

# Energy and Water Solutions

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## *Millennium*

Models CNG4 and CNGM8

### **CNG Conversion Kit Instructions and Owner's Manual For all EFI (Electronic Fuel Injected) Engines**

**These instructions are not the complete instructions that come with your kit. Some of our information is confidential and is only provided with your kit.**

**CNG Conversion Kit Parts List – Check to make sure your kit is complete before beginning.**

Millennium Controller, Change-Over Switch, Pressure Gauge, Wire Harnesses and Small Parts Bag

Aluminum Mixer

Regulator with Bracket and Hardware

Filling Nozzle

Filling Nozzle Bracket

1 Roll of 6mm HP Tubing

6 ft of 5/16" Heater Hose

3 ft of 3/4" Fuel Hose

Instructions and Owner's Manual

CNG Sticker

Model CNGM8 comes with 2 regulators, 2 pressure gauges and extra hoses and hardware.

1 Bag of the Parts Below:

3 High Pressure 6 mm Compression Fittings

6 High Pressure 6 mm Ferrules

6 High Pressure Tubing Straps

Aluminum Fitting for Mixer

4 Small Heater Hose Clamps

8 Large Hose Clamps

3" of 3/8" Heater Hose

2 Reducing Heater Hose Tees

8 Large Wire Ties

12" Heat Shrink Tubing

6 Small Self Tapping Screws for Tubing Straps

4 Large Self Tapping Screws for Mounting filling Nozzle and Regulator

### **Disclaimer**

1. No Refunds on Used or Opened CNG (Compressed Natural Gas) Conversion Kits, CNG Parts, or CNG Cylinders.
2. Refunds are only with Return Authorization and have a 20% restocking fee.
3. Shipping Is Non-Refundable on all our products sold.
4. Our CNG Conversion Kits are not EPA or DOT certified.
5. Some of our CNG Cylinders are not DOT Certified, but are ISO Certified.
6. All CNG Conversion Kits, CNG Parts, or CNG Cylinders Installed or not Installed are considered Do It Yourself and are installed at your own risk.
7. Installation of CNG Conversion Kits, CNG Parts, or CNG Cylinders is Buyers Responsibility to Obtain, Perform, and Maintain.
8. By purchasing any of our products you agree To Forever Hold Harmless, Indemnify, and Covenant Not to Sue Energy and Water Solutions or anyone affiliated with Energy and Water Solutions.
9. The One-Year Warranty Provided by Energy and Water Solutions is only for Workmanship and Quality of the CNG Conversion Kits, CNG Parts, or CNG Cylinders.
10. We do not guarantee that you will not get a "Check Engine" light after installing our CNG Conversion Kits.

11. You agree to these terms and conditions by Viewing, Sharing, or Purchasing our information and products.
12. Individual Results May Vary In All Aspects and Respects Not Limited.
13. We reserve the right to change these terms at anytime for any reason without notice.

## **BEFORE YOU BEGIN INSTALLATION**

**Make sure your engine is running properly on gasoline before installing this kit. An engine that is not running properly or has low compression may run worse on CNG.**

**Make sure all maintenance needed is performed before installing.**

**Install the conversion kit while the engine is cool.**

**Completely read these instructions before proceeding. Use [www.alldatadiy.com](http://www.alldatadiy.com) to purchase the service manuals for your vehicle, if needed, to locate parts and wires on your vehicle.**

### **Verify the Oxygen Sensor Voltage**

1. Locate any oxygen sensor before any catalytic converters to connect to. The oxygen sensor wire is critical for proper operation. If the oxygen sensor is not the proper type with voltages below 1 volt DC or is defective the engine will not run properly on CNG. This is how the oxygen sensor operates. If the oxygen sensor voltage is below .5 volts (500 mv) the engine is running lean. If the voltage is above .5 volts the engine is running rich. The oxygen sensor voltage must go above and below .5 volts every few seconds on both fuels when the engine is running. If it doesn't, the sensor is the wrong type, defective, has a bad ground, or the engine's wiring is shorting the voltage. At this time you can only check the voltage while the engine is running on gasoline. See the trouble guide if the voltage is not correct.
2. See Locating and Connecting the Oxygen Sensor. Just verify that the sensor is working properly at this time and connect to it later as instructed. Note which wire is the correct wire so you can connect to it later.

### **Regulator Installation**

1. Find a location to install the regulator as close as possible to the air intake hose where the mixer will be installed. If possible, the regulator should be installed so that it is perpendicular to the radiator or front of the vehicle. Mount using the bracket and hardware provided. The bracket is fastened to the bolt on the front center of the regulator with a locking washer and nut. It can be installed using the large self tapping screws, the bolt provided, or welding it to the fire wall or side wall or anywhere to hold it securely in place. You may need to place the bracket in a vice to bend it to fit and you may need to fabricate a bracket if the bracket provided will not work. You can rotate the regulator to make installation of the gas in, gas out, coolant lines, and pressure gauge as easy as possible. Model CNGM8 will come with 2 regulators, mounting bracket and hardware. Mount the two regulators next to each other. See the steps below for connecting these items.
2. There is a large black knob on the back edge of the regulator to adjust the idle. Do not adjust the small black knob as this is a drain to flush the regulator if needed. Do not adjust the brass screw as it is set at the factory.

