Engine - Body On

Special Tool(s) / General Equipment

 E234289	205-036 (T70P-4067-A) Wrench
	303-050 (T70P-6000) Lifting Bracket, Engine
	303-1518 Bracket, Engine Removal TKIT-2009C-F TKIT-2009C-ROW
	303-214 (T83T-6312-B) Wrench, Fan Clutch Nut
 307-346	307-346 (T97T-7902-A) Retainer, Torque Converter TKIT-1998-LM (NavigatoR) TKIT-1997-F/FLM/LT
Floor Crane	
Transmission Jack	
Hose Clamp Remover/Installer	

Materials

Name	Specification
MotorcraftÂ® Multi-Purpose Grease Spray XL-5-A	ESB-M1C93-B
MotorcraftÂ® PAG Refrigerant Compressor Oil YN-12-D	WSH-M1C231-B

NOTICE: Change the engine oil any time the turbocharger is removed from the engine. The passages in the block, located underneath the turbocharger, are direct passages to the lubrication system. Debris and/or coolant may enter the lubrication system and engine damage may occur.

NOTE: *It is recommended that this component be serviced with the vehicle body removed. If the body was removed, refer to Engine â€" Body Off in this section.*

NOTE: *During the repair or installation of fuel-related components, cap, tape or otherwise appropriately protect all fuel openings 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: *Carry out the following 5 steps if installing a new engine, long block or short block to remove any contaminants from the radiator and heater core.*

1. **NOTICE: Failure to inspect the components for debris may result in repeat failures.**

   NOTE: *It may be necessary to use a borescope to inspect the components.*

   When an engine or turbocharger is replaced due to a failure, inspect the following components for potential metal debris. If evidence of debris is found, clean or replace the components as needed.
   - CAC and the CAC tubes
   - Intake air system
   - Exhaust manifolds
   - EGR cooler and pipes
   - Diesel Oxidation Catalyst (DOC)
   - Turbocharger (on engine failure only)

2. Remove the primary cooling system radiator.

   Refer to: Radiator (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Removal and Installation).

3. **NOTICE: Radiator internal pressure must not exceed 138 kPa (20 psi). Damage to the radiator can result.**

   NOTE: *Dispose of old coolant and flushing water contaminated with antifreeze and cleaning chemicals in accordance with local, state or federal laws.*

- Backflush the radiator using a garden hose with the radiator rotated so the lower radiator hose location is at the top.
- Use a garden hose in the lower hose location and backflush.

4. **NOTICE: Heater core internal pressure must not exceed 138 kPa (20 psi). Damage to the heater core can result.**

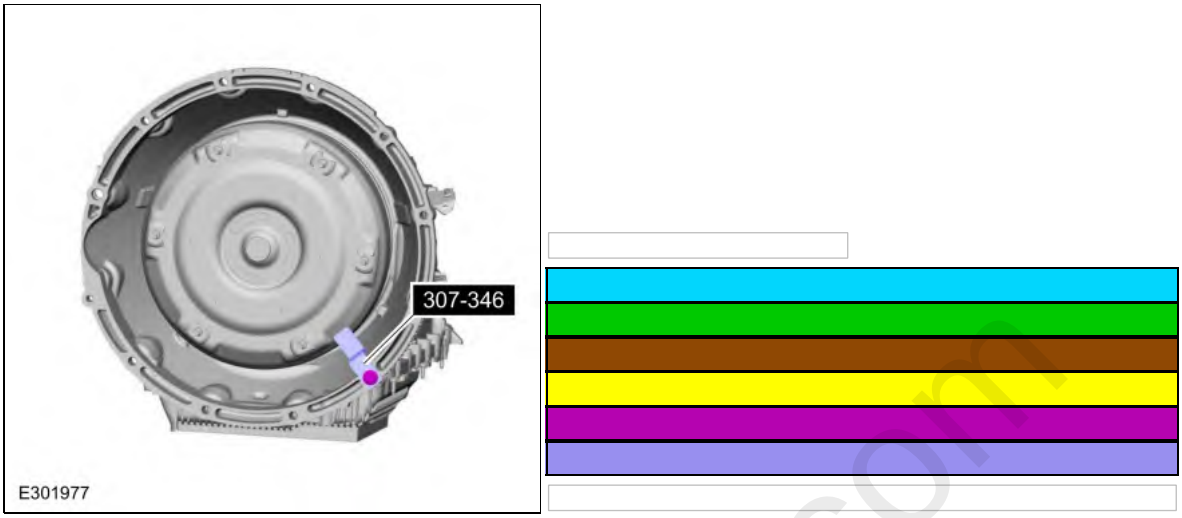
   NOTE: *Dispose of old coolant and flushing water contaminated with antifreeze and cleaning chemicals in accordance with local, state or federal laws.*

   Backflush the heater core using a garden hose in the heater core outlet hose.

5. Install the primary cooling system radiator.

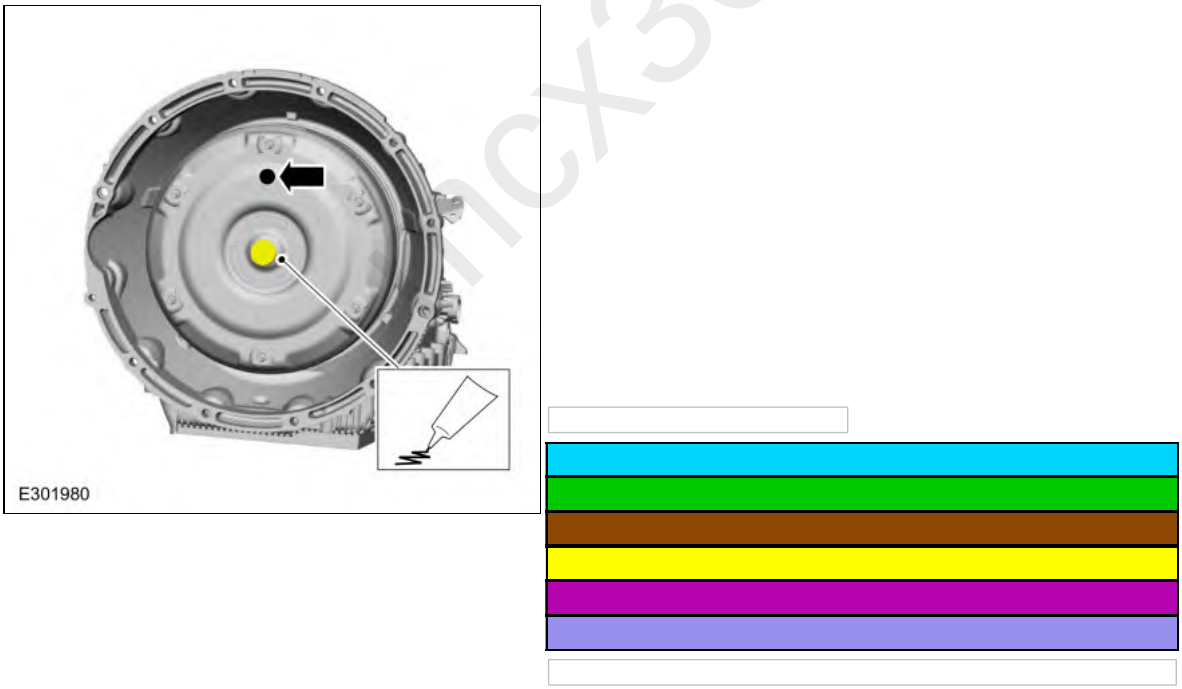
   Refer to: Radiator (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Removal and Installation).

6. Remove Special Service Tool: 307-346 (T97T-7902-A) Retainer, Torque Converter.



7. **NOTICE: Prior to installation of the engine, lubricate the torque converter pilot hub or damage to the torque converter or the engine crankshaft can occur.**

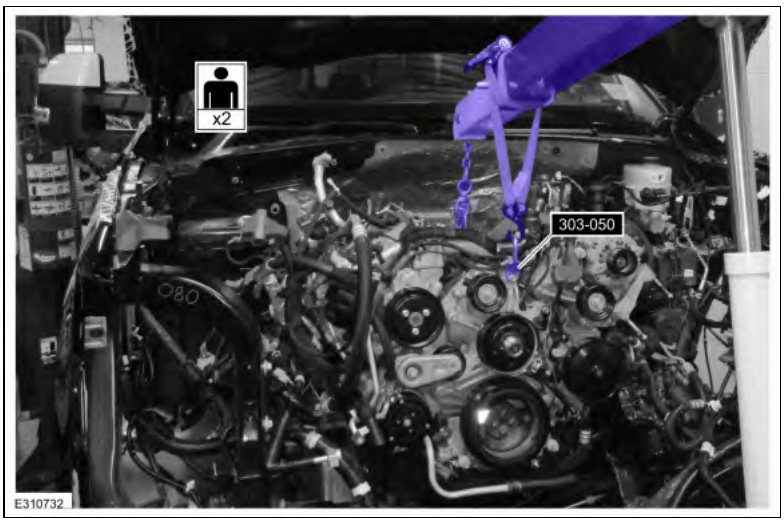
   Lubricate the torque converter pilot hub with multi-purpose grease and align the paint dot on the torque converter in the 12 o'clock position.
   Material: MotorcraftÂ® Multi-Purpose Grease Spray / XL-5-A (ESB-M1C93-B)



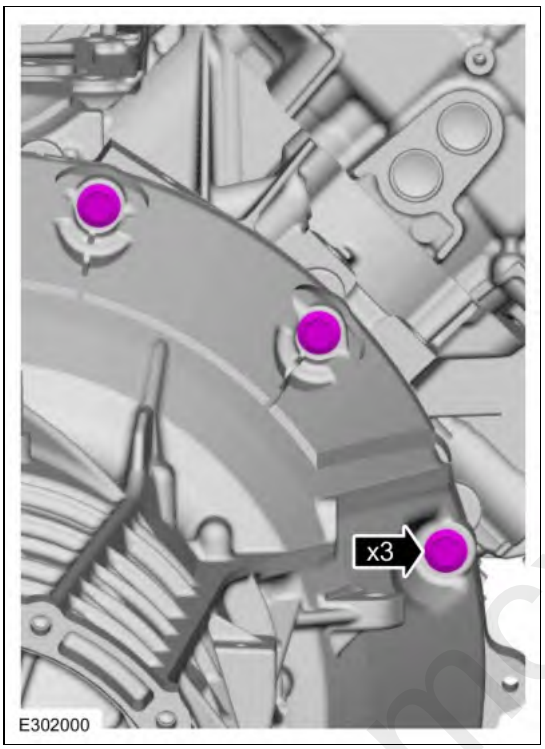
8. **NOTICE: During installation of the engine, the engine oil cooler will pass very close to the frame crossmember. Install the engine slowly, continually checking to make sure the engine oil cooler does not hit the frame crossmember, or component damage may occur.**

   NOTE: *Use caution to make sure the torque converter studs align with the holes in the flexplate while joining the engine to the transmission.*

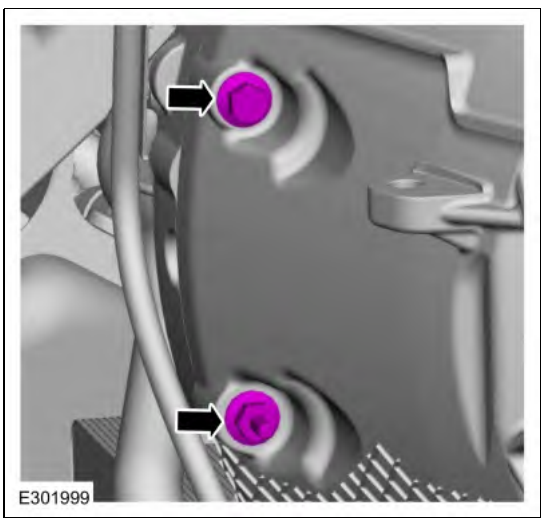
   - Position the engine in the vehicle. Allowing the engine to roll forward, install the engine.
     Use the General Equipment: Floor Crane
   - Once the engine has cleared the crossmember. Install a ratchet strap.
   - Using the ratchet strap, level the engine.
   - Install the engine to the transmission.



