



E3 Etch Kit includes:

- E3 Etch™ electronic controller and power supply**
- Stainless steel pan**
- 2 electrodes**
- Copper Sulfate\* (for brass, bronze and copper)**
- 4 Foam Spacers**
- Copper square**
- Copper blank**
- Ready-to-use images printed on E3 Etch laser paper**

\* Keep **Copper Sulfate** away from children and pets. Avoid contact with skin and eyes; wear rubber gloves and eye protection, as it can be an irritant. Hazardous if ingested. The solution can be re-used and stored in liquid form (strain with a coffee filter to remove debris), and replenished by adding distilled water. To etch fine silver or sterling, a different electrolyte is required. Please read the last page about etching silver.

**Supplies Needed:**

- Packing Tape
- 400-or 600 grit wet/dry sandpaper (some harder metals require 400 grit for sanding)
- Rubbing alcohol
- Cotton swabs
- Distilled Water
- Oil paint marker or fingernail polish for masking edges of the metal if needed
- Resist method to create design for image:

- A) Direct Toner Transfer: Black laser toner image printed on E3 Etch paper (or use pre-printed designs included in kit)
  - Household iron
  - Wooden board for ironing
  - Press cloth (an old pillowcase works well)
- B) Oil-based paint marker
  - Heat embossing tool or hair dryer
- C) Resist Paint (Jacquard) or fingernail polish
  - Heat embossing tool or hair dryer
- D) E3 UV-30 resist (see [www.sherrihaab.com/etch](http://www.sherrihaab.com/etch) for more information)

**Steps for E3 Etching**

Choose a resist method to apply a design to your metal. In addition to the methods described here, you can mask the metal with tape or stickers. The metal will etch wherever the metal is exposed.

1. For all methods, prepare the copper blank by sanding it with 400- or 600-grit sandpaper. This will give the metal some “tooth” to help the resist to adhere. After sanding, Use a cotton swab to clean the surface with rubbing alcohol. Dry the piece, and avoid touching the surface. **If the copper has a plastic coating on it, remember to peel it off before sanding!**



2. Transfer a design to the copper using one of the following methods:

**Direct Toner transfer method (A)**

Print a black and white design into E3 Etch laser paper using a toner-based laser copier. Choose a design with strong lines and crisp details. The black areas of the design will act as a resist in the etching solution. Cut the design to fit your copper blank. Hint: If the image has text, print the image in reverse so that the text will appear correctly on the copper.

Place the copper on a wooden board. Place the image face down on the copper. Use a press cloth to cover the paper, being careful not to displace it. Press the piece with an iron set on high (cotton or linen) heat with firm pressure for a minute or so. Cover the entire surface to evenly heat. Check the piece to make sure the paper is adhered. The toner will adhere to the metal to act as your resist. The paper should be flat where the toner is heated with no ripples. It will, however, bubble up where the white of the paper is.



After the piece cools for a few minutes, place it in a dish of water and let it soak for about 10 minutes. Carefully remove the paper backing by rolling the paper fibers off with your fingers. Re-dip the piece in water to moisten if needed. Dry with a cloth. If sections of the design did not transfer, use a paint pen or nail polish to fill in missing details. If your transfer didn't work, you can always sand the piece or use acetone to remove the toner and start again.



**Oil Paint Marker Resist option (B)**

Create a freehand design by using an oil-based paint marker, or combine this with another method to create your design. Heat set with a heat tool or hot hair dryer. Remove with acetone after etching.



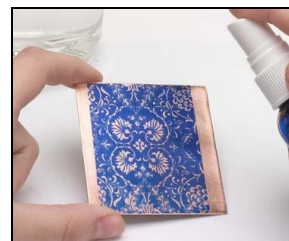
**Paint Resist option (C)**

Paint such Resist Paint (Jacquard) works well for freehand work with a paintbrush. Heat set with heat tool or hot hair dryer. This paint simply peels off after etching. Nail polish is another "paintable" resist. Remove polish with acetone.

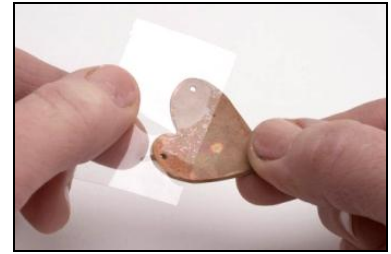


**UV Film Resist option (D)**

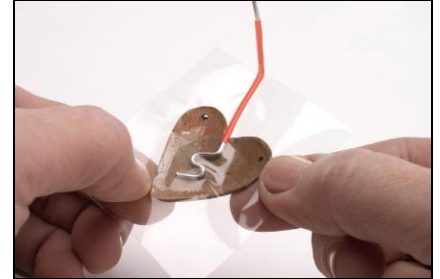
E3 UV-30 is the most durable resist method and produces pristine results. See [www.sherrihaab.com/etch](http://www.sherrihaab.com/etch) for more information.



