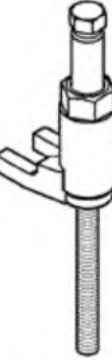


Engine

Special Tool(s) / General Equipment

 E129694	100-001 (T50T-100-A) Slide Hammer
 E139373	100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge
 E234289	205-036 (T70P-4067-A) Wrench
	303-050 (T70P-6000) Lifting Bracket, Engine
	303-1510 Remover, Front Crank Seal
	303-1513 Remover, Rear Crank Seal
	303-1517 Adapter, Camshaft Remover/Installer TKIT-2009C-F TKIT-2009C-ROW
	303-1518 Bracket, Engine Removal TKIT-2009C-F TKIT-2009C-ROW
	303-214 (T83T-6312-B) Wrench, Fan Clutch Nut
	310-230 Remover, Fuel Injector TKIT-2010FT-F TKIT-2010FT-ROW
Feeler Gauge	
Slide Hammer Dent Puller	
Floor Crane	
Mounting Stand	

NOTICE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enter the oil passages, coolant passages or the oil pan, may cause engine failure.

NOTICE: 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.

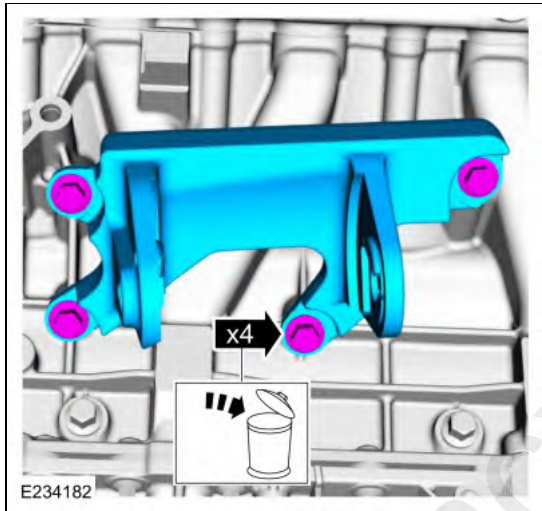
NOTE: This procedure assumes that the engine was removed using the recommended body off engine removal procedure. If it was necessary to remove the engine using the alternate body on engine removal procedure, some of the components in this procedure will have already been removed.

NOTE: Disassembly of the engine requires various inspections/measurements of the engine components. These inspections/measurements will aid in determining if the engine components will require replacement.

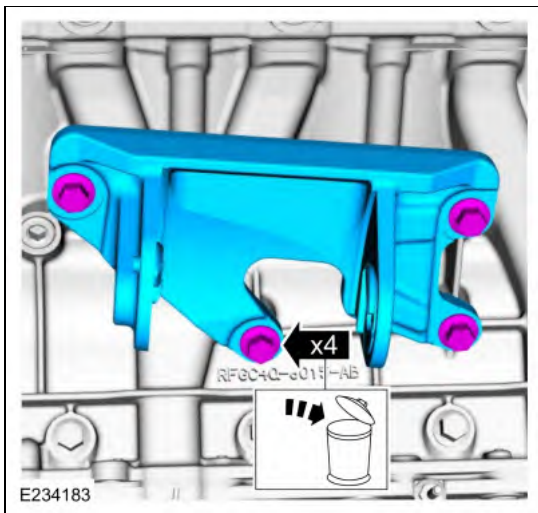
NOTE: Refer to the exploded view under the Engine Component View in the Description and Operation.

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. Remove the engine.
Refer to: Engine - Body Off (303-01B Engine - 6.7L Power Stroke Diesel, Removal).
Refer to: Engine - Body On (303-01B Engine - 6.7L Power Stroke Diesel, Removal).
2. **NOTICE:** Discard the engine mount bracket bolts and install new bolts or damage to the vehicle may occur. They are a torque-to-yield design and cannot be reused.
- Remove the bolts and the LH engine mount bracket.
 - Discard the bolts.

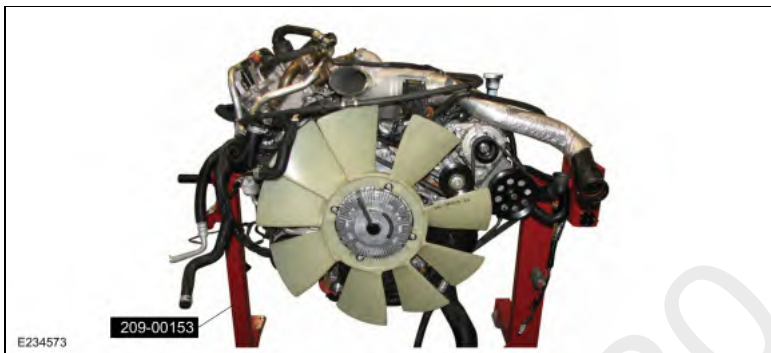


3. **NOTICE:** Discard the engine mount bracket bolts and install new bolts or damage to the vehicle may occur. They are a torque-to-yield design and cannot be reused.
- Remove the bolts and the RH engine mount bracket.
 - Discard the bolts.

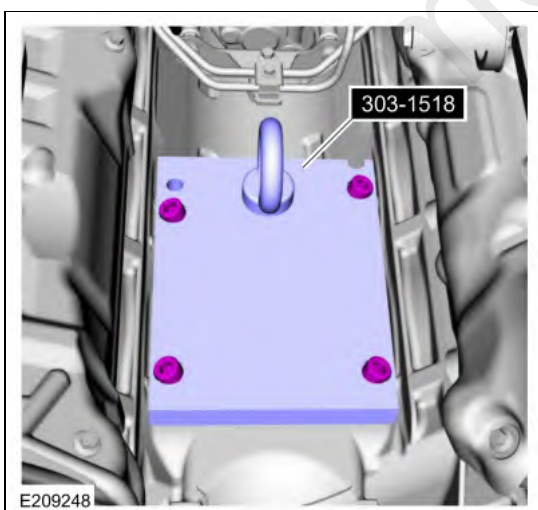


4. **NOTICE:** Use Rotunda Part Number 209-78203 or equivalent to support the engine on the mounting stand. Failure to correctly support the engine may result in engine damage.

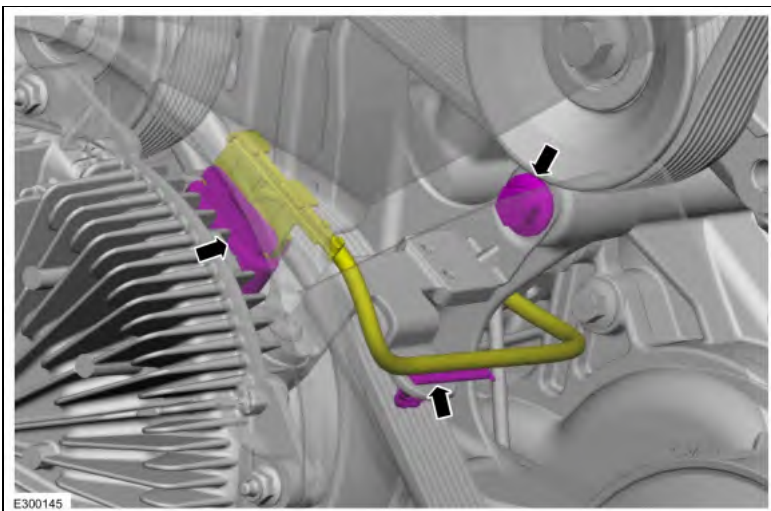
Mount the engine to a mounting stand. Remove the ratchet strap and the floor crane.
 Use the General Equipment: Mounting Stand
 Use the General Equipment: Floor Crane



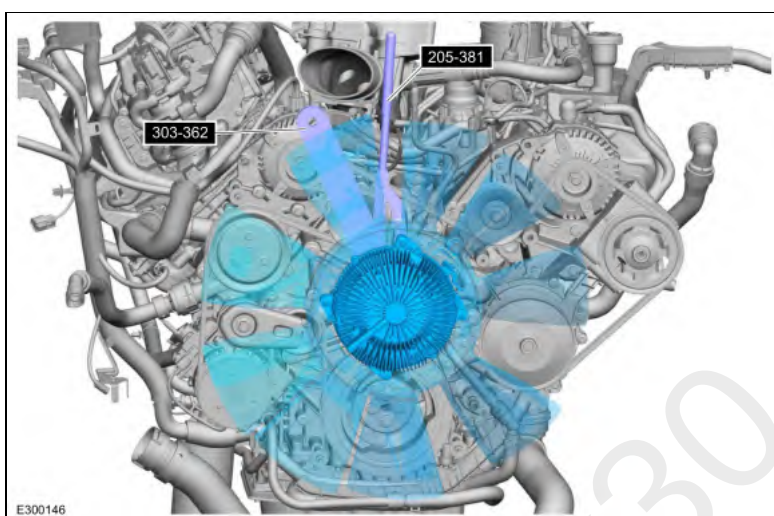
5. Remove Special Service Tool: 303-1518 Bracket, Engine Removal.



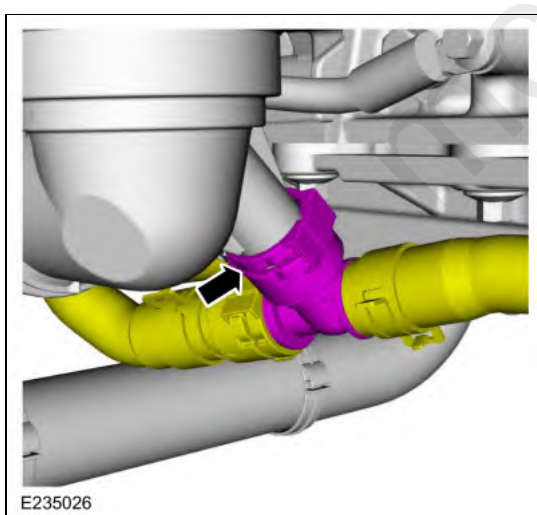
- 6.
- Disconnect the fan clutch electrical connector and the wire retainer.
 - Remove the fan clutch electrical connector bolt.



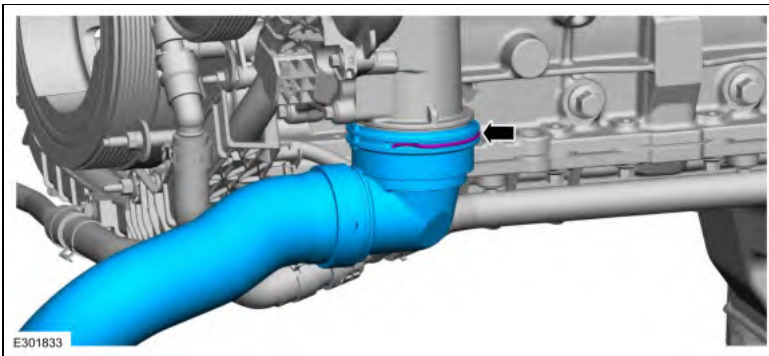
7. Using the special tools, remove the cooling fan assembly.
Use Special Service Tool: 205-036 (T70P-4067-A) Wrench, 303-214 (T83T-6312-B) Wrench, Fan Clutch Nut.



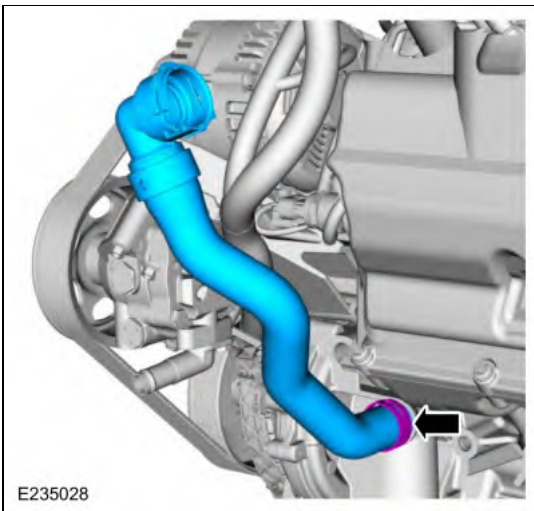
8. Remove the clip and disconnect the coolant hose.



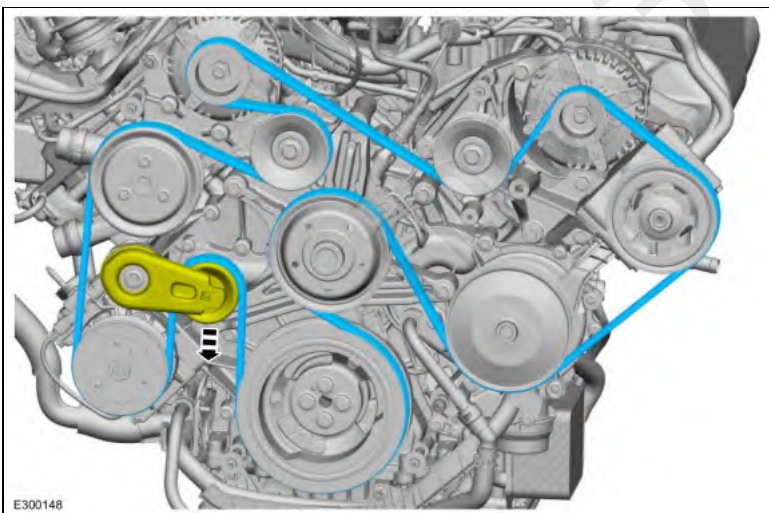
9. Remove the clip and the lower radiator hose.



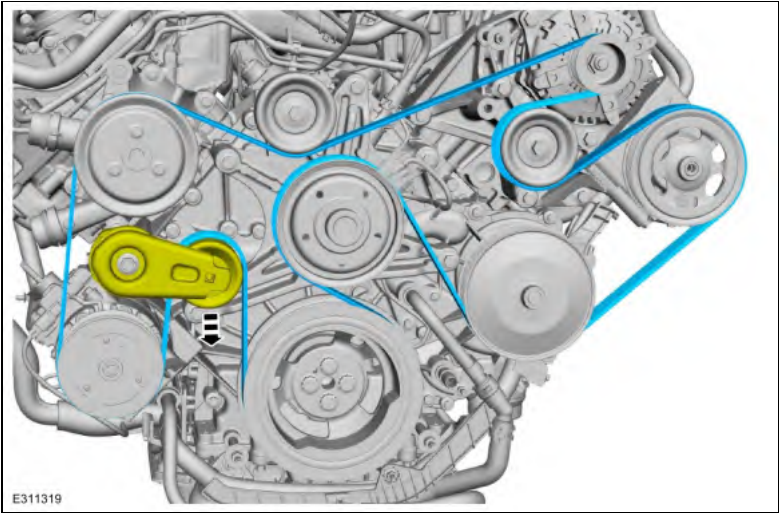
10. Remove the coolant engine fill hose.
Use the General Equipment: Hose Clamp Remover/Installer



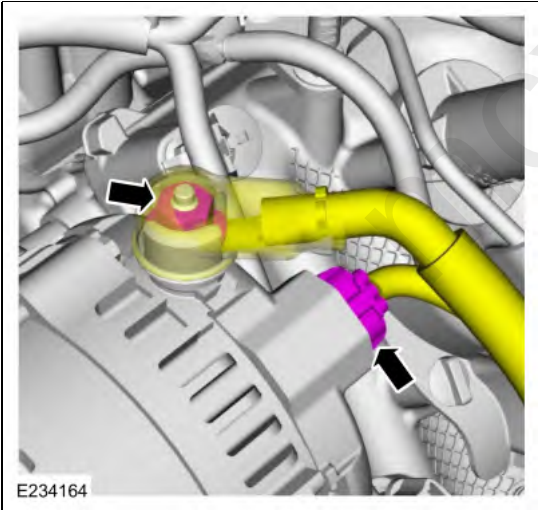
11. If equipped with dual generator, remove the accessory drive belt.



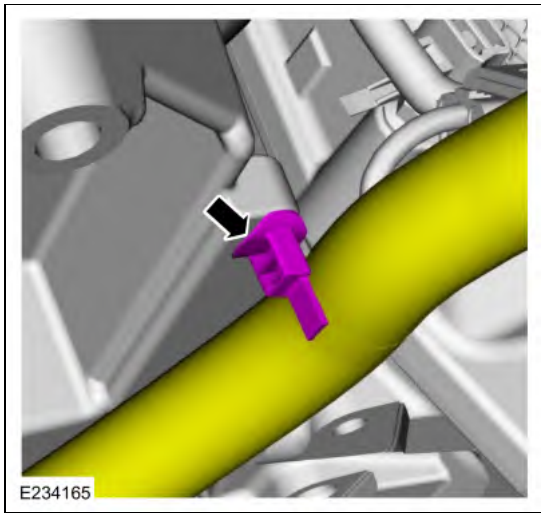
12. If equipped with single generator, remove the accessory drive belt.



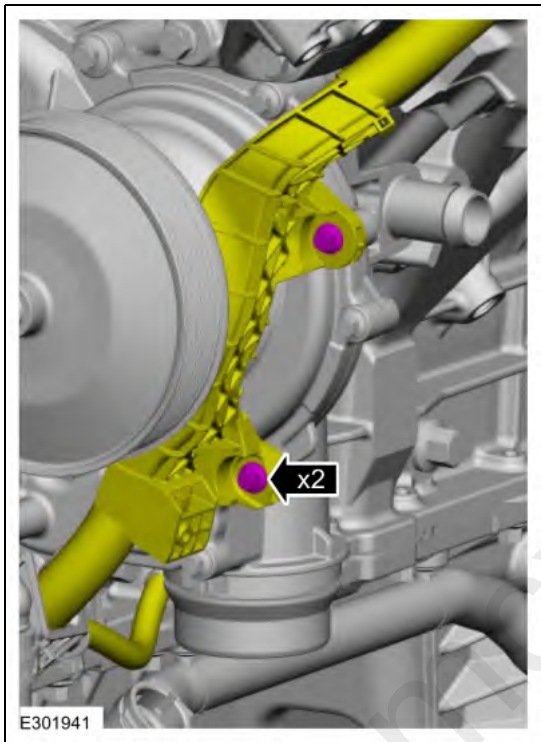
- 13.
- Position back the boot and remove the nut.
 - Disconnect the generator electrical connector.



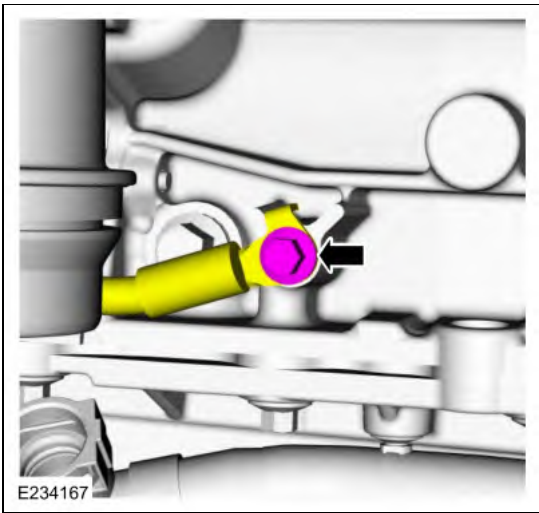
14. Disconnect the battery wire harness retainer from the bracket.



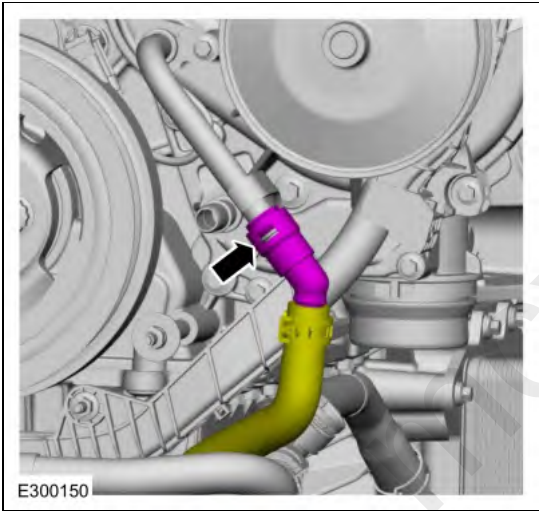
15. Remove the bolts from the battery wire harness.



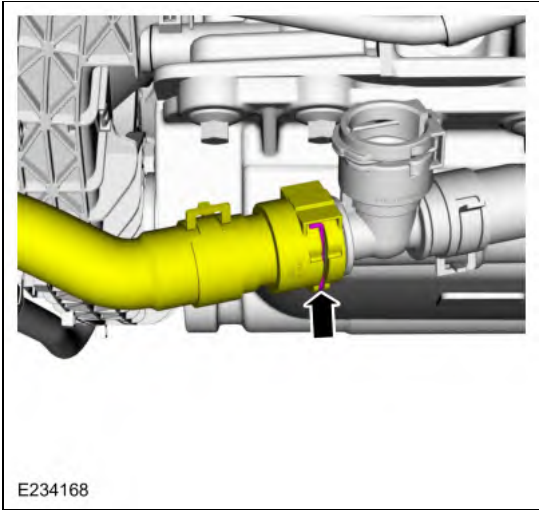
16. Remove the LH ground bolt.



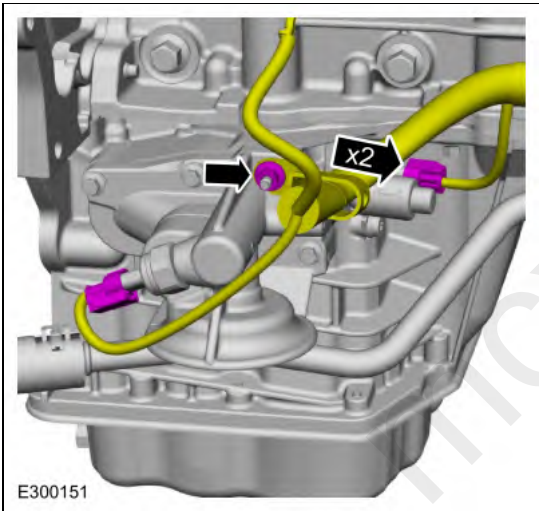
17. Disconnect the transmission oil cooler coolant hose.



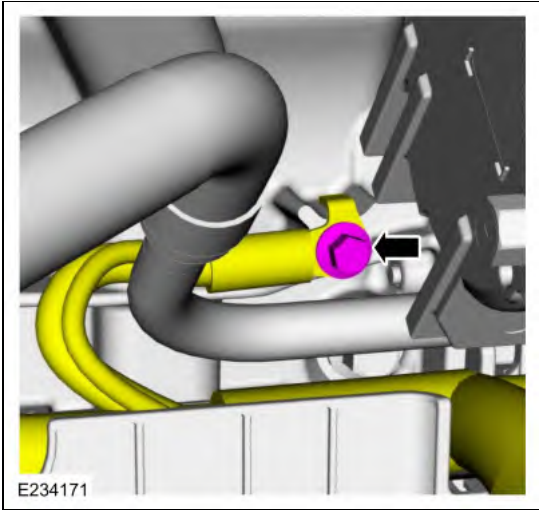
18. Remove the clip and disconnect the heater hose.



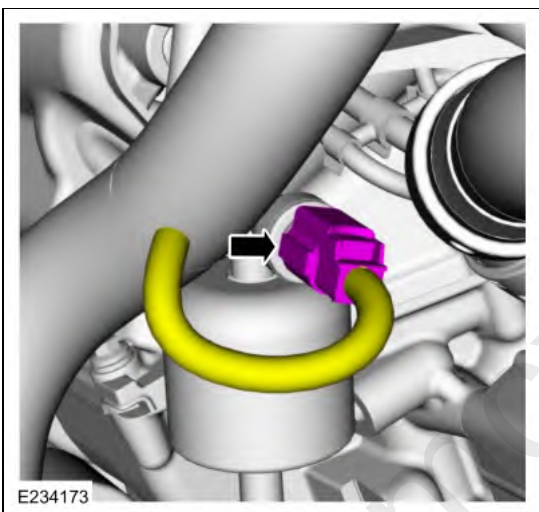
- 19.
- Disconnect the electrical connectors.
 - Remove the nut and position out the battery wire harness.



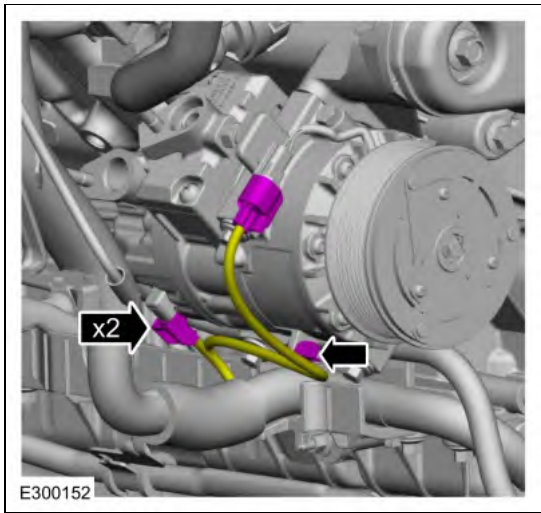
20. Remove the RH ground bolt.