9. Install the RH bellhousing bolts.
   Torque: 46 lb.ft (63 Nm)

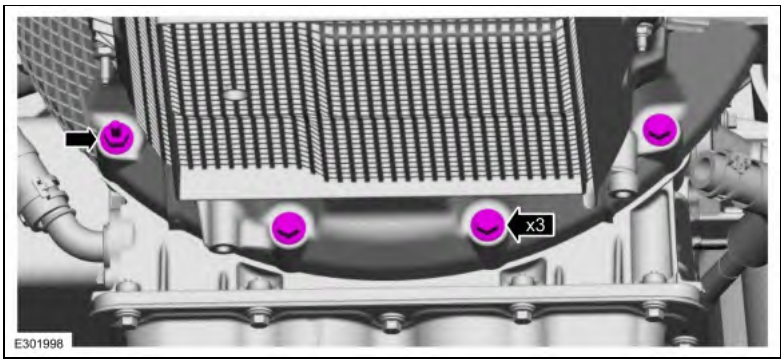


10. Install the LH bellhousing stud bolt and the bolt.
    Torque: 46 lb.ft (63 Nm)

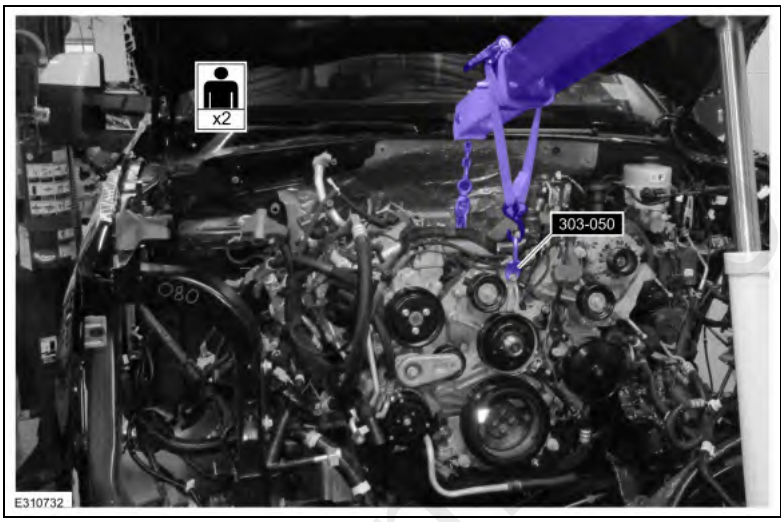


11. Remove the transmission jack.
    Use the General Equipment: Transmission Jack

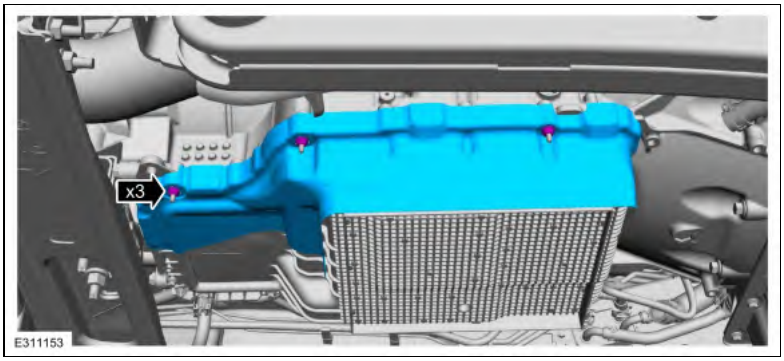
12. Install the lower engine bellhousing bolts and the stud bolt.
    Torque: 46 lb.ft (63 Nm)



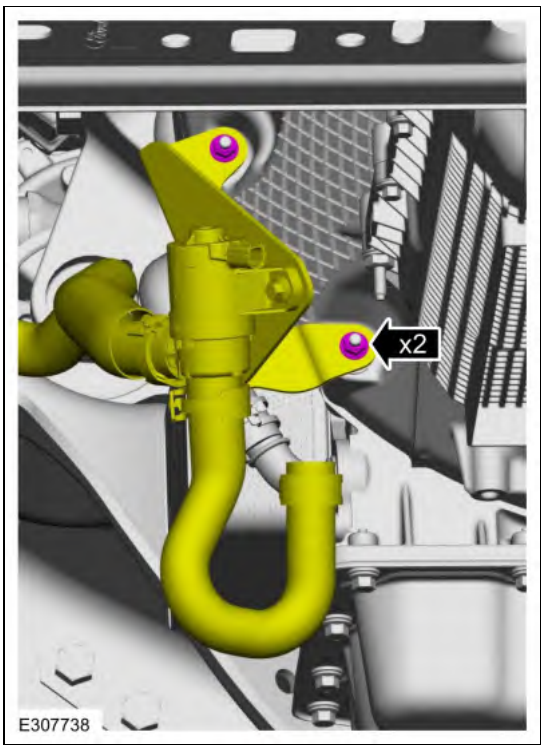
13.
- Lower the engine into position.
- Remove the ratchet strap.
- Remove the floor crane.
  Use the General Equipment: Floor Crane



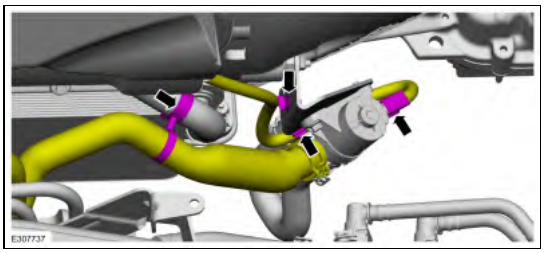
14. Install the transmission heat shield and the nuts.
    Torque: 80 lb.in (9 Nm)



15. Position back the valve and install the nuts.
    Torque: 106 lb.in (12 Nm)



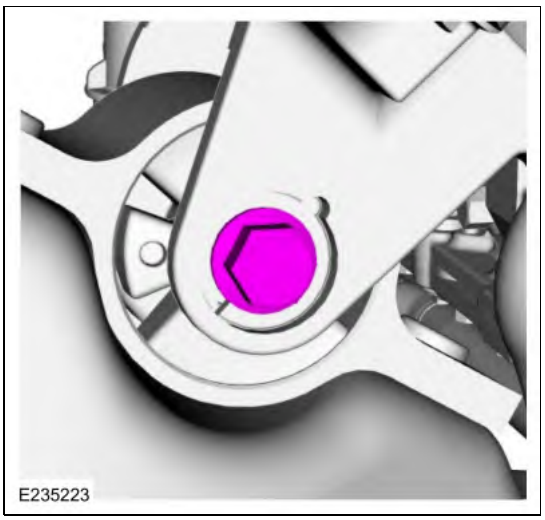
16. Connect the electrical connector and the retainers.



17. **NOTICE: Failure to replace the engine mount cross bolts may result in engine mount damage.**

    NOTICE: Only use hand tools when installing the engine mount cross bolts or damage to the engine mount cross bolts may occur.

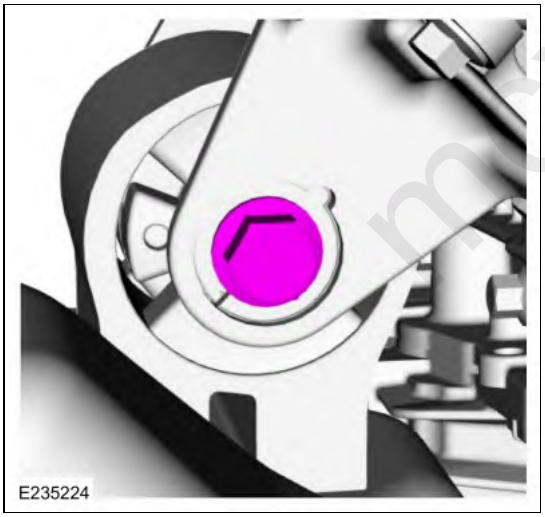
    Install the LH engine mount cross bolt.
    Torque: 258 lb.ft (350 Nm)



18. **NOTICE: Failure to replace the engine mount cross bolts may result in engine mount damage.**

    NOTICE: Only use hand tools when installing the engine mount cross bolts or damage to the engine mount cross bolts may occur.

    Install the RH engine mount cross bolt.
    Torque: 258 lb.ft (350 Nm)



19. **NOTICE: Failure to replace the transmission support insulator nuts may result in transmission support insulator damage.**

    Remove and discard the transmission support insulator nuts.

20. Tighten the transmission support insulator studs.

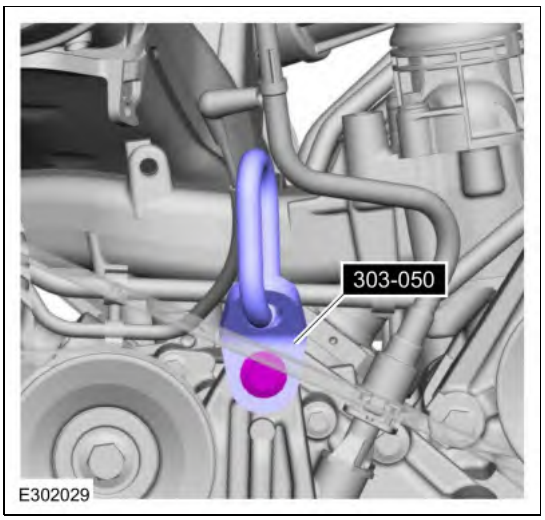
    Torque: 66 lb.ft (90 Nm)

21. **NOTICE: Failure to replace the transmission support insulator nuts may result in transmission support insulator damage.**

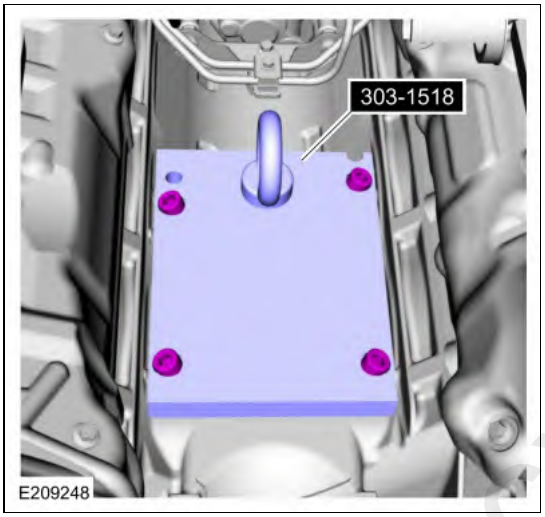
    NOTICE: Only use hand tools when installing the transmission support insulator nuts or damage to the transmission support insulator may occur.

    Install new transmission support insulator nuts.
    Torque: 85 lb.ft (115 Nm)

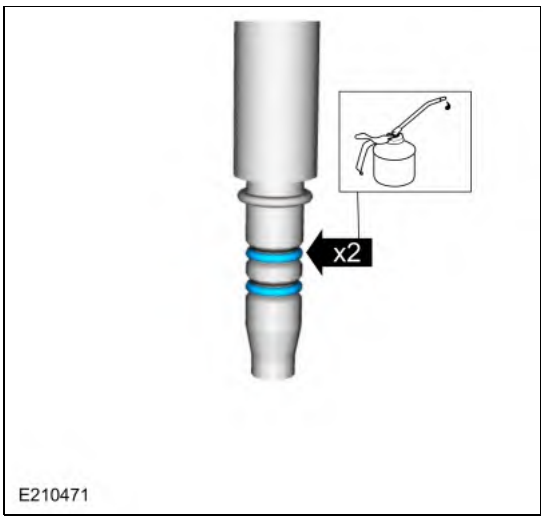
22.
    Remove Special Service Tool: 303-050 (T70P-6000) Lifting Bracket, Engine.
    Torque: 18 lb.ft (25 Nm)



23. Remove Special Service Tool: 303-1518 Bracket, Engine Removal.

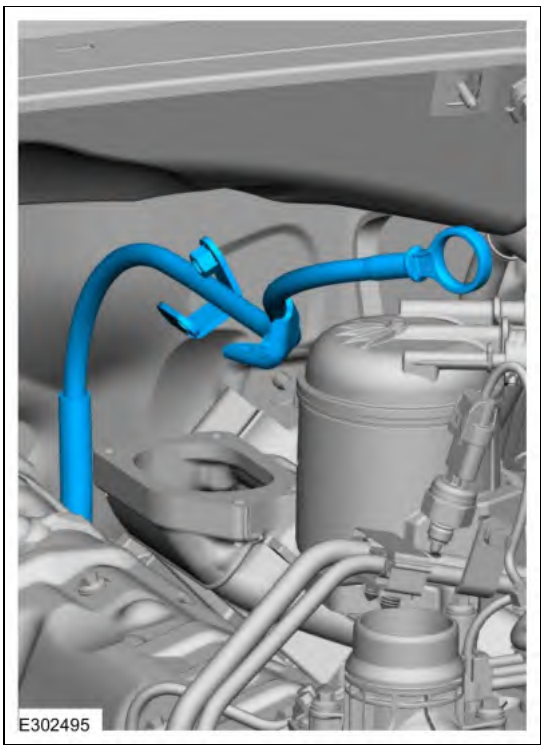


24. Install new O-ring seals on the oil level indicator tube and lubricate with clean engine oil.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).



