Building an Electrolysis Copper Cleaner

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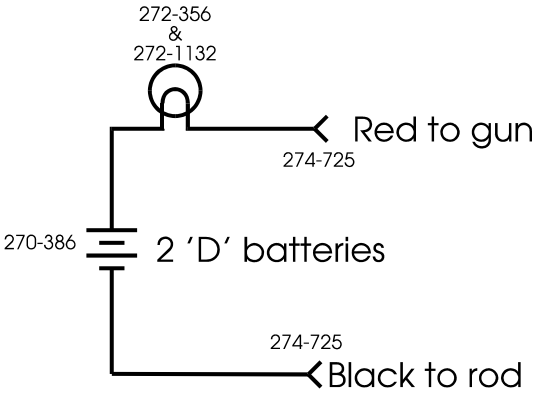
I've been a gun enthusiast all my life. With the advent of the Internet, you can find all types of information for all types of interests. While surfing the web I stumbled upon Fr. Frog's excellent web site, specifically his Homemade Firearms Cleaners and Lubricants page http://home.sprynet.com/~frfrog2/homemade.htm . This project is based on his homemade electronic copper fouling remover.

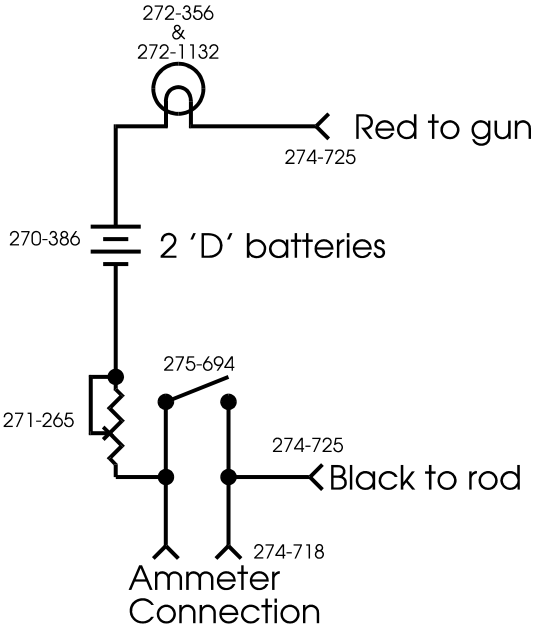
You need to decide just how fancy you want your unit to be. Just as in buying a car, the more options you add, the more money you'll spend! I purchased all the parts I needed at Radio Shack. I have included parts lists for each of the following circuits at the end of this article. Also, each schematic contains the Radio Shack part numbers.



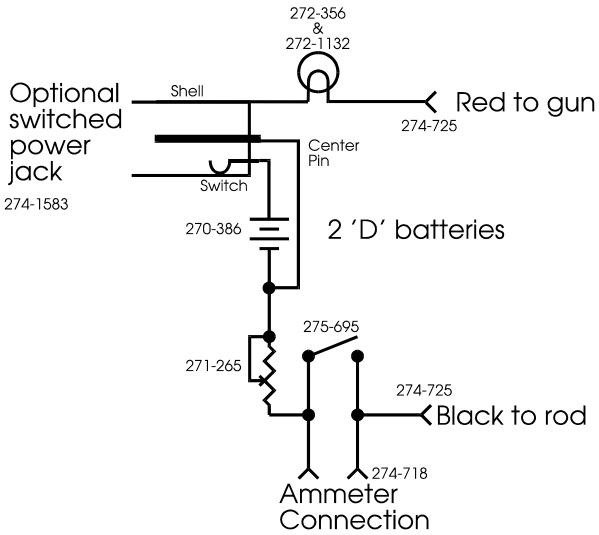
Circuit 1: "Plain Jane" Version

Circuit 1 is the "plain Jane" version. It really is nothing more than a flashlight in a box. This circuit runs at about 100ma and will do the job quite nicely. The lamp is used as a short indicator. If the lamp glows brightly then your rod is touching the barrel and causing a short. In normal operation, the lamp should glow dimly, or not at all. This plan has the battery holder inside the box, so you will need the larger box (270-1806 6" x 4" x 2").

