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ER HyZor (Basic) Kit~Version B

Assembly • Installation • Operation

INTRO TO ER HYZOR TECHNOLOGY

The ER HyZor is an 'on-board' electrolyzer that turns water into a high-energy mixture called 'Brown's Gas' (BG).

Brown's Gas significantly raises the combustion efficiency of carbon-based fuels like methane, natural gas, gasoline and diesel by acting like a catalyst. As a result, power, performance & fuel economy are increased. At the same time, pollution is reduced.

PROJECT SUCCESS

Read through this entire instruction booklet and watch the DVD before beginning. It is highly recommended that at least of 2 tanks of fuel mileage be recorded prior to installing the ER HyZor. That way you can accurately record your gains. Use *Fuel Saver Log*

Gather all the parts, tools and supplies needed to complete the ER HyZor. (see sidebar pgs. 1 & 8) Expect to spend about 4 hours building your device and another 4 hours installing it.

PARTS CUTTING

Following the HyZor Cut Chart, (fig.1) cut 14 spacer rings $\frac{3}{8}$ " (9 mm) wide and 2 cell tubes $2\frac{3}{4}$ " (7 cm) long from each of the two 2" x $7\frac{1}{2}$ " PVC pipes.

A hacksaw is recommended. If using a powered saw, go slowly to prevent the saw from grabbing the plastic.

It's okay for the edges of the cuts to show 'saw marks'. Scrape off plastic residue.

Next, cut a $1\frac{1}{4}$ " (32mm) 'gap' out of each ring, so they can be compressed to slide into the cell tubes. (pic. 1)

END CAP ASSEMBLY

Put an O-ring on the terminal-plate bolts. Fill the threads of the bolts next to the O-ring, with hot glue for a length of $\frac{1}{4}$ " (6mm). (pic. 2)

Taking care not to cross-thread the plastic threads, start screwing one terminal-plate into an end cap. Once the bolt is just through the plastic, use hot air to heat the end plate to re-melt the glue. When the bolt tip is hot to the touch, continue screwing it into the end cap. *Glue will flow into the threads for a liquid-tight seal.*

When you feel resistance, the O-ring has made contact. Put a nut on and hold it with a wrench while tightening the bolt. *It'll be about 1/2 to 1 full turn. The nut is needed to prevent hot plastic threads from stripping out.* Finish the other end cap the same way.

Once the caps have cooled, remove the nuts. Make a circle of hot glue around the bolts on the surface of the caps. (pic. 3) Install a washer and a nut.

ASSEMBLY TOOLS NEEDED

- hacksaw
- $\frac{3}{8}$ " drill
- $11/32$ " drill bit, $3/16$ " drill bit
- 2 x 4 gluing jigs
- 2 x 2 x 6" stuffing jig
- hot glue gun
- hot air blower (or hair dryer)
- small hammer
- multi-meter
- test light (probe)
- soldering iron
- needle-nose pliers
- spoon
- glass measuring container
- scale
- knife
- side cutters
- open-box wrench set

ASSEMBLY SUPPLIES ~ not included

- PVC primer and glue
- rosin core solder
- isopropyl alcohol
- teflon tape
- Sodium Hydroxide (lye)
- Q-Tips

PARTS ~ not included

- ER Carburetor Enhancer Kit or ER EFIE device
- 5 amp fuse & fuse holder
- #18 red & black stranded wire
- #20 wires (various colors)
- metal pipe strapping
- plastic wire ties
- $\frac{1}{4}$ " ID clear PVC hose
- 3 of #10 ring terminal ends

parts included ~ cont'd on pg 8

Assembly Skills Needed

- use a hacksaw
 - use drill
 - use hot glue gun
 - prime & glue PVC pipe
 - wrap threads with teflon tape
 - use multi-meter
 - use test light (probe)
 - soldering
 - mix Lye
-
- Taking the time to measure, cut, glue and assemble with precision is essential to achieving the best performance from your ER HyZor.
 - PVC glue hardens in seconds. Test the parts before you glue them so you know exactly what to do. Take small steps and work quickly.
 - If you are inexperienced with HyZor skills, get FREE lessons online. (see HyZor Resources)
 - The HyZor Resources is a special section of the Eagle-Research website that is only available to ER HyZor Kit buyers.
 - Register your ER HyZor serial number to receive the url, a username, and password for the HyZor Resources. (see p.8)

