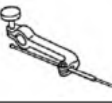


Engine - Enhanced Long Block

Special Tool(s) / General Equipment

	100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge
	205-036 (T70P-4067-A) Wrench
	303-050 (T70P-6000) Lifting Bracket, Engine
	303-103 (T74P-6375-A) Holding Tool, Flywheel T74P-77000-A TKIT-2009TC-F
	303-1518 Bracket, Engine Removal TKIT-2009C-F TKIT-2009C-ROW
	303-214 (T83T-6312-B) Wrench, Fan Clutch Nut
	308-021 (T75L-4201-A) Gauge, Clutch Housing
Strap Wrench	
Floor Crane	
Hose Clamp Remover/Installer	

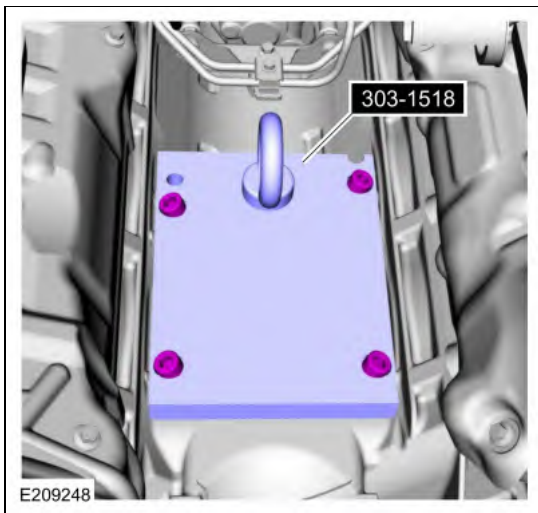
NOTE: This procedure assumes the engine will be installed using the recommended body off engine installation procedure. If it will be necessary to install the engine using the alternate body on engine installation procedure, some of the components in this procedure should not be installed at this time. Refer to Engine â€œ Body On in this section.

NOTE: During the repair or installation of fuel-related components, cap, tape or otherwise appropriately protect all fuel opening to prevent the ingress of dirt or other contamination. Remove caps, tape and other protective materials prior to installation.

NOTE: For EXPORT ONLY vehicles (outside US/Canada) an Export Supplement is provided and should be referenced to identify differences that can impact service procedures. Vehicles can be identified by referring to the underhood Vehicle Emission Control Information (VECI) label which states, "Not certified for US EPA or CARB Regulations".

NOTE: Refer to the exploded view under the Engine Component View in the Description and Operation.

1. Install Special Service Tool: 303-1518 Bracket, Engine Removal.
Torque: 41 lb.ft (55 Nm)



2.
 - Using a Floor Crane, remove the engine from the shipping crate. Position the engine on wood blocks as needed.
Use the General Equipment: Floor Crane
 - Verify that the engine is stable on the wooden blocks.
3. If equipped with a block heater, remove the block heater plug.

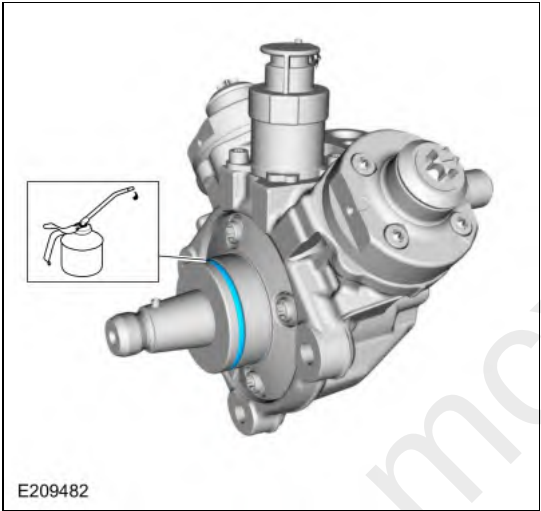


4. If equipped, apply clean engine coolant to the O-ring seal and install the block heater.

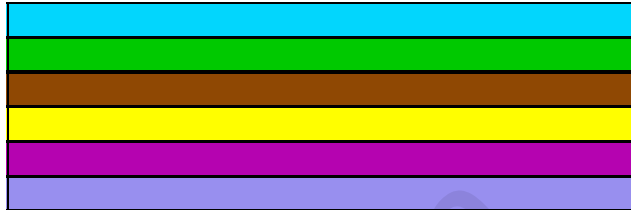
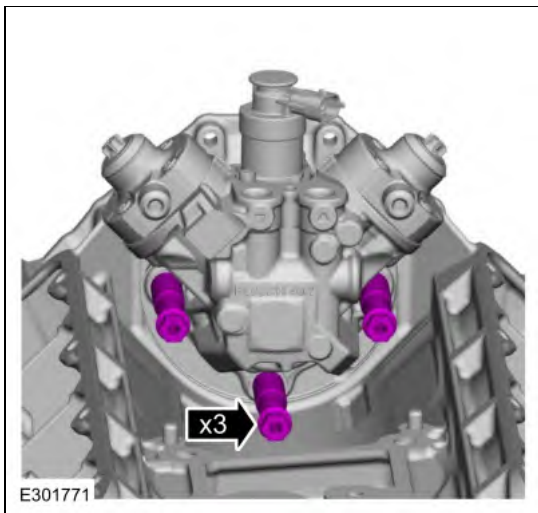
Refer to: Specifications (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Specifications).
Torque: 30 lb.ft (40 Nm)



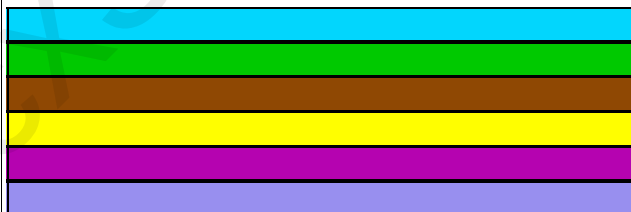
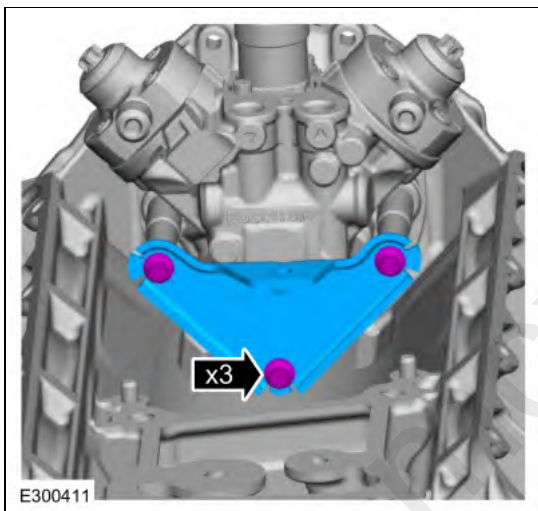
5. Install a new high-pressure fuel injection pump O-ring seal and lubricate with clean engine oil.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).



6. Install the high-pressure fuel injection pump and the high-pressure fuel injection pump spacers.
Torque: 18 lb.ft (24 Nm)

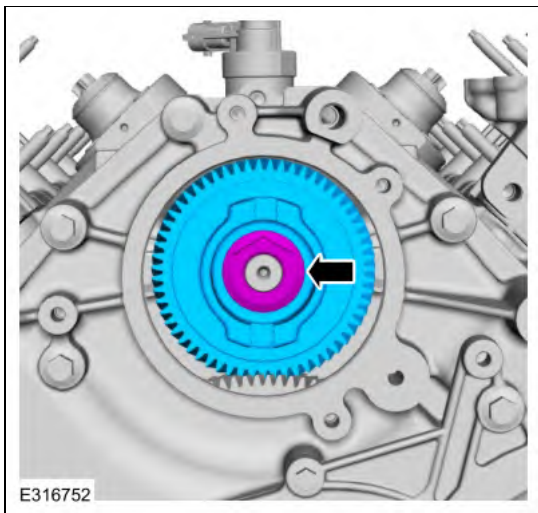


7. Install the fuel rail supply tube bracket and the bolts.
Torque: 89 lb.in (10 Nm)



8. **NOTE:** The crankshaft gear contains a single timing mark. The camshaft gear contains a single timing mark and a double timing mark. The high-pressure fuel injection pump gear contains a double timing mark. The engine is timed correctly when the single mark on the crankshaft gear is aligned with the double mark on the camshaft gear, and the single mark on the camshaft gear is aligned with the double mark on the high-pressure fuel injection pump gear. Additionally, the keyway on the high-pressure fuel injection pump drive gear must be at 12 o'clock position.

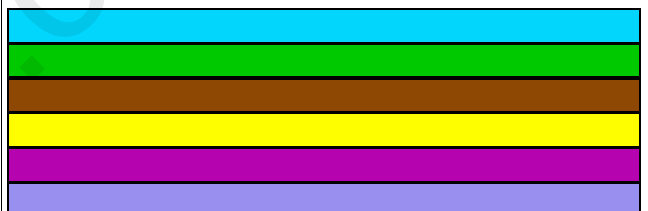
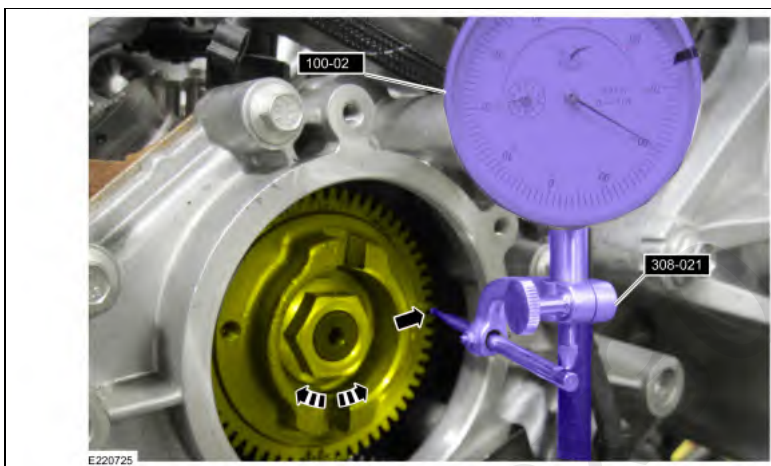
- Install the high pressure fuel injection pump drive gear and nut.
Torque: 59 lb.ft (80 Nm)
- Verify the timing marks are aligned.



9. Using the special tool, check the high-pressure fuel injection pump drive gear backlash.

Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).

Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge. , 308-021 (T75L-4201-A) Gauge, Clutch Housing.

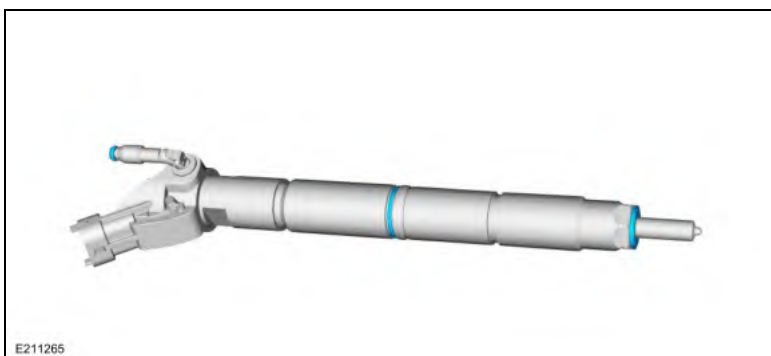


10. **NOTE:** Do not apply engine oil to the fuel injectors.

NOTE: Only one fuel injector shown.

NOTE: If the fuel injector is being reused, make sure to install it in the original location.

Install a new copper combustion gasket, O-ring seal and fuel injector return O-ring seal on the fuel injectors. Position the fuel injectors into the engine.



11.

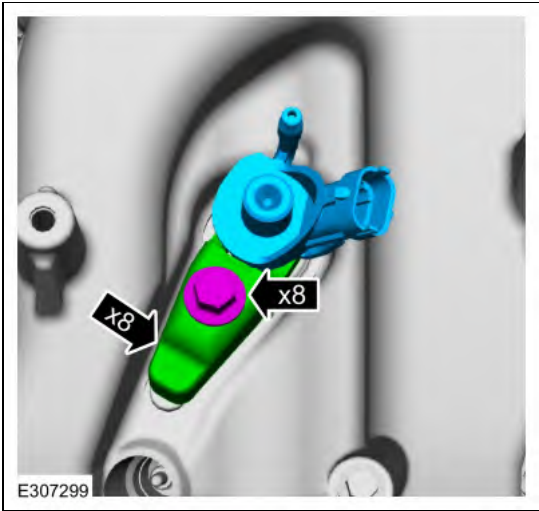
- **NOTICE:** Failure to tighten the fuel injector correctly can lead to engine failure.

Install the fuel injector hold-down clamps and the new fuel injector bolts.

Torque:

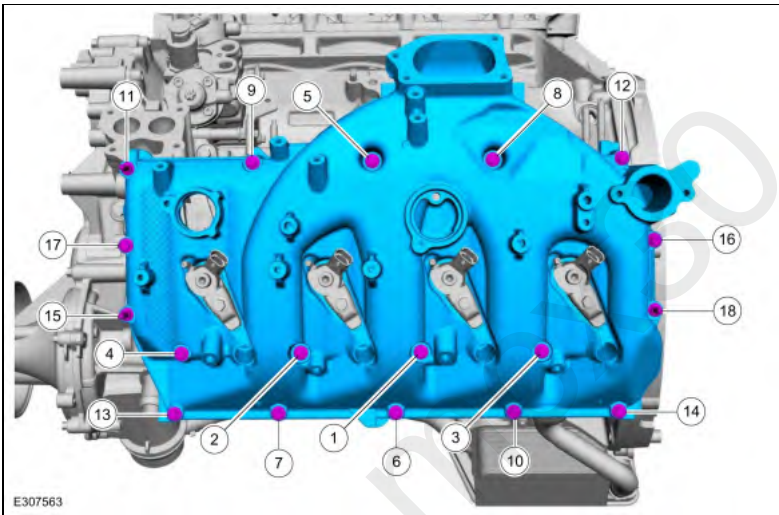
Stage 1: 22 lb.ft (30 Nm)

Stage 2: 90°



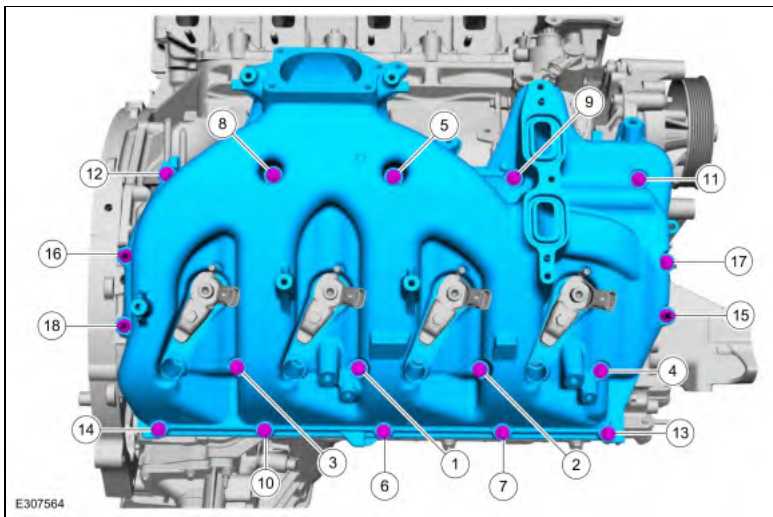
12. Final tighten the LH valve cover bolts in the sequence shown.

