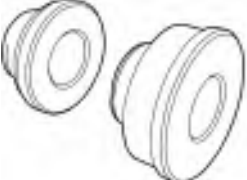
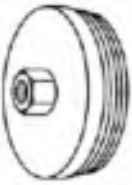


Engine

Base Part Number: Base Part Number: 6L084

Special Tool(s) / General Equipment

 E129694	100-001 (T50T-100-A) Slide Hammer
 E234304	205-142 (T80T-4000-J) Installer, Differential Bearing Cone
 E133913	205-153 (T80T-4000-W) Handle
 E175042	303-1247 VCT Spark Plug Tube Seal Remover and Installer TKIT-2006UF-FLM TKIT-2006UF-ROW
 E134603	303-409 (T92C-6700-CH) Remover, Crankshaft Seal TKIT-1992-FH/FMH/FLMH TKIT-1993-LMH/MH

	303-448 (T93P-6303-A) Holding Tool, Crankshaft TKIT-1993-FLM TKIT-1993-LM
	303-519 (T95P-6701-EH) Remover, Crankshaft Rear Oil Seal TKIT-1995-FH/FLMH TKIT-1995-LMH/MH
	303-F047 Lifting Bracket, Engine
Floor Crane	
Three Leg Puller	
Mounting Stand	
Plastic Scraper	

Materials

Name	Specification
Motorcraft® Silicone Gasket Remover ZC-30-A	-
Motorcraft® Metal Surface Prep Wipes ZC-31-B	-
Motorcraft® Metal Brake Parts Cleaner PM-4-A, PM-4-B	-

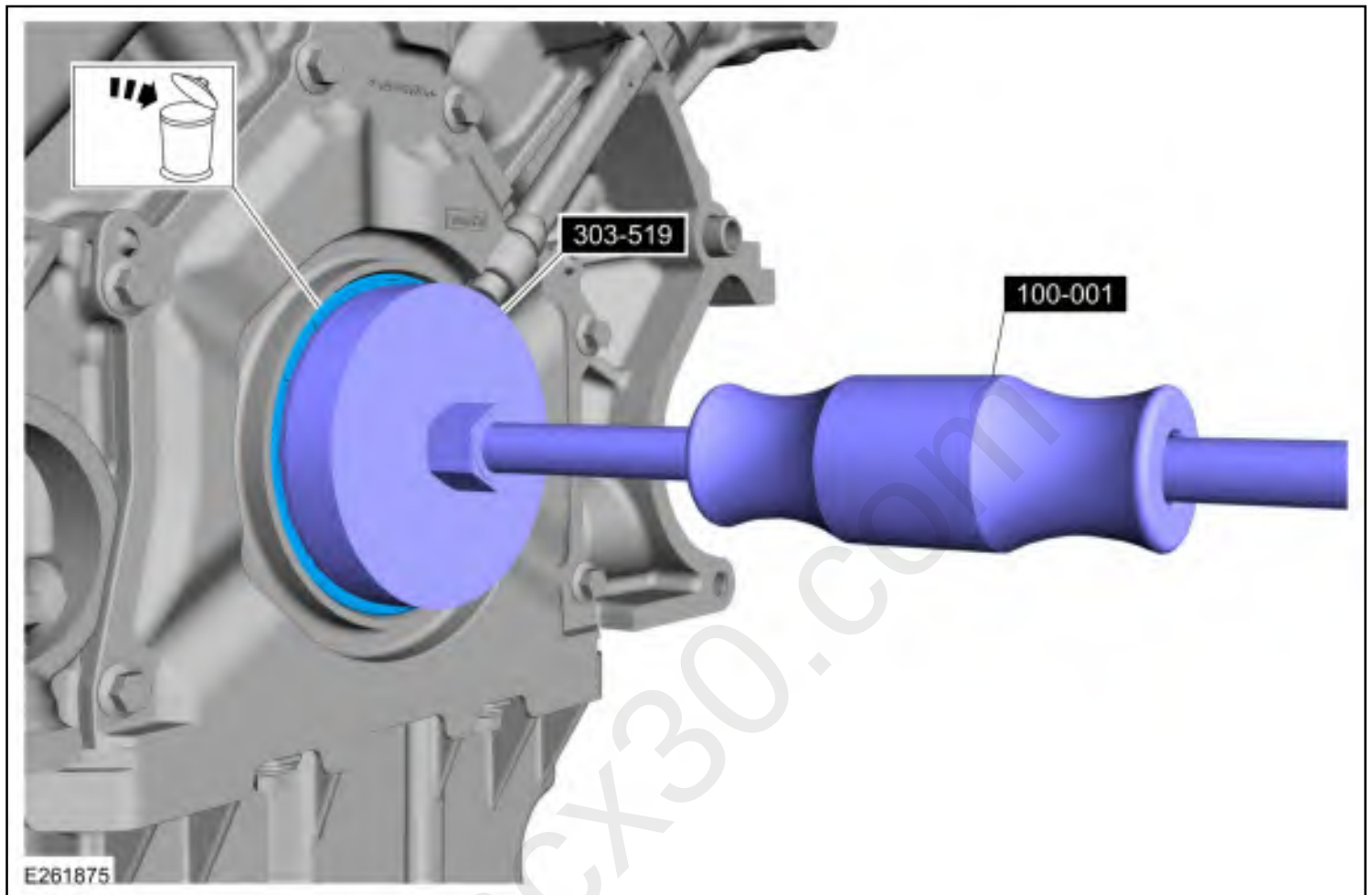
NOTICE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

NOTICE: Remove the cylinder heads before removing the crankshaft. Failure to do so can result in engine damage.

NOTE: If the components are to be reinstalled, they must be installed in their original location. Mark the components for installation into their original location.

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

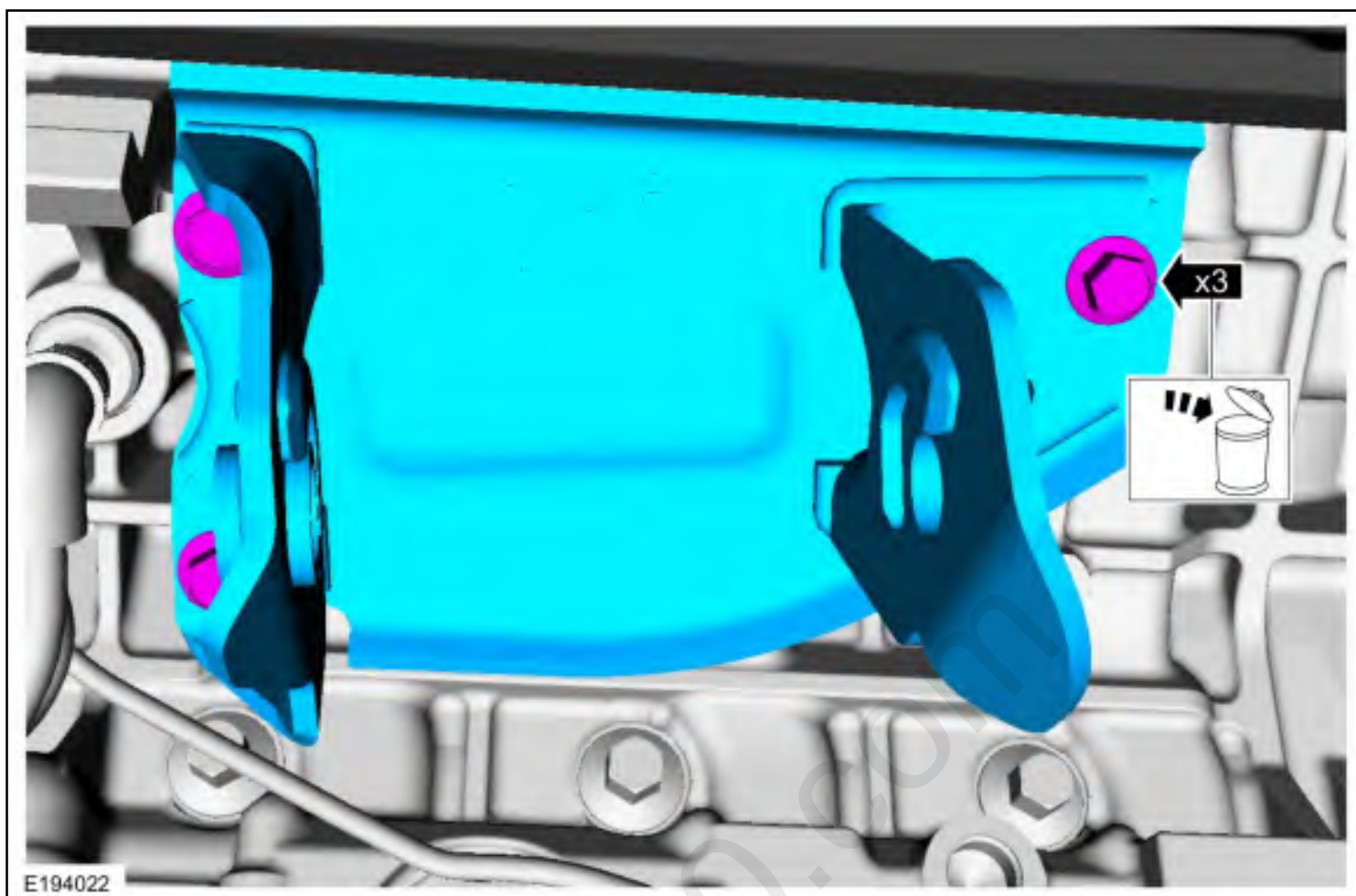
1. Using the special tools, remove and discard the crankshaft rear seal.
Use Special Service Tool: 303-519 (T95P-6701-EH) Remover, Crankshaft Rear Oil Seal. , 100-001 (T50T-100-A) Slide Hammer.



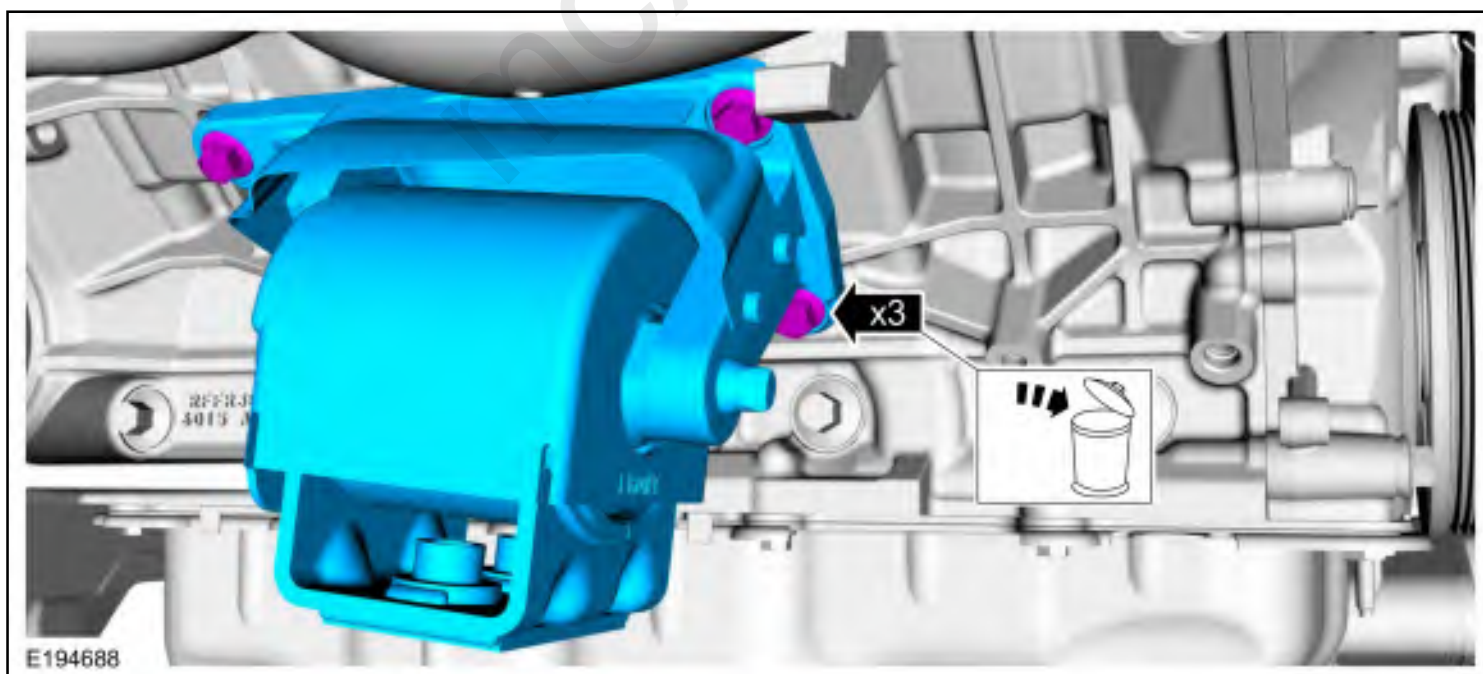
2. Using a floor crane, install the engine on a mounting stand and remove the special tool.
Remove Special Service Tool: 303-F047 Lifting Bracket, Engine.
Use the General Equipment: Floor Crane
Use the General Equipment: Mounting Stand



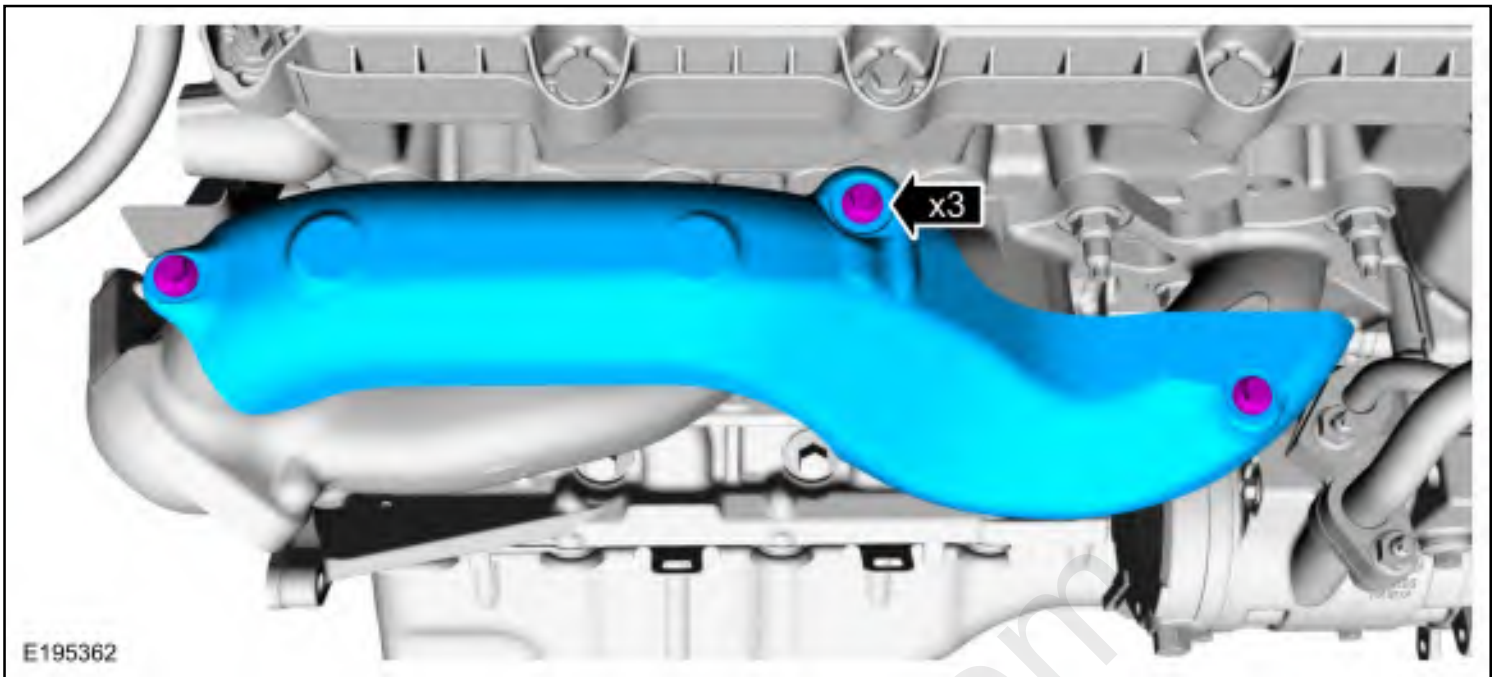
3. Remove the bolts and the LH engine mount-to-cylinder block bracket.
 - Discard the bolts.



4. Remove the bolts and the RH engine mount and bracket as an assembly.
- Discard the bolts.



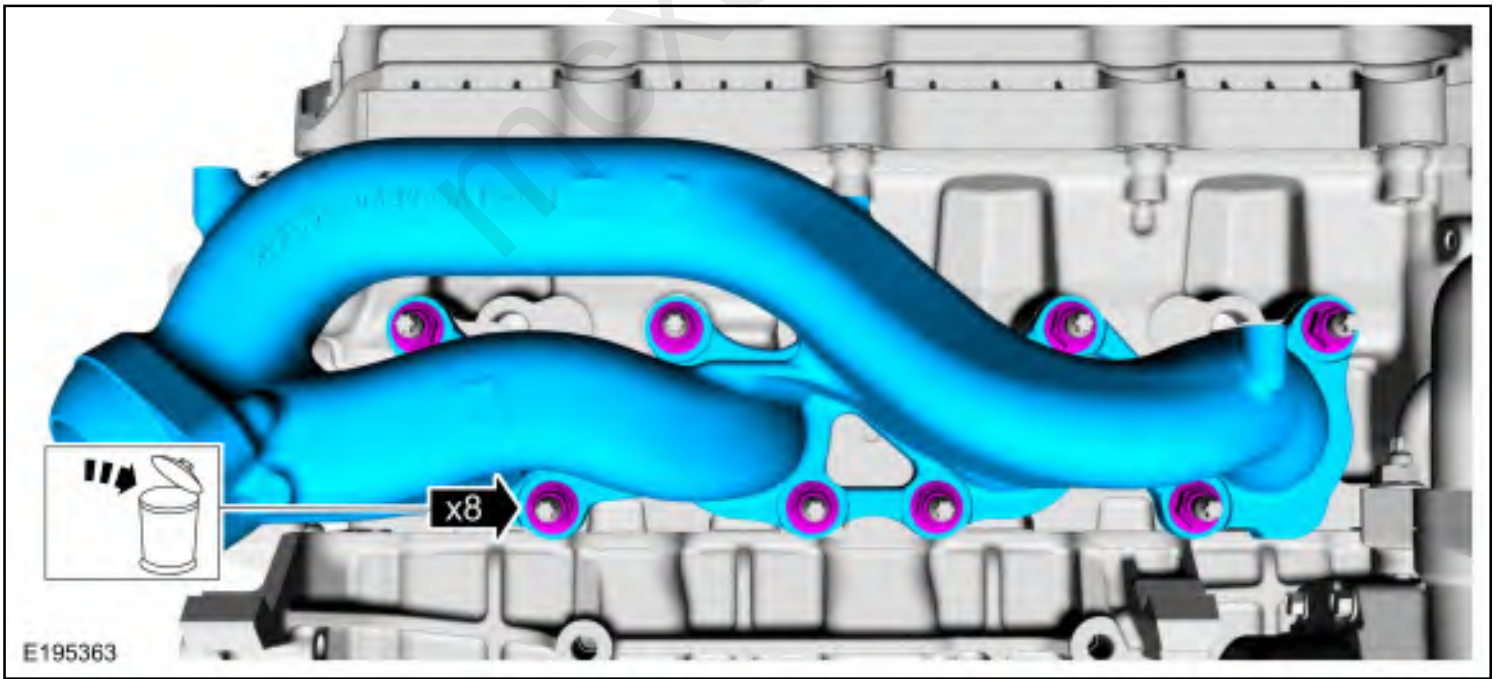
5. Remove the bolts and the RH exhaust manifold heat shield.



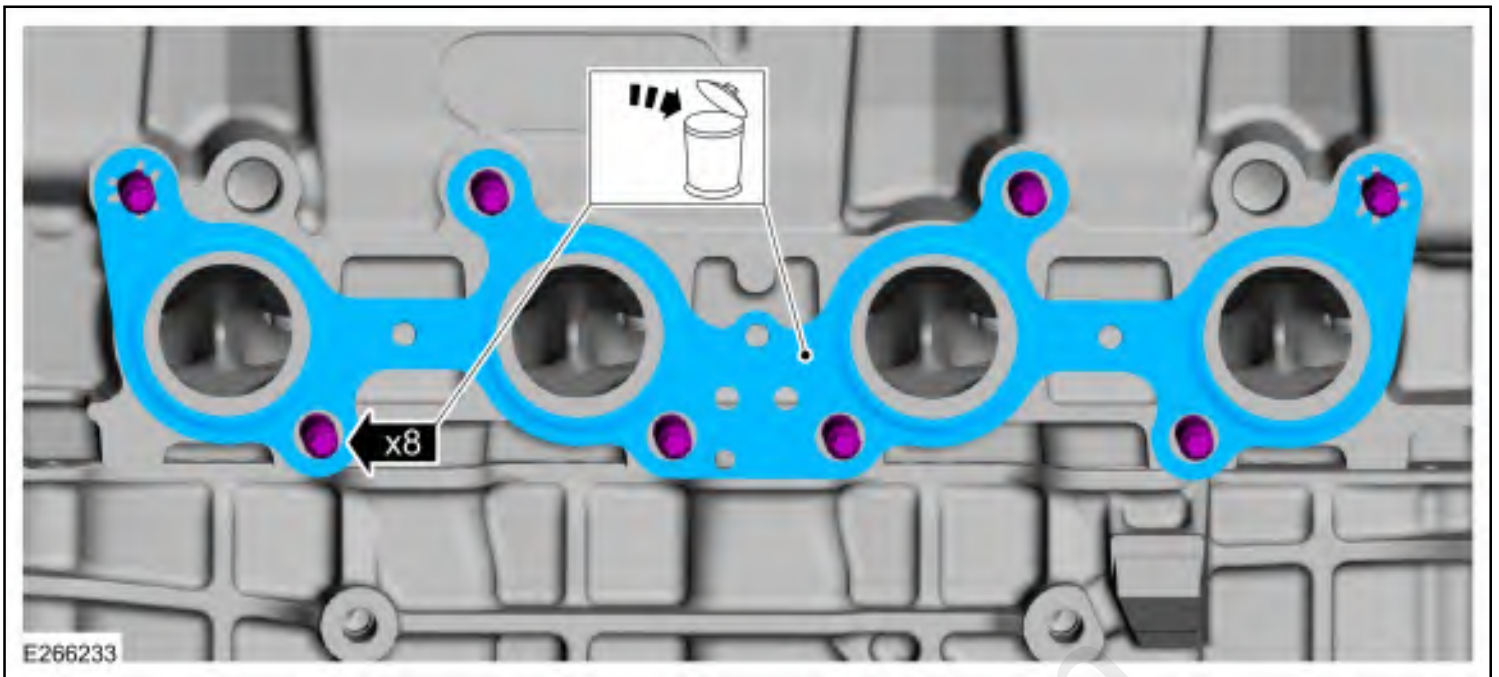
6. Remove and discard the nuts.

- Remove the exhaust manifold.
- Clean and inspect the exhaust manifold.

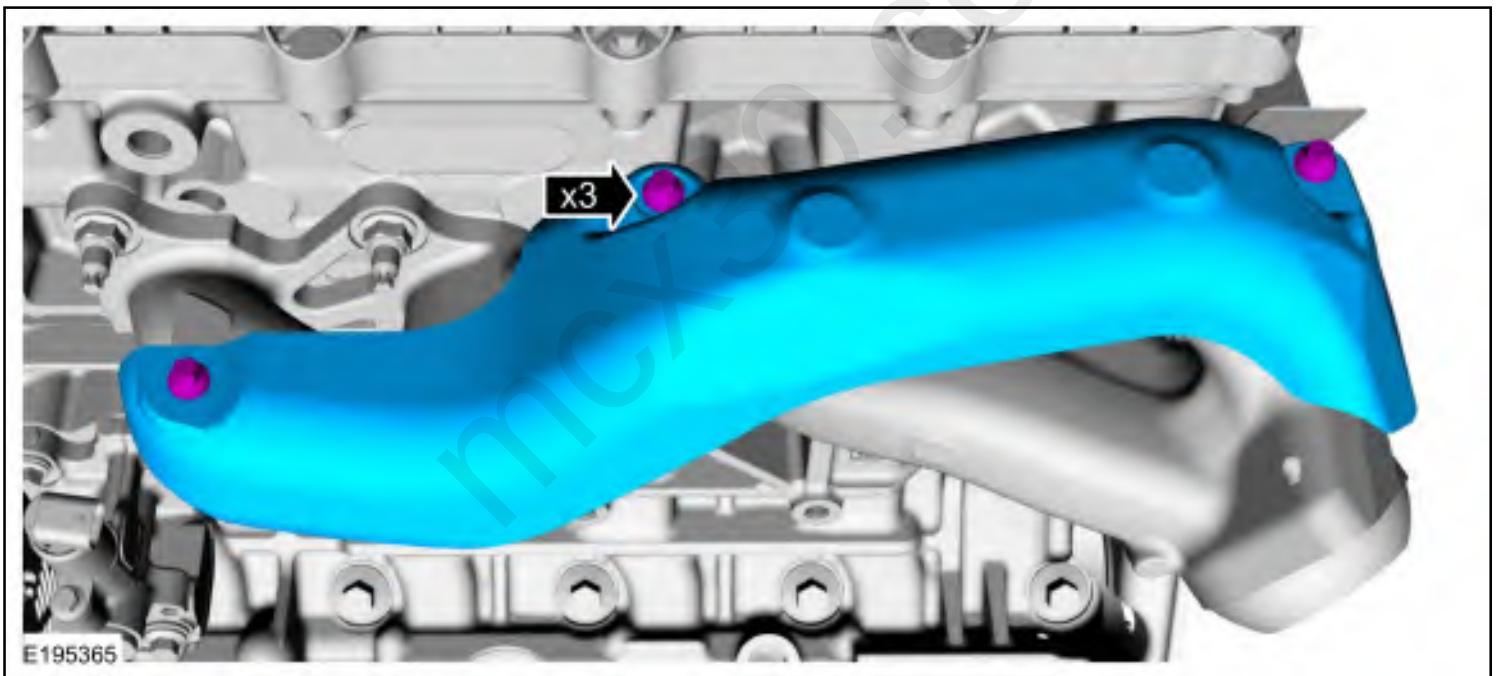
Refer to: [Exhaust Manifold Cleaning and Inspection](#) (303-00 Engine System - General Information, General Procedures).



7. Remove and discard the gasket and studs.



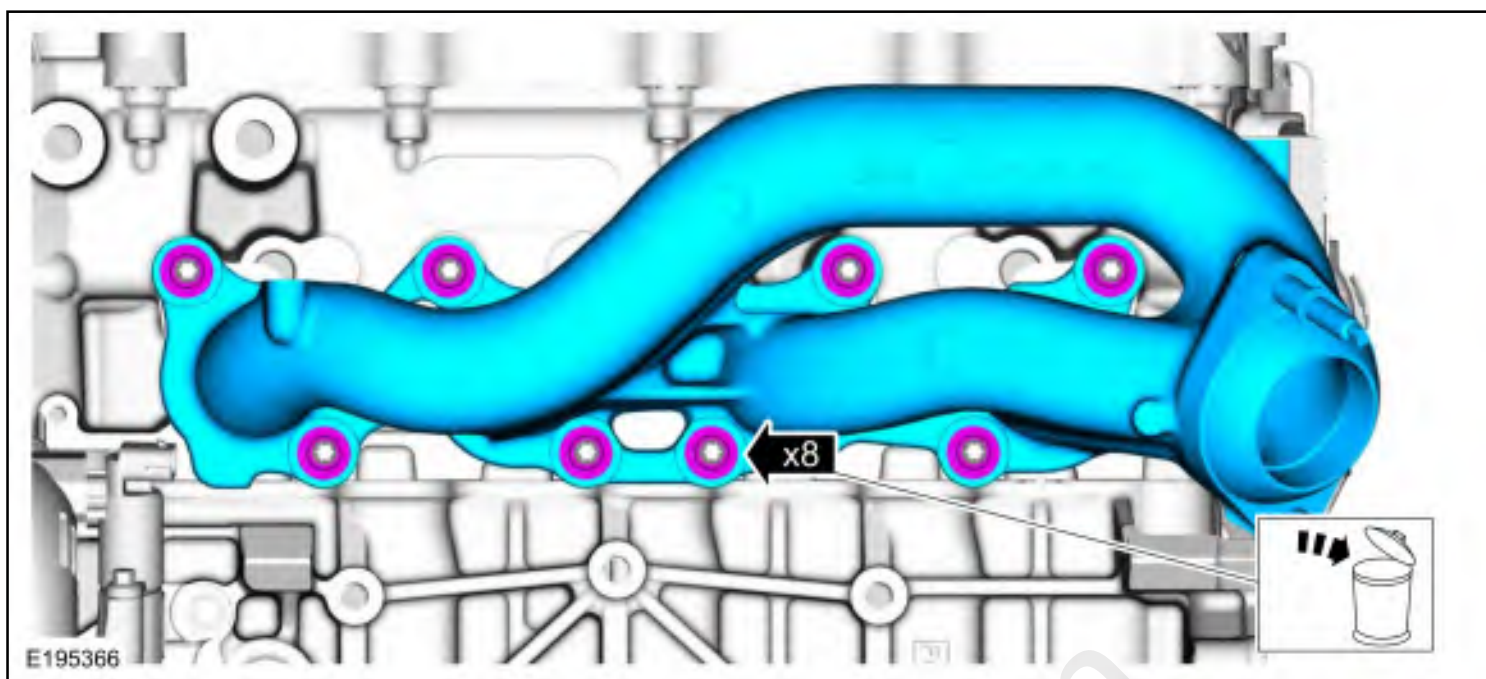
8. Remove the bolts and the LH exhaust manifold heat shield.



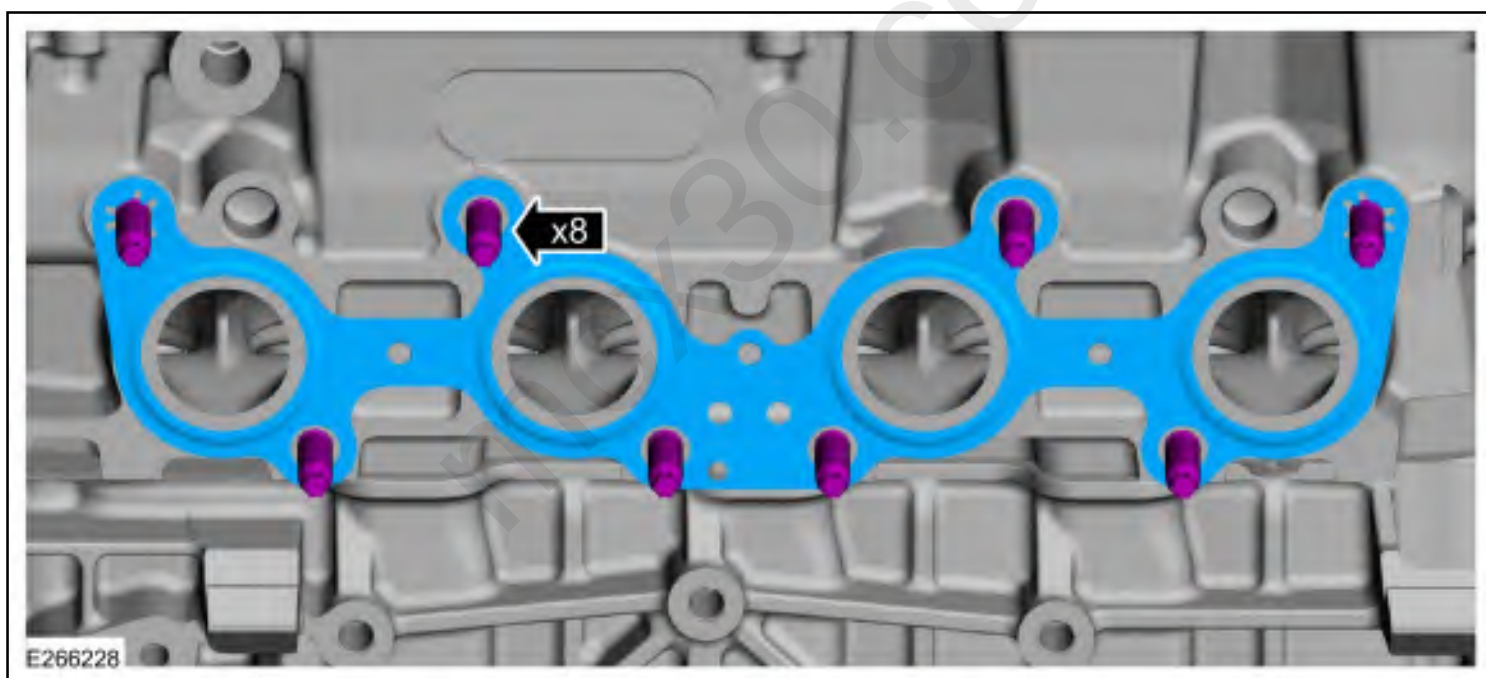
9. Remove and discard the nuts.

- Remove the exhaust manifold.
- Clean and inspect the exhaust manifold.

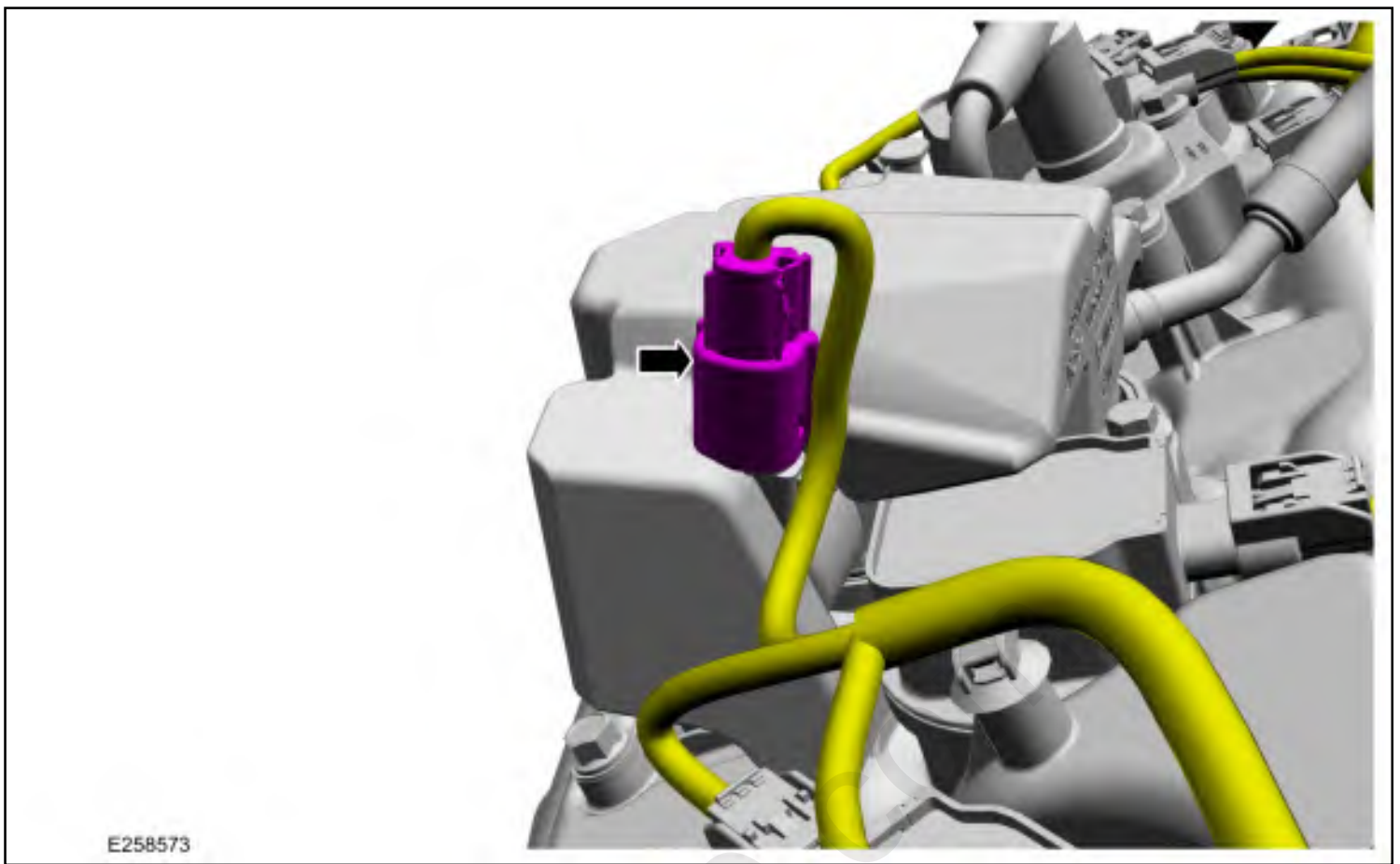
Refer to: [Exhaust Manifold Cleaning and Inspection](#) (303-00 Engine System - General Information, General Procedures).



10. Remove and discard the gasket and studs.

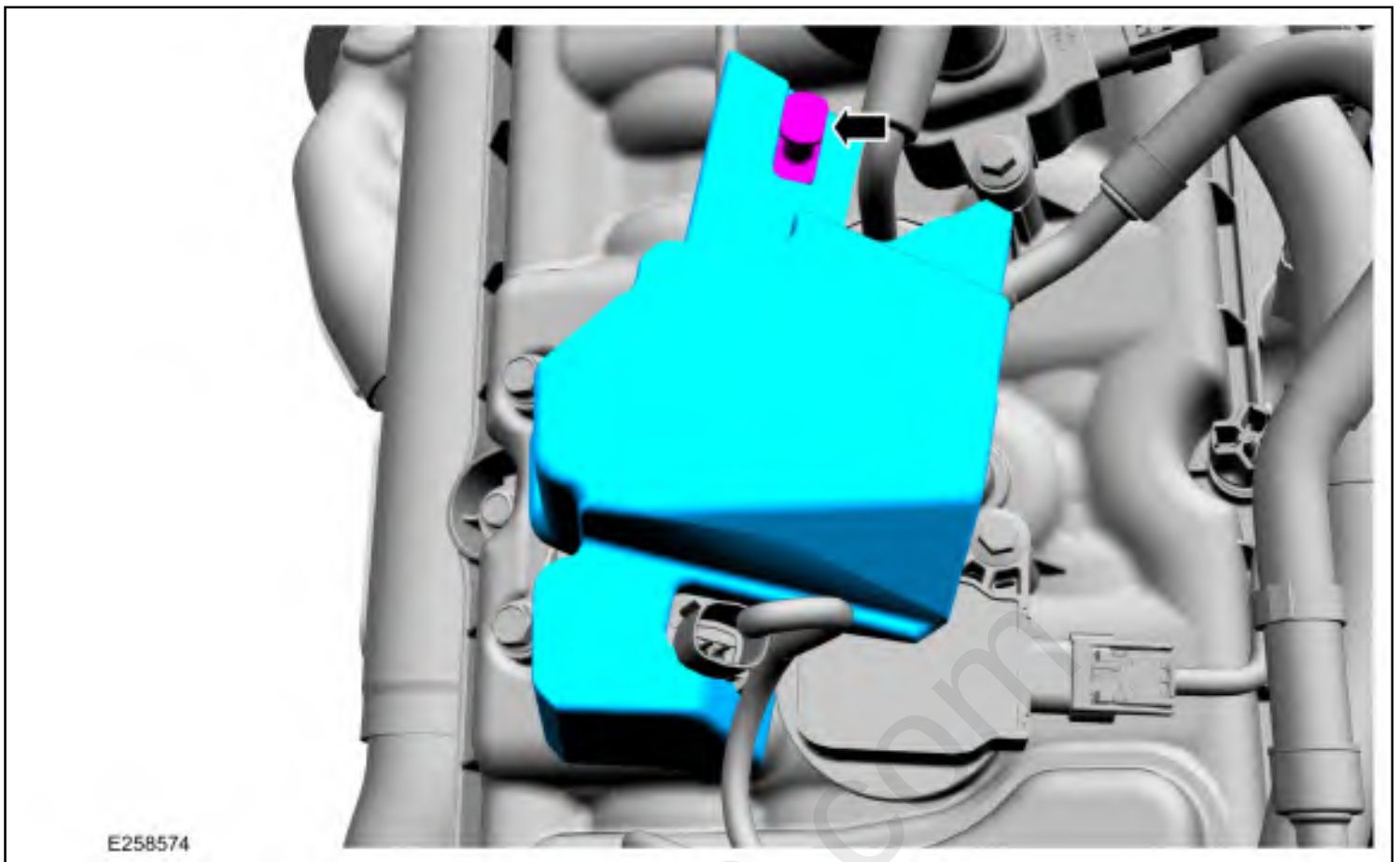


11. Disconnect the high-pressure fuel pump electrical connector.

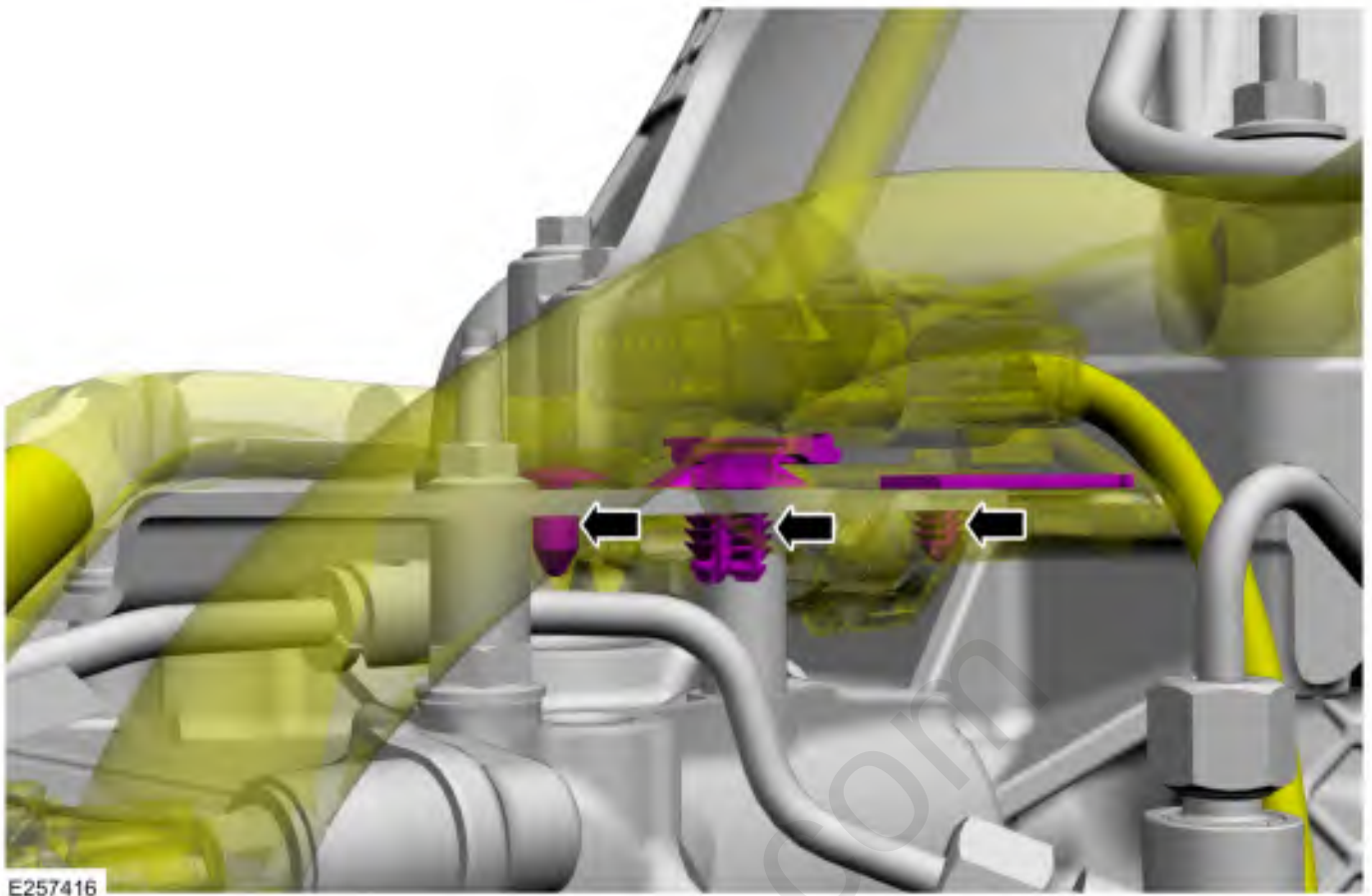


12. **NOTE:** When removing or installing the fuel injection pump noise insulator, spreading the openings will reduce the risk of damage.

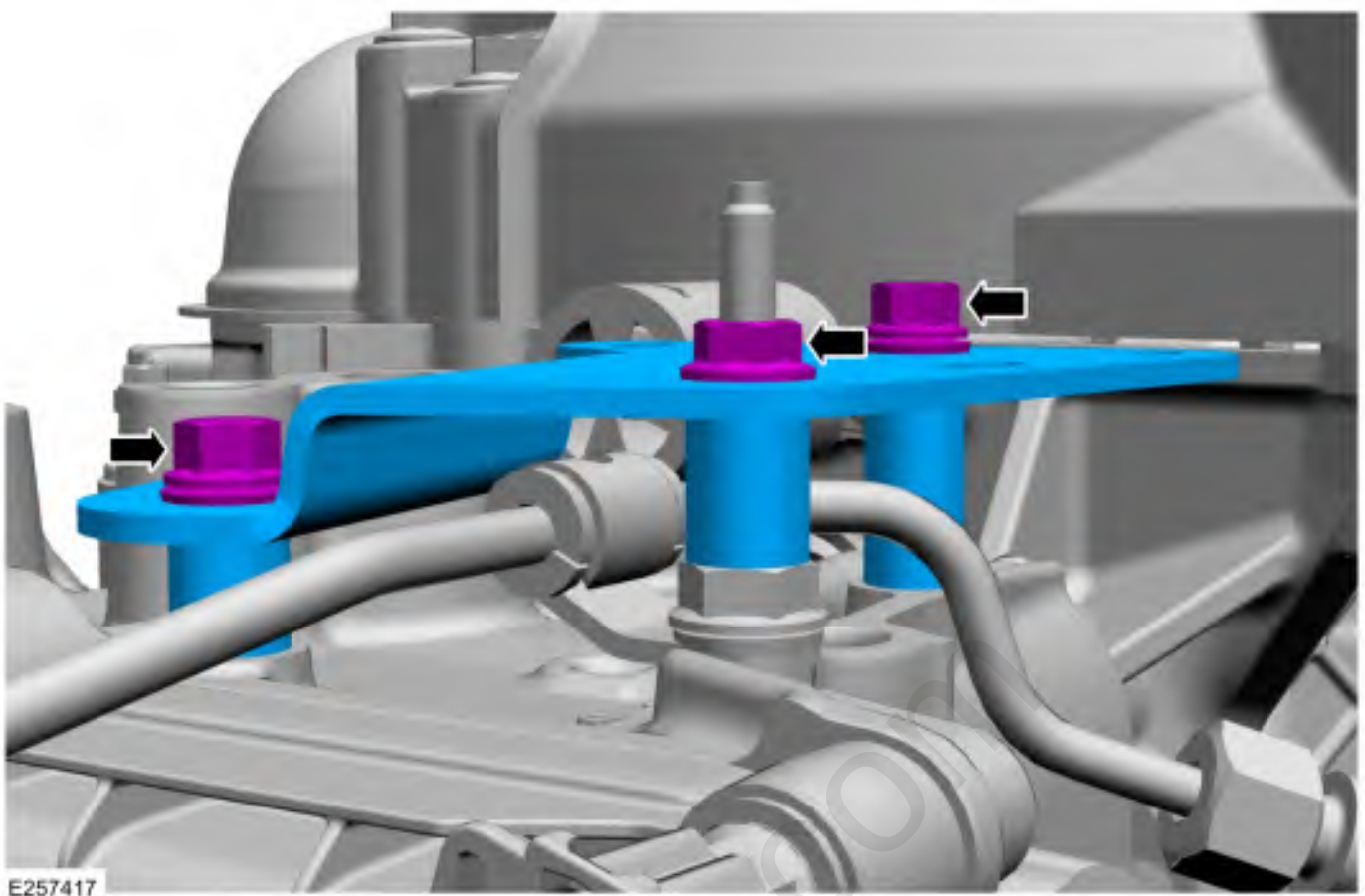
Release the retainer, then remove the fuel injection pump noise insulator.



