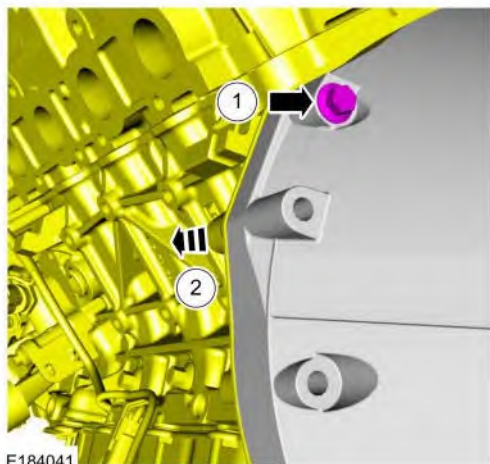
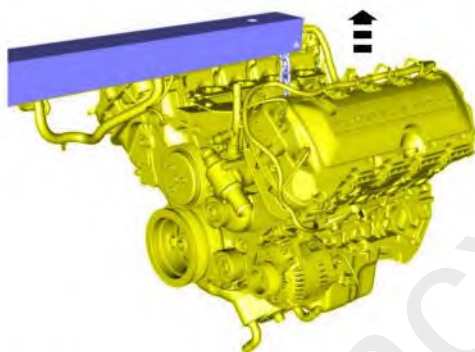




59.

Using the Floor Crane lift the engine from the vehicle.

Use the General Equipment: Floor Crane



DISASSEMBLY > ENGINE

Special Tool(s) / General Equipment



100-001 (T50T-100-A)
Slide Hammer



205-142 (T80T-4000-J)
Installer, Differential Bearing Cone

	205-153 (T80T-4000-W) Handle
	303-1247 VCT Spark Plug Tube Seal Remover and Installer TKIT-2006UF-FLM TKIT-2006UF-ROW
	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 ZC-31-B	-
Metal Brake Parts Cleaner (U.S.) PM-4-A, PM-4-B (U.S.)	-

 **NOTE:** 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.

 **NOTE:** 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.

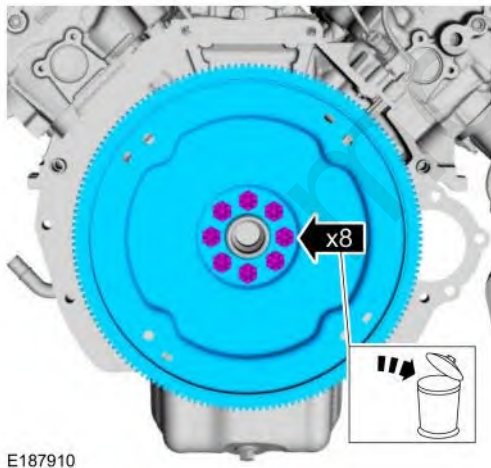
 **NOTE:** Refer to the exploded view under the Engine Component View .

6-Speed Automatic Transmission - 6R80

 **NOTE:** The flexplate bolts are torque-to-yield design and are not reusable

1.
Remove and discard the flexplate bolts.

Remove the flexplate.



6-Speed Manual Transmission - MT82

- 2.

 **WARNING:** Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved

techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.



NOTE: Loosen the bolts evenly to prevent clutch pressure plate damage.



NOTE: If the parts are to be reused, index-mark the pressure plate to the flywheel.

Remove and discard the pressure plate bolts.

Remove the pressure plate and the clutch disc.



NOTE: The flywheel bolts are torque-to-yield design and are not reusable

3.

Remove and discard the flywheel bolts.

Remove the flywheel.



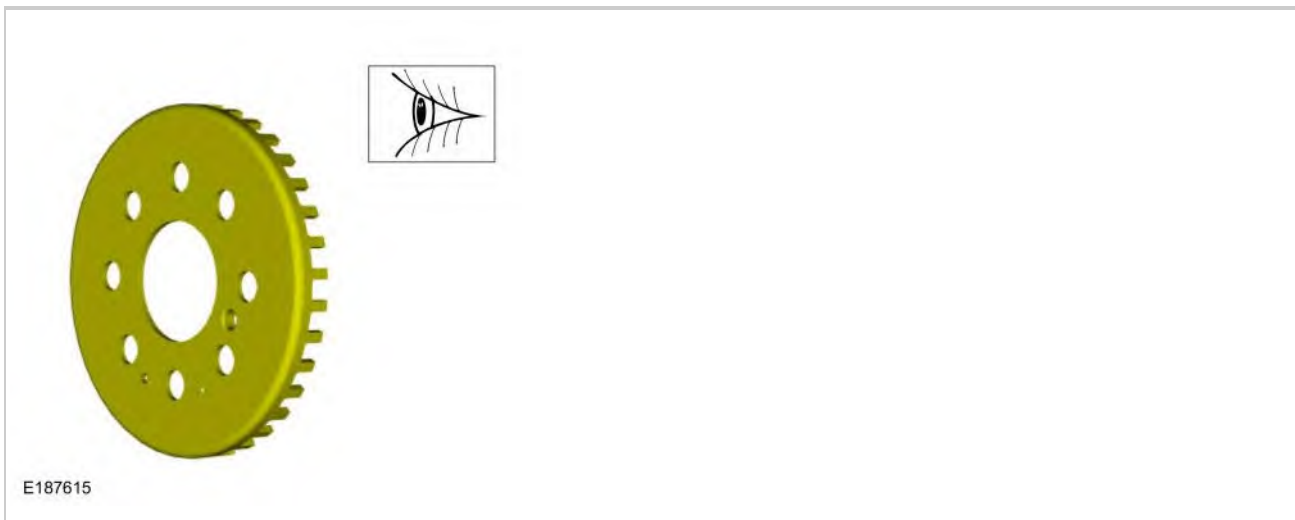
6-Speed Automatic Transmission - 6R80/6-Speed Manual Transmission - MT82

 **NOTE:** Engine equipped with manual transmission shown in illustration, automatic transmission engine similar.

4. Remove the crankshaft sensor ring and the engine-to-transmission spacer plate.



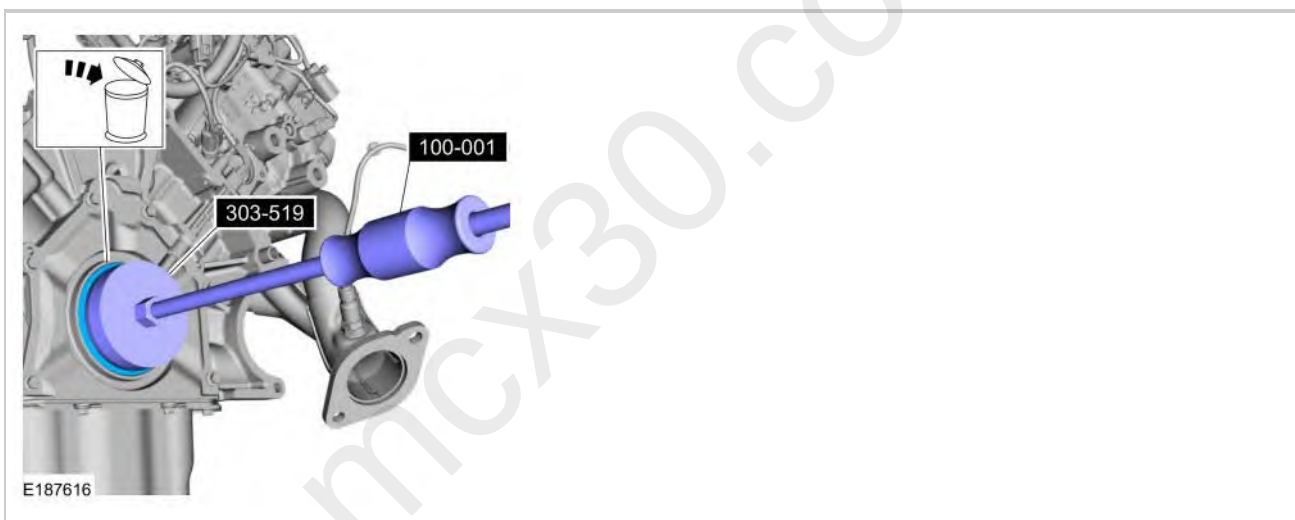
5. Inspect the crankshaft sensor ring for damage. If the crankshaft sensor ring has been dropped or has any visual damage, it must be replaced.



6.

Using the special tools, remove and discard the crankshaft rear seal.

Use Special Service Tool: 100-001 (T50T-100-A) Slide Hammer, 303-519 (T95P-6701-EH) Remover, Crankshaft Rear Oil Seal.



7.

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

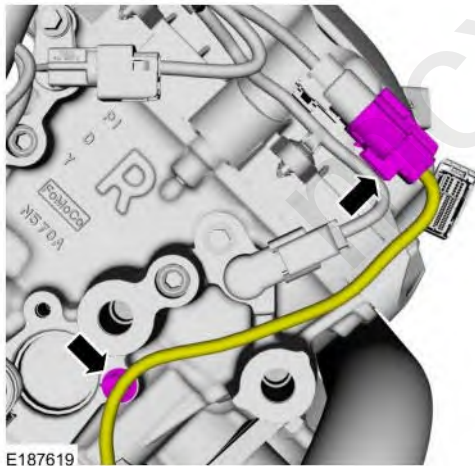
Use the General Equipment: Mounting Stand



E189975

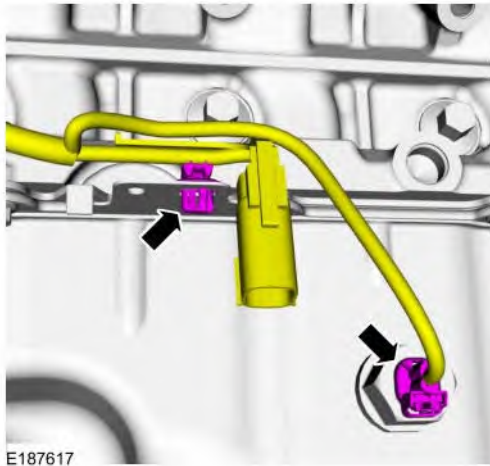
 **NOTE:** Manual transmission engine shown in illustration, automatic transmission engine similar.

8. Disconnect the RH HO2S electrical connector and wiring harness retainer.



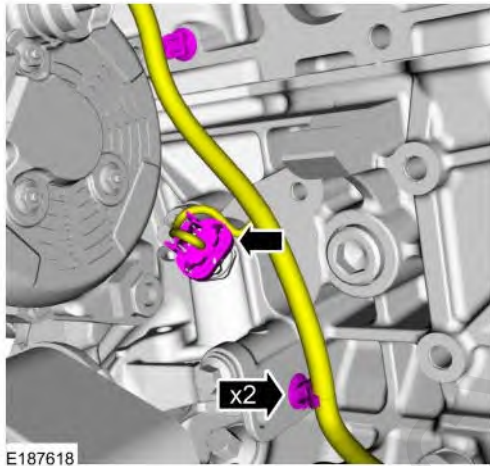
E187619

9. Disconnect the engine oil level sensor electrical connector and the wiring harness retainer.



10.

Disconnect the EOP) switch electrical connector and the wiring harness retainers.

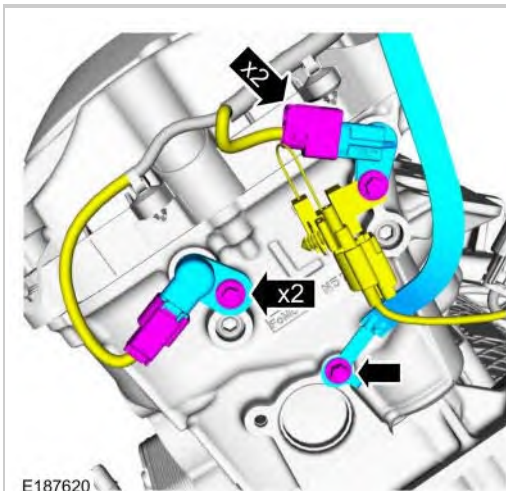


11.

Disconnect the LH camshaft position sensor electrical connectors.

