

Engine - Body Off

Special Tool(s) / General Equipment

	303-050 (T70P-6000) Lifting Bracket, Engine
	303-1518 Bracket, Engine Removal TKIT-2009C-F TKIT-2009C-ROW
	307-346 (T97T-7902-A) Retainer, Torque Converter TKIT-1998-LM (NavigatorR) TKIT-1997-F/FLM/LT
Floor Crane	
Transmission Jack	
Hose Clamp Remover/Installer	

Materials

Name	Specification
Motorcraft® Multi-Purpose Grease Spray XL-5-A	ESB-M1C93-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 vehicle body was not removed, 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 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."

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.

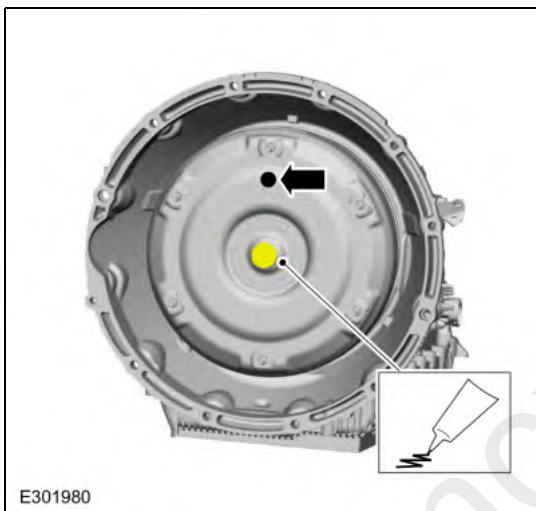
- CAC and the CAC tubes
- Intake air system
- Exhaust manifolds
- EGR cooler and pipes
- Diesel Oxidation Catalyst (DOC)
- Turbocharger (on engine failure only)

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



3. **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: Motorcraft® Multi-Purpose Grease Spray / XL-5-A (ESB-M1C93-B)

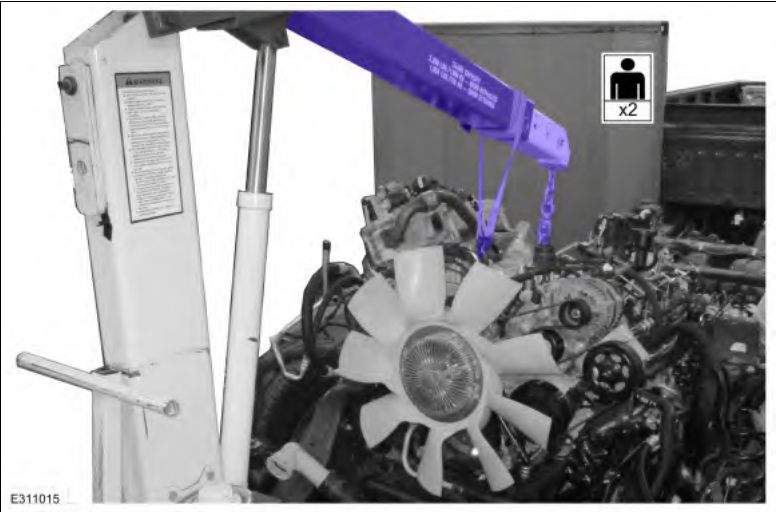


4. **NOTICE:** During installation of the engine, the engine oil cooler will pass very close to the frame crossmember. Install the engine slowly, continually checking to make sure the engine oil cooler does not hit the frame crossmember, or component damage may occur.

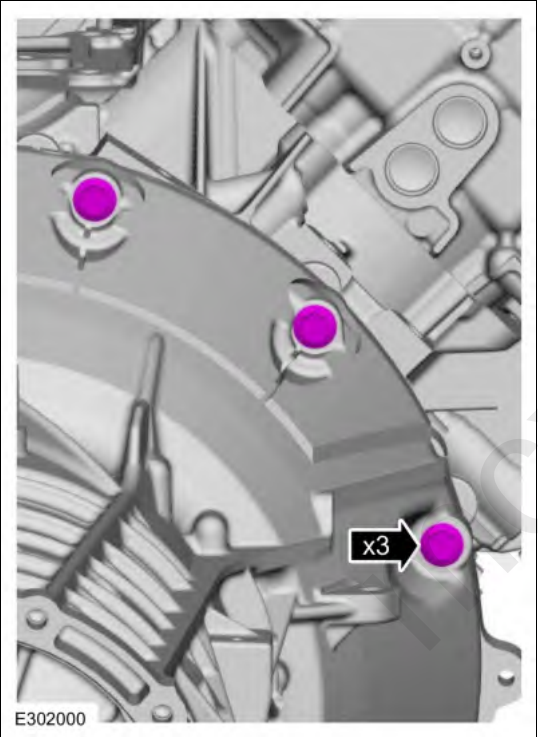
NOTE: Use caution to make sure the torque converter studs align with the holes in the flexplate while joining the engine to the transmission.

Using the floor crane and the ratchet strap, install the engine into the vehicle and join the engine to the transmission.

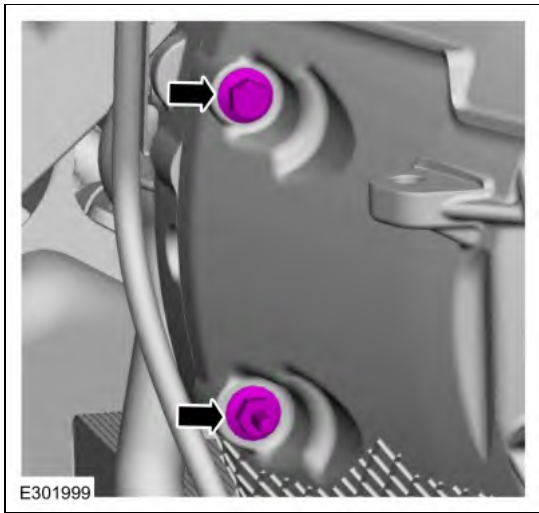
Use the General Equipment: Floor Crane



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



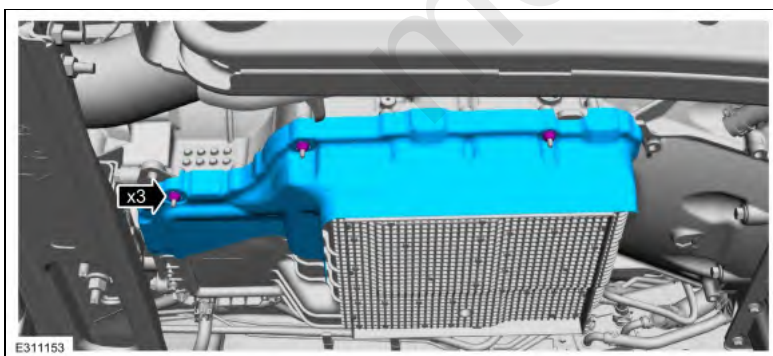
6. Install the LH bellhousing stud bolt and the bolt.
Torque: 46 lb.ft (63 Nm)



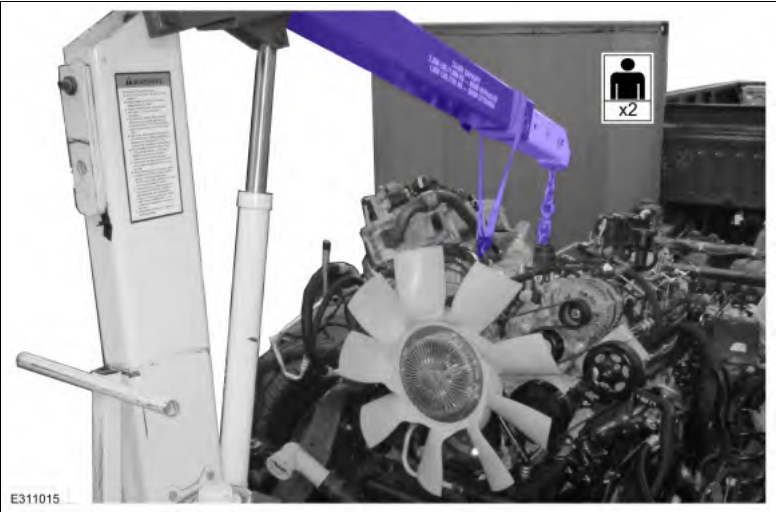
7. Remove the transmission jack.
Use the General Equipment: Transmission Jack
8. Install the lower engine bellhousing bolts and the stud bolt.
Torque: 46 lb.ft (63 Nm)



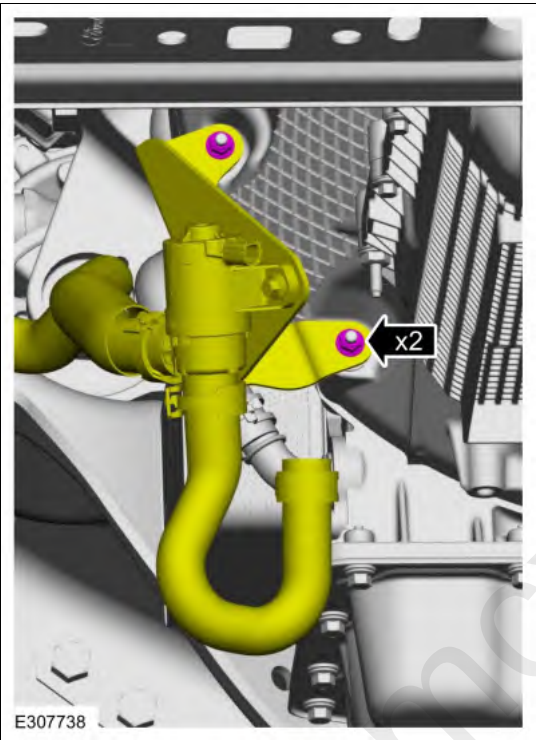
9. Install the transmission heat shield and the nuts.
Torque: 80 lb.in (9 Nm)



