

Screen Printing

Booklet

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Please Notice: We had to make our Screen printing booklet into a plan 8 ½”x 11” format so our customers would not need to stable a booklet together. We hope you enjoy this information. All this information can be applied to screen printing Solar Cells on glass, plastic or metal. If you are needing more information as in large booklet forms as well as Screen Printing supplies, then check out these companies online at: www.silkscreenbiz.com another great supplier to check out is at: www.ryanrсс.com

The following photo's are just examples of what is used to Screen Print.



2 wood frame printing screens



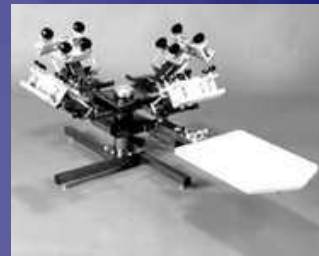
Example: of 3 aluminum frames



1 color t-shirt printer, which can be used to print Solar Cells



6- Color T-shirt Printer



4-Color T-shirt Printer



Screen cloth & Photo Emulsion

Learn how to Screen Print. Screen printing is done all over the world by very large printing companies right down to the guy who does it at home in his basement. Screen printing was first discovered by the Chinese hundreds of years ago. It is a very simple process that anyone can do. The Chinese first used silk to use in there wood frames to print with, then as time went on better material was made to print with.

We hope you enjoy this small booklet, it was thrown together very quickly for Creative Science and Research as a help for there customers. If you would like to learn more. your local library will have more information or any local art store. many books have been written on this subject or see www.Silkscreenbiz.com www.ryanrсс.com or signindustry.com

SO HOW DO WE SCREEN PRINT?

Screen printing is done by using a wooden frame with screen printing cloth stretched over it, Then there is a photo emulsion applied to the screen, dried and then exposed to a bright light source, (You can use the sun or a photo bulb) but before exposing it to the light source, you must first apply your film positive to the back of screen. A film positive is simply a clear piece of plastic with a silhouette or a profile or art work design filled in with a dark color, in this case you can use dark red or black. Art stores and screen supply companies sell a red film you can cut with an exacto knife called amerlith. You simply cut out your design and peel away the background that you do not want. I suggest you go to a local screen printing shop and ask them if you can buy a small 24" x 24" piece, it would be cheaper than buying a whole roll. Once you are done cutting out your design on the amberlith plastic film, you then spray the front of it (the side with the film cut on it,) with all purpose spray adhesive, let it dry for 3 minutes or so and then apply to back of Photo emulsioned screen and then expose to light source.

Now after exposing it to the sun, the screen is then washed out with water using a water hose. The black or red image on the film positive did not let any sun get to the photo emulsion, therefor the unexposed photo emulsion can then be washed out, the other has been hardened by the sun light and can not be washed out. now after the screen has dried. you can use it to print your image with over and over as many times as you like.

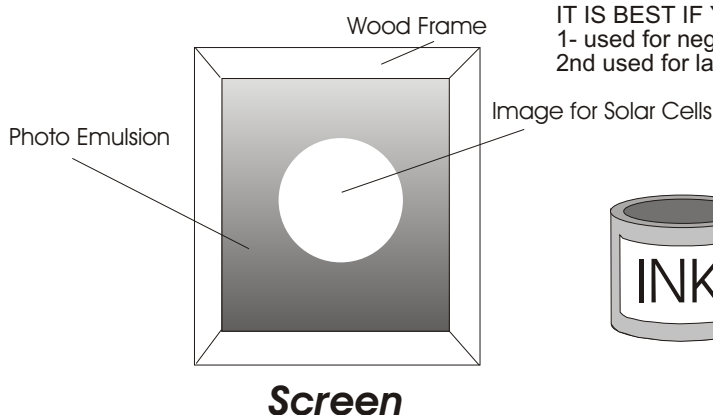
Ink is then applied to the inside of the screen, and by using a soft rubber squeegee, you pull the ink over top of the image area. ink then only passes through that area which was not exposed to the sun. (See our video) This process is known as screen printing.

Let me give an example: The screen is like an open water valve, when certain areas of the screen are stopped off, then the water can not go through it, only where you want it to go.

The photo emulsion can be like this example: take a 8 1/2" x 11" piece of paper. now cut a hole in it. now lay it flat down onto a table. Now get a can of spray paint and begin spraying the paper. Now lift the paper up and what do you have? you have a painted circle. This is the same way screen printing works. The nice thing about screen printing is you can pass just about any type of liquid you want through the screen print area. If you are printing on paper you can screen print with any type of paint or screen printing ink, just as long as it is thick enough. If it is to thin your printed image will have run spots.

Of course there is a much easier way to make your own screen and that is to buy one. they are not that expensive. In your Yellow page phone book look under art supply stores and then look under Screen printing companies. Tell them what you are doing and ask them how much they will charge for a screen the size of a T-shirt screen, (Fine mesh-yellow or white) and also ask how much they would charge to coat out and expose for you. should be only about \$25 for the screen and \$19 to coat out with photo emulsion and expose it for you. They are pro's most know what they are doing.

Materials you will need



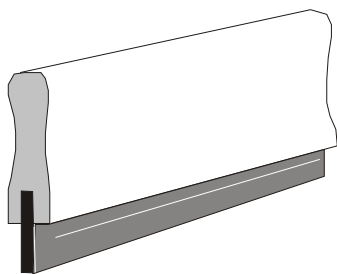
IT IS BEST IF YOU MAKE OR BUY 2 SCREENS
1- used for negative contact, nickel mesh print
2nd used for layers n-type and p-type.



Screen Printing Ink

Ink can be thick paint(oil base), or special Screen printing ink, or in your case an Ink that you will create to print Solar Cells with.

Printing Ink can not be to thin or it will run on the printed image. and it can not be to thick where it will not go through the screen. By adding your thinner or not adding thinner you can control this. it is like thinning paint to paint a house.



Squeegee

Used to move the printing ink from the top of the inside of the screen to the bottom. To press the ink through the image and screen onto the glass or paper.