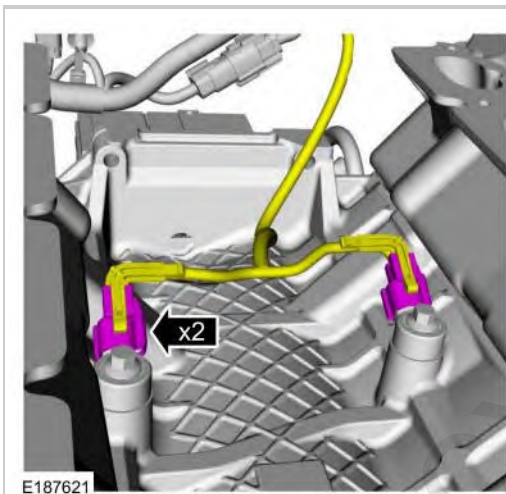
Remove the bolt and the ground wire.

Remove the bolts and the LH camshaft position sensors.



12.

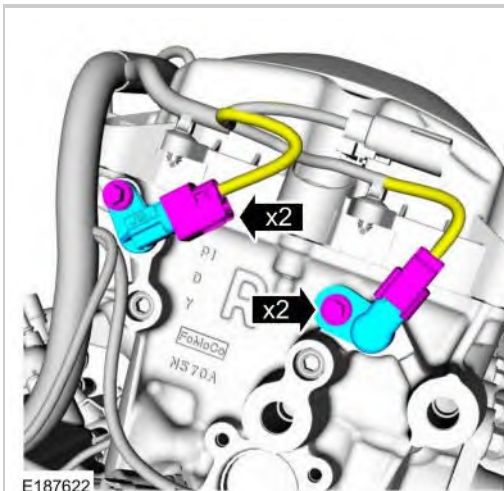
Disconnect the KS electrical connectors.



13.

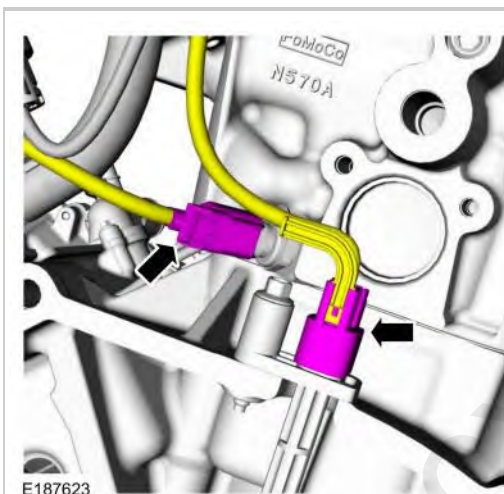
Disconnect the RH camshaft position sensor electrical connectors.

Remove the bolts and the RH camshaft position sensors.



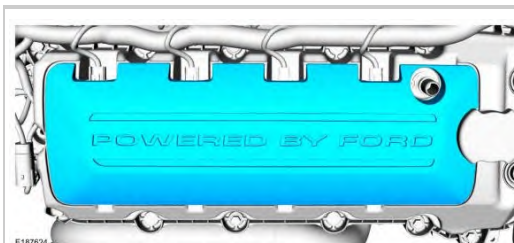
14.

Disconnect the CHT sensor and the CKP sensor electrical connectors.



15.

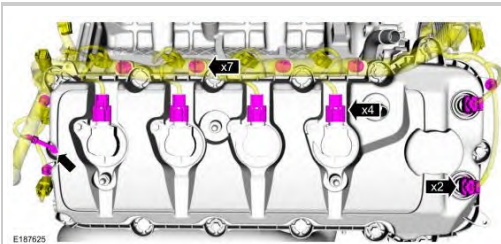
Remove the RH spark plug cover.



 **NOTE:** Engine equipped with automatic transmission shown in illustration, manual transmission engine similar.

16.

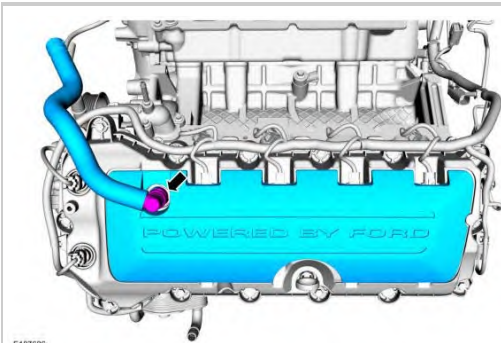
Disconnect the wiring harness electrical connectors and retainers.



17.

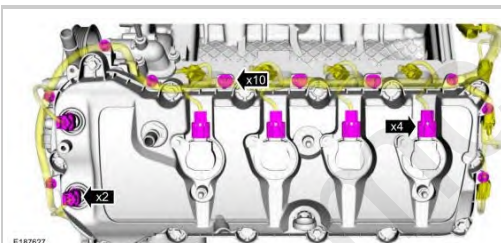
Remove the crankcase ventilation tube. Refer to: QUICK RELEASE COUPLING .

Remove the LH spark plug cover.



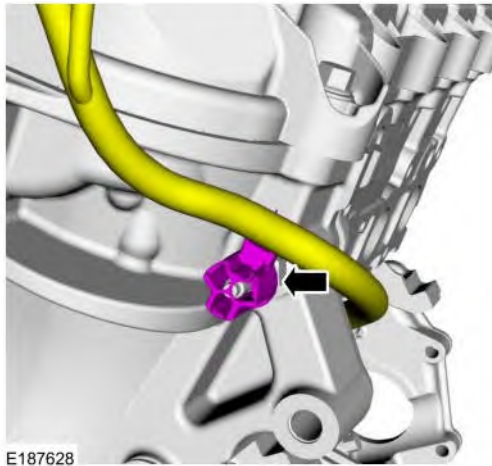
18.

Disconnect the wiring harness electrical connectors and retainers.



19.

Detach the wiring harness retainer from the engine front cover stud bolt.



20.

1.

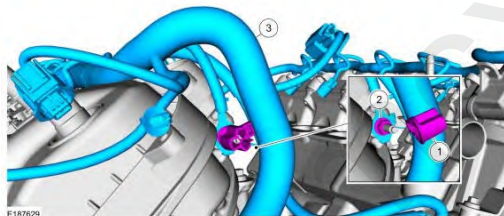
Detach the wiring harness retainer from the engine front cover stud bolt.

2.

Remove the nut and the ground wire.

3.

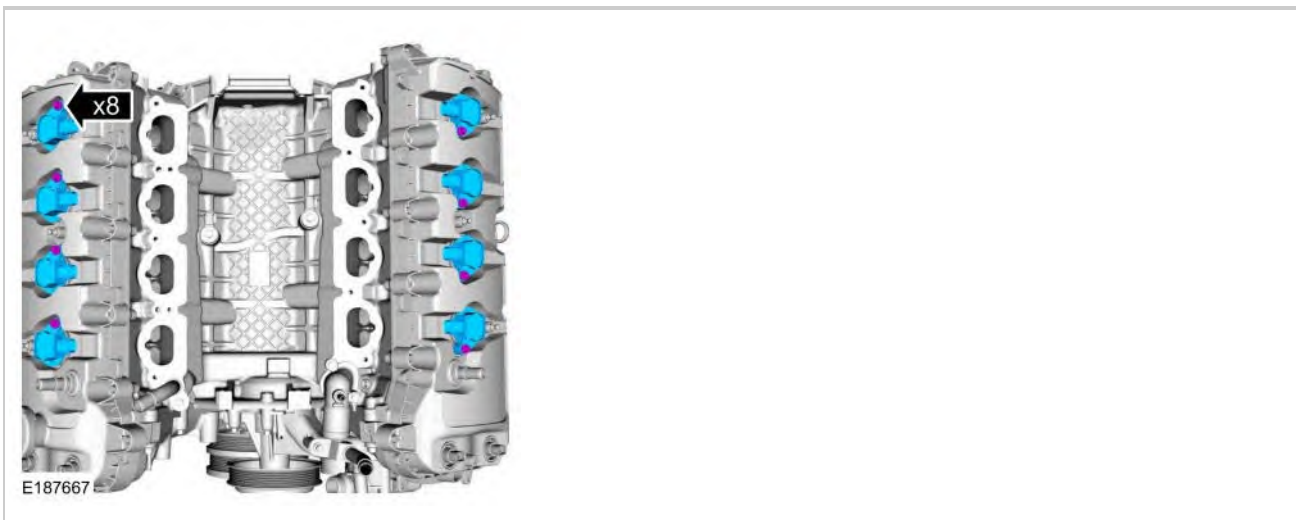
Remove the wiring harness from the engine.



 **NOTE:** When removing the ignition coils, a slight twisting motion will break the seal and ease removal.

21.

Remove the bolts and the ignition coils.



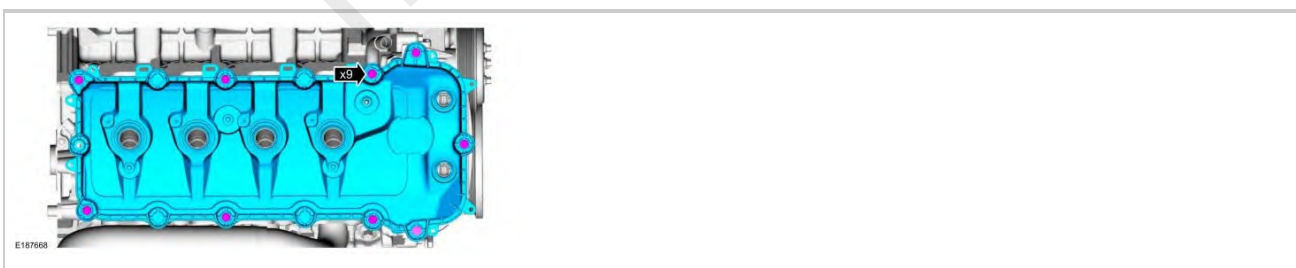
22.

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



23.

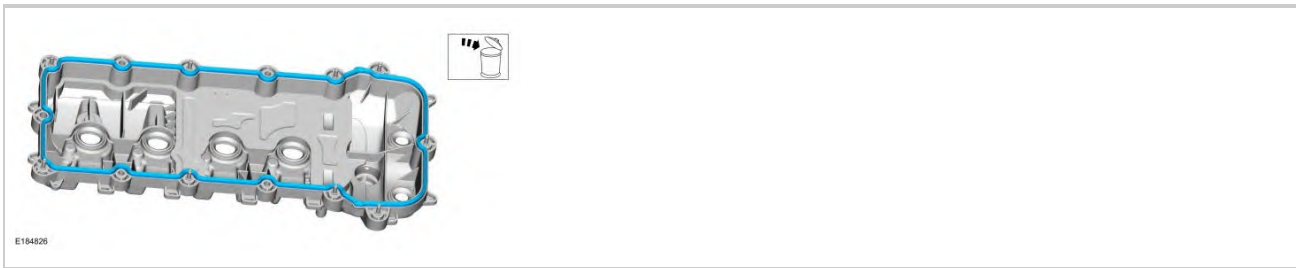
Loosen the bolts and remove the RH valve cover.



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

24.

Remove and discard the gasket.



25.

Inspect the VCT variable force solenoid seals. Remove any damaged seals using the special tools.

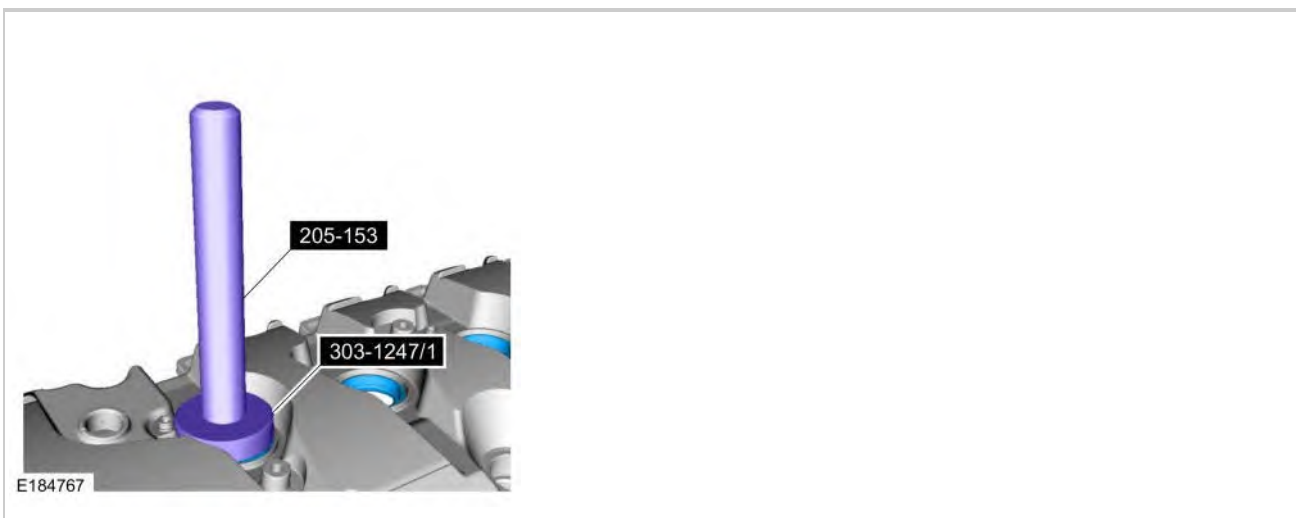
Use Special Service Tool: 205-153 (T80T-4000-W) Handle, 205-142 (T80T-4000-J) Installer, Differential Bearing Cone.