Torque: 106 lb.in (12 Nm)

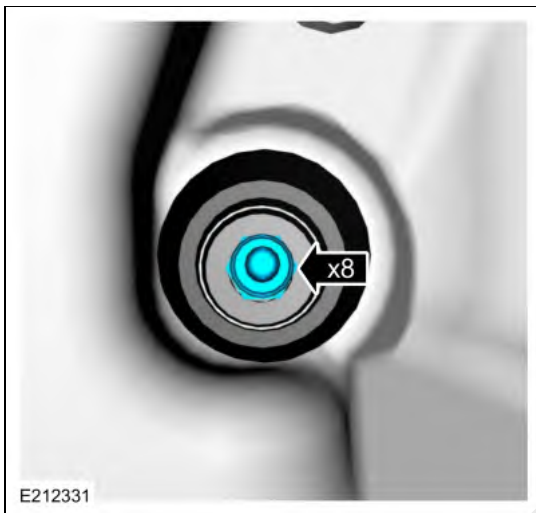


13. Final tighten the RH valve cover bolts in the sequence shown.

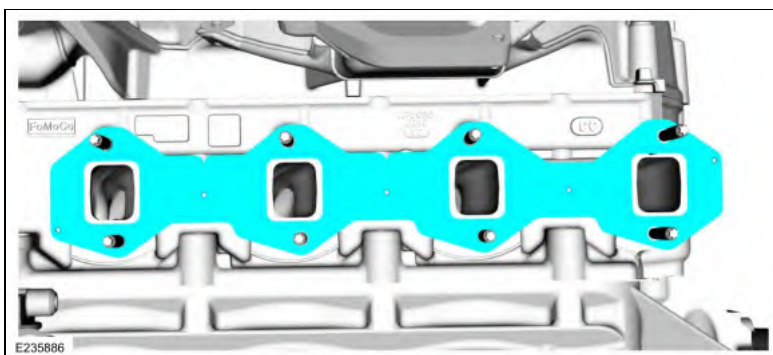
Torque: 106 lb.in (12 Nm)



14. Install the glow plugs.
Torque:
 Stage 1: 35 lb.in (4 Nm)
 Stage 2: 50 Å°



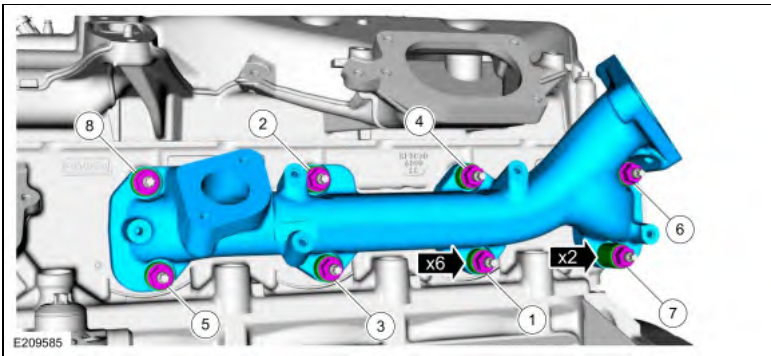
15. Install a new RH exhaust manifold gasket.



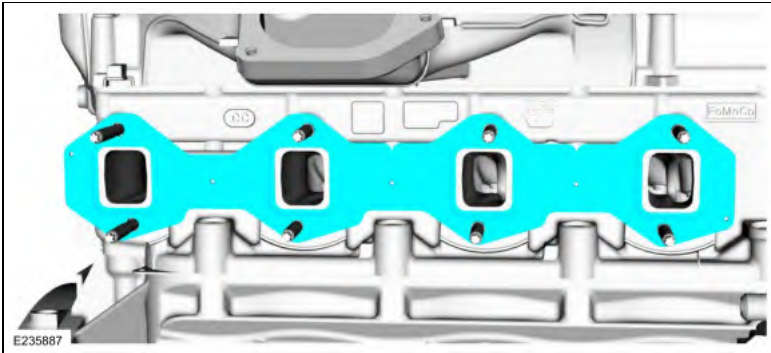
16. **NOTE:** Install the spacers as marked on removal.

Install the RH exhaust manifold, the spacers and the new nuts.

- Torque:*
 Stage 1: 159 lb.in (18 Nm)
 Stage 2: 18 lb.ft (25 Nm)
 Stage 3: Tighten a second time to : 18 lb.ft (25 Nm)



17. Install a new LH exhaust manifold gasket.



18. **NOTE:** Install the spacers as marked on removal.

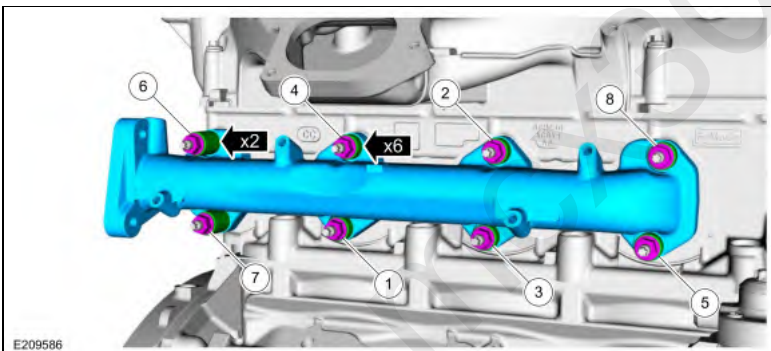
Install the LH exhaust manifold, the spacers and the new nuts.

Torque:

Stage 1: 159 lb.in (18 Nm)

Stage 2: 18 lb.ft (25 Nm)

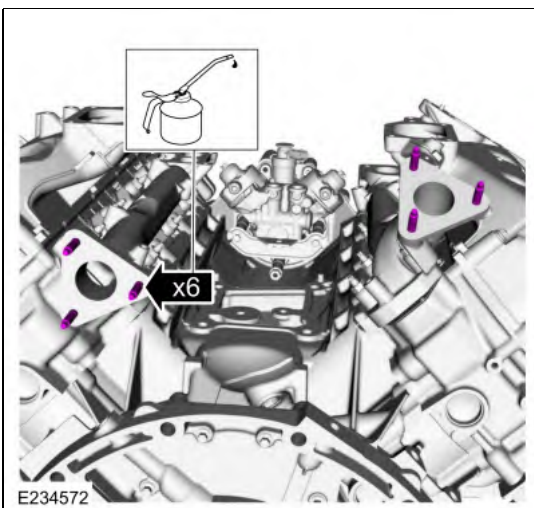
Stage 3: Tighten a second time to : 18 lb.ft (25 Nm)



19. Apply clean engine oil to the threads and install the exhaust manifold studs.

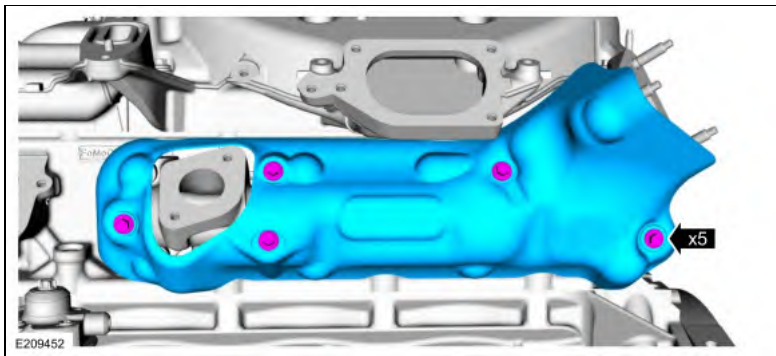
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).

Torque: 115 lb.in (13 Nm)

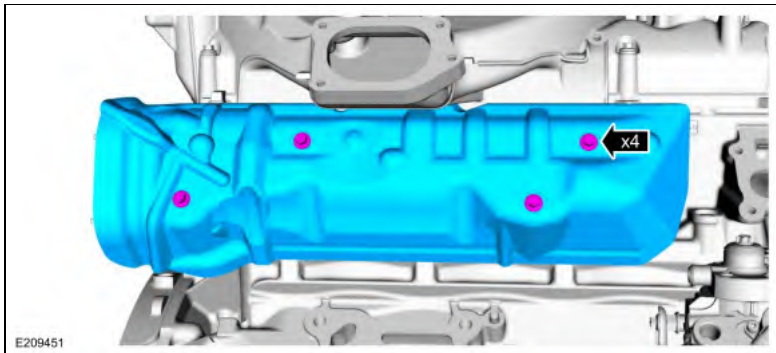


20. Install the RH exhaust manifold heat shield and the bolts.

Torque: 89 lb.in (10 Nm)

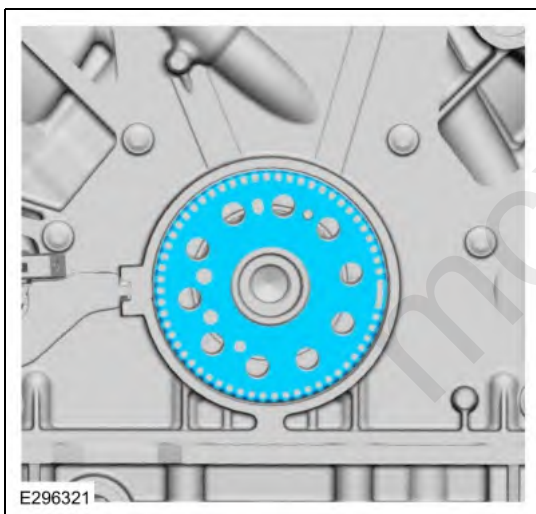


21. Install the LH exhaust manifold heat shield and the bolts.
Torque: 89 lb.in (10 Nm)

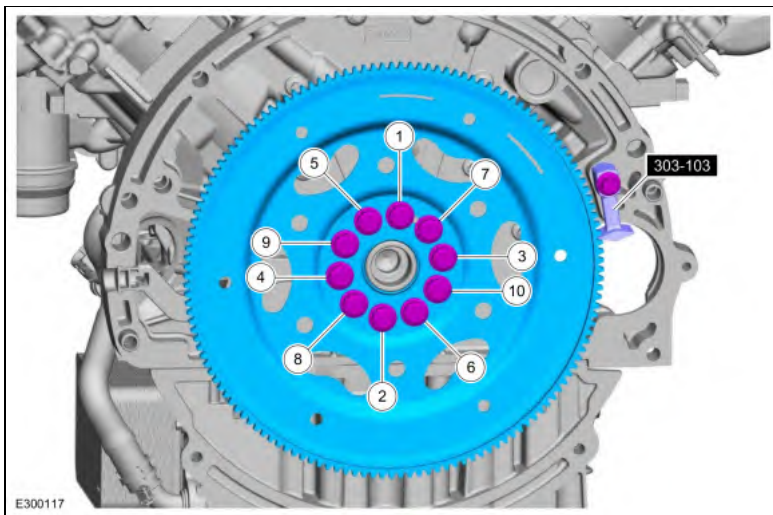


22. **NOTICE: Do not use magnetic screwdrivers or other magnetic tools around the CKP sensor and the crankshaft sensor pulse ring or damage to the components may occur.**

Install the crankshaft sensor pulse ring.



23. Install the flexplate and the new bolts.
Use Suggested Tool: 303-103 (T74P-6375-A) Holding Tool, Flywheel. Tool shown or a commercially available equivalent can be used.
Torque:
Stage 1: 44 lb.in (5 Nm)
Stage 2: 74 lb.ft (100 Nm)



24. Install a new vacuum pump gasket.

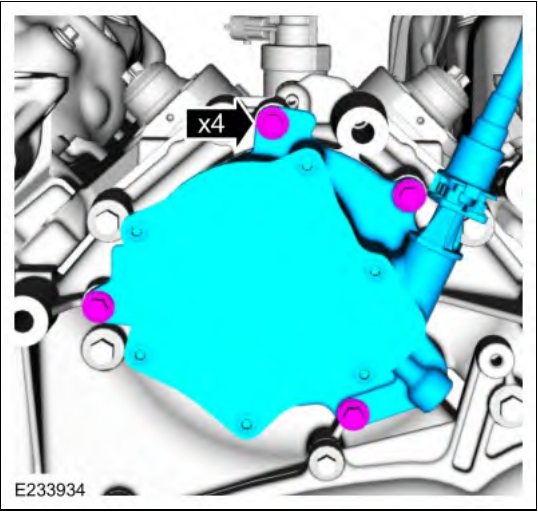


25. Install the vacuum pump and the bolts.

Torque:

Stage 1: 89 lb.in (10 Nm)

Stage 2: 45 Å°



26. **NOTICE:** To prevent engine damage, always install new bolts when installing the crankshaft pulley.

NOTE: Use the strap wrench to prevent the engine from turning while tightening the bolts.

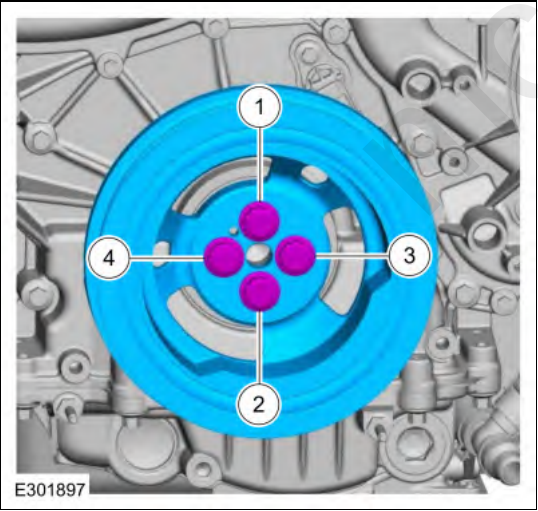
Position the crankshaft pulley and install the new bolts.

Use the General Equipment: Strap Wrench

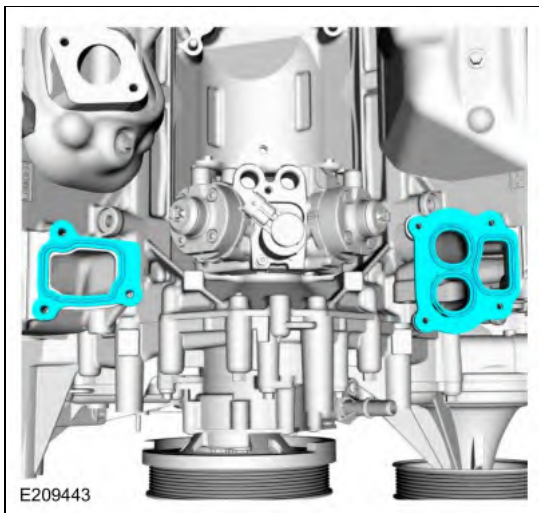
Torque:

Stage 1: 22 lb.ft (30 Nm)

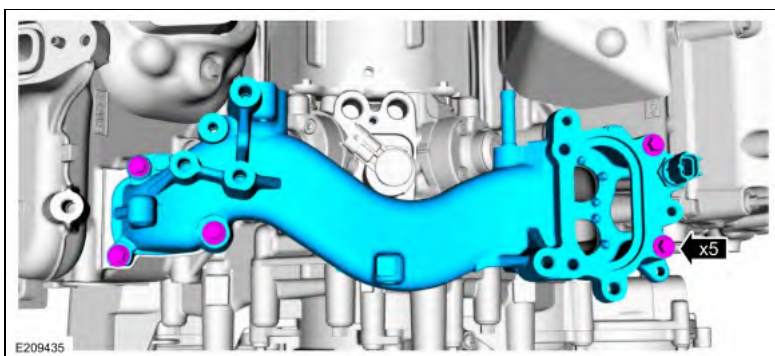
Stage 2: 90 Å°



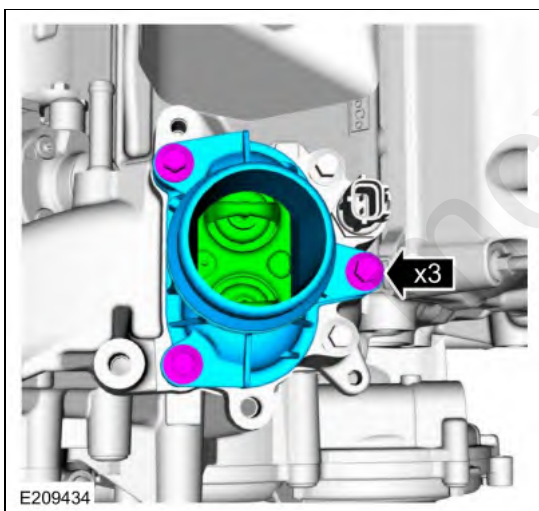
27. Install the new coolant crossover manifold gaskets.



