

Screen Printing 101

A beginners guide to textile screen printing.

\$10.00



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This booklet is a step by step reference guide to the basics of screen-printing. It assists in the selection of tools and materials and briefly describes the proper methods for their use. Although it will not provide every detail, it provides the basic information necessary for any beginner to get a successful start in the basics of screen printing t-shirts.

Screen Frame Selection

Screen print supply companies distribute them all over the country. A standard size is 20" x 24" OD (outside dimension). There are three types to choose from.

1. **Standard wood frame**
 - ✓ The plus — they are inexpensive and today's wooden frames hold tension reasonably well.
 - ✓ The minus — they are not forever, do not clean up well, get heavier with age and have a tendency to warp. They also must be re-stretched on a stretching machine. To do this your self would cost about \$2000-\$3000 dollars. Most shops send their frames to screen-print supply companies to get them re-stretched. You can expect to get approximately twenty jobs out of the fabric before they need re-stretching
2. **Rigid aluminum frame**
 - ✓ The plus - they are forever, stay flat and clean up well.
 - ✓ The minus - they are not re-tensionable and must be re-stretched on a stretching machine just like the wood frame mentioned above.
3. **Self-tensioning frame.**
 - ✓ The plus – they are forever (with a little maintenance), they clean up well and you can re-stretch and re-tension them your self.
 - ✓ The minus – they can be a challenge to learn to stretch.

Each of the frame choices will provide positive results. Don't spend a lot of time worrying about the choice. You will get an opportunity to work with all of them eventually.

Recommendation: rigid aluminum. Easy to use, clean up well and last forever.

Processing a screen.

Also referred to as making a stencil. There are many manufacturers of the products needed to process a screen. They all work the same, just follow the steps listed below for perfect results.

1. **Degreasing the screen.** A degreaser removes the grease, oil and dirt from the screen fabric so that the emulsion adheres well. For complete product information, follow the guidelines from the manufacturer.
 - A. Place your screen into your sink get it wet
 - B. Using a soft nylon bristle brush, scrub the mesh on both sides with a degreasing agent.
 - C. Rinse the screen thoroughly with cool water.
 - D. Allow the screen to dry. Normally done by placing them in front of a fan making sure that no dirt gets blown into the mesh.
2. **Coating the screen.** This is done with a product called emulsion. Basically, a modified Elmer's glue that is light sensitive. Mix and store it according to the manufacturer's directions.
 - A. Pour the scoop coater full of emulsion.
 - B. Secure the screen frame in an upright position, preferably so that you can use two hands to hold the coater. If not this can be done, hold the frame with one hand and the coater with the other.
 - C. Press the rounded edge of the coater tight against the bottom of the print side of the mesh and tilt the coater forward until the flat left and right edges of the coater touch the mesh.
 - D. With some pressure, slowly drag the coater up the mesh slowly until you reach the last inch or so at the top.
 - E. Tilt the coater back, wait for about 5

seconds for the extra emulsion to flow back into the coater and then continue up and out at the same time to finish this side.

- F. Turn the screen frame around to the squeegee side and repeat the same process from step B.

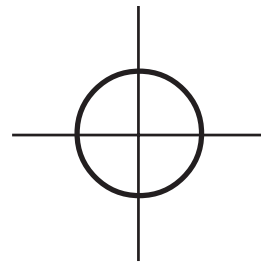


to be done in a yellow lit or a dimly lit room. White light is the vehicle for exposure of the emulsion, therefore keep it to a minimum.

3. **Pre-registering the screen.**

To minimize the press time set up it is recommended that you pre-register the art to the screen before you expose it.

When artwork is created, a set of registration marks, or bulls-eyes, should be included on all the color separations.



A “master art positive” or MAP is a composite of all the colors with the registration marks included. This is a sample.

Tips to consider:

- ✓ Make sure the screen is thoroughly dry before you start.
- ✓ You will achieve a more even coat of emulsion if you secure the screen so that you can handle the coater with two hands.
- ✓ You are trying to achieve an even coat so that your emulsion will expose at the same rate in all areas.
- ✓ The screen should be laid horizontal, print side down after coating for drying.
- ✓ Blowing warm air, not over 110°F, is recommended for a faster and more thorough drying of the emulsion.
- ✓ The process of mixing the emulsion, coating the screen, drying the screen, and storing the dry coated screen need



- A. Tape your MAP to your screen registration viewing table. It should be placed centered and square in a reverse position so that it reads backward.



- B. Place the frame onto your viewing table over your MAP. By using transparent tape, attach your first color separation to your screen taking care to match the registration marks to each other.



