

Instructions for Assembling the 11 plate "Clear Education Cell" from stores.homestead.com/hydrogengarage

(updated 04/08)



(photo of previous design, using only 3 plates)

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 H₂O 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.)

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Parts :

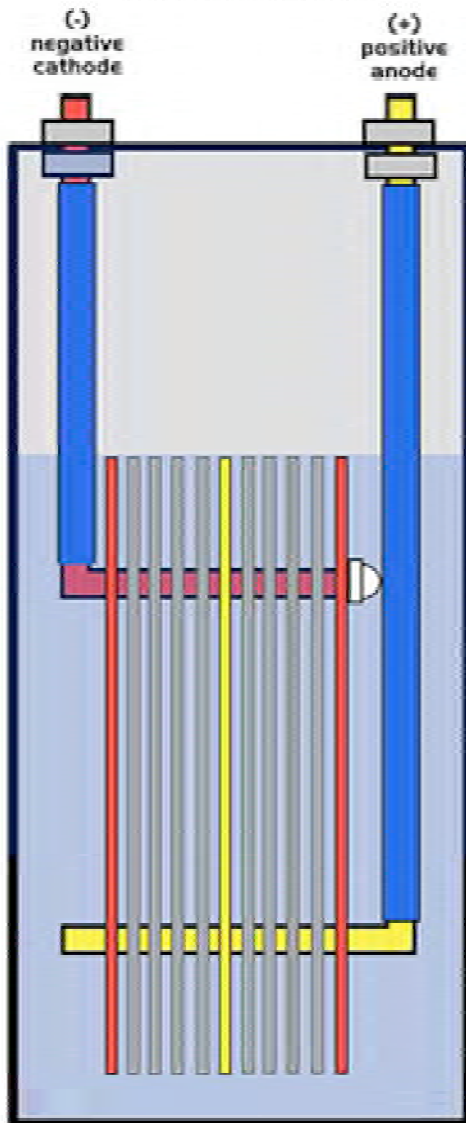
- 1) 2 - 1/4" • 316SS threaded rods, one 9.25" long, pre-bent (anode, positive rod) and 13.5" long, pre-bent (cathode, negative rod)
- 2) 10 -316L ss .25" nuts (5 are thin, 5 are normal nuts)
- 2) 1 - clear filter housing
- 3) 11 - 304SS plates. 2.5" x 6", 1 anode,(perforated), 2 cathode (perforated) and 8 neutral (solid plates).
- 4) 2 nylon 1/4" nuts and 2 nylon cap nuts.
- 5) 20 nylon washer/spacers 3/8"ID, 14 - 1/8" spacers.
- 6) 6 thin nylon washers, same size as (5)
- 7) 12" of 1/4" ID 3/8" OD white/clear poly. insulation tubing
- 8) 6"of 3/8"ID, 1/2"OD, clear poly insulation tubing.
- 9) 3/4" Brady (blue) check valve
- 10) 3/4" PVC 45°, water filler with 1/2" push in safety cap plug
- 11) 3/4" outgas connector (fits a 1/2 OD", 3/8 ID" gas output hose) No 3/8" ID hose provided. You will need anywhere from 18" to 5 ' of this egas hose.

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 all plates with 60 grit sandpaper and then wash again.

Assembling Instructions : The "ELEVEN PLATE CELL" The 11 plate cell runs approx. 2.4 - 2.6 volts between each plate. You will hook up 12 volts at the top of the cell, but the voltage between the plates will be divided up to about 2.4 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 8 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.

11 PLATE CELL



Yellow = (+) Red = (-)
 (Yellow & Red are perforated plates)
Grey = neutral (solid plates)
Blue = Isolators (rubber or plastic hose)

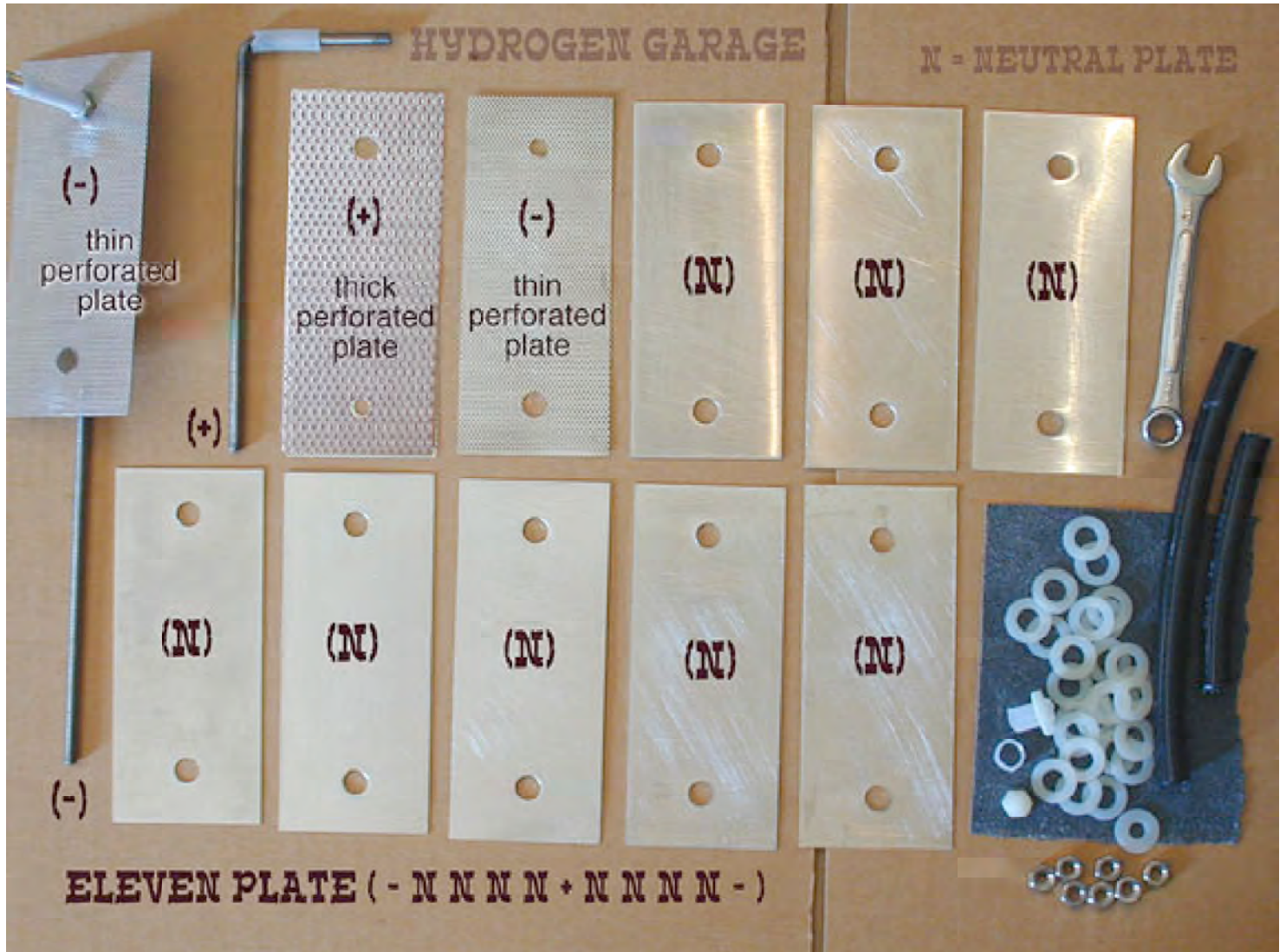


Eleven Plate Cell (2.5"x6"plates)

