Note from Patrick Kelly:

These plans are included on this web site, mainly because people are being charged for them.

I personally believe that these plans show a wholly ineffective design and I do not recommend that you attempt to replicate it.

At the very best, you should consider it to be a research and development project, probably with little likelihood of your efforts being successful. It is most definitely NOT a build, install and drive away project.

Please be aware that these plans have been around for a long time and in that period, not a single person has stated that they have replicated the design and got it to work. Not even one person. Most people are generally delighted to tell others of their success, but that has not happened in this instance.

Based on my knowledge of many different styles of electrolysers, in my opinion, there is not the slightest chance of this design ever operating as claimed. However, I have no direct proof that it does not work, so by all means, check the design out, but just be aware that I don’t know of a single experienced person who considers that there is the slightest chance of the unit actually operating.
Your Alternative to Soaring Fuel Prices

Hydro-Gen

"Hydro-Gen System” pat. Pending
Congratulations on your decision to purchase this E-Book. We have made every effort to keep the price of this E-Book as reasonable as possible so that every person can afford it. Getting off the spiraling gasoline price merry-go-round is that important.

This manual contains a brief explanation of how the Hydro-Gen System works. We will go into detail of using Water as a fuel. Some of the explanations used may not be clear to some of you. We do get somewhat technical. However, if you follow the instructions laid out here, you can build this System. This E-Book contains detailed construction Steps as well as Suppliers for all the parts used. When you get into the Electronics of the System, if you’re not comfortable with doing that section, you can, of course, hire an Electronics tech. to help you. We have made every attempt to make this as easy as we can for the average person to understand.

A note of Caution: When you get to the “Preliminary Testing” and the “Final Assembly and Test” sections, these sections are very detailed and somewhat complex, DO NOT shortcut these procedures. They may seem lengthy and appear to duplicate themselves, but they don’t. All of the Steps are there for a reason. When you’re done, you will have a “Hydro-Gen System” tuned to your Specific Engines requirements. And your vehicle will be running on Water. Free Water.

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When you get to the “Preliminary Testing” and the “Final Assembly and Test” sections, these sections are very detailed and somewhat complex, DO NOT shortcut these procedures. They may seem lengthy and appear to duplicate themselves, but they don’t. All of the Steps are there for a reason. When you’re done, you will have a “Hydro-Gen System” tuned to your Specific Engines requirements. And your vehicle will be running on Water. Free Water.
The Hydro-Gen System

Congratulations on your decision to purchase plans for the Hydro-Gen System. We have made the instructions as easy to follow as we can. We have included several drawings to help you understand and build the system. Throughout the instructions you will find a detailed materials list as well as suppliers for the components. Welcome to the Hydrogen Fuel System of our future, that is available now.

Figure #1 shows the entire Hydro-Gen System. While each component is essential to it’s operation, the heart of the system is the Hydrogen/Oxygen Generator, since it converts water into Hydrogen/Oxygen to power your engine. A Water Tank and Pump store and supply water for the Generator. Precise electronic signals from the Control Module initiate and sustain the creation of Hydrogen and Oxygen within the Generator. An In-Dash Gauge and Indicator Assembly allows you to accurately monitor all aspects of the Hydro-Gen System. Every part of the Hydro-Gen System is ruggedly designed for long life and reliable operation.
Hydrogen/Oxygen Generator

The following synopsis of the Hydro-Gen System may be somewhat confusing to those of you who have little knowledge of Electronics or Chemistry, but do yourself a favor, read it thoroughly. It will help you understand not only how the components work together but you will also understand how important it is to follow the instructions very closely and not take short cuts or use inferior materials.

Figure #2 – The Hydrogen/Oxygen Generator housing is a round cylinder constructed from high temperature CPVC pipe, a material widely used by the building industry in plumbing and heating systems. CPVC pipe is durable and nearly indestructible. It’s also a very “friendly” material in that it is easy to work with and can be used to fabricate many other things such as furniture, planters and housings for just about anything. The Generator housing contains a Coil and two cylindrical Electrodes used to generate Hydrogen and Oxygen. Each Electrode is made from Stainless Steel.

Now, understand that two Atomically different forms of Hydrogen are produced within the Generator. Most of the generated Hydrogen gas is Orthohydrogen, a very powerful and fast burning gas created by the two Electrodes. A precisely controlled high frequency electronic signal from the Control Module activates and controls the Electrodes. The other form of Hydrogen gas produced is Parahydrogen. It is created by the Coil in the Generator, but in much less quantity than the Orthohydrogen. A precisely controlled, very low frequency electronic signal from a separate circuit within the Control Module activates and controls the Coil.

Parahydrogen is a less powerful and slower burning gas, but is necessary to prevent precombustion (Commonly called “knocking or pinging”). Parahydrogen slows the burning rate of the Hydrogen/Oxygen mix, thus boosting its Octane level. Such precise control allows you to exactly match your engines Octane requirements. To raise Octane levels in gasoline, specific additives must be used to slow its burning rate. At best this is a far less accurate method, since it depends on trying to average the Octane requirements for millions of engines. Our precise control allows you to match the Octane requirements for your specific engine.

The Hydrogen/Oxygen Generator is actually an electronic circuit. The two Electrodes form a huge Capacitor, thousands times larger than Capacitors used in typical circuits, with Water acting as its dielectric. The Inner Electrode is Negatively charged, and the Outer Electrode is Positively charged, by the high frequency Control signal. Chemically, each water Molecule (H2O) is composed of two Positively charged Atoms of Hydrogen and One Negatively charged Atom of Oxygen. Since opposites attract, the Positively charged Hydrogen Atoms are pulled toward the Inner Electrode. But, at the same instant, the Negatively charged Oxygen Atoms are pulled toward the Outer Electrode. This action aligns every Water Molecule between the Electrodes, with the ends of each Molecule being pulled in opposite directions. For a brief moment more accurate alignment and increased pulling action upon the Water Molecules occurs. But, the Control signal pulses keep charging the Water Capacitor to higher and higher voltage levels; actually several thousand volts. Suddenly the electrical forces become so great that the Water Molecules burst apart (Scientists call this action disassociation) into their Gaseous forms of Hydrogen and Oxygen. If you were able to look into the Generator, this action would be obvious because of the formation of millions of tiny Hydrogen and Oxygen bubbles. As long as the Control signal is applied, the Water Capacitor remains fully charged; continuously creating Orthohydrogen and Oxygen.

The Generator Coil forms a different electronic circuit. This is an Inductive Circuit, meaning it creates a Magnetic field as opposed to the charged field created by the Water Capacitor. The very low frequency Control signal (a short pulse) activates the Magnetic field of the Coil. As soon as the pulse stops, the Magnetic field collapses. This then creates an even stronger Magnetic field, but a field of opposite Polarity. This is how an Inductive Circuit works, an action known as “Inductive kick”. Each pulse is precisely timed so that immediately after the Magnetic field reverses another short pulse arrives. Once again the Coil is charged and its Magnetic field collapses. But now the continually reversing Magnetic field becomes even stronger due to the added energy of each new pulse. Eventually (within a few seconds) the Coil reaches its maximum Magnetic strength, called its Saturation Point, which is extremely high. Most Molecules are affected by Magnetic fields. Such is the case here. The Coil’s reversing Magnetic fields vibrate the Water Molecules so severely that they disassociate into their gaseous forms of Parahydrogen and Oxygen. Disassociation obviously occurs, as evidenced by the creation of millions of tiny Hydrogen and Oxygen gas bubbles around the Coil.
At this point we’ve covered everything needed to understand the basic functions of the Generator. All the other components of the Hydro-Gen System are simply used to precisely control the action of the Generator. By varying the strength and frequency of the Control Module signals, the rate at which Hydrogen and Oxygen are created can be varied to match engine requirements at any particular moment. Water is supplied by the Tank and Pump, while a Level Sensor and Switch control water level within the Generator. For safety, a relief valve protects against excessive pressure buildup within the Generator. Separate ports are provided for attaching hoses to route Hydrogen gas to the engine and to a gauge to monitor gas pressure within the Generator. A drain valve is installed to allow periodic flushing of accumulated minerals and contaminants. The bottom cap is threaded so that the Generator can be opened up for inspection and/or repair and for occasional cleaning of the Electrodes and Coil. Two pairs of Stainless Steel rods protrude from the Generator body to provide electrical connection of the Electrodes and Coil to the Control Module.

As shown in Figure#1, the Generator gas output hose connects to a Flame Arrestor, which in turn connects to pressure fittings attached to the engine Carburetor. The Flame Arrestor provides protection against combustion flashback into the Generator in the event that the engine backfires. As with the Generator, the Flame Arrestor body is constructed from CPVC pipe. Pressure fittings are readily available at engine high-performance shops. They’re designed for converting engines to run on Propane, so are perfectly adaptable to the Hydro-Gen System.

We recommend installing the Generator in the engine compartment. It can be installed anywhere you can find room in the vehicle, even in the trunk if necessary. But, everything is simplified by placing it near the engine since that will minimize the routing of hoses, gauge lines and electrical wiring

**Water Tank and Pump**

This is probably the simplest part of the whole system. Just about any large container will hold water, but we’ll recommend a particular type of tank when we get to the construction phase. There are many ways to save a few $$ while building the Hydro-Gen, but if you want a quality product, don’t be tempted to cut corners. The whole system is designed to be highly reliable, so don’t take the chance of messing it up with cheap parts that are inferior. One example is that we recommend installing a Water Level Sensor in the water tank so you can easily monitor water quantity, and these Sensors are relatively expensive. If you don’t use the Sensor you’ll have to occasionally compare the miles you’ve driven versus the quantity of water; all based upon MPG of water consumption. Or you can visually check the water level fairly often, but someday, yes someday you’ll run the Water Tank dry and wish you had spent the extra $ for a Sensor and Indicator. It’s best to use a relatively large Water Tank. We recommend a 16-gallon Tank with translucent level markings, for easy measurement. The size provides a good reserve for long distance trips. We also recommend installing a 6-inch vent tube into the Tank cap to prevent spillage from sloshing water. Because of its size, the only practical location for the Water Tank is in the trunk.

You will have to decide on the Pump location. If you use the Self-Priming Pump we recommend, you can mount it in the engine compartment. If you choose not to, you will have to mount the Pump directly onto the Tank or very close by, and at a level near the bottom of the Tank. Also, if you don’t use a Self-Priming Pump, the water hose going from the Pump to the Hydrogen/Oxygen Generator will have to be capable of withstanding at least 66-psi water pressure. That’s the minimum recommended Pump pressure capacity required to overcome max. Gas pressures of 65-psi within the Generator, with an additional 1-psi needed to activate the One-Way Valve installed on the Generator housing. Plus, if you don’t use a Self-Priming Pump, you’ll have to run an extra power lead back to the trunk. For simplicity and reliability, we recommend a Self-Priming Pump.

**In-Dash Indicators**

To permit easy monitoring of the Hydro-Gen functions, we recommend two gauges: Generator Pressure (GEN PRESS) and Cylinder Head Temperature (CHT). We recommend 4 indicator lights: GEN WATER LOW, PUMP ON, TANK WATER LOW, and PWR ON. These should be installed in the vehicle dash or on an auxiliary panel. See Figure #3

Monitoring the GEN PRESS and CHT gauges allows you to develop a feel for how the system responds to various driving conditions. They’ll also help in tweaking the system to obtain max. Performance and economy. The GEN WATER LOW light normally remains UNLIT.
As “fuel” (Water) is consumed, the Generator water level gradually drops until the GEN WATER LOW light illuminates. At that point the Water Pump should start pumping water, illuminating the PUMP ON light. When the Generator water level has risen back to normal level, the GEN WATER LOW light should go back out. At the same time the Pump will stop running, and the PUMP ON light will go out. So, under normal operating conditions, both lights should illuminate at the same time, and both lights should go out at the same time. Any other light combination indicates a malfunction.

**Control Module**

The Control Module contains electronic circuits for controlling and/or providing power to all the Hydro-Gen electrically operated devices. Separate circuits exist to perform each of the following functions:

- Provide power to Generator Electrodes in the form of a high frequency signal, creating Orthohydrogen and Oxygen.
- Provide power to the Generator Coil in the form of a very low frequency signal, creating Parahydrogen and Oxygen.
- Control power to the Water Tank Pump by signals received from the Generator Water Level Sensor.
- Provide busing and terminal points for distributing power to the system gauges, indicators and sensors.

**Generator Electrode Circuit Schematic**

Figure #6 shows the schematic diagram for the Generator Electrode circuit. Its output is a square wave pulse, which is applied to the cylindrical electrodes of the Hydrogen/Oxygen Generator shown in Figure #1. Figure #4 shows this square wave pulse, which has an On: Off ratio of 1:1. Which means that the pulse is turned On for as long as it’s turned Off. The square wave pulse shown in Figure#5 has On: Off ratio of 3:1. That is, the pulse is turned On for 3 times as long as it’s turned Off.

The Generator Electrode circuit of Figure #6 is capable of varying its square wave pulse ratio between 1:1 and 10:1. Each On: Off pulse sequence is referred to as a “cycle” since each new pulse sequence keeps cycling On and Off in an identical way. Figure #4 shows 3 cycles of On: Off pulse sequences. If these cycles were all to occur within a time span of one second, we would refer to the pulse as having a frequency of 3 cps (cycles per second). If 127 cycles were all to occur within a time span of one second, we would refer to the pulse as having a frequency of 127 cps. Signal frequency is no longer measured in cps; instead the more common term is Hz. (Hertz). The symbol K is used to denote units of 1,000. So then, 3 cps would be 3Hz and 127 cps would be 127Hz. Thus 3,000 Hz would be 3 KHz and 127,000 Hz would be 127 KHz. The square wave created by the circuit of Figure#6 can be varied in frequency from approximately 8 KHz to 260 KHz.

The square wave pulse ratio determines the amount of current sent to the Generator Electrodes by the circuit of Figure#6. If the ratio is low (1:1), very little current arrives at the Electrodes. So the Generator produces very little Hydrogen and Oxygen. If the ratio is high (10:1), maximum current reaches the Electrodes and the Generator produces Maximum Gas Volume.

Varying voltage input from a Potentiometer connected via a 10K Resistor to Pin #3 of component LM741 causes the circuit to vary the pulse ratio, and consequently controls the amount of gases produced. The Potentiometer shaft connects to the vehicle Throttle Linkage, enabling control of Gas volume in direct response to voltage changes controlled by the rotation of the Potentiometer shaft in relation to Throttle Position. A Trimming Potentiometer connects Pins #2 and #6 of component LM741, enabling precise adjustment of the Throttle Input Signal. A second Trimming Potentiometer connects Pins #4 and #7 on component NE555, allowing precise pulse width adjustment. The Electrode pairs of each Generator exhibit a unique frequency of electrical resonance at which optimum gas volume is created. This frequency varies among different Generators. Several factors determine resonance frequency such as: Electrode size and shape, Generator chamber size and shape, spacing between Electrodes, Coil parameters and relative positioning as well as pulse amplitude (voltage level). A Trimming Potentiometer connected between Pins #1 and #2 of component CD4069 allows the precise frequency to be obtained. By selecting various combinations of Dipswitch connections to a bank of 4 Capacitors, pulse frequency can be varied between approximately 8KHz and 260 KHz.
Generator Coil Circuit Schematic

Figure #7 shows the schematic diagram for the Generator Coil Circuit. Its output is a square wave pulse, which is applied to the Coil of the Hydrogen/Oxygen Generator shown in Figure #1.

The Generator Coil Circuit creates a pulsed signal very much similar to that of the Electrode circuit of Figure #6; but production of Parahydrogen and Oxygen by the Coil entails totally different operating parameters than does Orthohydrogen and Oxygen produced by the Electrodes. Optimum operating frequency for the Coil is much lower, within the range of approximately 16Hz to 25 Hz.

Coil frequency directly correlates to the optimum operating frequency of the Electrode circuit since its input signal is received directly from Pin #3 of Electrode circuit component NE555. The Electrode circuit signal is received via the “Divide by N” Logic Circuit, which produces one output signal in response to a specific number of input signals. For example, if the optimal frequency of the Electrode circuit is 19 KHz and the “Divide by N” Logic Circuit creates one output pulse for every 1,000 input pulses, the output frequency of the “Divide by N” Logic Circuit would be 19 Hz. That signal is received via Pin #2 of component NE555, which creates the required square wave pulses. Those pulses are sent via Pin #3 to the base of Transistor 2N3055, where they are amplified and transmitted to the Coil.

The volume of Parahydrogen and Oxygen created by the Coil can be precisely regulated by adjusting the pulse width and amplitude Trimmer Potentiometers of its associated circuit. Parahydrogen acts as an Octane Booster. Therefore, the volume required depends entirely upon the operating demands of your engine. Since Parahydrogen cools the combustion process, excess volume tends to reduce engine efficiency. With that in mind, the Coil Circuit should be adjusted so that enough Parahydrogen is created to prevent engine (knocking) precombustion. However, if engine-operating temperature is running on the high side (as determined by the CHT gauge) increasing Parahydrogen volume is an effective way to lower the operating temperature.

In-Dash Indicators Circuit Schematic

The In-Dash Indicators circuit schematic is shown in Figure #8. Two gauges and four Light Emitting Diodes (LED’s) make the In-Dash Indicators Assembly. The Generator pressure (GEN PRESS) gauge connects via a hose to its respective fitting on the Generator itself (refer to Figure #1). The Cylinder Head Temp. (CHT) gauge electrically connects to a sensor placed under an engine spark plug.

When Generator Water Level Sensor is activated by low water level, its 12 VDC signal is sent to Pin #2 of Detector LM741 via a 10K Resistor. Detector output from Pin #6 triggers the base of Power Transistor E3055T, completing the circuit to activate the Water Pump and illuminate the “PUMP ON” LED. The 12VDC sensor signal also illuminates the “GEN WATER LOW” LED. When Generator water rises to its normal level, the Sensor opens; turning off the Pump and both LEDS.

When the Tank Water Level Sensor is activated by low water level (at 1/3 tank level), its 12VDC output signal illuminates the “WATER LOW” LED. After refueling (adding water), the Level Sensor opens, turning off the LED. When the Hydro-Gen System is turned on, the “PWR ON” LED illuminates. The Generator Electrode Circuit (Figure #6) activates the LED.