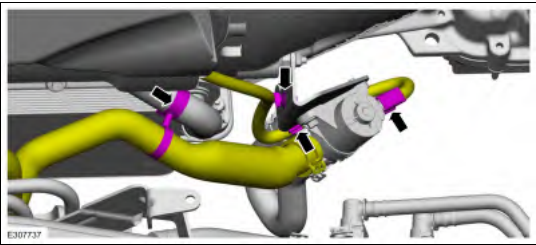
10.
 - Lower the engine into position.
 - Remove the ratchet strap.
 - Remove the floor crane.
Use the General Equipment: Floor Crane



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



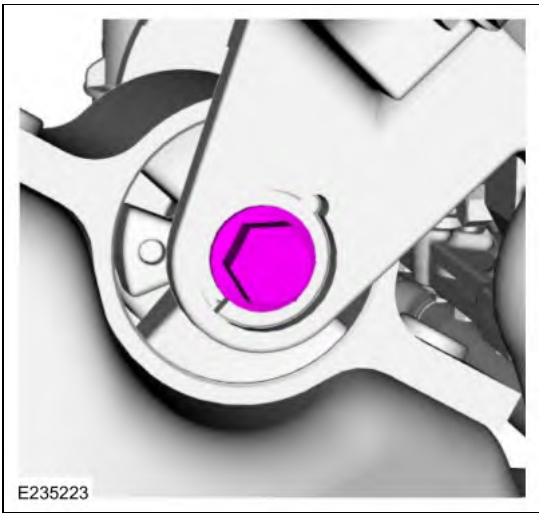
12. Connect the electrical connector and the retainers.



13. **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.

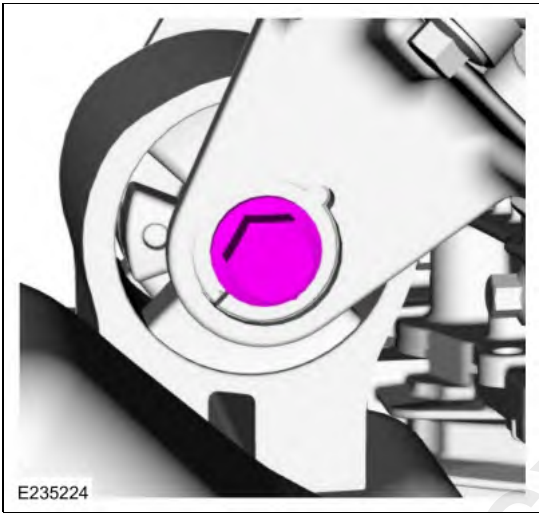
Install the LH engine mount cross bolt.
Torque: 258 lb.ft (350 Nm)



14. **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)



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

Remove and discard the transmission support insulator nuts.



16. Tighten the transmission support insulator studs.

Torque: 66 lb.ft (90 Nm)



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

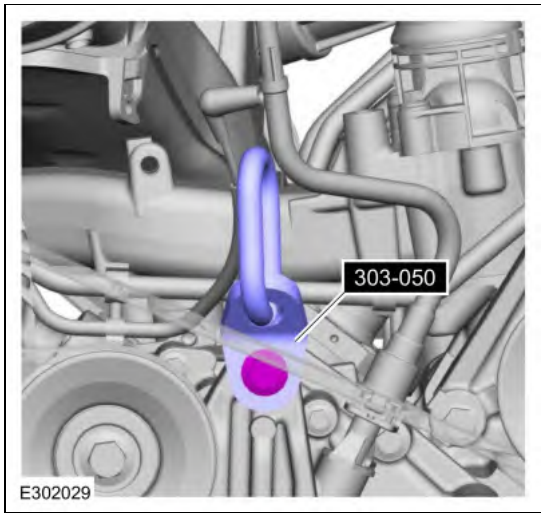
NOTICE: Only use hand tools when installing the transmission support insulator nuts or damage to the transmission support insulator may occur.

Install new transmission support insulator nuts.

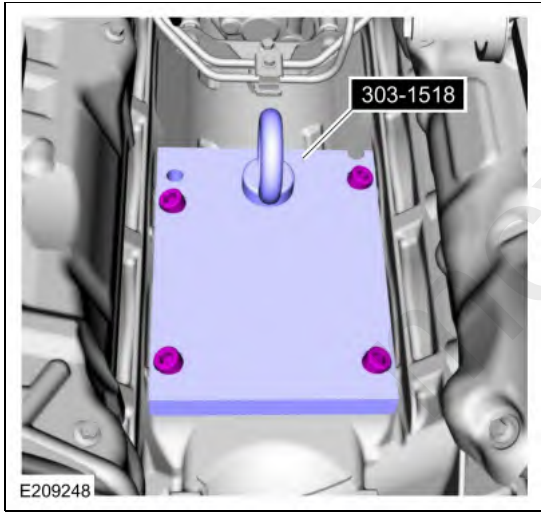
Torque: 85 lb.ft (115 Nm)



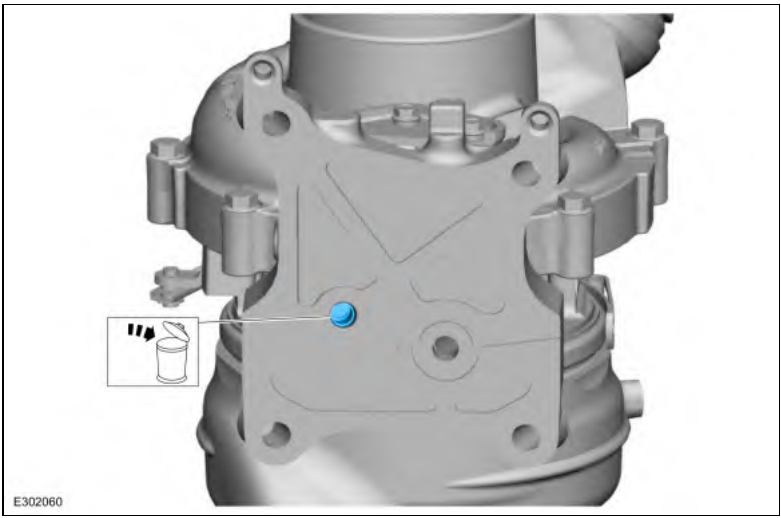
18. Remove Special Service Tool: 303-050 (T70P-6000) Lifting Bracket, Engine.
Torque: 18 lb.ft (25 Nm)



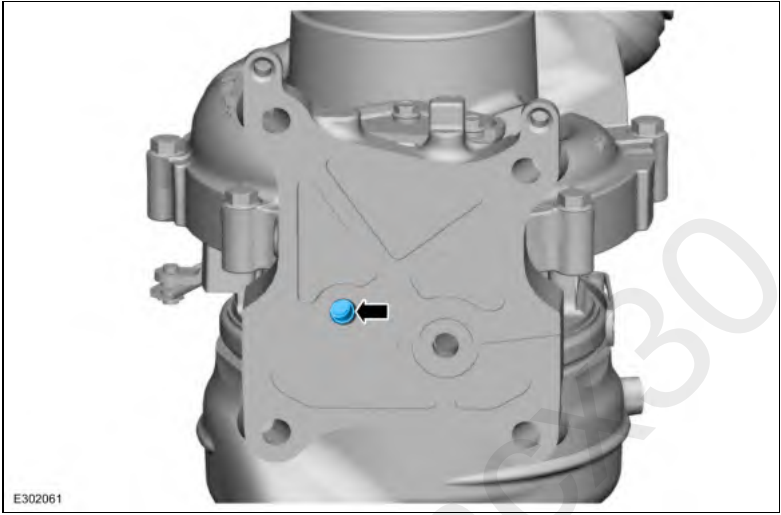
19. Remove Special Service Tool: 303-1518 Bracket, Engine Removal.



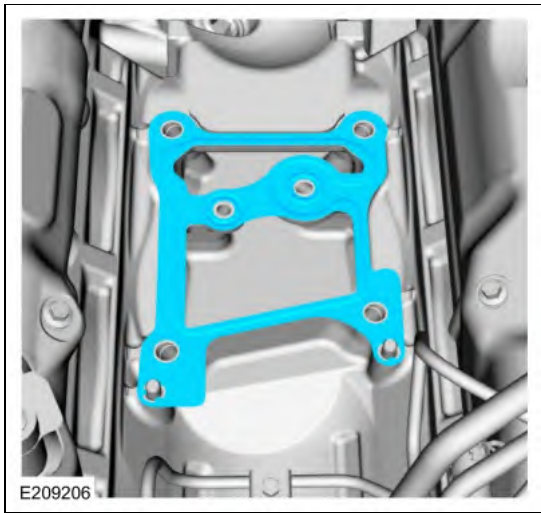
20. Remove and discard the TC oil supply filter.