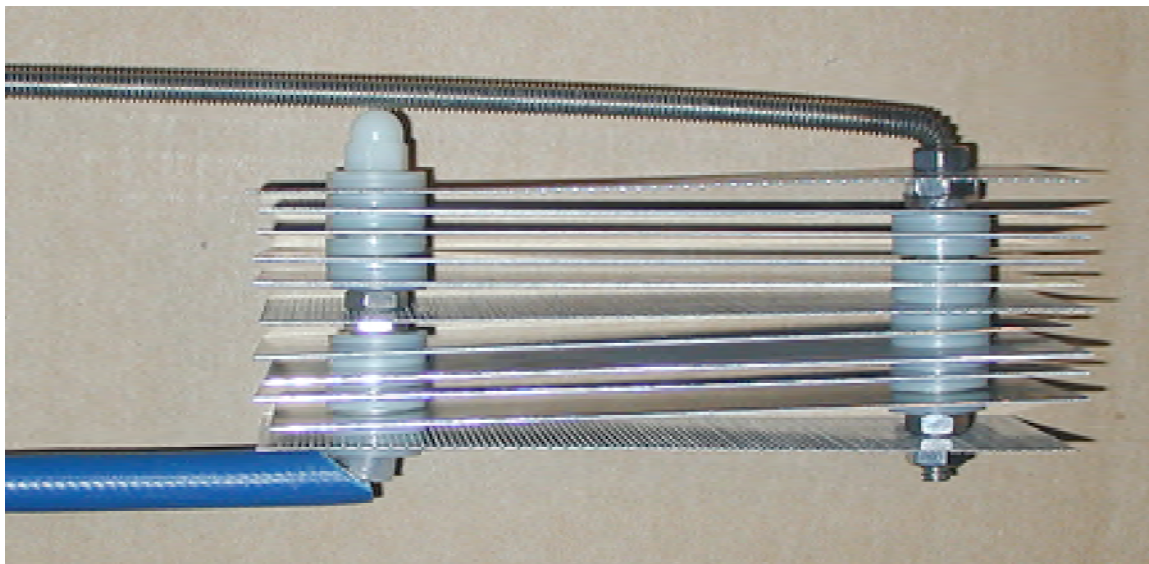
When assembling this cell, remember, the neutral plates never touch each other or any metal, the 3/8" punched holes ride on the 3/8" OD tubing, so it never touches the rod. Even the SS nuts cannot touch, The SS nuts are covered by the larger diameter tubing, the clear 1/2" vinyl tubing, just as long 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.

Preparations :

After washing the plates, acquire rough grit sandpaper, 40-60 grit for scoring the plates with a criss cross pattern, this 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 with soap and water.



8 neutral plates (solid SS) & 3 perf. plates should be scored in a criss-cross pattern with rough 40-60 grit sandpaper



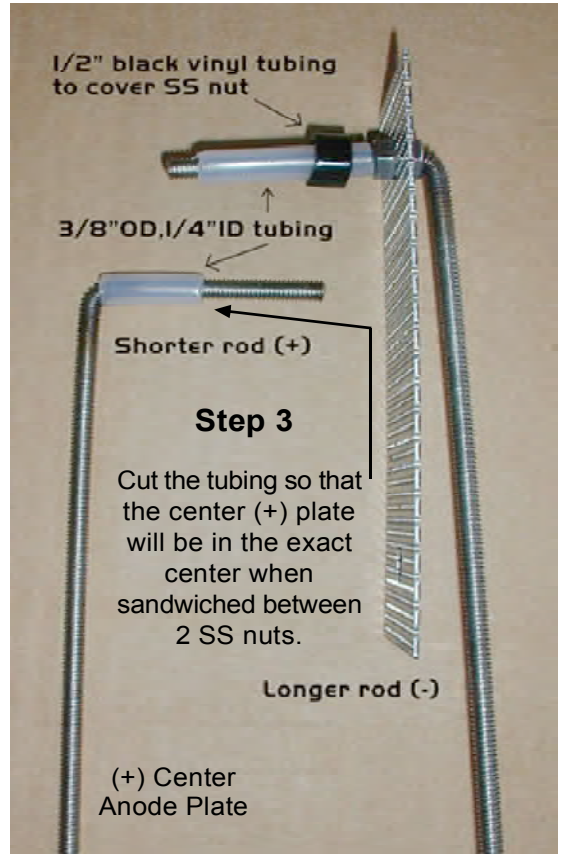
To the left is a finished 11 plate assembly. It needs a isolator hose on the long negative cathode side. We try and make all spacing the same distance of 1/8". The center anode plate has 2 thin ss nuts, but still the middle space will be closer to 1/4" In the photo to the left we used the thin perforated plates, your kit comes with thicker 22 gauge ss perforated stainless plates. Plan on preassembling the plates, before tightening down. The next pages shows the assembly steps.

**Assembling Instructions :
Eleven plate Cell • Step 1**



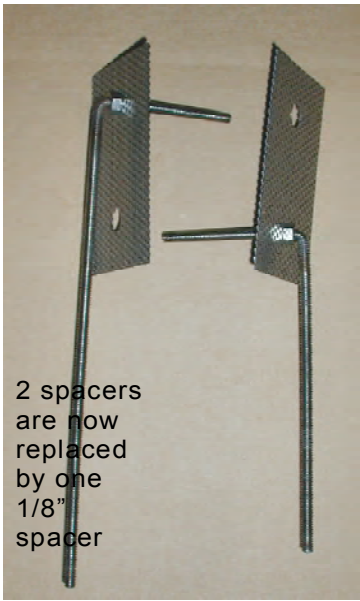
Start with the 1/4" • 316SS threaded and bent rods. Make sure the per bent rods are at a close 90° angle. You might have to bend them to a perfect 90 degree angle in a vise with a rag wrapped around the threads to prevent thread damage. The longer rod is for the negative (cathode) and the shorter rod is the positive (anode).

Step 1 : 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 buy another SS nut, tighten real good, as tight as you can get it, as if it will never get lose with all the car vibrations and many road trips. Make sure the rod and plate is 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. See photo to the left. Then add a cut tubing piece 1/4" to fit over the SS nut, see photo. to insulate the nut to the next neutral plate.



Step 3
Cut the tubing so that the center (+) plate will be in the exact center when sandwiched between 2 SS nuts.

Assemble the first cathode plate, by threading a 1/4" nut as far onto the rod as possible, tighten until it gets to the bend and stops. Add the cathode plate #1 and another nut. Then cut a piece of 3/8" clear milky tubing to expose 3/8" on the end.