### **Mixer Installation**

1. Make sure there are no hoses that may be sucking intake air between the throttle body and where the mixer is installed. For proper operation the hoses may need to be relocated in front of the mixer if they are sucking air from the intake.
2. Make sure the mixer is installed at least 3 inches away from the mass air flow sensor. It can be installed in front or behind the mass air flow sensor. There are a few engines that may require the mixer to be installed before the mass air flow sensor for proper operation. After complete installation it may be necessary to relocate the mixer, but is uncommon.
3. Completely remove the air intake hose from the engine.
4. Check the mixer for proper fit into the intake hose. The mixer should be installed between the air filter and the throttle body where it is easiest to install and where the hose is easiest to connect to the regulator. If your engine has a turbo charger the mixer must be installed between the air filter and the turbo charger and not after the turbo charger. The end of the mixer that has the face with the 4 holes must be the upstream side of the mixer where the air will flow into the mixer. It will not work if installed backwards. A 60% to 70% reduction of the air intake through the mixer is normal. All air must flow through the center of the mixer and no air should flow around the mixer.
5. Remove the aluminum fitting from the mixer. Place the mixer in the intake hose. If it is a loose fit, it must be sealed so no air will leak around the mixer and so the mixer is held in place firmly so it will not move. You must use a method of holding the mixer in place so that it cannot move by using a clamp around the intake hose and mixer if it is flexible, a silicone, RTV, or similar sealant, or screws.
6. Drill, or cut a hole in the intake hose so the aluminum fitting can be threaded into the mixer. If the intake hose is flexible, drill a 1/2" hole into the air intake for the fitting and the hose will make a tight seal.

7. Thread the hose fitting through the hole in the intake hose and into the mixer. Do not over tighten. Make sure the mixer is installed so the intake hose will still fit onto the throttle body and so the hose fitting on the mixer will be in the best location to install the gas hose from the regulator to it. Make sure you clean any shavings from the hose so nothing will get into the engine.
8. Seal any leaks around the aluminum hose fitting so no air can leak into the intake hose.
9. Reinstall the air intake to the engine and make sure all hoses and wire connectors are reinstalled.

### **Low Pressure Gas Hose and Stepper Motor Installation**

1. Locate the stepper motor as close to the mixer as possible. It can be installed in any position. Install the  $\frac{3}{4}$ " ID hose using hose clamps to the regulator gas out fitting, stepper motor, and mixer fitting. Cut the hose as needed. Place the clamps about 3" onto the hose before inserting the fittings to the hose. The black gas out fitting can be rotated to the desired position. Make sure the hose does not kink. 90 degree  $\frac{1}{2}$ " barb fittings can be used if needed, but if used, you will need additional hose clamps. If you have model CNGM8, you will need to install the gray plastic tee fitting before the stepper motor so that the CNG from both regulators can be regulated by the stepper motor.
2. Tighten the hose clamps, but do not over tighten them. If any hose clamp should slip or strip replace it with another hose clamp.

### **Coolant Hose Connection**

1. Slide a hose clamp onto both ends of the  $\frac{5}{16}$ " hose.
2. Install the  $\frac{5}{16}$ " hoses to the small center fittings of the reducing tees. This will help leakage while installing as the center fittings will already be sealed.
3. Locate the 2 heater hoses going to the heater core. Make sure they are not air conditioning lines. Do not install with the engine hot. Cut each hose at the most convenient location to install a reducing tee into each hose. The  $\frac{5}{8}$ " reducing tee can be installed on most  $\frac{1}{2}$ ",  $\frac{5}{8}$ ", or  $\frac{3}{4}$ " heater hose. If only one heater hose is accessible you can connect both tees to one hose with at least 5 inches of hose between the tees. If the tees are installed on the same hose, install a hose clamp between the 2 tees to close off the hose slightly to restrict the flow so some coolant will flow through the regulator, but most will flow through the larger hose.
4. Cut the heater hose. Slide a hose clamp onto each end of the heater hose before inserting the reducing tee onto the hose. Check the  $\frac{5}{16}$ " heater hose to see if it is long enough to connect from the tees to the fittings on the regulator. It should be long enough for most installations. If it is not long enough, purchase enough hose for the shortest connection.
5. Install the two heater hoses to the two heater fittings on the regulator. It makes no difference which hose connects to each fitting.
6. If you have model CNGM8, connect a  $\frac{5}{16}$ " hose from one tee fitting to one regulator. Connect the other  $\frac{5}{16}$ " hose from the other tee to the other regulator. Connect a length of the  $\frac{5}{16}$ " hose from one regulator to the other regulator so the hoses are installed in series. The coolant will flow from one tee fitting, through one regulator, through the other regulator, and then back to the other tee fitting.
7. Tighten all the hose clamps tight, but do not over tighten. If any hose clamp should slip or strip replace it with another hose clamp.
8. Check for leaks after installing your kit and after you start your engine.

