

**LP-KIT
 DUAL FUEL**

UNIVERSAL INSTALLATION INSTRUCTIONS



1. Drain Gasoline Tank.
2. Run Engine Until it Stops.
3. Disconnect Battery Leads.
4. **IF POSSIBLE** - the gasoline tank should be removed. If it is not removed it should be filled with non-combustible material that will not freeze if left out-of-doors.
5. Drain Radiator.
6. **REMOVE THE FOLLOWING:**
 - a. Fuel lines
 - b. Gasoline carburetor
 - c. Fuel pump
 - d. Pipe plug from the intake manifold.
 - e. Choke cable assembly.
7. **INSTALL THE FOLLOWING:**
 - a. Fuel pump cover and gasket
 - b. Decal over Gasoline gauge
 - c. Plug gasoline tank inlet and outlet opening - if gasoline tank is not removed
 - d. Vaporizer solenoid assembly - as close to carburetor assembly as possible. carburetor outlet fitting should face down if possible.
 - e. Brass fittings provided for the thermostat housing and water pump - Face fittings towards vaporizer assembly.
 - f. Vacuum switch with fittings provided in the intake manifold.
 - g. Wire Vacuum switch to ignition switch side of coil.
 - h. Propane carburetor
 - i. Water lines from water fitting closest to propane solenoid to thermostat housing; from remaining fitting to water pump. - Clamp or nylon strap where necessary. If regulator is mounted so that one water fitting is higher than the other - the hose hook-up will be as follows: Thermostat housing to lower fitting and water pump to upper fitting.
 - j. Carburetor hose from vaporizer to carburetor.
 - k. Bulkhead fitting relief valve assembly - Relief valve should be away from driver, towards rear of truck.
 - l. Auxiliary fuel line from the propane solenoid to the bottom of bulkhead assembly. Clamp where necessary - NO closer than 4" from exhaust manifold and all electrical wires.
 - m. Main fuel line from the top of the bulkhead assembly to the fuel cylinder.
 - n. Cylinder brackets - **Cylinder must NOT extend past the counter weights.**
 - o. Attach battery cables and fill radiator.
 - p. With fuel cylinder valve turned on - energize the propane solenoid and check the system for leaks - using a soap solution. Most liquid detergents mixed with water will do.
8. Run and adjust per adjustment instructions.

IMPCO FUEL SYSTEM ADJUSTMENT INSTRUCTIONS

1. BE SURE THAT WATER HOSES, FUEL HOSES AND WIRES ARE PROPERLY FASTENED IN PLACE. THEY SHOULD BE CLEAR OF THE EXHAUST SYSTEM AND SHARP OBJECTS.
2. THE FUEL CYLINDER MUST BE LOCATED WITHIN THE OUTER LIMITS OF THE MACHINE.

CHECK FOR FUEL SYSTEM LEAKS

1. PRESSURIZE THE FUEL SYSTEM BY OPENING THE FUEL CYLINDER HAND VALVE SLOWLY AND CONTINUE AS FOLLOWS:
 - A. SYSTEMS WITH VACUUM OPERATED SHUTOFF VALVES SUCH AS THE IMPCO VFF30 MUST HAVE VACUUM APPLIED TO THE VALVE TO ALLOW FUEL TO PASS THROUGH TO THE CONVERTOR (VAPORIZER-REGULATOR). THIS CAN BE DONE BY OPERATING THE ENGINE CRANKING MOTOR.
 - B. SYSTEMS WITH ELECTRICALLY OPERATED SHUTOFF VALVES MUST HAVE CURRENT TO THE VALVE BEFORE IT OPENS AND ALLOWS FUEL TO PASS THROUGH. A VACUUM SWITCH OR OIL PRESSURE SWITCH MUST BE USED AS AN ADDITIONAL SAFETY AND WIRED IN SERIES WITH THE ELECTRIC SOLENOID. ACTUATING EITHER OF THESE CAN BE DONE WITH THE CRANKING MOTOR. IT MAY TAKE MORE CRANKING TO ACTUATE THE OIL PRESSURE SWITCH.
2. CHECK ALL OF THE FUEL CONNECTIONS FOR LEAKS WITH AN APPROVED LEAK CHECK SOLUTION WHILE THE SYSTEM IS UNDER LP GAS PRESSURE OF NOT LESS THAN 90 PSI. ALL LEAKS MUST BE REPAIRED.