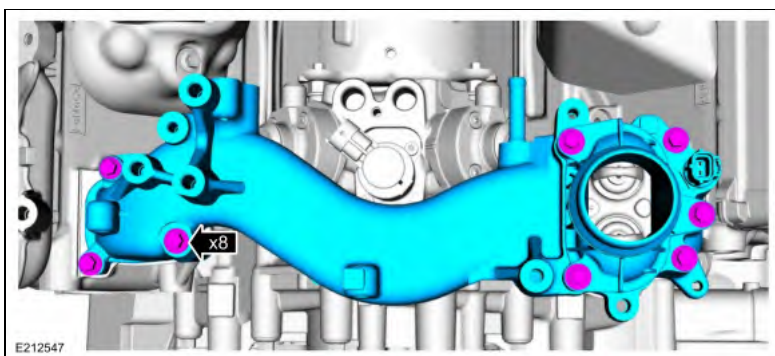
28. Install the coolant crossover manifold and the bolts. Finger-tighten the bolts.



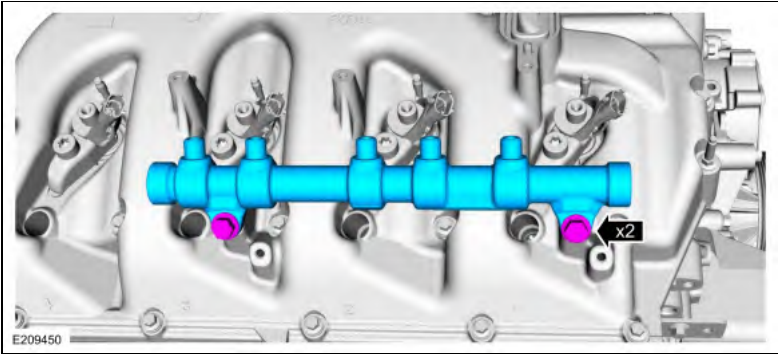
29. Install the new thermostat, the thermostat housing and the bolts. Finger-tighten the bolts.



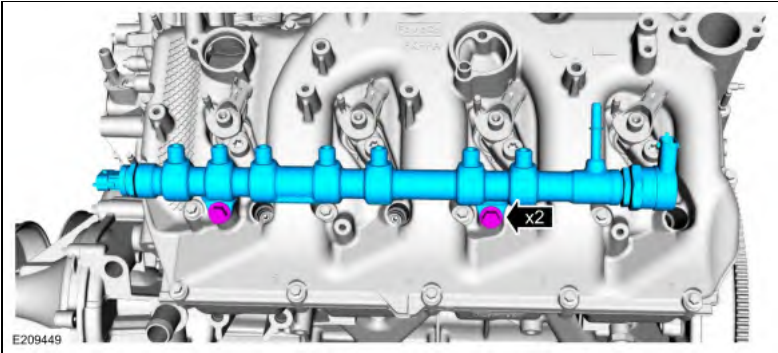
30. Tighten the coolant crossover manifold bolts and the thermostat housing bolts.
Torque: 89 lb.in (10 Nm)



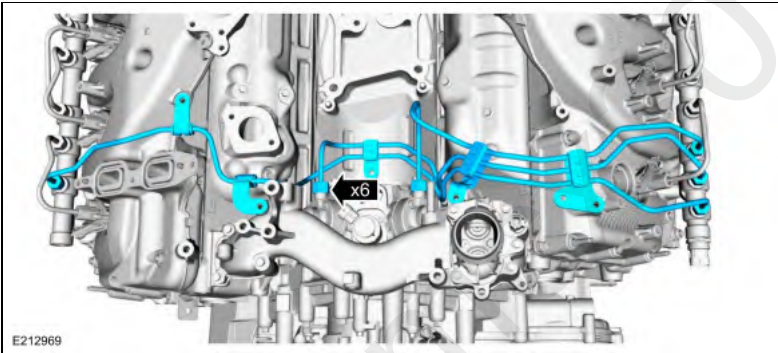
31. Position the RH fuel rail and loosely install the bolts.



32. Position the LH fuel rail and loosely install the bolts.



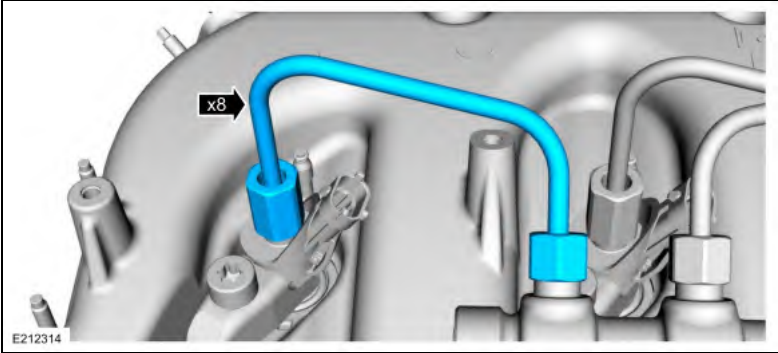
33. Position the fuel rail supply tube assembly. Hand start the fuel rail supply tube assembly connectors.



34. **NOTE:** Only one fuel injector supply tube shown.

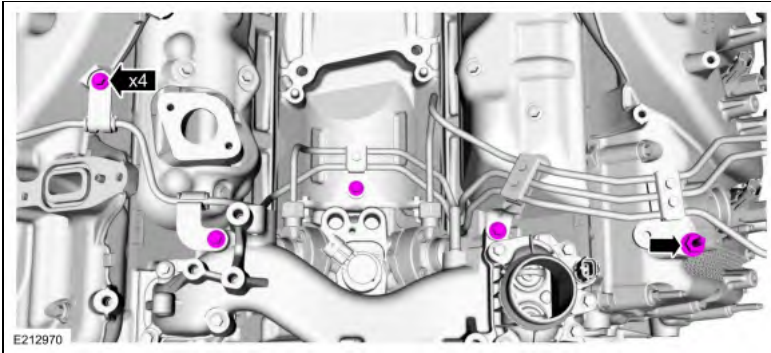
NOTE: Only hand start the fuel injector supply tube.

- Install the fuel injector supply tubes.
- Start from front to rear of the engine.



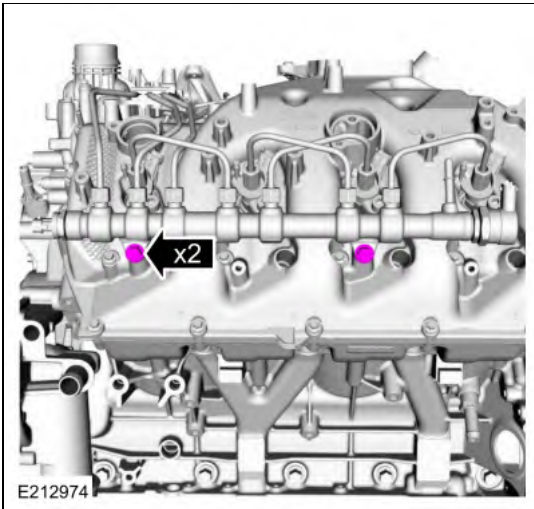
35. **NOTE:** Only hand start the fuel rail supply tube assembly bolts.

Install the fuel rail supply tube assembly bolts.



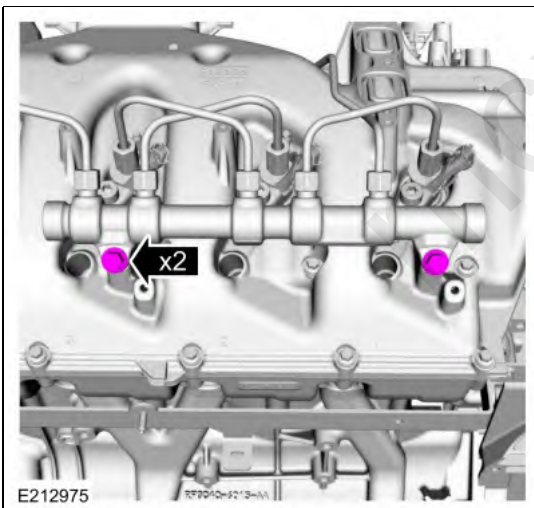
36. Tighten the LH fuel rail bolts.

Torque: 18 lb.ft (24 Nm)



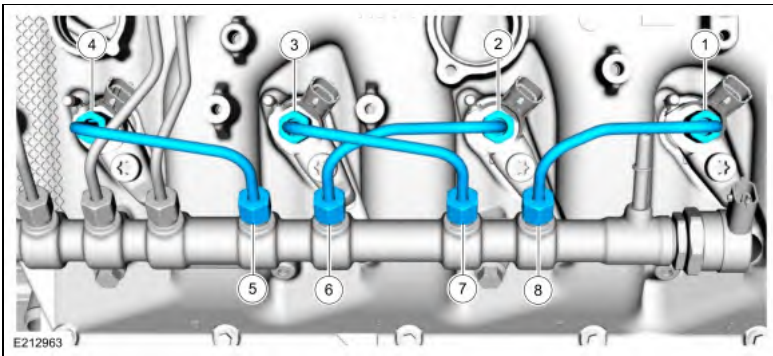
37. Tighten the RH fuel rail bolts.

Torque: 18 lb.ft (24 Nm)



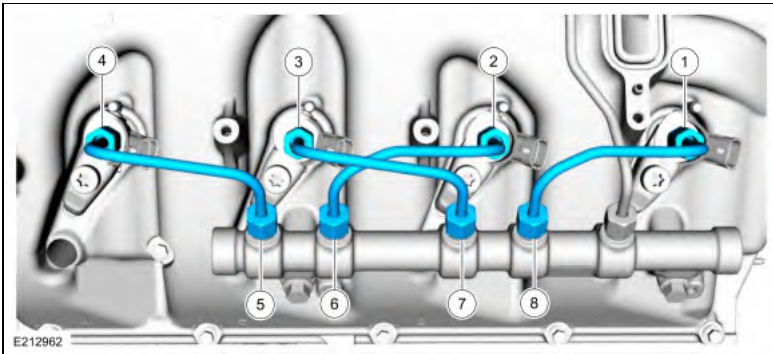
38. Tighten the LH fuel injector supply tubes in the sequence shown.

Torque: 89 lb.in (10 Nm)



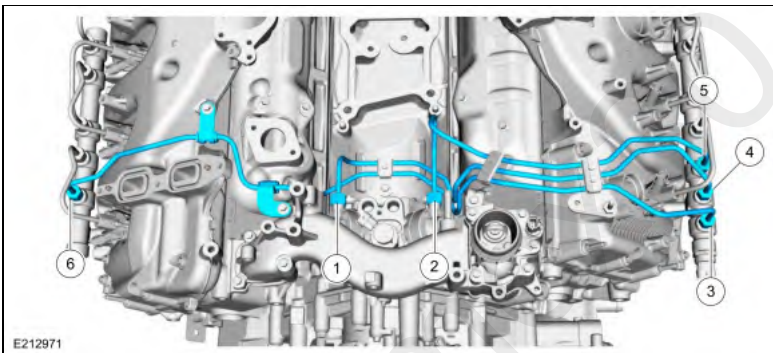
39. Tighten the RH fuel injector supply tubes in the sequence shown.

Torque: 89 lb.in (10 Nm)



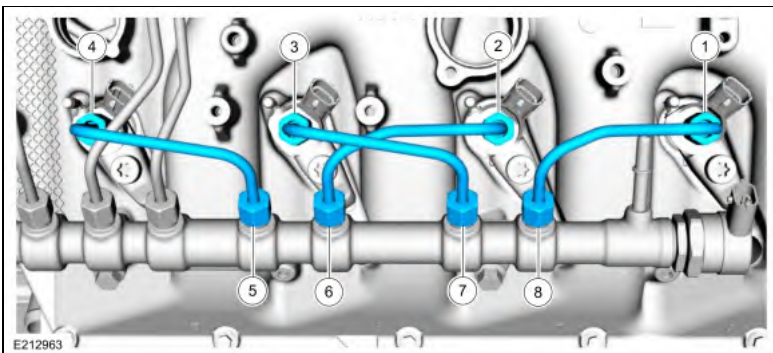
40. Tighten the fuel rail supply tube assembly connectors in the sequence shown.

Torque: 89 lb.in (10 Nm)



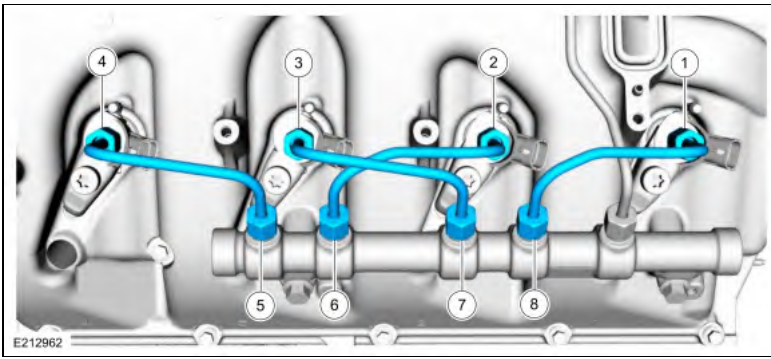
41. Tighten the LH fuel injector supply tubes in the sequence shown.

Torque: 65 Å°



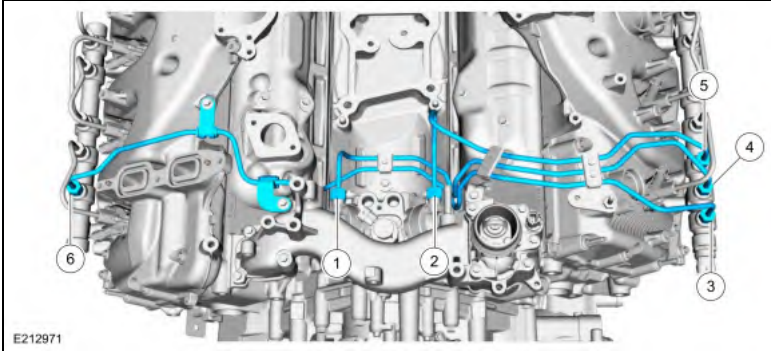
42. Tighten the RH fuel injector supply tubes in the sequence shown.

Torque: 65 Å°



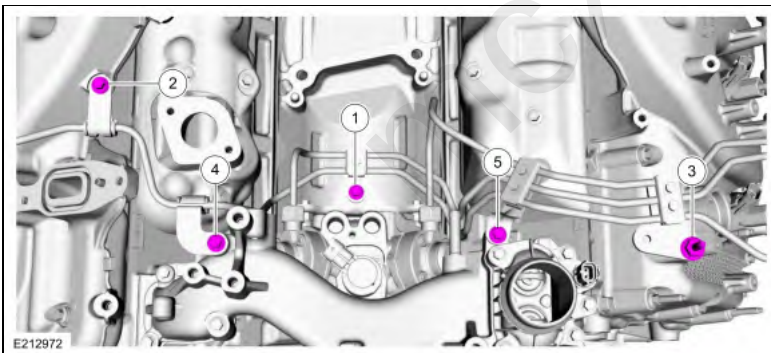
43. Tighten the fuel rail supply tube assembly connectors in the sequence shown.

Torque: 65 Å°



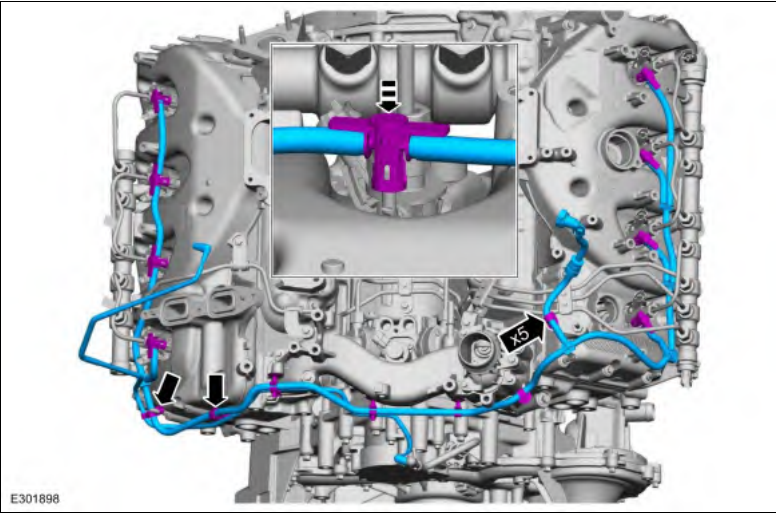
44. Tighten the fuel rail supply tube assembly bolts in the sequence shown.