### **How to Safely Install HP (High Pressure) Tubing and Fittings**

1. Use only extreme pressure fittings and tubing rated for at least 3,000 psi. All tubing and fittings included in your conversion kit are extreme pressure fittings rated at 3,000 psi or higher.
2. Make all bends by hand slowly and carefully bending only slightly along its length.
3. If needed use a  $\frac{1}{4}$ " tubing bender if you need to bend any small radius bends.
4. Do not use any tubing that has been kinked or damaged from improper bending or damaged while installing.
5. Use a helper to run the long length of tubing from the cylinder to the engine area to avoid damaging the tubing by kinking it or scrapping it.
6. If the end of the tubing is not sealed, tape the end while installing so nothing gets into the tubing.
7. Slide the nut and then the ferrule onto the tubing before threading the nut onto the fitting. Make sure at least 2 inches of the end of the tubing is straight, and the white rubber coating removed so the fittings will slide onto the tubing. Be careful to not drop and lose the nuts or ferrules. Three extra ferrules are included in the kit in case they are dropped or need to be redone. Do not replace any parts with lower pressure parts available at your local hardware or plumbing store.
8. Insert the tubing all the way into the fitting and make sure it does not slide out while tightening the nut.
9. Always use two wrenches so one wrench is opposing the force of the wrench on the nut when tightening any fittings, and tighten tight, but do not over tighten. Tighten only  $1\frac{1}{2}$  turns after the fitting begins to compress the ferrule. If there is any doubt that the tubing has slipped out while tightening, remove the fitting and inspect the ferrule. The ferrule must be completely on the tubing with some tubing extending

beyond the ferrule. If the fitting is ever removed after it has been tightened, tighten only ¼ to ½ turn after the fitting starts to compress the ferrule.

10. Do not twist or bend the tubing while installing fittings.
11. You do not need to use thread sealant on compression fittings.
12. After tightening any fittings make sure the tubing does not move when pulling or twisting. If the tubing can be moved at all you did something wrong. Remove the nut and make sure the ferrule is firmly attached to the tubing and not on the very end of the tubing. If not, you will need to cut off the ferrule and use a new high pressure ferrule of the same type and start again.
13. Use 6 to 8 wraps of Teflon tape to all male pipe thread fittings and wrap in the same direction as when tightening.
14. Build a 3 to 4 inch loop in all tubing runs near the connection to any device to allow for expansion and contraction.
15. Only cut the HP tubing with a tubing cutter. Cut slowly only cutting a little with each rotation of the tubing cutter. The tubing is hard steel and cutting fast will damage the tubing cutter and the tubing. Ream out the tubing after it is cut making sure to not get anything in the tubing. If you do not ream out the tubing it will take longer to fill with CNG and the flow may be restricted and the vehicle may not run properly. Make sure no shavings are left in the tubing that could damage the regulator or your engine. Blow the tubing out with compressed air, if needed.

### **Installing the HP (High Pressure) Tubing and Fittings**

1. Read the instructions above before proceeding.
2. We have 3 fill nozzle options. You will be provided with a nozzle with a ¼ turn valve unless you have requested one of our other fill nozzle options. If you have the standard fill nozzle with a ¼ turn valve go to step 3. If you have the strait nozzle without the ¼ turn valve you will run tubing from one port of the cylinder valve to the fill nozzle and from the other port of the cylinder valve to the regulator. You will be provided with an extra half roll of tubing an extra ¼" adaptor fitting with this option. If you have the cylinder valve with the fill nozzle on it, you just run the tubing from the remaining port of the cylinder valve directly to the regulator. This option should only be used where the cylinder is installed outside the vehicle such as in a truck bed.
3. Install the CNG cylinder to the vehicle following the cylinder installation instructions.
4. If the cylinder is installed in the vehicle or in the truck, the cylinder valve and all fittings should be vented to the outside using at least an 8 mil thick bag or a hose. We have vent bags and vent fittings available if needed.
5. Drill 1/2" holes where needed to rout the tubing from the cylinder area to the engine area. If installing the optional vent fitting, drill a 1 1/8" hole where the tubing will exit the vehicle and fasten the fitting with 3 screws. The angled end of the fitting should be to the outside with the longest end to the front.
6. Use the 3" length of 3/8" heater hose to slide over the tubing and half way into the hole to protect the tubing if not using the vent fitting.
7. Install the pressure gauge included with your kit to the shorter port of the gas in tee fitting of the regulator. If you have model CNGM8, install a pressure gauge to each regulator. Do not tighten the pressure gauge by turning the gauge. Tighten only by using a wrench on the square head fitting. Use the thick aluminum washer taped to the back of the pressure gauge to make the seal. Place it on the end before threading it onto the regulator. If the pressure gauge ends up where you cannot see it by turning the tee on the regulator, remove the pressure gauge and add the other thinner aluminum washer and install again.
8. Mount the fill nozzle under the gasoline flap next to the fill cap, if possible. Make every effort, even if it is difficult, to install it there if there is room as this will make filling very easy. Install using the 6" bracket provided using 2 large self tapping screws, or bolt, or weld the bracket in place. You may need to install the tubing to the nozzle before installing to make installation easier as you may not be able to tighten the fittings after it is installed. Do not install the fill nozzle in the trunk or in the vehicle. You may also install the fill nozzle near the cylinder in the back of a truck, under the hood, or any other place where it can be safely installed. The fill nozzle must be located so the filling station nozzle can easily be connected to it. The filling station nozzle and valve bracket is large so make sure there is room to connect it to your nozzle.
9. Go to your nearest CNG filling station and check out the nozzle and how it operates, and how the gas is purchased. Try to closely watch at least one vehicle fuel while you are there. Try to do this before you begin the installation of your conversion kit.
10. There are two output ports on all cylinder valves. We do not supply the adaptor fittings to connect to your cylinder valve if you did not buy the cylinder or cylinder valve from us. We have most adaptor fittings for most cylinder valves available on our website on the PRICES page. Our tubing is 6mm steel and only the proper fitting should be used. Install the HP tubing from one port on the cylinder valve to the filling nozzle center port closest to the red handle with the mounting nut on it.
11. Install tubing from the filling nozzle port opposite of the filling nozzle to the longer high pressure port on the regulator. If you have model CNGM8, install tubing from both high pressure ports of both regulators to the high pressure tee fitting. Locate the tee fitting as close as possible to the regulators. Install tubing from the filling nozzle to the high pressure tee fitting near the regulators. Do not locate the tubing near any moving parts, hot exhaust, or engine parts. When running the tubing under the vehicle, keep the tubing