13. Detach the wiring harness retainers from high-pressure fuel line shield.

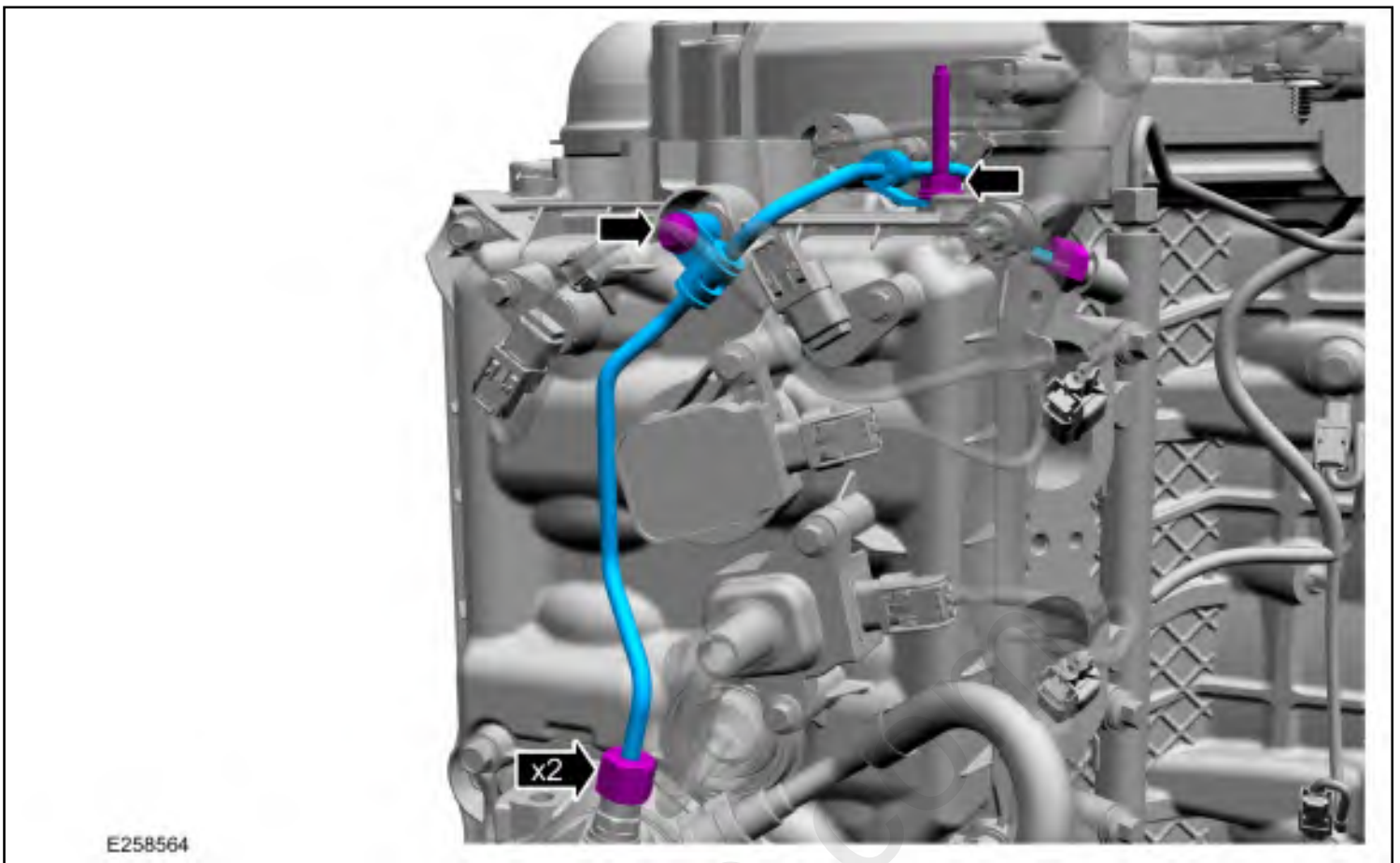


14. Remove the high-pressure fuel line shield retainers, then remove high-pressure fuel line shield.

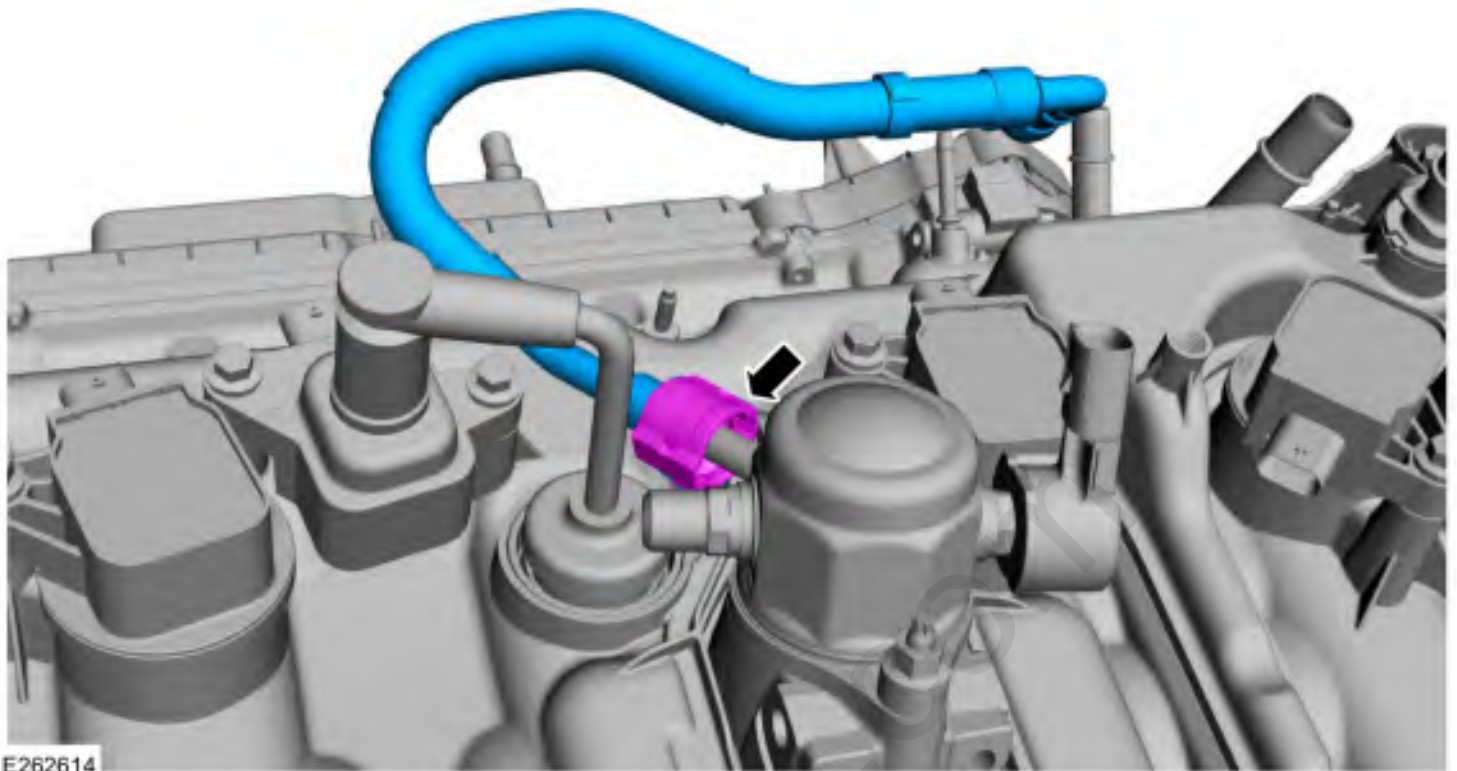


15. **NOTICE:** To release the fuel pressure in the high-pressure fuel tube, wrap the high-pressure fuel tube flare nuts with a shop towel to absorb any residual fuel pressure during the loosening of the high-pressure fuel tube flare nuts.

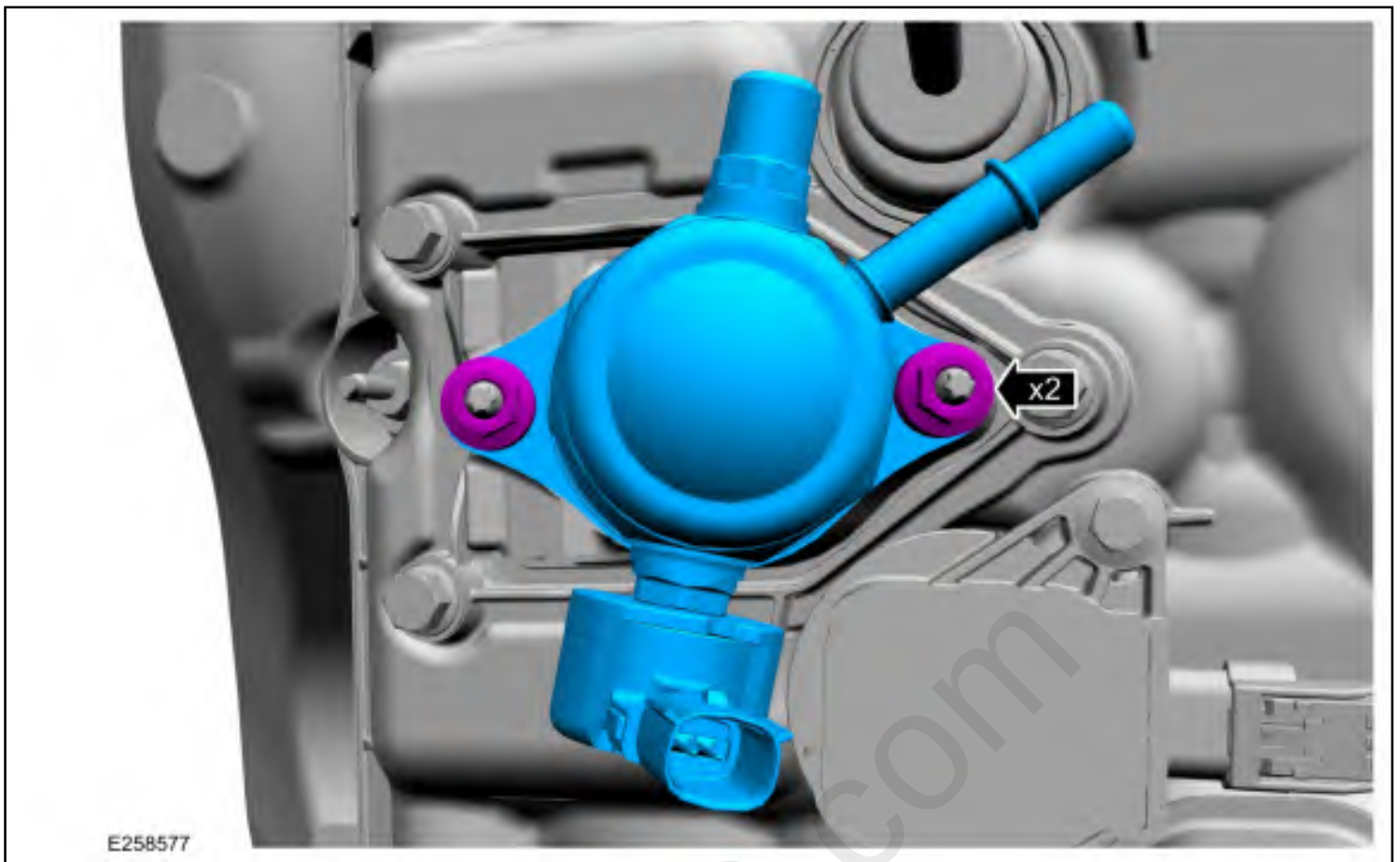
Remove the high-pressure fuel tube retainers. Disconnect the high-pressure fuel tube flare nuts, then remove and discard the high-pressure fuel tube.



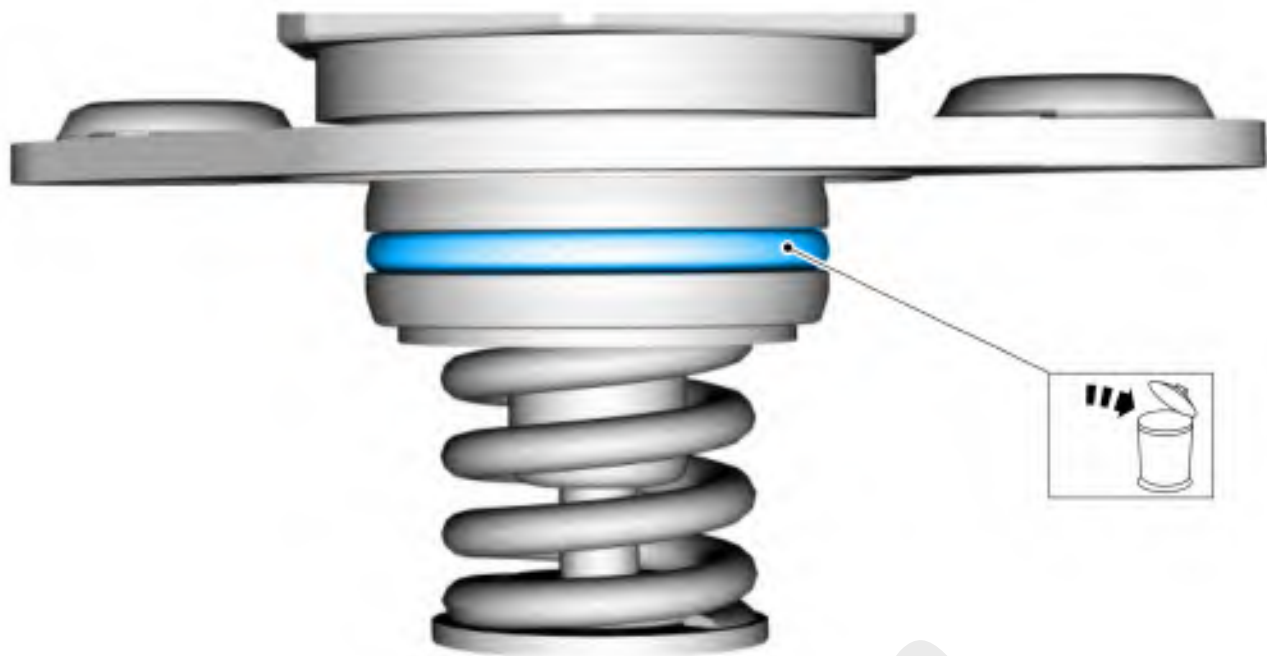
16. Disconnect the quick release coupling and remove the high-pressure fuel tube.
Refer to: [Quick Release Coupling](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-VCT, General Procedures).



17. Alternately loosen the high-pressure fuel pump nuts one complete revolution at a time and remove, then remove the high-pressure fuel pump.



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



E242552

19. Remove the high-pressure fuel pump roller tappet.

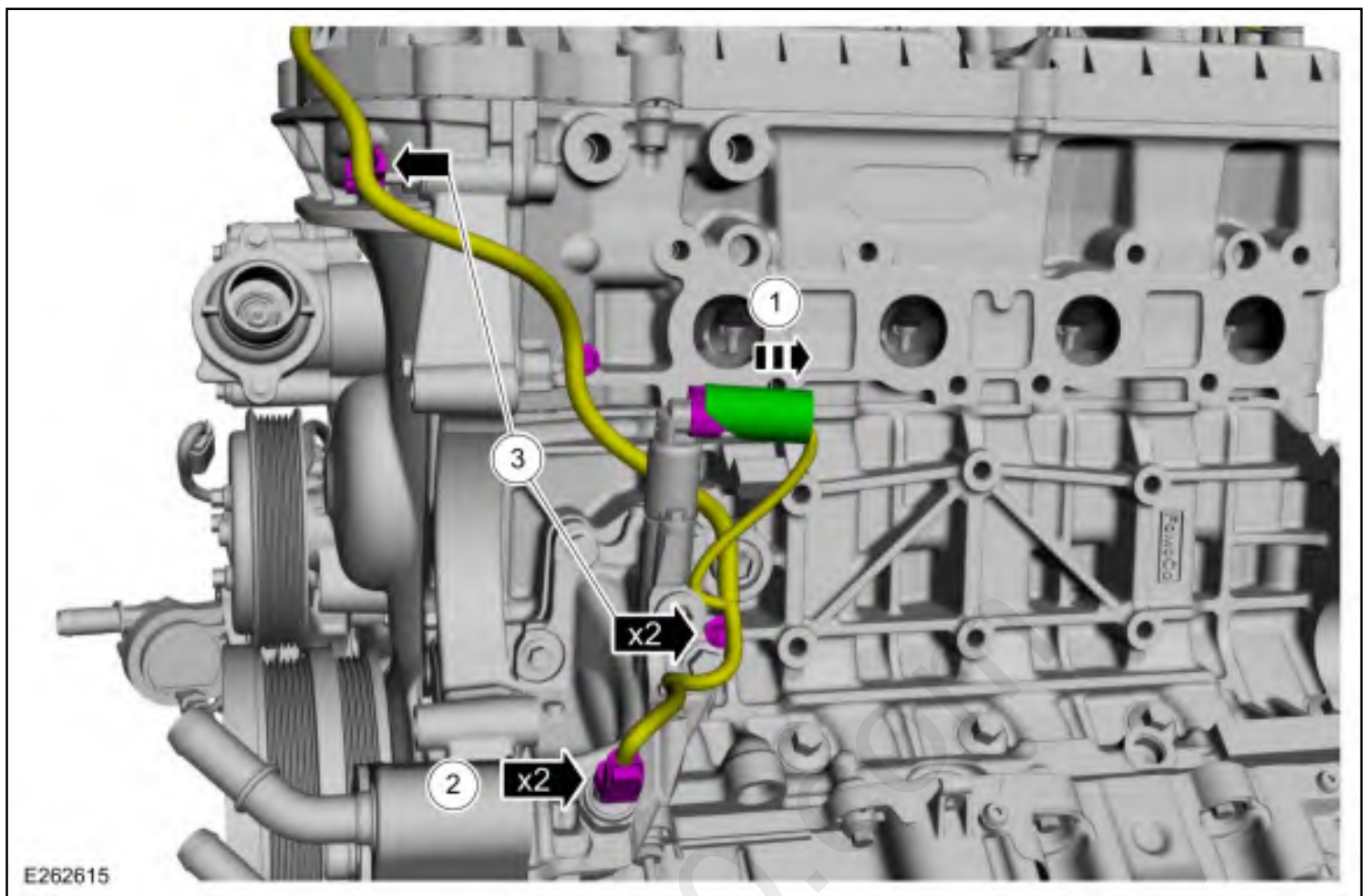


20. Inspect the high-pressure fuel pump roller tappet. If any flat spots or scoring are found, especially in the indicated areas, then inspect the high-pressure fuel pump and the high-pressure fuel pump roller tappet drive lobe. Install new components as needed.

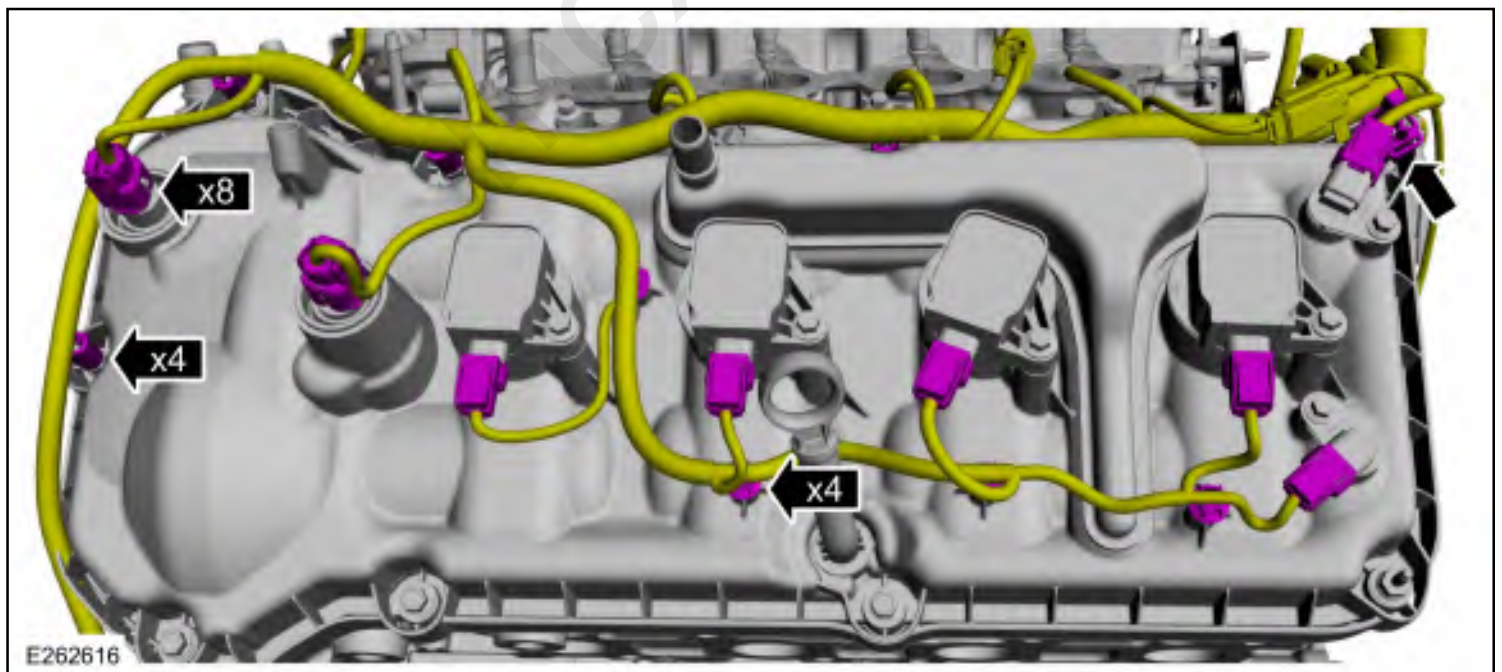


E175709

1. Reposition the wiring harness insulator.
2. Disconnect the engine wiring harness electrical connectors.
3. Detach the engine wiring harness retainers.

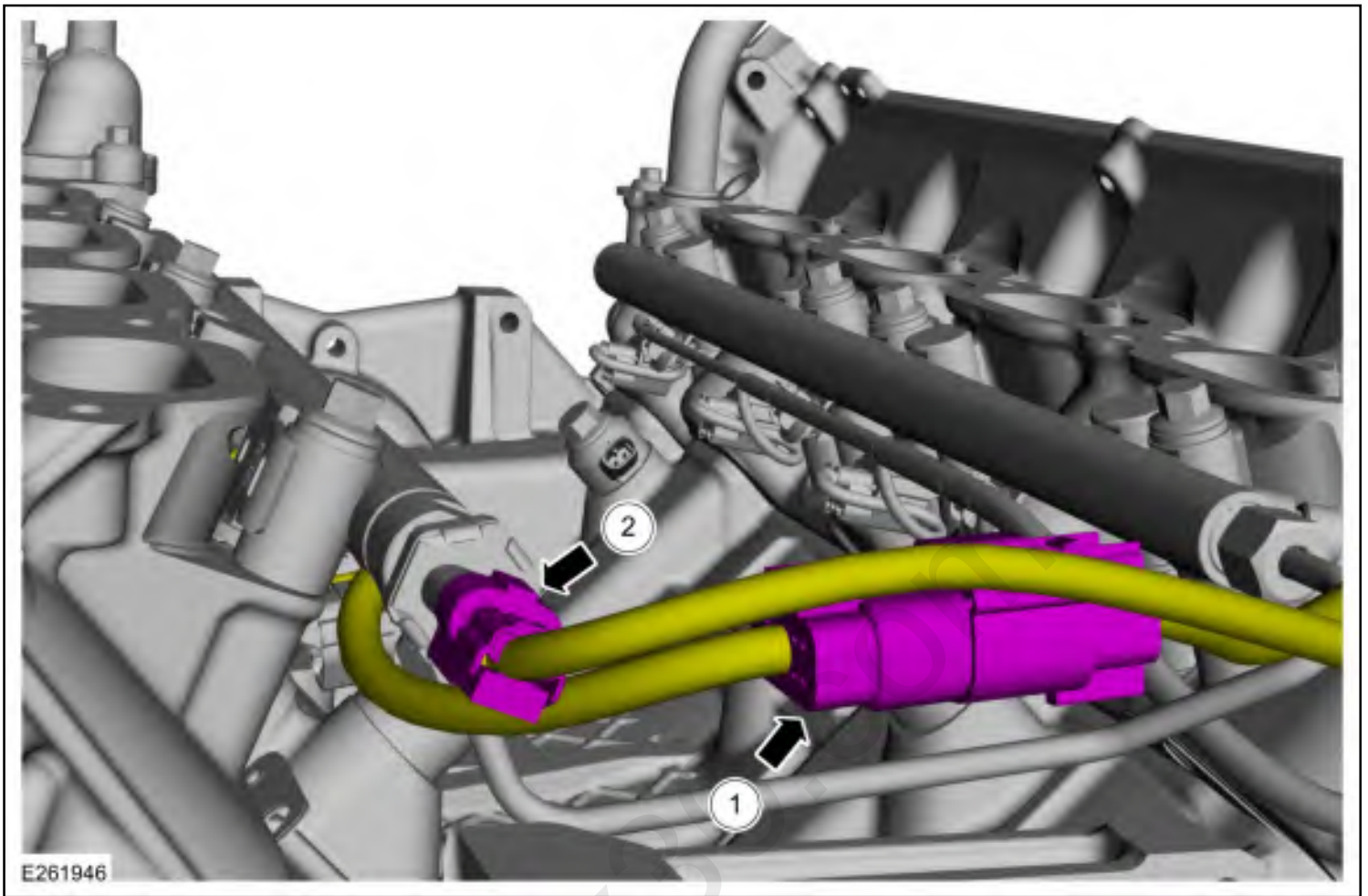


1. Disconnect the engine wiring harness electrical connectors.
2. Detach the wiring harness retainers.

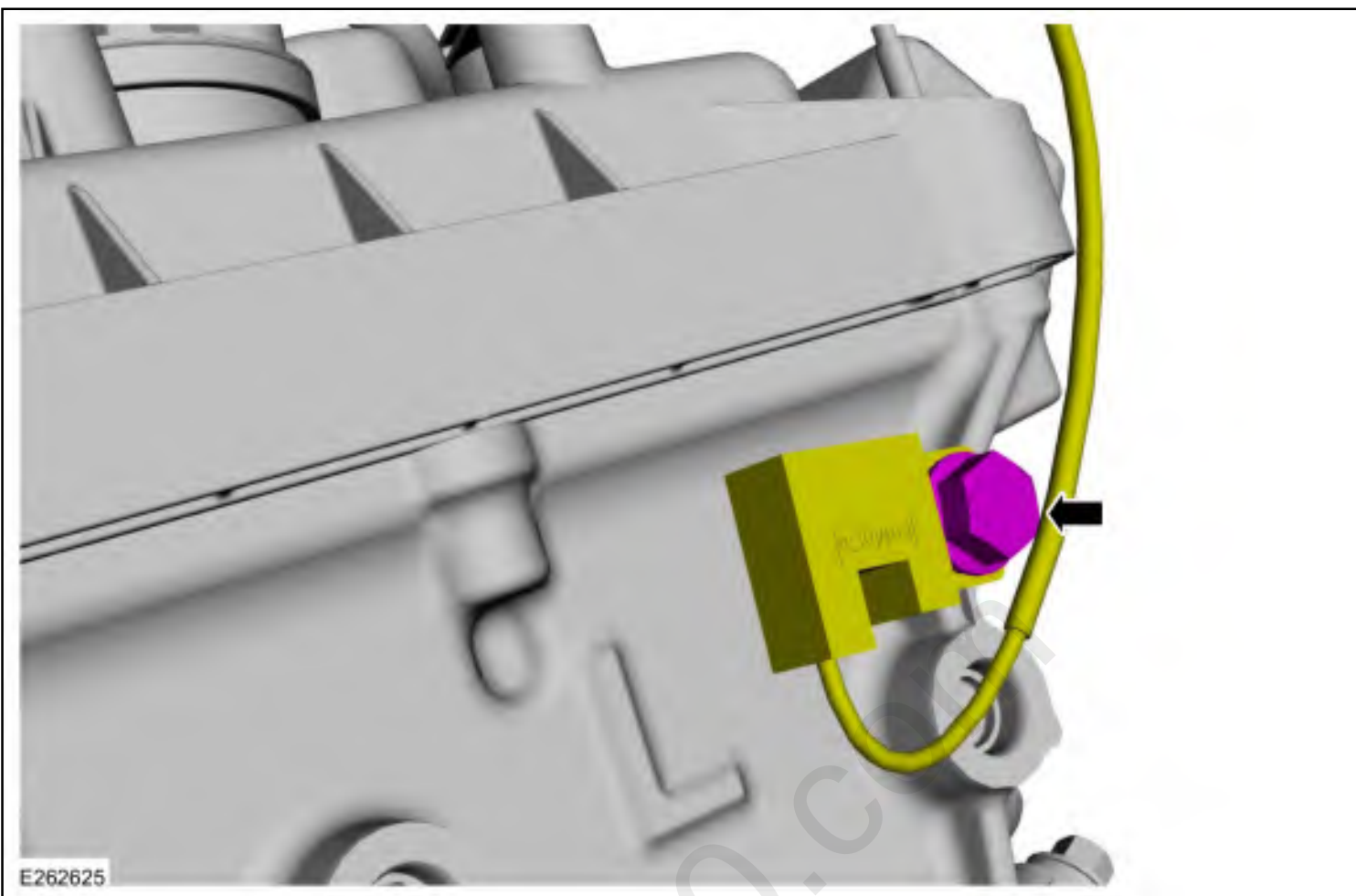


1. Disconnect the fuel rail electrical connector.

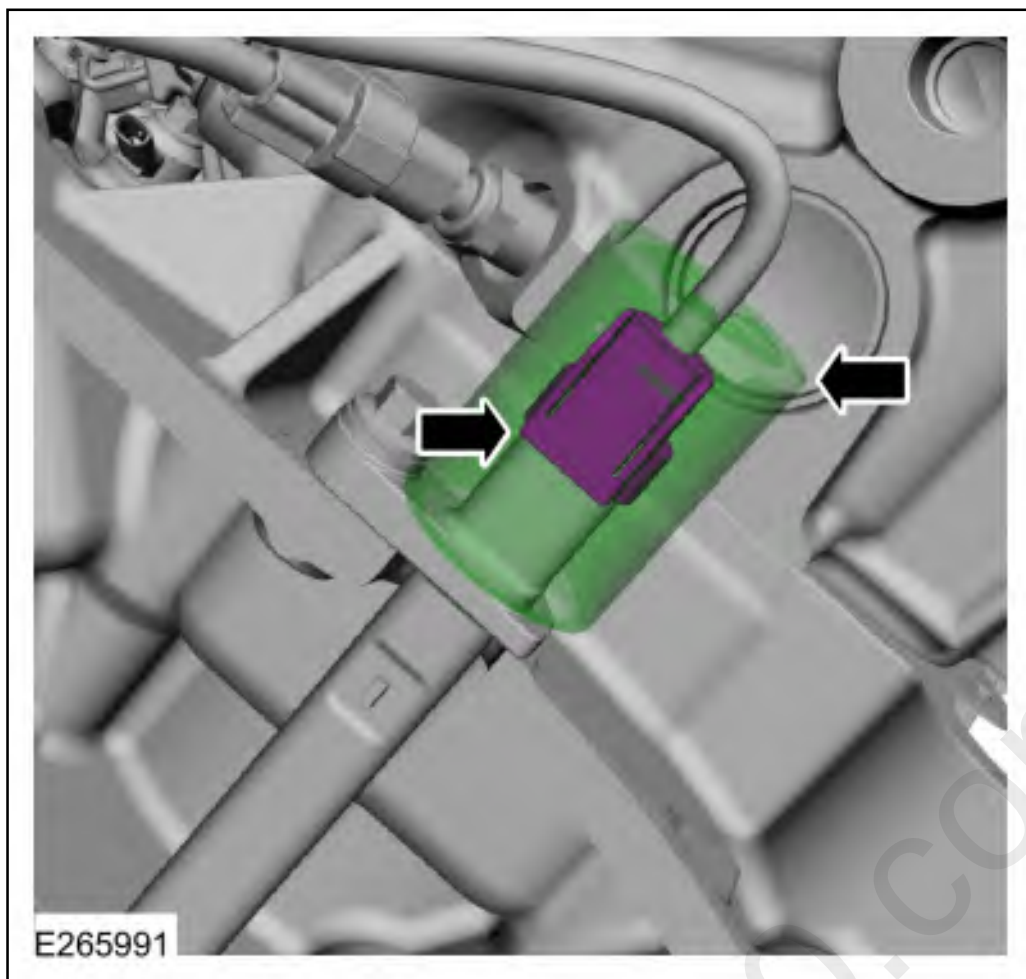
2. Disconnect the fuel sensor electrical connector.



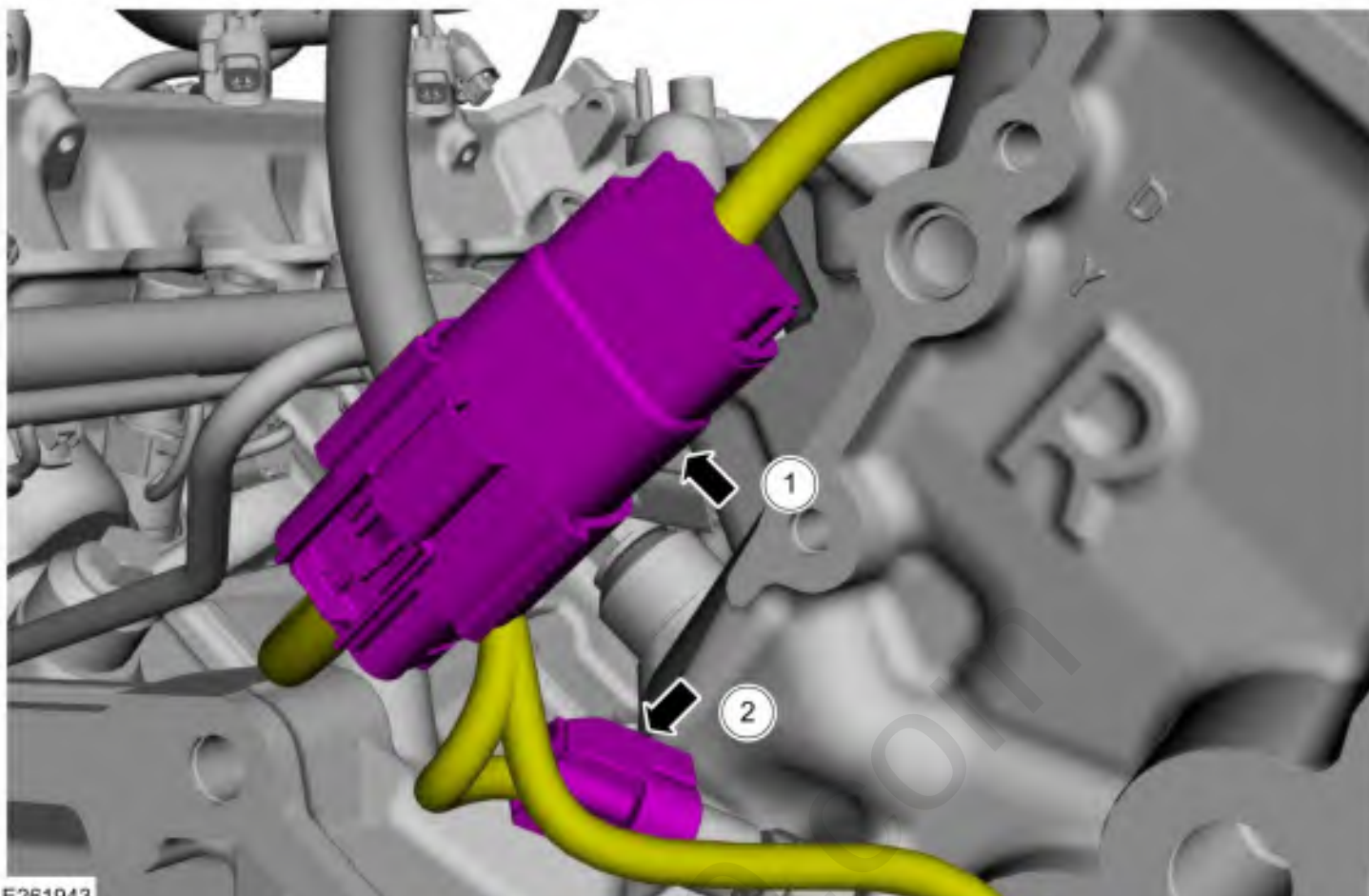
24. Remove the bolt and position the capacitor aside.



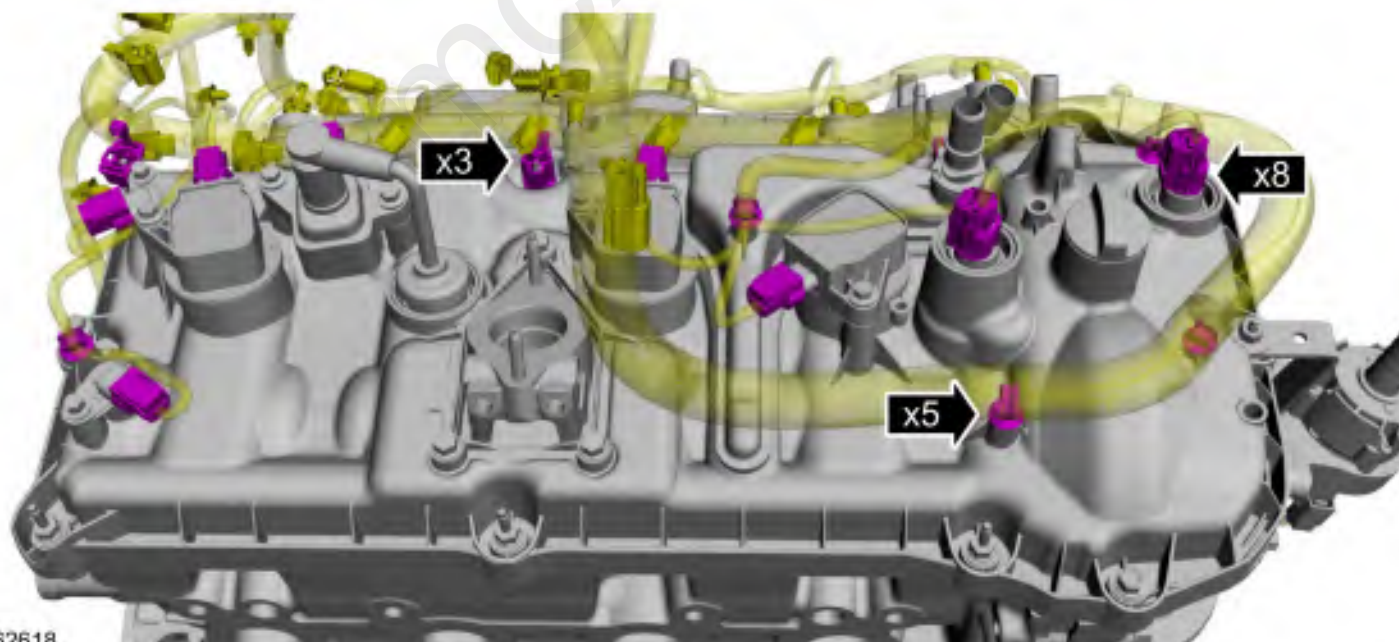
1. Position the wiring harness insulator aside.
2. Disconnect the CKP sensor electrical connector.



1. Disconnect the fuel rail electrical connector.
2. Disconnect the CHT sensor electrical connector.

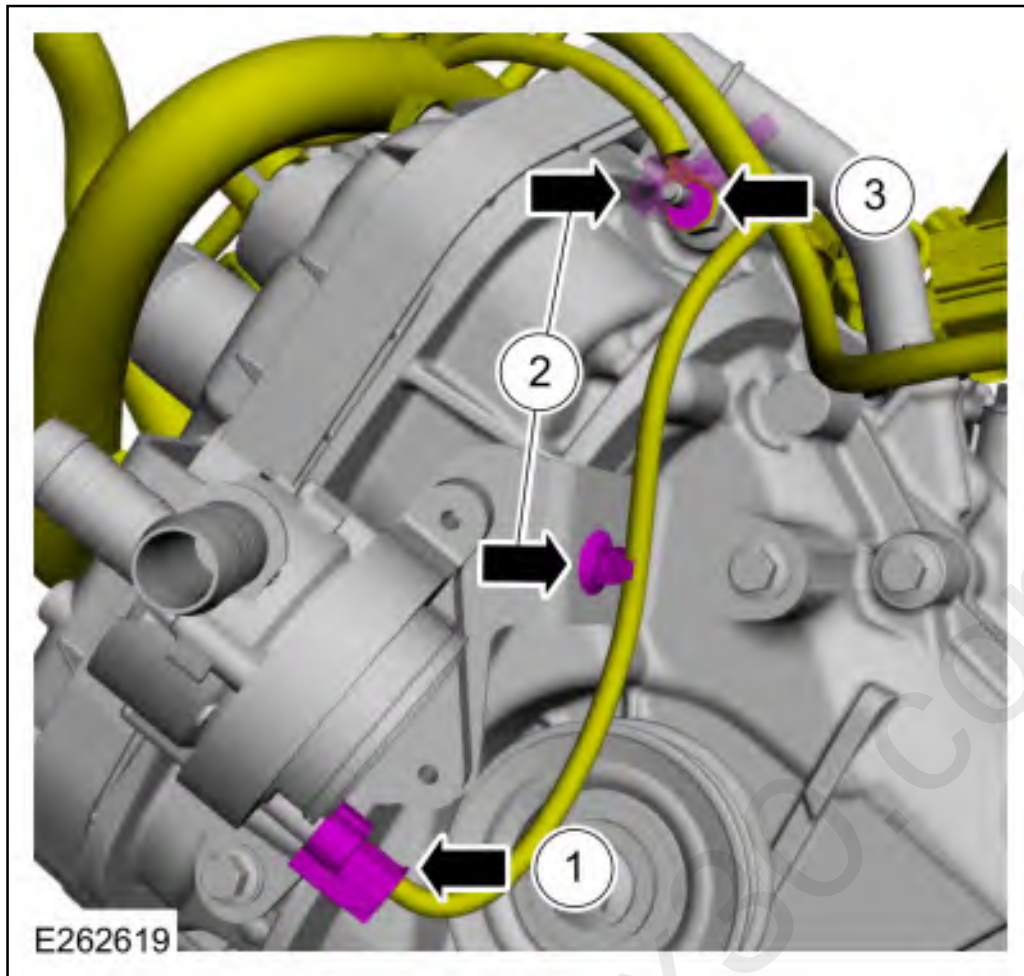


1. Disconnect the engine wiring harness electrical connectors.
2. Detach the wiring harness retainers.

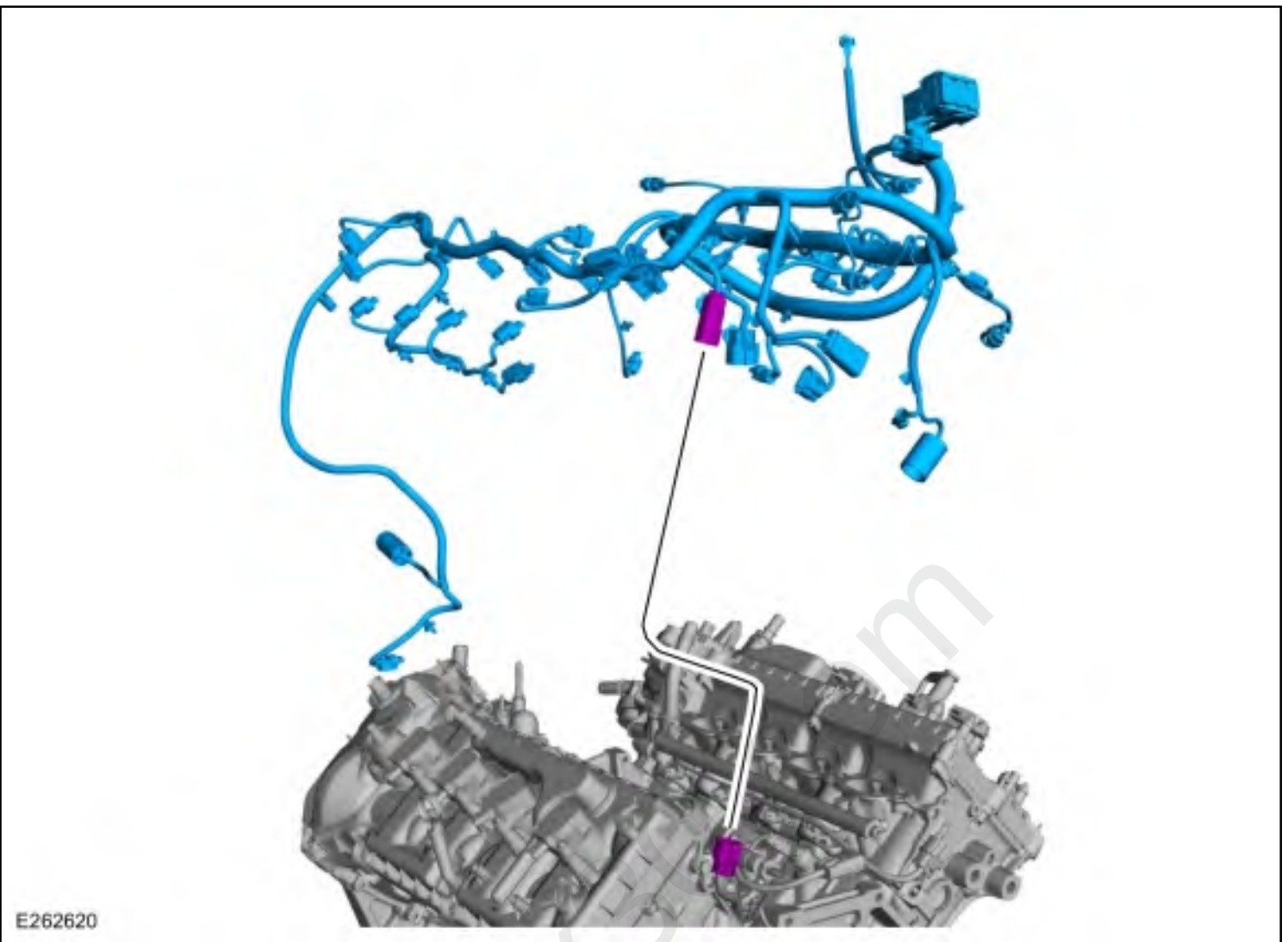


1. Disconnect the engine wiring harness electrical connector.

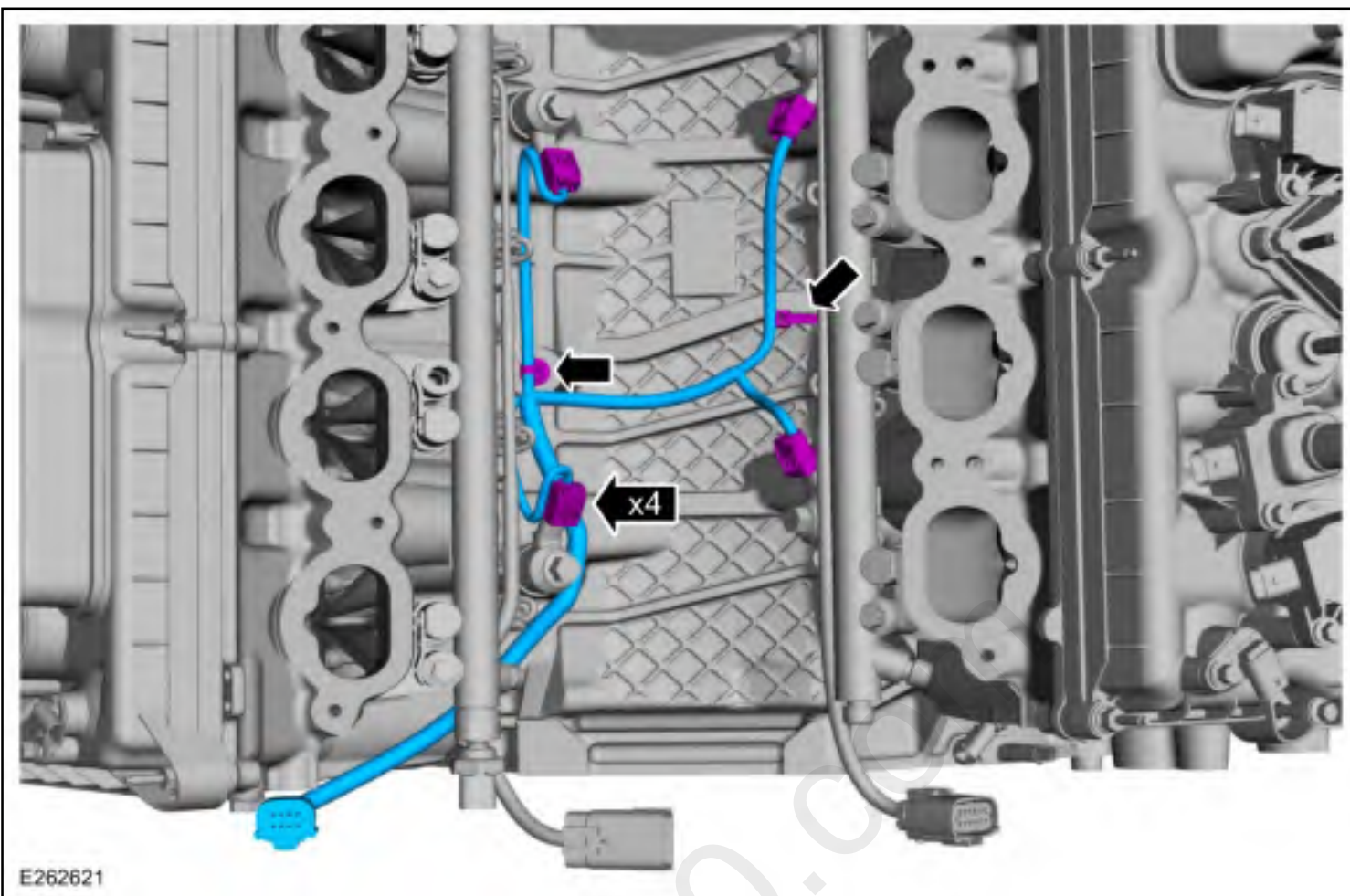
2. Detach the engine wiring harness retainers.
3. Remove the nut and the ground wire eyelet.



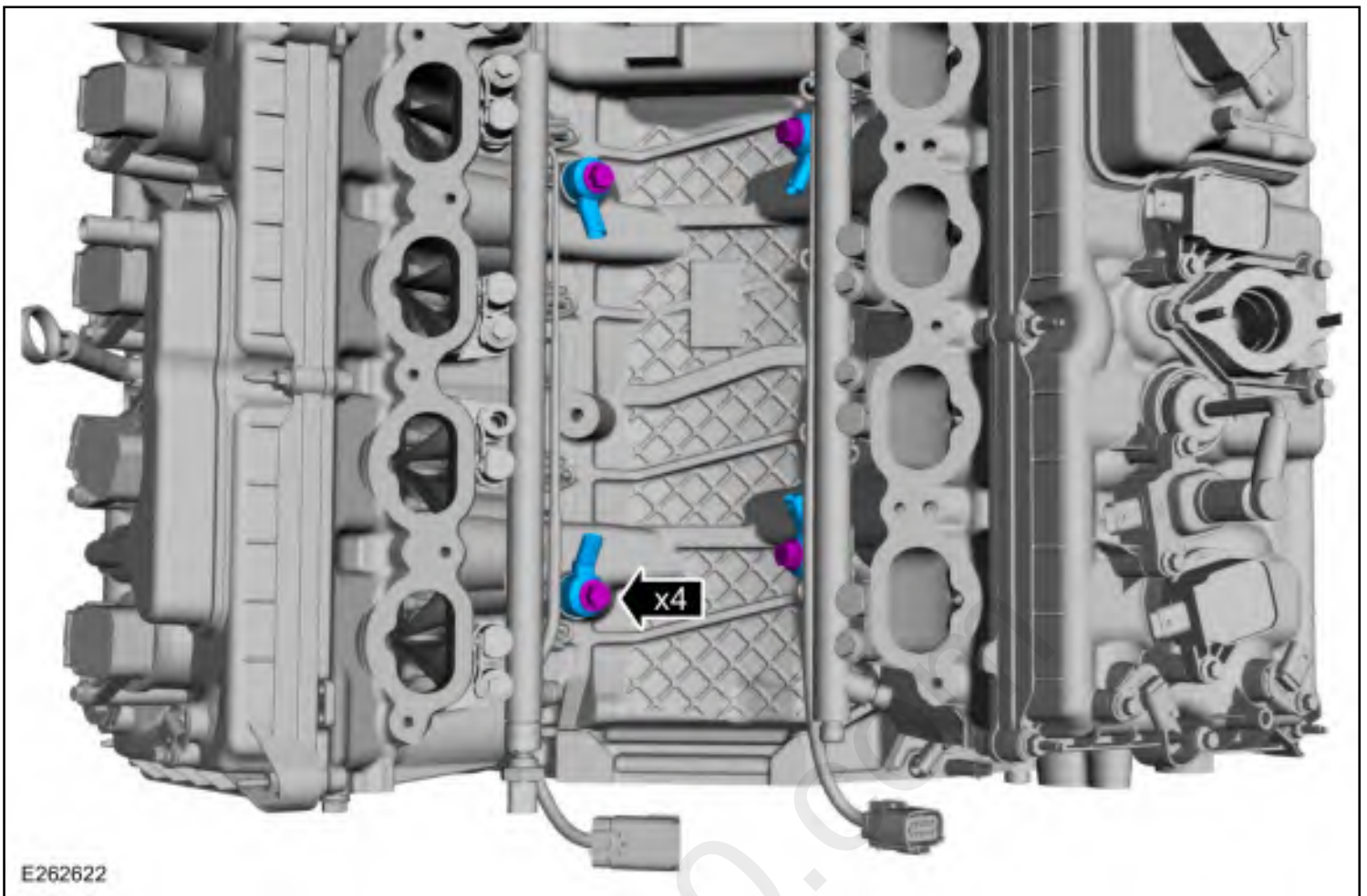
29. Disconnect the engine wiring harness and remove the harness from the engine.