21. Install a new TC oil supply filter.



22. Install a new TC mounting gasket.

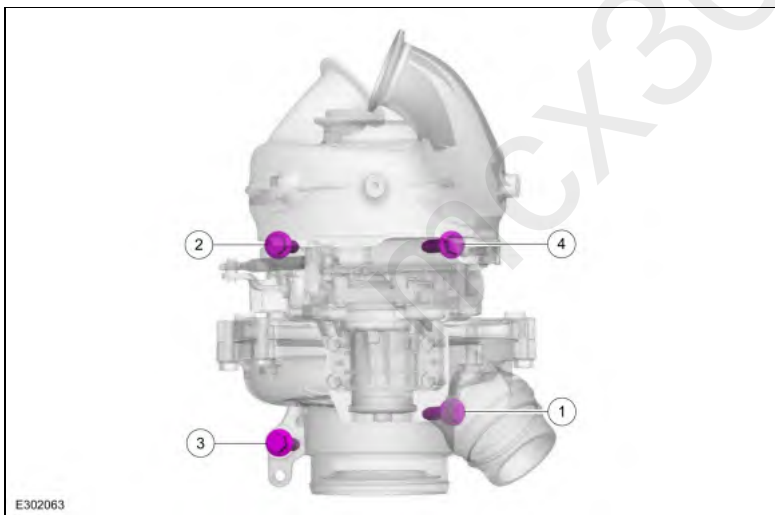


23. Install the TC and the new bolts.

Torque:

Stage 1: 133 lb.in (15 Nm)

Stage 2: 41 lb.ft (55 Nm)



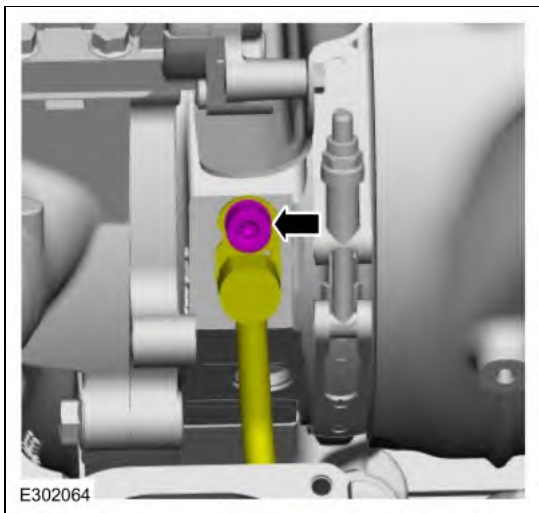
24. Lubricate the TC coolant outlet tube O-ring with clean engine coolant. Position back the TC coolant outlet tube and install the new bolt.

Refer to: Specifications (303-03B Engine Cooling - 6.7L Power Stroke Diesel, Specifications).

Torque:

Stage 1: 106 lb.in (12 Nm)

Stage 2: 30 Å°



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

Install a new LH turbocharger inlet pipe gasket.



26. **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:

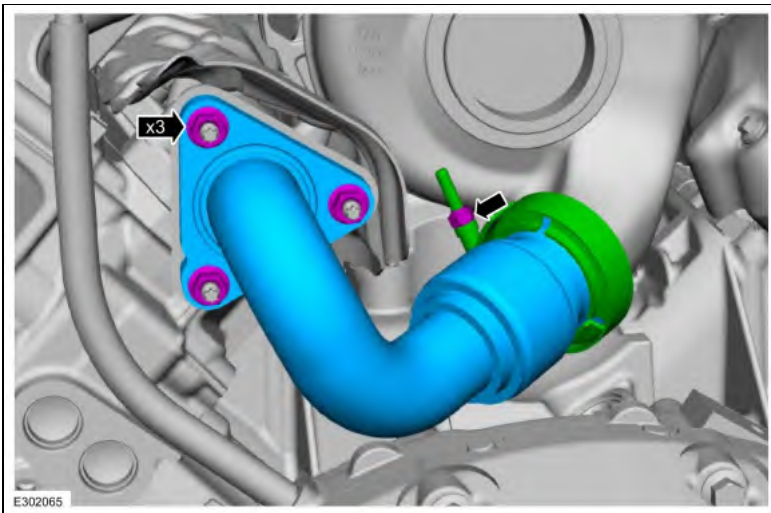
Stage 1: Tighten the clamp nut to : 106 lb.in (12 Nm)

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)



27. Install the TC outlet pipe and the new clamp. Install the bolt hand tight.

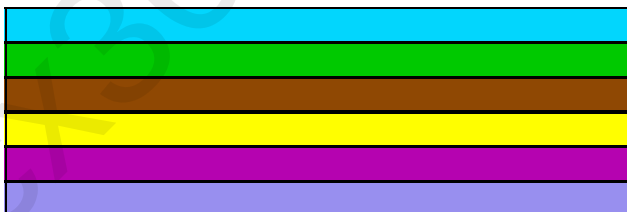
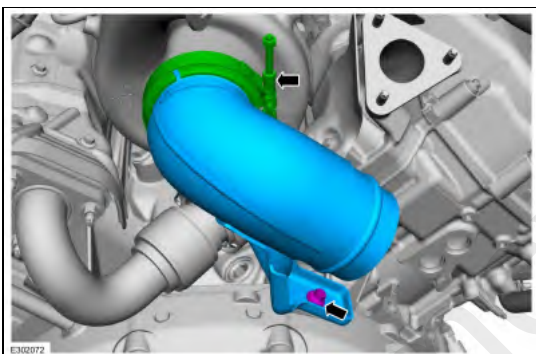
Torque:

Stage 1: Tighten the clamp nut to: : 106 lb.in (12 Nm)

Stage 2: Tighten the bolt to: : 18 lb.ft (25 Nm)

Stage 3: Loosen the clamp nut : 1 turn(s)

Stage 4: Tighten the clamp nut to: : 159 lb.in (18 Nm)



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

Install a new RH turbocharger inlet pipe gasket.



29. **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:

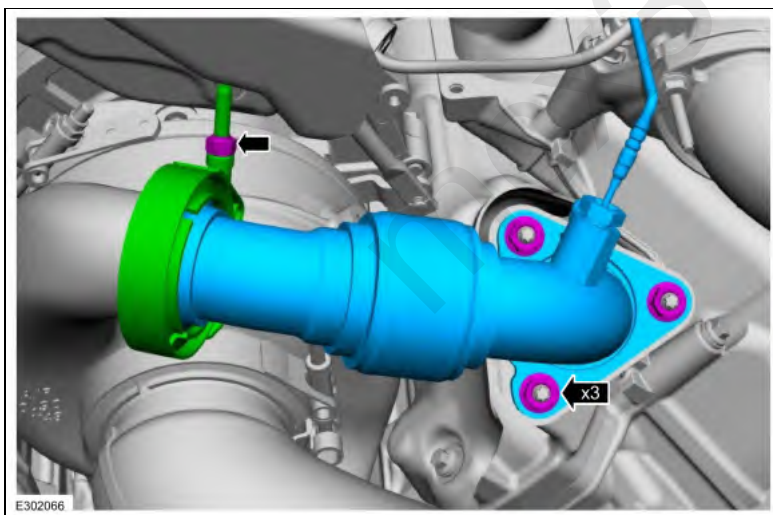
Stage 1: Tighten the clamp nut to: : 106 lb.in (12 Nm)

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)

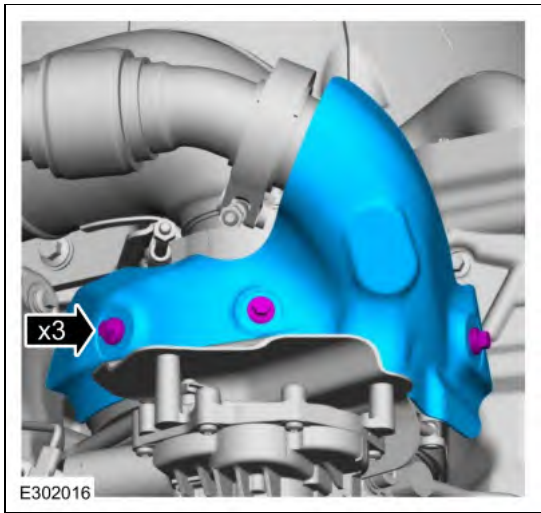
Stage 4: Loosen the clamp nut : 1 turn(s)

Stage 5: Tighten the clamp nut to: : 159 lb.in (18 Nm)