above other car parts when possible to keep it up as high as possible where it is better protected from damage. The tubing must not be installed so that it is below the frame of the vehicle where it is in a crush zone where it can be crushed.

12. Strap the HP tubing in place every 18" using the small self-tapping screws provided and the thin flat metal straps provided. Just simply bend them to make a strap.
13. Tighten the nut that the pressure gauge is threaded into after you have the fitting in the desired position. It has o-rings so do not over tighten it.

## **Electronics**

### **Installing the Millennium Controller**

1. Decide where you will install the Millennium controller. It can be installed under the hood or under the dash.
2. If installed under the hood it must be installed upright and so the connector is located at the bottom to keep moisture out of the controller. It must not be installed where it is lying horizontally.
3. Locate where all the wires will be connected and routed and organize the wires and cut to the desired lengths so that you will have a neat organized installation.
4. Purchase the black wire sleeves to protect and organize the wires, if desired.

### **COS (Change-Over Switch) Installation**

1. Run the cable with the small black connector that plugs into the back of the COS from the engine compartment through the fire wall and into the driver's side of the vehicle.
2. Remove the black plastic mounting bracket from the COS.
3. Mount the COS on, in, or under the dash near the driver where it is in view of the driver using the mounting bracket and 2 screws. If mounted in the dash you will need to secure it in place with glue or some other means.
4. Plug the COS wire harness connector into the COS.
5. Tie the wire harness up out of the way inside the vehicle with wire ties.

### **Locating and Connecting the 12-volt Battery Wire**

The battery voltage maintains the program memory. If the voltage is disconnected the programming could be lost. Connecting to a computer is required if the program is lost. It is important that the program is saved after all programming is completed so that it can be easily reprogrammed if needed.

1. Connect the red with the black stripe wire from the FBS Controller to the fuse holder and then from the fuse holder to a +12-volt battery wire. This can be at the battery or any other wire that always has +12-volt battery voltage. You will need to cut a 6" to 12" length of the red with the black strip wire first. Solder the wires to fuse holder clips and then inset the fuse holder clips into the fuse holder. Make sure the fuse is not installed at this time.

### **Locating and Connecting the 12-volt Ignition Wire**

2. Locate a 12-volt ignition wire. Use your service manual to help locate a wire. Make sure the wire turns off and on with the ignition and never shuts off while the engine is starting or running. If the voltage is ever interrupted the controller will convert back to gasoline while running on CNG. Do not use a wire that turns on with just the accessories on. Connect the red wire from the COS (Change-Over Switch) to the fuse holder and then from the fuse holder to the 12-volt ignition wire. You will need to cut a 6" to 12" length of the red wire first. Solder the wires to fuse holder clips and then inset the fuse holder clips into the fuse holder. Make sure the fuse is not installed at this time.

### **Locating and Connecting the Chassis Ground**

1. Connect all ground wires from the Millennium controller, pressure gauge, and fuel injector emulators, if used, to a good chassis ground. It may be best to connect all the ground wires together and then connect one jumper wire to the chassis ground using extra ground wire from the controller.

### **Connecting the Wires to the Regulator Solenoid Valve**

Do not connect any electric cylinder valves to the blue wire or to the solenoid on the regulator. This will damage the controller and void the warranty. Electric cylinder valves must be connected to a 12 VDC ignition wire. The solenoid is controlled by a safety device, which is integrated in the Millennium controller. The solenoid only enables the CNG fuel only when the engine is running. If the engine stalls, the CNG supply is automatically turned off.

1. Connect a ground wire to the negative spade connector of the solenoid coil on the regulator. Use the extra length from one of the ground from the controller. Crimp and then solder the wire to a female spade connector. Install an insulated cover over the spade connector.
2. Connect the blue wire from the Millennium controller and from all fuel injector emulators, if used, together and then one blue wire to the positive terminal of the solenoid coil on the regulator using a spade connector. Install the spade connector as instructed above.
3. If you have model CNGM8 you will connect to the solenoids on both regulators.

### **Locating and Connecting the TPS (Throttle Position Sensor)**

This connection is optional but is recommended. Disconnect this wire if the engine goes into limp mode which may happen on a few engines when this wire is connected.

