ROUSH CLEANTECH

2014

Ford E-450 Micro Bird Bus Fuel Chiller

LIQUID PROPANE AUTOGAS

MARCH, 2014

P11JC-01F001-DA

When performing a new propane autogas system install, this manual is intended to serve as a supplement to the ROUSH CleanTech install instructions “Ford E-450 Dual Rear Wheel Cutaway, Liquid Propane Autogas System — Aft-Axle” (document number P11JC-01F001-A).

This document is also intended to serve as instructions when retrofitting a previously installed ROUSH CleanTech Propane Autogas System with a fuel chiller.

The ROUSH CleanTech fuel chiller system is designed to be compatible with a Carrier-brand auxiliary A/C system using a roof-mounted A/C condenser and TM-16 compressor.

To maintain proper electrical system performance in extreme conditions and on vehicles with high electrical demand with the fuel chiller system, ROUSH CleanTech recommends using the highest capacity alternator available and an auxiliary battery.

ROUSH CleanTech does not make claim to the effect on A/C system performance with the addition of the fuel chiller system.

SPECIAL EQUIPMENT REQUIRED

DESCRIPTION	TOOL NUMBER
A/C Recovery/Charging Station	—
A/C Hose Fitting Install Tool	Oetiker Clamp Tool or equivalent
Hose Cutter	Burgaflex 8767 or equivalent

INSTRUCTIONS

NEW FORWARD FUEL LINE SUPPLIED WITH FUEL CHILLER KIT

For liquid propane autogas (LPA) installations incorporating a fuel chiller, a unique forward fuel supply line is used. Refer to the procedure on page 5 of the base kit INSTALLATION INSTRUCTIONS, P11JC-01F001-A, and install the forward fuel supply line, P13-SO-10S110-A, supplied with this kit.

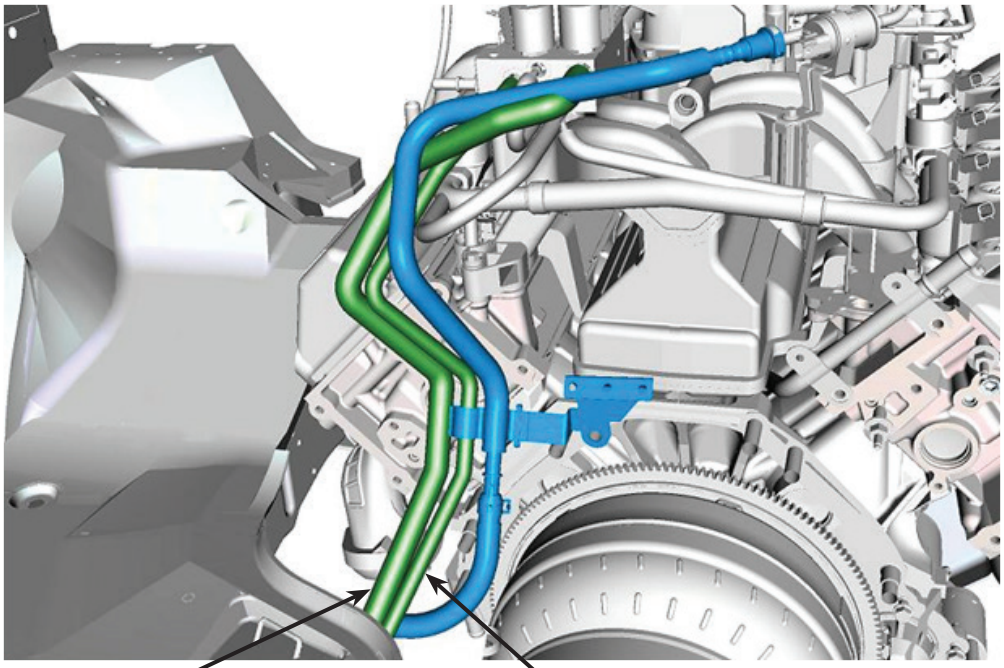


Figure 1 – Forward Fuel Lines

INSTALLING REMOTE PRESSURE RELIEF VALVE (PRV)

1. Discharge the carrier cabin/secondary A/C system. Do this according to the instructions for your A/C charging equipment. DO NOT TAMPER WITH THE FRONT A/C SYSTEM. Service ports for the secondary A/C system are located on the frame rail across from the secondary condenser box assembly. The high side port is on top, the low side port is on bottom. Record how much R134a refrigerant and PAG oil is pulled so that the correct recharge amount can be determined.
2. If necessary, remove the alternator to provide access to service parts.
3. Remove the pressure relief valve (PRV) (**Figure 2**) from the rear of the secondary compressor and save for reuse at the remote mounting location. Capture any PAG oil that comes out of the compressor in a clean container for reuse.

4. Check that the O-rings are in place at the ends of the new 9/16-18 ORFS x 3/8-24 ORB adapter fitting, 10-126-0002, and apply a light coat of PAG refrigerant oil to each O-ring. Install the adapter fitting in the port at the back of the secondary compressor.

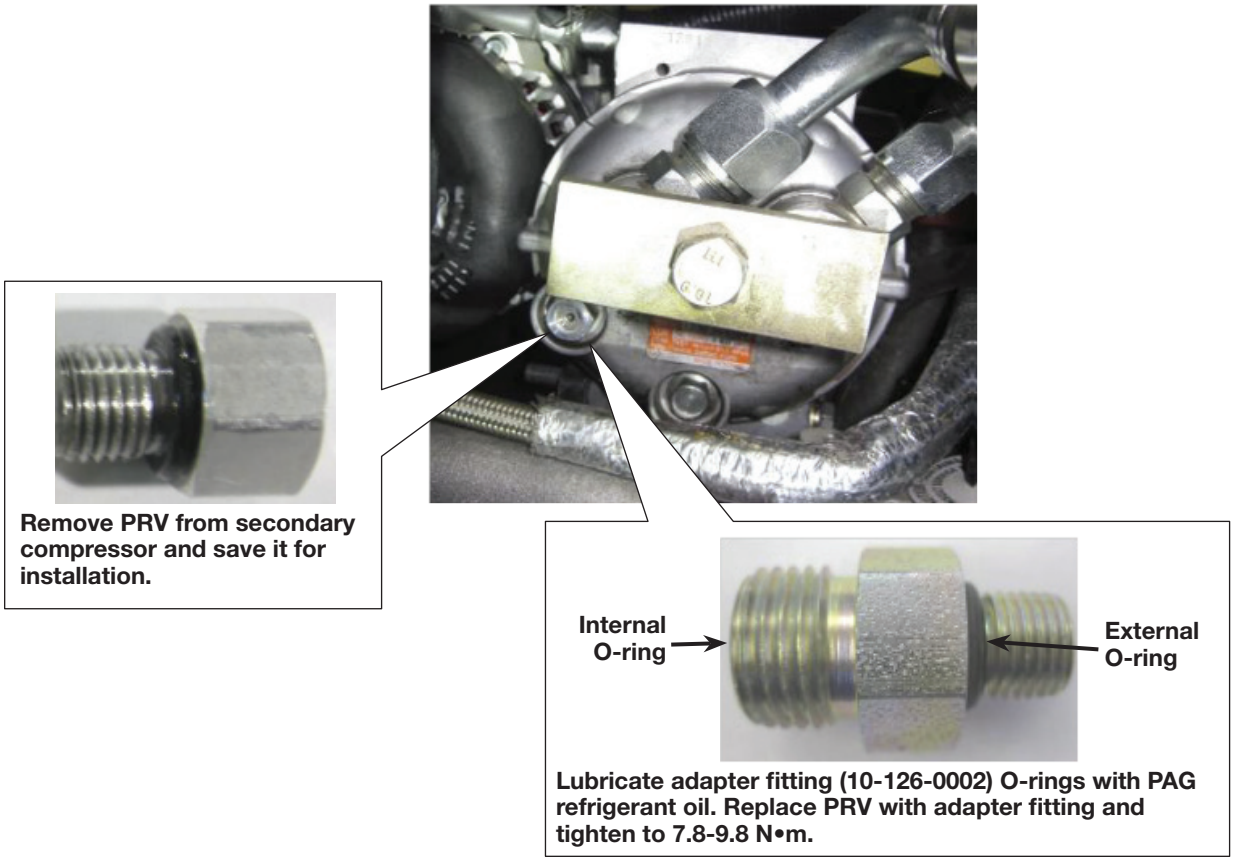


Figure 2 – Adapter Fitting Installation

5. Connect the heat shield covered end of the remote PRV line, P13-SO-12A200-A, onto the secondary A/C compressor adapter fitting and tighten to specification.

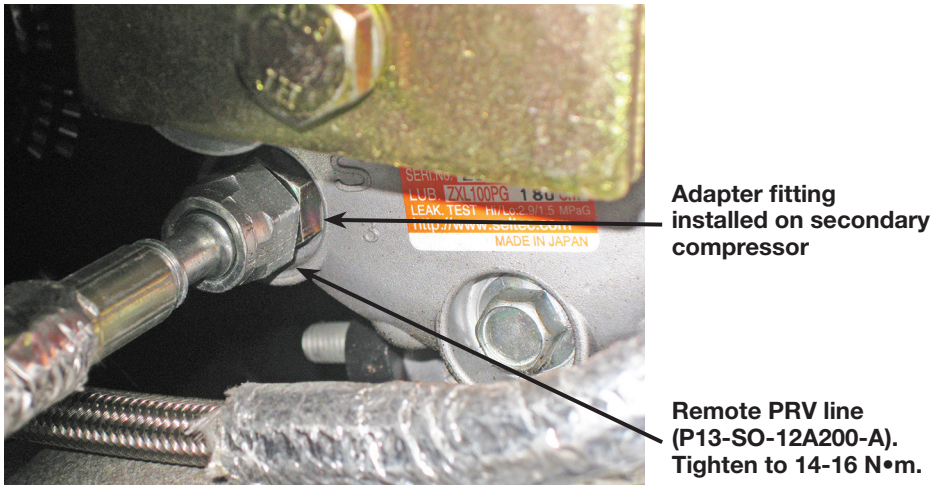


Figure 3 – Remote PRV Line Connection

6. Route the remote PRV line, P13-SO-12A200-A, from the rear of the secondary A/C compressor along the top right side of the engine to the back of the intake manifold, then across to the fuel lines. Continue routing the line down along the fuel lines to the underbody exhaust shield and across the left side frame rail. Take care to tie the line back, away from the hole in the shield.

