

# Sponge + Ferric Chloride Method -- Etch PCBs in One Minute!

by [TechShopJim](#) on July 12, 2009

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## intro: Sponge + Ferric Chloride Method -- Etch PCBs in One Minute!

In this Instructable, I will show you **how to etch a circuit board with about a tablespoon of ferric chloride etching solution** and a 2 inch square sponge. You will be amazed as the exposed copper on the PCB disappears before your eyes, and your board is completely etched in a minute or less!

I found a passing mention of this technique of using a sponge with a small amount of ferric chloride on the [Pulsar web site](#), and I was very skeptical that it could possibly work. So naturally, I tried it.

Whenever I have made circuit boards in the past, I did it just like most of us do. I put the ferric chloride into a small tub, dropped the masked circuit board into the solution, and rocked it back and forth for a long time. Even with fresh, strong ferric chloride solution, it would usually take at least 10 minutes for the copper to be removed. As the solution grew weaker, the etch would take longer and longer.

A few months ago, I discovered the 1-part pool acid (muriatic acid) to 2 parts hydrogen peroxide method of etching a circuit board. You will find lots of wonderful Instructables on this method. That method works great, and it made me mad that I spent so much money and effort with ferric chloride over the years when I already had all the chemicals I needed right at home to use this method. The down sides of the acid and hydrogen peroxide solution are that the muriatic acid can cause skin burns and is a little dangerous and damages things that it contacts. Also, I found the etching solution to be quite aggressive which was great for fast etching, but I ended up with severe undercutting and partial obliteration of the traces, and the solution tended to be more corrosive to the resist materials I used, and partially dissolved the mask away during the etch.

This weekend I tried this sponge and ferric chloride method to etch 3 Arduino shield boards I am prototyping for our RFID-enabled member access system at [TechShop](#) (*TechShop is the 15,000 square foot membership-based DIY workshop with locations in Menlo Park CA, Portland OR and Durham NC*). I was so impressed with the success of this technique that I decided to write it up as an Instructable.

The method I will now show you gives you the advantages of all the other methods, and none of the downsides. Specifically:

- o You get a fast etch (much faster than either method I know of),
- o You use a tablespoon of solution, so disposal problems are eliminated
- o A small bottle of ferric chloride will last for hundreds of boards
- o No tank or tub is needed, no heating or agitation
- o Undercutting is practically non-existent, and the resist stays in place
- o There is no need to try to reduce the amount of copper being etched
- o The etch is so fast that it is actually exciting to watch and show your friends!

Let's get to it, shall we?



### Image Notes

1. The circuit board shown is a project I am working on at TechShop...an Arduino shield that is part of our RFID-based member access system for the TechShop workshop area. I etched the circuit boards with this sponge method.

## step 1: What You Will Need

You don't need a lot of supplies for this Instructable, just the following:

- o Ferric chloride (available at Radio Shack, 16 oz bottle for \$10, part number 276-1535)
- o Sponge (2" x 2" square, cut from any sponge, or paper towel will work too)
- o Rubber Gloves (you don't want to stain your hands)
- o Copper Circuit Board (one or two sided)
- o Cup of water (to drop the etched board into to stop the etching)



### Image Notes

1. Ferric Chloride: This common etchant is still available from your local Radio Shack (even though they are moving more towards being a consumer electronics retailer every day), and from just about any electronics supply house and even suppliers on eBay. Buy ferric chloride solution, and avoid the temptation to buy cheaper solid or powdered dry mix. This bottle from Radio Shack is only \$10 and with this method will last you pretty much forever.
2. Sponge: This one is just a synthetic sponge I cut from a larger kitchen sponge. Keep it thin so you don't have to use as much ferric chloride to saturate it...a little goes a LONG way!
3. Rubber Gloves: These are just to keep your hands from getting stained yellow from the ferric chloride. They also sort of replace the need for a tank or tub of ferric chloride.
4. Cup of Water: This is to drop your etched circuit board into to stop the etching process. You could also just rinse it under a faucet, but I like to do it this way so I can etch multiple boards in series without getting my gloves wet with the water.
5. Copper Circuit Board: This one is just a single-sided scrap that I will use for this Instructable.