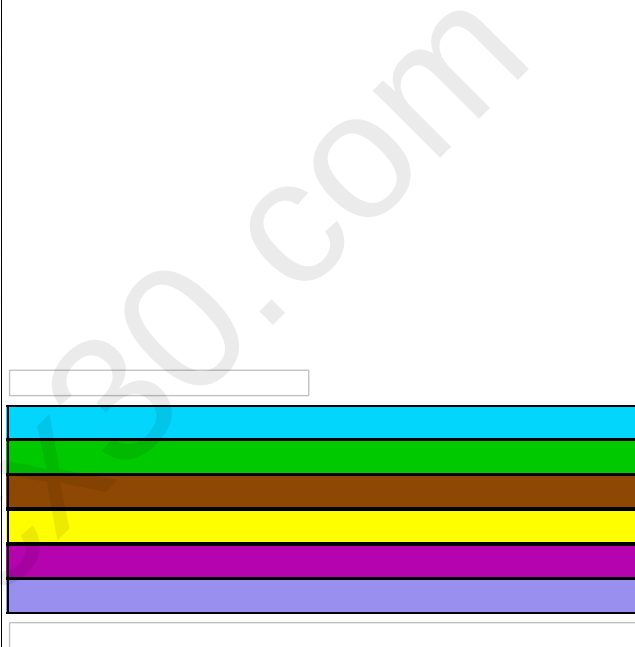
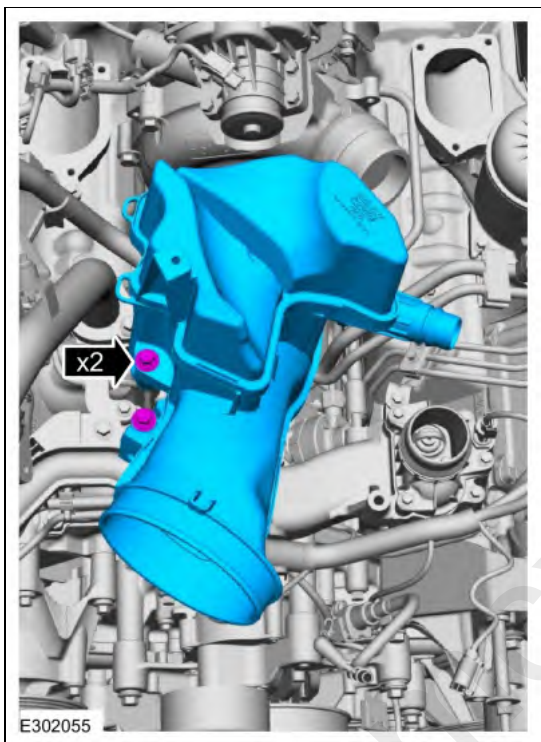


30. Install the TC heat shield and bolts.

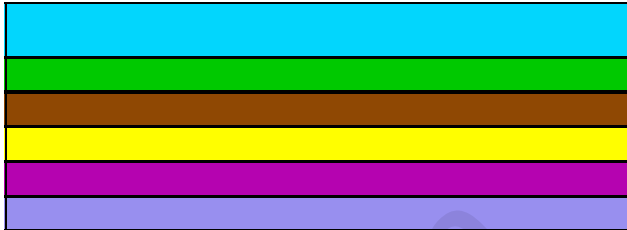
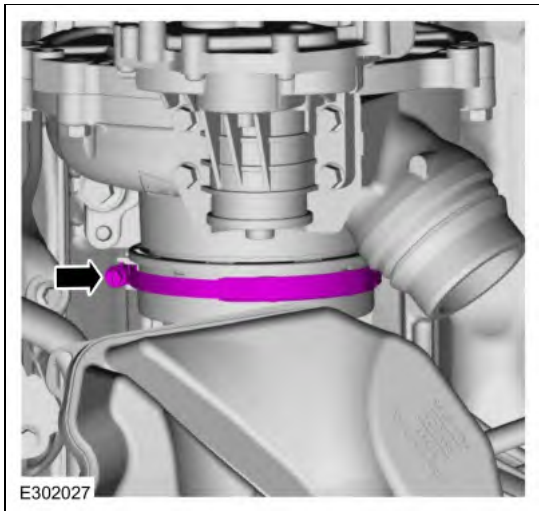
Torque: 89 lb.in (10 Nm)



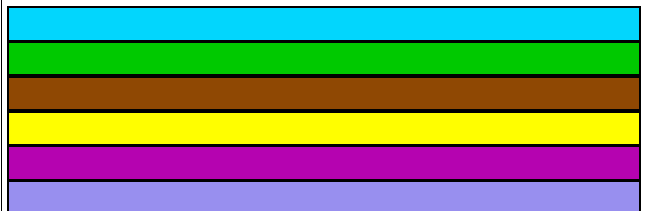
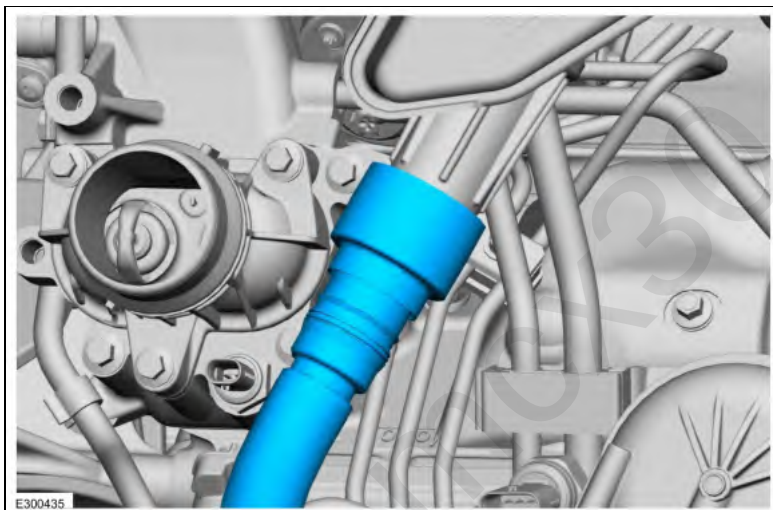
31. Install the lower intake manifold and the bolts.
Torque: 18 lb.ft (24 Nm)



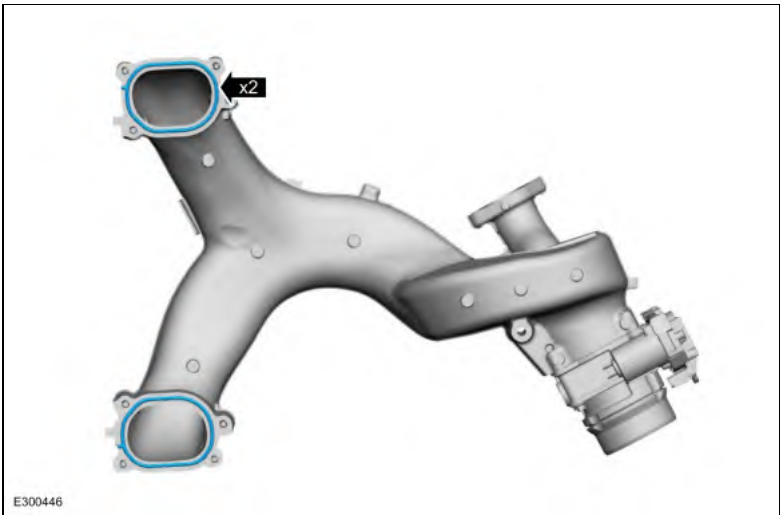
32. Tighten the lower intake manifold clamp.
Torque: 31 lb.in (3.5 Nm)



33. Connect the crankcase vent oil separator hose to the lower intake manifold.



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



35. **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.

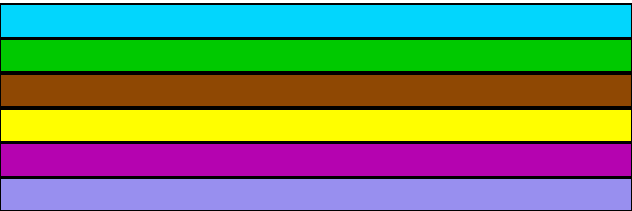
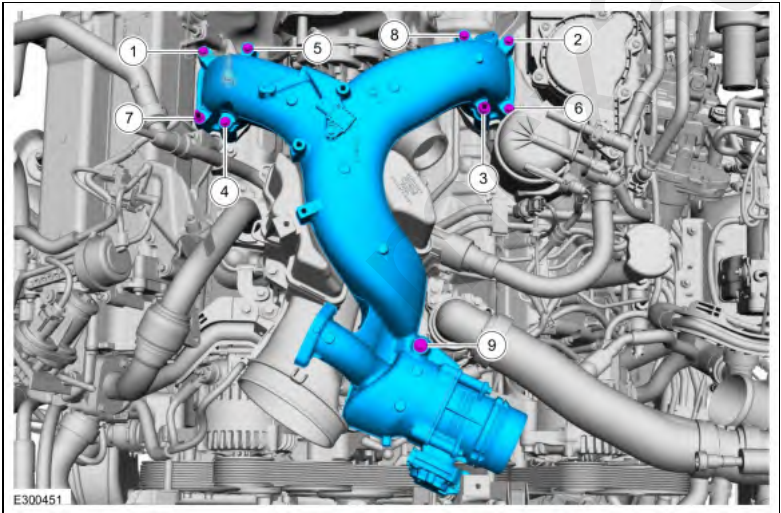
- Remove the cover or tape from the valve covers and lower intake manifold prior to installing the upper intake manifold.
- Install the upper intake manifold and tighten the retainers.