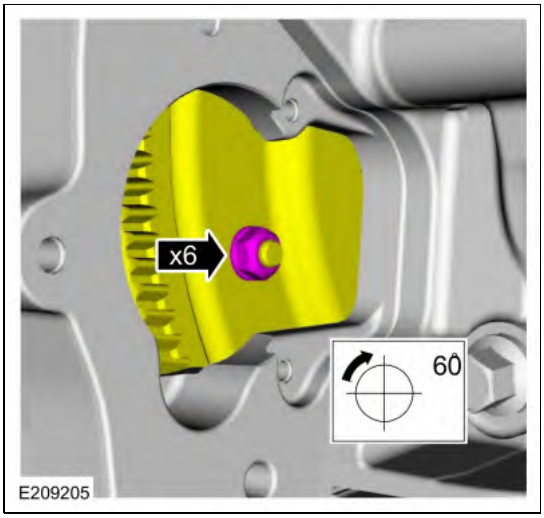
25. **NOTE:** *Verify that the oil level indicator tube is bottomed in the engine rear cover.*

    Install the oil level indicator tube.

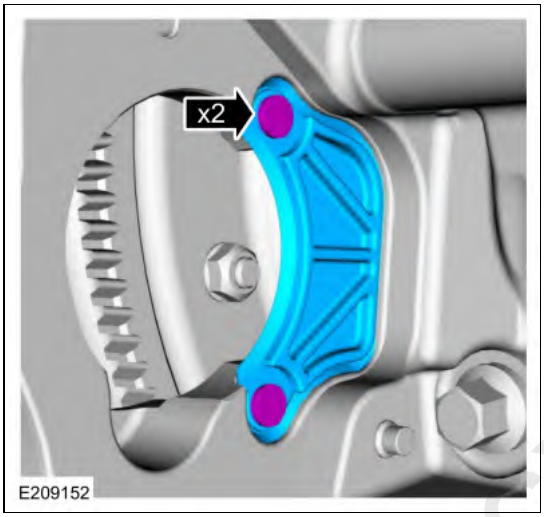


26. **NOTE:** *Using the crankshaft pulley bolts, turn the engine clockwise.*

    Install the new torque converter nuts.
    Torque: 41 lb.ft (55 Nm)



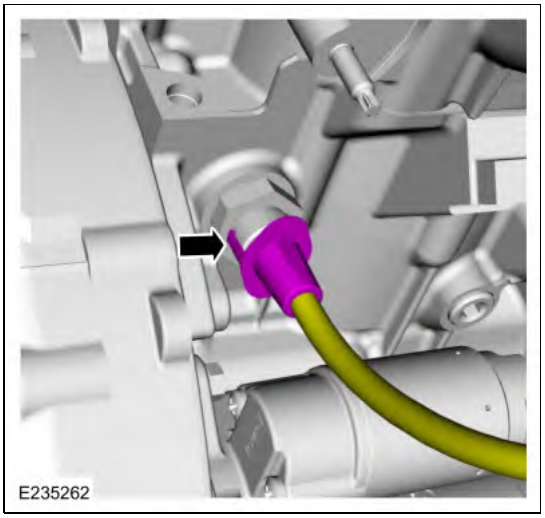
27. Install the access cover and the retainers.



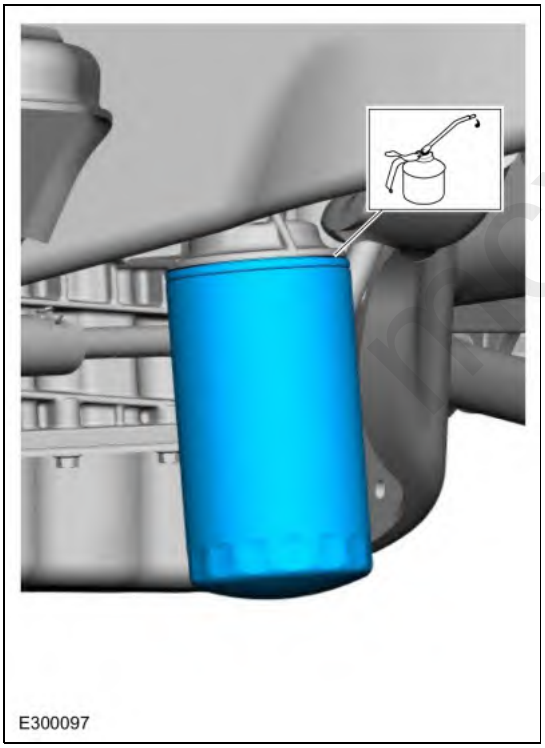
28. Install the starter motor.

    Refer to: Starter Motor (303-06B Starting System - 6.7L Power Stroke Diesel, Removal and Installation).

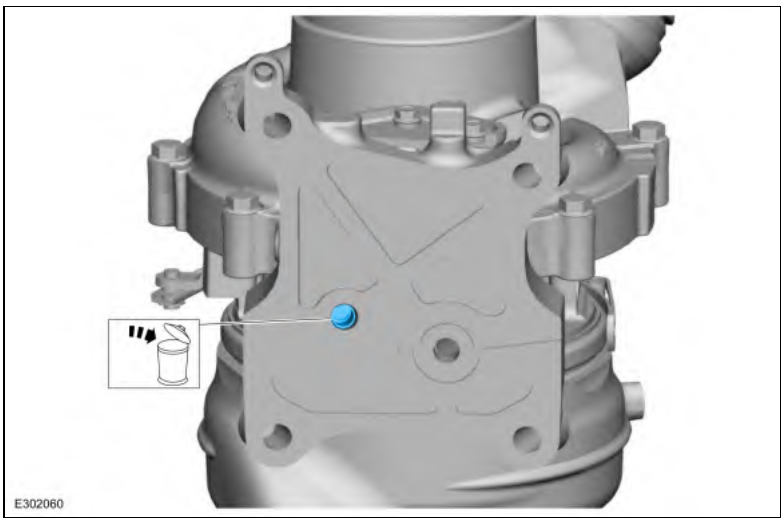
29. If equipped, connect the block heater electrical connector.



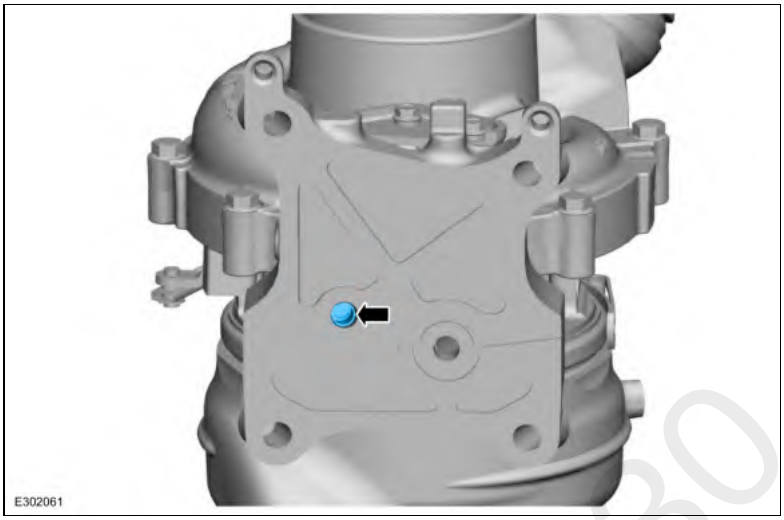
30. Lubricate the rubber seal with clean engine oil and install the new oil filter.
    Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).
    Torque:
    Stage 1: 44 lb.in (5 Nm)
    Stage 2: 230 Â°



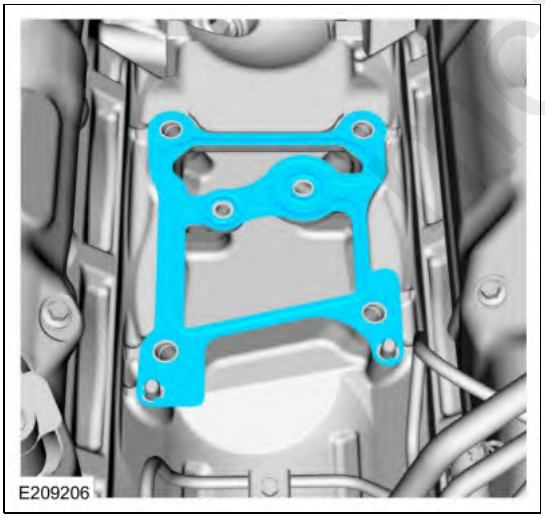
31. Remove and discard the TC oil supply filter.



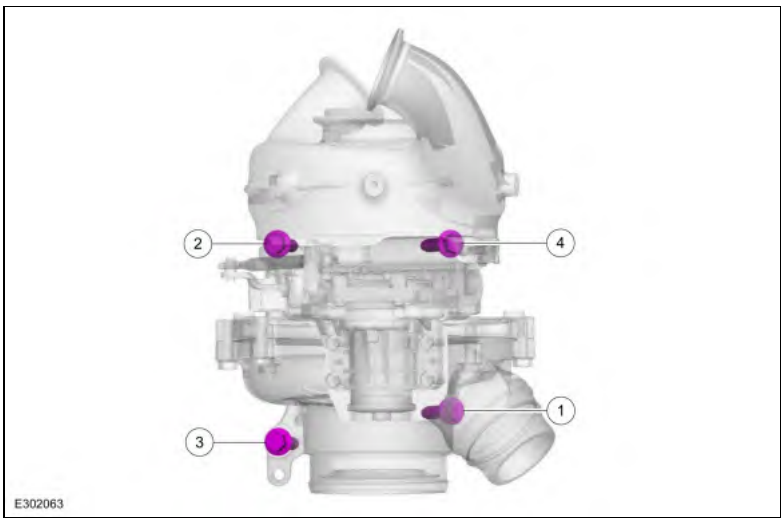
32. Install a new TC oil supply filter.



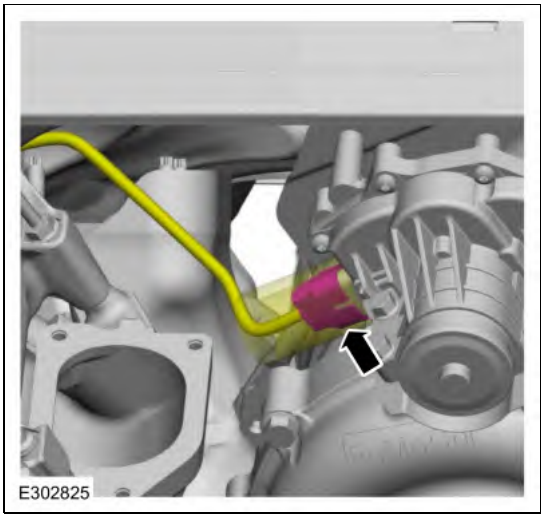
33. Install a new TC mounting gasket.