Torque: 89 lb.in (10 Nm)

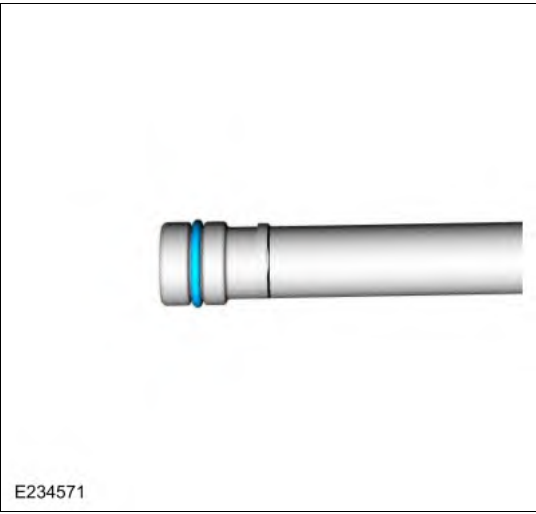


45.

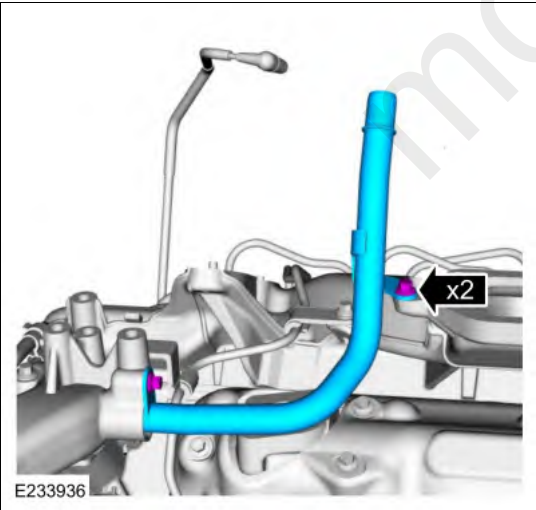
- Position the fuel injector return hose and vacuum hose assembly on the engine and connect the retaining clips.
- Connect the fuel injector return hose fittings to the fuel injectors.
- Push down on the center of the fuel injector return hose fitting to lock the fitting.



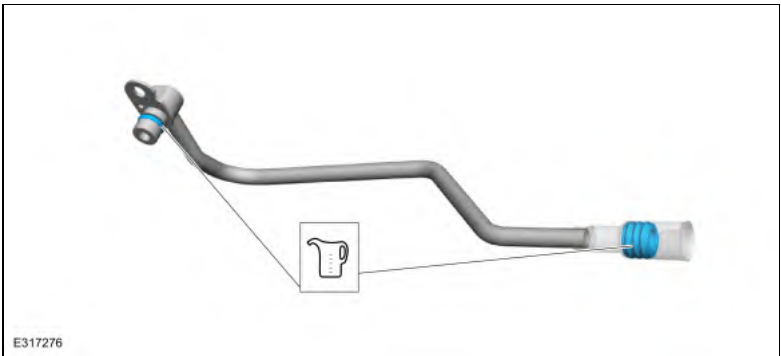
46. Install a new O-ring seal on the heater supply tube and lubricate with clean engine coolant.
Refer to: Specifications (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Specifications).



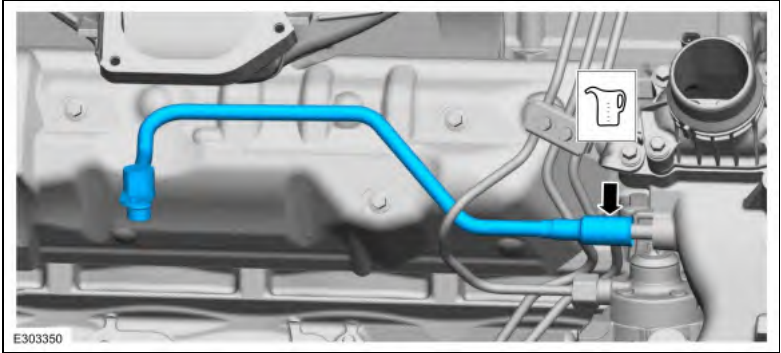
47. Install the heater supply tube and the bolts.
Torque: 89 lb.in (10 Nm)



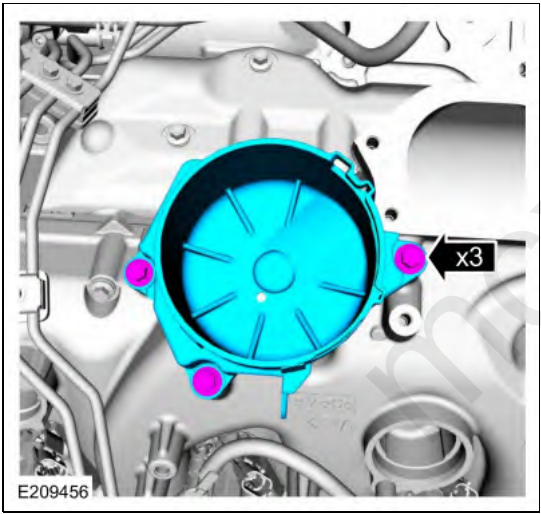
48. **NOTE:** Make sure the grommet is properly seated in the tube.
Install the TC coolant tube O-ring seal and the grommet.



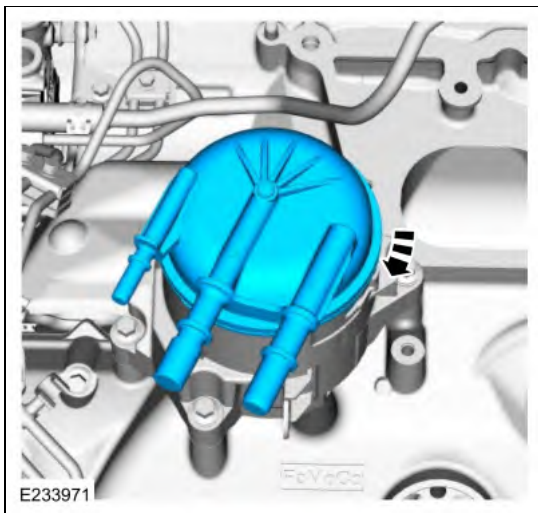
49. Lubricate with clean engine coolant and install the TC coolant tube.
Refer to: Specifications (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Specifications).



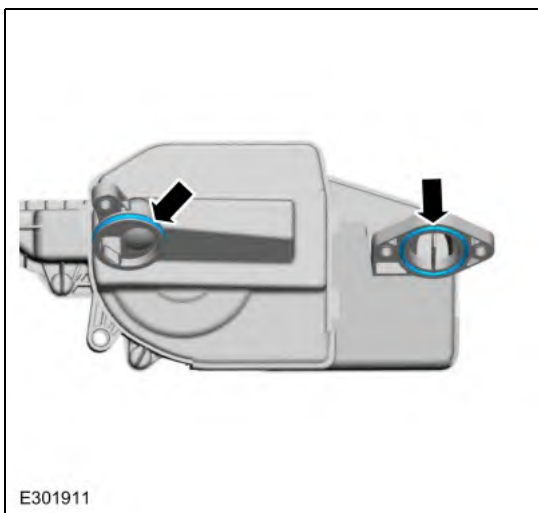
50. Install the secondary fuel filter bracket and bolts.
Torque:
Stage 1: 71 lb.in (8 Nm)
Stage 2: 45 Å°



51. **NOTE:** Rotate the fuel filter clockwise to install.
Install the new secondary fuel filter.



52. If necessary, install the new crankcase vent oil separator gasket and the O-ring seal.



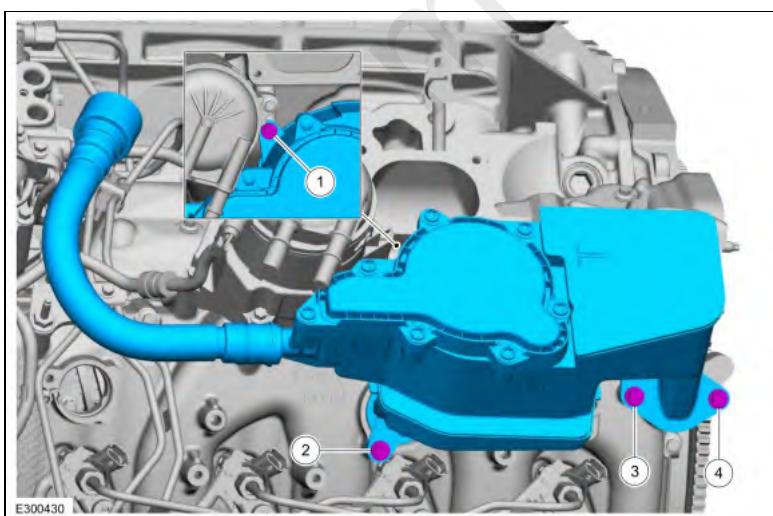
53. **NOTE:** Do not lubricate the O-ring seal or gasket prior to installation.

Install the crankcase vent oil separator and bolts.

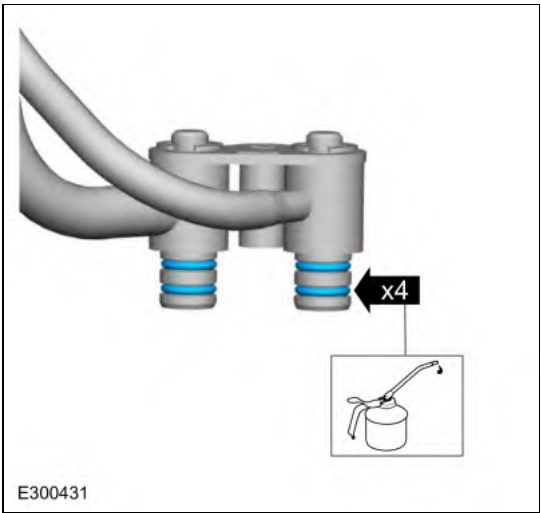
Torque:

Stage 1: 89 lb.in (10 Nm)

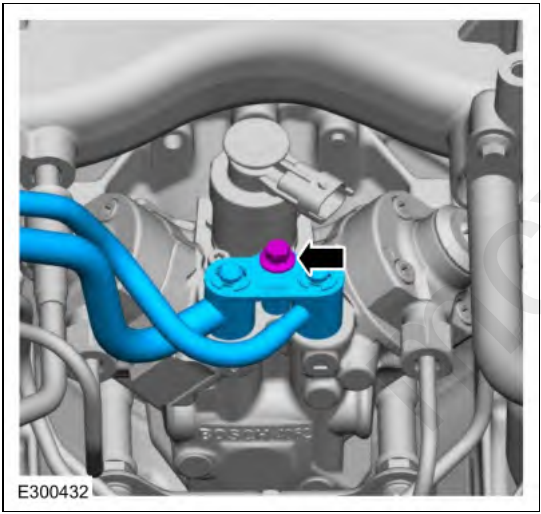
Stage 2: 45 Å°



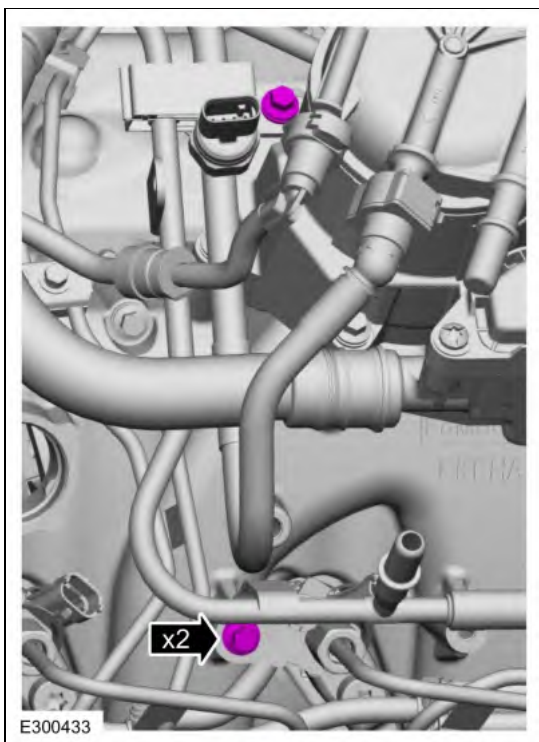
54. Install the new O-ring seals on the fuel injection pump supply tube assembly and lubricate with clean engine oil.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).



55. Install the fuel injection pump supply tube assembly and hand start the bolt.



56. Hand start the fuel injection pump supply tube assembly bolts.

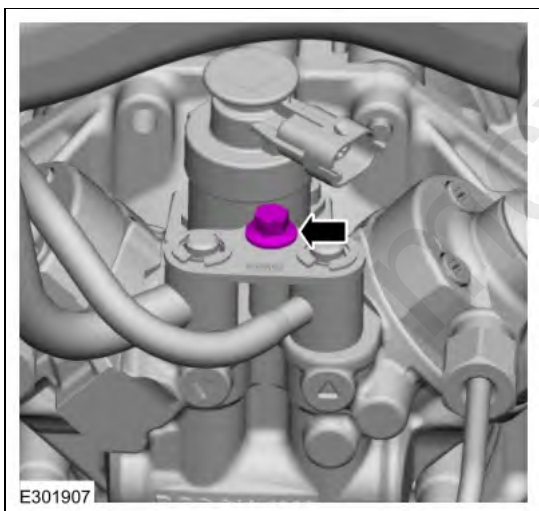


57. Tighten the fuel injection pump supply tube assembly bolt.

Torque:

Stage 1: 89 lb.in (10 Nm)

Stage 2: 45°

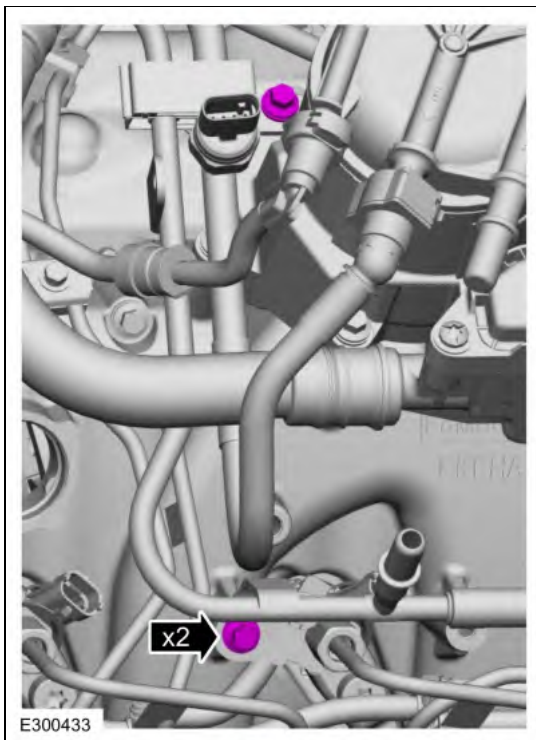


58. Tighten the fuel injection pump supply tube assembly bolts.

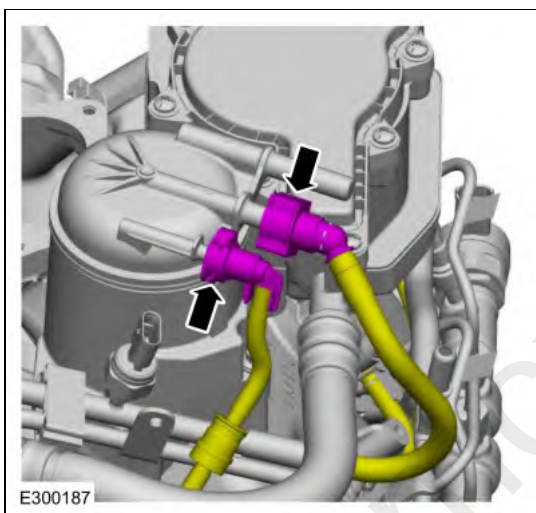
Torque:

Stage 1: 89 lb.in (10 Nm)

