identical properties.

recrystallization annealing Full annealing performed after cold working and initiating recrystallization.

recrystallization temperature The approximate minimum temperature of which a new strain-free structure is produced in cold worked metal within a specified time.

rectangular (cartesian) robot A robot whose mechanical structure of the arm comprises three prismatic joints, whose axes are arranged in a cartesian coordinate system.

rectangular notch thin-plate weir A thin-plate weir with a notch of rectangular shape in the plane perpendicular to the direction of flow. Pertains to liquid flow measurements in open channels. See figure in ISO publication 772-1978 or BS 3680:Part 1: 1983.

rectifier Electric component for converting an alternating current into a direct current by the inversion or suppression of alternate half-waves. See diode.

rectifier instrument An instrument intended to measure alternating quantities, usually of the permanent-magnet moving-coil type, in association with a rectifying device.

rectifying element A circuit element which conducts current in one direction only.

rectifying section The section of trays in a distillation column above the feed plate. In this section the

vapor is enriched in the light components that are taken over head.

rectilinear In a straight line – specifically, moving, forming or bounded by a straight line.

rectilinear potentiometer See resistive potentiometer.

recuperator A process unit for recovery of heat from waste flue gases of high temperature processes. Recuperators are used to transfer heat continuously from one fluid to another. When applied to steam boilers they are commonly called “preheaters”. Recuperators are of three general types classified according to the direction of flow of the waste gases and air, as follows: **1.** Counter flow. **2.** Parallel or co-current flow. **3.** Cross flow.

recursive function A function whose values are natural numbers and are derived from natural numbers by substitution formulae in which the function is an operand.

recursively defined sequence A sequence of terms in which each term after the first is determined by an operation in which the operands include some or all of the preceding terms.

recycled fiber, secondary fiber Fiber material which has previously been incorporated in some paper or board product; see virgin fiber.

recycling (gas) Injecting gas back into a formation to maintain reservoir pressure to produce a larger percentage of oil from the formation. Pertains to the petroleum industry.

red liquor Spent liquor with a reddish colour, normally from acid or neutral sulphite cooking of hardwood.

redox electrode assembly A sensor generally comprising a measuring electrode and a reference electrode, producing an electrical signal which is a function of the ratio of the activities, or concentrations, of the oxidized and reduced states of the ions present in the solution.

redox potential See oxidation reduction potential.

red shortness See hot shortness.

red tape operation In a computer, operations which do not directly contribute to the results, i.e., those internal operations which are necessary to process data, but do not in themselves contribute to any final answer.

reduced capacity trim (for control valves) Reduced capacity trim is used for the following reasons: **1.** To achieve precise control at low flow in a process which may soon be expanded in capacity to a much higher flow rate. Valve body changeouts are eliminated. **2.** To absorb vibrations and thermal energy in the relatively larger, heavier walled body, having a smaller flow port and much heavier guiding. **3.** To provide ample feeding and gradual turning of fluid into the throttling zone resulting in reduced velocities in order to reduce abrasive erosion by slurry. **4.** To reduce gas outlet velocity to a subsonic level in the valve body, downstream of the seat orifice. **5.** To avoid using pipe line reducers as a cost savings or to avoid using them where piping strength requires a full size body. **6.** To correct initial oversizing errors or to handle flow when the process capacity is reduced.

reduced crude oil Crude oil that has undergone at least one distillation process to separate some of the lighter hydrocarbons. Reducing crude lowers its API gravity.

reducing atmosphere An atmosphere which tends to: **a.** promote the removal of oxygen from a chemical compound; **b.** promote the reduction of immersed material.

reduction 1. A process by which data are condensed.

2. Removal of oxygen from a chemical compound.

redundancy 1. In the transmission of information, that fraction of the gross information content of a message which can be eliminated without loss of essential information. **2.** The use of duplicate modules or devices to minimize the chance that a failure might disable an entire system.

redundancy (information theory) 1. The amount by which the logarithm of the number of symbols available at the source exceeds the average information content per symbol of the source. **2.** See ISO publication 2382/XVI.

redundancy check A check that uses one or several extra digits or characters associated to data for the detection of errors.

redundancy computer system Several computers used in a special configuration the major number of them are in on-line mode and the others are in stand-by mode, ready to be used if any of the on-line computers malfunction.

redundant A characteristic of having data, equipment, personnel etc. which are more than the efficient minimum which might be required. Redundant characters often work as checking devices, as in parity and other checks.

redundant check See redundancy check.

Redwood scale A time-based viscosity scale used predominantly in Great Britain; it is similar in concept to the Saybolt scale.

reed relay A special switching device which consists of magnetic contactors which are sealed into a glass tube. The contactors are actuated by the magnetic field of an external solenoid, electromagnet, or a permanent magnet.

reeling section The final section of a wet machine or a pulp-drying machine in which the web, either whole or slit longitudinally, is wound onto a reel or reels; see reel-up.

reel-up (in a paper machine) The final section of a paper machine or board machine where the web is wound up to form a reel (jumbo roll).

re-entrancy The property which allows a callable program to be called and executed before it has completed the execution from a previous call.

refereed test A predetermined destructive or nondestructive test made by a regulatory body or a disinterested organization, often to fulfill a regulatory requirement; in some cases, the test may be done by the regulated organization and merely witnessed by an agent of the regulatory body.

reference accuracy See accuracy rating.

reference acoustic pressure That magnitude of a complex sound that produces a sound-level meter reading equal to the reading that results from a sound pressure of 0.0002 dyne per square centimeter at 1 000 hertz. Also called reference sound level.

reference atmosphere The agreed atmosphere to which test results determined in other atmospheres may be corrected if suitable correlation factors are available from established data.

reference block (numerical control) A block that contains the alignment function character and all the data necessary to commence or recommence the execution of the work.

reference conditions Conditions of use for a measuring instrument prescribed for performance testing, or to ensure valid intercomparison of results of measurements.

reference data Data, which by general agreement may be used as a standard or as a basis for prediction and/or comparison with observed data.

reference electrode In pH measurements, an electrode, usually hydrogen-filled, used to provide a reference potential. See also glass electrode.

reference input signal One external to a control loop, serving as the standard of comparison for the directly controlled variable. See figure in ANSI/ISA publication. S 51.1, 1979.

reference junction That thermocouple junction which is at a known or reference temperature. Note: The reference junction is physically that point at which the thermocouple or thermocouple extension wires are connected to a device or where the thermocouple is connected to a pair of lead wires, usually copper.

reference junction compensation A means of counteracting the effect of temperature variations of the reference junction, when allowed to vary within specified limits. See also reference junction.

reference model A standard definitive document or conceptual representation of a system or process.

reference model CIM A reference for computer integrated manufacturing.

reference noise The magnitude of circuit noise that will produce a noise-meter reading equal to that produced by 10^{-12} watt of electric power at 1 000 hertz.

reference operating conditions The range of operating conditions within which a device is designed to operate within specified accuracy limits.

reference performance Performance attained under reference operating conditions. Performance includes such things as accuracy, dead band, hysteresis, linearity, repeatability etc.

reference performance characteristics Those performance characteristics attained under reference operating conditions.

reference pressure The pressure relative to which a differential-pressure transducer measures pressure.

reference pressure error The error resulting from variations of a differential pressure transducer's reference pressure within the applicable reference pressure range. Note: For use in specifications only, it is usually specified as the maximum change in output, at any measurand value within the specified range, when the reference pressure is changed from ambient pressure to the upper limit of the specified reference pressure range.

reference pressure range For use in specifications only, the range of reference pressures which can be applied without changing the differential pressure transducer's performance beyond specified tolerances for reference pressure error. When no such error is specified, none is allowed.

reference pressure sensitivity shift The sensitivity shift resulting from variations of a differential-pressure transducer's reference pressure within specified limits.

reference pressure zero shift The change in the zero-measurand output of a differential pressure transducer resulting from variations of reference pressure (applied simultaneously to both pressure ports) within its specified limits.

reference signal 1. A signal, derived from a reference variable, which is compared with the feedback signal at the comparing element. **2.** The signal proportional to magnetic flux of the primary device which is compared in the secondary device with the flow signal. Pertains to electromagnetic flowmeters.

reference sound level See reference acoustic pressure.

reference source A device which is intended to produce, for reference purposes, an electrical or magnetic quantity within specified tolerances.

reference standard 1. A secondary standard with which standards of lower accuracy are compared. **2.** A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived.

reference value method (measurements in electricity) A mode of reproducing a unit of measurement (or a multiple or submultiple of that unit) either in terms of fixed values of certain properties of bodies or in terms of physical constants.

reference value scale (of a quantity or property) For a given quantity or property, a series of values determined in a defined manner and adopted by convention. Example: The International Practical Temperature Scale based on the freezing and boiling point of a series of specified pure substances and on the use of specified measuring instruments and interpolation formulae.

reference variable 1. An input variable to a controlling system which sets the desired value of the controlled variable. Notes: **a.** The reference variable may be manually set, automatically set or programmed. **b.** The reference variable is usually expressed in the same units as the controlled variable. **2.** An input variable to a comparing element in a controlling system which sets the desired value of the controlled variable.

refiner A machine for the treatment of fiber material in water, equipped either with refining discs (disc refiner) or a refining plug in a conical housing (conical refiner). A refiner normally operates continuously.

refiner groundwood, refiner mechanical pulp Mechanical pulp manufactured by defibration of chips or sawdust in a disc refiner.

refinery A modern refinery is a large plant of many diverse processes. A refinery receives its charge stock, or crude oil, from the field via pipeline or from a tanker if the plant is located on a waterway. By processes that include heating, fractionating, pressure, vacuum, reheating in the presence of catalysts, and washing with acids, the crude is divided into hundreds of components: from exotic light gases to volatile liquids down through gasoline, naphtha, kerosene, gas oils, and light and heavy lubricating oil stocks to heavy bunker fuel, residual oil, and finally petroleum coke, the bottom of the barrel.

refinery gas The commercially non-condensable gas resulting from fractional distillation of crude oil, or the cracking of crude oil or petroleum distillates. Refinery gas is either burned at the refineries or supplied for mixing with city gas.

refining (of fiber material) Mechanical treatment of fibrous material in a refiner; see beating.

reflection (fiber optics) The abrupt change in direction of a light beam at an interface between two dissimilar media so that the light beam returns into the medium from which it originated. Reflections from a smooth surface is termed diffuse.

reflux The recycle stream that is returned to the top of the column. This stream supplies a liquid flow for the rectifying section that enriches the vapor stream moving up the column. Material in the stream is condensate from the overhead condenser. Reflux closes the energy balance by removing heat introduced at the boiler.

reflux ratio A quantity usually expressed as the ratio of the reflux flow to the distillate flow. The ratio is used primarily in column design.

reformatting The act of changing the representation of data from one format to another, usually with the data being input from a machine-readable source. Reformatting may include the translation or conversion of data values from one character set to another, such as from ASCII to EBCDIC.

reforming processes The use of heat and catalysts to effect the rearrangement of certain hydrocarbon molecules without altering their composition appreciably; the conversion of low-octane gasoline fractions into higher-octane stocks suitable for blending into finished gasoline; also the conversion of naphthas to obtain more volatile product of higher octane number.

refractive index profile (optical communication) The distribution of the refractive index along a diameter of a crosssection of an optical fiber.

refractivity Ratio of phase velocity in free space to that in the medium, minus 1.

refractometer An instrument for measuring the refractive index of a liquid or solid, usually from the critical angle at which total reflection occurs.

refractor metal A metal that has an extremely high melting point; in the broad sense, a metal that has a melting point above those of iron, nickel and cobalt.

refractory A nonmetallic material highly resistant to fusion and suitable for furnace roofs and linings.

refractory metal oxide semiconductor See RMOS.

refractory substance See conservative substance.

refresh 1. The process by which the electron beam of a CRT repeatedly scans the screen to keep the image constant to the human eye. Pictures should be refreshed 30 times a second if they are to be flicker-free. 2. The periodic renewing of data, or data carrying electrical charges, in a semiconductor memory.

refresh buffer A digital memory where graphic displays are stored as a matrix of intensity values. Each bit holds the location and status of a pixel on the screen.

refresh rate The number of times in each second that the information displayed on a nonpermanent display, for example, a CRT, is rewritten or reenergized.

refrigerant type dryer Moisture is separated by lowering the air temperature by means of a refrigeration compressor and heat exchanger.

refrigeration cooling Cooling system which uses refrigeration techniques, i.e. uses a liquid which, when caused to assume the vapor state, absorbs heat at a high rate during the change of state.

refuse The solid portions of the products of combustion.

regain moisture content Same as dry basis moisture content.

regenerate To bring something into existence again after decay of its own accord or after intentional destruction.

regenerated leach liquor (electrometallurgi) The solution that has regained its ability to dissolve desired constituents from the ore by the removal of those constituents in the process of electrowinning.

regeneration In a computer storage device whose information storing state may deteriorate, the process of restoring the device to its latest undeteriorated state. See also rewrite.

regenerative circuit (fluid power systems) Circuit in which discharge fluid from a component, usually a cylinder, is directed to the input of the compo-

nent or system, the object being to increase actuator speed at the penalty of reduced actuator force.

regenerative feedback A technique which returns part of the output of a machine system or process to the input in a way that causes a larger quantity to be added to the input with an increase of output results.

regenerative memory, regenerative storage Memory (storage) devices that need to be refreshed or the contents will gradually disappear.

regenerative repeater (data transmission) A repeater that performs pulse regeneration. Note: The retransmitted signals are practically free from distortion.

regenerator 1. A refinery vessel into which inactive or spent catalyst is pumped to regenerate it, to burn off the coating of carbon or coke. Air at a temperature of 1,100°F is mixed with the spent catalyst, causing the oxidation of the carbon and leaving the catalyst clean and regenerated. 2. See regenerative repeater. 3. A process unit for recovery of heat from waste flue gases of high-temperature process. 4. A repeater, that is, a device which detects a weak signal in a fiber optic communication system, amplifies it, cleans it up, and retransmits it in optical form.

register Special or reserved area of memory or program.

register 1. A storage device having a specified storage capacity – such as a bit, a byte, or a computer word – and usually intended for a special purpose. 2. Logic system composed of *n* identical cells each having a logic output and a set of common control inputs (inhibition input, clear input, etc.) and which is intended to store a *n*-digit binary number.

register (of an integrating instrument) The part of an integrating instrument which enables the measured value to be determined.

register address field The part of a computer instruction that contains a register address.

register capacity The upper and lower limits of the numbers that can be processed in a computer register.

register length The storage capacity of a register.

register standard A standard which is officially registered, but has no legal status. Note: Most of these standards are created by recognized societies of experts. These societies may be national or international.

regression The rate at which an output changes in relation to the changes in inputs.

regression testing (software) Selective retesting to detect faults introduced during modification of a system or system component, to verify that modifications have not caused unintended adverse effects, or to verify that a modified system or system component still meets its specified requirements.

regular scale See note under linear scale.

regular velocity distribution The distribution of velocities which sufficiently approaches that established in a long straight length of the closed conduit to permit an accurate measurement of the flow-rate to be made.

regulated power supply A unit which maintains a constant output voltage of current for changes in line voltage, output load, ambient temperature or time.

regulation A binding document which contains legislative, regulatory or administrative rules and which is adopted and published by an authority legally vested with the necessary power.

regulator A device to adjust the flow of gases, liquids or electricity. Various types with modifiers are: air pressure, differential pressure, flow, level, pilot operated, supply, vacuum, voltage.

regulator, self-operated controller A controller in which all the energy to operate the final controlling element is derived from the controlled system.

reheated steam Superheated steam which derived its superheat from a reheater.

reheating The process of adding heat to steam to raise its temperature after it has done part of its intended work. This is usually done between the high pressure and low pressure sections of a compound turbine or engine.

reheating furnace (in steel production) The function of the reheating furnace is to raise the temperature of steel in the course of processing until it is sufficiently hot to be plastic enough for economic reduction by rolling or forging to the desired section. Reheating furnaces are divided into two general classes: **1.** Batch type. **2.** Continuous type including pusher type, walking-hearth type and roller-hearth-type furnaces.

Reid vapor pressure A measure of volatility of a fuel, its ability to vaporize. Reid vapor pressure, the specific designation, is named after the man who designed the test apparatus for measuring vapor pressure.

reinforced board, reinforced paper Board or paper strengthened with an insert or surface layer of wire, net, fabric, tapes or foils.

reinforced insulation A single insulation system applied to live parts which provides a degree of protection against electric shock equivalent to double insulation. (Per IEC 335-1). See also basic insulation, supplementary insulation, double insulation.

reject Material enriched in impurities which has been removed during the cleaning of pulp or stock.

rejector Filter or part of a circuit which rejects a particular frequency or band of frequencies.

relative address 1. An address expressed as a difference with respect to a base address. **2.** A label used to identify the location of data in a program by reference to its position with respect to some other location in that program.

relative damping For an underdamped system, a number expressing the quotient of the actual damping of a second-order linear system or element by its critical damping. See further ANSI/ISA publication S 51.1, 1979.

relative entropy (information theory) Refer to ISO publication 2382/XVI.

relative error The ratio of an absolute error to the true, specified or theoretically correct value of the quantity that is in error.

relative flow coefficient (control valves) The ratio of the flow coefficient at a relative travel to the rated flow coefficient.

relative gain An open-loop gain determined with all other manipulated variables constant, divided by the same gain determined with all other controlled variables constant.

relative humidity Ratio of actual partial pressure of water vapor to saturation vapor pressure at ambient temperature.

(measurement of) relative humidity It is not always easy to make measurement of relative humidity directly; consequently, inferential methods of determining relative humidity have been developed. See wet and dry bulb method, electric hygrometer method, nylon ribbon hygrometer method and dew point measurement.

relative humidity sensors The different types of sensors for relative humidity measurement can be listed as follows: **1.** Hygrometers. Mechanical and elec-

trical. Many materials change their dimensions when moisture is adsorbed and desorbed. **2.** Wet/dry bulb psychrometers. Comparison of wet and dry bulb temperature. **3.** Piezoelectric sorption. Hygroscopically coated quartz crystal. **4.** Surface resistivity or conductance. Impedance sensor. Element of hygroscopic material exhibits large change in impedance with change in moisture content.

relative magnitude The relationship or comparison of the magnitude of one quantity or another, most often related to base magnitude and expressed as a difference from or percentage of the base or reference.

relative molecular mass These quantities are dimensionless. They were formerly called atomic weight and molecular weight, respectively. Relative atomic mass and relative molecular mass are defined as the ratio of the average mass per atom or molecule (of natural isotopic composition) to 1/12 of the mass of an atom of the nuclide carbon 12.

relative response The ratio of the response of a device or system under some specific condition to its response under stated reference conditions.

relative travel (control valves) The ratio of the travel at a given opening to the rated travel.

relative velocity See dimensionless velocity.

relative viscosity Relative viscosity of a fluid is defined as the ratio of the absolute viscosity of the fluid to the absolute viscosity of water, with both the fluid and water at the same temperature and their viscosities measured in the same units.

relaxation An action requiring an observable length of time for initiation in response to a sudden change in conditions.

relaxation oscillation An oscillation where energy is accumulated relatively slowly in one element of a system and transferred rapidly to another.

relay A relay is a device which makes a measurement or receives a signal which causes it to operate and to effect the operation of the equipment. The great majority of relays are in one of the following groups: **1.** Induction relays; **2.** Attracted-armature relays; **3.** Moving coil relays; **4.** Thermal relays; **5.** Timing relays.

relay air gap Air space between the armature and the pole piece. This is used in some relays instead of a nonmagnetic separator to provide a break in the magnetic circuit.

relay amplifier A device used in an analog system for the comparison of two signals and incorporates an amplifier to drive a switch.

relay armature gap The distance between armature and pole face.

relay bias Bias produced by a spring on an electromagnet. By acting on the relay armature, the spring tends to hold it in a given position.

relay contact chatter The undesired intermittent closing of open contacts or opening of closed contacts. It may occur either when the relay is operated or released or when the relay is subjected to external shock or vibration.

relay flutter Erratic rather than positive operation and release of a relay.

relay ladder logic A control language for programming programmable logic controllers.

relay ladder program Synonymous with ladder program.

relay magnet A coil and iron core forming an electromagnet which, when energized, attracts the armature of a relay and thereby opens or closes the relay contacts.

relay rack See rack.

relevant failure A failure that should be included in interpreting test or operational results or in calculating the value of a reliability performance measure. Note: The criteria for the inclusion should be stated.

reliability The ability of an item to perform a required function under stated conditions for a stated period of time. See also software reliability.

reliability (performance) The ability of an item to perform a required function under given conditions for a given time interval.

reliability and maintainability management The administration of the functions and activities necessary to determine and satisfy the reliability performance and maintainability performance requirements of an item.

reliability and maintainability plan A document setting out the specific practices, resources and activities necessary to ensure that an item will satisfy given reliability performance and maintainability performance requirements relevant to a given contract or project.

reliability block diagram Block diagram showing, for one or more functional modes of a complex item, how faults of the subitems represented by the blocks, or combinations thereof, result in a fault of the item.

reliability growth A condition characterized by a progressive improvement of a reliability performance measure of an item with time.

reliability index A quantitative measure of the reliability of equipment or system.

reliability model A mathematical model used for prediction or estimation of reliability measure of an item.

reliability test Test and analyses carried out in addition to other type tests and design to evaluate the level of reliability in a product, etc., as well as the dependability, or stability, of this level relative to time and use under various environmental conditions.

relief flow rate (pneumatic) Rate at which air can flow through the unloading device for a specified increase in controlled pressure above the original setting, measured under specified conditions.

relief valve A relief valve is a pressure relief valve actuated by inlet static pressure having a gradual lift generally proportional to the increase in pressure over opening pressure.

relieving pressure regulator Pressure regulator equipped with an unloading device to prevent the outlet pressure exceeding the original setting.

relocatable Computer program or routine which does not contain fixed addresses, and can therefore be easily relocated elsewhere in the memory.

relocatable address An address that is adjusted when the computer program containing it is relocated.

relocatable machine code (software) Machine language code that requires relative addresses to be translated into absolute addresses prior to computer execution.

relocatable program A computer program that is in such a form that it may be relocated.

(to) relocate To move a computer program or part of a computer program, and to adjust the necessary address references so that the computer program can be executed after being moved.

reluctive pressure transducer A type of pressure sensor in which a moving armature attached to a pressure-sensitive element varies the reluctance of a magnetic circuit—either a permanent magnet or an electromagnet—thus producing an output current in a measuring coil.

remanence The magnetic flux density that remains in a magnetic circuit after the removal of an applied magnetomotive force. Note: This should not be confused with residual flux density. If the magnetic circuit has an air gap, the remanence will be less than the residual flux density.

remedial maintenance The maintenance performed following equipment failure, as required, on an unscheduled basis. Contrasted with preventive maintenance.

remote In data processing, a term used to refer to any devices that are not located near the main computer.

remote access Pertaining to communication with a data processing facility by one or more stations that are distant from that facility.

remote batch processing Batch processing in which input-output units have access to a computer through a data link.

remote centre compliance device, RCC (industrial robots) A compliant device with remote centre used to interface a robot to its end-effector or working medium. Note—The remote centre compliance device allows a gripped part to rotate about its tip or to translate without rotating when pushed laterally at its tip.

remote control Any system of control performed from a distance.

remote data logging An arrangement for the numerical representation of selected telemetered quantities on log sheets or paper or magnetic tape, or the like, by means of an electric typewriter, teletype, or other suitable devices.

remote debugging The use of a remote terminal to debug computer programs.

remote job entry, RJE Submission of a job through an input unit that has access to a computer through a data link.

remote/local Refers to device connection to a given computer with remote devices attached directly over communications lines and local devices attached directly to a computer channel; in a network environment the computer itself may be a remote device to the CPU controlling the network.

remote maintenance Maintenance of an item performed without physical access of the personnel to the item.

remote manipulation Using electromechanical or hydromechanical equipment to enable a person to perform manual operations while remaining some distance from the work location; usually used for handling radioactive or otherwise hazardous materials.

remote processing The processing of data received from remote locations.

remote set point adjuster A device which will provide a change in set point setting as a function of an input signal from a remote source.

remote terminal A device or modem for communicating with computers from sites which are physically separated from the mainframe of the computer, and usually distant enough so that communications facilities rather than direct cables are used.

remote variable The signal connected to the RV input terminals. Depending on the controller configuration, it may be a manual signal, a controller output, or a PV signal. Refers to Honeywell TDC 3000 control systems.

removable bridgeway globe valve The removable bridgeway globe valve is a flangeless design that eliminates the bonnet joint.

repair That part of corrective maintenance in which manual actions are performed on the item.

repair coverage The proportion of faults of an item that can be successfully corrected.

repair time That part of active corrective maintenance time during which repair actions are performed on an item.

repeatability (electrical transducers) The ability of a transducer to reproduce output readings when the same measurand value is applied to it consecutively, under the same conditions, and in the same direction.

repeatability (numerical control) The closeness of agreement between successive results obtained when a specified operation is performed a specified number of times at one set-up. It may be expressed as the error range for a specified number of measurements with a probability of 95%.

repeatability (software) See test repeatability.

repeatability (of a measuring instrument), fidelity See under fidelity.

repeatability error The algebraic difference between the extreme values obtained by a number of consecutive measurements of the output over short period of time for the same value of the input under the same operating, approaching from the same direction, for full range traverses. Note: It is usually expressed in percentage of span and does not include hysteresis or drift.

repeatability of measurements The closeness of the agreement between the results of successive measurements of the same measurand carried out subject to all of the following conditions: the same method of measurement, the same observer, the same measuring instrument, the same location, the same conditions of use, repetition over a short period of time. Note: Repeatability may be expressed quantitatively in terms of the dispersion of the results.

repeater 1. A combination of apparatus for receiving either one-way or two-way communication signals which are either amplified, reshaped, or both. A repeater for one-way communication signals is termed a "one-way repeater" and for two-way communication signals a "two-way repeater". 2. See optical repeater. 3. A system component which reconstitutes signals into standard voltages; currents and timing.

repeats per minute See under integral action rate (reset rate).

repetency The reciprocal of the wave length.

repetition rate The number of repetitions of an event per unit time.

replacement theory The mathematics of deterioration and failure, used in estimating replacement costs and selecting optimum replacement policies.

report generator A software program that can direct the production of output reports if the computer is provided with format and specifications, input file detail, sorted input data, input/output procedure rules and other information.

representation A combination of bits, characters, or other elements to form a unit of data.

reproduce In a computer, to prepare a duplication of stored information.

reproducer A device used to translate electrical signal into sound waves.

reproducibility In process instrumentation, the closeness of agreement among repeated measurements of the output for the same value of input made under the same operating conditions over a period of time approaching from both directions.

reproducibility (numerical control) The closeness of agreement between individual results obtained when a specified operation is performed on similar or different pieces of equipment not at one set-up. It may

be expressed as the error span between two individual results with a probability of 95%.

reproducibility error The algebraic difference between the extreme values obtained by a number of repeated measurements of the output for the same value of input made under the same operating conditions over a period of time, as approached from both directions. Note: It is usually expressed in percentage of span and does include hysteresis, repeatability, dead-band, and eventually drift, if the period of time is long enough.

reproducible failure, systematic failure A failure related in a deterministic way to a certain cause, which can only be eliminated by a modification of the design or manufacturing process, operational procedures, documentation or other relevant factors.

reproducing head The playback head in a tape recorder.

reprogrammable ROM A ROM that can be programmed any number of times. Generally, however, the information stored in a reprogrammable ROM is changed very seldom.

repulsion motor A single-phase motor in which the stator winding is connected to the source of power and the rotor winding to the commutator. Brushes on the commutator are short-circuited and are placed so that the magnetic axis of the brush winding is inclined to that of the stator winding. This type of motor has a varying speed characteristic.

required input motion, RIM (valve actuators) The input motion in terms of acceleration, velocity, and displacement expressed as a function of frequency that a device being tested shall withstand and still perform its intended function.

requirements inspection See inspection.

requirements phase (software) The period of time in the software life cycle during which the requirements for a software product, such as the functional and performance capabilities, are defined and documented.

requirements specification (software) A specification that sets forth the requirements for a system or system component; for example, a software configuration item. Typically included are functional requirements, performance requirements, interface requirements, design requirements, and development standards.

requirements verification See verification.

rerun To repeat all or part of a computer program run (on a machine).

rescue point, restart point A place in a computer program at which its execution may be restarted; in particular, the address of a restart instruction.

resealing pressure (pressure relief devices) Resealing pressure is the value of decreasing inlet static pressure at which no further leakage is detected after closing.

Research Institute of Industrial Safety (Japan) See under RIIS.

reseating pressure See closing pressure.

reserve controller The controller part of the Uninterrupted Automatic Control (UAC) package. Refers to Honeywell TDC 3000 control systems.

reserve controller director, RCD Part of the Uninterrupted Automatic Control package. It determines which of the eight Basic Controllers has failed and allows appropriate switching and data transfer, so as to replace the failed Basic Controller. Refers to Honeywell TDC 3000 control systems.

reserved variable Any variable available only to specific programs in the system. Contrast with global variable.

reservoir A holding tank, cistern or pond for storing reserves of potable or make-up water.

reservoir expansion capacity (fluid power systems) Volume of gas above the maximum liquid capacity level to allow for volume changes caused by temperature increases etc.

reservoir, receiver (fluid power systems) Container for storing the working medium of a power system.

reserv shutdown (electric generating unit) The state in which a unit is available but not in service. Note: This is sometimes referred to as economy shutdown.

reset 1. To return a register or storage location to zero or to a specified initial condition. **2.** See integral (reset) (I) control action. See also set. **3.** A nonprocessing condition of certain intelligent devices (e.g., PIUs and Basic Controllers) caused when the microprocessor determines a diagnostic failure has occurred. Depending on the system, valve outputs can be frozen at their last position. **4.** A control on a 4500 or 45000 computer's Programming and Maintenance Console that allows the operator to bootload a program, reset the hardware, or coat computer memory with a fixed pattern. Refers to Honeywell TDC 3000 control systems.

reset action 1. See reset control action. **2.** Another name for integral control made.

reset circuit Switching system with closed action path containing at least one binary storage element by whose set condition the controlled system is influenced until the reset condition generated by the controlled system, is effective.

reset control See integral control.

reset control action See integral (reset) (I) control action.

reset dwell time (electronic analog computer) The time spent in reset. In cycling the computer from reset, to operate, to hold, and back to reset, this time must be long enough to permit the computer to recover from any overload and to charge and discharge all integrating capacitors to appropriate initial voltages.

reset mode, initial condition mode That operating mode of an analog computer during which the integrators are inoperative and the initial conditions are set.

reset rate See integral action rate.

reset switch A machine-operated device that restores normal operation to the control system after a corrective action.

reset time For an element with proportional and integral action (PI-action), the input variable of which is given a stepwise variation, the reset time is the time required for the output variable to reach twice the value of the variation that occurred immediately after the step was applied.

reset timer 1. A timer which can be reset by electrical means. May be either an "on delay" or "off delay" type. **2.** A timer with one or more circuits which spring-reset to zero when the clutch is disengaged.

reset windup, integral windup A phenomenon in a closed control loop, where an integral element is followed by a non-linear element operating within its saturation range, resulting in the delayed response of the controlled variables to a change of sign of the error variable. This delayed response may cause excessive overshooting of the controlled variable.

reshaping signal A restoration of signals which comply with requirements for amplitude, shape, and timing. These signals generate from another signal.

resident Pertaining to computer programs that remain on a particular storage device.

resident control program, nucleus That part of the control program that is resident in main storage.

residual A term used to describe oils that are "leftovers" in various refining processes; heavy black oils used in ships' boilers and in heating plants.

residual chlorine, total residual chlorine (water quality) Chlorine remaining in solution after chlorination, present in the form of free chlorine or combined chlorine, or both.

residual error The error remaining after attempts at correction.

residual fuels Products remaining from crude petroleum by removal of some of the water and an appreciable percentage of the more volatile hydrocarbons.

residual pressure (fluid power systems) Value of the output pressure in the "off" of the device.

residual stress Stress present in a component that is free of external forces or thermal gradients.

residuum What is left after crude oil has been refined to extinction; a heavy, black, tar-like substance remaining after all usable fractions have been distilled off. The bottom of the barrel, literally.

resilient seated valve Valve with seat(s) of some soft material in contrast to seat(s) in some hard material such as stainless steel.

resin A man-made polymeric material used in the finishing of textiles to give, for example, permanent press, water and oil repellancy, or other desirable finishes.

resistance Unit for measurement of electrical resistance is ohm. (SI unit). 1 ohm = 1 V/A. It is defined as the resistance through which a difference of potential of one volt will produce a current of one ampere.

resistance box A box containing carefully constructed and adjusted resistors, which can be introduced into a circuit by switches or keys.

resistance-capacitance coupling Also called RC coupling. Coupling between two or more circuits, usually amplifier stages, by a combination of resistive and capacitive elements.

resistance furnace An electric furnace in which the heat is developed by the passage of current through a suitable resistor, which may be the charge itself or a resistor imbedded in or surrounding the charge.

resistance grounded Grounded through a resistance, so as to limit the amount of current in a circuit.

resistance heating (electric furnace steelmaking) Resistance heating can be applied through three methods: **a.** the indirect method in which the steel is heated by radiation and convection from resistors through which the current is passed; **b.** the direct method in which current is passed directly from a power source through the metal; and **c.** the induction method in which current is induced in the steel by an induction coil connected to a power supply.

resistance loss The power lost when current flows through a resistance. Its value in watts is equal to the resistance in ohms multiplied by the square of the current in amperes.

resistance patenting Patenting including direct electric resistance heating of the material treated.

resistance soldering A method of soldering in which a current is passed through and heats the soldering area by contact with one or more electrodes.

resistance standard See standard resistor.

resistance strain gage A strain gage consisting of a small strip of resistance material cemented to the part under test. Its resistance changes when the strip is compressed or stretched.

resistance temperature coefficient 1. The ratio of the resistance change of an element between two temperatures to the product of the temperature change and the original resistance. **2.** The magnitude of change in resistance due to temperature, usually expressed in percent per degree Celsius or parts per million per degree Celsius ($\text{ppm}/^\circ\text{C}$). If the changes are linear over the operating temperature range, the parameter is known as temperature coefficient.

resistance temperature sensor An electrically conducting element of which the electrical resistance varies with the temperature. Note: The resistive elements used can be subdivided into two categories: **1.** Those in which the resistance increases with increasing temperature, called PTC (positive temperature coefficient) material, e.g. nickel, platinum and some semiconductor materials. **2.** Those in which the resistance decreases with increasing temperature, called NTC (negative temperature coefficient) material, e.g. some semiconductor materials.

resistance temperature detector, RTD See resistance temperature sensor.

resistance thermometer In principle, any material whose electrical resistance changes in a significant and repeatable way when temperature changes could be used as a thermometer. In practice, only certain metals and certain semiconductors are used routinely. Resistance thermometers with metallic sensing elements are usually called resistance thermometer detectors (RTDs). Resistance thermometers that use semiconductor elements are called thermistors (see this term). The standards for RTDs are summarized as follows: **1.** RC 21-4-1966 (SAMA); **2.** B.S. 1904:1964 (BSA); **3.** DIN 43760; **4.** MIL-T-24388 (US. Department of Defence); **5.** IEC 751. All above standards have a nominal resistance of 100 ohm at 0°C except the SAMA standard which has a nominal resistance of 98.129 ohm also at 0°C . See also resistance temperature sensor and platinum resistance thermometer.

resistive coupling The association of two or more circuits with one another by means of resistance mutual to the circuits.

resistive flowmeter A device for measuring liquid flow rates in which an electrical output signal proportional to flowrate is determined from the rise and fall of a conductive differential-pressure manometer fluid in contact with a resistance-rod assembly.

resistive load Load in which the voltage is in phase with the current.

resistive potentiometers Resistive potentiometers are a popular form of potentiometer, the majority of those used in control systems having specially constructed wipers for a long working life. Potentiometers are available in a number of forms.

resistor furnace A resistance furnace in which the heat is developed in a resistor that is not a part of the charge.

resistor starting (or starter) A motor starter using resistance to limit inrush current. The resistors are shorted by a paralleling contactor on the final step. A nontransition type of starting.

resistor-transistor-logic, RTL Logic performed by resistors; transistors produce an inverted output.

resolution (fluid power systems) Increment of input signal required to produce a change in valve output at a specified signal level, expressed as a percentage of rated signal. Resolution is normally specified as

the minimum signal required to cause either an increase or a decrease of valve output. If these signals differ, the larger of the two should be quoted.

resolution The least interval between two adjacent discrete details which can be distinguished one from the other. Note: The term resolution is often understood in the case of instrument with digital output as the smallest change in the output (display).

resolution (industrial robots) The smallest distance or angle that can be effected by each axis of the robot.

resolution (electrical transducers) The magnitude of output step changes as the measurand is continuously varied over the range. Notes: **1.** This term relates primarily to potentiometric transducers. **2.** For use only in specifications, resolution is best specified as average and maximum resolution; it is usually expressed in percent of full scale output. **3.** In the sense of the smallest detectable change in measurand use threshold.

resolution (numerical control) The least interval between two adjacent discrete details that may be distinguished one from the other. Examples: **1.** Of a measuring system, the smallest measurable increment. **2.** Of a control system, the smallest controllable increment of movement.

resolution factor The ratio in percentage of the maximum dead band to the measuring span.

resolution sensitivity The smallest change in an input that produces a discernible response.

resonance Of a system or element, a condition evidenced by large oscillatory amplitude, which results when a small amplitude of a periodic input has a frequency approaching one of the natural frequencies of the driven system.

resonance frequency Of a control system. The frequency at which the ratio of the amplitude of the controlled condition to that of the command signal is a maximum.

resonance method (of measurement) A comparison method of measurement in which a known relationship between the compared values of a particular quantity is established by means of the attainment of a condition of resonance or near-resonance.

resonances (electrical transducers) Amplified vibrations of transducer components, within narrow frequency bands, observable in the output, as vibration is applied along specified transducer axes.

resonant cavity See optical cavity.

resonant circuit A circuit in resonance.

resonant frequency (electrical transducers) The measurand frequency at which a transducer responds with maximum output amplitude. Notes: For use only in specifications: **1.** When major amplitude peaks occur at more than one frequency the lowest of these frequencies is the resonant frequency. **2.** A peak is considered major when it has an amplitude at least 1.3 times the amplitude of the frequency to which specified frequency response is referred. For subsidiary resonance peaks see resonances.

resonate To bring to resonance.

resource definition The layout, requirements, configuration, design and capacity of resources needed to perform a particular function or operation.

resource sharing The sharing of one central processing unit by several users and/or several peripheral devices. Resource sharing is used in connection with the sharing of time and memory.

respiration (water quality) The exchange of gases between an organism and its environment resulting from the oxidation of substrate with the release of en-

ergy. It may be accomplished either aerobically or anaerobically.

responder A station which can transmit a specific response to a message received over a data highway.

response characteristic For defined conditions, the relationship between a stimulus and the corresponding response. Notes: **1.** The relationship may be based on theoretical or experimental considerations; it may be expressed in the form of an algebraic equation, a numerical table or a graph. **2.** When the stimulus varies as a function of time, one form of the response characteristic is the transfer function (the Laplace transform of the response divided by that of the stimulus).

response-critical That aspect of controlling a process which implies the need to react to random disturbances in time to prevent impairment of yield, or dangerous conditions. Real time is often used synonymously.

response curve **1.** Exhibits the trend of communication response in a system. **2.** A plot of output versus frequency for a specific device. **3.** A plot of stimulus versus output. **4.** A graphical representation of frequency response.

response-frequency diagram Two cartesian graphs, one showing the amplitude and the other the phase of the harmonic response, plotted against frequency as abscissa.

response time **1.** The time required for the output to first reach a definite value after the application of a step input or disturbance. **2.** The total time necessary to send a message and receive a response back at the sender exclusive of application processing time.

response time (temperature measurement) The time required for the indication of a thermometer, which has been subjected to an essentially instantaneous change in temperature, to traverse 63 percent of the temperature interval involved. Following such a temperature change the indication of the thermometer may be expected to traverse 99 percent of the temperature interval in a period ranging from 5 to 8 time constants so defined, depending on the details of its construction.

response time (electrical transducers) The length of time required for the output of a transducer is to rise to a specified percentage of its final value as a result of a step change of measurand.

response time (fluid power systems) See valve response time.

response time testing (of thermocouples and resistance thermometer) New techniques permit response time testing of thermocouples and resistance thermometers without removing them from process installations. See further ISA publication Industrial Temperature Measurement.

responsiveness The ability of an instrument or control device to follow wide or rapid changes in the value of a dynamic measured variable.

responsivity The ratio of an optical detector's electrical output to its optical input. Notes: **1.** Generally expressed in amperes per watt or volts per watt of incident radiant power. **2.** "Sensitivity" is sometimes used as an imprecise synonym for responsivity.

restart (programmable controllers) Pertaining to programmable controller systems. See cold restart, hot restart, warm restart respectively.

restoration, recovery That event when the item regains the ability to perform a required function, after a fault.

restore **1.** To return a cycle index, a variable address, or other computer word to its initial value. **2.** Periodic

regeneration of charge, especially in volatile, condenser-action storage systems.

restoring torque The torque which tends to bring the moving element back to them mechanical zero of the instrument. Pertaining to electrical measuring instruments.

restricted breathing enclosure, limited breathing enclosure See limited breathing enclosure.

restricted space (industrial robots) The portion of the maximum space that is restricted by limiting devices that establish limits that will not be exceeded in the event of any foreseeable failure of the robot system.

restricted trim Control valve trim which has a flow area less than the full area for that valve.

restrictor (fluid power systems) Device which restricts the flow of a fluid thereby creating a pressure drop.

restriking voltage The voltage that appears across the terminals of the switching device immediately after the breaking of the circuit.

retained flange (butterfly valves) A liner retained in the body by the pipe flanges or by a continuous or segmented ring. The segmented ring provides a means of adjusting the liner to disk interference to achieve improved sealing. The bore of the pipe flanges is smaller in diameter than the body bore therefore the flanges retain the liner in the body.

retaining ring (valves) A split ring that is used to retain a separable flange on the upper and lower valve bodies.

retention Proportion of a component present in the original mixture which remains in the mixture at some stage of the process or in the final product; see system retention, wire retention. The original mixture may be a pulp suspension, stock or coating slip. The retention may be measured in e.g. a pulp, paper or board web.

retention period The length of time for which data on a data medium is to be preserved.

retention period, detention time (water quality) The theoretical period during which water or waste water is retained in a particular unit or system as calculated from a specified flow.

retentive data Data stored in such a way that its value remains unchanged after a power down/power up sequence.

retina In optical character recognition, a major component of a scanning device.

retirement phase (software) The period of time in the software life cycle during which support for a software product is terminated.

retract (in) stroke (cylinder) Inward movement of the piston rod.

retrieve To find and select specific information.

retrofit, retrofitting To modify or add to an engine, item of equipment, or operating plant something new for the sake of efficiency, better performance, or increased safety. To retro (go back) and fit or make a change or refinement in the original item of equipment or plant. Derives from the term retroactive refitting.

return flow oilburner A mechanical atomizing oil burner in which part of the oil supplied to the atomizer is withdrawn and returned to storage or to the oil line supplying the atomizer.

return pressure, back pressure (fluid power systems) Pressure at the return port of the valve.

return signal In a closed loop, the signal resulting from a particular input signal, and transmitted by the loop and to be subtracted from the input signal. See also feedback signal.

return-to-zero recording, RZ Return-to-reference recording in which the reference condition is the absence of magnetization.

return transfer function In a feedback control device, the transfer function that relates a loop return signal to the corresponding loop input signal.

return wire The ground, common, or negative wire of a direct-current circuit.

reusable program, reusable routine A computer program (routine) that may be loaded once and executed repeatedly, subject to the requirements that any instructions that are modified during its execution are returned to their initial states and that its external program parameters are preserved and unchanged.

reverberation The persistence of sound due to the repeated reflections from walls, ceiling, floor, furniture and occupants in a room or auditorium.

reverberation chamber An enclosure in which all surfaces have been made as sound-reflective as possible. It is used for certain acoustic measurements.

reverberation room See reverberation chamber.

reverberation time The time it takes for average sound-energy density to decrease to one-millionth of its original steady-state value after sound from the source has stopped.

reverse acting controller A controller in which the value of the output signal decreases as the value of the input (measured variable) increases. See direct acting controller.

reverse acting diaphragm actuator See reverse actuator.

reverse action Control action in which the output decreases with increasing input.

reverse actuator A diaphragm actuator in which the actuator stem retracts with increasing diaphragm pressure.

reverse blocking thyristor A thyristor that can only be triggered into conduction when the anode is positive with respect to the cathode of the device.

reversed feedback, negative feedback See negative feedback.

reverse direction flow In flowcharting, a flow in a direction other than left to right or top to bottom.

reverse gate current (thyristor) The gate current when the junction between the gate region and the adjacent anode or cathode region is reverse biased.

reverse osmosis A process used in the industry for removing salt and other contaminants from water. The process uses the phenomenon of osmosis, the diffusion through a semipermeable membrane of a solvent, leaving behind the solute or dissolved substance. In reverse osmosis, the solvent (water) diffuses through the man-made membrane, leaving the salt and other contaminants behind.

reverse polarity An electrical circuit in which the positive and negative electrodes have been interchanged.

reverse Polish notation, postfix notation, suffix notation A method of forming mathematical expressions in which each operator is preceded by its operands and indicates the operation to be performed on the operands or the intermediate results that precede it.

reverse video A CRT screen display of dark characters on a light background – the opposite of the usual CRT screen display.

revers gate voltage (thyristor) The voltage between the gate terminal and the terminal of an adjacent region resulting from reverse gate current.

reversible meter (water meters) A meter which may be operated in a direction contrary to the normal

direction of flow while complying with the maximum permissible error limits.

reversible seat (control valves) Refers to a seat ring with seating surfaces on both sides such that when one surface has worn, the ring may be reversed to present a new surface to contact the closure member.

revisit rate The frequency (in conversions per second) at which a single analog input channel is assessed and converted to a digital value within the stated accuracy.

revolute (articulated) robot A robot whose mechanical structure of the arm comprises three rotary joints.

rewrite 1. To write again. **2.** In a destructive-read storage device, to return the data to the state it had prior to reading. See also regenerate.

Reynolds number A dimensionless parameter expressing the ratio between the inertia and viscous forces. Note: When specifying a Reynolds number, one should indicate the characteristic dimension on which it has been based for example diameter of the conduit, diameter of the pressure device, diameter of a Pitot tube head, etc. See further ISO publication 4006-1977 or BS 5875: 1980. See also ISA handbook of control valves relating to hydro dynamic noise prediction.

RFQ Request for Quotation.

RGB Monitor system that uses three separate input signals controlling red, green and blue colour picture beams.

rheology The science that treats the flow of matter. Rheology in drilling refers to the makeup and handling of a drilling mud circulation system; drilling mud control and characteristics.

rheoplectic substance A fluid whose apparent viscosity increases with time at any constant shear rate.

rheostat An electric component in which resistance introduced in to a circuit is readily variable by a knob, handle, or by mechanically driven means.

RH-OB process (in steelmaking) A recirculation degassing process. The RH-OB system is used primarily for the removal of hydrogen and a certain amount of carbon from the steel.

R-H process (in steelmaking) Ruhrstahl-Heraeus Process. A recirculation degassing process.

RI Radio Interference.

ribbon cable (optical communication) An optical cable in which the optical fibers are incorporated in a flat ribbon.

Richter scale The magnitude of an earthquake indicates its strength at the source which is expressed by the scale of Richter. The scale of Richter runs from 1 to 9. Regarding local effects of earthquake and related to industrial location see Mercalli scale.

riffler See sandtable.

rigid disk A disk memory in which the magnetic medium is coated onto a rigid substrate.

rigidity 1. Same as stiffness. **2.** The inability of the production process to reroute around equipment of breakdown occurs.

RIIS Research Institute of Industrial Safety (Japan). Approval certification body for products (systems) intended for installation in hazardous locations. Example: intrinsically safe applications.

ring A sequential network topology where each node is connected to exactly two nodes, and serves as a repeater when it is not sourcing data onto the network.

ring balance manometer A circular shaped split liquid manometer with a unit pivoted at the center of the circle and a balance by weight at the bottom. The pressure is applied by flexible connections and the angular displacement of the ring indicates the diffe-

rential pressure. See figure in IEC publication 902, 1987.

ring crush resistance, RCT (of paper or board)

The maximum compressive force per unit length which a test strip bent into the form of a cylinder can withstand on its edge without failure; see edgewise crush resistance, flat crush resistance. Ring crush resistance is determined according to a standardized test procedure.

Ringelmann chart A series of four rectangular grids of black lines of varying widths printed on a white background, and used as a criterion of blackness for determining smoke density.

ringing An oscillating transient in an output signal that occurs following a sudden rise or fall in the input signal.

ringing period (electrical transducers) The period of time during which the amplitude of output oscillations, excited by a step change in measurand exceeds the steady-state output value.

ring latency (token ring access method) In a token ring medium access control system, the time (measured in bit times at the data transmission rate) required for a signal to propagate once around the ring.

ring network, loop A network in which every node has exactly two branches connected to it and in which there are exactly two paths between any two nodes.

ripple Periodic.

ripple Periodic deviations around an average measured or supplied value, occurring at frequencies which may be related to that of the mains supply or of some other definite source, such as chopper. Ripple is determined under specified conditions.

RISC Reduced Instruction Set Computer. A computer architecture using a small set of instructions at the hardware level. RISC enables a complex processor to be built from very high-speed, simple components. IBM invented the RISC concept.

riser See feedhead.

rise time For a step response, the time interval between the instant when the output signal, starting from zero, reaches a small specified percentage (for instance 10%) of the final steady-state value, and the instant when it reaches for the first time a specified large percentage (for instance 90%) of the same steady-state value.

risk The combination of the frequency, or probability, and the consequence of a specified hazardous event. Note: The concept of risk has always two elements; the frequency with which a hazard occurs and the consequences of the hazardous event.

RMM Read Mainly Memory. A nonvolatile memory used much as a ROM or PROM except that data contained therein may be altered through the use of special techniques (often involving external action) which are much too slow for read/write use.

RMOS Refractory Metal Oxide Semiconductor. A MOS device that uses refractory metals like molybdenum instead of aluminium or silicon as the gate metal.

rms value, rootmean square value The square root of the average of the squares of the instantaneous values.

rms voltage The effective value of a varying or alternating voltage. That value which would produce the same power loss as if a continuous voltage were applied to a pure resistance. In sine-wave voltages, the rms voltage is equal to 0.707 times the peak voltage.

roadmap A printed pattern of nonconductive material by which the circuitry and components are delineated on a board to aid in service and repair of the board.

robotics Designing, building and applying robots.

robot system A robot system includes: the robot (hardware and software) consisting of the manipulator whether mobile or not; power supply and control system; the end-effector; any equipment, devices or sensors required for the robot to perform its task; any communication interface that is operating and monitoring the robot, equipment, or sensors, as far as these peripheral devices are supervised by the robot control system.

robot vision The use of vision system to provide visual feedback to an industrial robot. Based on the vision systems interpretation of a scene, the robot may be commanded to move in a certain way.

robust control Control in which satisfactory operation is performed in spite of large variations in process parameters.

robustness (software) The extent to which software can continue to operate correctly despite the introduction of invalid inputs.

rocking stem power unit Type of diaphragm type power unit.

rod float, velocity rod See under velocity rod.

Roentgen A quantity of x-ray or gamma-ray radiation that produces, in air, ions carrying one electrostatic unit of electrical charge of either sign per 0.001293 gram of air.

Roentgen rays An alternative term for x-rays.

roll The process in which alphanumeric text moves across a CRT screen to the left or right. As a character disappears on one end of the screen, a new character appears at the other end.

roll, beater roll See hollander.

roller (fluid power systems) Device attached to the operating mechanism to permit operation by means of a cam or slide acting at right angles to the mechanism.

roller-hearth reheating furnace (in steel production) A type of continuous reheating furnace also used in heat-treating operations, such as bright annealing of tubes, stampings, drawn parts, etc.; for normalizing, annealing, hardening and tempering steel bars; for annealing malleable iron, small steel and iron castings, and forgings.

(to) roll in To restore to main storage the sets of data that were previously rolled out.

rolling (computer graphics) Scrolling restricted to an upward or downward direction.

rolling diaphragm actuator In this design the longer stroke permits the travel to match that of piston types without the diaphragm working area being affected as with most other types of diaphragm actuators.

rolling refiner A refiner in which the material is beaten between a horizontal cylindrical shell and a number of fluted steel rolls which rotate about their own axes and at the same time revolve round the inside of the refiner chamber. The roller refiner is used for refining fiber material with a pressing and kneading action.

roll-out To transfer sets of data, such as files or computer programs of various sizes, from main storage to auxiliary storage for the purpose of freeing main storage for another use.

ROM See read-only memory.

romware Software stored in ROM.

RON Research Octane Number: Octane number for a gasoline component or product.

root locus Plots in the complex plane of the variations of the poles of the closed-loop transfer function with changes in the open-loop gain.

root mean square value, r.m.s. value The square root of the mean of the squares of the instantaneous

values of a quantity taken over a specified time interval. For a periodic quantity, the time interval equal to a period.

root sum square The square root of the sum of the squares.

rotameter See variable area flowmeter.

rotary actuator A rotary actuator is used with valves with rotary closure members such as ball, plug and butterfly valves. A linear motion of one element is converted into rotary motion of the valve element.

rotary blade valves The one piece combination blade and shaft of this design rotates in ball bearings then cams into the seat giving bubble tight shut off. Flow capacity of this valve is that of a throttling type ball valve having slightly reduced ports and 50% greater than a flat blade butterfly valve. It is capable of handling slurries.

rotary continuous casting process (in steel production) An alternative to the conventional vertical continuous casting process.

rotary eccentric plug valves The valve plug rotates through a 50° angle from the full open position and cams into the seat. The leading edge of the plug passes the top of the seat by a narrow margin and then the trailing edge contacts the upper seat section. Further rotation and application of stem torque by the actuator flexes the plug arms, forcing the leading edge of the disc into contact with the lower seat camming the plug tighter into the upper seat.

rotary hearth furnace (in steel production) A type of continuous reheating furnace. The rotary hearth type permits the external walls and roof to remain stationary while the hearth section of the furnace revolves.

rotary joint An assembly connecting two rigid members which enables one to rotate in relation to the other, about a fixed axis.

rotary kiln The rotary kiln is a versatile furnace that find widespread use in the production of direct-reduced iron (DRI). The furnace is designed to use hydrocarbon fuels in the iron oxide reduction chamber without prior gasification. The rotary kiln furnace is a revolving horizontal cylinder comprising a shell with an internal refractory lining. The furnace is tilted at an angle of 3 to 4 percent from the horizontal toward the discharged end. The burden travels through the rotary kiln by rotation of the kiln and gravity.

rotary oil burner A burner in which atomization is accomplished by feeding oil to the inside of a rapidly rotating cup.

rotary piston meter A type of positive displacement flow meter.

rotary pump Pump in which the pumping members deliver continuously while rotating about their axes (for example, a gear pump).

rotary relay 1. A relay in which the armature rotates to close the gap between two or more pole phases (usually with a balanced armature). **2.** A term sometimes used for stepping relay.

rotary seal Sealing device used between parts that have relative rotary motion.

rotary seats (for ball valves) One manufacturer offers valve seats which are rotated a few degrees with each valve opening. Ratchet steps on the side of the seat facing the ball are moved one ratchet each time the ball approaches the full closed position by a pawl on the ball. Ball valve seats suffer their most severe wear at the point where the seat is cracked open and by changing this position wear is distributed around the entire seating surface giving it longer life.

rotary stepping relay See stepping relay.

rotary stepping switch See stepping relay.

rotary-vane meter A type of flowmeter. A typical rotary-vane meter may be comprised of an impeller driven by the fluid, a cam to move a set of vanes into the fluid stream to form an isolation chamber, and a spring to retract the vane at the end of its cycle. The space between two adjacent vanes forms the isolation chamber and the revolutions of the impeller are totalized and registered in volumetric terms.

rotating-cup viscometer A laboratory device for measuring viscosity in terms of the drag torque on a stationary element, such as a paddle or cylinder, immersed in a liquid contained in a cup that rotates at constant speed.

rotational delay, search time The time required for the read/write head of a direct access storage device to locate a particular record on a track corresponding to a given address or key.

rotational frequency For measurement of rotational frequency in SI units see under reciprocal second.

rotational viscometer (for consistency measurement) A viscometer for consistency measurement based on the theory that resistance to deformation by a fluid is directly proportional to the torque on the spindle. The base construction is a spring loaded spindle assembly, rotating table assembly, and an indicating instrument.

rote gain See derivative action gain.

rotor type vacuum gage A device for measuring low pressures, down to 10^{-7} torr, by sensing the deceleration of a rotor (usually a steel ball) levitated in a rotating magnetic field, the rotor being exposed directly to the evacuated space.

roughing filter A biological filter operating at considerably higher than normal organic or hydraulic loading rates, intended to reduce the excess concentration of readily degradable organic substances in high-strength industrial wastes.

round chart instrument A recording instrument whose output trace is written on a circular paper chart.

rounded orifice An orifice whose inlet side is rounded rather than sharp edged.

round-nosed horizontal-crested weir A weir rounded upstream corner. See figure in ISO publication 772-1978 or BS 3680:Part 1: 1983.

round off To delete the least-significant digit or digits of a numeral and to adjust the part retained in accordance with some rule.

router A network device that interconnects two computer networks that have the same network architecture. A router requires OSI Level 1, 2 and 3 protocols.

routine A set of coded instructions arranged in proper sequence to direct the computer to perform a desired operation or sequence of operations. A subdivision of a program consisting of two or more instructions that are functionally related. See check routine.

routing The selection of a path or channel for sending data.

row In computers, the characters or corresponding bits of binary-coded characters that make up a word.

RPM Reprogrammable PROM.

RS 232 A logic level and connector specification for serial ASCII data transmission; sometimes called the "EIA interface".

RS 232C A communication interface between a modem and other computer devices that complies with EIA Standard RS-232C. RS232C is the American counterpart to CCITT's V.24 and V.28 Standards.

RS 422 A four wire communications link, capable of long-distance operation without losing information.

RS 511 A messaging standard, also known as MMS, under development in EIA for communication between factory floor devices.

RS flip-flop A flip-flop having two inputs, designated R and S. At the application of a clock pulse, a 1 on the S input will set the flip-flop to the 1 or on state, and 1 on the R input will reset it to the 0 or off state. It is assumed that 1s will never appear simultaneously at both inputs. A logic level and connector specification for serial ASCII data transmission; sometimes called the "EIA interface".

RST flip-flop A flip-flop having three inputs "R", "S" and "T".

RSX 11 Real-time resource sharing executive. A real-time, multiprogramming operating system that controls the sharing of system resources among any number of user-prepared tasks.

RT 11 A single-user foreground/background real-time disk operating system; real-time does not mean that it is capable of accepting real-time data directly, but rather is an indication that it can support a real-time system such as TELEVENT.

RTB Resistance Thermometer Bulb. See resistance thermometer.

RTD Resistance Temperature Device or Detector. See resistance thermometer.

RTS Request To Send. An RS 232 control signal between a modem and user's digital equipment that initiates the data-transmission sequence on a communication line.

RTS/CTS delay See train time.

rubber-banding (computer graphics) Moving the common ends of a set of straight lines while the other ends remain fixed.

rubber boot (control valves) A protective device similar to a flexible bellows, which is used to prevent build-up to abrasive deposits on the valve stem.

ruby laser An optically-pumped ruby crystal producing a very intense and narrow beam of coherent red light. It is used in light-beam communication and for localized heating.

rugosity coefficient A coefficient linked with the boundary roughness and the geometric characteristics

of the channel used in flow formulae concerning open channels. Note: The most frequently used coefficients are the Chezy, Darcy-Weisback, Hazen-Williams, Kutter, Manning and Strickler coefficients.

rule-based system, production system (expert systems) A knowledge-based system that draws inferences by applying a set of if-then rules to a set of facts following given procedures.

rule matching The matching of the goal and the elements of a given problem by cascaded application of a series of if-then rules whose premises are true.

running torque 1. The turning power of a motor when running at its rated speed. **2.** Force movement produced by a stepper motor after it has been accelerated to a running rate (sometimes also called slew or pull-out torque).

rupture The ability of contacts to break apart or rupture the electrical flow without welding under excessive currents.

rupture disk device (pressure relief devices) A rupture disk device is a non-reclosing pressure relief device actuated by inlet static pressure and designed to function by the bursting of a pressure containing disk.

rupture pressure The pressure, determined by test, at which a device will burst. Note: This is an alternate to the designed procedure for establishing maximum working pressure (MWP). The rupture pressure test consists of causing the device to burst.

rust (corrosion) A corrosion product consisting primarily of hydrated iron oxide. Note: This term is properly applied only to iron and ferrous alloys.

rust-resistance So constructed, protected or treated that rust will not exceed a specified limit when subjected to a specified rust resistance test.

Rutherford, rd 1. A quantity of radioactive material that produces one million disintegrations per second. **2.** A quantity of a nuclide having an activity equal to one Rutherford.

ryotron A thin-film inductive superconductive device. An inductive switch capable of inductance variation of better than three orders of magnitude.

RZ See return-to-zero recording.

S

S Symbol for siemens. Unit for electric conductance (SI unit).

s Symbol for second. Base unit for time (SI unit). Do not write "sec." or secs, instead of s.

(type) S Letter designation for thermocouple and thermocouple extension wire with a certain temperature – emf relationship. Material identification Platinum – 10 Percent Rhodium versus Platinum. See ISA publication ANSI-MC 96.1-1982 and IEC publication 584-1.

S-100 bus A hobbyist and small business user standard board and bus system which has become a de facto standard for microcomputers.

SAA Standards Association of Australia.

sack kraft paper, kraft sack paper Kraft paper for paper sacks.

sacrificial protection (corrosion) Reduction or prevention of corrosion of a metal in an environment acting as an electrolyte by coupling it to another metal that is electrochemically more active in that particular electrolyte.

