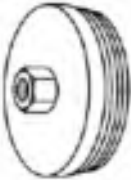


Crankshaft Rear Seal

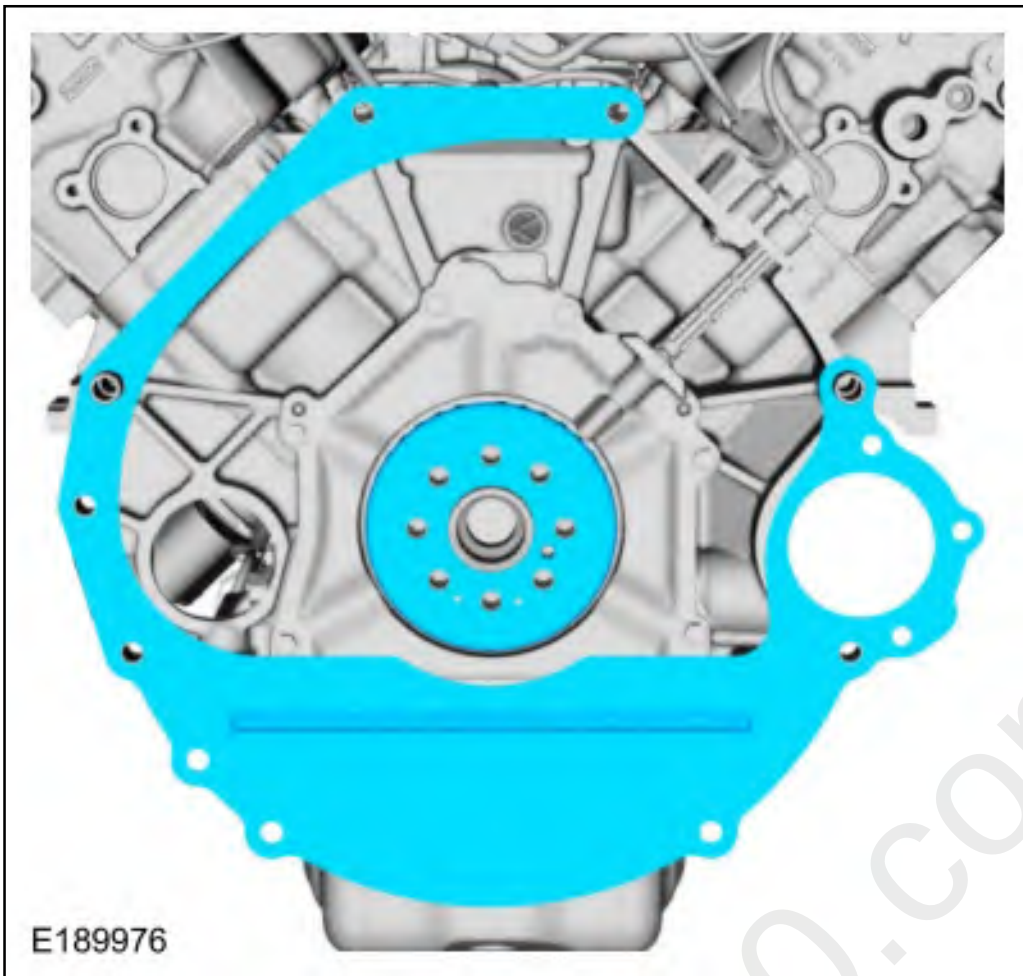
Base Part Number: Base Part Number: 6701

Special Tool(s) / General Equipment

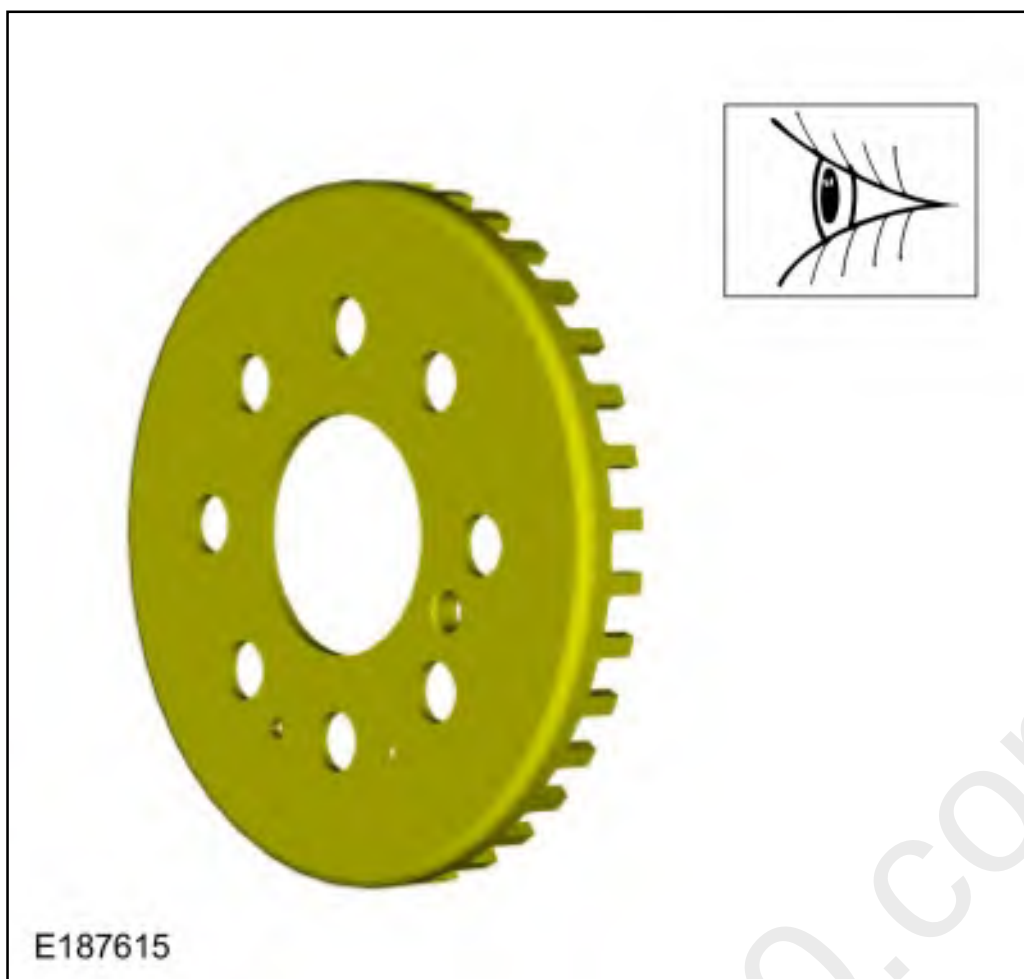
 E129694	100-001 (T50T-100-A) Slide Hammer
 E133913	205-153 (T80T-4000-W) Handle
 ST2980-A	303-1250 Seal Installer, Rear Main TKIT-2006UFFLM
	303-519 (T95P-6701-EH) Remover, Crankshaft Rear Oil Seal TKIT-1995-FH/FLMH TKIT-1995-LMH/MH

Removal

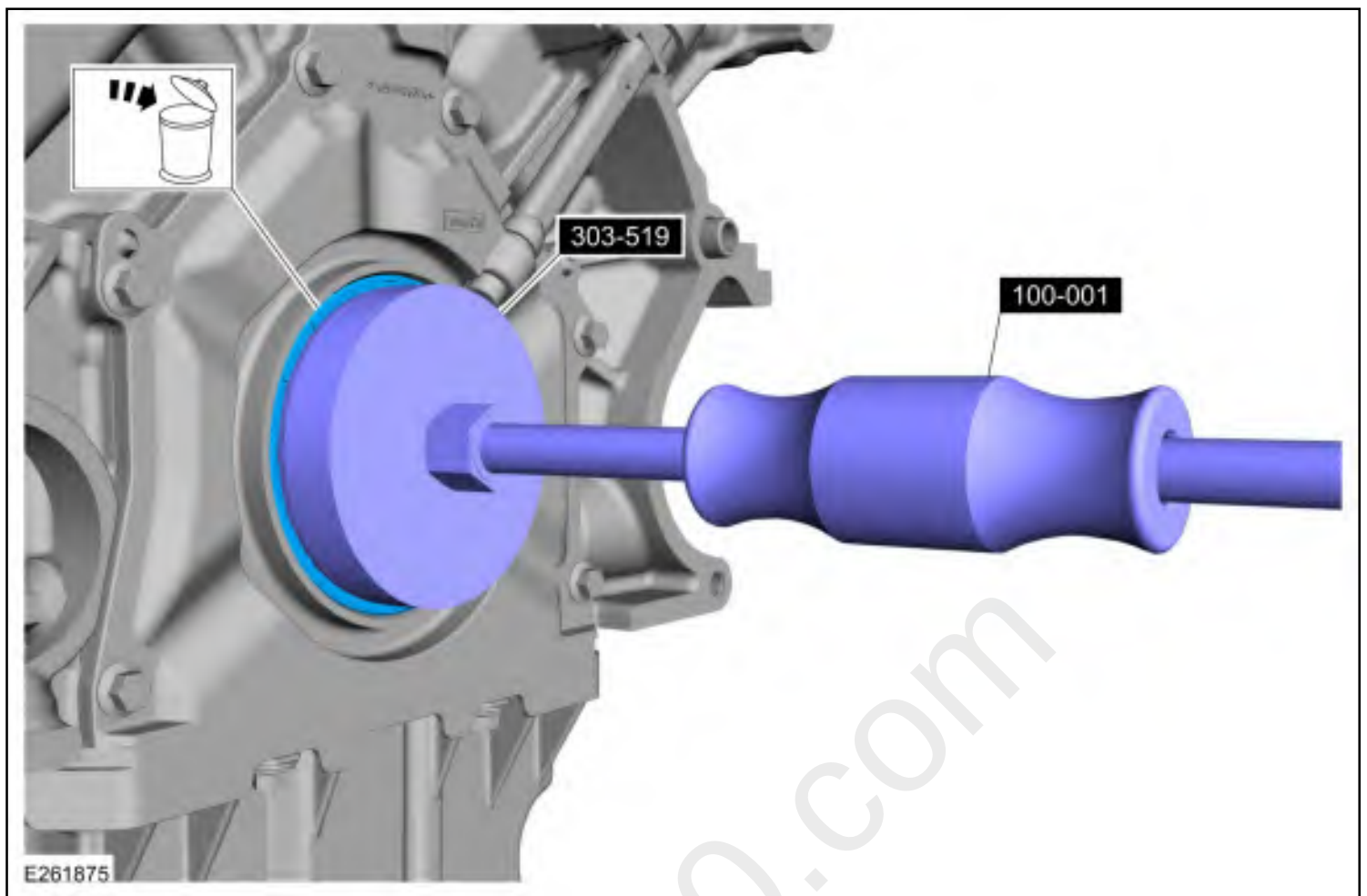
1. Remove the flexplate.
Refer to: Flexplate (303-01 Engine - 5.0L 32V Ti-VCT) .
2. Remove the crankshaft sensor ring and the engine-to-transmission spacer plate.



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

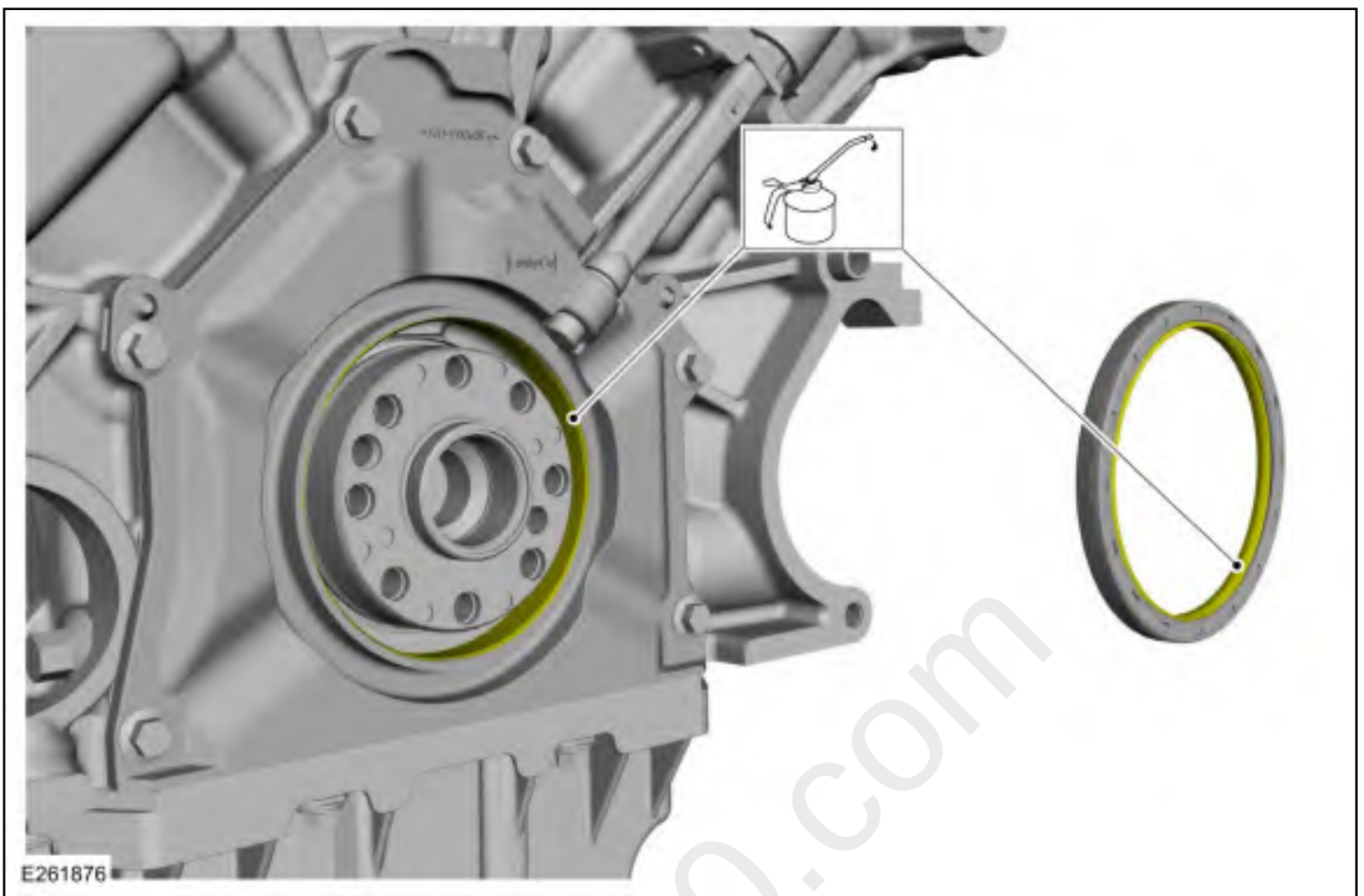


4. Using the special tools, remove and discard the crankshaft rear seal.
Use Special Service Tool: 303-519 (T95P-6701-EH) Remover, Crankshaft Rear Oil Seal. , 100-001 (T50T-100-A) Slide Hammer.

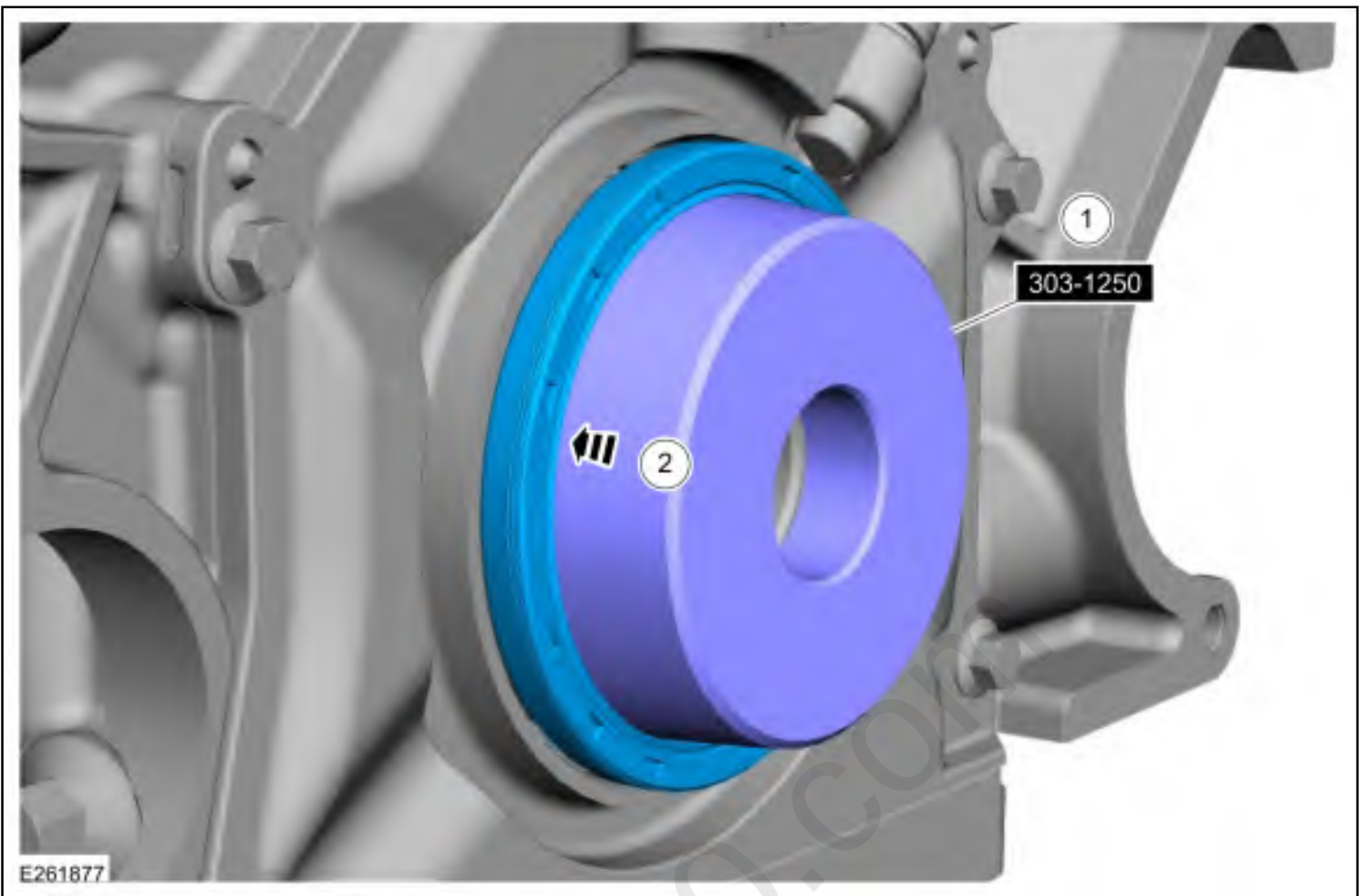


Installation

1. Lubricate the seal bore and the seal lips with clean engine oil.

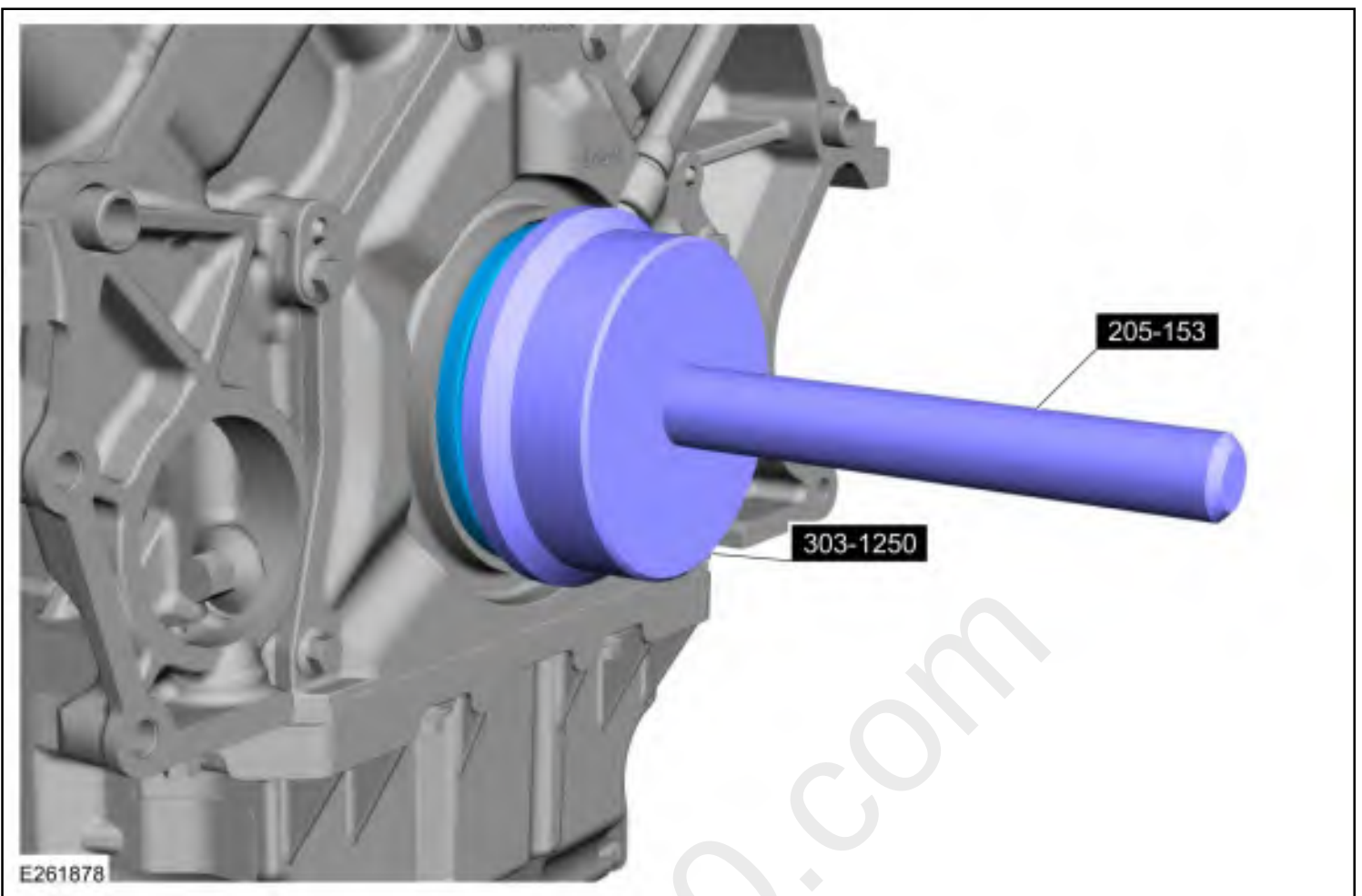


- Position the special tool onto the end of the crankshaft.
Use Special Service Tool: 303-1250 Seal Installer, Rear Main.
- Slide the new crankshaft rear seal onto the tool.

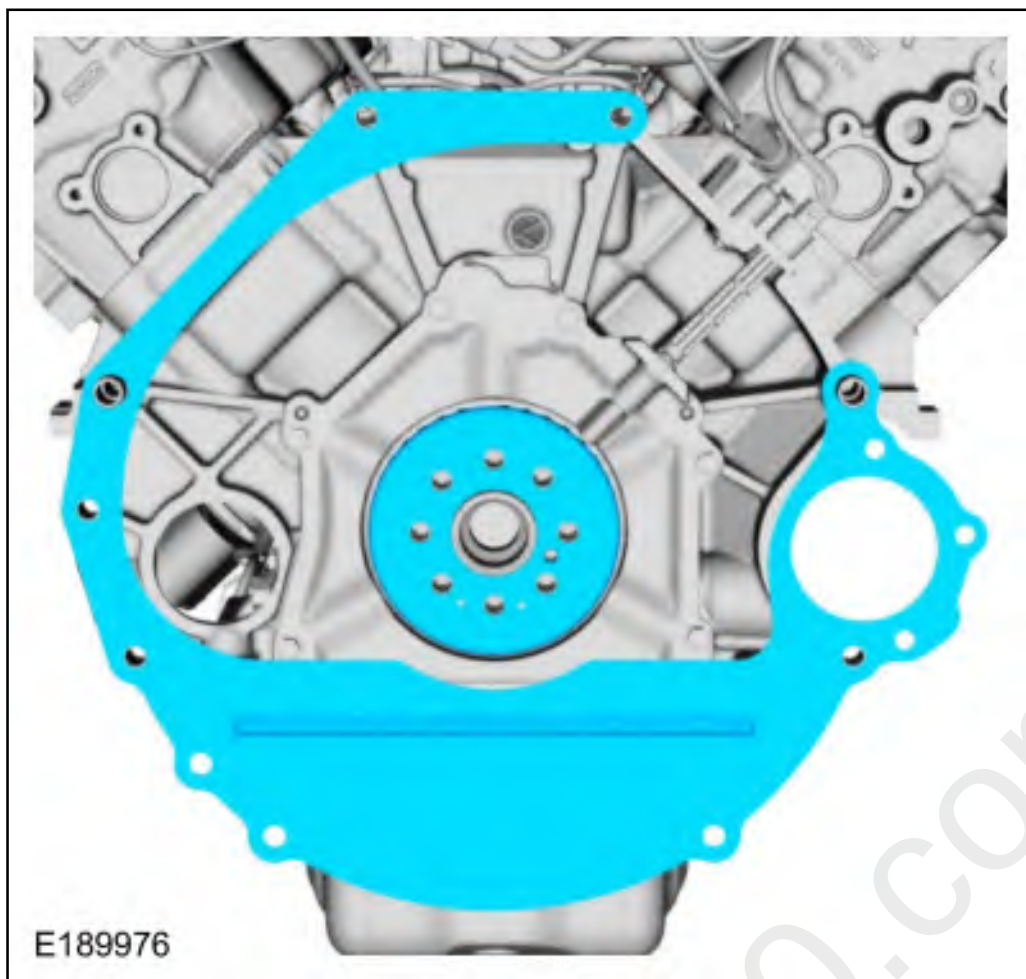


3. Using the special tools, install the crankshaft rear seal.

Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 303-1250 Seal Installer, Rear Main.



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



5. Install the flexplate.
Refer to: Flexplate (303-01 Engine - 5.0L 32V Ti-VCT) .

Engine Front Cover

Base Part Number: Base Part Number: 6C086

Special Tool(s) / General Equipment

Plastic Scraper
Oil Drain Equipment
Hose Clamp Remover/Installer

Materials

Name	Specification
Motorcraft® Silicone Gasket Remover ZC-30-A	-
Motorcraft® Metal Surface Prep Wipes ZC-31-B	-
Motorcraft® Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Metal Brake Parts Cleaner PM-4-A, PM-4-B	-

Removal

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.

1. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
2. Release the fuel system pressure.
Refer to: [Fuel System Pressure Release](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-

VCT, General Procedures).

3. Disconnect the battery ground cable.

Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .

4. Drain the engine cooling system.

Refer to: Cooling System Draining, Vacuum Filling and Bleeding (303-03 Engine Cooling - 5.0L 32V Ti-VCT) .

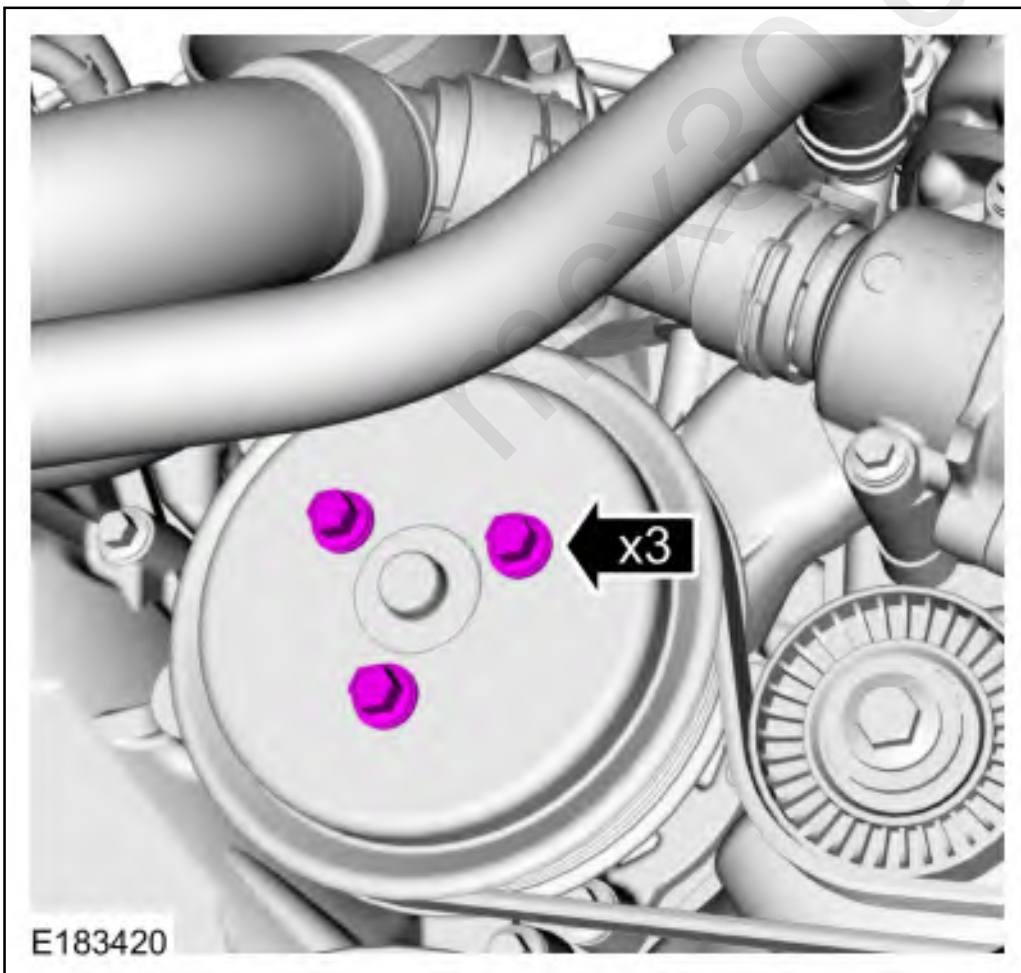
5. Remove the following items:

1. **NOTE:** *It is not necessary to clamp off the degas bottle hose with the cooling system drained.*

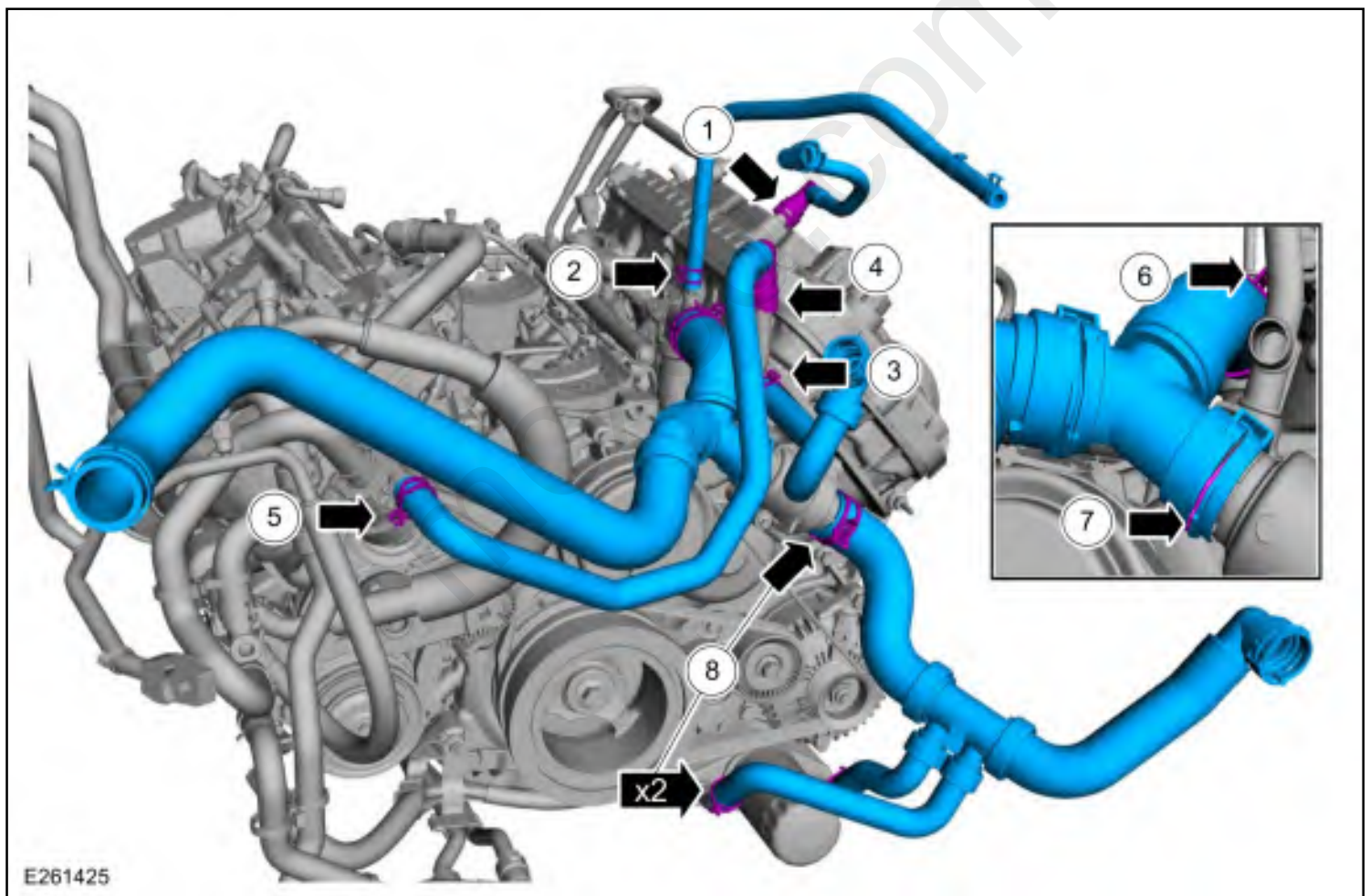
Refer to: [Degas Bottle](#) (303-03D Engine Cooling - 5.0L 32V Ti-VCT, Removal and Installation).

2. Refer to: Cooling Module (303-03 Engine Cooling - 5.0L 32V Ti-VCT) .
3. Refer to: Valve Cover LH (303-01 Engine - 5.0L 32V Ti-VCT) .
4. Refer to: Valve Cover RH (303-01 Engine - 5.0L 32V Ti-VCT) .

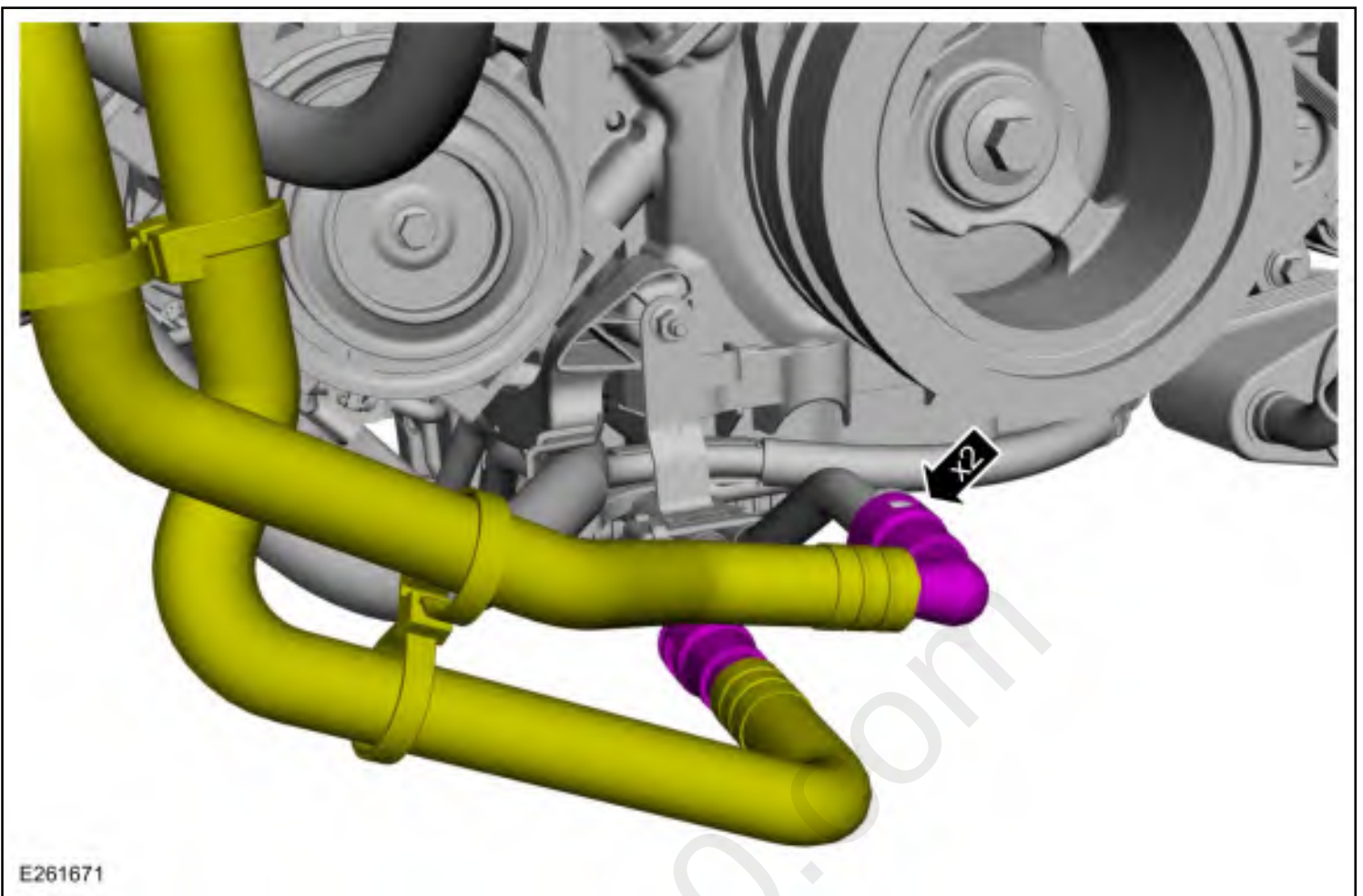
6. Loosen the coolant pump pulley bolts.



1. Disconnect the quick release coupling and remove the crankcase vent tube.
Refer to: [Quick Release Coupling](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-VCT, General Procedures).
2. Release the clamp and remove the coolant hose.
Use the General Equipment: Hose Clamp Remover/Installer
3. Release the clamp and remove the coolant hose.
Use the General Equipment: Hose Clamp Remover/Installer
4. Disconnect the quick release coupling.
5. Release the clamp and remove the coolant hose.
Use the General Equipment: Hose Clamp Remover/Installer
6. Release the clamp and remove the coolant hose.
Use the General Equipment: Hose Clamp Remover/Installer
7. Release the spring clip and remove the coolant bypass T assembly from the engine.
8. Release the clamps and remove the coolant hose assembly.
Use the General Equipment: Hose Clamp Remover/Installer



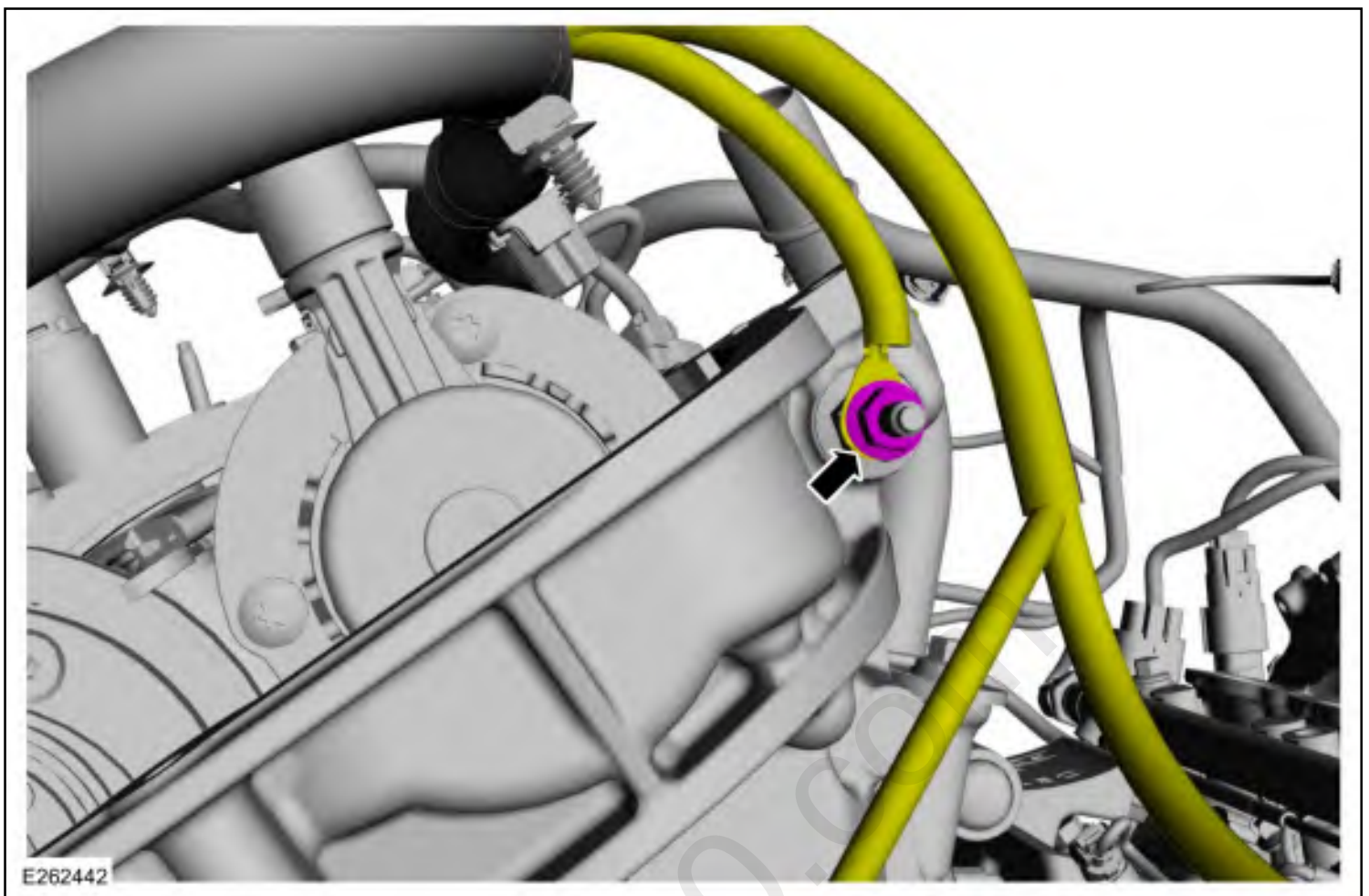
8. Disconnect the coolant hose quick release couplings.



9. Remove the following items:

1. Refer to: Accessory Drive Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
2. Refer to: Air Conditioning (A/C) Compressor Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
3. Refer to: Accessory Drive Belt Tensioner (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
4. Refer to: Air Conditioning (A/C) Compressor Belt Tensioner (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
5. Refer to: [Coolant Pump](#) (303-03D Engine Cooling - 5.0L 32V Ti-VCT, Removal and Installation).
6. Refer to: Crankshaft Front Seal (303-01 Engine - 5.0L 32V Ti-VCT) .

10. Remove the nut and ground wire.

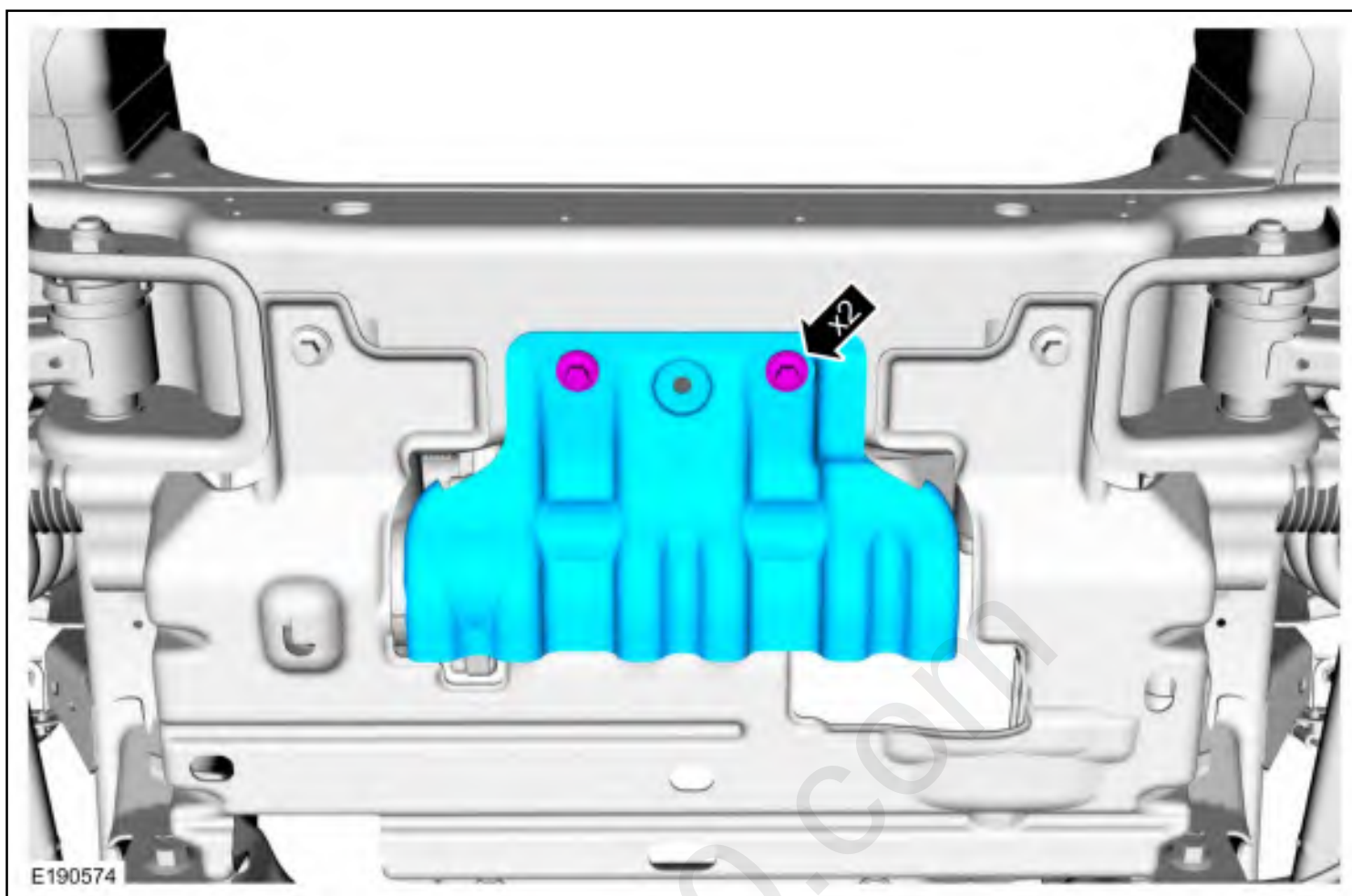


11. Remove the bolts and position the generator aside.



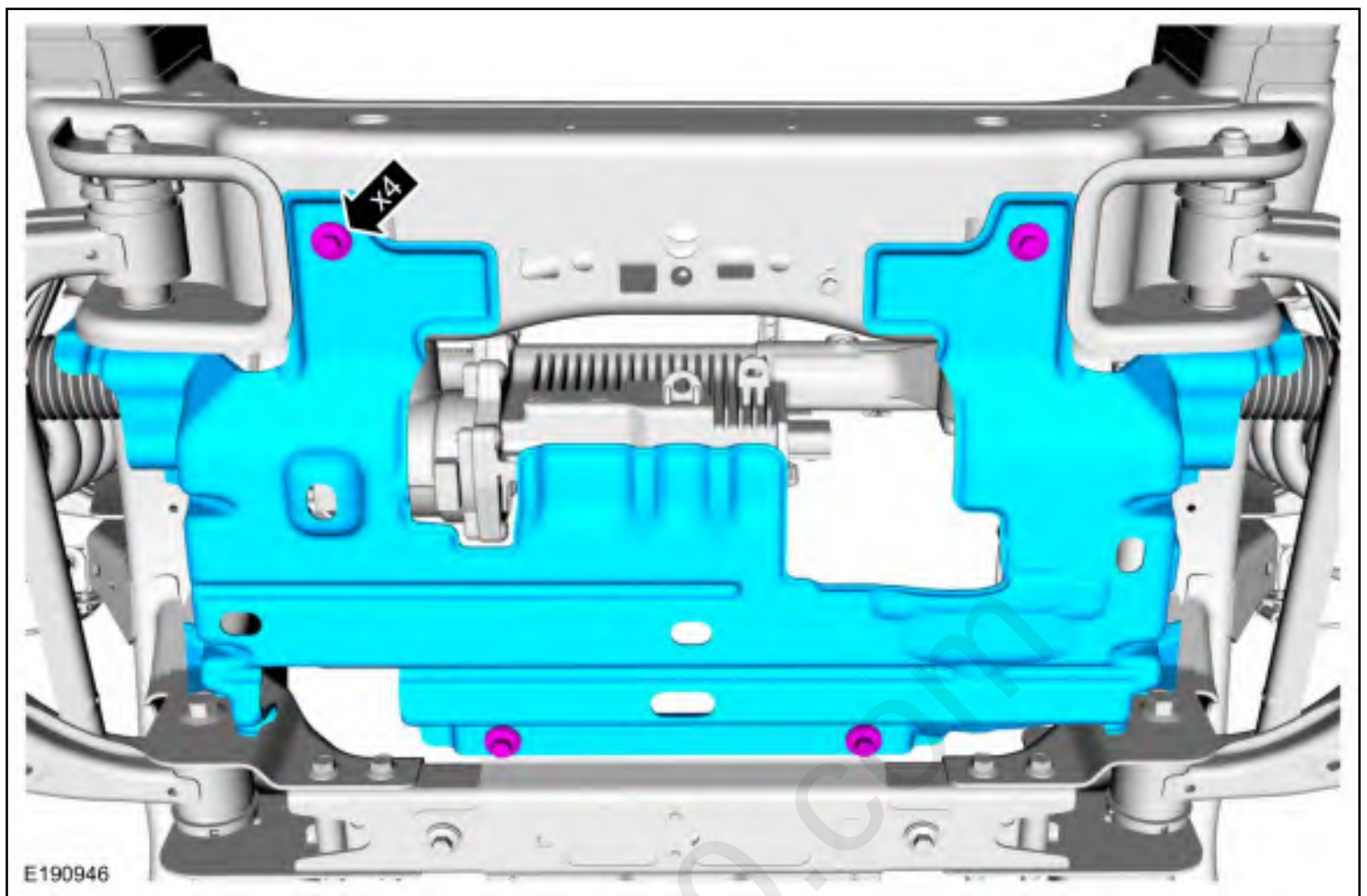
12. **NOTE:** *If equipped.*

Remove the bolts and the skid plate.



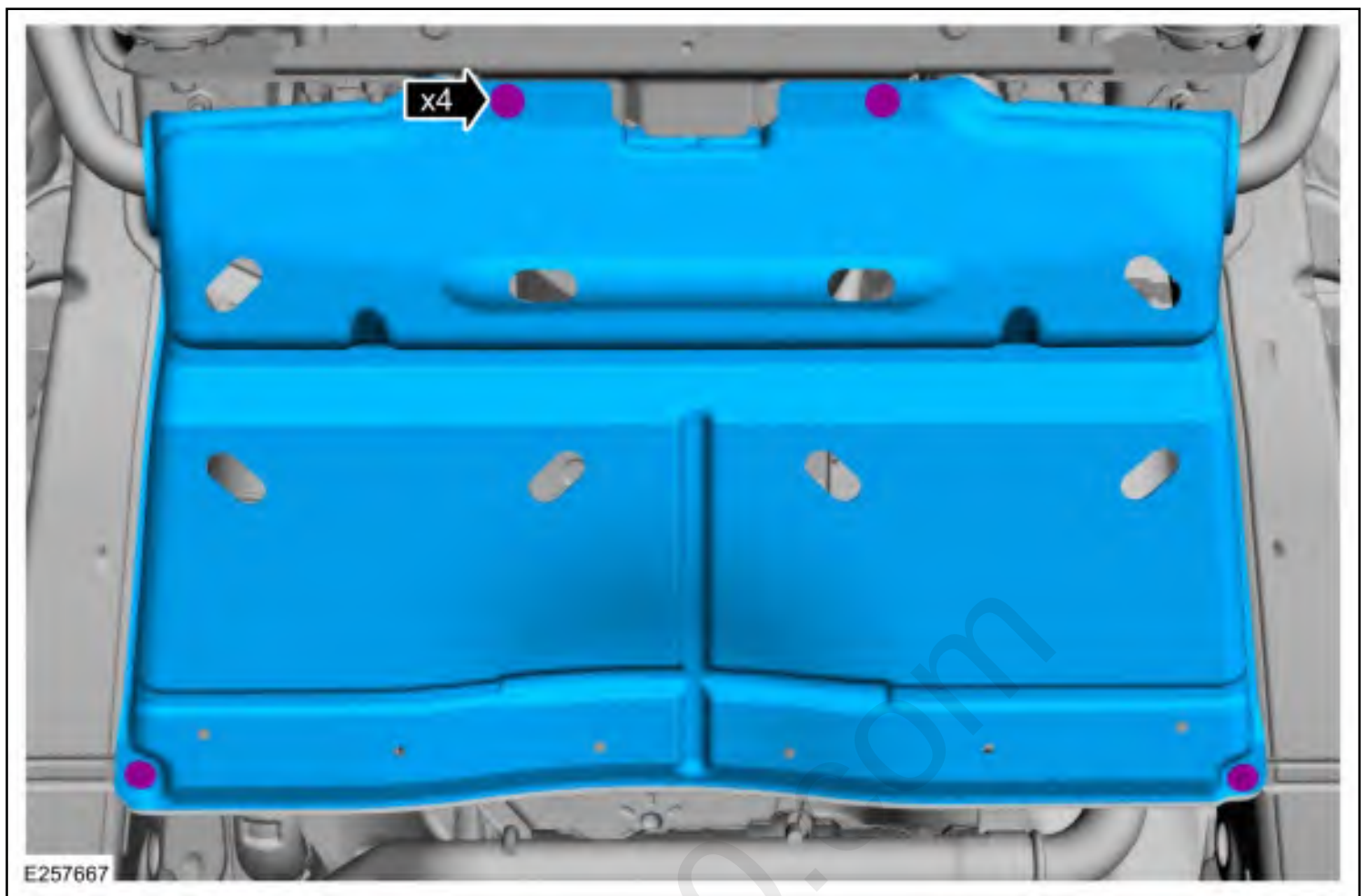
13. **NOTE:** *If equipped.*

Remove the fasteners and the underbody shield.



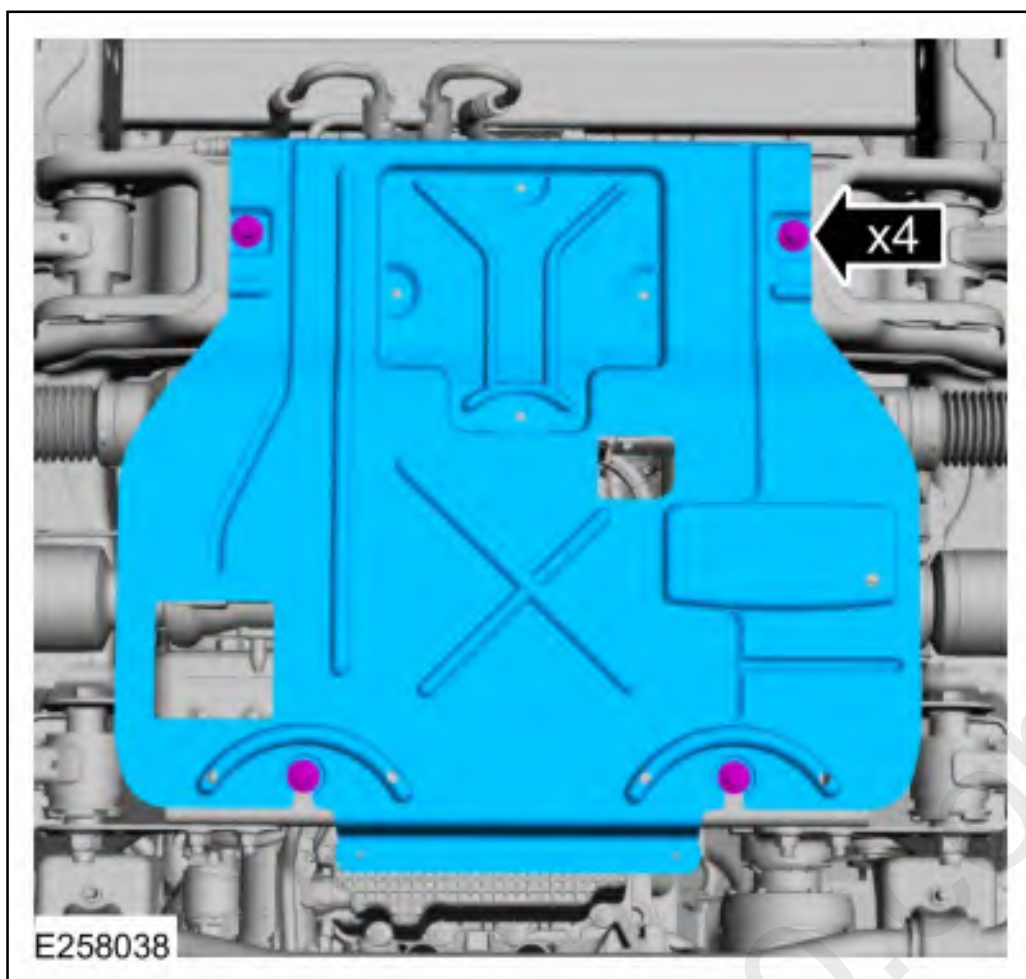
14. **NOTE:** *If equipped.*

Remove the bolts and the underbody shield.

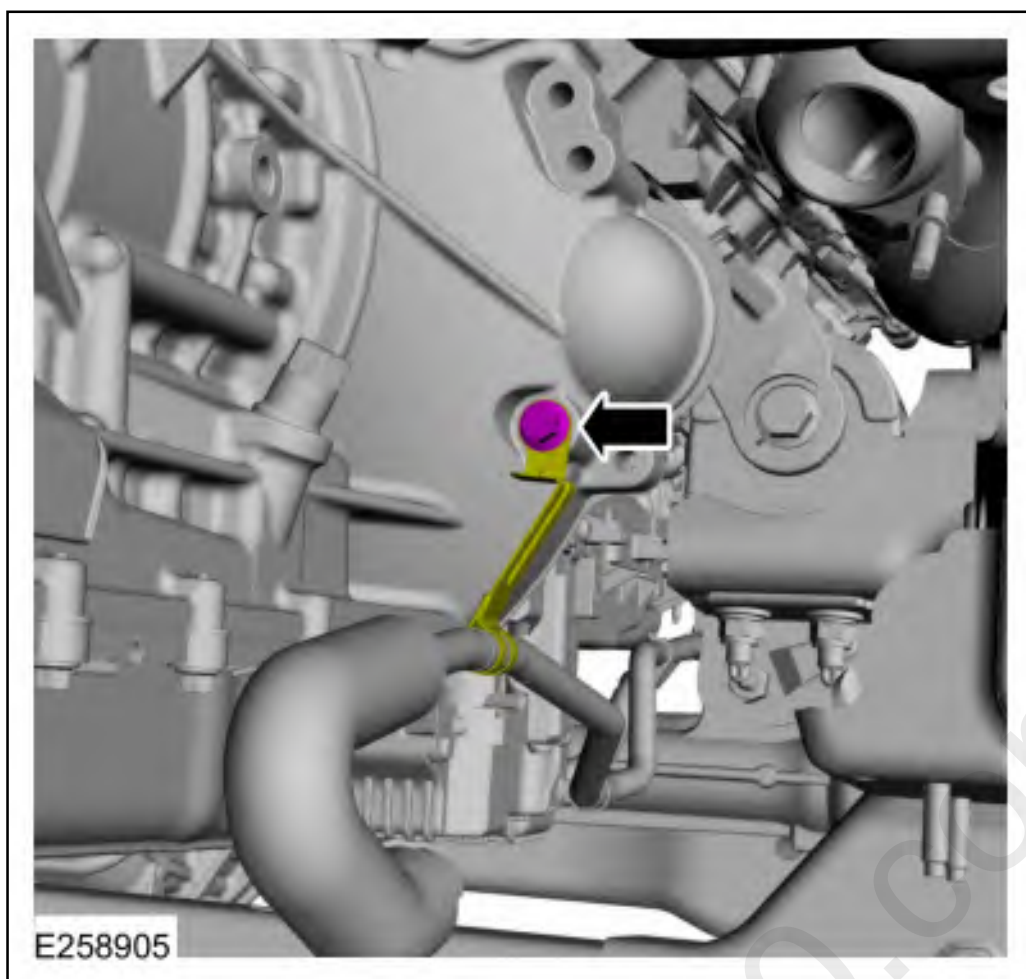


15. **NOTE:** *If equipped.*

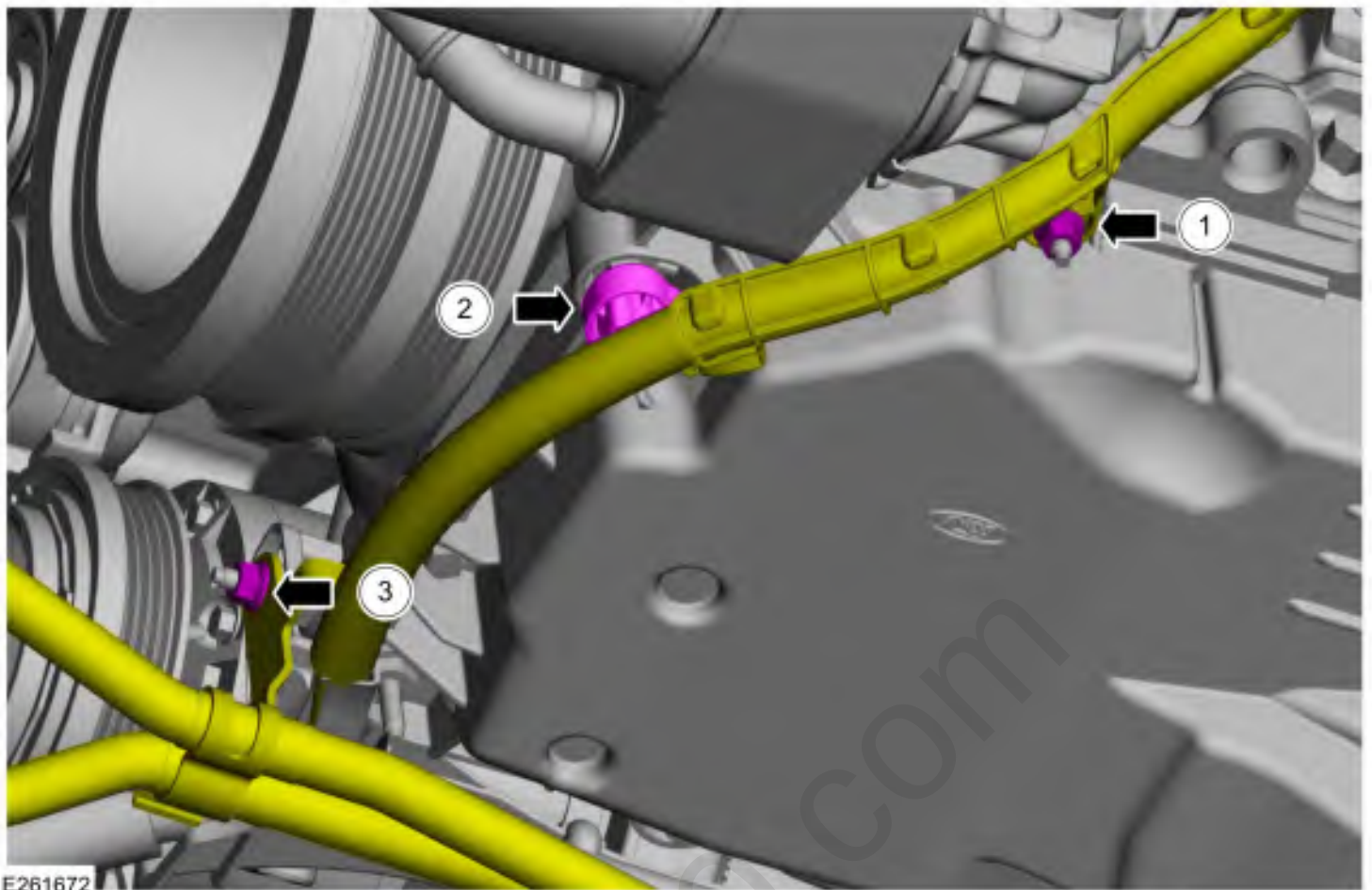
Remove the bolts and the skid plate.



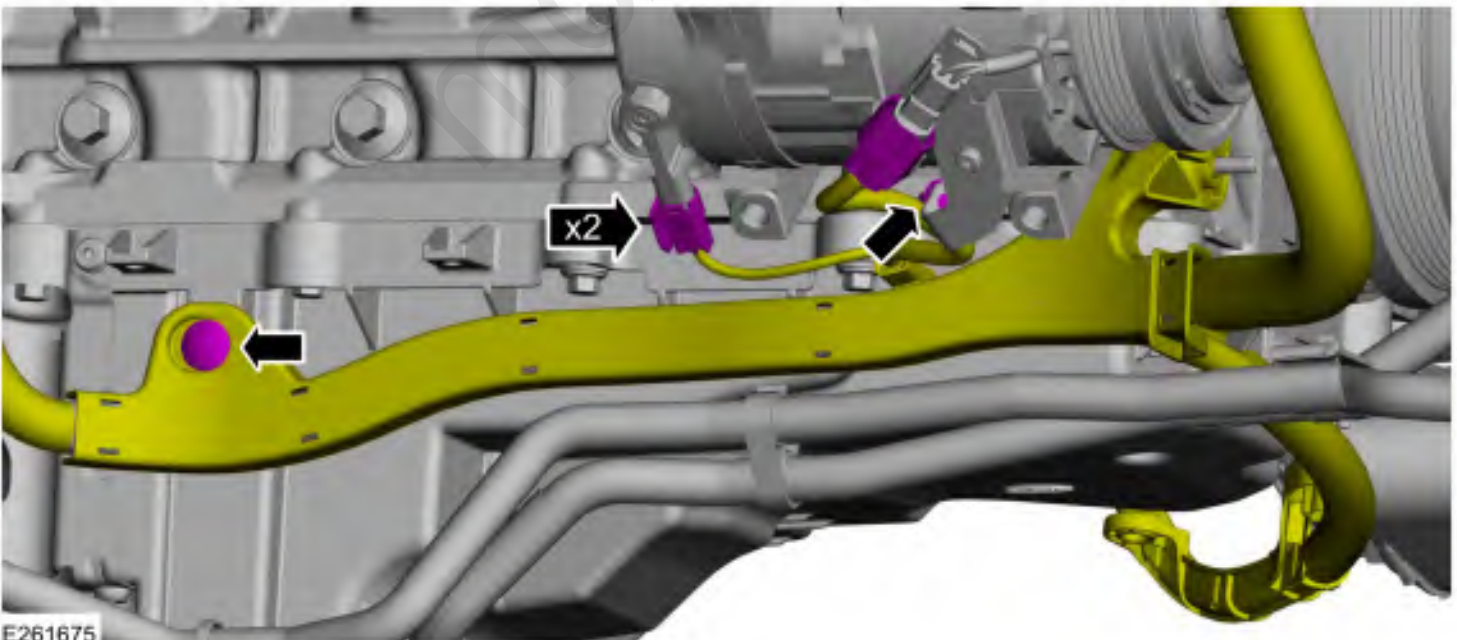
16. Remove the transmission-to-engine bolt and transmission cooler tube support bracket.



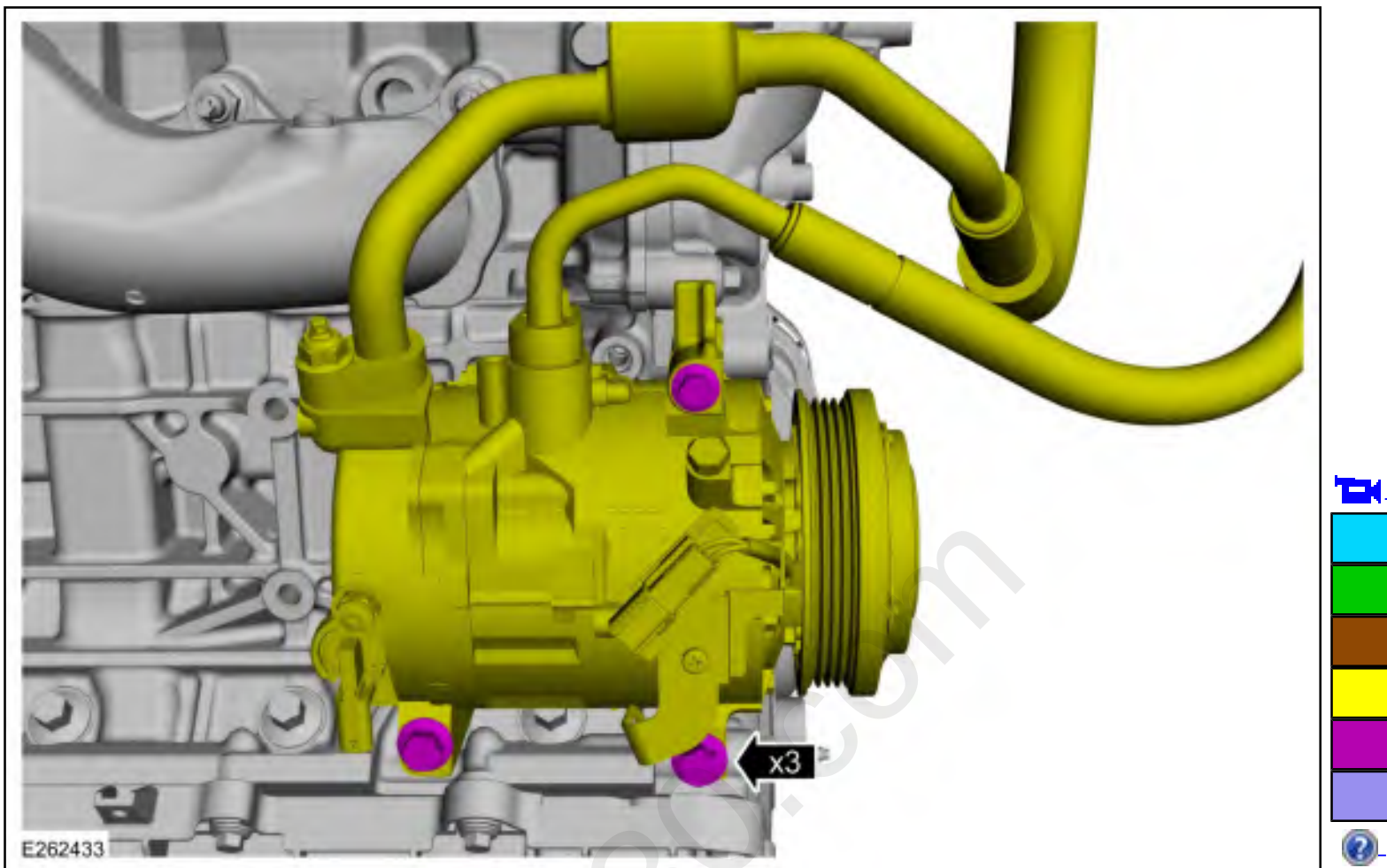
1. Remove the nut.
2. Detach the wiring harness retainer.
3. Remove the nut and position the coolant tube and wiring harness brackets aside.



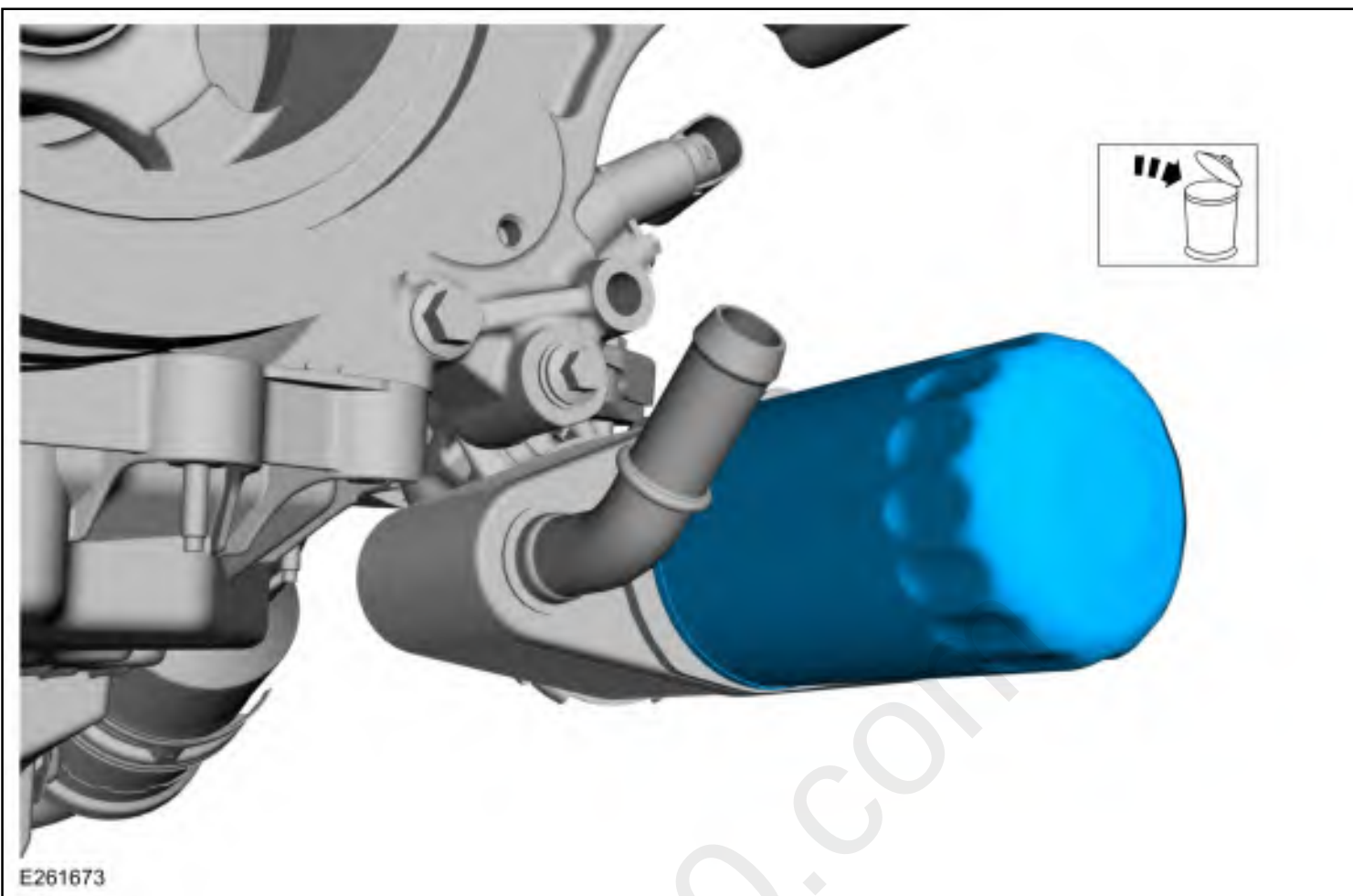
1. Disconnect the A/C compressor electrical connectors.
2. Detach the wiring harness retainers.



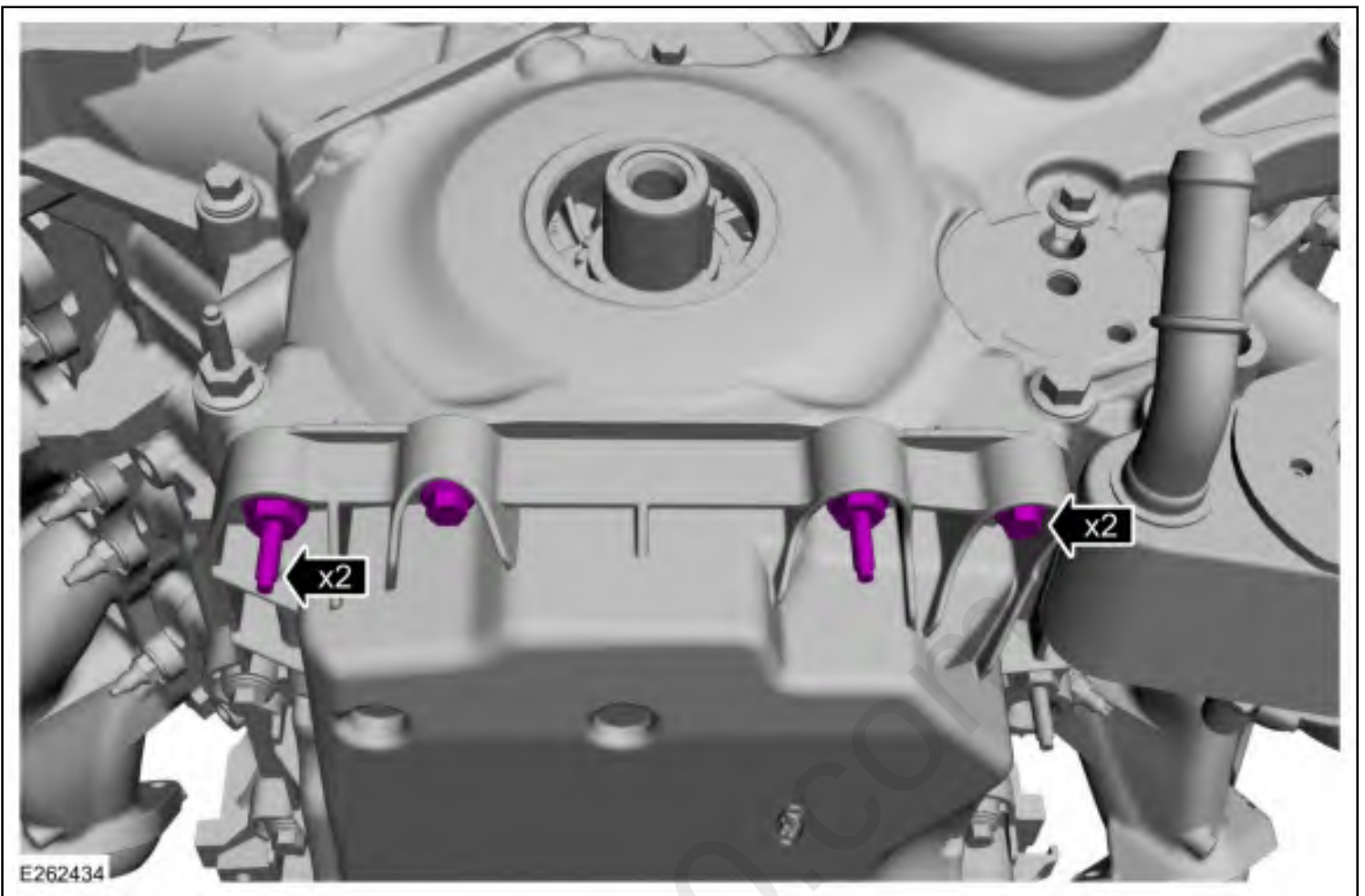
19. Remove the bolts and position the A/C compressor aside.



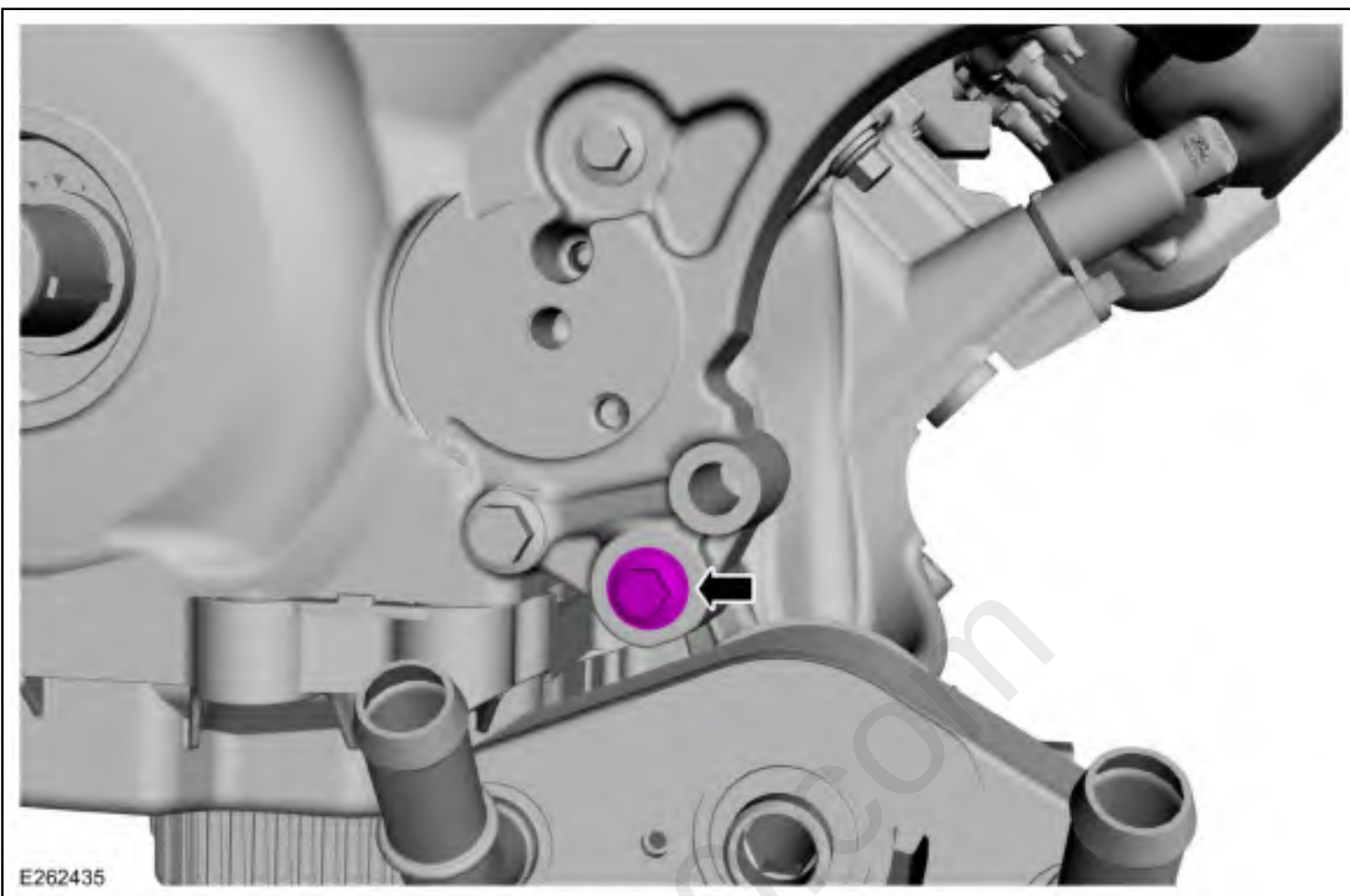
20. Remove and discard the engine oil filter.



