ROUSH CLEANTECH

2007 - 2008

Ford E-350

LIQUID PROPANE AUTOGAS

July 8, 2011

KIT INSTALLATION INSTRUCTIONS

Current as of 7/8/2011

TABLE OF CONTENTS

Part Number P07C2-RKITIM-AB

Important Notice:
The engine will run only with propane as fuel when this installation is complete. Before replacing the gasoline system with the ROUSH CleanTech Liquid Propane Autogas system, provide a supply of HD5 liquid propane with which to fill the new tank.

Introduction

This manual is a guide for the installation of the ROUSH CleanTech kit for converting a 2007/2008 Ford E-350 DRW van equipped with the 5.4L 2V V8 engine to run on propane fuel. Only a few components are involved.

Before installing your liquid propane conversion kit, read the installation instructions and verify that all items in the packing list are present.

The liquid propane conversion kit is designed and tested to function properly only on Ford Motor Company vehicles as they are equipped from the factory (stock powertrain). The use of aftermarket parts and equipment, or any other performance parts not sold by, manufactured by, or approved in writing by ROUSH CleanTech for specific application to the 2007/2008 E-350 DRW van equipped with the 5.4L 2V V8 engine with a liquid propane conversion kit will result in powertrain damage and potential engine failure. ROUSH CleanTech will not accept responsibility for such damage and failure.

The ROUSH CleanTech parts serve the same functions as the Ford parts they replace. The ROUSH CleanTech parts are designed for durability, reliability and economy in combination with liquid propane.

Propane, like gasoline, must be handled safely with knowledge of its characteristics. *Training in Basic Principles and Practices* developed by the Propane Education and Research Council (PERC), Washington, DC is available via an interactive DVD program at a modest price.

For most purposes in an automobile dealership, the basic course should be sufficient. Certification, if required, based on this material is also available, either on-line or through local facilities, at additional cost.

Safety

The National Fire Protection Association (NFPA) publishes a code book of rules that apply to the storage, handling, transportation and use of liquefied petroleum gas (LP-Gas or LPG). The book is known as *NFPA 58*. It is revised as necessary and published every other year. This code is adopted as law in virtually every political subdivision in the United States. Check with your local authorities for regulations applicable to liquid propane.

Observe all safety precautions provided in the Ford Motor Company Technical Services service information concerning the handling of the gasoline fuel system.

Alert Messages

The following alert messages appear from time to time in appropriate places in this manual. Ensure that all personnel in the immediate area are aware of these reminders.

⚠ **Danger:** Although propane is nontoxic, nonpoisonous, has the lowest flammability range of any alternative fuel and dissipates quickly when released into the atmosphere, propane vapor is heavier than air and seeks the lowest point. When the ratio of propane to air is between 2.2% and 9.6%, propane will burn in the presence of an ignition source at 940°F (504°C) or hotter. Keep away from heat, sparks, flames, static electricity or other sources of ignition. Failure to heed this danger may result in severe personal injury or death.

⚠ **Danger:** The fuel supply lines remain pressurized after engine shutdown. Keep away from heat, sparks, flames, static electricity or other sources of ignition. Do NOT enter storage areas or confined space unless they are adequately ventilated. Failure to heed this danger may result in severe personal injury or death.

⚠ **Danger:** Do NOT carry lighted smoking materials or smoke while working on fuel system components. Failure to heed this danger could result in severe personal injury or death.

⚠ **Danger:** Disconnect the battery ground at the battery to ensure that the vehicle electrical system has no current. Failure to heed this danger could result in severe personal injury or death.

LIMITED LIABILITY DISCLAIMER

The information in this publication was accurate and effective at the time the publication was approved for printing and is subject to change without notice or liability. ROUSH CleanTech reserves the right to revise the information herein and to make changes and discontinue production of described parts at any time.

TWO-PERSON PROCEDURES

Removal and installation procedures take place under the hood and under the vehicle. The vehicle must be raised to permit working underneath. Installing the tank under the vehicle requires the cooperation of two persons in conjunction with a hoist of at least 500-pound capacity.

STAINLESS STEEL FUEL LINES

Unlike Ford, the ROUSH CleanTech fuel lines are constructed from stainless steel. Do NOT attempt to use the original fuel lines. Carbon steel corrodes more quickly in the presence of liquid propane.

JIFFY TITE FUEL LINE END CONNECTORS

Some of the ROUSH CleanTech fuel lines use a Jiffy Tite connection to aid in assembly. A special fitting is required to remove these lines once the connection has been made.

THREADED FUEL LINE END CONNECTORS

Also unlike Ford, some of the ROUSH CleanTech fuel lines are equipped with threaded end connectors. Do NOT cross thread these connectors. Always tighten each connector by hand before applying a wrench to avoid cross threading.

THREADED FASTENERS

Hand tighten all threaded fasteners before applying a wrench to avoid cross threading.

BARE METAL SURFACES

You will be drilling holes through painted metal. Bare metal must be deburred and coated with a primer or sealer as specified in order to prevent rapid corrosion. The coatings must be allowed to dry before the affected parts are assembled.

METAL-TO-METAL CONTACT

There are locations where fuel lines pass closely to each other and to other metal surfaces. Do NOT allow direct contact between these parts. Apply EPDM sleeves to the fuel lines to prevent direct contact. Ensure that the sleeves cover the targeted areas.

Packaging

Carefully inspect the contents of the kit you receive to ensure that all parts are available before beginning installation. A parts list is enclosed with the propane kit.

Installation, Garaging and Training

Chapter 11, page 58-67, of *NFPA 58, 2008 edition*, applies to engine fuel systems using LP-Gas in internal combustion engines, including containers, container appurtenances, carburetion equipment, piping, hose and fittings and their installation. Additionally, this chapter applies to garaging of vehicles and to the training of personnel.

Paragraph 11.2 specifies that each person engaged in installing, repairing, filling or otherwise servicing an LP-Gas engine fuel system shall be trained. For additional information about the CETP E-Learning computer-based training program developed by PERC, contact Courtney Gendron at courtney.gendron@propanecouncil.org.

Purging and Venting (Tanks and Lines)

Venting of LP-Gas to the atmosphere is covered by paragraphs 7.3.1, General, and 7.3.2, Purging, on page 58-55 of *NFPA 58, 2008*.

Paragraph 7.3.2.2 reads as follows. “Venting of cylinders indoors shall only occur in structures designed and constructed for cylinder filling in accordance with (*NFPA 58, 2008: paragraph*) 6.5.1, Chapter 10 and 7.3.2.2(A) through 7.3.2.2(C). The following paragraphs are quoted from *NFPA 58, 2008*.

7.3.2.2(A) Piping shall be installed to convey the vented product outdoor at least 3 ft (1 m) above the highest point of any building within 25 ft (7.6 m).

7.3.2.2(B) Only vapors shall be exhausted to the atmosphere.

7.3.2.2(C) If a vent manifold is used to allow for the venting of more than one cylinder at a time, each connection to the vent manifold shall be equipped with a backflow check valve.

7.3.2.3 Venting of containers outdoors shall be performed under conditions that result in rapid dispersion of the product being released.

7.3.2.4 If conditions are such that venting into the atmosphere cannot be accomplished safely, LP-Gas shall be burned at least 25 ft (7.6 m) from combustibles.

7.3.2.5 Venting of containers and burning of LP-Gas from containers shall be attended.

ROUSH Technical Assistance

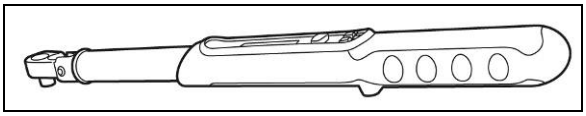
Call ROUSH CleanTech Customer Service at 1-800-597-6874 with any questions regarding kit installation.

Special Tools

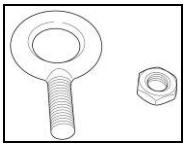
Touch-Up Paint

Liquid Leak Detector

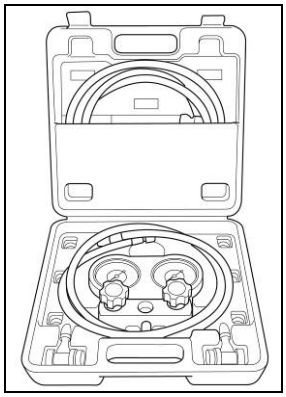
Premium Aerosol Undercoating



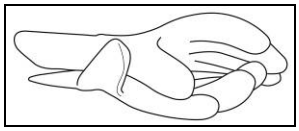
Torque Wrenches (to 22 Nm and to 200 Nm)



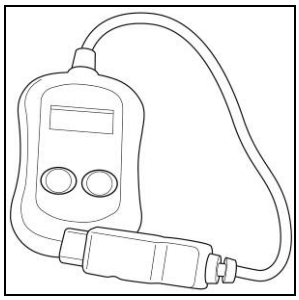
5/8"-11 Eyebolt and Locknut



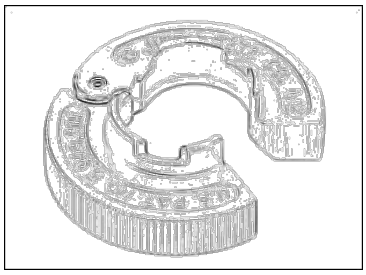
A/C Manifold Gauge Kit



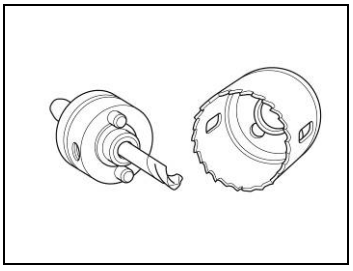
Gloves (Approved for Propane)



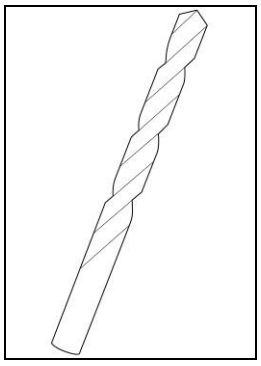
Scan Tool



Jiffy Tite Disconnect Tool



Hole Saw – 29 mm



Drill Bit – 15 mm

Disassembly and Installation

Special care should be taken to label the reusable fasteners and parts taken off during this procedure.

⚠ **Danger:** The fuel supply lines remain pressurized after engine shutdown. Keep away from heat, sparks, flames, static electricity or other sources of ignition. Do NOT enter storage areas or confined spaces unless they are adequately ventilated. Failure to heed this danger may result in severe personal injury or death.

⚠ **Danger:** After de-pressurizing the gasoline system, disconnect the battery ground at the battery to ensure that the vehicle electrical system has no current. Failure to heed this danger could result in severe personal injury or death.

Reprogramming the Powertrain Control Module

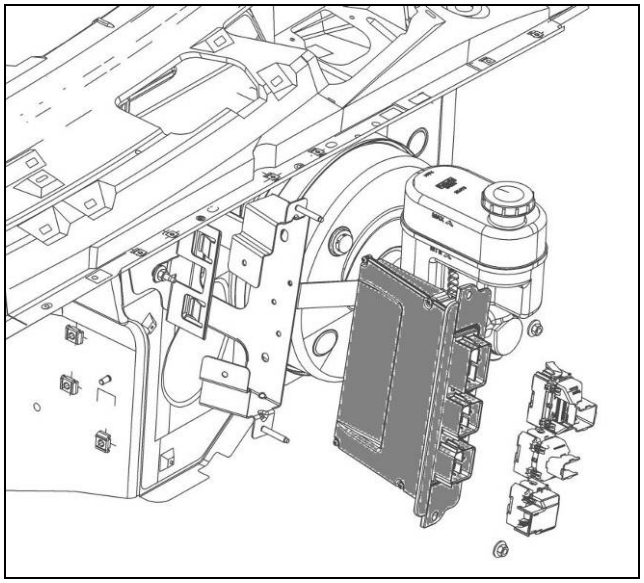
⚠ **Caution:** The Ford E-350 Powertrain Control Module (PCM; also called ECM, ECU, PCU or EEC) is programmed specifically for the vehicle using the vehicle identification number (VIN). It must be reprogrammed and returned to the vehicle from which it was removed.

Before removing the PCM and sending it to Roush CleanTech for reprogramming, a self-test diagnosis MUST BE performed and resulting error codes corrected.
Failure to heed this caution may result in improper function of the diagnostic and anti-theft programs.

⚠ **Caution:** Operating the engine without reprogramming by ROUSH CleanTech will result in engine damage or failure and will void all warranties.

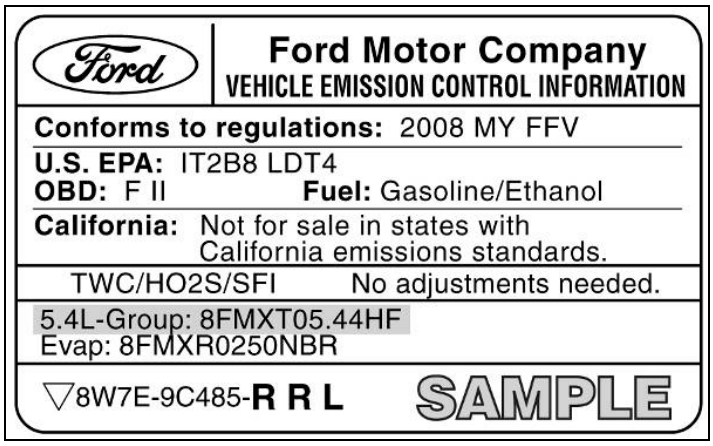
ROUSH CleanTech provides the necessary PCM packaging, overnight transportation (each way) and reprogramming at no charge. Follow these steps to expedite the service.

1. Using a scan tool, check for all error codes. Correct all errors before continuing.
2. De-pressurize the fuel rail using the procedure described in Section 310-00, Fuel System, General Information, in the Ford Service Information Workshop Manual.
3. Remove the battery from the vehicle.
4. Following the procedure described in the *Ford Service Information Workshop Manual, Section 303-14A, Electronic Engine Controls — Gasoline Engines*, remove the powertrain control module (PCM). Disconnect the three (3) PCM connectors by lifting the grey levers over the connector back shell and lifting the connectors from their sockets. Remove the two (2) nuts and position the PCM wiring harness aside. Remove the PCM from the vehicle by pulling the PCM forward and lifting it out of the engine compartment. Keep the fasteners for reuse.



5. Install the Hang Tag (P07L3-9A095-K) onto the rear view mirror of the vehicle.

6. Write the requested information, including the GVWR, on the E-350 Propane PCM Label (P07C2-9A095-DA). The test group information will be found on the original VECI label. The propane fuel tank serial number can be found on the raised serial badge welded to the side of the tank. Once all information has been completed, apply the label to the back side of the PCM**.**

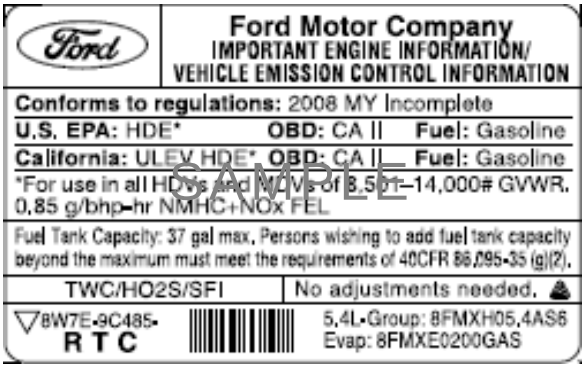


Note: Do NOT alter or remove the original VECI label from the vehicle. This label is required by law. Failure to heed this note may void all warranties.

7. Using the bubble wrap provided, wrap the PCM securely and package it within the PCM shipping box (PBC2-SB-A).
8. Enter your name and address in the FROM area of the shipping label provided with the box.
9. Peel off the label on the right side of the form and attach it to the outside of the shipping box in the indicated area. Retain the left side of the form for your records.
10. Call for a FedEx Package Pickup. Dial 1-800-463-3339, then 0, and speak to an agent in person. Do NOT use the automated option to schedule a pickup.
11. Inform the agent that you have a FedEx Express Prepaid Stamp package and request a pickup.

FedEx will deliver the package to ROUSH via overnight service. ROUSH will reprogram the PCM during the day in which it is received and return it to you via overnight service.

Included with the newly flashed PCM will be a ROUSH VECI label which must be affixed to the hood so that both the original and new labels can be read. Refer to the section “Installing Badges and Labels” for VECI placement. The graphic shown is a typical sample of the ROUSH VECI label.



If you need to ship via another carrier, our address is:

ROUSH Powertrain Development
Building 57
Attention: PCM Flash
777 Republic Drive
Allen Park, MI 48101

If you have any questions, call ROUSH CleanTech Customer Service at 1-800-597-6874.

Removing the Original Fuel Tank

Refer to the *Ford Technical Services, Service Information, Section 310-01, Fuel Tank and Lines*, for complete instructions for removing the original fuel tank.

⚠ **Danger:** Read and follow all applicable alert messages in the Ford manual. Failure to heed this danger may result in severe personal injury or death.

⚠ **Danger:** The fuel supply lines remain pressurized after engine shutdown. Keep away from heat, sparks, flames, static electricity or other sources of ignition. Do NOT enter storage areas or confined spaces unless they are adequately ventilated. Failure to heed this danger may result in severe personal injury or death.

⚠ **Danger:** Do NOT bring lighted smoking materials or smoke while working on fuel system components. Failure to heed this danger could result in severe personal injury or death.

⚠ **Danger:** Disconnect the battery ground at the battery to ensure that the vehicle electrical system has no current. Failure to heed this danger could result in severe personal injury or death.

Removing the Original Filler Pipe

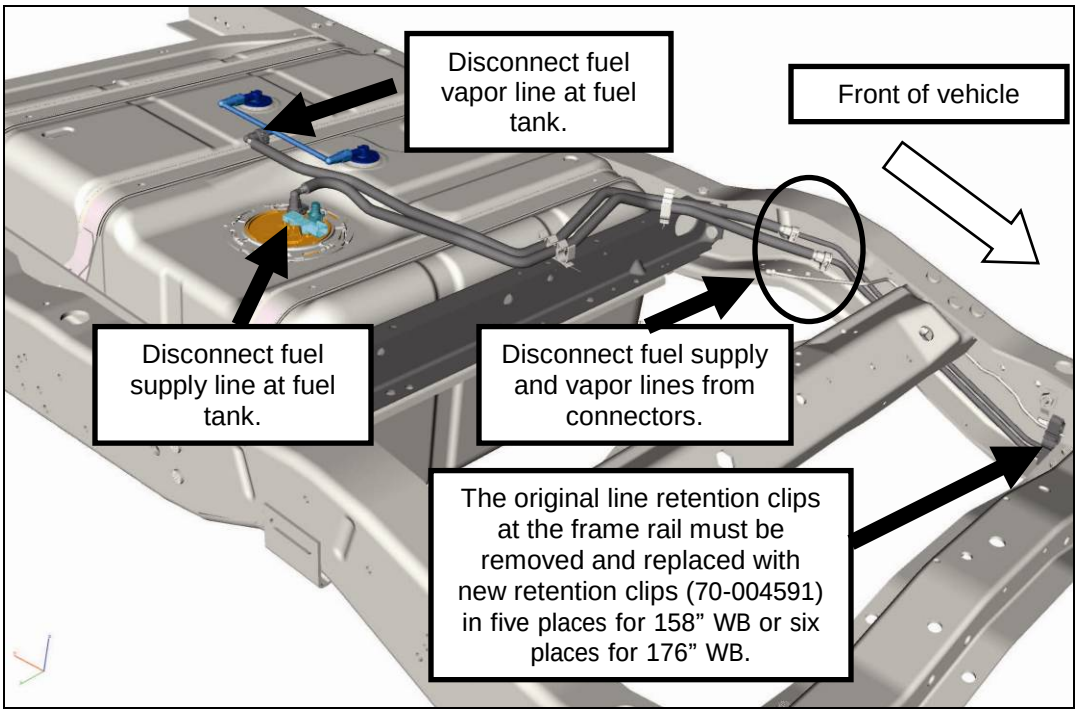
Refer to the *Ford Technical Services, Service Information, Section 310-01, Fuel Tank and Lines*, for complete instructions for removing the original filler pipe.

If installing this kit on an un-finished vehicle (no box or bed installed) the filler pipe, fuel supply and vapor lines (at tank) can be removed along with the fuel tank in the previous step.

Removing the Original Fuel Supply and Vapor Lines

Refer to *Ford Technical Services, Service Information, Section 310-01, Fuel Tank and Lines, Fuel Lines*, for complete instructions for removing the fuel supply and vapor lines forward along the frame rail to the engine except as follows:

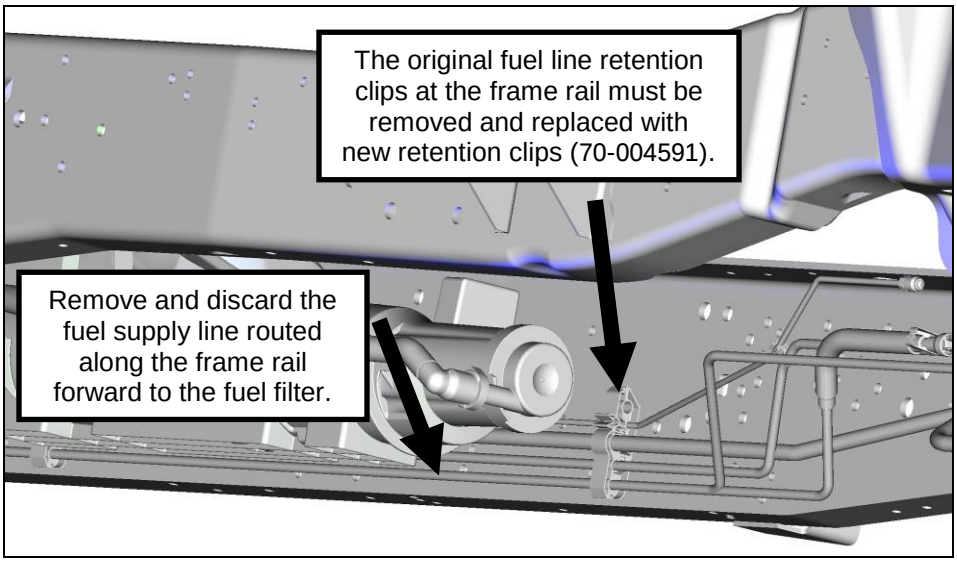
1. Be careful NOT to remove, damage or discard any fuel line retention clips attached to either the frame or transmission unless otherwise instructed. Some of these clips will be used to retain the new propane fuel lines.
2. Remove and discard the fuel supply and vapor lines that run from the aft axle fuel tank to the connectors at the frame rail.



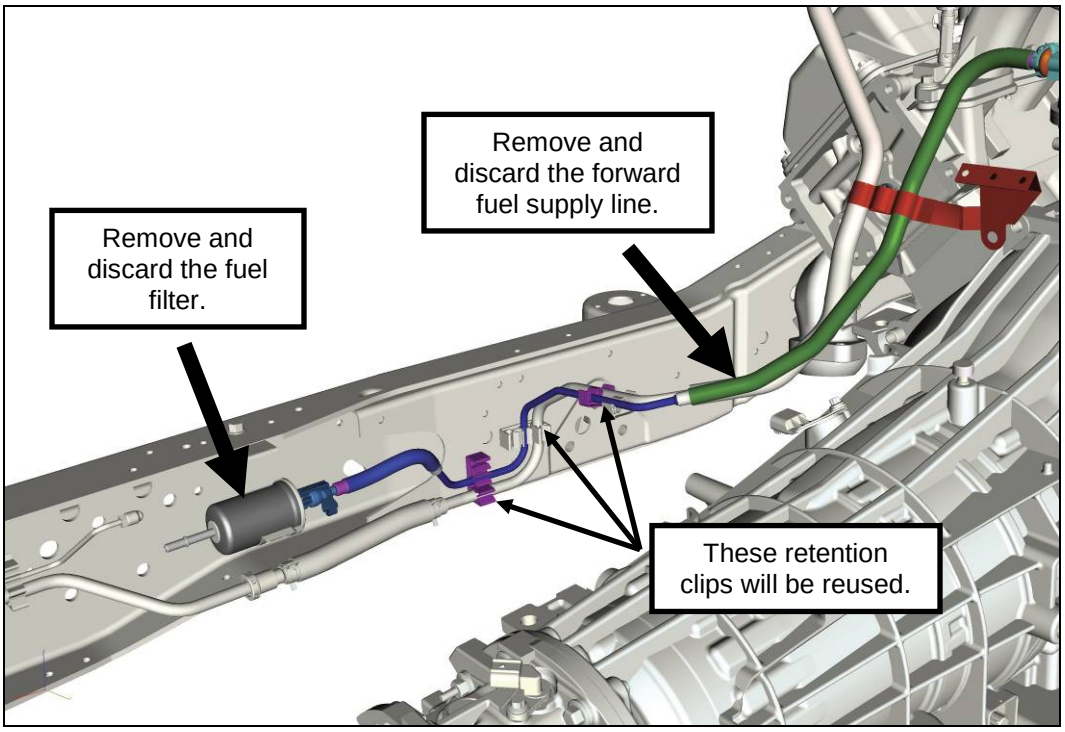
3. Remove the fuel vapor line between the fuel tank and the vapor canister from the retention clips along the frame rail.

4. Remove and discard the fuel supply line that is routed along the left frame rail from the rear axle area forward to the fuel filter. The original fuel line retention clips at the frame rail **must** be removed and replaced with new retention clips (70-004591) which can be found in Hardware Kit B (PBC2-HKB-A).

Note: While identical in appearance, the slots in the new retention clips (70-004591) are slightly larger to accommodate the 3/8" diameter fuel supply line. The 3/8" diameter lines will not fit into the original retention clips.

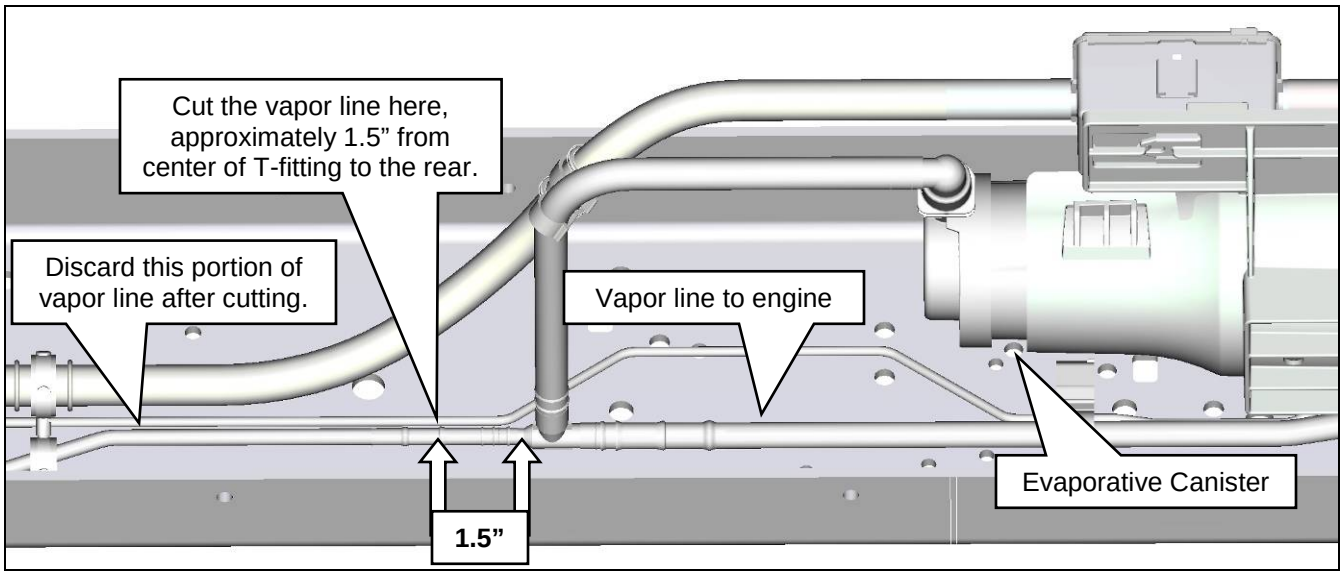


5. Remove and discard the fuel filter and forward fuel supply line that is routed from the left frame rail up to the engine.



Note: The fuel vapor line from the fuel tank must be modified to accept the fuel temperature pressure transducer (FTPT) assembly (components can be found in Hardware Kit E PBC2-HKE-A). The FTPT assembly will be attached to the vapor line just behind the T-fitting that leads to the vapor line going to the engine and the vapor line to the evaporative canister quick-connect attached to the end of the EVAP canister.

6. Cut the plastic sleeve of the vapor line in the area shown. Cut between the T-fitting barb and the steel line approximately 1.5" from the 90° portion of the T-fitting. Leave the plastic of the sleeve on the t-fitting barb as it must be retained for proper fit of the hose to be installed. Discard the steel vapor line that was attached to the OEM fuel tank.

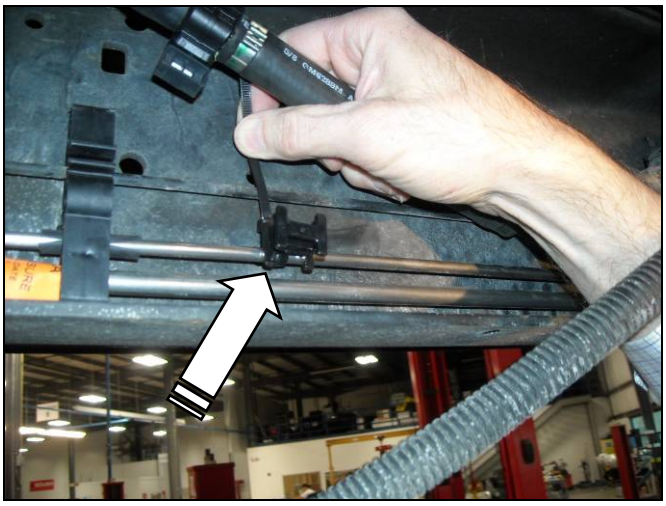


Note: Obtain the parts from the Hardware Kit E (PBC2-HKE-A) and assemble the parts to build up the FTPT sensor assembly on the bench or as you install the parts in place of the cut off vapor line behind the OEM barb t-fitting. For this procedure, refer to the following picture.

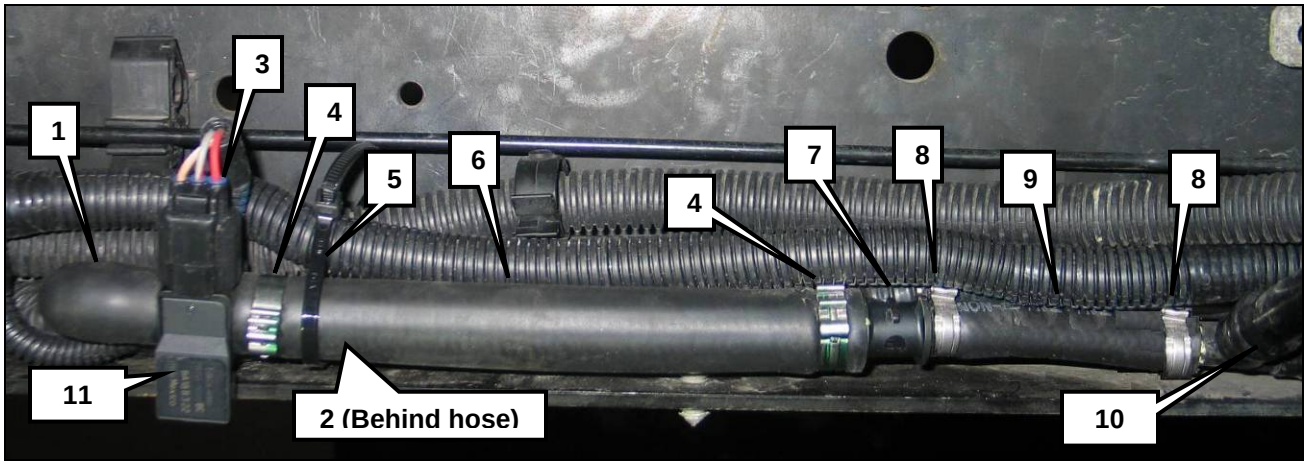
7. Add the 3/8 x 3" Hose (5283K12) over the cut off fuel vapor line. (This can be done after performing the following steps on the bench.)
8. Position two (2) 3/8" Crimp Clamps (16700017) over the 3/8 x 3" Hose (5283K12).
9. Insert the 3/8" x 5/8" barb tube fitting (5463K227) into the 3/8 x 3" hose.
10. Position two (2) Crimp Clamps (16700017) at each end of the 3/8 x 3" hose and crimp the 3/8" clamps to secure the barb tube fitting and the hose. (Preserve one clamp to retain the assembly if being built up before installation onto the cut off vapor line.)
11. Install the 5/8 x 7" long Hose (A-CB9722-625-7) onto the barb tube fitting.
12. Position two (2) Cobra Clamps (01080006021) over the 5/8 x 7" long hose.
13. Insert the FTPT Sensor (945A-9C052-B) into the 5/8 x 7" Hose (A-CB9722-625-7).
14. Position two (2) Cobra Clamps (01080006021) onto each end of the 5/8 x 7" long hose and tighten to secure the hose to the barb tube fitting and the FTPT sensor.
15. Install the Vacuum Cap (MR0150) onto the open end of the FTPT sensor.
16. If assembled on the bench, install the FTPT sensor assembly onto the OEM barb t-fitting, position the crimp clamp and tighten to retain the assembly.

Note: Do NOT secure the FTPT sensor assembly with zip ties until after the ROUSH CleanTech fuel supply line, fuel return line and electrical harness have been installed and properly routed along the frame rail.

17. Secure the Nylon Swivel Standoff (151-06500) to the fuel return line using one (1) zip tie. Position the standoff on the return line near the FTPT sensor location.



18. Install a zip tie through the second section of the Nylon Swivel Standoff (151-06500) and around the 5/8 x 7" long hose to secure the assembly.



1. Vacuum Cap (MR0150)	7. Barb Tube Fitting, 3/8" x 5/8" (5463K227)
2. Nylon Swivel Standoff (151-06500)	8. Crimp Clamp, 3/8" (16700017)
3. FTPT Harness Connector	9. Hose, 3/8 x 3" (5283K12)
4. Cobra Clamp (01080006021)	10. OEM Barb T-Fitting
5. Zip Tie	11. FTPT Sensor (9U5A-9C052-B)
6. Hose, 5/8 x 7" Long (A-CB9722-625-7)	

Note: After the ROUSH CleanTech main wiring harness has been installed, make sure to plug the electrical harness connecter into the FTPT sensor.