Construction of the Generator (Electrodes)

Since engine requirements dictate the volume of Hydrogen and Oxygen gases that the Generator must create, and gas volume is variable, I recommend sizing it as large as is practical to allow reserve capacity. Maximum outside diameter (O.D.) of 4-1/2 “ is already determined by the construction material used for the Generator Housing (4” CPVC Schedule 80 pipe). I recommend a minimum height of 10”. Maximum heights depends upon available space within the engine compartment, but for structural integrity, limit the max. height to 18”. Carefully check the engine compartment of your vehicle to ensure that adequate space exists for Generator installation. We believe that you’ll find that the 10” height is the easiest to work with. I’ve included dimensions and material lists for 18” also, more than 10” or less than 18”, you’ll have to adjust the dimensions.

NOTE: It may be possible to obtain the 3-1/2” Outside Dia. Stainless Steel Tubing with a wall thickness of .040”to .063” and of T-304 alloy at a local exhaust and muffler shop, but be very careful. All tube Dimensions, including roundness must be held within .005” throughout its entire length. Do Not use cheap tubing. If you do, the efficiency of the Hydro-Gen System will be severely degraded. If you are unable to obtain good quality tubing locally, we recommend the following source:
To construct the Generator, obtain a 3-1/2" O.D. T304 Stainless Steel tube with a wall thickness of .040" and .063", 5" shorter than the determined height of the Generator. This tube will be used to construct the Outer Electrode. Refer to the Generator exploded view, Figure #11 to help in correct construction.

NOTE: The following Steps #2, #3, & #4 will be used to determine the Outside Dia. for the Inner Electrode. This procedure will create a .045" gap between the inside wall of the Outer Electrode and the outside wall of the Inner Electrode. This is the optimum gap for maximum efficient production of Hydrogen and Oxygen gases with the Hydro-Gen System.

1. After determining the Generator height, obtain a 3-1/2" O.D. T304 Stainless Steel tube with a wall thickness of .040" and .063", 5" shorter than the determined height of the Generator. This tube will be used to construct the Outer Electrode. Refer to the Generator exploded view, Figure #11 to help in correct construction.

2. Multiply the wall thickness of the Outer Electrode by 2 (two) and record the result as dimension “A”. For example, if the wall thickness were .050", dimension “A” would be .100”.

3. Add .090” to dimension “A” and record that as dimension “B”. For example, if dimension “A” were .100”, then dimension “B” would be .190”.

4. Subtract dimension “B” from 3.50” (3-1/2”). Record this as dimension “C”. For example, if dimension “B” were .190", dimension “C” would be 3.31”.

5. To construct the Inner Electrode, obtain a Stainless Steel tube, alloy T304 with an O.D. equal to dimension “C” with a wall thickness of .040” to .063” and of the same length as the one for the Outer Electrode.

6. Refer to Figure #9. Drill eight (8) 1/4” holes spaced at 45 degrees radially around the diameter of one end of the Outer Electrode tube. Locate the hole centers 11/32” from the edge of the tube. Deburr the holes inside and out after drilling. You’ll find that drilling Stainless Steel works best if you use a carbide-tipped drill bit and light lubricating oil. Drill the holes slowly so as to not burn the drill bit and overheat the Electrode.

7. Repeat Step #6 to drill eight (8) 1/4” holes centered at 11/32” from the edge of the other tube, the Inner Electrode.

8. Referring to Figure #9, drill 1/8” holes in the Outer Electrode around the end of the tube on the same end as the 1/4” holes. Locate the centers for these holes 3/32” from the tube edge with the holes spaced at 3/8” intervals around the tube. Deburr the inside and outside of the holes after drilling.

9. Repeat the procedure of Step #8 to drill 1/8” around the diameter of the Inner Electrode. Drill these holes at the same end as the 1/4” holes. Deburr the holes inside and out after drilling.

10. Thoroughly clean all oil residues from both Electrodes using MEK or Acetone and a soft clean cloth.

11. Silver Bearing Solder and flux can be purchased at any large hardware or electrical supply store. Bare Stainless Steel Welding rod can be obtained at most Welding Supply stores.

12. Referring to Figure #9, cut two (2) 3” lengths from a 3/32” dia. Bare Stainless Steel Welding Rod, alloy T-304. Using a fine file, square the ends and deburr both ends.

13. Solder one of the rods to the OUTSIDE surface of the Outer Electrode as shown in Figure #9. Set the rod parallel to the length of the tube with 2” protruding past the edge of the tube.

14. Repeat the procedure of Step #13 and solder the other rod to the INSIDE surface of the Inner Electrode, also with 2” protruding past the tube edge.

15. After the Electrodes have cooled, thoroughly scrub the solder joints with warm, soapy water using a stiff-bristle brush. Thoroughly rinse the Electrodes with warm water and dry with a soft clean cloth.

16. Now, take a coffee break. Not beer, you want this Generator to work, don’t you?
**Generator Housing**

**NOTE:** Use CPVC pipe *(Schedule 80)* only to construct the **Generator Housing.** **DO NOT** use PVC pipe, or CPVC Schedule 40, since it will not withstand high temperature or pressure like the Schedule 80 will. **DO NOT** use CPVC pipe larger than 4” since it does not offer an adequate safety margin against rupture when subjected to high temperature and pressure. Careful attention to craftsmanship and detail during construction is essential to ensure safe and reliable operation. Any large plumbing supply store or large hardware store should have all the items you will need. However, if you have a problem finding these items, below is a supplier we recommend that has all the items you will need.

**List of materials needed:**
- One (1) CPVC 4” threaded pipe nipple, 12” long, Schedule 80 - #30314
- One (1) CPVC 1-1/2” pipe, 12” long Schedule 80 - #29018
- One (1) CPVC 4” straight coupling, Schedule 80 - #30059
- One (1) CPVC 4” cap, Schedule 80 - #30047
- One (1) CPVC 4” threaded cap, Schedule 80 - #29147
- One (1) 1/8” thick, 24” x 48” CPVC sheet - #45299
- One (1) 1” dia. x 6” length CPVC Rod, Schedule 80 – 43183
- One (1) pint can CPVC cement - #29053
- One (1) pint can of primer - #28292
- One (1) 8 oz. Can of pipe joint compound – 16532

The above materials are for a **Generator Housing** that is determined to be 10” long.

If you decide you need the longer one (18”) you will have to also order the following:
- One (1) CPVC 4” pipe 12” long, Schedule 80 - #29022
- One (1) CPVC 4” straight coupling, Schedule 80 - #30059

We will go thru the steps to build the 10” **Housing** and will add the additional steps needed to build the 18” **Housing** at the end.

**NOTE:** CPVC 4” Schedule 80 pipe has an outside diameter *(O.D.)* of 4.5” *(4-1/2”).*

1. Using a miter box or a table saw to assure squareness, cut off one of the 12” pipe nipple threaded ends 2-3/4” from one end. Dress the cut edges with fine sandpaper or a fine file.
2. Measure the inside diameter of the threaded end cap. Securely clamp the 1/8” thick CPVC sheet to a drill press bed. Drill a 1/2” dia. Hole thru the sheet. Using a *Fly Cutter* (available a large hardware store), cut a disk to the dia. you measured. Check that the disk fits snugly into the end cap. If loose or too tight, cut another disk. Be sure to drill the 1/2” hole in the sheet before you recut another disk.
3. Cut a second disk to the same dia as the first one (the one that fits snugly), be sure to also drill a 1/2'’ hole in the sheet before cutting the second disk.
4. Apply primer and then cement to one surface of each disk and join the disks together. Carefully align the edges and wipe the excess cement from the edges. Allow the disks to dry for 1 hour before continuing.
5. Refer to **Figure #10;** bevel the edges of the disk to fit the curved contour of the bottom of the end cap. These disks will not fit all the way to the bottom of the end cap but must be level. Be sure the outer edge of the disk measures between 1/32” and 1/16” after beveling.
6. Lightly coat the threads of the **Housing** and end cap, and the bottom edge of the housing with Petroleum Jelly. Apply primer to the mating surfaces of the disk and end cap. Apply cement to the primed area of the end cap only and install the disk, seating it firmly and evenly. Remove any excess cement from the parts with a soft clean cloth.
7. Temporarily thread the end cap onto the Housing, seating it slowly, but firmly. After about 15 minutes remove the end cap.

NOTE: The end cap will be temporarily threaded onto the Housing to assure accurate alignment of the disks when cementing them in place. Do not use excessive cement when installing the disk to prevent bonding of the Housing and end cap threads. Be sure the Petroleum Jelly coats only the end cap threads.

If you are building the 18” Housing, complete these steps in place of Step #1.

8. Using a miter box or table saw to assure squareness, cut the threaded pipe nipple 5-1/2” from one of its threaded ends. Dress the cut edges with fine sandpaper of a fine file.

9. Prime the outside mating surface of the cut end of the 5-1/2” pipe nipple and one of the inside mating surfaces of the coupling. Apply an even layer of cement to the primed surfaces and assemble the parts. Allow drying for at least 10 minutes before continuing.

10. Prime the outside mating surface of the 12” pipe and inside mating surface of the coupling attached to the pipe nipple. Apply an even layer of cement to the primed surfaces and assemble the parts. Allow the parts to dry for at least 30 minutes before continuing.

11. Using a miter box or a table saw to assure squareness, cut the pipe assembly near the unthreaded end to form a total pipe length equal to 1/2” less than the determined Housing height. Dress the cut edges with fine sandpaper or a fine file.

12. Go back to Step #2 and continue the same steps as for the 10” Housing.

13. Repeat the procedure of the preceding Steps #2, #3, #4, & #5 for the unthreaded end cap. There’s no need to apply Petroleum Jelly to any area of the unthreaded end cap. Apply primer to the mating surface of the disk and the end cap. Apply cement to the primed area of the end cap only and install the disk, seating it firmly and evenly. Remove any excess cement that squeezes out from between the parts with a soft clean cloth.

NOTE: Be sure to carefully measure the inside dia. of the unthreaded end cap before cutting the disks for this cap also.

14. Seal the 1/2” hole on the threaded end cap with electrical tape. Use a stiff bristle brush and warm soapy water, thoroughly clean the Petroleum Jelly from the threads and all other areas of the end cap and Housing. Rinse all the parts with warm water. Re-wash the parts a second time with warm soapy water and then rinse clean. Wipe all parts dry with a clean soft cloth.

15. Completely cover the inside surfaces of both end caps with strips of electrical tape. Cut away the tape to open up the 1/2” hole in each disk.

NOTE: The cavity in each end cap under the disks will be filled with Epoxy Cement. To prevent trapping air bubbles, the caps must remain level while pouring in the Epoxy and while it cures. Centering and leveling the curved end caps in the inner cores of large rolls of tape works well (duct tape rolls are good for this).

NOTE: Use only high quality, high temperature, waterproof Epoxy Cement to fill the end cap cavities. Using an inferior cement may lead to eventual failure of the Hydro-Gen Generator.

NOTE: To this end, we recommend J-B WELD. It can be purchased just about anywhere. J-B WELD comes in 2 oz. Tubes (one resin, and one hardener). You will probably need at least one pkg. To fill each end cap cavity. Be sure to have enough J-B WELD on hand before starting this step. Once the Epoxy is mixed, there’s no stopping it from curing. Once it cures, you cannot add more Epoxy to it, it will not bond properly.

16. Mix about a 4 oz. Batch of Epoxy in a disposable container such as a small paper cup. Slowly fill the cavity (to avoid trapping air bubbles) to the top of the 1/2” hole in one of the end caps. If necessary, quickly mix more Epoxy to finish the end cap.

17. Repeat Step #16 to fill the cavity in the other end cap.

NOTE: You’ll find that when filling the cavities, tapping on the outside of the end cap will help in filling the cavity.

18. Allow the Epoxy to cure for 24 hours. Remove all electrical tape from the end caps. Remove any Epoxy from above the top of the 1/2” hole until flush with the disk surface by grinding, scraping, sanding or whatever it takes.

19. Measure the Inside dia. of the Inner Electrode. Record this dia. as Dimension “D”.
20. Securely clamp the 1/8” CPVC sheet to a drill press bed. Using the Fly Cutter, cut a disk with the dia. of Dimension “D” from the sheet. Check that the disk slides easily into the end of the Inner Electrode at the end opposite the soldered rod, being neither loose nor tight. If the disk is either too loose or too tight, recut another disk.

21. Subtract .250” (1/4”) from Dimension “D” and record that as Dimension “E”. For example, if Dimension “D” is 3.21”, Dimension “E” would be 2.96”

22. Securely clamp the 1/8” CPVC sheet to the drill press bed. Using the Fly Cutter, cut another disk with the dia. of Dimension “E”.

23. Apply primer and then cement to one of the flat surfaces of each disk. Join the disks, centering the smaller disk on the larger disk. Center the disk as carefully as is possible. Clean the excess cement that squeezes out from the edges of the disk.

24. Grind a small notch in the outer edge of the larger disk so that the disk’s slide easily into the Inner Electrode over the soldered rod.

NOTE: The next two (2) steps will be used to cut a flat ring from the 1/8” CPVC sheet. DO NOT unclamp the sheet from the drill press bed until Step #25 is completed.

25. Securely clamp the 1/8” CPVC sheet to the drill press bed, centering the Fly Cutter at least 4” from the edge of the sheet. Cut a 3-1/2” hole in the sheet.

26. Adjust the Fly Cutter to a dimension of 3-15/16”, and cut the ring out.

27. Check that the ring slides easily onto the Outer Electrode at the end opposite the soldered rod. The ring must be neither too loose nor too tight. If needed, cut another ring.

28. Repeat the procedure of Step #25 and cut a 3-5/8” hole in the 1/8” thick CPVC sheet.

29. Repeat Step #26 exactly. Check the fit as in Step #27.

30. Apply primer and then cement to one of the flat surfaces of each ring; Join the rings, aligning the outer edges carefully. Clean any excess cement from the outer edges with a clean soft cloth. Allow the rings to dry for at least 30 minutes before continuing.

31. Next, grind a small notch into the inner edge of the rings just large enough to allow the rings to slide easily into the threaded end cap. Be sure when wrapping the tape that it does not protrude below the edge of the smaller ring at any point. DO NOT overlap the tape if you need to add more wraps, butt the tape ends before continuing to wrap more tape.

32. Using plastic electrical tape, wrap the outer edges of the rings until they slide easily into the threaded end cap. If the rings are too loose, add more tape, if too tight, remove some tape.

NOTE: Refer to Figure #12 to gain a better understanding to installing the rings into the threaded end cap. BE CAREFUL to apply primer only to the flat surface of the threaded end cap disk contacted by the smaller ring. DO NOT remove the tape until instructed to do so.

33. Apply primer to the flat surface of the smaller ring. Using a cotton swab or Q-tip, apply primer to the flat surface of the disk in the threaded end cap that will be contacted by the smaller ring. Apply a thin even layer of cement to the primed surfaces and install the ring into the end cap, allowing the taped edges to center the ring. Allow the parts to dry for at least 30 minutes before continuing.

NOTE: The next step will center the disks completed in Step #23 within the threaded end cap. Again, be certain that the tape does not protrude below the surface of the smaller disk at any point. DO NOT overlap tape ends if you have to add more tape to the disk. If you need to add more tape, butt the tape ends then continue wrapping. Refer to Figure #12 for a better understanding of these details.

34. Using plastic electrical tape, wrap the outer edge of the large disk until the tape creates a snug fit within the inside edge of the ring assembly.

NOTE: When installing the disks, make sure to offset the notch in the disk by at least 3/4” from the notch in Rings, as shown in Figure #12

35. Apply primer to the flat surface of the small disk and the flat inside surface of the threaded end cap. Apply an even layer of cement to the primed surfaces and install the disk assembly into the end cap. Align the disks with their notch offset at least 3/4” from the ring’s notch, as shown in Figure #12. Using a large C-clamp, lightly clamp the disks and end cap. Allow the parts to dry for at least 8 hours before continuing.

36. Remove all electrical tape from the threaded end cap assembly. Scrape away any excess cement that may have squeezed onto the flat inside surface of the end cap in those areas that will contact the bottom edges of the Electrodes and threaded end of the Housing.
37. Drill a 37/64” hole through the center of the threaded end cap as shown in Figure #12. You will be drilling thru the J-B WELD Epoxy that was installed earlier. This hole will be threaded later to install the Drain Cock.

38. Next, using a #41 drill bit, drill two (2) holes through the bottom of the threaded end cap at the locations where the notch’s are in the disk for the Inner Electrode and the Outer Electrode, as shown in Figure #12.

39. Temporarily align each Electrode and rod with its respective hole drilled in Step #38. Check that each Electrode and rod can be installed into the threaded end cap and seated firmly on the cap surface. Make any necessary adjustments to achieve correct seating of the Electrodes.

40. With the Electrodes in place, with a marking pen mark a short reference line near the top inside of the Inner Electrode. Mark another short reference line near the top inside of the Outer Electrode, aligning it with the mark on the Inner Electrode. Remove the Electrodes from the end cap.

Coffee break again. Take a break before going to the next step, it is a little delicate.

NOTE: The next step will help to center the Inner Electrode within the Outer Electrode, Again, DO NOT overlap tape ends if you add more tape. Butt the tape ends before continuing to wrap the tape.

41. Using plastic electrical tape, wrap the top end of the Inner Electrode until it fits snugly into the Outer Electrode. Allow about 1/4” of the tape to protrude above the top edge of the Electrode to allow easy removal later. Do not remove the tape until instructed to do so.

42. Arrange a way to solidly support the threaded end cap while installing the Electrodes and while the Epoxy cures. Again, centering and leveling the curved caps on the inner cores of a large roll of tape will make this job easier.

43. Once again, clean the bottom ends and the rods with MEK or Acetone using a clean soft cloth.

44. Seal the bottom ends of the two (2) holes in the end cap that the Electrodes will penetrate, with short pieces of tape. The tape will be pushed aside as the rods poke thru the end cap when the Electrodes are installed. The tape is there to prevent the Epoxy from dripping out until the Electrodes are installed.

45. Mix up about 2-3 oz. Of Epoxy in a disposable container such as a small paper cup. Fill in the slot in the end cap where the Electrodes will seat about 1/2 full.