1. SPRAY ADHESIVE
2. RAGS-Viva PAPER TOWELS for clean up.
3. MINERAL SPIRITS
4. LACQUER THINNER
5. SMALL DOOR HINGES
6. A TABLE TO PRINT ON
7. PHOTO EMULSION or LACQUER FILM
8. RUBYLITHE or AMBERLITH FILM
9. EXACTO KNIFE
10. Screen Coater 13 1/2"

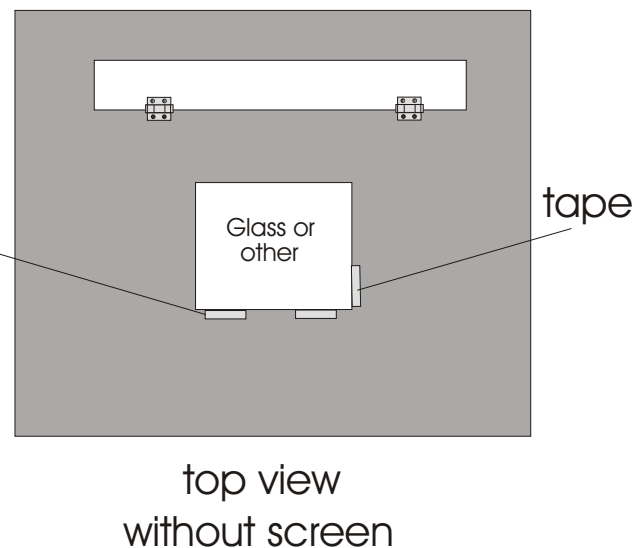
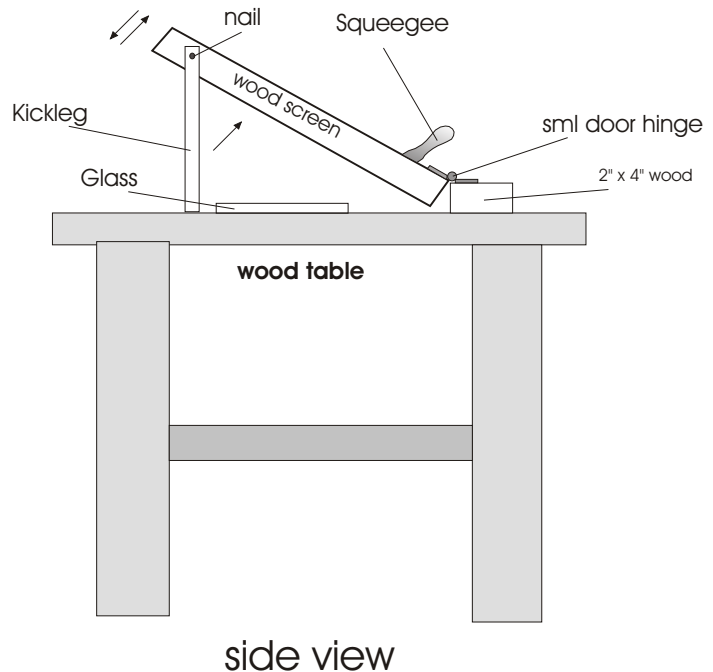
How to Screen Print

Now lets assume that the screen is all prepared and ready. 1st- You attach the 2 x 4 to the table using nails or wood screws. Then you take the wood screen and lay it flat on the table, push the back up against the 2x4, now attach the door hinge to the 2x4 and the wood screen using wood screws. you will need 2 hinges one for the top left side and one for the right top side. Now the screen can move up and down. Now to keep the screen up while you are registering the glass or what ever you will be printing on, you will need to add a kickleg (see drawing). now lay down the screen on top of the glass, and move the glass around until the print image is right over top of it or is in the desired position. Now take some masking tape and tape 3 pieces onto the table right up to the glass, this will be your registration marks which you can then after printing your first piece of glass or paper can place another in the same place and print it in the exact same spot. You can Screen Print the Solar Cells either-

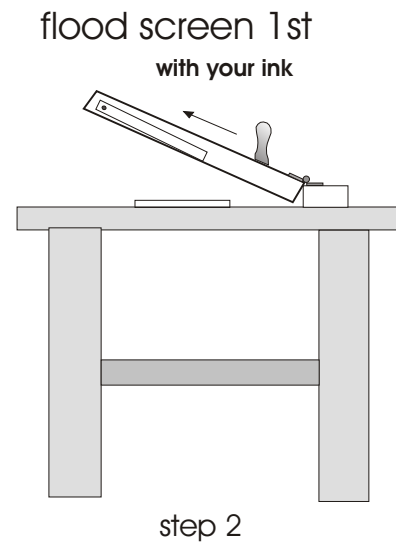
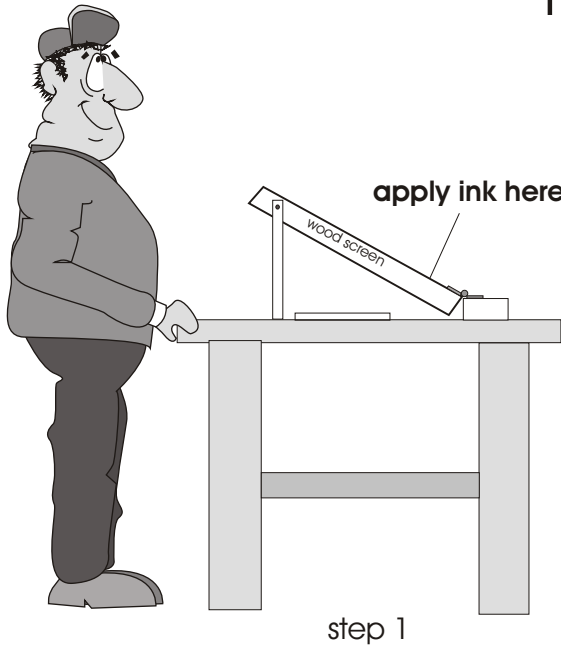


Registration

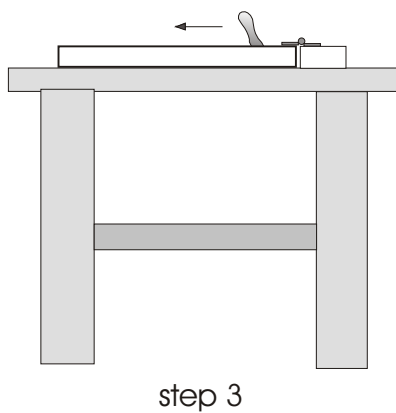
To simplify registration we are showing the top view without the screen. (of course the screen should be there when registering your item that you are going to print.) Once you have completed registration pencil around the glass onto the table, then remove glass then place paper all around pencil area on the outside so you will not overspray the hold down adhesive. Now spray the adhesive onto the table and let dry 5-10 minutes. This process will help hold down the glass to the table while you are printing so the glass will not move and you will get a good print.