Torque:

Stage 1: Tighten bolts 1 thru 8 to: : 89 lb.in (10 Nm)

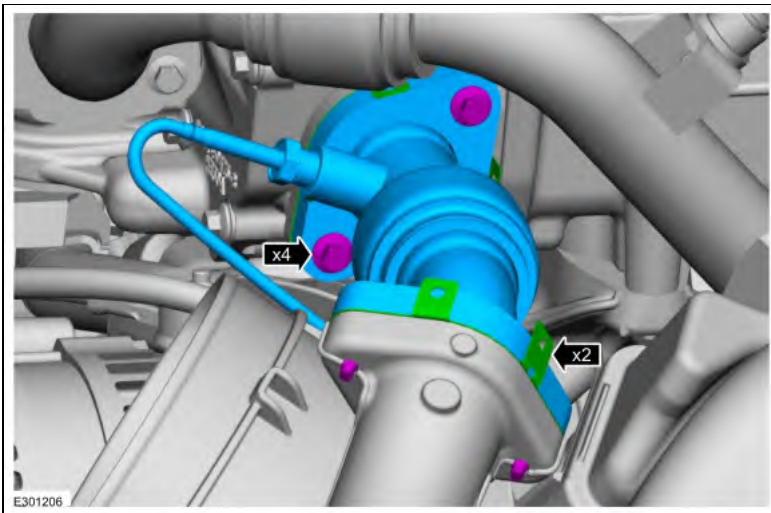
Stage 2: Tighten bolts 1 thru 8 to: : 98 Å°

Stage 3: Tighten bolt 9 to: : 18 lb.ft (24 Nm)

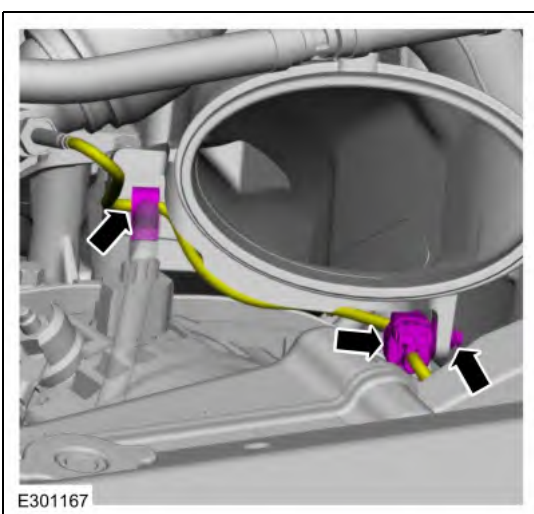


36. Using new gaskets, install the EGR cooler outlet tube and the bolts.

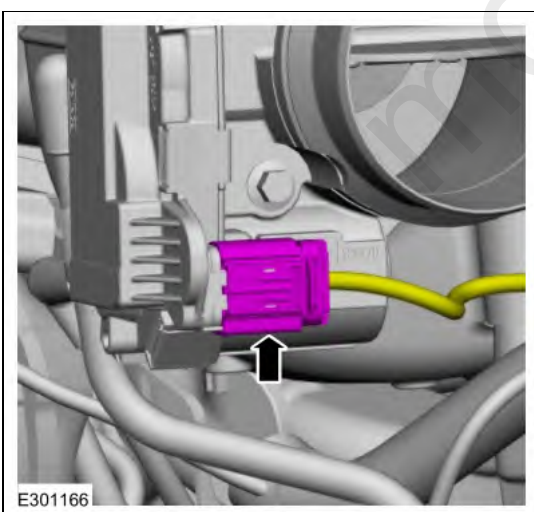
Torque: 89 lb.in (10 Nm)



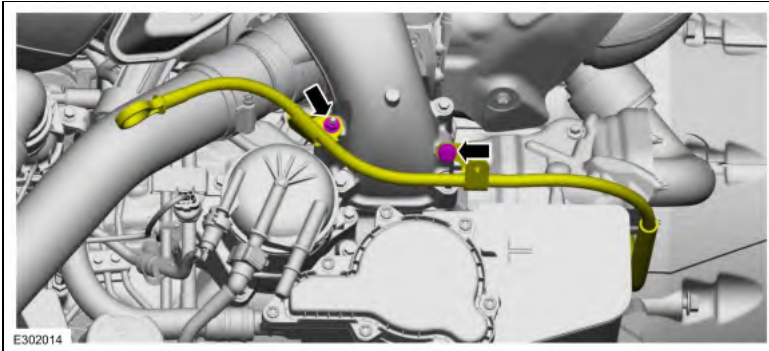
37. Connect the EGRT sensor electrical connector and the wire retainer.



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

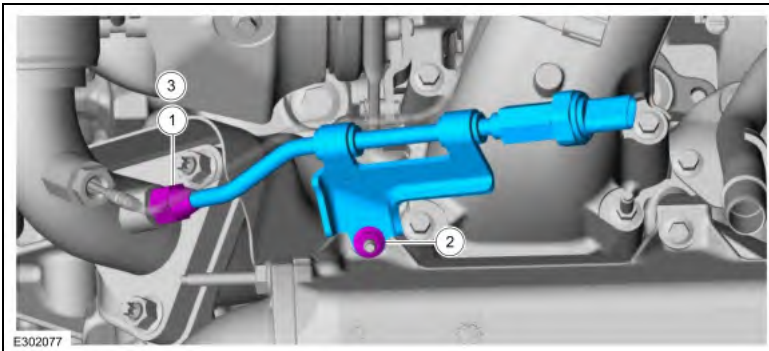


39. Position back the engine oil level indicator tube, install the nut and the bolt.
Torque: 89 lb.in (10 Nm)



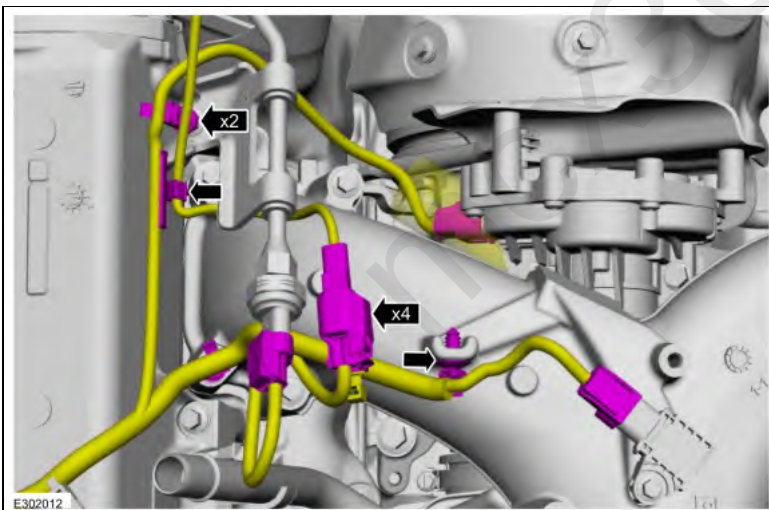
40.

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)

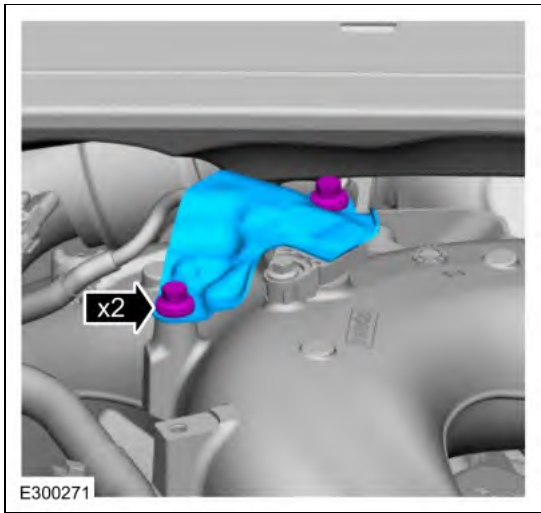


41.

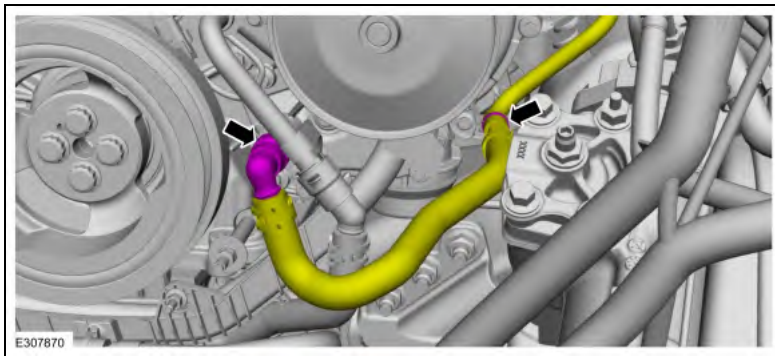
- Connect the MAP sensor, EP sensor, EGRT sensor and the turbocharger actuator electrical connectors.
- Connect the wiring harness retainers.



