Ford F-650 Chassis Cab
Liquid Propane Autogas Fuel System — Dual and Single Tanks

Revision History		
-AA	Initial Release	10/2013
-AB	SRM Isolator Delete	11/2014
-BA	Add Single Tank Configuration	02/2015

Installation Instructions

P13FB-01F001-BA

February 2015

CONTENTS

REMOVING THE POWERTRAIN CONTROL MODULE

1. Using a scan tool, check for all diagnostic trouble codes. Correct all trouble codes before continuing.
2. Depressurize the fuel rails using the procedure described in the *Ford Workshop Manual Section 310-00 Fuel System, General Information*.
3. Remove the powertrain control module (PCM) following the procedure in the *Ford Workshop Manual, Section 303-14, Electronic Engine Controls.* Disconnect the three PCM connectors by lifting the levers over the connector back shell and pulling the connectors from the PCM sockets. **Figure 1.1**. Remove the two nuts and position the PCM wiring harness connectors aside. Keep all fasteners for reuse.
4. Disconnect the mass airflow (MAF) sensor connector **Figure 1.4**. If necessary, disconnect the PCV hose from the throttle body adaptor and the left valve cover. **Figure 1.2**. Disconnect the PCV hose at the intake air hose and at the right valve cover (discard the OEM hose). **Figure 1.3**. Loosen the clamp of the intake air hose at the throttle body. **Figure 1.5**. Remove the air cleaner assembly including the air filter cover and intake air hose. Disconnect the battery terminals from the battery at the battery box on the frame. Detach the OEM harness running across the intake manifold. **Figure 1.6**.

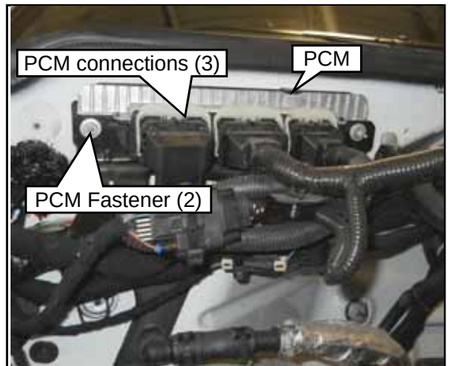


Figure 1.1

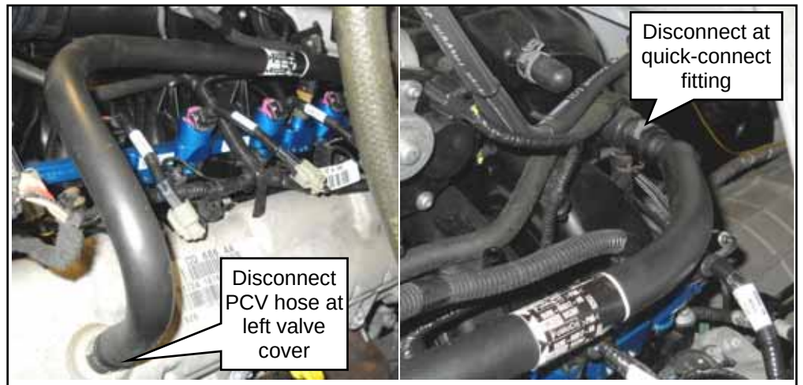
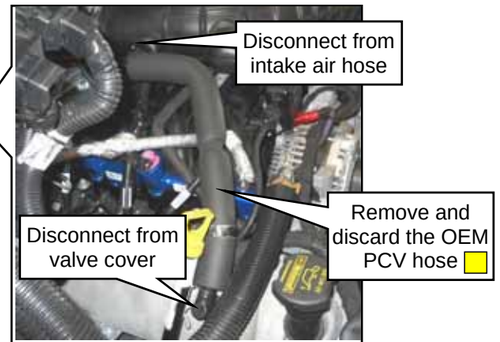


Figure 1.2



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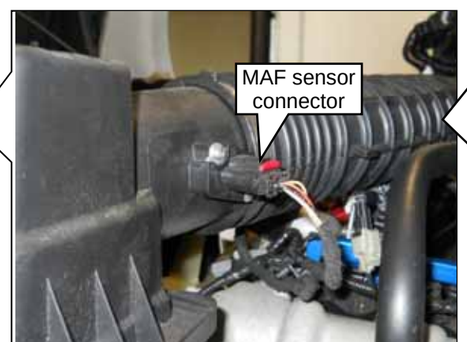

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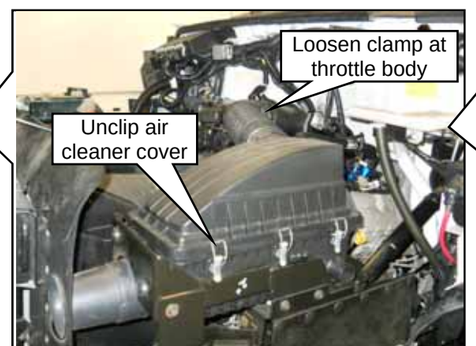

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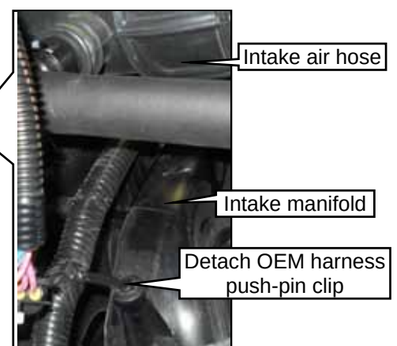


Figure 1.6

SENDING THE PCM FOR REPROGRAMMING

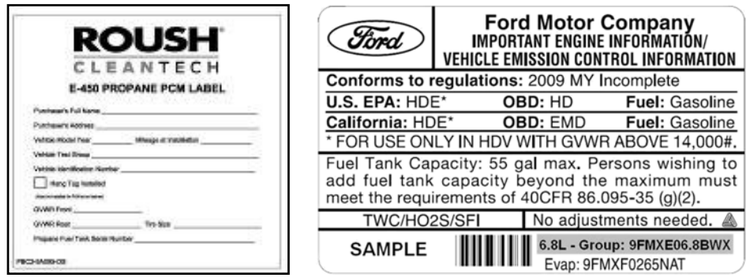


Figure 1.6 — Example Labels Only

1. Write the requested information, including the gross vehicle weight rating (GVWR), on the PCM Return Label (P-01F010-AA). The group information is found on the original vehicle emission control information (VECI) label (example: 6.8L - Group: 9FMXE06.8BWX). The propane fuel tank serial number is located on the raised serial badge welded to the side of the tank. Once all information has been completed, apply the label to the backside of the PCM.

Note: Do NOT alter or remove the original VECI label from the vehicle. The law requires this label. Failure to heed this notice may void all warranties. **Figure 1.6**.

2. Pack the PCM securely in the shipping box (P10C2-SB-A) provided. Enter your name and address in the **FROM** area of the shipping label provided and apply the label to the box.
3. 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.

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

Included with the returned newly flashed PCM will be a ROUSH CleanTech VECI label and supplemental instructions for installing the new VECI label.

Note: ROUSH CleanTech Certified Installers authorized to perform on-site PCM flashing should consult the appropriate training materials for proper VECI label selection and disposition. Failure to follow the training guidelines properly could result in non-conformance to federal and local regulations.

REMOVING OEM FUEL TANK

Refer to the *Ford Workshop Manual, Section 310-01, Fuel Tank and Lines*, for instructions on removing the original fuel tank, tank shield and all associated hardware including frame rail brackets. Also, refer to the *Ford Workshop Manual, Section 414-01, Battery, Mounting and Cables*, for instructions on removing the original battery cover, battery, battery box, electrical cables, terminals, connectors and all associated hardware.

1. Drain the fuel from the tank.
2. Remove the steps from the fuel tank. **Figure 2.1**. **Note:** Save all steps, step brackets and mounting hardware for use on the new propane fuel tanks. Additional steps, brackets and hardware can be found in the step kit P13FB-02H100-A/B/C/D/E/F/G for the vehicle model you are working on.
3. Remove the right hand steps, step brackets and hardware. Remove the battery cover, battery and battery box. **Figure 2.2**. **Note:** The battery cover, battery, battery box and all electrical harnesses, terminals and connectors must be relocated to accommodate the new right side propane fuel tank. The relocation MUST be within the OEM requirements for the location. Add no more than what is required for the additional cable to extend the battery and battery box.
4. Disconnect fuel supply line from fitting on tank and disconnect two electrical connecters. **Figure 2.3**.
5. Disconnect the vapor lines at the tank. **Figure 2.4**.
6. Support the fuel tank using the appropriate lifting device. Remove the four tank support bracket fasteners (two per tank) secured to the left frame rail. **Figure 2.5**. Remove the entire tank assembly including the supports, brackets, straps and all frame hardware. Slide the fuel tank assembly away from the left frame rail and out of the vehicle.

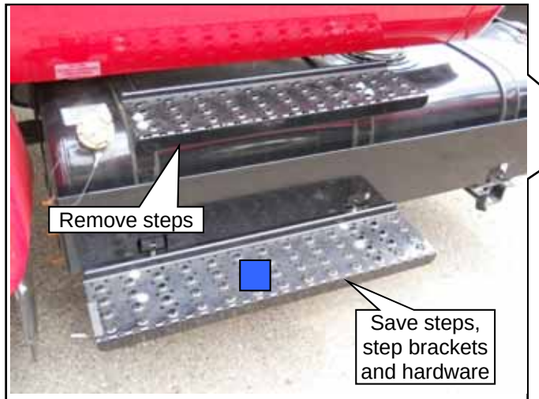


Figure 2.1

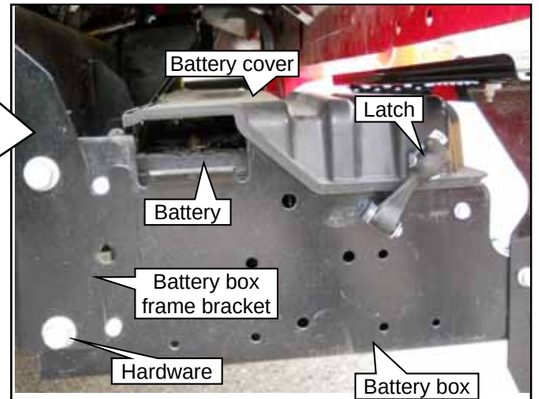


Figure 2.2

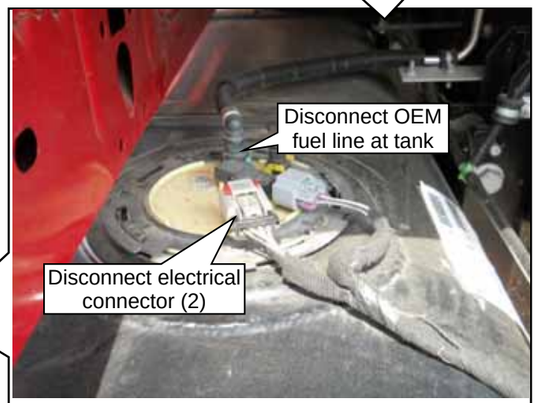


Figure 2.3

Figure 2.4

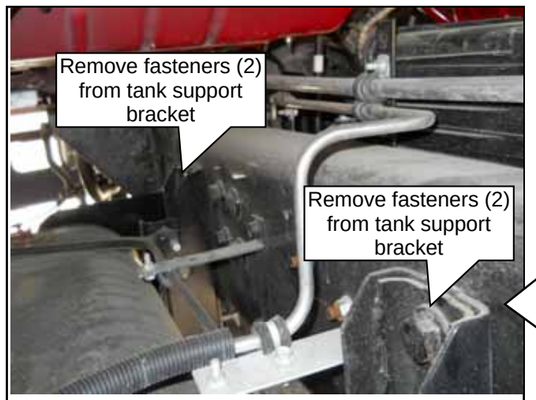


Figure 2.5

REMOVING OEM FUEL LINE AND REAR VAPOR LINE

Refer to the *Ford Workshop Manual, Section 310-01, Fuel Tank and Lines*, for complete instructions on removing the original fuel supply line.

1. Remove the vapor line assembly from the P-clamps on the frame rail and from the evaporative canister. Disconnect the vapor line quick-connect at the canister. Remove the vapor line support brackets to avoid interference with the new fuel tanks. **Figure 3.1**.
2. Remove the OEM fuel supply line from the P-clamps along the frame rail. Remove all tank mounting hardware line and hose standoff brackets, etc., from the frame rail, if not already done. **Figure 3.2**.

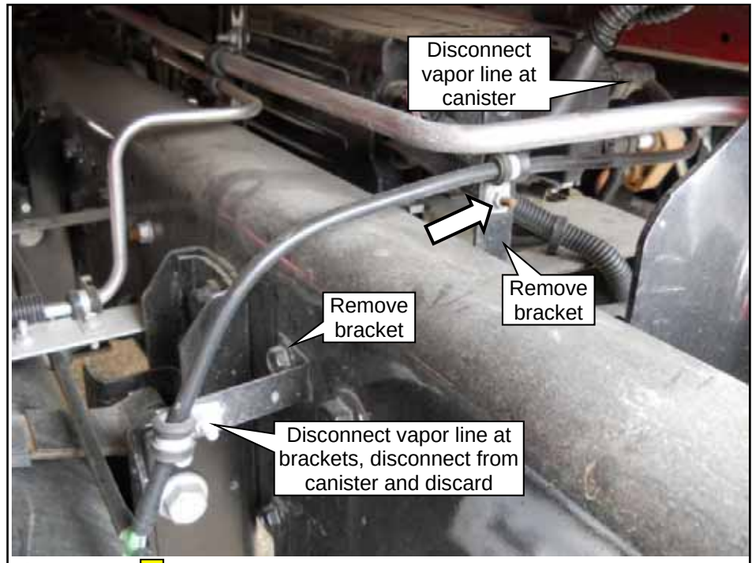


Figure 3.1

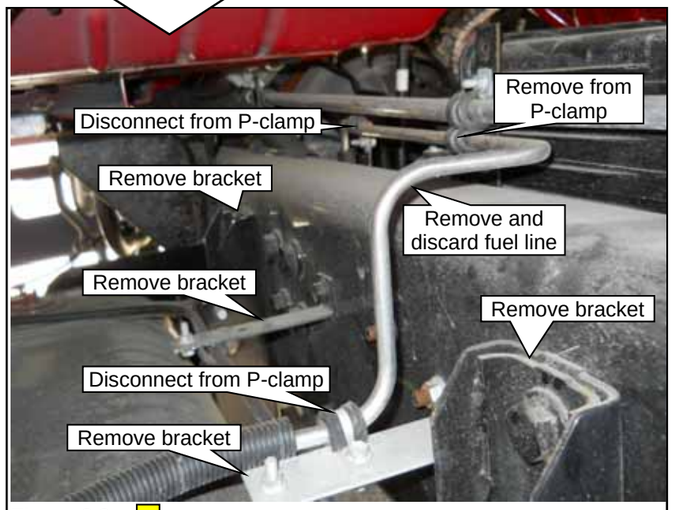


Figure 3.2

REMOVING OEM FORWARD FUEL SUPPLY LINE AND VAPOR LINE

Refer to the *Ford Workshop Manual, Section 310-01, Fuel Tank and Lines*, for complete instructions on removing the original forward fuel supply line and setting aside the evaporative canister.

1. Disengage the gasoline forward fuel supply line from retention clips, disconnect from fuel rail and discard the line. **Figures 4.1** and **4.2**.
2. Disconnect the OEM vapor line from the quick-connect fitting near the frame rail and on the engine at the VMV. **Figure 4.2**.
3. Disengage the vapor line from the retention clips at the bracket and transmission. **Figure 4.2**. Modify the line and add new hose assembly. Refer to *Modify OEM Vapor Line and Install New Vapor Hose Assembly*.

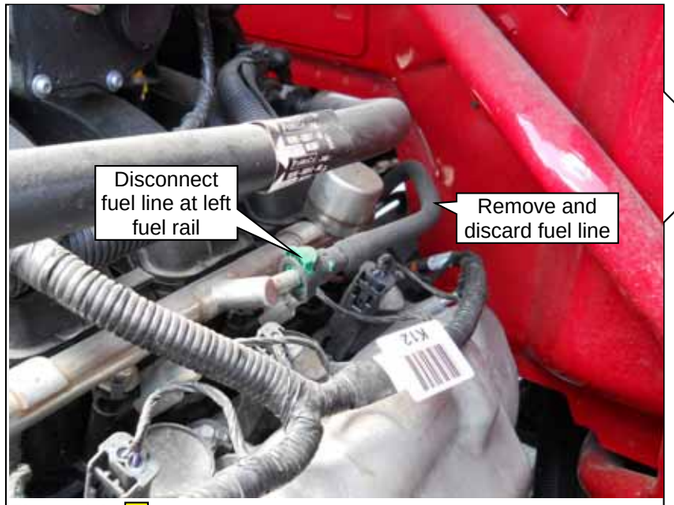


Figure 4.1

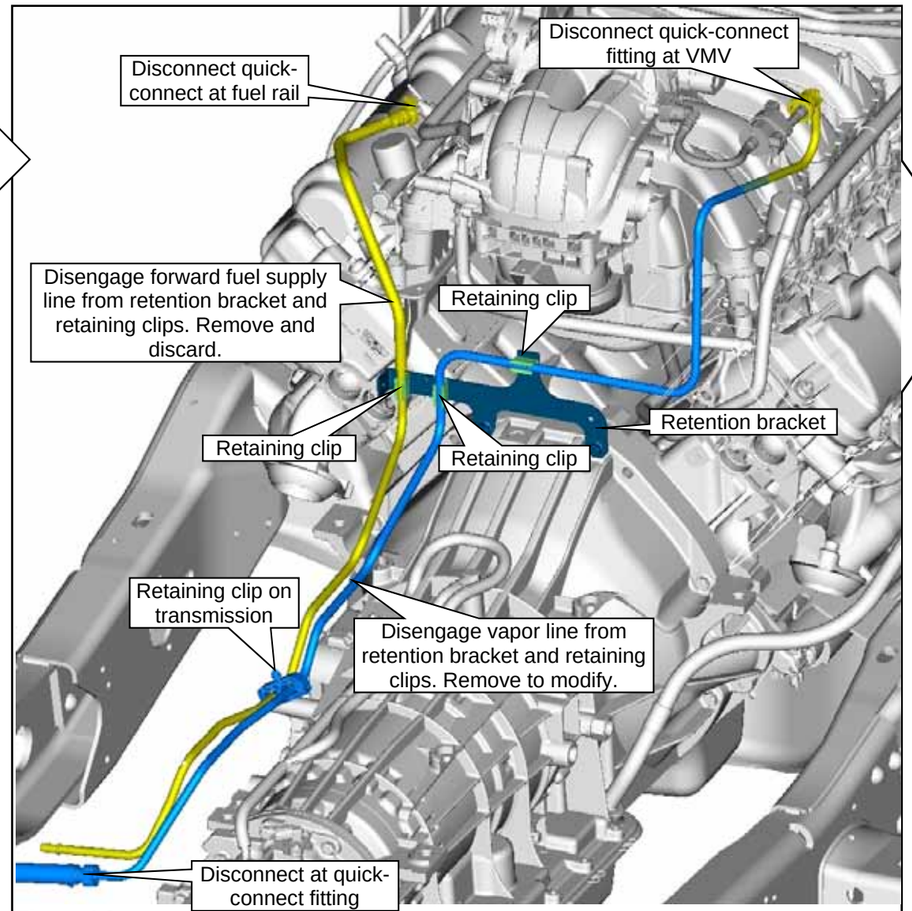
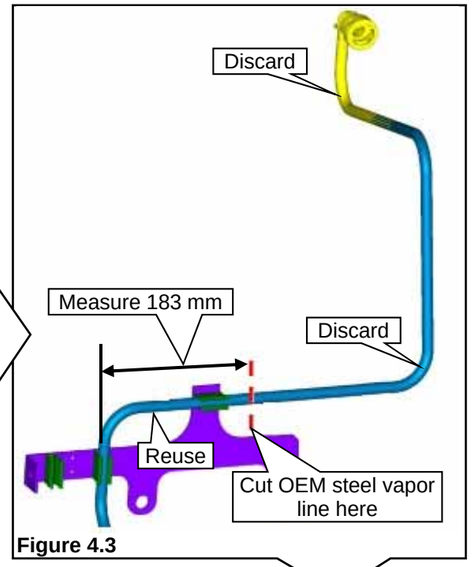


Figure 4.2

MODIFY OEM VAPOR LINE AND INSTALL NEW VAPOR HOSE ASSEMBLY

1. Modify the OEM vapor line by cutting the steel portion of the line as indicated. Measure from the outside of the lower portion of the line approximately 183 mm, mark and cut using a tubing cutter. **Figure 4.3**.
2. Attach the ROUSH CleanTech vapor hose assembly to the modified OEM steel vapor line. Use a stepless ear clamp to secure the hose to the line. **Figures 4.4** and **4.5**. The hose should not be clamped tight until after the orientation between the line and hose is correct.



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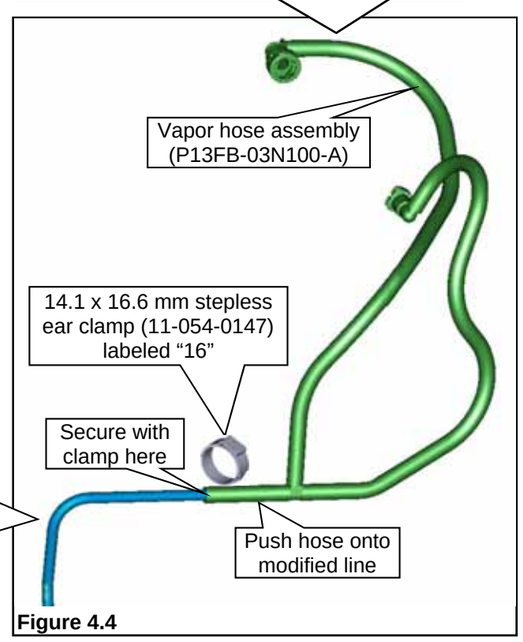


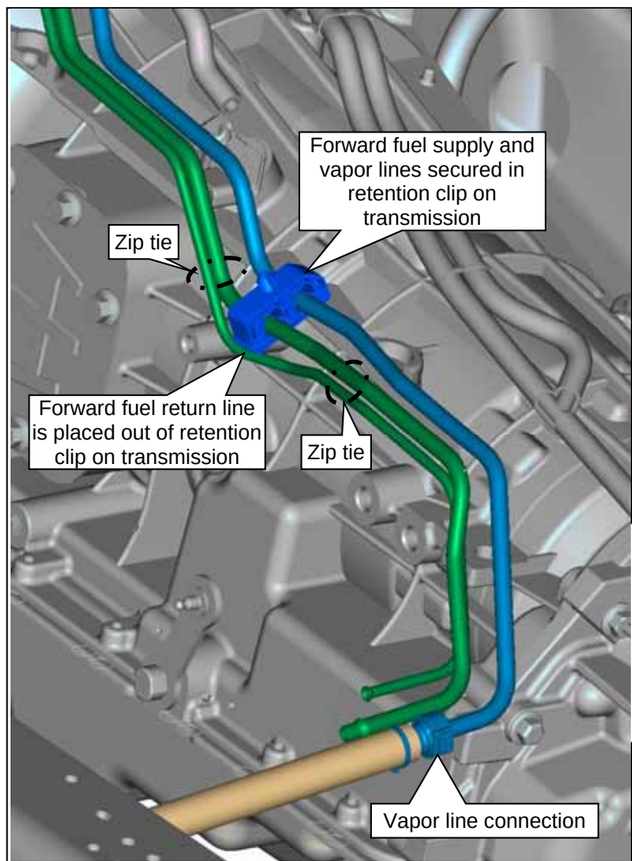
Figure 4.4

Figure 4.5

INSTALLING NEW FORWARD FUEL LINES AND MODIFIED VAPOR LINE WITH NEW HOSE ASSEMBLY

After removing original gasoline fuel line, temporarily position ROUSH CleanTech forward fuel supply and return lines, along with the modified vapor line and new vapor hose so that lines and hose extend into the engine compartment near the right side of the intake manifold. Final installation is after fuel rail pressure control module (FRPCM) has been installed.

1. Install forward fuel supply line, forward fuel return line and modified vapor line. **Note:** Use pliers to assist in snapping the lines into the bracket. Follow the routing of the original lines and run the new lines into transmission bracket retaining clips (3) and up into engine compartment over to the right side of the engine. **Figures 5.1** and **5.2**.
2. Install the lines into the retention clip on the transmission. Connect the modified vapor line into the OEM vapor line quick-connect fitting at the lower end. **Figure 5.3**.



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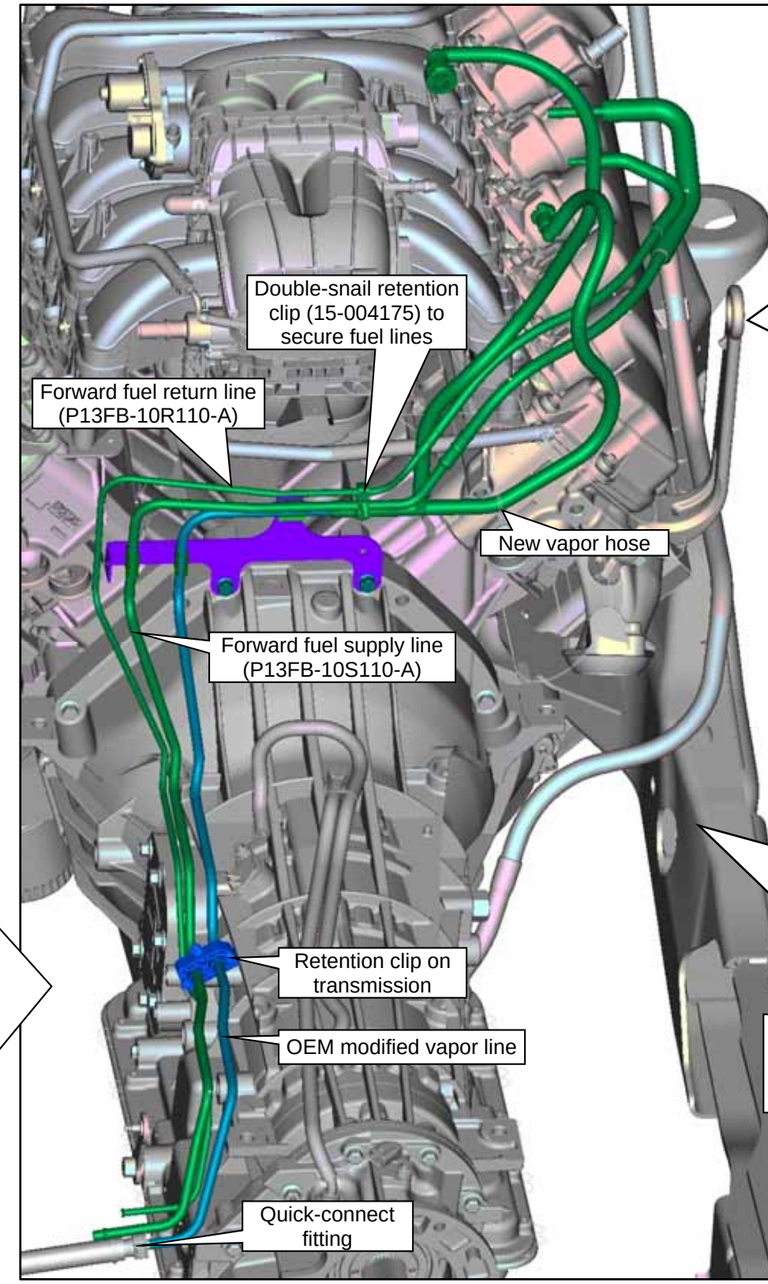


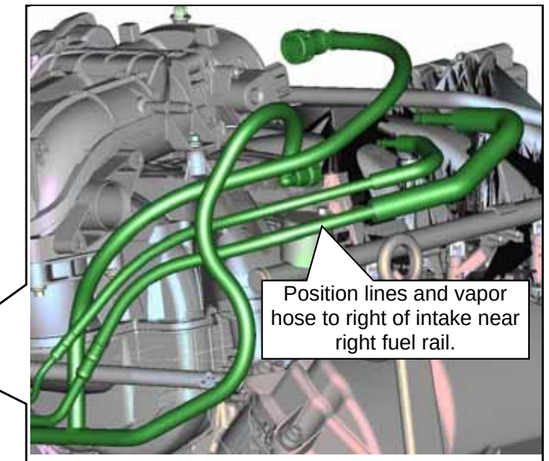


Figure 5.1

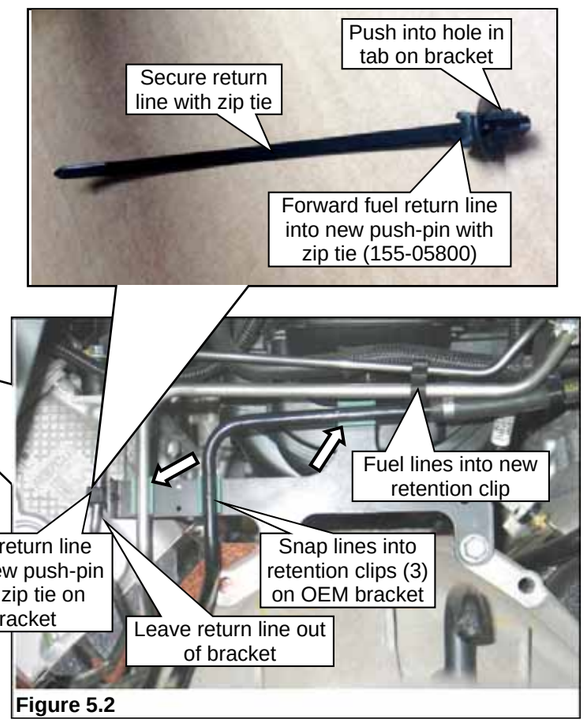


Figure 5.2

PREPARING ENGINE COMPARTMENT

Refer to the *Ford Workshop Manual, Section 303-04, Fuel Charging and Controls — 6.8L (3V)*, for complete instructions on removing the fuel rails and injectors.
Some original parts will be reused. The components in this section may be saved, discarded or new. Refer to color key.

1. If necessary, disconnect the intake manifold runner control (IMRC) actuator electrical connector. **Figure 6.1**.
2. Unplug the electrical harness connector from OEM VMV.
3. Disconnect the VMV hose quick-connect fitting from the throttle body adapter. **Figure 6.2**.
4. Remove the bolt securing the bracket and remove the VMV assembly (hose, VMV and bracket) for modification. **Figure 6.2**.
5. Separate the hose with quick-connect from the VMV. Pull the OEM VMV bracket out of the VMV. Discard the hose, bracket and bolt. **Figure 6.3**.
6. A new VMV mounting bracket found in hardware kit P13FB-ENGKIT-A is to be installed onto the FRPCM. The VMV and rubber isolator will be pushed onto the new bracket after the bracket has been installed. **Figure 6.3**.
7. Connect the VMV-to-intake engine purge hose assembly to the VMV and is to be secured with a stepless ear clamp. **Note:** This clamp should NOT be tightened until after the orientation between the VMV and hose is correct with the assembly installed. Install convolute over the purge hose. **Figure 6.4**.

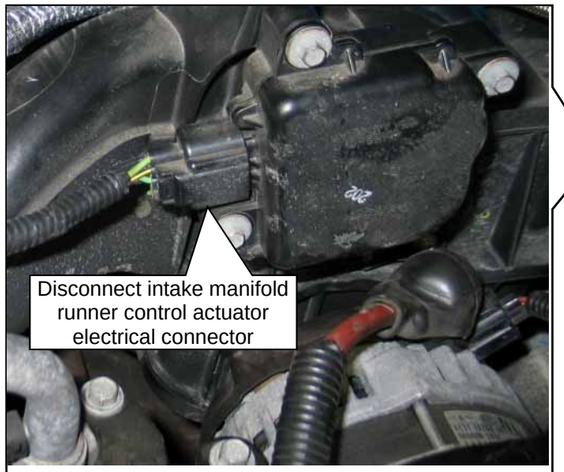
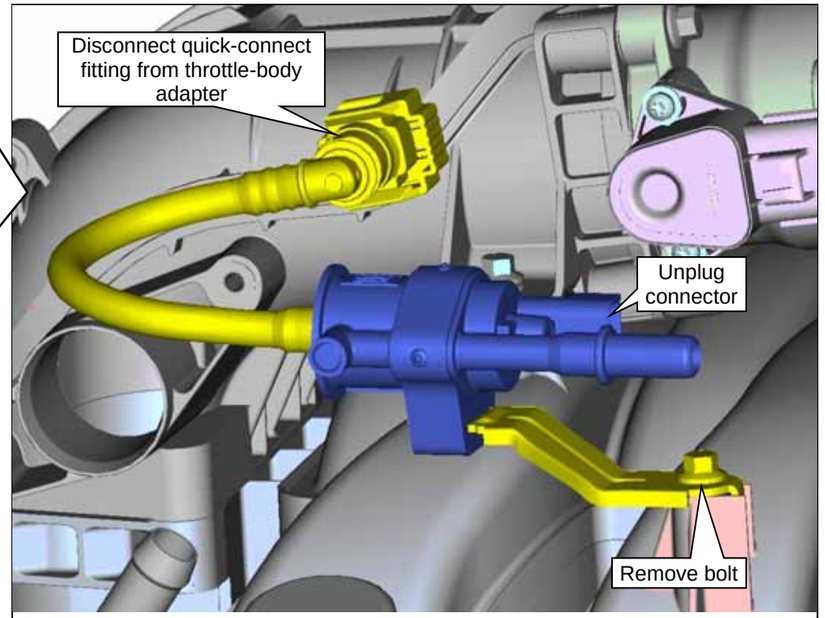


Figure 6.1



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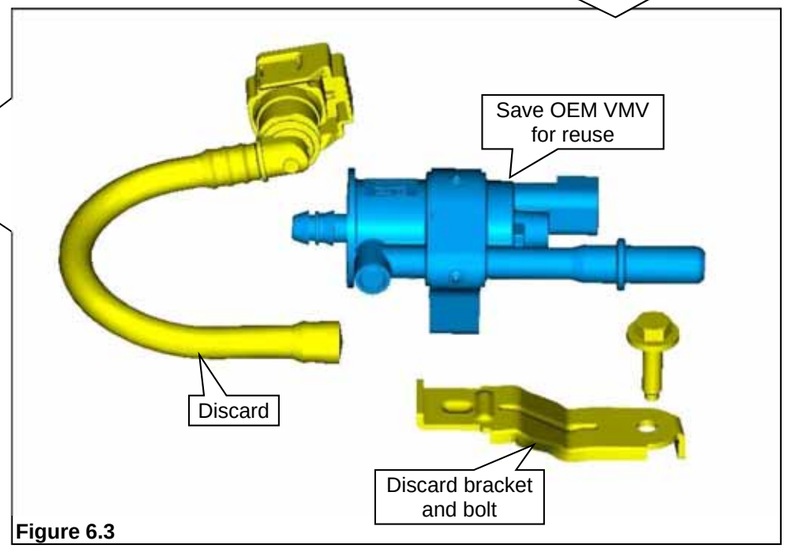


Figure 6.3

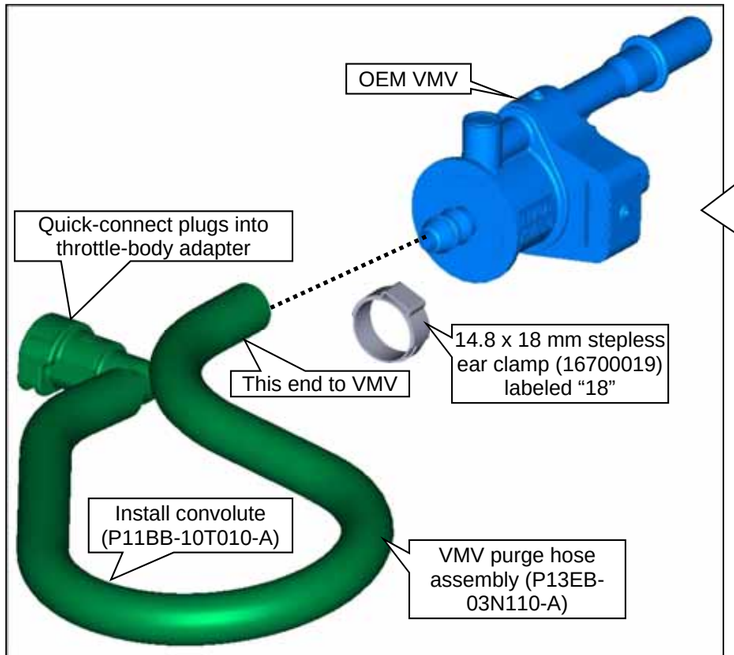


Figure 6.4

8. If necessary, remove the engine wiring harness from the mounting studs on the valve cover.
9. Disconnect electrical connector from each OEM fuel injector. **Figure 7.1**.
10. If not already done, using a Ford-approved fuel line removal tool, disconnect the fuel supply line from the left fuel rail. **Figure 7.1**.
11. Remove the six fuel rail mounting bolts and fuel rail assembly (with crossover hose). **Figure 7.2**.
12. Discard fuel rail assembly and bolts.