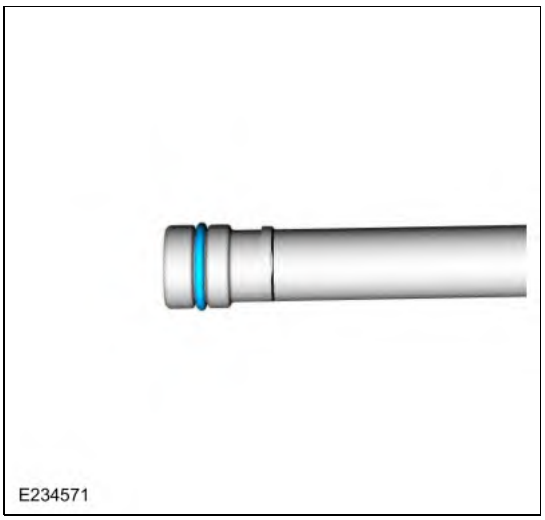
34. Install the TC and the new bolts.
    Torque:
    Stage 1: 133 lb.in (15 Nm)
    Stage 2: 41 lb.ft (55 Nm)



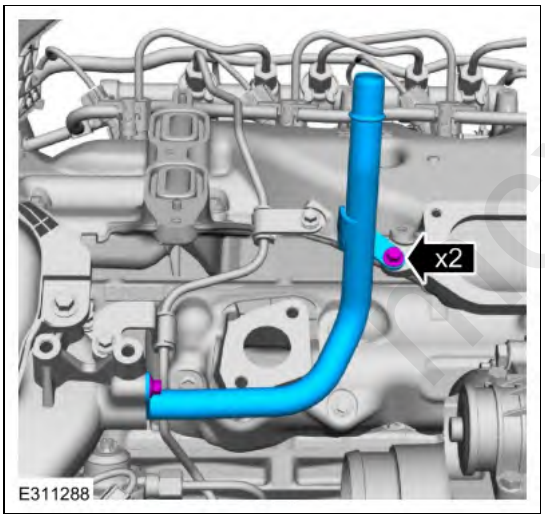
35. Connect the TC actuator electrical connector.



36. 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).

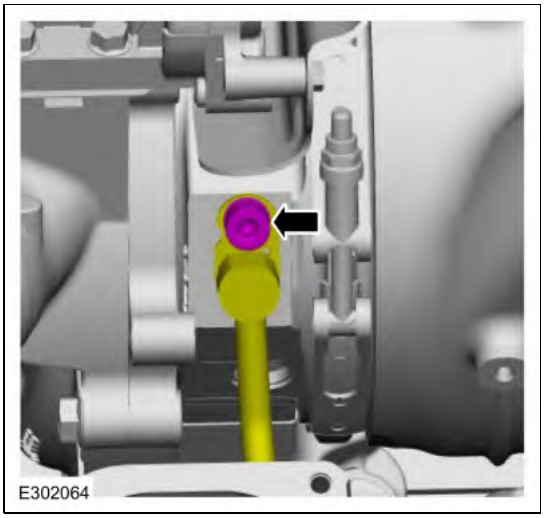


37. Install the heater supply tube and the bolts.
Torque: 89 lb.in (10 Nm)



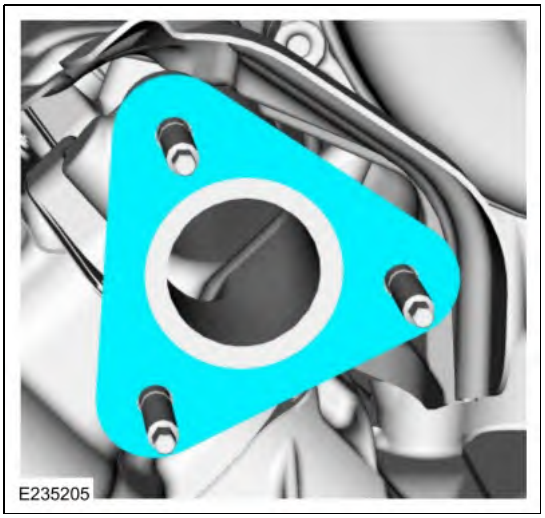
38. Lubricate the O-ring with clean engine coolant. Position back the TC coolant outlet tube and install the new bolt.

Refer to: Specifications (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Specifications).
Torque:
Stage 1: 106 lb.in (12 Nm)
Stage 2: 30 Â°



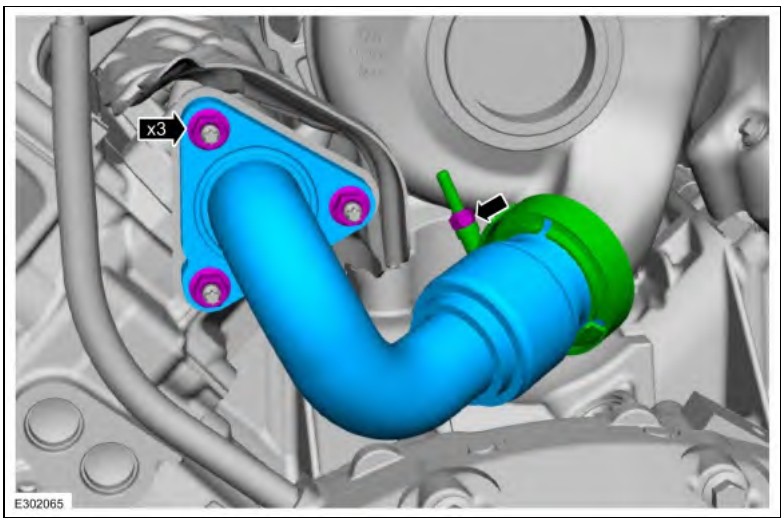
39. **NOTE:** *Clean all exhaust connections before assembly.*

    Install a new LH turbocharger inlet pipe gasket.



40. **NOTICE: Do not bend or twist the turbocharger inlet pipes or damage to the bellows on the turbocharger inlet pipes may occur.**

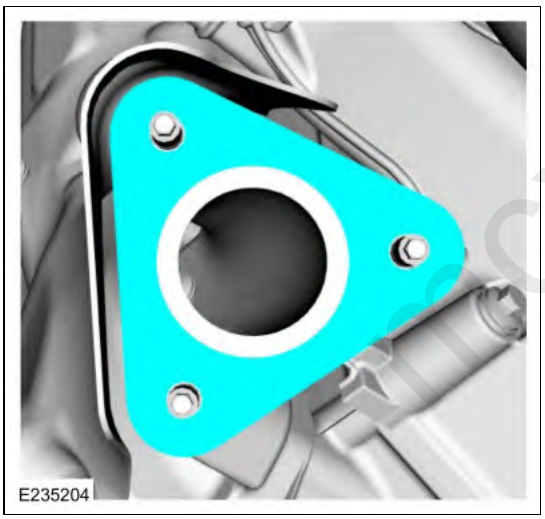
    Install the LH turbocharger inlet pipe, the new turbocharger clamp and the new nuts.
    Torque:
    Stage 1: Tighten the clamp nut to: : 106 lb.in (12 Nm)
    Stage 2: Tighten the nuts to: : 18 lb.ft (25 Nm)
    Stage 3: Tighten the nuts a second time to: : 18 lb.ft (25 Nm)
    Stage 4: Loosen the clamp nut : 1 turn(s)
    Stage 5: Tighten the clamp nut to: : 159 lb.in (18 Nm)



41. Install the exhaust downpipe.

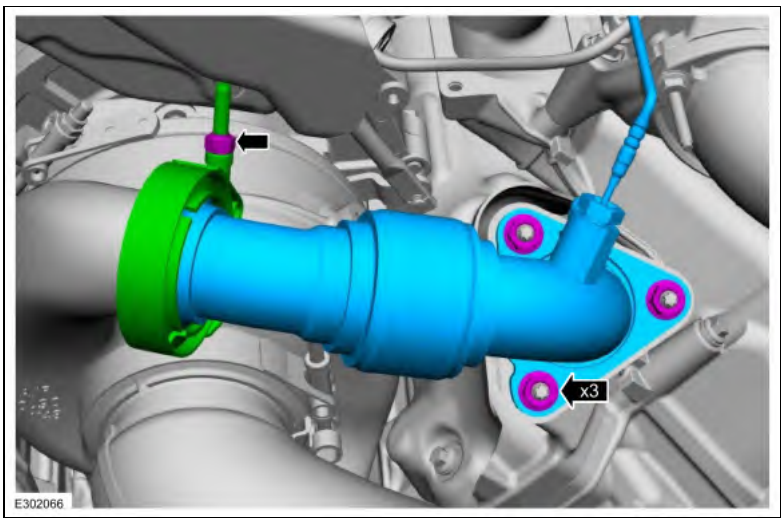
42. **NOTE:** *Clean all exhaust connections before assembly.*

    Install a new RH turbocharger inlet pipe gasket.

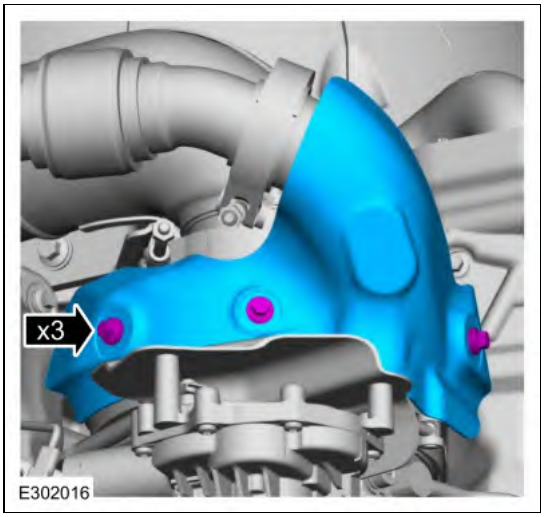


43. **NOTICE: Do not bend or twist the turbocharger inlet pipes or damage to the bellows on the turbocharger inlet pipes may occur.**

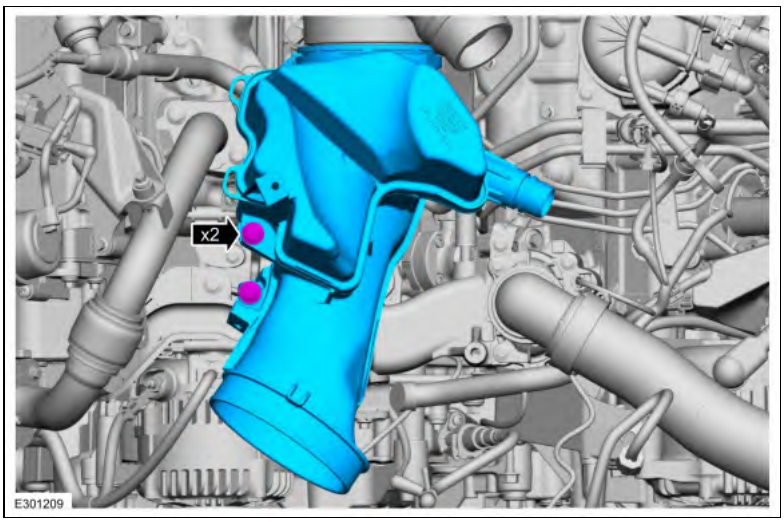
    Install the RH turbocharger inlet pipe, the new turbocharger clamp and the new nuts.
    Torque:
    Stage 1: Tighten the clamp nut to: : 106 lb.in (12 Nm)
    Stage 2: Tighten the nuts to: : 18 lb.ft (25 Nm)
    Stage 3: Tighten the nuts a second time to: : 18 lb.ft (25 Nm)
    Stage 4: Loosen the clamp nut : 1 turn(s)
    Stage 5: Tighten the clamp nut to: : 159 lb.in (18 Nm)



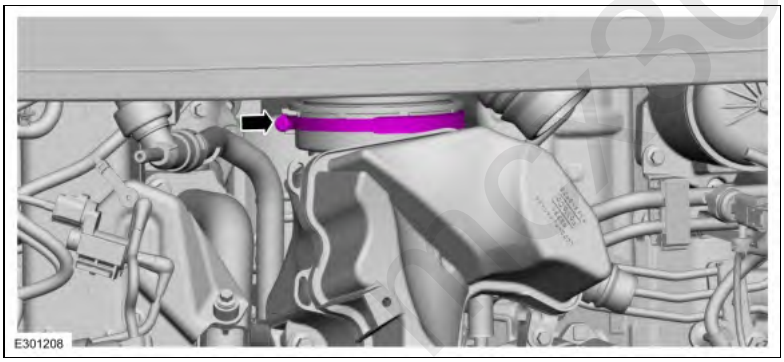
44. Install the TC heat shield and bolts.
    Torque: 89 lb.in (10 Nm)