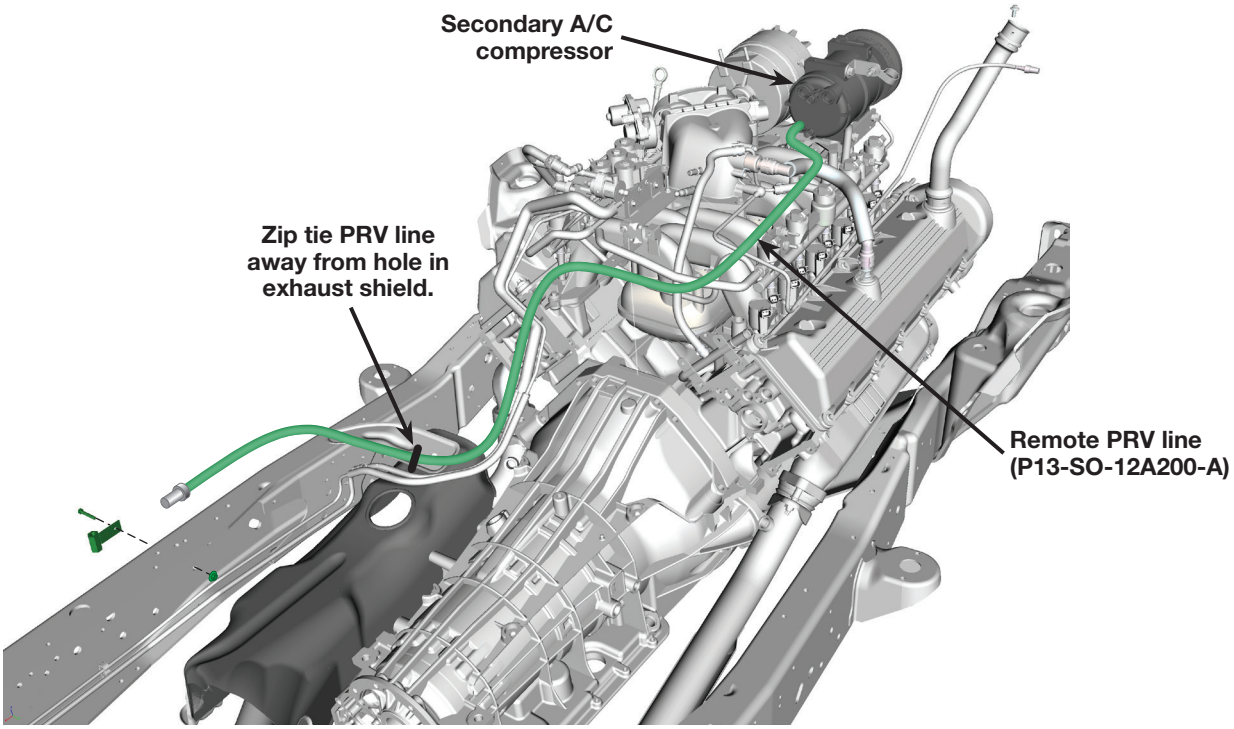


Figure 4 – Remote PRV Line Installation

7. Install the remote mounting bracket, P13-SO-12B210-A, for the PRV on the outboard surface of the left side frame rail using an M6 x 1.0 x 25 bolt, W500215-S439, and an M6 x 1.0 lock nut, W704521-S437, tightened to 8-12 N•m. Use the oblong holes in the frame rail as reference in locating the PRV bracket mounting hole.

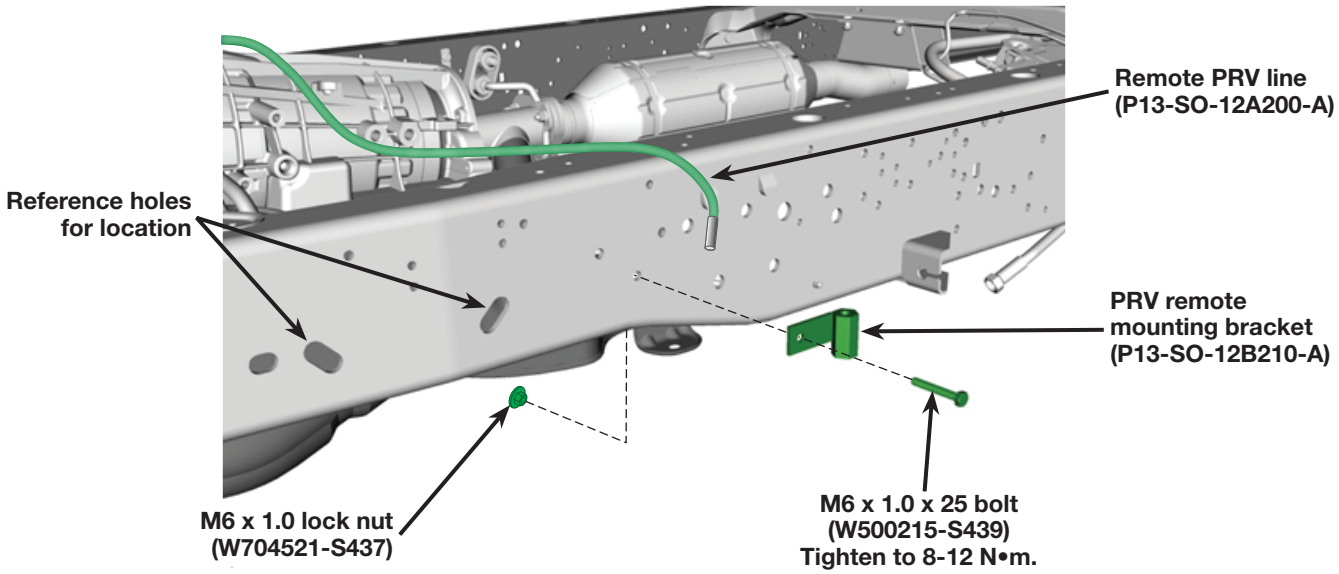


Figure 5 – Remote PRV Bracket Installation

8. Check that the internal O-ring is in place at the end of the new 9/16-18 ORFS x 1/8-27 MNPT adapter fitting, 10-126-0003, and apply a light coat of PAG refrigerant oil to the O-ring. Install the adapter fitting into the remote PRV mounting bracket, P13-SO-12B210-A, on the frame rail and tighten to 16 N•m. Connect the remote PRV line to the adapter fitting and tighten to 14-16 N•m.
9. Install the PRV (from the secondary compressor) at the bottom port of the PRV bracket and tighten M6 x 1.0 x 25 to 7.8-9.8 N•m.

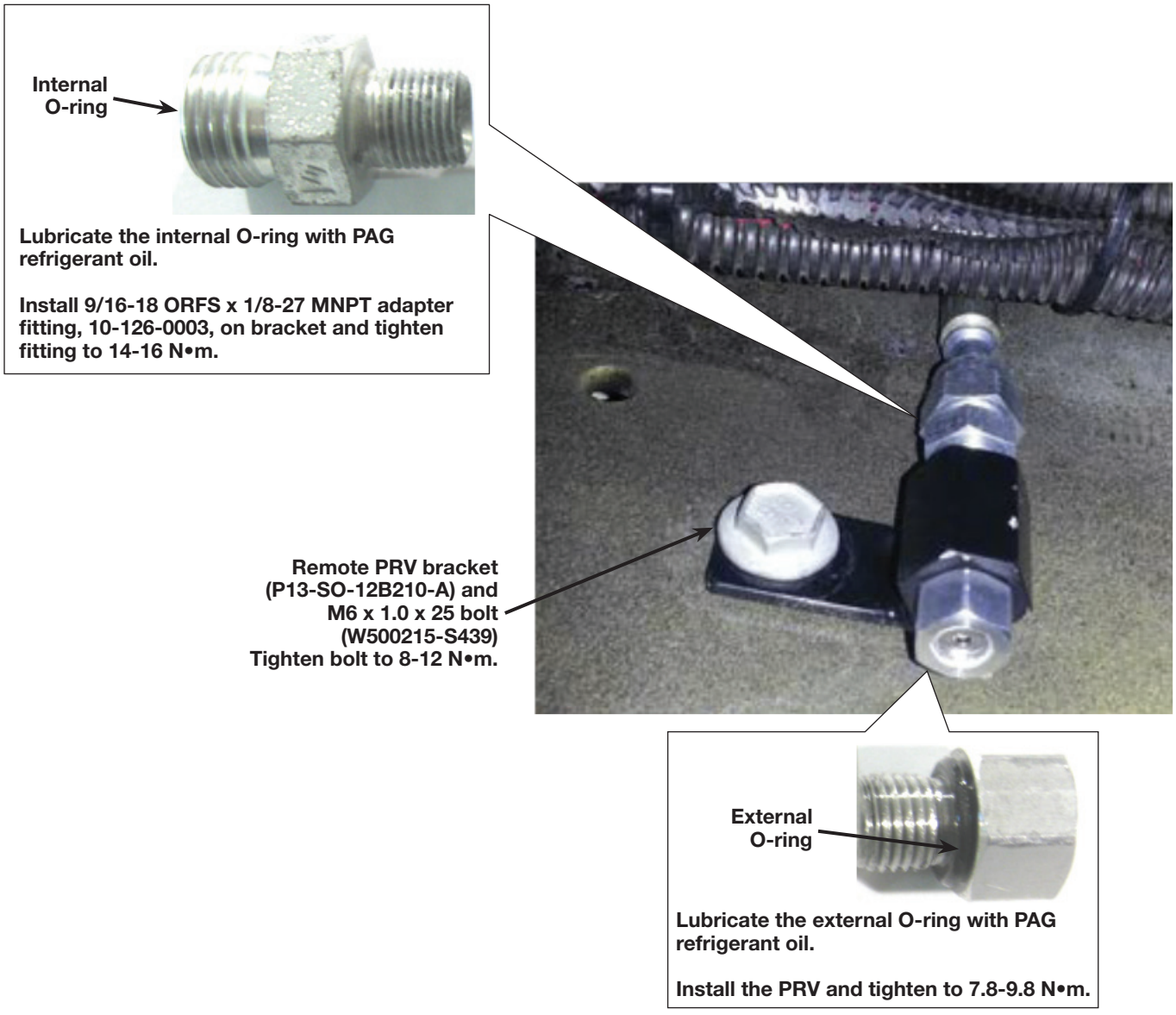


Figure 6 – Adapter Fitting and PRV Installation

INSTALLING THE CHILLER MOUNTING BRACKET

1. The fuel chiller mounting bracket, P13-SO-12B110-A, requires two additional holes in the frame rail. These holes will be located on the outside of the left side (driver's) frame rail, across from the secondary condenser box.
2. Mark and drill new hole in position as shown below.