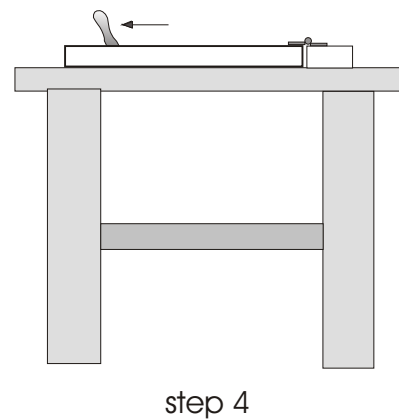
Printing



Start to print
Holding squeegee with 2 hands
press down w/angle and come
toward you.

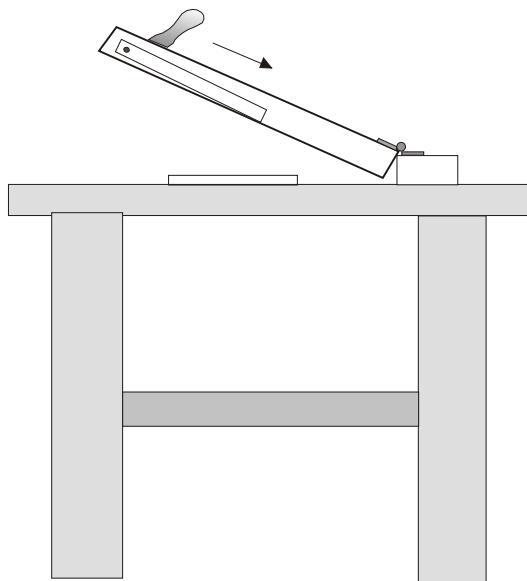


Finished print



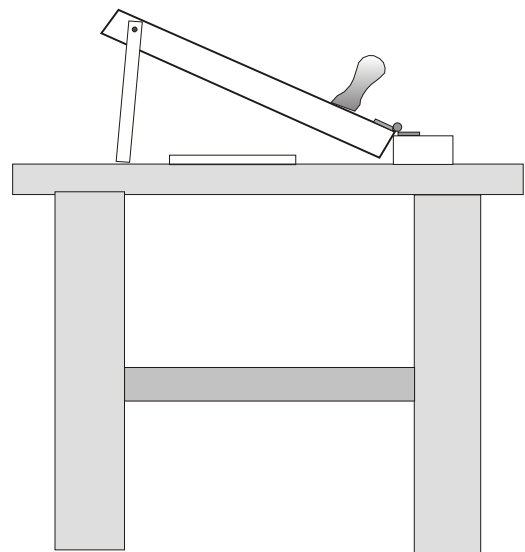
Printing cont...

flood screen again
for next print. or STOP.



step 5

Remove object (Glass)
that you have printed and
let it air dry.



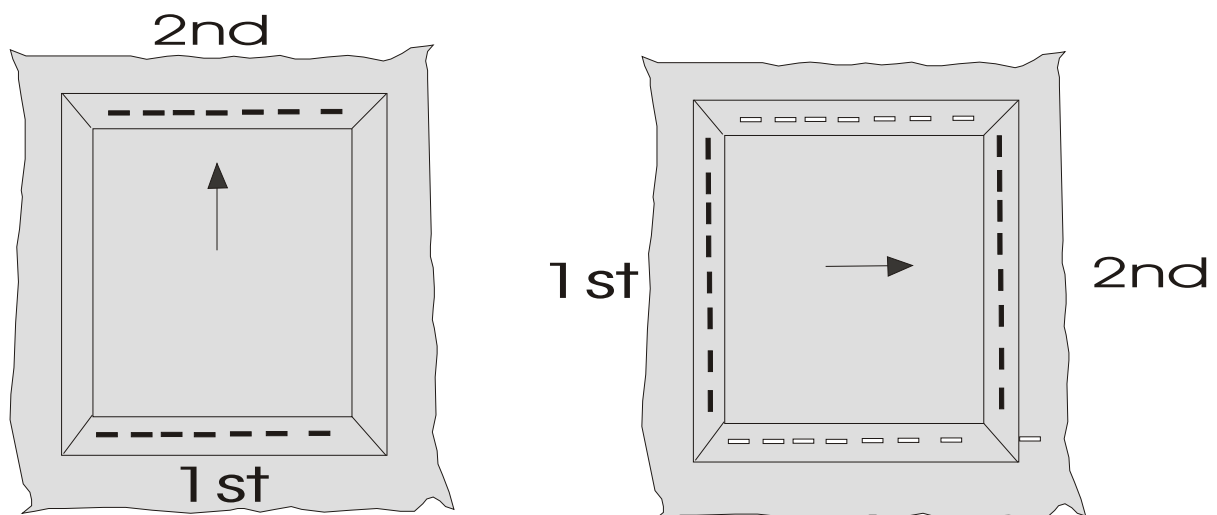
step 6

Once you have finished printing, you must clean up your screen. It is very important not to let ink dry in screen. The longer you wait the more chance you will have of your screen getting glogged up and you could mess up your screen forever. Use paper towels and mineral spirits to clean up. depending on what kind of ink you use will determine what type of clean up solvent.

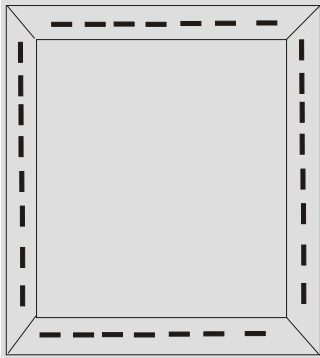
Making your Screen

It is very easy to build your own screen. Use 2" x 2" pieces of wood for your frame. You can angle them together or square them together. Use wood glue and steel angle from a hardware store, this will help keep the frame strong. Frame size is 19 1/2" x 23 1/2".

Now you must purchase screen material from a art supply store or from a screen printing supply company or buy some from a screen printing shop. Most shops are very helpful. (Some sign painting companies also screen print, Check your yellow page phone book.) tell them you want to buy a fine screen mesh yellow or white. But not too fine a mesh, but not too coarse either. Now place your frame down flat on a table and place your screen mesh over top of it. cut your screen mesh leaving about 4" hanging from all around the frame. Now using a staple gun, start stapling one end only, now go to the opposite end and staple that while gripping the screen mesh in your right hand and stapling with the other hand. **YOU MUST STRETCH THE MATERIAL TIGHT STARTING FROM THE CENTER** and working your way outward.