45. Install the lower intake manifold and the bolts.
    Torque: 18 lb.ft (24 Nm)



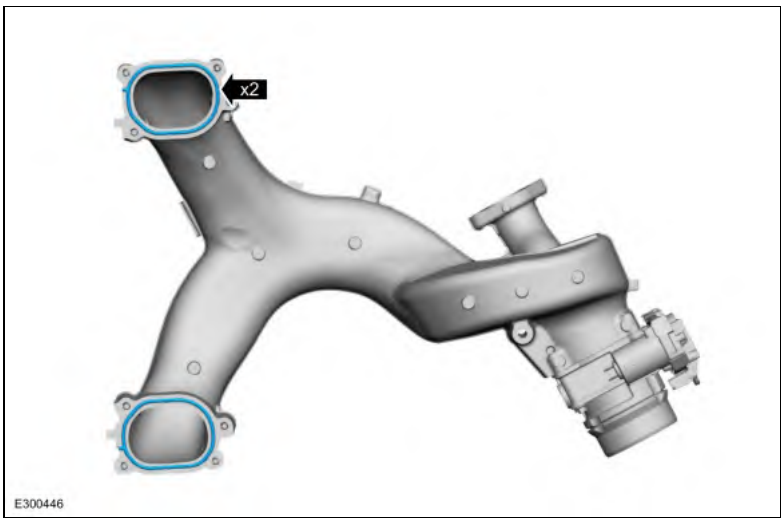
46. Tighten the lower intake manifold clamp.
    Torque: 31 lb.in (3.5 Nm)



47. Install the crankcase vent oil separator.

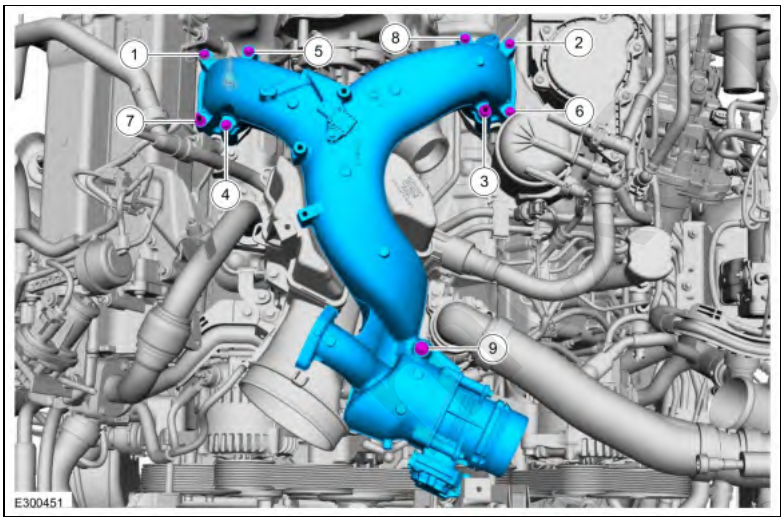
    Refer to: Crankcase Vent Oil Separator (303-08B Engine Emission Control - 6.7L Power Stroke Diesel, Removal and Installation).

48. If removed, install the new upper intake manifold gaskets.

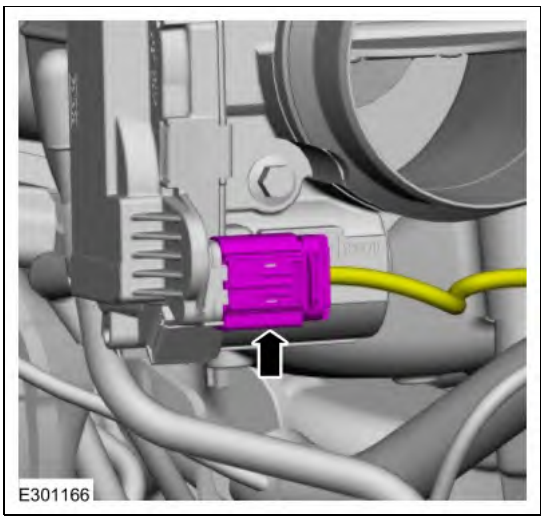


49. **NOTICE: Do not slide the upper intake manifold across the lower intake manifold during installation. Failure to follow this may result in damage to the upper intake manifold gaskets.**

    - Remove the cover or tape from the valve covers and lower intake manifold prior to installing the upper intake manifold.
    - Install the upper intake manifold and tighten the retainers.
      Torque:
      Stage 1: Tighten bolts 1 thru 8 to: : 89 lb.in (10 Nm)
      Stage 2: Tighten bolts 1 thru 8 to: : 98 Â°
      Stage 3: Tighten bolt 9 to: : 18 lb.ft (24 Nm)



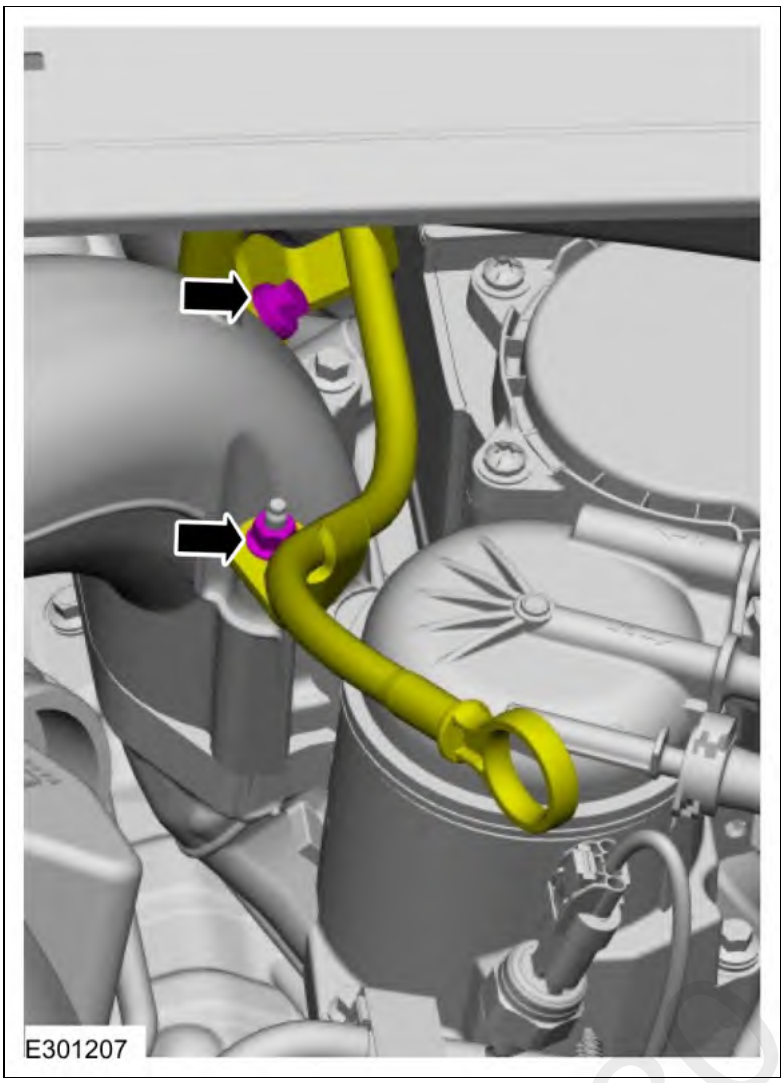
50. Connect the TB (throttle body) electrical connector.



51. Install the EGR cooler.

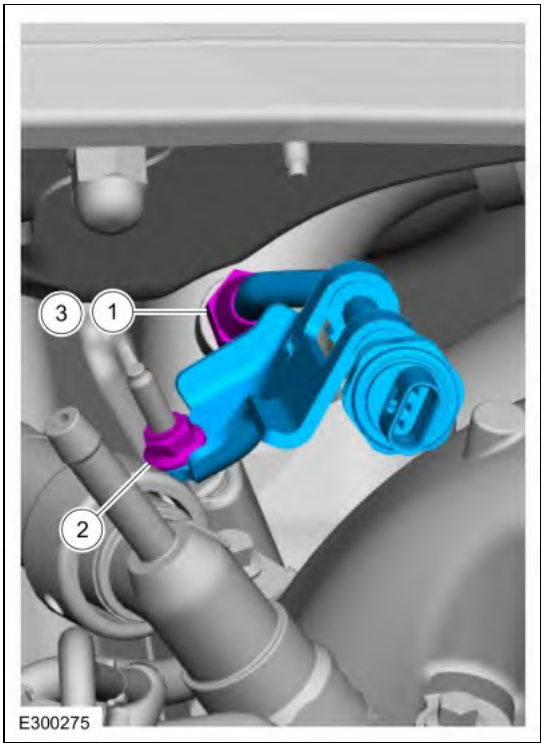
    Refer to: Exhaust Gas Recirculation (EGR) Cooler (303-08B Engine Emission Control - 6.7L Power Stroke Diesel, Removal and Installation).

52. Position back the engine oil level indicator tube, install the nut and the bolt.
    Torque: 89 lb.in (10 Nm)



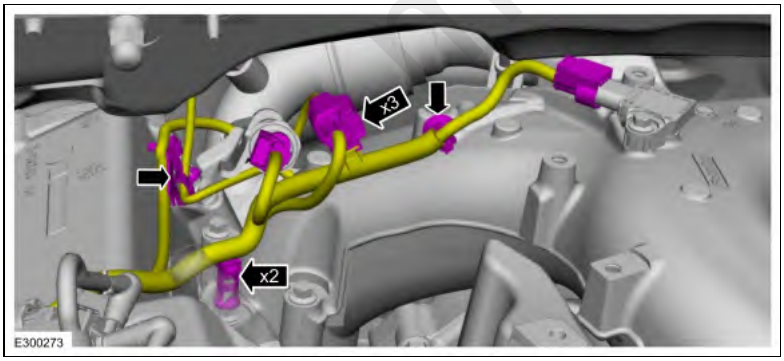
53.

1. Install the EP (exhaust pressure) sensor tube assembly and nut. Tighten the EP sensor tube assembly.
   Torque: 133 lb.in (15 Nm)
2. Tighten the nut.
   Torque: 89 lb.in (10 Nm)
3. Tighten the EP sensor tube assembly.
   Torque: 177 lb.in (20 Nm)

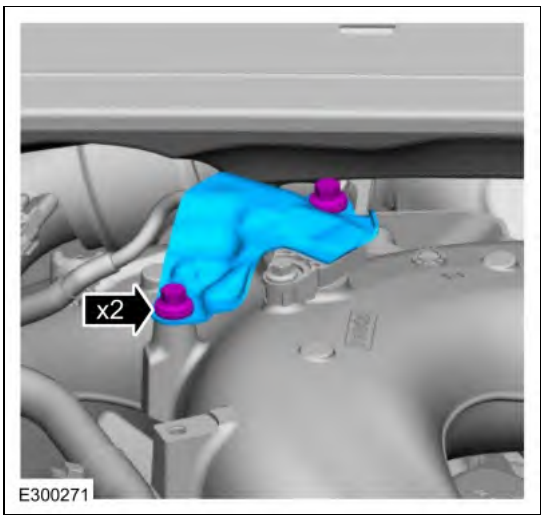


54.

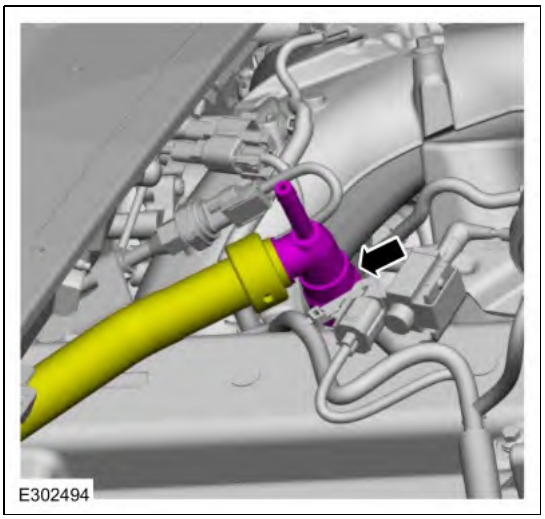
- Connect the MAP sensor, EP sensor and the EGRT sensor electrical connectors.
- Connect the wiring harness retainers.



