Household Items To Gather Up:

1) Acetone
2) Paper towel
3) ScotchBrite® (green pad)
4) Tarn-X® cleaner (optional)
5) Water tray

TONER TRANSFER PAPER

This specialty paper is coated just on one side with Dextrin, a non-toxic, non-hazardous starch-based product which makes the coated side appear to be a lighter shade of blue. It is safe to use in all laser printers and photostatic copiers but not for inkjet or wax printers. Read the note on the front of the toner transfer paper for full safety details.

- **Which Side To Print:**

Print only on the coated (lighter shade of blue) side. If you print on the wrong side of the paper it won't release the toner image and the page will be wasted.

- **Keep The Paper Sealed:**

This paper is dimensionally stable (e.g. lies flat) at 70% RH. If the paper if left exposed to a dry environment (< 50% RH) it will begin to curl which can cause printer jams or result in poor print quality. You will notice that after the paper has been run through your printer it will have a noticeable curl. This is due to the hot fuser rollers removing some of the paper's moisture. It is normal to experience some paper curl after printing but it will not affect the transfer process. This toner transfer paper should not be run through the printer twice since the curl may cause a printer jam. Instead, print to a smaller piece of transfer paper!

- **Economize on Paper Usage:**

This technique will enable you to run very small pieces of transfer paper through any printer device. This is an important trick if using a copier because most require you to use a full-size sheet of paper.

First print your circuit image to a regular sheet of white paper using the manual feed tray. Cut a small piece of the blue transfer paper about 1/2" larger than the size of the printed image and lay it coated-side up, directly over the printed image. Using an Avery® type of laser-safe label, tape the top edge of the blue transfer paper to this white "carrier" sheet (i.e. the edge that goes into the manual feed tray first) and print again. If this carrier-sheet jams the total paper thickness is too great for your printer. Simply cut out the printed image on the white paper so the blue transfer paper sits INSIDE the opening and hinge like a "doggy door". Place the "carrier" into the manual feed tray and print. The image should print perfectly to the small piece of transfer paper.

- **Handling The Paper:**

Handle the paper by the edges if possible and always with dry hands! Try not to get fingerprints over the coated side.

BLANK "PCB" LAMINATES

There are two parameters for copper laminate boards: copper weight (1/4oz, 1/2oz, 1oz, 2oz) and board thickness (.032"/.064"/.096"). These numbers vary a thousandth or so between vendors. Our system is geared for the new .032" standard thickness to be able to easily pass through the laminator, and 1/2oz copper foil for very fast etch times.

- **Cutting To Size:**

These boards cut very cleanly and easily with just a conventional paper cutter so there is no need to use an expensive shear.

- **Preparing The Copper Surface:**

The ideal way to clean the copper is to use a drop of dish washing soap on a green ScotchBrite® scouring pad. Rinse well then use Tarn-X® cleaner to make the copper as bright and oxidation free as possible. If during the toner transfer process, your toner image becomes damaged for whatever reason, remove the toner image with Acetone and re-clean as above.

TONER REACTIVE FOILS (TRF)

GreenTRF is for your circuit image whereas WhiteTRF is optionally applied to silkscreen images. The dull side of either foil is laid over the toner image, run through the laminator, peeled back and discarded. The foil pigments will only stick to the toner image when subjected to heat & pressure.

To apply a foil to either a circuit or silkscreen image, cut a piece about 2" longer than the board, wrap 1" around the leading edge and insert into the laminator. Immediately after the rollers have grabbed the board and foil, drop your fingers down on top of the foil to induce drag over the foil thus preventing wrinkles from forming over the toner image.

- **GreenTRF:**

Toner is very porous. Without a sealer over the toner image the etchant can easily work into the granular makeup of toner and cause pitting of the copper surface. The job of the green foil is to prevent this from ever happening regardless of the density of the toner image.