Preparing the Engine Compartment

Refer to the *Ford Technical Services, Service Information, Section 303-04A, Fuel Charging and Controls, Removal and Installation*, for complete instructions for removing the fuel rails and injectors.

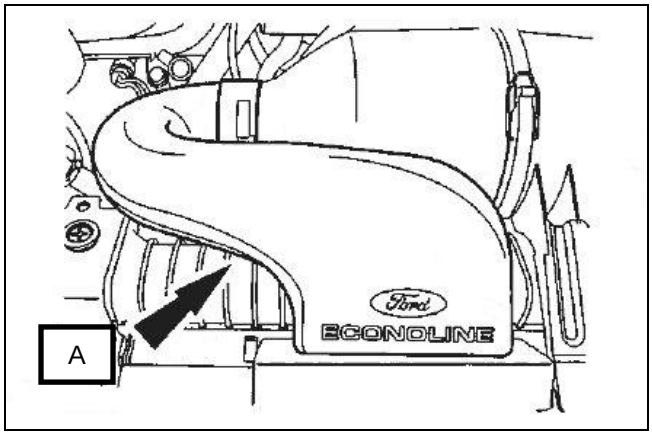
Some parts will be reused. The following procedures indicate which items may be salvaged or discarded and which are to be set aside for reuse.

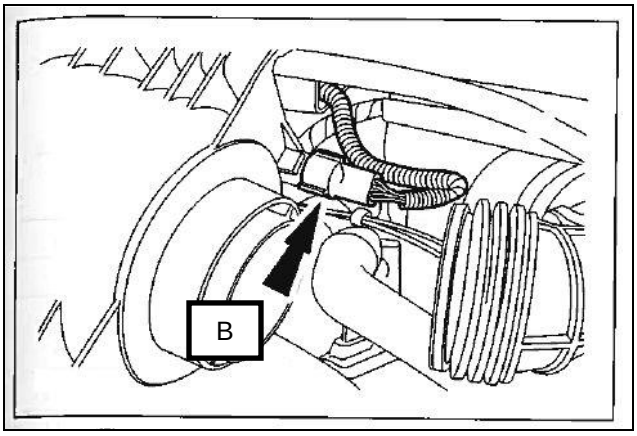
⚠ **Danger:** The fuel supply lines remain pressurized after engine shutdown. Keep away from heat, sparks, flames, static electricity or other sources of ignition. Do NOT enter storage areas or confined spaces unless they are adequately ventilated. Failure to heed this danger may result in severe personal injury or death.

⚠ **Danger:** Read and follow all applicable alert messages in the Ford manual. Failure to heed this danger may result in severe personal injury.

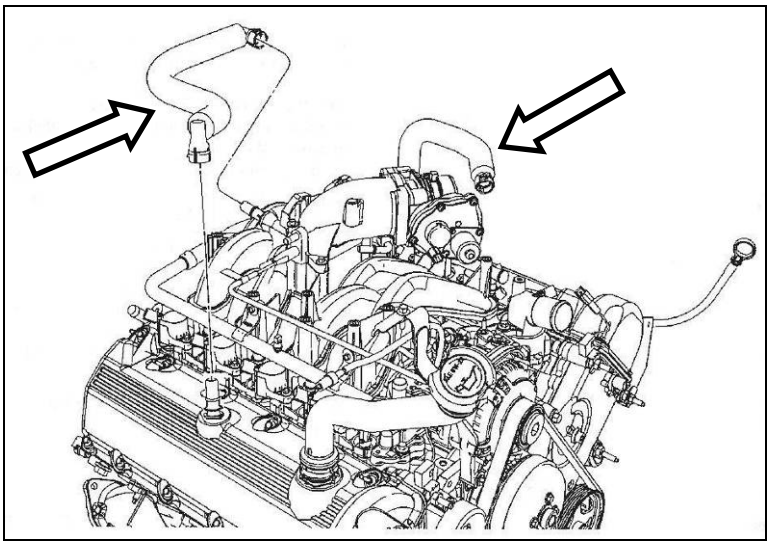
⚠ **Danger:** If not already done, disconnect the battery terminals from the battery.

1. Remove the engine cover (doghouse) located inside the vehicle to gain access to the top and rear of the engine.
2. Remove the air cleaner inlet assembly (A), disconnect the mass air flow (MAF) sensor connector (B) and remove the air cleaner cover. The upper radiator shroud will need to be removed for tool access. These components and fasteners will be reused.

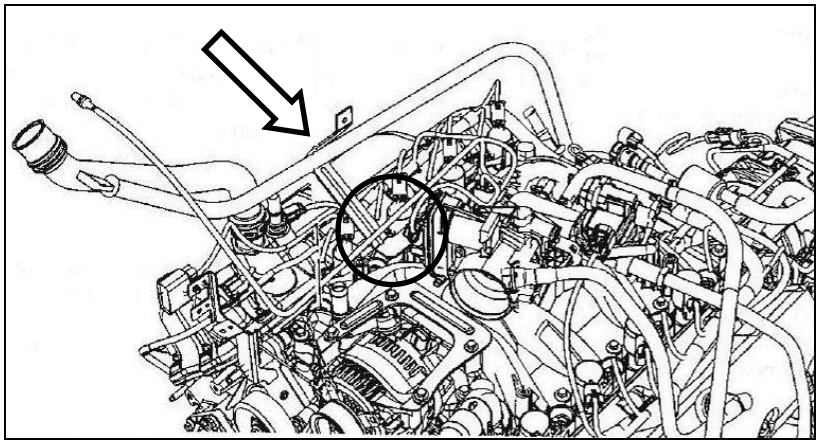




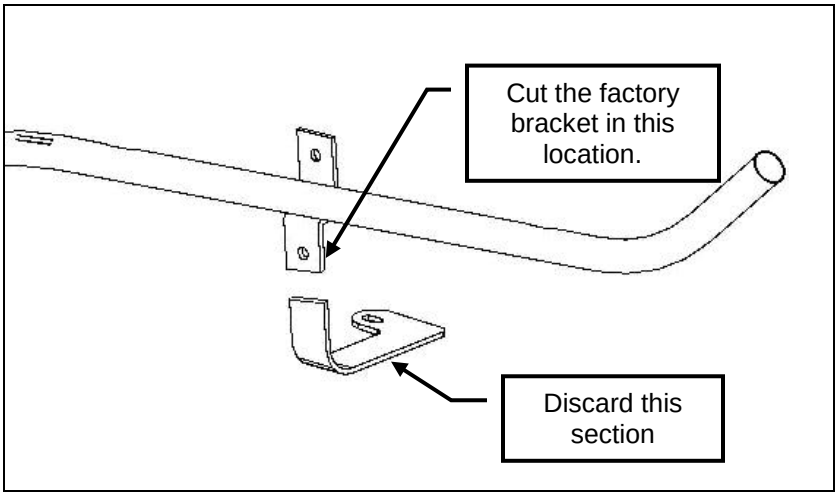
3. Disconnect the heater hose support bracket for additional working clearance. Set aside the bracket and fastener, they will be reused.
4. Disconnect and remove the PCV lines and tubes for additional working clearance. These lines and tubes will be reused.



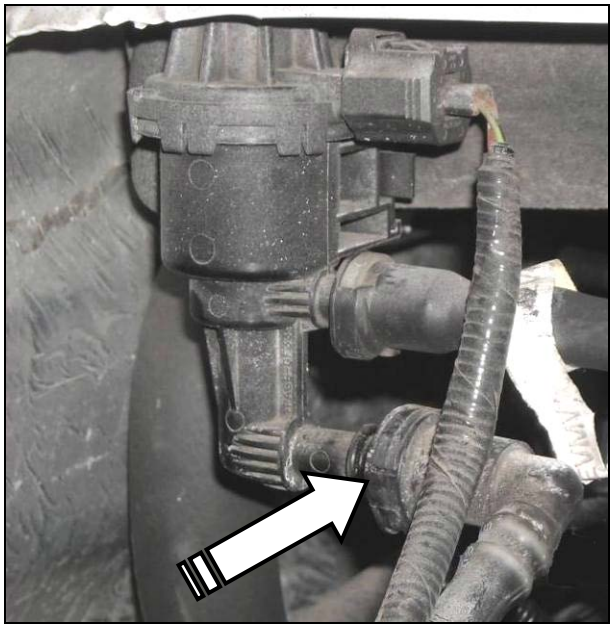
5. Remove the bolt that retains the transmission dipstick mounting bracket to the intake manifold. Do not remove the dipstick tube from the transmission. The following modification can be done in vehicle. Place a suitable cloth below the dipstick mounting bracket to cover engine components and catch metal cuttings and debris.



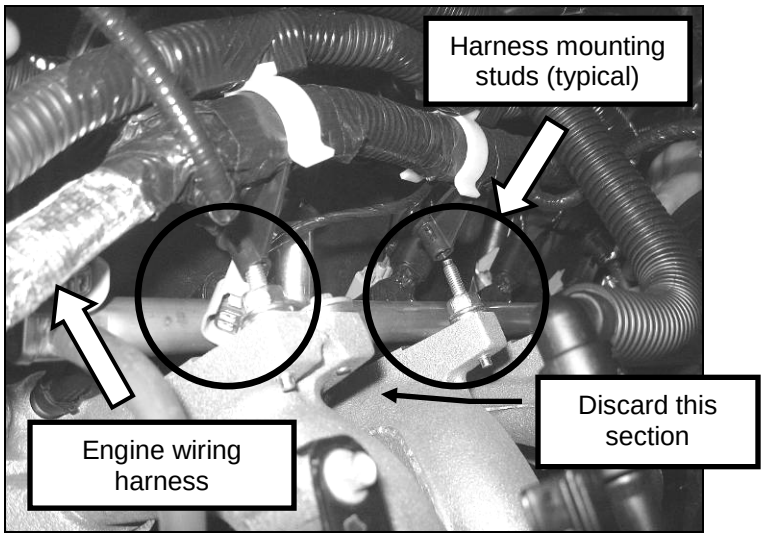
6. Modify the factory dipstick tube mounting bracket as shown. The cut line will be 12mm (1/2”) below the edge of the existing hole in the bracket. Deburr and apply a rust preventive coating to the newly cut edge of the bracket. ROUSH CleanTech suggests Motorcraft Premium Undercoating (PM-25-A).



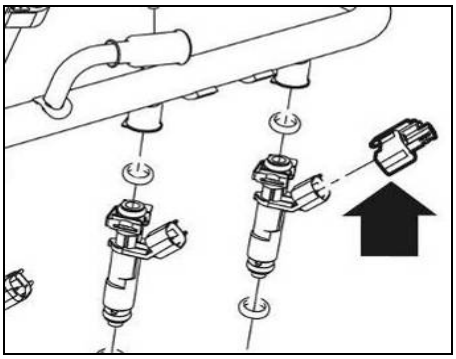
7. Disconnect the VMV tube from the VMV located at the left upper portion of the engine cover opening. It is not necessary to remove the VMV or disconnect the electrical connection.



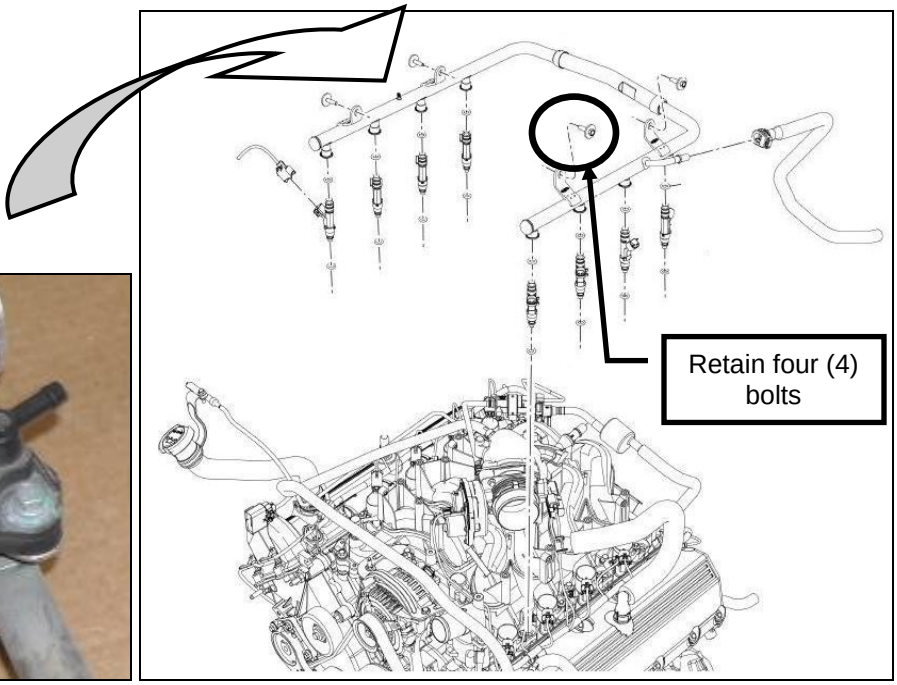
8. Carefully remove the engine wiring harness from the mounting studs that retain the harness. Let the harness rest on top of the valve covers.



9. Disconnect the engine wiring harness from all eight fuel injectors.



10. Disconnect the Ford harness connector from the IPTS. Disconnect the vacuum line from the IPTS.
11. Using a Ford-approved fuel line removal tool, disconnect the fuel supply line from the fuel rail. Remove and set aside the fuel rail and injectors. The rail and injectors will not be reused. Retain the fuel rail mounting fasteners. They will be repurposed in a later step.



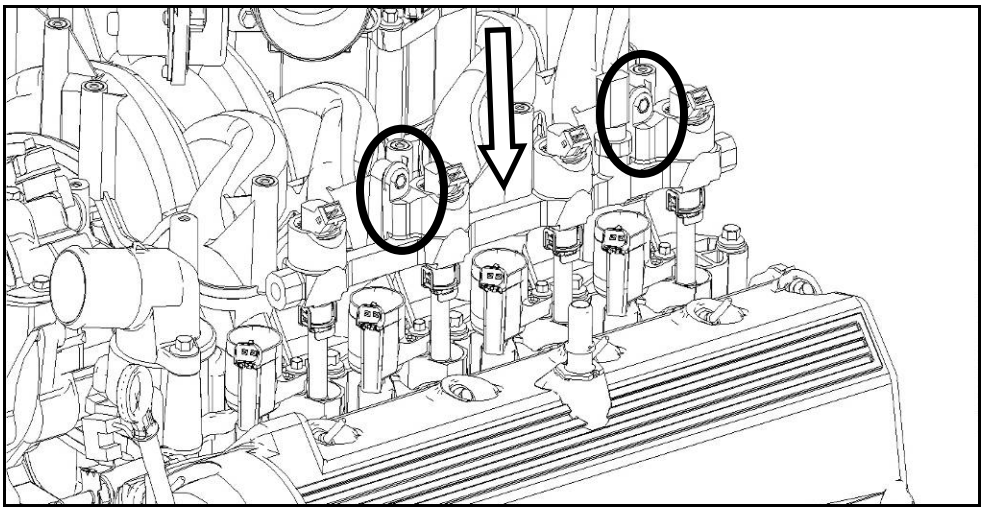
12. Remove the studs from the intake manifold that held the engine wiring harness. The studs will not be reused.

Installing the New Fuel Rail Assemblies

⚠ **Caution:** Hand tighten all fuel line connectors and fasteners before applying a wrench to avoid cross threading. Failure to heed this caution may result in property damage.

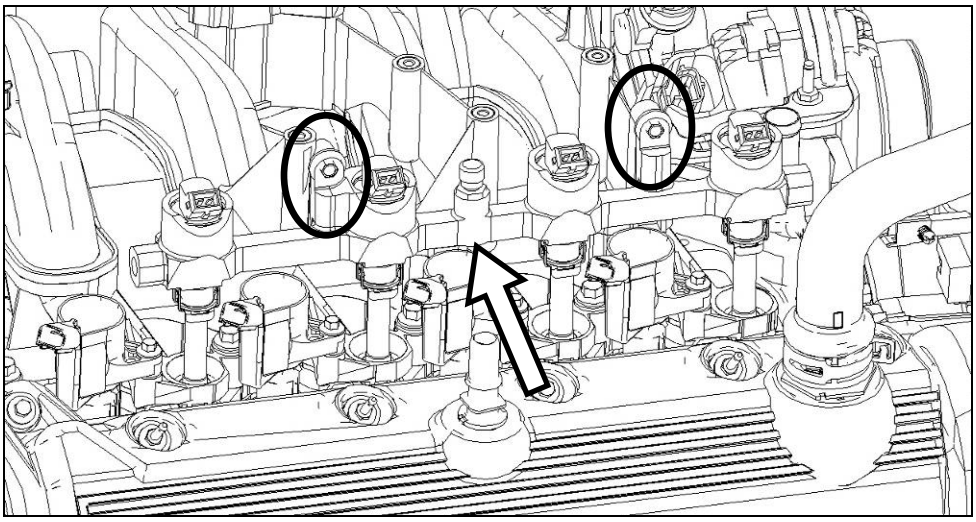
1. Using engine oil (Motorcraft SAE 5W-20 or equivalent), lubricate the lower O-rings on the injector nozzles before seating the rail assemblies into the intake manifold injector pockets.
2. Position the Left Hand Fuel Rail Assembly (P10C2-9F899-A) onto the driver side of the intake manifold and fully seat the nozzles. Using two (2) M6 x 1 x 20 bolts (W500214-S437) found in Hardware Kit A (PBC2-HKA-A), secure the LH fuel rail to the intake manifold. Carefully install bolts by hand to avoid cross-threading; then, tighten bolts to 8–12 Nm.

⚠ **Caution:** Make sure the nozzles are correctly aligned before seating. Failure to heed this caution could result in serious property damage.

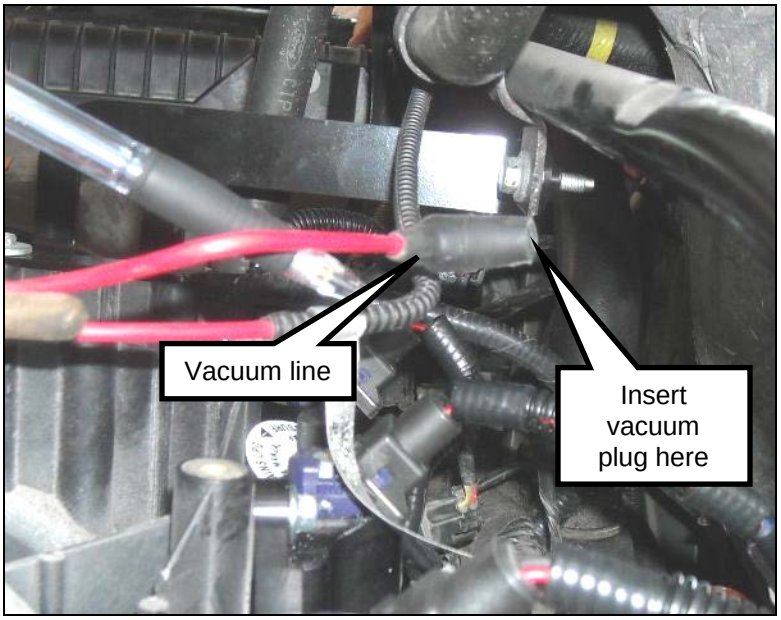


3. Position the Right Hand Fuel Rail Assembly (P10C2-9F899-B) onto the passenger side of the intake manifold and fully seat the nozzles. Using two (2) M6 x 1 x 20 bolts (W500214-S437) found in Hardware Kit A (PBC2-HKA-A), secure the RH fuel rail to the intake manifold. Carefully install bolts by hand to avoid cross-threading; then, tighten bolts to 8–12 Nm.

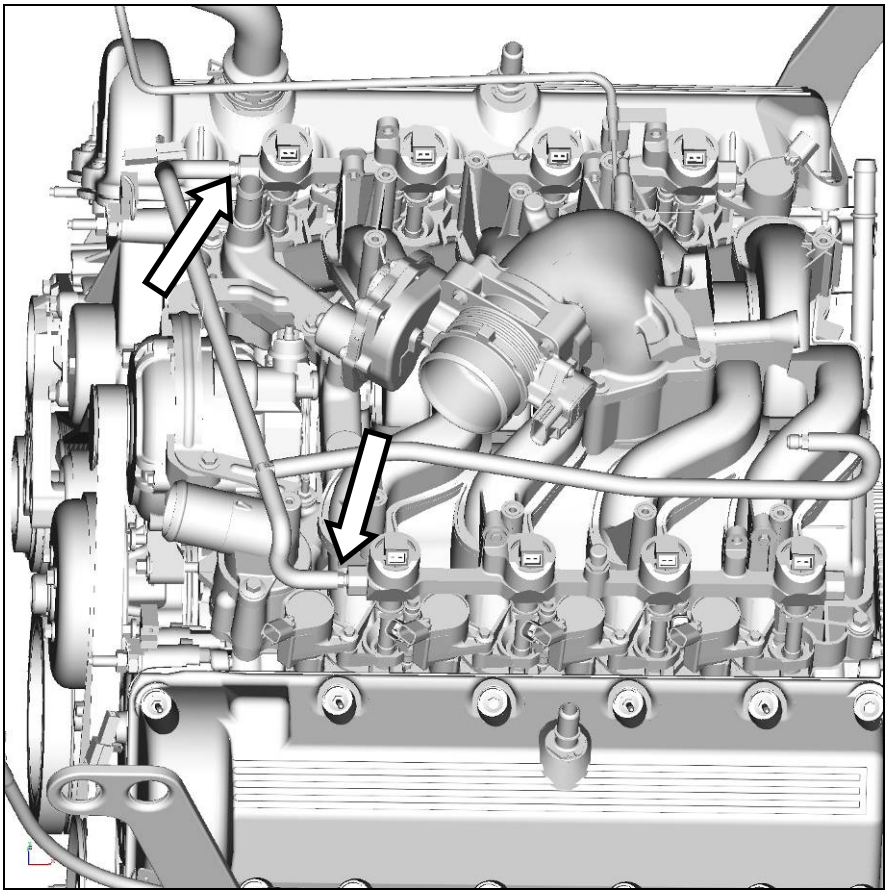
⚠ **Caution:** Make sure the nozzles are correctly aligned before seating. Failure to heed this caution can result in serious property damage.



4. Obtain the Vacuum Plug (P19119A), which is part of Hardware Kit A (PBC2-HKA-A), and install the plug into the disconnected vacuum line (from Ford IPTS).

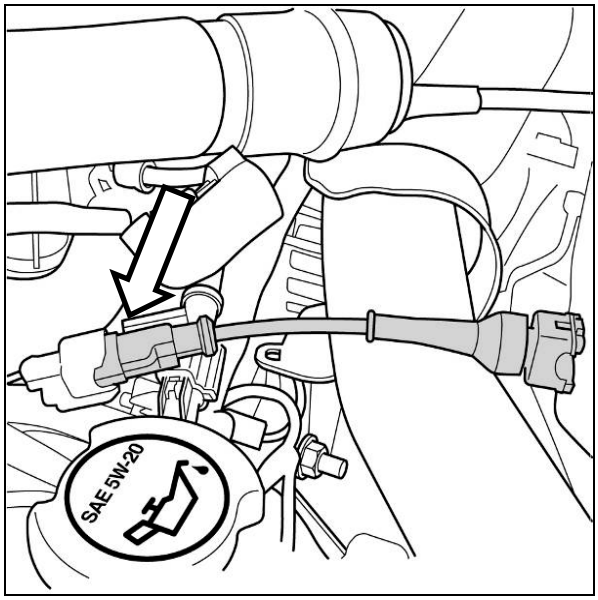


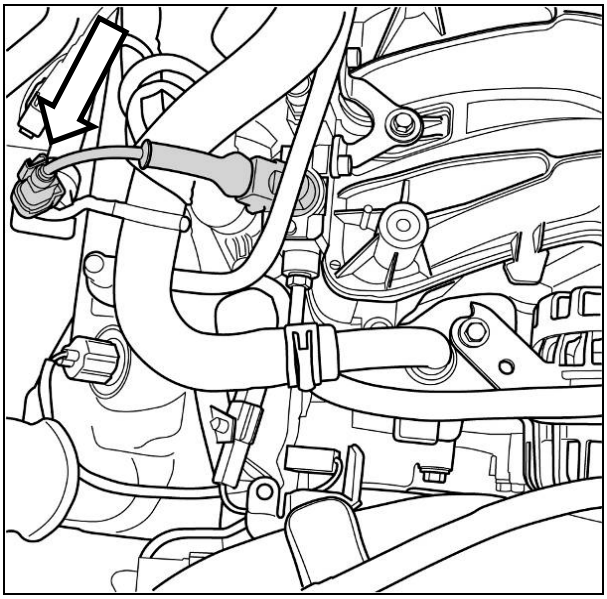
5. Orient and install the Fuel Return Line and Tee Assembly (P07C2-9E965-A) onto the forward ends of the fuel rails. Tighten the connections to 18–22 Nm. The rear connection (fuel supply line and tee assembly) will be done after the FRPCM is installed.



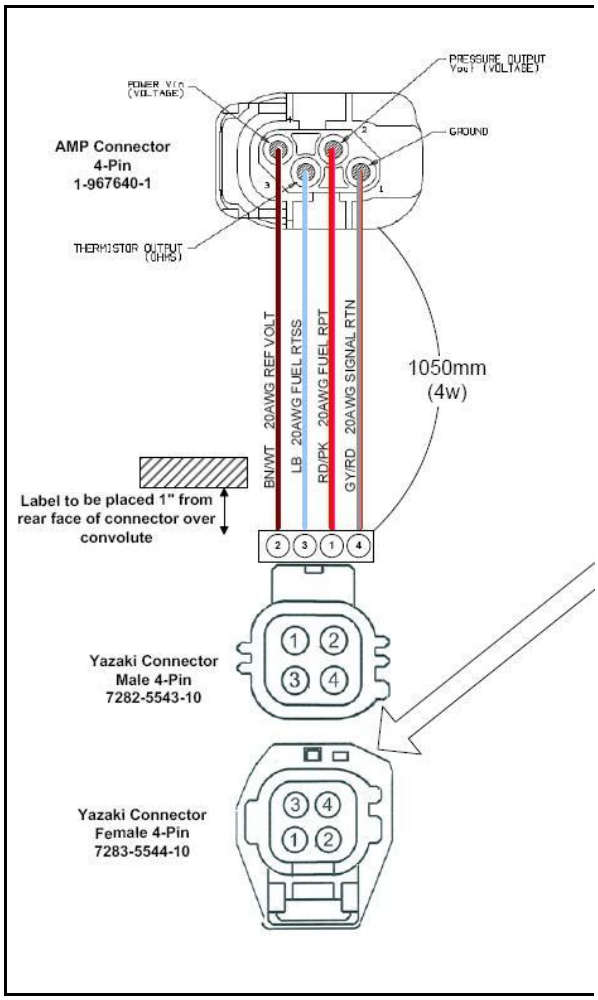
6. Connect one (1) Fuel Injector Jumper (P07L3-9C978-A) to each original harness connector (8 places). The fuel injector jumpers can be found in Hardware Kit F (PBC2-HKF-A). Connect the opposite end of each jumper to its respective fuel injector.

⚠ **Caution:** Make sure that each jumper attaches to its correct mating connector to avoid cross wiring. Failure to heed this caution will result in engine malfunction and possible property damage.

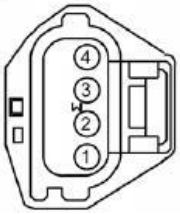




7. Obtain the IPTS Jumper Harness (P07C2-9C062-A). In this application the Ford engine electrical harness connector is different than the IPTS jumper harness connector. The Ford connector for the sensor must be de-pinned from the harness wires and replaced with the appropriate ROUSH CleanTech IPTS 4-pin female connector that comes with the jumper harness.
8. De-pin the original Ford IPTS sensor connector and retain all seals and locks. Use the seals and locks in the new connector as you transfer the pins and terminals.
   - Insert pin-1 terminal with the RD/PK wire (from Ford harness) into the back side of cavity 1 of the new connector.
   - Insert pin-2 terminal with the BN/WH wire (from Ford harness) into the back side of cavity 2 of the new connector.
   - Insert pin-3 terminal with the LB wire (from Ford harness) into the back side of cavity 3 of the new connector.
   - Insert pin-4 terminal with the GY/RD wire (from Ford harness) into the back side of cavity 4 of the new connector.



Base Ford E-350 Fuel Rail Pressure And Temperature (FRPT) Sensor Connector

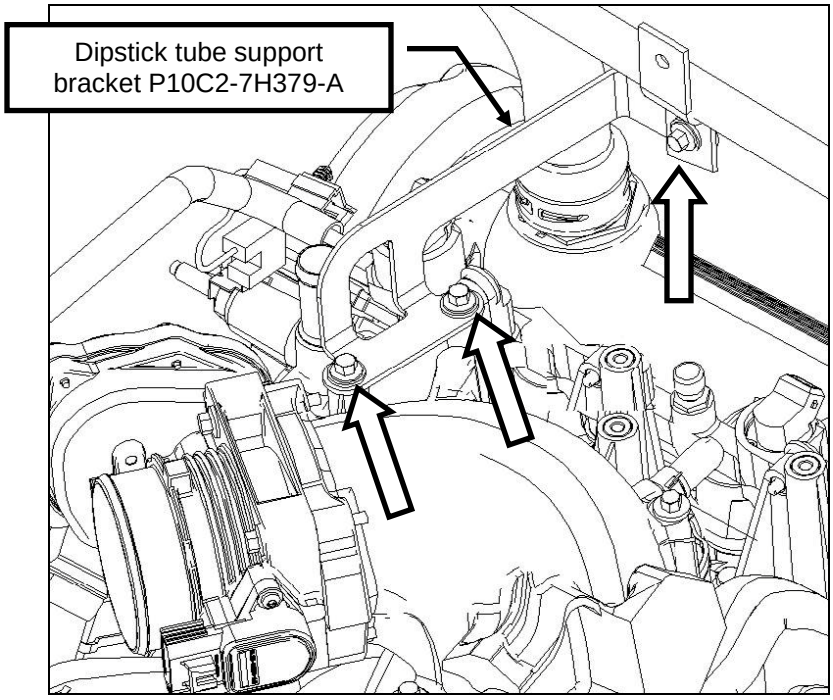


Pin	Circuit	Gauge	Circuit Function
1	141 (RD-PK)	20	Fuel rail pressure transducer
2	351 (BN-WH)	20	Reference voltage
3	1164 (LB)	20	Fuel rail temperature sensor signal
4	359 (GY-RD)	20	Signal return

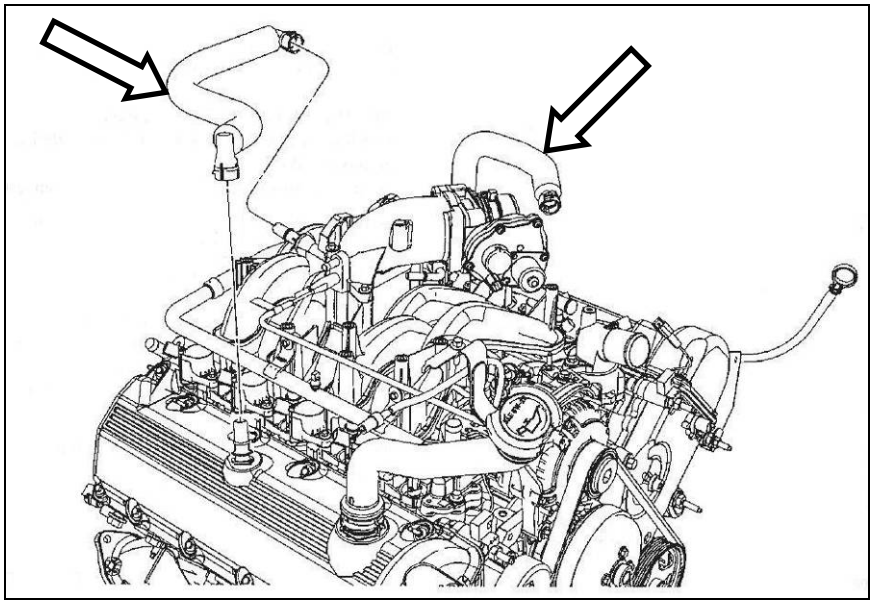
OEM Ford IPTS Harness to be de-pinned and terminals inserted into Yazaki Connector Female 4-Pin 7283-5544-10

9. Connect the IPTS jumper harness to the IPTS on the left hand fuel rail. Route the jumper along the intake manifold. Connect the harness end of the jumper to the Ford engine electrical harness connection point for the sensor.

10. Install the Transmission Dipstick Tube Support Bracket (P10C2-7H379-A) found in Hardware Kit A (PBC2-HKA-A) to both the intake manifold and previously modified transmission dipstick mounting bracket using three (3) take off M6 fuel rail mounting fasteners in the locations shown. Tighten to 8–12 Nm.



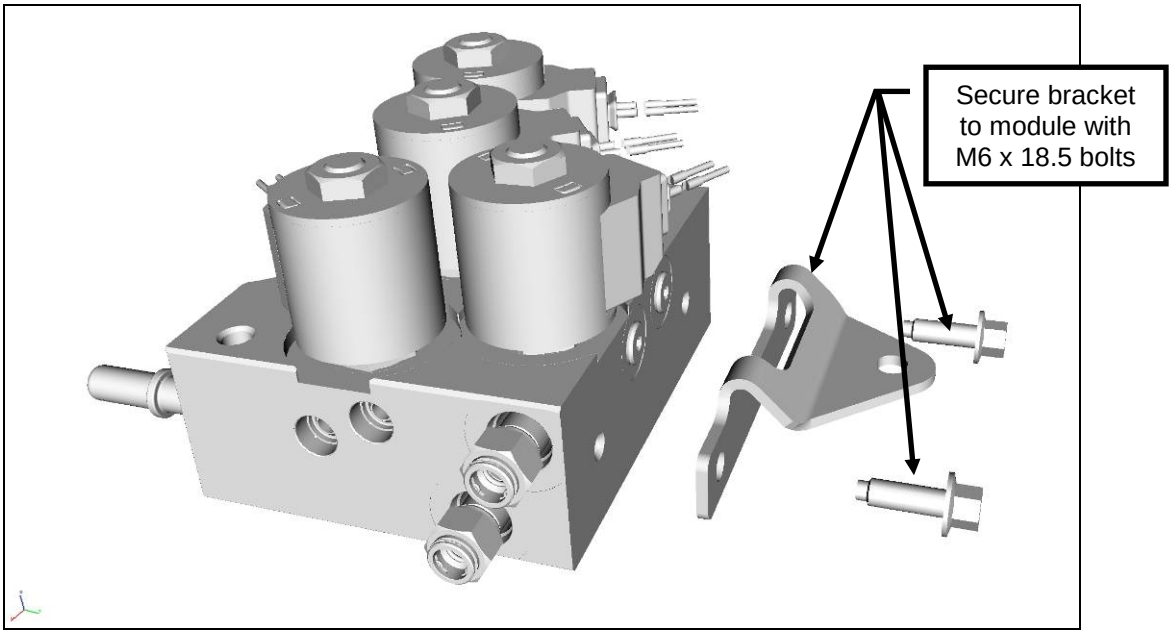
11. Reinstall the PCV Hoses that were previously removed for added accessibility.