Circuit 2: Current Adjust and Ammeter Connection



In circuit 2 I've added a rheostat to adjust current, and a means to measure the current. This is important especially if you use an external power supply. You should use no more than 200 milliamps (ma). The first time I used my box with just the batteries I could adjust the current from 25ma to 100ma, more than enough to do the job. The switch is used to bypass the ammeter connection. An ammeter must be connected in series with the circuit. If you connect the ammeter, the switch can be in either position for the circuit to work, but must be in the on position (contacts open) for the ammeter to function. (See my notes on installing the DPDT switch) If you don't connect the ammeter, the switch must be off (contacts closed) for the circuit to work. If you connect the ammeter, set the rheostat to the minimum position. If the rod is touching the barrel causing a short you could damage your ammeter. Same comment about putting the battery holder inside the box.

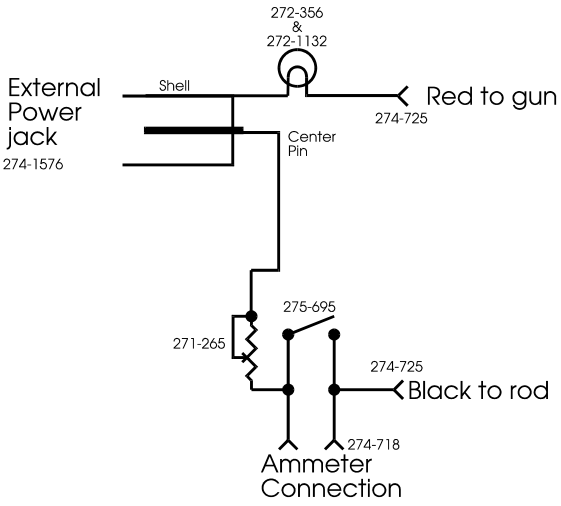


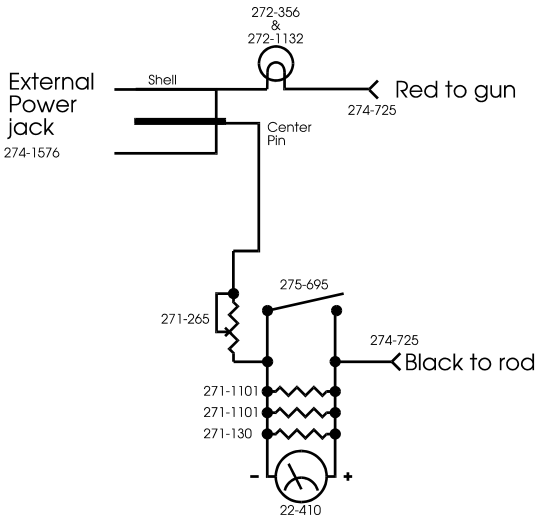
Circuit 3: External Power w/Current Adjust and Ammeter Connection

The DC power jack (274-1583) allows you to connect an external 3 volt power supply. This jack has an internal switch to disconnect the battery if the power supply is connected. Pay attention to how this jack is connected. Your power supply must have a **negative** tip; i.e. tip polarity must be negative. This switched power connector is used if the battery holder is inside the box.

Circuit 4: External Power

The batteries in this circuit are not inside the box, so the smaller box is used. Instead, a power plug is connected to the 2 'D' battery holder, which is then connected to the power jack to provide power. When connecting the power plug to the battery holder, connect the black (negative) wire to the pin, and the red (positive) wire to the shell. You can substitute the power jack for the internal batteries in any of the above circuits. Instead of batteries you can use a 3-volt AC/DC power supply. This will prevent you having to replace batteries if you use your unit frequently.





Circuit 5: The "Deluxe" Version w/Ammeter

I actually built circuit 2, improved it to circuit 3, then settled on the deluxe version. Radio Shack sells a panel meter graduated in volts up to a maximum of 15. Circuit 5 uses this meter in series with two 10-ohm resistors, and a 0.47-ohm resistor. Do **not** install the 15K-ohm resistor that comes with the meter. This is used for measuring volts; we are measuring milliamps. I left the switch in the circuit so I could disconnect the ammeter. (Actually the switch shorts across the ammeter so it effectively reads 0ma.) Remember, now that you have an ammeter connected all the time, either start with the rheostat in the minimum position, or the switch off before you connect power in case the rod is shorted to the barrel. If you don't and you do have a short you could damage your meter.