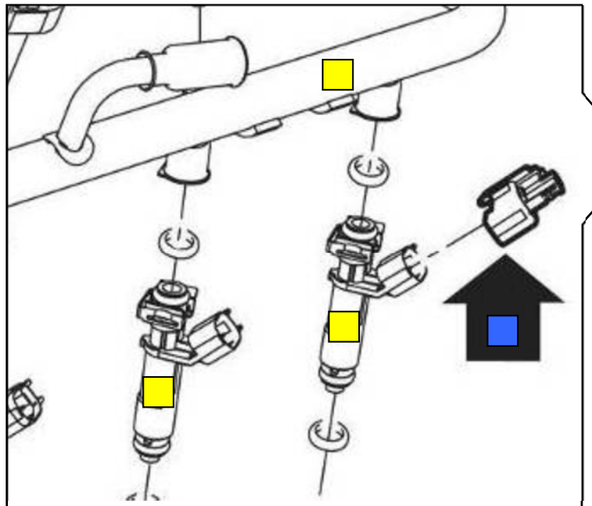


Figure 7.1

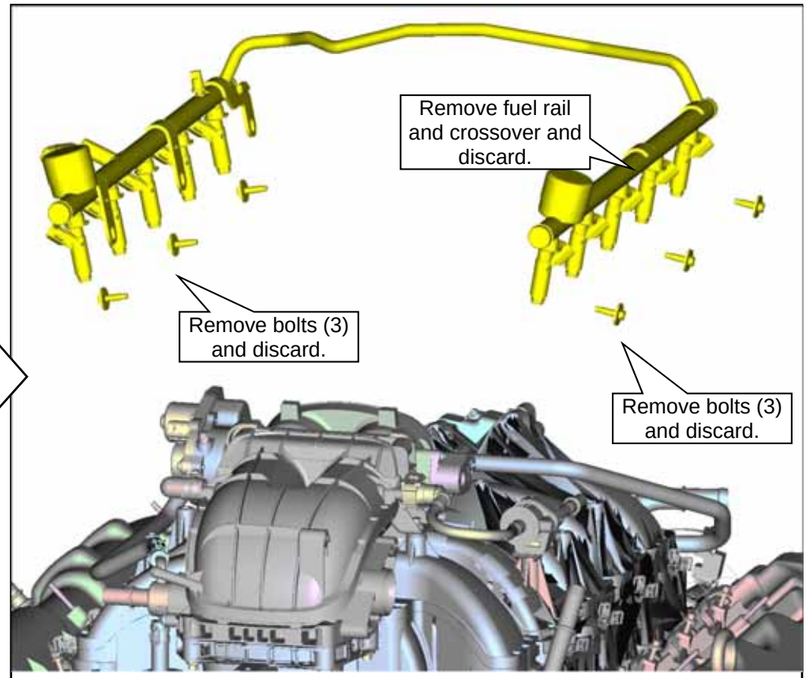


Figure 7.2

INSTALLING NEW FUEL RAILS AND FUEL RAIL RETURN FUEL LINE ASSEMBLY

1. If necessary, disconnect coil electrical wires for clearance. **Note:** Installers must apply convolute to the crossover coolant hose before installing the RH fuel rail.
2. Install three fuel rail mounting brackets to each fuel rail. Tighten the screws to 8–12 Nm. **Figures 8.2** and **8.5**.
3. Using engine oil (Motorcraft SAE 5W-20 or equivalent), lubricate lower O-rings on injector nozzles before seating rail assemblies.
4. Position left hand fuel rail assembly onto driver side of intake manifold and fully seat nozzles. Using three M6 x 1.0 x 16 bolts found in hardware kit P13FB-ENGKIT-A, secure fuel rail to intake manifold. Tighten bolts to 8–12 Nm. **Figure 8.3**.
5. Position right hand fuel rail assembly onto passenger side of intake manifold and fully seat nozzles. Using three M6 x 1.0 x 16 bolts found in hardware kit P13FB-ENGKIT-A, secure fuel rail to intake manifold. Tighten bolts to 8–12 Nm. **Figure 8.4**.
6. Orient and install fuel rail return line assembly (found in hardware kit P13FB-FUELLINES-A or B) onto forward ends of fuel rails. Push to connect fittings. **Figure 8.1**.

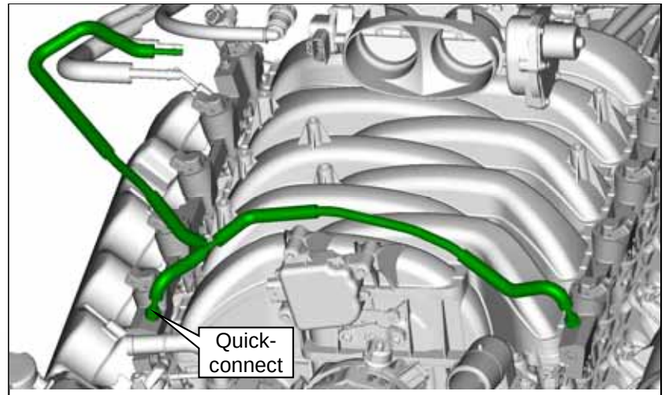
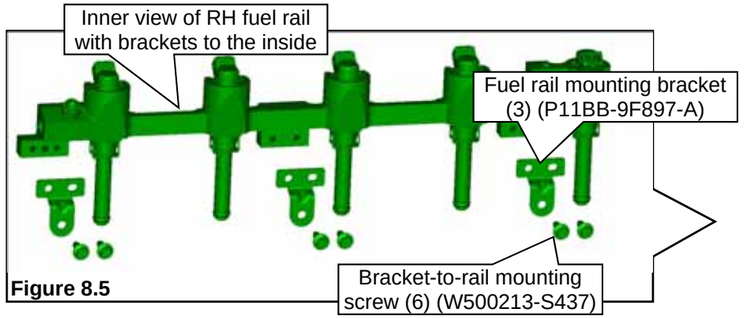


Figure 8.1



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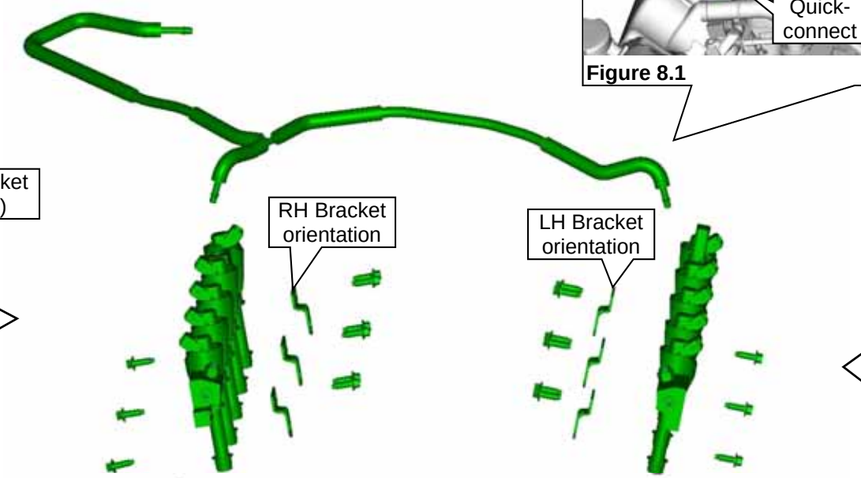


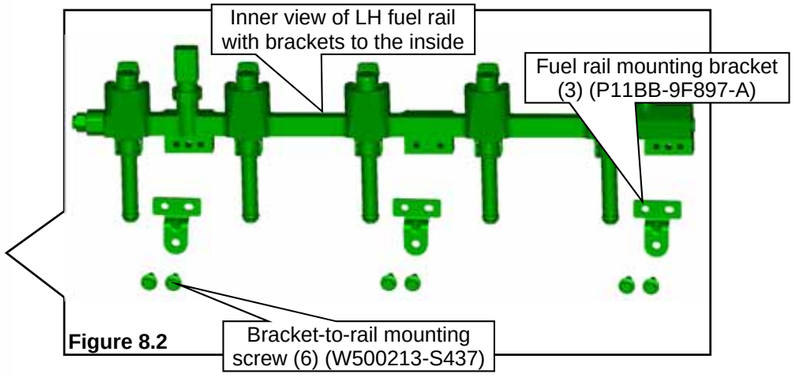
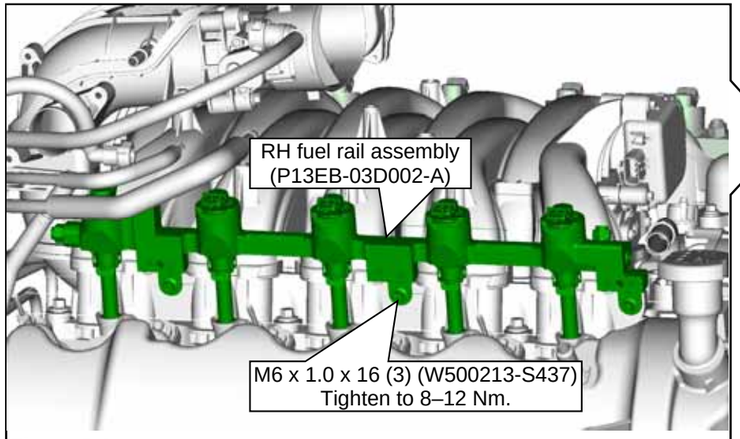


Figure 8.2



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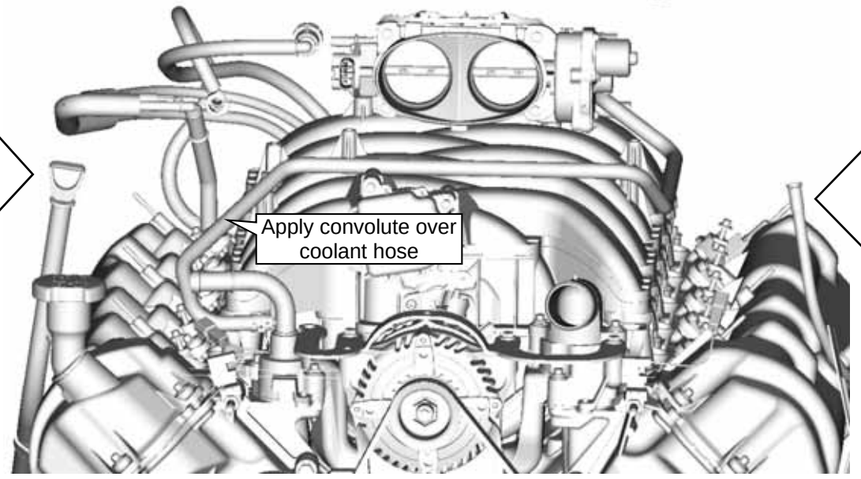


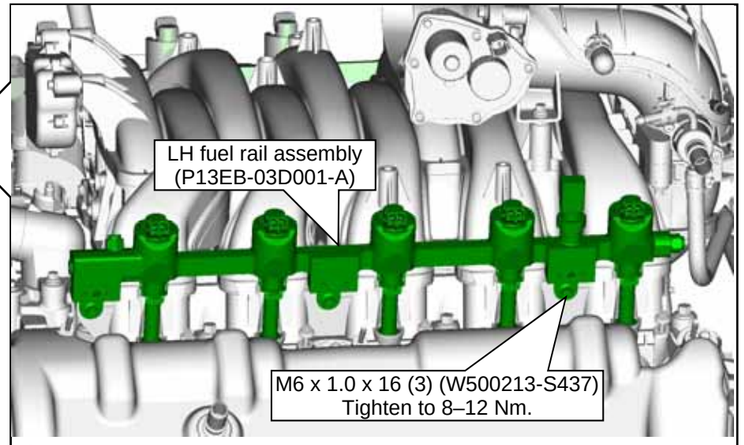


Figure 8.3

7. If applicable, connect coil wires.
8. Connect a fuel injector jumper to each original fuel injector harness connector. The ten jumpers can be found in hardware kit P13FB-ELECKIT-A. Connect opposite end of each jumper to its respective fuel injector. **Figures 9.1** and **9.2**.
9. Connect the intake manifold runner control (IMRC) actuator electrical connector. **Figure 9.3**.
10. If present, add a 400 mm length of 1” convolute to the OEM coolant crossover hose and secure the convolute with two zip ties, one at each end. The convolute should span to the center of the intake manifold and is installed to prevent chafing at the right fuel rail. Attach the OEM harness push-pin clip to the intake manifold. **Figures 9.4** and **9.5**.

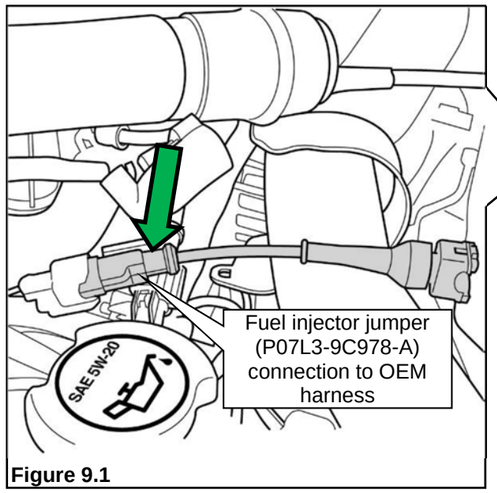
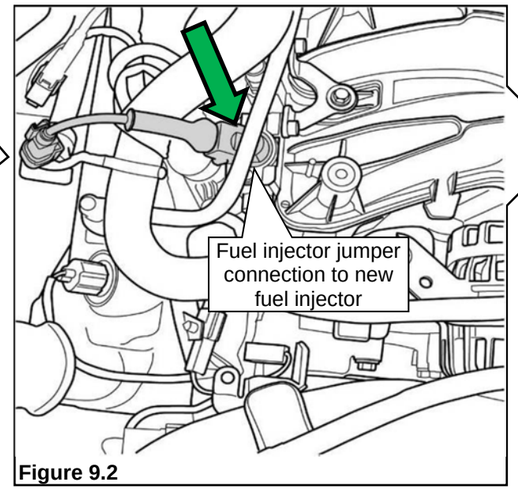


Figure 9.1



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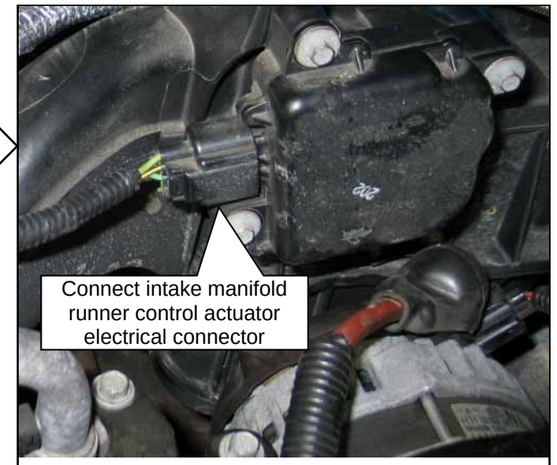


Figure 9.3

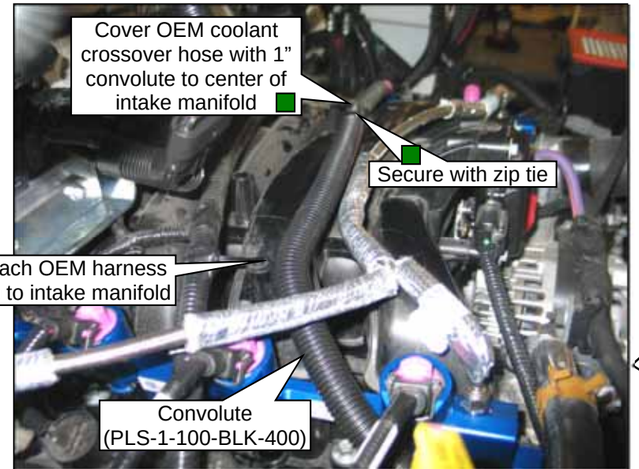


Figure 9.5

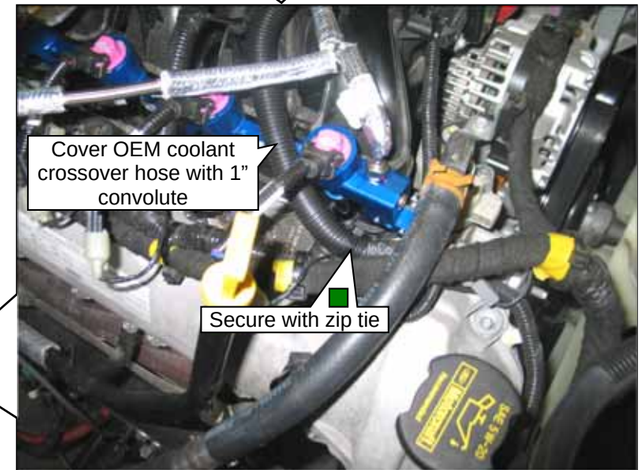


Figure 9.4

INSTALLING FUEL RAIL PRESSURE CONTROL MODULE

The following parts are found in hardware kit P13FB-ENGKIT-A.

1. Remove the OEM throttle body adapter M6 x 20 mounting bolt. Reuse this bolt to help secure the FRPCM bracket. **Figure 10.2**.
2. Position the FRPCM mounting bracket to the engine. **Figure 10.3**. Install the OEM throttle body adapter bolt, the button head bolt in the depression of the bracket and a third bolt at the rear of the bracket into the right fuel rail. Tighten bolts to 8–12 Nm.
3. Position the FRPCM to the bracket and align the four holes. **Figure 10.4**.
4. Loosely install two M6 x 16 bolts into the front bracket of the FRPCM. **Figure 10.5**.
5. Position the VMV bracket to the FRPCM inner rear hole with the tab of the bracket rearward. Loosely install two M6 x 62 bolts through the FRPCM into the FRPCM bracket. **Figure 10.6**. Tighten all four bracket bolts to 8–12 Nm.

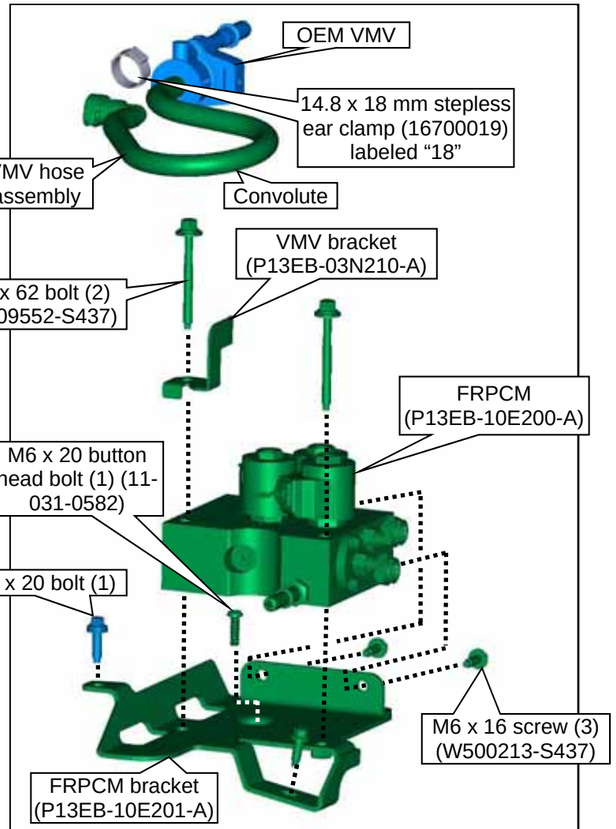


Figure 10.1

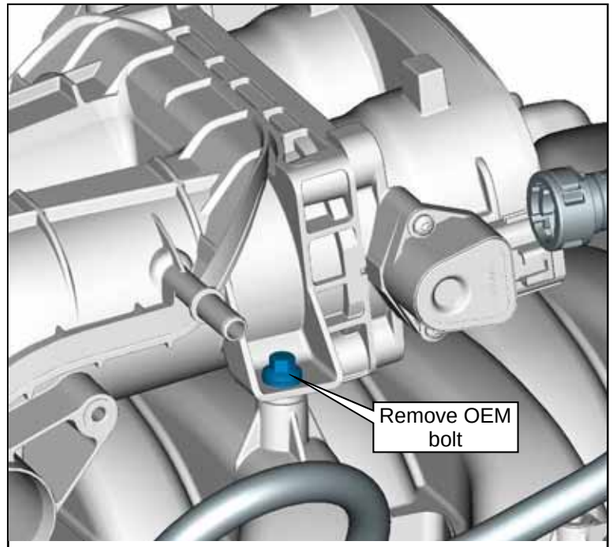


Figure 10.2

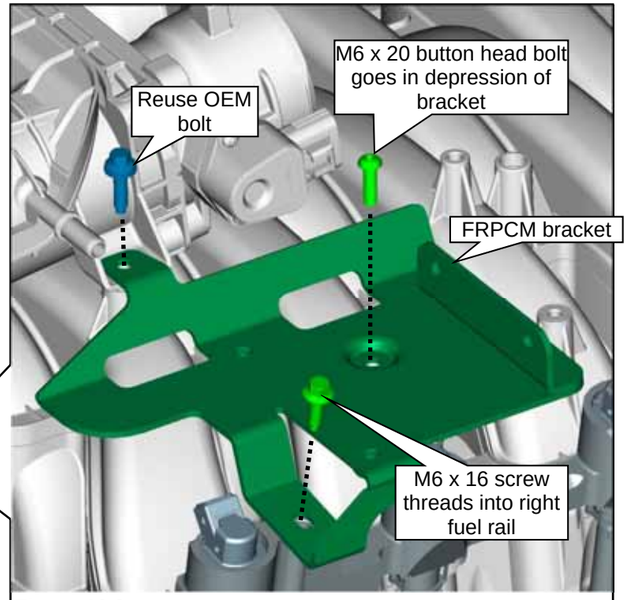


Figure 10.3

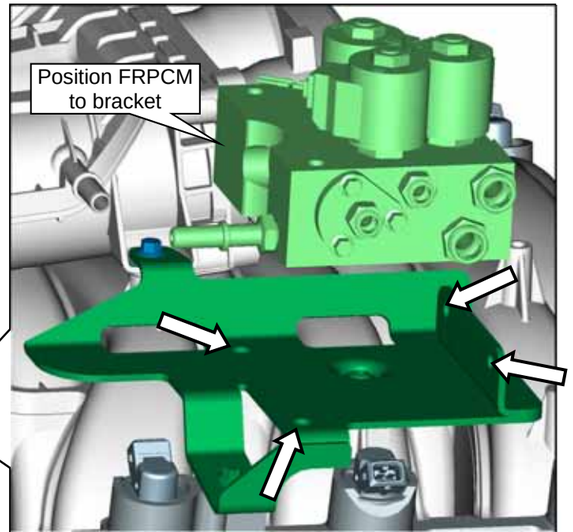


Figure 10.4

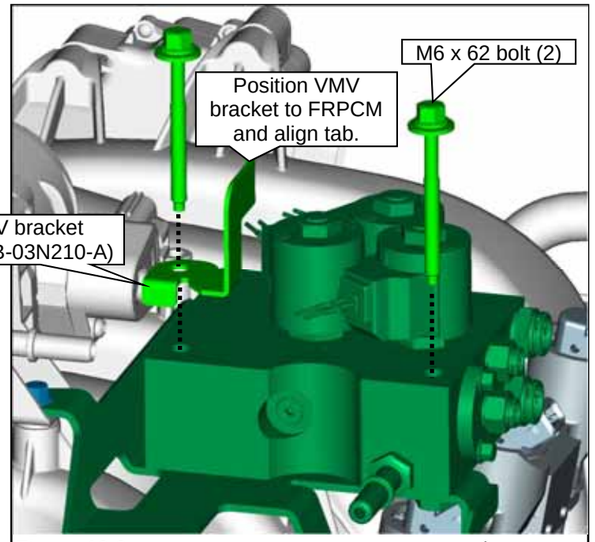


Figure 10.6

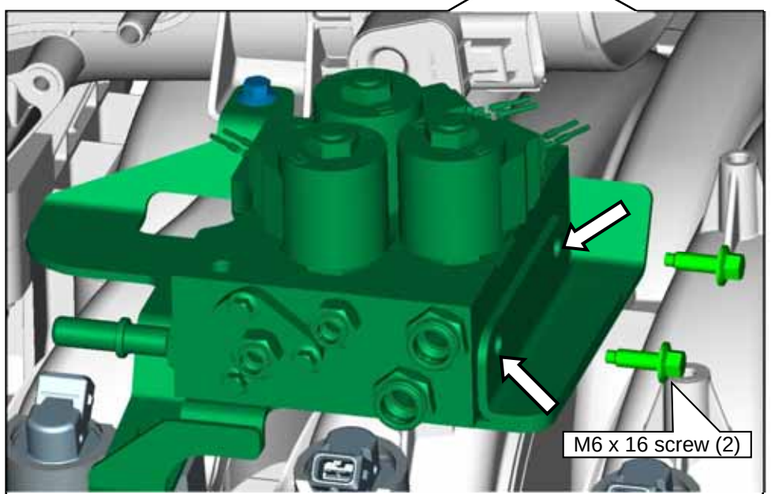


Figure 10.5

Note: For all quick-connect fittings and lines, make sure you push and pull on the lines to make sure they are securely connected.

6. Position the VMV with new vapor hose assembly to the bracket. Slide the VMV onto the bracket until secure. Plug the vapor hose assembly quick-connect fitting onto the port of the throttle body adaptor. Use a crimping tool to tighten the stepless ear clamp after the assembly is installed and correctly oriented. Refer to *Special Tools* for more information. Connect the OEM electrical connector to the VMV. **Figure 11.2**.

Note: Refer to **Figure 11.1** for FRPCM fuel line identification for line-to-port and vapor hose bleed port location.

7. Orient and install fuel rail supply line assembly onto rearward ends of fuel rails. Push to connect fittings. Plug the open end of the fuel rail supply fuel line into the FRPCM lower front 3/8” port. **Figure 11.3**.
8. Connect the forward fuel return line into the FRPCM lower rear 1/4” port. **Figure 11.5**.
9. Connect the forward fuel supply line into the FRPCM upper front 3/8” port. **Figure 11.5**. This line may be labeled with a tag indicating **TOP**.
10. Connect the fuel rail fuel return line into the FRPCM upper rear 1/4” port. **Figure 11.6**. This line may be labeled with a tag indicating **TOP**.
11. Connect the vapor canister purge hose assembly to the bleed port on the FRPCM and to the VMV port. **Figure 11.7**.

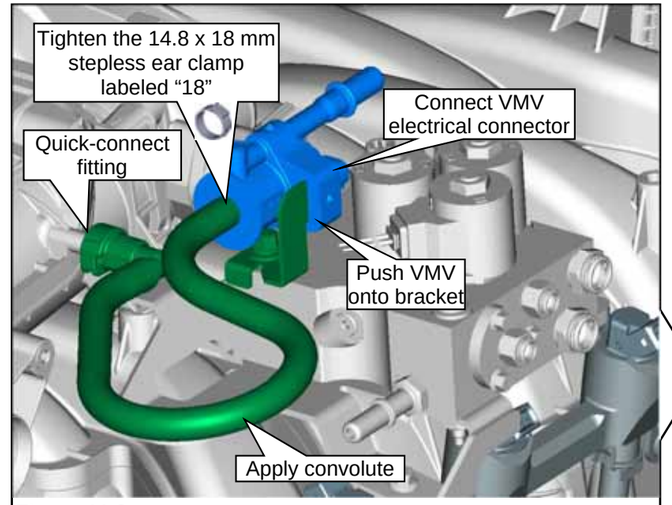


Figure 11.2

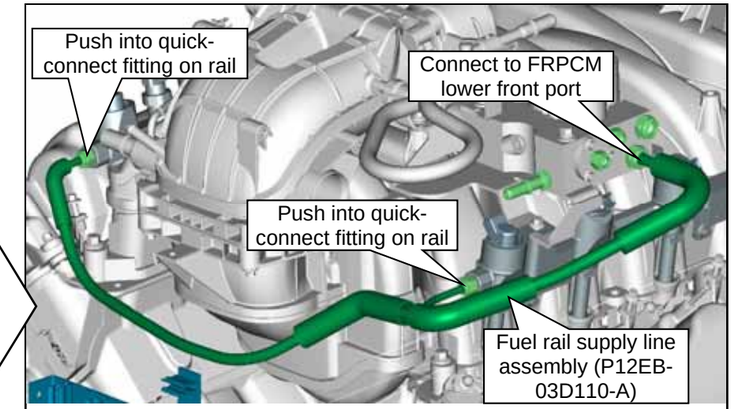


Figure 11.3

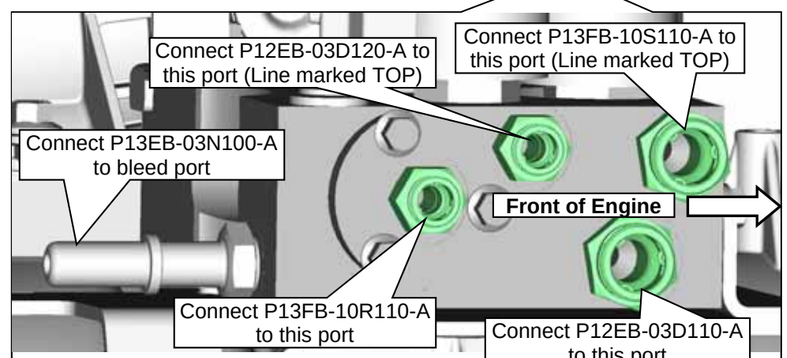


Figure 11.1

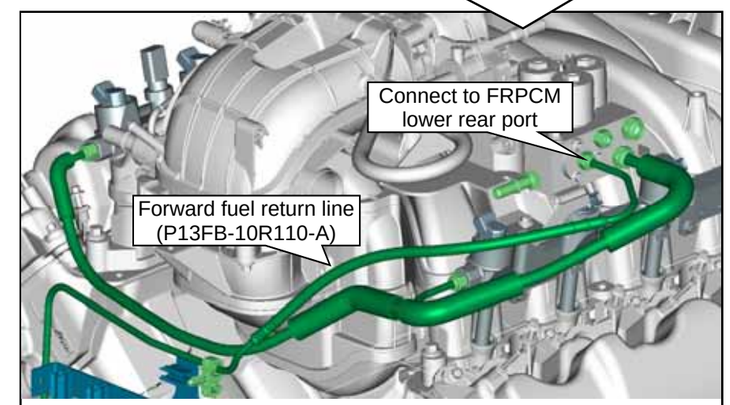


Figure 11.4

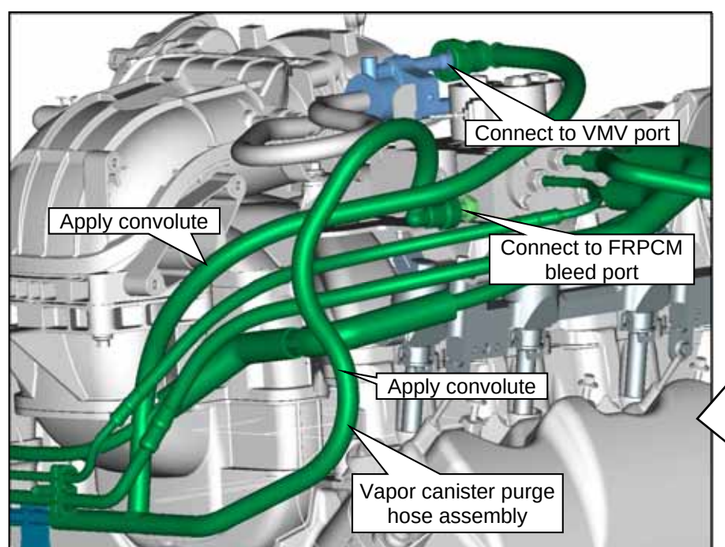


Figure 11.7

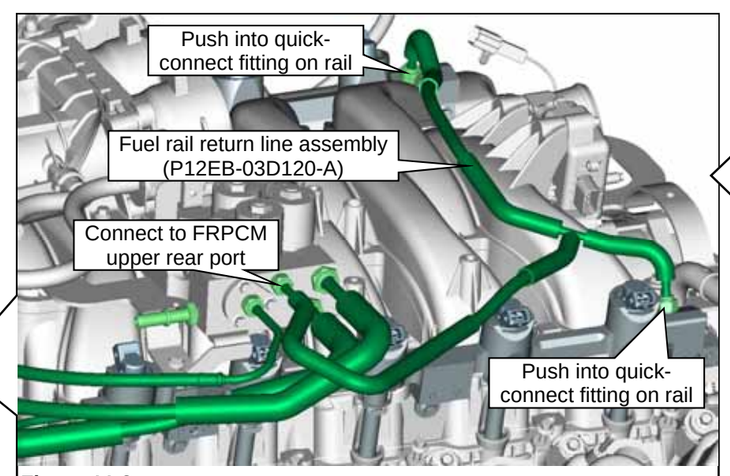


Figure 11.6

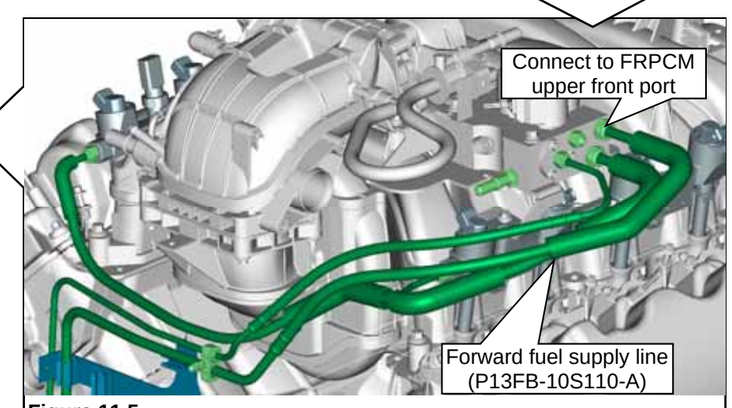


Figure 11.5

INSTALLING AIR INDUCTION SYSTEM AND NEW PCV HOSE

1. Install the air induction system. Connect the induction hose (tube) to the throttle body and tighten the clamp to specification. **Figure 12.1**.
2. Install the air cleaner cover over the air cleaner and secure with the three OEM cover latches. **Figure 12.2**.
3. Connect the MAF sensor electrical connector. **Figure 12.3**.
4. Attach any miscellaneous hoses and other connections as needed.
5. Install the new PCV hose (found in hardware kit P13FB-ENGKIT-A) to the air induction hose (tube) on the right near the throttle body. Push the quick-connect onto the fitting. Push the lower end of the PCV hose onto the fitting (port) of the valve cover. Secure the PCV hose to the heater hose using a dual clamp tie to ensure the PCV hose is secure and slopes downward. **Figure 12.4**.

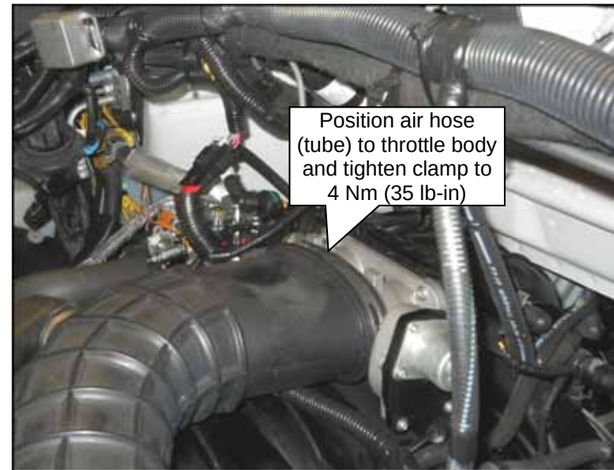


Figure 12.1

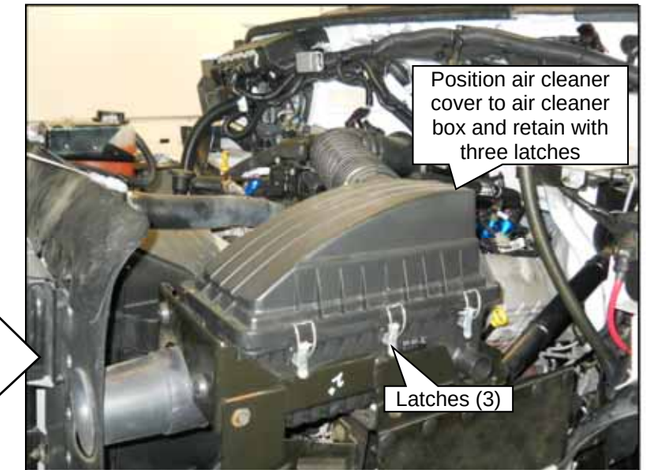


Figure 12.2

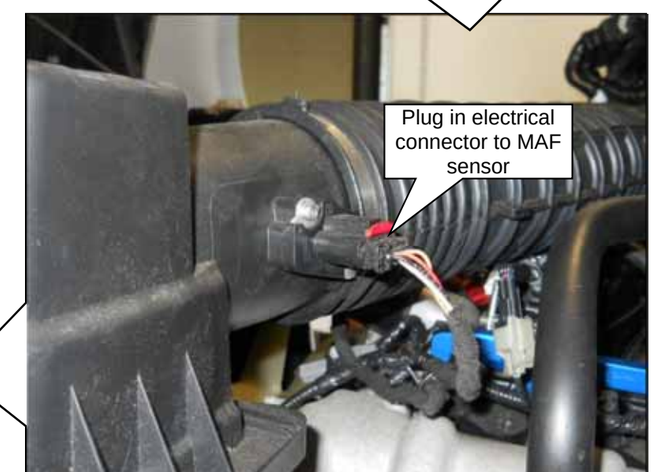


Figure 12.3

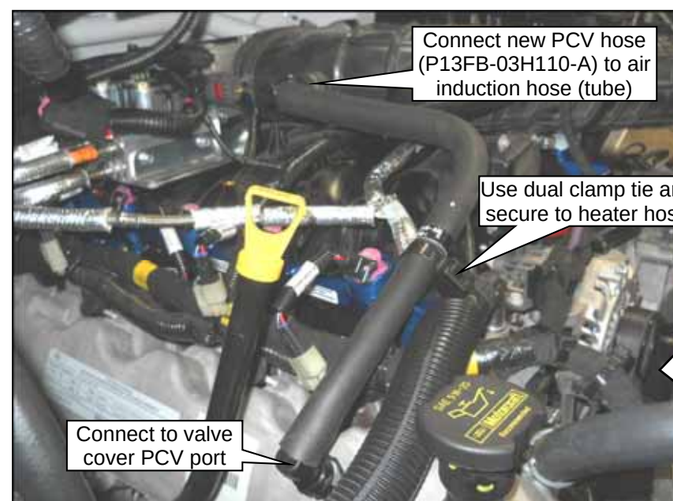


Figure 12.4

INSTALLING SMART RELAY MODULE AND RELAY FUSE BOX BRACKET

Note: All parts for installing the smart relay module and the relay fuse box bracket are supplied in hardware kit P13FB-ELECKIT-A. The SRM is supplied in hardware kit P13FB-SRMKIT-A/B.