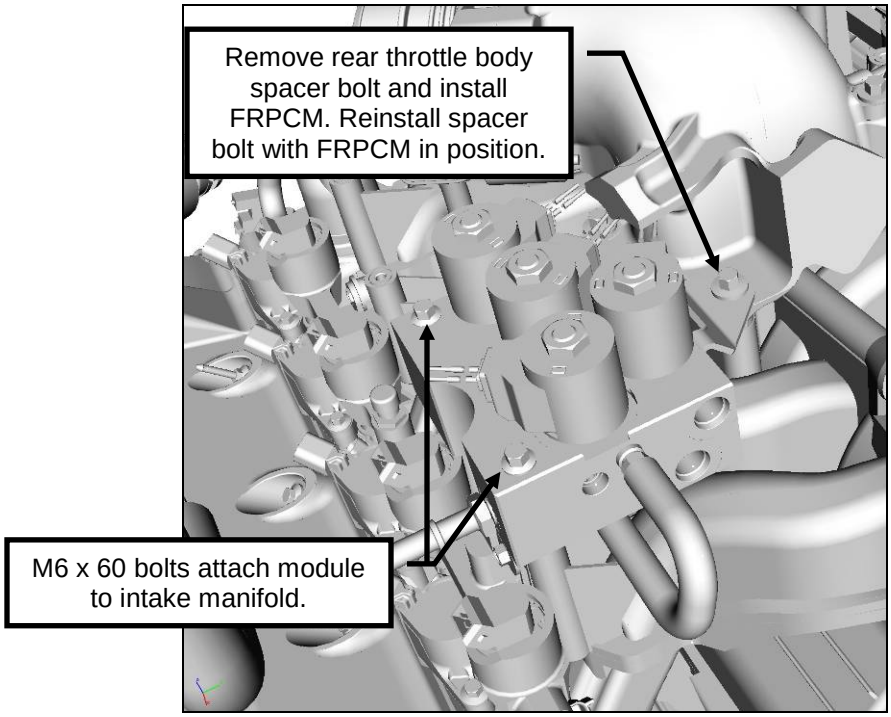
Mounting the Fuel Rail Pressure Control Module (FRPCM)

⚠ **Caution:** Hand tighten all fuel line connectors and fasteners before applying a wrench to avoid cross threading. Failure to heed this caution can result in property damage.

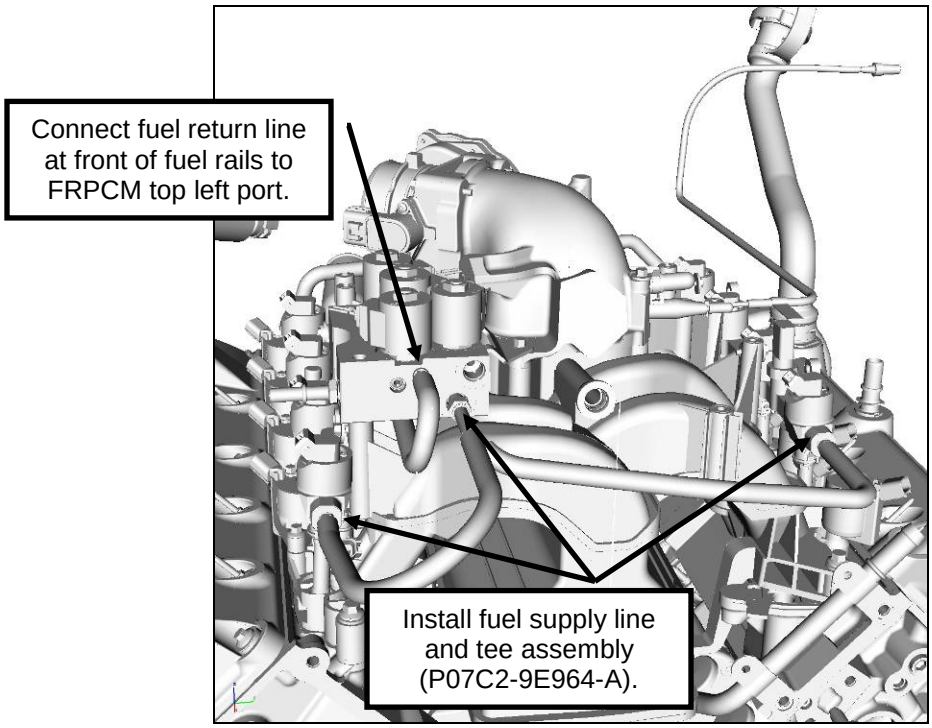
1. Install the FRPCM-to-Intake (throttle body) Bracket (P07C2-9E360-A) onto the FRPCM using the two (2) M6 x 1.0 x 18.5 mm bolts (W500213-S437) as shown. Tighten the bolts to 8–12Nm. These parts can be found in Hardware Kit E (PBC2-HKE-A).



2. Remove and retain the left-rear throttle body spacer-to-intake manifold bolt. Position the FRPCM onto the two vertical bosses located on the left rear corner of the intake manifold. Loosely install two (2) M6 x 1.0 x 60 bolts (W709552-S437), found in Hardware Kit E (PBC2-HKE-A) to secure the FRPCM to the intake manifold. The mounting bracket should now be aligned with the rear left throttle body spacer mounting hole. Reinstall the throttle body spacer bolt. Tighten all bolts to 8–12 Nm.

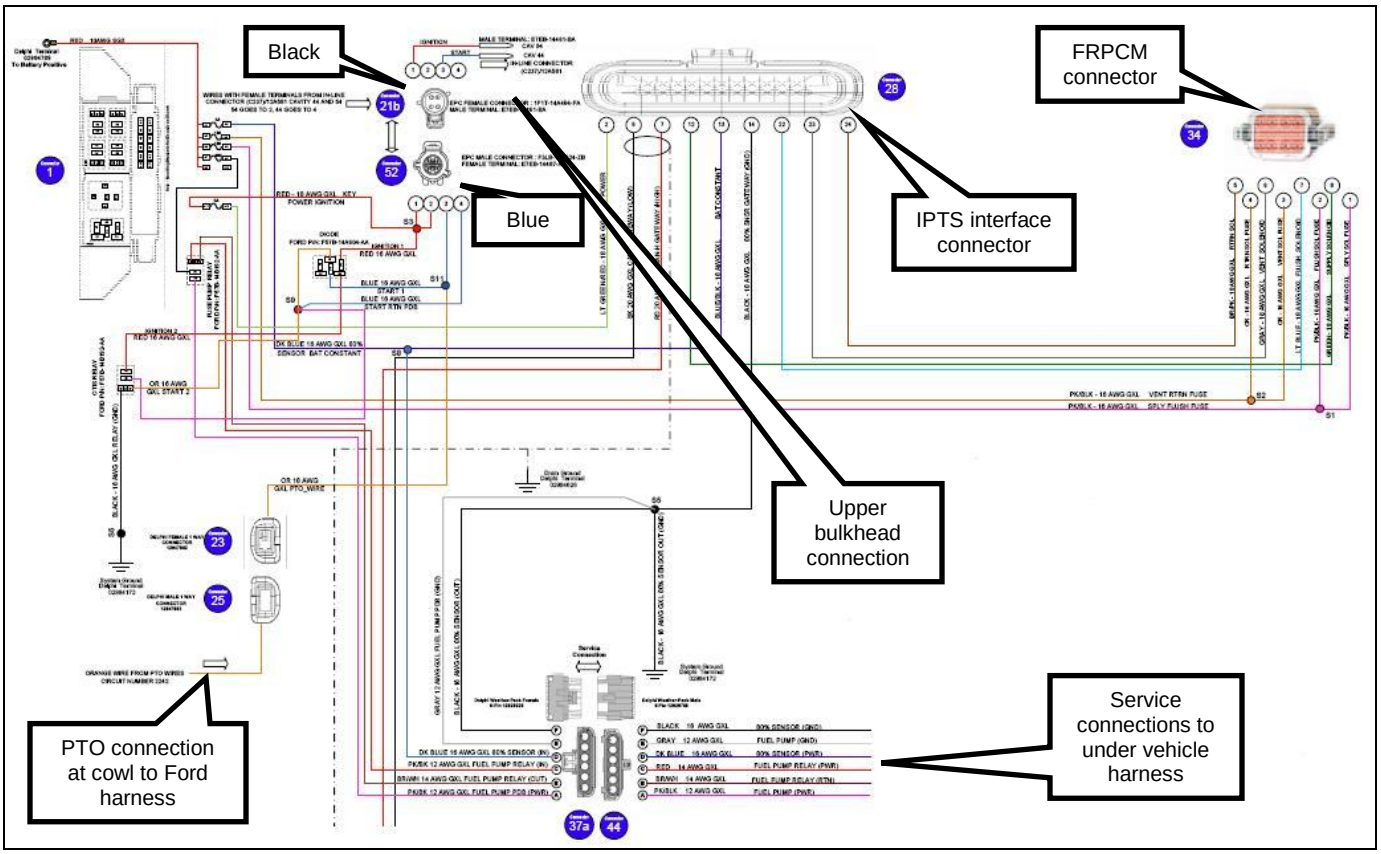


3. Install the Fuel Return Line and Tee Assembly (P07C2-9E965-A) into the top left port on the FRPCM. Tighten the line fitting to 18–22 Nm.
4. Install the Fuel Supply Line and Tee Assembly (P07C2-9E964-A) between the left and right fuel rails and the bottom right port on the FRPCM. Tighten the line fittings at the fuel rails to 18–22 Nm. Push the quick-connect fitting into the FRPCM until it clicks into place. Firmly pull on the fitting to make sure it is locked in place.

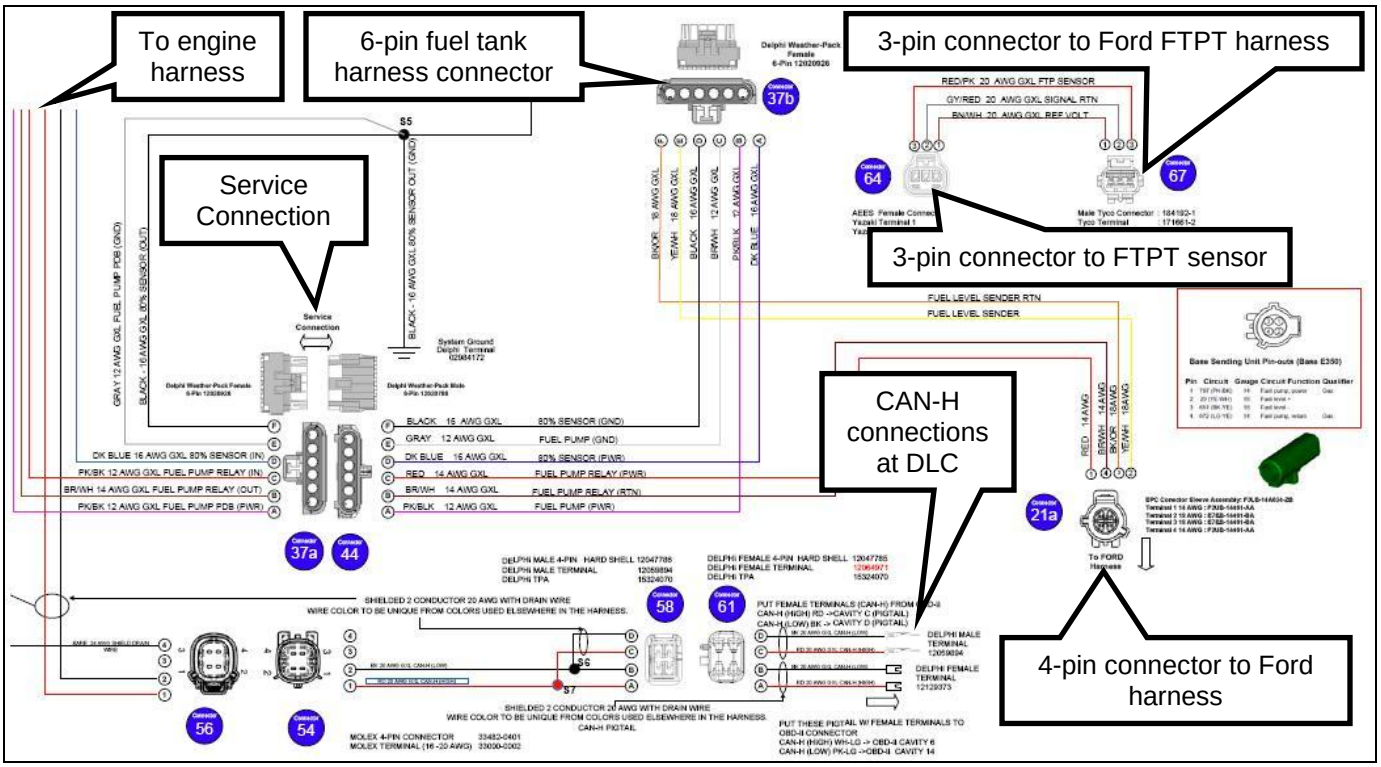


Installing the New Wiring Harness

Note: A graphic representation of the ROUSH CleanTech vehicle main wiring harness assembly (P08C2-3075-A) is shown. We recommend reviewing the two illustrations and becoming familiar with each connector along with its corresponding location on the vehicle prior to installation.

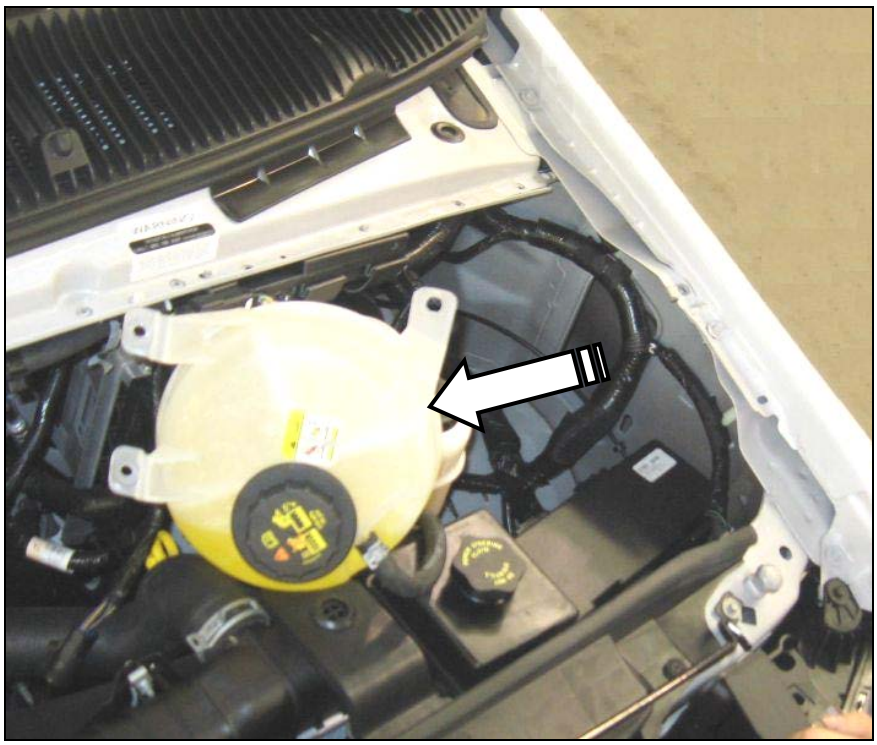


Main Vehicle Wiring Harness — Engine Compartment Connections



Main Vehicle Wiring Harness — Passenger Compartment and Under Vehicle Connections

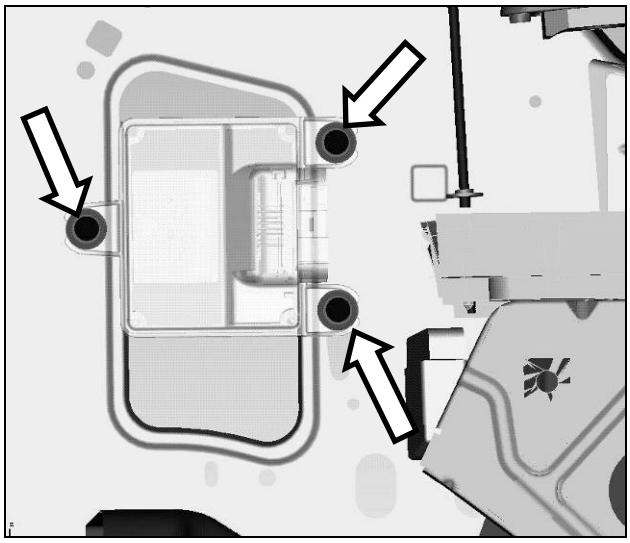
1. Remove and retain the three (3) degas bottle mounting fasteners and lay the degas bottle on its side on top of the brake master cylinder area as shown.



2. Remove the Ford wiring harness conduit (at inner fender) by clipping two (2) zip ties and removing two (2) bolts. Discard the conduit.

3. Position the IPTS Interface Module (P10C2-12A650-A) onto the inner fender in the position shown and mark to drill three holes, if needed. Drill the holes in the location shown and, using three (3) #12-14 x 1.5” self-tapping screws (91324A582) found in Hardware Kit F (PBC2-HKF-A), secure the module to the inner fender.

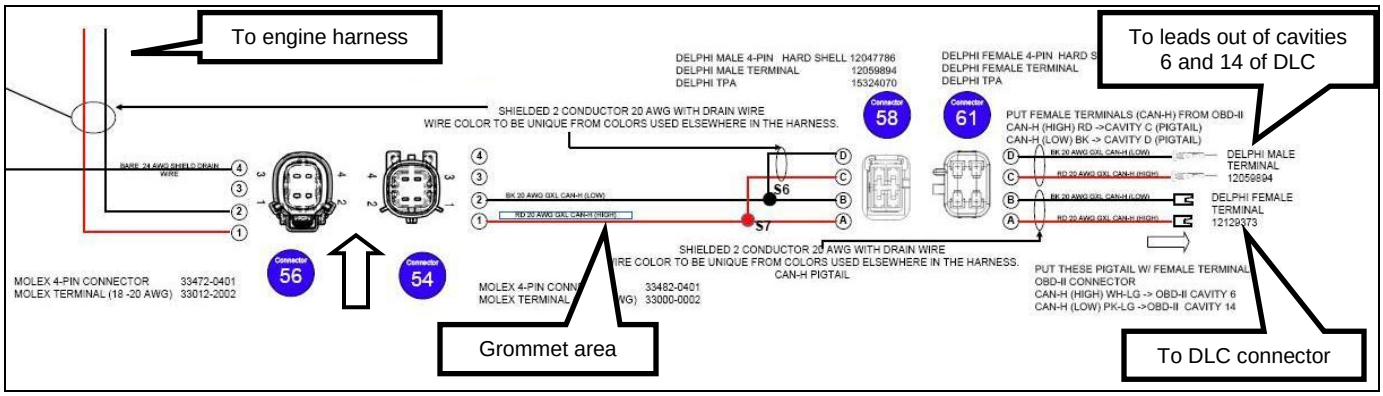
Note: It may be necessary to remove the wiring harness push pins/retainers from the inner fender to gain access to this area. Once the module is installed, reinstall the push pins/retainers to secure the wiring to the inner fender if necessary.



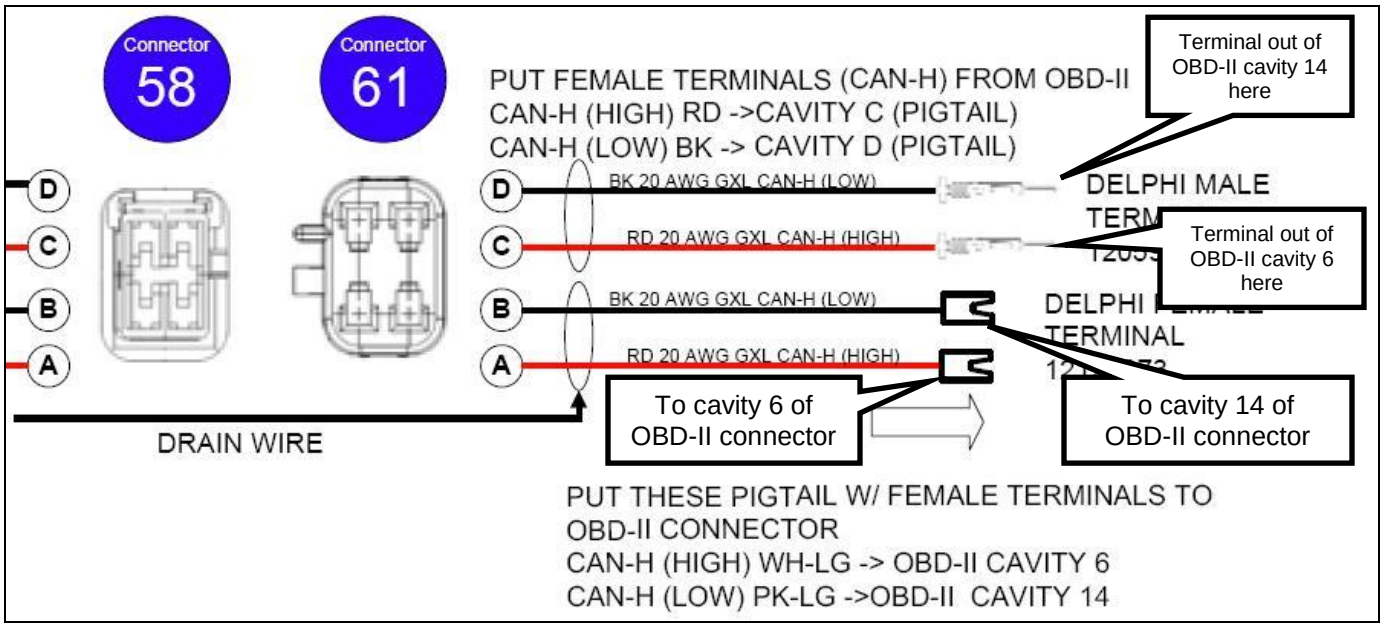
4. Drill a 29 mm (1-1/8”) hole in the dash panel to the right of the master cylinder and main wiring pass-through in the location shown (indent in sheet metal).

⚠ **Caution:** Use care when drilling to avoid damaging the wiring harness in the cab interior behind the panel. Use a 29 mm hole saw with a pilot bit extending NO MORE than 1/2-inch beyond the saw teeth and push the drill no deeper than what is necessary to cut through the metal panel.

5. Disconnect the 4-pin connector C54 from the main wiring harness connector C56 so that this portion of the harness can be routed from inside the passenger compartment under the dash panel and eventually through the newly drilled hole. This portion of the harness includes C54, shielded 2-conductor harness with drain wire, convolute covering, 4-pin connectors C58 and C61 and four (4) CAN-H pigtail wires, two with female terminals and two with male terminals.



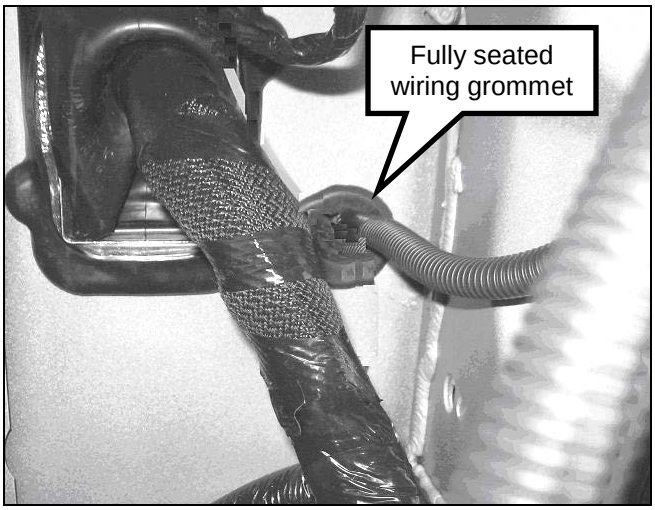
6. From inside the passenger compartment, remove the closeout panel below the steering wheel/column to gain access to the area where the wiring harness is to be installed.
7. Route the end of the wiring harness with the four (4) CAN-H pigtail wires under the dash area to the OBD-II data link connector (DLC). Route the C54 connector and grommet end of the wiring harness over to the newly drilled hole in the dash panel.
8. Disconnect wiring harness connectors C58 and C61 (four pigtail wires with two female terminals and two male terminals). Perform steps 9 and 10 to connect into the OBD-II DLC.
9. Working behind the OBD-II DLC, remove pin 6 terminal from the connector and plug it onto the ROUSH CleanTech harness lead with male terminal C (RD CAN-H High). Insert the female terminal with the CAN-H (High) RED wire of the ROUSH CleanTech harness into cavity 6 of the OBD-II DLC.
10. Working behind the OBD-II DLC, remove pin 14 terminal from the connector and insert it onto ROUSH CleanTech harness lead with male terminal D (BK CAN-H Low). Insert the female terminal with the CAN-H (Low) BLACK wire of the ROUSH CleanTech harness into cavity 14 of the OBD-II DLC.



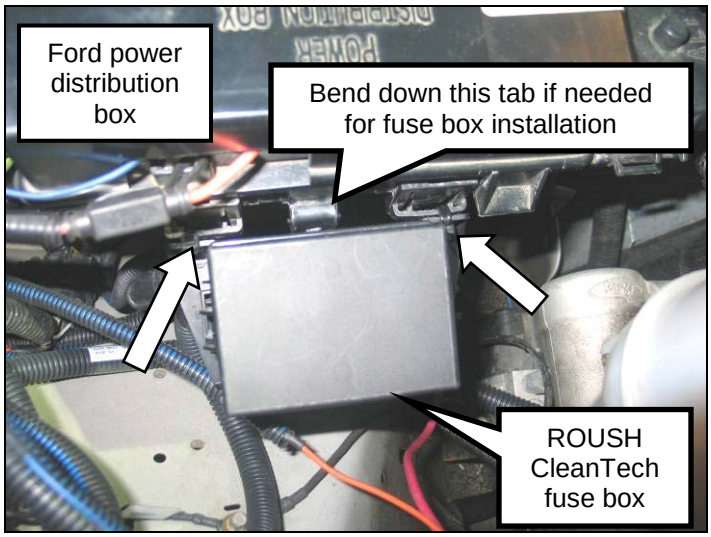
11. Reconnect wiring harness connectors C58 and C61. Verify wires and terminals are properly inserted and locked into place.
12. Route the wiring harness away from any sharp edges, pedal assemblies or switches and secure the harness using zip ties (1A868) which can be found in Hardware Kit F (PBC2-HKF-A).

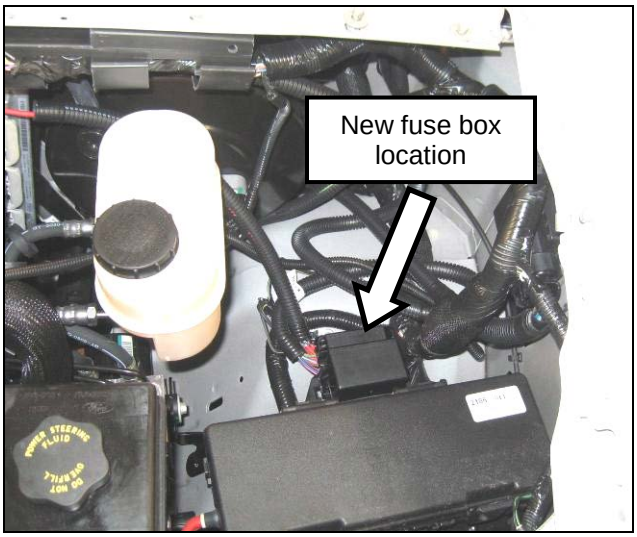
13. From inside the passenger compartment, beside the fuse panel to the left of the accelerator pedal, carefully pass the end of the harness through the dash panel until the grommet is properly seated in the newly drilled hole.

Note: After passing the wiring through the dash panel, you must re-connect this harness to the rest of the ROUSH CleanTech vehicle main wiring harness to be installed next.

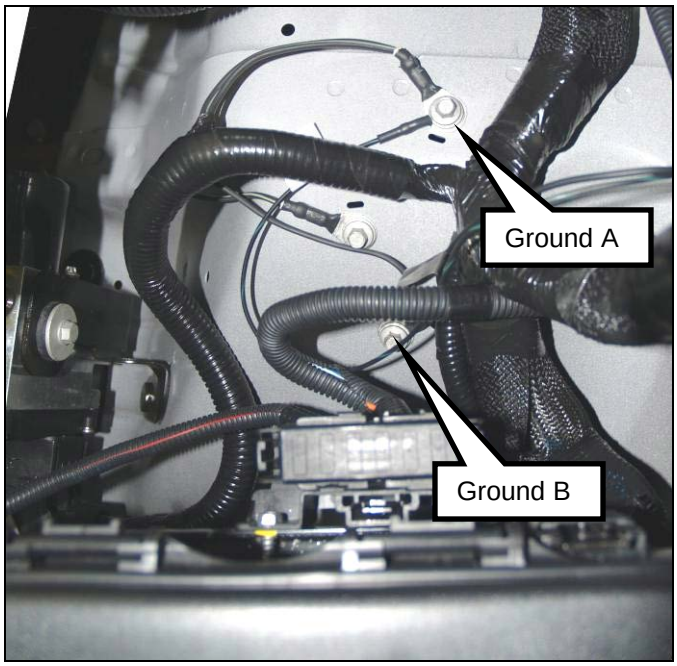


14. Position the closeout panel under the dash below the steering wheel/column, install the fasteners and tighten the fasteners to secure the panel.
15. Position the “fuse box” portion of the ROUSH CleanTech Vehicle Main Wiring Harness Assembly (P08C2-3075-A) onto the back side of the Ford power distribution box. Secure the ROUSH CleanTech fuse box to the Ford power distribution box plastic bracket lugs using two (2) zip ties as shown.

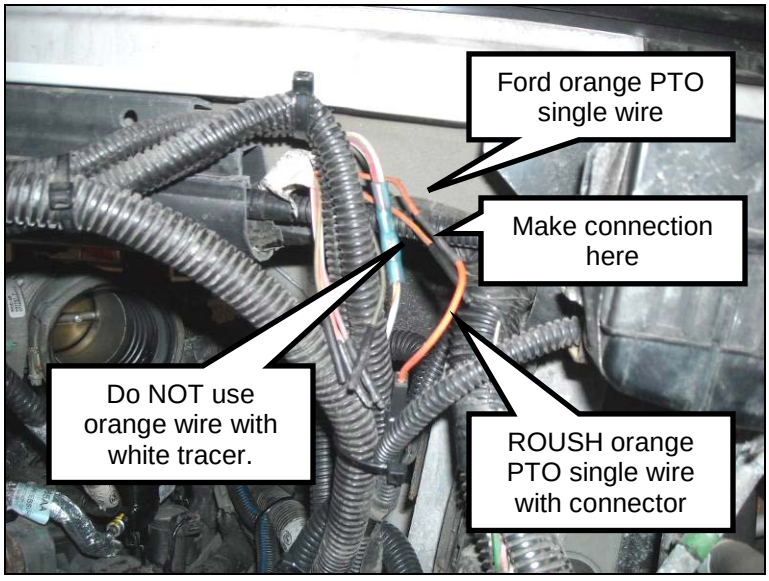




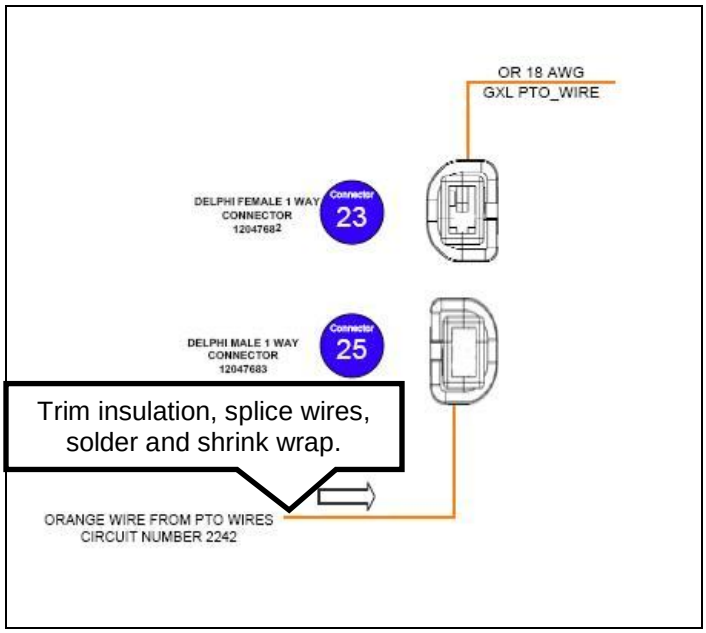
16. Make the connection between the ROUSH CleanTech vehicle main wiring harness and the ROUSH CleanTech IPTS interface module on the inner fender. Reconnect the under dash section of the harness that passes through the dash panel to the main wiring harness.
17. Secure the wiring harness system ground eyelet “A” to the existing ground location found rear of fuse box on the inner fender as shown. Secure the second wiring harness shield ground eyelet “B” in the other ground location.