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TEE ASSEMBLY

Making sure the (+) bolt hole points towards one of the legs of the Tee, glue the HyZor Tower Assembly onto the Tee. (pic. 4)

FLOAT STEM ASSEMBLY

Glue the 1/2" cap onto the 1/2" stem. (pic. 5)

Wrap teflon tape 3 times around the float switch threads. Hold the tape tightly against the threads and turn the float stem as if you were threading it into its hole. Make sure the trailing end of the tape is pulled tight as you turn. (pic. 6)

Taking care not to strip the plastic threads, screw the float switch onto the stem. **The float wires must be free to move or they will twist and break.**

A multi-meter should read continuity between the wires when the float is up, and no continuity when it is down. If incorrect, pull off the clip, turn the float over and retest.

Push the float stem tube through the cap bushing, so at least 1 1/2" sticking beyond the surface of the cap. Then temporarily screw the cap onto the HyZor tower, hand-tight.

Gently tap the top of the float stem until the float's center line is slightly below the inside curve of the Tee. *Be careful not to hit the wires.*

Cut a groove into the float stem tube to mark its depth, then unscrew the cap and remove the tube. Apply solvent and cement to both bushing hole and float stem tube. Then re-install the float stem tube to the mark.

NEUTRAL-ZONE INSERTION

Put 2 of #10 washer on the (+) bolt. Fill it's threads with hot glue for 1/4" (6mm) toward the 'head' end. *Don't get glue on the head of the bolt or the washers.* (pic.7)

From the inside of the tube, screw the bolt into the tube until the threads are even with the outside wall of the tube.

On 'A' version, (to prevent (+) terminal wire from breaking off) use needle nose pliers to hold the neutral zone wire 1/4" from plate before bending 90°. (pic. 8a)

'B' version neutral-zone wire does not need to be bent. (pic 8b)

The neutral-zone-assembly needs to be bent 90° at two points. Make sure the (+) terminal wire is on the inside of the bend. Use pliers to get a tight bend at the very end of each side of the connecting strip. *It is better to under-bend slightly then to over-bend.*

You should end up with two small tabs protruding **beyond** the bottom of one side of the assembly. (pic. 8c)

Put the neutral zone assembly into the center of the Tee. Route the wire along the wall of the tower Tube.

Trim the neutral-zone wire 3/4" above (+) bolt. Wrap the neutral-zone wire tightly around the bolt (pic. 9). The wire must be between the washers.

Reheat the glue with hot air. Tighten the (+) bolt using a 5/16" wrench.

CELL TUBE ASSEMBLY

Glue one 'cell tube' at a time, into the Tee.

Insert 7 rings and 6 plates (fig. 2) into the 2 cell tubes using a 2x2 plunger. (pic. 10)

Start with a ring, then a plate. Tightly pack each ring down so the plates will not shift.

Using a Q-tip, put a little glue on the inside of the cell tube before inserting each ring; to keep the rings from shifting. Solvent isn't necessary.

Cut Chart ONLY

Does NOT Refer To Assembly

50% Scale

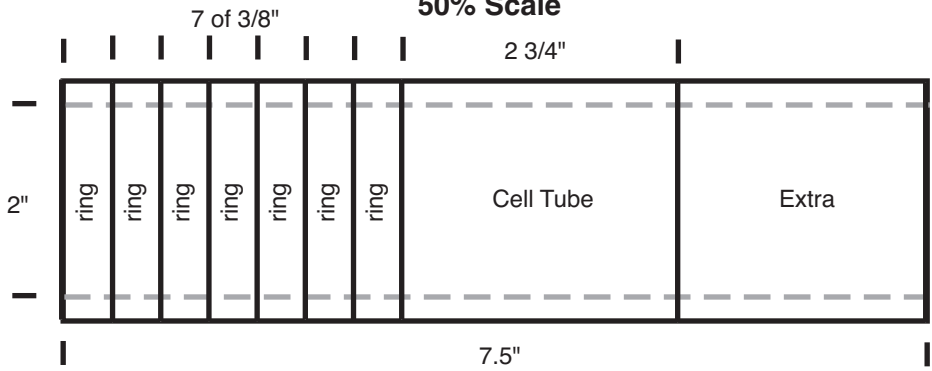


fig. 1



Lye Handling Safety Tips

- Use ONLY pure lye
- Use ONLY teflon tape for thread sealant. No other sealant is compatible with the lye solution.
- A plastic pop/soda bottle can be cut to make a funnel for pouring lye into your HyZor.
- Safety spray bottle filled with lemon or vinegar, safety glasses and rubber gloves, ventilation.
- Mix lye in a well ventilated area.