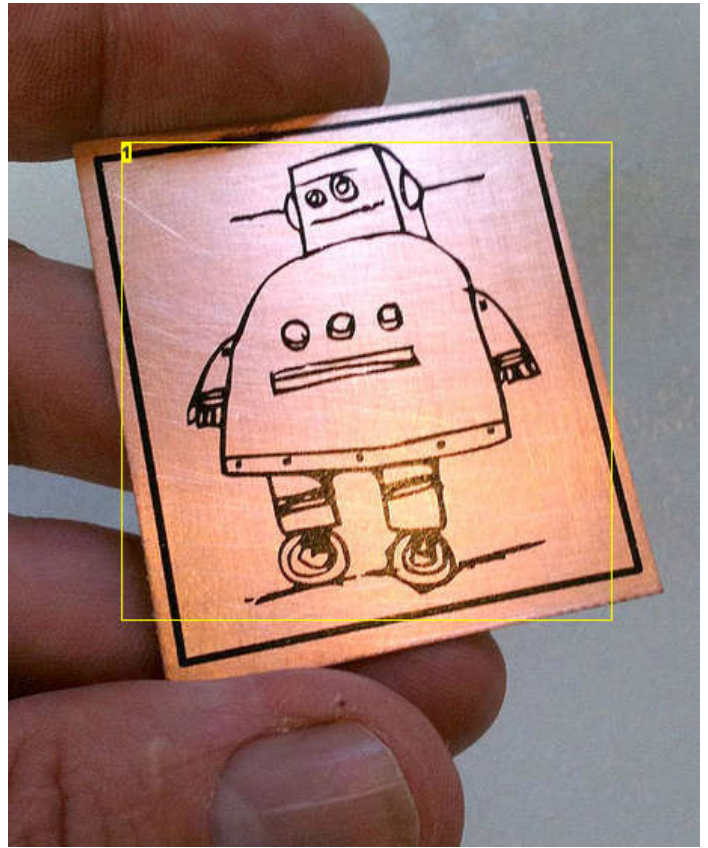
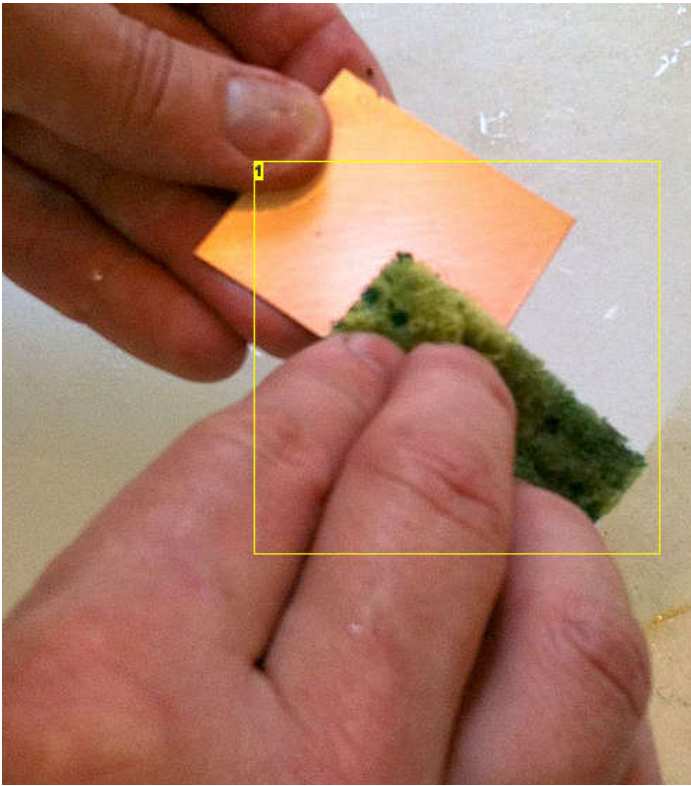
## step 2: Clean the Copper and Apply the Resist for the Circuit Pattern

There are lots of Instructables about how to apply the circuit pattern onto your copper, including peel and press, photo paper, tape, photo-sensitive emulsions, and even Sharpie pen. I will not touch on that part of the process here, but the method I prefer to use is laser printing onto a piece of Pulsar's dextrin paper and using one of their \$70 personal laminators to apply the toner to the board. Then you rinse the paper and PCB under water and the paper slides right off, leaving the toner stuck fast to the board.

The key to any method of applying the resist is to make sure your copper circuit board is absolutely clean. I use a Scotch Brite pad and some dish detergent to scrub the copper clean, as shown in the first photo. Then I blot it with paper towel and let it completely dry. Never touch the cleaned copper, because oil from your fingers will cause the resist to not adhere to the copper, and the resist will come off during the etching process.

If you want to play with this Instructable right now and you don't want to make an actual circuit, just use a Sharpie pen to draw a little squiggle onto your cleaned copper circuit board.

In this case, I laser printed the Instructables robot onto Pulsar paper and applied it to the clean copper board with a laminator. Hey, it came out pretty good!



#### Image Notes

1. Scotch Brite Pad: Scrub that copper until it shines! Use a few drops or more of dish detergent to remove any grease and oil.

#### Image Notes

1. Laser printed toner applied to cleaned board. You can use any of a variety of techniques for creating your resist mask...using Pulsar dextrin-coat paper is only one of the many ways but is my favorite.

### step 3: Etch the Board (Instant Gratification!)

Put on your rubber gloves.

Open the bottle of ferric chloride and put the sponge over the opening, and tip the bottle to let about a tablespoon or so of solution saturate into the sponge.