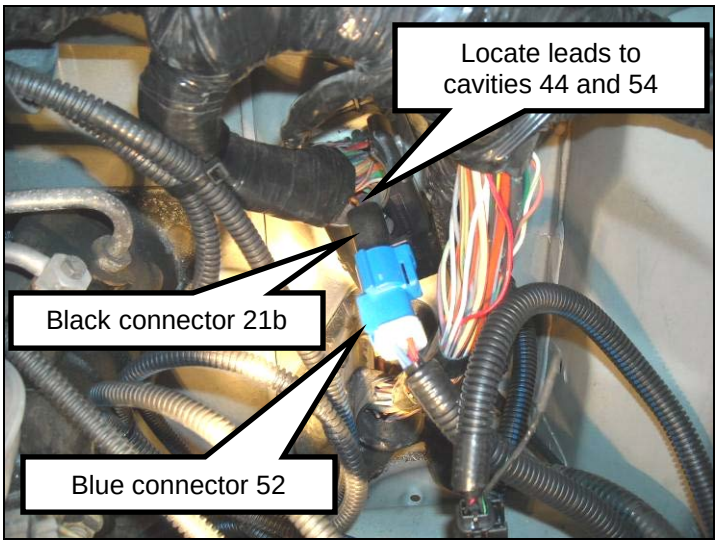
18. Locate the Ford harness along the cowl at the back of the engine compartment opening to the left. Under the wiring loom, separate the harness to locate the Ford orange PTO shrink-wrapped single wire.



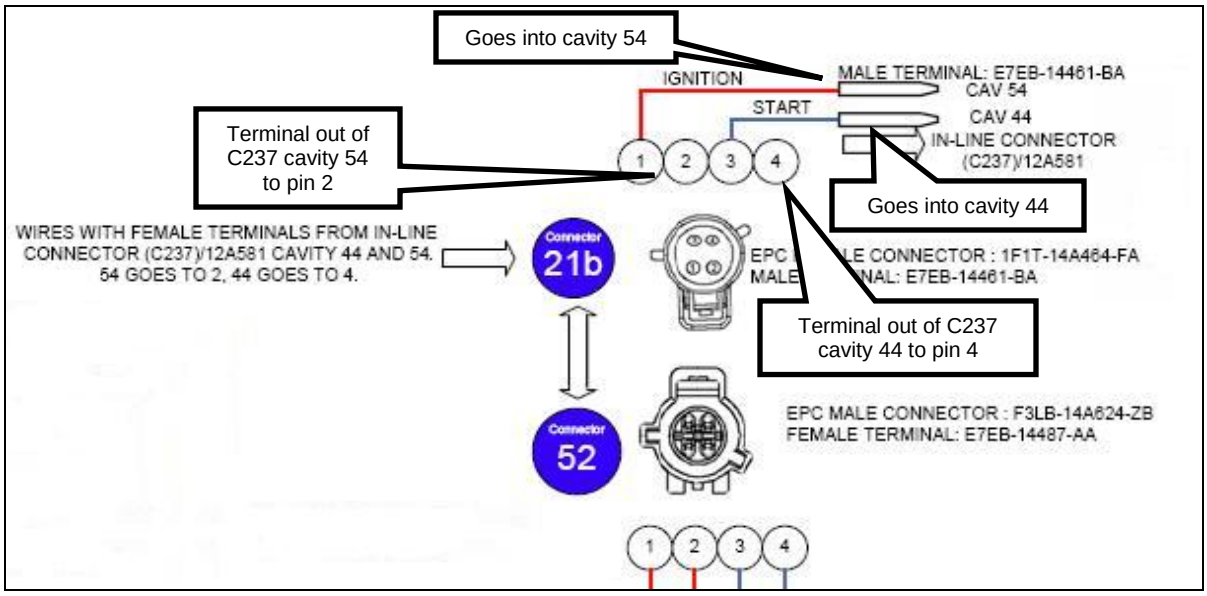
19. Unplug connector 25 of the ROUSH CleanTech main wiring harness from connector 23. The connector has the single orange wire with no terminal.
20. Remove the shrink wrap from the Ford orange wire. Cut the orange wire insulation back as well as the insulation from the ROUSH CleanTech single wire lead. Place a piece of shrink wrap over one of the wires. Splice the two single orange wires together. Solder the connection and after cool, move the shrink wrap over the spliced area and heat until tight over the splice.
21. Plug connecter 25 into connecter 23 of the ROUSH CleanTech main wiring harness to complete this connection.



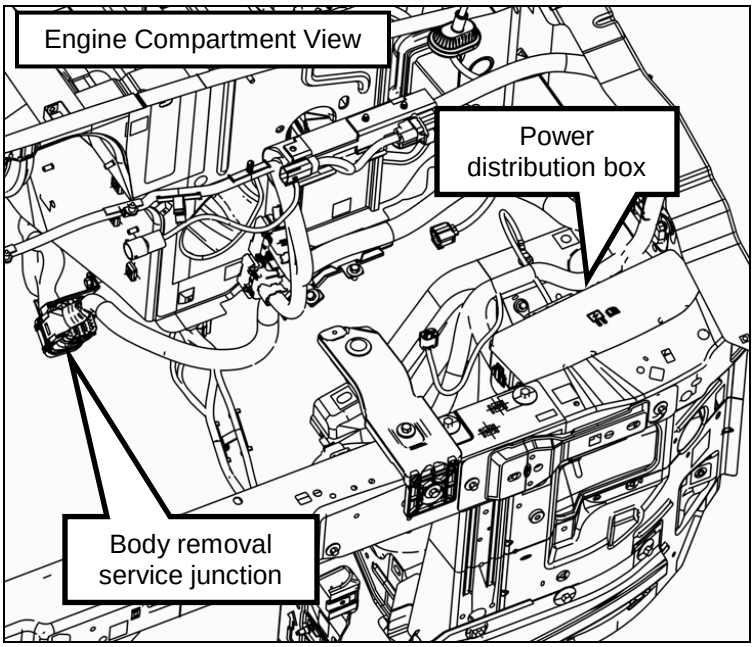
22. Unplug ROUSH CleanTech black connector 21b from blue connector 52 of main wiring harness.
23. Locate the Ford C237 connector harness at upper bulkhead connection. Locate the 2–3 inch leads going to cavities 44 and 54 of Ford C237.



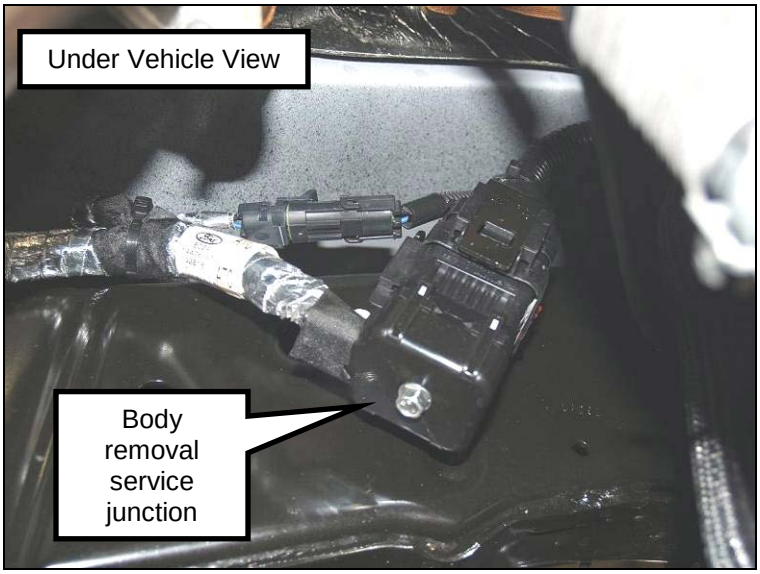
24. Remove pin 44 terminal out of Ford C237 cavity 44 and plug the pin terminal into the back of the ROUSH black connector 21b at cavity 4.
25. Remove pin 54 terminal out of Ford C237 cavity 54 and plug the pin terminal into the back of the ROUSH black connector 21b at cavity 2.



26. Plug the ROUSH CleanTech black connector 21b into the blue connector 52 of the main wiring harness to complete this connection.
27. Connect the new wiring harness battery positive eyelet to the positive terminal on the battery. Route the ROUSH CleanTech battery positive wire over to the vehicle battery along the existing Ford harness wires.
28. Route the two breakouts (6-pin and FRPCM) of the harness toward the engine along the cowl/dash panel below the brake booster. Route the break out with the 6-pin service connection behind the engine and back toward the left (driver side) frame rail, following the Ford chassis harness.
29. Route the FRPCM connector along the side of the Ford engine wiring harness on the left side of the engine. Plug the FRPCM harness connector into the FRPCM.



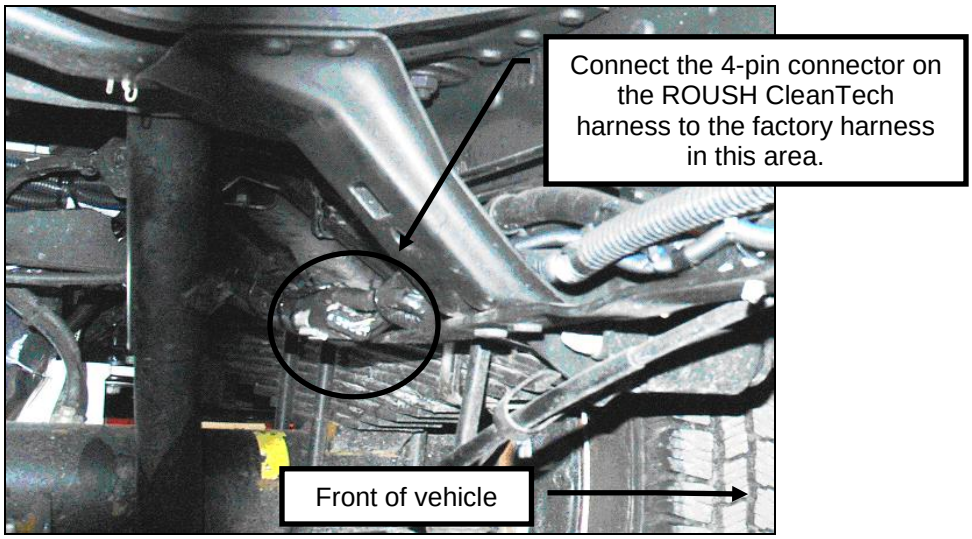
Note: Make sure that the ROUSH CleanTech main wiring harness is routed away from the exhaust pipes, manifolds, catalytic converters and exhaust heat shields.



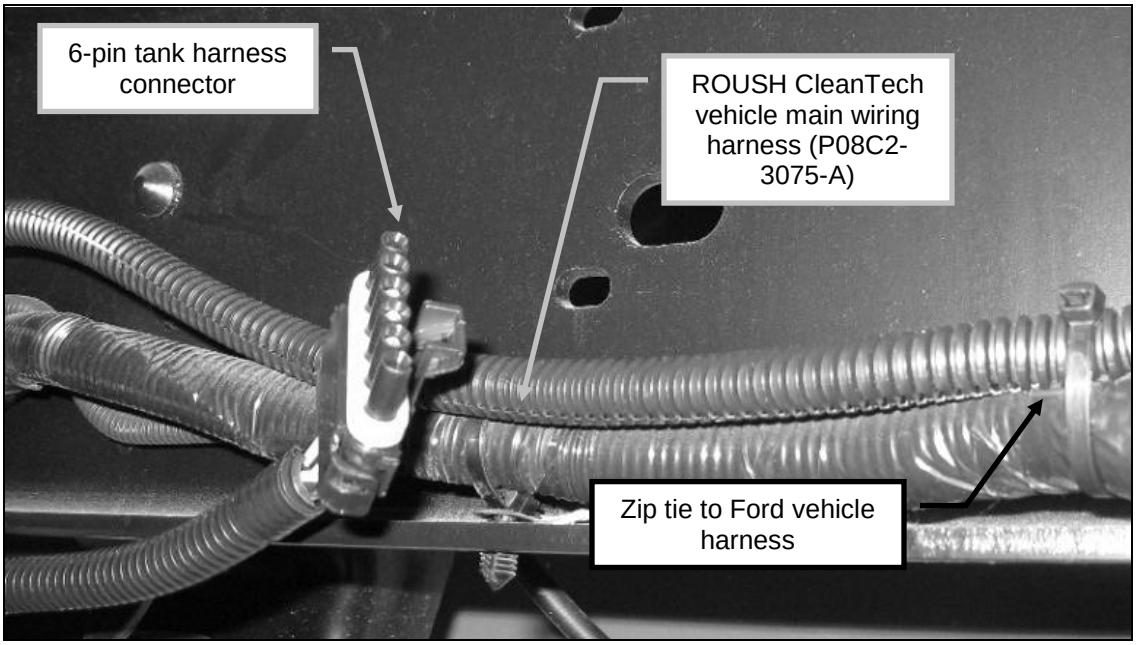
30. Reinstall the degas bottle using the three (3) fasteners. Tighten the fasteners to 8–12 Nm.

Note: It is recommended to route the entire harness and make all connections prior to retaining the harness with zip ties. Retaining the wire harness with zip ties is the final step of the wiring harness install.

31. Connect the 6-pin service connector to its mating connector on the rear part of the harness. Extend the harness rearward along the Ford chassis harness. Use zip ties found in Hardware Kit F (PBC2-HKF-A) to secure the harnesses to each other. Plug the 3-pin connector into the FTPT sensor behind the vapor canister. Continuing rearward behind the rear suspension plug 3-pin FTPT connector to the Ford harness. Plug the 4-pin connector into the fuel pump/sender connector of the Ford vehicle harness (This connection was unplugged when the original gasoline fuel tank was removed from the vehicle.) Route the factory harness back towards the front of the vehicle as necessary to make this connection.



32. Use zip ties found in Hardware Kit F (PBC2-HKF-A) to secure the harness to the main body harness. The only connection not made yet will be the 6-pin connector that connects the ROUSH CleanTech vehicle main wiring harness to the fuel tank. The 6-pin connection will be made after the tank is installed.

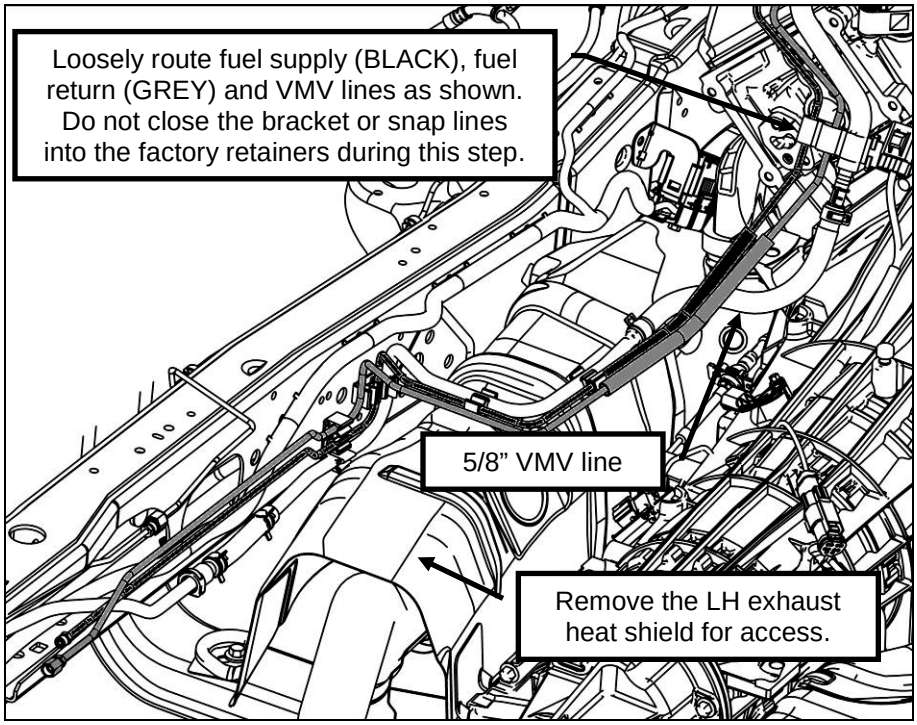


Note: It is recommended to route the entire harness and make all connections prior to retaining the harness with zip ties. Retaining the wire harness with zip ties is the final step of the wiring harness install.

Installing the New Forward Fuel Lines

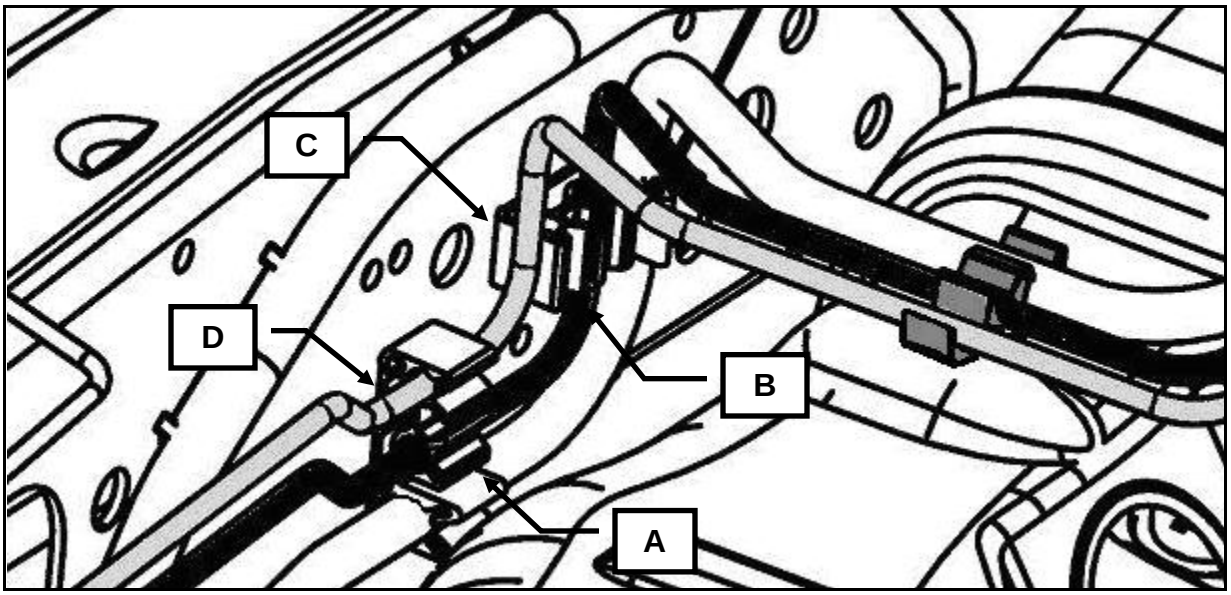
⚠ **Caution:** Hand tighten all fuel line connectors and fasteners before applying a wrench to avoid cross threading. Failure to heed this caution may result in property damage.

1. Install the Forward Fuel Supply Line (P07C2-9F911-A) (shown in BLACK) and the Forward Fuel Return Line (P07C2-9F912-A) (shown in GREY) from underneath the vehicle. Following the stock 5/8" VMV line, route both lines above the LH exhaust heat shield, which can be removed for greater access, through the transmission bellhousing bracket and into the engine compartment. Do not close the bellhousing bracket at this time as this will be done once all connections to the FRPCM are complete.



2. Install the fuel supply line (BLACK) into the clips in two (2) places (“A” and “B”). Install the fuel return line (GREY) into locations “C” and “D”. No EPDM sleeves are needed at this forward location.

Note: Thin EPDM Sleeves (1/4” to 3/8” — P07L3-9C328-B) found in Hardware Kit B (PBC2-HKB-A) are used to secure the fuel return line in the retaining clips along the frame rail in back of this location.



3. Reinstall the LH exhaust heat shield if removed.
4. Route the forward fuel supply and return lines from the engine down along the frame rail. Unclip the VMV line quick-connect above the LH exhaust heat shield. Place both of the new propane fuel lines behind this line and re-connect the VMV joint. At each point where the fuel lines clip into the factory retention clips, install one (1) EPDM Sleeve (P07L3-9C328-B) on the return line (1/4”), to make sure there is proper retention of the line. Remove the Ford factory fuel line retention clips. Install new Fuel Line Retention Clips (70-004591) which can be found in Hardware Kit B (PBC2-HKB-A), snap the lines into the retention clips.

Note: The fuel return line should be routed in the top grooves and the fuel supply line should be routed in the bottom grooves for proper design clearances.

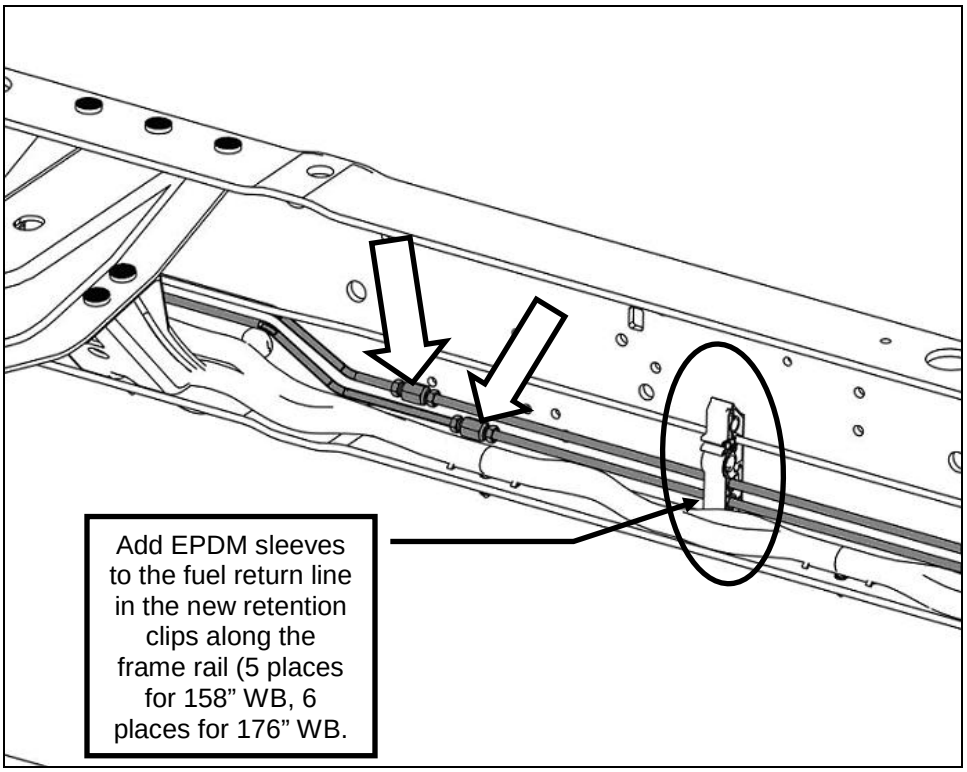
5. Install the Rear Supply Line (PBC2-9288-C) and the Rear Return Line (PBC2-9A086-A) from behind the rear axle, through the hole in the frame crossmember. Snap these into position using the new Fuel Line Retention Clips (70-004591) which can be found in Hardware Kit B (PBC2-HKB-A).

Note: The fuel return line should be routed in the top grooves and the fuel supply line should be routed in the bottom grooves for proper design clearances.

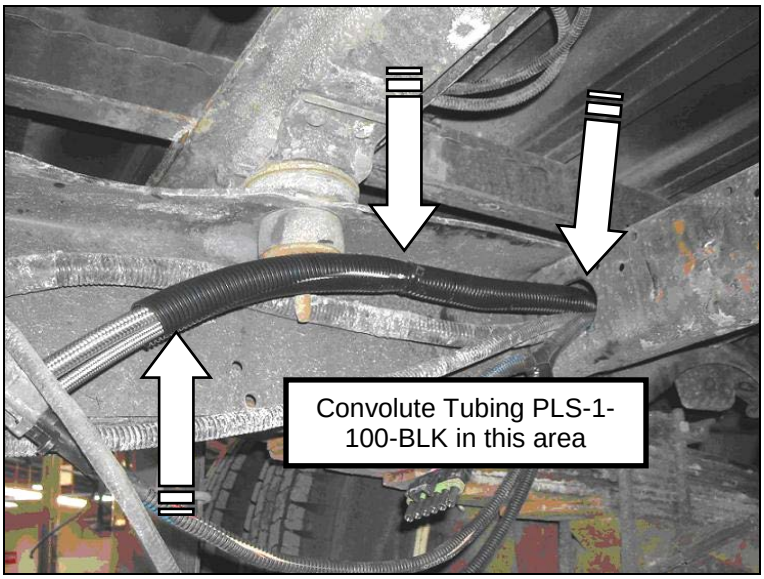
If the vehicle being built has a 176” wheelbase, two (2) Intermediate Fuel Lines (return PBC2-9J280-A and supply PBC2-9J280-B) found in Fuel Line Supplemental Kit — E-350 (PBC2-FUELKIT-A) will be needed. These lines join the forward supply and rear supply lines as well as the forward return and rear return lines. If the vehicle being built has a 158” wheelbase, the forward and rear supply and return lines mate directly to one another without the need for the intermediate lines.

6. Tighten all of the line fittings to 18–22 Nm.

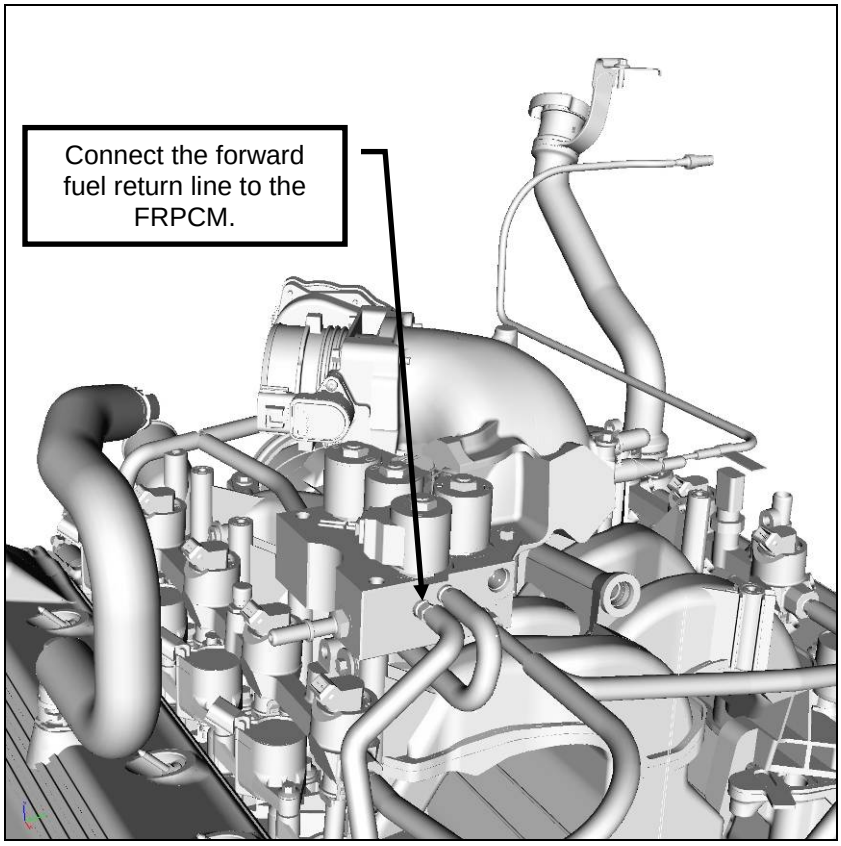
Note: Match color tags on mating lines for proper routing.



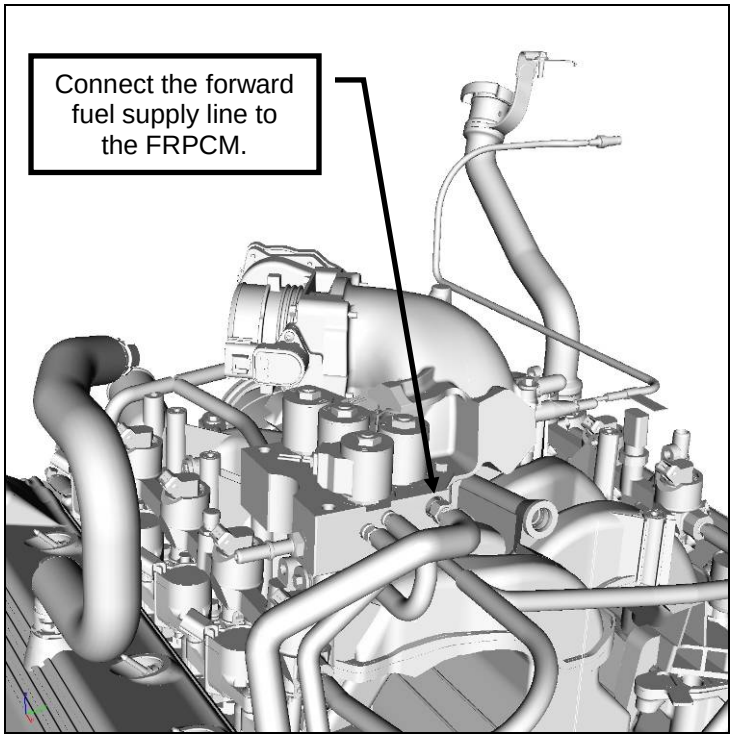
7. Wrap both the fuel return and fuel supply lines with convolute 1” diameter tubing 30” in length (PLS-1-100-BLK) in the area shown. The convolute can be found in Hardware Kit B (PBC2-HKB-A). Make sure the convolute tubing starts ahead of the crossmember opening approximately two inches and then extends as far as it will to the rear. Attach the convolute to the fuel lines using three (3) zip ties.



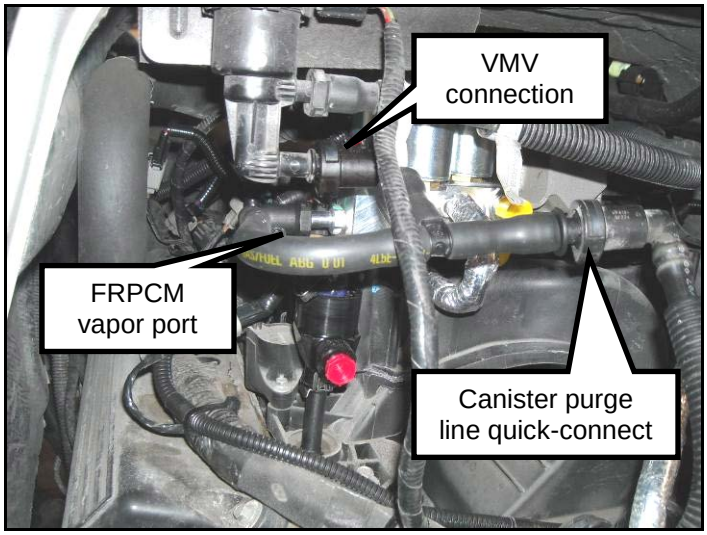
8. Install the Forward Fuel Return Line (P07C2-9F912-A blue tag) into the lower left port on the FRPCM. Tighten the line fitting to 18–22 Nm.



9. Install the Forward Fuel Supply Line (P07C2-9F911-A orange tag) into the top right port on the FRPCM. Push the quick-connect fitting of the line into the fitting in the port until it clicks into place. Firmly pull on the line to make sure it is locked in place.

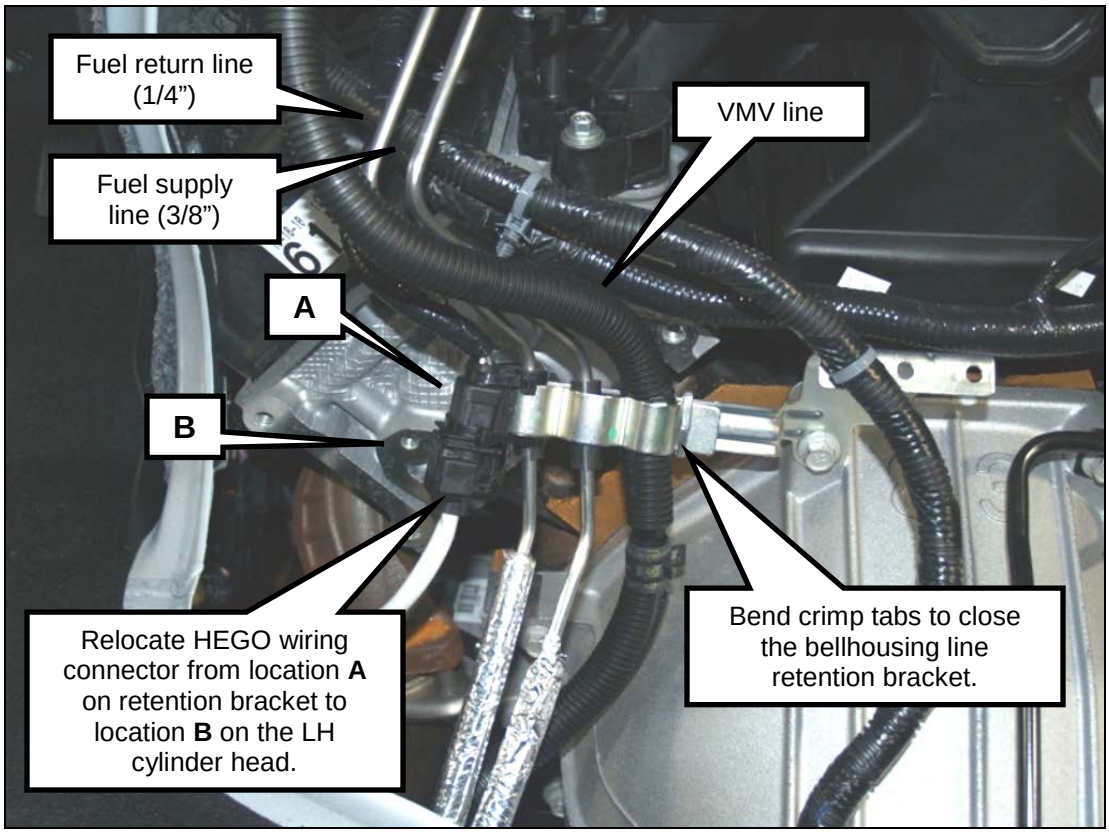


10. Connect the vapor port on the FRPCM to the Ford vapor management valve (VMV) with the FRPCM Purge Hose Assembly (P07C2-9K313-A) provided in Hardware Kit E (PBC2-HKE-A).
11. Connect the canister purge line to the male port on the FRPCM purge hose assembly.



12. With the Ford engine harness routed around the fuel lines, reinstall the harness push pins as needed.
13. With both lines, along with the 5/8" VMV line, correctly positioned as shown, close the bracket and bend the crimp tabs to firmly secure the lines.

Note: In order to properly seat the return fuel line in the leftmost "slot", it is necessary to relocate the HEGO wiring connector from its location on the retention bracket (A) to one of the threaded holes (B) located on the rear of the LH cylinder head.



