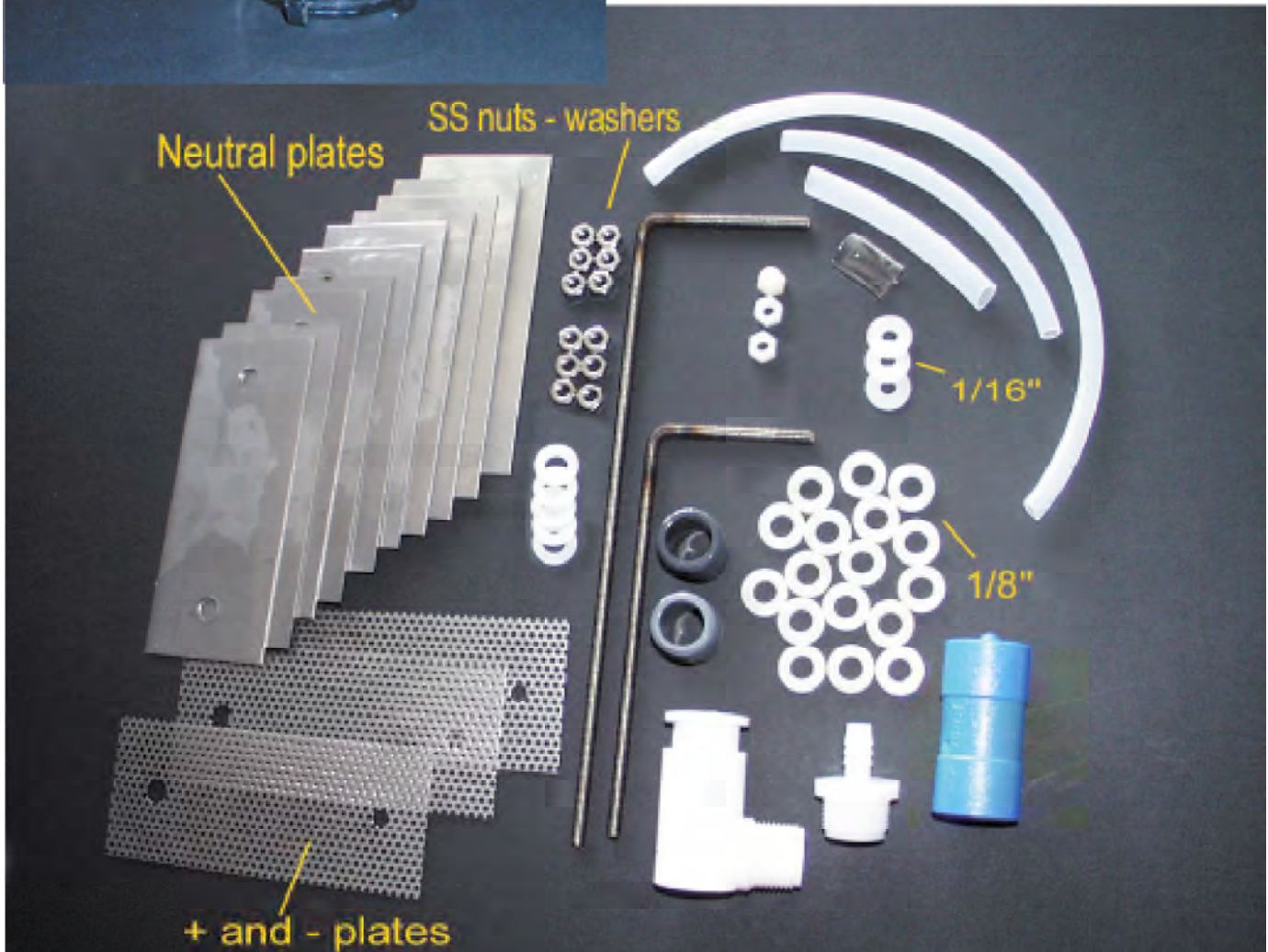


## Instructions for Assembling the 13 plate "Clear Education Cell"

I hope you will enjoy the education and the awareness of making a hydrogen/oxygen homemade fuel cell. A cell that does not burn one ounce of a hydro-carbon to make it. Unlike the hybrid cells made by the major car manufactures, this hydrogen/oxygen cell runs off of pure H<sub>2</sub>O and 12 volts from your vehicle's battery. It will add a mixture of hydrogen/oxygen to the air intake of your fuel. You can add a MC-12 PWM circuit to the cell, inwhich pulses the DC current & you will produce the magic Brown's Egas. Adding a catalyst to your existing fuel. To start I have to have you read the "Terms & Conditions" from Hydrogen Garage LLC, written by a lawyer, for lawyers and law suits. Since we are liable, we have to cover ourselves the best we can. I also believe in safety. Safety is no accident. All through these assembly instructions we will always be safety first. Respect for the power of hydrogen will always be first. ( This cell design in published and given away to the public, therefore no one can patent over this particular design. Enjoy.)



## **TERMS & CONDITIONS of HYDROGEN GARAGE LLC**

Viewers and users of this website, linked pages, affiliated pages, files, etc. are granted access to and use of the information contained herein under the following conditions.

Hydrogen Garage, LLC grants you a limited license to access and make personal use of the contents herein. The information contained herein is intended solely for educational and entertainment uses. For this reason, no advice or information, whether oral or written, you obtain from this website, and/or affiliated and/or linked websites, whether oral or written, shall create any warranty (express or implied) whatsoever. This disclaimer of liability applies to any damages or injury caused by any failure of performance, error, omission, defect in transmission, computer virus, any unauthorized access and unauthorized alteration of the content herein whether for breach of contract, tortuous behavior, negligence, or under any other cause of action. User specifically acknowledges that Hydrogen Garage, LLC is not liable for the defamatory, offensive or illegal conduct of other users or third parties and the risk of injury of injury from the foregoing rests entirely with the user.

By viewing, using, and visiting this website, user acknowledges that any alteration to a vehicle can result in the breach of various warranties provided by their manufacturers, distributors, or sales dealerships. User acknowledges that he or she shall hold harmless Hydrogen Garage, LLC, its affiliates, sponsors, whether in their own personal capacity or representative capacity through corporations, partnerships, and the like in any event a warranty is thereby nullified. Moreover, user acknowledges that he or she is hereby apprised or does already know the fact that various alterations of their vehicle, no matter how minor or insignificant may not be in compliance with the laws of their particular state, jurisdiction, county, or other Federal law. Hydrogen Garage, LLC expressly urges all users to refer to all laws to ensure they are in complete and fastidious adherence therewith. Hydrogen Garage, LLC does not advocate the violation of any laws for any purposes whatsoever. User agrees to use this website contingent upon his or her agreement to abide by all applicable laws.

Furthermore, user is warned that various alterations may be very hazardous especially with respect to the energy systems of the vehicles. Hydrogen Garage, LLC denies all responsibility for any injuries or damages resulting from alterations to the fuel systems. Due to the dangerous nature of working with the fuel or energy systems of vehicles, Hydrogen Garage, LLC expressly warns and recommends that any alterations to their vehicles be made by a licensed, certified, and experienced professional. Moreover, any alterations, and experiments promoted in this site is intended for use on private property (ie. not to be used with publicly subsidized and accessible roads) and exclusively for recreational vehicles. In all cases, user acknowledges and expressly takes the risks attendant to the undertaking of any experimentations or alterations to any vehicle due to the contents of this website.