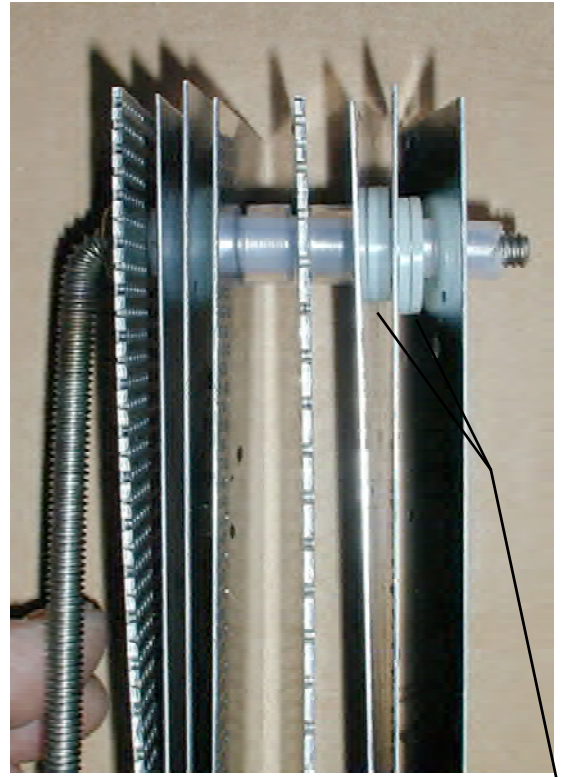


Step 2

In the photo to the left, I added a 1/4" piece of black or clear vinyl tubing (3/8" OD) to fit over the SS nut, then comes the neutral solid plates with 2 nylon 3/8" ID washers between the neutral plates, giving a 1/8" space between the plates. Slide 3 neutral plates with 2 washers in between each neutral plate (neutral means they don't touch any other metal.)

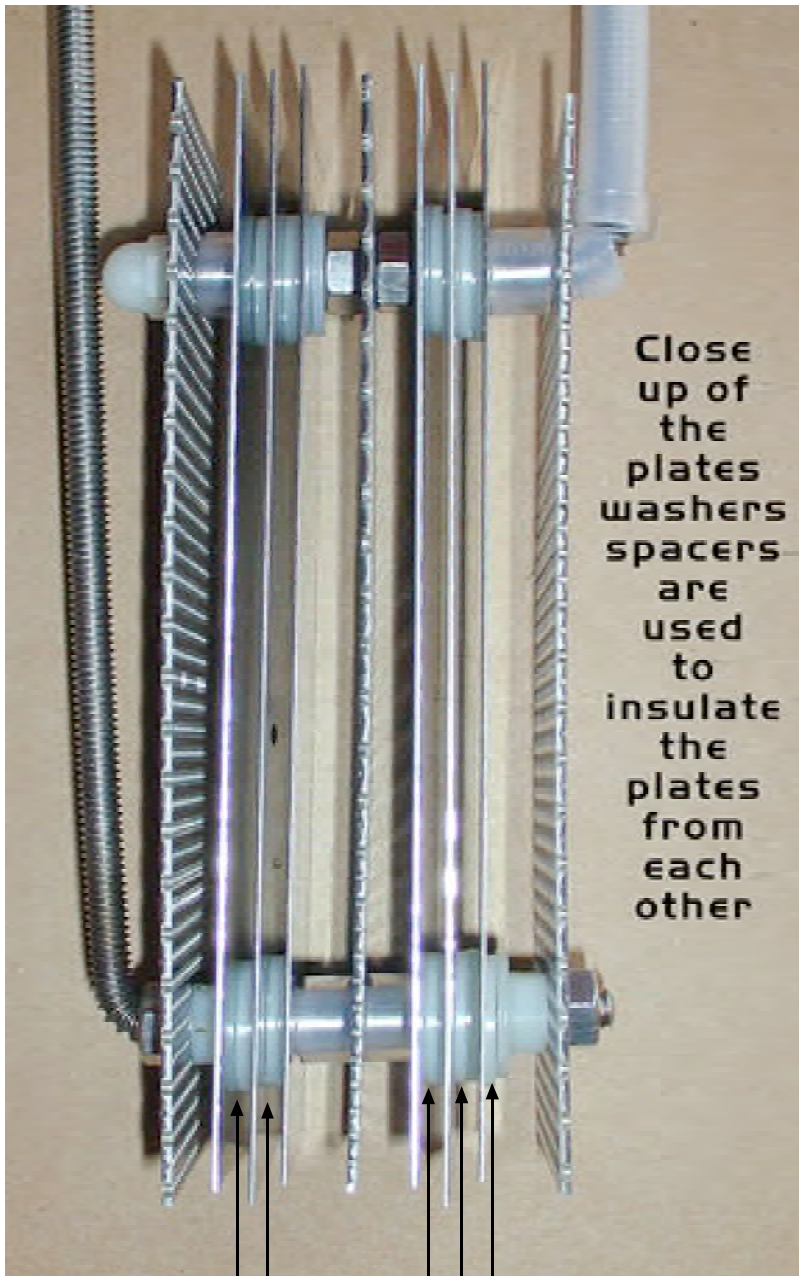
Remember the center plate is the positive plate, it is sandwiched between 2 SS nuts. The 2 negative plates are on the ends. Both the positive and neg. plates are the heavier perforated plates.

Cut 1 1/4" black (or clear) vinyl to cover the ss nut from touching the next solid plate. Space the solid plates from each other with 2 nylon washers each. Then cut 2 1/4" 1/2" clear vinyl tubing that fits over the 3/8" tubing to help hold the center plate away from touching the solid plates. Follow the photos carefully.



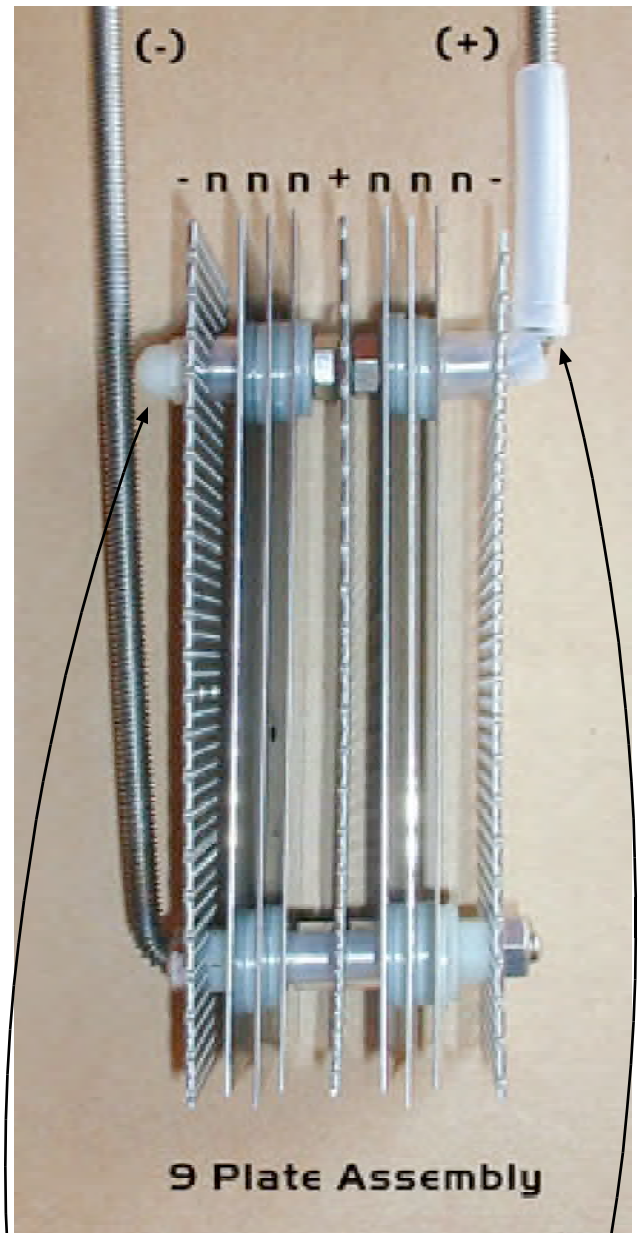
2 washers replaced by one 1/8" thick washer