BEFORE YOU MAKE ANY FUEL ADJUSTMENTS:

1. THE AIR CLEANER SHOULD BE INSTALLED.
2. IGNITION TIMING MUST BE CHECKED AND ADJUSTED PER THE ENGINE MANUFACTURER'S SPECIFICATIONS. PROPANE BURNS SLOWER THAN GASOLINE. RETARDED TIMING WILL REDUCE HORSEPOWER AND INCREASE EXHAUST EMISSIONS. MOST MANUFACTURERS RECOMMEND ADVANCING THE TIMING 3 TO 5 DEGREES. THIS WILL INCREASE LOWER END TORQUE HORSEPOWER; HOWEVER YOU MAY EXPERIENCE A LOSS OF POWER UNDER EXTREME HEAVY LOAD CONDITIONS. WHEN MACHINES ARE WORKED VERY HARD, BE CAREFUL NOT TO ADVANCE THE TIMING BEYOND THE MANUFACTURER'S RECOMMENDATION. THIS WOULD CAUSE UNNECESSARY STRESS ON THE ENGINE.
3. CONVERTING ENGINES TO BURN PROPANE MAY CAUSE THE GOVERNED ENGINE SPEED TO CHANGE. TO MAINTAIN THE TRUCK'S "NO LOAD" AND "LIGHT LOAD" DRIVABILITY, IT MAY BE NECESSARY TO RESET THE GOVERNOR TO FACTORY SPECIFICATIONS. THE ENGINE AND TRANSMISSION MUST BE AT ITS NORMAL OPERATING TEMPERATURE PRIOR TO MAKING ANY ADJUSTMENTS.

POWER ADJUSTMENT:

FULL POWER MIXTURES ARE CONTROLLED BY THE MIXTURE ADJUSTMENT AT THE FUEL INLET OF THE MIXER. THE FUEL MIXER CASTING IS MARKED WITH AN "R&L" INDICATING THE FULL, RICH AND LEAN POSITIONS OF THE VALVE. THIS ADJUSTMENT WILL CONTROL THE FULL LOAD FUEL MIXTURE AND MUST BE MADE WITH THE ENGINE UNDER FULL OR WORKING LOAD.

IDLE ADJUSTMENT:

TURNING THE SCREW "IN" WILL MAKE THE FUEL MIXTURE RICHER AND TURNING IT "OUT" WILL MAKE IT LEAN. THIS ADJUSTMENT MUST BE MADE AT THE MANUFACTURER'S RECOMMENDED IDLE RPM.

WE STRONGLY RECOMMEND THAT YOU USE A CARBON MONOXIDE FUEL ANALYZER TO ADJUST THE FUEL MIXTURE.

READINGS USING CARBON MONOXIDE ANALYZER

POWER MIXTURE - .5% +/- .25%
IDLE MIXTURE - .5% TO .75%

READINGS USING AIR FUEL RATIO ANALYZER

POWER SETTING - 15.5 - 16 TO 1
IDLE SETTING - 14.5 TO 1

NOTE: WHEN EXHAUST ANALYZERS ARE NOT AVAILABLE, A TACHOMETER MAY BE USED. MAKE FUEL ADJUSTMENTS TO OBTAIN MAXIMUM RPM READING, THEN LEAN FUEL MIXTURE TO LOWER READINGS 10 - 20 RPM.

IMPORTANT !

CARBON MONOXIDE - WHAT SERVICE PERSONNEL SHOULD KNOW!

OSHA REQUIREMENT

THE CO LEVEL SHALL NOT EXCEED 50 PPM MEASURED OVER AN 8 HOUR PERIOD IN THE WORK ENVIRONMENT.