In addition to the terms set forth above neither Hydrogen Garage, LLC nor its affiliates, whether acting in their personal, representative, or corporate capacity, and their respective officers, directors, employees, agents, attorneys, accountants, consultants, advisors, and partners shall be liable regardless of the cause or duration, for any errors, inaccuracies, omissions, or other defects in, or untimeliness or minute of, the information contained within this website, its linked pages, sponsors, and affiliates.

All foregoing contents are the sole intellectual property of Hydrogen Garage, LLC. & HydrogenGarage.com

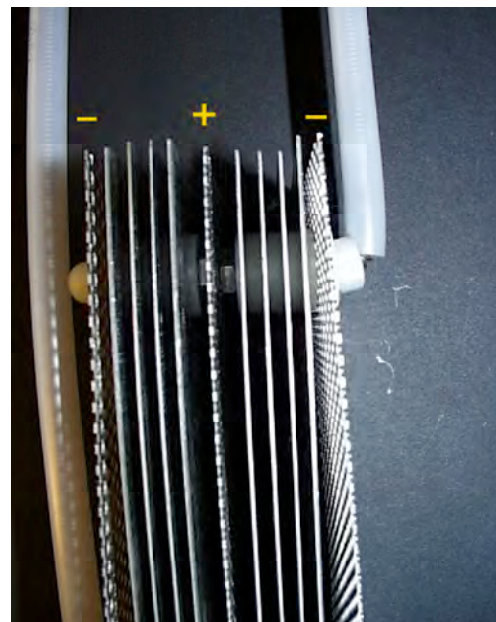
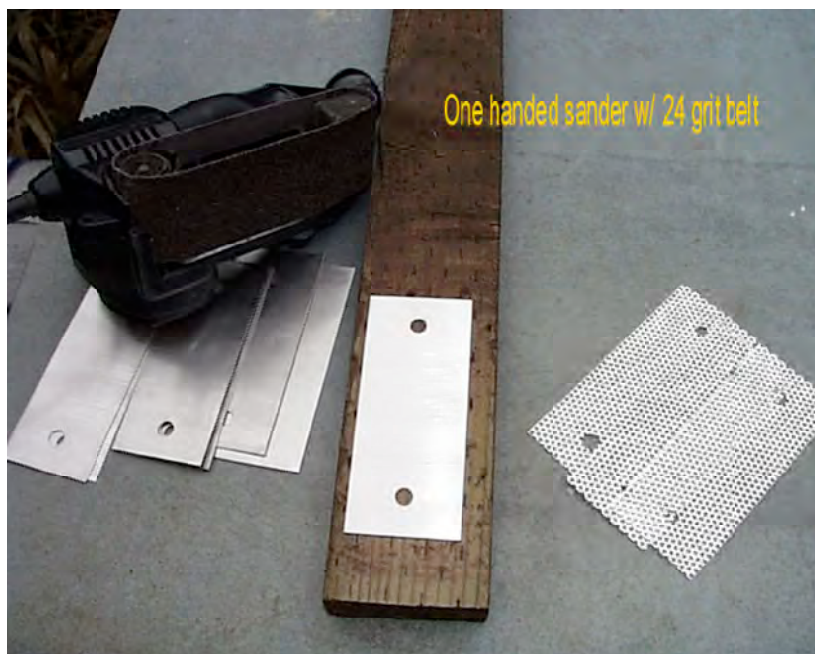


## Repeat :

After washing the plates, acquire rough grit sandpaper, 40-60 grit for scoring the plates with a criss cross pattern, the more scratches the better. The rough surface is part of the catalytic conditioning process of the plates. It allows the hydrogen /oxygen bubbles to come off the edges of the soaring. You must use the roughest grit you can find. We buy the black paper, but the red oxide works too. Score the perforated as well. Score both sides, after scoring wash again 7 again with dish soap and water.

## BEGIN ASSEMBLY

Wash Stainless steel before assembly with dish soap scrub all the SS plates and nuts and especially the threaded rod. I use one of those green scoring padded sponges, that you get from your kitchen sink. Steal the old one and tell your wife to buy a new one for the dishes. You want to wash off any oil from the plates and especially the treaded rod that was turned with cutting oil. Any oil left on the steel will result in contaminants in the cell, later Repeat and wash hands too. Score and cross hatch each plate w/ min 60 grit black sand paper, I used a one handed belt sander w/ 24 grit belt, but be careful w/ larger sanders. By hand is safest.



## Assembling Instructions

**The "13 Plate Cell"** The 13 plate cell runs approx. 2v- 2.2 volts between each plate. You will hook up 12-14 volts at the top of the cell, but the voltage between the plates will be divided up to approx. 2 volts between each plate. Bench test the voltage later by hooking up to battery and taking a voltmeter and test between the top of each plate, one by one, then this part will make more sense to you. This cell will stay clean, no anode sludge should build up, it should stay clean for about 2-3 months of driving. The lower voltage absorbed by the 10 neutral plates makes this cell stay cooler. I will be warm to touch after an hour of driving, but not hand burning hot as a 12 volt cell can get. No erosion or oxidation of the electrodes, with 2 volts. The plates will tinted a bronze color later, this is a part of the conditioning process. This cell will last for years, as long as you make sure no 12 volts between the stainless is exposed under water, later we show these areas of 12v exposure.



**Assembling Instructions :**

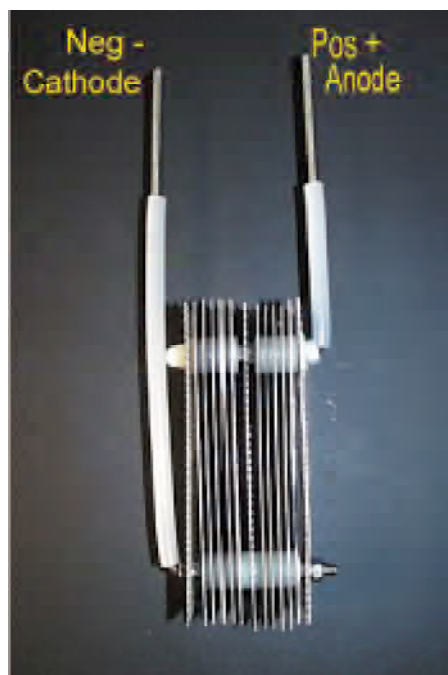
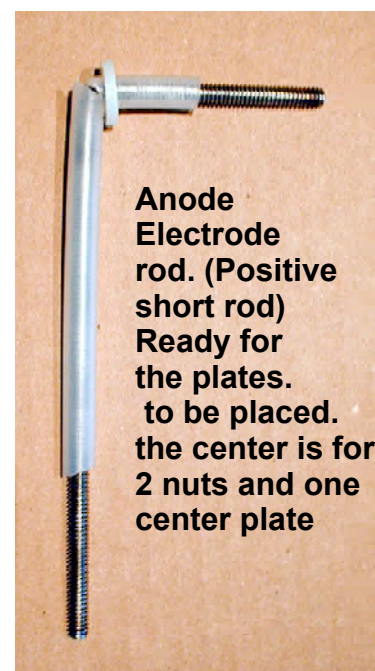
**Step 1**

Start with the 1/4" 316SS threaded and bent rods. Make sure the pre-bent rods are as close to 90% angle. You might have to bend them to a perfect 90 degree angle in a vise with a rag wrapped around the threads to prevent thread damage.