Besides the electrical parts, you will also need:

Rubber stoppers (2)
White vinegar 1 part (1 qt)
Ammonia 1 part (1 qt)
Distilled water 2 parts (1 gal)
1/8"x 36" stainless steel TIG welding rod (2)
8 x 3/8" sheet metal screws (2)

I purchased the rubber stoppers and sheet metal screws at my local hardware store, the chemicals from Wal-Mart, and the TIG welding rods from a local welding supply house in town. However, there are plenty of welding suppliers on the web if you can't find a

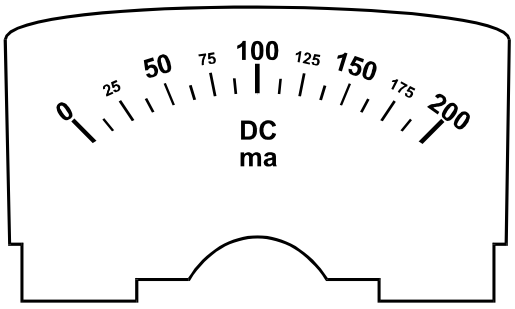
local supplier. To mix your solution, pour out half of the distilled water, then replace with the vinegar and ammonia.

As mentioned before, I started with circuit 2, then improved it to circuit 3. I drilled all the mounting holes in the plastic box and mounted all the hardware before wiring the circuit. The box comes with both a plastic and aluminum cover; I used the plastic because it's much easier to drill. I installed the banana jacks (274-725) on one end, and the 2 D battery holder (270-386) inside the box on the opposite end. I installed the DC power jack (274-1583) on the side of the box away from the battery holder, and all other components on the top also away from the battery holder.

The battery holder takes up about ½ of the inside volume of the box, which is why I had to install all components in/around the open half. (I had to remove the battery holder when I installed the panel meter.) When installing the dual chassis mount jack (274-718) be sure the holes for the test leads are oriented correctly. After I assembled my box I found I had rotated one of the posts 90degrees which made connecting the test leads for my ammeter difficult. After installing all the hardware you can solder the connections.

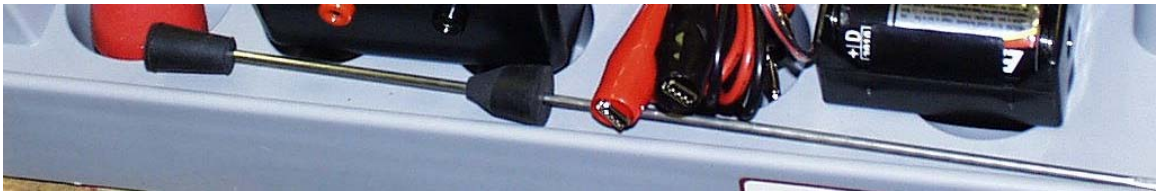
The switch is actually a double-pole, double-throw (DPDT) switch. The rocker is imprinted with a '1' and '0' to indicate on and off. I wanted this to indicate if the meter was connected (1) or not (0), but if you note the schematic, the meter works when the switch is open. I connected the switch so when it is in the '0' position it shorts across the meter (contacts closed), and in the '1' position the contacts are open.

If you wish to install the meter, you can change the meter face to read 0 – 200ma. Here is the template, which you can print on self-adhesive label paper. Carefully remove the clear plastic cover from the meter. It pops off of the meter by loosening the barbed catches from the rear. Position the new face over the original and press in place. Replace the cover and install the meter in the unit.



Prepare the test leads by unscrewing the plastic probe body and snipping off the tips. Connect the test leads to the corresponding colored alligator claw clips. Be sure to slip the insulator on the wire **before** connecting the clips. You can save some money by purchasing test probe wire and connecting directly to the circuit through a hole in the side of the box. Connect the clips to the other end of the wires.

I purchased two of the smallest rubber stoppers I could find at my local hardware store. I drilled a 3/16" hole halfway through the first stopper from the small end. This is used to plug the chamber and hold the stainless steel rod. I drilled a 3/16" hole completely through the second stopper, then mounted it on a 1/4" drill bit and chucked it in my drill. With my drill running, I held the narrow end of that stopper against my running belt sander and narrowed the end until it would fit most caliber barrels.



My test gun was my S&W 629 .44 magnum Trail Boss. It has a 3 1/2" Magna-Ported barrel, but after my last cleaning, I noticed quite a bit of copper fouling. First I thoroughly degreased and dried the barrel as instructed on Fr. Frog's web site. I chucked the revolver in my gun vise with the muzzle up. I cut about 12" of stainless steel welding rod and inserted it through the barrel into the chamber stopper (the one with the hole drilled only halfway through). I then firmly pressed the stopper into the chamber. I then took two pieces of duct tape to cover the Magna-Ports. I used the de-soldering bulb to squirt the ammonia/vinegar solution into the barrel. I then slipped the muzzle stopper over the rod until it touched the muzzle, thereby centering the rod in the barrel.