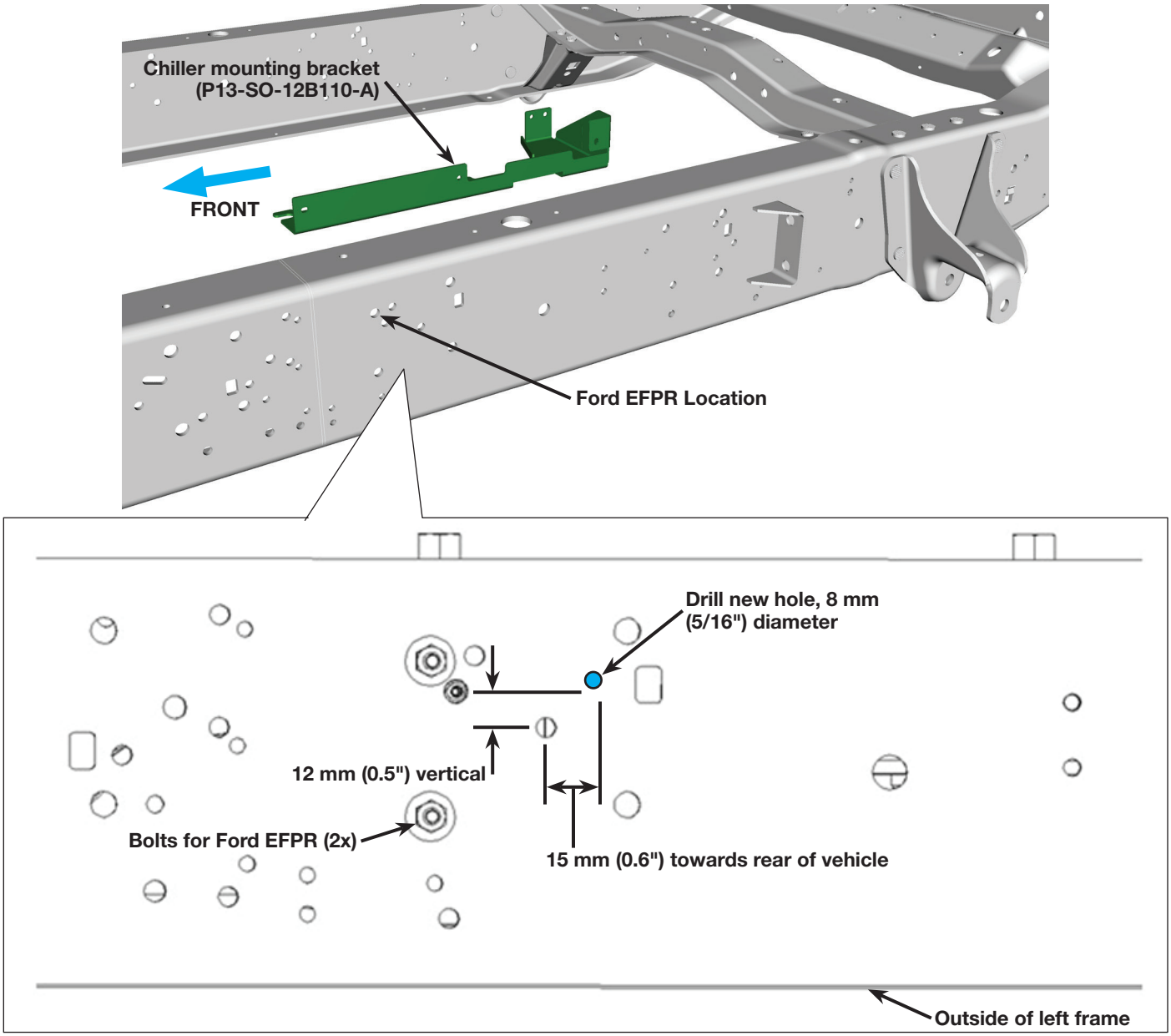


Figure 7 – Marking Chiller Mounting Bracket Front Hole

3. Temporarily mount the chiller bracket (P13-SO-12B110-A) in position on the frame rail using the front and center mounting bolts.
   - Using the chiller bracket as a template, center punch the rear mounting hole on the frame rail. Remove the bracket and drill the frame hole using an 8 mm (5/16") bit.

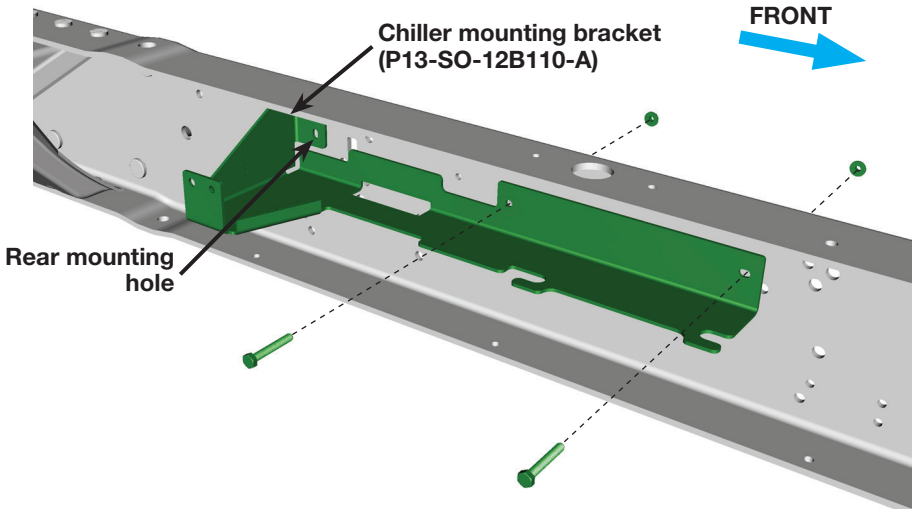


Figure 8 – Marking Chiller Mounting Bracket Rear Hole

4. Reinstall the mounting bracket with all three M6 x1.0 x 25 mounting bolts, W500215-S439, and M6 x 1.0 lock nuts, W704521-S437 (**Figure 9**). Tighten the bolts to 8-12 N•m.

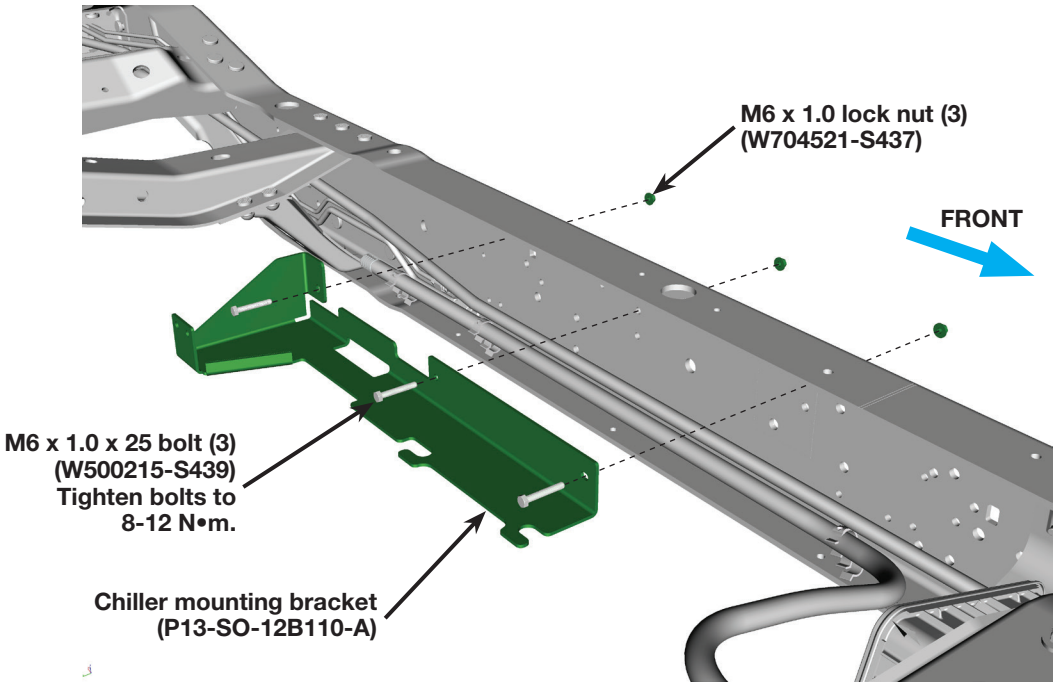


Figure 9 – Chiller Mounting Bracket Installation

EFPR INSTALLATION

Note: If you are retrofitting a ROUSH CleanTech LPA system with a fuel chiller system, the ROUSH CleanTech electronic fuel pump relay (EFPR) must be relocated as shown. For new system installations, mount the ROUSH CleanTech EFPR as shown.