**The longer rod is for the Negative (cathode) & the shorter rod is Positive (anode).**

**Step 1 :Assemble the first cathode plate;**

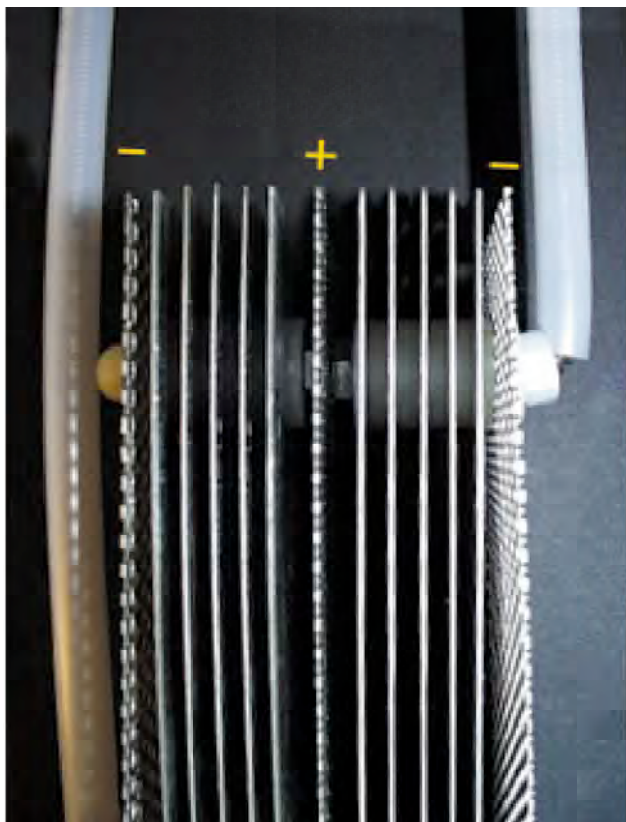
Thread the first nut as far as it will go, tighten real good, all the way to the 90% bend. Slide the first perforated plate onto the rod followed by another SS thin nut, tighten real good, as tight as you can get it, as if it will never get loose with all the car vibrations and many road trips. Make sure the rod and plate are parallel. Also make sure the larger 3/8" hole is below, the 1/4" punched hole fits the 1/4" rod. Next cut a piece of 1/4" ID tubing with 3/8" of thread showing. Then add a cut lg tubing piece 3/16" to fit over the thin SS nut, see photo, to insulate the nut to the next neutral plate.



As you assemble the 13 plate set, keep in mind that you want to keep an even 1/8" spacing between the plates, as possible. If it gets a little wider to 1/4" that is OK. The wide 1/8" nylon washers work well at keeping this 1/8" space, towards the center plate and end plates it usually goes a bit wider to 3/16" to 1/4" that is OK. Also isolating the threaded rods as they come down into the container is another must. Also the use of Marine Goop on the bends after assembly. To keep 12 v. exposure as isolated as possible.



When assembling this cell, remember, the neutral plates never touch each other or any metal, the 3/8" punched holes ride on the 3/8" OD tubing, so it never touches the rod. Even the SS nuts cannot touch, The SS nuts are covered by the larger diameter tubing, the clear 1/2" vinyl tubing, just as long as they isolate from each other. Also you should pre assemble first, take it apart and then re-assemble tightening the SS nuts to the plates as tight as you can get it, and also as parallel to the plate as possible (rod to plate). The idea is once you finish assembling the plates, you will not have to re-do it later, after year of use. Also when using the nylon nuts, don't over tighten, they can strip easily.

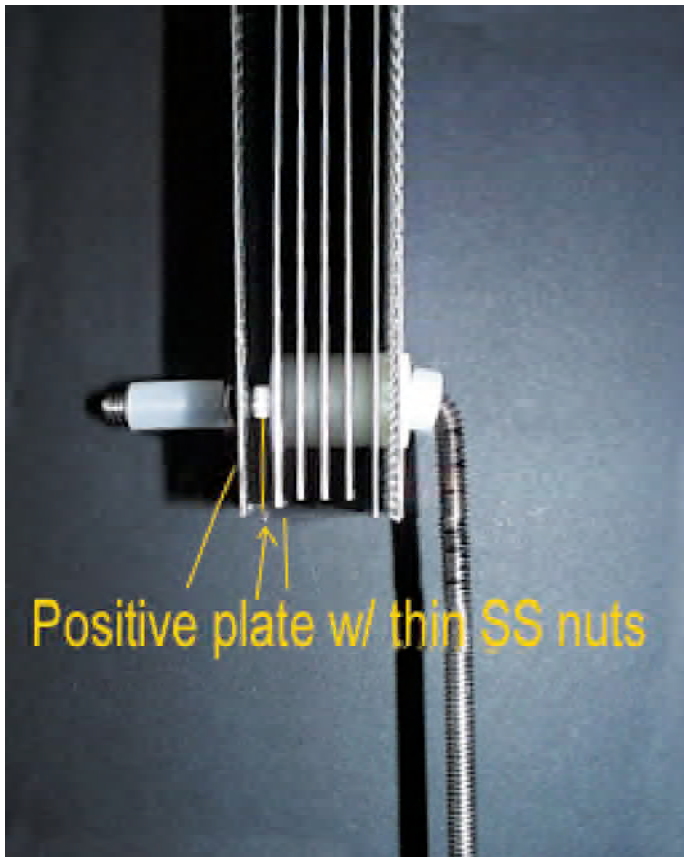


## Step 2 :Assemble the anode plate

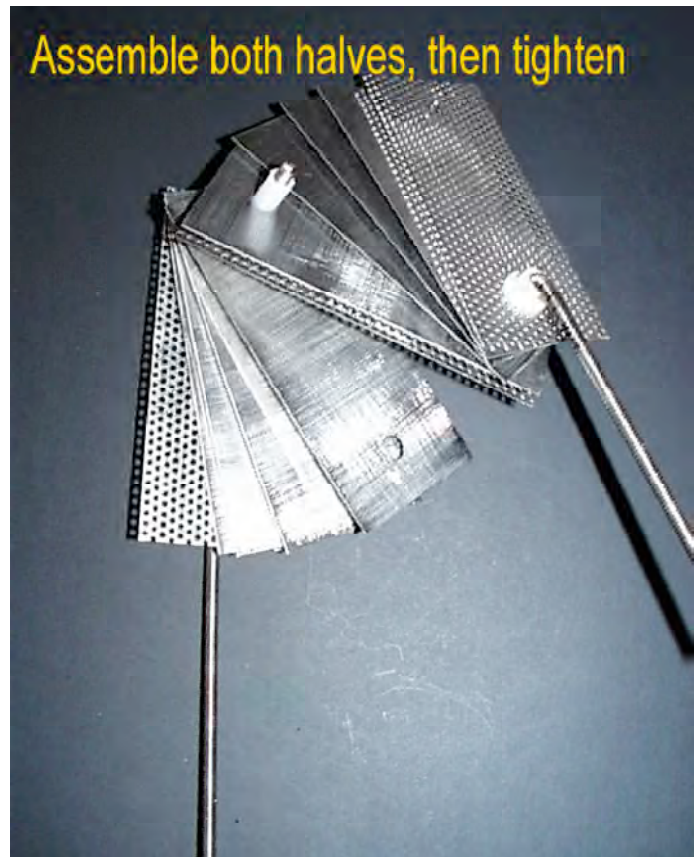
Thread on a nylon nut to the bend as far as it will go, carefully. Add a piece of 1/4" tubing a bit longer than half way, you'll trim later. Next add a 1/8 x 3/8" ID nylon washer. {Note, keep this tubing against the nylon nut so the Neg plate NEVER touches this anode rod. Next, add another 1/8" nylon washer & proceed to stack this half w/ 4 neutral plates spacing each w/ a 1/8" washer. Do likewise on the Neg cathode rod, step 1, but adding a long length on tubing to insulate the pos plate added later.