Notes

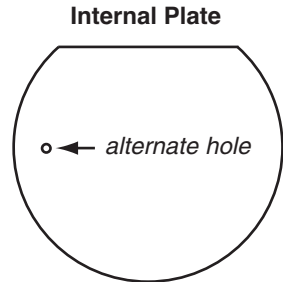


fig. 2

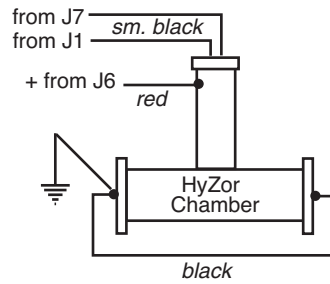


fig. 3

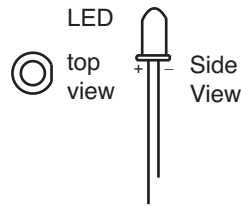
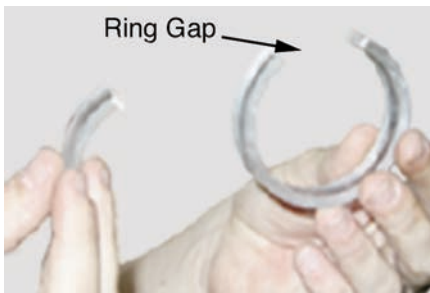
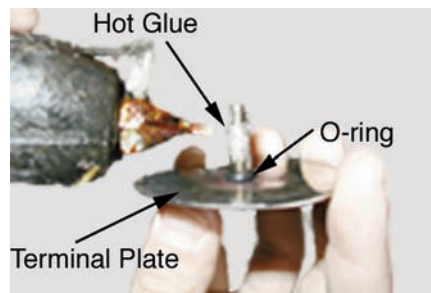


fig. 4



pic. 1




pic. 2

Guarantee

All Eagle-Research products are sold with a money back guarantee. If you are dissatisfied for any reason, return the product(s) within 60 days of receipt of the product(s) for a full refund of the product(s) price.

Ensure a Well-Made Circuit Board

- Be sure the pieces are fully inserted into the component side of the board, (bend leads to hold) before soldering.
- Arrange resistors and diodes flat and neat on the board.
- Clean and  tin the soldering iron.
- Solder only on the bottom side of the board.
- Hold the iron's tip on both the board and component simultaneously and allow solder to flow into joints.
- To melt solder, apply solder only to the component.
- Don't allow solder to bridge or puddle to other components.

Resistors and Values

R1 = 1K
R8 & R11 = 56.2 K
R6 = 68 ohm
R3 & R10 = 402 ohm

Diodes

D2, D3, D7
Diodes are polarity sensitive. Make sure the band mark (on the diode) matches the mark on the circuit board.

Light Emitting Diodes

LEDs are polarity sensitive. Both the flat spot on the edge ring and the short lead indicate the (-). (fig. 4)

continued on pg. 5

Make sure not to cover the plate hole with glue.

Reverse every second plate so that the holes *don't* line up. Put all the ring gaps' in a row directly above the flat edges of the plates. Position a ring at each end.

Be sure the flat edges of the plates line up with the neutral-zone flat edge.

Glue the end caps onto the cell packs. *Do not put pressure on the negative (-) bolts.*

(BASIC) CIRCUIT BOARD ASSEMBLY Inserting Components


(see sidebar, pg. 4, fig. 5 before continuing)

Solder resistors first, diodes second.

Mount the 2 of IRFD9014s into the P3 and P4 locations. Mount the IRFD014 in the N1 location. Then mount the IRF9Z34, face up, in the P1 location. Bend the leads backward at 90° where they narrow. *(see pg. 5 sidebar for mosfet notes)*

Insert the 7809 face up in the U1 location.