1. Install new EFPR (AA8A-9D412-C) just forward of original Ford EFPR. Align the upper hole of the relay with frame rail hole, mark lower relay hole on frame rail and drill an 8 mm (5/16") hole in rail. Use two spacers (AS75-18-32) between EFPR and frame rail, position relay and install two M6 bolts (R18020004-00-S439) and locknuts (W702147-S437). Tighten to 7.6-10.4 N•m.

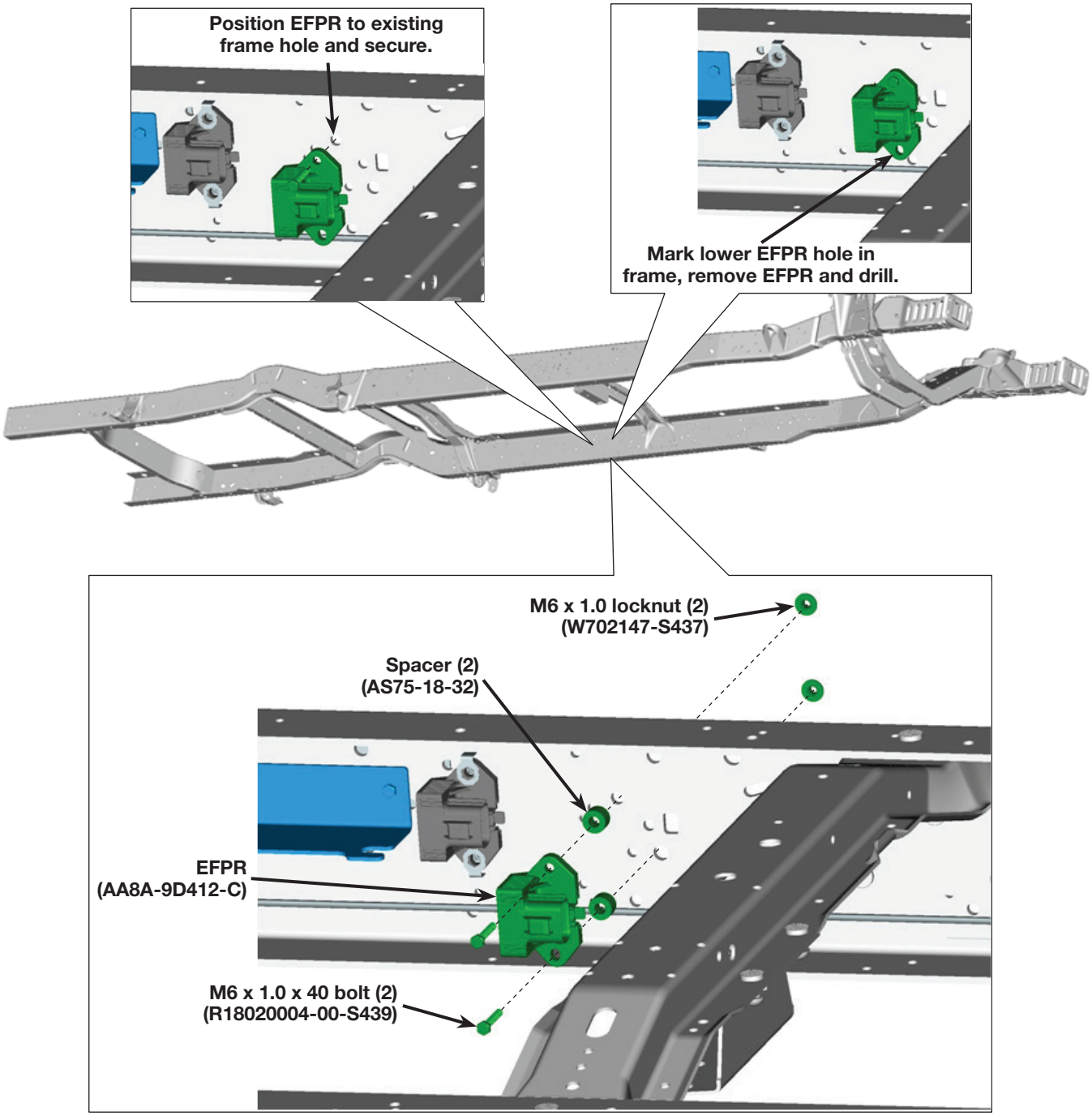


Figure 10 – EFPR Installation

ASSEMBLING CHILLER, FUEL AND A/C LINES

1. Referencing Figure 8, mount the NPT ends of both fuel chiller adapter fittings, P13-SO-12A150-A, to the radial ports of the chiller, P13-SO-00540-02, and tighten to 34 N•m. Visually check that there are medium-sized O-rings seated in the four fitting ends of the adapter fitting on the radial fuel chiller ports.
2. Connect the NPT end of each flexible fuel supply line, P-10S102-D-407, to the end ports of the fuel chiller. Tighten the fittings to 54 N•m.
3. Connect the 90-degree MIO fitting of the A/C hose assembly #1, P13-SO-12A100-A, -8 hose to the fuel chiller port on the right with the hose leading off to the left (**Figure 11**). Tighten the fitting to 28.5-36.5 N•m.
4. Connect the 90-degree MIO fitting of A/C hose assembly #2, P13-SO-12A100-B, -8 hose to the fuel chiller port on the left with the hose leading off to the left (**Figure 11**). Tighten the fitting to 28.5-36.5 N•m.

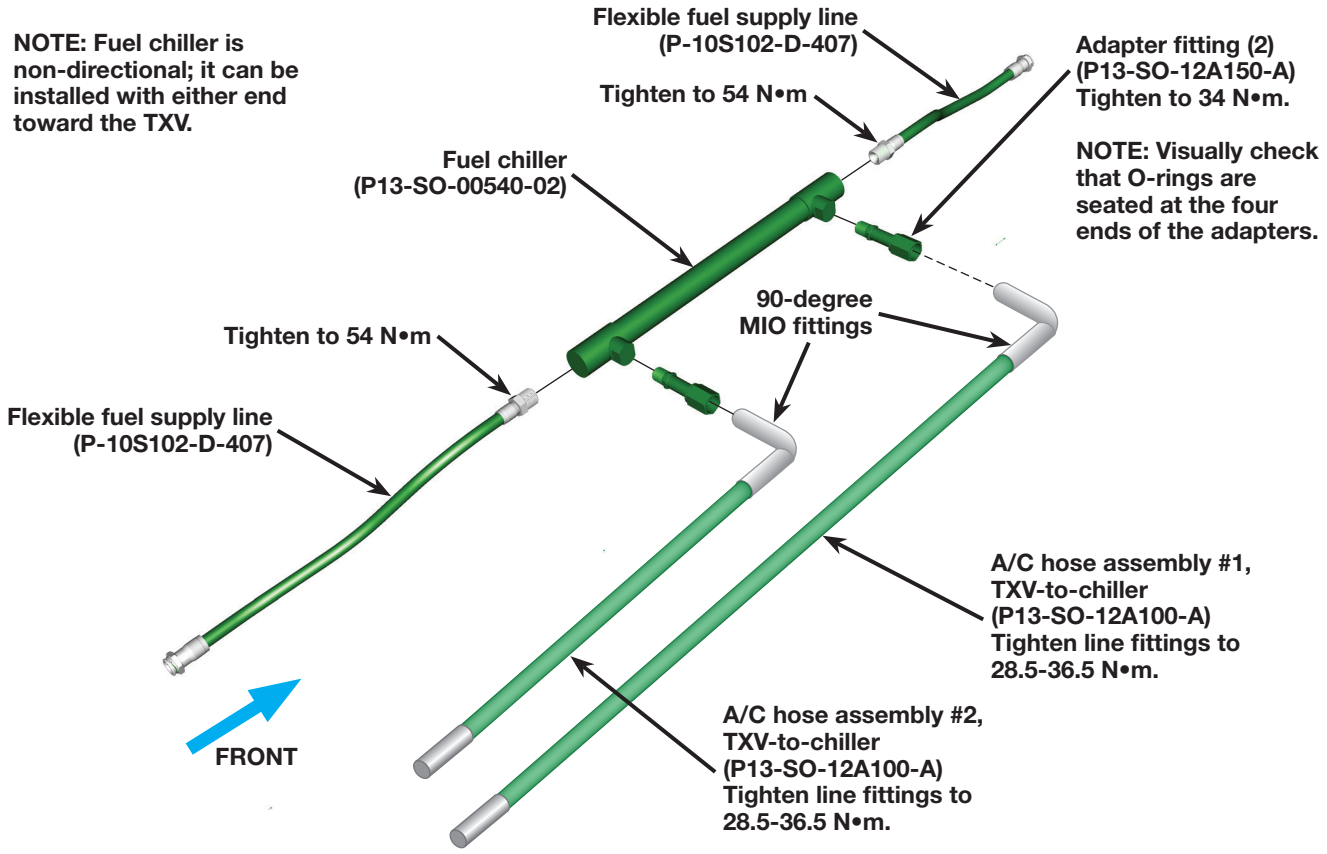
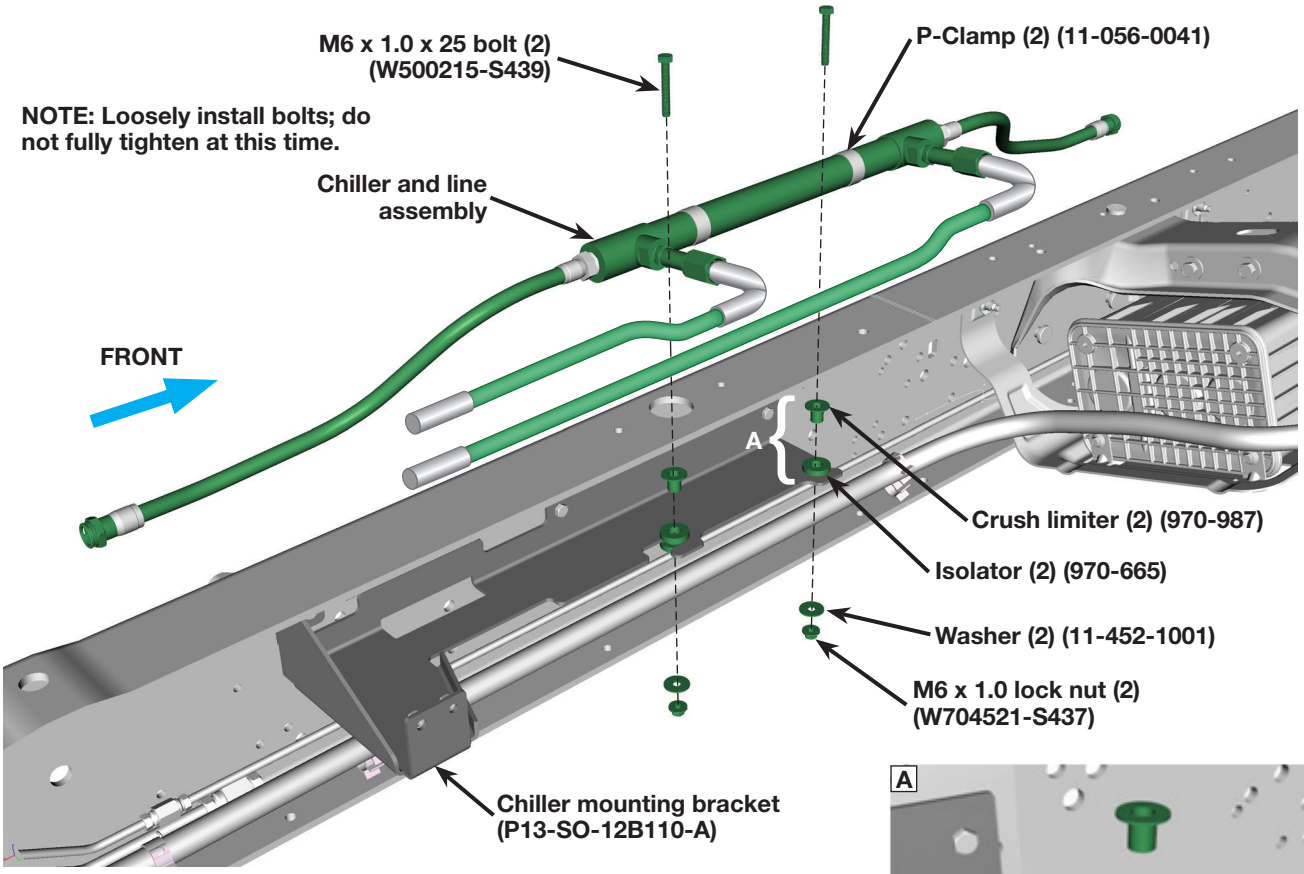
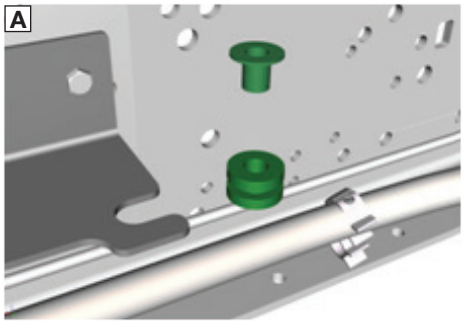