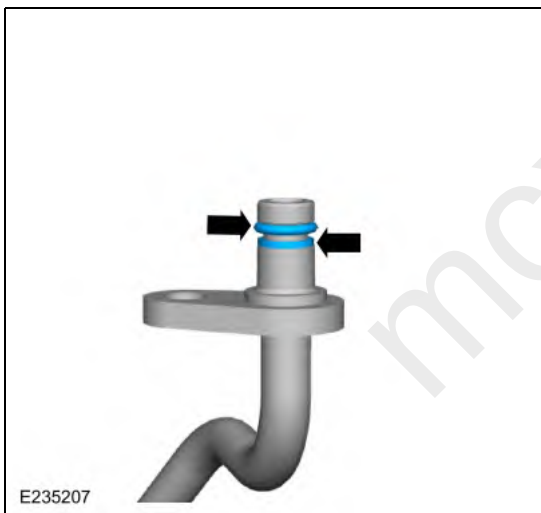
42. Install the intake manifold support and the bolts.
Torque: 89 lb.in (10 Nm)



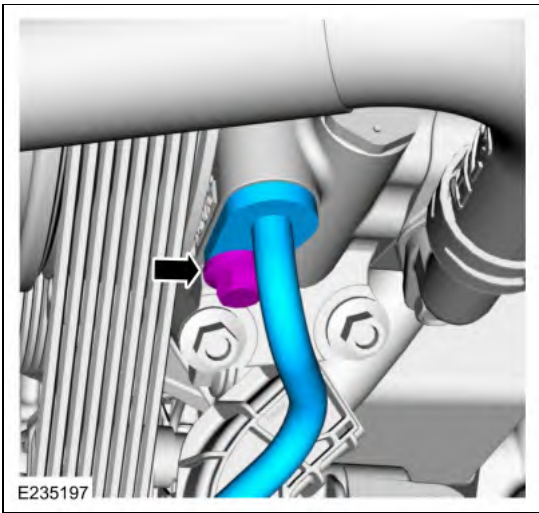
43. Position back the coolant hose and connect the retainer on the frame. Connect the coolant hose to the transmission oil cooler coolant tube.



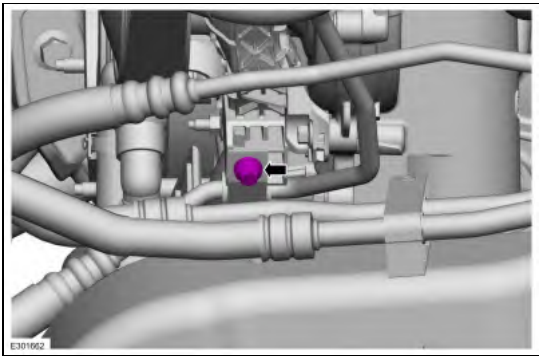
44. Install the new power steering tube O-ring seals.



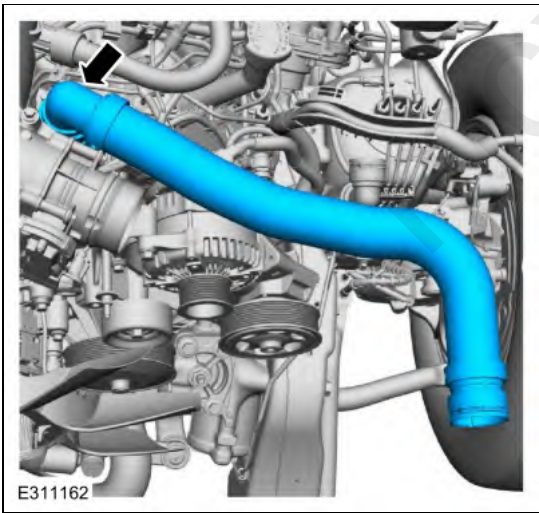
45. Position back the power steering hose and install the bolt.
Torque: 18 lb.ft (25 Nm)



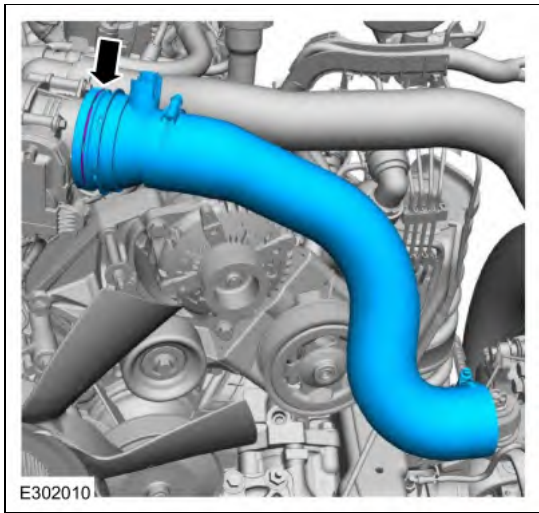
46. Install the retainer to the power steering line bracket.
Torque: 44 lb.in (5 Nm)



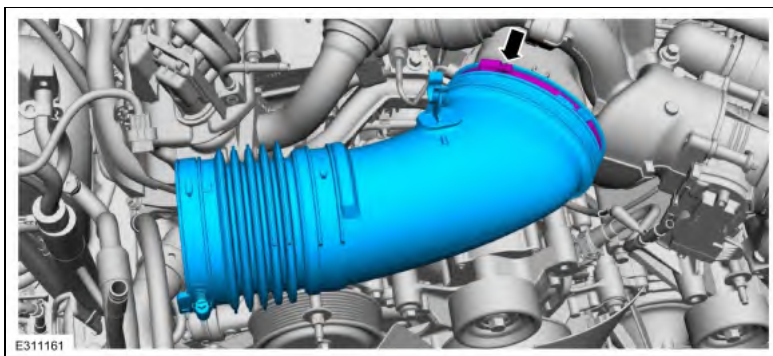
47. Install the upper radiator hose.



48. Install the CAC outlet pipe.



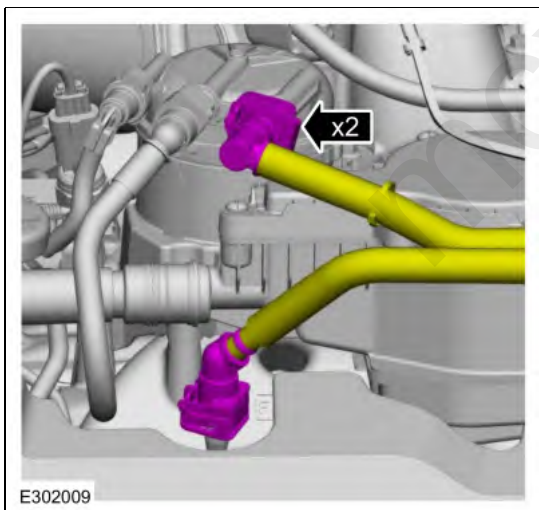
49. Install the ACL (air cleaner) outlet pipe and tighten the clamp.
Torque: 44 lb.in (5 Nm)



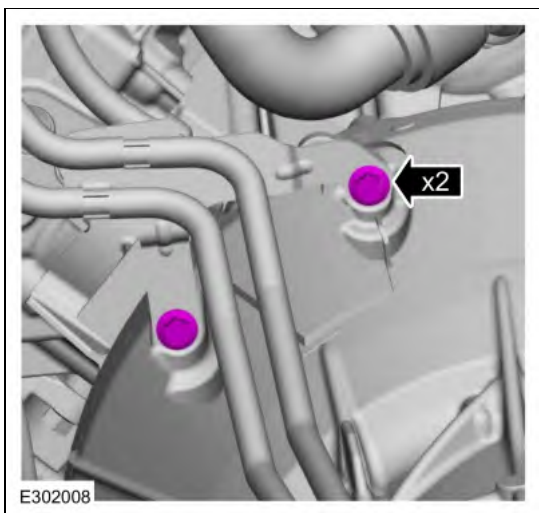
50. **NOTICE:** Fuel injection equipment is manufactured to very precise tolerances and fine clearances. To prevent fuel system damage, it is essential that absolute cleanliness is observed when working with these components.

Position back the fuel tubes and connect the tubes.

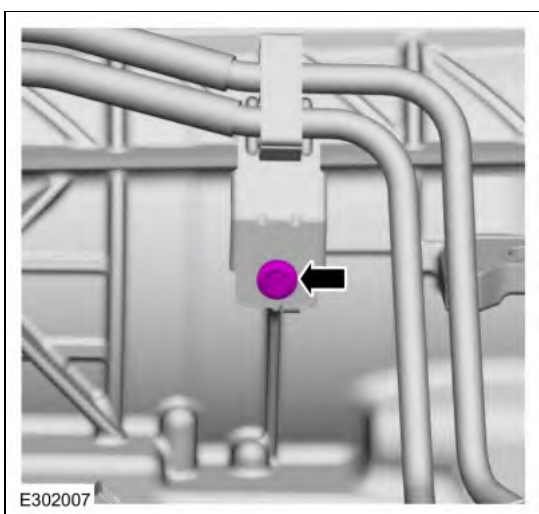
Refer to: Quick Release Coupling (310-00 Fuel System - General Information - 6.7L Power Stroke Diesel).