***Stretch Screen and staple down to wood frame.
Then trim up screen mesh all the way to the outside frame.
Screen should be tight enough to bounce a penny on it.***



Prep. your Screen

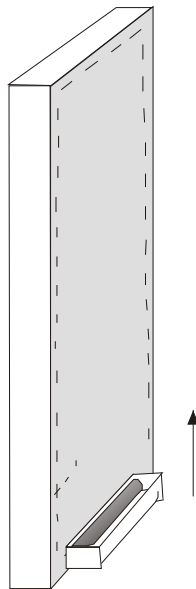
Now you must prepare your screen for the photo emulsion. If the screen is not cleaned right, the photo emulsion will have a hard time sticking to it.

Use Ajax scrubbing bleach cleaner (Bleach powder You can buy it at any store.)



Now take the screen and spray it on both sides with water, now while it is still wet apply the Ajax bleach on both sides, (it does not take much, Don't over kill it.) Now using a wet cotton rag or cloth scrub the screen on both sides, clean it very well. Now take a water hose and spray out all the ajax, THIS IS VERY IMPORTANT! Spray both sides of the screen. Each side should take you about 2 - 3 minutes per side to spray out. if all of the bleach is not sprayed it it will cause problems with the photo emulsion, it will not stick good in spots. Bleach will take out exposed photo emulsion, this is what the old timers used to clean out the photo emulsion after they where done screen printing with the screen. But in your case you will just keep the image in the screen for later use.

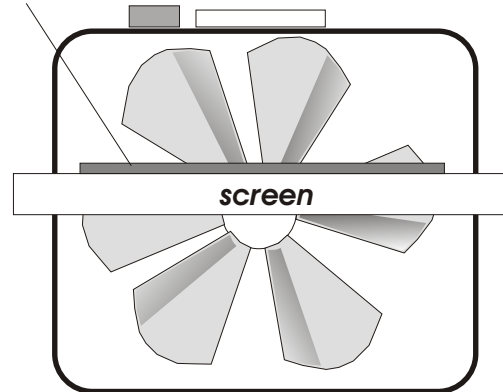
Now set the screen aside and let air dry or use a fan to dry it with. (put your screen in a place where not alot of dust is located.) Once your screen is dry you are ready for the photo emulsion. you will need a very low light area, 1- small bottle of photo emulsion (Follow the instructions on the bottle.) and 1- plastic or metal screen coater. make sure the photo emulsion is very well mixed before each use. Now take the photo emulsion and pour it into the screen coating spreader. (you can make one your self out of card board or buy one at a supply store. The plastic ones are very cheap.) Now take the screen coater with hand while holding the small screen with the other. Starting from the bottom, place the screen coater onto the screen, Now angle it so the emulsion will start to slowly run out. Now slowly move up and over the screen coating the back side with one coat. Now flip screen over to the other side and coat it the same way. you should now have a nice smooth thin coat of photo emulsion on both sides of screen, wait 70 seconds, now coat just the back side of screen one more time. now you are done. place the coater on a flat table and take a small square piece of card board and smooth out the build ups that where made by the edge of the coater. Now take the screen and lay it flat away from the floor and apply a fan. YOU MUST USE A FAN!



Coating out screen

What you are seeing here is the back of the screen being coated out with a screen coater with photo emulsion in it. Coat backside, then front side, then back side again, then let dry with a fan. (See Video)

Photo emulsion



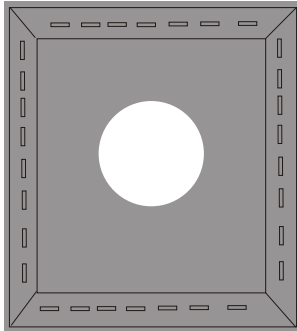
Side view of screen being dried with fan.

Let dry for about 2 hrs

Exposing. your Screen

Now once your screen has dried, you take your film positive which you can cut from amberlith or rubylith using an exacto knife. It is a red easy to cut film that is attached to a clear piece of mylar plastic. You cut away what you do not want to print. It is very simple. In your case you simply cut a square or a circle and remove all the red film around it. While leaving the circle or square. (You can also buy this at any supply store.) Or you can do it all on a computer using a laser printer, printing your image in black on clear plastic. or you can copy your image using a copier at a copier office supply place. (They sell clear plastic for this. many people use it for overhead projectors.)

Now you can spray the back of your film positive with spray adhesive, (If you spray the wrong side just use mineral sprits to wipe it off.) Now let the spray dry for 5 minutes. Now stick it to the back side of the photo screen. now lay it flat on the dry ground out in the full sun light for about 5-10 minutes. It has been a long time since I have done it this way, But I am sure it is 10 minutes. After that time take off the film and take your screen into a semi- dark area (Best if inside of a garage.) and take a water hose with a sprayer attached and start spraying it lightly with a spray of water not a strong stream. spray out the unexposed photo emulsion, you will see it start to come out in about 1 or 2 minutes, now spray the other side of screen lightly. now hold screen up to a light to see if you got all of it out.



Exposing. your Screen cont...

Now while screen is still wet, feel both sides of the emulsion with one finger if either side feels snotty or very soft and green and it is coming off onto your finger, then you have not exposed screen long enough in the sunlight. If it is fine then take a piece of news paper and place it on the back side of screen first, now take your hand and smooth the news paper out on the screen, the paper will begin soaking up water from the screen.

This is called blotting the screen, you do this on both sides of the screen. if the news paper sticks to the inside of the screen then you have under exposed the screen. (It will stick a little this is normal.)

Now repeat the blotting one more time.(But Quickly). Now you must take an air hose and with a very small amount of pressure blow out the rest of the water from the print area. (You can blow it out, by blowing out the water by mouth, but not to fun to do.) or you can use a small air brush air compressor, it is great for this. If you do not do this, you can get what we call a clear glog up. When you go to print you will see small streaks in your print. If you study and do everything I told you, you will have no problems.

Now set the screen back up in front of the fan and let it dry for about 1 - 2 hrs. After it has dried you are now ready to plug up the pinholes. Pinholes are caused by dust during exposure. Use a small modeling brush and take some of your fresh photo emulsion and mix in a little water then stir it up real good. Then touch up all the pin holes around the print area. (There should not be that many if you have done it right.)

You can do your touching up in a lighted area. after you have touched up your pin holes, let screen dry for about 1 hr. then expose to the sun for 5 - 10 more minutes this will harden the touch up photo emulsion you used. because if you do not expose the unexposed touch up emulsion, when you go to print if you are using a hard thinner in your ink such as Lacquer thinner or Xylene Thinner it will harden the photo emulsion permanently into the screen and you will never get it out, if you ever want to use the screen for something else. They have 2 types of Photo emulsion, One is great for using with mineral spirits the other is great for using with These harder thinners. Such as Lacquer thinner or Xylene. Which you can buy at a paint store or hardware store.

