

Energy and Water Solutions

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DIEL

Diesel CNG Conversion Kit Instructions and Owner's Manual for all Diesel Engines

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 10% 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.

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

Basic EFI Controller (Includes Indicator and Change-Over Switch, and Pressure Gauge)

Regulator

Regulator Bracket

Filling Nozzle with Valve

Filling Nozzle Bracket

20 ft of HP Tubing

HP Fittings and Straps Bag

6 ft of 3/8" Heater Hose

3 ft of 3/4" Heater Hose for Gas Hose

2 Reducing Heater Hose Tees

Instruction and Owner's Manual

Cylinder Valve if Purchased with Kit

1 Bag of Parts Below:

3/4" 90 Degree Elbow

4 Small Heater Hose Clamps

4 Large Heater Hose Clamps

2 Large Gas Hose Clamps

1 Spade Connector

1 3/8" Hole Connector

6 Large Wire Ties

6 Small Wire Ties

6 Heat Shrink Tubing Caps

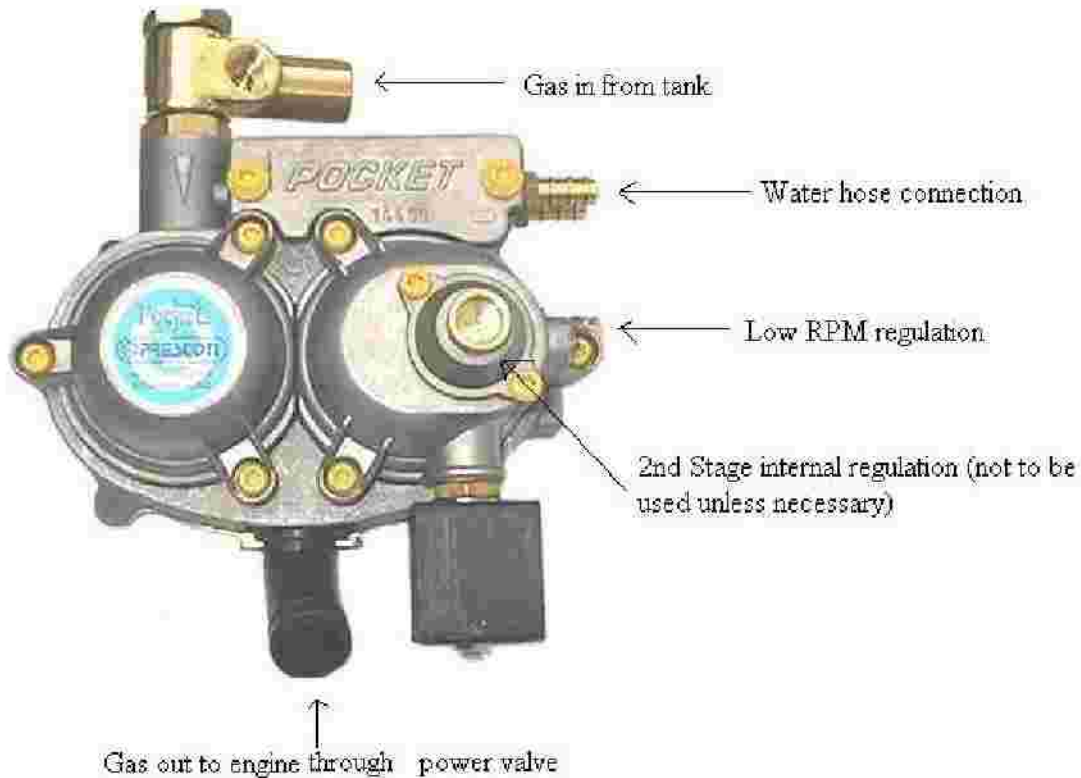
8 Self Tapping Screws

Install the conversion kit while the engine is cool.

Completely read these instructions and the instructions included with all your electronic components before proceeding. If you do not have a service manual you should buy one at your local auto parts store. It will help you find many wires and parts much easier. Do not start the installation until you have read and understand our above.

Regulator Installation

1. Find a proper place to install the regulator as close as possible to the inlet manifold or mixer. The regulator must be installed with the gas outlet facing down. Mount using the 8" bracket provided.
2. You will find a screw at one side of the regulator to adjust the low engine idle speed. This regulation is set at the factory so do not need to touch it unless you need to adjust the idle.
3. At the front of the regulator you will find another screw. Do not adjust this screw as it regulates the internal pressure and is set at the factory.