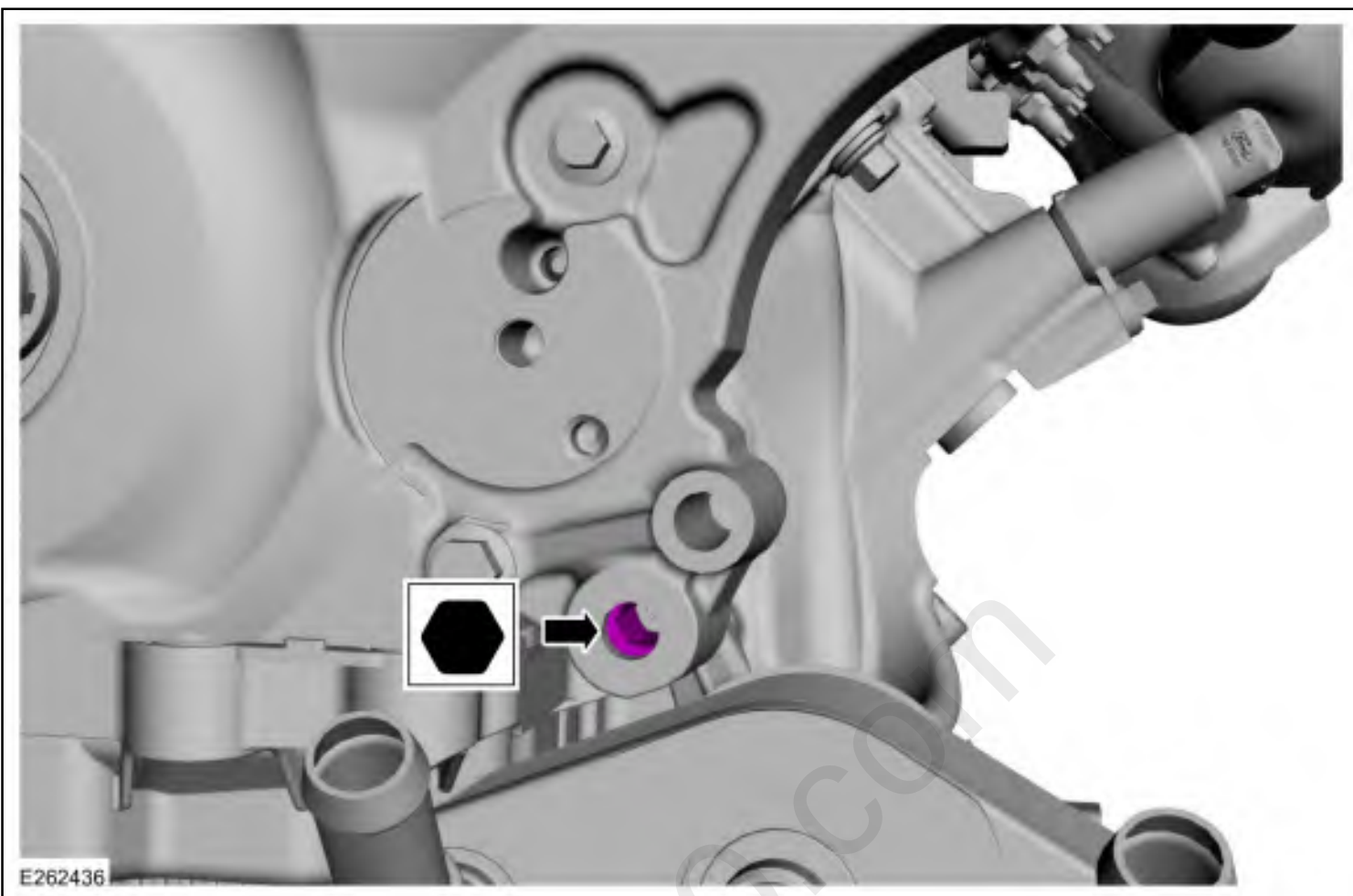
21. Remove the bolts and stud bolts.



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

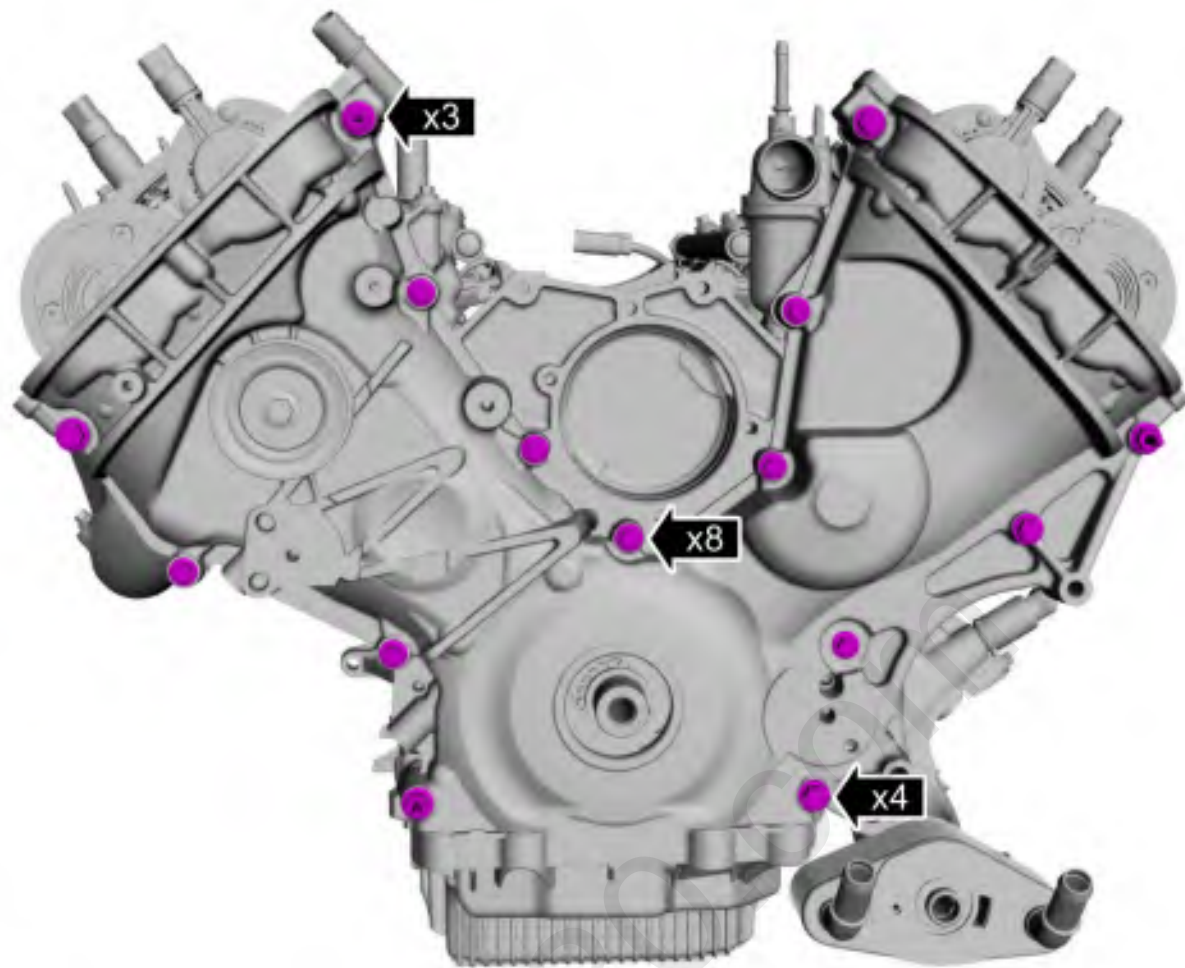


23. Using a 10 mm Hex Bit loosen the engine front cover-to-oil filter adapter jack screw.



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

Remove the bolts and stud bolts.

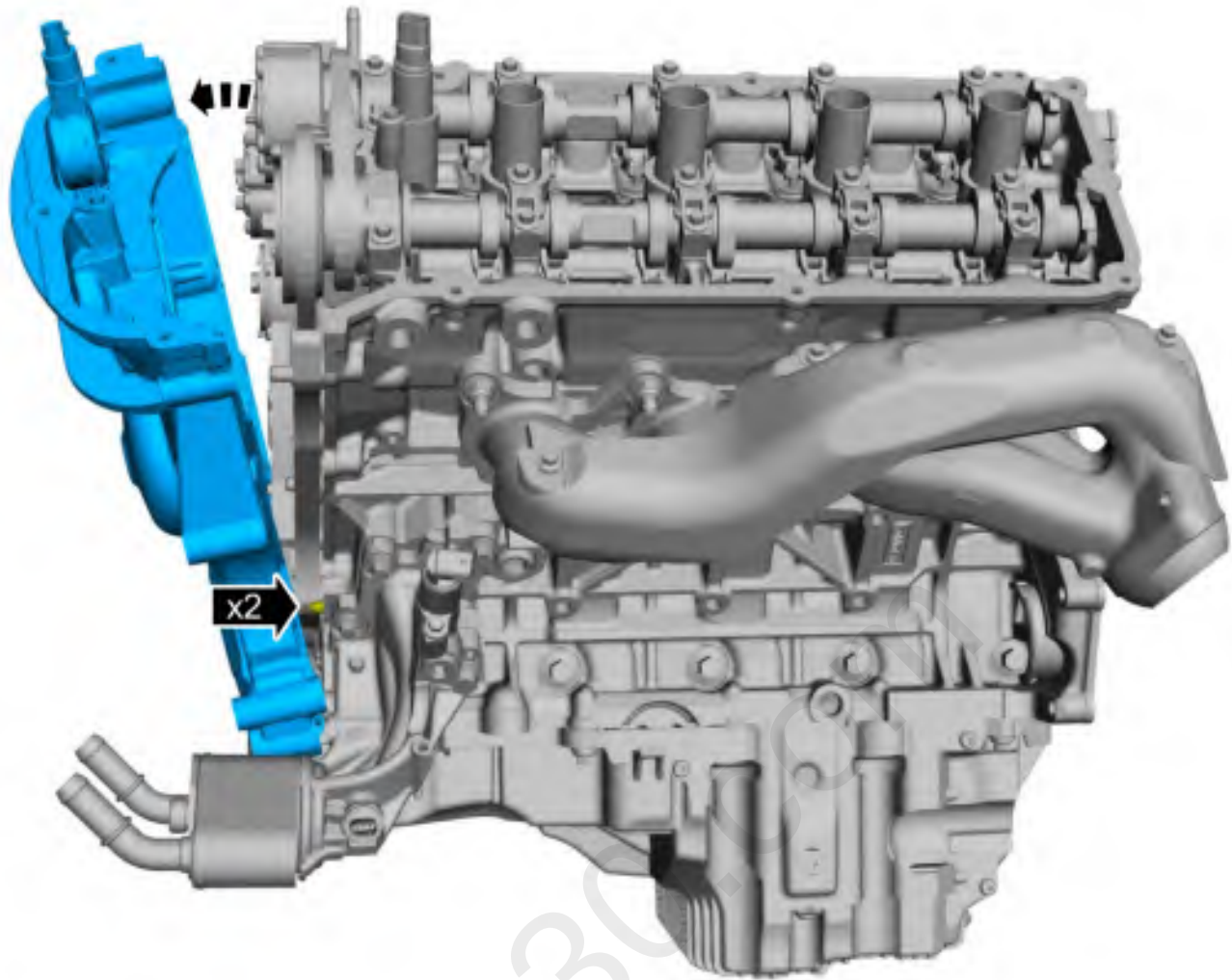


E262437



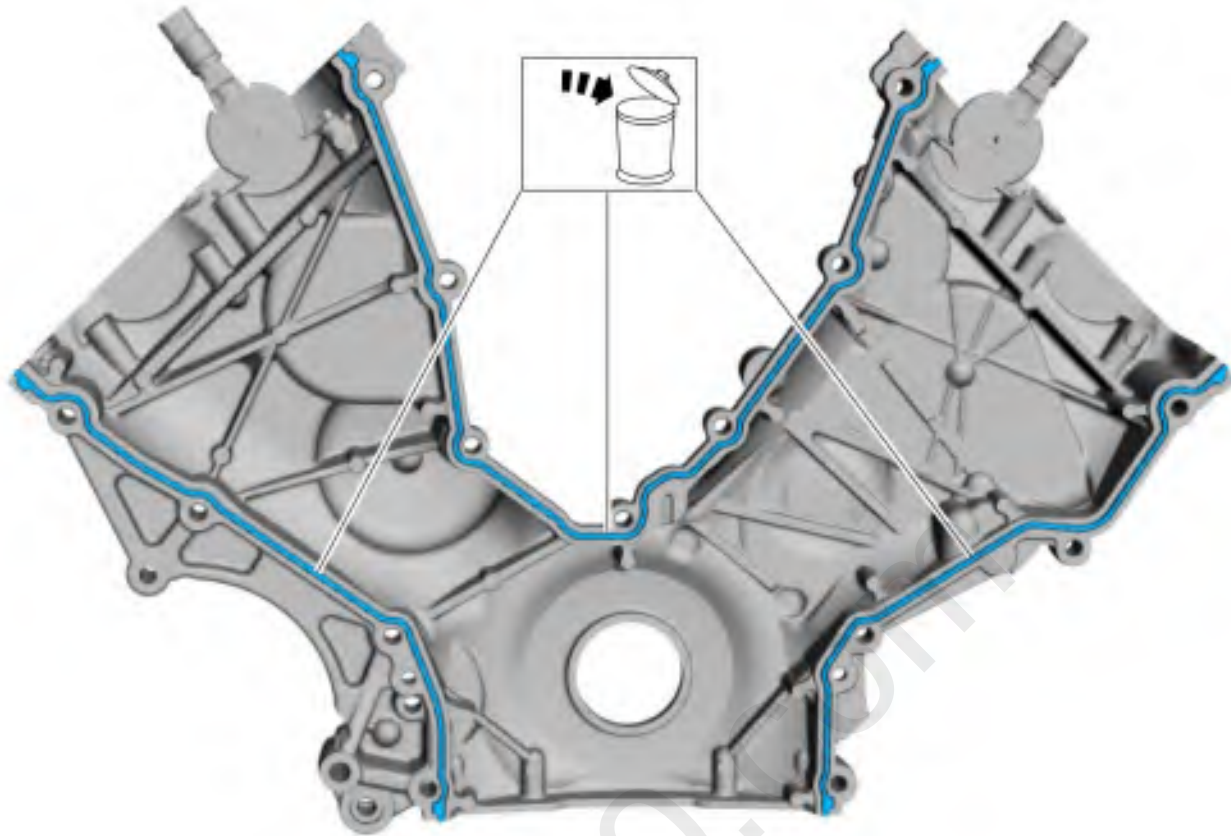
25. **NOTE:** *Timing drive components removed from view for clarity.*

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



E262438

26. Remove and discard the gaskets.



E262439

27. **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.

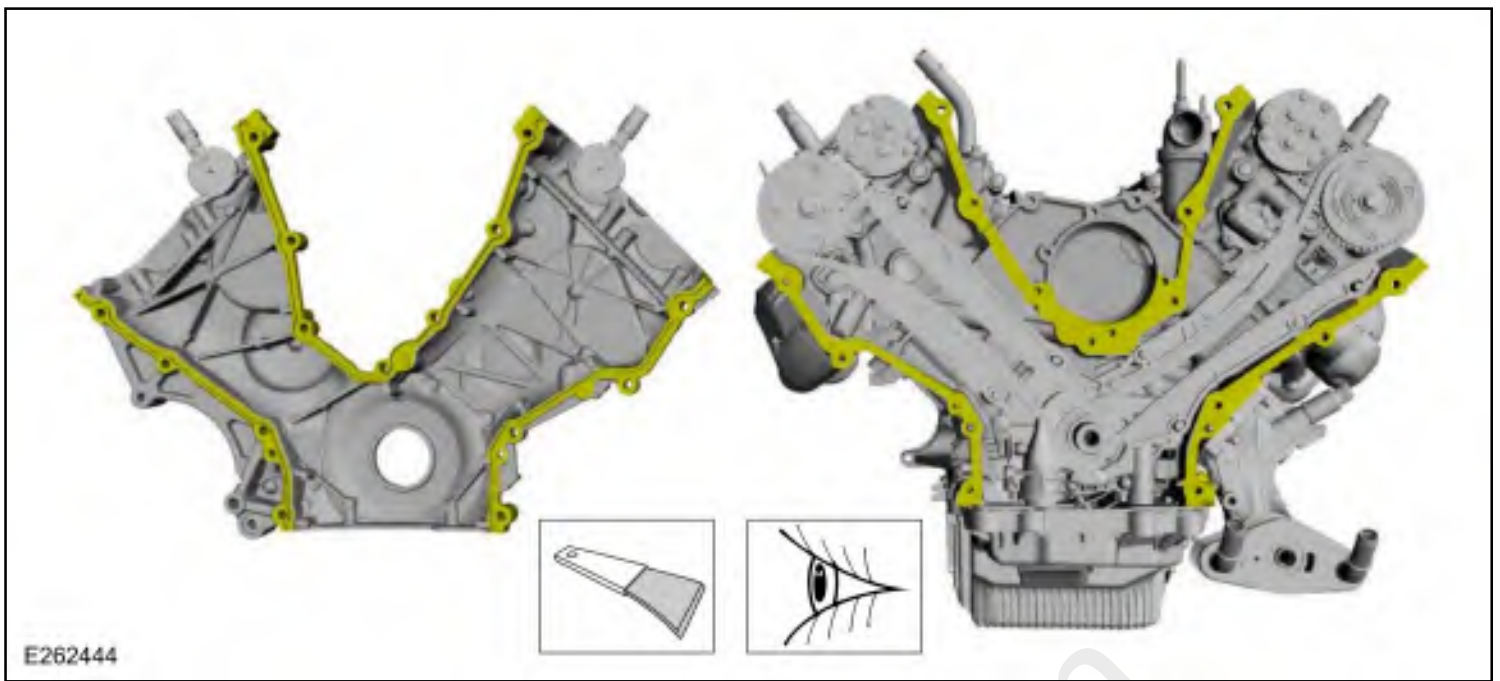
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

Use the General Equipment: Plastic Scraper

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

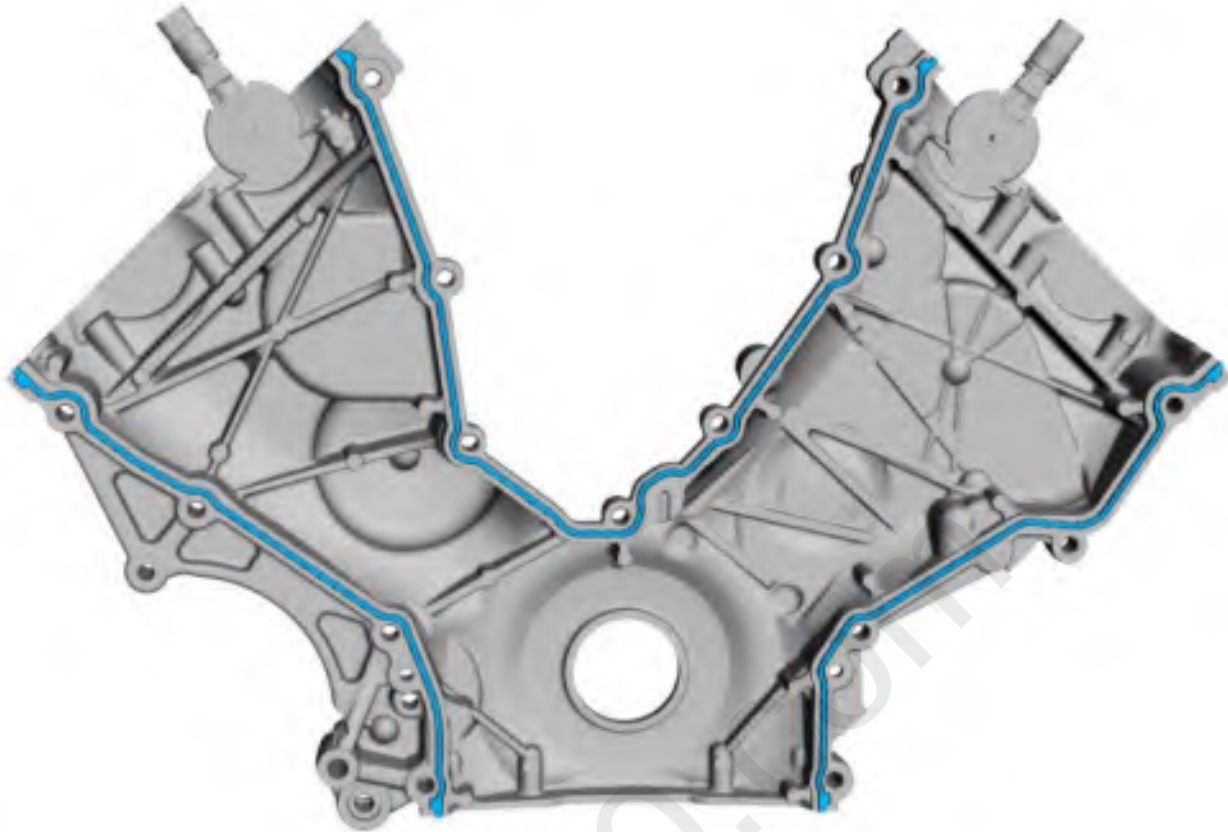
Material: Motorcraft® Metal Brake Parts Cleaner / PM-4-A, PM-4-B

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



Installation

1. Install new gaskets on the engine front cover.

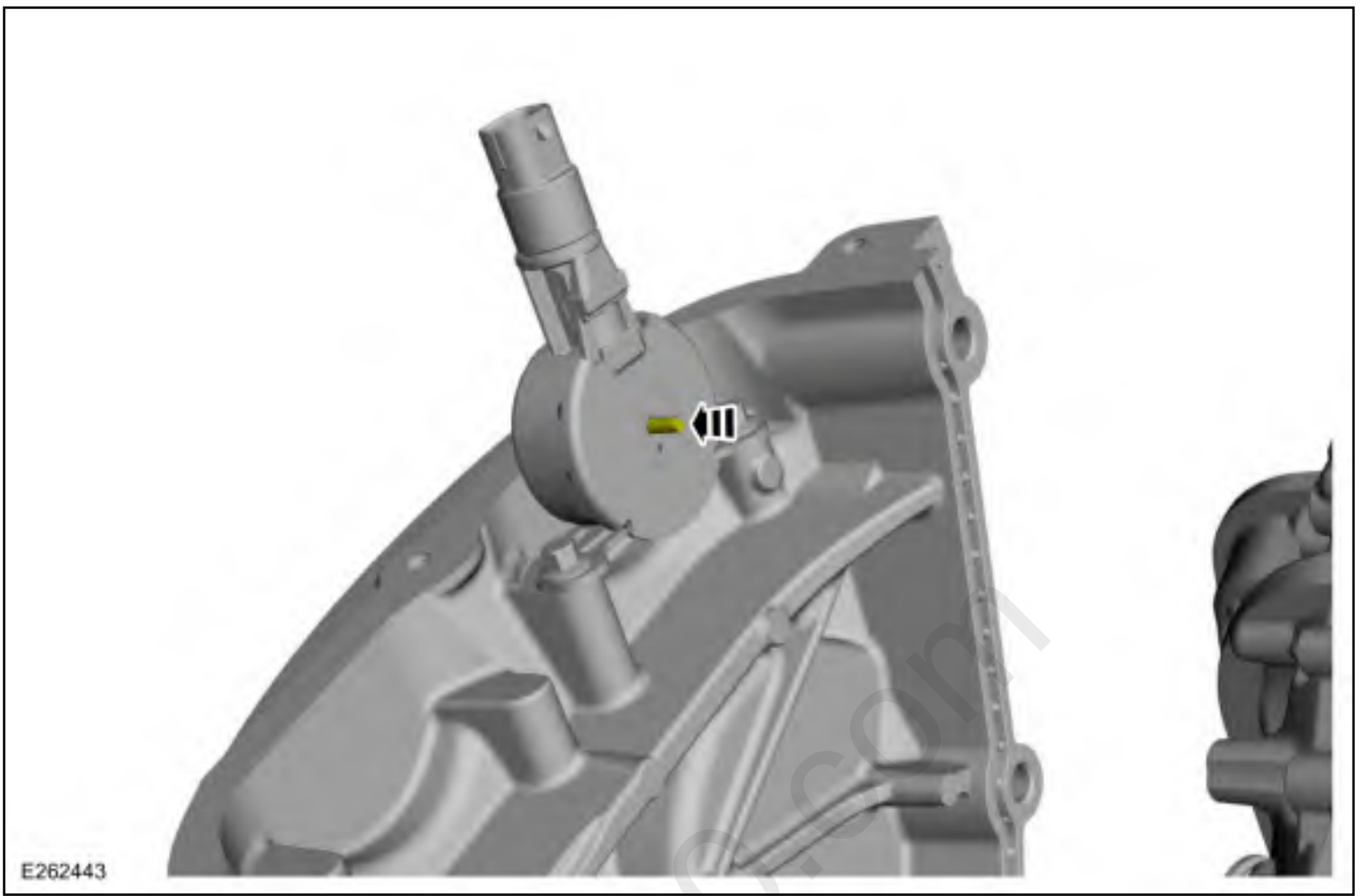


E262441

2. **NOTICE:** The VCT variable force solenoid pins must be fully depressed to avoid interference with the VCT valve tips when installing the engine front cover. Failure to follow these instructions can result in damage to the engine.

NOTE: *RH shown, LH similar.*

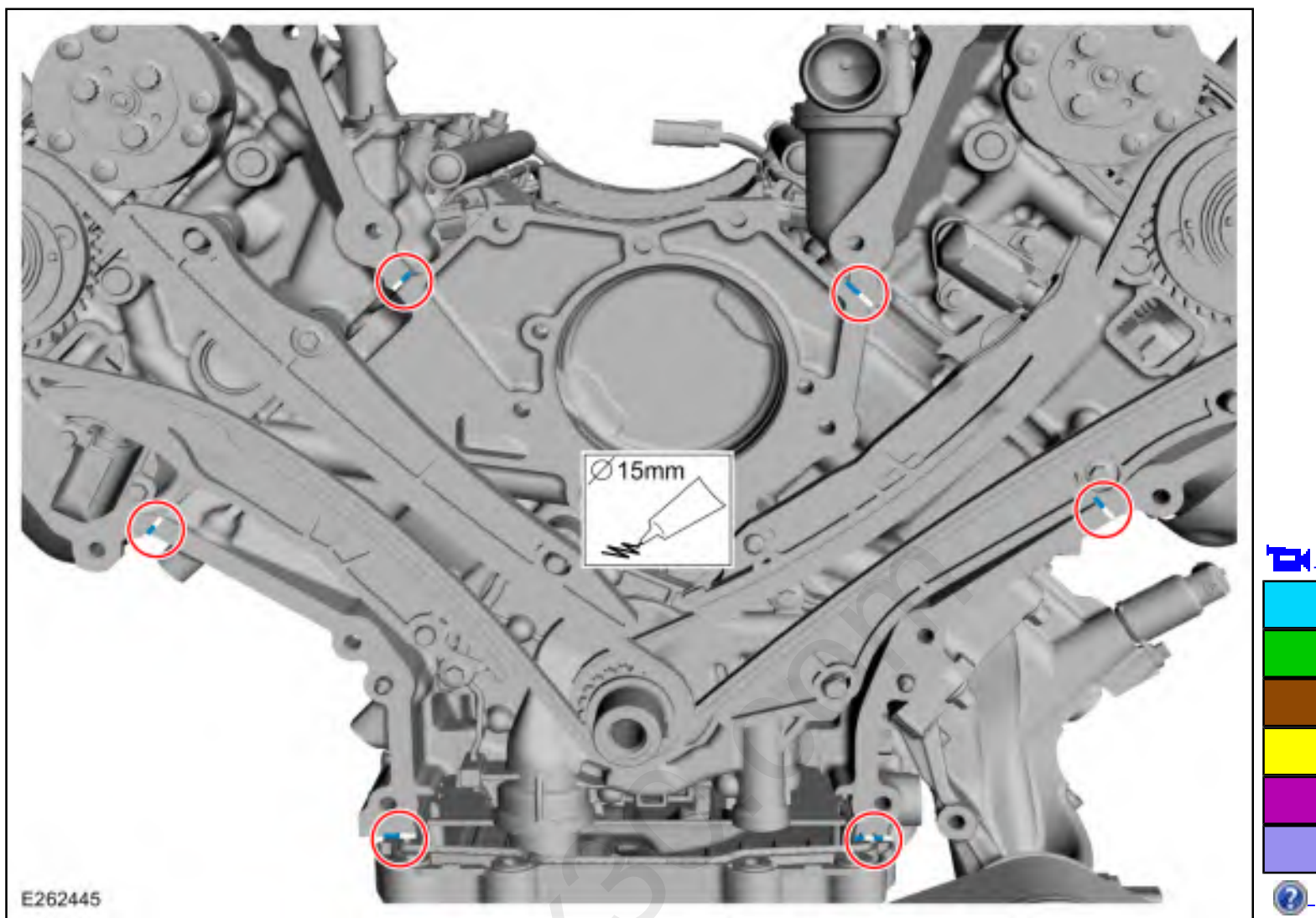
Fully depress the VCT variable force solenoid pins.



3. **NOTICE:** The engine front cover must be installed and all fasteners final tightened within 5 minutes of applying the sealer. If this cannot be accomplished, install the engine front cover and tighten fasteners 6, 7, 8, 9, 10 and 11 to 8 Nm (71 lb-in) within 5 minutes of applying the sealer. All of the fasteners must then be final tightened within 1 hour of applying the sealer. If this time limit is exceeded, all sealant must be removed and the sealing area cleaned. Failure to follow this procedure can cause future oil leakage.

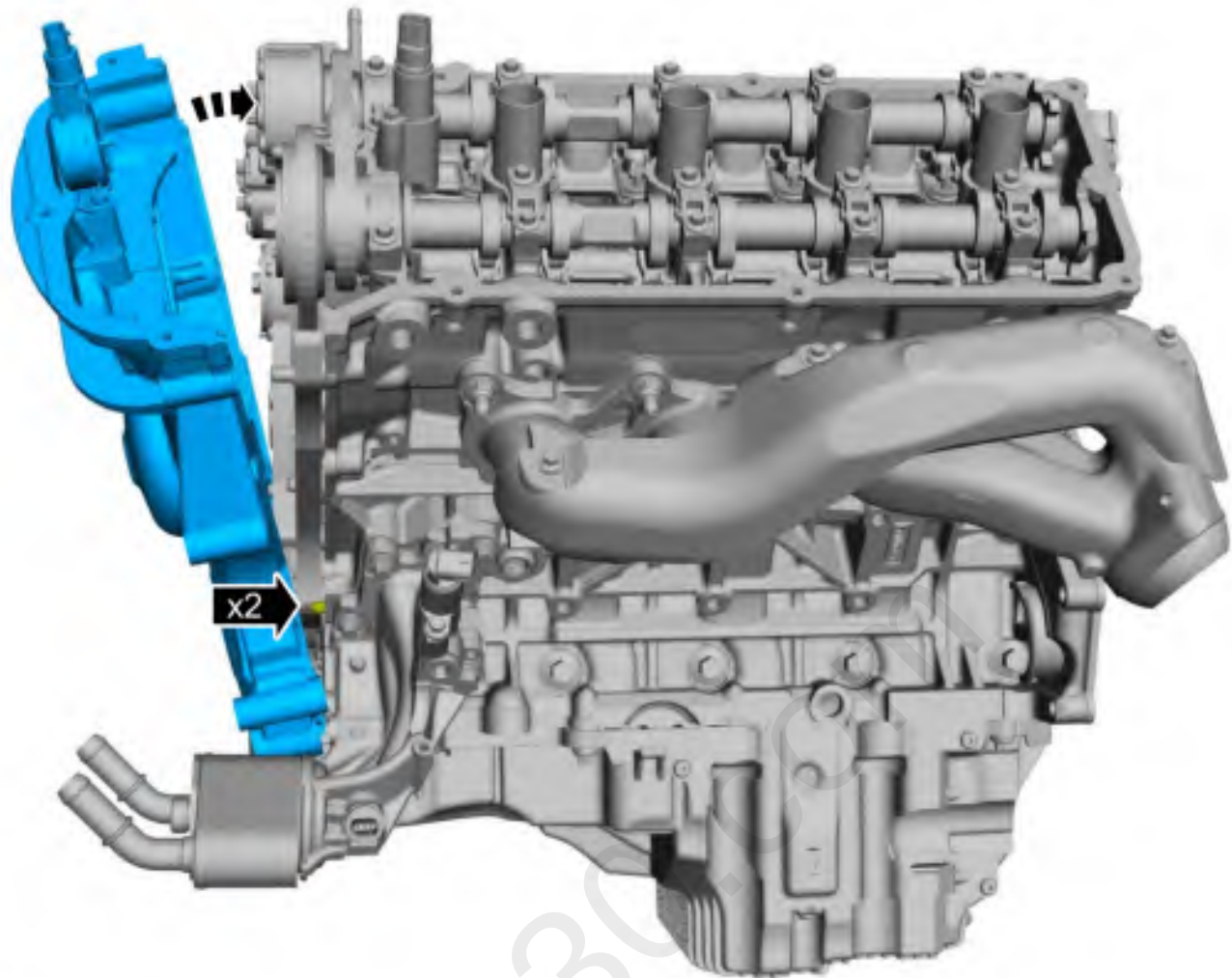
Apply a 15 mm (0.59 in) diameter drop of silicone gasket and sealant to the cylinder head-to-cylinder block joints and the oil pan-to-cylinder block joints.

Material: Motorcraft® Silicone Gasket and Sealant / TA-30 (WSE-M4G323-A4)



4. **NOTE:** Make sure that the engine front cover gaskets are in place on the engine front cover before installation.

Position the engine front cover onto the dowels.



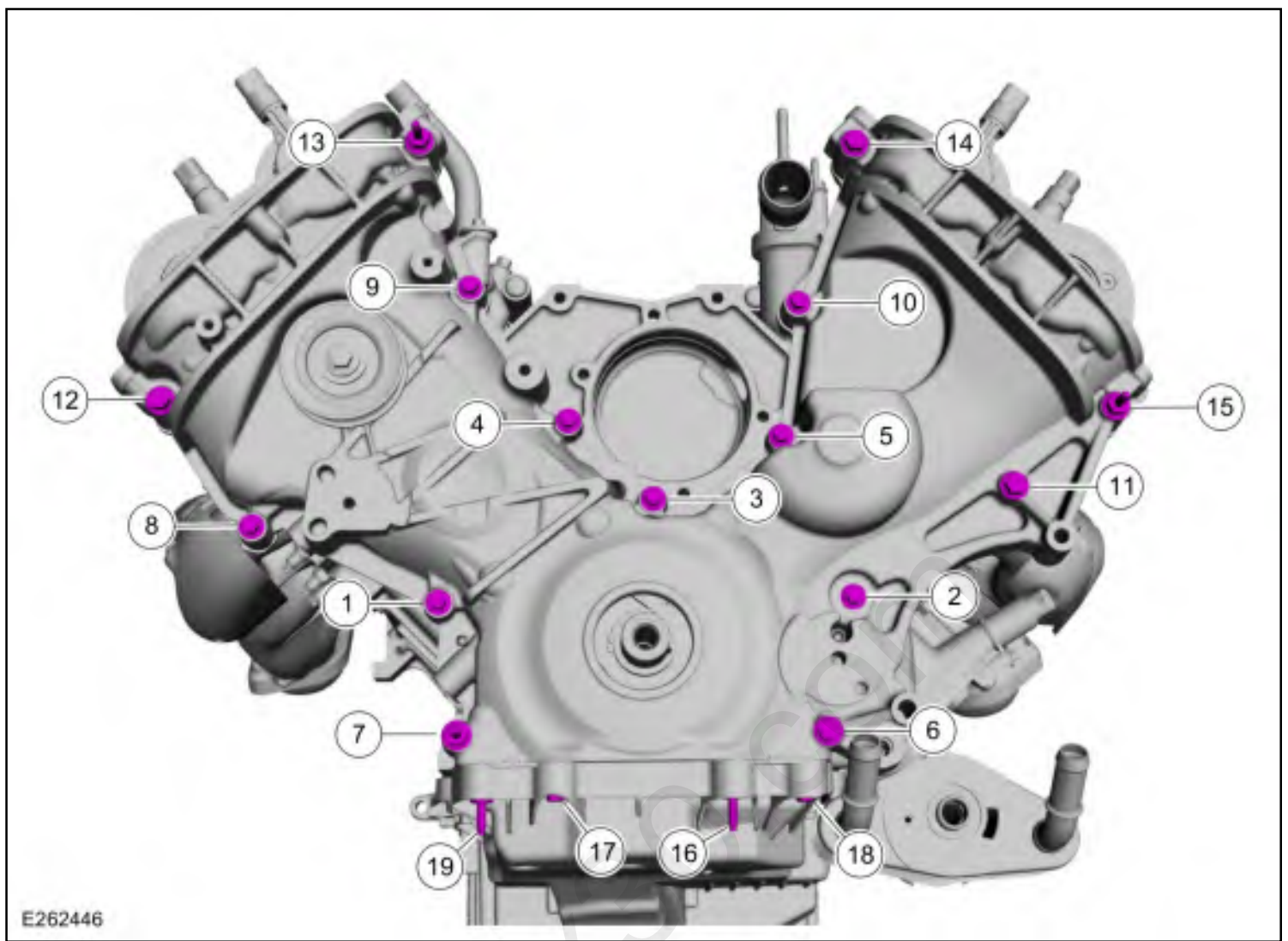
E262440

5. **NOTICE:** The engine front cover must be installed and all fasteners final tightened within 5 minutes of applying the sealer. If this cannot be accomplished, install the engine front cover and tighten fasteners 6, 7, 8, 9, 10 and 11 to 8 Nm (71 lb-in) within 5 minutes of applying the sealer. All of the fasteners must then be final tightened within 1 hour of applying the sealer. If this time limit is exceeded, all sealant must be removed and the sealing area cleaned. Failure to follow this procedure can cause future oil leakage.

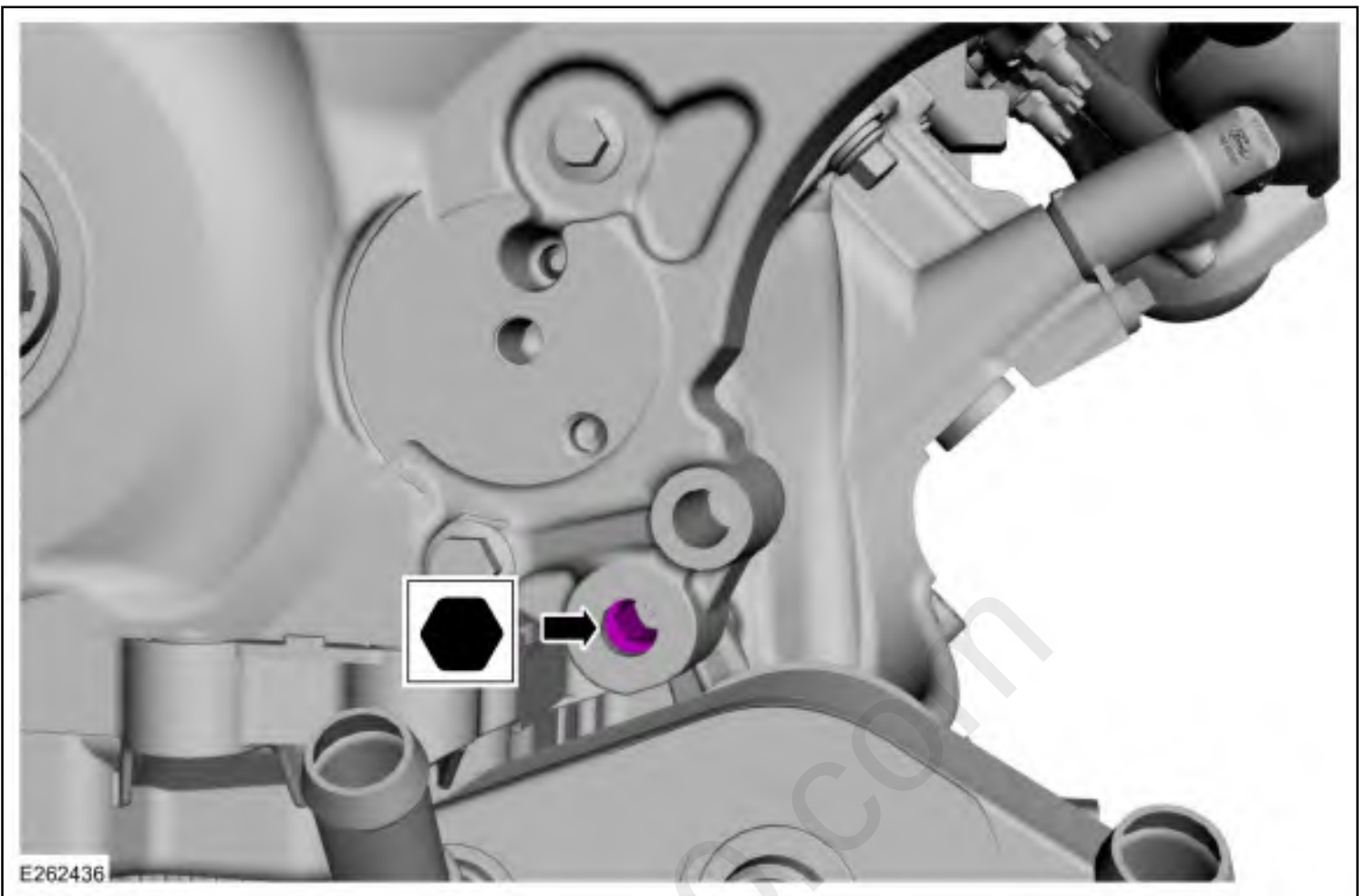
Install the bolts and stud bolts.

Torque:

- Stage 1: Fasteners 1-15 : 18 lb.ft (25 Nm)
- Stage 2: Fasteners 16-19 : 89 lb.in (10 Nm)
- Stage 3: Fasteners 1-15 : 60°
- Stage 4: Fasteners 16-19 : 45°



6. Using a 10 mm Hex Bit, turn the engine front cover-to-oil filter adapter jack screw into contact with the oil filter adapter.
Torque: 44 lb.in (5 Nm)

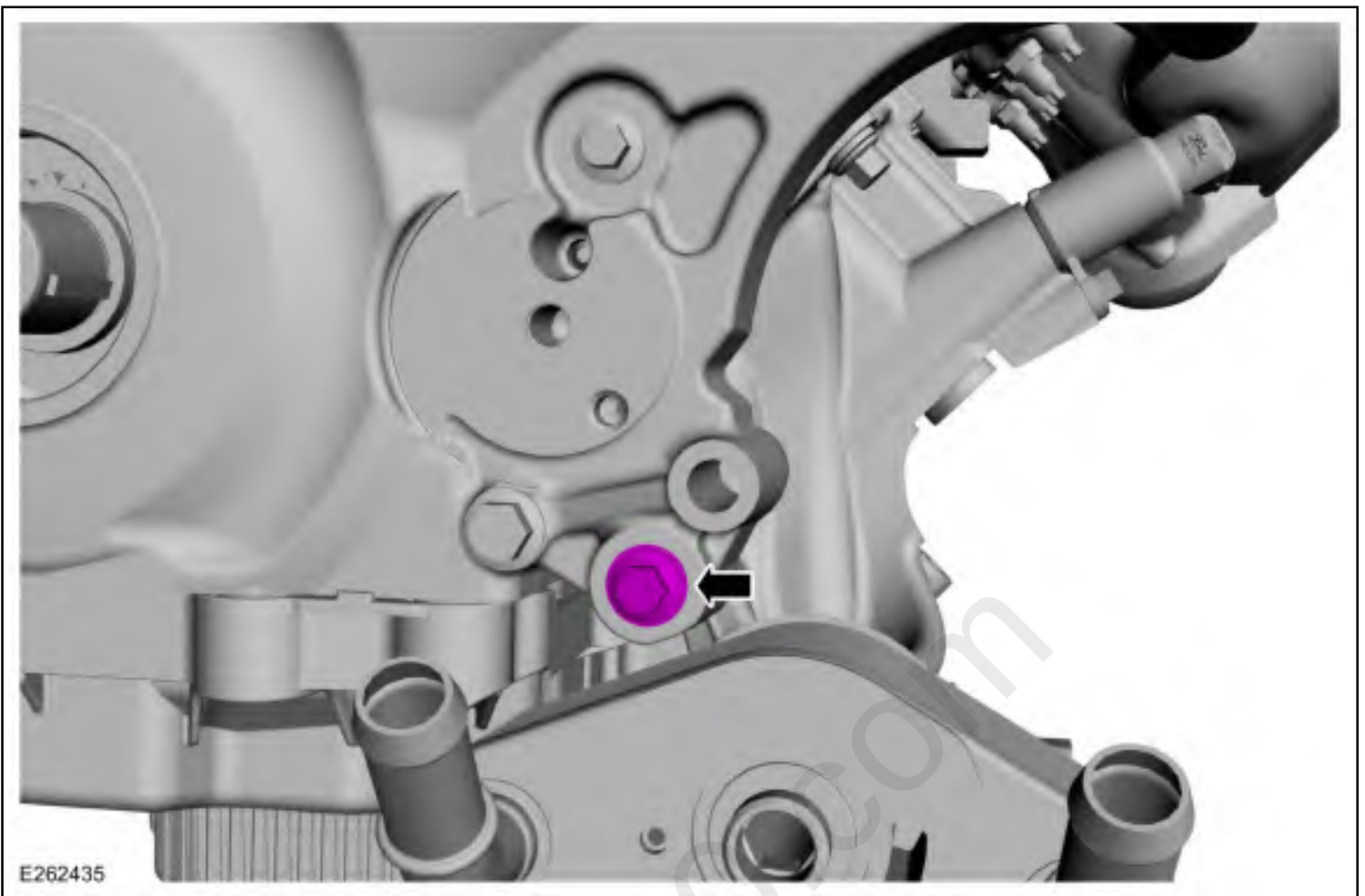


7. Install the engine front cover-to-oil filter adapter bolt.

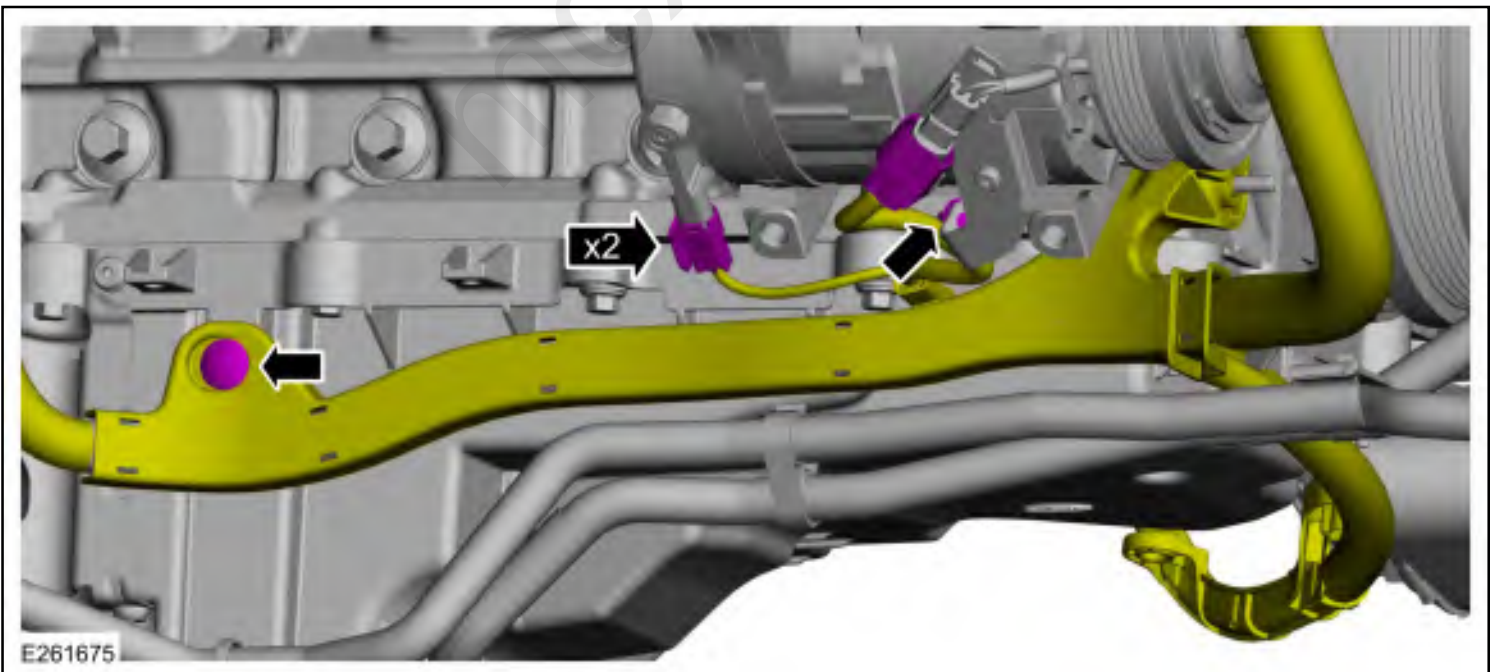
Torque:

Stage 1: 18 lb.ft (25 Nm)

Stage 2: 60°



1. Connect the A/C compressor electrical connectors.
2. Attach the wiring harness retainers.

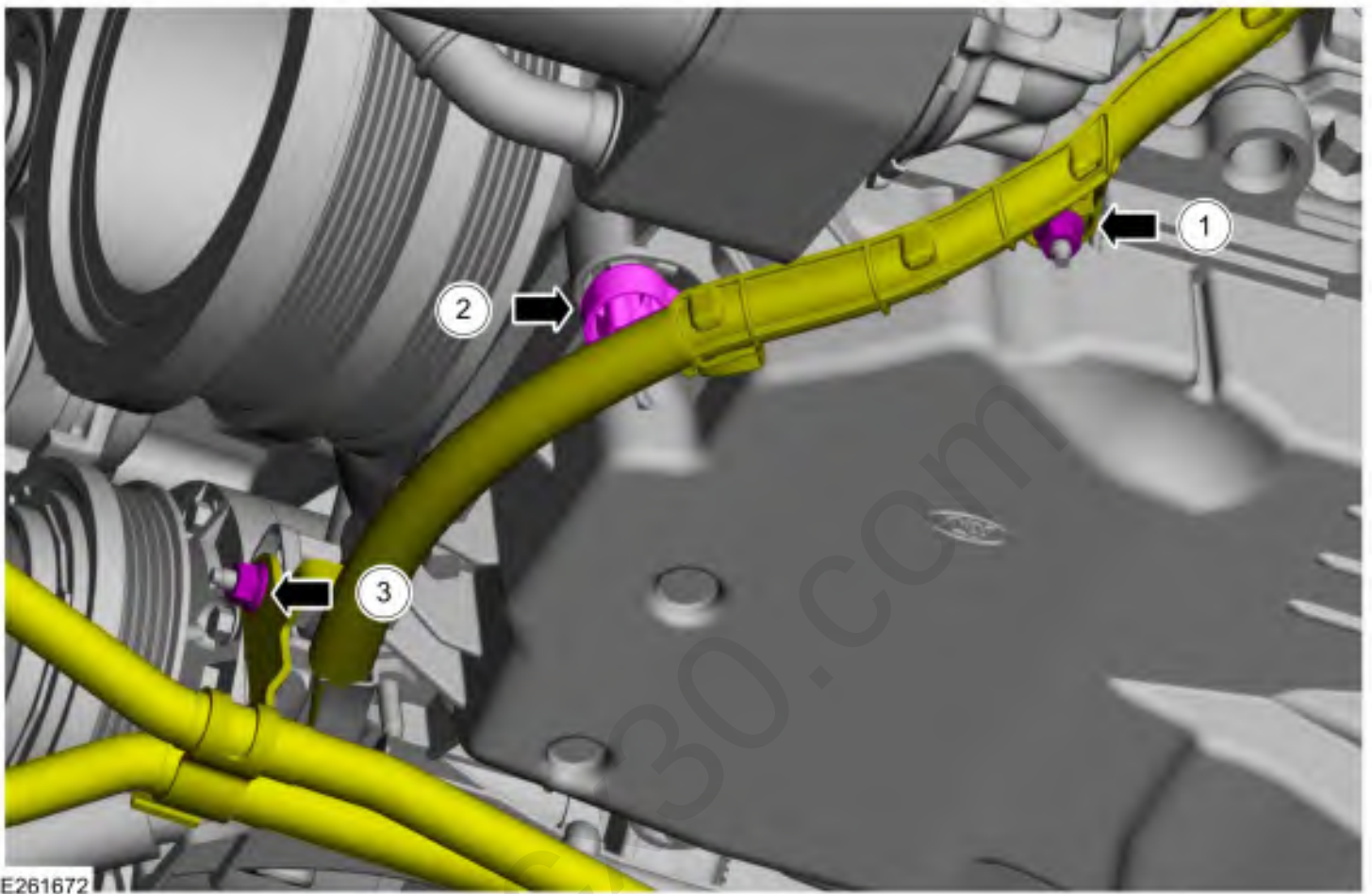


1. Install the nut.

Torque: 106 lb.in (12 Nm)

2. Attach the wiring harness retainer.
3. Position the coolant tube and wiring harness brackets and install the nut.

Torque: 115 lb.in (13 Nm)

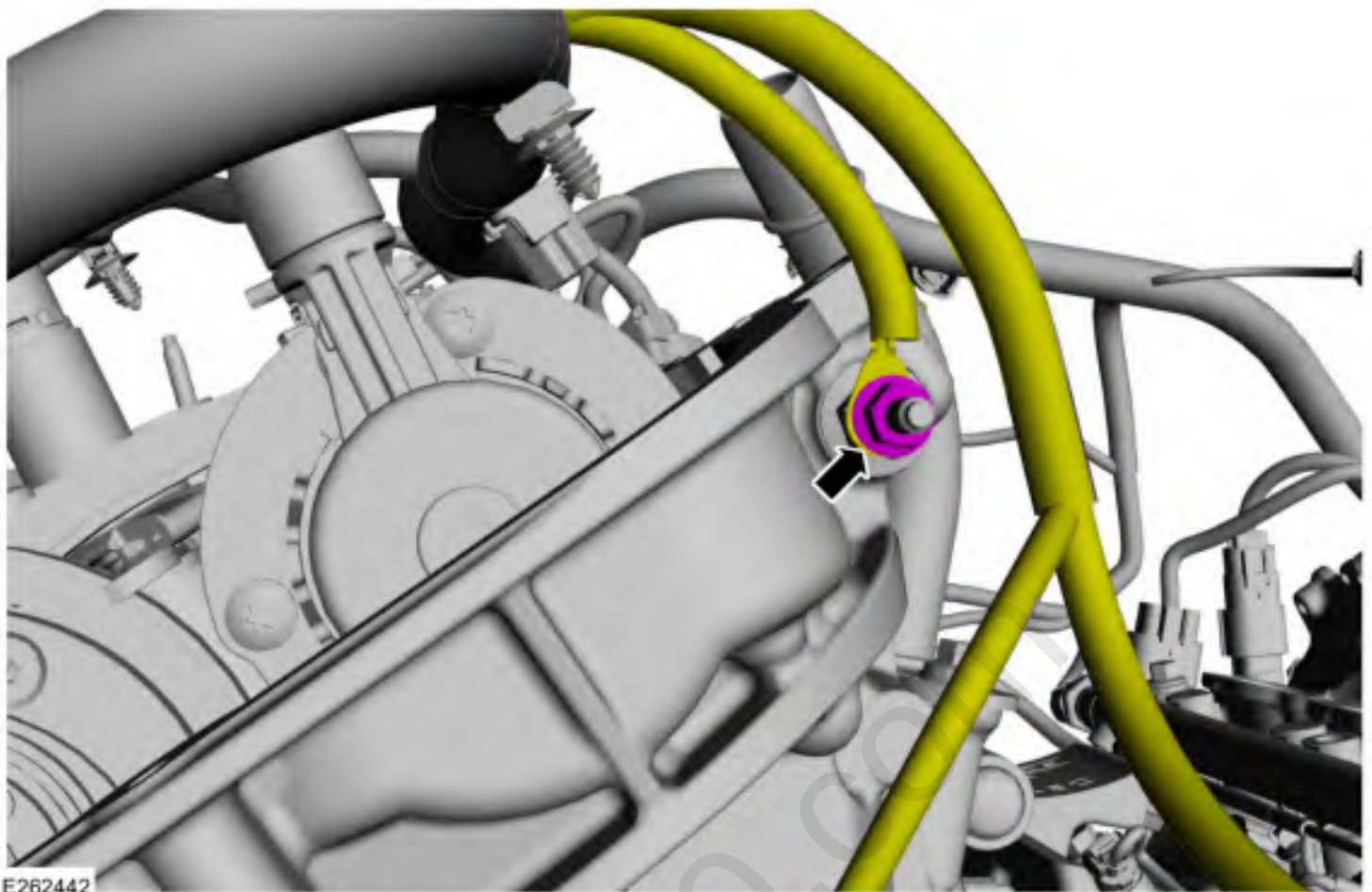


10. Install the generator, the bolt and the nut.

Torque: 35 lb.ft (48 Nm)



11. Install the ground wire and nut.
Torque: 89 lb.in (10 Nm)



12. Install the following items:

1. Refer to: Crankshaft Front Seal (303-01 Engine - 5.0L 32V Ti-VCT) .
2. Refer to: [Coolant Pump](#) (303-03D Engine Cooling - 5.0L 32V Ti-VCT, Removal and Installation).
3. Refer to: Air Conditioning (A/C) Compressor Belt Tensioner (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
4. Refer to: Air Conditioning (A/C) Compressor Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
5. Refer to: Accessory Drive Belt Tensioner (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
6. Refer to: Accessory Drive Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .

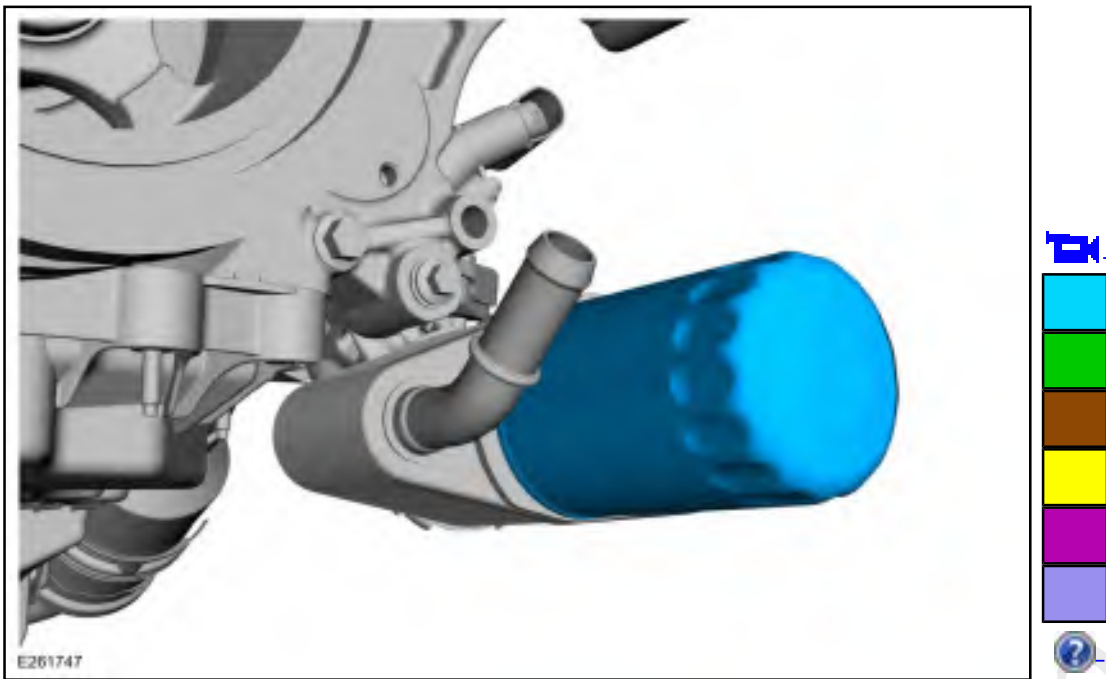
13. **NOTE:** *Do not lubricate the O-ring seal.*

Install a new oil filter.

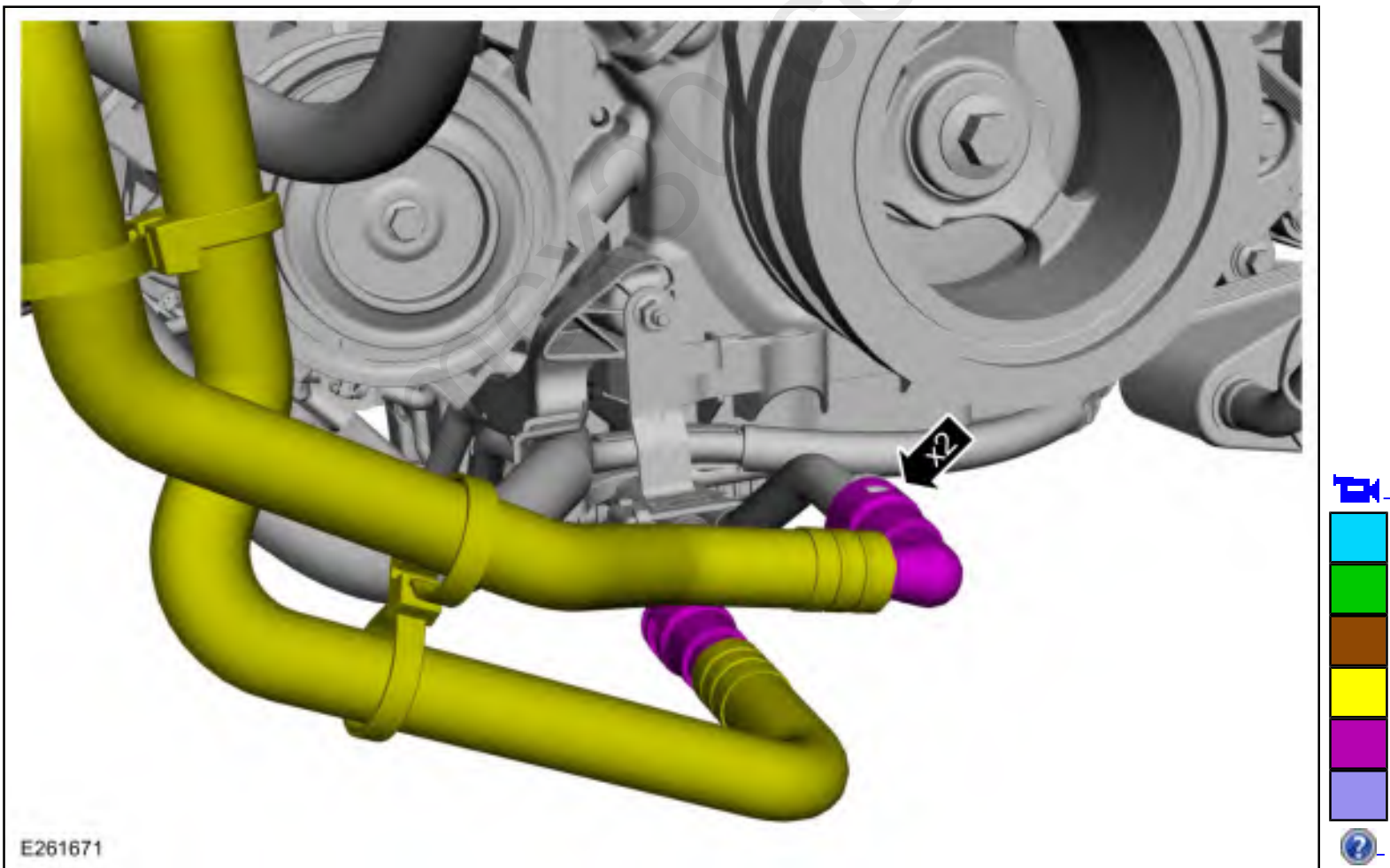
Torque:

Stage 1: 44 lb.in (5 Nm)

Stage 2: 180°



14. Connect the coolant hose quick release couplings.



1. Install the coolant hose assembly and the clamps.

- Use the General Equipment: Hose Clamp Remover/Installer
2. Install the coolant bypass T assembly and engage the spring clip.
 3. Install the coolant hose and clamp.

Use the General Equipment: Hose Clamp Remover/Installer

4. Install the coolant hose and clamp.

Use the General Equipment: Hose Clamp Remover/Installer

5. Connect the quick release coupling.

6. Install the coolant hose and clamp.

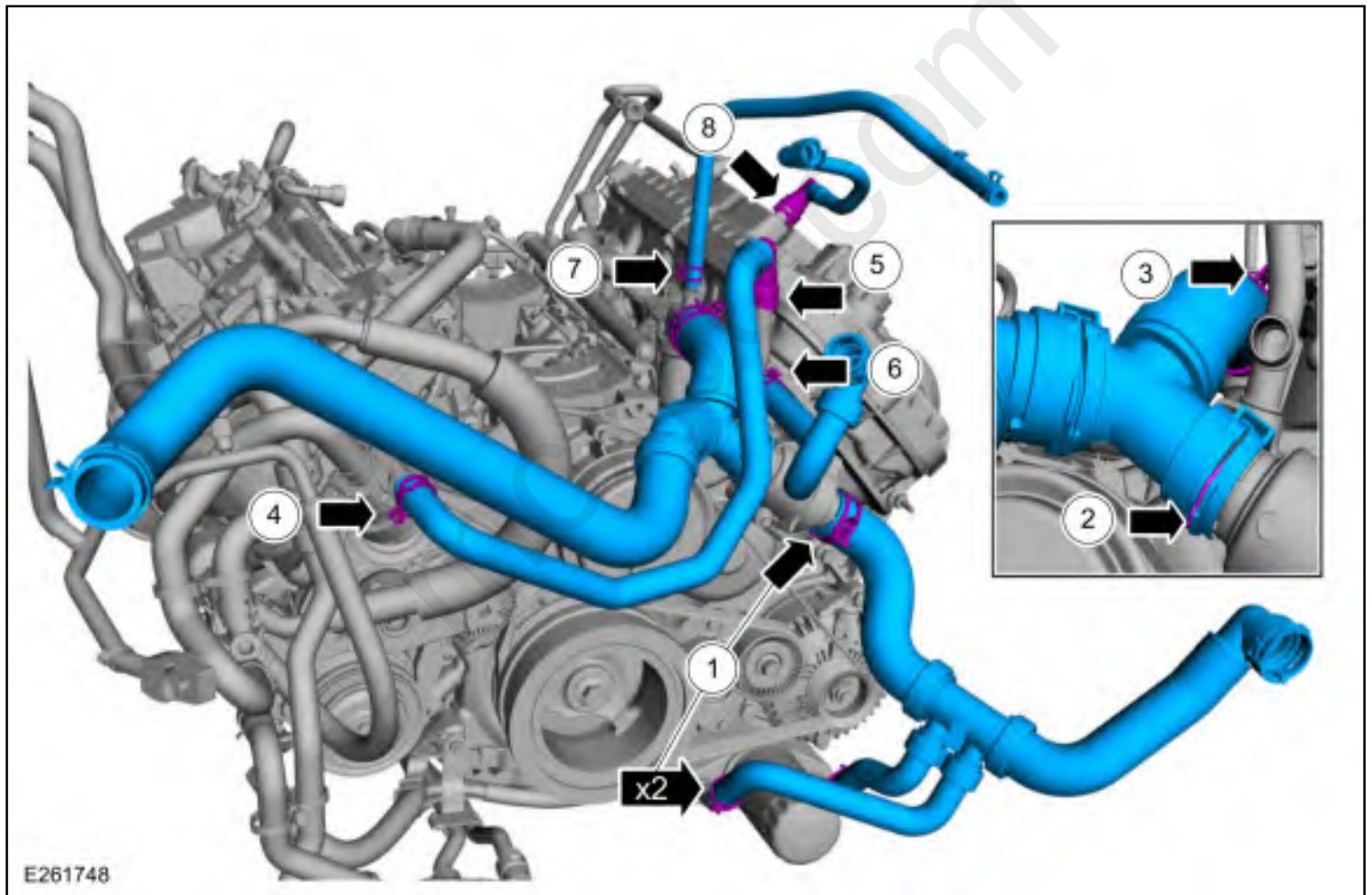
Use the General Equipment: Hose Clamp Remover/Installer

7. Install the coolant hose and clamp.

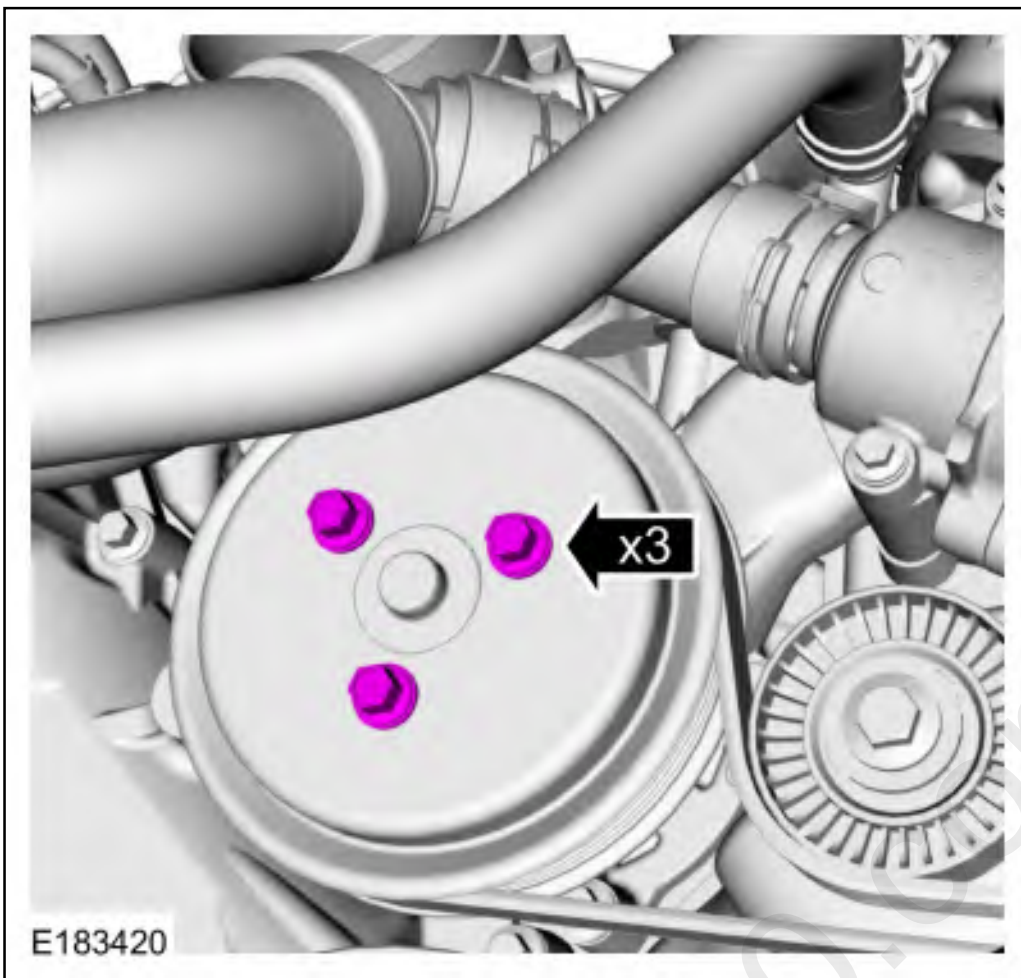
Use the General Equipment: Hose Clamp Remover/Installer

8. Install the crankcase vent tube and connect the quick release coupling.

Refer to: [Quick Release Coupling](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-VCT, General Procedures).



16. Torque: 18 lb.ft (25 Nm)



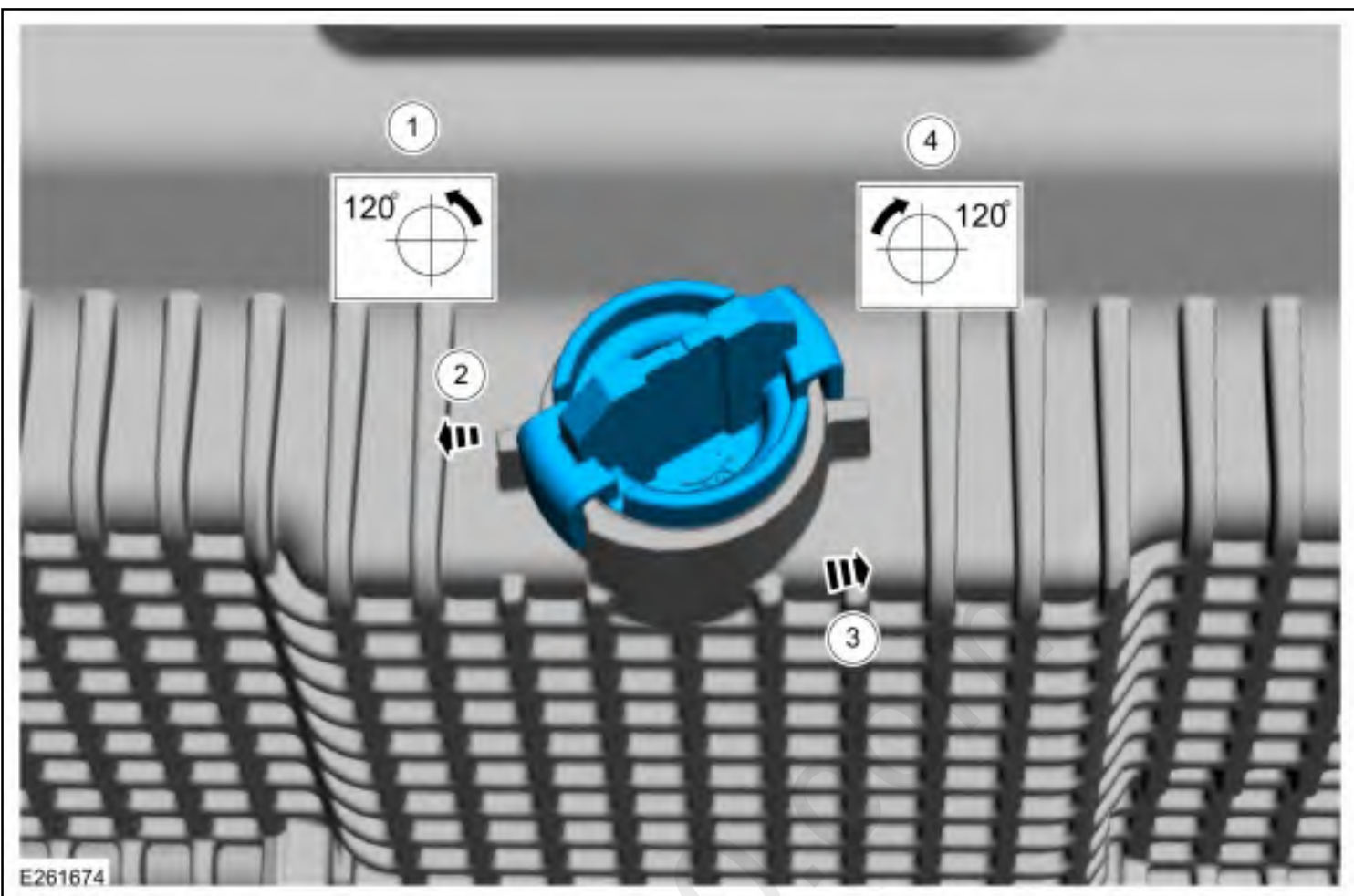
17. Install the following items:

1. Refer to: Valve Cover RH (303-01 Engine - 5.0L 32V Ti-VCT) .
2. Refer to: Valve Cover LH (303-01 Engine - 5.0L 32V Ti-VCT) .
3. Refer to: Cooling Module (303-03 Engine Cooling - 5.0L 32V Ti-VCT) .
4. Refer to: [Degas Bottle](#) (303-03D Engine Cooling - 5.0L 32V Ti-VCT, Removal and Installation).

18. **NOTE:** *The drain plug should be removed and installed by hand, do not use tools.*

1. Turn the oil drain plug by hand counterclockwise 120 degrees.
Use the General Equipment: Oil Drain Equipment
2. Pull the oil drain plug out of the oil pan.
3. After the oil has drained, push the oil drain plug into the oil pan.
4. **NOTICE: Overtightening will damage the oil drain plug and possibly the oil pan.**

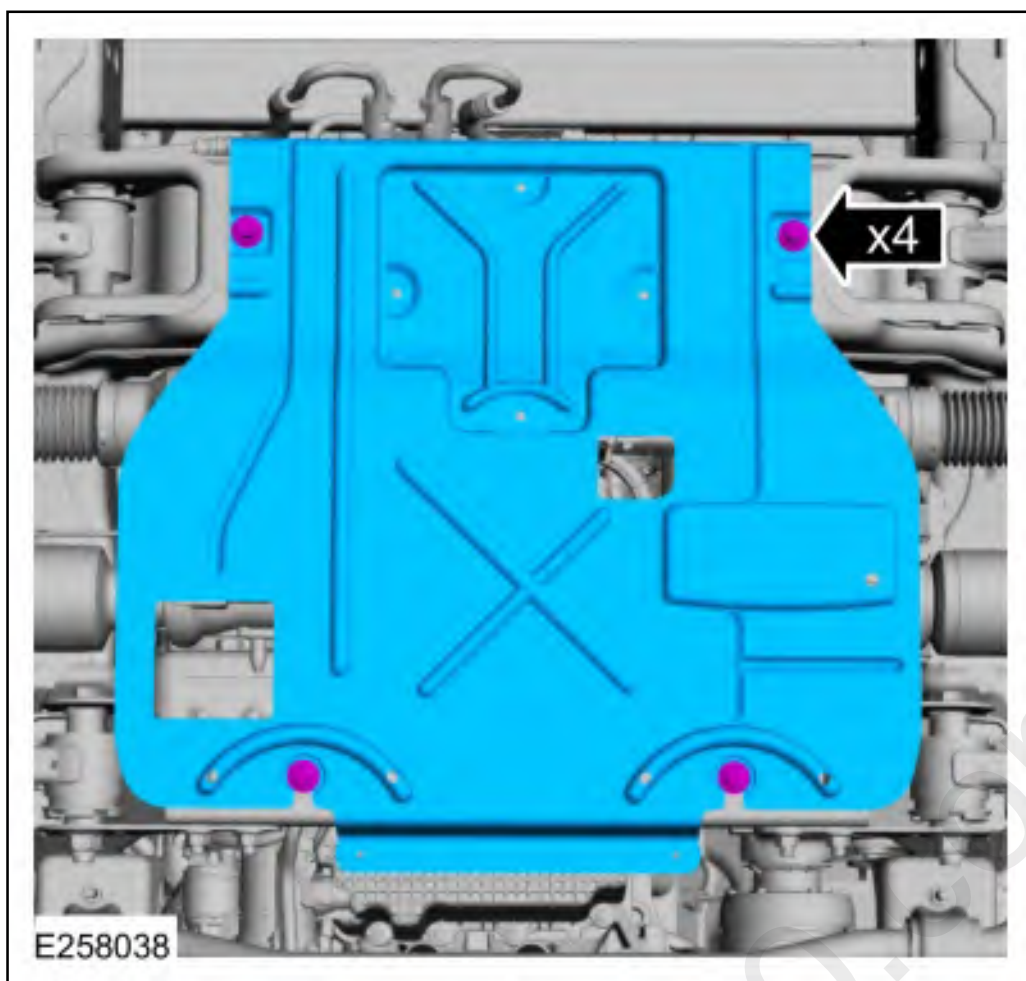
Turn the oil drain plug by hand clockwise 120 degrees.



19. **NOTE:** *If equipped.*

Install the skid plate and bolts.

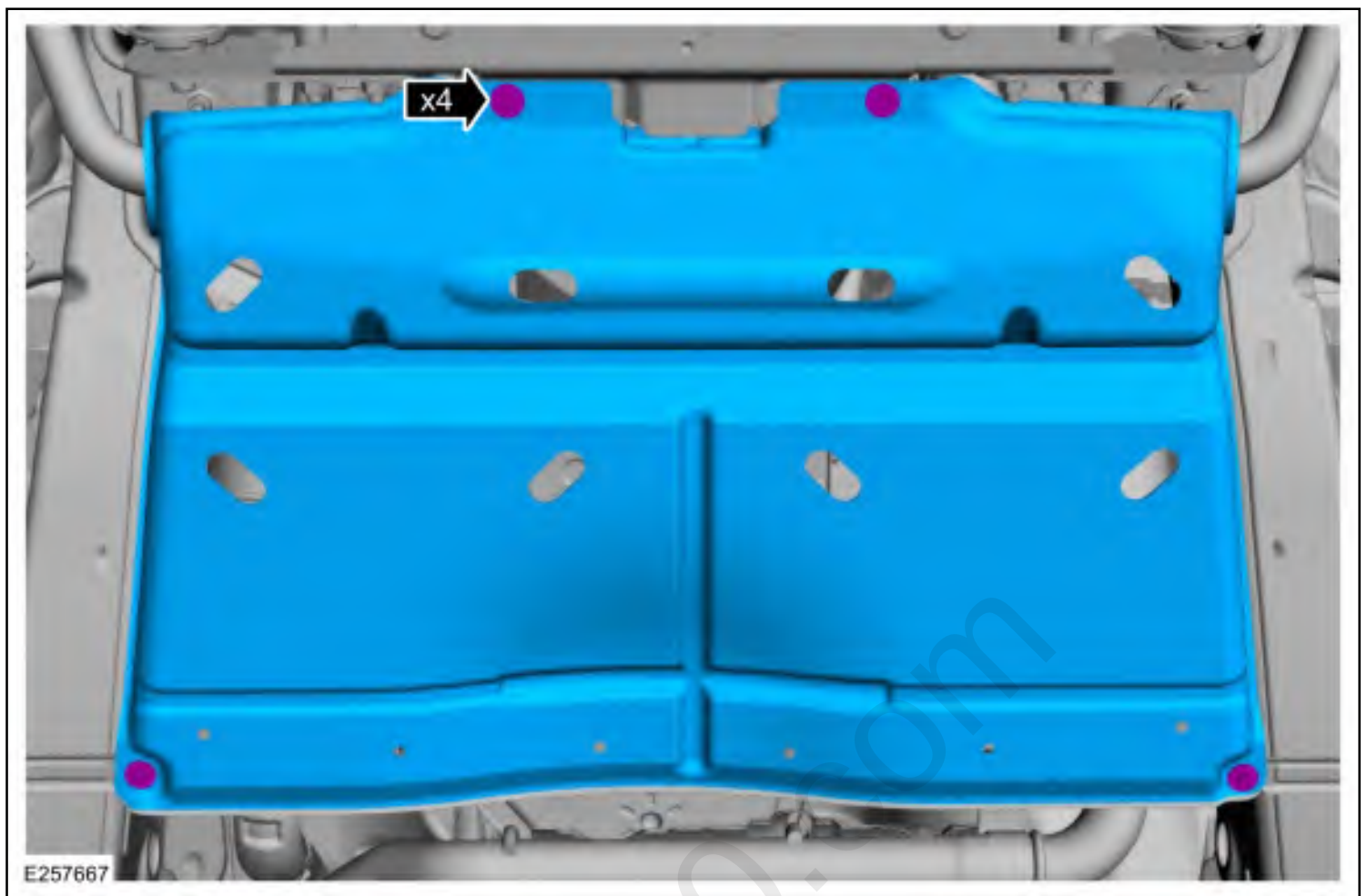
Torque: 30 lb.ft (40 Nm)



20. **NOTE:** *If equipped.*

Install the underbody shield and the bolts.