**Step 3:** This shows progress w/ a Neg to plate to start, and four neutral plates, all spaced 1/8" ideally Negative now half completed, remembering to keep tubing against nut so the begriming neutral remains neutral by not contacting the cathode rod - ever. Ideally, an 1/8" is the optimum spacing @ all plates. When a nut is applied, just add a thin washer in addition to the 1/8" to make equal the distance between each.



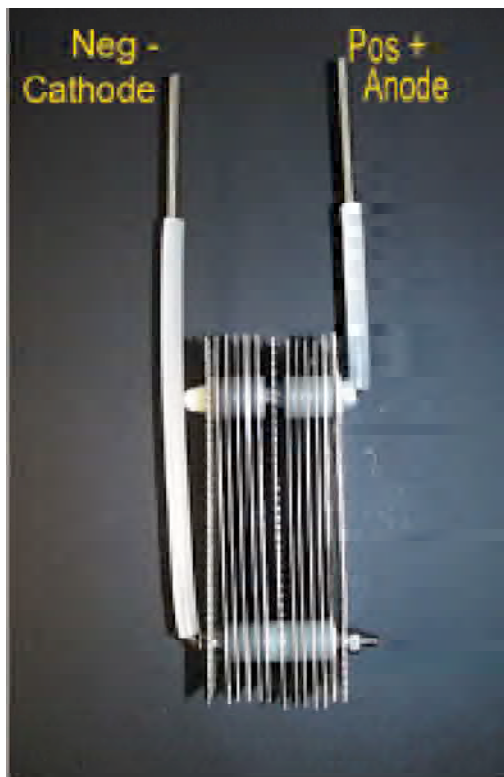


This detail shows Pos - Anode assembly, note that Pos plate is secured w/ a thin nut on either side of the + plate, on the Pos rod. Work out the length of the short pieces of tubing between the center + plate to insulate the neutral & Neg - end plates from the Pos + rod.



Next, leaving all but the starting nuts loose, the two halves can now be assembled to make the entire unit. I have to stress this issue about tubings that need to end against a nut & washers that slip over tubing need to do just that, because they can & will move until put in their correct order upon tightening the final nuts. Cut plastic tubings to leave enough thread to allow a nut & washer, plus a little at each of the ends.

All plates in proper order & note the use of washer size, type, etc. Pos. rod ends w/ a nylon nut, to insulate at Neg. rod w/ tubing. Try to maintain an 1/8" spacing.

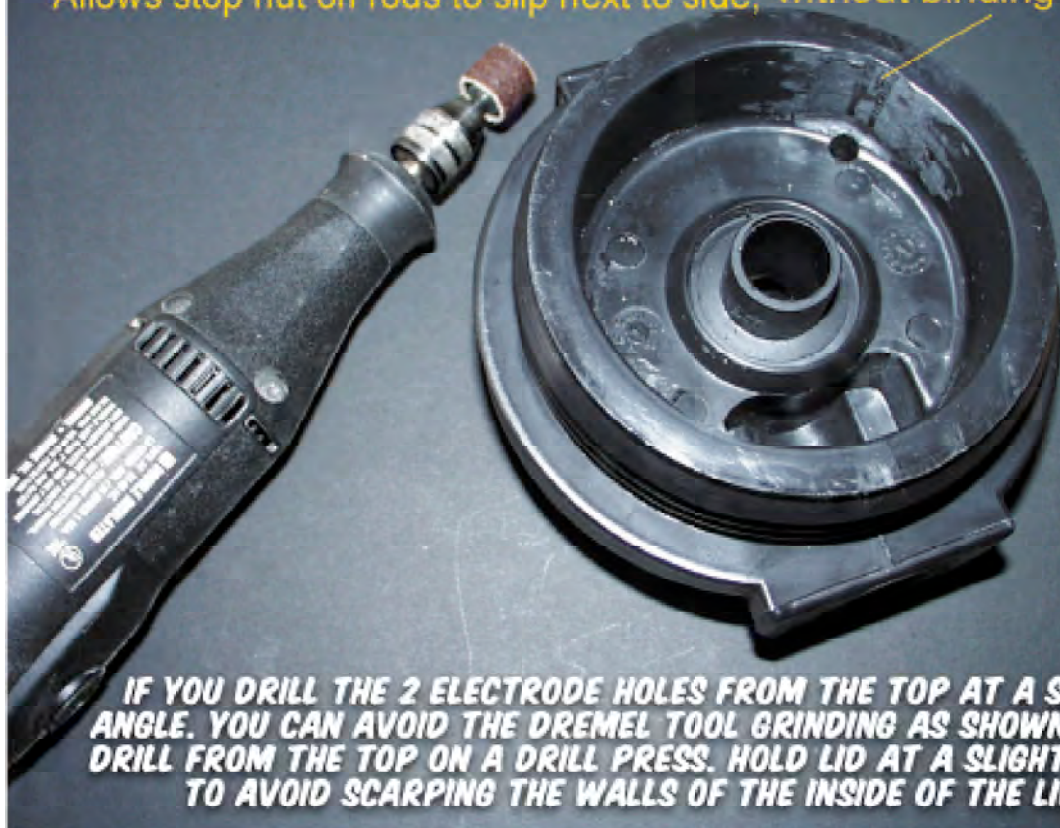


Remember the center plate is the Positive plate, it is sandwiched between 2 SS thin nuts. The 2 Negative plates are on the ends. Both the Positive and Neg. plates are the perforated plates.

You will have to bend in the corners of the outside perf. plates by about an 1/8" in and about a 1/2" down on the bottom edges on the plates that fit into the clear housing. The bottom dia. of the clear filter housing has a narrower dia. than the top. Bending in the lower 4 edges, with a pair of pliers, stops any scraping on the sides of the clear housing down near the bottom of the filter housing. This is one of the parts that stopped us from making a 13 plate cell, we were prior, a 11 plate cell assembly. The bending of the edges works & fits.