- C. The positive should be taped in an upright but reversed position on the mesh so that the design reads backward.
 D. Leaving your MAP in place repeat this process with every screen required for the job.

4. **Multiple image pre-registration.**

There are times when you would like to expose more than one job on the same screen. To do this follow the same steps outlined in step 3.

Just place each MAP you want on the screen onto the viewing area before you start pre-registering the frames. Keep in mind that printing is easier when you allow for 2 or 3 inches of free mesh area around each job.

5. **Exposing the screen.**

The key to getting perfectly exposed screens is establishing the correct time.



- A. Included with your exposure unit manual is an exposure step wedge guide. Tape it to your coated screen and place it into your exposure unit with the guide facing the light.
 B. Start exposing the entire image for five minutes. This is just a suggested random starting place. The emulsion manufacturer will be able to suggest specific times for each product.
 C. Place a light blocker on the glass covering only two inches of the step wedge guide and continue your exposure to the light for one minute. Step the blocker over two inches every minute until you have covered the entire image.
 D. After you have finished you will have a screen that has been exposed from 5 minutes to 12 minutes.
 E. Remove the step wedge guide and place the frame into your sink with the print side facing you.

- F. Wash out your exposure with cool water. Start by rinsing the print side and then the squeegee side. Let the screen soak for a minute or so and then continue rinsing on the print side only.
- G. Record the time that gives you the best exposure result. Use that time for that emulsion and mesh count combination. Be aware that each mesh count will require a different exposure time.

What to look for:

- ✓ If the whole design area washes away you have underexposed. You need more time under the light.
 - ✓ If you cannot wash out the entire image area you have overexposed. You need less time under the light.
 - ✓ You are looking for the time in between that washes out the cleanest and is the least slimy to the touch on the squeegee side.
- H. After you wash out the screen you should squeegee out the excess water with a window squeegee and then place the screen in front of a fan to dry.
 - I. When the screen is dry place it back in front of your viewing light. Look for pinholes, imperfections in the screen, anything that needs to be blocked out. Use a dab of your emulsion with a small piece of card or a paintbrush to fill in the opening. Place the screen back in front of your exposure light to expose the touched up area. Your screen



does not need to be placed into the hold down area for this re-exposure.

6. Stripping a screen.

This is to remove a stencil from a screen to use it for another job. A screen can be used for approximately 20 jobs before it needs to be remeshed.

- A. After your screen has been cleaned from its last job, place it in your sink and rinse with cool water.
- B. Spray with stencil remover and let soak for a few minutes.
- C. Scrub with a nylon brush.
- D. Rinse the image off the screen with cool water.
- E. You may need to repeat this procedure for complete stencil removal.
- F. Return to step 1 to use the screen again.

Note: An electric power wash unit with about 1000 psi is helpful for this process.

Press Set-Up Basics

- 1. Place each screen into a screen holder loosely.
- 2. Tape up the screens before printing. You can use masking tape, carton sealing tape or, our favorite, split tape. Tape the four inside walls of the frame. Tape all the way up the frame side with the remaining tape edge onto the screen mesh. Remember, more tape means less clean up.



3. Tape the MAP to a platen. Make sure that it is square and centered to the platen.



4. Bring the first screen down to the platen. Move it around until the registration marks on the screen match the marks on the MAP. When it does tighten the screen clamp knobs to secure the frame.
5. You may find that the screen moves. At this time use your micro adjustments to re-align the screen to its proper position.
6. Repeat this process with each screen required for the job.
7. Remove your MAP.
8. If you choose to print off contact use your off contact knob to make that adjustment. Normally the distance equal to the thickness of a quarter is a good place to start.

Printing Basics

1. **Screen mesh selection.**
Use the following guidelines for general purpose printing jobs.
 - A. 76 count – Printing bold copy onto dark colored fabrics. Gives a heavy ink deposit for high opacity. Very athletic print.
 - B. 110 count – By far the industries choice as the “do it all” mesh.
 - C. 150 count – Printing onto light colored fabrics with regular detail and medium ink deposit.
 - D. 200 count – Printing onto white or light colored goods with low opacity. Nice soft

hand feel. Very good for high detail artwork.

2. **Ink selection.**

There are many brands of quality plastisol inks to choose from. It will be difficult to choose a bad ink product. Some brands may need to be modified with a product called curable reducer to achieve the desired printing viscosity. The modification is usually to thin the ink so that it flows smoother through the screen. Another common ink additive is a bonding agent that is added to improve adhesion to non-absorbent fabrics like nylon and polyester. Check with your ink manufacturer for more details.