HOW DOES PARTS PER MILLION (PPM) RELATE TO PERCENTAGE NUMBERS?

ONE MILLION PARTS PER MILLION EQUALS ONE HUNDRED PERCENT OF THE ENGINES EXHAUST GASES.

10% CO EQUALS 100,000 PPM

1% CO EQUALS 10,000 PPM

.1% CO EQUALS 1,000 PPM

.01% CO EQUALS 100 PPM

FOR EACH ONE ONE-HUNDREDTH OF ONE PERCENT YOU WILL HAVE 100 PPM.

EXAMPLE: .01 % X 1,000,000 PPM CO = 100 PPM CO.

WITH ADEQUATE VENTILATION AND FOLLOWING THE ENCLOSED ADJUSTMENT INSTRUCTIONS, YOU SHOULD BE ABLE TO KEEP THE CARBON-MONOXIDE LEVEL BELOW THE OSHA REQUIREMENT.

**WE STRONGLY RECOMMEND THE USE OF A
CARBON MONOXIDE ANALYZER**

RECOMMENDED SAFETY MAINTENANCE PROCEDURE FOR LP GAS FUELED FORKLIFT TRUCKS

WARNING: All fuels used in internal combustion engines are flammable and should be treated with caution. All cigarette smoking and open flames should be prohibited. Sparks should be avoided. The fuel cylinder should be mounted so that it does not extend outside the truck and should also be properly positioned by using the locating pin or key way.

The fuel valve should be turned off when the machine is not in service.

Cast fittings should not be used in the LP-GAS system.

Use only Underwriters Laboratories or Factory Mutual listed LP-GAS hose assemblies where pressure fuel lines are required.

All pipe threaded fittings should be installed using an approved sealing compound.

Fuel lines should be supported by clamps to minimize chafing and wear.

The LP-GAS solenoid valve should be wired to an automatic shut off switch (oil pressure or vacuum) to prevent leakage of gas in the event the ignition is on without the engine running.

Check the propane solenoid or vacuum shutoff valve for leakage as follows:

1. Turn fuel cylinder valve off, start and run engine until it stops.
2. Install a 0 to 30 PSI pressure gauge per instruction A or B.
 - A. For propane systems with a single unit consisting of primary and secondary regulators, install at the primary test port.
 - B. For propane systems consisting of two separate regulators, install between the primary and secondary stages.
3. Turn cylinder fuel valve on. The pressure gauge should maintain a zero reading.
If it does not, the solenoid valve or vacuum shutoff valve must be repaired or replaced.

An odor is added to LP-GAS to help detect leaks. If the gas odor is detected the fuel cylinder supply valve and engine should be turned off. Remove all sources of ignition, and ventilate the area. Make all of the necessary repairs before you turn the fuel supply on.

The complete LP-GAS system should be inspected periodically. Check all hoses for wear, connections for leaks and all parts for damage.

NOTE: Fuel hoses have a limited life expectancy. They should be checked for cracking and drying due to age. Hoses with visible signs of age should be replaced. Use only Underwriters Laboratories or Factory Mutual listed LP-GAS parts for replacements.

NOTE: The above information is provided as a guide. Consult the National Fire Protection Association pamphlet 58 for the safe storage and handling of liquefied petroleum gases. Governmental safety regulations in your locality could vary. Check with the authority having jurisdiction to be sure that you meet all of their requirements. Contact the manufacturer for detailed service information.