SAE number A classification of lubricating oils in terms of viscosity only. A standard established by the Society of Automotive Engineers.

safe area See non-hazardous area.

safety The conservation of human life and its effectiveness, and the prevention of damage to items, consistent with mission requirements.

safety circuit Gives warning of faults or abnormalities, or operates a trip on a protective device.

safety combustion control See combustion (flame) safeguard.

safety control Control (including relays, switches, and other auxiliary equipment used in conjunction therewith to form a safety control system) which are intended to prevent unsafe operation of the controlled equipment.

safety factor The amount by which the normal operating rating of a device can be exceeded without causing failure of the device.

safety hardware Enclosures and equipments required to make high pressure apparatus and electrical apparatus safe for man and environment, particularly in explosively hazardous atmospheres. Note: For example, safety valves, "d" enclosures, intrinsically safe barriers, circuit breakers, residual current devices (earth leakage circuit breakers) etc.

safety integrity The likelihood of a safety-related system achieving its required safety functions under all the stated conditions within a stated period of time.

safety lifecycle The elements of a system lifecycle that are safety-related.

safety plug See rupture disk device.

safety-related system A system that: **1.** Implements, independently of any other system, the required safety functions necessary to achieve a safe state for the equipment under control (EUC) or to maintain a safe state for the EUC. **2.** Achieves, on its own or with other safety-related systems, the necessary level of safety-integrity for the implementation of the required safety functions.

safety relief valve A safety relief valve is a pressure relief valve characterized by rapid opening pop action or by opening generally proportional to the increases in pressure over the opening pressure.

safety rod See control rod.

safety shut down The action of shutting off all fuel and ignition energy to the burner by means of safety control or controls such that restart cannot be accomplished without operator action.

safety valve A safety valve is a pressure relief valve actuated by inlet static pressure and characterized by rapid opening or pop action.

safe working pressure See design pressure.

salamander (or bear) When a blast furnace has been in operation for an extended period of time, the portion near the center of the hearth that cannot be cooled adequately gradually erodes away, leaving a dish-shaped cavity in the hearth blocks. This cavity fills, with liquid metal. This metal is known as salamander or bear.

saleable mass (of pulp) The actual mass of the pulp multiplied by the dry solids content and divided by the theoretical commercial dryness. See also ISO 801.

Salem direct-reduction process A direct-reduction process using a rotary-hearth furnace as the reduction reactor.

salinity indicator system A system, based on measurement of varying electric resistance of the solution, to indicate the amount of salt in boiler feed water, the output of an evaporator plant, or other fresh water.

salinometer An instrument for measuring water salinity, may utilize electrical conductivity measurement or a hydrometer calibrated to read percent salt content directly.

salmonid (fish) Fish belonging to the family Salmonidae, for example Atlantic salmon, brown trout and char, often used as biological indicators of water quality.

salt-bath or lead-bath furnace A type of batch heat-treating furnace. It is designed to hold a bath of molten salt or lead in which the material is immersed for treatment. These furnaces are usually small pot-like affairs but some large furnaces have been constructed of rectangular shape. The bath is heated and maintained at proper temperature either by electrical resistance or by combustion of a fuel. Furnaces with a molten bath for heat treating are called pot furnaces when the bath is contained in a pot or crucible.

salt water (corrosion effect on stainless steel)

A characteristic of corrosion by salt water is that it frequently takes the form of pitting. In the case of stainless steels this is largely due to the fact that salt water induces local breakdown of the passive film to which these steels owe their ability to resist corrosion. Another cause of pitting of these steels is the fact that barnacles and other marine organisms which attach themselves to steel equipment are capable of oxygen concentration cells. Once established, these cells are very active and produce a considerable amount of corrosion and pitting.

salt water wedge The wedge-like intrusion of a large mass of salt water flowing in from the sea under the fresh water in a tidal waterway, where mixing by turbulence is inappreciable.

SAM Serial Access Memory.

SAMA Scientific Apparatus Makers Association (USA).

(to) sample To obtain the values of a function for regularly or irregularly spaced distinct values from its domain. Note: Other meanings of this term may be used in particular fields, for example in statistics.

sample-and-hold device A device that senses and stores the instantaneous value of an analog signal.

sampled data Data in which the information content is determined only at discrete time intervals. Sampled data may be either analog or digital in form.

sampled data control (industrial control) That branch of automatic control theory concerned with the control of variables whose current values are not continuously available for comparison with the setpoint but instead are sampled only at given intervals.

sampled signal A signal which is updated only at given intervals by a new observation of the variable.

sample plan The plan designed by a telemetry engineer to sample and encode data incrementally so that it may be accurately decoded and re-created.

sampler See sampling element.

sampler (water quality) A device used to obtain a sample of water, either discretely or continuously, for the purpose of examination of various defined characteristics.

sample rate 1. The rate at which the analog sample is measured and/or displayed per second. **2.** The rate at which samples are taken in the analog-to-digital conversion process.

sampling 1. The process of measuring a physical quantity at finite intervals, usually at equal intervals of time. **2.** In statistics, obtaining a sample from a population.

sampling action Type of action of an element whose output variable represents the actual value of the input variable at the instants when the input variable was sampled.

sampling control Type of control in which reference variable and controlled variable are taken discontinuously in time (sampled) to generate the manipulated variable by means of an element with holding action.

sampling controller A controller using intermittently observed values of a signal such as the set point signal, the actuating error signal, or the signal representing the controlled variable to effect control action.

sampling cross-section station A cross-section of an open channel lying downstream of the injection cross-section, at which samples are taken or in which the concentration is directly measured.

sampling element, sampler 1. Signal converter which changes a continuous signal into a sampled signal. **2.** Transfer element which at specific instants observes the values of the input variable and converts them into sampled output variable. Note: The analog digital converter of a process computer works as a sampling element.

sampling error 1. The error in a statistic due to a finite number of samples. **2.** Errors arising from improperly selected samples, or samples improperly collected so that the samples are not representative.

sampling gate A circuit with an output only when the gate is opened by an activating pulse.

sampling interval (in automatic control) See sampling period.

sampling line (water quality) The conduit which leads from the sampling probe to the sample delivery point or the analysing equipment.

sampling network (water quality) A system of predetermined sampling locations designed to monitor one or more specified sites.

sampling oscilloscope An oscilloscope which employs signal sampling together with means for constructing a coherent display from the samples taken.

sampling period The time interval between two consecutive observations in a periodic sampling control system.

sampling probe (water quality) That part of sampling equipment which is inserted into a body of water and into which the water sample initially passes.

sampling site (water quality) The general area within a body of water from which samples are taken.

sampling station See sampling cross-section station.

sampling test A test on a number of devices taken at random from a batch.

sampling theorem A theorem (developed by Nyquist in 1928) which states that two samples per cycle will completely characterize a band-limited signal; that is, the sampling rate must be twice the highest-frequency component. (In practice, the sampling rate is ordinarily from five to ten times the highest frequency.)

sandtable, riffler, (for pulp or stock) Troughs or channels (sometimes fitted with transverse baffles) for the removal by sedimentation of heavy impurities from a flowing, very dilute suspension of pulp or stock.

sandwich A packaging method in which components are placed between boards or layers.

sanitary engineering A field of civil engineering that deals with construction and operation of facilities that protect public health.

sanitary motor A type of motor used in the food industry. It usually has a frame that is so shaped that deposits of material cannot collect to contaminate nearby food, and can be easily kept clean.

SANZ Standards Association of New Zealand. (Formerly NZSI).

SAP Service Access Point. The connection point between a protocol in one OSI layer and a protocol in the layer above. SAPs provide a mechanism by which a message can be routed through the appropriate protocol as it is passed up through the OSI layers.

saponification value Measure of the free and combined acids in oils reacting with potassium hydroxide. The result is expressed as milligrammes of potassium hydroxide per gramme of fluid.

saprobic (water quality) Associated with decaying organic matter.

sapwood Wood which in the living free consists of living wood cells.

satellite communication Principle of reflection or regeneration of telegraphic or telephonic signals from earth satellites, using highly directive antennae for transmission and reception, orientated by computer calculation of orbit.

satellite computer A processor connected locally or remotely to a larger central processor. Performs certain processing tasks; sometimes independent of the central processor, other times subordinate to the central processor.

satellite plant (petroleum industry) A facility that supports the main processing plant; a plant that derives its feedstock or raw material from the main processing unit.

satellite platform See production platform.

sat in finish A type of metal finish produced by scratch brushing a polished metal surface to produce a soft sheen.

satining machine See smoothing machine.

saturable-core reactor See saturable reactor.

saturable reactor Also called a saturable-core reactor. A magnetic-core reactor, the reactance of which is controlled by changing the saturation of the core by varying a superimposed unidirectional flux.

saturable transformer A saturable reactor with an additional winding to provide voltage transformation or isolation from the ac supply.

saturated That operating state of a transistor in which there is no further increase in collector current when the base current increases.

saturated air Air which contains the maximum amount of water vapor that it can hold at its temperature and pressure.

saturated color A pure color, i.e., one not contaminated by white.

saturated logic A type of logic in which one output state is the saturation voltage of a transistor. Examples are resistor-transistor logic (RTL), diodetransistor logic (DTL) and transistor-transistor logic (TTL). See also unsaturated logic.

saturated steam Steam at the temperature corresponding to its pressure.

saturated temperature The temperature at which evaporation occurs at a particular pressure.

saturated water Water at its boiling point.

saturates (refinery) Components of refinery-process gas streams: methane, ethane, propane, butanes and others. Saturates is a synonym for hydrocarbons whose carbon atoms are saturated with hydrogen atoms. These gas streams are further refined in a facility called by refinery engineers the sats gas plant.

saturating reactor A magnetic-core reactor operating in the region of saturation without independent control means.

saturation 1. A condition at which the air is unable to hold any more moisture at a given temperature. **2.** Phenomenon represented by the part of a characteristic curve for which the ordinates (which represent the output variable) show a negligible additional change for any further increase of the abscissae (which represent the input variable).

saturation (textile term) The greatest intensity of color achieved during dyeing.

saturation (petroleum industry) 1. The extent to which the pore space in a formation contains hydrocarbons or connate water. **2.** The extent to which gas is dissolved in the liquid hydrocarbons in a formation.

saturation curve A magnetization curve for a ferromagnetic material.

saturation flux density See saturation induction.

saturation induction Sometimes loosely referred to a saturation flux density. The maximum intrinsic induction possible in a material.

saturation point The point beyond which an increase in one of two quantities produces no increase in the other.

saturation pressure See bubble-point pressure.

saturation testing (data communication) Program testing with a large bulk of messages, and either using or simulating the use of all lines and terminals in the system.

Saunders valve (control valves) A typical valve consists of a housing, having a central raised weir and a moveable diaphragm, clamped between the body and the bonnet. This diaphragm is pressed against the weir, or central body portion, to provide tight shut-off. The Saunders patent valves are used primarily for the control of corrosive fluids, heavy liquids, or liquids having solid particles in suspension.

save – all tray, white water tray Equipment for the collection and preservation of white water which runs off the wire in the fourdrinier forming section. The save-all tray may include shields, channels and chests. The water so collected is known as tray water.

Saybolt color scale A standardized color scale used primarily in the petroleum and pharmaceutical industries to grade the yellowness of pale products; it is based on matching the color of a column of the sam-

ple liquid with one of a set of color-controlled glass disks, as described in ASTM standard D156.

Saybolt viscosimeter See viscosimeter.

Sb Chemical symbol for antimony.

s-band In telemetry, the portion of the radio frequency spectrum between 2 200 and 2 300 MHz.

SBC Single Board Computer Computer whose main components are contained in one PCB.

SBR Initials for synthetic butadiene rubber, the main ingredients of which are derived from petroleum.

SCADA Supervisory Control and Data Acquisition. A software package that obtains data from production environment activities and uses it for a variety of applications. These applications includes simple control, monitoring, trending and data collation for upstream use.

scaffold A movable or temporary platform that allows workers to perform tasks at considerable heights above the ground – it may be either supported from ground level on a framework or suspended from above on ropes or cables.

scalar A quantity characterized by a single value.

scale 1. A range of values frequently dictated by the computer word-length or routine at hand. **2.** An ordered set of scale marks, together with any associated numbering, forming a part of an indicating device.

scale deposit (water quality) Adherent inorganic deposit formed on surfaces by water which has become supersaturated with respect to one or more solutes, or destabilized by loss of carbon dioxide, for example, by boiling.

scale division The interval between any two consecutive scale marks.

scale factor The factor by which the number of scale divisions indicated or recorded by an instrument should be multiplied to compute the value of the measured variable. Note: Deflection factor is a more general term than scale factor in that the instrument response may be expressed alternatively in units other than scale divisions.

scale factor (analog computers) The multiplication factor necessary to transform problem variables to computer variables. A problem variable is a variable appearing in the mathematical model of the problem. A computer variable is a dependent variable as represented on the computer.

scale interval The difference between the scale values corresponding to two successive scale marks. Note: Scale interval is expressed in the units marked on the scale, regardless of the units of the measurand.

scale length For a given scale, the length of the line between the first and the last scale marks and passing through the centres of all the shortest scale marks. Note: The line may be real or imaginary, curved or straight.

scale marking The series of marks distributed on a scale according to a appropriate law. Note: The English word “graduation” means the process of setting out a scale.

scale multiplier, coefficient unit A functional unit whose output analog variable is equal to the input analog variable multiplied by a constant.

scale numbering The set of numbers, marked on a scale, which either correspond to the values of the measurand defined by the scale marks or merely indicate the numerical order of the scale marks.

scaler Also called a scaling circuit. A circuit which produces an output after a predetermined number of input pulses have been received.

scale range For a given scale, the range of scales values between the extreme scale marks. Note: The sca-

le range is expressed in the units marked on the scale, regardless of the units of the measurand, and is normally stated in terms of its lower and upper limits for example 100°C to 200°C.

scale spacing The distance between any two successive scale marks measured along the same line as the scale length. Note: Scale spacing is expressed in units of lengths, regardless of the units of the measurand or the units marked on the scale.

scale units The units of measure stated on an instrument scale.

scale-up Using data from an experimental model or pilot plant to design a larger (scaled-up) facility or device.

scaling The process of changing a quantity from one notation to another.

scaling (heat treatment) Flaking off of oxide scale. Scaling occurs beyond the scaling temperature.

scaling (in computer graphics) Enlarging or diminishing all or part of a display image. Note – Scaling does not have to be carried out with the same factor in all directions.

scaling (for analog-to-digital conversion) An operation, generally preceding analog-to-digital conversion either by amplification or by attenuation, to match the range of the input signal to that of the converter.

scalp To remove the surface layer of a billet, slab or ingot, thereby removing surface defects that might persist through later operations.

scan 1. Collection of data from process sensors by a computer for use in calculations, usually obtained through a multiplexer. **2.** Sequential interrogation of devices or lists of information under program control.

scan cycle The time in seconds required to obtain a collection of data (for example, all data from one remote, all data from all remotes, and all data of a particular type from all remotes).

scanistor An integrated semiconductor optical-scanning device that converts images into electrical signals.

scan line One line of light generated by a television screen as its beam sweeps from left to right.

scanner 1. An instrument which automatically samples or interrogates the state of various processes, files, conditions, or physical states and initiates action in accordance with the information obtained. **2.** A switching device that sequentially samples a number of points. **3.** A multiplexing arrangement that sequentially connects one channel to a number of channels. **4.** In a facsimile transmitter, the part which systematically translates the densities of the subject copy into the signal waveform.

scanning The systematic examination of data.

scanning control system Sampling control system in which one controller is used in sequence in two or more control loops.

scanning-electron microscopic (SEM) inspection An inspection that is electrically destructive and is performed only on a sample basis. SEM inspection is used to examine the quality of metallization on integrated circuits at very high magnification. It is particularly affective in detecting microcracks which may cause catastrophic device failure.

scanning-line frequency The number of scanning lines per second.

scanning range Pertaining to photoelectric proximity switches, the distance between the target surface and the light receiver.

scanning rate (or speed) The speed at which a computer can select and convert an analog input variable.

scanning speed The number of inches per second explored by the spot of light or other source of energy in television, facsimile, radar etc.

scanning supervisory system A system in which the master controls all information exchange. The normal state is usually one of repetitive communication with the remote stations.

scan rate 1. The rate of interrogation of a series of analog input channels expressed in terms of input channels per second. **2.** The rate at which a control computer periodically checks a controlled quantity.

Scara robot A revolute robot whose axes of the rotary joints of the arm are vertical, with horizontal compliance.

scattering (optical communication) The changes in many directions of an incident wave after striking randomly distributed particles or a rough surface.

scattering loss A reduction in the intensity of transmitted radiation due to internal scattering in the transmission medium or to roughness of a reflecting or transmitting surface.

scavenger 1. A reactive metal added to molten metal to combine with and remove dissolved gases or other impurities. **2.** Chemical added to boiler water to remove oxygen.

scavenging To search through and access data material without permission.

SCC 1. Single Cotton Covered (wire). **2.** Single Conductor Cable.

SCE Single Cotton over Enamel (wire).

sceptre A language for use in designing and analyzing circuits. Implemented on several computers.

SCÉPTRON Acronym for spectral comparative pattern recognizer. A device which automatically classifies complex signals derived from any type of information that can be changed into an electrical signal.

schedule 160 A term used to define the wall thickness of pipe (schedule 40, 80, 160 and others).

scheduled maintenance The preventive maintenance carried out in accordance with an established time schedule.

scheduled outage An outage that results when a component is deliberately taken out of service at a selected time, usually for purposes of construction, maintenance, or repair.

scheduled outage duration The period from the initiation of a scheduled outage until construction, preventive maintenance, or repair work is completed and the affected component is made available to perform its intended function.

scheduled outage duration The period from the initiation of a scheduled outage until construction, preventive maintenance, or repair work is completed and the affected component is made available to perform its intended function.

scheduling 1. The task of determining what the succession of programs should be in a multiprogramming system. **2.** Designation of time and sequence of projected operations.

scheduling algorithm An algorithm that determines the order in which competing jobs are allowed to use resources.

schematic circuit diagram See schematic diagram.

schematic diagram 1. Also called a schematic circuit diagram, diagram or schematic. A diagram of the electrical scheme of a circuit, with components represented by graphical symbols. **2.** A drawing which shows by means of graphic symbols, the electrical connections, components and functions of a specific circuit arrangement.

Schering bridge A type of ac bridge circuit particularly useful for measuring the combined capacitive and resistive qualities of insulating materials and high-quality capacitors.

Schneider front-end A front-end train of amplifiers to interface gas chromatograph instruments to a real-time computer.

Schottky TTL A TTL circuit that incorporates Schottky diodes to greatly speed up TTL circuit operation.

Schwarz radiometer The Schwarz radiometer consists of pin type thermopile elements mounted in a casing. It is used to measure irradiance or radiant flux. Semiconducting materials are employed in the thermocouples.

scientific language One designed for writing mathematical or scientific programs.

scientific sampling Concerns a designed selection sample that represents the population in a manner that characteristics and conclusions can be theorized concerning the population.

scintillation 1. In radio propagation, a random and usually relatively small fluctuation of the received field about its mean value. **2.** The flash of light produced by an ionic action. **3.** A momentary breakdown of a tantalum-oxide film in a capacitor, accompanied by rapid heating of the dielectric. Such events are caused by capacitor overvoltages or improper techniques of capacitor manufacture. **4.** The flash of light produced by certain crystalline materials when a charged particle is passed through them.

scintillation material A material that exhibits the property of emitting optical photons in response to ionizing radiation.

scintillation spectrometer A scintillation instrument system so designed that it can separate and determine the energy distribution in heterogeneous radiation.

sclerometer An instrument that determines hardness of a material by measuring the height to which a standard steel ball rebounds when dropped from a standard height.

scope In assembler programming, that part of a source program in which a variable symbol can communicate its value.

scotch boiler A cylindrical steel shell with one or more cylindrical internal steel furnaces located (generally) in the lower portion and with a bank or banks (passes) of tubes attached to both end closures.

scouring 1. Physical or chemical attack on internal surfaces of process equipment. **2.** Mechanical finishing or cleaning using a mild abrasive and low pressure.

scouring range (textile term) An installation of equipment for the continuous removal of oils, pectins, waxes, and warp tints from fabrics prior to bleaching and mercerization.

SCR Silicon Controlled Rectifier. A semiconductor device that functions as an electrically controlled switch for dc loads. The SCR is one type of thyristor.

scrabbling plant A facility for purifying or treating natural gas for the removal of hydrogen sulfide or other impurities.

scrambled The encoded or secret from a signal which is unintelligible except when decoded or descrambled.

scratch hardness A measure of the resistance of minerals or metals to scratching.

scratch pad A unique internal storage area, reserved for intermediate results, various notations, or working area.

scratchpad memory, scratchpad storage A small immediate access memory area of a central processor, with a significantly faster access time than the larger main storage.

scratch register Addresses of scratch pad storage locations which can be referenced by the use of only one character.

screen (paper industry) An apparatus having holes or slits and intended for the separation of suspended material according to size; see screen room.

screen (textile term) Formerly, a woven structure with rectangular openings which permitted the passage of print paste; now, also a perforated metal sheet formed electrolytically, which performs the same task.

screen (CRT) The surface in an electrostatic cathode ray storage tube where electrostatic charges are stored and by means of which information is displayed or stored temporarily.

screening (of a fiber suspension) Separation of suspended material into fractions according to size with the aid of one or more screens; see chip screening.

screening The display of raw or processed data for operator verification.

screening test (reliability) A test or a set of tests intended to remove or detect defective items or those likely to exhibit early failures.

screen room The department in a pulp mill where the pulp is subjected to screening or other pulp cleaning process to free it from impurities.

screw pump Pump with one or more screws rotating in a body.

screw type grinder, spindle grinder A grinder in which rotating, vertically arranged screws arranged in pairs continuously during operation press the wood in a vertical shaft down against the grindstone.

script A knowledge representation that uses predetermined sequences of events to determine the results of interactions between entities. Note: The script is event-orientated in contrast with a frame which is data-orientated and which refers to a point in time.

scrolling (computer graphics) Moving a window a vertically or horizontally in such a manner that new data appear within the viewport as old data disappear.

scrubber 1. A device for removing entrained dust or moisture from a process gas stream. **2.** A device for washing out or otherwise removing an undesirable or gaseous component from a process gas stream. **3.** An apparatus for the removal of solids from gases by entrainment in water.

scuffing 1. A dark mark or blemish, sometimes due to abrasion, on a smooth or polished surface. **2.** A form of mild adhesive wear generally exhibited as a dulling of the worn surface.

SDLC Abbreviation for synchronous data link control, a type of data link protocol.

seal 1. Any device used to prevent gases or liquids from passing through. **2.** Replaceable element of a sealing device.

sealant back up (for ball valves) A sealant is sometimes used to hydraulically jack the seat against the ball for tighter sealing as well as providing a viscous sealant at the ball-to-seat-joint. Injection pressures can vary from 2 000 to 15 000 psi which is a highly efficient means of improving sealing in services which are not contaminated by the slight amount of sealant in the flow stream.

seal chamber A chamber in which a liquid interface isolates the process liquid from the transmitter body without altering the measurement of pressure.

seal compatibility Ability of an elastomer to resist the action of a fluid on dimensions and mechanical properties.

sealed reservoir (fluid power systems) Reservoir sealed for storing fluid isolated from atmospheric conditions.

sealing compound A type of wax or pitch compound used in dry batteries, capacitor blocks, transformers or circuit units to keep out air and moisture.

sealing gap The distance between the armature and the center of the core of a magnetic-closing device when the contacts first touch each other.

sealing liquid (separation terminology) A liquid (water) injected into a separator bowl at the start-up so as to form a liquid seal before the process liquid is admitted, since the latter would otherwise go through the empty bowl unseparated. See barrier liquid.

sealing voltage (or current) (contactors) The voltage (or current) necessary to complete the movement of the armature of a magnetic circuit-closing device from the position at which the contacts first touch each other.

seal leg The piping from the instrument to the top elevation of the seal fluid in the impulse line.

seal-off pressure See resealing pressure.

seal pot See seal chamber.

seal welded bonnet (valves) A bonnet welded to a body, at assembly, to provide a zero leakage joint. This construction consists of a low-strength weld with the bonnet retained to the body by other means to withstand the body pressure load acting on the bonnet area.

seamless-pipe mill A mill for producing seamless pipes. The seamless process includes all of the regular and alloy grades of steel.

search To examine a series of items for any that have a desired property or properties.

search cycle The part of a search that is repeated for each item. It consists of locating the item and carrying out a comparison.

search key A key used for data retrieval.

search space In problem solving, the set of possible steps leading from initial states to goal states.

search time 1. The time required to locate a particular field of data in storage. Searching requires a comparison of each field with a predetermined standard until an identity is obtained. This is contrasted with access time which is based upon locating data by means of the address of its storage location. **2.** See rotational delay.

search tree A tree-like graph that accounts for the various rules applied in a search, of the nodes explored and of the results obtained.

season cracking (corrosion) Cracking resulting from the combined effect of corrosion and internal stress. A term usually applied to stress-corrosion cracking of brass.

seat (control valves) That portion of a seat ring or valve body which a valve plug contacts for closure.

seat angle (control valves) The angle between the axis of the seat orifice and the seating surface. A flat seated valve has a seat angle of 90°. The seat angle of the closure member and seat may differ slightly to provide line contact.

seat area (control valves) Seat area is the area determined by the seat diameter.

seat diameter (control valves) The smallest diameter of contact between the fixed and moving portions of the pressure containing elements of a valve.

seating time The elapsed time after the coil of a relay has been energized until the armature of the relay is seated.

seat joint (control valves) The area of contact between the closure member and the valve seat which establishes the seating action.

seat leakage (control valves) The rate of flow of a fluid (compressible or incompressible) passing through an assembled valve in the closed position under specified test conditions. Specifications for seat leakage classifications are contained in IEC publication 534-4, with Amendment No. 1.

seat leakage test See IEC publication 534-1, with Amendment No. 1.

seat load (control valves) The total net contact force between the closure member and seat with stated static conditions.

seat ring (control valves) A part assembled in the valve body to provide a removable valve seat.

secondary The output winding of a transformer.

secondary air Combustion air introduced into a combustion chamber over the burner flame to provide excess air and ensure complete combustion.

secondary colors (textile term) Colors formed by the mixture of two primary colors.

secondary combustion Combustion which occurs as a result of ignition at a point beyond the furnace. See also delayed combustion.

secondary control, subsidiary control Part of cascade control, operating with a reference variable, provided by the main controller and with measurement and feedback of subsidiary controlled variables only.

secondary device (electromagnetic flowmeter) This equipment contains the circuitry which extracts the flow signal from the electrode signal and converts it to a standard output signal directly proportional to flow-rate. This equipment may or may not be mounted on the primary device.

secondary failure (reliability) A failure of an item, caused either directly or indirectly by the failure or the fault of another item.

secondary fiber See recycled fiber.

secondary hardening Hardening of certain alloy steels by precipitation hardening during tempering; the hardening occurring during this stage supplements hardening achieved by controlled cooling from above the critical temperature in a step that precedes tempering.

secondary insulation A nonconductive material whose prime functions are to protect the conductor against abrasion and provide a second electrical barrier. Placed over the primary insulation.

secondary loop The inner loop of a cascade system.

secondary memory See secondary storage.

secondary pressure Secondary pressure in a safety, safety relief, or relief valve is the pressure existing in the passage between the actual discharge area and the valve outlet.

secondary standard A standard whose value is fixed by comparison with a primary standard.

secondary station In high level data link control (HDLC), the part of a data station that executes data link control functions as instructed by the primary station and that interprets received commands and generates responses for transmission.

secondary steelmaking process See ladle metallurgy.

secondary storage The storage facilities not an integral part of the computer but directly connected to and controlled by the computer, e.g. hard disks and magnetic tapes.

secondary treatment (water quality) Treatment of sewage by biological processes, such as biological

filtration and settlement, or activated sludge, as distinct from preliminary treatment (grit separation, comminution, etc.), primary treatment (primary sedimentation) and tertiary treatment (effluent polishing by sand filtration, micro-straining, etc.).

secondary treatment (boilers) Treatment of boiler feed water or internal treatment of boiler-water after primary treatment.

secondary winding The output winding of a transformer or similar electrical device.

second derivative action, D_2 -action Type of continuous action in which the value of the output variable is at all times proportional to the second time derivative of the input variable (i.e., in the case of a controller, of the system deviation).

second generation computer A computer utilizing solid-state components.

second moment of area The SI unit for measurement of second moment of area is metre to the fourth, m^4 . Use m^4 for all kinds of tables and calculations. Avoid the previously used mm^4 and cm^4 .

second-order lag A term used to describe the signal-delaying and signal-size-changing effects of a part of the control loop. The name comes from the form of the equation which represents the relation between output and input.

second polar moment of area The SI unit for measurement for second polar moment of area is metre to the fourth, m^4 . Use m^4 for all kinds of tables and calculations. Avoid the previously used mm^4 and cm^4 .

second, s Base SI unit for measurement of time. Multiples of second like ms and ks, are increasingly common in technology and science. Do not write "sec." or "secs" instead of s. In strict technical or scientific context give preference to the SI unit second. The units minute, min, and hour, h, are additional units. Avoid min and h in calculations.

second source 1. Companies which license and produce the design from the original manufacturer. 2. The manufacturer of a device, other than the original one.

seconds saybolt furol, SSF A measurement of the viscosity of a heavy oil. Sixty cubic centimeters of an oil are put in an instrument known as a Saybolt viscosimeter and are permitted to flow through a standardized orifice in the bottom at a specified temperature. The number of seconds required to flow through is the oil's viscosity, its SSF-number. See seconds saybolt universal.

seconds saybolt universal (SSU) A measurement of the viscosity of a light oil. A measured quantity of oil—usually 60 cubic centimeters—is put in an instrument known as a Saybolt viscosimeter and is permitted to flow through an orifice in the bottom at a specified temperature. The number of seconds required for the flow through is the oil's SSU number, its viscosity.

SECOOL (secondary cooling) Name of Alfa-Laval cooling system using sea, lake or river water or air for cooling a closed circuit of fresh (treated) water, which is used for process cooling purposes.

sectional header boiler A horizontal boiler of the longitudinal or cross-drum type, with the tube bank comprised of multiple parallel sections, each section made up of a front and rear header connected by one or more vertical rows of generating tubes and with the sections or groups of sections having a common steam drum.

section modules The SI unit for measurement of section modules is metre cubed, m^3 . Use m^3 for all kinds of tables and calculations. Avoid the previously used mm^3 and cm^3 .

sector A set of bits comprising the smallest addressable unit of information in a drum or disk memory.

security The protection of computer hardware and software from accidental or malicious access, use, modification, destruction, or disclosure. Security also pertains to personnel, data, communications, and the physical protection of computer installations.

sediment Solid particles formed as a result of erosion that are or have been transported by liquid flow.

sedimentation (water quality) The process of settling and deposition, under the influence of gravity, of suspended matter carried by water or waste water.

sedimentation – decantation – evaporation method A method of obtaining the sediment concentration in a sample containing suspended sediment by letting the sample stand undisturbed, so that the sediment will settle down from suspension, then successively decanting the sediment-free liquid and generally subjecting the sample to the processes of evaporation.

sedimentation basin, clarifier, settling tank (water quality) A large tank where settling of suspended matter takes place. It is often equipped with mechanical scrapers to gather the solid residue for removal from the bottom of the tank.

sedimentation tube A basic component of many items of equipment through which particles settle in a column of liquid, usually water.

sediment concentration The ratio of the mass or volume of the dry sediment in a water/sediment mixture to the total mass or volume of the suspension.

Seebeck coefficient The Seebeck coefficient of a particular material is the potential difference established along a wire of that material by the application of a unit temperature difference and has units of volts/°C. It is commonly called the thermoelectric power of the material. The Seebeck coefficient is an intrinsic property of the material (like resistivity or density).

Seebeck effect See under thermocouple.

Seebeck emf Also called thermal emf. The emf produced by the Seebeck effect.

seeding 1. The inoculation of a biological system for the purpose of introducing appropriate micro-organisms. 2. See fault seeding.

seek time 1. The time that is needed to position the access mechanism of a direct-access storage device at a specified position. See also access time. 2. See also positioning time.

segment 1. A self-contained portion of a computer program that may be executed without the entire computer program necessarily being maintained in the internal storage at any one time. 2. The section of a field bus which is terminated in its characteristic impedance. Segments are linked by repeaters to form a complete field bus. 3. A collection of display elements that can be manipulated as a unit.

segmental orifice plate Thin orifice plate the orifice of which has the shape of a segment of a circle. See figure in ISO publication 4006-1977 or BS 5875:1980. This plate is generally employed for measuring liquids or gases which carry non-abrasive impurities, which are normally heavier than the flowing fluid such as light slurries, or exceptionally dirty gases.

segmentation A technique for managing variable-sliced areas of memory, termed segments, that contain logical program parts.

segmented ball A closure member that is a segment of a spherical surface which may have one edge contoured to yield a desired flow characteristic. Type of ball valve.

segment table A table that describes all segments of a task and is used by the operating system for memory allocation, relocation and paging.

segregation (heat treatment) Deviation from average composition in a phase, arising from diffusion or from the conditions prevailing during solidification etc.

seiche An oscillation of the surface of a liquid caused mainly by winds and variations of atmospheric pressure.

seismic effects Unpredictable combinations of vibrations and shock transmitted through the earth's crust, caused by man (e.g., explosions) or nature (e.g. geological faulting, volcanic activity or sea waves breaking and pounding on a shore line). Note: It is customary to describe an earthquake and its local effects by its magnitude and intensity.

seismograph A device that records vibrations from the earth.

seizing signal A signal which is often translated at the start of a message to initiate a circuit operation at the receiving end of a circuit.

selected value The right-hand digital display window located on a Data Entry Panel that displays a variety of information depending on which Data Entry Panel button is pressed. Refers to Honeywell TDC 3000 control systems.

selective dump The dumping of the contents of one or more specified storage areas.

selective heating (heat treatment) Heating of only part of an object. The purpose of selective heating can be to enable subsequent heat treatment to give different parts of the object different properties.

selective-ion electrode A type of oxidation-reduction-potential electrode that involves use of a metal-metal-salt combination as the measuring electrode, which makes the electrode particularly sensitive to solution activities of the anion in the metal salt.

selective leaching Type of localized corrosion. This is the removal of one element in an alloy. The most common example is dezincification. It occurs with copper-zinc (brass) alloys containing more than 15% zinc when they are used in contact with water having a high content of oxygen and carbon dioxide. The result is a weakening in the strength of the metal as well as creating a porous metal. The remedy in this instance is to use a brass having a lower zinc content.

selective network One for which the loss and/or phase shift are functions of frequency.

selector relay A relay capable of automatically selecting one or more circuits.

selector switch A multiposition switch that permits one or more conductors to be connected to any of several other conductors.

selenium A chemical element with marked photosensitive properties and a resistance that varies inversely with illumination. It is used as a rectifier layer in metallic rectifiers.

self-acting controller An automatic controller which derives the energy for operation from the process it is controlling.

self-adapting Pertaining to the ability of a system to change its performance characteristics in response to its environment.

self-adaptive system A system which can exhibit the qualities of reorganization and/or learning.

self-adjusting communication, adaptive communication, self-optimizing communication A method in which automatic changes in the communications system allow for changing inputs or changing characteristics of the device or process being controlled.

self-checking code, error-detecting code A code in which each coded representation conforms to specific rules of construction so that their violation indicates the presence of errors.

self-contained instrument An instrument that contains all of its component parts within a single case or enclosure, or has them incorporated into a single assembly.

self-diagnostic 1. The hardware and firmware within a controller which allows it to continuously monitor its own status and indicate any fault which could occur within it. **2.** The self-checking operations performed by various system modules, usually when powered on, or reset. Refers to Honeywell TDC 3000 control systems.

self-excitation The supplying of required exciting voltages by a device itself rather than from an external source.

self-extinguishing Material which ignites and burns when exposed to flame or elevated temperature, but which stops burning when the flame or high temperature is removed.

self-generating Providing an output signal without applied excitation. Examples are piezoelectric, electromagnetic and thermoelectric transducers.

self-heating Internal heating resulting from electric energy dissipated within a device.

self inductance 1. The property which determines the amount of electromotive force induced in a circuit whenever the current changes in the circuit. **2.** At any pair of terminals of a network, the ratio of an applied potential difference to the resultant current at these terminals, all other terminals being open.

self-latching relay A relay in which the armature remains mechanically locked in the energized position until deliberately reset.

self-operated controller (regulator) A controller in which all the energy to operate the final controlling element is derived from the controlled system.

self-optimizing communication See self-adjusting communication.

self-organizing machines Machines that can recognize, or learn to recognize, such stimuli as patterns, characters, and sound, and which can then adapt to a changing environment.

self-powered Equipment containing its own power supply.

self-regulation (inherent regulation) The property of a process or machine which permits attainment of equilibrium, after a disturbance, without the intervention of a controller.

self-regulation The property of a process or machine which permits attainment of equilibrium, after a disturbance, without the intervention of a controller.

self-relative address A relative address that uses as base address the address of the instruction in which it appears.

self-relative addressing A method of addressing in which the address part of an instruction contains a self-relative address.

self-relocating program Can be loaded into any area of main storage. Contains initialization routine to adjust its address constants so that it can be executed at that location.

self-reset Automatically returning to the original position when normal conditions are resumed (applied chiefly to relays and circuit breakers).

self-saturation The saturation obtained in a magnetic amplifier by rectifying the output current of a saturable reactor.

self-starting synchronous motor A synchronous motor provided with the equivalent of a squirrel-cage winding so it can be started like an induction motor.

self-testing The ability of a piece of equipment to automatically verify the proper operation of its components or subsystems.

self-tuning See adaptive control.

self-tuning controllers Continuous adaptive controllers utilizing tuning procedures based on identifying the parameters of a static model of the process and calculating the controller coefficients from the model parameters and some agreed closed loop performance specification.

selsyn An induction machine or device which consists of stator and rotor elements each carrying one or more windings, the mutual inductance depending upon the angular position of the rotor with respect to the stator.

semantic net See semantic network.

semantic network, semantic net A concept-based knowledge representation in which objects or states appear as nodes connected with links that indicate the relationships between various nodes.

semantics 1. The relationships between symbols and their meanings. **2.** The discipline of expressing the meanings of computer language constructs in metalanguages. See also syntax.

semaphore A shared variable used to synchronize concurrent processes by indicating whether an action has been completed or an event has occurred.

semiautomatic controller A control device in which some of the basic functions are performed automatically.

semi-automatic cycle (fluid power systems) Cycle which, after being started, completes one cycle and stops at the initial position.

semi-automatic operation Operation mode in which only a part of the functions of the process control system is performed without action of a human operator.

semi-bleached pulp Pulp bleached to a brightness intermediate between that of unbleached pulp and that of fully bleached pulp.

semi-chemical pulp Pulp in which the fibers have been separated mechanically after a preliminary chemical treatment, normally cooking.

semiconductor An electronic conductor with resistivity usually in the range between metals and insulators in which the electrical charge-carrier concentration increases with increasing temperature over some temperature range.

semiconductor chip A small, rectangular slice of material, usually silicon and 4 mm² or less, on which a complete semiconductor device has been built. It can be either a simple single function like a transistor used as an amplifier, or a complex integrated circuit replacing thousands of discrete components. Chips are often called integrated circuits.

semiconductor controlled rectifier (SCR) An alternative name used for the reverse-blocking triode thyristor.

semiconductor diode A two-terminal device formed of a semiconductor junction having a nonlinear characteristic which will conduct electric current more in one direction than in the other.

semiconductor dopant An impurity added to a superpure semiconductor in order to produce the required electrical qualities.

semiconductor dual in-line package A standard method of packaging integrated circuits with input/output pins bent at right angles and in lines along the

two long sides of the unit so that they go straight into holes in a printed circuit board.

semiconductor element Active electronic components with at least three electrodes acting as a current path between anode and cathode when an appropriate signal is applied to the control electrode.

semiconductor memory A memory whose storage medium is a semiconductor circuit. Often used for high-speed buffer memories and for read-only memories. Almost all semiconductor memories are volatile.

semiconductor radiation detector (germanium gamma-ray detectors) A semiconductor device that utilizes the production and motion of excess free charge carriers in the semiconductor for the detection and measurement of particles or photons of incident radiation.

semiconductor strain gage A type of strain measuring device particularly well suited to use in miniature transducer element; it consists of a piezoresistive element that is either bonded to a force-collecting diaphragm or beam or diffused into its surface.

semiconductor temperature sensor See thermistor.

semicustom IC An LSI circuit that incorporates either linear or digital components. Semicustom ICs are designed to serve as replacements for small to medium-scale ICs and are based on the concept of integrating extremely complex functions onto a single IC to fulfill a particular custom function.

semidigital readout Presentation of the values of the measured quantity by the combination of a digital readout and an indication by a scale and index.

semiduplex In a communications circuit, a method of operation in which one end is duplex and one end simplex. This type of operation is sometimes used in mobile systems with the base station duplex and the mobile station or stations simplex. A semiduplex system requires two operating frequencies.

semienclosed 1. Having the ventilating openings in the case protected with wire screen, expanded metal, or perforated covers. **2.** Having a solid enclosure except for a slot for an operating handle or small openings for ventilation or both.

semigraphic panel A panel provided above the control panel with a simplified graphic representation of the process with or without signalling devices displaying the state of the process.

semisubmersible A large, floating drilling platform with a buoyant substructure, part of which is beneath the surface of the water. Some of the huge platforms are self-propelled. As they often drill in waters to deep for conventional chain-and-cable anchors, they maintain their position over the borehole by the use of thrusters, jets, or Kort nozzles controlled by onboard computers.

semithickened black liquor Black liquor withdrawn from an intermediate stage of the evaporator plant. Pertains to pulp and paper manufacturing.

send-receive keyboard A combination transmitter and receiver with transmission capability from keyboard only.

sense amplifier 1. A circuit used to sense low-level voltages such as those produced by magnetic or plated-wire memories and to amplify these signals to the logic voltage levels of the system. **2.** A circuit used in communications-electronics equipment to determine a change of phase or voltage and to provide an automatic control function.

sense data Information from an input/output file control unit including error, unusual, or attention conditions.

sense switch See alteration switch.

sensible heat **1.** Heat that causes a temperature change. **2.** Heat that changes the temperature of the air without changing its moisture content. Heat added to air by a heating coil is an example of sensible heat.

sensing element **1.** The element directly responsive to the value of the measured variable. Note: It may include the case protecting the sensitive portion. **2.** That part of the transducer which responds directly to the measurand. Note: This term is preferred to "primary element", "primary detector", "primary detecting element". Pertains to electrical transducers.

sensing element elevation The difference in elevation between the sensing element and the instrument. Note: The elevation is considered positive when the sensing element is above the instrument.

sensing field The zone in which an object can be sensed by a proximity switch.

sensistor A silicon resistor the resistance of which varies with temperature, power and time.

sensitivity Change in the response of a measuring instrument divided by the corresponding change in the stimulus.

sensitivity (electric transducers) The ratio of the change in transducer output to a change in the value of the measurand. Note: In the sense of the smallest detectable change in measurand use threshold.

sensitivity (photoelectric switches) **1.** The ratio of the electrical quantity at the light receiver to the luminous power on the light receiving area. **2.** For photoelectric and proximity switches with analog output signal, the ratio of the output signal change to the input signal.

sensitivity, detection threshold (optical communication) The minimum power required to achieve a specified quality of performance. Notes: **1.** Output signal to noise ration, error rate etc. are typical performance measures. **2.** Sensitivity is sometimes used an imprecise synonym for responsivity.

sensitivity shift (electrical transducers) A change in the slope of the calibration curve due to a change in sensitivity.

sensitized stainless steel Any austenitic stainless steel having chromium carbide deposited at the grain boundaries. This deprives the base alloy of chromium resulting in more rapid corrosion in aggressive media.

sensitometer An instrument used to measure the sensitivity of light-sensitive materials.

sensor The primary element of a measuring chain which converts the input variable into a signal suitable for measurement. Notes: **1.** The relationship between the input variable and the output signal of a sensor is fundamental and cannot be altered by external means other than physically or functionally modifying the device. **2.** Examples of sensors are the measuring junction of a thermocouple, the platinum wire of a platinum resistance thermometer element. See also (measuring) transducer.

sensor (numerical control) A unit which is actuated by a physical quantity and which gives a signal representing the value of that physical quantity.

sensory control (industrial robots) A control scheme where the robot motion or force is adjusted in accordance with outputs of external sensors.

sentinel **1.** A symbol marking the beginning or the end of some element of information such as a field, item, block, tape, etc. **2.** A tag or flag.

separable flange (valves) A removable flange which fits over a valve body flow connection. It is generally held in place by means of a retaining ring.

separately powered device (field bus) Device that does not receive its operating power via the field bus signal conductors.

separating control character One of a set of control characters used to delimit hierarchic units of data. The first separating character in a hierarchy might be used between words, paragraphs, or for nested brackets, etc.

separation circuit A circuit that separates signals according to their amplitude, frequency or some other selected characteristic.

separator (petroleum industry) A pressure vessel used for the purpose of separating well fluids into gaseous and liquid components. Separators segregate oil, gas, and water with the aid, at times, of chemical treatment and the application of heat.

separator-filter A piece of process equipment that removes solids and entrained liquid from a fluid stream by passing the fluid both through a set of baffles or a coalescer and through a screen.

separator gas Natural gas separated out of the oil by a separator at the well.

septic A condition produced by putrefaction, resulting from the absence of dissolved oxygen.

septic tank (water quality) Closed sedimentation tank in which settled sludge is in immediate contact with the waste water flowing through the tank, and the organic solids are decomposed by anaerobic bacterial action.

septum Dividing partition in a waveguide.

(to) sequence To place items in an arrangement in accordance with the order of the natural numbers.

sequence A series of items that have been sequenced.

sequence chain Sequence of alternating steps and transitions without divergence.

sequence check A check to determine whether items follow one another in a prescribed manner.

sequence circuit Circuit which establishes the order in which two or more phases of a cycle occur.

sequence control (numerical control) A system of control in which a series of machine movements occurs in a desired order, the completion of one movement initiating the next, and in which the extent of the movements is not specified by numerical input data.

sequence control register The computer register that keeps track of the location of the next instruction to be processed.

sequence monitor Computer monitoring of the step-by-step action that should be taken by the operator during a startup and/or shutdown of a power unit.

sequence selection divergence See beginning of sequence selection.

sequencer A mechanical or electronic device that may be set to initiate a series of events and to make the events follow in sequence.

sequence relay A relay which controls two or more sets of contacts in a predetermined sequence.

sequence selection convergence See sequence junction.

sequence switch The stage in an active file system which controls transmitted and received signals.

sequence timer A succession to time delay circuits arranged so that completion of the delay in one circuit initiates the delay in the following circuit.

sequence valve Valve in which, when the inlet pressure exceeds the preset value, the valve opens to permit flow through the outlet port. (The effective setting is not affected by the pressure on the outlet port.)

sequencing Ordering in a series or according to rank or time.

sequential Pertaining to a process in which all events occur one after the other, without any time lapse between them.

sequential access 1. Obtaining data from an input/output device in a serial manner only. **2.** See also serial access.

sequential-access memory, SAM 1. A serial-type memory in which words are selected in a fixed order. **2.** A method of information retrieval where the complete memory is scanned and each word is, in its turn, read out, worked on, then rewritten.

sequential circuit Switching system of which the value of the output variable at a specified instant depends on the values of the input variables at this instant and a finite number of preceding instants, as well as the initial state.

sequential computer A computer in which events occur in time sequence, with little or no simultaneity or overlap of events.

sequential control Type of control in which a sequential program is executed, the latter prescribing the actions on a system in a predetermined order, some actions depending on the execution of preceding ones or on the fulfillment of certain conditions.

sequential element A device having at least one output channel and one or more input channels, all characterized by discrete states, such that the state of each output channel is determined by the previous states of the input channels.

sequential events recording system, SERS A system which monitors bistable equipment operations and process status and records changes of state in the order of detected occurrences.

sequential function chart, SFC A graphical representation of a sequential program consisting of interconnected steps, actions and directed links with transition conditions.

sequential logic element See sequential element.

sequential logic function A logic function in which there exists at least one combination of input states for which there is more than one possible resulting combination of states at the outputs.

sequential memory The memory which stores events in the same order in which they were received by the system. The memory capacity can be expressed as the number of events or levels.

sequential processes (software) Processes that execute in such a manner that one must finish before the next begins. Contrast with concurrent processes.

sequential program A plan which prescribes the actions on a system in a predetermined order and in which some actions depend on the execution of preceding ones or on the fulfillment of certain conditions.

sequential programming The programming of a device by which only one arithmetical or logical operation can be executed at one time.

sequential relay A relay that controls two or more sets of contacts in a predetermined sequence.

sequential sampling Sampling inspection in which the decision to accept, reject or inspect another unit is made following the inspection of each unit.

sequential search, linear search A search in which a set of data is scanned in a sequential manner.

sequential timer A timer in which each interval is initiated by the completion of the preceding interval.

serial 1. Pertaining to a process in which all events occur one after the other. Example: The serial transmission of the bits of a character according to the V24 CCITT protocol.

serial access The capability to enter data into a storage device or a data medium in the same sequence as

the data are ordered, or to obtain data in the same order as they have been entered. Synonymous with sequential access.

serial addition Addition that is performed by adding, digit place after digit place, the corresponding digits of the operands.

serial arithmetic unit One in which the digits are operated on sequentially. See also parallel arithmetic unit.

serial bit Pertaining to computer storage in which the individual bits making up a word appear in time sequence.

serial communication A method of transmitting information between devices by sending all bits serially over a single communication channel.

serial computer 1. A computer having a single arithmetic and logic unit. **2.** A computer, some specified characteristic of which is serial, for example, a computer that manipulates all bits of a word serially. Contrast with parallel computer.

serial data Data transmitted sequentially, one bit at a time.

serial data transmission See serial transmission.

serial digital computer One in which the digits are handled serially. Mixed serial and parallel machines are frequently called serial or parallel, according to the way the arithmetic processes are performed.

serial identification A serial number or block number used with a part number to denote each unit (a lot has a quantity of several units) in a family of similar items. It provides for affectivity identification of design changes (SAMA).

serial interface A port that sends or receives the 8 bits in each byte one by one, much like the beads on a string. Printers that will be located far from the computer usually require a serial interface.

serial I/O A method of data transfer between a computer and a peripheral device in which data is transmitted for input to the computer (or output to the device) bit by bit over a single circuit.

serialize To convert from parallel-by-bit to serial-by-bit.

serializer See dynamicizer.

serial memory A memory whose information media is continuous. Data is identified by its content or form. Data may be obtained only by performing a serial search through the contents of the memory.

serial mode A type of computer operation that is performed bit by bit, generally with the least significant bit handled first. Reading and readout are accomplished bit after bit by shifting the binary data through the register.

serial number An integer denoting the position of an item in a sequence.

serial operation The flow of information through a computer in time sequence, usually by bit but sometimes by characters.

serial operation (telecommunication, data transmission) The flow of information in time sequence, using only one digit, word, line, or channel at a time.

serial-parallel Pertaining to processing that includes both serial and parallel processing, such as one that handles decimal digits serially but handles the bits that comprise a digit in parallel.

serial-parallel converter See staticizer.

serial printer, character printer See character printer.

serial processing Type of data processing within a digital computer whereby all programs are handled sequentially rather than simultaneously.

serial programming The programming of a computer by which only one arithmetical or logical operation can be executed at one time, e.g., a sequential operation.

serial storage Storage in which time is one of the coordinates used to locate any given bit, character, or (especially) word. Storage in which words appear one after the other in time sequence.

serial-to-parallel converter In PCM telemetry, the circuitry which converts a serial bit stream into bit-parallel data outputs, each transfer representing one measurement.

serial transmission The sequential transmission of a groups of bits constituting a character or other entity of data.

series A succession of quantities, each derived from the preceding amount or amounts according to some fixed law. The first and last terms of a series all called the extremes, and the intervening terms the means.

series cascade action A type of control-system interaction whereby the output of each controller in a series (except the last one) serves as an input signal to the next controller.

series circuit A circuit in which resistances or other components are connected end to end so that the same current flows throughout the circuit.

series excitation The field excitation obtained in a motor or generator by allowing the armature current to flow through the field winding.

series flow control valve (fluid power systems) Pressure-compensated flow control valve which regulates the flow passing through it, usually in one direction only.

series mode rejection The ability of a system or a device to suppress the effect of a series mode signal on its output.

series mode rejection ratio, SMRR The ratio of the value of the series mode signal causing a given change in the output information to that increment of the desired signal required to produce the same change in the output information. Notes: **1.** The series mode rejection ratio may be expressed as a ratio or in decibels as 20 times the log of that ratio. **2.** For example, in a dc signal system, the signal input of a device may be filtered for an ac mains frequency signal to a specified attenuation ratio.

series mode signal Unwanted differential signal across the input terminals of a system or device.

series mode voltage An unwanted part of the input voltage which is superimposed on the voltage initiated by the quantity to be measured. Note: Typical examples of a series mode voltage are induced voltages, e.g. an ac ripple on a dc signal, or thermopotentials.

series motor, series-wound motor A motor in which the field and armature circuits are connected in series. A series motor has a high starting torque, but its speed varies with the load.

series of standards, group standard See group standard.

series operation (stabilized supply apparatus) A mode of operation of stabilized supplies, in which the output terminals are connected in series, so that the output voltages of the supplies are additive.

series-parallel Same as serial-parallel.

series-parallel control A method of controlling motors wherein the motors or groups of them, may be connected successively in series and in parallel.

series-parallel starting The process of starting a motor by connecting it to the supply which the primary winding phase circuits initially in series, and changing them over to a parallel connection for running operation.

series ratio (fluid power systems) Number of identical devices mounted in series, which can be controlled by the output of a device.

series regulator A device that is placed in series with a source of power and is able to automatically vary its series resistance, thereby controlling the voltage or current output.

series resistance Any sum of resistances, installed in sequential order, within one circuit.

series resistor (electric instrument) A resistor that forms an essential part of the voltage circuit of an instrument and generally is used to adapt the instrument to operate on some designated voltage or voltages. The series resistor may be internal or external to the instrument.

series snubber Circuit elements, usually including a inductor, connected in series with a switching device to limit the rate of rise or fall of current through the device when switching on or off, respectively.

series winding In a motor or generator, a field winding that carries the same current as the armature.

series wound motor A commutator motor in which the field and armature circuits are in series.

serviceability performance, serviceability performance The ability of a service to be obtained within specified tolerances and other given conditions when requested by the user and continue to be provided for a requested duration.

server Dedicated computer or peripheral that provides a function to a network.

service 1. A set of functions offered to a user by an organization. **2.** In network architecture, the capabilities that a layer provides to the adjacent layer closer to the end user. Notes: **1.** The service in a given layer may depend upon services in layers closer to the physical media. **2.** See figure in ISO publication 2382-18 for example.

serviceability Those properties of an equipment design that facilitate service and repair in operation.

service bits (telecommunication) Those bits that are neither check nor information bits.

service corrosion (dry cell) The consumption of the negative electrode as a result of useful current delivered to the cell.

service factor For a facility such as a chemical processing plant or electric generating station, the proportion of time the facility is operating-actual operating time in hours divided by total elapsed time in hours, expressed as a percent.

service integrity The degree to which a service is provided without excessive impairments, once obtained.

service liability See product liability.

service life The period of time during which a device is expected to perform in a satisfactory manner.

service program (routine), utility program (routine) A computer program (A routine) in general support of the processes of a computer.

service rating The maximum voltage or current which a component is designed to carry continuously.

service regulator A pressure regulator in the air supply to a group of pneumatic instruments. The main regulator.

service request The appeal by a process or task for access to a system resource.

service reservoir (water quality) A storage unit for treated water in a distribution system.

service support performance The ability of an organization to provide a service and assist in its utilization.

service switch A switch for disconnecting the line voltage from the circuits it services.

service water General purpose water which may or may not have been treated for a variety of special purposes.

servo (a contraction of servomechanism) A transducer type in which the output of the transduction element is amplified and fed back so as to balance the forces applied to the sensing element or its displacements. The output is a function of the feedback signal.

servo amplifier A servo unit in which information from a synchro is amplified to control the speed and direction of the servomotor output.

servo beam balance See definition of servo manometer.

servo control (fluid power systems) Control method in which a signal representing the required state of the controlled element is compared with a signal representing the actual state. The controlling element takes up a position determined by the difference between these signals.

servo link A mechanical power amplifier which permits low strength signals to operate control mechanisms that require fairly large powers.

servo manometer A type of liquid head sensor that incorporates a servo system to convert a detected liquid pressure into a record or an indication of the liquid level.

servomechanism An automatic feedback control device in which the controlled variable is mechanical position or any of its time derivatives.

servomechanism (numerical control) A servo system in which the controlled variable is a mechanical position or any of its derivatives with respect to time.

servo motor The final controlling element in a servomechanism. It is the motor which receives the output from the amplifier elements and which drives the load.

servo potentiometer A potentiometer driven by a positional servomechanism.

servo stability (numerical control) The capability of a servo-system to restore the output value to its equilibrium value, without oscillation or with damped oscillation after this value has been disturbed.

servo-system, closed loop control system (numerical control) An automatic control system incorporating power amplification and feedback that causes the value of an output variable to correspond closely to the value of an input quantity.

servovalve An electrical-input, fluid-control valve.

(to) set, (to) bind (of a variable) To assign a value to a variable; in particular, to assign a value to a parameter.

set point 1. A signal representing the reference variable. **2.** An input variable which sets the desired value of the controlled variable.

set point command See set point.

set point control, SPC 1. A control technique in which the computer supplies a calculated setpoint to a conventional analog instrumentation control loop. **2.** See supervisory control.

set point generator A device which generates the set point to a controller as a function of time and/or another variable.

set-reset flip-flop A standard flip-flop except that if both the set and reset inputs are a 1 at the same time, the flip-flop will assume a prescribed state.

setting accuracy The ability to set a knob, switch or other adjustment to desired time delay, speed, light,

sound or other. Normally specified in percent of maximum or at set point.

settling solids (water quality) That portion of the initially suspended solids capable of being removed by sedimentation after a specified settling period under specified conditions.

settled sewage Sewage from which the gross solids and most of the settleable solids have been removed by settlement.

settling Partial or complete separation of heavy materials from lighter ones by gravity.

settling tank See sedimentation basin.

settling time (for step response) Time interval between the instant of a step change in one of the input variables and the instant, when the output variable does not deviate more than a specified tolerance (e.g. 5%) from its final steady-state value. Note **1.** Conventional values for tolerance are $\pm 2\%$ and $\pm 5\%$. Note **2.** For non-linear behavior, both magnitude and position of the input variable should be specified.

seven-segment display A display format consisting of seven bars so arranged that each digit from 0 to 9 can be displayed by energizing two or more bars.

severity levels Recommended severity levels for electrostatic discharge (ESD) test are given in IEC standard 801-2, Part 2: Electrostatic discharge requirements.

sewage The water-borne wastes of a community.

sewage effluent Treated sewage discharged from a sewage treatment works.

sewage fungus An adherent growth, consisting of communities of filamentous bacteria (for example *Sphaerotilus natans*) and fungi (for example *Fusarium aqueductum*) and other species, with protozoa, which may occur in sewage treatment plants or in streams as a result of the discharge of incompletely treated sewage, effluent or industrial waste water.

sexadecimal, hexadecimal 1. Characterized by a selection, choice or condition that has sixteen possible different values or states. **2.** Of a fixed radix numeration having a radix of sixteen.

SFA 3012 BASEFA Standard, Intrinsic Safety.

SFIT Swiss Federal Institute of Technology.

shade (textile term) A color produced by a dye or pigment mixture.

shading 1. Variations in brightness in a televised image because of local defects in the signal plate of a camera tube, arising from inadequate discharge. Corrected by injective waveforms in the output signal. **2.** The technique of varying the directivity of a transducer by controlling the amplitude and phase distribution over the active area of the transducer.

shadow column instrument An indicating instrument in which the indications are given by a shadow column on an illuminated scale which may be a part of the instrument or may be separate from it.

shadow memory Duplicate memory accessed by a special code.

shaft horsepower 1. The power output of an engine, turbine or motor. **2.** The power input to a pump or compressor.

shaft position encoder Also called converter or coder. An analog-to-digital converter which transduces a mechanical analog shaft rotation to an electrical digital representation.

shakedown test An equipment test carried out during the installation work.

shakeout Removing castings from their original/sand or other molds.

shale oil Oil obtained by treating the hydrocarbon kerogen found in certain kinds of shale deposits. When

the shale is heated, the resulting vapors are condensed and then treated in an involved process to form what is called shale oil or synthetic oil.

shannon, binary unit of information content A unit of logarithmic measure of information equal to the decision content of a set of two mutually exclusive events expressed as a logarithm to base two.