1. Disconnect the KS electrical connectors.
2. Detach the wiring harness retainers.
3. Remove the KS harness from the engine.



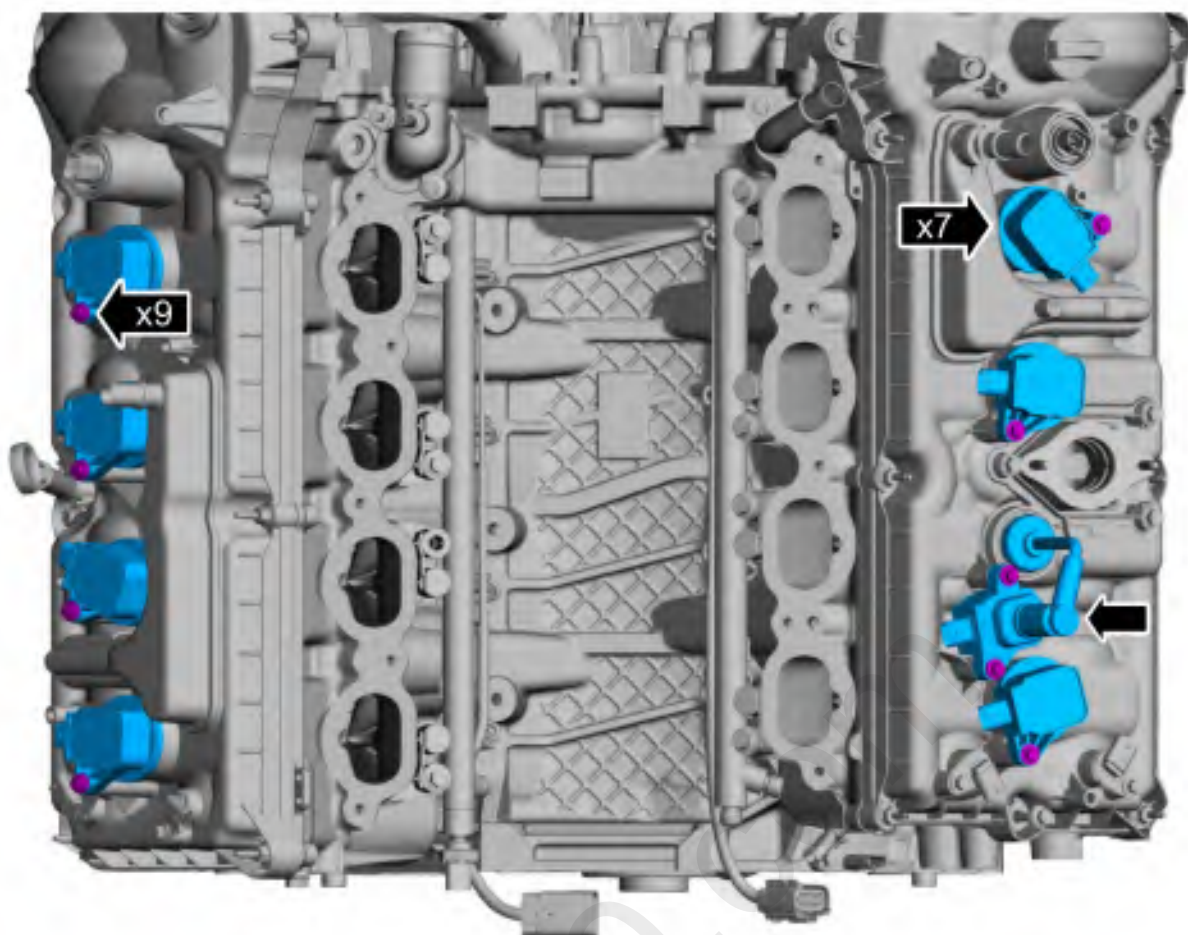
31. Remove the bolts and the KSs.



32. **NOTE:** Use compressed air to remove any foreign material from the ignition coil-on-plugs and surrounding area before removing the ignition coil-on-plugs.

NOTE: When removing the ignition coil-on-plugs, a slight twisting motion will break the seal and ease removal.

1. Remove the ignition coil-on-plug retaining bolts.
2. Remove the ignition coil-on-plugs.



E262623

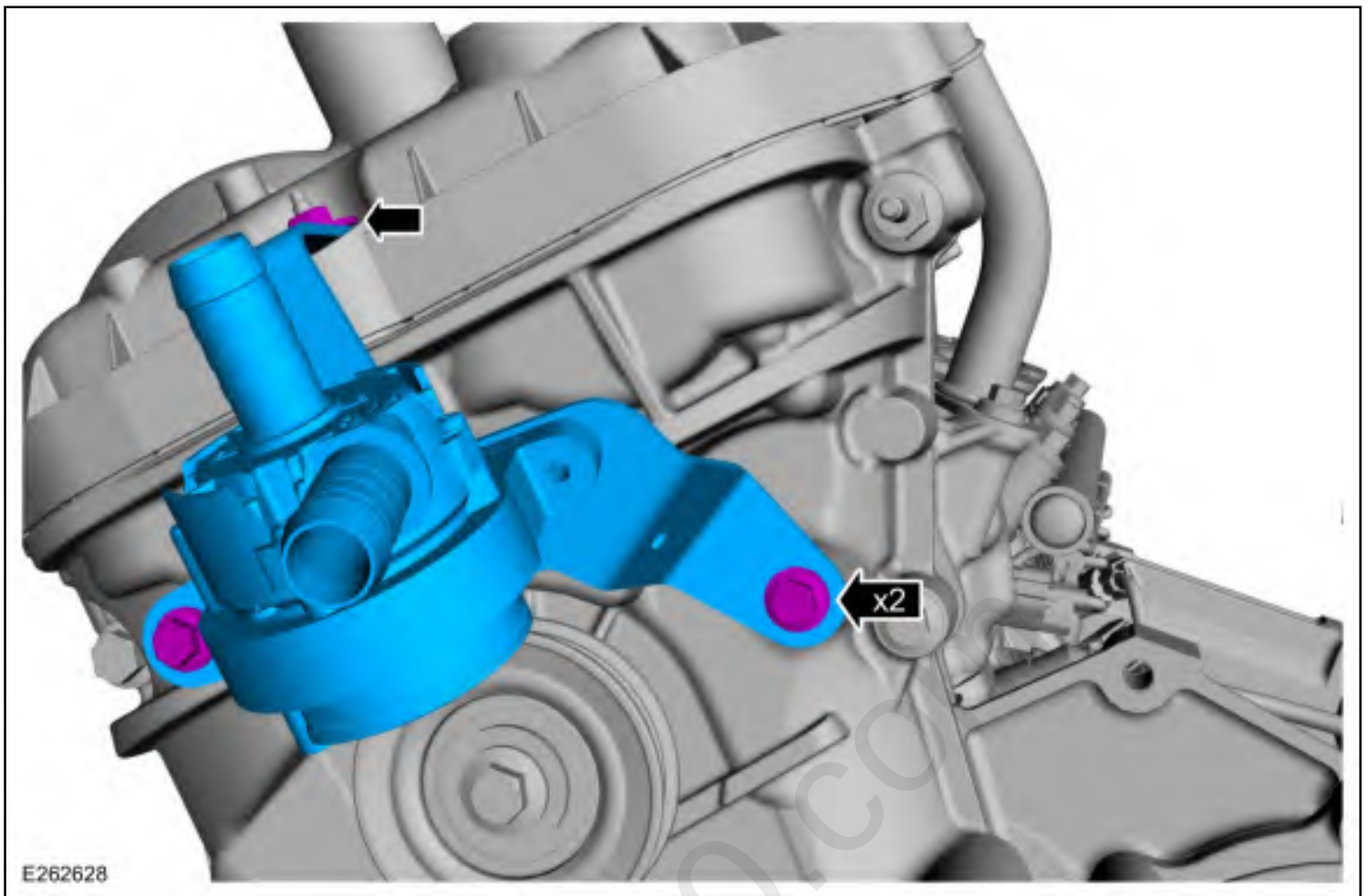
33. Inspect the ignition coil-on-plug assembly for cracks, rips, or tears. Replace any damaged coil-on-plug assemblies.



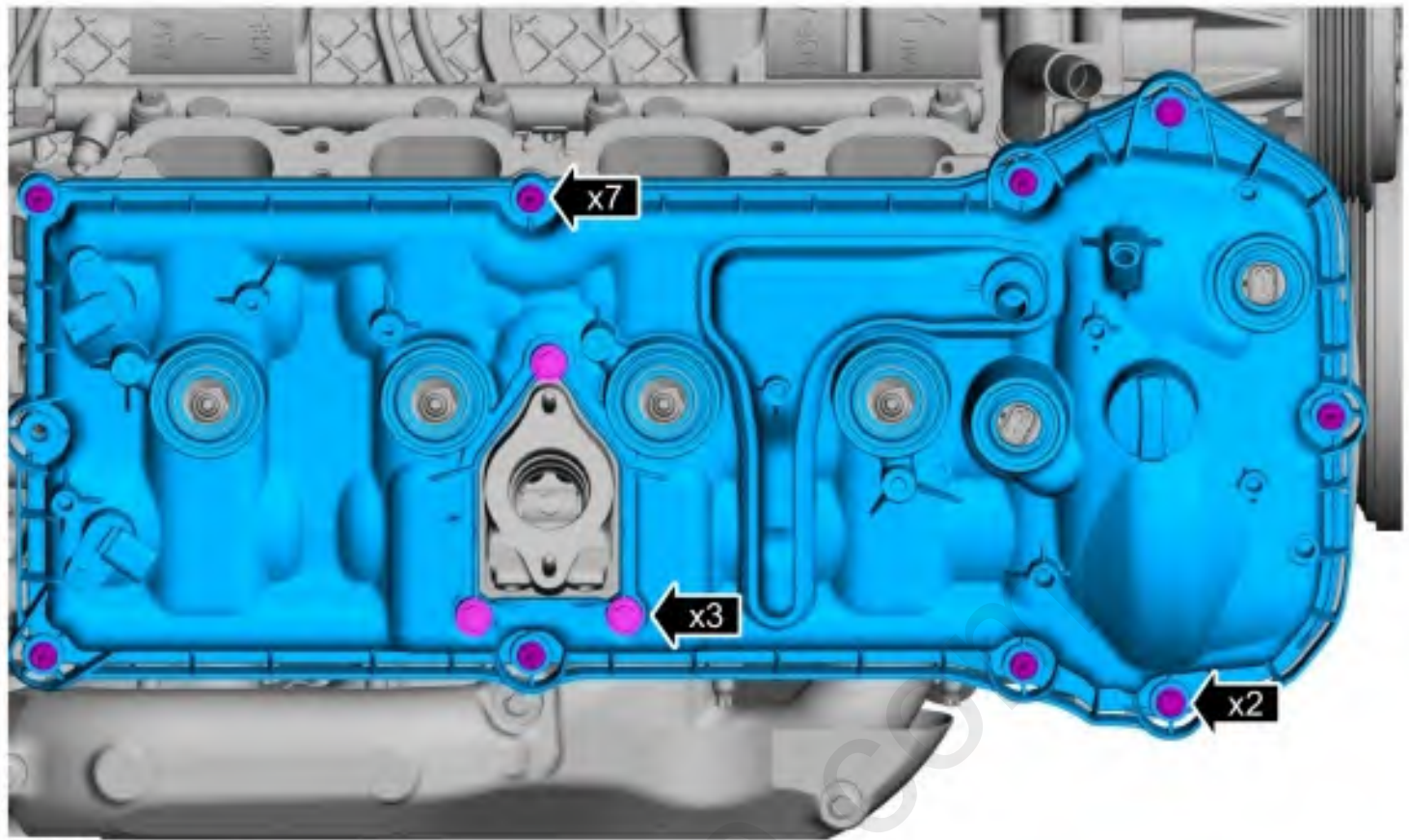
E254986



34. Remove the fasteners and the coolant pump.



35. Loosen the bolts and remove the valve cover.



E262355



36. **NOTE:** Clean the valve cover gasket groove with soap and water or a suitable solvent.

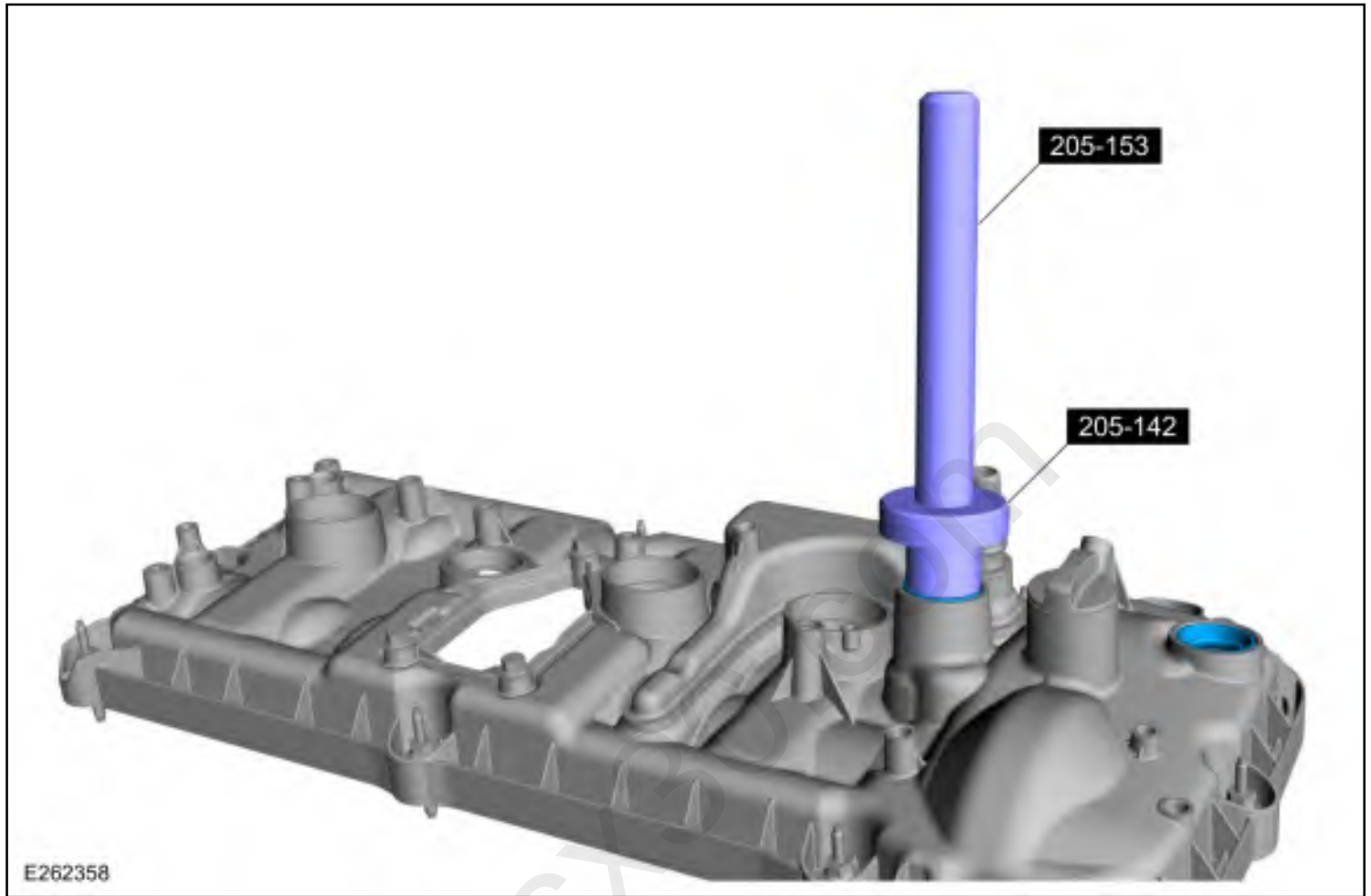
Remove and discard the gaskets.



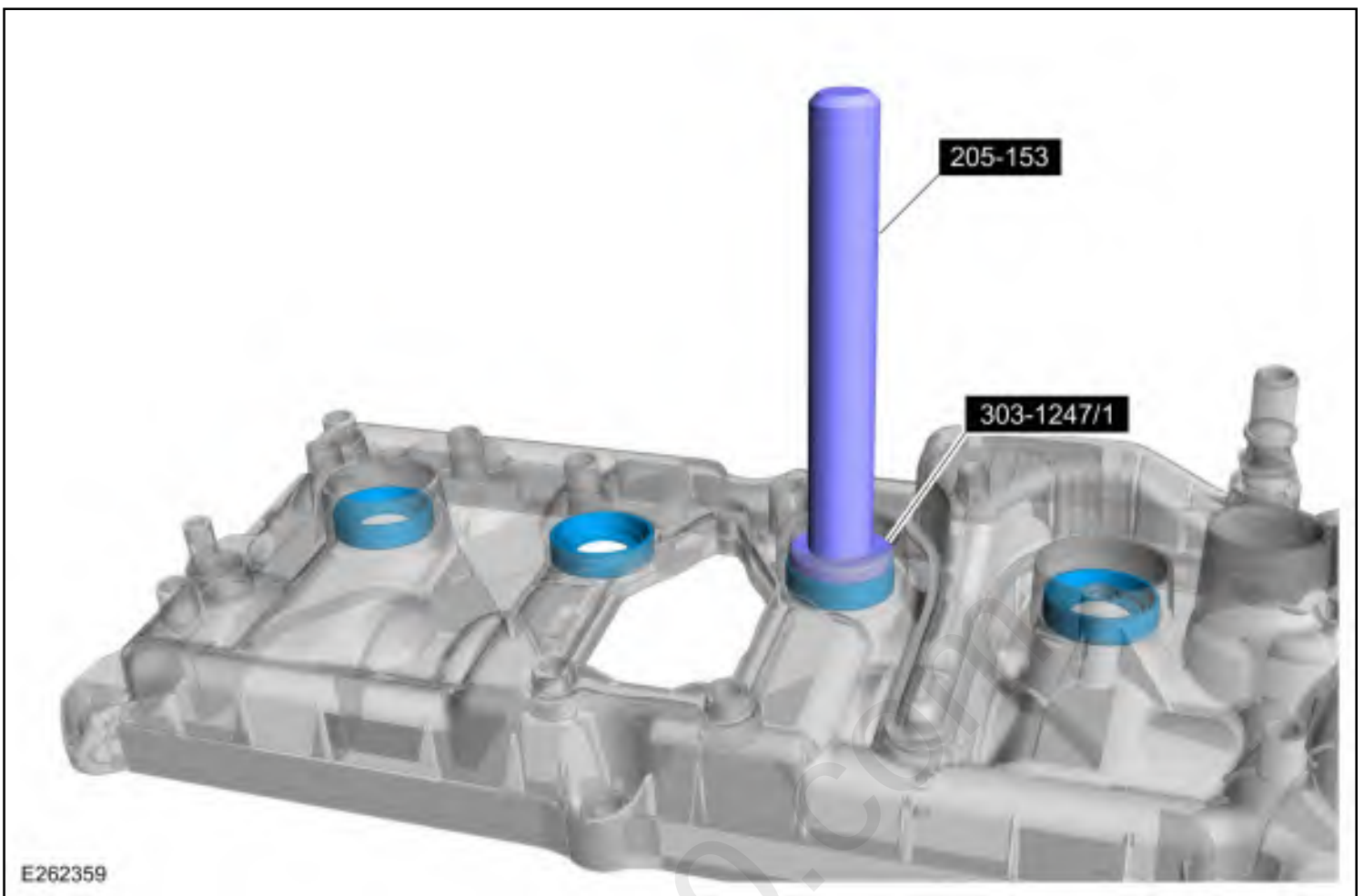
E262356



37. Inspect the VCT variable force solenoid seals. Remove any damaged seals using the special tools.
Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 205-142 (T80T-4000-J) Installer,
Differential Bearing Cone.



38. Inspect the spark plug seals. Remove any damaged seals using the special tools.
Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 303-1247 VCT Spark Plug Tube Seal
Remover and Installer.



39. **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 which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean the valve cover mating surface of the cylinder head and engine front cover.

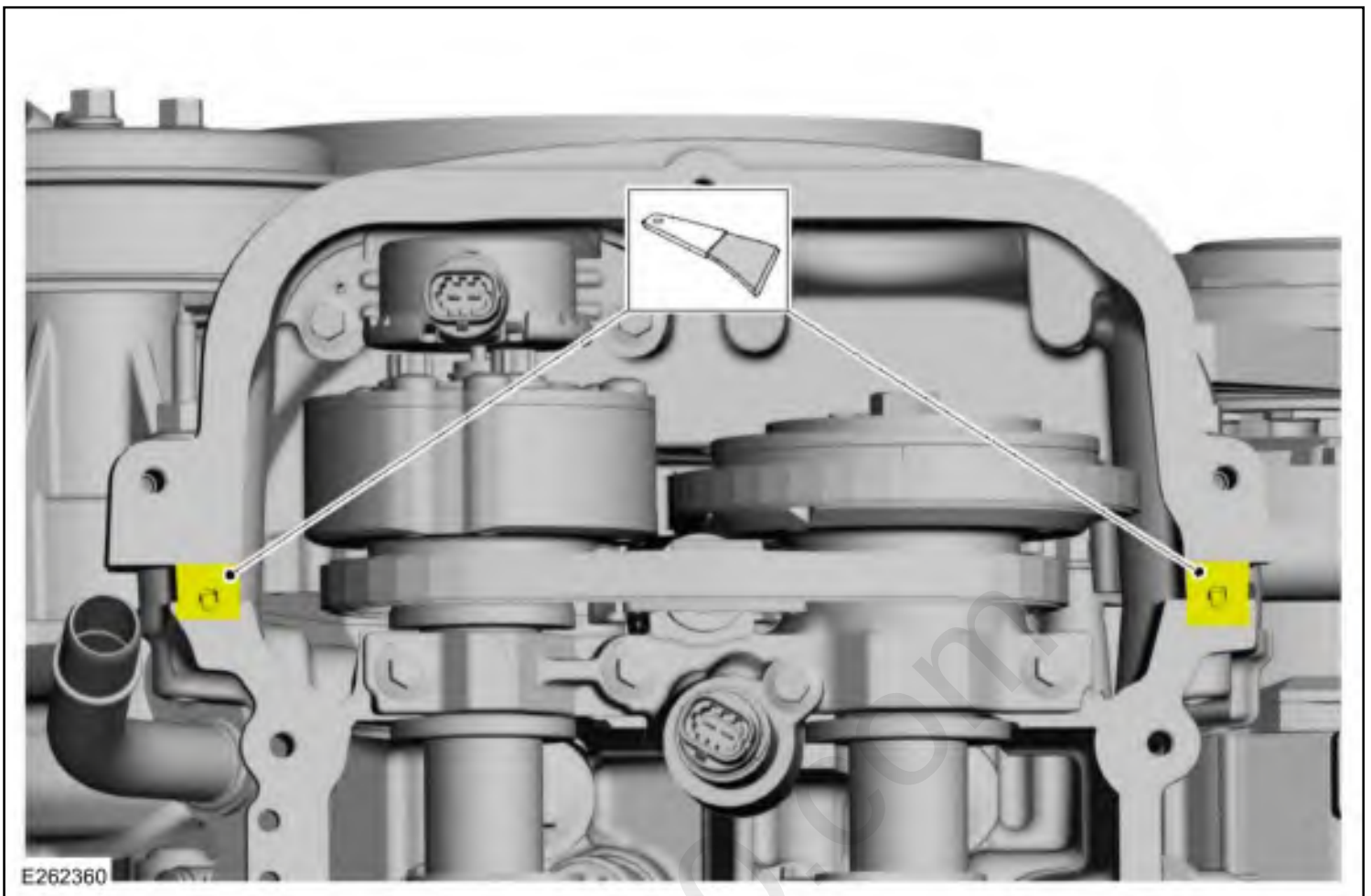
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

Use the General Equipment: Plastic Scraper

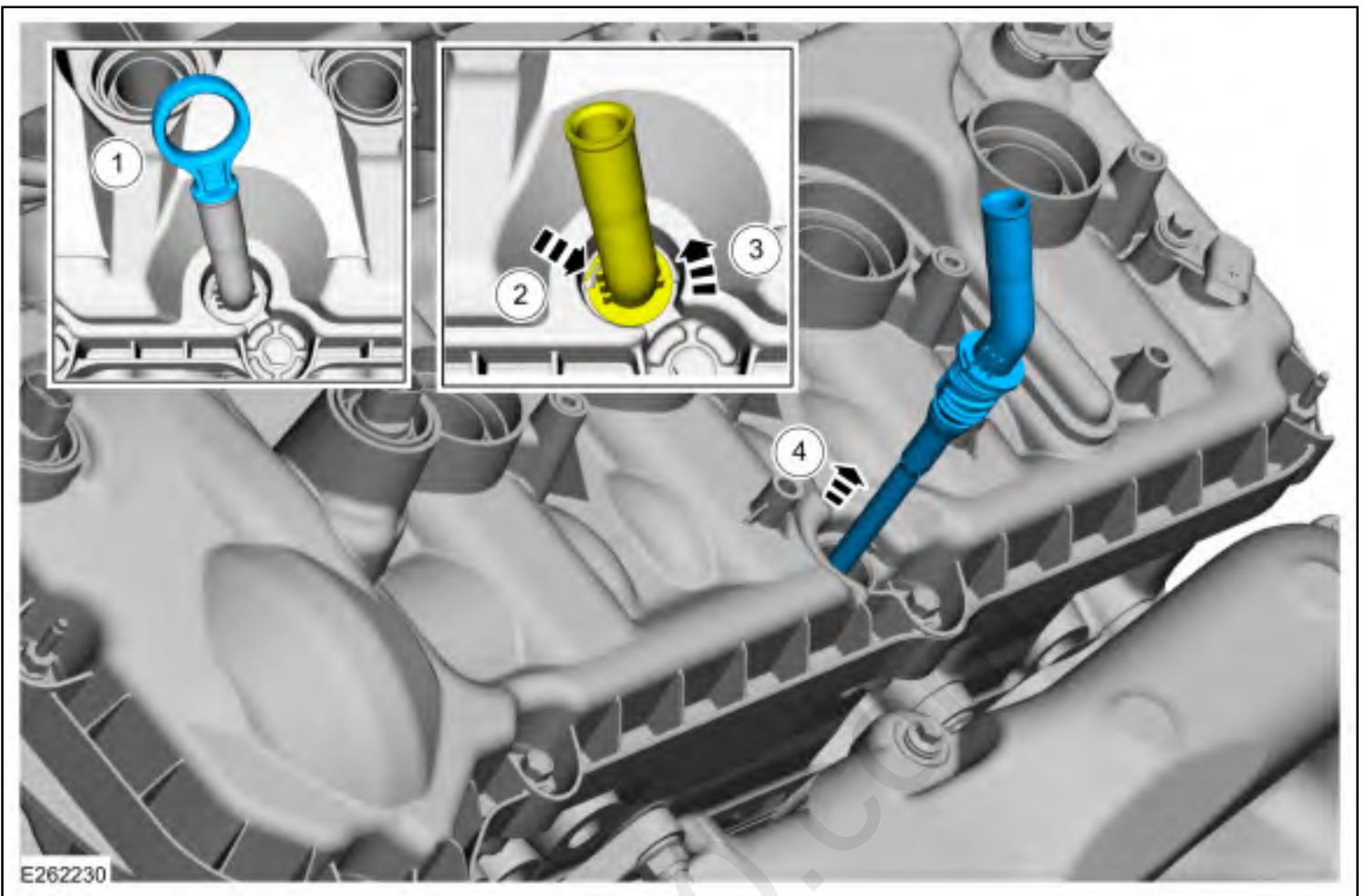
Material: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material: Motorcraft® Metal Surface Prep Wipes / ZC-31-B

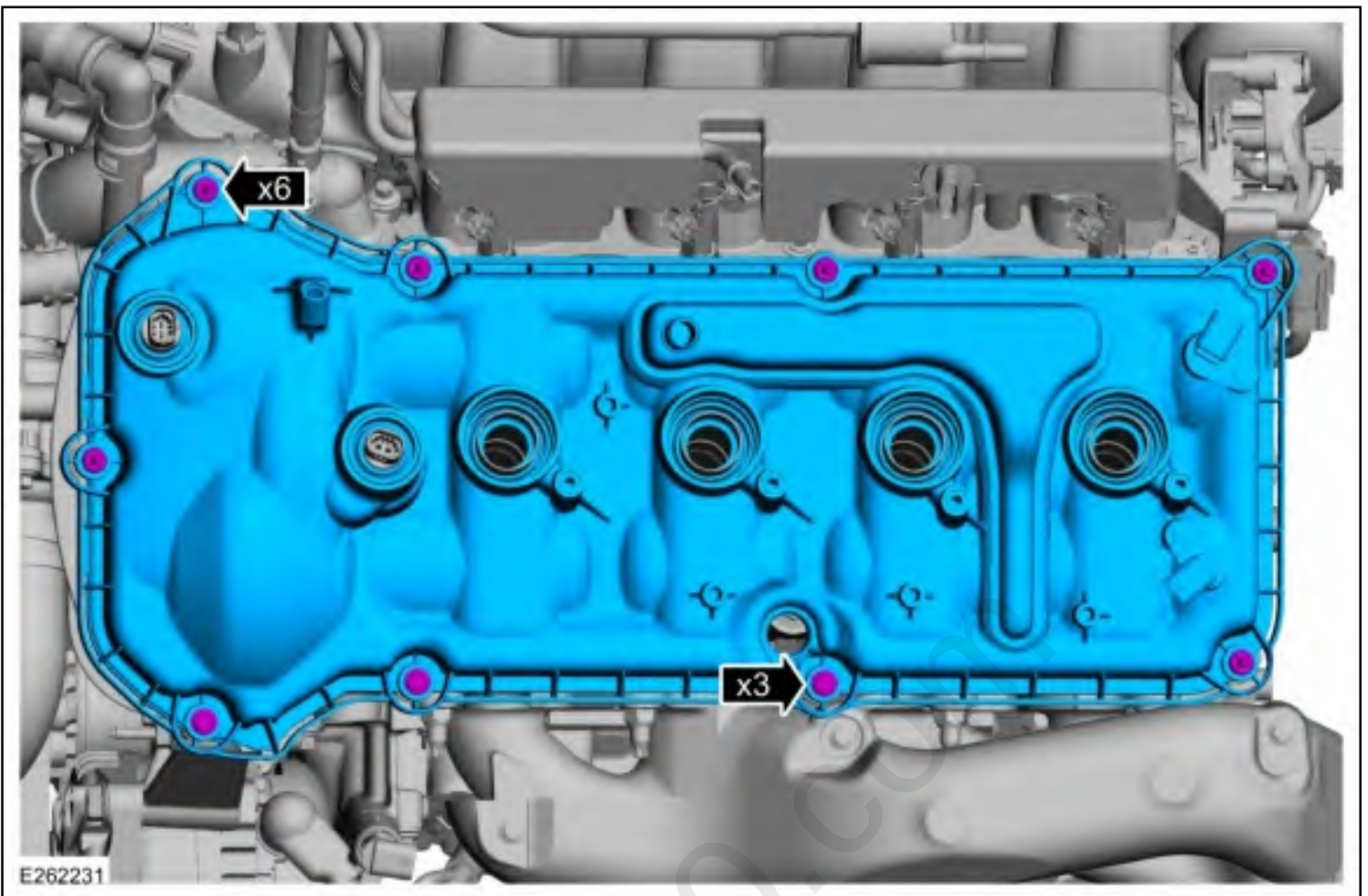
Material: Motorcraft® Metal Brake Parts Cleaner / PM-4-A, PM-4-B



1. Remove the oil level indicator.
2. Depress the tab.
3. Rotate the oil level indicator tube counterclockwise.
4. Pull the oil level indicator tube from the engine.

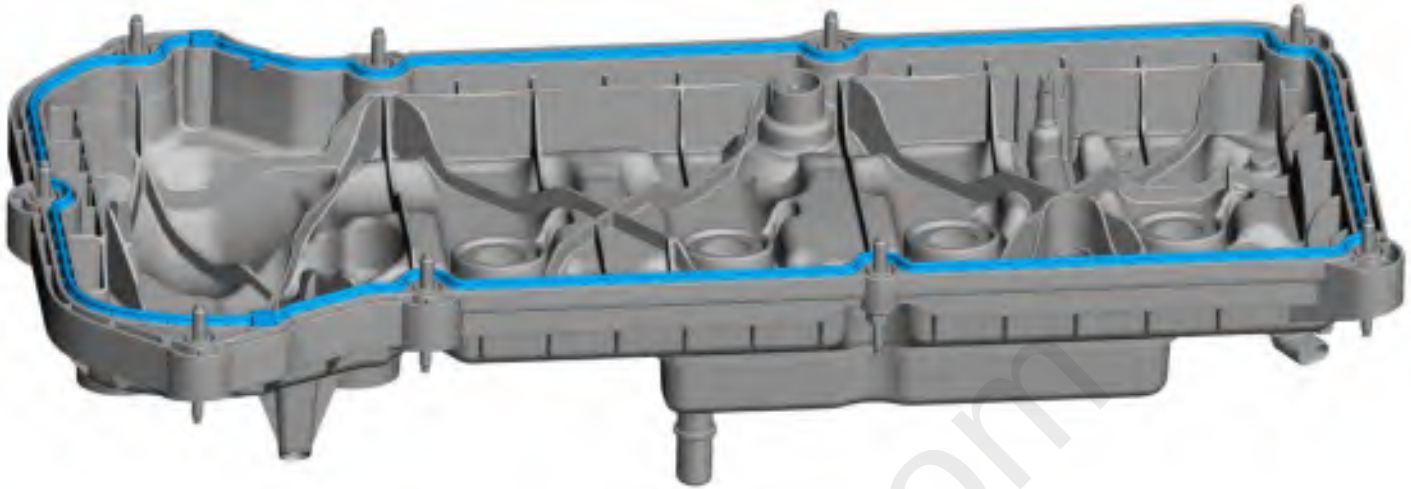


41. Loosen the fasteners and remove the valve cover.



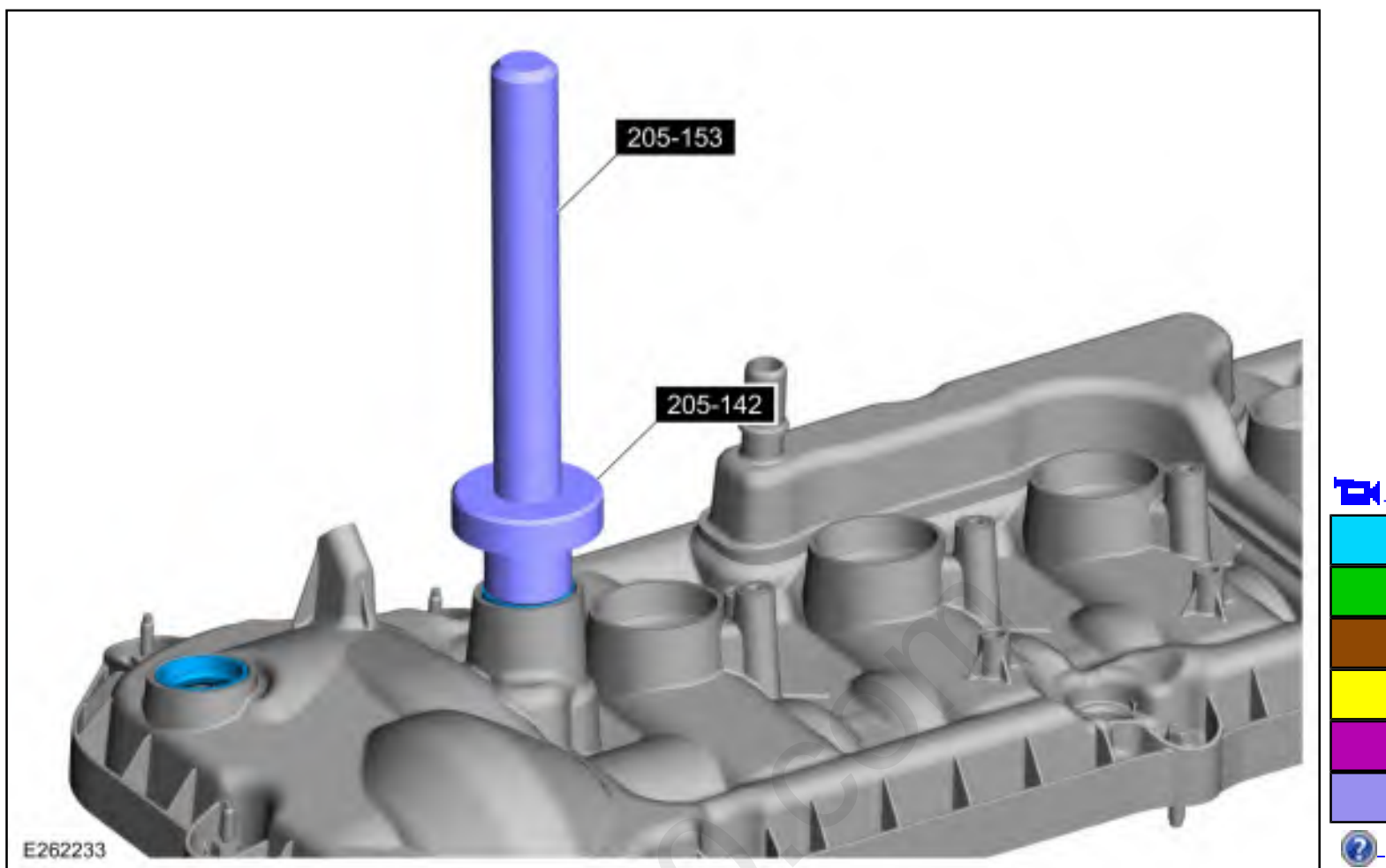
42. **NOTE:** Clean the valve cover gasket groove with soap and water or a suitable solvent.

Remove and discard the gasket.

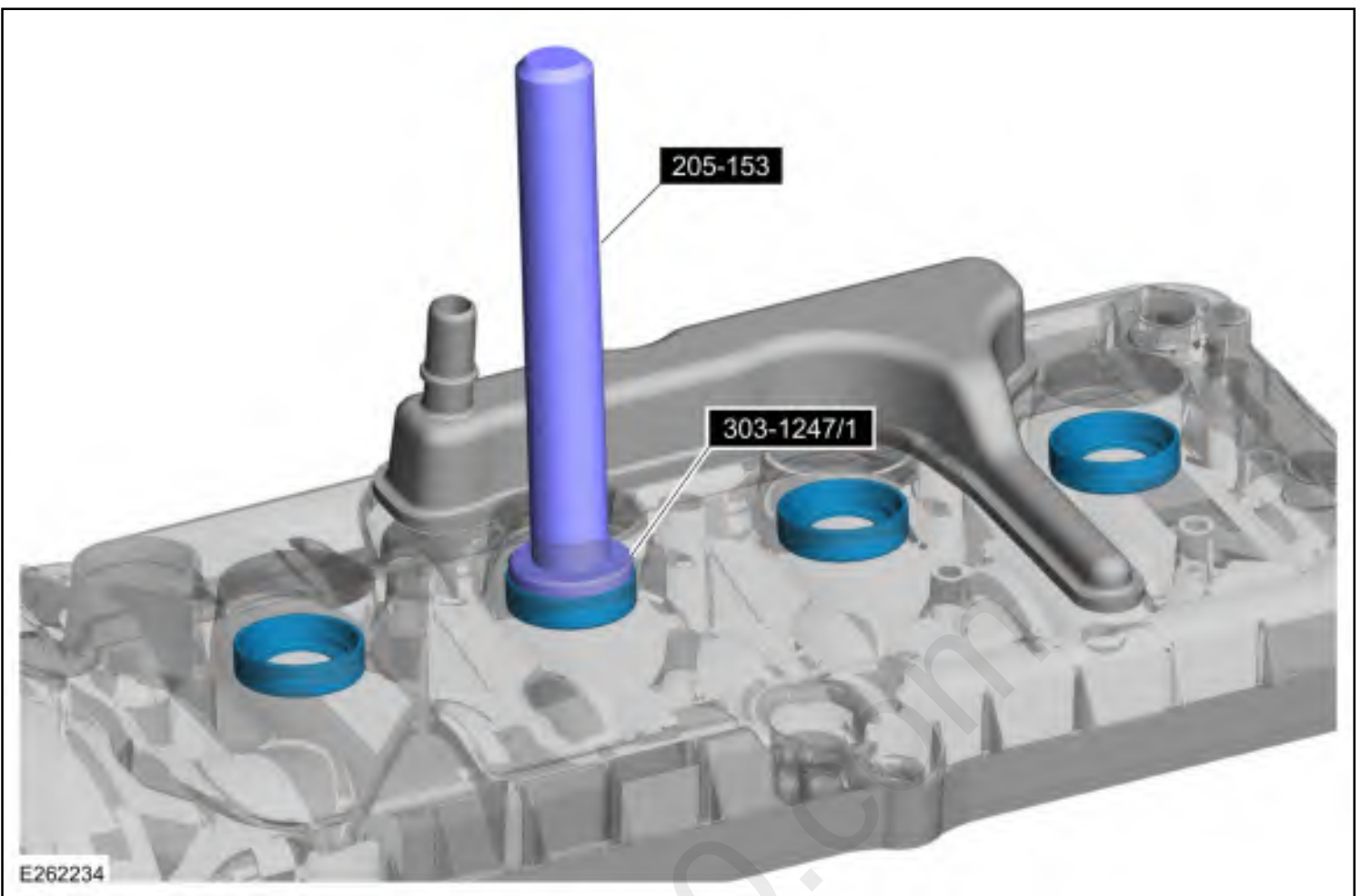


E262232

43. Inspect the VCT variable force solenoid seals. Remove any damaged seals using the special tools. Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 205-142 (T80T-4000-J) Installer, Differential Bearing Cone.



44. Inspect the spark plug seals. Remove any damaged seals using the special tools.
Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 303-1247 VCT Spark Plug Tube Seal Remover and Installer.



45. **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 which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean the valve cover mating surface of the cylinder head and engine front cover.

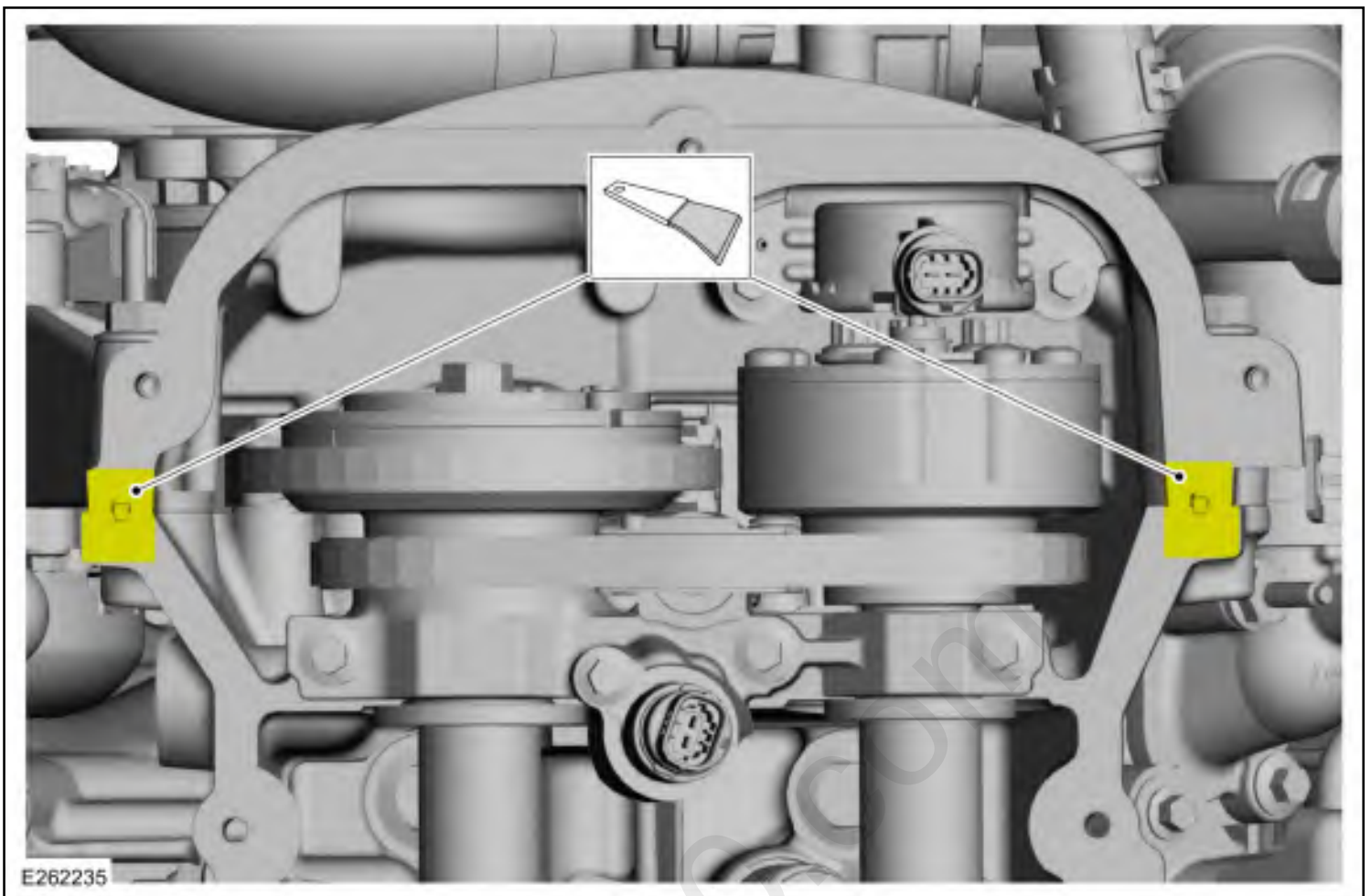
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

Use the General Equipment: Plastic Scraper

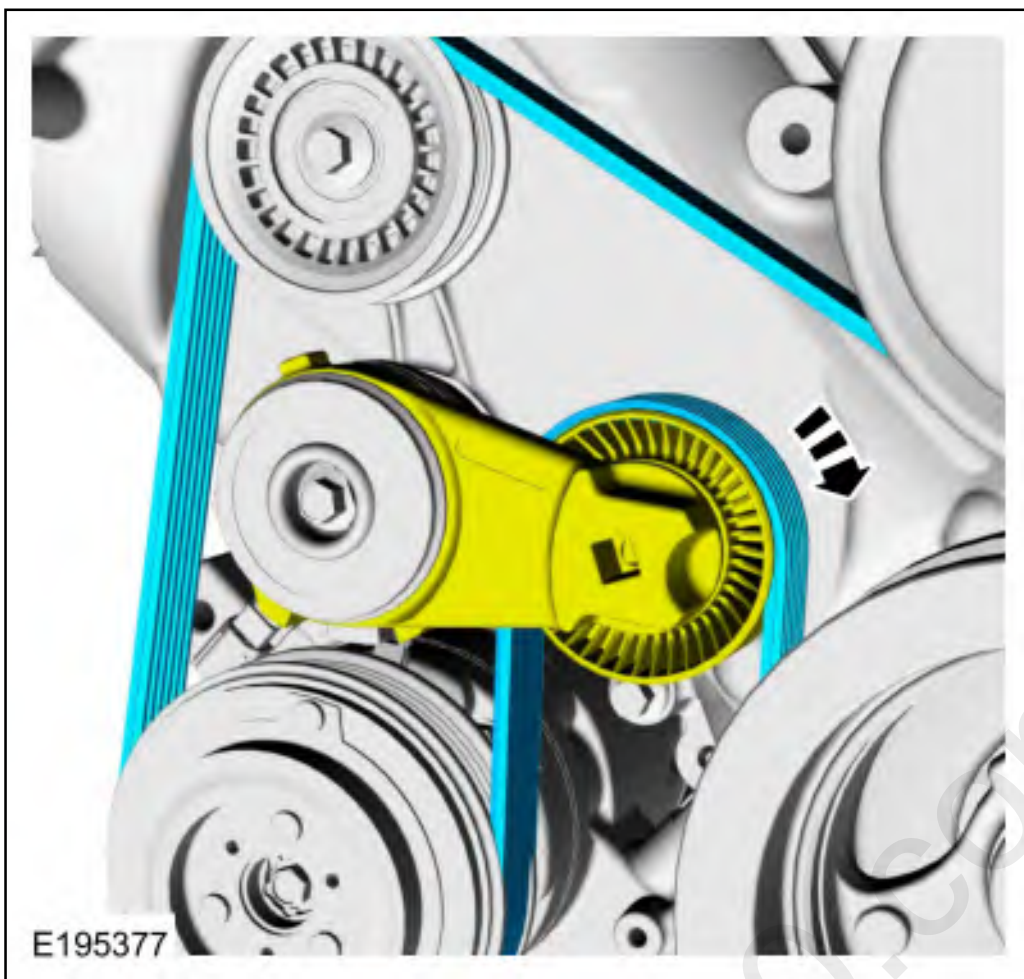
Material: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material: Motorcraft® Metal Surface Prep Wipes / ZC-31-B

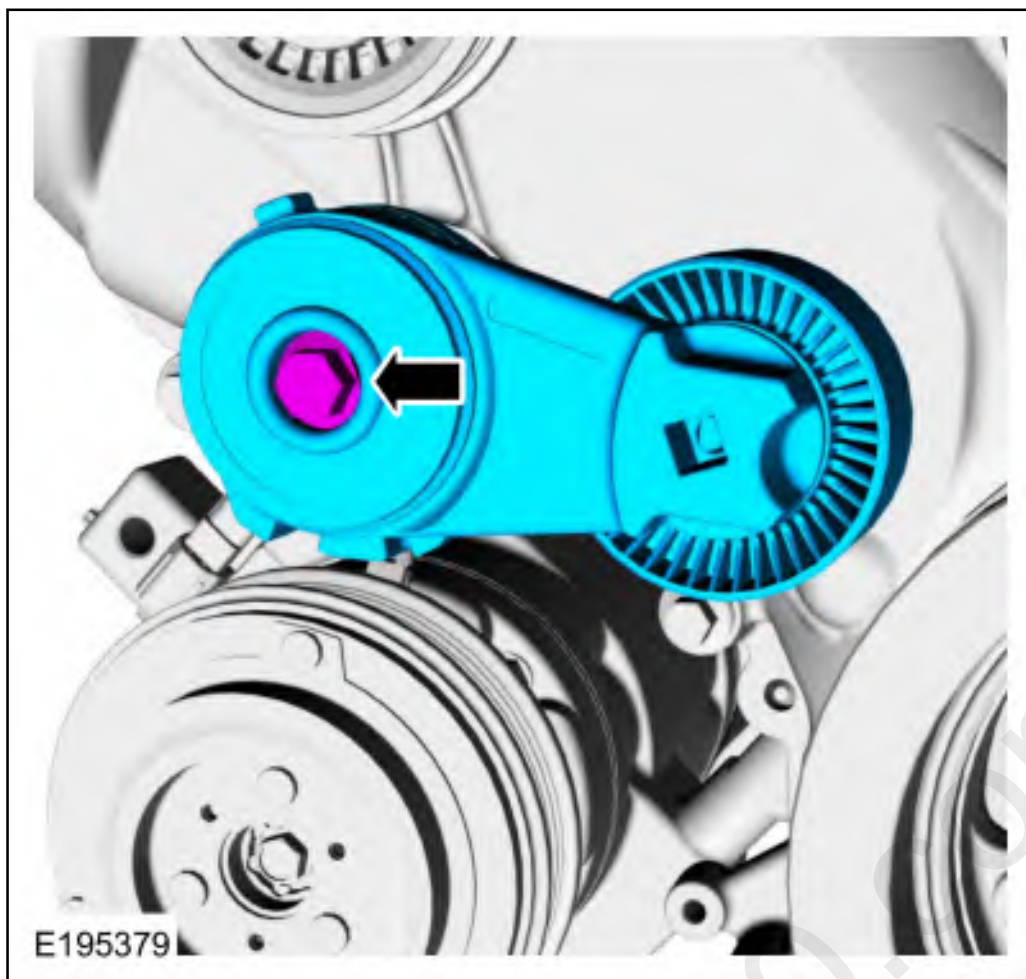
Material: Motorcraft® Metal Brake Parts Cleaner / PM-4-A, PM-4-B



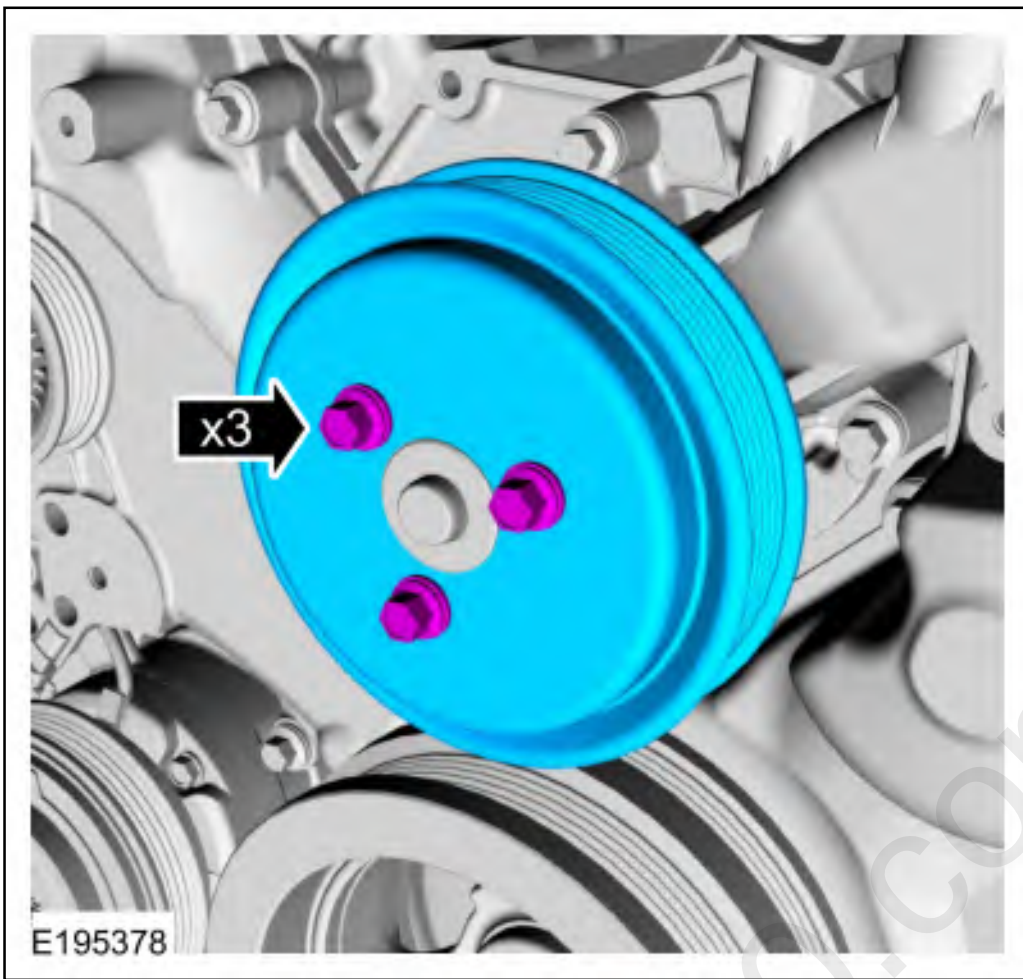
46. Rotate the A/C compressor belt tensioner clockwise and remove the A/C compressor belt.