1. Assemble the SRM to the SRM mounting bracket using four (4) M6 mounting screws, four (4) M6 nuts and and eight (8) washers. Tighten to specification. **Figure 13.1**.
   Note: Make sure that the SRM is oriented in the SRM bracket so that the electrical connector/harness (when connected) faces downward for proper routing.
2. Detach the washer hose and clip from the outside of the right inner fender. Remove the OEM wiring harness retainer and discard. **Figure 13.2**.
3. Position the SRM bracket drill template F-650 to the outside of the right inner fender. Refer to *Special Tools* for more information. Align the designated holes in the template with the holes in the inner fender. Punch mark the two drilling locations. **Figure 13.3**.
4. Drill the two locations using an 8 mm (5/16") bit. Deburr and coat the holes with touch up paint. Refer to *Special Tools* for more information. **Figure 13.4**.
5. Install four washers to the studs of the SRM bracket, position the assembly to the inner fender and install four flange nuts to temporarily secure the assembly. Attach the fuse box bracket to the SRM bracket and secure with one M6 flange bolt. **Figure 13.5**.
6. Tighten the four flange nuts to specification. Position the windshield washer hose and install the push clip to secure. **Figure 13.6**.

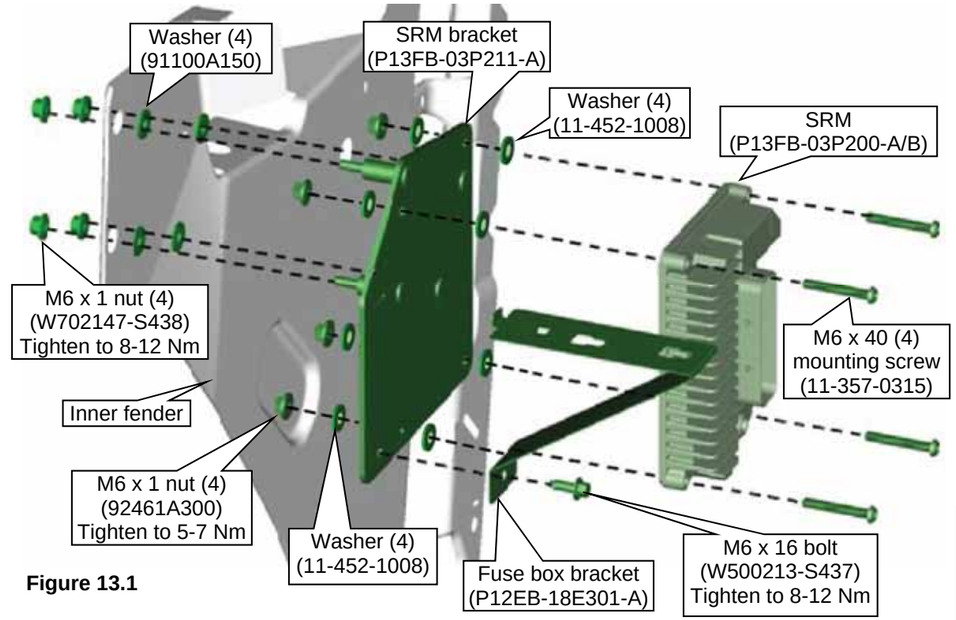


Figure 13.1

Figure 13.2

Figure 13.6

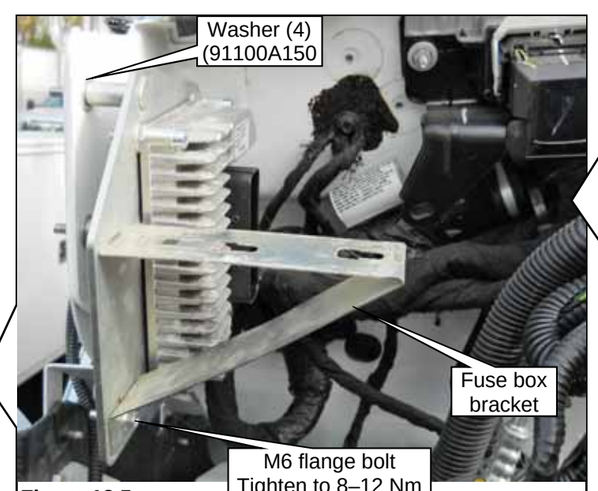


Figure 13.5

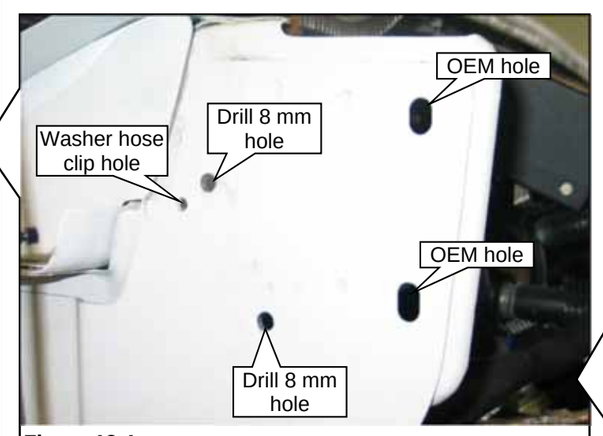


Figure 13.4

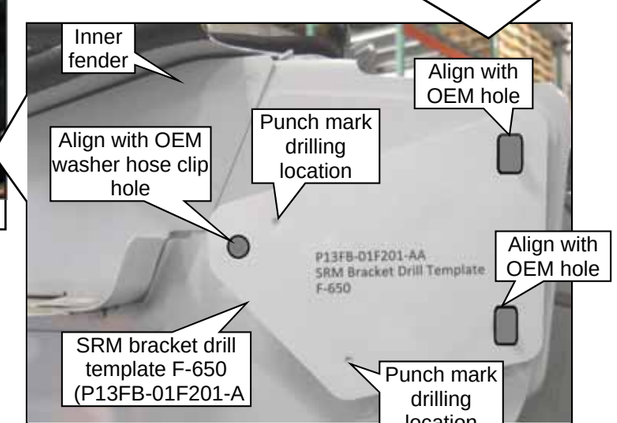
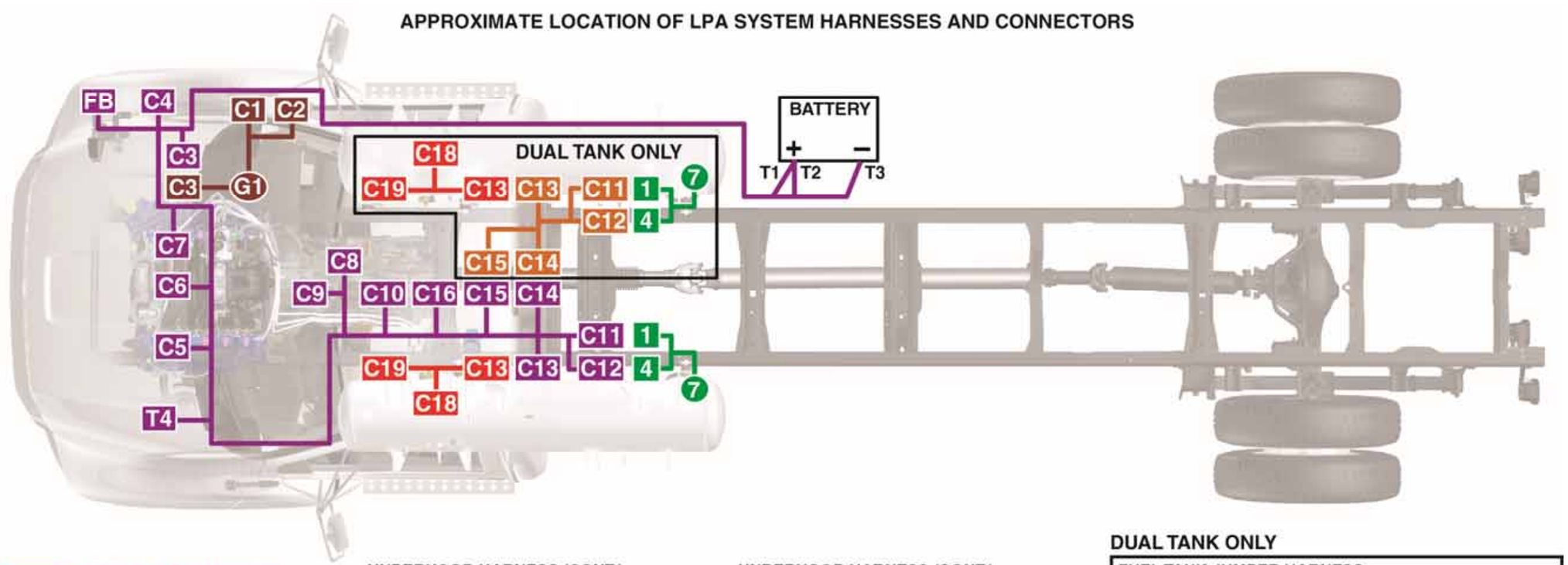


Figure 13.3

WIRING HARNESS CONNECTOR LAYOUT — F-650 CHASSIS CAB



UNDERHOOD HARNESS
IN-TANK HARNESS
TANK SOLENOID HARNESS
FUEL TANK JUMPER HARNESS (DUAL TANK ONLY)
CAN HARNESS

IN-TANK HARNESS (LH AND RH)

1	FUEL PUMP #1 INLINE 2-PIN
4	FUEL PUMP #2 INLINE 2-PIN
7	GROMMET

UNDERHOOD HARNESS

C3	UNDERHOOD/CAN INLINE CONNECTOR 2-PIN
C4	SRM 46-PIN

UNDERHOOD HARNESS (CONT.)

C5	IPTS 4-PIN
C6	FRPCM 6-PIN
C7	FLIM 4-PIN
C8	FORD EFPR 8-PIN
C9	RCT EFPR 8-PIN
C10	TO FORD INLINE CONNECTOR 8-PIN
C11	UNDERHOOD/IN-TANK FP#1 INLINE (LEFT TANK) 2-PIN
C12	UNDERHOOD/IN-TANK FP#2 INLINE (LEFT TANK) 2-PIN
C13	TANK SOLENOID INLINE CONNECTOR (LEFT TANK) 4-PIN
C14	UNDERHOOD/FUEL TANK JUMPER INLINE CONNECTOR 2, 4-PIN

UNDERHOOD HARNESS (CONT.)

C15	UNDERHOOD/FUEL TANK JUMPER INLINE CONNECTOR 1, 4-PIN
C16	UNDERHOOD/FUEL PUMP AND SENDER INLINE CONNECTOR 4-PIN
FB	AUX FUSE BOX
T1	PWR #1 RING TERMINAL
T2	PWR #2 RING TERMINAL
T3	GROUND RING TERMINAL
T4	TERMINAL INSERTED IN SPLICE PACK

TANK SOLENOID HARNESS (LH AND RH)

C13	UNDERHOOD/TANK SOLENOID INLINE CONNECTOR 4-PIN
C18	SUPPLY VALVE SOLENOID 2-PIN
C19	FUEL SENDER 2-PIN

DUAL TANK ONLY

FUEL TANK JUMPER HARNESS

C11	FUEL TANK JUMPER/IN-TANK INLINE 1 (RIGHT TANK) 2-PIN
C12	FUEL TANK JUMPER/IN-TANK INLINE 2 (RIGHT TANK) 2-PIN
C13	FUEL TANK JUMPER/TANK SOLENOID INLINE (RIGHT TANK) 4-PIN
C14	FUEL TANK JUMPER/UNDERHOOD INLINE 2, 4-PIN
C15	FUEL TANK JUMPER/UNDERHOOD INLINE 1, 4-PIN

CAN HARNESS

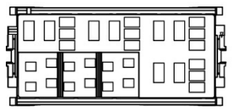
C1	BODY MODULE 12-PIN
C2	TO FORD HARNESS CONNECTOR 12-PIN
C3	CAN/UNDERHOOD IN-LINE CONNECTOR 2-PIN
G1	GROMMET

100254b

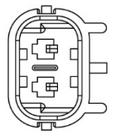
WIRING HARNESS CONNECTOR END VIEWS — F-650 CHASSIS CAB

UNDERHOOD HARNESS

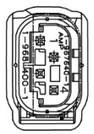
FUSE_BOX



C3
UNDERHOOD/CAN
INLINE CONNECTOR

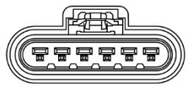


C5
IPTS

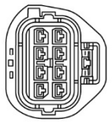


C7
FLIM

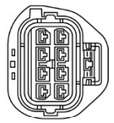
C6
FRPCM



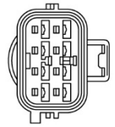
C8
FORD FPCM



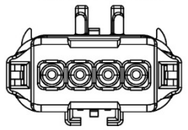
C9
RCT EFPR



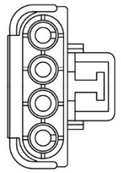
C10
UNDERHOOD/TO FORD
INLINE CONNECTOR



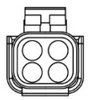
C16
UNDERHOOD/FUEL PUMP
AND SENDER INLINE
CONNECTOR



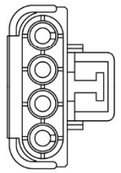
C15
UNDERHOOD/
FUEL TANK JUMPER
INLINE CONNECTOR



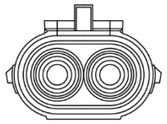
C14
UNDERHOOD/
FUEL TANK JUMPER
INLINE CONNECTOR



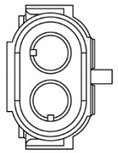
C13
UNDERHOOD/
TANK SOLENOID
INLINE CONNECTOR
(LH TANK)



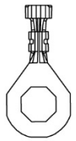
C11
UNDERHOOD/IN-TANK
FUEL PUMP #1 (LH TANK)



C12
UNDERHOOD/IN-TANK
FUEL PUMP #2 (LH TANK)



RING TERMINALS
T1/PWR #1
T2/PWR #2
T3/GND-BATT



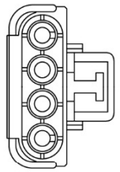
SINGLE PIN CONNECTOR
T4/PWR #3

TANK SOLENOID HARNESS

C19
FUEL SENDER

C18
SUPPLY
VALVE
SOLENOID

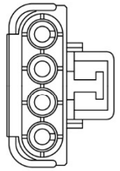
C13-M
TANK SOLENOID/
UNDERHOOD INLINE



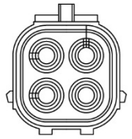
DUAL TANK ONLY

FUEL TANK JUMPER HARNESS

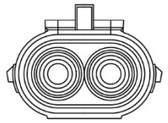
C15
UNDERHOOD/FUEL TANK
JUMPER INLINE CONNECTOR



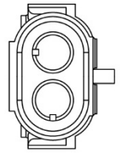
C14
UNDERHOOD/FUEL TANK
JUMPER INLINE CONNECTOR



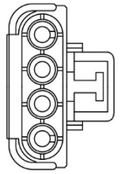
C11-M
FUEL TANK JUMPER/
IN-TANK INLINE 1
(RH TANK)



C12-M
FUEL TANK JUMPER/
IN-TANK INLINE 2
(RH TANK)



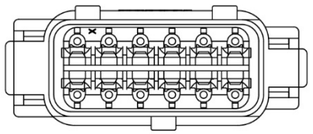
C13-F
FUEL TANK JUMPER/
TANK SOLENOID INLINE
(RH TANK)



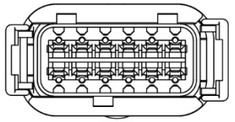
CAN HARNESS

C3-F
CAN/UNDERHOOD
INLINE CONNECTOR

C1
BODY MODULE



C2
TO FORD HARNESS
CONNECTOR



100256a

INSTALLING CAN BUS WIRING HARNESS

Note: A hole must be drilled so that the controller area network (CAN) bus harness can be routed from the interior into the engine compartment.

1. Pull back the floor mat next to the right kick panel. Remove the right kick panel (module access cover). **Figure 16.1**. Remove the door opening trim by pulling back the door opening weatherstrip, lifting to remove the floor scuff plate and unsnapping the front door opening trim panel. **Figure 16.2**.
2. Disconnect the washer bottle (three screws, harness clip and electrical connection) and position out of the way. **Figure 16.3**. From inside the lower right area of the engine compartment, mark the location to drill a 35 mm (1-3/8”) pass-through hole for the CAN bus harness. The marked location should be centered between the two depressions as shown. **Figure 16.4**.
3. At the marked location, drill the hole using a 35 mm (1-3/8”) hole saw. **Note:** When drilling, push the drill no deeper than what is necessary to cut through the metal panel and floor sound deadening material. Drill at the same angle of the floor panel. **Figure 16.5**. After the panel metal is cut, continue the hole by cutting through the floor sound deadening material. Assistance is required to hold the material during drilling (or use utility knife to cut material). Deburr and coat the hole with touch up paint. Refer to *Special Tools* for more information. **Figure 16.6**.
4. Disconnect the OEM module upper connector. The CAN bus harness tee’s into this connection. **Figure 16.7**.
5. Feed the CAN bus harness through the 35 mm drilled hole into the engine compartment. Tee the CAN bus wiring harness between the Ford trailer brake module upper connecter and the Ford harness connector. Tuck the CAN bus harness neatly in this area and zip tie as needed. **Figure 16.8**.
6. Pull the CAN bus harness grommet until it snaps securely into the 35 mm hole in the floor. **Figure 16.9**.
7. Install the door opening trim, scuff panel and kick panel module access cover. **Figures 16.1** and **16.2**.

Figure 16.1

Figure 16.2

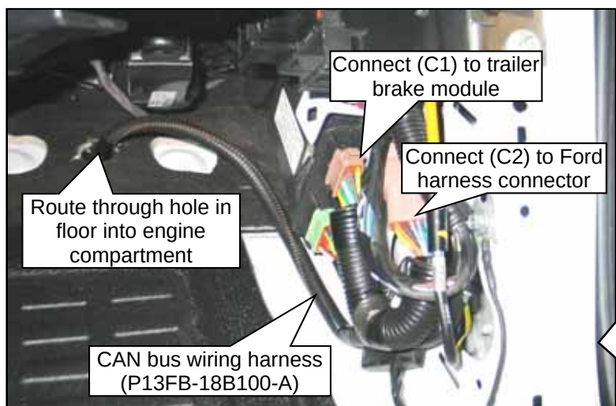


Figure 16.8

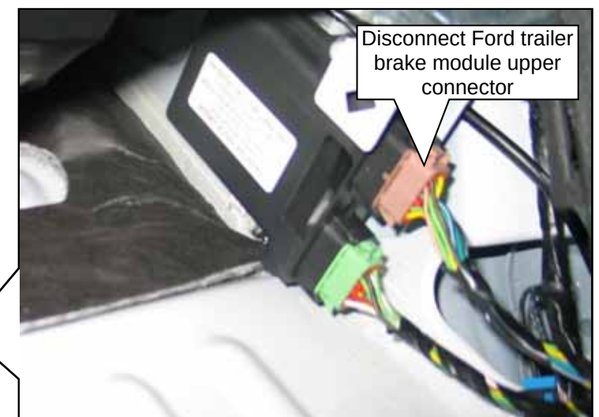


Figure 16.7

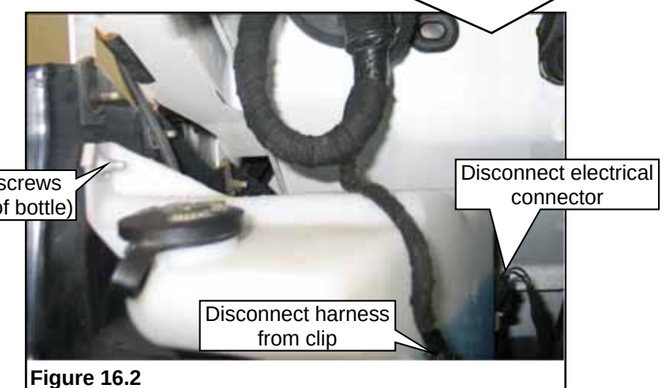


Figure 16.2

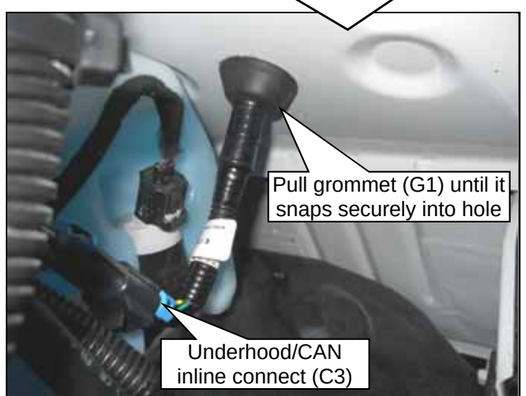


Figure 16.9

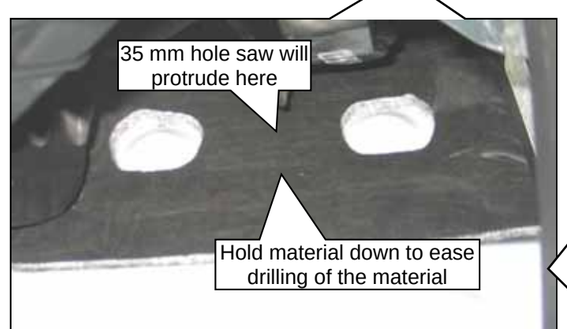


Figure 16.6

Figure 16.5

Figure 16.4

INSTALLING UNDERHOOD WIRING HARNESS

Note: All parts for installing the underhood harness are supplied in hardware kit P13FB-ELECKIT-A. **Note:** It is recommended to route the entire harness and make sure all connections can be made before retaining the harness with zip ties or dual clamp cable ties. Retaining parts of the harness prematurely can cause unnecessary work.

1. Drape the underhood harness across the engine compartment on top of the engine near the cowl with the fuse box and SRM connector to the right side near the SRM.
2. Attach the SRM connector (C4) to the SRM, push the connector into place until fully seated and close the connector latch securely. **Note:** The SRM connector must be oriented downward for proper harness installation. **Figure 17.1**.
3. Position the auxiliary fuse box (part of harness) onto the bracket and slide it in until locked in place. Check to make sure that the fuse box tabs are fully seated and that the lock tab is latched. **Figure 17.1**.
4. Plug in the fuel level interface module (FLIM) connector (and in-line fuse) to the underhood harness FLIM (C7) connection. Use two zip ties to secure the FLIM to the underhood wiring harness as shown. Zip tie the underhood harness to the OEM electrical harness every 8–12 inches along the routing. **Figure 17.2**.
5. Route battery connection breakout of underhood harness down between inner fender and fender brace and then, down right frame rail to battery box location. Zip tie to SRM breakout of underhood harness. Make the positive (T1 and T2 power #1 and #2 ring terminals) and negative (T3 ground ring terminal) connections to the battery positive and negative terminals. Route the underhood/CAN inline connector down to the CAN harness connector (C3) and make the electrical connection. **Figure 17.3**.
6. Continue routing the underhood harness across the cowl and down the left side of the brake booster. Use zip ties to secure the harness to the OEM harness along the way. **Figure 17.4**.
7. Make the electrical connection of the FRPCM (C6) to the FRPCM. **Figure 17.5**.
8. Make the electrical connection of the IPTS (C5) to the IPTS on the left fuel rail. **Figure 17.6**.

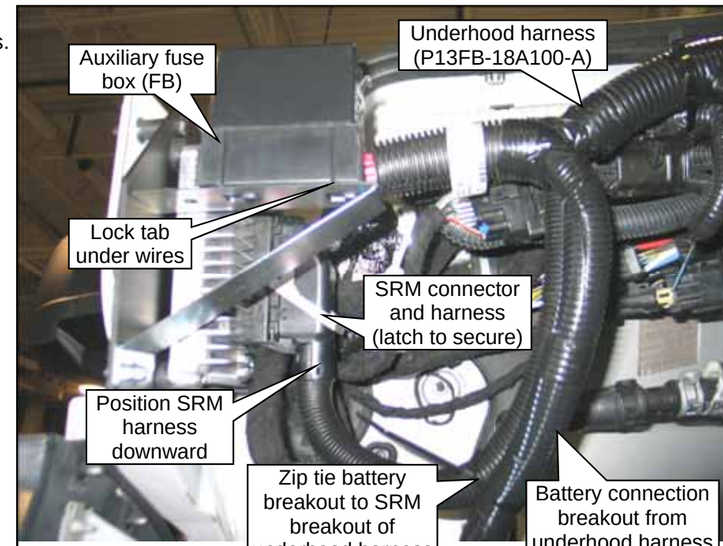


Figure 17.1

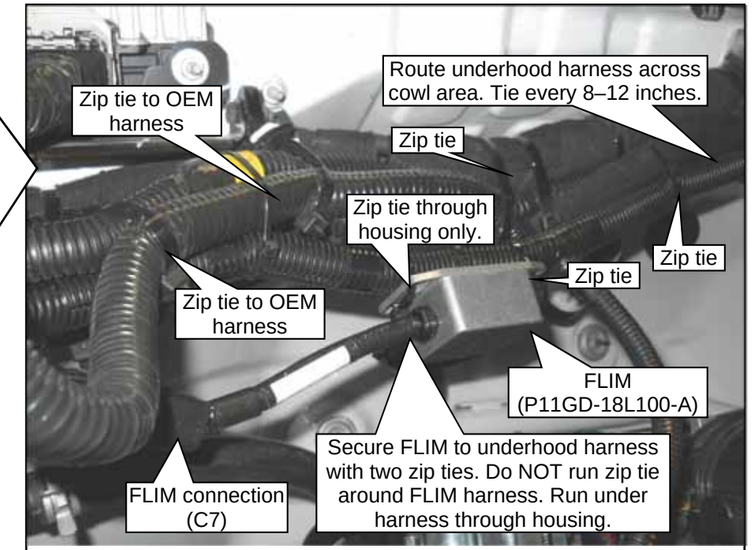


Figure 17.2

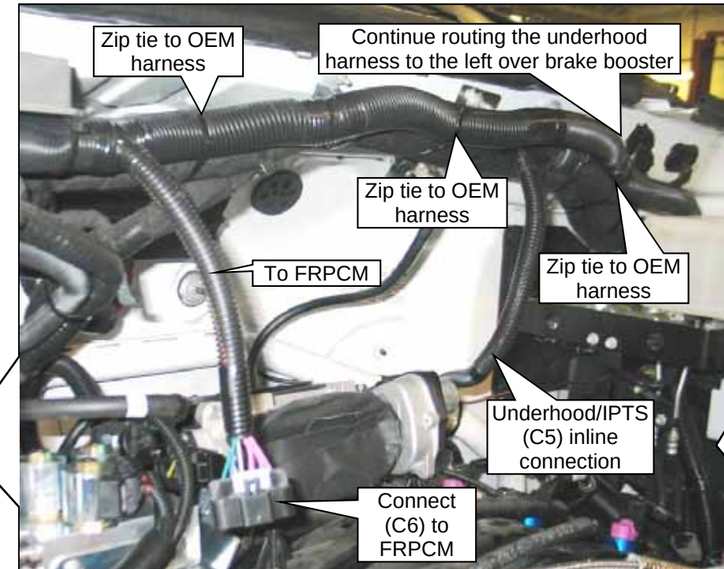


Figure 17.4

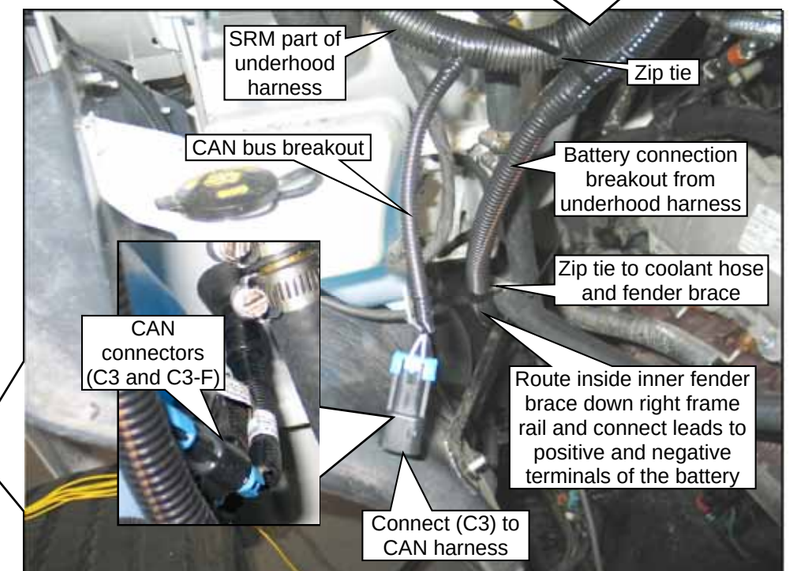


Figure 17.3

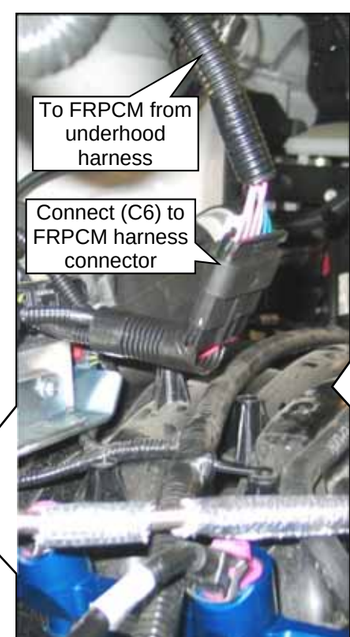


Figure 17.5

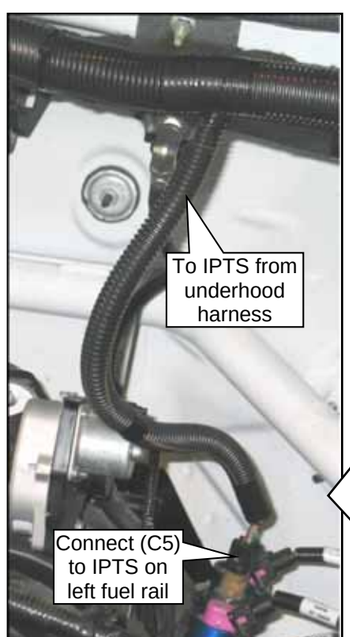


Figure 17.6

9. Route the underhood harness down to the left of the brake booster. Continue down between the left inner fender and fender brace. **Figure 18.1**.
10. Insert the open terminal end of the green single wire breakout (T4) (Key On, ignition wakeup) into the Ford splice block (with existing red power wires). Push the open terminal into the splice block until secure. Zip tie the connector of the single wire breakout connector to the underhood harness. **Note:** Do NOT use the second splice block having black ground wires. **Figure 18.2**.
11. Route the lower end of the underhood harness down along the wheel well to the left of the steering column and back toward the left side frame rail. Following the OEM chassis harness. Secure with zip ties every 8–12 inches where possible. **Note:** Make sure to secure the underhood harness away from the steering column and other high heat or moving components. **Figure 18.3**.
12. Continue the harness over the crossmember to the inside of the left frame rail. Zip tie to the OEM chassis harness. **Figure 18.4**.
13. Follow the OEM chassis harness down and rearward over transmission support crossmember. **Figure 18.5**.
14. Continue with the harness to the rear, securing with zip ties to the OEM harness. This portion of the harness goes up to connect to the Ford, new EFPRs and Ford harness with connectors (C8, C9 and C10). **Figure 18.6**.

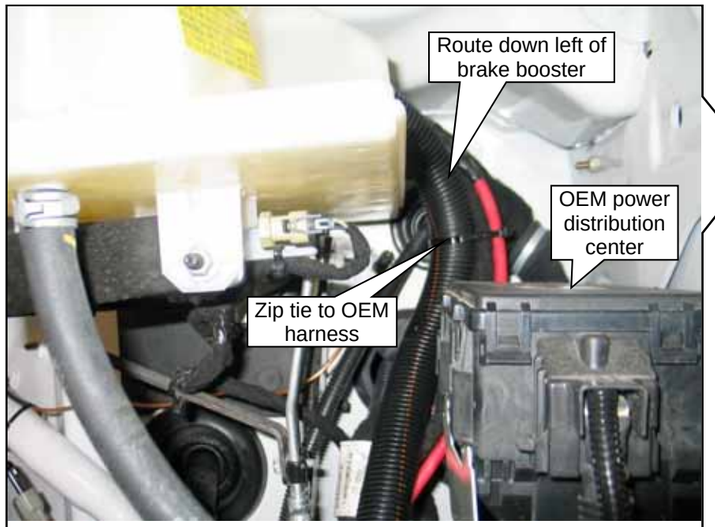


Figure 18.1

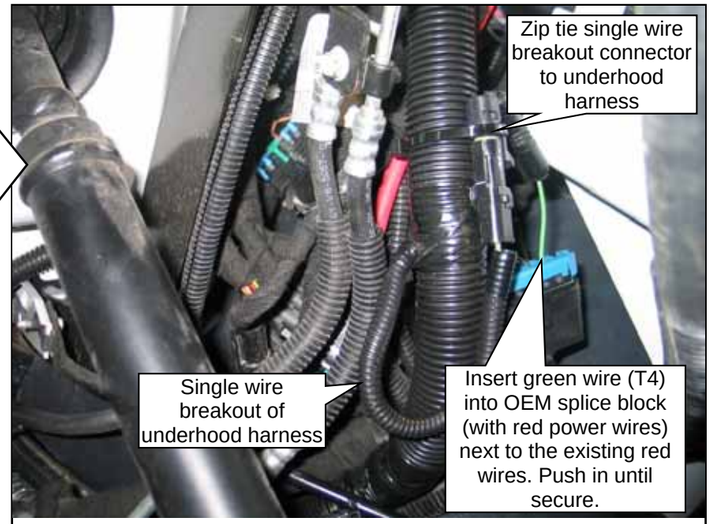


Figure 18.2

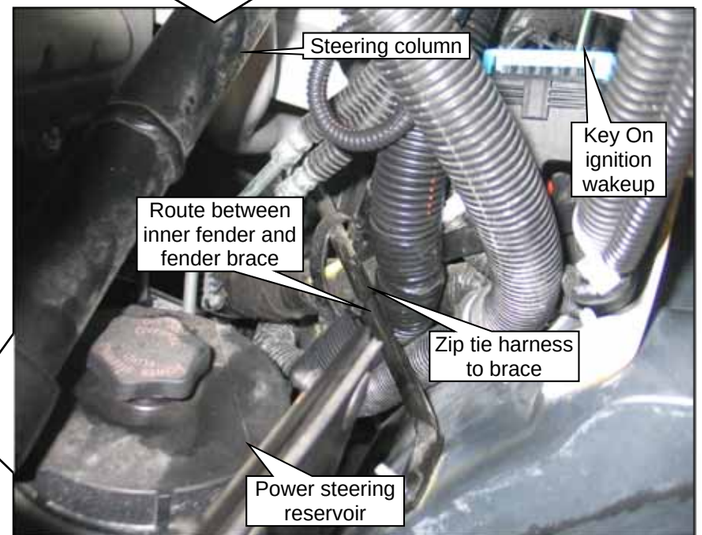


Figure 18.3

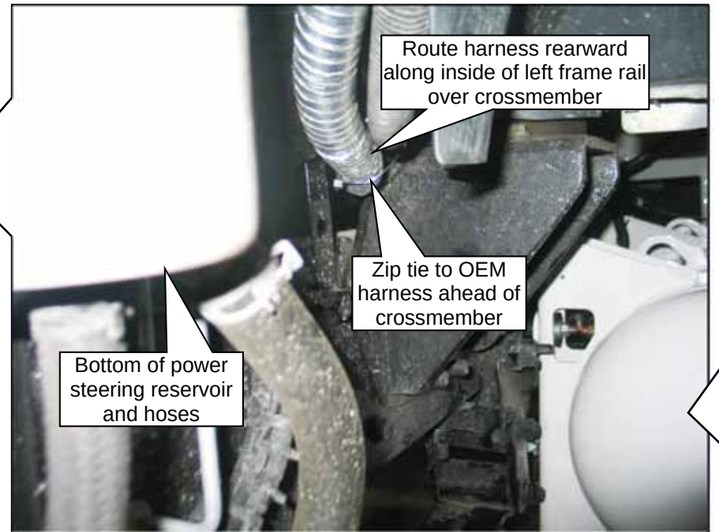


Figure 18.4

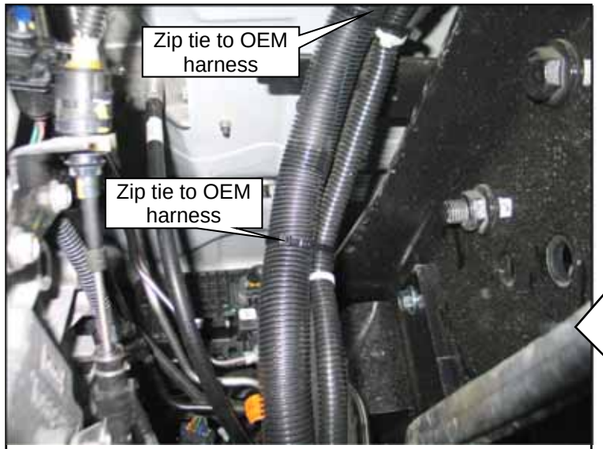


Figure 18.5

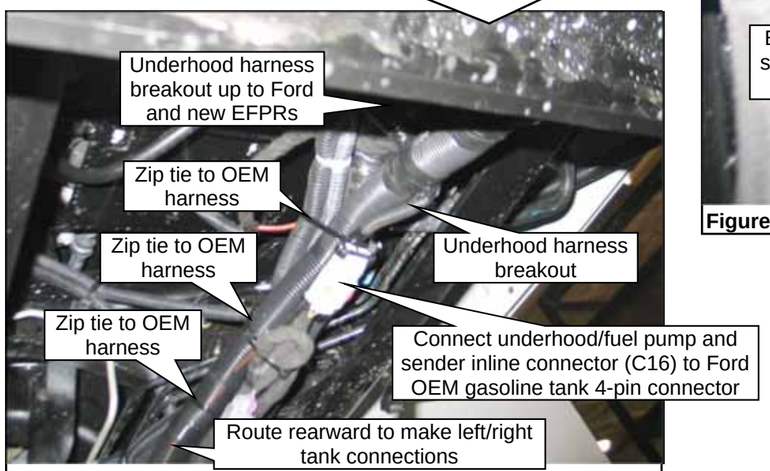


Figure 18.6

15. Disconnect the connector from the Ford EFPR on the vapor canister bracket. Remove the two screws and lift the Ford EFPR. Discard the two screws. **Figure 19.1**.
16. Slide the new RCT EFPR bracket under the Ford EFPR. Install two new M6 x 1 x 30 bolts and two new M6 x 1 nuts to secure the Ford EFPR and trap the new bracket. Tighten to specification. Slide the new RCT EFPR onto the bracket until locked in place. **Figure 19.2**.
17. Connect the underhood harness EFPR connectors to the Ford EFPR (C8), the RCT EFPR (C9) and to the Ford EFPR OEM inline connector (C10). **Figure 19.3**.
18. Continue securing the underhood harness to the OEM harness to the rear and zip tie as necessary. The end of the harness has two breakouts, one to the rear for the left tank connections which routes under the ABS brake module at the left frame rail and the other breakout with two connectors (C14 and C15) connects to the fuel tank jumper harness for the dual tank. These are tied back for the single tank. **Figures 19.4** and **19.5**.
19. **Dual Tank Only:** Connect underhood harness to fuel tank jumper harness, run up through cab rear support and crossmember (Regular cab) and to the right side for connections to the RH tank after it is installed. **Figures 19.4**, **19.6, 19.7** and **19.8**.
20. **Dual Tank Only:** Remove OEM harness cable ties on crossmember and replace with two new dual clamp cable ties. Install the cable ties at the OEM locations (left and right but leave center OEM tie as is) with the wider end of the cable clamp facing up. Install a bolt through the cable tie, crossmember and secure with nut inside the crossmember at both locations. After tank installation, run the transfer fuel lines over crossmember and secure with dual clamp cable ties at the front separate from the harnesses. Secure the OEM harnesses and the jumper harness with the cable ties at the rear separate from the lines. Secure the oxygen sensor connector directly with the right rear dual clamp cable tie. **Figures 19.6, 19.7** and **19.8**.
21. **Dual Tank Only:** Drape the RH fuel tank jumper harness over the right frame rail. Connect the harness to the right tank after the tank is installed. **Figure 19.9**.
22. **Single Tank Only:** Cover both 4 pin connectors (C14 and C15) with dielectric grease then wrap with electrical tape. **Figure 19.4**. See (SCHEMATIC — ROUSH WIRING HARNESS (F-650 CHASSIS CAB) for more information.
23. **Single Tank Only:** Wrap the C14 and C15 connectors back over themselves and secure them using zip ties.
24. Finish routing the battery harness breakout of the underhood harness along the outside of the right frame rail and make the battery positive and battery negative connections after the battery box has been relocated. **Figures 19.10**.