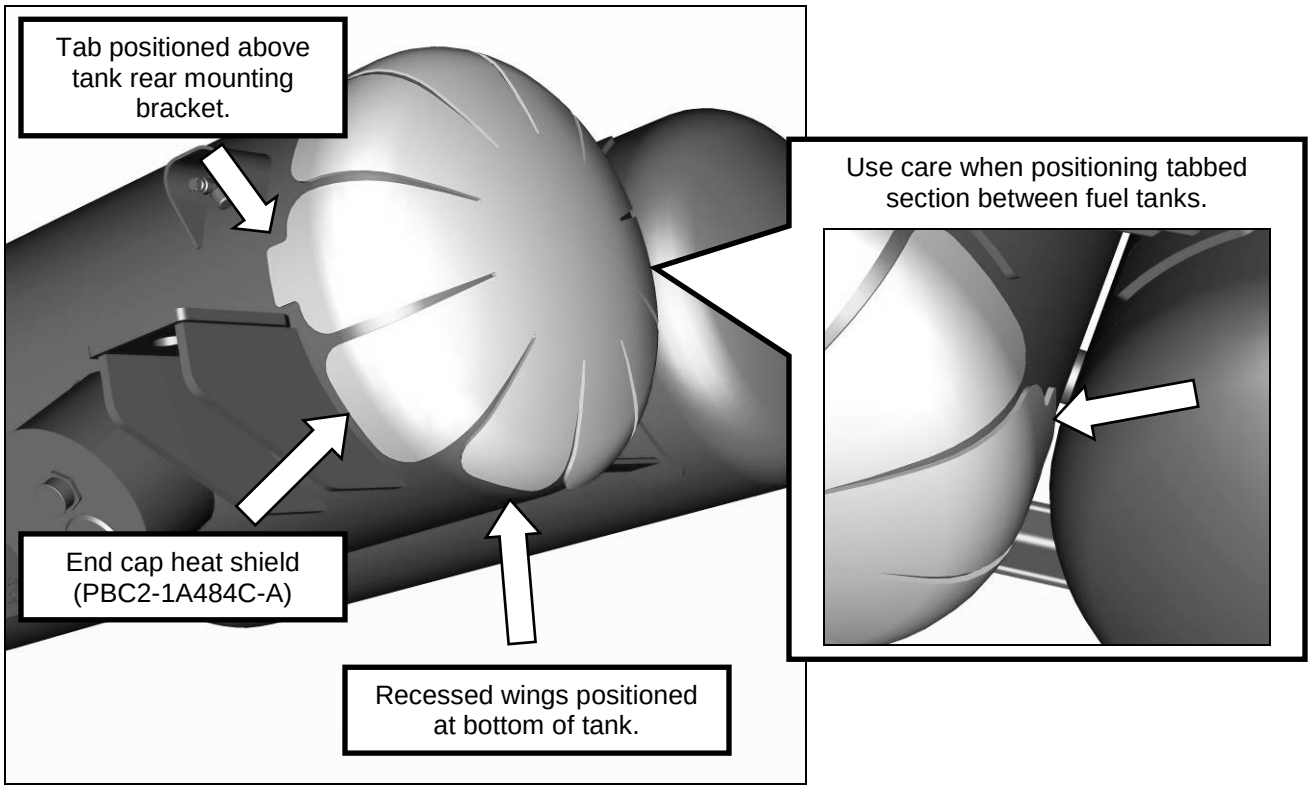
Preparing the Tank Assembly

⚠ **Caution:** Use care when removing the protective wrap from the fuel tank heat shield to avoid the adhesive side of the shield material from folding over and adhering. Should this happen, it becomes impossible to separate the adhered layers without damaging the heat shield material.

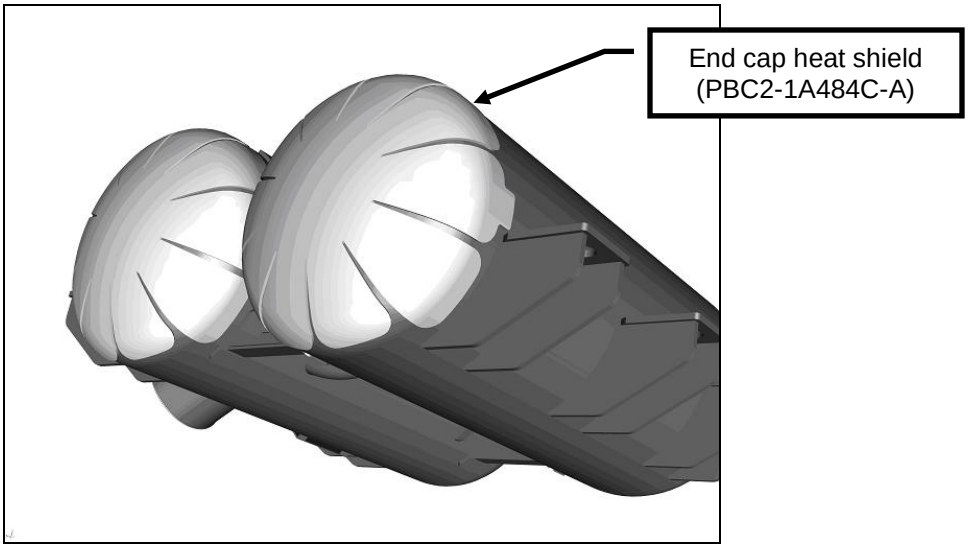
To remove the protective wrap, place the heat shield on a suitable flat surface with the silver outer covering facing downward. Beginning at the removal tab, slowly pull the wrap back while holding the shield at its edge to avoid the material folding over and contacting another surface.

1. Apply one (1) End Cap Heat Shield (PBC2-1A484C-A) to the Fuel Tank (P07C2-9K007AX-B) left rear end cap as shown. The heat shield is correctly positioned when a tabbed wing is above the tank rear mounting bracket and the recessed wings are at the bottom of the tank. **Using a rubber mallet, flatten down the edges of the heat shield material to reduce any sharp edges and ensure maximum adhesion to the tank surface.**

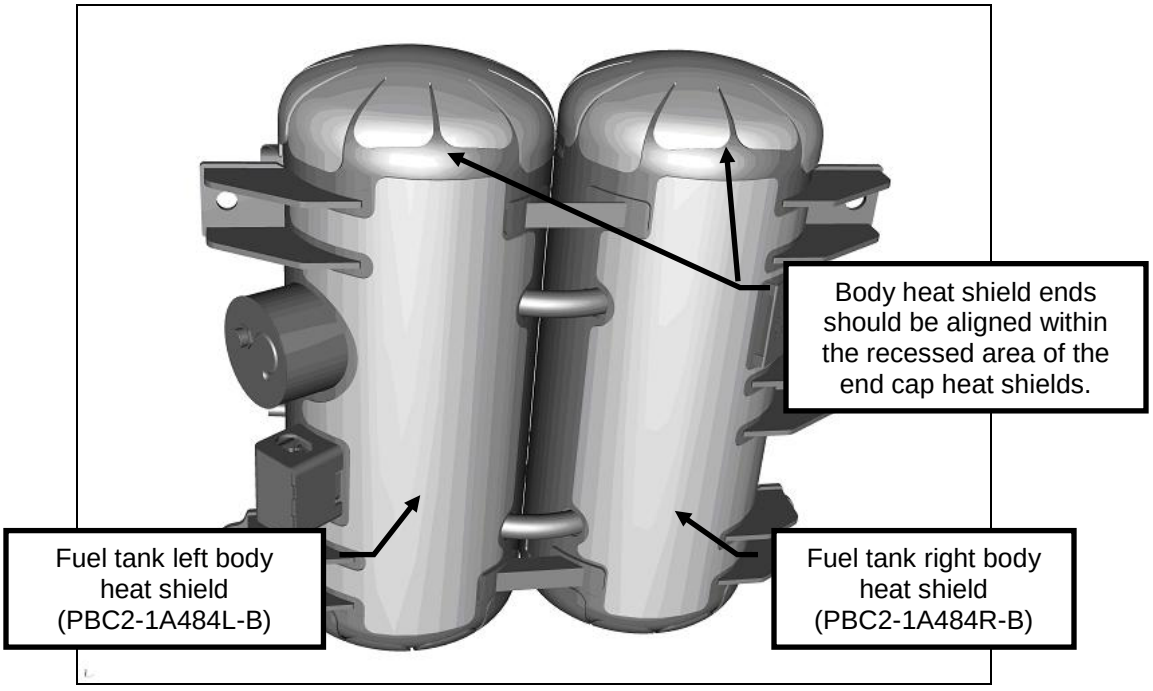
⚠ **Caution:** Use care when positioning the opposite tabbed wing section of the heat shield between tanks. Do not allow the adhesive side of the heat shield to contact the tank's surface before it is in the proper location. Trying to reposition the heat shield once it has made contact can damage the material and affect its adhesion to the tank.



2. In the same manner as done for the fuel tank left side, apply one (1) End Cap Heat Shield (PBC2-1A484C-A) to the Fuel Tank (PBC2-9K007AX-B) right rear end cap as shown. **Using a rubber mallet, flatten down the edges of the heat shield material to reduce any sharp edges and ensure maximum adhesion to the tank surface.**

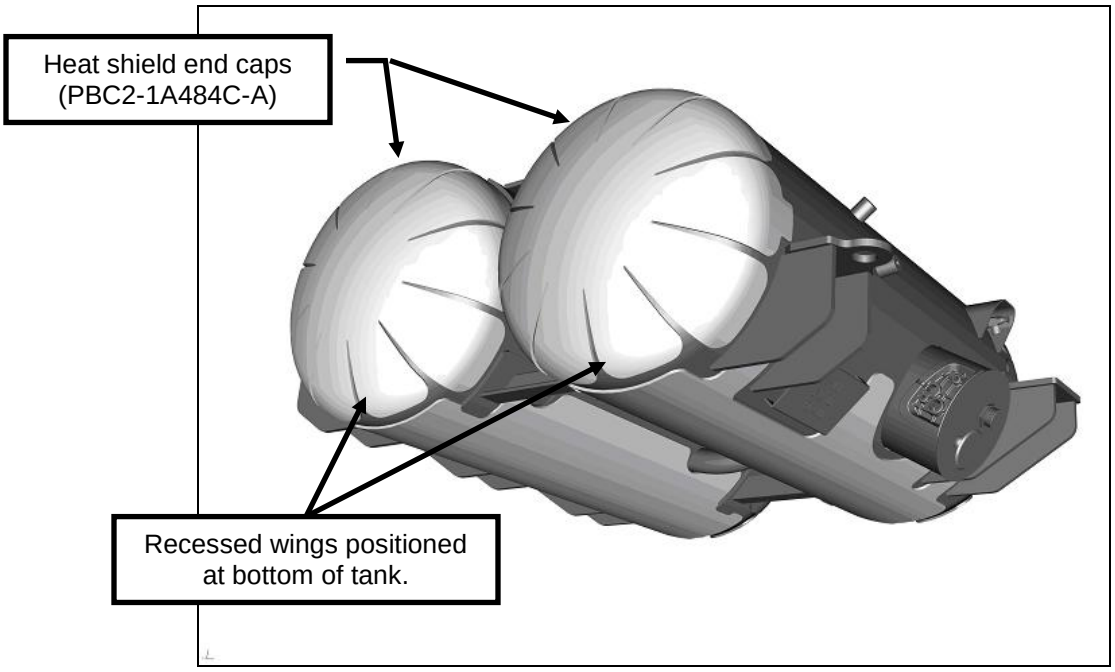


3. Apply the fuel tank Left Body Heat Shield (PBC2-1A484L-B) to the bottom body section of the Fuel Tank (PBC2-9K007AX-B) left half as shown below. If installed correctly, the rear end of the body heat shield will be aligned within the recessed area of the end cap heat shield. **Using a rubber mallet, flatten down the edges of the heat shield material to reduce any sharp edges and ensure maximum adhesion to the tank surface.**



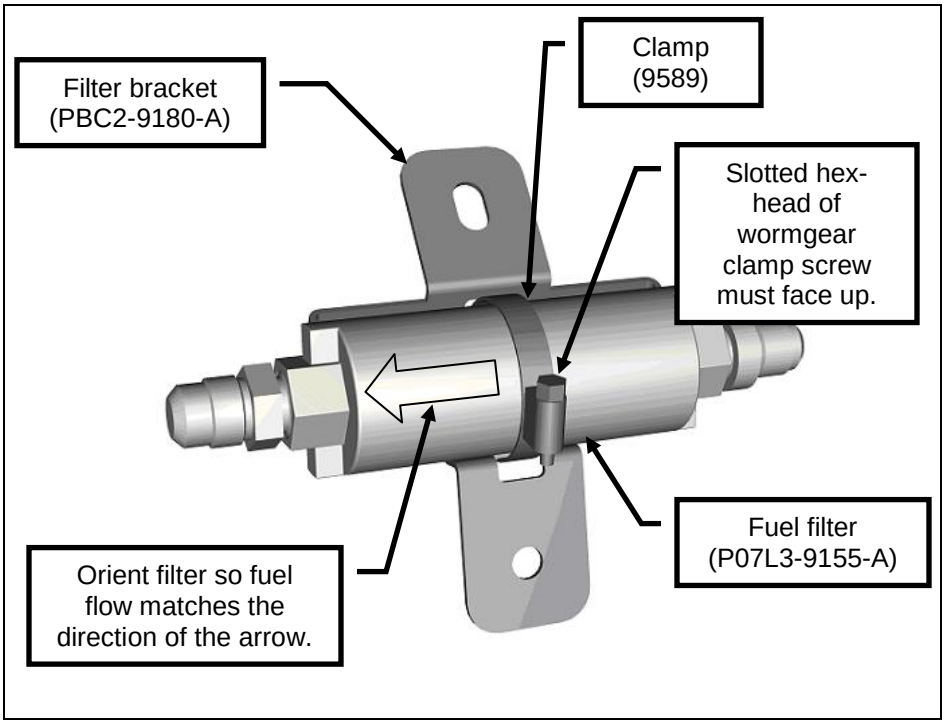
4. In the same manner as done for the fuel tank left half, apply the fuel tank Right Body Heat Shield (PBC2-1A484R-B) to the bottom body section of the Fuel Tank (PBC2-9K007AX-B) right half as shown above.

5. Apply one (1) End Cap Heat Shield (PBC2-1A484C-A) to the fuel tank left front end cap and one (1) End Cap Heat Shield (PBC2-1A484C-A) to the fuel tank right front end cap as shown. Make sure that the tabbed wings are positioned above the tank left and right mounting brackets and that the recessed wings are at the bottom of the tank halves. **Using a rubber mallet, flatten down the edges of the heat shield material to reduce any sharp edges and ensure maximum adhesion to the tank surface.**

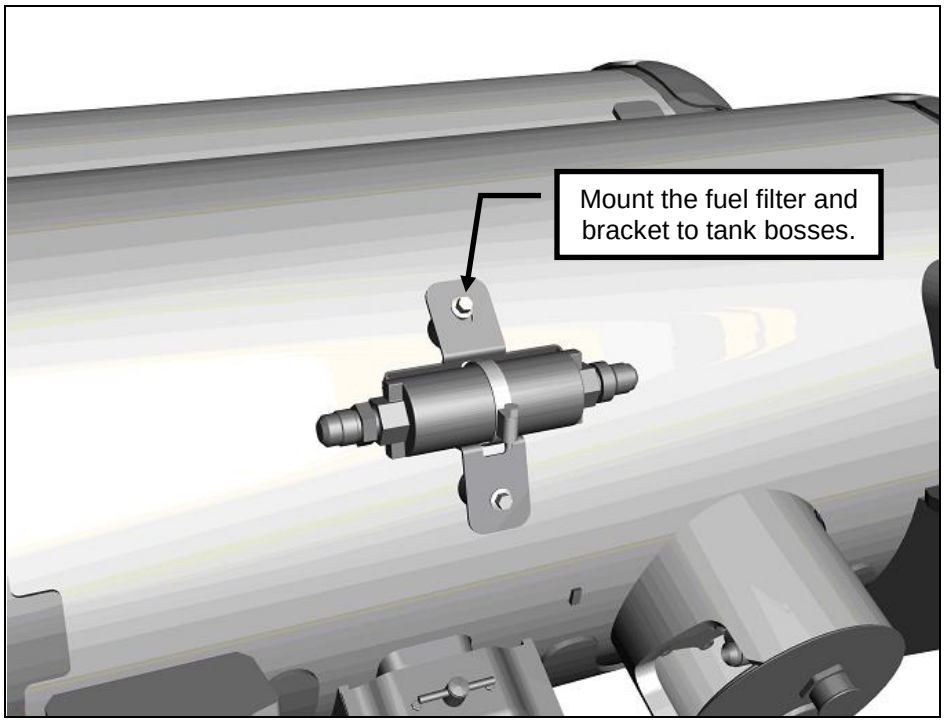


6. Assemble the Fuel Filter (P07L3-9155-A) to the Fuel Filter Bracket (PBC2-9180-A) using one (1) Wormgear Clamp (9589). Tighten the clamp to 4–5 Nm. These parts can be found in Hardware Kit D (PBC2-HKD-A).

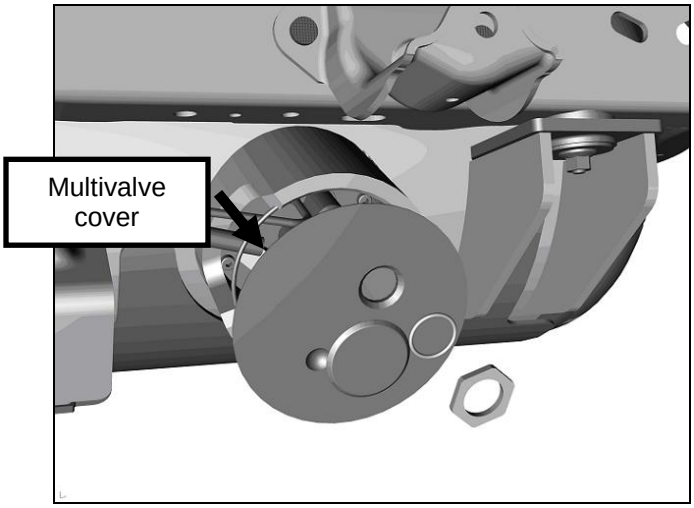
Note: The arrow on the filter indicates the direction of fuel flow. Make sure the filter is assembled to the bracket in the correct orientation and that the slotted hex-head of the wormgear clamp screw is facing up to provide access from above the frame rail and fuel tank left half.



7. Install the fuel filter and bracket assembly to the tank using two (2) M8 x 1.25 x 20 bolts (W500223-S439). These can be found in Hardware Kit D (PBC2-HKD-A). Tighten the bolts to 20–30 Nm.



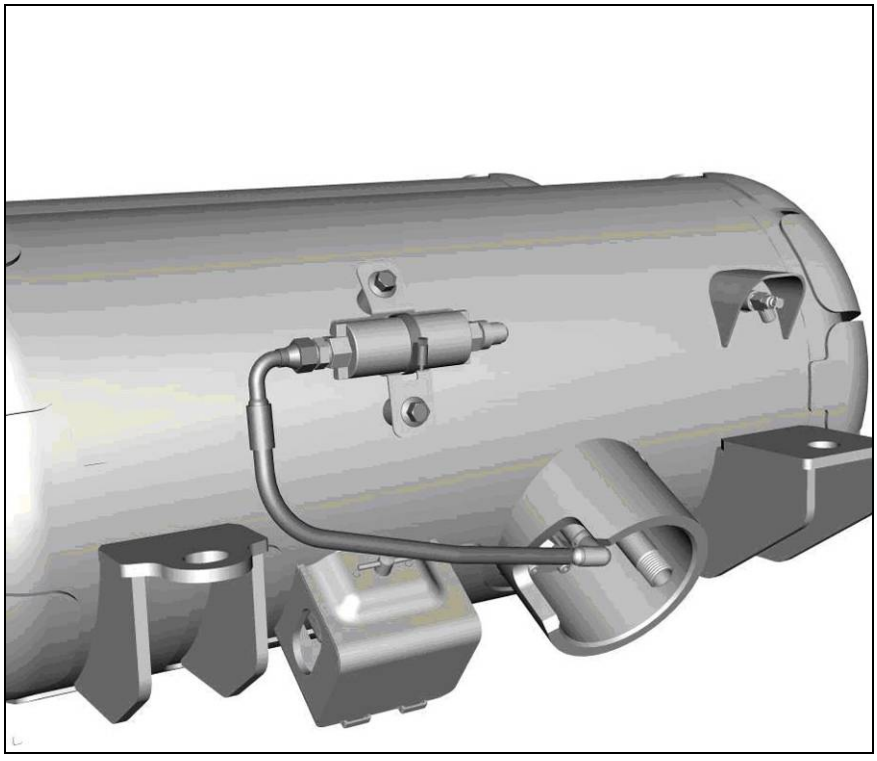
8. Remove the plastic shipping cap, M24 nut, O-ring and cover from the multivalve assembly. Set the cover, O-ring, M24 nut and shipping cap aside. These parts, including the shipping cap, will be installed later.



9. Before making the fuel line connections, check that the fuel supply valve is functioning by briefly applying 12-volt power to the pink and brown wire terminals at the 6-pin connector. The fuel supply valve is functioning if a “click” is heard.
10. Connect the fuel Remote Fill Line (PBC2-9047-A) to the outlet of the fuel filter. Tighten the line fitting to 41–49 Nm.

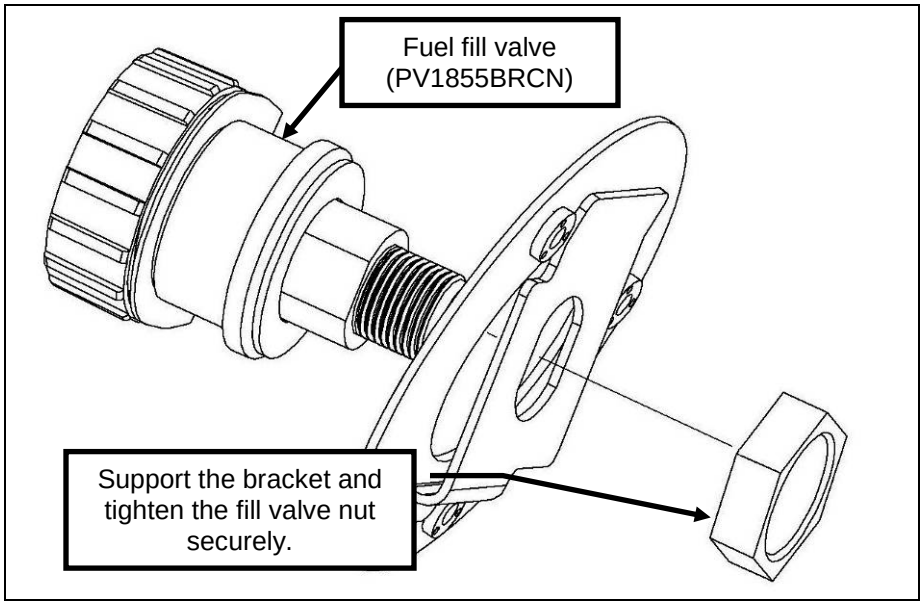
Note: Hold the 90-degree fitting of the remote fill line towards the fuel tank while tightening the line nut. Do not allow the fitting to rotate while tightening the line nut. After the fuel tank has been fully install in the vehicle and the tank mounts tightened, check the clearance between the remote fill line and the frame rail. There must be at least a 10mm clearance between the rail and the line. If not, loosen the remote fill line fitting nut at the fuel filter, rotate the line closer to the tank, securely hold the 90-degree fitting in this position and retighten the line nut to specification.

11. Loosely connect the opposite end of this line to the 90-degree fitting underneath the multivalve cover. This connection will be undone later for assembly clearances and then correctly tightened.

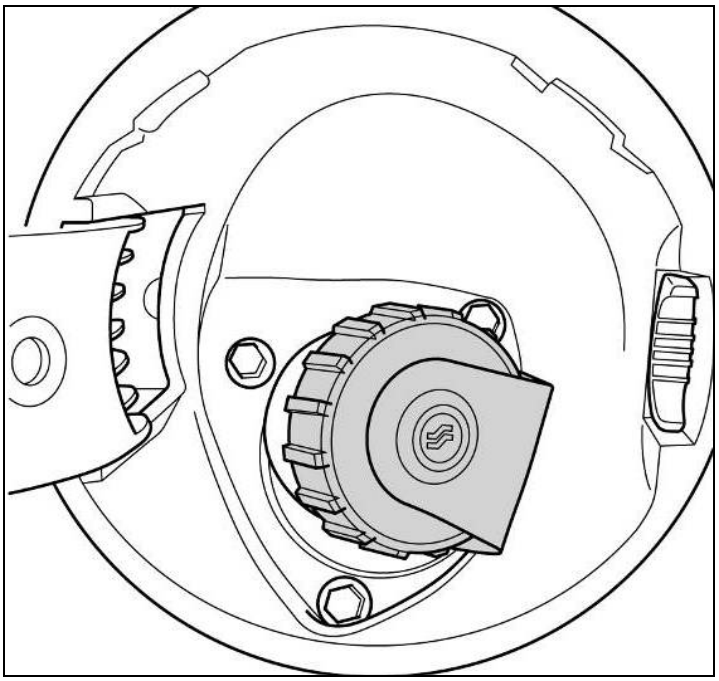


⚠ **Caution:** Hand tighten all fuel line connectors and fasteners before applying a wrench to avoid cross threading. Failure to heed this caution may result in property damage.

12. Remove the nut and washer from the Fuel Fill Valve (PV1855BRCN) and assemble the valve to the fuel Filler Neck Mounting Bracket (P10C2-9B213-A) as shown. Support the fill valve and bracket assembly and tighten the nut securely. These parts can be found in Hardware Kit D (PBC2-HKD-A).

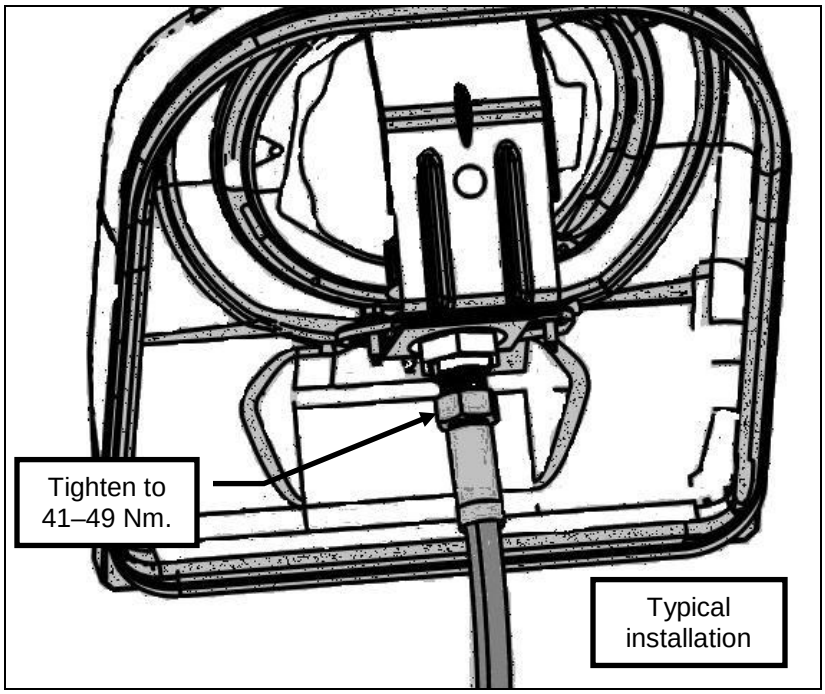


13. If applicable, install the fuel fill valve and fuel filler neck mounting bracket behind the factory fill door using three (3) M5 x 0.8 x 16mm bolts (W706841-S437). These bolts can be found in Hardware Kit D (PBC2-HKD-A). Tighten the bolts to 5–7 Nm.



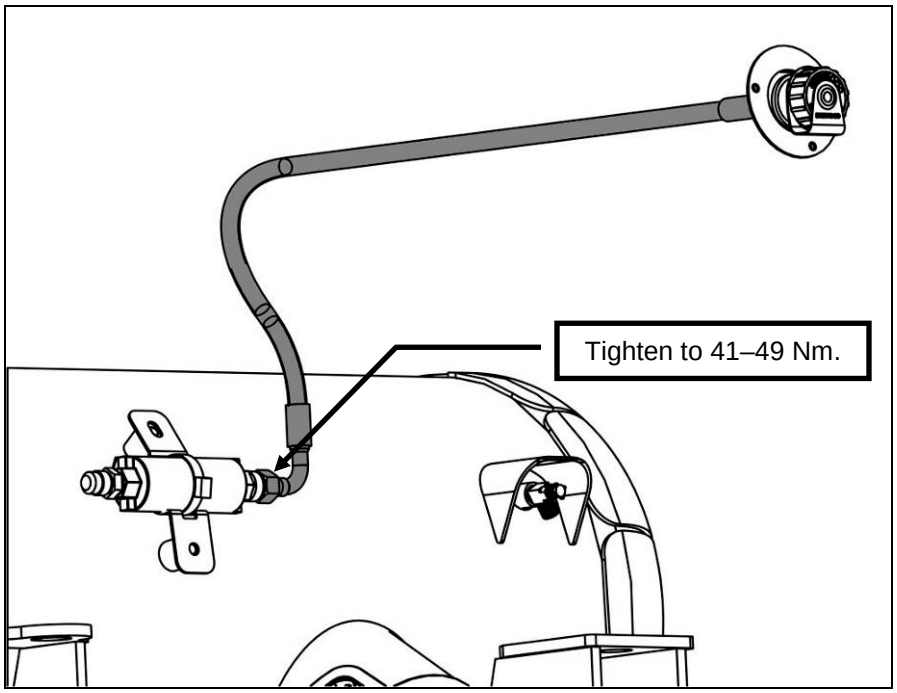
14. Install the Remote Fill Line (PBC2-9034-A) to the fuel fill valve. Tighten the fitting to 41–49 Nm.

Note: The remote fill line must not be twisted, kinked or otherwise come into contact with the frame rail after the fuel tank is installed. Check the clearance of the fill line with the frame rail to make sure there is at least a 10mm clearance between the line and the rail.

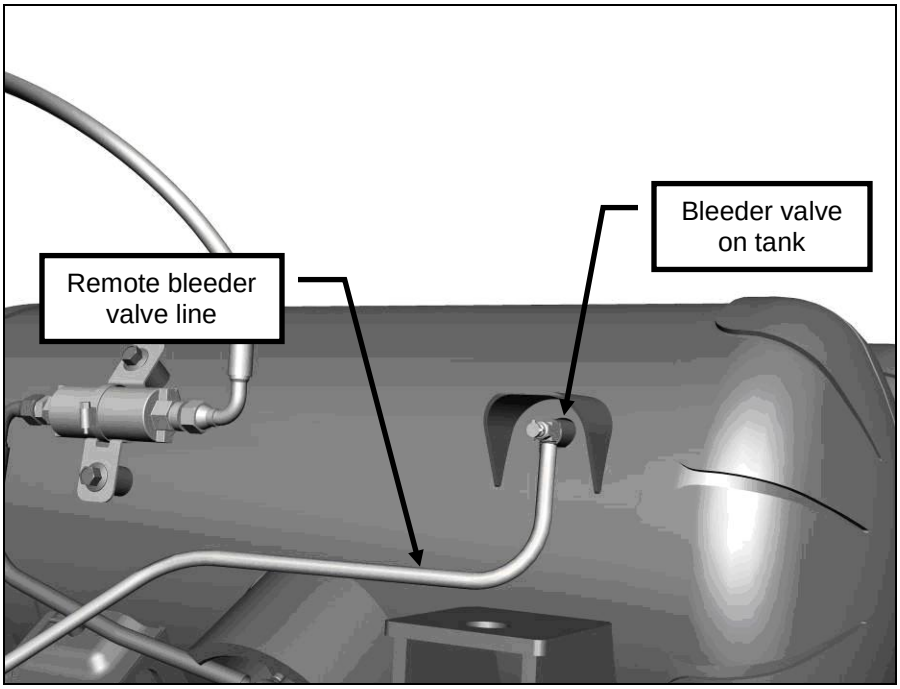


15. Connect the opposite end of the remote fill line (end with 90-degree fitting) to the fuel filter inlet. Tighten the fitting to 41–49 Nm. Make sure to securely hold the 90-degree line fitting while tightening the line nut and that the fitting is positioned towards the fuel tank.

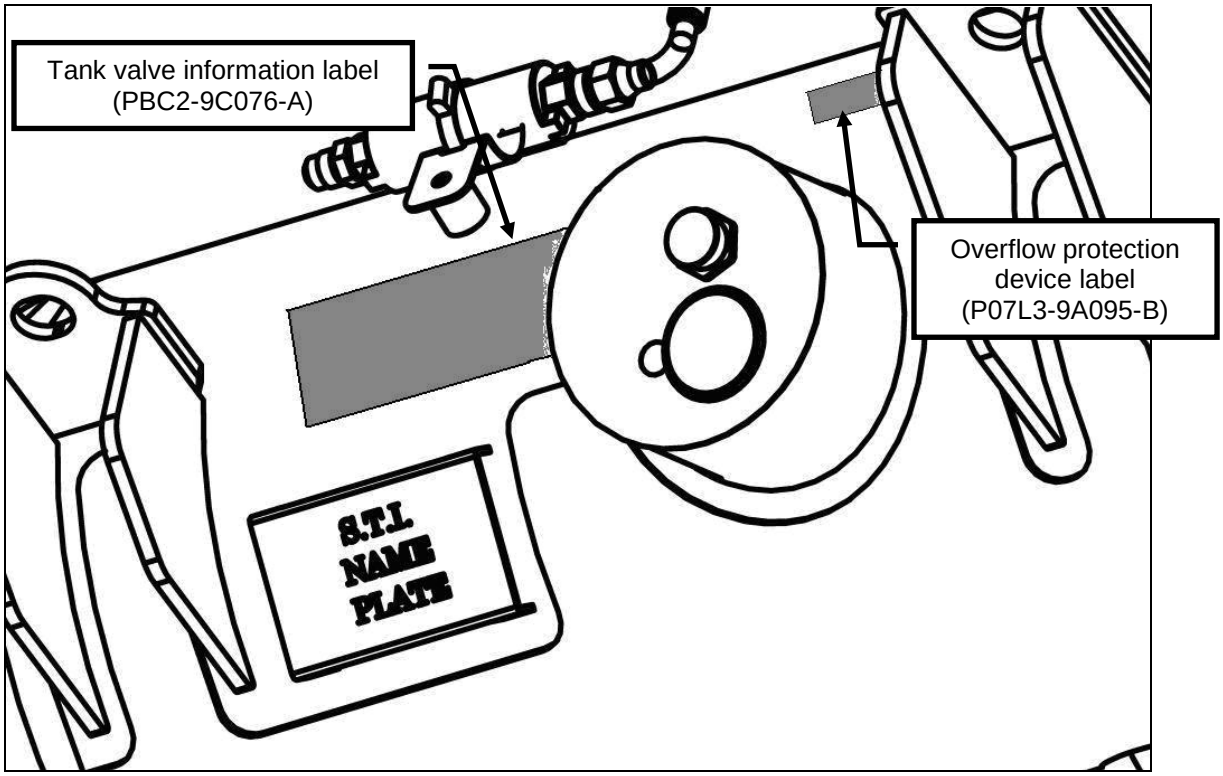
Note: The remote fill line must not be twisted, kinked or otherwise come into contact with the frame rail after it is installed. Check the clearance of the fill line with the frame rail to make sure there is at least a 10mm clearance between the line and the rail.