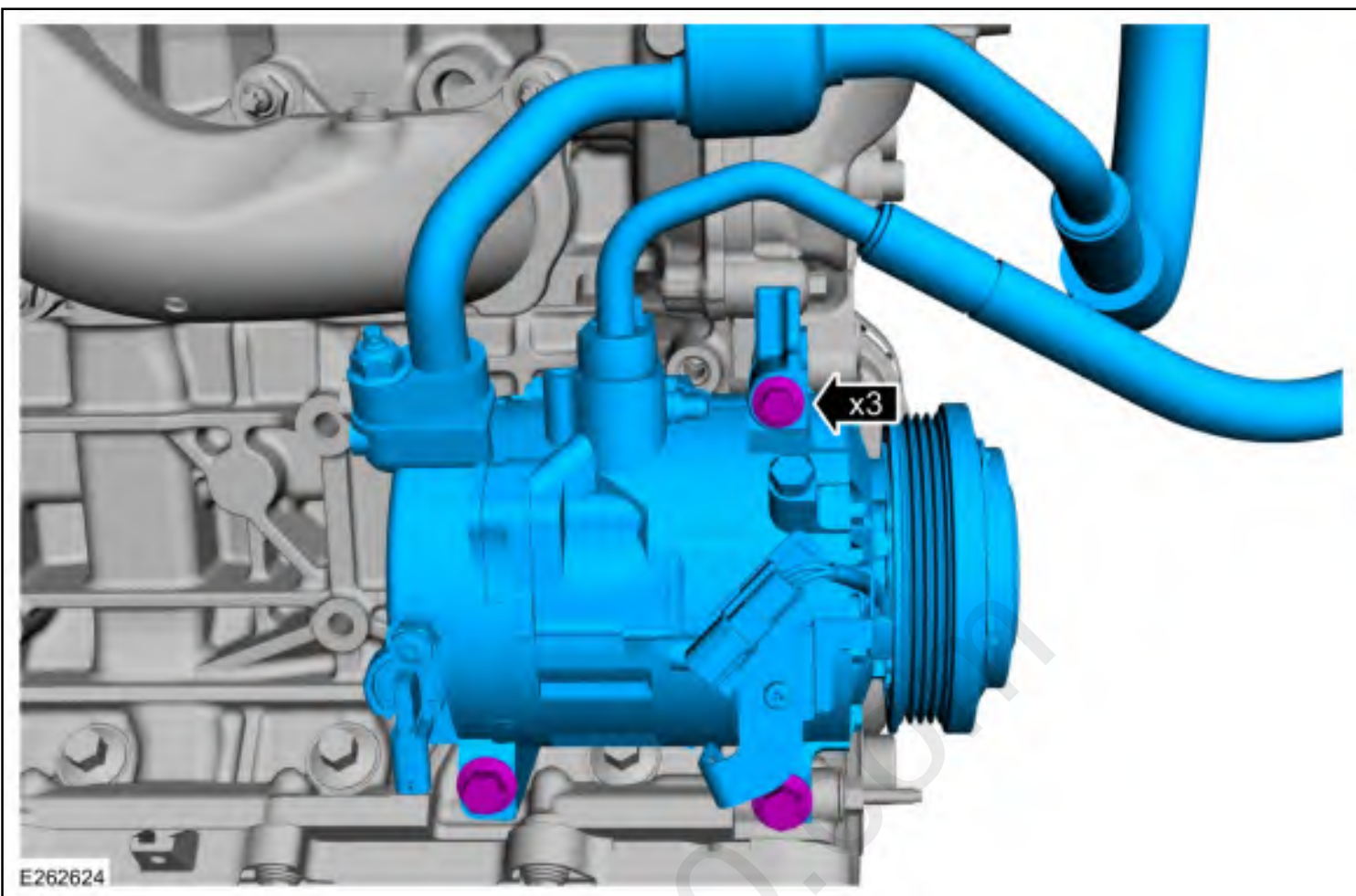
47. Remove the bolt and the A/C compressor belt tensioner.



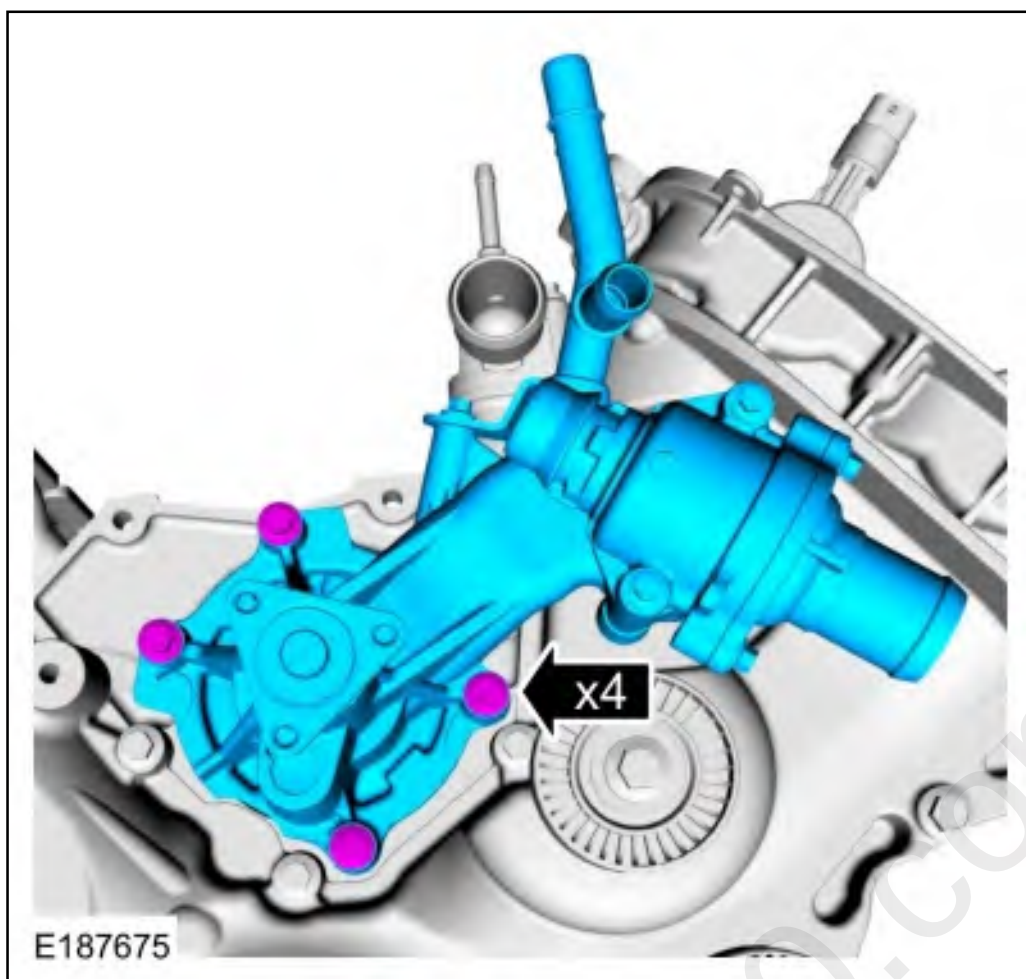
48. Remove the bolts and the coolant pump pulley.



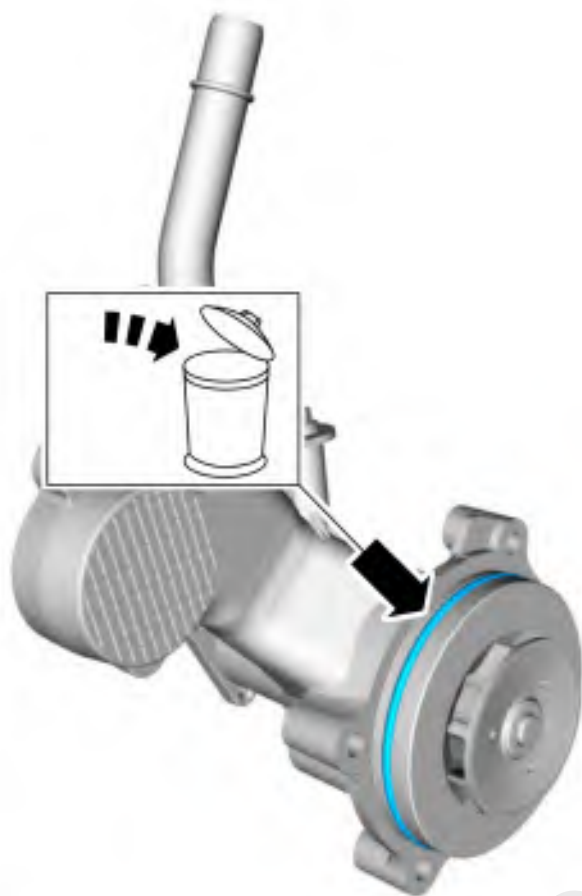
49. Remove the bolts and the A/C compressor.



50. Remove the bolts and the coolant pump.

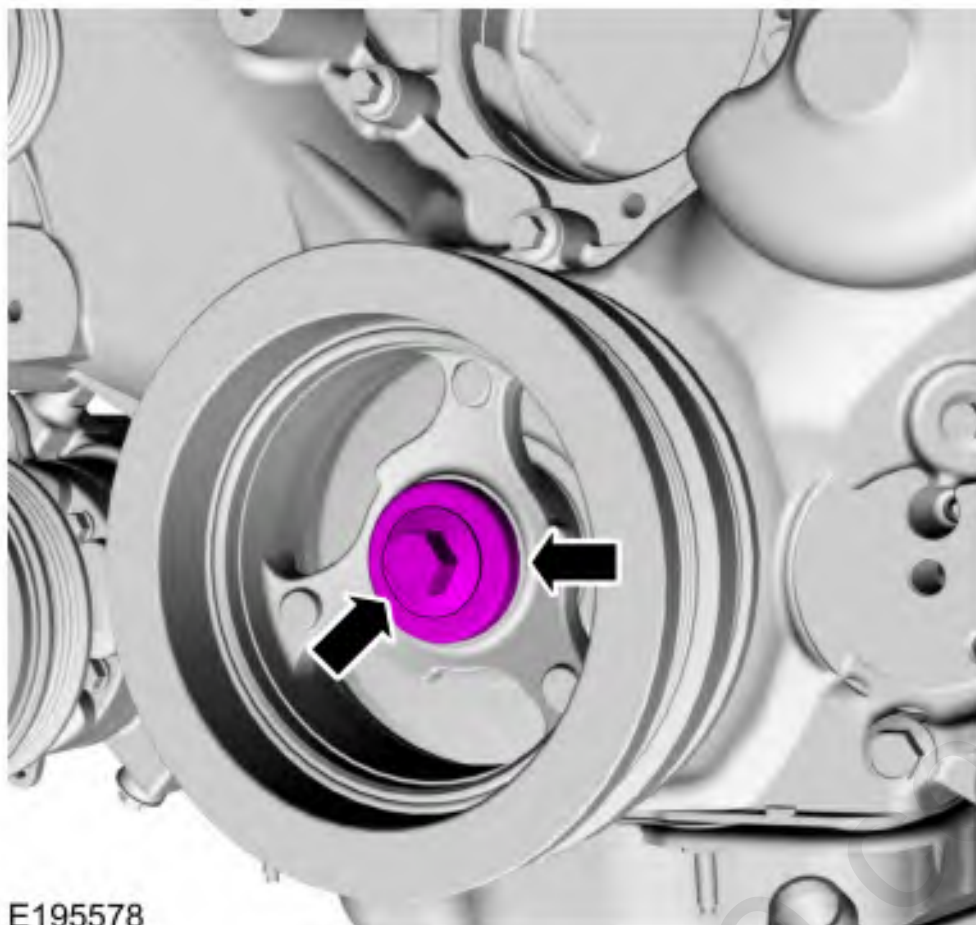


51. Remove and discard the coolant pump O-ring seal.



E183428

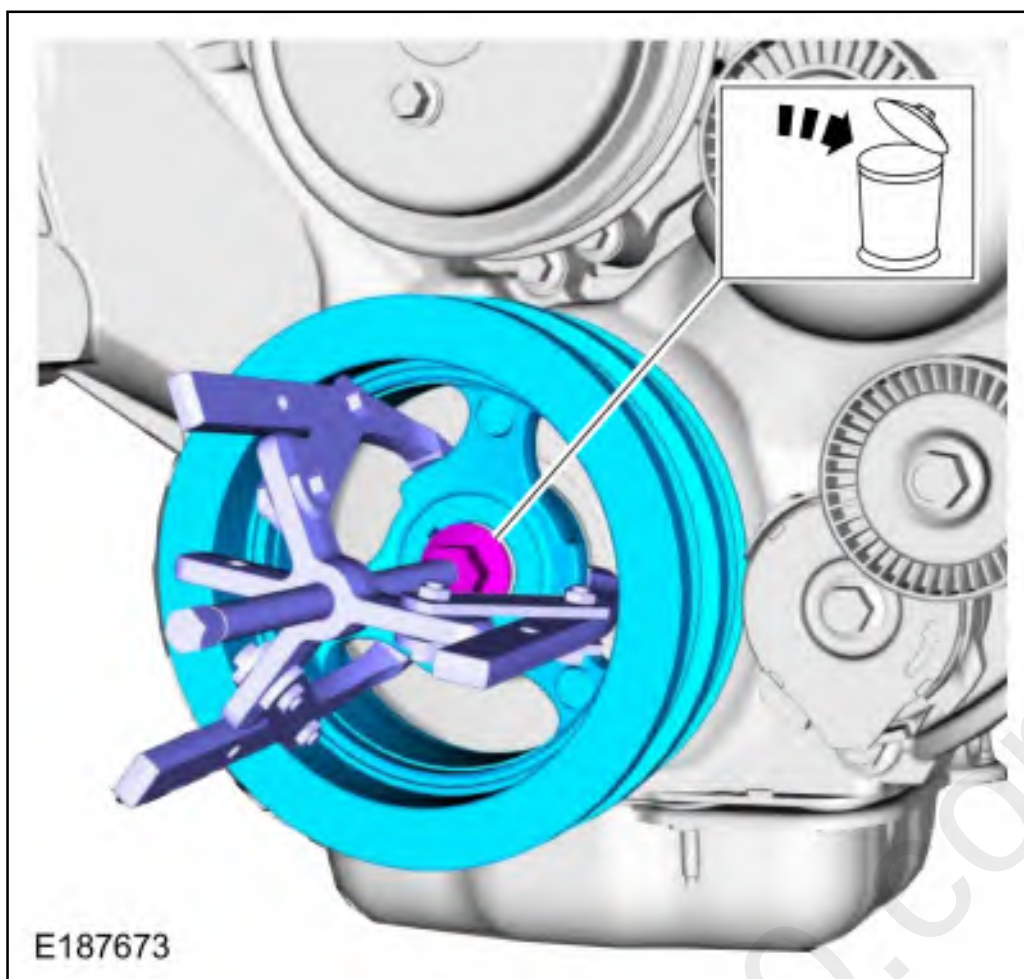
52. Remove the crankshaft pulley bolt and washer.



E195578



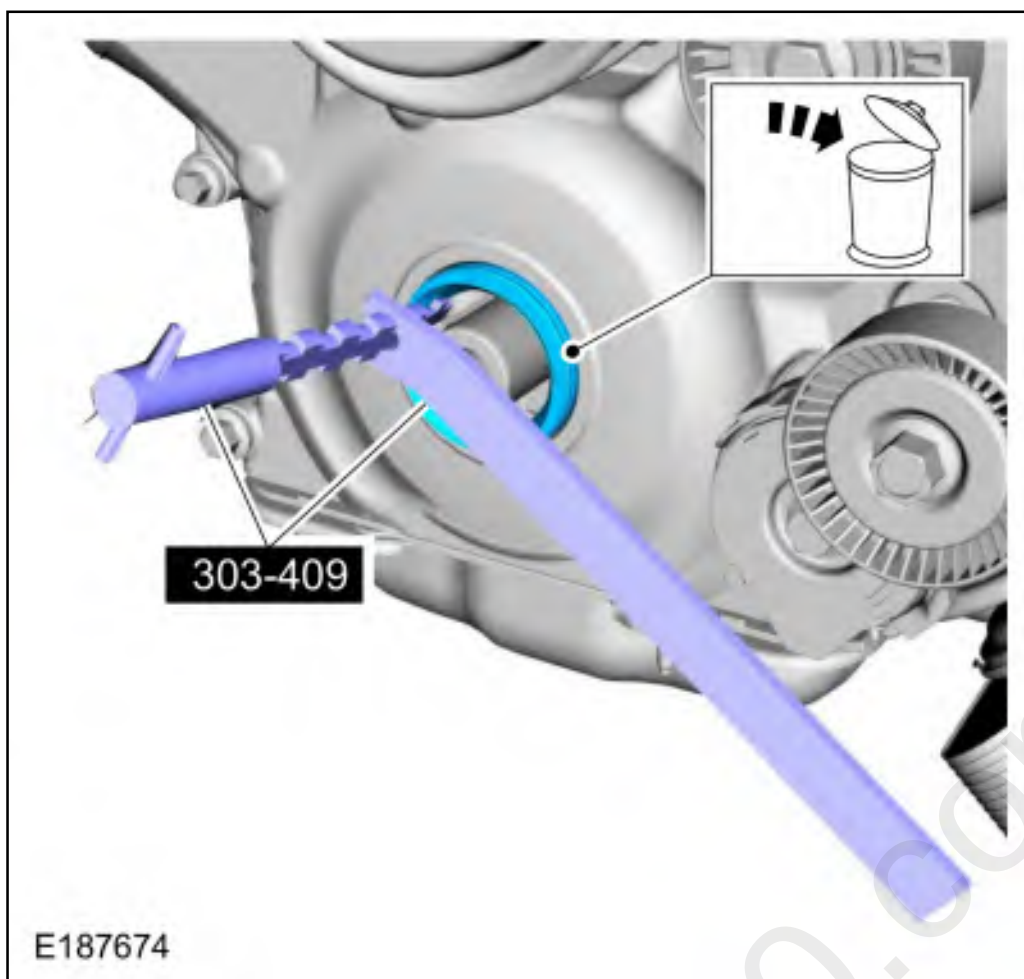
1. Using the 3 Leg Puller and the crankshaft pulley bolt, remove the crankshaft pulley.
Use the General Equipment: Three Leg Puller
2. Discard the crankshaft pulley bolt.



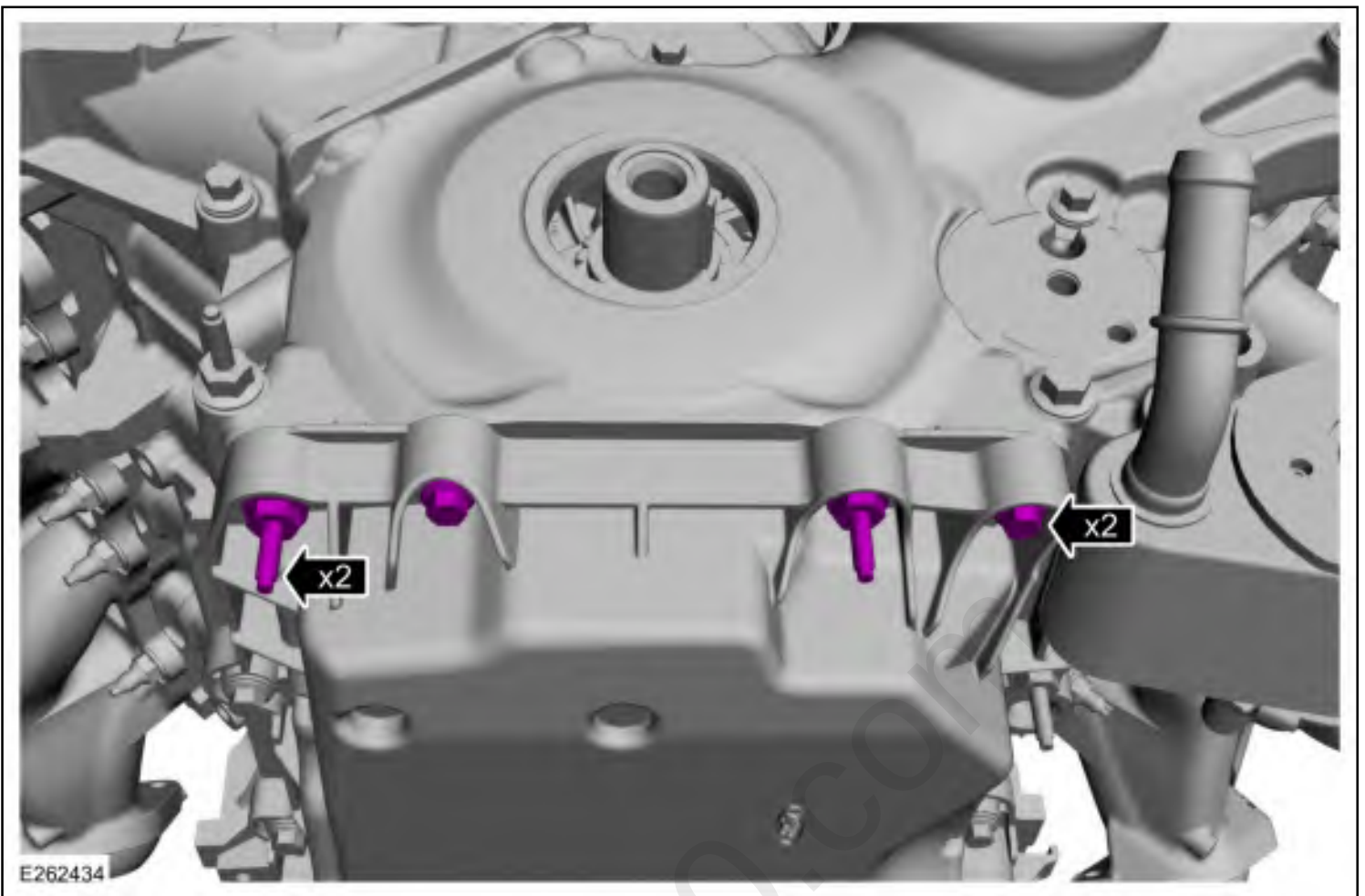
54. **NOTICE:** Use care not to damage the engine front cover or the crankshaft when removing the seal.

Using the special tool, remove and discard the crankshaft front oil seal.

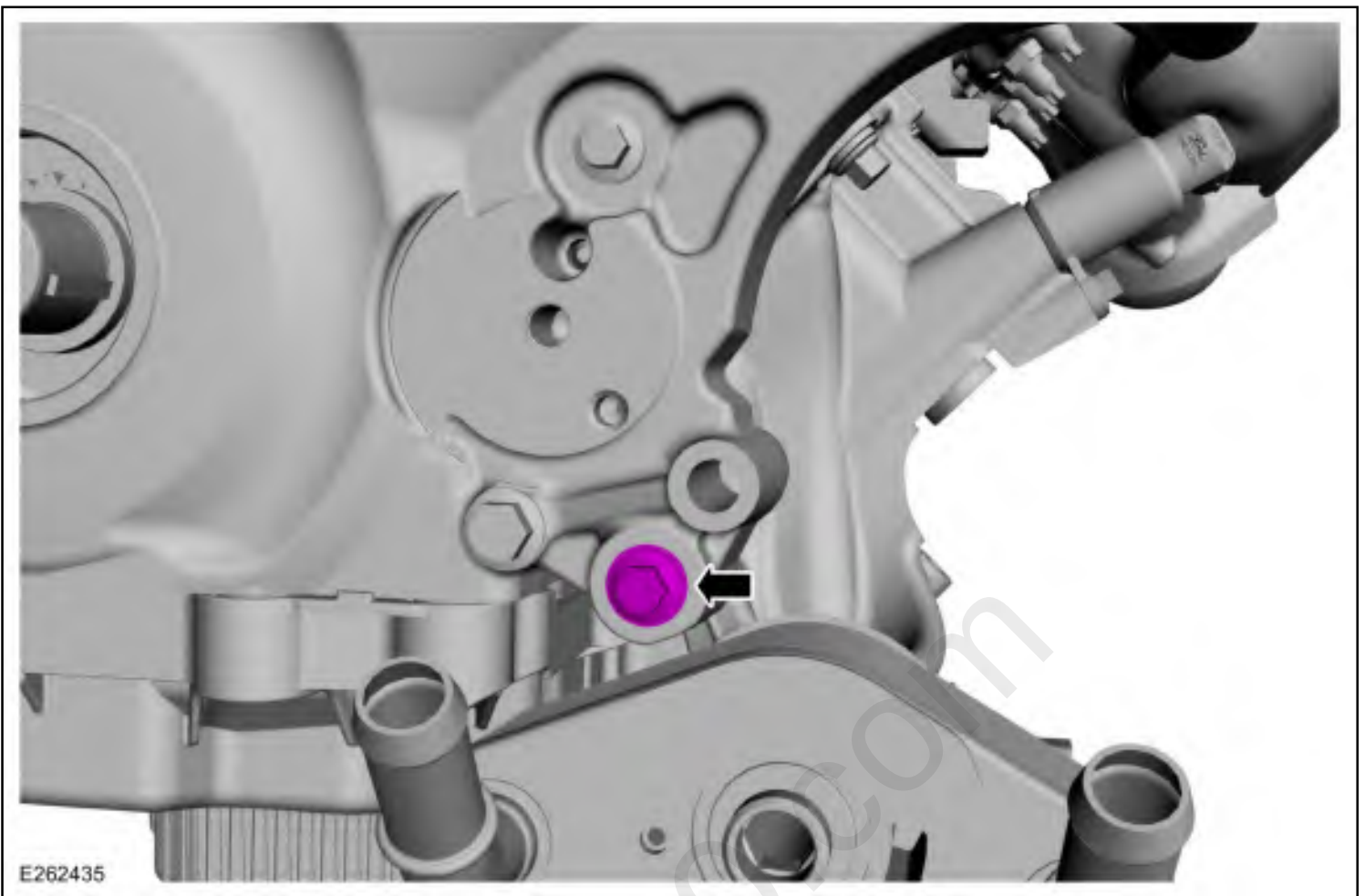
Use Special Service Tool: 303-409 (T92C-6700-CH) Remover, Crankshaft Seal.



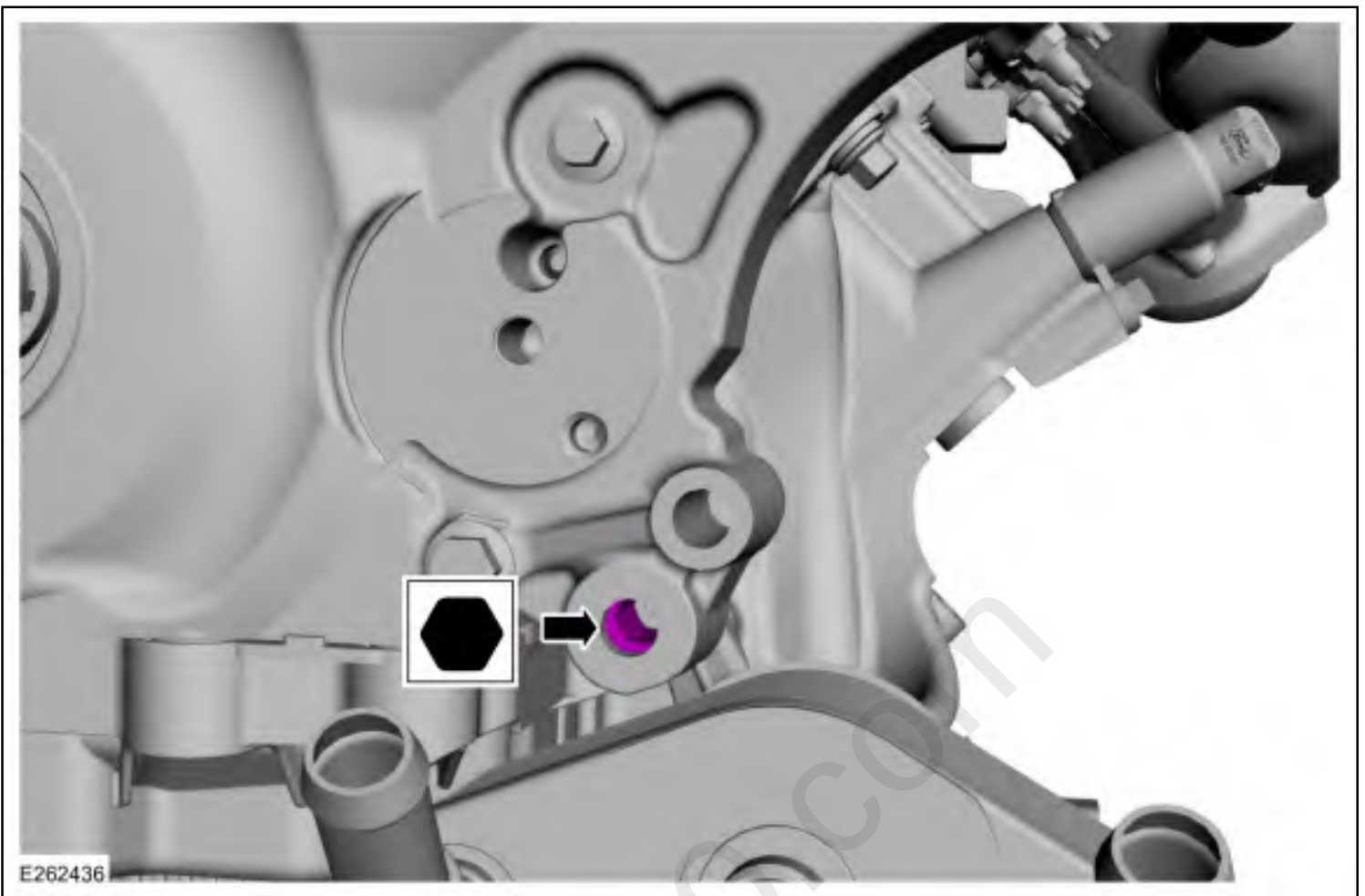
55. Remove the bolts and stud bolts.



56. Remove the engine front cover-to-oil filter adapter bolt.

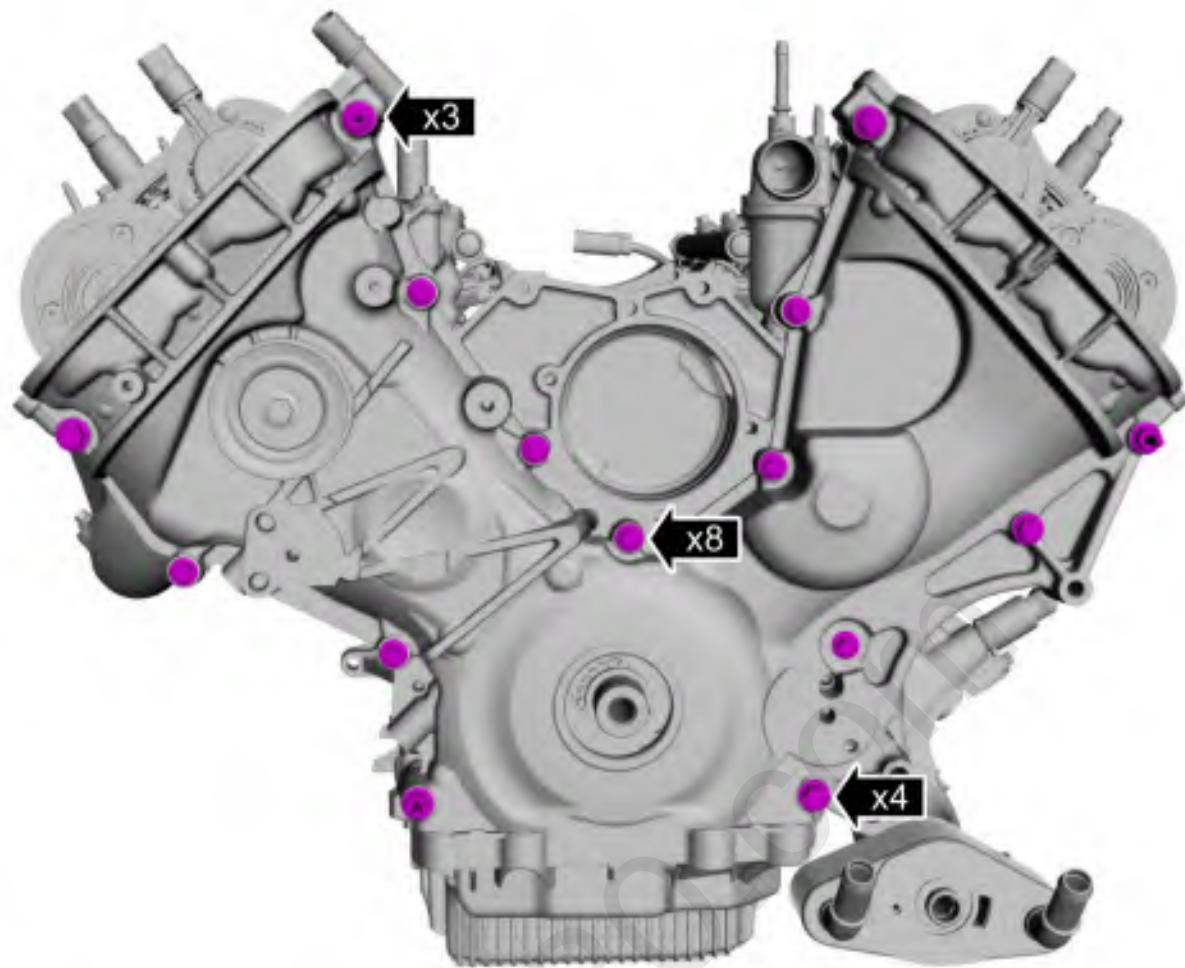


57. Using a 10 mm Hex Bit loosen the engine front cover-to-oil filter adapter jack screw.



58. **NOTE:** *There are 3 different fasteners used, note the location of fasteners for assembly.*

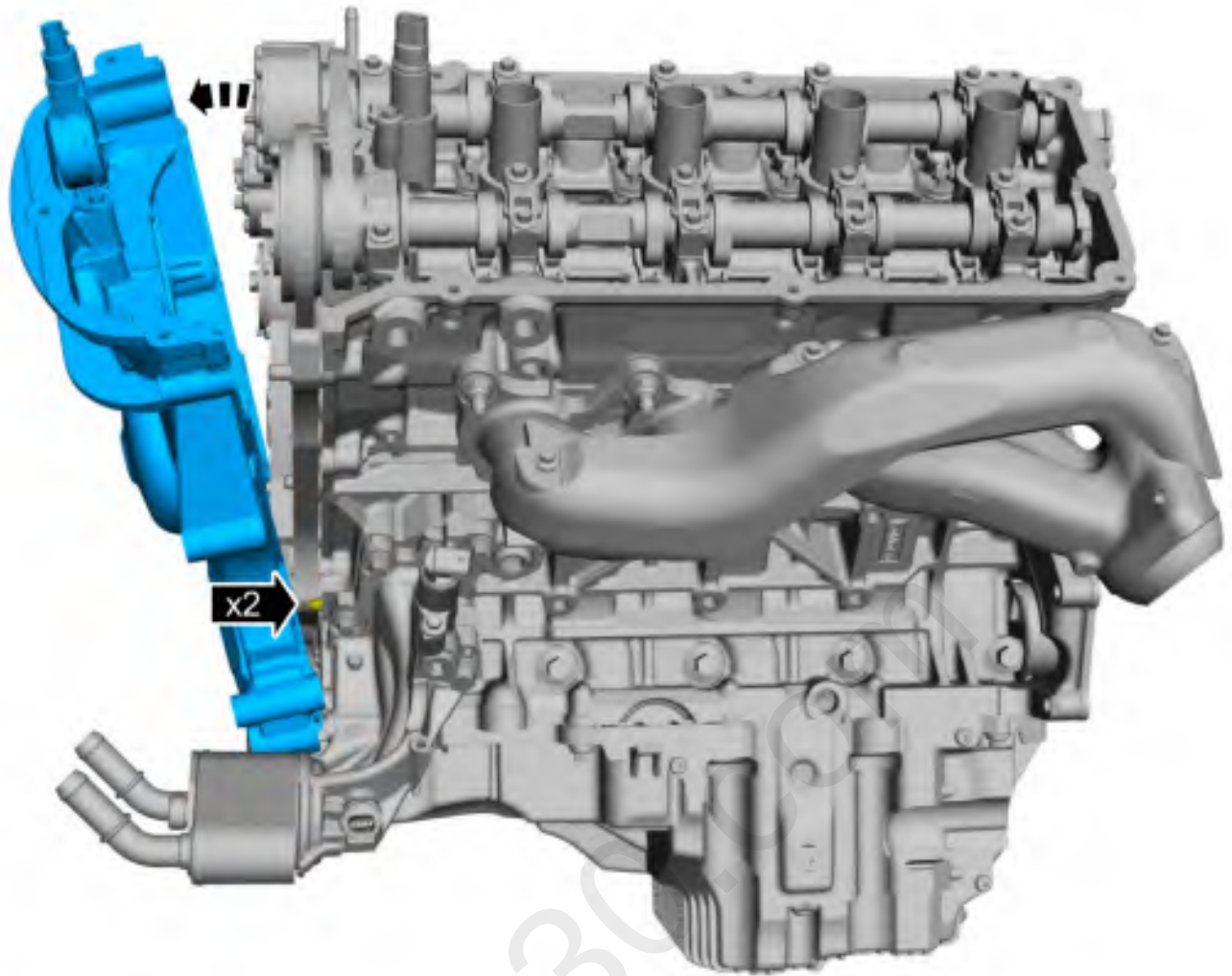
Remove the bolts and stud bolts.



E262437

59. **NOTE:** *Timing drive components removed from view for clarity.*

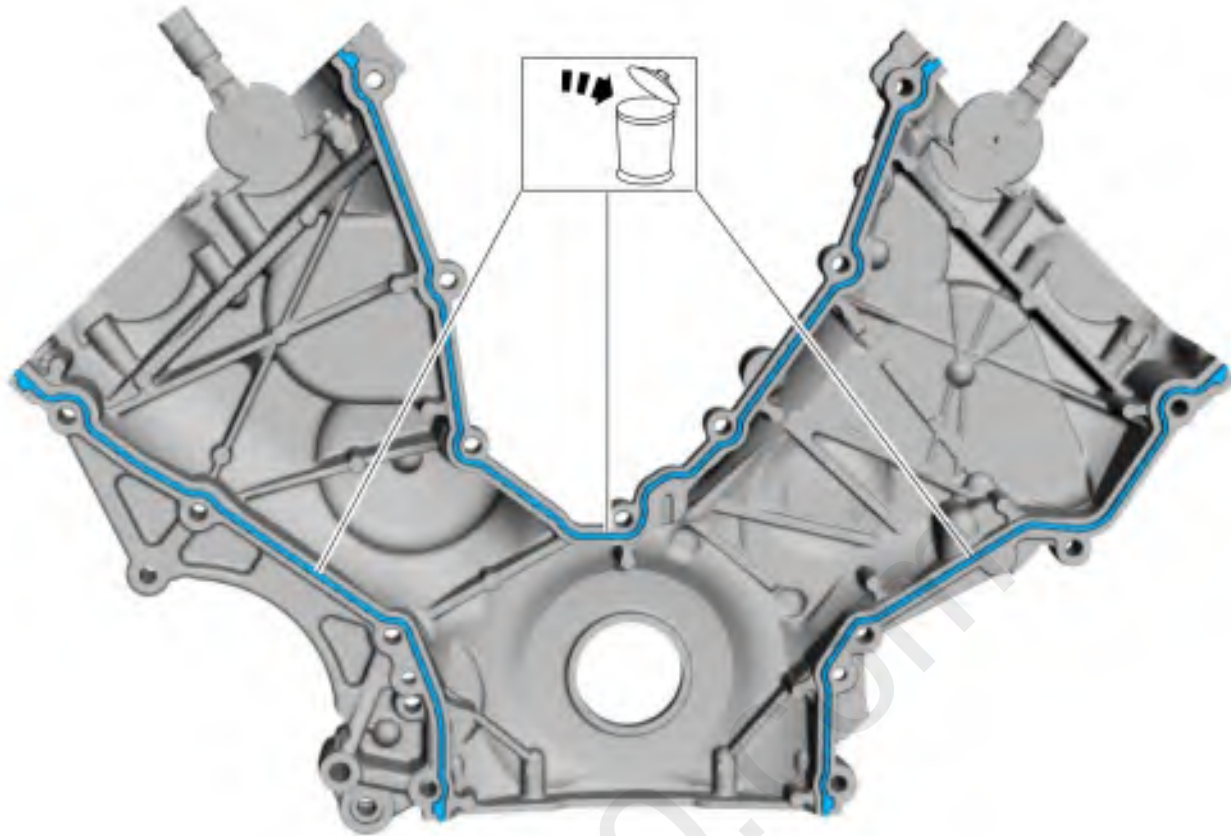
Remove the engine front cover from the front cover-to-cylinder block dowels.



E262438



60. Remove and discard the gaskets.



E262439

61. **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 which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean and inspect the mating surface.

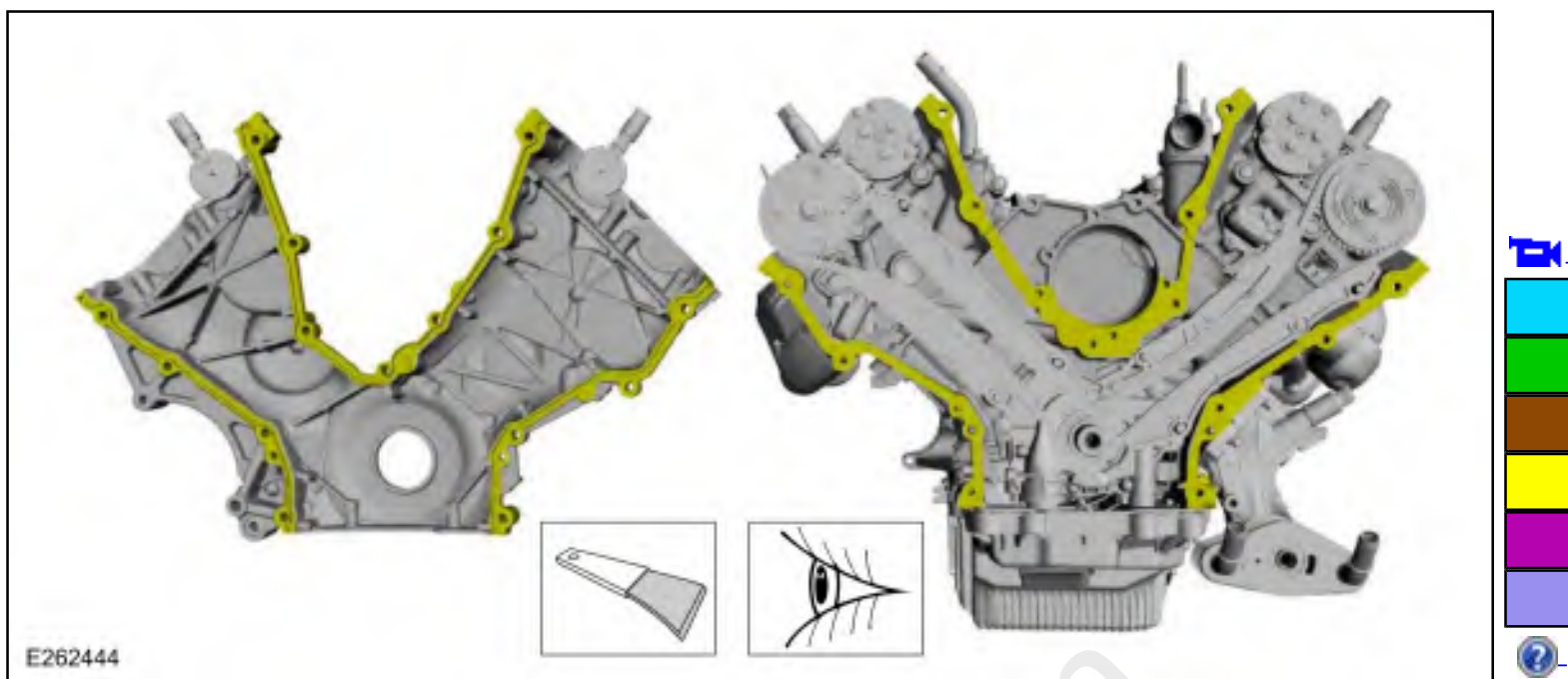
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

Use the General Equipment: Plastic Scraper

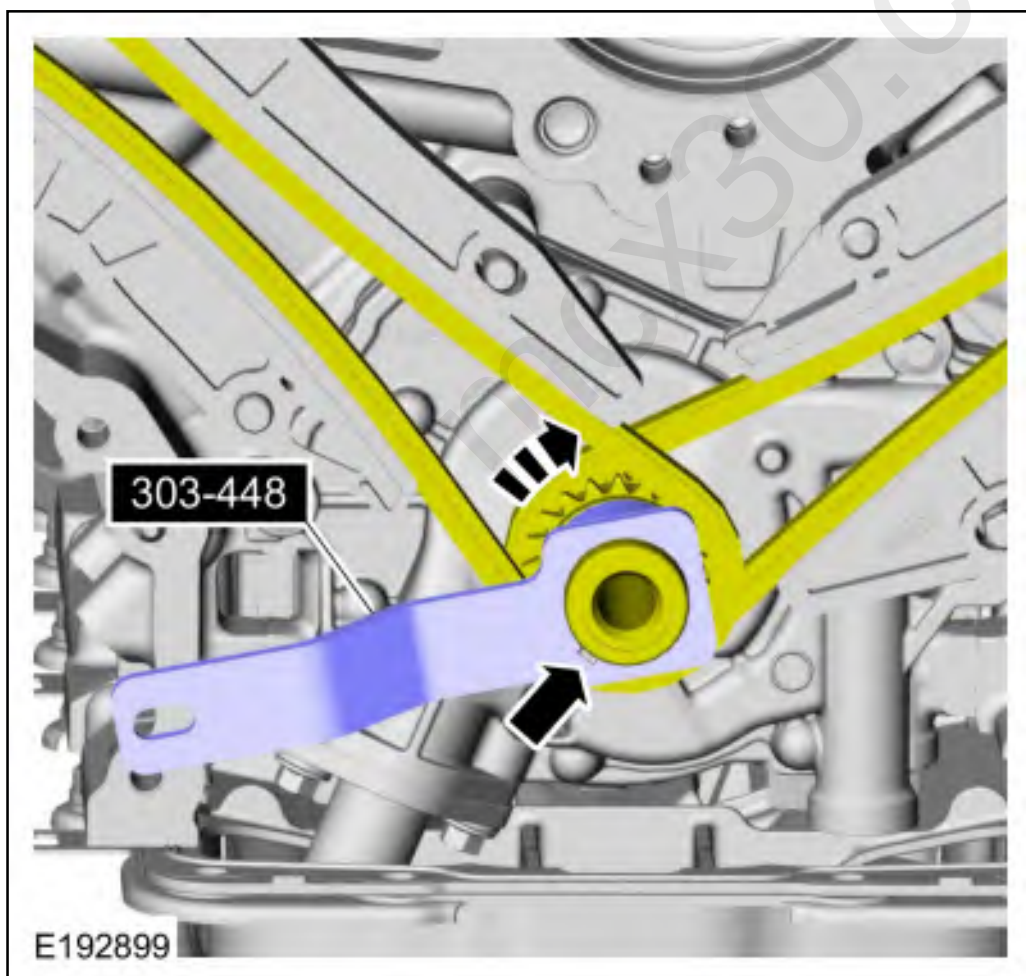
Material: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material: Motorcraft® Metal Brake Parts Cleaner / PM-4-A, PM-4-B

Material: Motorcraft® Metal Surface Prep Wipes / ZC-31-B

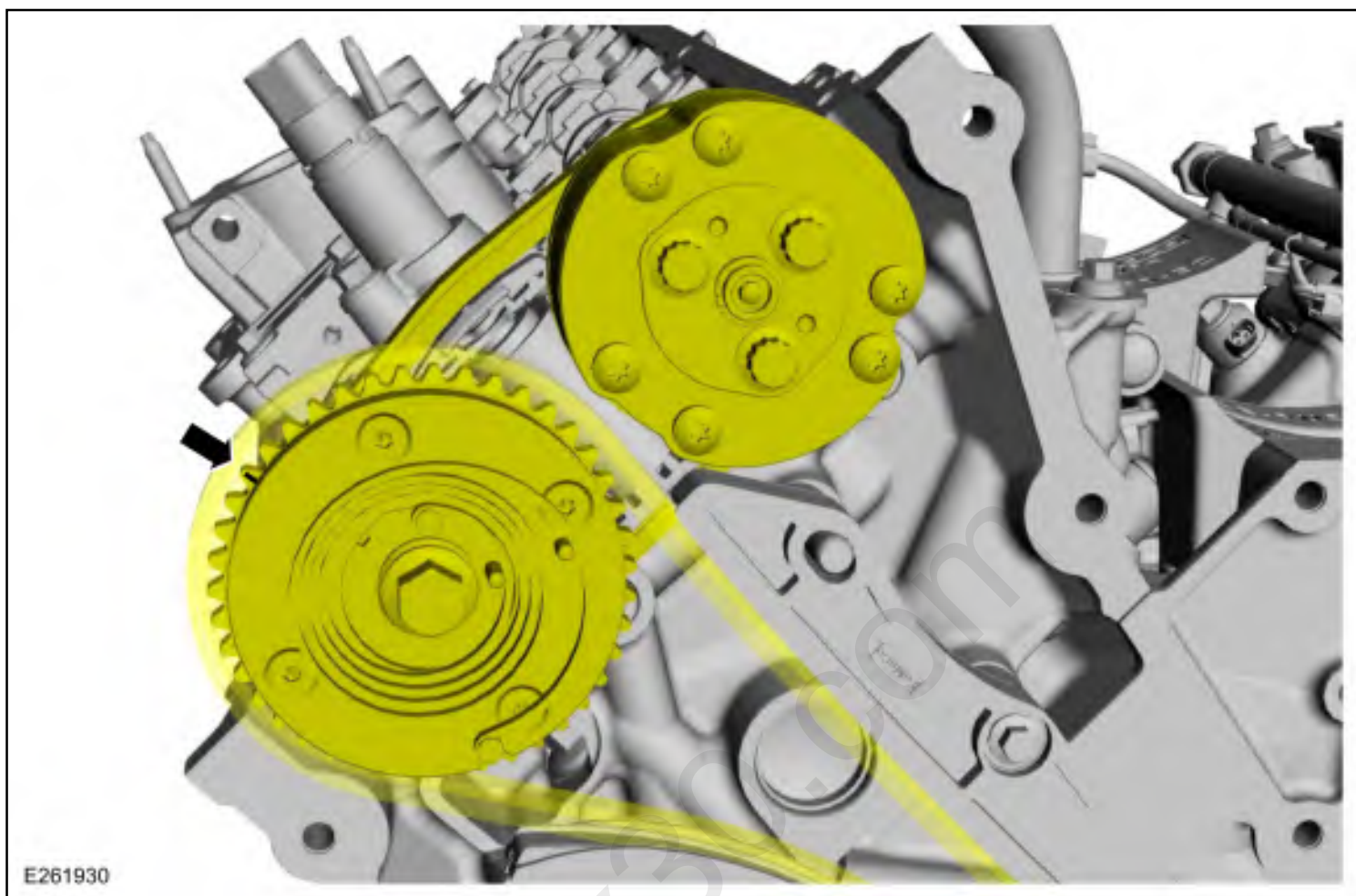


62. Using the special tool, rotate the crankshaft clockwise until the keyway is at the 7:30 position.
Use Special Service Tool: 303-448 (T93P-6303-A) Holding Tool, Crankshaft.

