LPEFI® Installation Manual

For

2010 GMC G van Trucks with 6.0 Liter Engine

Models: 4500

Mono-Rail System

274560 REV. A

January 18, 2010

Bi-Phase Technologies, LLC

Eagan, Minnesota, U.S.A.

REVISION HISTORY

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Introduction

This instruction booklet shows how to convert a gasoline vehicle to run on clean burning propane utilizing our *LPEFI® (Liquid Propane Electronic Fuel Injection)* system.

The system is vehicle specific and installing a system on any vehicle that the kit was not designed for will void the warranty and may also violate emission laws.

Anyone who installs or repairs the *LPEFI®* system must be trained and certified. This must also include training in the safe handling and characteristics of propane. Bi-Phase Technologies provides such training upon request. Some states may require a license to work on propane vehicles. Consult your state or local authorities or your state propane gas association. Bi-Phase Technologies, LLC is not responsible for your oversight to comply with federal, state or local laws regulating the installation or repair of propane gas systems.

The *LPEFI®* system is a sequential multi-port fuel injection system that injects propane in a liquid state to the engine. It works much the same way as a modern sequential multi-port gasoline fuel injection system and can be diagnosed with the same diagnostic scanners used for gasoline vehicles.

The *LPEFI®* system is covered by U.S. and International patents. The *LPEFI®* system is also certified to the United States E.P.A. standards.

The information in this manual is believed to be accurate as of its date of publication, but it is subject to change. Up-to-date information and changes, if any, can be requested from Bi-Phase Technologies.

In the event of any safety-related changes Bi-Phase Technologies will notify all customers who returned the warranty registration card for the affected vehicles.

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Notes

Propane Safety

 This is a safety alert symbol. It is used through out this manual to alert you to potential hazards. Whenever you see this symbol, you should read and obey the safety warnings that follow. Failure to obey these warnings could result in serious personal injury or property damage.

Please read the <u>Specific Warnings</u> below before proceeding with the installation or repair of any propane system

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 **WARNING: Always unplug the LPEFI Liquid Propane Control Module (LPCM) or disconnect the battery before you work on any part of the LPEFI system.**

The LPEFI tank contains an electronic control box. Any time the driver door is opened, the LPEFI system could go into a purge mode, pumping liquid propane through the hoses and injectors. To prevent a sudden release of cold liquid propane, disconnect the power from the LPCM before you loosen any hose fittings. Failure to do this could cause personal injury and fire hazard.

 **WARNING: Never loosen fittings or vent any propane. Escaping liquid propane can cause frostbite and severe freeze burns. If liquid propane touches your skin, it causes a burn similar to frostbite. Wear insulated PVC rubber gloves resistant to propane. Wear goggles for protection against accidental release of pressurized products and thermal protective clothing when handling refrigerated liquids.**

Propane is stored as a liquid. When you release liquid propane, it tries to evaporate as quickly as it can, by absorbing heat from its surroundings. Everything it touches gets chilled to –44 degrees F (-42 deg. C). If liquid propane sprays on your fingers, it will freeze them-right down to the bone. Anyone who works with liquid propane must wear insulated PVC rubber gloves.

 **DANGER: Do not remove any valves, bulkheads or fittings from a propane tank unless the tank has been properly drained (evacuated) completely. The pressure inside a propane tank can push a loosened bulkhead or valve out with enough force to cause injury. Release of propane in an uncontrolled situation will create a flammable/explosive mixture of air and propane, which could cause serious injury, death and property damage.**

Propane is stored under pressure. When you remove a valve or bulkhead from the tank, all of the pressure is released at once, in a violent rush. Always drain the tank before you work on it. Failure to do this will result in damage to the tank or valves and can result in severe injury or death. You should drain the tank using a flare stack in an approved safe manner. Your propane supplier can help you with this.

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DANGER: Do not vent or release propane indoors or near sewers, pits or low lying areas. Propane can accumulate in low spots, creating a fire hazard. Propane can also displace oxygen, creating a suffocation hazard.

Propane is heavier than air. It can fill low, sheltered areas with flammable vapors. If these vapors are ignited, they can create a fire or explosion, causing severe property damage, injury or death. Never release propane near sewers, pits or indoors.

WARNING: Keep all sources of ignition away from propane vehicles while the fuel system is being serviced. Even if the tank and fuel lines are empty, there may still be flammable vapors near the vehicle.

Do not allow smoking, sparks, flames, running vehicles or other sources of ignition near the vented propane. Failure to do this could result in fire or explosion, causing severe property damage, injury or death.

WARNING: Do not disconnect any propane hoses unless they have been properly drained completely.

Propane in the hoses is kept under pressure, even when the engine is off. When you disconnect a hose, the internal pressure is released all at once. Always drain the fuel lines before you disconnect them. Failure to do this can result in damage to the hose fitting and possible injury.

WARNING: NO SMOKING OR OPEN FLAMES IN OR AROUND PROPANE VEHICLES DURING FUELING OR SERVICING.

Facts about Propane & Propane Powered Vehicles

Propane gas is the most widely used alternative fuel, with nearly 4 million vehicles worldwide running on propane. More than 350,000 vehicles run on propane in the U.S., according to the U.S. Department of Energy's Alternative Fuels Data Center.

Propane powered vehicles offer the best combination of durability, performance and driving range.

The first propane powered vehicle ran in 1913.

Bi-Phase Technologies' *LPEFI®* (Liquid Propane Electronic Fuel Injection) system has surpassed other technologies today by introducing liquid fuel injection. This technology improves power, efficiency and operating characteristics. For more information call for our General Information and Training Manual.

Safety comes first is a motto you should always live by. Without knowledge of a product it is hard to follow this motto. In our manuals we try to stress the need for knowledge and provide warning signs to alert you.

It is your responsibility to know the law. NFPA, National Fire Protection Association, has manuals to help you understand safe handling of many products. We recommend that you obtain and read their NFPA #58, Standard for the Storage and Handling of Liquefied Petroleum Gases.
To further enhance the industry's safety and service, a number of training programs and efforts have been implemented throughout the country. The National Propane Gas Association has developed a Certified Employee Training Program (CETP), which provides service personnel with a complete technical training curriculum. We encourage you to contact your state propane gas association or the National Propane Gas Association for more information on how you can benefit from such programs. Visit www.propanesafety.com for more information.

Bi-Phase Technologies, LLC

Approximate Properties of LP Gases

(Commercial Propane)

Specific gravity of liquid (water = 1) at 60 degrees F.	0.504
Initial boiling point at 14.7 psia, degrees F.	- 44.0
Weight in lbs per gallon of liquid at 60 degrees F	4.24
Specific heat of liquid, BTU/lb. at 60 degrees F.	0.630
Cubic ft. of vapor per gallon at 60 degrees F.	36.38
Cubic ft. of vapor per pound at 60 degrees F.	8.66
Specific gravity of vapor (air = 1) at 60 degrees F.	1.50
Ignition temperature in air, degrees F.	920 to 1120
Maximum flame temperature in air, degrees F.	3,595
Limits of flammability in air	
Percent of vapor in air/gas mixture	
a) Lower	2.15
b) Upper	9.60
Heating values	
a) BTU per cubic foot	2,488
b) BTU per pound	21,548
c) BTU per gallon	91,500
Chemical formula	C_3H_8
Vapor pressure in psig	
a) 70 degrees F	127
b) 100 degrees F	196
c) 105 degrees F	210

Pre-Installation Inspection

(Recommended)

If the vehicle is new and has less than 1,500 miles we recommend the following:

- Visually inspect the vehicle
  Is the malfunction indicator lamp illuminated?
  Does the engine start and run smooth?
  Are there any fluid leaks?