The Throttle Position Sensor is mechanically connected to the butterfly and the gas pedal. It sends a variable signal to the ECU that is proportional the opening angle of the butterfly. In the latest generation of vehicles where the opening of the butterfly is achieved through an electromechanical device as opposed to linkage, the TPS signal can be taken at the sensor which reads the position of the gas pedal.

1. The TPS connector is located at the throttle body on most engines. See your wiring diagram for your engine.
2. Most TPS connectors will have 4 to 7 wires. There will be a chassis ground, 12 volts battery voltage, 5 Volts, and the TPS voltage wire. Some engines have dual TPS wires. You can connect to either one. Turn the ignition on but do not start the engine to check the voltage.
3. The TPS voltage with the throttle closed will be .7 to .9 volts. After locating the TPS, have someone press on the gas pedal to open the throttle and the voltage will increase to over 3 volts with full throttle. If your voltage is above 4 volts at idle and decreases when the throttle is pushed the TPS type will need to be changed to an inverted TPS voltage using the software provided.
4. Connect the blue and yellow wire from the Millennium controller to the TPS sensor wire.

### **Connecting to the Fuel Injectors**

1. The two yellow wires from the Millennium controller are used to disconnect the fuel injectors when using CNG and then to reconnect the fuel injectors when using gasoline. The resistor supplied is connected so that if the engine's ECU is looking for a signal from the fuel injectors it will see a signal but the resistor will prevent the fuel injectors from operating while running on CNG. If your common fuel injector wire goes to the ignition relay or somewhere other than the ECU you will not need to install the resistor. If you are not sure then install the resistor. If you should break the resistor during installation, you can purchase a resistor at Radio Shack. It is a 330 ohm 2 watt resistor.
2. Use the fuel injector wire diagram for your engine to locate the common wire that connects to all fuel injectors. The wire is usually the same color as the same color wire that is connected to every fuel injector. Cut the fuel injector common wire and connect either yellow wire from the Millennium controller and one end of the resistor supplied and to the end of the wire going to the fuel injectors. See the wire diagram. Make sure you will only disconnect the fuel injectors before cutting the wire. The wire diagram may show this wire going to other places and it may look like you cannot connect to the wire, but you can if you follow the wire and make sure you connect to the wire where you are disconnecting only the fuel injectors.
3. Connect the other yellow wire and the other end of the resistor and to the other end of the wire going to the engines ECU, fuse box, or other location.
4. If it is too hard to locate or connect to the single common wire, you can connect to all the common same color fuel injector wires. You will need to make this connection at the wire harness after both sides of a V type engine merge to one location. Cut all the common same color fuel injector wires at one location and connect either yellow wire and one end of the resistor to all the common wires going to the fuel injectors.
5. Connect the other yellow wire and the other end of the resistor to the other end of the common wires going to the engines ECU, fuse box or other location. Make sure you will only disconnect the fuel injectors before cutting the wires. Follow the wires if needed. Do not connect to the different color wires going to the fuel injectors as this will short all the fuel injectors and the engine will not run on gasoline.

### **Locating and Connecting the Oxygen Sensor (O2) Wire**

1. The oxygen sensor is located on or after the exhaust manifold. The proper connection to the proper oxygen sensor is critical for the proper operation when using CNG. This is how it works. If the oxygen sensor (O2) voltage is below .5 volts (500 mv) the engine is running lean and the Millennium controller drives the stepper motor, which is a valve, open. If the voltage is above .5 volts, the engine is running rich and the Millennium controller drives the stepper motor closed. If the regulator is adjusted properly, the voltage and stepper motor will go up and down every few seconds maintaining the proper fuel ratio without reaching the maximum or minimum settings. The settings are automatically adjusted by the Millennium controller as you drive providing the perfect fuel ratio. Use this information when troubleshooting if you have any problems.

2. Most O2 connectors will have 3 or 4 wires. A chassis ground, 12 volts battery voltage, and the O2 wire.
3. Use a meter to check for the proper voltage on each wire. The O2 voltage will be about .5 volts with the ignition on and the engine not running on most engines. The engine may need to be running to read the voltage. Use your service manual to locate the wire so you can wire to it without starting the engine. Some late model engines have higher voltage air fuel ratio sensors that have 2 to 3 volts. Do not connect to these sensors or any sensor with a voltage over 1 volt. If you do not have an O2 before the catalytic converter, you will need to have a universal, low cost, unheated oxygen sensor installed before the catalytic converter and connect to the new O2 wire. An O2 and bung can be purchased from us or your dealer. You can have the bung welded on to the exhaust and the sensor threaded into the bung. A bung installed will cost \$50 to \$100 at a muffler shop. The muffler shop may tell you that installing CNG on your engine will damage your catalytic converter. Our kits will not damage your engine or your catalytic converter. Most sequential injection conversion kits, including EPA certified kits, may damage engines and catalytic converter as they do not adjust the fuel properly because these kits do not use the oxygen sensor to adjust the fuel ratio like all our kits do.
4. Many engines will have multiple O2s. If you have more than one sensor, connect to the easiest sensor to connect to before the catalytic converter.
5. Connect the purple wire from the Millennium controller to the O2. Some sensor wires have an outer ground shield with the sensor wire inside so make sure that you connect to the inside wire. The ground shields should be reconnected to each other if cut. Do not connect the gray wire.
6. The O2 signal is only monitored so the wire must not be cut so it is still connected to the engine's ECU. The gray wire from the controller is not connect and should be insulated.

