

## Tools & Supplies Needed

- Black & white high contrast design  
B/W only, line art or halftone. No grey scale.
- Toner based copier or laser printer
- Sheets of PNP Blue resist
- Hot plate with a flat solid surface, or a block of aluminum to put across the top of a coiled hot-plate. (a thermometer would be handy.)
- Wooden burnishing stick or two
- Metal to etch or anodize, & masking tape.

## Background

There are several processes that rely on chemical action to do something different to different parts of the same piece of metal. The two most obvious are etching and titanium anodizing. The way that we, as metal-smiths, control which parts of the metal are acted upon is to use a “resist”. A resist is a generic term for some sort of coating that prevents a chemical from acting on a particular area of material.

A classic example is the use of hot wax on easter eggs. First dye the whole egg some light color, and then draw on the egg with melted wax, or crayon. Dying it again with a darker color, will reveal the waxed areas retaining the colors of the first dye and the crayons. The wax resisted the action of the dye, and kept those areas light. Waxes of various sorts are a classic family of resists, used for far more than just dye.

PNP Blue is a modern resist that appears more refined than molten wax, but it's actually not that different.

PNP stands for “Press-N-Peel”. It was originally developed to allow electronics types to etch their own circuit boards. For this, they needed a resist that was very tough, easy to use, and had very high resolution. Strangely enough, jewelers have these same requirements, so it migrated over to our world, and knocked the socks off of the several thousand year old materials we'd been using previously. (and laboriously)

## Procedure

### STEP ONE:

*Design.* Find yourself a design that you'd like to work with. It needs to be solid black & white. No grey scale. It can be halftoned, if the halftone dots are large enough. Line art is best. Do whatever scaling you need to get it to the exact size you need for your piece.

The PNP will reverse the design, so make sure to flip the design right-for-left, or use a design that doesn't care which way it faces. Watch out for words and pictures.

### STEP TWO:

*Get Blue.* Once your design is the right size and facing the other way, it's time to get it onto the PNP Blue. If you're working on a computer, and you have a laser printer, load the PNP into the printer, either in the bypass tray, or the main paper tray. The goal is to get the ink onto the non-shiny side of the PNP, so it may be helpful to mark one side of a blank piece of paper, and print on that first to see which side the printer prints on. It needs to be a black & white laser printer. Inkjets won't work.

If you're using a copier, the same applies, the goal is black ink on the non-shiny side. Set up the PNP however you need to get this result. It may be a good idea to set the copier to copy at or near maximum darkness.

Either way, the end goal is a sheet of PNP with your design on the non-shiny side, in bold, black ink. You shouldn't see any 'thin' black patches, or grey scale looking areas that aren't halftones. If you do, that piece is junk, Try it again on a different piece with the darkness turned up.

PNP is expensive per sheet, so it's always a good idea to try to get as much onto each sheet as possible. If working in class, try to team up with other students to get several designs on each sheet. A good idea is to tape all the designs to one piece of paper, and then run that through the copier.

### STEP THREE:

**Clean the Metal.** Clean your metal. For a generic surface, a quick pass against a scotch-brite wheel on a buffer is plenty. The goal is to clean all the dirt, tar-nish, and grease off the surface. The slightly scratchy surface left by the scotch-brite seems to help the PNP adhere. There are some situations where you may want a highly polished surface under the PNP. In this case, just clean the surface with dish soap or windex to degrease it. It's generally a good idea to work on a piece that's slightly larger than your final goal, just to make life easier.

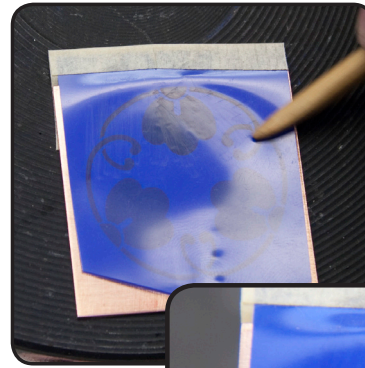
### STEP FOUR:

**Tape & Go.** Cut your design out of the main sheet of PNP. Use masking tape to tape one edge of it down to the cleaned side of your metal, shiny side up. The important part is to only tape one edge, and to keep the masking tape from covering any of the black areas of the design. The PNP should hinge away from the metal like a book cover. If there's not enough room on the front of the metal & PNP, it's OK to put the tape on the back, extending out beyond the edge. Use that bit to stick to excess PNP sticking out beyond the edge of the metal. (Cut the PNP a little large to allow for this excess if you think you may need to do it this way.)

### STEP FIVE:

**Burnish.** Put the metal & PNP sandwich face up onto a warmed hot plate. It's important that the hot plate have a flat surface, not a coil. If it has a coil, find a thick plate of aluminum or iron to form a flat working surface. The plate should be heated to somewhere between 250-300°F. (In the studio, both of our hot-plates are marked, between "Low" and "Warm".)

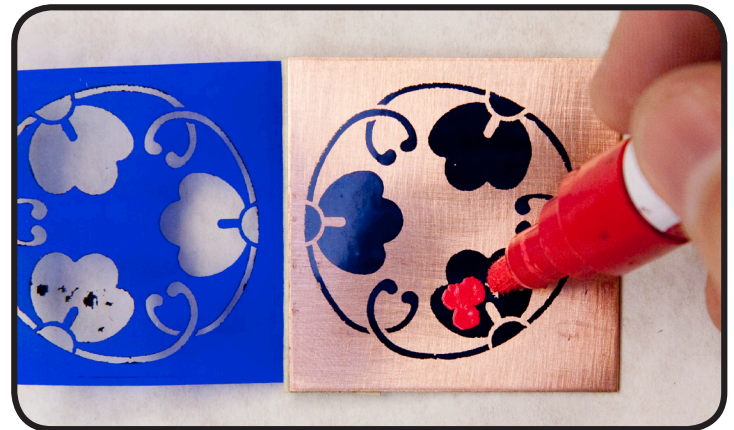
Let the metal heat for a few seconds, then use the wooden rods to rub the pattern down against the metal. It can be helpful to use another piece of wood to help hang onto the metal. Start at the top near the tape hinge, and work your way down towards the free end. The idea behind the hinge is to leave the free end loose to deal with any expansion from heat or rubbing. Once the metal is hot enough, you'll notice the black areas get slightly darker as you rub over them. This is how you know that they're stuck to the metal. Keep rubbing until you're sure each area has gone solidly black. Once every black area has been fully burnished, take the metal off the hot plate and let it cool down.



*Starting burnishing.  
Start at hinge and work  
towards the open end.  
Make sure the black areas  
all get burnished completely.*



*The top right quadrant has been burnished.  
Notice that those areas are slightly darker.*



*Patching the peeled design with a paint pen.*

### STEP SIX:

**Pull & Patch.** Once the metal is cool enough to touch, peel the PNP off. It should come off cleanly, leaving solid black areas where your pattern was. If there are large areas that didn't transfer, hinge the PNP back down, and try again. It should still line up perfectly. If there are just a few pin-holes in the solid areas, patch them using a Deco paint pen.

Once the PNP is off, and the design is patched if it needs it, the resist stage is done.

If you need to remove the PNP without disturbing the surface otherwise, use lacquer thinner.