Low Pressure Gas Hose Installation

1. Install the 3/4" hose from the regulator gas out fitting to the air intake before the turbo.
2. Remove the air intake.
3. Cut a hole in the air intake and insert the 90 degree fitting into the air intake so that it is pointing in the direction of the airflow and so the other end of the fitting is sticking out of the air intake as much as possible.
4. Install the 3/4" ID hose using the hose clamps. Use the clamps that are opened with pliers. Place the clamps about 3" onto each end of the hose before inserting the fittings into the hose.
5. Open the clamp with pliers and slide over the fitting.
6. Clean and then install the intake.
7. Clean or replace the air filter. Keep the air filter clean. A dirty air filter will restrict the air and increase the CNG flow which may cause excessive CNG to the engine.

Heater Hose Connection

1. Locate the 2 heater hoses going to the heater core. Make sure they are not air conditioning lines. Cut each hose at the most convenient location to install a reducing tee into each hose. Make sure the heater control is not between the engine and the tee connection. The 5/8" reducing tee can be installed on most 1/2", 5/8", or 3/4" heater hose.
2. Slide a hose clamp onto each end of the heater hose before inserting the reducing tee into the hose. Use the hose clamps that are tightened with a screwdriver or socket.

3. Check the 5/16" heater hose to see if it is long enough to connect from the tees to the 5/16" heater 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.
4. Slide a hose clamp onto the 5/16" hoses.
5. Install the 5/16" hoses to the small center fittings of the reducing tees.
6. Slide a hose clamp onto the other ends of the 5/16" heater hoses.
7. Install the two 5/16" heater hoses to the two heater fittings on the regulator. It makes no difference which hose connects to each fitting.
8. Tighten all the hose clamps.
9. Wait to check for leaks until after installing your kit and you are ready to drive.

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.
2. Use a ¼" tubing bender if you need to bend any small radius bends under 6". The tubing bender will cost much less than buying a new length of tubing.
3. Make all large radius bends slowly and carefully bending only slightly along its length.
4. Do not use any tubing that has been kinked or damaged from improperly bending or installing the tubing.
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. Be careful to not drop and lose the nuts or ferrules. 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 on the fitting and opposing the force of the wrench on the nut when tightening any fittings, and tighten very tight, but do not over tighten.
10. Do not twist or bend the tubing while installing fittings.
11. Never use any thread sealant on compression fittings.
12. After tightening any fittings make sure the tubing does not move when pulling, twisting, or wiggling back and forth. Make sure the nut is tight. 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. If not, you will need to 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 tread fittings and wrap in the same direction as when tightening.
14. Leave a little slack in all tubing runs 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, make sure no shavings are left in the tubing that could damage the regulator or your engine.

Installing the HP (High Pressure) Tubing and Fittings

1. Read to instructions above before proceeding.
2. Install the CNG cylinder to the vehicle following the cylinder installation instructions.
3. If the cylinder is installed in the vehicle or in the truck, the blow off on the cylinder valve must be vented to the outside using at least an 8 mil thick bag or hose. Our valves will vent with a ¾ ID hose and a hose clamp connected to the cylinder valve and over the blow off nut with the three holes. Make sure the clamp is not installed over the vent holes so the air path is blocked. Drill a hole to the outside and rout the bag or hose to the outside under the vehicle and seal the hole around the hose or bag with silicone sealant.
4. Drill 1/2" holes where needed to rout the tubing from the cylinder area to the engine area.
5. Use 3" lengths of the 5/16" heater hose to slide over the tubing and half way into each hole to protect the tubing. Use a hose clamp or other means to keep the hose in place in the hole. A 5/16" heater hose installed over the tubing if desired can protect the entire length of tubing. Additional hose is available at your local auto supply store or from you CNG dealer.
6. Mount the filling nozzle either near the cylinder or under the hood, near the regulator, and where it is convenient to fuel the vehicle using the 6" bracket provided. It may be possible to mount the nozzle near the radiator where it can be accessed without raising the hood. It may be easier to fill from the trunk or near the cylinder than have to raise the hood to fill.
7. The nozzle end must be located so the filling station nozzle can easily be connected to it. The filling station nozzle is about 16" long so make sure there is room to connect it to your nozzle.
8. Go to your nearest CNG filling station and check out the nozzle and how it operates, and how the gas is purchased. Bring your nozzle and connect it to the filling station nozzle momentarily to see how it operates and fits. Try to closely watch at least one vehicle fuel while you are there. Do this step before you begin the installation of your conversion kit.