Shannon's law Law defining the maximum information carrying capacity of a transmission line.

shaping pulse The intentional processing of a pulse waveform to cause deviation form a reference waveform.

shareable program A (reentrant) program that can be used by several users at the same time.

shared-logic word processing (computer applications) Word processing performed on a system composed of multiple work stations that share the logic and storage sections of a single central processor.

shared time control Control in which one controller divides its computation or control time among several control loops rather than by acting on all loops simultaneously.

sharp-edged weirs The sharp-edged weir is a simple means of measuring liquid flow in open channels. It does, however, require a stilling chamber or weir box on the upstream side. In addition, if the liquid carries entrained solids, they will accumulate in the stilling section and must be removed periodically or the accuracy will be affected.

shear modulus For measurement of shear modulus in SI units see under pascal.

shear stability (of a fluid) Ability of a fluid to maintain its properties under operating conditions with respect to its viscosity.

shear stress For measurement of shear stress in SI units see under pascal.

shear test Any of various tests intended to measure the shear strength of a solid.

shear viscometer Viscometer that measures viscosity of a non-Newtonian fluid at several different shear rates. Viscosity is extrapolated to zero shear rate by connecting the measured points and extending curve to zero shear rate.

sheathed thermocouple A sheathed thermocouple is a thermocouple having its thermoelements, and sometimes its measuring junction, embedded in mineral oxide insulation compacted within a metal protecting tube. Sheathed thermocouples are used in many industrial applications, particularly in which adverse environmental conditions may affect the thermocouple wires.

shed The process of eliminating one device's influence (i.e., load or control) over another device, usually to achieve more limited but more predictable operation.

shelf A structure (with open top) designed to house specific types of instruments, and which usually provides for the partial removal of an instrument while operating. Also, complete removal using quick disconnecting devices is usually provided.

shelf aging The change with time of the properties of a stored component or material.

shelf mounted instrument An instrument with provisions for quick disconnection which is designed for mounting in a shelf.

shell – and tube heat exchanger A common type of industrial heat exchanger with a bundle of small-diameter pipes (tubes) inside a long, cylindrical steel shell. The space inside the shell not filled with tubes carries the cooling water or other liquid. The liquid to be cooled is pumped through the tubes. Heat exchangers

act not only as a cooling apparatus but are often used as a waste heat recovery system. Heat normally lost to a cooling medium can be used to heat a process stream.

shell still The oldest and simplest form of a distillation still; a closed vessel in which crude oil is heated and the resulting vapors conducted away to be condensed into a liquid product.

sheltered location (Class C, IEC 654-1) A location where neither air temperature nor humidity are controlled. The equipment is protected against direct exposure to sunlight, rain or other precipitation and full wind pressure.

shielded cable 1. A single – or multiple – conductor cable surrounded by a separate conductor (the shield) intended to minimize the effects of adjacent electrical circuits. **2.** A cable in which each insulated conductor is enclosed in a conducting envelope so constructed that substantially every point of the surface of the insulation is at ground potential with respect to ground under normal operating conditions.

shielded enclosure A screened or solid metal housing designed expressly for the purpose of isolating the internal from the external electromagnetic environment. The purpose is to prevent outside electromagnetic fields from causing performance degradation and to prevent emission from causing interference to outside activities.

shielded room An enclosed area made free from electrical interference that would affect the sensitivity of electrical equipment.

shielded wire An insulated wire covered with a metal shield, usually of tinned, braided copper wire.

shielding 1. A method of preventing interaction between circuits by surrounding the circuits with metal plates. **2.** See shielded cable.

shield percentage Also called shield coverage. The physical area of a circuit or cable actually covered by shielding material, expressed in percent.

shift The movements of some or all of the characters of a word each by the same number of character places in the direction of a specified end of the word.

shift character In telecommunications, a control character that determines the alphabetic/numeric shift of character codes in a message.

shift register A register in which shifts are performed.

shives Fiber bundles present in pulp or paper which derive from incomplete fiber separation during the pulping process.

shock 1. A sudden non-periodic motion caused by a blow, impact, collision, concussion or violent shake or jar. Note: There are two methods used to quantify and measure shock. The first is to specify a value of acceleration or deceleration together with its duration. The second method is to specify a height of free fall onto a specified flat surface. **2.** IEC publication 654-3, Part 3 considers the specific operating conditions of vibration, shock, seismic and mechanical stress conditions to which land-based, and off shore, industrial-process measurement and control systems may be exposed during operation, storage or transportation.

shock pressure Pressure existing in a shock wave.

shockproof electric apparatus Electric apparatus designed to withstand, to a specified degree, shock of specified severity.

shock test (mechanical) A test to determine the ability of a device to withstand suddenly applied forces of specified magnitude and duration.

shock wave An extremely thin wave in an elastic or compressible medium characterized by a sharp wave

front and high intensity; it is typically generated by supersonic flow in a fluid, an explosion, a sudden intense pressure transient, or a sharp intense blow on the surface of an elastic solid.

shop instruments Instrument and meters that are used in regular routine shop or field operations.

short contact switch A selector switch in which the movable contact is wider than the distance between its clips, so that the new circuit is made before the old one is broken.

shorting switch A switch type in which contact is made for a new position before breaking contact with the previous position. Classified as a make-before-break switch.

SHORT MIX Name of process by Alfa-Laval for alkaline refining of fat.

shotgun tank A tall, slender tank for separating water and sediment from crude oil.

shredder A machine for the dry shredding of pulp; see fluff.

shrinkage Contraction of a metal or plastics material upon cooling, or in the case of plastics, upon curing (polymerization).

shrinkage (of a sheet of paper or board) Relative reduction in the dimensions of a sheet of paper or board in the machine direction or the cross direction, normally during drying.

shroud A machine element used chiefly as a protective covering over other elements, especially in a rotating assembly.

shrouded vane anemometer A device for measurement of air flow, normally employed as a hand-held device.

shunt 1. To divert all or part of a process flow away from the main stream and into a secondary operation, holding area or bypass. **2.** A register connected in parallel with the current circuit of a measuring instrument in order to reduce, by a known ratio, the current passing through it.

shunt regulator (power supplies) A device placed across the output of a regulated power supply to control the current through a series-dropping resistance in order to maintain a constant output voltage or current.

shunt valve A valve that allows a fluid under pressure to escape into a passage that is of lower pressure or can accommodate higher flow rates than the normal passage.

shunt-wound motor A direct current motor which has its field (stationary member) and armature (rotating member) circuit connected in parallel. Its speed can be regulated by varying either the applied armature or field voltage.

shut-down circuit An electronic, electrical, hydraulic or pneumatic circuit that provides controlled steps for turning off or closing down process equipment; it is usually designed for automatically sequence shut-down actions and prevent equipment damage due to performing them out of sequence; it may be used for normal or emergency situations.

shutoff head The pressure developed by a centrifugal or axial-flow pump at its discharge when the discharge flow is zero.

shuttle (textile term) A boat-shaped device that carries filling yarns across the width of the fabric in the weaving process.

shuttle valve (fluid power systems) Valve with two inlets and a common outlet. The outlet is automatically connected to one or other of the inlets by the action of the inlet pressures.

Si Chemical symbol for silicon.

SI See International System of Units.

sideband (data transmission) A band of frequencies containing components of either the sum (upper sideband) or difference (lower sideband) of the carrier and modulation frequencies.

sideband The frequency band on either the upper or lower side of the carrier frequency.

side contraction This term is used in two different ways: **a.** The reduction in the width of the nappe down-stream of a thin-plate weir due to the inward velocity component at the sides. **b.** The local reduction in the width of an open channel in a standing wave flume. See figure in ISO publication 772-1978. Pertains to liquid flow measurement in open channels.

side effect (software) Any external effect caused by the execution of a function procedure other than that of yielding the result value.

side frequency A single frequency in the sideband.

side-mounted handwheel See handwheel operators.

side rake The angle between a reference plane and the tool face of a single-point turning tool.

side relief angle In a cutting tool, the angle between a plane normal to the base and the flanks of the tool below the cutting edge.

siderite A mineral. Contains variable amounts of calcium, magnesium or manganese. The siderite ores are sometimes termed "spathic iron ore" or "black-band ore". Carbonate ores are commonly calcined before they are charged into the blast furnace.

side-scan sonar An electronic device that transmits high-frequency sound waves through water and records the vibrations reflected back from an object on the seafloor. Side-scan sonar is used to map the ocean floor; to discover the mounds, escarpments, or other obstructions when an undersea pipeline is to be built or a drilling/production platform is to be set.

side slope The tangent of the angle which the side of the open channel makes with either the horizontal or the vertical, which should be stated. The tangent of the angle may also be expressed as the ratio of the horizontal and vertical components of the slope, taking either of them as unity; the component taken as unity should be stated. The side slope may also be expressed as a percentage. Pertains to liquid flow measurement in open channels.

siemens, S International standard unit (SI unit) of conductance which replaces and is identical with the term "mho". The reciprocal of resistance in ohms.

sieve diameter The length of the side of the smallest square opening through which the particles will just pass.

sight glass A glass tube in which the height of a liquid in a tank or pressure vessel may be observed.

sighting tube A tube, usually made of a ceramic material, that is used primarily for directing the line of sight for an optical pyrometer into a hot chamber.

sigma phase A brittle, nonmagnetic, intermetallic compound generally formed between iron and chromium during long periods of exposure at 1 050 to 1 800°F.

sign 1. In arithmetic, a symbol which distinguishes negative quantities from positive ones. **2.** An indication of whether a quantity is greater than zero or less than zero. The signs often are the marks, + and -, respectively, but other arbitrarily selected symbols may be used, such as 0 and 1, or 0 and 9; when used as codes at a predetermined location, they can be interpreted by a person or machine.

signal 1. In process instrumentation, physical variable, one or more parameters of which carry information

about another variable (which the signal represents).
2. In communications, a designed or intentional disturbance in a communication system. Contrast with noise.

signal amplitude sequencing control (split-ranging) Actions in which two or more output signals are generated according to different functions by one input signal. Note: A special type of split ranging is the so-called signal amplitude sequencing, where the output signals are responding consecutively with or without overlap to the magnitude of the input signal. See figure in IEC publication 902, 1987.

signal attenuation The reduction in the strength of electrical signals.

signal booster relay A pneumatic relay that is used to reduce the time lag in pneumatic circuits by reproducing pneumatic signals with high volume and/or high pressure output. These relays may be either volume boosters, amplifying or a combination of both.

signal characterizer A device the output variable of which is related to its input variable by a predetermined functional relationship. Note: In analog simulation terminology this device is commonly called a function generator. The use of the word generator should be avoided for this device.

signal circuit common, signal common A number of "signal" circuits may have a common direct electrical connection. This is the "signal" circuit common, which may, or may not, be connected to earth.

signal conditioning To process the form or mode of a signal so as to make it intelligible to or compatible with a given device, including such manipulation as pulse shaping, pulse clipping, digitizing, and linearizing.

signal converter A specialized transmitter which converts one standardized transmission signal to another. Examples: P/I, I/P, V/I, I/V, V/P, P/V, I/I, P: pressure, I: current, V: voltage. Note: Standardized signals are 4–20 mA, 20–100 kPa, 0–10 V.

signal converter, signal transducer A transducer which converts one standardized transmission signal to another.

signal delay The transmission time of a signal through a network. The time is always finite, may be undesired, or may be purposely introduced.

signal distance The path length which a signal is required to traverse.

signal filtering The shaping of amplitude or phase characteristics with respect to frequency, for the purpose of meeting an operational requirement. This usually is accomplished by analog methods.

signal generator (for measuring purposes) A source of electrical signals, whose characteristics (waveform, frequency, voltage etc.) can be fixed or controlled within specified limits.

signal ground The ground return for low-level signals such as inputs to audio amplifiers or other circuits that are susceptible to coupling through ground-loop currents.

signal intelligence A generic term which includes both communications intelligence and electronics intelligence.

signal isolation The absence of interference between the signal circuits and all other circuits and earth. Note: The interference can be electrical, electromagnetic, capacitive, etc. depending on the nature of the signal.

signalizing Perceptible presentation of a binary signal.

signal level 1. The difference between the measure of the signal at any point in a transmission system,

and the measure of an arbitrary reference signal.
2. The magnitude of signal compared to an arbitrary reference magnitude.

signal line One of a set of signal conductors in an interface system used to transfer messages among interconnected devices.

signal parameter That parameter of an electrical quantity whose values or sequence of values convey information.

signal power An expression of absolute signal strength at a specific point in a circuit.

signal processing The processing of the information contained in a signal by modulating, demodulating, mixing, gating, computing or filtering.

signal processing function Pertaining to programmable controller systems, the signal processing function consists of the application program storage, the data storage, the operating system, the execution of the application program functions. It processes signals obtained from sensors as well as internal data storage in accordance with the application program.

signal purity (network analyzers) A measure of freedom from frequency components other than the desired measurement frequency. It includes harmonics, subharmonics, spurious mixer products, and unwanted components of signal or local oscillator leakage. Note: The resulting error in measurement is a function of the detection system and of the frequency response of the network under test, as well as the signal purity.

signal regeneration Signal transformation that restores a signal so that it conforms to its original characteristics.

signal selector A device which selects the desired signal from among two or more input signals.

signal-separation filter A bandpass filter which selects the desired signal or channel from a composite signal.

signal shaping, signal transformation The action of modifying one or more characteristics of a signal, such as its maximum value, shape or timing.

signal-shield ground A ground technique for all shields used for the protection from stray pickup of leads carrying low-level, low-frequency signals.

signal simulator A hardware device that generates a signal similar in most respects to actual data from a test vehicle.

signal-to-noise ratio Ratio of signal amplitude to noise amplitude. Note: For sinusoidal signals, amplitude may be peak or rms. For non-sinusoidal signals, peak values should be used.

signal tracing The process of locating a fault in a circuit by injecting a test signal at the input and checking each stage, usually from the output backwards.

signal transformation, signal shaping See signal shaping.

signal transformer The signal transformer is an electric amplifier. Its input is connected to the output of the light receiver. Its output triggers measuring, display, control or switching devices. Pertains to photoelectric and proximity switches.

signal voltage The effective (root-mean-square) voltage value of a signal.

signal wave A wave whose shape conveys some intelligence, message or effect.

signal winding (saturable reactor) Also called an output winding. In a saturable reactor, the control winding to which the independent variable (signal wave) is applied.

signature analysis A means of isolating digital logic faults at the component level. Basically, the technique involves the tracing of signals and the conversion of length bit streams into four-digit hexadecimal "signatures". Using logic diagrams and schematics specially annotated with correct signatures at each data node, and guided by troubleshooting trees, the serviceman traces back until he finds a section of the circuit which has a correct input signature and incorrect output signature.

signature curve For a process, the transient-response curve of the variable after a step-change in the position of the final control element. This curve is obtained with the controller disconnected, and shows the response of the process as part of the control loop. Also called the process signature curve and the process reaction curve.

sign bit A single bit, usually the most significant bit in a word, which is used to designate the algebraic sign of the information contained in the remainder of the word.

sign character A character that occupies a sign position and indicates the algebraic sign of the number represented by the numeral with which it is associated.

significance, weight Of a digit place in a positional representation, the factor by which the value represented by a character in the digit place is multiplied to obtain its additive contribution in the representation of a real number.

significant digit In a numeral, a digit that is needed for a given purpose. In particular, a digit that must be kept to preserve a given accuracy or a given precision.

signum A function equal to -1 for all negative values of the independent variable, $+1$ for all positive values and 0 for the zero value.

silencer A large cylindrical vessel constructed with an arrangement of baffles, ports and acoustical grids to muffle the exhaust noises of stationary engines. Also used under certain flow conditions to reduce noise from liquids or gases passing through control valves.

silica Silica is a fairly stable dioxide of the element silicon, SiO_2 . It occurs in quartz, sand, diatomite, chert, and flint. When combined in silicates, it forms an essential part of many minerals.

silicon 1. A metallic element often mixed with iron or steel during smelting to provide desirable magnetic properties for transformer-core materials. In its pure state, it is used as a semiconductor. **2.** A brittle, gray, crystalline chemical element which, in its pure state, serves as a semiconductor substrate in microelectronics. It is naturally found in compounds, such as silicon dioxide.

silicon bronze A corrosion-resistant alloy of copper and 1 to 5% silicon that has good mechanical properties.

silicon cell A solid-state device, composed of silicon, that is used to convert radiation into electrical energy.

silicon controlled rectifier See SCR.

silicon controlled switch, SCS A four-terminal pnpn semiconductor switching device; it can be triggered into conduction by the application of either a positive or negative pulse.

silicon detector, silicon diode A crystal diode that uses a crystalline silicon. Also called silicon detector.

silicon dioxide 1. A compound that results from oxidizing silicon quartz. **2.** An abundant material found in the form of quartz and agate and as one of the major constituents of sand.

silicon double-base diode See unijunction transistor.

silicone fluid Fluid composed of silicones. It may contain other constituents.

silicones A family of synthetic materials consisting of silicon and oxygen, usually with associated carbon atoms. They generally have a low vapor pressure and withstand extremely high temperatures.

silicon monoxide A dielectric material often used in the fabrication of a microelectronic device to form an insulator, substrate or thin-film capacitor dielectric.

silicon nitride A compound that is deposited on the surface of a silicon monolithic integrated circuit to improve the stability of the integrated circuit.

silicon oil A generic term for a family of relatively inert liquid organosiloxane polymers used as electrical insulation.

silicon oxide A dielectric material commonly used in the surface passivation of microelectronic circuits.

silicon rectifier 1. One or more silicon rectifying cells or cell assemblies. **2.** Semiconductor diode that converts alternating current to direct current and which can be designed to withstand large currents and high voltages.

silicon rubber seal Polysiloxanes having inorganic molecular chains with attached organic groupings. They are outstanding amongst rubbers in their retention of rubber-like properties over a very wide temperature range.

silicon steel Steel containing 3 percent to 5 percent silicon. Its magnetic qualities makes it desirable for use in the iron cores of transformers and in other ac devices.

silicon symmetrical switch A thyristor modified by the addition of a semiconductor layer to make the device into a bidirectional switch. It is used as an ac phase control for synchronous switching and control of motor speed.

silicon transistor One formed from a silicon crystal, sometimes specified in preference to germanium because of its higher temperature stability.

silicon unijunction transistor See unijunction transistor.

Silicon Valley The area around Sunnyvale, California, where most of the American semiconductor manufacturers are located. Also called Silicon Gulch.

silk-covered wire A wire covered with one or more layers of fine floss silk. It is a better insulator than cotton. Also, it is more moisture-resistant and permits more turns of wire within a given space.

silk-covered wire A wire covered with one or more layers of fine floss silk. It is a better insulator than cotton. Also, it is more moisture-resistant and permits more turns of wire within a given space.

silting (fluid power systems) Accumulation of fine particles at a specific location in a fluid system.

siltometer An instrument that separates into different sizes the particles of a sample of sediment, either by deposition through a water column or by means of an air current and measures the volume or mass of the different grades thus separated.

silver storage battery An alkaline storage battery in which the positive active material is silver oxide and the negative contains zinc.

SIMA Scientific Instrument Manufacturer's Association of Great Britain.

similitude Resembling something else – for example, a process that has been scaled up from a laboratory or pilot plant operation to commercial size.

simmer Simmer is the audible or visible escape of fluid between the seat and disk at an inlet static pressure below the popping pressure and at no measurable

capacity. It applies to safety or safety relief valves on compressible fluid service.

simple harmonic current Also called sinusoidal current. A symmetrical alternating current, the instantaneous value of which is equal to the product of a constant and the sine or cosine of an angle having a value varying linearly with time.

simple sound source A source that radiates sound uniformly in all directions under free-field conditions.

simple tone A sound wave, the instantaneous sound pressure of which is a simple sinusoidal function of time.

simplex channel (data transmission) A path for electrical transmission of information in one direction between two or more terminals.

simplex circuit (data transmission) A circuit derived from a pair of wires by using the wires in parallel with ground return.

simplex mode Operation of communication channel in one direction only with no capability for reversing.

simplex modem A two-wire modem that can transmit in only one direction.

simplex modem with backward channel Two-wire modem that can transmit simultaneously in both directions, with the primary direction being reasonably high speed and the secondary (or backward) direction being rather low speed.

simplex transmission Data transmission over a data circuit in one pre-assigned direction only.

SIMSCRIPT A generic class of discrete, event-oriented simulation languages.

simulate To represent certain features of the behavior of a physical or abstract system by the behavior of another system.

simulation The representation of selected characteristics of the behavior of one physical or abstract system by another system. In a digital computer system, simulation is done by software.

simulation (mathematical) The use of a model of mathematical equations generally solved by computers to represent an actual or proposed system.

simulator program A program that causes one computer to imitate the logical operation of another computer for purposes of measurement and evaluation.

simultaneous In a process, pertaining to two or more events that occur within the same interval of time, each event handled by a separate functional unit.

simultaneous access The process of taking information from or placing information into computer storage where the time required for such access depends on simultaneously transferring all elements of a word from a given storage location. Also called parallel access.

simultaneous sequence convergence See sequence joining.

simultaneous sequence divergence See sequence forking.

simultaneous sequences, parallel mode (in switching systems) When the clearing of a transition leads to the activation of several sequences at the same time, these sequences are called simultaneous sequences.

simultaneous transmission Transmission of control characters or data in one direction while information is being received in the other direction.

sine potentiometer A dc voltage divider (potentiometer), the output of which is proportionate to the sine of the shaft-angle position.

sine wave A wave that can be expressed as the sine of a linear function of time, or space, or both.

singeing (textile term) A continuous process for the burning off of surface fibers in order to prepare a smooth ground for printing or whenever the smoothest fabric is desired.

singing point (data transmission) For a circuit which is coupled back to itself, the point at which the gain is just sufficient to make the circuit break into oscillation.

single acting An actuator in which the power supply acts in only one direction. In a spring and diaphragm actuator, for example, the spring acts in a direction opposite to the diaphragm thrust. Single acting spring and diaphragm actuators may be further classified as to direction of stem movement on increasing fluid pressure: **a.** air to extend actuator stem, **b.** air to retract actuator stem.

single-acting cylinder (fluid power systems) Cylinder in which displacement in one direction is by fluid force and in the other by another force.

single-acting positioner A positioner is single acting if it has a single output.

single-acting solenoid Electro-magnetic mechanism which can take up two positions, being operated by one extreme position by energizing the coil.

single-acting, spring return cylinder (fluid power systems) Single-acting cylinder returned by gravity.

single address Same as one-address.

single block mode of operation (numerical control) The mode of operation of a numerically controlled machine in which, at the initiation of the operator, it operates in automatic mode of operation for one block of control data only.

single-board microcomputer, monoboard microcomputer A single printed-circuit board containing, as a minimum, processor, memory (ROM and/or RAM) and input/output, usually a combination of serial and parallel ports. May also include a counter/timer function and bus interconnection scheme.

single cascade action A type of control-system action whereby the input to the second of two automatic controllers is supplied by the first.

single density A computer diskette that can store approximately 3,400 bits per inch.

single-ended input (output), earthed input (output), grounded input (output) An input (output) circuit in which one input (output) terminal is directly connected to measuring earth. In many cases, this is the common point terminal.

single flange (lugged) A thin annular section body whose end surfaces mount between the pipeline flanges, or may be attached to the end of a pipeline without any additional flange or retaining parts, using either thru bolting and/or tapped holes.

single-floating action Floating action in which the rate of change of the output variable has only the absolute value.

single function (measuring) instrument A measuring instrument intended for the measurement of one kind of quantity only.

single ground See uniground.

single hardening (heat treatment) Hardening after e.g. carburizing, comprising intermediate cooling and quenching from a temperature matching the properties of the outer layers; see double hardening.

single length Relates to the representation of numbers in binary form so that the values of the numbers can be contained in a single word.

single-line representation Representation wherein two or more connections are represented by a single

line. Pertains to methods of the representation of components and connections in diagrams.

single-loop feedback A loop in which feedback may occur only through one electrical path.

single-loop standby A device that allows the operator to assume manual control of a specific loop, thereby providing a hard manual output that bypasses the Basic Controller. Refers to Honeywell TDC 3000 control systems.

single-mode fiber (optical communication) An optical fiber in which the radiation of only one bound mode can propagate at the wavelength of interest.

single-operand instruction An instruction containing a reference to one register, memory location or device.

single-phase circuit Either an alternating-current circuit with only two points of entry, or one with more than two points of entry but energized in such a way that the potential differences between all pairs of points of entry are either in phase or 180° out of phase. A single-phase circuit with only two points of entry is called a single-phase, two-wire circuit.

single-point grounding A grounding system that attempts to confine all return currents to a network which serves as the circuit reference. It does not imply that the grounding system is limited to one earth connection. To be effective, no appreciable current is allowed to flow in the circuit reference; i.e., the sum of the above return currents is zero.

single-polarity pulse A pulse which departs from normal in one direction only.

single pole A switch, relay, etc. in which connections to only one circuit can be made. A single pole-single-way switch is a simple on-off switch.

single-pole, double-throw, SPDT A three-terminal switch or relay contact for connecting one terminal to either of two terminals.

single-pole, single-throw, SPST 1. A two-terminal switch or relay contact which either opens or closes one circuit. **2.** A switch with only one moving and one stationary contact. Available either normally open (no) or normally closed (nc).

single precision (mathematics of computing) Characterized by the use of one computer word to represent a number in accordance with the required precision.

single pulse (thyristor) A gate signal applied at the commencement of the conducting interval in the form of a single pulse of predetermined duration, amplitude, and frequency.

single rail The method of data transfer in a computer on only one line or wire. The device at the destination must be able to handle the data in either the high-level or low-level value. The return path is by way of common or ground.

single range (measuring) instrument A measuring instrument having only one measuring range.

single sampling A type of inspection where an entire lot or production run (population) is accepted or rejected based on results of inspecting a single group of items (sample) selected from the population.

single-seat trunnion supported ball valves This type of design provides a rigid drive to position the ball for fine throttling and in this respect gives better performance than the floating ball which has a loose fitting tang driving the ball. Balls may be faced with replaceable caps which cover the surface which comes into contact with the seat ring. This permits replacement of the ball wear surfaces, which is important if the valve is exposed to an erosive substance.

single sequence (in switching systems) A single sequence is made up of a series of steps which will be activated one after another.

single-sheet galvanizing process Refers to hot-dip galvanizing of cut-length sheets by passing them one by one in close succession through the molten zinc. Compare continuous hot dip galvanizing process.

single-sideband transmission (data transmission) The method of operation in which one sideband is transmitted and the other sideband is suppressed. The carrier wave may be either transmitted or suppressed.

single-speed floating controller A floating controller in which the output changes at a fixed rate increasing or decreasing depending on the sign of the actuating error signal. See floating controller. Note: A neutral zone of values of the actuating error signal in which no action occurs may be used.

single-stage bleaching Bleaching carried out in a single bleaching stage.

single-stage compressor A machine that raises pressure in a compressible fluid in a single pass through a single set of machine elements.

single-stream batch A method of batch processing in which only one stream of batch commands is processed.

single-sweep operation (oscilloscopes) The operation of a time base so that one sweep only is triggered. Further sweeps are prevented until time base has been externally reset.

single-throw A contact arrangement in which each contact form included is a single contact pair.

single-throw switch A switch in which only one set of contacts need to be moved to open or close the circuit.

single-wire line A transmission line that utilizes the ground as one side of the circuit.

sink In communication practice: **1.** A device which drains off energy from a system. **2.** A place where energy from several sources is collected or drained away. **3.** Anything into which power of some kind is dissipated.

sink mode output A mode of operation of solid state output devices in which the device controls the current from the load, i.e. when the output is energized it connects the load to the negative polarity of the supply.

sinter A ceramic material or mixture fired so that it is not completely fused but in a coherent mass.

sintered arrester Type of flame arrester.

sintering The process in which metals or other powders are bonded by cold-pressing them into the desired shape and then heating them so that a strong, cohesive body is formed.

sintering (for blast furnace charging) Sintering has been referred to as the art of burning a fuel mixed with ore under controlled conditions. The flexibility of the process permits conversion of a variety of materials including naturally fine ores and ore fines from screening operations, flue dust, ore concentrates, and other iron-bearing materials of small particle size into a clinker-like aggregate that is well suited for use in the blast furnace.

sinusoid A curve having ordinates proportional to the sine of the abscissa.

sinusoidal Varying in proportion to the sine of an angle or time function (e.g., ordinary alternating current).

sinusoidal (sine-force) response The forced response due to a sinusoidal stimulus. Note: A set of

steady-state sinusoidal responses for sinusoidal inputs at different frequencies is called the frequency-response characteristic.

sinusoidal current See simple harmonic current.

sinusoidal electromagnetic wave In a homogeneous medium, a wave with an electric field strength proportionate to the sine (or cosine) of an angle that is a linear function of time, distance or both.

sinusoidal wave A wave the displacement of which varies as the sine (or cosine) of an angle that is proportional to time, distance or both.

siphon A tube, hose or pipe for moving liquid from a higher to a lower elevation by a combination of gravity acting on liquid in the longer leg at atmospheric pressure acting to keep the shorter leg filled.

SIRA 1. Scientific Instrument Research Association.
2. Safety Investigation Regulations.

SI system International System of Units.

site address Addresses contained by polling messages which identify the terminal being addressed. Also called station address.

six-stand continuous mill (in steel production) A type of rolling mill.

size preparation room A department for the preparation of size, normally rosin size. Pertains to the pulp and paper industry.

size press A roll press in which the web is given a coating of size, coating slip or other material. The size press is placed in the drying section of the paper machine.

size press coating The coating of a web in a size press.

sizing (in the paper industry) Addition of size either to the stock (stock sizing) or to the surface (surface sizing) of paper or board.

sizing (software) The process of estimating the amount of computer storage or the number of source lines that will be required for a system or a system component.

SJIB Scottish Joint Industry Board for the Electrical Contracting Industry.

skeletal code A set of instructions in which some parts such as addresses must be completed or specified in detail each time the set is used.

skew The angular or longitudinal deviation of a tape row from a specified reference.

skewing Time delay or offset between any two signals in relation to each other.

skew ray (optical communication) A ray that does not intersect the fiber axis of an optical fiber.

skinner A wire brought out at the end of a cable prepared for soldering to a terminal.

skinning Peeling the insulation from a wire.

skip (computing systems) An instruction to proceed to the next instruction; a blank instruction.

skip instruction Same as skip and NO-OP instruction.

slab (in steel production) See bloom.

slabbing or blooming mills (in steel production) See blooming and slabbing mills.

slab interferometry (fiber optics) The method for measuring the index profile of an optical fiber by preparing a thin sample that has its faces perpendicular to the axis of the fiber, and measuring its index profile by interferometry.

slab line (waveguide) A uniform transmission line consisting of a round conductor between two extended parallel conducting surfaces, so that the propagating wave is essentially confined between the surfaces.

slab press A batchwise press which compresses flash dried pulp into rectangular slabs. A number of such sl-

abs – normally 3 to 7-stacked together form the contents of a bale of flash dried pulp.

slag Slag is the name applied to the fusible material formed by the chemical reaction of a flux with the gangue of an ore, with the ash from a fuel, or with the impurities oxidized during the refining of a metal. Each of the primary metallurgical processes in the production of iron and steel also results in the production of a slag.

slasher A machine used to apply size to warp yarns prior to weaving.

slave A unit of electronic gear under the control of signals from the master equipment.

slave station A station that is selected by a master station to receive data.

slave tracking operation (stabilized supply apparatus) An interconnection of stabilized supplies (having one or more output terminal(s) in common), the slave supplies having their output always held equal or proportional to the output of the "master" supply.

sleeve valves The sleeve valve design has a slotted tube with the slots divided by a bridgwall across the flow axis. Flow must pass outside of the tube, around the bridgwall and into the tube again. A sleeve type diaphragm, the only moving part, seals the slots until upstream line pressure exceeds control pressure in the annular cavity surrounding the outside of the sleeve.

slew Rapid movement of paper in a printer, ignoring the normal line advance.

slewing rate (thyristor) A rate at which the output changes in response to a step change in control signal input.

slice 1. That part of a waveform lying inside two given amplitude limits on the same side of the zero axis.

2. The part of the head box which regulates the flow of the stock onto the wire. Pertains to the pulp and paper industry.

slide valve (fluid power systems) Valve in which the flow paths are connected or isolated by means of a movable sliding member. The movement may be axial, rotary or both.

slide wire A bare resistance wire and a slider that can be set anywhere along the wire to provide a continuously variable resistance.

sliding gate valves A typical sliding gate valve design consists of a two piece housing, clamping a stationary gate that serves as a valve seat. Another "slideable" seal, pressed against the seat by the upstream fluid pressure, serves to adjust the flow rate by gradually uncovering the stationary slots in the seat ring gate.

sliding plate viscometer A viscometer based on the principle of the shearing of a sample of fluid between two parallel plates under the action of a constant shearing stress.

sliding seal Sealing device used between parts that have relative reciprocating motion.

sliding-vane rotary flowmeter A type of positive-displacement flowmeter in which radial vanes slide in or out to trap and release discrete volumes of the metered fluid as a rotor containing the vanes revolves about a central cam surface which controls vane position.

slime 1. In paper mills, a mucous deposit on surfaces in contact with stock or white water produced by the action of bacteria, fungi or algae. Slime normally contains fibers, particles of dirt etc. **2.** A mudlike deposit in the bottom of a chemical process or electroplating tank.

sling psychrometer A device for determining relative humidity that consists of a wet-and-dry bulb ther-

mometer mounted in a frame that can be whirled about.

slip 1. A pigment suspension. **2.** A term commonly used to express leakage in positive-displacement flowmeters. **3.** The difference between the synchronous speed of a motor and the speed at which it operates.

slip-in liner (butterfly valves) An annular shaped liner which makes a slight interference fit with the body bore and which may be readily forced into position through the body end. May be plain or reinforced.

slip ring A device for making electrical connections between stationary and rotating contacts.

slip seal A seal between members designed to permit movement of either member by slipping or sliding.

slitter and cutter section The final section of a wet machine or a pulp-drying machine where the web is cut into sheets which are collected into piles and subsequently formed into bales.

slitting Dividing a web in the machine direction into several narrower webs. Pertains to the pulp and paper industry.

slope area method A method of discharge determination in a reach, based on the surface slope and the wetted areas of the various cross sections in the reach. Pertains to measurement of liquid flow in open channels.

slope stage – discharge relation See fall stage – discharge relation.

slot 1. One of eight user-accessible processing blocks within the Basic Controller. Refers to Honeywell TDC 3000 control systems. **2.** The physical area, usually including a connector and edge guides where an electronic board is held. Refers to Honeywell TDC 3000 control systems.

slot (in artificial intelligence) A frame component used to store features such as object names, specific attributes called facets, values and pointers to other frames.

slot oven See by-product coke ovens.

slot selector Push buttons on a Data Entry Panel or keys on an Operator Station's Keyboard that are used to select information from a computational slot in a Basic Controller or position in a group for display. Refers to Honeywell TDC 3000 control systems.

sloughing (water quality) The continuous release of zoogeal film material from the supporting medium of a biological filter, in the form of humus sludge.

slow memory See slow storage.

slow-release relay, slow-releasing relay A slow acting relay in which a copper slug, or collar, at the heelpiece end of the core delays the restoration momentarily after the operating circuit is opened. Such a relay is often marked SR on circuit diagrams.

slow storage, slow memory Computer storage in which the access time is relatively long.

SL/RN process A direct reduction process. A forerunner to the SL/RN process the R-N process (for Republic Steel Company and National Lead Corporation) was developed originally in Norway, primarily to recover TiO₂ from titanium-bearing ore for the production of paint pigments. Further developed by Lurgi Chemie in cooperation with the Steel Company of Canada (Stelco) to form the SL/RN process to produce iron by treatment of iron-bearing ores.

SLSI Super Large Scale Integration (100,000 transistor per chip).

sludge The accumulated settled solids separated from various types of water as a result of natural or artificial processes.

sludge (petroleum industry) An oleo-like substance caused by the oxidation of oil or by contamination

with other materials; a thick, heavy emulsion containing water, carbon, grit, and oxidized oil.

sludge acid See acid sludge.

sludge bulking A phenomenon which occurs in activated sludge plants whereby the activated sludge occupies an excessive volume and does not settle readily; usually associated with the presence of filamentous organisms.

sludge cake Dewatered sewage sludge discharged from a filter press of similar device, usually containing about 25 to 35% (m/m) dry solids.

sludge conditioning The physical and/or chemical treatment of sludge to facilitate dewatering.

sludge thickening The process by which water is removed from sludge either by prolonged settlement aided by slow mechanical stirring and sometimes with the addition of chemicals, or by solids flotation or centrifugation.

sludge volume index, SVI, Mohlman index The volume in millimetres occupied by 1 g of activated sludge after settlement under specified conditions for a specified time, usually 30 min.

slug 1. A large "dose" of chemical treatment applied internally to a steam boiler intermittently. Also used sometimes instead of "priming" to denote a discharge of water out through a boiler steam outlet in relatively large intermittent amounts. **2.** A small, simply shaped piece of metal used as starting stock for forging, upsetting or extrusion. **3.** Liquid that completely fills the internal passage of a tube for a short distance.

slug flow Uneven flow in a gas pipeline in which there is heavy condensation and dropout of both water and gas liquids: natural gasoline, butane, etc. The liquids accumulate in low places in the pipeline or at a riser and shut off or block the gas flow until enough pressure builds up to blow the liquid slug out of the line.

slug-type heat flux sensor Consists of a metallic disc, or slug, of known weight and thermal mass insulated from its housing and having a thermocouple attached to its back surface. The rate of rise of slug temperature is then proportional to the rate of heat transfer into the slug.

sluice 1. A waterway fitted with a vertical sliding gate for controlling the flow of water. **2.** A channel for draining away excess water.

slurry 1. A mixture of water or oil and pulverized solid material that can be poured or pumped in a pipeline. **2.** A thin pourable mix of water and cement.

slush compound (corrosion) A non-drying oil, grease or similar organic compound, that, when coated over a metal affords at least temporary protection against corrosion.

slusher, pulper See pulper.

slushing Preparation of a fiber suspension by the defibration of pulp or paper.

small scale integration, SSI Low density of integrated circuits per unit area.

smart terminal A terminal with a built-in processor for handling input.

SME Society of Manufacturing Engineers. See CASA/SME.

SME Society of Manufacturing Engineers (see CASA/SME).

smelting Any metallurgical operation in which metal is separated by fusion from the impurities with which it may be chemically combined or physically mixed is called smelting.

Smith predictor A method of closed loop control for processes with an appreciable dead time.

smoke 1. A dispersion of fine solid or liquid particles in a gas. **2.** Small gas borne particles of carbon or soot, less than 1 micron in size, resulting from incomplete combustion of carbonaceous materials and of sufficient number to be observable.

smoke detector A device which detects visible or invisible products of combustion.

smokeless flare (petroleum industry) A specially constructed vertical pipe or stack for the safe disposal of hydrocarbon vapors or, in an emergency, process feed that must be disposed of. Smokeless flares are equipped with steam jets at the mouth of the stack to promote the complete combustion of the vented gases. The jets of steam induce greater air flow and cool the flame, resulting in complete combustion without smoke or ash.

smoke point The maximum flame height in a standard test that kerosene or jet fuel will burn without smoking.

smooth To apply procedures that bring about a decrease in or elimination of rapid fluctuations in data.

smoothing 1. Averaging by a mathematical process or by curve fitting, such as the method of least squares or exponential smoothing. **2.** A technique to decrease or eliminate rapid data fluctuations.

smoothing machine, (satining machine) A machine for glazing.

smoothing press A press without a felt normally placed as the final press in the press section of a paper machine. The smoothing press improves the surface of the paper and removes felt marks.

smoothing roll coating Roll coating of a web by a process in which the applied coating slip is smoothed out with small rolls, some of which may rotate in a direction opposite to the direction of movement of the web.

smooth line Cable pairs or transmission lines with no added inductive loading.

smothered-arc furnace A furnace in which the arc or arcs is covered by a portion of the charge.

SMR See series mode rejection.

SMRE Safety in Mines Research Establishment (UK).

SMRE is responsible for certification of flame-proof, intrinsically safe, and other electrical apparatus for use in mines.

SMRR See series mode rejection ratio.

Sn Chemical symbol for tin.

SNA Systems Network Architecture. A layered network architecture developed by IBM. The layers isolate applications from systems networks, services, enabling users to write applications independent of the lower networking software layer.

snap-action contacts A contact assembly such that the contacts remain in one of two positions of equilibrium with substantially constant contact pressure during the initial motion of the actuating member until a point is reached at which stored energy causes the contacts to move abruptly to a new position of equilibrium.

snap magnet A permanent magnet used in thermostatic, pressure and other control devices to provide quick make-and-break action at the contact and thereby minimize sparking.

snapshot dump (computing systems) 1. A dynamic dump of the contents of one or more specified storage areas. **2.** A selective dynamic dump performed at various points in a machine run.

snapshot routines Special type of debugging routines that include provisions for dynamic printout of selected data at various checkpoints in a computing operation.

Snell's law The sine of the angle of incidence, divided by the sine of the angle of refraction, equals a constant called the index of refraction when one of the mediums is air.

snivitz A small pulse of noise.

snow A speckled background on an intensity-modulated CRT display that is produced by electronic noise.

snubber (control valves) A device which is used to damp the motion of the valve stem. This is usually accomplished by an oil filled cylinder/piston assembly. The valve stem is attached to the piston and the flow of hydraulic fluid from one side of the piston to the other is restricted.

soaking-pit furnace (in steel production) The function of the soaking-pit furnace is to raise the temperature of steel in the course of processing until it is sufficiently hot to be plastic enough for economic reduction by rolling or forging to the desired section. From the metallurgical standpoint, soaking-pit and reheating furnaces must be constructed to heat the steel uniformly and, by suitable temperature and combustion control, hold it at the desired temperature for a specified length of time.

soaking time Period of time during which a material subjected to heat treatment remains at the required temperature; see holding temperature. An object's soaking time can be calculated from the instant its surface reaches the required temperature.

soak timer A reset timer, usually dial-adjustable, as applied in a temperature-control system for controlling the length of time the temperature is held at a predetermined level.

soap bubble test A leak test consisting of applying soap solution to the external surface or joints of a system under internal pressure and observing the location, if any, where bubbles form indicating the existence of a gas leak.

socket contact A female-type contact used to mate with a pin, i.e. male-type contact.

soda/chlorine pulp Chemical pulp manufactured by treating fibrous vegetable raw material alternately with sodium hydroxide and chlorine.

soda pulp Chemical pulp manufactured by cooking with sodium hydroxide solution.

sodarecovery boiler, soda recovery unit A steam generator combined with a smelting furnace for the utilization of the heat of combustion of the black liquor and the recovery of the greater part of its inorganic components.

soda recovery plant The department in a sulphate mill or soda pulp mill where the black liquor is burned and where the greater part of the inorganic constituents are collected, in fused or powder form, for recirculation in the process.

sodium absorption ratio, SAR A ratio for irrigation waters, used to express the relative activity of sodium ions in exchange reactions with soil.

soft annealing See full annealing.

soft copy A volatile representation of information (i.e. a CRT display).

soft detergent (water quality) A detergent containing a surface active agent, which is susceptible to biodegradation, and whose surfactant properties are substantially reduced in the biological treatment of sewage.

softening (water quality) The removal of most of the calcium and magnesium ions from water.

softening agent A substance – often an organic chemical – that is added to another substance to soften it.

soft error An error that occurs sporadically and that may not appear on successive attempts to read data. Synonymous with transient error.

soft mineral A mineral that is softer than quartz, which mean less than 7 on the Mohs scale of hardness.

soft seated trim Globe valve trim with an elastomeric, plastic or other readily deformable material used either in the valve plug or seat ring to provide tight shutoff with minimal actuator forces. See ANSI B 16.104 for leakage classifications.

soft soldering Process of joining two metals with a fusible alloy or solder that melts below 427°C (800°F). See hard soldering.

soft start (thyristor) At turn-on, a gradual increase in output at a predetermined rate from zero or a set minimum to the desired maximum.

soft tissue machine, cellulose wadding machine See cellulose wadding machine.

software Intellectual creation comprising the programs, procedures, rules and any associated documentation pertaining to the operation of a data processing system. Contrast with hardware. See also application software, system software.

software buffer A location or set of locations in memory given by name by the resident program and used to hold information until it can be used.

software configuration management See configuration management.

software data base A centralized file of data definitions and present values for data common to, and located internal to, an operational software system.

software development cycle The period of time that begins with the decision to develop a software product and ends when the product is delivered.

software development process The process by which user needs are translated into software requirements, software requirements are transformed into design, the design is implemented in code, and the code is tested, documented, and certified for operational use.

software documentation Technical data or information, including computer listings and printouts, in human readable form, that describe or specify the design or details, explain the capabilities, or provide operating instructions for using the software to obtain desired results from a software system. See also documentation, system documentation, user documentation.

software engineering The systematic approach to the development, operation, maintenance, and retirement of software.

software house A company which offers software programs support services to users.

software library A controlled collection of software and related documentation designed to aid in software development, use, or maintenance. Types include software development library, master library, production library, program library, and software repository. See also system library.

software life cycle The period of time that starts when a software product is conceived and ends when the product is no longer available for use.

software maintenance Modification of a software product after delivery to correct faults.

software monitor A software tool that executes concurrently with another computer program and that provides detailed information about the execution of the other program.

software programmable A system whose functions are defined by a program, generally supplied by the

manufacturer, that may be redefined or updated by changing or replacing the program.

software quality The totality of features and characteristics of a software product that bear on its ability to satisfy given needs; for example conform to specifications.

software quality assurance See quality assurance.

software reliability The ability of a program to perform a required function under stated conditions for a stated period of time.

software requirements specifications Documentation of the essential requirements (functions, performance, design constraints, and attributes) of the software and its external interfaces.

software tool A computer program used to help develop, test, analyze, or maintain another computer program or its documentation; for example, automated design tool, compiler, test tool, maintenance tool.

software verification and validation plan A plan for the conduct of software verification and validation.

soft water Water with a low hardness.

softwood pulp Pulp produced from softwood.

soil mechanics A branch of civil engineering that deals with the application of principles of solid and fluid mechanics to the design, construction and maintenance of earthworks and stable foundations.

soil pipe A vertical drain for carrying sewage from a building into a sewer or septic system.

sol A fluid (liquid or gas) in which there is a homogeneous suspension or dispersion of colloidal matter. A sol (from solution) is more fluid than a gel.

solar cell A photoelectric cell using silicon, which collects photons from the sun's radiation and converts the radiant energy into electrical power with reasonable efficiency.

soil noise Electromagnetic radiation from the sun at radio frequencies.

solderless contact, crimp contact A contact whose back portion is a hollow cylinder to allow it to accept a wire. After a bared wire is inserted, a swedging tool is applied to crimp the contact metal firmly against the wire. An excellent mechanical and electrical contact results.

solderless lug A terminal lug which holds the conductor it terminates by compressing it under a screw.

solderless wrap, wire wrap A method of connection in which a solid wire is tightly wrapped around a rectangular, square or V-shaped terminal by means of a special tool.

solder lug Device to which wire is secured by soldering.

solenoid Current-carrying coil of one or more layers. Usually a spiral of closely-wound insulating wire, in the form of a cylinder.

solenoid actuator Actuator in which the displacement of the controlled part is obtained by the attraction of the armature of a solenoid.

solenoid valve An electric solenoid valve can be used to advantage in combination with diaphragm control valves in some applications. As an example, a three-way solenoid valve supplying or exhausting air from a diaphragm control valve to achieve on-off operation.

solid angle For measurement of solid angle in SI units see under steradian.

solid board Board consisting of a single furnish layer.

solid circuit 1. Modification of properties of a material; i.e., silicon, so that components can be realized in one mass (i.e., resistors, capacitors, transistors, diodes). **2.** Subminiature realization of a circuit in three

dimensions; e.g., as built up as parts of a semiconductor crystal or by etching or deposition on a substrate.

solid conductor An electrical conductor consisting of a single wire.

solid contamination (of pneumatic supply)

Contamination in solid form expressed as percentage of solid particles per unit of mass.

solid electrolyte oxygen analyzer Analyzer measuring oxygen content in fluids, using electrochemical behavior of a solid, e.g. zirconia at high temperature.

solid fault, permanent fault, persistent fault A fault of an item that persists until an action of corrective maintenance is performed.

solid-logic technology, SLT Microelectric circuits used as the basic components of the modern computing system. They carry and control the electrical impulses that represent information within a computer.

solid solution (heat treatment) Solution constituting a solid phase; see intermediate phase.

solid state Pertains to various types of electronic components that convey or control electrons within solid materials. Transistors, germanium diodes, and magnetic cores are solid-state components; vacuum and gas tubes and electromechanical relays are not.

solid-state circuit A complete circuit formed from a single block of semiconductor material. See also monolithic integrated circuit.

solid-state logic Microelectronic circuits are a product of solid logic technology (SLT) and make up many system's basic circuitry. These microminiaturized computer circuits are called logic circuits because they carry and control the electrical impulses that represent information within a computer.

solid-state magnetic modules Made by the following process; magnetic alloys are deposited in a vacuum and under the influence of a high magnetic field, on planes of glass so thin that the direction of their magnetic fields can be switched within several billionths of a second.

solid-state oxygen analyzer probe The probe is applied directly to the gas stream and requires no sampling system. The heart of the probe is a stabilized zirconium cell that is heated to a controlled temperature of 850°C. At this temperature, it generates a voltage that is related to the difference in the partial pressures of oxygen in the process gas stream and in a reference gas. The reference gas is applied to one side of the cell and the process gas to the other. The lower the oxygen concentration in the process gas, the greater the voltage generated.

solid-state physics A branch of physics which covers all properties of solid materials, including electrical conduction in crystals of semiconductors and metals, superconductivity and photoconductivity.

solid-state switch A no-contact switch that completes a circuit by means of solid-state components.

solidus The highest temperature at which a metal or alloy is completely solid.

solid wire Wire which consists of a single conductor, not of multiple strands.

solion Contraction of solution ion. An electrochemical sensing and control device in which ions in solution carry electric charges to give amplification corresponding to that of vacuum tubes and transistors.

solution Mixture of two or more substances, constituting a phase in which the composition can vary within wide limits; see interstitial solution, solid solution.

solution annealing, solution heat treatment Heat treatment whereby one or more alloy constituents already precipitated as separate phases mostly enter into solution; initial stage of precipitation hardening.

solution space A conceptual or formal area defined by all of the states that constitute solutions for a specific problem.

solvent A liquid capable of absorbing another liquid, gas, or solid to form a homogeneous mixture; a liquid used to dilute or thin a solution.

solvent coated paper Paper coated with resin, plastic etc. dissolved in a volatile solvent which is permitted to evaporate after the coating operation.

solvent extraction test A cleanliness test method, using a solvent to extract contaminants for inspection. The method is sometimes used as a supplement to other techniques or to check inaccessible surfaces for industrial-process measurement and control equipment to be used for oxygen service. See further IEC publication 877 (1986).

solvents Industrial solvents most frequently used in the procedures for cleaning industrial process measurement and control equipment for oxygen service are listed in IEC publication 877 (1986).

solvent washing Solvent washing may be described as the removal of organic contaminants from the surface to be cleaned by the use of suitable solvents or detergent solutions. To increase the efficiency, one may resort to ultrasonic cleaning which may be described as loosening of oil and grease or other contamination from a metal surface by the immersion of parts in a solvent or detergent solution in the presence of high-frequency vibrational energy. May be part of procedures for cleaning industrial-process measurement and control equipment to be used for oxygen service, which is outlined in IEC publication 877 (1986).

sones 1. A unit of loudness. A simple tone of frequency 1 000 hertz, 40 dB above a listener's threshold, produces a loudness of 1 sone. 2. A value for loudness. May be used for overall evaluation of a sound or of a frequency band. The sone scale is linear (in contrast to decibels which are logarithmic).

sonic 1. Pertaining to the speed of sound. 2. Utilizing sound waves.

sonic cleaning The cleaning of contaminated materials by the action of intense sound waves produced in the liquid into which the material is immersed.

sonic delay line A delay line using a medium providing acoustic delay, such as, mercury or quartz delay lines.

sonic frequencies Vibrations which can be heard by the human ear (from about 15 hertz to approx. 20,000 hertz).

sonic interface detector A pipeline sensing probe for detecting the approach of a product interface by identifying the change in sound velocities between the two products being pumped. The electronic device has a probe inserted through the wall of the pipeline, protruding into the fluid stream. The probe picks up the variations in sound velocities and through the proper linkage can give an audible alarm or actuate valves when the interface arrives. See interface (petroleum industry).

sonic nozzle – type Smith and Matz A device consisting of a circular profile convergent and a conical divergent. See figure in ISO publication 4006-1977 or BS 5875:1980.

sonic nozzle, sonic venturi-nozzle A nozzle whose geometrical configuration is such that the flow-rate is measured in a critical condition.

sonic nozzle-type LMEF A device consisting of a circular profile convergent, a cylindrical throat and a conical divergent. See figure in ISO publication 4006-1977 or BS 5875: 1980.

sonic soldering The method of joining metals by the use of mechanical vibration to break up the surface oxides.

sonic speed See speed of sound.

sonic thermocouple A thermocouple so designed that gas moves past the junction with a velocity of mach 1 or greater, resulting in maximum heat transfer to the junction.

sonograph **1.** An instrument for recording sound or seismic vibration patterns. **2.** An instrument for converting sound into percussive (seismic) vibrations.

sonoluminescence **1.** The creation of light in liquids by sonically induced cavitation. **2.** The luminescence of a substance resulting from its exposure to ultrasonic waves.

soot A black deposit containing impure carbon and oily compounds resulting from the incomplete combustion of resinous materials, oils, wood and other bituminous materials.

sophisticated A piece of equipment, system, etc., which is complex and intricate or requires special skill to operate.

sophisticated vocabulary An advanced and elaborate set of computer instructions, enabling the computer to perform such intricate operations as linearizing, extracting square roots, selecting the highest number etc.

sorption The combination of absorptive and adsorptive processes in the same material.

sound **1.** Also called a sound wave. An alteration in pressure, stress, particle, displacement or velocity, etc., propagated in an elastic material, or the superposition of such propagated alterations. **2.** An undulatory motion of air or other elastic medium, which can produce the sensation of hearing when incident on the ear. (Sound requires a medium for propagation, for unlike electromagnetic waves, sound cannot travel through a vacuum).

sound absorption The conversion of sound energy into some other form (usually heat) in passing through a medium or on striking a surface.

sound absorption coefficient The incident sound energy absorbed by a surface or medium, expressed in the form of a fraction.

sound analyzer Measures each frequency, or a small band of frequencies in the spectral distribution of energy. Particularly useful for tracing sources of vibration or noise in rotating equipment.

sounding line, sounding rod (liquid flow measurement in open channels) A rod or chain or cable with weight attached to its lower end for determining the depth.

sound power (level) **1.** The sound power of a device is a constant for any given operating condition – regardless of the environment. For example, a loudspeaker with a given electrical input produces the same sound power whether in a small reverberant room: or in an open field. Pertaining to control valves see IEC publication 534-8-4. Part 8, Section Four: Prediction of noise generated by liquid flow through control valves. **2.** The ratio, expressed decibels, of the sound power emitted by a source to a standard reference power of 10^{-13} watt. **2.** The number of watts of acoustic power radiated by a noise source.

sound pressure The total instantaneous pressure at a given point in the presence of a sound wave, minus the static pressure at that point.

sound pressure level, SPL **1.** In contrast to sound power level, sound pressure level is a function of the acoustic environment, distance and directivity of the noise generating device as well as the operating con-

ditions. Pertaining to control valves see IEC publication 534-8-4. Part 8, Section Four: Prediction of noise generated by liquid flow through control valves. **2.** The SI unit for measurement of sound pressure level is bel, symbol B. A value in bel is defined as the base 10 logarithm for the quotient of two power levels. Common multiple: decibel, dB.

sound reflection coefficient Also called acoustical reflectivity. Ratio at which the sound energy reflected from a surface flows on the side of incidence, to the incident rate of flow.

sound transmission coefficient (of an interface or septum) Also called acoustical transmittivity. The ratio of the transmitted to the incident sound energy. Its value is a function of the angle of incidence of the sound.

source address In computer systems having a source-destination architecture, the source address is the address of the device address or memory location from which data is being transferred.

source code Virtually any computer language, from assembly to high-level, that doesn't fit the definition of object code.

source document A paper containing information that is to be read into the computer.

source efficiency (fiber optics) The ratio of emitted optical power of a source to the input power generally electrical power.

source ground (signal transmission system) Potential reference at the physical location of a source, usually the signal source.

source impedance **1.** The impedance presented to the input of a device by the source. **2.** The impedance of the excitation supply presented to the excitation terminals of the transducer. Pertains to electrical transducers.

source language A programming language which cannot be directly processed by the hardware of a computer but requires compilation into an object program consisting of instructions in a machine language which can be directly understood by the computer. Example: COBOL, ALGOL, FORTRAN, PL/I.

source machine The computer used to translate the source program into the object program.

source mode output A mode of operation of solid state output devices in which the device controls the current to the load, i.e., when the output is energized it connects the load to the positive polarity of the supply.

source power efficiency (optical communication) The ratio of emitted optical power of a source to the input power generally electrical power.

source program **1.** A computer program expressed in a source language. **2.** A computer program that must be compiled, assembled, or interpreted before being executed by a computer.

source recording The recording of information in machine-readable form, such as punched cards or tape, magnetic tape, etc.

sources of interference Pertaining to electromagnetic compatibility, depending on the different industrial environments a wide variety of interference sources can be encountered. The following sources are among the most conspicuous ones: switchgear, contractors, relays, welders, radio and television transmitters, walkie-talkies, vehicle radio transmitters and electrostatically charged operators. The interference generated by this wide variety of different sources can be grouped into three main types of interferences: **1.** Magnetic. **2.** Electrical (broadband, narrowband). **3.** Electromagnetic. See further IEC publication 801-1

Electromagnetic compatibility for industrial-process measurement and control equipment.

source treatment valve designs The term source treatment, in contrast to path treatment, refers to treating valve noise in designing the control i.e. at the source. There are four basic source treatment valve designs currently on the market. For details on different designs see ISA handbook of control valves and the manufacturer's literature.

sour crude Crude oil containing excessive amounts of sulfur (sulphur), which liberate corrosive sulfur (sulphur) compounds during refining. Contrast with sweet oil.

sour gas Natural gas containing chemical impurities, notably hydrogen sulfide (sulphide) (H_2S) or other sulfur (sulphur) compounds that make it extremely harmful to breathe even small amounts; a gas with a disagreeable odor resembling that of rotten eggs.

sour products Gasoline, naphthas, and refined oils that contain hydrogen sulfide (sulphide) (H_2S) or other sulfur (sulphure) compounds. Sourness is directly connected with odor.

sour-service trim A designation by manufacturers of oilfield fittings and equipment that their products have finishes resistant to corrosion by hydrogen sulfide (sulphide) (H_2S) and other corrosive agents in "sour" oil and gas. See sour gas.

sour-water stripper tower A refinery vessel; a tower for the physical removal of contaminants from "sour water" – water from knockout drums, condensates from accumulators and other processing units – before it undergoes biological treatment or is discharged in the plant's waste-water system.

South African Government Mining Engineer South African approval certification body for products (systems) intended for installation in hazardous locations. Example: intrinsically safe applications.

SP3T Single Pole Triple Throw (switch).

SP4T Single Pole Quadruple Throw (switch).

SP 50 The ISA Standards and Practices Committee 50 chartered to develop a digital communications protocol (field bus).

space (computing devices) **1.** A site intended for the storage of data, for example, a site on a printed page or a location in a storage medium. **2.** A basic unit of area, usually the size of a single character. **3.** One or more blank characters. **4.** To advance the reading or display position according to a prescribed format, for example, to advance the printing or display position horizontally to the right or vertically down.

space attenuation The loss of energy, expressed in decibels, of a signal in free air caused by such factors as absorption, reflection, scattering and dispersion.

space character A character that causes the print or display position to advance one position along the line without producing any graphic character. Note: The space character is described in ISO 646, ISO 4873 and ISO 6937-1.

space technology The systematic application of science and engineering to the exploration and exploitation of outer space.

space wave The radiated energy consisting of the direct and ground waves.

spalling (corrosion) Spontaneous separation of a surface layer from a metal.

span **1.** The algebraic difference between the upper and lower limit values of a given range. Examples: **a.** Range 0–150°C, Span 150°C. **b.** Range –20 to 200°C, Span 220°C. **c.** Range 20 to 150°C, Span 130°C. **d.** Range 4 mA to 20 mA, Span 16 mA. **e.** Range –100°C to –20°C, Span 80°C.

span adjustment Means provided in an instrument to change the slope of the input–output curve. See span shift.

span error **1.** The difference between the actual output span and the specified output span. Note: It is usually expressed as a percentage of the specified output span. **2.** The difference between the actual span and the ideal span. Note: It is usually expressed as a percent of ideal span.

span shift **1.** The change in output span due to some influences. See figure in IEC publication 902, 1987. **2.** Any change in slope of the input–output curve. See figure in ANSI/ISA publication S51.1, 1979.

sparging A treatment process in which a vigorous stream of air or other gas from a perforated or open-ended pipe is passed through water.

spark recorder A type of recorder where sparks passing between a metal pointer and an electrically grounded plate periodically burn small holes in recording paper as it moves slowly across the face of the plate.

spark test A test performed on wire and cable to determine the amount of detrimental porosity or defects in the insulation.

SPC See supervisory control.

SPC/SQC Statistical Quality Control/Statistical Process Control. A set of techniques based on statistical principles and methods used to regulate the quality of products and processes.