NOTE: Be sure to install the Outer Electrode first!!

46. Using your finger, apply a very thin, but unbroken coat of Epoxy completely around the bottom edge (rod end) of the Outer Electrode. Form a band of Epoxy extending about 1/4“ high from the bottom edge, coating both the inside and outside surfaces of the Electrode.

NOTE: The 1/8” holes around the bottom edges of the Electrodes help secure the Electrodes to the end cap, because the Epoxy will fill in the holes. Install the Electrodes slowly into the end cap slot so as not to trap air bubbles inside of the holes.

47. Install the Outer Electrode into the end cap. As the Electrode starts to enter the slot, lower it very slowly so that the Epoxy has sufficient time to flow into the small (1/8”) holes drilled around the bottom edge without trapping air bubbles. After the Electrode is firmly seated into the end cap slot, remove the tape from the bottom of the end cap where the rod poked thru.

48. Apply a thin film of Petroleum Jelly to the surface of the tape wrapped around the top of the Inner Electrode.

49. Repeat Steps #46 & #47 to install the Inner Electrode into the end cap. Use the alignment marks on the tops of the Electrodes to aid in finding the second hole for the rod on the Inner Electrode. Remove the tape from the bottom of the end cap where the rod from the Inner Electrode poked thru.

50. Using cotton swabs or Q-tips remove any excess Epoxy oozing from the eight (8) 1/4” holes around the bottoms of the Electrodes. If necessary, continue to do this until the holes are clear or the Epoxy starts the set. Using a clean soft cloth, clean the Epoxy from the rod ends protruding thru the end cap and from the surrounding surface of the end cap.

51. Place about five (5) pounds of weight on top of the Electrodes to help keep them firmly seated on the end cap while the Epoxy hardens. Folding a small towel or two and placing them on top of the Electrodes with a stack of hardcover books on top, works very well. This will distribute the weight well and the towels will help in setting the books in place on top of the tape that is protruding above the tops of the Electrodes.

NOTE: Allow the Epoxy to cure for at least 24 hours at room temperature before removing the weights or disturbing the Electrode assembly.
52. After the assembly has cured for at least 24 hours, remove the weights from the assembly and remove the tape from between the two Electrodes. Using #400 grit sandpaper, remove any Epoxy residue from the rod ends protruding thru the bottom of the threaded end cap.

53. This completes the Electrode assembly.

**Housing Attachments**

1. Temporarily thread the Electrode assembly onto the Generator Housing, tightening it firmly. Support the entire assembly on the inner core of a large roll of tape.

2. Refer to Figure #13; fabricate 3 Coil support brackets (using dimensions shown) from the 1/8” CPVC sheet.

**NOTE:** For the most efficient operation, the Coil must be located approximately 1/4” above the tops of the Electrodes. Use a shim between the Electrodes and each bracket to obtain the correct clearance. Be careful not to cement the shims to the brackets or the Housing.

3. Using two pieces of the 1/8” CPVC sheet scrap for each bracket, apply the primer and then cement to the brackets and the inside wall of the Housing at 120 degree spacing as shown in Figure #13. After attaching the brackets, allow drying for 30 minutes. Use care so as not to cement the shims in place.

4. Remove the Electrode assembly from the Housing.

5. Mounting the Generator assembly can be done many ways. We have shown one way that is simple and sturdy. If you choose a different mounting, use care to make it sturdy enough to withstand road vibrations.

6. Brackets 1/4 “ thick are made from two layers of the 1/8” CPVC sheet as shown in Figure #14. Dress the edges of each strip using sandpaper or a fine file. Form the brackets by applying primer and then cement to the mating surfaces of two strips and then joining them together using care to align the edges. Clean the excess cement from the edges.

7. A piece cut from the leftover piece from the straight coupling will be used for part of the Housing brackets as well as a Doubler to increase the wall thickness of the Housing where a hose fitting will be installed.

8. Cut a 1-1/2” wide ring from the end of the coupling, Refer to Figure # 15. Using a band sander, sand the side of the ring to form a flat surface approximately 1-1/4” wide. Sand the side at another point to make a second mount. Cut the two pieces from the ring by cutting where shown. This will form two sections from the ring, each with flat outside surfaces ax. 1-1/2” by 1-1/4”. Dress the edges with fine sandpaper or a fine file.

9. As shown in Figure #15, attach one or these pieces to each flat bracket, locating the ring section in the middle of the bracket. Apply primer and then cement to both surfaces and the join together. Wipe off any excess cement with a clean soft cloth. Be sure to square the curved surface of each section with the length of the bracket.

10. Make a Doubler by cutting a section 1-1/2” wide from the ring as shown in Figure #15. Dress the edges and round the corners slightly with fine sandpaper or a fine file.

11. Temporarily thread the end cap onto the Housing, seating it firmly. Choose a point anywhere around the Housing as shown in Figure #15, and mark a spot 1/4” up from the edge of the end cap. Remove the end cap. Apply primer and then cement to the mating surfaces of the Doubler and the Housing and attach the Doubler to the Housing with its lower edge at the spot marked on the Housing. Align the edge parallel to the Housing bottom edge. Allow the parts to dry for at least 4 hours before continuing.

12. Drill a 37/64” hole thru the center of the 1-1/2” x 1-1/2” Doubler and Housing wall as shown in Figure #15. Be sure to drill the square with the Housing wall.

**NOTE:** Threads will be tapped into this hole to install a barbed hose fitting to connect to the Check Valve.

13. Drill a 1/4” hole near the end of each bracket (total of 4 holes) at location shown in Figure #14. Smooth and round the corners of each bracket slightly with fine sandpaper or a fine file.

**NOTE:** Now, the Check Valve hose will attach to the barbed fitting that will be installed in the hole you drilled in Step #12. Keep this in mind when determining the direction in which you prefer the fitting to be pointing in relation to the Housing being mounted on the mounting brackets. We recommend pointing it either to the left or the right to minimize Generator space requirements.
14. Position the brackets as shown in Figure #14, and clamp them to a flat surface. Check that the Housing seats evenly onto the curved section of each bracket with no gaps between the Housing and the curved section. Re-align as necessary.

15. Set the Housing in the position determined earlier and apply primer and then cement to the mating surfaces of the brackets and the Housing. Attach the Housing to the brackets being careful to align as required. Support the Housing as necessary to keep from rotating or shifting while the cement cures. Allow the parts to dry for at least 2 hours before continuing.

**Unthreaded End Cap**

**List of Materials:**

- Thread Taps – 1/8” NPTF and 3/8” NPTF (Cutting Tool Supply: specify Greenfield Taps for CPVC pipe, or obtain locally).
- Two Barbed 1/8” NPT x 1/8” Hose Fittings (SMC Part # 253490)
- Two 3/8” NPT Stainless Steel Inline Check Valves (Generant Part #ICV-MM-375-SS-1).
- One 3/8” NPT Pressure Relief Valve (Stra-Val Part #RVA-05, specify pressure setting of 85 psi).
- One 3/8” NPT Internal Seat Drain Cock (Fastener Hut Part # 230A).
- Five 3/8” NPTF x 3/8” Brass Barb Hose Fittings, Male Pipe Rigid (NPTF Short) (Fastener Hut Part # 10506B-106A).
- Four 3/8” NPTF x 3/8” Brass Barb Hose Fittings, Female Pipe Rigid (Fastener Hut Part # 10506B-206A).
- One 35 SS Series Stainless Steel Top Mount Level Switch, 1/8” NPT (Norgren Part #0107-024).
- One LS 11 Plastic Side Mount Level Switch, PBT, 5/8”-11 UNC (Norgren Part #1873-024).

**Suppliers:**

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<tr>
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<tbody>
<tr>
<td>340 W. Gerri Lane</td>
<td>5858 Centerville Rd.</td>
<td>1865 Rt. 23 S, PO Box 768</td>
</tr>
<tr>
<td>Addison, IL. 60101</td>
<td>St Paul, MN. 55127</td>
<td>Butler, NJ. 07405</td>
</tr>
<tr>
<td>Phone: 1-630-543-7171</td>
<td>Phone: 1-651-653-0599</td>
<td>Phone: 1-973-838-6500</td>
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<tr>
<th>Strava</th>
<th>Fastener Hut Inc.</th>
<th>Norgren, c/o Kip Fluid Cont. Inc</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 Columbus Ave.</td>
<td>3781 Glengarry Way NE</td>
<td>72 Spring Lane</td>
</tr>
<tr>
<td>Garfield, NJ. 07026</td>
<td>Roswell, GA. 30075-2615</td>
<td>Farmington, CT. 06032</td>
</tr>
<tr>
<td>Phone: 1-973-340-9258</td>
<td>Phone: 1-770-480-4617</td>
<td>Phone: 1-800-722-5547</td>
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</table>

**Unthreaded End Cap Details**

**NOTE:** A short length of CPVC rod inside the end cap will be used as a spacer for the Water Level Switch.

**CAUTION:** Be sure to use only NPTF taps. To prevent possible water and gas leakage, **DO NOT** use NPT taps. Both NPT and NPTF threads will seal properly in NPTF tapped holes. Be sure to tap to the correct depth by turning the tap until the 12th thread from the front of the tap fully enters the hole. Be sure to keep the tap aligned parallel to the sides of the spacer.

1. Using a miter box or table saw to assure squareness, cut a spacer approx. 2” long from 1” dia. CPVC rod. Using an “R” size drill bit, drill a hole thru the center of the rod its entire length, and parallel to its length. A drill press will be helpful here. Drill a hole thru the center of the end cap with the “R” drill as shown in Figure #16.

2. Using a 1/8-27 tap, tap threads into one end of the hole drilled in the spacer. Be sure to keep the tap aligned parallel to the sides of the spacer and to tap to depth of 12 threads from the end of the tap.
3. Temporarily thread the 35 SS Water Level Switch into the tapped hole, seating it firmly. Insert the switch power leads from inside the end cap thru the drilled hole in the end cap. Measure and record the distance from the inside surface of the end cap to the end of the switch center tube. Remove the switch from the rod. Making a square cut, cut the rod as required so that the end of the switch center tube is positioned 3” from the surface of the end cap, as shown in Figure #16.

4. Apply primer and then cement to the untapped end of the spacer rod and its mating surface inside the end cap. Install the spacer into the end cap being certain to align the hole in the spacer with the hole in the end cap. Using a Q-tip, remove any excess glue that may have oozed into the hole.

**Slosh Shield**

1. Using a miter box or table saw to assure squareness, cut a 3-1/16” long section from 1-1/2” CPVC pipe. Drill four (4) 1/8” holes into the sides of the pipe, spaced at 90-degree intervals and 1/4” from the edge as shown in Figure #17.

**NOTE:** Six of the seven disks cut will be used for the Flame Arrestor.

2. Using a Fly Cutter, cut seven (7) 1-57/64” disks from 1/8” thick CPVC sheet. Drill a 3/8” dia. hole thru the center of one of the disks.

3. Apply primer and then cement to the mating surfaces of the drilled disk and the end of the pipe opposite the four (4) holes. Attach the disk to the pipe, being certain to center the disk on the pipe.

**Flame Arrestor**

1. Using a miter box or a table saw to assure squareness, cut a 3” long section from 1-1/2” CPVC pipe.

2. Using a Fly Cutter, cut a 1-1/2” disk from the 1/8” CPVC sheet. Check that the disk fits snugly inside the 1-1/2” pipe. If it doesn’t, cut another one adjusting the dia. of the cut. Then cut four (4) identical disks.

3. Apply primer and then cement to two of the disks and join them together, wiping excess cement from the edges with a clean, soft cloth.

4. Repeat Step #3 with the remaining two disks.

5. In this same manner, make two (2) stacks of three (3) disks each from the six (6) disks cut in Step #2 of the Slosh Shield procedure. Cement together, making two (2) assemblies. Allow them to dry for 2 hours.

6. Drill a 3/8” hole thru the center of each of the two (2) stacked disks.

7. Referring to Figure #18, drill a total of thirteen (13) 1/8” holes thru each of the 1-1/2” disks at the indicated locations.

8. Apply primer to the edge of one of the 1-1/2” disks and to the inside of the 1-1/2” x 3” long pipe, applying the primer inside the pipe only for 3/8”. Apply cement to the primed surfaces and slide the disk into the pipe so that it is inside the pipe 1/8” as shown in Figure #18. Form a small bead of cement around the joint where the disk and the pipe meet, being careful not to get any cement in the thirteen (13) holes. Allow drying for at least 2 hours before continuing.


10. Repeat the procedure of Step #8 with the remaining 1-1/2” disks in the other end of the tube.

**NOTE:** Stainless Steel Wool is available at large supermarkets, or obtain it from the following supplier:

IWP
2575 W. Lemoyn
Melrose Park, IL. 60160
Phone: 1-800-732-9336
FAX: 1-708-345-0810

**CAUTION:** Again, be sure to use only NPTF taps. To prevent possible water and gas leakage, DO NOT use NPT taps. Both NPT and NPTF threads will seal properly in NPTF tapped holes.

Be sure to tap to the correct depth by turning the tap until the 12th thread from the front of the tap fully enters the hole.

Be sure to always keep the tap aligned squarely with the surface around the drilled hole.

**NOTE:** Be sure the two (2) stacks of three (3) disks joined in the preceding Step #5 have dried for at least 24 hours. When drilling holes in the following Step #11, be sure to keep the drill bits squared with the curved outer surface of the unthreaded end cap. This places the axis of each of the three holes at an angle to the axis of the center hole as shown in Figure #16.
11. Referring to Figure #16, drill two (2) 37/64” holes thru the top of the unthreaded end cap, each hole located 1-3/4” from the center hole in the cap. Be sure to keep the drill bit squared with the curved outer surface of the end cap.

Using an “R” size drill bit, drill a hole thru the top of the end cap 1-3/4” from the center hole in the cap as shown in Figure #16.

NOTE: Use extreme care to keep the taps aligned squarely with the surface at each holes location. Since the end caps are curved, each hole will have a different square alignment. Be sure also to tap to the correct depth of 12 threads from the end of each tap.

12. Tap 3/8-18 threads into the 37/64” holes at the following locations:
   - Two (2) holes on top of the unthreaded end cap.
   - One (1) hole on the bottom of the threaded end cap.
   - One (1) hole in the Doubler on the Housing wall.
   - One (1) hole in each of the two (2) Flame Arrestor end caps.

13. Tap 1/8-27 threads into the “R” size hole closest to the edge on top of the unthreaded end cap.

14. Tap threads into the 37/64” hole in each of the two (2) stacks of three disks joined in Step #5 using a 3/8-18 tap. Apply primer and then cement to the mating surfaces of one of the stacks of disks and the 3” Flame Arrestor pipe. Attach the disks to the pipe, being sure the tapped end of the hole faces outward. Repeat this procedure for the other stack of disks.

## Water Level Switch Test & Installation

NOTE: You need to verify correct operation of the Water Level Switch before installing the Slosh Shield. The following steps will help you perform this test. Please follow carefully.

CAUTION: DO NOT attempt to control power to any electrical device directly through the Water Level Switch. Doing so will damage or destroy the Switch.

NOTE: The Water Level Switch contains very high quality Magnetic Reed Contacts. It will reliably operate thru literally millions of cycles when connected to a properly designed electronic circuit. Now, the Water Level Switch is usually supplied with NC (normally closed) contact configuration. Step #1 will verify this.

1. Connect an Ohmmeter leads to the switch power leads. Suspend the Switch from its power leads and verify that the Ohmmeter indicates closed switch contacts. If the contacts are not closed, go to Step #3. If they are closed, continue to Step #2.

2. Slowly slide the Switch Float upward. Verify that the contacts open at approx. the midpoint of Float travel. If the contacts open properly, go to Step #4. If the contacts do not open properly, the Switch is defective and must be replaced.

3. Use a marking pen and mark a small dot on top of the Switch Float.

NOTE: The Switch probably has NO (normally open) contact configuration. Inverting the Float changes it to the required NC configuration. Carefully remove the Float retaining clip located at the bottom of the center tube. Remove the Float, invert it and reinstall the Float. Reinstall the retaining clip. Verify that the dot on the Float is now at the bottom and repeat the procedure of Steps #1 and #2 to verify.

4. Using a countersink tool, or a large drill bit, form a small bevel in the outer end of the center hole in the unthreaded end cap thru which the Switch leads will pass.

NOTE: As an added precaution against possible water and/or gas leakage, we recommend using pipe joint compound on all threaded Housing components.

CAUTION: DO NOT apply excessive torque to the Water Level Switch threads while installing the Switch into its mounting Spacer. Excessive torque can damage the Spacer threads, causing water and/or gas leakage as well as possible system failure.

5. Apply a light coating of pipe joint compound to the threads of the Switch and mounting Spacer according to the directions on the product label. Insert the Switch power leads thru the Spacer hole and thread the Switch into place, seating it firmly.
NOTE: The following steps are used to verify correct Switch operation in response to water level changes.

6. Get a transparent container (such as a large glass jar) with an outside dia. of approx. 2-1/2” to 3-3/4” and an inside depth of at least 3-1/2”. Place the unthreaded end cap on top of the container with the Switch inside. Be sure the bottom surface of the end cap seats evenly on top of the container. Position the end cap so that at least one of the large tapped holes projects inside the container and the Switch Float is at least 1/4” away from the container wall. Measure water level with the Switch Float in water.

7. Connect the ohmmeter leads to the Switch leads. Check that the Switch contacts are closed. Very slowly pour water thru the large tapped hole until the Switch contacts just open, and remain open. If the contacts close again, add a slight amount of water and wait several seconds before checking again. Keep repeating this process until the Switch remains open. Check that water level is at least 2” from the top edge of the jar. If the water level is less than 2” from the top, Switch is defective and must be replaced.

8. Remove the end cap assembly from the jar and dry as necessary with a soft clean cloth.

9. Apply primer and then cement to the mating surfaces of the Slosh Shield and the end cap. Attach the Slosh Shield, centering it around the Switch Float.