26.

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.





NOTE: 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.

27.

Clean the valve cover mating surface of the RH cylinder head and engine front cover. Refer to: RTV Sealing Surface Cleaning and Preparation .

Use the General Equipment: Plastic Scraper

Material

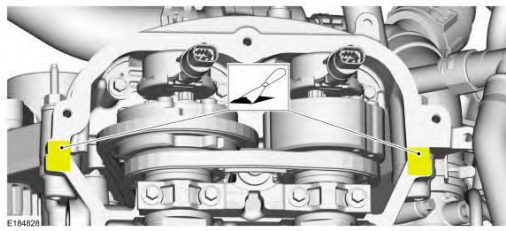
: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material

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

Material

: Metal Brake Parts Cleaner (U.S.) / PM-4-A, PM-4-B (U.S.)



28.

1.

Remove the oil level indicator.

2.

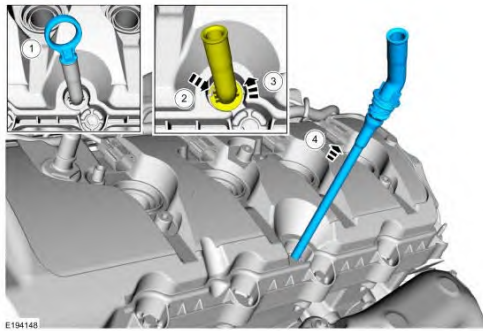
Depress the tab.

3.

Rotate the oil level indicator tube counterclockwise.

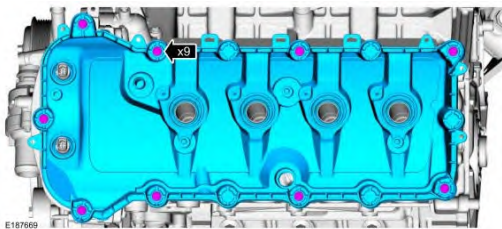
4.

Pull the oil level indicator tube from the engine.



29.

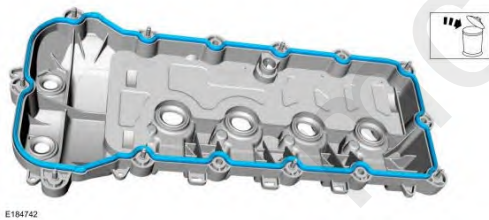
Loosen the bolts and remove the LH valve cover.



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

30.

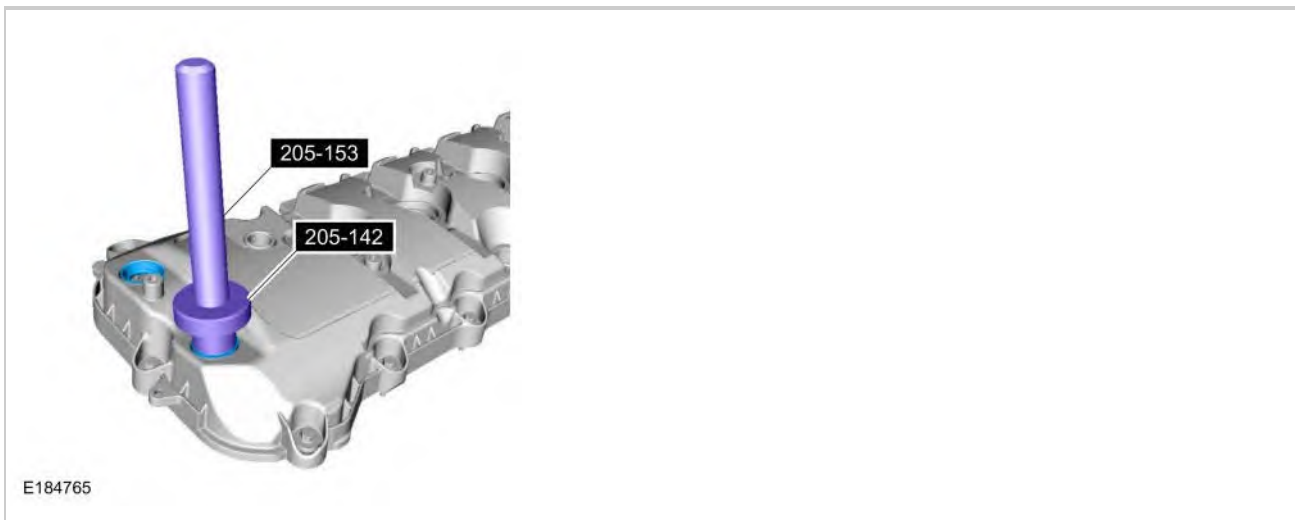
Remove and discard the gasket.



31.

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.



32.

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.



 **NOTE:** 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.

33.

Clean the valve cover mating surface of the LH cylinder head and engine front cover. Refer to: RTV Sealing Surface Cleaning and Preparation .

Use the General Equipment: Plastic Scraper

Material

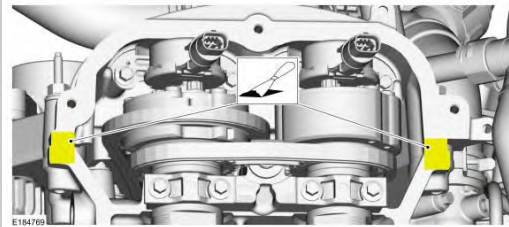
: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material

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

Material

: Metal Brake Parts Cleaner (U.S.) / PM-4-A, PM-4-B (U.S.)

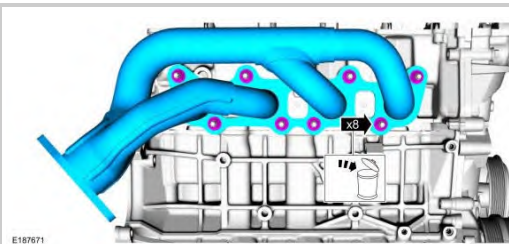


34.

Remove and discard the nuts.

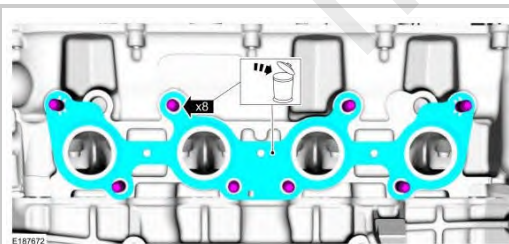
Remove the exhaust manifold.

Clean and inspect the exhaust manifold. Refer to: Exhaust Manifold Cleaning and Inspection



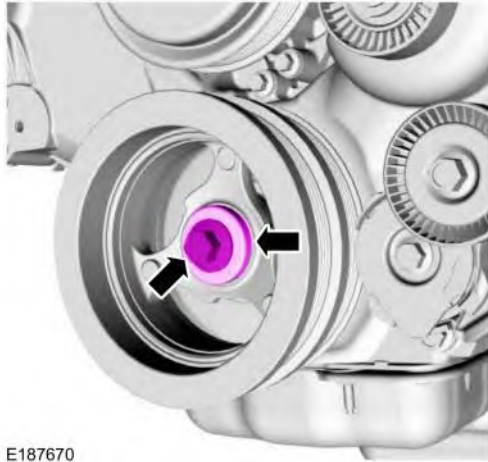
35.

Remove and discard the gasket and studs.



36.

Remove the crankshaft pulley bolt and washer.



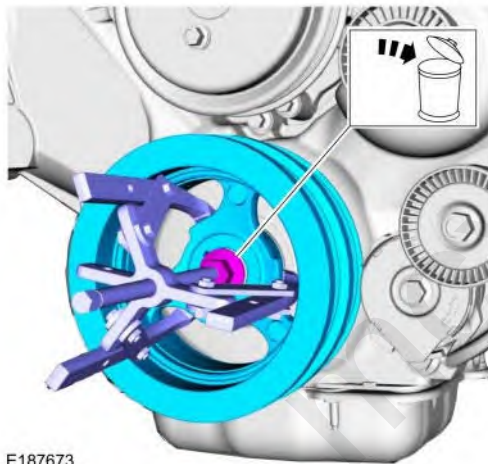
E187670

37.

Using the 3 Leg Puller and the crankshaft pulley bolt, remove the crankshaft pulley.

Use the General Equipment: Three Leg Puller

Discard the crankshaft pulley bolt.



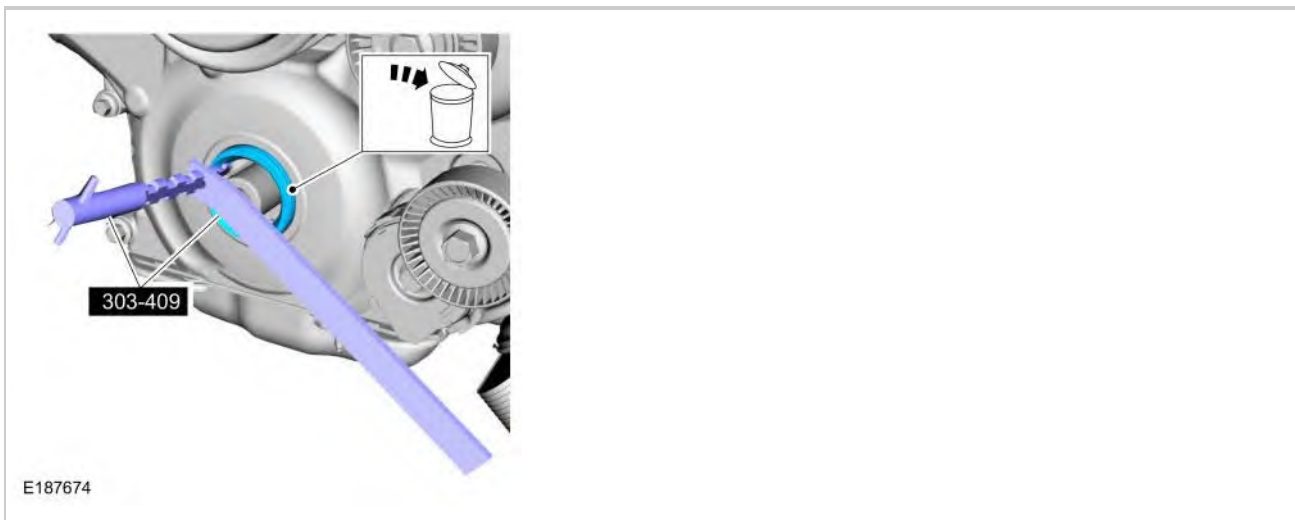
E187673

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

38.

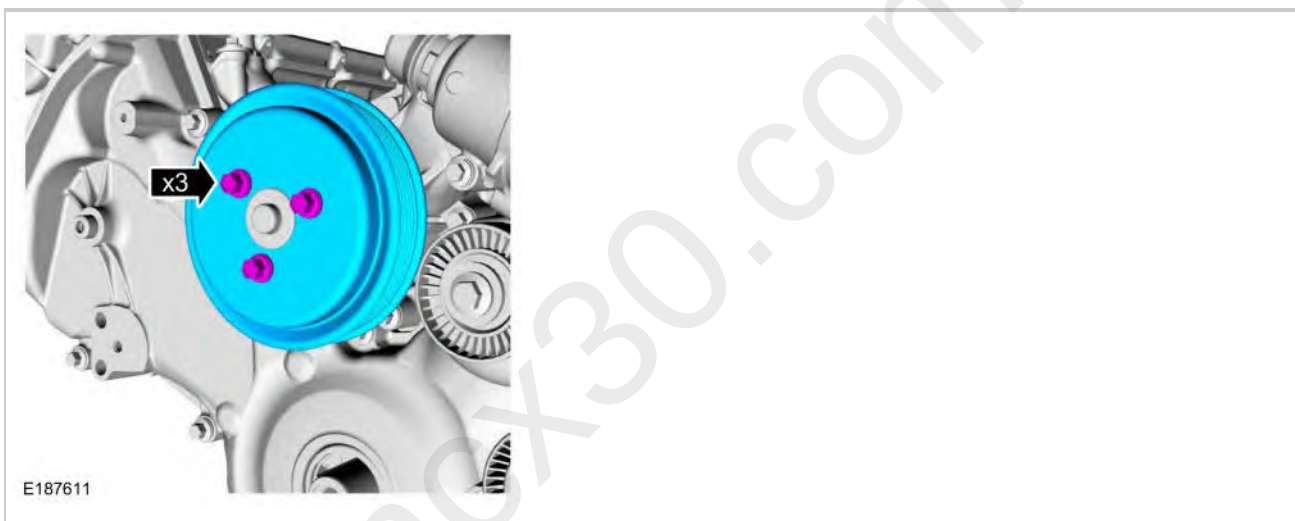
Using the special tool, remove and discard the crankshaft front oil seal.