9. Install HP tubing from the cylinder valve to the side port of the filling nozzle. Do not locate the tubing near any moving parts, or hot exhaust or engine parts. When running the tubing under the vehicle, keep the tubing above any other car parts when possible to keep it up as high as possible where it is better protected from damage.
10. Strap the HP tubing in place every 18" to 24" using the ½" long screws provided and the thin flat metal straps provided. Just simply bend them to make a strap.
11. Install a length of HP tubing from end fitting of the filling nozzle to the regulator.
12. Install the pressure gauge include with your 250i controller to the shorter port of the gas in fitting of the regulator. Do not tighten the pressure gauge by turning the gauge. Tighten only by using a wrench on the square head fitting. Use gas pipe dope on the pressure gauge threads.
13. Tighten the nut on the top of the regulator in between the pressure gauge and HP fitting. It has o-rings so do not over tighten.

Electronics

Wiring Tips

1. Locate all sensor wires you can with the ignition on and without starting the engine.
2. Do not turn the ignition on until you are ready to locate each sensor wire or ignition wire, and only for a minute or two.
3. You can make the connections at the sensor connector, or if you have a wiring diagram and can locate the wires, and can locate the vehicles ECU you can make the connections near the ECU or at the main wiring harness.
4. Locate a good chassis ground and place the black test lead under a bolt and tighten while locating all wires. Set the meter to read resistance and place the red test lead to the battery negative and check for near zero resistance to verify a good ground.
5. Leave the sensor connector plugged in while locating the sensor wires.
6. Gently insert the red test lead from where the wire enters the connector, between the sensor wire and the rubber seal about 3/8" to reach the connector pin, and read the voltage.
7. Make sure you have the test meter set to the proper DC voltage range for the wire you are locating. You will be reading voltages from a few milli-volts to battery voltage. To read milli-volts, set the meter to the lowest DC voltage range. If you are using an auto-range meter make sure you note the voltage range when reading the voltage.
8. After locating the proper wire expose 6" inches of wire and cut the wire 3" from the connector. You will need to remove the plastic wire protector from the wires to expose the wire.
9. All black chassis ground wires will be connected together and connected to a good chassis ground. All blue regulator (reducer) solenoid wires must be connected together.
10. All wire connections should be soldered with heat shrink tubing installed over the connection. Cut the shrink tubing to a 1" length for each connection. Use a heat gun if you have one to shrink the tubing. If you do not have a heat gun use the soldering iron by carefully sliding the back of the soldering tip back and forth against the tubing on at least 2 sides to shrink the tubing. Be careful not to overheat the tubing.
11. If you do not have a pensile type soldering iron, flux and solder you will need to purchase them. Make sure all wires are fluxed before soldering. Make sure you slide the shrink tubing on the wire before soldering if needed.
12. Do not install the fuse in the inline fuse holder until all wiring is completed and your cylinder is filling with CNG.

Read the above wiring tips and use them for all the following steps.

Installing the DIEL Basic EFI Controller and Locating and Connecting the 12-volt Ignition Wire

1. Read the instructions that are included with your DIEL Controller.
2. Install the wire cable from the DIEL Controller through the firewall and into the engine compartment.
3. Remove the fuse from the inline fuse holder and leave it out until the installation is complete.
4. Decide where you are going to locate the controller and mount it.
5. Connect the red wire from the DIEL Controller to an ignition wire that has power when the key is in the on position, when starting the engine and when the engine is running. Check to make sure it does not have power when the engine is off. Check to make sure it always has power when in the on position, while starting and while the engine is running.

Locating and Connecting the Chassis Ground

1. Connect the back wire to a good chassis ground and to the regulator.

Connecting the Wires to the Regulator Solenoid Valve

1. Connect a black wire to the mounting bolt on the back of the regulator using the 3/8" hole connector. Use the extra length from the black wire from one of the controller if possible. Crimp and then solder the wire to the connector. Tighten the mounting nut on the regulator.
2. Connect the blue wire to the positive terminal of the solenoid valve using the spade connector. Crimp and then solder the wire to the spade connector. Slide the spade connector onto the solenoid valve spade terminal.
3. Tighten the nut that holds the solenoid, but do not over tighten it. If the nut ever gets loose the solenoid will not get power and the solenoid will not energize and the regulator will not operate.