INSTALLATION INSTRUCTIONS FOR MODEL "E" AND "E-2" VAPORIZERS

- Select mounting location below water level of radiator (to avoid air lock) and within close proximity to the mixer to allow for the shortest length of vapor hose to the mixer. Do not mount on engine due to excessive vibration. Position can be anywhere from level to 90 degrees down with the vapor port in the downward position.
- Check bottom of vaporizer for port identification. (Water, fuel inlet, fuel vapor inlet)
- Install all fittings and lock off valve (if electric lock off) in appropriate ports, pointing them in the most convenient direction for final hookup. Use a thread sealer. NOTE: Do not over tighten fittings, especially the lock off valve, in order to avoid cracking the main housing. Cracked housings due to over tightening will not be covered by warranty.
- Select inlet & outlet sources for hot water from vehicle cooling system. (Direction of water flow is not important.) **Suggestions:** Heater hoses, threaded ports in thermostat housing, water pump, engine block, cylinder head or intake manifold. Optional "Y" tubes can be used in heater hoses to create a separate water circuit if desired. If water ports are difficult to access or locate, you may choose to purchase a hose tap kit from **NASH FUEL – Phone # 859-881-0509**. This will include 2 hose taps that can be used to tap into the upper and lower radiator hoses for a 5/8" hose connection that can then be routed to the vaporizer. **Part # HTC625ST** for a set of straight hose taps or **HTC62545deg** for a set of taps that come out of the heater hose at a 45 degree angle. Can be a great time saver.
- **ELECTRICAL:** Connect one wire of the electric lock off (if used) to frame ground, and the other to the positive terminal on the ignition coil or ignition terminal of the key switch. If a vacuum switch is used, connect this circuit to energize the lock off when vacuum is present.
- **LPG PRESSURE HOSE:** Select the most convenient routing to the fuel tank. Avoid hot exhaust system components, moving components such as drive shafts, and sharp surfaces such as sheet metal.
- **VAPOR HOSE:** Follow the shortest route to run this hose from the vaporizer to the mixer, clamping both ends securely.
- **OPTIONAL EQUIPMENT AVAILABLE:** Cold start assist kits – electrical or manual, Hot water thermostat kits to control the temperature of the vaporizer - to help eliminate tar buildup in the vaporizer, Power boost valve – vacuum operated. Available from **NASH FUEL 859-881-0509**

TECHNICAL INFORMATION: LPG CARBURETOR ADJUSTMENT

1) Idle Mixture Adjustment Screw

Turning the screw "IN" will make the fuel mixture leaner.

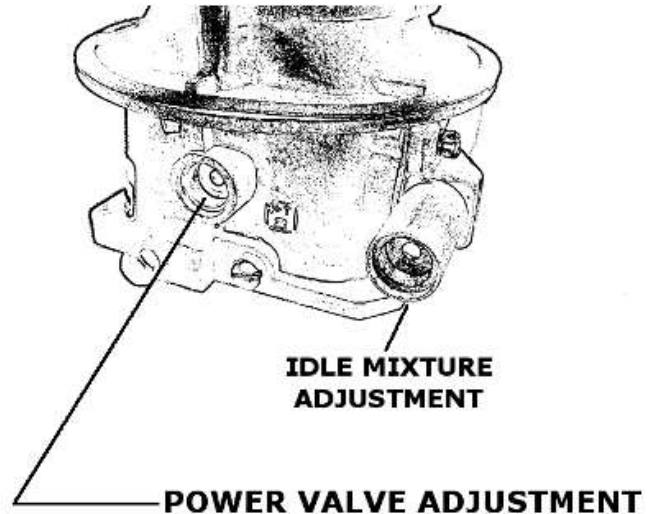
Turning the screw "OUT" will make the fuel mixture richer.

The Idle Mixture Adjustment Screw is adjusted correctly with an exhaust gas analyzer.

Mixture should be adjusted to .50% - .90% CO (Carbon Monoxide).

Without an exhaust gas analyzer:

Turn the idle mixture screw in until engine starts to run rough, or loses RPM or speed. Then, turn idle screw out approx. 1/2 turn "OUT" or until engine smoothens out. This will ensure you're not in a lean mode but are in a richer mode so the engine will not burn up valve.



2) Idle Speed Adjustment Screw

Idle Speed should always be set to manufacture's specifications.

Most engines today idle between 650-750 RPM.

3) Power Mixture Adjustment Valve

This setting is preset at the factory and should not require adjustment.

This adjustment is only effective when the engine is near full load condition.