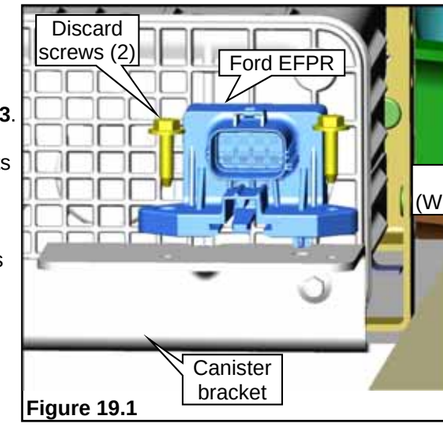


Figure 19.1

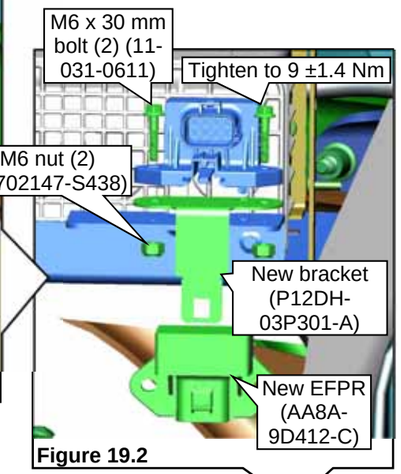


Figure 19.2

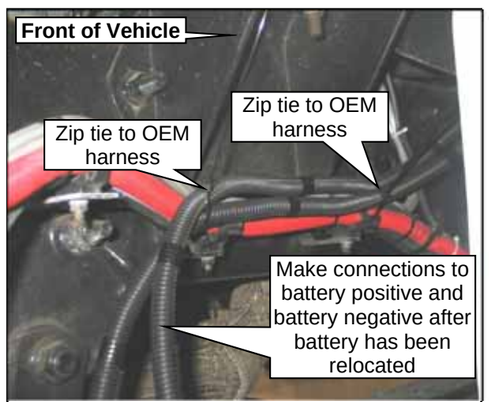


Figure 19.10

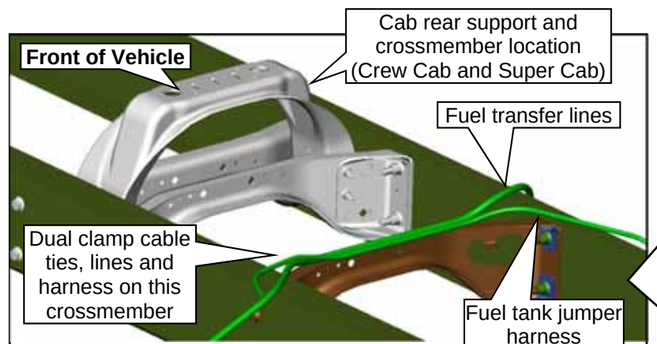


Figure 19.7 (Dual Tank Only)

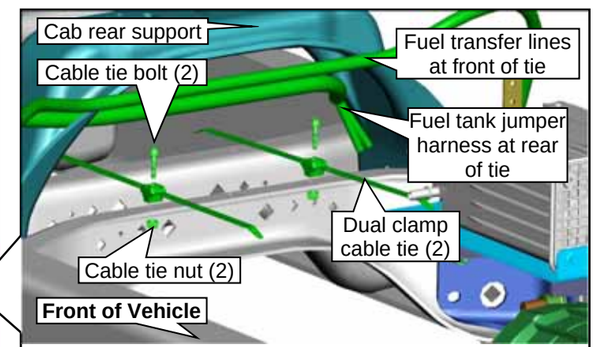


Figure 19.6 — Regular Cab Crossmember Location (Dual Tank Only)

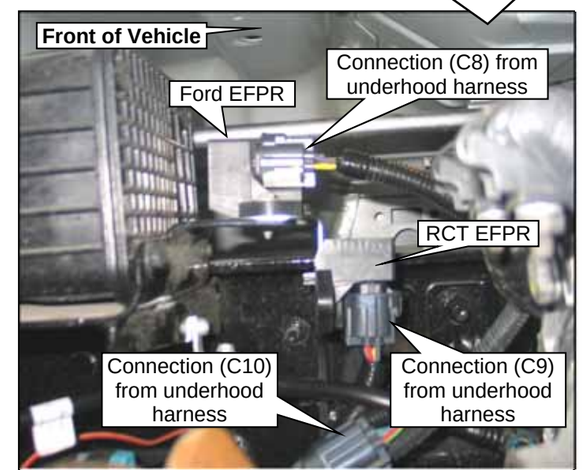


Figure 19.3

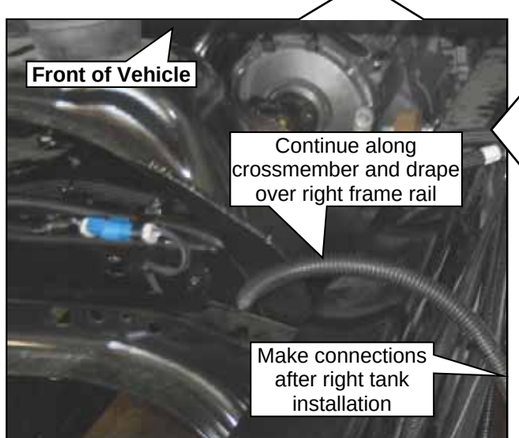


Figure 19.9 (Dual Tank Only)

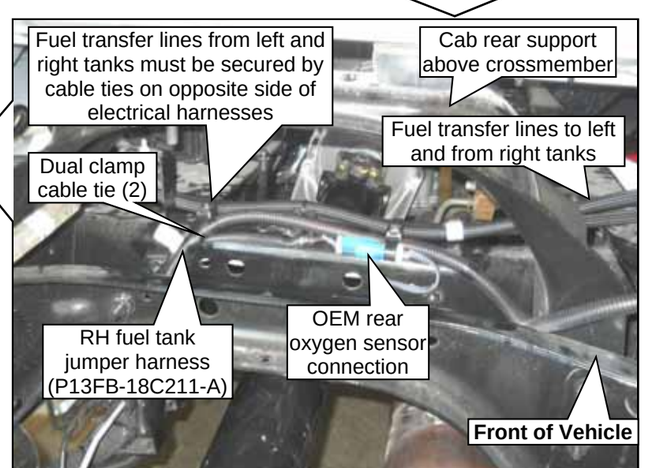


Figure 19.8 (Dual Tank Only)

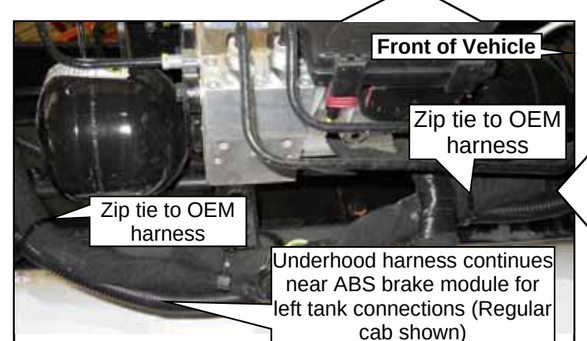


Figure 19.5

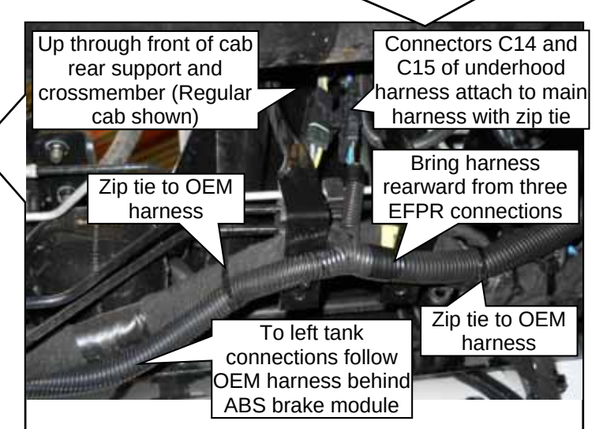


Figure 19.4 (Dual Tank Only)

DISCARD REUSE NEW

PLUGGING VAPOR CANISTER PORT AND SEALING FTPT CONNECTOR

1. Preassemble quick-connect fitting and vacuum cap found in hardware kit P13FB-VAPOR-A. **Figure 20.1**.
2. Install assembly onto vapor canister top port. **Figures 20.2** and **20.3**.
3. Connect underhood/fuel pump and sender inline connector (4-pin) to the Ford fuel pump connector (removed from gasoline tank). **Figure 20.4**.
4. Seal the fuel tank pressure transducer (FTPT) connector in the Ford wiring harness, previously removed from the gasoline tank. **Figure 20.4**.
   - Pack connector terminals with Ford dielectric grease, or equivalent.
   - Seal open end of FTPT connector with electrical tape.
   - Use zip ties to secure underhood wiring harness and FTPT connector to the Ford wiring harness.

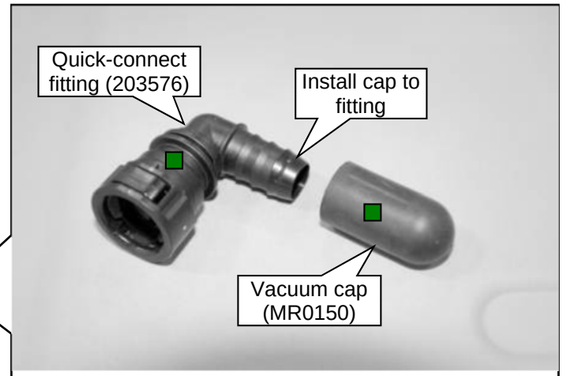


Figure 20.1

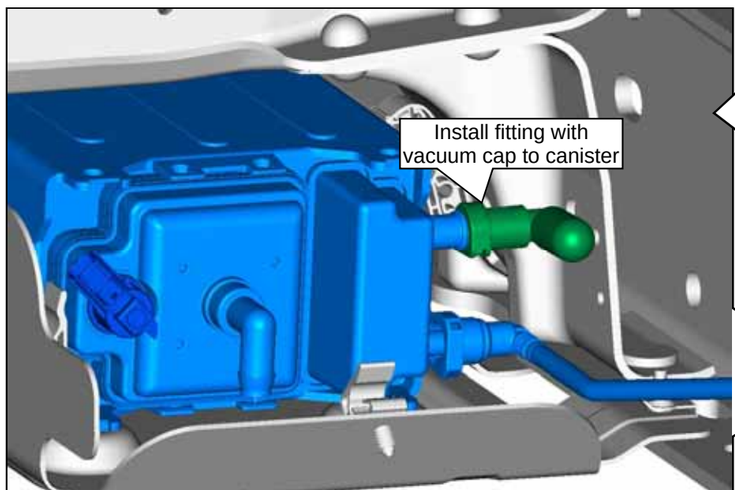


Figure 20.2

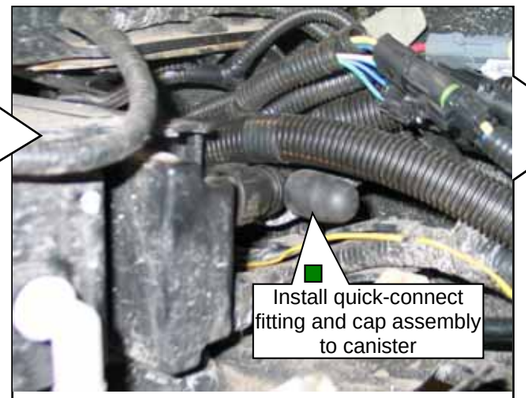


Figure 20.3

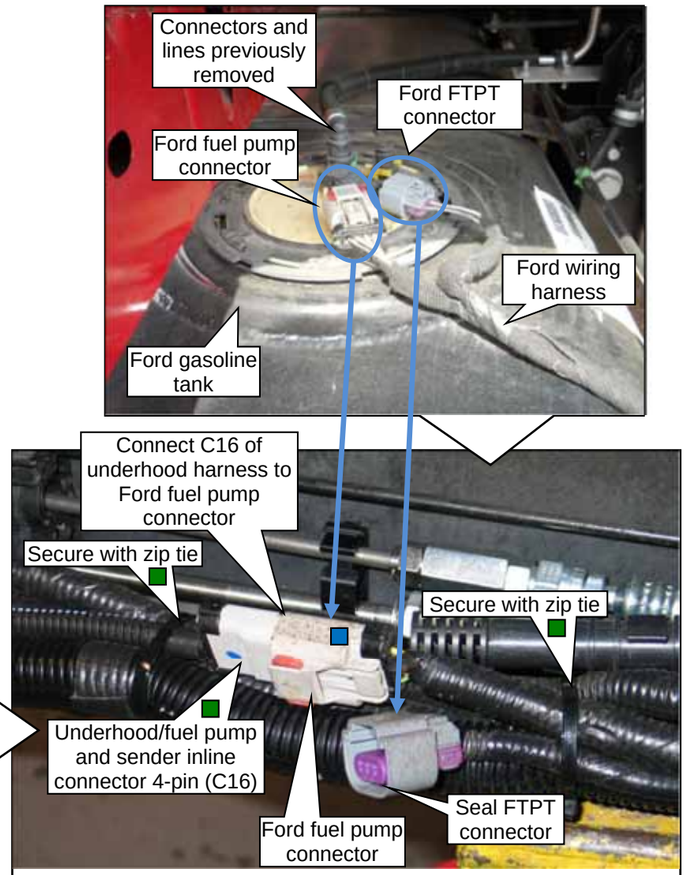
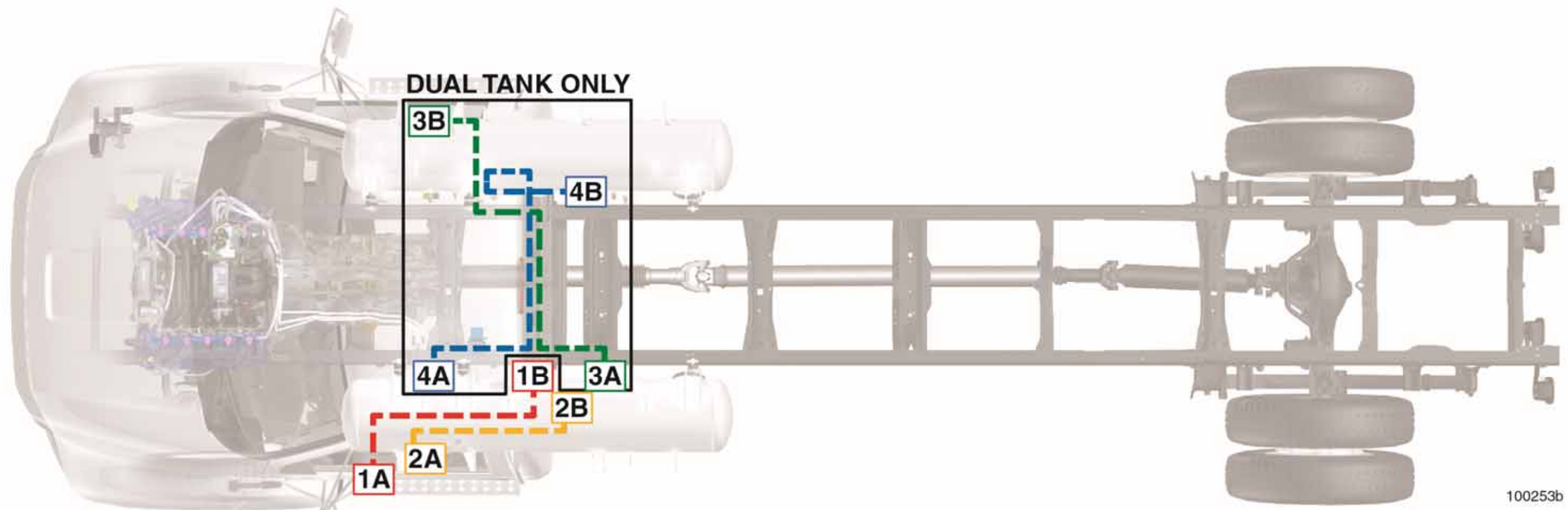


Figure 20.4

FUEL LINE LAYOUT, DUAL AND SINGLE TANK — F-650 CHASSIS CAB



FILL LINE P-10D120-C-1185
FILL LINE P-10D124-C-1000
FILL LINE P-10D121-C-2035
TRANSFER LINE P13FB-1Q130
DUAL TANK ONLY

FUEL TANK LINE ROUTING

1A	FILL VALVE (MOUNTED TO STEP)
1B	FILL FILTER
2A	TANK OPD (OUTBOARD)
2B	FILTER ELBOW
3A	FILTER TEE
3B	BALL VALVE
4A	TANK OPD (INBOARD)
4B	SUPPLY VALVE

DUAL TANK ONLY

PREPARING THE TANKS FOR INSTALLATION

Left Hand Long Tank (P13FB-10A005-A)

1. Install double snail clips in the front and middle tank mounting saddles to secure the rear (tank mounted) fuel supply and return lines. Orient the clips as shown. **Figure 22.1**.
2. Position six saddle bracket isolator assemblies to the tank saddle brackets and install them using a soft mallet. **Note:** Use soapy water on the isolators to ease installation. **Figure 22.2**.
3. Install the rear fuel supply and rear fuel return lines onto the fuel tank. Push the quick-connect ends of the lines into the fuel supply and fuel return valves. Push-pull the lines to make sure they are secure. Snap the lines into the two double snail clips. **Figure 22.3**.
4. Attach the tank solenoid harness to the solenoid connector, level sender connector and to the weld tabs on the side using zip ties. **Note:** Temporarily, drape end of the harness over the top of the tank. **Figure 22.4**.
5. Install two M6 J-clips to the filter bracket weldment on the tank. **Figure 22.5**.
6. Position the fuel filter bracket to the bracket on the tank, install the two bolts and tighten to specification**. Figure 22.5**.
7. Position the clamp into the bracket. Unscrew the clamp and position the fuel filter into the bracket through the clamp. Tighten the clamp to secure the filter. **Note:** Make sure the filter is oriented in the correct direction for proper fuel flow**. Figure 22.6**.
8. Install fill system fill lines and distribution tee to the fuel filter and LH OPD. The fill line requires convolute. Secure to the tank weld tabs with P-clamps, nuts and bolts. **Figure 22.7**. Tighten the fittings on the filter to 53–61 Nm. Tighten the fill lines at T-fitting to 41–49 Nm.

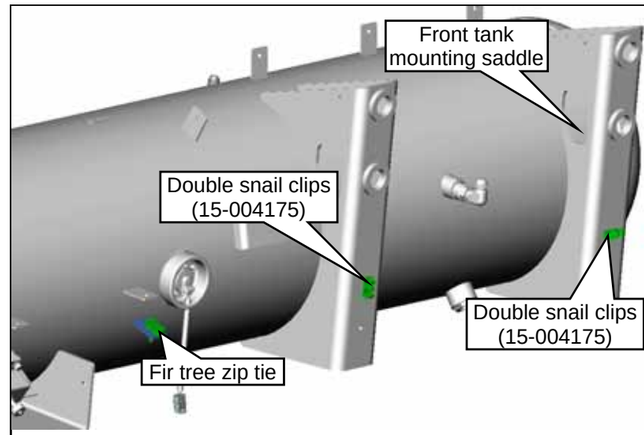


Figure 22.1

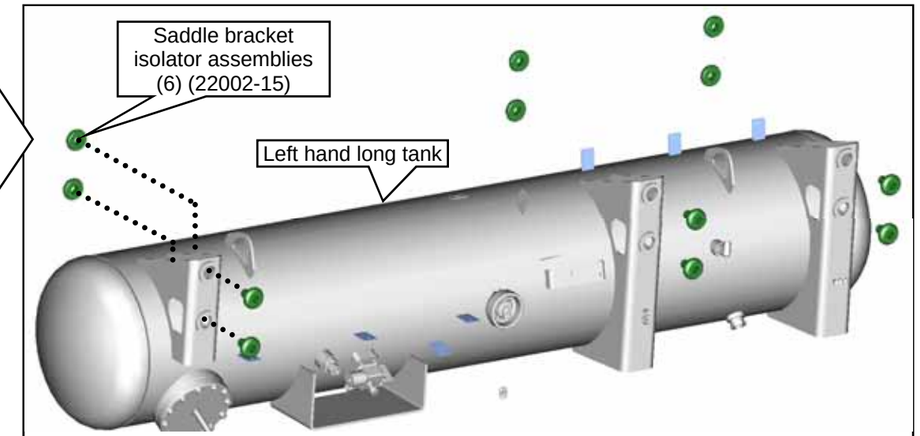


Figure 22.2

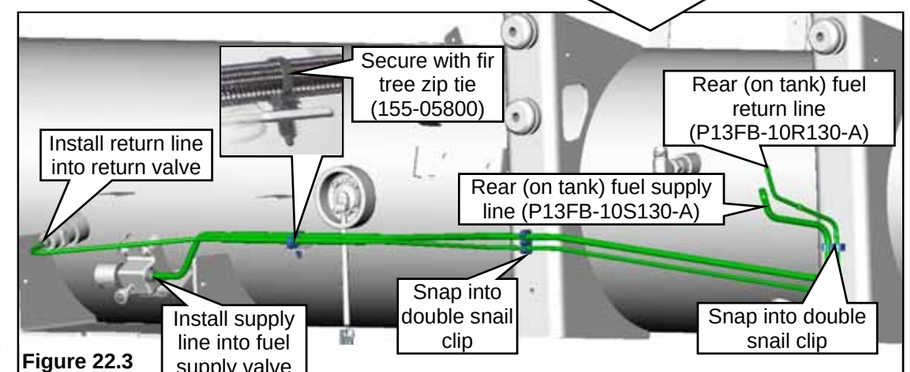


Figure 22.3

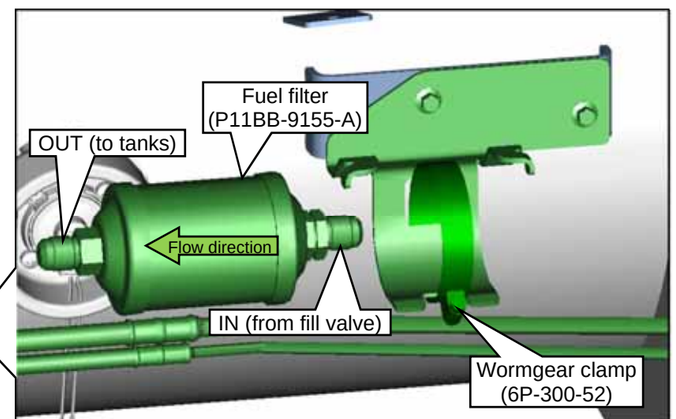


Figure 22.6

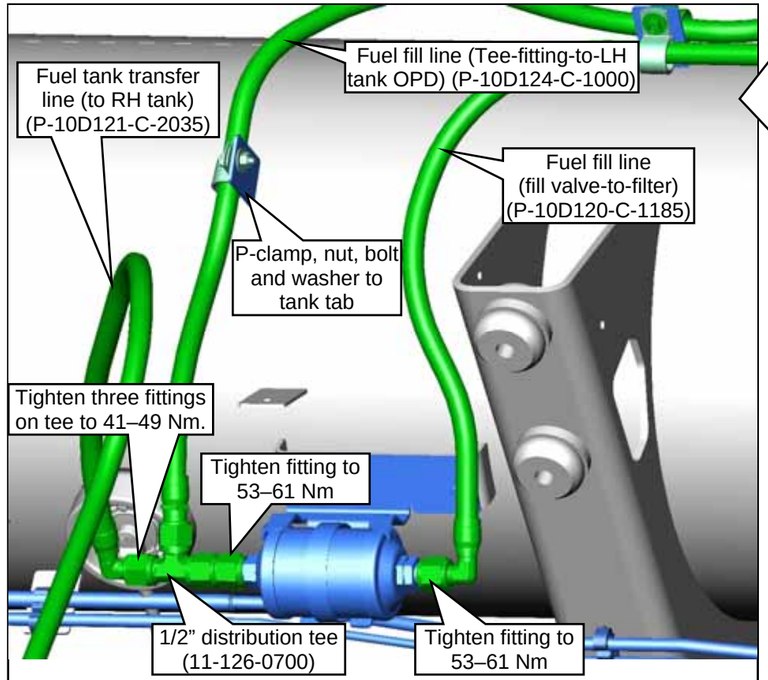


Figure 22.7 (Dual Tank Only)

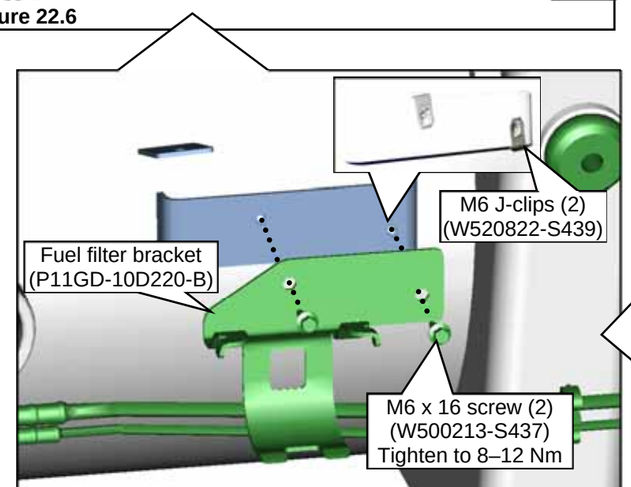


Figure 22.5

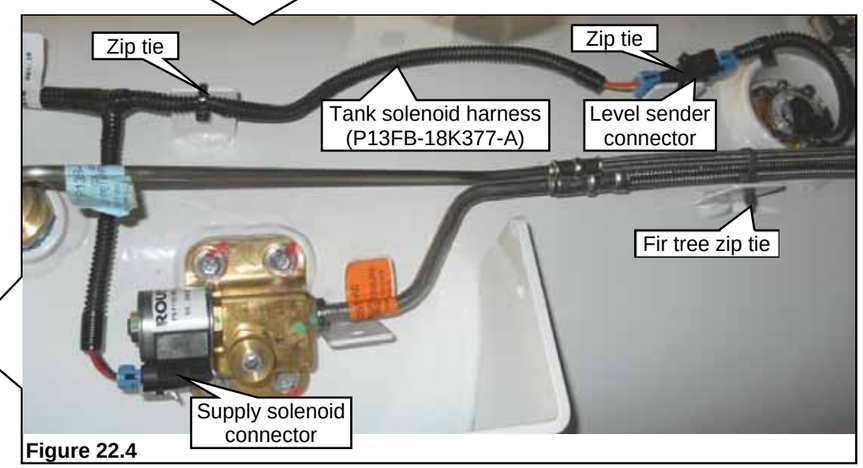


Figure 22.4

9. Route the fill line from the distribution tee to the LH OPD (tank fill valve) and secure with two P-clamps, M6 nuts, bolts and washers. Route the fill line from filter along tank tabs and secure with two P-clamps, M6 nuts, bolts and washers (bolt, nut, washer shared with two P-clamps). The end of this line attaches to the fill valve after tank and valve installation. **Figures 23.1** and **23.2**.

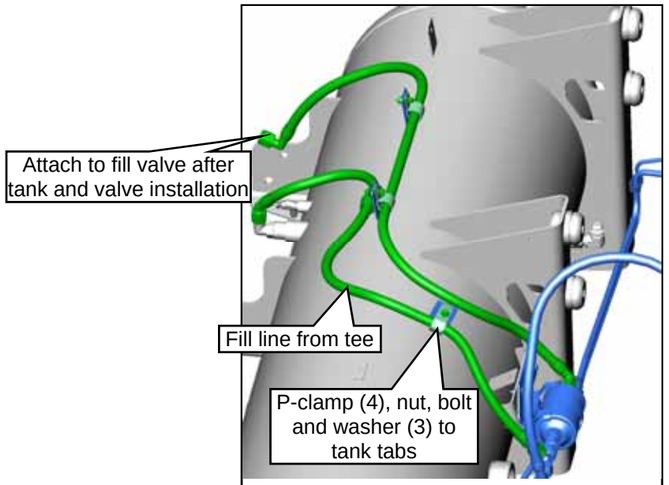


Figure 23.1 (Dual Tank Only)

Right Hand Long Tank (P13FB-10A006-A)

1. Install two double snail clips, one in each tab above the fuel level sender to secure the tank mounted fuel transfer line. Orient the clips as shown. Install an M6 x 25 bolt and an M6 flange nut from kit P13FB-FUELLINE-A to the hole in the middle tank mounting bracket (saddle) as shown with bolt on the inside and nut on the outside. Tighten the bolt and nut to 9–11 Nm. **Figure 23.3**.
2. Position six saddle bracket isolator assemblies to the tank saddle brackets and install them using a soft mallet. **Note:** Use a suitable lubricant on the isolators to ease installation. **Figure 23.4**.
3. Install the RH tank fuel supply valve transfer line onto the tank. Push the quick-connect fitting of the line into the fuel supply valve. Push-pull the line to make sure the line is secure. Snap the line into the two double snail clips. Install a fir tree zip tie at the third tab on the tank (nearest supply valve). Attach the vertical portion of the line to the M6 bolt (and nut) on the tank middle saddle mount using a stud mount zip tie from kit P13FB-FUELLINE-A. **Figure 23.5**. See inserts.
4. Attach the tank solenoid harness to the solenoid connector and to the level sender connector. Secure the harness to the four weld tabs using edge clip zip ties. **Figures 23.6**, **23.7** and **23.8**. **Note:** Temporarily, drape end of harness over top of tank.
5. Attach the ball valve to the weld tab on the RH long tank using a P-clamp, bolt and nut. Tighten to specification. Connect a fuel fill line from the ball valve to the RH long tank OPD. Tighten the fittings to specification while aligning the line to the OPD. **Figure 23.9**.

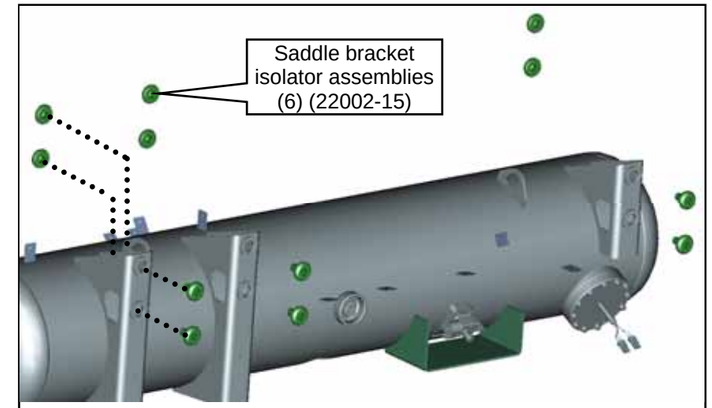


Figure 23.4

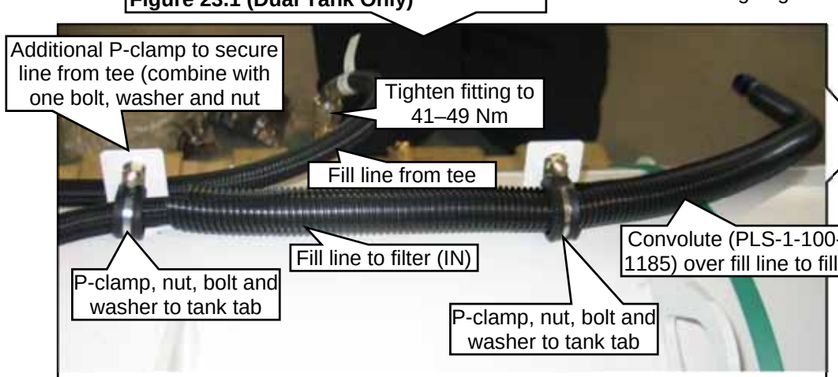


Figure 23.2

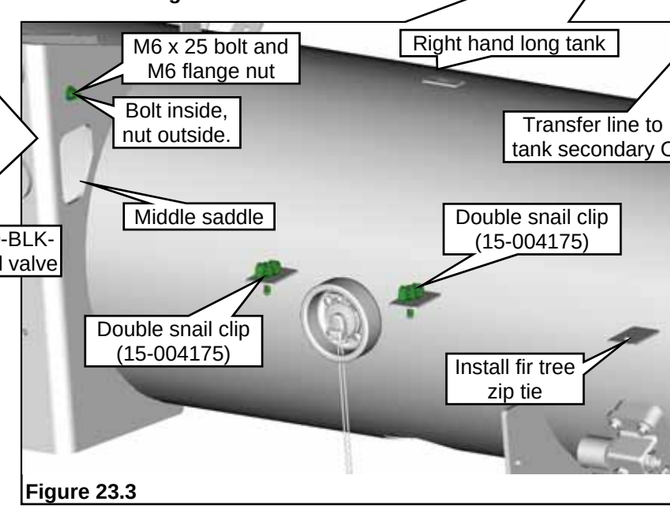


Figure 23.3

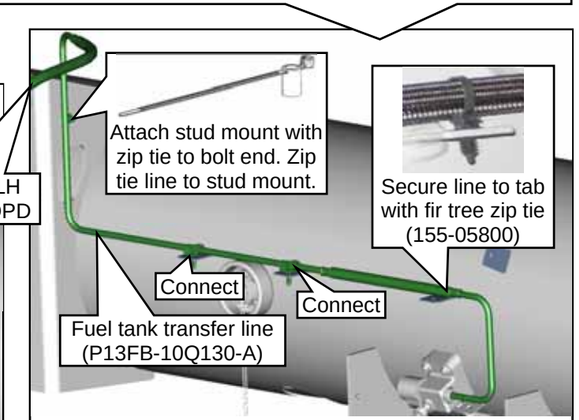


Figure 23.5

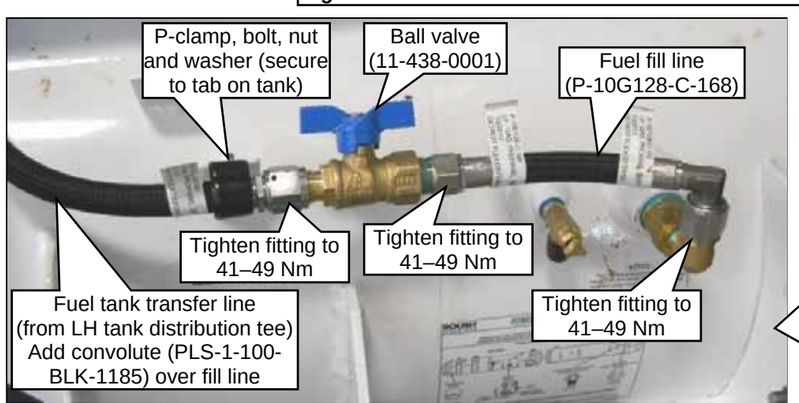


Figure 23.9

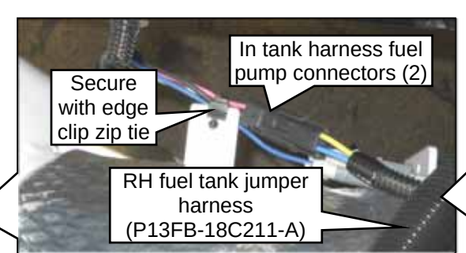


Figure 23.8

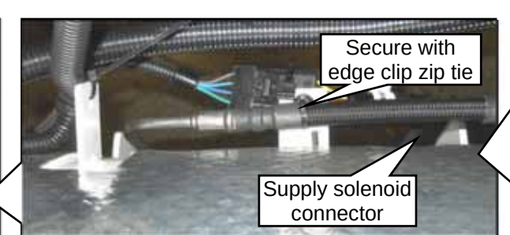


Figure 23.7

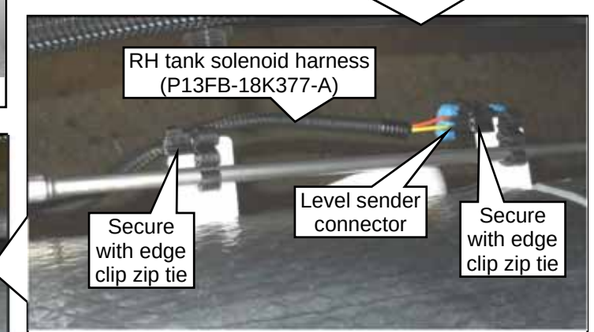


Figure 23.6

Left Hand Short Tank (P13FB-10A005-B)

1. Install double snail clips in the left tank front mounting saddles to secure the rear (tank mounted) fuel supply and return lines. Orient the clips as shown. **Figure 24.1**.
2. Position four saddle bracket isolator assemblies to the tank saddle brackets and install them using a soft mallet. **Note:** Use a suitable lubricant on the isolators to ease installation. **Figure 24.2**.
3. Install the rear fuel supply and rear fuel return lines onto the fuel tank. Push the quick-connect ends of the lines into the fuel supply and fuel return valves. Push-pull the lines to make sure they are secure. Snap the lines into the two double snail clips. **Figure 24.3**.
4. Attach the tank solenoid harness to the solenoid connector, level sender connector and to the weld tabs on the side using zip ties. **Note:** Temporarily, drape end of the harness over the top of the tank. **Figure 24.4**.
5. Install two M6 J-clips to the filter bracket weldment on the tank. **Figure 24.5**.
6. Position the fuel filter bracket to the bracket on the tank, install the two M6 x 16 bolts and tighten to specification**. Figure 24.5**.
7. Position the clamp into the bracket. Unscrew the clamp and position the fuel filter into the bracket through the clamp. Tighten the clamp to secure the filter. **Note:** Make sure the filter is oriented in the correct direction for proper fuel flow**. Figure 24.6**.
8. Install fill system fill lines and distribution tee to the fuel filter and LH OPD. Secure to the tank weld tabs with P-clamps, nuts and bolts. **Figure 24.7**. Tighten the fittings on the filter to 53–61 Nm. Tighten the fill lines at T-fitting to 41–49 Nm.