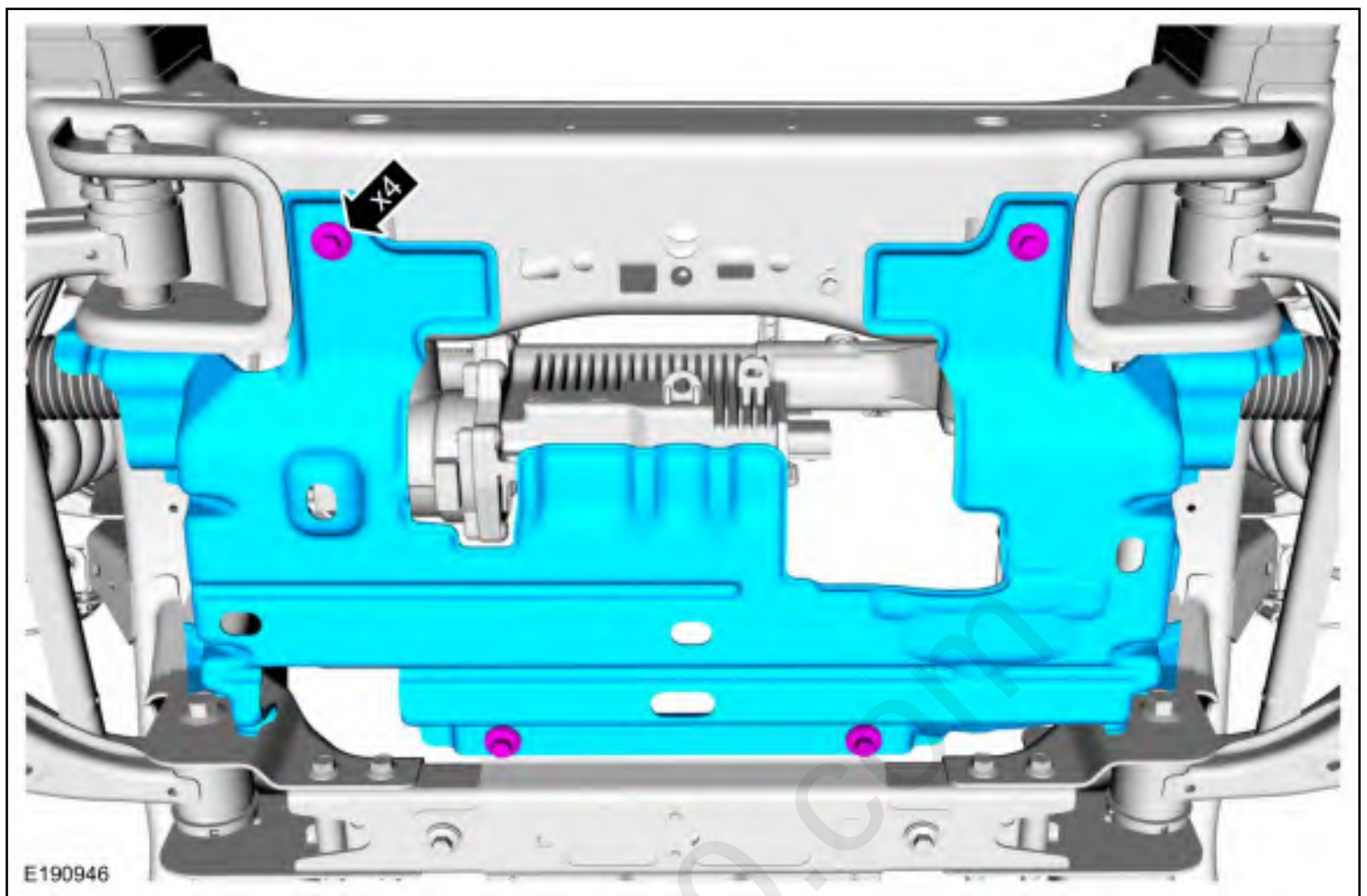
Torque: 71 lb.in (8 Nm)



21. **NOTE:** *If equipped.*

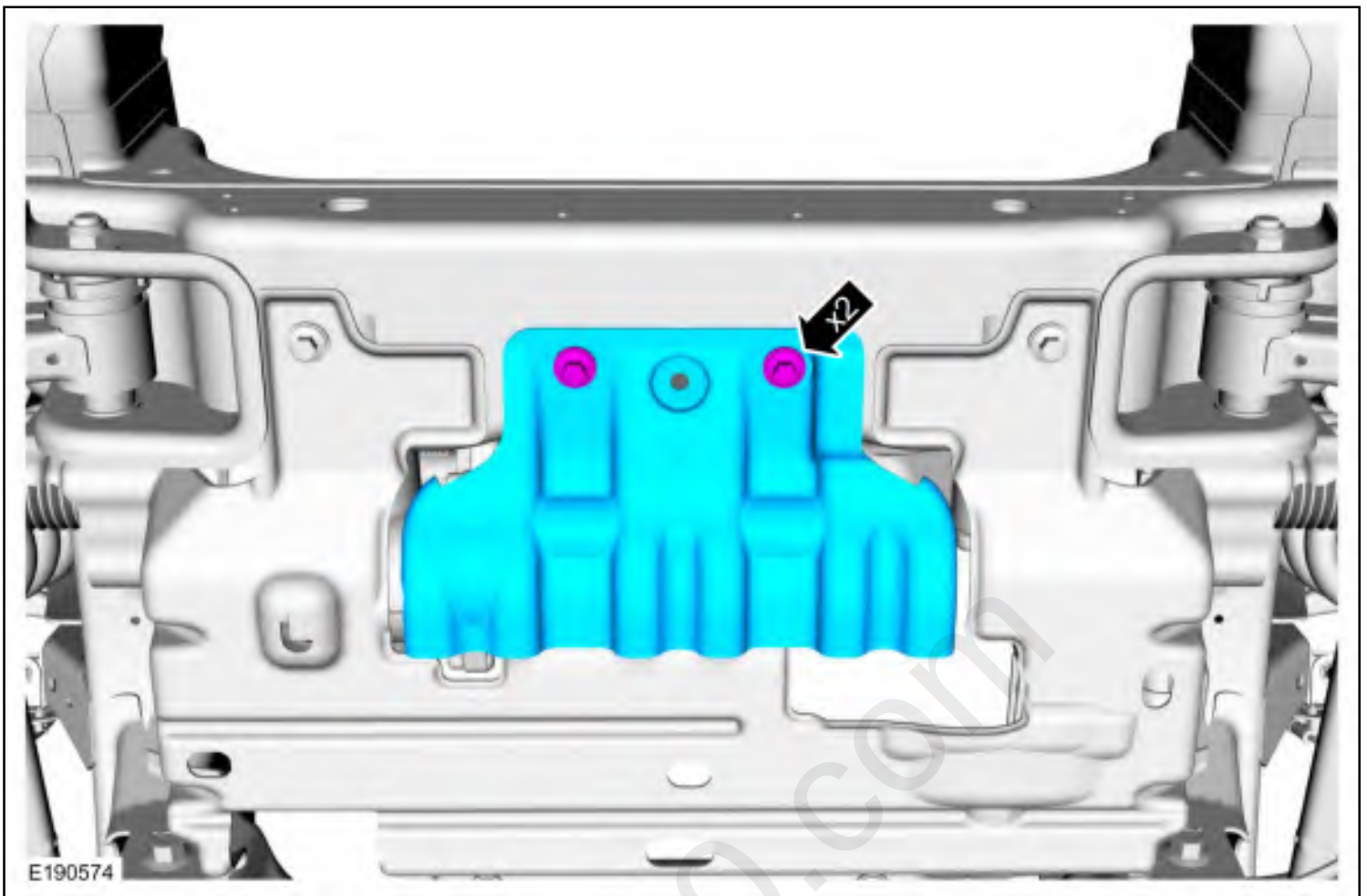
Install the underbody shield and fasteners.

Torque: 30 lb.ft (40 Nm)



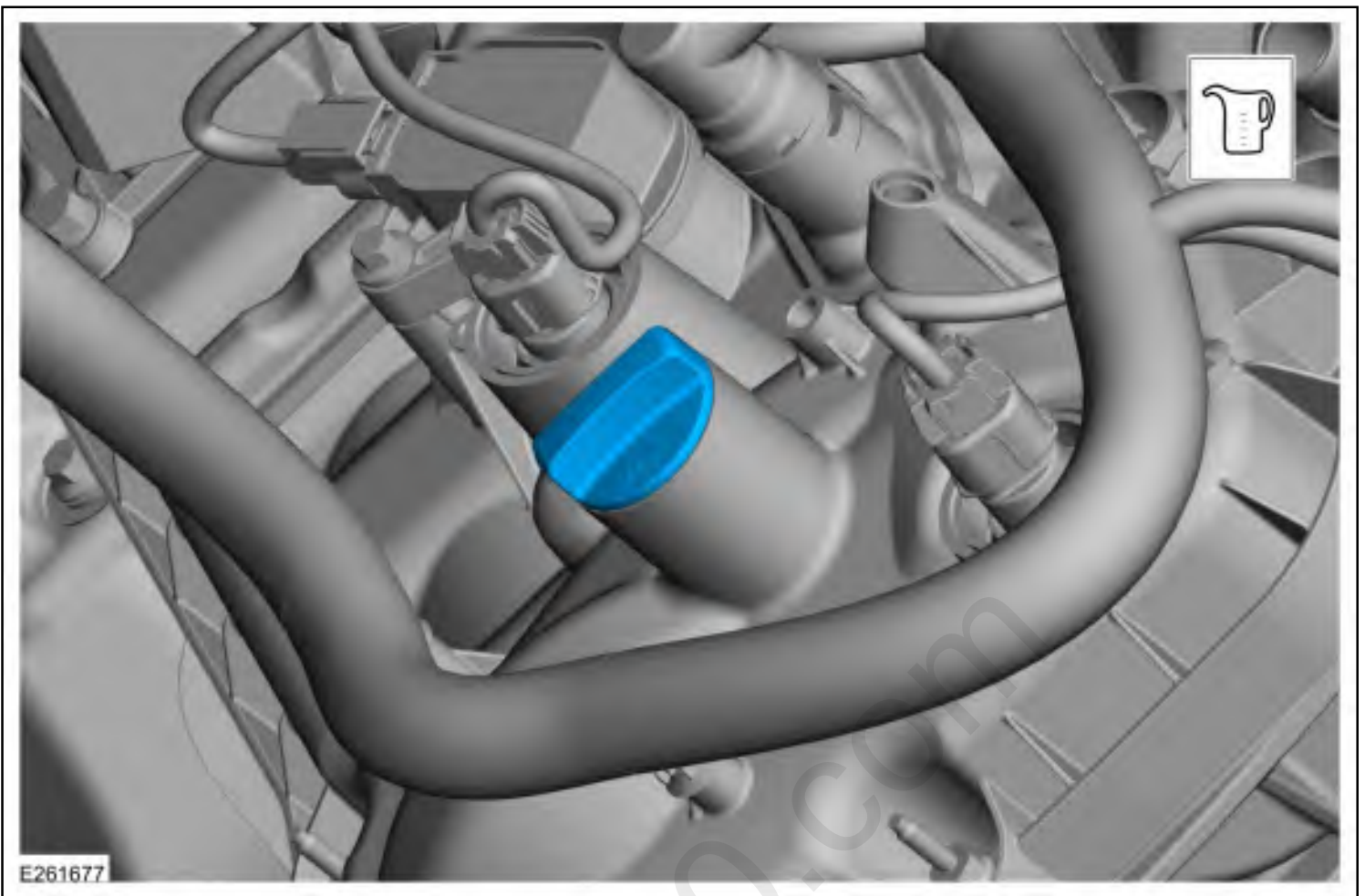
22. **NOTE:** *If equipped.*

Install the skid plate and bolts.
Torque: 30 lb.ft (40 Nm)



23. Fill the engine with clean engine oil.

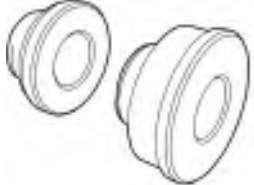
Refer to: [Specifications](#) (303-01D Engine - 5.0L 32V Ti-VCT, Specifications).



24. Connect the battery ground cable.
Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .
25. Fill and bleed the engine cooling system.
Refer to: Cooling System Draining, Vacuum Filling and Bleeding (303-03 Engine Cooling - 5.0L 32V Ti-VCT) .
26. Use the Powertrain Control Module (PCM) Misfire Monitor Profile Correction routine in the diagnostic scan tool.

Valve Cover LH

Special Tool(s) / General Equipment

 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
Plastic Scraper	

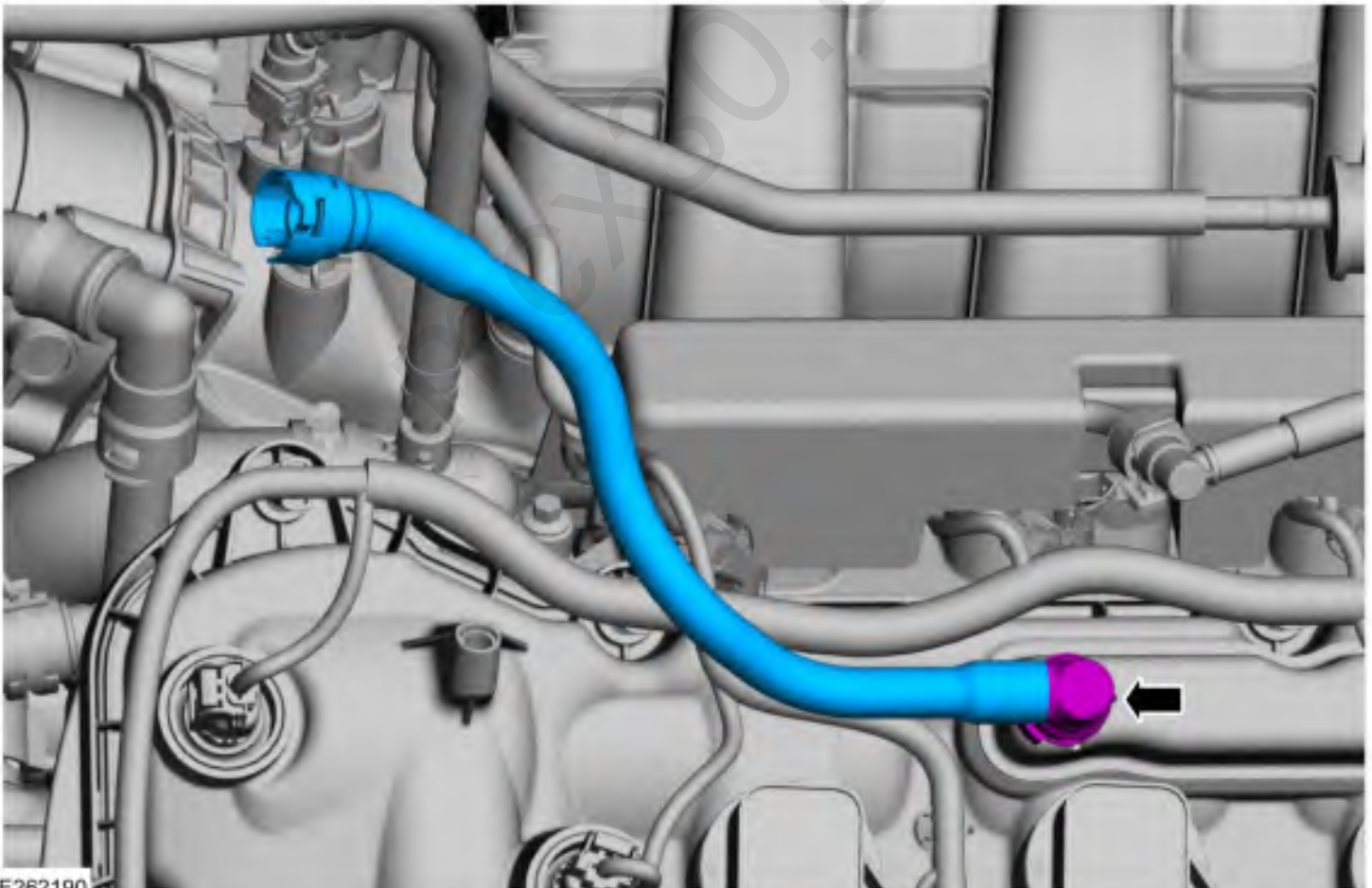
Materials

Name	Specification
Motorcraft® Silicone Gasket Remover ZC-30-A	-
Motorcraft® Metal Surface Prep Wipes ZC-31-B	-
Motorcraft® Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

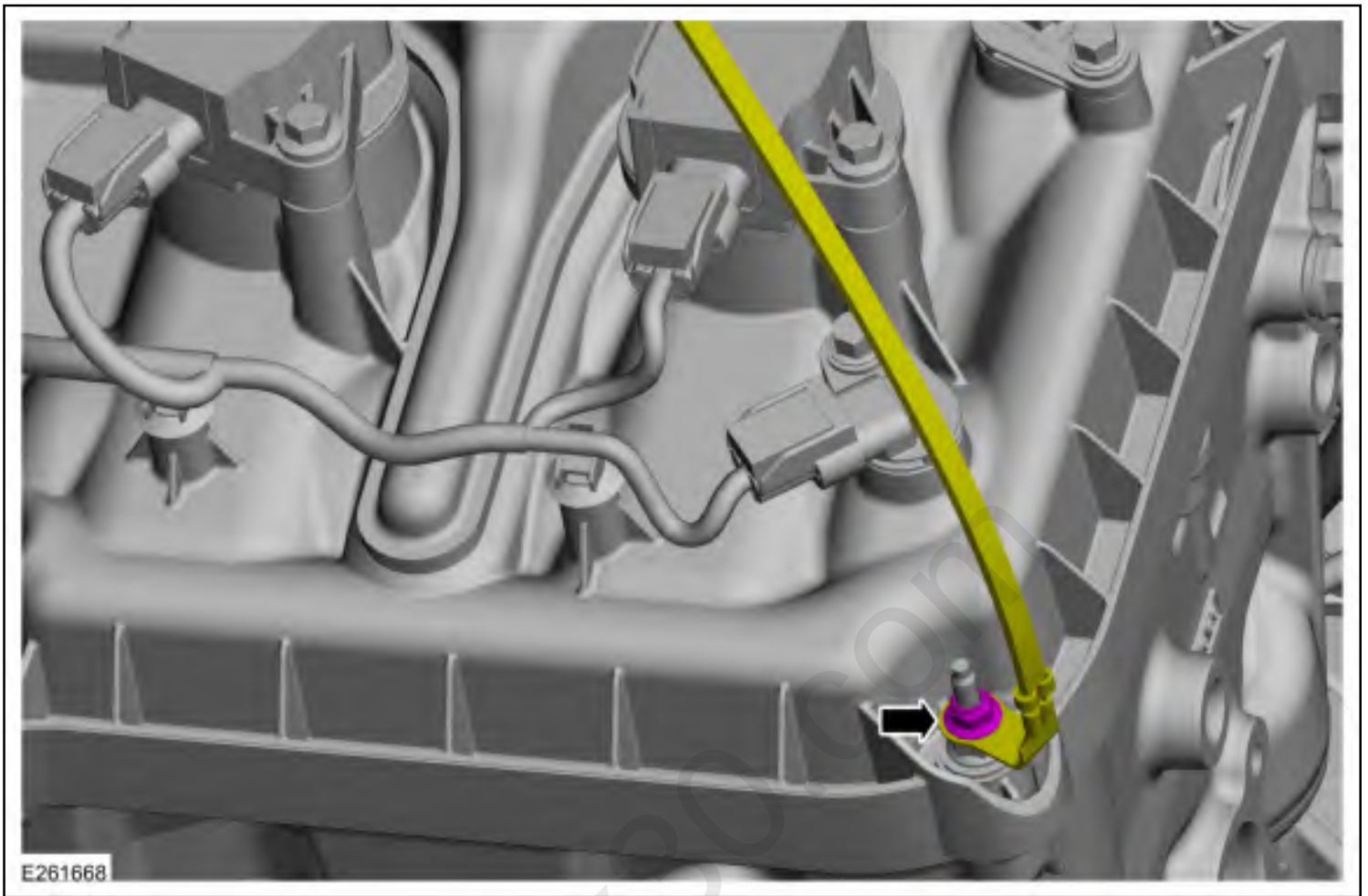
Removal

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.

1. Remove the following items:
 1. Refer to: [Air Cleaner Outlet Pipe](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).
 2. Refer to: [Air Cleaner](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).
2. Disconnect the quick release coupling and remove the PCV tube.
Refer to: [Quick Release Coupling](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-VCT, General Procedures).



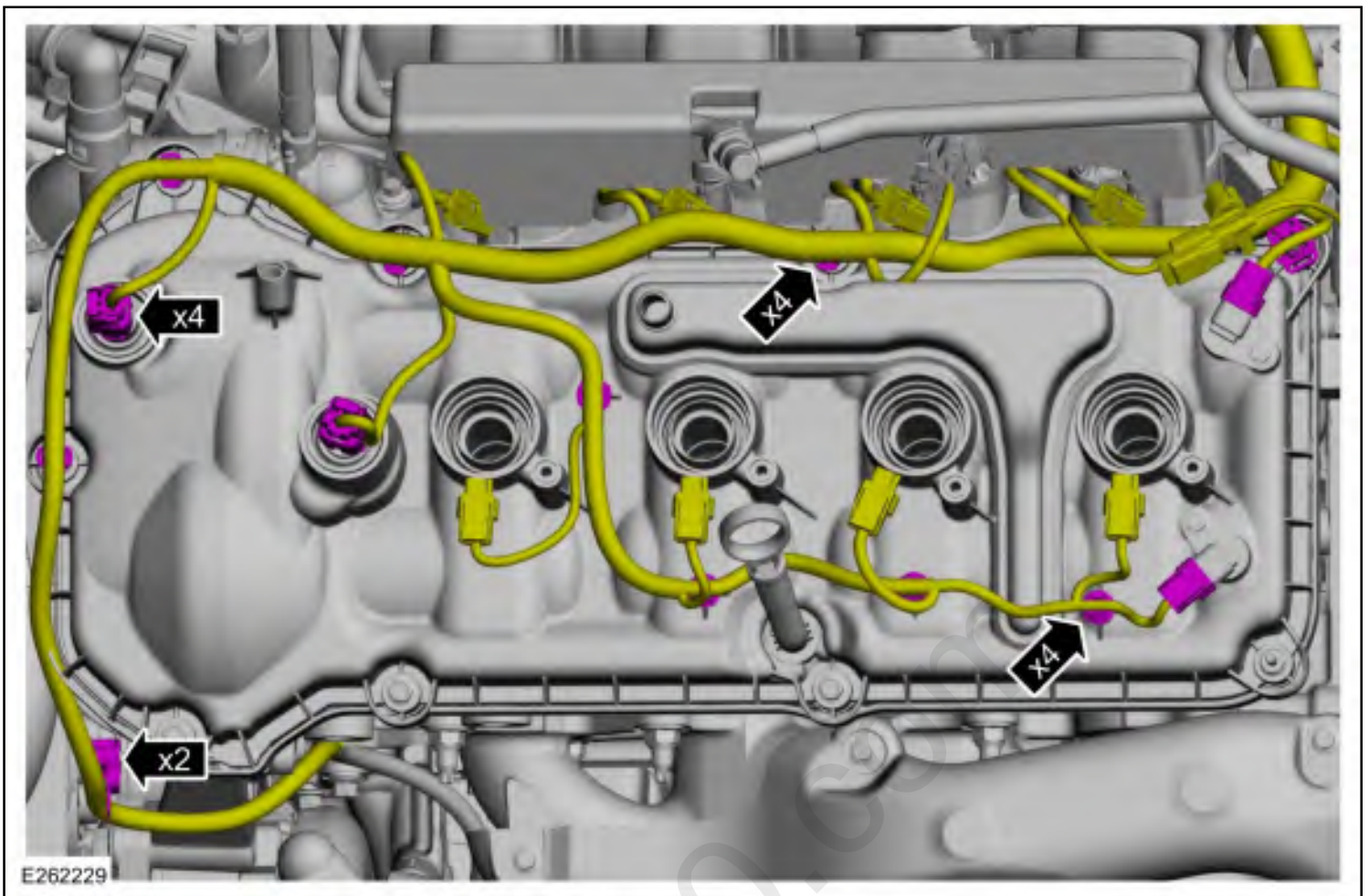
3. Remove the nut and ground wire.



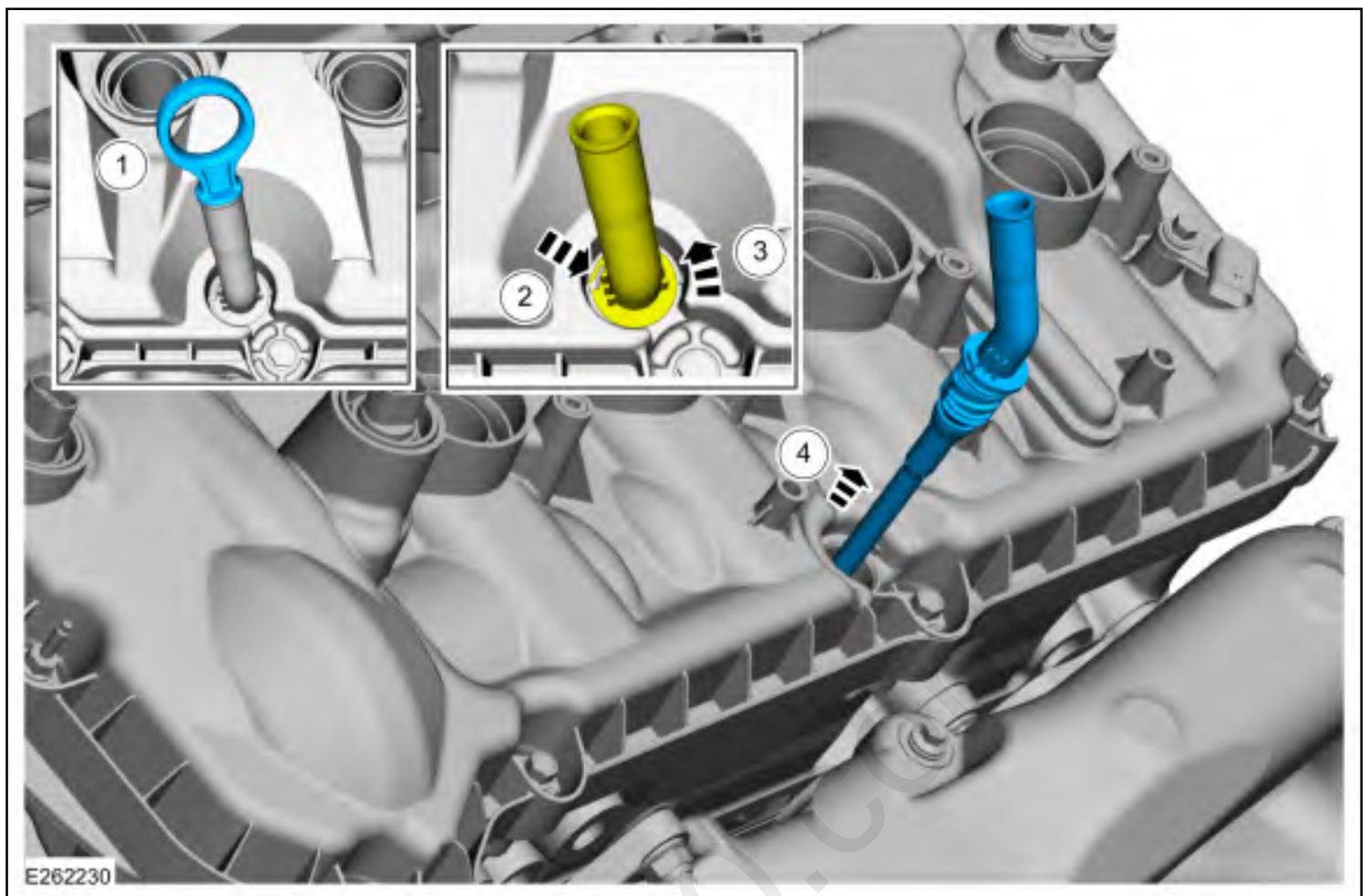
4. Remove the LH ignition coils.

Refer to: Ignition Coil-On-Plug (303-07 Engine Ignition - 5.0L 32V Ti-VCT) .

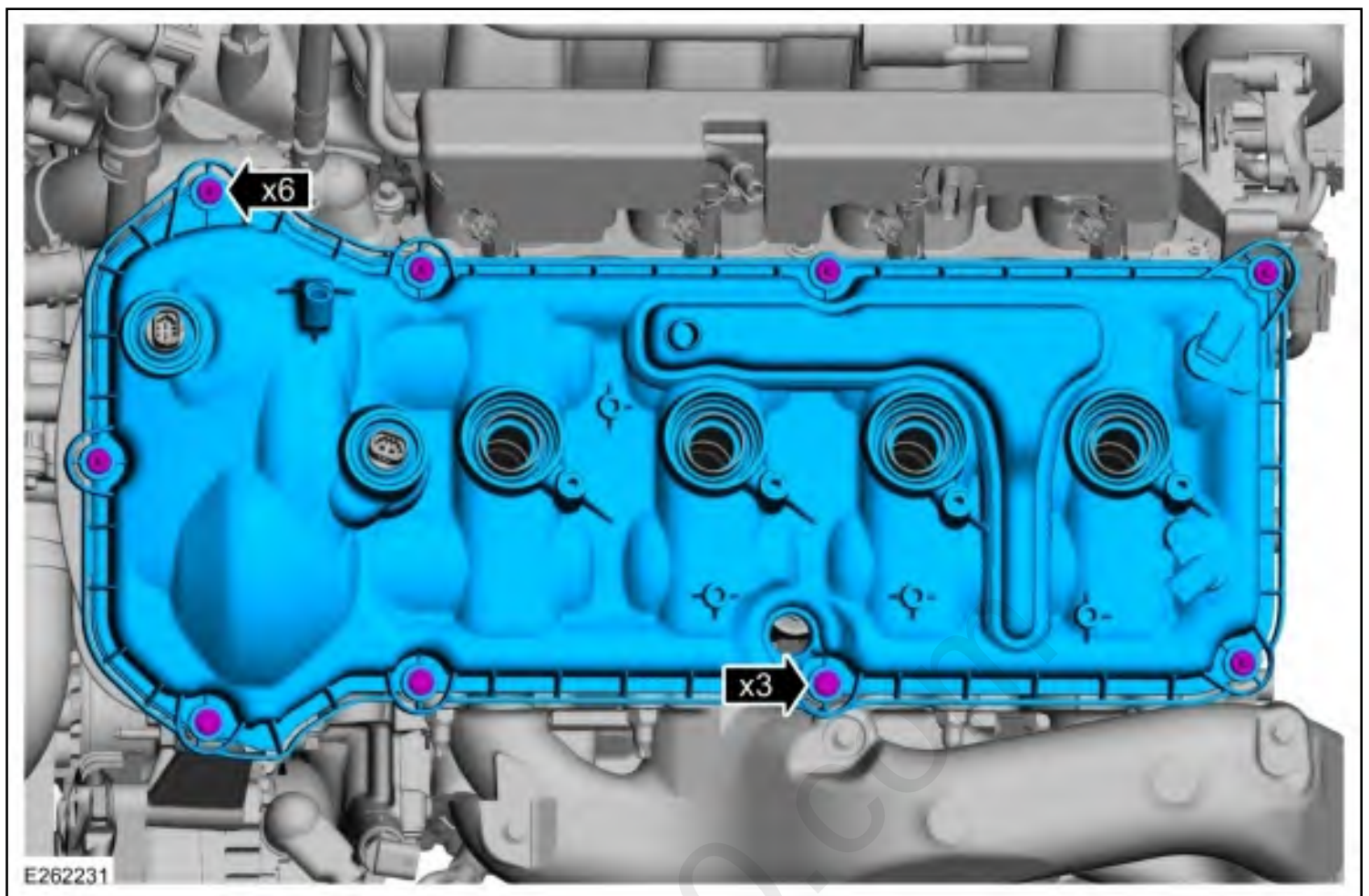
- Disconnect the engine wiring harness electrical connectors.
- Detach the wiring harness retainers.



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.

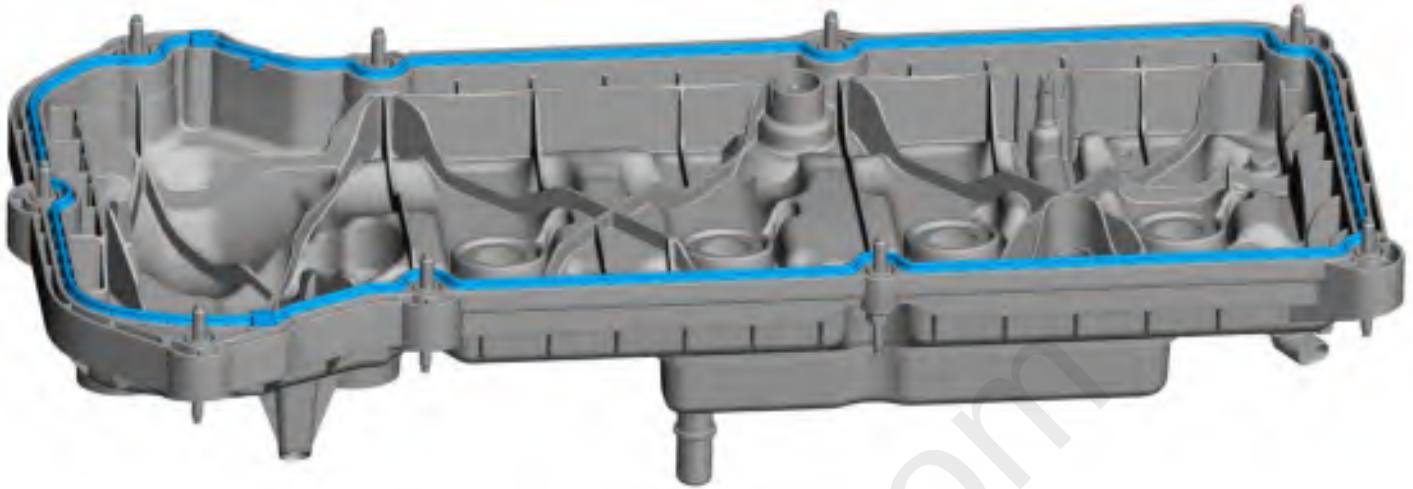


7. Loosen the fasteners and remove the valve cover.



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

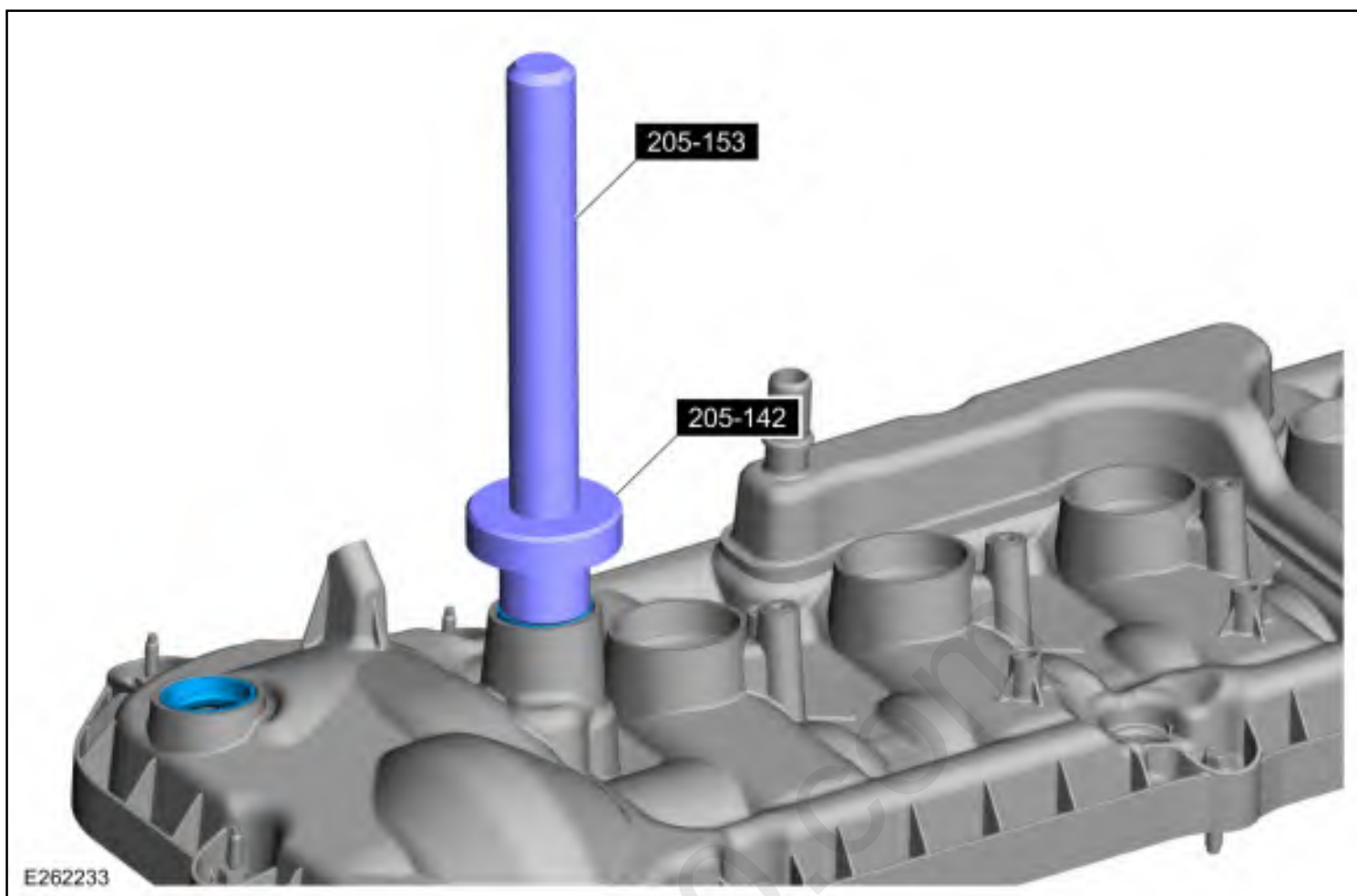
Remove and discard the gasket.



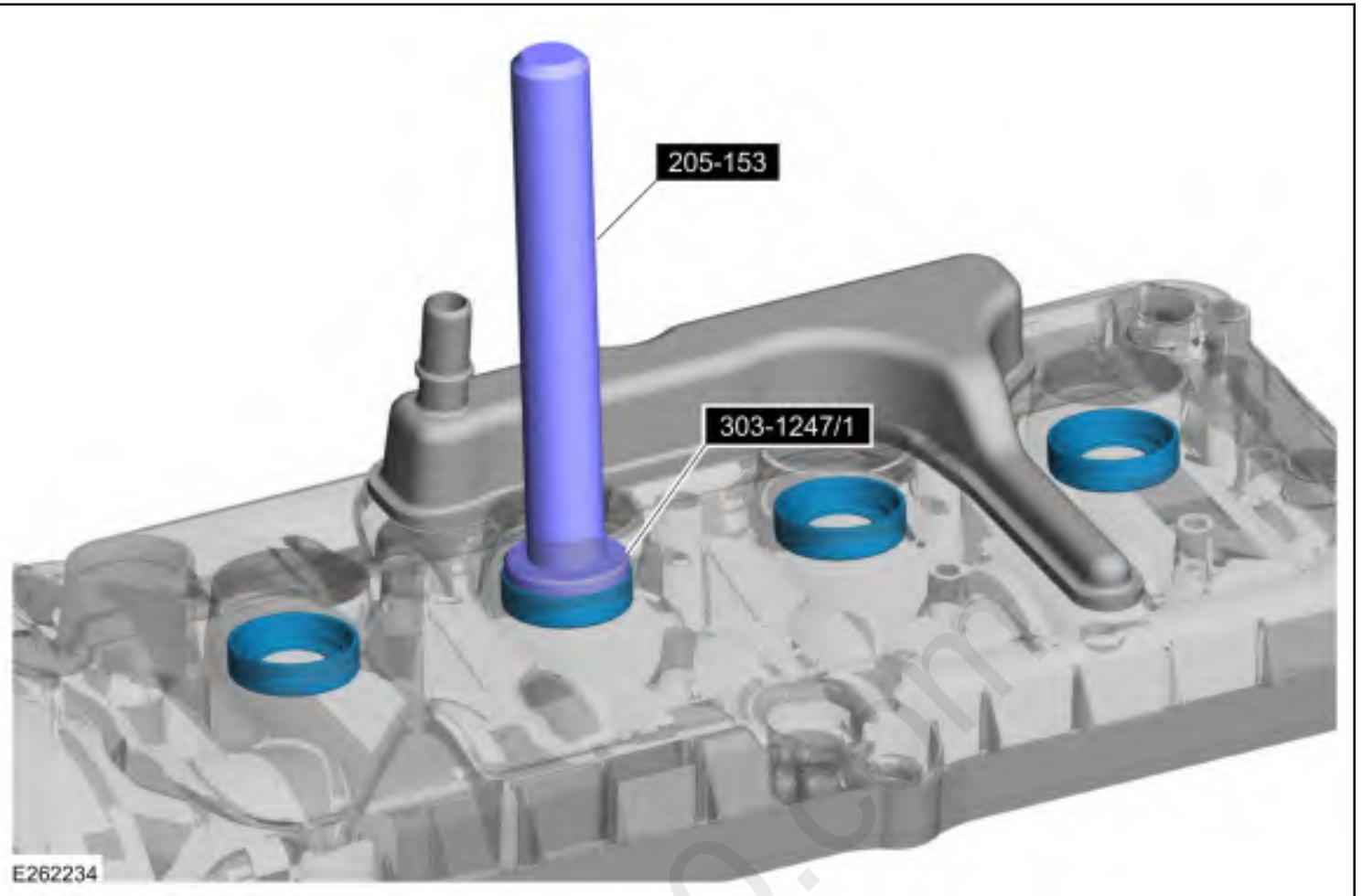
E262232



9. 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.



10. 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.



11. **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.

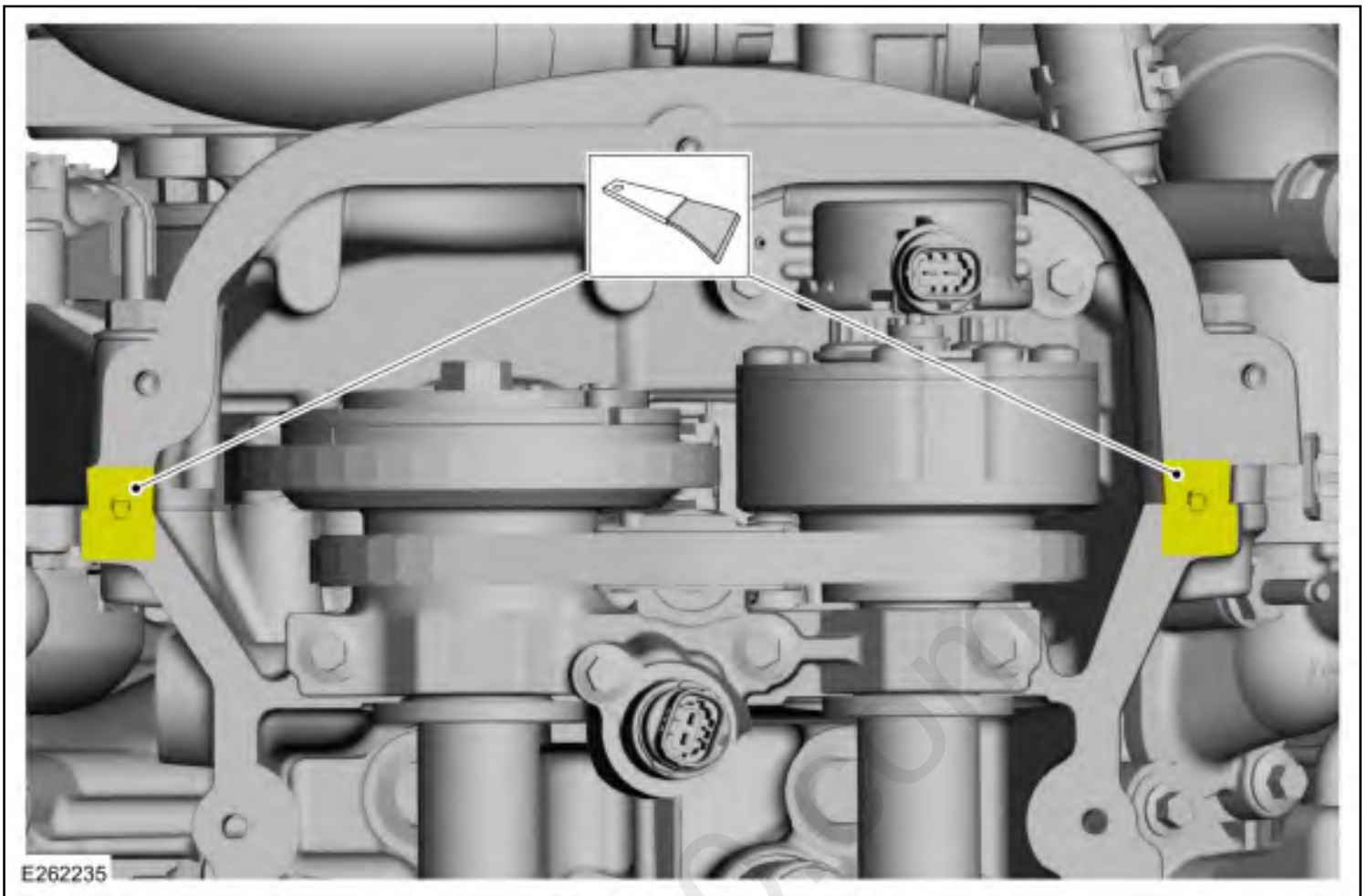
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

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

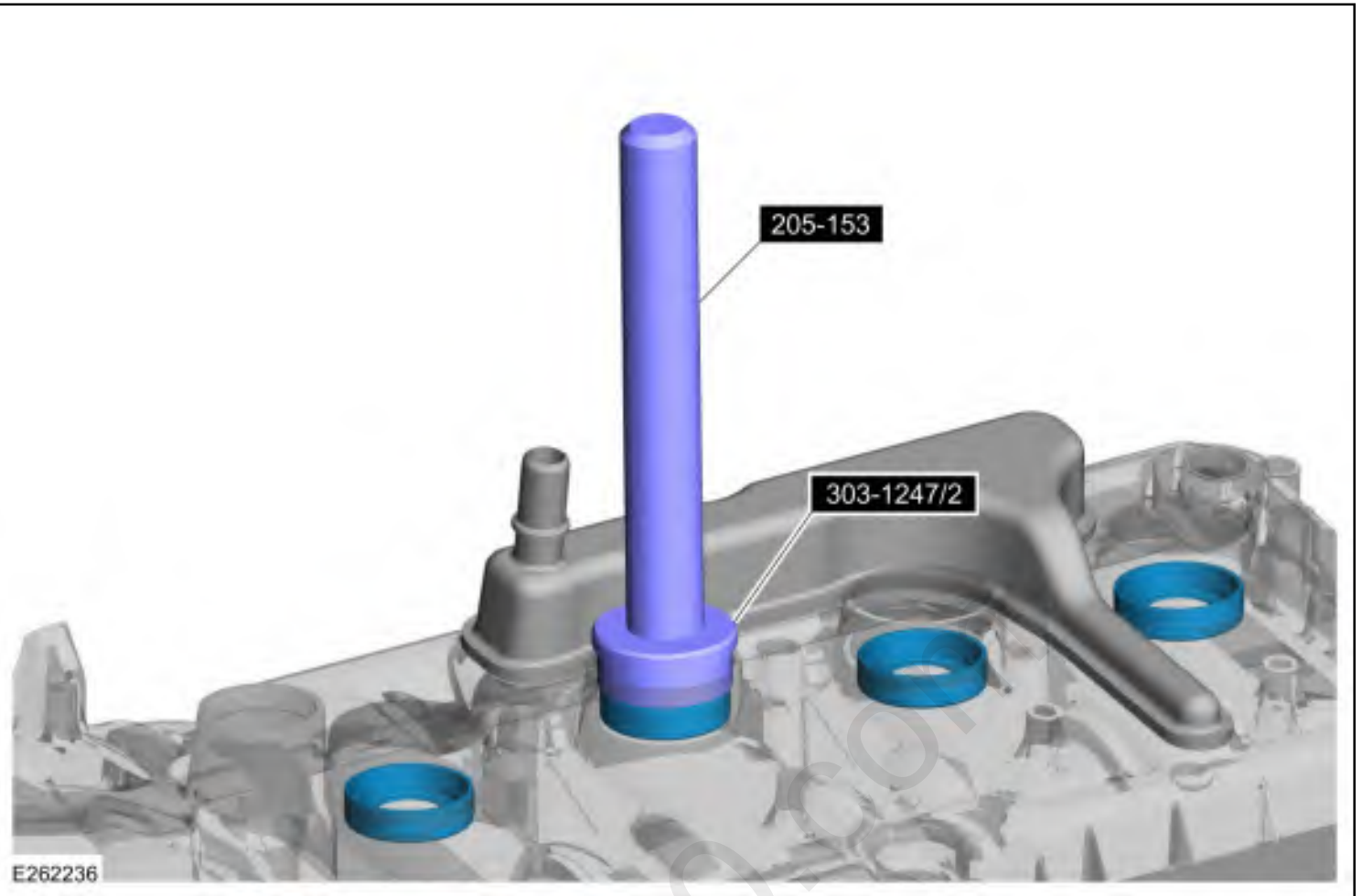


Installation

1. **NOTE:** *Installation of new seals is only required if damaged seals were removed.*

Using the special tools, install new spark plug tube seals.

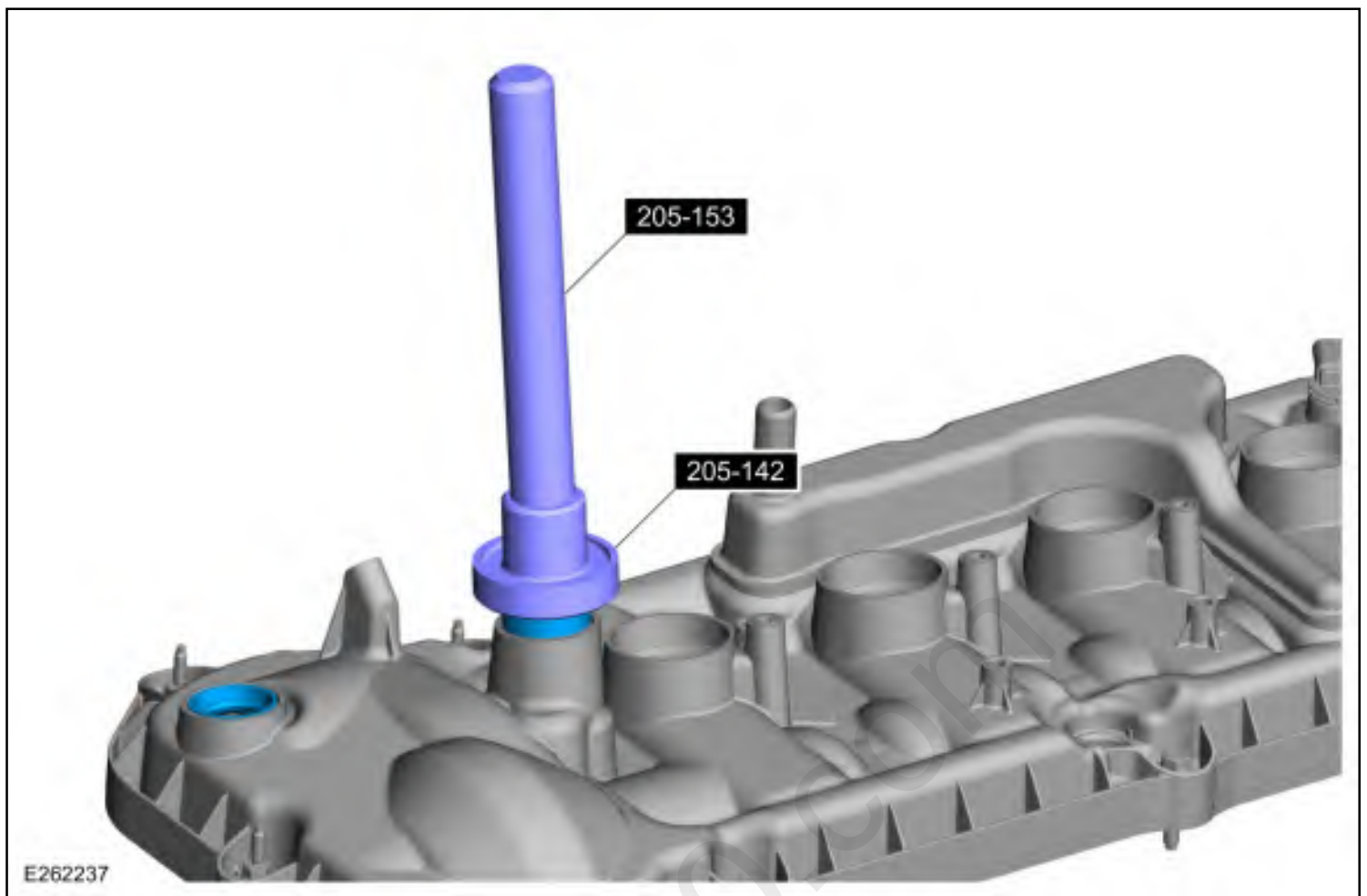
Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 303-1247 VCT Spark Plug Tube Seal Remover and Installer.



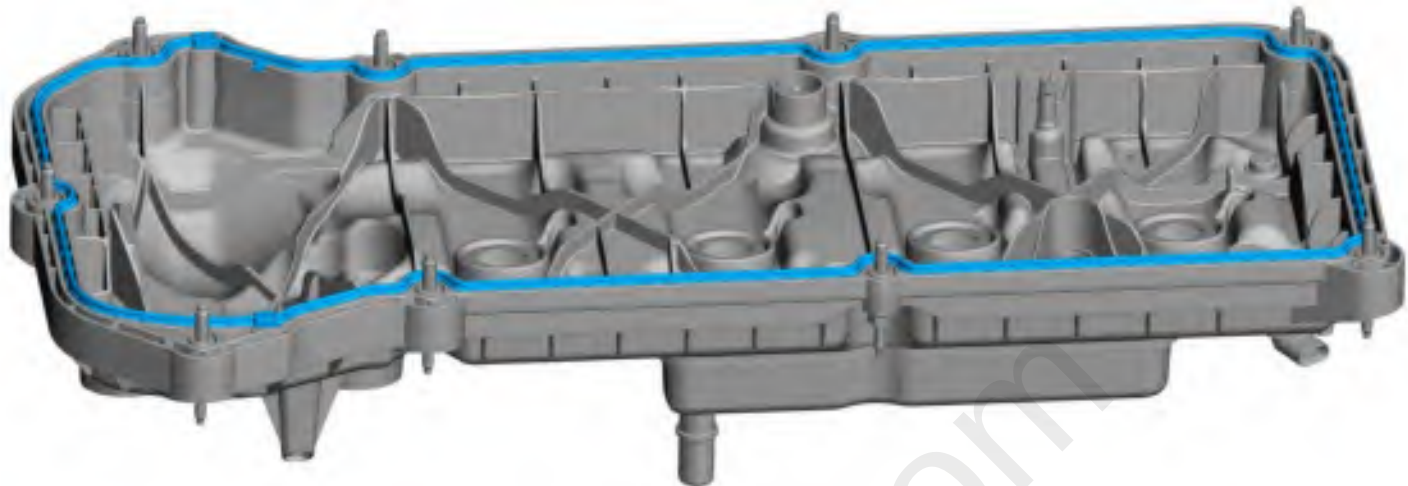
2. **NOTE:** *Installation of new seals is only required if damaged seals were removed.*

Using the special tools, install new VCT variable force solenoid seals.

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



3. Install a new gasket.



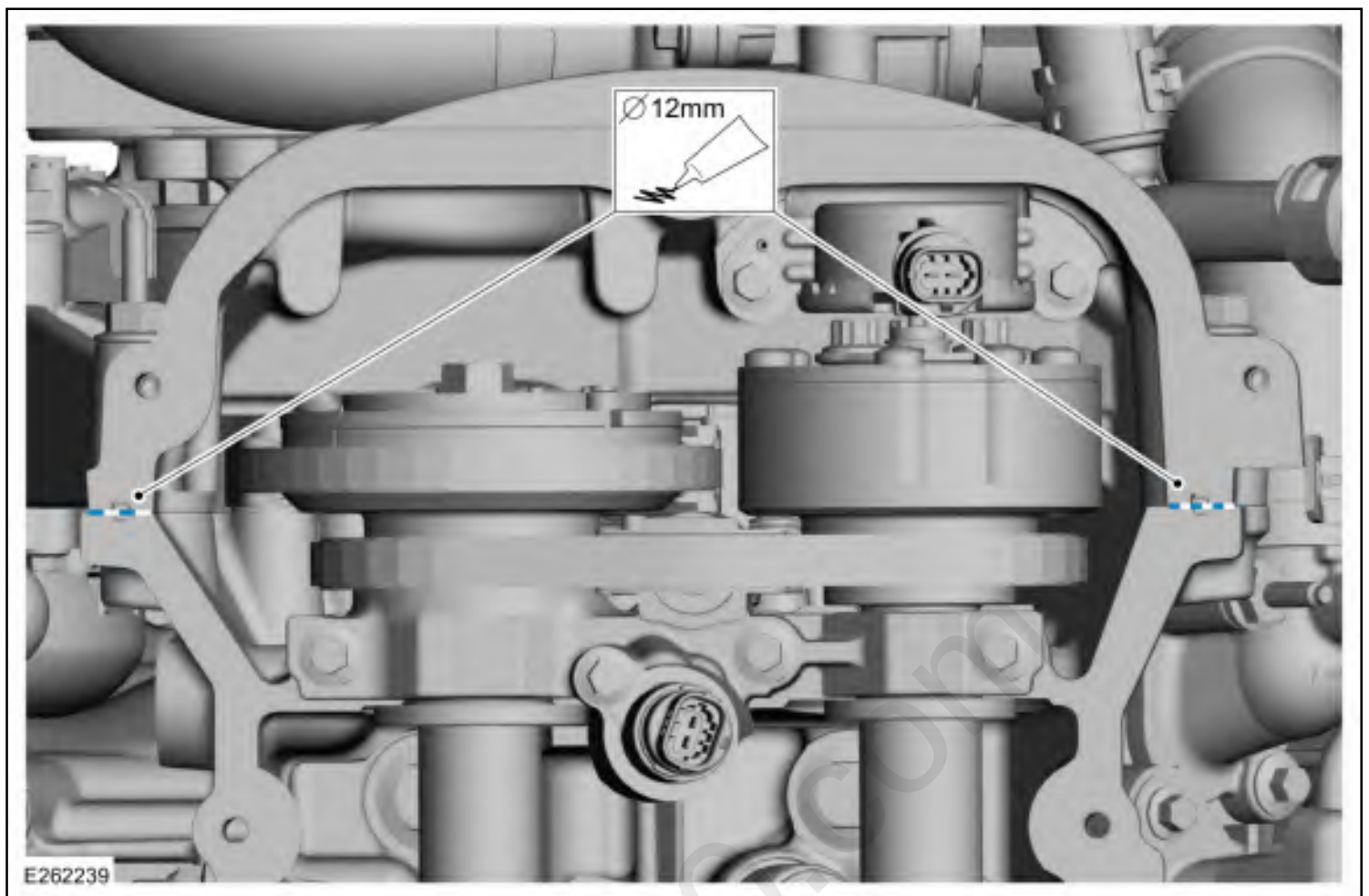
E262238



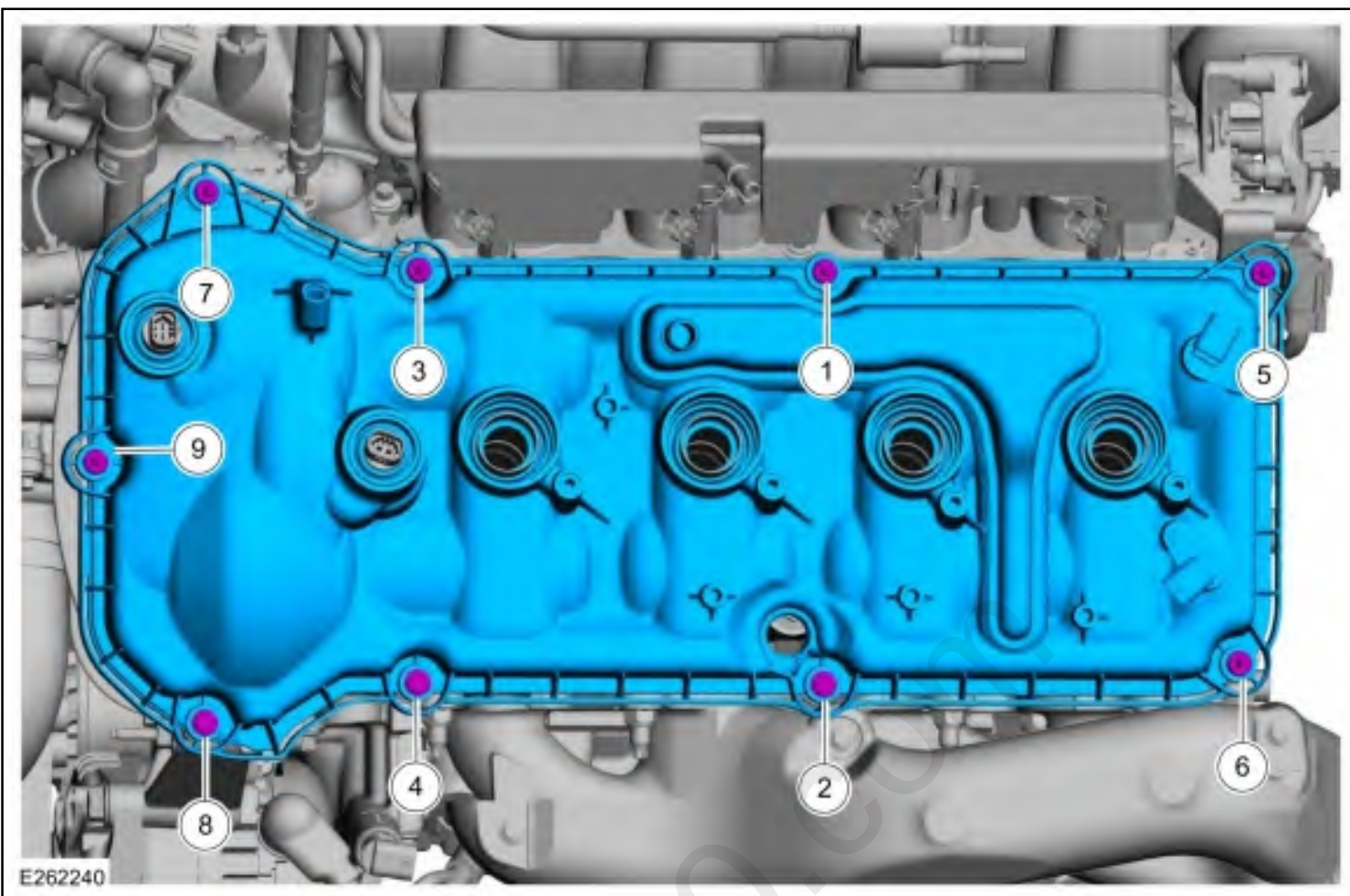
4. **NOTICE:** If the valve cover is not installed and the fasteners tightened within 5 minutes, the sealant must be removed and the sealing area cleaned.

Apply an 12 mm (0.47 in) bead of silicone gasket and sealant to the engine front cover-to-cylinder head joints.

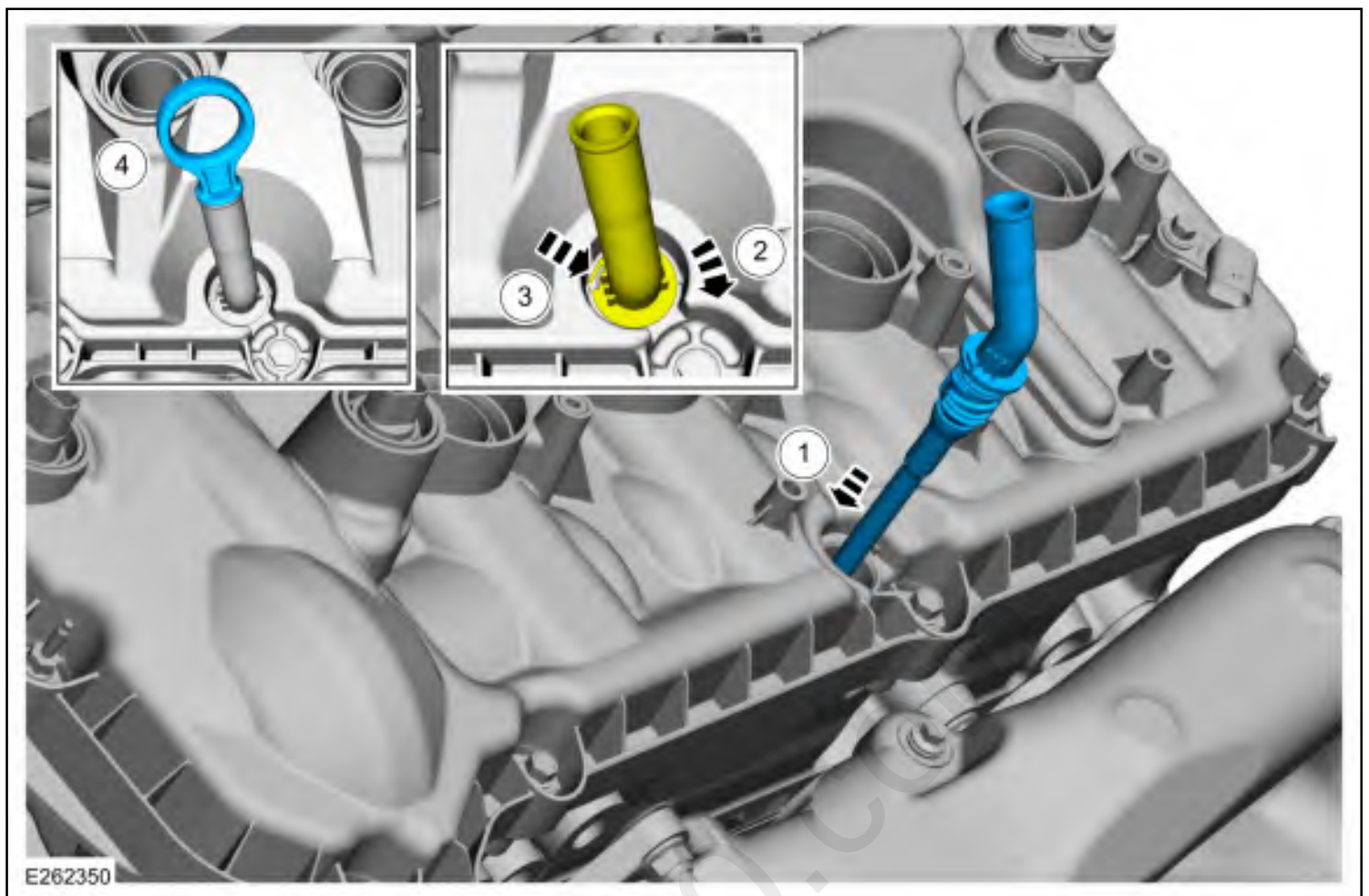
Material: Motorcraft® Silicone Gasket and Sealant / TA-30 (WSE-M4G323-A4)



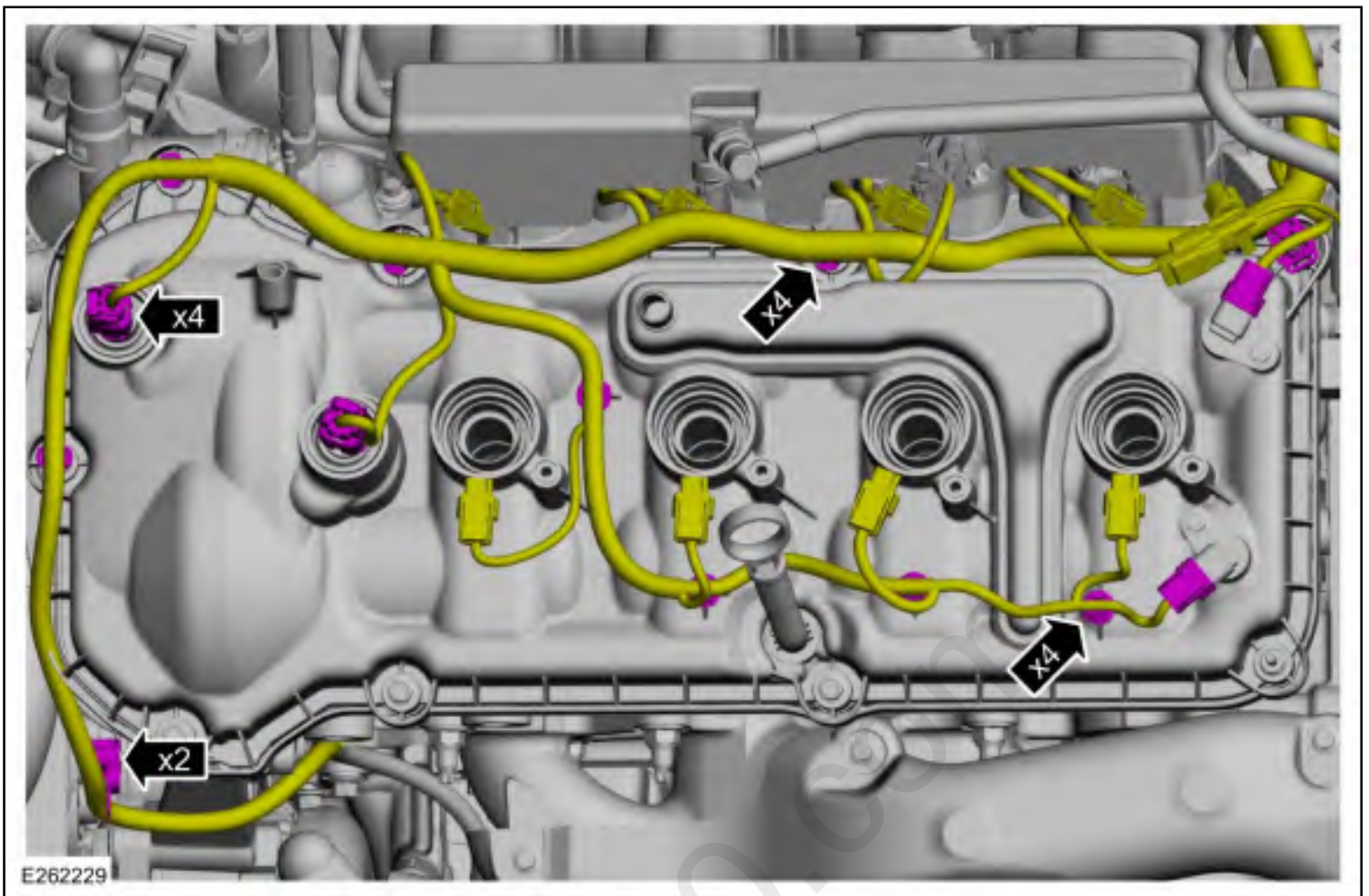
5. Install the valve cover and tighten the bolts.
Torque: 89 lb.in (10 Nm)



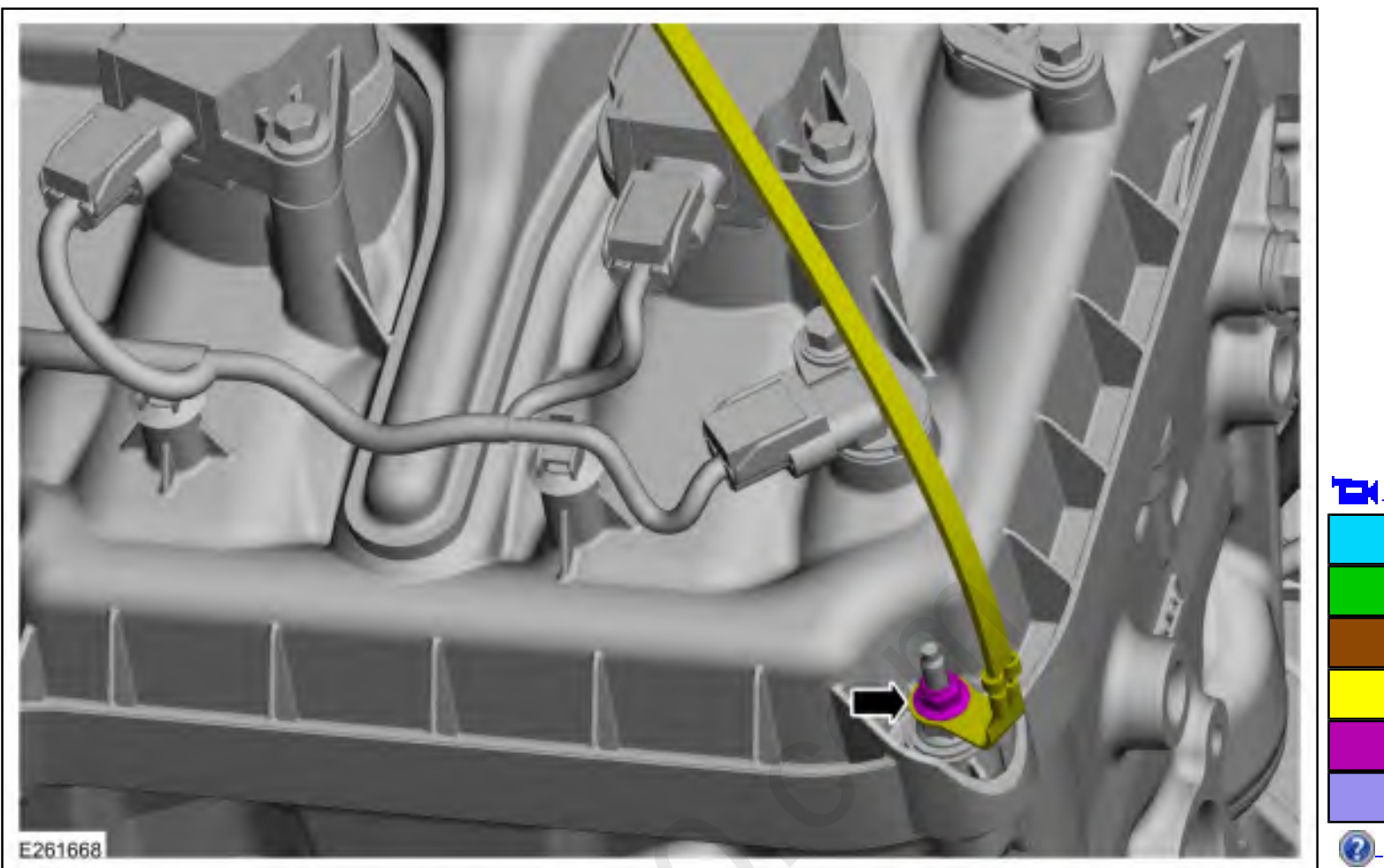
1. Push the oil level indicator tube into the engine.
2. Rotate the oil level indicator tube clockwise.
3. Verify the tab is locked in place.
4. Install the oil level indicator.



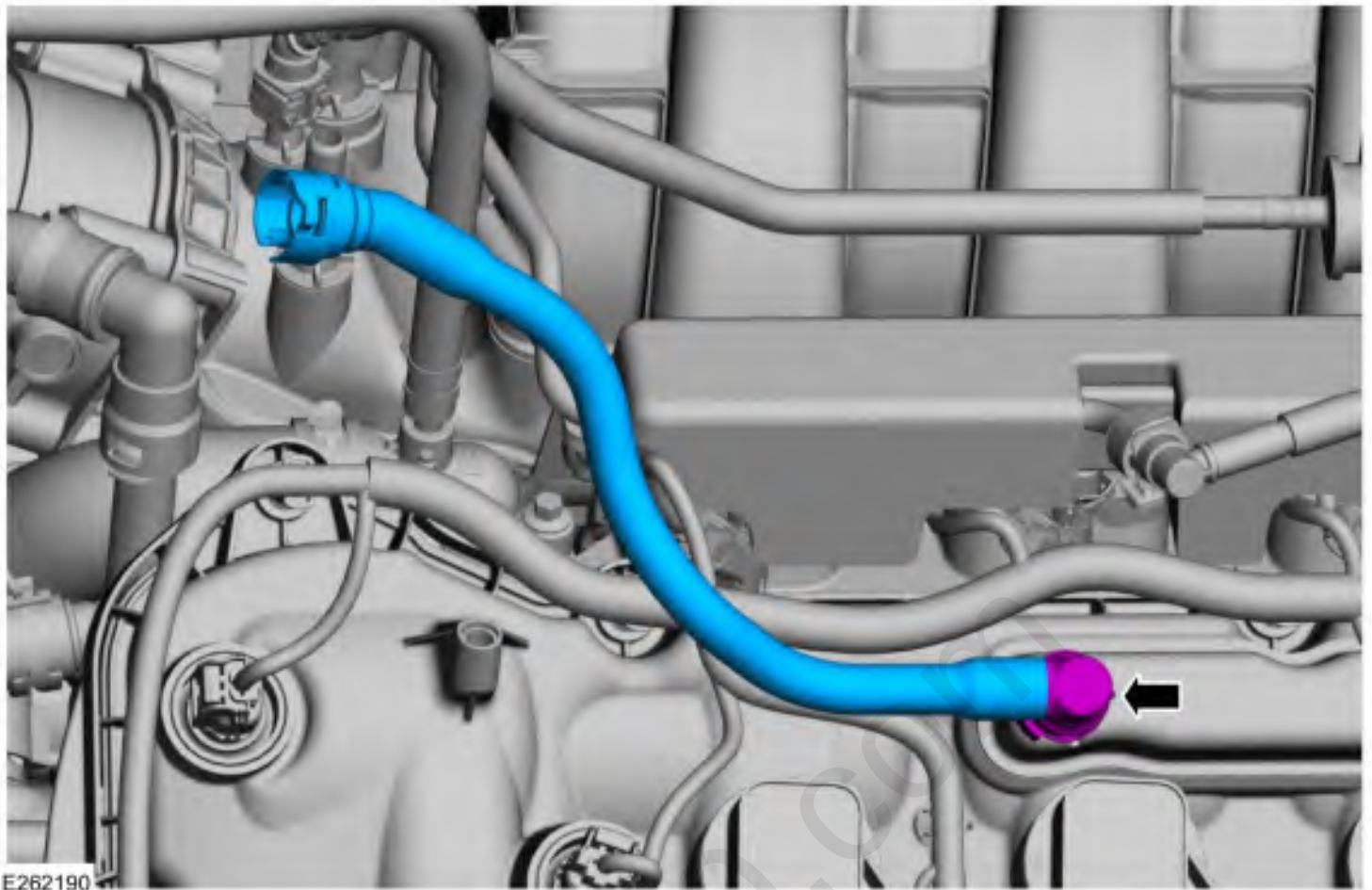
- Connect the engine wiring harness electrical connectors.
- Attach the wiring harness retainers.



8. Install the LH ignition coils.
Refer to: Ignition Coil-On-Plug (303-07 Engine Ignition - 5.0L 32V Ti-VCT) .
9. Install the ground wire and nut.
Torque: 53 lb.in (6 Nm)



10. Position the PCV tube and connect the quick release coupling.

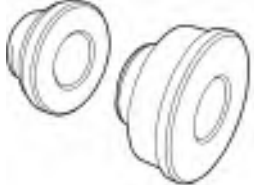


11. Install the following items:

1. Refer to: [Air Cleaner](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).
2. Refer to: [Air Cleaner Outlet Pipe](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).

Valve Cover RH

Special Tool(s) / General Equipment

 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
Plastic Scraper	

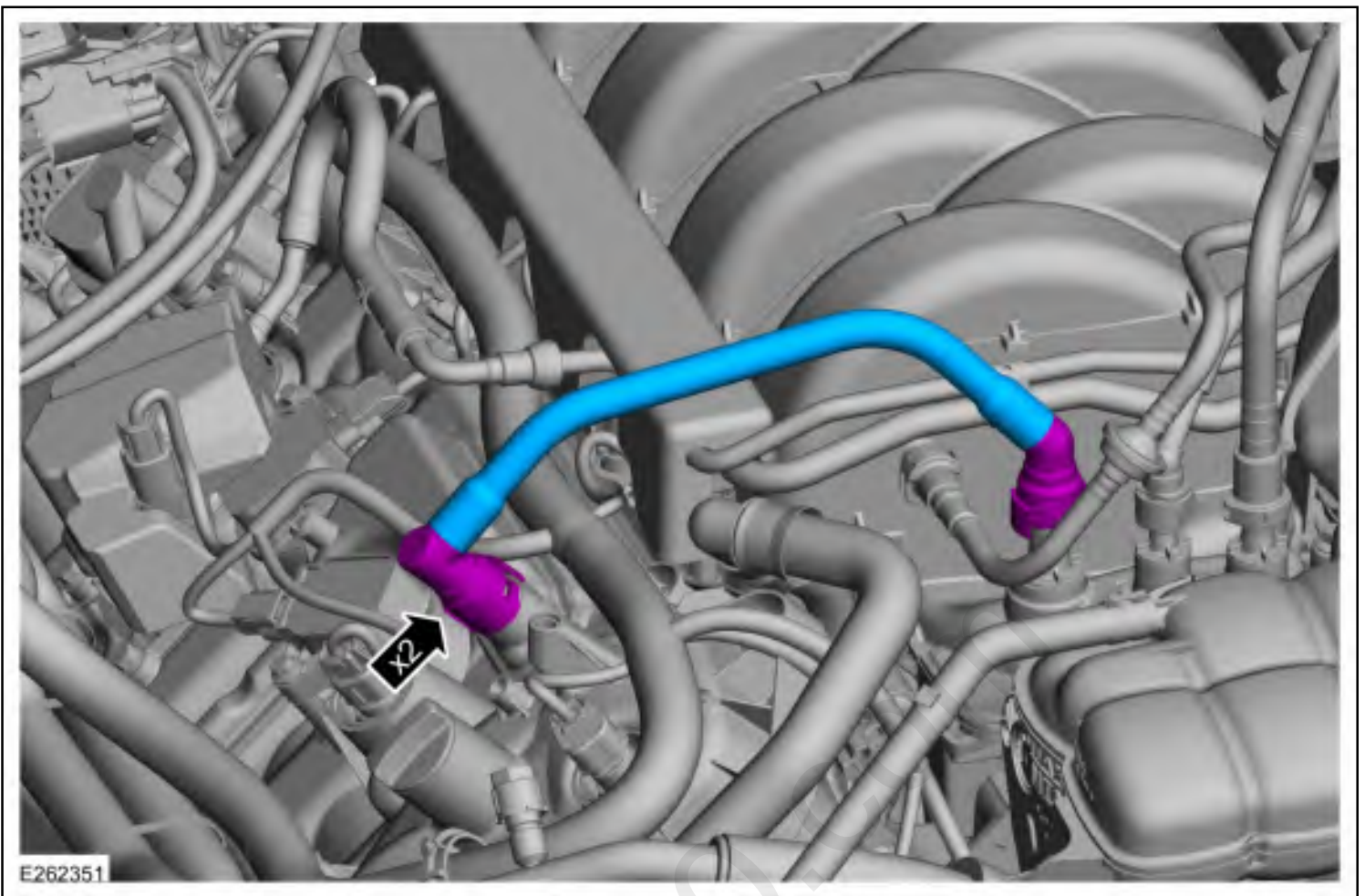
Materials

Name	Specification
Motorcraft® Silicone Gasket Remover ZC-30-A	-
Motorcraft® Metal Surface Prep Wipes ZC-31-B	-
Motorcraft® Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

Removal

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.

1. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
2. Release the fuel system pressure.
Refer to: [Fuel System Pressure Release](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-VCT, General Procedures).
3. Disconnect the battery ground cable.
Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .
4. Drain the engine cooling system.
Refer to: Cooling System Draining, Vacuum Filling and Bleeding (303-03 Engine Cooling - 5.0L 32V Ti-VCT) .
5. Disconnect the quick release couplings and remove the PCV tube.
Refer to: [Quick Release Coupling](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-VCT, General Procedures).



6. Remove the following items:

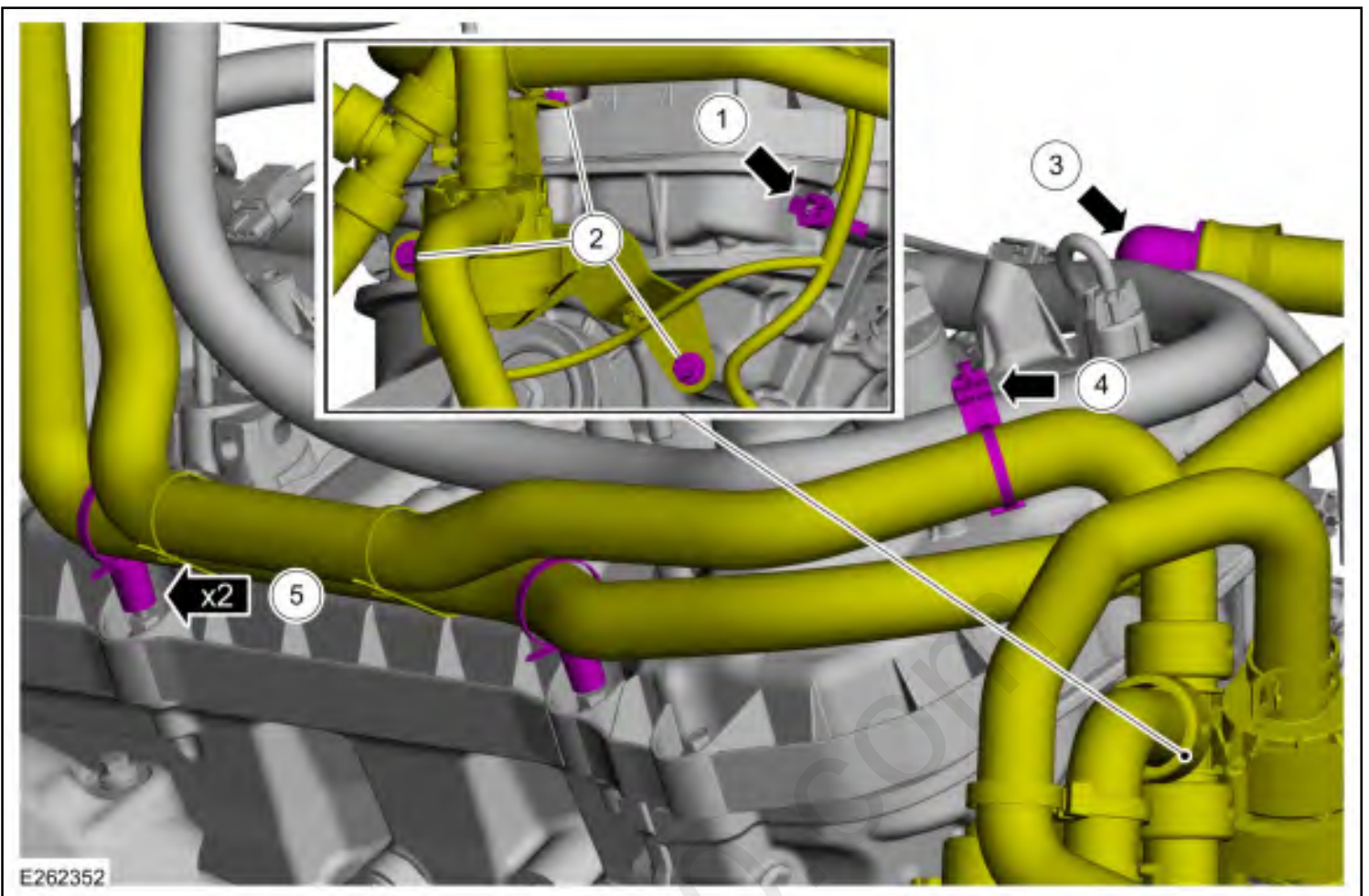
1. High pressure fuel pump.

Refer to: [High-Pressure Fuel Pump](#) (303-04D Fuel Charging and Controls - 5.0L 32V Ti-VCT, Removal and Installation).

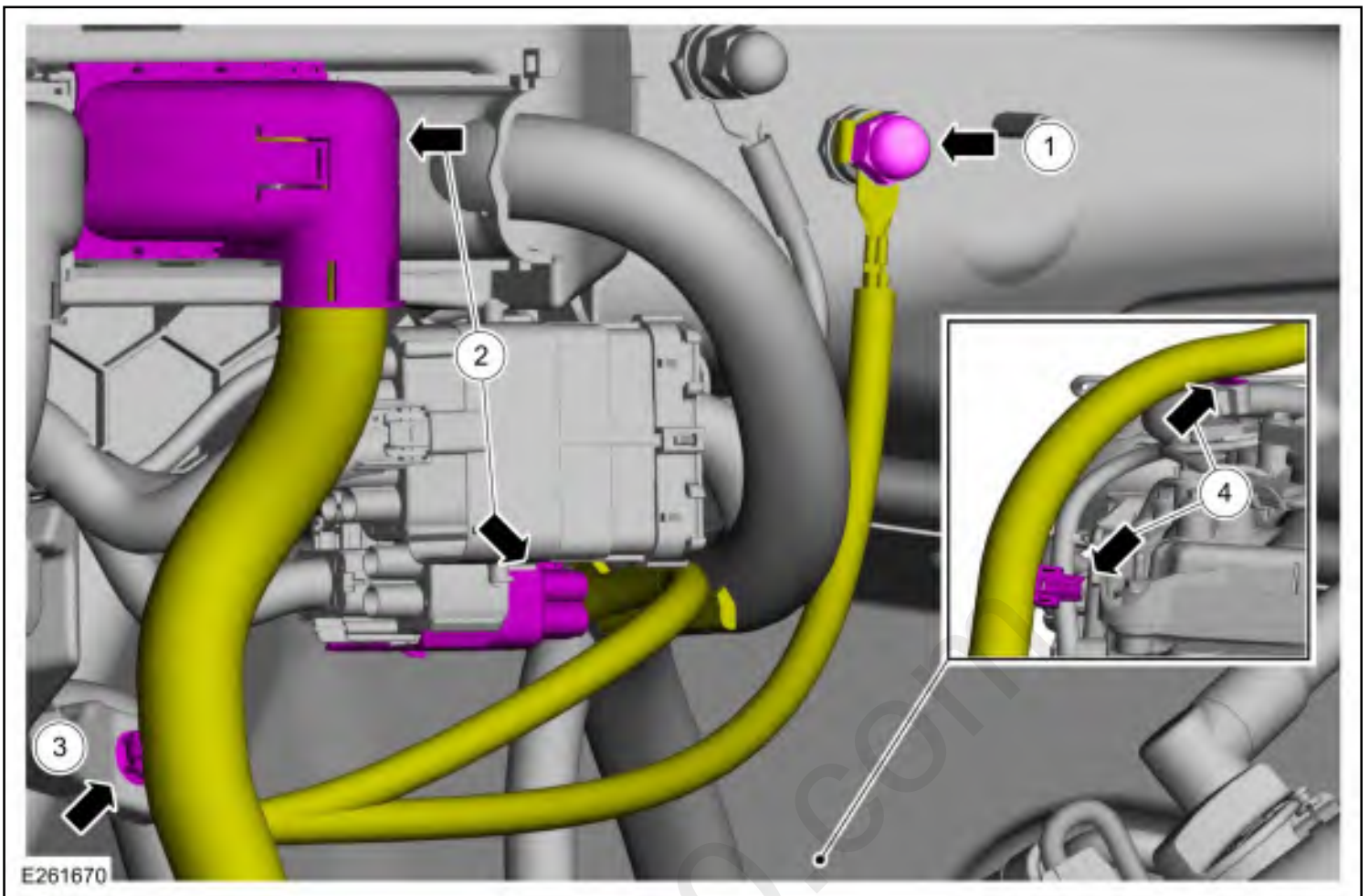
2. LH ignition coils.

Refer to: [Ignition Coil-On-Plug](#) (303-07D Engine Ignition - 5.0L 32V Ti-VCT, Removal and Installation).

1. Detach the wiring harness retainer.
2. Remove the fasteners and position the coolant pump aside.
3. Disconnect the heater hose.
4. Detach the coolant hose retainer.
5. Detach the coolant hose retainers.



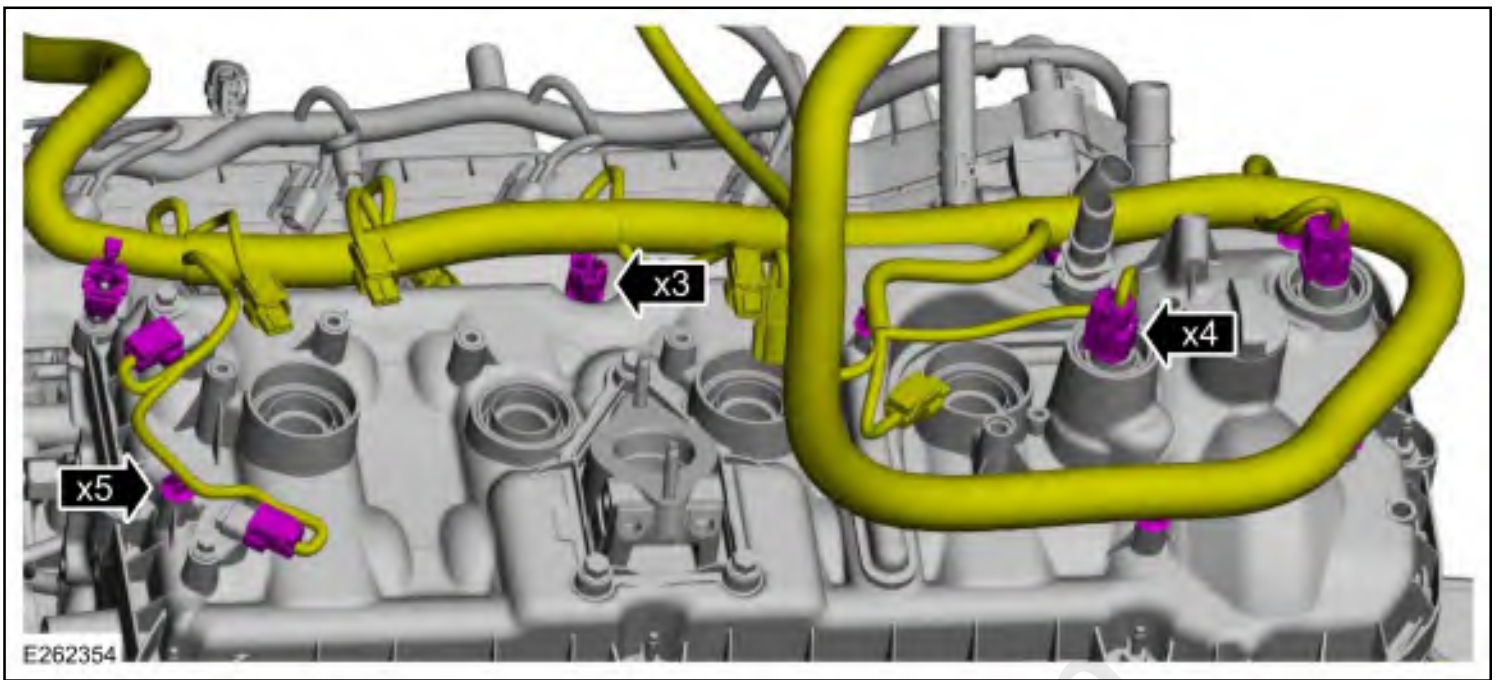
1. Remove the nut and the ground strap.
2. Disconnect the engine wiring harness connectors.
3. Detach the engine wiring harness retainer.
4. Detach the transmission wiring harness retainers.



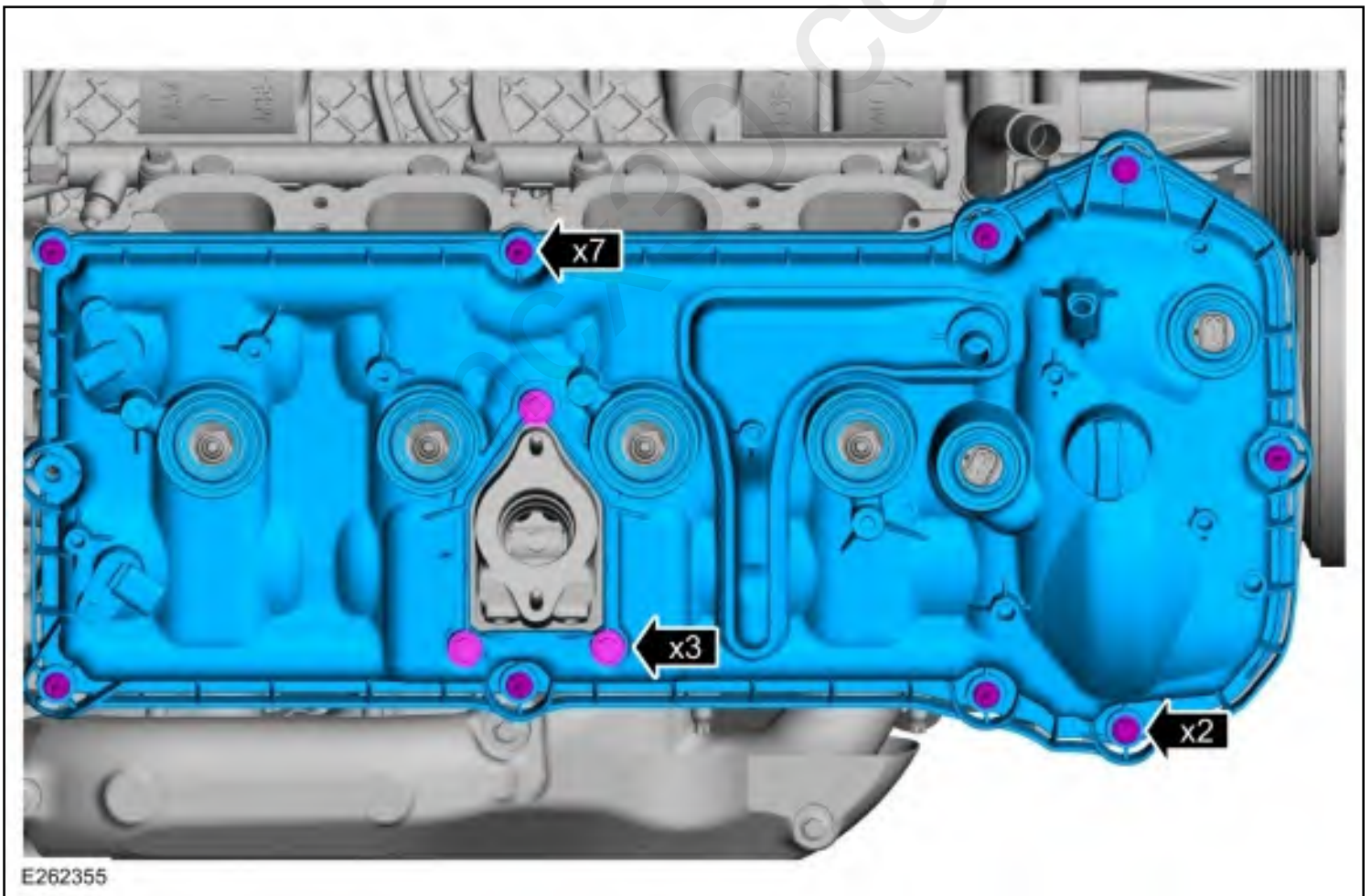
9. Remove the RH ignition coils.

Refer to: Ignition Coil-On-Plug (303-07 Engine Ignition - 5.0L 32V Ti-VCT) .

- Disconnect the engine wiring harness electrical connectors.
- Detach the wiring harness retainers.

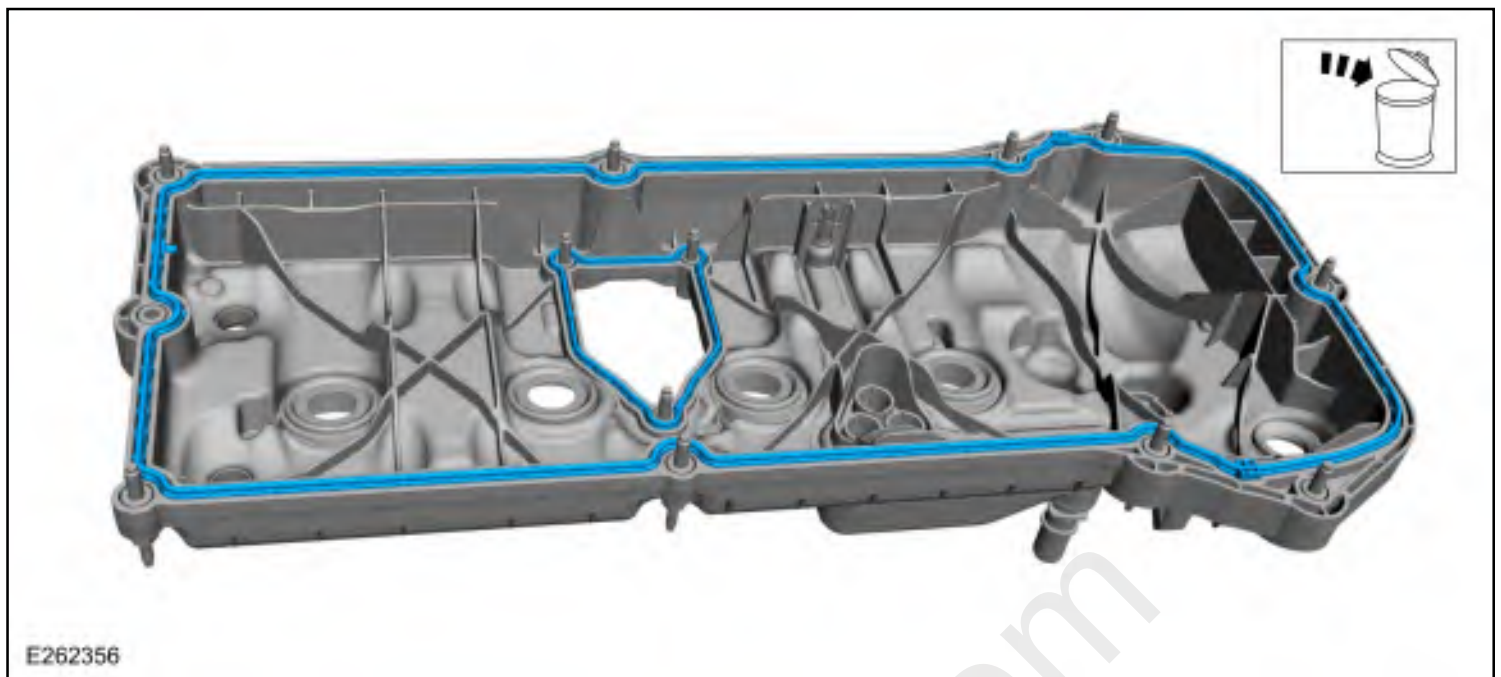


11. Loosen the bolts and remove the valve cover.

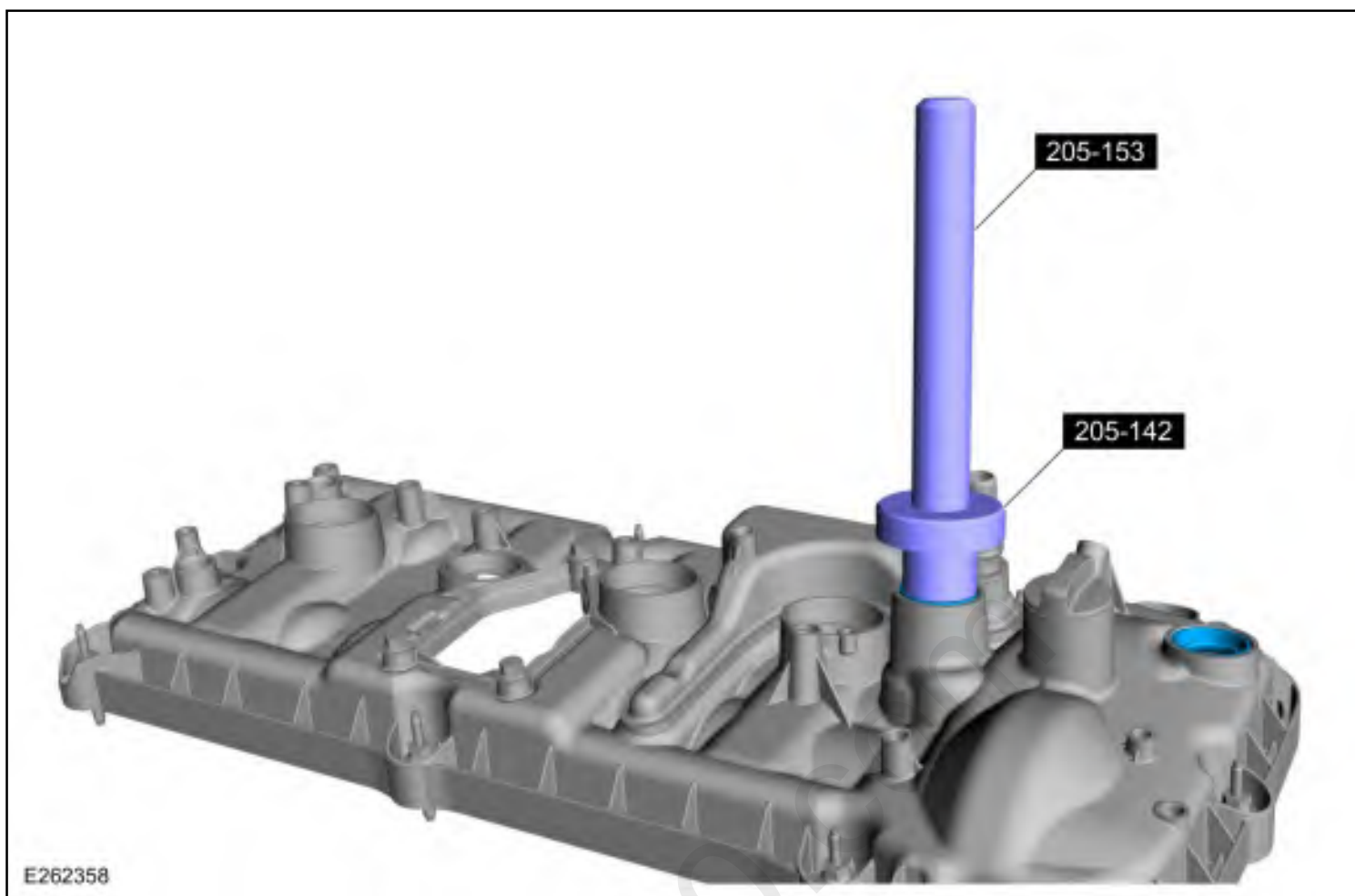


12. **NOTE:** Clean the valve cover gasket groove with soap and water or a suitable solvent.

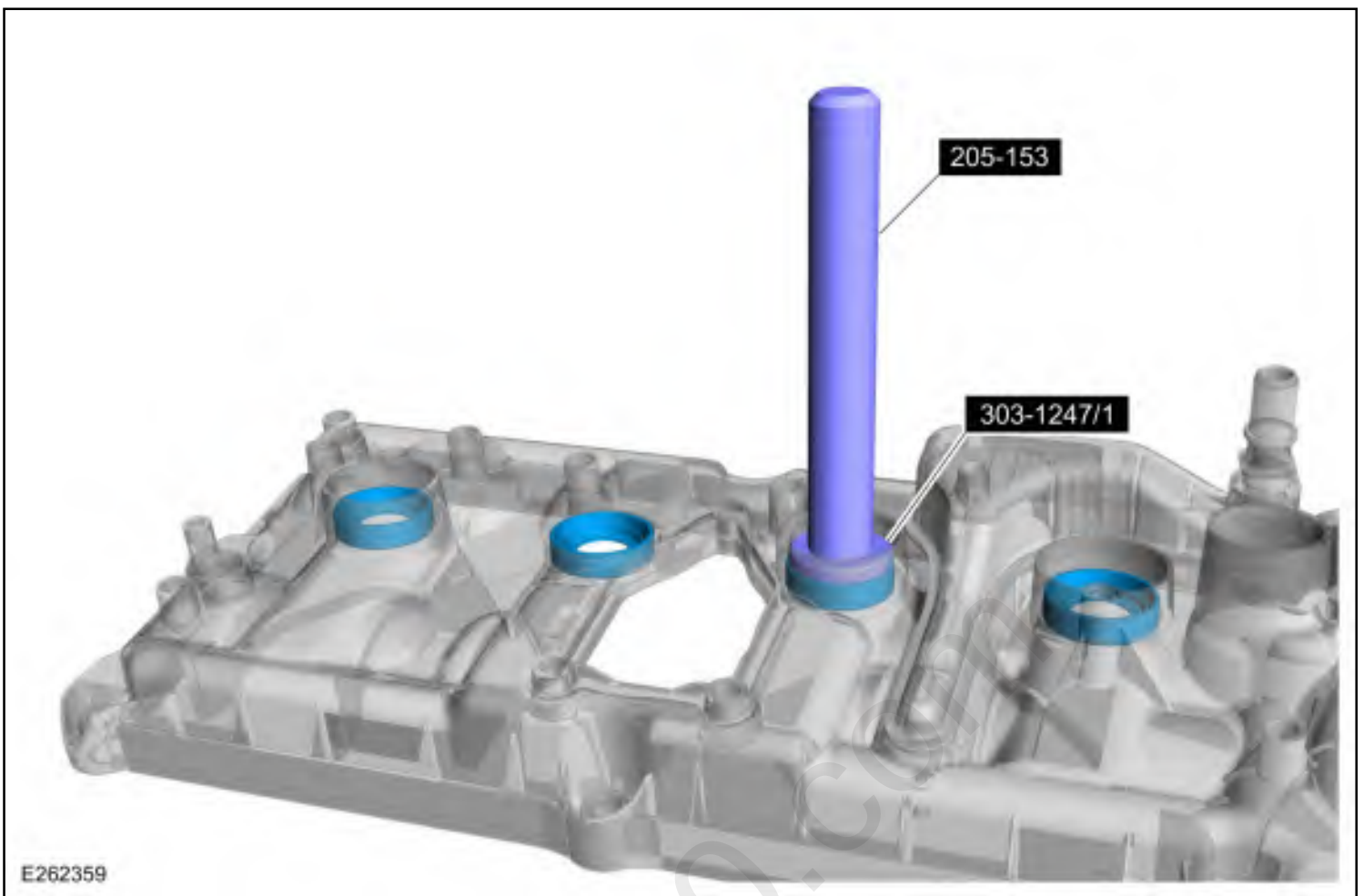
Remove and discard the gaskets.



13. 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.



14. 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.



15. **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.

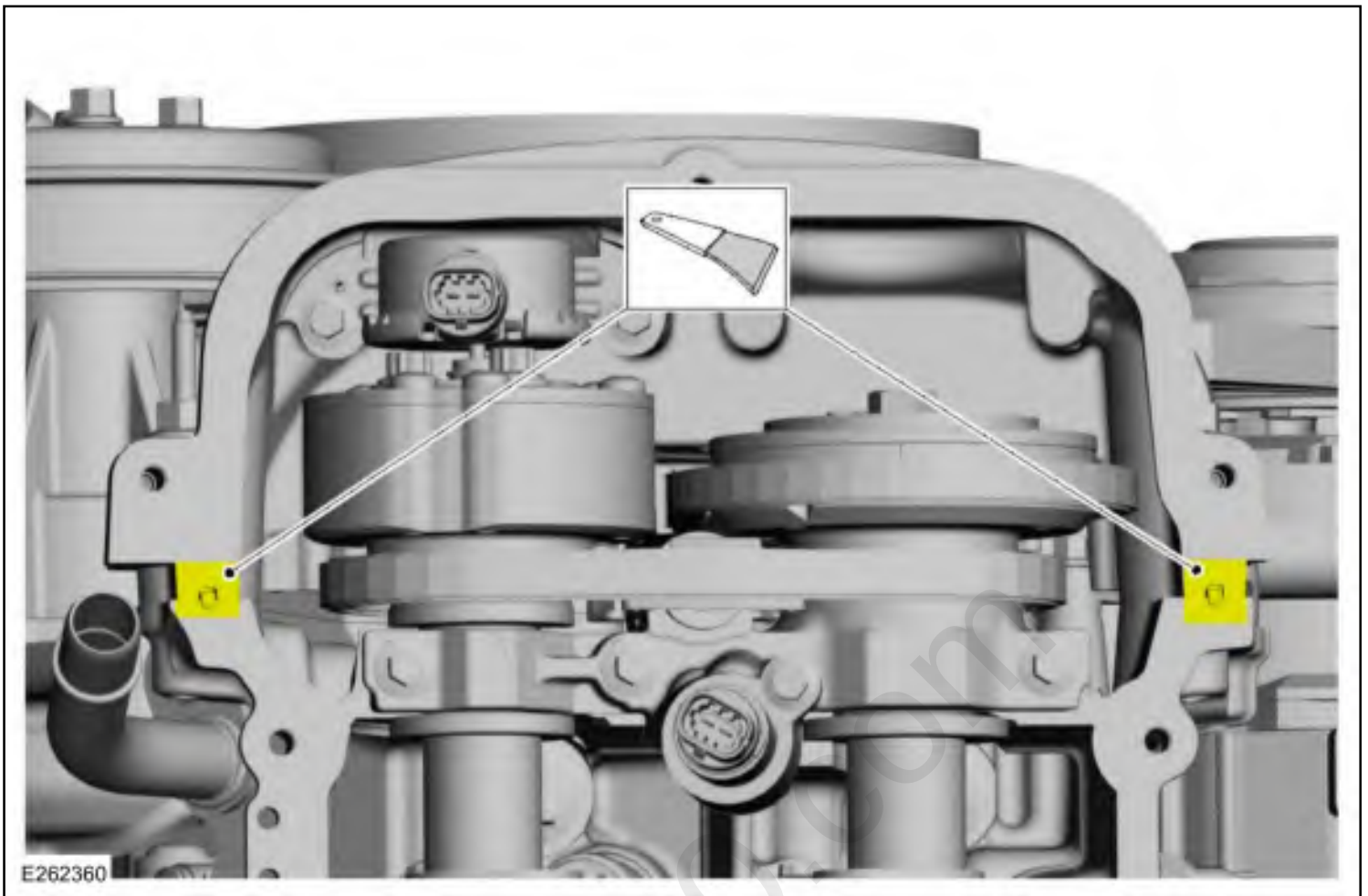
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

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

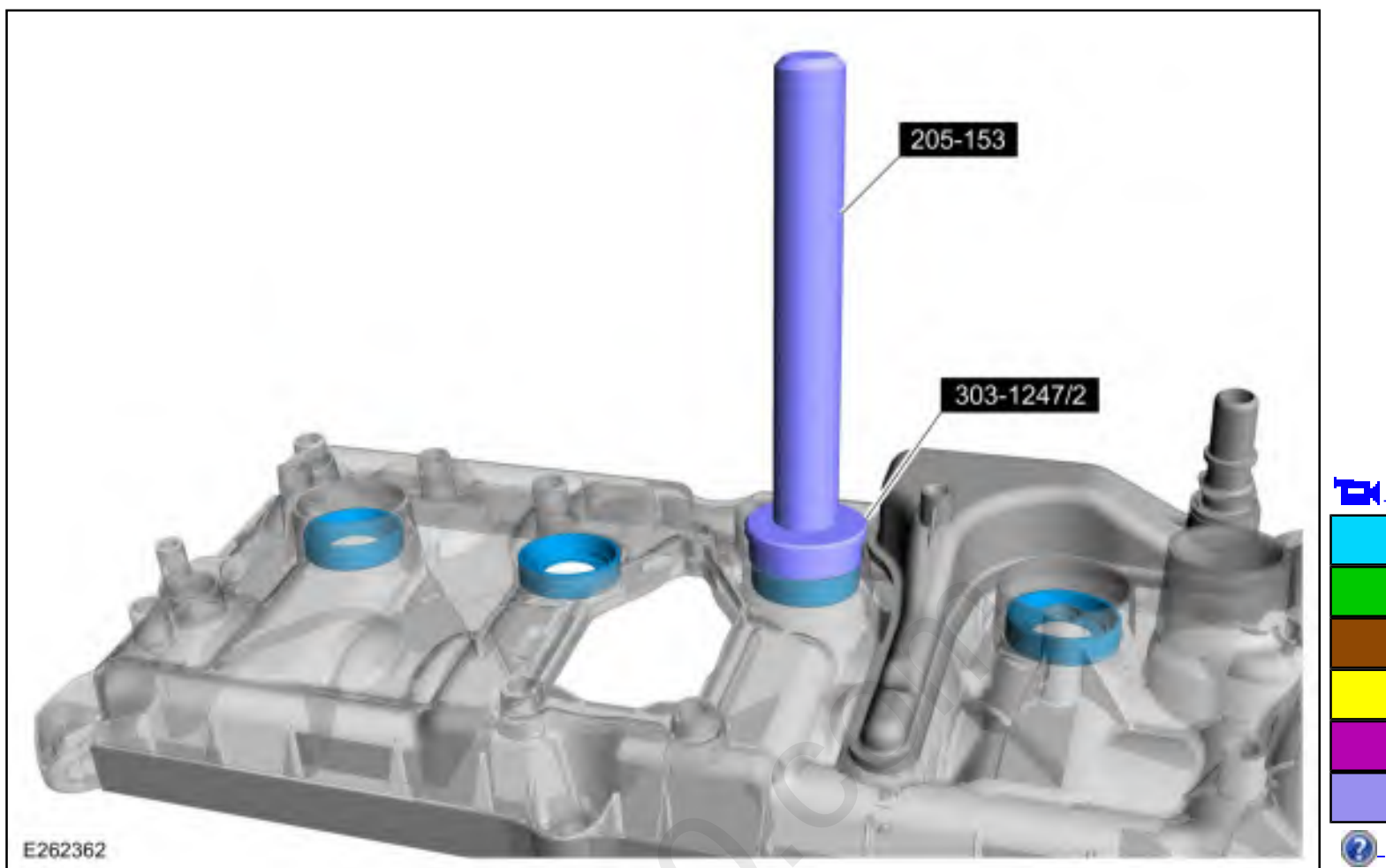


Installation

1. **NOTE:** *Installation of new seals is only required if damaged seals were removed.*

Using the special tools, install new spark plug tube seals.

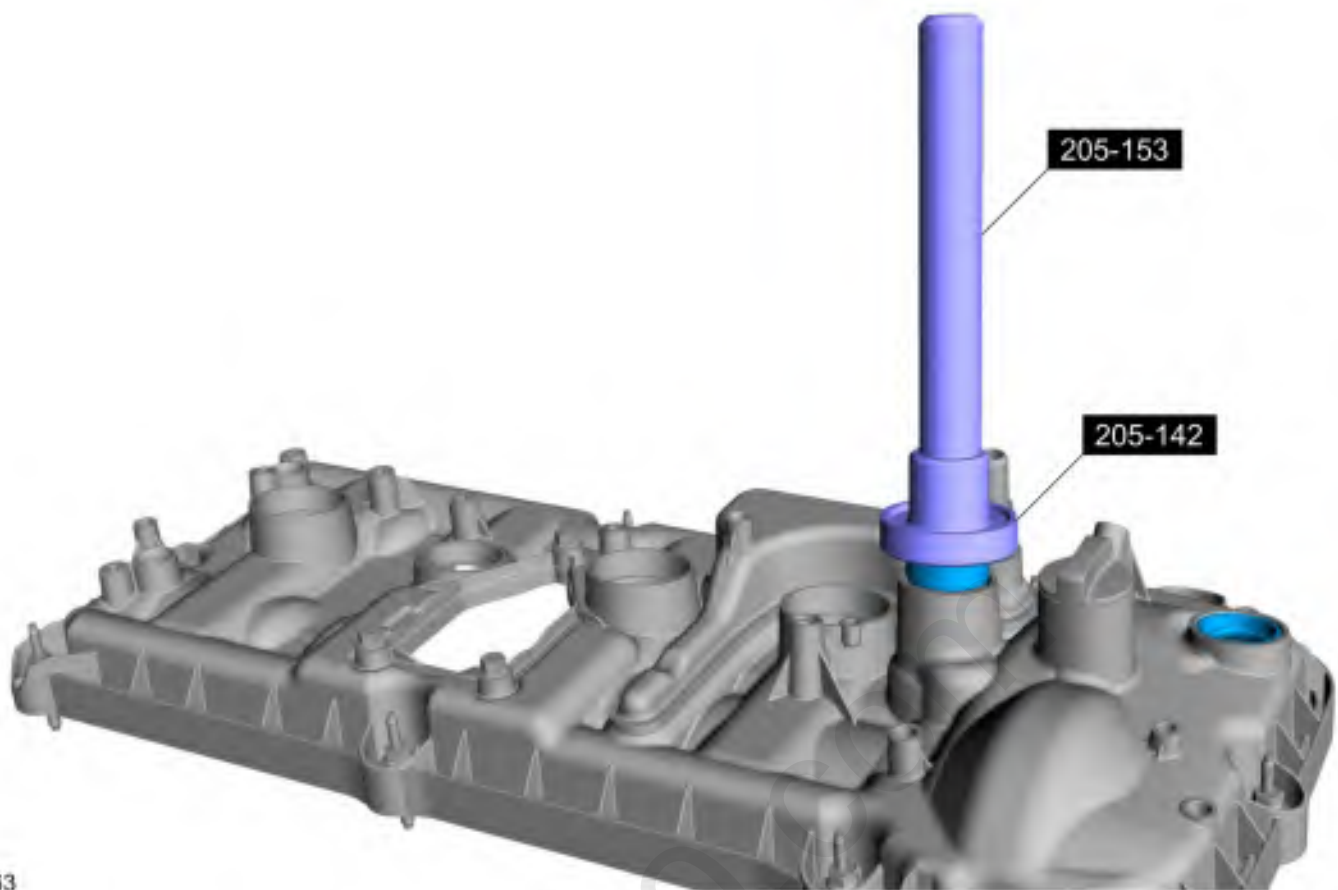
Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 303-1247 VCT Spark Plug Tube Seal Remover and Installer.



2. **NOTE:** *Installation of new seals is only required if damaged seals were removed.*

Using the special tools, install new VCT variable force solenoid seals.

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



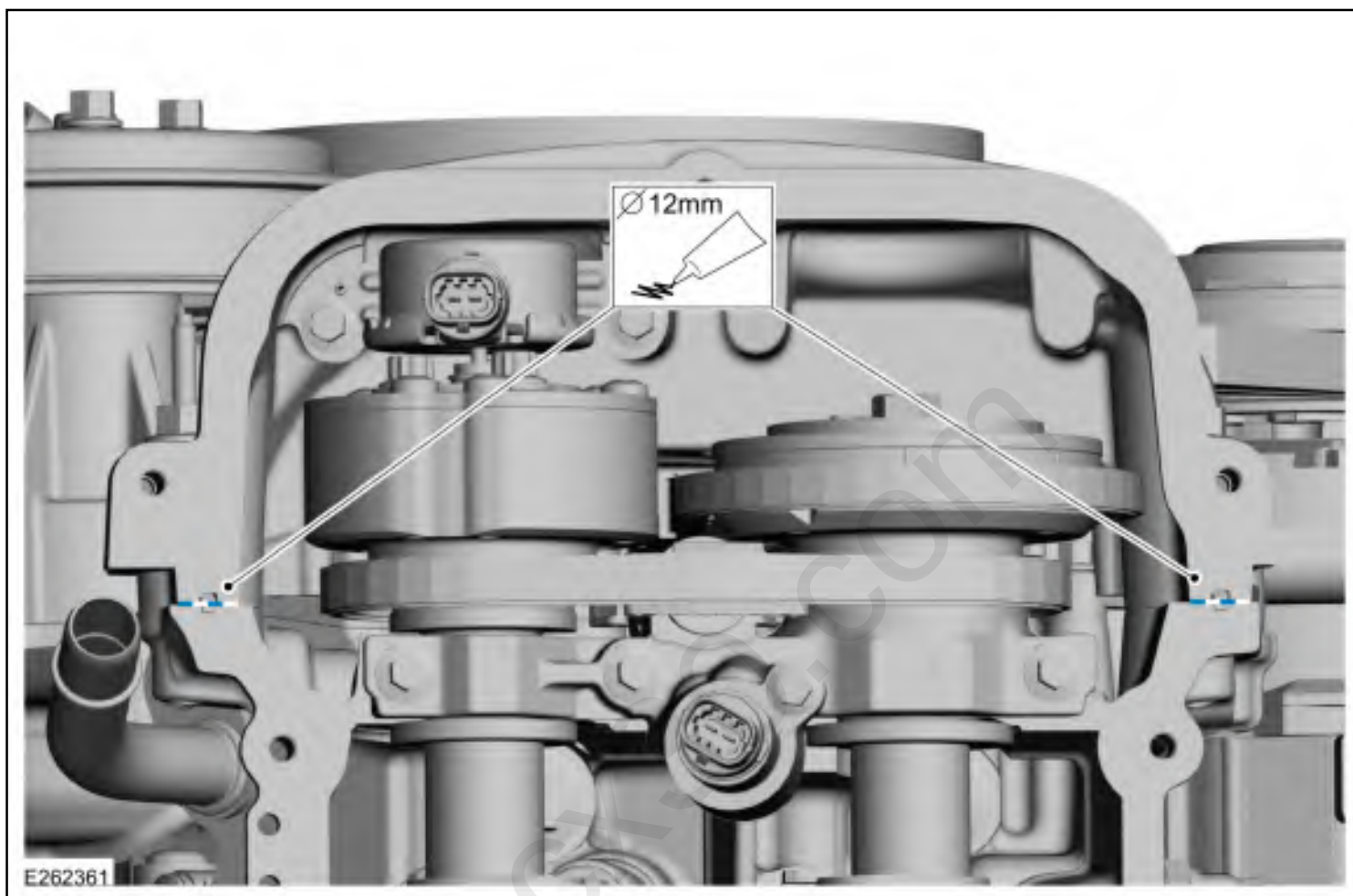
3. Install new gaskets.



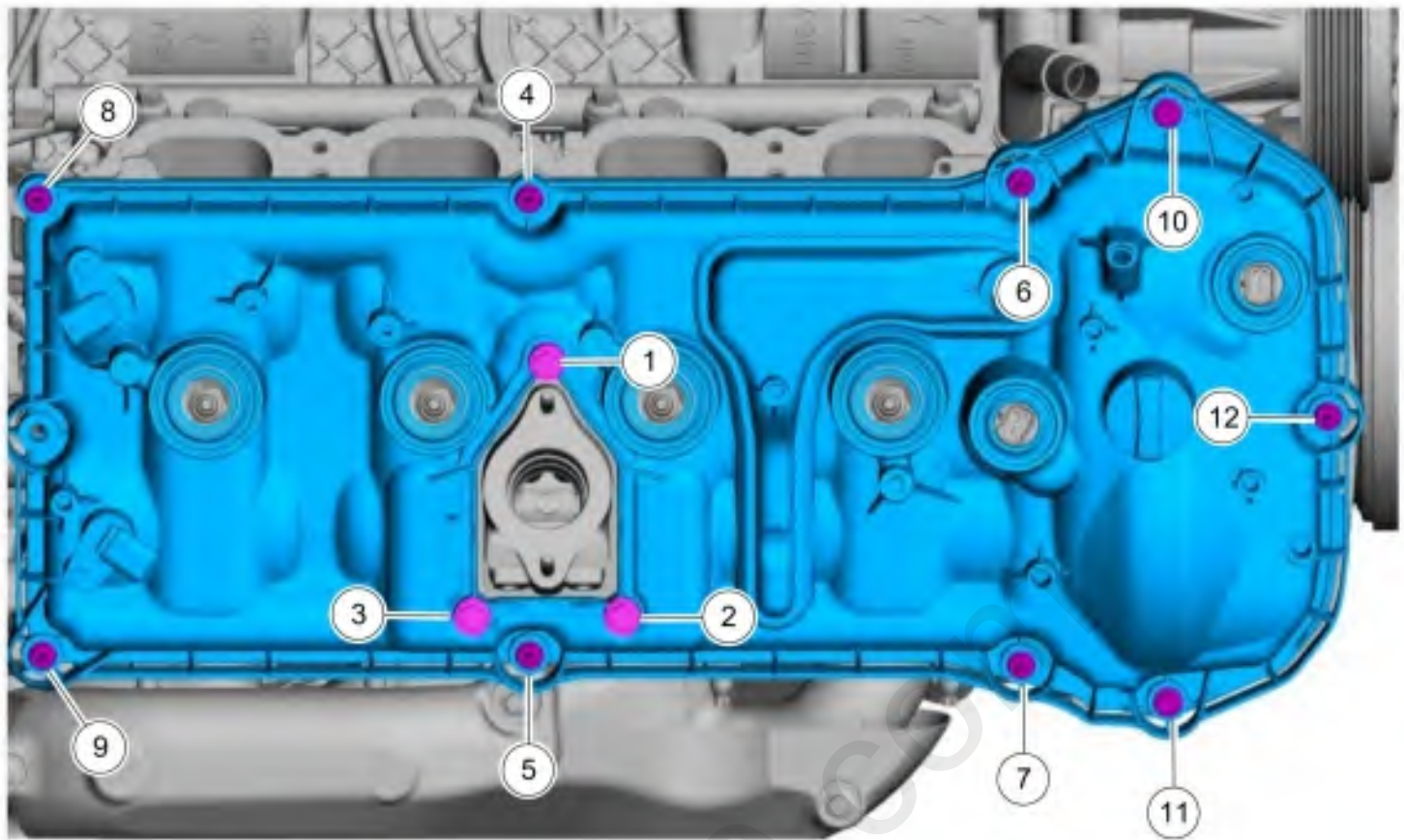
4. **NOTICE:** If the valve cover is not installed and the fasteners tightened within 5 minutes, the sealant must be removed and the sealing area cleaned.

Apply an 12 mm (0.47 in) bead of silicone gasket and sealant to the engine front cover-to-cylinder head joints.

Material: Motorcraft® Silicone Gasket and Sealant / TA-30 (WSE-M4G323-A4)

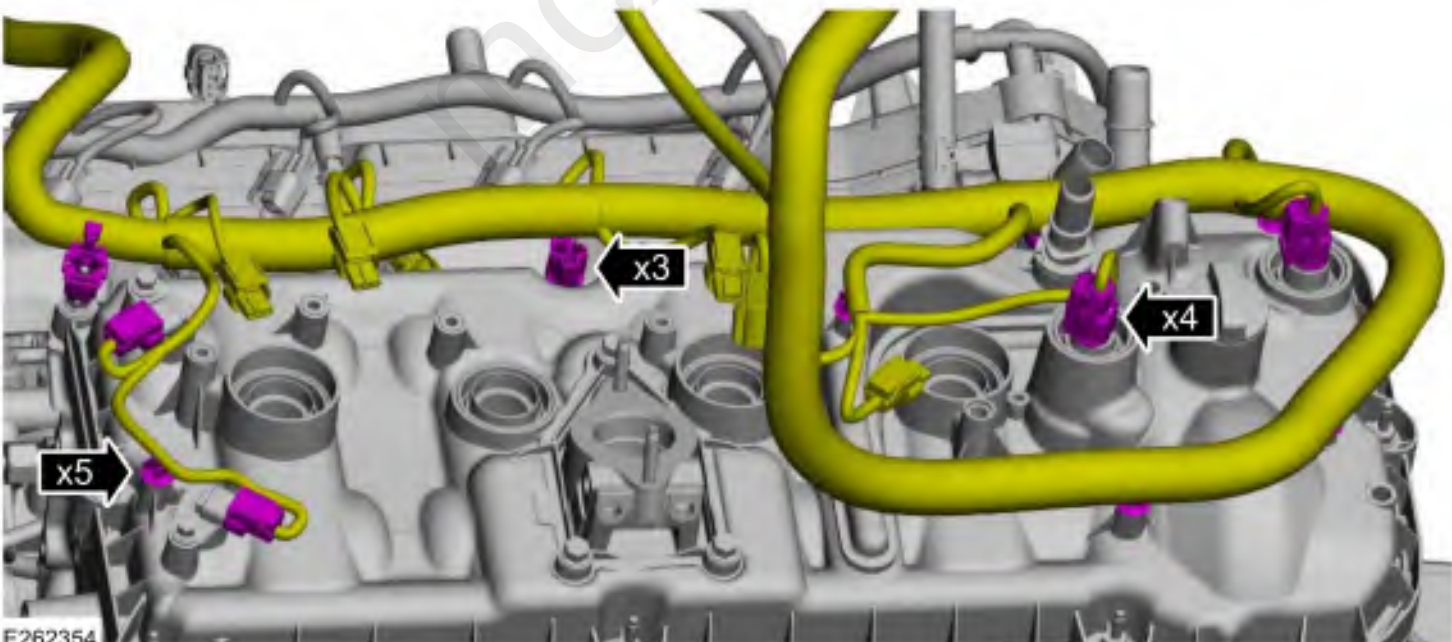


5. Install the valve cover and tighten the bolts.
Torque: 89 lb.in (10 Nm)



E262401

- Connect the engine wiring harness electrical connectors.
- Attach the wiring harness retainers.

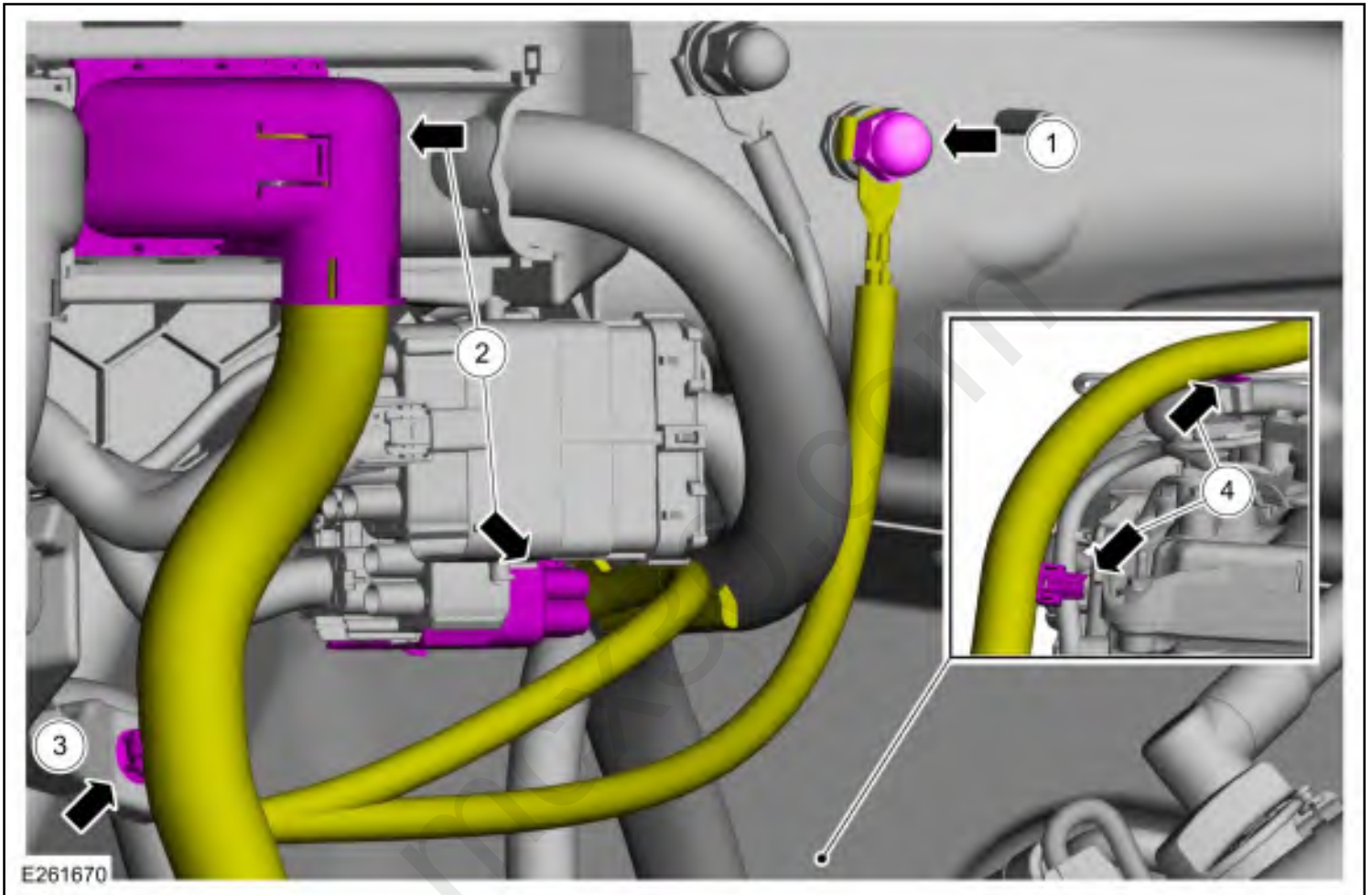


E262354

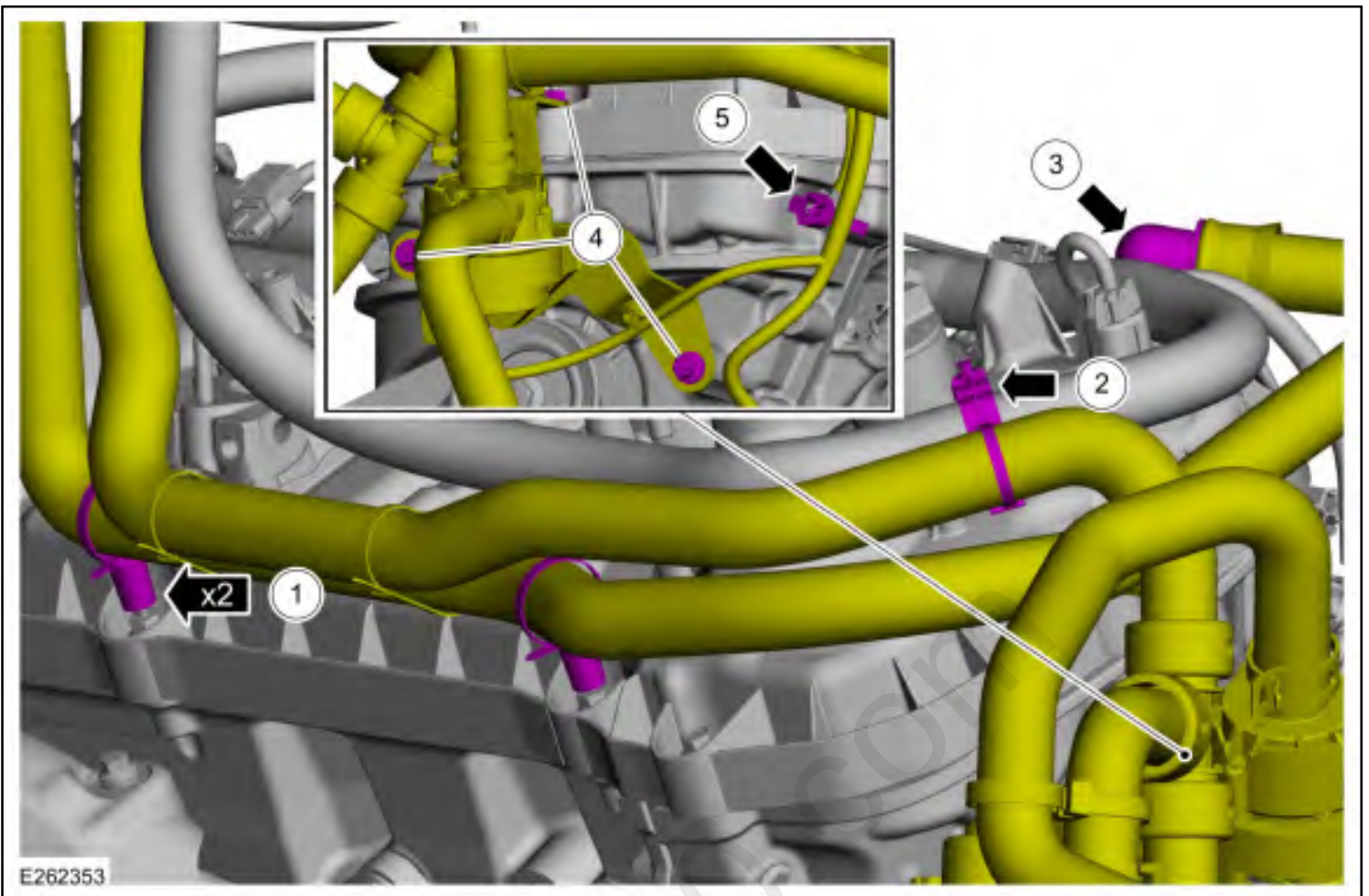
7. Install the RH ignition coils.

Refer to: Ignition Coil-On-Plug (303-07 Engine Ignition - 5.0L 32V Ti-VCT) .

1. Install the ground strap and the nut.
Torque: 106 lb.in (12 Nm)
2. Connect the engine wiring harness connectors.
3. Attach the engine wiring harness retainer.
4. Attach the transmission wiring harness retainers.



1. Attach the coolant hose retainers.
2. Attach the coolant hose retainer.
3. Connect the heater hose.
4. Position the coolant pump and install the fasteners.
Torque: 62 lb.in (7 Nm)
5. Attach the wiring harness retainer.



10. Install the following items:

1. LH ignition coils.

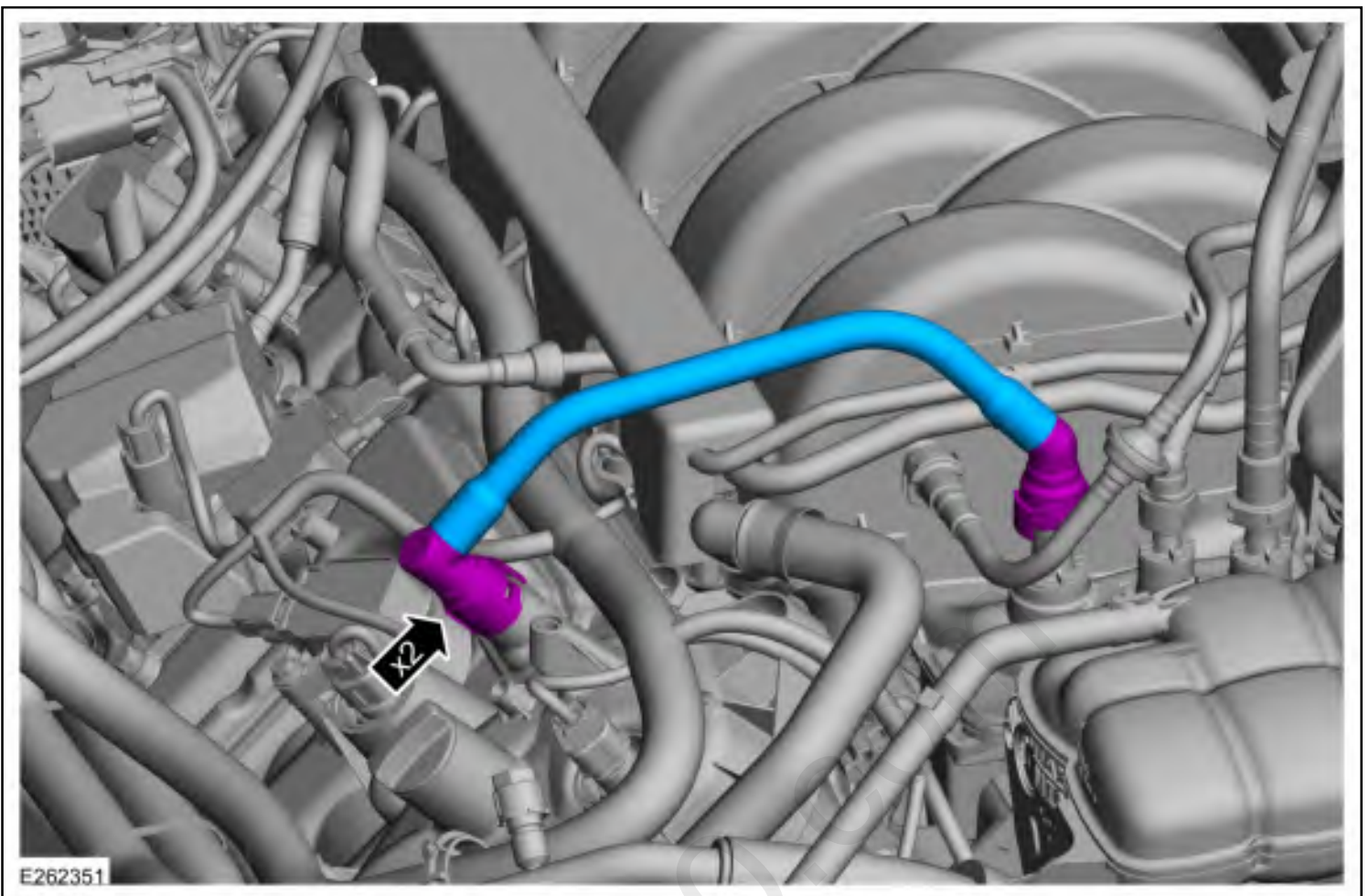
Refer to: [Ignition Coil-On-Plug](#) (303-07D Engine Ignition - 5.0L 32V Ti-VCT, Removal and Installation).

2. High pressure fuel pump.

Refer to: [High-Pressure Fuel Pump](#) (303-04D Fuel Charging and Controls - 5.0L 32V Ti-VCT, Removal and Installation).

11. Position the PCV tube and connect the quick release couplings.

Refer to: [Quick Release Coupling](#) (310-00D Fuel System - General Information - 5.0L 32V Ti-VCT, General Procedures).



12. Fill the engine cooling system.

Refer to: Cooling System Draining, Vacuum Filling and Bleeding (303-03 Engine Cooling - 5.0L 32V Ti-VCT) .

Camshaft LH

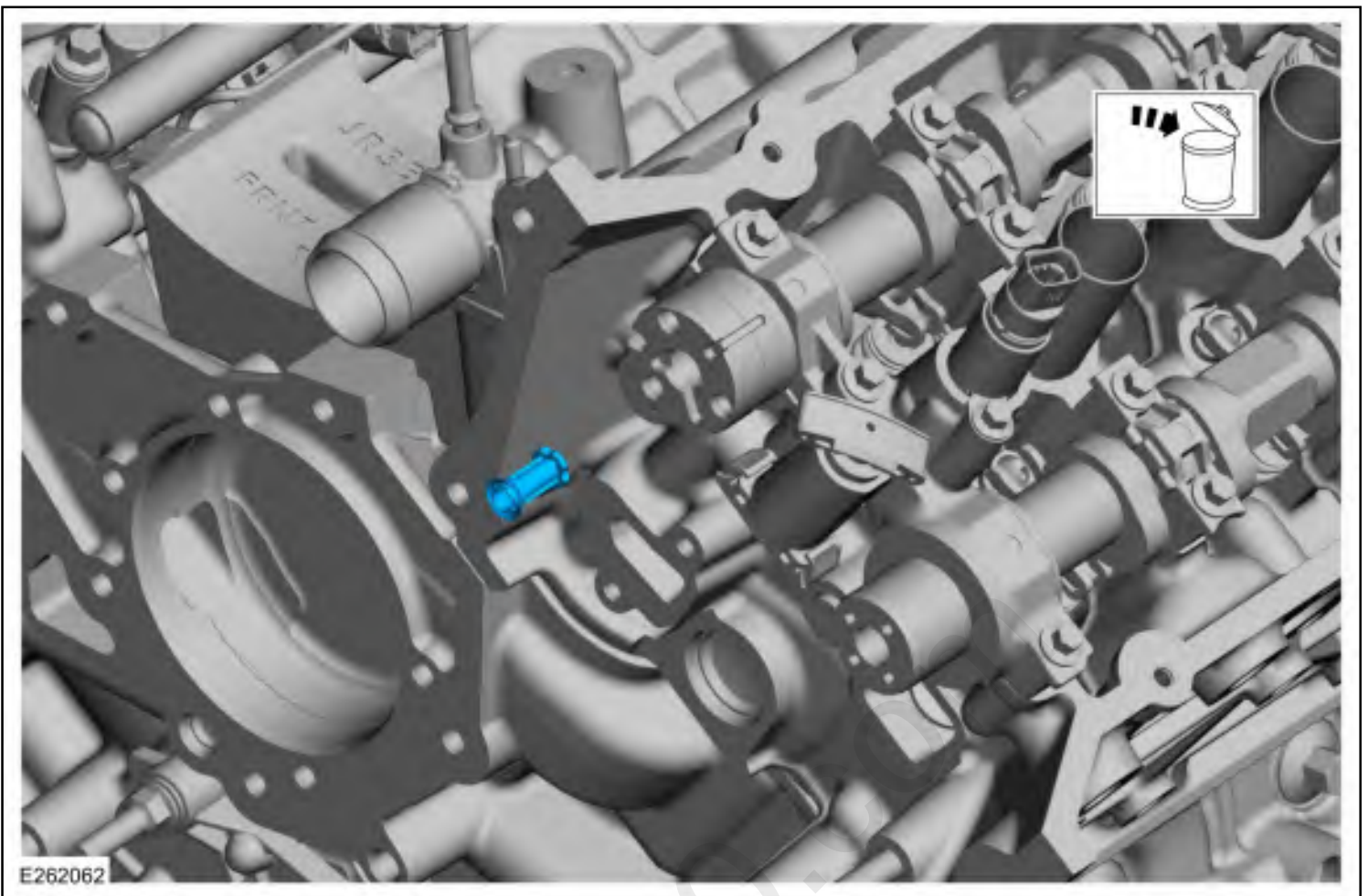
Removal

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.

NOTE: If the RH camshafts are being serviced at the same time as the LH camshafts, remove the RH camshafts first. Refer to the procedure in this section.

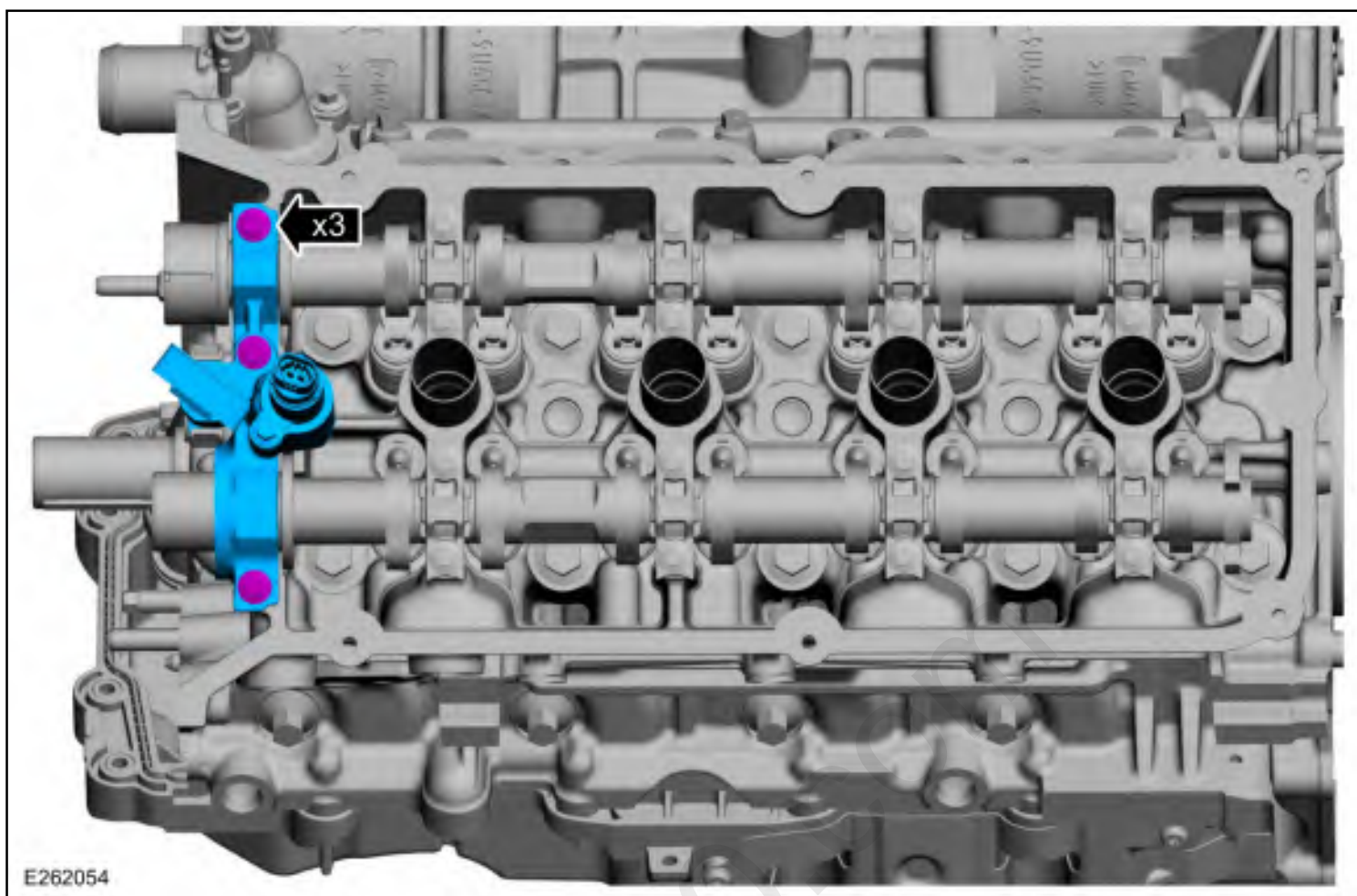
NOTE: If the components are to be reinstalled, they must be installed in their original locations.

1. Remove the LH VCT units.
Refer to: Variable Camshaft Timing (VCT) Unit (303-01 Engine - 5.0L 32V Ti-VCT) .
2. Remove and discard the VCT system oil filter.

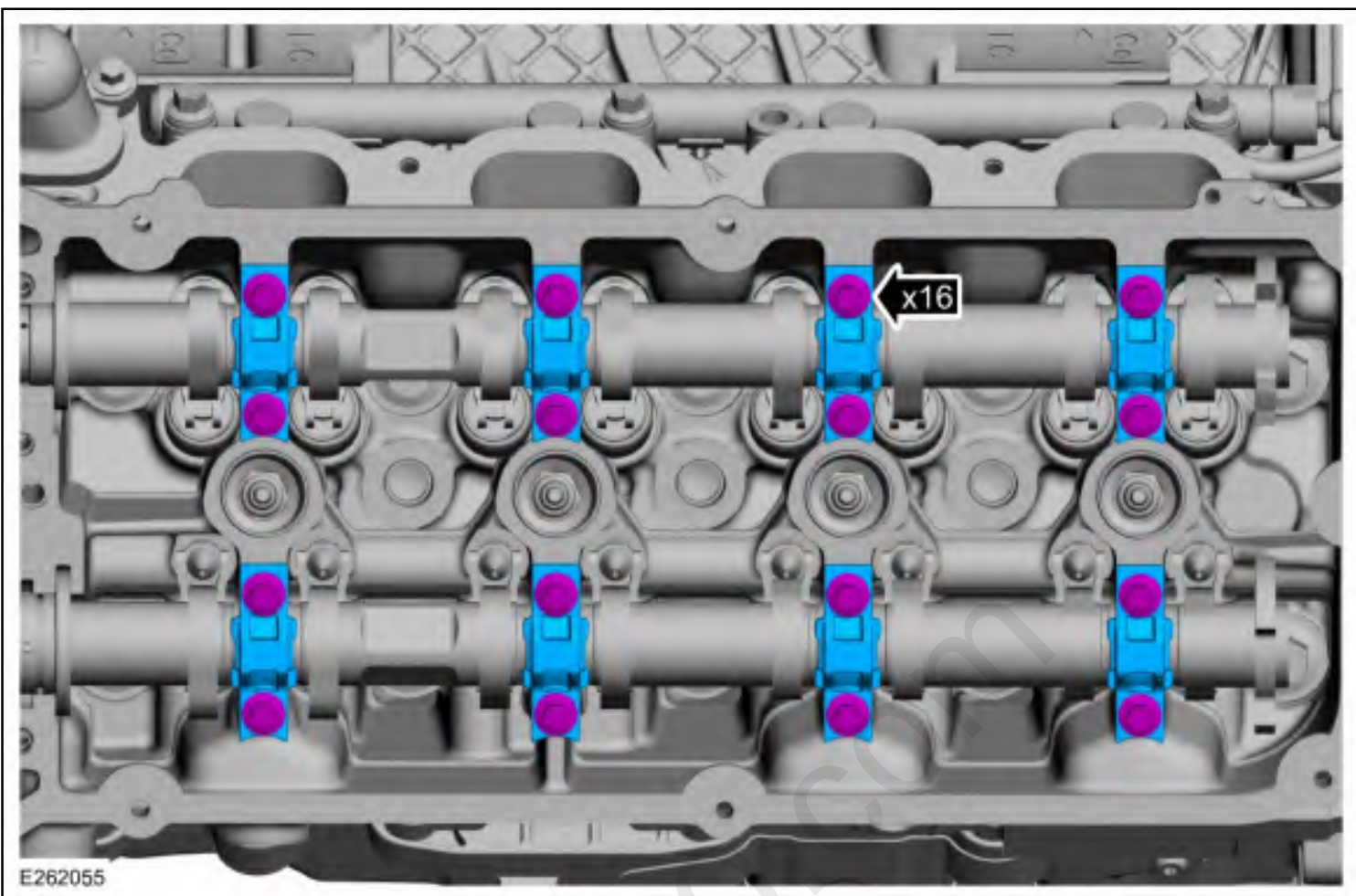


3. **NOTICE:** The front camshaft bearing mega cap must be removed first and then the remaining camshaft bearing caps. Failure to follow this direction may result in damage to the engine.

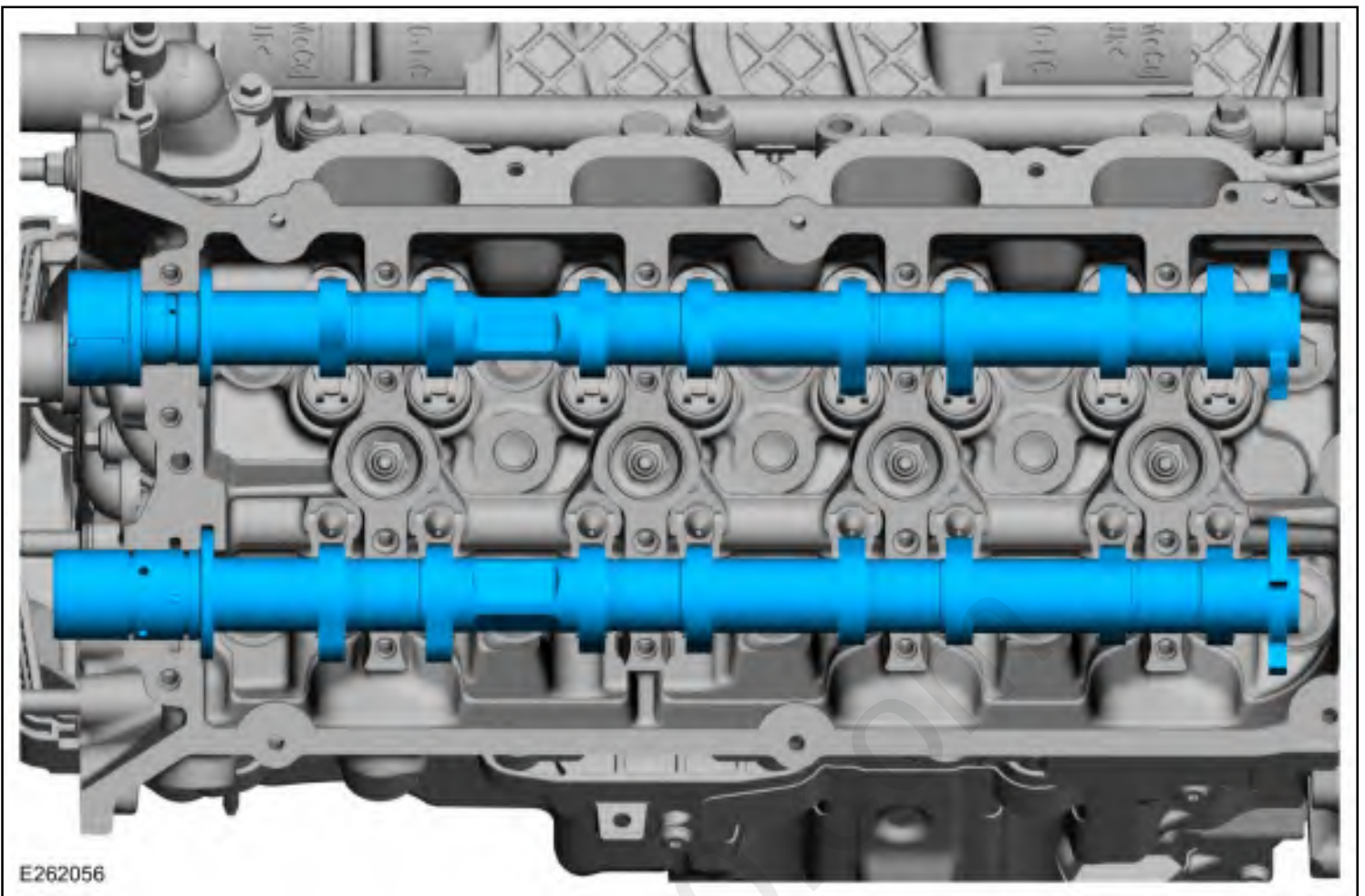
Remove the bolts and the front camshaft bearing mega cap.



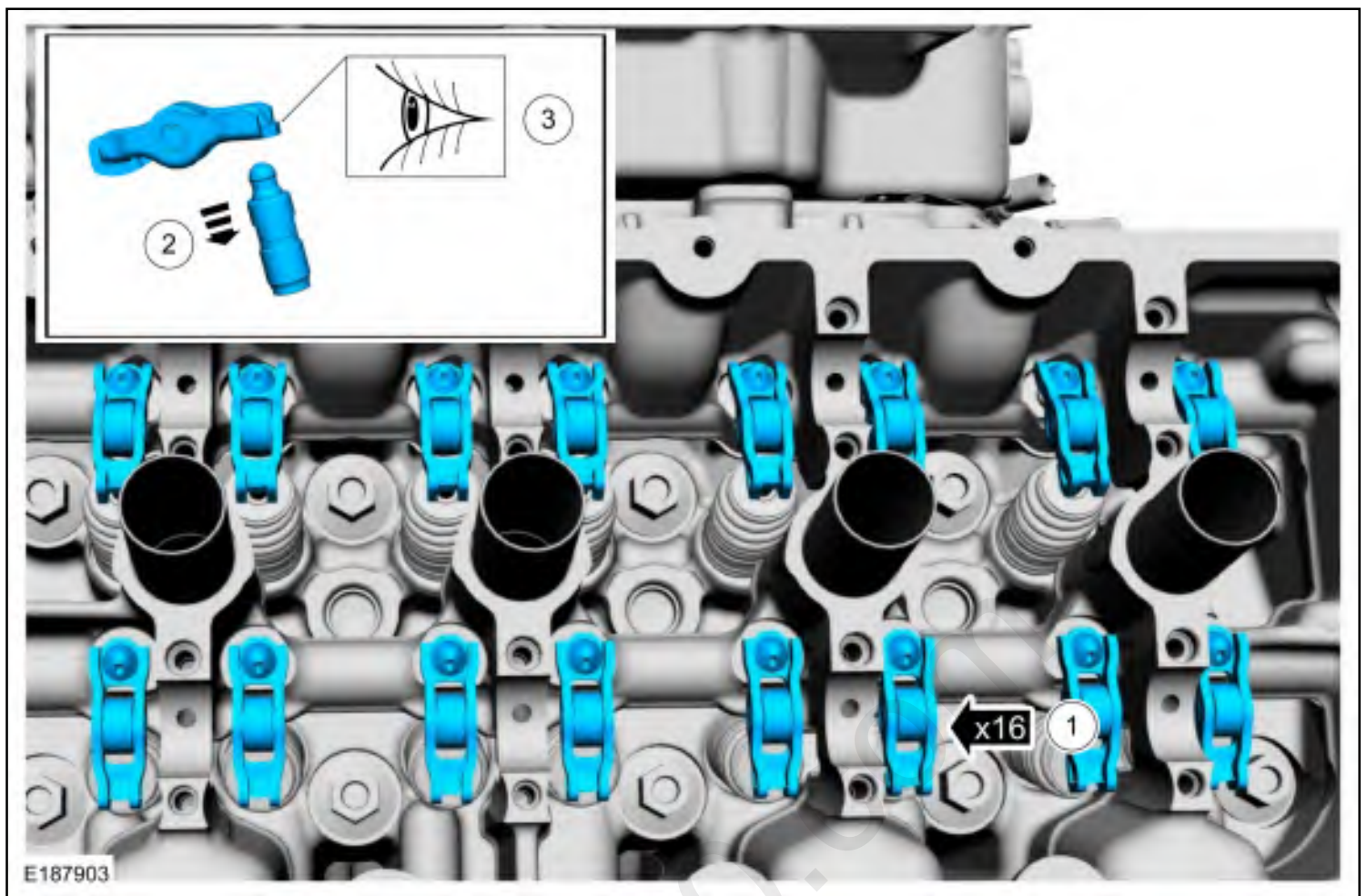
4. Remove the bolts and the camshaft bearing caps.