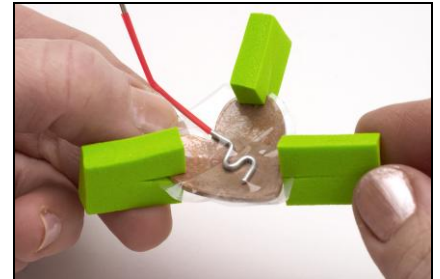
3. To prepare the copper for etching, paint around the edges with the oil paint pen, fingernail polish or fold tape over to mask the edge. Apply a piece of tape covering just part of the copper on the back side as shown.



4. Prepare to attach a conductive electrode wire to the back of the copper. Bend one of the coated electrode wires enclosed into a **soft** 90-degree angle at about the middle of the wire. To extend the life of the wire, do not use pliers; use your fingers to ensure a gentle bend. Make a few short bends (zigzag or "s" shape) on the exposed silver end of the wire, which will be taped to the exposed part of the back of the copper for conductivity. Clip off any extra wire. Position the zigzag end onto the exposed copper. The metals must touch to properly conduct, so make sure you are placing the wire below the tape that was applied in step 6. Place a second piece of tape over the back of the silver portion to adhere and to ensure good contact. Fold the edges of the tape over, to make "tabs" as shown in step #5 or trim the tape close to the edge. At this stage the entire back and sides of the copper should be taped or masked off.



5. Mix the etching solution. (To etch on silver, use silver nitrate or copper nitrate solution instead.) For copper and brass, mix and dissolve 2 oz. or (55 grams) of the copper sulfate powder in 16 oz (475ml) distilled water in the stainless pan. It helps to do this in advance to give the crystals time to dissolve. It is not critical that the amounts are precise; you may use more or less water. Attach the foam spacers around the shape to be etched to suspend it level with the bottom of the pan. Make sure the foam does not cover any part of the copper you wish to etch. You can make your own tabs with folded pieces of tape out to the sides to affix the spacers without disturbing your design.

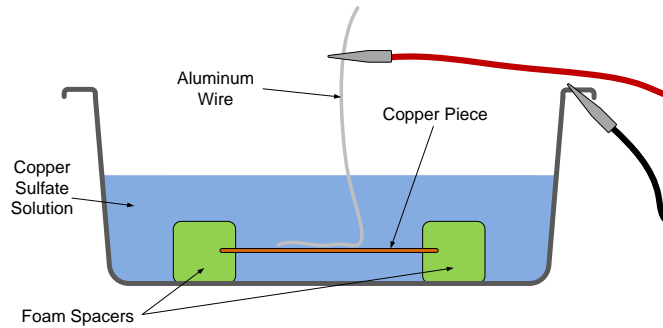


6. Attach the black clip to the pan and the red clip to the exposed end of the electrode wire. The first photo shows the orientation of the clips and copper just as it is about to be set down in the bottom of the pan (9A). Set the copper down so the spacers touch the bottom of the pan (9B).



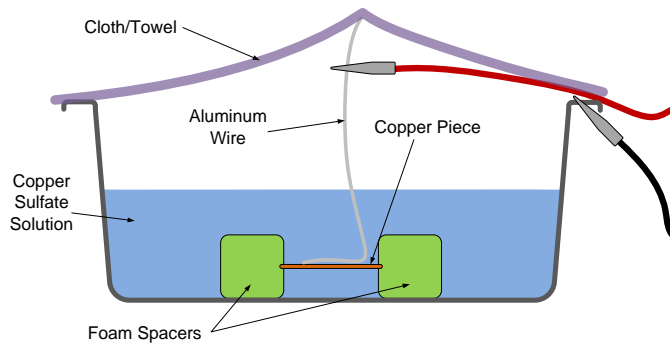
Submerge the copper with the design FACE DOWN\*; the spacers will keep the copper from touching the bottom of the pan during etching. **The spacers need to sit on the bottom of the pan so that there is about 1/2 inch (1.5cm) of distance between the bottom of the pan and the copper. The piece of copper should be level and should not float or move (9C).**

\* Etching is achieved as an electric current and solution work together to transfer the copper from the piece, plating it directly to the bottom of the pan. This is why the design faces the bottom of the pan.