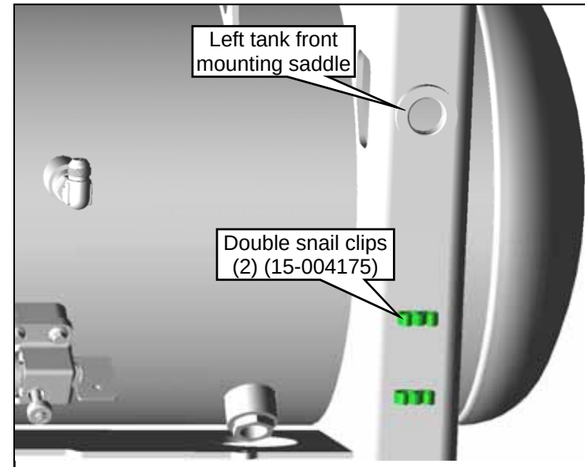


Figure 24.1

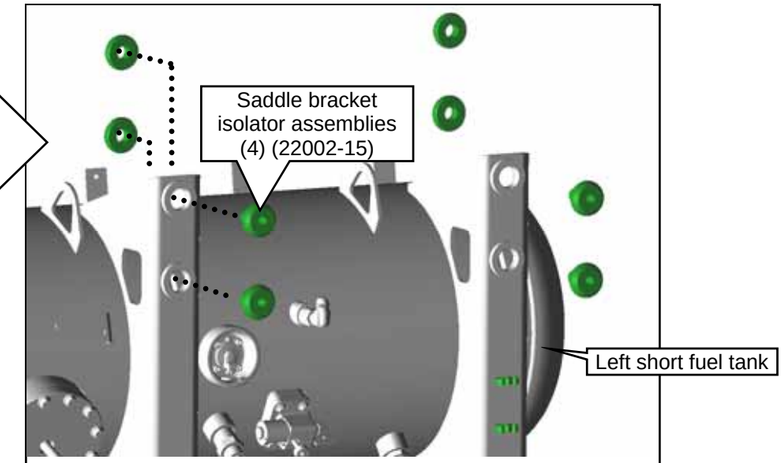


Figure 24.2

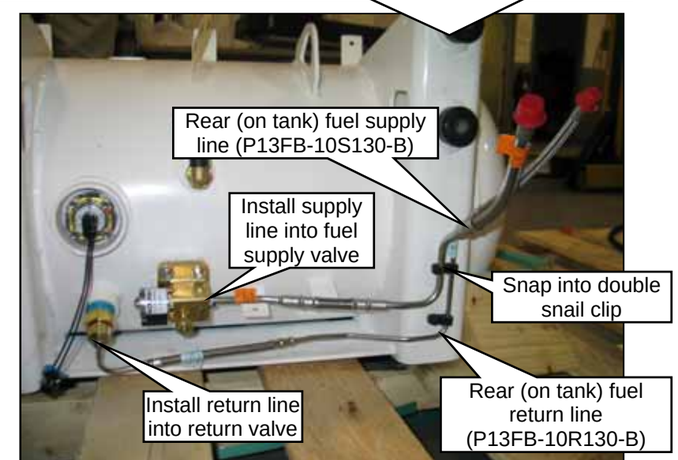


Figure 24.3

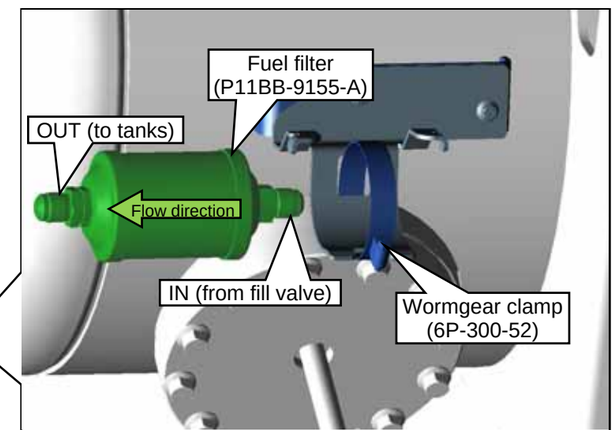


Figure 24.6

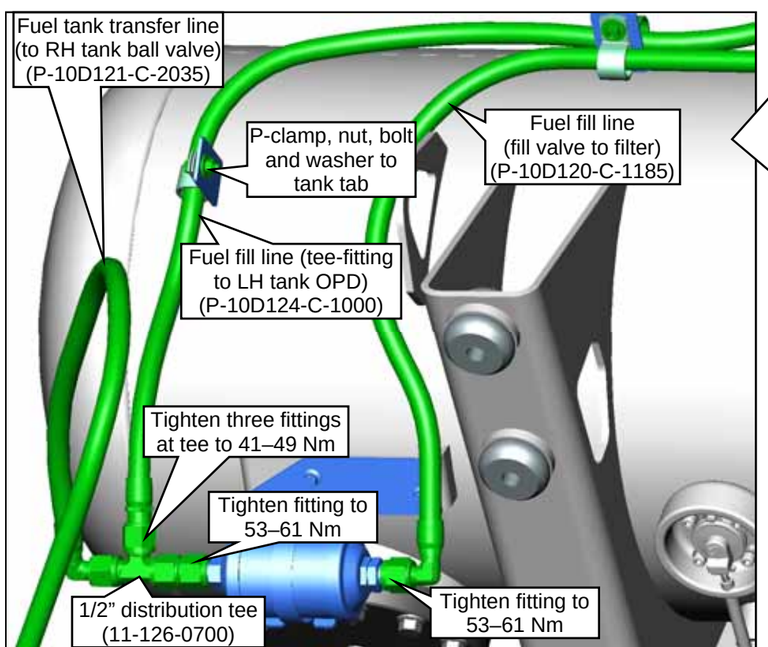


Figure 24.7 (Dual Tank Only)

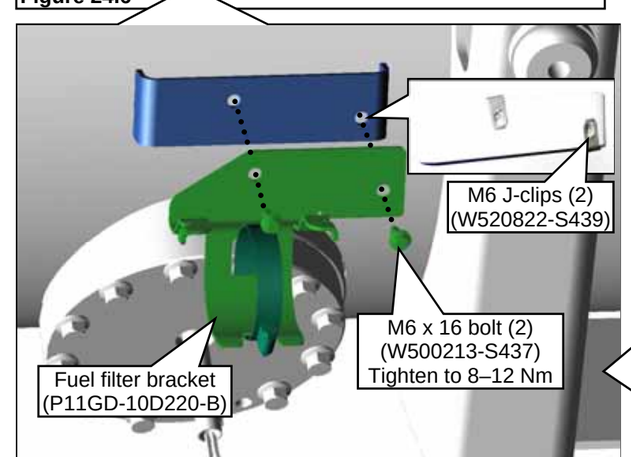


Figure 24.5

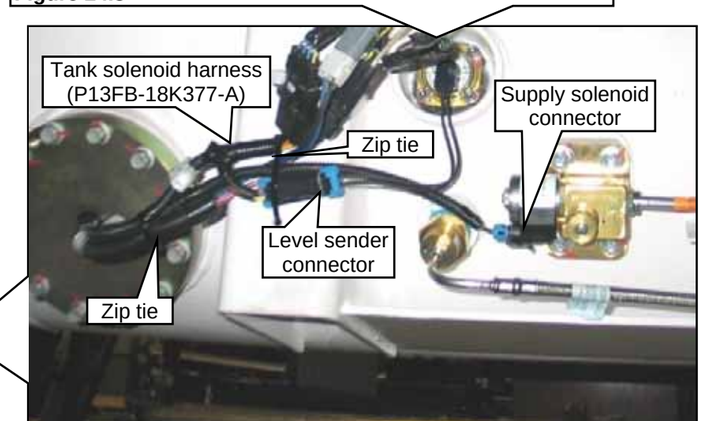


Figure 24.4

9. Route the fill line from the distribution tee to the LH OPD (tank fill valve) and secure with two P-clamps, M6 nuts, bolts and washers. Route the fill line from filter along tank tabs and secure with two P-clamps, M6 nuts, bolts and washers. The end of this line attaches to the fill valve after tank and valve installation. **Figure 25.1**.

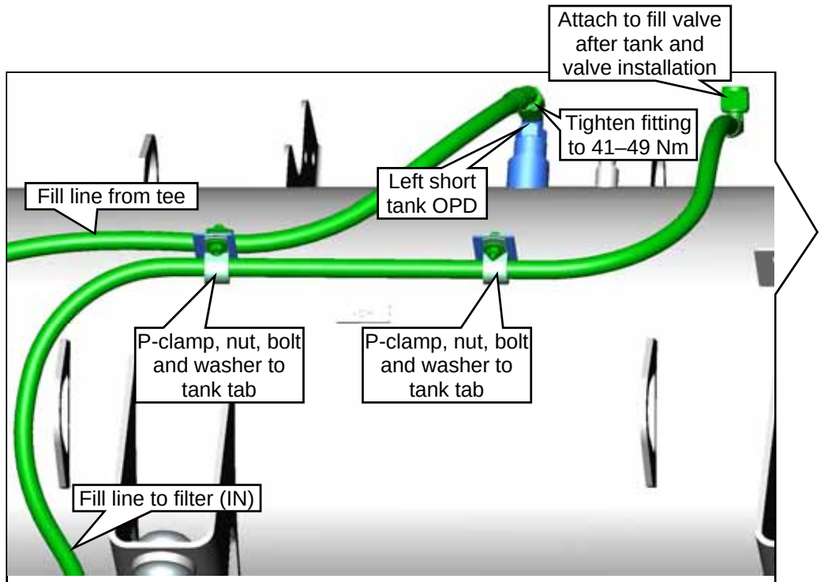


Figure 25.1

Right Hand Short Tank (P13FB-10A006-B)

1. Install one fir tree zip tie in the right short tank rear mounting saddle to secure the tank-mounted fuel transfer line. **Figure 25.2**.
2. Position four saddle bracket isolator assemblies to the tank saddle brackets and install them using a soft mallet. **Note:** Use a suitable lubricant on the isolators to ease installation. **Figure 25.3**.
3. Install the RH tank fuel supply valve transfer line onto the tank. Push the quick-connect fitting of the line into the fuel supply valve. Push-pull the line to make sure the line is secure. Snap the line into the double snail clip on the rear mounting saddle. **Figure 25.4**.
4. Attach the fuel supply valve and level sender (solenoid) harness to the solenoid connector, level sender connector and to the weld tab with the fuel transfer line using a zip tie. **Figure 25.5**.
5. Attach the ball valve to the weld tab on the right short tank using a P-clamp, bolt and nut. Tighten to specification. Connect the fuel fill line from the ball valve to the right short tank OPD. Tighten the fittings to specification while aligning the line to the OPD. **Figure 25.6**.

Figure 25.2

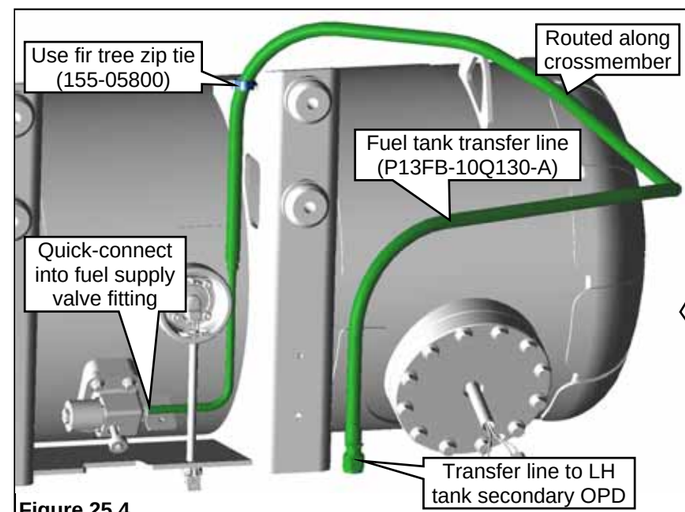


Figure 25.4

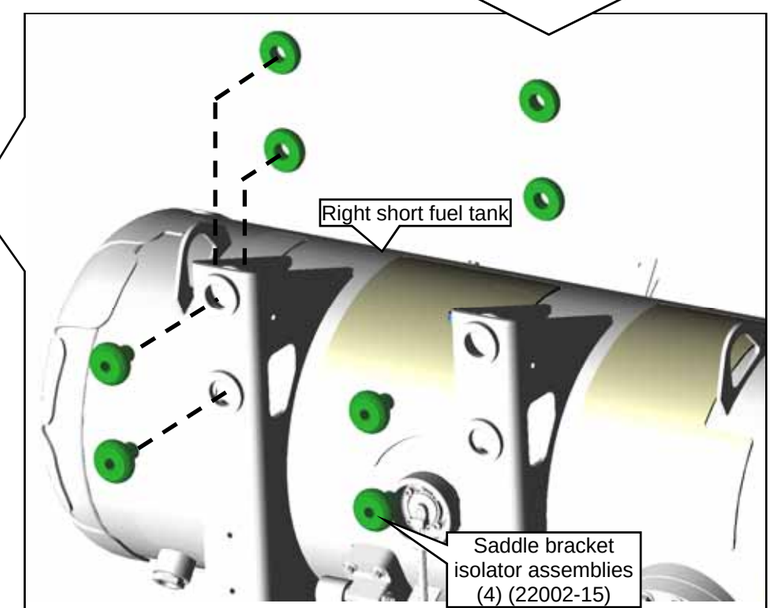


Figure 25.3

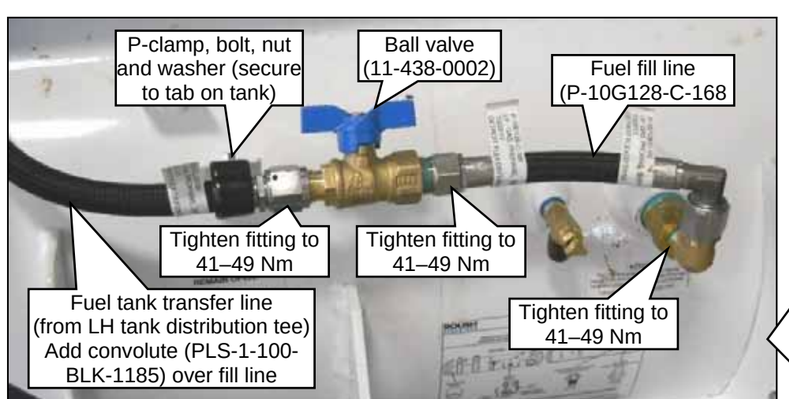


Figure 25.6

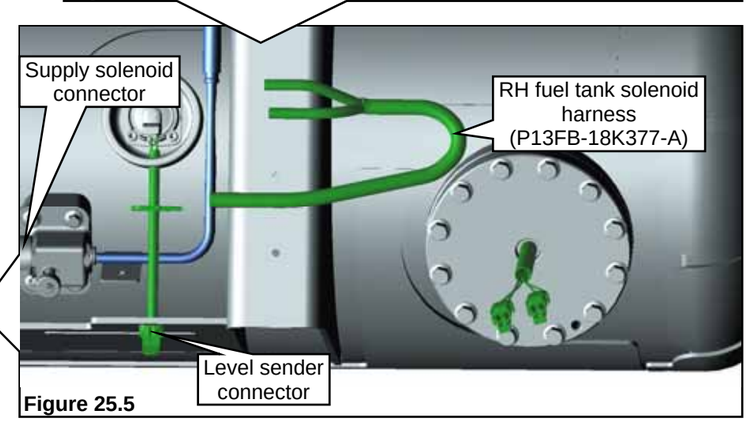


Figure 25.5

PREPARING THE TANKS FOR INSTALLATION

Single Fuel Tank Assembly (P13FB-10A005-C)

1. Install double snail clips in the front and middle tank mounting saddles to secure the rear (tank mounted) fuel supply and return lines. Orient the clips as shown. **Figure 26.1**.
2. Position six saddle bracket isolator assemblies to the tank saddle brackets and install them using a soft mallet. **Note:** Use soapy water on the isolators to ease installation. **Figure 26.2**.
3. Install the rear fuel supply and rear fuel return lines onto the fuel tank. Push the quick-connect ends of the lines into the fuel supply and fuel return valves. Push-pull the lines to make sure they are secure. Snap the lines into the two double snail clips. **Figure 26.3**.
4. Attach the tank solenoid harness to the solenoid connector, level sender connector and to the weld tabs on the side using zip ties. **Note:** Temporarily, drape end of the harness over the top of the tank. **Figure 26.4**.
5. Install two M6 J-clips to the filter bracket weldment on the tank. **Figure 26.5**.
6. Position the fuel filter bracket to the bracket on the tank, install the two bolts and tighten to specification**. Figure 26.5**.
7. Position the clamp into the bracket. Unscrew the clamp and position the fuel filter into the bracket through the clamp. Tighten the clamp to secure the filter. **Note:** Make sure the filter is oriented in the correct direction for proper fuel flow**. Figure 26.6**.
8. Install fill system fill lines and 90 degree elbow to the fuel filter and OPD. The fill line requires convolute. Secure to the tank weld tabs with P-clamps, nuts and bolts. **Figure 26.7**. Tighten the fittings on the filter to 53–61 Nm. Tighten the fill lines at T-fitting to 41–49 Nm.

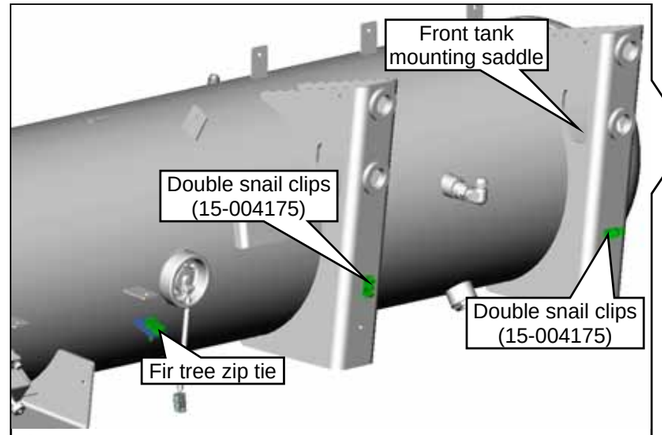


Figure 26.1

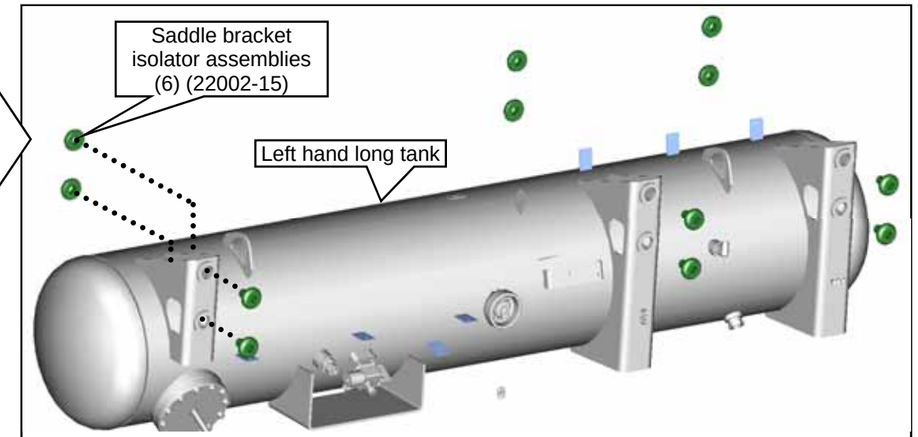


Figure 26.2

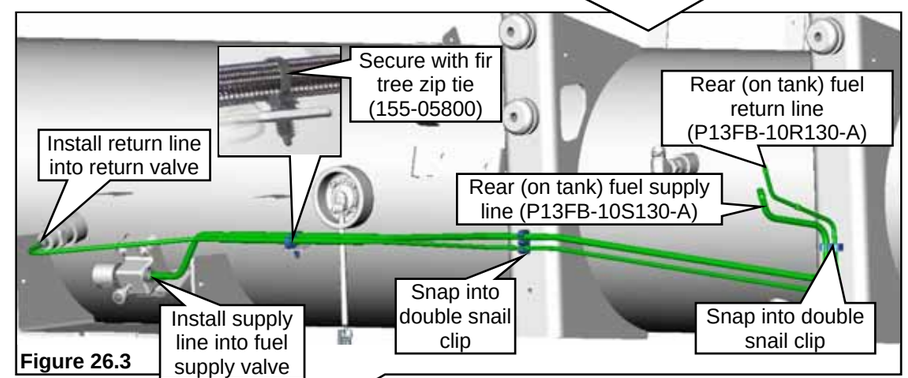


Figure 26.3

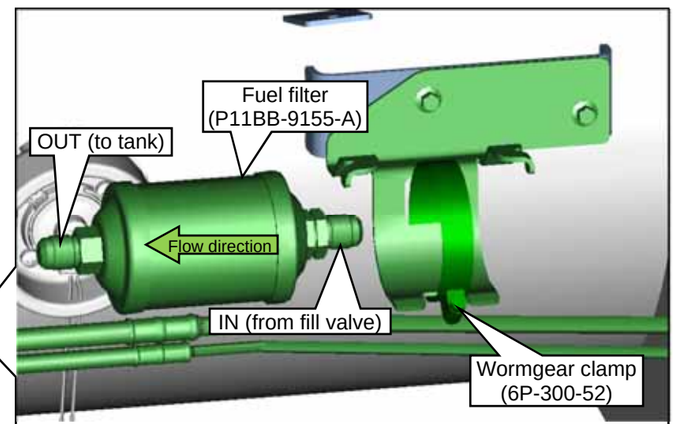


Figure 26.6

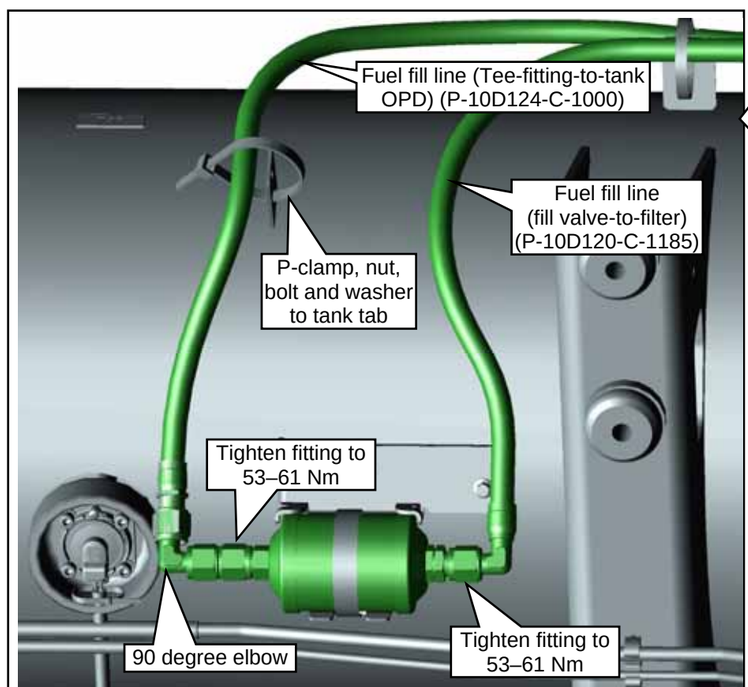


Figure 26.7

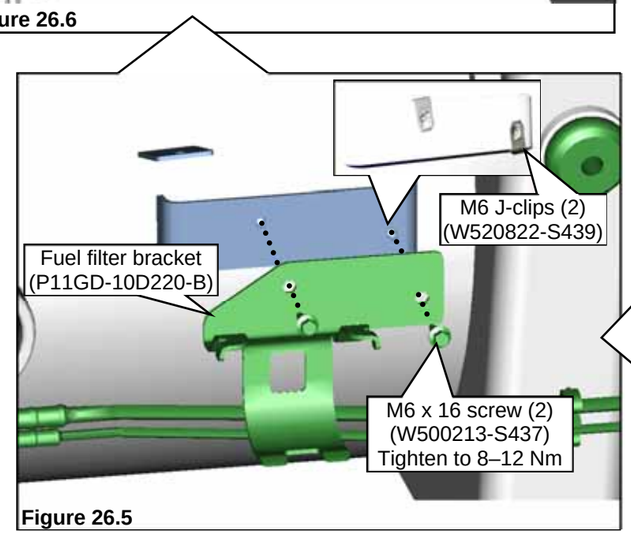


Figure 26.5

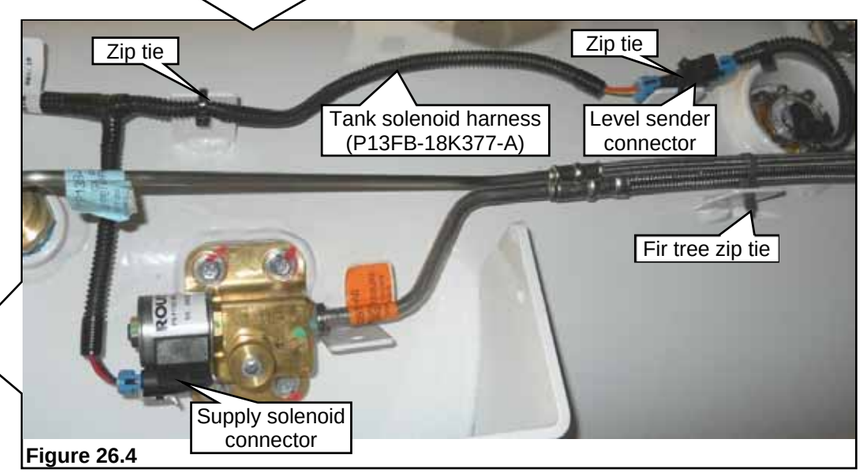


Figure 26.4

9. Route the fill line from the distribution tee to the LH OPD (tank fill valve) and secure with two P-clamps, M6 nuts, bolts and washers. Route the fill line from filter along tank tabs and secure with two P-clamps, M6 nuts, bolts and washers (bolt, nut, washer shared with two P-clamps). The end of this line attaches to the fill valve after tank and valve installation. **Figures 27.1** and **27.2**.

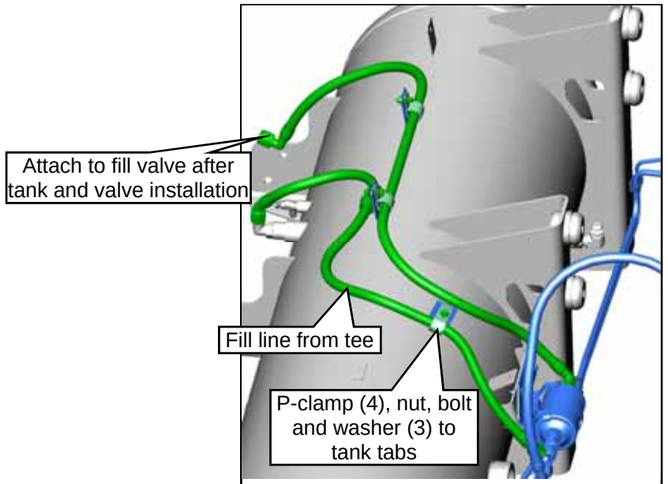


Figure 27.1

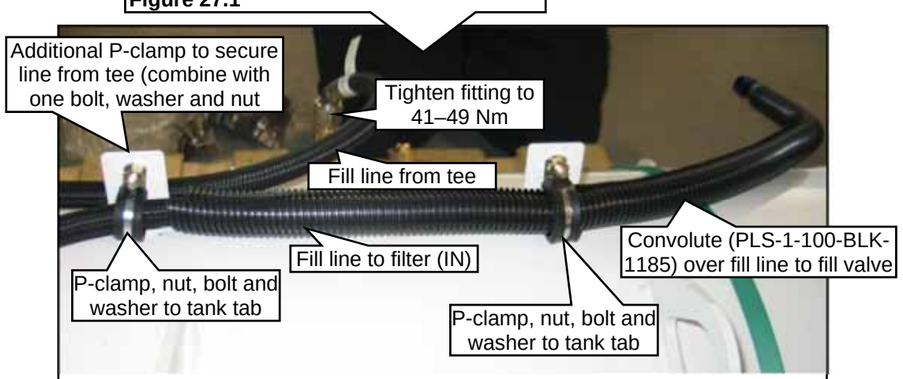


Figure 27.2

INSTALLING THE NEW FUEL TANKS (SINGLE, DUAL LONG AND SHORT TANKS)

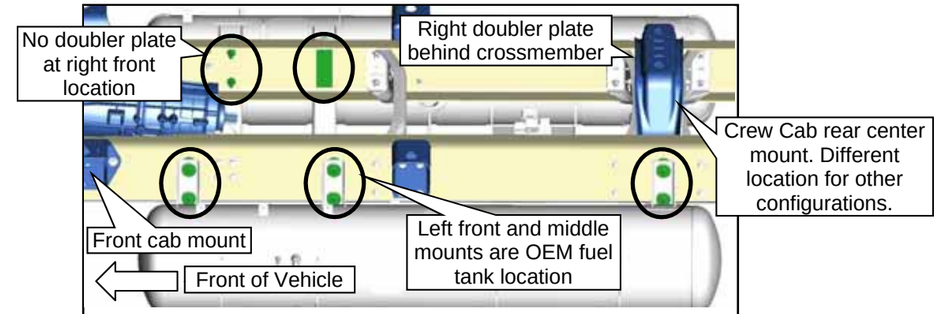
Left Long/Single Tank Installation

Note: The Left Long/Single Tank Mounting Profile (to the right) indicates the mounting locations of the tank mounting hardware.

1. Attach the tank to a suitable lifting device on a stable platform. Make sure the tank is centered and positioned horizontally to the frame and the mounting hardware and is in position near the left frame rail. **Figure 28.1**.
2. Inside the left frame rail, position the tank mounting doubler plates with two bolts (each plate) onto the left frame rail at the three tank mounting locations. Note: All mounting hardware is the same at all locations. **Figures 28.2 and 28.3**.
3. Install snubbing washers, one on each bolt at the mounting locations. Position the tank closer to the mounting bolts on the left frame rail. Lift and align the tank with the six mounting bolts. **Figure 28.4**.
4. Push the tank against the left frame rail, aligned with the six bolts. **Note:** With assistance, push on the six bolts to keep them in place when positioning the tank. Have a few assistants help maneuver the tank into place until the remaining fasteners can be installed on the inside of the tank saddle brackets. At each mounting location, install two snubbing washers and two M12 x 1.75 mounting nuts (prevailing torque), one each onto the M12 bolts. Thread into place until the tank is snug against the frame rail at all top and bottom locations. Note: Ensure that one end of the tank is not pitched up or down and that the tank is positioned level before tightening mounting fasteners. Tighten all six fasteners to specification. **Figure 28.5**.
5. Temporarily route the tank transfer line over the left frame rail towards the right side tank area following a crossmember. **Figure 26.6** and **Figure 26.7**.
6. The primary fuel fill line should be routed across the left tank toward the new fill valve area which will be attached under the top step. **Figure 28.6**.
7. Temporarily route the right fuel tank jumper harness over the left frame rail along the cab rear support crossmember to the right tank area.

Note: In Super Cab vehicles with long tank installation, an ABS brake module ground bolt interferes with the rear tank mounting saddle. Trim, reverse or relocate this ground bolt to prevent interference.

Important Note:
The single tank is identical to the left-hand long tank. Unless otherwise noted, follow the left-hand long tank procedures to install the single tank.



Left Long Tank Mounting Profile (Crew Cab Shown)

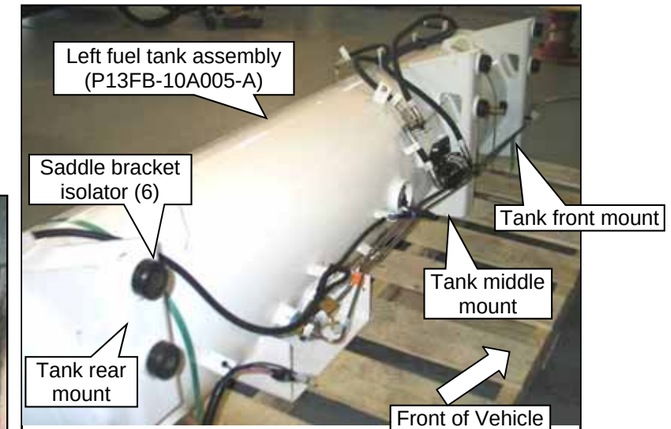


Figure 28.1

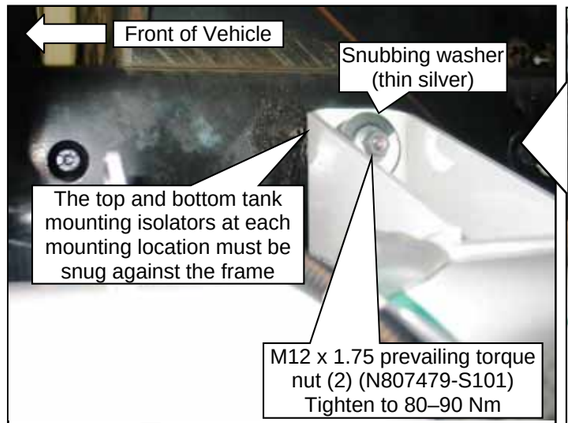


Figure 28.5

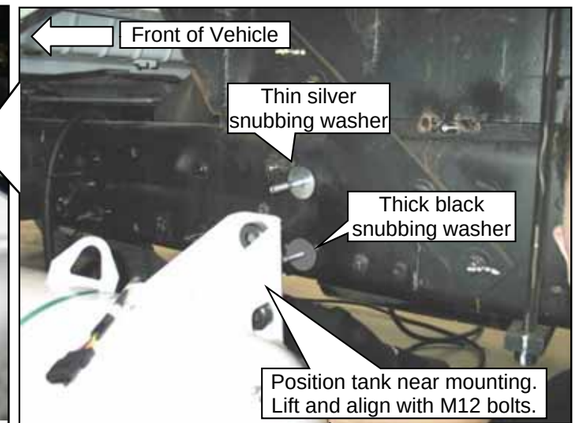


Figure 28.4

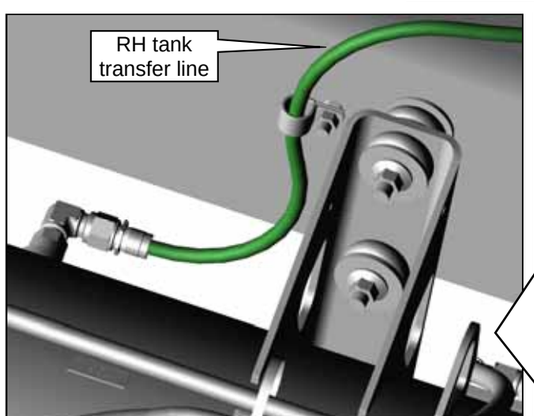


Figure 28.7 (Dual Tank Only)

Figure 28.6

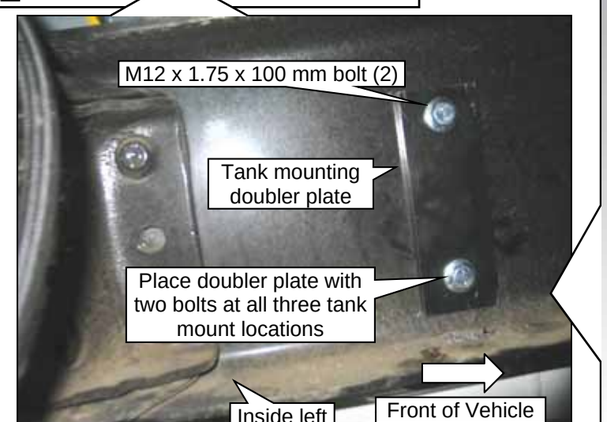


Figure 28.3

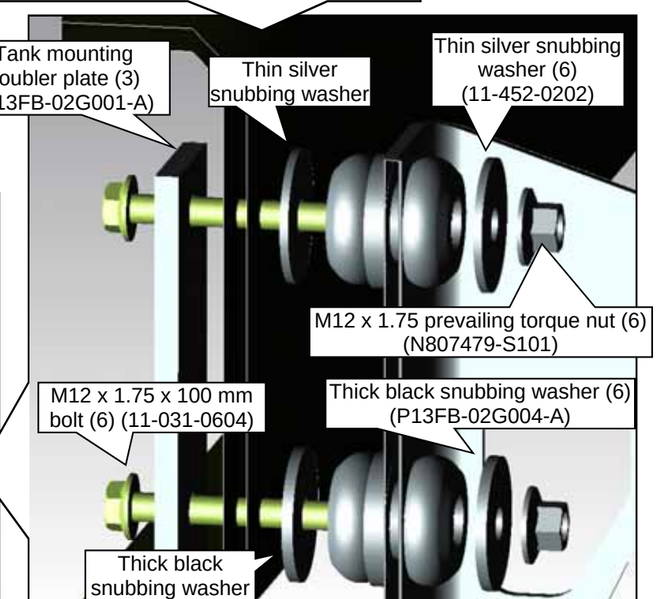
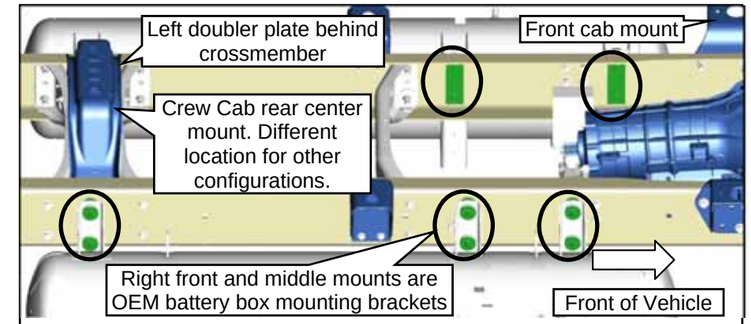


Figure 28.2 — Fastening Hardware Same for All Locations

Right Long Tank Installation

Note: The Right Long Tank Mounting Profile (to the right) indicates the mounting locations of the tank mounting hardware.