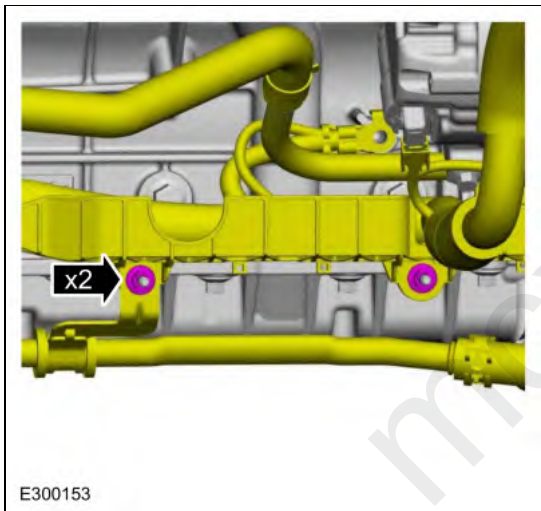
21. Disconnect the A/C pressure switch electrical connector.



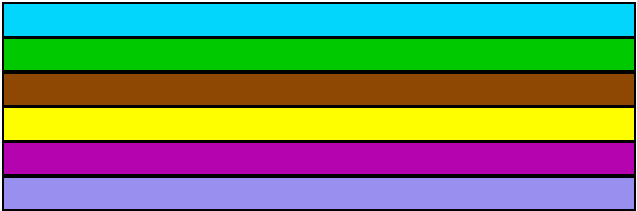
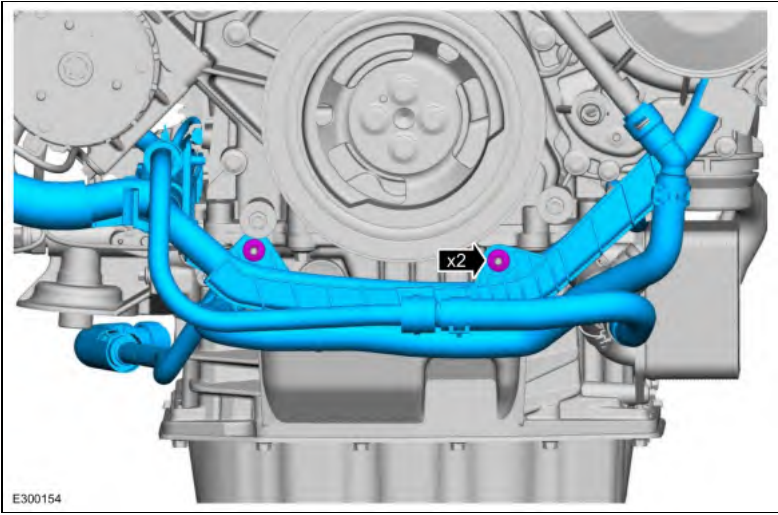
22. Disconnect the A/C electrical connectors and the wire retainer.



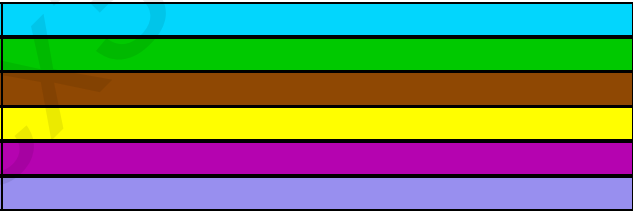
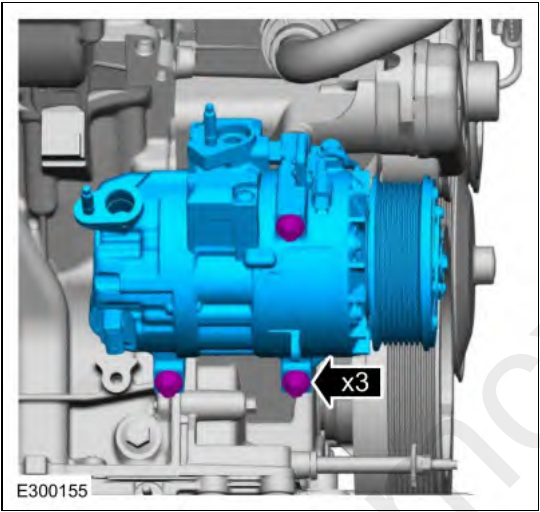
23. Remove the nuts, position out the coolant tube and the battery wire harness.



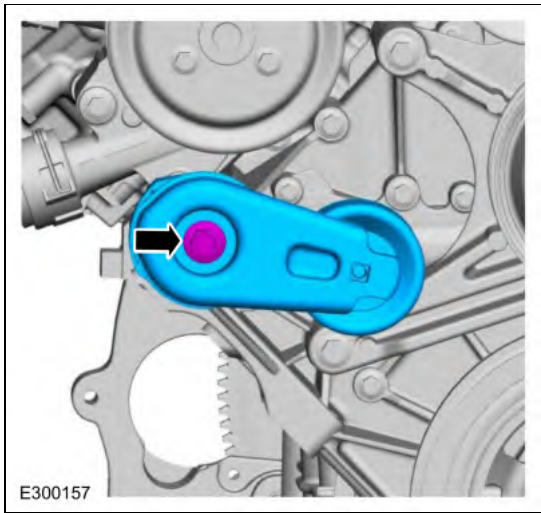
24. Remove the nuts, the coolant hoses and the battery wire harness.



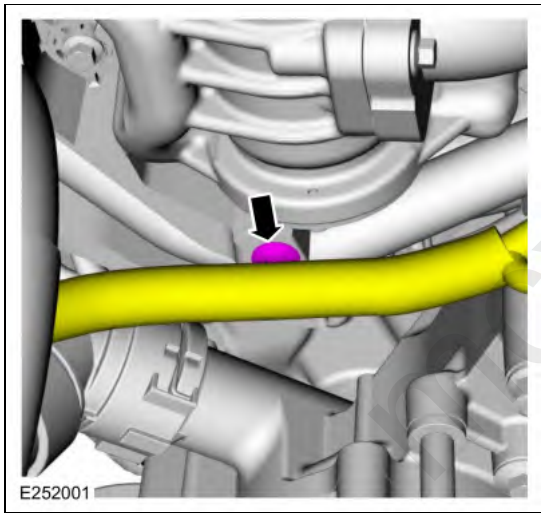
25. Remove the bolts and the A/C compressor.



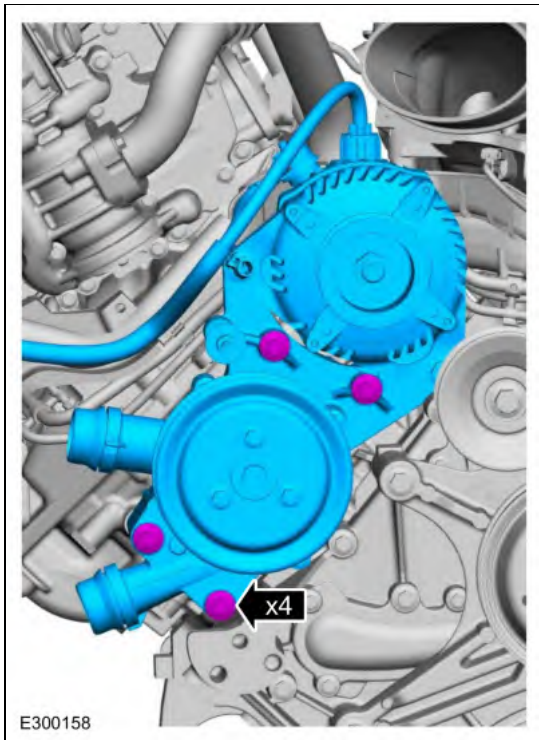
26. Remove the bolt and the accessory drive belt tensioner.



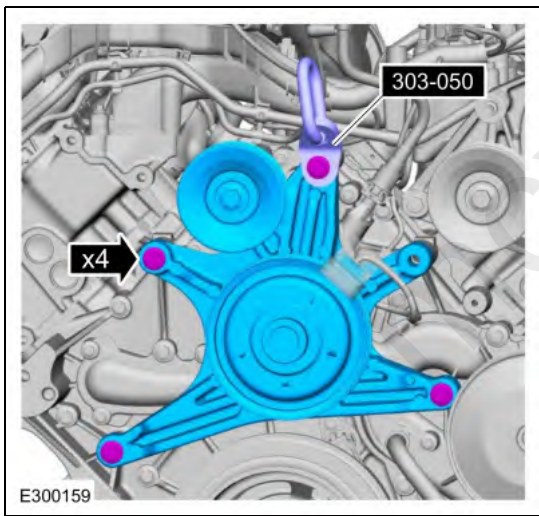
27. If equipped with dual generator, disconnect the wire harness retainer.



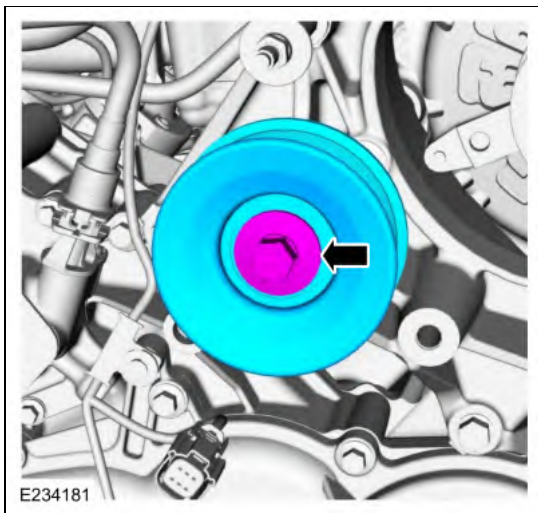
28. **NOTE:** Dual generator shown, single generator similar.
Remove the bolts and the secondary coolant pump.



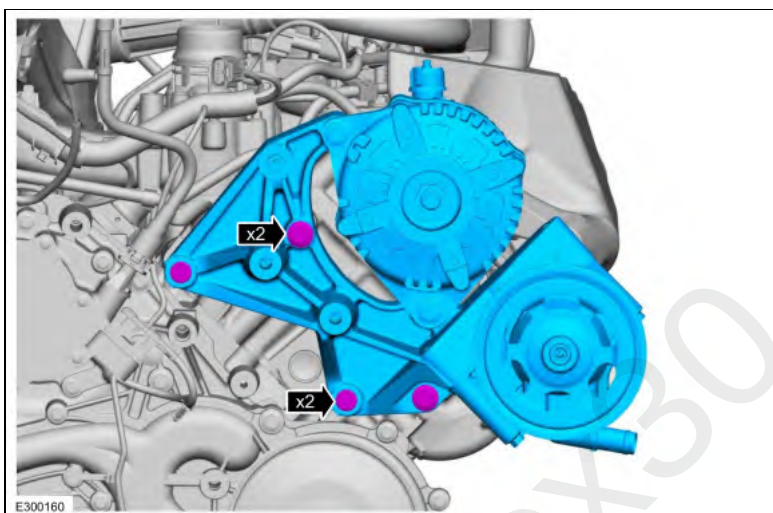
29. Remove the bolts, the engine lifting bracket and the cooling fan drive assembly.
Use Special Service Tool: 303-050 (T70P-6000) Lifting Bracket, Engine.



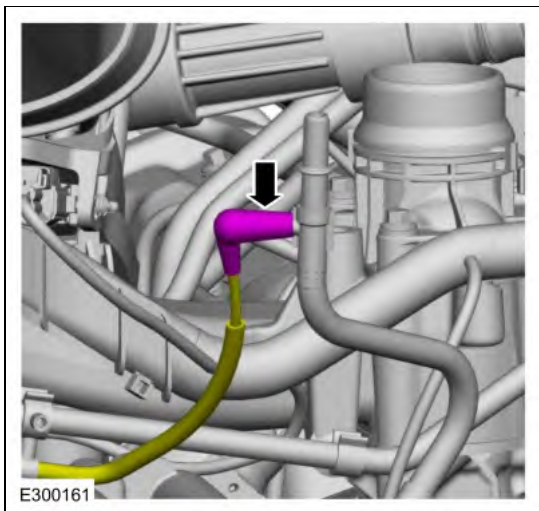
30. If equipped with dual generator, remove the idler pulley.



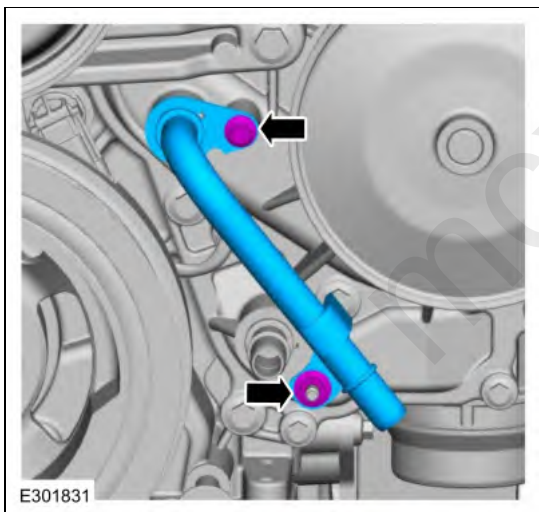
31. Remove the bolts and the power steering pump mounting bracket.



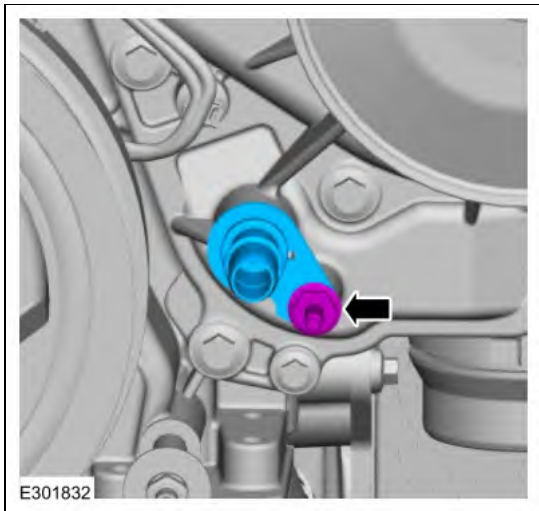
32. Disconnect the engine vacuum hose at the tee.



33. Remove the nut, the bolt and the transmission oil cooler coolant tube.

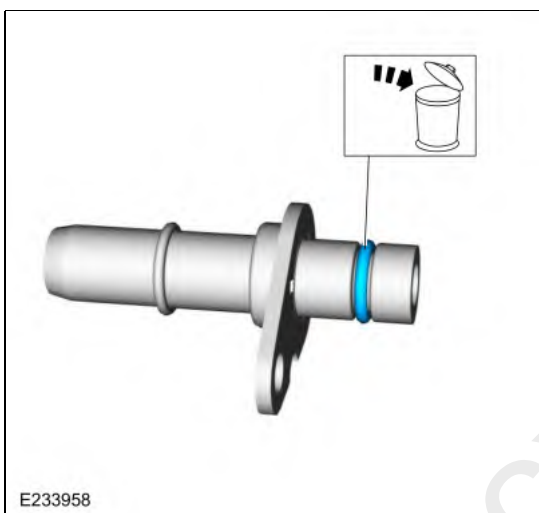


34. Remove the stud bolt and the transmission oil cooler coolant tube.

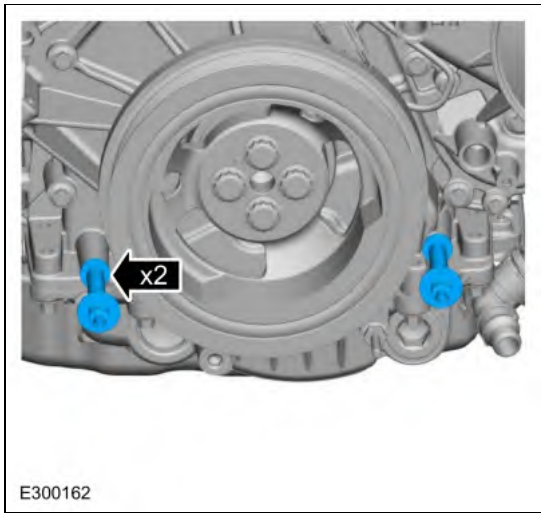


35. **NOTE:** Only one tube shown.

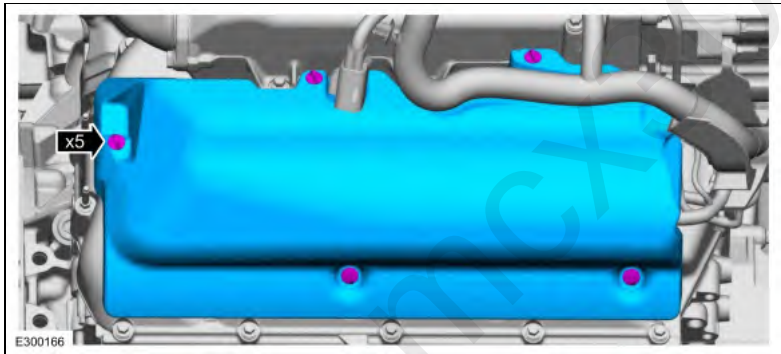
Remove and discard the transmission oil cooler coolant tube O-ring seals.



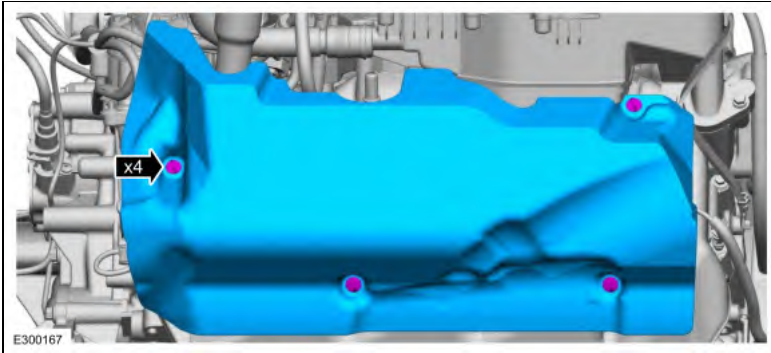
36. Remove the stator standoffs.



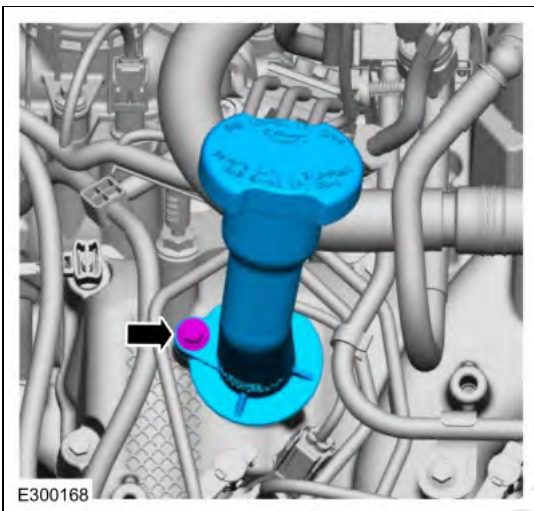
37. If equipped, remove the push pins and the RH sound shield.



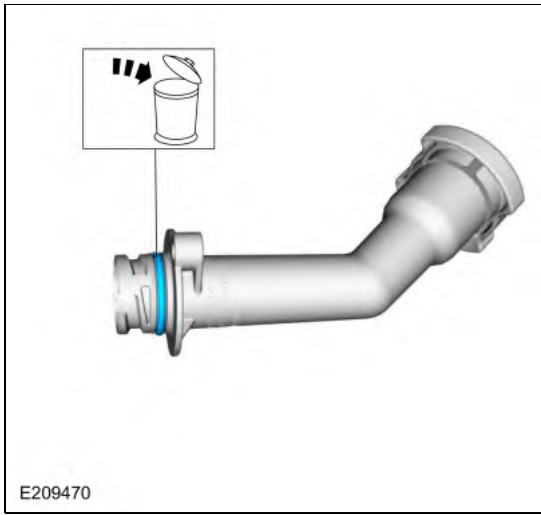
38. If equipped, remove the push pins and the LH sound shield.



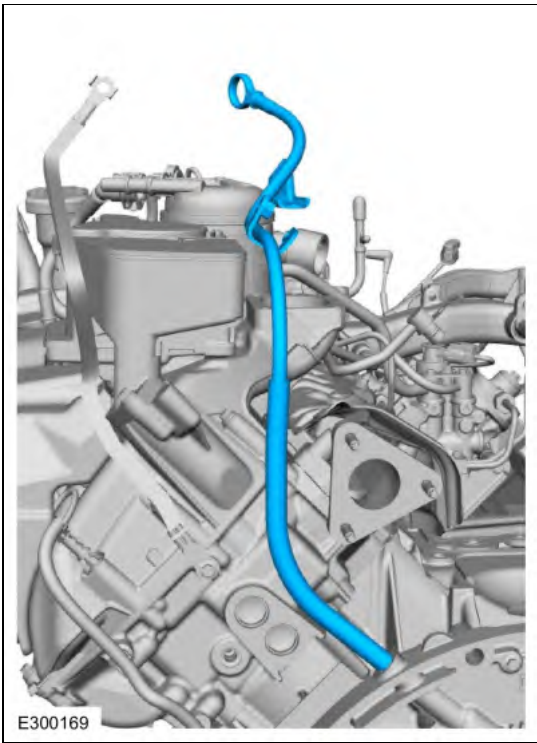
39. Remove the bolt and the oil fill pipe.



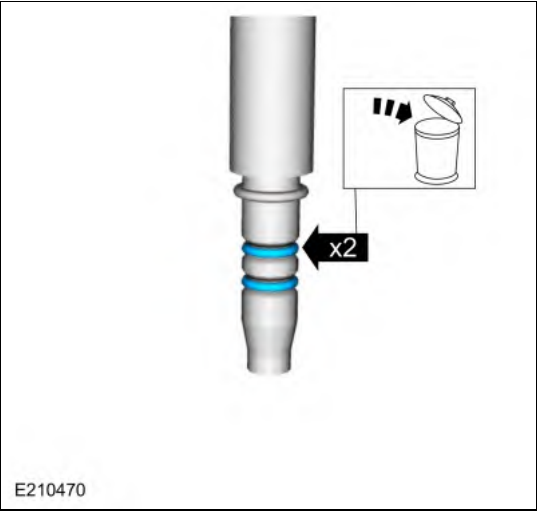
40. Remove and discard the oil fill pipe O-ring seal.



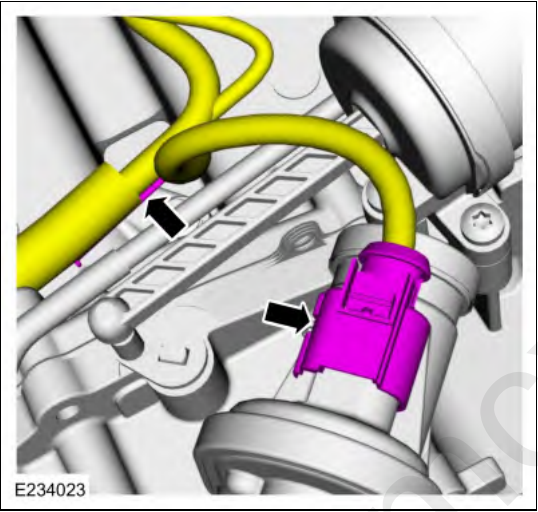
41. Remove the oil level indicator tube.



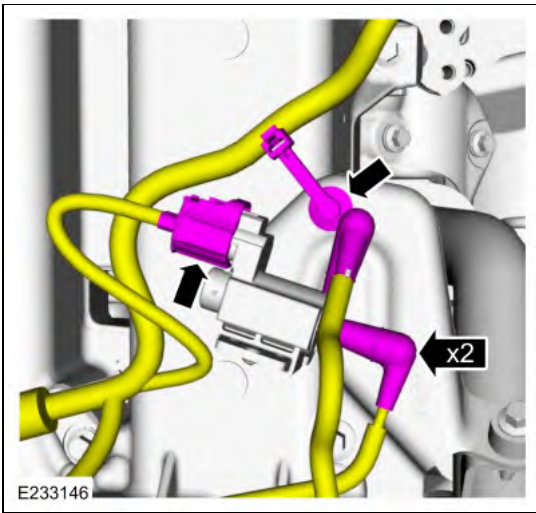
42. Remove and discard the oil level indicator tube O-ring seals.