Figure 11 – Fuel Chiller and A/C Line Assembly

INSTALLING CHILLER ASSEMBLY AND THERMAL EXPANSION VALVE (TXV)

1. Insert the two isolators, 970-665, and two crush limiters, 970-987, into slots at the inboard side of the fuel chiller mounting bracket, P13-SO-12B110-A (**Figure 12**).
2. Mount/position the two P-clamps, 11-056-0041, onto the in-line fuel chiller and line assembly. Assemble the fasteners to the chiller mounting bracket with the two M6 x 1.0 x 25 bolt heads, W500215-S439, at the top. Loosely assemble the fasteners, but do not fully tighten yet to allow adjustment to the fuel chiller position.





Insert crush limiters, 970-987, into isolators, 970-665, and insert assembly into the slots at inboard side of the chiller bracket.

Figure 12 – Chiller Assembly Installation

3. Bolt the TXV, 71R8301, to the fuel chiller mounting bracket with the isolator, P13-SO-12B115-A, between them. The adhesive portion of the isolator should mate flush with the bottom edge of the TXV (mounting holes should be visible). Assemble the fasteners with the two M6 x 1.0 x 40 bolts, R18020004-00-S439, going through the TXV, the isolator and then the bracket. Tighten with lock nuts, W704521-S437, to 8-12 N•m.

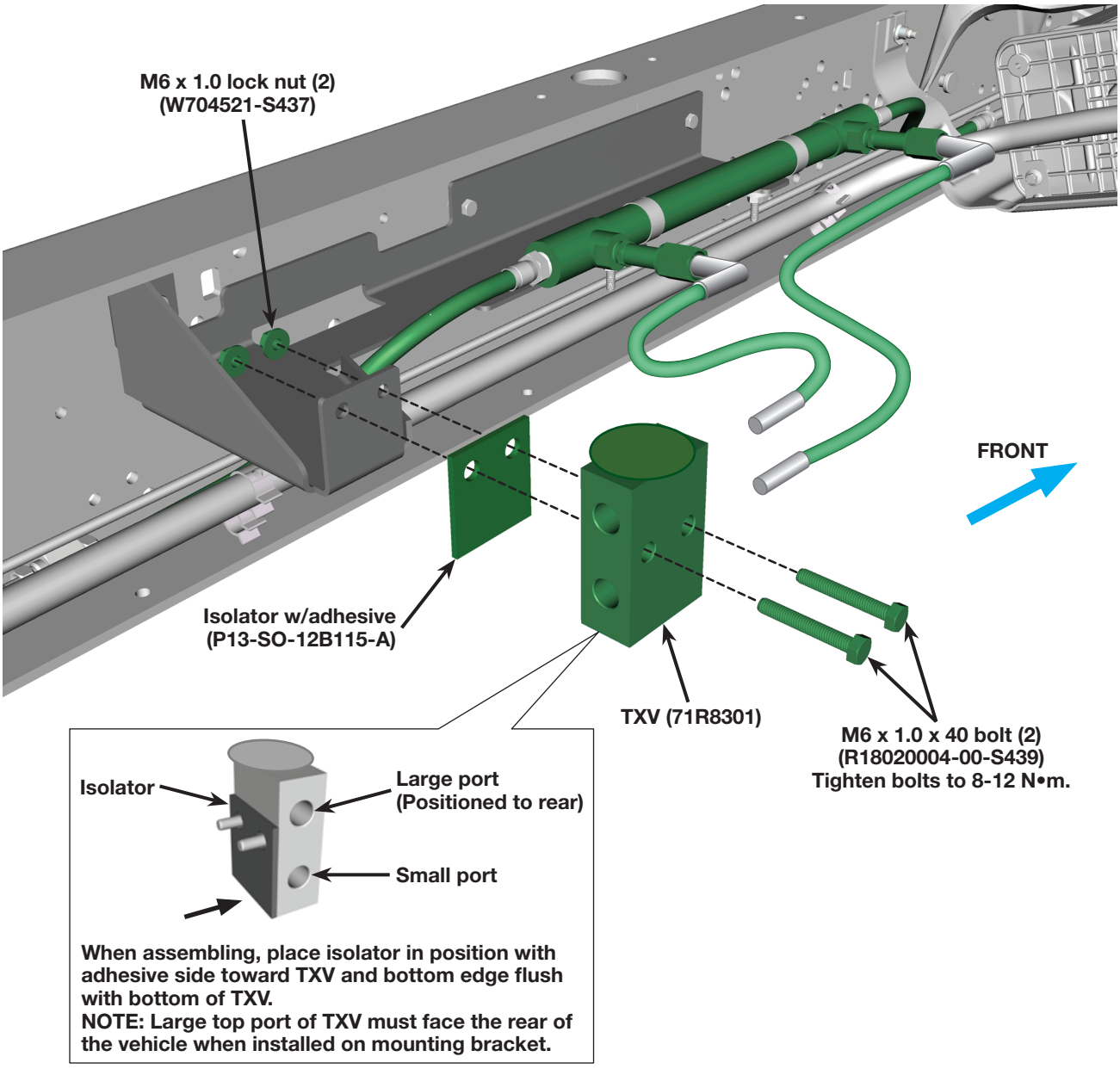


Figure 13 – TXV Installation

4. Insert the medium-sized O-rings on to the MOR ends of A/C hose assembly #1, P13-SO-12A100-A, and assembly #2, P13-SO-12A100-B.
5. Attach the MOR ends of A/C hose assembly #1 and #2 to the TXV and tighten to tighten to 28.5-36.5 N•m. The A/C hose assembly #1 connects to the bottom TXV port and the A/C hose assembly #2 to the top TXV port.
6. Adjust the fit of the fuel chiller in the P-clamps, 11-056-0041, as necessary.