5. Remove the intake and exhaust camshafts.

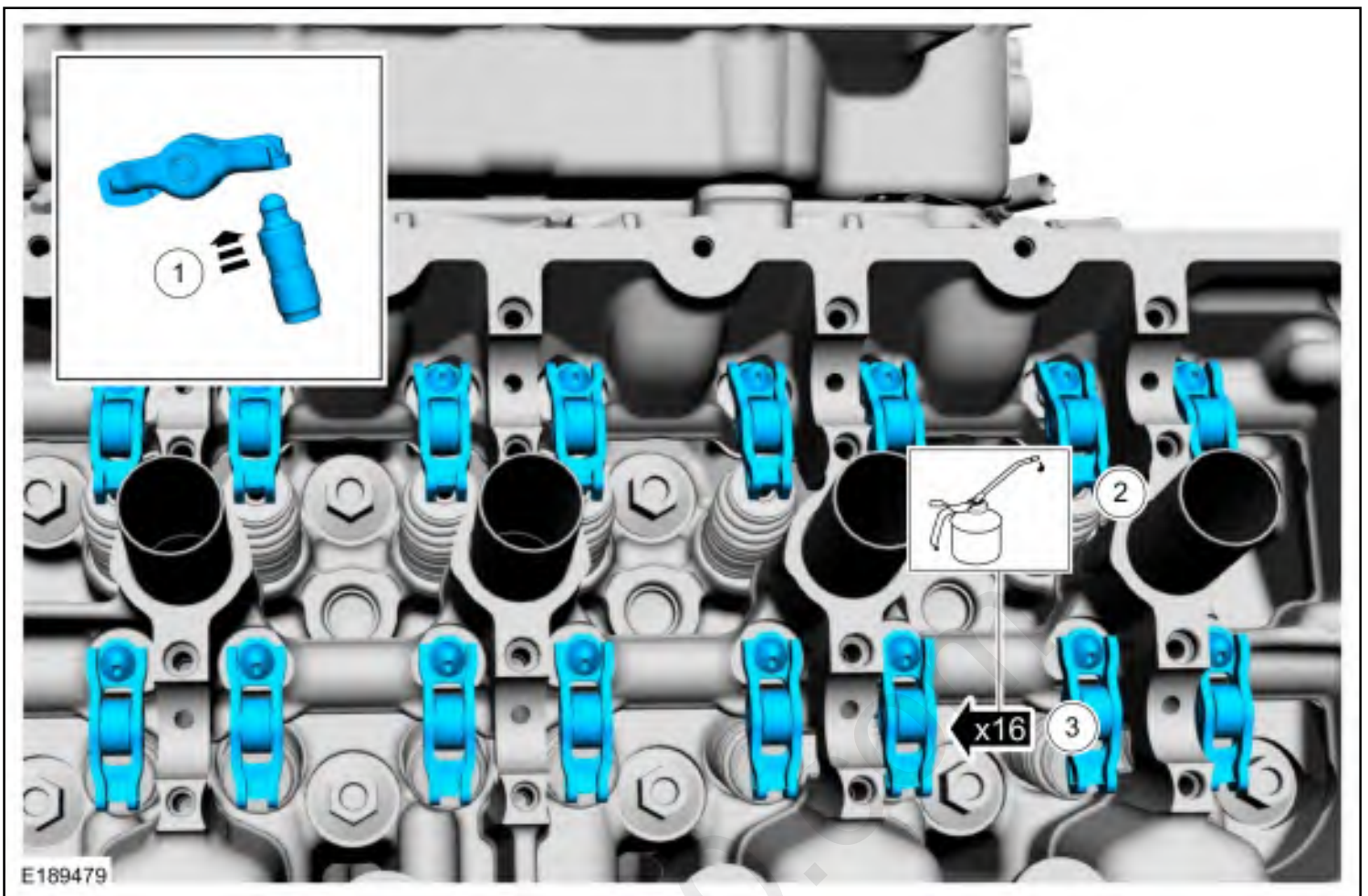


1. Remove the camshaft roller follower and hydraulic lash adjuster assemblies.
2. Separate the hydraulic lash adjusters from the spring clips on the camshaft roller followers.
3. Inspect the hydraulic lash adjuster and roller follower for damage. If any damage is found, inspect the camshaft lobes and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



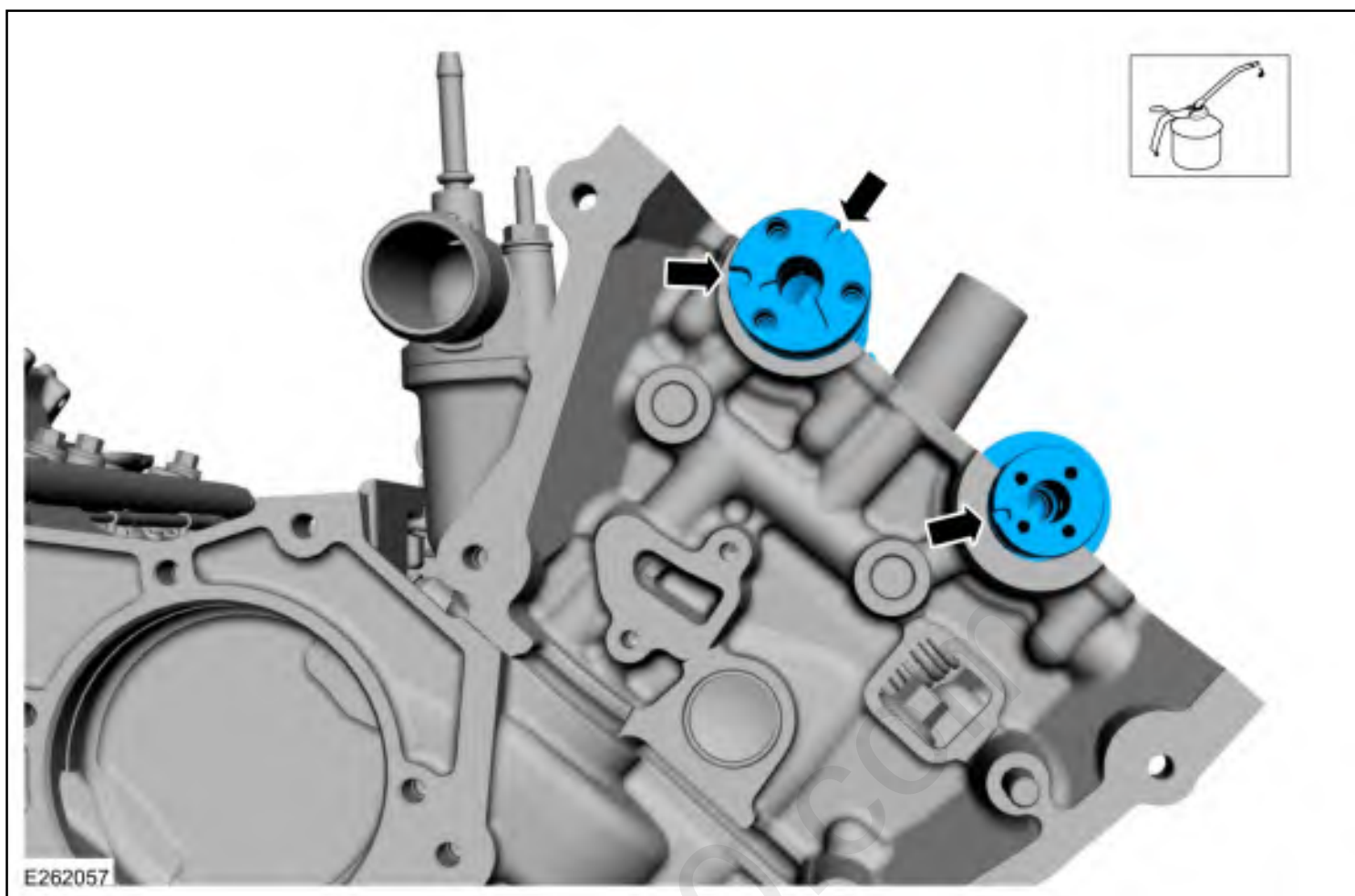
Installation

1. **NOTE:** *If the components are to be reinstalled, they must be installed in their original locations.*
1. Assemble the hydraulic lash adjusters onto the spring clips on the camshaft roller followers.
2. Lubricate the camshaft roller follower and hydraulic lash adjuster assemblies with clean engine oil.
3. Install the camshaft roller follower and hydraulic lash adjuster assemblies.

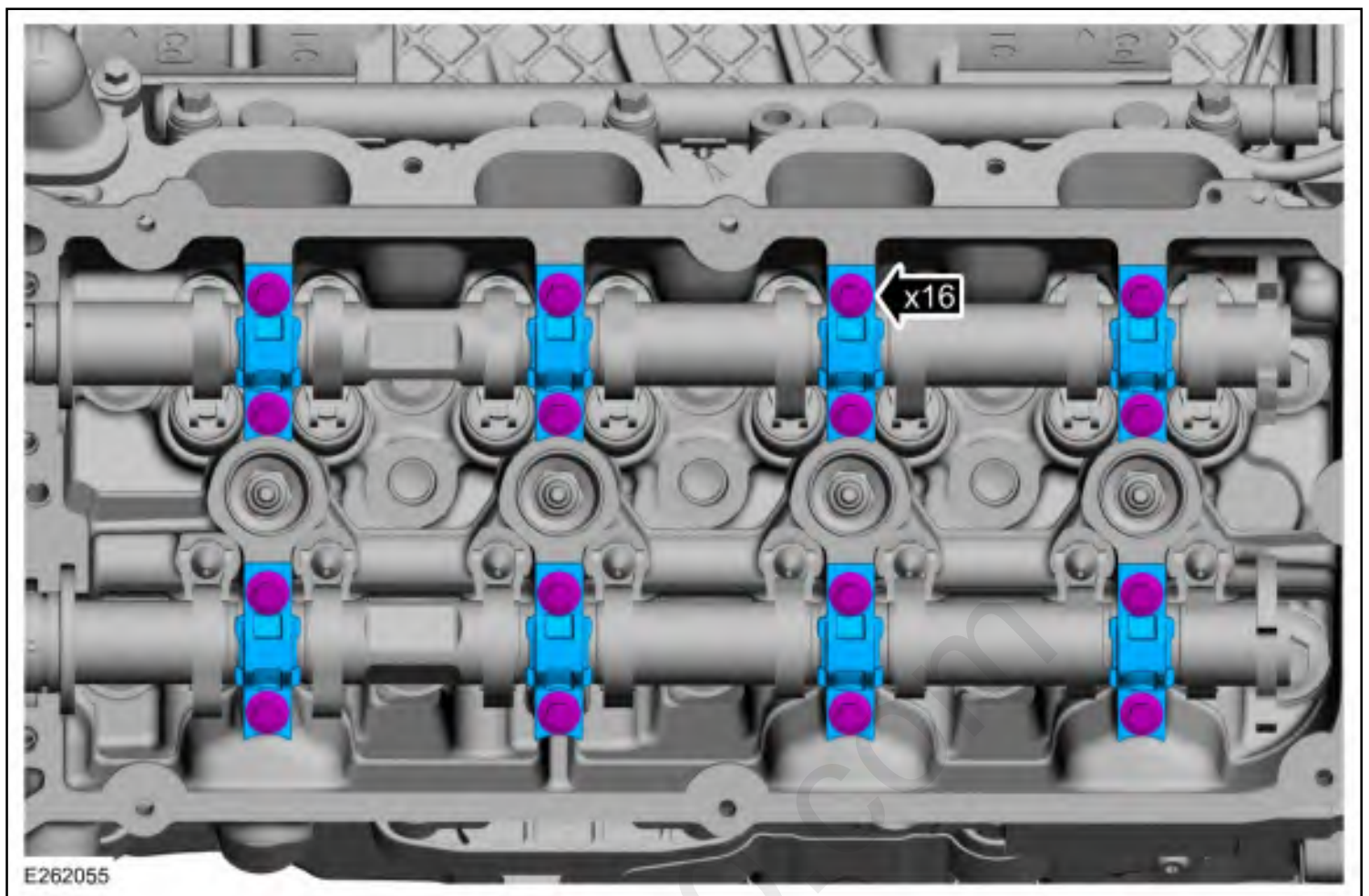


2. **NOTE:** *Lubricate the camshafts with clean engine oil prior to installation.*

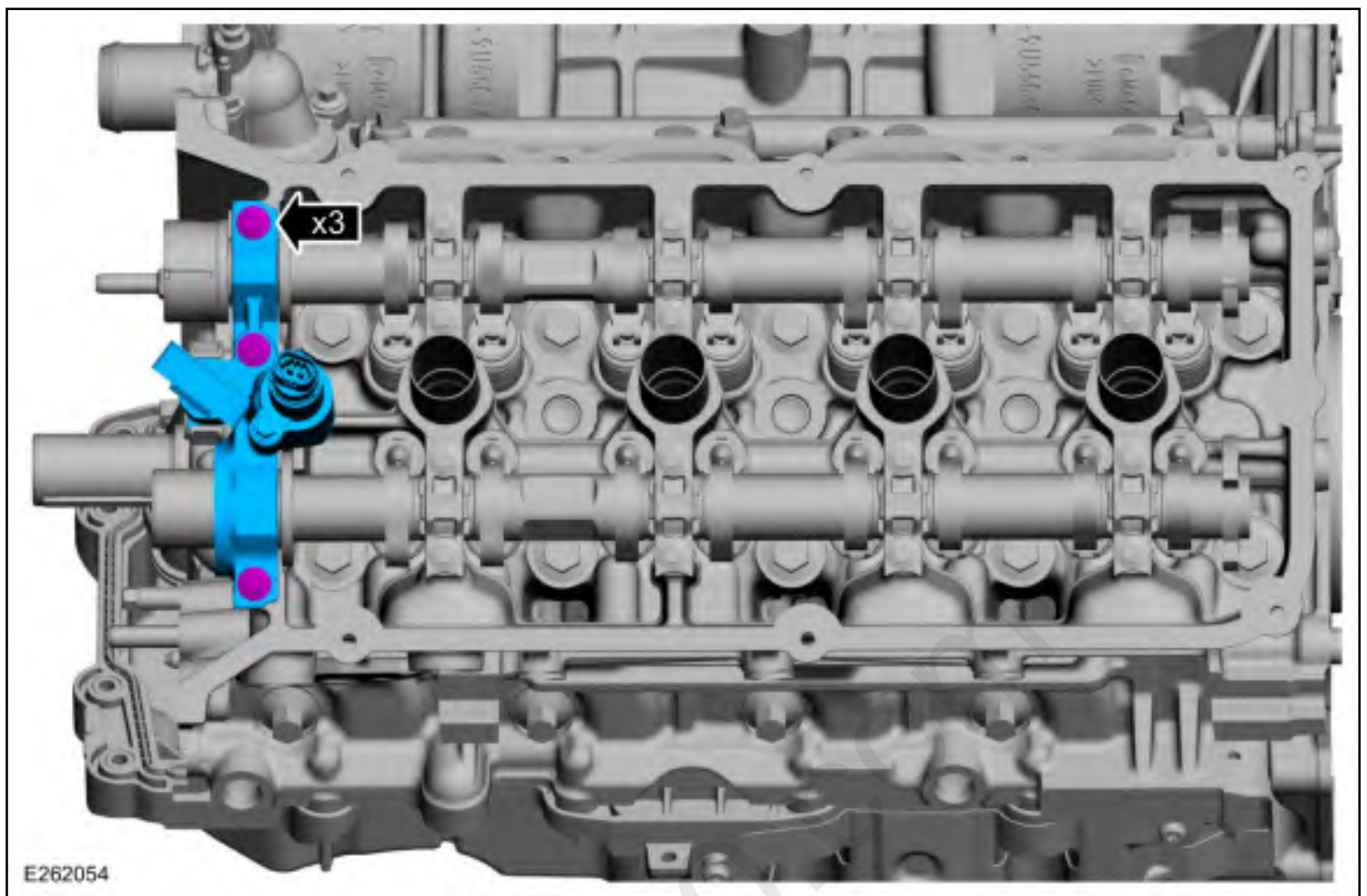
Install the intake and exhaust camshafts in the neutral position. Align the D-slots as shown in the illustration.



3. Install the camshaft bearing caps and the bolts. Do not tighten at this time.



4. Install the front camshaft bearing mega cap and the bolts. Do not tighten at this time.

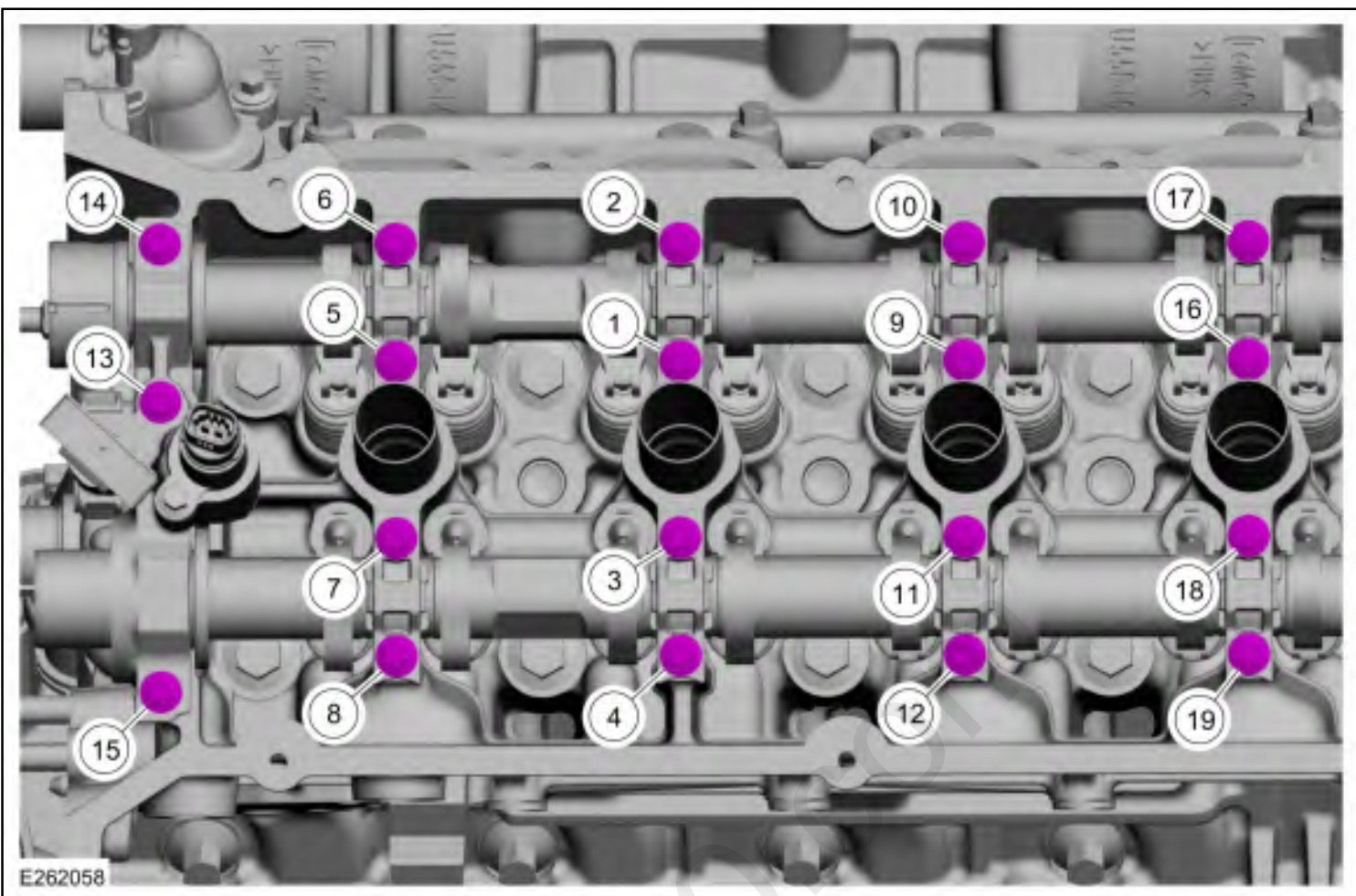


5. Tighten the bolts.

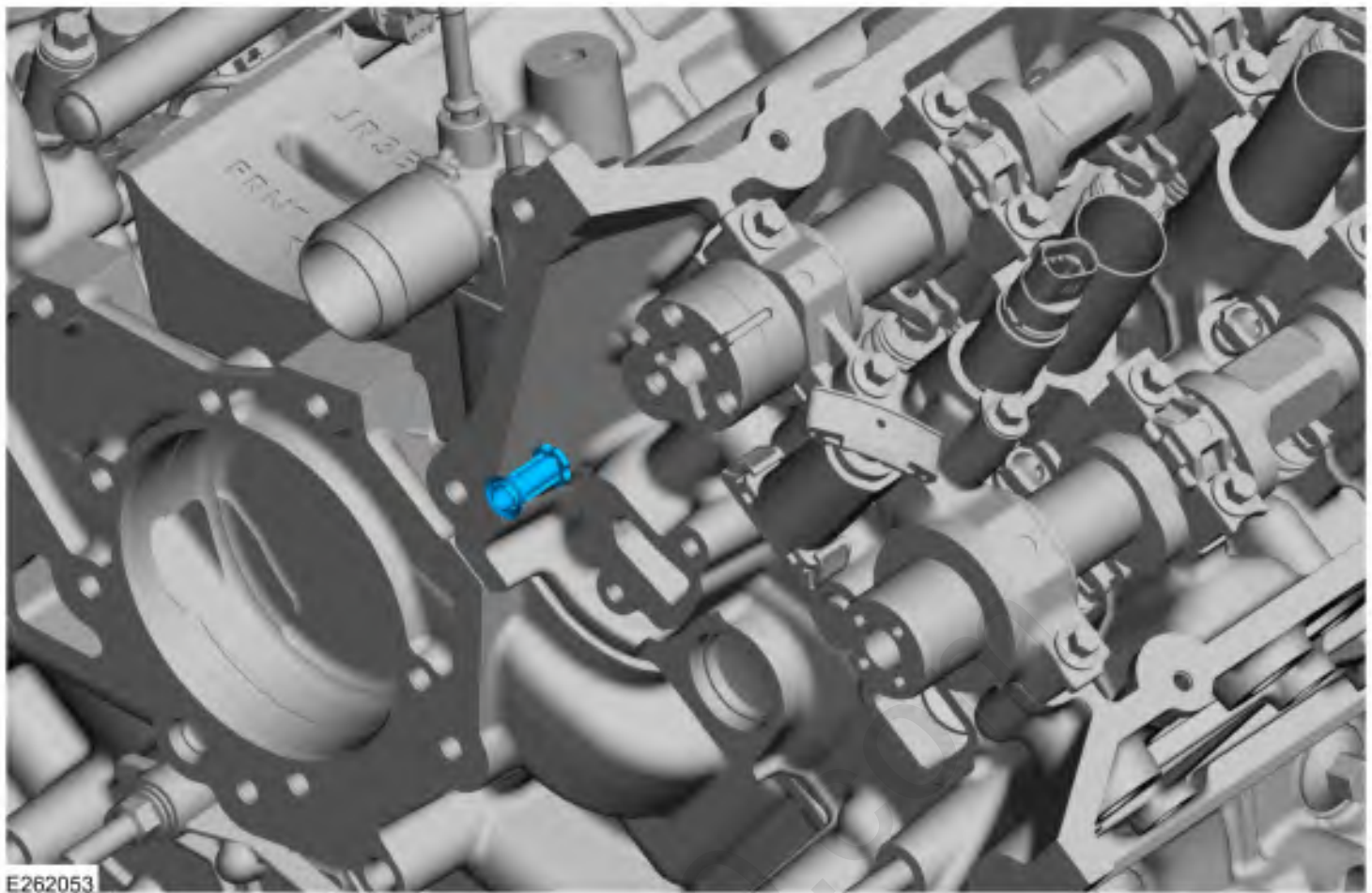
Torque:

Stage 1: 53 lb.in (6 Nm)

Stage 2: 45°



6. Install new VCT system oil filter into the camshaft.



7. Install the LH VCT units.

Refer to: Variable Camshaft Timing (VCT) Unit (303-01 Engine - 5.0L 32V Ti-VCT) .

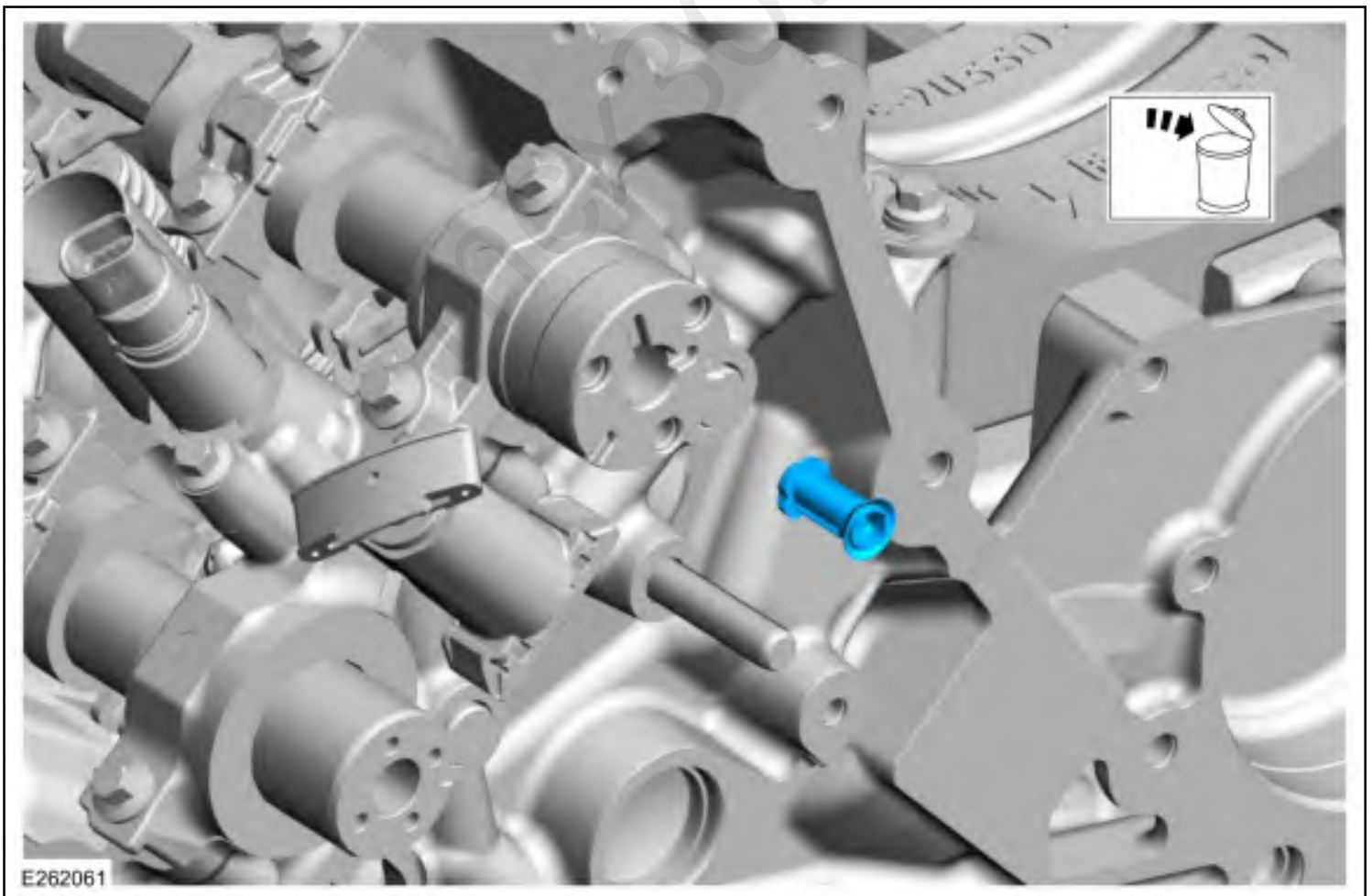
Camshaft RH

Removal

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.

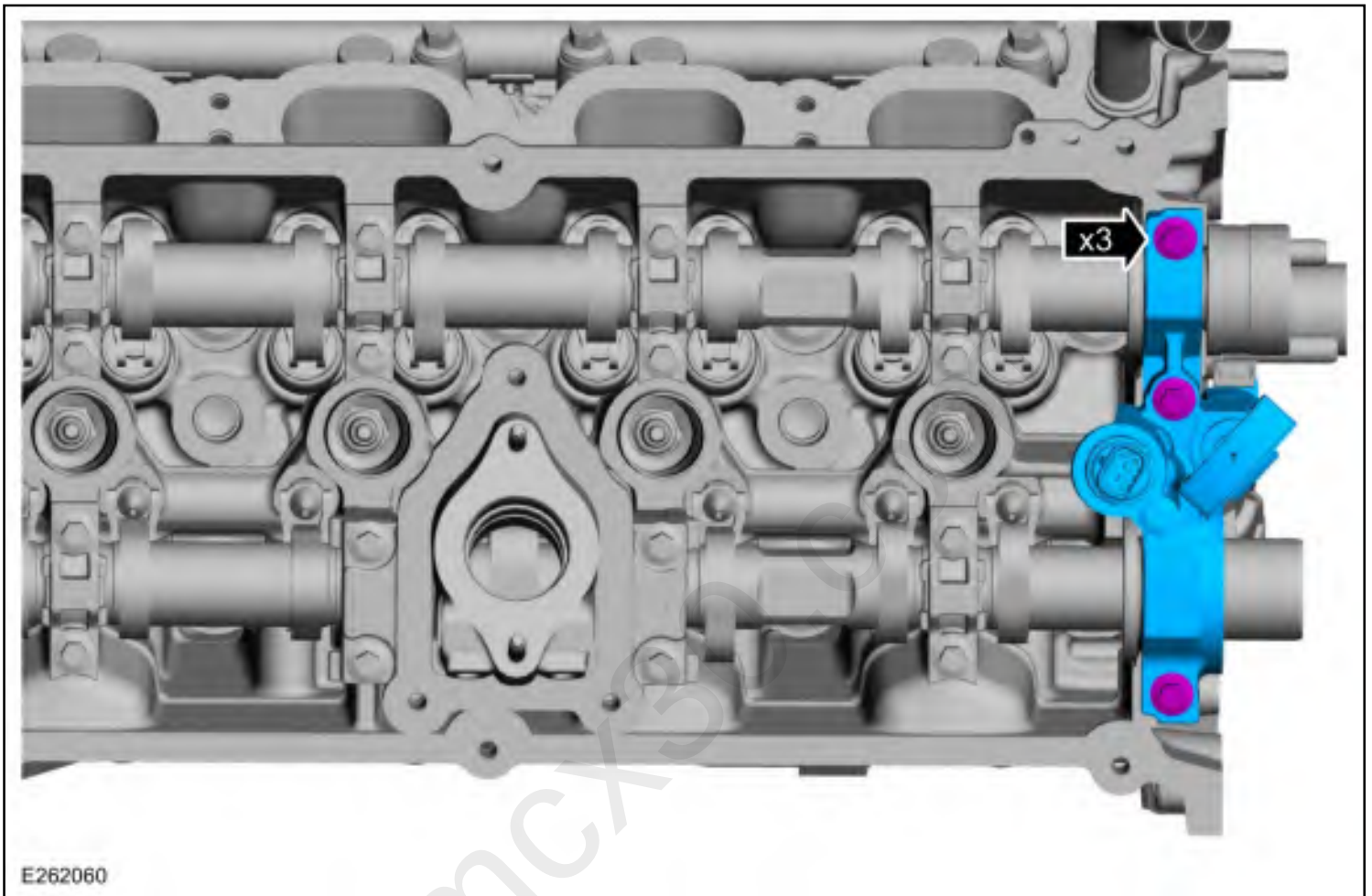
NOTE: If the components are to be reinstalled, they must be installed in their original locations.

1. Remove the RH VCT units.
Refer to: Variable Camshaft Timing (VCT) Unit (303-01 Engine - 5.0L 32V Ti-VCT) .
2. Remove and discard the VCT system oil filter.

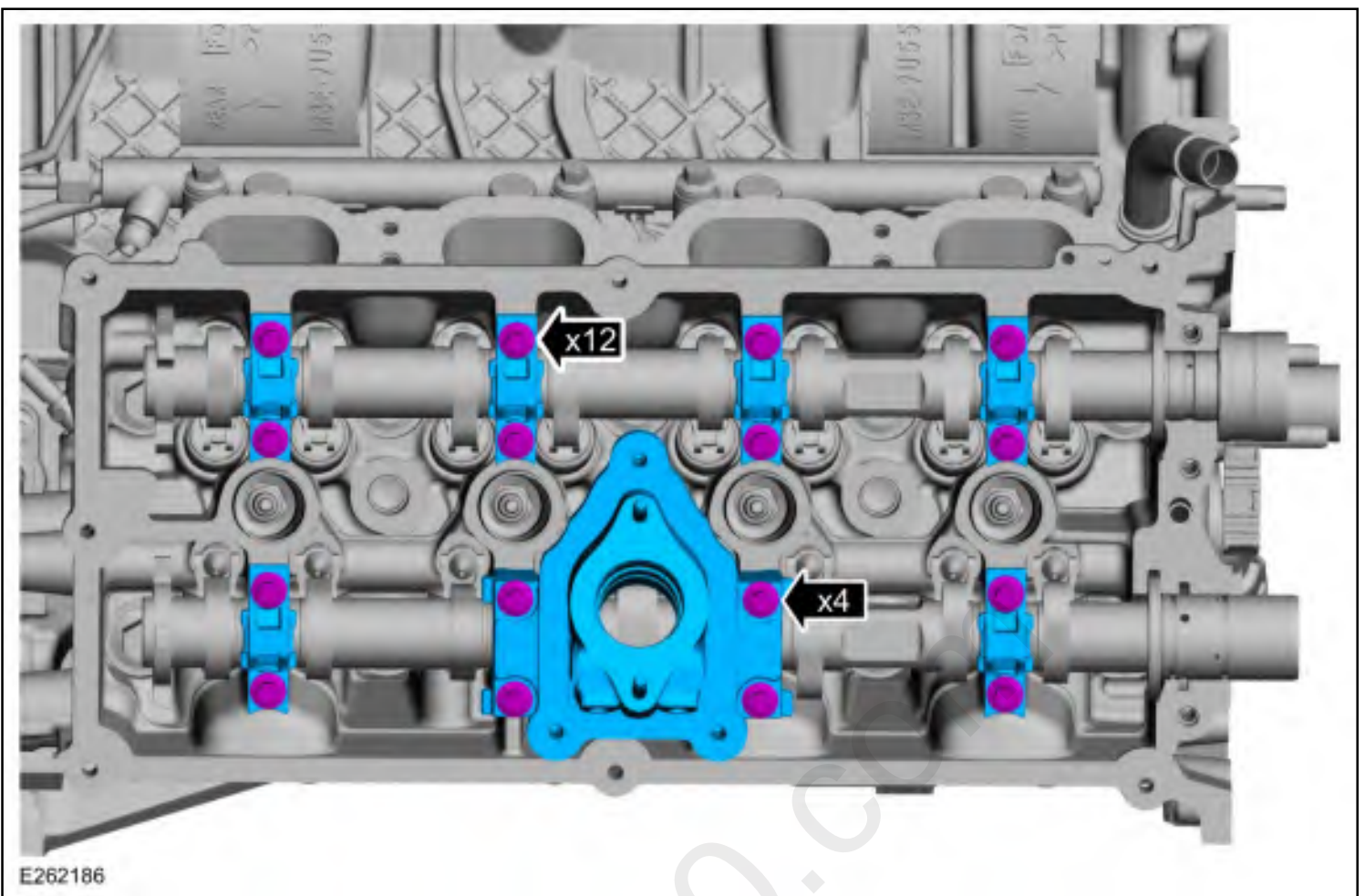


3. **NOTICE:** The front camshaft bearing mega cap must be removed first and then the remaining camshaft bearing caps. Failure to follow this direction may result in damage to the engine.

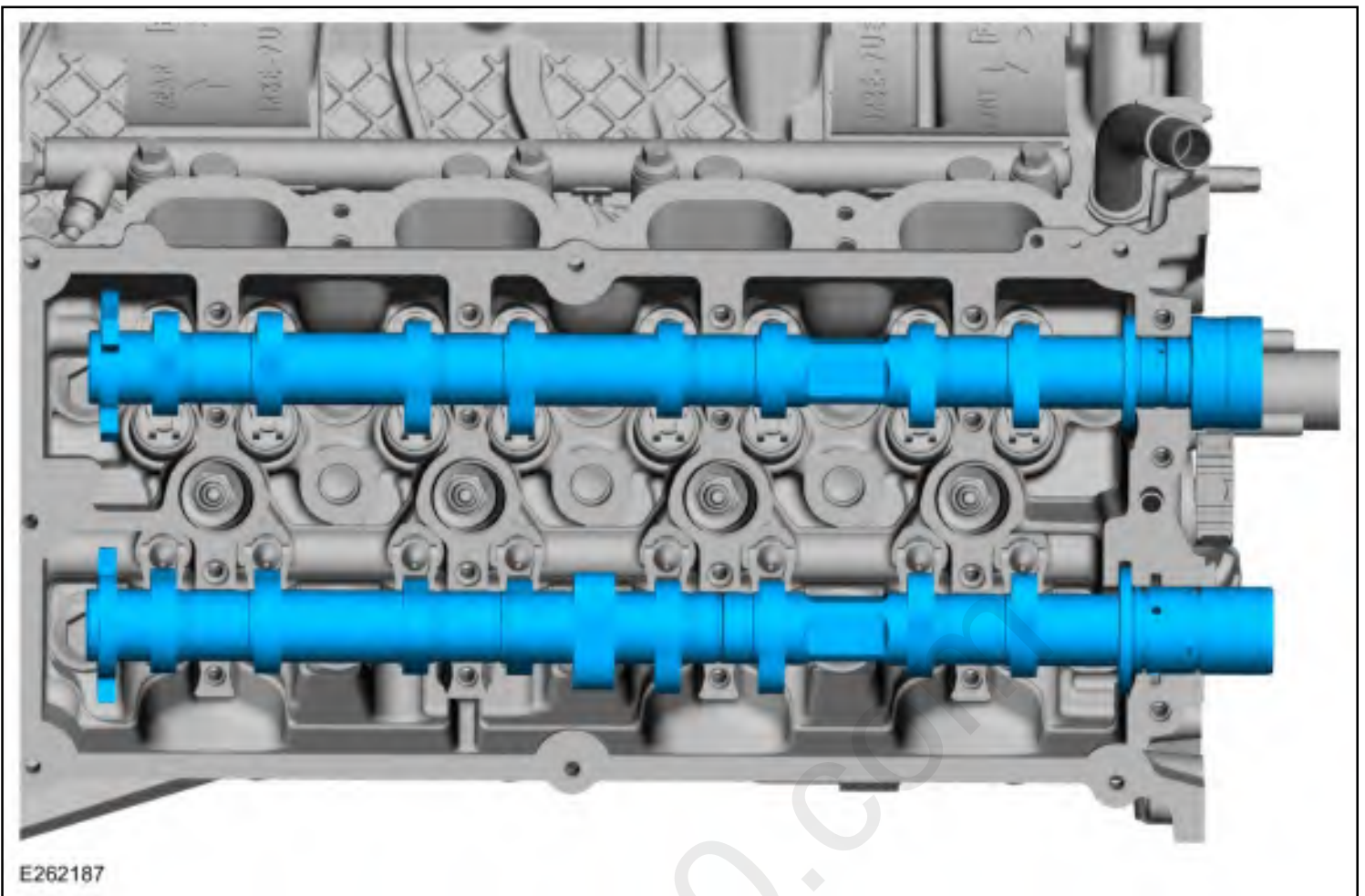
Remove the bolts and the front camshaft bearing mega cap.



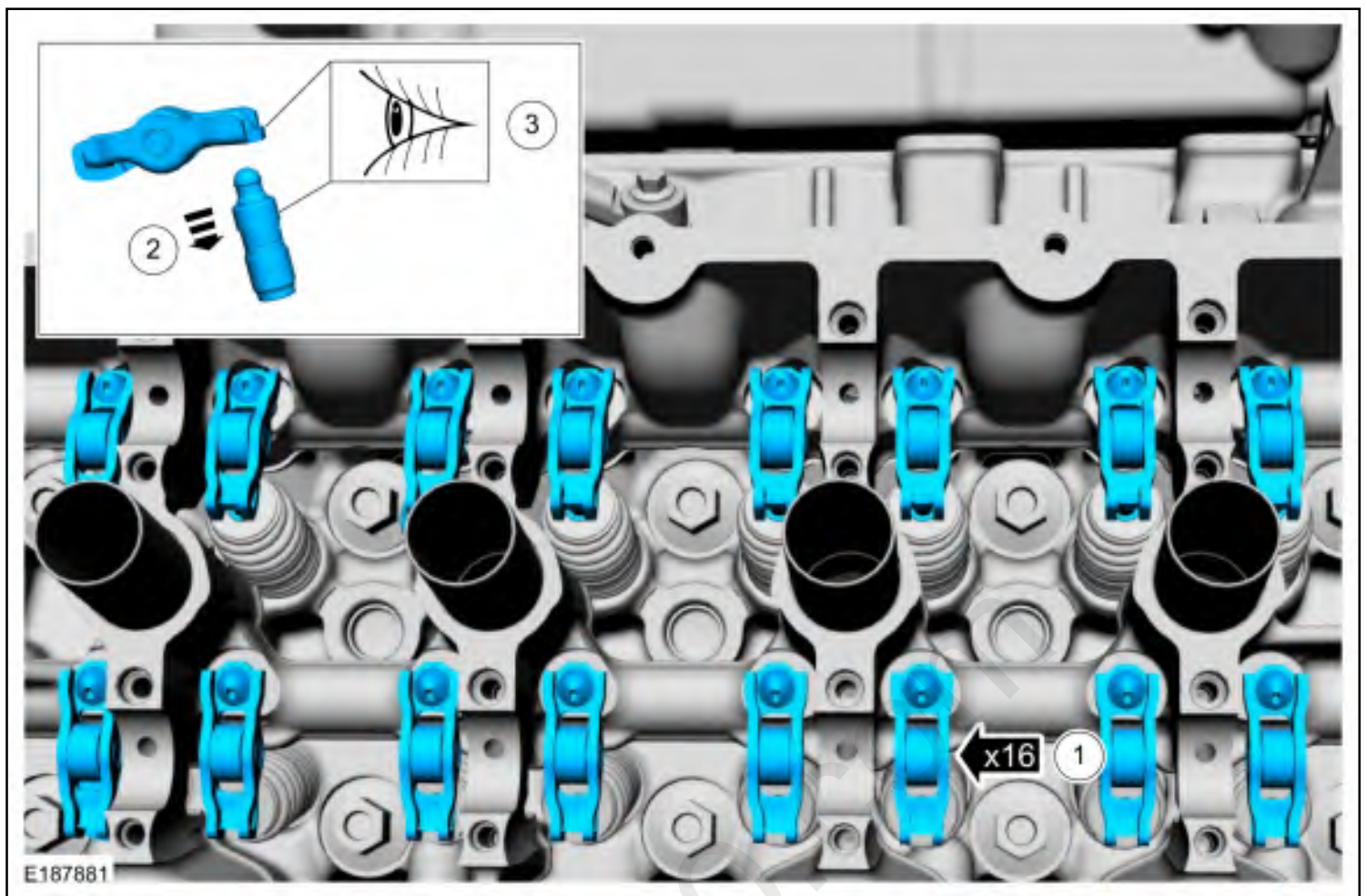
4. Remove the bolts and the camshaft bearing caps.



5. Remove the intake and exhaust camshafts.

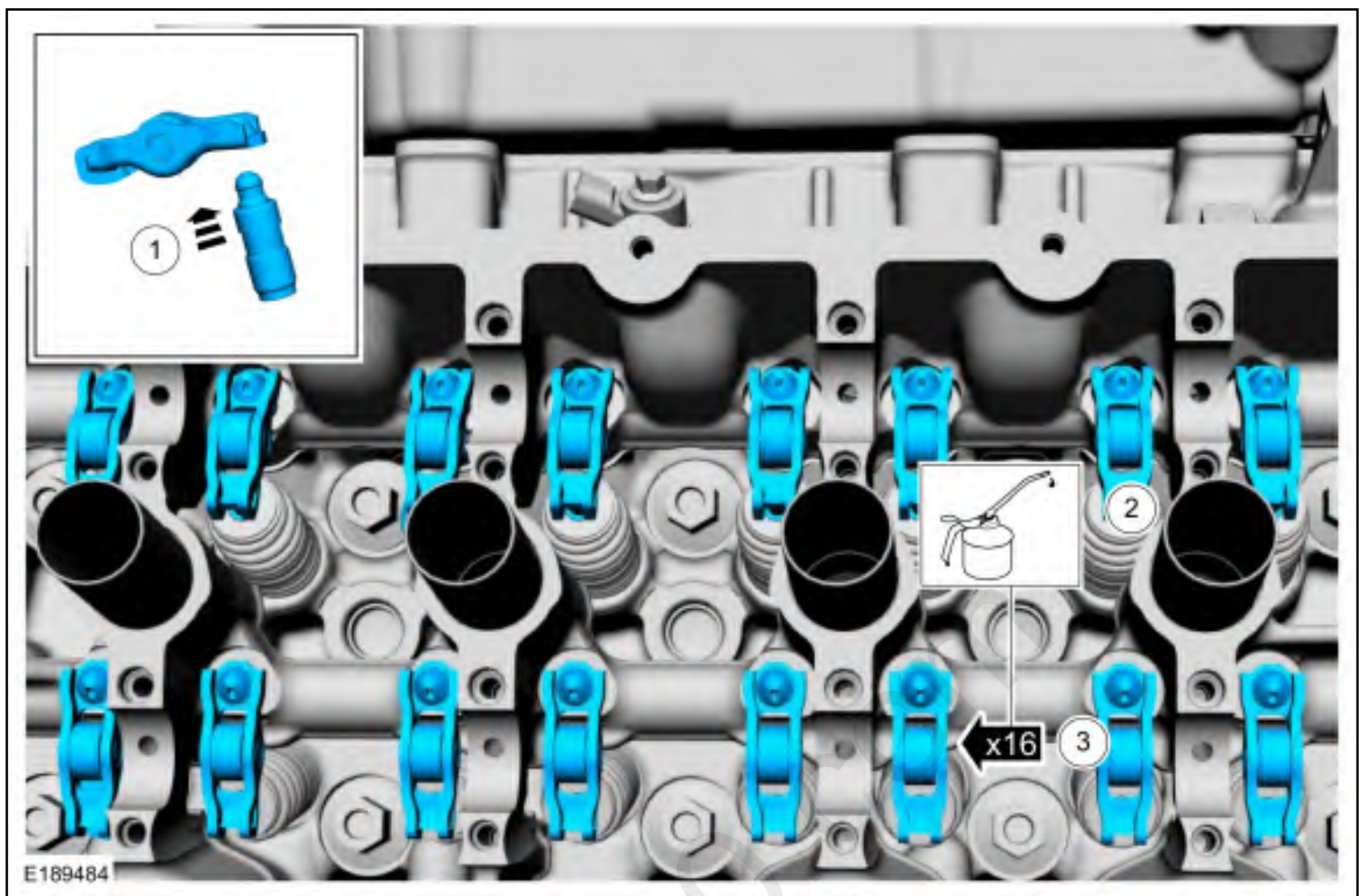


1. Remove the camshaft roller follower and hydraulic lash adjuster assemblies.
2. Separate the hydraulic lash adjusters from the spring clips on the camshaft roller followers.
3. Inspect the hydraulic lash adjuster and roller follower for damage. If any damage is found, inspect the camshaft lobes and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



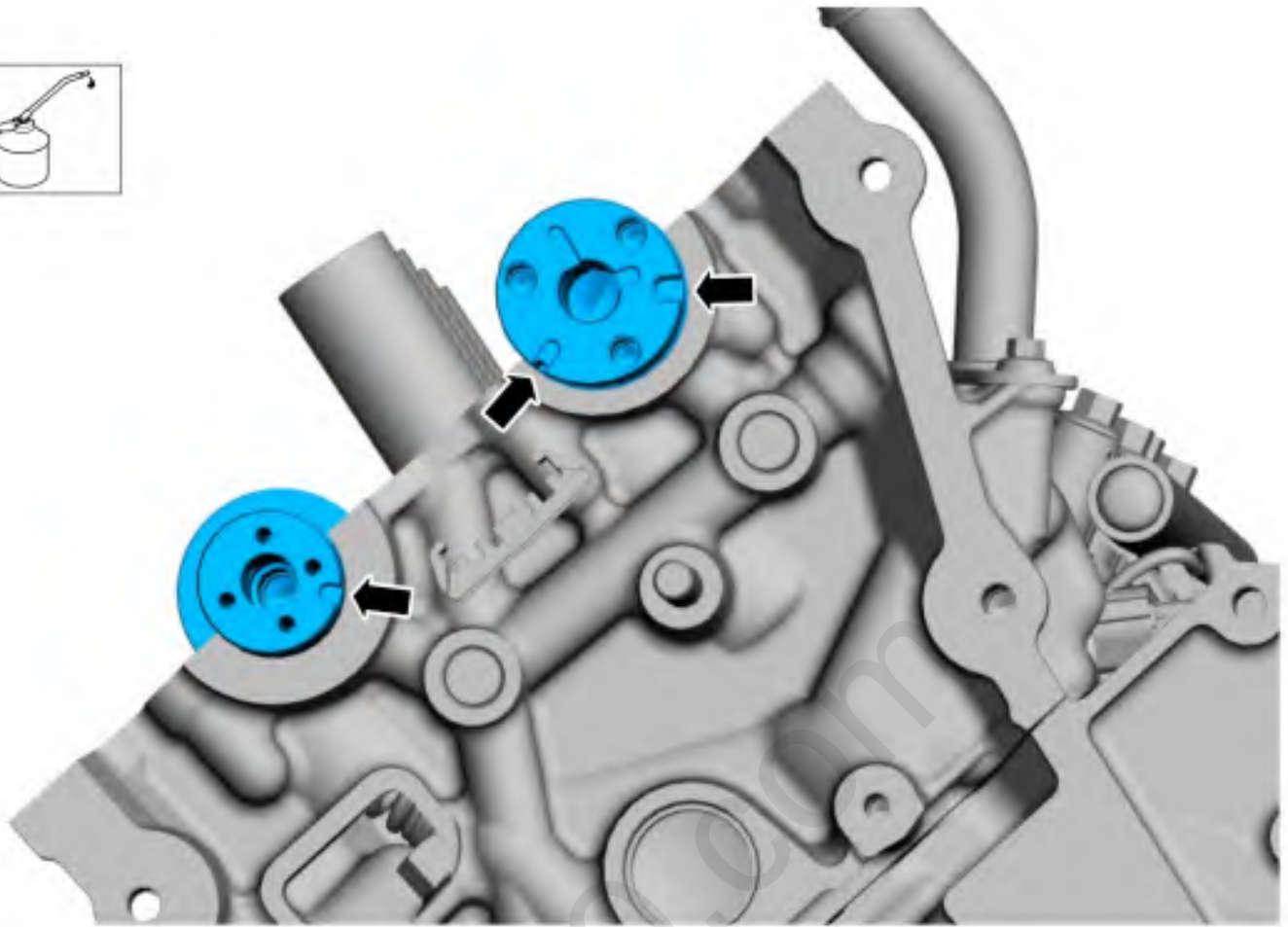
Installation

1. **NOTE:** *If the components are to be reinstalled, they must be installed in their original locations.*
 1. Assemble the hydraulic lash adjusters onto the spring clips on the camshaft roller followers.
 2. Lubricate the camshaft roller follower and hydraulic lash adjuster assemblies with clean engine oil.
 3. Install the camshaft roller follower and hydraulic lash adjuster assemblies.



2. **NOTE:** *Lubricate the camshafts with clean engine oil prior to installation.*

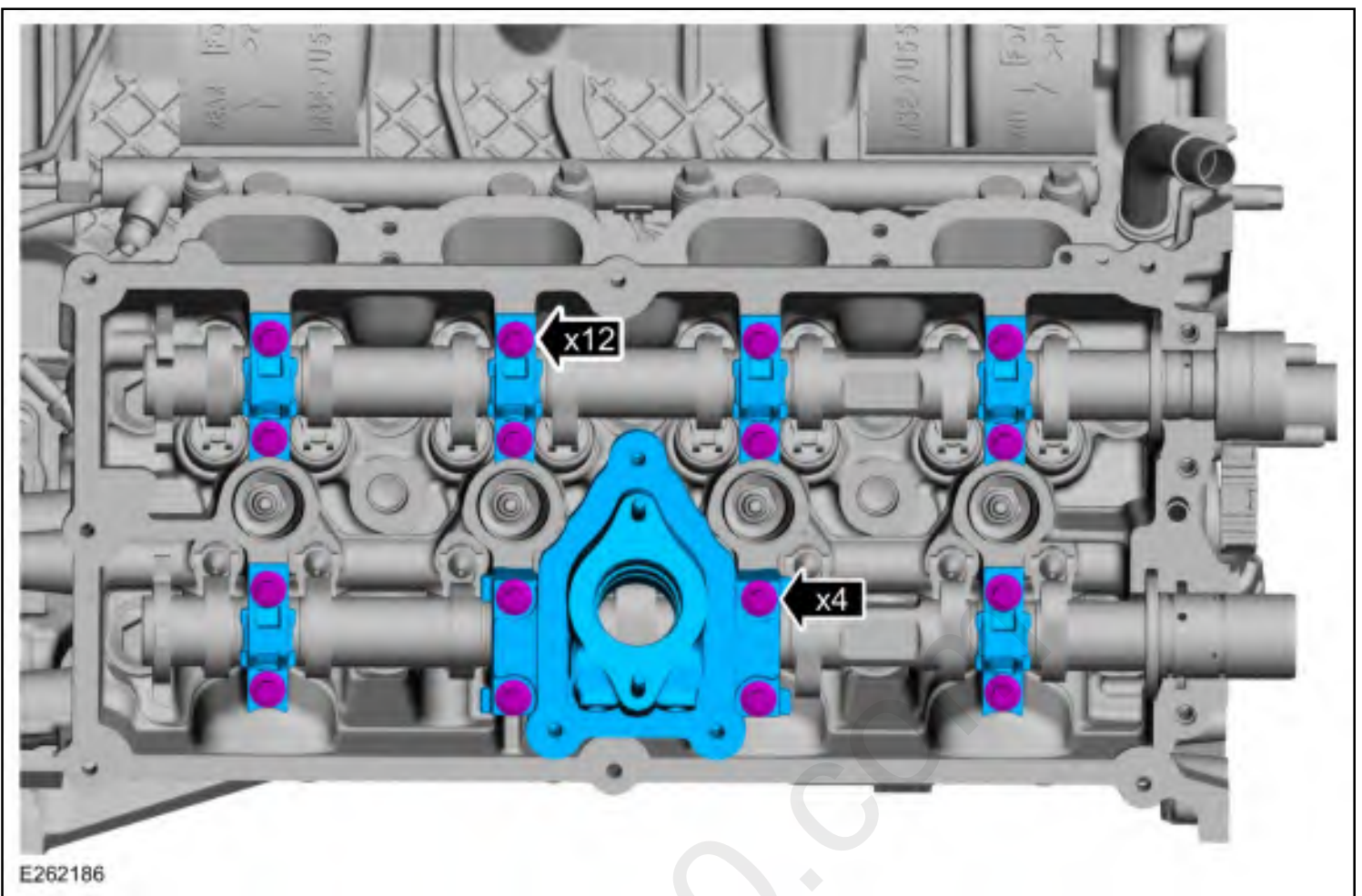
Install the intake and exhaust camshafts in the neutral position. Align the D-slots as shown in the illustration.



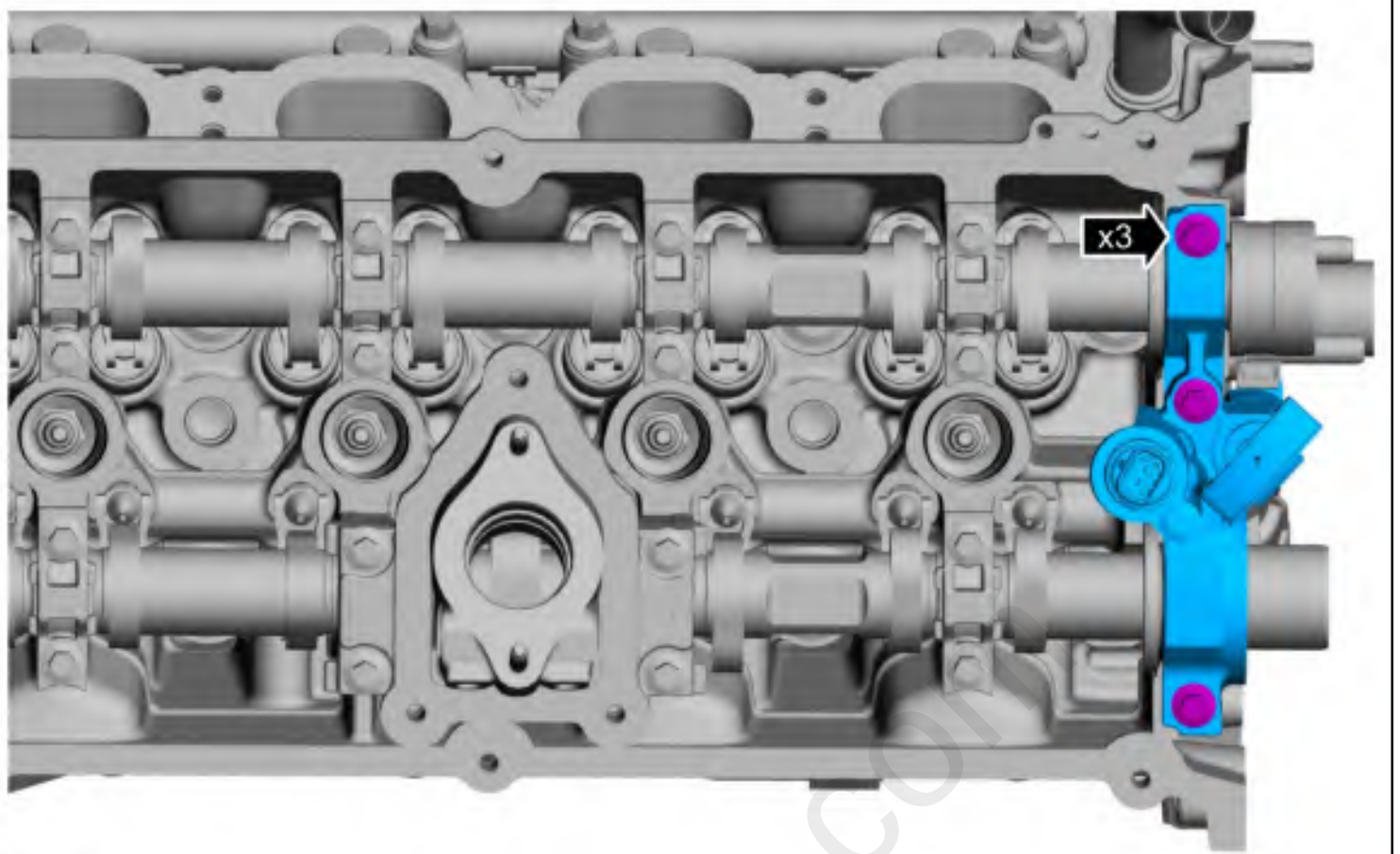
E262188



3. Install the camshaft bearing caps and the bolts. Do not tighten at this time.



4. Install the front camshaft bearing mega cap and the bolts. Do not tighten at this time.



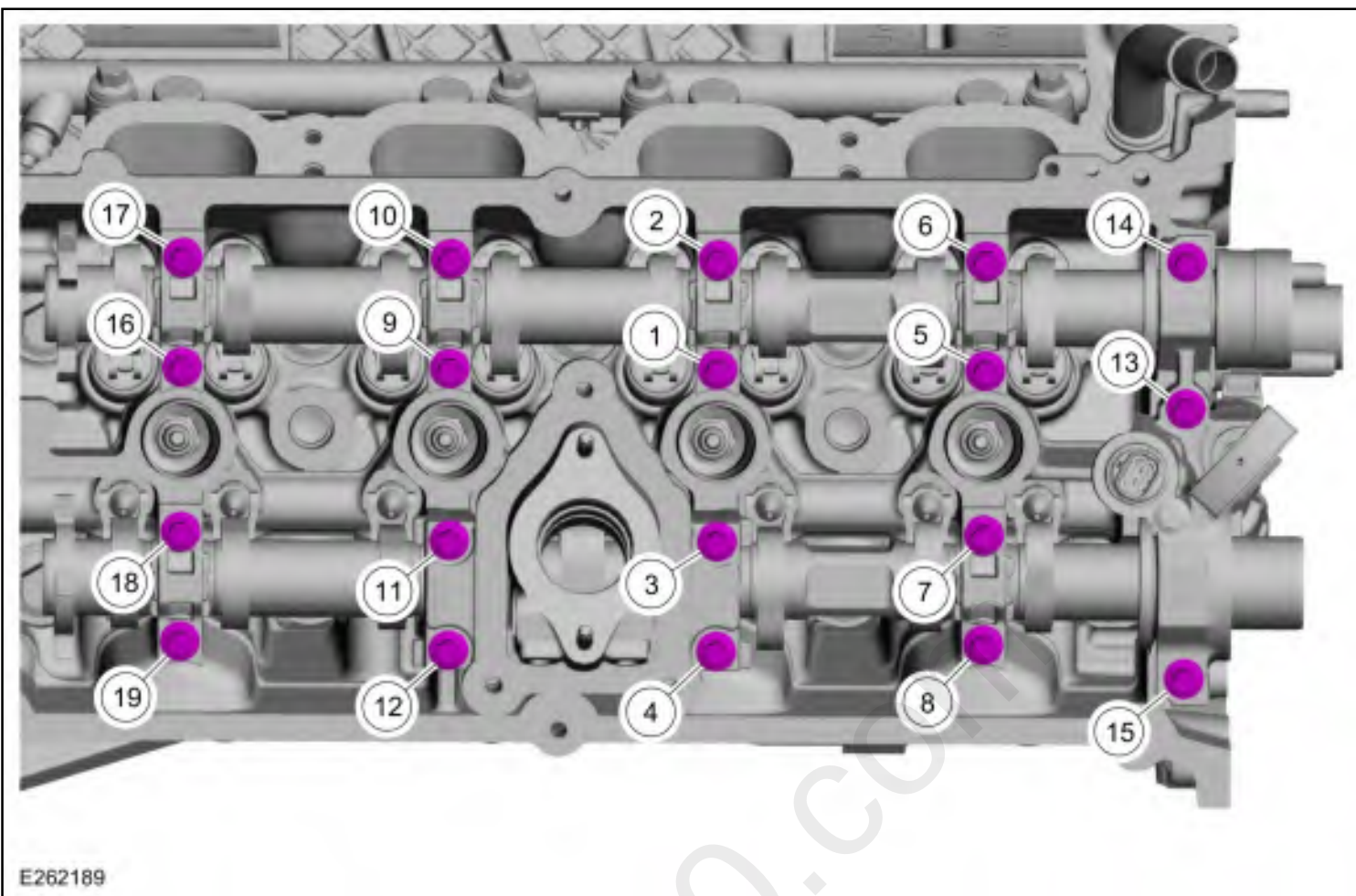
E262060

5. Tighten the bolts in sequence.

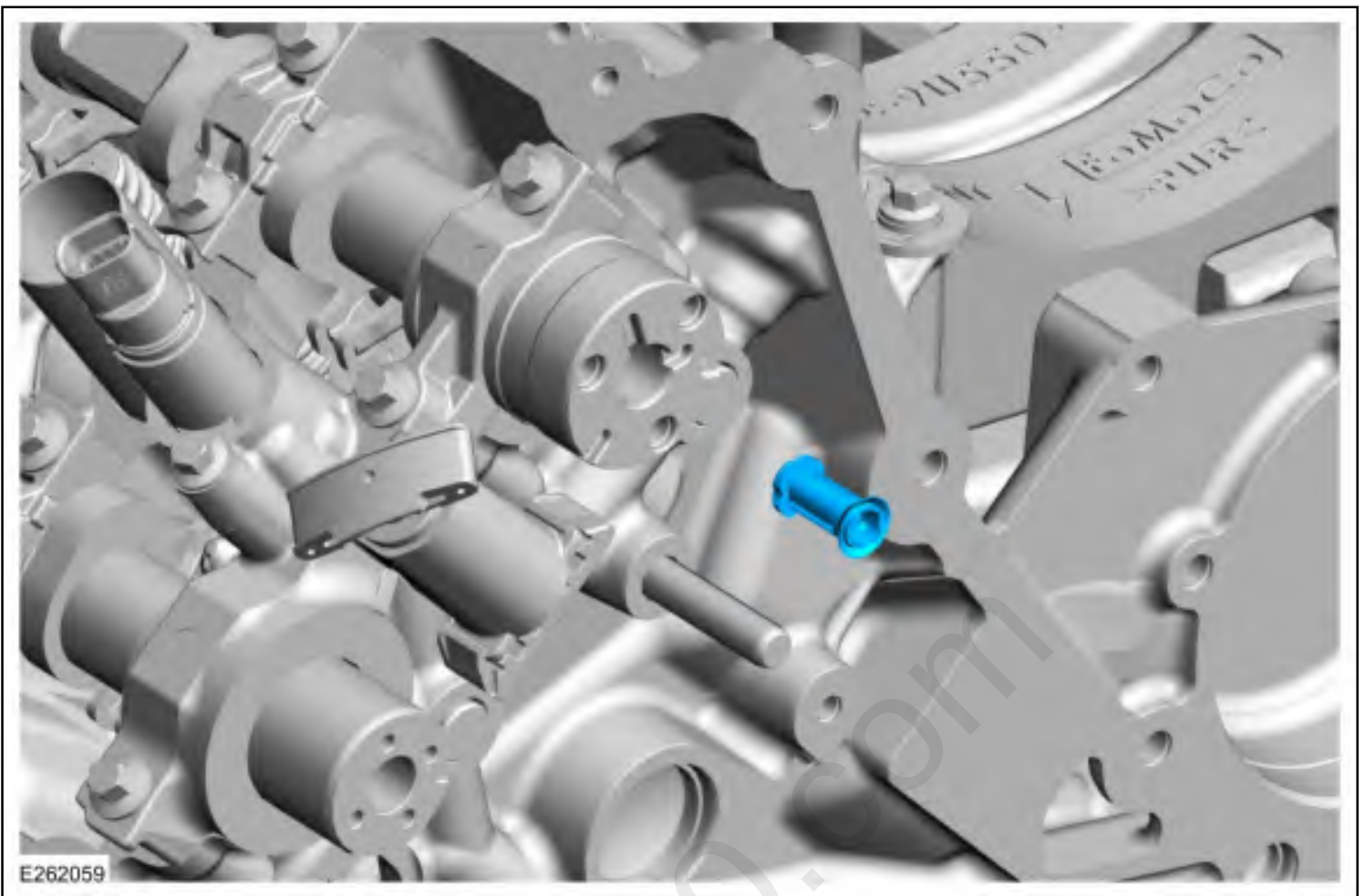
Torque:

Stage 1: Bolts 1-19: 53 lb.in (6 Nm)

Stage 2: Bolts 1-2, 5-10, 13-19: 45° Bolts 3-4, 11-12: 90°



6. Install a new VCT system oil filter into the camshaft.



7. Install the RH VCT units.

Refer to: Variable Camshaft Timing (VCT) Unit (303-01 Engine - 5.0L 32V Ti-VCT) .

Oil Pan

Base Part Number: Base Part Number: 6675

Special Tool(s) / General Equipment

Plastic Scraper
Oil Drain Equipment
Vehicle/Axle Stands

Materials

Name	Specification
Motorcraft® Silicone Gasket Remover ZC-30-A	-
Motorcraft® Metal Surface Prep Wipes ZC-31-B	-
Motorcraft® Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Metal Brake Parts Cleaner PM-4-A, PM-4-B	-

Removal

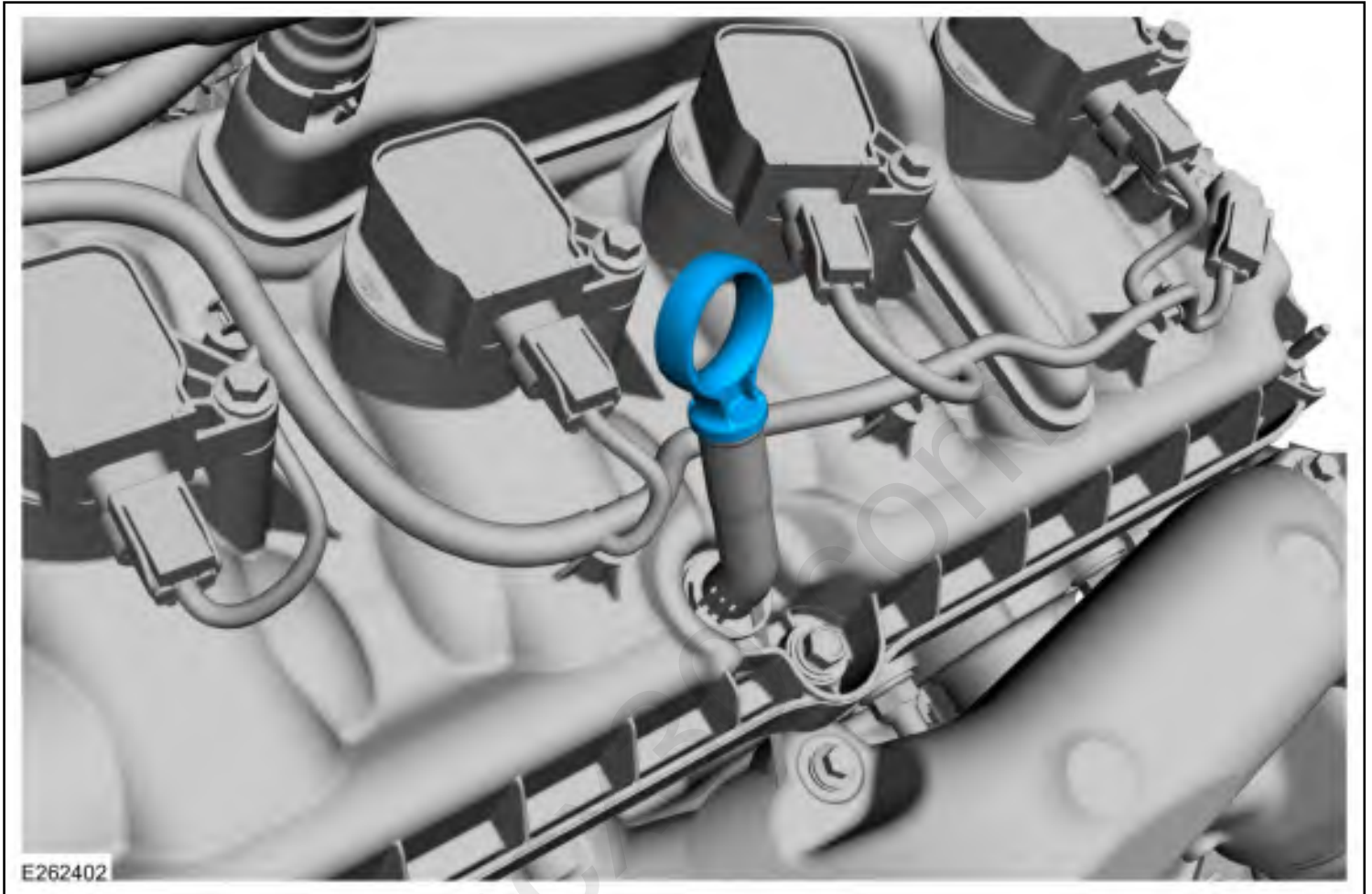
NOTICE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

4x2/4x4

1. With the vehicle in NEUTRAL, position it on a hoist.

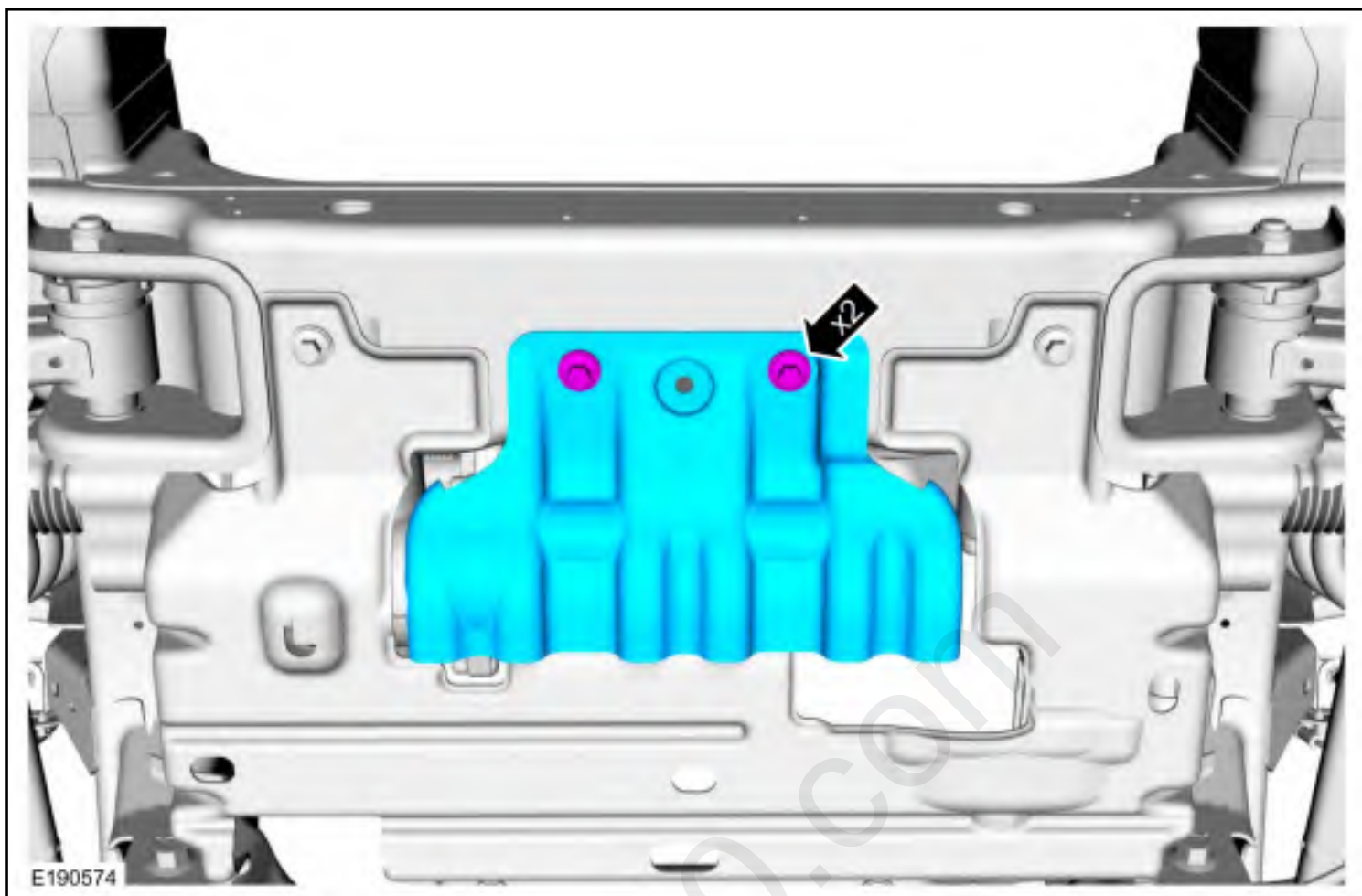
Refer to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).

2. Disconnect the battery ground cable.
Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .
3. Remove the oil level indicator.



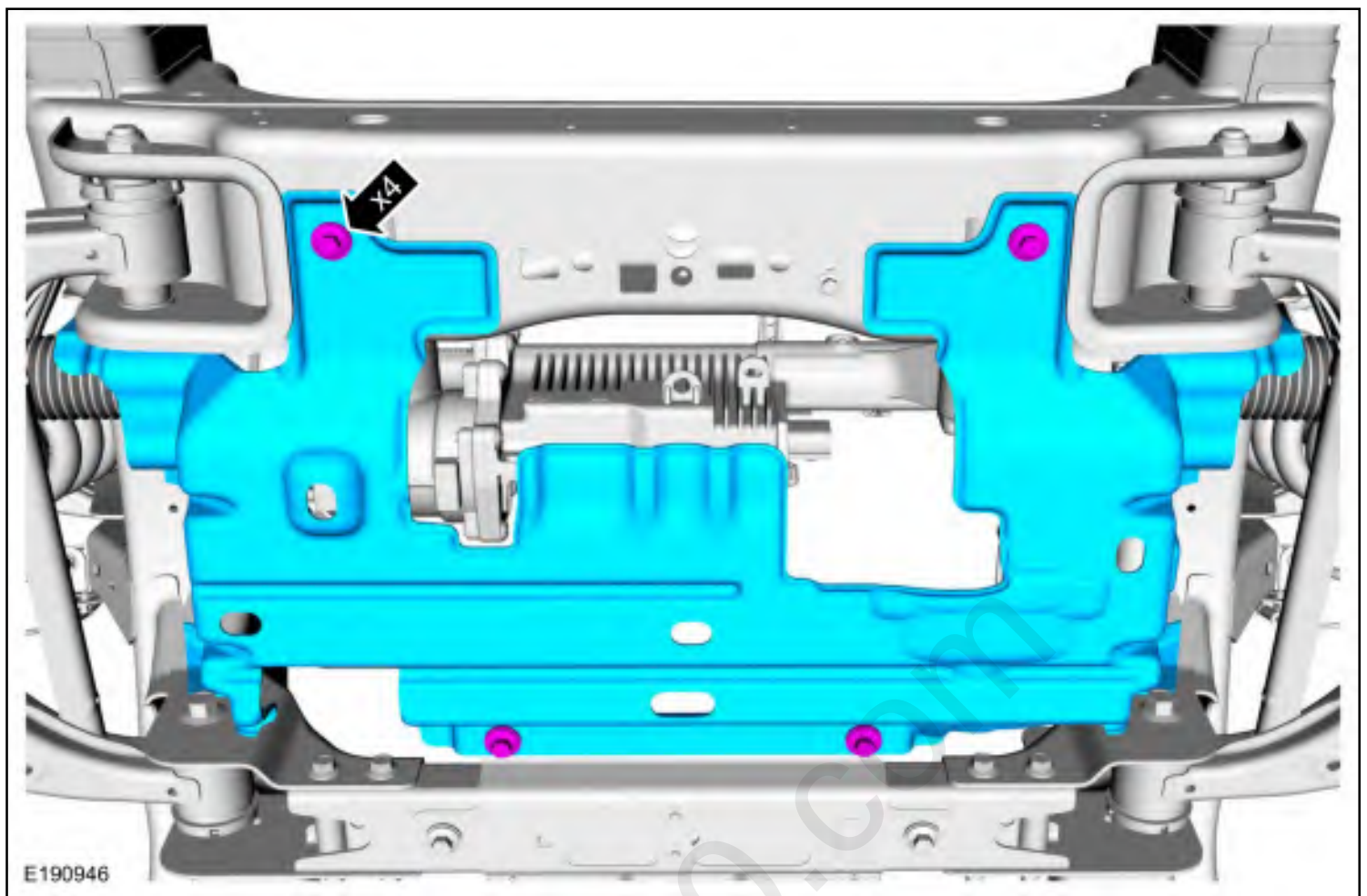
4. **NOTE:** *If equipped.*

Remove the bolts and the skid plate.



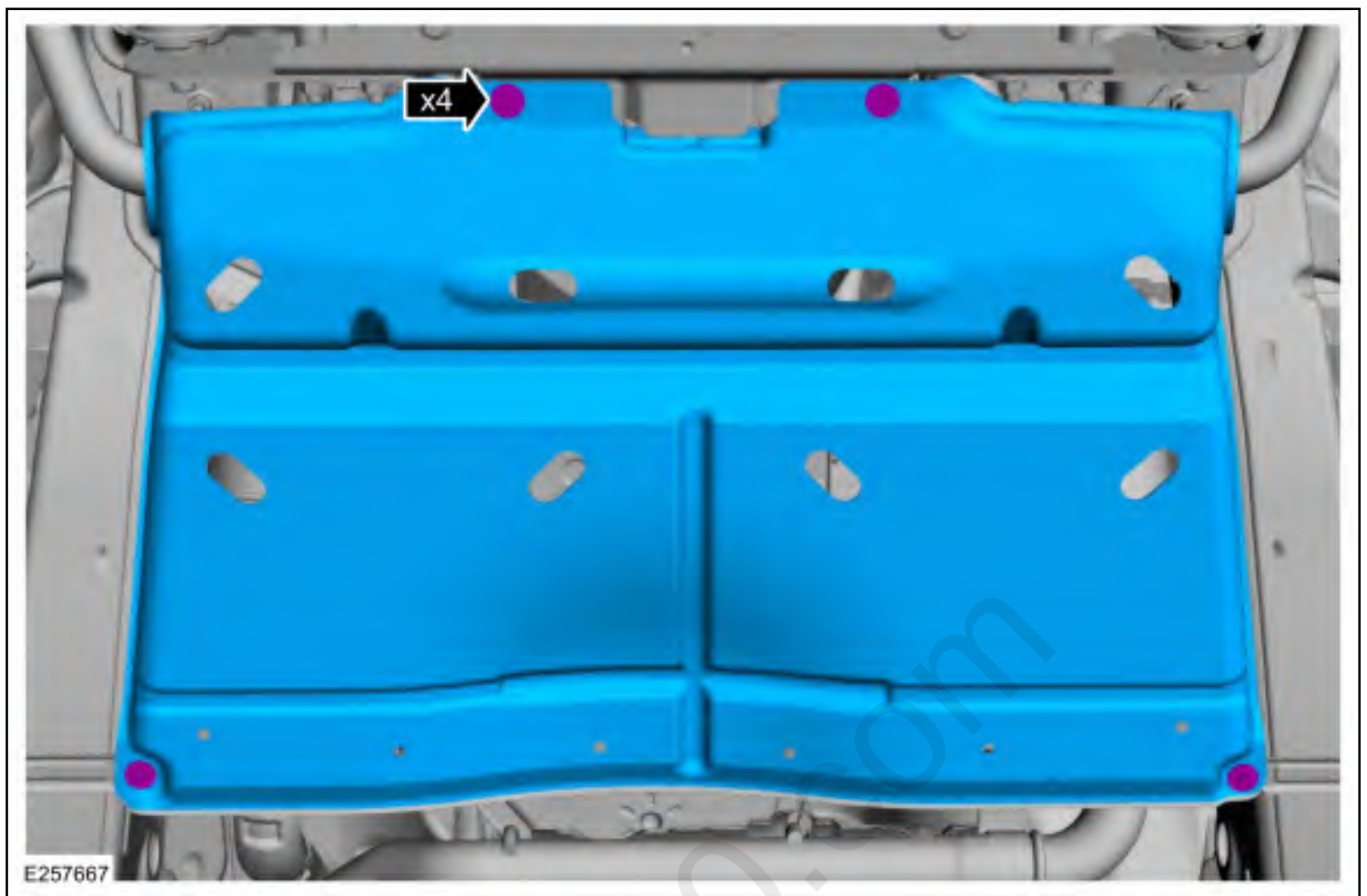
5. **NOTE:** *If equipped.*

Remove the fasteners and the underbody shield.