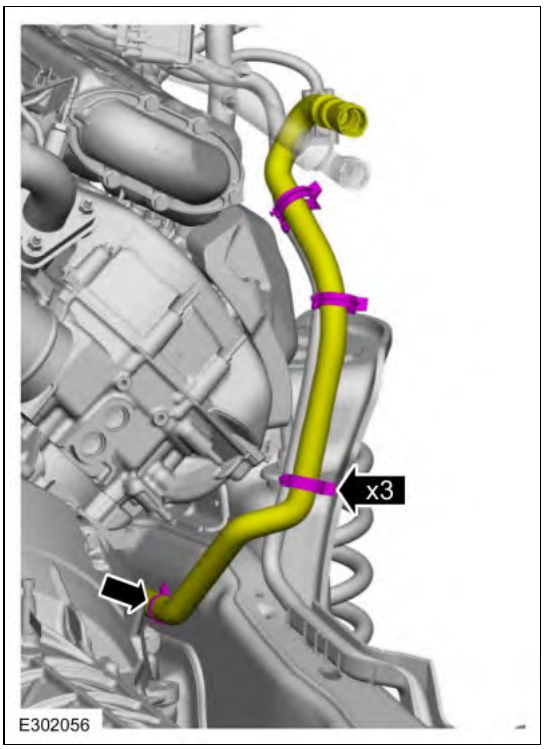
55. Install the intake manifold support and the bolts.
Torque: 89 lb.in (10 Nm)



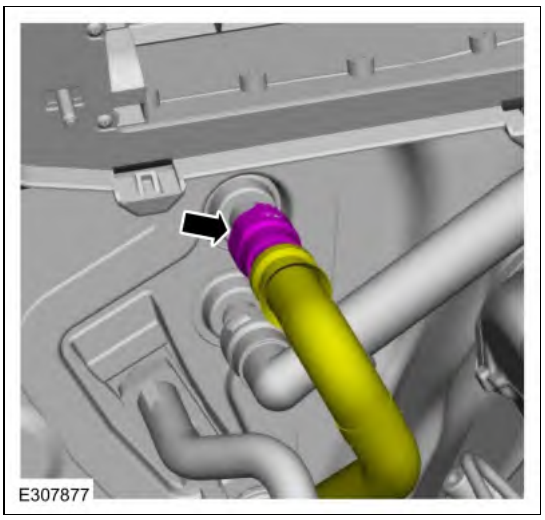
56. Connect the heater hose at the heater supply tube.



57. Connect the heater hose retainer to the frame. Connect the heater hose to the retainers.

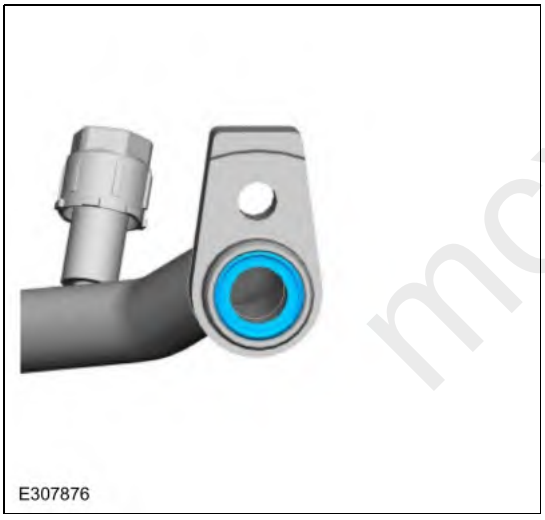


58. Connect the heater hose.

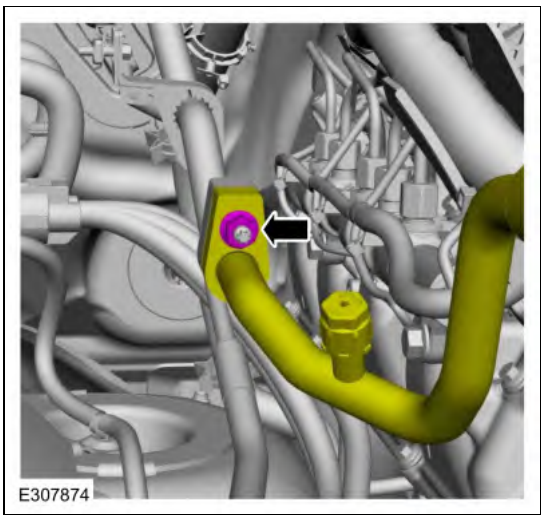


59. **NOTICE: Only use the specified material to lubricate the seals.**

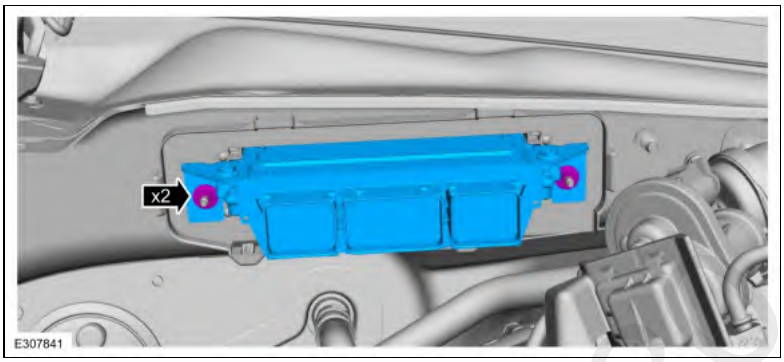
    Install a new O-ring seal and lubricate with clean PAG refrigerant oil.
    Material: MotorcraftÂ® PAG Refrigerant Compressor Oil / YN-12-D (WSH-M1C231-B)



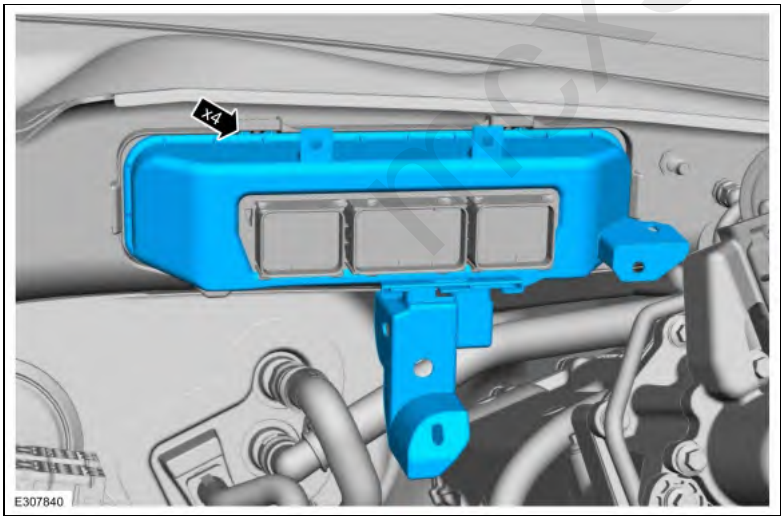
60. Position the evaporator-to-compressor suction tube fitting and install the nut.
    Torque: 159 lb.in (18 Nm)



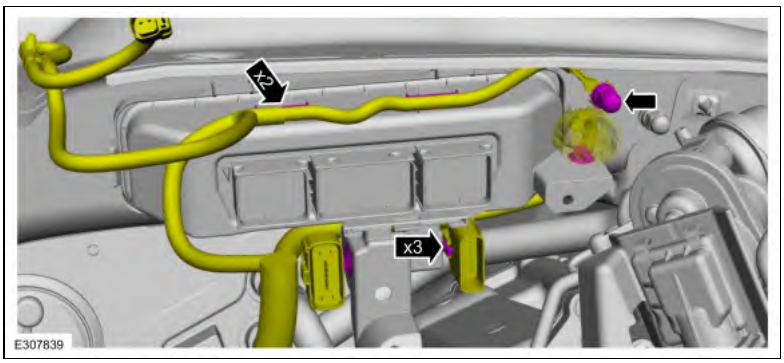
61. Install the PCM and the nuts.
Torque: 80 lb.in (9 Nm)



62. Install the PCM cover.

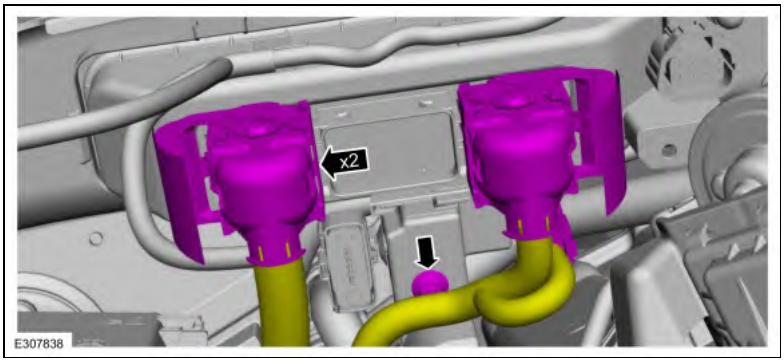


63.
- Position the wire harnesses back and connect the retainers.
- Install the ground cable nut.
Torque: 106 lb.in (12 Nm)



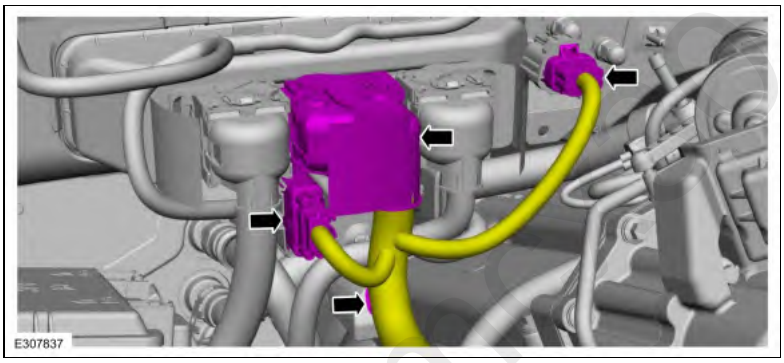
64.

- Position back the wire harness and connect the retainer.
- Connect the PCM electrical connectors and the electrical connector.

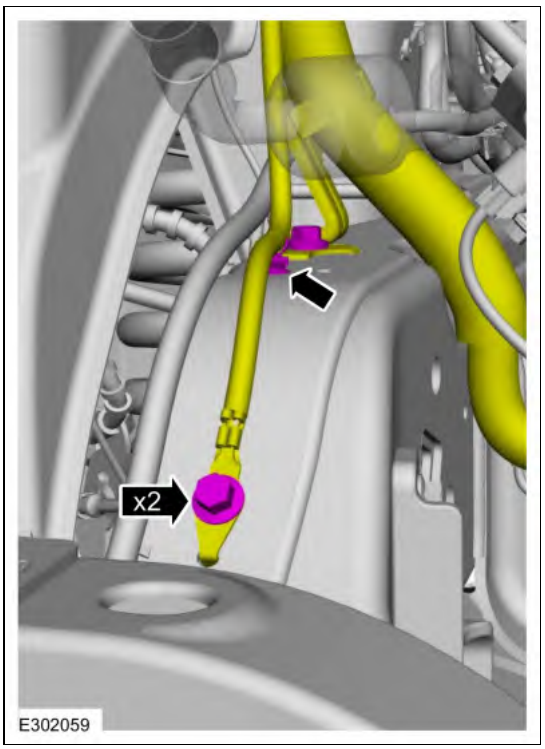


65.

- Position back and connect the PCM electrical connector and the electrical connectors.
- Connect the retainer.