**Toroid Coil**

NOTE: The Hydro-Gen Coil is hand-wound around a Ferrite Toroid Core with insulated, high temperature copper wire. Close attention to detail and craftsmanship is essential to building an efficient and reliable Coil. There are literally millions of different coil configurations in existence. It’s a great area for experimenting since coil design is as much an art as it is science. Believe it or not, there’s actually an organization dedicated to the craft, the International Coil Winding Association, based in England.

Be forewarned that winding any Coil, especially a Toroid Coil, is a tedious task, but we’ll do our best to make the job as easy as possible. This Coil is created from 2,000 turns of insulated copper wire wrapped around a circular Magnetically Sensitive Core. That means you have to pull each wire wrap thru the Toroid Core just as many times.

Teflon Insulated Copper Magnet Wire is the only way to go. It handles heat extremes very well and is impervious to just about anything. It isn’t cheap, but well worth the investment.

You can order this wire from MWS Wire Industries. They carry over 25,000 different magnet and specialty application wires. Be sure to order “Double Build” (extra heavy) insulation, 23 AWG. You’ll need almost 550 feet of this wire. So order 550 feet and you will have enough.

**List of Materials:**

- One Ferrite Toroid Coil Core 3.50 OD x 2.00 ID x .500 thick (National Magnetics part # 995).
- Copper Magnet Wire, Teflon Coated, Heavy Build, 23 AWG, 550 Ft. (MWS Wire Ind. custom ord.).
- Teflo Etching Solution (“FluoroEtch”) (Acton Technologies)
- One Pkg. Heat Shrink Tubing, assorted sizes (Radio Shack, Catalog # 278-1610).

**List of Suppliers:**

- National Magnetics Group
  1210 Win Dr.
  Bethlehem, PA 18017-7061
  Phone: 1-610-867-7600
  FAX: 1-610-867-0200

- MWS Wire Industries
  31200 Cedar Valley Dr.
  Westlake Village, CA 91362
  Phone: 1-818-991-8553
  FAX: 1-818-706-0911

- Acton Technologies
  100 Thompson St
  PO Box 726
  Pittston, PA 18640
  Phone: 1-570-654-0612
  FAX: 1-570-654-2810

- Radio Shack
  (Nationwide stores)
After the Coil is completed, you need to coat it with a few thin layers of CPVC cement. This way you’ll end up with something that will last just about forever, and is practically indestructible. This also makes it very easy to solidly attach inside the Housing with CPVC cement. As you probably know, getting anything to stick to Teflon is almost impossible, except when I try my hand at cooking something. That is why it takes a special chemical etching to allow the CPVC cement to adhere. There are several Co.’s that specialize in this process, but the cost is extremely high. Now, there is a safe and easy etching process that can be done at home with great results, in a relatively new product called “FluoroEtch”. You simply warm FluoroEtch to 130 degrees, slosh the Coil around in it for about a minute, and then slosh it in Isopropyl or Methyl Alcohol for a minute or two. Wash the Coil in warm soapy water and rinse with warm water then let it air dry. After doing this, just about anything will stick to the Teflon Coated Coil, so be very careful with it. We are telling you all this so that when you call Acton Technologies you’ll sound knowledgeable enough that they won’t hesitate selling you the FluoroEtch.

1. We recommend cutting the Magnetic wire into four (4) 100 Ft. lengths and one (1) 150 Ft. length. Otherwise, you’ll have to pull 550 Ft of wire thru the Core 2,000 times. This works out to just over 104 miles of wire pulled thru the core and a very sore arm as well as probably a tangled mess. By working with 100 Ft and 150 Ft lengths, you’ll have to make four (4) solder splices to the wire, but you can cut your wire pulling down to a more manageable 22 miles. If your concerned about this length, you can go even further with eleven (11) 50 Ft lengths, with ten (10) solder splices and a length of just 9-1/2 miles. Making the lengths any shorter will require far too much soldering time and bulk. DO NOT try wrapping several times around the Core and then pulling the rest thru the Core. That will end up bending and straightening the wire many times and will eventually destroy the wire.

2. Forming a 3.50” OD x 2.0” ID x .50” Toroid Coil from 23 AWG wire requires about 250 turns of wire per wrapped layer. Since the Coil builds is size as it’s wrapped, each wrap uses an average of about 3” of wire. So, each 100 Ft of wire provides about 400 wraps, or slightly over 1-1/2 layers. Therefore, four (4) 100 Ft lengths and one (1) 150 Ft length will build an 8 Layer Coil of at least 2,000 turns.

NOTE: Save the 150 Ft wire for the last layer in case you need the extra wire to complete the 8th Layer without splicing near the Coil entry wire. NOW, any time you interrupt the wrapping, you must tightly wrap a strip of plastic electrical tape completely around the Coil to secure the last wrap. Teflon is extremely slippery stuff, you don’t want to come back after a break and find that your wrapped coils have loosened.

NOTE: The first complete wrapping of the Coil forms Layer #1 for the inner core. This is the critical layer since each subsequent layer will automatically position itself by nesting between the wires of the previous wrap.

3. Referring to Figure #19, slip a 1” length of small heat shrink tubing about 4” onto the Magnet Wire and apply heat to shrink it in place. If you are right-handed, you’ll probably choose to wrap the Coil in a clockwise direction, holding the Core with your left hand. Then, lay the shrink tubing on top of the Core, angled off to the left at about 30 degrees from straight as shown.

4. Start the first wire wrap over the shrink tubing at about its midpoint. This will be the start of Layer #1 for the inner core. Be sure to keep the wire wraps tight against each other in the Inside edge of the Core, with no overlapping. Keep tension on the wire at all times, with the wire always pointing straight out from the Core. This first wrap dictates the wire position of each subsequent wrap since each wire will fall into the depression formed between the wires of the preceding wrap. So, if you do a loose sloppy wrap on the first wrap, you’ll end up with a sloppy Coil. Take your time to do the job right. Continue wrapping until you have completed a full turn of the Coil. This completes Layer #1. Tightly wrap a strip of plastic electrical tape around the wire and the coil entry wire at the end of Layer #1.

5. Carefully check the position of each wire on the outside edge of the Core. If wrapped properly, there will be approx a .019” gap between any two wires. But, you can position each wire close enough by using a short piece of Coil wire as a feeler gauge. If the gauge wire touches the Core surface between any two wires, the gap is too wide, so at least one of the wires is out of position. Using your fingernail or a small blunt instrument slightly shift the wires to close the gap enough to keep the feeler gauge wire from contacting the Core surface. After you go around the Coil a few times, you should be able to visually detect wires out of position. It is very important to keep the spacing in this first layer as close to this as is possible. Using FluoroEtch, etch the Teflon surface of the wires as explained above.
6. Mix about a 1/2 oz. batch of the Epoxy (J-B WELD). Using a small brush, carefully apply a thin layer of Epoxy around the Outer edge of the Coil. Apply with a motion parallel to the wires to prevent wire movement. Be sure the Epoxy contacts the Coil surface between the wires. Suspend the Coil from its wires and allow the Epoxy to cure for at least 8 hours.

7. Start wrapping Coil Layer #2, exercising care to position each wire into the gap formed between the wires of Layer #1 on the Inner and Outer edges of the Coil. Count and record the number of turns. Continue wrapping until you get within about one (1) foot of the wire end. Secure the wire by tightly wrapping plastic electrical tape around the wire and Coil.

8. Coil thickness tapers down between the Inner and Outer edges. To minimize Inner Coil thickness, position wire splices on top or bottom of Coil, midway between the edges as shown in Figure #19.

9. Temporarily wrap the wire for two or three more turns and cut it about 1/2” short of the Outer edge. To splice to the next wire length, unwrap the wire and use a sharp knife to scrape away the Teflon coating from about 1/2” of each wire end. Be careful to keep the knife blade perpendicular to the wire.

10. Slide a 1/2” length of heat shrink tubing over the end of the next length of Coil wire. Twist the wire ends together for 7 to 8 turns to form a splice. Cut the splice length to about 1/4” and bend it back toward the Coil until it lays flush against the Coil wire. Solder the splice, slide the heat shrink tubing until it’s centered over the splice and apply heat to shrink the tubing. Let the splice to cool before continuing.

11. Remove the plastic electrical tape from the Coil and continue wrapping until Layer #2 is completed. Remember to record the number of turns required to complete Layer #2.

12. Referring to your recorded number of Coil turns needed to complete Layer #2, determine the number of Coil Layers required to complete the Coil with a total number of 1,800 to 2,100 turns.

NOTE: Although the total # of Coil turns is not critical, almost all Coils require a total of 8 wire Layers.

13. Repeat the procedure of the preceding Steps #6 thru #9 until the last Layer has been completed. Be sure the last turn ends within a turn or two of the Coil entry wire (Layer #1). Cut last wire to about 12”.

14. Referring to Figure #19, temporarily slide a 5” length of heat shrink tubing over the ends of the Coil wires (from Layer #1 and the last Layer). Draw the tubing snugly up against the Outer edge of the Coil and bend the Coil leads back toward the Coil at the outer end of the tube. Tightly wrap each Coil wire 4 to 5 times around the tubing about 1” from the end, twist the wires together for at least 5 or 6 turns. DO NOT heat shrink this tubing; it is just temporary.

15. CAUTION: USE EXTREME CARE DURING THE NEXT PROCEDURE TO PREVENT DAMAGING THE COIL WIRES.

16. TO ASSURE PROPER AND COMPLETE BONDING OF CPVC CEMENT TO THE COIL AFTER ETCHING, DO NOT HANDLE THE COIL WITH BARE HANDS. IF THE COIL MUST BE HANDLED AFTER ETCHING, USE CLEAN COTTON GLOVES.

17. Using FluoroEtch, while suspending the Coil by the heat shrink tubing; etch the surfaces of the Teflon coated Coil wires. Follow the directions on the product label. If necessary, review the etching procedure explained at the beginning of this section. Always handle the Coil by suspending it by the tubing during each phase, from etching thru final warm water rinse. Use clean paper towels to absorb water drips from the bottom of the Coil until dripping stops. Allow drying for 4 hours before continuing.

18. Using a soft bristle brush, coat the entire surface of the Coil with a thin even layer of CPVC cement. Use cotton swabs or Q-Tips to wipe away excess cement that may be dripping from the bottom of the Coil until dripping stops. Allow the cement to air dry for at least one (1) hour and then apply a second thin even layer of CPVC cement in the same manner.

19. Repeat Step #18 until a total of 5 to 6 layers of CPVC cement have been applied to the Coil. Allow at least one (1) hour drying time between each layer. Allow the final layer of cement to dry for at least eight (8) hours before continuing.

20. Unwrap the Coil wires from the heat shrink tubing and remove the tubing from the wires. Cut a 1” length of heat shrink tubing large enough to slip snugly over the Coil wires and the heat shrink tubing of the Coil entry wire. Draw tubing tightly against the Coil outer edge and apply heat to shrink the tubing.

21. Using a soft bristle brush, apply a thin bead of CPVC cement about 1/4” wide around the Coil end of the tubing and surface of the outer Coil edge. Allow the cement to air dry for about one (1) hour and then apply a second bead of cement over the first bead. Suspend the Coil from the end of its wires and allow it to air dry for at least 24 hours before continuing.

22. After the cement has dried for 24 hours, cut the Coil wires to a length of three (3”) inches from the Coil.
Toroid Coil Installation

NOTE: We recommend locating the Coil electrical connections on the side of the Housing directly opposite the Water Pump Inlet Port. This will minimize possible Coil wire connector fatigue due to the effects of water turbulence at high pump pressure.

1. Using a #41 drill bit, drill two (2) holes in the Housing at the locations shown in Figure #20.
2. Cut two (2) 4” lengths of 3/32” bare Stainless Steel Welding Rod. Make a 90 degree bend in one end of each rod to form a leg 1-1/2” long, cut the other leg to a length of 3/4”, as shown in Figure #20. Using a file, square off the ends of each rod and deburr the edges.
3. Using a sharp knife, scrape the Teflon coating from about 1/2” of each Coil wire end. Always keep the knife blade perpendicular to the wire to prevent damage to the wire.
4. Wrap one of the Coil wire ends around the top of the 1-1/2” leg of one of the rods for at least 4 to 5 turns. Using Silver Bearing Solder, solder the wire to the rod leg. Trim away any excess wire. Form a wire strain relief at the bottom of that leg by wrapping heavy thread for at least 3 to 4 turns around the leg and the wire, secure the thread with a knot at the outside of the rod leg.
5. Repeat Step #4 with the other Coil wire end and the other rod.
6. Using a soft bristle brush and warm soapy water, clean the soldered areas of the rods and wires. Rinse with warm clean water and allow the thread to air dry for at least one (1) hour before continuing.
7. Coat the entire length of the long legs of the two rods with a thin even layer of CPVC cement. Allow to dry for about 30 minutes, and then apply a second thin even coat of CPVC cement. Allow the rods to air dry for one (1) hour before continuing.
8. Temporarily install the Coil on top of its three (3) support brackets within the Housing. Position the Coil with the wires and rods pointing toward the holes drilled in Step #1. Temporarily attach three small strips of plastic electrical tape on top of the Coil to mark the location of each support bracket.
9. Remove the Coil from the Housing and apply primer to the bottom of the Coil at the three marked locations and the top surface of the three support brackets. Coat the top of each support bracket with a heavy layer of CPVC cement. Install the Coil onto the support brackets, positioning it with the wires and rods pointing toward the two #41 drilled holes. If necessary, shift the Coil slightly to center its outside edges within the Housing. Allow the Coil assembly to air dry for at least two (2) hours before continuing.

NOTE: The two (2) #41 holes in the inside Housing wall must be countersunk to a depth sufficient to clear the inside radius of the bend in the rods allowing the long soldered leg of each rod to lay flush against the Housing wall with the soldered leg pointing upward. Deburr the inside ends of the holes with a round file or a larger drill. Check to see that the rods fit into the holes with the long leg flush against the inside surface of the Housing.
10. Using #400 grit sandpaper, polish the surface of the unsoldered leg of each rod. Remove the three strips of plastic electrical tape from the top of the Coil. Mix a small amount of Epoxy (J-B WELD), apply a thin coat of Epoxy to the unsoldered leg of one rod. Using a toothpick, apply a thin coat of Epoxy to the inside of its respective hole in the Housing.
11. Apply primer and then cement to the inside of the Housing where the rod will sit. Apply cement also to the soldered leg of the rod. Full insert the rod into its hole in the Housing with the long leg pointing straight up. Hold the rod in place for about 5 minutes until the cement dries sufficiently to hold it in place. While the cement continues to fully dry, clean any excess Epoxy from the rod end using a soft clean cloth and a solvent like Acetone or MEK.
12. Repeat Step #11 with the other rod. Allow the Epoxy to cure for at least eight (8) hours before continuing.

NOTE: Several layers of CPVC cement are used to secure the Coil to the Housing brackets, and the rods and wires to the Housing wall and to seal the rods against possible water and/or gas leakage thru the holes in the Housing.
13. Lay the Housing on its side and apply a thick layer of CPVC cement over the wires and the soldered leg of each rod. Extend the cement layer around the holes where each rod enters the Housing wall, forming about a 1/2” dia. puddle around each hole. Allow the cement to air dry for at least one (1) hour before continuing.
14. Stand the Housing on end. Using a soft bristle brush, apply a thick layer of CPVC cement over and around the Coil surface above where it contacts each of the support brackets. Be sure the layer extends the width of each bracket. Allow to air dry for at least one (1) hour before continuing.
15. Repeat Steps #13 and #14 at least 4 to 5 times to obtain the desired thick layer of cement. Allow the cement to air dry for at least one (1) hour between successive layers.
16. After the cement has thoroughly dried and the Epoxy has fully cured, use #400 grit sandpaper to remove Epoxy residue from the rod ends.

**Unthreaded End Cap Installation**

*NOTE:* Generator function and efficiency is not effected in any way by the circular position of the Unthreaded end cap.

1. Check that the mating surfaces of the end cap and the top of the Housing are clean and free of any debris. Clean the mating surfaces if necessary with a soft clean cloth and a mild solvent such as isopropyl alcohol.
2. After determining the desired position of the end cap, apply primer and then CPVC cement to the mating surfaces of the end cap and the Housing. Slide the parts together seating them firmly.
3. Stand the Housing on end to prevent the possibility of excess cement running into the threaded holes in the end cap. Allow the assembly to air dry for at least one (1) hour.

**Generator Final Assembly**

1. Cut the two (2) rod ends protruding thru the bottom of the threaded end cap to a length of 1/2”. Using a fine file, square the end of each rod and deburr the edges.

*NOTE:* as an added precaution against possible water and/or gas leakage, we recommend using pipe joint compound on all threaded Generator Housing components.

2. Apply a coating of pipe joint compound to all threaded holes in the Generator Housing and end caps.

*CAUTION:* TO PREVENT DAMAGE TO THREADED HOLES IN CPVC MATERIAL, DO NOT APPLY EXCESSIVE TORQUE TO COMPONENTS WHILE INSTALLING THEM. THREAD DAMAGE CAN CAUSE WATER AND/OR GAS LEAKAGE AND POSSIBLE SYSTEM FAILURE.

3. Apply a light coating of pipe joint compound to the threads of the Drain Cock. Thread the Drain Cock into the 37/64” threaded hole on the bottom of the threaded end cap, seating it firmly. Repeat this procedure to install the remaining components:
   - One (1) 3/8” Barbed Hose Fitting into 37/64” hole in the Housing Doubler.
   - One (1) 3/8” Barbed Hose Fitting into 37/64” hole on top of the Housing.
   - One (1) 1/8” Barbed Hose Fitting into “R” size hole on top of Housing.
   - One (1) Pressure Relief Valve into 37/64” hole on top of Housing.
4. Using a toothpick, force a small quantity of Silicone Sealant (RTV Sealant) into the hole in the end cap thru which the Water Level Switch leads pass. Form a small and smooth fillet of Sealant around the leads and the end of the hole. Allow the Sealant to cure for at least 24 hours before continuing.
5. Visually inspect all surfaces and components of the Housing and end caps to verify their integrity. Correct any possible defects as required.
6. Thoroughly flush the interior of the Generator Housing with warm water. Stand the Housing on end and allow excess water to drain for at least 15 minutes. Using a soft clean cloth, thoroughly dry the Housing exterior and the threads of the Housing and the end cap.
7. Apply a light coating of pipe joint compound to the Housing and end cap threads. Thread the end cap onto the Housing and tighten firmly.
In-Dash Indicator Panel Assembly

NOTE: Personal preference dictates the layout of Panel Gauges and LED indicators. During assembly, refer to Figures #6, #7 & #8 for a better understanding of the wiring.