SPDT Single Pole Double Through. A three-contact switching arrangement which connects a circuit to one of two alternate connections.

special purpose computer A computer that operates upon a restricted class of problems.

special purpose logic Proprietary features of a programmable controller which allow it to perform logic not normally found in relay ladder logic.

specific acoustic impedance The complex ratio of sound pressure to particle velocity at a given point within the medium.

specific acoustic reactance The imaginary component of specific acoustic impedance.

specific acoustic resistance The real component of specific acoustic impedance.

specific address Same as absolute address.

specification (related to quality systems) The document that prescribes the requirements with which the product or service has to conform. Note: A specification should refer to or include drawings, patterns or other relevant documents and should also indicate the means and the criteria whereby conformity can be checked. (ISO definition.)

specification tree A drawing showing the indented relationships among specifications independent of the assembly or installation relationships of the items specified. The tree shows the dependency of specifications on other specifications (SAMA).

specification verification See verification.

specific code Same as absolute code.

specific conductance See electrolytic conductivity.

specific conductivity The conducting ability of a material in mhos per cubic centimeter. It is the reciprocal of resistivity.

specific dielectric strength The dielectric strength per millimeter of thickness of an insulating material.

specific energy The sum of the elevation of the free surface above the bed and the velocity head based on the mean velocity at that section. Pertains to liquid flow measurement in open channels.

specific gravity The ratio of the mass of a body to the mass of an equal volume of water at 4°C or other specified temperature.

specific gravity (gas) The density of a gas compared to the density of air.

specific gravity (liquid) The density of a liquid compared to the density of water.

specific heat 1. The capacity of a material to be heated at a given temperature (expressed as calories per degree Celsius per gram), compared to water with a specific heat of 1. **2.** The amount of heat required to raise a specified mass by one unit of a specified temperature.

specific heat capacity The SI unit for measurement of specific heat capacity is joule per kilogram kelvin.

specific humidity The weight of water vapor in a gas water vapor mixture per unit weight of dry gas.

specific mass The ratio of the mass of a given volume of the sediment to the mass of an equal volume of water.

specific viscosity Ratio of absolute viscosity of a fluid to that of a standard fluid, usually water, both at same temperature.

specific volume The volume of air per unit of mass. For instance, specific volume can be expressed in cubic meters per kilogram of dry air. The reciprocal of cubic meters per kilogram, or density, is often used and becomes the mass per cubic meter. For example, a specific volume of 0.90 cubic meter per kilogram of dry air has a density of 1+0.90 or 1.11 kilograms per cubic meter.

specified characteristic curve A line which shows the values in steady state of an output variable which a system or device should give as a function of a corresponding input variable, under defined conditions. See figure in IEC publication 902, 1987.

specified measuring range, specified working range The set of values of a measurand for which the error of a measuring instrument is intended to lie within specified limits. Note: The upper and lower limits of the specified measuring range are sometimes called the maximum capacity and minimum capacity respectively.

spectogram A machine-made graphic representation of sounds in terms of their component frequencies.

spectograph An instrument with an entrance slit and dispersing device that uses photography to obtain a record of the spectral range. The radiant power passing through the optical system is integrated over time, and the quantity recorded is a function of the radiant energy.

spectral analysis A frequency decomposition of the analog input signals. Identification of the frequency spectrum.

spectral density A value of a function the integral of which over a frequency interval represents the contributions of the signal components within that frequency interval.

spectral emissivity The ratio, at a specified wavelength, of thermal radiation emitted from a non-blackbody to that emitted from a blackbody at the same temperature.

spectral intensity A function that precisely defines the spectrum and has the units of voltage squared per unit frequency.

spectral irradiance (optical communication) Quotient of the irradiance contained in an elementary range of wavelength at a given wavelength, by that range.

spectral luminous gain (optoelectronic device) Luminous gain for a specified wavelength interval of either the incident or the emitted flux.

spectral radiance (fiber optics) Radiance per unit wavelength interval at a given wavelength, expressed in watts per steradian per unit area per wavelength interval.

spectral radiant flux The radiant flux per unit wavelength interval, usually in watts per nanometer.

spectral radiant gain (optoelectronic device) Radiant gain for a specified wavelength interval of either the incident or the emitted radiant flux.

spectral reflectivity Reflectivity at a particular wavelength.

spectral responsivity (optical communication) Responsivity per unit wavelength interval at a given wavelength.

spectral width (optical communication) A measure of the wavelength extent of a spectrum or spectral characteristic.

spectral window, transmission window (fiber optics) A wavelength region of relatively high transmittance, surrounded by regions of low transmittance.

spectrofluorometer An instrument for determining chemical concentration by fluorometric analysis using two monochromators – one to analyze the wavelength of strongest emission and the other to select the wavelength of best excitation in the sample.

spectrometer 1. Instrument used for measurements of wavelength or energy distribution in a heterogeneous of radiation. **2.** A spectroscopy which includes an angular scale for measurement of the angular deviation and wavelengths of the components of the spectrum.

spectrophotometer 1. An instrument for measuring the reflection of light from a textile sample. **2.** An instrument for measuring spectral transmittance or reflectance.

spectrophotometry 1. A process of making comparisons between parts of light spectra by means of a photometric device in combination with a spectrometer. **2.** Study of the reflection or transmission properties of specimens as a function of wavelength.

spectroradiometer A instrument for measuring the radiant energy from a source at each wavelength through the spectrum.

spectroscopy The branch of optics that deals with radiations in the infrared, visible and ultraviolet region of the spectrum.

spectrum The distribution of quantity as a function of frequency or of wave length.

spectrum (fiber optics) See optical spectrum.

spectrum analyzer An instrument used to display the amplitude or power distribution of a signal as a function of frequency.

spectrum display unit On a telemetry receiver, a device which displays the spectrum at and on both sides of the frequency to which the receiver is tuned.

spectrum frequency The range of frequencies of electromagnetic radiation waves which are divided in low frequency (LF), medium frequency (MF), high frequency (HF), etc.

speech synthesis data capture A method of using speech as a direct form of input.

speed control circuit, flow control circuit (fluid power systems) Circuit the purpose of which is to control speed of operation usually by regulating flow.

speed measurement Speed measurement in the field of industrial process instrumentation generally refers to the rotating speed of a shaft on the process equipment. The rotational speed of a shaft can very easily be converted into distance per time units; such as feet per second or R.P.M. Three of the most common speed measuring systems are: 1. Tachometer ge-

nerator systems. 2. Magnetic speed measuring systems. 3. Stroboscopic system.

speed of sound, sonic speed The speed at which sound waves travel through a medium (in air and at standard sea-level conditions, about 750 miles per hour or 1 080 feet per second, or 329 m/s).

speed of transmission, rate of transmission (data transmission) The instantaneous rate of processing information by a transmission facility. Usually measured in characters or bits per unit time.

speed-ratio control A control function which maintains a preset ratio of the speeds of two drives.

speed regulator A regulator which maintains or varies the speed of a motor at a predetermined rate.

speed variator, torque variator See torque variator.

spent catalyst A catalyst that has become coated with a residue from the reactions it has been a part of or has been promoting. For example, in a catalytic cracking unit (cat cracker), some petroleum coke is formed and ends up as a deposit on the minute grains of the catalyst, which then becomes inactive or spent. The spent catalyst is not discarded (it's expensive) but is made fresh and active again by a treatment in a vessel called a regenerator. Here, the carbon coating is burned off the catalyst by injecting 1,100°F air into the vessel.

spent liquor separation The removal of used cooking liquor (spent liquor) from the digester at the end of a pulp cook.

spent liquor, waste liquor The process liquid from a completed pulp cook or bleaching stage.

spent wash Liquid remaining after ethanol has been removed by distillation from fermented sulphite waste liquor.

spherical plug valve (fluid power systems) Plug valve in which the surface of contact between the plug and the valve body is spherical and requires a method of sealing.

spheroid As it applies to the industry, a spheroid is a steel storage tank in the shape of a sphere flattened at both poles designed to store mainly LP gases under pressure. See Hortonsphere.

spheroidization A type of annealing which causes practically all carbides in the steel to agglomerate in the form of small globules or spheroids.

spherulitic – graphite cast iron See ductile iron.

spike 1. An abrupt transient which comprises part of a pulse but exceeds its average amplitude considerably. 2. A pulse of short duration and of greater amplitude than an average pulse.

spill The accidental release of a hazardous chemical or radioactive liquid from a process system or a container.

spindle grinder See screw type grinder.

spine robot A robot whose mechanical structure of the arm is made up of one or more sets of cells each pivoting around the centre of the preceding one.

spin-on filter (fluid power systems) Filter with an element sealed in its own pressure housing for independent mounting to the hydraulic system.

spiral concentrator (for iron-ore concentration) A spiral concentrator is a curved-bottom trough, wound around a vertical axis in the form of a helix. When fed at the top with a slurry of iron ore and gangue, the less dense gangue, being more readily suspended by the water, attains greater tangential velocity than the iron minerals, and migrates toward the outer rim of the spiral trough. Wash water is added along the inside rim to further wash away the lighter gangue. After a few turns, a band of iron mineral

forms along the inner rim, and the gangue forms bands forward the outer rim.

SPIRALFLOW Name of process by Alfa-Laval for heating and cooling of wine mash.

spiral flow test Determining the flow characteristics of thermoplastics resins by measuring the length and weight of resin that flow along a spiral cavity.

spiral gages The spiral type measuring element is used widely in industrial pressure gages. Briefly it is a thin walled tube which has been flattened on opposite sides to produce approximately elliptical cross section. The tube is then formed into a spiral. When pressure is applied to the open end, the tube tends to uncoil.

spiral welded pipe Pipe made by forming steel plate into long helical strips, fitting the strips together, and welding the spiral seams.

spirofalic Brand name for a spiral-wound stainless steel gasket with asbestos or Teflon filler.

splashproof A device or machine so constructed and protected that external splashing will not interfere with successful operation.

splice (in fiber optics) A permanent junction between two optical fiber ends. It can be a mechanical splice, formed by gluing or otherwise attaching the ends together mechanically, or a fusion splice, formed by melting the ends together.

splice loss (optical communication) That insertion loss attributable to an optical fiber splice.

SPLIT A programming language for machine tools.

split-beam colorimeter An instrument for determining the difference in radiation absorption by the sample at two wavelengths in the visible or ultraviolet region.

split body A body divided in half by a plane containing the longitudinal flow path axis. Type of valve body. Useful where there is a demand either for frequent inspection or replacement of the valve trim.

split body angle control valves This type of valve has an acid resistant tantalum liner which offers considerable savings over a solid tantalum valve. Other liner materials may also be used. The contoured plug is also clad.

split clamp ends Valve end connections of various proprietary designs using split clamps to apply gasket loading.

split range control Type of control with one or more controllers influencing several final controlling elements of different range or action in order to cover the complete manipulating range.

split-ranging See signal amplitude sequencing control.

splitter 1. Plates spaced in an elbow of a duct so disposed as to guide the flow of fluid through the elbow with uniform distribution and to minimize pressure drop. 2. That part of a fluid amplifier which separates alternative outputs.

sponge coke Petroleum coke that looks like a sponge, hence the name. Sponge coke is used for electrodes and anodes.

sponge metal Any metal mass produced by decomposition or chemical reduction of a compound at a temperature below the metal's melting temperature.

spontaneous combustion Ignition of combustible materials following slow oxidation without the application of high temperature from an external source.

spooling The process of temporarily storing data on disk or tape files until another aspect of processing is ready for the data (such as printing it).

spool valve (fluid power systems) Valve in which the flow paths are connected or isolated by a

cylindrical sliding member positioned within the matching bore of the valve body.

sporadic fault See intermittent fault.

spot check A type of random inspection in which only a very small percentage of total production is checked to verify that a process remains within its control limits.

spot face A machined annular surface around a bolt hole on the side of a through bolted flange, opposite the gasket face, that is provided for nut seating.

spot recorder A recording instrument in which the record is made by a spot of light (visible or invisible) on a light-sensitive chart.

spray aeration A process by which the dissolved oxygen concentration in a water is increased by spraying the water in the air. The process is also used for purging water of undesirable gases.

spray quenching (heat treatment) Quenching in a jet of liquid, see fog quenching.

spread (information theory) See irrelevance.

Sprenkle straightener (flow measurements)

Type of straightening device consisting of three perforated plates in series with a length equal to one pipe diameter between successive plates. Three plates shall be held together. See figure in ISO publication 5167.

spring adjuster (for actuator) A fitting, usually threaded on the actuator stem or into the yoke, to adjust the spring compression.

spring and belows gages A spring-opposed belows pressure measuring element used for intermediate and low pressure ranges.

springer-finger action Operations of electrical contacts to permit a stress-free spring action to develop contact pressure, i.e., used in sockets of printed circuits and in many other types of connectors.

spring loaded seat (ball valves) A seat design that utilizes a mechanical means, such as a spring, to exert a greater force at the point of ball contact to improve the sealing characteristics, particularly at low pressure differential.

spring loaded teflon cone Type of packing sometimes used in valve packing boxes.

spring rate The force change per unit change in length. This is usually expressed as pound per inch or Newtons per millimeter.

spring return Moving parts of the unit are returned to the initial position by spring force after the actuating forces have been removed.

spring sloughing, vernal sloughing (water quality) Increased sloughing which may occur in a biological filter during the spring because of an upsurge of biological activity.

spring temper A level of hardness and strength for nonferrous alloys and some ferrous alloys corresponding approximately to a cold worked state two-thirds of the way from full hard to extra spring temper.

sprocket hole, feed hole Any of a series of perforations along the edge of motion picture film, paper tape, computer paper or continuous stationery.

SPST Single Pole Single Throw. A two-contact switching arrangement which opens or closes one circuit; the circuit may be normally open or normally closed.

spurious error Errors due to instrument malfunction or to human goof-ups.

spurious response (general) Any response, other than the desired response, of an electric transducer or device.

spurious signal Unpredicted signals in control systems.

squared error A mathematical technique for introducing the square of the error in the error term of a linear algorithm so as to produce a non-linear correction.

square edged thin orifice plate Plate the thickness of which is small compared with the diameter of the measuring conduit, the orifice of which is circular, concentric with the conduit axis and sharp and square on the upstream edge. The profile is defined precisely in ISO 5167. See also figure in ISO publication 4006-1977 or BS 5875:1980.

square-edged weir A weir with a rectangular profile. See figure in ISO publication 772-1978. Pertains to liquid flow measurement in open channels.

square-law scale See note non-linear scale.

square metre, m² Unit for measurement of area. (SI unit). Common multiples: mm², km². Use cm² whenever convenient, but use dm² restrictively. For land areas use the unit hectare, ha, whenever more convenient than the units m² or km². Do not use the units acre or are.

square wave A square – or rectangular – shaped periodic wave which alternately assumes two fixed values for equal lengths of time, the transition time being negligible in comparison with the duration of each fixed value.

squaring circuit 1. A circuit which changes a sine wave or other wave into a square wave. **2.** A circuit which contains nonlinear elements and which produces an output voltage proportional to the square of the output voltage.

squeeze rolls (textile term) Parallel rolls which are used to extract excess liquid from open-width fabrics during processing.

sr Symbol for steradian unit for measurement of solid angle (SI unit).

SRI Stanford Research Institute.

SRQ Service Command Request in the ASCII code.

SSE Single Silk Enameled.

SSEB South of Scotland Electricity Board.

SSF See seconds Saybolt furol.

SSI See small scale integration.

SSP process The SSP (Sustained Shockwave Plasma) process is similar to the EEP process; however, the plasma of the SSP is processed at up to 30 000 revolutions per minute by an electromagnetic field rather than the mechanical device of the EPP process. See EPP process.

SSRU See seconds Saybolt universal.

ST 412/506 An electrical interface.

stability 1. For a system, the property such that, after having been displaced from its steady-state conditions by an external disturbance, it comes back to those steady-state conditions when the disturbance has ceased. **2.** The ability of a measuring instrument to maintain constant its metrological characteristics. Note: It is usual to consider stability with respect to time. Where stability with respect to another quantity is considered, it should be stated explicitly. **3.** The stability of a transducer to retain its performance characteristics for a relatively long period of time. **4.** The ability of a waste water or sludge, either before or after treatment, to resist biodegradation.

stability error The change in a performance characteristic of an instrument due to lack of stability.

stability test (water quality) A test for biologically treated sewage in which methylene blue is added to a sample of the effluent. The time taken to decolorize the dye in the absence of air is a measure of the stability of the effluent. (Also termed the methylene blue test).

stabilization 1. The means and methods by which a measuring instrument maintains its indicated or supplied values during a specified time when influence quantities and/or the load, if any, are changed within specified limits. **2.** Heat treatment intended to impart permanency of dimension or structure to a material or object. **3.** A biological or chemical process whereby readily degradable organic substances (dissolved or particulate) are oxidized to materials which are either inorganic or very slowly degradable.

stabilization network As applied to operational amplifiers and servomechanisms, a network used to shape the transfer characteristics to eliminate or minimize oscillations when feedback is provided.

stabilization pond See oxidation pond.

stabilized feedback See negative feedback.

stabilized supply apparatus A power supply apparatus in which one or more of the output quantities remain within specified limits when the conditions of use, including load and influence quantities, are changed within specified limits.

stabilizing feedforward or feedback Modifying feedforward or feedback with the object of minimizing the tendency to self-oscillation.

stable element Any device, such as a gyroscope, used to maintain a stable spatial position for devices such as instrumentation or ordnance mounted in a ship or aircraft.

stable state 1. In a trigger circuit, a state in which the circuit remains until the application of a suitable pulse. **2.** The state of a system is said to be stable if the magnitude of the departures produced by a disturbance, either constant or terminated, is limited and related to the magnitude of the disturbance.

stack 1. The portion of a chimney above roof level. **2.** Any structure that contains flues for discharging waste gases to the atmosphere. **3.** A portion of a memory and several registers used for temporarily holding information. A stack often operates on the last-in-first out principle.

stack draft The magnitude of the draft measured at inlet to the stack.

stacked job Same as batched job.

stack effect That portion of a pressure differential resulting from difference in elevation of the points of measurement.

stack effluent Gas and solid products discharged from stacks.

stack gas Gases that are vented to the air through various stacks at refineries and power-generating plants etc. Stack gases contain carbon monoxide, carbon dioxide, sulfur (sulphur) compounds, and particulate matter (small grains of solid material). Today, it is mandatory that industrial stacks have scrubbers, electrostatic precipitators, and other devices to reduce the amount of noxious gases and the gritty particulate matter.

stack indicator, stack pointer The address of the storage location that contains the item of data most recently stored in a pushdown storage.

stage 1. A term usually applied to an amplifier to mean one step, especially if part of a multistep process, or the apparatus employed in such a step. **2.** A hydraulic amplifier used in a servovalve. Servovalves may be single-stage, two-stage, three-stage etc.

stage discharge relation A curve or table which expresses the relation between the stage and the discharge in an open channel at a given cross-section for a given condition of flow, for example steady, rising or falling. See figure in ISO publication 772 or BS 3680: Part 1:1983.

staged pump Pump with pumping elements which operate in series.

stage recorder, liquid level recorder A device which records automatically, either continuously or at frequent time intervals, the liquid level as sensed by a float or some other device.

staging The moving of data from an offline or low-priority device back to an online or higher-priority device.

stagnation pressure Sum of the static pressure and the dynamic pressure. It characterizes the state of the fluid when its flow energy is completely transformed into pressure. For an element of fluid at rest, the static pressure and the stagnation pressure have the same numerical value.

stagnation temperature The temperature that would be attained if all of the kinetic energy of a moving stream of fluid were converted to heat.

Stahl zener barrier German manufacturer of zener barriers.

stainless steel High alloy steel that does not rust in normally occurring conditions. In general, stainless steel contains over 12% chromium, besides which other alloy substances such as nickel can be included.

stalled tension control A control function that maintains tension in the material at zero speed.

stalled torque control A control function that provides for the control of the drive torque at zero speed.

stamp charging (steel industry) Stamp charging is a process where the entire coal charge to the coke oven is stamped, or compressed, and then pushed into the oven for coking.

stand alone A controller capable of operation without help from a higher level.

standard 1. An accepted criterion or an established measure for performance, practice, design, terminology, size, etc. **2.** A rule or test by which something is judged.

Standard Association of Australia Australian standards association. Also an approval certification body for products (systems) for use in hazardous locations.

standard atmospheric pressure A reference pressure approximately equal to the mean atmospheric pressure at sea level; because atmospheric pressure varies with elevation and is not constant with time, standard atmospheric pressure is defined arbitrarily as an absolute pressure of 14.695 psi, 30.0 in. of mercury or 760 mm Hg (using mercury of density 13.595 g/cm³).

standard cell A reference cell for electromotive force.

standard error Applied to statistics such as the mean, to provide a distribution within which samples of the statistics are expected to fall.

standard fit Any fit between mating parts whose allowance and tolerance have been standardized.

standard gage A highly accurate gage used only as a reference standard for checking or calibrating working gages.

standardization The process of establishing by common agreement engineering criteria, terms, principles, practices, materials, items, processes, equipment, parts, subassemblies and assemblies to achieve the greatest practicable uniformity of items of supply and engineering practices, to ensure the minimum feasible variety of such items and practices, and to effect optimum interchangeability of equipment parts and components.

standardized signal A signal the lower and the upper range values of which are standardized. Example: 4–20 mA dc, 20–100 kPa.

standard noise temperature A standard reference temperature (T) for noise measurements, taken as 290 K.
standard resistor Also called a resistance standard. A resistor which is adjusted to a specified value is only slightly affected by variations in temperature, and is substantially constant over long periods of time.

standard solution A reference solution containing a selected concentration of dissolved substances.

standard source In fiber optics, the reference optical power source to which emitting and detecting devices are compared for calibration purposes.

standard specification A technical specification or other document available to the public, drawn up with the cooperation and consensus or general approval of all interests affected by it based on the consolidated results of science, technology and experience, aimed at the promotion of optimum community benefits and approved by a body recognized on the national, regional or international level. Note: In some languages the word "standard" is often used with another meaning than in this definition, and in such cases, it may refer to a technical specification which does not satisfy all the conditions given in the definition, for example, "company standard".

standard symbols language Prescribed graphical shapes used to represent special meanings or functions that can occur in any computer program.

standard volume indicator A volume indicator with the characteristics prescribed by the American Standards Association.

standby 1. Condition of equipment which will permit complete resumption of stable operations within a short period of time. **2.** A duplicate set of equipment to be used if the primary unit becomes unusable because of malfunction.

standby power supply Equipment which supplies power to a system in the event the primary power is lost. It may consist of batteries, charging circuits, auxiliary motor generators or a combination of these devices.

standby redundancy That redundancy wherein a part of the means for performing a required function is intended to operate, while the remaining part(s) of the means are inoperative until needed.

standby state A non-operating up state during the required time.

standby time The time interval during which an item is in a standby state.

standing wave A wave in which, for any of the dependent wave functions, the ratio of its instantaneous value at one point on the wave to its instantaneous value at any other point does not vary with time.

standing-wave flume A flume containing a constriction which causes the flow to change from subcritical to supercritical, and in which the measurement of one water level, the upstream one allows a calculation of the discharge. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772.

standpipe A vertical tube filled with a liquid such as water.

star-connected circuit A polyphase circuit in which all the current paths of the circuit extend from a terminal of entry to a common terminal or conductor which may be the neutral conductor.

star coupler (optical communication) A passive coupler in which power may be either distributed from one or several input ports to a larger number of output ports or combined from several input ports to a smaller number of output ports.

star-delta starter A switch for starting a three-phase motor by connecting its windings first in star and then in delta.

star network A tree network in which there is exactly one intermediate node. See figure in ISO publication 2382-18, 1987.

star program Perfect program that runs first time with no errors or bugs.

starter, starting mix In some chemical processes, a reactive mixture used to initiate a reaction between less reactive chemicals.

starting reactor A reactor for decreasing the starting current of a machine or device.

start-to-discharge pressure See opening pressure.

statcoulomb The unit of charge in the centimeter-gram-second electrostatic system. It is that amount of charge that repels an equal charge with a force of one dyne when they are in a vacuum, stationary, and one centimeter apart.

state diagram (software) A directed graph in which nodes correspond to internal states of a system, and edges correspond to transitions; often used for describing a system in terms of state changes. See also Petri net.

state equations A set of equations, which expresses the first time derivatives of the state variables as functions of the same state variables, the input variables, the system parameters and the time.

state feedback control Type of control with proportional feedback of a complete set of measured or estimated state variables.

state graph A symbolic representation of the consecutive states of a sequential circuit where the individual states are represented by circles and the transition functions are represented by lines. Note: The state of a sequential circuit is the set of values of the state variables at a specified instant.

statement 1. In computer programming, either a meaningful expression that may describe or specify operations or a generalized instruction in automatic coding. **2.** A language construct that represents a step in a sequence of actions or a set of declarations.

state (in artificial intelligence) A snapshot description of a problem at one stage of its solution.

state space A space which contains the state vector of a system.

state table A table of all combinations of values of the input variables and the corresponding values of the output variable of a switching function.

state trajectory (automatic control) The vector function describing the dependence of the state on time and initial state.

state transition diagram A diagram showing the set of possible states of an item and the possible one step transitions between these states.

state transition table A table of all consecutive states of a sequential circuit, listing for any state and any value of the input variable the resulting next state and the value of the output variable.

state transition time The time required for the transition from one voltage range to the other in case of a change between logic states.

state variable One of a set of variables completely determining the state of a system at any time in the future provided a system model, initial state and input variables are known.

state variable technique This technique is one of the most powerful analytical methods available to system designers. A practical system may have a number of input signals, and a number of output signals, the input and output signals being related by differential

equations called state equations. The information provided by these equations allows the designer to select system parameters which give the desired performance.

state vector One whose components are the state variables.

static Having no particular orientation or directional characteristics. Also having no tendency to change position.

static accuracy Accuracy determined with a constant output.

static analysis (software) The process of evaluating a program without executing the program. See also desk checking. Contrast with dynamic analysis.

static behavior The behavior of a control system or an individual unit under fixed conditions (as contrasted to dynamic behavior, under changing conditions).

static breakdown voltage The voltage at which a transient suppressor begins to conduct when subjected to slow-rising dc. Does not account for transient rise-time rates.

static burn-in High temperature test with device subjected to unvarying voltage rather than to operating conditions; either forward or reverse bias.

static calibration (electrical transducers) A calibration performed under room conditions and in the absence of any vibration, shock or acceleration (unless one of these is measured).

static cell A memory cell basically a cross-coupled flip-flop.

static circuitry Employs switching devices whose outputs are essentially dc levels, and which can be switched from one state of the other at any arbitrary instant. A typical example of a static circuit element is the flip-flop or a stable multivibrator.

static compliance (industrial robots) The maximum amount of displacement per unit of load applied to the mechanical interface.

static connection A pipe tap on a manifold used to connect process pressure to an instrument.

static discharge head Static head from the centreline of a pump to the free discharge surface.

static dump (computing systems) Dumping that is performed at a particular point in time with respect to a machine, often at the end of a run.

static efficiency The mechanical efficiency multiplied by the ratio of static pressure differential, from fan inlet to fan outlet.

static electricity discharge A transfer of electrostatic charge between bodies of different electrostatic material. From the technical point of view the precise term for this phenomenon is static electricity discharge. However, the term electrostatic discharge (ESD) is widely used in the technical world and in technical literature.

static errors Specific errors independent of the time variable as contrasted with dynamic errors which depend on frequency, i.e., inadequacy of the dynamic response of a computing unit.

static friction See sticktion.

static gain (zero-frequency gain) Of gain of an element, or loop gain of a system, the value approached as a limit as frequency approaches zero. Note: Its value is the ratio of change of steady-state output to a step change in input provided the output does not saturate.

static head Short for hydrostatic head.

static-head liquid-level meter A pressure-sensing device, such as a gage, so connected in the piping system that any dynamic pressures in the system cancel

each other and only the pressure difference due to liquid head above the gage position is registered.

static image, background image (computer graphics) That part of a display image, such as a form overlay, that is not changed during a particular sequence of transactions.

staticizer, serial-parallel converter A functional unit that converts a time sequence of signals into a corresponding set of simultaneous signals.

static line regulation The output voltage variation of a power supply as the line voltage is varied slowly from rated minimum to rated maximum, with the load current held at the nominal value.

static load regulation The output voltage variation of a power supply as load current is varied slowly from 0 to 100 percent of rating, with the input line voltage held at the nominal value.

static measurement The measurement of a quantity whose value can be considered constant for the duration of the measurement. Note: The qualifier "static" applies to the measurand and not to the method of measurement.

static memory See static storage.

static model See steady-state model.

static pressure 1. Pressure measured in a fluid in such a way that the velocity of this fluid has no effect on the measurement. 2. The steady-state pressure applied to a device; in the case of a differential pressure device, the process pressure applied equally to both connections.

static pressure measurement of level in open vessels One of the most flexible and convenient means of measuring liquid level is the static pressure method. Instruments of this type are actuated by changes in hydrostatic head of the liquid as the level changes. This head is the "weight" of liquid above a reference level or datum line. Head is often expressed in terms of pressure or level height. The simplest method is a properly calibrated "pressure gage" with a pressure tap located at the approximate minimum level line in the vessel. See also diaphragm box method and purge method.

static pressure tapping Set of holes in a Pitot tube positioned so as to measure the static pressure of the fluid. Also, a tapping or tappings, drilled on the conduit wall, so as to measure the static pressure of the fluid.

static pressure tube See static tube.

static RAM Random access memory which requires continuous power but does not need to be refreshed as with dynamic RAM. Memory density is not as high as for dynamic RAM.

static seal Sealing device used between parts that have no relative motion.

static stability The property of a physical system which maintains constancy in its static and dynamic responses despite changes in its internal conditions and variations in its environment. Compare with dynamic stability.

static storage 1. In computers, storage in which the information does not change position (e.g., electrostatic storage, flip-flop storage, binary magnetic-core storage, etc.). The opposite of dynamic storage. 2. A storage device that does not require periodic refreshment.

static stores Digital registers in telemetry devices that hold set-up instructions from the computer.

static suction head Static head from the surface of a supply source to the centreline of a pump.

static switch A semiconductor switching device in which there are no moving parts.

static temperature The temperature of a fluid as measured under conditions of zero relative velocity between the fluid and the temperature-sensitive element, or as measured under conditions that compensate for any relative motion.

static test Any measurement taken in a normally dynamic system under static conditions, for instance, a pressure test of a hydraulic system under no-flow conditions.

static tube A device used to measure static pressure in a stream of fluid.

static unbalance (control valves) The net force produced on the valve stem by the fluid pressure acting on the closure member and stem within the pressure retaining boundary with the fluid at rest and with stated pressure conditions.

static weighing Method in which the net mass of liquid collected is deduced from tare and gross weighings made respectively before the flow is diverted into the weighing tank and after it is diverted to the by-pass.

station 1. The set of functional units which consists of the data terminal equipment, the data circuit terminating equipment, and their common interface. **2.** Pertaining to a field bus in industrial control systems, an entity connected to the bus and containing various functions.

station address See site address.

stationary information source, stationary message source (information theory) A message source from which each message has a probability of occurrence independent of the time of its occurrence.

stationary noise A disturbance having time-invariant properties.

stationary rake Set of local velocity sensors mounted on one or more fixed rods and which explore simultaneously the whole measuring cross-section. Pertains to measurement of fluid flow in closed conduits.

stationary random noise A random disturbance with time-invariant statistical properties.

stationary wave A standing wave in which the energy flux is zero at all points on the wave.

station control A switching network station direction operations such as polling, selecting etc.

station management The portion of Network Management that applies to the lowest two OSI layers.

statistical error Arises in measurements of average count rate for random events, as a result of statistical fluctuations in the rate.

statistical hypothesis An assumption about the frequency distribution of observations whose numerical values depend upon chance.

statistical multiplexer Multiplexers which send two output characters for each input character: the terminal number and the data. This solves the problem of telling the receiver which character came from which input line. Also called asynchronous time division multiplexers (ATDM).

statistical quality control Any method of controlling the attributes of a product or controlling the characteristics of a process that is based on statistical methods of inspection.

statistical quality control A means of controlling the quality of a product or process by the application of the laws of probability and statistical techniques to the observed characteristics of such product or process.

statistical sample A small portion of the entire population. It is drawn so that every value in the population has an equal chance of being included. A sample must be representative of the population.

statistical test model (software) A model that relates program faults to the input data set (or sets) which cause them to be encountered. The model also gives the probability that these faults will cause the program to fail.

statmho The cgs electrostatic unit of conductance.

statohm The cgs electrostatic unit of resistance.

statoscope A barometer for recording small changes in atmospheric pressure.

status code Information used to indicate the state or condition of system components. Refers to Honeywell TDC 3000 control systems.

status line A simple method of representing some state of a device in an interconnection scheme.

status memory The memory which contains the most recently scanned status of all inputs.

status signal A signal which characterizes the status or status change of the controlling system or controlled system.

steady flow Flow in which the flow-rate through a measuring section does not vary significantly with time. Note: The steady flows observed in conduits are in practice flows in which quantities such as velocity, pressure, mass density and temperature vary in time about mean values independent of time; these are actually "statistically steady flows".

steady oscillation An oscillation the amplitude, periodic and wave form of which remain unchanged.

steady-state (fluid power systems) Condition of a specified variable at a time, when no transients are present. For the purpose of this definition, drift is not considered to be a transient.

steady-state condition 1. A state of a system which is maintained after all transient effects have subsided and as long as all input variables remain constant. **2.** Pertaining to fiber optics, the condition in a multimode fiber in which the relative power distribution among the bound modes is independent of length. Also called equilibrium mode distribution. **3.** Pertaining to fluid power systems, conditions in which relevant variable parameters do not change appreciably after a period of stabilization.

steady-state deviation 1. Steady-state value of the system deviation when all input variables are maintained constant. **2.** The system deviation after transients have expired. See also offset.

steady-state deviation of the n-th order Steady-state value of the system deviation when the n-th derivative of one input variable is maintained constant and the other input variables are constant.

steady-state gain See gain.

steady-state model A mathematical model that represents the process at equilibrium (infinite time) conditions.

steady-state optimization A method of optimizing some criterion function of a process usually using a steady-state model of the process. Linear programming is frequently the optimization method used and a function approximating the profit of the process is a typical optimizing criterion. Contrast with dynamic optimization.

steady-state oscillation Oscillation in which the motion of each point is a periodic quantity.

steady-state power conditions Conditions persisting for more than a specified time duration. Relating to the industrial process industry see IEC publication 654-2, Part 2: Power.

steady-state response (system or element) The part of the time response remaining after transients have expired. Note: The term steady-state may also be

applied to any of the forced-response terms: for example steady-state sinusoidal response.

steady-state value The value of a current or voltage after all transients have decayed to negligible values.

steady-state vibration See steady-state oscillation.

steam The vapor phase of water substantially unmixed with other gases.

steam atomizing oil burner A burner for firing oil which is atomized by steam. It may be of the inside or outside mixing type.

steam attenuation Reducing the temperature of superheated steam by injecting water into the flow or passing the steam through a submerged pipe.

steam cock A valve for admitting or releasing steam.

steam dryer A device for removing water droplets from steam. See steam scrubber.

steam electric evaluating and recording system (SEER) A software package for Honeywell 4500 and 45000 process computers that performs continuous scanning and alarming of out-of-limits conditions instantaneously. The system also provides a record of variables before and after a plant trip or major equipment failure.

steam generating unit A unit to which water, fuel, and air are supplied and in which steam is generated. It consists of a boiler furnace, and fuel burning equipment, and may include as component parts water walls, superheater, reheater, economizer, air heater, or any combination thereof.

steaming Treatment of wood, e.g. chips or round timber, with steam. The purpose of steaming is often to expel air from the wood in order to facilitate the penetration of cooking liquor and in other cases soften the wood as a preliminary to subsequent mechanical treatment.

steaming plant See treating plant.

steam-jet blower A device which utilizes the energy of steam flowing through a nozzle or nozzles to induce a flow of air to be supplied for combustion.

steam purity The degree of contamination. Contamination usually expressed in ppm.

steam quality The percent of weight of vapor in a steam and water mixture.

steam scrubber A series of screens, wires, or plates through which steam is passed to remove entrained moisture.

steam separator A device for removing the entrained water from steam.

steam tracing An arrangement for heating a process line or instrument-air line to keep liquids from freezing or condensing – often, a piece of pipe or tubing carrying live steam is simply run alongside or coiled around the line to be heated.

steam trap A device on a steam line designed to trap air and water condensate and automatically bleed the air and drain the water from the system with a minimum loss of steam pressure.

steel Alloy with iron is chief constituent and with carbon content so low that solidification is not accompanied by the formation of either cementite or graphite. Apart from iron and carbon, steel generally also contains silicon, manganese, phosphorous, sulphur and possibly small quantities of other elements; see alloy steel.

steel ladle See ingot.

Stefan-Boltzmann law This states that the total irradiance inside an isothermal enclosure (or full radiator) is proportional to the fourth power of the kelvin temperature.

stalling basin An area ahead of the weir plate large enough to pond the liquid so that it approaches the weir plate at low velocity, also called weir pond.

stellite (trade name) A cobalt-based alloy containing chromium, tungsten and carbon. It can be welded to the base metal or procured in a completely cast form. Good corrosion and erosion properties.

stem (control valves) The rod, shaft or spindle which connects the valve actuator with the closure member. Definition of this part common to many types of control valves.

stem anti-rotation device (control valves) A mechanical means of preventing rotation of the linear actuator stem and/or valve stem.

stem boot (control valves) A protective device similar to a flexible bellows, used outside the bonnet to protect the valve stem from surrounding atmosphere.

stem guide (control valves) A guide bushing closely fitted to the valve stem and aligned with the seat.

stem seals (control valves) The part or parts needed to effect a pressure-tight seal around the stem while allowing movement of the stem.

stem unbalance (control valves) The net force produced on the valve plug stem in any position by the fluid pressure acting upon it.

step action Type of action in which only a finite number of values, called steps, can be imposed on the output variable.

step-by-step system A type of line switching system which uses step-by-step switches.

step change The change from one value to another in a single increment in negligible time.

step compensation, step correction The effect of a control function or a device that will cause a step change in an other function when a predetermined operating condition is reached.

step control action Type of action in which only a finite number of values, called steps, can be imposed on the output variable.

step counter In a computer, a counter used in the arithmetical unit to count the steps in multiplication, division and shift operation.

step down The decrease the value of some electrical quantity, such as a voltage.

step-down transformer A component consisting of two coupled coils in which the output voltage is less than the input voltage.

step enabling condition Condition generated by boolean operation which allows switching to the next step in a sequential control.

step fiber A glass optical fiber which has a core of uniform optical density. That is, there is a step function change between the optical density of the cladding and the optical density of the core.

step generator A device for testing the linearity of an amplifier.

step (in switching systems) Element of a function chart participating in the definition of the state of the system at a given time. A step may be either active or inactive. The set of active steps defines the situation of the system considered. Notes: Commands or actions may be associated to each step. A step can only activate a command if it is active. Steps are separated by transitions.

step index fiber (optical communication) An optical fiber having a step index profile.

step index profile (optical communication) A refractive index profile characterised by a constant refractive index within the core and a sharp decrease in the refractive index at the core-cladding interface.

step input A sudden but sustained change in an input signal.

stepped aeration, tapered aeration (water quality) A modification of the activated sludge process

whereby a greater quantity of air is admitted to the upstream end of the aeration tank where the highest biological activity exists, and a lesser amount of air is admitted to the downstream end of the tank.

stepper motor, stepping motor A motor in which rotation occurs in a series of discrete steps controlled electromagnetically by individual (digital) input signals. Applications of stepper motor or stepping motor include machine tool control, tape drives, coordinate positioning and milling tables, rotary indexing tables, etc.

stepping relay, rotary stepping switch, rotary stepping relay 1. A multiposition relay in which moving wiper contacts mate with successive sets of fixed contacts in a series of steps moving from one step to the next in successive operations of the relay. **2.** A switch which electromechanically steps its wipers across a bank of contacts.

stepping switch A switching device or relay which has discrete conditions and advances from one condition to the next each time it receives an input pulse.

step quenching Interrupted quenching in one quenching agent followed by quenching in another, usually air; see martempering.

step response 1. The time response of a system produced by a step-wise variation of one of the input variables. See figure in IEC publication 902, 1987. Note: The unit step response of a linear system is obtained by establishing the ratio between the output response to the corresponding input step. **2.** The time response of a system produced by an instantaneous variation of one of the input variables from one constant level to another. **3.** The total (transient plus steady-state) time response resulting from a sudden change from one constant level of input to another.

step response stability For a single input, single output linear, time invariant system, the property that a step-wise variation of the input variable with a bounded step height produces a change of the output variable towards a final limited value with increasing time.

step response time The time interval between the instant of a step change in one of the input variables and the instant when the output variable reaches for the first time a specified percentage of its steady-state condition. See "time constant" for use of the 63,2% value.

step servo motor A device that, when properly energized by dc voltage indexes in definite angular increments.

step setting operation Operation mode in which any step in a sequence chain of a sequential control can be set directly.

steps per revolution The total number of steps required for the output shaft of a dc stepping motor to rotate 360°, or one complete revolution. Steps per revolution is calculated by dividing the step angle into 360°.

steps per second The number of angular movements accomplished by the motor of a dc stepping motor in 1 second. This figure replaces the rpm figure of a standard drive motor.

step stress test A test consisting of several increasing stress levels applied sequentially for periods of equal time duration to an item.

step up To increase the value of an electrical quantity, such as a voltage.

step voltage regulator A device consisting of a regulating transformer and a means for adjusting the voltage or the phase relation of the system circuit in steps.

steradian, sr The solid angle which, having its vertex in the center of a sphere, cuts off an area of the surface of the sphere equal to that of a square with sides of length equal to the radius of the sphere. The SI unit for measurement of solid angle is steradian.

sterilization A process which inactivates or removes all living organisms (including vegetative and spore forms) as well as viruses.

step-up transformer A component consisting of two coupled coils in which the output voltage is greater than the input voltage.

stick circuit A circuit used to maintain energization of a relay or similar unit through its own contacts.

sticking In computers, the tendency of a flip-flop to remain in, or to spontaneously switch to, one of its two stable states.

stiction (static friction) Resistance to the start of motion, usually measured as the difference between the driving values required to overcome static friction upscale and downscale.

stiffness In process instrumentation, the ratio of change of force (or torque) to the resulting change in deflection of a spring-like element. Note: Stiffness is the opposite of compliance.

stiffness factor The angular lag between the input and output of a servosystem.

stiffness, rigidity See bending resistance.

stilling tube A tube placed vertically in the stream in such a way as to permit the measurement of the stage in relatively still liquid. Pertains to liquid flow measurement in open channels.

still video A telecommunication system whereby a telephone is linked to a screen and calls are joined by fixed images at the caller or of information.

stilpnomelane An iron-silicate mineral.

stimulate To cause an occurrence or action artificially, rather than waiting for it to occur naturally, as to stimulate an event.

stimulus 1. See measurand. **2.** See note measurement signal.

stitch bonding A method of making wire connections on an integrated circuit board using impulse welding or heat and pressure to bond a connecting the wire through a hole in the welding electrode.

stochastic Pertaining to direct solution by trial-and-error, usually without a step-by-step approach, and involving analysis and evaluation of progress made, as in a heuristic approach to trial-and-error methods. In a stochastic to a problem solution, intuitive conjecture or speculation is used to select a possible solution, which is then tested against known evidence, observations or measurements. Intervening or intermediate steps toward a solution are omitted. Contrast with algorithmic and heuristic.

stock (stuff) The aqueous suspension of papermaking pulp and other raw materials during the period between the slushing and the formation of a web or a sheet.

stock consistency The mass of suspended dry material in a stock sample divided by the mass or volume of the sample. Stock consistency is determined according to a standardized test procedure, and is normally expressed as a percentage by weight.

stock metering Regulation of the mixed and proportioned stock flow to the paper machine; see stock proportioning.

stock preparation All treatment to which the stock is subjected before it reaches the paper machine.

stock proportioning Adjustments of the quantities of the different stock components in order to achieve

the desired furnish. Pertains to pulp and paper manufacturing.

stoddard solvent A specific type of petroleum naphtha used chiefly in dry cleaning.

stoker A mechanical means of feeding coal or other solid combustibles into a furnace, burning them under controlled conditions and carrying away solid combustion products.

Stokes A unit of kinematic viscosity (dynamic viscosity divided by sample viscosity); the centistoke is more commonly used.

stoneware Glazed ceramic ware used in certain laboratory and industrial applications involving corrosive chemicals.

stop-and waste valve A type of plug valve that, when in a closed position, drains the piping above or beyond it. When the valve is turned a quarter turn to shut it off, a small port or hole in the valve body is uncovered, permitting water above the valve to drain out, preventing a freezeup in cold weather. Stop-and waste valves are used mainly on small-diameter water piping.

stop bit A bit that indicates end of asynchronous serial transmission.

stop cock A small valve for roughly controlling or shutting off the flow of fluid in a pipe.

stopcock A type of plug valve usually installed on small diameter piping; petcock.

stop-cycle timer A timer which runs through a single cycle and then stops until the starting signal is reinitiated.

stop instruction An exit that specifies the termination of the execution of a computer program.

stop or throttle valve Those valve(s) that normally provide fast interruption of the main energy input to a turbine. Throttle valves are sometimes used for turbine control during start-up.

stop signal (data communication) In start-stop transmission, a signal at the end of a character that prepares the receiving device for the reception of a subsequent character.

storage A functional unit into which data can be placed, in which they can be retained, and from which they can be retrieved.

storage access time In a computer, the time required to transfer information from a storage location to the local storage register or other location, where the information then becomes available for processing.

storage allocation The assignment of storage areas to specified data.

storage battery Two or more storage cells connected in series and used as a unit.

storage capacity, storage size The amount of data that can be contained in a storage device, measured in units of data. Notes: **1.** A unit of data can be a binary character, a byte, a word, etc. **2.** For registers, the term register length is used with the same meaning.

storage cell, storage element The smallest unit that can be addressed in storage.

storage CRT A CRT that can retain a visual image for some length of time so that it is not necessary to refresh to avoid flicker.

storage cycle A periodic sequence of events occurring when information is transferred to or from the storage device of a computer. Storing, sensing, and regeneration form parts of the storage sequence.

storage cycle time The time required in milliseconds, microseconds, nanoseconds, etc. for a storage cycle.

storage density The amount of characters stored per unit length or area of storage medium (for example, number of characters per inch of magnetic tape).

storage device A functional unit into which data can be placed, in which they can be retained and from which they can be retrieved.

storage dump A listing of the contents of a storage device, or selected parts of it. Synonymous with memory dump, see also core dump.

storage element See storage cell.

storage fill A set of instructions and data loaded into storage as a logical unit.

storage location A position in a storage device that is uniquely specified by means of an address.

storage medium Any device or recording medium into which data can be stored and held until some later date.

storage oscilloscope An oscilloscope which retains information via a means other than normal persistence of the screen.

storage partitioning See memory partitioning.

storage protection Limitation of access to a storage device, or to one or more storage locations, by preventing writing or reading or both.

storage search time The time needed to locate a particular datafield in storage.

storage size See storage capacity.

storage tube A type of cathode ray tube that retains a display image without requiring refresh.

store-and-forward switching (data communication) A method of switching whereby messages are transferred directly or with interim storage, each in accordance with its own address.

stored command Command which is issued as soon as the associated step is activated and is terminated when explicitly reset by a subsequent step. The stored command is identified in IEC 848 by the conventional letter "C".

stored program Same as stored routine.

stored program computer A digital computer that, under control of internally stored instructions, can synthesize, alter, and store instructions as though they were data and can subsequently execute these new instructions.

stored program control Programmed control the program of which is stored in a controller memory.

stored program logic A program stored in a memory unit containing logical commands to the remainder of the memory so that the same processes are performed on all problems.

stored routine A series of instructions in storage to direct the step-by-step operation of the machine. Synonymous with stored program.

stove oil A light fuel oil or kerosene used in certain kinds of wickless-burner stoves.

straight-cut control system (numerical control) A system in which the controlled cutting action occurs only along a path parallel to linear, circular, or other machine ways.

straightening vane A device placed in the approach channel to improve the flow conditions. There are two general types of vanes; tubular and fin.

straight line coding **1.** A set of instructions in which there are no loops. **2.** A programming technique in which loops are avoided by unwinding.

strain The deformation per unit length produced in a solid as a result of stress.

strainer Coarse filter usually of woven wire construction. This may be in the form of a complete filter or just an element.

strainer, knotter screen A screen for removal of knots, shives and other impurities from the stock just before it enters the paper machine.

strain error (electrical transducers) The error resulting from a strain imposed on a surface to which the transducer is mounted. Notes: **a.** This term is not intended to relate to strain transducers (strain gage). **b.** See also mounting error.

strain foil A type of strain gage made by photoetching a resistance element out of thin foil.

strain gage An element, the electrical resistance of which varies with applied tension and compression. Note: It may be the sensing element in a strain gage pressure transducer etc. There are two basic forms of strain gage; the bonded type and the unbonded type – the former being the most popular type.

strain hardening See work hardening.

strain rosette An assembly of two or more strain gages used for determining biaxial stress patterns. Also known as rosette strain gage.

strain sensitivity A characteristic of a conductor that describes its resistance change in relation to a corresponding length change. When referring to a specific strain gage material, strain sensitivity is commonly known as the gage factor.

strand (in continuous casting) A bar, billet, bloom or slab produced by continuous casting.

strand casting See continuous casting.

stranding The twisting together of small wires to form a single larger conductor.

stratification Non-homogeneity existing transversely in a gas stream.

stratification of flow The state of a fluid that consists of two or more layers arranged according to their density, the lightest layer being on top and the heaviest at the bottom.

stratified language A language that cannot be used as its own metalanguage. Example: FORTRAN.

stray current corrosion Corrosion caused by current through paths other than the intended circuit or by an extraneous current in the earth.

stream 1. An input data path to the computer from a single telemetry source. **2.** Water flowing continuously or intermittently along a well-defined course, as for a river, but generally on a smaller scale. **3.** The liquid flowing in an open channel.

stream day An operating day on a process unit as opposed to a calendar day. Stream day includes an allowance for regular downtime.

stream degassing process (in steelmaking) A form of vacuum-degassing process. The following systems are included in the stream degassing processes: **a.** ladle-to-mold degassing; **b.** ladle-to-ladle degassing; **c.** tap degassing.

streamer, streaming tape drive A magnetic tape unit especially designed to make a nonstop dump or restore of magnetic disks without stopping at inter-block gaps.

streamline flow A type of fluid flow in which flow lines within the bulk of the fluid remain relatively constant with time.

stream tube In the characterization of fluid flow, an imaginary tube whose wall is generated by streamlines passing through a closed curve.

street elbow A pipe elbow with an external thread at one end and an internal thread at the other end.

strengthening (of a sulphite cooking acid) Increasing the SO₂ content of a sulphite cooking acid by the absorption of introduced sulphur dioxide gas; compare hot acid system.

stress The force producing strain in a solid.

stress ageing; stress aging Ageing to relieve internal stresses. Stresses can arise during heat treatment, mechanical working or welding; see stress relieving.

stress amplitude One-half the algebraic difference between the maximum stress and minimum stress in one cycle of repeated variable loading.

stress corrosion cracking The failure by cracking when a metal is under stress and exposed to a corrosive environment is called stress corrosion. Methods of combating stress corrosion cracking are by lowering the stress imposed on the material or selecting a material with a lower strength.

stress model A mathematical model used to describe the influence of relevant applied stresses on a reliability performance measure or any other property of an item.

stress relieving Heat treatment to reduce or to relieve the internal stresses of a material. Other treatments such as full annealing and tempering can also result in the reduction or relief of internal stresses.

stretch forming Shaping a piece of sheet metal or plastics sheet by applying tension and then wrapping the sheet around a die form; the process may be performed cold or the sheet may be performed cold or the sheet may be heated first. Also known as wrap forming.

striking potential The voltage required to start an electric arc.

string A sequence of elements of the same nature, such as characters, considered as a whole.

string galvanometer A galvanometer in which the moving element is a conductive thread which is stretched between the pole pieces of a permanent magnet or of an electromagnet.

string-shadow instrument An indicating instrument in which the measured value is indicated by means of the shadow of a filamentary conductor whose position in an electric or magnetic field depends on the magnitude of the quantity being measured.

strip casting (in steel production) Strip casting is an ambitious concept with the object of casting liquid steel directly into strip of similar thickness to hot band produced from hot strip mills.

strip chart recorder A recording instrument in which the chart is a strip driven by the chart driving mechanism.

stripping In flowcharting, the use of a line across the upper portion of a symbol to indicate the presence of a detailed representation elsewhere in the same set of flowcharts.

stripper A distillation column that has no rectifying section. In such a column, the feed enters at the top and there is no other reflux.

stripping 1. A process for chemically removing undesired dye or chemicals from fabric (textile term). **2.** Removing the insulation from a wire. **3.** A process using either acids or plasma to remove the resist coating of a wafer after the exposure, development and etching steps.

stripping plant See gasoline plant.

stripping section That section of a distillation column below the feed. This section strips the light components from the liquid moving down the column.

stroke 1. In character recognition, a straight line or arc used as a segment of a graphic character. **2.** For control valves and fluid power systems see "travel".

stroke (cylinders) Distance travelled by the piston in moving from one extreme position to another.

stroke character generator (computer graphics) A character generator that generates character images composed of line segments.

stroke cycle (control valves) Travel of the closure member from its closed position to the rated travel opening and return to the closed position.

stroke device (computer graphics) An input device that provides a set of coordinates that record the path of the device.

stroke time (control valves) The time required for one-half a stroke cycle at specified conditions.

Strouhal number A nondimensional parameter. Pertains to flow measurement terminology.

structural analysis Determination of the stresses and strains in a structural member due to combined gravitational and applied service loading.

structural steel Hot-rolled steel produced in standard sizes and shapes for use in constructing load-bearing structures, supports and frameworks. Examples: I-beams, H-beams and Z-sections.

structure The arrangement of the parts of a compound object, e.g. the configuration, form and distribution of the crystals in a metal. The word structure is also used in the sense part of a material, not necessarily homogenous; see phase.

structure The relations among the elements of a system.

structuring (of a system) Establishing the relations among the elements of a system in accordance with given criteria.

stub A short length of transmission line cable joined as a branch to another line or cable.

stuff See stock.

stuff chest See pulp chest.

stuffing box A packing gland; a chamber or "box" to hold packing material compressed around a moving pump rod or valve stem by a "follower" to prevent the escape of gas or liquid.

stylus A sharp pointed implement used for writing, marking or engraving. See pen.

stylus recorder A recording instrument in which the record on the chart is made by a stylus requiring no ink.

subalphabet A subset of an alphabet.

subassembly Parts and components combined into a unit for convenience in assembling and servicing. A subassembly is only part of an operating unit; it is not complete in itself.

subatomic Smaller than atoms – i.e., electrons or protons.

sub band The frequency band from 6 megahertz (MHz) to 54 megahertz (MHz), which may be used for two-way data transmission.

subcarrier 1. A carrier used to modulate another carrier. **2.** A carrier applied as a modulating wave to another carrier or an intermediate subcarrier.

subcarrier band A band (of frequencies) associated with a given subcarrier and specified in terms of maximum subcarrier deviation.

subcarrier channel The channel required to convey telemetry information involving a subcarrier band.

subcarrier discriminator In FM telemetry, the device which is tuned to select a specific subcarrier and demodulate it to recover the data.

subcarrier oscillator The basic subcarrier frequency generator whose output frequency is used as the transmission or carrier medium of desired signal information; in telemetry, the desired signal information is most often used to frequency modulate the subcarrier for transmission.

sub critical flow The flow in which the Froude number is less than unity and surface disturbances can travel upstream.

sublayer A subdivision of an OSI layer; e.g. the IEEE 802 Standard divides the link layer into the LLC and MAC sublayers.

sub level (numerical control) In the operational structure of an NC system, the functional categories selected by the mode selector.

sublimation The natural processes by which a solid substance vaporizes without going through a liquid state, e.g., snow and ice.

submerged flow See drowned flow.

submerged-resistor induction furnace A furnace for melting a metal. It comprises a melting hearth, a descending melting channel closed through the hearth, a primary induction winding, and a magnetic core which links the melting channel and primary winding.

submerged weir, drowned weir A weir in which the upstream water level is affected by the downstream water level. Pertains to liquid flow measurement in open channels.

submergence The distance measured from the crest level to the downstream water surface when the flow is submerged, i.e., no air is contained beneath the nappe. Pertains to liquid flow measurement in open channels.

submergence ratio The ratio of the downstream total head to the upstream total head over a weir the crest being taken as the datum. Pertains to liquid flow measurement in open channels.

sub-multiple of a unit (of measurement) A smaller unit of measurement which is formed from a given unit according to scaling conventions. Example: One of the decimal sub-multiples of the metre is the millimetre.

subnanosecond Less than a nanosecond.

suboptimization The process of fulfilling or optimizing some chosen objective which is an integral part of a broader objective. Usually the broad objective and lower-level objective are different.

subprogram (numerical control) A segment of a machine program which can be called into effect by the appropriate machine control command.

subprogram 1. A part of a larger program which can be converted into machine language independently. **2.** A program unit that may be invoked by one or more other program units. Examples are procedure, function, subroutine.

subscript A symbol that is associated with the name of a set to identify a particular subset or element.

subset A set each element of which is an element of a specified other set.

subsidence See damping and subsidence ratio.

subsidence ratio In process instrumentation, the ratio of the peak amplitudes of two successive oscillations of the same sign measured from an ultimate steady-state value, the numerator representing the first oscillation in time. See figure in ANSI/ISA publication S 51.1, 1979.

subsidiary control See secondary control.

subsonic A generic term roughly designating a speed less than the speed of sound in a given fluid medium.

substance See grammage.

substitute gas See synthetic natural gas.

substitution method of measurement A method of measurement in which the measurand is replaced by a quantity of the same kind, of known value, and chosen so that the effects on the indicating device are the same. Example: Determination of a mass by means of a balance and known masses using the Borda substitution method.

substrate (of a microcircuit) The supporting material upon which or within which an integrated circuit is fabricated, or to which an integrated circuit is attached.

subsurface corrosion Formation of isolated particles of corrosion product(s) beneath the metal surface. This results from the preferential reaction of certain alloy constituents by inward diffusion of oxygen, nitrogen, sulfur, etc. (internal oxidation).

subsurface float A float with its greatest drag below the surface for measuring subsurface velocities. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

subsystem 1. A group of assemblies or components or both combined to perform a single function. **2.** A portion of a larger system consisting of several components or process units which, together, have the characteristics of a system by themselves.

subtidal zone The region of shore below the mean low tide level.

subtractor A functional unit whose output data are a representation of the difference between the numbers represented by its input data.

subtrahend In a subtraction operation, the number or quantity subtracted from the minuend.

successive approximation An analog-to-digital conversion technique in which increasingly larger or smaller known voltages are compared with the unknown voltage. The equality decision made in each iteration ultimately forms the binary representation of the analog value.

success ratio The ratio of the number of successful attempts to the total number of trials. It is frequently used as a reliability index.

suction box A box which by induced suction removes water from a felt or from a stock-bearing wire which passes over the box. Pertains to pulp and paper manufacturing.

suction lift The pressure, in feet of fluid, that a pump must induce on the suction side to raise the fluid from the level in the supply well to the level of the pump. Also known as suction head.

suction line A tube, pipe or conduit that leads fluid from a reservoir or intake system to the intake port of a pump or compressor.

suction pressure Absolute fluid pressure at a pump inlet.

suction valve One of two sets of valves in a reciprocating pump, e.g., a mud pump, triplex pump etc. The other set of pump valves is the discharge valves.

sudden failure A failure that could not be anticipated by prior examination or monitoring.