- Install a diagnostic scan tool and verify there are no DTCs (Diagnostic Trouble Codes) stored in the computer memory

If the vehicle is used and has more than 10,000 miles we recommend in addition to the above:

- Remove and examine the spark plugs and conduct a compression test
- During diagnostic scan mode document the following from the scan tool data stream:
  Short term fuel trim, bank 1 & 2
  Long term fuel trim, bank 1 & 2
  IAC (idle air control %)
  Oxygen sensor activity

Note: *Proceed with the LPEFI® system installation if all conditions are acceptable. If any problems are discovered it is not recommended to install the LPEFI® system until the problems are repaired. After the installation is complete refer to the Post-Installation Inspection found in this manual.*

LPEFI® System Installation

Note: *The kit contains all the components needed for conversion, decals, owner information card and a warranty registration card. The warranty registration card, along with the Post-Installation Inspection form, must be filled in and returned to Bi-Phase Technologies for warranty to be valid. Label placement is described later in this installation manual.*

Removing the gasoline system

WARNING: Disconnect the battery before you work on any part of the LPEFI® system.

Remove gasoline fuel rails, fuel line, tank & evaporative emission system (if the vehicle is equipped with the EVAP components):

CAUTION: Gasoline under pressure. Gasoline is flammable & toxic. Use extreme caution and eliminate all sources of ignition while handling. Wear gloves & goggles.

Note*: When disconnecting or connecting injector connectors be careful and pull locking tab up to disconnect and push in on connector (squeeze) to disconnect. After reconnecting push locking tab down to lock connector. Be careful not to break this plastic tab and locking piece*.

1. Remove the seats, the bottom of the dash and dog house
2. Remove the air box and antifreeze reservoir

3. Remove and discard the bracket on the rear of the driver side head
4. Unplug injector wiring harness from each injector for use on the *LPEFI®* injectors
5. Place drain pan under driver side of bell housing to catch any gasoline spilled while disconnecting the fuel lines

Note*: Gasoline residue will drain out of the lines and rails when you disconnect.*

6. Using a 3/8” QD tool, disconnect the supply fuel line from the steel line attached to the driver side frame rail

7. Remove four (6 mm) mounting studs and nuts holding the gasoline fuel rails to the intake manifold

8. Remove the EVAP purge valve from the fuel rail

9. Remove the line from EVAP purge valve and install a vacuum cap

10. Remove the gasoline fuel rails from the engine

11. Remove the fuel tank pressure sensor from the tank and leave it plugged into the OEM harness. The other connector will plug into the *LPEFI®* harness

12. Drain all gasoline from the fuel tank, lines and discard them in the proper environmental manner

Tank Installation

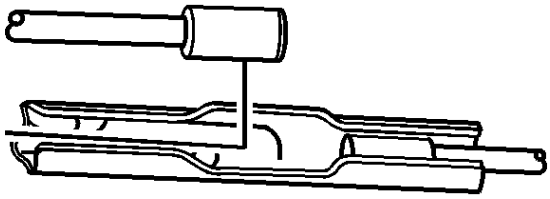
Primary tank is installed on the driver side

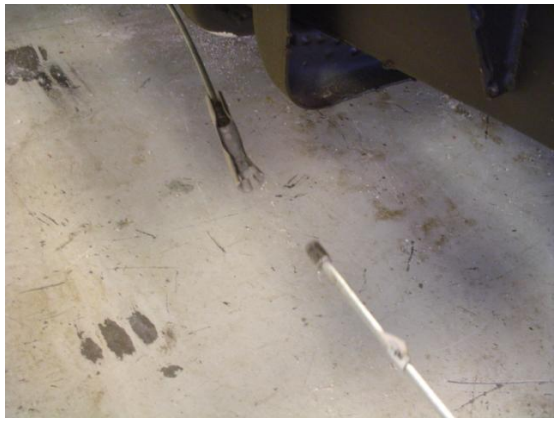
1. Remove the emergency brake cable bracket

***Note**: discard in a proper manner*

2. Disconnect the front brake cable from the intermediate cable
    1. Set the parking brake

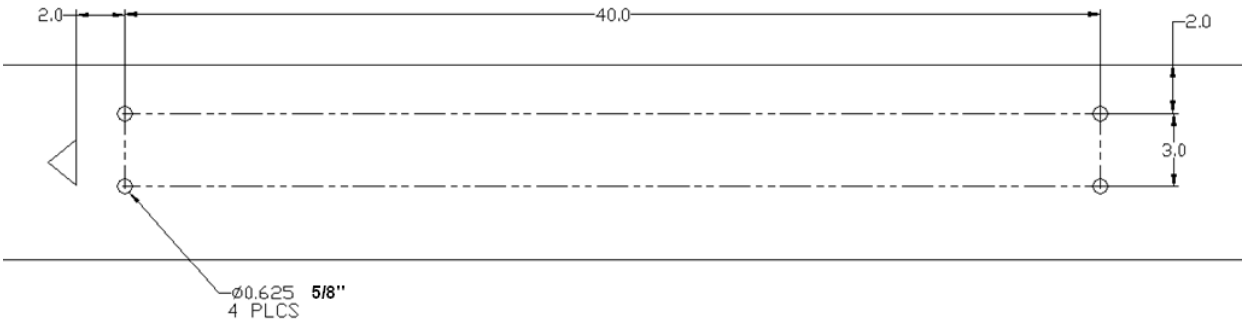
2. Secure brake cable a the rear of the cable (vise grip)
3. Release the parking brake. Pull the brake cable and have another person secure the front of the cable (vise grip)





3. Use a 5/8" drill bit to drill mounting holes; use the 5/8" bolts, Belleville washers & nuts provided in the kit to mount tank

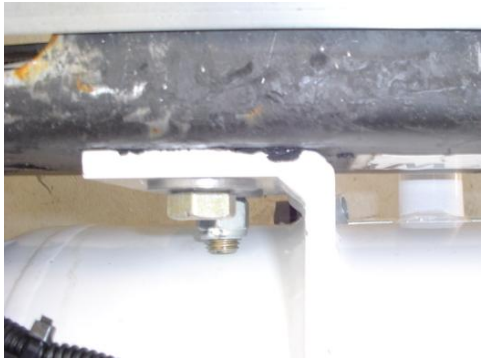
4. Left set of holes are drilled 2" from the triangle, 2" down from the top of the frame and 3" apart. Second set of holes 40" apart. Reference diagram below



5. Before raising the tank install the two tank brackets to be fastened to the frame rail cross members
Note: Use the hardware supplied with the brackets