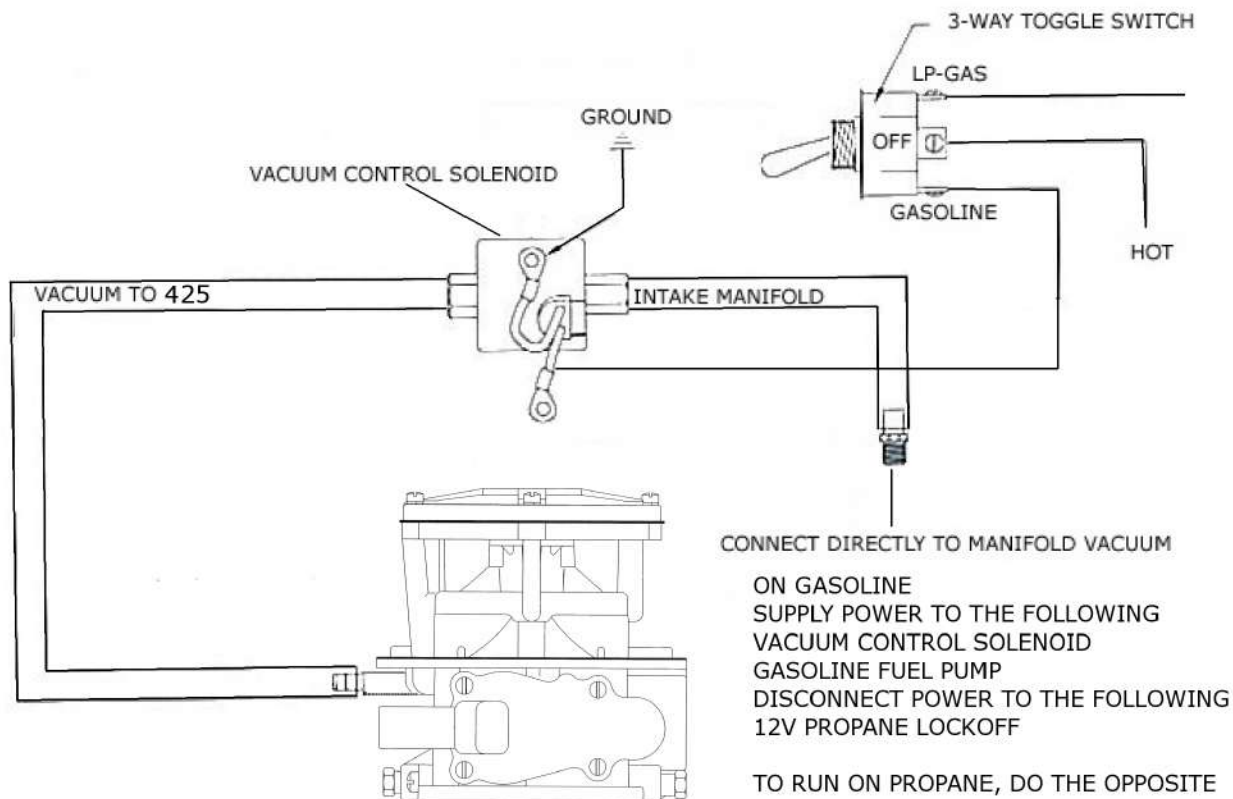
NOTE: Can only be adjusted with the engine loaded, or close to the fully loaded condition.

If adjustment is needed, follow these steps:

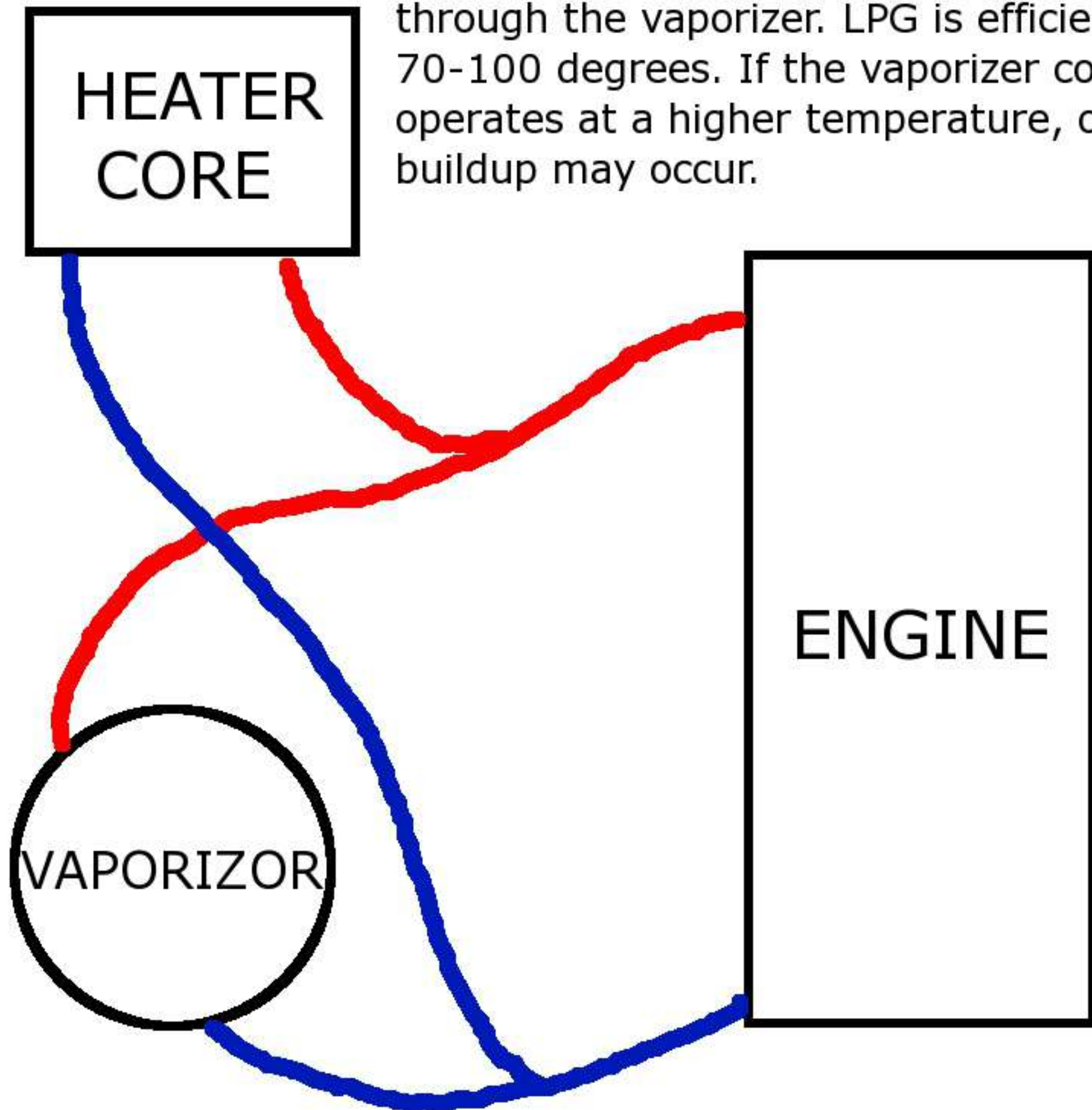
1. Set parking brake and block drive wheels.
2. Connect a Tachometer to the engine.
3. Accelerate engine to Full Rated RPM Level.
4. Pull backwards on Tilt Lever until pump reaches hydraulic relief bypass.
The RPM should drop according to the specifications for the hydraulic bypass (Typically 250-500 RPM).
If the RPM will not drop, check and adjust your hydraulic pressure to the manufacturer's specifications before continuing.
5. Turn the Power Adjustment Valve until the highest engine RPM is reached.

NOTE: Using an exhaust gas analyzer your percentage of CO should be (.50% - 1.0%).