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



39.

Remove the bolts and the coolant pump pulley.



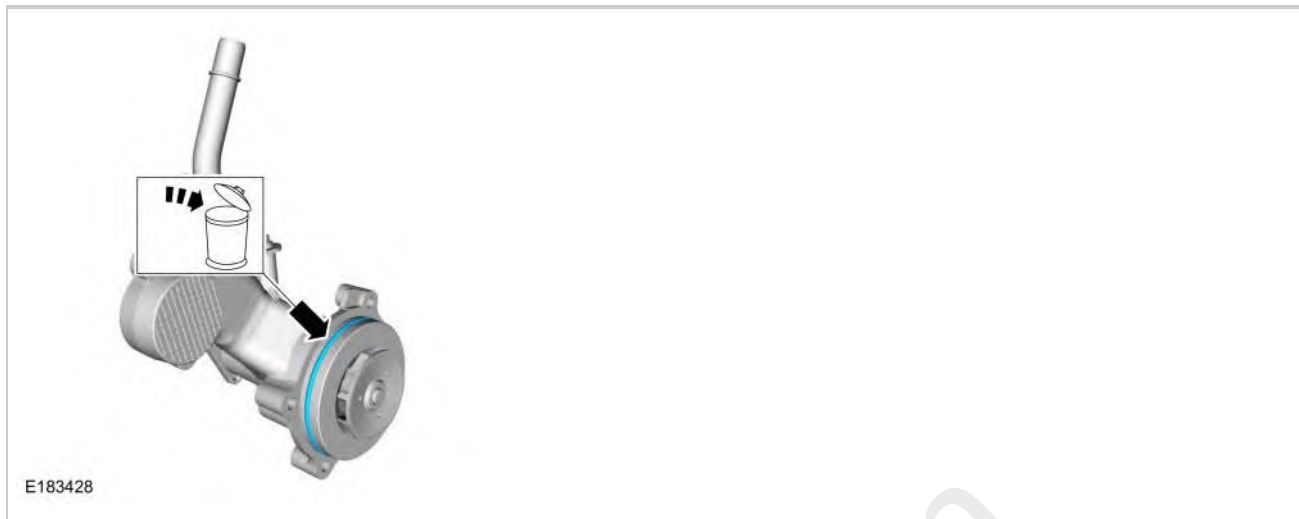
40.

Remove the bolts and the coolant pump.



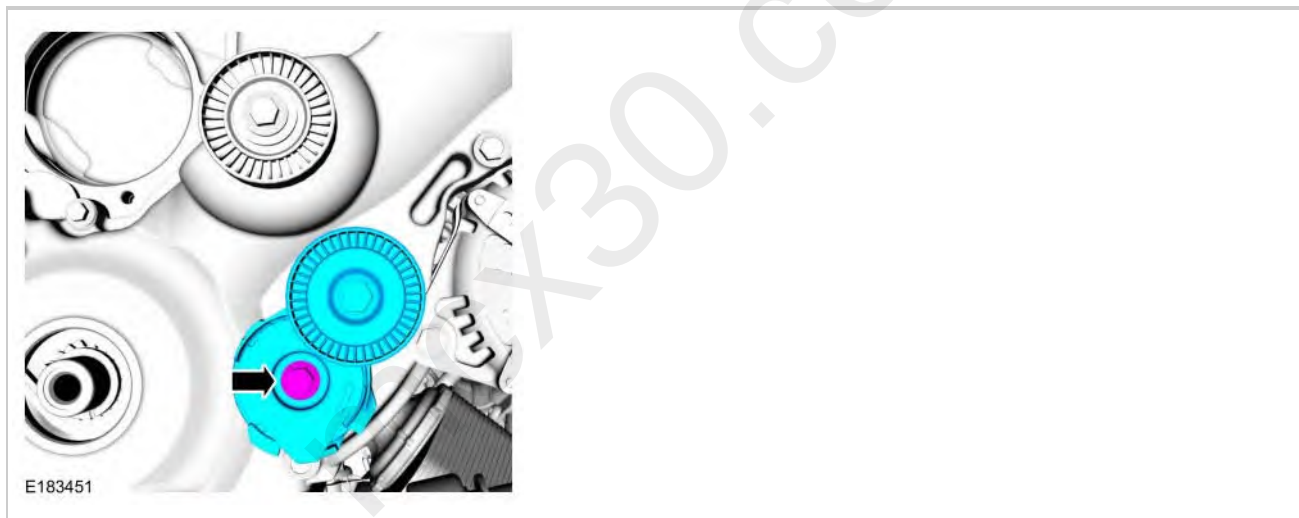
41.

Remove and discard the coolant pump O-ring seal.



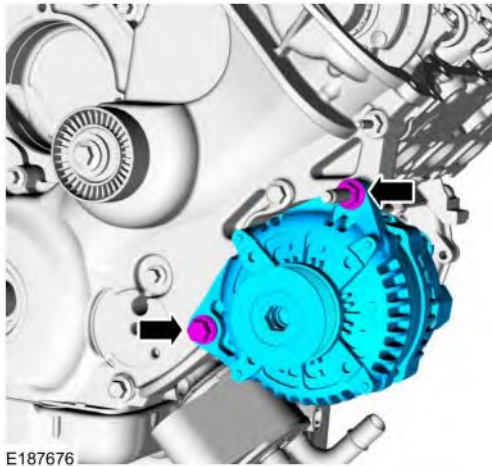
42.

Remove the bolt and the accessory drive belt tensioner.



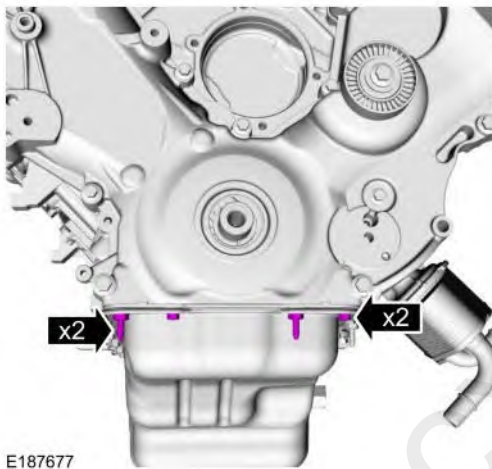
43.

Remove the nut, the bolt and the generator.



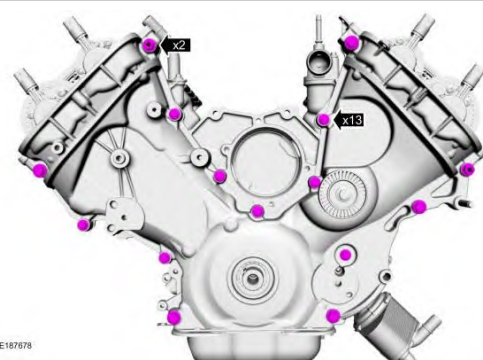
44.

Remove the bolts and stud bolts.



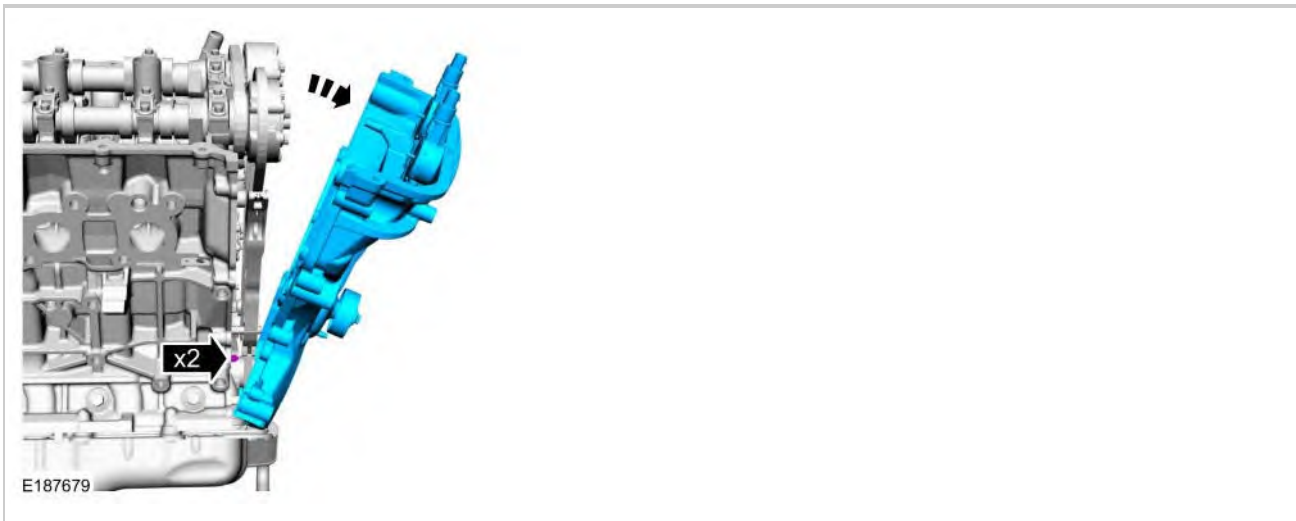
45.

Remove the bolts and stud bolts.



46.

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



47.

Remove and discard the gaskets.



 **NOTE:** 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.

48.

Clean and inspect the mating surface. Refer to: RTV Sealing Surface Cleaning and Preparation .

Use the General Equipment: Plastic Scraper

Material

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

Material

: Metal Brake Parts Cleaner (U.S.) / PM-4-A, PM-4-B (U.S.)

Material

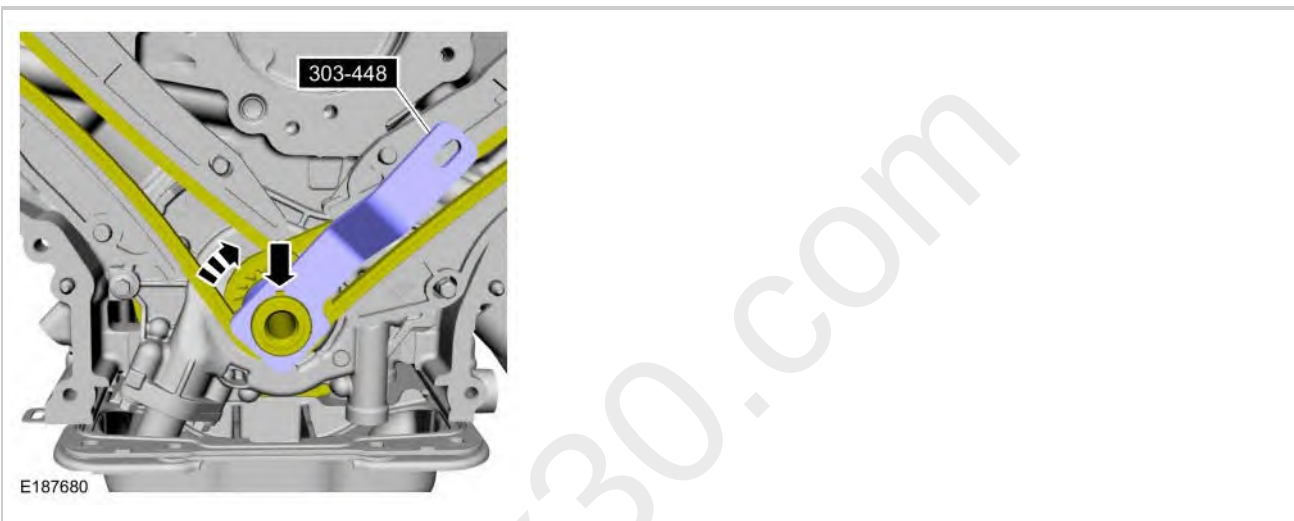
: Motorcraft® Metal Surface Prep / ZC-31-B



49.