- **WhiteTRF:**

For a very professional look to your board you can optionally add a silkscreen layer. Initially the image will of course be black and sometimes may give you better contrast over your board, however, for the "conventional" PCB look white has always been the accepted color of choice. If you apply the WhiteTRF you might find some white pigment left behind where it shouldn't be. This is due to surface tension over the board. Excess white is easily removed by laying down strips of 3M® Temporary tape and lifting off.

PRE-PRINTED IMAGES

The pre-printed "sample" sheet of circuit images included in this kit, is a "trouble-shooting" tool if you were to experience a problem transferring images made on your printer or copier. These images are printed on a known good laser printer with the toner density set to maximum. If for example, you saw toner particles floating in the water bath after the transfer paper removal step, it would indicate that either the toner density was not high enough (from your printer) or the laminator wasn't hot enough to fuse the toner. To determine where the problem lies you'd use a test image after the laminator was given a full 30 minutes to heat up. If all is good, this would confirm proper laminator operation so your focus would be on your printer's density setting.

- **Printers:**

This paper can not be used with wax, inkjet or full-color (CMYK) printers. Use only conventional, B&W toner-based laser printers or photo-copiers. However, you can use any printer to create a "master" on white paper, then use a toner-based copier to duplicate your image to the blue transfer paper. Resolution loss is minimal.

- **Problem Printers:**

To date we have discovered only the Brother® brand of printers to be incompatible with our system. They use a completely different type of toner formulation requiring very high fusing temperatures. If you have a Brother® laser printer, there is an alternative to consider...

- **Laser Printer Alternative:**

Many customers who have just an inkjet printer and/or don't want another laser printer just to use this product, have picked up an inexpensive B&W no-frills copier (Canon® brand highly recommended). Using the copier, you would simply duplicate the original inkjet or Brother® printout on white paper to a sheet of the blue toner transfer paper.

- **Setting Printer Density:**

All laser printers have a "density" control for the amount of toner being laid down. The laser printer "density" control for your printer can be somewhat elusive to locate since very few users ever need to change their toner density. (Copiers on the other hand just use the "contrast" control to adjust density of the printout). HP printers, being one of the most commonly used brands by engineers, use the term "DENSITY" on a scale of 1-5. This setting should always be set to 5 for our needs. Consult your printer's manual for specific instructions for changing the toner density of your particular brand. Don't confuse Density with Resolution or any other printer modifier. Also, you will want to turn off all "economy mode" settings because you want the most toner you can get out of the printer.

- **Attention HP users:**

For all current 1,200 dpi printers on a PC, the toner "density" is changed something similar to this: START > Programs > HP LaserJet Series (printer model here) > HP LaserJet toolbox, then select Advanced Printer Settings, then Print Quality and finally set "Density" to 5 with "Economode" off.

LAMINATOR vs. IRON

These instructions assume you are using the recommended GBC® laminator. If you plan on using an iron you should go to our website for instructions on how to calibrate and use a household iron. We highly recommend using the laminator over the iron because of the extreme roller pressure and heat exerted by the the laminator which is responsible in large part for excellent toner image transfers.

- **Warm Up Cycle:**

All GBC® brand laminators need about 30 minutes to achieve a full "heat-soak" of the pressure rollers

before first use. Disregard the first illumination of the LED "Ready" light. If your laminator has a "thickness" or a "dial" setting, always keep it at the highest/maximum setting.

- **Carriers:**

Most GBC® laminators state that a "carrier" is required. This does NOT apply when using this product because we are working with rigid materials not lightweight plastic "pouches".

- **Finding A Suitable Laminator:**

If you elected to get your own laminator keep in mind that it must be a late-model GBC® brand. There are many outlets for GBC® laminators, available as either a 9" or 12" model. The model we select for our dealers will always be the best performing and lowest price 9" model available. In the USA, Canada & Mexico the preferred 110v unit is called the "PERSONAL" model while it's international 220v cousin is called the "H-65". Other GBC® models will work fine but are more expensive. We have found no other manufacturers to work as well as the GBC brand.