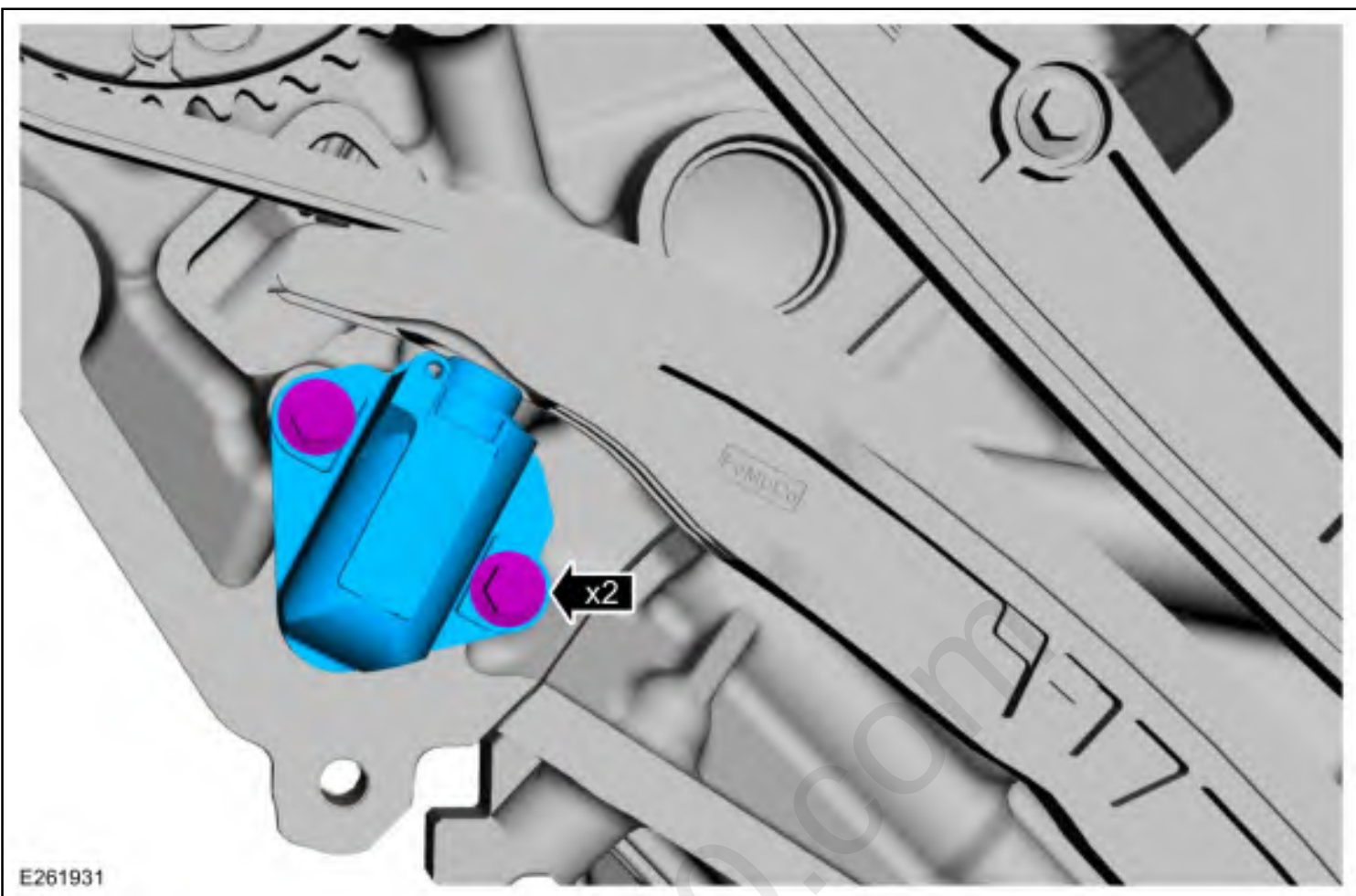


63. Verify the timing mark on the RH VCT unit is on top, if not, rotate the crankshaft clockwise one

complete revolution so the keyway is at the 7:30 position.

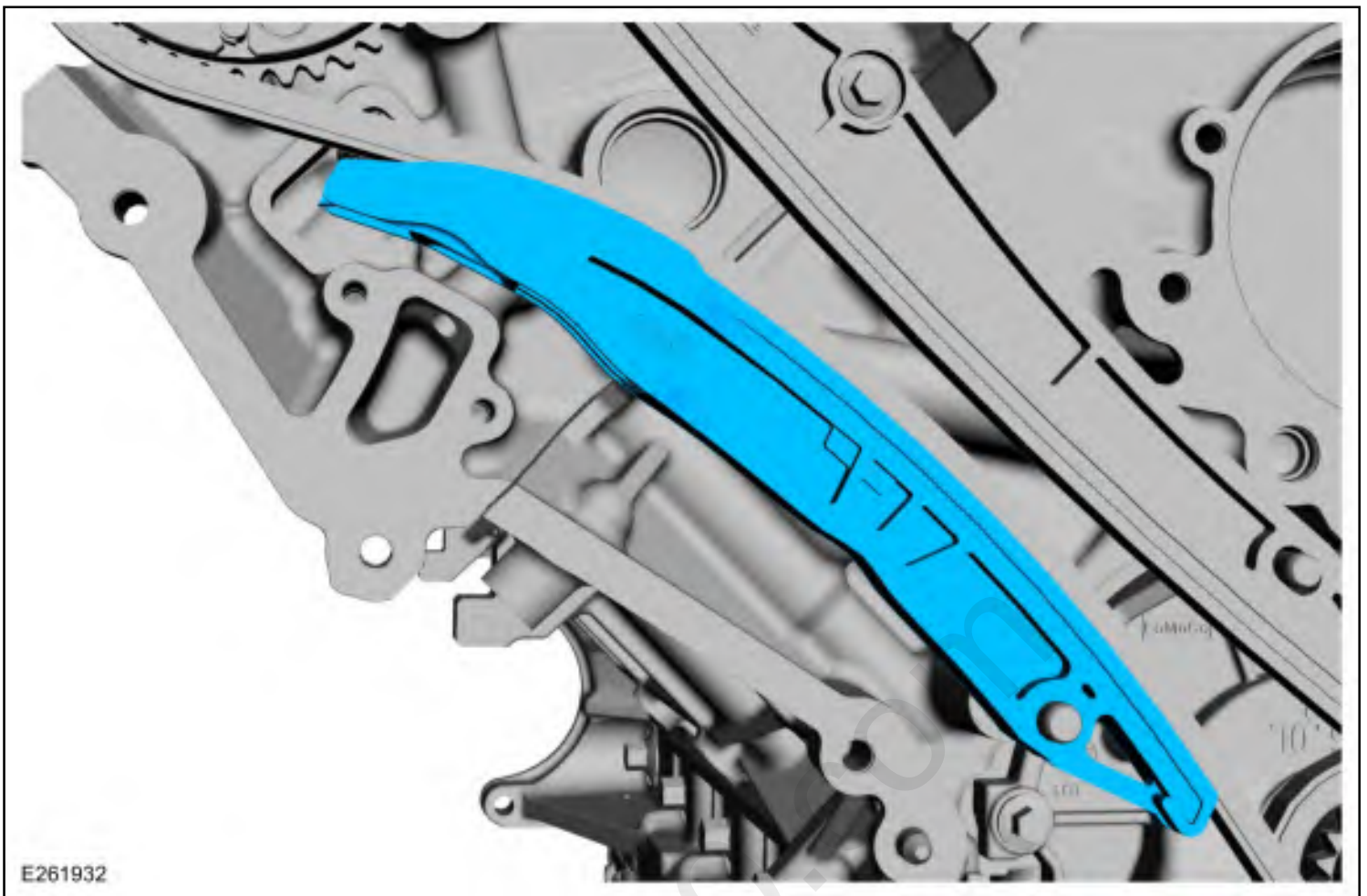


64. Remove the bolts and the RH primary timing chain tensioner.



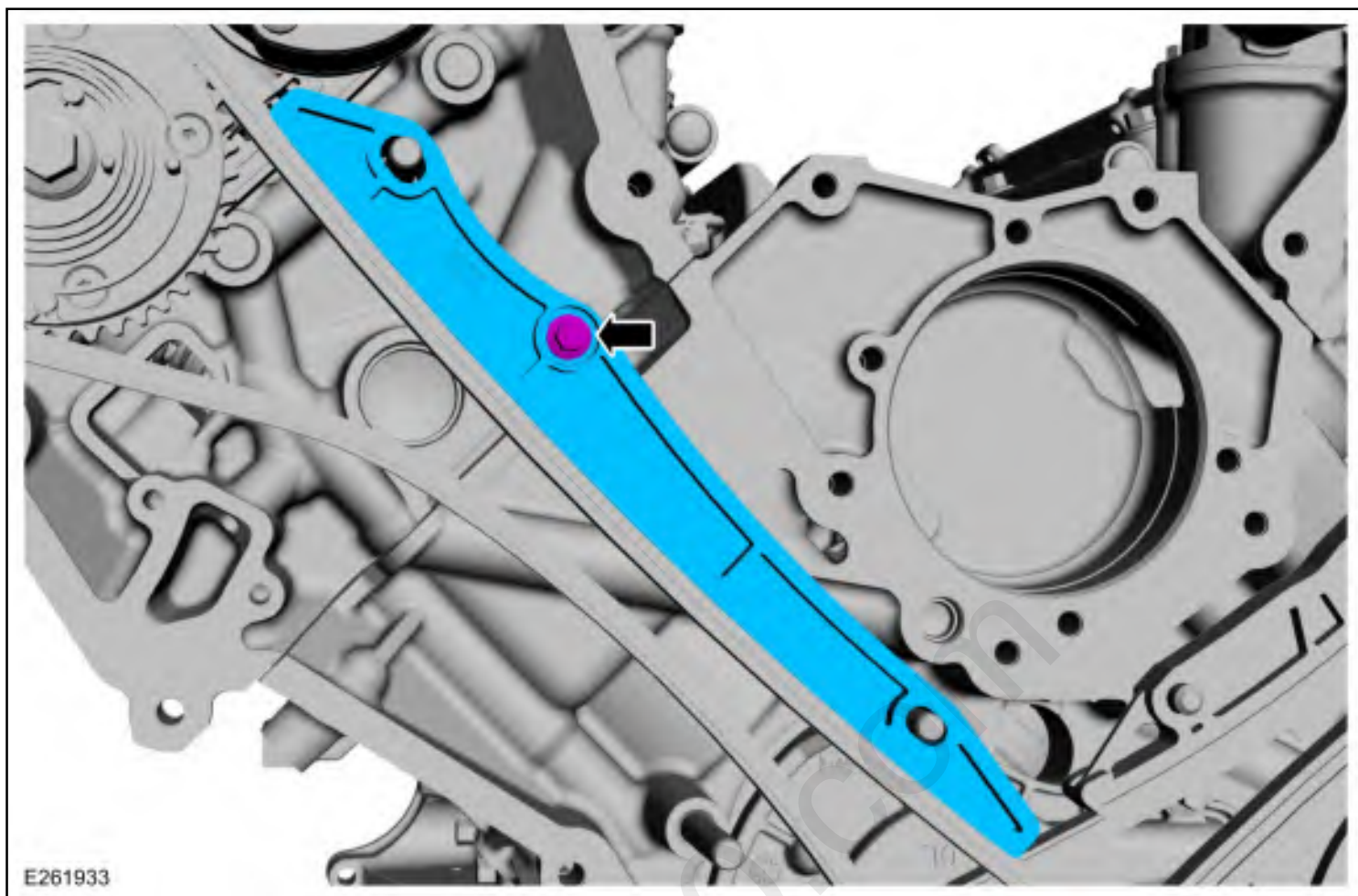
65. **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the RH timing chain tensioner arm. Return the crankshaft keyway to the 7:30 position after removing the RH timing chain tensioner arm.

Remove the RH timing chain tensioner arm.

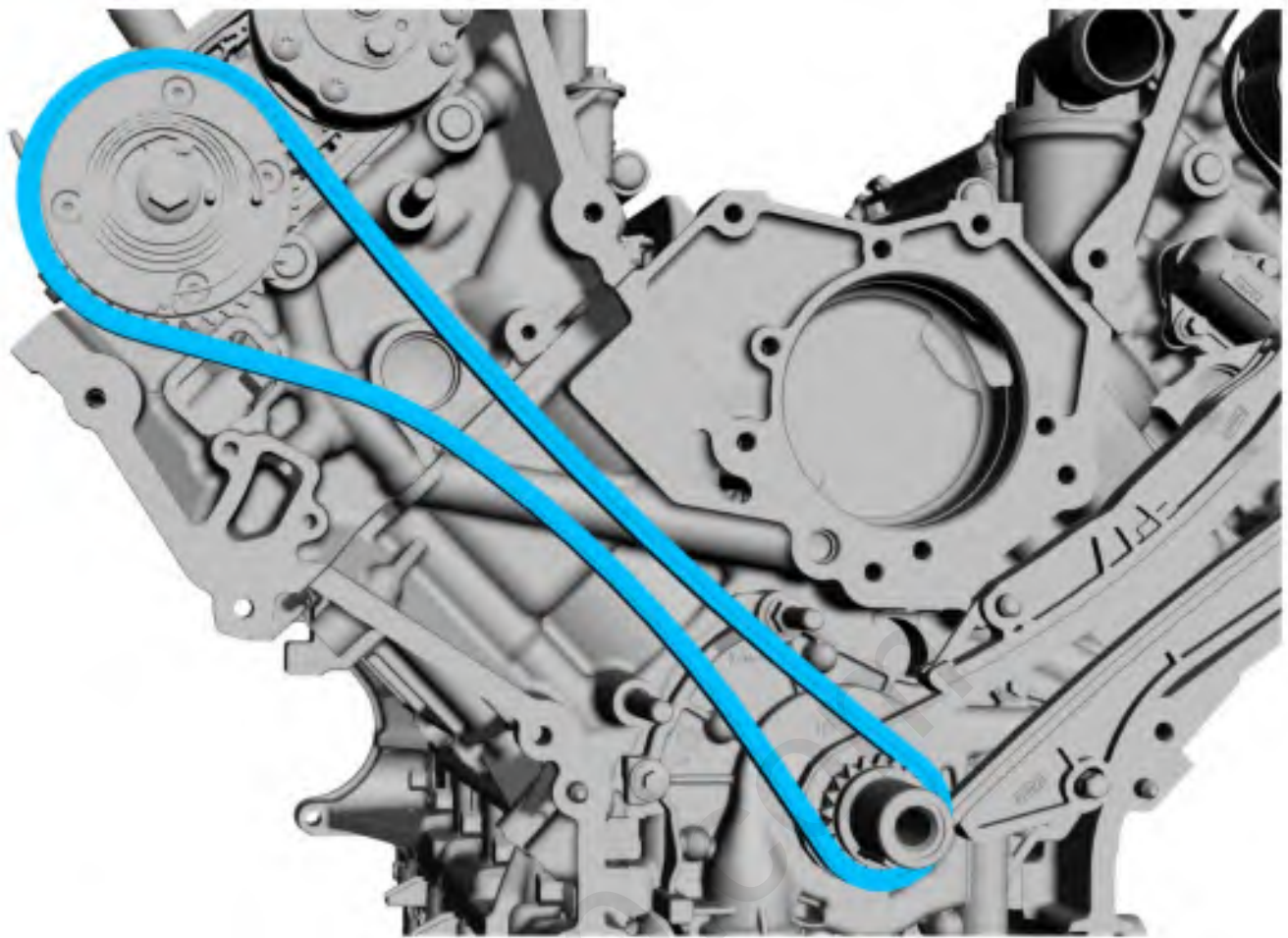


66. **NOTE:** *It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the RH timing chain guide. Return the crankshaft keyway to the 7:30 position after removing the RH timing chain guide.*

Remove the bolt and the RH timing chain guide.

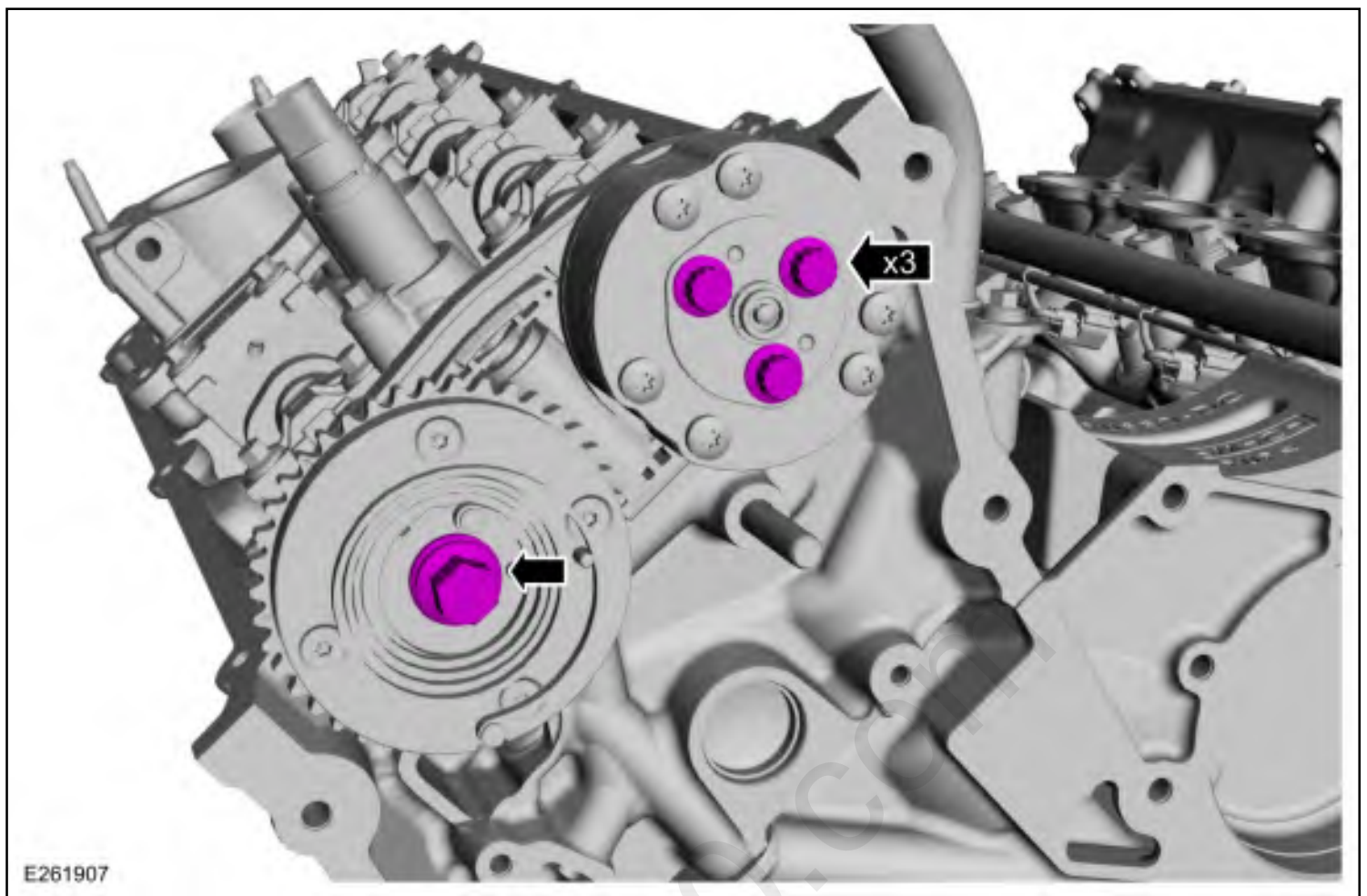


67. Remove the RH timing chain.

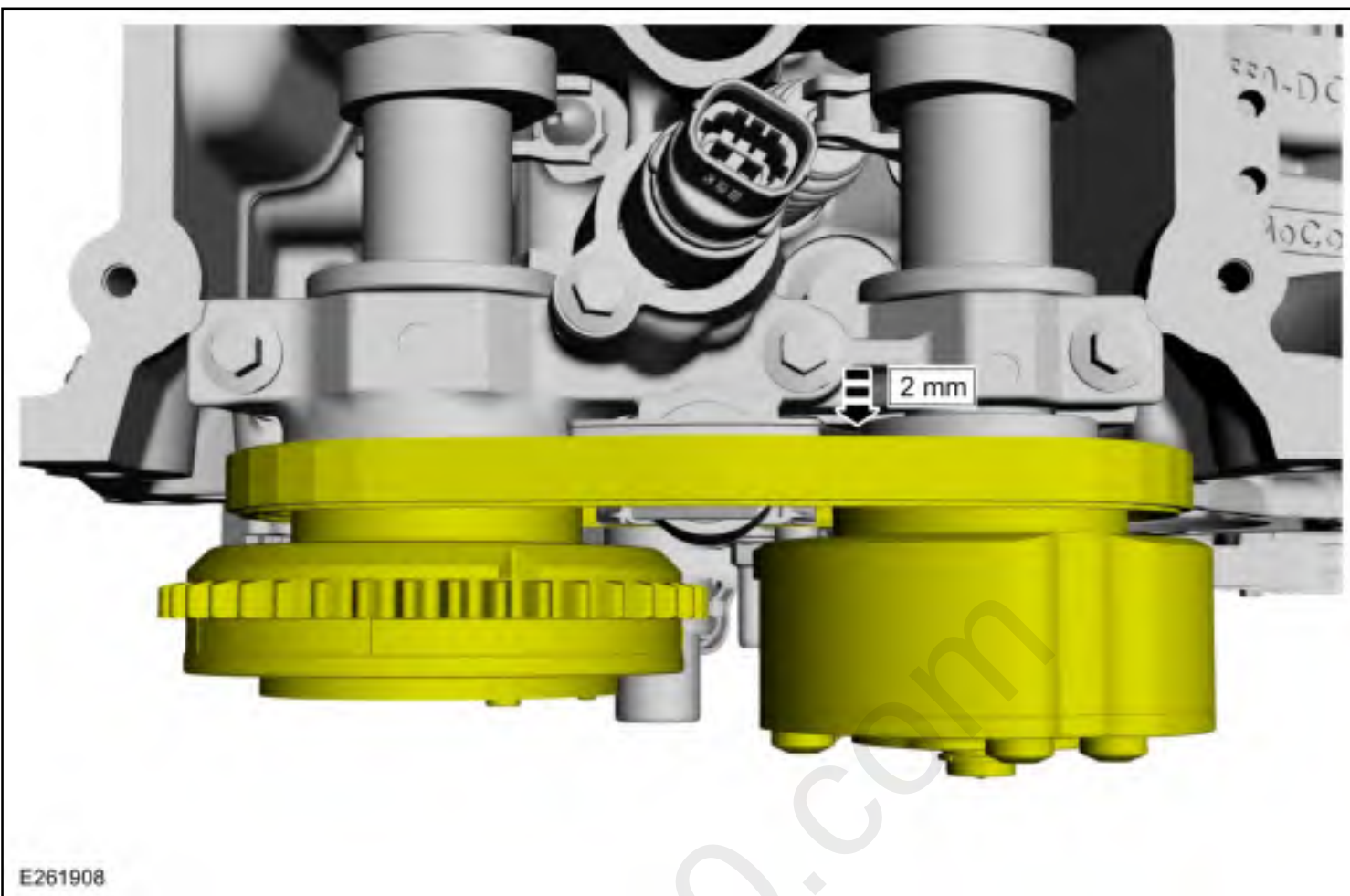


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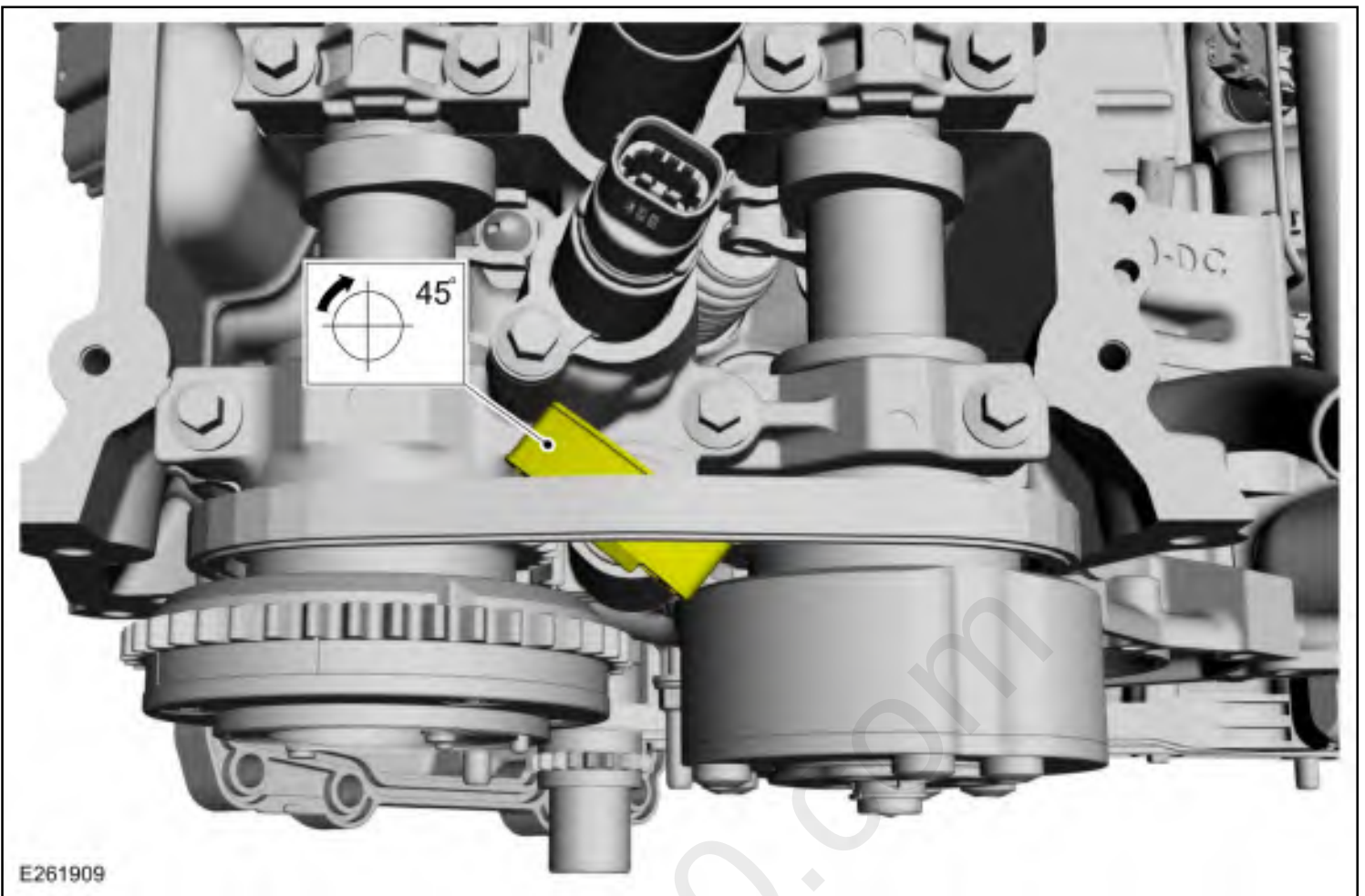
68. Remove the intake and exhaust VCT assembly bolts.



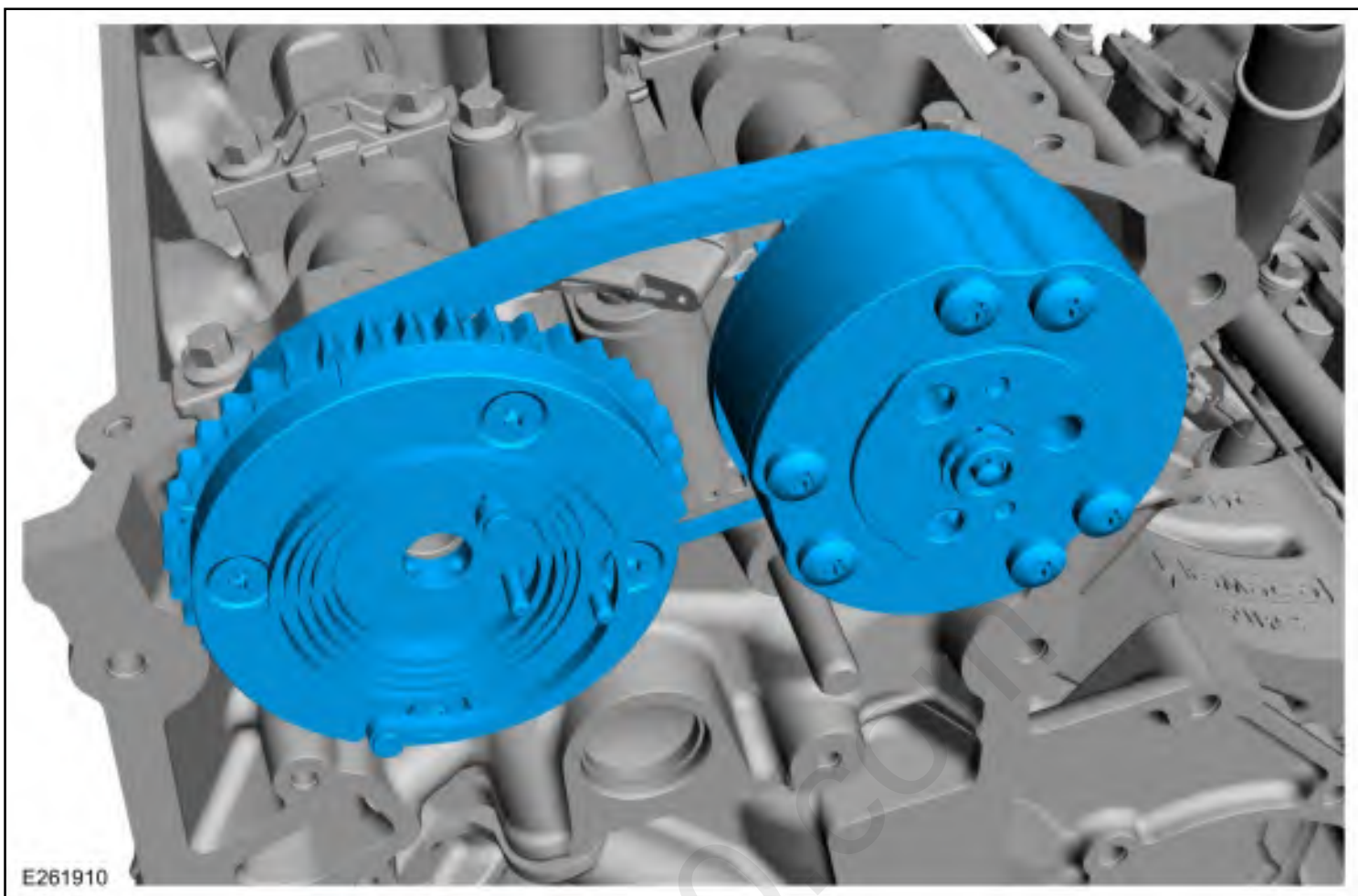
69. Slide the VCT assemblies and secondary timing chain forward 2 mm (0.078 in).



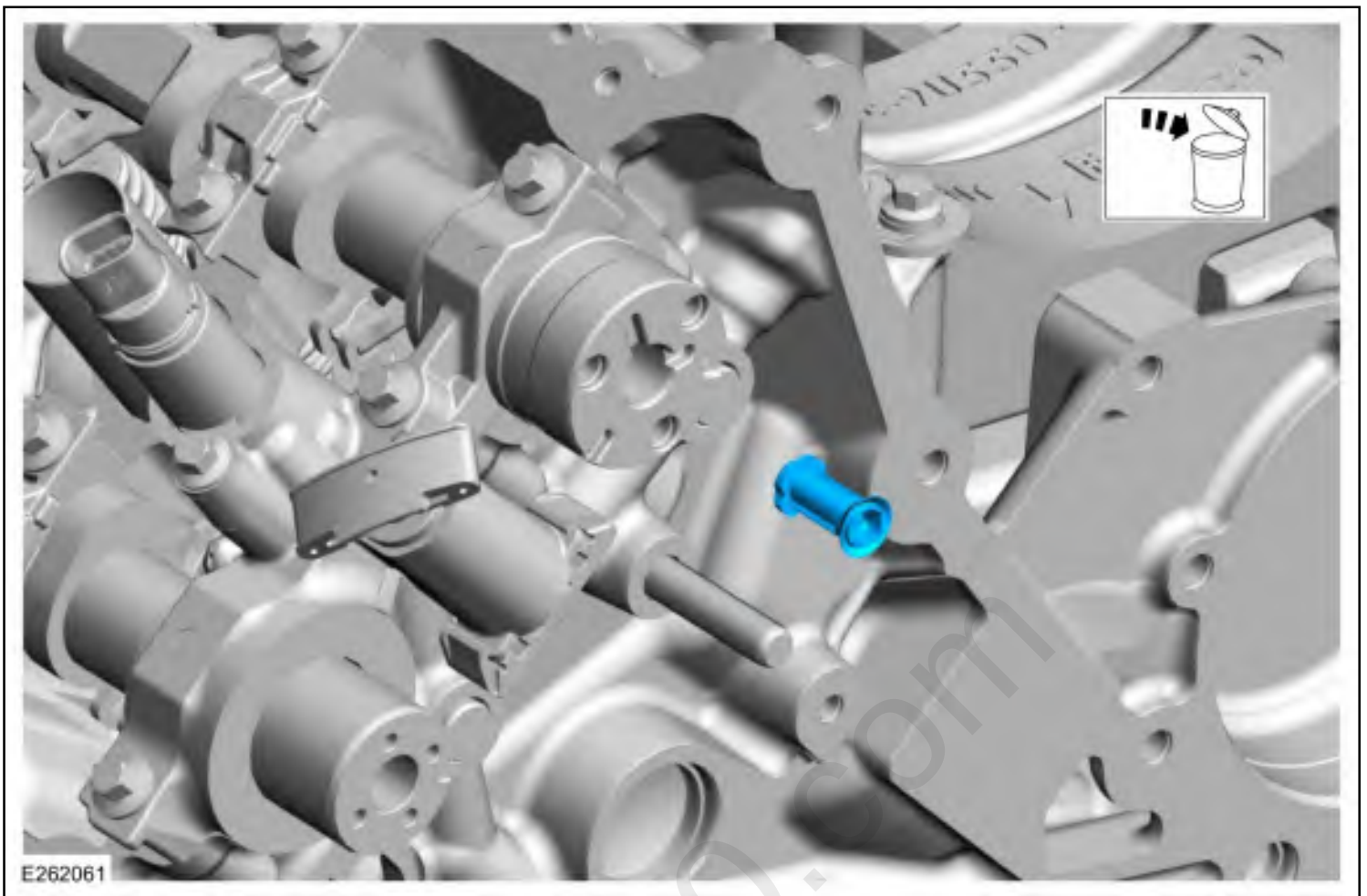
70. Depress and turn the secondary tensioner clockwise 45 degrees.



71. Remove the VCT assemblies and the secondary timing chain.

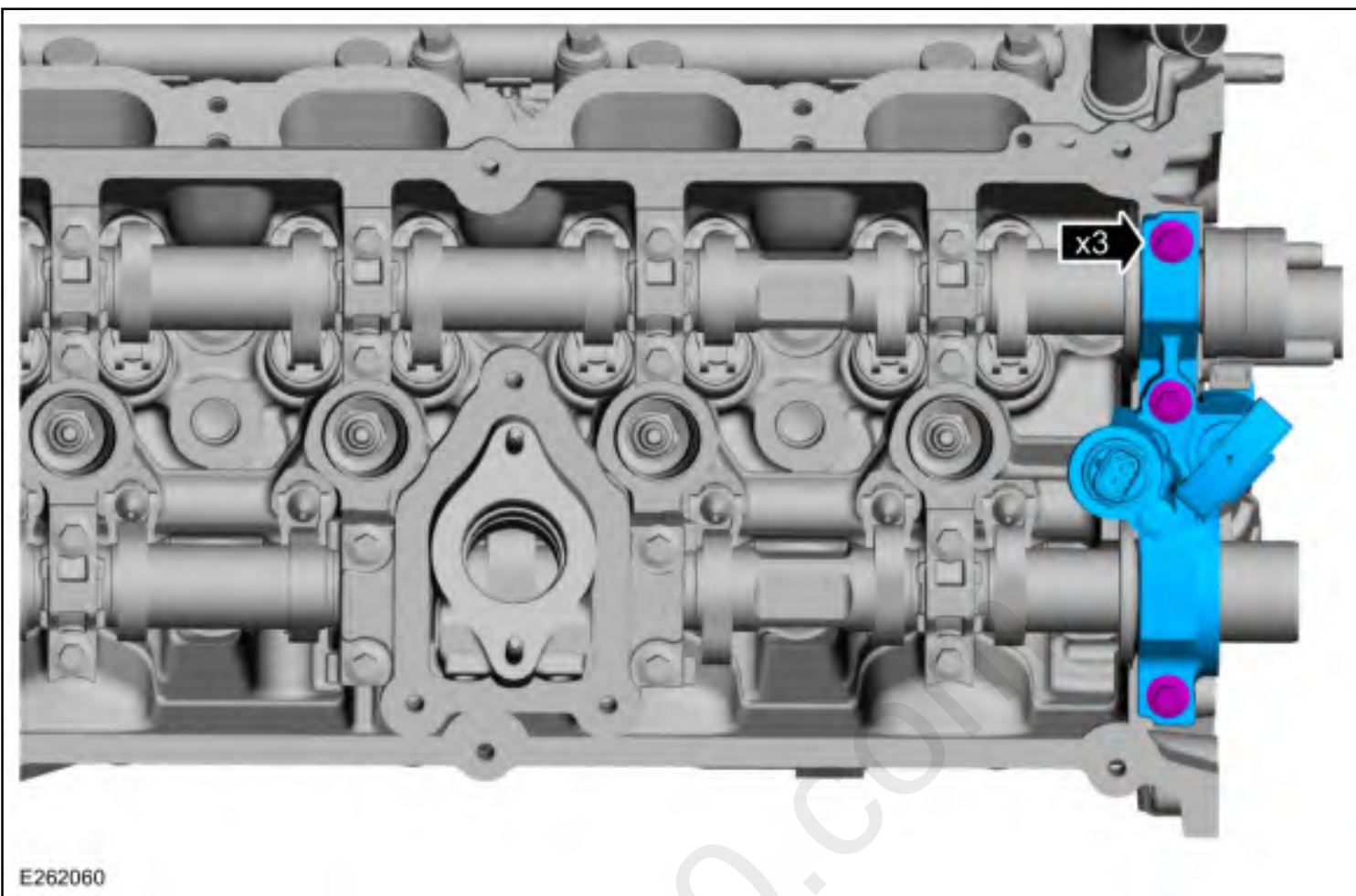


72. Remove and discard the VCT system oil filter.

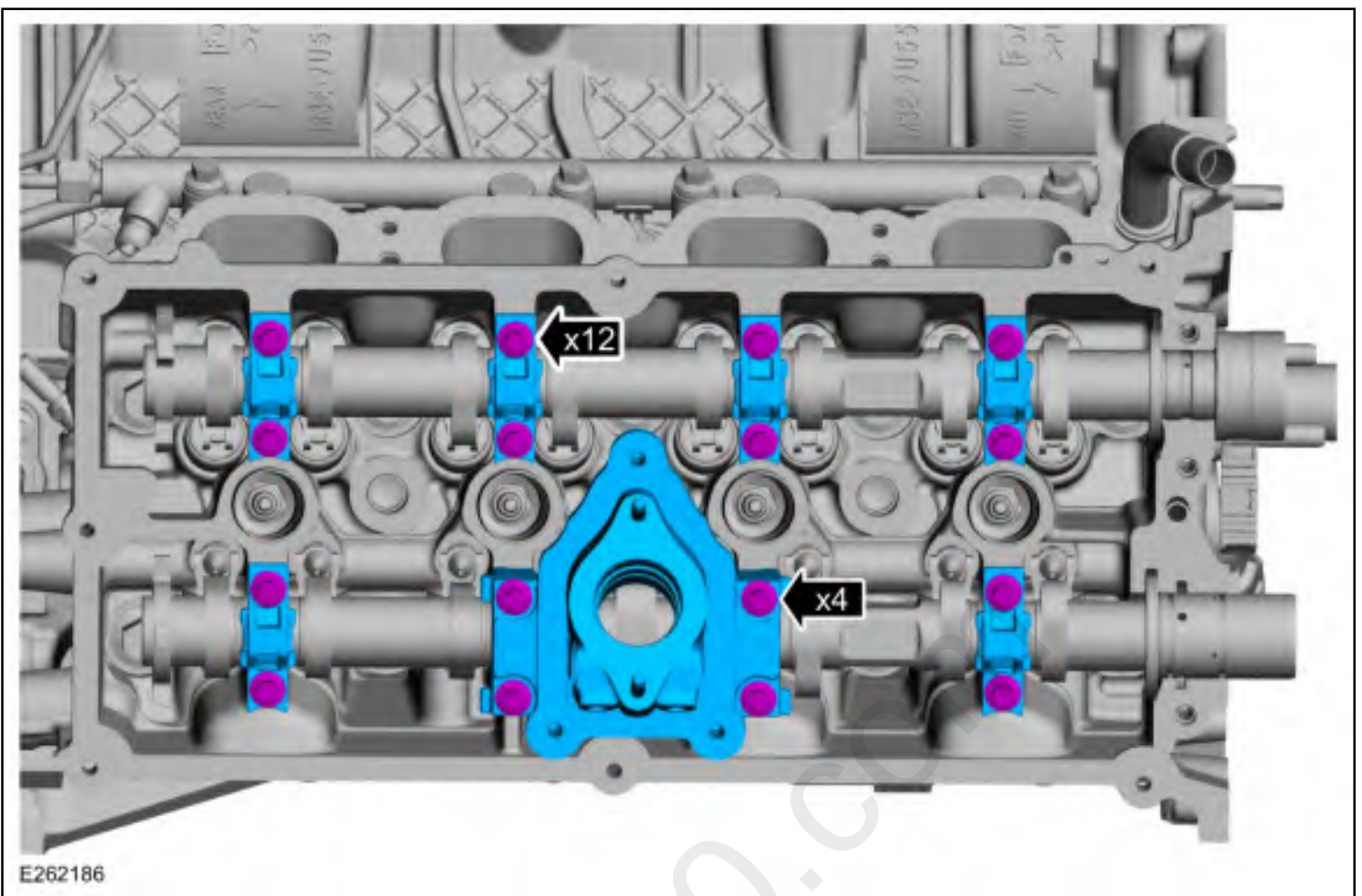


73. **NOTICE:** The front camshaft bearing mega cap must be removed first and then the remaining camshaft bearing caps. Failure to follow this direction may result in damage to the engine.

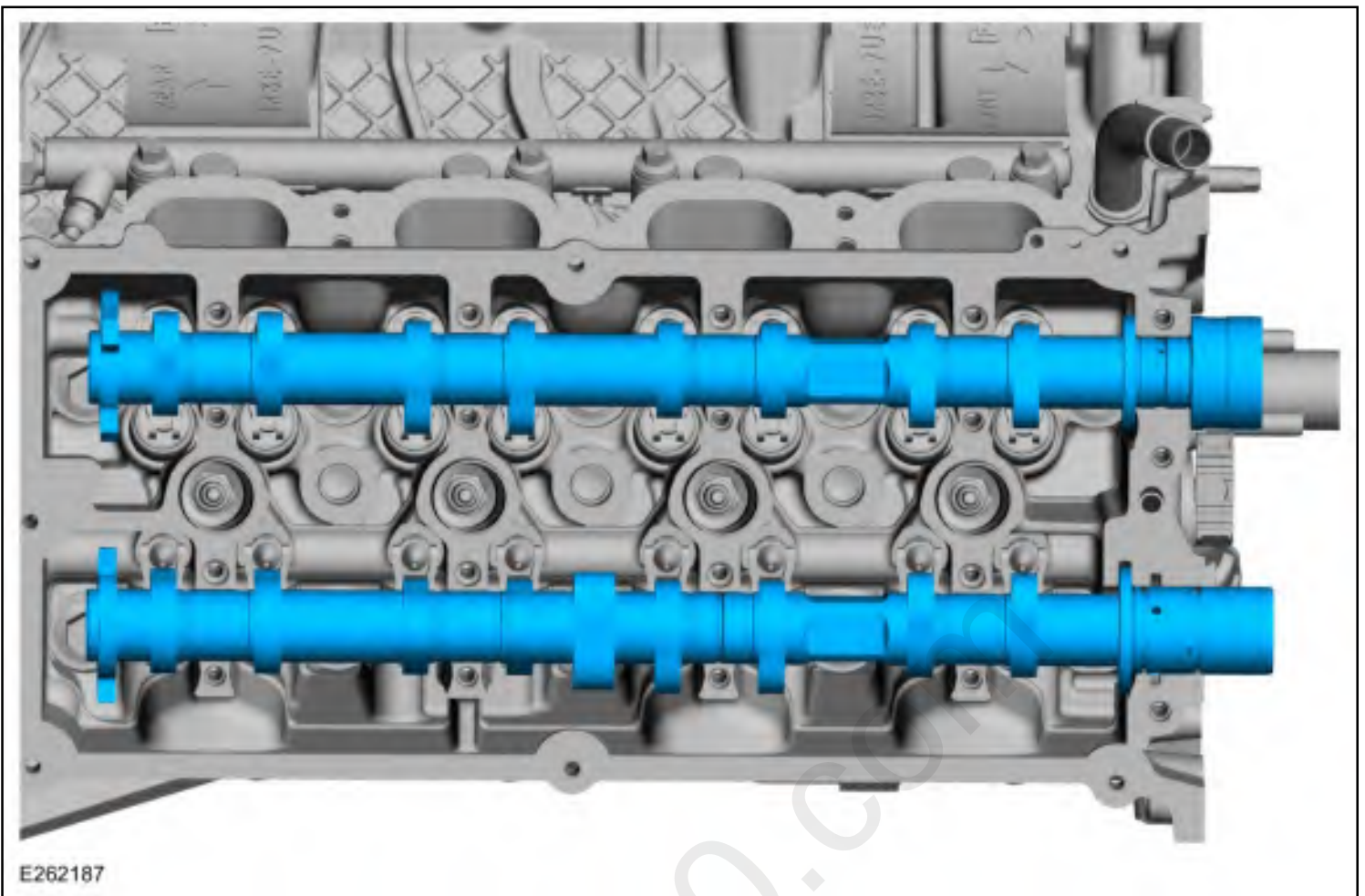
Remove the bolts and the front camshaft bearing mega cap.