With this first test I decided to use just the batteries. I connected my test leads to the correctly colored jacks on the end of the box, then connected the red clip to the revolver frame, and the black clip to the rod and left it connected for 45 minutes. I adjusted the rheostat for maximum current of 100ma. After I removed the clips, drained the barrel, and removed the rod I found the rod was coated with a dark green/black residue, and the barrel was bright, shiny clean. Obviously my little homemade cleaner worked. The rod can be cleaned with fine steel wool and can be used over and over again.

My second test was with a 1911 barrel that I have been using for 3-gun competition with copper jacketed ball ammo. This time I used the AC/DC power supply. Using this supply I could adjust the current from 50ma to 170ma. I adjusted the current for 100ma and left the circuit connected for 45 minutes. As before, the rod was coated with a dark green/black residue, but the barrel was clean.

You can use this product with the commercial cleaning solutions used with these types of electric cleaning units, but remember because the homemade unit runs at a higher current, you only need to let it run for 45 minutes or so.

Parts Lists

Circuit 1

270-1806	Project box 6” x 4” x 2”
270-386	2 D-cell battery holder
272-356	Lamp Base
272-1132	2.47 volt lamp for above base
274-725	Banana jacks (for leads to gun)
278-704	Test leads
270-349	Claw clips
278-1218	22 gauge stranded hookup wire
64-2086	De-soldering bulb (used as a dropper)

Circuit 2

270-1806	Project box 6” x 4” x 2”
270-386	2 D-cell battery holder
272-356	Lamp Base
272-1132	2.47 volt lamp for above base
271-265	25 ohm rheostat
274-416	Knob for rheostat
274-725	Banana jacks (for leads to gun)
274-718	Dual chassis-mount jack (for ammeter connection)
278-704	Test leads
270-349	Claw clips
275-695	DPDT rocker switch
278-1218	22 gauge stranded hookup wire
64-2086	De-soldering bulb (used as a dropper)

Circuit 3

270-1806	Project box 6” x 4” x 2”
270-386	2 D-cell battery holder
272-356	Lamp Base
272-1132	2.47 volt lamp for above base
271-265	25 ohm rheostat
274-416	Knob for rheostat
274-725	Banana jacks (for leads to gun)
274-718	Dual chassis-mount jack (for ammeter connection)
278-704	Test leads
270-349	Claw clips
275-695	DPDT rocker switch
274-1573	DC Power Plug, 5.5 x 2.5mm
274-1583	DC panel jack with switch 5.5 x 2.5mm
278-1218	22 gauge stranded hookup wire
64-2086	De-soldering bulb (used as a dropper)
273-1755	Optional 3v 500ma AC – DC power supply (use tip ‘N’ 5.5 x 2.5mm)

Circuit 4

270-1805	Project box 6” x 3” x 2”
270-386	2 D-cell battery holder
272-356	Lamp Base
272-1132	2.47 volt lamp for above base
271-265	25 ohm rheostat
274-416	Knob for rheostat
274-725	Banana jacks (for leads to gun)
274-718	Dual chassis-mount jack (for ammeter connection)
278-704	Test leads
270-349	Claw clips
275-695	DPDT rocker switch
274-1573	DC Power Plug, 5.5 x 2.5mm
274-1576	DC panel jack 5.5 x 2.5mm
278-1218	22 gauge stranded hookup wire
64-2086	De-soldering bulb (used as a dropper)
273-1755	Optional 3v 500ma AC – DC power supply (use tip ‘N’ 5.5 x 2.5mm)

Circuit 5

270-1805	Project box 6” x 3” x 2”
270-386	2 D-cell battery holder
272-356	Lamp Base
272-1132	2.47 volt lamp for above base
271-265	25 ohm rheostat
274-416	Knob for rheostat
274-725	Banana jacks (for leads to gun)
278-704	Test leads
270-349	Claw clips
275-695	DPDT rocker switch
274-1573	DC Power Plug, 5.5 x 2.5mm
274-1576	DC panel jack 5.5 x 2.5mm
22-410	Panel meter
271-1101	10 ohm, 1/2 watt resistors
271-130	0.47 ohm, 5 watt resistor
278-1218	22 gauge stranded hookup wire
64-2086	De-soldering bulb (used as a dropper)
273-1755	Optional 3v 500ma AC – DC power supply (use tip ‘N’ 5.5 x 2.5mm)