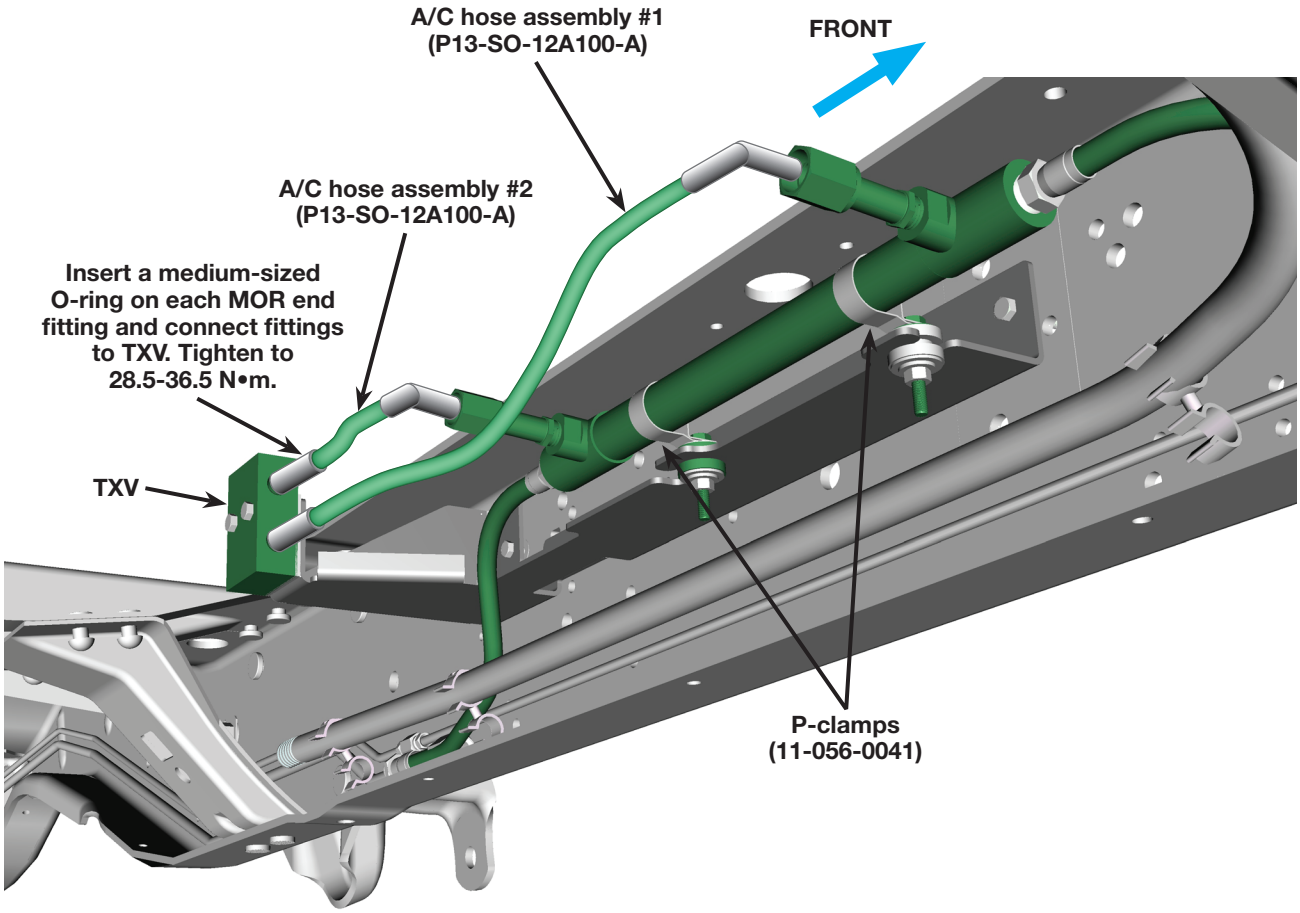


Figure 14 – Chiller A/C Line Connections

CONNECTING CHILLER FUEL AND A/C LINES TO VEHICLE

1. Attach the forward side flexible fuel supply line #2, P-10S102-D-407, to the forward fuel supply line #1, P13-SO-10S110-A, end. Adjust the location of the fuel chiller in the P-clamps if necessary to ensure that the lines do not flex and contact any sharp corners.
2. Install one edge guard strip, 22-420-0001, on the chiller mounting bracket edge near the rear fuel supply line #2 (**Figure 15**). Install the other strip of edge guard, 22-420-0001, on the vapor canister bracket near the forward fuel line (**Figure 15**).

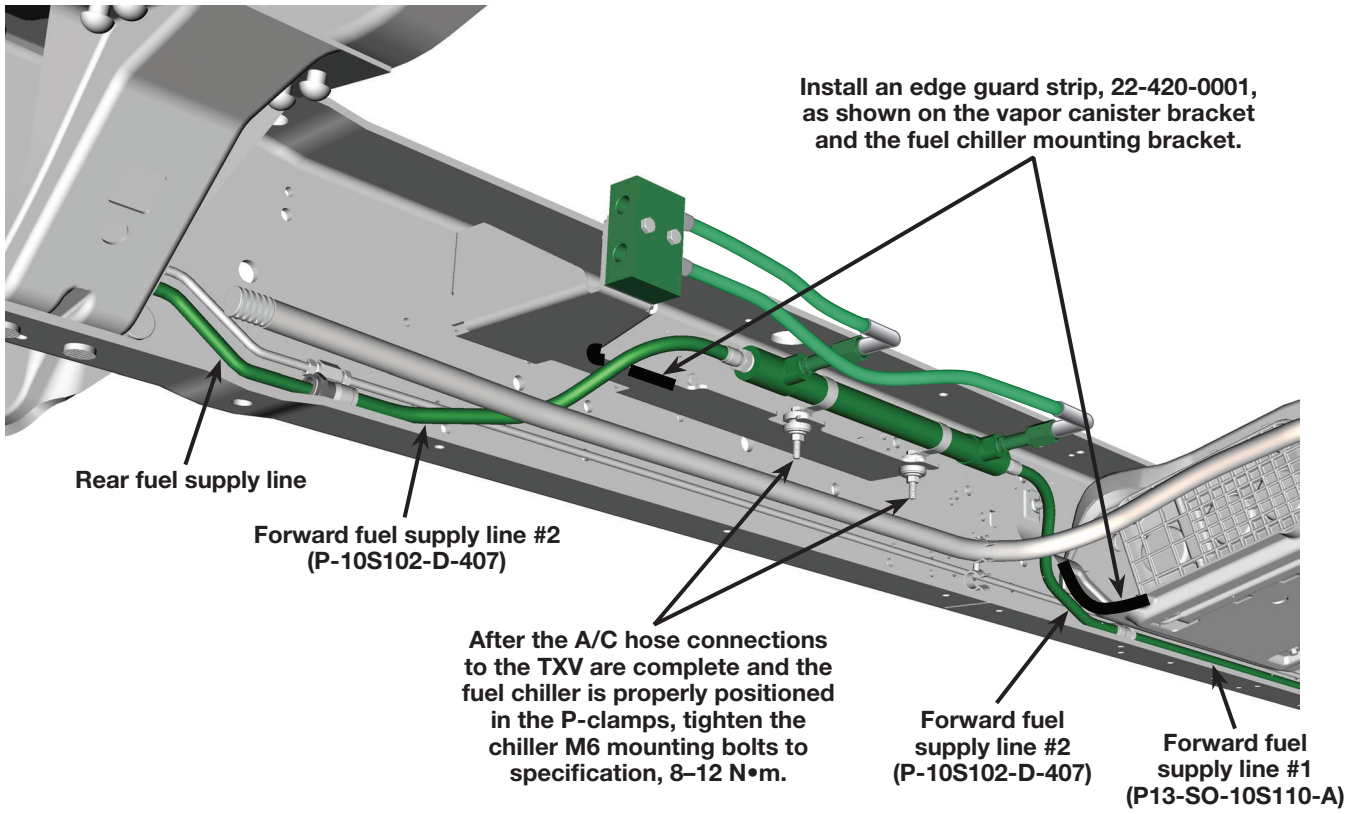


Figure 15 – Chiller Fuel Line Connections

3. Insert the large O-ring onto the -10 MOR fitting of the large A/C hose assembly #4, P13-SO-12A100-D. Install the small O-ring onto the -6 MOR fitting of the small A/C hose assembly, P13-SO-12A100-C.
4. Referencing Figure 16, attach the -10 MOR end of the larger hose to the top port of the TXV and tighten to 39.5-44.5 N•m. Attach the -6 MOR end of the smaller hose to the bottom port on the TXV and tighten to 22-27 N•m.
5. Flex the larger A/C line with the -12 tee up to the existing 5/8” A/C line with a large sweeping radius and mark the location of the center of the tee relative to the line. Flex the smaller A/C line with the -8 tee up to the existing 13/32” A/C line with a large sweeping radius and mark the location of the center of the tee relative to the line.
6. Cut the existing A/C lines at the marked locations. Splice the -12 tee end of A/C hose assembly #4 into the 5/8" line with hose clamps and hose clamp locators (**Figure 17**). Then splice the -8 tee end of A/C hose assembly #3 into the 13/32" line with hose clamps and hose clamp locators. Use the Oetiker clamp tool, or equivalent, to secure the tees to the cut vehicle A/C hose lines. Secure the lines as necessary to ensure that they do not contact the frame.