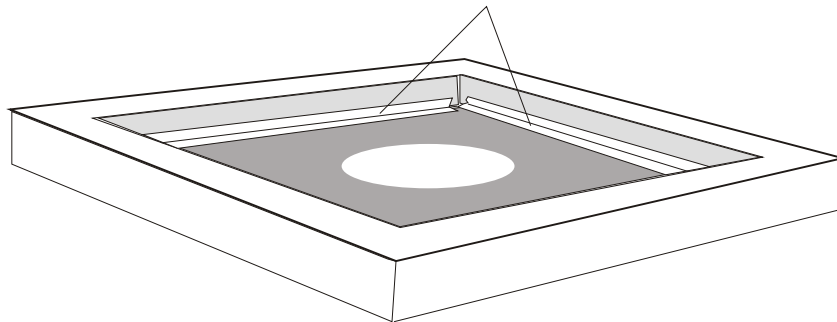
SUPPLIERS

Internet: www.ryanrss.com, www.Silkscreenbiz.com, www.lancergroup.com, www.SignIndustry.com

National Decorators Supply Co. 443 Virginia Ave. Indianapolis, IN.
phone: 1-800-428-5022 zip 46203
or call: 1-800-382-2095 in INDIANA

Now tape the inside corners on the inside of your screen where the ink is going to be. You want to plug up every hole so the ink will not leak through onto your table or the glass or paper you are printing on. After you have done this then go back to page 3 and 4 and go through the steps. You are now ready to print. I hope we have giving you enough info to work with, I believe we have. Do not let this all scare you out of screen printing. Screen printing is very simple to do once you do it.

Masking Tape



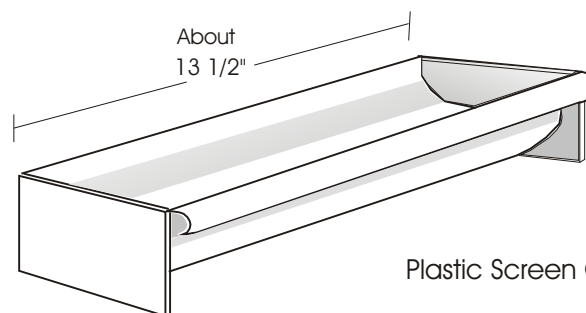
Now Carefully mix your solar cell chemicals together and by using the thinner described in the Patent thin as needed chemicals will be in powder form. except for thinner.



Photo-emulsion



Card board scraper



Plastic Screen Coater



Photo Screen Emulsion



Screen Clamps

Screen clamps can be purchased at any screen supplier. They are used for table top printing. This is what you should start out with.



Optional: 1- Color T-shirt printer or jacket printer, also great for printing flat material such as signs and Solar Cells, stickers etc..

BE YOUR OWN BOSS!
Start your own Screen Printing Business

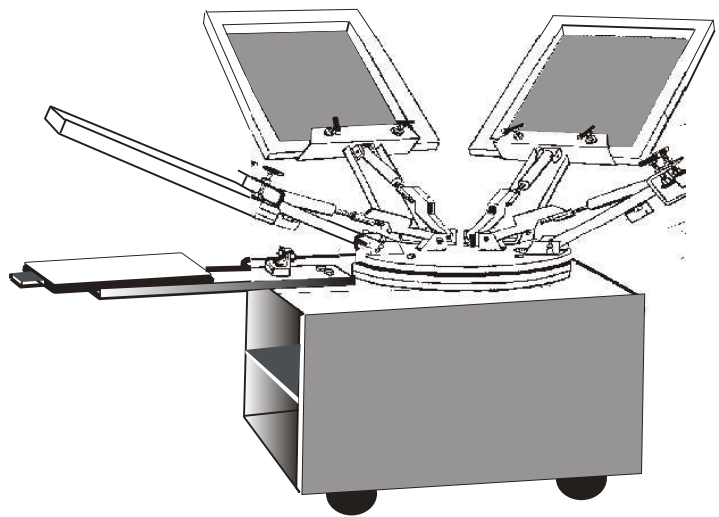
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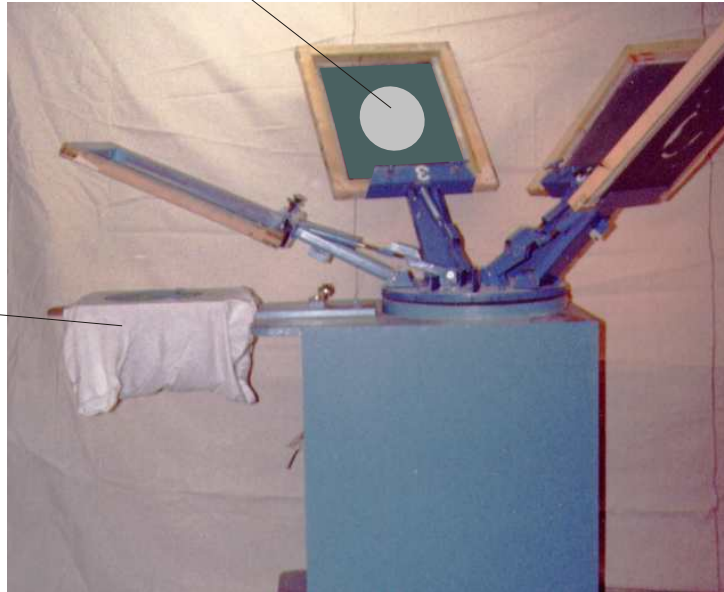
Screen Printing

#SCR7

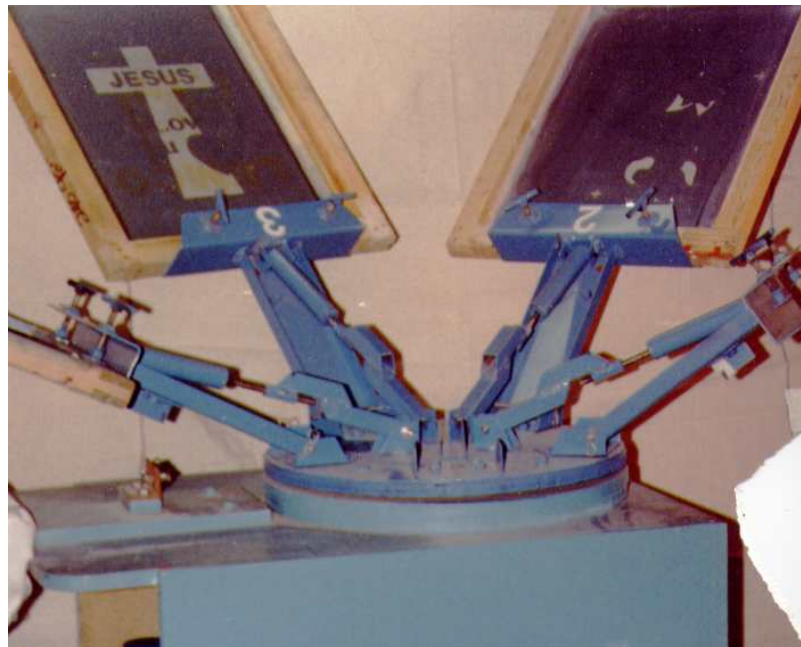
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Example: 4" diameter Solar Cell Image in photo screen