Mount the 50K potentiometer in the R2 position.

After all soldering is done, remove the  flux from the circuit board, to prevent corrosion. Use isopropyl alcohol and a tooth brush, then pat dry with tissue.

Seal the electronics against moisture with your choice of enclosure, tape or tool dip.

Don't cover the metal tab of P1. It needs to radiate heat. If it gets too hot to touch, fasten the heat sink onto the tab.

PLANNING TO INSTALL THE ER HYZOR


Before making a decision about where to mount your HyZor, consider the following:

- Under the hood is recommended for quick & easy access. Be careful not to interfere with any of the vehicles moving components.
- The HyZor container is plastic. It's location must not exceed 100°C (212°F).
- The (+) bolt must not touch any electrically conductive surfaces.
- The ER HyZor chamber needs to be mounted in an upright position.
- Space is needed to close the vehicle's hood without touching the HyZor.
- A favorite place is behind the grill in front of the radiator.
- If the HyZor 'water fill' isn't easy to reach, a 'water fill' hose can be routed to somewhere easy to reach.

Routing Wires & Hoses

Decide how the electrical wires and gas hose (to air filter) will be routed. *If you route the wires through metal, be sure to use a grommet to protect the wires from sharp edges of metal.*

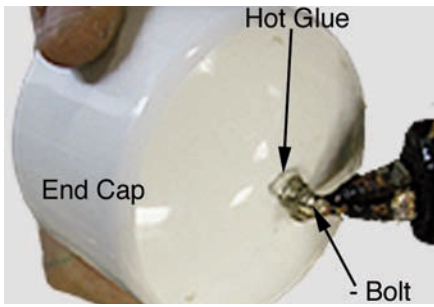
CHAMBER INSTALLATION

Connect a  black 18 gauge wire between the two terminal bolts located on the ER HyZor end caps. (fig. 3) *Hold terminal when tightening outer nut to prevent inner nut from turning.*

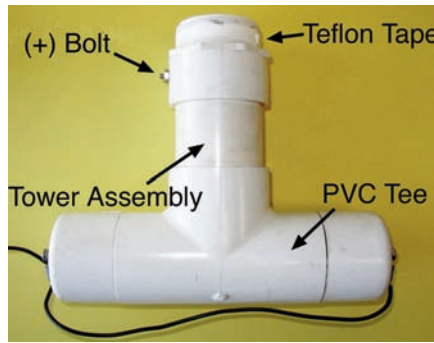
Wrap the teflon tape 6 times around the top 3-5 threads of the HyZor tower.

You may have to vary the wraps of teflon tape in order to have your 'water fill' and your 'vapor out' fittings line up where you want them.

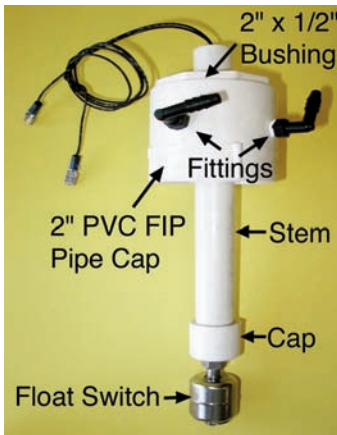
Mount the HyZor securely in your chosen location with plastic wire ties, and/or pipe strapping. Make sure everything touching the chamber is secure. *Loose hoses & objects can vibrate holes in the plastic.*