When you have done it right it should look like the photos here on this page.



2 nylon washer/.spacers shown between the neutral plates. Now replaced by just one 1/8" spacer. It will provide a 1/8" space between the plates and isolate from the anode and cathode, should be touching no metal!

*Some times a pre-assembly is necessary in building your plate setup. Scratching up the neutral solid plates with coarse sand paper with a cross hatch pattern causes the hydrogen and oxygen bubbles to come off the cut ridges from the sand paper. I don't always do this, but have in the past. At first the shiny neutral plates don't seem to be putting off any bubbles, but after a month of conditioning and use in your car, they start to bubble off better than new.



This piece of tubing insulates the positive rod from the negative plate. Put one on the other side as well. To keep 12 v. migration, from the 2 rods.

The other side is insulated with the nylon cap end. The longer rod is negative it should be isolated as well. be isolated. The shorter rod should be insulated because it is right near the negative plate, we provided clear vinyl 3/8" hose for this purpose.

This updated 4/08 11 plate assembly we try and get 1/8" space between all plates, this unifies the voltage between the plates, we now provided thinner SS nuts to do this task of even plate spacing. Keep this in mind when assembling. The 1/4" gaps between the anode & cathode plates and nuts will be more like 3/16" spacing.

Bench Testing

Now that your 11 plate electrodes are assembled. Time to test the bubble action. Fill the water filter housing 3/4 full of water. What kind of water. Any water, tap water having the most contaminants in the water. Distilled water or R.O. water, with the least minerals and contaminants in the water. Rain water works too. I like to use spring water that I get in the summer out of the ground at 3600' in the mts. That virgin water has healing properties in the water (when you drink it) and seems to take a charge faster. (Never drink from the cell!) The cell is like a battery, it will eventually hold about a .5 -1.5 volt charge, even when it sits idle for a few days. It is also a water purifier in a sense that it will bring the contaminants to the top as brown foam and when you turn off the cell, it settles to the bottom, as a red colored sludge. The cleaner your water the less containments will come forth. Also that red sludge comes from the slight iron in the stainless, and yellow color from the chrome. Now if you run a 12 volt cell with the 7 plates being (-+--+--) it will draw alot of current and boil away and make a great amount of egas, but will heat up fast due to the voltage. Too much heat also creates steam after about a 1/2 of driving on a summer day. The ideal voltage 1.8 volts between your electrode plates. No heat will be generated and electrolysis, the splitting of the water will still happen, about 1.4 volts the electrolysis process will stop. Any voltage past 2 volts, will start to add heat and heat up the water. Now if you live in a cold climate you may want some heat. 3-4 volts model, I recommend the 9 plate (- n n n + n n n -) 80° f., is the ideal temp. for premium electrolysis. The heat of your engine will get the heat up quickly in warm climates.

Rules of electrolysis :

- 1) The more amps, the more the egas. (electrolysis gas)
- 2) Ideal temperature of your cell water to electrolyze is 80 degrees f.
- 3) 1.8 volts is the ideal voltage between your plates, no heat is generated.
- 4) 3-4 volts create heat slowly. 12 volts creates heat right away (in 5 minutes) may even melt the plastic around your electrodes & eventually creates steam as well as H&O egas
- 5) The more the electrolyte (KOH), the more the amp draw.
- 6) Neutral plates absorb voltage, not amps. (dummy plates hooked up to nothing, just in the way)

Fill your cell 3/4 with water, add about a tablespoon of KOH potassium hydroxide (electrolyte) to the cell slowly. Potassium hydroxide is a base (totally alkaline, opposite of acid) is a hazardous chemical, much like lye and should be respected. Comes in a white pellet form, 95% pure KOH, also a plant food in a concentrate. If you put one of these pellets in your eye, it can blind you. Just like lye, it can blind you. Use gloves when handling it. Don't let it splash when putting in your cell water. Diluted electrolyte water feels like what bleach does to your skin, it will burn your skin slightly, if you get any on your skin go wash it off ASAP. It has a slick feeling like bleach in water. Wash off spills on your skin with vinegar. Vinegar is an acid and off sets the alkaline KOH. Best to not touch it all, and use rubber gloves when handling. Also close the lid to the KOH ASAP, any moisture in the air will absorb into the KOH pellets and start to turn to gel.

Bench testing. Now put your electrodes into the cell with the 2 rods sticking out of the cell, no lid right now. Hook up a car battery or battery recharger to the posts, the negative one is the longer one and the shorter rod is the positive. Hook up a DC ammeter or use the amp reading gauge on some battery rechargers. At first your amp draw will be low. The more KOH you add, the more amps you will get and the more egas it will produce. Do bench testing in a well ventilated room. Don't leave hooked up, the foam and bubbles you observe is in matter hydrogen and oxygen gas an it explosive. The longer exposed to the less the commission power. So only hook up for 30 seconds at a time. Also if you add more electrolyte (KOH), turn off the connection. If you use the battery recharger, the connections spark, when you connect it live. Best to hook up then plug in your battery recharge. You should also read the voltage between each opposing plate with a voltmeter.