Replace T-shirt
with Glass or other
and print solar cells



JCM1 5 -Color Screen Printing Machine
Constructed By: David Waggoner 1991



Free News

Example of other screen printing devices. Although you can print without a machine it would be nicer for you. Again if you want to go the cheap way you can get set up for less than \$100 using an old table top and 2 small screens and a kick leg to keep your screen up and to flip it back when you want to lower your screen after you flood your screen. Below is a photo of a spring loaded kick leg designed by David Waggoner. You may want to build your own. Or simply use a long piece of wood with a nail.

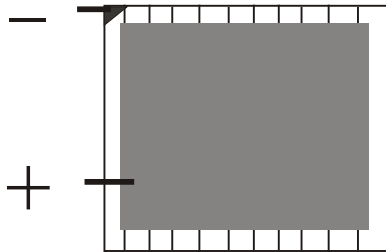


Screen printing Kick leg, Spring loaded, Keeps screen in up position when flooding with ink and lowers

Designed and built by: David Waggoner

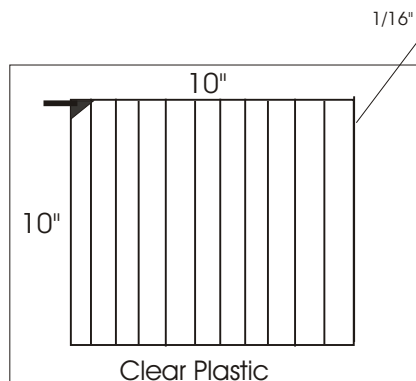


Solar Cell Printing



If I were you, I would make the Solar Cells in this shape. You will get more Free Energy For your money. Hopefully soon we can have a step by step booklet made to show you how to do it. But there is so much research to do and so little time to do it.

FILM POSITIVES WOULD LOOK LIKE THIS

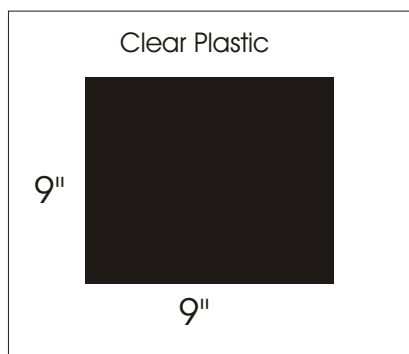


1ST PRINT:

This is what will connect to the negative layer. Using Nickel, silver or aluminum ink or paint.

You can buy this ink or paint at any electronic supply house or screen printing supply house.

Image size 10" x 10"



#2,#3,#4 & #5 LAYERS:

This one film positive can be used for all 4 of the last layers. this means you can print one layer, clean it up then print your next layer then clean it up etc... by using the same screen for all 4 of the last layers, because the image is the same.

Image size 9" x 9"

#5 layer is for picking up the + positive. Use a solid 9"x9". Using nickel or aluminum ink or paint.

Screen Printing

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6 - Color T-shirt, Jacket and cap printer



Infra red dryer for drying ink printed on t-shirts or other. Signs etc...



Hand Squeegee, wood and rubber



Photo Emulsions etc...



Different size wood screens



Photo Screen Exposure
You can simply use sunshine or a bright photo bulb as well.



Photo Emulsions Coater

Screen Printing

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GENERAL INFORMATION: Garment screen printing is a mass-production-manufacturing method by which, most typically, a quantity of finished garments is printed with a design, in one or more of several kinds of ink.

A permeable printing fabric is stretched tightly across a frame. To this fabric, typically by mechanical and photographic means (similar to those used in basic black-and-white photography), a stencil is affixed. This screen/stencil represents one color in a multi-color design. For every color in the design, another stencil, another screen, and another position on your printing press are required. In other words, if you're printing a design composed of four colors, you'll require a four-color press with four screens, each of which bears its own stencil.

Each with a separate squeegee, the ink colors are, in turn, pushed through their stencils onto the garment. This is done by hand on a manual press, or mechanically on an automatic press.

After all the colors have been printed on the garment, it is typically run through a conveyORIZED dryer, or curing unit, which cures the ink, to make the design impervious to normal washing and drying as well as normal wear and tear.

The decorated garments are then sold at retail, at wholesale, by mail order or through any number of different outlets, and you can pocket the profit. Don't be fooled, though. You can lose money almost as easily as you can make it if proper understanding and appropriate planning aren't part of your formula for success.

The above, of course, is a very simplified description of the garment-screen-printing process. It gets more complex from here. Still, if it sounds appealing, read on, always bearing in mind that the best way to establish a successful garment-decorating operation is to learn as much as you can about the market and the procedures involved in serving it, prior to making any significant investment in equipment or supplies, and prior to making any long-range business plans.

Computer Separations [top](#) Computer separations usually are rendered from art created in a computer graphics program. Other art can be separated with the use of a computer, but first it must be scanned or converted digitally before it can be manipulated in a graphics program. Although there are many separation programs and drawing programs with separation options, they all must reach a common end.

A piece of art created in a vector program is separated easily because the color usage is controlled during the creation of the art. The program will render separations per color and will print out exactly what the artist needs.

Fine art or photographs can be separated by computer provided the artist has access to a large-format scanner, a drum scanner, or a digital camera. (If the art department doesn't own any equipment, a service bureau can be paid to scan these images.) For best results, the image should be scanned at about 300 DPI in an RGB mode and saved as a TIFF file. Once the piece of art is converted digitally, it can then be introduced into the design program (in this case, preferably a program that can manipulate full-color scanned images, like PhotoShop). When a design is in this type of program, it can render process separations, or areas of color can be selected to create individual channels for each color, producing spot plates. The use of PhotoShop plug-ins can decrease time spent creating spot-color channels. Many of these plug-ins use a predetermined ink color set, which enables the finished product to closely resemble the original design.