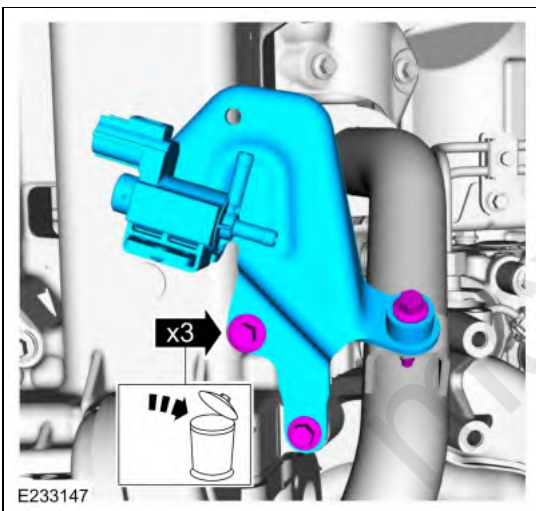
43. Disconnect the EGR valve electrical connector and the wire retainer.



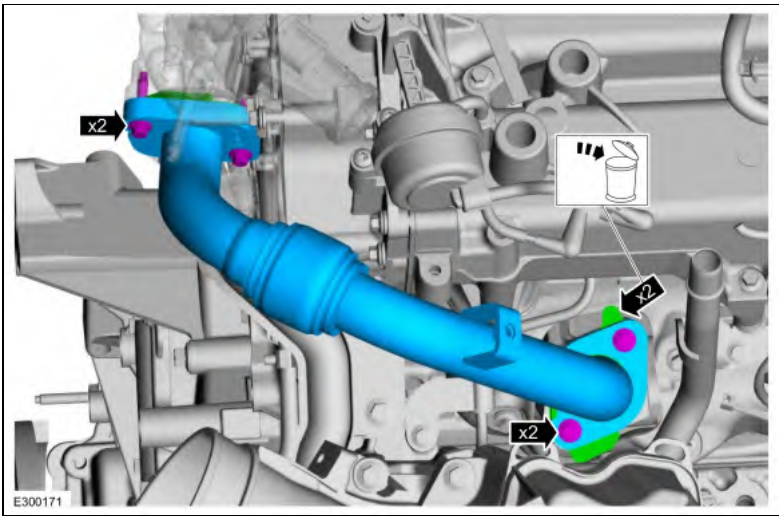
44. Disconnect the electrical connector and the vacuum hoses from the bypass valve solenoid. Detach the wire harness retainer.



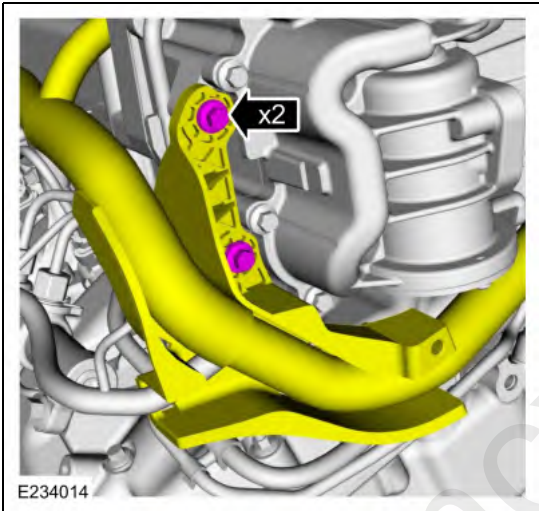
45. Remove the bolts and EGR cooler inlet tube bracket. Discard the bolts.



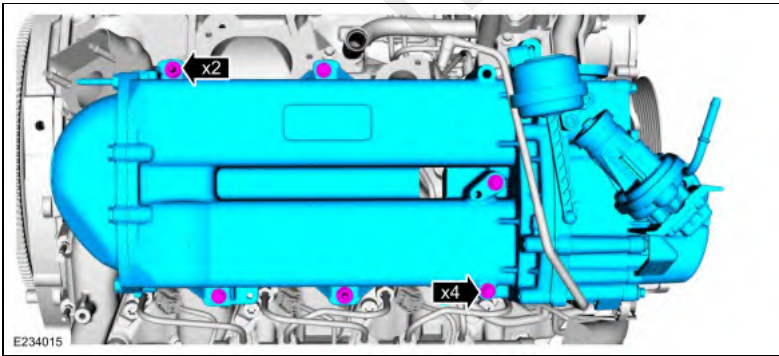
- 46.
- Remove the bolts and the EGR cooler inlet tube.
 - Remove and discard the gaskets.



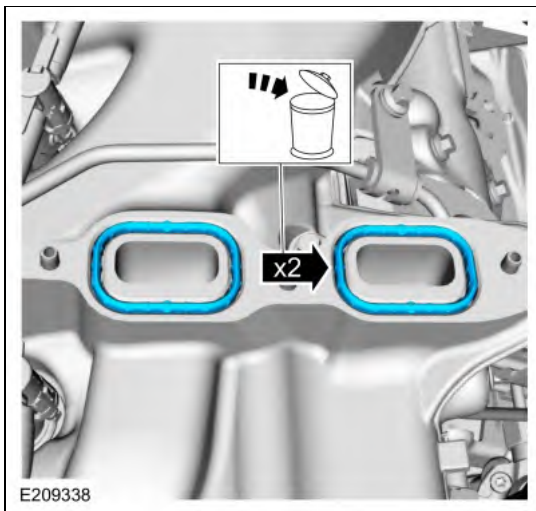
47. Remove the bolts and position aside the engine wire harness.



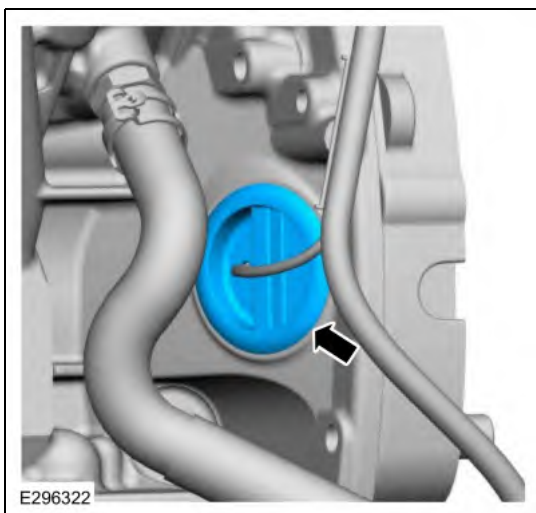
48. Remove the stud bolts, the bolts and the EGR cooler assembly.



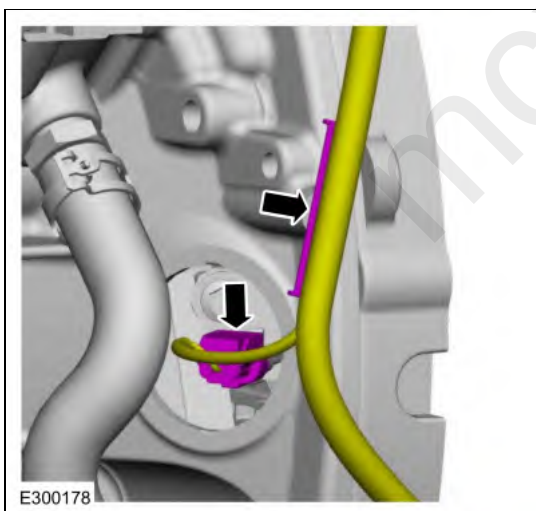
49. Remove and discard the EGR cooler gaskets.



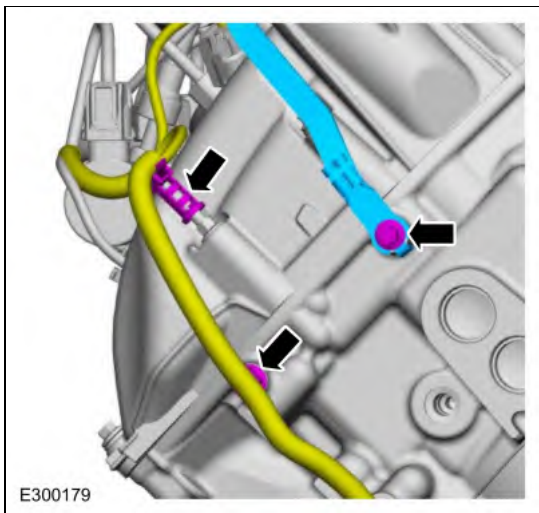
50. Remove the CKP sensor cover.



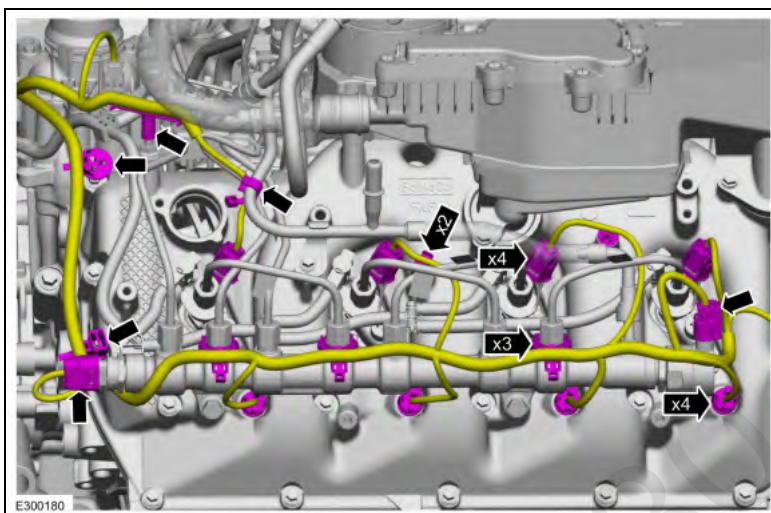
51. Disconnect the CKP sensor electrical connector and the wire retainer.



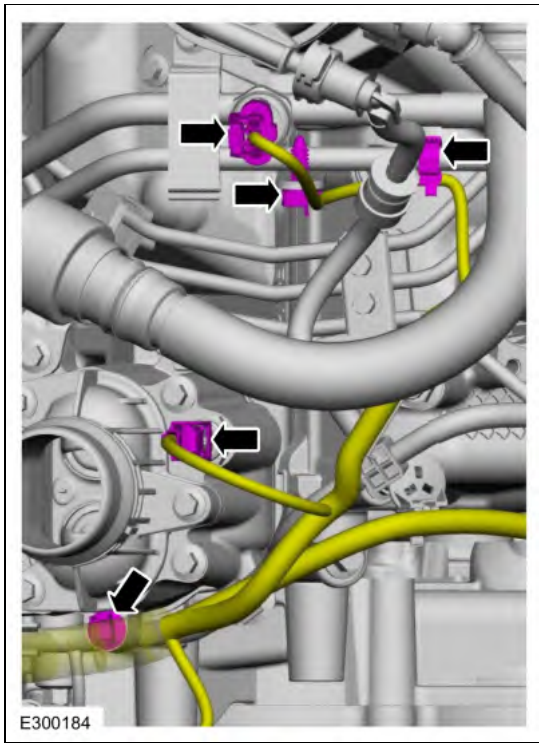
- 52.
- Remove the bolt and the ground strap.
 - Disconnect the wire retainers.



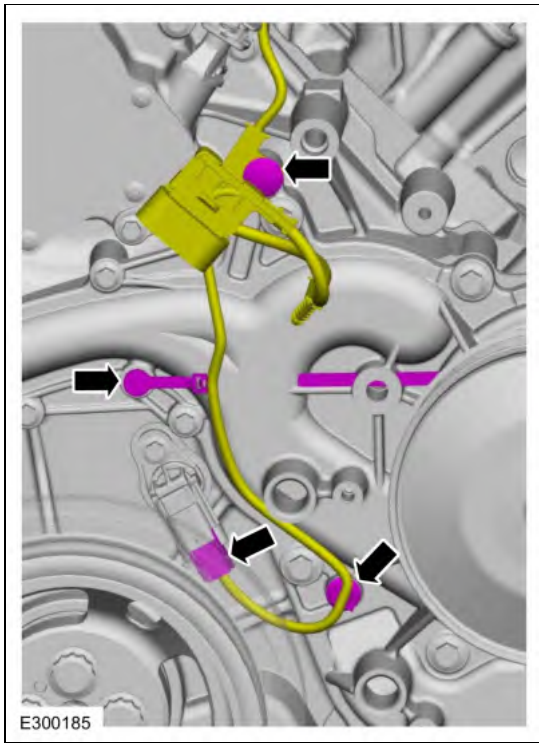
53. Disconnect the LH valve cover wiring.



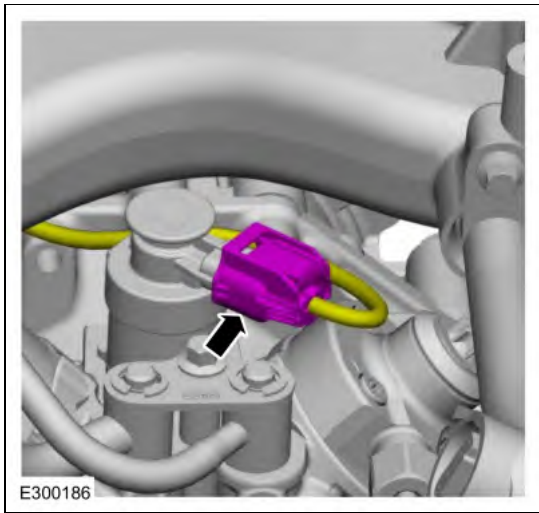
54. Disconnect the fuel pressure and temperature sensor, the ECT sensor electrical connectors and the wire retainers.



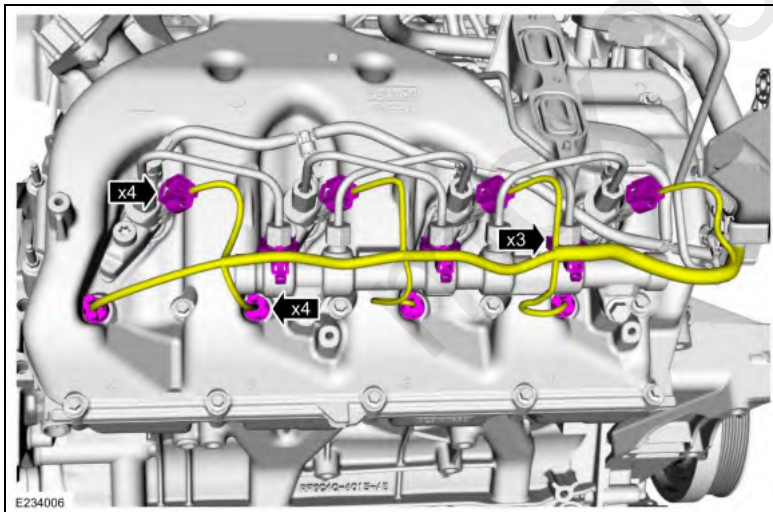
55. Disconnect the CMP sensor electrical connector and the wire retainers.



56. Disconnect the fuel volume control valve electrical connector.

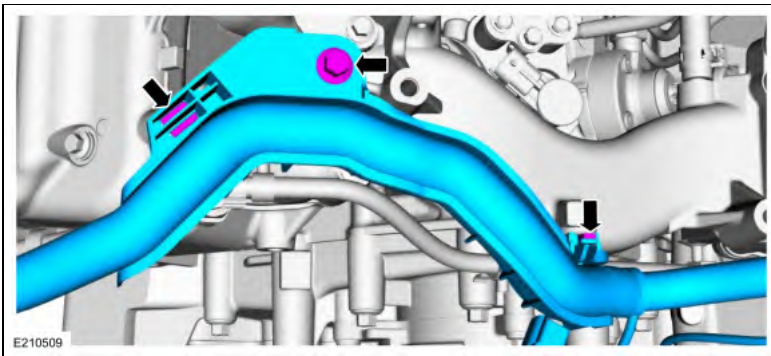


57. Disconnect the RH valve cover wiring.

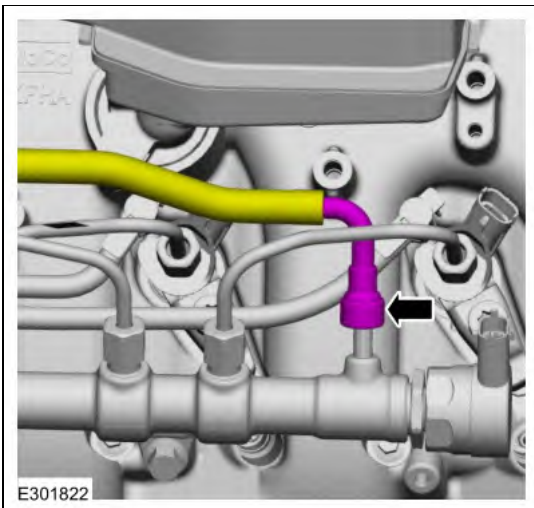


58.

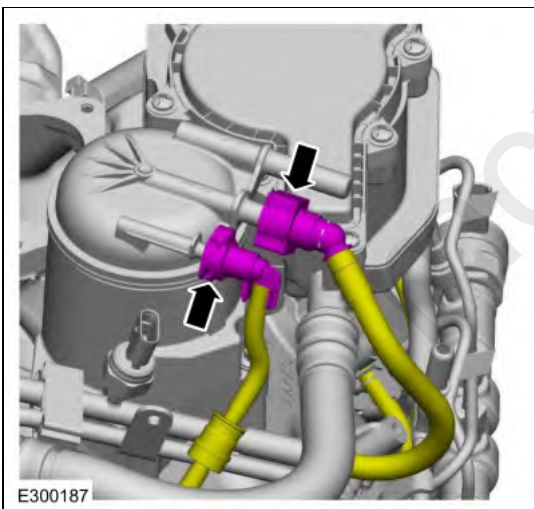
- Remove the bolt and disconnect the engine wire harness retainers.
- Pull forward to disconnect the engine wire harness retainer and then pull up to disconnect the other retainer. Remove the engine wire harness from the engine.



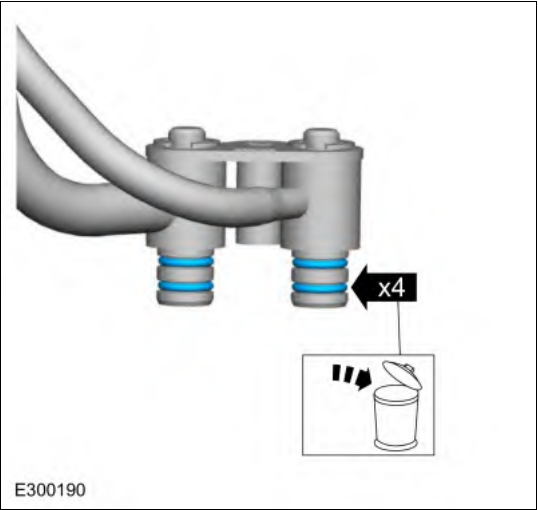
59. Disconnect the fuel injection pump hose from the fuel rail.
 Refer to: Spring Lock Couplings (310-00B Fuel System - General Information - 6.7L Power Stroke Diesel, General Procedures).



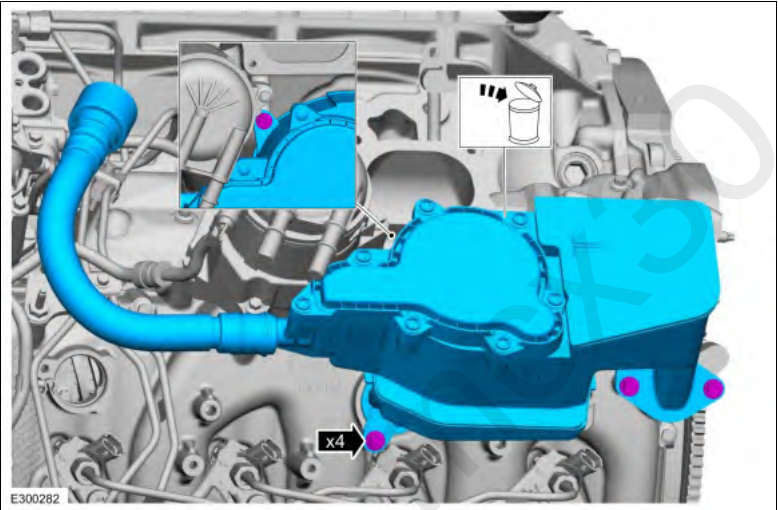
60. Disconnect the fuel injector return hose and the fuel injection pump supply tube.
 Refer to: Quick Release Coupling (310-00 Fuel System - General Information - 6.7L Power Stroke Diesel).



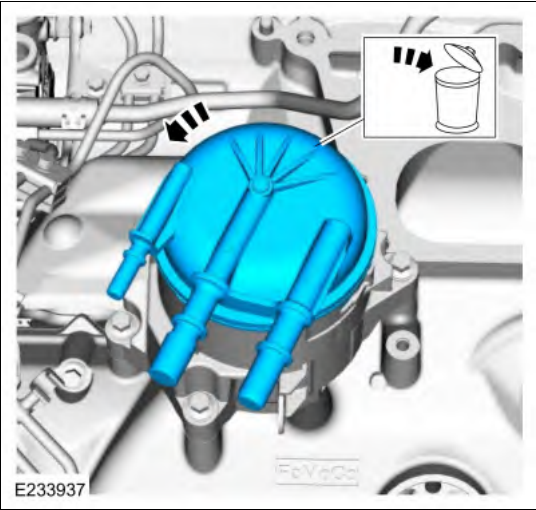
61. Remove and discard the fuel injection pump supply tube assembly bolts.



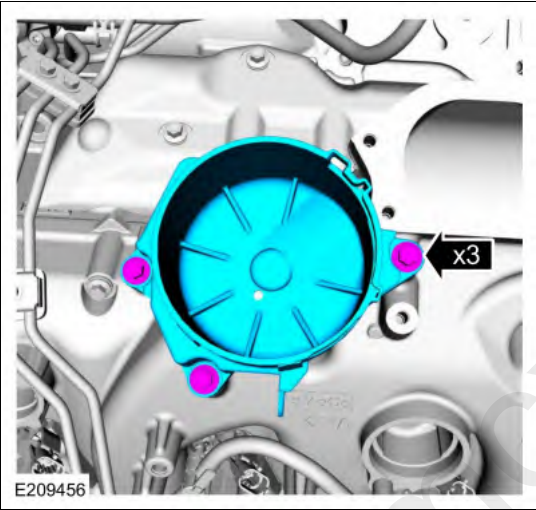
64. Remove the bolts and crankcase vent oil separator. Discard the crankcase vent oil separator.



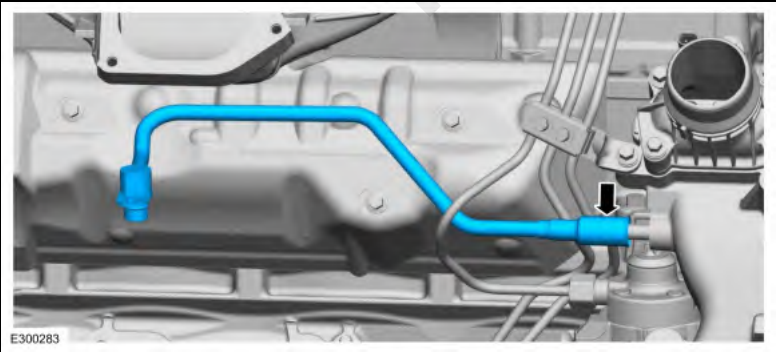
65. **NOTE:** Rotate the fuel filter counter clockwise to remove.
Remove and discard the secondary fuel filter.



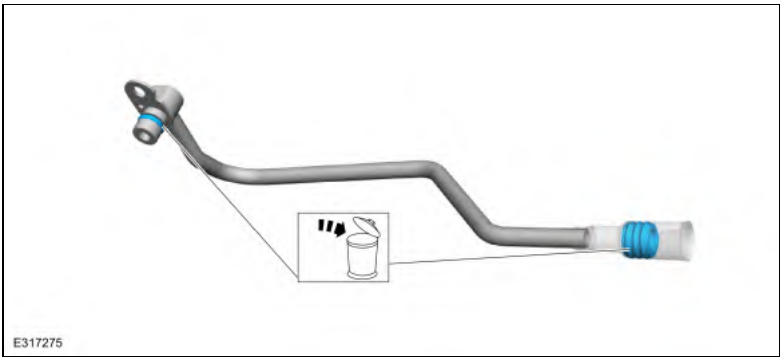
66. Remove the bolts and the secondary fuel filter bracket.