***IMPORTANT:* Install all hardware before tightening any tank mounting bolts**

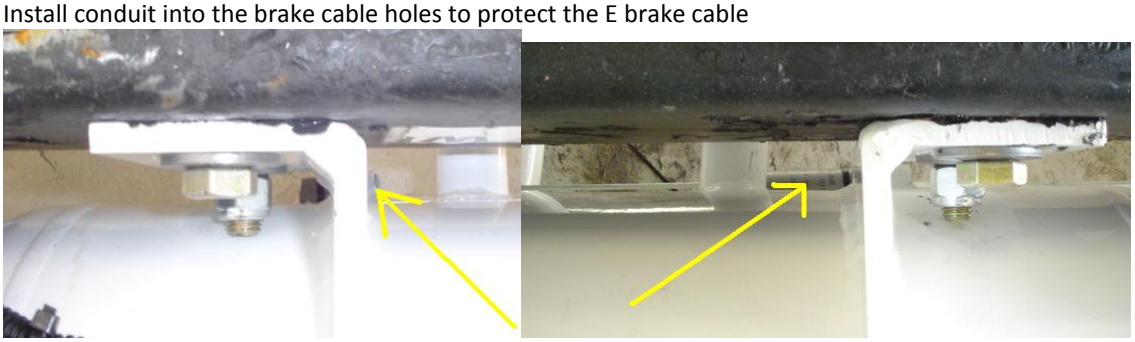
6. Raise the tank into place and install the bolts, two bolts per support; tighten these four mounting bolts until the Belleville washers are flat or torque to 148 – 154 ft-lb



7. Install the four bolts to the cross member brackets

8. Torque the two bolts into the cross members to 70 – 78 ft-lb

9. Install conduit into the brake cable holes to protect the E brake cable



10. Slide the intermediate brake cable through the conduit and reconnect to front cable

11. Slide the intermediate brake cable through the conduit and reconnect to front cable

Primary tank fuel gauge

1. Install fuel level sending unit on the primary tank

***Note**: Use the 240 - 40 ohm resistance fuel level gauge sending unit supplied in the kit.*

2. When installing a fuel level gauge sending unit always reset the sender to zero using a small magnet; after installed on the tank the sending unit's needle should register zero or empty unless there is fuel in the tank

Fill hose installation

1. Install the fill fitting to the right side tank bracket

2. Install the 45 degree from the 10.5” hose to the fill fitting. (Torque to 44-48 ft-lb.) the other end to the inlet of the fill filter

3. Install the 90 degree fitting from 12.25” hose to the outlet of the fill filter

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WARNING: ***Stop fill valve elbows are never tightened at the tank manufacturer. The valve is tight but the elbow must be tightened and clocked to the proper position. Do not allow the valve itself to move while tightening the elbow.***

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4. Install “T” fitting into the stop fill valve of the outside fuel tank

5. Install the 23” hose between both stop fill valves. Routing the hose over the top of the frame rail

6. Verify the hoses are routed in a way that there is no interference with chassis components that could cause chaffing

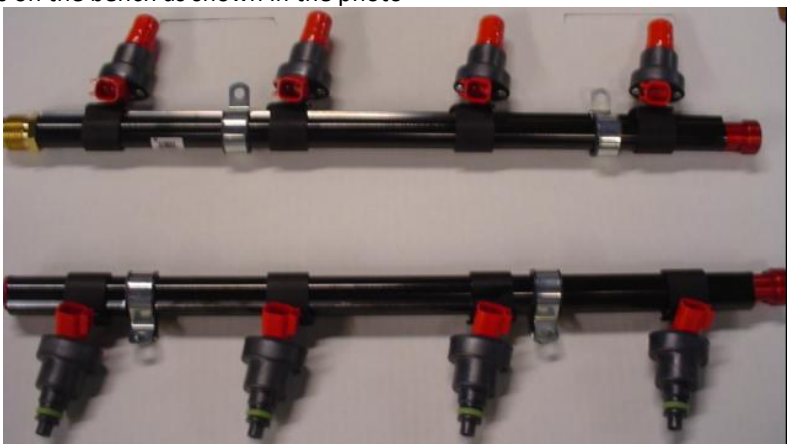
New Spark Plugs

1. Replace the OEM spark plugs with NGK-IFR7F-8DS (stock #5794) 14mm x 5/8" Hex Iridium Platinum resister plugs. Plug gap: .8mm or 0.31 in

LPEFI® fuel rail installation

1. Remove the new fuel rails from the conversion kit.

2. Place both rails on the bench as shown in the photo



3. The top fuel rail in the photo is the passenger side rail

4. The bushings and hold down clamps are not mounted on the rails and will need to be installed prior to installation on the engine

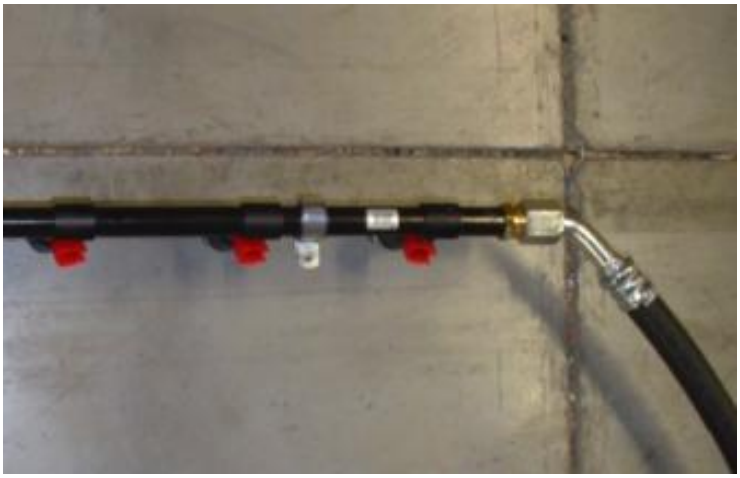
5. Lubricate the lower o-rings (green) on each injector and place each rail on the engine with the QD hose inlet connectors facing toward the rear of the engine

Note: *The injector electrical connectors should be facing outward to allow clearance between injector & intake plenum. The electrical connector could interfere with the installation of the rail or the installation of the rail could damage the injector if not pre-positioned outward.*

6. Before installing fuel rails, install the 4 studs in the manifold. Apply <u>one</u> drop of *red* "Loctite" to the threads that go into the manifold. torque of 12 NM (106 in-lb)

7. Install the short primary hose to the passenger side rail as shown in the next two photos

Note: verify the hose is routed in a way that there is no interference with chassis components that could cause chaffing



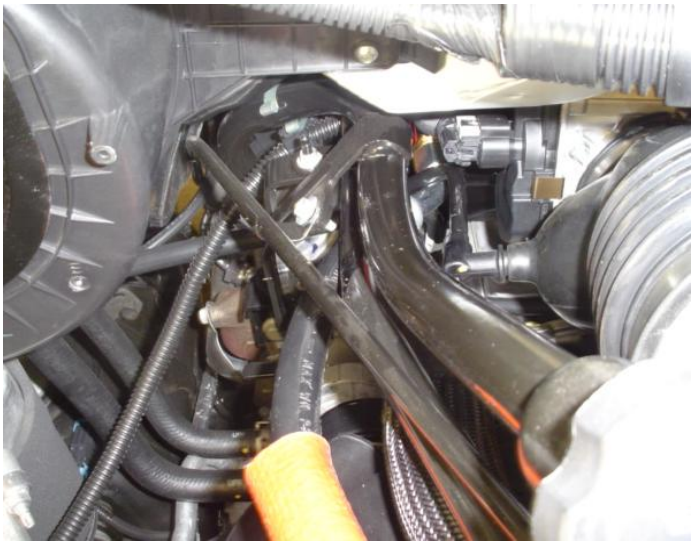
8. Install the 3” vinyl trim to the oil fill bracket as shown in the photo