Sulfiban process (coke-oven plants) See absorption stripping processes.

sulfide (sulphide) stress cracking, SSC Brittle failure by cracking under the combined action of tensile stress and corrosion in the presence of water and hydrogen sulfide (sulphide).

sulfonated oil Mineral or vegetable oil treated with sulfuric acid to make an emulsifiable form of oil.

sulfur (sulphur) bacteria Bacteria able to oxidize hydrogen sulfide (sulphide) to sulfur (sulphur), temporarily store sulfur (sulphur) in the cell and oxidize sulfur (sulphur) to sulfate (sulphate).

sullage Household waste water, other than faecal and urinary wastes.

sulphate-carbonate ratio The proportion of sulphates to carbonates, or alkalinity expressed as carbonates in boiler water.

sulphate cooking acid Cooking liquor for the manufacture of sulphite pulp.

sulphate pulp Chemical pulp manufactured by cooking with a solution containing sodium hydroxide and sodium hydrogen sulphide as active components and possibly other agents including black liquor.

sulphite pulp Chemical pulp manufactured by cooking with sulphite cooking acid.

sulphite waste liquor Spent liquor from a completed sulphite cook.

sulphur burner A furnace in which sulphur is burned to sulphur dioxide.

sulphur oxides Oxidized forms of sulphur (SO_2 , SO_3) are generated as combustion products of sulphur-bearing fossil fuels. Low levels of sulphur oxides can passivate reactive metals and thus retard corrosion. At higher levels they attack certain types of metals, elastomers and plastics. The reactions with metals normally occur when these gases dissolve in water to form sulphurous and sulphuric acid. (Extracted from IEC 654-4: Corrosive and erosive influences.)

sum check, summation check A comparison of checksums, computed on the same data on different occasions, or on different representations of the data, to verify data integrity.

summation action A type of control-system action where the actuating signal is the algebraic sum of two or more controller output signals, or where it depends on a feedback signal which is the algebraic sum of two or more controller output signals.

summation instrument, totalizer An instrument intended to determine the sum of the values of quantities of the same kind measured simultaneously in different circuits.

summer See analog adder.

summing amplifier An operational amplifier that produces an output signal equal to a weighted sum of the input signals.

summing integrator A functional unit whose output analog variable is the integral of a weighted sum of the input analog variables with respect to time or with respect to another input analog variable.

summing point A point at which signals are added algebraically. Note: In a block diagram, it is primarily symbolized by a circle.

summing unit, weighted A device the output of which is a representation of a weighted sum of two or more of the quantities represented by its inputs.

supercalender A calender normally separate from the paper machine, fitted with a number of calender bowls (rolls) lying stacked one upon the other in such a manner that elastic rolls alternate with smooth steel rolls, only one of which is driven. One or more of the steel rolls may be heated.

supercharge To supply air to an engine's intake or suction valves at a pressure higher than the surrounding atmosphere.

superchlorination (water quality) A continuous process in which comparatively high concentrations of chlorine are used in the terminal stage of the treatment of water; this would normally be followed by dechlorination. It is also used occasionally for disinfection of service reservoirs and of distribution and plumbing systems.

supercompressibility The extent to which behavior of a gas departs from Boyle's law.

superconductivity The physical characteristic displayed by certain materials whose resistance to the flow of electric current becomes zero below a specified temperature, i.e., a magnetic field can change threshold value of temperature at which superconductivity occurs and such phenomenon is used in cryogenic devices (Cryotron).

supercritical flow The flow in which the Froude number is greater than unity and surface disturbances will not travel upstream. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

superheated steam Steam at a higher temperature than its saturation temperature.

superheater A nest of tubes in the upper part of a steam boiler whose function is to raise the steam temperature above saturation temperature.

supernatant liquor The liquid above settled solids, as in a gravity separator.

superplasticity The unusual ability of some metals and alloys to elongate uniformly by several thousand percent at elevated temperatures without separating.

supersensitive relay A relay that operates on extremely small currents (usually less than 250 microamperes).

supersonic 1. A generic term roughly designating at speed that exceeds the speed of a sound in a given fluid medium. **2.** For an aircraft any speed that exceeds Mach 1.

supervision The control and monitoring operations of a system including, where appropriate, those operations which ensure reliability and safeguarding.

supervisor, supervisory program See executive program.

supervisory control 1. Control in which the control loops operate independently subject to intermittent corrective action. Note: For example, the corrective action can be set point changes by an operator or another external source. **2.** A term used to imply that a controller output or computer program output is used as an input to other controllers, e.g., generation of set-points in cascaded control systems. Used to distinguish from direct digital control.

supervisory control and data acquisition system, SCADA A hardware and software package for Honeywell 4500 and 45000 process computers that uses data acquisition and operations monitoring techniques for transmission systems and distribution substations for power delivery systems.

supervisory program, supervisor See executive program.

supervisory system A computer-based process control system. It can include one or more BASIC Stations. It features the capability to calculate complex variables, exert supervisory control, and supplement a BASIC System by providing additional calculations, alarms, displays, and reports. Refers to Honeywell TDC 3000 control systems.

supplementary insulation An independent insulation applied in addition to basic insulation in order to ensure protection against electric shock in the event of a failure of the basic insulation (Per IEC 335-1). See also basic insulation.

supplied quantity See note material measure.

supply flow (fluid power systems) Flow of liquid through the supply ports of the device or system.

supply port, inlet port, input port Port which provides a passage for the inlet flow.

supply pressure The pressure at the supply port of a device. IEC standard 382 specifies standard pneumatic supply pressures and pressure limits.

supply voltage The voltage obtained from a power supply to operate a circuit.

supply water (water quality) Water, which usually has been treated, that passes into a distribution network or a service reservoir.

support software A library of software tools used selectively or in total to produce software. This library

may consist of compiler, link, editors, source update programs, etc.

support system A programming system used to support the normal translating functions of machine-orientated, procedural-orientated, and problem-orientated language processors.

suppressed-carrier transmission Communication in which the carrier frequency is suppressed either partially or maximally. One or both of the sidebands may be transmitted.

suppressed range See elevated-zero range.

suppressed span See elevated-zero range.

suppressed weir, full-width weir 1. A weir whose sides are in the same plane as the open channel, thus eliminating (suppressing) side contractions of the stream. Pertains to liquid flow measurement in open channels. **2.** A rectangular weir in which the width of the approach channel is equal to the crest width, i.e., there are no end contractions. Pertains to liquid flow measurement in open channels.

suppressed-zero instrument Any indicating or recording instrument whose zero (no load) indicator position is offscale, below the lower limit of travel for the pointer or marking device.

suppressed-zero range A range for which the zero value of the measured variable is less than the actual lower range measuring value (zero does not appear on the scale). See figure in IEC publication 902, 1987. Notes: **a.** For example: 20–100 kPa. **b.** Terms elevation, elevated range or elevated span should be avoided. The term “suppressed-zero range” is preferred. Refer to IEC publication 902, 1987 and ANSI/ISA publication S 51.1, 1979.

suppressed-zero scale A scale whose scale range does not include the scale value corresponding to zero value of the measurand. Example: Scale of clinical thermometer.

suppression See elevated-zero range.

suppression ratio (of a suppressed-zero range)

The ratio of the lower-range value to the span. See table in ANSI/ISA publication S 51.1, 1979.

surcharge (water quality) A condition obtaining when a flow in a gravity sewer increases after it is already flowing full. This may result in overflow from manholes.

surface active agent (water quality) A chemical compound possessing surface activity which, dissolved in a liquid and particular in water, lowers the surface tension or interfacial tension by preferred adsorption at the liquid/vapour surface, or other interfaces.

surface analyzer An instrument that measures or records irregularities in a surface.

surface blowoff Removal of water, foam, etc. from the surface at the water level in a boiler.

surface condenser Any of several designs for inducing a change of state from gas to liquid by allowing the gas phase to come in contact with a surface such as a plate or tube which is cooled on the opposite side, usually by being in direct contact with flowing cooled water.

surface draw-down The local lowering of the water surface in an approach channel, caused by the acceleration of the flow passing over an obstacle or through a control.

surface hardening Hardening to a pre-determined depth. See also case hardening.

surface leakage The passage of current over the surface of an insulator rather than through it.

surface pH The pH-value in the surface layer of e.g. a moistened paper sample.

surface sensor Resistance thermometer elements are readily fabricated into sensors suitable for surface temperature measurements. Surface sensors may be clamped, bolted or cemented to a surface.

surface sizing See sizing.

surface tension A property of liquids in which the surface tends to contract to the smallest possible area, as in the formation of spherical raindrops; a phenomenon attributed to the attractive force or cohesion between the molecules of a liquid.

surface velocity The velocity of a liquid at its surface at a given point.

surface water Water which flows over, or rests on, the surface of a land mass.

surface wave (optical communication) An electromagnetic wave which travels along the surface separating two media in a manner determined by the geometrical shape of the surface and the properties of the media near that surface.

surfactant A chemical which changes the surface potential energy; for example, a soap or detergent.

surge (electric power) A transient wave of electrical current, voltage, or power in the circuit lasting from a few microseconds (commonly referred to as a transient "spike") to several seconds or longer (commonly referred to as a power surge).

surge (fluid power systems) Temporary rise and fall of flow or pressure.

surge admittance Reciprocal of surge impedance.

surge arrester A protective device for limiting surge voltages on equipment by discharging or bypassing surge current.

surge damping valve (fluid power systems) Valve which reduces shock by limiting the rate of acceleration of fluid flow.

surge generator, impulse generator An electric apparatus that produces high-voltage surges for testing insulators and for other purposes.

surge pressure Operating pressure plus the increment above operating pressure to which a device may be subjected for a very short time during pump starts, valve closings, etc.

surge suppressor A device operative in conformance with the rate of change of current, voltage, power, etc. to prevent the rise of such quantity above a predetermined value.

surge tank A vessel on a flow line whose function is to receive and neutralize sudden, transient rises or surges in the stream of liquid.

susceptibility The characteristic of electronic equipment that results in unwanted responses when subjected to electromagnetic energy.

susceptibility test Pertaining to electromagnetic compatibility, interference susceptibility test are essentially equipment withstand test designed to demonstrate the capability of equipment to function correctly when installed in its working environment. See further IEC publication 801-1 Electromagnetic compatibility for industrial-process measurement and control equipment, Part 1: General introduction.

suspended load That part of the total sediment transported which is maintained in suspension by turbulence in the flowing water for considerable periods of time without contact with the stream bed. It moves practically with the same velocity as that of the flowing water. It is generally expressed in mass or volume per unit of time.

suspended solids 1. Undissolved solids in boiler water. 2. Solids removed by filtration or centrifuging under specified conditions.

suspension 1. A fine wire or coil spring that supports the moving element of a meter or other instrument. 2. A system of springs or other devices that support an instrument or sensitive electronic equipment on a frame and reduce the intensity of mechanical shock or vibration.

swaging Any of several methods of tapering or reducing the diameter of a rod or tube, most commonly involving hammering, forging, or squeezing between simple concave dies.

swapping A process that interchanges the contents of an area in main storage with the contents of an area in auxiliary storage.

sweat The condensation of moisture from a warm saturated atmosphere on a cooler surface. A slight weep in a boiler joint but not in sufficient amount to form drops.

SWEB 1. South Wales Electricity Board (UK). 2. South Western Electricity Board (UK).

sweep (oscilloscopes) A spot displacement produced by the time base.

sweep accuracy (oscilloscopes) Accuracy of the horizontal (vertical) displacement of the trace compared with the reference independent variable, usually expressed in terms of average rate error as a percent of full scale.

sweep generator Also called timing oscillator. A circuit which applies voltages or currents to the deflection elements in a cathode-ray tube in a such way that the deflection of the electron beam is a known function of time, against which other periodic electrical phenomena may be examined, compared and measured.

sweep rate (oscilloscopes) The reciprocal of the time coefficient.

sweet crude Crude petroleum containing very little sulphur. Contrast with sour crude.

sweet gas Natural gas containing no hydrogen sulphide or mercaptans.

swept volume (cylinders) Volume of a theoretically incompressible fluid that would be displaced by the piston during a complete stroke. (For double-acting cylinders, it shall be given for both directions of stroke).

SWG Standard Wire Gauge.

swirl remover Device inserted in a conduit to eliminate or reduce circumferential velocity components which produce swirl. A swirl remover is a type of flow-straightening device.

switch 1. A device that is used to connect or disconnect shift, transfer or divert, some physical quantity from one condition to another. Various types with modifiers are: air, electric, key, level, pneumatic, pressure, rotary, selector, toggle, transfer, and tumbler. 2. A short term for message switcher.

switch (USA), switch point In a computer program, a parameter that controls branching and is bound prior to the branchpoint being reached.

switchboard 1. A single large panel or an assembly of panels on which are mounted the switches, circuit breakers, meters, fuses and terminals essential to the operation of electrical equipment. 2. A manually operated apparatus at a telephone exchange.

switchgear A general term covering switching, interrupting, control, metering, protective and regulating devices; also assemblies of these devices and associated interconnections, accessories and supporting structures, used primarily in connection with the generation, transmission and distribution of electric power.

switch indicator, flag An indicator that determines or shows the setting of a switchpoint.

switching algebra Boolean algebra which is applied to switching circuits, digital systems, and some communications switching.

switching circuit (data transmission) Term applied to the method of handling traffic through a switching center, either from a local user or from other switching centers, whereby additional electrical connection is established between the calling and the called station.

switching control See control switching.

switching differential The difference between the operate and release points of a switch, caused by hysteresis. It can be in units of amperes, volts, inches, millimeters, gausses etc.

switching element Element which implements a switching function. Note: Binary-logic elements, storage elements, and delay elements are examples of switching elements.

switching function A function of which the input variable and the output variable can only take a finite number of values.

switching function A function that has only a finite number of possible values and whose independent variables each have only a finite number of possible values.

switching hysteresis Pertaining to photoelectric and proximity switches, the difference between the upper and lower switching threshold. The relative switching threshold is the ratio of the switching hysteresis to the lower switching threshold.

switching point A point in the input span of a multiposition controller at which the output signal changes from one position to another. See figure in ANSI/ISA publication S 51.1, 1979.

switching power supply A power supply (usually dc output) which achieves its output regulation by means of one or more active power handling devices which are alternately placed in the off and on states. Distinguished from linear or dissipative power supplies.

switching system A telephone routing using a computer system to control the lineswitching circuits.

switching transients Transient voltage spikes that appear at a multiplexer's output when the multiplexer is switched from one channel to another and one of the switches is turned off.

switching transistor A three-terminal device with one terminal controlling the electrical impedance between the other two. Typical transistors switching circuits include inverters, converters, switching voltage regulators and relay and solenoid drivers.

switching value For a step element, any value of the input variable at which the value of the output variable changes. Note: The output variable may change between two values for two different switching values, upper and lower value, depending on the direction of the change of the input variable.

switching variable A variable which can assume only a finite number of values. Note: The most frequent switching variable is the binary logic variable, which can assume one of only two logic values representing the logic states 0 and 1.

switch mode (thyristor) The starting instant of the controller ON-state interval is nonperiodic. This instant may be random (analogous to contactor operation), or it may be selected, for example, at voltage zero.

switch train A series of switches in tandem.

swivel connection (joint) (fluid power systems) Connection which permits angular displace-

ment of pipelines at the point of connection but does not permit continuous rotation.

symbol 1. Any recognizable sign, mark, shape or pattern used as a building block for designing meaningful structures. **2.** See logic symbol.

symbolic address An address expressed in a form convenient for computer programming.

symbolic code A code which expresses programs in source language, i.e., by referring to storage locations and machine operations by symbolic names and addresses which are independent of their hardware determined names and addresses. Synonymous with pseudo code and contrasted with machine language.

symbolic control Pertaining to control by communication of discrete alphanumeric or pictorial symbols that are not physically isomorphic with the variables being controlled, usually by a human operator.

symbolic instruction An instruction in assembly language directly translatable into machine code.

symbolic language 1. A programming language that expresses addresses and operation codes of instructions in symbols convenient to humans rather than in machine language. **2.** "Human-orientated" programming language; any programming language that must first be "translated" into machine language by means of compilers, assemblers, etc.

symbolic logic, mathematical logic The discipline in which valid argument and operations are dealt with using an artificial language designated to avoid the ambiguities and logical inadequacies of natural languages.

symbolic processing A type of processing that primarily uses symbols rather than numeric representations of data. In expert systems, symbols are not restricted to a numeric context, but may represent objects, concepts and processes (DEC).

symbolic programming The use of arbitrary symbols to represent addresses in order to facilitate programming.

symbols for hydraulic and pneumatic components Graphical symbols for hydraulic and pneumatic equipment and accessories for fluid power transmission see ISO 1219 Fluid Power Systems and Components-Graphic Symbols.

symbols for quantities See note under (measurable) quantity.

symbol table A table constructed by an assembler or compiler to bind symbolic labels to their actual addresses.

symmetrical Balanced - i.e., having equal characteristics on each side of a central line, position or value.

symmetrical transducer A transducer in which all possible termination pairs may be interchanged without affecting transducer function.

symmetric binary channel A channel that is designed to convey messages consisting of binary characters and that has the property that the conditional probabilities of changing any one character to the other character are equal.

symmetric linear programming A fast and efficient mathematical technique for solving distribution and allocation problems in manufacturing operations.

sync Short for synchronous, synchronization, synchronizing, etc.

synchro generator A shafted electronic component which emits a low frequency ac signal proportional to the angle of rotation of its shaft.

synchronous Pertaining to two or more processes that depend upon the occurrence of events common to the processes.

synchronous clock An electric clock driven by a synchronous motor, for operation on an ac power system in which the frequency is accurately controlled.

synchronous computer A computer in which all operations and events are controlled by equally spaced pulses from a clock. Contrasted with asynchronous computer.

synchronous data link control procedure (SD-LC) A data link protocol intended for bit-serial synchronous data communications between buffered stations on a data link using centralized control. It applies to both half-duplex and full duplex operation, and may be employed in point-to-point, multipoint, and loop configurations.

synchronous generator. **1.** A synchronous alternating-current machine which transforms mechanical power into electric power. A synchronous machine is one in which the average speed of normal operation is exactly proportional to the frequency of the system to which it is connected. **2.** A circuit designed to synchronize an externally generated signal with a train of clock pulses. The generator produces precisely one output pulse for each cycle of the input signal. The output pulse thus has a width equal to that of the period of the clockpulse train.

synchronous logic The type of digital logic used in a system in which logical operations take place in synchronism with clock pulses.

synchronous motor **1.** An induction motor which runs at synchronous speed. **2.** Type of ac electric motor in which rotor speed is related directly to frequency of power supply. **3.** An alternating-current motor which operates at a speed determined solely by the frequency of supply power, and does not slow down as its load increases.

synchronous operation An operation in which each event or the performance of each operation starts as a result of a signal generated by a clock.

synchronous transmission A mode of data transmission such that the time of occurrence of each signal representing a bit is related to a fixed time frame.

synchro system An electric system for transmitting angular position or motion. It consists of one or more synchro receivers or synchro control transformers and may include differential synchro machines.

synchro-to-digital converter (S/D) An electronic device for converting the analog output signal of a rotary transformer (synchro) into a digital word for further processing.

sync signal, synchronizing signal The signal employed for synchronizing the scanning. In television it is composed of pulses at rates related to the line and field frequencies.

synergetic A tying together of every unit of a system, which when combined develop a total larger than their arithmetic sum. Also called synergistic.

synergism (water quality) The increase in intensity of an effect (chemical or biological) by one substance or organism, due to the presence of another substance or organism; the combined effect is greater than the additive effects of the separate substances or organisms.

synfuel Short for synthetic gas or oil.

syntax (software) **1.** The relationships among characters or groups of characters, independent of their meanings or the manner of their interpretation and use. **2.** The structure of expressions in a language. **3.** The rules governing the structure of a language. See also semantics.

synthesis The combining of parts in order to form a whole, e.g., to arrive at a circuit, computer, or program, starting from performance requirements.

synthesis (in artificial intelligence) The generation of artificial voice, written text, and images, by a functional unit.

synthetic language A pseudocode or symbolic language. A fabricated language.

synthetic lubricant Any of a group of lubricating substances that can perform better than straight petroleum products in the presence of heat, chemicals or other severe environmental conditions.

synthetic natural gas Commercial gas made by the reduction or gasification of solid hydrocarbons; coal, oil shale and tar sand. Syngas; substitute gas. See gasification.

synthetic oil A term applied to oil from coal, oil shales, and tar sands.

synthetic speech Artificially reproduced acoustic signals that are recognizable as human speech.

sysgen See system generation.

system Set of interdependent elements constituted to achieve a given objective by performing a definite function. Note: The system is considered to be separated from the environment and other external systems by an imaginary surface which cuts the links between them and the considered system. Through these links, the system is affected by the environment, is acted upon by the external systems, or acts itself on the environment or the external systems.

system An organized collection of personnel, machines, and methods required to accomplish a set of specific functions.

system analysis The examination of an activity, procedure method, technique, or a business to find out what must be accomplished and how the necessary operations may best be accomplished.

system architecture The structure and relationship among the components of a system. The system architecture may also include the system's interface with its operational environment.

systematic error **1.** A component of the error which, in the course of a number of measurements of the same measurand, remains constant or varies in a predictable way. **2.** For a measuring instrument, see "bias error".

systematic failure See reproducible failure.

systematic fault A fault resulting from a systematic failure.

system bleeding (fluid power systems) Removing pockets of air trapped in the circuit. Usually carried out at low pressure by means of small valves or connections at high points. Removing water in the air circuit with separator drain-valve.

system check module A device that monitors system operability if power fails or deviations from desired computer operations develop. It initiates appropriate emergency actions by the computer.

system cleaning (fluid power system) Removal of contaminant from all fluid passages and internal spaces to which the working fluid has access.

system control See control system.

system debugging The technique of detecting, diagnosing, and correcting errors (bugs) which may occur.

system design The process of defining the hardware and software architectures, components, modules, interfaces, and data for a system to satisfy specified system requirements. The result of the system design process.

system deviation **1.** For a control system, the difference between the reference variable and the controlled variable at a given instant. **2.** The instantaneous

value of the directly controlled variable minus the set point. See also actuating error signal.

system diagnostics A program resembling the operational program rather than a systematic logical-pattern program which will detect overall system malfunctions rather than isolate or locate faulty components.

system diagram Relatively simple diagram, often using single-line representation, showing a system, its sub-systems and the main connections or interrelations among these systems. A system diagram showing a system containing primarily non-electrical devices in the process flow paths is normally designated (process) flow diagram.

system documentation Documentation conveying the requirements, design philosophy, design details, capabilities, limitations, and other characteristics of a system. Contrast with user documentation.

system element (measurement system) One or more basic elements with other components and necessary parts to form all or a significant part of one of the general functional groups into which a measurement system can be classified. Typical examples of system elements are: a thermocouple, a measurement amplifier, a millivoltmeter.

system engineering 1. A method of engineering which takes into consideration all the elements in the control system and the process itself. **2.** The process of selecting and integrating functionally distinct devices, mechanism, and subsystems necessary for optimum performance of the operation.

system error In a control system, the difference between the value of the ultimately controlled variable and its ideal value.

system flushing (fluid power systems) Operating the system containing a special cleaning fluid (flushing oil) at low pressure to clean the inner passages and cavities in the circuit. The flushing oil is replaced by the correct working fluid before the system is put into normal service.

system generation, sysgen (acronym) The process of selecting optional parts of an operating system and of creating a particular operating system tailored to the requirements of a data processing installation.

system ground A common point to which the grounds for various pieces of equipment in a system are connected. The system ground is generally the best point to connect to earth ground.

system-level controller A microprocessor-based controller that controls centrally located HVAC equipment such as variable air volume (VAV) supply units, built-up air handlers, and central chiller and boiler plants. These controllers typically have an expandable I/O device capability, a library of control programs, and may control more than one mechanical system from a single controller. In a BMS (Building Management System), these controllers provide processing of point data for higher level processors and typically include energy management programs.

system library (software) A controlled collection of system-resident software that can be accessed for use or incorporated into other programs by reference, for example, a group of routines that a linkage editor can incorporate into a program as required. See also software library.

system matrix A matrix which, at a given time, describes the connections between the values of the system state variables and their rate of change.

system of units (of measurement) A set of units established for a given system of quantities. Note: A system of units comprising a set of chosen base units,

together with derived units determined by their defining equations and proportionality factors. Examples: **a.** International System of Units, SI; **b.** CGS system of units.

system overshoot (industrial control) The largest value of system deviation following the first dynamic crossing of the ideal value in the direction of correction, after the application of a specified stimulus.

system performance test A test performed on a system under normal or simulated normal conditions of the important parameters of the process such as temperature, flow, level and pressure.

system pressure (fluid power systems) Nominal pressure usually measured at the inlet to the first valve or at pump outlet (normally the relief valve setting).

system reliability The probability that a system, including all hardware and software subsystems, will perform a required task or mission for a specified time in a specified environment.

system restart 1. A restart that allows reuse of previously initialized input and output work queues. **2.** A restart that allows reuse of a previously initialized link pack area.

system retention The proportion of any component in the pulp suspension or stock fed to the machine system which is present in the web which leaves the machine system; see retention. The machine system may be a wet machine, paper machine or board machine system. The components may be fibers, fine material, filters, size etc.

system science The branch of organized knowledge dealing with systems and their properties, the systemized knowledge of systems.

System Six A family of Fischer & Porter process control devices using distributed control. An open network using MLT-stations and X-terminals as operator stations and distributed control stations for process control.

system software Software designed for a specific computer system or family of computer systems to facilitate the operation and maintenance of the computer system and associated programs. Contrast with application software.

system specification (fluid power systems) Document detailing the materials, functional performance and standard of a piece of equipment or complete system or installation to meet the performance specification.

system specification The specification which establishes the functional, performance and design criteria for the design, development, testing and production of a complete system. This specification allocates the system into functional entities identified as configuration items (SAMA).

system program Computer programs provided by a computer manufacturer. Examples are operating systems, assemblers, compilers, debugging aids, input/output programs etc.

system support Functions such as language translators, debugging tools, diagnostics and libraries which enable a system user or programmer to write and test tasks in an efficient manner.

system testing The process of testing an integrated hardware and software system to verify that the system meets its specified requirements. See also acceptance test, qualification testing.

system validation See validation.

system verification See verification.

T

T 1. Symbol for tesla, unit for magnetic flux density and magnetic induction (SI unit). See tesla. **2.** Symbol for prefix tera. See tera.

(type) T Letter designation for thermocouple and thermocouple extension wire with a certain temperature-emf relationship. Material identification Copper versus Copper-Nickel. See ISA publication ANSI-MC 96.1-1982 and IEC publication 584. Copper-nickel may in some publications be referred to as constantan.

Ta Chemical symbol for tantalum.

table An arrangement of data each item of which may be identified by means of arguments or keys.

tachometer generator A tachometer generator is essentially a small permanent magnet dc generator which will develop an output emf which is directly proportional to the armature speed.

tachometric relay A relay in which actuation of the contacts is effected at a predetermined speed of a moving part.

TACMA The Association of Control Manufacturers (UK).

tag 1. Same as flag. **2.** Same as label. **3.** Information that is used as an identifier or label for other information. The term is often used synonymously with "point". Refers to Honeywell TDC 3000 control systems.

tag address See symbolic address.

tagging (flow marker or tracer) technique The flow measurement technique called tagging often is referred to as the tracer method or flow-marker technique. In practice, either a substance introduced into a flowing fluid or a natural marker in the fluid is traced between two points and measuring the time it takes the marker to traverse the known distance results in a direct measurement of flow rate.

Tag-Robinson colorimeter A laboratory device used to compare shades of color in oil products by varying the thickness of a column of the oil until its color matches that of a standard.

tail ends See leader.

tail gas Residue gas from a sulphur recovery unit; any gas from a processing unit treated as a residue.

tailing Leftovers from a refining process; refuse material separated as a residue.

tailing (hydrometallurgy and ore concentration) The discarded residue after treatment of an ore to remove desirable materials.

tailpiece Fitting inserted into a flexible tube and secured.

Takahax process (coke-oven plants) See wet oxidation processes.

take-off point (fluid power systems) Auxiliary connection on units or pipes for fluid supply or measurement.

tandem cylinder Arrangement of at least two pistons on the same rod moving in separate chambers on the same cylinder body allowing the compounding of force.

tank circuit A resonant electronic circuit that consists of a capacitor and an inductor connected in parallel.

tank farm A group of large riveted or welded tanks for storage of crude oil or product.

tantalum oxide A dielectric material used in capacitors; it is formed, electrochemically in a thin film on surfaces of tantalum metal.

tap 1. A device for extracting a portion of the optical signal from a fiber. **2.** A fixed electrical connection to

a specified position on the element of a potentiometer, transformer etc.

tap center A connection to the electrical midpoint of a coil, resistor or transformer winding.

tape A ribbon of flexible material used as a storage medium, described by qualifying adjective such as paper, magnetic, oiled etc.

tape-and-plump-bob liquid-level gage See plump-bob gage.

tape-controlled machine A machine tool operated automatically by means of control signals read off a length of magnetic or punched paper tape.

tape control unit A unit (including buffering) designed to control the operation of the magnetic tape transport.

tape deck The basic assembly of a tape recorder, consisting of the tape-moving mechanism (the tape transport) and a head assembly. Some decks also include recording and playback preamplifiers, these properly are called tape recorders.

tape drive A device that moves tape past a head. Also called tape transport.

tape dump The transfer of complete contents of information recorded on tape to the computer of another storage medium.

tape editor A program used to edit, correct, and update symbolic program tapes using the computer and teletype unit.

tape feed A mechanism which feeds the tape to be read or sensed by a computer or other data-handling system.

tape formatter A device, including buffers and controls, for recording ordered data on magnetic tape in gapped form, in a format recognized by a computer.

tape head The transducer on a tape recorder past which the tape runs during record or replay.

tape leader The tape preceding or following the body of a program.

tape limited Pertaining to a computer operation in which the time required for the reading and writing of tapes is greater than the time required for computation.

tape loadpoint The position of magnetic tape where reading or writing can begin.

tape memory A serial, bulk-storage, off-line memory.

tape operating system, TOS Used for smaller systems without disk drives, this operating system has its component modules (i.e., compilers, linkage-editor, etc.) stored on a system tape. Contrast with disk operating system (DOS).

tape parity Parity error that occurs when information is transferred to or from magnetic tape.

taper A dimensional feature where thickness, height, diameter or some other measurement varies linearly with distance along a given axis.

tape reader An input device that reads data from tape.

tape recorder A mechanical-electronic device for recording voice, music and other audio-frequency-material.

tapered aeration, stepped aeration (water quality) See stepped aeration.

tapered fiber (optical communication) An optical fiber whose cross section dimensions change progressively with distance along the optical fiber.

tapered plug (control valves) Plug is tapered and may be lifted from seating surface before rotating to close or open.

tapered tube and float (flowmeters) Type of area flowmeter a design like the rotameter. In the operation of the tapered tube and float device, the float rises in the tube as the flow increases until the space between the tube and the float is large enough to decrease the fluid velocity to a value that results in a balance between the force of the flow acting on the float and the mass of the float. Because the device is designed such that the differential pressure or head remains constant, the volume rate of flow is directly proportional to the space between the float and the walls of the tube. In addition, for a constant diameter float and a uniformly tapered tube, the area of the space is proportional to the height of the float in the tube.

tape relay A method used (using perforated tape as the intermediate storage) for relaying messages between the transmitting and receiving stations.

tape search A hardware process by which an operator or computer can cause instrumentation tape to be searched automatically for specific start and stop times for data reduction.

tape speed compensation signal A signal recorded on instrumentation tape along with the data (preferable on the same track as the data) to correct electrically for tape speed errors during playback.

tape-to-printer program A program designed to transfer data from magnetic tape to a printer.

tape track The path traversed by one head during the record or playback process.

tape transmitter 1. A machine actuated by previously punched paper tape and used for high-speed code transmission. 2. A facsimile transmitter designed for transmission of subject copy printed on narrow tape.

tape transport The mechanism which moves magnetic or paper tape past sensing and recording heads and is usually associated with data processing equipment.

tape-type liquid-level gage A liquid-level gage consisting of a tape wound around a drum which is attached to a pointer or other level indicator, with one end of the tape attached to a float and the other counterweighted to keep the tape taut.

tape unit A device consisting of a tape transport, controls, a set of reels, and a length of tape which is capable of recording and reading information on and from the tape, at the request of the computer under the influence of a program.

taphole A hole in the side or bottom of a furnace or ladle for draining off molten metal.

tapped resistor A wirewound fixed resistor having one or more additional terminals along its length, generally for voltage-divider applications.

tappet An oscillating part such as a lever, operated by a cam or push rod, and used to tap or push another machine element such as a valve.

TAPPI Technical Association of the Pulp and Paper Industry.

tapping See dither.

tare The empty weight of a carrier, bucket, drum, or other container.

target computer A computer which has its programs prepared by a host computer.

target flowmeter Meters of this type are also referred to as vane, gate, drag or force flowmeters. Fluid flowing through the device causes a plate to swing outward, away from the fluid jet. At no flow, the plate rests against the end section of the meter. In its simplest form, the device is used as a flow indicator only and no flow scale is provided. However, the meter

may be provided with a scale for the determination of flow rate, where the scale might be the angle through which the target or vane swings.

target flow transducer A transducer which measures the square of the flow rate of a fluid in a closed conduit by the force exerted on a circular disk centrally located in the conduit and perpendicular to the flow. See figure in IEC publication 902, 1987.

target language, object language A language into which statements are translated.

target machine The computer being emulated by another computer. Contrast with host machine.

target program, object program A computer program in a target language that has been translated from a source language.

target value Desired operating value of a noncontrolled process variable indicating point that is commonly associated with Analog Units and PIUs. Refers to Honeywell TDC 3000 control systems.

tarnish (corrosion) Surface discoloration of a metal caused by formation of a thin film of corrosion product.

task A set of instructions, data and control information capable of being executed by the central processing unit of a digital computer in order to accomplish some purpose; in a multiprogramming environment, the time of the central processing unit is shared between the tasks, but in a non-multiprogramming environment a task is simply the current work being done.

task (tank forms) A task represents the movement of a single product in the tank farm from at least one source to at least one destination. More than one source or destination can be defined for a task.

task control block, TCB The consolidation of control information related to a task.

task dispatcher The control program that selects from the task queue the task that is to have control of the central processing unit and gives control to the task.

task management Those functions of the control program that regulate the use by tasks of the central processing unit and other resources, except for input/output devices.

task program (industrial robots) The set of motion and auxiliary functions instructions which define the specific intended task of the robot system; this type of program is normally generated by the user. Note: An application is a general area of work, a task is specific within the application.

task queue A queue of all the task control blocks present in the system at any one time.

taut-band suspension In an indicating instrument, a mechanical arrangement in which the moving element is suspended by means of a thin, flat conducting ribbon at each end.

Tc Chemical symbol for technetium.

T/C, TC Thermocouple.

T/C, TC Thermocouple.

TCP/IP Transmission Control Protocol/Internet Protocol. Standard for transmission of data over a Ethernet network.

TCU See transmission control unit.

TDC 3000 BASIC System A family of Honeywell process control devices that use distributed control. Typical BASIC Systems might contain a process computer, operator stations, process interface units, basic controllers, a highway traffic director plus other equipment and software necessary to accomplish the control operation.

Te Chemical symbol for tellurium.

teach pendant (industrial robots) A hand held unit linked to the control system with which a robot can be programmed or moved.

teach programming (industrial robots) Programming performed – by manually leading the robot end – effector – or by manually leading a mechanical simulating device – or by using a teach pendant to move the robot, through the desired actions.

tear factor, tear index The tearing resistance divided by the grammage. The tear index is expressed in SI-units. Pertains to paper.

tearing resistance The force required to tear e.g. a sheet of paper under specified conditions continuing from an initial cut.

technical characteristics Those attributes of equipment that pertain to the engineering principles governing its functions.

technical delay The accumulated time necessary to perform auxiliary technical actions associated with the maintenance action itself.

technical regulation A regulation containing or referring to a standard or a technical specification. Note: A technical regulation may be supplemented by technical guidance which outlines some way(s) to fulfill the regulation.

technical scale of mineral hardness In addition to the Mohs scale, there is a so-called technical scale or hardness that includes 15 minerals, listed softest to hardest: talc, gypsum, calcite, feldspar, apatite, orthoclase, pure silica glass, quartz, topaz, garnet, fused zircon, corundum, silicon, carbide, baron carbide, and diamond.

technical specification A document which lays down characteristics of a product or a service such as levels of quality, performance, safety, dimensions. It may include terms and definitions, symbols, testing and test methods, packaging, marking or labelling requirements. A technical specification may also take the form of a code of practice.

tee coupler (optical communication) A passive coupler that connects three ports.

teeming Pouring molten metal into an ingot mold; most often used with reference to steel production.

teflon – asbestos packing Type of packing for valve packing box. Composed of die-formed split rings with skived joints. Made from braided, white asbestos impregnated with pure teflon and containing mineral oil.

TEL See tetraethyle lead.

tele A prefix from the Greek which means “far off”.

telebrineller (or Brinell meter) A portable hardness tester.

telecommand The use of telecommunication techniques to cause a change in the status of operational equipment.

telecommunications Pertaining to the transmission of signals over long distances such as by telegraph, radio, or television.

telecontrol The control of operational equipment at a distance using the transmission of information by telecommunication techniques.

teleindication The telemonitoring of status information such as alarm conditions, or switch positions, or valve positions.

teleinstruction The transmission, using telecommunication techniques, of switching and/or adjusting instructions to a station for manual operation.

telematics, telematique The integration of computer-processing applications with telecommunications capabilities.

telemetry The science of measuring quantities, transmitting the results to a distant station, and interpre-

ting, indicating, and/or recording the quantities measured.

telemetry frame In pcm systems, one complete sampling of words or channels of information at a given rate; in time-division multiplexing, one complete commutator revolution.

telemetry front end, TFE Hardware devices that accept multiplexed data and time, establish synchronization, convert to parallel data, and provide timing pulses, status, and the like for computer entry.

telemetry input channel A device which prepares telemetry data for input to a real-time computer.

telemonitoring The supervision of the status of operational equipment at a distance using telecommunication techniques.

teleoperator A mobile robot controlled by a human operator. Teleoperators are most often used in areas that would be hazardous to human beings.

telephone frequency See voice frequency.

telephone trunk A telephone line between two central offices that is used to provide communications between subscribers.

teleprinter A common alphanumeric input/output communications device, the teleprinter is essentially an electric typewriter with communications capability.

teleprocessing Data processing by means of a combination of computers and data communication facilities.

teleregulation The combination of telemonitoring and telecommand facilities in a closed loop, generally including an automatic decision making part.

telescopic connection (joint) (fluid power systems) Joint consisting of two tubes sliding longitudinally one within the other to convey the working medium to the equipment.

telescoping cylinder (fluid power systems) Cylinder with two or more stages of extension, achieved by hollow piston rods sliding one within the other.

teleswitching The telecommand of operational equipment having two determined states.

TEM mode (fiber optics) See transverse electromagnetic mode.

TE mode (fiber optics) See transverse electric mode.

tempco Acronym for temperature coefficient.

temper See tempering.

temperature Indication of how hot or cold a substance is. The SI base unit for measurement of temperature is kelvin, symbol K. See kelvin.

temperature coefficient, TC 1. A factor used to calculate the change in the characteristics of a substance device or circuit element with changes in its temperature. **2.** The percentage change in the output voltage or (current) of a regulated power supply due to a variation of ambient temperature. The values are usually expressed as a percentage per degree Celsius and restricted to the specified ambient range of the unit. **3.** The SI unit is reciprocal kelvin.

temperature compensation The process whereby the effects of an increase or decrease in ambient temperature are cancelled.

temperature controller (fluid power systems) Device which maintains the fluid temperature within prescribed limits.

temperature cycling An air-to-air temperature stress test usually performed at -65°C for 10 minutes followed by $+150^{\circ}\text{C}$ for 10 minutes for 10 cycles with a maximum transfer time of 5 minutes. This screen determines the reliability of a part that may be exposed to extreme high and low temperatures.

temperature error (electrical transducers) The maximum change in output, at any measurand value within the specified range, when the transducer temperature is changed from room temperature to specified temperature extremes.

temperature error band (electrical transducers) The error band applicable over stated environmental temperature limits.

temperature gradient error (electrical transducers) The transient deviation in output of a transducer at a given measurand and value when the ambient temperature or the measured fluid temperature changes at a specified rate between specified magnitudes.

temperature sensor See thermocouple and thermistor.

temperature shock A rapid change from one temperature extreme to another.

temper brittleness Condition caused by embrittlement in connection with heating to a certain temperature or with gradual cooling after hardening and tempering.

temper carbon Graphite derived from the malleablizing of white cast iron.

tempering, temper Heat treatment of a material after hardening below its corresponding transformation temperature in order to achieve a satisfactory balance between hardness and toughness.

tempering air Air at a lower temperature added to a stream of pre-heated air to modify its temperature.

template 1. A guide or pattern used in laying out parts to be manufactured. 2. A guide used in drawing standard shapes on an engineering or architectural drawing.

temporal coherence (optical communication) See time coherence.

temporary ground A connection between a grounding system and parts of an installation that are normally alive, applied temporarily so that work may be safely carried out in them.

temporary hardness, alkaline hardness (water quality) That hardness which is removed by boiling. It is normally caused by the presence of hydrogen carbonates.

temporary storage location A specific area of memory set aside for data in process of an intermediate state of computation, e.g., in the central processing unit, such storage often called, scratch pad memory.

TEM wave Transverse electromagnetic wave.

tens complement (mathematics of computation) The radix complement of a decimal numeral, which may be formed by subtracting each digit from 9, then adding 1 to the least significant digit and executing any required carries. For example the tens complement of 4830 is 5170.

tensile strength 1. The maximum force supported per unit width of a test strip until the onset of rupture in a tensile test. The tensile strength is determined according to a standardised test. Pertains to paper. 2. In tensile testing, the ratio of maximum load to original cross-sectional area. Also called "ultimate strength".

tensile test, pull test A method of determining mechanical properties of a material by loading a machined, cast or molded specimen of specified cross-sectional dimensions in uniaxial tension until it breaks; the test is used principally to determine tensile strength, yield strength, ductility and modulus of elasticity.

tension 1. Mechanical, the condition of strain which tends to stretch. 2. Electrical, the potential or electrostatic voltage.

tenter frame (textile term) A machine containing parallel chains with clips or pins attached, which

move a fabric continuously through a housing at a preset width.

tera Prefix for the numerical quantity of 10^{12} . Symbol T (SI unit).

teracycle A mega megacycle per second -10^{12} cycles per sec.

teraohm One million megaohms, or 10^{-12} ohms.

teraohmmeter An instrument used to measure extremely high resistance.

terminal 1. Any input/output device to receive or send source data in an environment associated with the job to be performed, capable of transmitting entries to and obtaining output from the system of which it is a part. 2. A point at which information can enter or leave a communication network.

terminal-based conformity The closeness to which the calibration curve of a device can be adjusted to approximate the specified characteristic curve so that the upper and lower range values of both input and output curves coincide. See figure in IEC publication 902, 1987 and/or ANSI/ISA publication S 51.1, 1979.

terminal-based linearity The closeness to which the calibration curve of a device can be adjusted to approximate the specified straight line so that the upper and lower range values of both input and output curves coincide. See figure in IEC publication 902, 1987 and/or ANSI/ISA publication S 51.1, 1979. For test procedures see the S 51.1 publication.

terminal block A terminal block is a block of insulating material that is used to support and join the termination of conductors. Often part of a thermocouple assembly.

terminal board, terminal strip An insulating base or slab equipped with terminals for connecting wiring. Terminal strips are available with threaded holes to accept thread screws or with threaded studs to accept fastening washers and nuts.

terminal box A housing where cable pairs are brought out to terminations for connections.

terminal conformity See conformity.

terminal connection diagram (or table) Connection diagram (or table) showing the terminals of a constructional unit and the internal and/or external connections to the terminals.

terminal emulation A situation in which special software makes a computer behave as though it were a terminal connected to another computer.

terminal I/O wait The condition of a task in which the task cannot continue processing until a message is received from a terminal.

terminal line (electrical transducers) A theoretical slope for which the theoretical end points are 0 and 100% of both measurand and output.

terminal transparency The ability, in a network, to allow incompatible terminals to communicate by line control conversion and automatic code conversion.

terminal unit An apparatus by means of which a connection (and translation, if required) is made between the considered interface system and another external interface system.

terminal user In systems with time sharing, anyone who is eligible to log on.

terminating The closing of the circuit at either end of a line or transducer by connection to some device.

termination proof In proof of correctness, the demonstration that a program will terminate under all specified input conditions.

termination rack A type of equipment rack which contains field wiring terminals and associated signal conditioning equipment. It thus provides the termina-

tion interface between a computer control system and field mounted instrumentation.

terminator A resistor used at the end of a cable or bus to reduce signal reflections. Refers to Honeywell TDC 3000 control systems.

ternary 1. Characterized by a selection, choice or condition that has three possible different values or states. **2.** Of a fixed radix numeration system, having a radix of three.

ternary code A code in which each element may be any one of three distinct kinds or values.

ternary gates Ternary circuits that operate on three logic states at a time, that is, in base 3 arithmetic instead of base 2.

ternary pulse-code modulation A form of pulse-code modulation in which each element of information is represented by one of three distinct values, e.g., positive pulses, negative pulses and spaces.

terne metal Terne metal is an alloy of lead and tin.

tertiary air Air for combustion supplied to the furnace to supplement the primary and secondary air.

tertiary treatment (water quality) The application of additional treatment processes to reduce further the polluting effects of sewage which has undergone primary and secondary treatment. This may refer to **1.** further physical treatment, or **2.** chemical treatment, or **3.** further biological treatment.

tesla The magnetic flux density given by a magnetic flux of 1 weber per square meter. Letter symbol T. (SI unit.)

test An experiment carried out in order to measure, quantify or classify a characteristic or a property of an item.

test bed (software) A test environment containing the hardware, instrumentation tools, simulators, and other support software necessary for testing a system or system component.

test bench Equipment designed specifically for making overall bench tests and equipment in a particular test setup under controlled conditions.

test case (software) A specific set of test data and associated procedures developed for a particular objective, such as to exercise a particular program path or to verify compliance with a specific requirement. See also testing.

test case generator See automated test generator.

test data Data developed to test a system or system component.

test data generator See automated test generator.

test design specification (software test documentation) A document specifying the details of the test approach for a software feature or combination of software features and identifying the associated tests.

test driver (software) A driver that invokes the item under test and may provide test inputs and report test results.

testing The process of exercising or evaluating a system or system component by manual or automated means to verify that it satisfies specified requirements or to identify differences between expected and actual result. Compare with debugging.

testing of industrial process control valves For inspection and routine testing of industrial process control valves see IEC publication 534-4 with Amendment No. 1.

test jack A jack that makes a circuit or circuit element available for testing purposes.

test language A procedure or programming language designed or adapted for the development of test specifications and routines.

test log A chronological record of all relevant details about the execution of tests.

test loop A cycle of test that can be repeated over and over, e.g., to locate intermittent faults.

test model A representation of equipment, a component or part of equipment, or the equipment itself, that is suitable for use in a functional test.

test plan (software) A document prescribing the approach to be taken for intended testing activities. The plan typically identifies the items to be tested, the testing to be performed, test schedules, personnel requirements, reporting requirements, evaluation criteria, and any risks requiring contingency planning.

test point 1. A connection to which no instrument is permanently connected, but which is intended for temporary, intermittent or future connection of an instrument. **2.** A convenient, safe access to a circuit or system.

test procedure (software) Detailed instructions for the setup, operation, and evaluation of results for a given test. A set of associated procedures is often combined to form a test procedures document.

test procedures for flow capacity (of control valves) See under flow capacity testing (of control valves).

test procedure standard Standard dealing with test methods, sometimes with the addition of other dispositions concerning the tests, such as sampling, use of statistical methods and sequence of tests. Note: In some cases, a test procedure standard can be similar to an evaluation standard.

test program 1. A software component that implements a test procedure. **2.** A particular group of test sequences or test patterns.

test programming procedures Documents which explain in detail the composition of test programs including definitions and logic used to compose the program. Provides instructions to implement changes in the program.

test rate A problem chosen to determine whether the computer or a program is operating correctly.

test repeatability (software) An attribute of a test indicating whether the same results are produced each time the test is conducted.

test report (software) A document describing the conduct and results of the testing carried out for a system or system component.

test routine A checking routine or a diagnostic routine.

test software Maintenance instructions which control the testing operations and procedures of the automatic test equipment. This software is used to control the unique stimuli and measurement parameters used in testing the unit under test.

test specification A document that defines the test requirements including test levels and performance requirements.

test stand A framework, rig or table equipped with instrumentation, power sources and auxiliary equipment necessary to perform an operating test on a machine electronic device, engine or instrument.

test support software Computer programs used to prepare, analyze, and maintain test software. Test software includes automatic test equipment (ATE) compilers, translation/analysis programs and punch/print programs.

test to failure The practice of inducing increased electrical and mechanical stresses in order to determine the maximum capability of a device.

test validity The degree to which a test accomplishes its specified goal.

tetrad A group of four, i.e., four pulses, used to express a decimal digit in the scale of 10 or 16.

tetraethyle lead, TEL A lead compound added, in small amounts, to gasoline to improve its antiknock quality. Tetraethyl lead is manufactured from ethyl chloride, which is derived from ethylene, a petrochemical gas.

tetrode transistor A transistor in which an extra terminal is supplied to the base.

text The part of a message which contains the substantive information to be conveyed.

textual form Presentation form using text, for example in written instructions and descriptions.

textual language A system consisting of a well-defined, usually finite, set of characters; rules for combining characters with one another to form words or other expressions; and a specific assignment of meanings to some of the words or expressions.

textural retrieval The automatic recognition, selection, interpretation, and manipulation of words, phrases, sentences, or any data in any form, but particularly in a textural structure, and the relating of these data for conclusions and useful results.

TFE Tetrafluoroethylene.

Th Chemical symbol for thorium.

thallofide cell A photoconducting cell which has thallium oxysulfide as the light-sensitive agent.

thematic role A set of functions that an entity may perform during the execution of a script. Note: Thematic roles are filled by actors.

theoretical air consumption Theoretical volume of air required for the operation of a device or installation in order to perform a given task or for a stated time, the method of calculation being stated.

theoretical commercial dryness (of pulp) A commercially used value for the dry solids content; see saleable mass (of pulp). The theoretical commercial dryness is normally 90 percent by weight. In certain countries a value of 88 percent by weight is adopted.

theoretical curve (electrical transducers) The specified relationship (table, graph or equation) of the transducer output to the applied measurand over the range.

theoretical cutoff frequency Disregarding any dissipation effects, the characteristic frequency at which the image attenuation constant of a transducer changes from zero to a positive value, or vice versa.

theoretical end points (electrical transducers)

The specified points between which the theoretical curve is established and to which no end point tolerances apply. Note: The points can be other than 0 and 100% of both measurand and output.

theoretical flame temperature See adiabatic temperature.

theoretical force (cylinders) Pressure multiplied by the effective piston area, ignoring friction. For double-acting cylinders, the value shall be given for both directions of stroke.

theoretical slope (electrical transducers) The straight line between the theoretical end points.

therm A unit of heat applied especially to gas. One therm equals 100,000 Btu.

thermal (hot wire) gages for high vacuums

High vacuums are widely used in the processing of foods, drugs and chemicals. The thermal type of high vacuum gage operates on the principle that the heat loss from a hot coil of resistance wire or from a hot filament varies as the pressure changes.

thermal alloying The act of uniting two different metals to make one common metal by the use of heat.

thermal analysis Determining transformation temperatures and other characteristics of materials or physical systems by making detailed observations of time-temperature curves obtained during controlled heating and cooling.

thermal arrest calorimeter A device for measuring heats of fusion in which a sample is frozen under vacuum at subzero temperatures and thermal measurements are taken as the calorimeter warms to room temperature.

thermal coefficient of resistance The relative change in resistance of a conductor or semi-conductor per unit change in temperature over a stated range of temperature. Note: Expressed in ohms per ohm per degree F or C (intended for use only in specifications).

thermal conductivity A measure of the ability of a substance to conduct heat. The SI unit for thermal conductivity is watt per metre kelvin.

thermal conductivity gas analyzer Gas analyzer using the change in resistance of a heated filament in the gas to measure one or several component concentrations.

thermal conductor A material which readily transmits heat by conduction.

thermal cones Any of a series of conical shaped thermometric devices made of materials that deform at specified temperatures; consists of mixtures of clay, salt and other materials in such proportions that their softening temperatures vary progressively through the series. Also known as pyrometric cone or Seger cone.

thermal contraction The shrinkage exhibited by most metals when cooled.

thermal converter Also called thermocouple converter, thermoelectric converter, thermoelectric generator or thermoelement. One or more thermojunctions in thermal contact with an electric heater or integral, so that the electromotive force developed by thermoelectric action at the output terminals gives a measure of the input current in the heater.

thermal cracking A refining process in which heat and pressure are used to break down, rearrange or combine hydrocarbon molecules. Thermal cracking is used to increase the yield of gasoline obtainable from crude oil.

thermal current converter A type of thermal converter in which the electromotive force developed at the output terminals gives a measure of the current through the input terminals.

thermal cutout An overcurrent protective device which contains a heater element that affects a fusible member and thereby opens the circuit.

thermal detector See bolometer.

thermal drift A change in the output of a regulated power supply over a period of time, due to changes in internal ambient temperatures not normally related to environmental changes. Thermal drift is usually associated with changes in line voltage and/or load changes.

thermal emf The electromotive force generated when the junction of two dissimilar metals is heated. (See also thermocouple).

thermal endurance An indication of the relative life expectancy of a product when exposed to operating temperatures much higher than normal room temperature.

thermal expansion 1. Physical expansion resulting from an increase in temperature; it may be linear and volumetric. **2.** The expansion of a material when subjected to heat.

thermal flowmeters In the thermal class of flowmeter, flow rate is measured either by monitoring the

cooling action of the flow on a heated body placed in the flow or by the transfer of heat energy between two points along the flow path. The two types of flow-measurement devices in the thermal class of flowmeters are the thermo-anemometer and the calorimetric flowmeter.

thermal instrument, electrothermal instrument An instrument which operates by the heating effect of one or more currents.

thermal junction See thermocouple.

thermal magnetic oxygen analyzer An analyzer designed to measure the magnetic susceptibility of a gas mixture is essentially an oxygen analyzer.

thermal oxidizers A large, cylindrical furnace, with refractory lining and banks of burners at various levels, for burning refinery gases before they are vented to the flare tower.

thermal protector (as applied to motors) A protective device for assembly as an integral part of a motor or motor-compressor and which, when properly applied, protects the motor against dangerous overheating due to overload and failure to start.

thermal radiation Radiation arising from the thermal excitation of atoms and molecules.

thermal recorder A recording instrument in which the record is made by a heated stylus on a heat-sensitive chart.

thermal relay Relays in which the operating quantity generates heat in a resistance winding and so affects some temperature-sensitive component.

thermal resistance (cable) The resistance offered by the insulation and other coverings to the flow of heat from the conductor or conductors to the outer surface.

thermal resistivity Thermal resistance of a unit cube of material.

thermal resistor An electronic device which makes use of the change in resistivity of a semiconductor with changes in temperature. See thermistor.

thermal sensitivity shift (electrical transducers) Intended for use only in specifications: The sensitivity shift due to changes of the ambient temperature from room temperature to the specified limits of the operating temperature range.

thermal shock An abrupt temperature change, applied to a device, likely to cause thermal stress.

thermal shock A wet-to-wet temperature stress test that usually takes 5 minutes at 100°C, followed by 5 minutes a 0°C for 15 cycles with a maximum transfer time of 10 seconds. The purpose of this test is to determine device resistance to sudden extreme changes in temperature.

thermal stress The mechanical tensions inside solid materials caused by the differences in thermal expansion due to temperature differences in a solid.

thermal time – delay relay A type of relay in which the time interval between energization and actuation is determined by the thermal storage capacity of the actuator critical operating temperature, power input and thermal insulation.

thermal transducer Any device which converts energy into electric power or other useful measuring medium. A typical example is a thermocouple device.

thermal transmittance The SI unit for measurement of thermal transmittance is watt per square metre kelvin.

thermal-type flowmeter An apparatus in which heat is injected into a flowing fluid stream and flow rate is determined from the rate of heat dissipation.

thermal-type liquid-level meter Any of several devices which indicate the position of liquid level in a

vessel by means of a thermally activated property such as an abrupt change in temperature, evaporation or condensation effects, or thermal expansion effects.

thermal voltage converter A thermoelement of low-current input rating with an associated series impedance or transformer, such that the electromotive force developed at the output terminals gives a measure of the voltage applied to the input terminals.

thermal zero shift (electrical transducers) Intended for use only in specifications: The zero shift due to changes of the ambient temperature from room temperature to the specified limits of the operating temperature range.

thermic Pertaining to heat.

thermionic converter, thermionic generator, thermoelectron engine A device which produces electrical power directly from heat.

thermionic emission Emission of electrons from a solid body as a result of elevated temperatures.

thermionic energy conversion The direct production of electricity by means of the electron emission from a heated substance.

thermistor Thermistors are semiconductors (usually metal oxides) with large temperature coefficients of resistance. Thermistors are available with positive temperature coefficients of resistance (PTC thermistors) and with negative temperature coefficients of resistance (NTC thermistors). For temperature measurement, NTC thermistors are used almost exclusively.

thermo-anemometer A type of thermal flowmeter. See thermal flowmeters.

thermocline The layer in a thermally stratified body of water in which the temperature gradient is at a maximum.

thermocouple A pair of electrical conductors of dissimilar materials, joined at one end (the measuring or hot junction) which produces an electromotive force (emf) due to the Seebeck effect, in a loop formed by joining the other ends of the dissimilar materials to any (emf) measuring device (the reference or cold junction). Note: The emf produced has a functional relationship depending on the physical nature of the dissimilar materials used and the difference between the temperatures of the measuring and reference junctions as well as the absolute temperatures. Thermocouples provides a means for sensing temperature in many processes.

thermocouple assembly A thermocouple assembly is an assembly consisting of a thermocouple element and one or more associated parts such as terminal block, connection head, and protecting tube.

thermocouple element A thermocouple element is a pair of bare or insulated thermoelements joined at one end to form a measuring junction and intended for use as a thermocouple or as a part of a thermocouple assembly.

thermocouple extension wire, thermocouple lead wire See extension wire.

thermocouple standards See under International Practical Temperature Scale of 1968 (IPTS 68).

thermocouple vacuum gage A vacuum gage which depends for its operation on the thermal conduction of the gas present. The pressure being measured is a function of the electromotive force of a thermocouple, the measuring junction of which is in thermal contact with a heater carrying a constant current.

thermocouple wire A wire drawn from special metals and alloys and calibrated to established specifications for use as a thermocouple pair.

thermodynamics The study of the relationship between heat and other forms of energy.

thermodynamic temperature scale Fundamental to a concept of temperature is the belief that at some sufficiently low temperature, thermal energy and molecular activity vanish (at absolute zero or zero Kelvin) and that there is a scale to which the temperature of various physical phenomena (such as melting points) can be assigned above zero Kelvin. This scale is called the thermodynamic temperature scale. It has a value of zero Kelvin at one point and a value of 273.15 Kelvins (or 0°C) at another point, where water freezes, or more correctly, 273.16 K where water vapor, solid, and liquid coexist in equilibrium – the triple point of water.

thermoelectric circuit See laws of thermoelectric circuits.

thermoelectric converter See thermal converter.

thermoelectric cooling A method of cooling a chamber based on the Peltier effect, in which an electric current is circulated in a thermocouple whose cold junction dissipates heat to the environment. Also known as thermoelectric refrigeration.

thermoelectric heating A method of heating involving a device similar to one used for thermoelectric cooling except that the direction of current is reversed in the circuit.

thermoelectric hygrometer A condensation – type hygrometer in which the mirror element is chilled thermoelectrically.

thermoelectric junction A thermojunction, as in a thermocouple or thermopile.

thermoelectric power See Seebeck coefficient.

thermoelectric series A tabulation of metals and alloys, arranged in order according to the magnitude and sign of their characteristic thermal emf.

thermoelement One of the two dissimilar electrical conductors comprising a thermocouple.

thermograph An instrument for recording air temperature. Also known as recording thermometer.

thermojunction One of the contact surfaces between the two conductors of a thermocouple.

thermomechanical pulp, TMP Mechanical pulp manufactured with little or no addition of chemicals through the defibration of chips heated to 105–130°C.

thermometer An instrument for measuring temperature.

thermometer well, thermowell A pressure-tight receptacle adapted to receive a temperature sensing element, provided with external threads or other means for pressure-tight attachment to a vessel.

thermometric hydrometer A hydrometer that has a thermometer as an integral part of the instrument to show the temperature of the liquid.

thermophilic digestion (conditioning) Anaerobic digestion of sludge at a temperature between 45 and 60°C, thereby encouraging the growth of micro-organisms which grow best in this temperature range, i.e. thermophilic micro-organisms.

thermophone An electroacoustic transducer that produces sound waves when a conductor whose temperature varies in response to a varying electric current causes air adjacent to the conductor to expand and contract.

thermopile A measuring part of a receiver, comprising thermocouples. Thermopile designs can broadly be classified as follows: **1.** The Moll type, where the hot junctions are exposed, as used often for heat transfer studies at high or medium power levels. **2.** The disc type, where the hot junctions are behind a receiving disc. **3.** The faster and more sensitive Schwarz type, designed for measuring thermal radiation at low levels in instruments.

thermoplastic material A plastic material that can be softened by heat and rehardened into a solid state by cooling. This remelting and remolding can be done many times.

thermoplastic polyesters Family of plastics with excellent dimensional stability, electrical properties, toughness and chemical resistance.

thermoplastic resin An organic solid that will repeatedly soften when heated and harden when cooled; examples include styrene, acrylics, polyethylene, vinyl and nylon.

thermosetting resin An organic solid that sets up (solidifies) under heat and pressure, and cannot be softened and remolded readily; examples include phenolic, epoxy, melamine and urea.

thermosol dyeing (textile term) A continuous dyeing operation where the disperse dye sublimates in a high-temperature, dry-heat environment and penetrates into the polyester fiber.

thermostat A mechanism that can be set to operate at definite temperatures and can convert the expansion of heated metal or fluid into sufficient movement and power to operate small devices, control electric circuits or small valves etc.

thermowell See protecting tube.

thickening 1. The process of increasing the concentration of solids in a sludge by the removal of water. **2.** Removal of water from a fiber suspension by drainage, excess pressure or suction on a screen wire or screen plate.

thick film A method of manufacturing integrated circuits by depositing thin layers of materials on an insulated substrate (often ceramic) to perform electrical functions.

thickness gage A device for measuring thickness of sheet material; it may involve physical gaging, but more often involves methods such as radiation absorption or ultrasonics.

thick waste liquor See concentrated waste liquor.

thin disc sensor A heat flux measuring device, consisting of a thin metallic foil disc bonded at its periphery, over a cavity, to a metallic body. Thermocouples measure the temperature difference between the center and the edge of the foil. The temperature difference is directly proportional to the rate of heat transfer to the foil. The millivolt signal produced by the sensor is directly proportional to heat flux.

thin film A method of manufacturing hybrid circuits in which evaporation or sputtering techniques are used to deposit very thin films of material onto a substrate.

thin-film memory In a computer, a storage device made of thin disks of magnetic material deposited on a nonmagnetic base. Its operation is similar to the core memory.

thin film sensor A heat flux sensor, utilizing a very thin temperature-sensitive resistance film which changes electrical resistance as it is heated. Electrical resistance change is proportional to surface temperature change due to heat flux arriving at surface.

thin film storage, magnetic thin film storage A magnetic storage in which data are stored by magnetic recording in a film of molecular thickness, coated on a substrate.

thin film strain gage A strain gage in which the gage is produced by depositing an insulating layer (usually a ceramic) onto the structural element then depositing a metal gage element onto the insulation layer by sputtering or vacuum deposition through a mask which defines the strain gage configuration.

thin liquor See weak liquor.

thinner An organic liquid added to a mixture such as paint to reduce its viscosity and make it more free-flowing.

thin plate notch weir A weir, the crest of which is a notch cut in a thin plate. See figure in British Standard 3680: Part 1: 1983.

thin plate weir A weir constructed of a vertical thin plate with a thin crest shaped in such a manner that the nappe springs clear of the crest. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983. Pertains to liquid flow measurement in open channels.

third generation computer Computers which use microcircuits and miniaturization of components. The third generation of computers began in about 1964 and helped to foster the growth at timesharing.

thixotropic A property of a paste or liquid which describes its ability to flow more readily when agitated or sheared.

Thomas (double) bridge See Kelvin (double) bridge.

Thomson coefficient The ratio of the voltage between two points on a metallic conductor to the difference in temperature between the same points.

Thomson effect One of the three (besides Seebeck and Peltier effects) thermoelectric effects found in thermocouples. The Thomson effect relates the transport of heat by an electrical current in thermocouple wires subject to a temperature gradient.

Thomson electromotive force The voltage that exists between two points that are of different temperatures in a conductor.