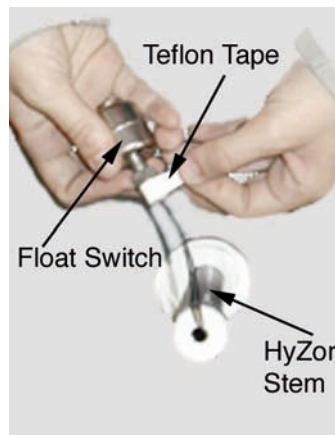
pic. 3



pic. 4



pic. 5



pic. 6

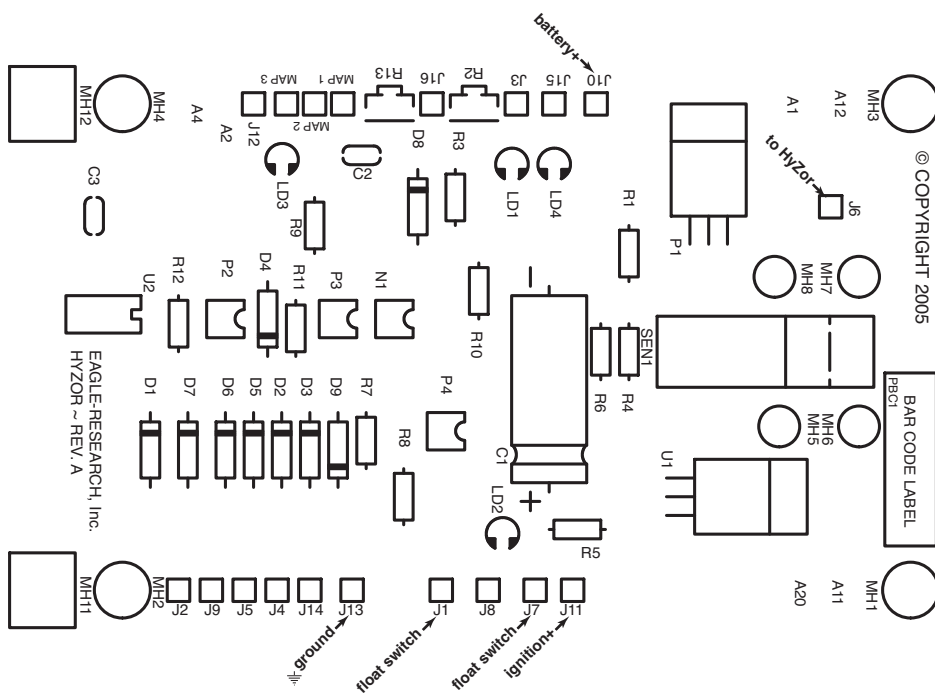


fig. 5

continued from pg. 4

Mosfets are Extremely Static Sensitive

Take extraordinary care handling them. Work in a static free environment.

Touch all mosfet pins with the same finger as you remove them from the protective foam or case.

Touch that finger (while holding the mosfet) to the circuit board before you insert the mosfet into the board. Bend the leads (a bit) once inserted to prevent mosfet from falling out. Solder as soon as possible.

Pay attention to the numerals on the mosfets. The n-channel mosfet (IRFD014) looks identical to the p-Channels (IRFD9014).

Pay attention to mosfet polarity on the board. *The side of the mosfet with two pins that are connected plugs into the holes that are connected underneath.* (see fig. 6)



fig. 6

🍏 GLOSSARY

bushing = an adapter that allows one size pipe to fit into a pipe of another size

drill bits = are described in fractional, numeric & letter sizes

FIP = female (threads) in pipe

flux = the residue of the rosin

ID = Inside Diameter

NPT = National Pipe Taper

OD = Outside Diameter

PVC = Poly Vinyl Chloride

rosin = the substance that takes away oxidization so that the solder will stick

tap = to create threads for a bolt

tin = to put a coating of solder on the tip of the soldering iron to insure good heat transfer

Circuit Board

bottom = solder side

top = component side

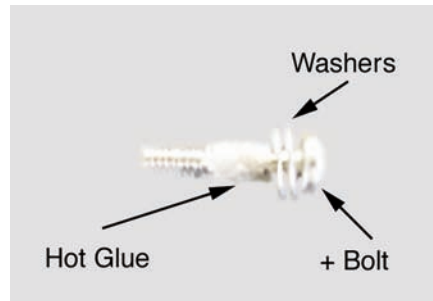
Wire Color Codes

black = vehicle ground

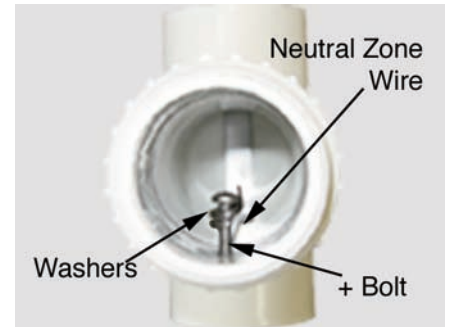
red = power

LED = Light Emitting Diode

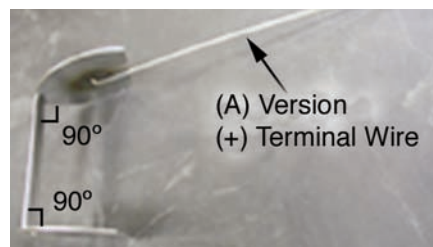
vehicle ground = all your vehicle's metal parts are the same as battery negative (must have continuity and zero voltage)