To calculate line counts for halftone screens, simply divide the mesh count by four. The result will equal the highest line count that should be used. The artist must have an understanding of mesh counts and their effect on the press. For instance, when a fade is needed in a design, the artist may be tempted to put it in a high mesh. However, if that same color also consists of large, open print areas, the printer will require a mesh in a lower count. In this instance, the artist should calculate the halftone line based on the lower mesh. To determine the best resolution for a design, multiply line count by 2.5. Example: 55 lines = 137.5 resolution. This should prevent the program from producing undersized dots in the lower-percentage halftone areas.

When the design is ready to be separated, it may be printed directly from the program, or you may split the channels to create individual files to be printed later. The program creates individual files for each color, giving the artist the option to go back and change a color individually if the print performance is not satisfactory. It is important to label each color and to make sure that each piece of film is complete with registration marks. Most programs offer these options on the separation screen, but some programs require the artist to incorporate the color names and registration marks with his or her designs. The artist must type each color name in its own color and color the registration marks with the "registration" color option.

Image output refers to the method in which a computer prints art or separations. One way of printing separations is on a laser jet printer. An artist may choose to print out directly on vellum, which exposes well, or on paper, which is then shot by a camera to render the films. In addition to laser jet printers, an image setter may be used to output separations. This equipment enables the artist to print out his or her art directly onto film (and can totally replace a darkroom).

Artwork [top](#)

Though there are many ways to create art, the artist should know some basic information for creating art for screen printing. Some of the questions the artist should ask include:

- What is the substrate? (color? type of garment? material content?)
- What type of print? (process? spot?)
- What size does the art need to be? (child? adult? left-chest?)
- What are the ink opacity requirements? (bright? muted? glossy? matte?)
- Is an underlay needed? (bright ink on darks? specialty inks?)
- What are the registration requirements? (butt? trap? overprint?)
- What are your production capabilities? (auto? manual? number of colors?)

Though most information can be standardized for each shop, some will be influenced by the customer's vision of what he or she wants to achieve with the print.

Art Creation [top](#)

The three most common forms of art created for screen printing are hand-drawn art, computer-generated art, or art replicated from fine paintings or photographs.

Hand-Drawn Art [top](#)

Hand-drawn art comes in many forms. An artist can create a keyline (an outline of the design) by drawing it on paper with an opaquing pen, shooting it on a camera, or scanning it into a computer. Art can be created from a hand-drawn keyline provided the image is loaded into a scanning program, converted into paths, and then placed into an art program. With the image in a format that can be manipulated, the artist can clean it up, change its size and position, add text, and place color in selected areas. Another option is to draw directly onto vellum or onto a coated screen. This method is not recommended, but it is effective for simple one-color designs.

Computer-Generated Art [top](#)

Computer-generated art is conceived and designed on a computer through a variety of design programs. The most common programs in the screen-printing industry are PhotoShop, Illustrator, Freehand, and Corel. Designs created on a computer are then separated with the computer's separation program.

Replications[top](#)

Replications of fine art or photographs are most successful when they are shot with a digital camera or scanned into a computer. The artist can then utilize an advanced color separator program on the computer. The artist also can separate replications by hand through a series of hand-cut overlays.

Art Separations [top](#)

After creation, art must be converted into final separations. The goal of art separation is to create individual films, either acetate or vellum, in which the print areas block UV light rays and the negative areas allow UV light to pass through. The most frequently used methods involve separating by hand, camera, and computer.

Hand Separations [top](#)

An artist can achieve hand separations in several ways.

Hand-cut positives are created by cutting photomasking film, or rubylith, into the shapes or letters needed. Then the artist peels away the negative unwanted portion, leaving rubylith in the areas to be printed.

Overlays are color separations created by the use of acetate or rubylith overlaid on a keyline to create positives. By cutting, drawing, applying adhesive dot patterns, and using acetate or burnishing letters, the artist can build each color (as well as additional colors with dot pattern overlays).

Hand-drawn separations are created by tracing the design directly onto the acetate or vellum. Starting with a keyline of the design, the artist overlays each color one at a time and traces until all of the separations are

Know Your Inks

Inks can be divided into three main groups according to how they dry:

1. Evaporation
2. Thermosetting
3. UV (ultraviolet light) exposure

Ink is made up of two basic components: pigments and a carrier. The carrier is usually either water or a solvent. Inks that dry by evaporation can be either water or solvent-based. The principal solvents are almost all VOCs or volatile organic compounds, which means they evaporate rather well. Water dries more slowly than the solvents, but doesn't put VOC emissions into the atmosphere.

Environmental concerns have led to a lot of interest in water-based inks and some very rapid developments in that area. Unfortunately, although water-based inks can now be used even on some plastics, they are still only available for a limited number of substrates. Most sign shops use air-dry inks exclusively, and most air-dry inks are still solvent-based. Multipurpose, vinyl, and enamel inks all use different solvents as carriers, which mean that each type of ink will be a little bit different to work with. For example, multipurpose and vinyl both dry faster than enamel, but both will remain vulnerable to solvents after they dry. Enamel will not.

While not often used in sign printing, thermosetting inks are common in other industries. Thermosetting inks cure rather than dry and will remain liquid until exposed to heat. Plastisol is undoubtedly the best-known thermosetting ink because of its widespread use in printing T-shirts and textiles. Epoxy inks are associated with the thermosetting group because a number of them can be heat-cured to increase durability. Epoxy inks cure through a chemical reaction between the base and a catalyst, which has to be added separately. Normally the catalyst is added just before you start printing because the ink cures within a few hours. They are commonly used for printing on glass, metal, ceramics and some types of plastic.

UV inks are definitely becoming more popular every day, but they need to be exposed to a powerful UV light source in order to cure. With their extremely high solids content and rapid curing ability UV inks are usually found in high-volume printing operations. As with the plastisols there is no danger of these inks drying in a screen. However, UV drying equipment requires a considerable investment, and beginning sign printers would be well advised to stick with the usual air-dry inks. Because they contain no VOCs, and consequently produce no environmentally harmful emissions, UV inks are often regarded as the wave of the future.

Match the ink to the substrate

Most adhesion problems arise when an inexperienced printer encounters an unfamiliar substrate. The most important single step you can take is to correctly identify the material you intend to print on. Be specific. Don't just tell your ink supplier you'll be printing on "plastic." Polypropylene and polystyrene are both plastics, but as different from one another as night and day when it comes to screen printing on them.