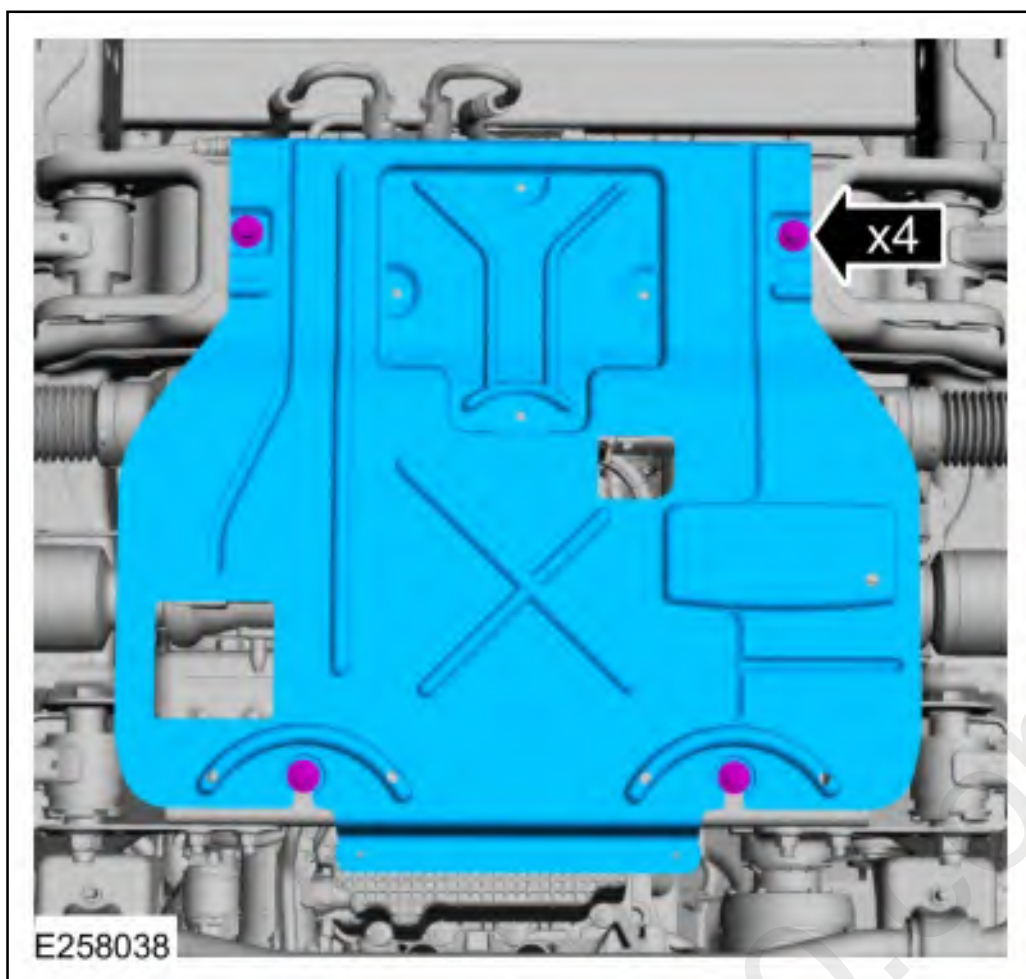
6. **NOTE:** *If equipped.*

Remove the bolts and the underbody shield.

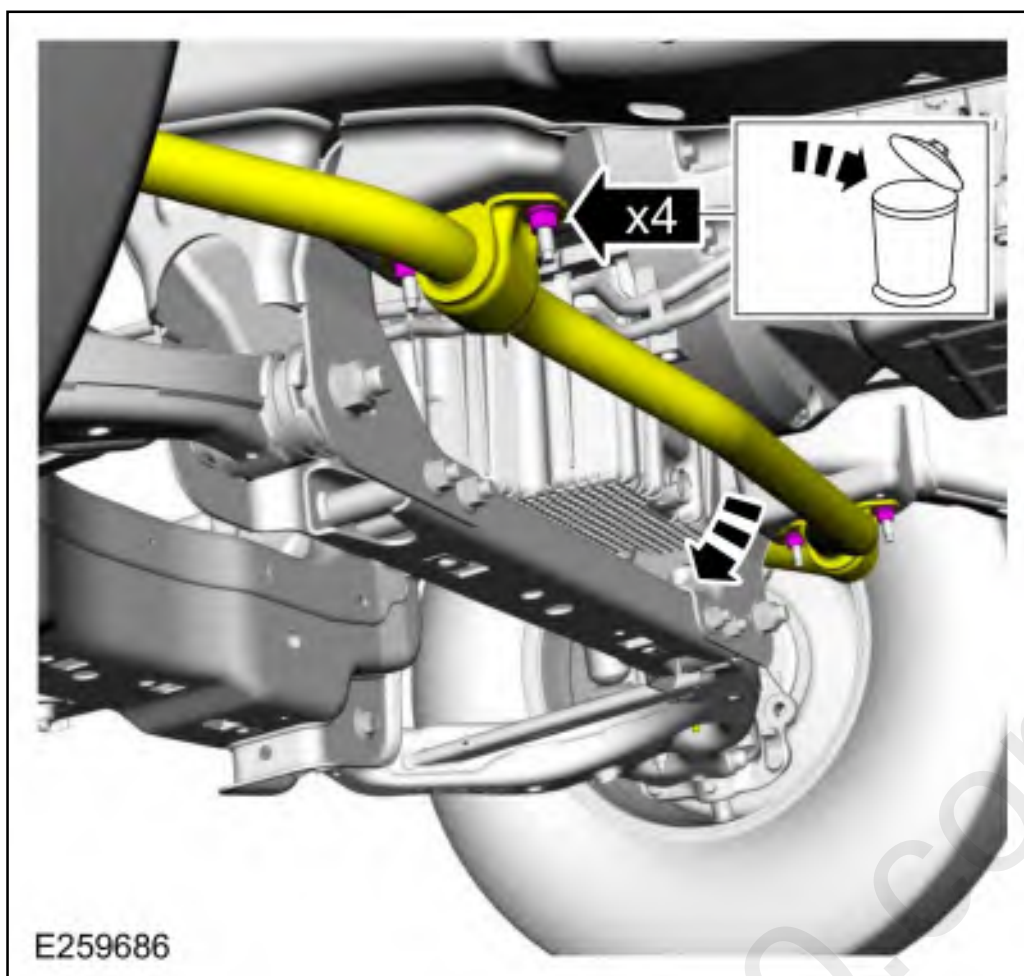


7. **NOTE:** *If equipped.*

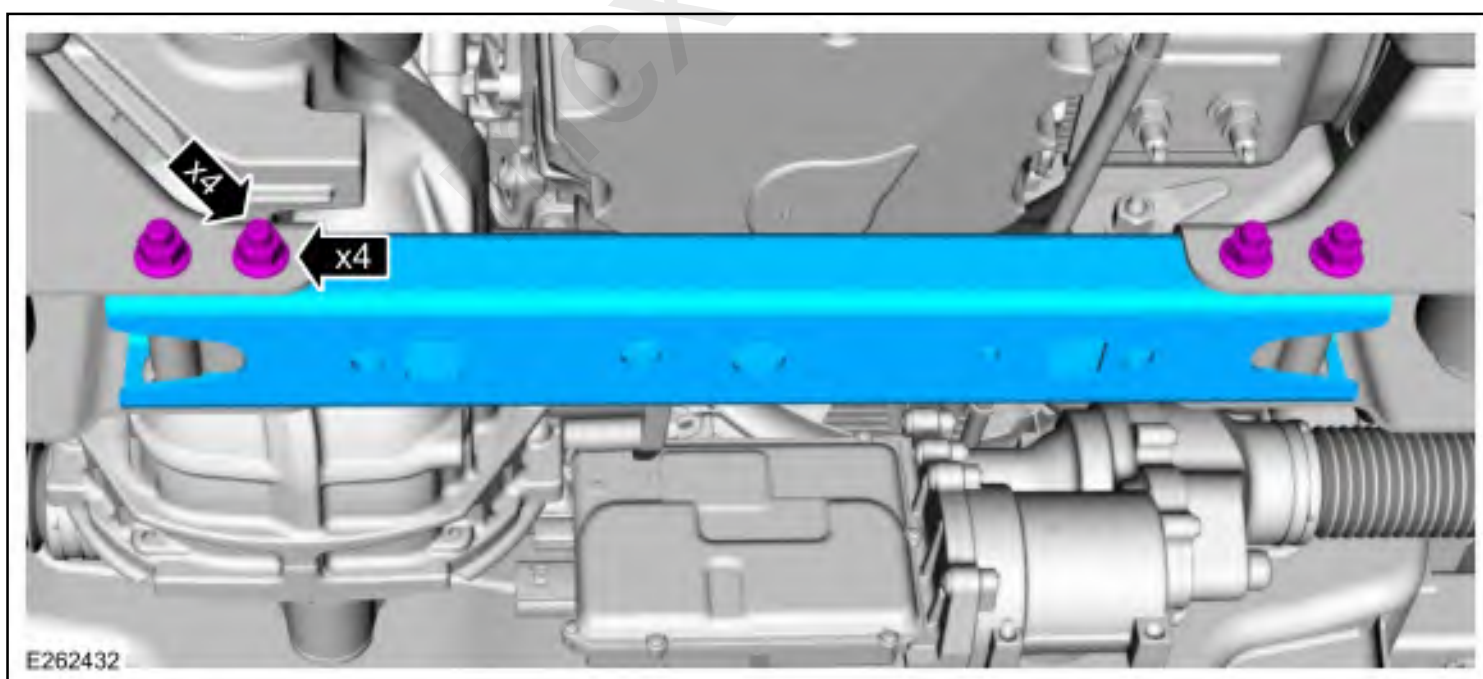
Remove the bolts and the skid plate.



8. Remove and discard the stabilizer bar bracket nuts.
 - Allow the stabilizer bar to swing downward.



9. Remove the nuts, bolts and the crossmember.



10. Remove the following items:
1. Transmission fluid cooler.

Refer to: [Transmission Fluid Cooler - 2.7L EcoBoost \(238kW/324PS\)/3.5L EcoBoost \(272kW/370PS\)/5.0L 32V Ti-VCT \(307-02 Transmission Cooling, Removal and Installation\)](#).

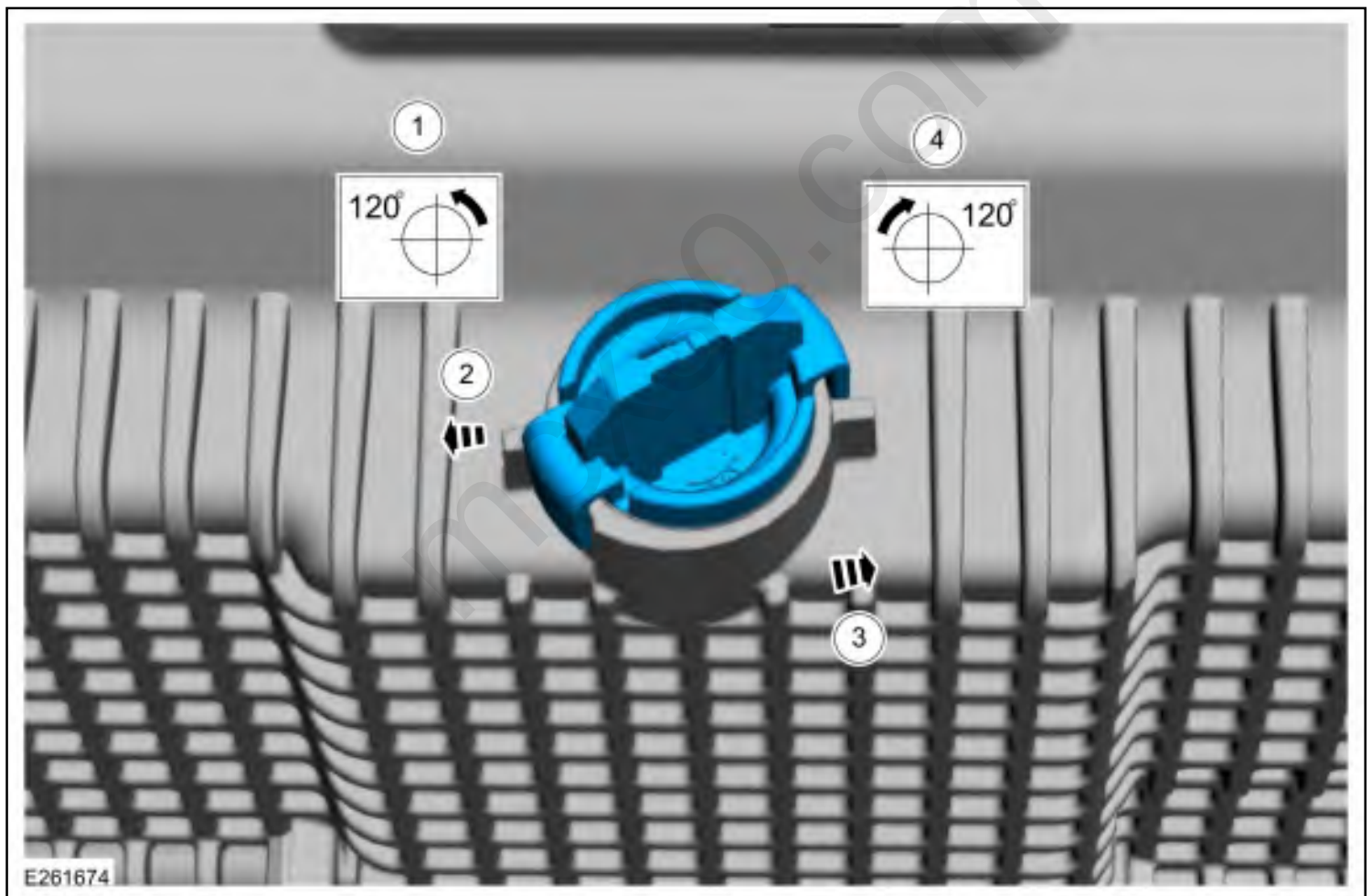
2. Engine oil cooler.

Refer to: [Oil Cooler](#) (303-01D Engine - 5.0L 32V Ti-VCT, Removal and Installation).

11. **NOTE:** *The drain plug should be removed and installed by hand, do not use tools.*

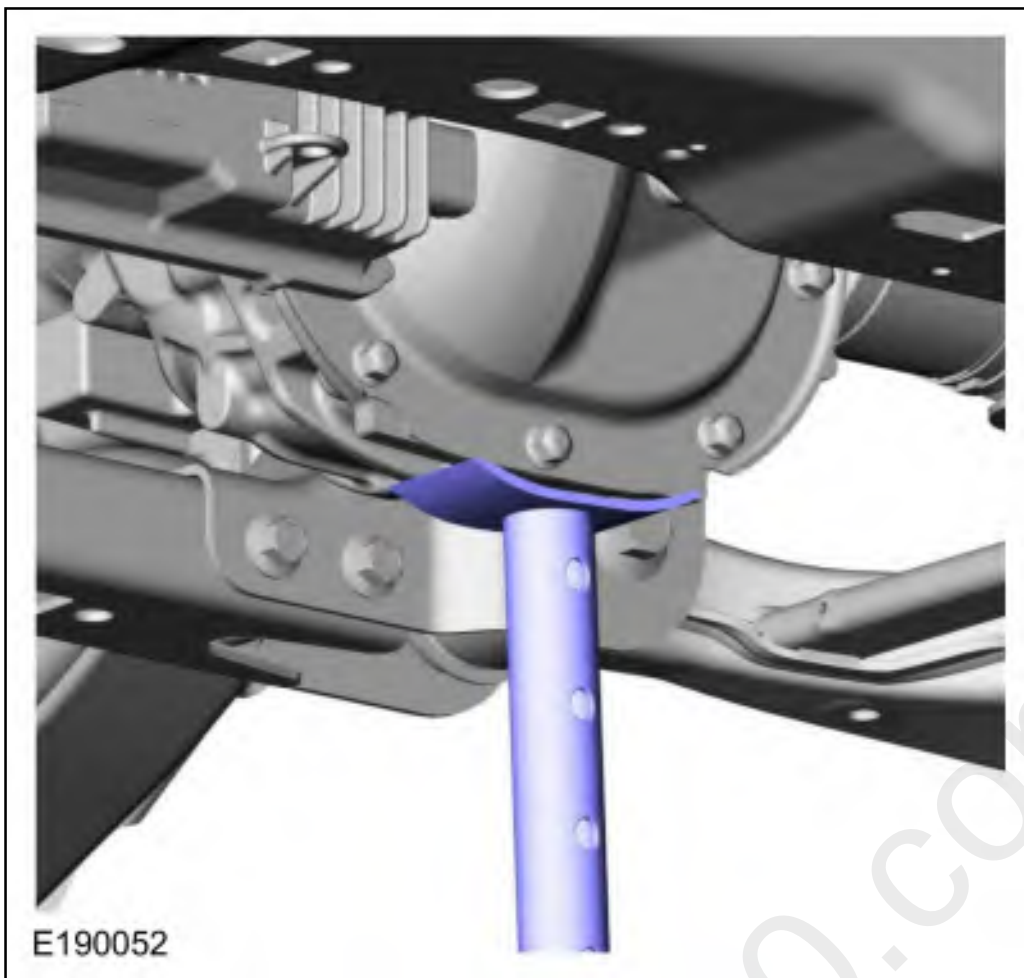
1. Turn the oil drain plug by hand counterclockwise 120 degrees.
Use the General Equipment: Oil Drain Equipment
2. Pull the oil drain plug out of the oil pan.
3. After the oil has drained, push the oil drain plug into the oil pan.
4. **NOTICE: Overtightening will damage the oil drain plug and possibly the oil pan.**

Turn the oil drain plug by hand clockwise 120 degrees.

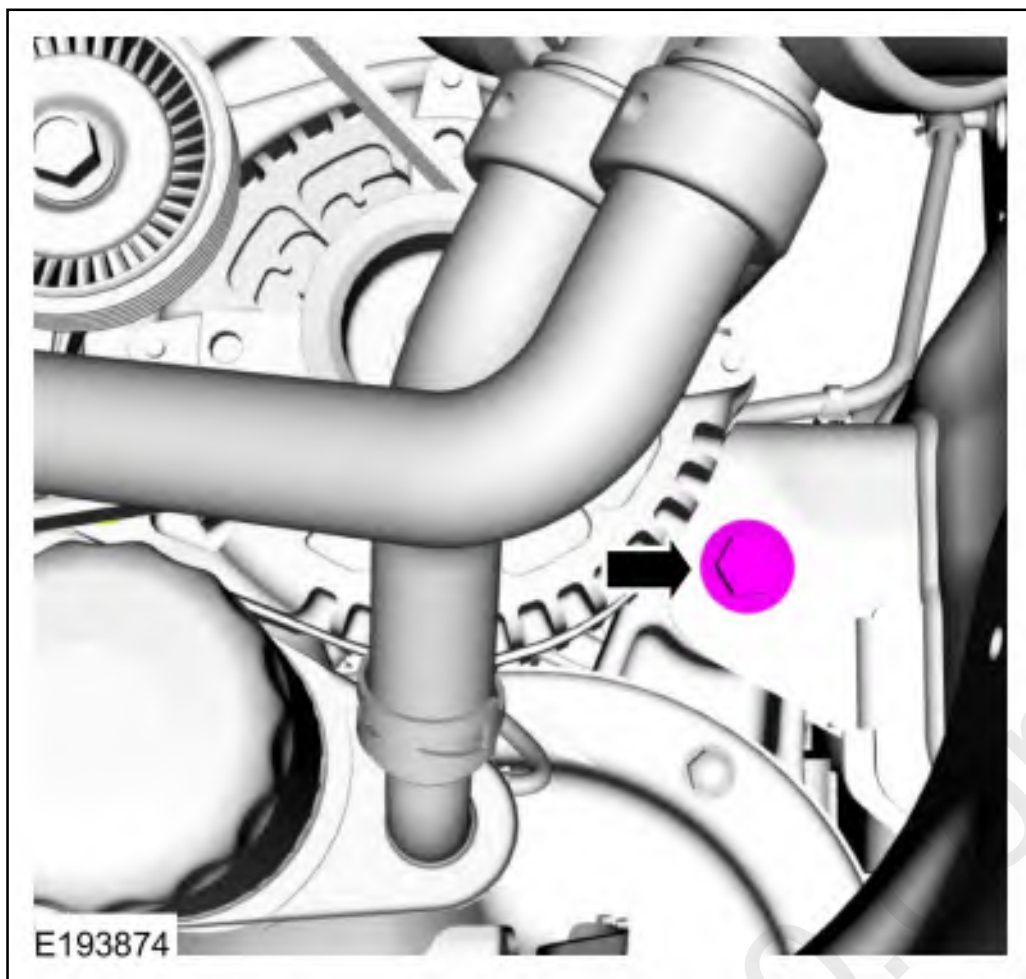


4x4

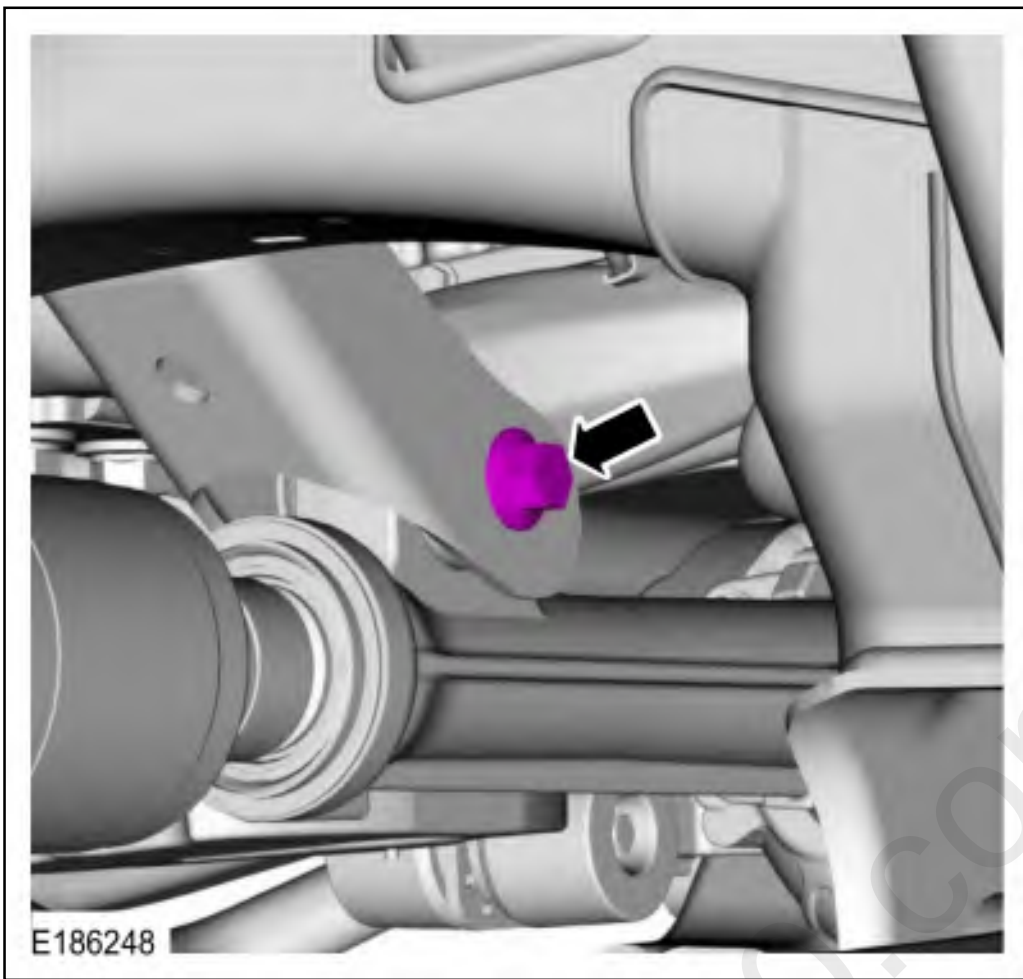
12. Using an adjustable stand, support the front axle.
Use the General Equipment: Vehicle/Axle Stands



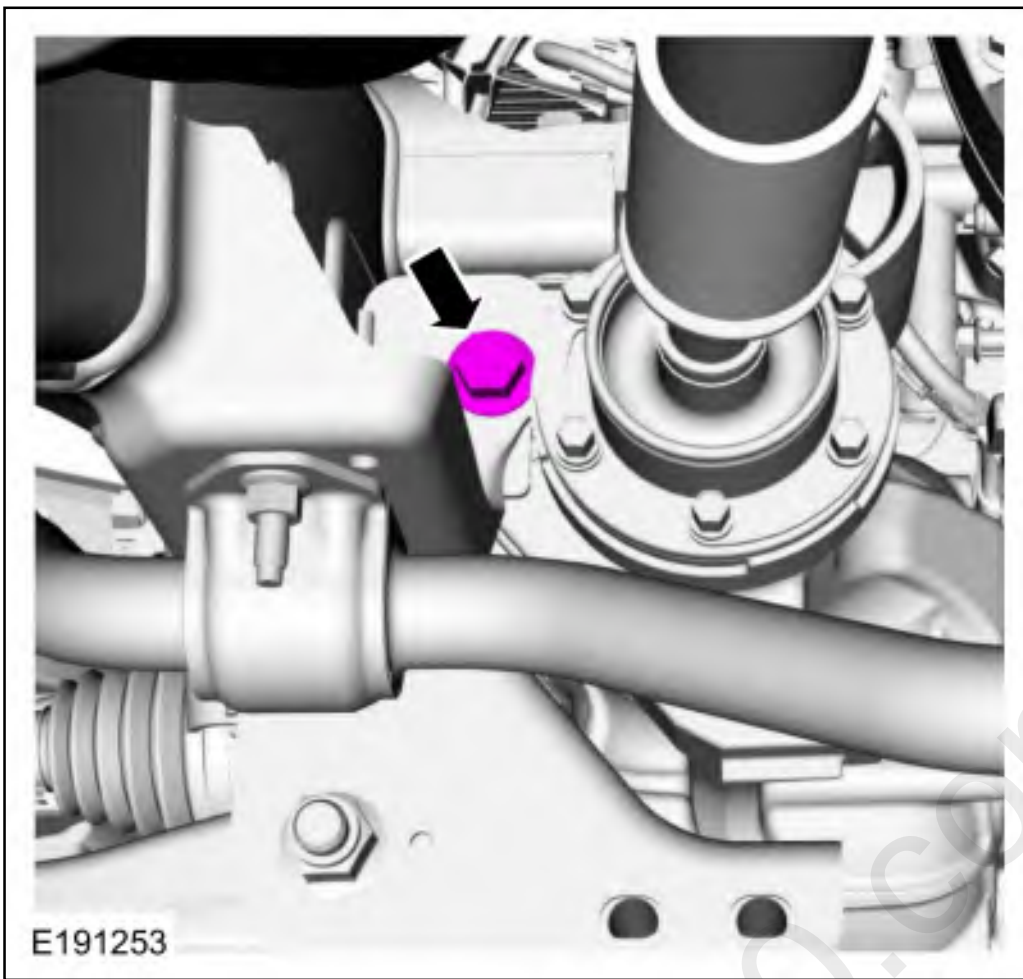
13. Remove the upper front axle carrier mounting bushing bolt.



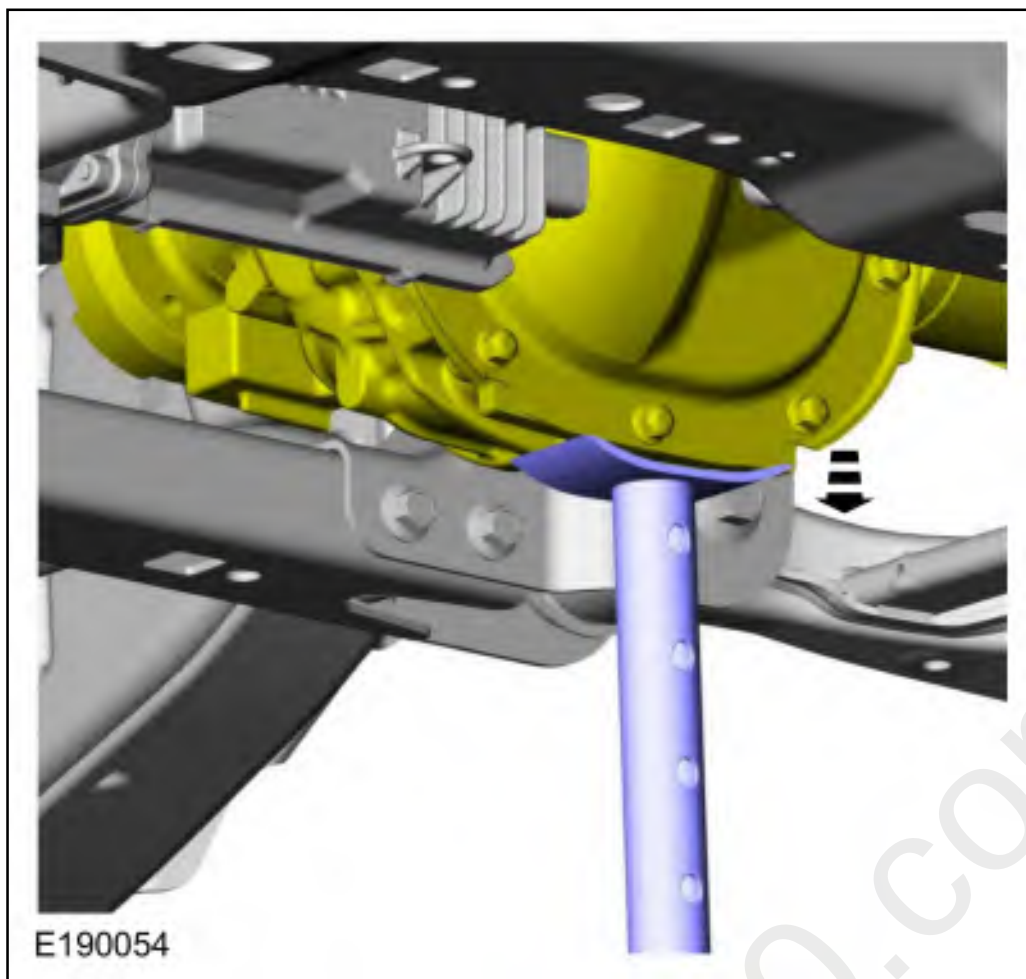
14. Remove the axle shaft housing carrier bushing bolt.



15. Remove the lower front axle carrier mounting bushing bolt.

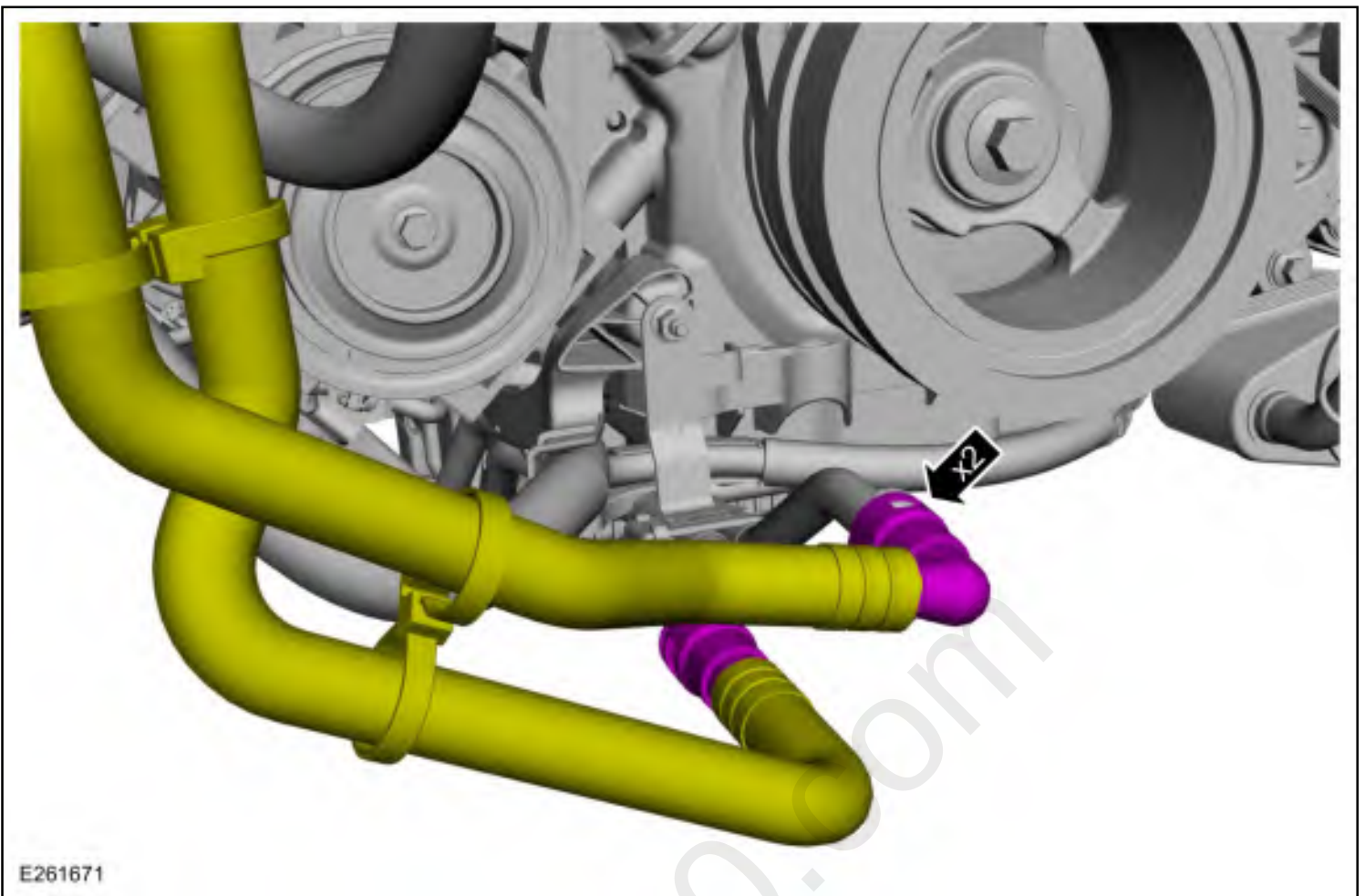


16. Using an adjustable stand, lower the axle to allow clearance for the oil pan to be removed.
Use the General Equipment: Vehicle/Axle Stands

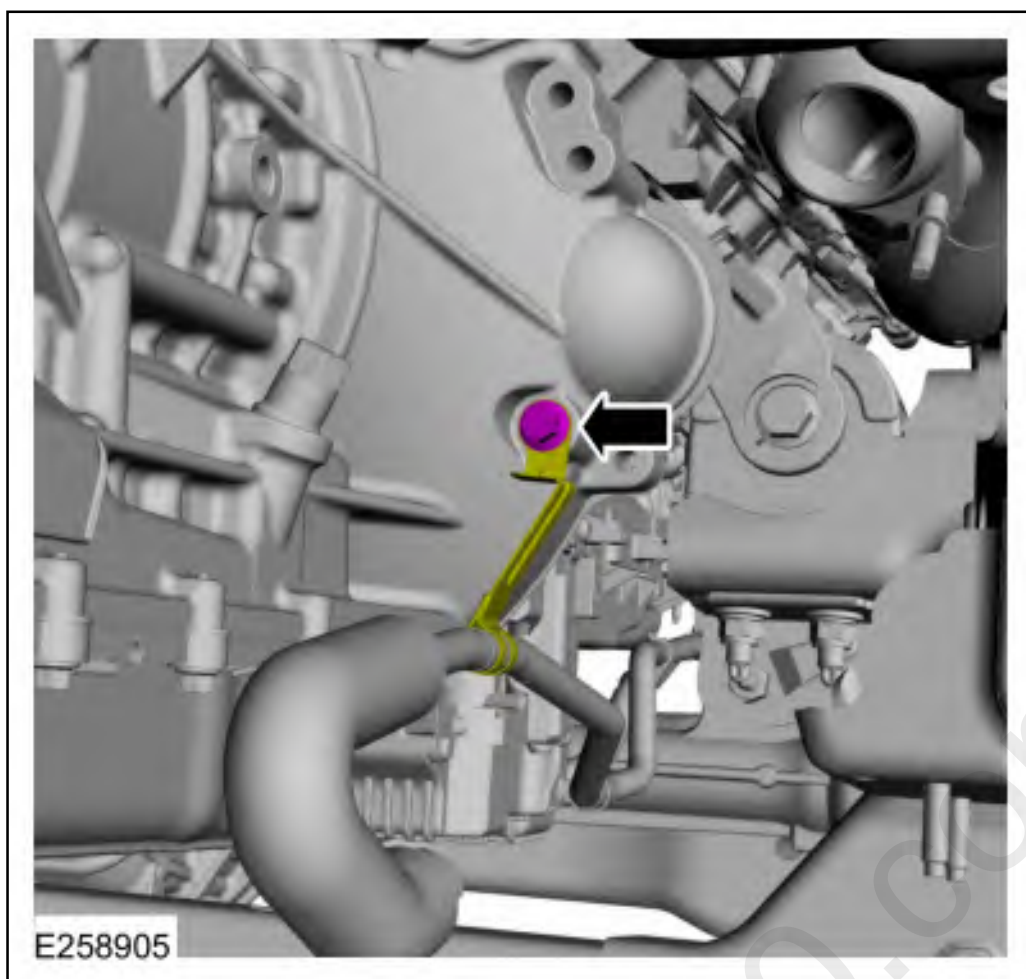


4x2/4x4

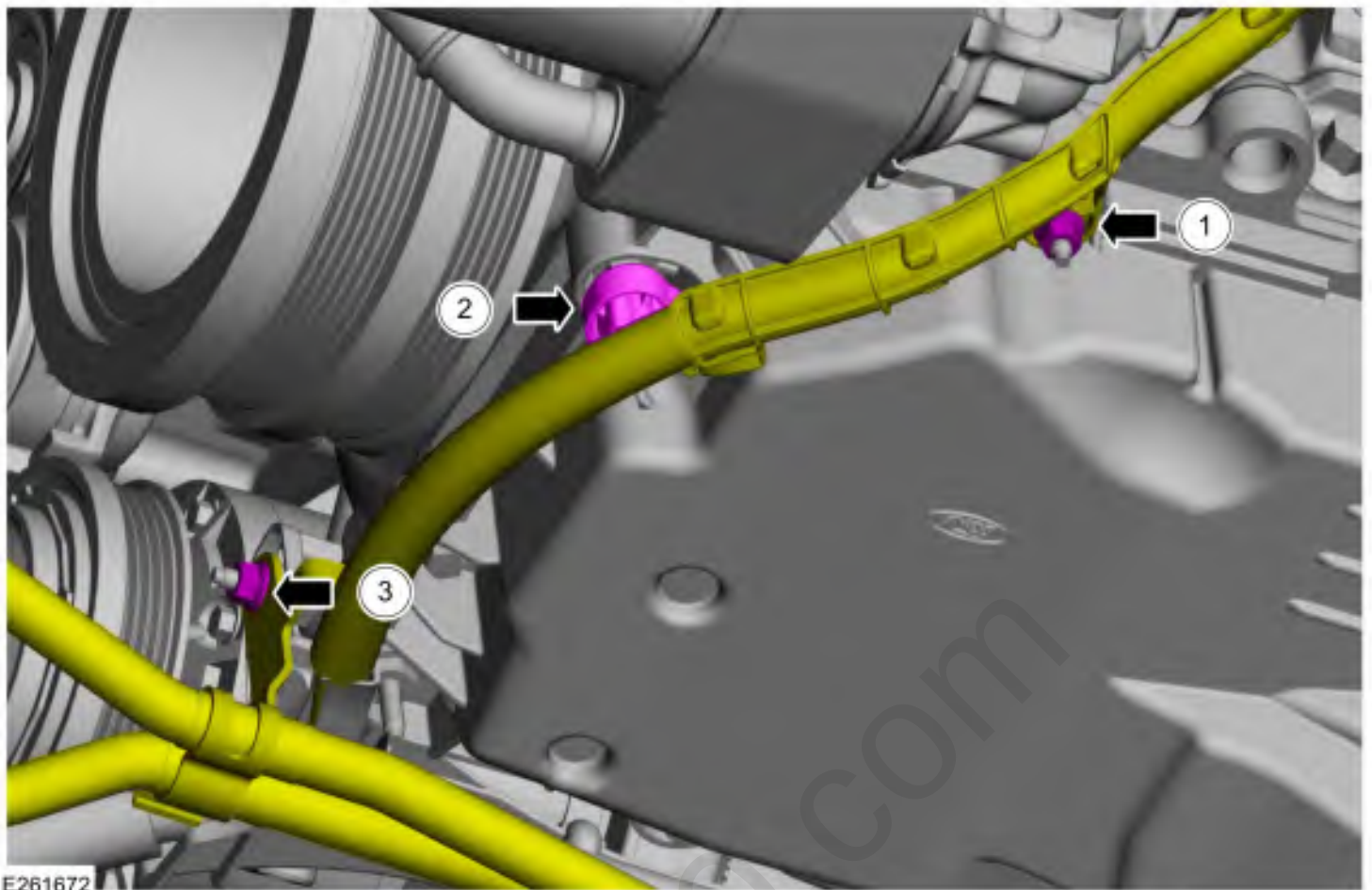
17. Disconnect the coolant hose quick release couplings.



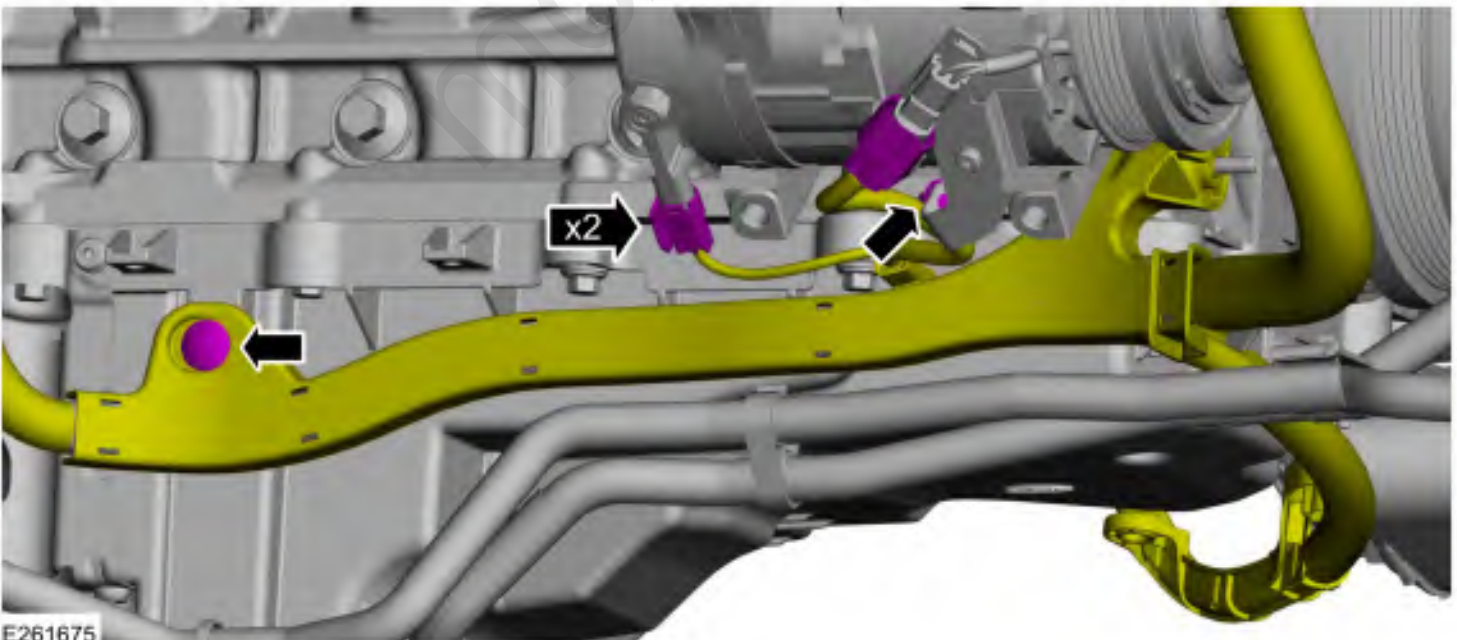
18. Remove the transmission-to-engine bolt and transmission cooler tube support bracket.



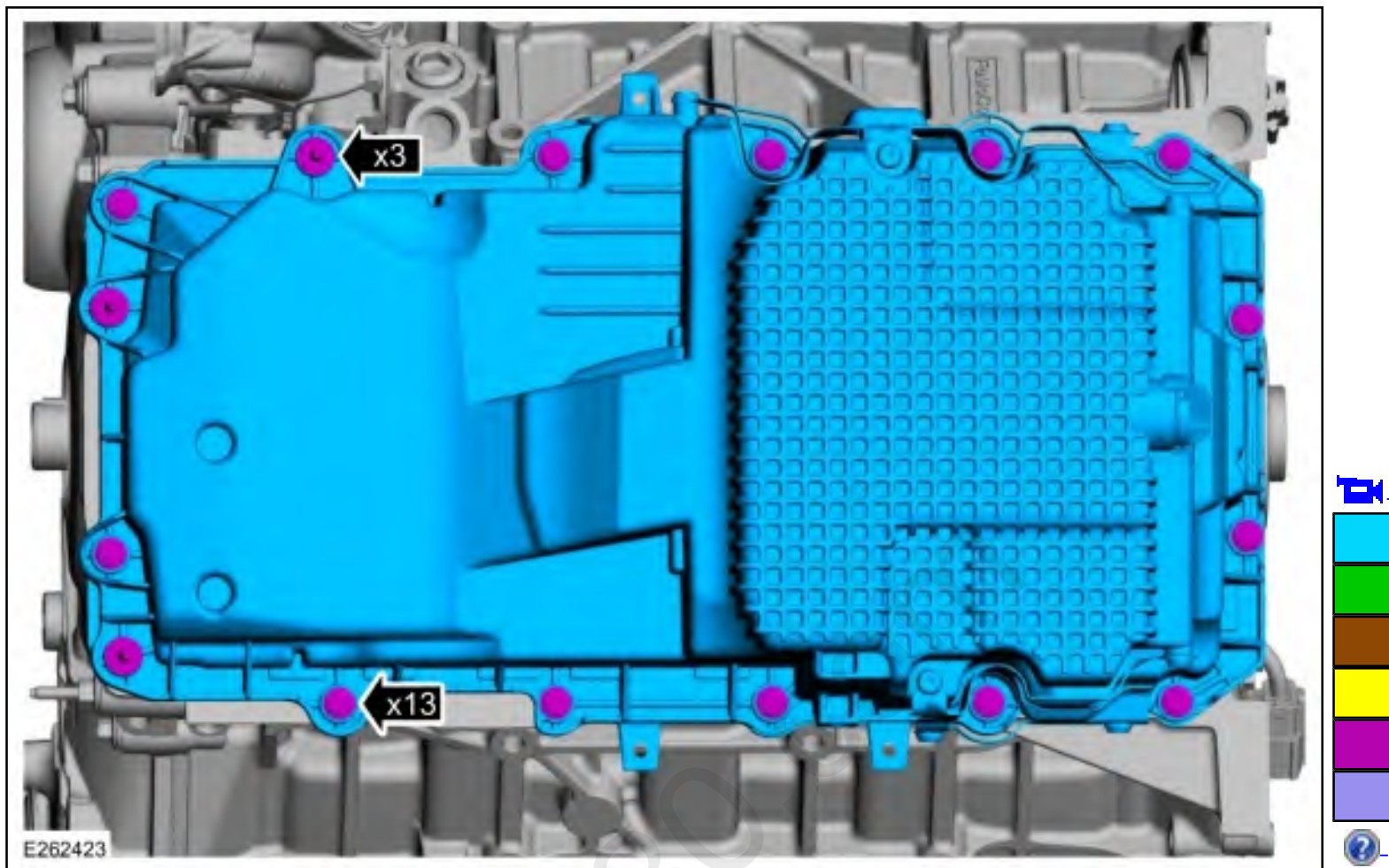
1. Remove the nut.
2. Detach the wiring harness retainer.
3. Remove the nut and position the coolant tube and wiring harness brackets aside.



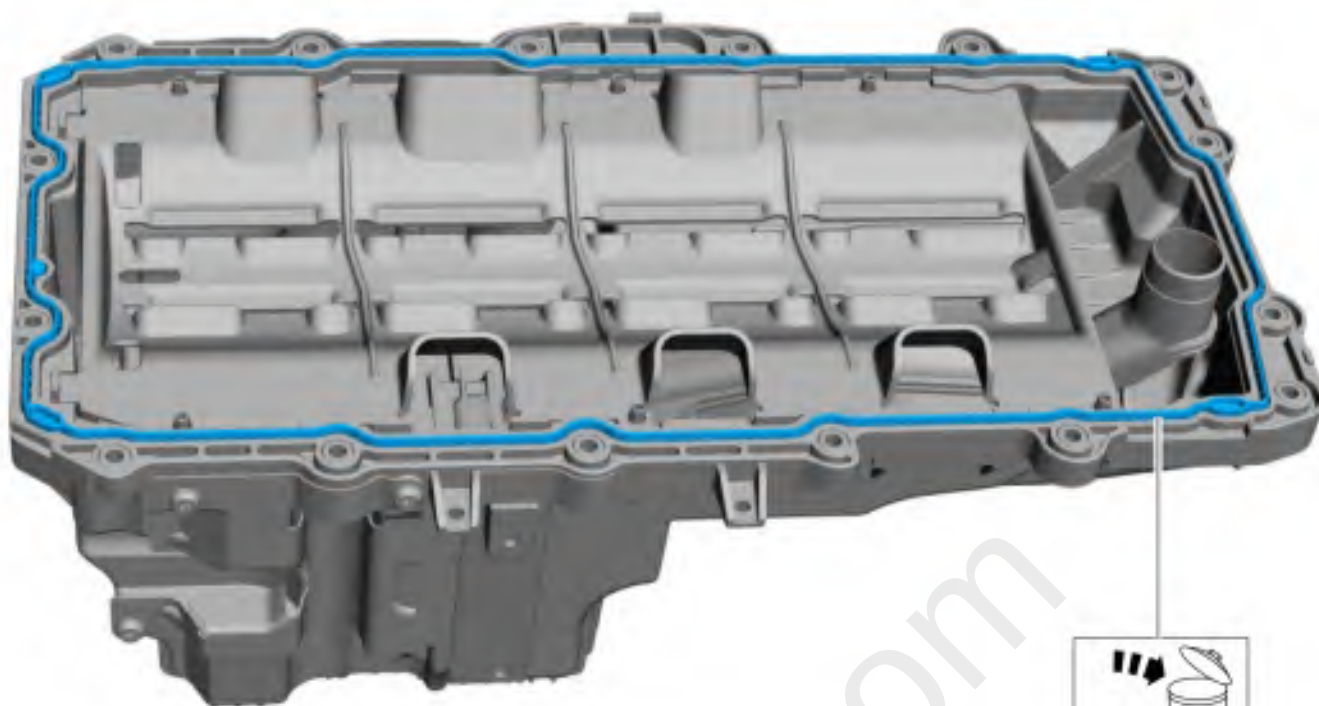
1. Disconnect the A/C compressor electrical connectors.
2. Detach the wiring harness retainers.



21. Remove the bolts, stud bolts and the oil pan.



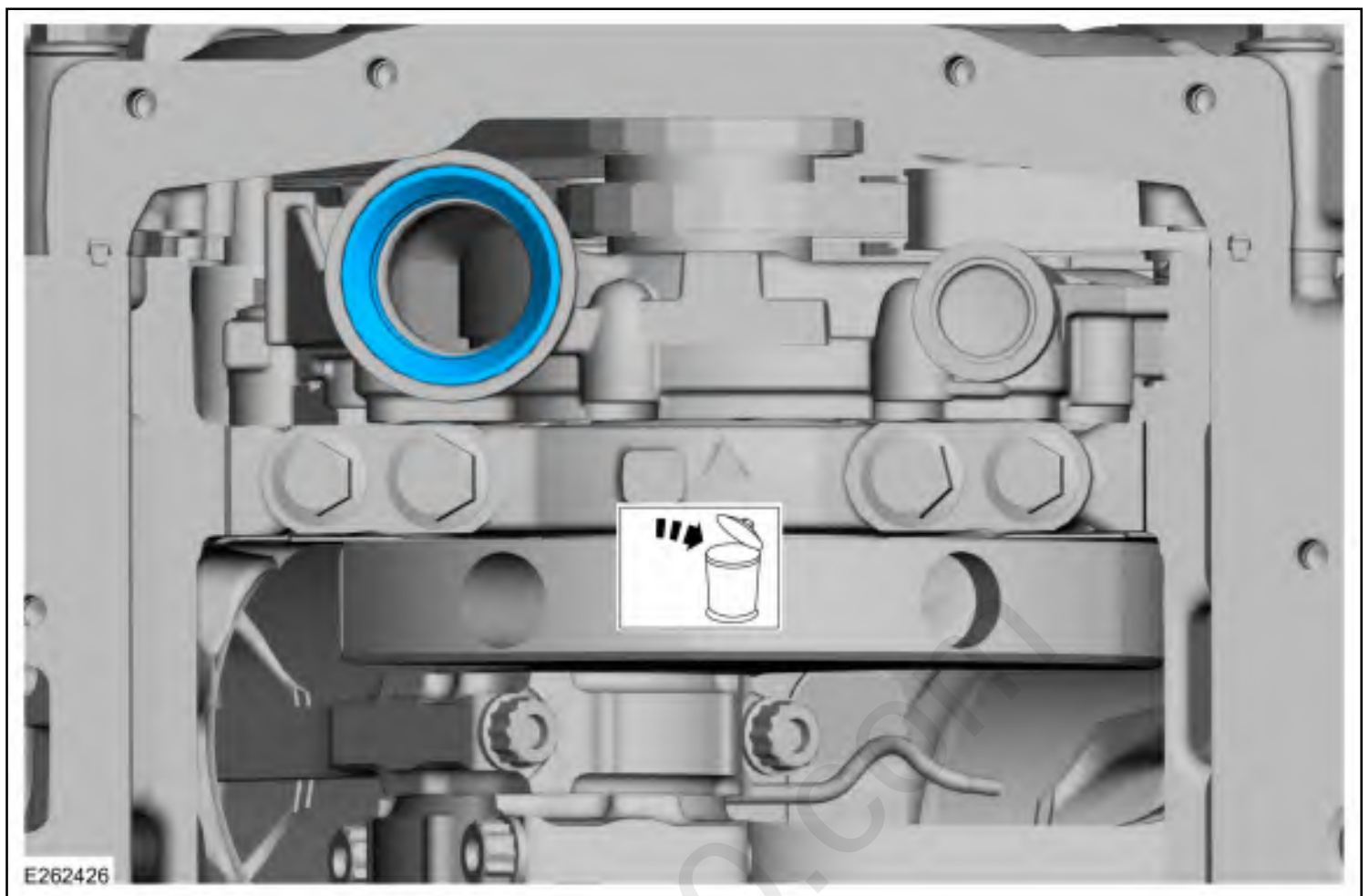
22. Remove and discard the oil pan gasket.



E262424

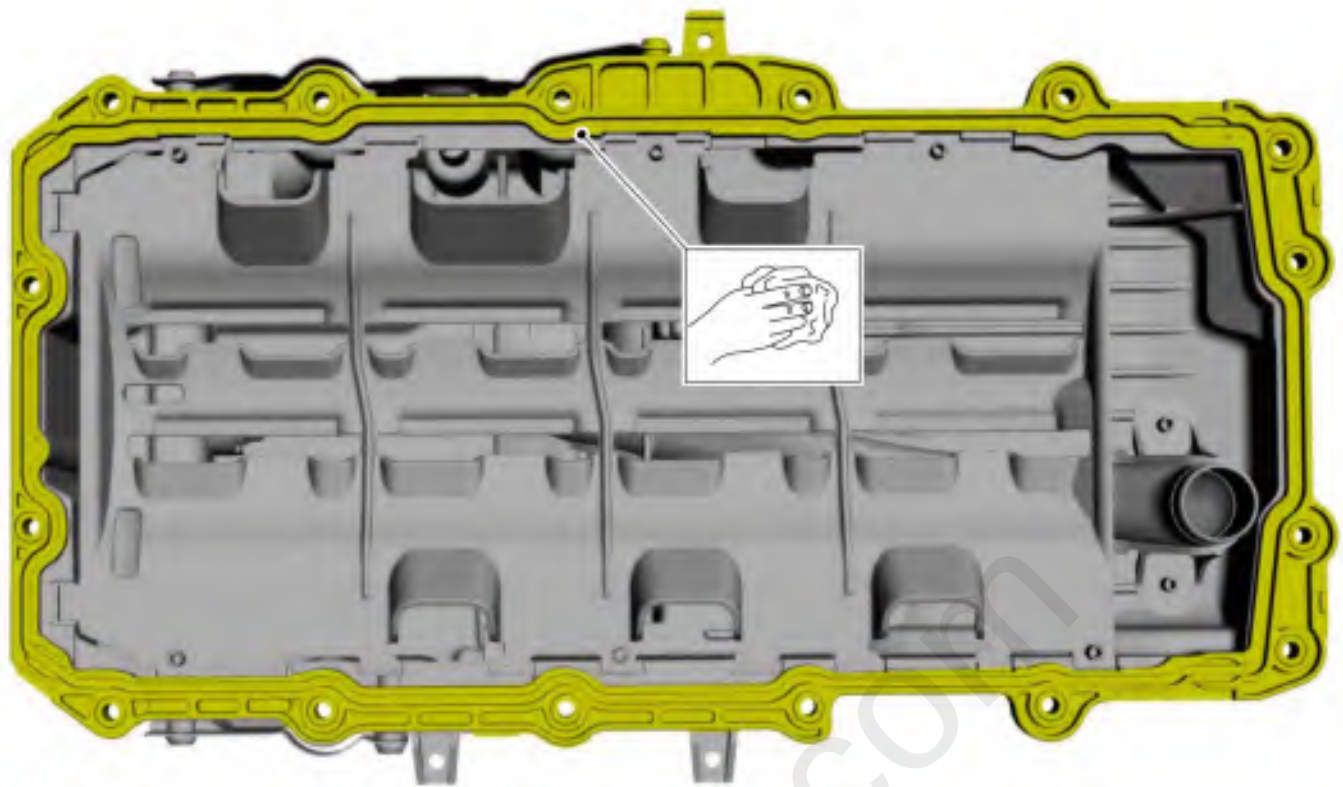
23. Remove and discard the oil pump pickup seal.





24. **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.



E262427

25. **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 traces of sealant.

Make sure that the oil pan mating faces of the cylinder block, engine front cover and rear seal retaining plate are clean and free of foreign material.

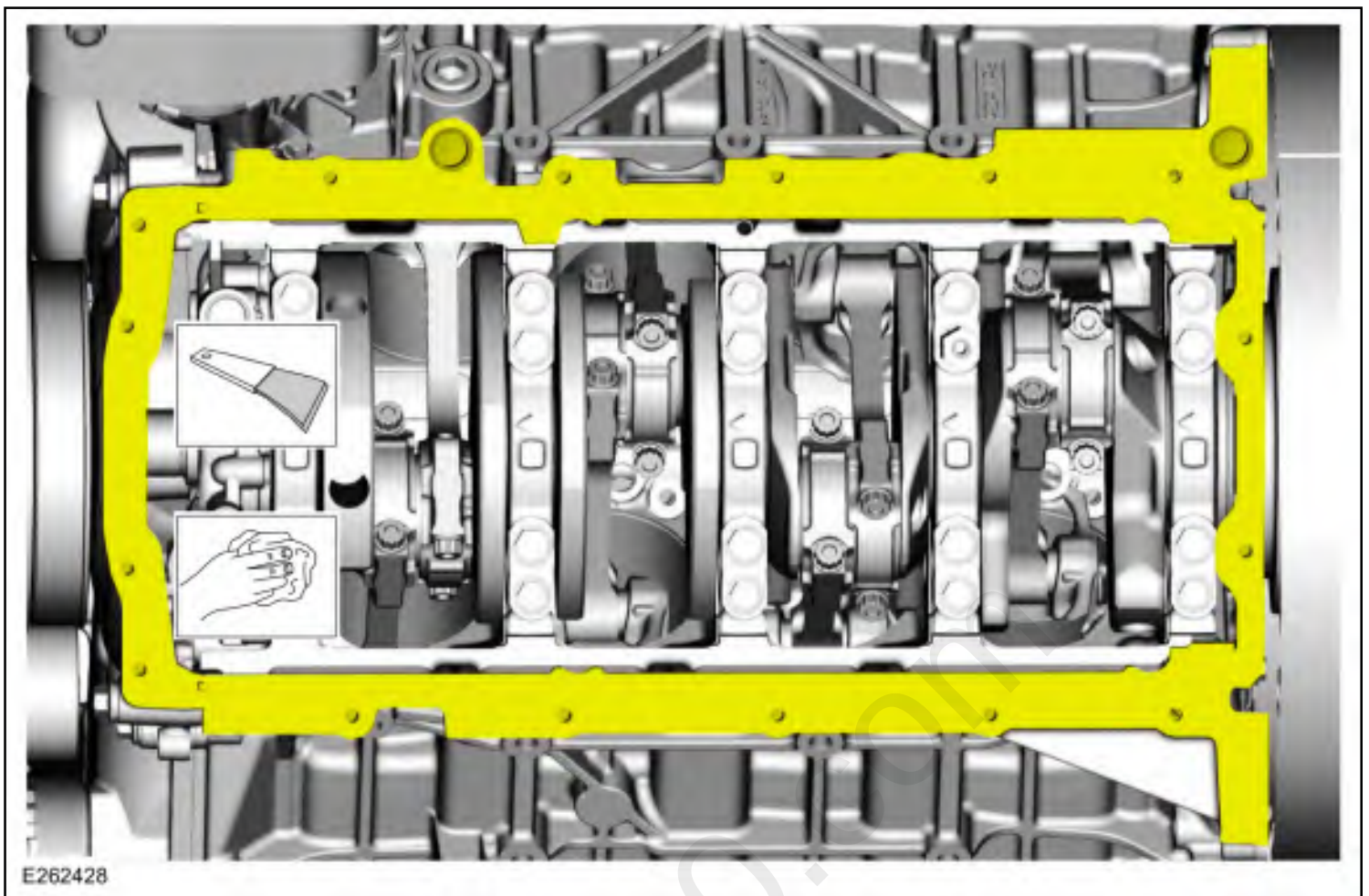
Refer to: [RTV Sealing Surface Cleaning and Preparation](#) (303-00 Engine System - General Information, General Procedures).

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

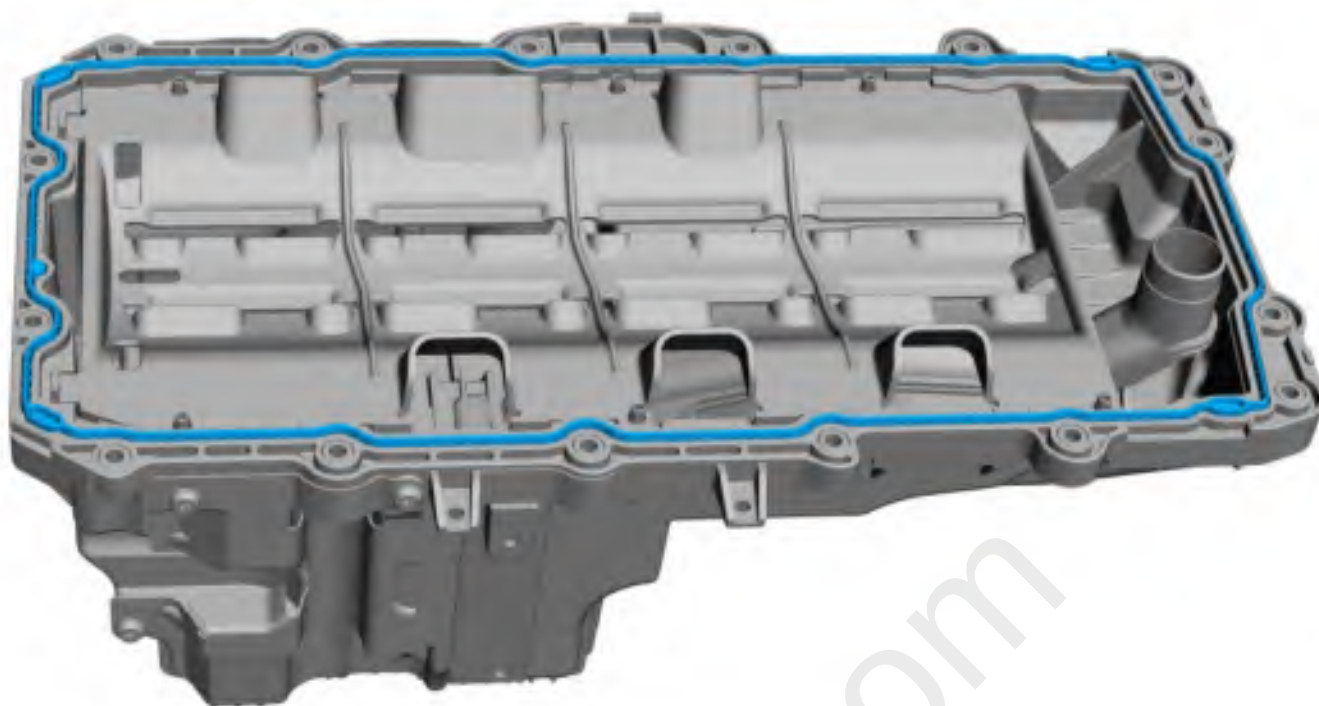
Material: Motorcraft® Metal Surface Prep Wipes / ZC-31-B



Installation

4x2/4x4

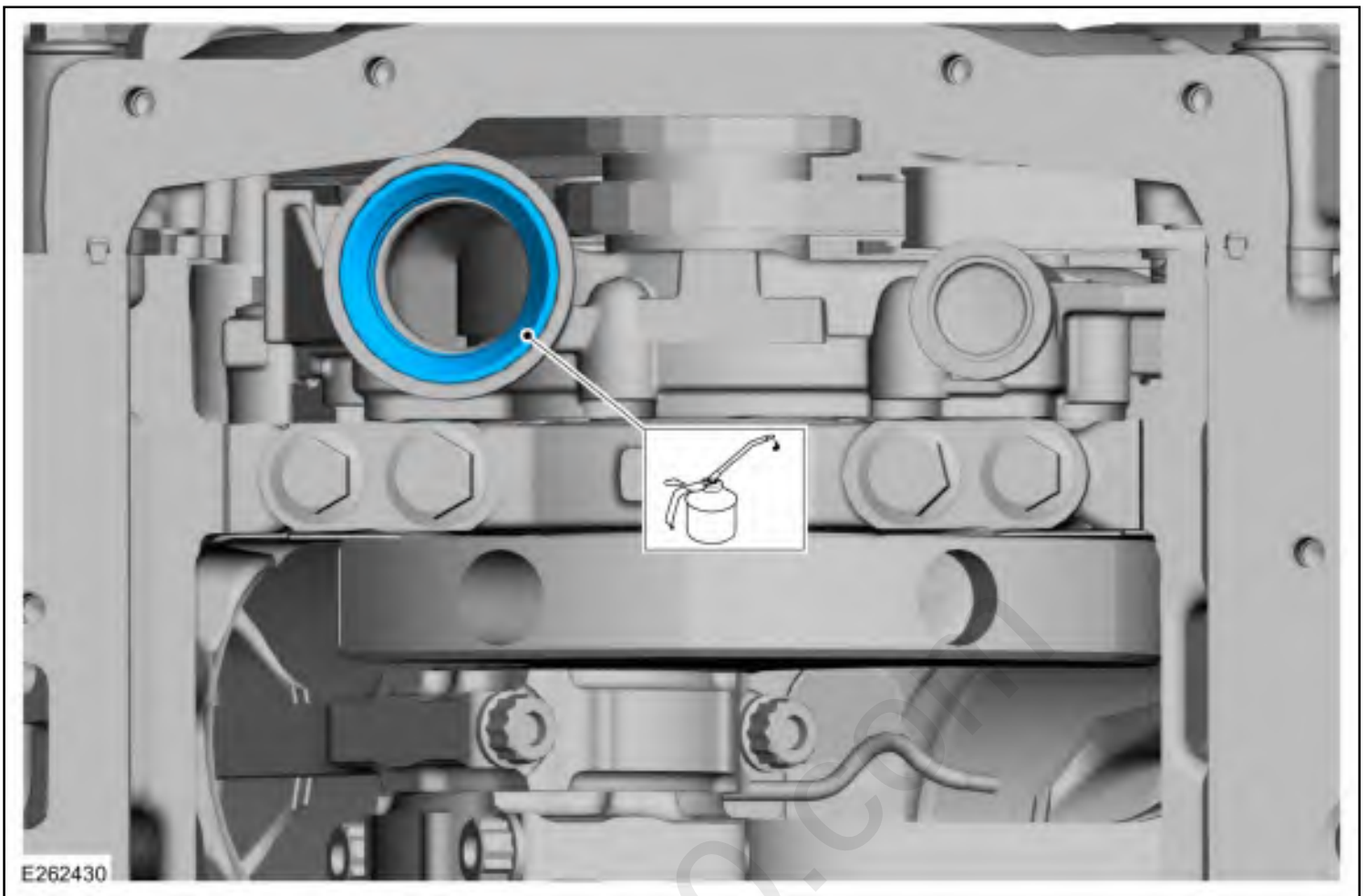
1. Install a new oil pan gasket.



E262425



2. Install a new oil pump pickup seal and lubricate with clean engine oil.

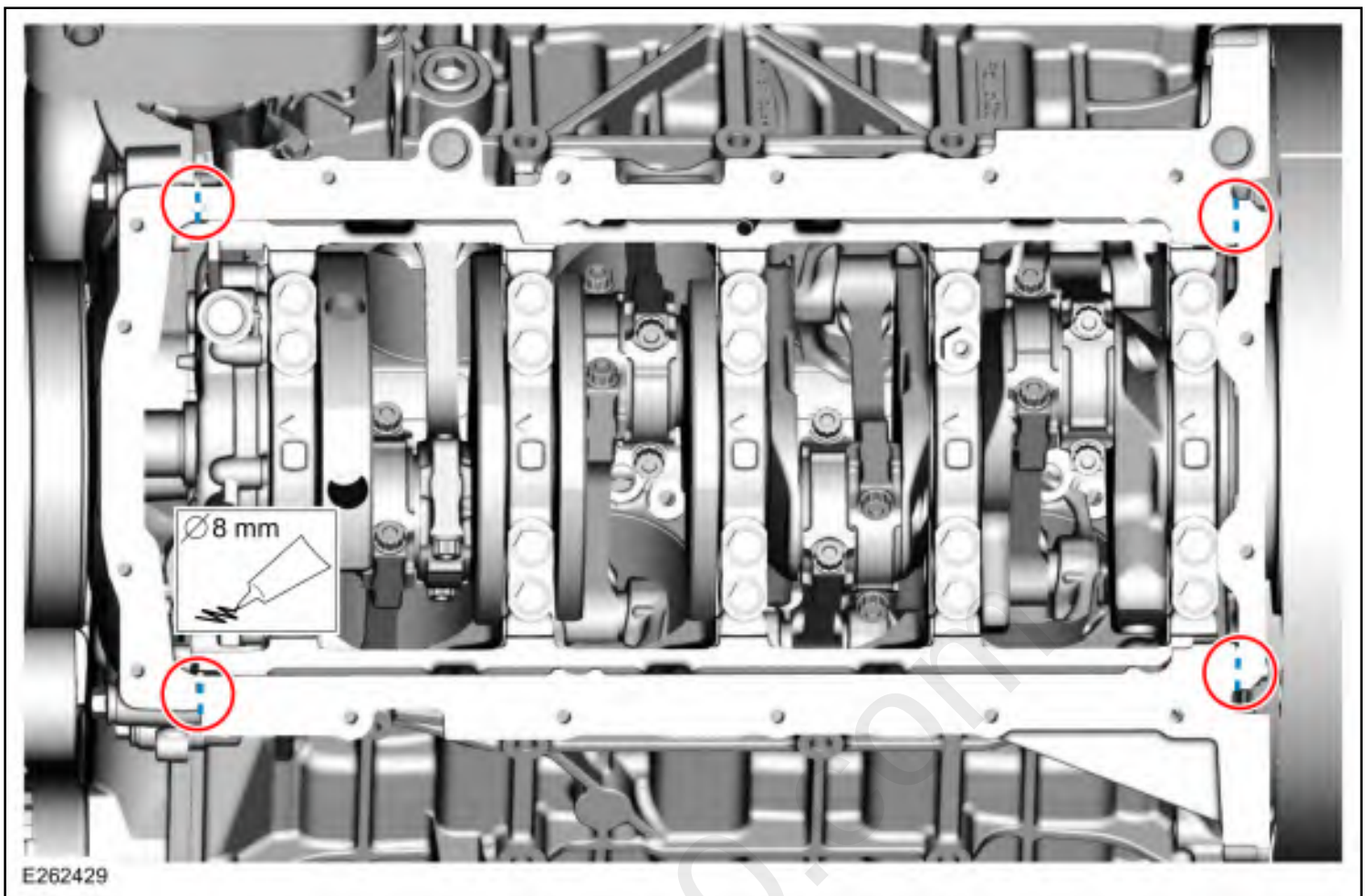


3. **NOTE:** *If the oil pan is not installed and the fasteners tightened within 5 minutes, the sealant must be removed and the sealing area cleaned. Failure to follow this procedure can cause future oil leakage. If this timing cannot be met, tighten fasteners 7, 8, 9 and 10 to 8 Nm (71 lb-in) within 5 minutes of applying the sealer and final torque all of the fasteners within 1 hour of applying the sealer.*

NOTE: *If the engine front cover has been removed, it is only necessary to apply sealant to the crankshaft rear seal retainer plate-to-cylinder block sealing surfaces.*

Apply an 8 mm (0.31 in) bead of silicone gasket and sealant to the crankshaft rear seal retainer plate-to-cylinder block sealing surfaces and the engine front cover-to-cylinder block sealing surfaces.

Material: Motorcraft® Silicone Gasket and Sealant / TA-30 (WSE-M4G323-A4)



4. **NOTE:** Fastener locations 7, 13 and 16 are stud bolts.

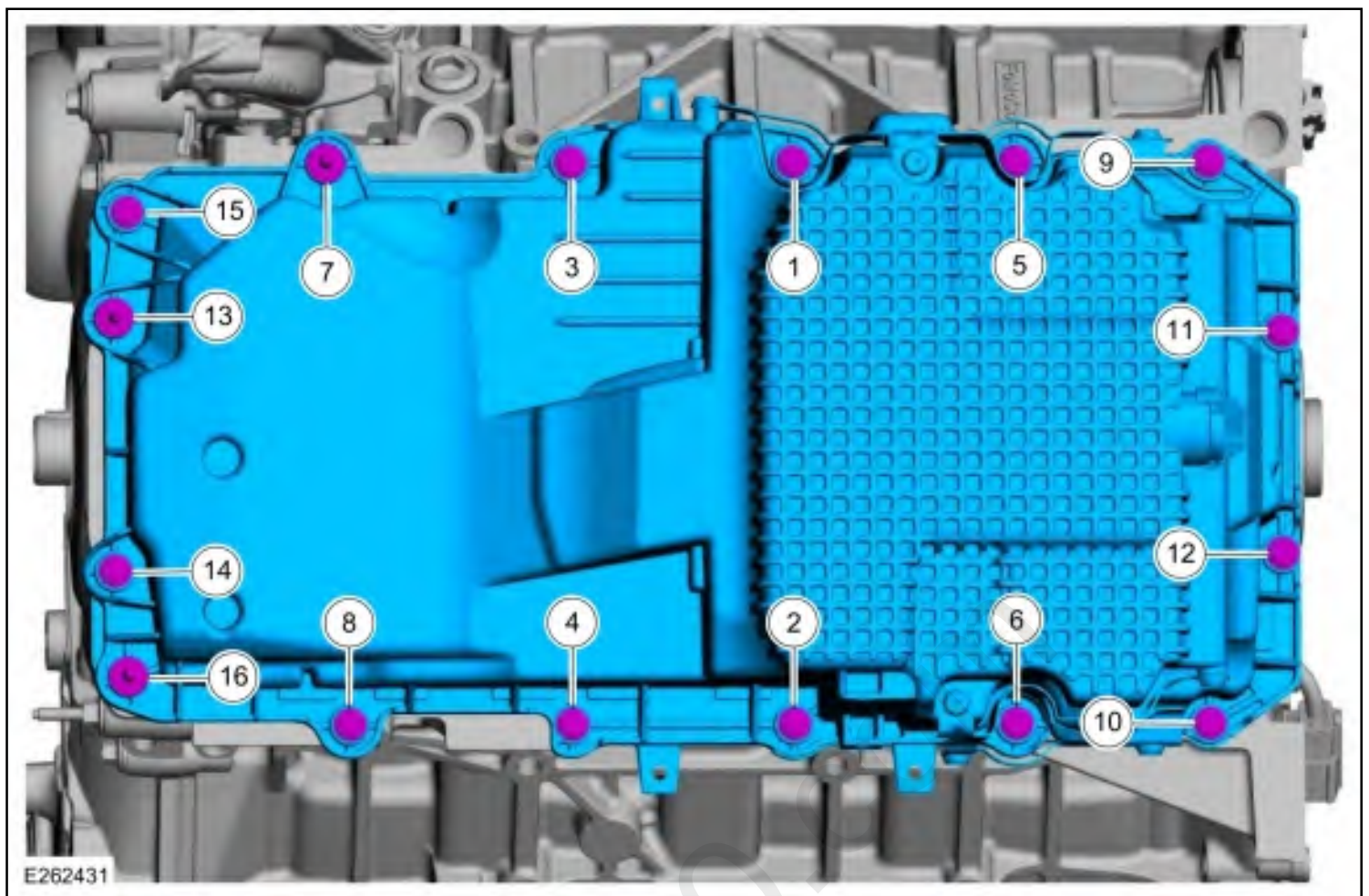
Using a new gasket, install the oil pan and the bolts.