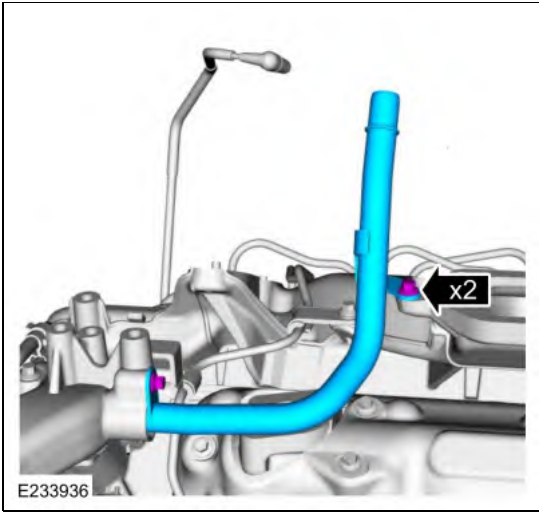
67. Remove the TC coolant tube.



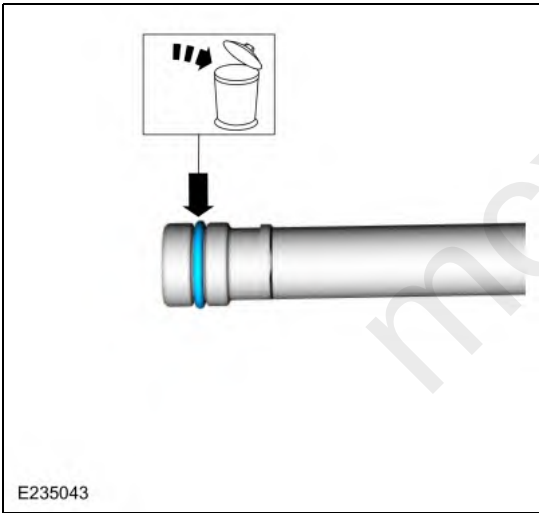
68. Remove and discard the O-ring seal and the grommet.



69. Remove the bolts and heater supply tube.



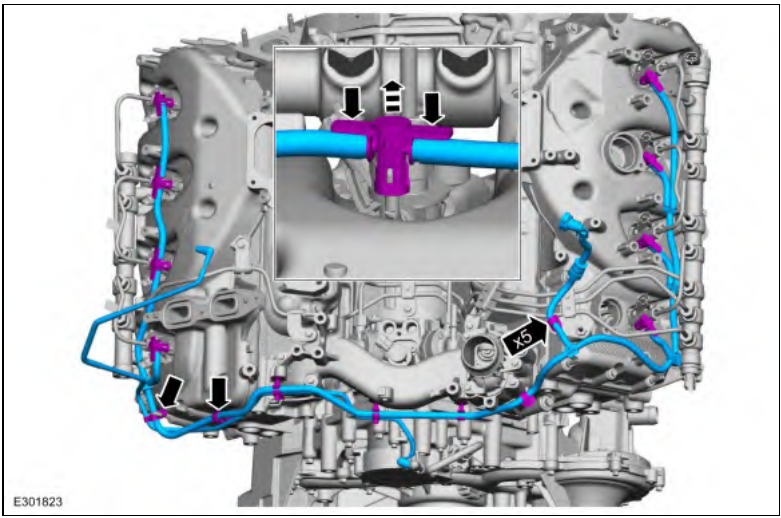
70. Remove and discard the heater supply tube O-ring seal.



71.

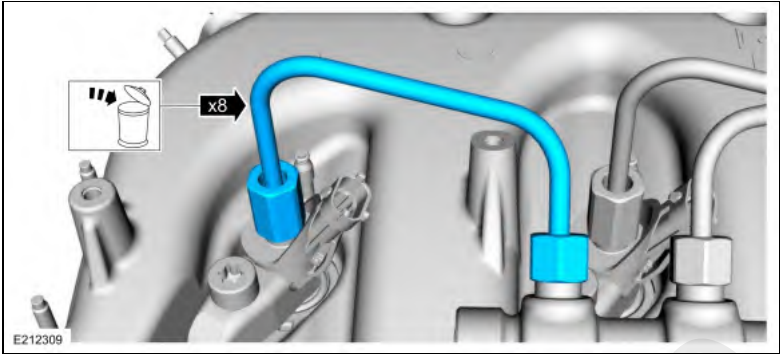
- **NOTICE:** The center lock of the fuel injector return hose connectors must be pulled completely out before the connector can be removed from the fuel injector or damage may occur to the connector.

- Push down on the tabs and pull up on the center of the fuel injector return hose fitting to unlock the fitting.
- Disconnect the fuel injector return hose fittings from the fuel injectors.
- Disconnect and remove the fuel injector return hose and vacuum hose assembly from the retaining clips.

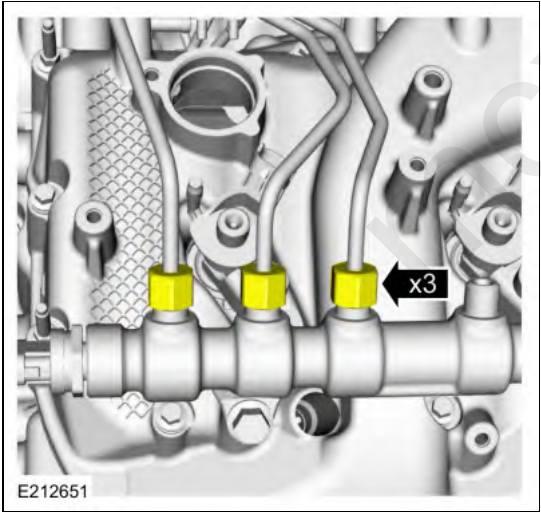


72. **NOTE:** Only one shown.

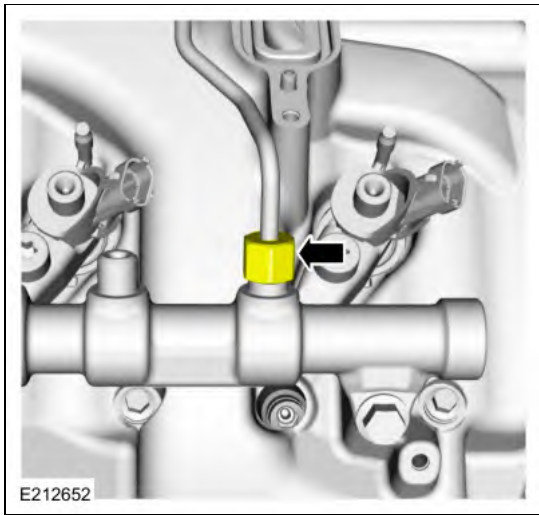
Remove and discard the fuel injector supply tubes.



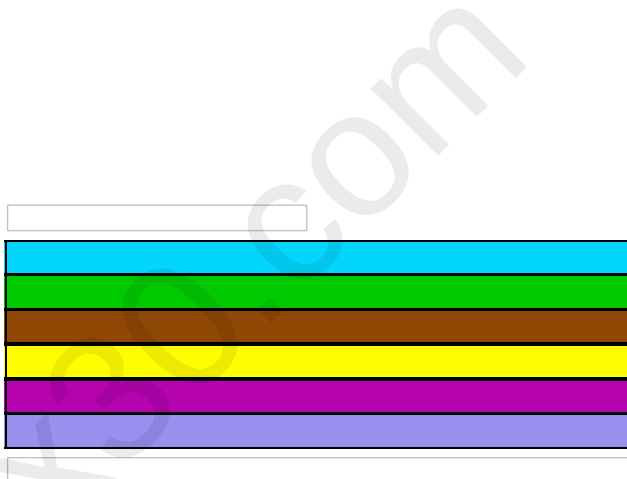
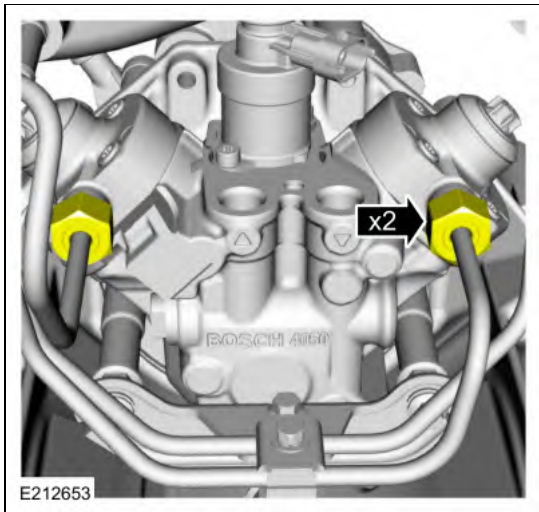
73. Disconnect the fuel rail supply tube assembly from the LH fuel rail.



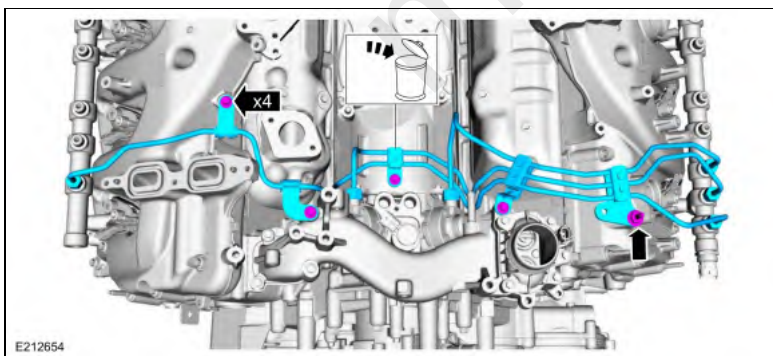
74. Disconnect the fuel rail supply tube assembly from the RH fuel rail.



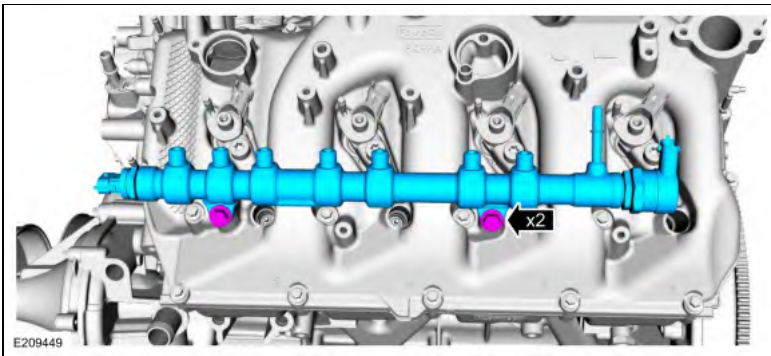
75. Disconnect the fuel rail supply tube assembly at the high-pressure fuel injection pump.



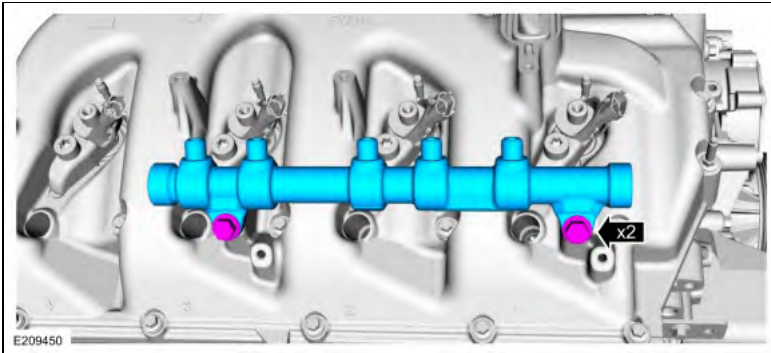
- 76.
- Remove the bolts for the fuel rail supply tube assembly.
 - Remove and discard the fuel rail supply tube assembly.



77. Remove the bolts and the LH fuel rail.

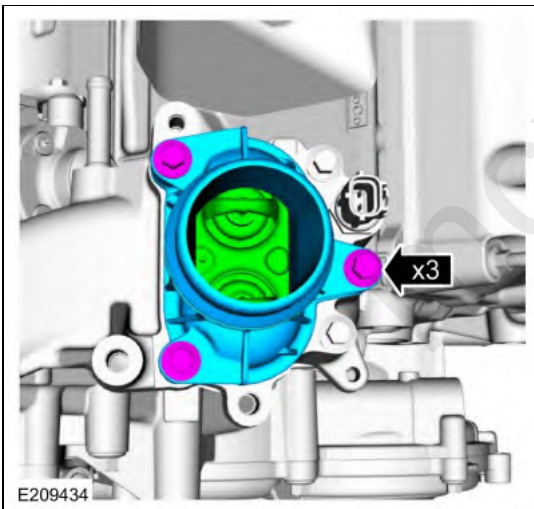


78. Remove the bolts and the RH fuel rail.

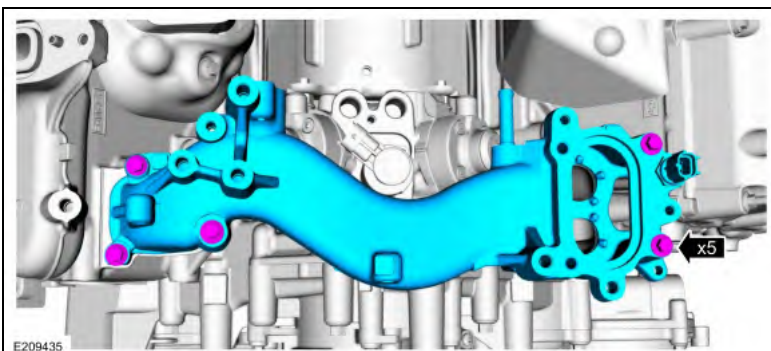


79. **NOTE:** Note the different lengths of the bolts.

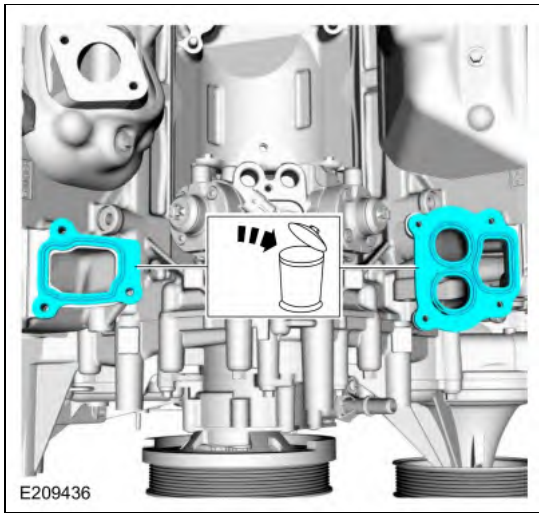
Remove the bolts, the thermostat housing and the thermostat.



80. Remove the bolts and the coolant crossover manifold.



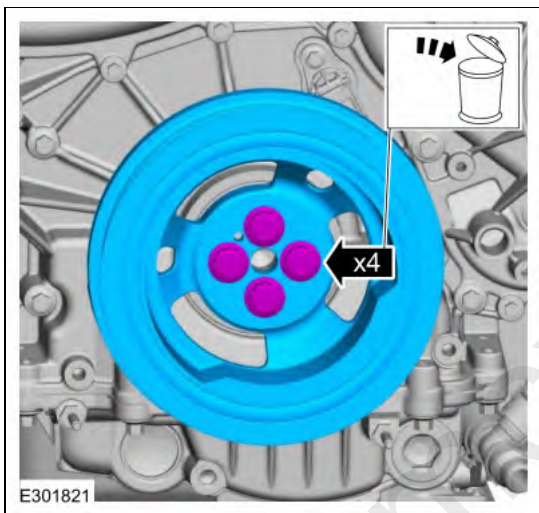
81. Remove and discard the coolant crossover manifold gaskets.



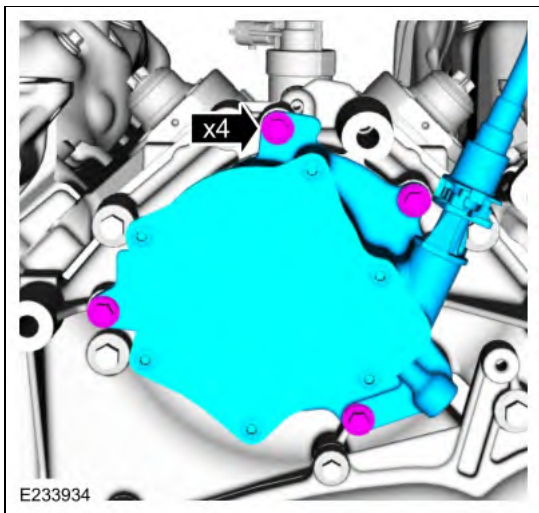
82. ⚠️**WARNING:** Support the vibration damper during mounting bolt removal. The damper can slide off the nose of the crankshaft. Failure to follow this instruction may result in serious personal injury.

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

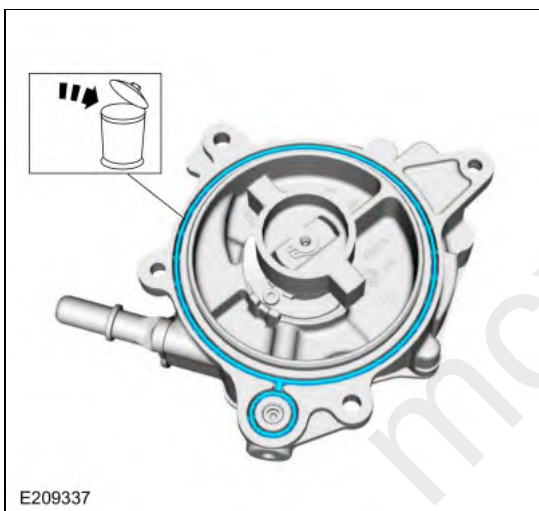
- Remove the bolts and the crankshaft pulley.
- Discard the bolts.



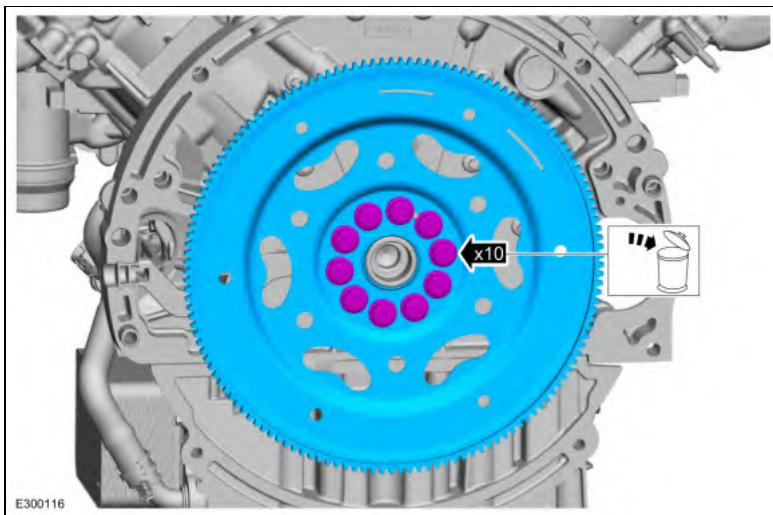
83. Remove the bolts and the vacuum pump.



84. Remove and discard the vacuum pump gasket.

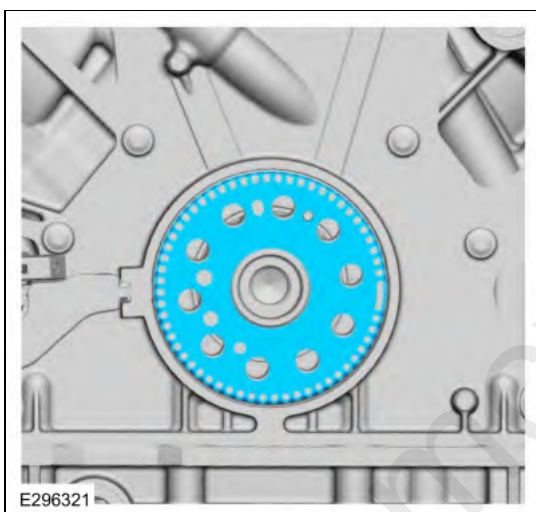


- 85.
- Remove the bolts and the flexplate.
 - Discard the bolts.

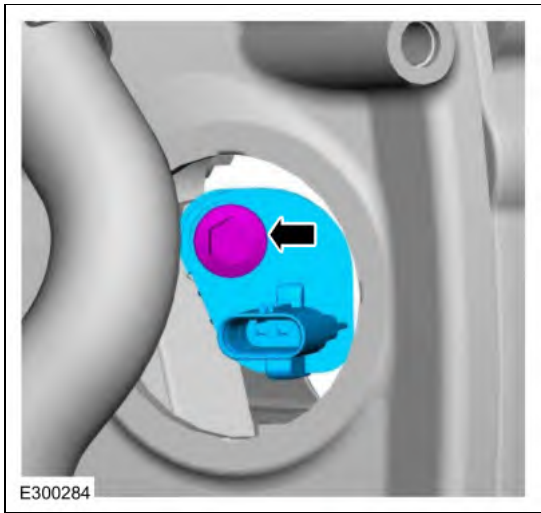


86. **NOTICE:** Do not use magnetic screwdrivers or other magnetic tools around the CKP sensor and the crankshaft sensor pulse ring or damage to the components may occur.

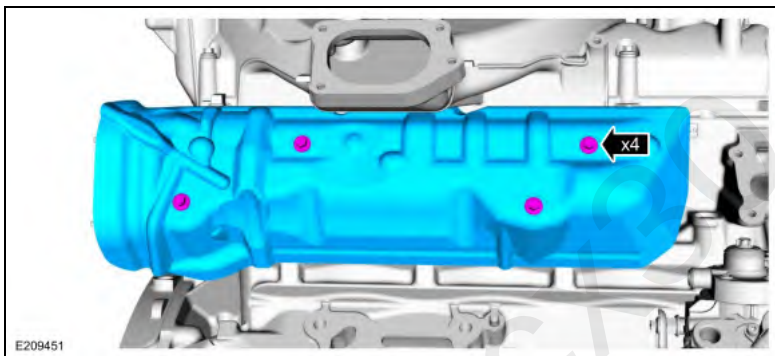
Remove the crankshaft sensor pulse ring.



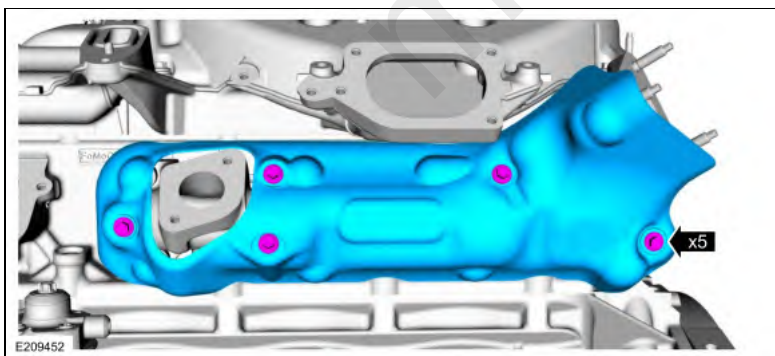
87. Remove the bolt and the CKP sensor.



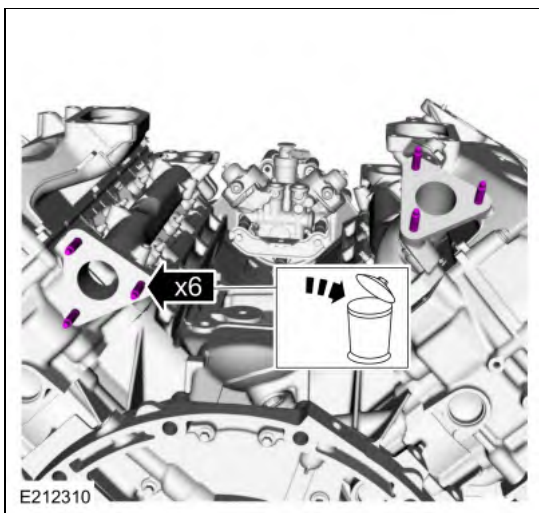
88. Remove the bolts and the LH exhaust manifold heat shield.