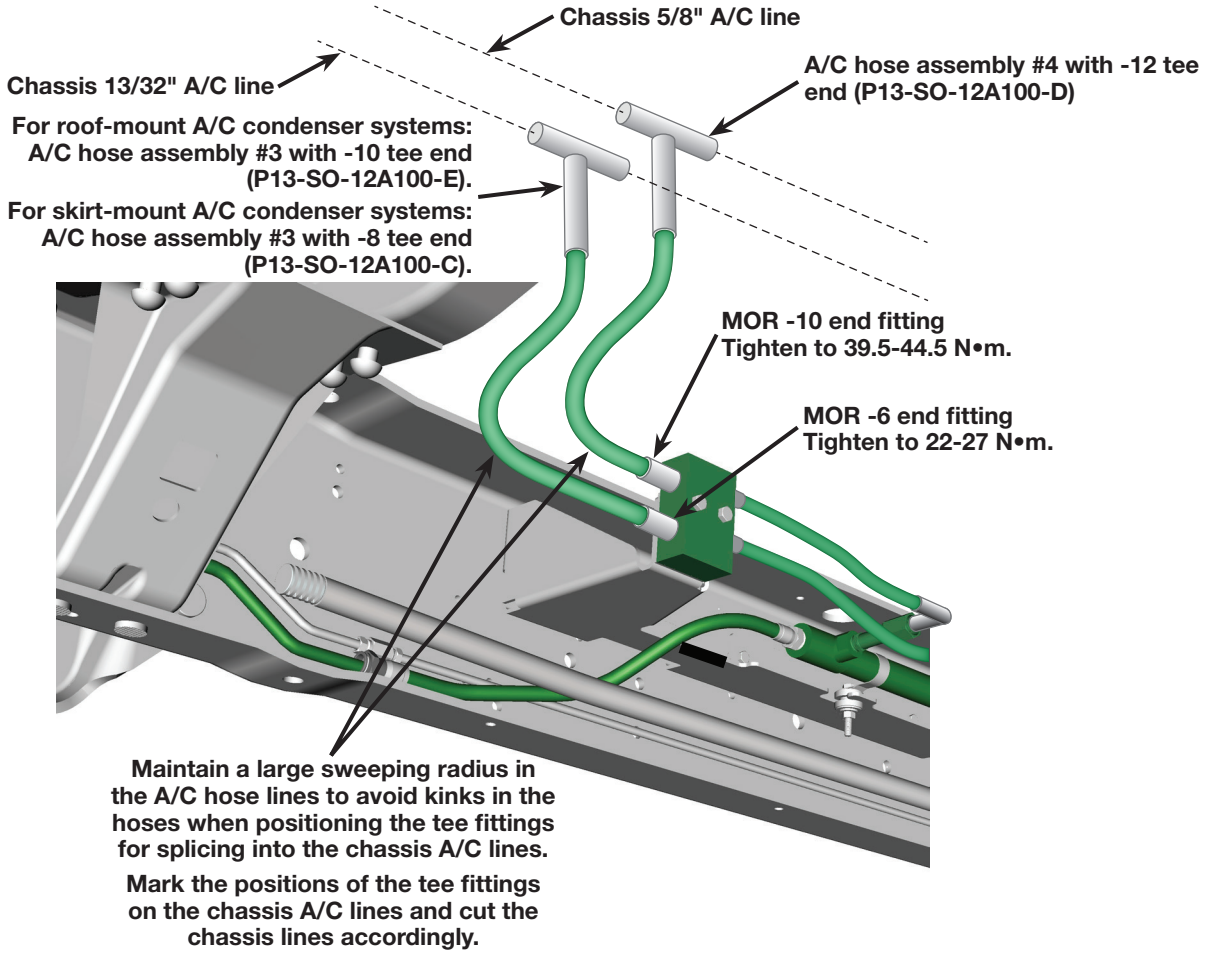


Figure 16 – TXV-to-Chassis A/C Line Connections

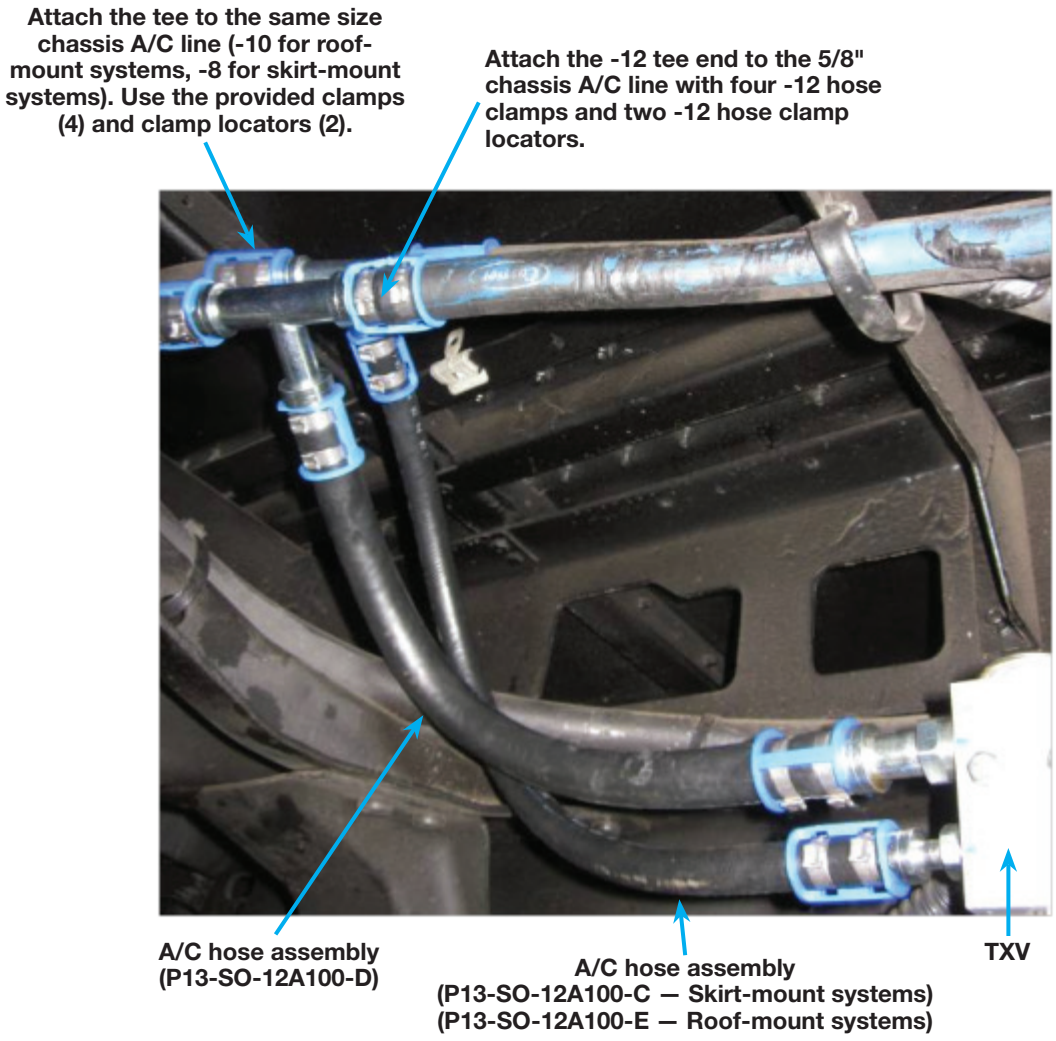


Figure 17 – TXV-to-Chassis A/C Line Connections Completed

SCHEMATIC — FUEL CHILLER A/C WIRING HARNESS

The following schematic shows the underhood harness, P13-SO-18A100-A, with an additional terminal connection for the A/C control jumper harness, P13-SO-18C230-A, required for the fuel chiller. The A/C control jumper harness extends from its connection to the underhood harness in the engine compartment through the pass-through hole in the dash panel and into the vehicle body compartment. In the body compartment, the two-wire jumper harness is connected to the system at the secondary A/C control junction.