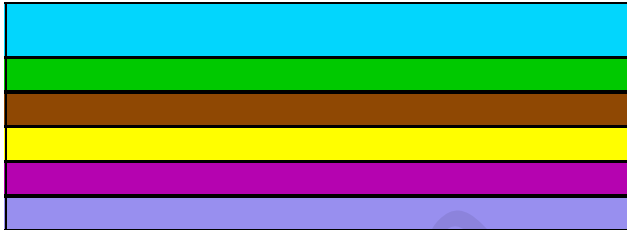
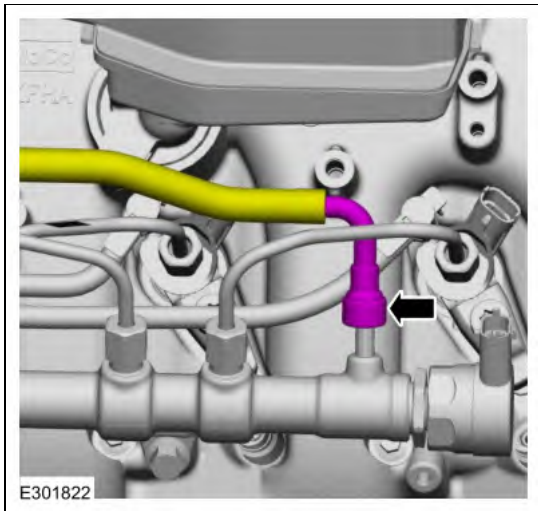
Stage 2: 45°



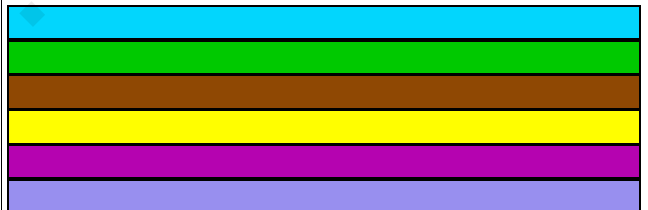
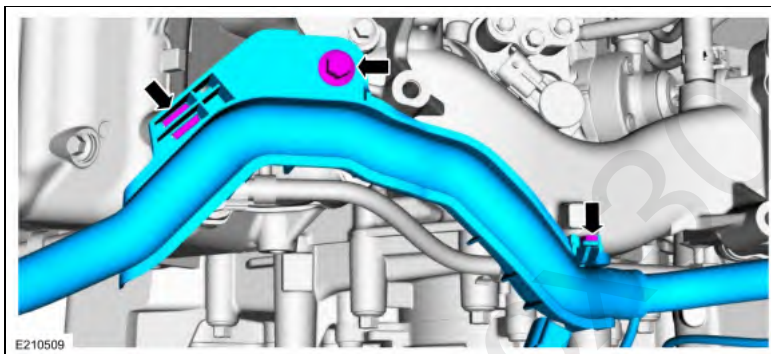
59. Connect the fuel injector return hose and the fuel injection pump supply tube.
 Refer to: Quick Release Coupling (310-00 Fuel System - General Information - 6.7L Power Stroke Diesel).



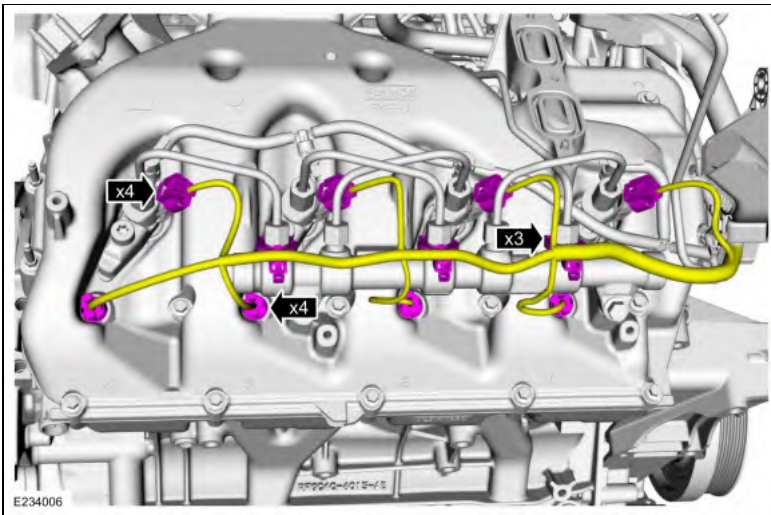
60. Connect the fuel injection pump hose to the fuel rail.
 Refer to: Spring Lock Couplings (310-00B Fuel System - General Information - 6.7L Power Stroke Diesel, General Procedures).



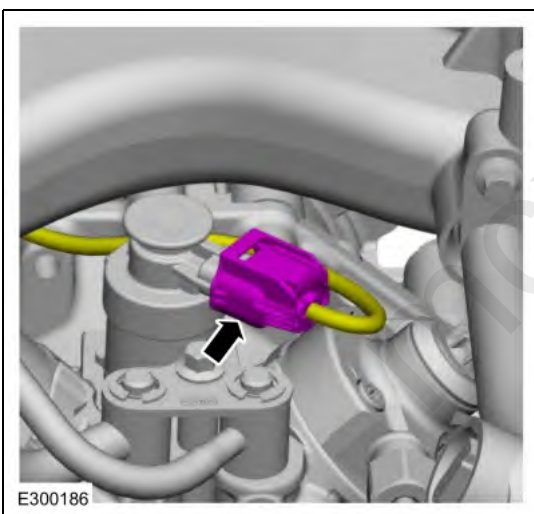
61. Position the engine wire harness over the engine. Connect the retainers and install the bolt.
Torque: 106 lb.in (12 Nm)



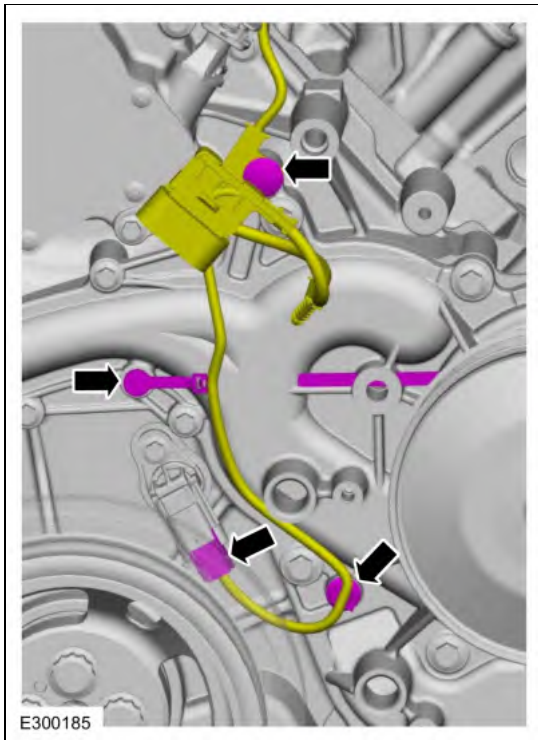
62. Connect the RH valve cover wiring.



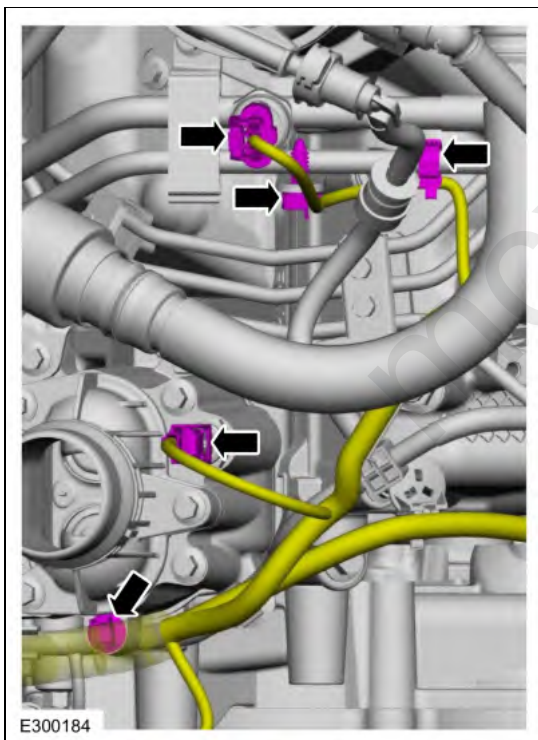
63. Connect the fuel volume control valve electrical connector.



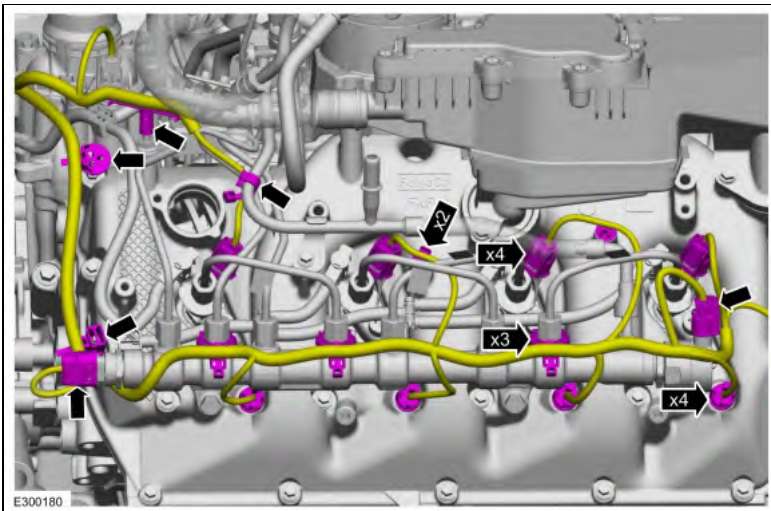
64. Connect the CMP sensor electrical connector and the wire retainers.



65. Connect the fuel pressure and temperature sensor, the ECT sensor electrical connectors and the wire retainers.

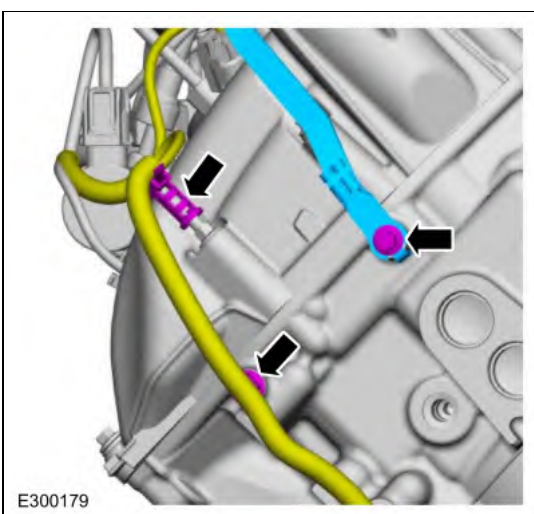


66. Connect the LH valve cover wiring.

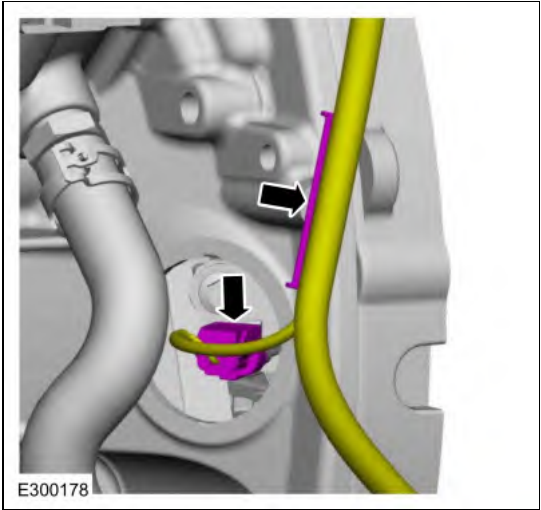


67.

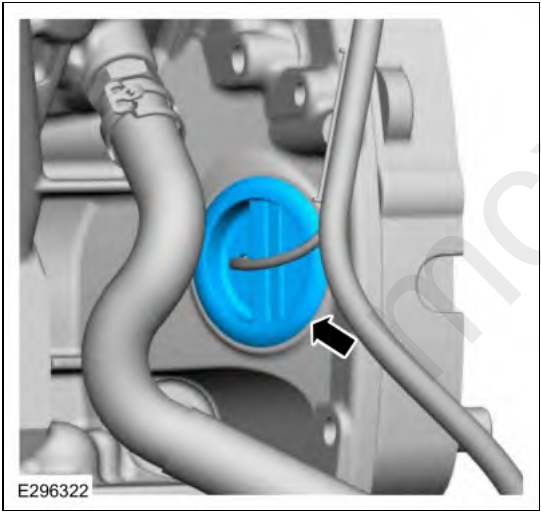
- Connect the wire retainers.
 - Install the ground strap and the bolt.
- Torque: 97 lb.in (11 Nm)*



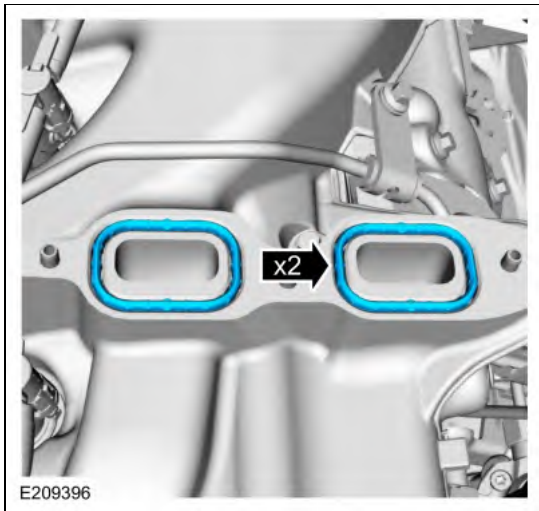
68. Connect the CKP sensor electrical connector and the wire retainer.



69. Install the CKP sensor cover.



70. Install the new EGR cooler gaskets.



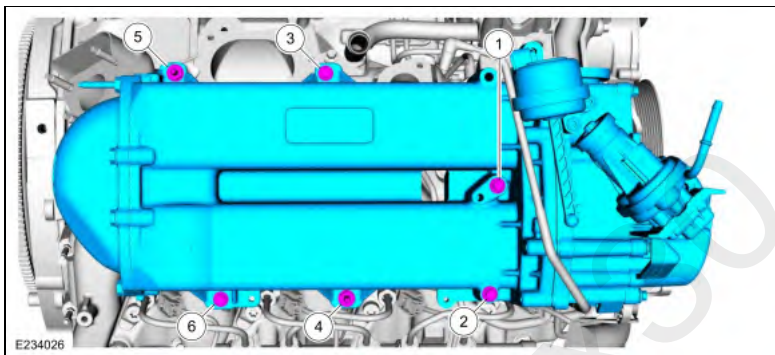
71. Install the EGR cooler assembly and the bolts.

Torque:

Stage 1: Tighten bolt 3 to: : 89 lb.in (10 Nm)

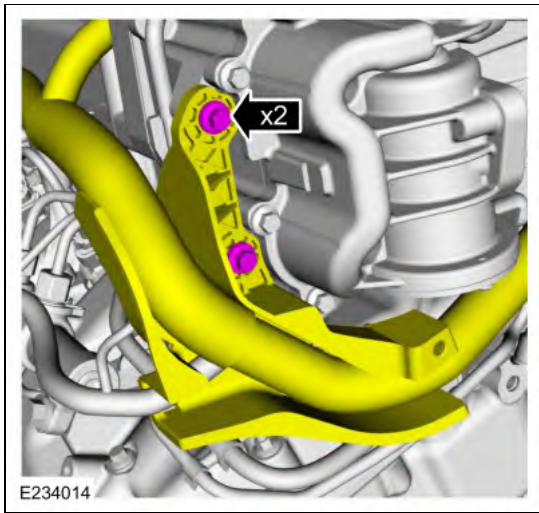
Stage 2: Tighten bolt 1 to: : 89 lb.in (10 Nm)

Stage 3: Tighten bolts 2, 4, 5 and 6 to: : 89 lb.in (10 Nm)



72. Position the engine wire harness and install the bolts.

Torque: 80 lb.in (9 Nm)

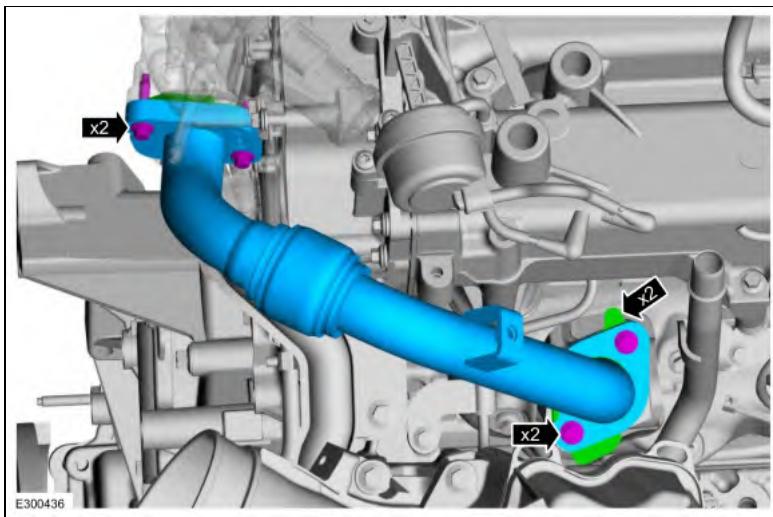


73.