89. Remove the bolts and the RH exhaust manifold heat shield.

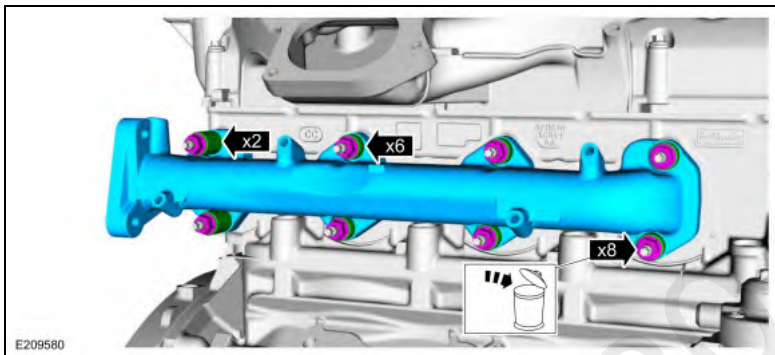


90. Remove and discard the exhaust manifold studs.



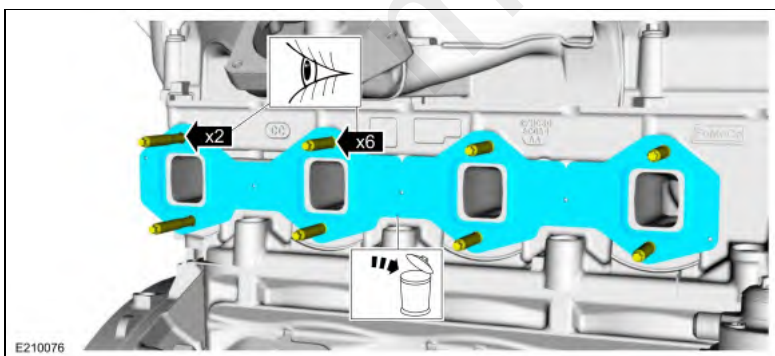
91. **NOTE:** Mark the location of the spacers before removal.

- Remove the nuts, the spacers and the LH exhaust manifold.
- Discard the nuts.



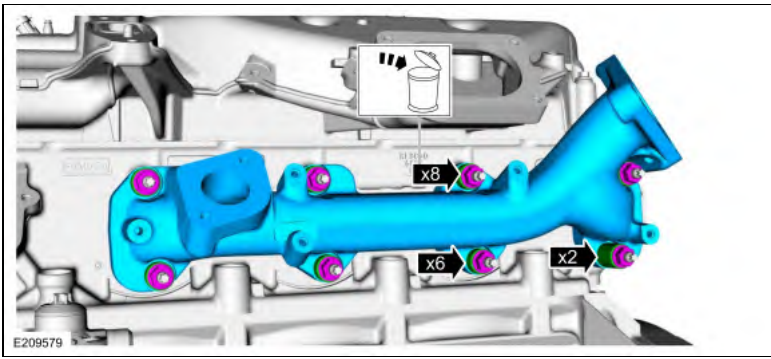
92.

- **NOTE:** Cylinder number 8 will have longer studs.
- Remove and discard the exhaust manifold gasket.
- Replace any exhaust manifold stud(s) that are damaged or removed with the nut.



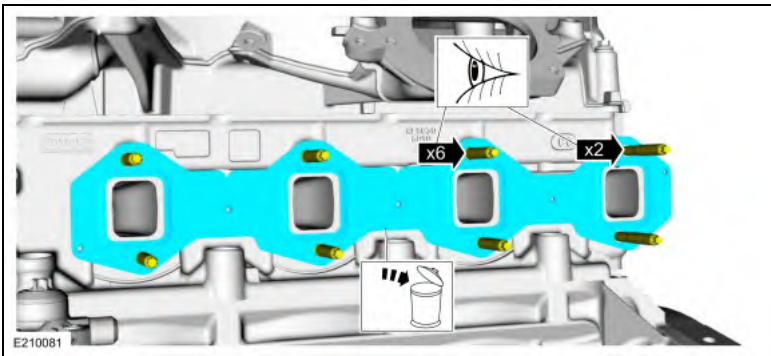
93. **NOTE:** Mark the location of the spacers before removal.

- Remove the nuts, the spacers and the RH exhaust manifold.
- Discard the nuts.



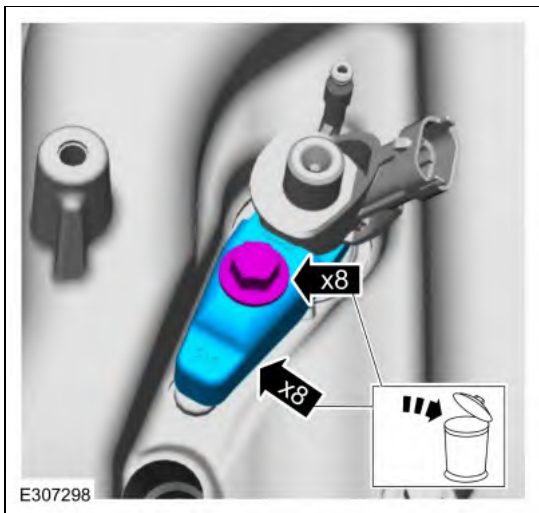
94.

- **NOTE:** *Cylinder number 4 will have longer studs.*
- Remove and discard the exhaust manifold gasket.
- Replace any exhaust manifold stud(s) that are damaged or removed with the nut.



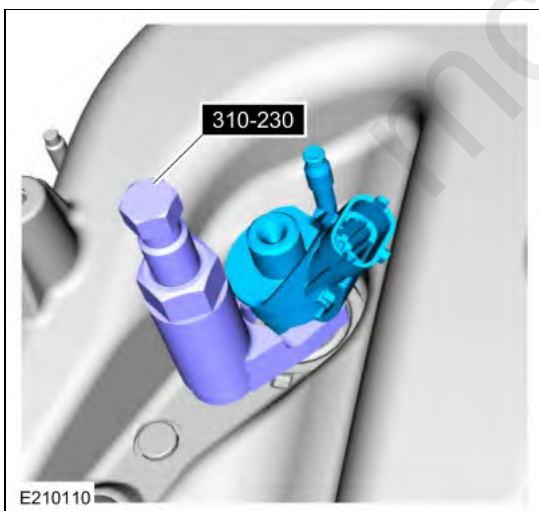
95. **NOTE:** *The fuel injector hold-down clamp bolts are torque-to-yield and cannot be reused.*

- Remove and discard the fuel injector bolts.
- Remove and discard the fuel injector hold-downs.



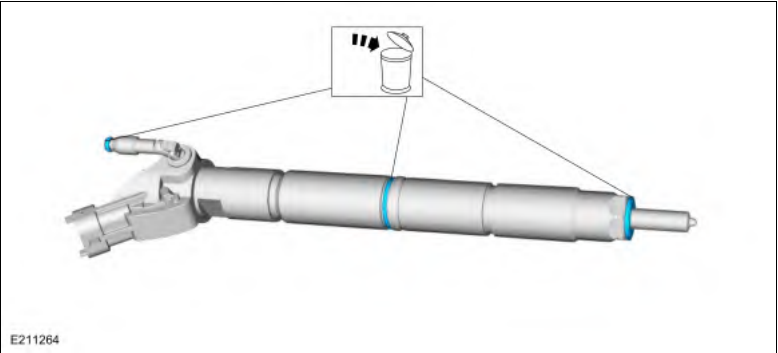
96. **NOTE:** Mark the location of the fuel injector prior to removal.

- Install the special tool to the fuel injector and fully hand-tighten the special tool mounting bolt.
Use Special Service Tool: 310-230 Remover, Fuel Injector.
- Install the push bolt and tighten to remove the fuel injector.
- Remove the special tool mounting bolt and the lower portion of the special tool. Remove the fuel injector.



97. **NOTE:** Only one fuel injector shown.

Remove and discard the O-ring seals and the copper combustion gasket.

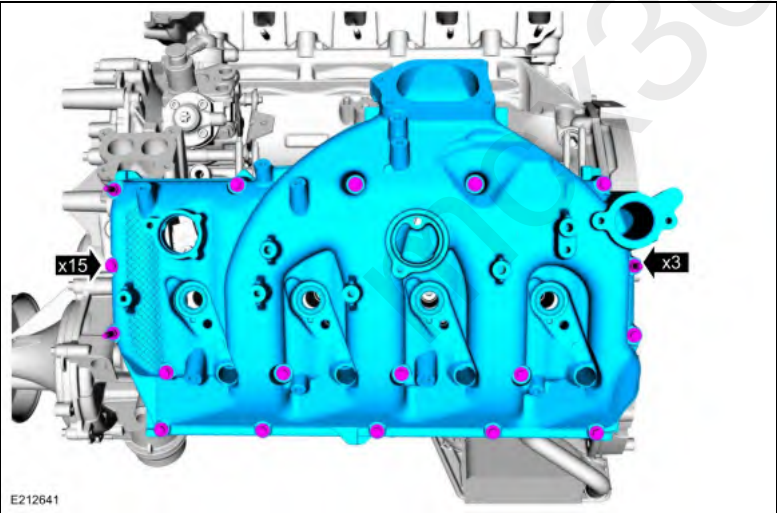


98. **NOTE:** Only one glow plug shown.

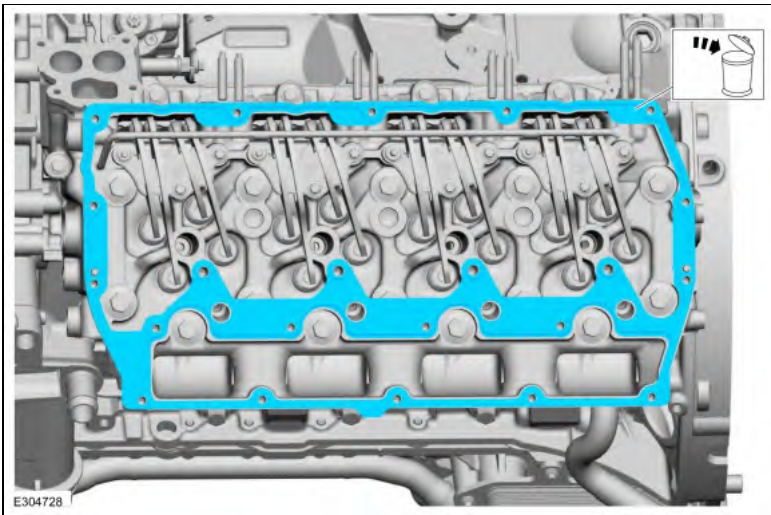
Remove the glow plugs.



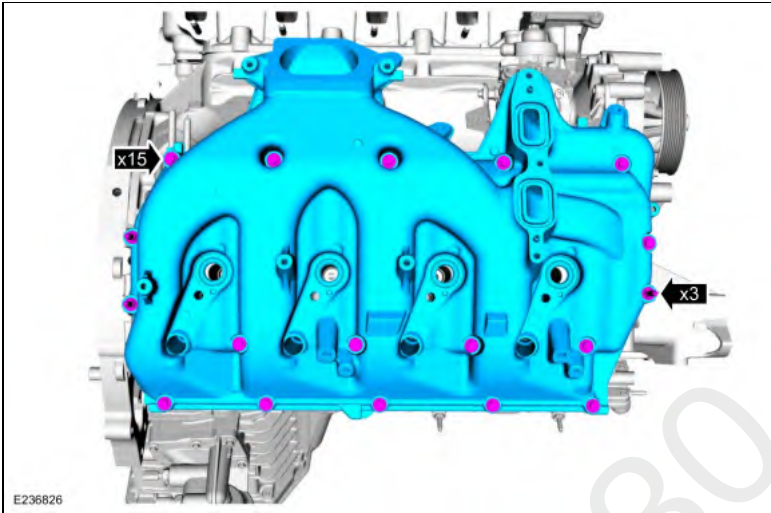
99. Remove the bolts, the stud bolts and the LH valve cover.



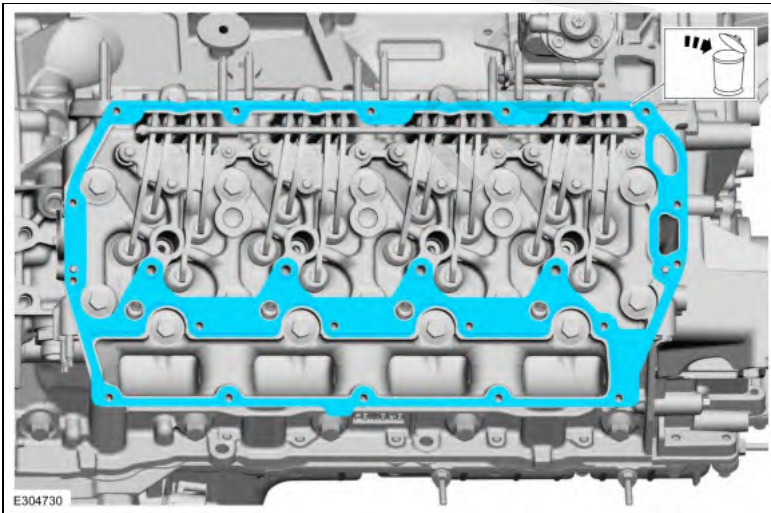
100. Remove and discard the valve cover gasket.



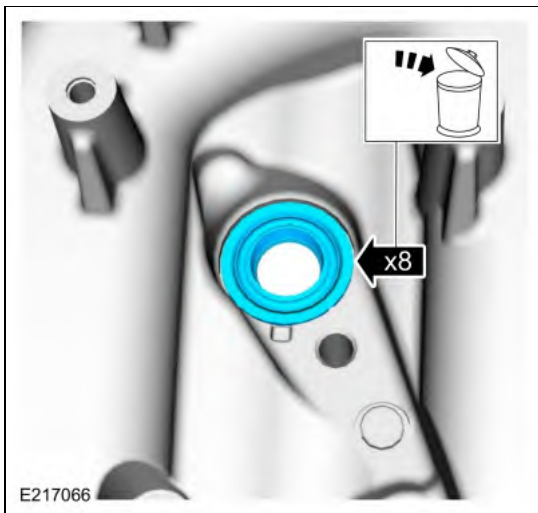
101. Remove the bolts, the stud bolts and the RH valve cover.



102. Remove and discard the valve cover gasket.



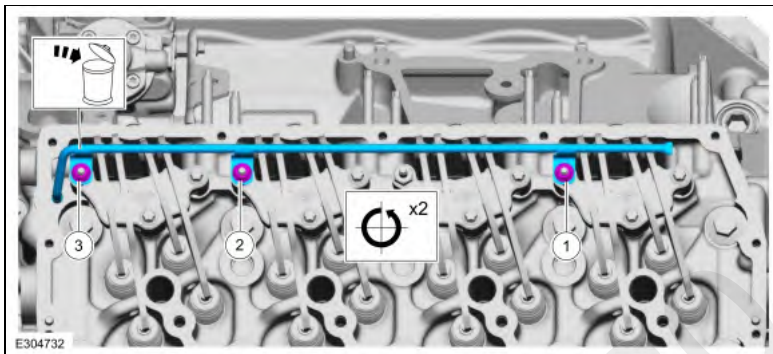
103. **NOTE:** Use the notch in the valve cover to aid in removing the fuel injector-to-valve cover seal.
Remove and discard the fuel injector-to-valve cover seals.



104. **NOTICE:** Failure to remove the oil spray bar in steps may result in damage to the studs.

NOTE: The nuts for the oil spray bar are captured nuts and remain on the oil spray bar.

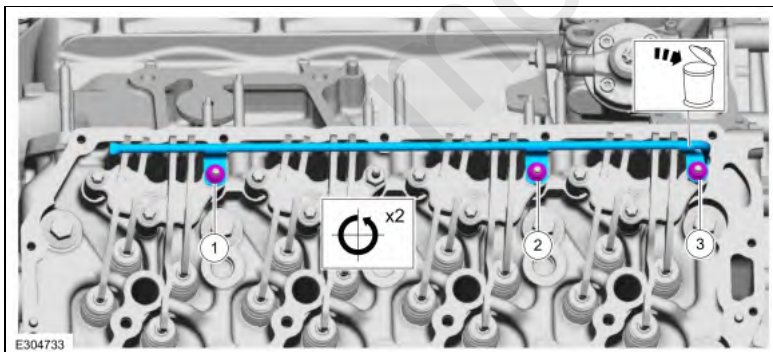
Remove and discard the LH oil spray bar. Loosen the nuts 2 revolutions at a time in the sequence shown until the LH oil spray bar can be removed.



105. **NOTICE:** Failure to remove the oil spray bar in steps may result in damage to the studs.

NOTE: The nuts for the oil spray bar are captured nuts and remain on the oil spray bar.

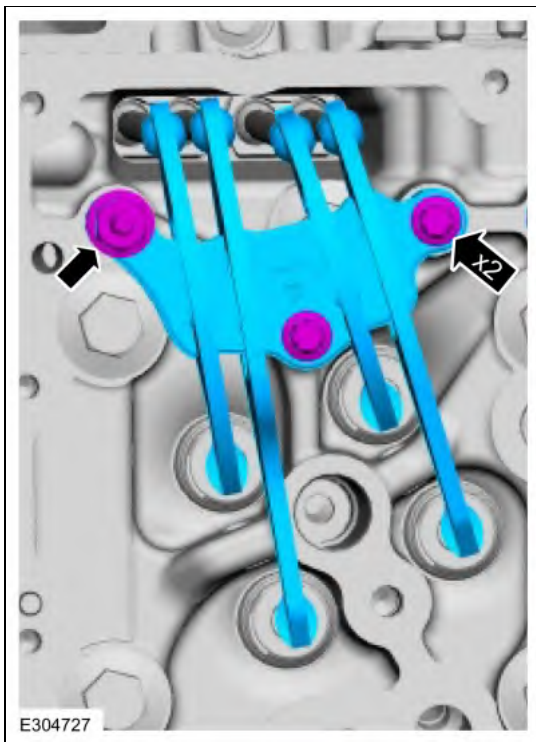
Remove and discard the RH oil spray bar. Loosen the nuts 2 revolutions at a time in the sequence shown until the RH oil spray bar can be removed.



106. **NOTE:** Mark the location of the rocker arm assemblies prior to removing.

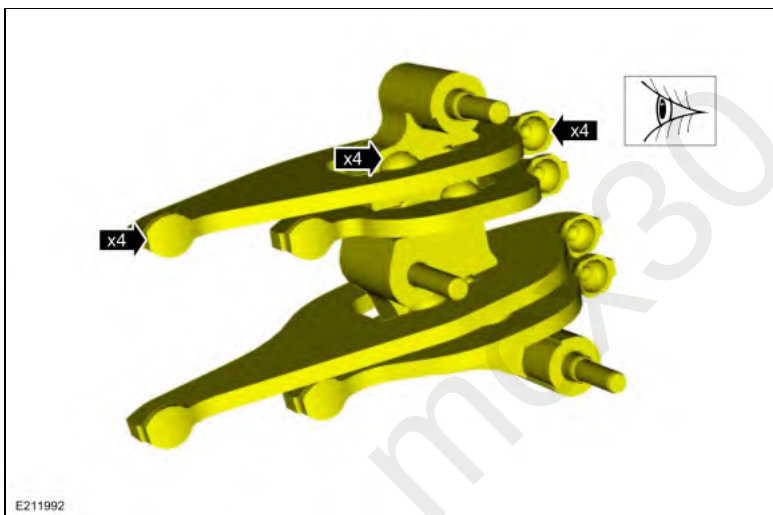
NOTE: Only one cylinder shown.

Remove the rocker arm assemblies.



107. **NOTE:** Do not disassemble the rocker arm assembly. They are serviced as an assembly only.

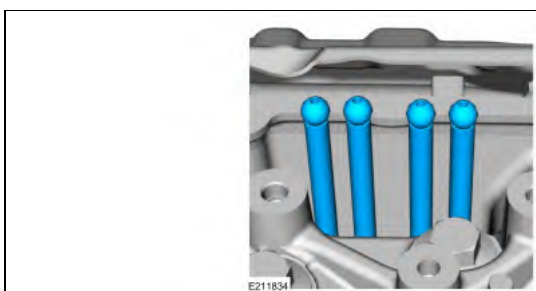
- Looking from the side of the rocker arm assembly, inspect each rocker arm ball for scuffing. Install new rocker arm assemblies as required.
- Inspect each rocker arm pivot foot and cup for pitting and scuffing. Install new rocker arm assemblies as required.



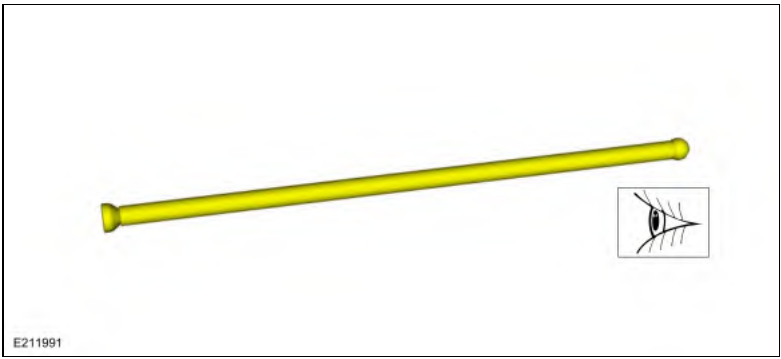
108. **NOTICE:** To prevent engine damage, keep the push rods in the order in which they were removed. Install all push rods back in their original positions.

NOTE: Only one cylinder shown.

Remove the push rods.



- 109.
- Inspect each push rod for wear and deposits which may restrict the flow of oil into the rocker arm assembly. Install a new push rod as needed.
 - Inspect the ball end of the push rod, if the end does not have a polished look, replace the push rod.

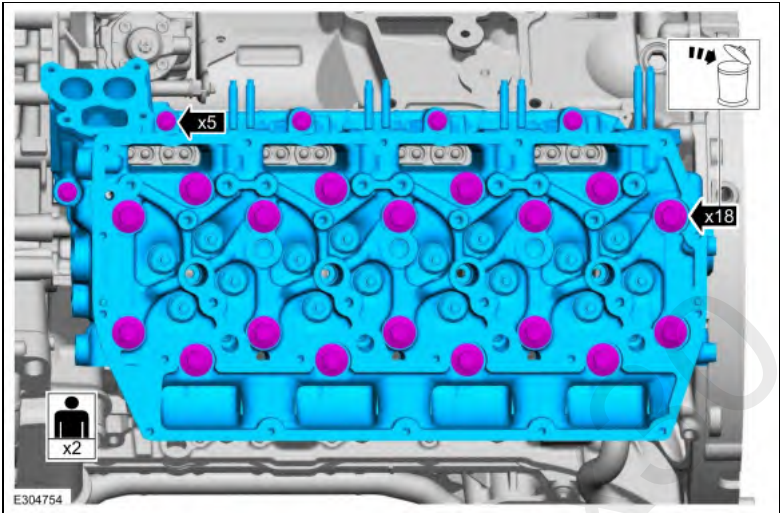


110. **NOTICE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

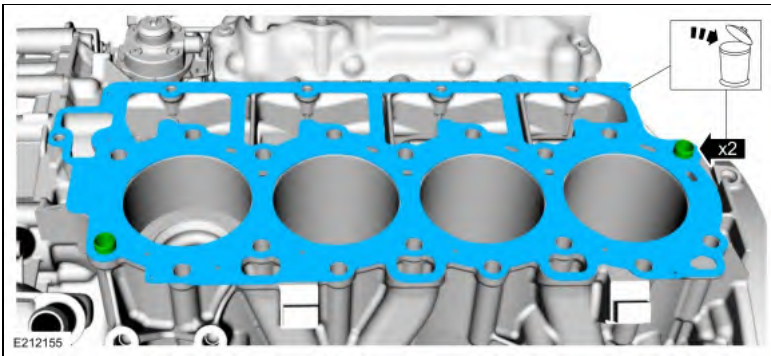
NOTICE: Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface

NOTE: The M12 cylinder head bolts must be discarded and new bolts installed. They are tighten-to-yield designed and cannot be reused.

- Remove and discard the M12 cylinder head bolts. Remove the M8 cylinder head bolts.
- Remove the LH cylinder head.



111. Remove and discard the LH cylinder head gasket and the cylinder head dowels.



112. Check the cylinder head distortion.

Refer to: Cylinder Head Distortion (303-01B Engine - 6.7L Power Stroke Diesel, General Procedures).

113.

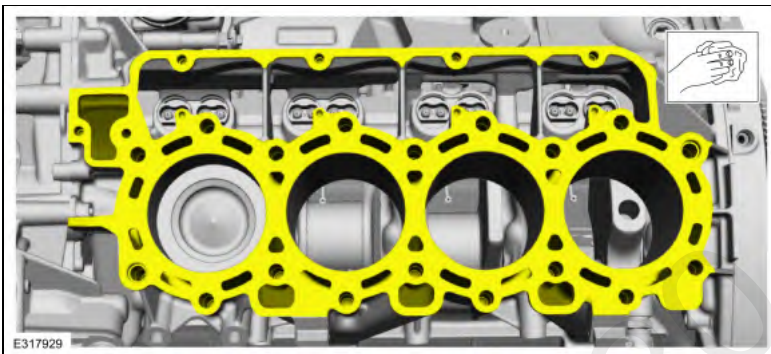
- **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

NOTE: Clean the cylinder block bolt holes using compressed air. Make sure all coolant, oil or other foreign material is removed.