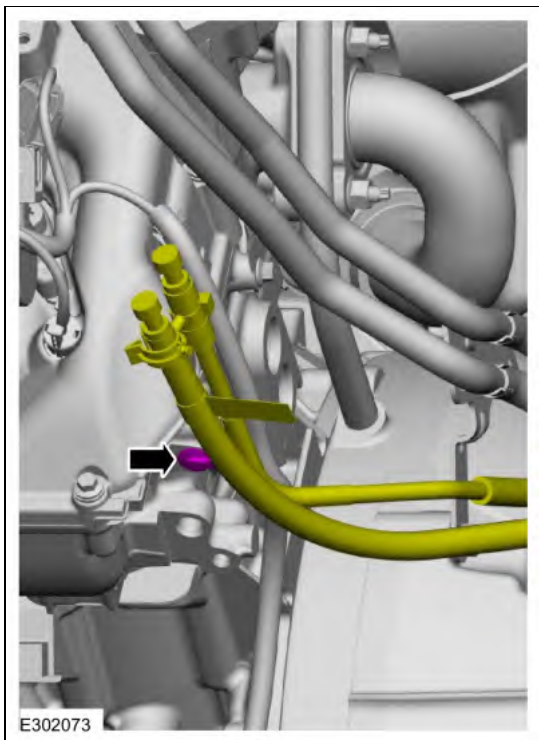


51. Install the fuel tube bracket bolts to the transmission bellhousing.
Torque: 46 lb.ft (63 Nm)

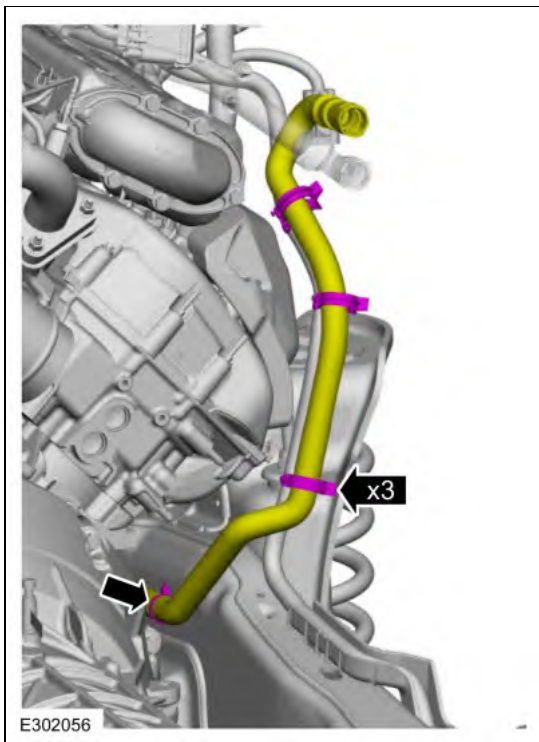


52. Install the fuel tube bracket bolt.
Torque: 18 lb.ft (25 Nm)

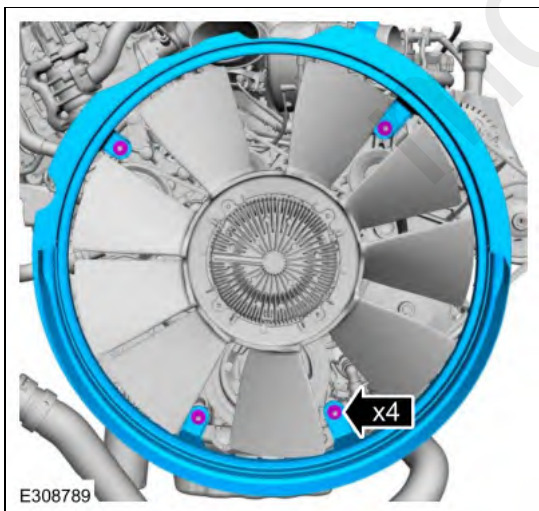




54. Connect the heater hose retainer to the frame. Connect the heater hose to the retainers.

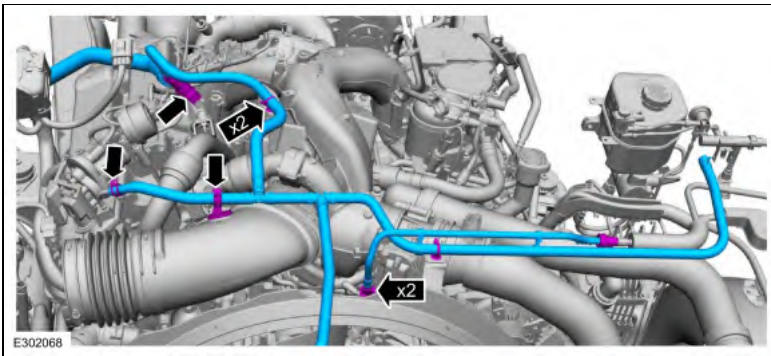


55. Install the cooling fan stator and nuts.
Torque: 159 lb.in (18 Nm)

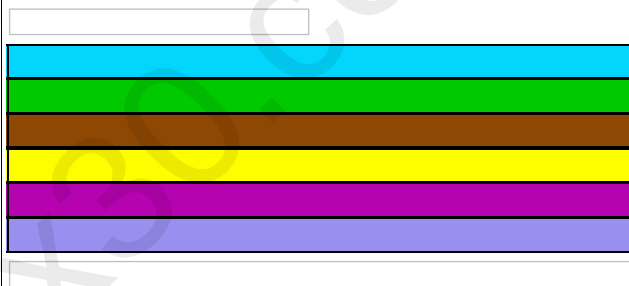
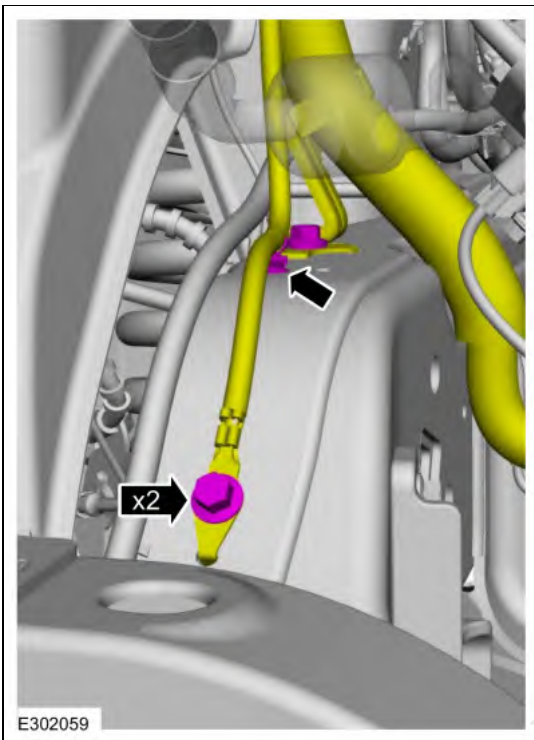


56.

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

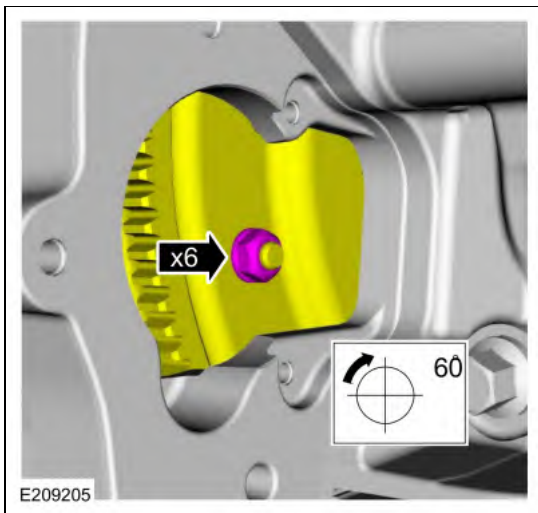


57. Position back the wire harness and connect the wire retainer. Install the bracket bolt and the ground wire bolt.
Torque: 22 lb.ft (30 Nm)

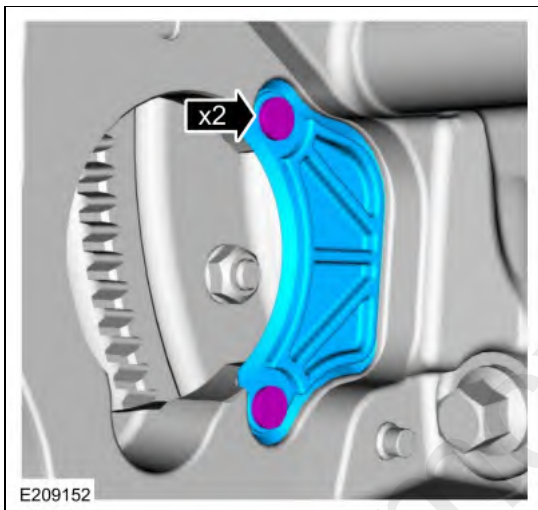


58. **NOTE:** Using the crankshaft pulley bolts, turn the engine clockwise.

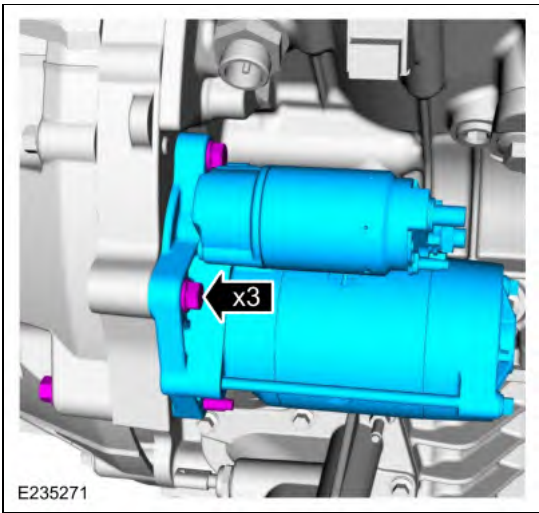
Install the new torque converter nuts.
Torque: 41 lb.ft (55 Nm)



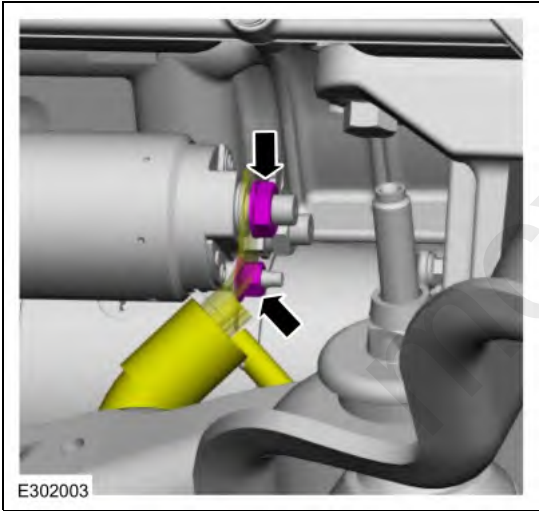
59. Install the access cover and the retainers.