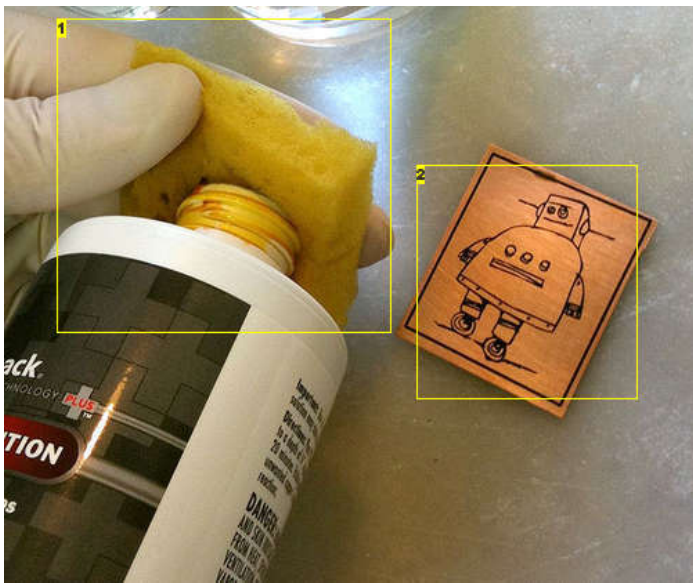
Now with the circuit board in the palm of one hand, simply wipe the solution-saturated sponge over the surface of the board over and over. Don't scrub, just keep wiping it all over. In just a few seconds of wiping, you will see the copper start to disappear!

You will find that unlike the submersion etching method, the copper in the center of the board etches away first, so you might want to try to focus on the edges as you wipe.

In less than a minute of continuous gentle wiping, your board will be fully etched before your eyes!

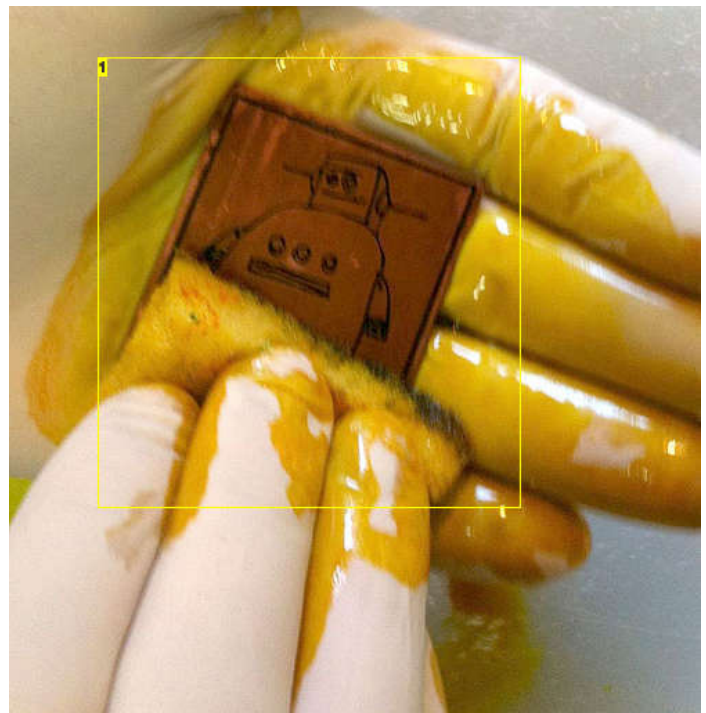
Drop the etched circuit board into the bowl of water to stop the etching action.

If you are etching multiple boards, you can rinse out the sponge, squeeze out most of the water, then re-apply ferric chloride solution if desired, but I have found that I can etch two 2" x 3" boards with one application.



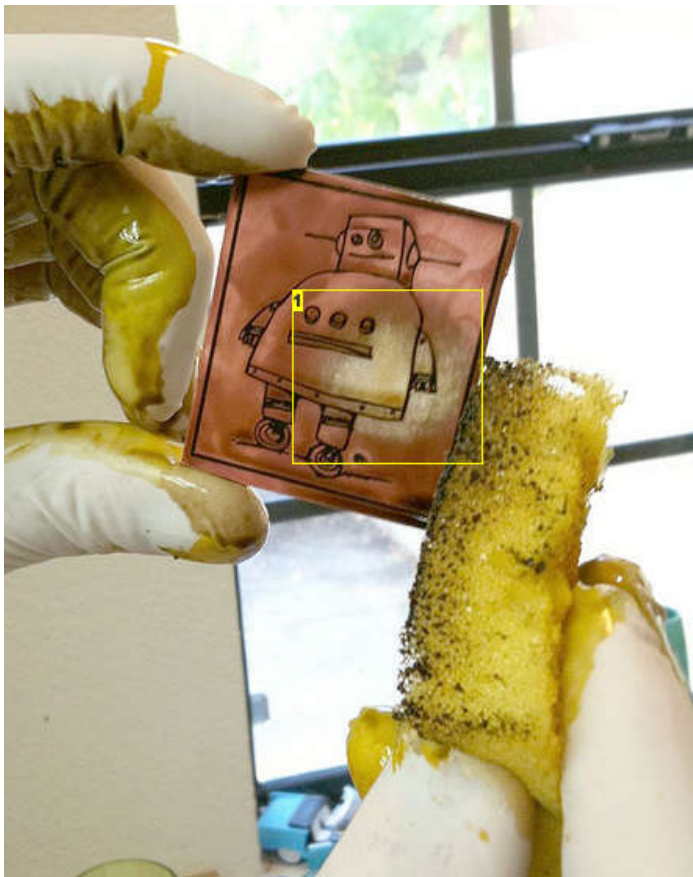
**Image Notes**

1. Saturate the sponge with only about a tablespoon or less of ferric chloride. It is astounding how little you actually need, and I didn't believe it until I actually tried it myself.
2. Cleaned copper board with resist applied is ready to be etched.