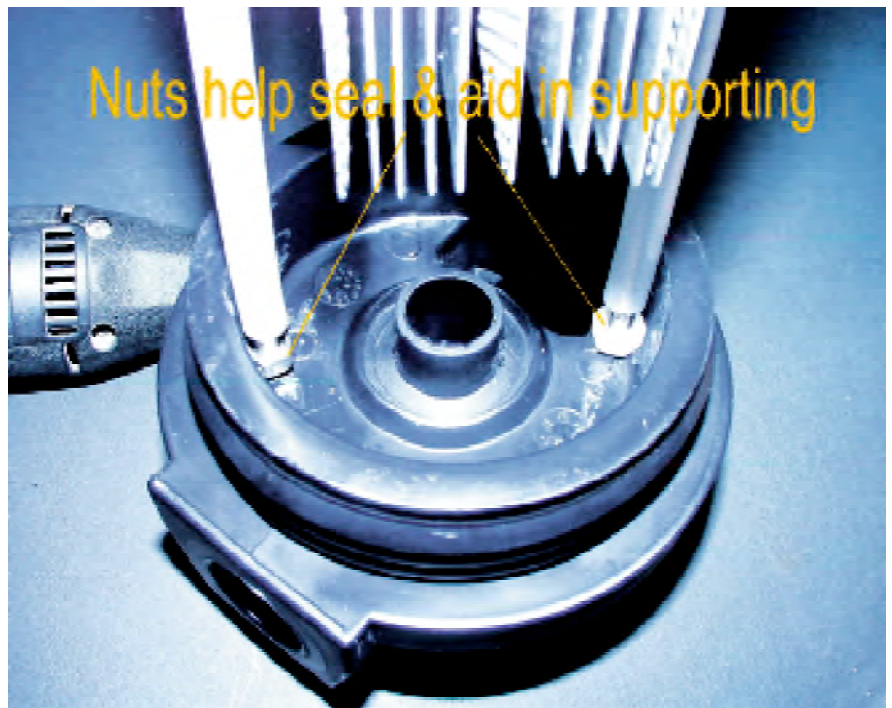


Remove some material on inside wall surface @ rod hole  
Allows stop nut on rods to slip next to side, without binding



#### Step 4

You'll need to drill two 1/4" holes through the lid from the top, so the rods pass up through the lid & out the top. If you drill down at a slight angle you can escape scarping the edge of the inside of the lid. You can also have the plastic isolation tubing around the 1/4" threaded rod go right up to the edge of the lid. In the photo to the right, Larry manage to get his plastic isolation tubing a nut inside the lid. That is OK, but not necessary. The water level never goes that high up, it may slush up there, but rarely. This design is very anti-slush, due to the cylinder and the plates acting like baffles.





Here is a close up photo of the Marine Goop, (from Amazing Goop available in most hardware stores.) that is added to the rod's bent corners to prevent any 12 volt leakage & erosion of the electrodes only at these exposed locations. Also the threaded rods must have the clear nylon tubes covering up the threaded rod that goes down into the cell.

Also you have to bend in the perf. plates at the 4 corners at the bottom of the plate assembly. I use a pair of pliers to do this. I start at 1/2" from the end of the perf. plate & bend in about a 1/8" of an inch is all, so that the corners of the perf. plates don't scrap the clear housing. This is how we fit 13 plates into the housing. In the past we could only get 11 plates inside, now we can make it fit and have an even more efficient cell & more cooler running cell.



13 Plate  
Clear  
Blender  
Cell



## Step 5 ; Finished

After you've centered up the unit by stopping the nuts in position, as to keep the fins as low as they can go without touching bottom, or scraping the inside of the plastic jar, add and secure the top nuts w/ SS washers on the lid surface first, to insure a, hopefully sealed condition. Next, add another SS washer per post, w/ the correct sized nuts, depending on the amount of threads showing when done. Put your Pos-Neg wire terminals under the last or top washer or add another washer & apply the P or N between the two, either allows you to tighten the top nut without allowing the terminal to spin at the same time, or very little.

This unit is ready for operation. It will be used w/ a bubbler, otherwise we would have added a "one way check valve" vs an open outlet. Enjoy!





**safety Spark Arrestor / Bubbler.**

to the right bottom is a photo of a simple safety “Bubbler/Spark arrester” Your outgas hose goes to this PVC pipe, filled 1/2 way with water, It stops sparks from a back fire from the carb, if, this shall ever happen. Most modern cars don’t back re, older carb. cars sometimes do. The “Bubbler” also works as a electrolyte trap, so no foaming up cell or bubbles enters our intake. You can place the bubbler anywhere under the hood of your car. article standing. The next photos of the cell insulation is in a GMC truck and I don’t use a Bubbler in this car, just a check value and hooked up to the vacuum system, with a air breather inline, with a needle valve on top to adjust the air in pin hole. The air line is bent at the bottom and sealed on the end and many tiny holes were drilled into the top of the hoses as to make an aerator. This bubbling helps shake off the hydrogen which tends to want to absorb into the metal.

The safety feature of this “Educational Cell” is the white water filler cap. It is a glue mount 3/4” PVC cap. DO NOT glue in place, just shove it on. If the cell ever blows this cap will shoot off first. It is very unlikely a spark will travel all the way up the hose to the cell, most likely any spark would explode the hydrogen oxygen gas at the end of the hose at contact with the e-gas, not way down the hose into your cell. though some say this has happened.



The black 3/4” fitting goes on the end of the check valve, this allows a 1/2” OD black rubber outgas hose or 1/2” OD clear polyurethane tubing to fit inside the back fitting. I do not glue the hose in as a blow off safety feature in case of back fire. The hose will blow off first.