### **Locating and Connecting the Ignition Pulse (Coil) or RPM Wire**

1. Connect the brown wire from the Millennium controller to the ignition pulse wire. Most late model engines will have individual coils for each cylinder with a connector with 3 or 4 wires. You will have a chassis ground, 12 volts battery voltage, and the pulse wire to turn on the coil to fire the spark plug. You will only need to connect to one coil pulse wire if you have more than one coil. You may have a coil for each cylinder or you may have a coil for every two cylinders. You may have two coils per cylinder. It does not matter, just connect to one. Older engines will have a single coil located in or near the distributor and the coil pulse wire will be connected to the primary side of the coil. Do not connect directly to any high-tension coil or spark plug wires. If you are not able to locate a coil wire, connect to the RPM wire. You may be able to connect to a camshaft or crankshaft wire, but only as a last resort.
2. When ready to locate the wire, start the engine. The wire that causes the voltage to vary around 10 to 12 volts is the ignition pulse wire. The voltage will be lower than the battery voltage. The battery voltage will be a steady voltage. Your meter will not respond fast enough to see the voltage changes but the voltage will vary enough to see it the correct wire. Do not connect directly to any high-tension coil or spark plug wires.

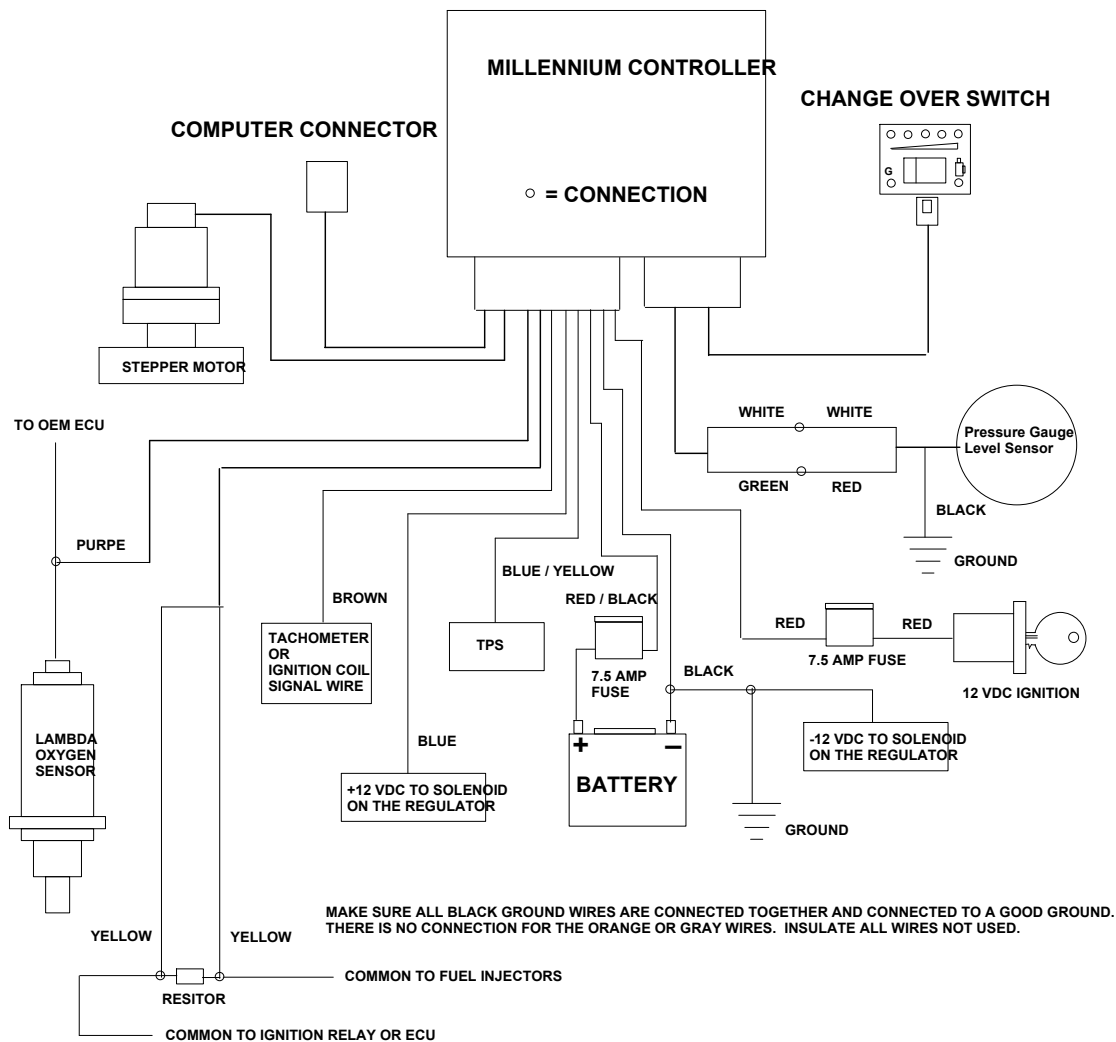
### **Connecting to the Pressure Gauge Level Sensor**

1. Connect the connector and wires supplied to the pressure gauge.
2. Connect the black wire from the gauge to ground. Cut the ring connector off if not needed.
3. Connect the white wire from the gauge to the white wire from the Millennium controller.
4. Connect the red wire from the gauge to the green wire from the Millennium controller.

