

The Details

What do you need to make this work? Not much, really:

- A large non-conductive container that will hold the part in water - A Rubbermaid tub, a plastic bucket, or a large non-metal trash can all work great as long as they don't leak.
- A battery charger or other source of 12V DC power.
- Wires or cables to connect the electrodes together.
- Sacrificial electrodes. Iron re-bar works great, but stainless steel is very bad (and the result is illegal and dangerous).
- Sodium Carbonate. Arm & Hammer LAUNDRY Soda, also known as [washing soda](#), is a good choice and what I used when I originally did this. I've also been informed by one of my readers, Chuck Wuest, that DuPont's Pool Care pH Increaser is 100% sodium carbonate, is readily available at home centers and pool stores, and comes in a nice moisture resistant container. Thanks, Chuck!
- Some chains or steel wire to suspend the part in the solution - copper wire is bad and messy.
- Water

The basics are pretty simple.

1. Find a container big enough to hold your part, plus some room to spare for the electrodes - they must not touch the part for this to work.
2. Fill the container with water and add 1/3 to 1/2 cup sodium carbonate (aka, laundry soda, etc.) per every 5 gallons of water. Mix thoroughly.
3. Position the sacrificial electrodes around the edge of the container and clamp them in place so that you have at least 4" of electrode above the water to connect to. The more the merrier - this is essentially a "line of sight" process between the part and the electrodes.
4. Wire all of the electrodes together so they are, electrically speaking, one big electrode. Make sure all connections are on clean metal and sufficiently tight to work.
5. Suspend your part in the solution using the wire/chains so it is not touching the bottom and is not touching any electrodes. The part must be electrically connected to the support mechanism and not connected to the electrodes for this to work.
6. Attach the battery charger **NEGATIVE** lead to the part and the **POSITIVE** lead to the electrodes. *Do not get this backwards!* If you do, you'll use metal from your part to de-rust your electrodes instead of the other way around -the positive electrodes are sacrificial and will erode over time. That's how the water becomes iron-rich.
7. Double check everything to be sure the right things are touching, the wrong things are not touching, and the cables are hooked up correctly.
8. Turn on the power - plug in the charger and turn it on.

Within seconds you should see a large volume of tiny bubbles in the solution - these bubbles are oxygen and hydrogen (very flammable!). The rust and gunk will bubble up to the top and form a nasty gunky looking layer there. More gunk will form on the electrodes - after some amount of use, they will need to be cleaned and/or replaced - the electrodes give up metal over time. That's why re-bar is such a nice choice - it's cheap and easy to get in pre-cut lengths.

The process is self-halting - when there is no more rust to remove, the reaction stops. This is handy because you don't have to monitor it, and because you can do large parts where they are not totally submersed at one time (aka, by rotating them and doing half at a time) without worrying about "lines" in the final part.

Once you are done, the part should immediately be final cleaned and painted - the part is very susceptible to surface rust after being removed from the solution. There will be a fine layer of black (I think it's black oxide) on the part that can be easily removed with your favorite cleaning method. Once it is removed, the part can be primed/painted as needed.

Safety Precautions

You're playing with serious stuff here, so stay safe. It's not rocket science, but if you're new to this, you might not know all of this - so read up *before* you do any of this.

- This process produces highly flammable and explosive hydrogen gas (remember the Hindenburg?), so do it outside, or in some other well ventilated area. Hydrogen is lighter than air (like natural gas), so it will collect near the ceiling - *not* sink to the floor like some other flammable vapors will (like propane and gasoline). If you have open flames near this (Hint: gas appliances like water heaters and furnaces have pilot lights!) you will most likely severely injure or kill yourself (and others near you) and become a contender for the Darwin Awards in the process.
- Assuming you used re-bar and steel wire/chain like you were told to, the waste water resulting from this is iron-rich - it's perfectly safe to pour it out onto the grass and your lawn will love it. Beware of ornamental shrubs that don't like iron-rich soil though, unless you *like* making your wife mad at you.
- Make sure the battery charger (or whatever source of power you use) stays dry. All of the usual cautions about any electrical device in a wet environment apply here.
- The solution is electrically "live" - it is a conductor in this system. Turn off the power before making adjustments or sticking your hands into the solution. You can get a mild shock if you stick your hands into the water with the power on.
- The solution is fairly alkaline and will irritate your skin and eyes. Use gloves and eye protection. Immediately wash off any part of your body the solution

comes into contact with with plenty of fresh water.

- Don't use stainless steel for the electrodes. The results are toxic and illegal to dump out.
- Don't use copper for the electrodes and anything else in the water - the results are messy.

If you are unsure of any of this or unsure about your safety - STOP! Get help before you do something stupid. Use common sense, be smart about what you're doing, and stay safe so you can finish your restoration project and enjoy it.