RPM Wiring

1. Connect the brown wire to the engines RPM pulse wire. Locate the wire using your repair manuals wiring diagram.

Final Wiring

1. Plug the wire connector into the DIEL Controller.
2. Use the wire ties provided to organize and support all the wires.
3. Make sure all wires are away from any moving parts, hot exhaust or engine parts.

DIEL

CNG Basic Change-Over Switch Owner's Manual

Model CNGBCM

General Description

This Change-Over Switch has been designed especially for use in CNG equipment installed in vehicles with EFI (Electronic Fuel Injection).

The main characteristics are:

- Engine starts with gasoline fuel and automatically changes to CNG when the engine reaches the set RPM level.
- Emergency Starting in CNG mode.
- Setting RPM change to CNG.
- CNG level gauge with reserve

Electrical Characteristics

Voltage: 12 VDC.

Max switch current: 10 A

Protection fuse: 5A

Max consumption: 15W

Switch Key: 1,000,000 operations

Packaging

Control Unit

Pressure Manometer with Sensor

Wire Harness

Insulating Cases and Terminals

Mounting Screws

5 Amp Fuse

Owner's Manual

Operation

In CNG mode the vehicle will start with gasoline and the fuel will be change to CNG once the set RPM level set by the installer is reached. The gasoline fuel gauge (yellow led) remains on and the level gauge of CNG blinks until changed to the CNG mode.

The CNG mode will be maintained until the switch is pushed to change to gasoline or the ignition is turned off.

Fuel Change

Push the switch while the engine is running anytime you want to make a fuel change.
Caution: Changing fuel while the engine is at low RPMs may cause the engine to stall.

Emergency Operation

This Switch has an emergency start function on CNG in case of a malfunction of the gasoline injection system. The following steps must be done to start the engine on CNG:

1. With the ignition off, push and hold the switch.
2. Turn the ignition switch to the on position and release the switch as soon as the yellow LED begins to blink.
3. Start the engine and verify the engine is running in the CNG mode.

Note: This emergency state will be permanent until the gasoline mode is selected.

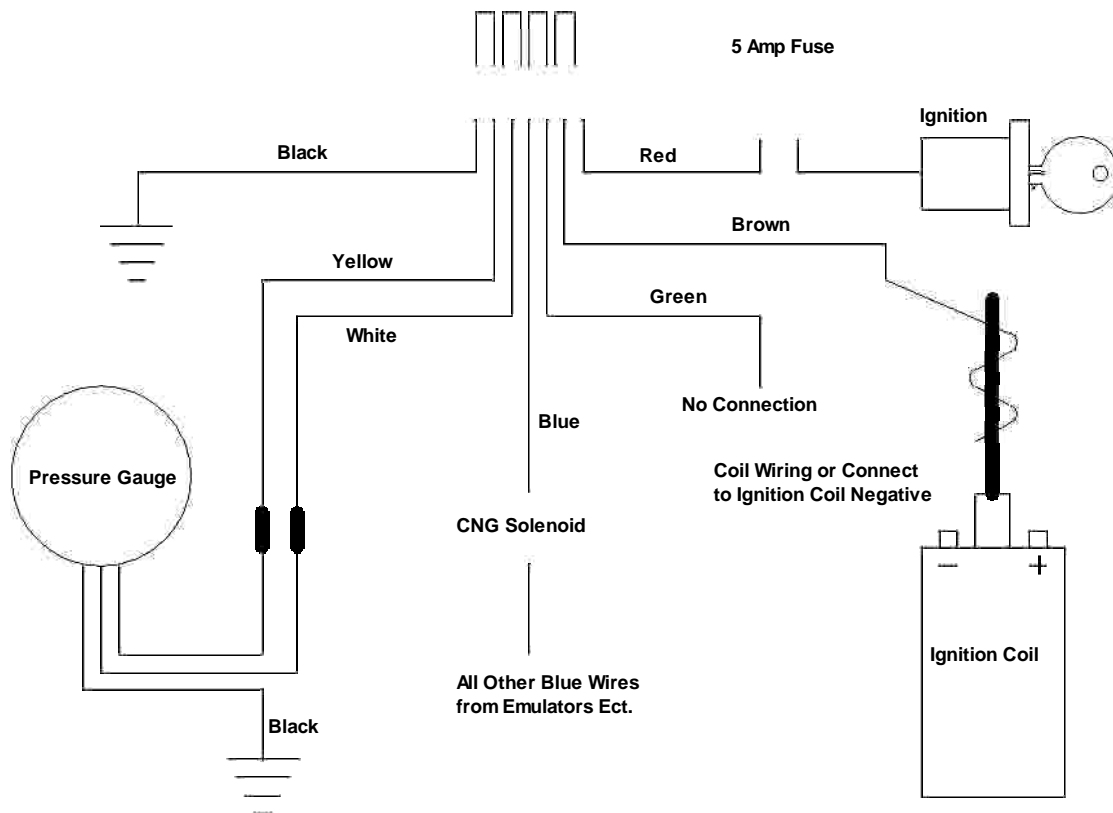
Programming the Fuel Change RPM Setting:

Due to the different kinds of ignitions, the RPM setting must be programmed for each vehicle.