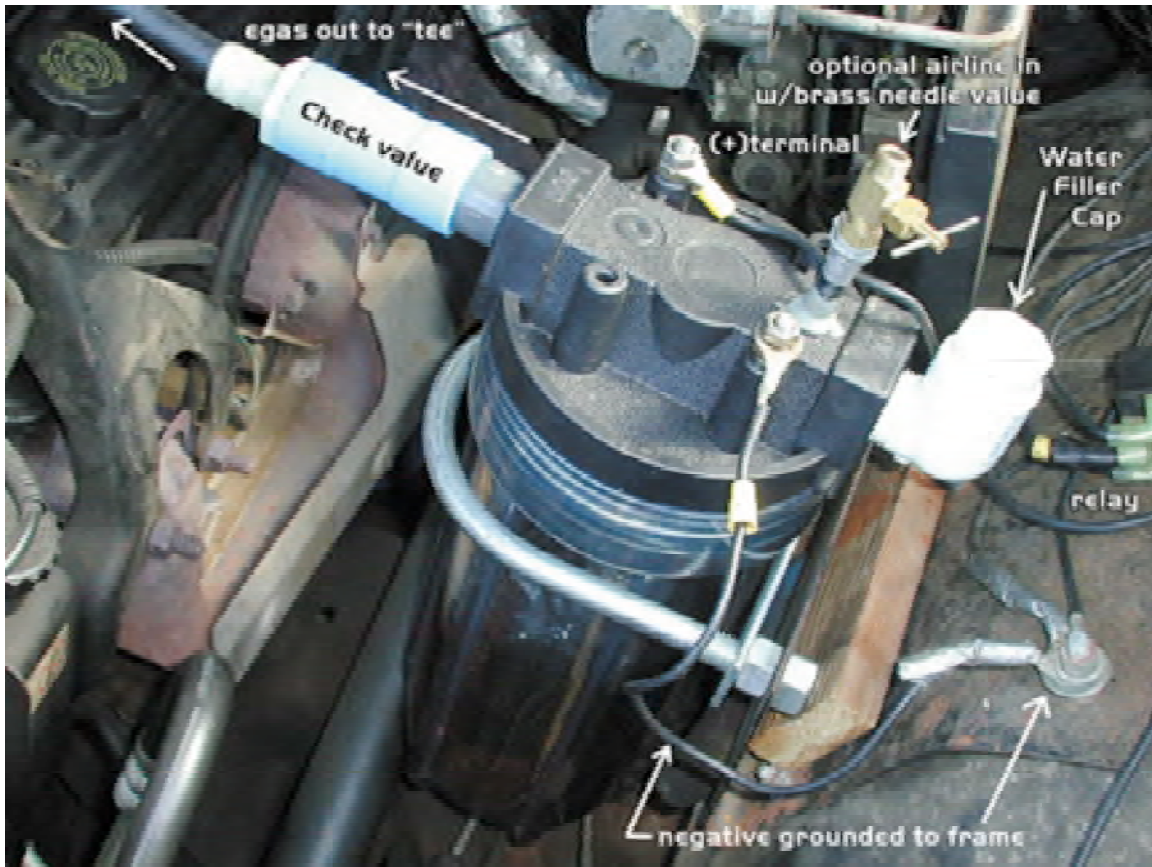
**Lid assembly**

Drill 2 - 1/4” holes for the anode and cathode, 1/4” threaded rod to come up through the bottom of the lid. Either opposite holes will work. Using these long holes help secure the rods tight and helps to get your electrodes rigid. Your out gas will go through the one way check value. Now decide weather you want the out gas 1/2” gas black rubber hose or cleat vinyl tubing, to view vapors. Now you have to decide do I want to add the e-gas to my vacuum system or do I run my outgas hose closest to the intake port, as close as possible. Brown’s gas starts to lose it’s combustion power when mixed with air. It is also the lightest element and tends to want to escape. Burn it before it has a chance to escape. If you decide the vacuum suck in to a tee into your PCV valve that comes out of your valve covers to your carb. “Tee” into that hose. Now the vacuum system only sucks during idle and crusting speeds (70mph). Optional airline in pipe that goes to the bottom of your cell helps bubble off the sticky hydrogen bubbles off the plates. It only requires a pin hole of air. We sell a breather line at the store : stores.homestead.com/hydrogen garage. When you go with the vacuum method, you will be now adding nitrous-oxide to the mix of hydrogen and oxygen. The atmosphere air is about 78% nitrogen, 20% oxygen and 1% argon and 1% other gases. When nitrogen burns it turns to nitrous oxide and out the tail pipe as nitrates or Nox. If you just let the e-gas build up in the cell and travel out your out gas hose to your fuel injection system or carb, you will not be adding air to the mix till it comes out of its hose. In fuel injection systems run the out gas hose up inside the intake housing, so it dangles in the middles of your intake manifold, this way causing a venture and draw to happen.



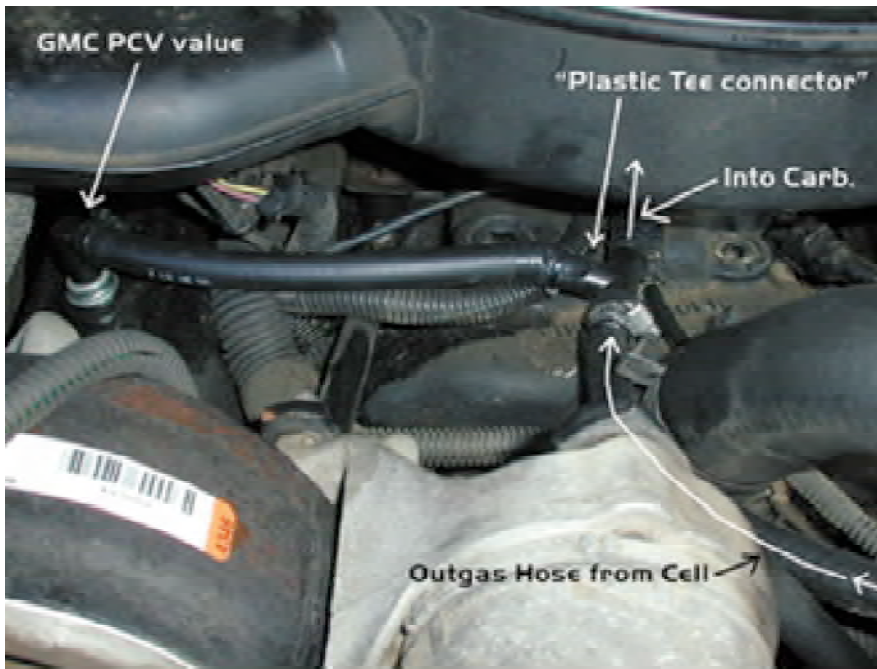
**Simple PVC 2.5” Bubbler/Spark Arrestor**  
10” tall w/rubber plumber’s caps



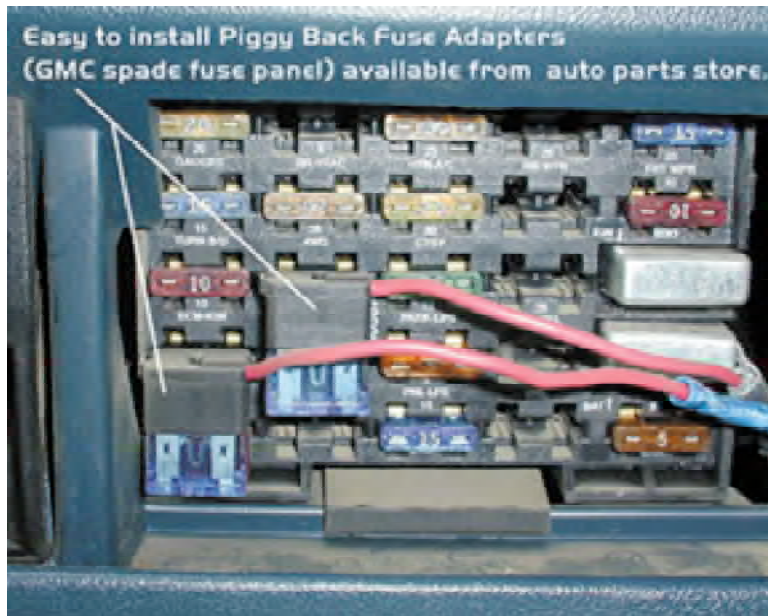


\*Please Note • During long, hot summer driving, you may need to take out the blue Brady check valve out and just use the "Bubbler / Spark Arrestor", as a check value. That way the condensation that collects in the hose will go back into the cell, once the car finally cools down, otherwise your :Bubbler: may fill with too much water. A thing to be aware of, but an easy fix. The air inlet is helps on vacuum systems, or use as an air in pump for diesel trucks.





This photo above shows the vacuum system hook up. Another place to send your out gas hose is into the air injection area or down the throat of your carb. Guys have experienced better mpg when they make the hose go up into the rubber boot, up into the air fuel injection ports, for about 12" or so. It acts like a venturi and draws the egas into the engine.



### Fuse panel

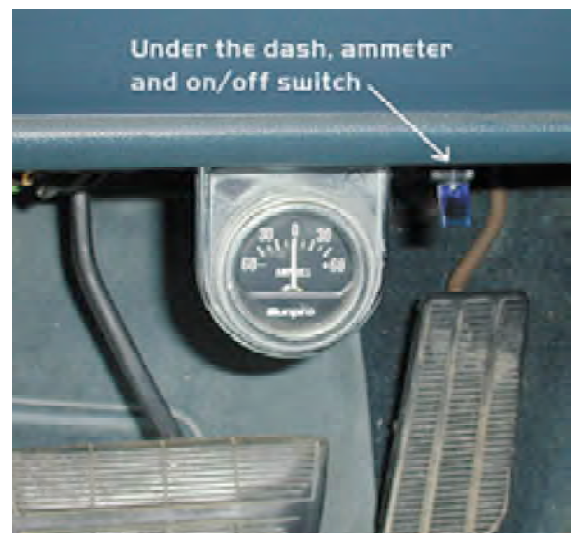
This photo shows the GMC spade type fuse panel. You can buy from a local auto part store. Piggy Back fuses that plug into the back of existing ignition fuse. So your switch is hooked up via your ignition, So when you r engine shuts down your cell shuts down. A SAFETY MUST!