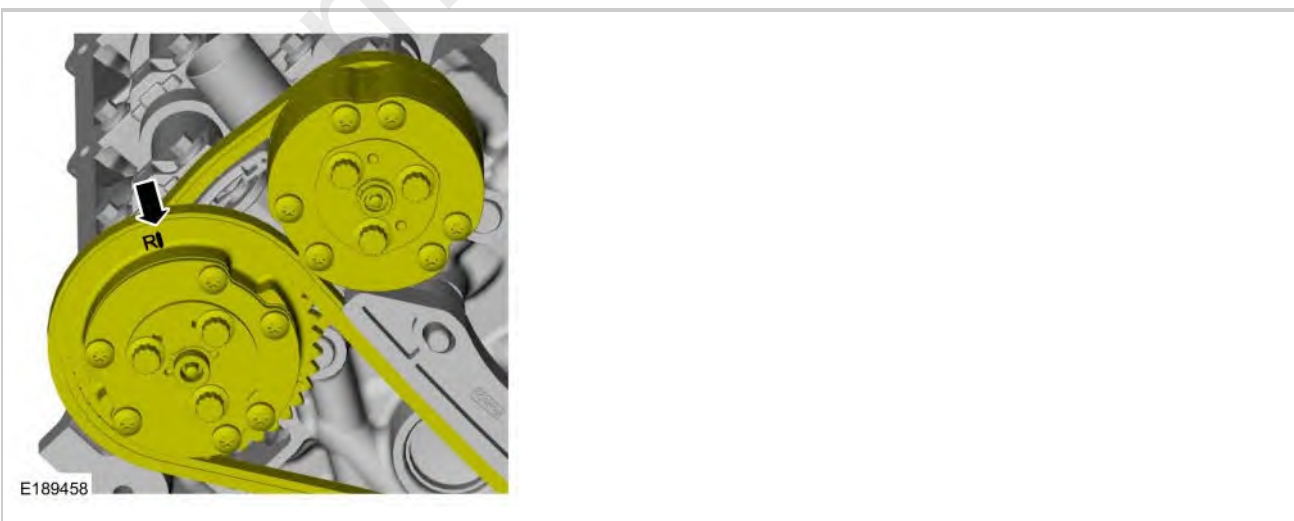
Using the special tool, rotate the crankshaft clockwise until the keyway is at the 12 o'clock position.

Use Special Service Tool: 303-448 (T93P-6303-A) Holding Tool, Crankshaft.



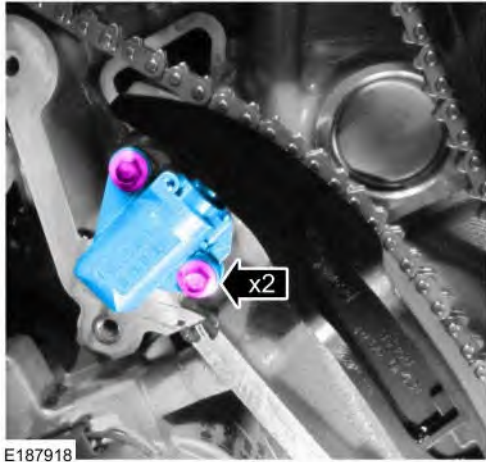
50.

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 12 o'clock position.



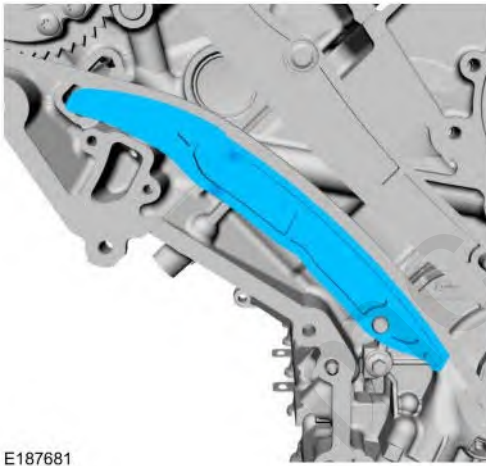
51.

Remove the bolts and the RH primary timing chain tensioner.



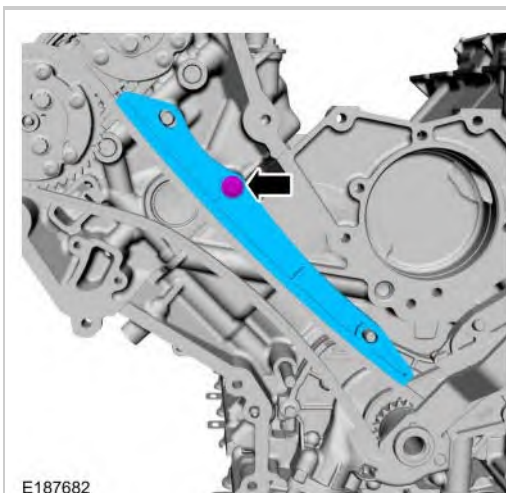
 **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the RH timing chain tensioner arm. Return the crankshaft keyway to the 12 o'clock position after removing the RH timing chain tensioner arm.

52.
Remove the RH timing chain tensioner arm.



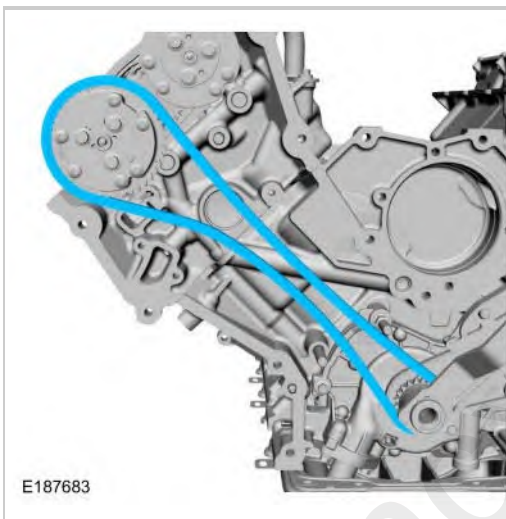
 **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the RH timing chain guide. Return the crankshaft keyway to the 12 o'clock position after removing the RH timing chain guide.

53.
Remove the bolt and the RH timing chain guide.



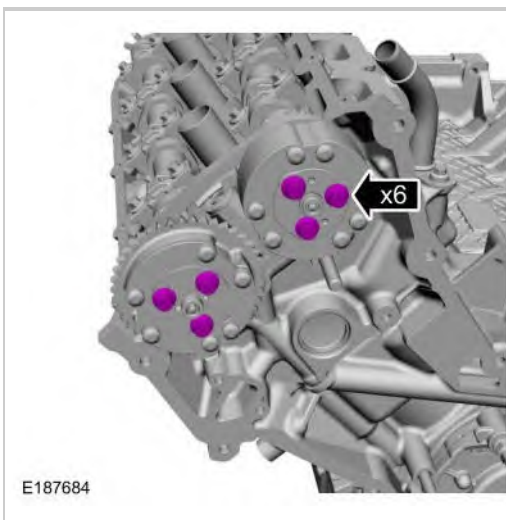
54.

Remove the RH timing chain.



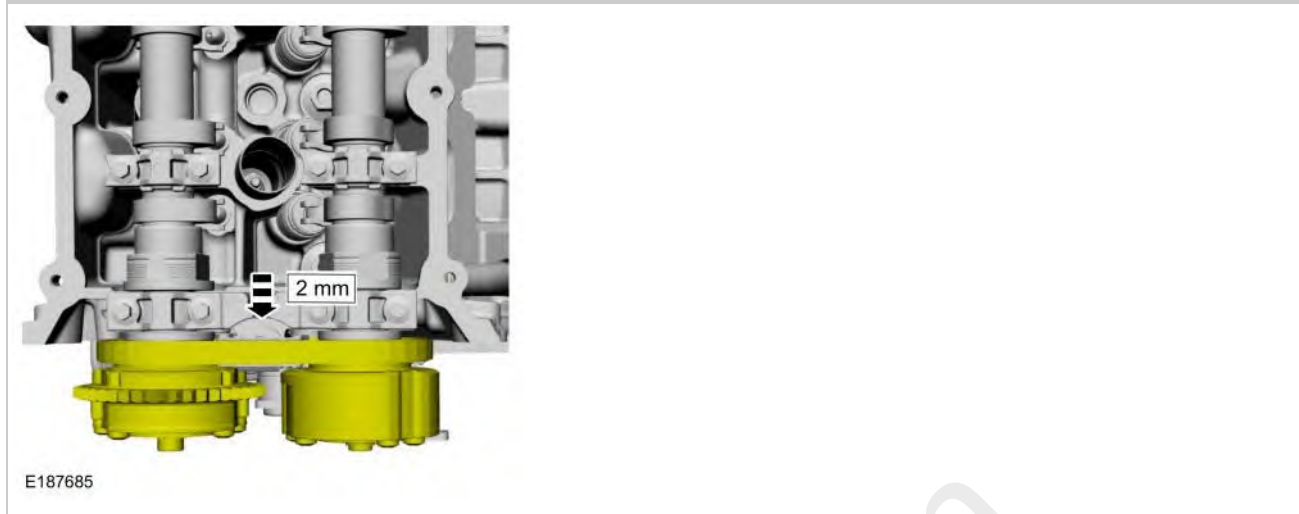
55.

Remove the intake and exhaust VCT assembly bolts.



56.

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



57.

1.

Depress the secondary timing chain tensioner.

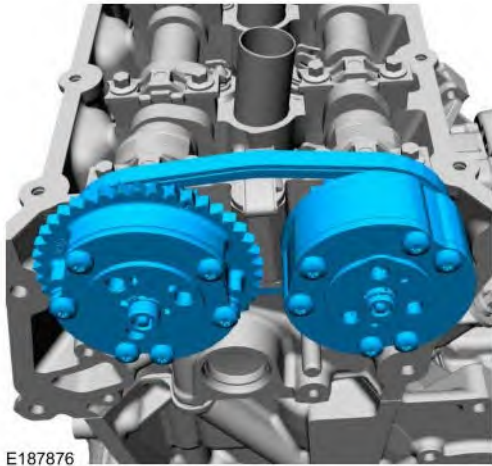
2.

Turn the tensioner counterclockwise 90 degrees.



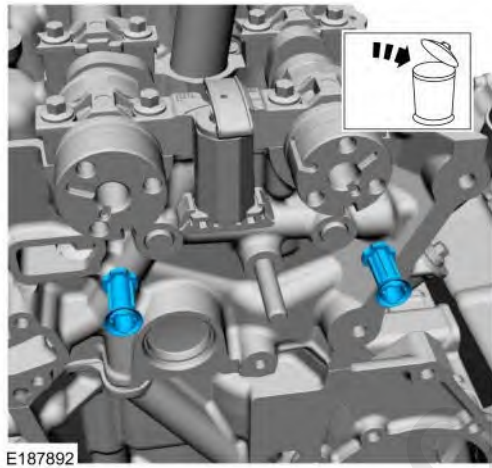
58.

Remove the VCT assemblies and the secondary timing chain.



59.

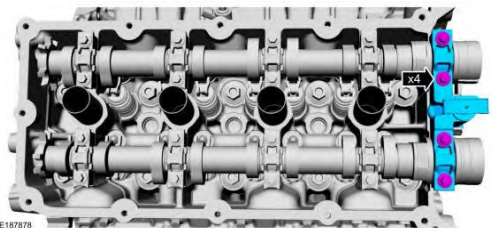
Remove and discard the VCT system oil filters.



 **NOTE:** 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.

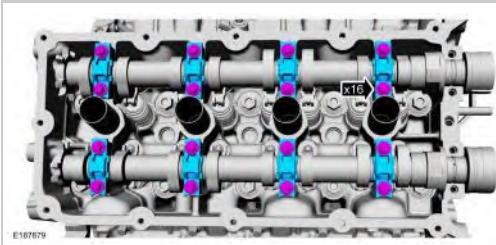
60.

Remove the bolts and the front camshaft bearing mega cap.



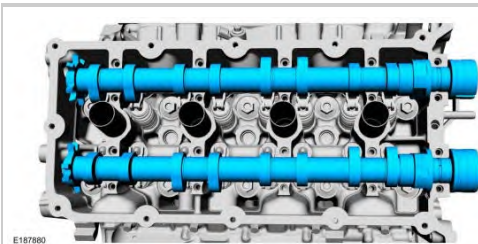
61.

Remove the bolts and the camshaft bearing caps.



62.

Remove the intake and exhaust camshafts.