Amount of Electrolyte to Use (KOH) (I use potassium hydroxide rather than sodium hydroxide, lye)

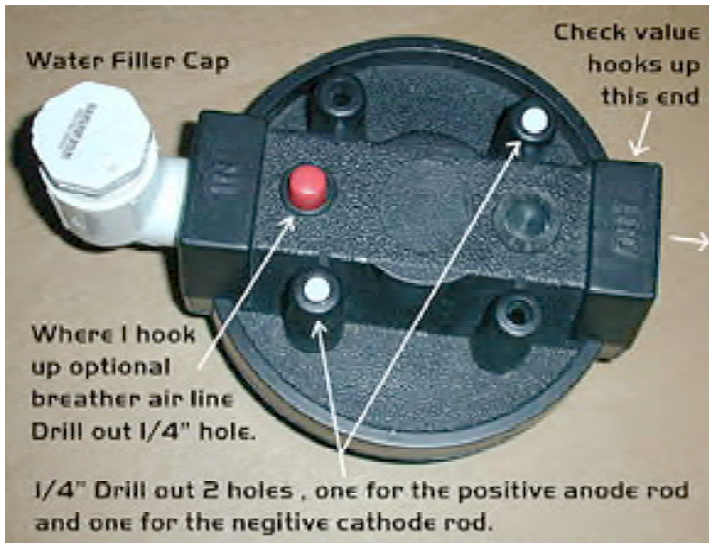
Here is the "Catch 22" part. With a 12 volt system (no neutral plates - + - + - + -) very little KOH is needed, about 2-5%, with a 2- 3 volt between the plates assembly (- n n n + n n n -) about 10-15% electrolyte is needed, with a 2 volts between the plate assembly: (- n n n n n n +) you will need up to 25% electrolyte to bring up the amps to about 20 amps. Even 10 amps. will produce enough egas to boost a gasoline or diesel fuel mix. Whatever you feel comfortable with. 10 amps - 20 amps. As for me I'd rather use less electrolyte. You can always add more KOH when it is installed under the hood of your car. Also note that once you get your amperage up to about 20 amps, you will never have to add electrolyte again. Just add water.

Final Cell Assembly

Let your cell plates sit in the water/electrolyte bath , it will condition the plates, hydrogen absorbs into the everything it touches, not plastic, but metal yes. Your cell will produce more amps after a week of driving.



Photo of a 9 plate assembly, for 11 plates just add 2 more solid (neutral) plates.



Safety Spark Arrestor / Bubbler.

To the right bottom is a photo of a simple safety "Bubbler/Spark Arrestor" 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 fire, older carb. cars sometimes do. The "Bubbler" also works as a electrolyte trap, so no foaming up cell or bubbles enters your intake. You can place the bubbler anywhere under the hood of your car. verticle 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 value on top to adjust the air in pin hole. The air line id 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 of he hydrogen which tends to want to absorb into the metal.

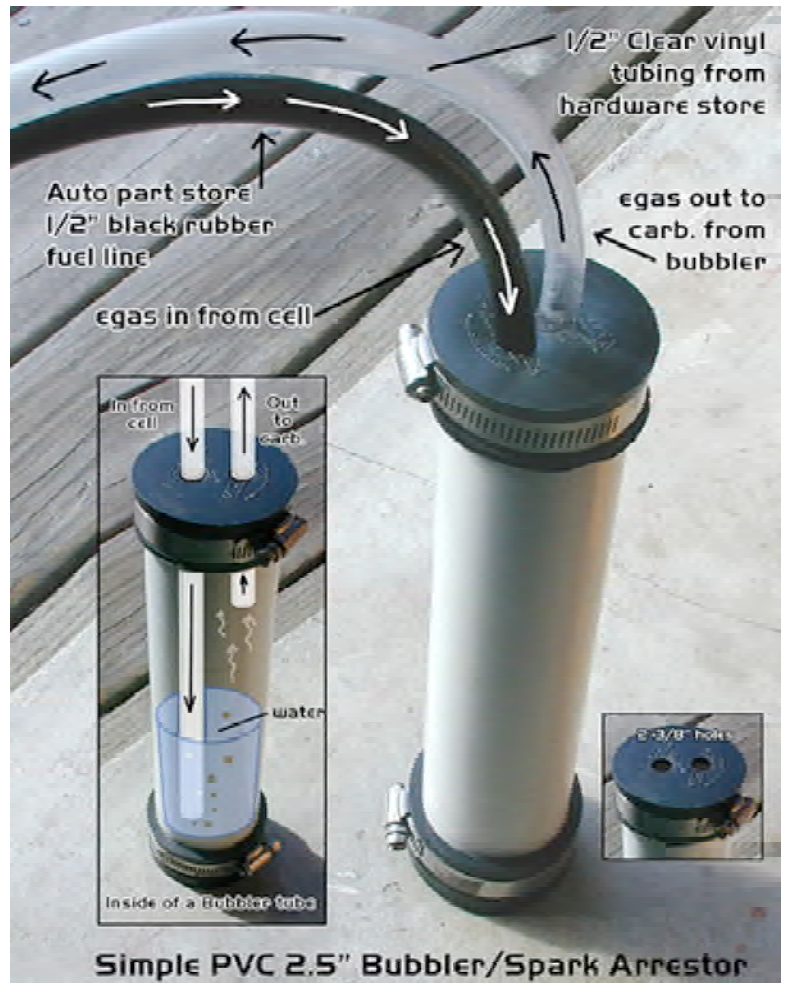
The safety feature of this "Educational Cell" is the white water filler cap. It is a glue mount 3/4" PVC ca. DO NOT glue in place, just shove it on. If the cell ever blows this cap will shoot off first. It is very unlikely a spark will travel all the way up the hose to the cell, most likely any spark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