List of Materials:

- One (1) Cylinder Head Temperature Gauge (CHT) kit, 2-1/16” Dia., (includes spark plug mounted thermocouple sensor) (Bus Boys Part # VDO-310901).
- One (1) 2 – Gauge Custom Console (Bus Boys Part # VDO-1108720).
- One (1) Pressure Gauge, 2-1/16” Dia. (Auto Meter Products Model # 2360).
- Two (2) Bulb and Socket Sets, 2 Watt, (Auto Meter Products Model # 2357).
- Four (4) LED Indicators:
  - Two (2) Green (Radio Shack Part # 276-304).
  - One (1) Yellow (Radio Shack Part # 276-351).
  - One (1) Red, Blinking (Radio Shack Part # 276-308).
- Three (3) 55 Ft Spools 18 ga. Insulated, Stranded Hookup Wire (Radio Shack Part # 278-1220).
- One (1) 9 – Position Male Interlocking Connector (Radio Shack Part # 274-229).
- One (1) 9 – Position Female Interlocking Connector (Radio Shack Part # 274-239).
- Two (2) Pkgs. Crimp-On Snap Connectors, (5 – male & 5 – Female) (Radio Shack Part # 64-3085 and #64-3086).
- One (1) Pkg. Assorted Ring Terminals (Radio Shack Part # 64-3032).
- One (1) Pkg. Assorted Grommets (Radio Shack Part # 64-3025).
- One (1) 10 Ft. length 1/8” Silicone Braid Reinforced Tubing (US Plastic Stock # 54051).
- Twenty (20) Small Stainless Steel Worm Thread Hose Clamps (Local Hardware Store)
- One (1) Pkg. Small Nylon Tie-Wraps (Local Hardware Store).

Material Sources:

<table>
<thead>
<tr>
<th>Bus Boys</th>
<th>Auto Meter Products Inc.</th>
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<tbody>
<tr>
<td>183 Lake Blvd East</td>
<td>413 W. Elm St.</td>
</tr>
<tr>
<td>Redding, CA  96003</td>
<td>Sycamore, IL  60178</td>
</tr>
<tr>
<td>Phone: 1-530-244-1616</td>
<td>1-815-895-8141</td>
</tr>
<tr>
<td>FAX: 1-530-224-0933 (24/7)</td>
<td>FAX: 1-815-895-6786</td>
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<tr>
<th>United States Plastic Corp.</th>
<th>Radio Shack</th>
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<tbody>
<tr>
<td>1390 Neubrecht Rd.</td>
<td>(Stores Nationwide)</td>
</tr>
<tr>
<td>Lima, OH 45801-3196</td>
<td></td>
</tr>
<tr>
<td>Phone: 1-800-537-9724 (7:30am-7pm EST Mon-Fri)</td>
<td>FAX: 1-800-854-5498 (24/7)</td>
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NOTE: The quickest and easiest method for mounting gauges and LED’s is to use a prefabricated console attached to the dash (on top or hanging down). Other methods may work, but we recommend the VDO-1108720 Custom Console, which is molded ABS plastic.

1. Temporarily mount the CHT and Pressure Gauges in the Console. Referring to Figure#2, determine the best locations for the four (4) LED’s and place reference marks at those locations on the outside of the Console. Drill a 7/32” hole at each location. To assure proper adhesion of the Silicone Sealant to the Console interior surface, roughen around the area of the drilled holes with fine sandpaper.

2. Temporarily disconnect the CHT gauge thermocouple lead and mount the gauge in the Console. Apply a light coating of pipe joint compound to the 1/8-27 threads of the Pressure Gauge and the 1/8-27 barbed hose fitting. Thread the fitting into the gauge and tighten firmly. Slip the 1/8” Silicone Tubing fully onto the barbed fitting and secure with two small Stainless Steel Hose Clamps. Firmly tighten the hose clamps and mount the Pressure Gauge in the Console.

NOTE: The shorter of the two LED leads is always the Anode (+) lead.
3. Identify the Anode (+) lead of each LED and cut it to a length of 1”. Cut four (4) 3 Ft lengths of 18 gauge hookup wire and strip 1/2” of insulation from the end of each wire. Wrap the ends of each wire end around each Anode lead and solder. Slide a 1-1/2” length of heat shrink tubing over each wire and flush against the LED and shrink the tubing.

4. Referring to Figure #3, identify the Console location for each LED. Using masking tape, attach an identifying label to each Anode wire.
   - Green, PWR ON
   - Green, PUMP ON
   - Yellow, GEN WATER LOW
   - Blinking Red, TANK WATER LOW

5. Cut two lengths of hookup wire to use as jumper wires between Bulbs and Sockets for the Gauges. Strip 1/2” of insulation from the ends of each wire. Solder a wire to one Socket center connector. Slide a 1” length of heat shrink tubing onto the wire and as far as possible onto the Socket base. Shrink the tubing. Cut a 3 Ft length of hookup wire and strip 1/2” of insulation from one end. Twist the ends of the soldered jumper wire and the 3 Ft wire together. Slide a 1” length of heat shrink tubing onto the wires and solder the wires to the other Socket center connector. Slide the tubing as far as possible onto the Socket base and shrink the tubing. Label the wire “Positive” (+).

6. Cut a 6” length of hookup wire. Repeat the procedure of Step #5 to connect the 6” wire and jumper wire between the two Socket base connectors. Strip 1/2” of insulation from the end of the 6” wire.

7. Cut the Cathode lead of the Green “PWR ON” LED to 1-1/2” long. Cut the Cathode lead of the Yellow “GEN WATER LOW” LED to 1” long. Cut an appropriate length of hookup wire to serve as a jumper wire between the Cathodes of both LED’s. Strip 1/2” of insulation from each end of the wire. Solder the jumper wire to the Yellow LED Cathode. Slide a 1-1/2” length of heat shrink tubing over the wire and flush against the LED and shrink the tubing. Twist the stripped ends of the jumper wire and 6” wire from Step #6 together. Slide a 1” length of tubing over the two wires and solder them to the Green LED Cathode. Slide the tubing flush against the LED and shrink the tubing. Cut a 3 Ft length of hookup wire and strip 1/2” of insulation from one end. Solder the wire to the Green LED Cathode. Slide a 1-1/2” length of heat shrink tubing over the wire and as far as possible onto the LED lead and shrink the tubing. Label the wire “Ground”. Cut the Cathode leads of the two remaining LED’s to 1” long. Cut two (2) 3 Ft lengths of hookup wire and strip 1/2” of insulation from the end of each wire. Solder the wires to the LED Cathodes. Slide a 1-1/2” length of heat shrink tubing over each wire and flush against the LED and shrink the tubing. Label the Green LED wire as “PUMP ON CATHODE” and the Red LED wire as “TANK WATER LOW CATHODE”.

NOTE: Silicone Sealant cures by chemical reaction with oxygen and water moisture in the air, which is why its sometimes referred to as RTV (Room Temperature Vulcanizing) cement. Sealant cure time can be shortened considerably by placing a water-dampened cloth within the Console interior and placing the Console into a plastic grocery bag (don’t seal the bag so that its airtight). This method is especially effective in dry climates.

8. O.K. time for a coffee break.

9. Slide each LED into its correct mounting hole in the Console. Slide one LED about 1/16” back from the interior surface of the Console and apply a small amount of Silicone Sealant into the gap between the LED flange and the Console surface. Slide the LED back into place and flush with the Console surface. Apply a thick bead of Sealant around the LED flange and about 1/4” onto the Console surface. Repeat the same procedure for the three remaining LED’s. Allow the Sealant to cure for at least 24 hours before continuing.

10. Install the Bulbs and Sockets into the Gauges. Draw the seven (7) LED wires and Bulb Socket wire together a short distance from the LED’s and secure the wire bundle with a tie-wrap. Tighten the tie-wrap and cut off the unused portion.

11. Drill and/or grind a hole to install a 5/8” ID Grommet thru the engine firewall at an appropriate location for routing of Control wires, Thermocouple lead, and Pressure Gauge tube. Deburr the hole and install the 5/8” Grommet. Insert the Thermocouple lead thru the Grommet from the engine side and reattach it to its CHT gauge terminal.
12. Permanently attach the *Console* to the *Dash* at the desired location. Secure the wires, *Thermocouple* lead, and *CHT* tube bundle with a tie-wrap placed every 6” along the length of the bundle. To prevent collapsing the *Pressure Gauge* tube, be sure not to over tighten the tie-wraps.

13. Cut the ends of the eight (8) wires to the same length and strip 1/4” of insulation from the end of each wire. Attach each wire to a separate pin of the 9-position Male Interlocking connector by crimping or soldering. Be sure to carefully label each wire.

14. Remove a spark plug from the engine and plug the hole with a soft clean cloth. To assure good electrical contact for the *Thermocouple*, polish the area contacted by the spark plug with #400 grit sandpaper. Remove the cloth from the spark plug hole. Slip the *Thermocouple* ring over the spark plugs threads and reinstall the spark plug. Tighten the spark plug to its normal torque value.

**Water Tank and Pump**

**List of Materials:**

- One (1) rectangular *Polyethylene Tank*, 16 Gallon, 21” x 14” x 14” (US Plastic Stock #8658).
- High-Low Temperature Silicone Tubing, 3/8” ID x 20 Ft, (US Plastic Stock #54037).
- Silicone Braid Reinforced Tubing, 3/8” ID x 20 Ft (US Plastic Stock #54055).
- One (1) High-Head Pump, 12 vdc, 75 psi (minimum) (Flojet).
- One (1) Brass Bushing, 3/4” *PTF Male* x 3/8” *PTF Female* (Fastener Hut Part #3220X12X06A).
- One Pkg. Crimp-On Butt Connectors (Radio Shack Part #64-3037).

**Material Suppliers:**

- U.S. Plastic Corp.
  1390 Neubrecht Rd.
  Lima, OH  45801-3196
  Phone: 1-800-537-9724 (7:30am / 7pm EST Mon-Fri)
  FAX: 1-800-854-5498 (24/7)

- Fastener Hut Inc.
  3781 Glengarry Way NE
  Roswell, GA  30075-2615
  Phone: 1-770-480-4617
  FAX: 1-770-998-2721

- Flojet Corp.
  20 Icon
  Foothill Ranch, CA  92610
  Phone: 1-800-235-6538
  FAX: 1-949-859-1153

- Radio Shack
  (Stores Nationwide)

**NOTE:** Water tank capacity is not critical, but should be at least 10 gal. The recommended tank is sturdily constructed, holds 16 gal. And is furnished with a 3/4” *FPT* outlet fitting.

1. Apply a thin coat of pipe joint compound to the internal threads of the 3/4” x 3/8” bushing and the threads of a 3/8” barbed hose fitting. Thread the fitting into the bushing and tighten firmly.

2. Apply a thin coat of pipe joint compound to the external threads of the bushing and the internal threads of the water tank fitting. Thread the bushing into the tank and tighten firmly.

**NOTE:** The *Water Level Switch* can be installed at the midpoint of either sidewall of the tank. Determine the best location based on the routing of electrical leads, position layout, etc. One Switch lead will be grounded to the vehicle frame and the other lead will be connected to the *Control Module*.

3. Drill a 5/8” hole in the sidewall of the *Water Tank* at the midpoint of its length and 4” up from the bottom. Rinse the tank out with water to remove any plastic chips from drilling.

4. Remove the *Tank cap*. Drill a 3/8” hole thru the center of the cap and thread the hole with a 3/8-18 tap. Rinse the cap with water to remove all cuttings. Thread a 3/8” barbed hose fitting into the tapped hole and seat firmly. Cut a 6” length of *High-Low Temp. Silicone Tubing*. Slip the tubing onto the fitting and secure with two (2) *Stainless Steel Clamps* and tighten firmly.

**CAUTION:** DO NOT ATTEMPT TO CONTROL POWER TO ANY ELECTRICAL DEVICE DIRECTLY THRU THE WATER LEVEL SWITCH. DOING SO WILL DAMAGE OR DESTROY THE SWITCH.
5. Strip 1/4" of insulation from the ends of the LS-11 Water Level Switch leads. Connect Ohmmeter leads to the Switch leads. Pivot the Switch Float until flush against the Switch body. Verify that the Ohmmeter indicates closed Switch contacts. If contacts are not closed, the Switch is defective and must be replaced.

6. Pivot the Float Switch away from the body until it is within 10 degrees of its stop. Verify that the Switch contacts are open. If the contacts are not open, the Switch is defective and must be replaced.

7. Using a soft clean cloth, dry the tank sidewall around the 5/8" hole. Apply pipe joint compound to the threads of the Switch body and mounting nut, and their mating surfaces with the tank wall. Install the Switch into the tank so the Float pivots upward, aligning its pivoting axis parallel to the tank bottom. Firmly tighten the Switch mounting nut.

8. Attach Ohmmeter leads to the Switch leads and verify the Switch contacts are closed. Plug the tank outlet fitting and fill the tank with water until the Switch contacts open. Continue filling the tank until the water level rises an additional 2". Verify that the Switch contacts are still open. Unplug the tank outlet and verify that the Switch contacts close when the water level drops to approx. the 1/3 full point, and proceed to Step #9. If the Switch contacts do not respond to changing water level, check to verify that the Switch is properly installed and the Float pivots freely. Verify that the Float is at least 1/4" away from any part of the tank. Correct any installation problems. If the Switch has been properly installed, then it is defective and must be replaced.

9. Drain the water from the tank and install the cap, tightening it firmly. Depending on where you plan to install the tank, construct a wood frame approx. 3" high to secure the tank from sliding around. Cut notches in frame to provide clearance for the tank outlet and the Switch mounting nut and wires.

10. Locate a convenient spot on the vehicle chassis close to the Water Tank and drill a 3/32" hole for the grounding ring terminal attachment for the Tank Switch. Using a clean rag and solvent, remove dirt and debris from around the hole. Remove the paint and/or rust from around the hole. Strip 1/2" of insulation from end of one Switch wire; crimp large ring terminal onto wire. Do not attach terminal.

11. If, as recommended the Water Pump is installed within the Engine compartment, High-Low Temp. Silicone Tubing will be used to connect the Tank to the Pump. If the Water Pump is to be installed in the trunk area or farther away from the Engine, then the tube connecting the Pump to the Check Valve will be pressurized (up to 85 psi) and Silicone Braid Reinforced Tubing must be used. If the Pump you are using is NOT self-priming, it MUST be installed near the Tank.

12. Determine the length of tubing needed to reach from the Pump or Water Tank to the Engine compartment. If the Pump will be located within the Engine compartment, go to Step #14. If the Pump will be located in the trunk or rear of the vehicle, go to Step #13.

13. Mount the Pump at the desired location in the trunk or the back of the car. Determine the length of tubing needed to attach the Pump to Tank. Cut High-Low Temp. Tubing to the required length and slide onto the Tank fitting. Secure tubing with two (2) small Stainless Steel hose clamps and tighten firmly. Slide the Tank into the wood frame you constructed to hold it in place. Slide two (2) small Stainless Steel hose clamps onto tubing coming from the Tank and slide the tubing onto the Pump inlet fitting. Slide hose clamps over the fitting and tighten firmly. Slide Silicone Braid Tubing onto the Pump outlet fitting. Slide two (2) Stainless Steel hose clamps over the fitting and tighten firmly.

14. Cut High-Low Temp. Tubing to the required length and slide the tubing onto the Tank fitting. Secure the tubing with two (2) small Stainless Steel hose clamps and tighten firmly. Slide Tank into wood frame.

15. Attach the Tank ring terminal to the 3/32" hole in the chassis with a sheet metal screw. Apply a layer of Petroleum Jelly or Grease over the terminal and screw to prevent corrosion buildup.

16. Strip 1/2" of insulation from the end of the remaining Switch wire and crimp a butt connector onto the wire. Determine the length of hookup wire needed to extend at least 3 Ft into the Engine compartment and cut to length. Strip 1/2" of insulation from the end of the hookup wire and crimp it to the butt connector. If the Pump is to be installed in the trunk or the rear of the vehicle, repeat this procedure to splice an equal length of hookup wire to each Pump Power lead.

17. Route the Tank and Pump wires and tubing thru the vehicle. Be sure to install a 3/4" ID Grommet wherever an access hole must be drilled. Use Tie-Wraps about every 6" to secure the wire and tubing bundle. Use caution to prevent crushing the tubing. Do not over tighten the Tie-Wraps.

18. Securely mount the Water Pump in the Engine compartment if the Pump is to be installed there. Slide two (2) small Stainless Steel hose clamps onto the High-Low Temp. Tubing. Install the tubing onto the Pump inlet fitting and tighten the hose clamps firmly.
Control Module

Materials List:
The following items are available at Radio Sack. The Part #'s are Radio Shack's.

- One #LM471
- One #NE555
- One #CD4069
- One bank of four (4) DIP switches
- Bank of four (4) Capacitors - .01u, .1u, .03u, 3300pf

When purchasing these components, take the Generator Electrode Circuit Schematic with you and the person at Radio Shack will be able to help you with the various resistors and capacitors.

- One #NE555
- One #CD4059A
- One #2N3055
- One #1N4007

Again, take the Generator Coil Circuit Schematic with you to Radio Shack

- One #LM741
- One #E3055T

Again, take the In-Dash Indicators Circuit Schematic with you to Radio Shack

- One Universal Component Board (Radio Shack Part # 276-168).
- One PC Board Kit (Radio Shack Part # 267-1576).
- One Enclosure 8” x 6” x 3” (Radio Shack Part # 270-1809).
- Two 12-Position Male Interlocking Connectors (Radio Shack Part #274-232).
- Two 12-Position Female Interlocking Connectors (Radio Shack Part #274-242).

NOTE: Since both the Electrode Circuit (Figure #6) and the Coil Circuit (Figure #7) operate at relatively low frequencies, physical layout of the Control Module components is not critical. Mount components using the Universal Component Board, or design and create your own PC Board layout using the PC Board Kit (even includes needed chemical solutions). The recommended Enclosure provides protection for the Control circuits and is easy to mount. The Electrode, Coil and Indicator circuits may be built on the same board or on separate boards, using the side-board mounting feature of the recommended Enclosure.