1. Attach the tank to a suitable lifting device on a stable platform. Make sure the tank is centered and positioned horizontally to the frame and the mounting hardware and is in position near the right frame rail. **Figure 29.1**.
2. Inside the right frame rail, position the tank mounting doubler plates with two bolts onto the right frame rail at the middle and rear tank mounting locations only. The front tank mounting location does not require a doubler plate, only two mounting bolts. Note: All other mounting hardware is the same at all locations. **Figures 29.2 and 29.3**.
3. Install snubbing washers, one on each bolt at the mounting locations. Position the tank closer to the mounting bolts on the right frame rail. Lift and align the tank with the six mounting bolts. **Figure 29.4**.
4. Push the tank against the right frame rail, aligned with the six bolts. Note: With assistance, push on the six bolts to keep them in place when positioning the tank. Have a few assistants help maneuver the tank into place until the remaining fasteners can be installed on the inside of the tank saddle brackets. At each mounting location, install two snubbing washers and two M12 x 1.75 mounting nuts (prevailing torque), one each onto the M12 bolts. Thread into place until the tank is snug against the frame rail at all top and bottom locations. Note: Ensure that one end of the tank is not pitched up or down and that the tank is positioned level before tightening mounting fasteners. Tighten all six fasteners to specification. **Figure 29.5**.
5. Temporarily route the fuel transfer line near the cab rear support crossmember over to the left tank secondary OPD. **Figure 29.6**.
6. An OEM battery cable harness standoff bracket at the front of the right tank may interfere with the tank and heat shield. Bend the bracket upward slightly to remove the interference. **Figure 29.7**.



Right Long Tank Mounting Profile (Crew Cab Shown)

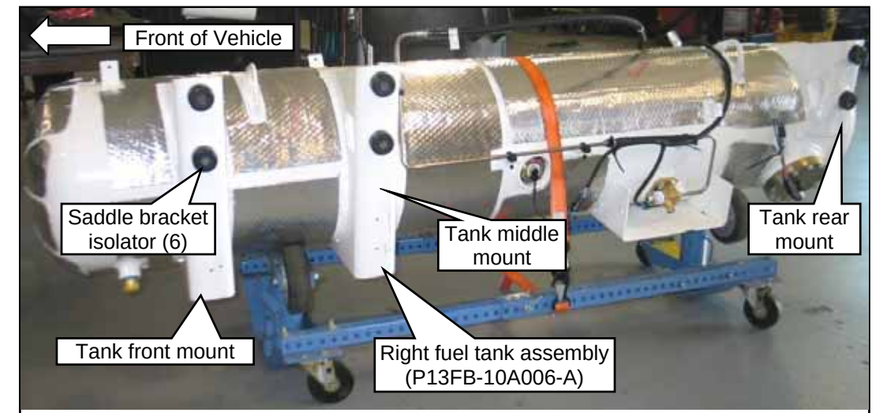


Figure 29.1

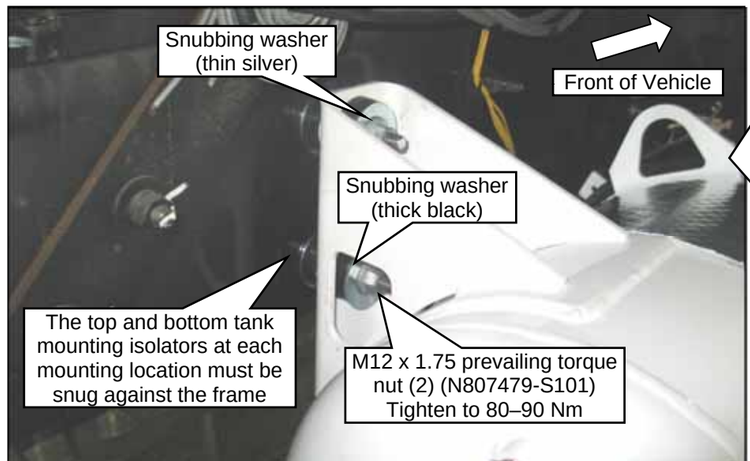


Figure 29.5

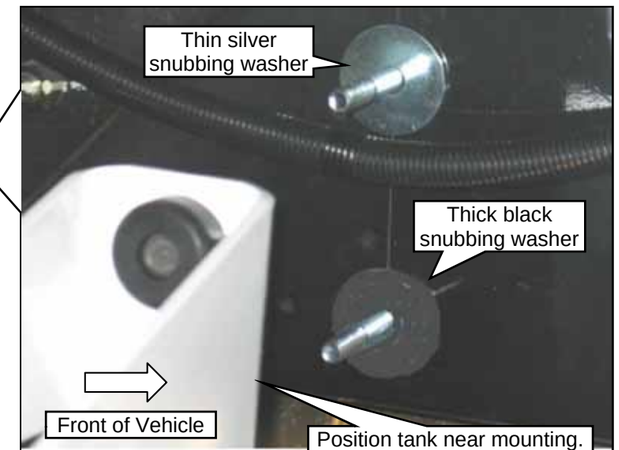


Figure 29.4

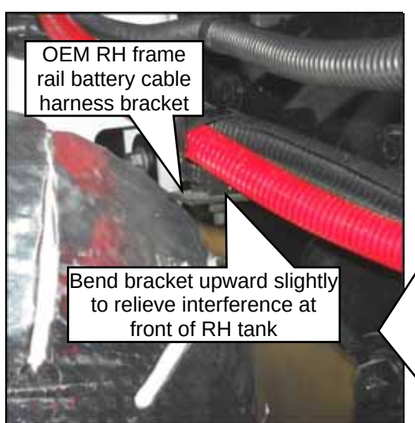


Figure 29.7

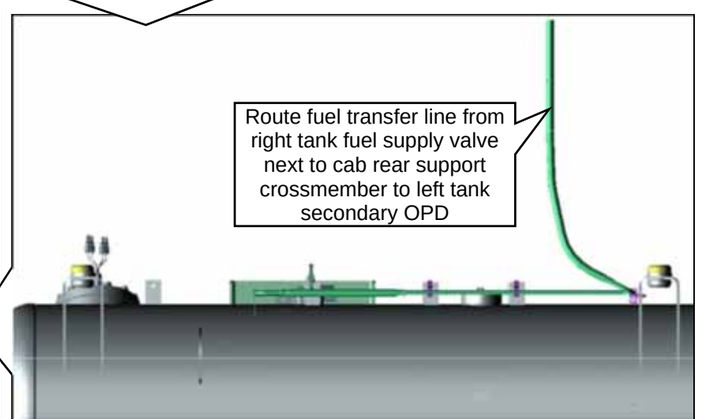


Figure 29.6

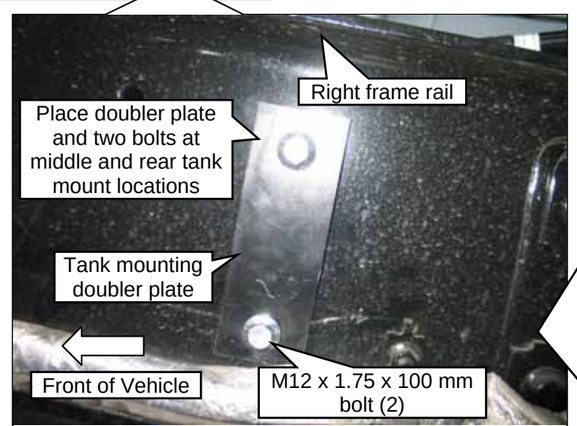


Figure 29.3

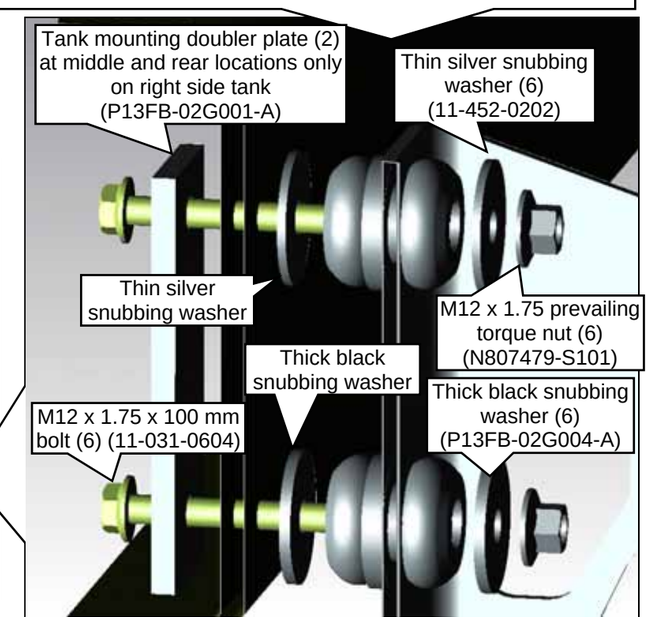
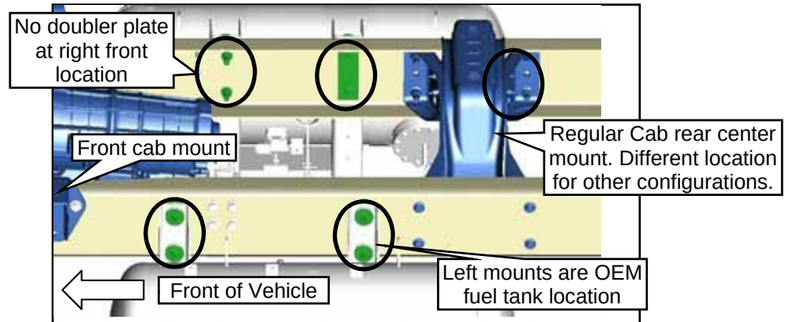


Figure 29.2 — Fastening Hardware Same for All Locations

Left Short Tank Installation

Note: The Left Short Tank Mounting Profile (to the right) indicates the mounting locations of the tank mounting hardware.

1. Attach the tank to a suitable lifting device on a stable platform. Make sure the tank is centered and positioned horizontally to the frame and the mounting hardware and is in position near the left frame rail. **Figure 30.1**.
2. Inside the left frame rail, position the tank mounting doubler plates with two bolts (each plate) onto the left frame rail at the two tank mounting locations. Note: All mounting hardware is the same at all locations. **Figures 30.2 and 30.3**.
3. Install snubbing washers, one on each bolt at the mounting locations. Position the tank closer to the mounting bolts on the left frame rail. Lift and align the tank with the four mounting bolts. **Figure 30.4**.
4. Push the tank against the left frame rail, aligned with the four bolts. Note: With assistance, push on the four bolts to keep them in place when positioning the tank. Have a few assistants help maneuver the tank into place until the remaining fasteners can be installed on the inside of the tank saddle brackets. At each mounting location, install two snubbing washers and two M12 x 1.75 mounting nuts (prevailing torque), one each onto the M12 bolts. Thread into place until the tank is snug against the frame rail at all top and bottom locations. Note: Ensure that one end of the tank is not pitched up or down and that the tank is positioned level before tightening mounting fasteners. Tighten all four fasteners to specification. **Figure 30.5**.
5. Temporarily route the tank transfer line over the left frame rail towards the right side tank area following a crossmember. **Figure 30.6**.
6. The primary fuel fill line should be routed across the left tank toward the new fill valve area which will be attached under the top step. **Figure 30.6**.
7. Temporarily route the right fuel tank jumper harness over the left frame rail along the crossmember to the right tank area.



Left Short Tank Mounting Profile (Regular Cab Shown)

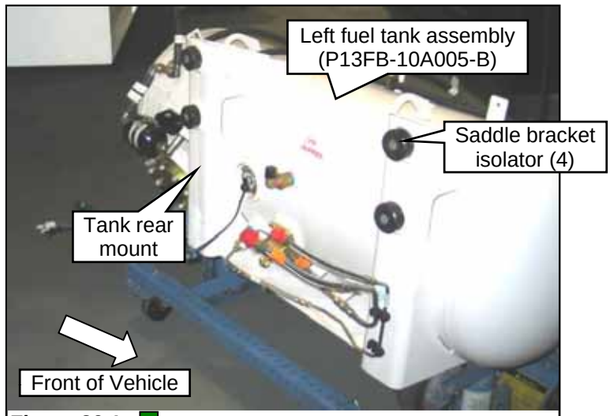


Figure 30.1

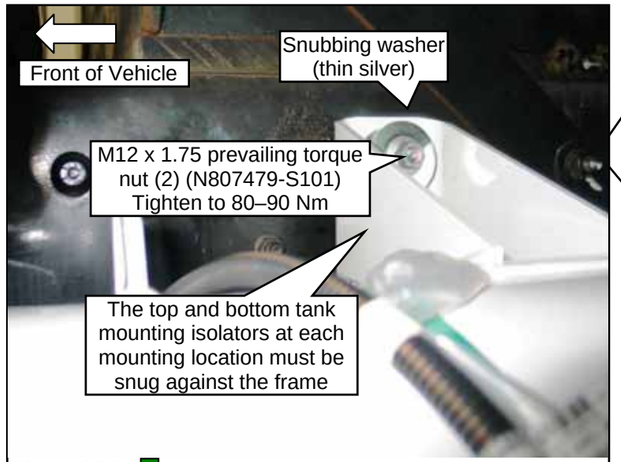


Figure 30.5

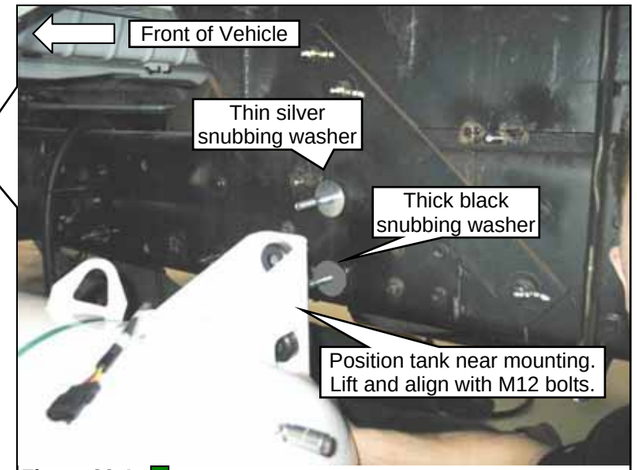


Figure 30.4

Figure 30.6

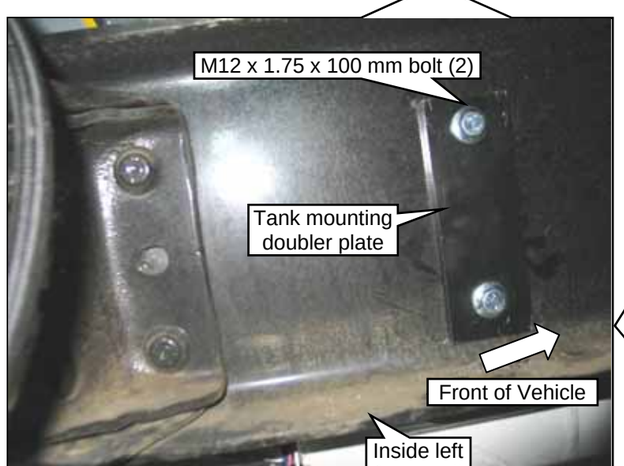


Figure 30.3

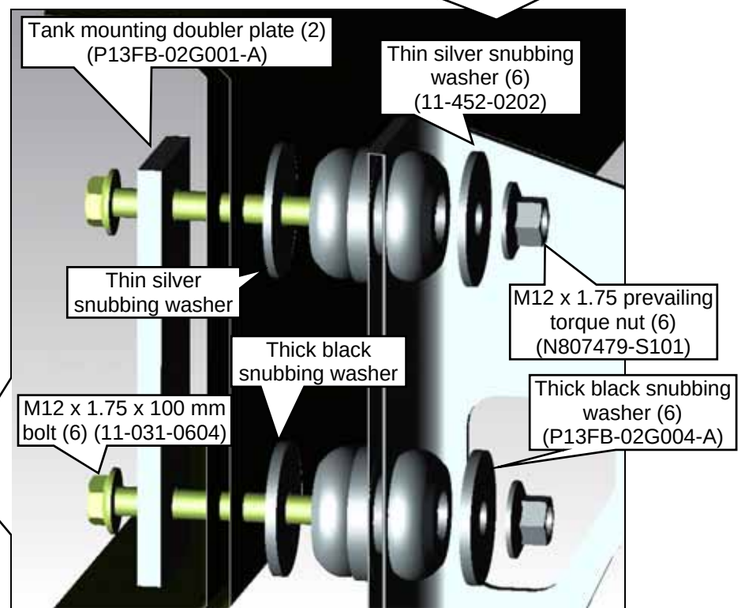
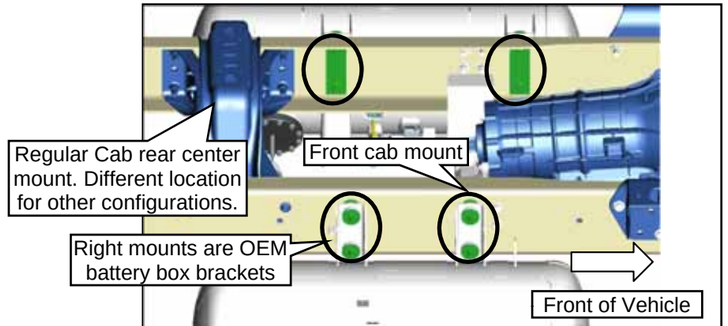


Figure 30.2 — Fastening Hardware Same for All Locations

Right Short Tank Installation

Note: The Right Short Tank Mounting Profile (to the right) indicates the mounting locations of the tank mounting hardware.

1. Attach the tank to a suitable lifting device on a stable platform. Make sure the tank is centered and positioned horizontally to the frame and the mounting hardware and is in position near the right frame rail. **Figure 31.1**.
2. Inside the right frame rail, position a tank mounting doubler plate with two bolts onto the right frame rail at the rear tank mounting location only. The front tank mounting location does not require a doubler plate, only two mounting bolts. Note: All other mounting hardware is the same at all locations. **Figures 31.2 and 31.3**.
3. Install snubbing washers, one on each bolt at the mounting locations. Position the tank closer to the mounting bolts on the right frame rail. Lift and align the tank with the four mounting bolts. **Figure 31.4**.
4. Push the tank against the right frame rail, aligned with the four bolts. Note: With assistance, push on the four bolts to keep them in place when positioning the tank. Have a few assistants help maneuver the tank into place until the remaining fasteners can be installed on the inside of the tank saddle brackets. At each mounting location, install two snubbing washers and two M12 x 1.75 mounting nuts (prevailing torque), one each onto the M12 bolts. Thread into place until the tank is snug against the frame rail at all top and bottom locations. Note: Ensure that one end of the tank is not pitched up or down and that the tank is positioned level before tightening mounting fasteners. Tighten all four fasteners to specification. **Figure 31.5**.
5. Temporarily route the fuel transfer line near the cab rear support crossmember over to the left tank secondary OPD. **Figure 31.6**.



Right Short Tank Mounting Profile (Regular Cab Shown)

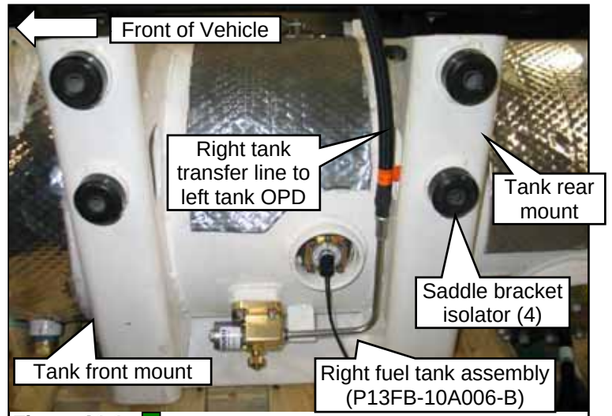


Figure 31.1

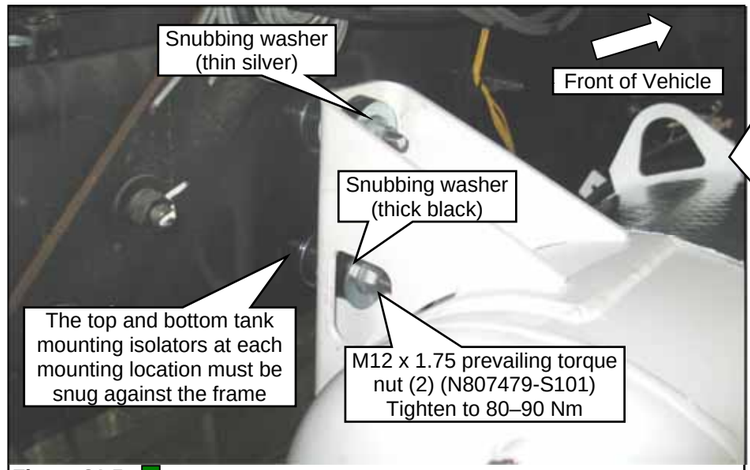


Figure 31.5

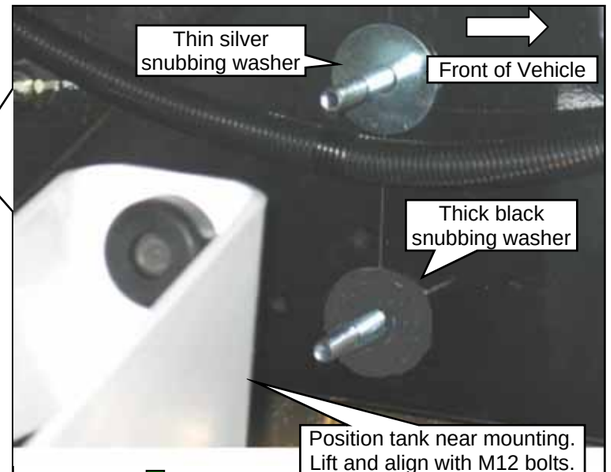


Figure 31.4

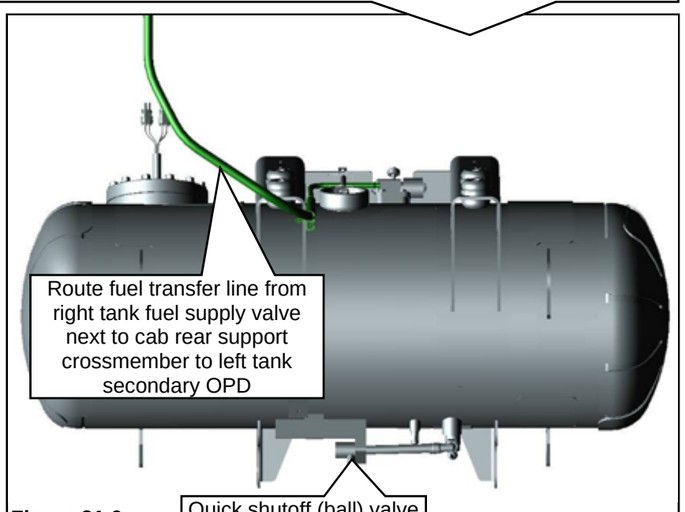


Figure 31.6

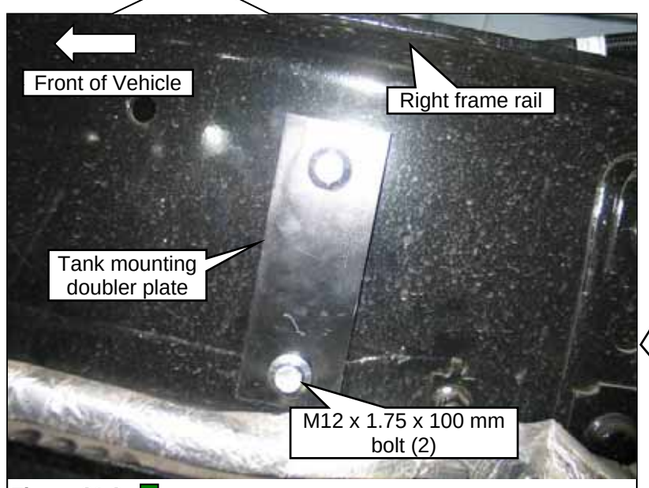


Figure 31.3

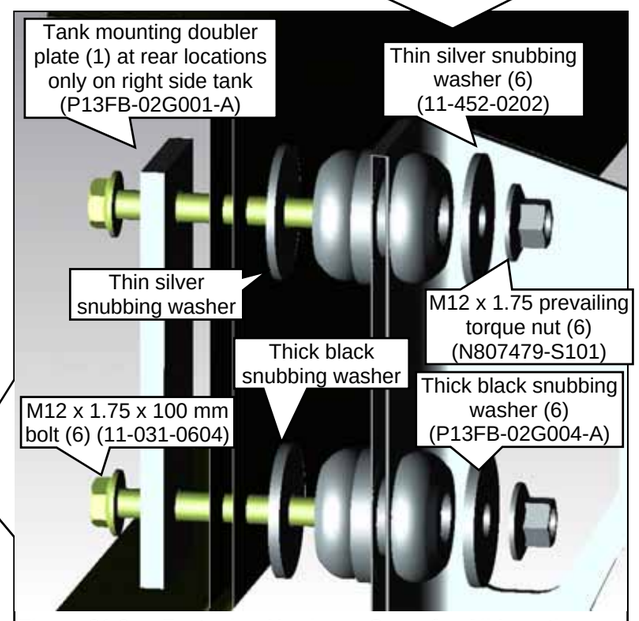


Figure 31.2 — Fastening Hardware Same for All Locations

Completing Transfer Line, Fill Line and Harness Connections

1. Route the end of the underhood harness (behind the ABS brake module) up, under the left frame rail. Connect the three underhood harness connectors to the two left tank fuel pump connectors and to the tank solenoid harness connectors. Secure the underhood harness and tank solenoid harness to a tab on the inside of the tank using zip ties. **Figures 32.1 and 32.2**.
2. **Dual Tank Only:** Route the RH tank jumper harness over the right frame rail and bundle the harness with the relocated battery cables along the outside of the frame rail. Bundle and zip tie all harnesses together. Continue the jumper harness to the rear and drop it down close to the RH tank solenoid and level sender harness connections. **Figure 32.3**.
3. **Dual Tank Only:** Make connections from RH tank jumper harness to the two fuel pump connectors and tank solenoid harness connectors. Zip tie the jumper harness to the tab on the RH tank. **Figure 32.4A**. Install heat wrap (from kit P13FB-TANK-B) over wiring harness on RH short tank as shown. Secure wrap with three zip ties as shown. **Figure 32.4B**.
4. **Dual Tank Only:** Two fuel lines are secured to the cab rear support crossmember (or other crossmember) using two double clamp cable ties. **Figure 32.5**. For more information, refer to page 19.
5. **Dual Tank Only:** Zip tie the two fuel lines together where they join just above the right frame rail. Route the fuel fill line from the LH tank filter tee (coming from crossmember) over the tank, under the cab and outside the tank to the ball valve. Support the fill line by a P-clamp and fasteners on the tank tab. **Figures 32.6 and 32.7**. Also, secure the fill line to a tab at the top of the tank using a P-clamp and fasteners. **Figure 32.3**. If not done, tighten the line fitting on the ball valve to specification.
6. **Dual Tank Only:** Route the RH tank transfer line from across cab rear support crossmember over the left frame rail and down to connect to the secondary OPD on the LH tank. Tighten the fitting to specification. **Figure 32.8**.
7. **Dual Tank Only:** Attach the P-clamp to the transfer line. Secure the P-clamp to the stud protruding from the frame rail using the supplied M10 nut. If necessary, remove the OEM bolt and reorient to permit installation. **Figure 32.8**.
8. **Dual Tank Only:** Zip tie the two fuel lines together where they join just above the left frame rail. **Figure 32.9**.

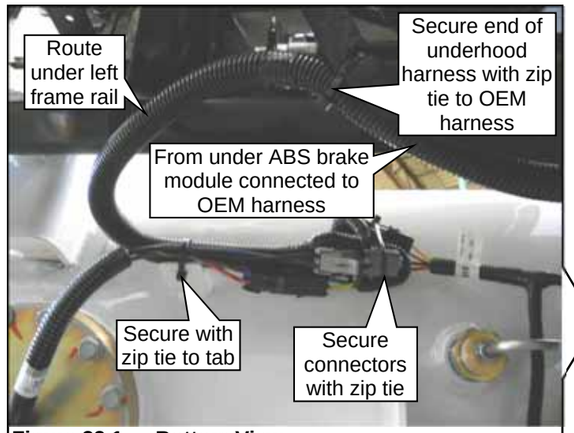


Figure 32.1 — Bottom View

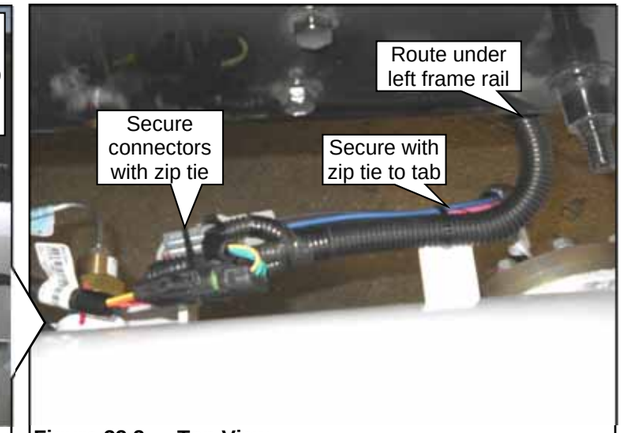


Figure 32.2 — Top View

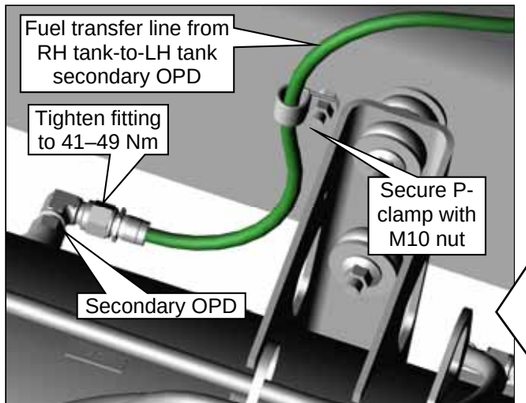


Figure 32.8 (Dual Tank Only)

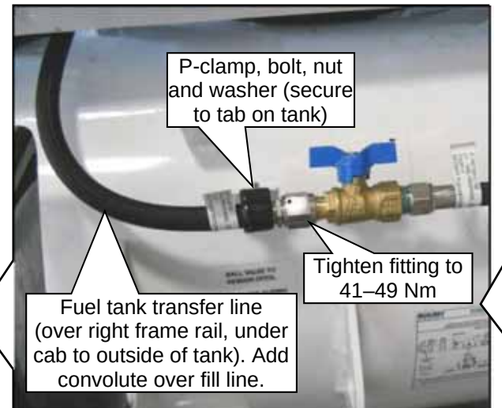


Figure 32.7 (Dual Tank Only)

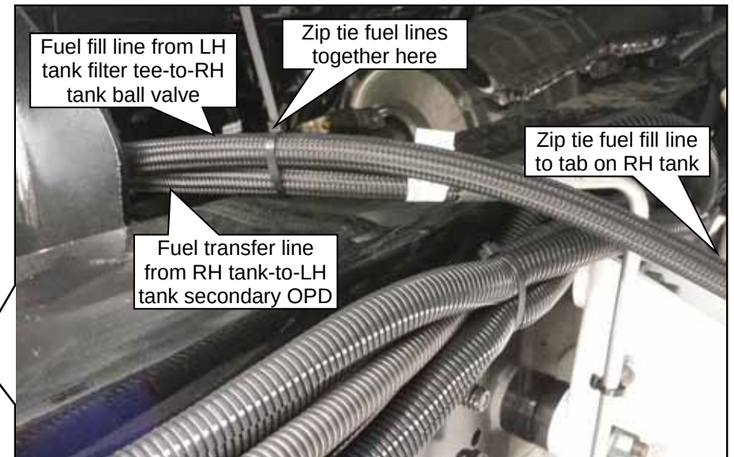


Figure 32.6 — Right Frame Rail (Dual Tank Only)

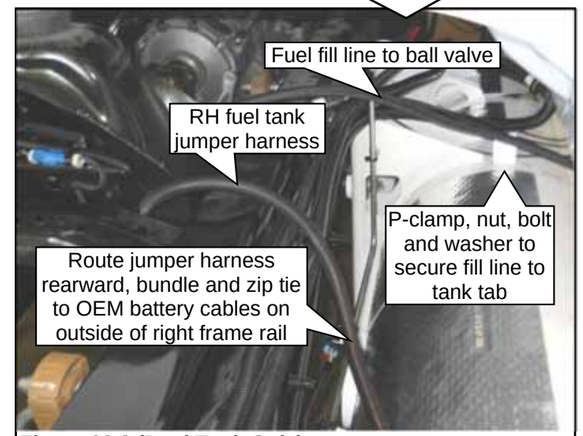


Figure 32.3 (Dual Tank Only)

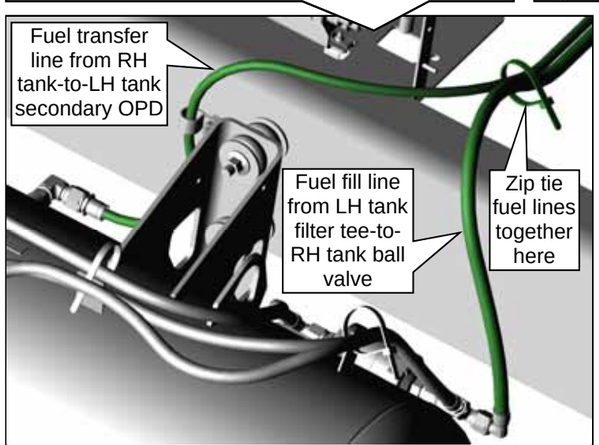


Figure 32.9 — Left Frame Rail (Dual Tank Only)

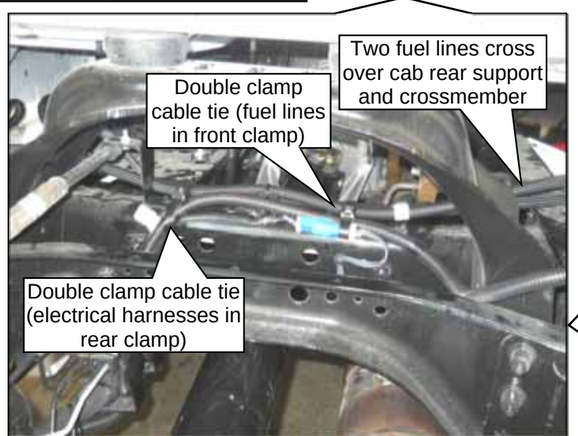


Figure 32.5 — Regular Cab Shown (Dual Tank Only)

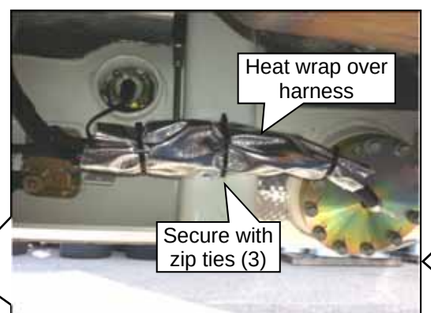


Figure 32.4B — RH Short Tank Shown (Dual Tank Only)

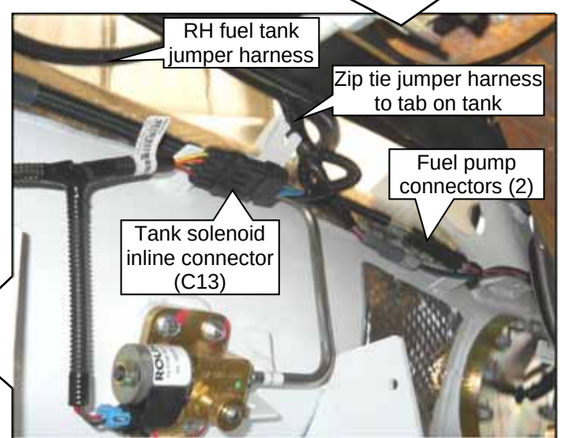


Figure 32.4A (Dual Tank Only)

INSTALLING THE STEPS AND HARDWARE

Regular Cab Short and Long Tank (Left Hand/Single and Right Hand) P13FB-02H100-A

1. Attach the new left and right step brackets to the step weldments on the left hand/single tank. Use four new M10 x 1.5 x 30 bolts and nuts for the two new step mounting brackets. **Figure 33.1**. The right side tank steps, brackets, U-nuts, bolts and nuts are reused from the OEM. **Figure 33.2**.
2. Reuse the OEM M8 bolts and U-nuts. Install the U-nuts into the left and right step brackets of the left hand/single and right hand tanks. Reuse the OEM upper and lower steps at the left hand/single and right hand tanks. Position the steps to the step brackets. Install the bolts through the steps into the U-nuts to secure the steps. Bolt locations for the upper and lower steps of the RH tank are the same. Bolt locations for the steps of the LH/single tank are the same for upper and lower rear, but different for the upper and lower front. Tighten all fasteners to specification. **Figures 33.1 and 33.2**.

