

## 5. HIGH PRESSURE PROCEDURES

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The high pressure portion of the system consists of the storage tanks, regulator, inline filter and rigid tubing (hardline). The Natural Gas can be shut off in two areas. There is a quarter turn valve located between the tank and regulator. Its location is marked by the "Manual Shutoff" label located on the driver's side of the vehicle. There is also a valve located on each tank. The valves must be in the OPEN position for the vehicle to run on Natural Gas.

## 5.1 FUELING THE VEHICLE

**WARNING:** *To avoid the ignition of fuel vapors that are vented to the atmosphere, the engine must be shut off. Extinguish all smoking material.*

1. Turn the engine off.
2. Make sure the tank valves are in the OPEN position.
3. Turn the selector knob on the fill nozzle to "VENT" position.
4. Connect the quick coupling, on the fill nozzle, securely to the system fill valve.
5. Turn the selector knob on the fill nozzle to the "ON" position.
6. Switch on the service pump. A slight hissing noise will be heard as the cylinder(s) begin to fill.
7. Watch the pressure gauge on the service pump. When the gauge reads approximately 3000 psi or when the fill pressure begins to move very slowly, the CNG tanks are full. **NEVER ATTEMPT TO OVER-PRESSURIZE THE CNG SYSTEM.**

**NOTE:** *After filling, the operator may notice a variance in pressure as the vehicle stabilizes. CNG tank pressure will vary with ambient air temperature. At 70° F, tank pressure is approximately 3000 psi. For every 10° difference add or subtract 100 psi. For example: if the air temperature is 80° F, then the tank pressure would be 3000 + 100 or 3100 psi. If the air temperature is 60° F, then the tank pressure would be 3000 - 100 or 2900 psi.*

8. Shut off service pump.
9. Place the selector on the fill nozzle to the "VENT" position. A short hiss of pressure is heard as a small amount of natural gas is vented into vent hose
10. Disconnect the quick coupling on the fill nozzle.

## 5.2 BLEEDING THE SYSTEM

Prior to any disassembly of the GFI system, the system must be depressurized. Attempting to work on the system with pressure could be dangerous to the technician and vehicle.

1. Turn manual shutoff valves on tanks to OFF position. If work is required on the high pressure side of the system, DO NOT shut off quarter-turn valve.
2. Start and run vehicle, in CNG mode, at high idle (approximately 1500 rpm) until engine autoswitches to gasoline.
3. SLOWLY crack open fitting that is to be disconnected for servicing. A slight escape of natural gas may be heard. Allow system to empty, then proceed with disconnection of fitting and service required.

**NOTE:** *This method is not used to vent or offload stored fuel in tanks. Refer to "Venting".*

### 5.3 LEAK TESTING

The leak test procedure is an essential part of safety and system operation checks. This test is mandatory before the vehicle can be released or advanced to the next stage of conversion.

1. Open all valves in CNG system. Open tank valves and quarter-turn valve.
2. Fill fuel cylinders to 1500 psi.
3. Apply a quality leak reactant over high pressure fittings and lines. Leaks from the system will exhibit soapy bubbles. A mild soap and water solution may be used as an alternate.
4. Repair any leaks discovered.

**WARNING:** *Never attempt to tighten or adjust fittings while system is under pressure. Close all tank valves and "bleed" system to minimize system pressurization. To relieve pressure, shut all tank valves then run vehicle until it stalls or autoswitches to gasoline.*

5. Open all valves in CNG system. Open tank valves and quarter-turn valve.
6. Fill fuel cylinders to 3000 psi.
7. Repeat leak check of high pressure lines. Include low pressure hoses from regulator forward.
8. Repair any leaks discovered.

### 5.4 VENTING

Venting is the term for discharging or offloading Compressed Natural Gas from a fuel storage tank. This operation can be safely carried out provided the following warnings are followed:

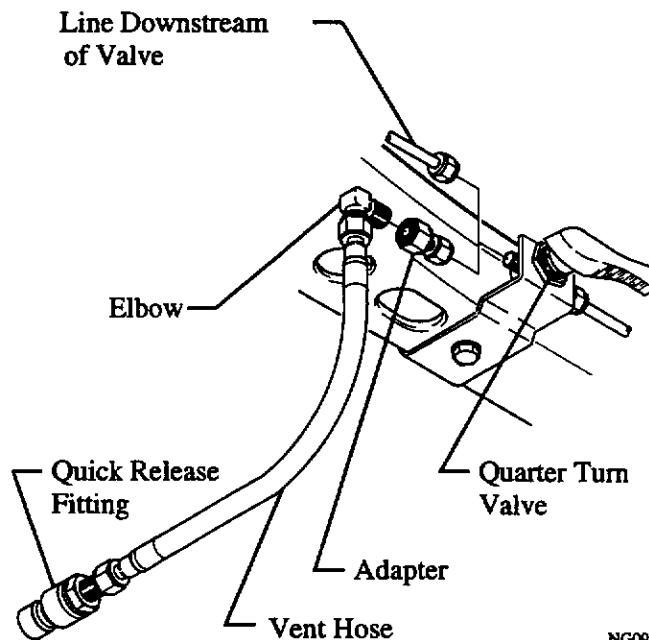
**WARNING:**

- *Always vent tanks in a well ventilated area that is approved and equipped for the procedures. Follow local regulations concerning off-loading natural gas. Consult your local Fire and Environmental authorities for specific regulations.*
- *Extinguish all smoking material.*
- *Never vent near open flame, heat sources or sparks.*
- *Never discharge gas by just opening the tank valves. High pressure can cause serious injury.*
- *Always ground the vehicle and natural gas system. High pressure escaping can cause static electricity buildup and subsequent sparking.*