3-WAY VACUUM CONTROL SOLENOID DUAL FUEL OPERATION

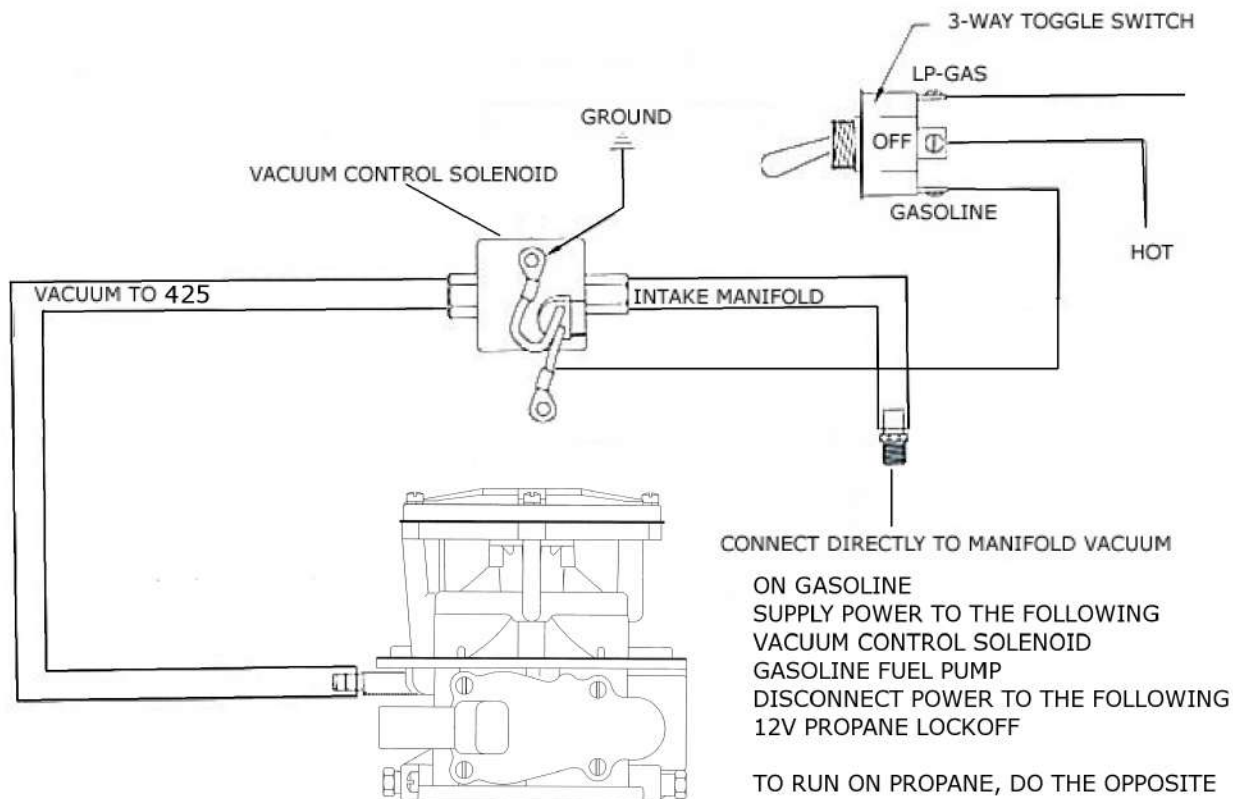


Engine coolant should not be force fed to through the vaporizer. LPG is efficient at 70-100 degrees. If the vaporizer continually operates at a higher temperature, oily buildup may occur.



COOLANT CONFIGURATION FOR VAPORIZER

3-WAY VACUUM CONTROL SOLENOID DUAL FUEL OPERATION



HOSE INSTALLATION



1. Place socket in vice as shown. Squirt end of hose with lubricant and screw counterclockwise into socket until hose bottoms. Back off 1/2 turn.



2. Lubricate the threads of the nipple for adequate lubrication.



3. Place nipple head in vice. Screw hose and socket clockwise onto nipple until large threads engage.



4. Position socket in vice as shown and complete assembly.