pic. 7



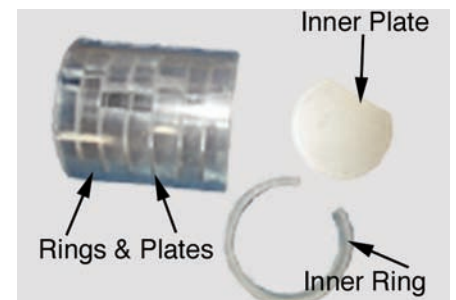
pic. 9



pic. 8a



pic. 8b



pic. 10



pic. 8c

Mixing Electrolyte

Mix 150 grams of sodium hydroxide (lye) into 350 gms of warm, distilled water. Pour the lye slowly, and stir constantly. *Dumping lye in fast will cause a violent reaction.*

Because the mixture is corrosive, use caution when pouring the lye solution into the ER HyZor. *Wash away any spills immediately with lots of water, flushing until the slippery feeling is gone.*

Hand tighten the float-switch-assembly onto the tower. Do not allow the wires to twist or the float will be damaged.

INSTALLING THE 'GAS OUT' HOSE

Drill a hole in the air filter housing, in such a way that the BG must travel through the air filter before going into the engine. The air filter will act as a backfire arrester and lye filter. Make the hole smaller than the hose you chose for the gas-out, so it's a tight fit. *Example: Drill an 11/32" hole for using with 3/8" OD vinyl tubing.*

Route the gas-out hose to the air filter. Use a sharp knife to taper the tip of the hose. Insert the hose into the hole so that it fits snugly. Fasten the hose along its route with wire ties. Put the rubber cap on the water-fill fitting.

ELECTRICAL WIRE INSTALLATION

Connect the black, 18 gauge, wire from the end caps, to a bare metal part of the vehicle to ground the ER HyZor. (fig. 3)

Use a multi-meter or test probe to locate a battery power source. It will have power when the ignition is off. *Example: A spare prong in your fuse box.*

Locate a 12 volt ignition (+) signal that shuts off when the ignition is off. *A spare prong in the fuse box or tapping into a wire like the radio.*

Disconnect the vehicle's positive battery terminal.

Connect a red 18 gauge wire to battery power. Run it through a 5 amp fuse holder and solder it to J10 on the circuit board. (fig. 5)

Connect a red 18 gauge wire to J6 on the circuit board. Connect the other end to the (+) bolt on the HyZor tower.

Connect a 20 gauge wire from the ignition signal to J11 on the board.

Connect the two float switch wires to J7 and J1. *They are not polarity sensitive.*

Connect J13 to vehicle ground. Reconnect positive battery terminal

Mounting The LEDs

LEDs can be board or remote mounted. "Remote mounting", choose a location that can be seen by the driver.

(Optional) When remote mounting the blue LED1, connect the output J3 to the (+) lead. Connect the (-) lead to the vehicle ground, recommended.

When remote mounting the yellow LED4 connect output J15 to the (+) lead. Connect (-) lead to the vehicle ground.

Use a 3/16" drill bit to make LED hole(s). Drill in a location that you can access from the back. Hot glue the LEDs in place making sure their leads do not touch any metal behind the dash.

INITIAL START-UP OF THE HYZOR

Turn on your key. A lit yellow LED confirms the HyZor is operating correctly. Add distilled water to the HyZor. It may need up to 150mL of water before the yellow light goes out. The blue LED, turns on, indicating the gas is being produced. *The brightness of the blue LED can be adjusted with R2. Your ER HyZor should have at least 13.5VDC at positive terminal when the blue LED is on and the engine is running.*

FAQs

- Q.** When do I refill the HyZor with water?
- A.** Put 10-50 mL in when the yellow light indicates. When the yellow LED is on, the power to the HyZor chamber is shut off to prevent damage that would be caused by low fluid level.
- Q.** What kind of water should be used in the HyZor?
- A.** Distilled water will reduce maintenance requirements. Do NOT use tap water.