Thomson heat The thermal energy absorbed or produced due to the Thomson effect.

threaded ends (valves) Valve end connections incorporating threads, either male or female.

threading The process by which the web is drawn through a paper machine or board machine with the aid of a leader.

three-capacity process A process which can be represented in block-diagram form by a second-order lag plus a first-order lag or by three first-order lags.

three-high mill (in steel production) A type of rolling mill consisting of one stand containing three horizontal rolls one above the other.

three-layer board, three-layer paper Board or paper consisting of three furnish layers couched together, of which the outer layers may have the same composition.

three-layer diode Also called Diac. A two-terminal voltage-controlled device exhibiting a bilateral negative resistance characteristic. The device has symmetrical switching voltages ranging from 20 to 40 volts and is specifically designed for use as a trigger in ac power-control circuits such as those using triacs.

three-mode controller Another name for a PID controller, i.e. a controller that provides proportional gain, plus integral, plus derivative action.

three-phase current A current delivered through three wires – each wire serving as the return for the other two, and the three current component differing in phase successively by one-third of a cycle, or 120 electrical degrees.

three-phase, four-wire system An ac supply system comprising four conductors – three connected as in a three-phase, three-wire system and the fourth to the neutral of the supply, which may be grounded.

three-phase, three-wire system An ac supply system comprising three conductors, between successive pairs of which are maintained alternating differences of potential successively displaced in phase by one-third of a cycle.

three-pole switch An arrangement of three single-pole switches coupled together to operate three contacts simultaneously.

three-position controller A multi-position controller having three discrete values of output. Note: This is commonly achieved by selectively energizing a multiplicity of circuits (outputs) to establish three discrete positions of the final controlling element. See figure in ANSI/ISA publication S 51.1, 1979.

three-position element Element in which the output variable can assume only three discrete values; zero and two values with opposite signs. In practical realization the change in the output variable is associated with a differential gap.

three-state logic A logic family that may be in one of three states rather than the usual two-high, low, or high impedance. In the high-impedance state the output voltage is unaltered. Logic in a high-impedance state may be easily and permanently connected to a bus.

three-step control Control by means of a three-step action element, the input variable of which being the error signal. Note: The neutral zone is normally combined with differential gaps on the negative and the positive sign of the error signal.

three-step controller A multi-step controller having three discrete values of output. Note: This is commonly achieved by selectively energizing a multiplicity of circuits (outputs) to establish three discrete positions of the final controlling element.

three-term controller A controller with proportional, integral and derivative actions.

three-way valve A valve with three end connections.

three-wire system A system of electric supply comprising three conductors, one of which (known as the neutral wire) is maintained at a potential midway between the potential of the other two (referred to as the outer conductors).

threshold (fluid power systems) Change of input signal required to produce a reversal in valve output at null expressed as a percentage of rated signal.

threshold (electrical transducers) The smallest change in the measurand that will result in a measurable change in transducer output.

threshold current (fiber optics) The driving current corresponding to lasing threshold.

threshold function A two-valued switching function of one or more not necessarily Boolean arguments that takes the value one if a specified mathematical function of the arguments exceeds a given threshold value, and zero otherwise.

threshold operation An operation that evaluates the threshold function of its operands.

threshold sensitivity The lowest value of a measured quantity that a given instrument or controller responds to effectively.

threshold values The limiting values of the dead band.

throat A constriction in a flume.

throat, orifice Opening of minimum cross-sectional area in a primary device.

throat area See bore area.

throttling The action to regulate fluid flow through a valve by restricting its orifice opening. Also see modulating.

throttling calorimeter An instrument that determines the moisture content of steam by admitting steam to a well insulated expansion chamber through an orifice and then measuring steam temperature; moisture content is found by referring to steam tables.

through beam photoelectric switch A photoelectric switch in which the light from the light emitter is

directed towards a receiver which is physically separate from it.

through conduit valve A class of gate valve whose valve body is made so that the gate or tongue of the valve and its seating element extend down through the fluid passageway or conduit of the valve. In an ordinary gate valve, the gate seats at the bottom of the conduit and does not extend through. Through conduit valves when in an open and closed position seal off the body of the valve from the fluid pumped through the pipe line. This is an important feature when the fluid being handled is corrosive.

through drying machine A machine in which a pulp or paper web is dried by means of air blown through the web.

throughput 1. A measure of the amount of work performed by a computer system over a given period of time. **2.** In data transmission, the total capability of equipment to process or transmit data during a specified time period.

through transfer function The transfer function of the through path in a feedback control loop.

throw Movement of a contact from one stationary point to another. A single-throw switch has a normally open or a normally closed circuit per pole. A double-throw switch has a normally open and a normally closed circuit per pole.

thrust Generically, the force any body exerts on another body – both can be stationary both can be in motion, or one can be stationary and the other in motion.

thump A low-frequency transient disturbance in a system or component.

Thylox and Giammarco Vetrocoke (coke – oven plants) See wet oxidation processes.

thyatron A type of hot-cathode gas tube in which one or more electrodes control the start of a unidirectional flow of current, often a control device for printers.

thyatron inverter An inverter circuit in which thyatron tubes convert the dc power to ac power.

thyrector A silicon diode that acts as an insulator until its rated voltage is reached; and as a conductor above that voltage. It is used for ac surge-voltage protection.

thyristor A bistable semiconductor device comprising three or more junctions that can be switched from an off (nonconducting) to an on (conducting) condition, or vice versa, by the application of a small electric signal.

thyristor converter An operative unit comprising one or more thyristor sections together with converter transformers, essential switching devices, and other auxiliaries, if any of these items exist. System control equipments are optionally included.

thyristor stack A single structure of one or more thyristors with its (their) associated mounting(s), cooling attachments, if any, connections whether electrical or mechanical and auxiliary components, if any.

thyristor trigger circuit A circuit for the conversion of a control signal to suitable trigger signals for the thyristors in a thyristor ac power controller including phase shifting circuits, pulse generating circuits, and power supply circuits.

thyrite A silicon-carbide ceramic material with nonlinear resistance characteristics. Above a critical voltage, the resistance falls considerably.

THz Terahertz (10^{12} hertz).

Ti Chemical symbol for titanium.

tie line (electric power systems) A transmission line connecting two or more power systems.

tie trunk A telephone line or channel directly connecting two private branch exchanges.

TIG Abbreviation for tungsten inert-gas welding. A technique using a tungsten electrode, generally without a filler material.

tile A preformed refractory usually applied to shapes other than standard brick.

tilting-disc check valve A type of check valve, usually for large-diameter pipelines, with the disc mounted on trunnions instead of a hinge as in more conventional check valves.

tilt-switch level detector A relatively simple device for detecting high level in a bulk solids container by means of a free-hanging sensor that produces a switch action when the rising level of bulk material tilts the sensor from its normal vertical position.

time For measurement of time in SI units see second.

time (electronic computation) See access time, word time.

time – temperature – transformation curve See TTT curve.

time acceleration factor The ratio between the time duration necessary to obtain the same stated number of failures or degradations in two equal sized samples, under two different sets of stress conditions involving the same failure mechanisms and fault modes and their relative prevalence. Note: One of the two sets of stress conditions should be a reference set.

time base (oscilloscopes) The sweep generator in an oscilloscope.

time base A device generally used to produce a spot displacement as a specified function of time.

time base error In instrument tape recording and playback, the data error which results from a difference between tape recording speed and tape playback speed.

time base generator A device used to develop a time base for calculations and control, e.g., a digital clock.

time base jitter (oscilloscopes) An unwanted fluctuation in the position of the display or a part of it in a direction parallel to the sweep.

time between failures The time duration between two consecutive failures of a repaired item.

time between interruptions The time duration between the end of one interruption and the beginning of the next.

time clock A loosely used term sometimes referring to time switches, sometimes to interval timers or to any other type of timer.

time code A serial BCD code, superimposed on a carrier so that it can be recorded on instrumentation tape, to annotate the time of day at which all data were recorded.

time code translator A hardware device to accept the serial time code (as from a separate track of an instrumentation tape), recognize synchronization, and prepare the time of day in parallel format for computer entry.

time coefficient (oscilloscopes) The quotient of the time to the distance that the spot is displaced by the time base during this time.

time coherence, temporal coherence (optical communication) Coherence such that the electromagnetic fields are correlated over a given time.

time constant 1. The time constant T is the time required to complete 63.2% of the total rise or decay of the output of a first-order linear system, initiated by a step or an impulse to the input. See further IEC publication 902, 1987. See also ANSI/ISA publication S 51.1, 1979. **2.** The ratio of the inductance to the resistance in an electric circuit consisting of inductance and resistance; in circuits consisting of capacitance

and resistance, the product of the capacitance and the resistance.

time delay actuator A time delay actuator is normally used with shutoff valves in on-off service. The time delay is usually caused by a variable orifice and is intended to help prevent water hammer, cavitation, or other similar phenomena.

time delay relay Also called slow-action relay. A relay in which there is an appreciable interval of time between the energizing and deenergizing of the coil and the movement of the armature.

time delay spectrometry An acoustic measurement technique utilizing a realtime spectrum analyzer.

time delay stopping or opening relay A time-delay which serves in conjunction with the device that initiates the shut-down, stopping or opening operation in an automatic sequence.

time derived channel Any of the channels obtained by time - division multiplexing of a channel.

time division multiplexer A device which permits the simultaneous transmission of many independent channels of varying speeds into a single high speed data stream.

time division multiple access, TDMA An advanced networking method used to communicate over satellites. It is a digital transmission technique. All signals are converted to digital bit streams. These bits are combined into a single stream for transmission, then separated at the receive station into separate bit streams and decoded to obtain the original message signals.

time division multiplex, TDM (data transmission) A system for the transmission of information about two or more quantities (measurands) over a common channel, by dividing available time intervals among the measurands to form a composite pulse train; information may be transmitted by variation of pulse duration, pulse amplitude, pulse position or by a pulse code.

time factor The comparison of the time between two events in a simulated computer run and actual real life time it would take for the same.

time frame In telemetry, the time period containing all elements between corresponding points of two successive reference markers.

time interval selector A circuit that functions to produce a specified output pulse when and only when the time interval between two input pulses is between set limits.

time lag The interval between two phenomena.

time limited command Command which is issued as soon as the associated step is activated and which ends as soon as a specified time has elapsed or when the associated step is deactivated before the specified time has elapsed. The time limited command is identified in IEC 848 by the conventional letter "L".

time-of-flight (TOF) flowmeter A type of sonic-class flowmeter. A sound wave is introduced to the flowing fluid in such a way that the sound wave alternately travels against the flow in one direction and with the flow in the other direction. The difference in transit time of the wave is proportional to the fluid rate because the sound wave is slowed when travelling against the fluid flow and accelerated when traveling with the flow. See also Doppler ultrasonic flowmeter.

time orientated sequential control 1. A type of sequential control in which most of the actions of the sequential program are initiated by time. **2.** Sequential control whose transition conditions depend only on time.

time out gate An internal counter within the Basic Controller that must be reset periodically by an on-

line computer, otherwise the Basic Controller sheds to the backup control strategy. Refers to Honeywell TDC 3000 control systems.

time-overcurrent relay (power switchgear) An overcurrent relay in which the input current and operating time are inversely related throughout a substantial portion of the performance range.

time pattern A picture-tube presentation of horizontal and vertical lines or rows of dots generated by two stable frequency sources operating at multiples of the line and field frequencies.

time per point (multiple-point recorders) The time interval between successive point on printed records. Note: For some instruments this interval is variable and depends on the magnitude of change in measured signal. For such instruments, time per point is specified as the minimum and maximum time intervals.

time phase Reaching corresponding peak values at the same instants of time, though not necessarily at the same points in space.

time phase Reaching corresponding peak values at the same instants of time, though not necessarily at the same points in space.

time program A plan which prescribes the actions on a system as a function of time only.

time proportioning control Control in which the output signal consists of periodic pulses whose duration is varied to relate, in some prescribed manner, the time average of the output to the actuating error signal.

time pulse distributor A device or circuit for allocating timing pulses or clock pulses to one or more conducting paths or control lines in a specified sequence.

time resolution The smallest interval of time that can be measured with a given system.

time response The variation in time of an output variable of a system, produced by a specified variation of one of the input variables, under specified operating conditions.

time-rises The time required for the output of a system (other than first-order) to change from a small specified percentage (often 5 to 10) of the steady-state increment to a large specified percentage (often 90 to 95), either before or in the absence of overshoot.

time scale (factor) (analog computing) A number used as a multiplier to transform the real time of the problem into computer time.

time schedule controller A controller in which the set point or the reference-input signal automatically adheres to a predetermined time schedule.

time sequence chart Sequence chart with the time axis plotted to scale.

time sequencing In a computer, switching signals generated by a program purely as a function of accurately measured elapsed time.

time sharing Pertaining to the interleaved use of time on a computing system that enables two or more users to execute computer programs concurrently.

time skew (analog-to-digital converter) In an analog to digital conversion process, the time difference between the conversion of one analog channel and any other analog channel, such that the converted (digital) representations of the analog signals do not correspond to values of the analog variables that existed at the same instant of time. Time skew is eliminated, where necessary, by the use of a multiplexer with a sample/hold feature, allowing all input channels to be simultaneously sampled and stored for later conversion.

time slicing A mode of operation in which two or more processes are assigned quanta of time on the same processor. Time sharing deprecated in this sense.

time stability The degree to which a component value is maintained to a stated degree of certainty (probability) under stated conditions of use, over a stated period of time.

time switch A clock-controlled switch used to open or close a circuit at one or more predetermined times.

time switching multiplex A sequential switching system that connects more than one piece of terminal equipment to a common channel by time slicing.

time-to-amplitude converter An instrument producing an output pulse whose amplitude is proportional to the time difference between start and stop pulses.

time-to-digital conversion The process of converting an interval of time into a digital number.

time to failure Total time duration of operating time of an item, from the instant it is first put in an up-state until failure or from the instant of restoration until next failure.

time to recovery, time to restoration The time interval during which an item is in a down state due to a failure.

time undervoltage protection (power switch-gear) A form of undervoltage protection that disconnects the protected equipment upon a deficiency of voltage after a predetermined time interval.

timing analyzer (software) A software tool that estimates or measures the execution time of a computer program or portions of a computer program either by summing the execution times of the instructions in each path, or by inserting probes at specific points in the program and measuring the execution time between probes.

TIM/TOM Table Into Memory, Table Out of Memory.

titration curve A plot with pH as the ordinate and units of reagent added per unit of sample as the abscissa.

Tl Chemical symbol for thallium.

Tm Chemical symbol for thulium.

TM mode See transverse magnetic mode.

TMP See thermomechanical pulp.

T network A network composed of three branches. One end of each branch is connected to a common junction point. The three remaining ends are connected to an input terminal an output terminal, and a common input and output terminal, respectively.

TNT Trinitrotoluene.

toggle 1. A flip-flop. **2.** Pertaining to a manually operated on-off-switch, i.e., a two-position switch. **3.** Pertaining to flip-flop, see-saw, or bistable action.

toggle frequency In a digital circuit, the number of times per second that the circuit changes state.

toggle switch A manually operated electric switch with a small projecting knob or arm that may be placed in either of two positions, "on" or "off", and will remain in that position until changed.

token bus An access procedure where the right to transmit is passed from device to device via a logical ring on a physical bus.

token passing A LAN-access technique in which participating stations circulate a special bit pattern (the token) that grants network access to each station in sequence; it is often used in ring topology networks, which have a single cable or dual cables strung from station to station in the shape of a ring. Bus topologies utilize a single strand of cable to which stations are attached. Tokens are special bit patterns or packets that circulate from node to node when there is no net-

work traffic. Possession of the token gives a node exclusive outgoing access to the network, thus avoiding conflict with other nodes that wish to transmit.

tolerable risk level The tolerable risk level is the maximum level of risk of a particular technical process or condition that is regarded as tolerable in the context of the circumstances in question.

tolerance (software) The ability of a system to provide continuity of operation under various abnormal conditions.

tolerance field (fiber optics) In general, the region between two curves (frequently two circles) used to specify the tolerance on component size.

tolerance frequency (data transmission) The maximum permissible deviation of the transmitted carrier frequency as related to assigned frequencies, and expressed as a percentage of assigned frequencies or Hertz.

tolerance limits The extreme upper and lower boundaries of a specified range; it is computed from the nominal value and its tolerance.

tolerances (of thermocouple or extension wire) The tolerance of a thermocouple or extension wire is the maximum allowable deviation in degress from the standard emf-temperature values of the type of thermocouple in question when the reference junction temperature is at the ice point and the measuring junction is at the temperature to be measured. See tables in ISA publication ANSI-MC 96.1 – 1982 and /or IEC publication 584-2 for tolerances.

tomography Scanning of a particular part of the body using x-rays or ultrasound.

tone burst generator Produces sound pulses of short duration, enabling direct audio sound to be separated from the reflected sound in acoustic measurements.

tone channel An intelligence or signalling circuit in which on-off or frequency-shift modulation of a frequency (usually an audio frequency) is used as a means of transmission.

tool (software) See software tool.

tool centre point, TCP (industrial robots) Actual or virtual point defined for a given application with regard to the mechanical interface coordinate system.

tool diameter offset (numerical control) A tool offset used for a rotary tool, in which the displacement is in the X axis (see ISO 841) or the Y axis (see ISO 841) or both and is equal to half the offset value.

tool function (numerical control) A command identifying a tool and calling for its selection either automatically or manually. The actual changing of the tool may be initiated by a separate tool change command.

tool offset (numerical control) A relative displacement that is applied to an axis of a machine for a specific portion or the whole of a program and causes a displacement in that axis only in the direction determined by the sign of the offset value.

tool path (numerical control) The patch described by a suitable defined point on a cutting tool.

tool path feedrate (numerical control) The velocity, relative to the workpiece, of the tool reference point along the cutter path, usually expressed in units of length per minute or per revolution.

tool post A device attached to the tool slide on a lathe or similar machine tool clamping and positioning a tool holder.

tool radius offset (numerical control) A tool offset used for a rotary tool, in which the displacement in the X axis (see ISO 841) or Y axis (see ISO 841) or both is equal to the offset value.

TOP Technical and Office Protocol. A development of the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) protocol (also IEEE 802.3) under the auspices of Boeing Computer Services for office and laboratory automation use. This has been combined with MAP and further development will be under the auspices of the MAP/TOP Users Group.

top and bottom guided, top and bottom guiding (control valves) A design in which the valve plug is aligned by guides in the body or in the bonnet and in the bottom flange.

top and port guided, top and port guiding (control valves) A design in which valve plug is aligned by a guide in the bonnet or body and the body port.

top-blown process A type of oxygen steelmaking process where the oxidizing gas being introduced by a pipe or lance containing special nozzles to impart a supersonic velocity to the exiting oxygen jets. This pipe or lance is watercooled. See also bottom-blown process and combination blowing process.

top-down (software) Pertaining to an approach that starts with the highest level component of a hierarchy and proceeds through progressively lower levels; for example, top down design, top-down programming, top-down testing. Contrast with bottom-up.

top guided, top guiding (control valves) A design in which the valve plug is aligned by a single guide in the body adjacent to the bonnet or in the bonnet. Such top guiding minimizes the effect of the weight of the valve plug and tends to increase resistance to trim vibration.

top mounted handwheel See handwheel operators.

topographical layout Layout method wherein the symbols for the components are placed so that their relative positions in the diagram correspond to the physical location of the components.

topology The logical interconnection between devices. Local area networks typically use either a broadcast topology (bus) in which all stations receive all messages, or a sequential topology (ring) where each station receives messages from the station before them and transmits (repeats) messages to the station after them.

topping plant An oil refinery designed to remove and finish only the light constituents of crude oil, such as gasoline and kerosene. In such a plant, the oil remaining after these products are taken off is usually sold as a fuel oil.

top relief See pressure control relief.

tops The fractions or products distilled or flashed off at the top of a tower or distillation unit in a refinery.

top separator A machine on the top of a continuous digester for the separation of the chips from the cooking liquor with which the chips have been impregnated and transported. In the pulp and paper industry.

top two-way fired soaking pit (in steel production) A type of soaking pit. This pit is of a deep rectangular design in which the fuel is fired from opposite ends into a combustion space above the ingots. The burners are set to fire horizontally at an angle to the centerline of the pit to obtain a swirling motion of the gases.

topworks (control valves) A nonstandard term.

torching The rapid burning of combustible material deposited on or near boiler – unit heating surfaces.

(the) Toronto system A plasma process being developed at the University of Toronto, Canada. A hybrid process involving the use of consumable electrodes.

torque A force that tends to produce rotation or twisting. See energy and torque.

torque amplifier A device with input and output shafts and supplying work to rotate the output shaft so that its position corresponds to that of the input shaft but does not impose any significant torque on the latter.

torque converter Any of several mechanisms designed to change or vary the torque, speed or mechanical advantage between an input shaft and an output shaft.

torque error See mounting error.

torque-tube flowmeter A device for measuring liquid flow through a pipe in which differential pressure due to the flow operates a bellows, whose motion is transmitted to a recorder arm by means of a flexible torque tube.

torque-type viscometer An instrument that can measure viscosity of Newtonian fluids, non-Newtonian fluids, and suspensions by determining the torque needed to rotate a vertical paddle or cylinder submerged in the fluid.

torque variator, speed variator A coupling device which can be acted on in order to vary the ratio of the angular velocities of a driving shaft and of a driven shaft (or the ratio of the available torques on these shafts).

torsion galvanometer A galvanometer in which the force between the fixed and moving systems is measured by the angle through which the supporting head of the moving system must be rotated to return the moving system to zero.

torsion hygrometer An instrument for measuring humidity in which a substance sensitive to humidity is twisted or spiraled under tension in such a manner that changes in length of the sensitive element will rotate a pointer in direct relation to atmospheric humidity.

tor, torr The unit of pressure used in the measurement of a vacuum. It is equal to 1/760 of a standard atmosphere, and for practical purposes may be considered equivalent to one millimeter of mercury (mm Hg).

total absorption spectrometer An instrument that measures the total amount of x-rays absorbed by a sample and compares it to the same amount absorbed by a reference sample; the sample may be solid, liquid or gas.

total air The total quantity of air supplied to the fuel and products of combustion. Percent total air is the ratio of total air to theoretical air, expressed as percent.

total alkali See effective alkali.

total carbon (water quality) The sum of the total organic carbon and total inorganic carbon present in water.

total conversion time The time interval required to perform the conversion of a value of an analog quantity into its digital representation or vice versa.

total distributed control A concept using the principle of partitioning control task and function into system modules. These modules are tied together by a communication link (the Data Hiway) so that total control is maintained throughout the distributed hardware. Refers to Honeywell TDC 3000 control systems.

total electrical power (fluid power systems) Sum of the instantaneous control power and the quiescent power.

total emissivity The ratio of radiation emitted by a surface to the radiation emitted by the surface of a blackbody under identical conditions. Important conditions which affect emissivity of a material are surface finish, color, temperature and wavelength of radiation.

total energy head The sum of the elevation of the free surface above the horizontal datum, of a section, and the velocity head based on the mean velocity at

that section. Pertains of liquid flow measurement in open channels.

total energy head line A plot of the total (energy) head in the direction of flow. See figure in ISO publication 772-1978. Pertains to liquid flow measurement in open channels.

total error band See error band.

total failure Fault condition which has completely interrupted a service.

total heat, enthalpy The sum of sensible and latent heat expressed in kilojoules per unit mass of the air. Total heat, or enthalpy, is usually measured from zero degrees Celsius for air.

total inorganic carbon (water quality) All the carbon in inorganic matter which is dissolved and suspended in water.

total input system transfer time (programmable controllers) For digital input: Sum of delay time, digital input (TID) and transfer time, digital input (TIT). For analog input: Sum of delay time, analog input (TAID) and transfer time, analog input (TAIT).

totalizing (measuring) instrument A measuring instrument which determines the value of a measurand by summation of partial values of the measurand obtained simultaneously or consecutively from one or more sources. Example: Electrical power summation meter.

totally enclosed (rotating machinery) A term applied to apparatus with an integral enclosure that is constructed so that while it is not necessarily airtight, the enclosed air has no deliberate connection with the external air except for the provision for draining and breathing.

total organic carbon, TOC (water quality) The quantity of carbon present in the organic matter which is dissolved or suspended in water.

total output system transfer time (programmable controllers) For digital output: Sum of transfer time, digital output (TOT) and delay time, digital output (TOD). For analog output: Sum of transfer time, analog output (TAOT) and delay time, analog output (TAOD).

total oxidized nitrogen (water quality) The total amount of the element nitrogen present as nitrate and nitrite in water, expressed in terms of concentration.

total pressure 1. Pressure exerted by a mixture of gases or vapors (the sum of the partial pressure of the constituents, by Dalton's Law). 2. The sum of the effective pressure and the dynamic pressure. For an element of fluid at rest, the effective pressure and the total pressure have the same numerical value.

total pressure Pitot tube Pitot tube provided only with a total pressure tapping hole. Note: A total pressure Pitot tube is generally associated with a separate static pressure tapping located on the conduit wall.

total pressure tapping Hole in a Pitot tube enabling the measurement of the stagnation pressure of the fluid.

total radiation pyrometer A total radiation pyrometer measures the total radiation power over a range of wavelengths. Ideally, it would measure all wavelengths, but glass used as a window acts as a filter, eliminating some wavelengths. Total radiation thermometers are based on application of the Stefan-Boltzmann law. In a typical industrial radiation pyrometer, a lens or mirror is used to focus the incoming radiation onto a blackened surface. The temperature of the blackened surface is monitored with a temperature sensor (such as a thermocouple).

total residual chlorine, residual chlorine (water quality) Chlorine remaining in solution after

chlorination, present in the form of free chlorine or combined chlorine, or both.

total solids concentration The weight of dissolved and suspended impurities in a unit weight of boiler water, usually expressed in ppm.

total spectral emissivity See total emissivity.

TOTAL system (Honeywell trademark) An extension of the SUPERVISORY System which features a plant optimization program, allows Fortran calculations and provides variable format displays or printout.

touch feedback A type of interaction in a manipulator in which servos provide force feedback to the manipulator fingers, providing a sense of resistance so the operator does not crush the object.

touch screen, touch sensitive screen A display device that allows the user to interact with a data processing system by touching an area on its screen.

toughness Ability (in materials) to fracture with a significant permanent deformation; see brittleness, ductility.

tourmaline A strongly piezoelectric natural or synthetic crystal.

tower - type furnace See continuous strand-type furnaces.

town gas See coal gas.

toxicity test 1. A test in which a substance at a prescribed concentration is brought into contact with specified organisms in order to estimate the toxic effects of the substance on them. 2. Test to determine the insalubrious biological or environmental effect of fluids when consumed, in contact with the person, ignited or heated.

TQC Total Quality Control. A theory of quality whereby the maker of the part has the responsibility for the quality of that part.

trace 1. The cathode-ray-tube display produced by a moving spot. 2. A record of the execution of a computer program; it exhibits the sequences in which the instructions were executed. 3. A record of all or certain classes of instructions or program events occurring during execution of a computer program. 4. To produce a trace.

traceability (quality) The ability to trace the history, application or location of an item or activity, or similar items or activities, by means of recorded identification (ISO definition).

traceability identification An identifier used with a part number to denote each unit (a lot has a quantity of several units) in a family of similar items. It provides for affectivity identification of design changes (SAMA).

trace element (analytical) An element present in very low concentrations.

trace element (essential), micronutrient A chemical element, which at extremely low concentrations is necessary for the normal metabolism of man, animals or plants.

tracer 1. An ion, compound or radionuclide introduced into a flow system to follow the behavior of some components of that system. 2. In automatic machine control, a sensing element that is made to follow the outline of a contoured template and produce the desired control signals.

tracer lines Small-diameter tubing paralleling and in contact with process or instrumentation piping in a refinery or other plant to provide heat or cooling for the fluid or gases in transit.

tracer methods Methods of measuring the flow-rate which involve the injection and detection of a tracer (for example, chemical or radio-active substance) in the flow.

tracing facility (in artificial intelligence) In a knowledge-orientated programming language or programming tool, a means of displaying the rules executed along with the values of the variables used.

tracing routine A routine that makes available a historical record of specified events in the carrying out of a program.

track On a data medium, a path associated with a single read/write head as the data medium moves past it.

track density The number of tracks per unit of length, measured in a direction perpendicular to the tracks.

tracker ball, track ball, control ball (computer graphics) A ball, rotatable about its center, that is used as an input device, normally as a locator.

track hold A facility that protects a track while it is being accessed. When data on a track is being modified by a task in one partition, that track cannot be accessed at the same time by a task or subtask in another position.

tracking error (of a measuring instrument) The error arising from a lag in the response of a measuring instrument to a changing stimulus.

tracking symbol (computer graphics) A symbol on the display surface that indicates the position corresponding to the coordinate data produced by a locator.

tracking system Any device that continually repositions a mechanism or instrument to follow the movement of a target object.

traffic 1. The signals or information which pass through a communications system. **2.** Term used to describe the flow of data over the Data Hiway in the Honeywell TDC 3000 control system.

train (data transmission) Sequence of pieces of apparatus joined together to forward or complete a call.

train/line (batch processes) A collection of one or more associated units and equipment modules arranged in serial and/or parallel paths used to make a complete batch.

train time The period required for synchronous modems, used on two – or four – wire leased lines to equalize the line and recover timing from the received data.

trandir A syntax-directed compiling language.

TRANS Abbreviation for transmitter. Also abbreviated xmt or xmmitter.

transaction (computer applications) An event that requires data contained in a master file to be processed.

transaction (supervisory control, data acquisition and automatic control) That sequence of messages between master and remote stations required to perform a specific function (for example, acquire specific data or control a selected device).

transaction file A file containing relatively transient data that, for a given application, is processed together with the appropriate master file.

transaction record One record in a file to be processed against a master file.

transceiver 1. A terminal device that can both transmit and receive signals. **2.** The combination of radio transmitting and receiving equipment in a common housing.

transconductor An active or passive network whose short-circuit output current is a specific, accurately known, linear or nonlinear function of the input voltage, thereby establishing a predetermined relationship between input voltage and output current.

transcribe (electronic computation) To copy data from one data medium to another, converting them as necessary for acceptance by receiving medium.

(measuring) transducer Device which accepts information in the form of a physical or chemical variable (its input variable) and converts it to an output variable of the same or another nature, according to a definite law. Note: There are many different types of measuring transducers, with different names, according to the nature of the physical phenomenon on which they are based, e.g.: displacement, angle, velocity, acceleration measuring transducers, flow measuring transducers or flowmeters, measuring transducers for electrical quantities, temperature measuring transducers, force and torque measuring transducers, pressure measuring transducers, deformation measuring transducers, level measuring transducers, analytical elements for chemical and physical measurements.

transducer (thyristor) A device which under the influence of a change in energy level of one form or in one system, produces a specified change in energy level of another form or in another system.

transduction element (electrical transducers) The electrical portion of a transducer in which the output originates.

transfer 1. The conveyance of control from one mode to another by means of instructions or signals. **2.** The conveyance of data from one place to another. **3.** An instruction for transfer. **4.** To copy, exchange, read, record, store, transmit, transport, or write data. **5.** An instruction which provides the ability to break the normal sequential flow of control. Synonymous with jump.

transfer chamber In plastics molding, an intermediate chamber or vessel for softening a thermosetting resin with heat and pressure before admitting it to the mold for final curing.

transfer check (electronic computation) A check (usually an automatic check) on the accuracy of the transfer of a word.

transfer constant, transfer factor A transducer rating consisting of a complex number equal to $1/2$ the natural logarithm of the complex ratio of the product of voltage and current entering a transducer to that leaving the transducer when the transducer is connected to its image impedance – the real part of the transfer coefficient is the image attenuation constant and the imaginary part is the image phase constant; transfer constants also can be determined for pressure and volume flow rate or force and velocity, instead of voltage and current.

transfer contact See break-make contact.

transfer control See jump.

transfer device See transfer standard.

transfer element Part of a system for which functional relationships specify dependencies of the output variables upon the input variables.

transfer function (fluid power systems) Differential equation in Carson notation or using the Laplace operator, which uniquely describes the relationship of the controlled flow to the input signal at zero load.

transfer function (automatic control) In a linear system, the ratio of the Laplace transform of an output variable to the Laplace transform of the corresponding input variable, with all initial conditions equal to zero. A mathematical expression frequently used by control engineers. The transfer function is useful in studies of control problems.

transfer function, frequency response (optical communication) The ratio of two complex

quantities characterising a signal as a function of frequency at the output and corresponding input of a device. Notes: **1.** These complex quantities are the Fourier or Laplace transforms of the signals as a function of time. **2.** For a linear system, the transfer function, also called baseband response function, is the Laplace or Fourier transform of the impulse response.

transfer instrument (radiation protection) Instrument or dosimeter exhibiting high precision which has been standardized against a national or derived standardized source.

transfer lag Any lag except dead time. Sometimes called capacity lag.

transfer operation An operation which moves information from one storage location or one storage medium to another, e.g., read, record, copy, transmit or exchange. Transfer is sometimes taken to refer specifically to movement between different storage media.

transfer printing (textile term) A process for moving a design from a low-cost printed substrate to the final piece of fabric.

transfer rate The rate at which a transfer of data between the computer registers and storage, input or output devices may be performed. It is usually expressed as a number of characters per second.

transferred information (information theory) Refer to ISO publication 2382/XVI.

transfer stability, BIBO-stability For a system with one input variable and one output variable the property that, at any time, a bounded variation in the input variable produces a bounded variation in output variable.

transfer standard A standard used as an intermediary to compare standards, material measures or measuring instruments. Note: When the comparison device is not strictly a standard, the term transfer device should be used. Example: Adjustable callipers used to intercompare end standards.

transfer switch A form of air switch arranged so that a conductor connection can be transferred from one circuit to another without interrupting the current.

transfer time The time interval between the instant at which a transfer of data starts and the instant at which the transfer is completed.

transfer time, digital input, analog input (programmable controllers) The time required by the signal to pass (transfer) from the input conversion circuit boundary to the data storage in a MPU memory (e.g. to be made available to the application program).

transfer time, digital output, analog output (programmable controllers) The time required by the signal to pass (transfer) from the data storage in a MPU memory (since it is elaborated by the application program) to the output storage at the output interface boundary.

(to) transform 1. To change the form of data according to specified rules, without fundamentally changing the meaning of the data. **2.** To convert a current or voltage from one magnitude to another, or from one type to another.

transformation Alteration in the state of a solid material.

transformation point The temperature at which an alloy or metal changes from one crystal state to another as it heats or cools.

transformation range (heat treatment) Temperature interval, or temperature-pressure range, within which transformation occurs in a given material; term specially applied to the temperature interval for iron-carbon alloys in the transformation to or from austenite.

transformed value of a measurand A value of a quantity which represents the measurand and which is functionally related to it. Note: The transformed value may be internal to a measuring system or may be provided as an output from the system. Examples: **a.** The value of the electrical output signal of a pressure transducer; **b.** An indication of a measured force as "percent of full load"; **c.** The value represented by a binary train within a digital electronic system or computer.

transformer 1. An electrical device which, by electromagnetic induction, transforms electric energy from one or more circuits to one or more other circuits at the same frequency, but usually at a different voltage and current value. **2.** A transducer of which the input variable and the output variable have the same physical nature without using auxiliary energy.

transformer bridge An ac measuring bridge intended to measure impedances, in which at least two arms consist of tapped windings on a transformer, making use of the known ratios of the turns and which can therefore have fixed value standards.

transformer-coupled solid-state relay A relay in which the control is applied to the primary of a low-power transformer, and the resulting secondary voltage triggers the thyristor switch to the load.

transformer voltage ratio The ratio of the root-mean-square primary terminal voltage to the root-mean-square secondary terminal voltage under specified conditions of load.

transient (behavior) The behavior of a variable during transition between two steady-states.

transient analyzer An electronic device for repeatedly producing a succession of equal electric surges of small amplitude and of adjustable waveform in a test circuit and presenting this waveform on the screen of an oscilloscope.

transient deviation 1. The difference between the instantaneous value and the ultimate steady-state value of a variable. **2.** The instantaneous value of the directly controlled variable minus its steady-state value.

transient digitizer A device which records a transient analog waveform and converts the information it has collected into digital form.

transient error, soft error An error that occurs sporadically and that may not appear on successive attempts to read data.

transient fault, intermittent fault, volatile fault A fault of an item which persists for a limited time duration following which the item recovers the ability to perform a required function without being subjected to any action of corrective maintenance.

transient motion Any motion which has not reached, or has ceased to be, a steady state.

transient oscillation A momentary oscillation which occurs in a circuit during switching.

transient overshoot 1. For a step response, the maximum transient deviation from the final steady-state value of the output variable, expressed in % of the difference between the final and the original steady-state values. See figure in IEC publication 902, 1987. **2.** The maximum excursion beyond the final steady-state value of output as the result of an input change.

transient overvoltage A momentary excursion in voltage occurring in a signal or supply line of a device which exceeds the maximum rated conditions specified for that device.

transient-peak inverse voltage Under specified conditions, the maximum allowable instantaneous value of nonrecurrent reverse (negative) voltage that may be applied to the anode of an SCR with the gate open.

transient peak value The maximum value of the output signal in its response to a step function input signal.

transient power disturbances Disturbances which have a specified time duration. Note: The duration of 0.2 s was chosen as a convenient value in the industrial-process industry. See IEC publication 654-2 Operation conditions for industrial-process measurement and control equipment, Part 2: Power.

transient recovery time (fluid power systems) Period of time required for a step input change in the pressure to damp out to within desirable operating band.

transient recovery time, transient response time Also called recovery time or response time. The interval between the time a transient deviated from a specified amplitude range and the time it returns and remains within the specified amplitude range. The amplitude range is centered about the average of the steady-state values that exist immediately before and after the transient.

transient response 1. The response of a transducer to a step-change in measurand. 2. Output versus time in response to a step input.

transient stability A condition that exists in a power system if, after an aperiodic disturbance, the system regains steady-state stability.

transient voltage capability (thyristor) Rated nonrepetitive peak reverse voltage. The maximum instantaneous value of any nonrepetitive transient reverse voltage which may occur across a thyristor without damage.

transinformation (content) (information theory) Refer to ISO publication 2382/XVI.

transistance The characteristic of an electrical element which makes possible the control of voltages, currents or flux so as to produce gain or switching action in a circuit. Examples of the physical realization of transistance occur in transistors, diodes, saturable reactors etc.

transistor An active semiconductor device with three or more terminals. It is an analog device.

transistor thermometer The transistor thermometer measures the voltage across a diode junction operated at constant current. This thermometer is now becoming a widely used, conventional thermometer, particularly for automatic cold-junction compensation in digital thermocouple temperature indicators.

transistor-transistor logic, TTL The most common form of integrated circuit logic.

transitional flow rate The flow rate value of which the maximum permissible error of the meter changes.

transition card A card which signals the computer that the reading – in of a program has ended and that the carrying out of the program has started.

transition conditions (in switching systems) A logic proposition which can either be true or false.

transition flow, transistional flow Flow lying between a laminar flow and a turbulent flow. Note: As a guide, the Reynolds number for the transition flow of a Newtonian fluid, when referred to the conduit diameter, is generally between a lower limit of 2 000 and upper limit which varies between 7 000 and 12 000 according to the conduit roughness and other factors.

transition frequency See crossover frequency.

transition function Set of relations, which determines the following state of a system from a given state and the simultaneous value(s) of the input variable(s).

transition (in switching systems) Element of a function chart allowing the transit of a preceding step to the following step. A transition condition is associ-

ated to the transition. A transition is enabled if all the immediately preceding steps, connected to this transition by directed links, are active. A transition is cleared if it is enabled, and if its associated transition condition becomes true; this clearing then activates the following step, and deactivates the preceding step. One single transition can link one or several preceding steps to one or several following steps.

transition matrix A matrix which describes the transition between two states of a linear system, not excited by input variables.

transition temperature The temperature below which the electrical resistance of a material becomes too small to be measured.

translate 1. To encode or decode. 2. To convert expressions in one language to synonymous expressions in another language.

translator (software) A program that transforms a sequence of statements in one language into an equivalent sequence of statements in another language.

(to) transliterate To convert data character by character.

translucent Partially transparent.

transmissibility Ratio of the response amplitude of the system in steady-state forced vibration, to the excitation amplitude. The ratio may be between forces, displacements, velocities or accelerations.

transmission 1. The sending of data to one or more locations or recipients. 2. The sending of data from one place for reception elsewhere. 3. In ASCII and communications, a series of characters including headings and texts. 4. When used with spectrophotometry, the ability of a chemical bond not to absorb but to transmit spectral energy. Energy can be reradiated, absorbed, or transmitted.

transmission code A code for sending information over communications lines.

transmission control character A control character used to control or facilitate transmission of data between data terminal equipments. Note: Transmission control characters are described in ISO 646 and 6429.

transmission control unit A device that regulates the information flow between computers and communications terminals.

transmission gain (data transmission) The increase in the power of an electrical signal from one point in the circuit to another.

transmission lag (filled system thermometers) The transmission lag of a filled system thermometer depends upon the length and internal diameter of the capillary tubing and the volume of the receiving element. Mercury-or liquid-filled thermometers have a transmission lag which is usually negligible because a very small volume of liquid must pass through the capillary on a change in temperature. Gas-and vapor-actuated thermometers have a small but noticeable transmission lag because of the compressibility of the filling medium.

transmission level (data transmission) The level of signal power at any point in a transmission system. It is equal to the ratio of the power at that point to the power at some point in the system chosen as a reference point. This ratio is usually expressed in decibels.

transmission line coupler A coupler that allows the passage of electric energy in either direction between balanced and unbalanced transmission lines.

transmission line, line 1. See line. 2. The communication path for signals from point to point such as a coaxial cable, or highpower transmission lines, i.e.,

any of various lines used to carry electrical energy from source to destination.

transmission line type photoelectric proximity switch A photoelectric proximity switch in which the light receiver evaluates the transmitted light of the target surface.

transmission loss (data transmission) A decrease in signal power in transmission from one point to another.

transmission measuring set (data transmission) A measuring instrument comprising a signal source and a signal receiver having known impedances, that is designed to measure the insertion loss or gain of a network or transmission path connected between those impedances.

transmission modes Field configurations by which electromagnetic or acoustic energy may be propagated by transmission lines, especially waveguides.

transmission ratio Pertaining to photoelectric proximity switches, the ratio of luminous power transmitted by a target surface to that incident upon it.

transmission speed The rate at which data is transferred. Usually measured in bits per second, characters per second, or words per minute.

transmission time (data transmission) The absolute time in interval from transmission to reception of a signal.

transmission type photoelectric proximity switch A photoelectric proximity switch in which the light receiver evaluates the transmitted light of the target surface.

transmitted information (information theory) Refer to ISO publication 2382/XVI.

transmitter 1. A measuring transducer of which the output is a standardized signal. Note: There are many self-describing modifiers to be used with transmitters such as: buoyancy displacer level, concentration, conductivity, density, differential pressure, emf, ion selective, level, ORP-oxidation, pH, position, pressure, reduction, resistance, speed-tachometer, temperature. **2.** Apparatus for converting electrical energy received from a source into radio-frequency electromagnetic energy capable of being radiated. **3.** In telephony, the microphone that converts sound waves into electrical signals at an audio-frequency rate.

transmitter (field bus) Transmits circuitry of a communication element.

transmitter evaluation IEC standard 770 "Methods of evaluating the performance of transmitters for use in industrial process control systems" specifies uniform methods of test for the evaluation of the performance of transmitters with pneumatic or electric output signals. Transmitters for the measurement of electrochemical properties such as pH transmitters, are not covered by this standard.

transmitting element (fiber optics) In fiber optics, the light-radiating side of the terminus in an optical conductor.

transmutation A nuclear reaction that changes a nuclide into a nuclide of a different element.

transparency The ability of a measuring instrument not to affect the value of the measurand.

transparent 1. Implying clear and unimpeded transit of light. Window-glass is a common example. **2.** A computer process or function that is invisible to the user.

transparent mode A means by which any bit pattern can be transmitted over the synchronous communications facility.

transparent refresh A means by which a display can accept new data without disturbing current data;

for a CRT display transparent refresh implies a capability for animation.

transponder A form of transmitter-receiver which transmits signals automatically when the correct interrogation is received.

transportability A measure of the ability to reuse computer programs on any industrial computer.

transportation and storage conditions The conditions to which a device may be subjected between the time of construction and the time of installation.

transportation lag Same as distance/velocity lag and dead time.

transport delay A form of time delay, known as transport delay, or distance-velocity lag may be present in many systems. If a system contains a transport delay, the output remains unchanged for some time after the input is altered. Examples of this are found in systems which control the flow of liquids, where the outlet is at the end of a long pipe. Alterations in the control valve setting does not immediately affect the output and it may take several seconds (i.e. the transport delay) before the liquid begins to flow from the output of the pipe.

transverse acceleration (electrical transducers) An acceleration perpendicular to the sensitive axis of the transducer.

transverse electric mode, TE mode (fiber optics) A mode whose electric field vector is normal to the direction of propagation. Note: In an optical fiber, TE and transverse magnetic (TM) modes correspond to meridional rays.

transverse electromagnetic wave A type of electromagnetic wave having both its electric field vector and its magnetic field vector everywhere perpendicular to the direction of propagation in a homogeneous isotropic medium.

transverse electromagnetic mode, TEM mode (fiber optics) A mode whose electric and magnetic field vectors are both normal to the direction of propagation.

transverse interference See normal mode interference.

transverse magnetic mode, TM mode (optical communication) A mode whose magnetic field vector is normal and whose electric field vector is not normal to the direction of propagation. Note: In an optical fiber, TM modes along with TE modes correspond to meridional rays.

transverse mode (differential) voltage The voltage at a given location between two conductors of a group.

transverse mode noise Interference which is apparent between power supply lines.

transverse response, transverse sensitivity (electrical transducers) The sensitivity of a transducer to transverse acceleration or other transverse measurand.

transverse wave A wave characterized by vectors perpendicular to the direction of propagation.

trap Conditional jump to a known location, automatically activated by hardware or software, with the location from which the jump occurred.

trapezoidal notch thin-plate weir A thin plate weir a notch of trapezoidal shape in the plane perpendicular to the direction of flow. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

trapped flux (superconducting material) Magnetic flux that links with a closed superconducting loop.

trapped fuel Any fuel in a fuel-delivery system, such as the fuel system of an internal combustion engine, that is not contained in the tanks.

trapped instruction A special instruction which is executed by a software routine in cases where the necessary hardware is absent.

travel (control valves) **1.** The amount of movement of the closure member from the closed position to an intermediate or the rated full open position. **2.** The displacement of the closure member from the closed position.

travel (fluid power systems) Displacement of the valve spool in either direction relative to the geometric null.

travel characteristic (control valves) The relationship between signal input and travel.

travel indicator (control valves) A means of externally showing position of the closure member; typically in terms of percent of or degrees of opening. Can be a visual indicator at or on the valve or a remote indicating device by means of transmitter or appropriate linkage. See position indicator.

traveling-grate (pelletizing) A pelletizing system for producing pellets is essentially a modification of the sintering process. The green balls are fed onto the grate continuously to give a bed depth of about 300 to 400 mm (12 to 16 inches) and are dried in the first few wind-boxes by updraft air recuperated from the firing zone, followed by downdraft drying using recuperated air from the cooler. Following drying, the pellets are preheated by downdraft air from the cooling zone. Firing is done downdraft in the combustion zone by burning fuel oil or natural gas with hot air from the cooling zone.

tray A horizontal plate in a distillation column that temporarily holds a pool of descending liquid until it flows into a vertical "downcomer" and onto the next tray. Each tray has openings to permit passage of ascending vapors.

treadle Control device foot-operated in two directions.

treated sewage Sewage that has received partial or complete treatment for the removal and mineralization of organic and other material.

treating plant A facility for heating oil containing water, emulsions, and other impurities and with the addition of chemicals causing the water and oil to separate. The water and other foreign matter settle to the bottom of the tank and are then drawn off.

tree A set of connected branches without meshes.

tree network A network in which there is exactly one path between any two nodes. See figure in ISO publication 2382-18, 1987.

trend display A display that shows the process variable versus time relationship for a point. A graph representing the value of a point over a period of time. Refers to Honeywell TDC 3000 control systems.

trend recorder A standardized signal recorder which may be shared among many variables either on a programmed basis or as selected by an operator.

trend selector Device used with conventional 3-pen recorders to select three trend points from those inputs wired to the recorder terminal panel. Refers to Honeywell TDC 3000 control systems.

triac A semiconductor device that functions as an electrically controlled switch for ac loads. Triac is a trade name for a bidirectional thyristor.

triad A group of three bits or three pulses, usually in sequence on one wire or simultaneously on three wires.

triangular notch (V-notch) thin-plate weir A thin-plate weir with two edges symmetrically inclined

to the vertical to form a triangular notch in the plane perpendicular to the direction of the flow. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

triangular-profile weir A weir having a triangular profile in a vertical direction in the direction of flow. Note: This should not be confused with triangular thin-plate weir. Pertains to liquid flow measurement in open channels. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

tribo A prefix meaning due to or pertaining to friction.

triboelectric Pertaining to electricity generated by friction.

tributary station In a multipoint connection or a point-to-point connection, using basic mode link control, any data station other than the control station.

trichloroethane A chlorinated industrial solvent. Often used for solvent washing, a cleaning procedure for cleaning industrial-process measurement and control equipment to be used for oxygen service. See IEC publication 877 (1986) for further details.

trichloroethylene See under trichloroethane.

trichloromethanes (THM) See haloforms.

trickling filter See biological filter.

trifluorotrchloroethene A fluorochlorinated industrial solvent. Often used for solvent washing, a cleaning procedure for cleaning industrial-process measurement and control equipment to be used for oxygen service. See IEC publication 877 (1986) for further details.

(to) trigger (thyristor) The act of causing a thyristor to switch from the off-state to the on-state.

trigger circuit A circuit that has a number of stable states or unstable states, at least one being stable, and is designed so that a desired transition can be initiated by the application of a suitable pulse.

trigger hold off (oscilloscopes) A circuit incorporated in the time base which prevents the sweep from being re-triggered until the spot has returned to its rest position and the circuit elements have completely relaxed.

trim **1.** The internal parts of a valve which are in flowing contact with the controlled fluid. **2.** To make a fine adjustment in a circuit or circuit element.

trimming **1.** The fine adjustment of capacitance, resistance or inductance in a circuit. **2.** Removing irregular edges from a stamped or deep drawn part. **3.** Removing gates, risers and fins from a casting.

trimming potentiometer An electrical mechanical device with three terminals. Two terminals are connected to the ends of a resistive element and one terminal is connected to a movable conductive contact which slides over the element, thus allowing the input voltage to be divided as a function of the mechanical input. It can function as either a voltage divider or rheostat.

trimmings Strips of paper or board which have been separated from the moving web and are normally returned to the process.

trim squirt See edge cutter.

trinstor A three-terminal silicon semiconductor device with characteristics similar to those of a thyristor and used for controlling large amounts of power.

trio Neighbouring red, blue, and green phosphor dots in the screen of the color cathode-ray tube.

triode thyristor A three-electrode thyristor, of which one electrode is the gate. Commonly it has three terminals.

trip-free relay See tripping relay.

triple-address Same as three-address.

triple point A temperature at which all three phases of a pure substance – solid, liquid and gas – are in mutual equilibrium.

triple-precision Characterized by the use of three computer words to represent a number in accordance with the required precision.

triple register, triple length register Three registers that function as a single register.

triplet (mathematics of computing) A group of three adjacent digits operated upon as a unit.

triplex cable A cable made up of three insulated single-conductor cables twisted together with or without a common insulating covering.

trip number The trip number is assigned to tasks related to the loading and unloading of ships and barges. Marine loading frequently involves loading multiple products, and therefore, multiple tasks.

tripping relay, trip-free relay A device which functions to trip a circuit breaker, contactor or equipment or to permit immediate tripping by other devices; or to prevent immediate reclosure of a circuit interrupter, in case it should open automatically even though its closing circuit is maintained closed.

trip protection circuit A protective circuit that electrically interrupts the output when an overload occurs.

trip voltage The voltage at which ionization occurs under any circumstances (also referred to as firing voltage).

tristate A type of logic device that has a high impedance state in addition to a high- and low-level output state. The high impedance state effectively disconnects the output of the device from the circuit; useful in the design of bus-orientated systems.

tristate device A device that has three states: on, off and electrically disconnected.

trivial response Under time-sharing option (TSO), a response from the system to a request for processing that should require only one time slice.

tropicalization A chemical treatment developed to combat the fungi that ruin electronic equipment in hot, humid jungle regions.

troubleshoot To search for the cause of a malfunction or erroneous problem behavior, in order to remove the malfunction. See debug.

troughing An open channel of earthen ware, wood, or other material in which a cable or cables may be laid and protected by a cover.

true complement A number representation that can be derived from another by subtracting each digit from one less than the base and then adding one to the least significant digit and executing all carries required. Tens complements and twos complement are true complements.

true density Mass divided by the volume of the material itself not including the volume of either closed or open voids or pores.

true mass flow A measurement that is a direct measurement of mass and independent of the properties and the state of the fluid.

true power The average power consumed by a circuit during one complete cycle of alternating current.

true ratio A characteristic of an instrument transformer equal to root-mean-square primary current (or voltage) divided by root-mean-square secondary current (or voltage) determined under specified conditions.

true value The assumed theoretical value of a perfectly defined variable. Notes: **1.** The true value of a quantity is an ideal concept and in general it cannot be known. **2.** In practice, use is made of the so-called conventional true value.

truncate 1. To terminate a computational process in accordance with some rule, e.g., to end the evaluation of a power series at a specified term. **2.** To drop digits of a number of terms of a series thus lessening precision, e.g., the number 3.14159265 is truncated to five figures in 3.1415, whereas one may round off to 3.1416.

truncated venturi tube Venturi tube for which the outlet diameter of the diffuser is less than the diameter of the conduit in which it is inserted.

truncation (of a computation process) The termination of a computation process, before its final conclusion or natural termination, if any, in accordance with specified rules.

trunk (data transmission) A single circuit between two points, both of which are switching centers and/or individual distribution points.

trunk (field bus) Main communication highway acting as a source of main supply to a number of other lines (spurs).

trunnion (ball valves) Extensions of the ball used to locate, support and turn the ball within the valve body. May be integral or attached to the ball.

truth maintenance system (expert systems) A knowledge-based system that maintains the truth of its knowledge base by keeping track of the dependencies between beliefs. Note: Truth maintenance consists mainly of deleting knowledge items that have led to false inferences.

truth table A table that describes a logic function by listing all possible combinations of input values and indicating, for each combination, the true output values.

TTL See transistor – transistor logic.

TTT curve, time-temperature-transformation curve Diagram indicating the period of time and the temperature necessary for the attainment of various transformation stages in isothermal transformation, as well as the phases and structures thereby produced; see CCT curve, equilibrium diagram.

tube bundle straightener Type of straightening device consisting of a number of parallel tubes fixed together and held rigidly in the pipe. See figure in ISO publication 5167 for details.

tuberculation (corrosion) The formation of localized corrosion products scattered over the surface in the form of knoblike mounds.

tumbling Tumbling can be described as a cleaning method that uses a quantity of hard abrasive material placed in a cavity to clean the internal surfaces. Tumbling can be part of procedures for cleaning control equipment for oxygen service, which are outlined in IEC publication 877 (1986).

tundish A pouring basin for molten metal.

tuned relay A relay which responds only at a resonant frequency.

tungsten – 3% rhenium/tungsten – 25% rhenium Designation for type of tungsten – rhenium thermocouple. Abbreviated W – 3% Re/W – 25% Re.

tungsten – 5% rhenium/tungsten – 26% rhenium Designation for type of tungsten – rhenium thermocouple. Abbreviated W – 5% Re/W – 26% Re.

tungsten carbide Tungsten carbide trim (for control valves) is generally made by pressing a powder mixture, sintering, and grinding to size. Various alloy binders of cobalt, chromium and nickel are used to give the desired properties of impact resistance, compressive strength and ability to withstand some degree of thermal shock; however these vary the apparent hardness. Tungsten carbide is attached to valve parts by brazing, epoxy cement bonding and interference fits.

Cost is generally three to four times that of type 316 stainless steel trim.

tungsten-inert welding, TIG A welding process using an inert gas envelope to protect the weld from oxidation in lieu of a flux. Gaining in importance for welding thermocouple junctions.

tungsten/tungsten – 26% rhenium Designation for a type of tungsten – rhenium thermocouple. Abbreviated W/W – 26% Re.

tuning 1. The adjustment of control constants in algorithms or analog controllers to produce the desired control effect. **2.** The adjustment relating to frequency of a circuit or system to secure optimum performance.

tunnel type furnace In tunnel type furnaces the stock to be heated is placed upon cars which then are pushed or pulled slowly through the furnace. Furnaces of this type sometimes reach over 90 metres in length.

turbidity Turbidity is defined as an optical appearance property of liquids caused by the presence of suspended particles. The particles cause a scattering of the light energy passing through the liquid, and the turbidity is influenced by the concentration, size, shape, and optical properties of the particles in addition to the optical properties of the fluid.

turbidity measurement A light is directed through a liquid sample held in a transparent chamber. Solid particles in the liquid will absorb and scatter the light. Light energy that passes through the chamber is measured and related to the cloudiness of the sample. The Jackson Candle Turbidimeter and the Jackson Turbidity Unit are the standard instrument and unit of turbidity measurement, respectively.

turbine control servomotor (hydraulic turbines) The actuating element which moves the turbine control mechanism in response to the action of the governor control actuator. Turbine control servomotors are designated as: **1.** gate servomotor, **2.** blade servomotor, **3.** deflector servomotor, **4.** needle servomotor.

turbine flow transducer A transducer which uses a multi-bladed rotor to measure fluid flow rate in a closed conduit. The rotational speed of the rotor, which is proportional to the flow rate, is usually detected by a device mounted outside the conduit. Note: The device usually consists of a tube containing straightening vanes upstream and a closely fitting rotor with rotor blades set at a defined pitch.

turbine meter A volumetric flow measuring device using the rotation of a turbine type element to determine flow rate.

turbine nozzle control system (gas turbines) A means by which the turbine diaphragm nozzles are adjusted to vary the nozzle angle or area, thus varying the rate of energy input to the turbine(s).

turboblower An axial-flow or centrifugal compressor.

turbocharger A centrifugal blower driven by an engine's exhaust-gas turbine to supercharge the engine. To supercharge is to supply air to the intake of an engine at a pressure higher than the surrounding atmosphere.

turbulence amplifier Fluidic digital element using laminar-to-turbulent flow transition to create the control effect.

turbulent burner A burner in which fuel and air are mixed and discharged into the furnace in such a manner as to produce turbulent flow from the burner.

turbulent flow Flow under conditions where forces due to viscosity are small in comparison to the forces due to inertia. Note: Turbulent flow is a flow in which irregular (random) velocity fluctuations in time and space are superimposed on the main flow.

turnaround The planned, periodic inspection and overhaul of the units of a refinery or processing plant; the preventive maintenance and safety check requiring the shutting down of a refinery and the cleaning, inspection, and repair of piping and process vessels.

turnaround time The elapsed time between submission of a job and the return of the complete output.

turndown (control valves) An obsolete term. See inherent rangeability.

turnkey To perform a complete job as under a turnkey contract; to take over and perform all necessary work of planning, procurement, construction, completion, a testing of a project before turning it over to the owner for operation.

turnkey system A system that includes all hardware and software, ready to operate.

turn-off thyristor, gate controlled switch A thyristor which can be turned from the on-state to the off-state, and vice versa, with appreciable gain by applying control signals of appropriate polarities to the gate terminal.

turn-off time The time that a switching circuit (gate) takes to stop the current it is controlling.

turn-on stabilizing time The time interval between the instant power is applied to a device and the instant at which the device performs according to its operating specifications.

turnover frequency See crossover frequency.

turnround time See turnaround time.

tutorial The instruction of basic fundamentals for a particular field of study or discipline.

Twaddle scale A specific gravity scale that attempts to simplify measurement of liquid densities heavier than water, such as industrial liquors; the range of density from 1 000 to 2 000 is divided into 200 equal parts, so that one degree Twaddle equals a difference in specific gravity of 0,005; on this scale, 40° Twaddle indicates a specific gravity of 1 200.

twinaxial cable A single shielded twisted pair cable which has low loss signal transmission and high noise immunity.

twin coaxial cable A configuration containing two separate, complete coaxial cables laid parallel or twisted around each other in one complex.

twin fourdrinier machine See double fourdrinier machine.

twin wire machine A paper or board machine in which the web is formed an partially dewatered between two wires.

twisted joint A union of two conductors wound tightly around each other.

twisted-pair cable A cable formed by twisting together two thin conductors which are separately insulated. This arrangement can reduce their intercapitance.

twister A piezoelectric crystal that generates a voltage when twisted.

twistor A computer memory element containing inclined helical windings of magnet wire on a nonmagnetic wire, with another winding over the helix. Information is stored in the form of polarized helical magnetization.

two-address Pertaining to an instruction code in which each instruction has two address parts.

two-capacity process A process which can be represented in block-diagram form as one second-order lag or two first-order lags.

two-color pyrometer See ratio pyrometer.

two-high reversing mill (in steel production) A type of rolling mill. In the phrase "two-high reversing mill", the term "two-high" refers to the fact that the mill consists of two rolls, one over the other. "Re-

versing" means that after the piece has gone through the rolls in the direction of the first pass, the rolls are brought to a standstill and then caused to rotate in the reverse direction.

two-high tandem mill (in steel production) A type of rolling mill. This mill consists of several single stands, each containing one pair of rolls, spaced on following another at such distances as to permit the rolled piece to be free between stands.

two-input adder A logic element which performs addition by accepting two digital input signals (a digit of a number and an addend or a carry) and which provides two output signals (a carry digit and a digit for the sum).

two-input subtractor A unit or device capable of representing the difference between two numbers, usually restricted to permitting the subtractend to have only one non-zero digit.

two layer board, two layer paper Board or paper consisting of two furnish layers of different composition couched together.

two-level subroutine A subroutine which has another subroutine within its own structure.

two mode controller A controller that provides proportional gain plus integral action.

two-out-of-five code A binary-coded decimal notation in which each decimal digit is represented by a binary numeral consisting of five binary digits of which two are of one kind, conventionally ones, and three are of the other kind, conventionally zeros.

two-phase Also called quarter phase. Having a phase difference of 90 electrical degrees, or one quarter-cycle.

two-phase current Two currents delivered through two pairs of wires at a phase difference of one-quarter cycle (90°) between them.

two-phase, five-wire system An alternating-current supply in which four of its conductors are connected as in a four-wire, two-phase system and the fifth is connected to the neutral points of each phase and usually grounded. Despite its name, it is strictly a four-phase, five wire system.

two-phase, four-wire system A system of alternating current supply comprising two pairs of conductors, between one pair of which is maintained an alternating difference of potential displaced in phase by one-quarter of a period from an alternating difference of potential of the same frequency maintained between the other pair.

two-phase, three-wire system An alternating-current supply consisting of three conductors. Between one conductor (known as the common return) and each of the other two, alternating differences of potential which are 90° out of phase with each other are maintained.

two-position action A type of control-system action that involves positioning the final control device in either of two fixed positions, without permitting it to stop at any intermediate position.

two-position controller A multi-position controller having two discrete values of output.

twos complement A true complement with a base of two.

two sidedness (of paper or board) A difference, e.g. in surface structure or color, between the two sides of a paper or board, arising during the manufacturing process.

two-sided sampling plan Any statistical quality control method whereby acceptability of a production lot is determined against both upper and lower limits.

two-step action Type of step action which imposes on the output variable either one of two steps.

two-step action with overlap The action of a control element whose output signal has one predetermined value when its input signal exceeds a certain threshold value, and another when its input signal is less than a second threshold value. The difference between the two thresholds is the overlap, which may be adjustable within which the output signal may have either of its predetermined values, depending on the previous history of the input signal. See figure in British Standard 1523.

two-step control Control by means of a two step action element, the input variable of which being the error signal. Note: A differential gap is normally included. See differential gap.

two-step controller A multi-step controller having two discrete values of output.

two-step controller with overlap A controller having two-step action with overlap.

two steps ageing, two steps aging Ageing under heating and holding at two levels of temperature and below the corresponding temperature for full annealing.

two-term controller A controller with proportional action and either integral or derivative action. See further British Standard 1523.

two-terminal-pair network Also called a four-pole, quadripole, or quadrupole network. A network with four accessible terminals grounded in pairs. One terminal of each pair may coincide with a network node.

two-way alternate communication Data communication such that data is transferred in both directions, one direction at a time.

two-way simultaneous communication Data communication such that data is transferred in both directions at the same time.

two-way switch A switch used for controlling electrical or electronic equipment, components or circuits from either of two positions.

two-way valve (control valves) A valve with one inlet opening and one outlet opening.

two-wire carrier system A system using only a single pair of wires. Different frequency allocations permit transmissions in both directions.

type 1. The combination of the common functional and constructive characteristics of specifications and designs of a certain kind of product. Note: The term model is often used in the same or similar sense.