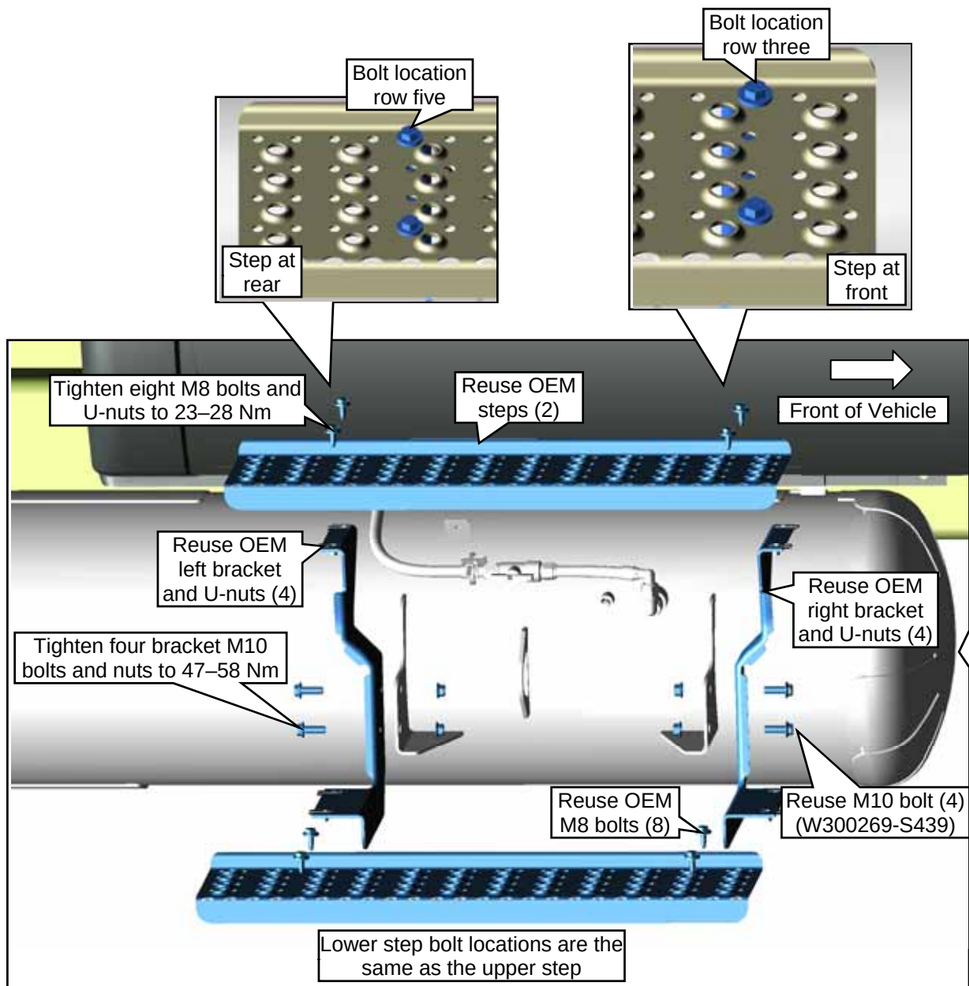


Figure 33.2 — Regular Cab Long Tank Shown — Right Hand Tank Shown (Short Tank Similar)

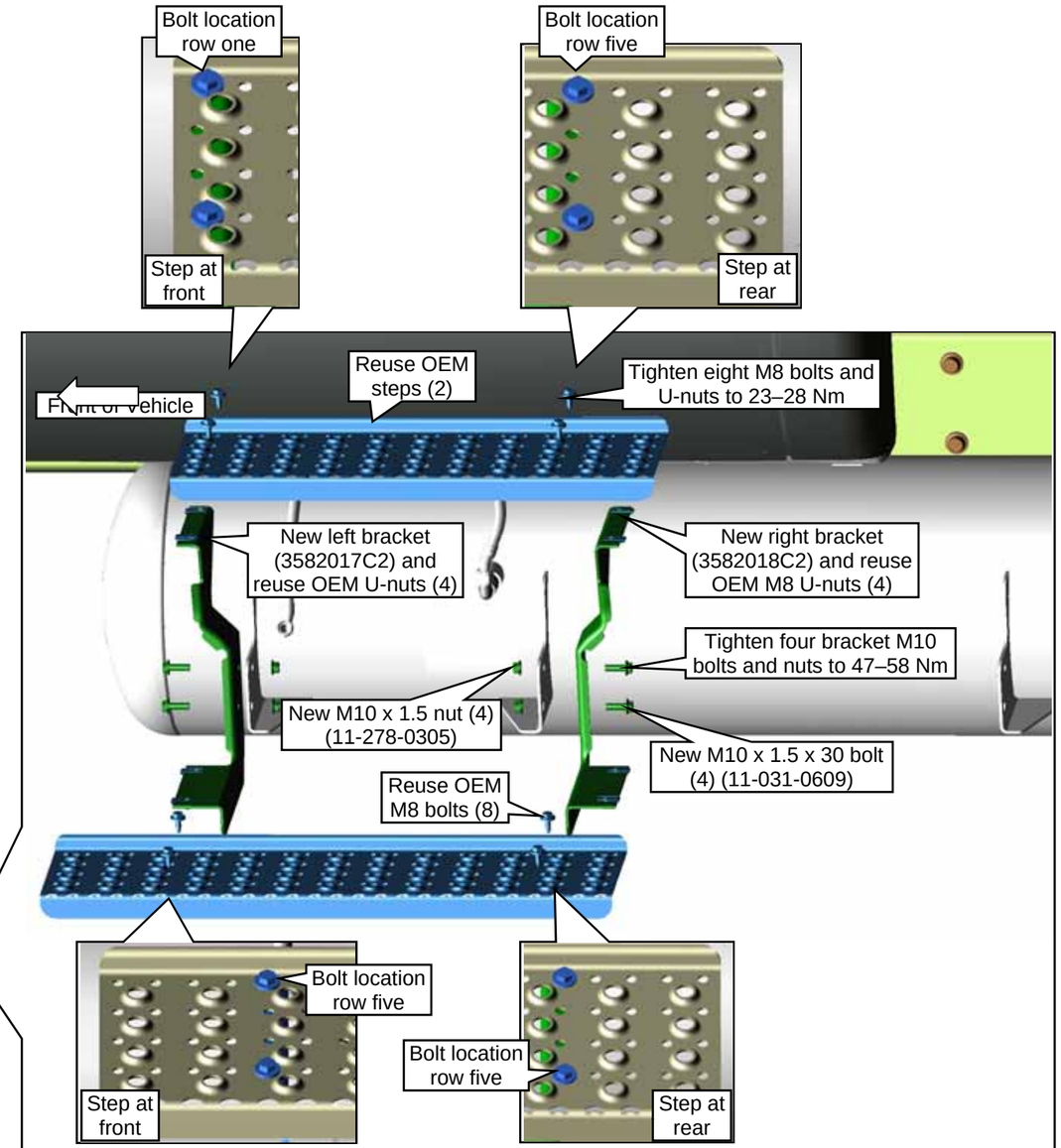


Figure 33.1 — Regular Cab Long Tank Shown — Left Hand/Single Tank Shown (Short Tank Similar)

Super Cab Long Tank (Built from 42 Gallon OEM Gasoline Tank, Left Hand and Right Hand) P13FB-02H100-B

1. Attach the new left and right step brackets to the step weldments on the left hand tank (front and middle attachments). Use four new M10 x 1.5 x 30 bolts and nuts for the two new step brackets. Reuse the rear most step bracket and hardware from the OEM for the left hand tank. **Figure 34.1**. The right side tank steps, brackets, U-nuts, bolts and nuts are all reused from the OEM. **Figure 34.2**.
2. Reuse the OEM step M8 bolts and U-nuts. Install the U-nuts into the right, left and left (three) step brackets of the left hand and right hand tanks. Reuse the OEM upper and lower steps at the left hand and right hand tanks and position the steps to the step brackets. Install the bolts through the steps into the U-nuts. The middle bracket hardware for the left hand tank under the two upper and lower steps is all new and is found in the kit. Install the upper and lower step adapters, M8 x 1.25 x 35 bolts, washers and M8 x 1.25 nuts at the middle between the two upper and lower steps. All steps and hardware on the right hand tank are OEM and are reused on the new right hand tank. Bolt locations for the RH tank upper and lower steps are the same. Bolt locations for the RH tank upper and lower steps are the same. Tighten all fasteners of the left and right tanks to specification. **Figures 34.1 and 34.2**.

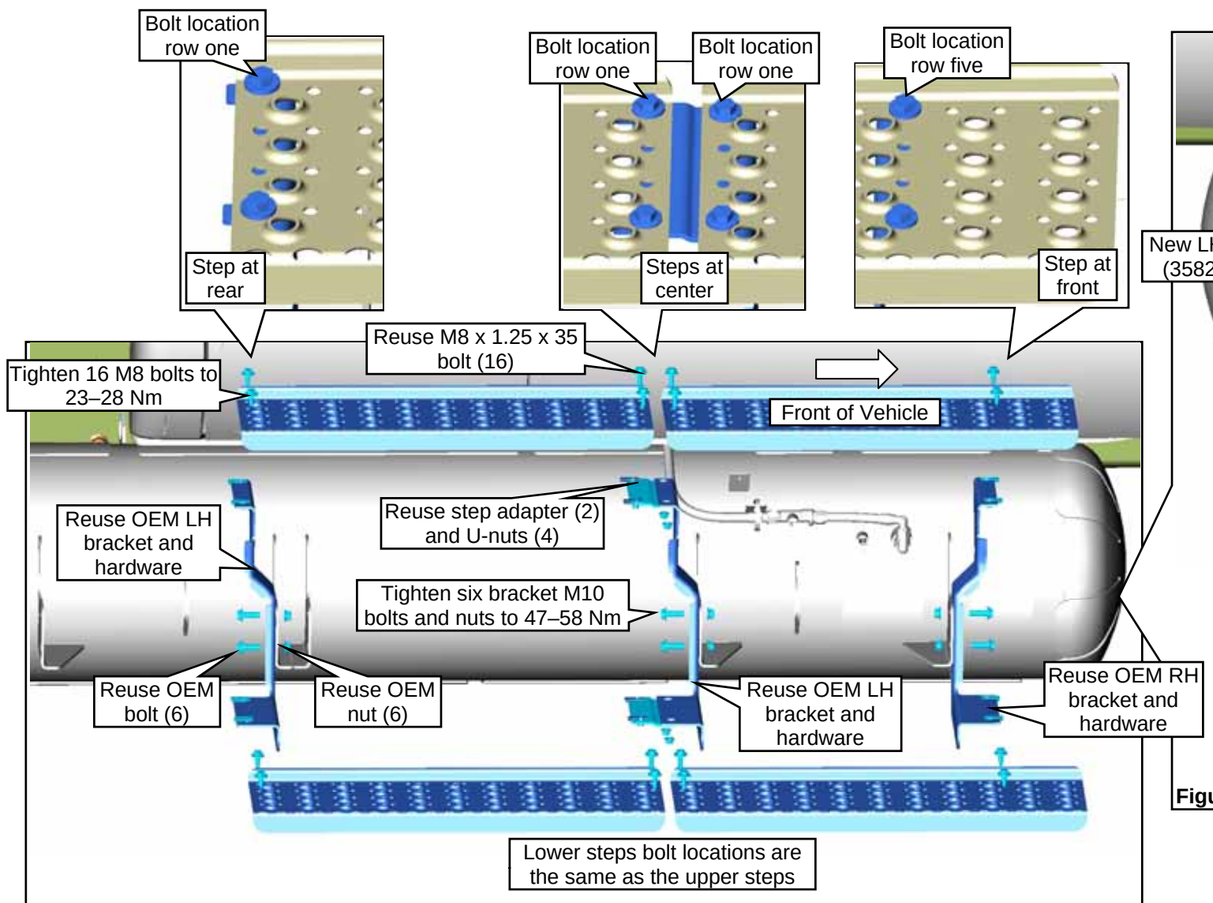


Figure 34.2 — Super Cab Long Tank (Built from 42 Gallon OEM Tank) Right Hand

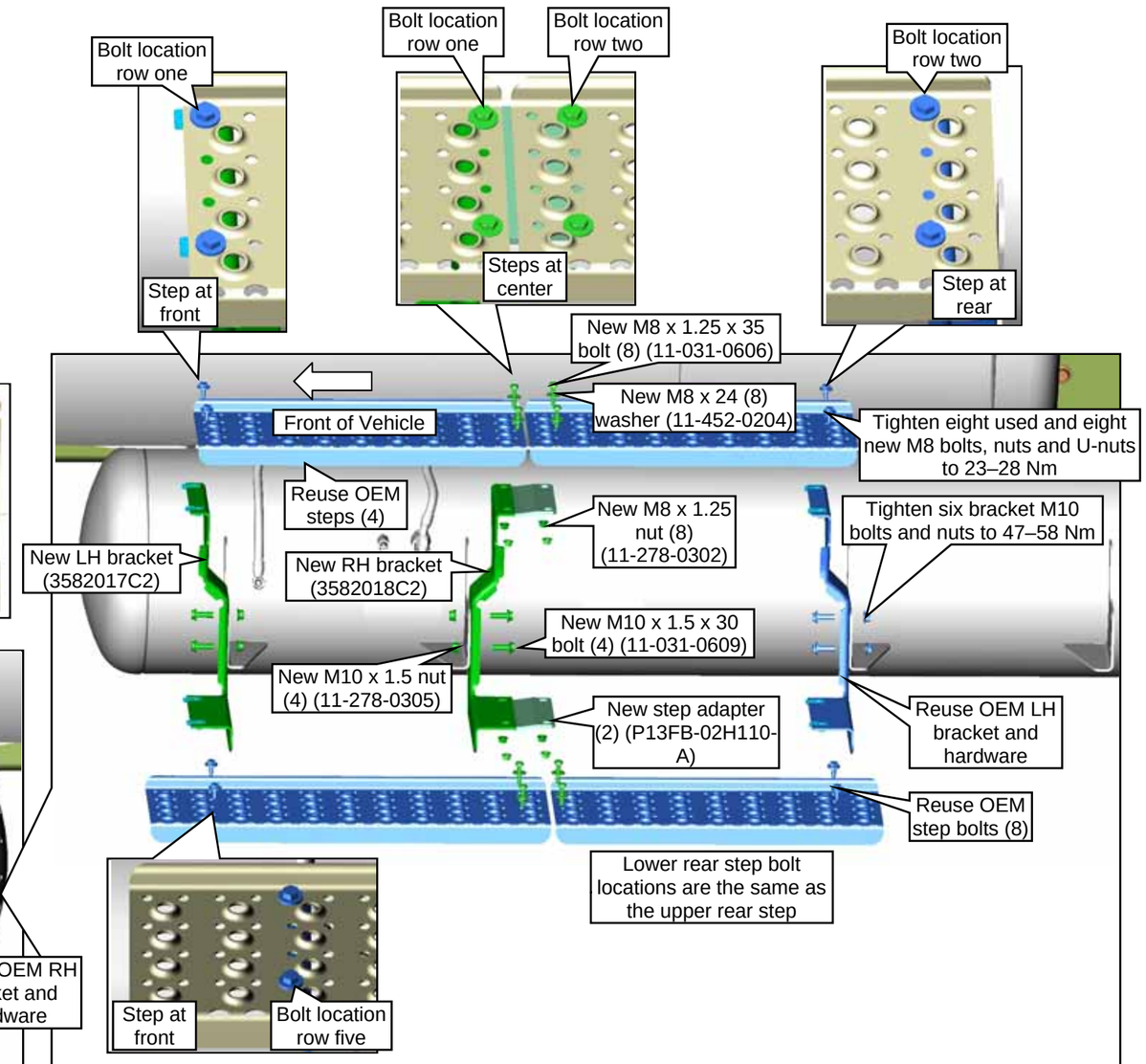
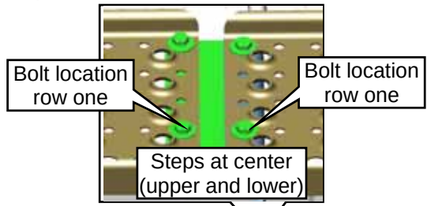


Figure 34.1 — Super Cab Long Tank (Built from 42 Gallon OEM Tank) Left Hand

Super Cab Short Tank (Built from 60 Gallon OEM Gasoline Tank, Left Hand and Right Hand) P13FB-02H100-C

1. Remove the two rear cab support crossmember Huck® fasteners (back of Super Cab) on the left side frame rail. Discard the fasteners. **Figure 35.1**.
2. Assemble the off frame support, the battery box support and the LH tank bracket using the M10 and M16 fasteners. Position the assembly to the LH frame rail where the Huck® fasteners were removed. Install two of the M16 x 2 x 50 mm bolts from the inside through the rear cab support crossmember into the assembly. Secure the assembly with two M16 x 2.0 nuts. Tighten the M16 bolts and nuts at the frame rail and the two M16 bolts securing the battery box support bracket to the off frame support bracket to specification. **Figures 35.2 and 35.3**.
3. Attach the two new left and one new right step brackets to the step weldments on the left hand tank (front, middle and rear attachments). Use six new M10 x 1.5 x 30 bolts and nuts for the three new step brackets. The left side tank steps, brackets, U-nuts, bolts and nuts are reused from the OEM. The step adapter plates at the middle of the upper and lower steps are new and found in the kit. **Figure 35.3**.
4. Reuse the OEM upper and lower step M8 bolts and U-nuts for both the left and right tanks. Install the U-nuts into the two left step brackets of the left and right tanks. Reuse the OEM upper and lower steps at the left and right tanks and position the steps to the step brackets. Install the bolts through the steps into the U-nuts to secure the steps. Start securing the upper and lower, left and right steps at the middle bracket hardware. The center hardware is all new and is found in the kit. Install the middle left and right, upper and lower step adapters, isolators, isolator washers, nuts and M8 x 1.25 x 35 bolts, along with the steps. Note: Use soapy water on the isolators to ease installation and to prevent isolator damage. Locate the steps to the center hardware at row one locations. Align the outer fasteners of the upper and lower, left and right steps to the mounting bracket holes as needed. Tighten all step fasteners to specification. **Figures 35.3 and 35.4**.



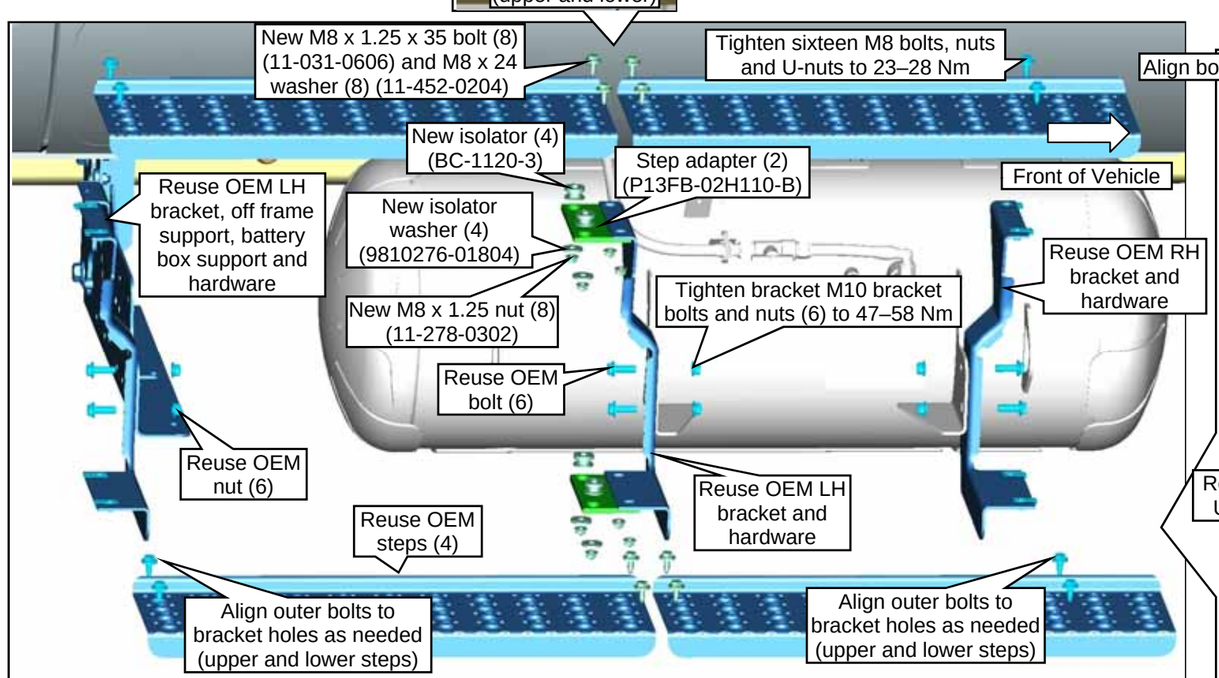
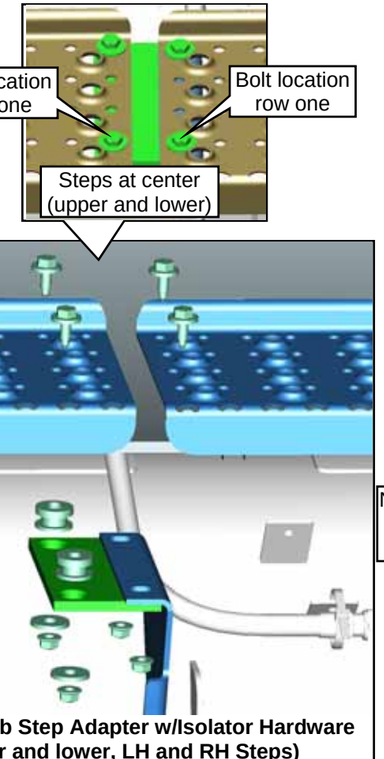


Figure 35.4 — Super Cab Short Tank (Built from 60 Gallon OEM Tank) Right Hand



Super Cab Step Adapter w/Isolator Hardware (for upper and lower, LH and RH Steps)

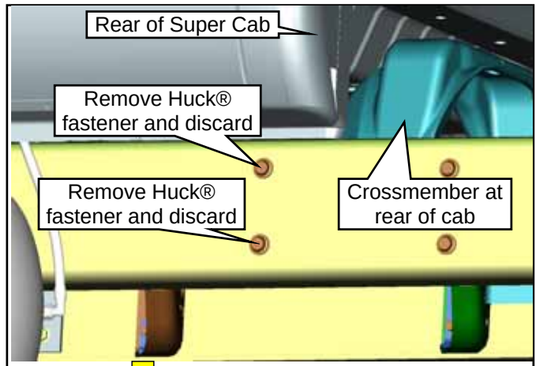


Figure 35.1

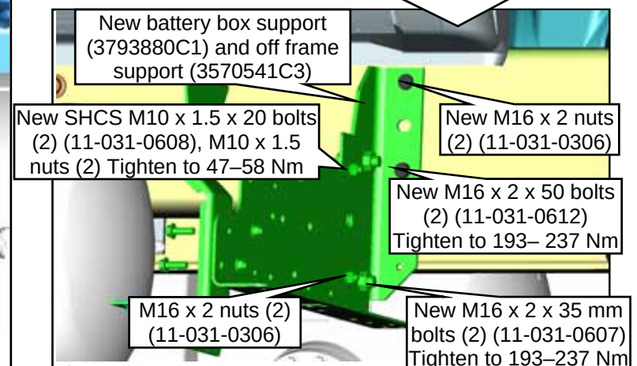


Figure 35.2

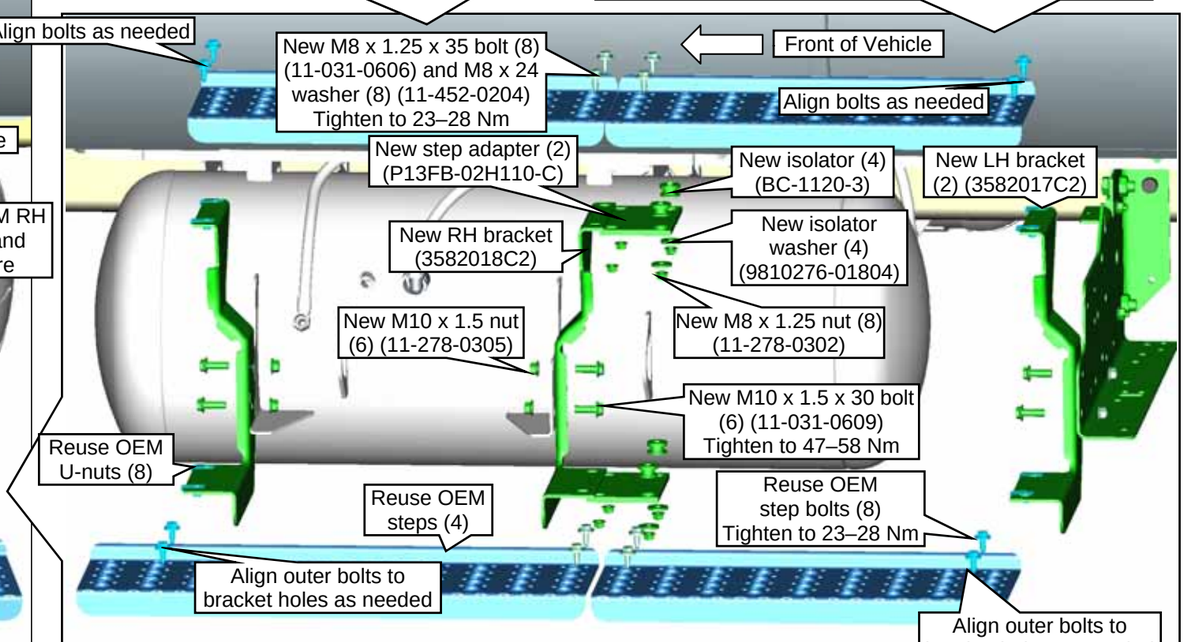


Figure 35.3 — Super Cab Short Tank (Built from 60 Gallon OEM Tank) Left Hand

Crew Cab Short Tank (Left Hand and Right Hand) P13FB-02H100-D

1. Two holes must be drilled in the left frame rail so that the front of the rear steps can be secured. Mark the locations of the two holes using the measurements shown. Drill the two marked locations in steps to a diameter of 11/16”. Note: The lower hole must also be drilled through the ABS module bracket mounted on the inside of the frame rail. Deburr and coat the holes with touch up paint. Refer to Special Tools for more information. **Figure 36.1**.
2. Assemble the off frame support, the battery box support and the LH tank bracket using the M10 and M16 fasteners. Position the assembly to the LH frame rail where the holes were drilled. Install two of the M16 x 2 x 50 mm bolts from the inside through the cab rear support crossmember. The lower bolt also goes through the ABS module bracket. Secure the assembly with the two M16 x 20 mm nuts. Tighten the M16 bolts and nuts at the frame rail and two M16 bolts at battery box support bracket to specification. Tighten the bracket M10 bolts and nuts to specification. **Figures 36.2 and 36.3**.
3. Attach the new left and right step brackets to the step weldments on the left tank (front and middle). Use four new M10 x 1.5 x 30 bolts and nuts to secure the brackets. **Figure 36.3**. Attach the OEM left and right step brackets to the step weldments on the right tank. Reuse four M10 bolts and nuts to secure the brackets. Tighten all fasteners to specification. **Figure 36.4**.
4. Reuse the OEM step M8 bolts and U-nuts for the left and right tanks. Install the U-nuts into the right and left step brackets. Reuse the OEM upper and lower steps for the left and right tanks and position the steps to the step brackets. Align the bolts to the front bolt locations for upper and lower, left and right steps. Align the rear upper and lower left and right steps as needed. Tighten all fasteners to specification. **Figures 36.3 and 36.4**.

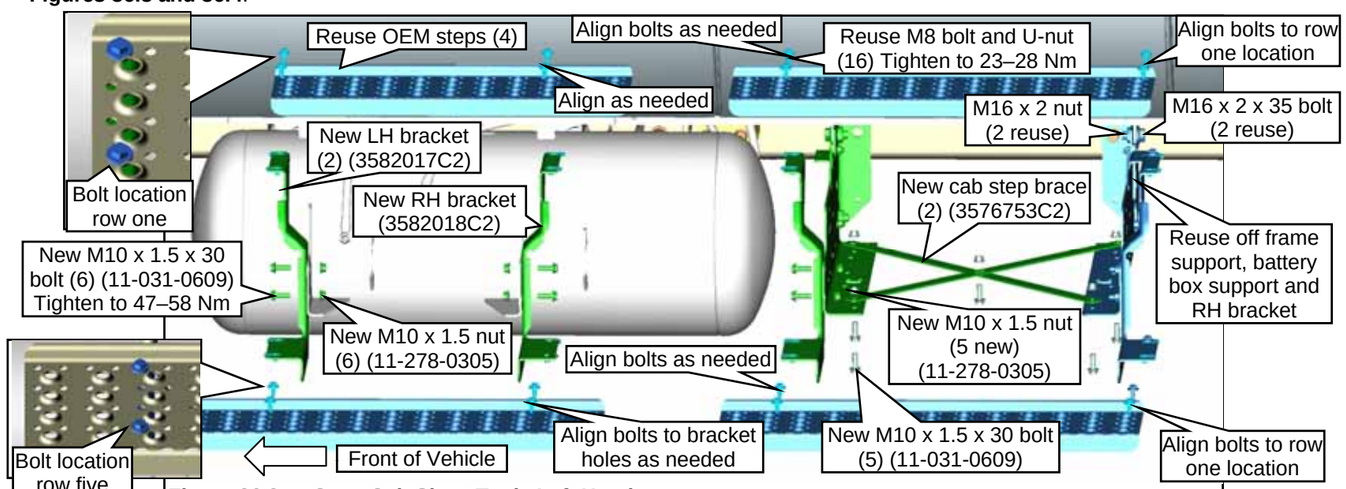


Figure 36.3 — Crew Cab Short Tank, Left Hand

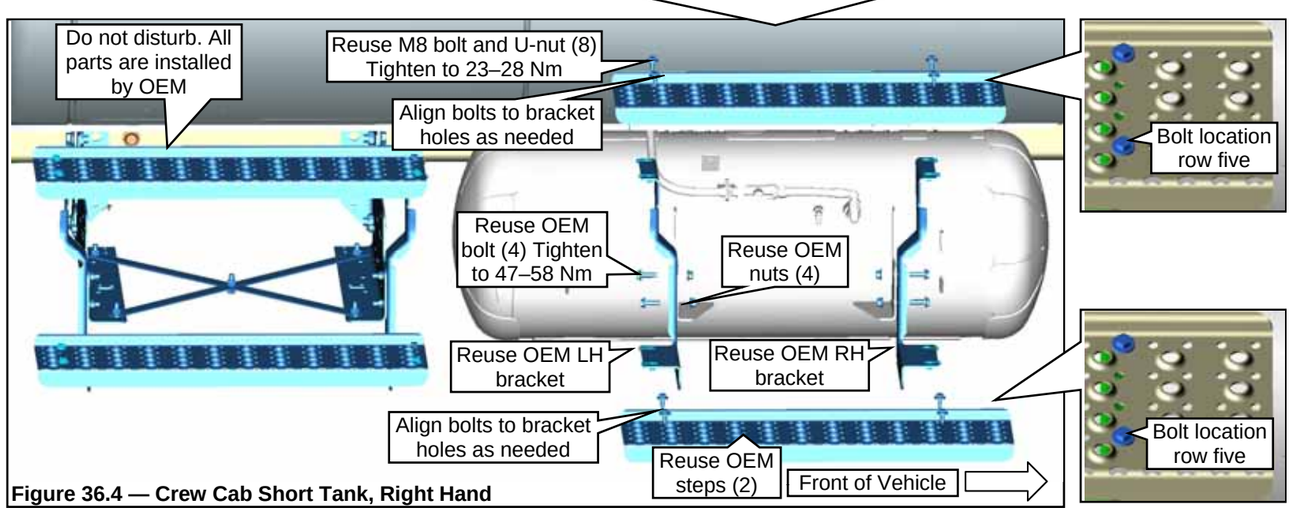


Figure 36.4 — Crew Cab Short Tank, Right Hand

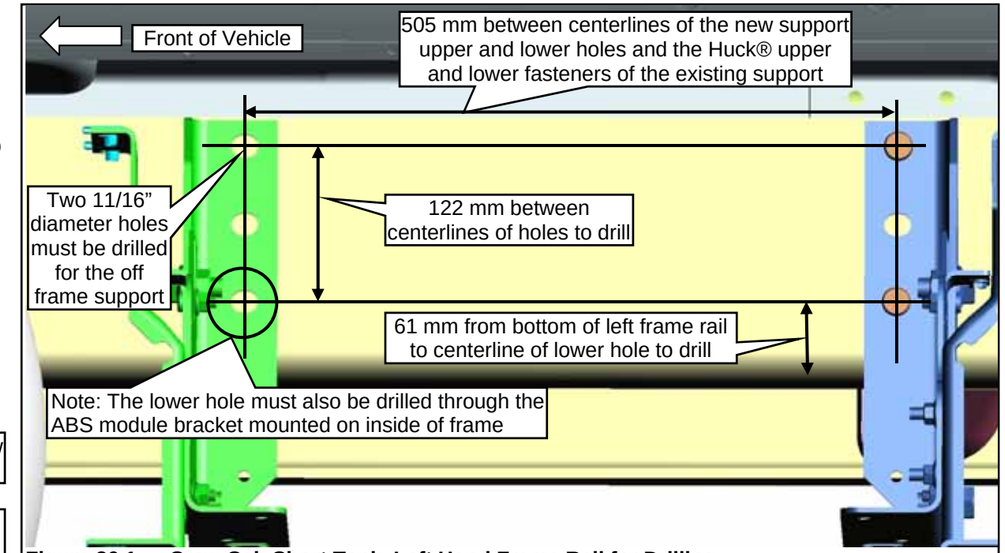


Figure 36.1 — Crew Cab Short Tank, Left Hand Frame Rail for Drilling

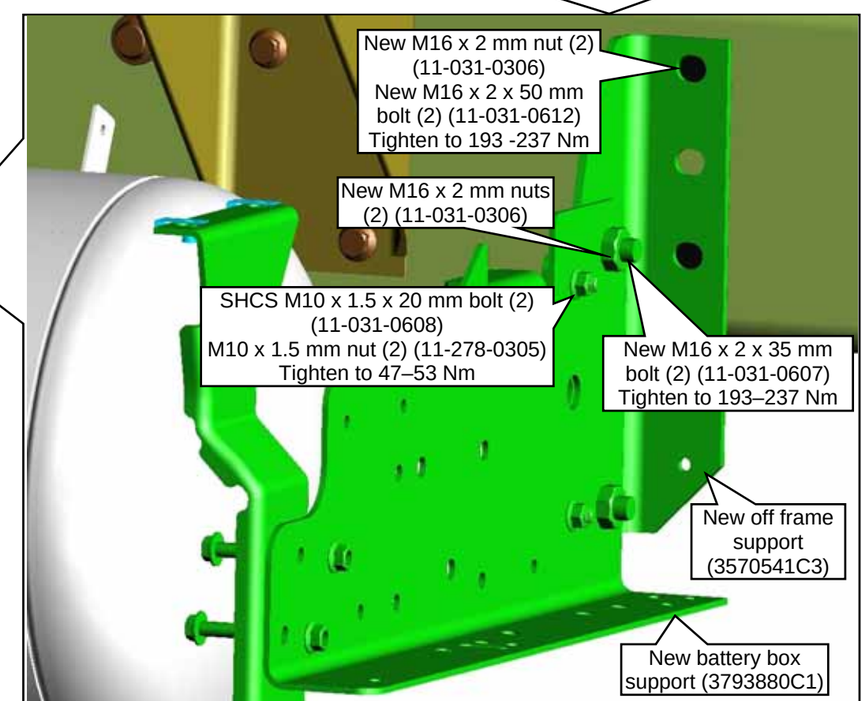


Figure 36.2 — Crew Cab Short Tank, Left Hand Tank Rear Step Front Bracket and Support

Super Cab Long Tank (Build from 60 Gallon OEM Gasoline Tank, Left Hand and Right Hand) P13FB-02H100-E

1. Attach the two new left and one new right step brackets to the step weldments on the left hand tank (front, middle and rear attachments). Use six new M10 x 1.5 x 30 bolts and nuts for the three new step brackets. **Figure 37.1**. The right side tank steps, brackets, U-nuts, bolts and nuts are all reused from the OEM. Tighten all fasteners to specification. **Figure 37.2**.
2. Reuse the OEM step M8 bolts and U-nuts. Install the U-nuts into the two outer step support brackets of the left tank. Reuse the OEM upper and lower steps at the left and right tanks. Position the steps to the step brackets. Start step mounting at the middle bracket hardware for the left and right tanks. This hardware is all new for the left tank and is found in the kit. The right tank hardware is reused. Install the upper and lower step adapters, M8 x 1.25 x 35 bolts, washers and M8 x 1.25 nuts at the middle between the upper and lower steps for the left tank. All steps and mounting hardware on the right tank are OEM and are reused. The outer step bolts at all locations is aligned as needed after the center step hardware is installed and aligned. Tighten all fasteners of both tanks to specification. **Figures 37.1 and 37.2**.