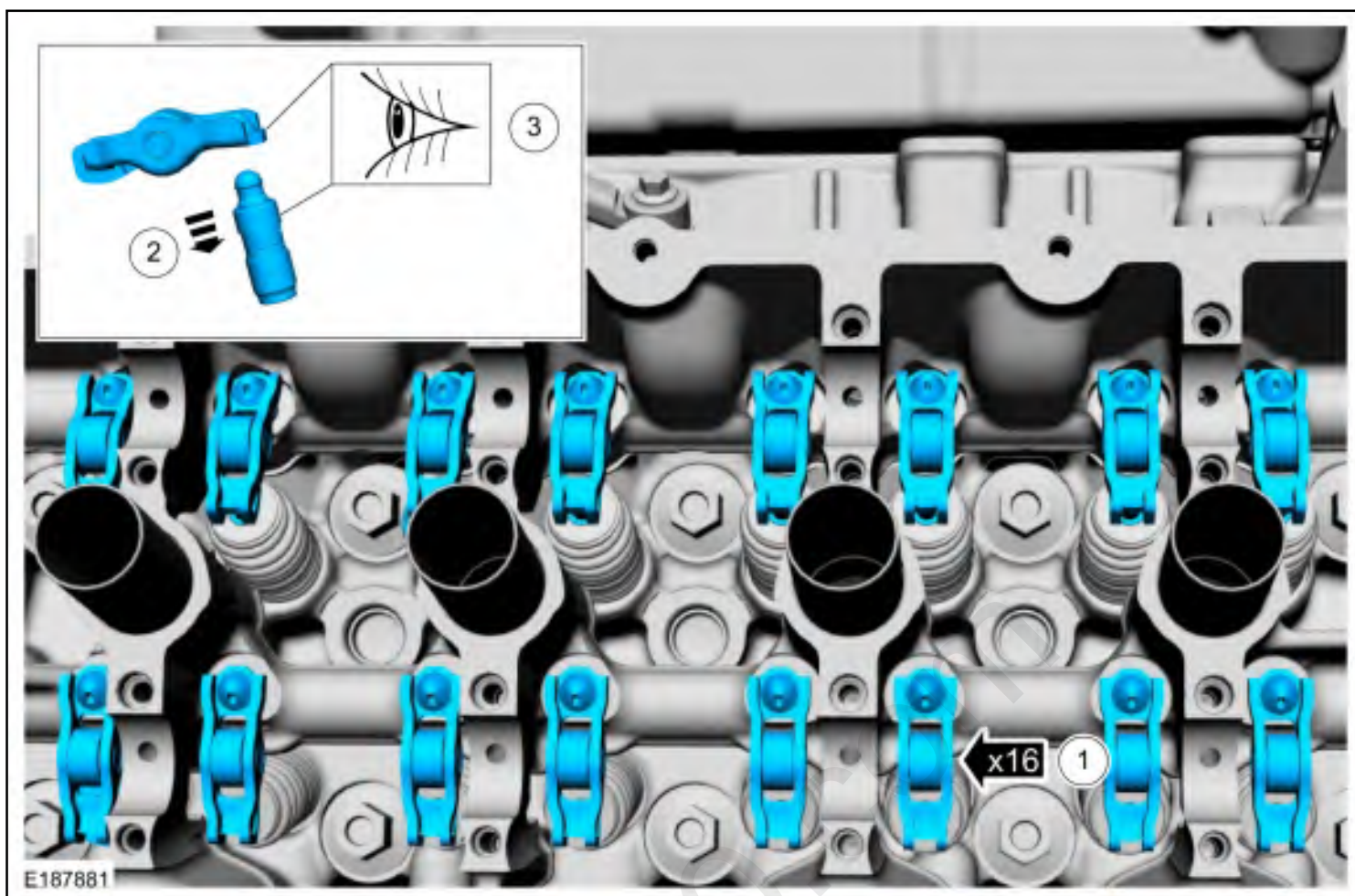
74. Remove the bolts and the camshaft bearing caps.



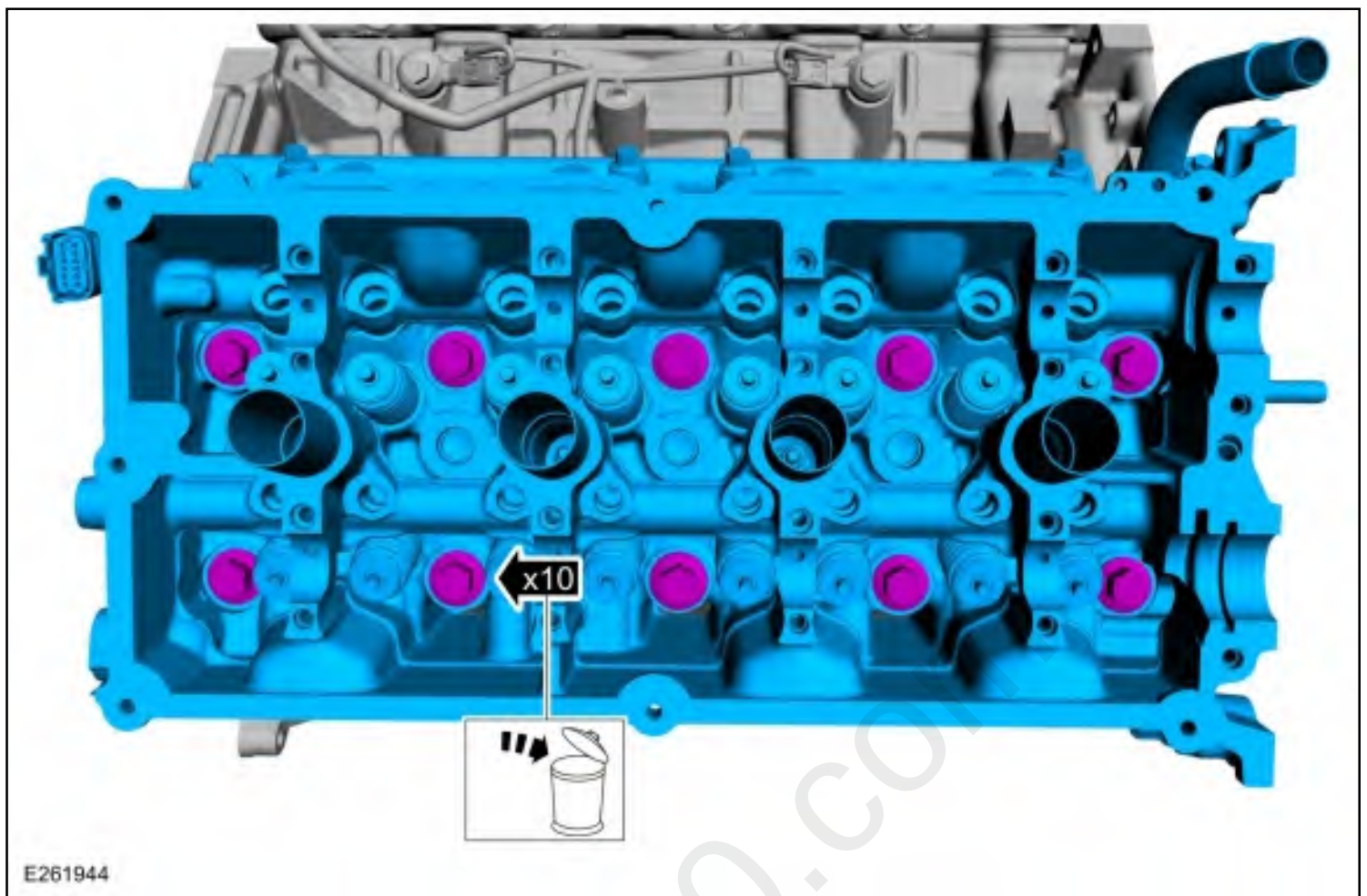
75. Remove the intake and exhaust camshafts.



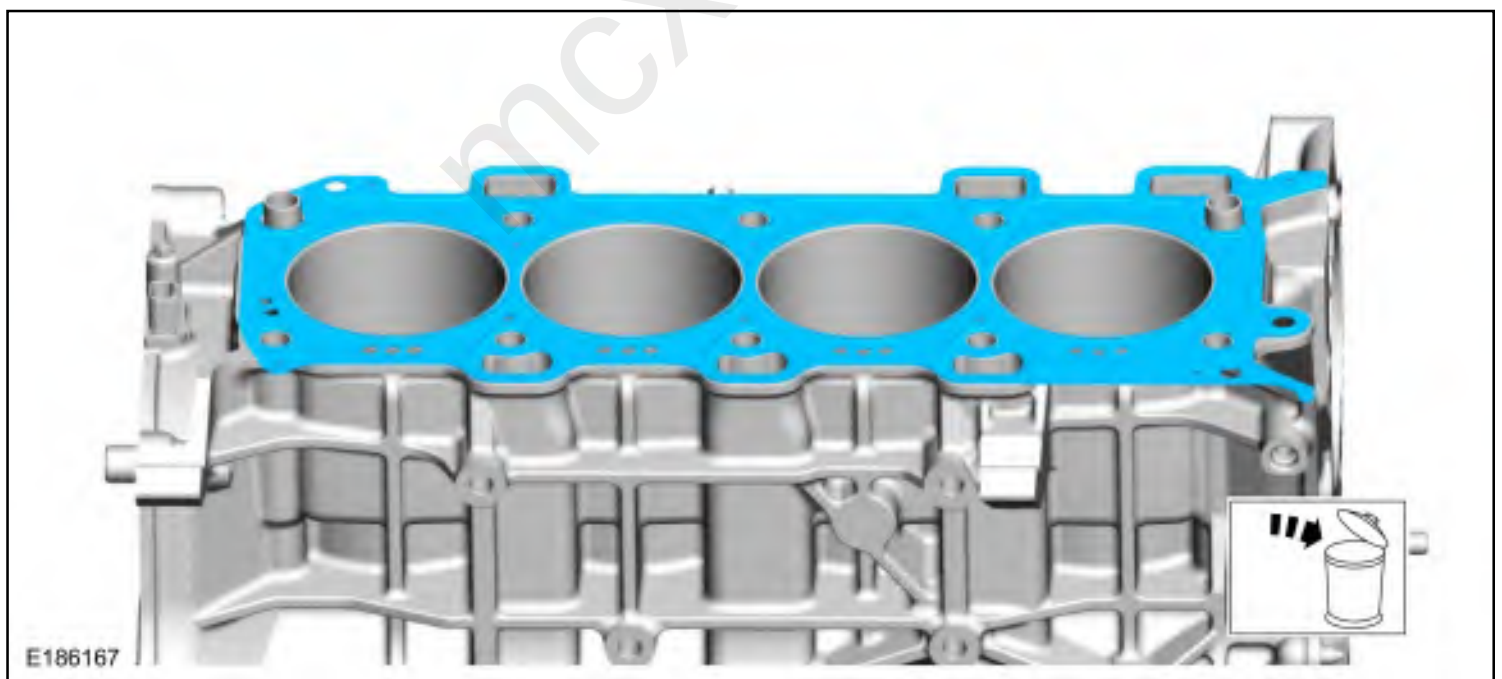
1. Remove the camshaft roller follower and hydraulic lash adjuster assemblies.
2. Separate the hydraulic lash adjusters from the spring clips on the camshaft roller followers.
3. Inspect the hydraulic lash adjuster and roller follower for damage. If any damage is found, inspect the camshaft lobes and valves for damage. Replace damaged components as necessary.



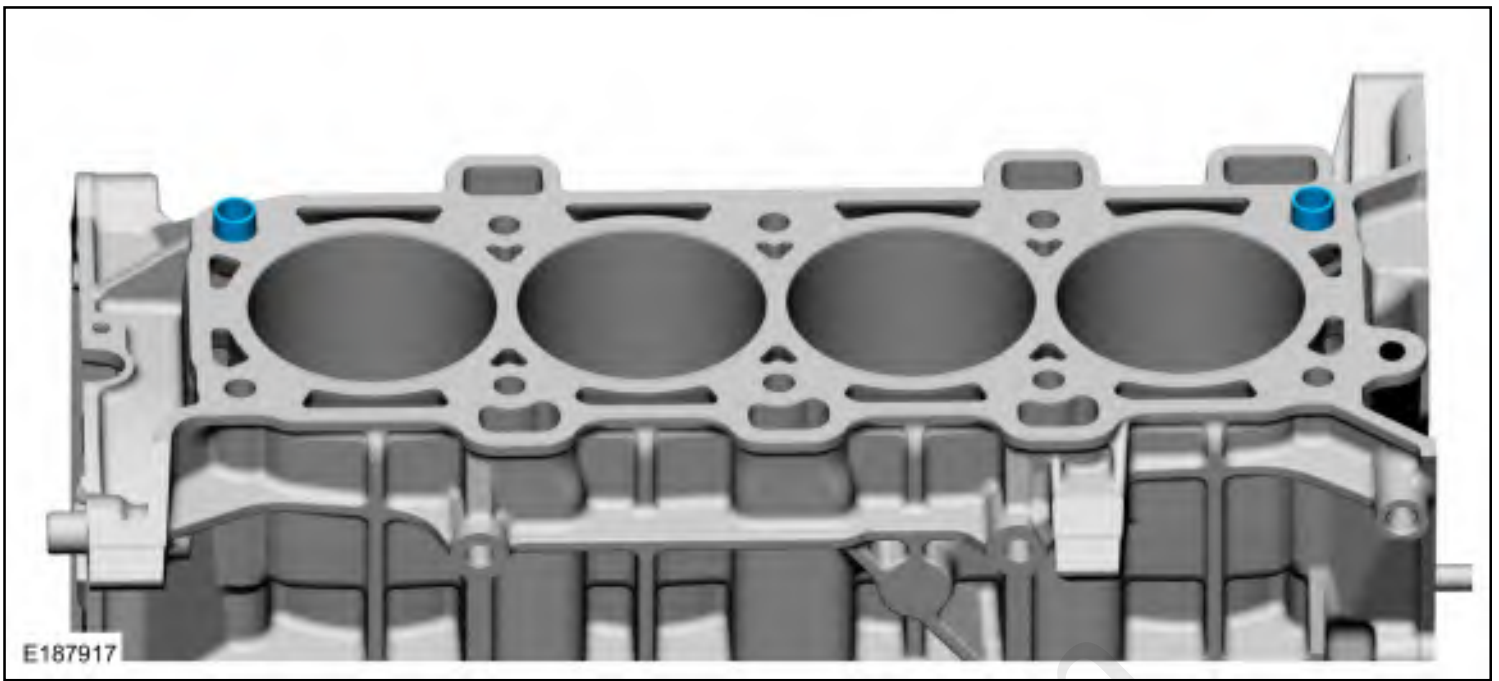
- Remove and discard the bolts.
- Remove the cylinder head.



78. Remove and discard the cylinder head gasket.



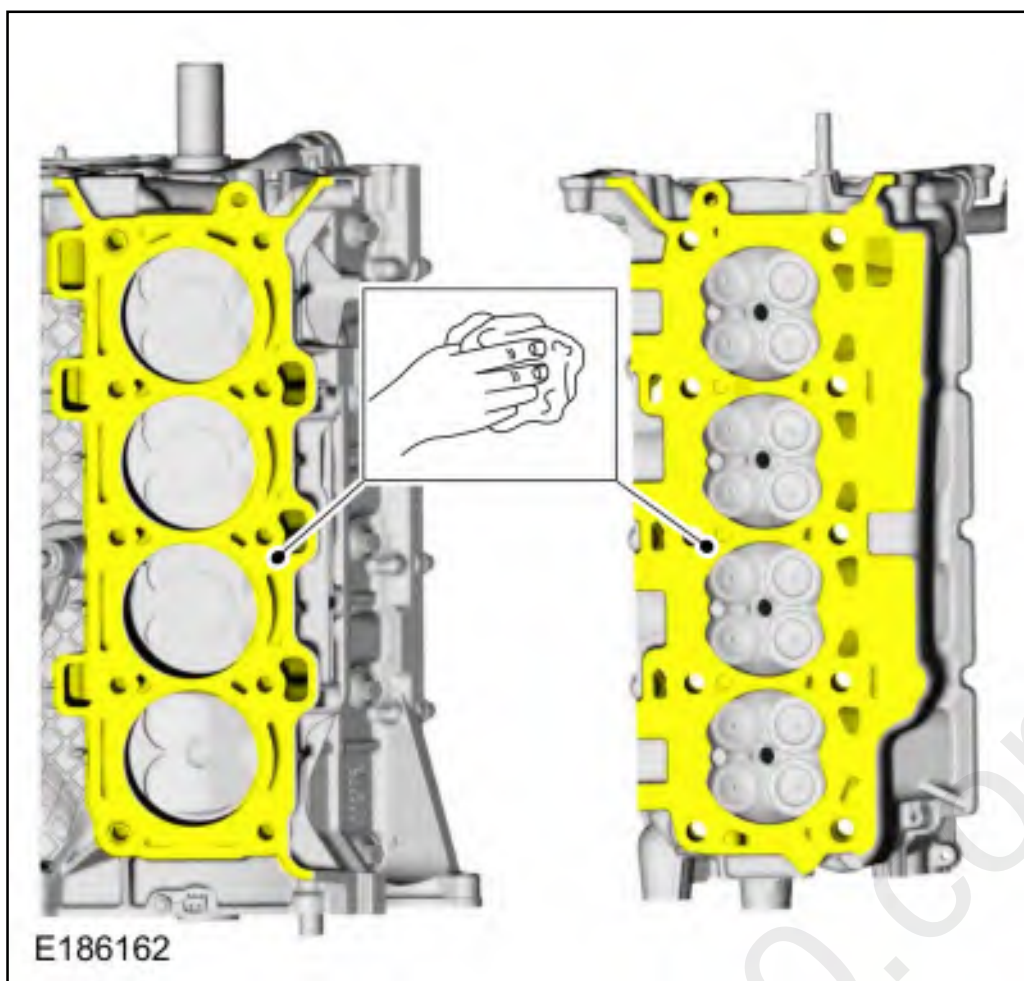
79. Remove the dowels.



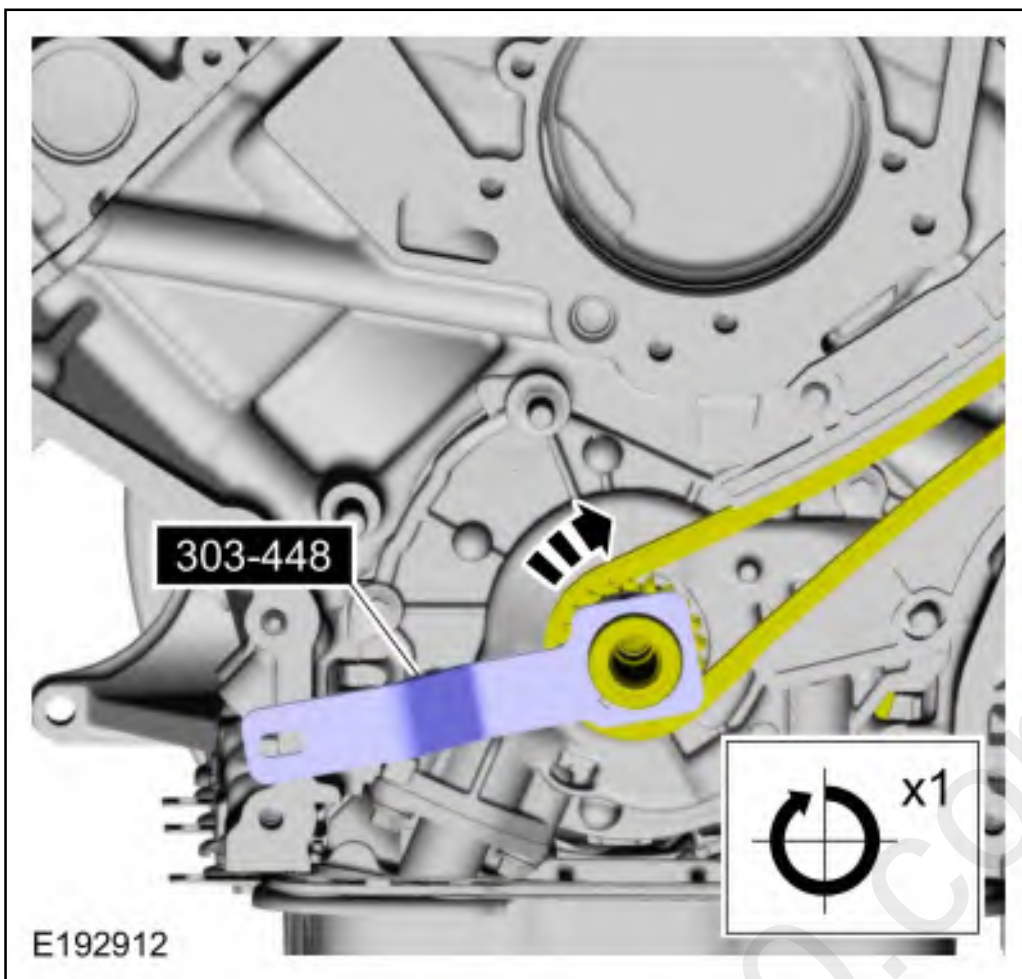
80. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

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

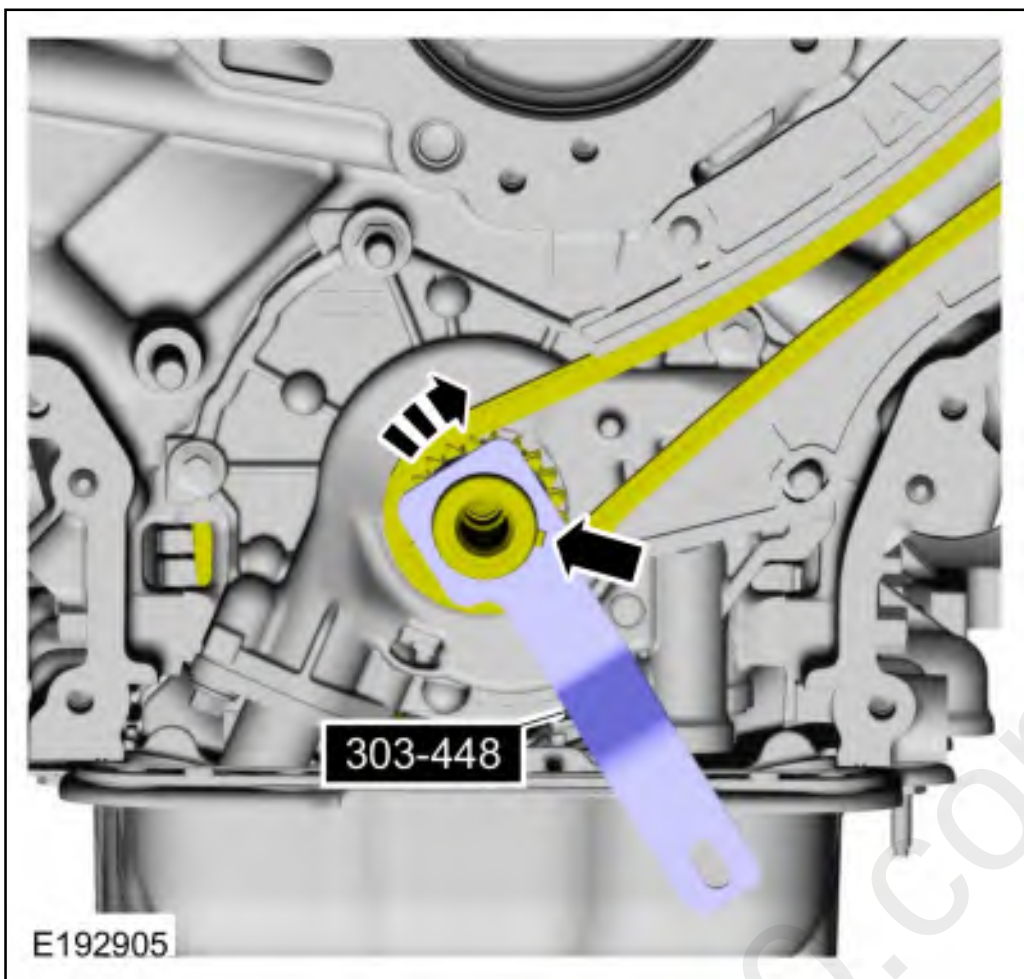
- Clean and inspect the cylinder head-to-cylinder block mating surfaces of both the cylinder head and the cylinder block
- Refer to: [Cylinder Head Distortion](#) (303-00 Engine System - General Information, General Procedures).
- Refer to: [Cylinder Block Distortion](#) (303-00 Engine System - General Information, General Procedures).



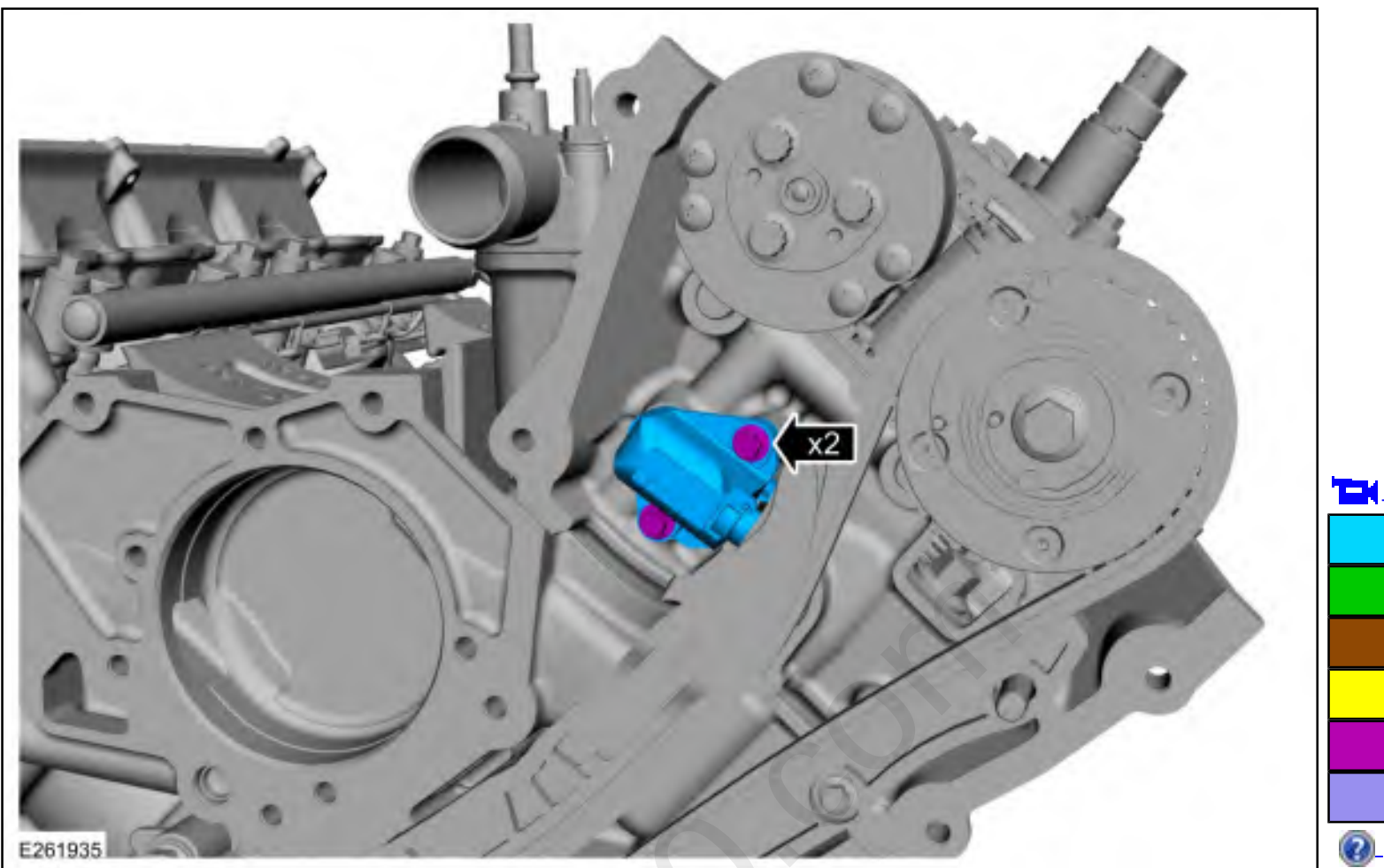
81. Using the special tool, rotate the crankshaft clockwise one complete revolution.
Use Special Service Tool: 303-448 (T93P-6303-A) Holding Tool, Crankshaft.



82. Using the special tool, rotate the crankshaft clockwise until the keyway is at the 3:30 position.
Use Special Service Tool: 303-448 (T93P-6303-A) Holding Tool, Crankshaft.

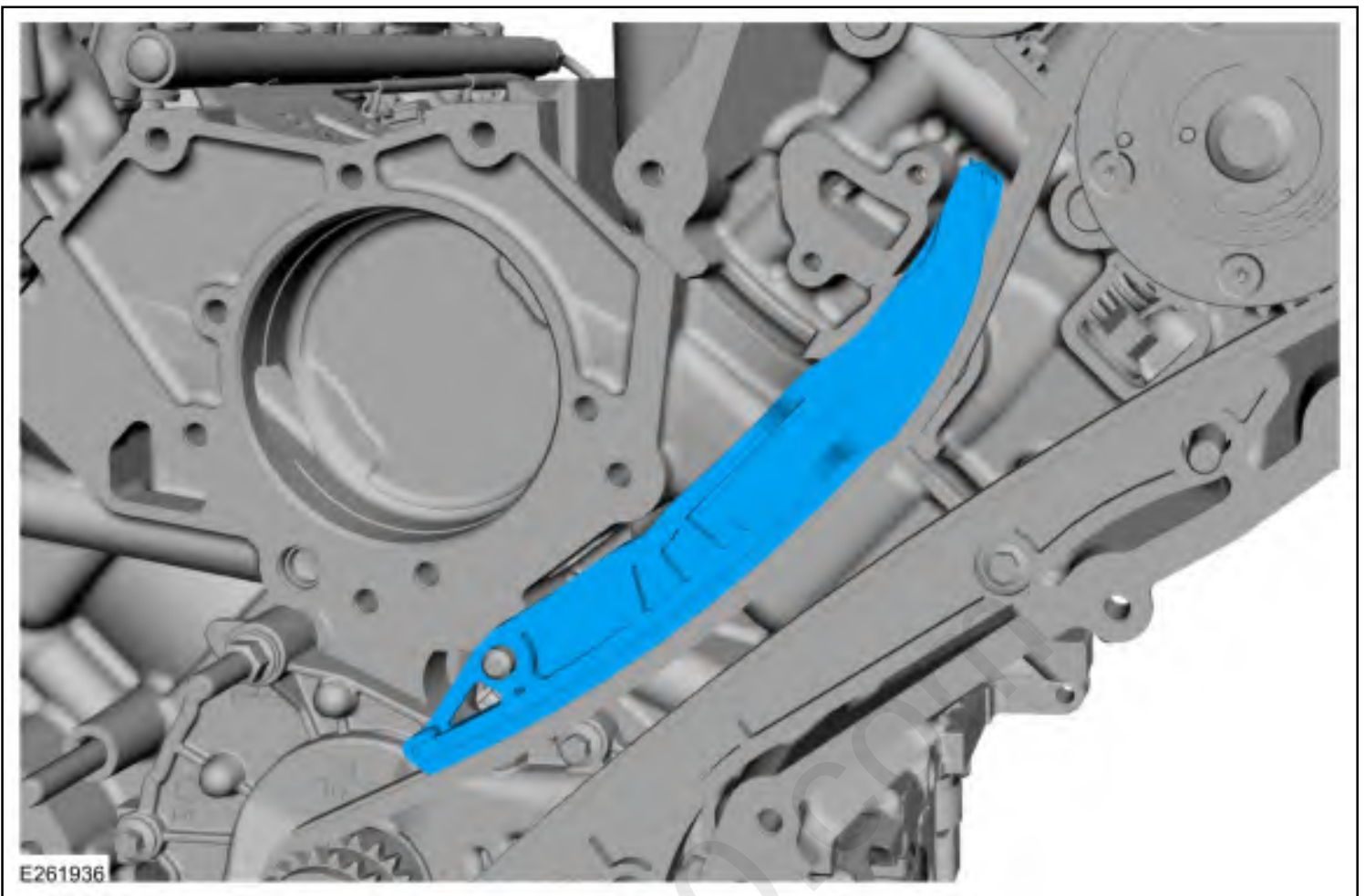


83. Remove the bolts and the LH primary timing chain tensioner.



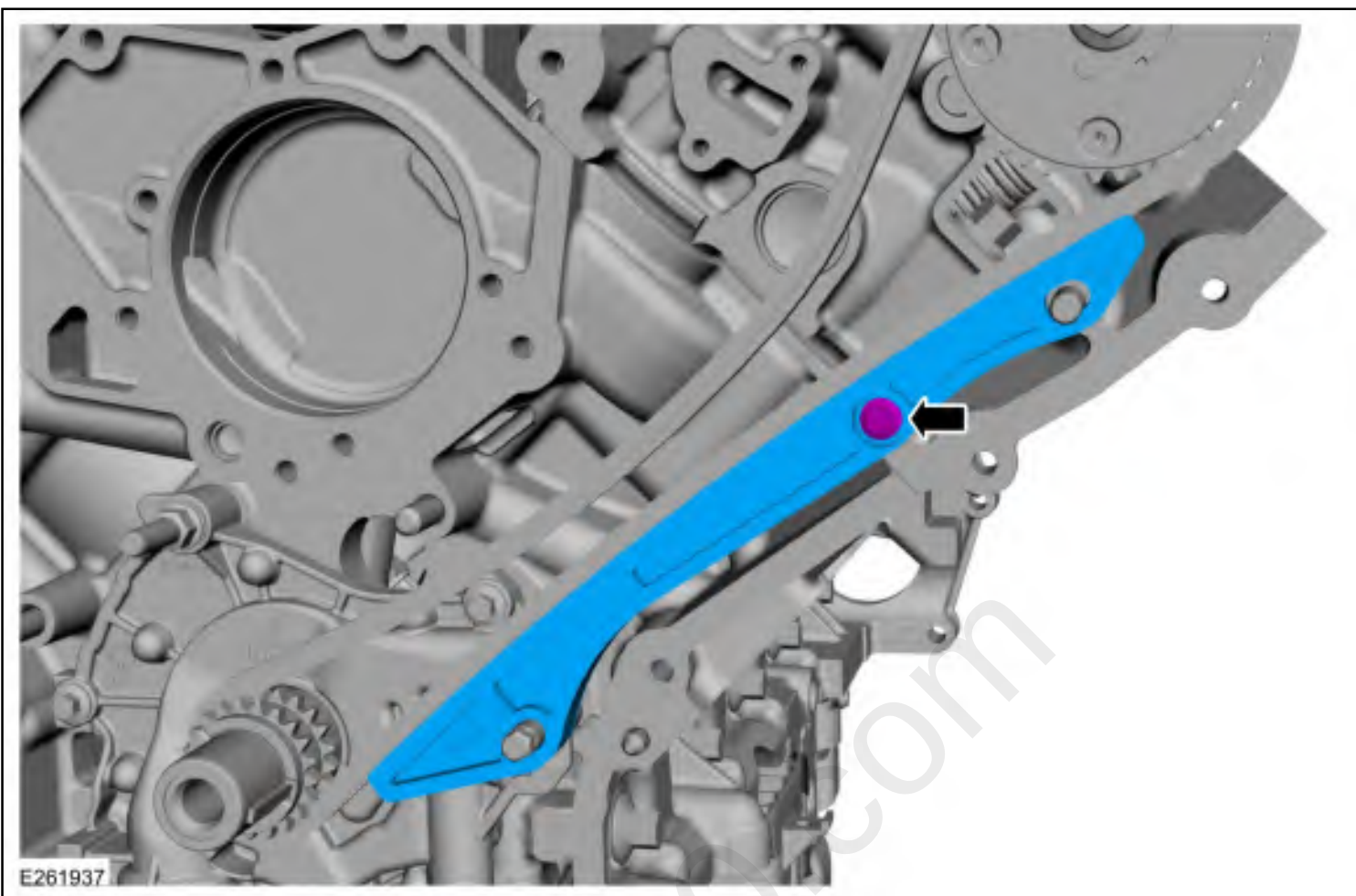
84. **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the LH timing chain tensioner arm. Return the crankshaft keyway to the 3:30 position after removing the LH timing chain tensioner arm.

Remove the LH timing chain tensioner arm.

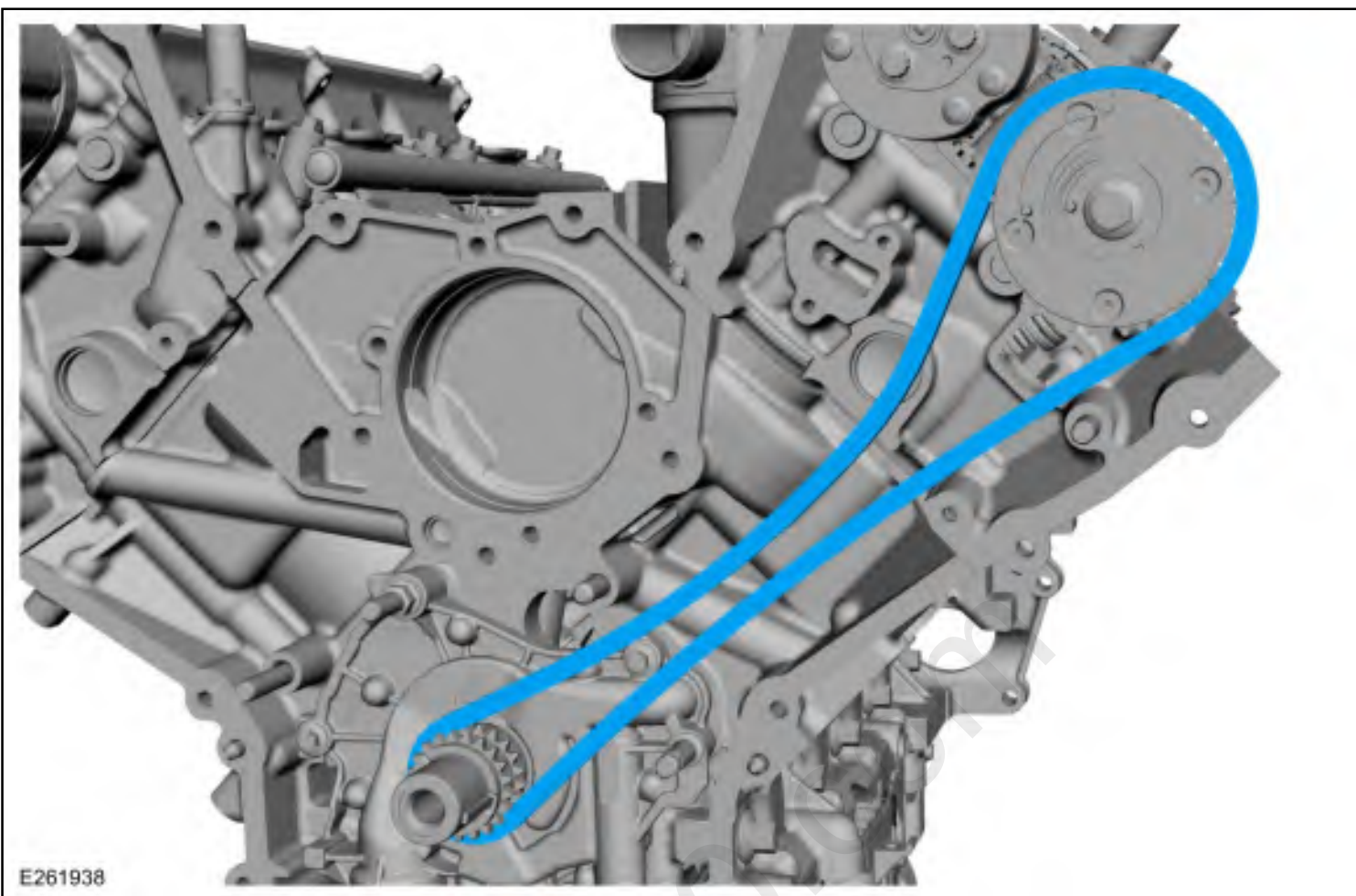


85. **NOTE:** *It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the LH timing chain guide. Return the crankshaft keyway to the 3:30 position after removing the LH timing chain guide.*

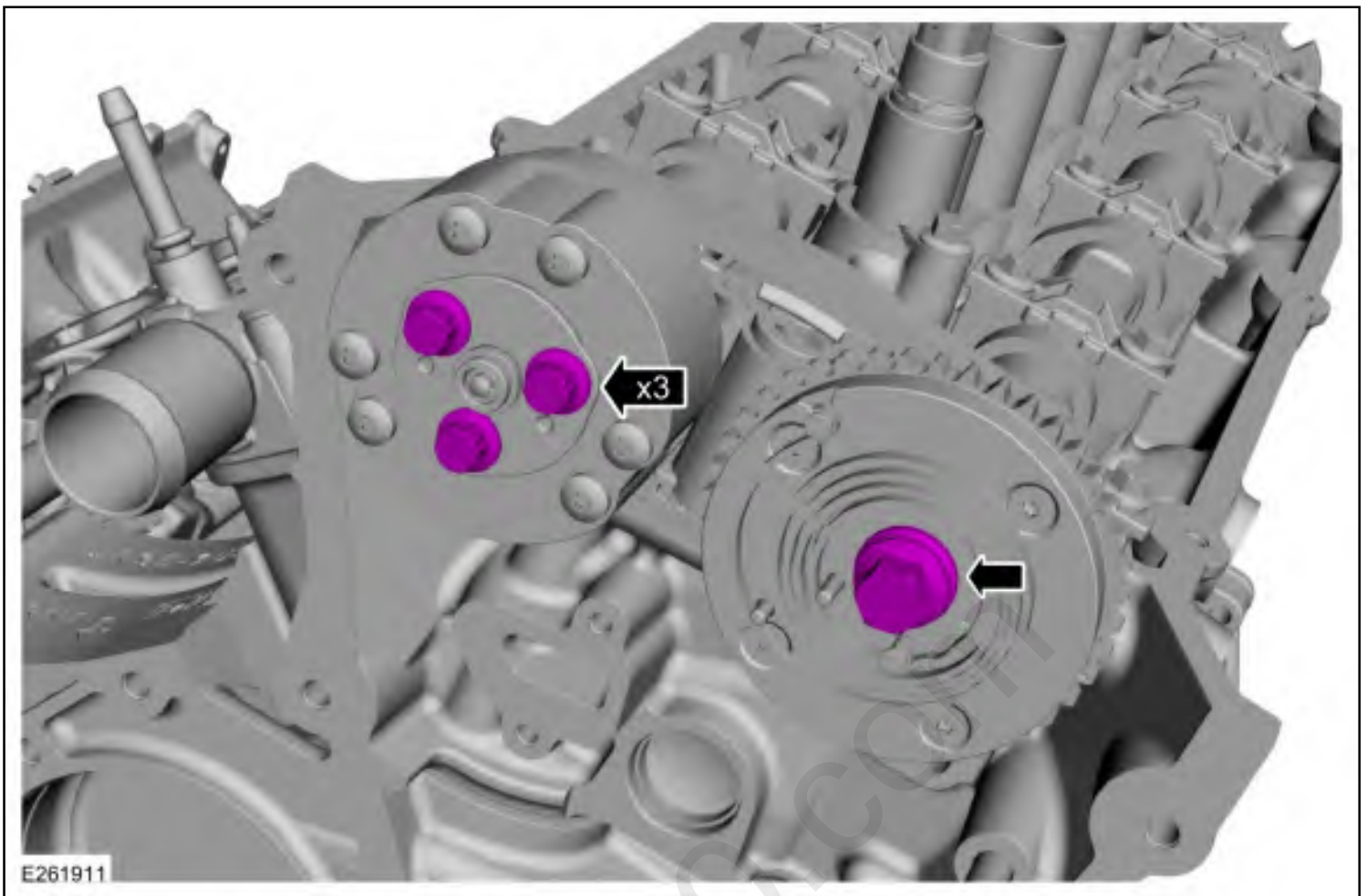
Remove the bolt and the LH timing chain guide.



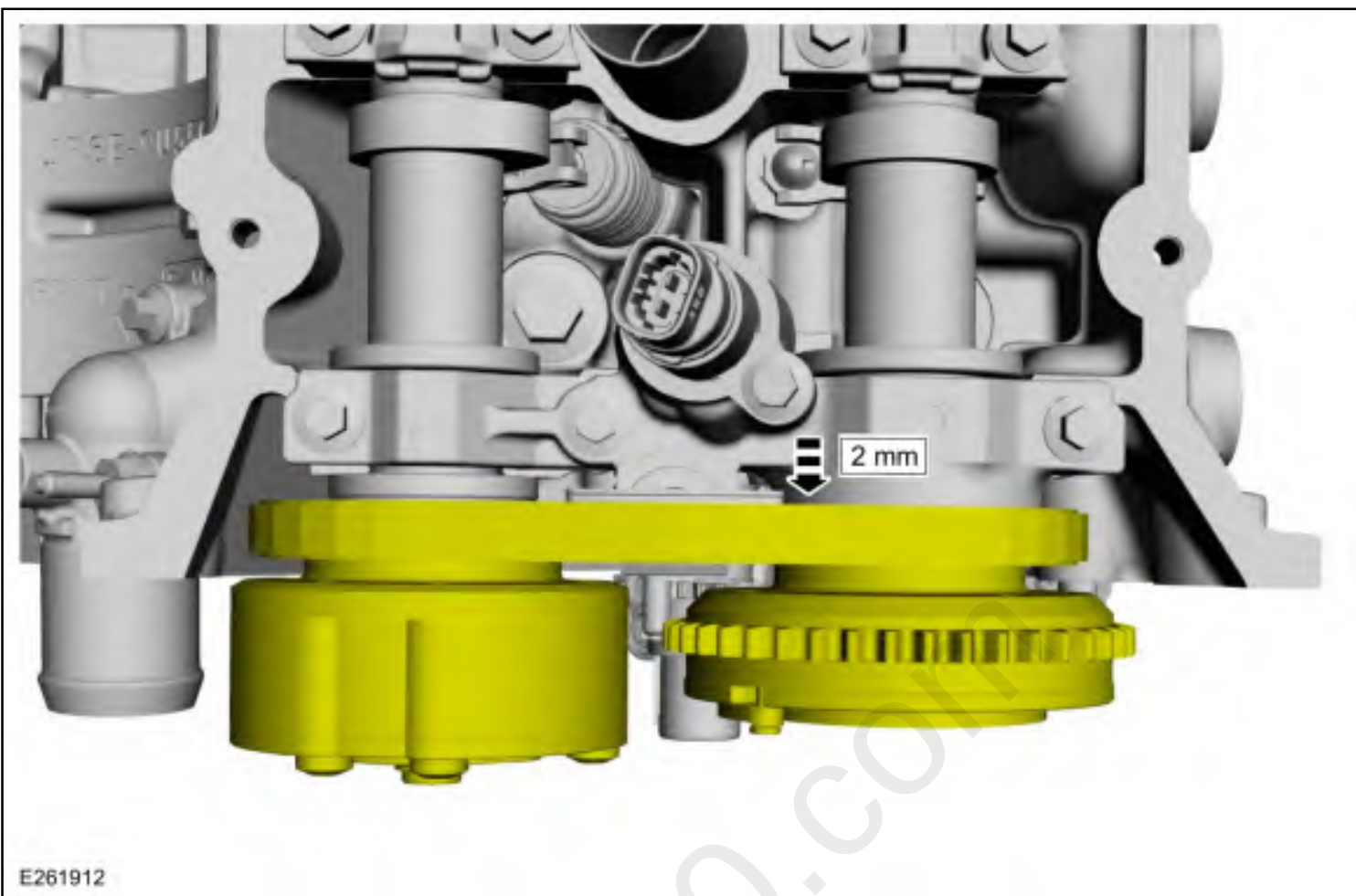
86. Remove the LH timing chain.



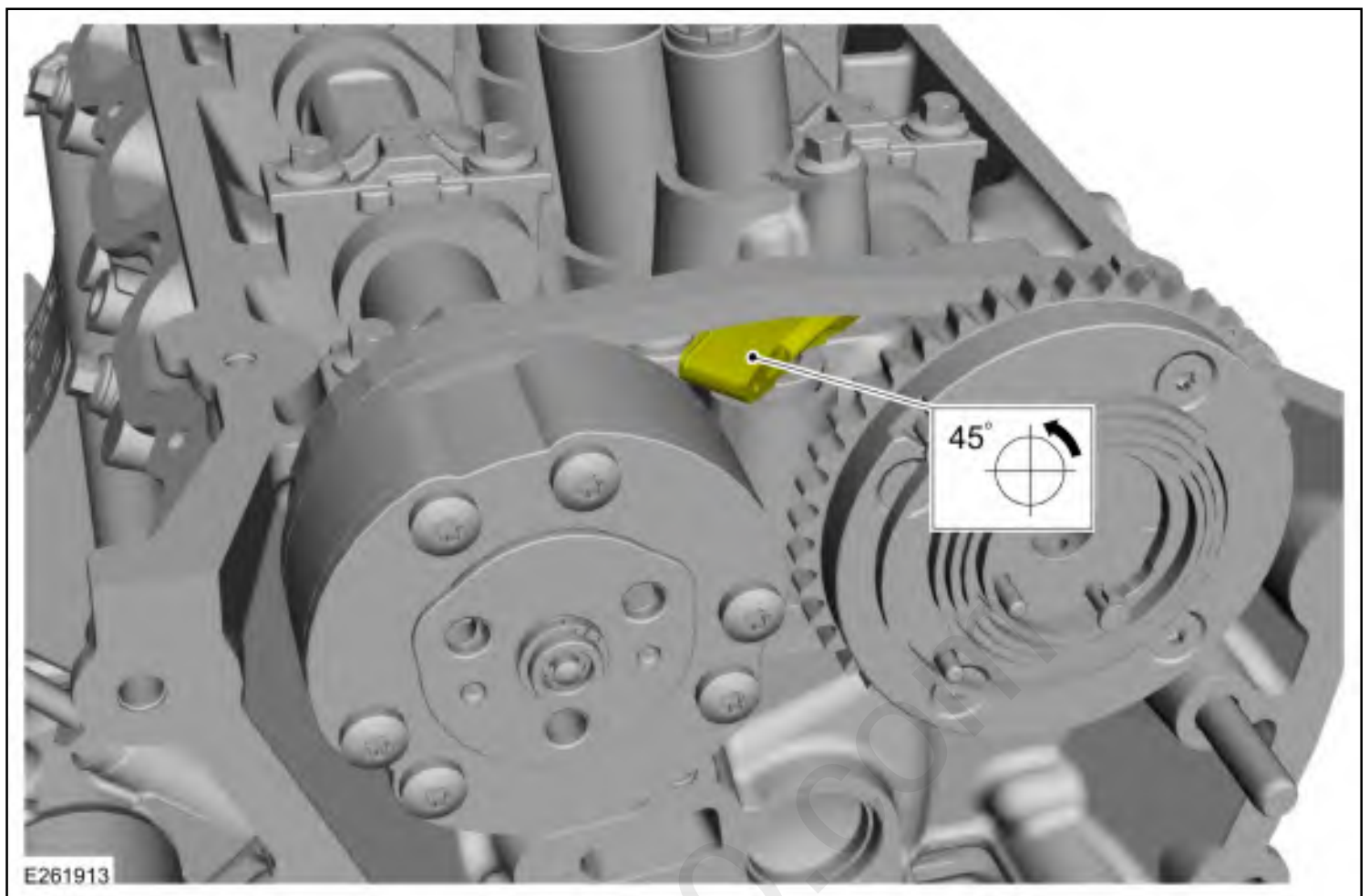
87. Remove the intake and exhaust VCT assembly bolts.