Clean and inspect the cylinder block mating surface.

- Check the cylinder block distortion.

Refer to: Cylinder Block Distortion (303-00 Engine System - General Information, General Procedures).

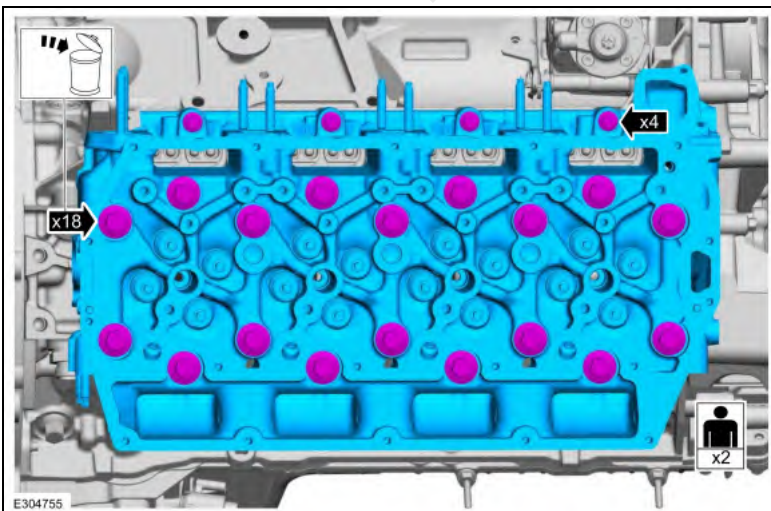


114. **NOTICE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

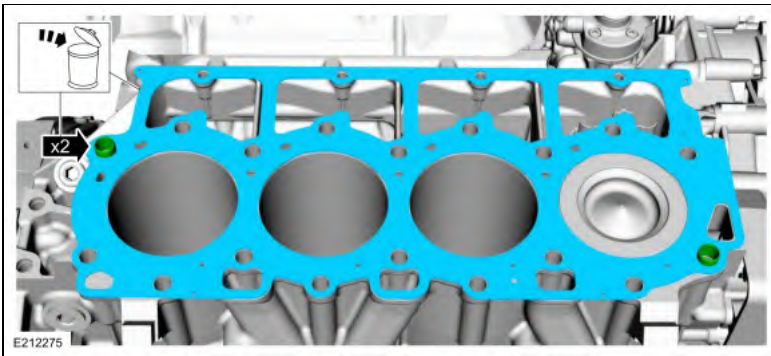
NOTICE: Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface

NOTE: The M12 cylinder head bolts must be discarded and new bolts installed. They are tighten-to-yield designed and cannot be reused.

- Remove and discard the M12 cylinder head bolts. Remove the M8 cylinder head bolts.
- Remove the RH cylinder head.



115. Remove and discard the RH cylinder head gasket and the cylinder head dowels.



116. Check the cylinder head distortion.
 Refer to: Cylinder Head Distortion (303-01B Engine - 6.7L Power Stroke Diesel, General Procedures).

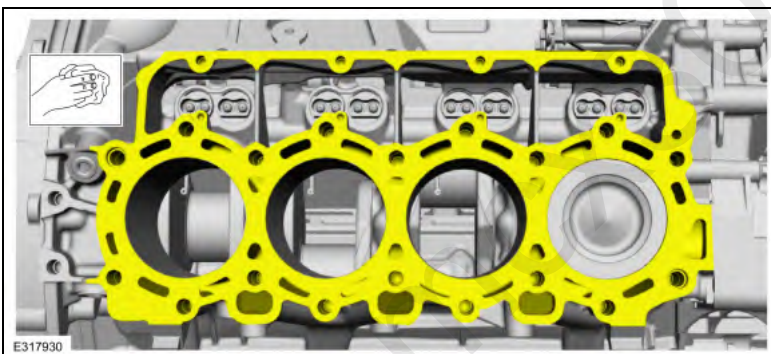
117.

- **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

NOTE: Clean the cylinder block bolt holes using compressed air. Make sure all coolant, oil or other foreign material is removed.

Clean and inspect the cylinder block mating surface.

- Check the cylinder block distortion.
 Refer to: Cylinder Block Distortion (303-00 Engine System - General Information, General Procedures).



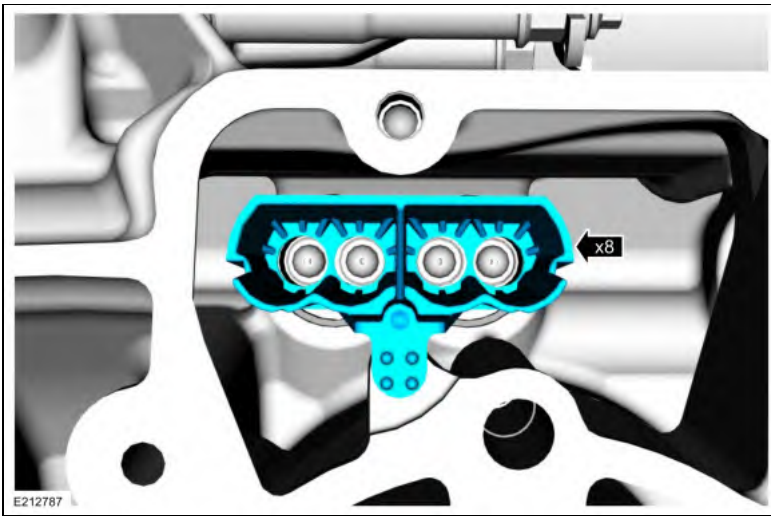
118. **NOTICE:** To prevent engine damage, keep the valve tappets in the order in which they were removed. Install all valve tappets back in their original positions or engine damage may occur.

NOTE: Always keep the valve tappets in the upright position or the hydraulic lash adjuster may fall out.

NOTE: Only one valve tappet guide shown.

NOTE: Some valve tappets will be removed with the valve tappet guides.

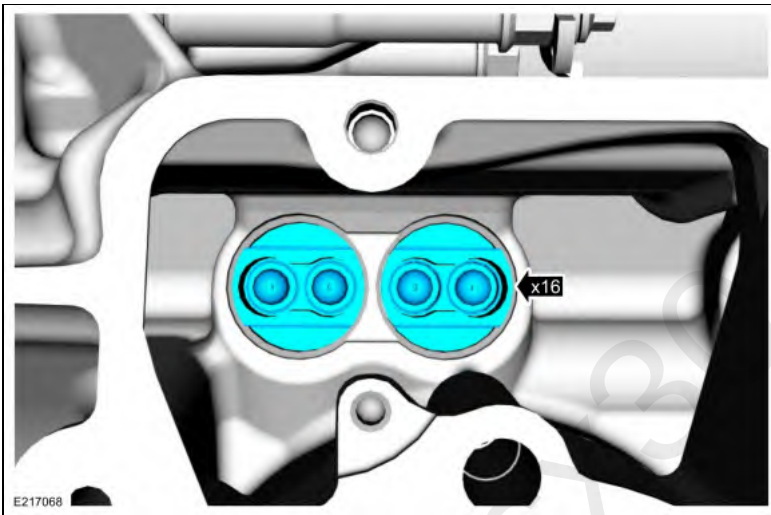
Remove the valve tappet guides.



119. **NOTE:** Always keep the valve tappets in the upright position or the hydraulic lash adjuster may fall out.

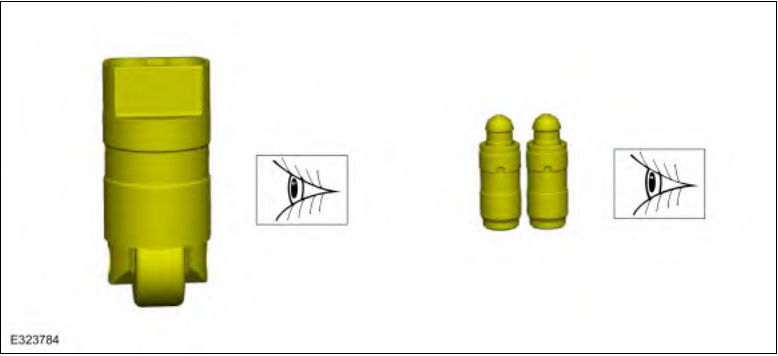
NOTE: Only one cylinder shown.

Remove the valve tappets from the engine.

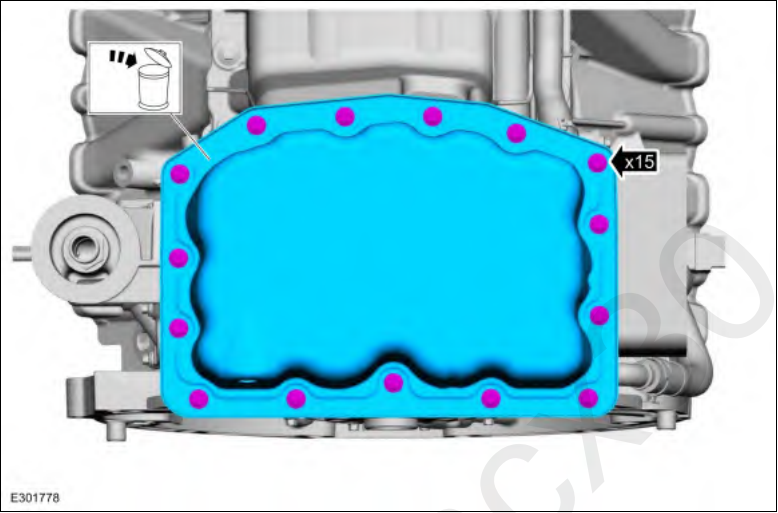


120. **NOTICE:** To prevent engine damage, keep the hydraulic lash adjuster in the order in which they were removed. Install all hydraulic lash adjuster back in their original positions or engine damage may occur.

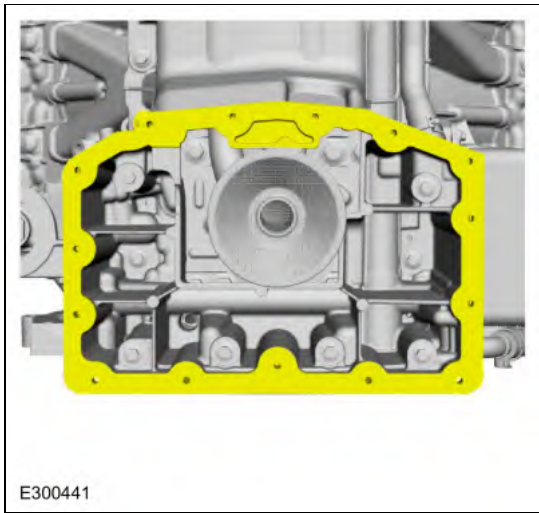
Inspect the valve tappet and the hydraulic lash adjuster for wear or damage. If any wear or damage is found, inspect the camshaft lobe for wear or damage. Replace components as necessary.



121. Remove the bolts and the lower oil pan. Discard the lower oil pan.



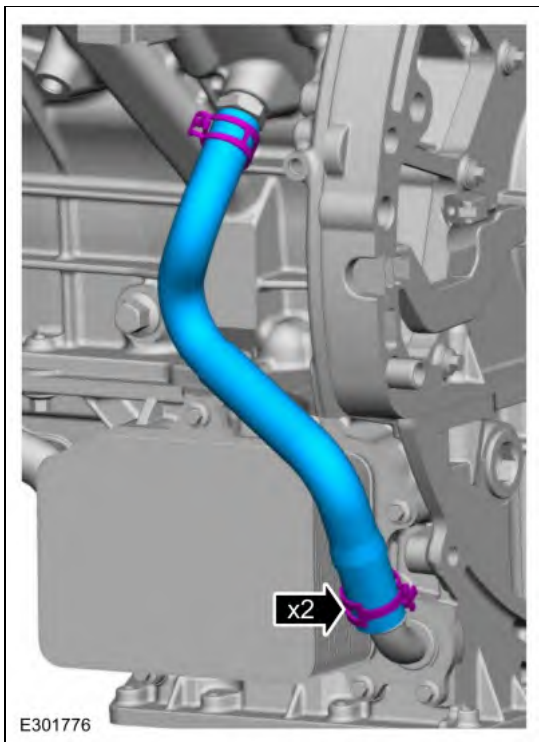
122. Clean and prepare the RTV sealing surface.
Refer to: RTV Sealing Surface Cleaning and Preparation (303-00 Engine System - General Information, General Procedures).



123. **NOTICE:** Use care when removing the hose from the oil cooler, damage to the oil cooler may occur during removal.

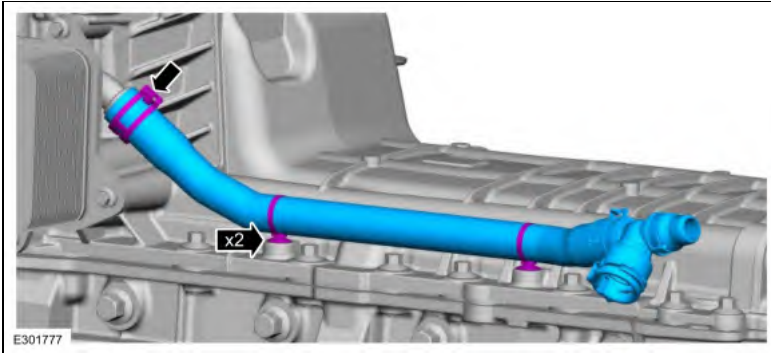
Remove the oil cooler inlet hose.

Use the General Equipment: Hose Clamp Remover/Installer



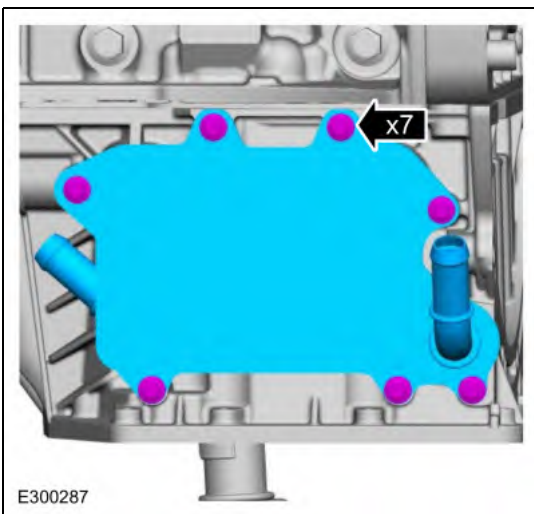
124. **NOTICE:** Use care when removing the hose from the oil cooler, damage to the oil cooler may occur during removal.

Disconnect the hose retainers. Remove the oil cooler outlet hose.
Use the General Equipment: Hose Clamp Remover/Installer

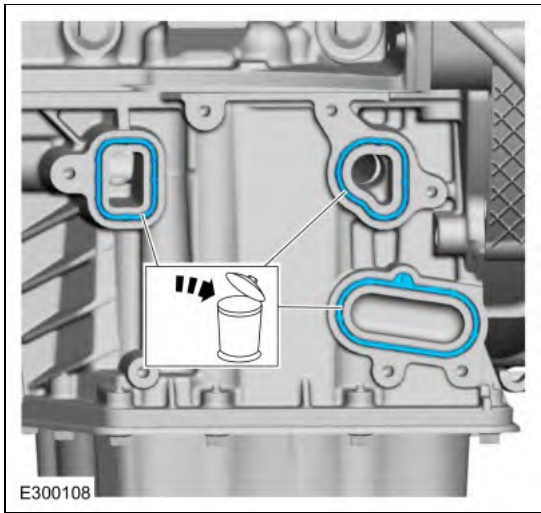


125. **NOTICE:** In the event of a catastrophic engine failure, or if installing a new short block, always install a new oil cooler. Foreign material cannot be removed from the oil cooler and engine damage may occur. Long blocks are equipped with a new oil cooler.

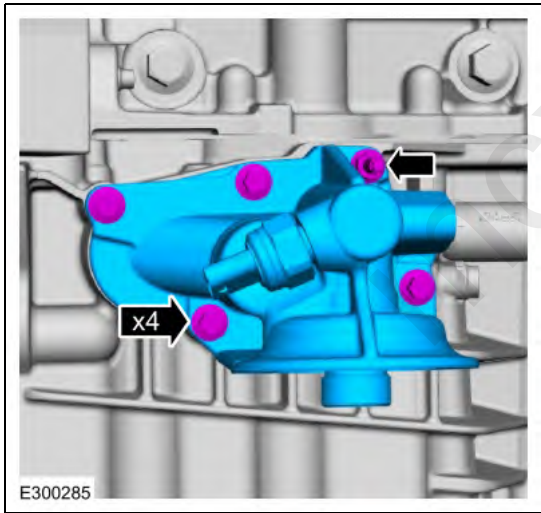
Remove the bolts and the oil cooler assembly.



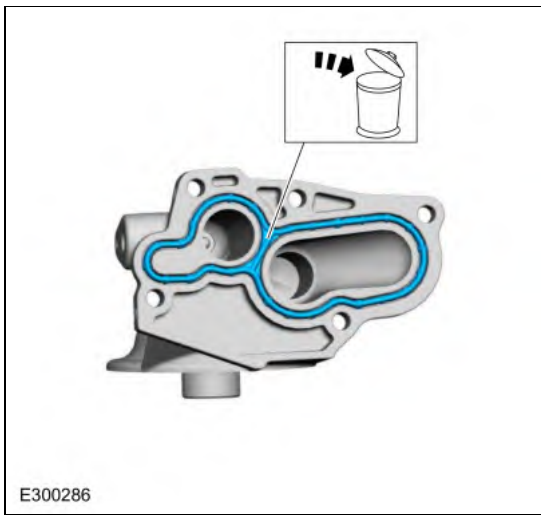
126. Remove and discard the oil cooler gaskets.



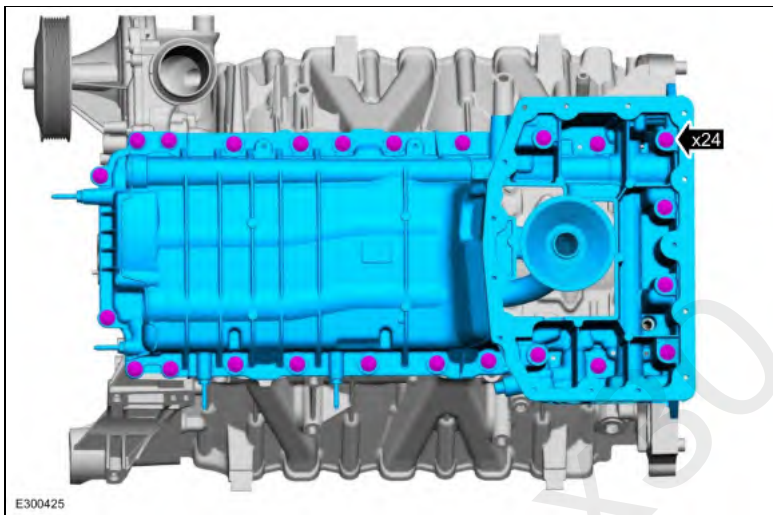
127. Remove the retainers and the oil filter adapter.



128. Remove and discard the oil filter adapter gasket.

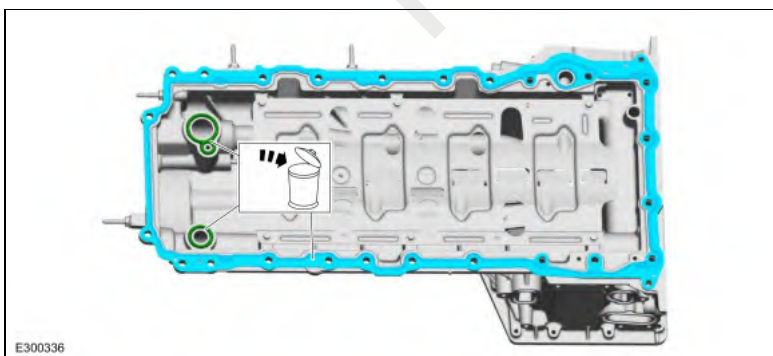


129. Remove the bolts and the upper oil pan.

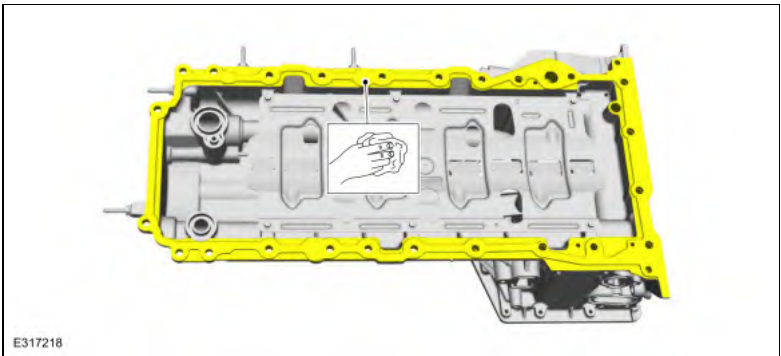


130.

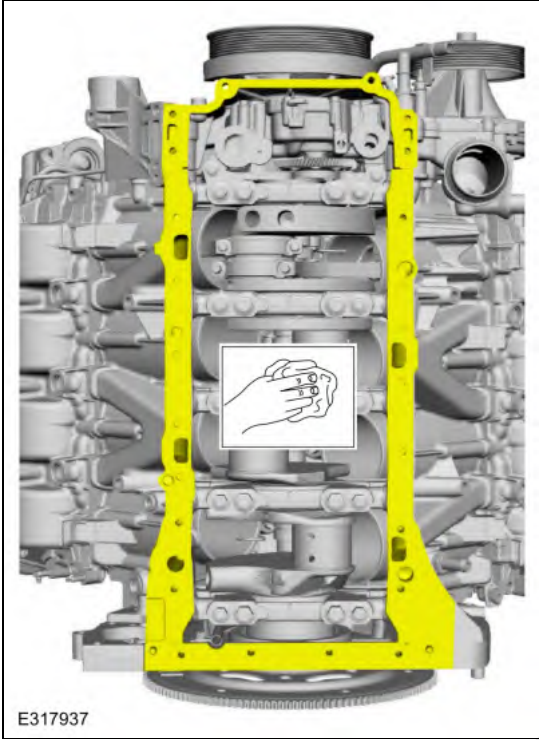
- Remove and discard the upper oil pan gasket.
- Remove and discard the oil pan press-in-place gaskets.



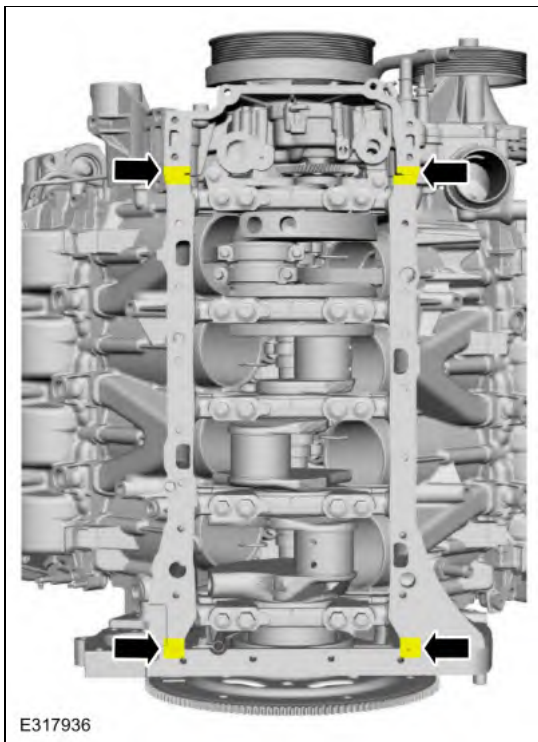
131. Clean and inspect the upper oil pan sealing surface.