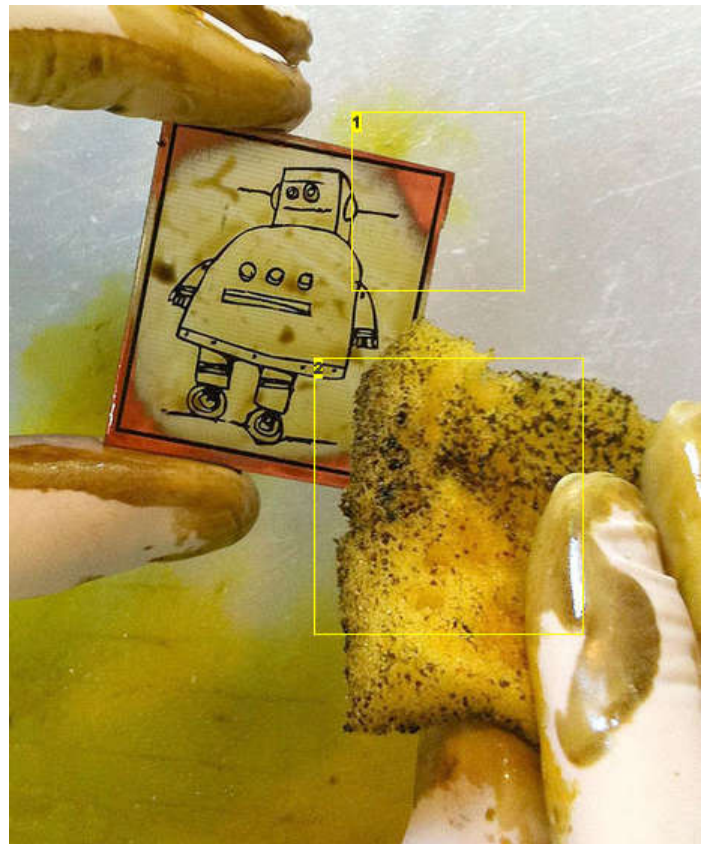
**Image Notes**

1. Gently wipe the copper with the saturated sponge over and over. You don't need to scrub! Sorry about the fuzzy image...it was hard to take the photo with my iPhone without using my hands, but that's another Instructable.



**Image Notes**

1. After just 15 seconds, the copper in the center is already dissolving away! As I hold the board up to the light, you can see light through it! If I was using the immersion method of ferric chloride etching, there's no way it would be dissolving away this quickly! Keep wiping.



**Image Notes**

1. After about 45 seconds, the corners and edges are dissolving away too. The copper in the center dissolves first, so try to stay focused with your gentle wiping on the edges and corners.
2. I still haven't put any more ferric chloride on the sponge!



**Image Notes**

1. After 60 seconds of wiping, all the copper is completely dissolved away. Drop the board into the cup of water to stop the etching action.

**step 4: Clean Up (Not Much To Do)**

The clean up really is just a matter of rinsing out the sponge, throwing away the rubber gloves (or rinsing them off for reuse), and cleaning any spilled drops of ferric chloride from the work surface.

You can reuse the sponge over and over, so rinse it and let it dry, and keep it with your bottle of ferric chloride.



**Image Notes**

1. Pretty easy clean up! Just toss the gloves away or rinse them for reuse.

## step 5: Finished Product, and Your Results

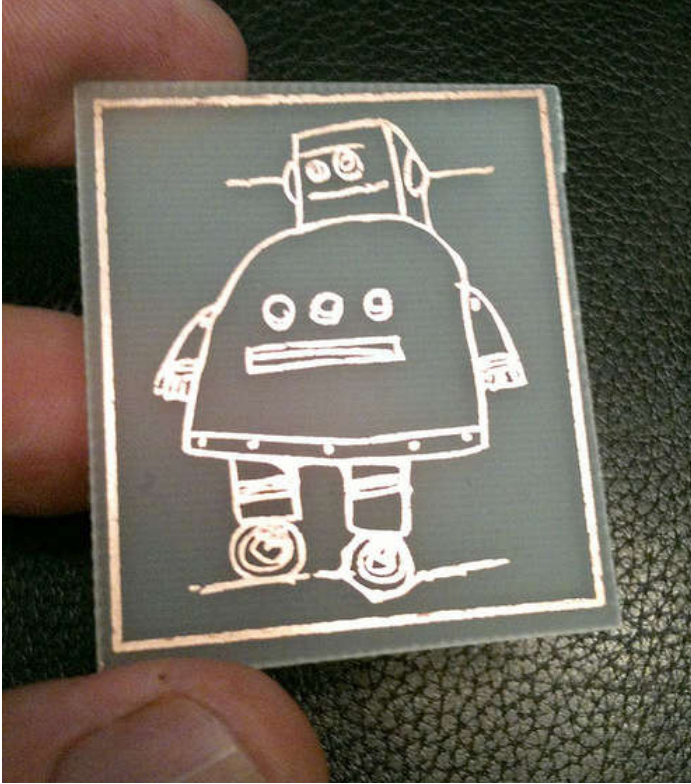
Here's the finished product. Not too bad for 5 minutes from start to end!