Most ink manufactures provide inks in three formulations

- A. Multipurpose – normally used right out of the container. It is terrific for printing on light colored goods. Especially good on multi-colored “wet on wet” printing jobs.
 - B. Low Bleed – normally used right out of the container. These are used on dark colored shirts to obtain the best ink coverage.
 - C. Athletic ink - designed to achieve the “bullet proof” athletic look desired on uniforms.
3. **Loading the shirt.**
Since the screens will meet the platen in the same position each time, you need to determine where to put the shirt.



- A. Spray the platen with spray adhesive. This is an aerosol glue that will hold the shirt to the platen to keep it from moving between colors.
- B. Determine whether the design goes on the front or the back of the shirt.
- C. Slide the shirt over the platen until the shoulders of the garment are square with the front edge of the platen.
- D. Holding the shoulders, pull the shirt toward you until your design will print in the proper location. For front prints it is usually 3" from the bottom of the collar and for the back prints 4" is typical.
- E. Smooth all of the wrinkles out of the garment.

4. The print stroke.

- A. Place a bead of ink across the back edge of the design.
- B. Select a square edged medium hardness squeegee (70 durometer).
- C. Hold the squeegee firmly with two hands spreading your fingers evenly across the handle.



- D. Place the squeegee blade at the rear of the image with the front edge of the blade at a slight forward angle to screen. The handle of the squeegee should be pointing at you with the blade pointing toward the back of the screen.

- E. Press the squeegee down evenly and pull forward. A clean print means that there is no ink residue remaining in the image area of the screen. You can pull the squeegee as many times as necessary to achieve this.
- F. Lift up the screen with one hand and, with the other, push the remaining ink across the image to the rear of the screen. This is referred to as flooding the screen. The purpose of flooding the screen is to prime it and to put the left over ink back into the proper position for printing the next shirt.

TIPS: By adjusting the angle of the squeegee you will effect the deposit of the ink. If you require more ink try a stronger angle, for less ink a more vertical position will help.

You may find that pushing the squeegee is a more comfortable printing stroke. Keep the angle of the squeegee the same only flood toward you and print back. However, once you choose a stroke style you need keep it for the entire job to minimize the possibility of shadowing the print.

Note: Printing the job. Most designs need to be printed using the following guidelines.

- ✓ Print light colors first with darker colors overlapping them.
- ✓ Print smallest part of the design first.
- ✓ Print specialty inks, such as metallic and puff, last.

5. Flash curing

This is a major part of the screen printing process and is done for several reasons.

- ✓ Pre-shrink the garment before you print it. This is usually done on nylon, polyester, or 100% cotton garments where the registration is tight. Load the garment, send it under the flash and leave it there longer than what the actual flash time would require.
- ✓ To enhance ink coverage or to prevent "bleeding" of the shirt color into the ink

color. Print the first color onto the garment and flash it until it is just dry to the touch. Let the print cool and then use the same screen to print it again.

- ✓ To prevent “muddy” prints. This happens in multicolor printing when one ink sits directly on top of another. The ink colors eventually will mix resulting in a muddy appearance of color. To prevent this, flash after each color.
- ✓ To avoid pick-up on the screen when printing a multi-color job. If you flash between each color, the print side of the screen will stay clean and reduce the possibility of shadowing.



The flash unit should be set on “high” and be approximately 3” away from the garment. It will take anywhere from 5 to 20 seconds to flash an ink. Remember that you are not trying to cure the ink on the shirt. Over flashing will cause its own list of problems

6. Curing the print

The basic principle of plastisol ink curing is obtaining 320°F throughout the entire ink deposit. The thicker the deposit of ink, the longer it may take.

- A. To get started adjust your belt speed to run at 60 seconds inside of the oven.
- B. Select the air settings and oven rack height.
- C. Apply a temperature strip on a T-shirt and run the shirt through the oven. You are looking for a temperature of 320°F to 330°F. If the temperature is too low, slow the belt down. If the temperature is too high, speed the belt up. Rerun a cool test shirt until you get the desired result. You may want to do this test in the middle of your print run as well.
- D. A standard quality check is to stretch your print left to right after it comes through the oven and cools. If the print does not crack then your print is most likely cured. If the print does crack it is under-cured. Slow down your belt speed and rerun the garments. An exception to this process would be if your initial ink deposit were so thin that there was not enough of an ink film to make the stretch test possible. Example: black ink on a white shirt printed through a 150 mesh.

There is a sample log sheet included with all Brown brand conveyor ovens. It is a good idea to continue the temperature strip testing for a good month of jobs. Record on your log sheet enough different examples so you can refer to it before each job. Track the

Dryer Cure Log

Garment Color	Ink Color	CureTime	Air Settings	Rack Level

garment color, belt speed, heater height and air settings. Even after you have developed a solid base of information about the variables of each job you run you should always use the crack test just to be safe.