1. Referring to Figure #6, build the Electrode Circuit using components as detailed.
2. Referring to Figure #7, build the Coil Circuit using components as detailed.
3. Referring to Figure #8, build the Indicators Circuit using components as detailed.

NOTE: A hole must be drilled in the Control Module enclosure for routing wires to the 9-Position Indicators Panel Connector. A second hole must also be drilled for routing wires to two 12-Position connectors for all other system components. Be sure to install an appropriately sized Grommet in each hole.

4. Drill a hole in the Enclosure and install a 3/8” ID Grommet. Cut eight (8) 1 Ft lengths of hookup wire and strip 1/2” of insulation from one end of each wire. Route one wire thru the Grommet and solder it to the Control “Ground” (-) bus See Figure #6 and label the wire. Refer to the following Figures to solder the seven (7) remaining LED and Bulb Socket wires (be sure to label each wire).

- PWR ON -- Figure #6
- All other LED’s – Figure #8
- Positive (+) Bulb Socket center connector wire – Figure #8

5. Cut the eight (8) wires to equal length and strip 1/4” of insulation from the end of each wire. Connect the wires to the 9-Position Female Interlocking Connector. Be sure the wire label at each position corresponds to the wire label at each position of the 9-Position Male Interlocking Connector. After connecting the wires, secure the wires with a Tie-Wrap placed every 3” along the length of the bundle.
6. Drill another hole in the enclosure and install a 1/2” ID Grommet. Cut nineteen (19) 1-foot lengths of hookup wire, strip 1/2” of insulation from one end of each wire. Solder two (2) wires to the appropriate terminals for the Generator Electrodes (Figure #6), two (2) wires to the appropriate terminals for the Generator Coil (Figure #7), one (1) wire to the appropriate terminal of the Pump Circuit (Figure #8), one (1) wire to the appropriate terminal for the Generator Water Level Switch (Figure #8). Solder five (5) wires before the fuse connection (battery + side of the power bus, see Figure #6) and five (5) wires to the negative (-) bus. Solder one (1) wire to the Throttle 10K Resistor (Figure #6). Solder two (2) wires to the Tank Water Level Switch (Figure #8). Be sure to carefully label all wires.

7. Cut the nineteen (19) wires to equal length and strip 1/4” of insulation from the end of each wire. Connect nine (9) of the wires to a 12-Position Male Interlocking Connector. Connect the remaining wires to a 12-Position Female Interlocking Connector. Secure the wires with a tie-wrap placed about every 3” along its length.

8. Close the enclosure. Attach the Control Module under the dash panel and as far forward as practical. Connect the 9-Position Interlocking Connectors of the Module and the In-Dash Indicators.

NOTE: Two of the connectors are to provide extra positions for future expansion, modifications and design improvements. Be sure to use a 12-Position Male Interlocking Connector and a 12-Position Female Interlocking Connector to prevent accidental connections.

Carburetor Adapter

NOTE: Since hundreds of various Carburetors exist, we recommend contacting Impco to purchase the Carburetor Adapter. They deal almost exclusively in gasoline engine fuel conversion systems. They have literally thousands of options available and have been in this business for about 50 years. Describe your vehicles’ engine and the Hydro-Gen System and ask for their recommendations. In particular, inquire about the possibility of installing a Beam – Garretson Carburetor Adapter. Be sure to tell them that this System is designed for switching back and forth between Hydrogen Fuel and Gasoline Fuel.

Material Supplier:

Impco Technologies
16804 Gridley Place
Cerritos, CA  90703
Phone: 1-562-860-6666
FAX: 1-562-860-3088

Throttle Assembly

NOTE: The Control Throttle uses a high quality precision potentiometer for reliability and durability. DO NOT substitute a cheaper potentiometer, they may and probably will soon fail or cause problems.

List of Materials:
- One Precision Potentiometer, Series 578, 100K (Clarostat Part # 578 X 1 G 32 P 104 SW).
- One 1 Foot length CPVC Rod, 3/4” diameter (US Plastic Part # 43182).

Material Suppliers:

State Electronics
36 Route 10
East Hanover, NJ 07936
Phone: 1-800-631-8083
FAX: 1-973-887-1940

United States Plastic Corp.
1390 Neubrech Rd.
Lima, OH  45801-3196
Phone: 1-800-537-9724 (7:30am – 7pm, EST Mon-Fri)
FAX: 1-800-854-5498 (24/7)
NOTE: Figure #21 depicts a typical throttle assembly. Since hundreds of various throttle linkages are in use, the following setup is offered as a general guideline. The Potentiometer mounting bracket is designed to allow Pot. Centering (rotating its housing) and precise adjustment of throttle sensitivity (bracket rotation). The throttle linkage sleeve allows precise Pot. Rotation limit adjustments (idle to full throttle) when combined with bracket rotation.

1. Determine the best location on the engine near the throttle linkage for installing the Sleeve and Arm assembly and Pot. Mounting bracket.

2. Fabricate a Pot. Mounting bracket with dimensions shown in Figure #21 from 1/8” CPVC sheet. If necessary, modify the bracket size and attachment points to suit your vehicle. DO NOT cut the 3/32” slot until instructed to do so.

3. Cut a 1-1/2” length of 3/4” dia. CPVC rod. Measure the diameter of the existing throttle linkage rod. Drill a hole lengthwise thru the CPVC rod to the diameter of the existing throttle linkage rod. Using a thin blade saw, cut the rod in half lengthwise. Using a belt sander, sand a flat surface at least 1/4” wide onto the outside of one rod half.

4. Cut a 1/2" x 1-1/4" sleeve arm from 1/8” CPVC sheet. Drill a 7/64” hole in one end of the arm about 1/4” from the end. Using a larger drill, bevel each end of the hole about 1/16” deep. Apply primer and then cement to the mating surfaces of the sleeve arm and the 3/4” dia. rod half with the sanded surface. Allow the parts to air dry for at least 2 hours and then smooth the cut edges of all parts with fine sandpaper.

5. Referring to Figure #6, position the shaft of the 100K Throttle Potentiometer (Pot.) at the midpoint of its range of rotation. Using a marking pen, put an alignment line between the Pot., shaft and the bushing at the point shown in Figure #21. Using a #41 drill bit, drill a hole in the shaft at a point in line with the shaft alignment mark and 3/16” in from the shaft end.

6. Temporarily install the Pot. Into the 3/8” hole in the mounting bracket. Cut a 6” length of 3/32” Stainless Steel Welding Rod and slide the rod into the hole drilled into the shaft. Align the shaft and bushing marks and rotate the Pot. Body so that the rod points upward (parallel with the front edge of the bracket. Place a mark at the point where the anti-rotation pin contacts the bracket. Remove the Pot. and rod from the bracket. As shown in Figure #21, cut a curved 3/32” wide slot extending 1/4” from each side of the marked point. Temporarily install the Pot. onto the bracket and check that the anti-rotation pin fits into the slot and moves freely as the Pot. Body is rotated. If necessary, file the slot with a small fine tooth file, and clean the edges with fine sandpaper.

7. Attach the Pot. To the bracket with the furnished nut and lock washer. Temporarily install the rod into the shaft hole. Rotate the Pot. Body to align the rod parallel with the front edge of the bracket and firmly tighten the mounting nut. Using a file, square off both ends of the rod and deburr with a fine file. Using MEK or Acetone clean the Pot. shaft and rod with a soft clean cloth. Flush the hole in the shaft with MEK or Acetone.

8. Mix a small quantity of Epoxy (J_B WELD). Using a toothpick, coat the shaft hole with a thin layer of Epoxy. Apply a thin layer of Epoxy to one end of the rod and insert it into the shaft hole, allowing it to extend about 1/8” beyond the end of the hole. Form a small fillet of Epoxy around the junction of the rod and shaft at both sides of the shaft. Allow Epoxy to cure for 24 hours before continuing.

9. Referring to Figure #21, attach the sleeve and arm assembly to the Throttle Linkage using a small hose clamp at each end. Locate the Pot. Directly below the arm with the rod protruding thru the hole in the arm. Position the bracket fore or aft and sideways until the rod is square with the sleeve arm and parallel with the front edge of the bracket when the Throttle Linkage is approximately at its midpoint of travel. Position the bracket up or down until the rod rotates thru an angle of approximately 60 degrees each side of center as the Throttle Linkage moves thru its full range.

10. Using two (2) 1/4” bolts, washers, and locknuts, attach the bracket to the Engine structure. Here is where you need to adapt the mounting procedure and even possibly the mounting bracket. All engines and carburetors are different so it’s impossible to make just one generic mount to fit all applications. Position the bolt in the slot at approximately the midpoint of the slot to allow the Pot. to move up or down for precise adjustment. Loosen the bolts slightly and pivot the bracket up and down. Check that the bolt does not bind in the slot at any point. If necessary, file the slot with a fine tooth file until the Pot body rotates freely. Clean up the slot with fine sandpaper.
11. Check that the Pot. Rod does not bind in the arms hole as the Throttle Linkage is moved thru its full range of travel. If necessary to eliminate binding, rotate the Pot. slightly up or down and/or slide the sleeve assembly fore or aft. Firmly tighten the bracket bolts and sleeve hose clamps.

**Preliminary Assembly and Testing**

**CAUTION: DO NOT ATTEMPT TO SOLDER WIRES DIRECTLY TO THE FOUR GENERATOR ELECTRODE AND COIL PINS. EXCESS HEAT WILL DAMAGE THE EPOXY BOND, POSSIBLY CAUSING WATER AND/OR GAS LEAKAGE.**

1. Install a male crimp on snap connector on each of the four Electrode and Coil pins of the Generator. Securely install the Generator in the Engine compartment using 1/4” bolts, washers and locknuts. Be sure the Generator is level with the vehicle frame. If the Water Pump is installed in the trunk or rear of the vehicle, go to Step #3. If the Water pump is installed in the Engine compartment, go to Step #2.

2. Cut a length of Silicone Braid Tubing to connect the Water Pump outlet to the 3/8” fitting on the side of the Generator Housing near the bottom. Allow some slack in the tubing.

3. If the Water Pump has an internal check valve, slide two (2) small hose clamps onto the water tubing and install onto the 3/8” barb fitting in the side of the Generator Housing near the bottom. Allow some slack in the tubing and firmly tighten the clamps. If the Pump does not have an internal check valve, install a check valve in the tubing a few inches from the barb fitting in the side of the Generator. Allow some slack in the tubing. Use two (2) small hose clamps on each barb fitting and tighten firmly. Be sure to install the check valve so that the flow direction arrow on the valve points toward the Generator.

4. Cut two (2) 3” lengths of braid tubing and attach them to each end of a check valve with small hose clamps. Tighten the clamps firmly. Using two (2) small hose clamps, attach a valve hose to the Carb Adapter on the Engine with the valve arrow pointing toward the adapter. Tighten the clamps firmly.

5. Using two (2) hose clamps, attach the Flame Arrestor to the check valve hose. Tighten the clamps firmly. Cut a length of Silicone Braid Tubing to connect the 3/8” barb fitting on top of the Generator to the Flame Arrestor. Slide four (4) small hose clamps onto the tubing and connect the tubing between the Generator and Flame Arrestor. Allow some slack in the tubing and tighten the clamps firmly.

6. Using two (2) small hose clamps, attach the Pressure Gauge Tubing to the 1/8” fitting on top of the Generator. Allow some slack in the tubing and tighten the clamps firmly.

7. Cut four (4) 5-Ft lengths of hookup wire and strip 1/2” of insulation from one end of each wire. Twist the stranded ends of two (2) wires together and trim the ends to a length of 3/8”. Crimp a ring terminal to the spliced wires and attach the terminal to the Control Power Switch. Repeat the procedure for the other two wires. Mount the Switch at a convenient point on the dash. Route one pair of Switch wires to the vehicle positive (+) power bus that is always “hot” (the battery side of the bus is shown in Figure #6). Cut the wires to length and strip 1/2” of insulation from the wire ends. Twist the wires together, trim to 3/8”, and crimp a ring terminal to the wire ends. **DO NOT** attach the terminal, or any other connector to the bus until instructed to do so.

8. Cut two (2) 5-Ft lengths of hookup wire and splice together with a ring terminal as was done in Step #7. Locate a convenient spot in the Engine compartment to attach the ring terminal to the vehicle chassis. Drill a 3/32” hole at that location and attach the terminal and coat the terminal with Petroleum Jelly or Grease to prevent corrosion.

9. Route the two (2) wires thru the Grommet installed in the Engine compartment firewall. Allowing slack in the wires, cut the wires to length to reach the two 12-position connectors of the Control Module. Trim 1/4” of insulation from the end of each wire and connect each wire to a negative (-) bus position of either of the 12 – Position Interlocking Connectors (see Step #6 in the Control Module section).

10. Route the remaining pair of Switch wires to the connectors and cut the wires to length, allowing some slack in the wires. Connect the wires to the connectors at two of the battery positive (+) power bus positions in the same manner as was done in Step #9.

11. Cut four (4) wires of appropriate length to connect the Generator Coil and Electrode pins to the connectors. Strip 1/4” of insulation from each wire end and install a female crimp-on snap connector to each wire. Attach the connectors to the Generator terminals. Route the wires to the Control Module connectors and cut the wire ends to equal length. Strip 1/4” of insulation from each wire end and connect each wire to the appropriate position of the Control Module connectors.
12. Referring to Figure #8, connect the Tank Water Level and Generator Water Level Switch wires to the appropriate positions of the Control Module connectors. Using butt connectors, splice hookup wire to the Switch wires as required to reach the Control Module connectors.

13. Cut two (2) lengths of hookup wire to connect the Throttle Pot. to the Control Module connectors. Strip 1/4” of insulation from one end of each wire and solder each wire to the Pot. Terminals. Slide a 1” length of heat shrink tubing onto each wire and over the soldered terminals and shrink the tubing.

14. Route the Pot. Leads to the Control Module connectors and cut their ends to equal length. Strip 1/4” of insulation from the end of each wire. Connect one Pot. Lead to a battery positive (+) power bus connector position. Connect the other lead to the connector position leading to the 10K resistor lead (see Figure #6). Rotate the Pot. Shaft to its midpoint position.

CAUTION: DO NOT CONNECT THE WATER PUMP LEADS, OR ADD WATER TO THE TANK UNTIL INSTRUCTED TO DO SO IN STEP #1 IN THE NEXT SECTION (Final Assembly and Testing).

15. Using an Ohmmeter, verify that the Control Module Power Switch is in the OFF position. If not, place the Switch in the OFF position.

16. Connect the Switch ring terminal to the battery positive (+) power bus.

CAUTION: POWER WILL BE APPLIED TO THE “Hydro-Gen System” IN STEP #18. ANY INCORRECT ELECTRICAL OR ELECTRONIC CONNECTION CAN LEAD TO SYSTEM OR COMPONENT FAILURE AND/OR DAMAGE. BE SURE TO DOUBLE-CHECK ALL ELECTRICAL AND ELECTRONIC CONNECTIONS BEFORE APPLYING POWER.

17. After double-checking all electrical and electronic connections of the Hydro-Gen System, correct any connection errors as required. Connect the two (2) 12 – Position Interlocking Connectors of the Control Module to the matching system connectors. Verify that all system connectors are properly engaged. If still in place, remove the Control Module enclosure cover.

CAUTION: DO NOT ATTEMPT TO START THE ENGINE UNTIL INSTRUCTED TO DO SO. THIS IS A PRELIMINARY TEST TO VERIFY BASIC SYSTEM FUNCTIONING. IF ANY PROBLEM EXISTS, SHUT OFF POWER IMMEDIATELY.

18. Immediately after applying power, check for the following system responses in the order noted. If any problem exists, shut the power OFF immediately.
   - NO smoke and/or electrical sparking
   - NO electrical overheating of any system component.
   - On the Indicator Panel, check that the LED’s function as follows:
     1. “PWR ON”, “PUMP ON” and “GEN WATER LOW” LED’s are lit.
     2. “TANK WATER LOW” LED is blinking.
   - On the Indicator Panel, check that the Gauge lights are lit.
     Place the Hydro-Gen Power Switch to the ON position. Verify that no problem exists. If a problem exists, turn power OFF immediately.

19. If no problem exists, go to Step #20. If a problem exists, troubleshoot to locate and repair (or replace) the failed component. After replacement or repair go back to Step #18.

20. Using your fingers as heat sensors, check that no system component is overheating. If NO overheating, go to Step #21. If there is overheating, turn power OFF and go back to Step #19.

21. Check that the vehicle gas pedal is in the full idle position. Connect a Digital Voltmeter to pin #6 of amplifier LM741 (refer to Figure #6) and record the voltage level. If voltage is present, go to Step #22. If no voltage exists, a component is defective and must be replaced. After replacing the component, go back to Step #18.

NOTE: As the gas pedal is moved from idle to full power, the voltage level at pin #6 of amplifier LM741 should increase slightly. Expect an increase of approximately 1 VDC to 4 VDC.

22. Move the gas pedal to full power. Record the voltage at pin #6. Compare the voltage with that recorded in Step #21. If the voltage level has increased by at least 1 VDC, go to Step #23. If the voltage level has not changed at all, a component is defective and must be replaced. After replacing the component, go back to Step #21.

23. Rotate the 20K “Throttle Adjust” Pot. From stop to stop. Verify that voltage at pin #6 varies as the Pot. is rotated. If voltage varies, go to Step #24. If voltage does not vary, a component is defective and must be replaced. After replacing the component, repeat this procedure.

24. Set the “Throttle Adjust” Pot. To its midpoint of rotation.
NOTE: The NE555 controller creates a highly stable square wave pulse. As the gas pedal is moved toward full power, the input voltage to the controller from the LM741 amplifier increases, increasing the pulse width ratio of the controller square wave output at pin #3.

25. Connect an Oscilloscope lead to pin #3 of the NE555 controller. Verify that a square wave pulse exists and that the pulse width ratio increases as the gas pedal is moved from full idle to full power. If a square wave exists and the pulse ratio increases, go to Step #26. If a pulse does not exist or the ratio does not increase as the gas pedal is moved, a component is defective and must be replaced. After replacing the component, repeat this procedure.