I hope you will agree that this method is faster, cheaper, and more exciting to watch than other etching methods you may have used in the past. I'll bet you'll never use the ferric chloride tub or tank immersion method again.

I'm not sure if this low-volume wiping method will work with the muriatic acid and hydrogen peroxide etchant, but it is worth a try.

Some information I read indicated that adding a small amount of citric acid to the ferric chloride will make it an even more effective etchant for use with the sponge or immersion methods. You can find citric acid powder at beer and wine making shops, and even on eBay.

Go ahead and try this sponge method, and let me know in the Comments section if this will become your new method for etching circuits like it did for me.



## Related Instructables



**How To Make A PCB** by PARKOUR123



**Desktop Voltage Regulator/Power Supply** by cousin



**(easily) etch images in copper** by prank



**Cheap and Easy Toner Transfer for PCB Making** by hilarycheng



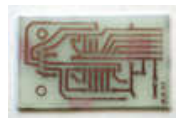
**DIY Flexible Printed Circuits** by ckharnett



**Making a Hand Drawn PCB.** by Ohm



**Increasing current on 78xx series regulators** by Talking Electronics





**5pcb** by vincent

# Comments


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 **vmspionage** says: Jul 16, 2009. 7:24 AM [REPLY](#)  
Hmmm, I wonder if I can use the sponge method with UV resist and ammonium persulfate... I'll give it a shot and let you know!

 **vmspionage** says: Aug 8, 2009. 10:37 PM [REPLY](#)  
Just a quick update, this does not work with ammonium persulfate etchant. It reacted with my sponge and made some stinky gasses, and the sponge seemed to accelerate the breakdown of my resist layer leaving me with some of my finer traces over etched. Oh well!


 **guiks** says: Aug 5, 2009. 8:50 AM [REPLY](#)  
What is the ferric chloride concentration?

 **JoeStrout** says: Jul 27, 2009. 9:07 PM [REPLY](#)  
It's not working for me. Here's what I did: 1. got a double-sided copper-clad board and a bottle of Ferric Chloride at Radio Shack; 2. scrubbed a piece of the board shiny with a scrubber and alcohol; 3. drew a pattern with a nice dark Sharpie; 4. poured some ferric chloride onto a sponge brush (that's a sponge on a stick from the dollar store, normally used for painting); 5. wiped the board continuously for 4-5 minutes. After rinsing and drying the board, I then used my ohmmeter to measure the resistance between two separated points on the board NOT part of my pattern, i.e., what should be bare board now. They were connected with a very low or zero resistance, for any two points.

That was last night; tonight I got out the same board, refreshed some of the Sharpie lines (which had been partly worn away), and tried again. This time I used a somewhat more vigorous back-and-forth motion, almost scrubbing but without applying much pressure, for 5 minutes (I timed it). Again rinsed and dried the board, and checked with the ohmmeter. There's a spot in the middle of the board which appears to be free of copper, but the rest of the board still has a thin film of it. Two points about 1 cm apart measure about 10 ohms.

Certainly the copper is not dissolving within seconds before my eyes, as described. I'm having to work hard here (10 minutes total so far) and I *still* don't have a decent board. At this point a bath and bubbler sounds easier; at least then I'm not sitting there applying the sponge for 10-20 minutes.


On the other hand, I've never made a PCB before by *any* method, and so maybe I'm messing up somehow. Any idea what I might be doing wrong?

 **TechShopJim** says: Jul 27, 2009. 10:20 PM [REPLY](#)  
Hi Joe...  
You aren't doing anything wrong. But I suspect you are using 1 oz or even 2 oz copper PCB. I use 1/2 oz, and this week I used 2-sided 1 oz and it took about 6 minutes to completely etch.

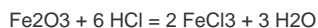
I have several comments:

- 1.). You don't need to scrub hard...in fact, gentle wiping seems faster and won't remove the resist.
- 2.). No need to measure with the meter...you will DEFINITELY know when the copper is gone because you'll see the bare board.
- 3.). Try 1/2 oz board. If you can't find it locally, you can get good single or double sided 1/2 oz board from Pulsar (see my link in the Instructable).


Keep trying. Failure is always an option...and it helps you eliminate all the methods that don't seem to work!


 **Nerdz** says: Jul 24, 2009. 12:37 PM [REPLY](#)  
I just etched a small MAX232 Board using this method, and I am \*VERY\* Pleased with the results. Far more Efficient than ANY method ive used thus far.  
I tried CuCl Out of curiosity, it works but takes a LONG time and I doubt anyone would have to be standing for more than 5 minutes rubbing a board. Luckily, I had maybe a 1/4 cup of FeCl3 Left :) and I only used a tablespoon of it. This is my new favorite method of etching PCBs :)

Now, I have to work on getting more FeCl3. Ive thought about reacting Red Iron Oxide with HCL. If my memory of Chem serves me right, This is what I should get:



FeCl3 should either precipitate out Or Go into a solution of H2O. Solubility of FeCl3 is 92g per 100ml of water (at 22C-about room temp)

 **TechShopJim** says: Jul 24, 2009. 1:53 PM [REPLY](#)  
I'm really glad you like the process...I like it too!  
I don't know about the chem stuff...I'll leave that to another person to comment.