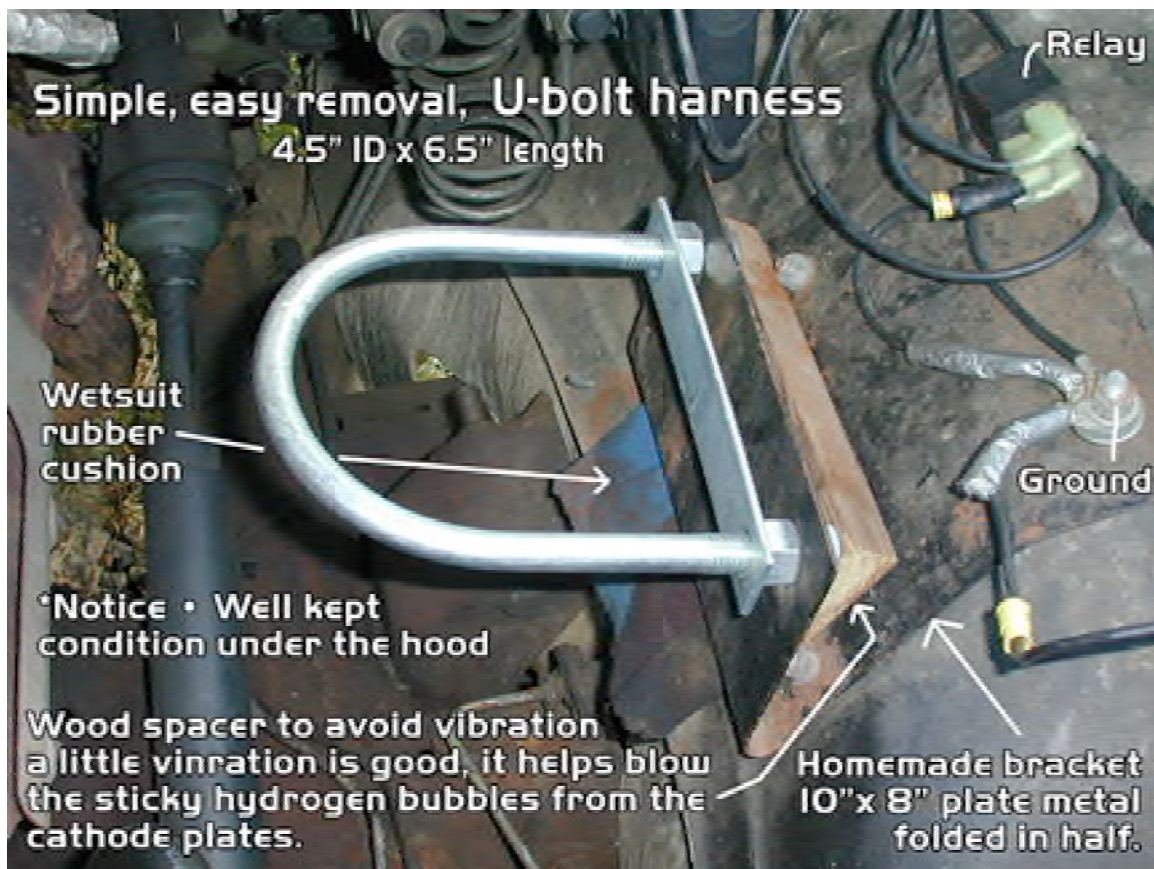
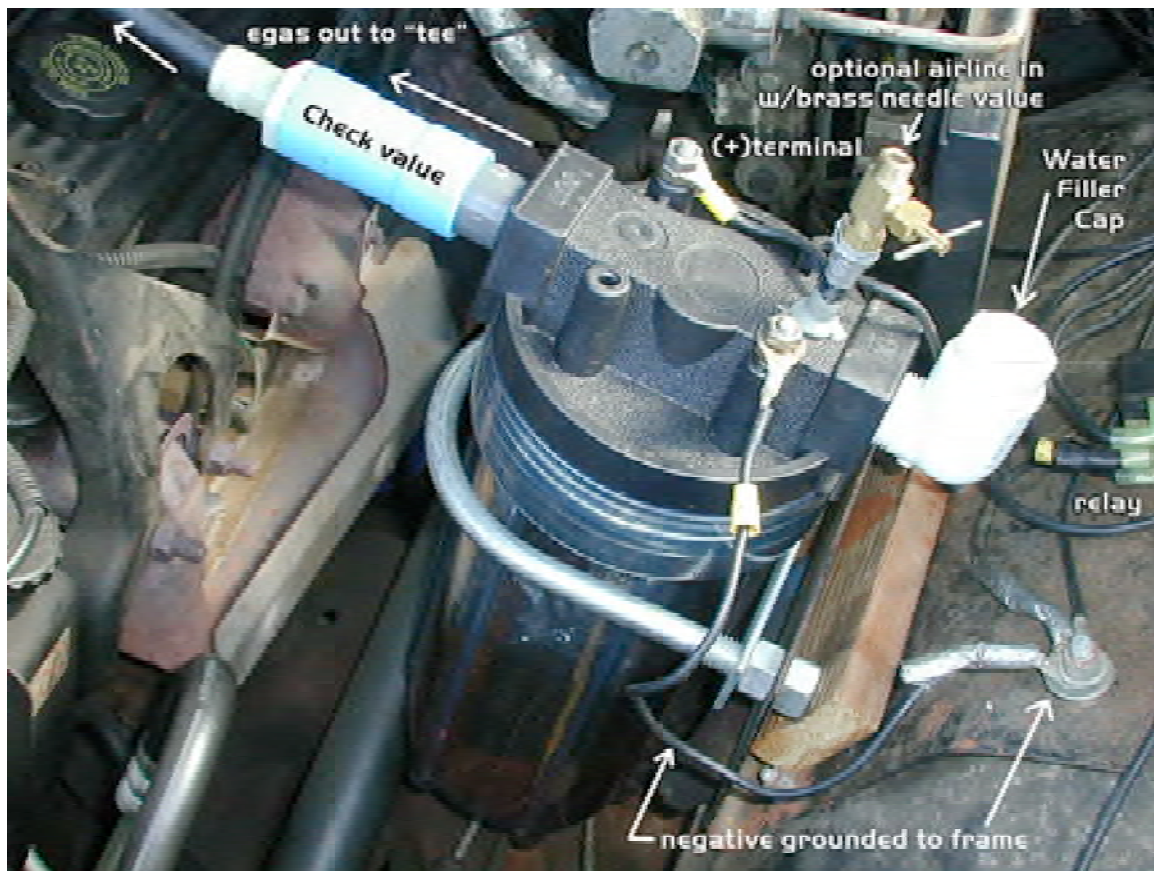
The black 3/4" fitting goes on the end of the check value, this allows a 1/2" OD black rubber outgas hose or 1/2" OD clear polyurethane tubing to fit inside the back fitting. I do not glue the hose in as a blow off safety feature in case of a backfire. The hose will blow off first.

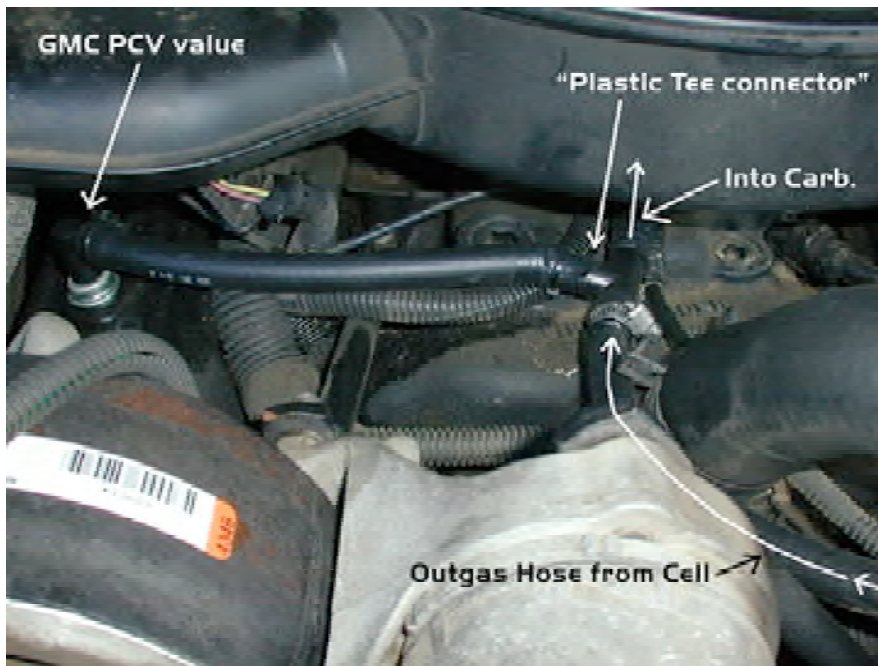
Lid assembly

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 ga: 1/2" gas black rubber hose or cleat vinyl tubing, to view vapors. Now you have to decide do I want to add the egas to my vacuur 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 powe 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 value that come out of your value covers to your carb. "Tee" into that hose. Now the vacuum system only sucks during idle and crusing speeds (70mph). Optional airline in pipe that goes to the bottom of your cell helps bubble of the sticky hydrogen bubbles off the plates. I only requires a pin hole of air. We sell a breather line at the stor : stores.homestead.com/hydrogengarage. When you go with the vacuum method, you will be now adding nitrous-oxide to the mi: of hydrogen and oxygen. The atmosphere air is about 78% nitroger 20% oxygen and 1% argon and 1% other gases. When nitroger burns it turns to nitrous oxide and out the tail pipe as nitrates or Nox. If you just let the egas build up in the cell and travel out you out gas hose to your fuel injection system or carb, you will not b 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.