9. Lubricate inner line with clean motor oil

10. Carefully guide the inner line into the center of the passenger side rail and feel for the line to engage the internal o-ring (see picture on left); 2” of inner line must be inserted into the rail to make a proper connection

11. Pull the outer hose onto the fitting on the end of the rail, tighten the flare nut (torque to 33-38 ft-lb); use a “backup wrench” on the rail to keep the brass fitting from turning as you tighten the flare nut; do not over tighten the flare nut; (brass fitting on the rail is tightened to 5-6 ft-lb)

12. Route the hose attached to the fuel rail from the inside of the cab



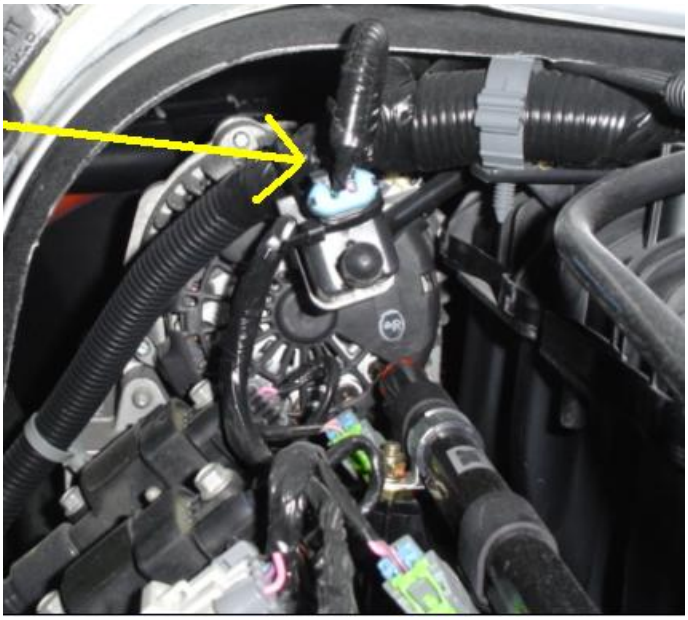
13. Route the hose to the right of the radiator hose

14. The hose goes over the top of the radiator to be attached to the long primary hose

Note: *Always be aware of routing of the harness. Do not route over the top of the fuel rail.*

15. Using the bolts supplied in the kit. Secure the *LPEFI®* injector rails to the intake manifold studs; tighten to a torque of 12 NM (106 in-lb)
16. Install original gasoline injector wiring harness and connect each injector connector to the proper cylinder

17. Attach the EVAP purge valve to the harness above it and left of the driver side fuel rail



Install the loop hose to the injector rails

NOTICE: *Take extreme care to center the nylon line into the rail end fitting and slowly push the line all the way in (turn the hose from side to side or twist it as you are pushing it in) or kinking of the nylon line may occur. Once the white inner line is completely in, push the entire fitting into the rail until it clicks and locks*

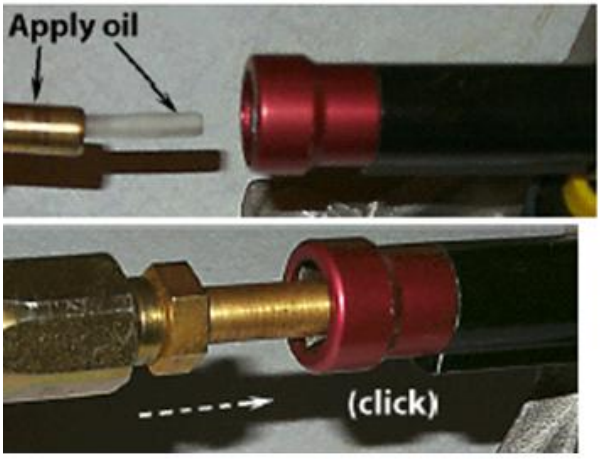
1. The hose will be inserted so the loop of the hose is facing upwards

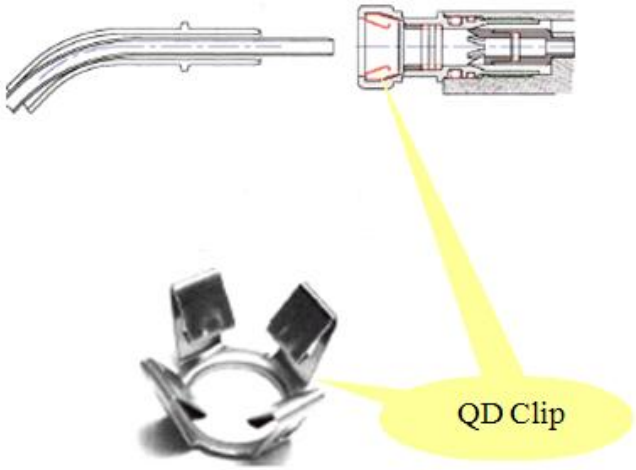
2. Lubricate the white nylon inner line of the two hose ends and insert into the injector rail

3. Verify the hose is routed in a way that there is no interference with chassis components that could cause chaffing

WARNING: ***Improperly attached fuel lines could cause the release of propane causing personal injury.***

4. Using a bright light look at the QD fittings and verify the four locking tabs are secured on the hose fittings
5. Gently pull on the on the hose ends to verify the fitting will not disconnect





IMPORTANT: **After hearing the click of the line quick connecting, visually look and verify the 4 sides of the QD clip are over the locking ring.**

6. Install WARNING label on the loop hose

Primary Hose Installation

1. Position the primary hose to be connected to the LPDM by routing the hose over the tank

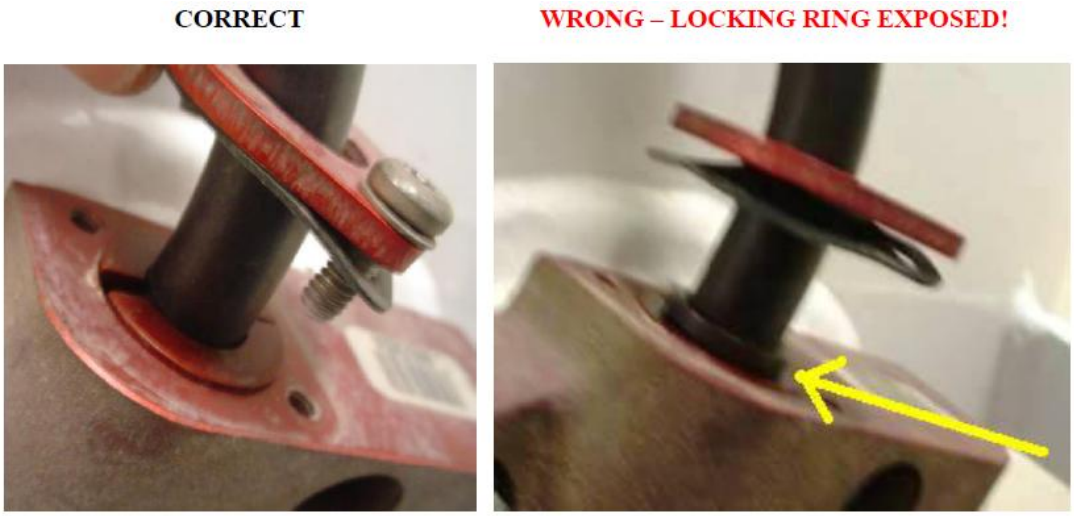
WARNING: ***Improperly attached fuel lines could cause the release of propane causing personal injury.***