- Using new gaskets, install the EGR cooler inlet tube and the bolts.
- Tighten the bolts at the exhaust manifold.
- Tighten the bolts at the EGR cooler.

Torque: 177 lb.in (20 Nm)

Torque: 89 lb.in (10 Nm)



74.

1. Install the EGR cooler inlet tube bracket and hand start the bolts.
2. Install the bolt.

Torque:

Stage 1: 89 lb.in (10 Nm)

Stage 2: 45 Å°

3. Tighten the bolt.

Torque:

Stage 1: 89 lb.in (10 Nm)

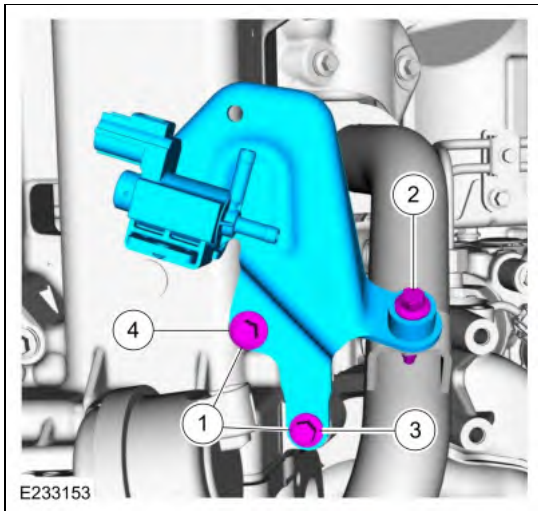
Stage 2: 45 Å°

4. Tighten the bolt.

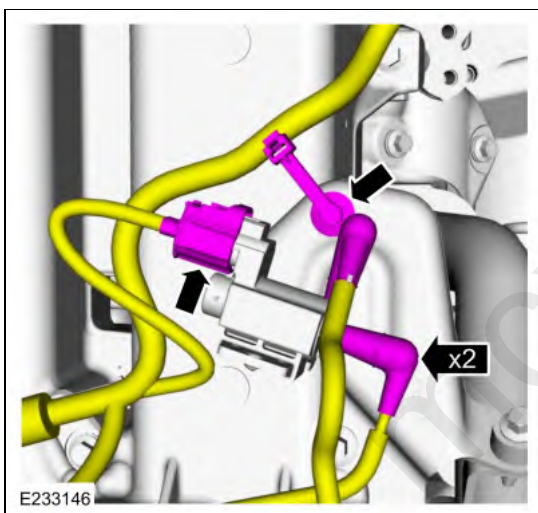
Torque:

Stage 1: 89 lb.in (10 Nm)

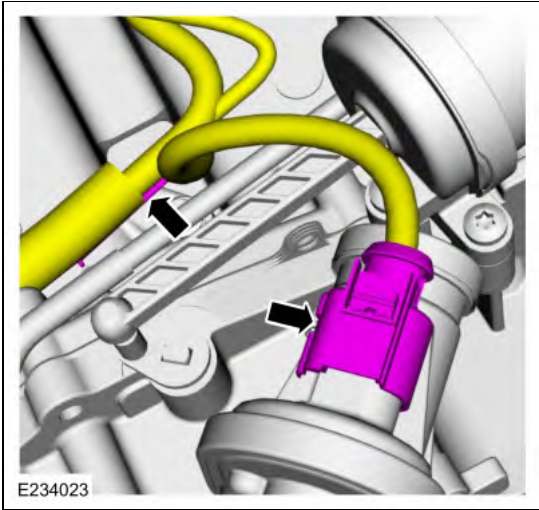
Stage 2: 45 Å°



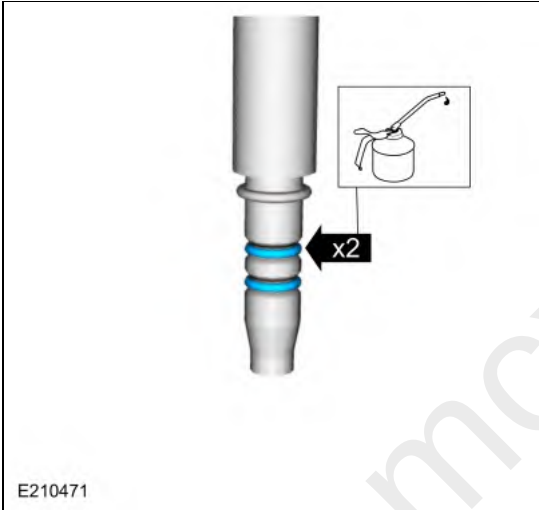
75. Connect the electrical connector and the vacuum tubes to the EGR bypass valve solenoid. Attach the wire harness retainer.



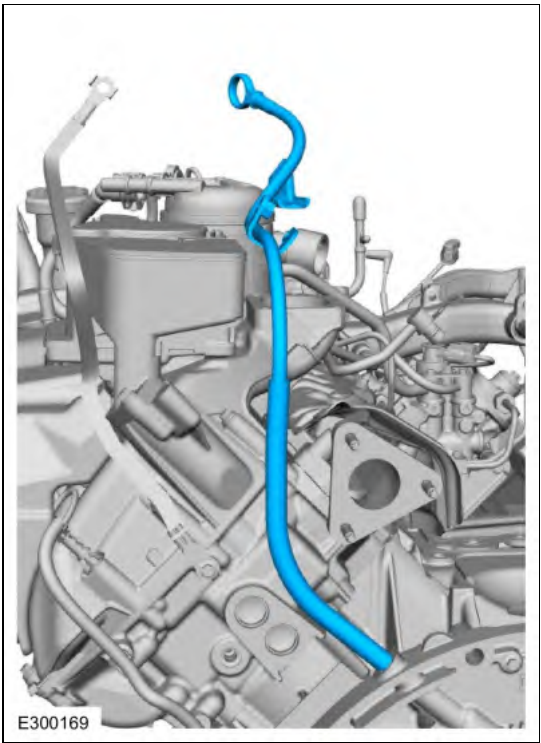
76. Connect the EGR valve electrical connector and the wire harness retainer.



77. Install new O-ring seals on the oil level indicator tube and lubricate with clean engine oil.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).



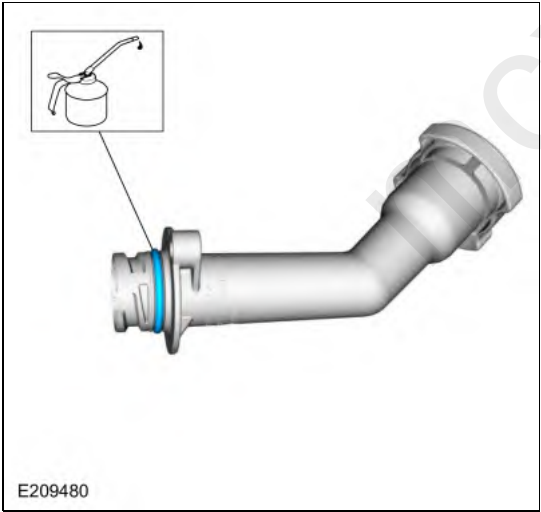
78. Install the oil level indicator tube.



E300169



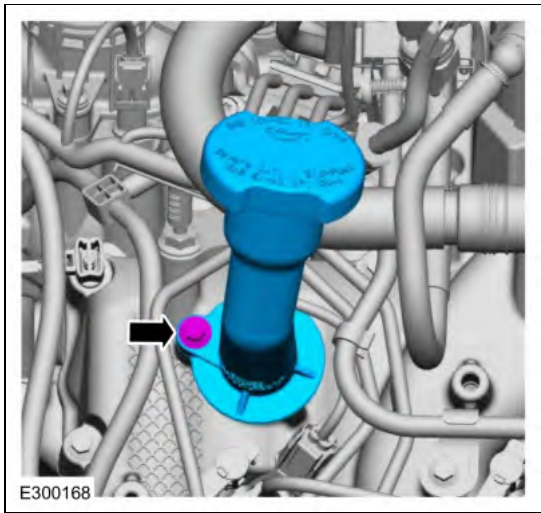
79. Install a new O-ring seal on the oil fill pipe and lubricate with clean engine oil.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).



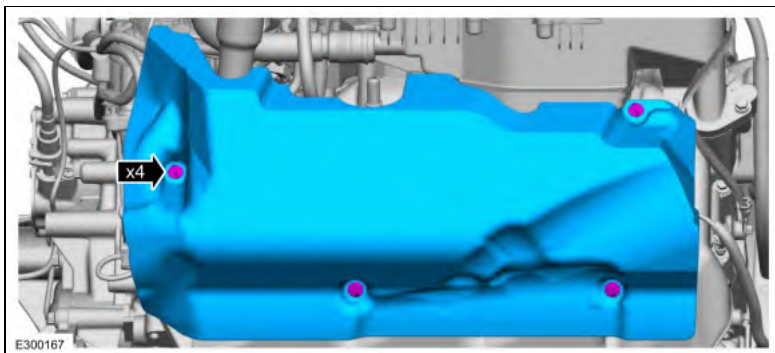
E209480



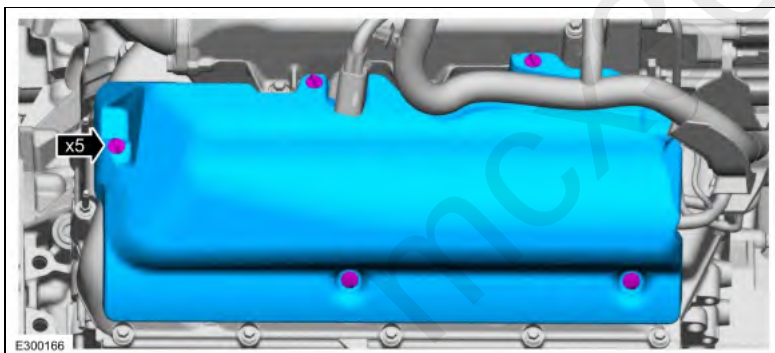
80. Install the oil fill pipe and the bolt.
Torque: 89 lb.in (10 Nm)



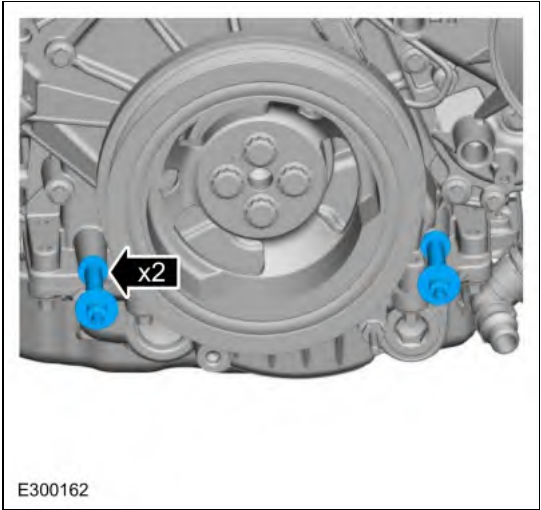
81. If equipped, install the LH sound shield and the push pins.



82. If equipped, install the RH sound shield and the push pins.

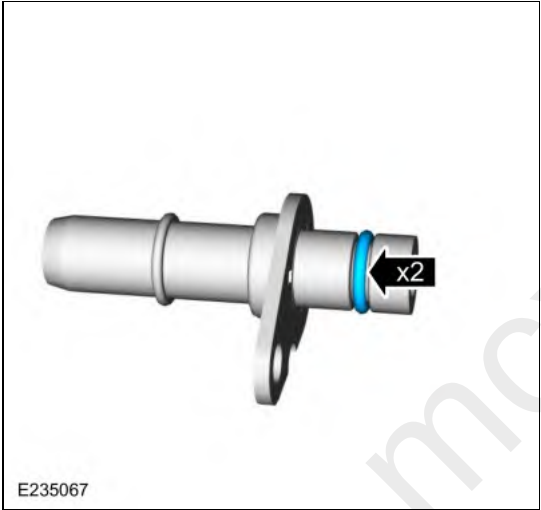


83. Install the stator standoffs.
Torque: 17 lb.ft (23 Nm)

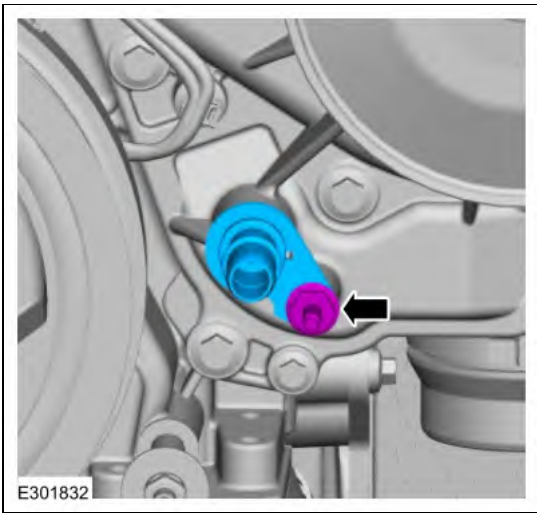


84. **NOTE:** *Only one tube shown.*

Install the new transmission oil cooler coolant tube O-ring seals and lubricate with clean engine coolant.
Refer to: Specifications (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Specifications).



85. Install the transmission oil cooler coolant tube and the stud bolt.
Torque: 89 lb.in (10 Nm)

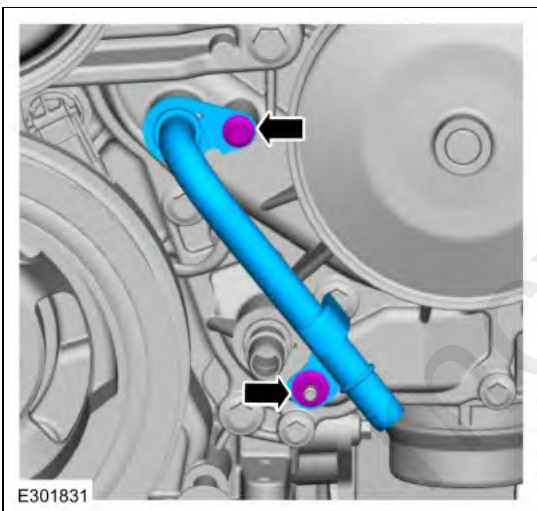


86. Install the transmission oil cooler coolant tube, the bolt and the nut.

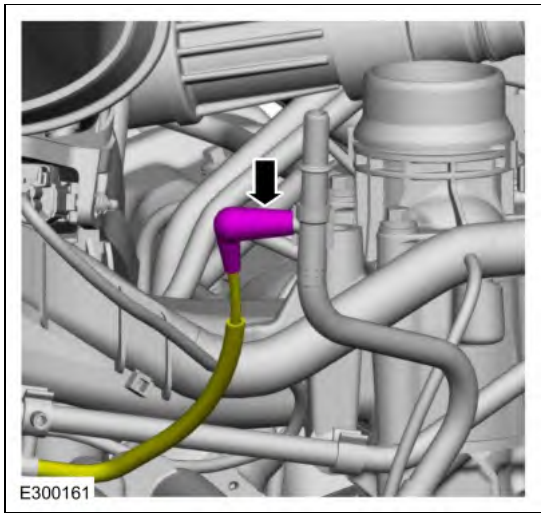
Torque:

Nut : 115 lb.in (13 Nm)

Bolt : 89 lb.in (10 Nm)

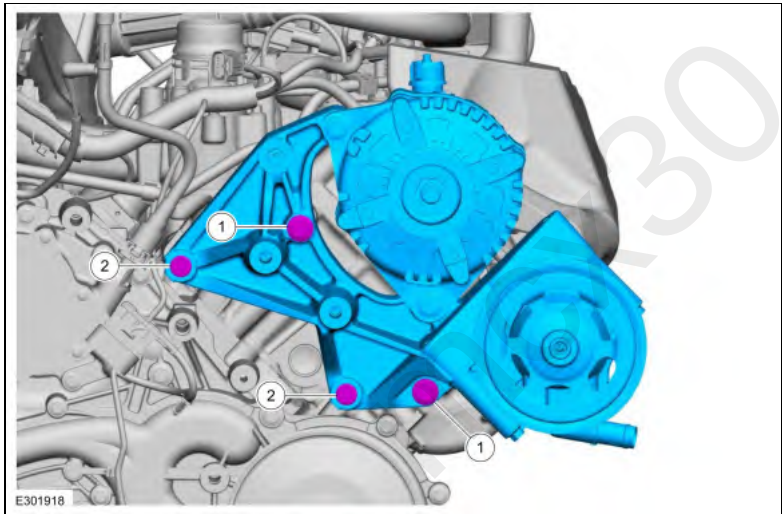


87. Connect the engine vacuum hose at the tee.



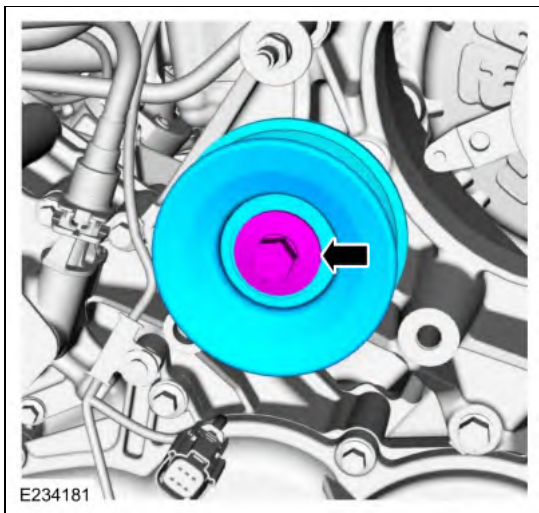
88.