26. Rotate the 2K “Pulse Width Adjust” Trim Pot. from stop to stop. Verify that the pulse width changes as the Pot. is rotated. If the pulse width changes, go to Step #27. If the pulse width does not change, a component is defective and must be replaced. After replacing the component, repeat this procedure.

27. Set the 2K Trim Pot. to its midpoint of rotation.

NOTE: The frequency of the square wave pulse falls in the range of 15KHz to 20KHz. The Trigger Oscillator Circuit provides variable frequency input pulses to the NE555 controller in response to adjustment to the 2K Trim Pot. and DIP Switch settings.

28. Connect the Oscilloscope lead to pin #3 of the NE555 controller. Verify that the square wave frequency changes as the Oscillator 2K Pot. is rotated. If the frequency changes, go to Step #29. If the frequency does not change, a component is defective and must be replaced. After replacing the component, repeat this procedure.

29. Set the Oscillator Pot. to its midpoint of rotation.

NOTE: Referring to Figure #7, the frequency of the Coil Circuit is controlled by the CD4059A Divide by N Counter, and falls in the range of 15Hz to 20Hz. Input to the Counter is received from the Electrode Circuit (Figure #6). When the frequency of the Electrode Circuit is changed, the frequency of the Coil Circuit changes accordingly. The Coil Circuit is adjusted with the 10K “Pulse Width Adjust” Pot.

30. Connect an Oscilloscope lead to pin #8 of the NE555 controller. Rotate the “Pulse Width Adjust” Pot. from stop to stop. Verify that the pulse width changes as the Pot. is rotated. If the pulse width changes, go to Step #31. If the pulse width does not change, a component is defective and must be replaced. After replacing the component, repeat this Step.

31. Set the “Pulse Width Adjust” Pot. to its midpoint of rotation.

32. Connect a Digital Voltmeter lead to pin #8 of the NE555 controller. Rotate the 10K “Strength Adjust” Pot from stop to stop. Verify that the voltage level changes as the Pot. is rotated. If the voltage level changes, go to Step #33. If the voltage level does not change, a component is defective and must be replaced. After replacing the component, repeat this Step.

33. Set the “Strength Adjust” Pot. to its midpoint of rotation.

34. Referring to Figure #6, set the DIP Switches according to Oscillator CD4069 manufacturer instructions to obtain a frequency between 15KHz and 20KHz. Connect an Oscilloscope or Frequency Meter lead to pin #6 of Oscillator CD4069. Verify that the Oscillator frequency is between 15KHz and 20KHz. If the frequency is not between 15KHz and 20KHz, adjust the 2K “Frequency Adjust” Pot. To obtain a frequency within that range. If the correct frequency cannot be obtained, there is a defective component (most likely CD4069) in the Oscillator Circuit. Locate and replace the defective component and return to this Step. If the correct frequency is obtained, go to Step #35.

35. Referring to Figure #7, and using an Oscilloscope or Frequency Meter, verify that the frequency of the pulse appearing at the Collector of component 2N3055 is from 15 Hz and 20 Hz. If the frequency is within that range, go to Step #37. If the frequency is not within that range, go to Step #36

36. Set the “Divide by N” Counter for an “N” factor of 1,000 according to the manufacturers instructions. Verify a frequency of 15Hz to 20Hz at the Collector of component 2N3055. If the frequency is within that range, go to Step #37. If the frequency is not within that range, a component is defective and must be replaced. After replacing the component, go back to Step #35.

37. Shut the power OFF.

Cylinder Head Temperature

NOTE: Hydrogen burns slightly hotter than gasoline, so you should expect slightly higher Cylinder Head Temperature (CHT). You must first establish CHT reference points by driving first on gasoline. The Hydro-Gen uses a very high quality fast-response CHT gauge, sensing CHT directly from the base of a sparkplug.
1. Drive your vehicle for at least 15 minutes (30 minutes in cold weather) on open highway to assure that the engine is up to normal operating temperature. Record CHT (in degrees Fahrenheit) under each of the following driving conditions:
   - Parked at idle, transmission in neutral, for three (3) minutes.
   - 25 MPH in residential areas for at least two minutes.
   - 60 MPH (or close to full power) on a steep grade for at least 30 seconds.

Final Assembly and Testing

1. If the Water Pump is installed in the trunk or in the rear of the vehicle, splice a hookup wire to its positive (+) power lead with a butt connector and connect it to a battery positive (+) power bus connector position. If the Pump is installed in the Engine compartment, connect it to a battery positive (+) power bus connector position. In like manner, connect the Pump negative (-) power lead to connector position leading to Collector lead of E3055T Switch as shown in Figure #8.

2. Fill the Tank with Water. Check that there are no water leaks from the Tank or any of the fittings. If necessary, correct or repair any leaks.

NOTE: Your vehicle is now ready to run on Water for the first time with the Hydro-Gen System. For Initial Operation, it’s best that the Engine is already warmed up to normal operating temperature. Running the Engine on gasoline for about 15 minutes is usually sufficient.

3. Park your vehicle on a level surface with the parking brake engaged and transmission in neutral. Open the trunk lid or the engine hood, depending on where your Hydro-Gen Water Pump is located.

4. Following manufacturers’ instructions set the Carburetor Adapter for Hydrogen operation.

CAUTION: CLOSELY MONITOR THE PRESSURE GAUGE. IF GENERATOR GAS PRESSURE EXCEEDS 70 PSI, SHUT POWER OFF IMMEDIATELY. AS A SAFETY PRECAUTION, PRESSURE EXCEEDING 85 PSI IS VENTED BY THE PRESSURE RELIEF VALVE. DO NOT DEPEND ON THE RELIEF VALVE TO RELIEVE EXCESS PRESSURE. IF ANY SYSTEM PROBLEM EXISTS, SHUT OFF POWER IMMEDIATELY.

NOTE: At idle, Gas Pressure should be in the range of 12 PSI to 28 PSI. At full power, about 28 PSI to 62 PSI.

5. Referring to Figures #6 and #7, set the “Throttle Adjust”, “Pulse Width Adjust”, (one in each circuit), “Frequency Adjust”, and “Strength Adjust” Pots. To their midpoint of rotation. Immediately after applying power, check for the possibility of any of the following problems. If any problem exists, immediately shut OFF power:
   - Smoke and/or electrical sparking.
   - Generator pressure exceeds 70 PSI.
   - Electrical overheating of any system components.
   - Gas and/or Water leakage from the Generator.
   - Water leakage from any tubing, fittings or other components.

Turn power ON. Wait for Generator pressure to reach at least 25 PSI. When pressure reaches 25 PSI, START YOUR ENGINE. Run the Engine at idle speed until instructed to do otherwise. If Generator pressure will not reach at least 25 PSI, go to Step #7. Check that none of the problems mentioned in Step #5 exist. If any exist, immediately shut power OFF and go to Step #6, if no problems go to Step #7.

6. Verify that the power is OFF. A system component has either failed or is defective. Troubleshoot to locate the component, go thru the testing procedures we outlined in the previous section (Preliminary Assembly and Testing) to locate the problem. Repair or replace the component and go back to Step #5

7. Shut power OFF. Obtain a small bucket or large container. Open the Generator Drain Cock and drain until empty. Close the Drain Cock. If no water is drained, go to Step #8. If at least some water drained, go to Step #14.

8. Turn power ON. Verify that the Water Pump runs. If the Pump runs, go to Step #9. If the Pump does not run, turn power OFF and go to Step #25.

9. Verify that water is reaching the Pump inlet. If water reaches the inlet, go to Step #13. If water does not reach the inlet, go to Step #10.

10. Disconnect the tubing from the Pump outlet. Verify that water now reaches the Pump inlet. If it does, go to Step #12. If not, go to Step #11.
11. Turn power OFF. Check for restrictions in the tubing leading to the Pump inlet. If a restriction is located, repair as required, reconnect tubing and go back to Step #5. If there is no restriction, then the Pump is defective and must be replaced or repaired. After replacing the Pump, go back to Step #5.

12. Verify that water is flowing from the Pump outlet and turn power OFF. If water was flowing, the Check Valve is either defective or installed backwards. Replace the Valve or reinstall correctly with the Arrow pointing towards the Generator, reconnect the tubing and go back to Step #5. If water was not flowing, the Pump is defective and must be replaced or repaired. After repair, go back to Step #5.

13. Disconnect the tubing from the Pump outlet. Verify that water now flows from the Pump outlet and turn power OFF. If water was not flowing, the Check Valve is either defective or installed incorrectly. Replace or repair the Valve. Be sure the Arrow on the Valve points towards the Generator and go back to Step #5. If water was not flowing, the Pump is defective and must be replaced or repaired. After repair or replacement go back to Step #5.

14. Turn power ON. Verify that there is no water present in the tubing leading from the Generator to the Flame Arrestor. Turn power OFF. If water was present, go to Step #15. If water was not present, go to Step #17.

15. Refer to Figure #8. Cut the Generator Water Level Switch wire connected to the Control Module positive (+) power bus within 6” of the Generator. Strip 1/4” from each end of the cut lead. Connect an Ohmmeter lead to the wire exiting the Generator and the lead to the vehicle ground (-). Verify that the Ohmmeter indicates that the Switch contacts are open. If the Switch contacts are open, go to Step #16. If the Switch contacts are closed, the Switch Slosh Shield has been incorrectly installed. Referring to Step #9 in the section titled “Water Level Switch Test” remove the Slosh Shield and reinstall it. Be sure the Shield is accurately centered around the Switch Float. Reconnect the Switch wires with a butt connector and go back to Step #5.

16. Reconnect the Switch wires with a butt connector. A defective component exists in the Pump Control Circuit. Replace the defective component and go back to Step #5.

17. Verify that the Check Valve in the tubing leading to the Engine is installed with the flow Arrow pointing toward the Engine. If the Check Valve is installed correctly, go to Step #18. If the Check Valve is not installed correctly, remove it, install it correctly and then go back to Step #5.

18. Set the water container on a level surface, mark the water level on the side of the container, and dispose of the water. Close the Generator Drain Cock.

19. Disconnect the gas outlet hose from the top of the Generator. Turn the power ON, wait for the Water Pump to stop running, and shut power OFF. Open the Drain Cock and drain the water into the container until the Generator is empty. Close the Drain Cock. Check the water level and dispose of the water. If the water level was higher than the level marked in Step #18, go to Step #20. If the water level was about the same, go to Step #26.

20. Reconnect the tubing and disconnect the tubing from the Carburetor Adapter. Turn power ON, wait for the Water Pump to stop running and shut power OFF. Open the Drain Cock and drain water into the container until the Generator is empty. Close the Drain Cock. Check the water level and dispose of the water. If the water level was higher than the level marked in Step #18, go to Step #21. If the water level was about the same, go to Step #22.

21. The Carburetor Adapter (associated parts) is either defective or requires adjustment. Following the manufacturers’ instructions, either adjust the Adapter or return it to the manufacturer for adjustment or repair. After adjustment or repair, reconnect the tubing and go back to Step #5.

22. Reconnect the tubing and disconnect the tubing between the Flame Arrestor and Check Valve. Turn the power ON, wait for the Water Pump to stop running and shut power OFF. Open the Drain Cock and drain the water into the container until the Generator is empty. Close the Drain Cock. Check the water level and dispose of the water. If the water level was higher than the level marked in Step #18, go to Step #23. If the water level was about the same, go to Step #24.

23. The Check Valve is defective. Replace the Valve, reconnect the tubing and go back to Step #5.

24. The Flame Arrestor has been constructed incorrectly. Remove the Flame Arrestor from the tubing, remove its fittings and dispose of the Flame Arrestor. Return to the “Flame Arrestor” procedure and following the instructions; construct a new Flame Arrestor, being more careful and exacting. Allow the CPVC cement to air dry for at least 24 hours. Apply a thin coating of pipe joint compound to the tapped threads in the ends of the Flame Arrestor and the fittings. Thread the fittings into the new Flame Arrestor and tighten firmly. Install the new Flame Arrestor into the tubing and go back to Step #5.
25. Turn power OFF. The most likely candidate for Pump failure is the Pump itself. Cut the Pump negative (-) bus wire and check Pump operation while disconnected from the Control Module. If the Pump still does not run, or draws current in excess of 15 amps during start up, repair or replace the Pump. Reconnect the new Pump wires using butt connectors. BEFORE you replace the Pump, you might also want to check to see if you blew the main fuse (see Figure #6). If, by chance the fuse has blown, replace it and recheck the Pump. Then go back to Step #5

If the Pump operates normally, reconnect the wire with a butt connector. Check to verify that the E3055T Switch (refer to Figure #8) has not failed due to Pump current overload. If the Switch has failed, replace it with a Switch of higher current capacity and go back to Step #5. If the Switch has not failed, cut the Generator Water Level Switch wire connected to the Control Module positive (+) power bus within about 6” of the Generator. Strip 1/4" from each end of the cut lead. Connect an Ohmmeter lead to the wire exiting the Generator and the other lead to vehicle ground (-).

Verify that the Ohmmeter indicates that the Switch contacts are closed. If the Switch contacts are closed, either the Pump is defective or a Pump Circuit component is defective (refer to Figure #8) or wiring errors exist. Troubleshoot to locate the problem and repair or replace as necessary. After correcting the problem go back to Step #5

If the Switch contacts are open, the Switch Slosh Shield has been installed incorrectly. Referring to Step #9 in the section titled “Water Level Switch Test”, remove the Slosh Shield and reinstall it, being very careful to accurately center the Slosh Shield around the Switch Float. Reconnect the Switch wires with a butt connector and go back to Step #5.

26. Verify that no water is present in the tubing leading from the Generator to the Flame Arrester. If water is present, turn the power OFF and go back to Step #15. If water is not present, read the following notes before going on to Step #27.

NOTE: The Hydro-Gen System is designed to operate well over a wide range of different electronic settings and adjustments. It is tolerant of just about anything short of gross adjustment errors. However, since each Engine has unique requirements, obtaining Optimal performance is mostly a matter of making simple trial and error adjustments.

Here are some general guidelines for gaining Optimal performance by the very effective method known as “tweaking”.

- At idle, Generator pressure should be 12 PSI to 28 PSI.
- At full power, Generator pressure should be 28 PSI to 62 PSI.
- For each driving or idle condition, be sure CHT never exceeds 40 degrees more than the values recorded in Step #1.
- Be sure CHT never exceeds 400 degrees.

NOTE: Tweaking the Hydro-Gen System is easier, safer and faster if another person drives while you Tweak.

27. Park your vehicle with the Engine at idle, transmission in neutral, and parking brake set. Wait until the Generator pressure stabilizes and go to Step #30.

28. Drive your vehicle at 25 MPH in a residential area. If the “Frequency Adjust” Pot. is rotated CW to increase Generator pressure, go to Step #30. If the “Frequency Adjust” Pot. is rotated CCW to increase Generator pressure, go to Step #37.

29. Drive your vehicle at 60 MPH (or full power) on a steep grade. If the “Frequency Adjust” Pot. is rotated CW to increase Generator pressure, go to Step #30. If the “Frequency Adjust” Pot. is rotated CCW to increase Generator pressure, go to Step #37.

30. Referring to Figure #6, rotate the “Frequency Adjust” Trim Pot. fully (CCW). Slowly rotate clockwise (CW). If Generator pressure starts to increase before rotating about 90% of total rotation, go to Step #31. If pressure does not increase, go to Step #37.

31. Rotate slowly CW until pressure stops increasing. Rotate an additional 10 degrees. Wait until pressure stabilizes and record pressure. Slowly rotate CCW until pressure starts to drop.

32. Rotate the “Pulse Width Adjust” Trim Pot. fully CCW. Slowly rotate CW. If pressure starts to increase before rotating about 90% of total rotation, go to Step #33. If pressure does not increase, go to Step #39.
33. Rotate slowly CW until pressure stops increasing. Rotate an additional 10 degrees. Wait until pressure stabilizes and record pressure. Slowly rotate CCW until pressure starts to drop. Slowly rotate CW until pressure increases to the recorded value. Record that the “Pulse Width Adjust Pot.” is rotated CW to increase pressure. Go to Step #34.

34. If you are Tweaking your Hydro-Gen with the Engine at idle, go to Step #35. If you are Tweaking your Hydro-Gen while driving, go to Step #36.

35. Refer to Figure #21. If necessary, adjust Engine idle speed by loosening the hose clamps and sliding the arm and sleeve assembly either fore or aft (Throttle Assembly). Tighten hose clamps firmly. If pressure exceeds 28 PSI, go to Step #41. If pressure is 28 PSI or less, go back to Step #28.

36. If pressure exceeds 62 PSI, go to Step #42. If pressure is 62 PSI or less, go to Step #44.

37. Rotate the “Frequency Adjust” Pot. fully CW. Slowly rotate CCW. If pressure starts to increase before rotating about 90% of total rotation, go to Step #38. If pressure does not increase, rotate the Pot. CW so its midpoint and go back to Step #32.

38. Rotate slowly CCW until pressure stops increasing. Rotate an additional 10 degrees. Wait until pressure stabilizes and record the pressure. Slowly rotate CW until pressure starts to drop. Slowly rotate CCW until pressure increases to the recorded pressure. Record that the “Frequency Adjust” Pot. is rotated CCW to increase pressure. If your Hydro-Gen is being tuned while idling, go back to Step #32. If your Hydro-Gen is being tuned while driving, go to Step #43.

39. Rotate the “Pulse Width Adjust” Pot. fully CW. Slowly rotate CCW. If pressure starts to increase before rotating about 90% of total rotation, go to Step #40. If pressure does not increase, rotate the Pot. CW to its midpoint and go back to Step #34.

40. Rotate slowly CCW until pressure stops increasing. Rotate an additional 10 degrees. Wait until pressure stabilizes and record pressure. Slowly rotate CW until pressure starts to drop. Slowly rotate CCW until pressure increases to the recorded pressure. Record that the “Pulse Width Adjust” Pot. is rotated CCW to increase pressure. Go back to Step #34.