2. See data type.

type channel A channel type refers to the way in which it is used: simplex, half-duplex, or full-duplex.

type of action of an element or system The way in which the input variable affects the output variable. Note: Distinction is made between continuous and intermittent action.

type of control Type of action of the controlling equipment (for instance: continuous control, step control, proportional control, etc).

type statements A series of statements in FORTRAN used to override the normal mode of assigning variable names and also to reserve arrays.

type test A test of one or more devices made to a certain design to show that the design meets certain specifications. Note: The type tests are in principle applied only on a sample. Normally, they are not repeated on all the individual equipments made in series.

Tysland-Hole process See pig iron electric furnace process.

TZM Tantalum Zirconium. Molybdenum Alloy.

U

μA Microampere (SI unit).

μbar Microbar (SI unit).

μF Microfarad (SI unit).

μg Microgram (SI unit).

μH Microhenry (SI unit).

U Chemical symbol for uranium.

UART See universal asynchronous receiver transmitter.

UASCII Same as ASCII. See USASCII

UHF See ultra high frequency.

UHV Ultra High Voltage.

UKAEA United Kingdom Atomic Energy Agency.

UKAPE United Kingdom Association of Professional Engineers.

UL Underwriter's Laboratories, Inc, a corporation, in USA, for the purpose of establishing safety standards on types of equipment or components.

UL certified For certain types of products which have met UL requirements, for which it is impractical to apply the UL Listing Mark or Classification marking to the individual product, a certificate is provided which the manufacturer may use to identify quantities of material for specific job sites or to identify field installed systems.

ULF Ultra Low Frequency (300–0 Hz).

UL listed Signifies that production samples of the product have been found to comply with established Underwriters' Laboratories requirements and that the manufacturer is authorized to use the Laboratories' Listing Markes on the listed products which comply with the requirements, contingent on the follow-up services as a check of compliance.

ultimate analysis Chemical analysis of solid, liquid or gaseous fuels. In the case of coal or coke, determination of carbon, hydrogen, sulphur, nitrogen, oxygen and ash.

ultimate biodegradation Biodegradation leading to complete mineralization.

ultimate cycle method See Ziegler – Nichols method.

ultimately controlled variable The variable whose control is the end purpose of the automatic control system.

ultimate oxygen demand, UOD The calculated amount oxygen required for complete mineralization.

ultimate period The cycle time for deviation cycles shown when a proportional controller is adjusted for the ultimate proportional band. Also called the ultimate cycle. See also ultimate proportional band.

ultimate proportional band The proportional band which produces a continuous cycling deviation of constant peak magnitude when the control action is proportional only and small disturbances occurs.

ultimate sensitivity or threshold One-half the deadband in a graphic recorder. When the instrument is balanced at the center of the deadband, it denotes the minimum change in measured quantity required to initiate pen response.

ultra filtration (water quality) The use of microporous membranes for the separation of large molecules or very finely divided suspended matter from water by filtration, often by means of applied differential pressure.

ultrahigh frequency, UHF The range of frequencies extending from 300 to 3 000 MHz.

ultrasonic Using frequencies above the audio-frequency range, i.e., above 20 kHz. Commercial and

military applications include ultrasonic cleaning, gauging, cutting detection instruments and welding.

ultrasonic atomizer A development in burners for heating oils in which high-frequency sound waves are focused on the stream of fuel, forming a spray of microscopic fuel droplets. The resulting intimate mixture of fuel and air makes for greater combustion efficiency.

ultrasonic bond A contact area where two materials are joined by means of ultrasonic energy and pressure.

ultrasonic coagulation A process that uses ultrasonic energy to bond small particles together, forming an aggregated mass.

ultrasonic delay line A delay line which utilizes the finite time for the propagation of sound in liquids or solids to produce variable time delays.

ultrasonic densitometer An instrument device for determining the thickness or density of an object or material, based on the time required for an ultrasonic signal to penetrate to a receiver and/or "echo" back to a receiver adjacent to another transmitter.

ultrasonic flow transducer A transducer which measures the velocity of a moving fluid by sensing the interaction between a beam of ultrasonic acoustic energy and the moving fluid.

ultrasonic frequency Also called an ultra-audible frequency. **1.** Any frequency above the audio range, but commonly applied to elastic waves propagated in gases, liquids or solids. **2.** Sound frequencies which are above the range of human hearing; approximately 20,000 Hz and higher.

ultrasonic inspection A nondestructive testing method of locating internal defects in a part by sending ultrasonic impulses (inaudible high-frequency sound waves of 0.5 to 11 megahertz) into the part and measuring the time required for these impulses to penetrate the material, be reflected from the opposite side or from the defect, and return to the sending point.

ultrasonic level measuring device A device which determines the level of a material (liquid or solid) by measuring the time taken by a beam of ultrasonic acoustic energy which is transmitted to and reflected from a surface or interface.

ultrasonic machining A machining method in which an abrasive slurry is driven against a workpiece by a tool vibrating axially at high frequency to cut an exact shape in the workpiece surface.

ultrasonic plating The chemical or electrochemical deposition and bonding of one or more solid materials to the surface of another material by the use of vibrational wave energy.

ultrasonic stroboscope A device for producing pulsed light by using ultrasound to modulate a light beam.

ultrasonic testing A nondestructive testing method in which high frequency sound waves are projected into a solid to detect and locate flaws, to measure thickness, or to detect structural differences.

ultrasonic thermometer The ultrasonic thermometer measures the temperature dependence of the velocity of sound in solids, liquids, or gases; a materials dependent property.

ultrasonic thickness gage Any of several devices that use either resonance or pulse-echo techniques to determine the thickness of metal parts-sheet or plate thickness, or pipe-wall thickness.

ultrasonic transducer A device for converting high-frequency electric impulses into mechanical vibrations, or vice versa, usually through the use of a magnetostrictive or piezoelectric material.

ultrasonic viscometer The probe or blade of the ultrasonic viscometer consists of magnetostrictive material. An ultrasonic electrical pulse excites longitudinal vibrations in the probe. The vibrations are dampened by the viscous fluid. The damping is electronically measured and calibrated in terms of viscosity.

ultrasonic welding Same as ultrasonic bonding.

ultraviolet, UV Optical radiation for which the wavelengths are shorter than those for visible radiation, that is approximately between 1 nm and 400 nm.

ultraviolet erasable PROM See EPROM.

ultraviolet flame detector (fire protection devices) A device whose sensing element is responsive to radiant energy outside the range of human vision (below approximately 4 000 Angstroms).

umbilical connection Any flexible grouping of electrical, mechanical or hydraulic connections between a machine, vehicle or robotics device and a source of power, control signals and data acquisition or auxiliary services.

umbral A distinct heading which is distinctly and totally relevant to the data being sought.

UMIST University of Manchester Institute of Science and Technology.

unary (binary) operator, monadice (dyadic) operator An operator that represents an operation on one and only one operand (on two and only two operands).

unary operation, monadic operation An operation on one and only one operand. Example: Negation.

unassociated gas Natural gas occurring alone, not in solution or free gas with oil or condensate.

unavailable time From the point of view of a user, the time during which a functional unit cannot be used.

unbalanced output An output where one of the two output terminals is substantially at ground potential.

unbalanced 1. A condition of an indicated line, electrical transmission, or network in which the impedances measured from corresponding points on opposite side are unequal. **2.** Lacking the conditions for balance. **3.** Frequently, a circuit having one side grounded.

unbalanced circuit A circuit whose two sides are inherently unlike.

unbalanced line A transmission line in which the voltages on the two conductors are not equal with respect to ground (e.g. a coaxial line).

unbalanced network Arranged for insertion into an unbalanced circuit, the earth terminal of the input being directly connected to the earth terminal of the output.

unbalanced vane pump Pump in which the transverse forces on the rotor are not balanced.

unblinking The turning on of the CRT beam.

unbleached pulp Pulp which has been subjected to any treatment intended primarily to brighten it; compare bleaching.

unbonded Stretched and unsupported between ends (usually refers to strain-sensitive wire).

unbonded strain gage A pressure-sensing element made up of resistance strain-gage wire elements arranged in a Wheatstone bridge. The unbonded strain-gage wires are suspended in air and are activated by a mechanism attached to a diaphragm or other pressure responding element.

unbound mode (optical communication) Any mode that is not a boundmode, generally a leaky or radiationmode of the fibre.

unbundling Pricing software and services separately from hardware.

unburned combustible loss See combustible loss.

UNC Unified Coarse Thread.

uncertainty The interval within which the true value of a measurand quantity is expected to lie with a stated probability.

uncertainty (expert systems) A condition appearing when a value cannot be determined during consultation or a fact or a rule in the knowledge base remains in doubt.

uncertainty of measurement An estimate characterizing the range of values within which the true value of a measurand lies.

uncharged Having a normal number of electrons and hence no electrical charge.

unconditional In a computer, not subject to conditions external to the specific instruction.

unconditional jump A jump that takes place whenever the instruction that specifies it is executed.

unconditional statement (programming languages) A statement that specifies only one possible execution sequence.

unconditional transfer of control Same as unconditional jump.

uncontrolled cooling, air cooling See cooling.

uncontrolled lines (data transmission) A line that contains terminals that may transmit to the central processor at any time they are ready to send. The central processor must be ready at all times to accept messages from this type of terminal.

unconventional natural gas The term applied to natural gas so difficult and expensive to find and produce that the sources have been by passed in favor of more easily obtainable supplies.

uncorrected result The result of a measurement before correction for assumed systematic errors. Notes: **1.** If only a single indication is involved, the uncorrected result is identical to the indication. **2.** In English, uncorrected result was formerly referred to as indicated value.

undamped natural frequency A natural frequency of oscillation of a system if its damping were reduced to zero.

undamped wave A wave the amplitude of which does not change.

undefined record A record that has an unspecified or unknown length.

undercurrent relay A relay that functions when its coil current falls below a predetermined value.

underdamped Damped insufficiently to prevent oscillation of the output following an abrupt input stimulus. Note: In an underdamped linear second-order system, the roots of the characteristic equation have complex values.

underdamped frequency (natural frequency) 1. Of a second-order linear system without damping, the frequency of free oscillation in radians or cycles per unit of time. **2.** Of a closed-loop control system or controlled system, a frequency at which continuous oscillation (hunting) can occur without periodic stimuli. Note: In linear systems, the undamped frequency is the phase crossover frequency. With proportional control action only, the undamped frequency of a linear system may be obtained in most cases by raising the proportional gain until continuous oscillation occurs. Also see. ANSI/ISA publication S 51.1, 1979.

underdamped, underdamping See damping.

underfilm corrosion Corrosion that occurs under films in the form of randomly distributed hairlines (filiform corrosion).

underflow (mathematics of computing) Pertaining to the condition that arises when a machine computation yields a nonzero result that is smaller than the smallest nonzero quantity that the intended unit of storage is capable of storing.

underflow (in calculators) The state in which the calculator shows a zero result for the most significant part of a number, while the least significant part of the number is dropped.

underglaze A glass or ceramic glaze applied to a substrate prior to the screening and firing of a resistor.

underlap (fluid power systems) Condition where the fixed and movable flow metering edges do not coincide with the spool at null in such a way that a flow path exists across two or more metering edges with the spool at null.

underliner (of board) A furnish layer in board lying between the outer ply and the middle.

underload relay A relay that operates when the load in a circuit drops below a certain value.

underpower relay A relay which functions when the power decreases below a predetermined value.

undershoot The initial transient response to an unidirectional change in input which precedes the main transition and is opposite in sense. (See also precursor).

understressing Repeatedly stressing a part at a level below the fatigue limit or below the maximum service stress to improve fatigue properties.

undervoltage protection Also called low-voltage protection. The effect of a device to cause and maintain the interruption of power to the main circuit upon the reduction or failure of voltage.

Underwriters' Laboratories, Inc See UL.

undetected fault time The time interval between failure and recognition of the resulting fault.

UNEF Unified Extra Fine. A thread standard.

uneven dyeing (textile term) A dyeing which is not uniform because of improper processing conditions, yarn, or fabric.

UNF Unified Fine. A thread standard.

unfired pressure vessel A vessel designed to withstand internal pressure, neither subjected to heat from products of combustion nor an integral part of a fired pressure vessels system.

unformatted ASCII A mode of data transfer in which the low-order seven bits of each byte are transferred; no special formatting of the data occurs or is recognized.

unformatted binary A mode of data transfer in which all bits of a byte are transferred without regard to their content.

ungrounded Not intentionally connected to ground except through high-impedance devices.

unibolt coupling A patented coupling or flange for joining two lengths of pipe. The two mating halves of the coupling have tapered shoulders. When torque is applied to the two halves by a single bolt, drawing the bolt lugs together, the coupling is tightened.

unidirectional current A current which maintains the same direction in a circuit. It may fluctuate or go negative.

unidirectional pulse train A pulse train in which all pulses rise in the same direction.

unidirectional transducer A transducer that responds to stimuli in only one direction from a reference zero or rest position.

UNIDO United Nations Industrial Development Organization.

uni-flow pump Pump in which the direction of flow is independent of the direction of rotation of the drive shaft.

uniform corrosion Uniform corrosion, the most common type, attacks over large surface areas. It is also the easiest to control through selection of appropriate materials or protection methods, such as zinc, chromium, cadmium or nickel plating etc. See also under localized corrosion.

uniform flow Flow in which the depth and velocity remain constant with respect to distance.

uniform waveguide A waveguide in which the physical and electrical characteristics do not change with distance along its axis.

uniground A single point in an electrical system connected to ground to eliminate noise currents. Also called single-point ground.

unijunction transistor, UJT Formerly called a double base diode. A three-terminal semiconductor device which exhibits a stable negative-resistance characteristic between two of its terminals. It is this negative resistance feature that makes the UJT suitable for the applications with which it is associated - thyristor trigger circuits, oscillator circuit, timing circuits, bistable circuits etc.

unilateral connection A connection through which information is transmitted in one direction only.

unilateral impedance Any electrical or electromechanical device in which power can be transmitted in one direction only; i.e., a thermionic valve or carbon microphone.

unilateralization The neutralization of feedback so that the transducer or circuit has unilateral response.

unilateral Laplace transform Refer to ANSI/ISA publication S 51.1, 1979.

unilateral switch A semiconductor device similar to a miniature SCR. It switches at a fixed voltage that depends on its internal construction.

unilateral transducer See unidirectional transducer.

uninterrupted automatic control A subsystem that, upon detecting a malfunction, automatically switches in a Reserve Controller and continues operation in the original mode. Refers to Honeywell TDC 3000 control systems.

uninterruptible power systems A solid-state power conversion system to provide a regulated ac power to critical loads.

union fitting (fluid power systems) Fitting which permits pipes to be joined and separated without requiring the pipes to be rotated.

union paper Papers consisting of two layers glued together with bitumen or similar material.

UNIPEDA International Union of Producers and Distributors of Electrical Energy.

unipolar (power supplies) Having but one pole, polarity, or direction. Applied to amplifiers or power supplies. It means that the output can vary in only one polarity from zero and, therefore, must always contain a direct-current component.

unipolar pulse A pulse that has appreciable amplitude in only one direction.

unipolar transistor A transistor which utilizes charge carriers of only one polarity.

unipole An all-pass filter section with one pole and one zero.

unstable Binary circuit or device, which has one stable state and in which the output changes state for the duration of the appropriate change of the input signal.

unit 1. A device having a special function. **2.** A basic element. **3.** See arithmetic unit, binary unit, central processing unit, and control unit.

unit (of measurement) A specific quantity, adopted by convention, used to express quantitatively, quantities which have the same dimension.

unit (batch processes) A collection of associated element, loops, devices, and/or equipment modules that perform a coordinated function. Units operate relatively independently of each other.

unit connection diagram (or table) Connection diagram (or table) showing or listing the connections within a constructional unit.

unit cost The total labor, material and overhead cost for one unit of production.

United States of America Standards Institute See American National Standards Institute.

uniterm A word, symbol, or number used as a descriptor for retrieval of information from a collection.

uniterming The selection of words considered to be important and descriptive of the contents of a paper for later retrieval of the articles, reports, or other documents. The selected words are then included in a uniterm index.

unit impulse response, weighting function The time response of a system produced by the application of a delta function (unit impulse function) on one of the inputs. Note: The weighting function is, for a linear system, the time derivative of the unit step response.

unit pulse See baud.

units and letter symbols See International System of Units (SI).

unit sensitivity (control valves) Pertaining to control valves, the percent increase in existing flow for an increase in movement of 1 percent of rated travel at a stated operating point.

unit separator A character developed to demarcate a logical boundary between item of data that are referred to as separate and distinct units.

(Heaviside) unit step A function, zero for all negative values of the independent variable and equal to unity for all positive values.

unit step current (or voltage) A current (or voltage) which undergoes an instantaneous change in magnitude from one constant level to another.

unit step response Step response of a linear system with the change of the output variable being related to the step-height of the input variable.

unit string A string that contains one element.

unit under test See UUT.

universal asynchronous receiver transmitter, UART This device will interface a word parallel controller or data terminal to a bit serial communication network.

universal control network, UCN In Honeywell TDC 3000 control systems, a local area network that connects the Local Control Network (LCN) through the Network Interface Module.

universal development system A development system that, by means of personality modules, can be used to develop the software and hardware for a range of microcomputers.

universal product code, UPC A bar code appearing on many retail products to uniquely identify the product. The code is designed to be read by an optical scanner attached to an electronic cash register.

universal station In Honeywell TDC 3000 control systems, the principal physical element of the man/machine interface, designed primarily as an operator console in a control room environment.

universal time A standard based on the rotation of the earth on its axis, with reference to the position of the sun. Also called Greenwich Mean Time and Greenwich Civil Time.

universal work station, UWS An alternative man/machine interface, designed for placement in an office setting for use by process engineers, process supervisors, and maintenance technicians. Refers to Honeywell TDC 3000 control systems.

uni-vibrator A circuit which holds information for a fixed time which is determined by the type of circuit elements.

UNIX An operating system; a trademark of Bell Laboratories.

UNIX A family of operating systems licensed by AT & T that are known for their relative hardware independence and portable applications interface. It is used widely in technical and scientific computing applications.

unlined body (control valves) A body without a lining.

unload In a computer: **1.** To remove the tape from the columns of a recorder by raising or lowering the recording head. **2.** To remove a portion of the address part of an instruction. **3.** See dump.

unloading circuit In an analog computer, a computing element or combination of computing elements capable of reproducing or amplifying a given voltage signal while drawing negligible current from the voltage source, thus eliminating any possible loading errors.

unloading circuit (fluid power systems) Circuit in which pump output is returned to reservoir at minimum pressure whenever delivery to the system is not required.

unloading valve Valve which opens an outlet to permit free flow to reservoir (or pneumatic exhaust).

unmanned station A pipeline pumping station that is started, stopped, and monitored by remote control. Through telecommunication systems, most intermediate booster station on large trunk lines are unmanned and remotely controlled from dispatcher's office.

unmonitored control system See open-loop control system.

(to) unpack To recover the original form of the data from packet data.

unrecoverable error An error for which recovery is impossible without the use of recovery techniques external to the computer program.

unsaturated logic A form of logic containing transistors operated outside the region of saturation; for example, current-mode logic (CML) and emitter-coupled logic (ECL).

unscheduled maintenance The maintenance carried out, not in accordance with an established time schedule, but after reception of an indication regarding the state of an item.

unsized paper See water leaf paper.

unstable (control system) Not possessing stability.

unstable state The state of a system is said to be unstable if the magnitude of the departures produced by a disturbance, either constant or terminated, is unlimited or, if limited, is determined by the nature of the system and not by the magnitude of the disturbance.

unstable state, metastable state In a trigger circuit, a state in which the circuit remains for a finite period of time at the end of which it returns to a stable state without the application of a pulse.

unsteady flow 1. Flow which may be laminar or turbulent, in which the flow-rate in a measuring section

fluctuates randomly with time. Note: The time interval being considered is to be long enough to exclude from this definition the random components of the turbulent flow itself. **2.** A flow in which the flow rate fluctuates randomly with time and for which the mean value is not constant.

unstratified language A language that can be used as its own metalanguage. Example: Most natural languages.

untrimmed machine width The width of the widest untrimmed web which can be produced on a given paper machine.

(to) unwind To state explicitly and in full, without the use of modifiers, all the instructions that are involved in the execution of a loop.

UOD See ultimate oxygen demand.

UP Unsaturated Polyester.

UPC Universal Product Code. A product identification system used primarily by the food industry, designed to assign a unique number to every product in distribution (USA).

update 1. To put into a master file changes required by current information or transactions. **2.** To modify an instruction so that the address numbers it contains are increased by a stated amount each time the instruction is performed. **3.** To modify a video display according to current information. **4.** The process of modifying or reestablishing data with more recent information.

update response time The interval between the entry of new data into a system and the display of that data.

updating The act of bringing information up to the current value.

upgrade To increase the value or quality of an operating system or commercial product by incorporating changes in design or manufacture without changing its basic function.

up-line loading With respect to BASIC Systems, deading a hiway device's data base into a computer or an LCN-based system and storing the information. Refers to Honeywell TDC 3000 control systems.

upper limit 1. For direct current signals: The specified highest value of the range. **2.** For direct current signals: The signal voltage corresponding to the maximum value of the direct voltage signal. **3.** Pertaining to analog pneumatic signal for industrial-process measurement and control systems, the pneumatic signal corresponding to the maximum value of the transmitted input. IEC standard 382 specifies 1.0 bar (preferred value) as upper limit and 0.2 bar (preferred value) as lower limit, span 0,8 bar.

upper radiation threshold Pertaining to photoelectric and proximity switches, the luminous power on the light receiver at which a transition from dark to light state occurs. The upper radiation threshold is also defined as minimum luminous power permitting light state and thus operation of the device.

upper range limit The highest value of the measured variable that a device can be adjusted to measure. Note: The following compound terms are used with suitable modifications to the units: measured variable upper-range limit, measured signal upper-range limit, etc. See tables in ANSI/ISA publication S 51.1, 1979.

upper range value Highest value of the variable that a measuring device is adjusted to measure within the specified accuracy; for multirange devices, the upper range value of the lower range value refer to the particular range that the measuring device is set to measure.

upper valve body (control valves) A half housing for a split body type valve. It contains internal valve

parts and has one flow connection. It usually includes a means for seating against leakage along the stem and provides a means for mounting the actuator.

up state A state of an item characterized by the fact that it can perform a required function, assuming that the external resources, if required, are provided.

upstream Facilities of operations performed before those at the point of reference. Oil production is upstream from pipeline transportation, and transportation is upstream from refining. See downstream.

upstream seating (ball valves) A seat on the upstream side of the ball, designed so that the pressure of the controlled fluid causes the seat to move toward the ball.

uptake A conduit for exhaust gases connecting the outlet of a furnace or firebox to a chimney or stack.

up time The time interval during which an item is in an up state.

uptime, operable time 1. The time during which a function unit would yield correct results if it were operated. **2.** See also available time.

uptimer A clock which counts time forward from a preset time.

uptime ratio The quotient of uptime divided by uptime plus downtime.

upward compatibility The compatibility provided for a program written for a lower level EDP system to be run on a higher level system.

UREA plant Plant for fertilizer manufacturing.

USASCII (now ASCII) US Standard Code for Information Exchange. The standard code, using a coded character set consisting of 7-bit coded characters (8 bits including parity check), used for information exchange among data processing systems, communication systems and associated equipment. The USASCII set consists of control characters and graphic characters. Synonymous with ASCII.

USASCSOCR The United States of America Standard Character Set for Optical Characters.

USASI United States of America Standards Institute. (Formerly ASA; Now ANSI)

useful life (reliability) Under given conditions, the time interval beginning at a given instant of time, and ending when the failure intensity becomes unacceptable or when the item is considered unrepairable as a result of a fault.

user class of service A category of a data transmission service provided by a data network in which the data signalling rate, the data terminal equipment operating mode, and the code structure (if any) are standardized.

user coordinate (computer graphics) A coordinate specified by a user and expressed in a coordinate system that is device independent.

user documentation (software) Documentation conveying to the end user of a system instructions for using the system to obtain desired results; for example, a user's manual. Contrast with system documentation.

user facility A set of functions available on demand to a user, and provided as part of a data network transmission service.

user friendly Term used to describe computer hardware or software that is easy to use, by virtue of its design and the facilities that are offered to the user.

user group A group of users of a specific manufacturer's equipment of software. The group meets to discuss common problems, share information and programs etc.

user program (programmable controllers) Synonymous with application program.

user program memory The portion of the programmable controller memory reserved for the storage of application program.

user task execution time (programmable controllers) The time required by a MPU to carry out a specified portion of a user's application program (e.g. a statement, a program module, etc.), including reading from memory and storing the result, and additional time required by the system software.

user terminal An input-output unit by which a user communicates with a computer.

U-shaped gyroscopic mass flowmeter A type of mass flowmeter.

utilities 1. Programs used to perform a routine task.
2. Standard routines of often-used functions usually supplied as part of system software.

utility program Same as service program (routine) and utility routine. See service program (routine).

utility routine Same as service program (routine), and utility program.

utility software Computer programs or routines designed to perform some general support function re-

quired by other application software, by the operating system, or by system users.

UTT orientated language A computer language used to program automatic test equipment to test units under test (UUT's), whose characteristics are directed to the test needs of the UUT's and therefore do not imply the use of a specific ATE (automatic test equipment) system or family of ATE systems (Mil.Std.)

U-tube manometer A device for measuring gage pressure or differential pressure by means of a U-shaped transparent tube partly filled with a liquid, commonly water; a small pressure above or below atmospheric is measured by connecting one leg of the U to the pressurized space and observing the height of liquid while the other leg is open to the atmosphere; similarly, a small differential pressure is measured by connecting both legs to pressurized space – for example, high- and low pressure regions across an orifice or venturi.

UUT Unit under Test. The entity to be tested. It may range from a simple component to a complete system.

UV Ultraviolet.

V

V 1. Chemical symbol for vanadium. **2.** Unit symbol for volt (SI unit).

V. 21 CCITT standard for communication 300 baud full duplex. Corresponding specification in USA is Bell 103.

V. 22 CCITT standard for 1 200 baud full duplex.

V. 23 CCITT standard for 600 and 1 200 baud half duplex and 1 200/75 and 75/1 200 baud split speed.

V. 25 bis CCITT standard for control of automatic modem.

V. 28 CCITT standard for the electric interface for serial communication.

V 22 bis CCITT standard for 2 400 baud full duplex.

VA Symbol for voltampere, unit for apparent power (SI unit).

VAC Volt AC

vacuum A low-pressure gaseous environment having an absolute pressure lower than ambient atmospheric pressure.

vacuum arc remelting furnace, VAR A type of electric steel making furnace. Also called consumable-electrode furnace.

vacuum breaker A device used in a water supply line to relieve a vacuum and prevent backflow. Also known as backflow preventer.

vacuum carbonate process (coke oven plants) See absorption stripping processes.

vacuum degassing process (in steelmaking)

Vacuum degassing processes, in the broadest sense refer to the exposure of molten steel to a low-pressure environment to remove gases (chiefly hydrogen and oxygen) from the steel. The effectiveness of any vacuum degassing operation depends upon the surface area of liquid steel that is exposed to low pressure. There are primarily three types of processes utilizing the vacuum degassing treatment: stream degassing, recirculation degassing, and vacuum ladle degassing.

vacuum deposition See vacuum plating.

vacuum distillation Distillation under reduced pressure (less than atmospheric) that lowers the boiling temperature of the liquid being distilled. This technique with its relatively low temperatures prevents cracking or decomposition of the charge stock.

vacuum electric furnaces (in steelmaking) Vacuum-melting techniques are employed in the case of some steels to obtain improved physical and mechanical properties which can not be obtained by any other means. Vacuum furnaces are heated by electrical induction, the electric-arc principle, electrical resistance, and by gas; however, only the first two have been used on any sizeable scale for melting steels.

vacuum filtration A process for separating solids from a suspension or slurry by admitting the mixture to a filter at atmospheric pressure (or higher) and drawing a vacuum on the outlet side to assist the liquid in passing through the filter element.

vacuum flasher A refinery vessel; a large diameter column where charge stock is distilled at less than atmospheric pressure. The pressure in some flasher vessels is less than one-third atmospheric. At this reduced pressure, lighter fractions of the heavy charge stock will flash off or vaporize. The lower the pressure, the lower the boiling point for all liquids.

vacuum forming A method of forming sheet plastics by clamping the sheet to a stationary frame, then heating it and drawing it into a mold by pulling a vacuum in the space between the sheet and mold.

vacuum fusion A laboratory technique for determining dissolved gas content of metals by melting them in vacuum and measuring the amount of hydrogen, oxygen and sometimes nitrogen released during melting; the process can be used on most metals except reactive elements such as alkali and alkaline-earth metals.

vacuum gage Any of several devices for measuring pressures below ambient atmospheric.

vacuum oxygen decarburization process See VOD process.

vacuum plating A process for producing a thin film of metal on a solid substrate by depositing a vaporized compound on the work surface, or by reacting a vapor with the surface, in an evacuated chamber. Also known as vapor deposition.

vacuum pump A device similar to a compressor whose inlet is attached to a chamber to remove non-condensable gases such as air and maintain the chamber at a pressure below atmospheric.

vacuum relief valve A vacuum relief valve is a pressure relief device designed to admit fluid to prevent an excessive internal vacuum; it is designed to reclose and prevent further flow of fluid after normal conditions have been restored.

vacuum system A system consisting of one or more chambers that can withstand atmospheric pressure without completely collapsing, and having an opening for pumping gas out of the enclosed space.

(data) validation A process used to determine if data are inaccurate, incomplete or unreasonable.

validation (software) The process of evaluating software at the end of the software development process to ensure compliance with software requirements. See also verification.

validation – cross The verification of results by replicating an experiment under independent conditions.

validity check A check based upon known limits or upon given information or computer results, e.g., a calendar month will not be numbered greater than 12, and a week does not have more than 168 hours.

valley (pulse terms) A portion of a pulse waveform between two specified peak magnitudes of the same polarity.

value (of a quantity) The expression of a quantity in terms of a number and an appropriate unit of measurement. Examples: 5,3 m; 12 kg; -40° .

value analysis, value engineering The systematic use of techniques which serve to identify required function, establish a value for that function, and finally to provide that function at the lowest overall cost. This approach focuses on the functions of an item rather than the methods of producing the present product design.

value theory The assignment of numerical significance to the worths of alternative choices.

valve (control valves) An assembly forming a pressure retaining envelope containing internal means for changing the flow rate of the process fluid.

valve (fluid power systems) Device which regulates the direction, pressure and flow of fluid used in fluid power circuits.

valve Simple vacuum device for amplification by an electron stream, covering diode, hexode, pentode, screened-grid triode.

valve actuator An electric, pneumatic, hydraulic, or electrohydraulic power-driven mechanism for positioning two-position or modulating valves, and dampers. Included are those components required to control valve action and to provide valve position output signals, as defined in the actuator specification.

valve body (control valves) The part of the valve which is the main pressure retaining boundary. It provides the fluid flow passageways and the pipe connecting ends.

valve body assembly (control valves) An assembly of a body, bonnet assembly, bottom flange and trim elements. The trim includes a valve plug which opens, shuts or partially obstructs one or more ports.

valve bonnet (control valves) See under bonnet assembly, bonnet types.

valve closure member (control valves) That part of a valve which is positioned to close, open, or to control the amount of flow.

valve diaphragm (control valves) A flexible member which is moved into the fluid flow passageway of the body to modify the rate of flow through the valve.

valve flow coefficient (C_v) (control valves) Number of U.S. gallons per minute of 60°F water that will flow through a valve with one psi pressure drop under stated conditions. Stated conditions include pressure and percent of rated travel. See also under flow coefficient.

valve packing (control valves) See packing.

valve plug (control valves) An obsolete term, see closure member.

valve polarity (fluid power systems) Relationship between the direction of control flow and the direction of input current.

valve positioner (control valves) An auxiliary control system designed to increase the accuracy and speed of the moving part of the valve.

valve pressure drop (fluid power systems) Sum of the differential pressures across the control orifices of the output stage. Valve pressure drop will equal the supply pressure minus the return pressure minus the load pressure drop.

valve recovery coefficient (control valves) The point above which no increase in flow rate is achieved for an increase in pressure drop. This coefficient is called the valve recovery coefficient because its value is a measure of the amount of pressure that is recovered between the vena contracta and the valve outlet. See further ISA handbook of control valves regarding this subject.

valve response time (fluid power systems) The initial point is the moment when the pilot pressure rises/falls past a given point; the completion point is when a given value of the outlet pressure or flow has been reached.

valve seats (control valves) The corresponding sealing surfaces within a control valve which make full contact when the control valve is in the closed position.

valve sizing (control valves) The determination of a control valve size, required for a given flow rate under specified pressure and temperature conditions, shall be carried out in accordance with IEC publication 534-2-1 for incompressible fluids and 534-2-2 for compressible fluids. The prediction of the flow rate achievable for a specific size and style of control valve under specified pressure and temperature conditions shall be carried out by the corresponding procedures in these publications. ANSI/ISA publication S 75.01

Flow Equations for Sizing Control Valves (compressible and incompressible fluids) also refers.

valve stem (or shaft) (control valves) A component extending through the bonnet which connects the actuator to, and positions, the closure member. For rotary valves, the word shaft should be used in place of stem.

valve trim (control valves) The internal parts of a valve which are in flowing contact with the controlled fluid. Examples are the closure member, seat ring, cage, stem and the parts used to attach the stem to the closure member. The body, bonnet, bottom flange and gaskets are not considered as part of the trim.

vane (control valves) The valve closure member in a butterfly valve, which provides a variable restriction in a port. Sometimes called disc.

vane type actuator (control valve actuator) A fluid powered device in which fluid acts upon a movable pivoted member, the vane, to provide rotary motion to the actuator stem.

vapor The gaseous product of evaporation.

vapor actuated thermometer See under vapor filled thermal system.

vapor degreasing Removal of soluble organic materials from the surfaces of equipment by continuous condensation of solvent vapors and their subsequent washing.

vapor filled thermal system Vapor filled thermal systems operates on the principle that fluids expand and vaporize when heated. In an industrial pressure type thermometer a usually cylindrical shaped metal bulb is installed in the process. This bulb is filled with a volatile liquid and its vapor. An internal pressure which is proportional to the temperature of the bulb builds up in the system. See also under filled thermal system.

vapor generator A container of liquid, other than water, which is vaporized by the absorption of heat.

vaporimeter 1. An apparatus in which the volatility of oils are estimated by heating them in a current of air. **2.** An instrument used to determine alcohol content by measuring the vapor pressure of the substance.

vaporization The change from liquid or solid phase to the vapor phase.

vaporization cooling, evaporative cooling A method of cooling hot electronic equipment by spraying it with a volatile, nonflammable liquid of high dielectric strength; the liquid absorbs heat from the electronic equipment, vaporizes, and carries the heat to enclosure walls or to a radiator or heat exchanger.

vapor phase pulping Heating with live steam without surrounding cooking liquor of chips which have previously been impregnated with cooking chemicals. Pertains to pulp and paper manufacturing.

vapor pressure 1. The pressure exerted by a vapor held in equilibrium with its liquid state. Stated inversely, it is the pressure required to prevent a liquid from changing to a vapor. **2.** Partial pressure of water vapor in a gaseous atmosphere.

vapor pressure thermometer See under vapor filled thermal system.

vapor recovery unit A facility for collecting and condensing vapors of volatile products being loaded into open tanks at oil refineries, terminals, and service stations. The vapors are drawn into a collecting tank and by pressure and cooling are condensed to a liquid. VR units significantly reduce air pollution by petroleum vapors.

vapor tight pressure See resealing pressure.

vapor treatment Heat treatment (especially of high-speed steel) using vapor at a temperature correspon-

ding to tempering in order to produce a thin layer of oxide on the material's surface; see bluing. The layer thereby formed increases the material's resistance to wear and corrosion.

var Symbol for var, unit for reactive power (SI unit). $1 \text{ var} = 1 \text{ VA}$ reactive power.

varactor Also called varactor diode, silicon capacitor, voltage-controlled capacitor, and voltage-variable capacitor. A two-terminal solid-state device that utilizes the voltage-variable capacitance of a pn junction. In the normal semiconductor diode, efforts are made to minimize inert capacitance, while in the varactor, this capacitance is emphasized. Since the capacitance varies with the applied voltage, it is possible to amplify, multiply and switch with this device.

var-hour meter, reactive energy meter An instrument intended to measure reactive energy by integrating reactive power with respect to time.

variable (quantity) A quantity or condition whose value is subject to change and can usually be measured. Note: The term variable alone is frequently used to circumvent the lengthy but correct denomination "variable quantity".

variable (in programming) **1.** A character or group of characters that refers to a value and, in the execution of a computer program, corresponds to an address. **2.** A language object that may take different values, one at a time. Note: The values of a variable are usually restricted to a certain data type.

variable address Same as indexed address.

variable area flowmeter A vertical tube with a conically shaped bore which widens towards the top in which the weight of a solid body (float) is supported by the upward force exerted by a fluid stream flowing upward through the bore of the tube. The position of the solid body in the tube is the indication of the flowrate through the tube. See figure in IEC publication 902, 1987. The following ISA documents refer to the subject of variable area flowmeter (rotameters): RP 16.1, 2, 3; RP 16.4; RP 16.5 and RP 16.6.

variable block format (numerical control) A block format in which the order of the words is specified but in which a particular word needs only to appear when specifying a new value, so that the number of the words in the block varies.

variable capacitance transducer A transducer which measures a parameter or a change in a parameter by means of a change in capacitance.

variable connector **1.** A flow chart symbol representing a sequence connection which is not fixed, but which can be varied by the flow-charted procedure itself. **2.** The device which inserts instructions in a program corresponding to selection of paths appearing in a flow chart. **3.** The computer instructions which cause a logical chain to take one of several alternative paths. Same as n-way switch and programmed switch.

variable costs An operating cost that varies directly with the production volume including direct material, direct labor and variable overhead costs (fixed factory overhead is not included in variable costs). For inventory order quantity purposes, unit costs must include both variable and fixed costs to determine the unit costs.

variable cycle operation Computer operation in which any cycle is started at the completion of the previous cycle, instead of at specified clock times.

variable displacement pump Pump in which the volume displaced per cycle can be varied.

variable inductance A coil the inductance of which can be varied.

variable inductance accelerometer An instrument for measuring instantaneous acceleration of a body.

variable length record In a computer, pertaining to a file in which there is no constraint on the record length. Opposite of fixed-length record.

variable point representation system (mathematics of computing) A radix numeration system in which the radix point is explicitly indicated by a special character at that position.

variable reluctance pickup A transducer that converts mechanical oscillations into audio-frequency electrical signals by varying the reluctance of an internal magnetic circuit.

variable reluctance proximity sensor A device that senses the position (presence) of an actuating object by means of the voltage generated across the terminals of a coil surrounding a pole piece that extends from one end of a permanent magnet; coil voltage is proportional to the rate of change of magnetic flux as the object passes through the field near the pole piece.

variable reluctance transducer Also called magnetic transducer. A transducer that depends for its operation on the variations in reluctance of a magnetic circuit.

variable speed motor A motor the speed of which can be adjusted within certain limitations, regardless of load.

variable speed pumping A pumping system where the flow is varied by changing the pump speed.

variable transformer An iron-core transformer with provision for varying its output voltage over a limited range, or continuously from zero to maximum, generally by the movement of a contact arm along exposed turns of the secondary winding.

variable voltage transformer An autotransformer in which the output voltage can be changed (essentially from turn to turn) by means of a movable contact device sliding on the shunt winding turns.

varindor An inductor, the inductance of which varies markedly with the current in the winding.

variometer A variable inductor in which the change of inductance is effected by changing the relative position of two or more coils.

varistor A two-terminal semiconductor device having a voltage-dependent nonlinear resistance.

Varley loop A type of Wheatstone bridge circuit which gives, in one measurement, the difference in resistance between two wires of a loop.

varmeter, reactive power meter An instrument intended to measure reactive power.

varnished cambric A linen or cotton fabric that has been impregnated with varnish or insulating oil and baked. It is used as insulation in coils and other radio parts.

VAR process (in steelmaking) In the vacuum arc remelting (VAR) process, a steel electrode having a chemical composition about the same as that of the desired product and usually in the as-cast state is dripped into a water-cold copper mold.

varying speed motor A motor which slows down as the load increases (e.g., a series motor, or an induction motor with a large amount of slip).

varying voltage control A form of armature – voltage control obtained by impressing on the armature of the motor a voltage that varies considerably with change in load, with a consequent change in speed, such as may be obtained from a differentially compound-wound generator or by means of resistance in the armature circuit.

vat See cylinder vat.

VAT Value Added Tax.

vat machine, cylinder machine A machine for the manufacture of paper or more usually board in which the web is formed on one or more cylinder-vat units.

vat section The section of a paper or board machine where the web is formed on one or more cylinder-vat units.

VAX Virtual Access Exchange.

VCO See voltage controlled oscillator.

VDMA Verband Deutscher Maschinenbau und Anlagenbau e.V.

VDU Video Display Unit. Any one of several types of shared human interface devices that use digital video technology.

vector (of variables) An ordered set of variables, treated as an entity.

vector ampere The unit of measurement of vector power.

vector diagram An arrangement of vectors showing the relationships between alternating quantities having the same frequency.

vectored interrupt An interrupt which carries the address of its service routine.

vector generator (computer graphics) A functional unit that generates directed lines segments.

vector power A vector quantity equal to the square root of the sum of the squares of the active and reactive powers. The unit is the vector-ampere.

vector power factor Ratio of the active power to the vector power. In sinusoidal quantities, it is the same as power factor.

vector processor See array processor.

vector scan Technique of displaying images on a screen, particularly suitable for precision drawings and animation. It is available only on special visual display units.

vectorscope An oscilloscope with a circular time base of extreme stability (determined by the frequency of the color subcarrier). The instrument can be used to check the time delay between two signals because the phase difference at a particular frequency can be related to time difference.

vector scope display See calligraphic display.

vector voltmeter A two-channel, high-frequency sampling voltmeter that can be connected to two input signals of the same frequency to measure not only their voltages but also the phase angle between them.

vee orifice (gate valves) "V" shaped flow control orifice which allows a characterized flow control as the gate moves in relation to the fixed vee opening.

vegetable parchment Paper which as a result of treatment with sulphuric acid has a dense, hard structure and is thus resistant to the penetration of organic substances such as fat and oils and is resistant to decomposition even in boiling water.

vehicle 1. A body such as an aircraft or rocket designed to carry a payload aloft. **2.** A self-propelled machine for transporting goods or personnel. **3.** A solvent or other carrier for the resins and pigments in paint, lacquer, shellac or varnish.

veined board, veined paper Board or paper containing a small quantity of fibers which differ in color from that of the remainder of the paper.

Veitch diagram A means of representing Boolean functions in which the number of variables determines the number of squares in the diagram: the number of squares needed is the number of possible states, that is two, raised to a power determined by the number of variables.

velocimeter An instrument for measuring the speed of sound in gases, liquids or solids.

velocity 1. Rate of movement past a point in a specified direction. Pertains to liquid flow measurement in open channels. **2.** In a wave, the distance travelled by a given phase of a wave divided by the time taken. **3.** A vector quantity that includes both magnitude (e.g., speed) and direction in relation to a given frame of reference. **4.** For measurement of velocity, speed in SI units see metre per second.

velocity (industrial robots) Displacement covered by the point under consideration per unit of time.

velocity algorithm A computer control algorithm, which calculates the required change in the value of the input variable of the final controlling element for each sampling period.

velocity area method 1. A method of discharge determination deduced from the area of the cross-section, bounded by the wetted perimeter and the free surface, and the integration of the component velocities in the cross section. Pertains to measurement of liquid flow in open channels. **2.** Methods which enable the flow-rate to be deduced from the measurement of local fluid velocities at a cross-section of the conduit by integration of the velocity distribution over that section.

velocity error The amount of displacement existing between the input and output shafts of a servomechanism when both are turning at the same speed.

velocity gradient The change in velocity per unit distance in a vertical direction. Pertains to measurement of liquid flow in open channels.

velocity head 1. The head obtained by dividing the square of the velocity by twice the acceleration due to gravity. Pertains to liquid flow measurement in open channels. **2.** Equivalent head through which the liquid would have to fall to attain a given velocity.

velocity lag error A lag, between the input and output of a device, that is proportional to the rate of variation of the input.

velocity limiter A device which reproduces an input signal as long as the rate-of-change (velocity) of that input signal does not exceed a preset limit; at velocities above that limit, the output signal will approach the value of the input signal at a rate equal to the set velocity limit.

velocity limiting control Control in which the rate of change of a specified variable is prevented from exceeding a predetermined limit.

velocity meter A flowmeter that measures rate of flow of a fluid by determining the rotational speed of a vaned rotor inserted into the flowing stream.

velocity of approach The mean velocity in an open channel at a specified distance upstream of a measuring device.

velocity of approach factor See ISO publication 4006-1977 or BS 5875: 1980.

velocity of propagation 1. The speed at which a disturbance (sound, radio, light, waves etc.) is radiated through a medium. **2.** The ratio of the speed of the flow of an electric current in an insulated cable to the speed of light, expressed in percentage.

velocity pressure The measure of the kinetic energy of a fluid.

velocity rod, rod float A floating rod weighted at the base so that it travels in a stream in an almost vertical position; the immersed portion may be adjustable. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

vena contracta (pressure) tappings Wall pressure tappings drilled on either side of an orifice plate, the upstream tapping being located at a distance of 1 D (D being the internal diameter of the conduit) from

the upstream face of the plate, and the downstream tapping being in the cross-section of minimum static pressure and therefore at a distance downstream of the upstream face of the plate which varies with the diameter ratio.

vena contracta (control valves) The location where cross-sectional area of the flowstream is at its minimum. The vena contracta normally occurs just downstream of the actual physical restriction in a control valve.

Venn diagram A diagram in which sets are represented by regions drawn on a surface.

vent Passage to a reference pressure, normally the ambient pressure.

venturi flume A flume containing a constriction which, in sub-critical flow, causes an increase in velocity and subsequent fall in water level and in which a measurement of the two water levels, upstream and at the contraction, allows a calculation of the discharge. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

venturi nozzle Venturi tube the convergent portion of which is a nozzle. The profile is defined precisely in ISO 5167.

venturi tube A flow sensor producing a differential pressure by means of a profiled tube generating a change in the velocity of the fluid flowing through it. The tube consists of a cylindrical entrance part, a convergent part, a cylindrical throat and a divergent part. A venturi tube like a flow nozzle, will handle about 60 percent more flow than an orifice plate but its permanent pressure loss will be only 10 to 20 percent of the differential pressure.

verification (software) The act of reviewing, inspecting, testing, checking, auditing, or otherwise establishing and documenting whether or not items, processes, services, or documents conform to specified requirements.

verification system See automated verification system.

verifier A device that checks the correctness of transcribed data usually by comparing with a second transcription of the same data or by comparing a retranscription with the original data.

verify To compare the results of one transcription against the results of another transcription of the same data. See also check.

vernal sloughing See spring sloughing.

vernier An auxiliary scale comprising subdivisions of the main measuring scale and thus permitting more accurate measurements than are possible from the main scale alone.

vernitel A precision device which makes possible the transmission of data with high accuracy over standard frequency-modulated telemetering systems.

vertical blanking The elimination of the vertical trace on a cathode-ray tube during frame flyback.

vertical boiler A fire-tube boiler consisting of a cylindrical shell, with tubes connected between the top head and the tube sheet forms the top of the internal furnace. The products of combustion pass from the furnace directly through the vertical tubes.

vertical firing An arrangement of a burner such that air and fuel are discharged into the furnace, in practically a vertical direction.

vertical hold control The control in a television receiver which varies the free-running period of the oscillator providing the vertical deflection.

vertically-fired or bottom center-fired soaking pit A type of soaking pit in which the fuel is fired vertically through a port, centrally located in the bottom

of the pit, around which the ingots are placed. This design was introduced with recuperators and controls for carrying out program heating.

vertical magnetic recording, perpendicular magnetic recording A technique of magnetic recording in which magnetic polarities representing data are aligned along the length of the recording track.

vertical orifice installation, vertical orifice run, vertical meter run An orifice plate used in a vertical pipeline.

vertical raster count The number of coordinate positions addressable across the height of the cathode-ray tube.

vertical redundancy In a computer, an error condition which exists when a character fails a parity check, i.e. has an even number of bits in an odd-parity system or vice versa.

vertical redundancy check, VRC An odd parity check performed on each character of a transmitted block of ASCII-coded data as the block is received.

vertical scrolling The ability of a word processor to move vertically, a line at a time, up and down through a display page or more of text.

vertical shaft furnaces (pelletizing) A shaft-furnace system for producing pellets. There are several variations in shaft furnace design, but the most common is the Erie type. Green bolls are charged at the top and descend through the furnace at a rate of 25 to 38 mm (1 to 1 1/2 inches) per minute countercurrent to the flow of hot gases.

vertical sync pulses The series of pulses which controls the cathode-ray tube receiver's vertical and horizontal oscillators.

vertical sync signal The signal which instructs the television set to return its beam to the top of the screen and begin a new field.

vertical velocity coefficient The coefficient applied to a single, or an equivalent single, velocity determination at any depth on a vertical to infer the mean velocity on that vertical. Pertains to measurement of liquid flow in open channels.

vertical velocity curve A curve showing the relation between depth and velocity along a vertical line in a given section of a stream. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983.

very high frequency, VHF The range of frequencies between 30 and 300 MHz. Wavelength: 10 to 1 meters.

very large scale integration See VLSI.

very low frequency, VLF Frequencies below 30,000 Hz. Wavelength: above 10,000 meters.

vessel 1. A container or structural enclosure in which materials – especially liquids, gas and slurries – are processed, stored or treated. **2.** In steelmaking, a vessel is a container, as is a ladle or a furnace, in which liquid steel can be contained while undergoing various treatments. It is designed for secondary steel refining, but is not designed for the transfer of molten steel as is a ladle.

vestigial Pertaining to remnant or remaining part.

V/F (boiler-to-feed ratio) A quantity used to analyze the operation of a distillation column.

VHF See very high frequency.

VHLL Very High Level Language. Usually a problem or requirements-description language ranging in form from the highly abstract to plain English.

viable bacteria Bacteria which are capable of metabolism and/or multiplication.

vibrating reed instrument An instrument intended to measure frequency, comprising a set of tuned vibra-

ting reeds, one or a few of which resonate under the action of an alternating current of the appropriate frequency flowing through one or more fixed coils.

vibrating reed viscometer A type of viscometer that continuously measures the viscosity of a liquid by measuring the damping effect or viscous drag of the liquid on a vibrating reed probe.

vibrating U-tube transducer A device for density measurement. The U-tube and its content are driven into mechanical vibration by an electrically excited drive coil. The vibration is a function of the mass of the material contained in the U-tube. It is sensed by a pickup coil, consisting of an armature and coil. Thus the vibration introduces an ac voltage in the coil. The output of the coil is then converted into a millivoltage output of the transducer. The U-tube configuration is also used with a pneumatic flapper-nozzle type of transducer.

vibration A periodic motion, reciprocating, rotary or both, usually with a well-defined fundamental frequency. See also vibrations.

vibrational severity The degree to which industrial process measurement and control equipment can be influenced or even damaged by a vibrational environment. See further IEC publications 902 and 654-3: Part 3. See also vibrations.

vibration error (electrical transducers) The maximum change in output at any measurand value within the specified range, when vibration levels of specified amplitude and range of frequencies are applied to the transducer along specified axis.

vibration galvanometer A galvanometer in which the natural frequency of the moving element is adjusted to resonate with the frequency of the current to be measured or detected.

vibration machine, shake table A device for determining the effects of mechanical vibrations on the structural integrity of function of a component or system.

vibration meter Also called a vibrometer. An apparatus comprising a vibration pickup, calibrated amplifier, and output meter, for the measurement of displacement, velocity and acceleration of a vibrating body.

vibration pickup A microphone that responds to mechanical vibrations rather than to sound waves.

vibration relay (power switchgear) A relay that responds to the magnitude and frequency of a mechanical vibration.

vibrations IEC publication 654-3, Part 3 considers the specific operating conditions of vibrations, shock, seismic and mechanical stress conditions to which landbased, and off-shore, industrial-process measurement and control systems may be exposed during operation, storage or transportation. Maintenance and repair conditions are excluded from consideration.

vibration sensitivity See vibration error.

vibration sensor A sensor which responds to vibrations of the surface on which it is mounted. Its sensitivity is adjustable to allow for the different levels of normal vibration, to which the sensor should not respond, at different locations.

vibration test A test to determine the ability of a device to withstand physical oscillations of specified frequency, duration and magnitude.

vibration type level detector A device for detecting the level of solids in a bin or hopper, in which a tuning fork driven by a piezoelectric crystal vibrates freely when the level is below the sensor position and is inhibited from vibrating when bulk material surrounds the sensor.

vibration welding Method of fusing two plastic parts by vibrating (rubbing) the mating surfaces together at relatively low frequencies, 90 to 120 Hz.

vibrator 1. Electromagnetic device which is used to change a continuous steady current into a pulsating current. **2.** An electromagnetic device for converting a direct voltage into an alternating voltage.

vibrator power supply A power supply incorporating a vibrator, step-up transformer, rectifier and filters for changing a low dc voltage to a high dc voltage.

vibrograph An instrument for making an oscillograph recording of the amplitude and frequency of a mechanical vibration, such as by producing a trace on paper or film using a moving stylus.

vibrometer See vibration meter.

vibronic isolation Systems which minimize the transfer of vibrations from the floor and surrounding environment to the surface of an optical table or other equipment mounted on them.

video In radio telemetry, this is the term generally applied to a telemetry multiplex output from a radio receiver.

video circuit A circuit capable of handling nonsinusoidal waveforms involving frequencies of the order of megahertz.

video copier An option that provides a permanent copy of the video monitor's display.

video display monitor A television-like device used to display letters, numbers, etc. and sometimes graphic symbols. Some monitors are combined with a keyboard and a display generator in a single housing and referred to as a terminal.

video receiver The data output of a telemetry receiver; the multiplex of telemetry measurements.

video terminal A computer terminal that incorporates a cathode-ray-tube (CRT) for displaying information on a screen. Some terminals are designed for data entry as well as display, and feature built-in minicomputers so that they can both edit and format input and operate as stand-alone data processing systems.

viewing transformation, window/viewport transformation (computer graphics) A mapping of the boundary and contents of a window into the boundary and interior of a viewport.

viewport (computer graphics) A predefined part of a display space.

virgin fiber, primary fiber Fiber which has not previously been used in any paper or board product. Virgin fibers should be contrasted with recycled fibers. Fibers which are returned to the process from the paper machine itself (edge trimmings, broke etc.) are normally classified as virgin fibers.

virgin medium, blank medium A data medium in or on which neither marks of reference nor user data have been recorded.

virtual Conceptual or appearing to be, rather than actually being.

virtual address 1. The immediate address or real-time address. **2.** The address of a storage location in virtual storage.

virtual block (telemetry computer systems) One of a collection of blocks comprising a file (or the memory image of that file). The block is virtual only in that its block number refers to its position relative to other blocks on the volume; that is, the virtual blocks of a file are numbered sequentially beginning with one, while their corresponding logical block numbers can be any random list of valid volume - relative block numbers.

virtual earth Live input terminal of a high-gain directly-coupled amplifier which remains approximately at earth potential although not connected to earth.

virtual leak A gradual release of gas by desorption from the interior walls of a vacuum system in a manner that cannot be accurately predicted; its effect on system operation resembles that of an irregularly variable physical leak.

virtual link packet switching A packet switching method where a network path is pre-established for each packet.

virtual machine (software) A functional simulation of a computer and its associated devices.

virtual memory 1. A technique that permits the user to treat auxiliary storage as an extension of main storage, thus giving the virtual appearance of a larger main storage. **2.** A programming method that allows the operating system to provide essentially unlimited program address space.

virtual page number The virtual address of a page of virtual memory.

virtual processor Software which allows an industrial user to consider a computer's resources to be entirely dedicated to him. A computer can simulate several virtual processors simultaneously.

visbreaking Mild thermal cracking.

viscometer gage An instrument that determines pressure in a vacuum system by measuring the viscosity of residual gases.

viscose pulp Dissolving pulp intended for the manufacture of viscose. Viscose, which is a solution of cellulose xanthogenate, is used for the manufacture of artificial fibers (viscose rayon) and film materials.

viscosimeter, viscometer A device for measuring the viscosity of liquids. See under capillary viscometer, falling-ball viscometer, sliding-plate viscometer, rotational viscometer, float-type viscometer, vibrating-reed viscometer, and ultrasonic viscometer.

viscosity One of the physical properties of a liquid, i.e., its ability to flow. It happens that the more viscous an oil, for example, the less readily it will flow. So the term has an inverse meaning – the lower the viscosity, the faster the oil will flow.

viscosity index Empirical measure of the viscosity/temperature characteristics of a fluid. When the variation is small, the index is high.

viscosity index improver Chemical compound added to a fluid to modify its temperature/viscosity relationship.

viscous drag gas density meter A viscous drag gas density meter has two separate chambers, one filled with air the other with a gas sample. Driven impellers in each chamber impart opposite rotation in the gas columns. Nonrotating impellers in the chambers are coupled together to measure relative drag, which can be calibrated in terms of the density of the sample gas.

viscous flow See laminar flow.

viscous friction The component of friction that is due to the viscosity of a fluid medium, usually idealized as a force proportional to velocity, and that opposes motion.

visible radiation, light Any optical radiation capable of causing a visual sensation directly on a human being.

Viton A A material often used as butterfly valve liner material for high temperature and special chemical services. Trademark-E.I. du Pont de Nemours Co.

vitreous 1. Having the nature of glass. **2.** A term used in ceramic technology indicating fired characteristics

approaching being glassy, but not necessarily totally glassy.

vitreous silica, fused silica Glass consisting of almost pure silicon dioxide (SiO_2).

vittrification The progressive reduction in porosity of a ceramic material as a result of heat treatment or some other process.

vittrified bond grindstone, ceramic grindstone See ceramic grindstone.

VLF Very Low Frequency (3–30 kHz).

VLSI Very Large Scale Integration, technology which allows more than 100,000 circuit elements on one chip.

VME bus A 16- and 32-bit microprocessor bus standard defined by Mostek, Motorola, and Signetics/Philips which conforms to Eurocard standards, DIN 41612 and 41494.

VMS DEC's VAX operating system.

V-notch, triangular notch thin-plate weir A thin-plate weir with two edges symmetrically inclined to the vertical to form a triangular notch in the plane perpendicular to the direction of the flow. Pertains to liquid flow measurement in open channels.

vocabulary A list of operating codes or instructions available to the programmer for writing the program for a given problem, for a specific computer, or for a specific language.

VOD process (in steelmaking) Vacuum Oxygen Decarburization. A vacuum ladle degassing process.

voice/data system An integrated communications system for transmission of both voice and digital-data signals.

voice frequency, vf (data transmission) Any frequency within that part of the audio-frequency range essential for the transmission of highly intelligible speech.

voice grade channel (data transmission) A channel suitable for transmission of speech, digital or analog data, or facsimile, generally with a frequency range of about 300 to 3 000 Hz.

voice grade line The common communications line used in normal telephone communications. It is an essential part of most communications systems involving computers and data transmission.

voice print An acoustic spectrograph that can be used to analyze sound patterns, especially the harmonic patterns that distinguish one person's voice from another's.

voice spectrum The total fundamental frequency range of the human voice.

voice synthesis Technology that produces sound or voices by processing compressed digital signals and storing them in a memory in the same manner a human voice generates sound processed by the vocal tract and other organs.

voice unit, VU A measure of the gross amplitude or volume of an electrical speech or program wave.

void 1. In character recognition, the inadvertent absence of ink within a character line. **2.** The absence of substance in a localized area.

void detector See flaw detector.

volatile display The nonpermanent image appearing on the screen of a visual display terminal.

volatile fault, intermittent fault, transient fault A fault of an item which persists for a limited time duration after which the item recovers the ability to perform a required function without being subjected to any action of corrective maintenance. Note: Such a fault is often recurrent.

volatile flammable liquid A flammable liquid having a flash point below 38°C (100°F) or whose temperature is above its flash point.

volatile memory, volatile storage A memory device whose contents are lost when power is cut off.

volatility With respect to memory, an inability to retain stored data in the absence of external power.

voltatization See vaporization.

volt The difference of electric potential between two points of a conductor carrying a constant current of one ampere, when the power dissipated between these points is equal to one watt. Unit symbol V (SI unit).