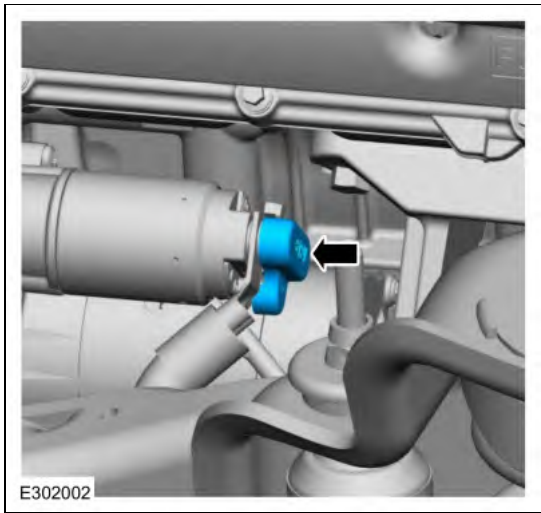
60. Install the starter motor and the bolts.
Torque: 18 lb.ft (25 Nm)



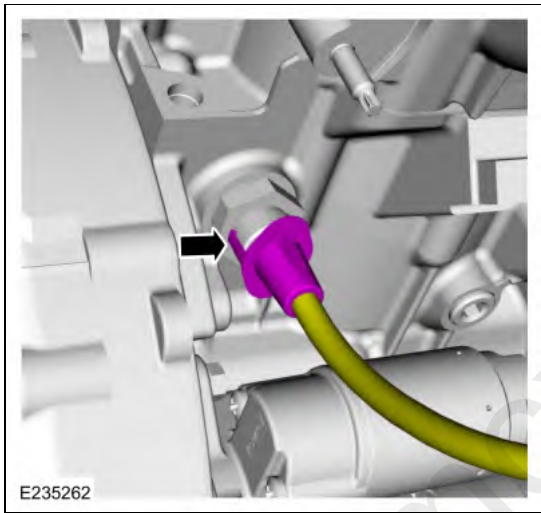
61. Position back the starter cables and install the nuts.
Torque:
 Large nut : 106 lb.in (12 Nm)
 Small nut : 53 lb.in (6 Nm)



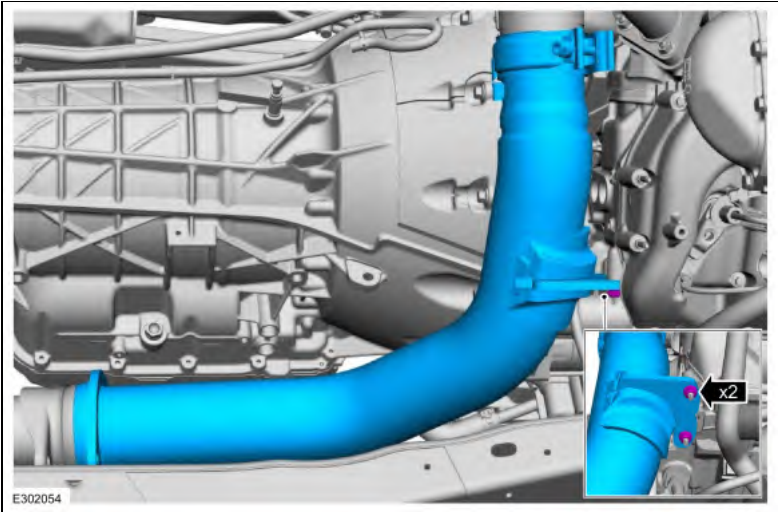
62. Install the starter cable cover.



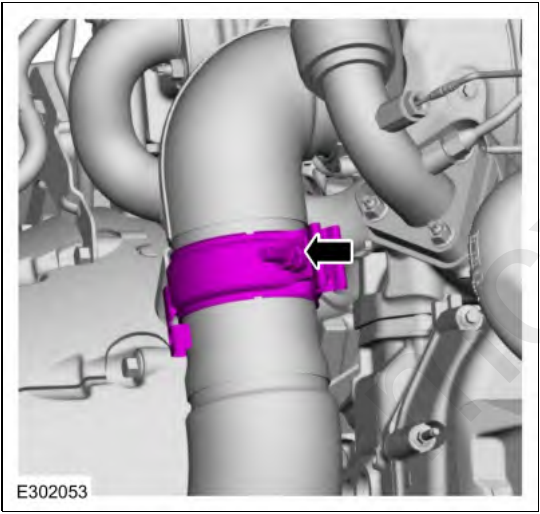
63. If equipped, connect the block heater electrical connector.



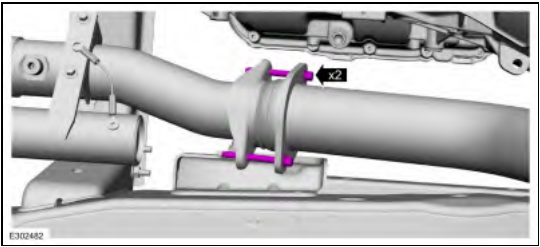
64. Install the exhaust downpipe and the new nuts.
Torque: 22 lb.ft (30 Nm)



65. Tighten the clamp for the exhaust downpipe.
Torque: 41 lb.ft (55 Nm)

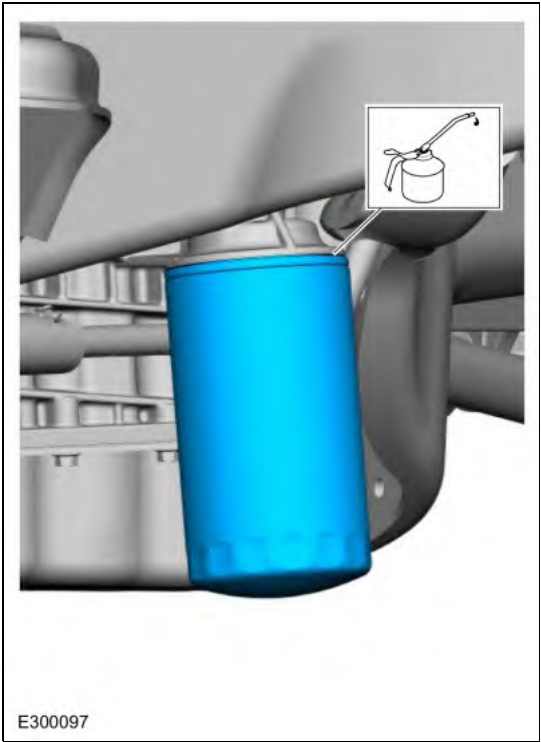


66. Install the new exhaust downpipe bolts.
Torque: 26 lb.ft (35 Nm)

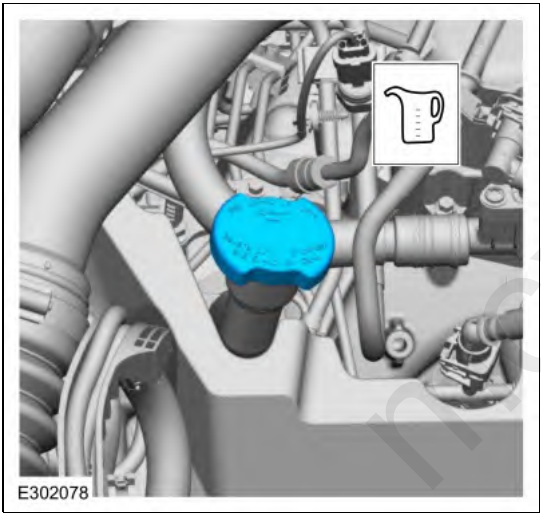


67. Lubricate the rubber seal with clean engine oil and install the new oil filter.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).
Torque:

Stage 1: 44 lb.in (5 Nm)
Stage 2: 230 Â°



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



NOTE: Carry out the following 4 steps if installing a new engine, long block or short block to remove any contaminants from the radiator and heater core.

69. Remove the primary cooling system radiator.

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

70. **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.

71. **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.

72. Install the primary cooling system radiator.

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

73. Install the following items:

1. Install the body.

Refer to: Body - 6.7L Power Stroke Diesel (502-02 Full Frame and Body Mounting, Removal and Installation).

2. Install the transmission fluid cooler.

Refer to: Transmission Fluid Cooler - 6.7L Power Stroke Diesel (307-02 Transmission Cooling - 6.7L Power Stroke Diesel) .

74. Bleed the fuel system

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

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

76. 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 & 10R140, General Procedures).

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