2. Remove retaining screws, plate, gasket and split collar retainers from LPDM

3. Install plate and gasket onto hose end fitting of primary hose

4. Lubricate with O-lube, the hose end fitting metal surface and white nylon inner line

5. Insert hose into center of LPDM port and push in slowly until metal hose end fitting is touching the top of the brass bushing in the port



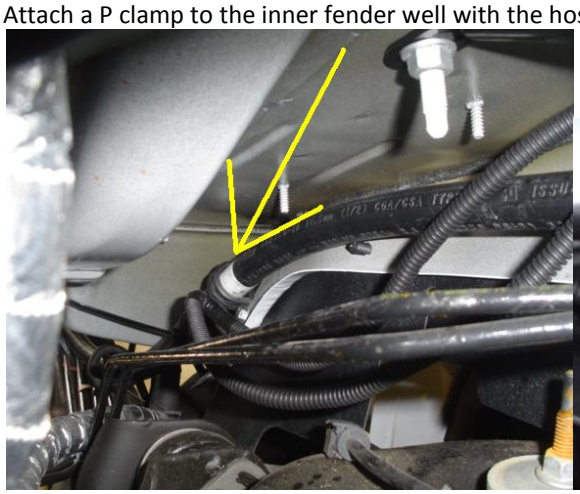
6. Insert split collar retainers and tighten screws until plate is flush with the LPDM
7. Install orange zip tie WARNING label to the hose as shown

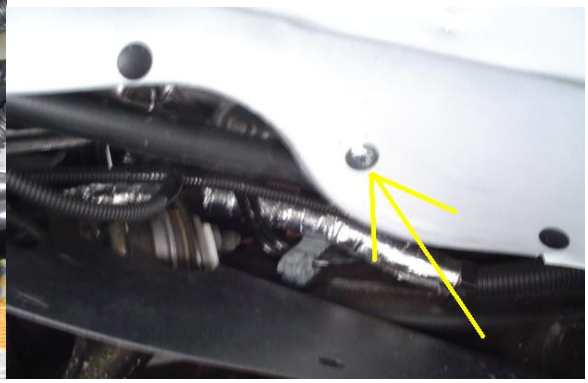
Note: *Primary hose loop will determine how much slack is available to secure the primary hose; verify the primary hose is routed in a way that there is no interference with chassis components that could cause chaffing*

8. Route the hose from the LPDM over the top of the tank attaching P clamps

9. Attach a P clamp to the frame rail so the hose goes over the top of the frame

10. Attach a P clamp to the inner fender well with the hose attached above the open side of the fender





11. Zip tie the hose to the brake line between the two P clamps under the cab inside frame rail

12. Zip tie hose to below the brake lines as shown, using the special size ties supplied in the kit

Note: *Insure that the hose is aligned so that no tension will be created on the fuel rail or the hold down clamps when installation is complete*

Attaching the union fitting to the primary hose

1. Assemble the union fitting as shown

2. Lubricate inner lines with clean motor oil

3. Torque the fitting to 33-38 ft-lb

Main wire harness

Note: Before securing any of the harness makes sure it is routed to meet the length requirement to make each connection. When you are prepared to secure the harness, tie wrap it every 8 inches.

Main LPEFI® harness (to existing GMC fuel pump wire harness)

1. Lay out the main harness with the four connectors pointed toward the rear of the truck

2. Route the harness from under the hood and down the inside driver side of the frame towards the rear of the truck

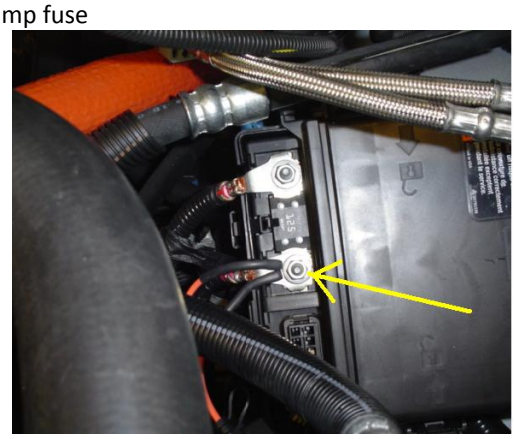
3. Route the OEM fuel pump harness forward down the inside driver side frame rail

4. Plug the *LPEFI®* 4 pin connector to the OEM fuel pump harness

Note: The fuel pressure is plugged into the OEM harness

Main LPEFI® harness (to 12 volt power) branch, is an orange wire with an in-line 20 amp fuse and (to 12 volt power to the ISD Relay) eyelet connectors on the end

5. Remove the nut from the 12 volt power on power distribution and install the eyelet from the orange wire with the 20 amp fuse and 2 amp fuse



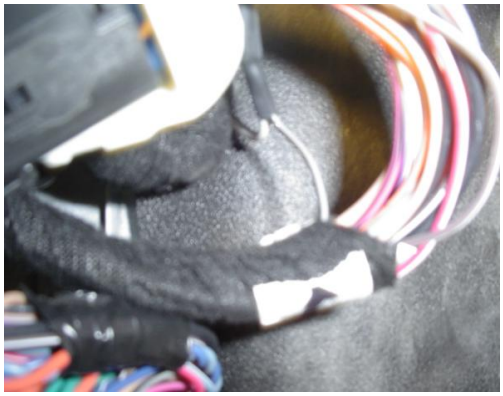
Main LPEFI harness (to door switch) branch, it is a white 16-gauge wire

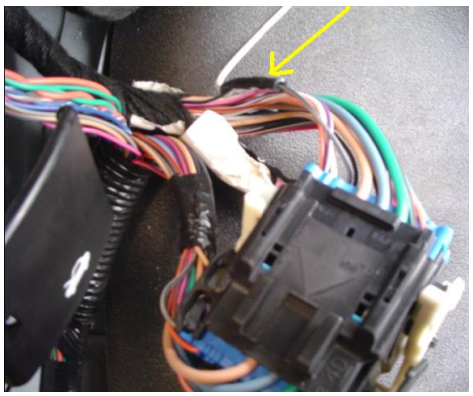
6. Guide the main *LPEFI®* wiring harness white wire (to door switch circuit)