Torque:

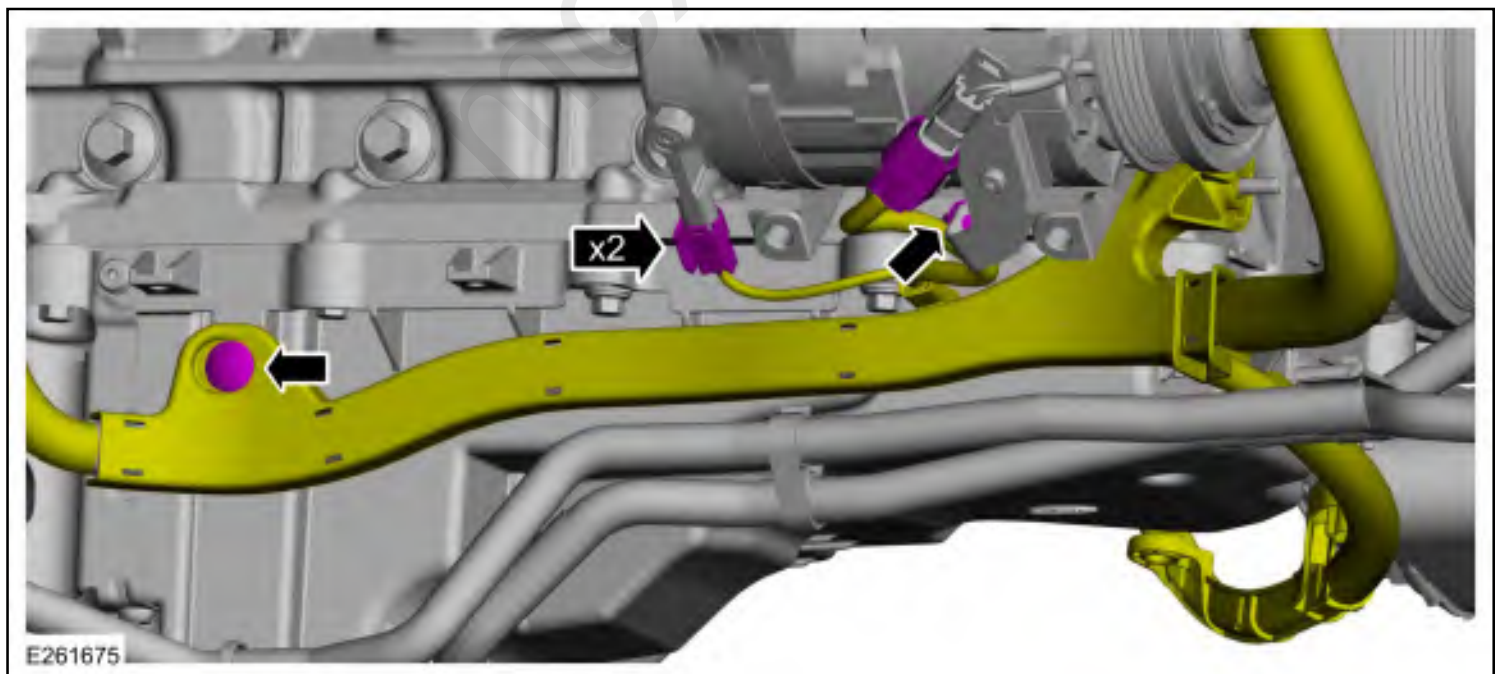
Stage 1: 18 lb.in (2 Nm)

Stage 2: 89 lb.in (10 Nm)

Stage 3: 45°



1. Connect the A/C compressor electrical connectors.
2. Attach the wiring harness retainers.

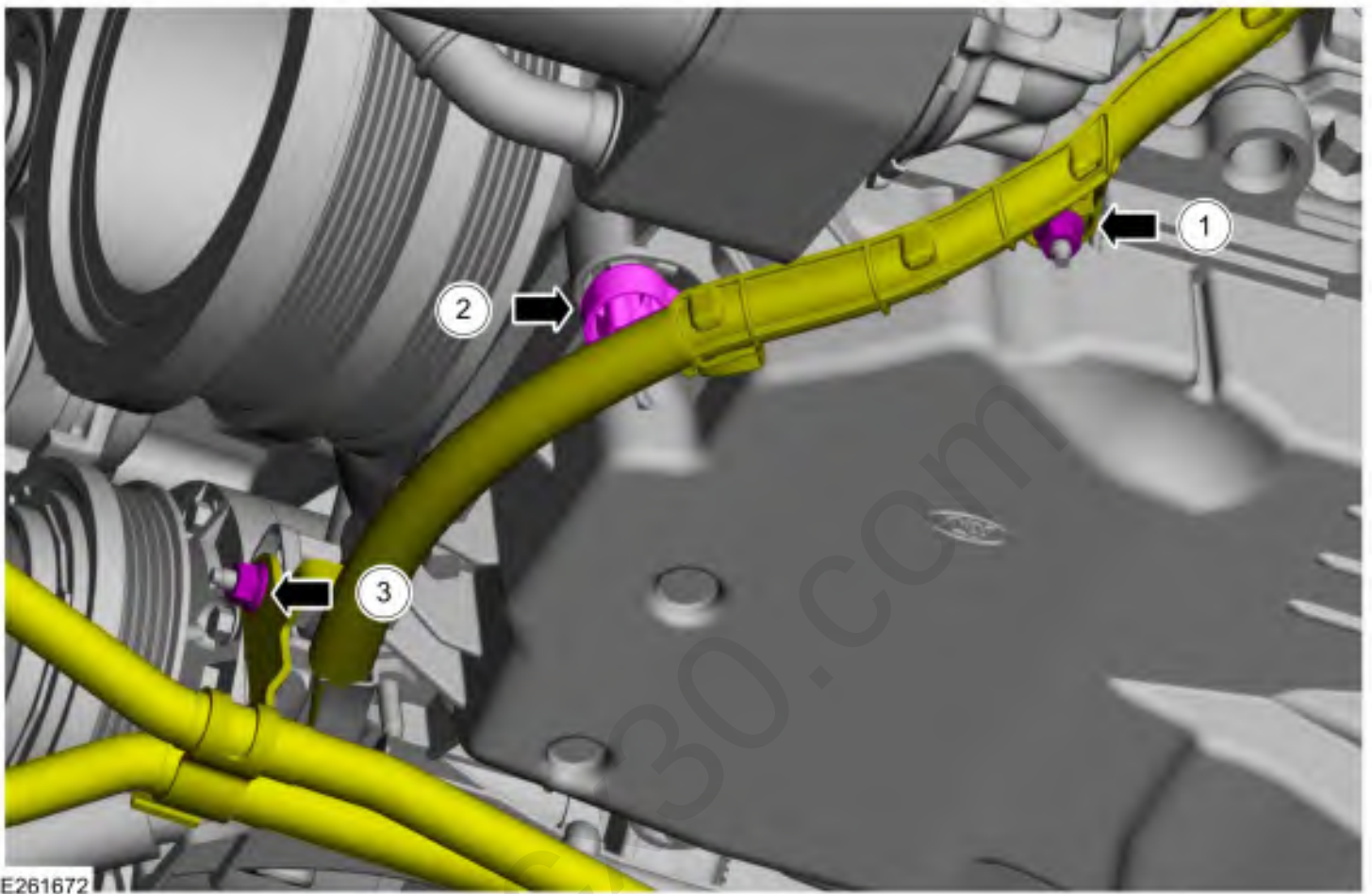


1. Install the nut.

Torque: 106 lb.in (12 Nm)

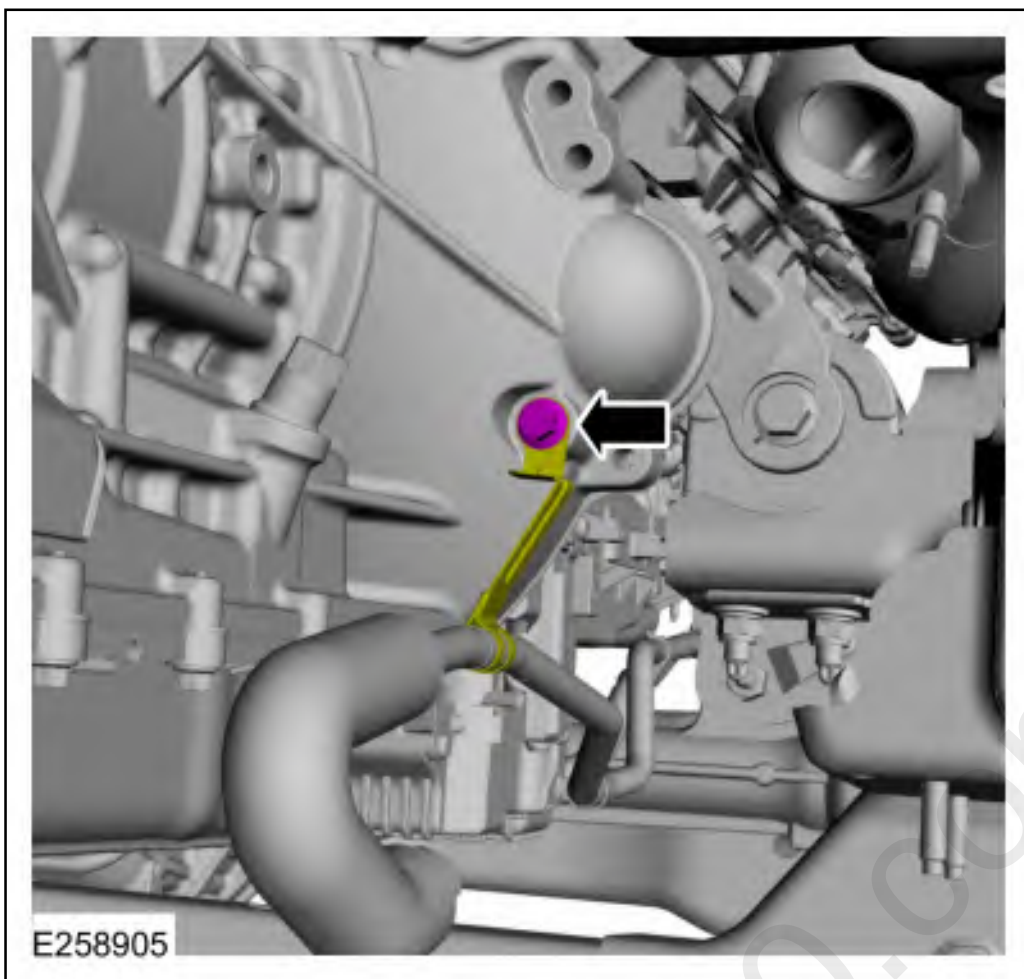
2. Attach the wiring harness retainer.
3. Position the coolant tube and wiring harness brackets and install the nut.

Torque: 115 lb.in (13 Nm)

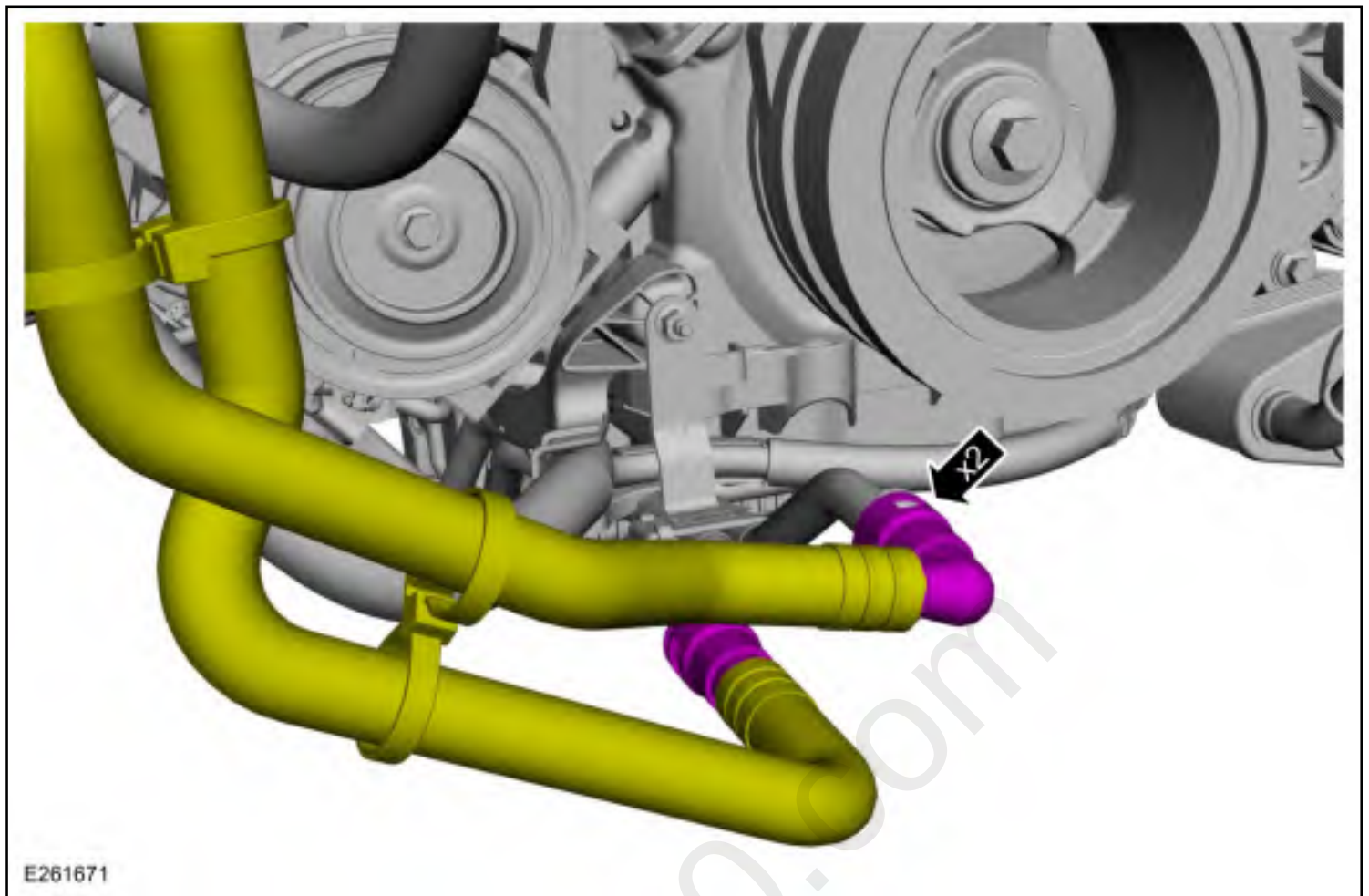


7. Install the transmission cooler tube support bracket and the transmission-to-engine bolt.

Torque: 35 lb.ft (48 Nm)

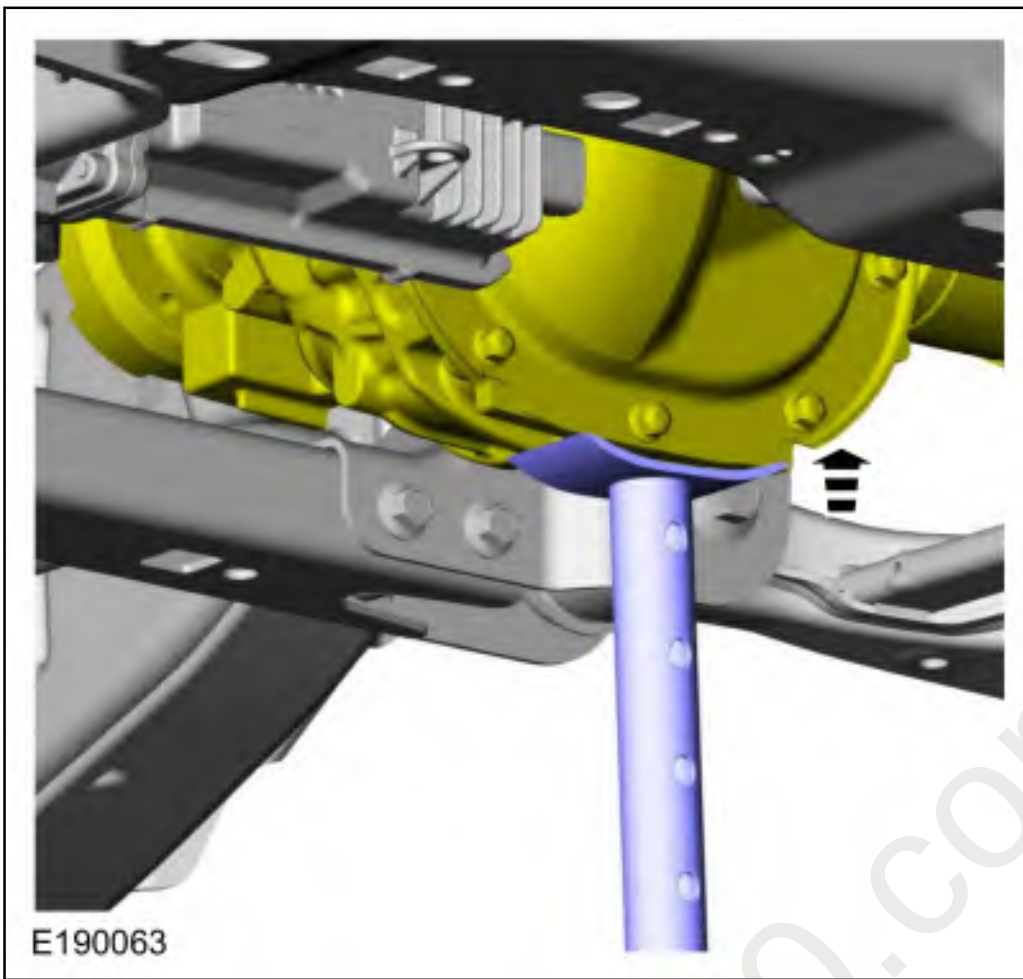


8. Connect the coolant hose quick release couplings.

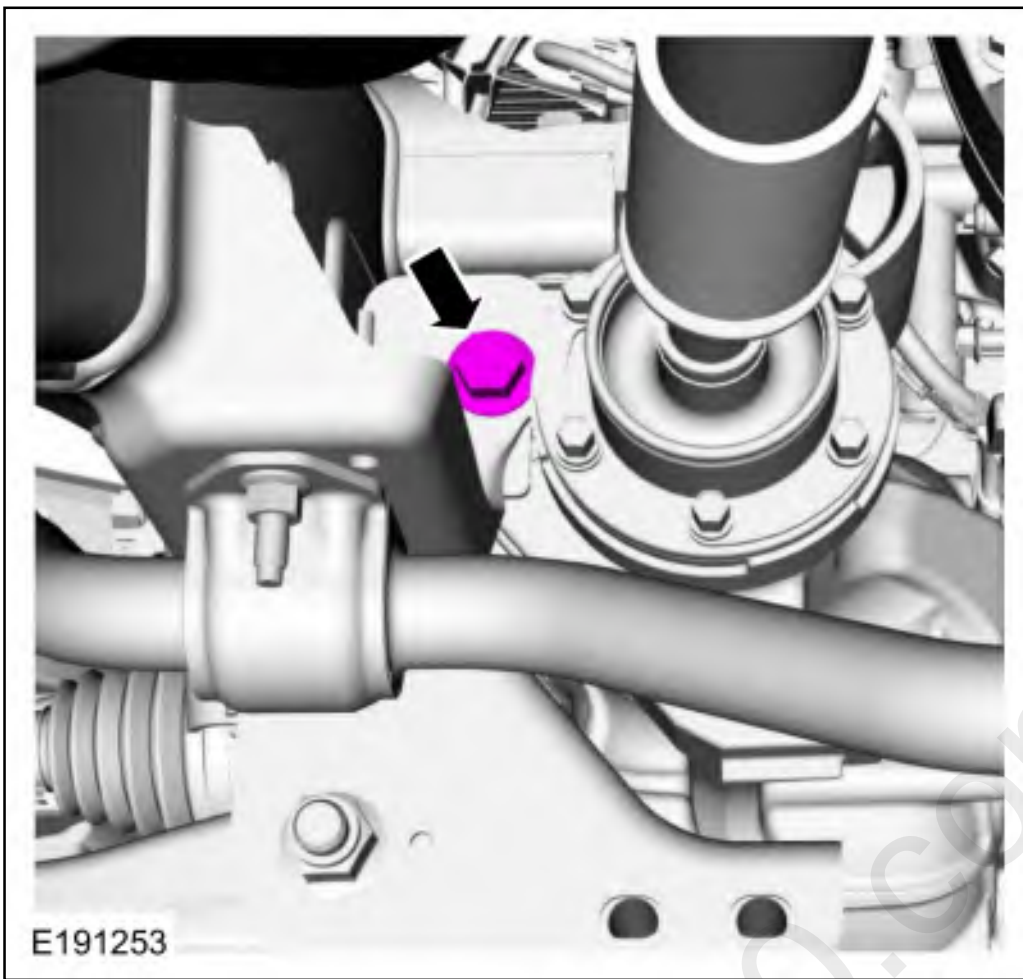


4x4

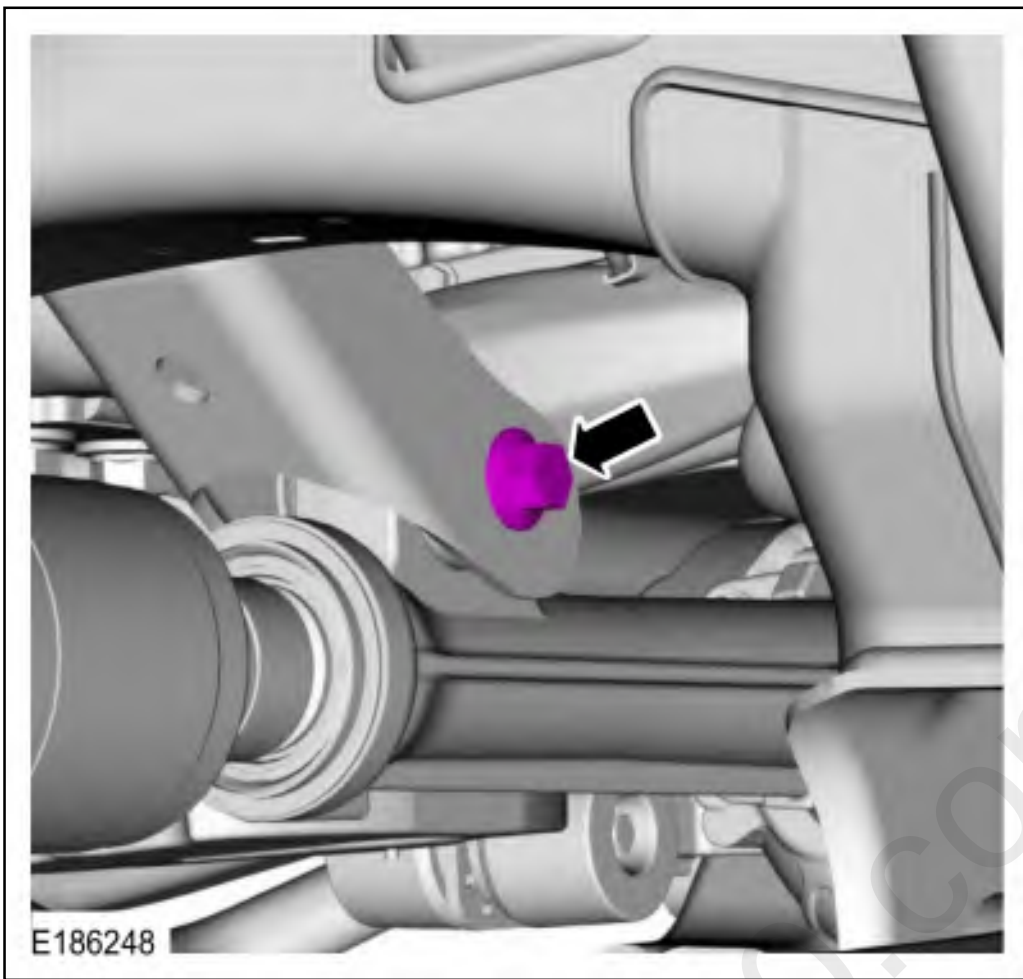
9. Using an adjustable stand, raise the front axle carrier into position.
Use the General Equipment: Vehicle/Axle Stands



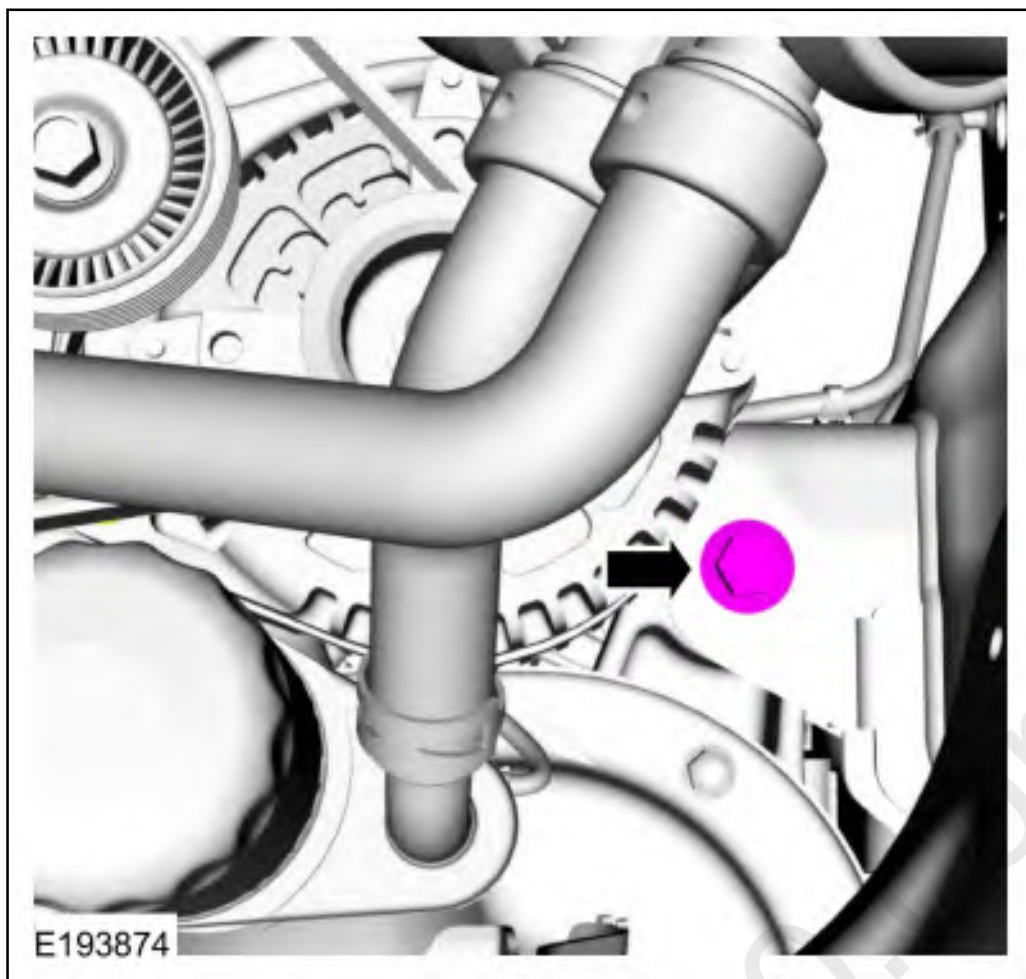
10. Install the lower front axle carrier mounting bushing bolt.
Torque: 85 lb.ft (115 Nm)



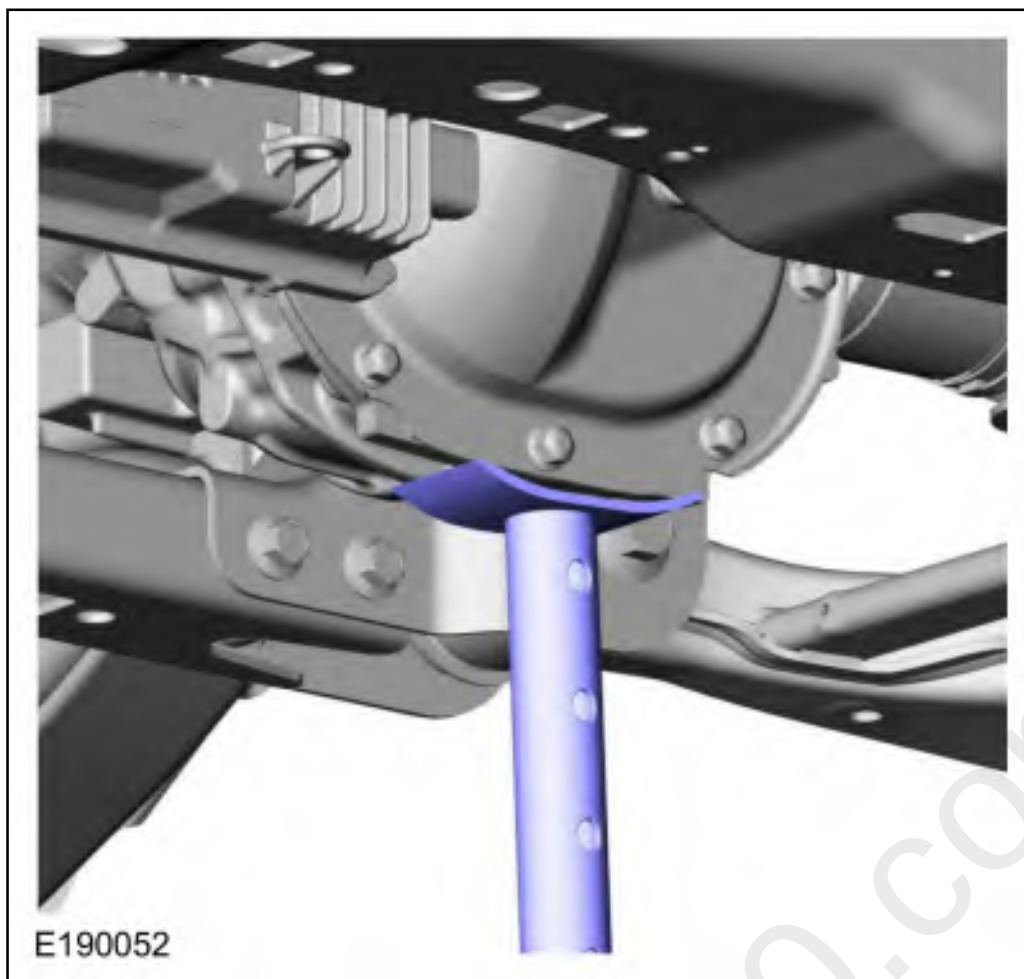
11. Install the axle shaft housing carrier bushing bolt.
Torque: 85 lb.ft (115 Nm)



12. Install the upper front axle carrier mounting bushing bolt.
Torque: 85 lb.ft (115 Nm)



13. Remove the adjustable stand.
Use the General Equipment: Vehicle/Axle Stands



4x2/4x4

14. Install the following items:

1. Engine oil cooler.

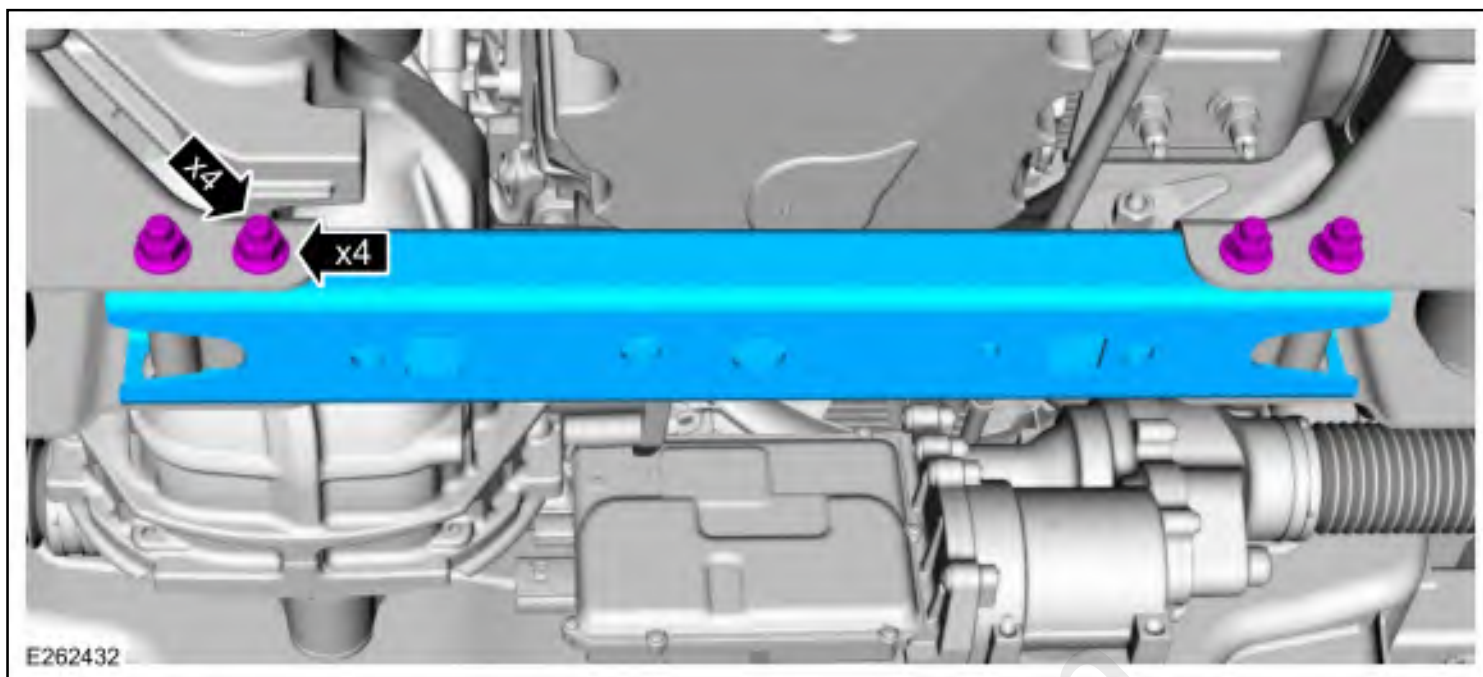
Refer to: [Oil Cooler](#) (303-01D Engine - 5.0L 32V Ti-VCT, Removal and Installation).

2. Transmission fluid cooler.

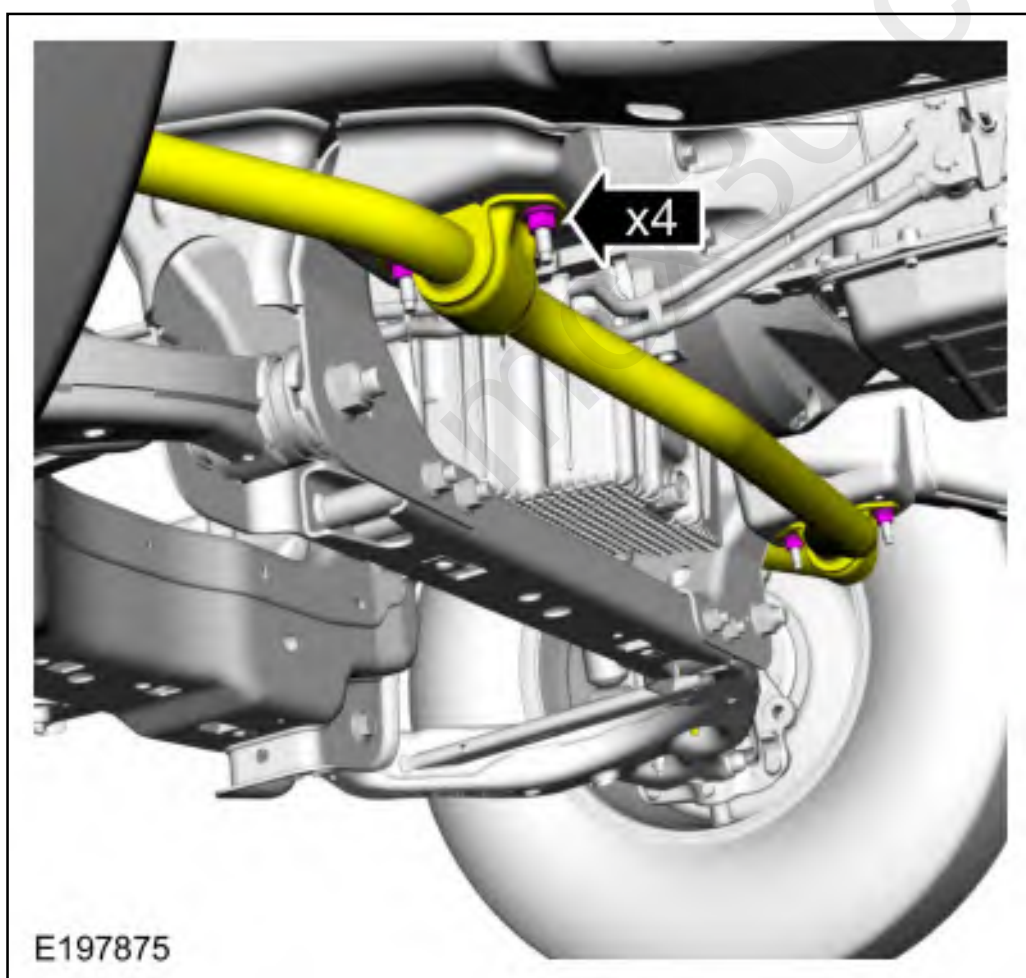
Refer to: [Transmission Fluid Cooler - 2.7L EcoBoost \(238kW/324PS\)/3.5L EcoBoost \(272kW/370PS\)/5.0L 32V Ti-VCT](#) (307-02 Transmission Cooling, Removal and Installation).

15. Install the crossmember, bolts and the nuts.

Torque: 66 lb.ft (90 Nm)



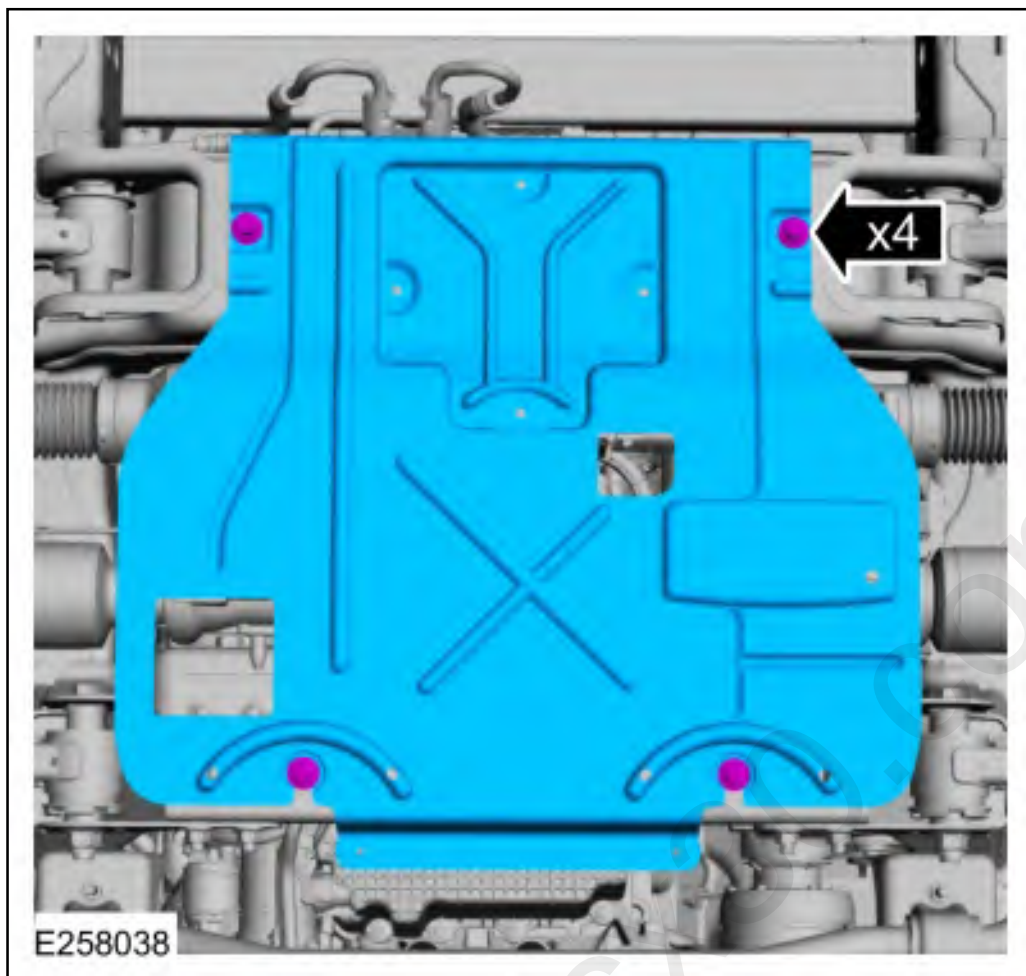
16. Position the stabilizer bar and install the new nuts.
Torque: 41 lb.ft (55 Nm)



17. **NOTE:** *If equipped.*

Install the skid plate and bolts.

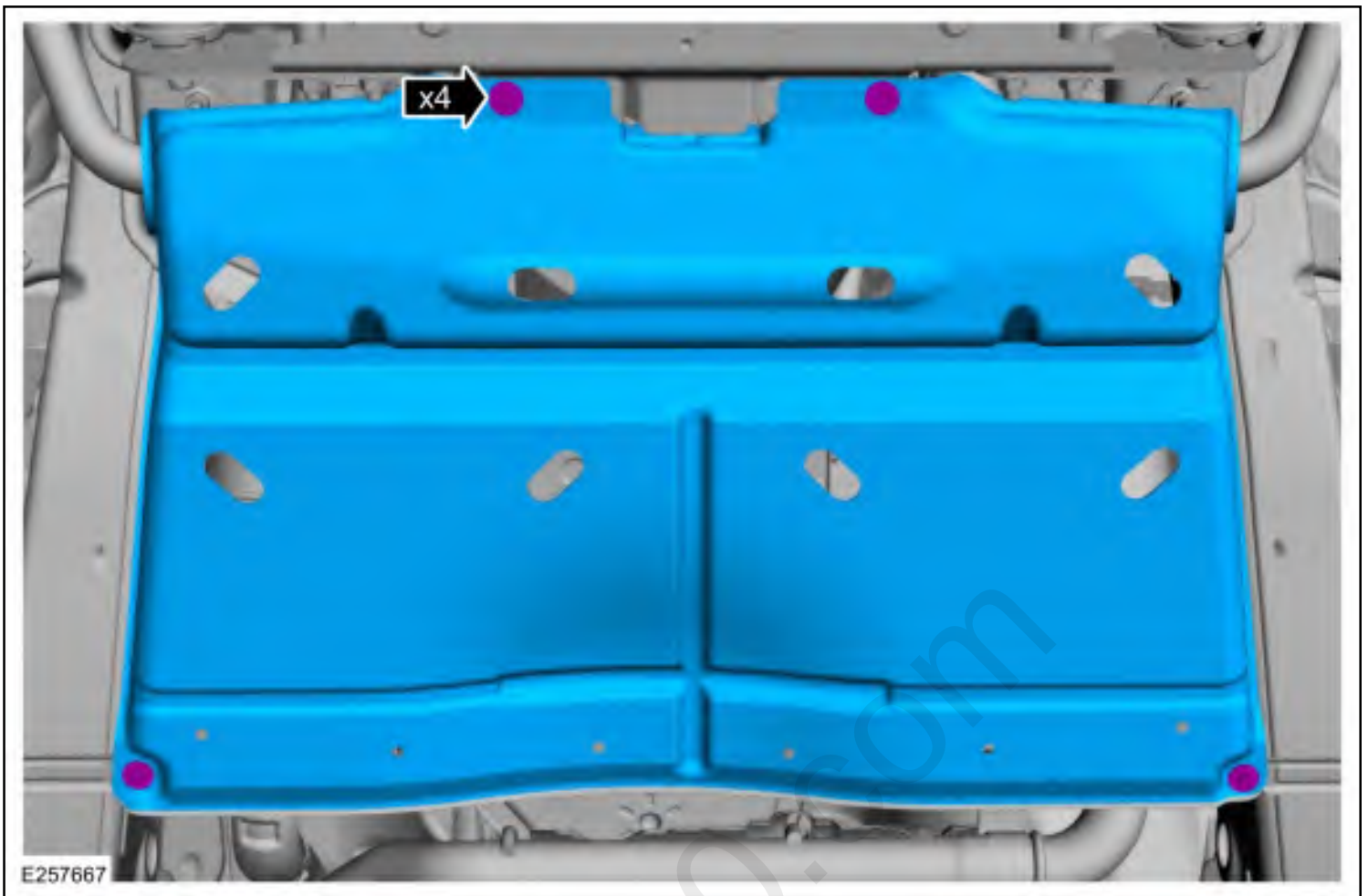
Torque: 30 lb.ft (40 Nm)



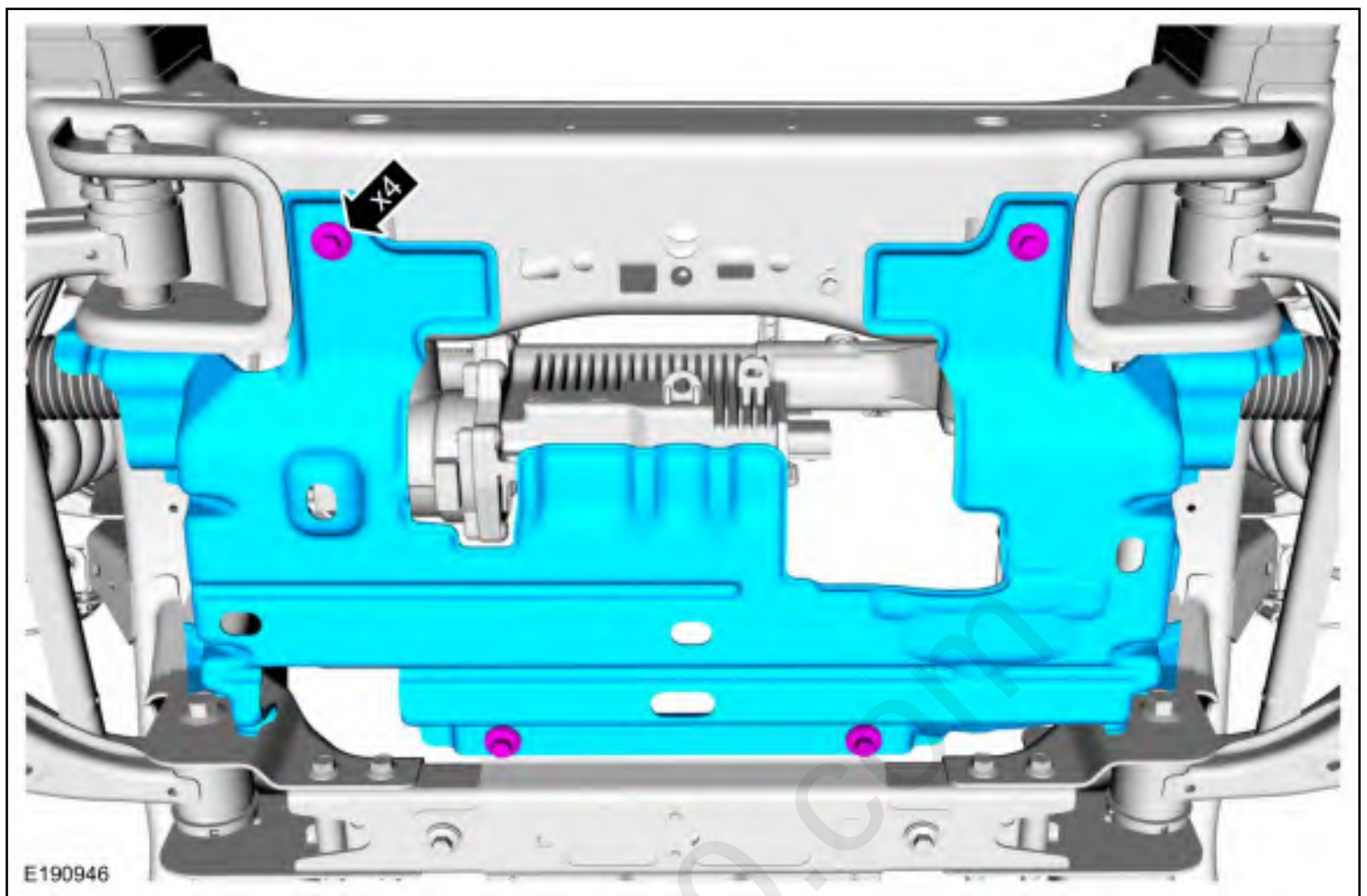
18. **NOTE:** *If equipped.*

Install the underbody shield and the bolts.

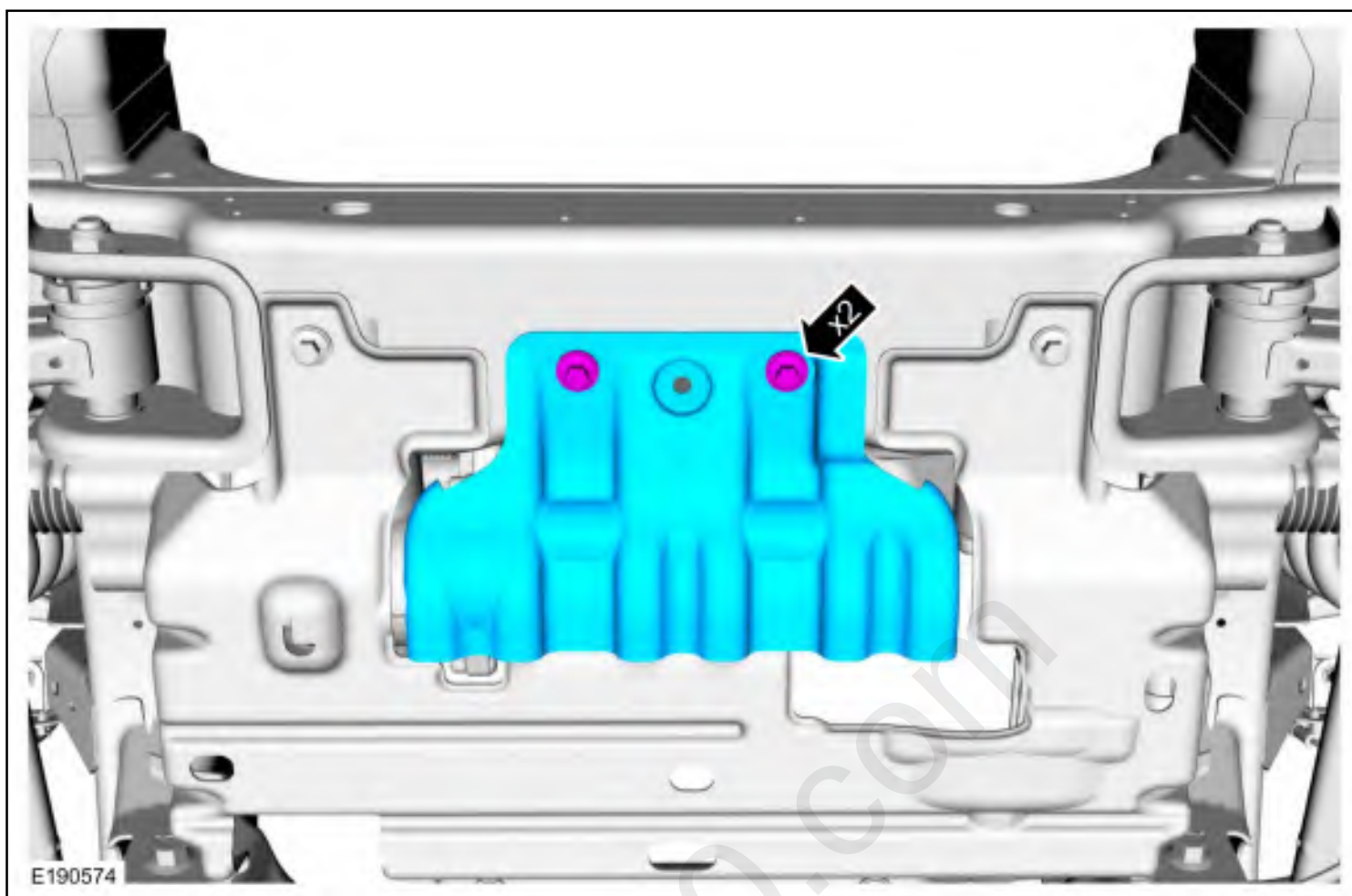
Torque: 71 lb.in (8 Nm)



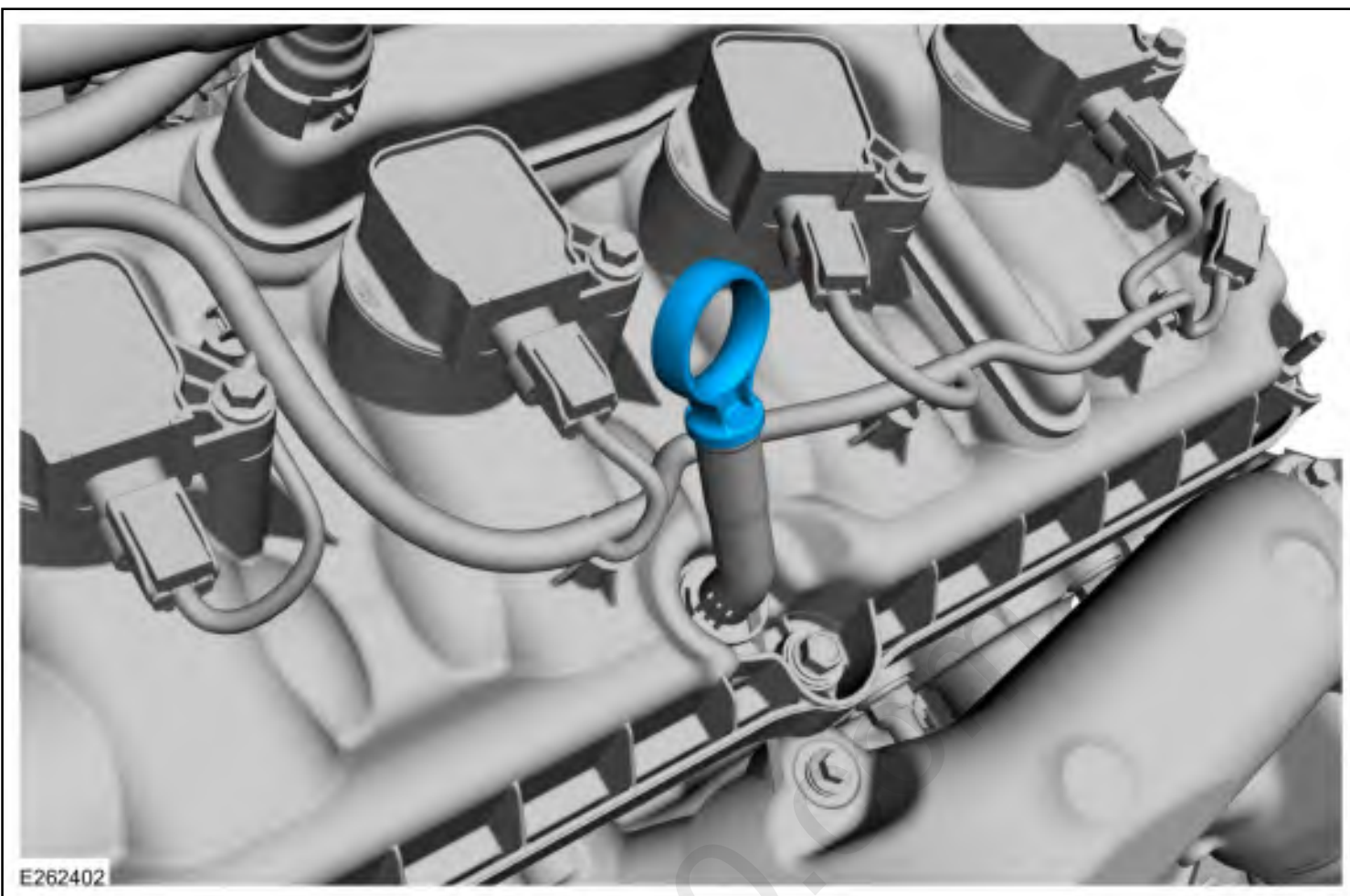
19. If equipped, install the underbody shield and fasteners.
Torque: 30 lb.ft (40 Nm)



20. If equipped, install the skid plate and bolts.
Torque: 30 lb.ft (40 Nm)

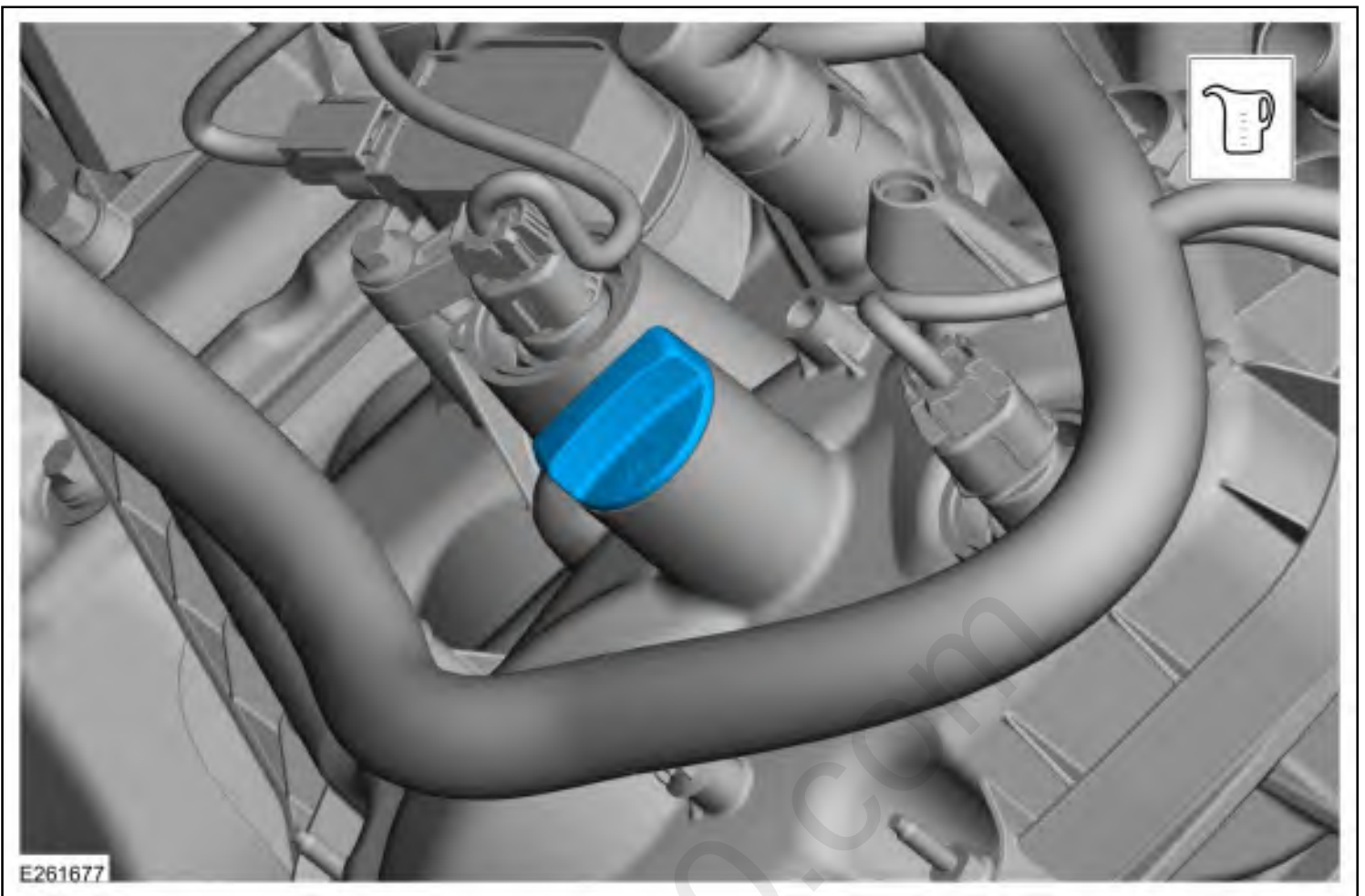


21. Install the oil level indicator.



22. Fill the engine with clean engine oil.

Refer to: [Specifications](#) (303-01D Engine - 5.0L 32V Ti-VCT, Specifications).



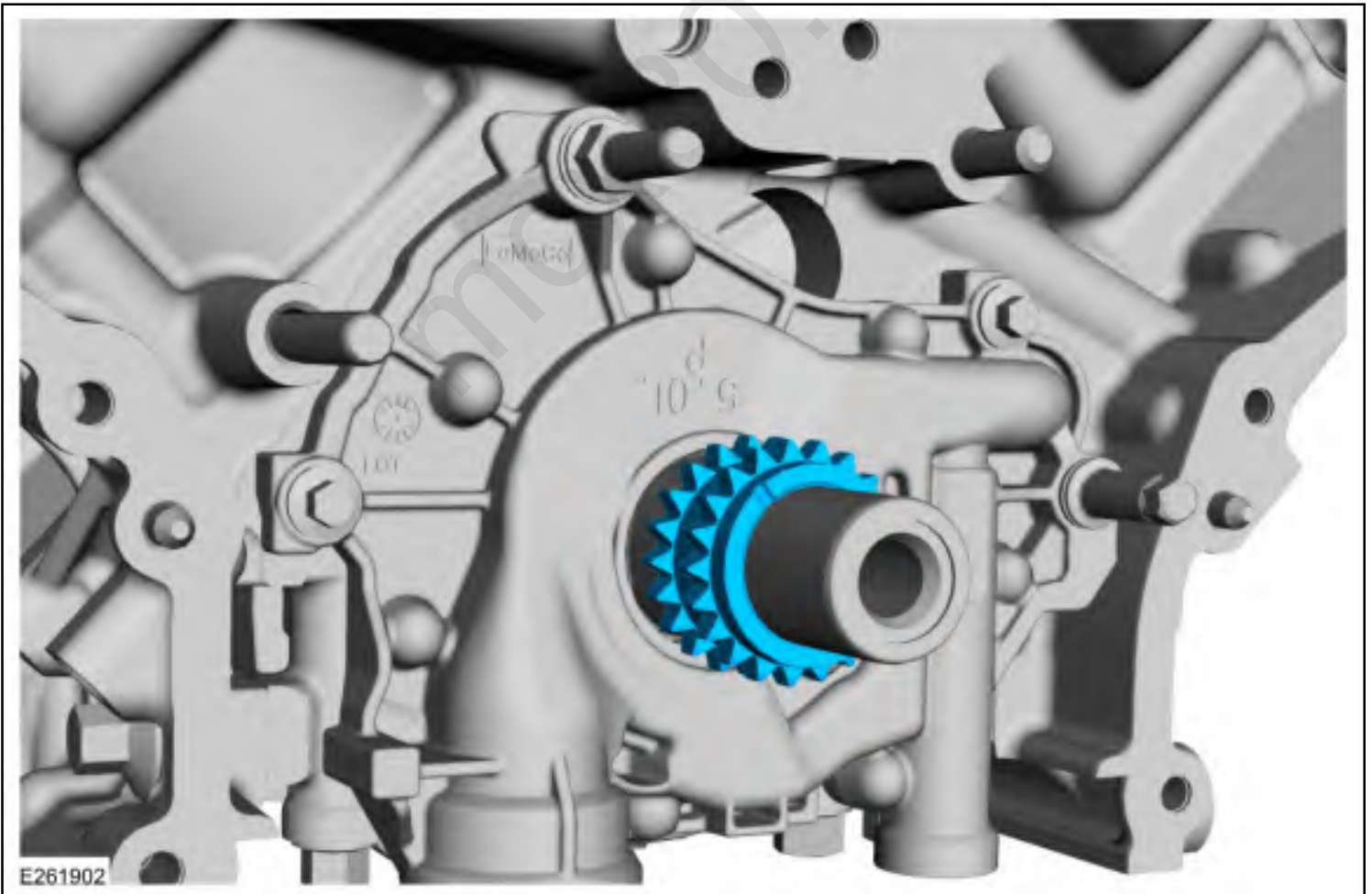
23. Connect the battery ground cable.
Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .

Oil Pump

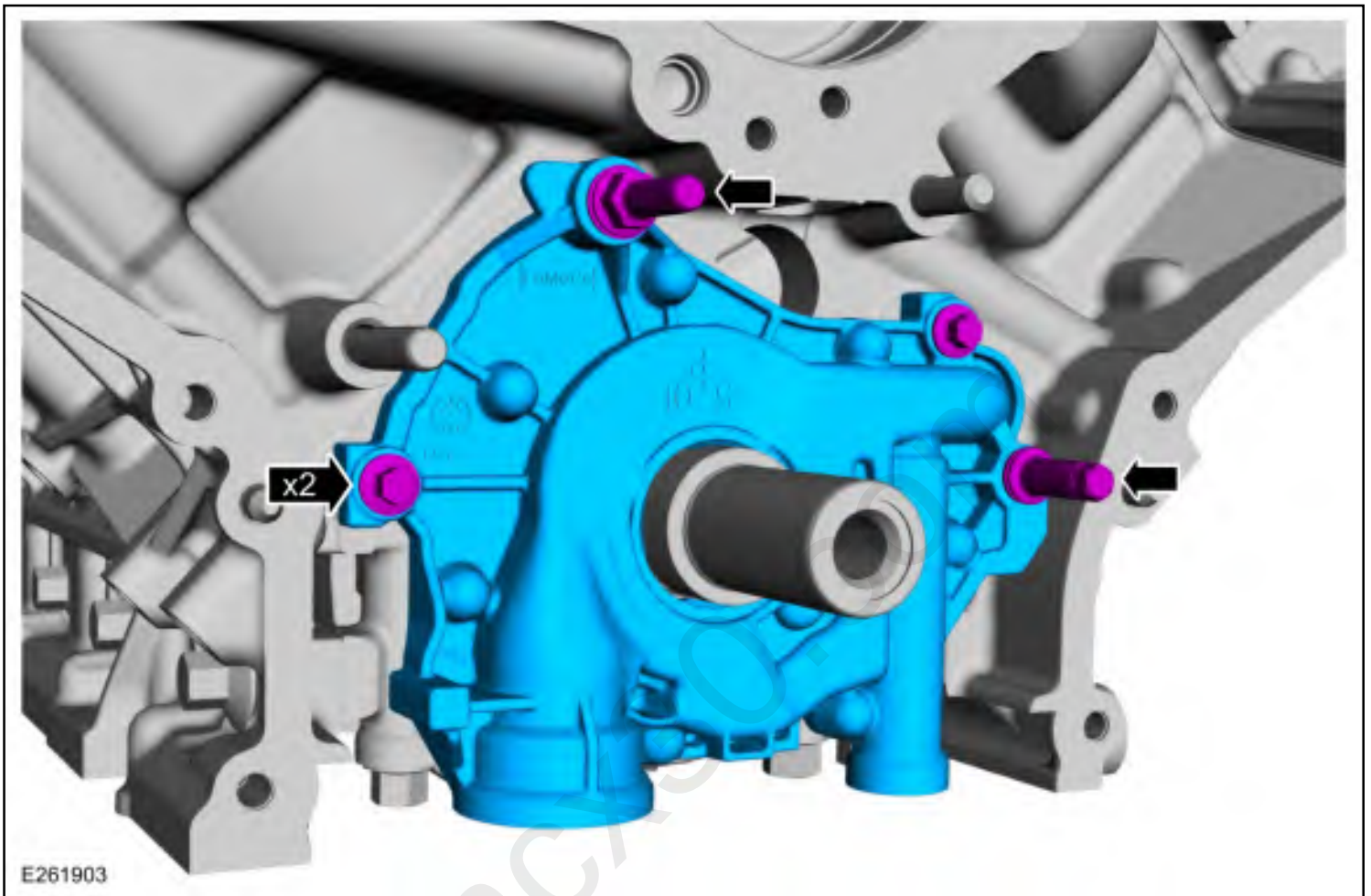
Base Part Number: Base Part Number: 6621

Removal

1. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
2. Remove the timing chains.
Refer to: Timing Chain (303-01 Engine - 5.0L 32V Ti-VCT).
3. Remove the crankshaft sprocket.



4. Remove the oil pan.
Refer to: Oil Pan (303-01 Engine - 5.0L 32V Ti-VCT) .
5. Remove the bolts, stud bolts and the oil pump.



Installation

1. Prime the oil pump. Add 2 tablespoons of clean engine oil to the oil pump and rotate the oil pump by hand.
2. **NOTE:** *Oil pump must be held against the cylinder block until all bolts are tightened.*
 - Rotate the inner rotor of the oil pump assembly to align the flats on the crankshaft and slip the oil pump over the crankshaft until seated against the block.
 - Rotate the oil pump until the bolt holes are aligned to the block and install the fasteners hand tight.

Torque:

 - Stage 1: A: 89 lb.in (10 Nm)
 - Stage 2: B: 18 lb.ft (25 Nm)
 - Stage 3: C: 89 lb.in (10 Nm)

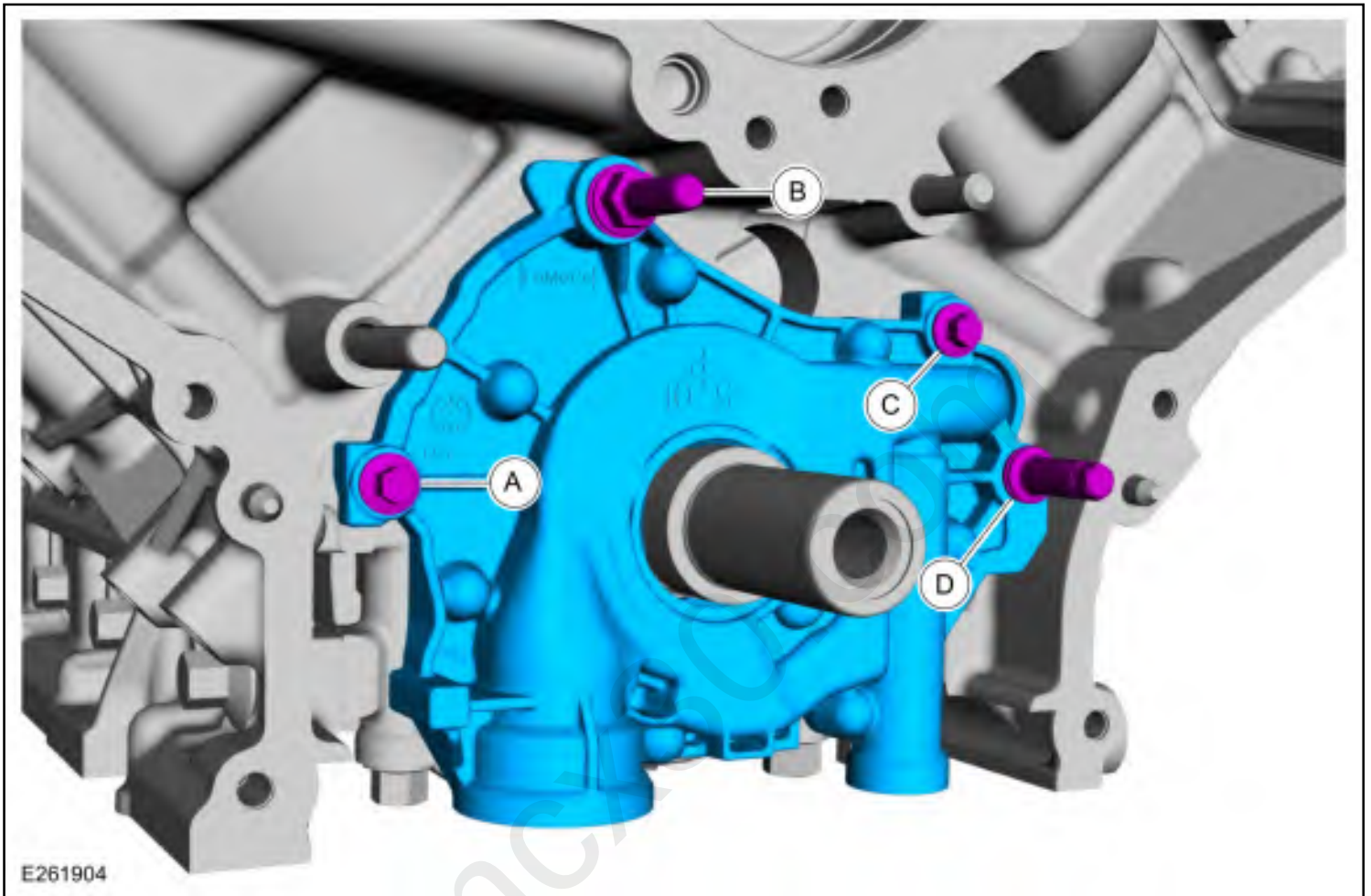
Stage 4: D: 177 lb.in (20 Nm)

Stage 5: A: 45°

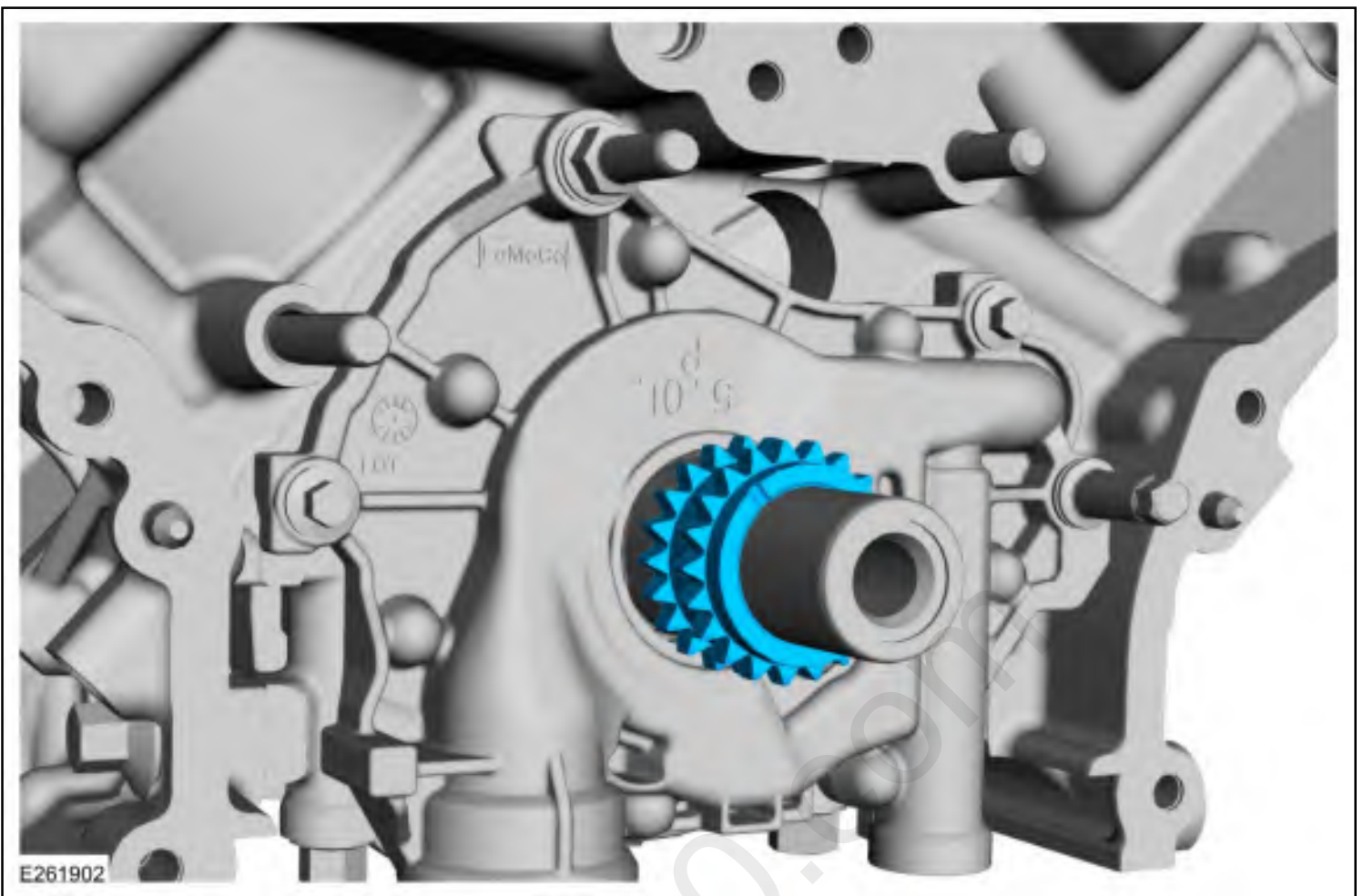
Stage 6: B: 75°

Stage 7: C: 45°

Stage 8: D: 60°



3. Install the oil pan.
Refer to: Oil Pan (303-01 Engine - 5.0L 32V Ti-VCT) .
4. Install the crankshaft sprocket.



5. Install the timing chains.
Refer to: Timing Chain (303-01 Engine - 5.0L 32V Ti-VCT) .

Oil Cooler

Special Tool(s) / General Equipment

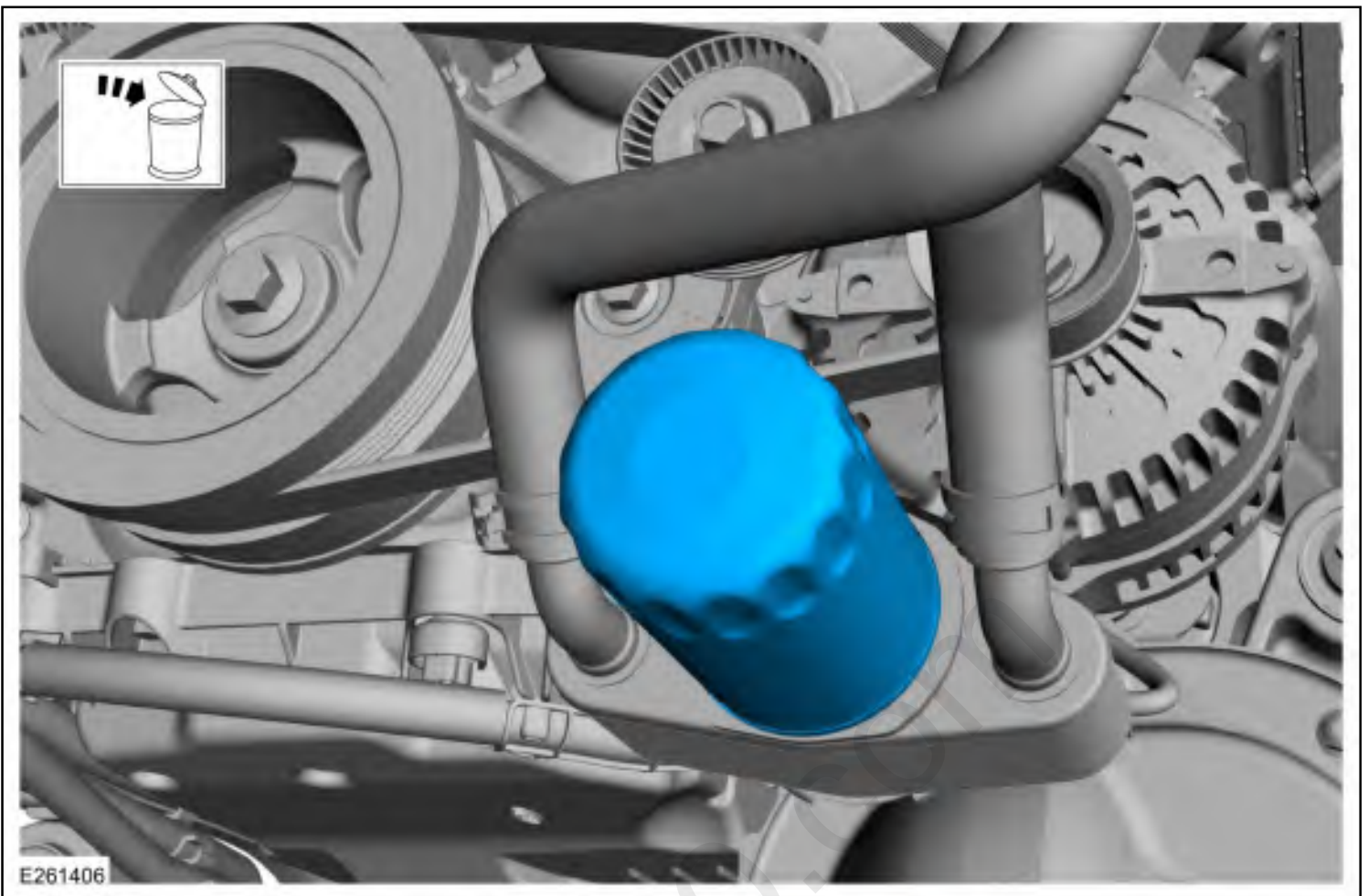
Locking Pliers

Materials

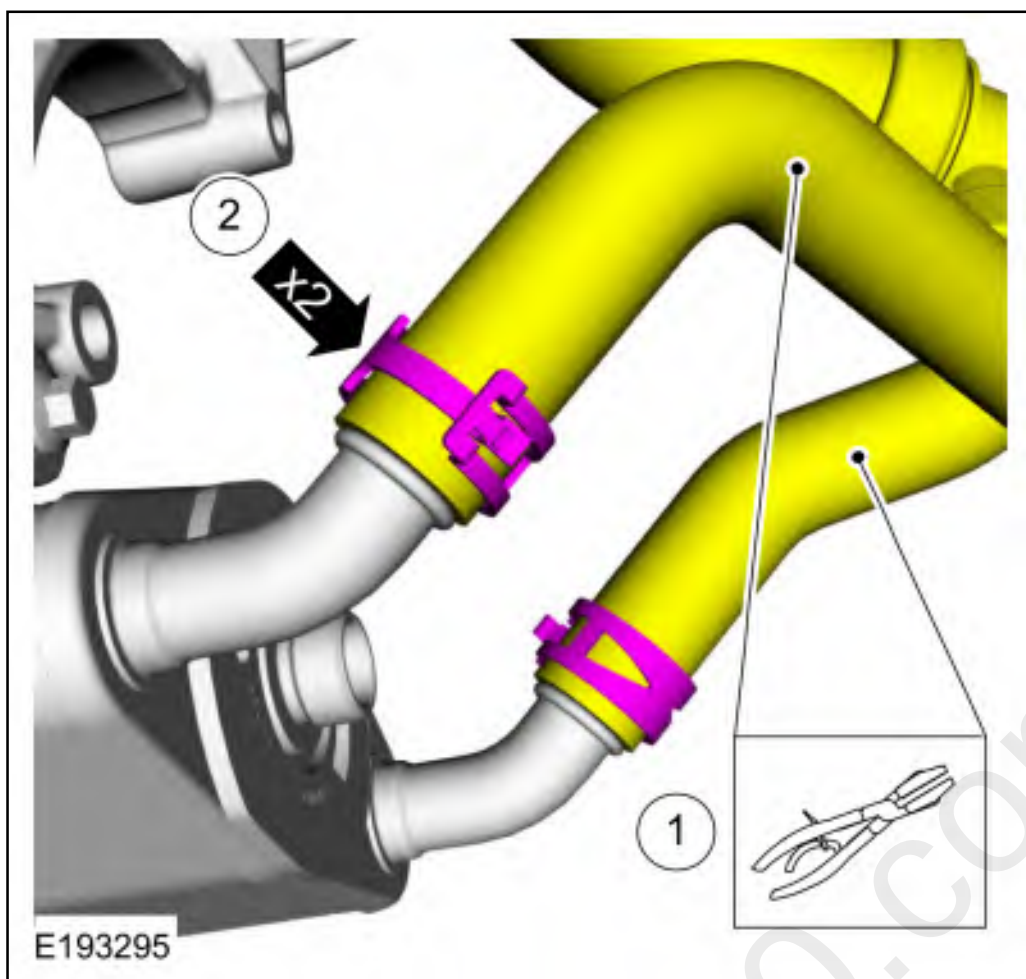
Name	Specification
Motorcraft® Orange Concentrated Antifreeze/Coolant VC-3-B	WSS-M97B44-D

Removal

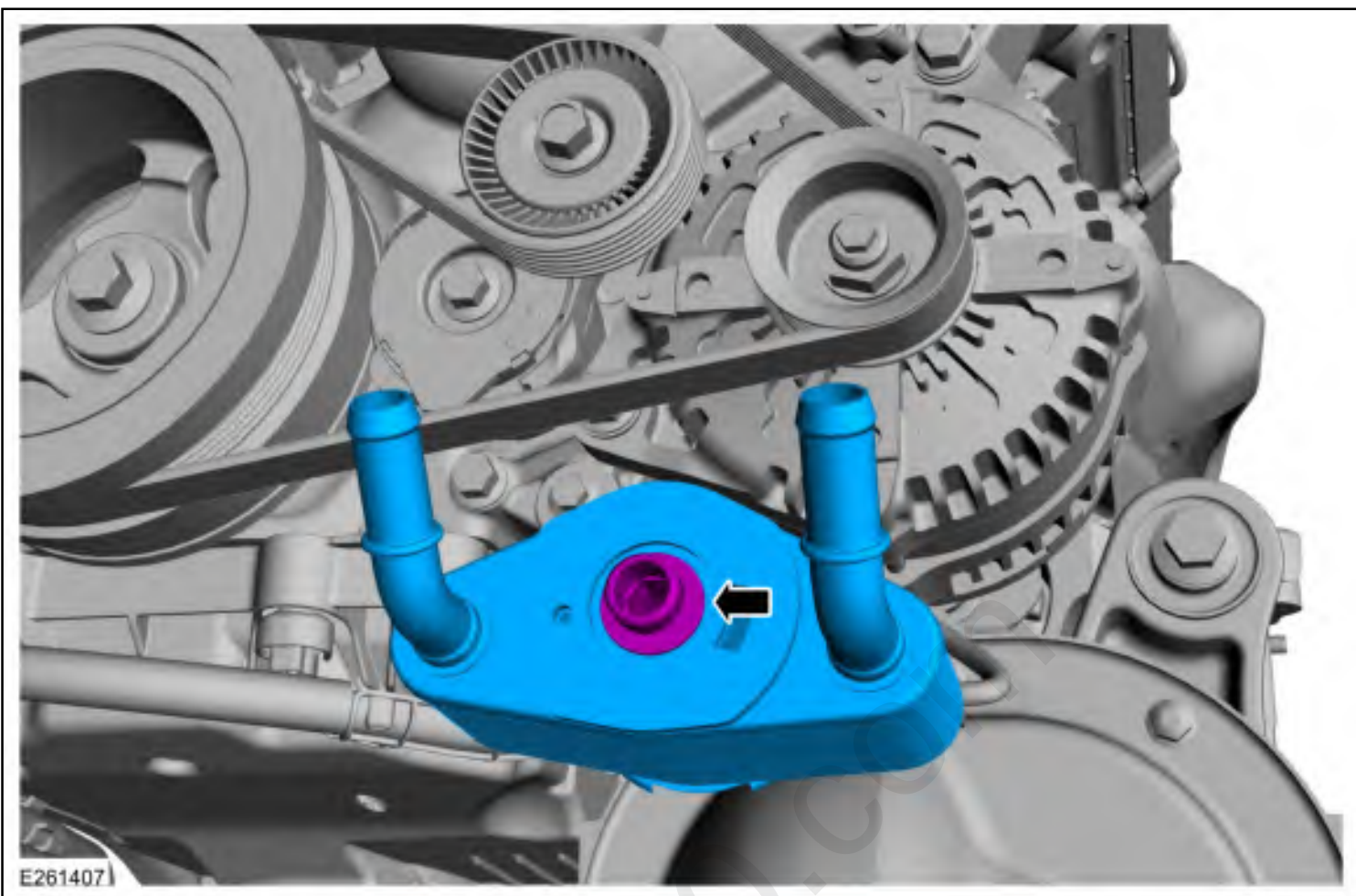
1. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
2. Remove and discard the engine oil filter.