1. With the ignition off, push and hold the switch.
2. Turn the ignition switch to the on position and do not release the switch until the red LED comes on.
3. Start the engine and maintain the engine at the desired RPMs. 2,000 RPMs is the recommend setting.
4. Push the switch while the engine is running at the desired RPMs and the red LED will turn off.
5. Turn the engine off.
6. Start the engine and verify the change over RPMs.

Wiring Diagram

Read and follow your CNG Kit Instructions before wiring.



How to Fill the CNG Cylinder

1. After completing all the steps above and completing your cylinder instructions, 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. Drive to your local CNG filling station.
4. Bring the wrenches needed to tighten any fittings if there is a leak.
5. 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.
6. 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.
7. Open the cylinder and filling nozzle valve.
8. Read and follow the filling station instructions.
9. Connect the filling station nozzle to your filling nozzle.
10. Before filling be ready to check for leaks as soon as the gas is turned on. 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.
11. If there are no leaks continue to fill the cylinder to 200 bar or 3,000 psi. If the filling station pressure is low you may not be able to reach the desired pressure. Do not overfill your cylinder.
12. Disconnect the filling nozzle.
13. Check for leaks again with the soap test
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 adjust and test your new system.

Programming and Adjusting

1. Check the cylinder pressure gauge again. If the pressure is still reading the same pressure, proceed to step 2.
2. If the pressure has dropped, check for leaks again.
2. Turn the cylinder valve on.
3. Install the fuse into the inline fuse.
4. Follow the programming instructions of the DIEEL Controller. Because you are installing this controller to a diesel engine, when the instructions say gasoline it will apply to diesel instead.
5. Start your engine.
6. With the vehicle in park, increase the engine speed to over 2,000 RPMs. The CNG light should now stay on and stop blinking.
7. If the CNG light does not come on at all, check the ignition voltage to the red wire and check the fuse. Make sure you have 12 volts. Make sure you have a good ground to the black wire and to the regulator. If you have 12 volts and the light keeps flashing then make sure the brown wire is connected to the RPM pulse wire and you have 12 volts to the solenoid on the regulator.
8. When everything is installed properly, your engine will run properly on natural gas and diesel. You will have an increase in horsepower when running on both fuels. It is extremely important that your engine always runs on at least 30% diesel fuel. Running the engine with less than 30% diesel fuel may damage your engine.
9. Take a test run in city traffic and on the highway. Closely monitor the engine temperature, exhaust and engine noise.
10. Some extra vibration at idle is not unusual. If the engine is running too rough at idle, you will need to reduce the low RPM CNG usage. To do this, turn the low RPM screw in. To increase the low RPM CNG usage, turn it out.
11. To reduce the high RPM and low RPM CNG usage place a large hose clamp on the CNG 3/4" gas hose and tighten slightly to reduce the CNG flow. Tighten or loosen as needed to adjust for the desired CNG usage for your engine. Do not install the hose clamp on or next to a fitting.
12. Fill your tank with Diesel fuel. Take a test drive and monitor the diesel usage. If the CNG usage is adjusted properly you will get at least a 100% increase in diesel fuel mileage. You should also see at least the same usage of CNG usage as diesel fuel. Always monitor the engine carefully while driving on both fuels.
13. Keep this manual and your controller manual in your vehicle. Installers make sure you leave all manuals with the vehicle.

Operation and Maintenance

1. Watch the indicator lights and fill the cylinder with CNG when needed.

2. 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.
3. Never run out of either gas, and never start your engine with the cylinder valve off.
4. Visually check your system for leaks or damage each time you fill the cylinder with CNG.
5. If you smell or hear a gas leak, do not start the engine and turn the cylinder valve off and have the leak repaired.
6. Clean or replace the air filter. Keep the air filter clean. A dirty air filter will restrict the air and increase the CNG flow which may cause excessive CNG to the engine.

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. Call a friend for help or take your car to a repair shop for help if needed.