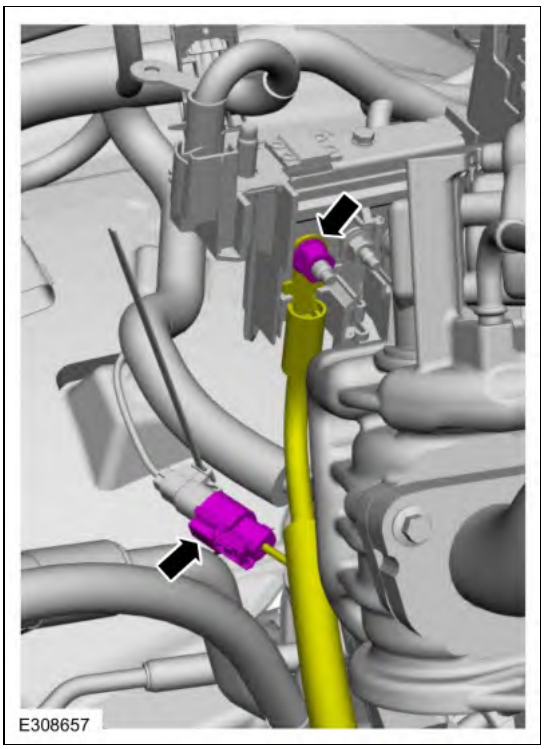


66. Position back the wire harness and connect the retainer. Install the bracket bolt and the ground wire bolt.
Torque: 22 lb.ft (30 Nm)



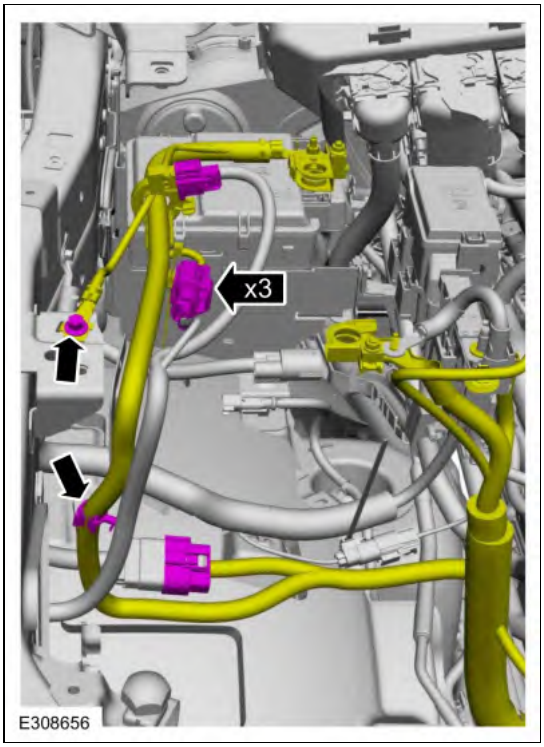
67.

- If equipped with dual generators, connect the electrical connector.
- Position back the harness and install the nut
  Torque: 106 lb.in (12 Nm)



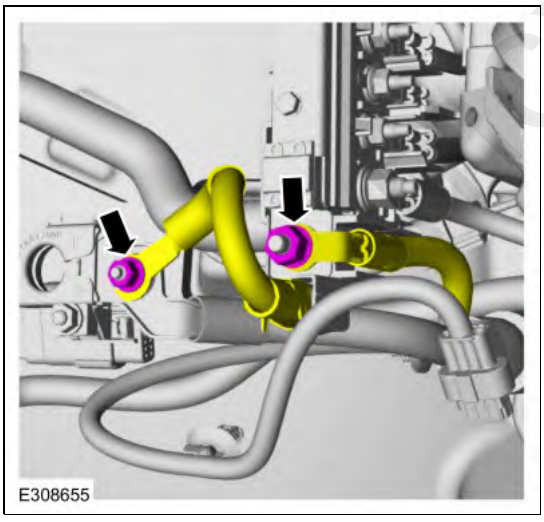
68.

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



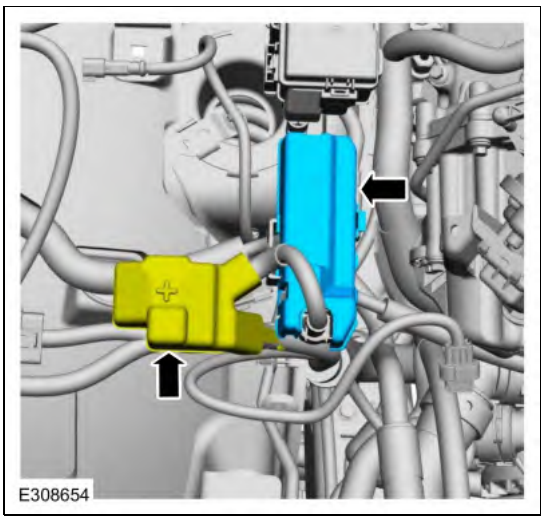
69.

- Connect the cable to the power distribution box and install the nut.
  Torque: 106 lb.in (12 Nm)
- Connect the cable to the battery harness and install the nut.
  Torque: 80 lb.in (9 Nm)

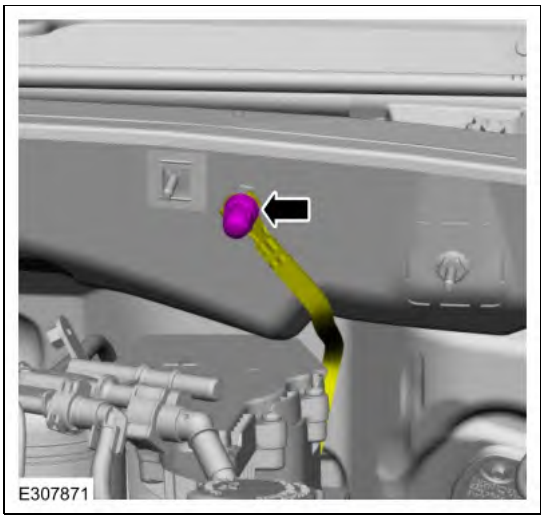


70.

- Install the power distribution cover.
- Position back the battery cable cover.

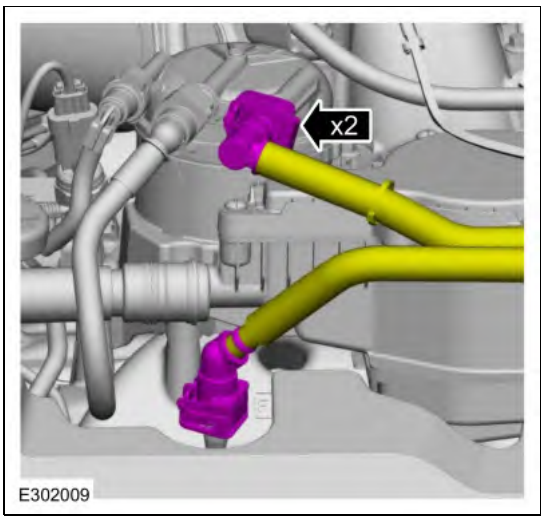


71. Position back the ground strap and install the retainer.
Torque: 106 lb.in (12 Nm)

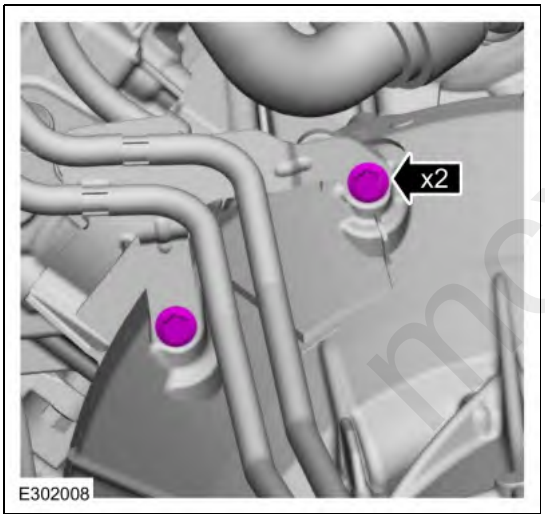


72. **NOTICE: Fuel injection equipment is manufactured to very precise tolerances and fine clearances. To prevent fuel system damage, it is essential that absolute cleanliness is observed when working with these components.**

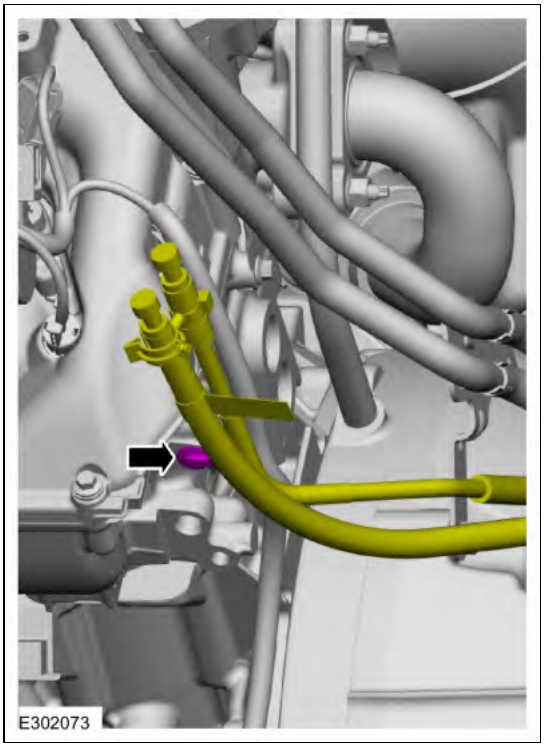
Position back the fuel tubes and connect the tubes.
Refer to: Quick Release Coupling (310-00 Fuel System - General Information - 6.7L Power Stroke Diesel) .



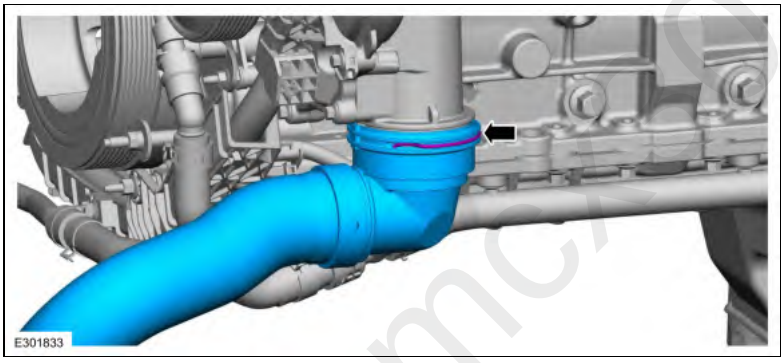
73. Install the fuel tube bracket bolts to the transmission bellhousing.
Torque: 46 lb.ft (63 Nm)



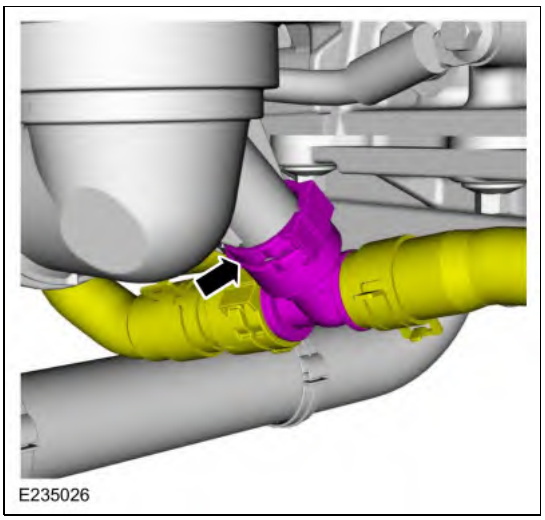
74. If equipped, connect the retainer for the transmission/ transfer case vent tubes.



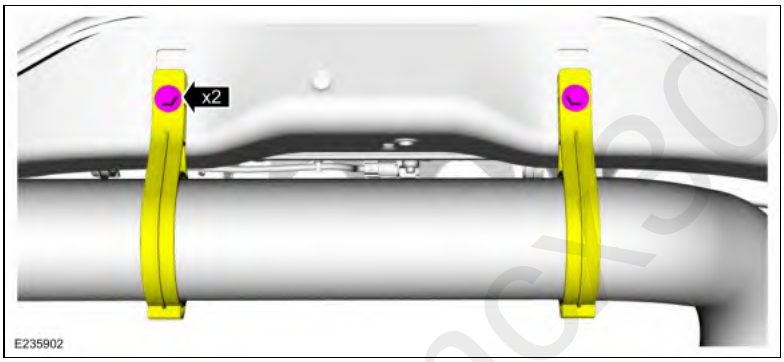
75. Install the lower radiator hose and install the clip.



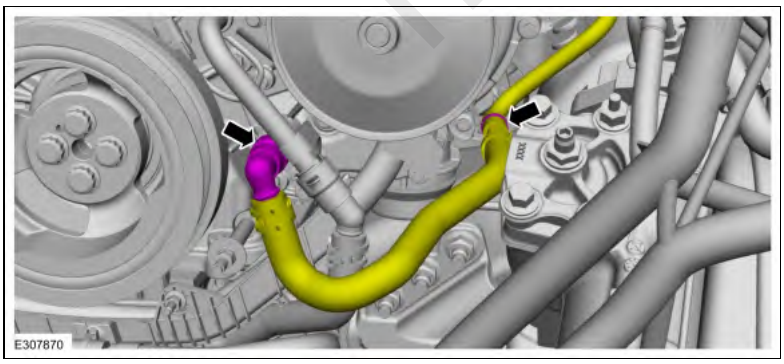
76. Connect the coolant hose and install the clip.