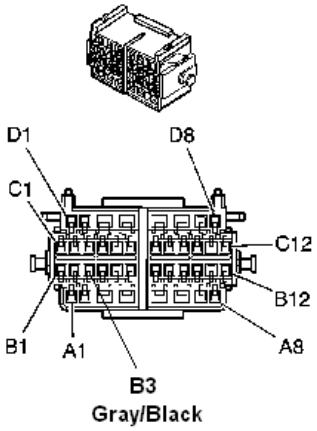
7. Remove the driver side kick panel

8. Route the white wire through the grommet to the inside of the cab

9. Connect white wire to the gray wire with the black tracer (Pin B3) of the X500 driver door harness. Lower connector of the two



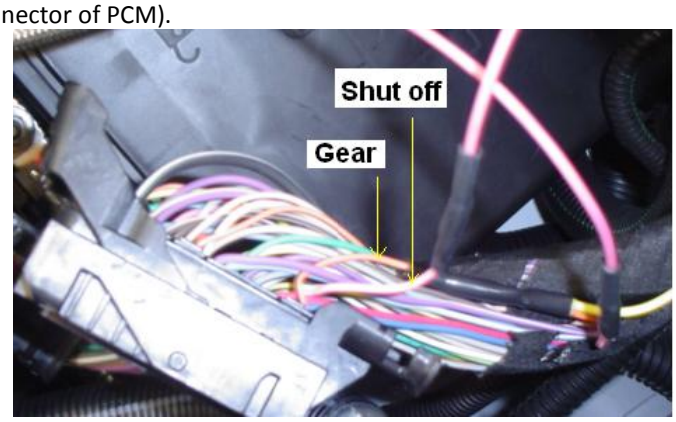


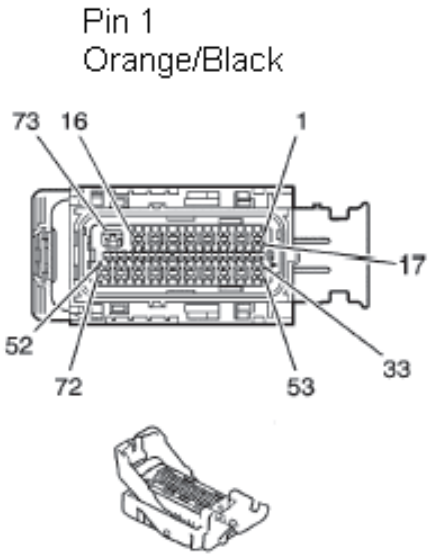


10. Install the kick panel

Main LPEFI harness (to gear signal) branch, it is a yellow 18 gauge wire

11. Attach the gear signal, yellow wire to the orange wire with the black tracer (pin 1) of the X1 PCM connector (Lower connector of PCM).

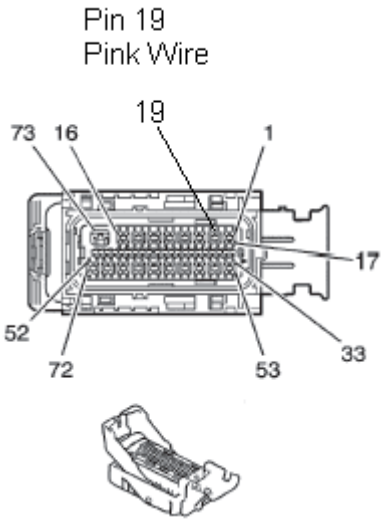




Main LPEFI harness (to ignition signal) branch, it is a Pink 18 gauge wire

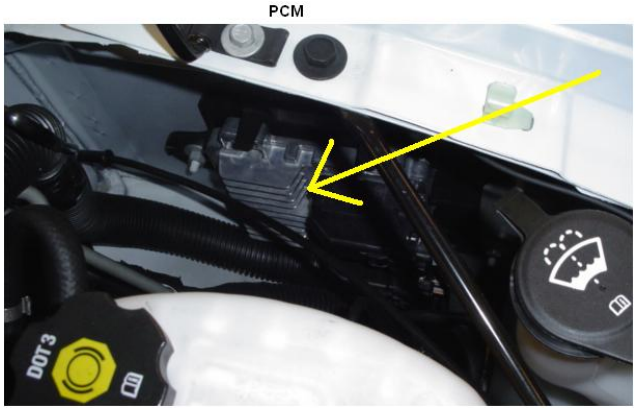
12. Attach the idle shut down signal, green wire to the pink wires of the (pin 19) X1 PCM connector

13. Cut the pink wire and solder in the two pink wires. The idle shut down relay installed in series with the pinks wires



Mounting the Idle shut down relay

15. Install the ISD relay on the driver side fender with the ground wire
16. Install the ground wire fastener after the ISD relay as in the photo



17. Plug the harness into the relay

Main LPEFI harness (to sending unit) branch, it is a black two pin connector

17. Connect the main LPEFI harness *(to sending unit)* branch to the fuel level gauge; use wire ties to secure to the primary hose

Note: *Always be aware of routing. Do not route near the exhaust and always use split loom to prevent chaffing.*

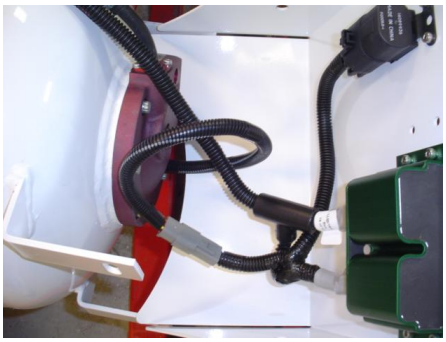
18. Prepare to install the *LPEFI®* protecting cover with the 3/8" bolts provided; at this time leave the bolts loose and **do not** connect the main *LPEFI®* harness *(to LPCM, relay and LPDM)*, to the electronic control box (LPCM) and relay

WARNING: Do not make the final electrical connections until the LPEFI system is completely sealed. Applying power could cause the valves in the tank to open, releasing fuel into the hoses.

Completing Wire Harness Installation:

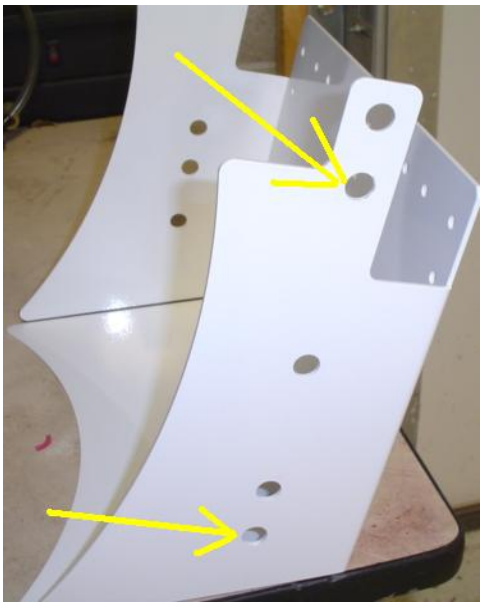
Main LPEFI harness (to LPCM, relay and LPDM) branch, is 4 connectors on 4 branches, tied together.