 **Einsteins Circuitry** says: Jul 18, 2009. 12:22 PM [REPLY](#)  
I remember trying this method before but not having much success because there was too much undercutting. I guess I'll try again but not "scrub", and only lightly wipe the board. Nice instructable and nice pictures!  
BTW, what does a banana have anything to do with etching. :p





**TechShopJim** says:

Jul 20, 2009. 11:21 PM [REPLY](#)

The banana was just some random garbage that was in the compactor when I took the picture of the dirty rubber gloves being thrown away. I thought it was kind of iconic-looking garbage because of the banana.

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**awang8** says:

Jul 23, 2009. 10:19 PM [REPLY](#)

Umm... And is that white thing underneath a nappy?

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**TechShopJim** says:

Jul 24, 2009. 1:52 PM [REPLY](#)

Not a nappy (diaper)...the blue is some of the used Pulsar paper, and the white is just bond paper and paper towels from the process. You are very observant!

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**Icohen** says:

Jul 23, 2009. 1:26 AM [REPLY](#)

Jim

Great Instructable! Congrats! Really solves a problem I am dealing with right now! Thanks!

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**awang8** says:

Jul 22, 2009. 11:32 PM [REPLY](#)

Citric Acid is also available at most supermarkets. People use it for making cordials.

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**aplrx** says:

Jul 21, 2009. 10:58 AM [REPLY](#)

Tacunada... Borrokera Ducarai...

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**valeen1959** says:

Jul 17, 2009. 7:21 AM [REPLY](#)

Check out their toner reactive film. I use the green for sealing the toner. As toner does not cover 100% (large areas will show some pitting) The TRF product makes a much better board. Frank at Pulsar talked me through modifying a laminator to work with the products and I have been making boards for a few years now. Note that the etch time will vary on the thickness of the copper used, all I can get here is 1 oz and it takes about 15 min to etch even with the sponge. Great product and thanks again Frank for making life easier.

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**doylep** says:

Jul 20, 2009. 5:13 PM [REPLY](#)

Valeen,

Any chance of getting some instructions for moding a laminator I have the standard GBC model that PCB in a box use but it is no good for 1.6mm pcb

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**valeen1959** says:

Jul 17, 2009. 8:52 PM [REPLY](#)

I fasten my board with double sided tape and place it in a container over a light table. This helps to see any spots that I need to concentrate on more as you can see where the copper remains. A little heat applied to the board after releases the tape squares (4each at .25 x.25 inches).

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**firehazrd** says:

Jul 17, 2009. 11:05 AM [REPLY](#)

Cool 'ible. Can't wait to try it. You have no idea how badly I wish there was a techshop in TX.

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**Rusdy** says:

Jul 16, 2009. 7:17 PM [REPLY](#)

WOW!!! Thanks for sharing this! This is definitely the simplest way to etch my board from now on!!

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**nomadiq** says:

Jul 14, 2009. 11:38 AM [REPLY](#)

I must try this soon with ferric chloride.

Does the hydrochloric acid method involve using concentrated (> 10 M) HCl? If so, I would not recommend rubbing a solution of that on a surface in the open air. The fumes would be painful to breathe, would burn your eyes and potentially be hazardous to your lungs and cause acidosis of the blood - you don't want any of these. I would recommend access to a fume hood if the acid is in any way a concentrated form that may fume.

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**TechShopJim** says:

Jul 14, 2009. 12:13 PM [REPLY](#)

The hydrochloric acid is just plain old pool acid. I'm not sure what the concentration is...anyone?

I'm not sure that the 1-part pool muriatic acid (hydrochloric acid) and 2 parts drug store peroxide formula would work any better with this sponge method, but it is worth a try. When I have used the acid/peroxide etch, it acts very quickly with the immersion method, so I don't think there is the same surface tension issue with it that occurs with ferric chloride.

I really want to try adding citric acid to the ferric chloride!

I agree the fumes from the acid would be potentially dangerous.

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**hinge** says:

Jul 16, 2009. 7:16 PM [REPLY](#)

Most probably concentration of " pool acid " would be in 30-32 % range. Diluting it with 2 parts hydrogen peroxide would make it (roughly) 10%. Acid in itself, even concentrated is not very "vicious". True, it can make you cough and suffocate, but scarcely cause any burns, during short expositions.



**clegett** says:

Jul 16, 2009. 8:04 AM [REPLY](#)

The Muriatic acid I've used is typically 20-40% HCl in water. Will be trying this method soon. Thanks!



**Taotaoba** says:

Jul 16, 2009. 9:49 AM [REPLY](#)

This can't be true. The max. concentration of HCL in water is 37% or 38%. And even 20% is a very very strong acid.



**nomadiq** says:

Jul 16, 2009. 10:31 AM [REPLY](#)

Maybe he means its a 20-40% solution of saturated HCl solution. That is, a saturated solution diluted 1/5 to 2/5 in water.



**nomadiq** says:

Jul 16, 2009. 9:10 AM [REPLY](#)

This is not too bad a concentration to work with. I'd still be cautious about fumes but the risk is much less at this concentration.

I would still recommend doing this in an area with good ventilation and have an "escape plan" in place, just in case fuming does happen. After you confirm it is not an issue, I guess these precautions could be dispensed with.