This does not just apply to plastics; the same thing goes for every type of material. You are not

printing on metal but on aluminum or brass. If the metal has a coating, remember you're not really printing "on" the metal, you're printing on that coating. The coating is what you need to identify.

Sometimes, though, you may unwittingly stray into unfamiliar territory. The substrate may closely resemble something you've printed before, but is it really the same material? Even if you've printed the same type of material a hundred times before, a slight change in the manufacturing process can make the familiar unfamiliar. Something as subtle and invisible as a new silicone coating can make a material impossible to print in the normal way.

Don't depend on your substrate supplier to alert you to every change in the manufacturing process or even be aware of it. Suppliers are not usually in the business of screen-printing themselves, and often the first time they become aware of a printing problem is when you tell them about one. The responsibility for knowing the material you're printing on and what it takes to put ink on it and keep it there is all yours. A basic rule to keep in mind is that any change in the substrate changes everything.

Another thing to consider: If you print on a number of different types of substrate, you can easily find yourself with a considerable investment in inventory. Not only do you have the different types of ink but their corresponding array of thinners, additives and wash-ups. Since a quart of ink is the smallest quantity you can buy, you may end up with nearly full cans of oddball colors dating back to a small area on a few signs you printed years ago. Over time this can amount to a considerable storage, and eventually, a disposal problem.

It's worth taking some time to organize your storage area because with a variety of different inks on hand, the risk of grabbing the wrong type increases. Using the wrong ink accidentally is just as bad as using the wrong one through ignorance. You should never mix different types of ink together and be very cautious even about blending similar types of ink if they come from different manufacturers.

Testing, testing

Fortunately, most suppliers will be able to give you some advice about which ink you need to use. While such recommendations are certainly welcome, they don't relieve you of the responsibility to do your own test prints. If you neglect this step, and run into problems, no ink manufacturer or substrate supplier will take the blame for them. Ink manufacturers print warnings in their catalogs and in every piece of literature they produce. It is your job to run test prints to see if the ink you're using will work on that specific substrate. The very fact that manufacturers need to post such disclaimers should alert you to the fact that problems are far from rare. When printers get together, horror stories of "ink failures" regularly make the rounds, but how can you call it "ink failure" when the ink has behaved exactly as it was designed to do?

Manufacturers do just about everything else to insure you get great results when you use their products. In fact, many of them will test your substrate using a number of their inks to see which one works best. You should be able to arrange with your supplier to send samples off to the lab for testing. It may take anywhere from a few days to a week or more for the results to come back, but they will definitely tell you which ink to use. Unfortunately, you may be in the position of keeping an anxious customer at bay while you wait for the test results. But it's far better to make a customer wait for the job than to have him unpack a bunch of signs and watch the ink flake off.

Manufacturer's labs can save you lots of money. The biggest saving obviously comes from avoiding the costs of a botched print job. But lab testing can also spare you the more modest expense of buying different types of ink to do your own tests. Still, once you've got that recommended ink, pour it into a screen and pull your own tests. A lot of factors can affect ink

into the middle of a production run.

After you've printed your samples, set them aside to dry for twenty-four hours. Then belabor your prints with fingernails, pencil points, and whatever else is handy. Do everything you can to try to scrape the ink off the substrate. Lay a strip of tape on the ink and smooth it down until you've got an almost perfect seal. Then rip it off. If the ink still stays on, you've got a winner.

Your choice of ink will affect a host of other factors as well: the mesh count in your screens, the stencil material used, and how you dry your prints. Each type of ink has its corresponding battery of solvents, additives and wash-ups, and in some cases, special screenprinting techniques designed to put that ink onto a substrate and keep it there. This is why printing on a number of different materials can get expensive. As we said earlier, a screenprinting ink has been developed for almost every type of material that can be printed. Fortunately, sign printers only have to worry about a few of them.

Screen printing, also known as serigraphy, is a method of applying ink to a surface through a stencil supported on a fine mesh of synthetic fibers or metal threads stretched tightly over a frame. The stencil provides a means to determine where the ink will be allowed to pass through the mesh to create an image on the surface to be printed. Ink is applied to the screen and pushed through the open mesh areas with a rubber or plastic squeegee to produce an image.

No other printing process is as versatile as screen printing. It can print on almost any surface, including: metal, glass, paper, plastic, cloth, wood, you name it! Machines for screen printing use the inside of the screen frame to act as the ink storage area. The ink is then forced through the screen by the squeegee pushing the ink in front of it.

Manual screen printing machines are used for some work such as limited runs or when printing very thin or very thick pieces. Most screen printing today is performed by semi or fully automatic screen press machines at rates of up to 5,000 or more prints per hour.

How to burn an image into a silk- screen.

Most people want to know how to burn the image into the screen. It is probably the most difficult part of silk-screening but it is very simple to do. This tutorial is a simple outline of how to get your artwork from you transparency to the screen.

Step 1:

First, you need to prepare the screen. The screen needs to be degreased so the emulsion will form a better bond with the screen. This can be done by spraying degreaser onto the screen and wiping it off.

Step 2:

The emulsion will now be applied to the screen. In a low-light room, pour the emulsion into the screen coater. Apply the emulsion to both sides of the screen. It is important that you do not apply the emulsion too thick. It is also important that a uniform coat is applied to the screen.

Let the emulsion dry for about an hour (or longer) in a dimly lit room. A fan should be placed about five feet away from the screen to assist in the drying process.

Step 3:

Prepare the artwork. A tutorial on how to prepare the artwork can be found by [clicking here](#).

Step 4:

Place the artwork on the screen.

A piece of glass should be placed on the artwork. This will act as a vacuum so your artwork will not move while it's being burnt into the screen.

Step 5:

An exposure light is included with Package #1, #2, and #3. Place the exposure light about one foot above the screen. Please take a look at the diagram below to see how everything is situated.

A black felt or cloth is placed beneath the screen to absorb light so that no light is reflected back up to the screen.

Step 6:

Burning times will vary, but ten minutes is a safe time. It is better to over-burn than under-burn the screen and emulsion.

After your screen is burnt. Take a spray bottle and mist the screen with water. Take your screen outside or to a sink or tub and rinse out your screen. If you are having trouble getting the emulsion out, you may have to increase the water pressure of your hose or sink.

You should be left with your image burnt into your screen. Once this step is complete, you are well on your way to printing t-shirts.

Screen printing is not limited to just t-shirts. This process will work on many different items. Our equipment can silkscreen most items that are flat. This is just a small list of other items that can be printed with our equipment.