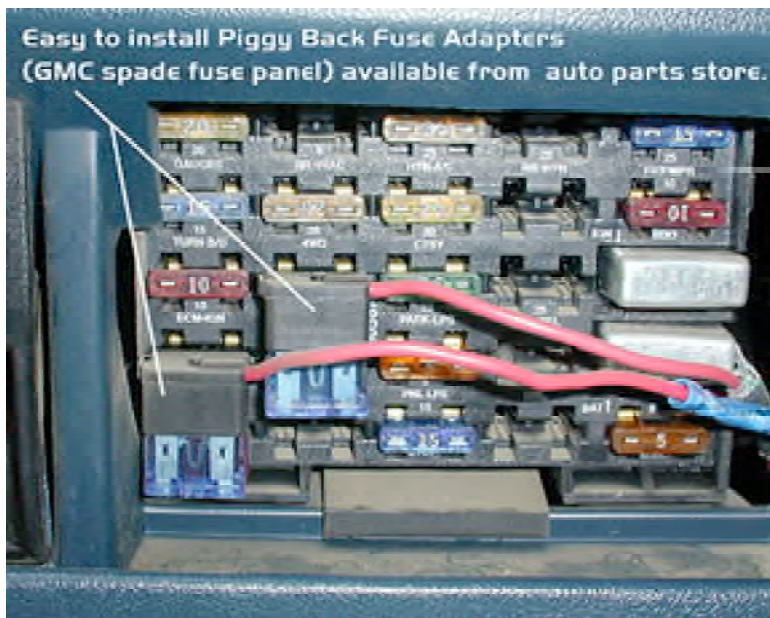


Simple PVC 2.5" Bubbler/Spark Arrestor





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

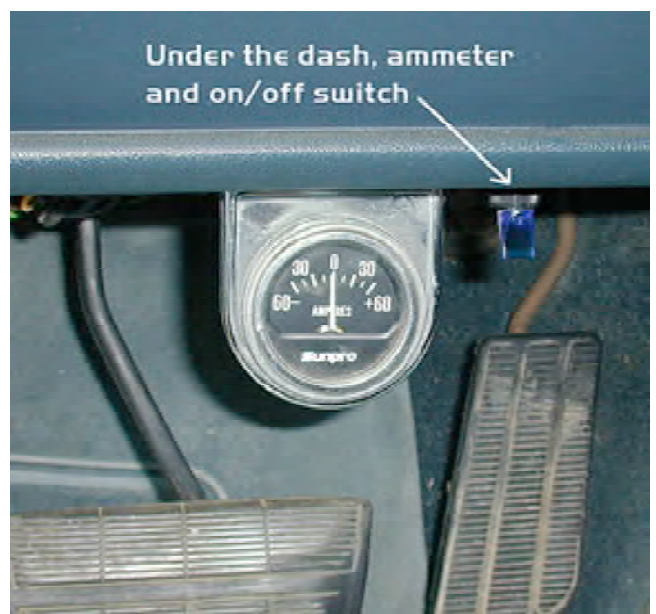
This photo shows the GMC spade type fuse panel. You can buy from a local auto part store. Piggy Back fuses that plug into the back of existing ignition fuse. So your switch is hooked up via your ignition, So when you r engine shuts down your cell shuts down. A SAFETY MUST!

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!

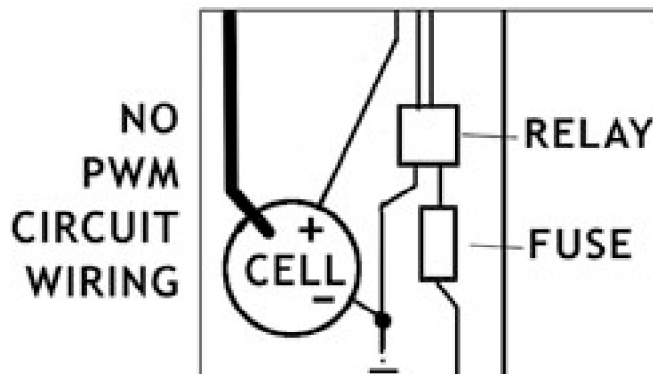
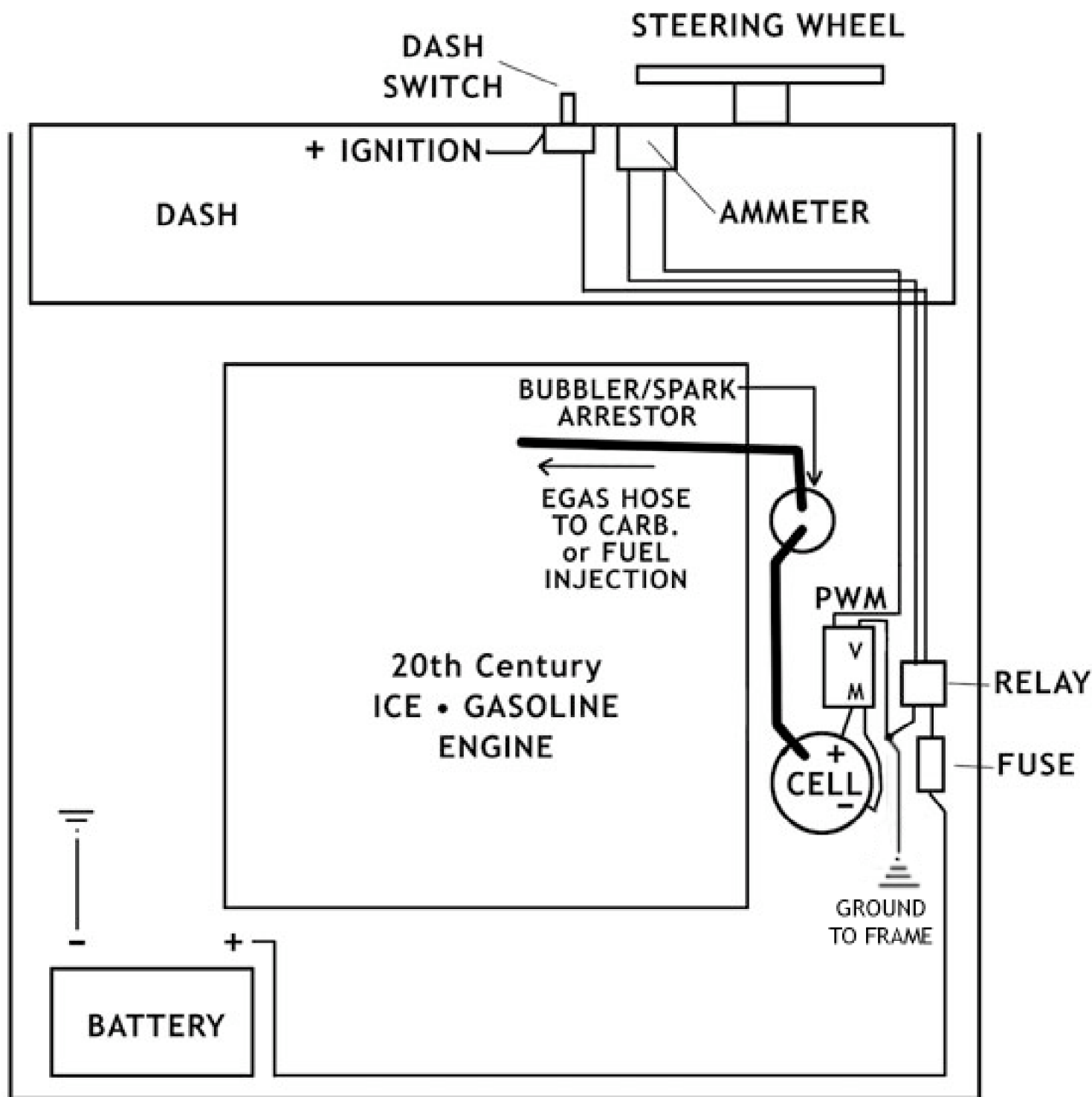
Under the Hood