A DC Ammeter under the dash along with a on/off switch close by, lets you know the amperage of your cell. When your cell heats up on a hot day, so will your amps go up. remember 80 degrees is ideal temp for electrolysis, not 120 degrees!

### Under the Hood

This photo shows the vacuum system hook up. Some claim better mpg when they hook up to the vacuum system. Hydrogen Garage recommends you run the hose through the air intake to the air filter itself, right up to it. This way any electrolyte vapors will be trapped in the air filter. Also very rare for a flashback to jump out of the carb. and through the air cleaner to you hose. Running a straight hose into the carb is best mpg. but not a safe place as before the recommended air filter placement. On diesel engines, run the outgas right into the last fuel injection header box on top of the engine, but running before the air filter and turbo booster. An added direction pump into the bottom of the cell helps with mpg. in a diesel pickup truck. I will find on to sell, they are simple 12 volt 1 amp small simple air pumps.

You will get better mpg with a hydrogen booster hooked up to 4 cylinder smaller engine, rather than a SUV or pickup truck. The larger the car's engine the larger the cell needed. This one works well in my truck and any car it will fits under the hood. Smaller cars and use 3" and 4" SS tubing that sell at Hydrogen Garage online. We have hooked this cell up to many different types of cars. They all experience better gas mileage. Also another device that adds better mileage is a simple fuel heater. A SS or Copper solder pipe that fits into your radiator water hose and has a coil of smaller copper or SS tubing inside the tube and your gasoline hooks up to it. The heating of the gasoline, creates a gasoline vapor much easier than cold gasoline. Fuel Injection patents that claim 150-250 mpg all heat the fuel up in some way or another!! An oil guy once told me the Pogue Carb. boiled the gas into a vapor steam. That is a secret in getting better mpg. Every car has different reactions to the newly added hydrogen/oxygen egas. An added square wave pulsed circuit causes true





## Hooking up the egas output hose to the engine fuel intake.

This entire installation, assembly takes a weekend to perform. Buy 10-12-14 gauge stranded auto wire (for sale at auto parts store) and black 1/2" OD. fuel line, or clear vinyl tubing from a hardware store. ( CV Surprisingly lasts under the hood with all the heat.) I don't hose clamp on the hoses (another safety feature, rather have them blow off in case of explosion.)

Some asked : "On your easier they show the hydrogen gas connected thru the PVC vacuum. On a carbureted system this is connected at the carburetor or just below?"

You run the hose closest to the intake (down the throat of the carb.), without getting in the way of the butterfly valve. Watch out if your car backfires, then straight down the throat of the carb would be dangerous in case a spark flies up the tube. Install a simple PVC , 2" bubbler/spark arrestor pipe. Some carbs have an extra port in at the bottom of the base of the carb, that may be another entrance to the combustion chamber without restriction & hydrogen escaping easier. Remember hydrogen is the lightest element. It wants to escape up. Also the fresher the egas coming out without touching the air the better some say, the egas is more powerful in a natural combo of molecules clustered together as ortho hydrogen.

When you add air into the mix of the H and O egas, in case of the PCV valve, "tee" in, vacuum system. Air gets sucked into the cell from the outside air. I call it a breather tube to the bottom of your cell causing bubble action that can be controlled by a small brass needle valve. Available in the store. When you add air into the bottom of the cell, the bubbles tend to blow off the sticky hydrogen bubbles from the stainless. Hydrogen likes to absorb into the metal it touches. Ortho hydrogen can produce during a gray lubricant to the metal. The cell has a breaking in period for the hydrogen to absorb into the plates. Your cell will always produce more egas later. You also charge the water in a cell. That takes a few days. I personally like to recycle the charged water by filter the continue through a coffee filter after the cell has a night to settle. You add KOH electrolyte only at the first time. The more KOH pellets the more the amperage will go up. The idle temperature of electrolyte is about 80° f. air the more powerful the egas.

Every car egas output hose is different. On **Fuel injection**, try drilling A hole in the rubber boot and run the hose up in the boot for about 6" to 12" it will act like venturi when the surrounding air is around this hose it will help draw out the egas out of the hose. A air inlet pipe with a needle valve on top of the cell running to the bottom of the cell sometimes helps. ( it does with the vacuum system) then you are adding nitrogen/oxy from the air. It works too, but a different type of egas. It all burns and all helped the combustion!. Sorry I don't have a perfect answer. Just experiment, then drive.