132. Clean and inspect the cylinder block, the engine front cover and the engine rear cover.



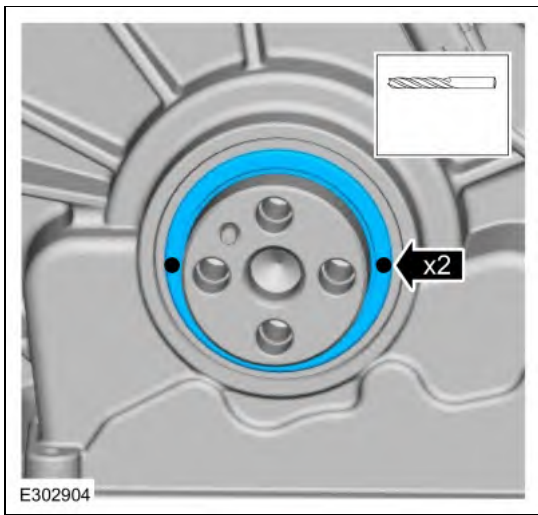
133. Clean and prepare the RTV sealing surface.
Refer to: RTV Sealing Surface Cleaning and Preparation (303-00 Engine System - General Information, General Procedures).



134.

1. Using a center punch, mark a location for 2 holes 180 degrees apart.
2. **NOTICE: Drill only deep enough to penetrate the slinger. Engine damage may occur if the slinger is drilled too deep.**

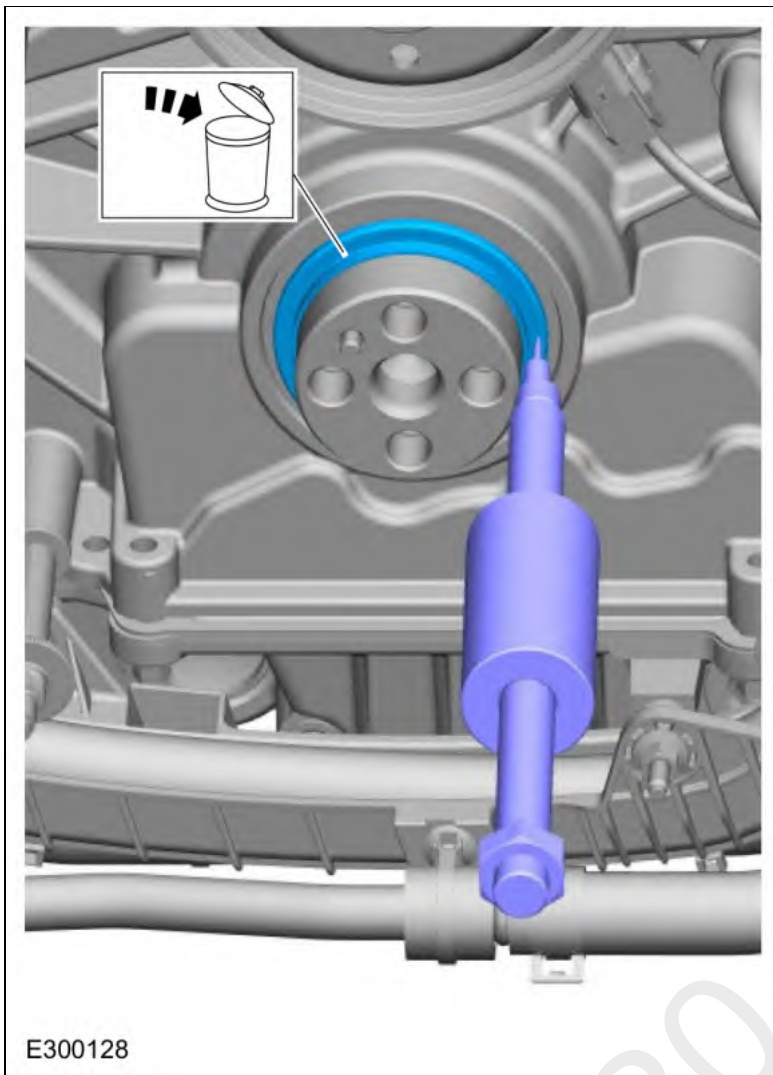
Using a drill bit of the appropriate size for the slide hammer dent puller being used, drill a hole on each side of the slinger as shown.



135. **NOTICE:** Use extreme care when removing the slinger or damage to the engine front cover may occur.

Using the 2 drilled holes, a commercially available slide hammer dent puller, walk the slinger off the crankshaft by alternating from side to side. Discard the slinger.

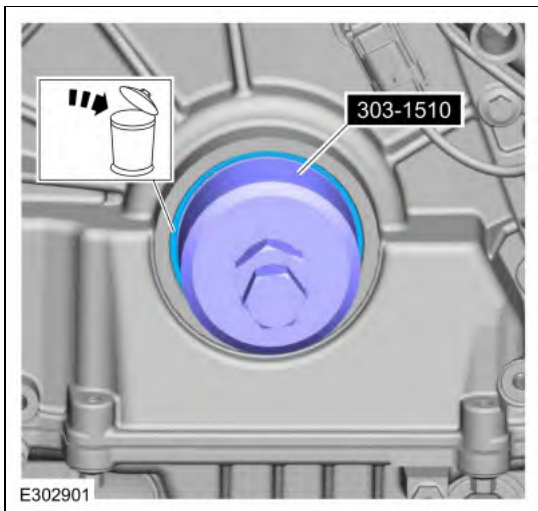
Use the General Equipment: Slide Hammer Dent Puller



136. **NOTICE:** Do not scratch or damage the crankshaft during removal or installation of the crankshaft front seal.

NOTE: The Front Crank Seal Remover needs to be threaded in until it stops turning.

Using the special tool, remove and discard the crankshaft front seal.
Use Special Service Tool: 303-1510 Remover, Front Crank Seal.

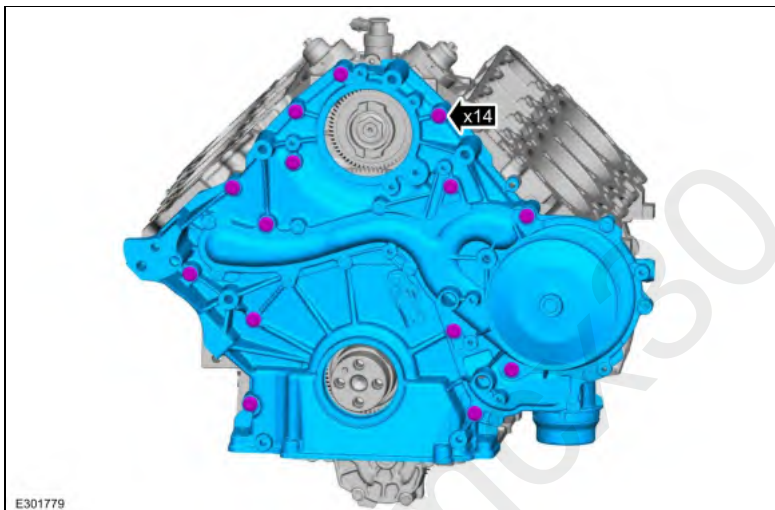


137. Clean and inspect the crankshaft sealing surface.

138. **NOTICE:** Use care when removing the engine front cover to not scratch the crankshaft sealing surface.

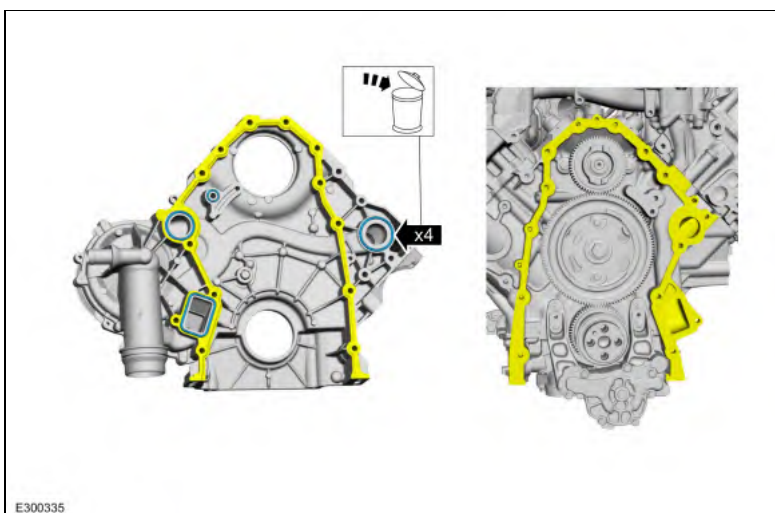
NOTE: Mark the location of the engine front cover bolts prior to removing them.

- Remove the engine front cover bolts.
- Remove the engine front cover.

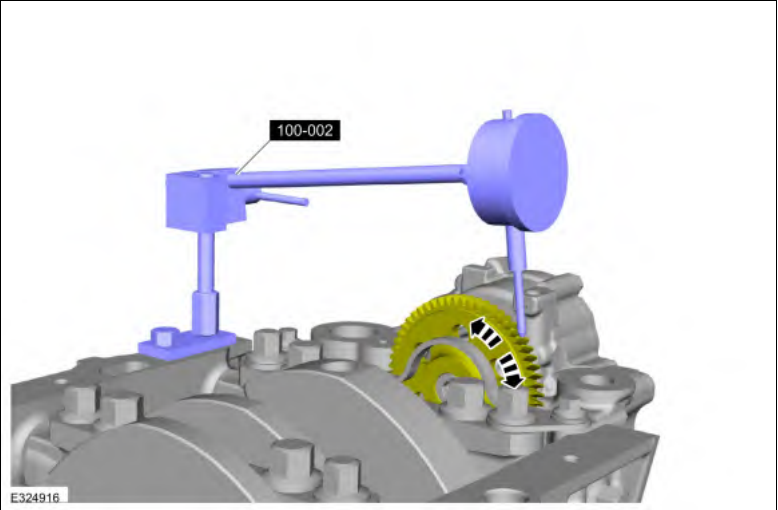


139.

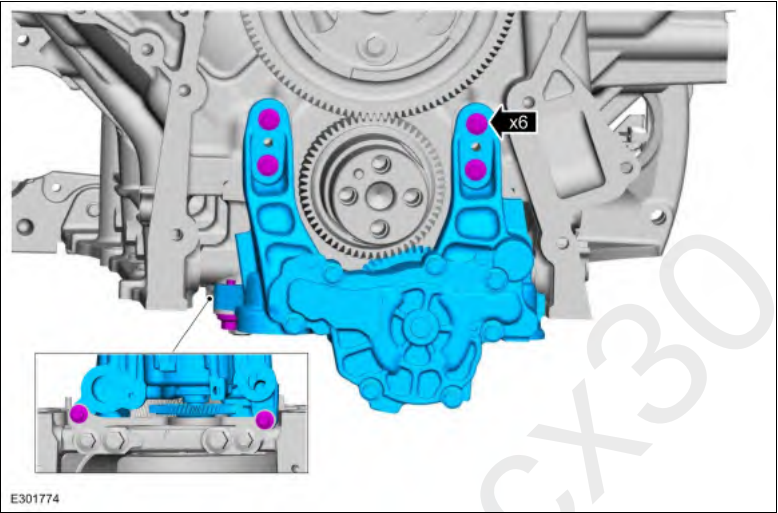
- Remove and discard the engine front cover gaskets.
 - Clean and prepare the RTV sealing surface.
- Refer to: RTV Sealing Surface Cleaning and Preparation (303-00 Engine System - General Information, General Procedures).



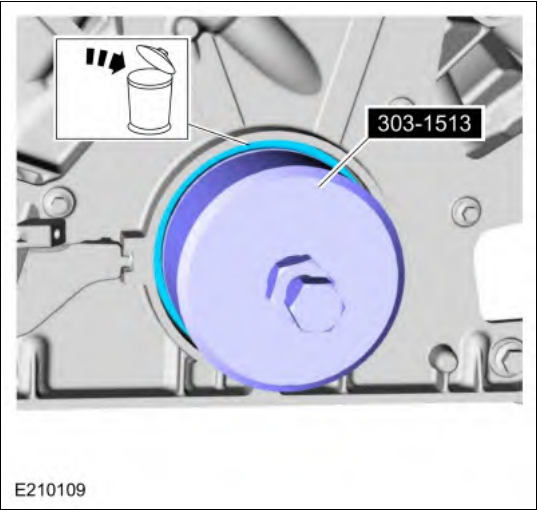
140. Using the special tool, check the oil pump drive gear backlash.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).
Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.



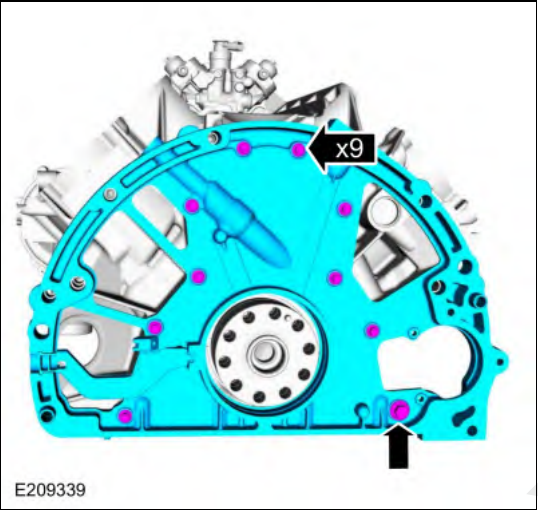
141. **NOTICE:** Remove the oil pump evenly or damage to the roll pins may occur.
Remove the bolts and the oil pump.



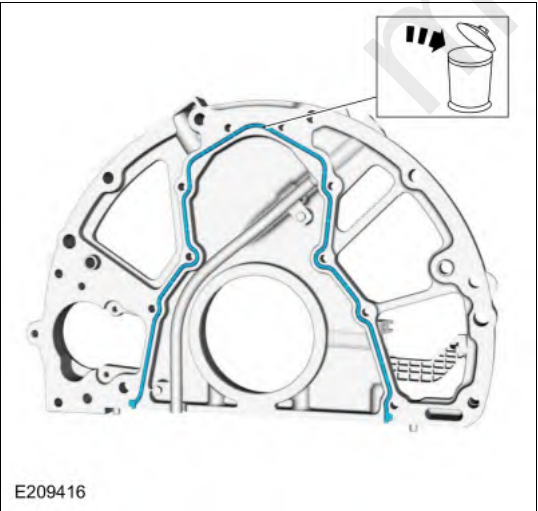
142. **NOTICE:** Do not scratch or damage the crankshaft during removal or installation of the crankshaft rear seal.
Using the special tool, remove and discard the crankshaft rear seal.
Use Special Service Tool: 303-1513 Remover, Rear Crank Seal.



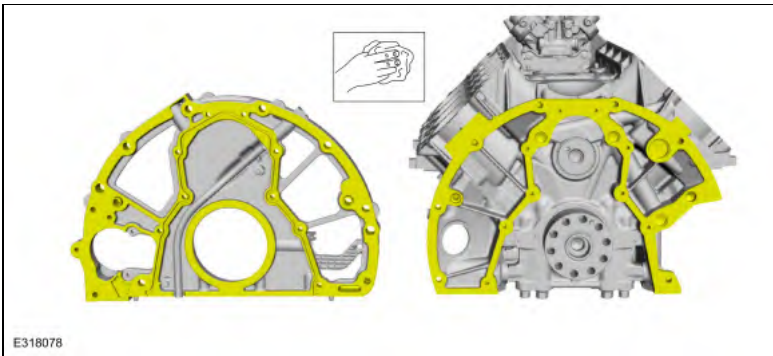
143. Clean and inspect the crankshaft sealing surface.
144. **NOTICE:** To prevent engine damage, replace damaged or missing dowel pins before installing the engine rear cover.
- Remove the bolts and the engine rear cover.



145. Remove and discard the engine rear cover gasket.



146. Make sure the mating surfaces are clean and free of foreign material.



147. **NOTE:** Prior to removing any piston and rod assemblies, it is recommended that piston protrusion be evaluated. This will help identify bent or twisted connecting rods.

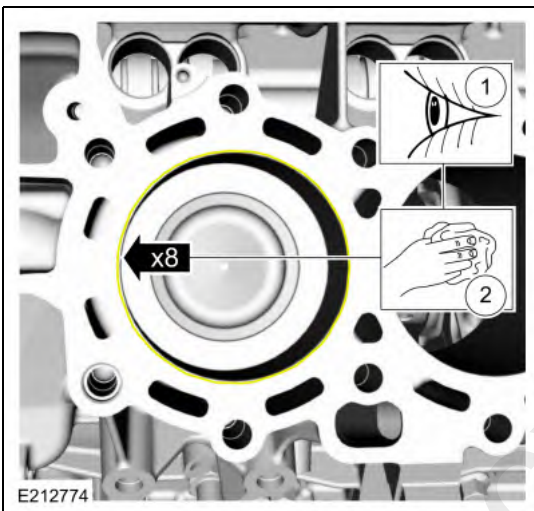
Check the piston protrusion.

Refer to: Piston Protrusion Check (303-00 Engine System - General Information, General Procedures).

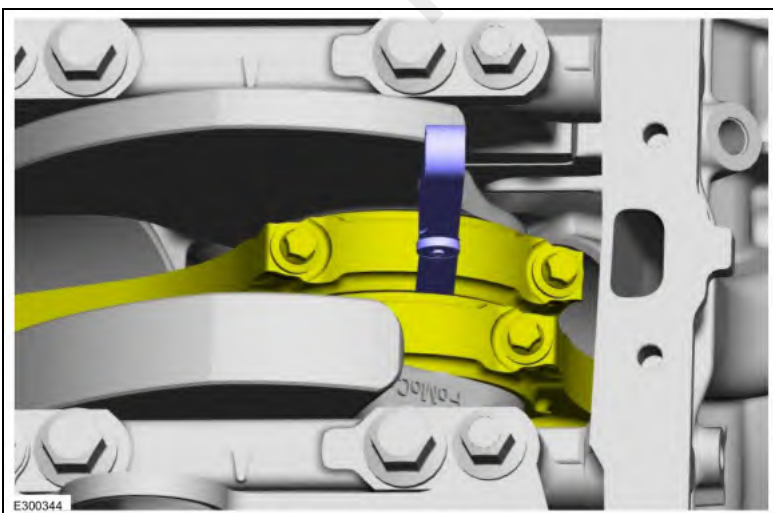
148. **NOTICE:** If evident from the top of the cylinder bore, remove the carbon ridge prior to removing the rod and piston assemblies. This reduces the chance of piston ring land damage during removal.

- Inspect the ridge.
- **NOTE:** Remove the carbon buildup, do not scratch the cylinder wall. Remove all debris from the cylinder.

Using an abrasive pad, remove the carbon ridge from the top of the cylinder bore.



149. Using a feeler gauge, check the connecting rod side clearance.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).
Use the General Equipment: Feeler Gauge

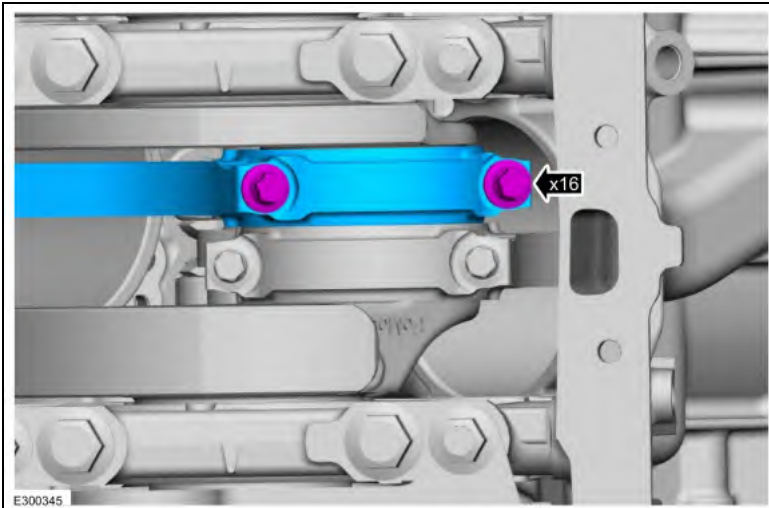


150. **NOTICE:** The connecting rods are powdered metal cracked rods and care should be taken to make sure that the connecting rod caps are oriented correctly with the connecting rods or engine damage may occur.

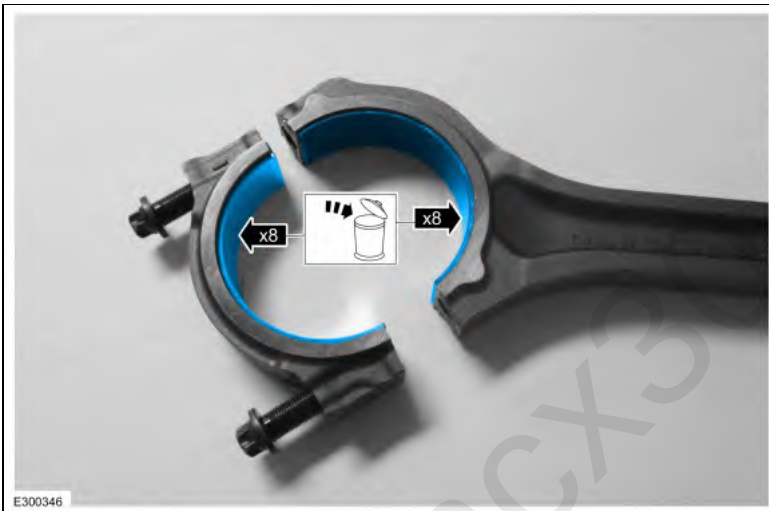
NOTE: Mark the location of connecting rod cap prior to removal.

NOTE: Only one connecting rod cap shown.

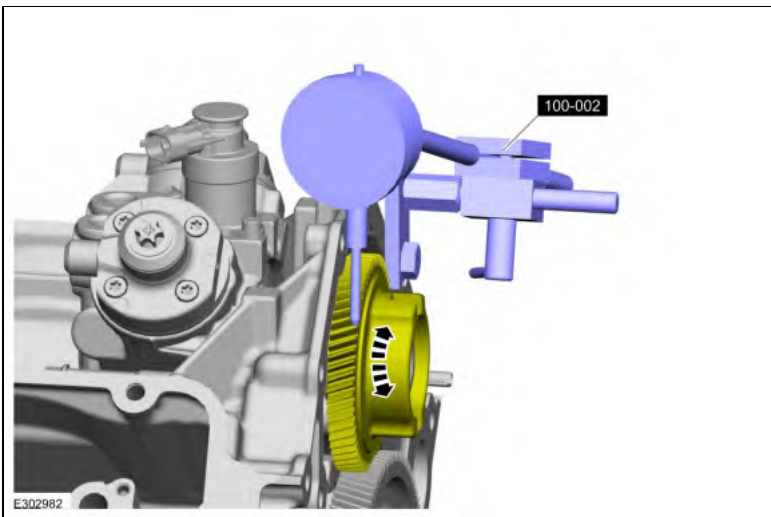
- Remove the connecting rod bolts and connecting rod caps.
- Using a wood or plastic hammer handle, push the connecting rod and piston assembly out of the cylinder bore.



151. Remove and discard the connecting rod bearings.

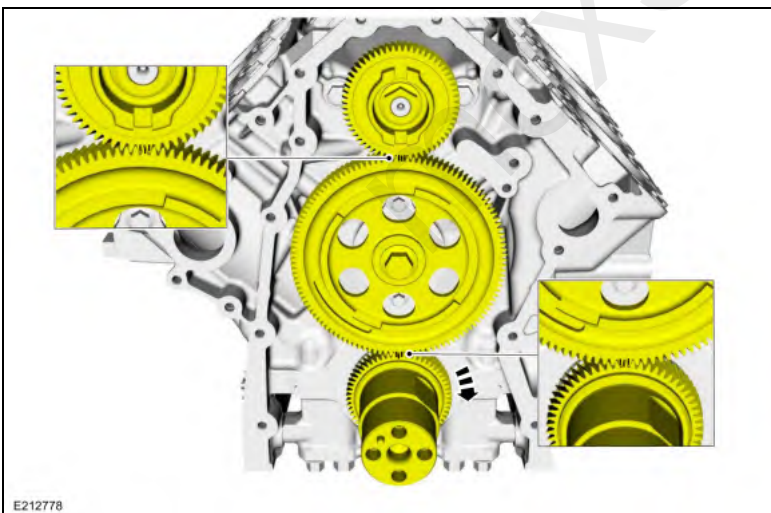


152. Using the special tool, check the high-pressure fuel injection pump drive gear backlash.
Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).
Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.