This photo shows the vacuum system hook up. Some claim better mpg when they hook up to the vacuum system. Other says running a straight hose into the carb is best mpg. On diesel engines, run the outgas right into the last fuel injection header box on top of the engine. 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 fit 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 Brown's Gas and true Brown's gas is has more combustional power than standard egas that comes straight from the battery. If you dial in the perfect frequency that the cell really bubbles away.



UNDER THE HOOD SIMPLE WIRING



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

This entire installation, assembly takes a weekend to perform. Buy 10-12 gauge stranded auto wire (for sale at auto parts store) and black 1/2" OD x 3/8" ID. 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 fly's 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 value, "tee" in, vacuum system. Air gets sucked into the cell from the outside air. I call it a breather tube to th3 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 of 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 ventri when the surrounding air is around this hose it will help draw out the egas out of the hose. Some say if they add an air inlet pipe with a needle value on top of the cell running to the bottom of the cell that the see MPG increase. (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! Some diesel trucks said when they added an MC-12 circuit and a aquarium air pump (\$10) wired from a DC/AC converter, 300watt \$40. and run the air to the bottom of the cell, they got even more MPG increase! Sorry I don't have a perfect answer. Just experiment, then drive.

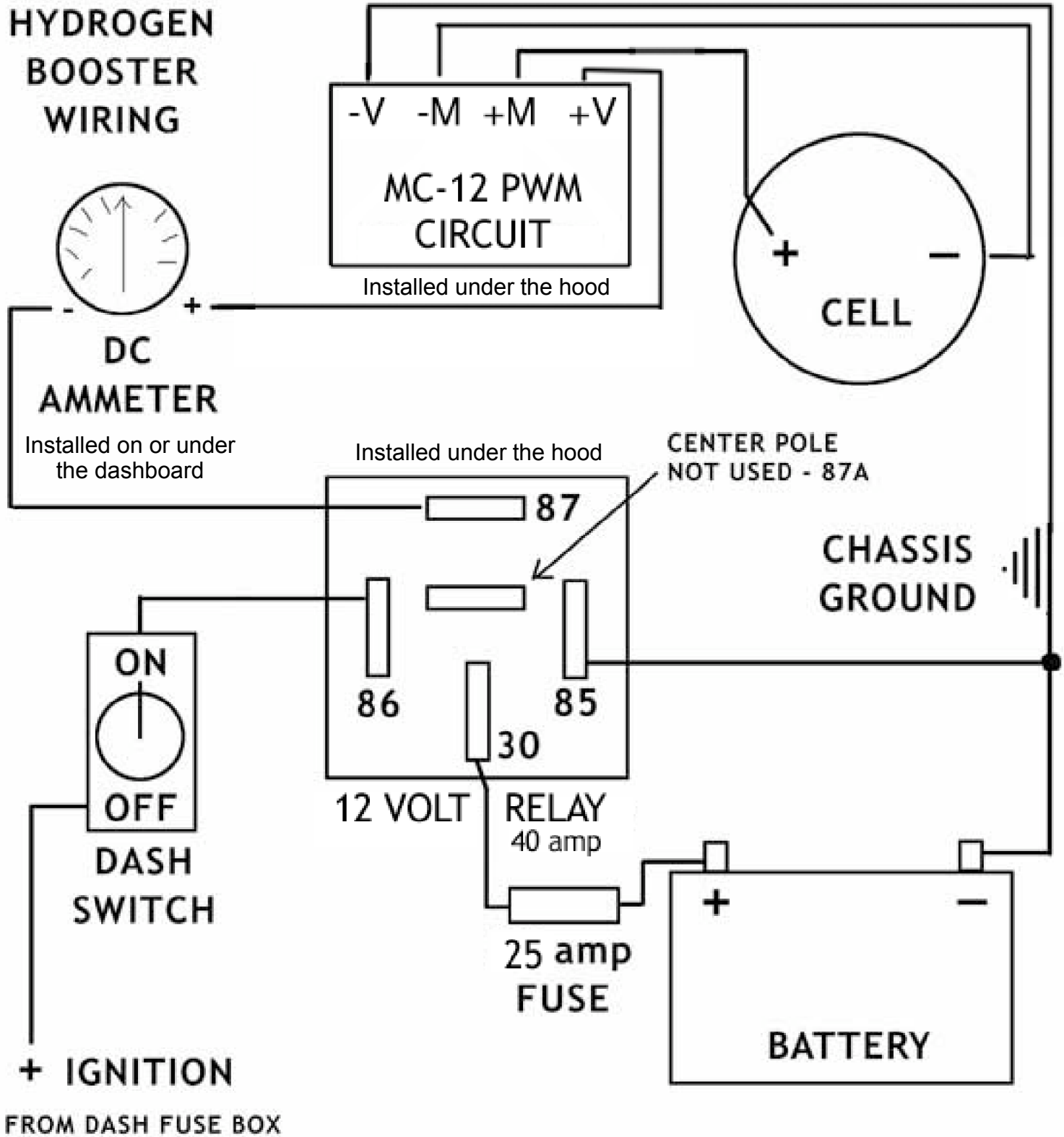
For **diesel pickup truck or cars**, there are 2 ways to run your output hose before or after the turbo right before the combustion chamber as close as you can get. Some run the hose into the housing on top of the motor (on some models) drill or tap a hole in the housing and run the hose about 6" into the air sucked in turbo chamber, it will act like a ventri. 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

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 of reading this document.

HYDROGEN BOOSTER WIRING



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.

updated 9/24/07