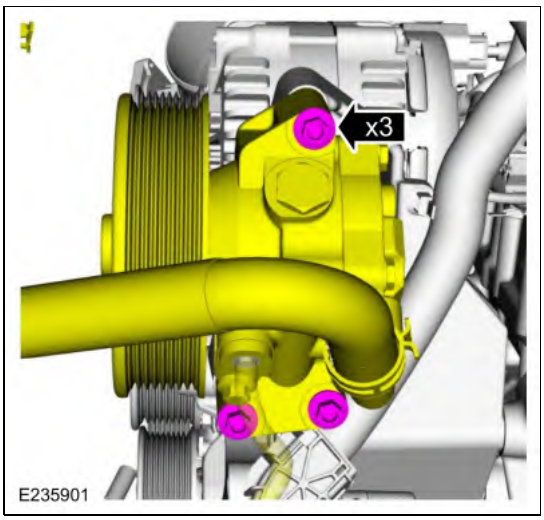
77. Position back the lower radiator hose and install the bolts.
Torque: 80 lb.in (9 Nm)



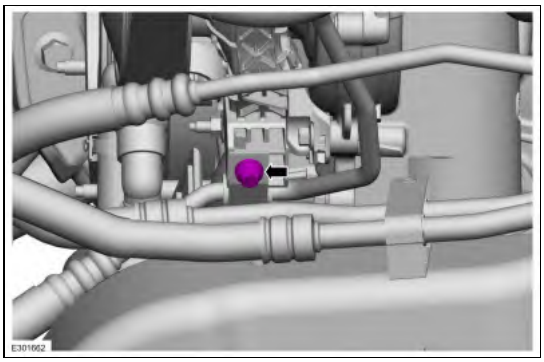
78. Position back the coolant hose and connect the retainer on the frame. Connect the coolant hose to the transmission oil cooler coolant tube.



79. Position back the power steering pump and bolts.
Torque: 18 lb.ft (25 Nm)

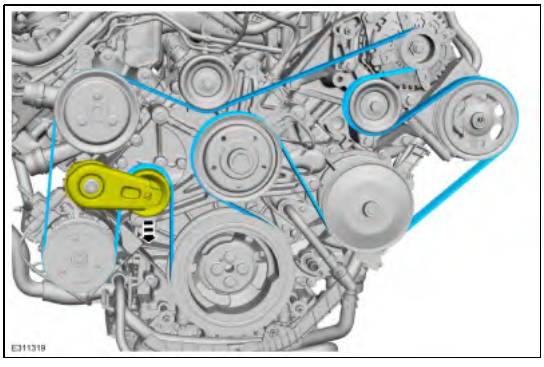


80. Install the retainer to the power steering line bracket.
Torque: 44 lb.in (5 Nm)

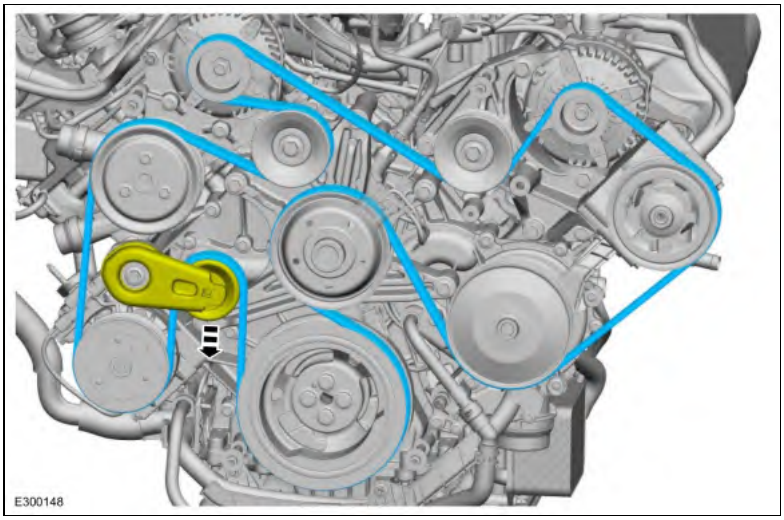


81. Install the upper radiator hose.

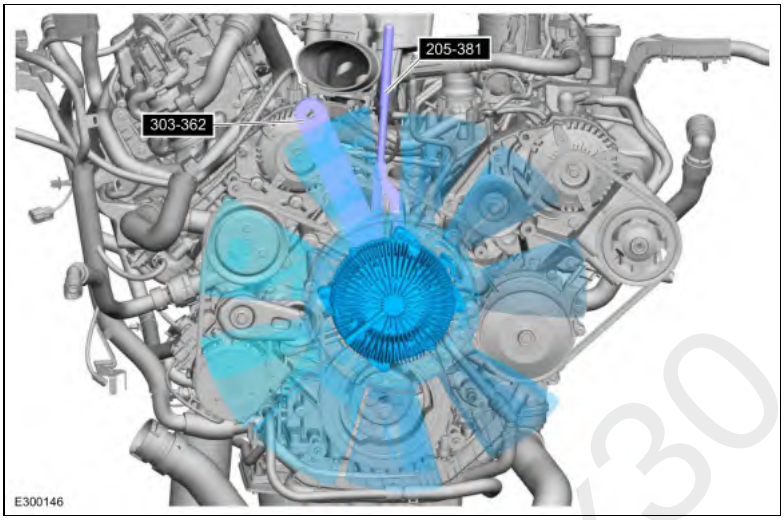
82. If equipped with single generator, install the accessory drive belt.



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

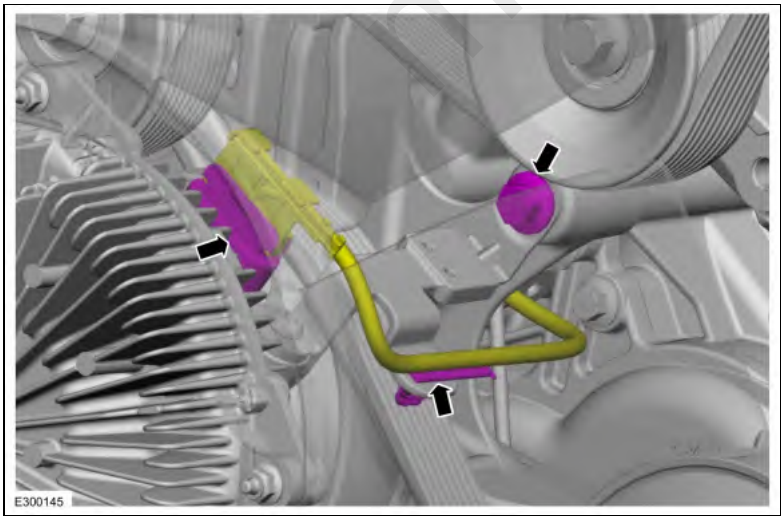


84. Using the special tools, install the fan clutch.
Use Special Service Tool: 205-036 (T70P-4067-A) Wrench. , 303-214 (T83T-6312-B) Wrench, Fan Clutch Nut.
Torque: 98 lb.ft (133 Nm)

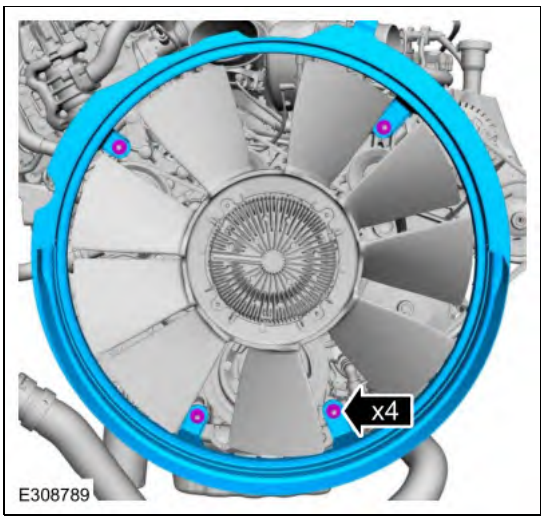


85.

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

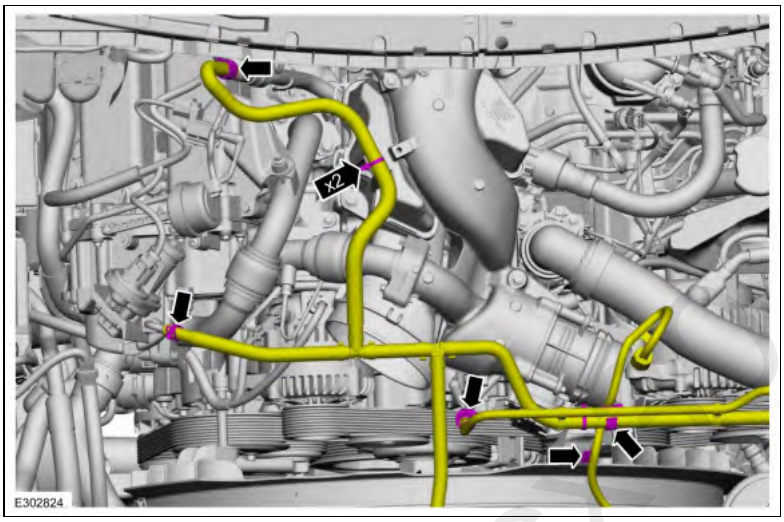


86. Install the cooling fan stator and nuts.
Torque: 159 lb.in (18 Nm)

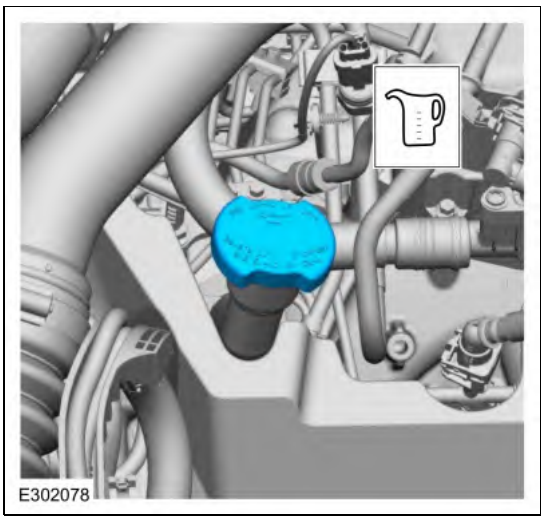


87.

- Position back the coolant hoses and connect.
  Use the General Equipment: Hose Clamp Remover/Installer
- Connect the vacuum hose connector.
  Refer to: Quick Release Coupling (310-00 Fuel System - General Information - 6.7L Power Stroke Diesel) .



88. Fill the engine with the correct engine oil for the climate.
    Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).



89. Install the following items:
    1. Install the cowl panel grille
       Refer to: Cowl Panel Grille (501-02 Front End Body Panels, Removal and Installation).
    2. Install the RH and LH battery trays.
       Refer to: Battery Tray (414-01 Battery, Mounting and Cables, Removal and Installation).
    3. Install the CAC
       Refer to: Charge Air Cooler (CAC) (303-12B Intake Air Distribution and Filtering - 6.7L Power Stroke Diesel, Removal and Installation).
    4. Install the CAC outlet pipe.
       Refer to: Charge Air Cooler (CAC) (303-12B Intake Air Distribution and Filtering - 6.7L Power Stroke Diesel, Removal and Installation).
    5. Install the CAC intake pipe.
       Refer to: Charge Air Cooler (CAC) (303-12B Intake Air Distribution and Filtering - 6.7L Power Stroke Diesel, Removal and Installation).
    6. Install the cooling module.
       Refer to: Cooling Module (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Removal and Installation).

90. Bleed the fuel system.
    Refer to: Fuel System Bleeding (310-00B Fuel System - General Information - 6.7L Power Stroke Diesel, General Procedures).

91. Start the engine and check the exhaust for leaks.

92. Check the transmission fluid level.
    Refer to: Transmission Fluid Level Check (307-01B Automatic Transmission, Transfer Case and Power Transfer Unit - 10-Speed Automatic Transmission â€“ 10R140, General Procedures).