All water has some impurities. Only the pure water comes out as Brown's Gas. The HyZor will gradually fill up with sludge as the impurities are left behind.

It is a good idea to remove the HyZor once a year to empty out the sludge.

Pour out the sludge through a coffee filter and you can reuse the electrolyte solution. Wash the chamber by swishing it with water. Be careful not to spill lye on anything.

- Q.** Will the HyZor freeze in the winter?
- A.** In really cold weather the solution will turn to slush. When the HyZor turns on, the electric current will thaw the slush and the HyZor will operate normally.

Note: Many people try to 'benchmark' the ER HyZor. This works okay if you provide 13.5 - 14.5 VDC as the vehicle would when running. 12 VDC is not enough voltage to move amperage through a cold electrolyzer.

**PARTS
~ included**

Check off boxes to the ER HyZor Kit parts to confirm inventory.

- 1 x assembly instructions
- 1 x HyZor DVD
- 2 x 2"x7¹/₂" PVC pipe
- 12 x internal plates
- 2 x 2" slip cap (end caps)
- 2 x 3/16" O-ring
- 2 x terminal plate assembly
- 1 x tower cap assembly
- 2 x 1/8" MPTx1/4" barbed fitting
- 1 x 1/2"x7³/₄" PVC tube
- 1 x 1/2" PVC cap
- 1 x float switch
- 1 x tower assembly
- 1 x 2" PVC tee
- 1 x neutral zone assembly
- 1 x #10x24x³/₄" SS bolt (+)
- 5 x #10 SS washers
- 6 x #10x24 SS nuts
- 1 x ER HyZor circuit board
- 1 x 1Kohm resistor
- 2 x 56Kohm resistor
- 1 x 68 ohm resistor
- 2 x 402 ohm resistor
- 3 x 1 amp diodes
- 1 x 7809 (voltage regulator)
- 1 x 50Kohm multi-turn pot.
- 2 x IRFD9014 mosfets
- 1 x IRFD014 mosfet
- 1 x IRF9Z34 mosfet
- 1 x mosfet heat sink
- 1 x T1-³/₄ Blue LED
- 1 x T1-³/₄ Yellow LED
- 1 x 1/4"ID rubber cap
- 1 x 10ml syringe

OPERATING THE HYZOR

The yellow LED indicates when water needs to be added. When the yellow light turns on, the HyZor power automatically turns off. The blue light also shuts off.

When the yellow light turns on, add a minimum of 10mL of water. *You do not need to immediately stop to add the water. The HyZor shuts off and will wait until water is added.*

You can add up to 50mL of water when the yellow light comes on. Adding 50mL reduces the frequency of refills.

TWEAKINGS

① Increasing the combustion efficiency of an engine increases the exhaust oxygen percentage.

The increased oxygen content in the exhaust is 'read' by the computer to be a lean mixture in the engine. The computer then adds extra fuel to bring the pollution back to 'normal'.

Fix this by installing an EFIE on each oxygen sensor mounted before the catalytic converter. The EFIE corrects the oxygen sensor's output signal by adding a 'floating' voltage. That way, the computer won't 'see' the extra oxygen and fight the fuel-saver by adding extra fuel.

② Brown's Gas speeds up the combustion process and increases the fuel's octane (anti-knock) rating.

Some vehicles automatically maximize engine's performance by advancing the timing (using a knock sensor to assist) as far as possible.

Brown's Gas 'virtually' causes a more advanced timing by increasing combustion speed.

Because of the increase in octane rating, vehicles that advance the timing until the engine knocks (and then retard the timing a bit) often advance too far when BG is used.

If too much of the combustion takes place Before Top Dead Center (BTDC) combustion pressure builds too soon, fighting the upward movement of the piston on the compression stroke. The result is less power and a loss in potential mileage. Obviously the opposite of what we desire.

Fix this by manually adjusting the ignition timing, retarding it toward TDC and/or use lower octane fuel (*which saves money too*).



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