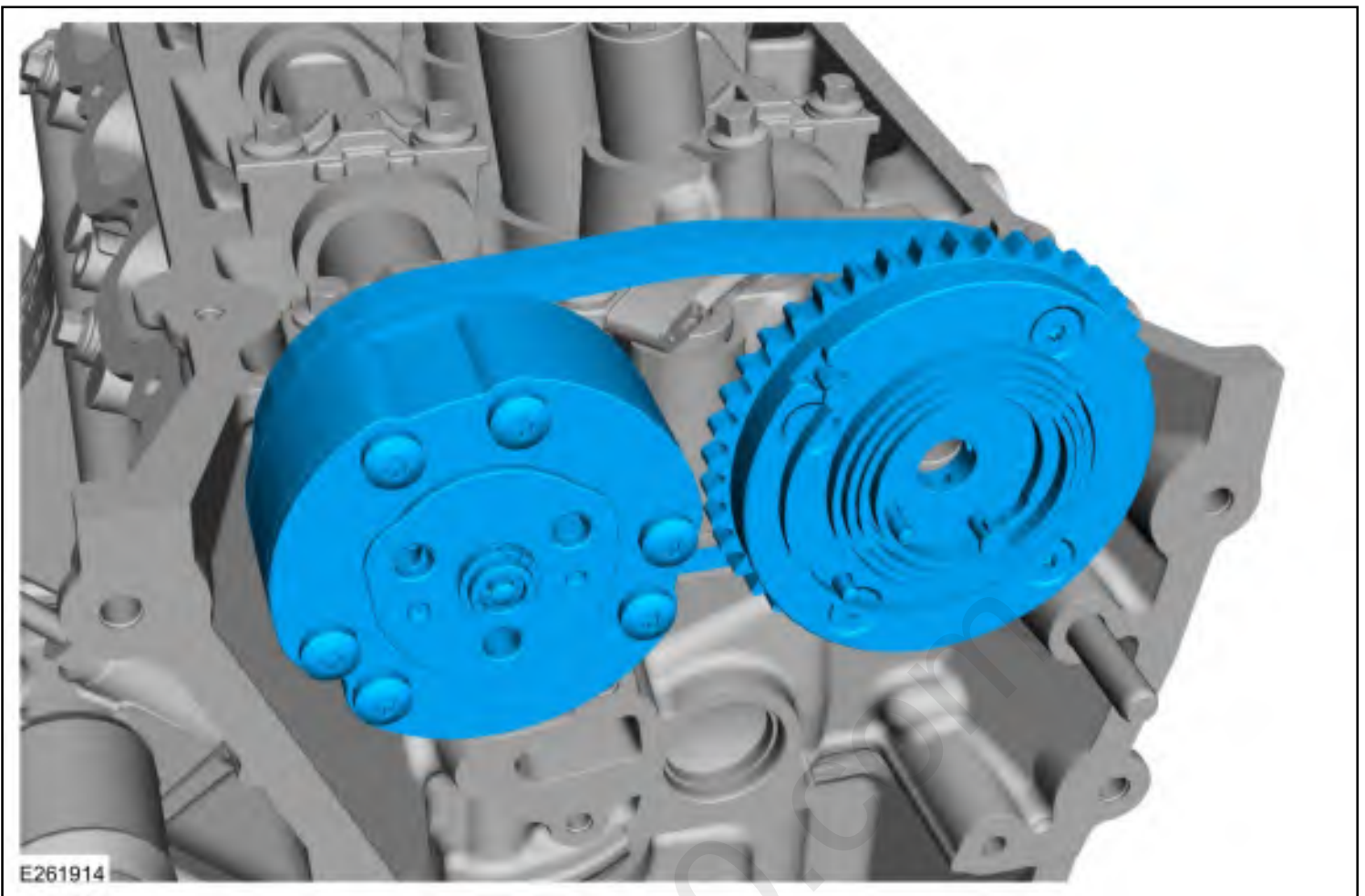
88. Slide the Variable Camshaft Timing VCT assemblies and secondary timing chain forward 2 mm (0.078 in).



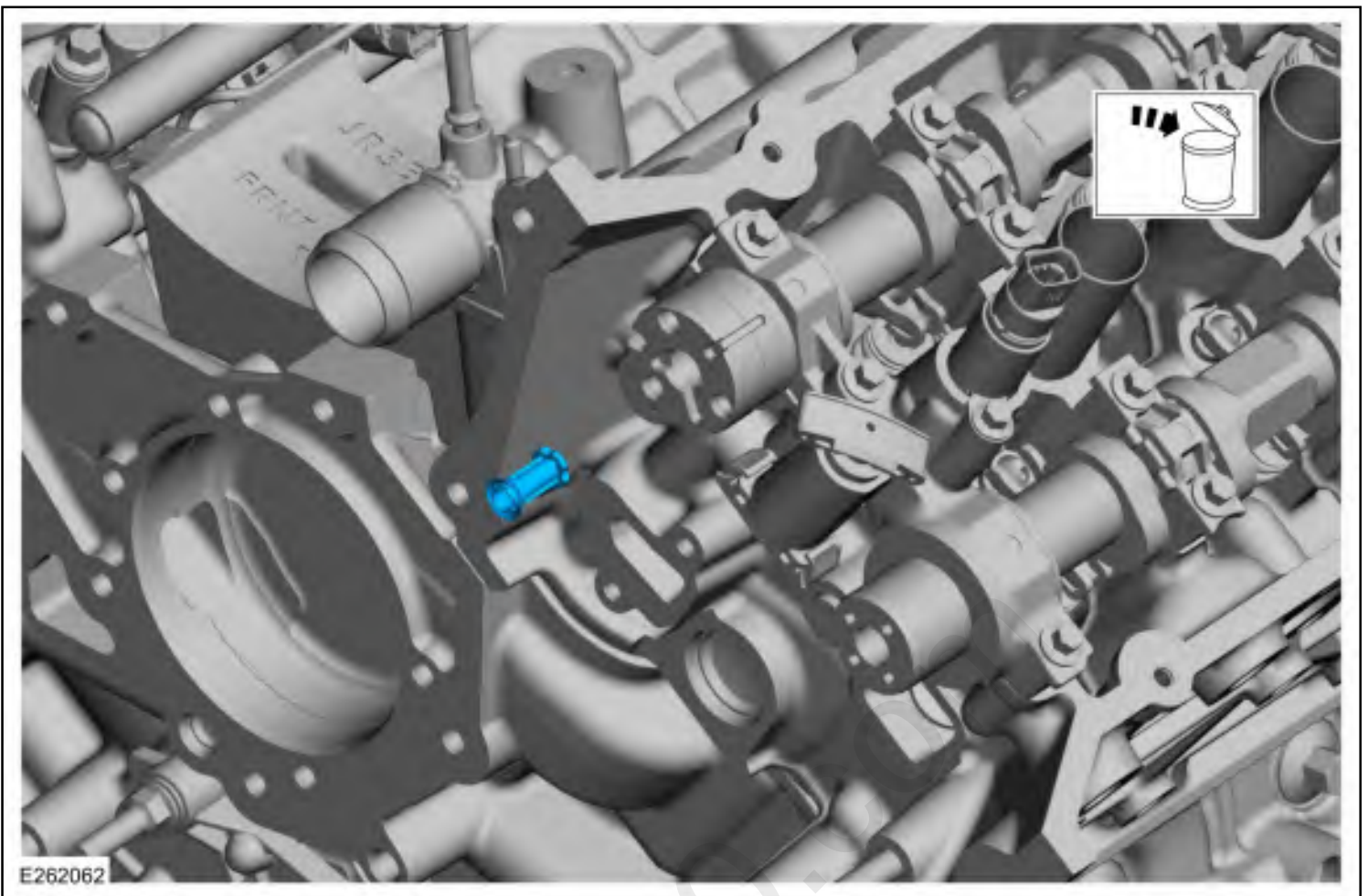
89. Depress and turn the secondary tensioner counterclockwise 45 degrees.



90. Remove the VCT assemblies and the secondary timing chain.

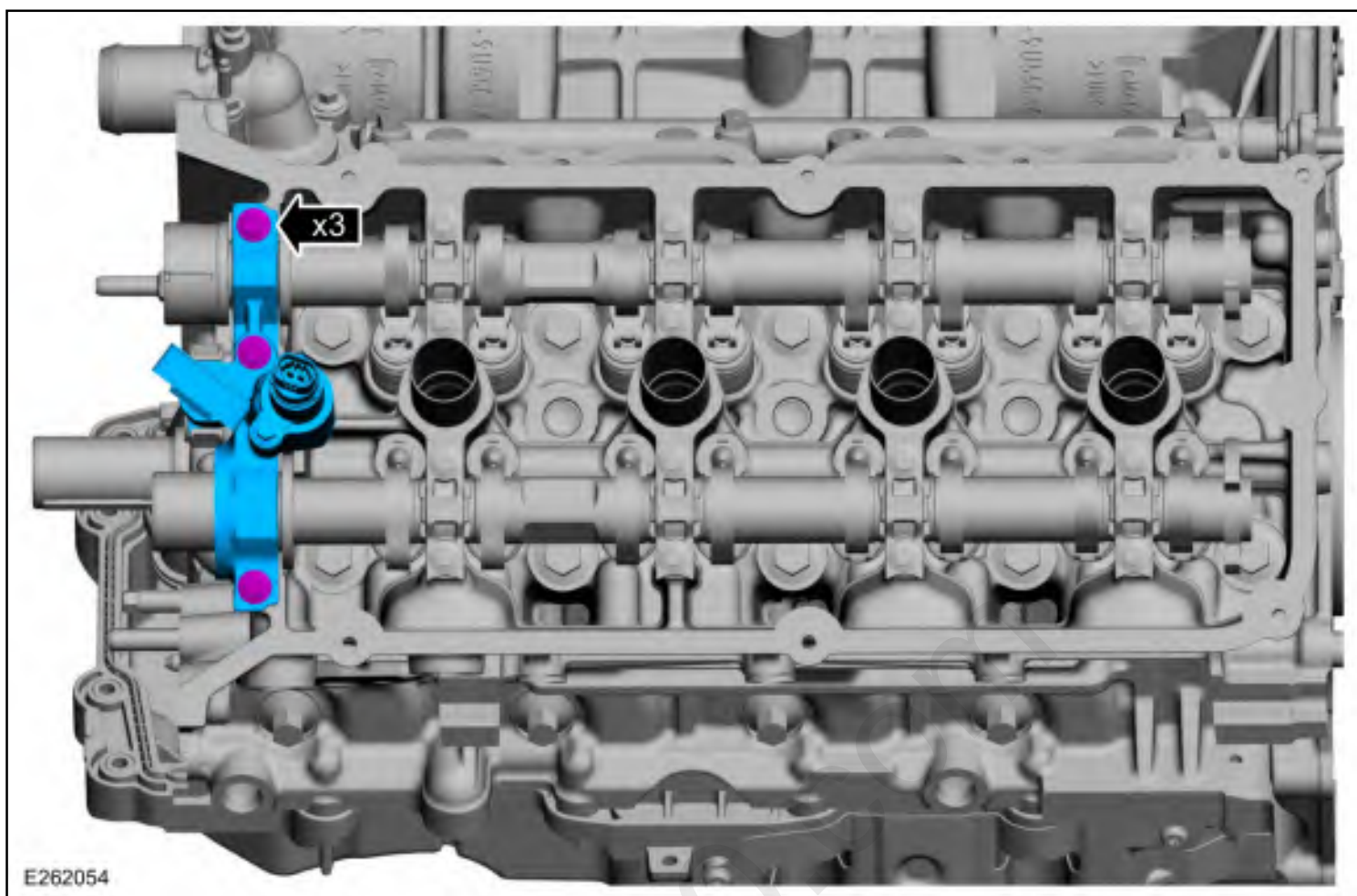


91. Remove and discard the VCT system oil filter.

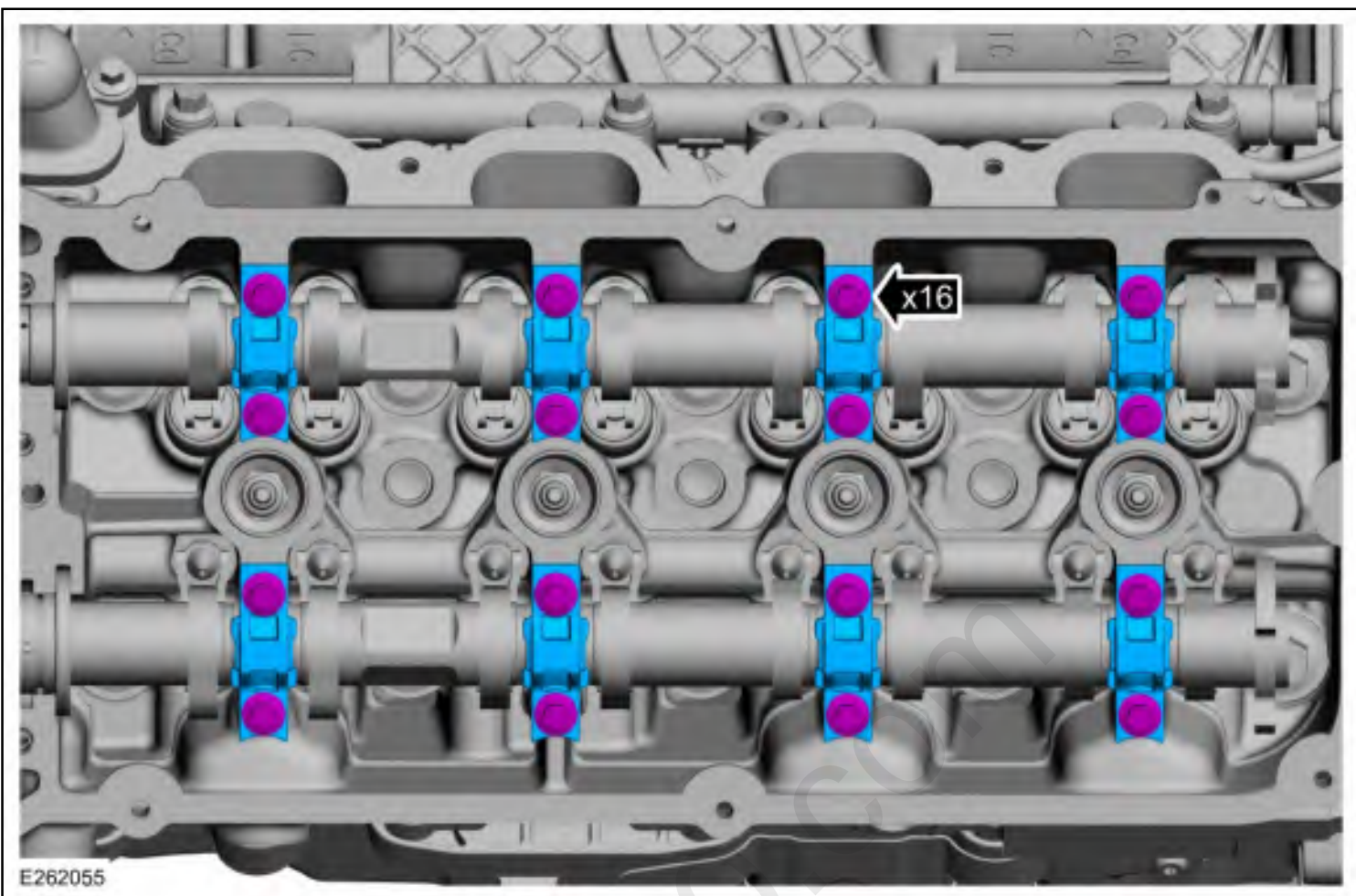


92. **NOTICE:** The front camshaft bearing mega cap must be removed first and then the remaining camshaft bearing caps. Failure to follow this direction may result in damage to the engine.

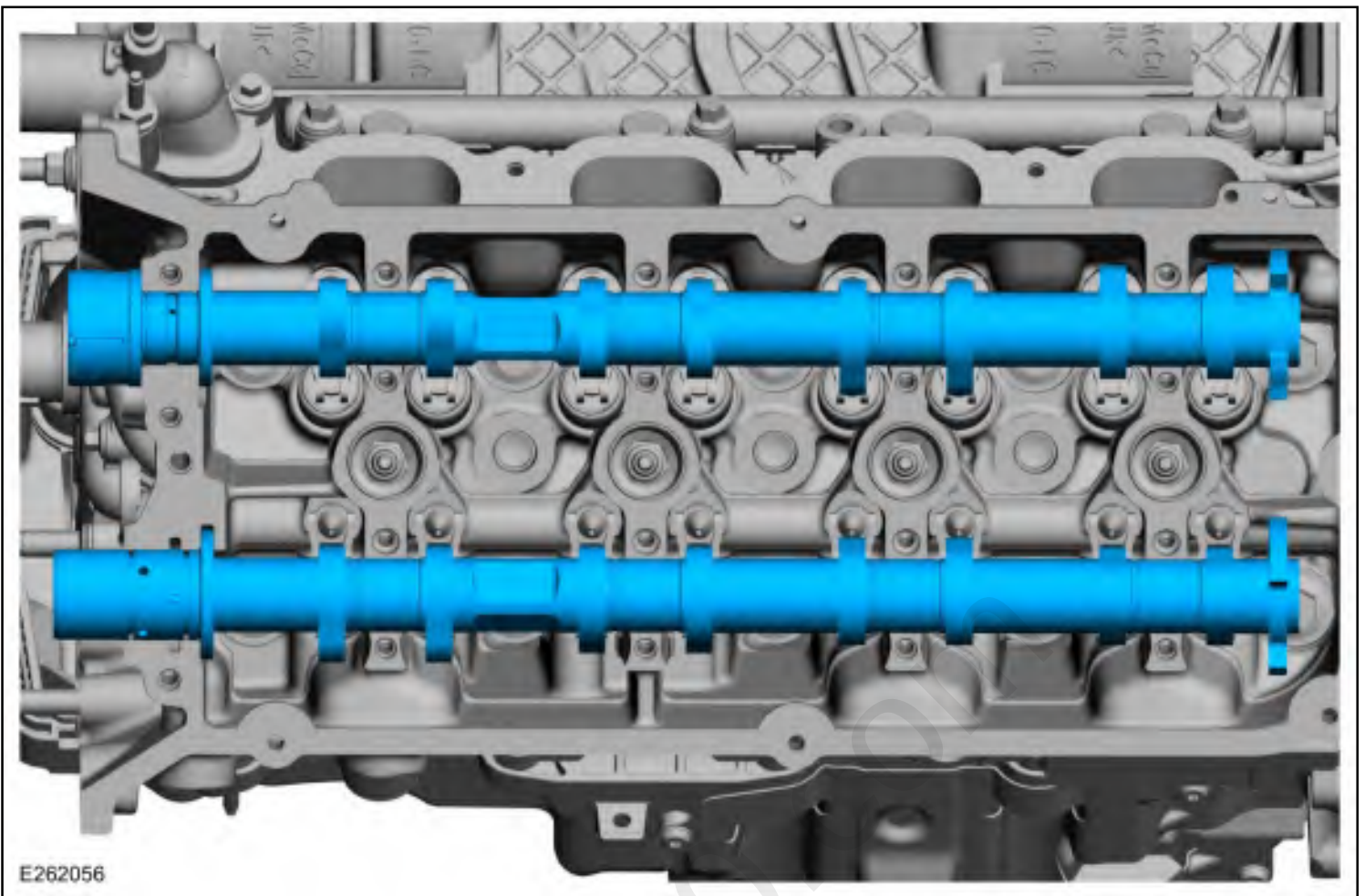
Remove the bolts and the front camshaft bearing mega cap.



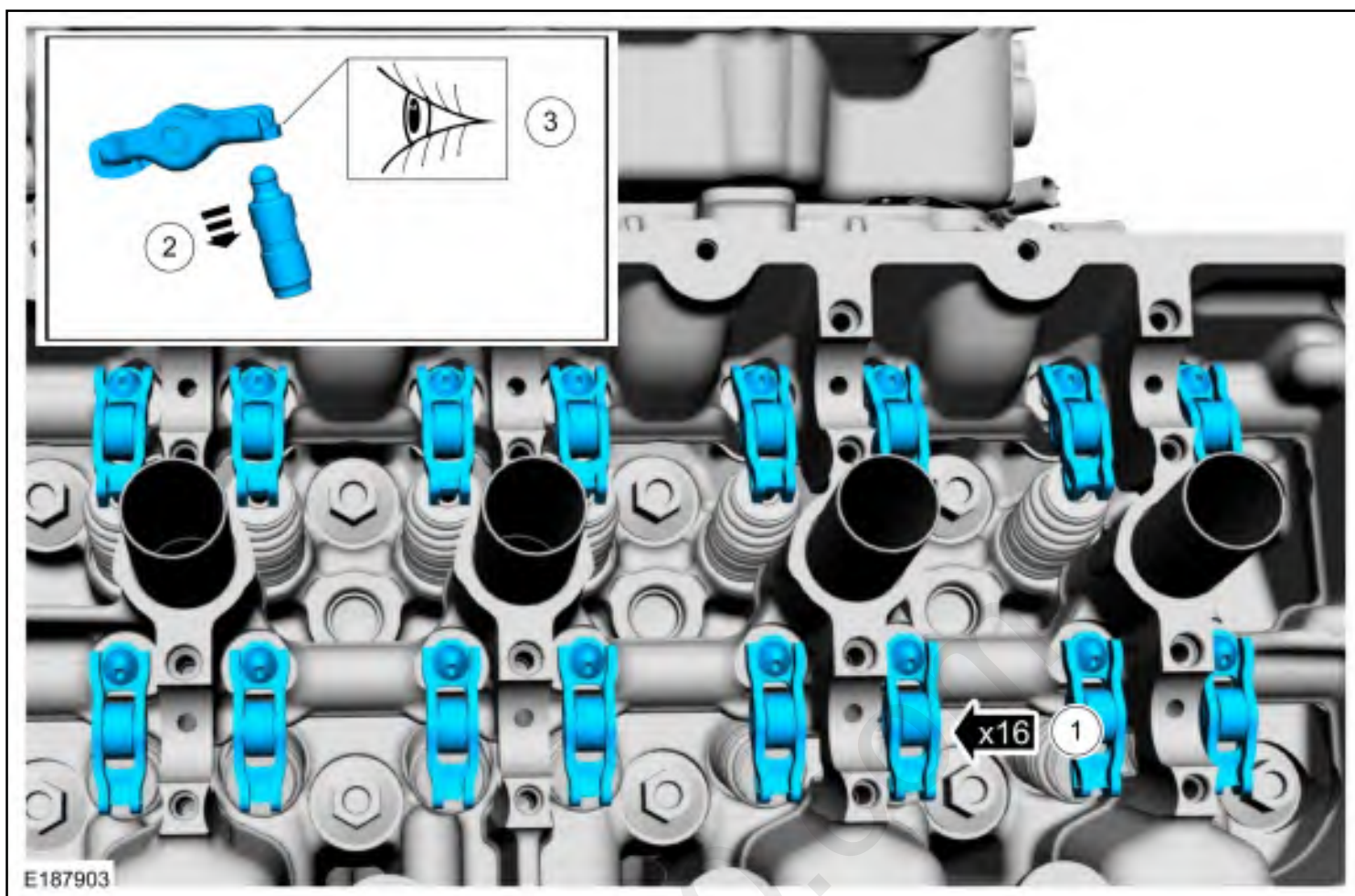
93. Remove the bolts and the camshaft bearing caps.



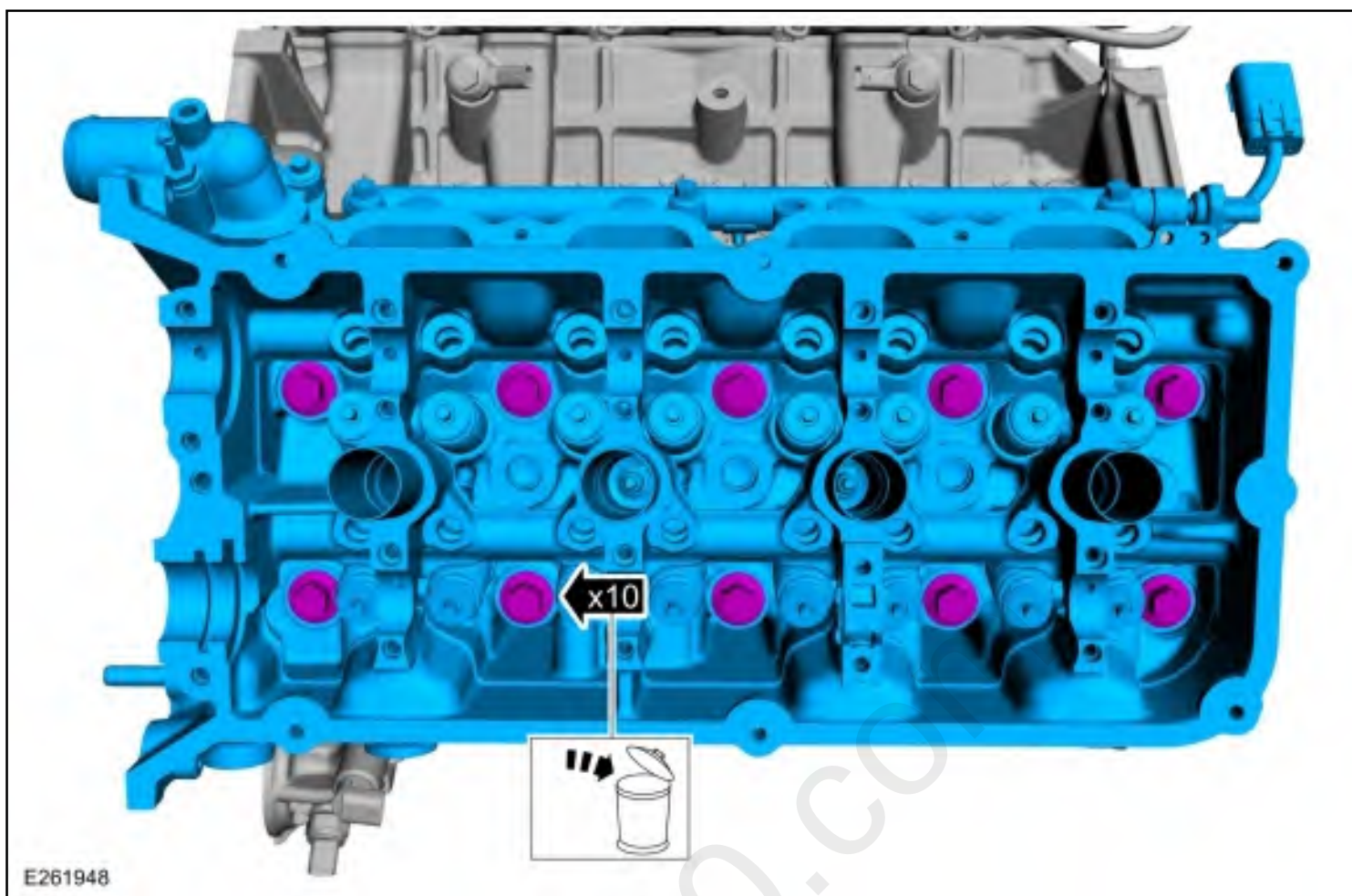
94. Remove the intake and exhaust camshafts.



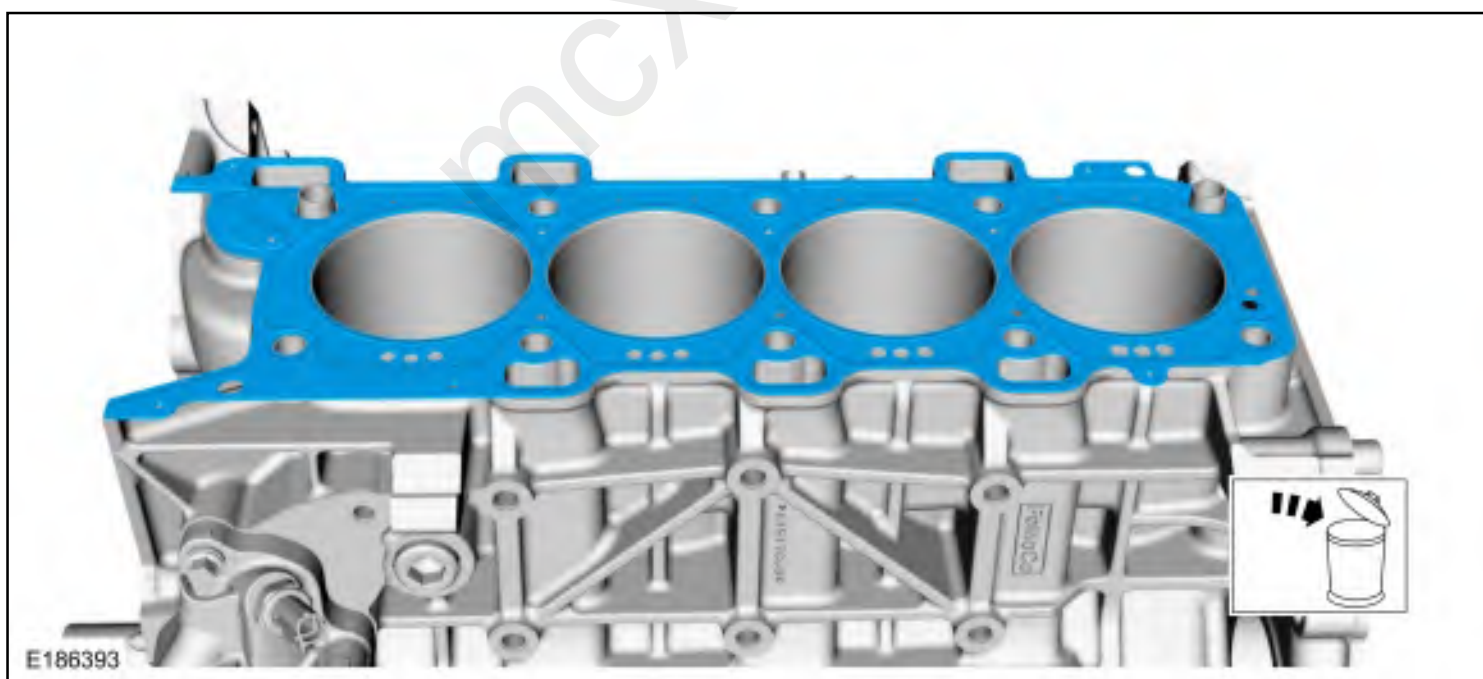
1. Remove the camshaft roller follower and hydraulic lash adjuster assemblies.
2. Separate the hydraulic lash adjusters from the spring clips on the camshaft roller followers.
3. Inspect the hydraulic lash adjuster and roller follower for damage. If any damage is found, inspect the camshaft lobes and valves for damage. Replace damaged components as necessary.



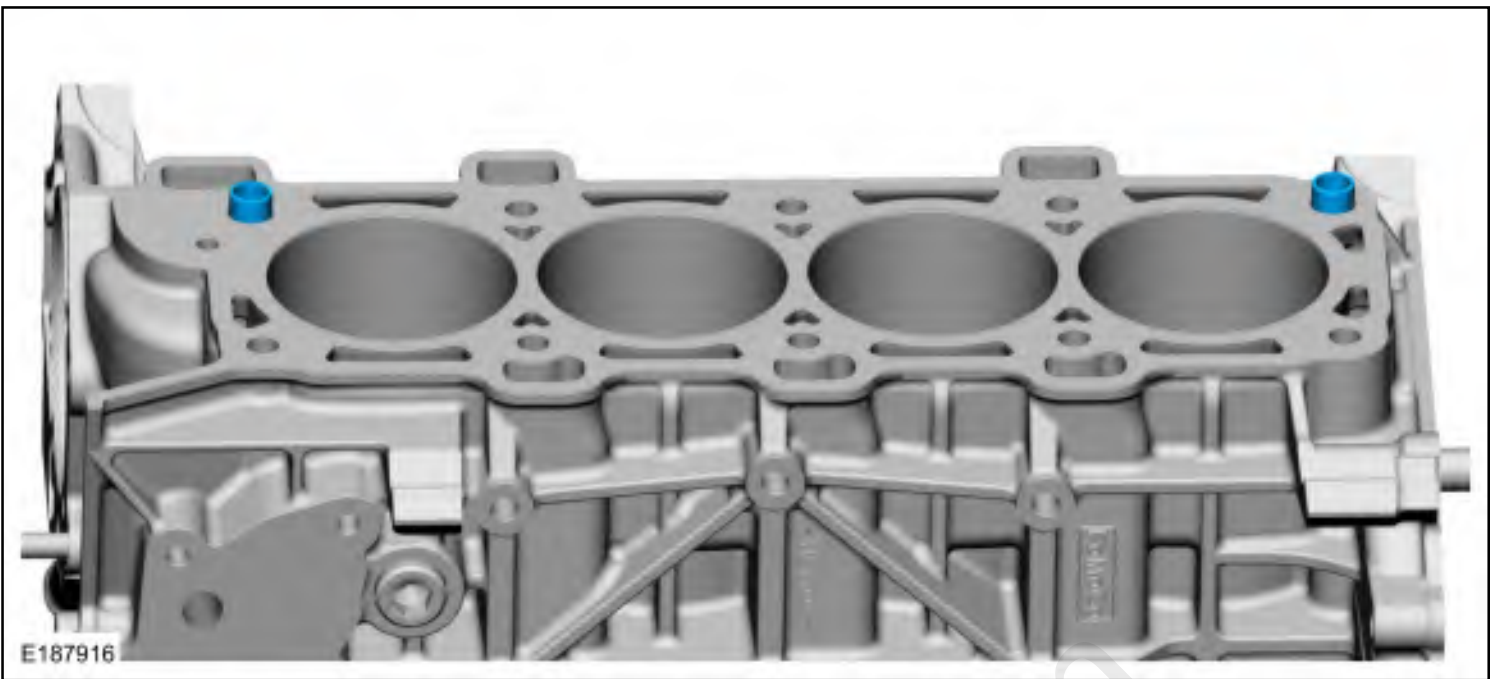
- Remove and discard the bolts.
- Remove the cylinder head.



97. Discard the cylinder head gasket.



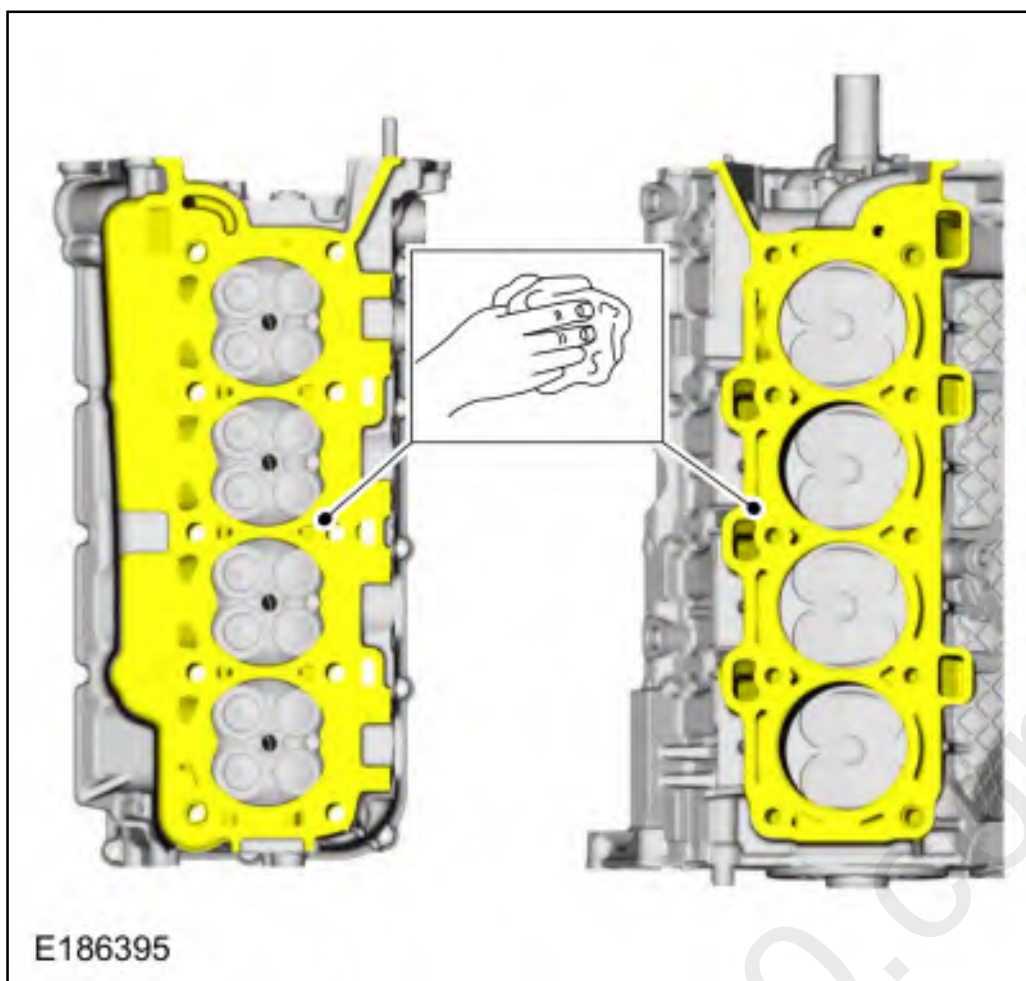
98. Remove the dowels.



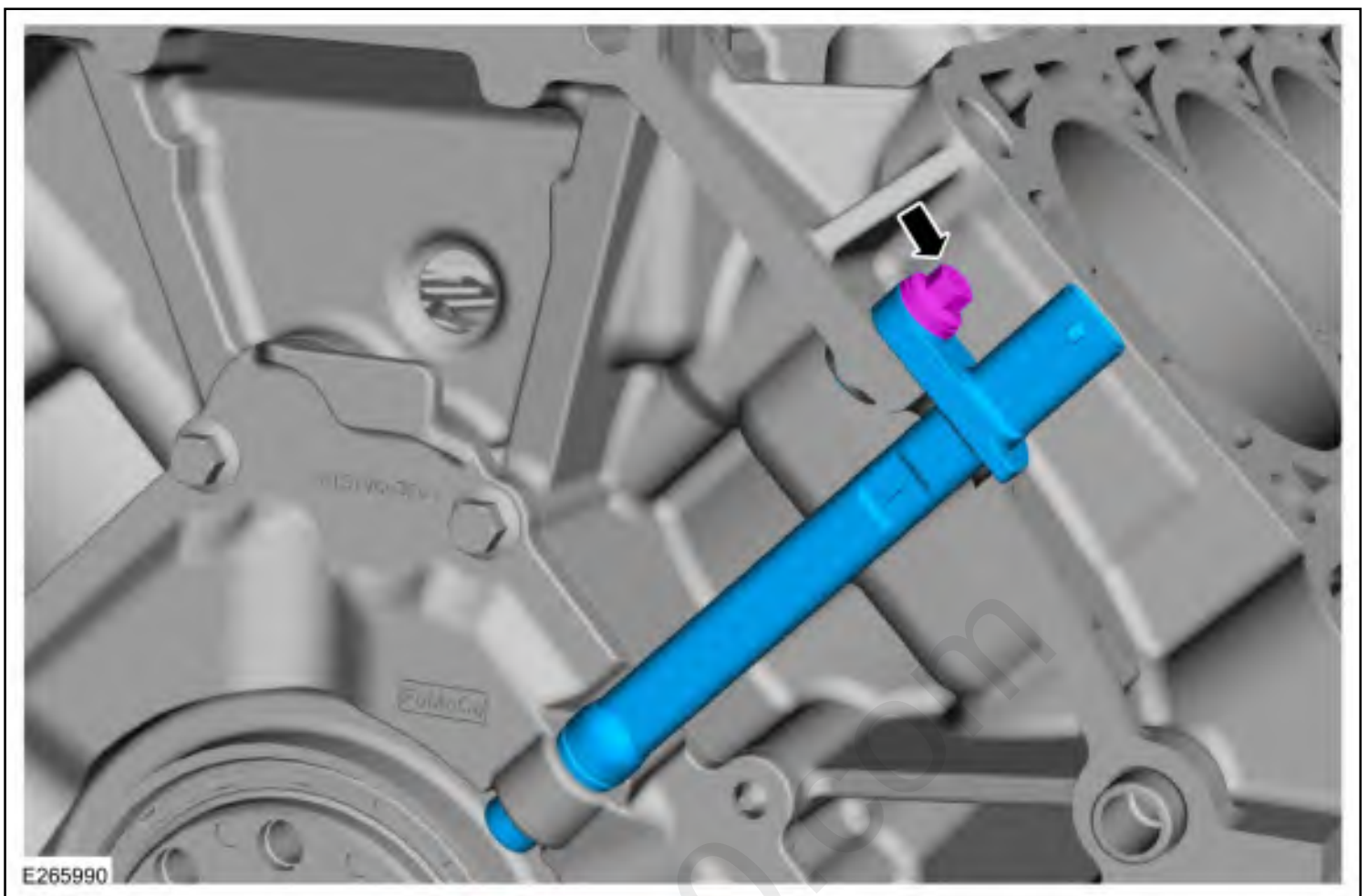
99. **NOTICE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

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

- Clean and inspect the cylinder head-to-cylinder block mating surfaces of both the cylinder head and the cylinder block
- Refer to: [Cylinder Head Distortion](#) (303-00 Engine System - General Information, General Procedures).
- Refer to: [Cylinder Block Distortion](#) (303-00 Engine System - General Information, General Procedures).



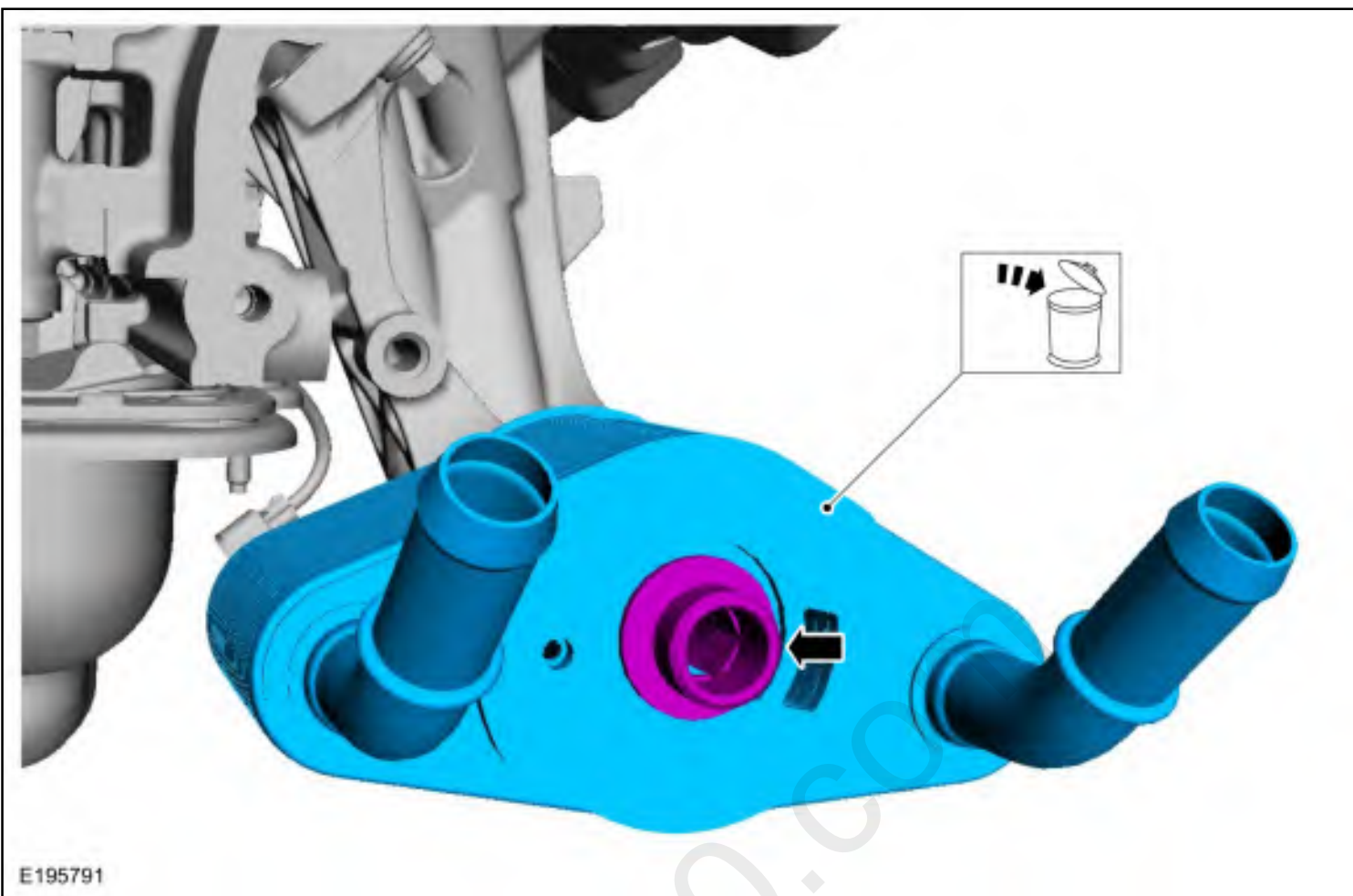
100. Remove the bolt and the CKP sensor.



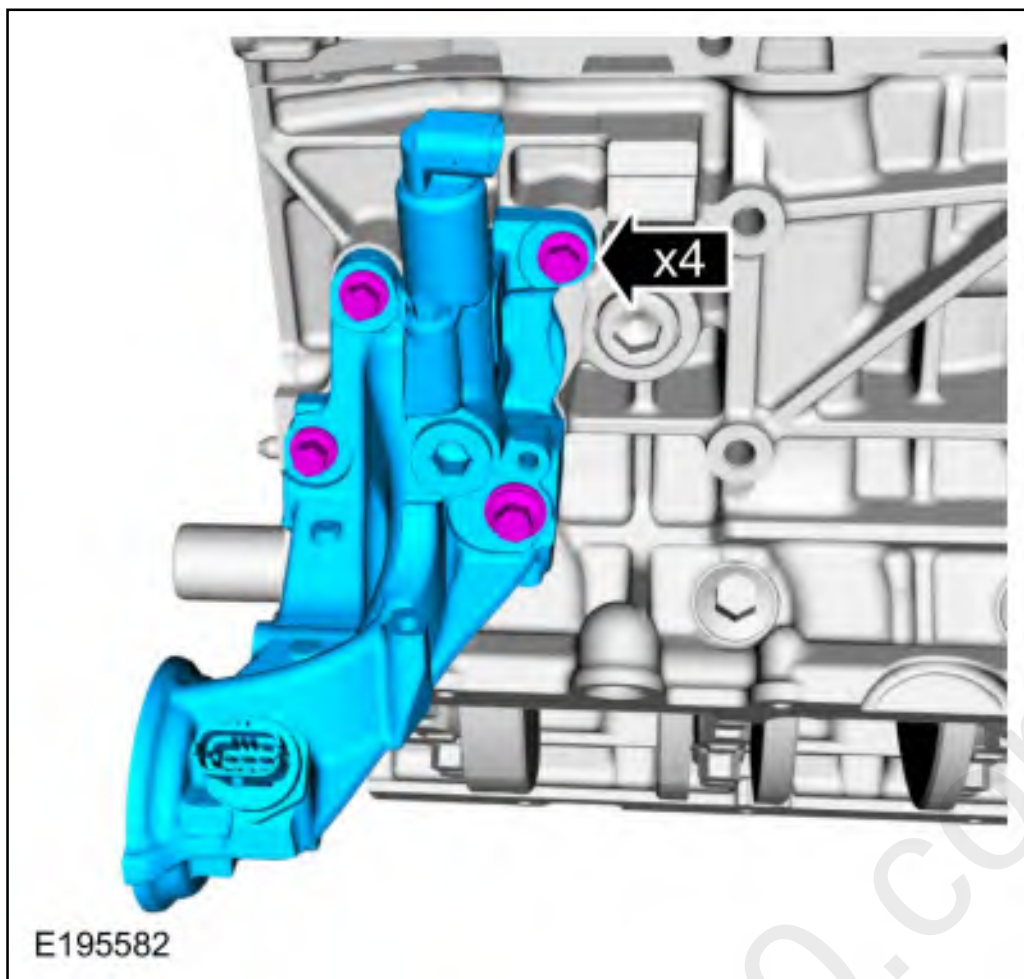
101. **NOTICE: A new oil cooler must be installed or severe damage to the engine can occur.**

Remove the threaded fitting and the oil cooler.

- Discard the oil cooler.