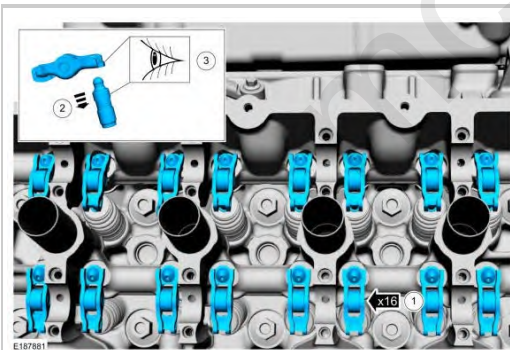


63.

Remove the camshaft roller follower and hydraulic lash adjuster assemblies.

Separate the hydraulic lash adjusters from the spring clips on the camshaft roller followers.

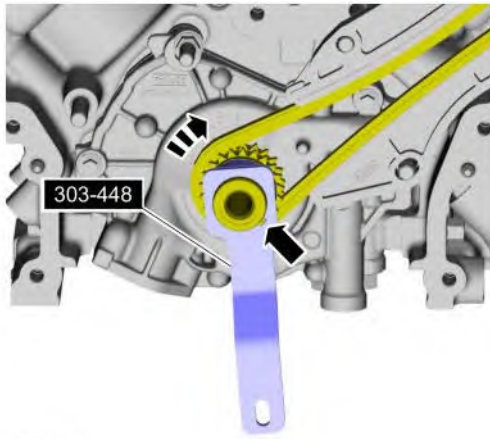
Inspect the hydraulic lash adjuster and roller follower for damage. If any damage is found, inspect the camshaft lobes and valves for damage. Replace damaged components as necessary.



64.

Using the special tool, rotate the crankshaft clockwise until the keyway is at the 5 o'clock position.

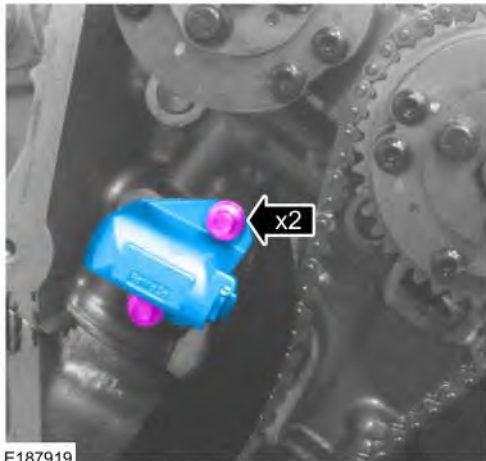
Use Special Service Tool: 303-448 (T93P-6303-A) Holding Tool, Crankshaft.



E187882

65.

Remove the bolts and the LH primary timing chain tensioner.

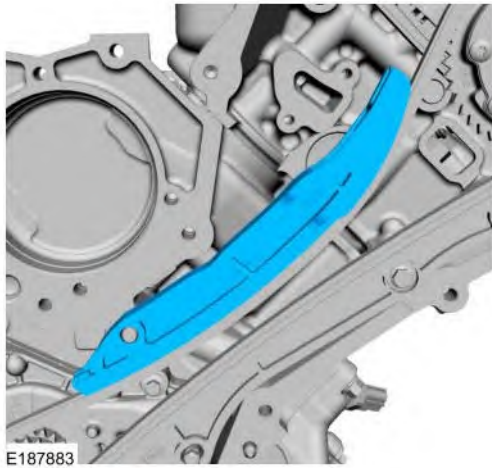


E187919

 **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 5 o'clock position after removing the LH timing chain tensioner arm.

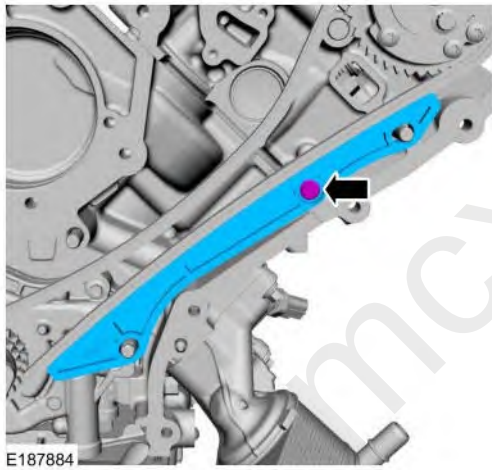
66.

Remove the LH timing chain tensioner arm.

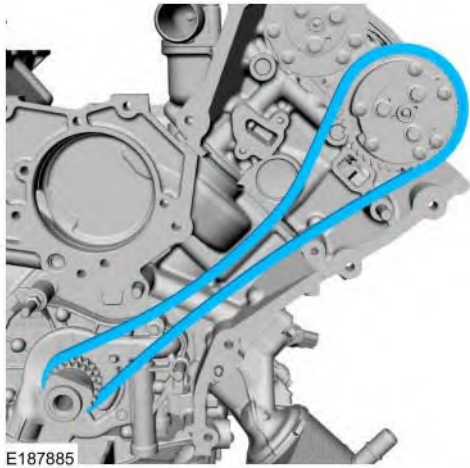


 **NOTE:** It may be necessary to rotate the crankshaft slightly to provide enough slack in the chain to remove the LH timing chain guide. Return the crankshaft keyway to the 5 o'clock position after removing the LH timing chain guide.

67.
Remove the bolt and the LH timing chain guide.



68.
Remove the LH timing chain.



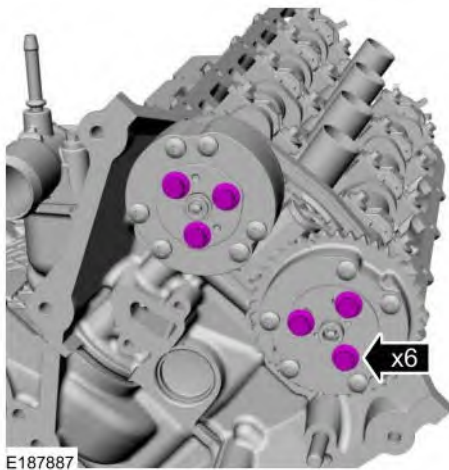
69.

Remove the crankshaft sprocket.



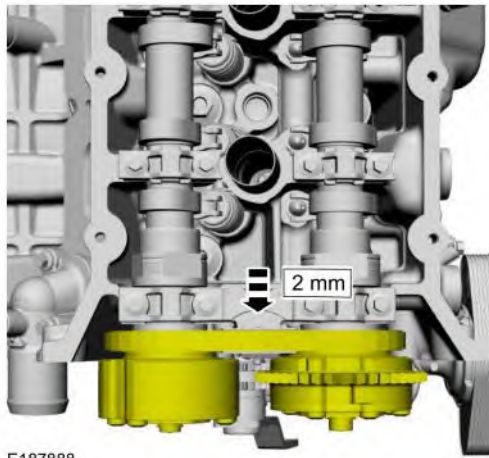
70.

Remove the intake and exhaust VCT assembly bolts.



71.

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



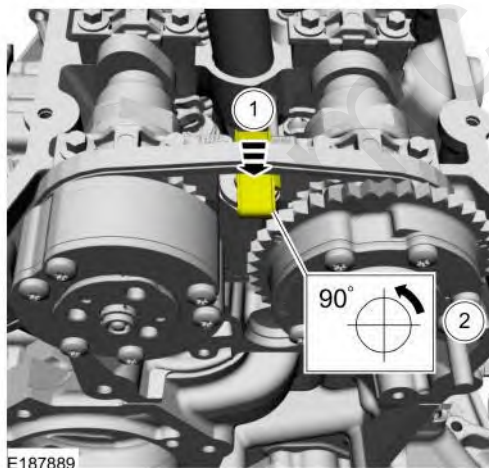
72.

1.

Depress the secondary timing chain tensioner.

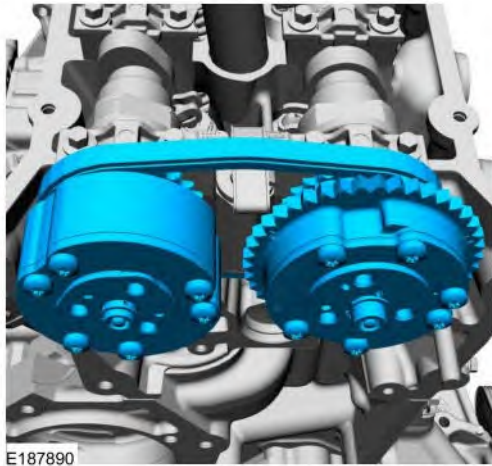
2.

Turn the tensioner counterclockwise 90 degrees.



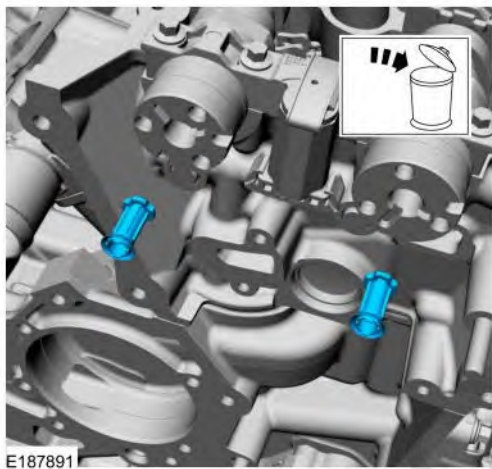
73.

Remove the VCT assemblies and the secondary timing chain.



74.

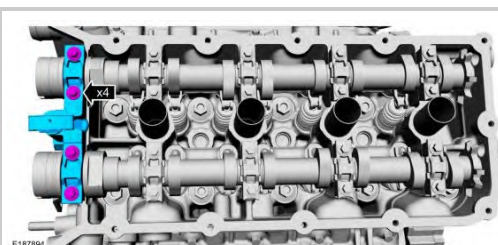
Remove and discard the VCT system oil filters.



 **NOTE:** 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.

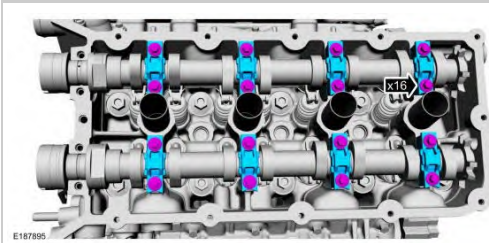
75.

Remove the bolts and the front camshaft bearing mega cap.



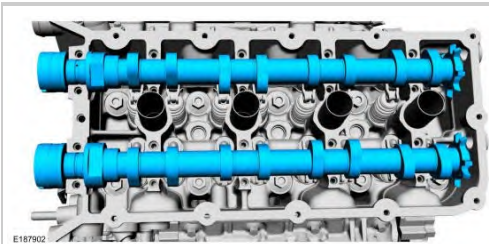
76.

Remove the bolts and the camshaft bearing caps.



77.

Remove the intake and exhaust camshafts.

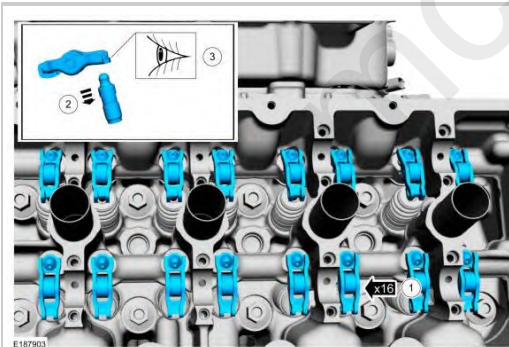


78.

Remove the camshaft roller follower and hydraulic lash adjuster assemblies.

Separate the hydraulic lash adjusters from the spring clips on the camshaft roller followers.

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.



 **NOTE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage can result if a warm or hot cylinder head is removed.

 **NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.



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

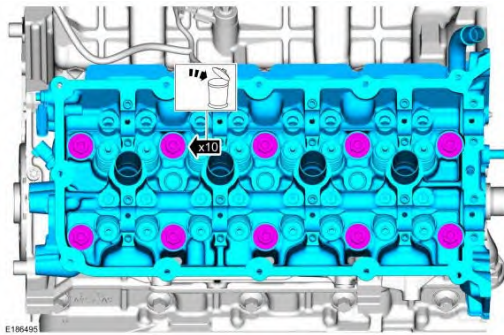


NOTE: The cylinder head bolts must be discarded and new bolts must be installed. They are a tighten-to-yield design and cannot be reused.

79.