19. Connect main LPEFI harness connection to LPCM and relay and LPDM



20. Assemble tank guard to rear of the primary tank
    a. Attach the 3 PAL nuts to the tank tabs
    b. Use the 3/8” flat, lock washers and bolts to assemble the cover to the tank

Note: *Use the mounting holes so cover plate is level with the bottom of the tank*



Install labels on the truck/registration

1. Install one "*LPEFI®*" transparent label on each side of the cab

2. Install the EPA emissions label on the plate on top of the engine intake; once placed do not try to remove this label as it would be destroyed

3. If the truck does not have a box or body installed yet, put the propane diamond in the glove box for placement later

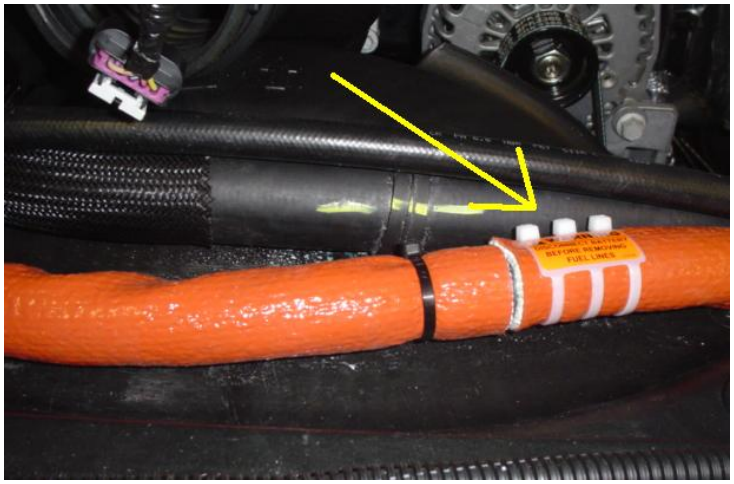
4. After the body is installed on the truck, install the blue "PROPANE" diamond on the back panel of the truck, toward the bottom right corner

Note: *Do not install on the bumper*

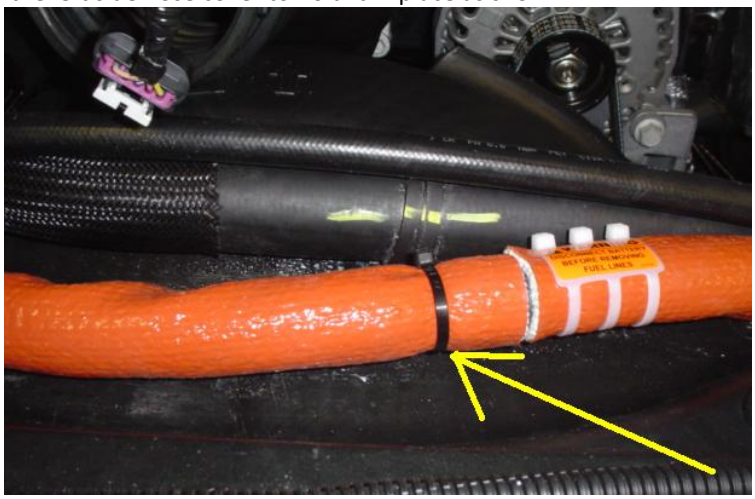
5. Install the orange WARNING label on the center of the dog house

6. Install the yellow ATTENTION label on the left top side of the dash

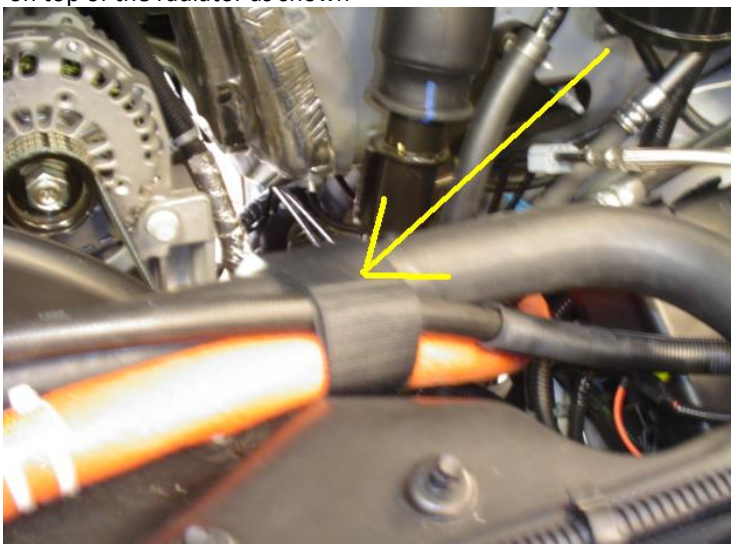
7. Install orange zip tie WARNING label to the hose as shown



8. Attach a zip tie to the left side hose cover to hold it in place as shown



9. Use Velcro fastener on top of the radiator as shown



10. Fill out vehicle warranty registration card and return to Bi-Phase Technologies along with the Post-Installation Inspection

11. Place laminated owners information cab card in the glove box or door pocket with the OEM's owners manual & other GM information

Post-Installation Inspection

Installation & test date_____
VIN_____Engine size_____Mileage_____
Make_____Model_____Mfg date_____
Customer name_____Address_____
City_____State_____Zip_____Phone_____

Installer company name_____Phone_____
Injector rail serial numbers Right_____ Left_____
Tank mfg._____Primary tank s/n_____Secondary tank s/n_____
Purge & fill propane tank Yes ☐ No ☐
Quantity of propane _____gallons
Leak test tank & *LPEFI®* system complete Yes ☐ No ☐
Leaks found & repaired Yes ☐ No ☐
Where_____

Before starting engine check and top off coolant level. After starting engine observe coolant level and heater operation until engine is at 190°F on the scan tool and all air has purged from the cooling system.

Tank Temps & Operating Pressures @ LPDM	*DataStream*
Tank temperature (bottom of tank) _____°F Room temperature _____°F Static pressure (tank pressure)_____p.s.i.g. Pump Pressures with Engine Running Static + supply valve + pump _____p.s.i.g. Static + supply valve + return valve + pump _____p.s.i.g.	ECT/Temperature_____°F At Idle: Bank 1 Bank 2 STFT _____ _____ LTFT _____ _____ Does the engine idle smoothly? Yes ☐ No ☐

Loop hose fingers ((4) engaged Yes ☐ No ☐

Primary hose installed correctly Yes ☐ No ☐

Gear select (yellow wire) attached to pin 1 (orange wire with black tracer) of connector X1 of the PCM? Yes ☐ No ☐

Transfer System (if equipped)
Any faults found using transfer system inspection tool? Yes ☐ No ☐
If yes describe fault/repair_____

Diagnostic Trouble Codes
Any DTCs in computer memory? Yes ☐ No ☐
List all codes:_____

If any DTCs found, repair all codes and retest
Comments:_____

Turn off vehicle & let it sit for 15 minutes with hood and doors closed.
Return to vehicle, open driver door. Does purge cycle initiate? Yes ☐ No ☐
Does vehicle restart easily after purge cycle is complete? Yes ☐ No ☐

Technician Name:_____

This inspection form must be returned to Bi-Phase Technologies.

Any problems found must be noted in the comment section and if a problem cannot be resolved Bi-Phase Technologies must be contacted at 1-888-465-0571.