**laci37** says:

Jul 24, 2009. 1:25 AM [REPLY](#)

If you don't screw up the mixture so the exothermic reaction doesn't heat up the hydrochloric acid too much no fumes will exit.



**virtallori** says:

Jul 16, 2009. 5:44 AM [REPLY](#)

Wow -- I'm looking forward to trying this method over the weekend. I do a LOT of etching (I make jewelry), and I'm curious to see how it works on solid copper and brass.

A couple of notes from my experience:

- Radio Shack had stopped carrying ferric chloride a couple of years ago, but apparently they now do stock it again. This is good to know. But in the meantime I've been using the powdered version, and I haven't found any difference between the two, other than a 2x price factor.
- You're better off with nitrile gloves than rubber gloves, especially those of you who want to experiment with this method on muriatic acid. Nitrile gloves are resistant to acids, whereas rubber gloves are not.
- You really should neutralize with baking soda after rinsing.

I have never gotten the muriatic acid method to work beyond a really good first batch. After that, nothing. One of the draws for me was the supposedly self-renewing solution aspect of it. I might have more luck with it using this method. Seeing how I have almost two gallons of the stuff, I'll give it a try.



**hinge** says:

Jul 16, 2009. 7:06 PM [REPLY](#)

if you use peroxide/hydrochloric acid mix, 1 batch is a "norm". Peroxide in acidic solution is not very stable, after etching for say 5-6 minutes most of oxygen is gone. What you have in the solution after "the first batch" is simply diluted hydrochloric acid plus some copper chloride (nice blue tint). To reactivate it is not worth the trouble. After all 1 gallon of concentrated HCl cost only 7-8 \$. Cost of 3 % hydrogen peroxide is negligible. "After etch " solution can be concentrated and used as an etchant again (as  $\text{CuCl}_2$  salt)



**gHjM3W5T20YCS4e30** says:

Jul 16, 2009. 10:06 AM [REPLY](#)

"self-renewing solution"

you have to add oxygen to renew the solution

hydrogen peroxide or air bubbles or leaving solution open with a large enough surface area to absorb oxygen from air in the time between uses

[copper etch oxygen cupric chloride hydrochloric acid - Google Search](#)



**virtallori** says:

Jul 16, 2009. 11:28 AM [REPLY](#)

Yes, I am aware of that. Adding more hydrogen peroxide didn't help in my case, and I don't have enough chemistry knowledge to troubleshoot beyond that.

I'm thinking that if the sponge method works well with muriatic and hydrogen peroxide, I could mix up just a tiny bit of solution at a time as I need it. Less mess and fuss than with  $\text{FeCl}$ .



**gHjM3W5T20YCS4e30** says:

Jul 16, 2009. 11:35 AM [REPLY](#)

use my [Google Search](#) to read up on the subject

sponge method with muriatic=(hydrochloric acid) is more dangerous



**matador29b** says:

Jul 14, 2009. 2:36 PM [REPLY](#)

This method works great, I have been using it for some time, and I am surprised no one had posted it before. So, thanks for that. It makes it easier and less messy if you use double sided tape to stick your board to the bottom of a plastic tray, and one of those sponges used for dishwashing that come with a handle (cheers for dollar store!). Gloves are optional and you can wash your board right on the tray.



**TechShopJim** says:

Jul 14, 2009. 6:29 PM [REPLY](#)

That's a cool idea!

I also thought about using suction cups or some other mechanism to hold the workpiece. The sponge on the stalk is wonderful! I'm going to Dollar Tree soon to get one!

I would very much like to design and build an orbital etching unit that has two sponges that are saturated with ferric chloride solution. You lift up the top part and place your board on the bottom sponge, and close the top sponge and turn the unit on. It wipes the board with the two sponges in an orbital pattern. I have not worked out any of the details yet, but it would be a nice alternative to a heated bubble tank!

There is still the ferric chloride disposal problem, but I argue that disposing of a teaspoon to a tablespoon of ferric chloride compared to disposing of a gallon or two of it, this method is much more "eco-friendly" any way you look at it.



**dpocius** says:

Jul 16, 2009. 6:09 PM [REPLY](#)

For FeCl disposal, how about rinsing the sponge out in a used aluminum pie plate, then setting it out to dry in the sun? The dried leftover iron and copper compounds are captured in an aluminum vessel which can be reused for the same purpose many times, and it should be OK to dispose of the plate with solids in mixed metal recycling. Comments?



**Eirinn** says:

Jul 16, 2009. 5:19 AM [REPLY](#)

Couldn't you use a vibrating motor? Make a setup like a vice with a sponge on each side - close the sponge-vice lightly around the pcb and turn on the vibrators so the sponges vibrate against the pcb.

I'm sure not if that's going to work but at least it was a funky idea a bit out of the ordinary :)



**dpocius** says:

Jul 16, 2009. 6:21 AM [REPLY](#)

Perhaps a random-orbital sander (a cheapie from Harbor Freight) with a Scotch-Brite pad in a shallow pool of FeCl, or a drip-wetted sponge. Put the scrubber pad on a short extension to keep the motor dry.