- **Maximum Board Thickness:**

GBC® laminators will have a difficult time passing .064" board on its own. You should limit board thickness to .032". If you must use .064" you will have to help out the laminator or else the motor/gear train may be damaged due to overloading which will be heard as a "clicking" sound. Our process is geared for .032" thick boards or less. Most all GBC® laminators (except the "Creative" model) can physically pass an .064" board through the unit but they lack the added torque required for the increased load factor, hence the need to assist a thicker board through the unit to prevent stalling the motor.

- **NOTE:**

Even though .032" boards are OK for use with the GBC® units, there is one exception. If you were to insert a .032" thick board the entire 8" width you may still stall the motor due to high loading. You might have to help it as you would if the board was thicker. The rule of thumb here is always run the board through by the narrowest dimension. If you hear a "clicking" sound, immediately lend assistance to help push/pull it through.

- **Safety Reminder:**

Whenever using a heated device like a laminator you should always be present in the room. If you are normally in another room, we suggest you pick up an inexpensive "Smoke/Fire Detector" and mount it above the unit. It's easy to forget the unit is running since it is very quiet. Since heated devices are fire hazards, why not give yourself a bit of advance warning. This is also a good time to check your fire extinguisher location and the proper operating pressure just to be on the safe side.

- **Transferring Your Toner Image:**

Every software package handles printing a bit differently between the upper and lower traces of a board layout so you'll need to experiment to know how to orient your images. We printed the sheet of "Sample" images in reverse so the text will show up "right-reading".

We suggest you practice with your printouts using regular white paper and an 'invisible' circuit board to mentally go through the reversal of the images to the copper surfaces. Once you are familiar with the way your software handles upper and lower printouts, you're ready to make your first board.

There is no right or wrong way to transfer one or both patterns however, we have found that transferring and etching one side at a time is easier, faster and results in better double-sided alignment. The basic technique requires you to mask off the opposite side of the board when you etch which can be easily done with standard "shelf-liner" type paper.

Also keep in mind that the very act of transferring a printed image will reverse it. Board layout is normally done via "X-Ray" view on-screen where you are looking through the board from the component side. Most software will not reverse the BOTTOM image which does render the correct orientation for our process. The TOP image however, should always be reversed. After working with the system, printout orientation will become more easily understood.

MAKING A SINGLE-SIDED PCB

STEP 1:

Clean the copper surface with a drop of dish washing soap on a ScotchBrite® kitchen scrubbing pad, rinse with running tap water and dry with paper towel. Dip the board in Tarn-X® to remove all oxidation from the copper surface.

STEP 2:
Trim and lay the printed image into position over the copper and insert into the laminator. The print should not overlap the board if possible. As soon as the rollers grab the board & paper you can let go. When the board exits, reverse the board (head-to-toe) and reinsert it for a second pass to ensure full even heating to every square inch.

STEP 3:
As soon as it exits the second time, slip the board into a tray of water... do not let it cool down! After about a minute or two the paper will separate. Remove, rinse and pat-dry the board.

STEP 4:
Cut a piece of GreenTRF about 2" longer than the board. Lay the foil, dull-side down over the board with 1" flipped around the leading edge of the board, (the edge to be inserted into the laminator). Insert in one smooth motion until the rollers grab the board. Immediately drop your fingers down over the foil to cause high drag over the foil to prevent wrinkles from forming over the toner image. After the board exits insert a second time in the same direction but this time do not touch the film. Upon exit, peel the foil 180° back over itself and discard.

STEP 5:
Inspect the green toner image very carefully for any distortions or missing green foil. Etch in your usual fashion or check out our website under "Tips & Tricks" to see how to etch extremely fast without even using an etching tank! After etching, neutralize the acid, wash and dry the board. Remove the GreenTRF and black toner with Acetone (or any "hot" solvent) using a new dry paper towel.

STEP 6:
A silkscreen layer can be applied directly over the fiberglass base the same way the circuit image was created but using the WhiteTRF.