Note: The only way to know if a job is really cured is to wash a sample garment.

8. **After job clean up.**

Screen wash is available from your local screen printing supply company. Any textile version will work fine. Follow the manufacturer's product specifications but the process is as follows:

- A. Leave the screen in the screen clamps.
- B. Remove any excess ink from the screen using a card and place it back into the ink container.
- C. Remove the tape from the screen and discard.
- D. Moisten paper towel with your screen wash and wipe the screen. Keep washing with clean moist towels until the screen is clean.
- E. Remove from the screen clamps and strip the image for further frame use.

- ✓ Different ink deposits and different garment types will affect your cure rate. Keep a dryer log.
- ✓ Use screen opener during print runs if your screen gets clogged.
- ✓ Spot cleaning guns (available from your local screen print supplier) will take cured, unwanted ink spots out of shirts.
- ✓ If you plan to use the same screen for printing both light and dark ink, start with the light color. It is easier to clean and will be hidden in the darker color.
- ✓ Try to overlap your last color in every job, this makes registration easier.

Tips

- ✓ Take the time to organize the entire order before starting.
- ✓ Think clean.
- ✓ The first print is always done on sample material.
- ✓ Imprint placement on the front is usually 3" from the neck on the front and 4" down on the back.
- ✓ Load the shirt all the way into the shoulders and then pull the shoulders back into the proper position.
- ✓ Unload the garment by pulling from the shoulders in an up and out motion.
- ✓ Use the crack test to make sure the print is cured.
- ✓ For placket printing, build up the platen so that the print area is above the placket height.
- ✓ Check with your shirt supplier because some garments are designed to be embroidered, not printed.

Glossary

- Bleeding** – Underlying color garment blending with an upper color layer of ink.
- Cure** -- Plastisol ink is cured when it reaches 320°F and has become a solid plastic film.
- Cure Rate** – The number of pieces that can be cured in a given period of time.
- Curable reducer** – Additive designed to reduce the thickness of plastisol ink.
- Degreaser** – Product designed to remove dirt, grease and oil from screen mesh.
- Durometer** – Squeegee blade hardness. 60° is soft, 70° is medium and 80° is hard.
- Emulsion** – Light sensitive product for creating a stencil on a screen.
- Exposure** – The process of placing an emulsion coated screen, with desired artwork, in front of light for a specified period of time.
- Film Positive** – An art color separation on acetate or vellum that is black and very opaque.
- Flash curing** – Using heat to gel the top of an ink film.
- Flood stroke** – Pulling ink across the image area of a screen to prime it for a print stroke.
- Free Mesh area** – The distance between the edge of two designs on a screen or from the edge of a design to the frame.
- Master Art Positive** – MAP. A composite of the artwork of a job, including registration marks.
- Off contact** – The distance between the garment and the print side of the screen. Often used to affect ink deposit.
- Opacity** – Ability of an ink to cover an underlying color of ink or garment.
- Pin-hole** – An open area of a stencil that should be sealed with emulsion. Usually caused by dust or air bubbles.
- Plastisol** – The predominant textile printing ink. Requires heat to cure and will not air dry. A liquid plastic that cures to a flexible film and adheres to textiles.
- Placket** – The button area of a shirt.
- Pre-registration** – Placement of art to a screen before exposure.
- Print Side** -- The side of the screen that the screen that touches the shirt.
- Registration** – Placement of colors together to ensure design effect.
- Registration Mark** -- Bulls-eye on each art separation to aid in press set up.
- Scoop Coater** – Trough like device used in applying emulsion to screens.
- Screen Frame** – Wood or aluminum with mesh stretch across.
- Screen opener** – Aerosol product designed to clean clogged ink in screens during a print run.
- Separation** – Each color in a design printed on a separate sheet of vellum or film.
- Squeegee Side** -- The inside of a screen and where the ink is placed.
- Split Tape** – Screen tape that is sticky on one half but not on the other. The adhesive part adheres to the mesh and the other side sits against the screen frame wall.
- Stencil** – Emulsion with a processed image.
- Stencil remover** – Product designed to remove an unwanted stencil from a screen frame.
- Step wedge guide** – Emulsion exposure rate tester.
- Stretch test** – Stretch a cured, cooled garment across the grain of the t-shirt. If the ink does not crack then it is probably cured.
- Thermolabel** – A pressure sensitive tag that changes color when exposed to heat. Sold in different heat levels. #5 is used in the t-shirt business.
- Viscosity** – Thickness of ink.