Testing the Installation

1. Visually inspect the tank, the hoses, the wiring and the engine compartment. Is everything assembled properly?
2. Fill the tank with 20 to 30 gallons of propane. It is recommended that you purge the tank with propane vapor and check all the fittings on the tank for leaks before filling the tank completely. Use an approved leak detection fluid or an electronic leak detector to verify there are no leaks. If any leaks are found stop and repair the leaks. The battery should not be connected at this time. (If the tank was filled before installation it should have been checked for leaks at that time.)
3. Connect a fuel pressure test gauge to the Schrader valve on the LPDM
4. Fuel pressure should be 0 psi at first.
5. If the connections on the electronic purge control assembly have not been made connect at this time.
6. Connect the battery. You may hear a click at the tank.
7. Open the driver door to start a purge cycle. You should hear the solenoid valves click and the pump running inside the tank. If not, check the electrical connections and refer to the troubleshooting section in the general diagnosis manual.
8. Simultaneously with the preceding step you should inspect all hose connections, the LPDM, the fuel rail connections and the injectors for leaks. If any leaks are found you should disconnect the Liquid Propane Control Module, evacuate the lines and repair. See the general diagnosis manual for procedures.
9. When the purge cycle ends, listen for leaking fuel near the hoses and around the entire system. If you do not hear any obvious hissing or smell propane, turn on the ignition key but do not start. This will start the fuel pump, followed by a purge cycle.
10. When you hear the fuel pump stop running notice the fuel pressure on the test gauge. This pressure should be anywhere from 30 psi in cold weather to 180 psi in hot weather.
11. Turn the key off, then on again to start another purge cycle.
12. While the pump is running, observe the fuel pressure. It should be 35 to 55 psi higher than it was in step 10.
13. Turn the key off and check for leaks at every hose fitting on the vehicle. Apply an approved leak detection fluid (similar to soapy water) or use an electronic propane leak detector. The tank, tank valves, fuel injectors and fuel rails have been tested at the factory but you must recheck, and check the hoses and hose fittings.

WARNING: Do not use an open flame to check for leaks. If you smell propane, it's from a leak. The LPEFI system uses sealed fittings and lined hoses, and the there should never be a propane odor from an LPEFI vehicle.

Typical Leak Checking Method

Testing the Installation (cont'd)

14. If there are no leaks, start the engine.
15. Connect a diagnostic scan tool to the vehicle.
16. With the engine running, check the diagnostic trouble codes (DTCs). Correct any problems you find. If the engine is not running smoothly, refer to the general diagnosis manual.
17. If there are no codes and the engine is running smoothly let the vehicle run until it is to full operating temperature (190° F on your Scan tool).
18. Turn the key off and follow the testing procedures described in the Post-Installation Inspection
19. Fill out the Post-Installation Inspection completely.
20. Turn off the engine and disconnect the fuel pressure gauge set. Be sure to reinstall the dust cap on the Schrader valve.

     **WARNING: The pressure test hose may contain cold liquid propane. Wear insulated rubber gloves and goggles.**

21. Drive the vehicle for at least 15 minutes, if possible. Drive under various conditions and a variety of speeds.
22. After the drive notice the long-term fuel trims as noted in the post-inspection. The long-term fuel trims should not be the same as they were before the drive. The long-term fuel trims should not be more than + or – 20%.
23. After driving and inspecting the vehicle turn it off and let it sit with the hood and doors closed for 15 minutes. After 15 minutes return to the vehicle, open the door to initiate a purge and start the engine. If the engine starts easily, 3 seconds or so, the vehicle is ready to use.
24. If there are no leaks, no DTCs and the engine runs well (smooth idle, smooth acceleration, good power), the vehicle is ready to use.
25. If you did not fill out the warranty registration card in the Installing Labels Procedure do so now. Also complete the Post-Installation Inspection and return both to Bi-Phase Technologies to establish the warranty start date for your vehicle.

Testing the Idle Shut Down (ISD) and Auto Purge functions of the LPCM

1. Testing the Idle Shut Down and Auto Purge control assembly (LPCM).
   Note: *Temperature must be above 50F*
2. Open the door, the purge cycle should initiate and run for 12 to 15 seconds.
3. When the purge cycle stops turn the ignition key to the on position. The purge cycle should initiate again.
4. Close the door.
5. Start the engine, the engine should start.
6. Before 30 seconds has passed turn the engine off. The purge cycle should initiate.
7. Re-start the engine again and let it run 60 seconds. After 60 seconds place your foot on the brake and place the vehicle in Drive then back into park. Leave the engine running.
8. 3 minutes after the vehicle was placed back into park the engine will shut off.
9. 90 seconds after the engine has shut off, an Auto Purge will occur.
10. If the system works as described, you have completed the tests of the ISD and Auto Purge functions.
11. If it does not work as described check all wire connections, battery voltage and contact Bi-Phase Technical Hotline at (888) 465-0571.

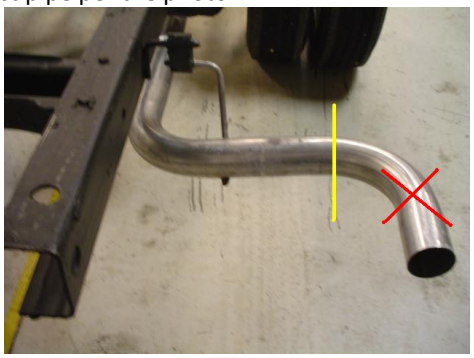
Additional options to install

Cab mirrors

1. Install per Velvac Inc. installation instructions

Exhaust pipe modification

2. Cut the bend off the exhaust pipe per the photo



Idle Shut Down (ISD) Functions

Idle shut Down Modes

- **3 Minute -** ISD after 3 minutes of idle, the engine will shut off
  - If the truck has been run in the past 30 minutes or if the truck has been moved (meaning if the Drive selector is moved from the Park position)
- **15 Minute -** ISD after 15 minutes of idle, the engine will shut off
  - If the truck has been shut off for over 30 minutes it will go into this ISD mode
    - This will allow for morning warm ups (Defrost windshield, etc)
    - Moving the gear select from the Park position will change the idle shut down mode to 3 minute mode when the truck is placed back into Park

Auto Purge

- Quicker engine start ups in warm weather
- Auto purge will run the pump after the truck is shut off (either by key or ISD) at approximately 1.5 minutes – 3 minutes – 6 minutes – 12 minutes and one last time in 24 minutes
- Auto Purge is <u>disabled</u> below the temperature of 50 degrees
  - So no drain on the battery will occur

Tampering Mode

- <u>ANY</u> tampering with the ISD components will shut off the fuel pump in the propane tank; the engine will shut off and may result in a **3 minute reset process or indefinitely if the tampering is not corrected**. The truck <u>will not start</u> within this 3 minutes
  - Tampering may include items like trying to remove or bypass components from the idle shutdown system or having the truck in drive with the parking brake on

Other notes

- The ISD will not turn off any lights, fan motor, etc
- A weak battery may be more evident with the ISD installed

LPEFI

Electrical Wiring Diagram With Idle Shut Down

Main Wiring Harness

GMC G Van 6.0L