If you have model CNGM8, you will connect the Millennium controller to only one pressure gauge. The other gauge can be used if one should ever fail. Connect the spare gauge wire harness to the unused gauge connector and insulate the spare wires.

### **Final Wiring**

1. Plug all wire connectors into the proper controllers, emulators, stepper motor, and fuel level sensor (pressure gauge).
2. Insulate all wires not used. Do not connect any spare wires that are not shown connected in the wire diagrams!
3. Use plastic wire covers over the wires, if desired.
4. Use the wire ties provided to organize and support all the wires.
5. Make sure all wires are away from any moving parts, hot exhaust or engine parts, or high-tension spark plug wires.
6. Install the CNG sticker to the vehicle to the back right side above the bumper.



### Installing an Oxygen Sensor and Bung to the Exhaust if needed

1. The bung must be installed before the catalytic converter. Metal shavings must not be allowed in the exhaust system where they can get into the engine or catalytic converter. Remove the exhaust pipe or exhaust manifold if necessary.
2. Wire the oxygen sensor as shown in the wire diagram.

### How to Fill the CNG Cylinder

1. After completing all the steps above, you are ready to fill your CNG cylinder. Do not fill it before then.
2. Double check that all high-pressure connections are tight, the cylinder is secure, and the tubing is secure and will not be damaged while operating the vehicle.
3. Leave all fuses out until you return home and are ready to run the engine on CNG.
4. Drive to your local CNG filling station.
5. Bring the wrenches needed to tighten any fittings if there is a leak.
6. Bring your soap test leak towel. All you need is several drops of dish soap on a couple of very wet paper towels. Rub the towels vigorously on all fittings to create suds and watch for any air bubbles, which indicate a leak.
7. Do not fill the cylinder with anyone in or near the vehicle during the first filling, and until the cylinder and the entire CNG system is filled to capacity and you are sure there are no leaks by testing for leaks.
8. Open the cylinder valve and filling nozzle valves before filling.
9. Read and follow the filling station instructions.
10. Connect the filling station nozzle to your filling nozzle.
11. Before filling be ready to check for leaks as soon as the gas is turned on. Fill only to 500 psi and test for leaks. Turn the CNG gas off and the cylinder valve off if you hear or see any leaks. Repair all leaks and then turn on your cylinder and filling nozzle valve. Check for leaks again.

12. If there are no leaks continue to fill the cylinder to 200 bar or 3,000 psi. Test for leaks again. Repair any leaks. If the filling station pressure is low you may not be able to reach the desired pressure. Do not overfill your cylinder.
13. Disconnect the filling nozzle.
14. It is normal for the cylinder to get warm when filling, and for the pressure of the cylinder to drop slightly after it cools.
15. Always when opening the cylinder valve just open it slightly and slowly until the pressure equalizes. Then open it all the way.
16. Drive home to make adjustments before driving on CNG.
17. Do not part the vehicle inside a garage or enclosed area for 24 hours after the cylinder is filled to 3,000 psi and there is no smell of CNG and no more leaks found.

### **Start up and Adjustment**

1. Make sure you have completely read and understand all of these instructions before proceeding.
2. If you are sure there are no leaks proceed. If not, check for leaks again.
3. Turn on the cylinder valve and filling nozzle valves.
4. Raise the hood and leave it open.
5. Install the fuses into the fuse holders.
6. Connect your computer to the Millennium controller according to the Millennium software instructions. Make sure the software is programmed for your engine and is running before proceeding. See the software instructions for any program settings that might need to be changed if the engine does not run properly on CNG. These instructions assume all settings are correct for your engine and normal adjustment is all that is needed.
7. Switch the COS (Change Over Switch) to the right position.
8. Start the engine and test for proper operation on gasoline. Observe the RPMs, TPS, and O2 readings on the software. Change the software settings if they are not reading properly. The O2 voltage should go above and below .5 volts every few seconds while idling and running above 2,000 RPMs. Do not proceed until the readings are correct. The engine will not run properly on CNG if the O2 voltage is not correct. Do not proceed until the O2 voltage is correct.
9. Turn off the engine and turn the key to off.
10. Switch the COS to the left for normal automatic operation.
11. Turn the ignition on without starting the engine. The COS should display the CNG level and the red gasoline light should be on.
12. Start the engine. The engine should start on gasoline and immediately convert to CNG. Run the engine for a couple of minutes.
13. Adjust the idle screw on the regulator while observing the software. Adjust the idle so the stepper motor is operating near the default setting. Change the default setting or adjust the mixer opening if needed. Your engine will run properly if all wiring is installed properly and the mixer is installed properly. Your Millennium controller is self adjusting and continuously adjusts itself for optimum performance. Once adjusted properly it will always run at peak performance.
14. If the engine stalls, start the engine again and repeat. If the engine does not convert to CNG see the trouble guide below. When the engine converts to CNG, the green CNG light will come on and after the overlap delay the red gasoline light will go out. The 4 green fuel level lights will come on if the cylinder is full. The 4 green lights will go out one at a time as the pressure in the cylinder drops. When it is near empty the red light will come on. The engine will automatically switch to gasoline at the set pressure if the automatic conversion is selected using the software.
15. Let the engine idle and observe the O2 voltage for proper operation.
16. Run the engine as steady as possible at 2500 RPMs and observe the O2 voltage for proper operation. Adjust the mixer if needed. Open it more if the stepper motor is operating below 120. Close the mixer more if the stepper motor is operating above 200. If the mixer setting is changed, adjust the idle again so that the stepper motor operates at about the same level as when running at 2500 RPMs.
17. Adjust the idle screw again if needed.
18. If the engine runs properly, take a test drive in a low traffic area for several blocks making several complete stops making sure it idles properly. If it is running well, take a test drive at highway speeds and see that it is running properly. You may notice a slight decrease in power. This is normal and is to be expected. You may get a check engine light on occasion. If you do, you should get a code reader and check and clear the code. It is usually a lean or rich code and is nothing to worry about. If you wait to convert to CNG after the engine is warm, most engines will not get an engine code. Try it a few times to see after you have driven the vehicle for a couple of weeks. Make sure you clear any codes first.
19. If the engine does not run or idle properly adjust the idle screw again as described above. The test drive should have given the controller time to self-adjust and adjusting the idle screw again should fix any problems you may experience.