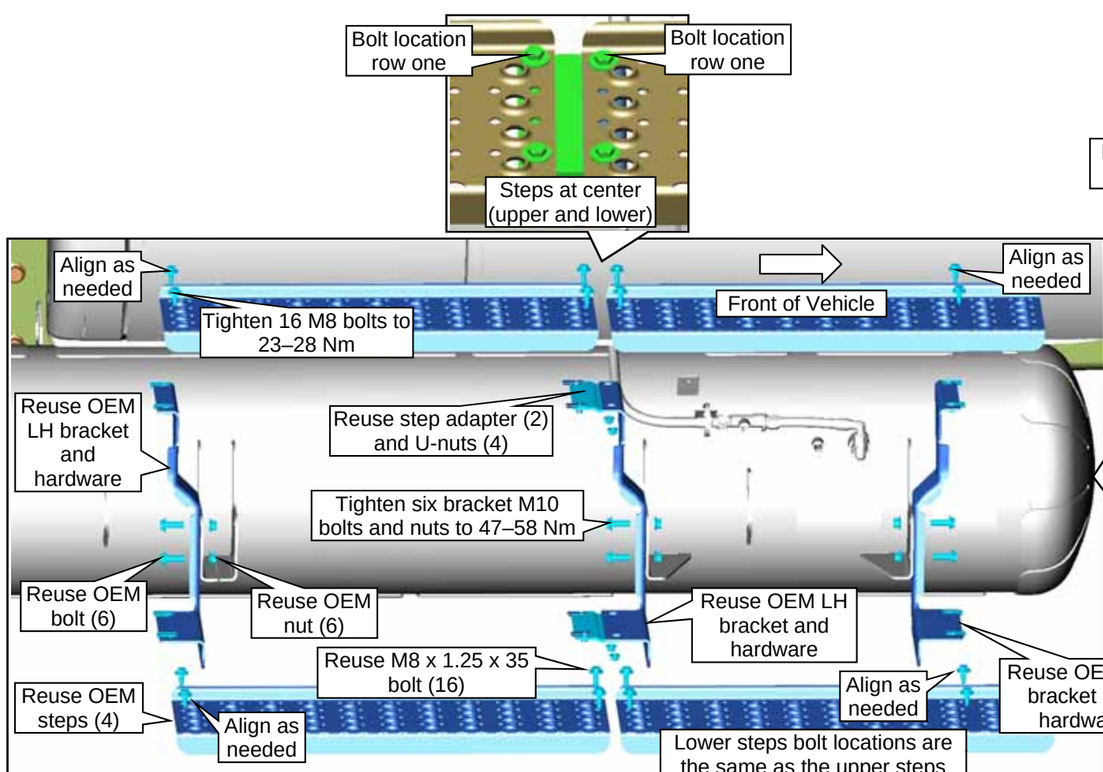


Figure 37.2 — Super Cab Long Tank (Build from 60 Gallon OEM Tank) Right Hand

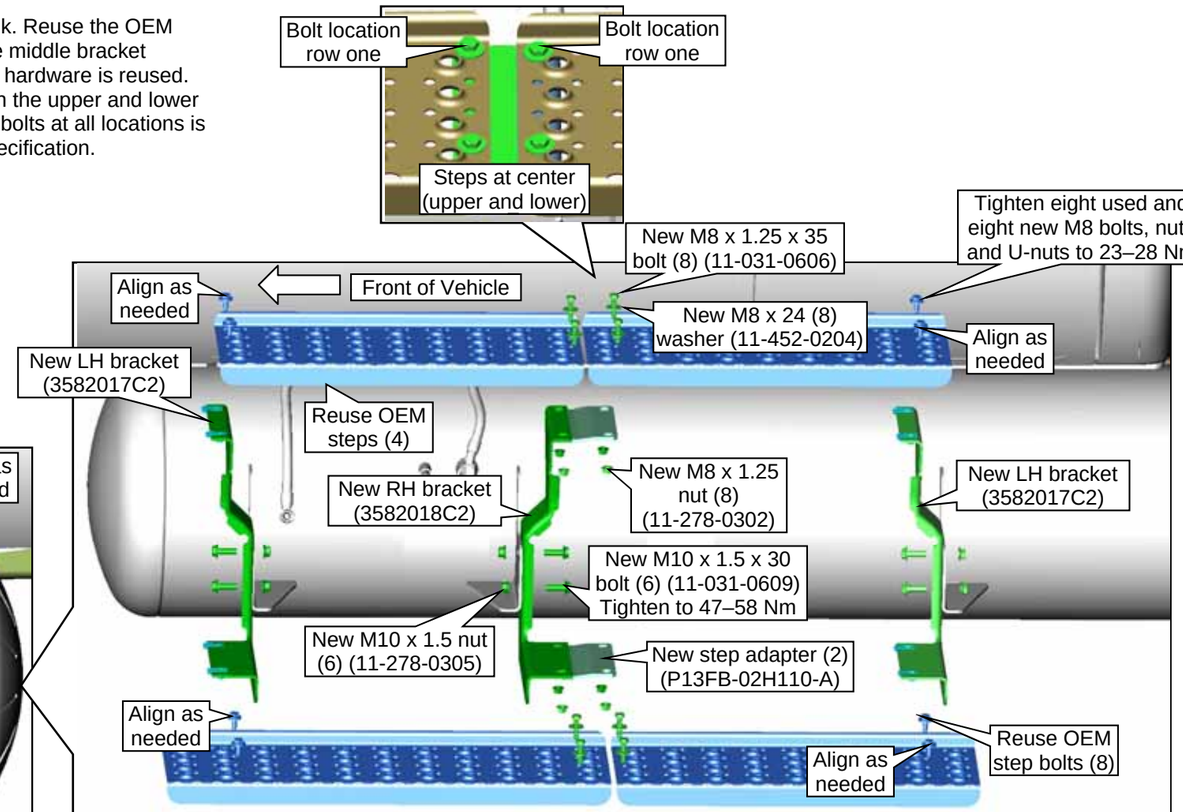


Figure 37.1 — Super Cab Long Tank (Build from 60 Gallon OEM Tank) Left Hand

Crew Cab Long Tank (Left Hand/Single and Right Hand) P13FB-02H100-F

1. Attach the four new left and right step brackets to the step weldments on the left hand tank. Use two M10 x 1.5 x 30 bolts and two M10 x 1.5 nuts for each step bracket installed (two LH and two RH). Tighten the eight bolts and nuts to specification. **Figure 38.1**. Attach the four OEM left and right step brackets to the step weldments on the right hand tank. Use two M10 x 1.5 x 30 bolts and two M10 x 1.5 nuts for each step bracket installed (two LH and two RH). Tighten the eight bolts and nuts to specification. **Figure 38.2**.
2. Position the two upper and two lower steps (four steps each tank) to the step brackets. Install the M8 bolts and U-nuts to secure the steps. Note: Remove the OEM U-nuts from the OEM equipment and install them on the new LH and RH step brackets for the left tank. Reuse the U-nuts already existing on the brackets for the right tank. Tighten all fasteners to specification. **Figures 38.1 and 38.2**.

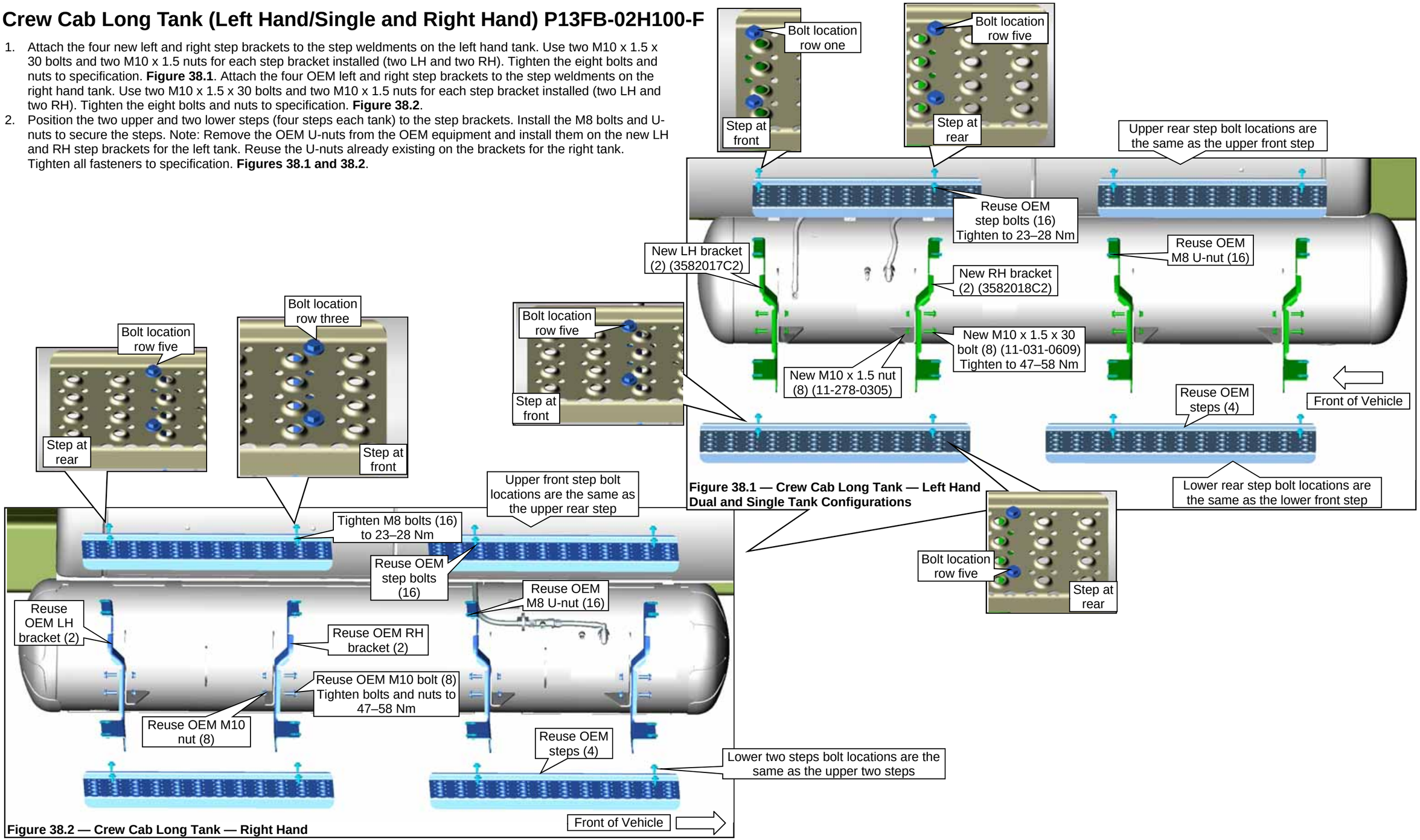


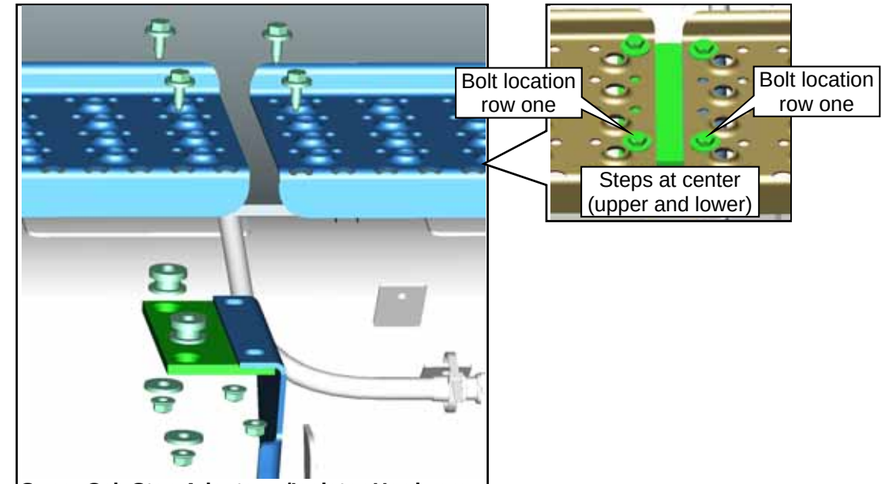
Figure 38.1 — Crew Cab Long Tank — Left Hand Dual and Single Tank Configurations

Figure 38.2 — Crew Cab Long Tank — Right Hand

Super Cab Short Tank (Built from 42 Gallon OEM Gasoline Tank, Left Hand and Right Hand) P13FB-02H100-G

Note: The off frame support, battery box support and LH tank bracket at the rear of the left and right tanks have been installed by the OEM on the frame rails. There is no need to disturb these assemblies.

1. Attach the one new left and one new right step brackets to the step weldments on the left hand tank (front and middle attachments). Use four new M10 x 1.5 x 30 bolts and nuts for the two new step brackets. The left side tank steps, brackets, U-nuts, bolts and nuts are reused from the OEM and the step adapter plates at the middle of the upper and lower steps are new and found in the kit. **Figure 39.1**.
2. Reuse the OEM upper and lower step M8 bolts and U-nuts for both the left and right tanks. Install the U-nuts into the front step brackets of the left and right tanks. Reuse the OEM upper and lower steps at the left and right tanks. Position the steps to the step brackets. Start at the center step support hardware which is new and is found in the kit. Install the center upper and lower step adapters, isolators, isolator washers, M8 nuts and M8 x 1.25 x 35 mm bolts for the left and right tanks. Note: Use soapy water on the isolators to ease installation and to prevent isolator damage. Align the outer step fasteners as needed after the center supports are installed. Tighten all step fasteners to specification. **Figures 39.1 and 39.2**.



Super Cab Step Adapter w/Isolator Hardware (for upper and lower, LH and RH Steps)

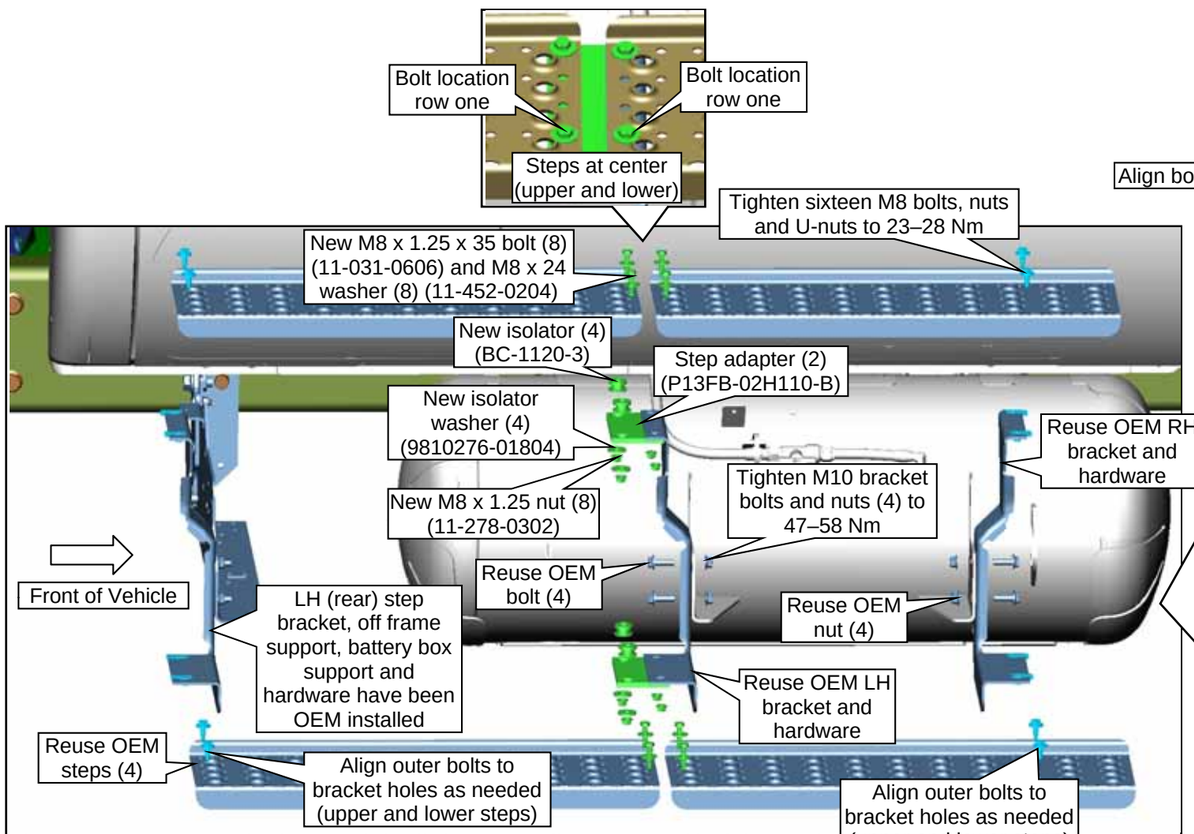


Figure 39.2 — Super Cab Short Tank (Built from 42 Gallon OEM Tank) Right Hand

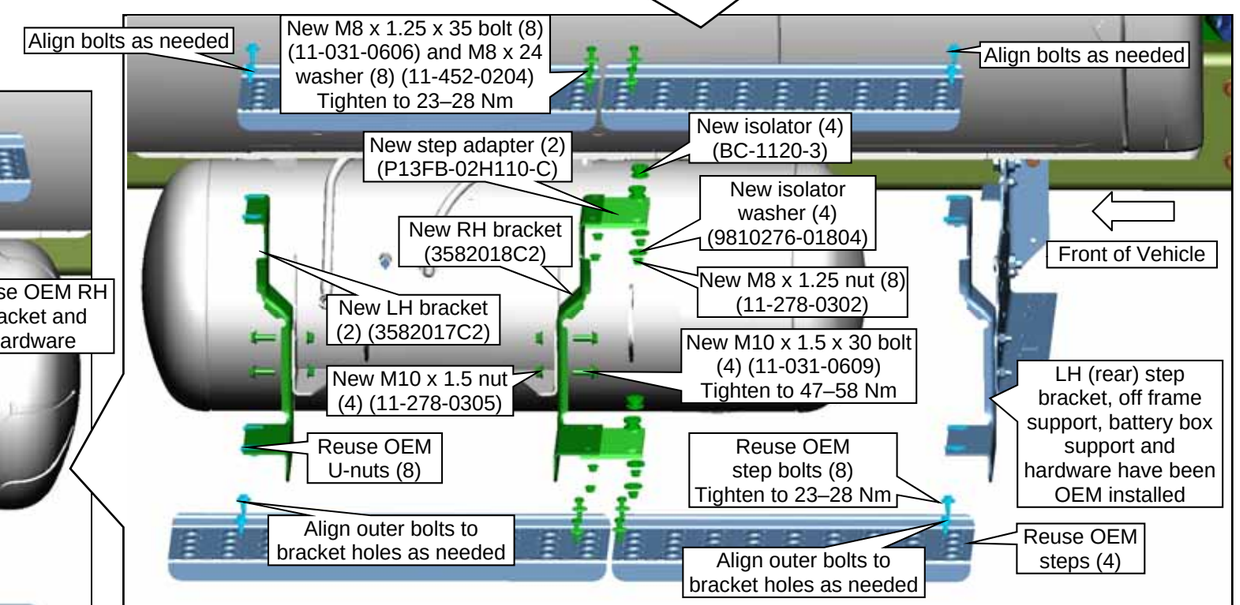


Figure 39.1 — Super Cab Short Tank (Built from 42 Gallon OEM Tank) Left Hand

INSTALLING NEW FUEL FILL SYSTEM

Note: The left side steps must be installed before installing the fill valve and bracket. A hole must be drilled in the left step bracket to support the fill valve bracket.

1. Install the upper two M8 J-clips onto the fill valve bracket. **Figure 40.1**.
2. Position the fill valve bracket under the left step and next to the left step bracket. Install the two top retaining bolts through the step, into the bracket. Lightly tighten the bracket bolts. **Figure 40.2**.
3. At the inside of the fill valve bracket, mark the drilling location of the fill valve bracket lower bolt hole. Make and center the mark on the left step bracket. **Figure 40.3**. Remove the fill valve bracket and two bolts. Remove the upper step for clearance.
4. Drill a pilot hole at the marked location and then drill to a final diameter of 11 ± 0.5 mm. **Figure 40.4**. Deburr and coat the holes with touch up paint. Refer to *Special Tools* for more information.
5. Install the upper step.
6. Remove nut and washer from fuel fill valve and assemble the valve to the fuel fill valve bracket. Support the fill valve and bracket assembly and tighten nut securely. Install the third (lower) M8 J-clip onto the fill valve bracket. **Figure 40.5**. These parts are in hardware kit P13FB-FILLKIT-A.
7. Attach the fuel fill valve and bracket assembly to the upper step and to the left step bracket using the three M8 x 20 mm flange bolts. Tighten the bolts to specification. **Figure 40.6**.
8. Install the fuel fill line to the fuel fill valve. Tighten the line fitting to specification. **Figure 40.7**.

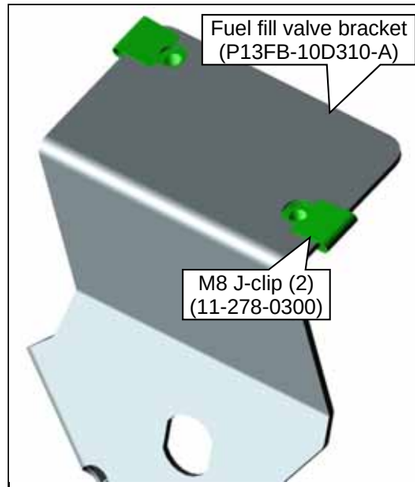


Figure 40.1

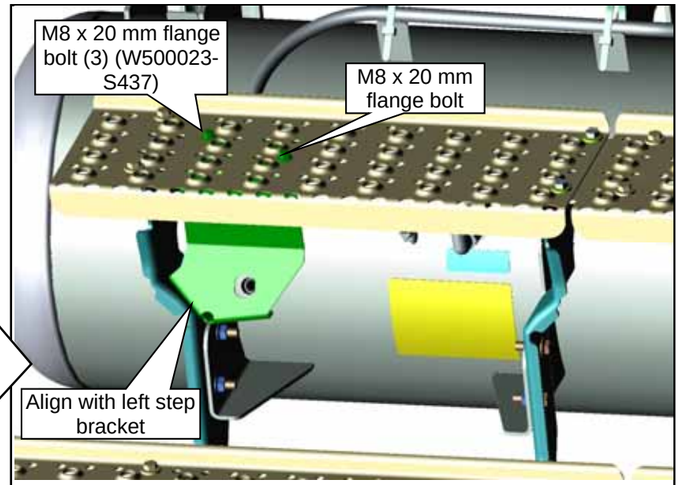


Figure 40.2

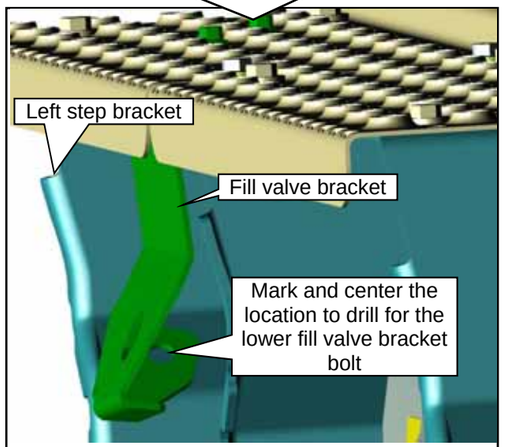


Figure 40.3

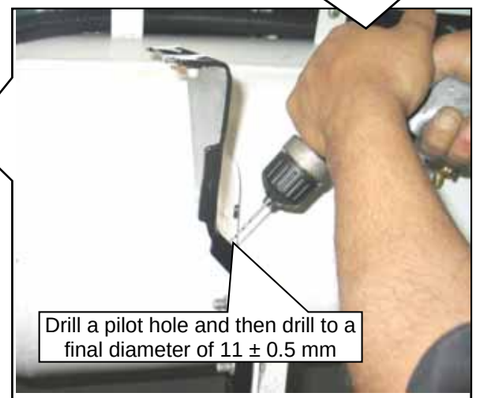


Figure 40.4

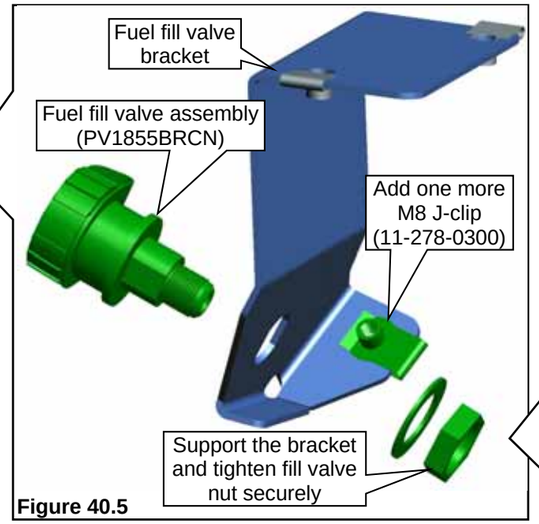


Figure 40.5

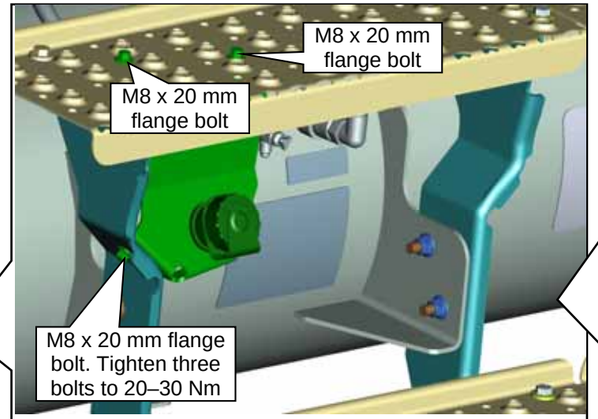


Figure 40.6

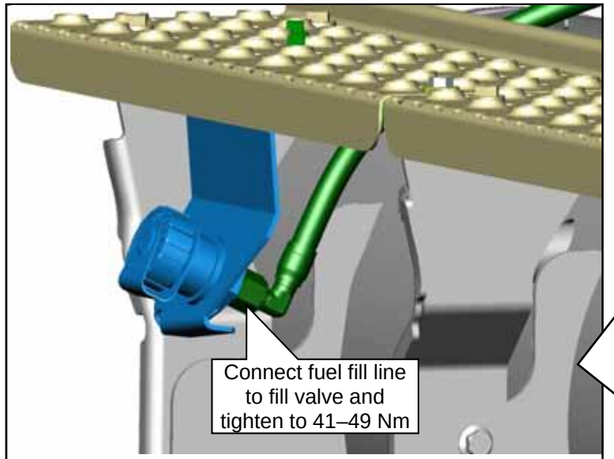
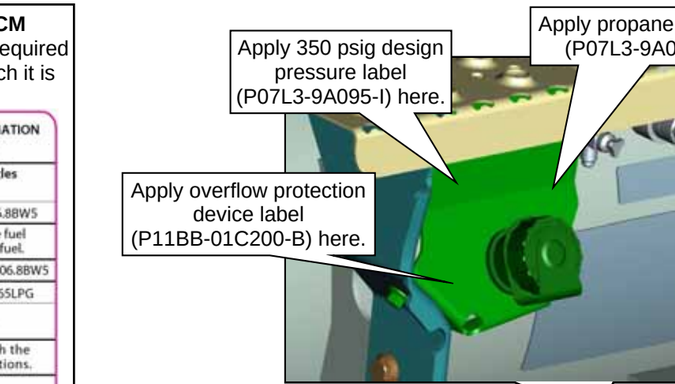


Figure 40.7

INSTALLING BADGES AND LABELS AND COMPLETING THE KIT INSTALLATION

ROUSH VECI Decal returned with PCM
Note: This label is vehicle-specific and is required by law to be applied to the vehicle to which it is assigned.

ROUSH	VEHICLE EMISSIONS CONTROL INFORMATION SUPPLEMENTAL LABEL 1 OF 2	
Authorized to convert the following Ford Motor Co. Vehicles 2012 F-450/550/650 Incomplete & Stripped Chassis		
Engine MY: 2011	OEM Gasoline Test Group: BFMXE06.8BW5	
This vehicle/engine is equipped with a Roush clean alternative fuel conversion system that allows it to operate on dedicated LPG fuel.		
Conversion Information:	Model Year: 2012	Test Group: CRIIE06.8BW5
CA Standards: N/A	OBD: N/R	EVAP: CRIIF0265LPG
FOR USE ONLY IN HDV WITH GVWR ABOVE 14,000 lbs.		
This conversion is manufactured and installed consistent with the principles of good engineering judgment and all EPA Regulations.		
Roush Industries, Inc. 12445 Levan Road Livonia, MI 48150 1-800-59-ROUSH	TWC/HO2S/AFS/SFI	
	This clean alternative fuel conversion has been certified to meet EPA Emissions Standards. P12EB-01D049-AA	



PCM Tamper Label (R07100008-10-A)

PCM Tamper Warning Label (R07100008-10-A) above OBDII diagnostic port

Badges and Labels

1. Clean and dry all surfaces before applying new self-adhesive badges and labels. All labels are found in hardware kit P13FB-LABELKIT-A.
2. Apply labels in locations shown.
3. Apply the ROUSH CleanTech VECI label to the location specified in the supplemental instructions included with the returned PCM. **Note:** These labels are vehicle-specific and are required by law to be applied to the vehicle to which they are assigned. Use the labels included with the PCM when returned to you by ROUSH CleanTech.

Diamond Propane Reflective (D85)

Bleeder Valve Inspection Label (P07L3-9A095-C) to end of driver door

ROUSH CleanTech Logo Dome Badge (P-01G100-A)

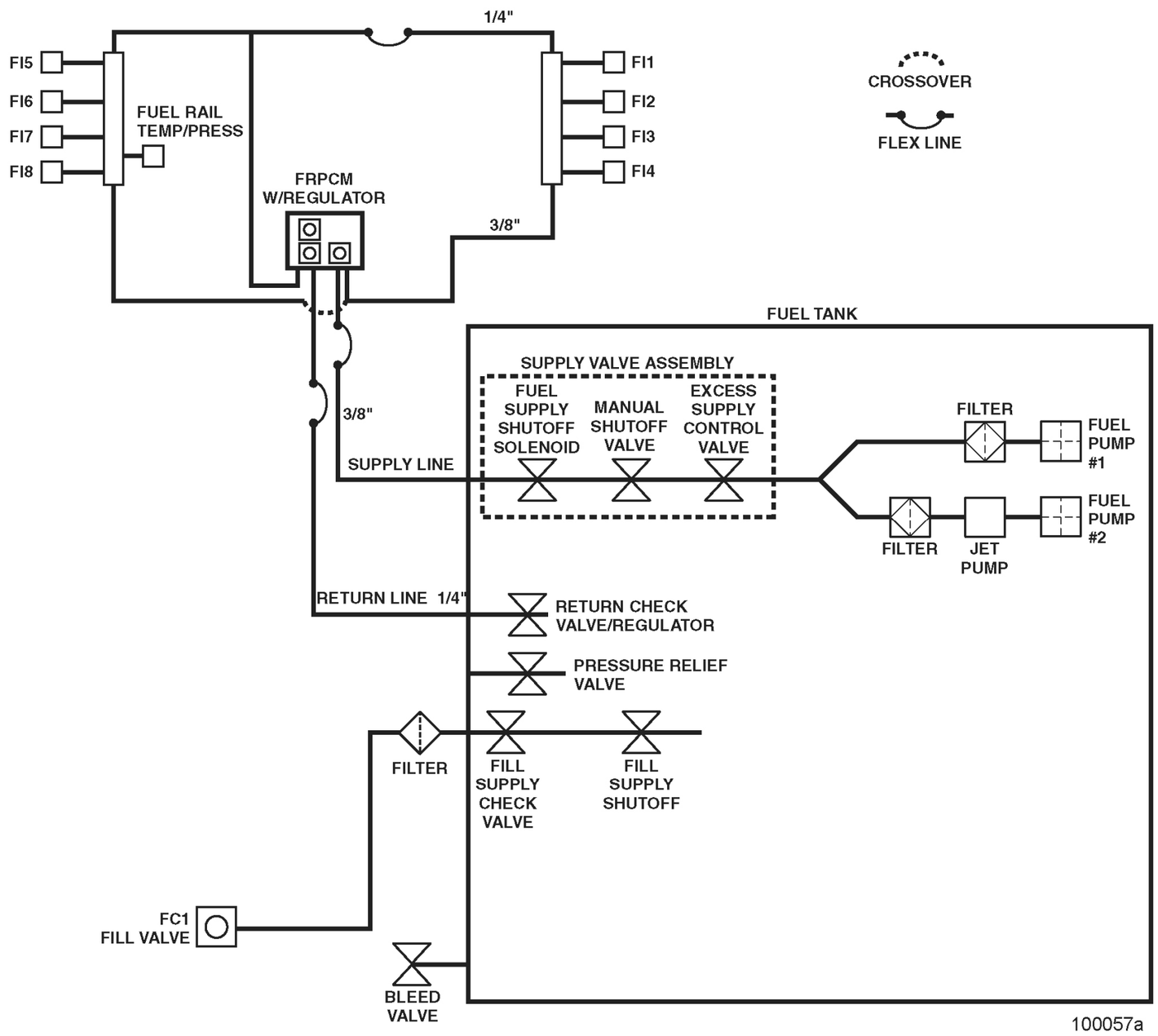
ROUSH CleanTech Badge Template (P12FB-01F200-A) from kit. Position as shown.

Remove backing from badge. Position edges of badge border against edges of template as shown.

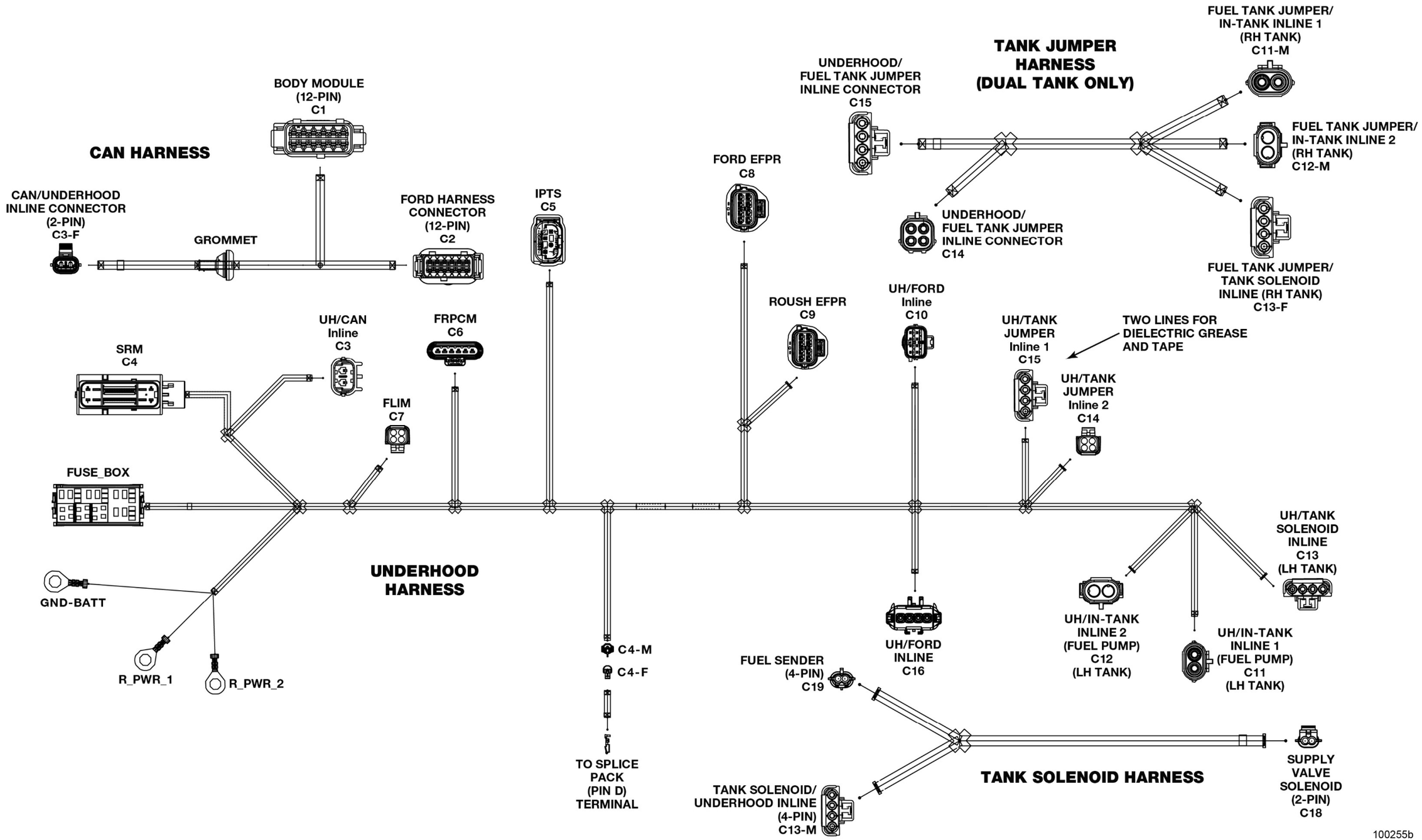
Completing the Kit Installation

1. Install reprogrammed PCM following procedure in the *Ford Workshop Manual, Section 303-14, Electronic Engine Controls*.
2. Install vehicle battery and connect positive and negative terminals. Tighten to 8–12 Nm.
3. Perform system leak check following established ROUSH CleanTech procedure.

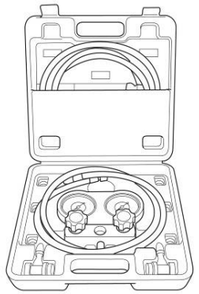
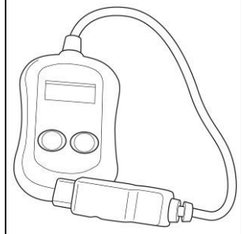
SCHEMATIC — ROUSH FUEL SYSTEM (TYPICAL)

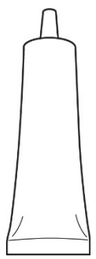
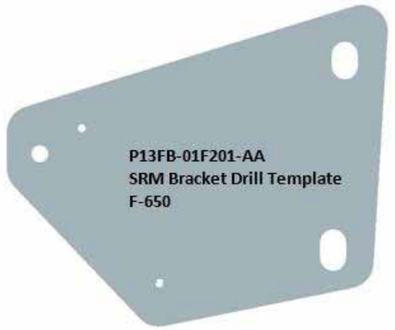


SCHEMATIC — ROUSH WIRING HARNESS (F-650 CHASSIS CAB)



SPECIAL TOOL

								
Touch-Up Paint	**Liquid Leak Detector**	**Premium Aerosol Undercoating**	**Torque Wrenches (to 22 Nm and to 200 Nm)**	**A/C Manifold Gauge Kit**	**Gloves (Approved for Propane)**	**Scan Tool**	**Jiffy-Tite Disconnect Tool (1/4” and 3/8”)**	**Hole Saw — 35 mm**

						
Vacuum Gauge	**Vacuum Pump**	**Dielectric Grease**	**Stepless Ear Clamp Pliers**	**Drill Bits — 1/8”, 5/16” and 1/2”**	**SRM Bracket Drill Template**	**Tubing Cutter**