**matador29b** says:

Jul 17, 2009. 1:57 PM [REPLY](#)

I would not advise that, with the hand method you have control over the pressure and the speed of the sponge, not so with the sander or a vibrator motor (don't take apart your vibrator to try this). Experiment, that is the fun of the hobby...



**roboman01** says:

Jul 16, 2009. 4:56 PM [REPLY](#)

I would think the Scotch-Brite pad would scratch off all of the resist...



**dpocius** says:

Jul 16, 2009. 6:00 PM [REPLY](#)

r-man01, you're right about the Scotch-Brite. Brain lag on my part. Stick with the wet sponge.

On the other hand, for removing the resist after etching and rinsing, how about Scotch-Brite in the same rig? A suitable non-flammable solvent and grade of Scotch-Brite might be just the ticket. Could be the basis of a semi-automated process for light mass-production of PCBs here.



**locofocos** says:

Jul 16, 2009. 4:35 PM [REPLY](#)

So how do you get the toner, sharpie, etc. off the board after etching it?



**dagenius** says:

Jul 16, 2009. 5:11 PM [REPLY](#)

you could use steel wool, or maybe the sponge will take it off with a little scrubbing. experimenting is really the best way to find out...



**dagenius** says:

Jul 16, 2009. 5:10 PM [REPLY](#)

Are you sure that you can simply dispose of extra Ferric Chloride in the trash? I thought that it was really bad for the environment, and that you have to give it to a hazardous waste facility.



**twocvbloke** says:

Jul 16, 2009. 1:55 PM [REPLY](#)

Cool, the last time I etched circuit boards was in school (about 12 years back), and that was the bubbling tank method, took ages to get them done!!! :P

I've not done any since, but I really would love to, I just haven't the equipment to do it, at least, the equipment to print circuits onto the boards (not even a laser printer, booo!!!), but this method means I don't need to buy the etcher tanks or bubbler things, just the solution and some gloves... :D

Nice job... :D



**TechShopJim** says:

Jul 16, 2009. 2:19 PM [REPLY](#)

I am currently using an old HP Laserjet 1100 printer, which are readily available on Craigslist and eBay for \$25 to \$50 (plus shipping if on eBay). eBay sellers carry refill toner for this printer for under \$10 for a big bottle, and I have refilled this cartridge about 8 times so far with perfect performance.

There is also a tiny free Windows program you can find on the Internet called "LJConfig.exe" which allows you to poke and tweak HP laser printers to do things like increase the amount of toner that gets used for each print, change the temperature of the fuser rollers, and even put a custom message on the LCD if the printer has one (you can freak out your co-workers by changing the idle message on the networked office printer to say "KILL THEM ALL." and nobody will know it was you...well, they might be able to look in the printer's log, so be careful I guess. I used this program to set the toner density to the maximum level (5) and the prints are really deep with completely solid blacks. This would probably work great for making transparencies with nice solid black images for contact exposing UV emulsion PCBs.



**twocvbloke** says:

Jul 16, 2009. 3:19 PM [REPLY](#)

Thanks for the recommendation, I used to have a Brother HL-760 laser printer (free from a skip (dumpster in the US)), never refilled it, only cleaned it out and it worked great until it started "leaking" toner everywhere and then the fuser failed, still 3 years free use!!! :D

I'll definitely have a look for a Laserjet, though never having much luck with them in the past (well, they were ancient, but they weren't mine!!!), they are reliable if you look after them!!! Looking at the 1100, it looks to suit my lack of space, but I'll take a gander at other small desktop models, no chance for the huge ones though, not enough room!!! :D



**pw2009** says:

Jul 16, 2009. 2:48 PM [REPLY](#)

I haven't tried the sponge-way yet, but I like it.

My PCB's take a while to etch in FeCl even though I heat and agitate them. When the board is copper-side down and raised slightly from the bottom of the tray, I noticed that the copper etches significantly faster, but I can't see it etching. When the copper side is up, I think the removed copper forms a film on the top which agitation just moves side to side but still remains on top as a barrier.

On a similar theme: I used cotton wool to remove stubborn areas of photo-etch-resist while developing in sodium hydroxide. I checked points on the PCB (still in the solution) gently with an ohm-meter to be sure the exposed photo-resist has been dissolved. Partially dissolved etch-resist may look done, but it will considerably slow down etching, as will any contamination.

It goes well with another idea from the Internet for using an Epson inkjet printer to create the artwork: selecting photo-quality paper as the medium but actually using Epson ink-jet transparencies. This gets a nice dense image. It's OK if you don't have some better way. See entry for "fotios" at <http://www.diyaudio.com/forums/showthread/t-117898.html> (link tested 16 July 09)



**hairybaroque** says:

Jul 16, 2009. 1:28 PM [REPLY](#)

We are worrying about polluting the water system with tiny quantities of a known fungicide. Would it work to paint your decking or garden fence with the leftovers on a gradual replacement basis? The different colours from the iron and copper in the solution might look nice ...



**TechShopJim** says:

Jul 16, 2009. 2:28 PM [REPLY](#)

That's a cool idea!



**Wieniec** says:

Jul 16, 2009. 1:54 PM [REPLY](#)

You can use hot (180-200C) iron against laminator. And of course "chalk" paper as base (sometimes i use paper from color magazines). It's well know and using method in Poland :)

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