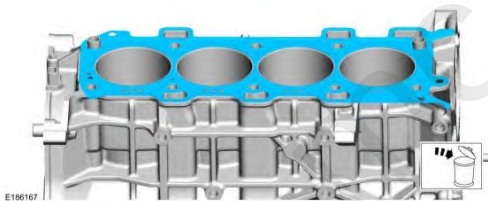
Remove and discard the bolts.

Remove the cylinder head.



80.

Remove and discard the cylinder head gasket.



81.

Remove the dowels.



NOTE: 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.



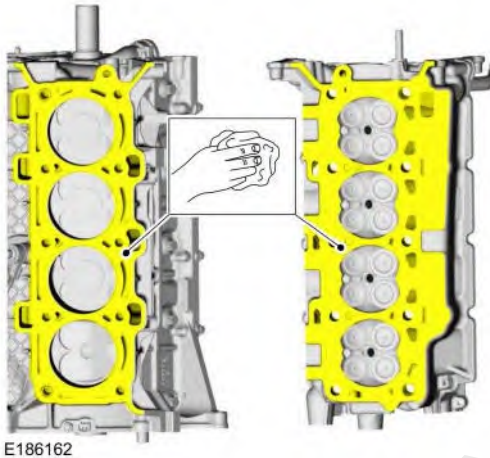
NOTE: Clean the cylinder head bolt holes in the cylinder block using compressed air. Make sure all coolant, oil or other foreign material is removed.

82.

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 .

Refer to: Cylinder Block Distortion .



NOTE: The cylinder head must be cool before removing it from the engine. Cylinder head warpage can result if a warm or hot cylinder head is removed.



NOTE: Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.



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

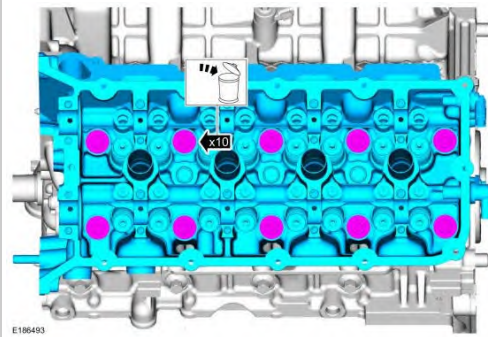


NOTE: The cylinder head bolts must be discarded and new bolts must be installed. They are a tighten-to-yield design and cannot be reused.

83.

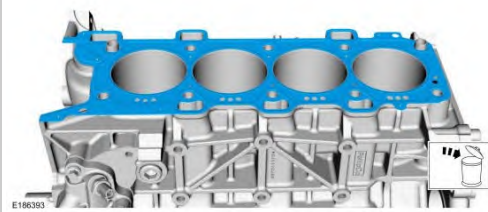
Remove and discard the bolts.

Remove the cylinder head.



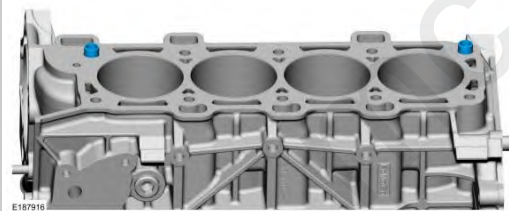
84.

Discard the cylinder head gasket.



85.

Remove the dowels.



 **NOTE:** 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.

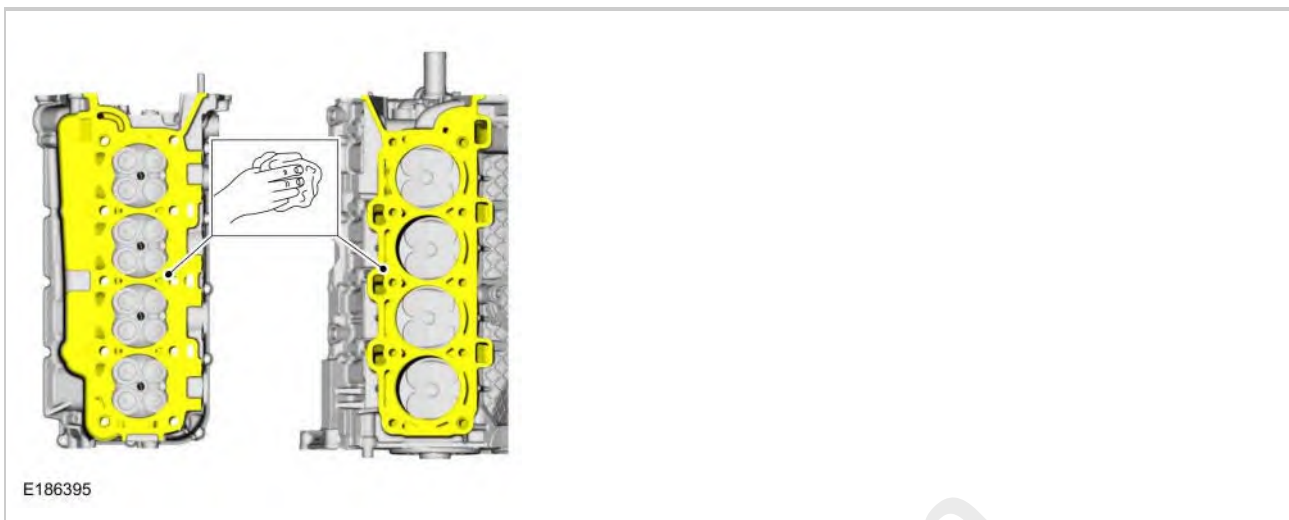
 **NOTE:** Clean the cylinder head bolt holes in the cylinder block using compressed air. Make sure all coolant, oil or other foreign material is removed.

86.

Clean and inspect the cylinder head-to-cylinder block mating surfaces of both the cylinder head and the cylinder block.

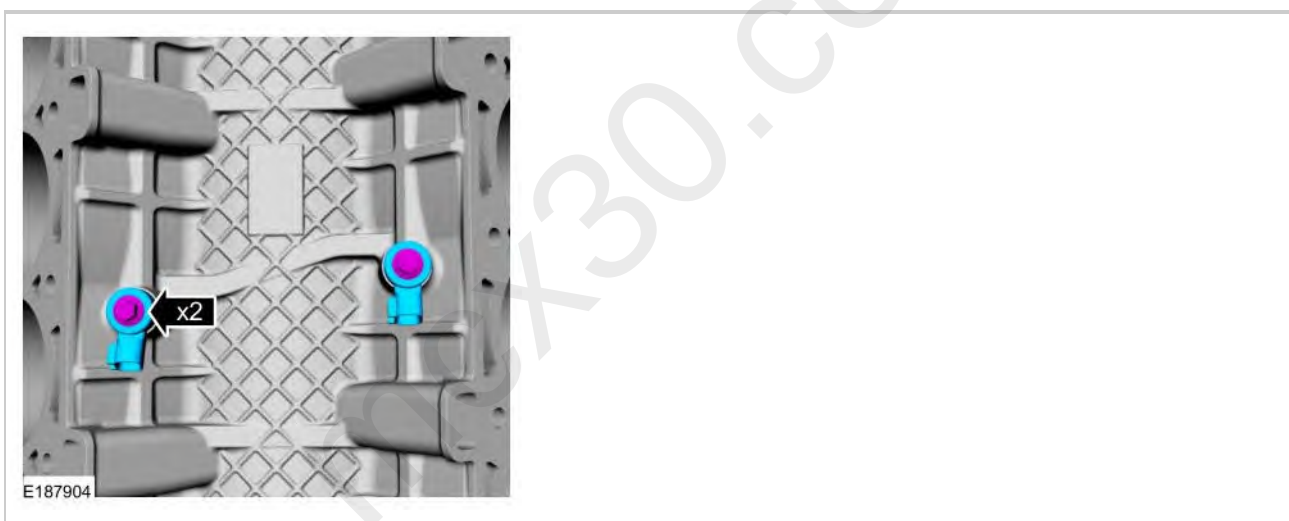
Refer to: Cylinder Head Distortion .

Refer to: Cylinder Block Distortion .



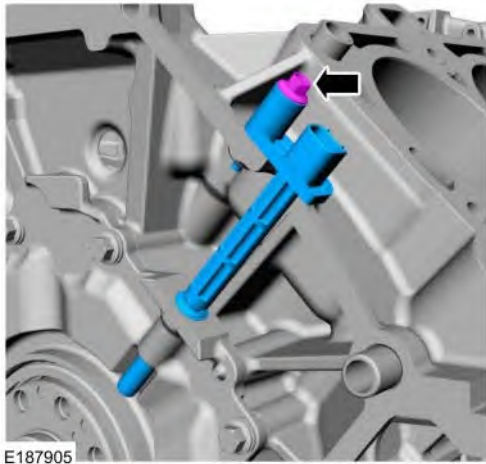
87.

Remove the bolts and the KSs.



88.

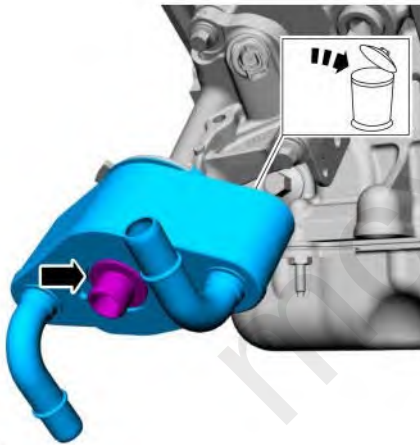
Remove the bolt and the CKP sensor.



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

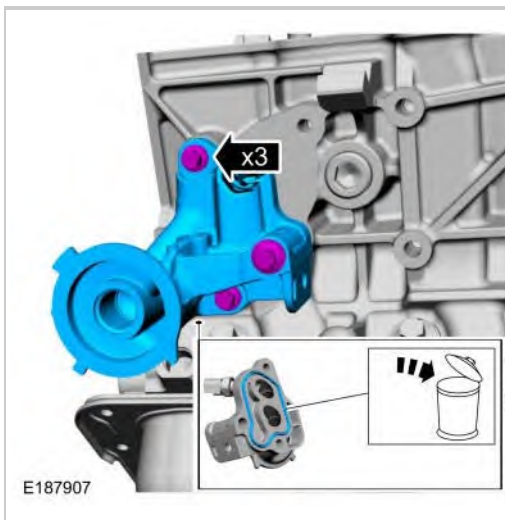
89.
Remove the threaded fitting and the oil cooler.

Discard the oil cooler.



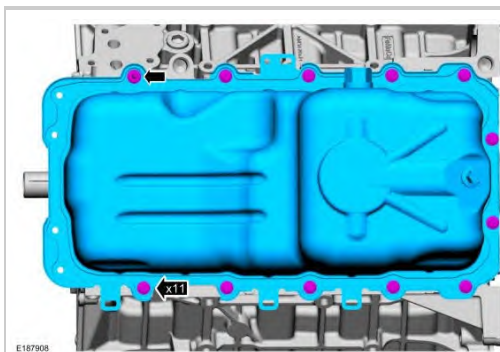
90.
Remove the bolts and the oil filter adapter.

Discard the gasket.



91.

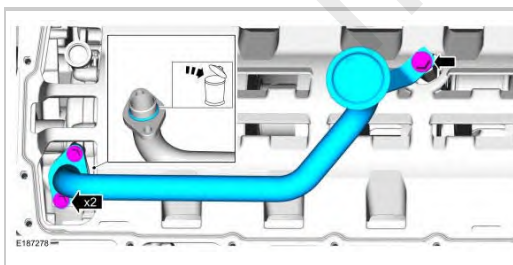
Remove the bolts and the oil pan.



92.

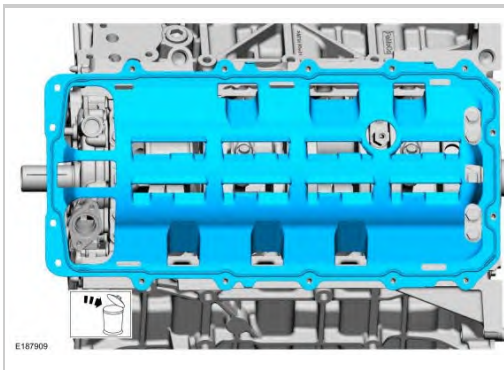
Remove the bolts and the oil pump screen and pickup tube.

Discard the O-ring seal.