Volta's law When two dissimilar conductors are placed in contact, the same contact potential is developed between them, whether the contact is direct or through one or more intermediate conductors.

voltage amplifier An amplifier used specifically to increase a voltage. It is usually capable of delivering only a small current.

voltage balance relay A device which operates on a given difference in voltage between two circuits.

voltage breakdown The voltage necessary to cause insulation failure.

voltage circuit (of a measuring instrument) A circuit of a measuring instrument to which is applied the voltage of the circuit to which the measuring instrument is connected. Note: This voltage may be either the voltage directly involved in the measurement or a proportional voltage supplied by an external voltage transformer or voltage divider or derived by means of an external series resistor (impedance).

voltage control A method of varying the magnitude of voltage in a circuit by means of amplitude control, phase control or both.

voltage controlled oscillator, VCO An oscillator in which the output frequency is dependent upon the input voltage.

voltage corrector (power supplies) An active source of regulated power placed in series with an unregulated supply to sense changes in the output voltage (or current). Also to correct for the changes by automatically varying its own output in the opposite direction, thereby maintaining the total output voltage (or current) constant.

voltage/current crossover The characteristic of a power supply that automatically converts the mode of operation of a power supply from voltage regulation to current regulation (or vice versa) as required by preset limits. The region near the intersection of the constant-voltage and constant-current curves is described by the term "crossover characteristics".

voltage divider A device comprising resistors, inductors, capacitors, transformer(s) or a combination of these components such that between two points of the device a desired fraction of the voltage applied to the device as a whole can be obtained.

voltage drop **1.** Diminution of potential along a conductor, or over an apparatus, through which a current is passing. **2.** Possible diminution of voltage between two terminals when current is taken from them.

voltage frequency converter A circuit that produces an output frequency which varies with the voltage applied to its input.

voltage gain Ratio of output to input voltages for amplifier, attenuator, etc.

voltage gradient The voltage per unit length along a resistor or other conductive path.

voltage influence (electric instruments) In instruments, other than indicating voltmeters, wattmeters, and varimeters, having voltage circuits, the percentage change (of full-scale value) in the indication

of an instrument that is caused solely by a voltage departure from a specified reference voltage.

voltage inverter A circuit having a response (output) proportional to a constant (the gain) times the input signal, but opposite in sign to it.

voltage level (data transmission) Ratio of the voltage at any point in a transmission system, to an arbitrary value of voltage used as a reference.

voltage limit A control function that prevents a voltage from exceeding prescribed limits. Voltage limit values are usually expressed as percent of rated voltage.

voltage multiplier A circuit for obtaining high dc potential from low voltage ac supply, effective only when load current is small.

voltage range multiplier Also called an instrument multiplier: **1.** A series resistor installed external to the measurement device to extend its voltage range. **2.** A precision resistor placed in series with a voltmeter to enable measurement of a high voltage with a voltmeter having a lower voltage range.

voltage rating Also called working voltage. The maximum voltage which an electrical device or component can sustain without braking down.

voltage ratio (electrical transducers) For potentiometric transducers, the ratio of output voltage to excitation voltage, usually expressed in percent.

voltage ratio (of a transformer) Ratio of the rms primary terminal voltage to the rms secondary terminal voltage under specified load conditions.

voltage regulator An electronic circuit used for controlling and maintaining a voltage at a constant level.

voltage relay A relay that functions at a predetermined value of voltage. Note: It may be an overvoltage relay, an undervoltage relay, or a combination of both.

voltage sensitive resistor A resistor (e.g., a varistor), the resistance of which varies with the applied voltage.

voltage standard An accurately known voltage source (e.g., a standard cell) used for comparison with or calibration of other voltages.

voltage stress That stress found within a material when subjected to an electrical charge.

voltage-to-frequency converter, V/F converter An electronic circuit that converts an input voltage into a train of output pulses at a rate that is directly proportional to the input.

voltage to ground The voltage between any live conductor of a circuit and earth (or common reference plane).

voltage transformer See potential transformer.

voltage transients Unpredictable and usually unavoidable spikes and surges of electrical power.

voltage transient suppression (thyristor) Reduction of the effects of voltage transients on controller components by reducing the voltage or energy of the transients to tolerable levels.

voltage tripler A rectifier circuit in which three diodes are employed to produce dc voltage equal to approximately three times the peak ac input voltage.

voltaic cell An electric cell having two electrodes of unlike metals immersed in a solution that chemically affects one or both of them, thus producing an electromotive force. The name is derived from Volta, a physicist who discovered this effect.

voltaic couple Two dissimilar metals in contact, resulting in a contact potential difference.

voltampere A unit of apparent power in an ac circuit containing reactance. It is equal to the potential in volts multiplied by the current in amperes, without taking phase into consideration. Letter symbol VA (SI unit).

volt-ampere-hour meter, apparent energy meter An instrument intended to measure apparent energy by integrating apparent power with respect to time.

voltampere reactive Component of the apparent power in an alternating current circuit which is delivered to the circuit during part of a cycle, but is returned to the source during another part of the cycle. The practical unit of reactive power is the var (SI unit), equal to one reactive voltampere. Also called wattless power.

volt-ohm-milliammeter A test instrument having different ranges for measuring voltage, resistance and current flow (in the milliamperage range) in electrical or electronic circuits. Also known as circuit analyzer; multimeter; multiple-purpose meter.

volume 1. A mass storage media that can be treated as file-structured data storage. **2.** A measure of capacity for a tank or other container in standard units. See cubic metre for measurement in SI units. **3.** The magnitude of a complex audio-frequency current measured in standard volume units on a graduated scale. **4.** The three-dimensional space occupied by an object.

volume booster See pneumatic volume booster.

volume flow-rate through a cross-section of a conduit The volume of fluid flowing through the cross-section of a conduit in unit time at the conditions of pressure and temperature pertaining to that section. Compare flow rate and mass flow rate.

volumetric activity The activity per unit volume of a given radioactive material. It is expressed in Bq/m³.

volumetric method Method of measurement principally used for liquids, in which the flow is directed during a certain time into a calibrated volumetric tank, the capacity of which is known as a function of the level to which the tank is filled.

volumetric tank A tank, which when filled with a given liquid and at a known temperature, has a capacity which is accurately related by a separate calibration to the liquid level in the tank.

volume unit, VU The unit of measurement for electrical speech power in communication work as measured by a VU meter in the prescribed manner. The VU meter is a volume indicator.

V-orifice gate valve This valve incorporates the wafer body design. In operation, the thin gate slides against a raised face seat, while a relief groove around the seat allows the gate to push solid particles in the fluid aside to prevent packing them in the seat area. The relief groove is flushed on each opening. The seating materials may be metal or resilient with an elastomer seat ring in the gate. This type of valve is frequently used in paper stock service.

vortex 1. The swirling motion of a liquid in a vessel at the entrance to a discharge nozzle. **2.** The point in a cyclonic gas path where the outer spiral converges to form an inner spiral and where the two spirals change general direction by 180°.

vortex amplifier (fluid power systems) Amplifier the operating principle of which is based on the pressure drop across a vortex, modulating the main flow.

vortex cleaner, cleaner, hydrocyclone (for pulp) A cyclone in which small particles of foreign matter (sand, flakes of rust, bark fragments etc.) are separated by centrifugal and shearing forces from fiber suspensions flowing rapidly in a spiral motion.

vortex precession flowmeter A form of vortex flowmeter belonging to the general class of flowmeters named fluid-dynamic-type flowmeters (see this term). The precession device has overall accuracy and rangeability comparable to the vortex shedding device; however, it is available only for gas-flow application. The overall pressure loss is approximately five times that of the vortex shedding flowmeter.

vortex shedding A phenomenon that occurs when fluid flows past an obstruction; the shear layer near the obstruction has a high velocity gradient, which makes it inherently unstable; at some point downstream of the immediate vicinity of the obstruction, the shear layer breaks down into well-defined vortices, which are captured by the flowing stream and carried further downstream.

vortex shedding flow transducer A transducer which measures the velocity of a fluid in a pipe by detecting the frequency of vortices being shed from a specially shaped obstruction element (also known as bluff body) in the fluid stream.

vortex-type flowmeter A device that uses differential-pressure variations associated with formation and shedding of vortices in a stream of fluid flowing past a standard flow obstruction – usually a circular element with a T-shaped cross section – to actuate a sealed detector at a frequency proportional to vortex shedding which, in turn, provides an output signal directly related to flow rate.

votator A device used principally in food-processing industries for simultaneously chilling and mechanically working on continuous emulsified stream such as in the production of margarine.

V-port rotary plug valve (control valves) A V-port hollow plug cams into a rectangular seat to give an inherent equal percentage characteristic at low flow and a linear characteristic at high flow. It is widely used for control of paper stock without dewatering because sharp corners and cavities have been eliminated.

VTIS The Alfa-Laval Vacu-Therm Instant Sterilizer. For sterilization of liquid products by injection of live steam at 130–140°C and subsequent flash evaporation.

VTL Variable Threshold Logic.

VU See voice unit.

vulcanizing Producing a hard, durable, flexible rubber product by steam curing a plasticized mixture of natural rubber synthetic elastomers and certain chemicals.

vulnerability level The point at which a piece of equipment becomes subject to damage or component failure.

W

W 1. Symbol for watt, unit for power (SI unit). $1\text{ W} = 1\text{ J/s}$. Use W for all forms of power. **2.** Chemical symbol for tungsten.

wafer A thin semiconductor slice of silicon or germanium with parallel faces on which matrices of microcircuits or individual semiconductors can be formed.

wafer body (control valves) A body whose end surfaces mate with the pipeline flanges. It is located and clamped between the piping flanges by long bolts extending from flange to flange. A wafer body is also called a flangeless body.

wafer-type sensor A sensor for heat flux measurement.

wait condition As applied to tasks, the condition of a task such that is dependent on an event or events in order to enter the ready condition.

waiting list Same as queue.

waiting time 1. Time which shall elapse before a command is issued. **2.** The time interval between the instant at which an instruction control unit initiates a call for data and the instant at which the actual transfer of data starts. Synonymous with latency.

waiver See concession.

waiver A written authorization report to accept material that during production or after inspection has been found to depart from the specified requirements, but the material is considered to be suitable for use "as is" or after repair by an approved method. This allows production to proceed. A deviation permits a change before it occurs and a waiver permits a change after it has occurred (SAMA).

wale (textile term) A knit fabrics, a length wise column of loops in the fabric.

walking-beam furnace (in steel production) A type of continuous reheating furnace. It is used to reheat slabs as well as billets and blooms. Also used in heat-treating operations. The furnace employs a special mechanism within the furnace known as a "walking beam" to move the material through the furnace.

walking-hearth furnace In a walking-hearth furnace, travel of the work through the heating chamber follows the same general path as in the walking-beam furnace. The main difference in method of conveyance is that in the walking-hearth furnace, the work rests on fixed refractory piers.

wall (pressure) tapping Annular or circular hole drilled in the wall of a conduit in such a way that, its edge is flush with the internal surface of the conduit, the tapping being such that the pressure within the hole is static pressure at that point in the conduit.

wall box A structure in a wall of a steam generator through which apparatus, such as sootblowers, extend into the setting.

WAN Wide Area Network.

warm restart (programmable controllers) Restart after power failure with a user programmed predetermined set of dynamic data and system predetermined application program context. A warm restart is identified by a status flag or equivalent means made available to the application program indicating that the power failure shut down of the programmable controller system was detected in the run mode.

warm start Restarting a computer without turning it off and on again.

warm-up period The time required after energizing a device before its rated performance characteristics apply.

warn See simmer.

washer 1. See washing beater. **2.** A ring-shaped component used to distribute a fastener's holding force, insulate or cushion a nut in place, or improve tightness of a bolted joint. **3.** A machine for mechanically agitating parts or materials in a detergent solution. Also known as washing machine.

washer, potcher A hollander designed for the washing and bleaching of a pulp suspension. A perforated cylinder immersed in the pulp makes possible a continuous removal of liquid.

washer room (in a pulp mill) The department in a pulp mill for the washing of pulp after cooking.

washing (of pulp) Displacement and leaching, normally with water, of soluble material from pulp, sometimes in combination with pressing. The soluble material consists normally of residual chemicals and substances which have been dissolved out of the pulp during cooking, bleaching or other chemical treatment.

washing (of iron ores) The earliest methods for improving the quality of iron ores consisted chiefly of processes called by the general name of "washing". Other more complex methods were adopted to upgrade ores that are not amenable to simple washing operations. The specific methods depend on the properties of the ore and include among others: heavy-media separation, spirals, flotation, and magnetic and electrostatic concentration.

washing beater, washer A hollander designed for the washing of pulp suspensions. A perforated cylinder immersed in the pulp or a screen plate at the bottom of the hollander through provides a continuous removal of liquid.

wash load That part of the suspended load which is composed of particle sizes smaller than those found in appreciable quantities in the bed material. It is in near-permanent suspension and, therefore, is transported through the stream without deposition. The discharge of the wash load through a reach depends only on the rate with which these particles become available in the catchment and not on the transport capacity of flow. It is generally expressed in mass or volume per unit of time. Pertains to liquid flow measurement in open channels.

waste fuel Any by-product fuel that is waste from a manufacturing process.

waste heat Sensible heat in non-combustible gases.

waste-heat boiler A process unit for recover of heat from waste flue gases of processes. Used to obtain heat recovery when a practical limit of recovery has been obtained by regenerators or recuperators, and there is still sufficient heat left in the waste gases to justify expenditures for the waste-heat boiler. Waste-heat boilers are most applicable to high-temperature continuous process. Waste-heat boilers usually are provided with superheaters and sometimes with economizers.

waste liquor See spent liquor.

waste paper Paper or board which after use or during converting is recovered and used after slushing in the manufacture of paper or board or for some other industrial purpose.

waste water Water discharged after being used in, or produced by, a process, and which is of no further immediate value to that process.

watchdog timer 1. A timer set by the program to prevent the system from looping endlessly or becoming idle because of program errors or equipment faults. **2.** A monitor circuit that establishes a definite period of time within which the device must complete certain operations (e.g., at least one interrupt per second, etc.). As long as the operational sequence is completed within the prescribed period of time the circuit alarms and/or halts device operation. Refers to Honeywell TDC 3000 control systems.

water A liquid composed of two parts of hydrogen and sixteen parts oxygen by weight.

water absorbcency (in paper) The quantity of water absorbed by paper when one side of it is in contact with water for a short period of time. The water absorbcency may be given as the Cobb number, i.e. the quantity of water in grams absorbed during a given time by one square metre of paper.

water activated battery A primary battery which contains the electrolyte but requires the addition of (or immersion in) water before it becomes usable.

water break test This test may be used to detect oily residues not found by other means. The surface is wetted with a spray of clean water. This should form a thin layer and remain unbroken for at least 5 s. Beading of the water droplets indicates the presence of oil contaminants. This method is generally limited to horizontal surfaces. This method may be used as one of cleanliness tests for industrial-process measurement and control equipment to be used for oxygen service. The different cleanliness methods are described in IEC publication 877 (1986).

water calorimeter A device for measuring radio-frequency power by determining the rise in temperature of a known volume of water in which the radio-frequency power is absorbed.

water column A vertical tubular member connected at its top and bottom to the steam and water space respectively of a boiler, to which the water gage, gage cocks, high and low level alarms and fuel cutoff may be connected.

water cooling Using a stationary or flowing volume of water to absorb heat and disperse it or carry it away.

water demulsibility Capacity of an emulsion of fluid and water to separate into two phases.

water-finished (WF) board, water-finished (WF) paper Board or paper with a high finish achieved by a treatment in which the web is moistened on one or both sides by a wet smoothing roll or rolls as it passes through a machine stack.

water-flow pyrheliometer A device for determining intensity of solar radiation in which the radiation sensor is a blackened water calorimeter; radiation intensity is calculated from the rise in temperature of water flowing through the calorimeter at a constant rate.

water gas Water gas or blue gas is generated by blowing steam through an incandescent bed of carbon. Water gas burns with a clear blue flame; hence, the name "blue gas". It is used in a number of chemical processes to supply a basic gas for synthetic processes.

water hammer noise (control valves) Water hammer noise and shock are caused by the sudden closure of valves that are stopping a moving column of liquid and by the reflection of shock waves within the liquid and piping system. Intensity varies directly with the density, velocity, and rate of deceleration of the flowing liquid.

water-in-oil emulsion Stabilized dispersion of water in a continuous phase of oil.

water jacket A casing around a pipe, process vessel or operating mechanism for circulating cooling water.

waterleaf paper, unsized paper Paper which has not been sized; see sizing.

water level The elevation of the surface of the water in a boiler.

water meter An integrating measuring device which continuously determines the volume of water flowing through the device using either a direct mechanical process by means of mobile wall volumetric chambers or the influence of water velocity on a moving device: turbine, propeller etc.

water meter flow-rate The quotient of the water volume flowing through the meter divided by the time of transit of this volume.

water pressure In non SI units: pounds per square inch = height of water column in feet x 0,434; e.g., 10-foot column of water x 0,434 = 4,34 pounds per square inch of pressure.

waterproof Impervious to water. Compare with water resistant.

waterproof enclosure (electric installation on shipboard) An enclosure constructed so that any moisture or water leakage which may occur into the enclosure will not interfere with its successful operation. In the case of motor or generator enclosures, leakage which may occur around the shaft may be considered permissible provided it is prevented from entering the oil reservoir and provision is made for automatically draining the motor or generator enclosure.

water resistant Slow to absorb water or to allow water to penetrate, often expressed as a maximum allowable immersion time. Compare with waterproof.

watertight enclosure (electric installations on shipboard) An enclosure constructed so that a stream of water from a hose not less than 1 in. in diameter under a head of 35 ft from a distance of 10 ft can be played on the enclosure from any direction for a period of 15 min without leakage. The hose nozzle shall have a uniform inside diameter of 1 in.

water trap Device fitted at a specific point in the installation in order to collect moisture and possibly other impurities.

water treatment equipment Any apparatus deionizers, electrolytic targets, filters, or other devices employed to control electrolysis, corrosion, scaling or clogging in water systems.

water tube boiler A boiler in which the tubes contain water and steam, the heat being applied to the outside surface.

water vapor A synonym for steam, usually used to denote steam of low absolute pressure.

water vapor transmission rate (of paper) The quantity of water vapor which passes through unit area of the paper in a given time at a given temperature and with a given difference in partial pressure of the vapor on the two sides of the sheet. The water vapor transmission rate is determined according to a standardized test procedure.

waterway (ball valves) The term "waterway" is commonly used to describe the hole in the ball of full ball valves. This differentiates it from the term "port" which is used for characterized ball valves and is the orifice formed between the ball and the seats. See under full ball valve, characterized ball valve and "full-port" ball valve.

watthour constant of a meter The registration, expressed in watthours, corresponding to one revolution of the rotor.

wathour meter, (active) energy meter An instrument intended to measure active energy by integrating active power with respect to time.

wattmeter, active power meter An instrument intended to measure active power.

wattsecond The amount of energy corresponding to 1 watt acting for 1 second. It is equal to 1 joule.

wattsecond constant of a meter The registration, in wattseconds, corresponding to one revolution of the rotor.

watt, W Unit for measurement of powers (SI unit). Use W for all forms of power, including power of automotive engines. A unit of the electric power required to do work at the rate of 1 joule per second.

wave 1. A propagated disturbance, usually periodic, such as a radio wave, sound wave, or a carrier wave used for transmitting data signals. **2.** A single cycle of a periodic propagated disturbance.

wave, waviness Deformation of a web of e.g. paper, normally at the edges, as a result of a non-uniform moisture content.

wave amplitude The maximum change from zero of the characteristic of a wave.

wave analyzer A tuned voltmeter used to measure the amplitude of a signal in a restricted frequency band which is tunable over a specified range of frequencies.

wave angle The angle at which a wave is propagated from one point to another.

wave band A band of frequencies, such as that assigned to a particular type of communication service.

wave converter A device for changing a wave from one pattern to another.

wave filter A transducer for separating waves on the basis of their frequency.

waveform 1. The shape of an electromagnetic wave. **2.** A graphical representation of the relationship, between voltage, current or power against time. It also provides a picture of the behavior of signals at given frequencies.

waveform digitizer A device which generates a digital signal corresponding to an analog waveform which it receives.

waveform generator A circuit driven by pulses from the master clock; it operates in conjunction with the operation decoder to generate timed pulses needed by other machine circuits to perform the various operations.

wavefront (optical communication) The locus of points where all components of the vectors of an electromagnetic wave have the same phase at the same time.

waveguide A hollow metal conductor within which very-high frequency energy can be transmitted efficiently in one of a number of modes of electromagnetic oscillation.

waveguide connector Also called a waveguide coupling. A mechanical device for electrically joining parts of a waveguide system together.

waveguide coupling See waveguide connector.

waveguide cutoff frequency Also called the critical frequency. The frequency limit of propagation, along a waveguide, for waves of a given field configuration.

waveguide dispersion (optical communication) That dispersion in a signal attributable to the dependence of the phase and group velocities on wavelength due to the geometric properties of the fiber.

waveguide filter A filter which has distributed properties that give frequency discrimination in a waveguide where it is inserted.

waveguide scattering (fiber optics) Scattering (other than material scattering) that is attributable to variations of geometry and index profile of the waveguide.

wave impedance In an electromagnetic wave, the ratio of the transverse electric field to the transverse magnetic field.

wavelength The shortest distance, in the direction of propagation, between two successive points of a periodic wave in which the oscillation has the same phase.

wavelength division multiplexing, VDM (optical communication) Multiplexing in which several independent signals are allotted separate wavelengths for transmission over a common optical transmission medium. Note: Wavelength division multiplexing is a form of Frequency Division Multiplexing (FDM).

wave motor A power conversion device for producing mechanical power from the lifting power of sea waves.

wave optics, physical optics (optical communication) The treatment of propagation of light as a wave phenomenon rather than a ray phenomenon, as in geometric optics.

wave soldering, flow soldering A soldering technique used extensively to bond electronic components to printed circuit boards.

wax Paraffin. In processing lubricating oil, one step is removing the paraffin, which retards the oil's ability to flow at low temperatures. In pumping wells the tubing becomes so coated with wax or paraffin on the inside that the flow of oil is blocked. When this happens the tubing is pulled and heated to melt the paraffin or it is scraped out.

Wb Symbol for weber. Unit for magnetic flux (SI unit).

w.c. Water column (hydrostatic head).

WDC Watts DC.

WDM See wavelength division multiplexing.

weak liquor, thin liquor Spent liquor, perhaps diluted, which is led to the evaporator plant. Pertains to pulp and paper manufacturing.

weakness fault A fault due to a weakness in the item itself when subjected to stresses within the stated capabilities of the item. Note: Weakness may be either inherent or induced.

wearout failure, aging failure (reliability) A failure whose probability of occurrence increases with the passage of time, as a result of processes inherent in the item.

wearout fault, aging fault A fault resulting from a failure whose probability of occurrence increases with the passage of time as a result of processes inherent in the item.

wear oxidation See fretting.

weatherproof (outside exposure) So constructed or protected that exposure to the weather will not interfere with successful operation.

weather resistance The relative ability of a material or coating to withstand the effects of wind, rain, snow and sun on its color, luster, and integrity.

web Pulp, stock, paper or board in the form of a continuous mat or ribbon during manufacture or converting.

weber, Wb The unit of magnetic flux in the International System of Units (SI).

Weber number 1. A dimensionless parameter expressing the ratio between the inertia and the surface tension forces in a liquid. See further ISO 772-1978 or BS 3680: Part 1: 1983. **2.** The Weber number is equivalent to the ratio of inertia force to the surface tension force. See further ISA handbook of control valves relating to hydrodynamic noise prediction.

weft The filling yarn in a woven fabric.

weighing method Method of measurement, suitable only for liquids, in which the flow is directed either intermittently or continuously into a weigh-tank on the scale of a weighing machine. The flow-rate is obtained by measuring the mass of liquid which is collected in a measured time.

weight See significance.

weighted average 1. An average performed on data in which some of the values are more heavily valued than others. 2. An averaging technique where the data to be averaged are nonuniformly weighted. The weights must always sum to 1.00 or 100 percent.

weighted noise level The noise level weighted in accordance with the 70-decibel equal-loudness contour of the human ear and expressed in dBm.

weighted summing unit A device the output of which is a representation of the algebraic sum of two or more of the quantities represented by its inputs.

weighted value The numerical value assigned to any single bit as a function of its position in the code word.

weighting function See unit impulse response.

weight-loaded accumulator (fluid power systems) Hydraulic accumulator in which the fluid is subjected to pressure by the gravitational force acting upon weights being transmitted to the fluid via a piston.

weight measurement See force and weight measurement.

weight or springless actuator Many types of weight actuators are in use today. One design permits adjustment of the power output of the actuator by adjustment of the fulcrum position on the rocker arm. Other types of weight actuators are designed with the weight attached to the lever arm located outside the valve body.

weir An overflow structure which may be used for controlling upstream surface level or for measuring discharge or for both. See figure in ISO publication 772-1978 or BS 3680: Part 1: 1983. Pertains to liquid flow measurement in open channels.

weir abutment See abutment.

weir pond See stilling basin.

weir type (valve body) A body having a raised contour contacted by a diaphragm to shut off fluid flow.

weir type flow sensor A dam (called a weir) is placed in an open channel or open conduit causing the liquid that flows in the channel to form a small waterfall in such a way that the liquid level on the low side of the weir is below the lowest point of the weir. The liquid passes over a known cut-out in the weir, which can be "V" shaped or a rectangle of known width, for example. The cross-sectional area of the liquid stream passes over the weir can be measured by the liquid level on the upstream side which is thus an indication of the flow rate of the liquid.

welded strain gage A type of foil strain gage especially designed to be attached to a metal substrate by spot welding; used almost exclusively in stress analysis.

weld ends, welded ends (valves) Valve end connections which have been prepared for welding to the line pipe or other fittings. May be butt weld (BWE), or socket weld (SWE).

well, thermowell 1. A pressure-tight tube or similarly shaped chamber, closed at one end, and usually having external threads so it can be screwed into a tapped hole in a pressure vessel to form a pressure-tight means of inserting a thermocouple or other temperature measuring element.

Wertheim effect When a wire placed in a longitudinal magnetic field is twisted, there will be a transient voltage difference between the ends of the wire.

Weston normal cell A standard cell of the saturated cadmium type in which the positive electrode is cadmium and the electrolyte is a cadmium sulfate solution.

wet (tensile) strength retention (of paper or board) Ratio of the tensile strength of the wet paper to the tensile strength of the same paper in the dry, conditioned state.

wet and dry bulb method A measuring method for determining percent relative humidity. A thermometer bulb, thermocouple or resistance thermometer bulb from which water is constantly evaporating will measure an air temperature lower than that of a dry bulb by an amount dependent upon the moisture content of the air. The lower temperature of the wet bulb is caused by evaporation of water from the surface of the bulb and it follows that the less moisture there is in the air, the greater will be the cooling effect. A graph, known as a "psychrometric chart", has been plotted, relating wet and dry bulb temperatures with percent relative humidity. Various bulb assemblies are available to suit specific measurement requirements.

wet assay Determining the amount of recoverable mineral in an ore or metallurgical residue, or the amount of specific elements in an alloy, using flotation, dissolution and other wet-chemistry techniques.

wet basis The more common basis for expressing moisture content in industrial measurement, in which moisture is determined as the quantity present per unit weight or volume of wet material; by contrast, the textile industry uses dry basis or regain moisture content as the measurement standard.

wet broke See broke.

wet bulb temperature The lowest temperature which a water wetted body will attain when exposed to an air current. This is the temperature of adiabatic saturation.

wet bulb thermometer A thermometer whose bulb is covered with a piece of fabric such as muslin or cambric that is saturated with water; it is most often used as an element in a psychrometer.

wet cell A cell the electrolyte of which is in liquid form and free to flow and move.

wet circuit 1. A circuit which carries direct current. 2. Circuit having current flow to melt (microscopically) contact material at point of contact, thereby dissolving and evaporating away contaminants.

wet classifier A device for separating solids in a liquid-solid mixture into fractions by making use of the difference in settling rates between small and large particles.

wet contact A contact through which direct current flows.

wet end The section of a pulp-drying machine, paper machine or board machine comprising the former(s) and the wet presses.

wet gas Natural gas containing significant amounts of liquefiable hydrocarbons.

wet high-intensity magnetic separation, WHIMS See WHIMS.

wet lap machine See intermittent board machine.

wet leg A liquid-filled low-side impulse line in a differential pressure level measuring system.

wet machine (for pulp) A machine on which a pulp suspension through thickening and pressing is dewatered to a web of wet pulp.

wetness A term used to designate the percentage of water in steam. Also used to describe the presence of a water film on heating surface interiors.

wet oxidation processes (coke-oven plants)

All wet oxidation processes utilize a reduction-oxidation catalyst to facilitate the wet oxidation of hydrogen sulphide to elemental sulphur or sulphate. The major commercial wet-oxidation processes which are used in the world today are: Thakahax process, Holmes-Stretford process, Fumaks process, Thylox and Giammarco Vetrocoke.

wet press A press in which the surfaces of the rolls are made of e.g. polished granite, rubber, fabric or felt intended for pressing water out of and for compacting the wet web. The wet press is placed in the wet end of the paper or board machine immediately preceding the drying section; see wet end.

wet pulp Pulp which has been dewatered largely by pressing.

wet reed relay A reed-type relay containing mercury at the relay contacts to reduce arcing and contact bounce.

wet shredding Mechanical disintegration of pulp, paper or board in the wet or moist state into smaller pieces or lumps by the tearing action of a shredding unit such as a toothed roll. Wet shredding normally precedes a subsequent, more complete defibration.

wet steam Steam containing moisture.

wet strength agent An additive in the stock which gives paper increased strength in the wet state.

wet strength paper Paper with a high wet (tensile) strength retention.

wet suction box A suction box in a fourdrinier machine intended only for drainage without the simultaneous suction of air through the web; compare dry suction box.

wetted parts Parts of a device (for example a transmitter) in direct contact with the process medium.

wetted perimeter (liquid flow measurement in open channels) The wetted boundary of an open channel at a specified section.

wet type differential pressure meter A design of differential-pressure instrument in which pressure difference is determined across an intermediate liquid in the instrument, by means of either an inverted-bell or float-type indicating mechanism.

WFEO World Federation of Engineering Organisations.

WG Working Group.

Wheatstone bridge A four arm measuring circuit intended to measure the value of a resistor which forms one of the arms, the other three arms being resistors, at least one of which is adjustable.

wheel-belt casting process An alternative to the conventional continuous casting processes. The characteristic feature of wheel-belt casters is a traveling mold which has the potential for high casting speeds and, therefore high productivity.

wheel diagram A method of representing a time-multiplexed format in the manner of a mechanical commutator or rotary switch.

wheel, pulley, crank and key actuators Type of actuator generally used for on-off service but may be used for flow control when systems require special service or additional regulation.

WHIMS Wet High Intensity Magnetic Separation. A concentrating process for recovery of iron oxides from natural ore fines, upgrading of spiral concentrates for direct-reduction feed, and recovery of hematite from tailings.

whirly bird The slang reference or expression to designate disk-pack equipment.

white cargo Clean cargo; a term to describe distillate-gasoline, kerosene, heating oil – carried by tankers.

white cast iron See cast iron.

white light A mixture of colors of visible light that appears white to the eye. In most cases a mixture of the three primary colors is sufficient to produce white light.

white liquor A solution of sodium hydroxide and sodium sulphide intended for use as cooking liquor in the manufacture of sulphate pulp. The cooking liquor in sulphate cooking is sometimes a mixture of white liquor and black liquor.

white mechanical pulp board Mechanical wood-pulp board manufactured largely of bright mechanical pulp.

white millboard Unglazed or glazed millboard manufactured solely of bright mechanical pulp.

whiteness See diffuse blue reflectance factor.

whiteness (of paper or board) The visually perceived property of paper or board which is characterized by high brightness, high light scattering and a minimum of color.

white object An object which reflects all wavelengths of light with substantially equal high efficiencies and considerable diffusion.

white oil A colloquial term for condensate, gas condensate, casinghead gasoline, liquid hydrocarbons produced with natural gas. See condensate.

white room An area in which the atmosphere is controlled to eliminate dust moisture and bacteria.

white water Water which is removed from a fiber suspension or web, e.g. in a paper machine or on a wire mould. White water normally contains fiber remnants and sometimes also fillers, dyestuffs, rosin size etc., and is usually recirculated.

white water system The flow circuit for the white water including the pipes, storage tanks, cleaning equipment and equipment for regulating the return of the white water to the process.

Wiberg-Söderfors process A direct reduction shaft-furnace process. The feed to the shaft furnace is lump ore, sinter or pellets.

wideband 1. Capable of passing a broad range of frequencies (said of a tuner or amplifier). **2.** Having a bandwidth greater than a voice band.

wideband channel A channel wider in bandwidth than a voice-grade channel.

wideband data set Data sets that permit rates of 72,000 bits per second.

wideband radiation thermometer A pyrometer that responds to a wide spectrum of the total radiation emitted by a target object; depending on the lens or window material used. Also known as broad band pyrometer; total radiation pyrometer.

wideband recording (instrumentation tape) A mode of recording or playback where the frequency response at a given tape speed is "wide".

wide range mechanical atomizing oil burner A burner having an oil atomizer with a range of flow rates greater than that obtainable with the usual mechanical atomizers.

width control The cathode-tube ray receiver hand control which varies the width of the picture.

Wiedemann-Franz law A theoretical result which states that the ratio of thermal conductivity to electrical conductivity is the same for all metals at the same temperature.

Wien's law The wavelength of maximum radiation intensity is inversely proportional to the absolute temperature of a blackbody, and the intensity of radiation at this maximum wavelength varies as the fifth power of the absolute temperature. See also Wien displacement law.

Wien displacement law The relationship between the temperature of a blackbody and the wavelength for its emission maximum.

Wien radiation law An expression representing approximately the spectral radiance of a blackbody as a function of its wavelength and temperature.

Williams-tube storage A type of electrostatic storage.

WIMPS Windows, Icons, Mice, Pointers, Scroll Bars.

Winchester disk Originally an IBM code name for a small, hard disk. Now a generic name for any (permanently sealed) hard-disk system for computer use. Winchester disks are available in 14-inch (35.6 cm) 8 inch (20.3 cm), 5 1/4-inch (13.3 cm) diameters.

windbox A chamber below the grate or surrounding a burner, through which air under pressure is supplied for combustion of the fuel.

winding, reeling Rolling up of a web of pulp, paper or board into a reel.

window (in computer graphics) A predefined part of a virtual space.

window An application software "design concept" that allows several programs to be run and displayed on the screen simultaneously and supports integration of data between applications programs.

windowing The division of a CRT display into sections (by means of software), allowing the display of data from several different sources.

wind tunnel An apparatus consisting of a duct, fans or other air-handling equipment, and instrumentation; it is used to study effects of airflow past solid objects.

windup 1. Saturation of the integral mode of a controller developing during times when control cannot be achieved, which causes the controlled variable to overshoot its setpoint when the obstacle to control is removed. **2.** Lost motion in a mechanical system that is proportional to the force or torque applied.

wing wall, abutment, weir abutment A wall at the side of a channel, generally normal to the axis of the weir against which a weir terminates. Pertains to measurement of liquid flow in open channels.

winning Recovering a metal from an ore or chemical compound.

wiper In a potentiometer, the contact that moves along the element, dividing the resistance according to its mechanical position.

wipe test A method used for cleanliness test of industrial-process measurement and control equipment to be used for oxygen service. The different test methods that can be used are described in IEC publication 877 (1986).

wire 1. An endless belt of wire gauze for the drainage of stock to a fiber web. **2.** A conductor of round, square or rectangular section, either bare or insulated.

wire board An electrical panel which can be changed with the addition or deletion of external wiring. Same as a plugboard, panel or board.

wire cloth See wire gauze.

wired-in Components that are connected in circuits, particularly subminiature valves and semiconductor devices, which are too small to be plugged safely into a holder.

wired program computer A computer in which the instructions that specify the operations to be performed are specified by the placement and interconnection of wires.

wire drawing The pulling of wire through dies made of tungsten carbide or diamond with a resultant reduction in the diameter of the wire.

wire frame representation (computer graphics) A mode of display showing all edges of a

three-dimensional object without distinguishing hidden lines.

wire gage Also called American Wire Gage (AWG), and formerly Brown and Sharpe (B & S) Gage. A system of numerical designations of wire sizes.

wire gauze (screening) arrester Type of flame arrester.

wire gauze, wire cloth A woven gauze of metallic or plastic threads intended for the manufacture of a wire.

wireless connection diagram The general physical arrangement of devices in a control equipment and connections between these devices, terminals, and terminal boards for outgoing connections to external apparatus. Connections are shown in tabular form and not by lines.

wire-link telemetry Also called hardwire telemetry. Telemetry in which a hardwire link is used as the transmission path, no radio link being used.

wire mould A wooden frame with transverse wooden bars over which a fine mesh wire gauze is stretched and through which the stock is drained in the manufacture of hand-made paper.

wire pack arrester Type of flame arrester.

wire part The section of a paper machine where the web is formed on a wire, between two wires or between a wire and some other surface; see fourdrinier former.

wire pit, wire tank The pit or tank below or at the side of a wire part in which white water or shower water from the wire is collected.

wire printer Same as matrix printer.

wire recording A recording method in which the medium is a thin stainless-steel wire (instead of a tape or disc).

wire retention Proportion of some component in the pulp suspension or stock supplied to the wire which is retained in the web when it leaves the wire; see system retention. The component concerned may be fibers, fiber remnants, fillers, size etc.

wire sense A wire used to determine or interrogate storage locations in core devices by sending a predetermined pulse down the sense winding.

wire splice An electrically sound and mechanically strong junction of two or more conductors.

wire storage A wire made of or coated with a magnetic material and used for magnetic recording.

wire tank, wire pit See wire pit.

wireways Sheet-metal troughs with hinged covers for housing and protecting electrical conductors and cable.

wire wrap A method of making an electrical connection in an electrical circuit by wrapping wires around specially designed terminals.

wiring diagram A circuit diagram that indicates the physical layout of the connections.

wiring hardness A group of coded insulated wires, cut to length, bent to shape and laced together. Installed as a unit to form the back-of-panel wiring for a unit of equipment.

withstand type test (withstand test) For programmable controller systems, a type test verifying that the application of more severe influencing quantities to the basic programmable controller system does not impair its ability to assume its intended mission.

Wobbe index The ratio of the heat of combustion of a gas to its specific gravity. For light hydrocarbon gases the Wobbe index is almost a linear function of the gas' specific gravity.

wobble switch Any of several designs of momentary or limit switches which are actuated by physical con-

tact of an object with an extended wire, rod or cable projecting from the switch body.

wobbulator More commonly called a sweep generator.

Wood's glass A type of glass that is relatively opaque to visible light but relatively transparent to ultraviolet rays.

wood chips See chips.

woodfree board, woodfree paper Board or paper of chemical pulp and/or rag pulp which may, however, contain a small, unintentionally introduced amount of mechanical pulp.

wood room An installation for the manufacture of chips, normally including equipment for cross-cutting, barking, chipping and chip screening.

word A set of characters that occupies one storage location and is treated by the computer circuits as a unit and transported as such.

word address format The order of appearance of character information within a word.

word format The way in which characters are arranged in a word, with each position or group of positions in the word containing certain specified information.

word generator An instrument that generates a data stream of ones and zeros with bit position, bit frequency, etc., completely under the control of the operator.

word length, word size The number of characters in a word.

word memory A limited characteristic of some equipment, whereby the words are available from the storage and not from individual characters.

word organized storage A storage device into which data can be stored or from which data can be retrieved in units of a computer word, or, with the same duration, in parts of a computer word.

word processor (computer application) 1. A text editor system for writing and formatting letters, reports and books. 2. An automated, computerized system incorporating variously an electronic typewriter, crt terminals, memory, printer and the like. It is used to prepare, edit, storage, transmit or duplicate letters, reports, records etc. as for a business.

word selector A hardware device that can select a given word or words whenever they occur in the format, and present each to the user as a display and/or analog output.

word time 1. In a storage device that provides serial access to storage locations, the time interval between the appearance of corresponding parts of successive words. 2. Same as minor cycle.

work The magnitude of a force times the distance through which that force is applied.

work file In sorting, an intermediate file used for the temporary storage of data between phases.

work hardening, strain hardening Plastic deformation at room temperature that makes a material significantly harder. The effect of work hardening can affect the whole material or only an outer layer. Work hardening is not a heat treatment.

working coltage See voltage rating.

working gas Gas stripped of all liquid hydrocarbons and used in gas-lift production of crude oil; lift gas.

working line, feed line (fluid power systems) Main pipelines (conductors) used for the transfer of fluid power.

working load The maximum service load that an individual structural member, or an entire structure, is designed to carry.

working memory, working storage A portion of the internal storage reserved for the data upon which

operations are being performed. Synonymous with working space and contrasted with program storage.

working pressure 1. The static pressure of the fluid immediately upstream of the primary device. Pertains to measurement of fluid flow in closed conduits. Similarly working temperature is the temperature of the fluid immediately upstream of a primary device. 2. The maximum allowable operating pressure for an internally pressurized vessel, tank or piping system.

working recipe (batch processes) A control recipe with a specific batch ID, which through its execution, coordinates the production of a single batch of the specified product. It may contain operator and/or system generated information.

working registers (scratchpads) These registers are used to store data during program execution. They can be accessed more easily and quickly than external storage, and increase the computational capabilities of the microprocessor.

working space Same as working storage.

working space (industrial robots) The set of poses relative to the base coordinate system which can be reached by the wrist reference point. The space in which the robot has no limitations in the movement of the secondary axes other than those imposed by the joint itself.

working standard A standard which, usually calibrated against a reference standard, is used routinely to calibrate or check material measures or measuring instruments.

working stroke (cylinders) Distance travelled by the piston in moving between two defined positions during actual operation.

working temperature The static temperature of the fluid immediately upstream of the primary device. Pertains to measurement of fluid flow in closed circuits.

working voltage to ground (electric instrument) The highest voltage, in terms of maximum peak value, that should exist between any terminal of the instrument proper on the panel, or other mounting surface, and ground.

work in process Work in process is the products in various stages of completion throughout the plant, including raw material that has been released for initial processing, up to the completed processed material awaiting final inspection and acceptance as a finished product. (APIC).

work station 1. A data processing station that is operated by a person and usually located at an endpoint node. 2. The assigned location where a worker performs the job. A human-machine interface devices that are composed of coordinated input/output devices which include video displays, keyboards, functional menus and may or may not include off-line storage capabilities. Used for graphics, text, data and retrieval functions.

world coordinate (computer graphics) A device independent cartesian coordinate used in the application program for specifying graphical input and output.

world coordinate system (industrial robots) A coordinate system referenced to earth or shop floor.

World Federation The joining together of three international regions: a. The Americas (Canadian MAP Interest Group and U.S. MAP/TOP Users Group) and Western Pacific (Australian MAP Interest Group), b. Asia (Japan MAP Users Group), and c. Europe (European MAP Users Group).

WorldFIP A global organization formed in February 1993, dedicated to develop an open, universal fieldbus

specification. The WorldFIB specification is based on the Factory Information Protocol (FIP) and completed versions of the IEC/ISA standard. The purpose of the organization is also to promote the acceleration of a viable international fieldbus standard for manufacturing and process control. Fieldbus is the term commonly used to describe digital protocols that enable communication between field-level devices and supervisory control systems.

worst case design A design in which the circuit is designed to function normally even though all component values have simultaneously assumed the worst possible conditions.

wound rotor motor An induction motor with a wound secondary. Sometimes called slip ring motor.

woven screen storage A digital storage plane woven from wires coated with thin films of magnetic material.

wow In instrumentation tape recording and playback, high-frequency tape speed variations. See flutter.

wrap **1.** One winding of a ferromagnetic tape. **2.** The length of the path of a magnetic recording tape along which the tape and head are in intimate physical contact.

wrap-around (computer graphics) Making that part of an image, which lies outside an edge of the display space, be displayed at the opposite edge of that space.

wrap-around liner (for butterfly valves) A liner extending around the end faces of the wafer body to form a gasket seal with the pipe flanges. The liner may cover all or part of the flange contact area of the wafer body.

wrap-around memory, wrap-around storage An arrangement of core storage in which the lowest numbered storage location is the successor of the highest numbered one.

wrap forming See stretch forming.

wrapped termination A gastight, separable connection formed by helically wrapping insulated copper wire around sharpened-edged rectangular posts, either manually, semi-automatically or automatically by means of numerically controlled machines.

wrapping tissue Soft and strong light-weight paper with a grammage normally between 12 and 30 g/m² intended primarily as a wrapping material for fragile articles.

wrist (secondary axes) (industrial robots) An interconnected set of links and powered joints between the arm and end-effector which supports, positions and orientates the end-effector.

wrist reference point (industrial robots) The intersection point of the two innermost secondary axes, or if this does not exist, a specified point on the innermost secondary axis.

(to) write To make a permanent or transient recording of data in a storage device or on a data medium. Note: The phrases "to read to" and "to read from" are often distinguished from the phrases "to write to" and "to write from" only by the viewpoint of the description.

write head A magnetic head capable of writing only.
write protection label A label, the presence or absence of which on a floppy disk prevents writing on that floppy disk.

write protect notch A cut-out in the diskette envelope that prevents the computer from writing on the diskette, but does not prevent the computer from reading the diskette.

write pulse In a computer, a pulse that is used to enter information into one or more magnetic cells for storage purposes.

write time The amount of time it takes to record information. Related to access time.

writing head Same as write head.

writing speed **1.** The speed of deflection of trace on phosphor. **2.** The rate of registering signals on a storage device.

wrought Metal in the solid condition that is formed to a desired shape by working (rolling, extruding, forging etc.) usually at an elevated temperature.

WV Working Voltage.

WVAC Working Voltage AC.

WVDC Working Voltage DC.

wye **1.** A network consisting of three branches meeting at a common node; an alternate form of tee network. **2.** A pipe fitting similar to a tee, but in which the branch is at 45° angle to the run.

wye connection Also called star connection. A Y-shaped ("Y" = "wye") winding connection.

WYSIWYG What You See Is What You Get. Term often used in connection with word processing.

X

X Reactance.

X-axis **1.** The reference axis in a quartz crystal. **2.** The horizontal axis in a system of rectangular coordinates. **3.** The horizontal or left-to-right direction in a two-dimensional system of coordinates.

XCO Crystal Controlled Oscillator.

x-coordinate Vertical axis position coordinate.

Xe Chemical symbol for xenon.

xenon A rare gas used in some thyratron and other gas tubes.

xerographic printer A device for printing an optical image on paper in which dark and light areas of the original are represented by electro-statically charged and uncharged areas on the paper.

xerography A dry copying processing involving the photoelectric discharge of an electrostatically charged plate. The copy is made by tumbling a resinous powder over the plate, the remaining electrostatic charge discharged and the resin transferred to paper on an offset printing master.

xeroradiography A printing process of electrostatic electrophotography that uses a photoconductive, insulating medium, in conjunction with X-rays or gamma rays, to produce latent electrostatic-charge patterns for achieving an observable pattern.

XHC Extreme High Vacuum.

XLPE Cross-Linked Polyethylene.

XMFR Transformer.

XMTR Transmitter. Also abbreviated trans or xmtr.

XNOR Exclusive NOR.

XOR Exclusive OR.

XPDR Transponder.

XPL Explosive.

XPT Cross Point.

x-ray diffraction analyzer Any of several devices for detecting the positions of monochromatic x-rays diffracted from characteristic scattering planes of a crystalline material.

x-ray fluorescence analyzer An apparatus for analyzing the composition of materials (solid, liquid or gas) by exciting them with strong x-rays and determining the wavelengths and intensities of secondary x-ray emissions.

X-rays Also called roentgen rays. Penetrating radiation similar to light, but having much shorter wavelengths. They are generally generated by bombarding a metal target with a stream of high-speed electrons.

X-ray spectrograph An instrument that is used to chart X-ray diffraction patterns, such as an X-ray spectrometer having photographic or other recording implements.

X-ray spectrometer **1.** An instrument for producing an X-ray spectrum and measuring the wavelengths of its components. **2.** An instrument designed to produce an X-ray spectrum of a material as an aid in identifying it.

X-ray spectrum An arrangement of a beam of X-rays in order of wavelength.

X-ray thickness gage A contactless thickness gage used to measure and indicate the thickness of moving cold-rolled sheet steel during the rolling process.

X-ray tube A vacuum tube in which X-rays are produced by bombarding a target with high-velocity electrons accelerated by an electrostatic field.

XTAL Crystal.

X-value A term sometimes used to designate the inductive or capacitive reactance of an ac electrical device or circuit.

xylene See aromatics.

XY plotter A device used in conjunction with a computer to plot coordinate points in the form of a graph.

XY recorder A recording instrument in which the marking device is moved along two orthogonal axes by two separate devices, to each of which a quantity to be recorded is applied.

XY switch A remote-controlled bank-and-wiper switch arranged so that the wipers move back and forth horizontally.

Y

Y **1.** Symbol for admittance. **2.** Chemical symbol for yttrium.

Yankee cylinder, Yankee dryer A drying cylinder (in a paper machine) with a large diameter and a polished surface.

Yankee machine A paper machine in which the drying is achieved substantially on a Yankee cylinder.

yarn dyeing (textile term) The dyeing of a fiber after it has been spun or textured into a yarn. The yarn can be wound on packages, beams, or skeins for batch dyeing or dyed continuously in a chain-warp.

Y-axis **1.** A line perpendicular to two parallel faces of a quartz crystal. **2.** The vertical direction, perpendicular to the X-axis, in a two-dimensional system of coordinates. **3.** The vertical axis on a graph or crt screen.

4. One of the three mutually perpendicular axes of a crystal.

Y-connected circuit A star-connected, three phase circuit.

Y-connection See Y-network.

Y-coordinate Vertical axis position coordinate.

Y-coupler (optical communication) A tee-coupler with one input port and two output ports.

yellowing Reduction in brightness as a result of aging or exposure to light.

yellow straw board, yellow straw paper Board paper, normally yellow in color, manufactured totally of unbleached strawpulp.

Y fitting Three-port fitting in the form of a "Y".

yield **1.** The quantity of a substance produced in a chemical reaction or other process from a specific amount of incoming material. **2.** In petroleum industry, see product yield. **3.** The ratio of usable output from a process to the material of value put into the process. Yield is usually expressed as a percentage and may be expressed in terms of total input of a specific raw material.

yield (melt) temperature (pressure relief devices) Yield (melt) temperature is the temperature at which the fusible material of a fusible plug device becomes sufficiently soft to extrude from its holder and relieve pressure.

yield map A microcircuit or semiconductor wafer on which dots indicate those devices that failed the test criteria.

yield strength See yield value.

yield stress The force per unit area at the onset of a plastic deformation, as determined in a standard mechanical-property test such as a uniaxial tension test.

yield stress limit, yield point The lowest stress in a material at which yield occurs under tension.

yield value Also called yield strength. The lowest stress at which a material undergoes plastic deformation. Below this stress, the material is elastic; above it, viscous.

Y-junction A junction of waveguides in which their longitudinal axes form a Y.

Y-network Also called a Y-connection. A star network of three branches.

yoke (control valves) The structure which rigidly connects the actuator power unit to the valve.

yoke **1.** In cathode ray tubes, the yoke is the set of wire coils that is wrapped around the end of the electron gun. **2.** In magnetic recording, the yoke is a group of read/write heads that are mounted and moved as a unit for reading and writing on media which consists of two or more tracks such as disks and magnetic tape. **3.** A clamping device to embrace and hold two other parts.

Young's modulus A constant that expresses the ratio of unit stress to unit deformation for all values within the proportional of the material.

YSF Yield Safety Factor.

YSLF Yield Strength Load Factor.

Y-style valve, Y valve Type of control valve. Self draining when installed at a certain angle. This design is commonly applied in molten metal installations and in cryogenic installations where the cooldown weight has to be kept to a minimum. Y valves have a relatively high flow capacity and a low cavitation factor.

Yugoslavian "S" Commission, S-Komisija
Yugoslavia Yugoslavian approval certification body for products (systems) intended for installation in hazardous locations. Example: intrinsically safe applications.

Z

Z Impedance.

ZA 1. Zero Adjusted. **2.** Zero and Add.

Z-angle meter An electronic instrument for measuring impedance in ohms and phase angle in electrical degrees.

Zanker straightener Type of straightening device consisting of a perforated with holes of certain specified sizes followed by a number of channels (one for each hole) formed by the intersection of a number plates. Detailed dimension for this device are given in ISO publication 5167.

zap In data processing, a slang word meaning to erase or wipe-out data.

z-axis Axis for depth in a three-dimensional graph or plot.

ZEBRA Zero Energy Breeder Reactor Assembly.

zener A semiconductor diode which, under reverse bias, is capable of conducting heavy currents.

zener barrier See barrier (zener) and intrinsic safety barrier.

zener effect A reverse-current breakdown due to the presence of a high electric field at the junction of a semiconductor or insulator.

ZENITH Zero Energy Nitrogen Heated Thermal Reactor.

zeolitic catalyst Catalyst formulations that contain zeolite (any of various hydrous silicates, a mineral) for use in catalytic cracking units.

zero (in data processing) The number that when added to or subtracted from any other number does not alter the value of that other number.

zero access storage Storage for which the latency (waiting time) is negligible at all times.

zero address instruction An instruction that contains no addresspart, being used when the address is implicit or when no address is required.

zero a device To erase all the data stored on a volume and reinitialize the format of the volume.

zero adjust A control for setting the reading of a device to the zero mark in the absence of any signal.

zero adjustment Means provided in an instrument to produce a parallel shift of the input-output curve. See zero shift.

zero based conformity The closeness to which the calibration curve of a device can be adjusted to approximate the specified characteristic curve so that the maximum positive and negative deviation are equal and the lower range value of both curves coincide. See figure in IEC publication 902, 1987.

zero based linearity The closeness to which the calibration curve of a device can be adjusted to approximate the specified straight line so that the maximum positive and negative deviation are equal and the lower range value of both curves coincide. See figure in IEC publication 902, 1987.

zero bias A positive or negative adjustment to instrument zero to cause the measurement to read as desired.

zero compensation A method by which, in certain transducers, the effects of temperature on the output at zero measurand may be minimized and maintained within known limits.

zero compression A technique used to eliminate the storing of nonsignificant leading zeros.

zero current turnout A characteristic of thyristors where turnoff is delayed until the next zero-current

crossing of the ac line. This "soft turnoff" eliminates arcing associated with inductive loads.

zero cut crystal A quartz crystal cut in such a direction that its temperature coefficient with respect to the frequency is essentially zero.

zero divergence field A vector field of zero divergence.

zero drift See zero shift.

zero elevation For an elevated zero range, the amount that the zero of the measured variable is above the actual lower measuring range value. Note: Zero elevation may be expressed either in units of the measured variable or in percentage of span.

zero elimination In a computer, the editing or deleting of nonsignificant zeros appearing to the left of the integral part of a quantity.

zero energy band An energy conservation technique that allows temperatures to float between selected settings, thereby preventing the consumption of heating or cooling energy while the temperature is in this range.

zero energy entrophy Energy which is completely predictable in nature and furnishes no information.

zero error The difference, under specified conditions of use, between the actual output value and the specified minimum value of the output range when the input is at the lower range value. Note: It is usually expressed as a percentage of the specified span.

zero error (of a measuring instrument) The datum error for zero value of the measurand.

zero error multiplier The particular error voltage at the output of an analog multiplier unit when one of the input voltages is zero and the other is arbitrarily selected, i.e., when it has its maximum value.

zero error reference A constant ratio of incremental cause and effect. Proportionality is a special case of linearity in which the straight line passes through the origin.

zero field residual voltage (Hall-effect devices) The voltage across the Hall terminals that exists when control current flows but there is zero applied magnetic field.

zero field residual voltage temperature drift (Hall generator) The maximum change in output voltage per degree Celsius over a given temperature range when operated with zero external field and a given magnitude of control current.

zero field resistive residual voltage (Hall-effect devices) That component of the zero field residual voltage which remains proportional to the voltage across the control current terminals of the Hall generator for a specified temperature.

zero fill A procedure to fill in characters with the representation of zeros, but which does not change meaning or content.

zero frequency gain See static gain (zero frequency gain).

zero governor A regulating device which is normally adjusted to deliver gas at atmospheric pressure within its flow rating.

zero gravity The condition, as in an orbiting satellite, when centrifugal force exactly counterbalances gravitational attraction.

zero gravity switch Also called weightlessness switch. A switch that closes when weightlessness or zero gravity is approached.

zero level 1. A reference level for comparing sound or signal intensities. **2.** The transmission power at a reference point in a circuit, to which all other power measurements in the circuit are compared.

zero level address, immediate address The contents of an address part that contains the value of an operand rather than an address.

zero measurand output (electrical transducers) The output of a transducer, under room conditions unless otherwise specified, with nominal excitation and zero measurand applied.

zero of a measuring instrument The direct indication of a measuring instrument when the instrument is in use with zero value of the measurand, any auxiliary power supply required to operate the instrument being switched on. Notes: **1.** This term is commonly called electrical zero in the case of a measuring instrument having an electrical auxiliary power supply. **2.** The term mechanical zero is often used when the instrument is not in use and any auxiliary power supply is switched off. **3.** The mechanical zero may possibly not coincide with the electrical zero; in some types of instrument the mechanical zero may be indeterminate.

zero offset See absence of offset.

zero offset (numerical control) A characteristic of a numerical control system that permits the origin of the numerical control measuring system to be shifted over a specified range with respect to the machine datum, the location of a permanent origin being stored in the numerical control system.

zero out zero The procedure of adjusting the measuring instrument to the proper output value for a zero-measurement signal.

zero potential 1. The potential of a point at an infinite distance; used to define capacitance. **2.** The potential of the earth, taken as a convenient reference for comparison.

zero power resistance In a thermistor, the resistance at a specified temperature when the electrical power dissipation is zero (usual reference temperature is 25°C).

zero scale mark The mark on the scale associated with the zero of the scale numbering.

zero shift 1. The change of the output value, due to some influence, when the input variable is at the lower range value. See figure in IEC publication 902, 1987. Note: It is usually expressed as a percentage of the specified output span. **2.** Any parallel shift of the input-output curve. See figure in ANSI/ISA publication S 51.1, 1979.

zero shift error In an electrical indicating instrument error manifested as a difference in deflection between an initial position of the pointer, such as zero, and the deflection after the instrument has remained deflected up-scale for an extended length of time. The error is expressed as a percentage of the end-scale deflection.

zero span (spectrum analyzer) A mode of operation in which the frequency span is reduced to zero.

zero stability The ability of an instrument to withstand effects which might cause zero shift. Usually expressed as a percentage of full scale.

zero state The condition of a binary memory cell when a logic zero is stored.

zero suppression 1. For a suppressed-zero range, the amount that the zero of the measured variable is below the actual lower measuring range value. Note: If expressed in units of the measured variable, the zero suppression is equal to the actual lower measuring range value. It may also be expressed in percenta-

ge of span (suppression ratio). **2.** The elimination of non-significant zeros from a numeral.

zero synchronization (numerical control) A technique that permits automatic recovery of a precise position after the machine axis has been approximately positioned by manual control.

zero transmission level reference point An arbitrary chosen point in a circuit to which all relative transmission levels are referred. The transmission level at the transmitting switchboard is frequently taken as the zero transmission level reference point.

zero vector A vector whose magnitude is zero.

zero voltage fired A circuit in which antiparallel connected thyristors are fired at points of voltage zero in the alternating current voltage wave.

zero voltage switch, ZVS A circuit designed to switch on at the instant the ac supply voltage passes through zero, thereby minimizing the radio-frequency interference generated at switch closure.

zero voltage turn-on A delay in application of the control signal to the thyristor until the ac power-line voltage next passes through zero.

ZFC Zero Failure Criteria.

ZG Zero Gravity.

Ziegler-Nichols method A method of determination of optimum controller settings when tuning a process-control loop (also called the ultimate cycle method). It is based on finding the proportional gain which causes instability in a closed loop.

zinc plating An electroplating coating of zinc on a steel surface which provides corrosion protection in a manner similar to galvanizing.

Zn Chemical symbol for zinc.

zone 1. On a multi-position controller, the range of input values between selected switching points or any switching point and range-limit. See figure in ANSI/ISA publication S 51.1, 1979. **2.** A portion of internal storage allocated for a particular function or purpose.

zone bits 1. The two leftmost binary digits in a digital computer in which six binary digits are used for characters and the four rightmost are used for decimal digits. **2.** The bits in a group of bit positions that are used to indicate a specific class of items (e.g. numbers, letters, special signs and commands).

zone control A method of controlling temperature or some other process characteristic by dividing a physical area or process flowpath into several regions, or zones, and independently controlling the process characteristic in each zone.

zone level controller A microprocessor-based controller that controls distributed or unitary HVAC equipment such as VAV (Variable Air Volume) terminal units, fan coil units, and heat pumps. These controllers typically have relatively few connected I/O devices, standard control sequences, and are dedicated to specific applications. In a BMS (Building Management System) these controllers provide processing of point data for higher level processors.

zones (hazardous locations) Formerly called divisions. A zone is an area of similar probability of the presence and concentration of the potentially explosive mixture. It is part of the area classification (the other part being the gas group). Three zones are recognized in UK: Zone 0 – In which an explosive gas-air mixture is continuously present or present for long periods; zone 1 – In which an explosive gas-air mixture is likely to occur in normal operation; zone 2 – In which an explosive gas-air mixture is not likely to occur in normal operation and if it occurs will exist only for a short time.

zoning The practice of dividing a building into sections for heating and cooling control so that one controller is sufficient to determine the heating and cooling requirements for the section.

zoogloal film A mucilaginous layer containing bacteria, protozoa and fungi, which covers the wetted surfaces of the medium in a mature biological filter, a slow sand filter, or the internal surface of the pipes in a sewer.

zooming (computer graphics) Progressively scaling the entire display image to give the visual impression of movement of all or part of a display group toward or away from an observer. Note – The scaling value should be the same in all directions.

zooplankton (water quality) Animals present in plankton.

ZPR Zero Power Reactor.

Zr Chemical symbol for zirconium.

Z relay Impedance relay.

ZS Zero and Subtract.

z-strength See internal bond strength.

z-transfer function For a linear system with synchronously sampled input and output variables, the ratio of the z-transform of the output variable to the z-transform of the corresponding input variable, with all initial conditions equal to zero.

z-value A term sometimes used to designate the impedance of a device or circuit, which is the vector sum of resistance and reactance (x-value).

zvs See zero-voltage switch.

Zyglo method A technique for liquid-penetrant testing to detect surface flaws in a metal using a special penetrant that fluoresces when viewed under ultraviolet radiation.

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