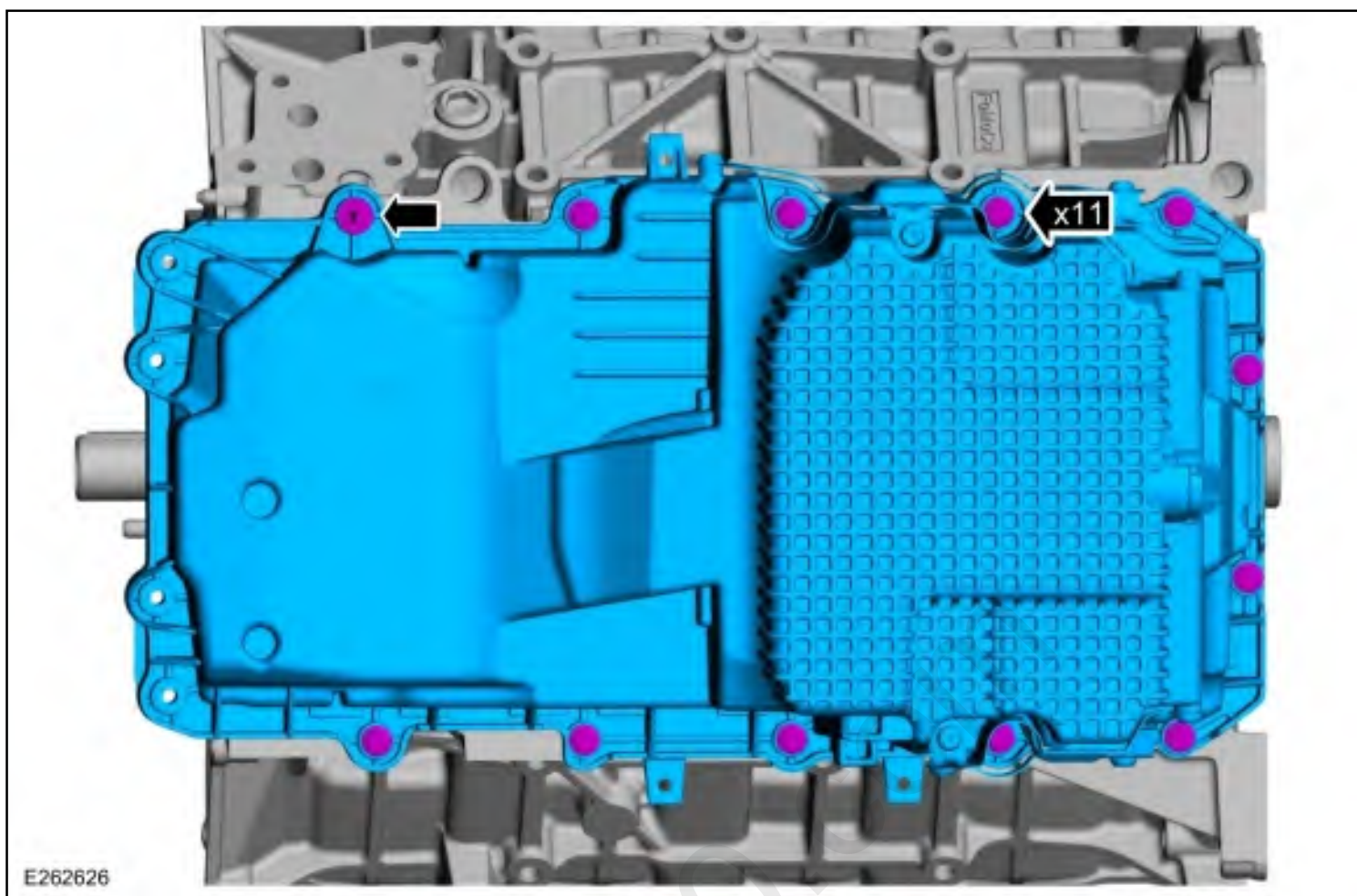
102. Remove the bolts and the oil filter adapter.



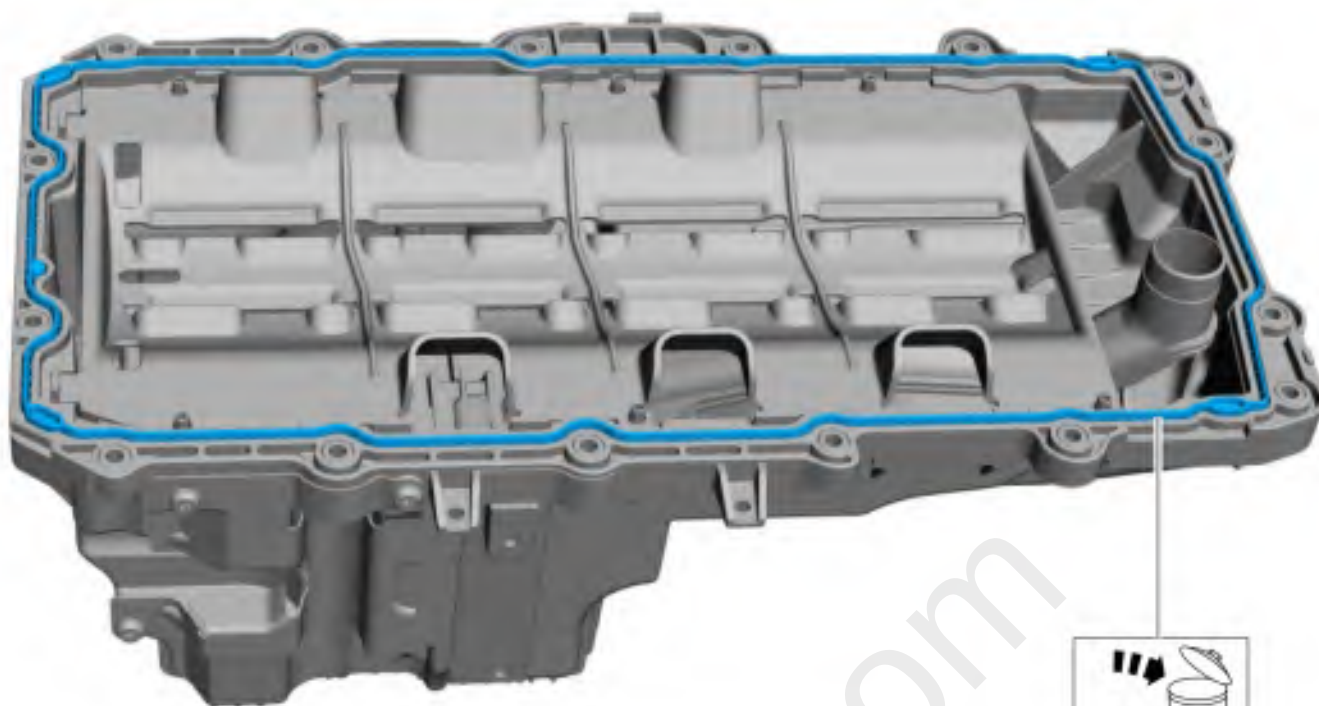
103. Discard the oil filter adapter gasket.



104. Remove the bolts, the stud bolt and the oil pan.



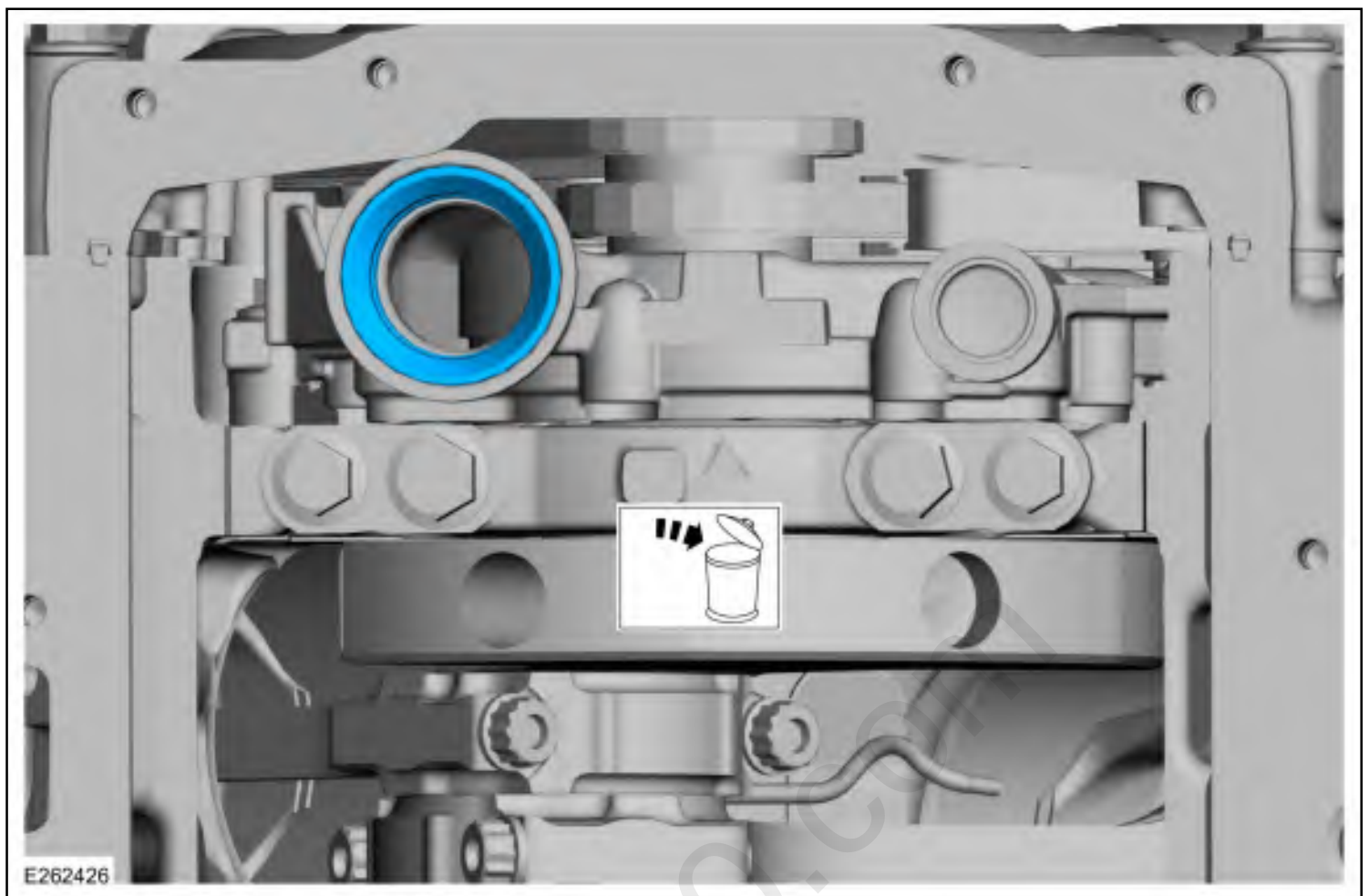
105. Remove and discard the oil pan gasket.



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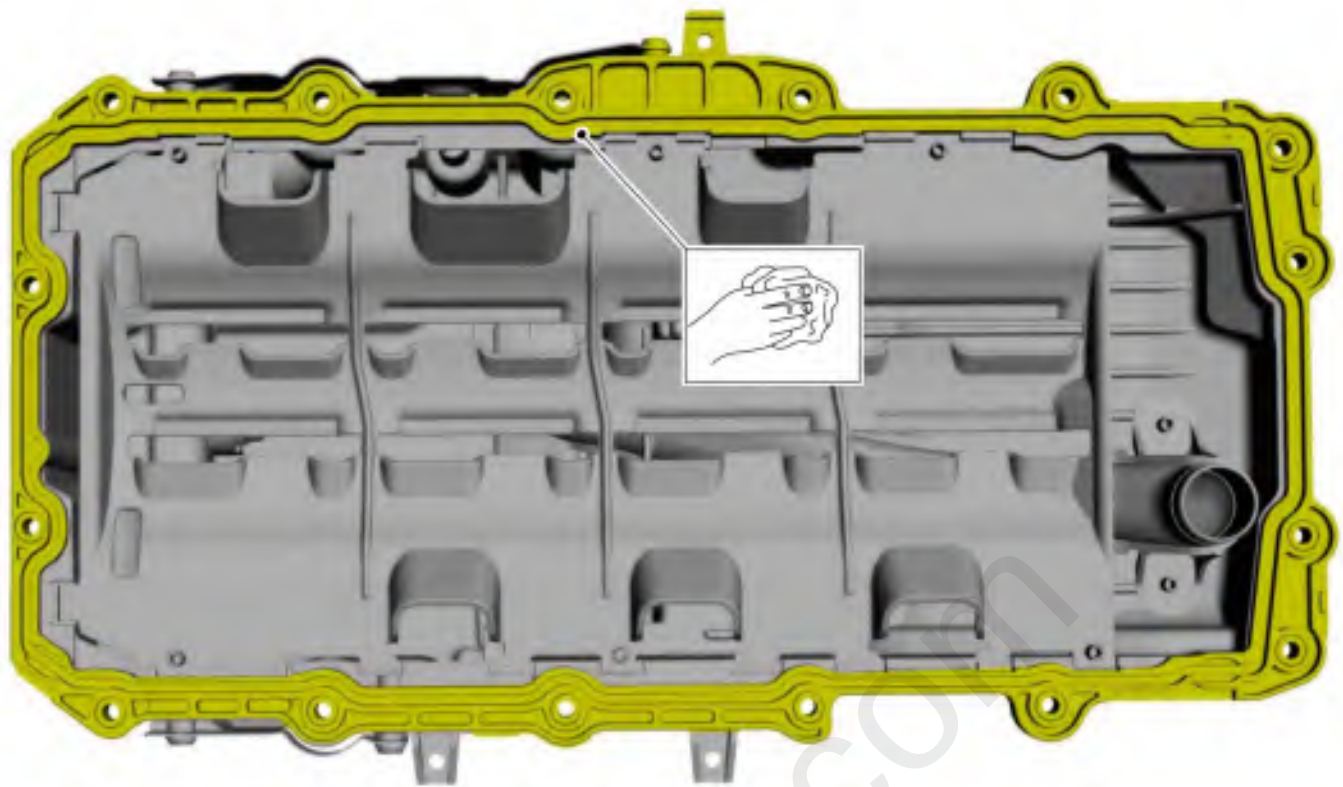
106. Remove and discard the oil pump pickup seal.





107. **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, which make leak paths.

Make sure that the mating faces are clean and free of foreign material.



108. **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 which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean the mating surface of the cylinder block.

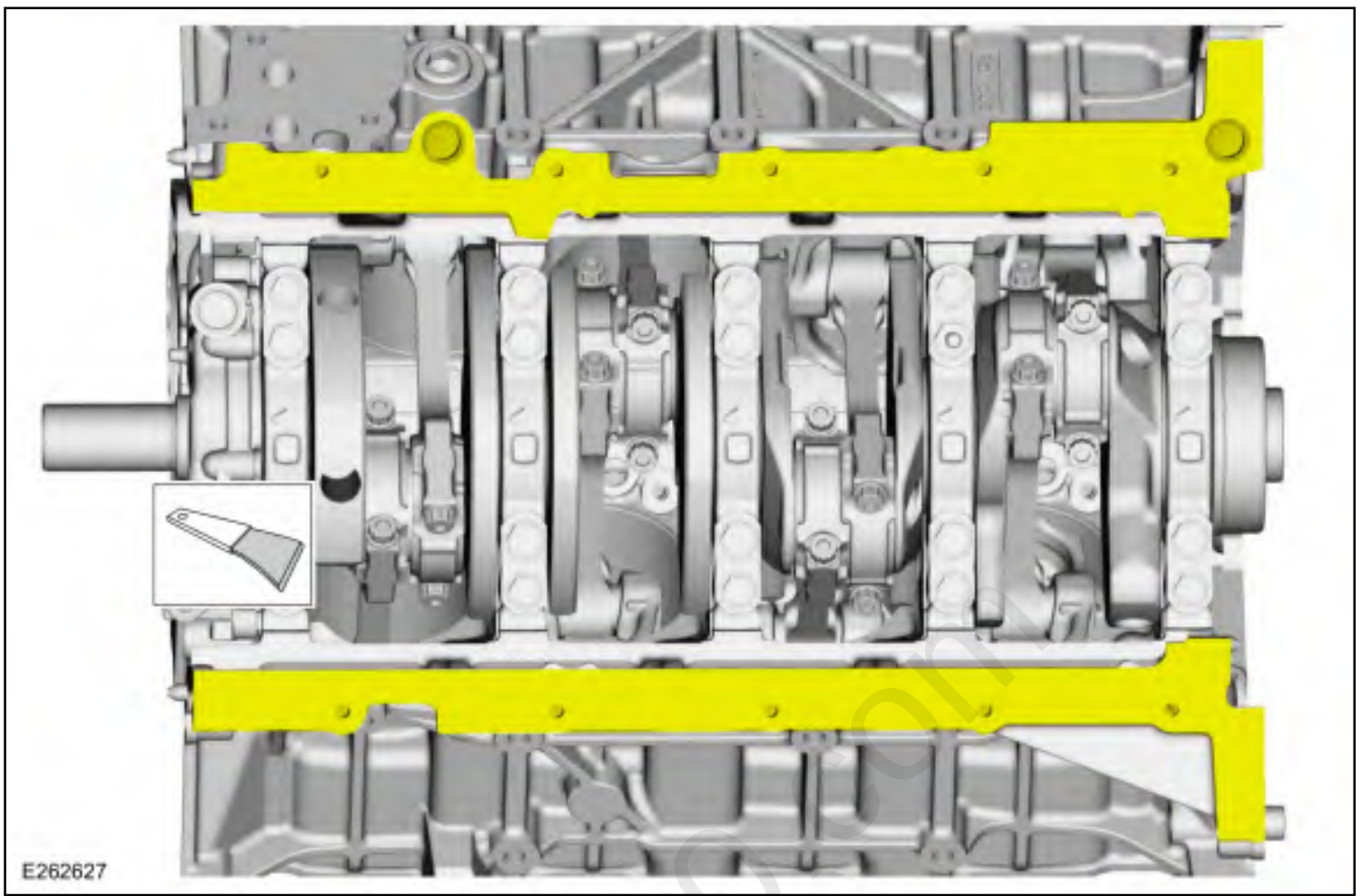
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

Use the General Equipment: Plastic Scraper

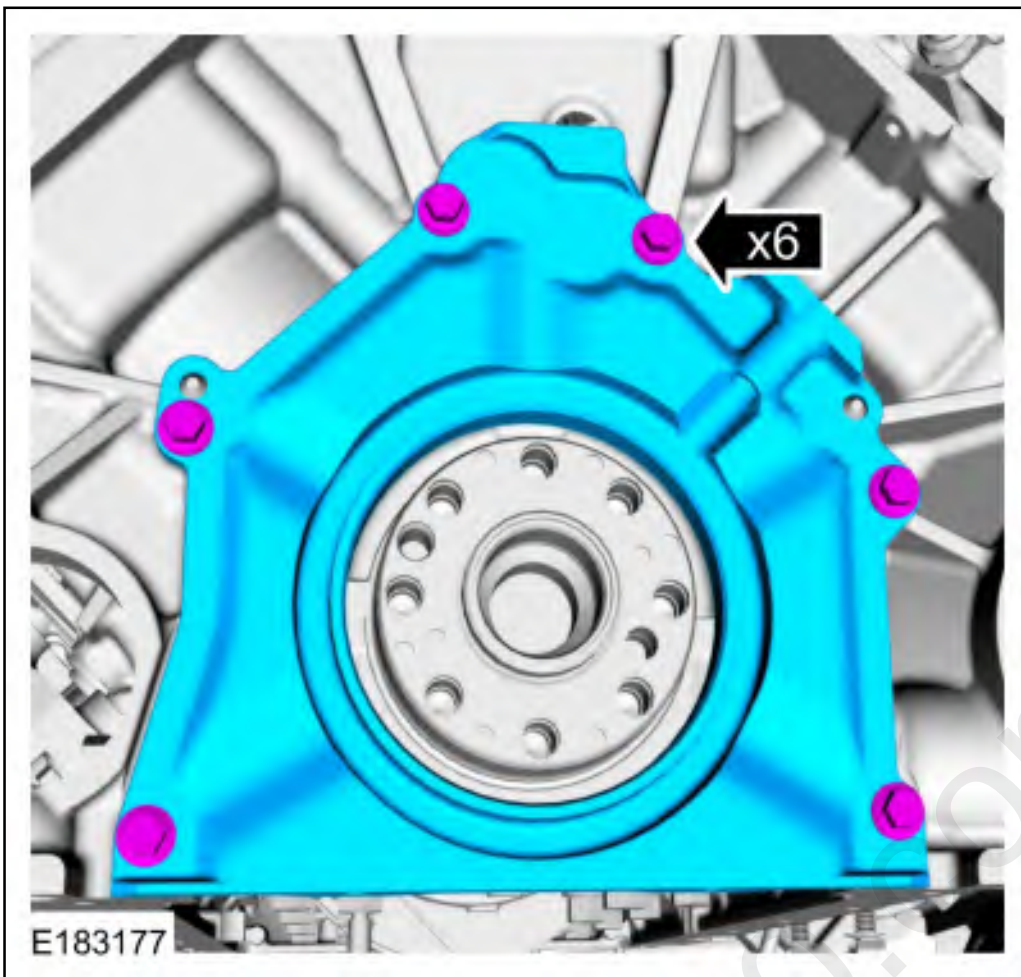
Material: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material: Motorcraft® Metal Surface Prep Wipes / ZC-31-B

Material: Motorcraft® Metal Brake Parts Cleaner / PM-4-A, PM-4-B



109. Remove the bolts and the crankshaft rear seal retainer plate.



110. **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 which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

Clean and inspect the mating surface.

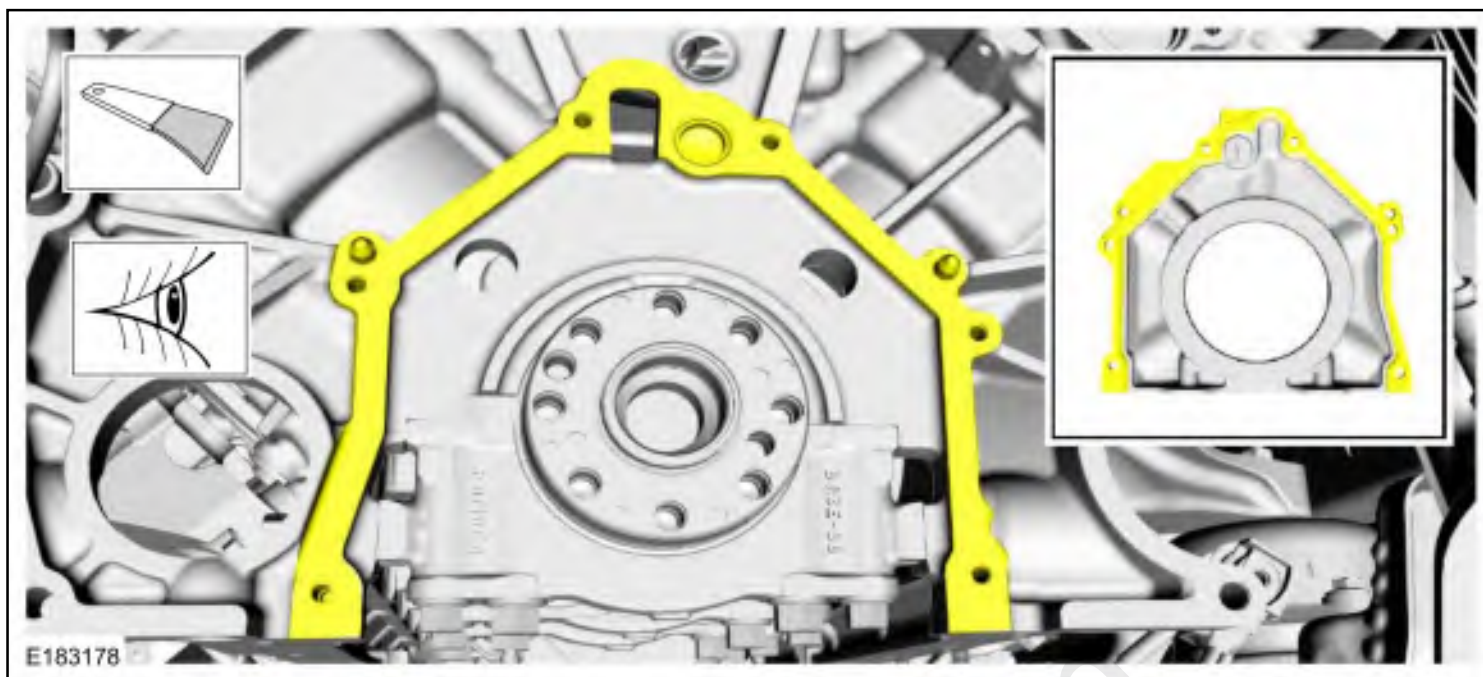
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

Use the General Equipment: Plastic Scraper

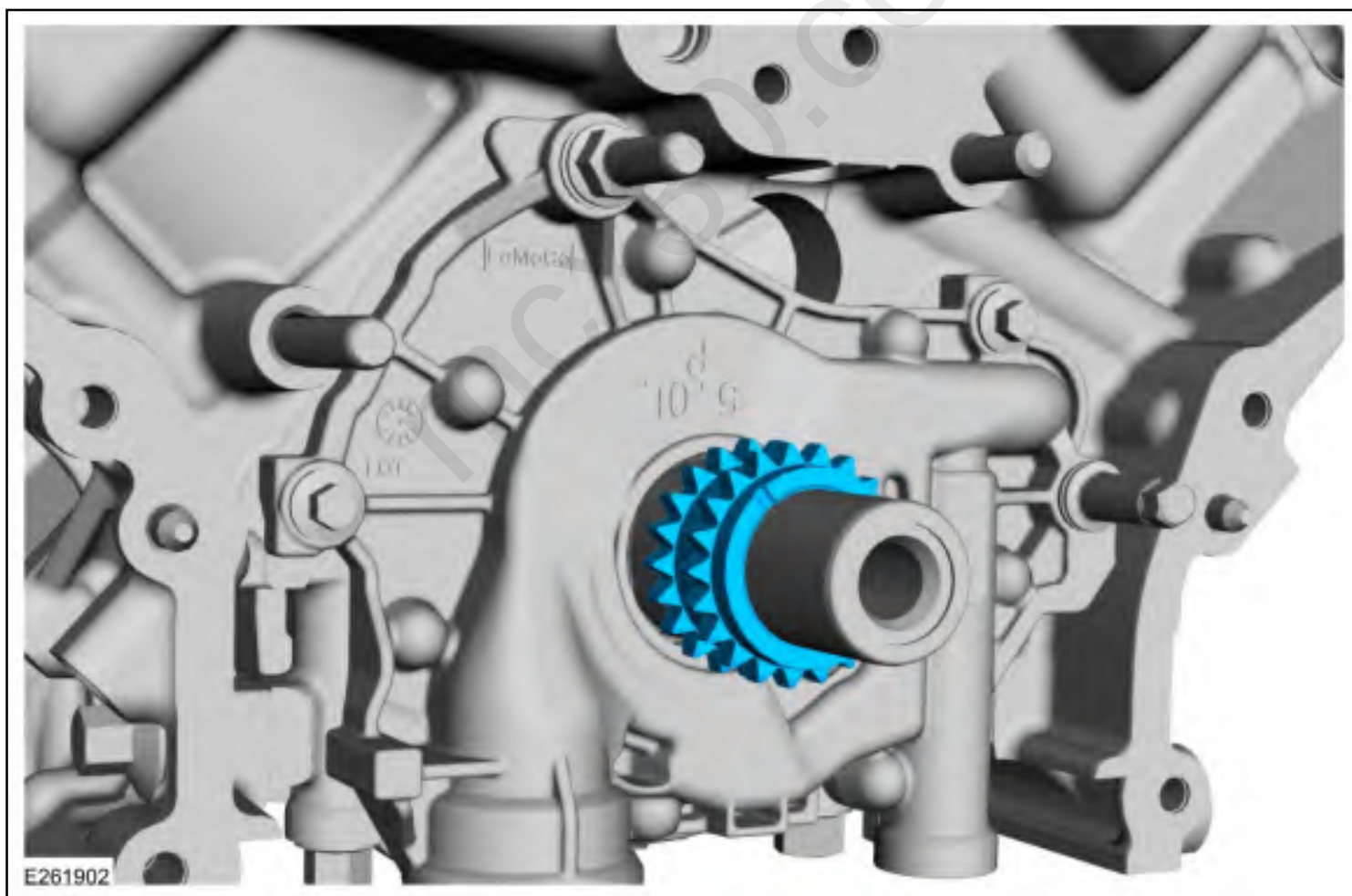
Material: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material: Motorcraft® Metal Brake Parts Cleaner / PM-4-A, PM-4-B

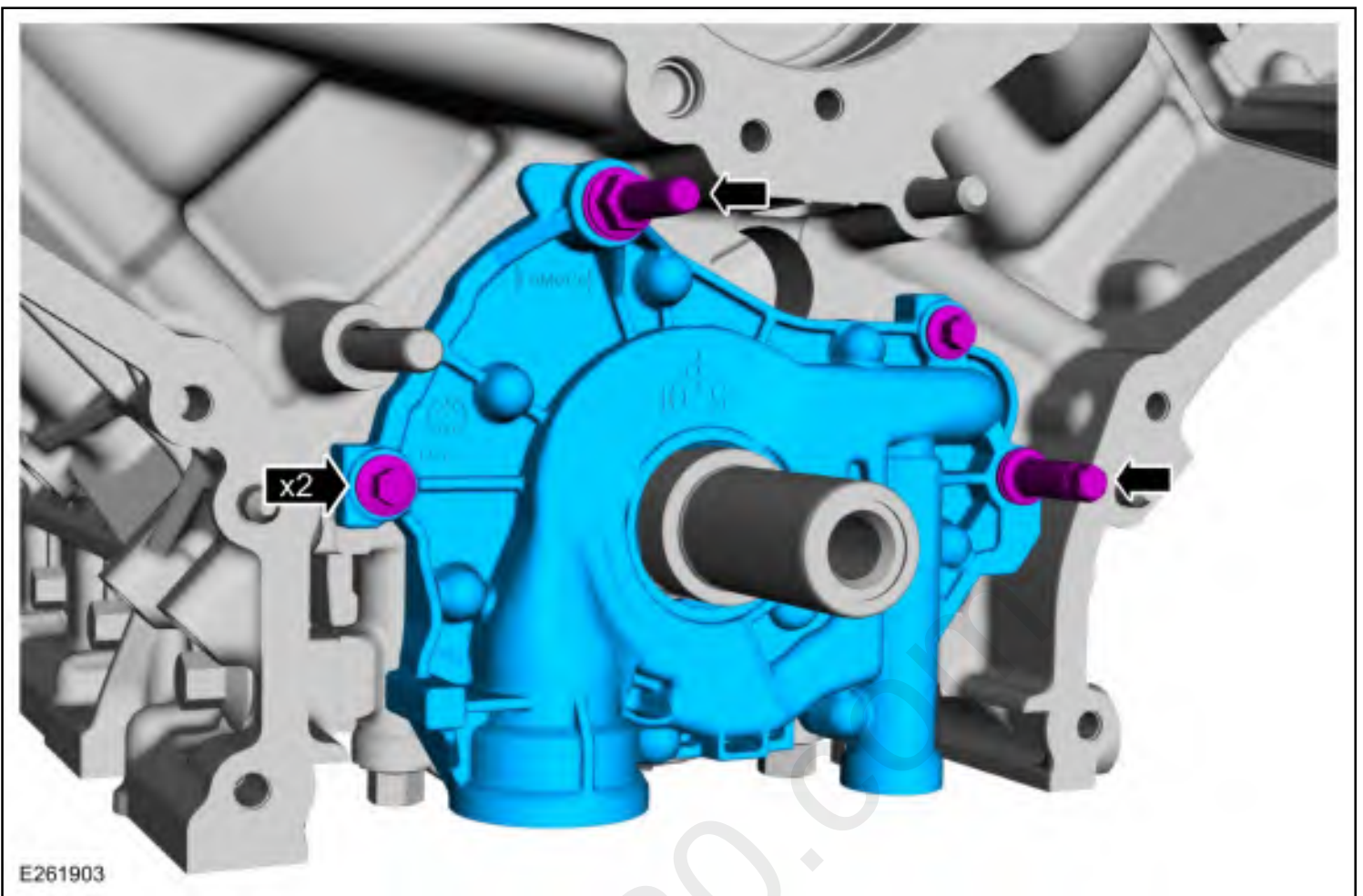
Material: Motorcraft® Metal Surface Prep Wipes / ZC-31-B



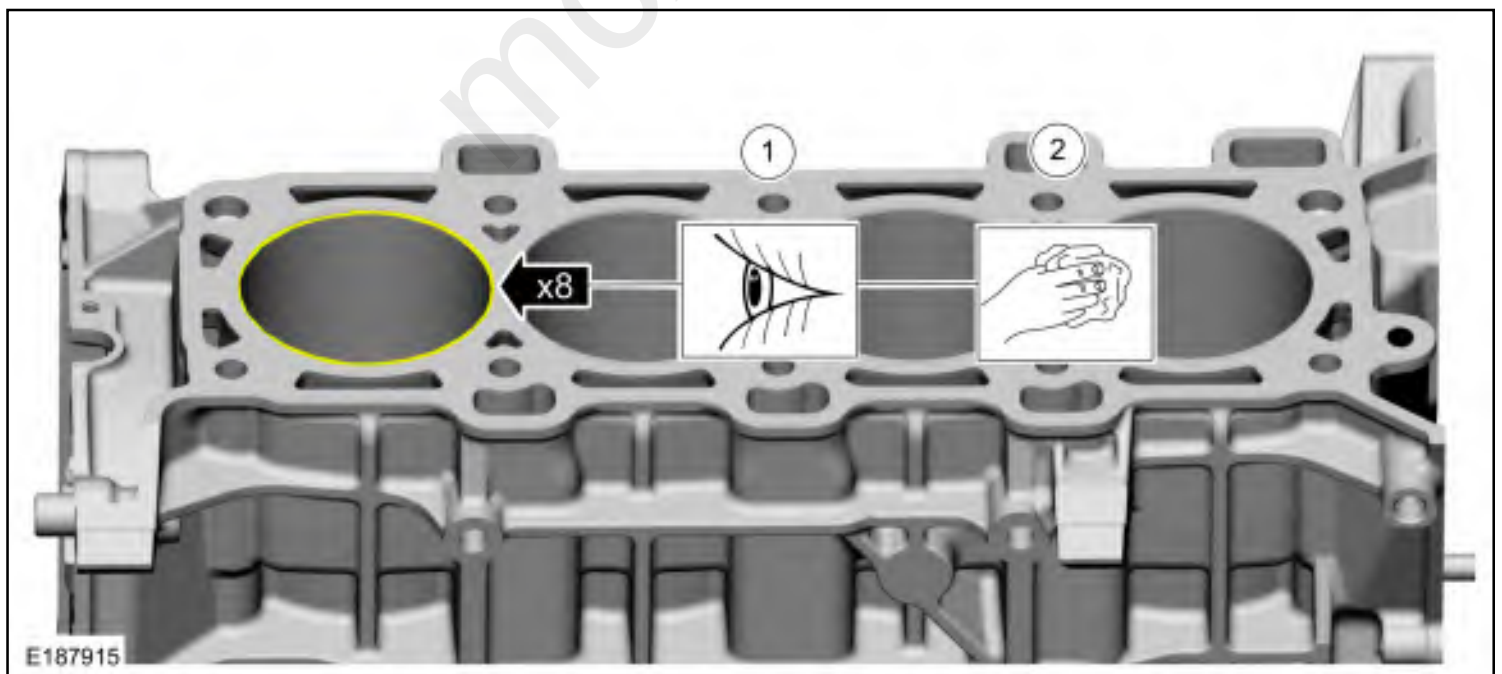
111. Remove the crankshaft sprocket.



112. Remove the bolts, stud bolts and the oil pump.

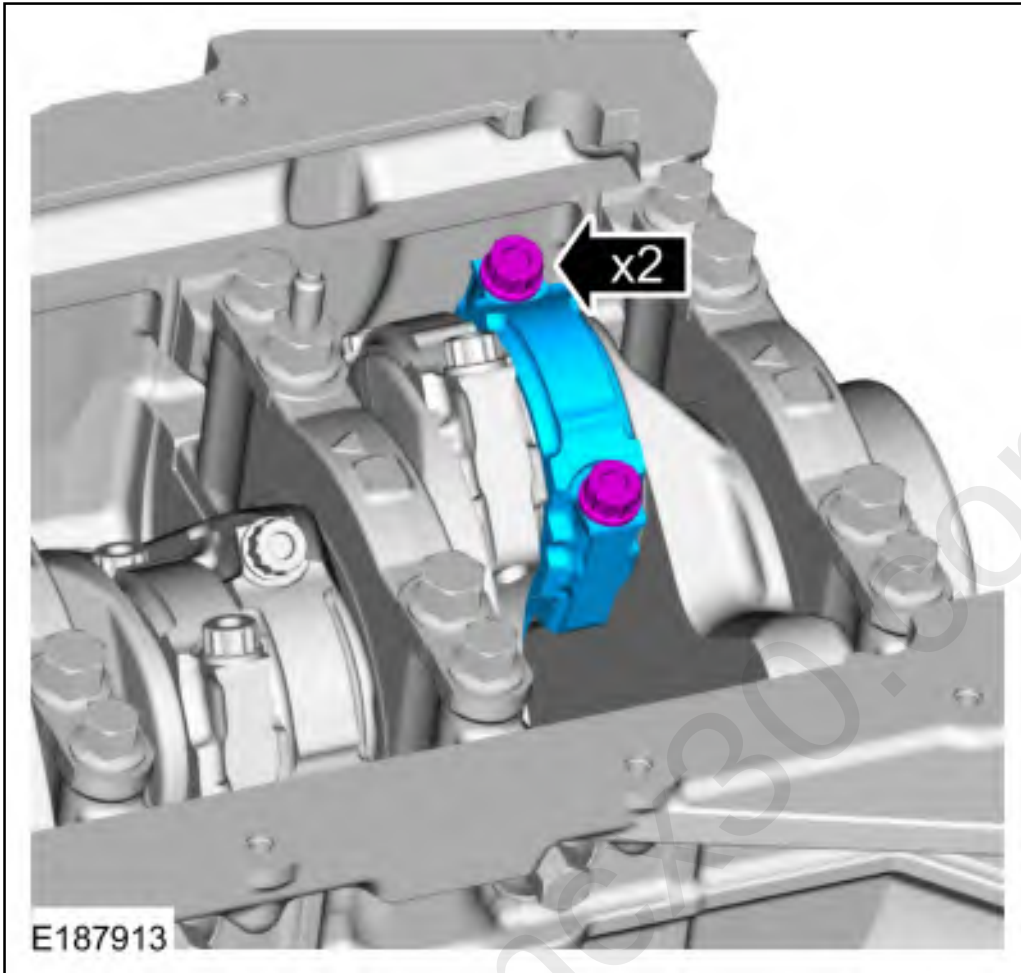


- Before removing the pistons, inspect the top of the cylinder bores.
- If necessary, remove the ridge or carbon deposits from each cylinder using an abrasive pad.



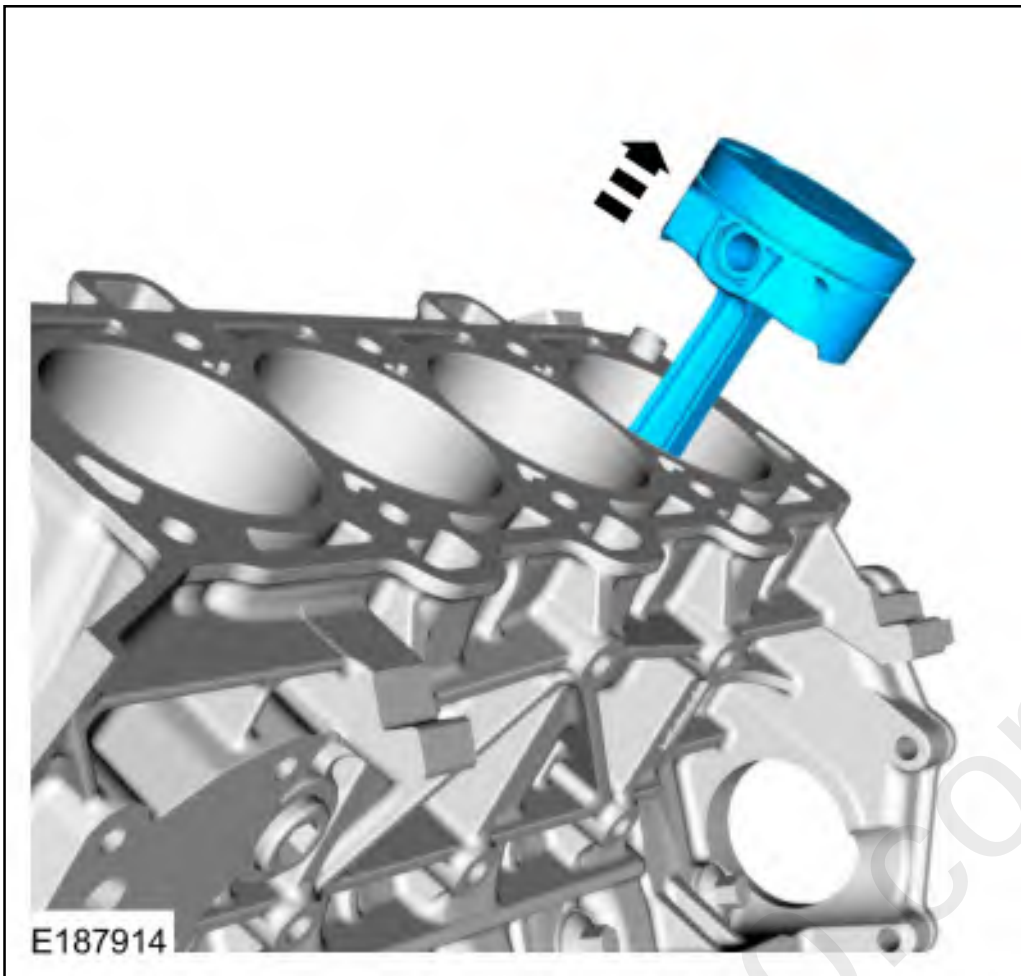
114. **NOTICE:** Verify that the connecting rod and rod cap have orientation numbers cast into them. If not, number the connecting rod and rod cap for correct orientation. Failure to do so can result in engine damage.

Remove the bolts and the connecting rod cap.



115. **NOTICE:** Do not scratch the cylinder walls or crankshaft journals with the connecting rod or engine damage may occur.

Remove the piston through the top of the cylinder block

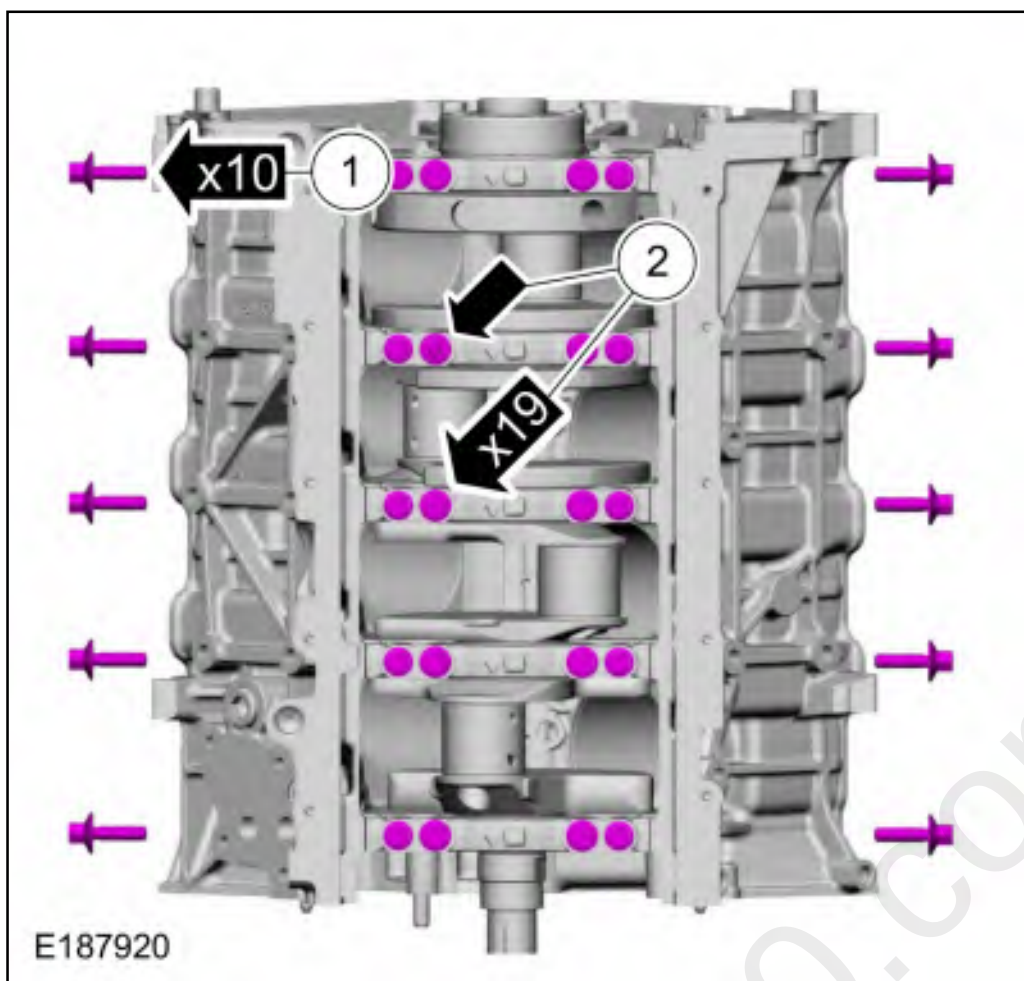


116. Repeat the previous 2 steps for each of the remaining pistons.

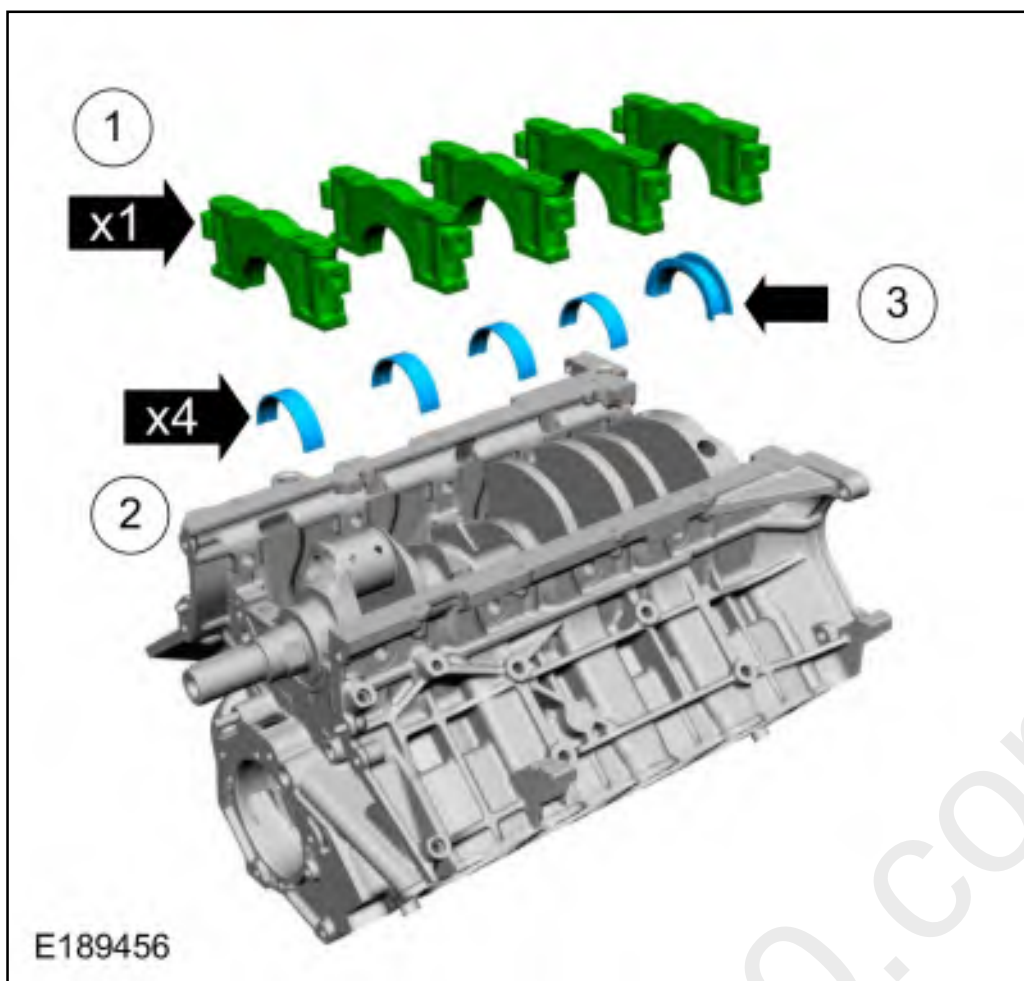
117. Disassemble the 8 pistons.

Refer to: [Piston Inspection](#) (303-00 Engine System - General Information, General Procedures).

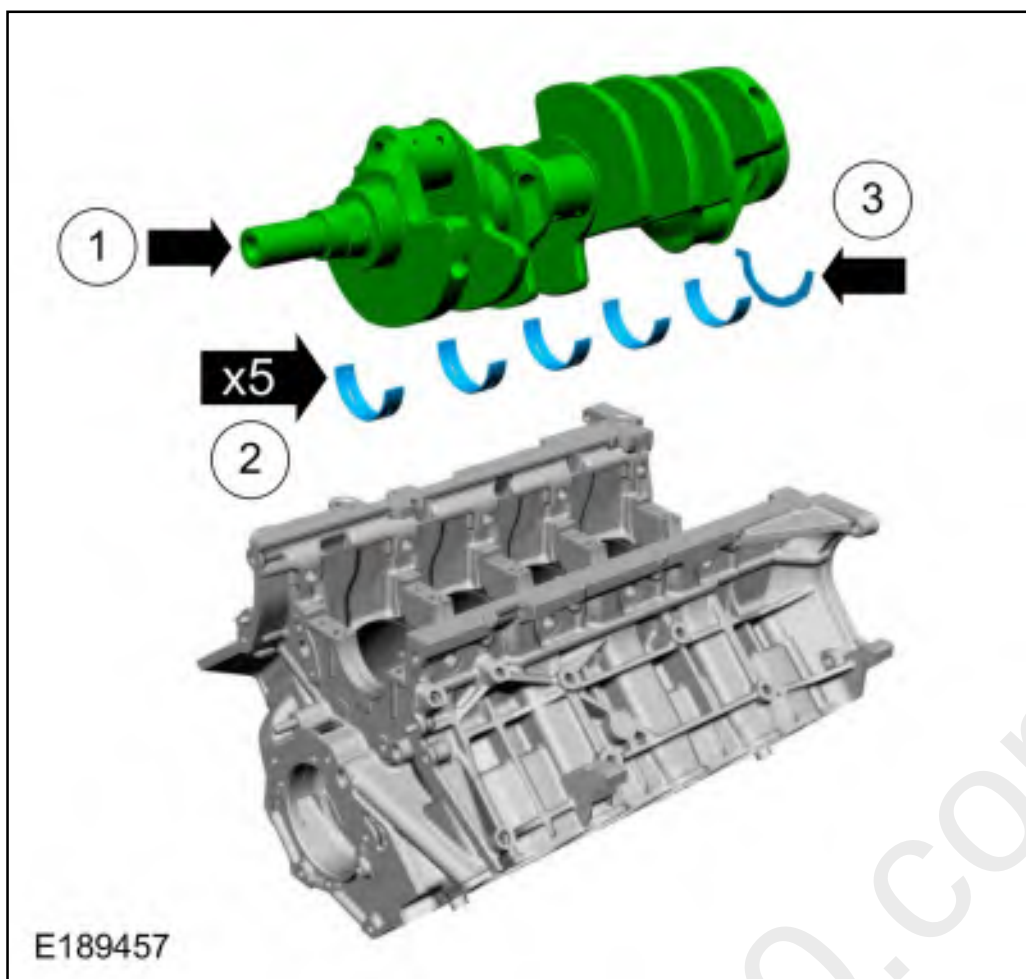
1. Remove and discard the cross-mounted main cap bolts.
2. Remove and discard the main bearing cap bolts and stud bolt.



119. Remove the main bearing caps (1), the lower crankshaft main bearings (2) and the lower thrust bearing (3).



120. Remove the crankshaft (1), the upper crankshaft main bearings (2) and the upper thrust washer (3) from the cylinder block.



121. Remove the bolts and the piston cooling jets from the cylinder block.