### **Operation**

1. The switch on the COS (Change Over Switch) should be set to the left position. When the switch is in this position, your engine will start on gasoline and switch to CNG while starting. The engine will continue to run on CNG until the engine is turned off, or the switch is pushed to the right position. In the right position the engine will only run on gasoline. The red LED on the bottom right of the COS will be on steady when starting or operating on gasoline. Do not switch fuels while the engine is idling or the engine may stall.
2. To start the engine on CNG in an emergency when it will not start or run on gasoline, switch the COS to the left position. Turn the ignition on without starting the engine. Switch the switch to the right and then back to the left. The yellow light will come on steady. Start the engine without turning the ignition off. The engine will start on CNG which may take 10 to 15 seconds to start. If it does not start after 15 seconds, wait several seconds and try the process again. Do not push on the throttle while starting on CNG or the engine may backfire!
3. If the automatic conversion to gasoline is selected the fuel will automatically change to gasoline before you run out of CNG. If it does not change before you lose power, the number in the software will need to be changed so it converts at a higher pressure.
4. If you run out of CNG or gasoline, you can change the fuel while you are driving by pushing the switch as described above. You will notice a slight hesitation as the fuel changes. It is wise to not run out of either fuel when fuel is available.
5. Watch the fuel indicator lights on the top of the COS and fill the cylinder with CNG when needed.
6. The Yellow LED light on the bottom left of the COS has three functions. If it is flashing quickly, it is set to start on gasoline and automatically switch to CNG. If it is steady on, it is in CNG operation. If it is flashing slowly it is indicating a faulty O<sub>2</sub> signal and will flash slowly while operating on gasoline or CNG. If you get a slow flashing light the system should be checked with the computer software observing the O<sub>2</sub> signal.
7. Keep at least ¼ tank of gasoline in your vehicle and when filling with gasoline only fill to ½ tank unless you will need more gas for a long driving range.
8. Turn the cylinder valve off if the vehicle is not going to be used for several days. If the cylinder has been turned off, make sure you turn it on carefully before starting your engine.
9. Never start your engine with the cylinder valve off or you may get warning lights and the engine may not operate properly and your vehicle may be unsafe to drive. Operate only on gasoline with the switch pushed to the right position until you have filled the cylinder with CNG and all warning lights have been cleared. You may also need to disconnect the negative battery terminal for several minutes to reset your engines ECU.
10. Visually check your system for leaks or damage each time you fill the cylinder with CNG.
11. If you smell or hear a gas leak, do not start the engine and turn the cylinder valve off and have the leak repaired.
12. It is common for many engines to get a “Check Engine” light while running on CNG and it does not mean your system is not installed and running properly. We recommend purchasing a low cost scanner to read the code and clear it. There are some good buys on [www.ebay.com](http://www.ebay.com). A lean or rich fuel code is the most common and is nothing to be concerned about as it usually only occurs while the engine is warming up.

## **Maintenance**

1. Check your system for proper operation and damage each time you fill with CNG.
2. Check for leaks monthly using the soap test.
3. Check hoses and pressure lines for damage or wear monthly.
4. Keep the dust cover on the filling nozzle.
5. Adjust the idle if needed as described in the Start up and adjusting section above.
6. Monthly check the cylinder to be sure it is secure and does not have any damage. If your cylinder has any damage have it inspected by a certified tank inspector.

## **Troubleshooting**

This section is only provided with your kit.

**Do not call your dealer or EWS with installation questions unless you are sure there is a problem with your conversion kit. It is your responsibility to install your kit. Study the instructions and drawings carefully. Call a friend for help or take your car to a repair shop for help if needed.**