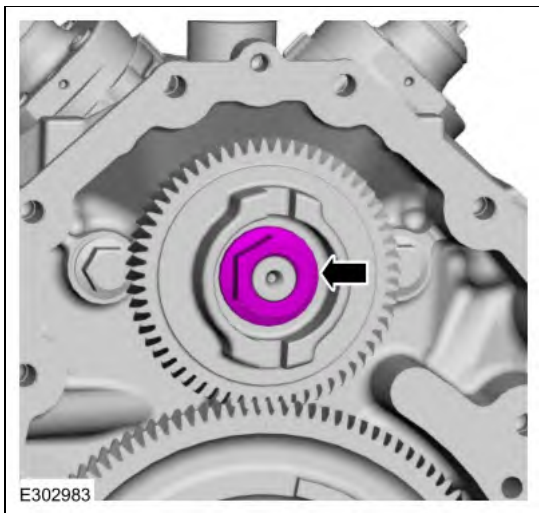


153. **NOTE:** The crankshaft gear contains a single timing mark. The camshaft contains a single timing mark. The high-pressure fuel injection pump drive gear contains a double timing mark. The engine is timed correctly when the single mark on the crankshaft drive gear is aligned with the double mark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

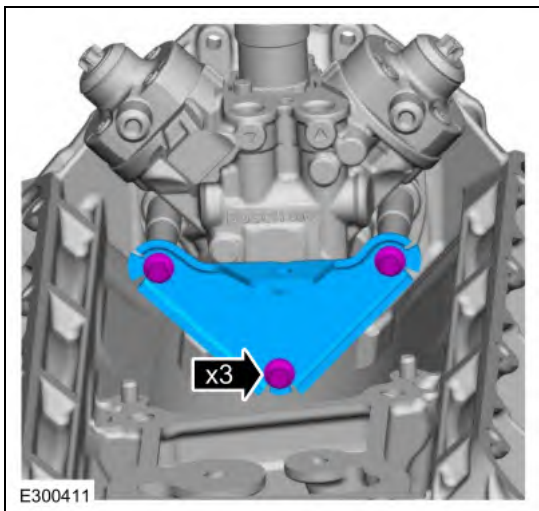
Rotate the crankshaft clockwise, as viewed from the front, until the single mark on the camshaft drive gear and the double mark on the high-pressure fuel injection pump drive gear are aligned.



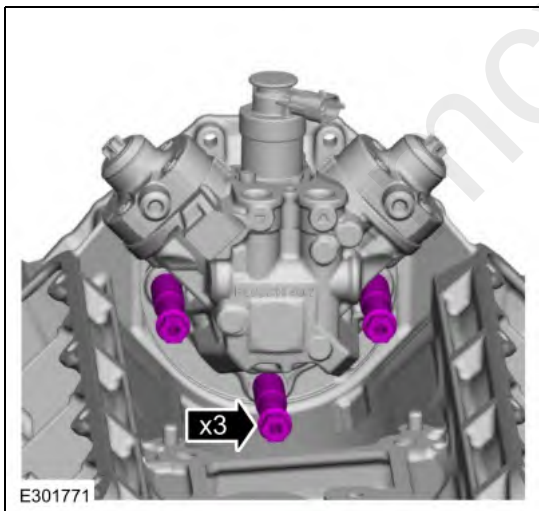
154. Remove the high-pressure fuel injection pump drive gear nut.



155. Remove the bolts and the fuel rail supply tube bracket.

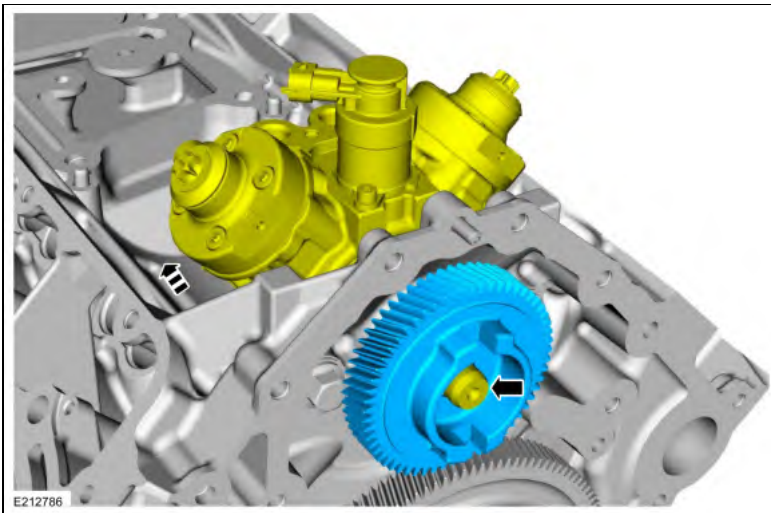


156. Remove the high-pressure fuel injection pump spacers.

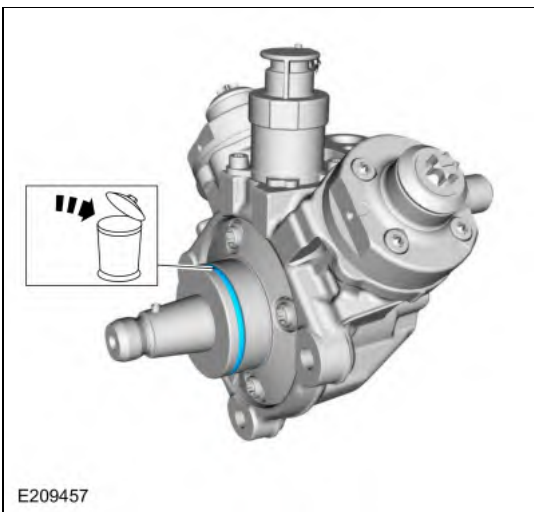


157. **NOTICE:** Do not pry against the mating surface of the high-pressure fuel injection pump or damage to the high-pressure fuel injection pump may occur.

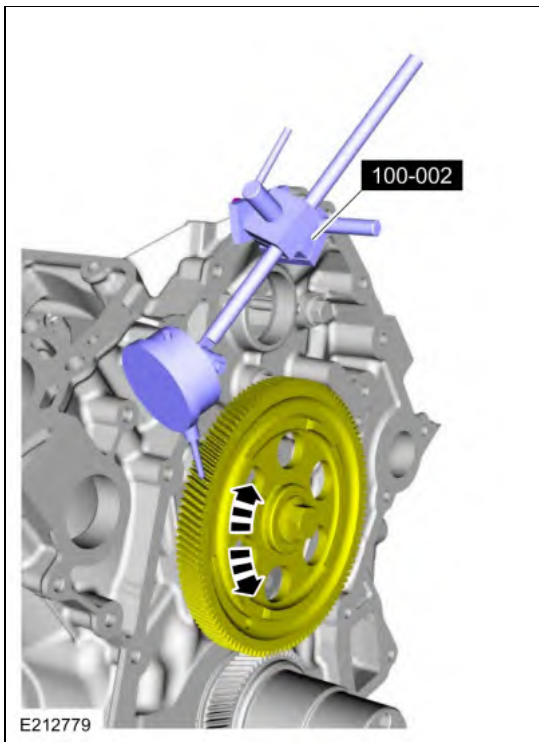
Position the high-pressure fuel injection pump rearward until the gear contacts the cylinder block. Using a mallet, tap the high-pressure fuel injection pump shaft to free the gear from the pump. Remove the high-pressure fuel injection pump and drive gear.



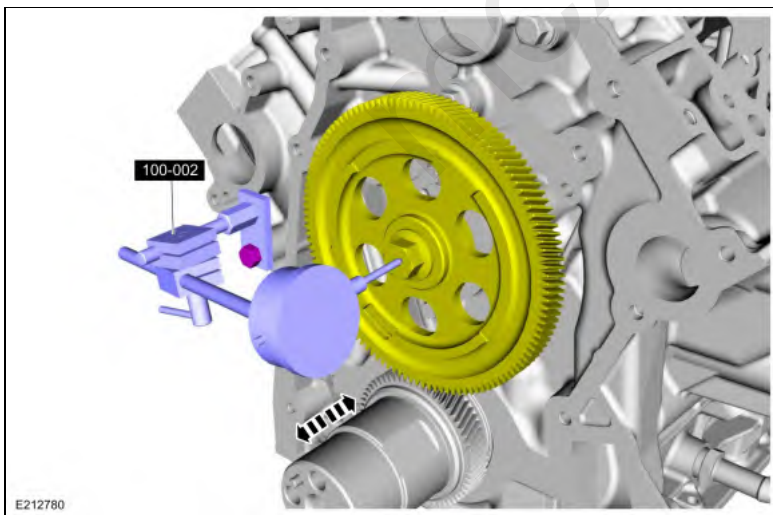
158. Remove and discard the high-pressure fuel injection pump O-ring seal.



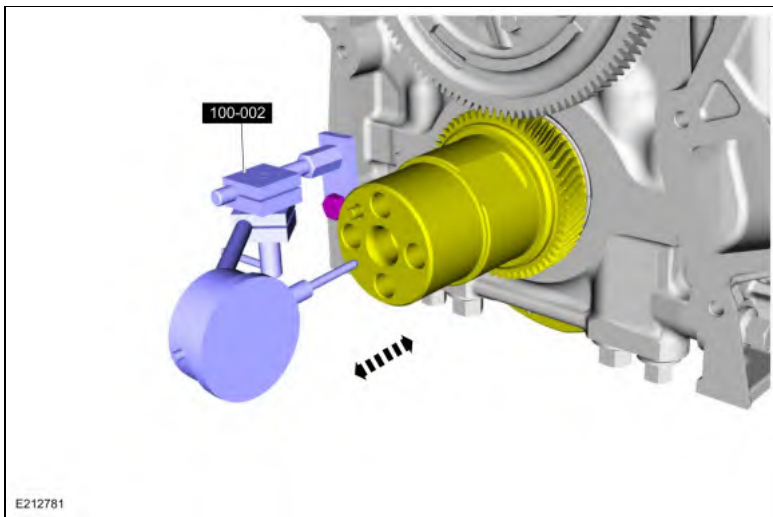
159. Using the special tool, measure the camshaft gear backlash.
 Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).
 Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.



160. Using the special tool, measure the camshaft end play.
 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.

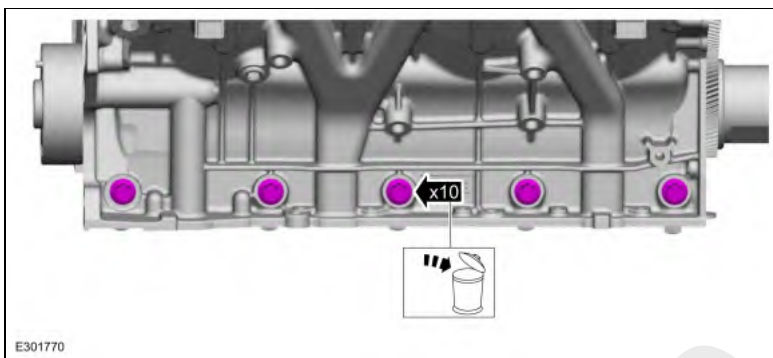


161. Using the special tool, measure the crankshaft end play.
 Refer to: Specifications (303-01B Engine - 6.7L Power Stroke Diesel, Specifications).
 Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.



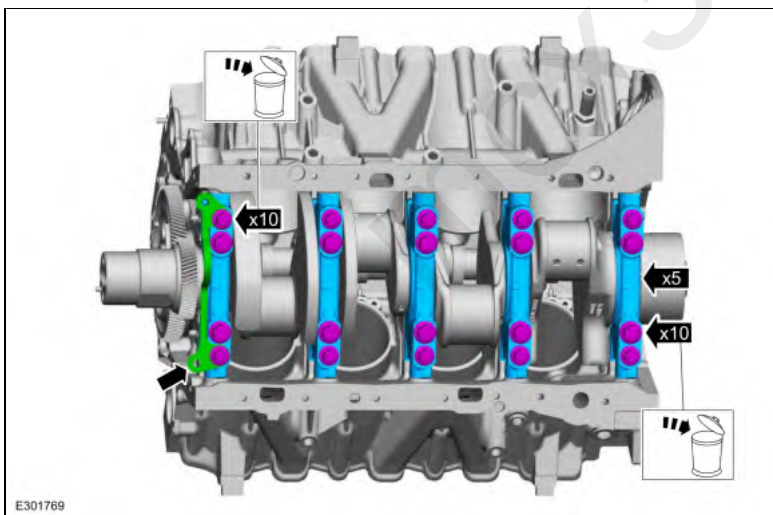
162. **NOTE:** RH side shown, LH side similar.

Remove and discard the crankshaft main bearing cap side bolts.



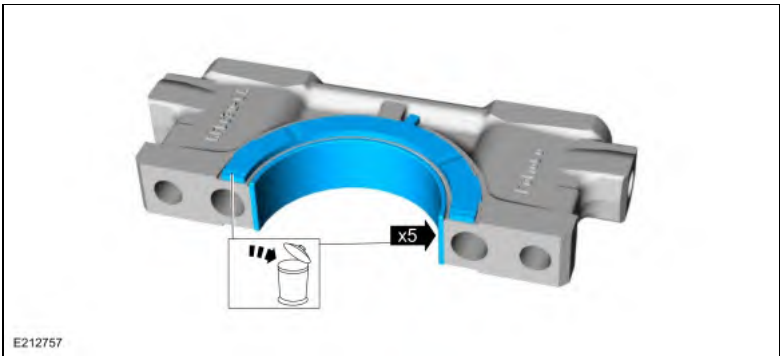
163.

- Remove the crankshaft main bearing cap bolts and the oil pump support bracket. Discard the bolts.
- Remove the crankshaft main bearing caps from the cylinder block.

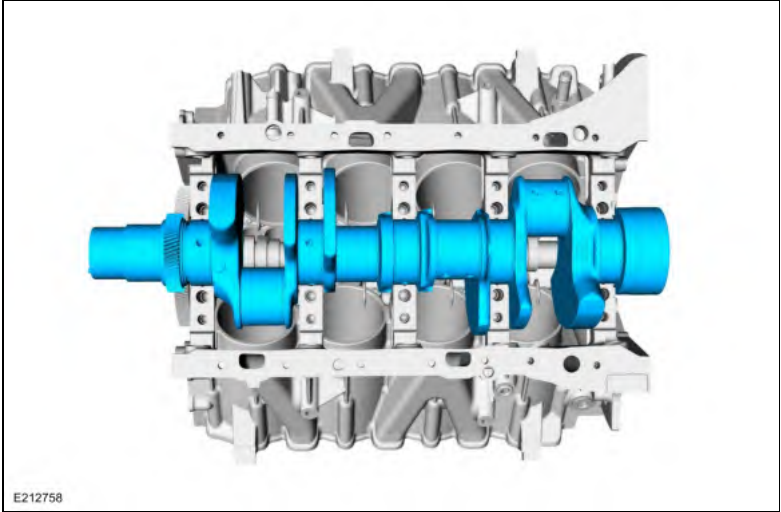


164. **NOTE:** Only the number 5 crankshaft main bearing cap has a thrust washer.

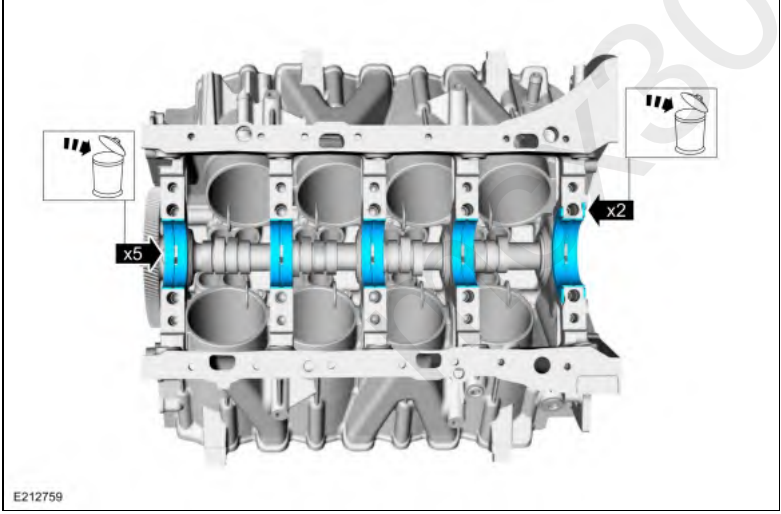
Remove and discard the lower crankshaft main bearing thrust washer. Remove and discard the lower crankshaft main bearings from the crankshaft main bearing caps.



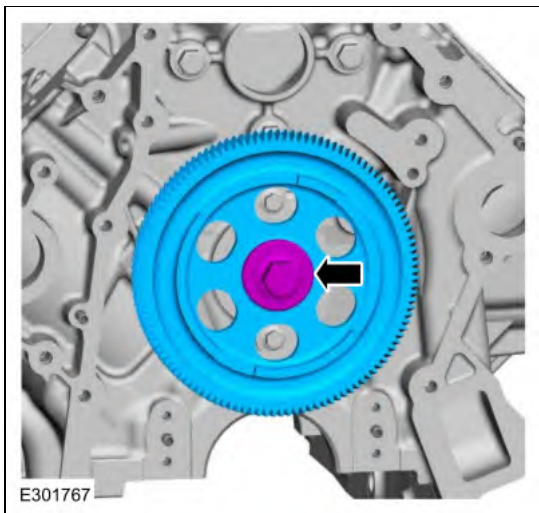
165. Remove the crankshaft from the cylinder block.



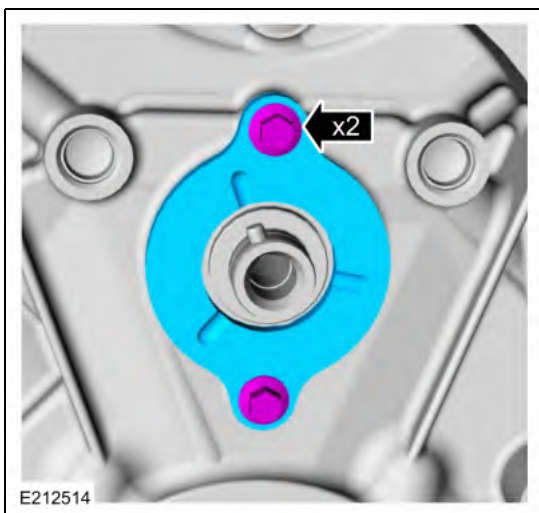
166. Remove and discard the upper crankshaft main bearing thrust washers. Remove and discard the upper crankshaft main bearings from the cylinder block.



167. Remove the bolt and the camshaft gear.



168. Remove the bolts and the camshaft thrust plate.



169. **NOTICE:** If the camshaft is being replaced, the camshaft bearings have to be replaced and machined by a machine shop. Failure to follow this may result in engine damage.

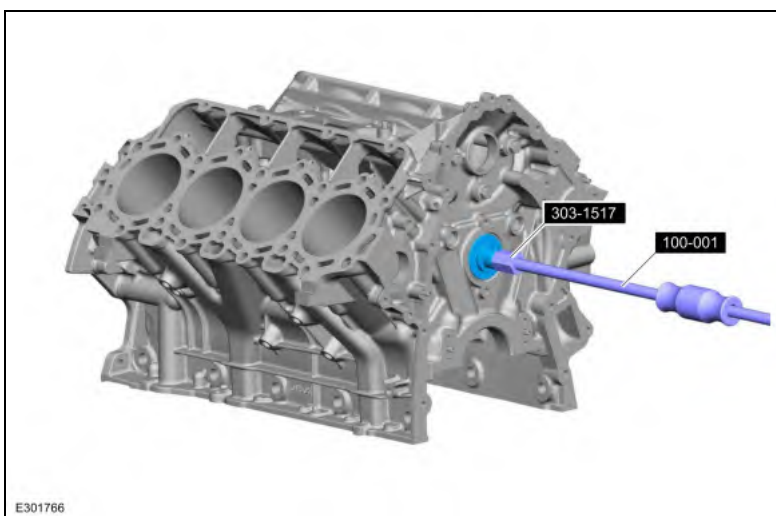
NOTICE: Use care when removing the camshaft from the engine or damage to the camshaft and the bearings may occur.

NOTICE: Use the slide hammer as a handle for the camshaft. Using the slide hammer as intended may result in engine damage.

NOTE: Use care when removing the camshaft, the camshaft will slide out the other end of the cylinder block.

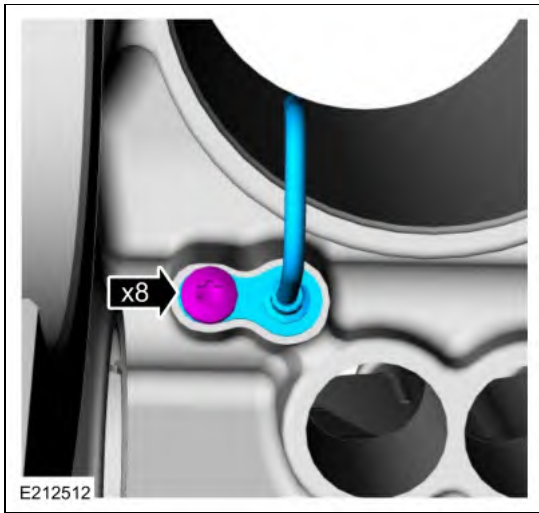
Using the special tools, remove the camshaft.

Use Special Service Tool: 303-1517 Adapter, Camshaft Remover/Installer. , 100-001 (T50T-100-A) Slide Hammer.



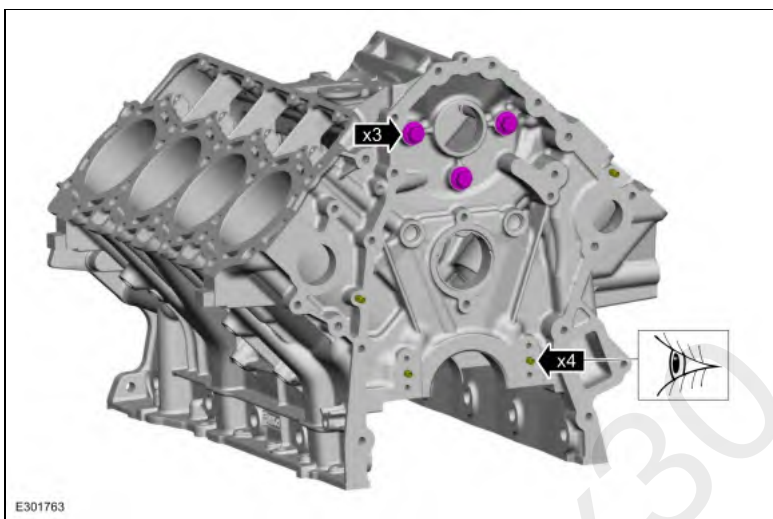
170. **NOTE:** Only one piston cooling tube shown.

Remove the bolts and the piston cooling tubes.



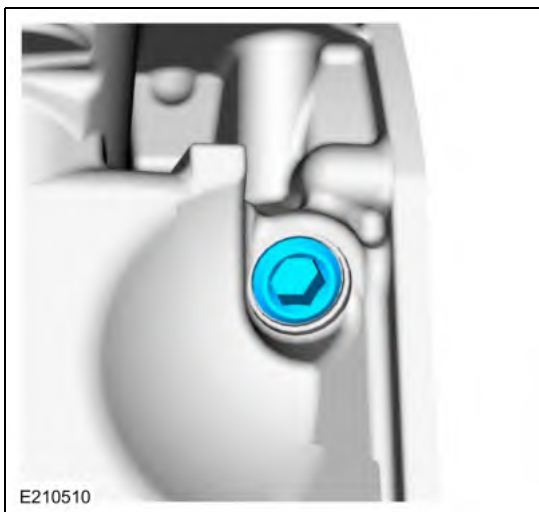
171.

- Remove the high-pressure fuel injection pump mounting bolts.
- Inspect the roll pins for wear or damage, replace if necessary.



172. **NOTE:** Only one pipe plug shown.

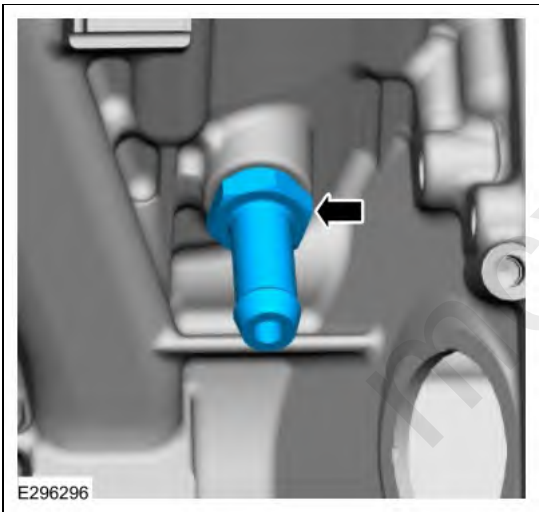
If necessary, remove the pipe plugs.



173. If equipped, remove the block heater.



174. If necessary, remove the oil cooler coolant fitting.



175. Inspect the turbocharger alignment dowels for wear and damage, replace if necessary.