1. Install the power steering pump mounting bracket and the bolts.
Torque: 18 lb.ft (25 Nm)
2. Install the remaining bolts.
Torque: 18 lb.ft (25 Nm)

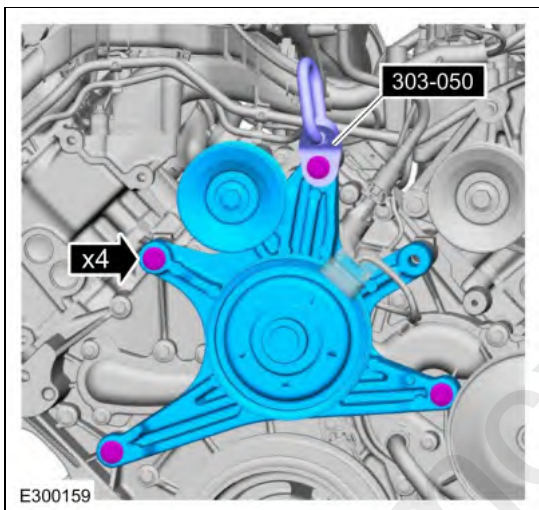


89. If equipped with dual generator, install the idler pulley.

Torque: 35 lb.ft (48 Nm)

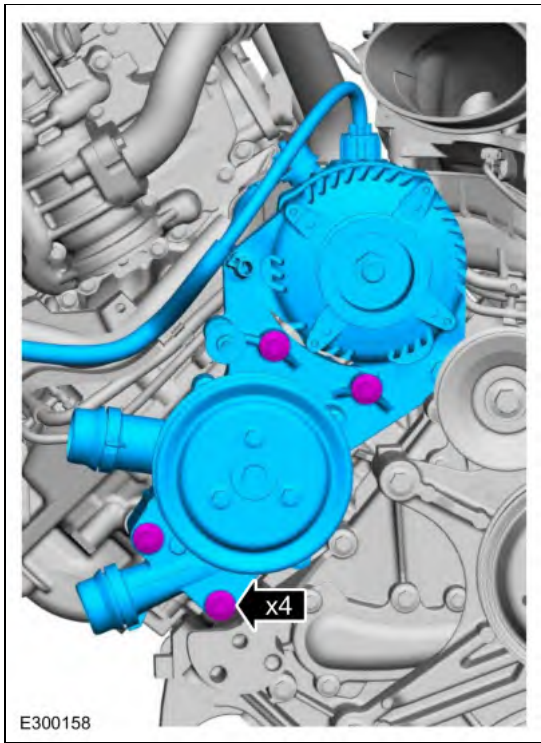


90. Install the cooling fan drive assembly, the engine lifting bracket and the bolts.
 Use Special Service Tool: 303-050 (T70P-6000) Lifting Bracket, Engine.
Torque: 18 lb.ft (25 Nm)

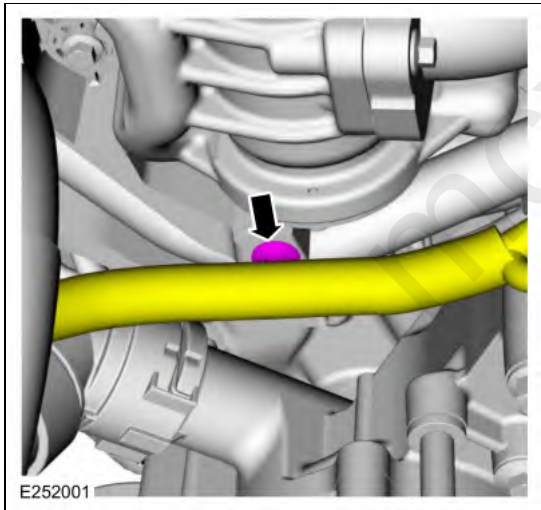


91. **NOTE:** Dual generator shown, single generator similar.

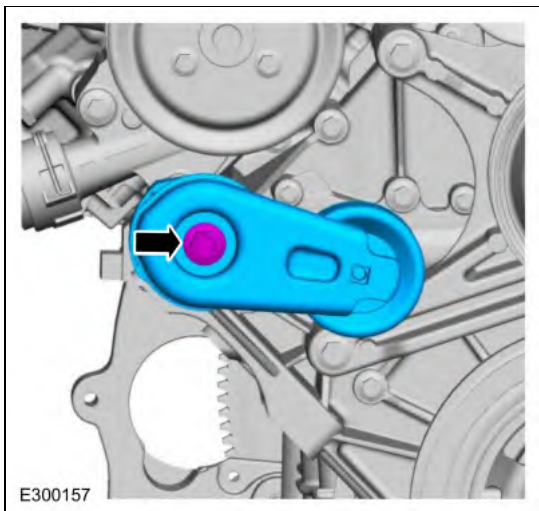
Install the secondary coolant pump assembly and the bolts.
Torque: 18 lb.ft (25 Nm)



92. If equipped with dual generator, connect the wire harness retainer.

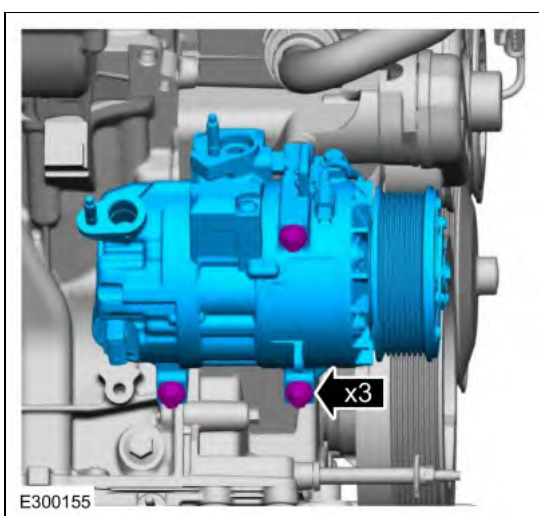


93. Install the accessory drive belt tensioner and the bolt.
Torque: 35 lb.ft (48 Nm)

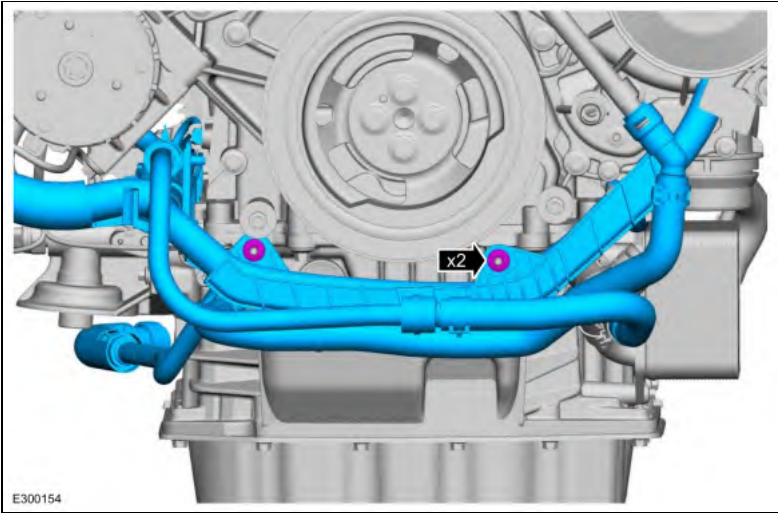


A horizontal bar chart consisting of six equally long bars stacked vertically. The bars are colored cyan, green, brown, yellow, purple, and light blue from top to bottom.

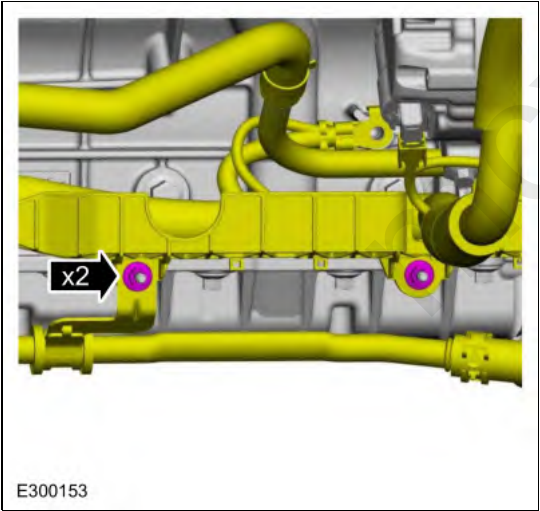
94. Install the A/C compressor and the bolts.
Torque: 18 lb.ft (25 Nm)



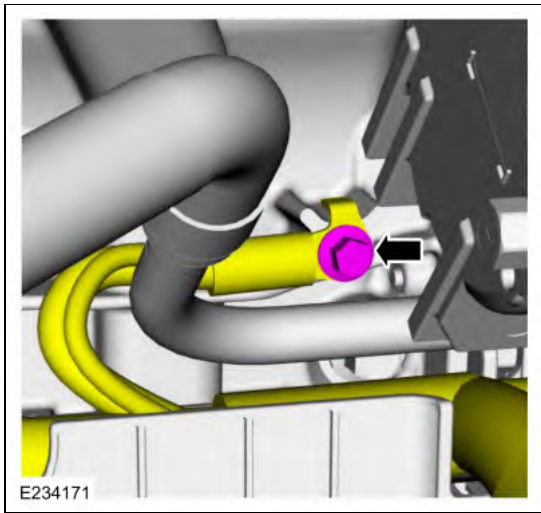
95. Install the battery wire harness, the coolant hoses and the nuts.
Torque: 106 lb.in (12 Nm)



96. Position back the battery wire harness and coolant tube. Install the nuts.
Torque: 106 lb.in (12 Nm)

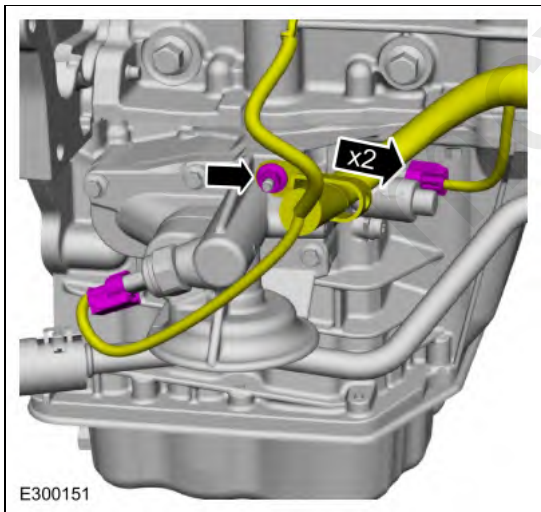


97. Connect the A/C electrical connectors and the wire retainer.

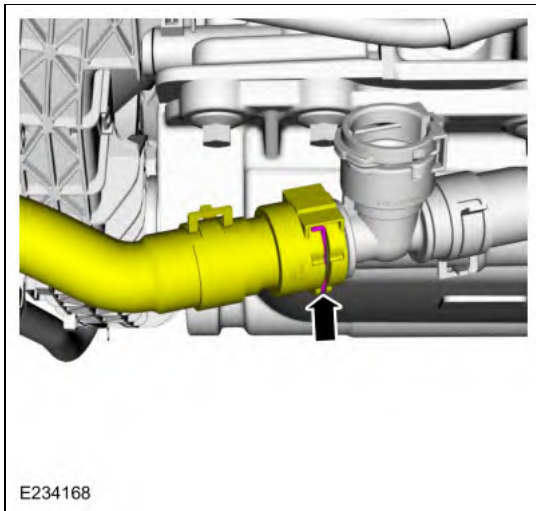


100.

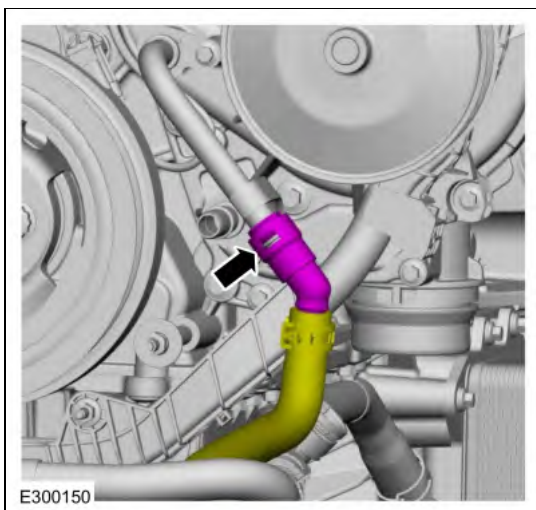
- Position back the battery wire harness and install the nut.
Torque: 106 lb.in (12 Nm)
- Connect the electrical connectors.



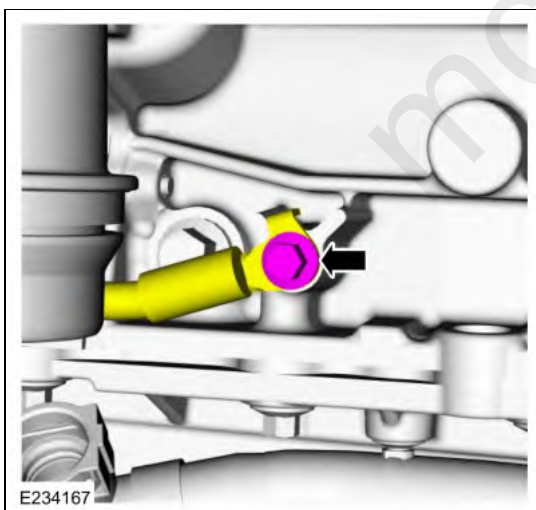
101. Connect the heater hose and install the clip.