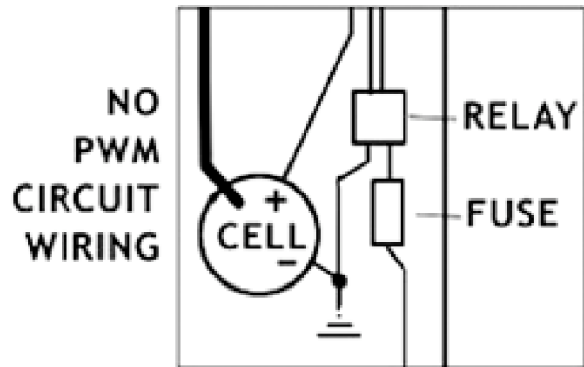
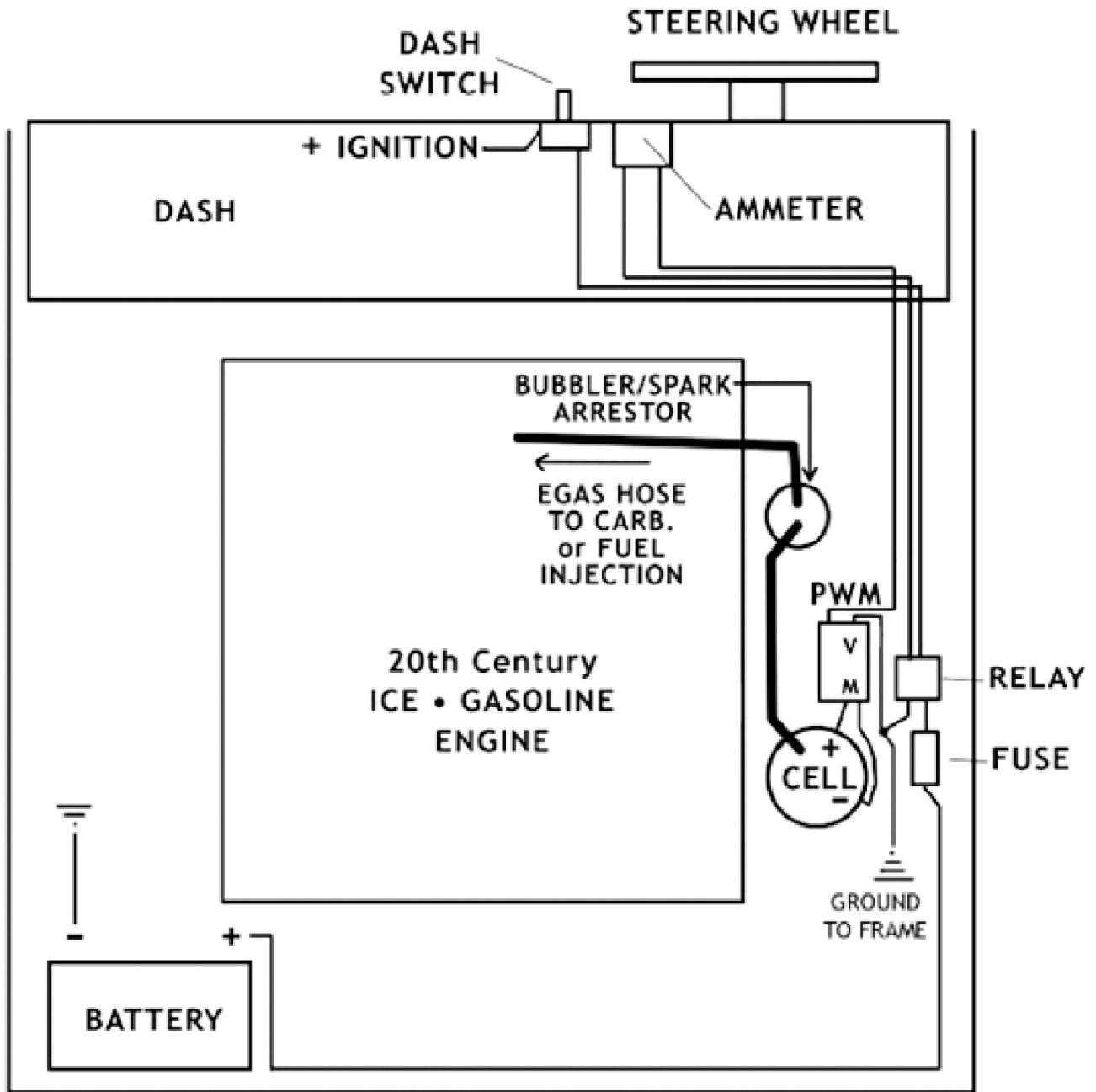
For **diesel pickup truck or cars**, run your output hose after the turbo right before the combustion chamber as close as you can get. Run the hose into the housing on top of the motor (on some models) drill or tap a hole in the housing and run the hose about 6" into the air sucked in turbo chamber, it will act like a venturi. The surrounding air will be sucked into the combustion chamber. Also some guys have installed a "bait tank" aerator into the bottom of the cell to help bubble of the hydrogen bubbles, they say this increased mileage another 10-15%!

Any more questions & answers go to ( <http://www.hydrogengarage.com/faq.html> )

We presume you read the Terms and Conditions of Hydrogen Garage LLC at <http://www.hydrogengarage.com/terms.html> Contact : [info@hydrogengarage.com](mailto:info@hydrogengarage.com)

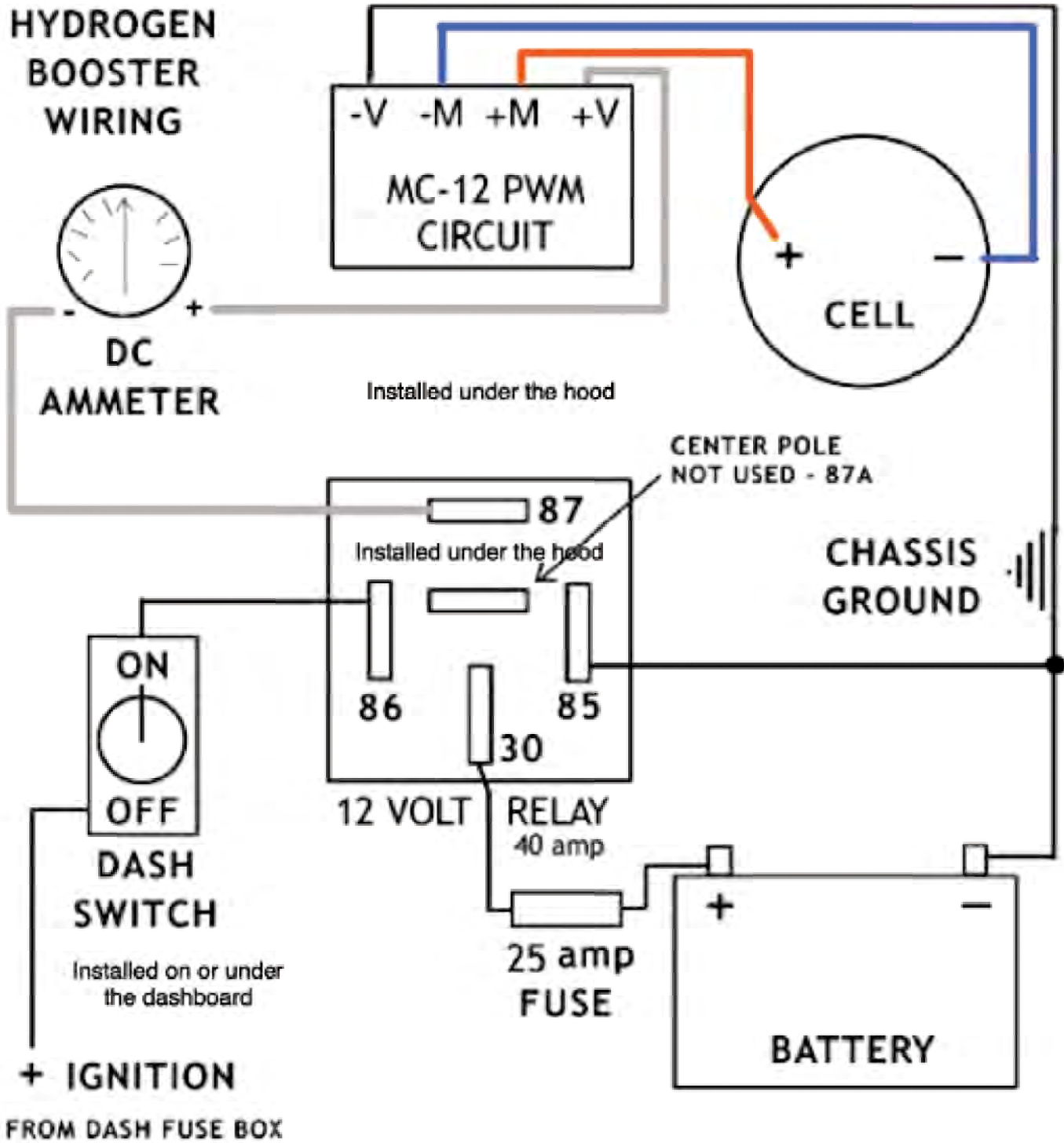
Please note \* These instructions were intended for experimenting on your vehicle in your garage, or on your own property, not our intention for you to go out on the US hwy's and byways of the US roadways. The laws of your state are in the hands of the driver. We have provided everything to make a homemade hydrogen cell, but we left the output hose and wires are up to you to obtain and install. Thank you for he consideration

# UNDER THE HOOD SIMPLE WIRING





# HYDROGEN BOOSTER WIRING



updated 8/24/08

In all these connections use 12 gauge stranded copper wire, can be purchased at a auto parts or hardware store. The ignition to switch and switch to the relay can be lighter wire, 16-20 gauge wire.