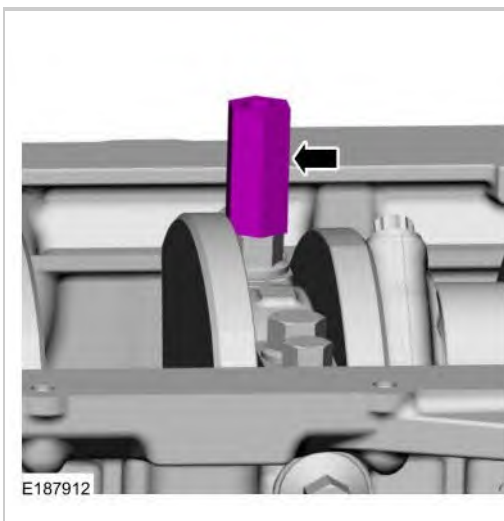
93.

Remove and discard the oil pan baffle and gasket.



94.

Remove the oil pump screen and pickup tube spacer.



 **NOTE:** 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.

95.

Clean the mating surface of the cylinder block. Refer to: RTV Sealing Surface Cleaning and Preparation .

Use the General Equipment: Plastic Scraper

Material

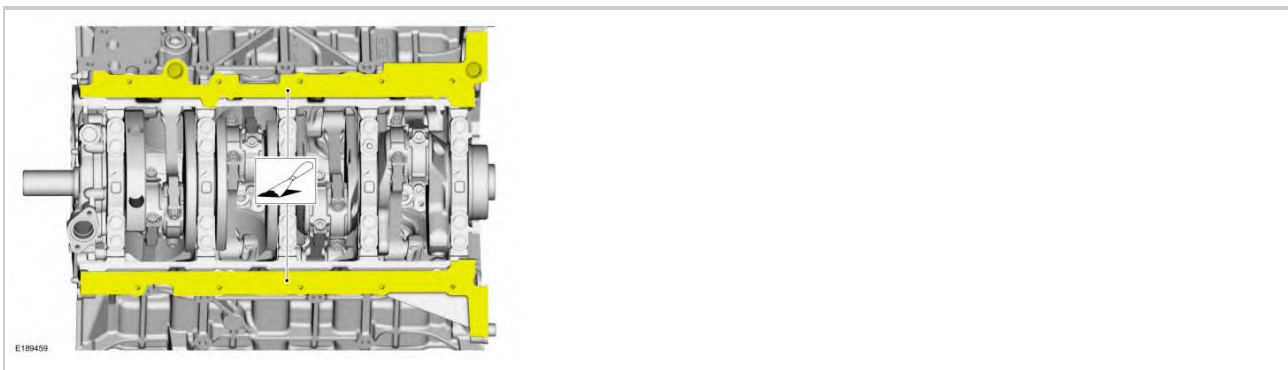
: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material

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

Material

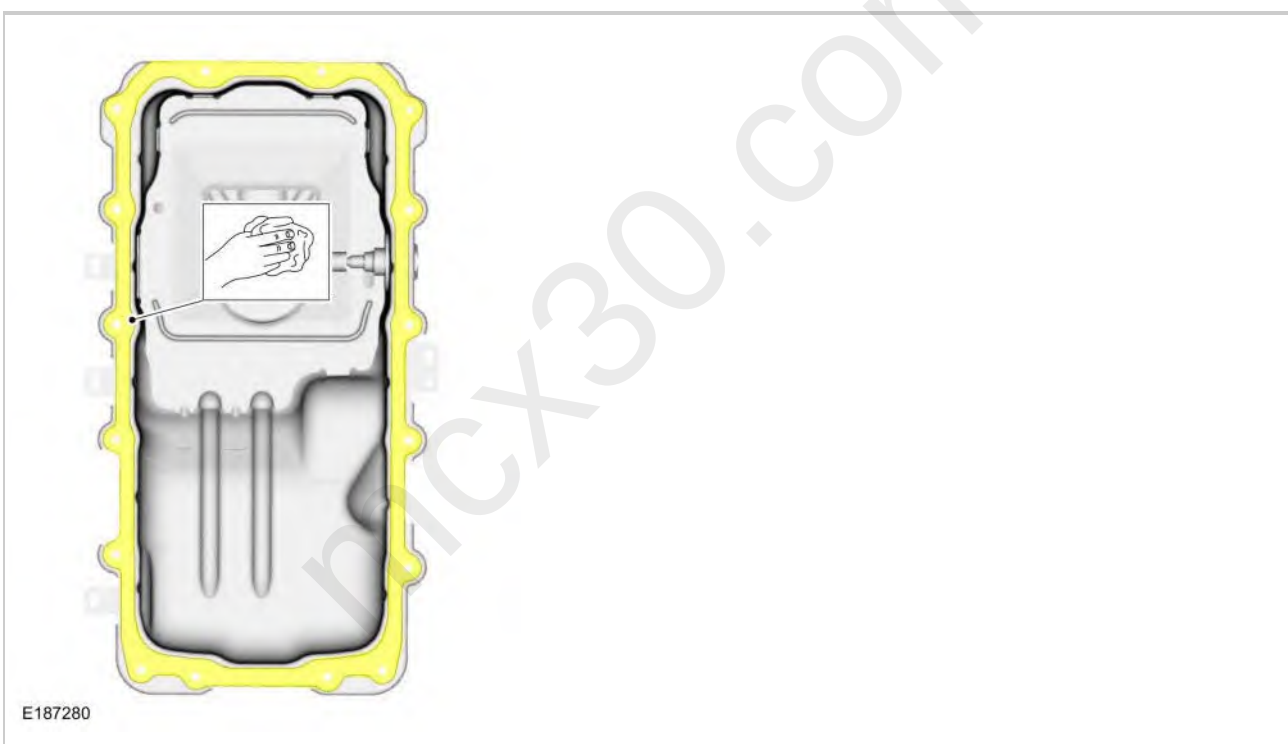
: Metal Brake Parts Cleaner (U.S.) / PM-4-A, PM-4-B (U.S.)



 **NOTE:** 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.

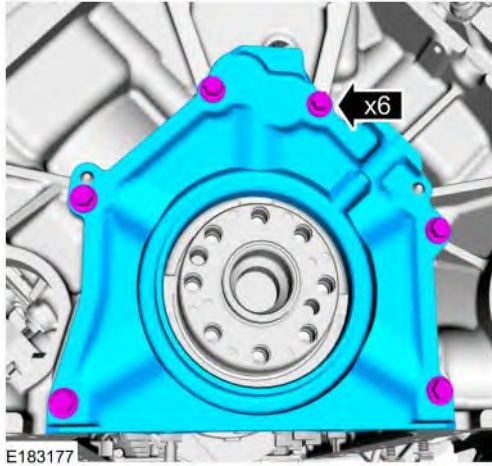
96.

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



97.

Remove the bolts and the crankshaft rear seal retainer plate.



 **NOTE:** 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.

98.

Clean and inspect the mating surface. Refer to: RTV Sealing Surface Cleaning and Preparation .

Use the General Equipment: Plastic Scraper

Material

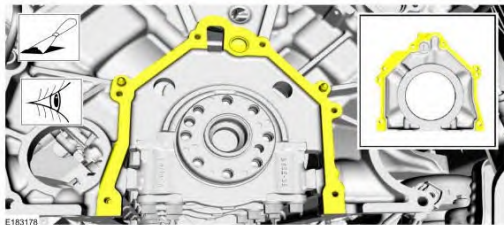
: Motorcraft® Silicone Gasket Remover / ZC-30-A

Material

: Metal Brake Parts Cleaner (U.S.) / PM-4-A, PM-4-B (U.S.)

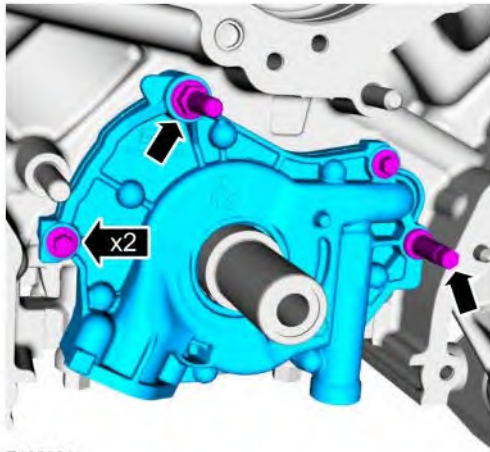
Material

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



99.

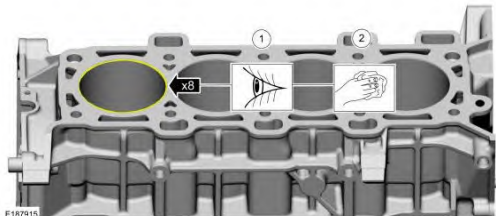
Remove the bolts, the stud bolts and the oil pump.



100.

Before removing the pistons, inspect the top of the cylinder bores.

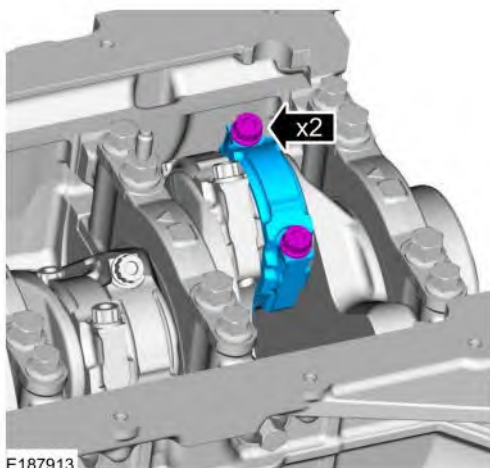
If necessary, remove the ridge or carbon deposits from each cylinder using an abrasive pad.



 **NOTE:** 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.

101.

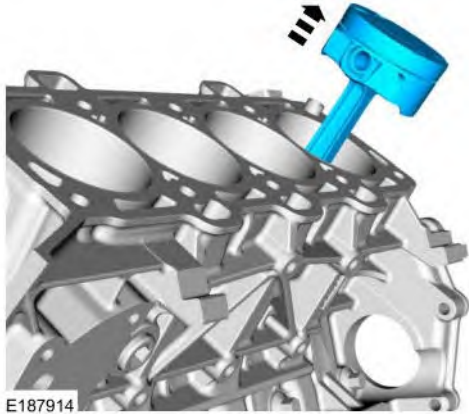
Remove the bolts and the connecting rod cap.



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

102.

Remove the piston through the top of the cylinder block.



103.

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

104.

Disassemble the 8 pistons. Refer to: Piston .

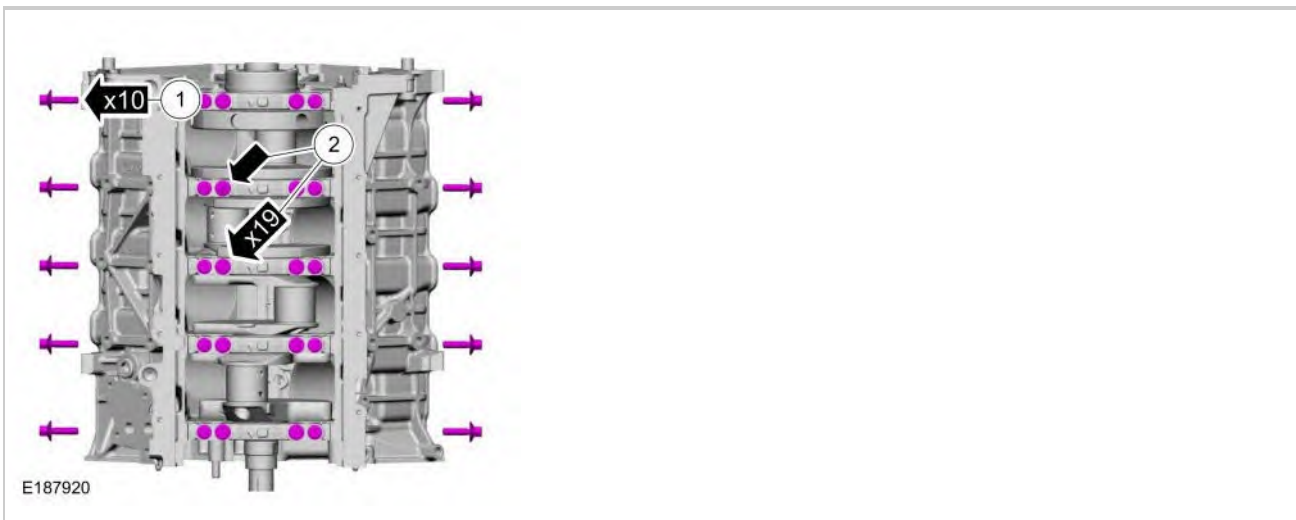
105.

1.

Remove and discard the cross-mounted main cap bolts.

2.

Remove and discard the main bearing cap bolts and stud bolt.



106.

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



107.

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