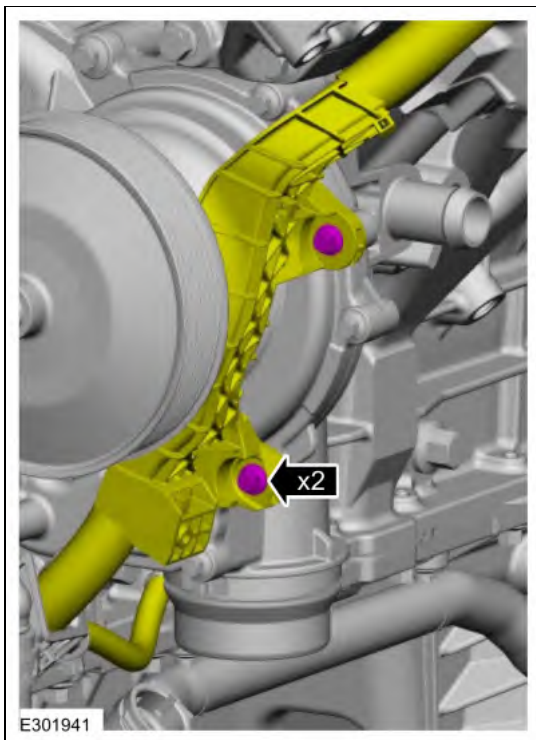
102. Connect the transmission oil cooler coolant hose.



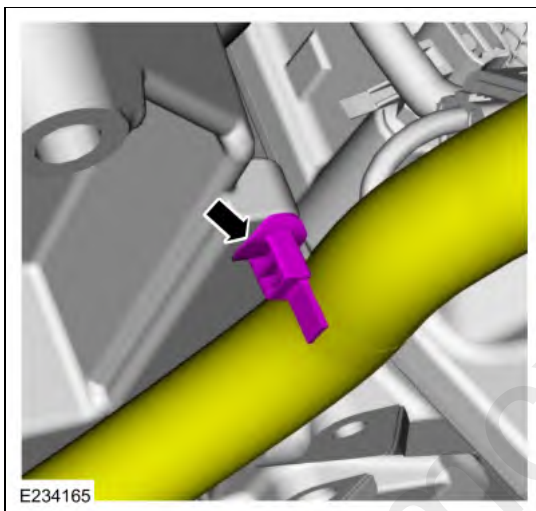
103. Position back the LH ground cable and install the bolt.
Torque: 18 lb.ft (25 Nm)



104. Install the bolts for the battery wire harness.
Torque: 106 lb.in (12 Nm)

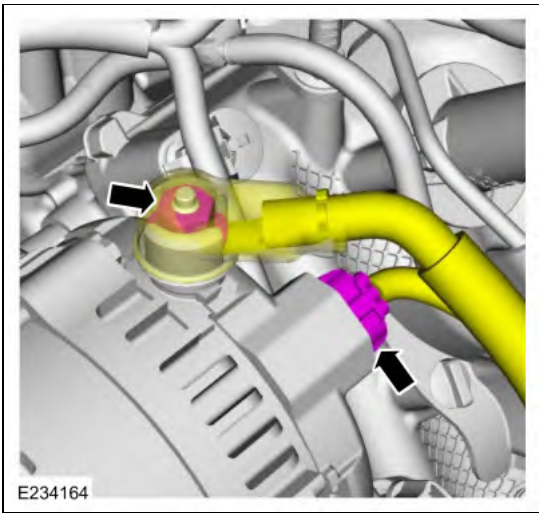


105. Connect the battery wire harness retainer to the bracket.

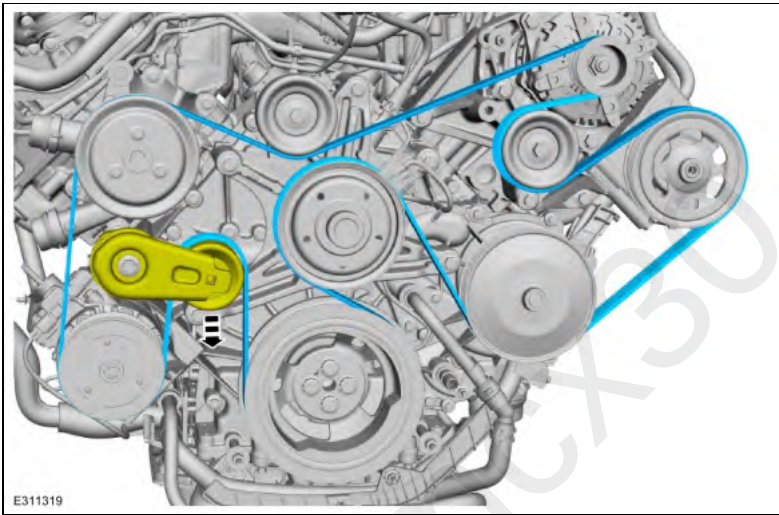


106.

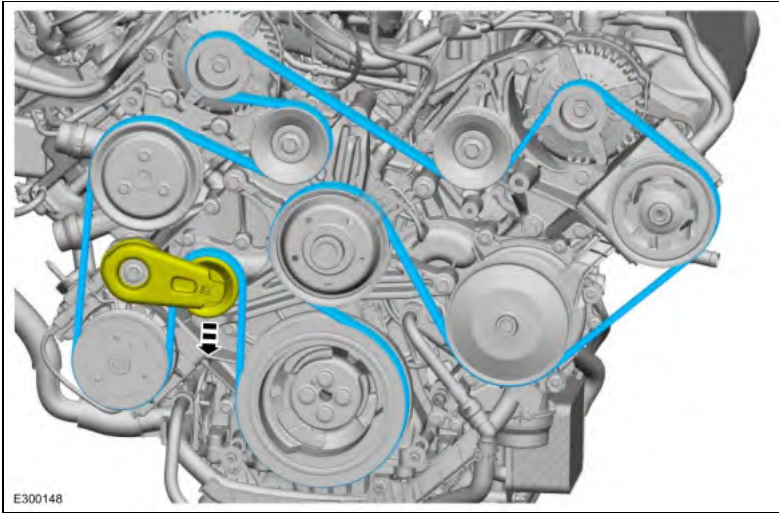
- Position back the cable and install the nut. Position back the boot.
Torque: 159 lb.in (18 Nm)
- Connect the generator electrical connector.



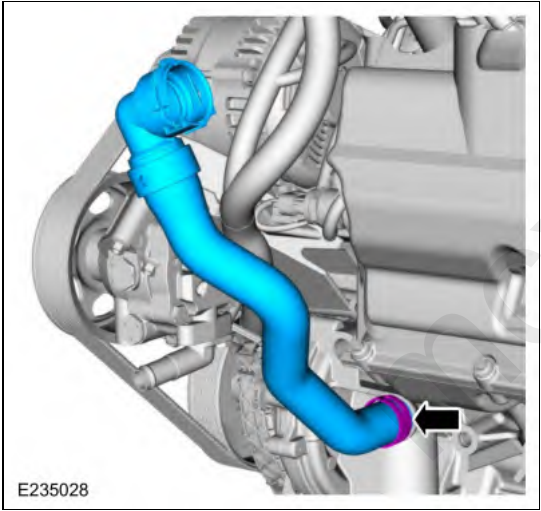
107. If equipped with single generator, install the accessory drive belt.



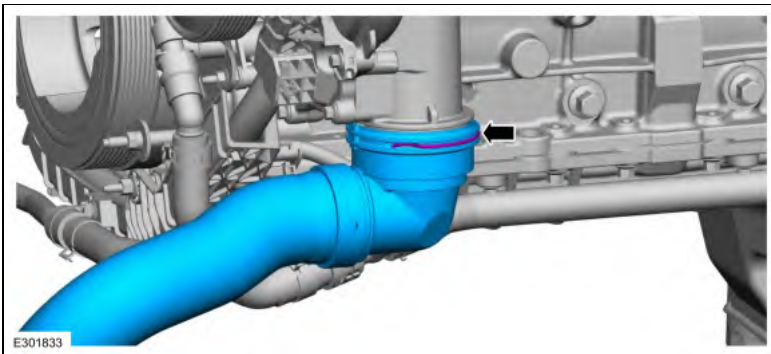
108. If equipped with dual generator, install the accessory drive belt.



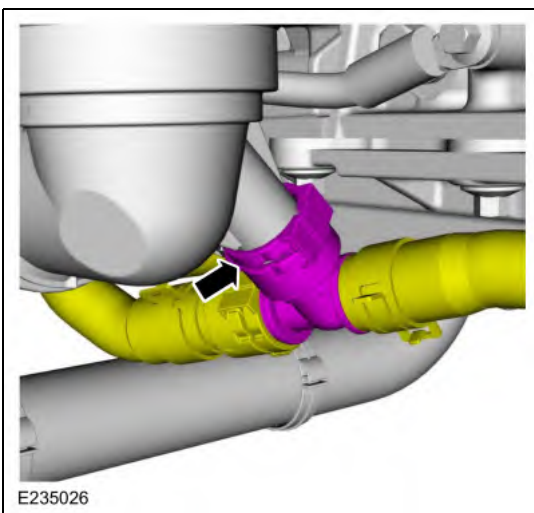
109. Install the coolant engine fill hose.
Use the General Equipment: Hose Clamp Remover/Installer



110. Install the lower radiator hose and install the clip.



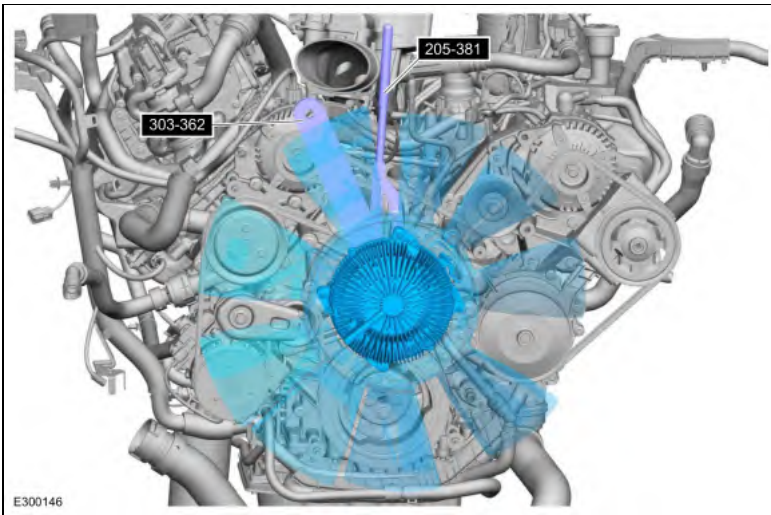
111. Connect the coolant hose and install the clip.



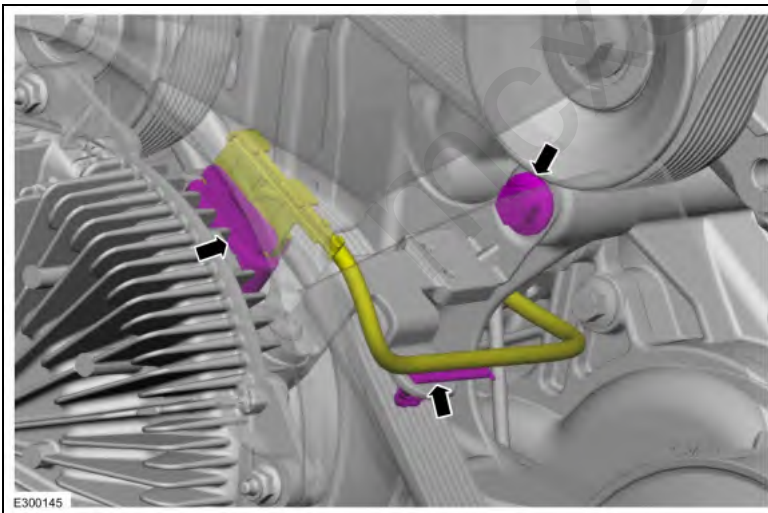
112. Using the special tools, install the cooling fan assembly.

Use Special Service Tool: 205-036 (T70P-4067-A) Wrench, 303-214 (T83T-6312-B) Wrench, Fan Clutch Nut.

Torque: 98 lb.ft (133 Nm)



- 113.
- Install the fan clutch electrical connector bolt.
Torque: 18 lb.ft (25 Nm)
 - Connect the fan clutch electrical connector and the retainer.



114. **NOTICE:** Do not tighten the engine mount bracket bolts more than 90 degrees after initial torque or damage to the bolts may occur.

NOTICE: Clean the engine mount mating surfaces of any dirt or foreign material prior to installation. Failure to follow these instructions may result in engine mount bracket or engine mount damage.

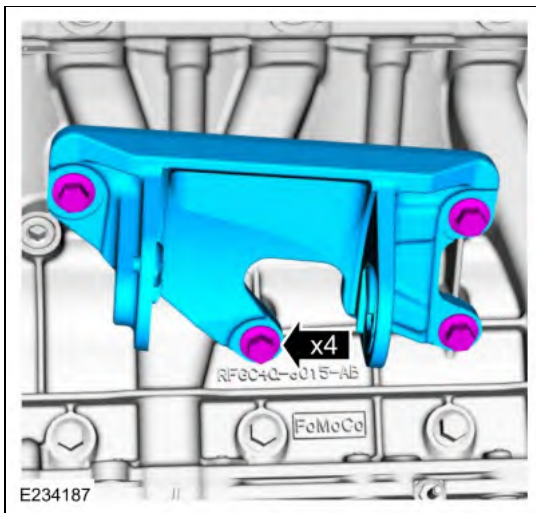
NOTE: Place a visible mark on the engine mount bracket and bracket bolts. Turning the bolt 1 flat of the bolt head is equal to 60 degrees.

Install the RH engine mount bracket and the new bolts.

Torque:

Stage 1: 41 lb.ft (55 Nm)

Stage 2: 60 Å°



115. **NOTICE:** Do not tighten the engine mount bracket bolts more than 90 degrees after initial torque or damage to the bolts may occur.

NOTICE: Clean the engine mount mating surfaces of any dirt or foreign material prior to installation. Failure to follow these instructions may result in engine mount bracket or engine mount damage.

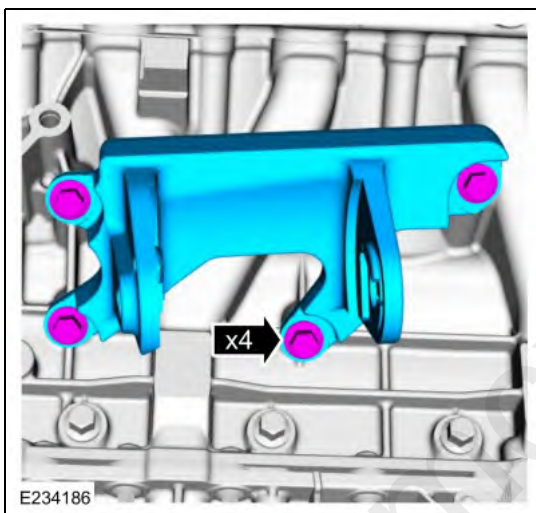
NOTE: Place a visible mark on the engine mount bracket and bracket bolts. Turning the bolt 1 flat of the bolt head is equal to 60 degrees.

Install the LH engine mount bracket and the new bolts.

Torque:

Stage 1: 41 lb.ft (55 Nm)

Stage 2: 60 Å°



116. Using the Floor Crane and a ratchet strap, remove the engine from the wooden blocks.
Use the General Equipment: Floor Crane

NOTE: The following steps are done on the body before the engine is installed.

117. Remove the CAC.
Refer to: Charge Air Cooler (CAC) (303-12B Intake Air Distribution and Filtering - 6.7L Power Stroke Diesel, Removal and Installation).
118. Flush the CAC and the CAC tubes with Simple Green® Pro HD.
Refer to: Charge Air Cooler (CAC) Cleaning (303-12B Intake Air Distribution and Filtering - 6.7L Power Stroke Diesel, General Procedures).
119. Install the CAC.
Refer to: Charge Air Cooler (CAC) (303-12B Intake Air Distribution and Filtering - 6.7L Power Stroke Diesel, Removal and Installation).
120. **NOTE:** Ensure the fuel is free of contaminants.

Replace the fuel filter.
Refer to: Fuel Filter (310-01B Fuel Tank and Lines - 6.7L Power Stroke Diesel, Removal and Installation).
121. Replace the TB (throttle body) gasket.
Refer to: Throttle Body (303-04B Fuel Charging and Controls - 6.7L Power Stroke Diesel, Removal and Installation).
122. Install the engine.
Refer to: Engine - Body Off (303-01B Engine - 6.7L Power Stroke Diesel, Installation).
Refer to: Engine - Body On (303-01B Engine - 6.7L Power Stroke Diesel, Installation).