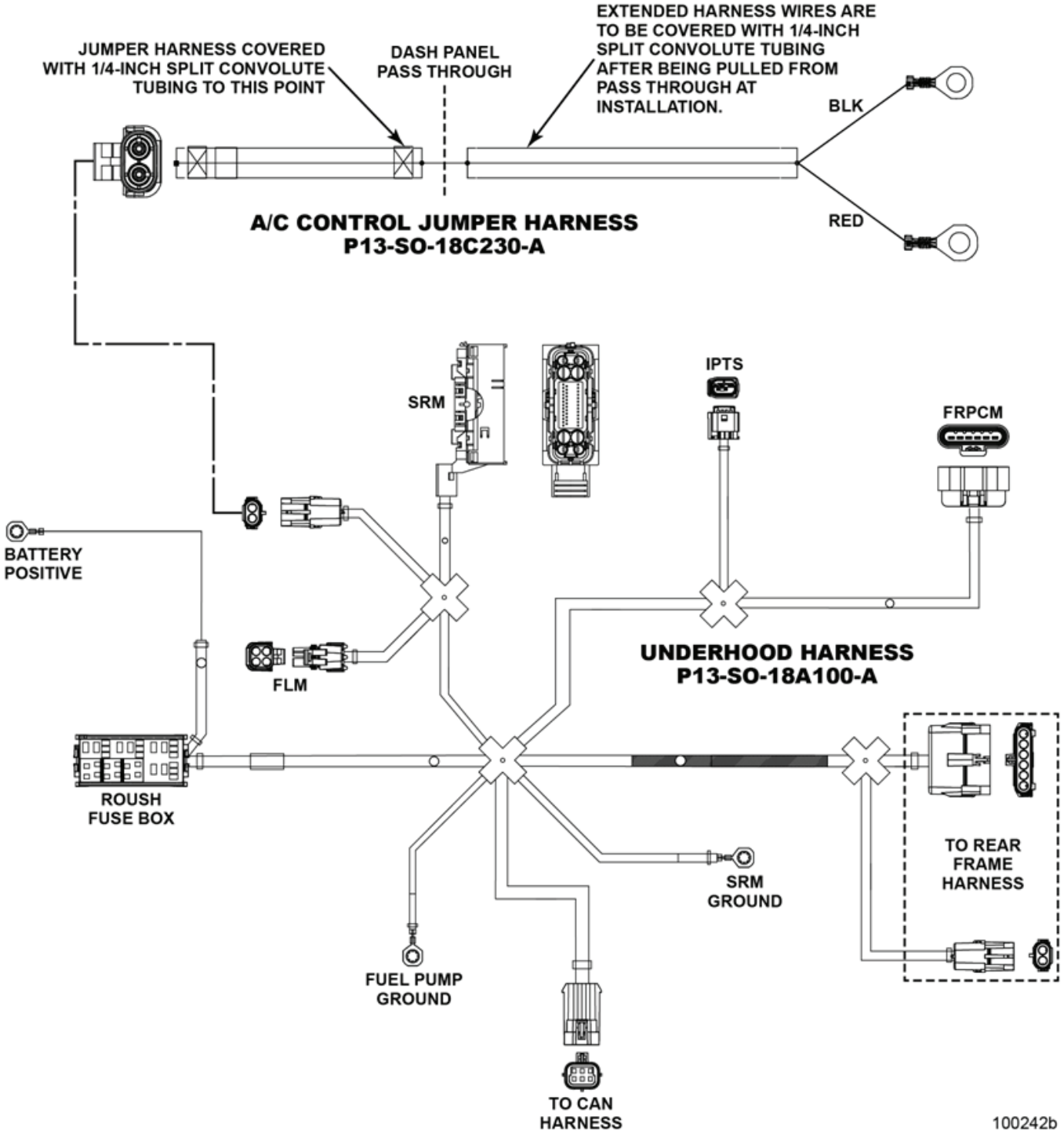


Figure 18 – Underhood Harness with Fuel Chiller and A/C Control Jumper Harness

CONNECTOR LOCATION ON UNDERHOOD HARNESS FOR A/C CONTROL JUMPER HARNESS

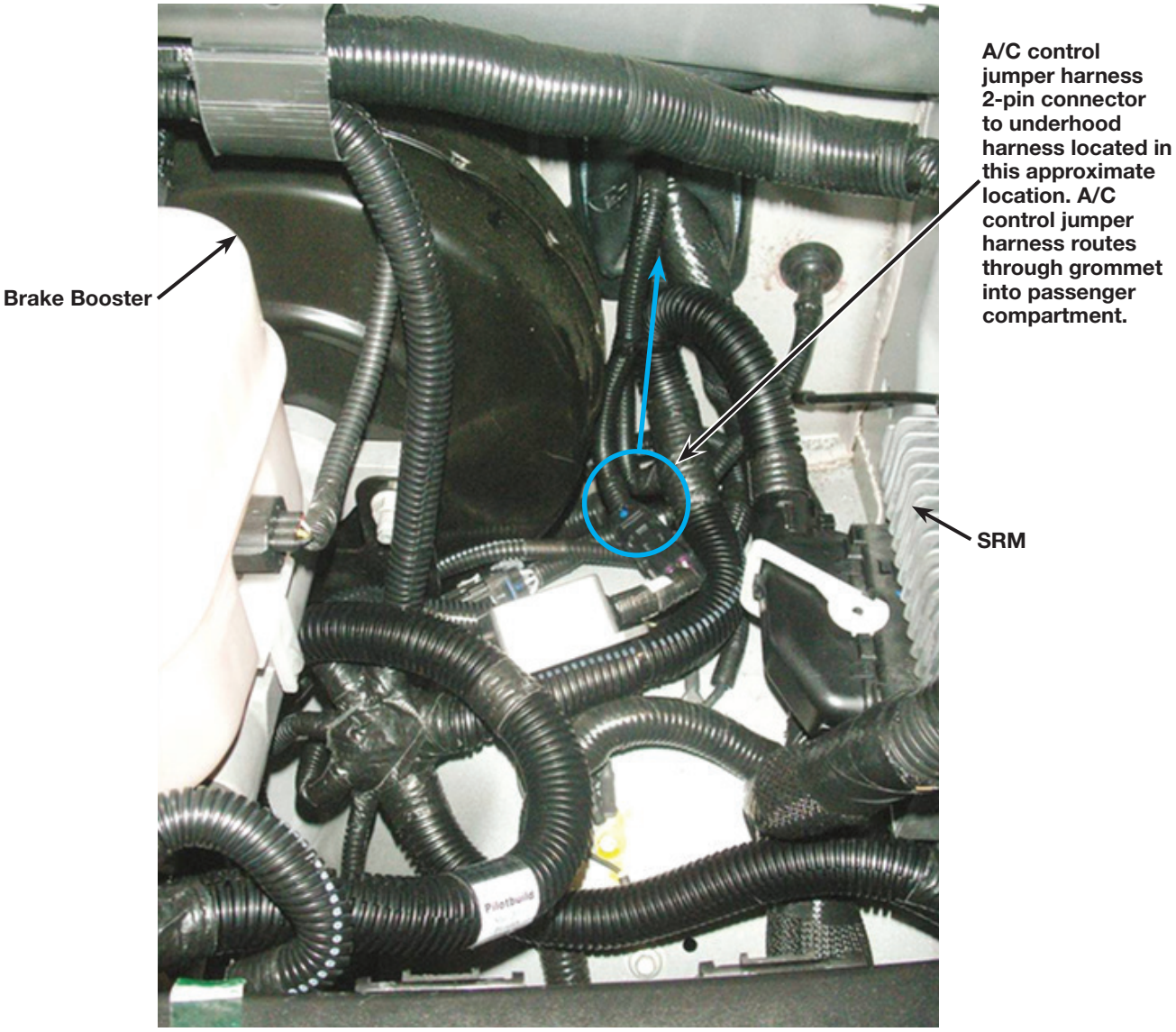


Figure 19 – A/C Control Jumper Harness Location

WIRING INSTRUCTIONS FOR COMPATABILITY WITH CARRIER A/C SYSTEMS

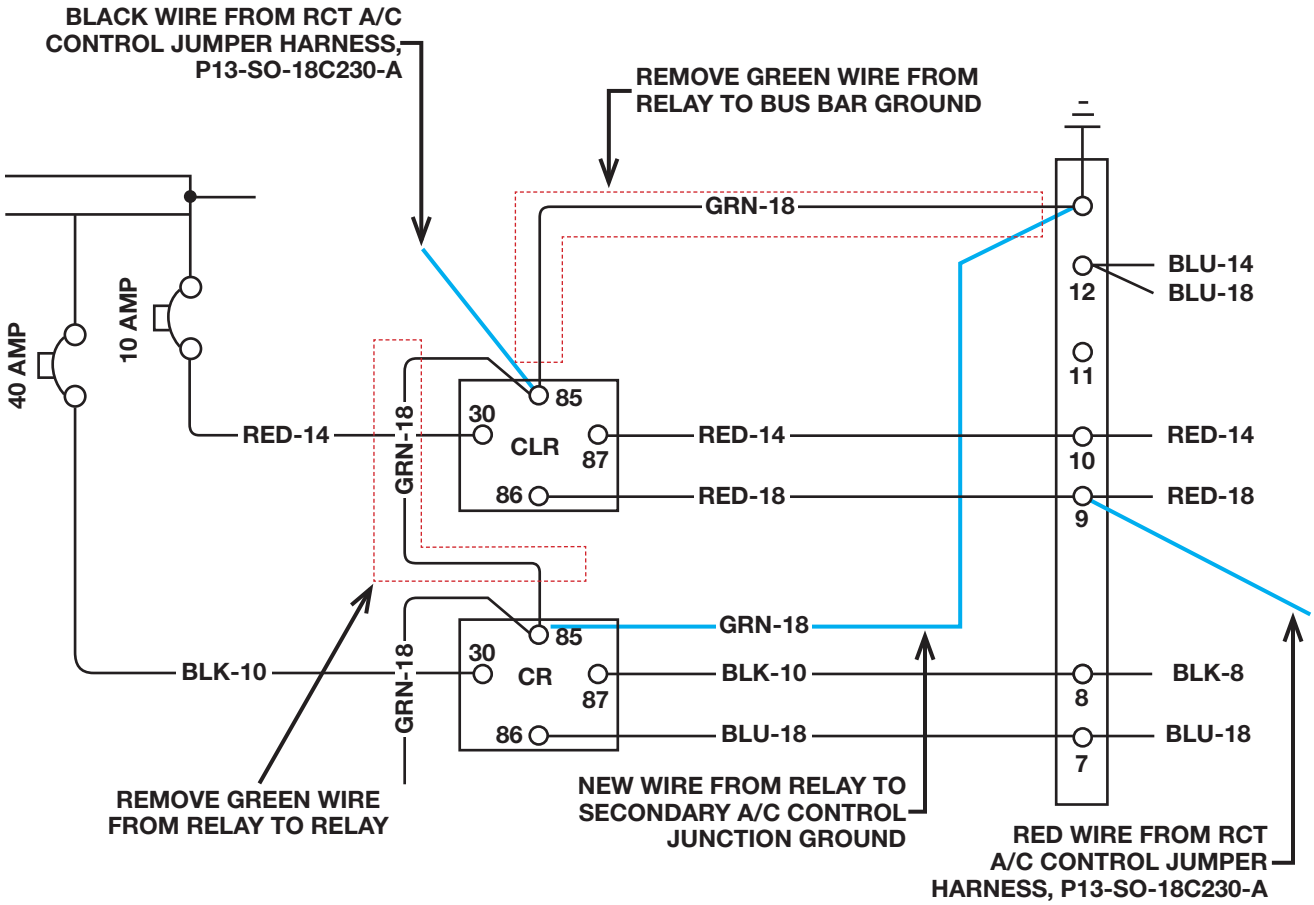


Figure 20 – A/C Control Jumper Harness Schematic

RECHARGING SECONDARY A/C SYSTEM

1. Recharge the A/C system. Fill with 3.5 lb of R134a. Determine PAG oil fill amount by taking the sum of the PAG46 recovered during the charge pull and from the compressor, plus 0.5 oz.
2. Check that the complete A/C circuit will hold a vacuum to ensure that it is not leaking. Refer to the appropriate model year E-450 Ford Workshop Manual, Section 412-00, Climate Control System, for charging and leak testing information.

COMPLETING THE KIT INSTALLATION

If you are installing the fuel chiller kit as a retrofit to a previously installed ROUSH CleanTech Propane Autogas System, proceed to “Adding Fuel to the Tank and Performance System Leak Checks” in the appropriate installation manual.

If you are installing the fuel chiller kit as part of a new propane autogas system install, proceed with the instructions in the ROUSH CleanTech Propane Autogas System Installation Manual.