9C NOTE: The copper piece is fully immersed in the Copper Sulfate solution and is held  $\frac{1}{4}$  to  $\frac{1}{2}$  inch above the bottom of the stainless steel pan by the foam spacers.

7. **Etching Small metal pieces** - Sometimes the copper will attempt to float instead of sitting on the bottom, especially if it is small. Put a dishcloth, lightweight booklet or similar item over the top of the pan and cables to help hold them down. Or instead of spacers, use un-split wooden chopsticks to suspend the piece from above (see technique for beads and small pieces for a photo of how to do this).

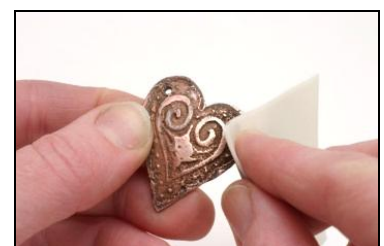


NOTE: Very small copper pieces may tend to float; this can be solved by draping a cloth or small towel over the pan. The cloth/towel will push down on the tip of the aluminum wire holding the copper piece down.

8. Set the E3 controller. If you have a lot of copper to etch away, use the “fast” setting. If you have a very small piece, or have very little copper exposed, use the “slow” setting. Turn the power on; the green light will indicate that the power is on. The red light indicates that the clips are properly attached. If the red light does not appear, check to make sure that plastic or tape is not interfering with the copper and wire contacts. Wait 2 hours for the etching to occur, leaving the piece undisturbed. Move the piece as little as possible to avoid disturbing the resist or toner. For a deeper etch, you can leave it for an additional 1 – 2 hours. Stop etching when the desired depth is obtained. Turn the power off and unclip the wire. Rinse the copper and dry it. Use a cotton swab with acetone to remove the toner or marker.



9. Finish the metal as desired. Add patina to darken recessed areas. Use a polishing pad to remove the patina from the raised areas of the design. Etched metal can be used for finished pieces and to make texture plates for clay or printing. Bronze and copper metal clays can also be etched using the E3 Etch controller with copper sulfate.



## Technique for etching on a small piece or bead shape

To etch on a bead, suspend the bead from a bent aluminum wire inserted into the bead hole so that it holds the bead close to the bottom of the pan. Turn the bead occasionally to face the design toward the bottom of the pan so it will etch around all sides. You can suspend the electrode wire attached to a bead or small blank between wooden chopsticks as shown instead of using foam spacers. Tape the sticks to the pan to keep piece steady. Remember to keep the piece close to the bottom of the pan but not touching. Hint: remember to make soft bends in your electrode wire at the point where the wire is taped to the piece as a sharp bend may cause the wire to erode during the etching process.



## Most frequently asked question when etching with the E3 Etch Controller

**Q:** My piece stopped etching after awhile during the electrical etching process, what did I do wrong? OR: The current light went off during the session or never lit up in the first place when I set my piece in the solution to begin etching?

**A:** You have lost your connection to complete the circuit necessary for etching, there are several reasons this can happen and all are fixable. Please read the following to remedy.

**IMPORTANT:** Before you try to diagnose the problem, plug the controller in and make sure the power light is on. Now touch the metal clip from the red lead to the metal clip of the green lead together. When they touch you should see the current light go on. If this is the case the controller is working properly. This means that you have a problem with your connection to your piece or contamination of the solution. Because electrical etching is actually a plating process, everything must be clean, well connected and pure metals and corresponding solutions must be used.

If your current light goes on when the clips are touched together, it's time to figure out what is interfering with your connection. Check the following:

1. Is your electrode wire firmly attached to the back of the piece? It may have come loose during etching. This can happen when solution gets under the tape or the tape is not very strong. Remedy this by sanding and cleaning the back of the piece. A rough surface holds tape better. Use a heavy clear packing tape to securely fix the exposed wire to the metal on the back of the piece. Sometimes the wire appears to be taped well but the wire is bent in such a way that part of it is not sitting flat on the piece. Re-bend the wire to make sure the wire is in contact and not flexing off at any point. It also may be that your aluminum electrode has become coated with residue of crystals from the solution. Use a fresh piece of wire or sand and clean the end of your wire.
2. The piece may be touching the metal pan. Make sure it is not touching the sides or bottom. Make sure that the clips from the red and green lead are not touching each other either.
3. Minerals in water can interfere with etching, always use distilled water.
4. Bits of loose copper or toner from previous batches along with solution that has become over concentrated due to evaporation can cause problems. Clean the pan and re-fresh with new solution.
5. Is the metal pure and not plated (copper, brass or bronze for copper sulfate) or (silver for silver nitrate)? Zinc or other metals can interfere with etching.
6. Some metal blanks are tumbled and polished. This can cause two problems; the metal may be so smooth that the wire, resist and tape have trouble "sticking" and secondly tumbling media may contain residue that coats the metal which will interfere with etching. Sand your piece aggressively to remove any impurities and then clean both sides with rubbing alcohol prior to taping or applying the resist. Some metals have an oily residue left from the manufacturer and must be cleaned as well.
7. Do you have tape on the back of your piece that you didn't notice? Clear tape is hard to see and you may need to examine your piece to make sure tape is not interfering with the placement of the electrode wire. You must have a metal to metal contact for a circuit to work.



## How to Etch on Fine and Sterling Silver

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The E3 Etch controller can be used to etch on fine silver or sterling silver with a silver nitrate or copper nitrate solution. (The copper sulfate that comes with the kit is only for use on brass, bronze and copper.)

Silver nitrate is for etching fine silver or sterling silver with copper alloy. Copper nitrate is for etching sterling silver composed of any kind of metals, and it will also etch copper. If you are not sure what metals are in your sterling silver, use copper nitrate, as metals besides silver or copper will contaminate your silver nitrate solution. Always use silver nitrate for our fine silver. Both solutions can be re-used if they are strained through a coffee filter after etching.

### **Silver Nitrate (for etching fine silver or sterling with copper alloy)**

Silver nitrate is a chemical compound available in powder form or in a pre-mixed solution. You only need a small amount to etch.

To mix your own solution, add ½ liter of distilled water to 10 grams of silver nitrate. Use only plastic or glass containers.

**CAUTION:** Air born silver nitrate dust is harmful to breathe, and even a small crystal can stain the skin. Wear a dust mask, eye protection and rubber gloves when handling the dry powder. When the solution is mixed, it is a 2% solution, which is similar in concentration to silver nitrate burn creams or the antibiotic solution previously used in baby's eyes at birth, but you should always wear rubber gloves as a protective measure. It is poisonous to ingest. Keep out of reach of children and pets. Follow all safety guidelines. The MSDS is available at [www.sherrihaab.com/etch](http://www.sherrihaab.com/etch).

Follow the instructions for etching on copper, using the silver nitrate solution instead of the copper sulfate solution. Use a dedicated pan for the silver nitrate solution. Silver etches 3 – 4 faster than copper. The etching process should take 30 minutes to 2 hours or more, depending on how deep you want the etch.

As sterling etches, you will see a small amount of dark residue form during the process. This is the copper extracted from the sterling. It will dissolve into the solution, and over time you may notice the solution turning blue.

After each etching session, filter the solution through a coffee filter and store in a marked bottle for storage. Store in a dark cupboard, as silver nitrate is air and light sensitive. The solution can be used over and over, but in the event you need to dispose of it, you can flush it away by diluting with lots of water. Do not flush into septic systems however, as silver nitrate is an anti-microbial.

### **Copper Nitrate (for etching any type of sterling silver or copper)**

Copper nitrate is available in crystal or powder form. You only need a small amount to etch.

To mix your own solution, add 12 ounces distilled water to one ounce of copper nitrate.

**CAUTION:** When using any dry chemical such as copper nitrate, wear a dust mask, eye protection and rubber gloves when handling the powder. Copper nitrate is a strong oxidizer and must not be used with or stored near combustible materials. Follow all safety guidelines. The MSDS is available at [www.sherrihaab.com/etch](http://www.sherrihaab.com/etch).

Follow the instructions for etching on copper, using the copper nitrate solution instead of the copper sulfate solution. Use a dedicated pan for the copper nitrate solution. Sterling silver etches 3 – 4 faster than copper. The etching process should take 30 minutes to 2 hours or more, depending on how deep you want the etch. During etching, you will notice residue forming in the solution. Move the debris with a plastic spoon to keep the metal from being blocked if necessary.

After each etching session, filter the solution through a coffee filter and store in a marked bottle for storage. It can be used over and over, but if necessary, it can be disposed of similarly to other electrolytes if flushed away with water. Use a silver nitrate solution (for fine and sterling with copper alloy) or copper nitrate solution (for sterling) instead of copper sulfate.