41. Using a marking pen, place an alignment mark on the “Frequency Adjust” and “Pulse Width Adjust” Pots. Determine the amount of pressure exceeding 28 PSI. (For example: if pressure is 32 PSI, excess pressure is 4 PSI). Reduce pressure to 28 PSI by alternately rotating each Pot. in the direction recorded a few degrees at a time. Attempt to divide the excess pressure equally between the two Pots. For example: if excess pressure is 4 PSI, attempt to reduce the pressure 2 PSI with each Pot. Go back to Step #28.

42. Using a marking pen, place an alignment mark on the “Frequency Adjust” and “Pulse Width Adjust” Pots. Determine the amount of pressure exceeding 62 PSI. (For example: if pressure is 70 PSI, excess pressure is 8 PSI). Reduce pressure to 62 PSI by alternately rotating each Pot. in the recorded direction a few degrees at a time. Attempt to divide the excess pressure equally between the two Pots. For example: if excess pressure is 8 PSI, attempt to reduce pressure 4 PSI with each Pot. Go to Step #44.

43. If the “Pulse Width Adjust” Pot. is rotated CW to increase Generator pressure, go back to Step #32. If the “Pulse Width Adjust” Pot. is rotated CCW to increase Generator pressure, go back to Step #39.

44. If you completed Hydro-Gen tuning after driving 25 MPH in a residential area, go to Step #45. If you completed Hydro-Gen tuning after driving 60 MPH (or full power) on a steep grade, go to Step #67.

45. Referring to Figure #21, be sure the throttle linkage moves thru its full range of travel from idle to full power without binding of the rod within the arm. Perform the procedure of Step #66 before proceeding. Drive vehicle at 60 MPH (or full power) on a steep grade. Listen closely for the sound of Engine pre-combustion (ping). If Engine pings, go to Step #46. If Engine does not ping, go to Step #56.

**NOTE:** The procedure of Steps #45 thru #65 tune the Coil Circuit to create an ideal mixture of Parahydrogen (created by the Coil) and Orthohydrogen (created by the Electrodes). Low levels of Parahydrogen (too lean) can result in excessively high CHT, a common cause of Engine pre-combustion (pinging). High levels of Parahydrogen (too rich) result in low CHT, cooling combustion, decreasing efficiency, and causing Engine roughness. Optimal mixture is achieved by leaning Parahydrogen to the point of creating “ping” and then slightly richening until “ping” disappears. You will be sequentially “tune” two different Pots. It’s very important to closely monitor CHT while leaning to prevent excessively high CHT. Refer to CHT recorded in Step #1 for driving 60 MPH (or full power) on a steep grade. Be sure the CHT does not exceed the recorded temp. by more than 40 degrees. **NEVER** allow the CHT to exceed 400 degrees.
46. Referring to Figure #7, rotate the “Pulse Width Adjust” Pot. fully CCW. If the Engine “pings”, go to Step #47. If the Engine does not “ping”, go to Step #52.

47. Rotate the “Pulse Width Adjust” Pot. fully CW. If the Engine “pings”, go to Step #48. If the Engine does not “ping”, go to Step #53.

48. Slowly rotate the “Pulse Width Adjust” Pot CCW. If the CHT decreases, continue rotating CCW until the CHT stops decreasing. Go to Step #49. If the CHT increases while rotating CCW, rotate fully CCW. Slowly rotate CW until the CHT stops decreasing. Go to Step #49.

49. Rotate the “Strength Adjust “Pot. fully CCW. If the Engine pings, go to Step #50. If the Engine does not ping, go to Step #54.

50. Rotate the “Strength Adjust” Pot. fully CW. If Engine pings, rotate each Pot. to its midpoint and go to Step #51 (“Pulse Width Adjust” and “Strength Adjust” Pots). If the Engine does not ping, go to Step #55.

51. Turn power OFF. Referring to Figure #7, the Coil Circuit is not producing enough Parahydrogen. Replace the 10K resistor connecting pin #3 of component NE555 to the base of component 2N3055 with a 10K Pot. Adjust the Pot. for about 9K resistance. Go back to Step #45. If you reach this Step again, adjust the Pot. for about 8K resistance and go back to Step #45. If necessary, each time you reach this Step, adjust the Pot. for about 1K less in resistance and go back to Step #45. If the Pot. is eventually adjusted for 2K or less, a circuit component is defective. Locate and replace the defective component. Adjust the Pot. for 10K resistance. Turn power ON and go back to Step #45.

52. Slowly rotate the “Strength Adjust” Pot. CW until pinging starts. Slowly rotate CCW until pinging stops and continue to rotate CCW about 5 degrees more. If the CHT is more than 40 degrees higher than the value recorded in Step #1, continue slowly rotating CCW until the CHT decreases to 40 degrees above the recorded value. Go back to Step #29.

53. Slowly rotate the “Strength Adjust” Pot. CCW until pinging starts. Slowly rotate CW until pinging stops and continue to rotate CW about 5 more degrees. If the CHT is more than 40 degrees higher than the value recorded in Step #1, continue slowly rotating CW until the CHT decreases to 40 degrees above the recorded value. Go back to Step #29.

54. Slowly rotate the “Strength Adjust” Pot. CW until pinging starts. Slowly rotate CCW until pinging stops and continue to rotate CCW about 5 more degrees. If the CHT is more than 40 degrees higher than the value recorded in Step #1, continue slowly rotating CCW until the CHT decreases to 40 degrees above the recorded value. Go back to Step #29.

55. Slowly rotate the “Strength Adjust” Pot. CCW until pinging starts. Slowly rotate CW until pinging stops and continue rotating CW about 5 more degrees. If the CHT is more than 40 degrees higher than the value recorded in Step #1, continue slowly rotating CW until the CHT decreases to 40 degrees above the recorded value. Go back to Step #29.

56. Referring to Figure #7, rotate the “Pulse Width Adjust” Pot. fully CCW. If the Engine pings, go to Step #62. If the Engine does not ping, go to Step #57.

57. Rotate the “Pulse Width Adjust “ Pot. fully CW. If the Engine pings, go to Step #63. If the Engine does not ping, go to Step #58.

58. Slowly rotate the “Pulse Width Adjust” Pot. CCW. If the CHT increases, continue rotating CCW until the CHT stops increasing. Go to Step #59. If the CHT decreases while rotating CCW, rotate fully CCW. Slowly rotate CW until the CHT stops increasing. Go to Step #59.

59. Rotate the “Strength Adjust” Pot. fully CCW. If the Engine pings, go to Step #64. If the Engine does not ping, go to Step #60.

60. Rotate the “Strength Adjust” Pot. fully CW. If the Engine pings, go to Step #65. If the Engine does not ping, rotate each Pot. to its midpoint, go to Step #61. (“Pulse Width Adjust” and “Strength Adjust” Pots).

61. Turn the power OFF. Referring to Figure #7, the Coil Circuit is producing too much Parahydrogen. Replace the 10K resistor connecting pin #3 of component NE555 to the base of component 2N3055 with a 20K Pot. Adjust the Pot. for about 11K resistance. Go back to Step #45.

If you reach this Step again, adjust the Pot. for about 12K resistance and go back to Step #45. If necessary, each time you reach this Step adjust the Pot. for about 1K more resistance and go back to Step #45. If the Pot. is eventually adjusted for about 18K resistance or more, a circuit component is defective. Locate and replace the defective component. Adjust the Pot. for 10K resistance. Turn power ON and go back to Step #45.
62. Slowly rotate the “Pulse Width Adjust” Pot. CW until pinging stops and continue to rotate CW 5 more degrees. If the CHT is more than 40 degrees higher than the value recorded in Step #1, and continue slowly rotating CW until the CHT decreases to 40 degrees above the recorded value. Go to Step #66.

63. Slowly rotate the “Pulse Width Adjust” Pot. CCW until the pinging stops and continue to rotate an additional 5 degrees. If the CHT is more than 40 degrees higher than the value recorded in Step #1, and continue rotating CW until CHT decreases to 40 degrees above recorded value. Go to Step #66.

64. Slowly rotate the “Strength Adjust” Pot. CW until pinging stops and continue to rotate CW an additional 5 degrees. If the CHT is more than 40 degrees higher than the value recorded in Step #1, continue slowly rotating CW until the CHT decreases to 40 degrees above the recorded value. Go to Step #66.

65. Slowly rotate the “Strength Adjust” Pot. CCW until the pinging stops and continue to rotate CCW an additional 5 degrees. If the CHT is more than 40 degrees higher than the value recorded in Step #1 and continue rotating CCW until the CHT decreases to 40 degrees above the recorded value. Go back to Step #29.

66. Precise Throttle adjustment is very easy using the special features of the Hydro-Gen Throttle Assembly (refer to Figure #21). Here’s the method we recommend:

A. Disengage the arm from the Throttle rod. Rotate the Pot. shaft thru the total range of rotation required going from idle to full power. Using a ruler, measure and record the total distance traveled by the tip of the Throttle rod as the Pot. is rotated.

B. Rotate the Pot. shaft to its midpoint of rotation and position the Throttle Linkage at its midpoint of travel. Slide the arm onto the Throttle rod and attach the arm and sleeve onto the Throttle Linkage with hose clamps.

C. Raise or lower the Pot. by rotating its mounting bracket about the 1/4” bolt until Throttle rod travel is equal to that recorded in paragraph “A” when the Throttle Linkage moves thru its full range of travel. If necessary to obtain added distance between the Pot. and the arm, the arm and sleeve assembly can be inverted to position the arm above the Linkage.

D. To assure smooth operation without binding, be sure the Throttle rod is squared with the surface of the arm when the Linkage is at its midpoint of travel. If necessary, rotate the Pot. body within the limits of the 3/32” slot and rotate the sleeve about the axis of the Linkage until the Throttle rod is square with the arm.

E. Adjust idle to desired speed. Operate the Throttle thru several cycles to verify smooth operation without binding.

F. Firmly tighten mounting bolts, hose clamps, and the Pot. retaining nut. With the Throttle at idle position, trim the Throttle rod to length so that it protrudes about 1/2” above the arm. Square the rod end with a fine file and deburr with sandpaper.

G. Mix a small quantity of Epoxy (J-B WELD) and apply into the 3/32” slot in the area of the anti-rotation pin to secure the Pot. against rotation. Allow the Epoxy to cure for 8 hours before moving the Linkage.

67. While driving, verify that the four (4) LED’s operate as follows:

- Green PWR ON lights when power is ON and is not lit when power is OFF.
- Green PUMP ON and yellow GEN WATER LOW – both light when the Water Pump is running and are not lit at all other times.
- Red TANK WATER LOW is not lit when Tank water level is more than 1/3 full and lights when water falls below that level.

If all four (4) LED’s operate properly, go to Step #68. If not, refer to Figures #6, #7, and #8 and troubleshoot to locate defective component or wiring error. Repair as required and go to Step #68.

68. CONGRATULATIONS, your Hydro-Gen System is working perfectly. After about 25 hours of driving, firmly tighten all hose clamps, and linkage connections.

69. As you have noticed, we had you do extensive testing of all the components used. That’s because, in our testing, we found several “New” components that were “Bad”. Do all the procedures we lay out here. You want to find a defective component in testing, not in driving.

70. KEEP THIS BOOK AND ALL YOUR NOTES FOR FUTURE USE IF YOU HAVE A PROBLEM OR WANT TO BUILD ANOTHER FOR ANOTHER VEHICLE. DON’T LOSE THIS BOOK.

71. Time for a coffee break, this time you can have beer if you want. You are done!!
Helpful Hints and Tips

MAINTENANCE: Your Hydro-Gen System is practically maintenance-free. Just fill with water and drive. But, normal tap water does contain minerals, which can accumulate within the Generator and coat parts inside. The Electrode gap will gradually fill with these deposits and efficiency will degrade until insufficient Hydrogen and Oxygen will be produced to run your Engine. You can prevent this build-up with periodic flushing and cleaning of the Generator.

FLUSHING: Since it’s so quick, easy and effective, we highly recommend Flushing the Generator at least every two weeks. There’s no need to start the Engine. Simply open the Drain Cock and turn power ON for a minute or two. The Water Pump will provide plenty of fresh water to do the job. Close the Drain Cock, wait for the pump to fill the Generator and turn power OFF. Be sure to refill the Water Tank.

CLEANING: A thin layer of minerals will eventually coat the Generator parts, and must be periodically removed. How often your Hydro-Gen Generator will need cleaning will vary depending on the mineral content of your water and the amount of driving done. To be safe, we recommend cleaning about every month or two. A mildly acidic mineral deposit cleaner works very well (such as: CLR or even just White Vinegar). There are dozens of products out there to do this. Turn the power OFF. Open the Drain Cock and drain the Generator. Disconnect the outlet tube at the Flame Arrestor and close the Drain Cock. Wear protective gloves and mix the cleaner according to the manufacturers instructions and pour thru the tube you disconnected (a small funnel will help) until the Generator is full. Wait a few minutes or whatever the manufacturer recommends and drain the Generator into a small bucket. Repeat this one more time and examine what you drain out of the Generator to see that it is clean. If necessary, repeat until clean. Close the Drain Cock and reconnect the tubing to the Flame Arrestor. Turn the power ON and let the Generator fill with water. Open the Drain Cock and let the Water Pump flush the Generator for a minute or two. Close the Drain Cock and let the Generator fill. Turn power OFF. Be sure to refill the Water Tank.

COLD WEATHER OPERATION: If the outside temperatures are going to be below freezing, you can add Isopropyl Alcohol to the Water Tank to prevent freezing. However, since Alcohol changes the dielectric properties of the water, the operating frequency must be changed to maintain efficient operation, by adjusting the Frequency Adjust Trim Pot. for peak performance (Figure #6). You might find that it is easier to install an Engine Tank Heater in the Water Tank System the same as you would for the Engine. Heat from a warm vehicle will keep the water from freezing, but when you stop for the night, all you have to do is plug the Tank Heater into a 110V outlet and the Heater heats and circulates the water. Follow manufacturers instructions when installing the Tank Heater.

STAINLESS STEEL: The only combustion by-product that your Hydrogen powered Engine produces is Water. Actually, it produces Hot Water. Now we all know what water does to steel. Unless your Engine already is equipped with Stainless Steel Valves, you might want to look into having them installed in the near future. The Stainless Steel Valves are fairly inexpensive; the biggest cost will be labor. Almost any high performance shop can install them for you. Now. Understand you do not have to do this right away. Our best guess is if you have reasonable mileage on your Engine with good valves it will probably last for 50,000 to 70,000 miles before you need to look into S.S. valves. Your Exhaust System is also subject to rusting. If your Exhaust System is fairly old, wait until it rusts thru and then replace with Stainless Steel components. If your Exhaust System is fairly new, you might want to look into using one of the new Ceramic Coatings that are readily available. Currently, there are no Rust Preventive additives available that can be added to the water without hurting the performance of the System. Now, we realize that the Stainless Steel Valves and Exhaust System are additional cost, but, not only will the new Stainless Steel components last a very long time, but remember, you are now running on WATER, FREE WATER not $$$GASOLINE.
FUEL INJECTION SYSTEMS: The *Hydro-Gen System* is designed for *Carbureted Engines*, not fuel injection. The technology is not quite there for that yet. But, remember, the early fuel injection systems were *Throttle Body* injection. This system will work with *Throttle Body* systems. In the near future, *Hydrogen Injection Components* will be “over the counter”. If you need to convert your full *Fuel Injection Engine* to *Carbureted*, check with your local high performance shop or you can contact *Impco* (*Impco* address and phone # were listed earlier in this book).

**WATCH:** Always keep an eye on the gauges, especially the *CHT*. Any abnormal change in the *CHT* usually signals a problem. Stop and check it out as soon as is possible. Again, as we said earlier, keep this book and all your notes in a safe place in the vehicle so that if you need it, you have it. **Good Luck!**

**NOTE:** Centurion Eng. expressly states that no warranty or guarantee applies to the Hydro-Gen System. The System has been tested and does work, if you follow all the instructions explictly. If you deviate from the instructions, your System may not work. You accept responsibility for your System and your vehicle. We are selling the manual only. If, in the process of building and tuning your system you find a better way of building or tuning that will help others in their Systems, e-mail Centurion and we will send an e-mail update to all the purchasers of our manual.

Now for a little Trivia. The concept of Hydrogen powered automobiles isn’t new. Way back in 1932 Charles Garrett patented an invention called the “Electrolytic Carburetor”. (U.S. Patent 2,006,676). His original idea is just a little different than what we have today. What has changed is 70+ years of technological advancement, which has made this new design a reality today. Just think, 1932, do you think that the big Oil Companies and the big auto manufacturers did not pursue his ideas?

How about the Vapor Carb invented by Charles Pogue back in the late 1930’s that our Military used on our Tanks in Africa in W.W. II that helped defeat Rommel because of extraordinary fuel economy. Just a little food for thought.

References:
- U.S. Patent 6,126,794 . “Apparatus for Producing Orthohydrogen and/or Parahydrogen” And “Prototype Vapor Fuel System” by Stephen Chambers.
- “Where in the World is All the Free Energy” by Peter Lindemann.
Hydrogen/Oxygen Generator

Figure #2
In-Dash Indicators

*Figure #3*

Square Wave - ON:OFF Ratio 1:1

*Figure #4*

Square Wave - ON:OFF Ratio 3:1

*Figure #5*
Generator Electrode Circuit Schematic

Figure #6
Generator Coil Circuit Schematic

*Figure #7*
In-Dash Indicators Circuit Schematic

Figure #8
Outer Electrode Shown
(Same dimensions for Inner Electrode.)

1/4" Holes every 45° interval.

1/8" Holes every 3/8".

3/32"  1"  3/8"

11/32"

ELECTRODE DETAILS
Figure #9

Inside diameter of threaded end cap.

1/32" - 1/16"

Match contour to end cap.

1/2" Hole

Disk Contour
Figure #10
Generator Details

Figure #11
Threaded End Cap Details

Figure #12

Coil Mounting Brackets

Figure #13
Housing Attachment Details

Figure #14

More Housing Attachment Details

Figure #15
Unthreaded End Cap Details

*Figure #16*

Slosh Shield Details

*Figure #17*

Flame Arrestor Details

*Figure #18*
Toroid Coil Details

Figure #19

Toroid Coil Installation

Figure #20
Throttle Assembly Details

Figure #21