16. Connect the remote bleeder valve line of Remote Bleeder Valve and Bracket Assembly (P11C2-RB001-A) to the bleeder valve on the fuel tank. Tighten the connection to 18–22 Nm.



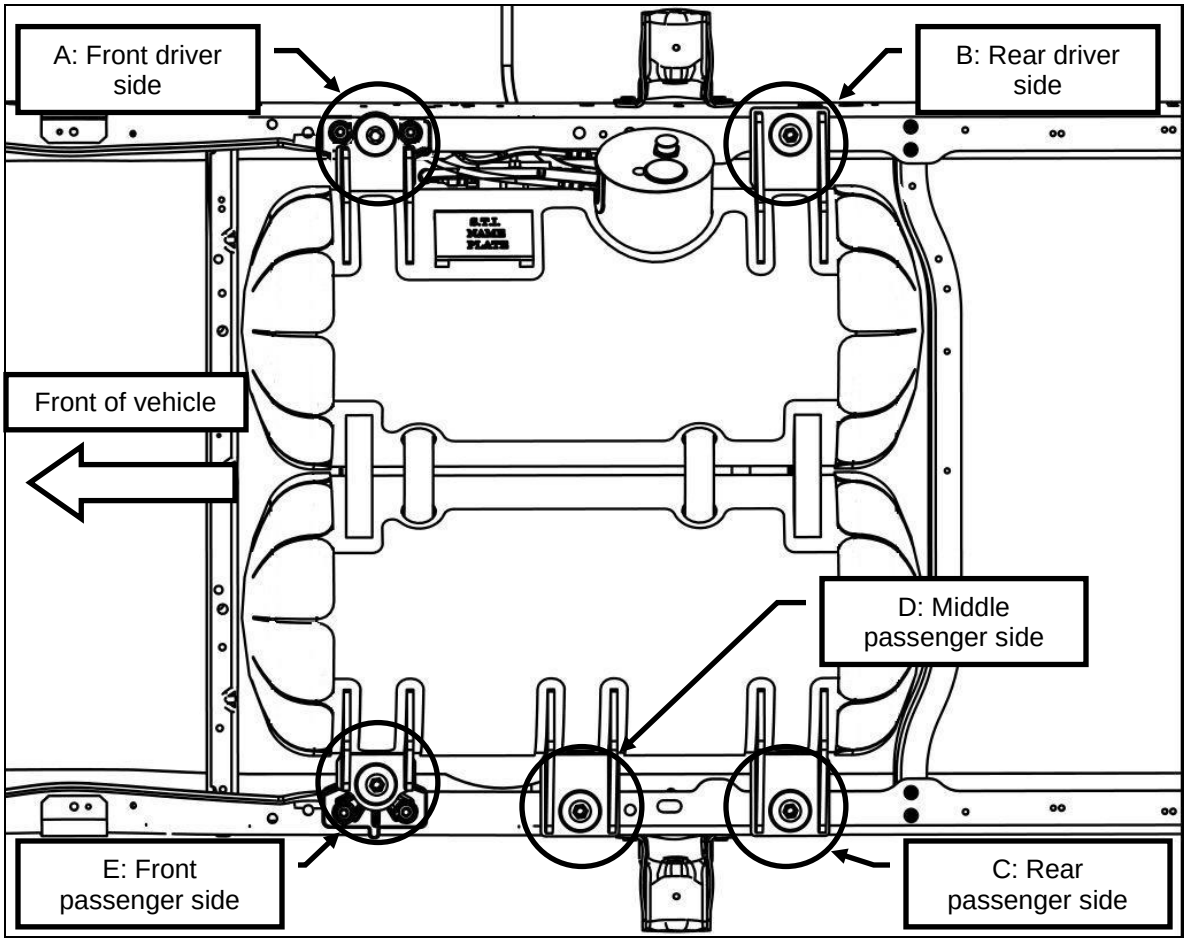
17. Install one (1) Overflow Protection Device Label (P07L3-9A095-B) onto the tank next to the bleeder valve and one (1) Tank Valve Information Label (PBC2-9C076-A) close to the multivalve collar as shown. These parts can be found in Hardware Kit G (PBC2-HKG-A).



Preparing the Frame

Note: On same earlier E-350 chassis the rear crossmember must be removed and repositioned to accommodate installation of the ROUSH CleanTech fuel tank. Please refer to the Appendix at the end of this kit installation instruction manual in Rear Crossmember Position Modification for Fuel Tank Installation.

The following picture illustrates the tank location from looking up beneath the vehicle rearward of the rear axle assembly. The following steps refer to each section (A thru E) as each mount location requires unique mounting hardware and assembly procedures.

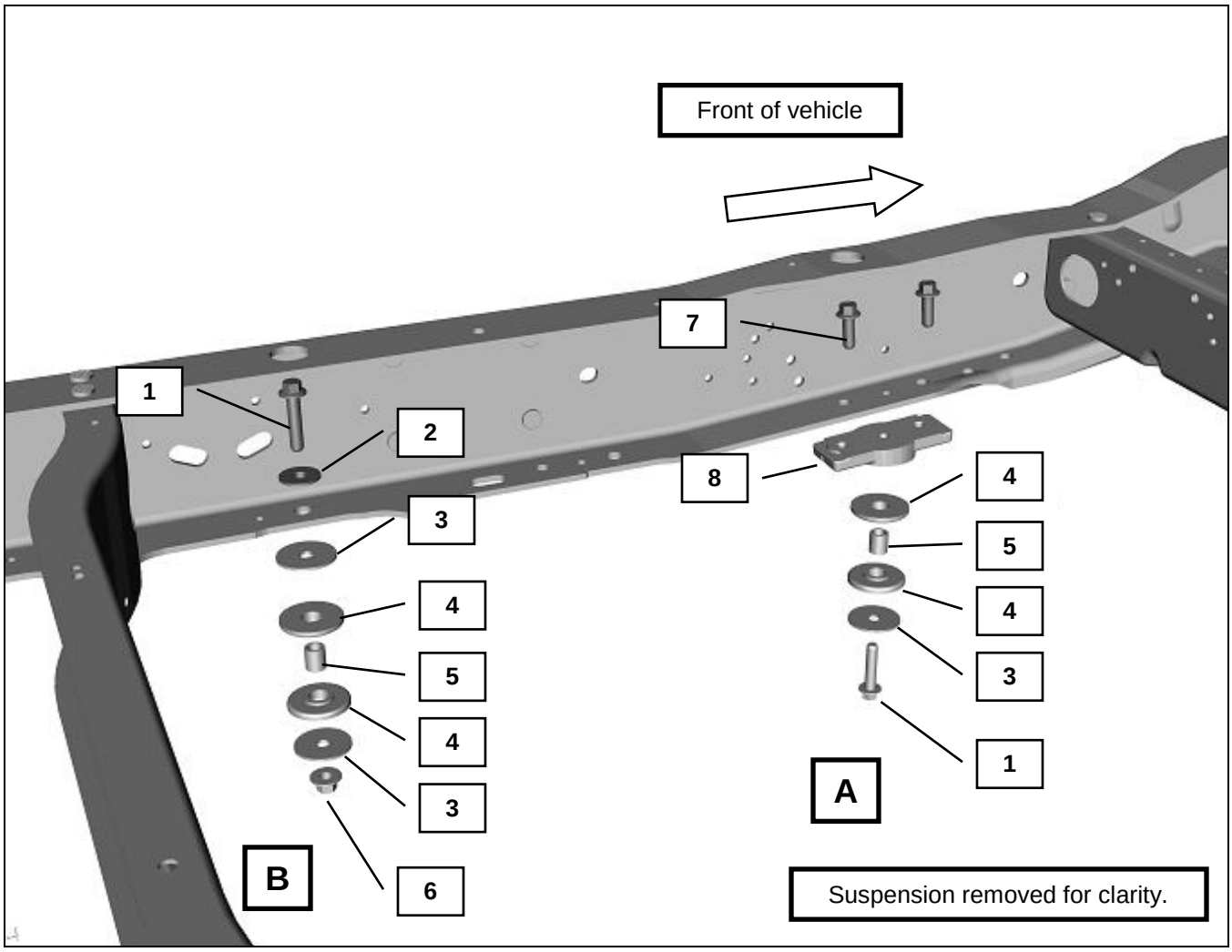


⚠ **Caution:** At locations B, C and D, a step-collar washer is required to be installed on the top side of the frame rail. During final tightening, the washer must be properly seated flat against the frame rail surface with the step collar inserted in the frame hole. Failure to follow this procedure can cause damage to the tank mounting components.

Mounting hardware for each location is shown in the exploded views that follow. The hardware used on E-350 applications is shown in the exploded views.

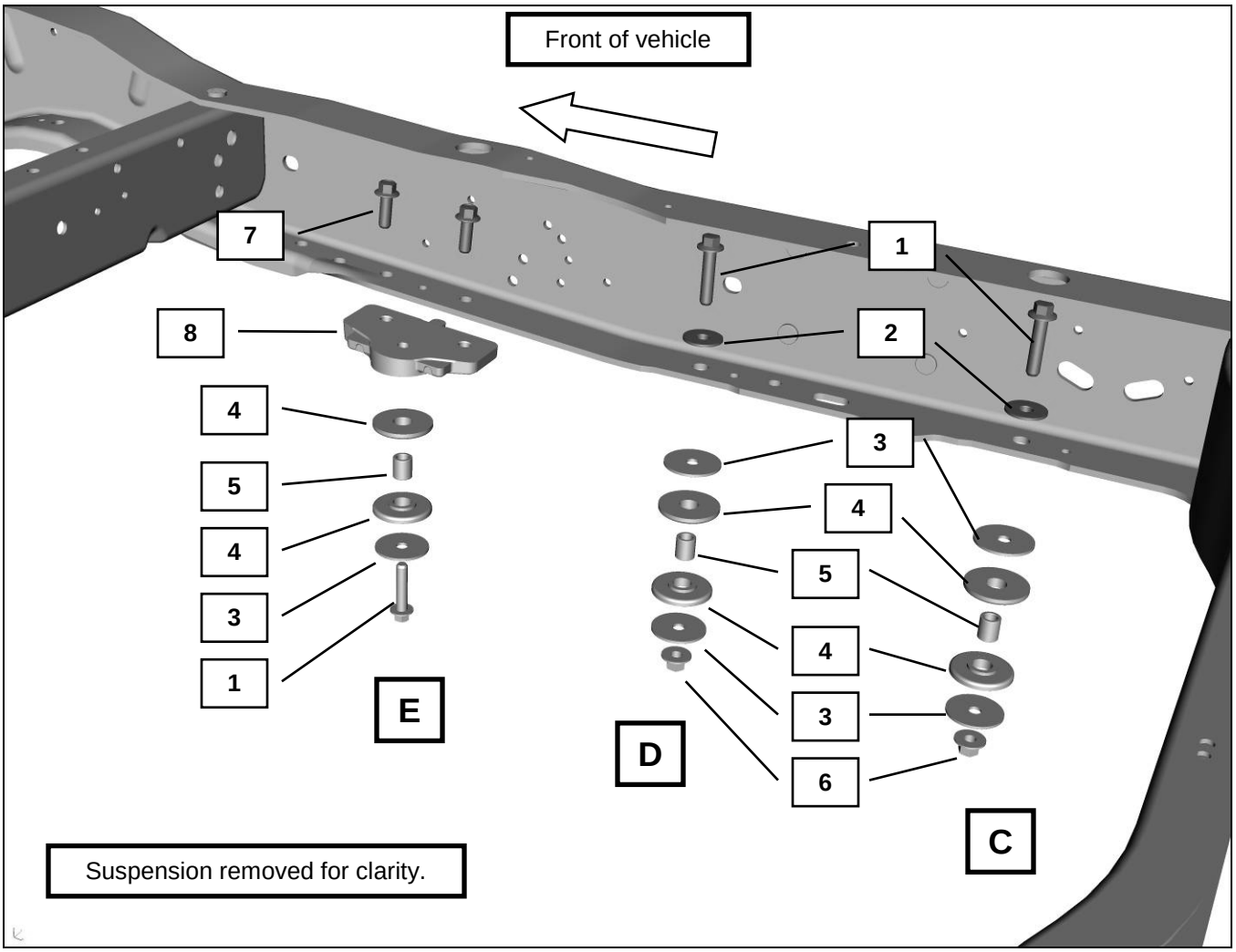
Note: In the following two exploded views, a washer with step collar (PBC2-3932-A) is used in three locations above the frame rail lower flange. In these three locations, the frame hole is larger than the bolt diameter. The step collar of the washer is positioned in the frame hole, providing a tight fit for the bolt.

DRIVER SIDE FRAME RAIL AND FUEL TANK MOUNTING HARDWARE



1. M12 x 1.75 x 55 bolts (W709906-S439)	5. Isolator crush limiter (PBC2-11293-A)
2. Washer (with step collar) (PBC2-3932-A)	6. M12 x 1.75 nut (W710807-S440)
3. Washer (P07L3-3932-A)	7. M12 x 1.75 x 35 bolt (W710233-S439)
4. Rubber Isolator (P07L3-9N052-A)	8. Frame mounting bracket, left (P07C2-9046-A)

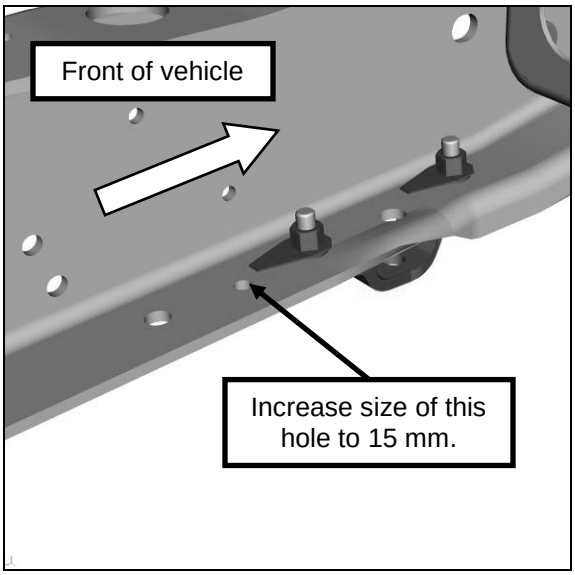
PASSENGER SIDE FRAME RAIL AND FUEL TANK MOUNTING HARDWARE

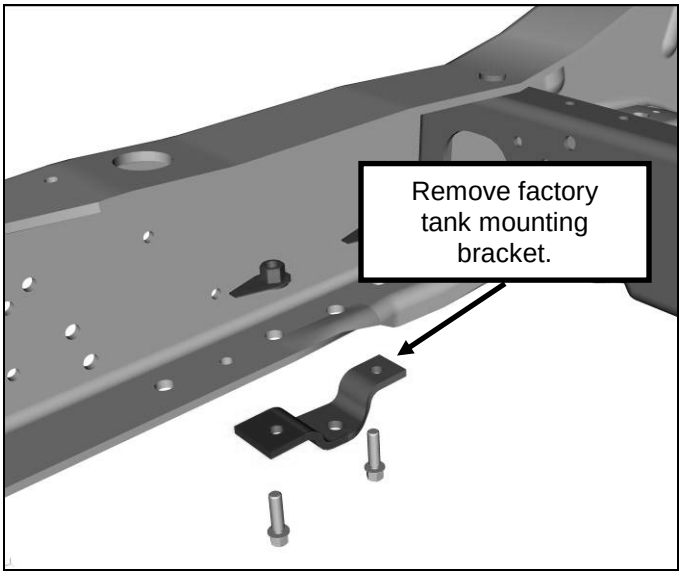


1. M12 x 1.75 x 55 bolts (W709906-S439)	5. Isolator crush limiter (PBC2-11293-A)
2. Washer (with step collar) (PBC2-3932-A)	6. M12 x 1.75 nut (W710807-S440)
3. Washer (P07L3-3932-A)	7. M12 x 1.75 x 35 bolt (W710233-S439)
4. Rubber Isolator (P07L3-9N052-A)	8. Frame mounting bracket, right (P07C2-9045-A)

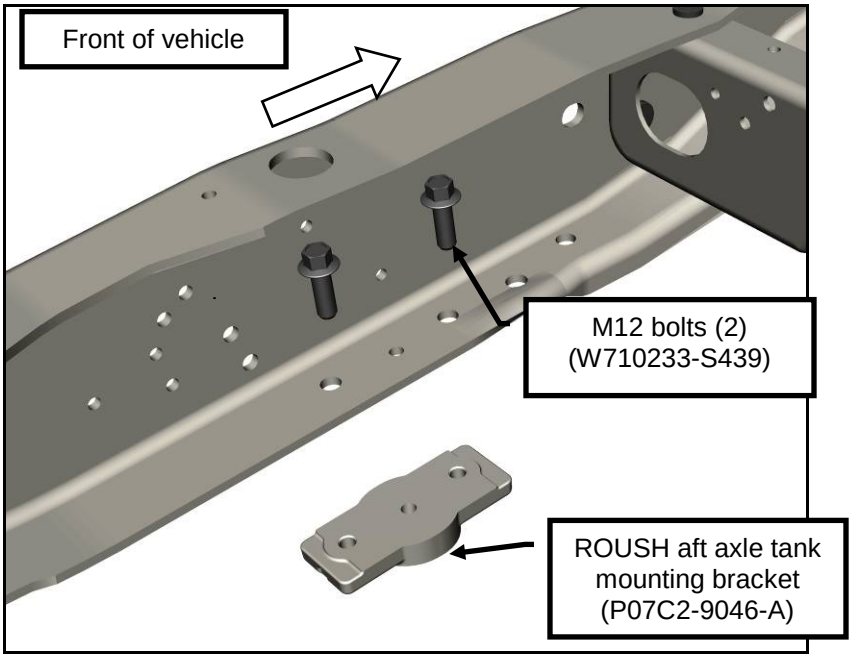
Note: The factory aft axle 55-gallon fuel tank mounting bracket that is bolted to the frame in location A must be removed prior to modifying the frame.

1. **Area A: Front Driver Side Mount** — Before installing the new mounting bracket to the frame, you will have to drill out an existing frame hole which will be the center through bolt hole of the cast bracket. The hole that needs to be opened up is the first hole on the frame directly before the factory tank mounting bracket.



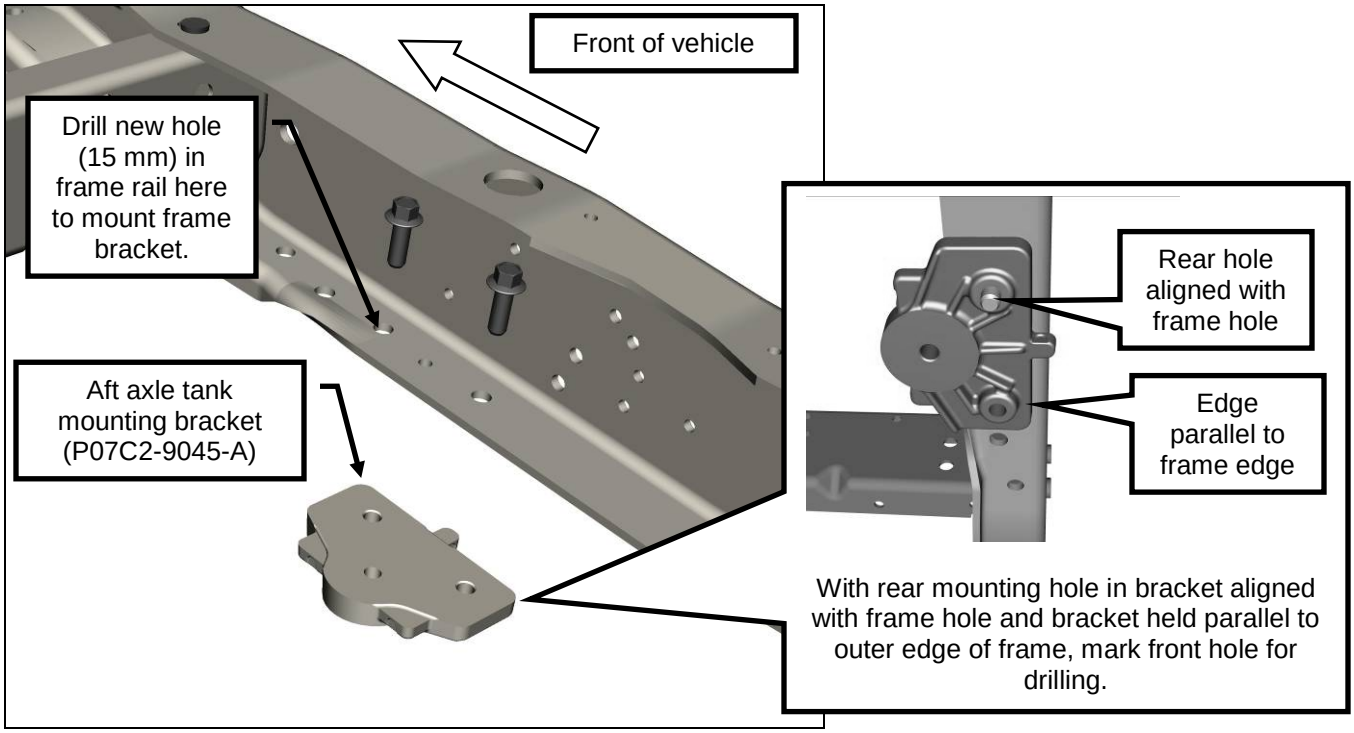


Drill this hole out to 15 mm. Debur and coat all bare metal using a premium undercoating. ROUSH CleanTech suggests Motorcraft Premium Undercoating (PM-25-A). Install the aft axle tank frame mounting bracket, left (P07C2-9046-A) using two (2) M12 x 1.75 x 35 (W710233-S439) bolts. The bolts can be found in Hardware Kit C (PBC2-HKC-A). The bolts are to be installed from the inside of the frame and threaded into the cast bracket. Install bolts, threading them into the bracket. Tighten the bolts to 100–110 Nm.



2. **Area B: Rear Driver Side Mount** — No modifications are needed in this area to mount the propane tank. The factory Ford fuel tank mounting location is reused.
3. **Area C: Rear Passenger Side Mount** — No modifications are needed in this area to mount the propane tank. The factory Ford fuel tank mounting location is reused.
4. **Area D: Middle Passenger Side Mount** — No modifications are needed in this area to mount the propane tank. The factory Ford fuel tank mounting location is reused.

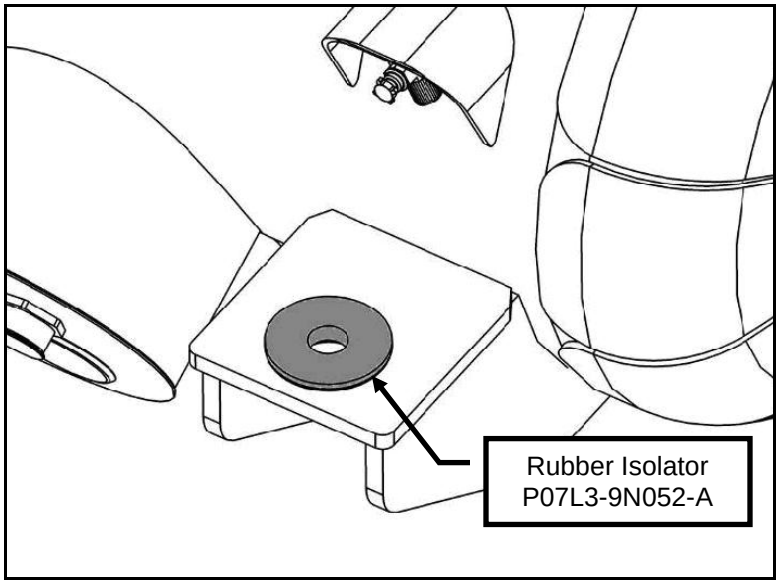
5. **Area E: Front Passenger Side Mounting** — Before installing the new passenger side mounting bracket to the frame, you must drill a new frame hole. Hold the tank mounting bracket in its correct location on the frame and use the bracket to mark the new hole position. Drill a 1/8” pilot hole and then drill this hole out to 15 mm. Debur and coat all bare metal using a premium undercoating. ROUSH CleanTech suggests Motorcraft Premium Undercoating (PM-25-A). Install the passenger side Aft Axle Tank Frame Mounting Bracket (P07C2-9045-A) using two (2) M12 x 1.75 x 35 (W710233-S439) bolts. These bolts can be found in Hardware Kit C (PBC2-HKC-A). The bolts should be installed from the inside of the frame and threaded into the tank mounting bracket. Tighten the bolts to 100–110 Nm.



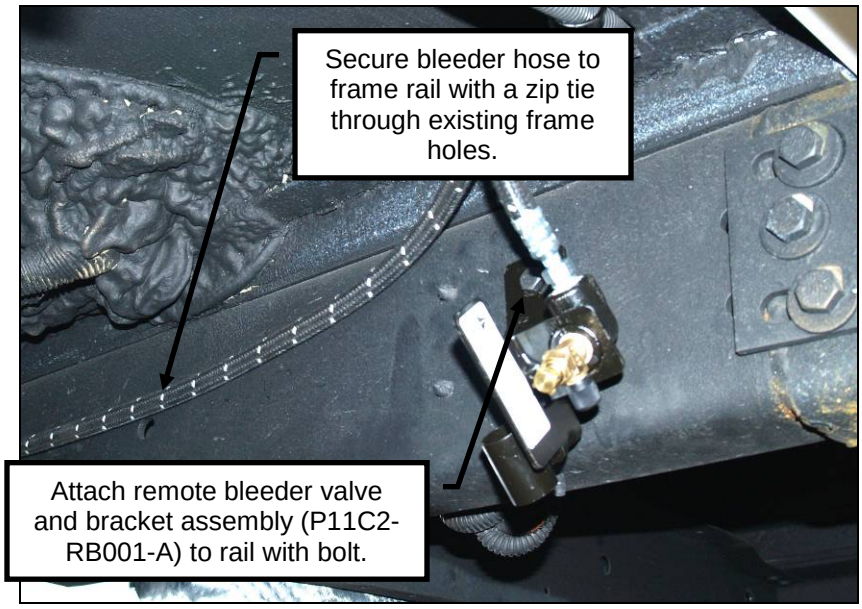
Installing the Fuel Tank Assembly

⚠ **Caution:** Hand tighten all fuel line connectors and fasteners before applying a wrench to avoid cross threading. Failure to heed this caution may result in property damage.

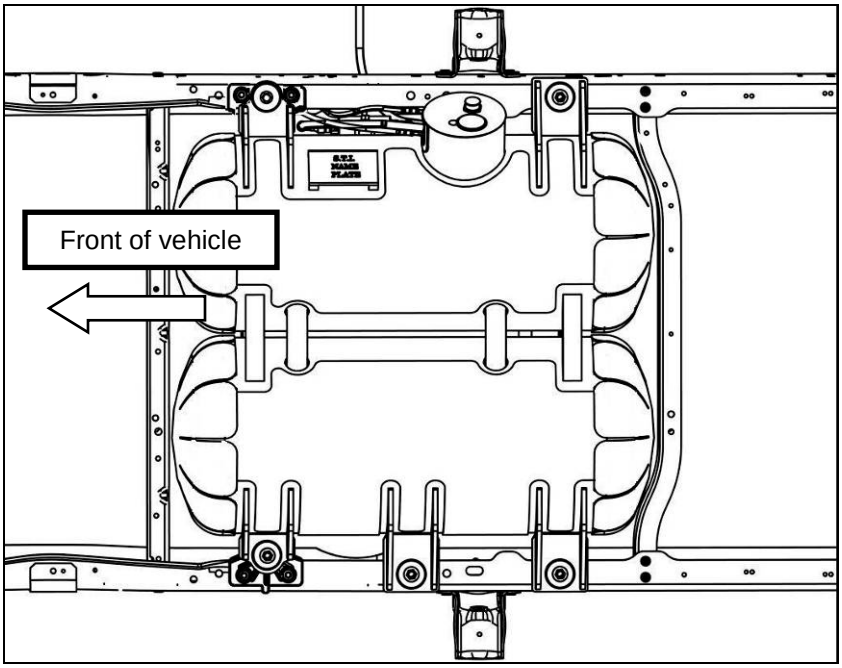
1. Position the fuel fill line from the fuel fill valve to the fuel filter on the top of the tank assembly and tuck the wiring harness up against the fuel tank. Slowly begin to raise the tank into position.
2. On the top of each tank mounting bracket place one Rubber Isolator (P07L3-9N052-A) found in Hardware Kit C (PBC2-HKC-A).



3. Place one (1) tank mounting washer (P07L3-3932-A) onto the top of the rubber isolators in tank mounting positions B, C and D.
4. Carefully raise the tank into position. Stop at a point before the tank is fully seated. Route the fuel fill and remote bleeder lines into position over the frame rail. Connect the fuel fill line to the filter and tighten the fitting to 41–49 Nm.
5. Route the remote bleeder valve, line and bracket assembly along the frame and position the bracket to the location shown. Attach the Remote Bleeder Valve and Bracket Assembly (P11C2-RB001-A) to the frame rail and install an M8 x 1.25 x 20 bolt (W500223-S439) and an M8 x 1.25 nut (N804178-S309). Tighten the fasteners to 18–22 Nm. Make sure to tighten the remote bleeder valve cap.

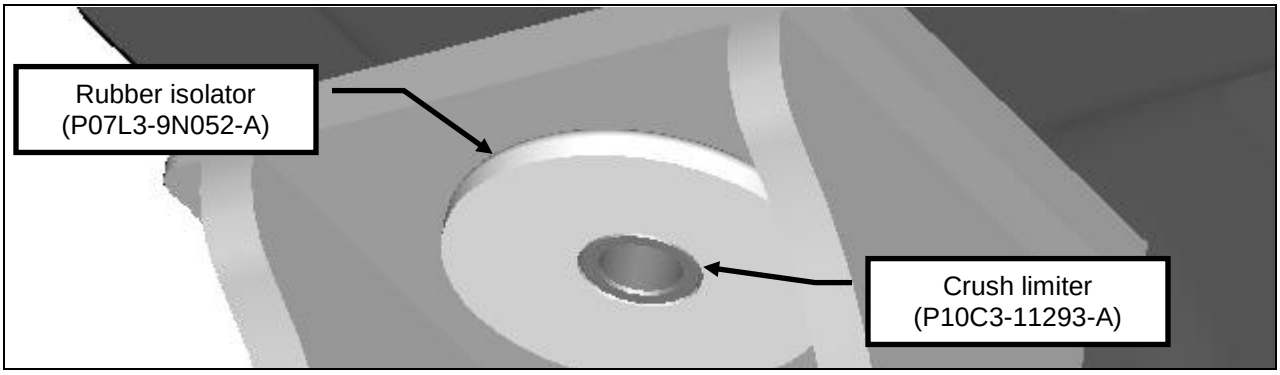


6. Continue to raise the tank into position, being careful to align the mounting holes on the tank brackets with the five (5) respective mounting holes in the frame brackets and frame rails before fully seating on all five (5) locations.



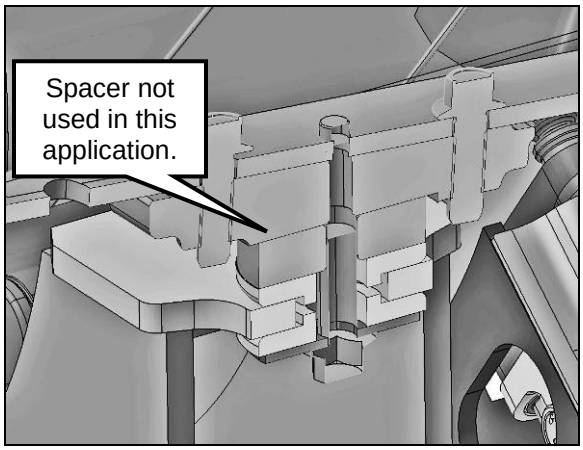
Bottom view illustrating a fully installed tank

7. Once all of the tank mounting brackets are aligned and seated firmly in position against the frame brackets and rails, install five (5) Isolator Crush Limiters (PBC2-11293-A) and the five (5) remaining Rubber Isolators (P07L3-9N052-A) into the underside holes on the tank mounting brackets (5 places). The rubber isolators can be found in Hardware Kit C (PBC2-HKC-A).

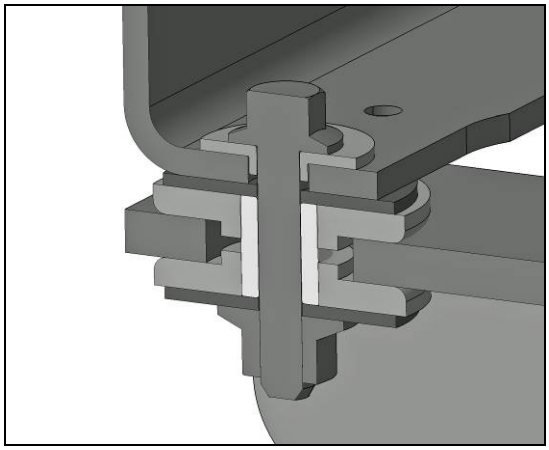


8. Loosely install the M12 x 1.75 x 55 bolts (W709906-S439) found in the vehicle Fuel Tank Mounting Supplemental Kit — E-350 (PBC2-TANKKIT-A) and washers (P07L3-3932-A) found in Hardware Kit C (PBC2-HKC-A). At locations B, C and D, mount the tank using a step-collar washer (PBC2-3932-A) positioned on the top side of the frame rail and a bolt inserted from the top side to a nut (W710807-S440) on the bottom side of the frame rail. Do NOT tighten the bolts at this time. Thread bolts in only up to the pre-applied Loctite®. Once all five (5) tank mounting bolts have been installed in the brackets, the bolts will be tightened to specification, engaging and setting the Loctite®.