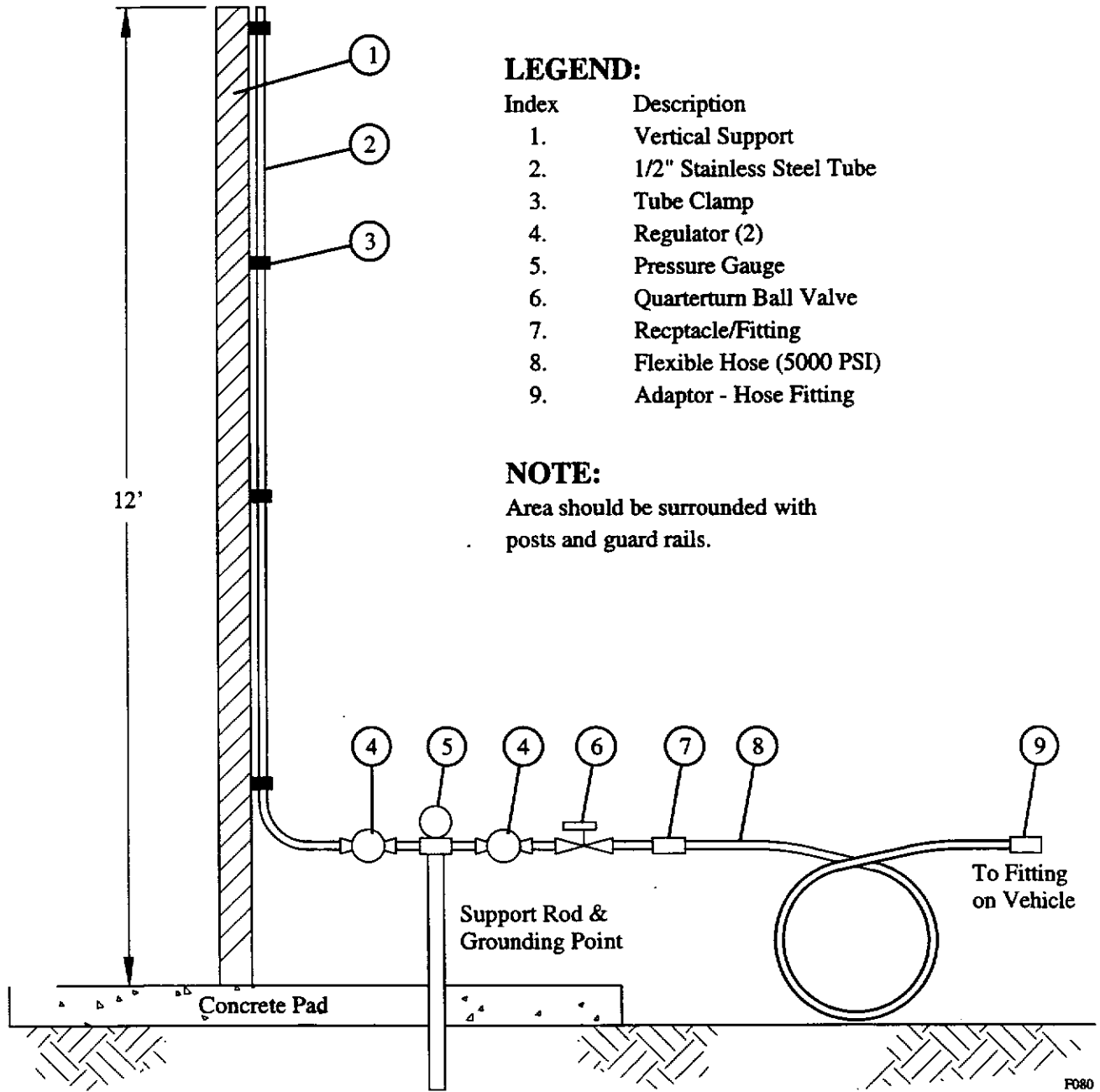
#### 5.4.1 PROCEDURE

1. Park vehicle in venting area.
2. Bleed system (refer to section 5.2). Leave quarter turn valve in OPEN position.
3. Disconnect battery. When disconnecting battery, disconnect BOTH terminals. Disconnect the negative (-) side first.
4. Ground the vehicle and system.
  - *Firmly secure a grounding strap on a hardline fitting, (for example, use the elbow where the lines meet) or on the tank valve.*
  - *DO NOT attach to tank or non metallic surface.*
  - *Attach other end to a secure grounding point such as the metal support tube or metal guard posts around the venting station.*

5. Slowly disconnect rigid tube from downstream side quarter turn valve.
6. Two adapters are furnished with the GFI venting kit, 3/8 to 3/8 and 3/8 to 1/4. Attach the correct adapter to the quarter turn valve.
7. Attach elbow of vent hose assembly to adapter.
8. Close quarter turn valve.
9. Attach quick release fitting on hose from venting station, to fitting on vent hose installed in step 7.
10. Open tank valve.
11. Open quarter turn valve.
12. Open valve at venting station.
13. When tank is empty, shut off valves and remove flexible hose.
14. Remove vent hose and adapter.
15. Reinstall line removed in step 5.



**NOTE:** Vent hose assembly and adapter are part of the GFI Venting Kit. To order, refer to the Illustrated Parts Catalog (section 6).



**5.4.2 VENTING AREAS**

The illustration above shows a **GENERIC** venting station. The main features are: a flexible hose (8) that attaches to the venting kit with fitting (9). Natural gas flows through a ball valve (6) and two regulators (4) and then is released through vent tube (2). The vent tube extends above head level. Consult your local Fire and Environmental authorities for specific construction guidelines and regulations.

The support posts and/or the guard rail posts should be metal and buried into the ground surface to provide a solid ground contact point for grounding the vehicle during venting operations.

## **5.5 NATURAL GAS FUEL QUALITY**

The principle component of Natural Gas (NG) is methane (CH<sub>4</sub>). This is beneficial for emissions because of the large reduction of Non-Methane HydroCarbons (NMHC). Natural Gas has a higher octane rating than gasoline.

### **5.5.1 FUEL CONTAMINATION**

Natural gas for vehicles is taken from a gas utility's distribution. A compressor station is used to dispense the fuel when filling a vehicle. Many times, these compressors discharge oil that mixes with the natural gas. Minute portions of this oil are acceptable and can be beneficial to lubricate the internal injector components. But, excess contamination is harmful and can deteriorate performance and cause excessive wear and eventually component failure.

The solution for this problem is proper filtration systems at the fueling stations. Some gas utility companies have been slow to respond or acknowledge the problem.

The vehicle servicing technician should be mindful of the amount of oil found in the system during routine maintenance (e.g. cleaning and changing the filters). If a large quantity of oil is present in the system, the technician should recommend to the customer the following items:

- Change filling stations - The contamination will not necessarily be the same from location to location.
- Accelerated Maintenance Schedule - By cleaning and changing the filters on a more frequent basis, the system can be kept cleaner and build up can be avoided.

When contamination creates a non-acceptable condition of poor performance or component failure, the technician must determine the extent of the contamination.

- Filters must be cleaned and/or changed.
- If the comp valve is affected, contact GFI for recommended cleaning procedures that are available.

### **5.5.2 LNG AND "DRY FUELS"**

The GFI system is designed to operate on Compressed Natural Gas as delivered from a regulated fueling source. **DO NOT** use LNG (Liquid Natural Gas) or CNG that is derived from processes such as flashing (heating) LNG. These alternate forms of natural gas can cause damage to various seals as well as excessive wear on the internal components of the comp valve and regulator.