Tank Mounting Fasteners – Cross-sectional Views

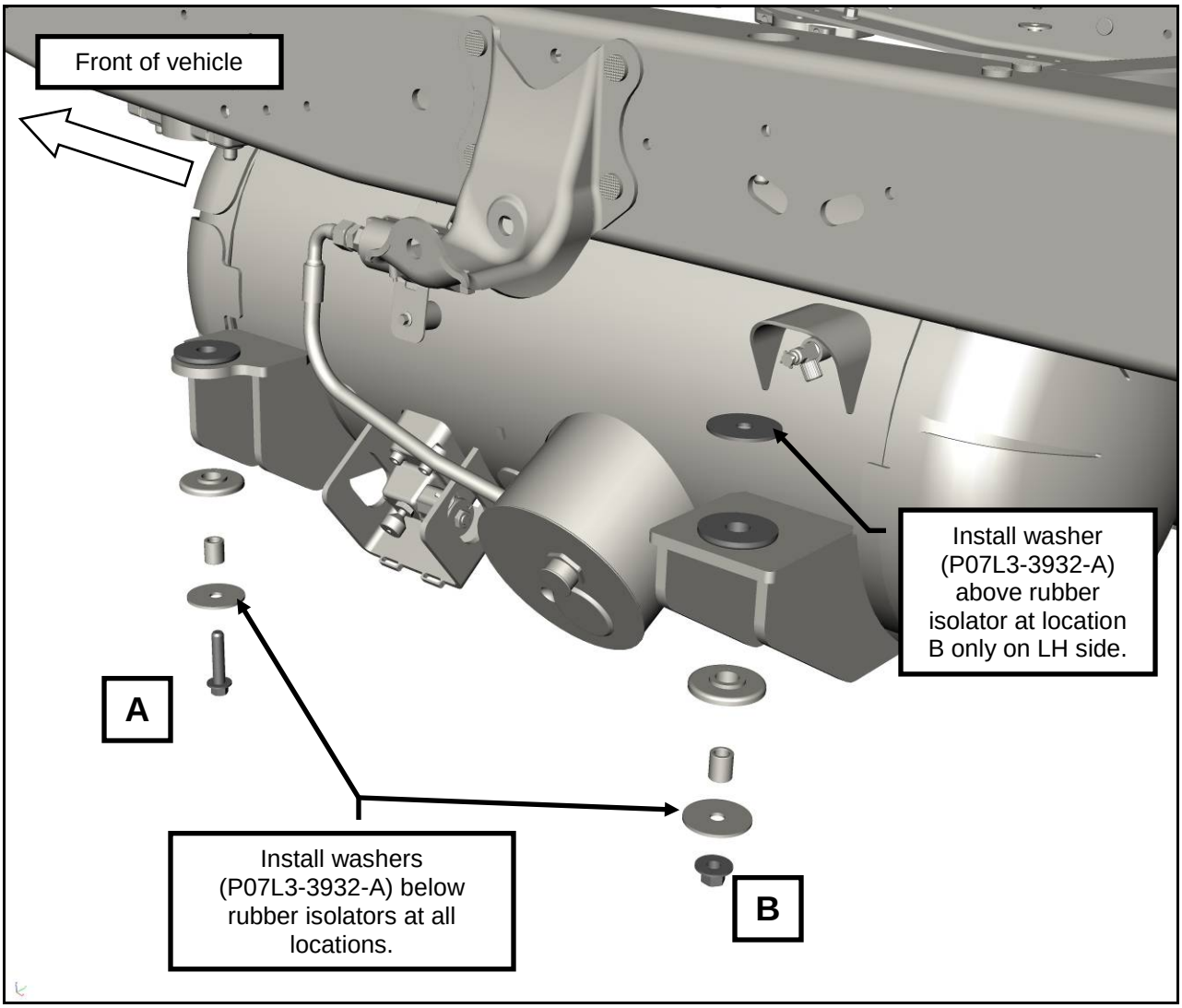


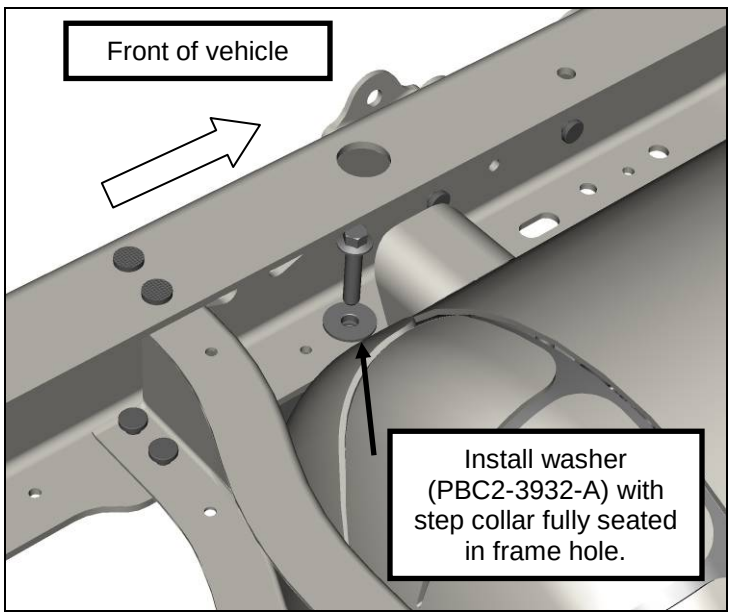
Frame Locations A and E



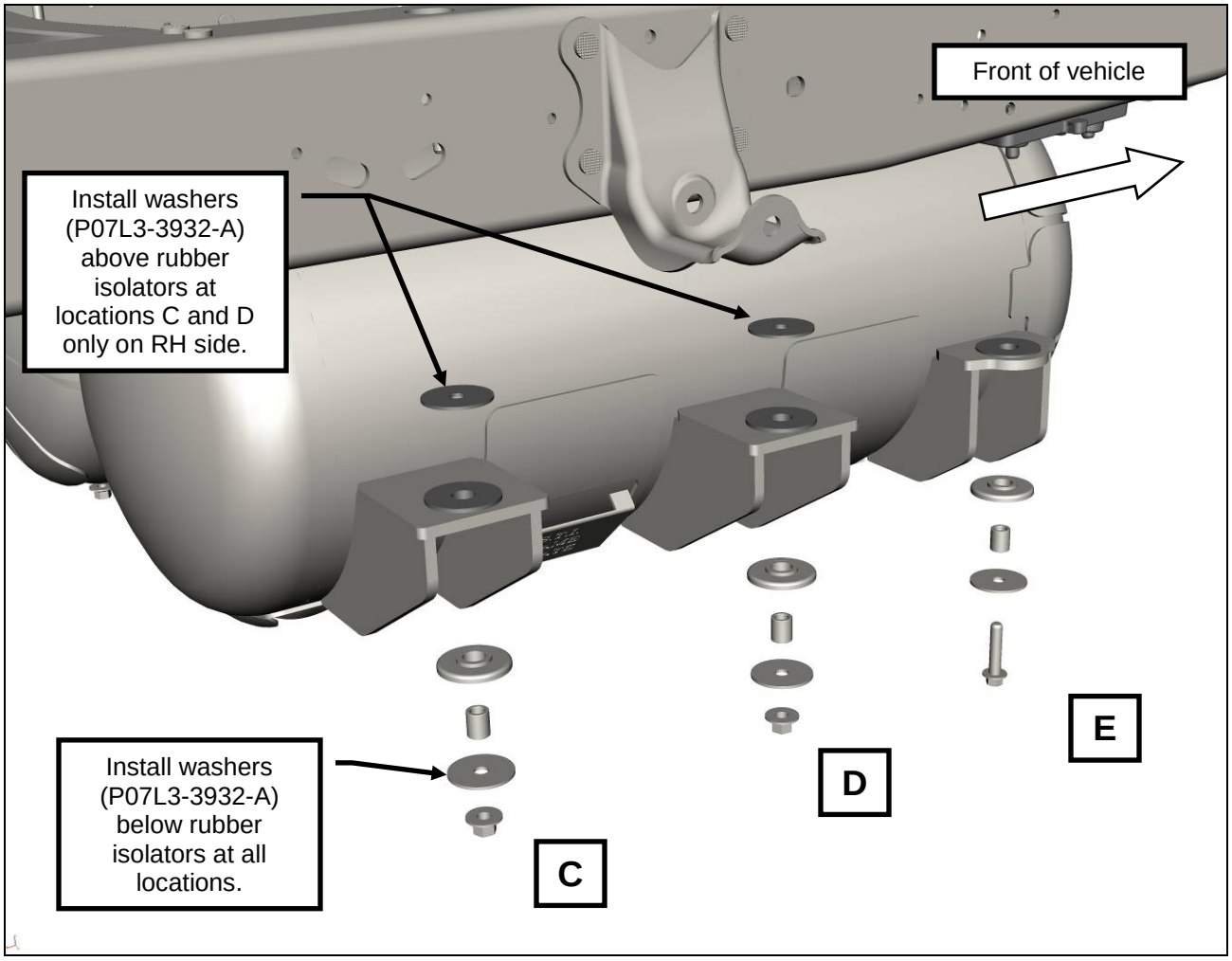
Frame Locations B, C and D

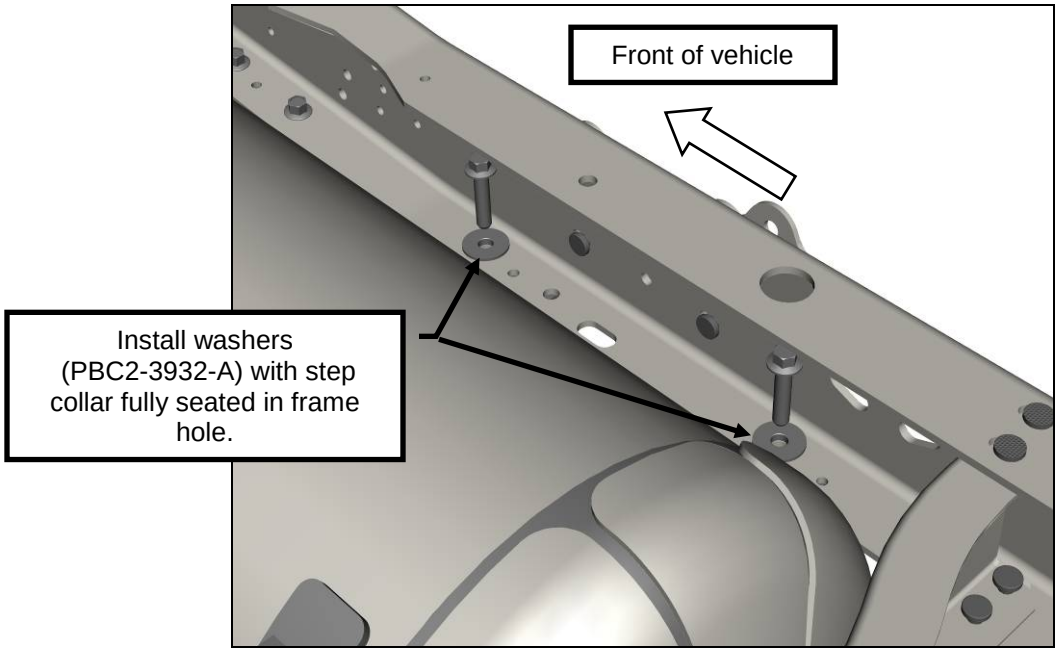
TANK MOUNTING – DRIVER SIDE (LOCATIONS A AND B)





Tank Mounting – Passenger Side (Locations C, D and E)

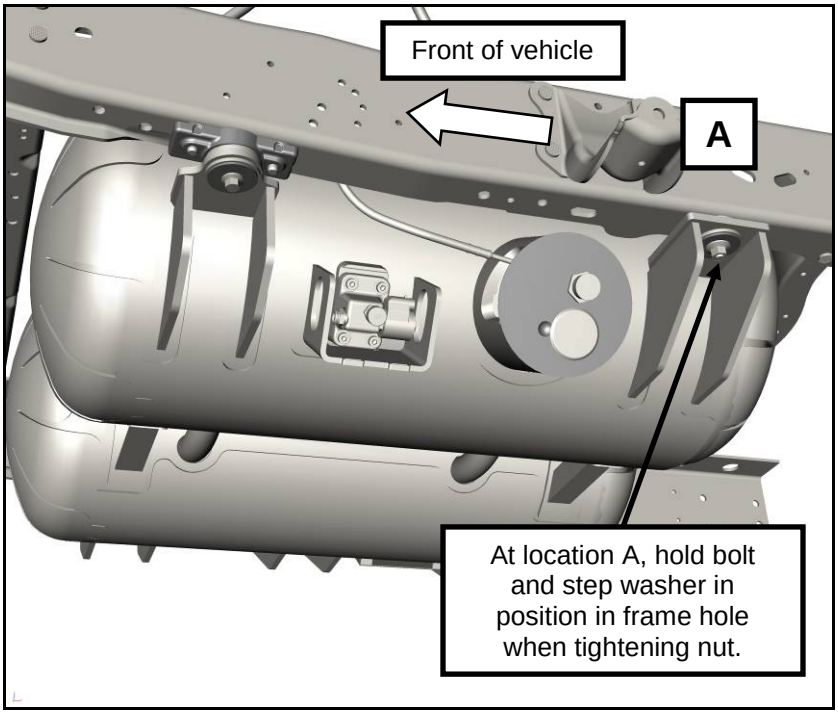


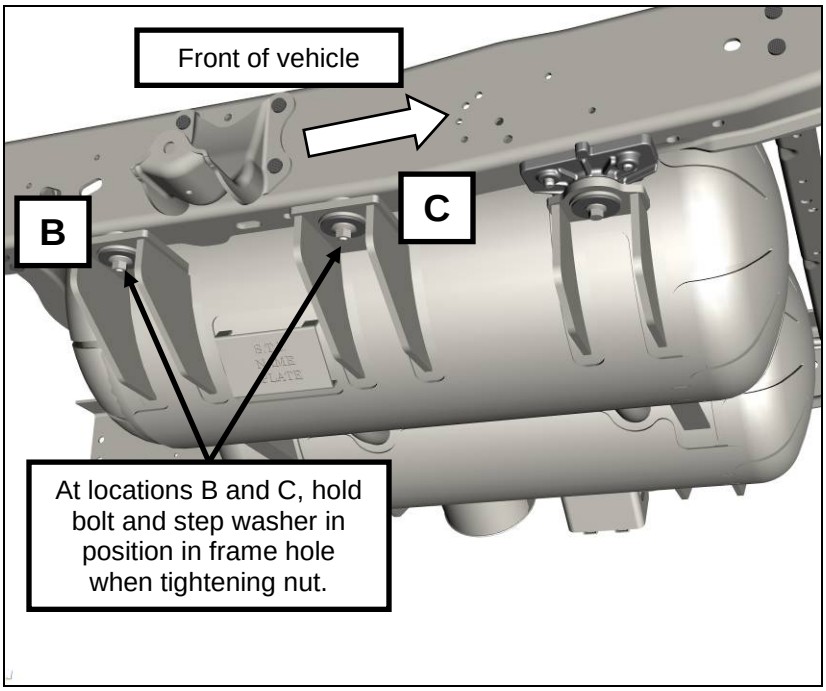


9. Once all tank mounting fasteners have been installed, tighten the five (5) tank mounting fasteners to 100–110 Nm.

Note: At locations B, C and D, hold bolt and step washer in position to ensure that the step collar of the washer remains properly seated in the frame hole during tightening.

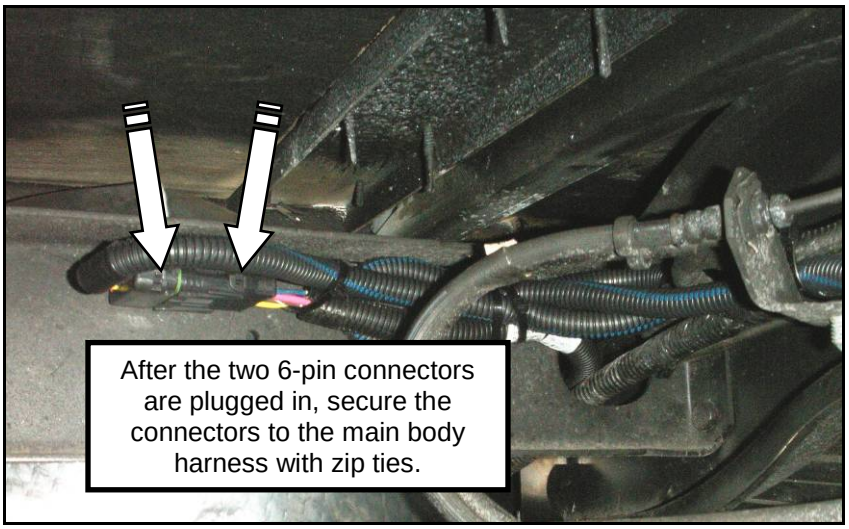
⚠ **Caution:** If the step-collar washers (locations A, B and C) are not properly seated in the frame holes during the tightening sequence, the washer(s) can be damaged and result in a loose mounting.



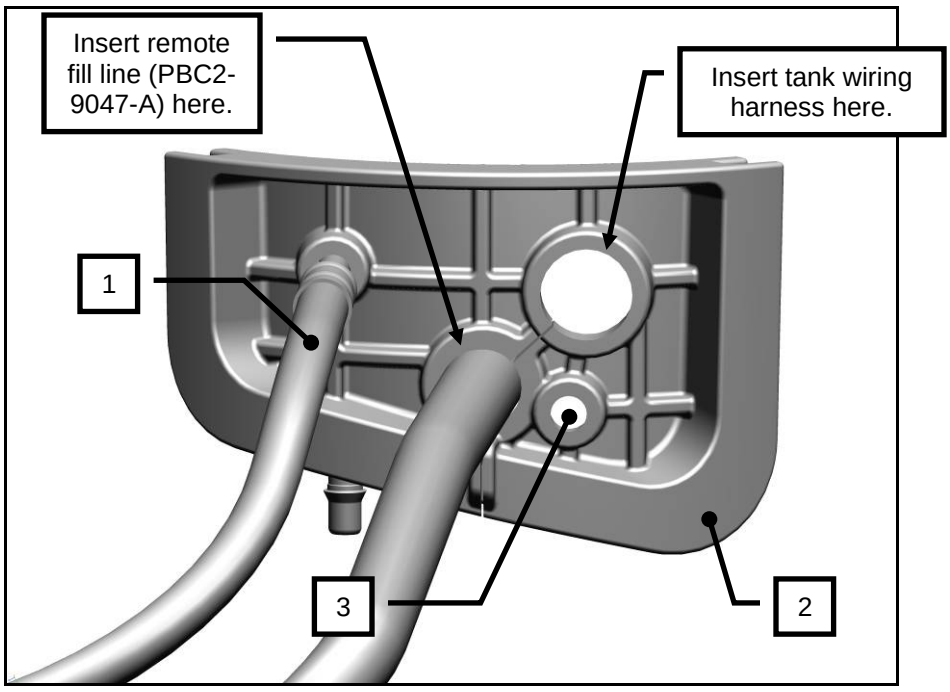


10. With the tank in position, remove the multivalve cover and obtain the fuel Supply Valve Cover (PBC2-9B228-B) which can be found in Hardware Kit C (PBC2-HKC-A). Disconnect the fuel fill line at the multivalve that was previously hand tightened.

11. Before making the fuel line connections, check that the fuel supply valve is functioning by briefly applying 12-volt power to the pink and brown wire terminals at the 6-pin connector. The multivalve is functioning if a “click” is heard.
12. Route the fuel tank 6-pin harness connector up along the frame through the fuel line routing hole. Connect the 6-pin tank wiring harness connector located on the ROUSH CleanTech Vehicle Main Wiring Harness (P08C2-3075-A) to the tank harness connector as shown.



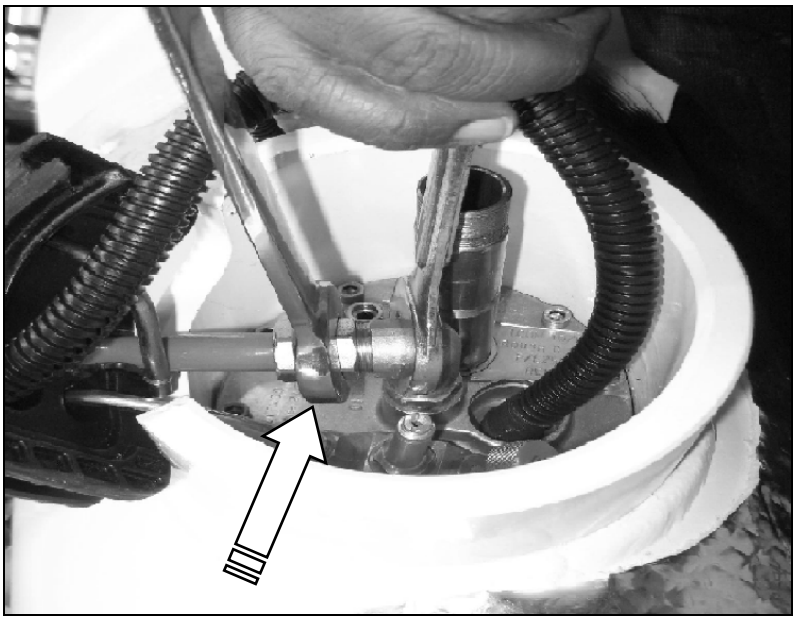
13. Install the Fuel Return Line (Item 1 — PBC2-9A086-A) through the tank collar grommet (Item 2 — P10C3-14487-A). Insert the fuel tank wiring harness (which is connected to the fuel tank) into the upper right hole of the grommet. Install the nylon push-pin plug (Item 3 — 90221A119) in the small hole at the bottom of the grommet. Install the fuel Remote Fill Line (PBC2-9047-A) into the remaining hole as shown.



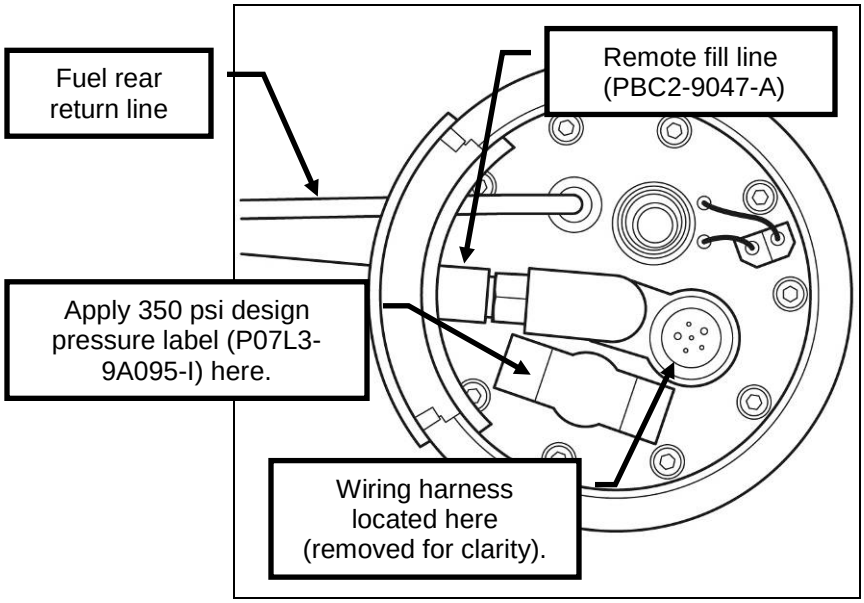
14. Install the fuel Remote Fill Line (PBC2-9047-A) to the 90-degree fitting on the multivalve as shown. Tighten the fill line to 41–49 Nm.

⚠ **Caution:** Do not allow the fill line to twist or kink while tightening the line nut fitting. This can cause the remote fill line to distort and contact the frame rail. Component damage can result.

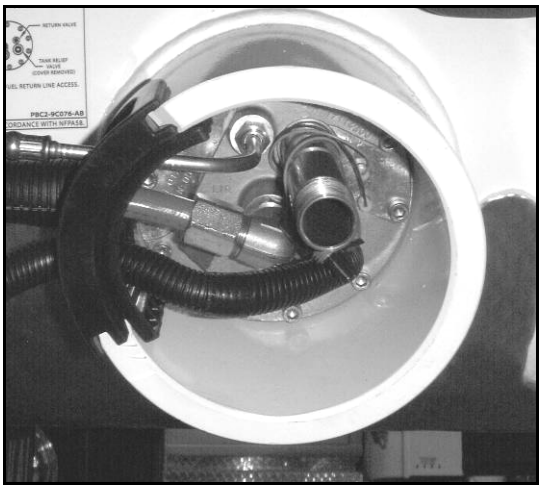
Note: The remote fill line must not be twisted, kinked or otherwise come into contact with the frame rail after it is installed. Check the clearance of the fill line with the frame rail to make sure there is at least a 10mm clearance between the line and the rail.

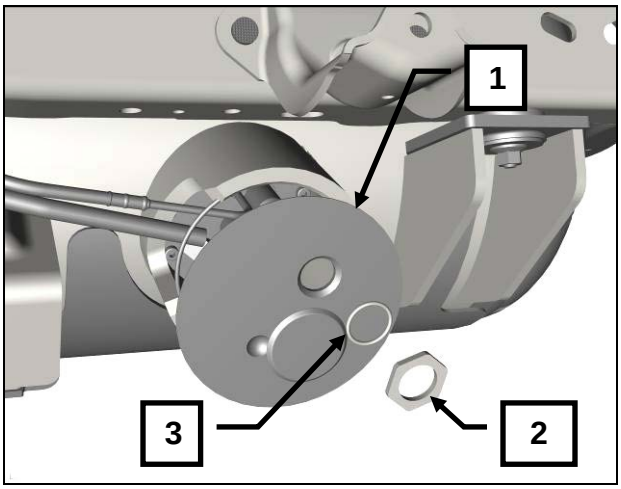


15. Remove the protective dust cap from the quick-connect fitting on the multivalve (located inside the tank collar). Install the tank collar grommet into the tank collar opening and push the fuel line into the quick-connect fitting as shown. Firmly pull on the line to make sure that the quick-connect fitting is locked in place. Install the 350 psi Design Pressure Label (P07L3-9A095-I) onto the top of the multivalve supply solenoid.

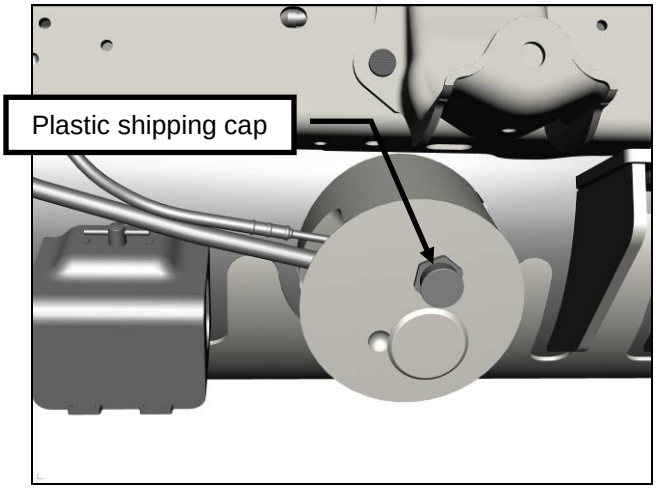


16. Once all connections have been made to the multivalve, and the hoses and wiring are neatly arranged inside of the collar as shown, secure the aluminum multivalve (collar) cover (item 1) to the tank using the M24 nut (item 2) and O-ring (item 3). All of these parts can be found in a bag that was shipped with the tank.

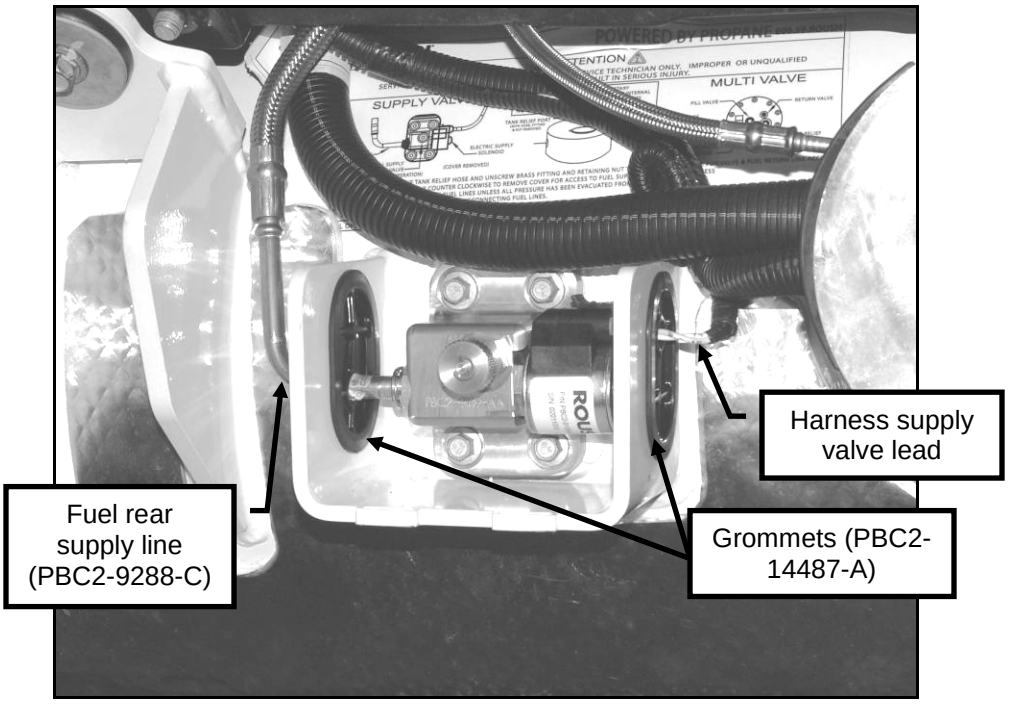




17. Install the plastic shipping cap (removed previously) onto the open port sticking out through the multivalve cover.

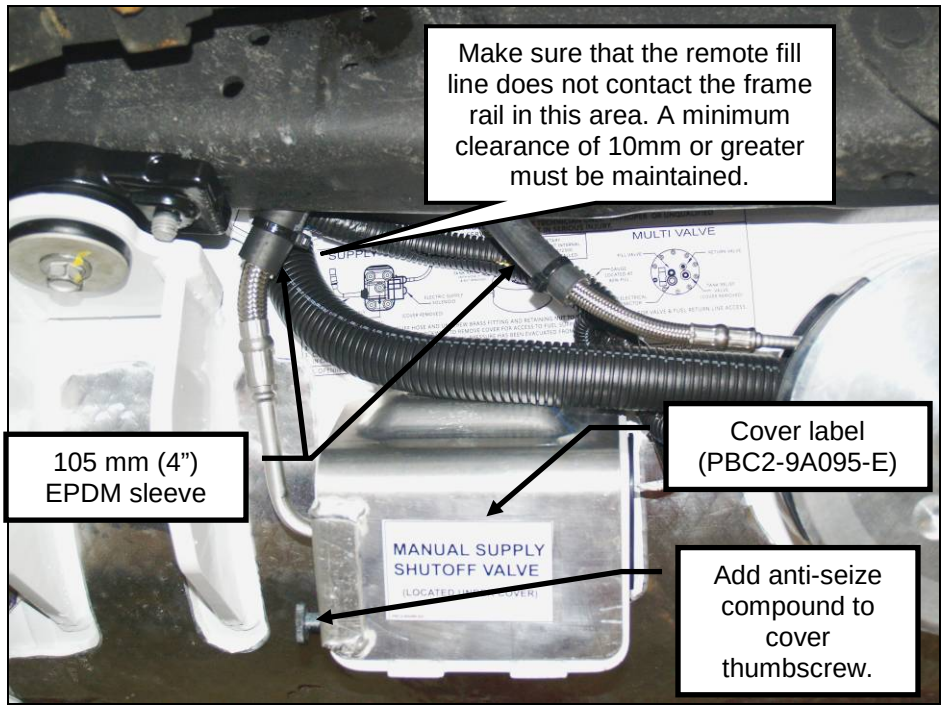


18. Insert the fuel Rear Supply Line (PBC2-9288-C) through the grommet (PBC2-14487-A). Align the quick-connect fitting of the fuel supply line with the supply valve port and push in to connect the line to the valve. Pull back firmly on the line to make sure the line fitting is locked into position. Insert the wiring harness supply valve lead (part of harness P08C2-3075-A) through the second grommet (PBC2-14487-A) and connect the lead to the valve terminal. Lubricate the outer edges of both grommets and push the grommets into the side openings of the supply valve collar.



19. Apply an anti-seize compound to the supply valve cover Thumb Screw (92581A340).
20. Install the Supply Valve Cover (PBC2-9B288-B) and tighten the thumb screw to secure the cover.

21. Apply the Supply Valve Cover Label (PBC2-9A095-E) to the supply valve cover as shown.
22. Add one (1) protective EPDM Sleeve (PBC2-9C328-A), found in Hardware Kit B (PBC2-HKB-A) along the flex section of each fuel line in the area where they may rub/contact the frame. Secure the sleeves to the lines using zip ties (1A868) found in Hardware Kit F (PBC2-HKF-A).



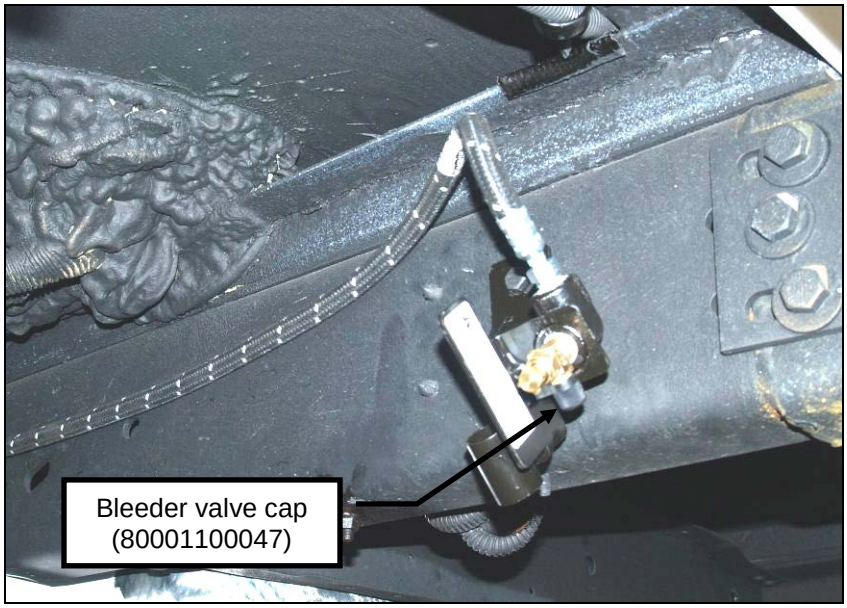
Installing the Reprogrammed PCM

1. Following the procedure described in the Ford Service Information Workshop Manual, Section 303-14, Electronic Engine Controls, install the powertrain control module (PCM).
2. Reinstall the vehicle battery and connect the positive and negative terminals.

System Leak Check

⚠ **Caution:** Hand tighten all fuel line connectors and fasteners before applying a wrench to avoid cross threading. Failure to heed this caution may result in property damage.

1. Remove the bleeder valve cap from the remote bleeder valve on the frame rail.



2. Attach a pressure gauge to the remote bleeder valve on the frame rail.
3. Make sure the bleeder valve located on the tank is open.
4. Open the remote bleeder valve. Pressure must exceed 20 psi. If it does, continue to the next step. If pressure does not exceed 20 psi, contact ROUSH CleanTech Customer Service at 1-800-597-6874 for assistance.
5. Close the valve and remove the gauge.
6. Attach the fuel pressure gauge to the service port on the passenger side fuel rail.
7. Cycle the ignition key repeatedly until the gauge reading equals the reading at the remote bleeder valve.
8. Allow the gauge to remain connected for a minimum of 10 minutes.
9. If the pressure degrades, search for leaks using a leak detector (i.e. soapy water, Snoop®, etc).
10. Repeat Step 6, Step 7 and Step 8 until all leaks have been stopped and the pressure does not degrade for 10 minutes.
11. Remove the fuel pressure gauge from the service port on the fuel rail and install the protective cap onto the service port.

Note: If the vehicle continues to fail this test, contact ROUSH CleanTech Customer Service at 1-800-597-6874 for assistance.

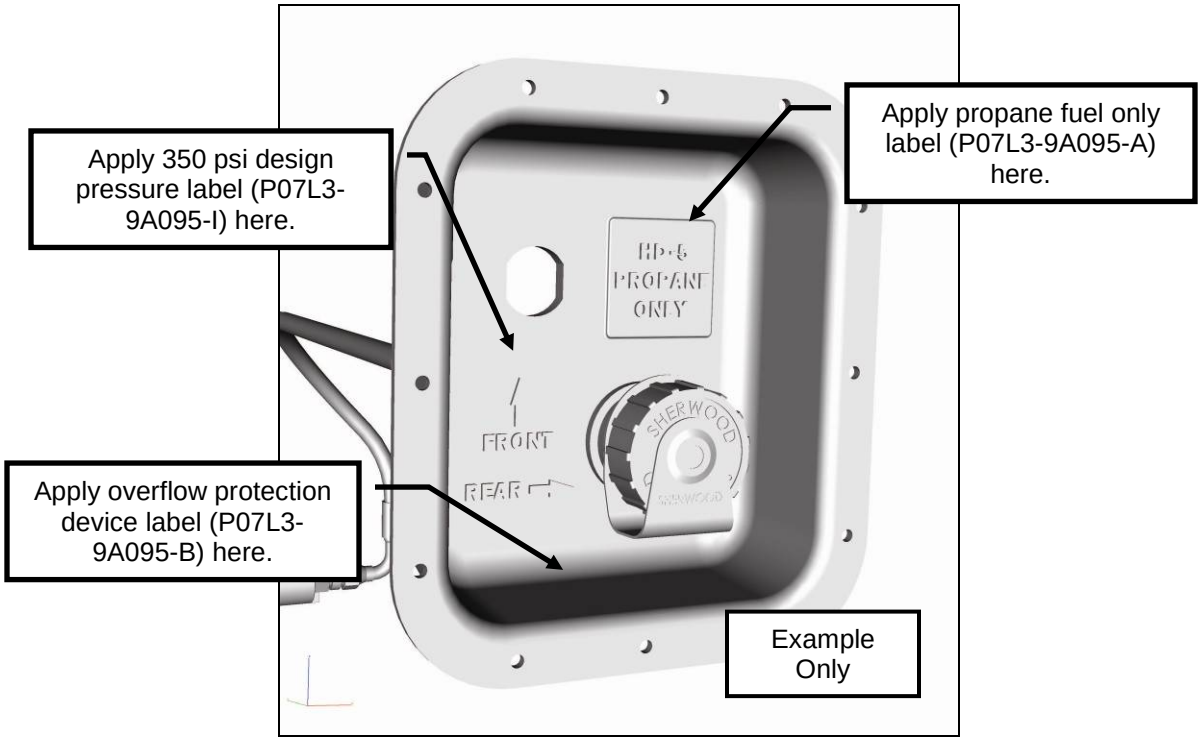
12. Open the remote bleeder valve to allow the contents of the tank to escape.
13. Close the valve.
14. Install the cap onto the remote bleeder valve.
15. Reinstall the air induction system in the reverse order it was removed.
16. Reinstall the engine cover (doghouse) inside the passenger compartment.

Installing Badges and Labels

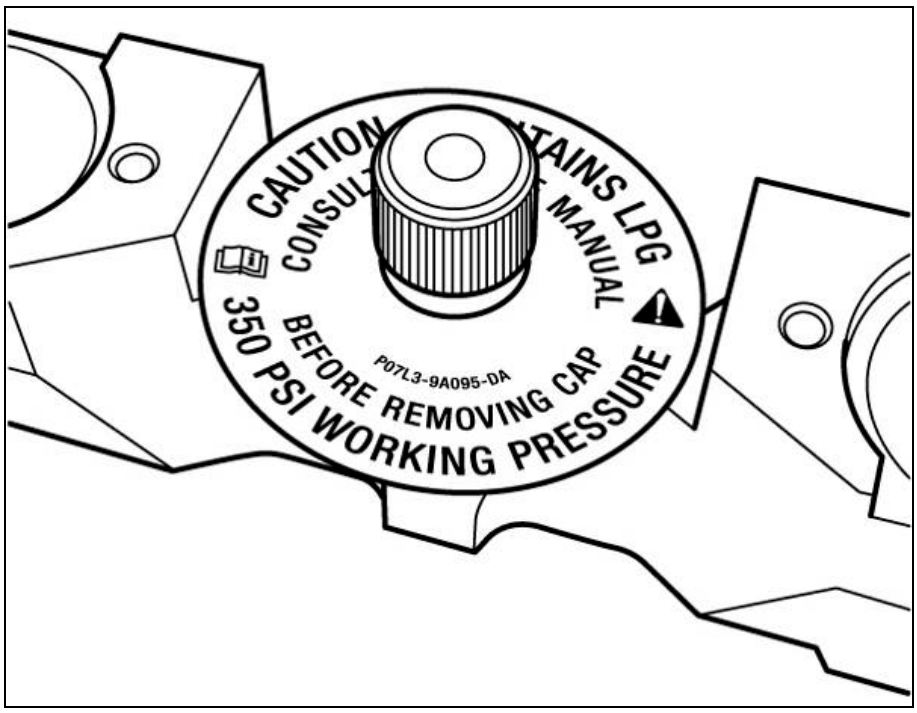
Clean and dry all surfaces prior to applying new self-adhesive badges and labels. All labels can be found in Hardware Kit G (PBC2-HKG-A).

1. Apply one (1) “PROPANE” reflective diamond label (D85) onto the lower right rear corner of the completed vehicle.

2. Apply one (1) Propane Fuel Only Label (P07L3-9A095-A) on the inside of the fuel fill bucket or on the bed beside the mounting location for the bucket. Apply one (1) 350 psi Design Pressure Label (P07L3-9A095-I) on the left center of the fuel fill bucket. Apply one (1) Overflow Protection Device Label (P07L3-9A095-B) on the bottom center flange of the fuel fill bucket.

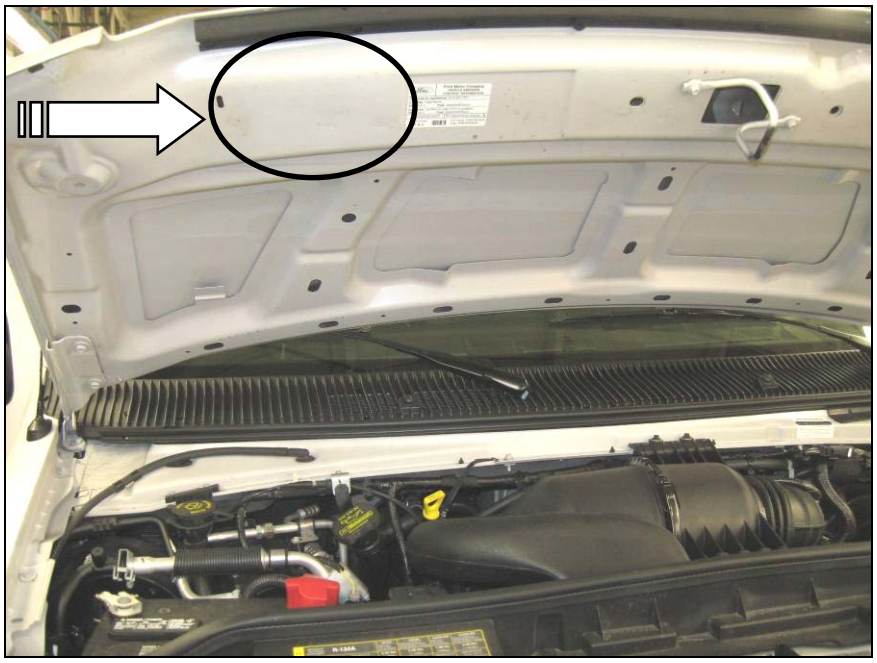


3. If not already done, remove the service port cap and install a fuel rail service port warning label (P07L3-9A095-D) onto the fuel rail. Reinstall the cap.



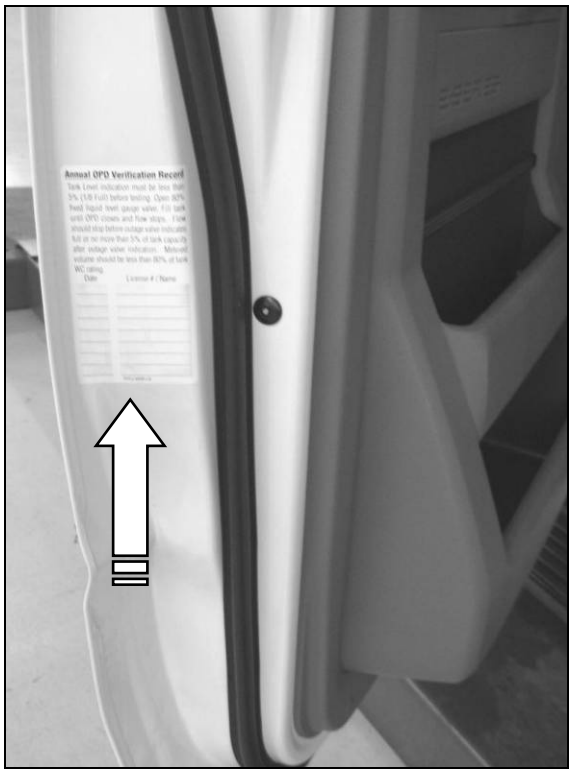
4. Apply the ROUSH VECI label returned with the PCM to the underside of the hood on the passenger side of the vehicle to the left of the Ford label.

Note: This label is vehicle-specific and is required by law to be applied to the vehicle to which it is assigned. Use the label included with the PCM when returned to you by ROUSH CleanTech.



Note: If the vehicle is Engine certified only, this VECI label is to be installed on the back of the passenger-side valve cover.

5. Apply the bleeder valve inspection label (P07L3-9A095-C) to the end of the driver side door as shown.



6. Install the PCM Tamper Warning Label (R07100008-AA) onto the cowl below the wiper tray near the PCM.

7. Install the ROUSH CleanTech badge (P11GD-01G100-A) under the Ford badge on the right and left front fenders. Right side shown as an example. The badges can be found in Hardware Kit G (PBC2-HKG-A).

Completing the Installation

The following procedure is required in order to ensure that the fuel system is leak-free and that any residual nitrogen is removed from the system. Failure to complete this process could result in leaks, excessive tank pressure and filling problems.

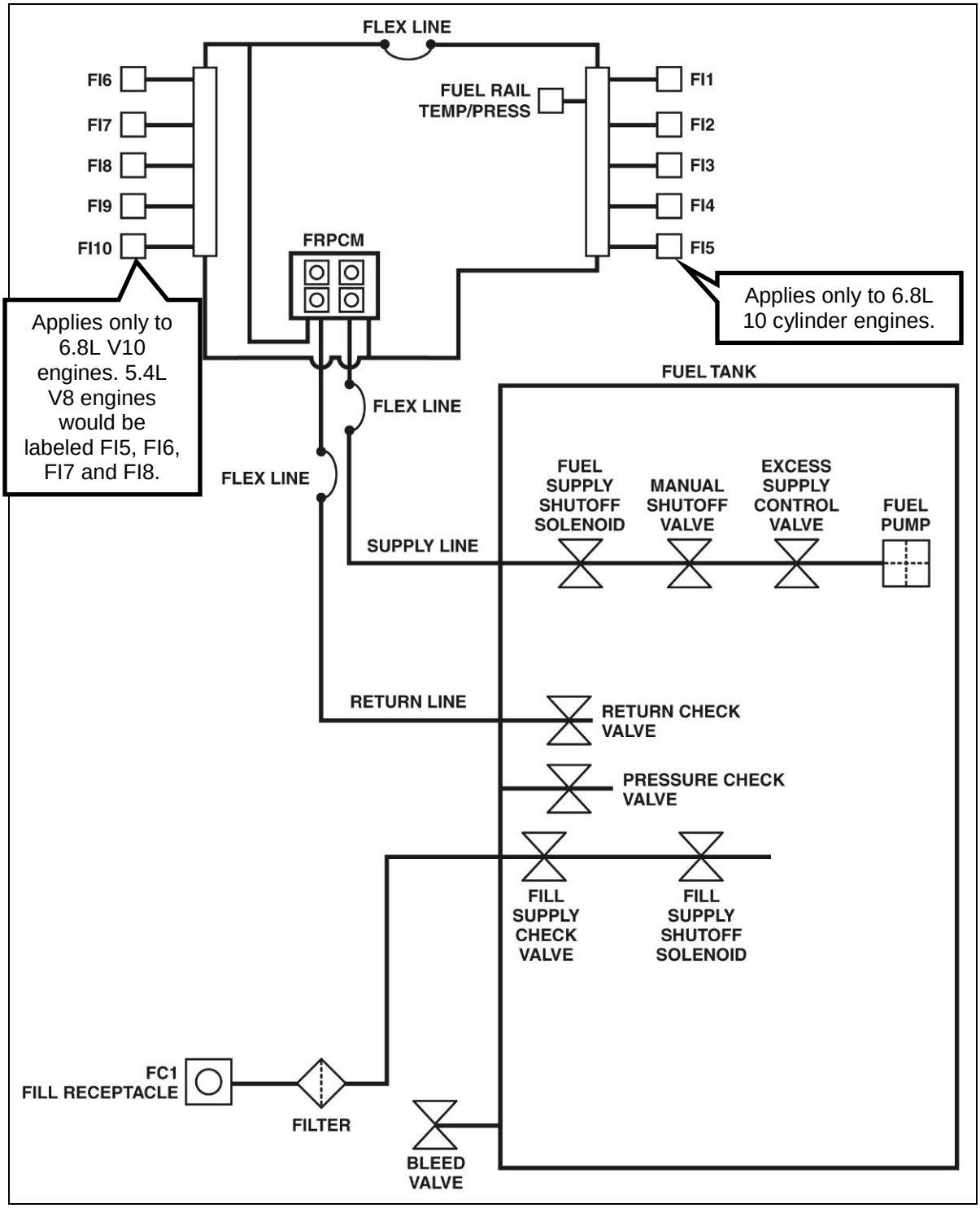
1. Verify that the remote bleeder valve is closed and that the bleeder valve on the tank is open.
2. Remove the remote bleeder valve cap. Open the remote bleeder valve and bleed the system until the system depressurizes. Close the valve and replace the cap.
3. Fill the tank with 0.1 (1/10) gallon of propane. Cycle the ignition key to the START position and then back to the OFF position. **Do NOT allow the engine to start during this step**.
4. Inspect and monitor for any leaks.
5. Remove the remote bleeder valve cap and open the remote bleeder valve for 10 minutes or until propane stops bleeding, whichever comes first. Close the remote bleeder valve and install the remote bleeder valve cap.
6. Fill the tank with 5 gallons of propane. Cycle the ignition key to the START position and then back to the OFF position. **Do NOT allow the engine to start during this step**.

Note: The next step confirms if any leaks are present in the fuel system.

7. Perform a final leak inspection at all fuel fill and fuel line connections to ensure no leaks are present using Snoop®, or a dish soap and water mixture.
8. Perform End of Line (EOL) testing and road test the vehicle.
9. Verify that there are no concerns; then, fill the vehicle tank with propane and record the total amount, in gallons, to fill the tank.
10. Insert the E-350 Owner's Manual (PBC2-19A321-A) into the glove box.

IF YOU HAVE ANY QUESTIONS DURING THE INSTALLATION OF THIS KIT, PLEASE CALL 1-800-59-ROUSH.

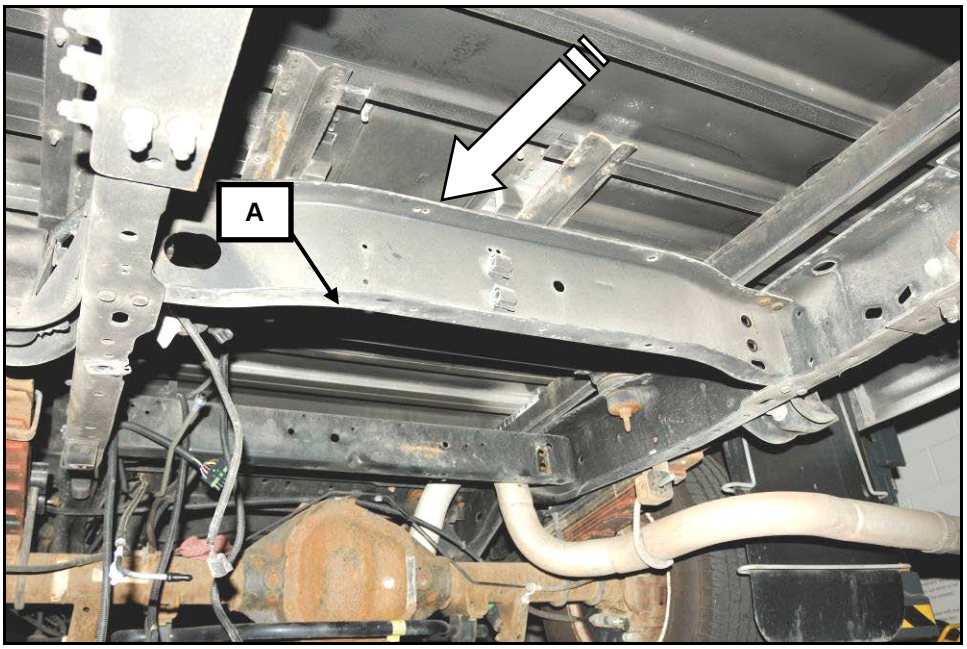
LP System Schematics and Diagrams



Appendix

Rear Crossmember Position Modification for Fuel Tank Installation

The Fuel Tank Installation for the ROUSH Liquid Propane Injection System Installation in some E-350 Super Duty DRW chassis must have the OEM Rear Crossmember moved to a position that allows the installation of the fuel tank. The crossmember must be moved rearward approximately 12 inches to accomplish fuel tank installation and maintain frame rigidity and integrity.



OEM Rear Crossmember Location

Remove the OEM Fuel Tank

⚠ **Warning**: Before working on or disconnecting any fuel system related components, relieve the fuel system pressure to prevent fuel spraying; fuel in the system is under high pressure, even with engine not running. Failure to follow this warning can result in serious personal injury.

1. Disconnect the negative battery cable from the battery.
2. Drain the fuel from the fuel tank.
3. Remove the OEM fuel tank, fuel tank shield, fuel vapor tube, fuel supply tube, fuel tank straps and electrical connections. Refer to the appropriate year Ford E-250, 350, 450, 550 Super Duty Workshop Manual Volume 2, Fuel System Section 310-01 for aft-of-axle fuel tank removal procedures.
4. Remove the ground connection on the top of the rear crossmember. Save the ground lug screw for reuse. Ground to be relocated to hole **A** in crossmember.

Remove the Rear Crossmember

Remove the rivets securing the crossmember to the frame side rails. Do the following.

⚠ **Caution**: Wear safe eye and ear protection when grinding, cutting and punching rivets to avoid serious personal injury.

⚠ **Caution**: Be careful while grinding or punching out rivets. Do not elongate or distort crossmember or frame side rail rivet holes. Do not grind on the crossmember or frame side rails. This can cause a loose or misaligned crossmember. Damage to components can result.

1. Working at the bottom of the four (4) lower rivets (two each side), grind off the rivets or cut two (2) perpendicular grooves into the end of the rivets.

Cutting Lower Rear Crossmember Rivet

2. Use a chisel to cut the rivets flush with the frame side rail.

Chiseling Lower Rear Crossmember Rivet

3. Trim the end of the rivets until flush with the frame side rail.

Trimming Lower Rear Crossmember Rivet

4. Punch the rivets out of the frame side rail and rear crossmember.

Punching Out Rear Crossmember Rivet

5. Perform Steps 1–4 for the remaining three (3) lower rivets.

6. Working at the bottom of the four (4) upper rivets (two each side, inside flanges of crossmember), grind off the rivets or cut two (2) perpendicular grooves into the end of the rivets.

Grinding Upper Rear Crossmember Rivet

7. Use a chisel to cut the rivets flush with the rear crossmember.
8. Trim the end of the rivets until flush with the crossmember. Punch the rivets out of the rear crossmember and frame side rail.
9. Perform Steps 6–8 for the remaining three (3) upper rivets.
10. Separate the rear crossmember from the frame side rails.

Separating Rear Crossmember

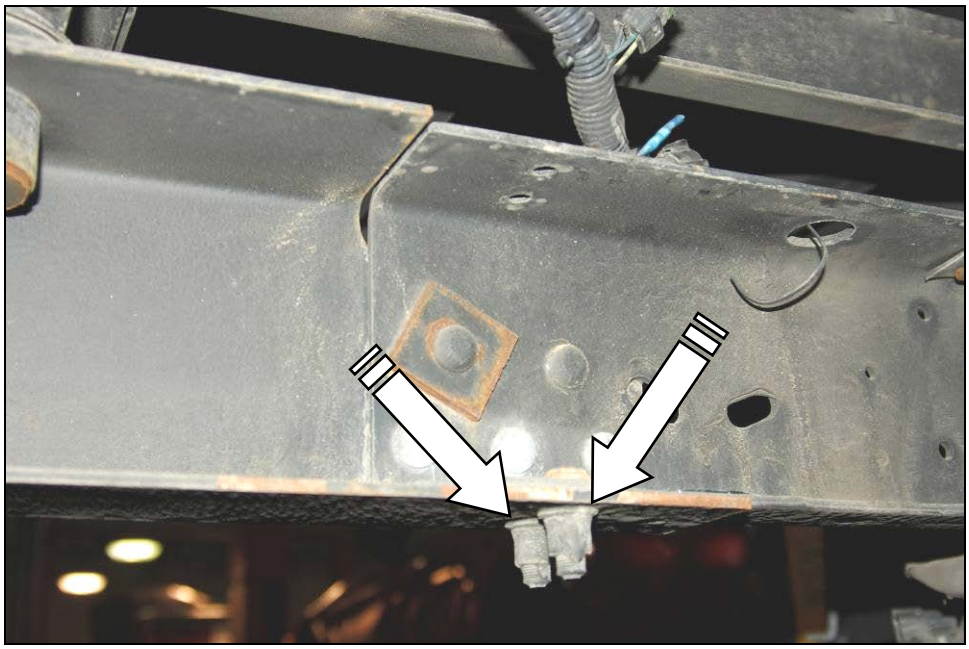
11. Deburr and apply a rust preventive coating to the original crossmember location, to include the frame rails and rivet holes. ROUSH CleanTech suggests Motorcraft Premium Undercoating (PM-25-A).

Preparing the New Location of Rear Crossmember

⚠ **Caution**: Wear safe eye and ear protection when grinding, cutting and punching rivets to avoid serious personal injury.

⚠ **Caution**: Be careful while grinding or punching out rivets. Do not elongate or distort crossmember or frame side rail rivet holes. Do not grind on the crossmember or frame side rails. This can cause a loose or misaligned crossmember. Damage to components can result.

1. Locate the four (4) lower HUCK™ Fasteners securing the frame rail extensions to the OEM frame side rails, located approximately 12 inches behind the original position of the rear crossmember.



Lower HUCK™ Fasteners at Frame Rail Extension

2. Using a cutoff grinding wheel, cut through the collar of the HUCK™ fastener. Make the cut from the flange of the collar to the end of the HUCK™ fastener. Cut through the collar as much as possible to release it from the HUCK™ Pin.

Cutting Lower HUCK™ Fastener Collar

3. Separate the HUCK™ collar from the HUCK™ pin and drive the pin out of the frame side rail and frame extension.

Separating Lower HUCK™ Collar from Pin

4. Perform Steps 1–3 for the three (3) remaining lower HUCK™ fasteners.

⚠ **Caution**: Do not remove or disturb the ten (10) HUCK™ fasteners (five each side) securing the sides of the frame extensions to the sides of the frame side rails. Damage to components can result.

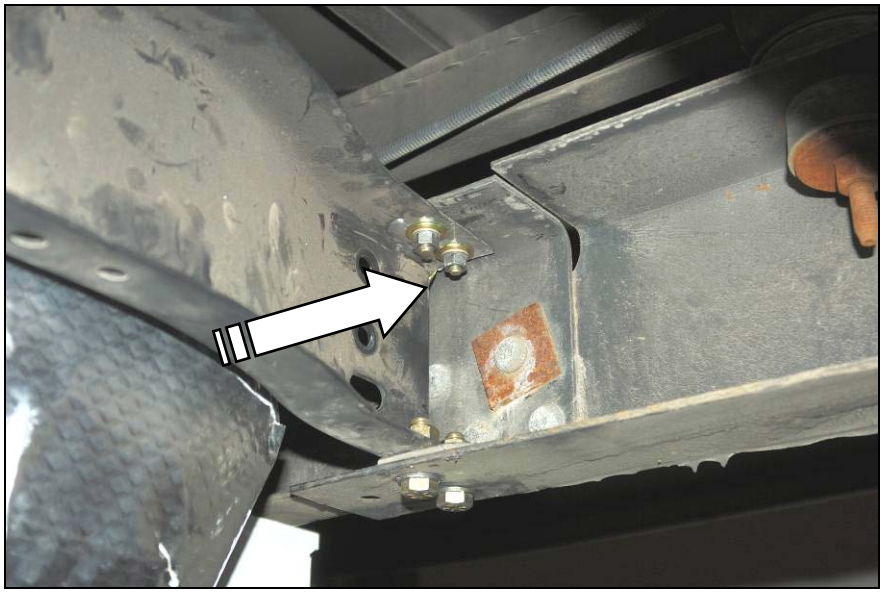
5. Deburr and apply a rust preventive coating to the new crossmember location, to include the frame rails and HUCK™ fastener holes. ROUSH CleanTech suggests Motorcraft Premium Undercoating (PM-25-A).

Preparing the Rear Crossmember for Installation

Slight modifications must be made to the rear crossmember so that the crossmember can be easily positioned and installed in its new location between the frame side rails.

1. At each end of the rear crossmember, trim approximately 1/2 inch of material out of the web of the crossmember. Leave a slight radius of material where the web meets the flange.

Note: Trimming the crossmember web is done to provide clearance from the HUCK™ pin heads (inside frame side rails) as the crossmember is being installed into position.



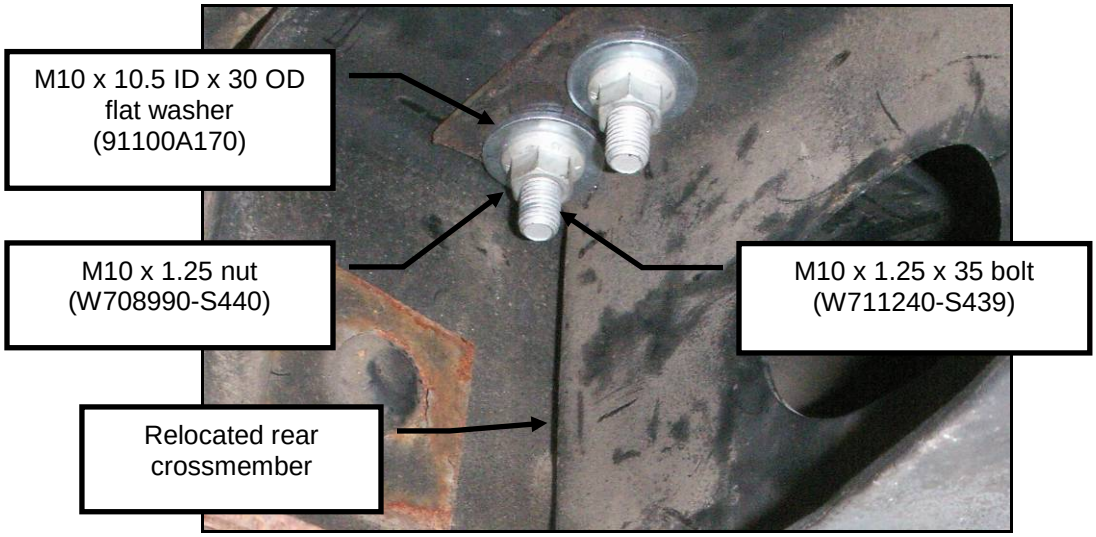
Area of Rear Crossmember Modification

2. If necessary, enlarge the rivet holes in the flanges of the rear crossmember in eight (8) locations (two upper and two lower in each end). Use a 1/2 inch drill bit to enlarge the holes.
3. Deburr and apply a rust preventive coating to the new crossmember where modifications have been made, including the bolt holes and web. ROUSH CleanTech suggests Motorcraft Premium Undercoating (PM-25-A).

Installing the Rear Crossmember and Fuel Tank Guard in the New Position

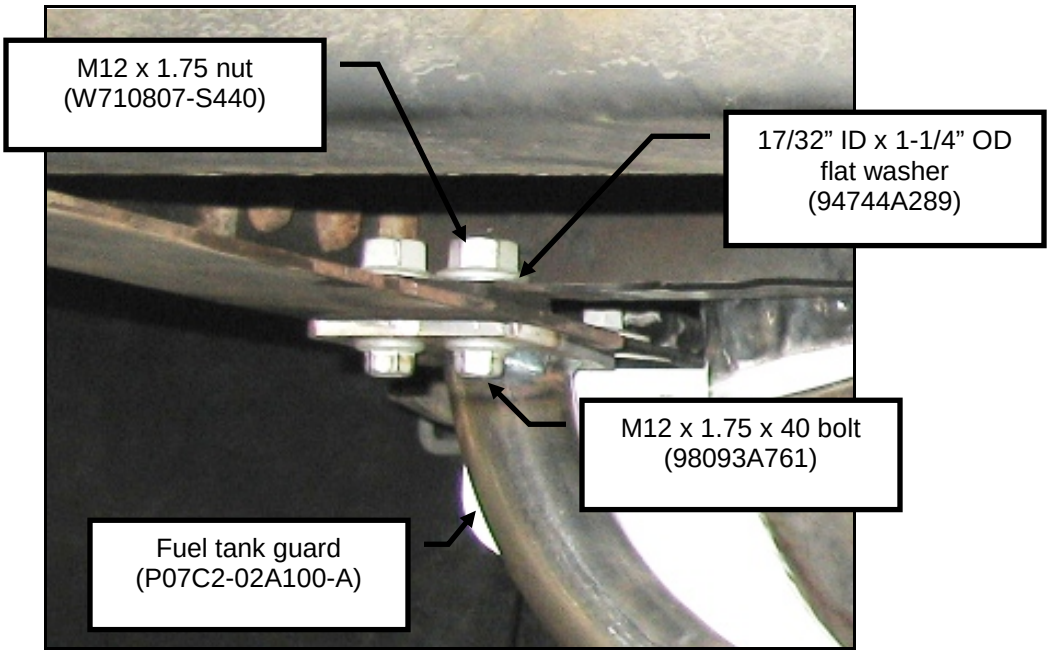
1. Obtain the following parts from Frame Supplemental Hardware Kit (P11-SO-FRAMEKIT-A) for installation of the rear crossmember and fuel tank guard.
   - Four (4) M10 x 1.25 x 35 bolts (W711240-S439), four (4) M10 x 1.25 nuts (W708990-S440) and eight (8) M10 x 10.5 ID x 30 OD flat washers (91100A170)
   - Four (4) each, M12 x 1.75 x 40 bolts (98093A761), M12 x 1.75 nuts (W710807-S440) and 17/32-inch ID x 1-1/4-inch OD flat washers (94744A289)
   - One fuel tank guard (P07C2-02A100-A)

2. Position the rear crossmember at the new location. From the top, insert four (4) M10 x 1.25 x 35 bolts (W711240-S439) with M10 x 10.5 ID x 30 OD flat washers (91100A170) through the frame rail flange and crossmember mounting holes. Add an M10 x 10.5 ID x 30 OD flat washer (91100A170) and an M10 x 1.25 nut (W708990-S440) to each upper bolt to secure the crossmember at the top.



Rear Crossmember Upper Mounting Bolts (LH side shown)

3. Place the fuel tank guard (P07C2-02A100-A) in position below the frame rails at the new rear crossmember location. From the bottom, insert four (4) M12 x 1.75 x 40 bolts (98093A761) through the fuel tank guard, frame rail flange and rear crossmember. Add a 17/32-inch ID x 1-1/4-inch ID flat washer (94744A289) to each lower bolt and secure with M12 x 1.75 nuts (W710807-S440). Flat washers are NOT used under the M12 bolt heads.



Rear Crossmember and Fuel Tank Guard Lower Mounting Bolts (LH side shown)

4. Tighten the fasteners to the specified torque:
   - Tighten M12 fasteners to 90–100 Nm.
   - Tighten M10 fasteners to 45–55 Nm.

Relocated Rear Crossmember and Fuel Tank Guard Installed