- Using hose locking pliers, clamp the oil cooler coolant hoses.
Use the General Equipment: Locking Pliers
- Disconnect the coolant hoses.



4. Remove the retainer and the oil cooler.



5. Remove and discard the gasket.



6. **NOTICE:** If metal or aluminum material is present in the oil cooler, mechanical concerns exist. Failure to correct these concerns may cause engine failure. To diagnose mechanical concerns, refer to Section 303-00.

Inspect the oil cooler.

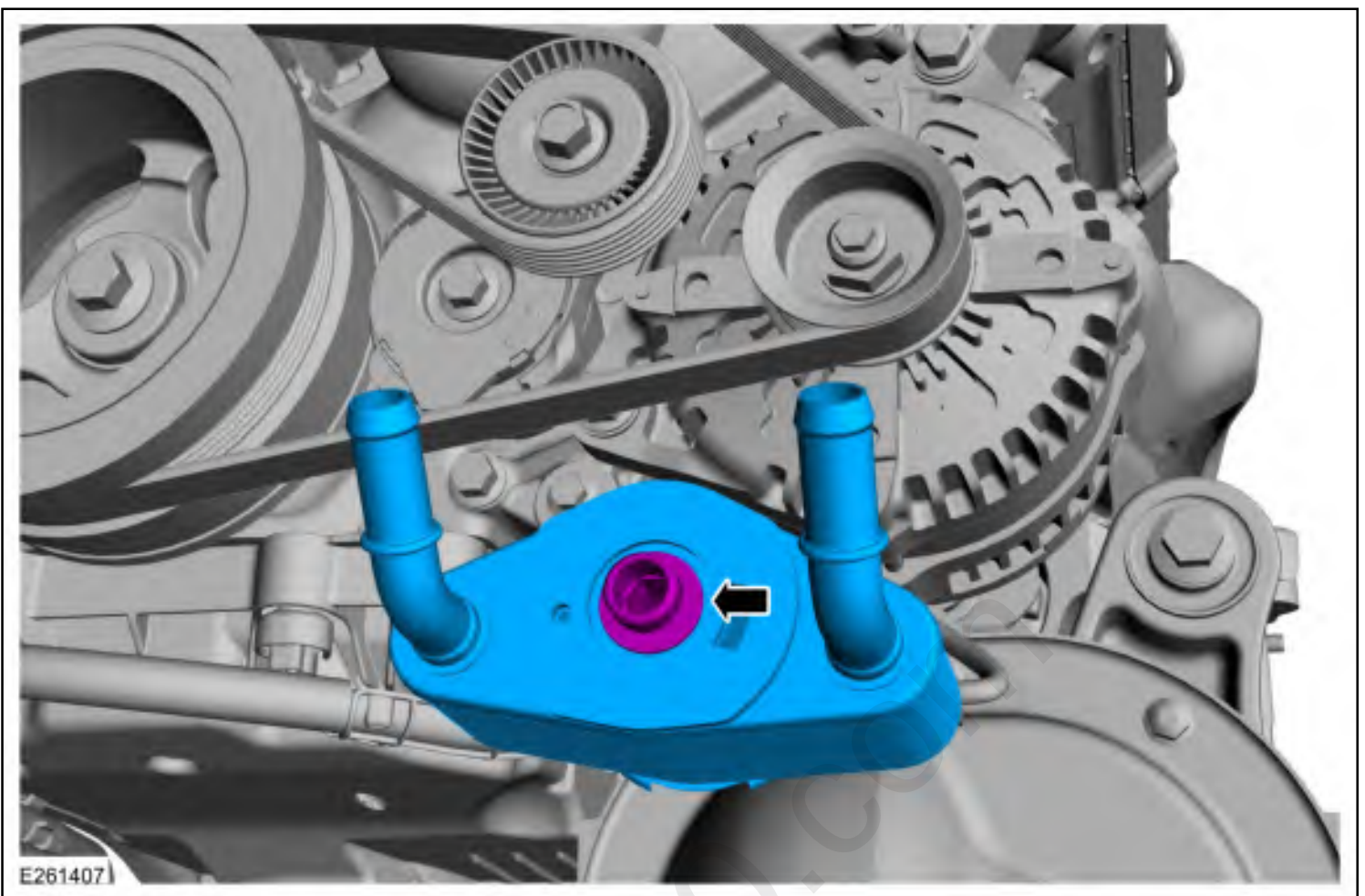


Installation

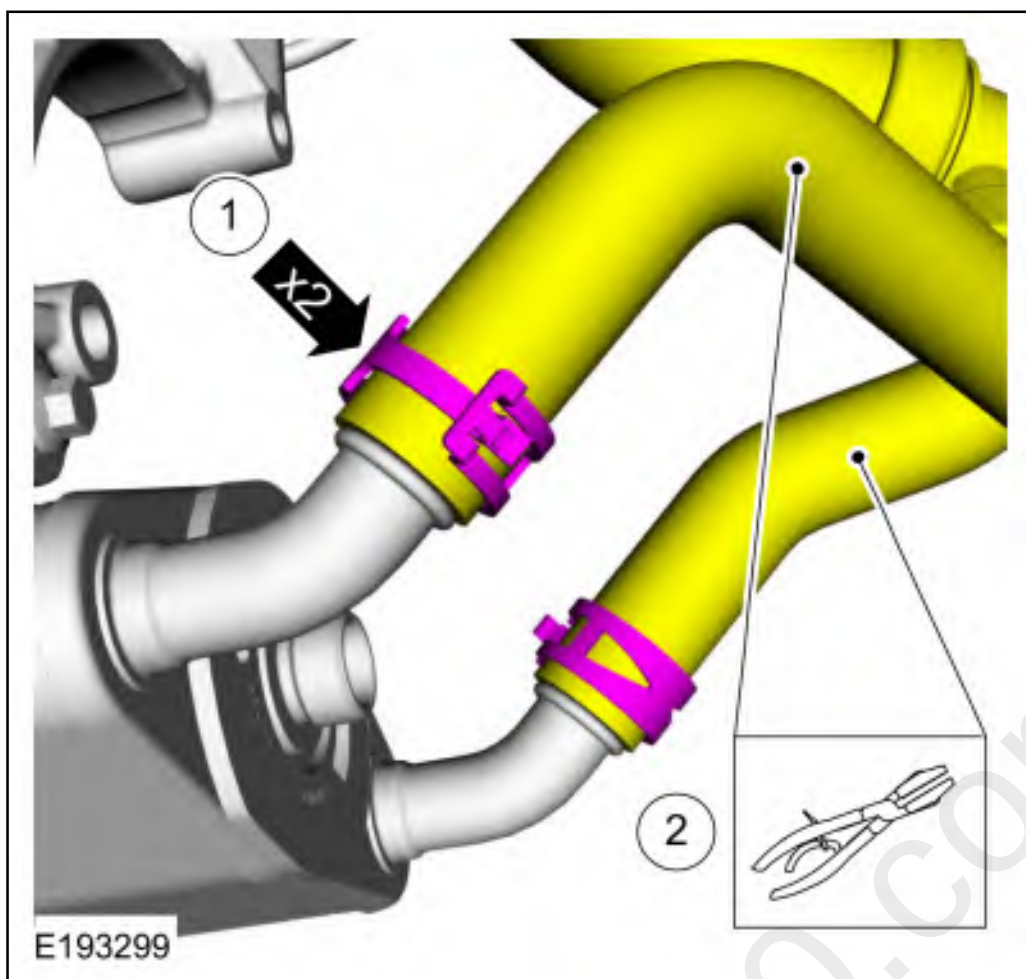
1. Install a new gasket.



2. Install the oil cooler and the retainer.
Torque: 43 lb.ft (58 Nm)



- Connect the coolant hoses.
- Remove the hose locking pliers.
Use the General Equipment: Locking Pliers



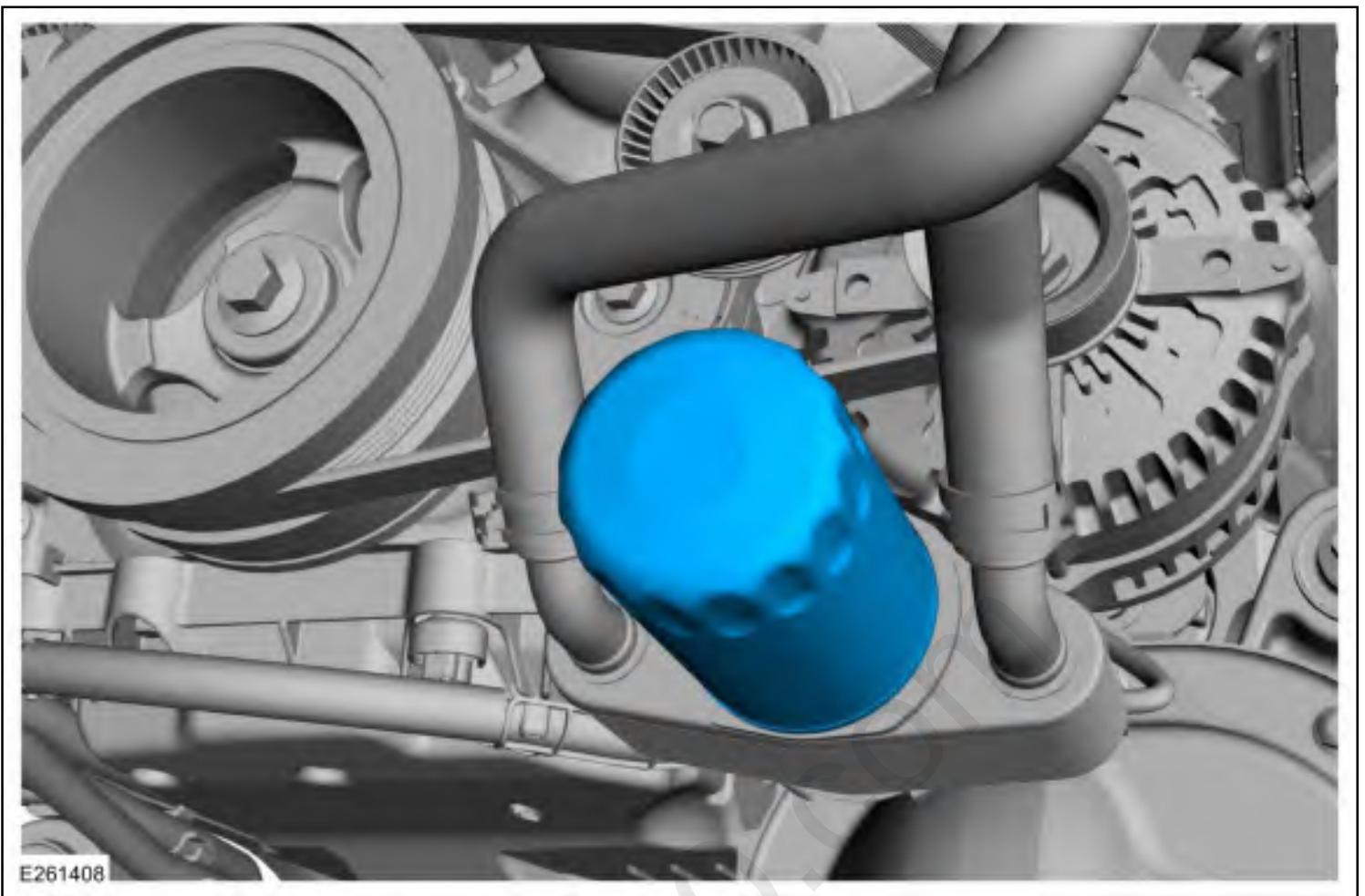
4. **NOTE:** Do not lubricate the O-ring seal.

Install a new oil filter.

Torque:

Stage 1: 44 lb.in (5 Nm)

Stage 2: 180°



5. Inspect and adjust the coolant level in the degas bottle

Material: Motorcraft® Orange Concentrated Antifreeze/Coolant / VC-3-B (WSS-M97B44-D)

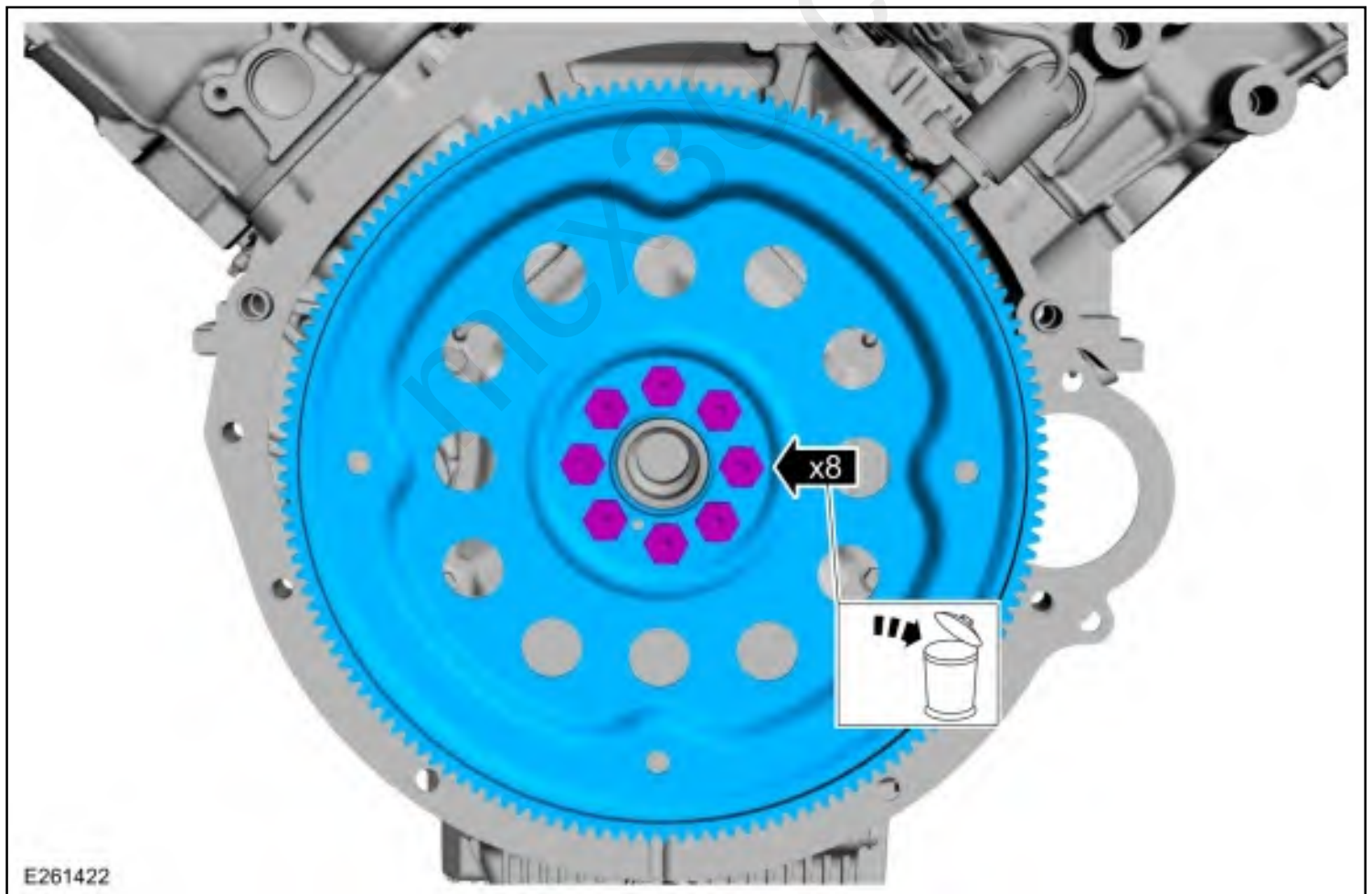
6. Inspect and adjust the engine oil level.

Refer to: [Specifications](#) (303-01D Engine - 5.0L 32V Ti-VCT, Specifications).

Flexplate

Removal

1. Remove the transmission.
Refer to: Transmission - 5.0L 32V Ti-VCT (307-01 Automatic Transmission - 6-Speed Automatic Transmission - 6R80) .
2. **NOTE:** *The flexplate bolts are torque-to-yield design and are not reusable.*
 - Remove and discard the bolts.
 - Remove the flexplate.



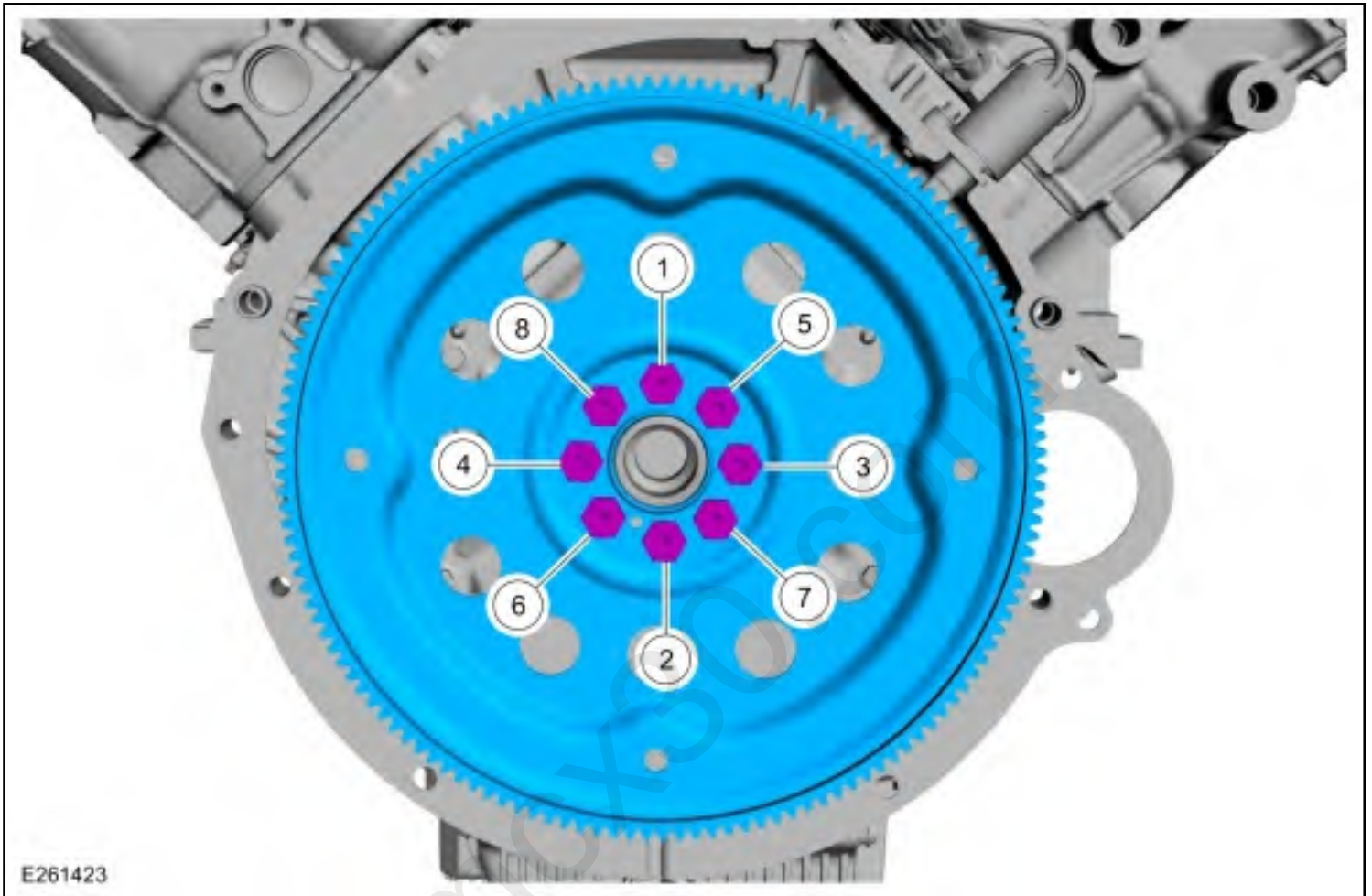
Installation

1. Install the flexplate and the bolts.

Torque:

Stage 1: 43 lb.ft (58 Nm)

Stage 2: 45°



2. Install the transmission.

Refer to: Transmission - 5.0L 32V Ti-VCT (307-01 Automatic Transmission - 6-Speed Automatic Transmission - 6R80) .

3. Use the Powertrain Control Module (PCM) Misfire Monitor Profile Correction routine in the diagnostic scan tool.

Exhaust Manifold LH

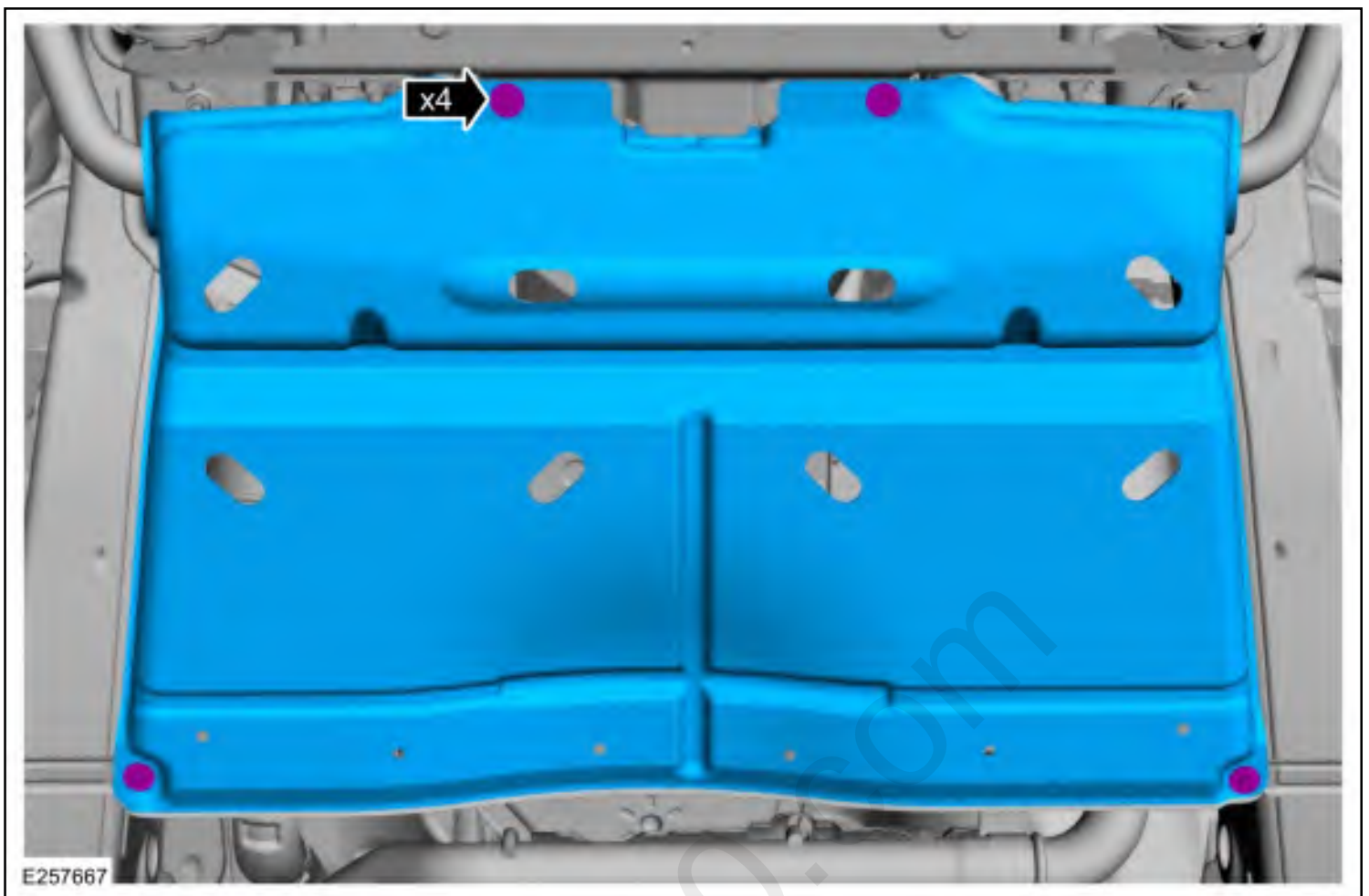
Base Part Number: Base Part Number: 9431

Removal

1. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
2. Disconnect the battery ground cable.
Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .
3. Remove the following items:
 1. **NOTE:** *It is not necessary to separate the air cleaner outlet pipe and the air cleaner, they can be removed as an assembly.*

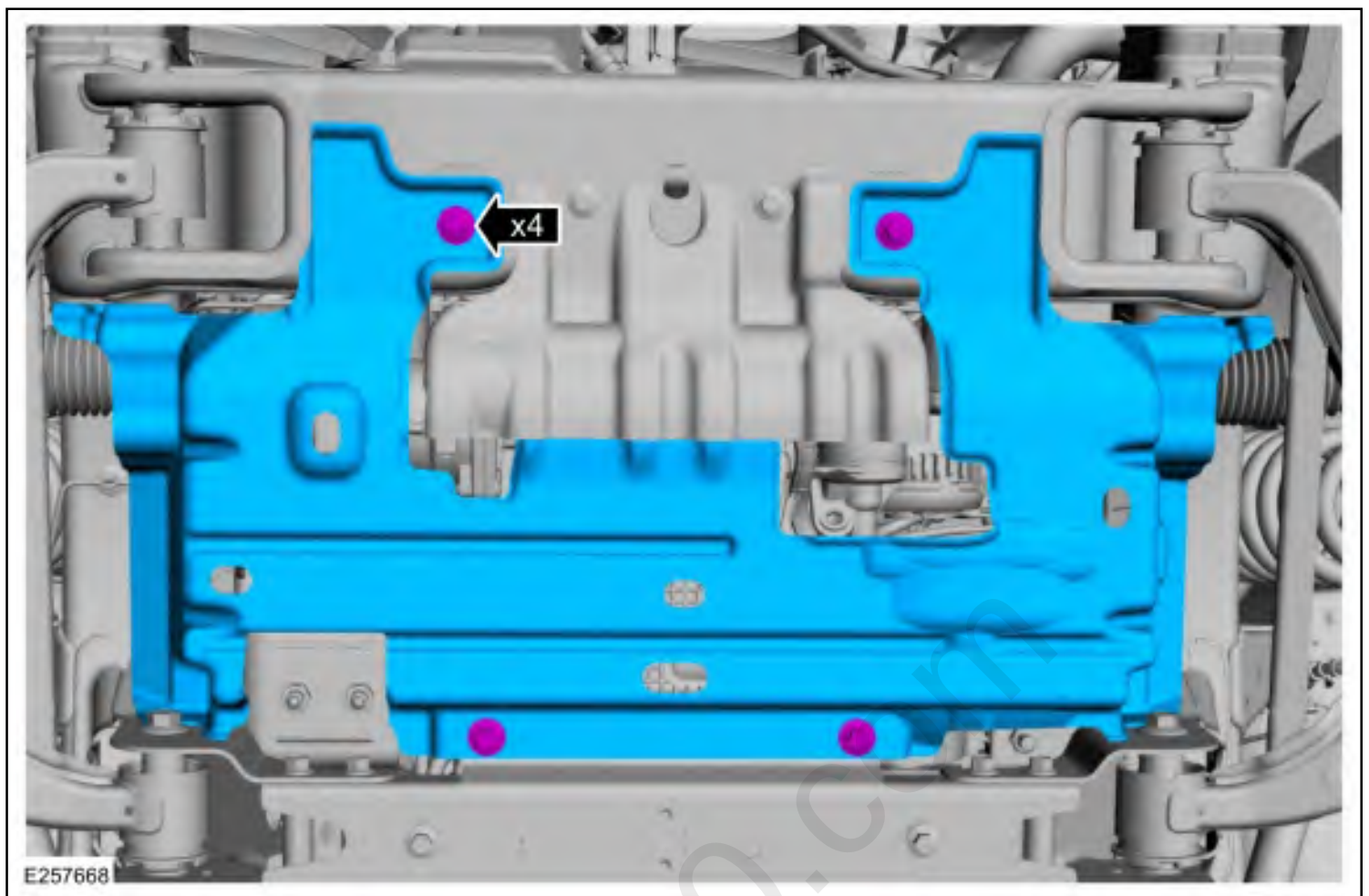
Refer to: [Air Cleaner Outlet Pipe](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).
 2. Refer to: [Air Cleaner](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).
 3. LH wheel and tire.
Refer to: [Wheel and Tire](#) (204-04A Wheels and Tires, Removal and Installation).
 4. LH fender splash shield.
Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
4. **NOTE:** *If equipped.*

Remove the bolts and the underbody shield.



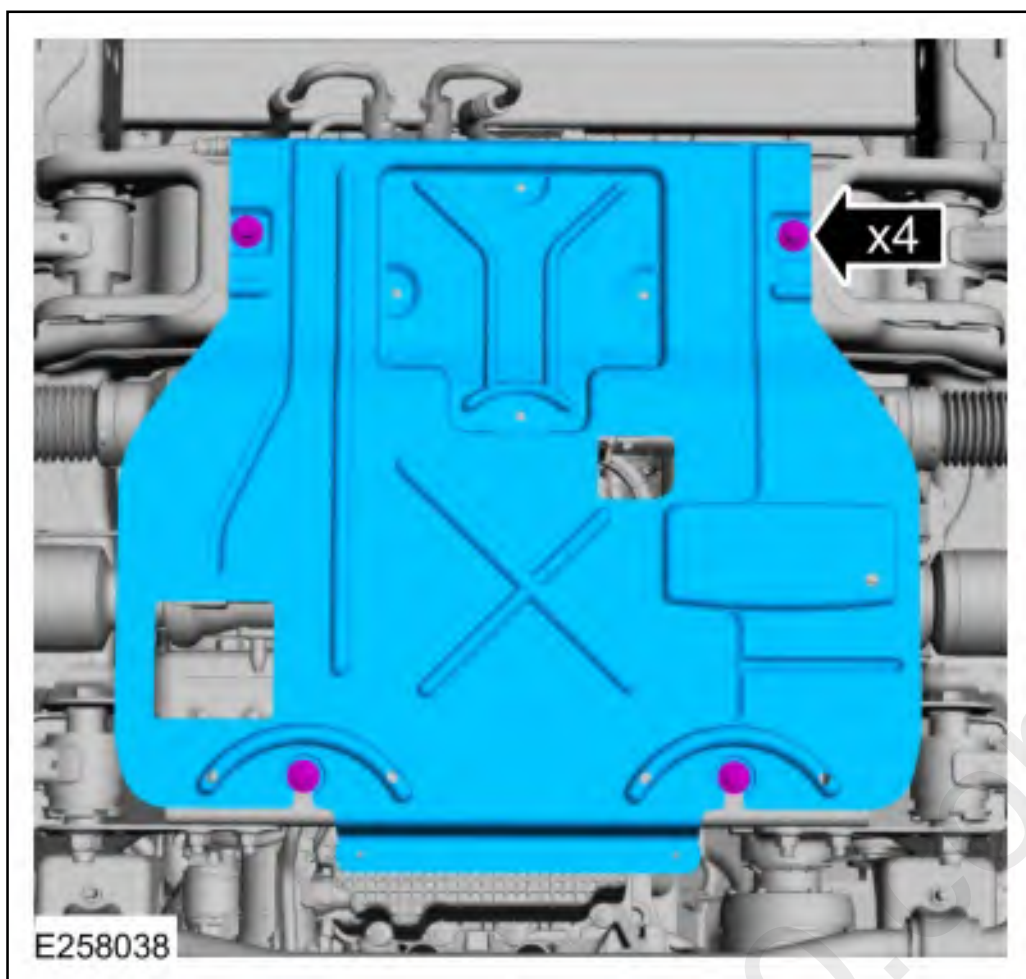
5. **NOTE:** *If equipped.*

Remove the bolts and the underbody shield.

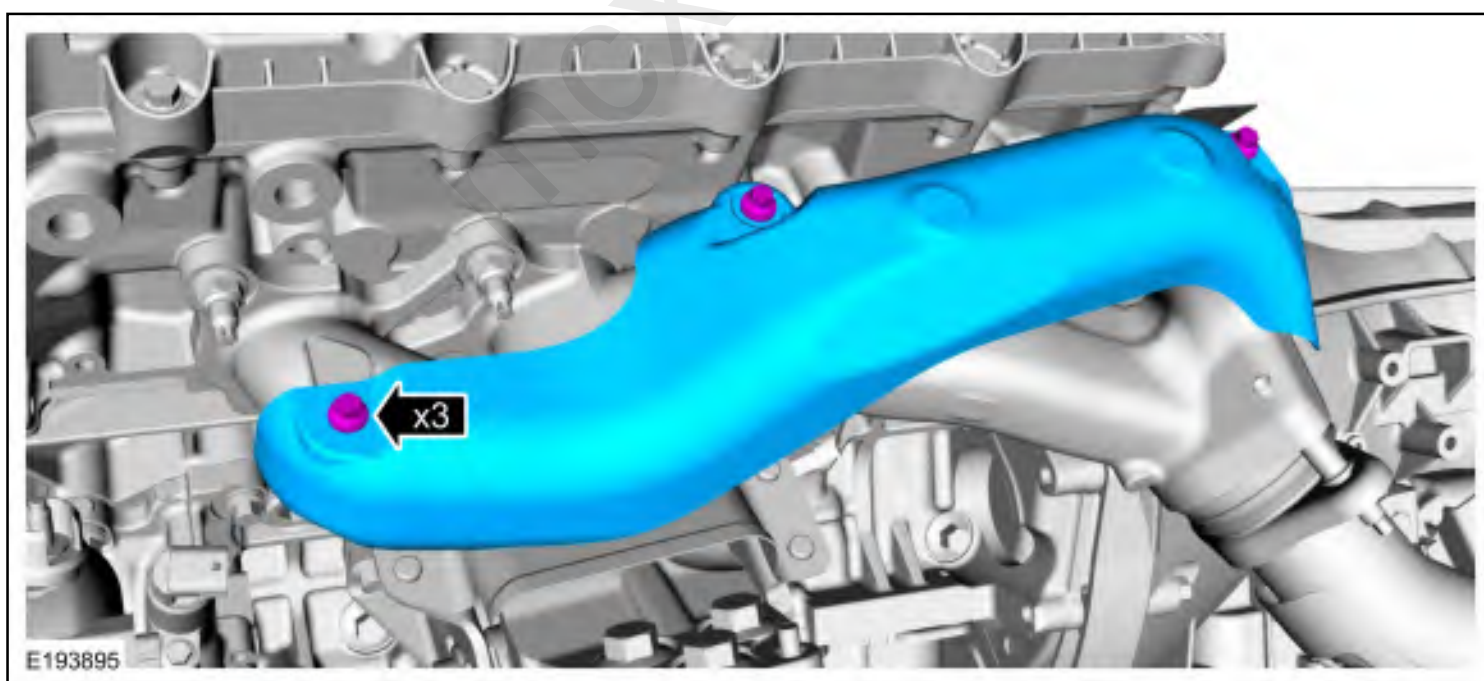


6. **NOTE:** *If equipped.*

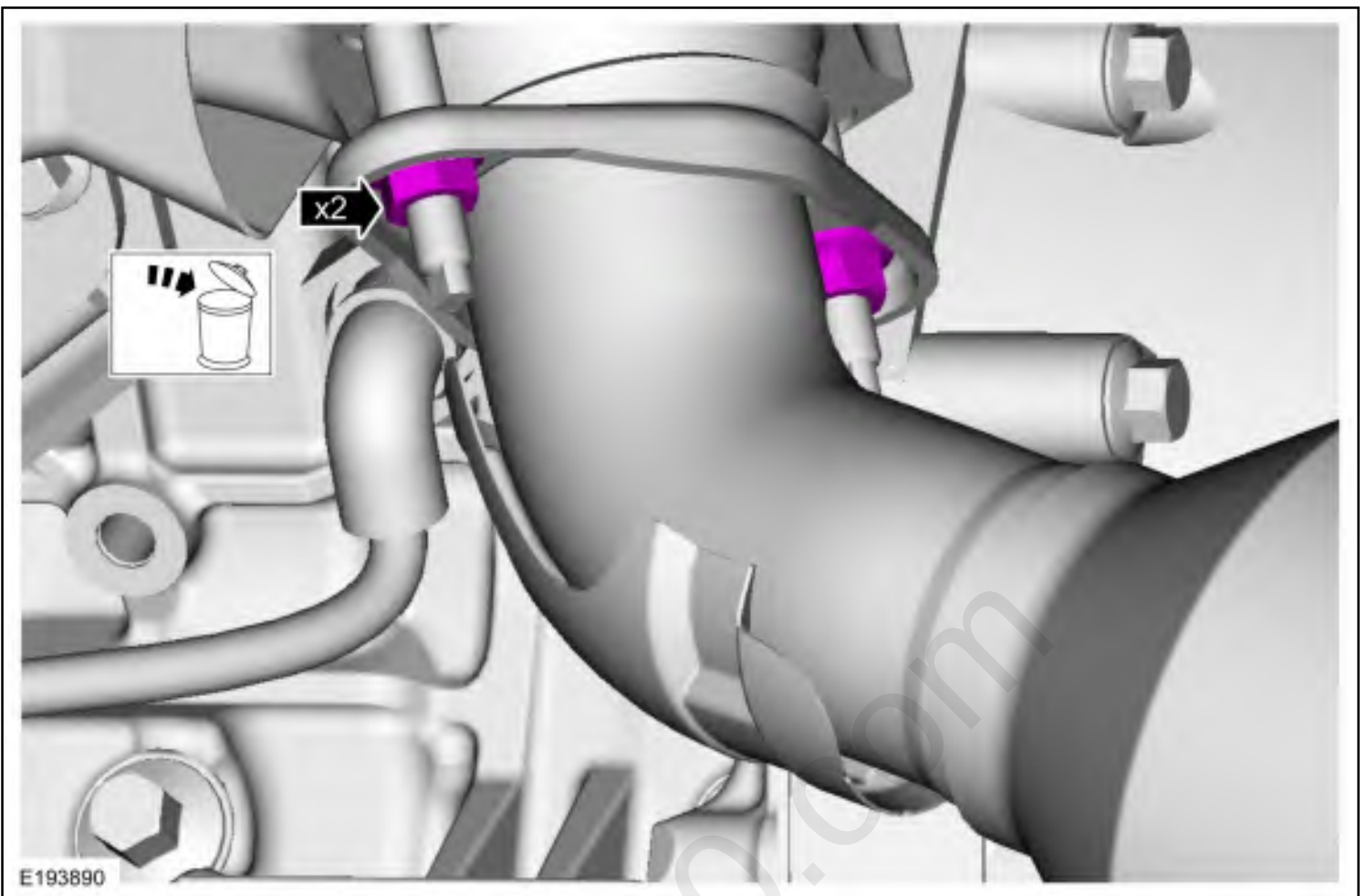
Remove the bolts and the skid plate.



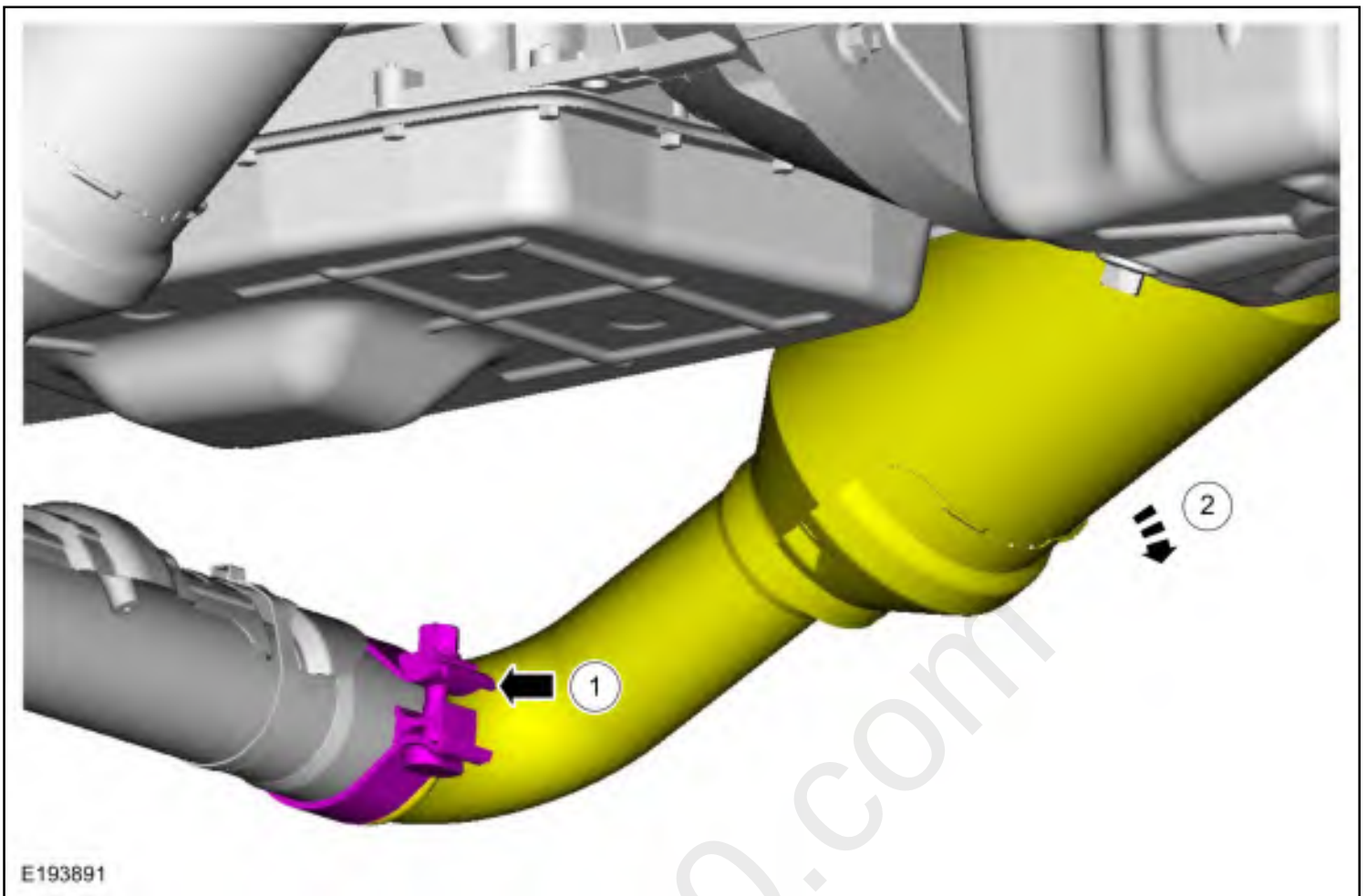
7. Remove the bolts and the LH exhaust manifold heat shield.



8. Remove and discard the catalytic converter-to-LH exhaust manifold nuts.



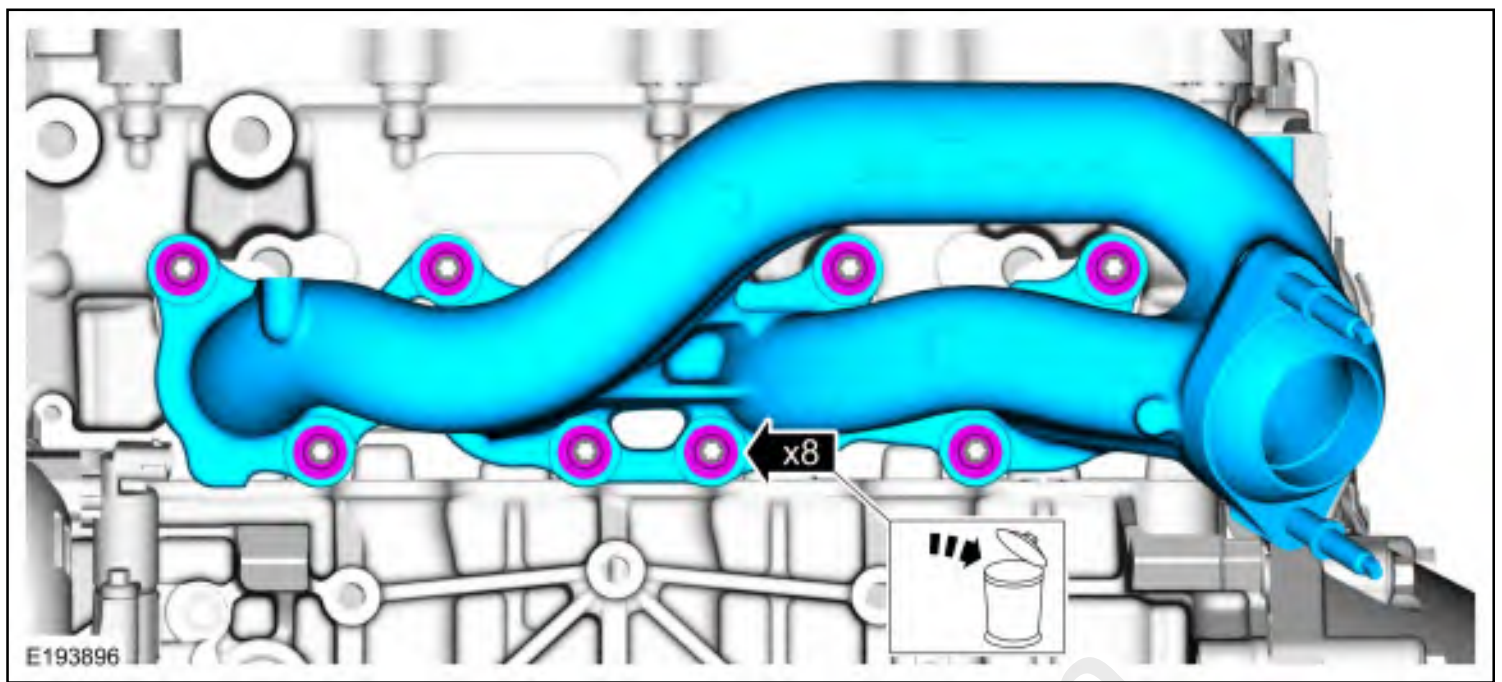
1. Loosen the LH catalytic converter-to- RH catalytic converter Torca® clamp.
 2. Lower the catalytic converter to disengage the catalytic converter flange from the LH exhaust manifold studs.
- Clean the catalytic converter-to-manifold mating surface.



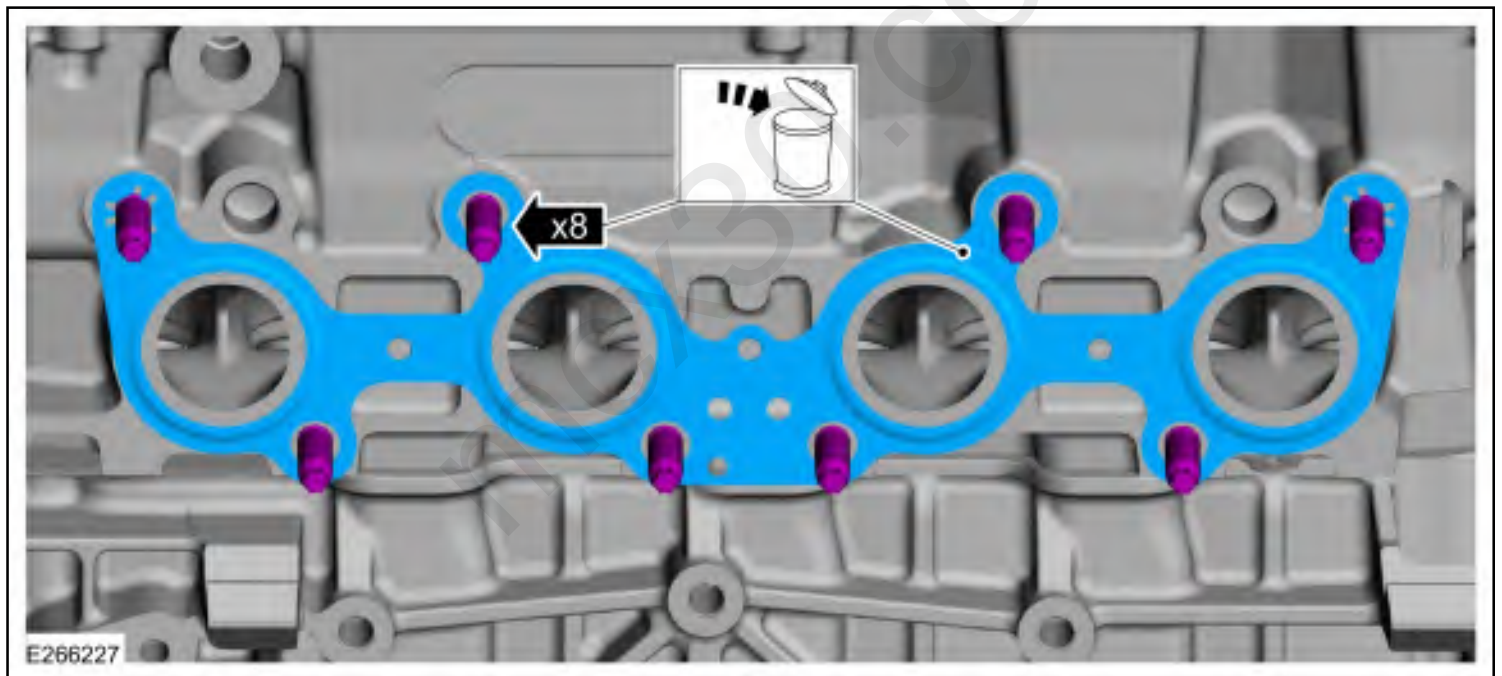
10. Remove and discard the nuts.

1. Remove the exhaust manifold.
2. Clean and inspect the exhaust manifold.

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

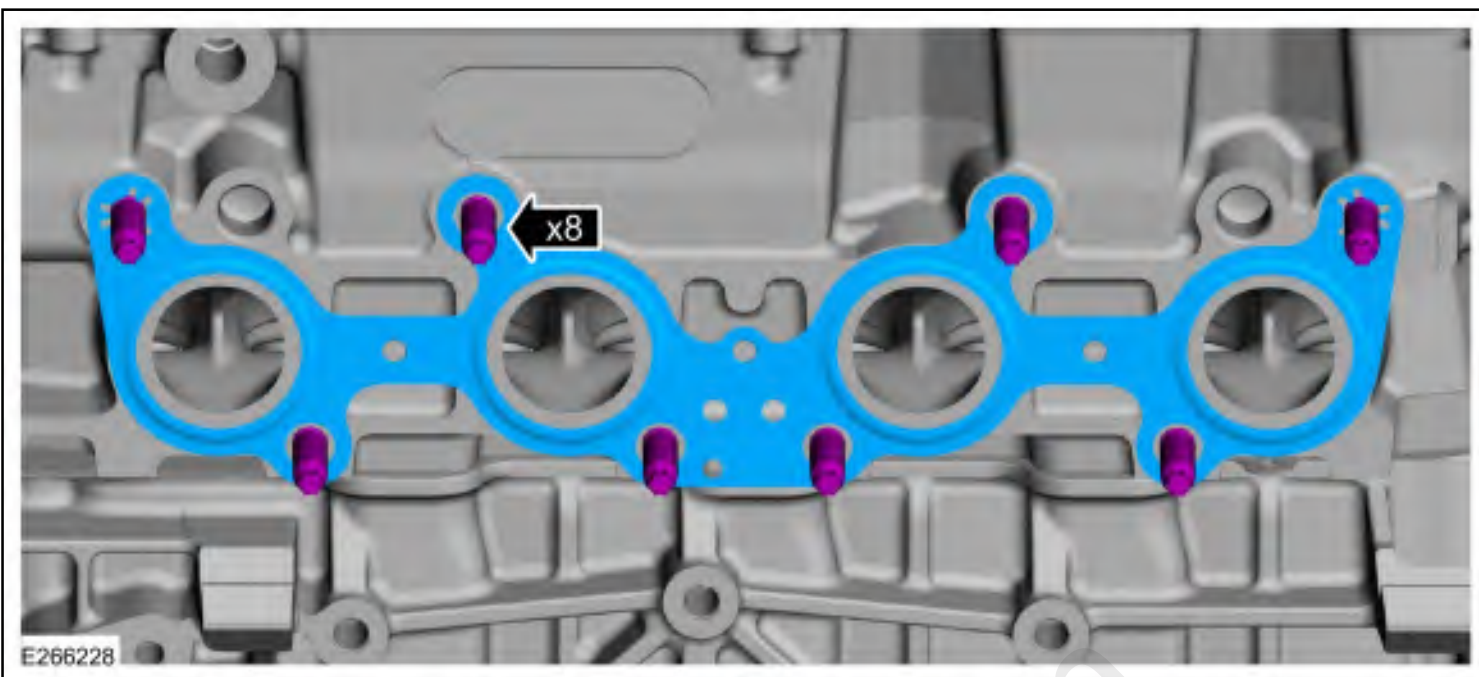


11. Remove and discard the gasket and studs.



Installation

1. Install new studs and new gasket.
Torque: 18 lb.ft (25 Nm)



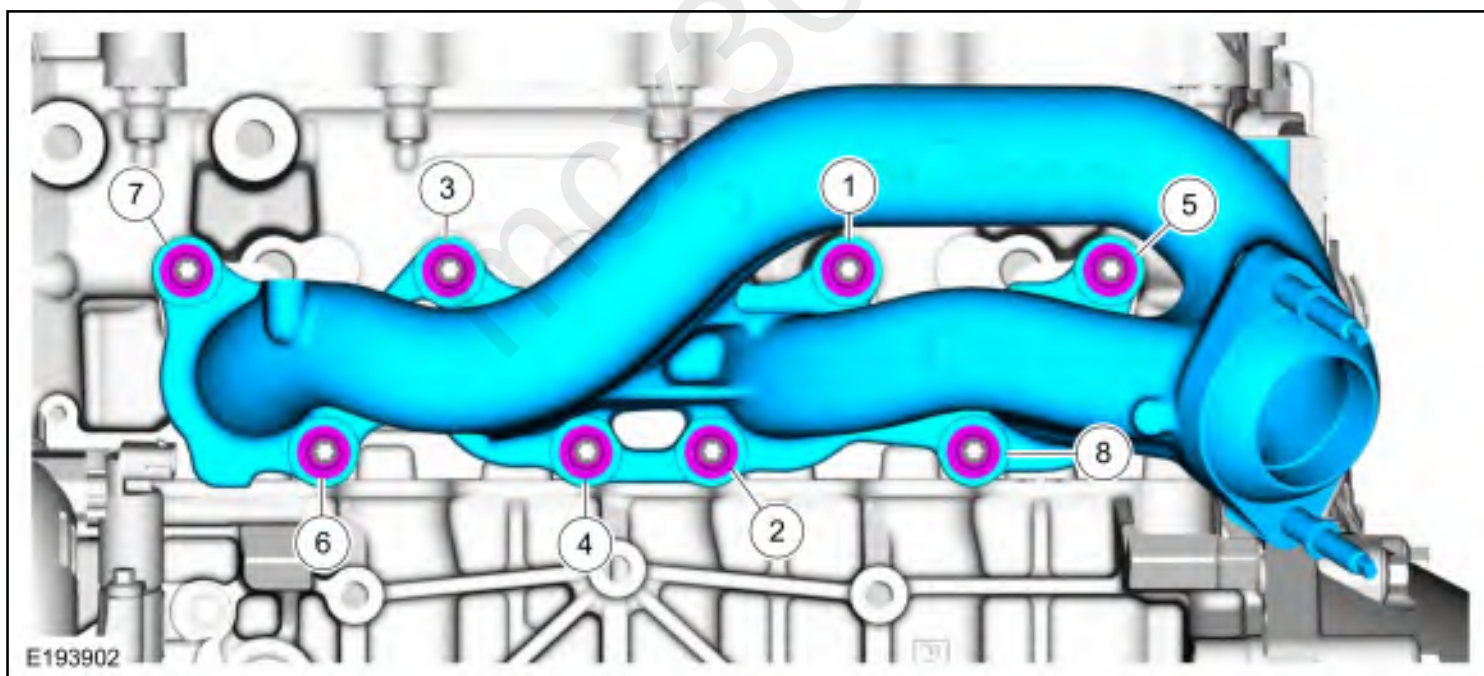
2. Install the exhaust manifold.

- Install the new nuts.

Torque:

Stage 1: 18 lb.ft (24 Nm)

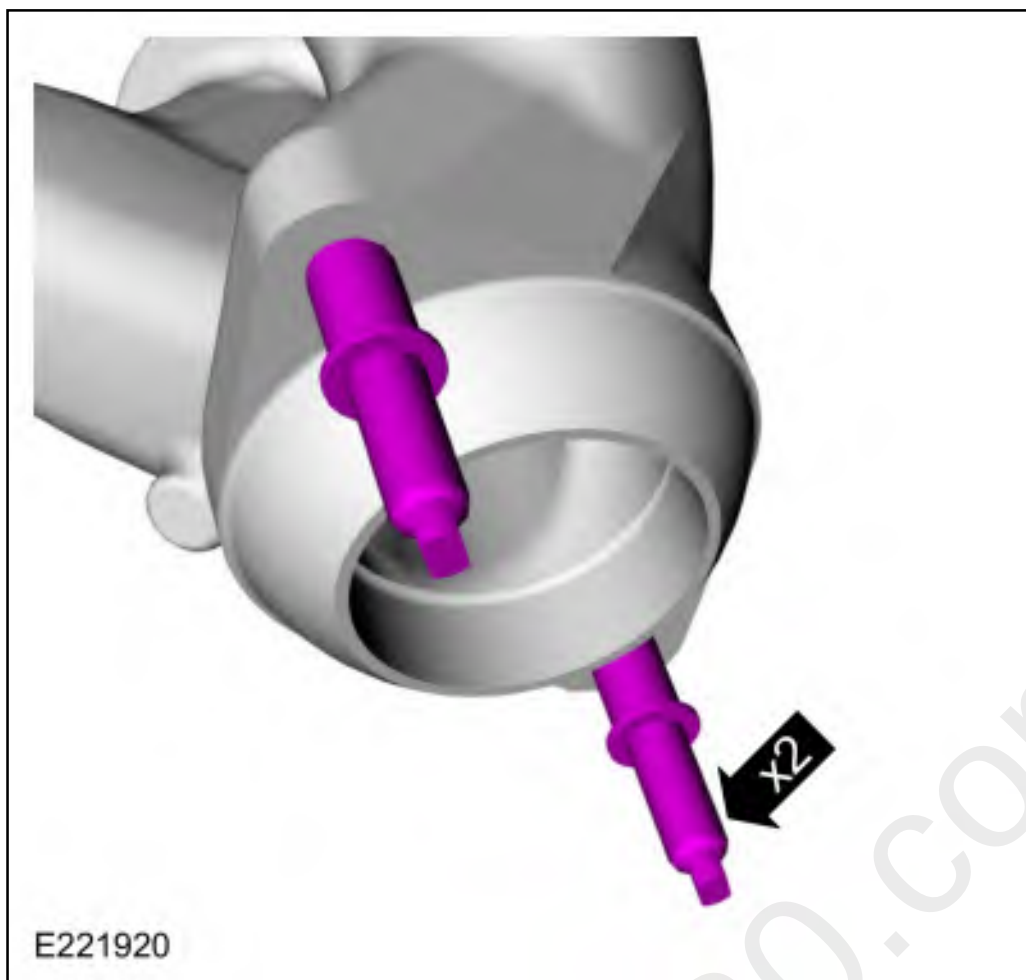
Stage 2: 24 lb.ft (32 Nm)



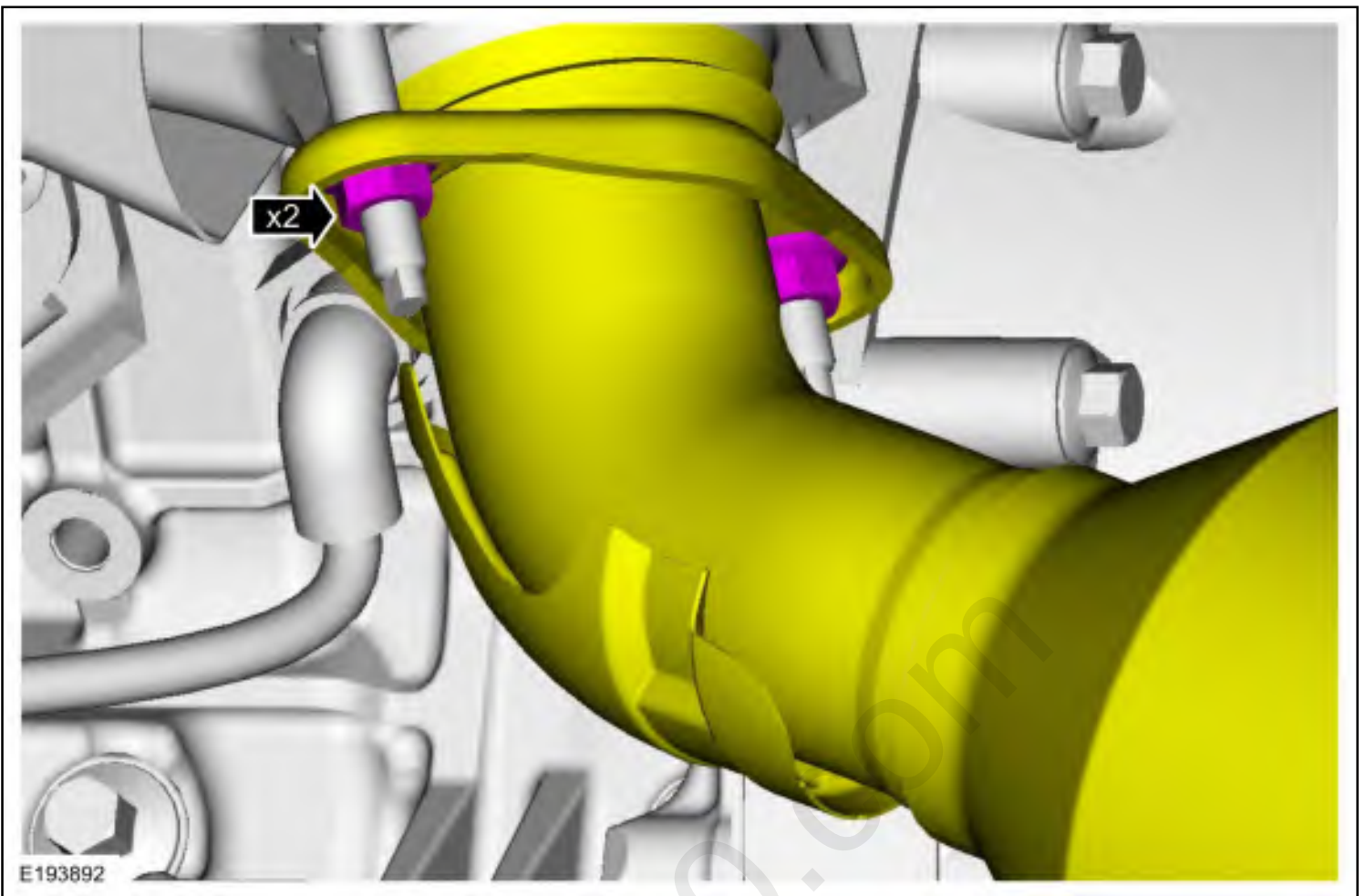
3. **NOTE:** Some replacement exhaust manifolds do not come with studs.

If necessary, install new studs.

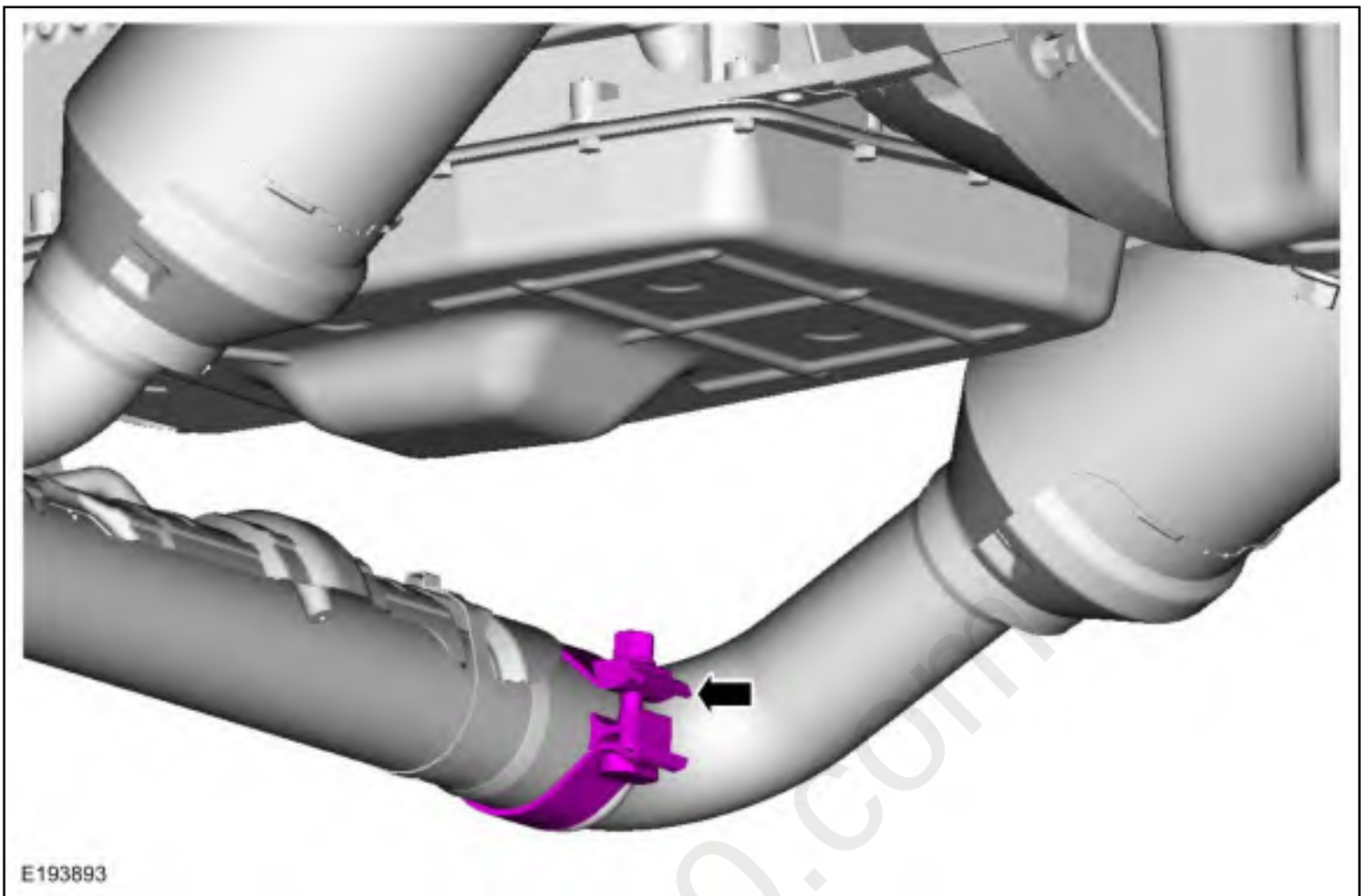
Torque: 30 lb.ft (40 Nm)



4. Position the LH catalytic converter onto the exhaust manifold and loosely install the new nuts.



5. Tighten the Torca® clamp.
Torque: 41 lb.ft (55 Nm)

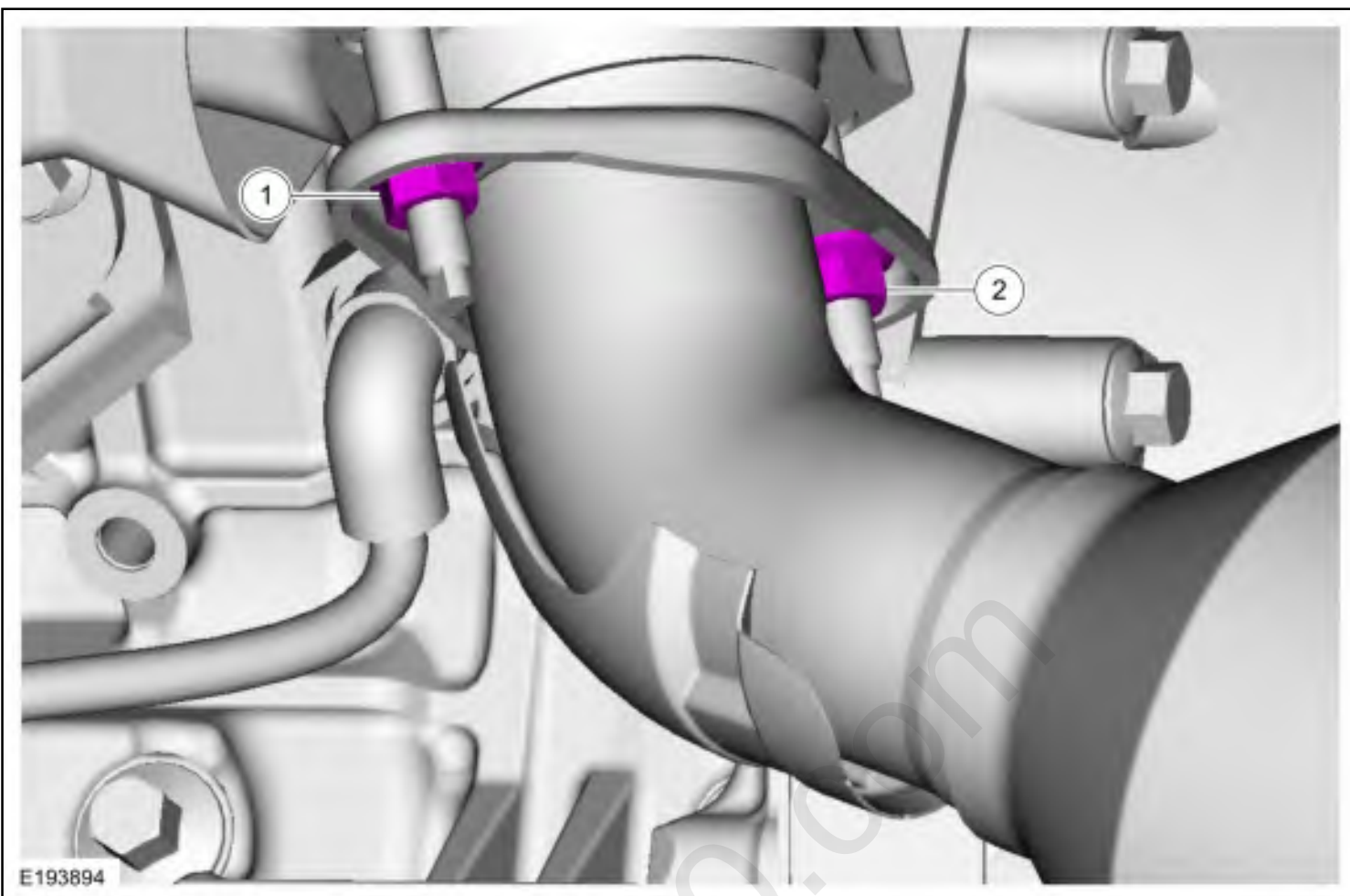


6. Tighten the nuts.

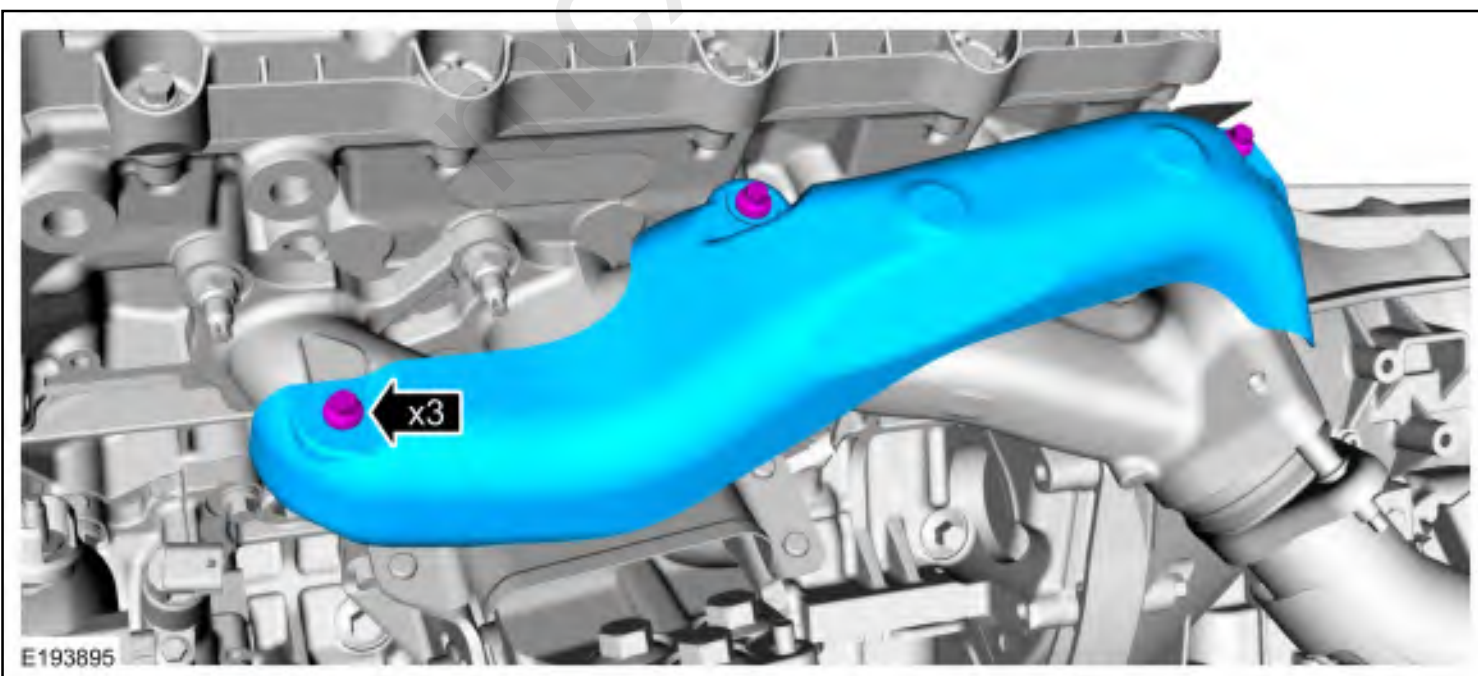
Torque:

Outer catalytic converter-to-exhaust manifold nut : 30 lb.ft (40 Nm)

Inner catalytic converter-to-exhaust manifold nut : 30 lb.ft (40 Nm)



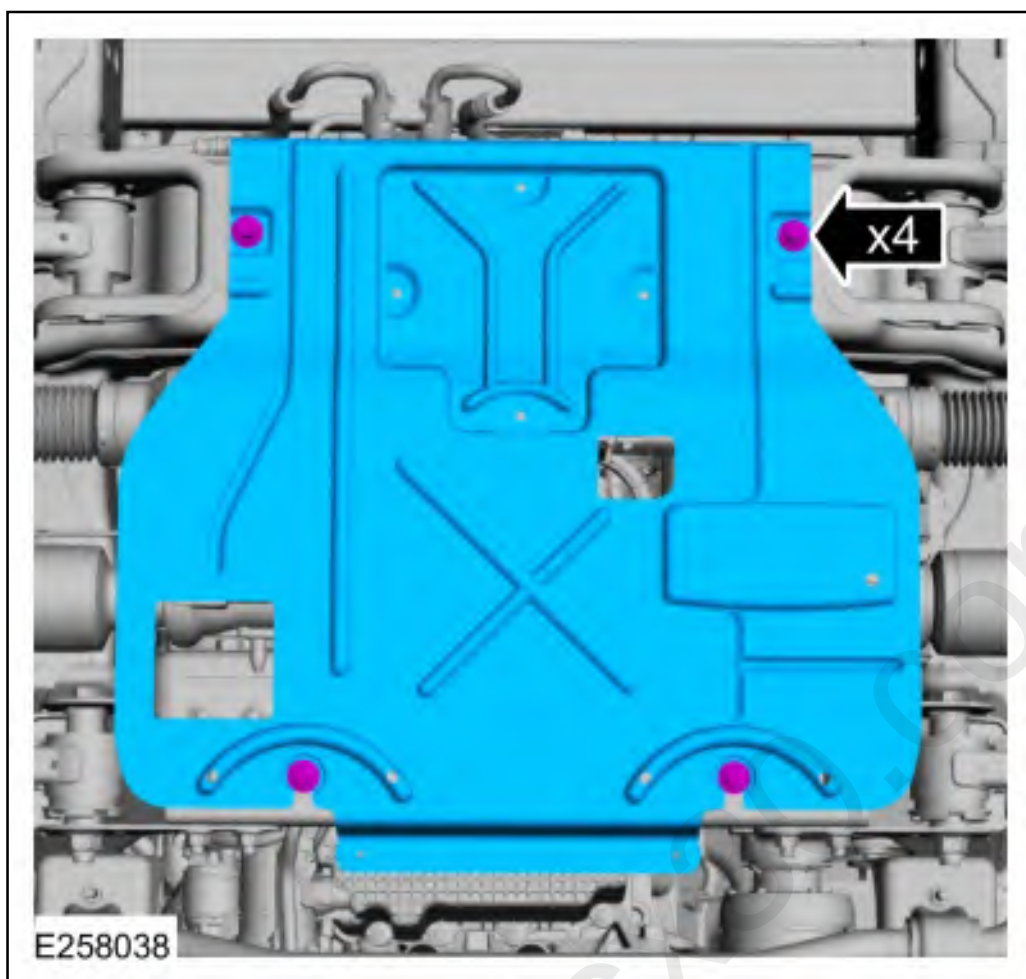
7. Install the heat shield and bolts.
Torque: 106 lb.in (12 Nm)



8. **NOTE:** *If equipped.*

Install the skid plate and bolts.

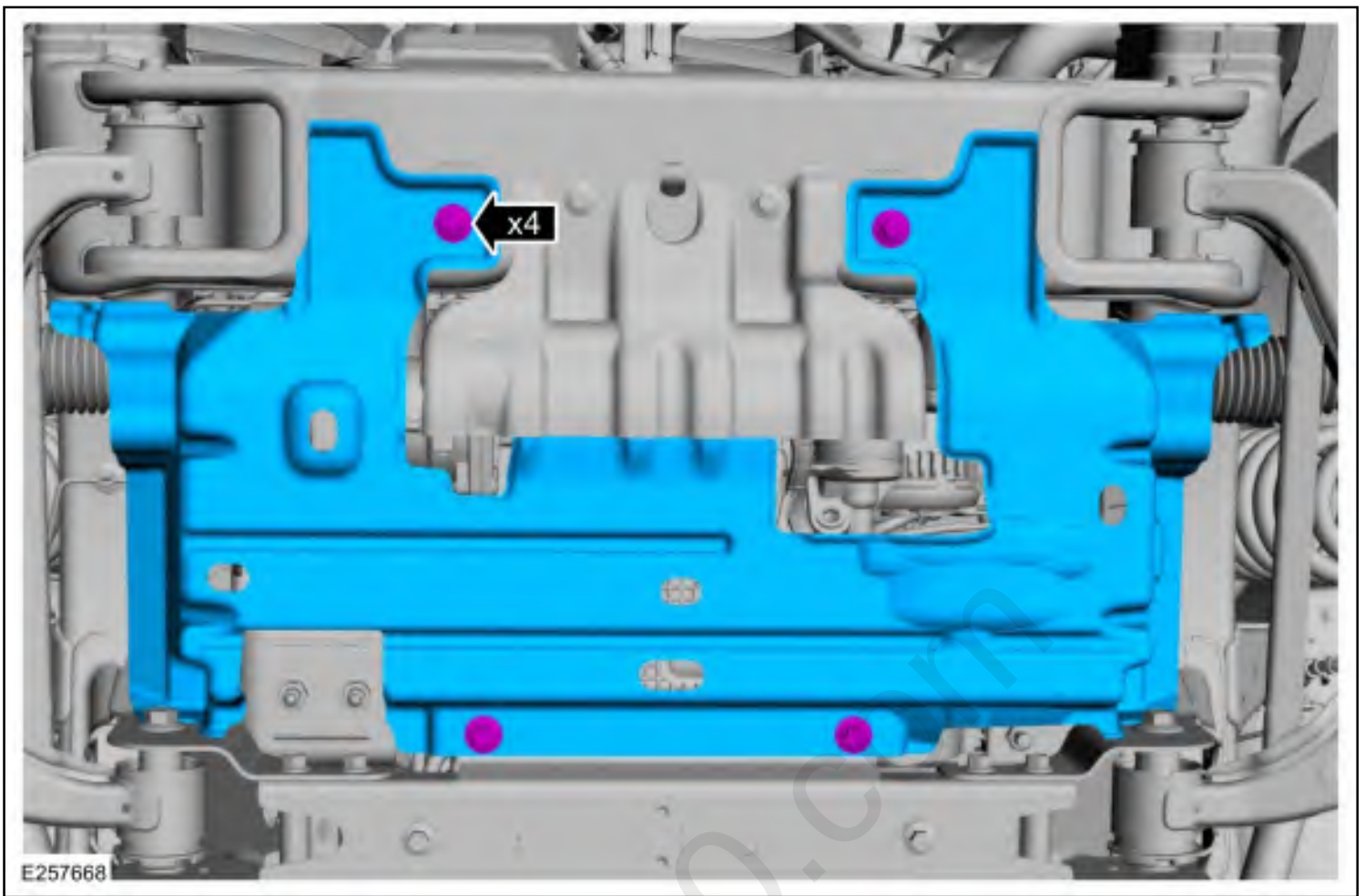
Torque: 30 lb.ft (40 Nm)



9. **NOTE:** *If equipped.*

Install the underbody shield and fasteners.

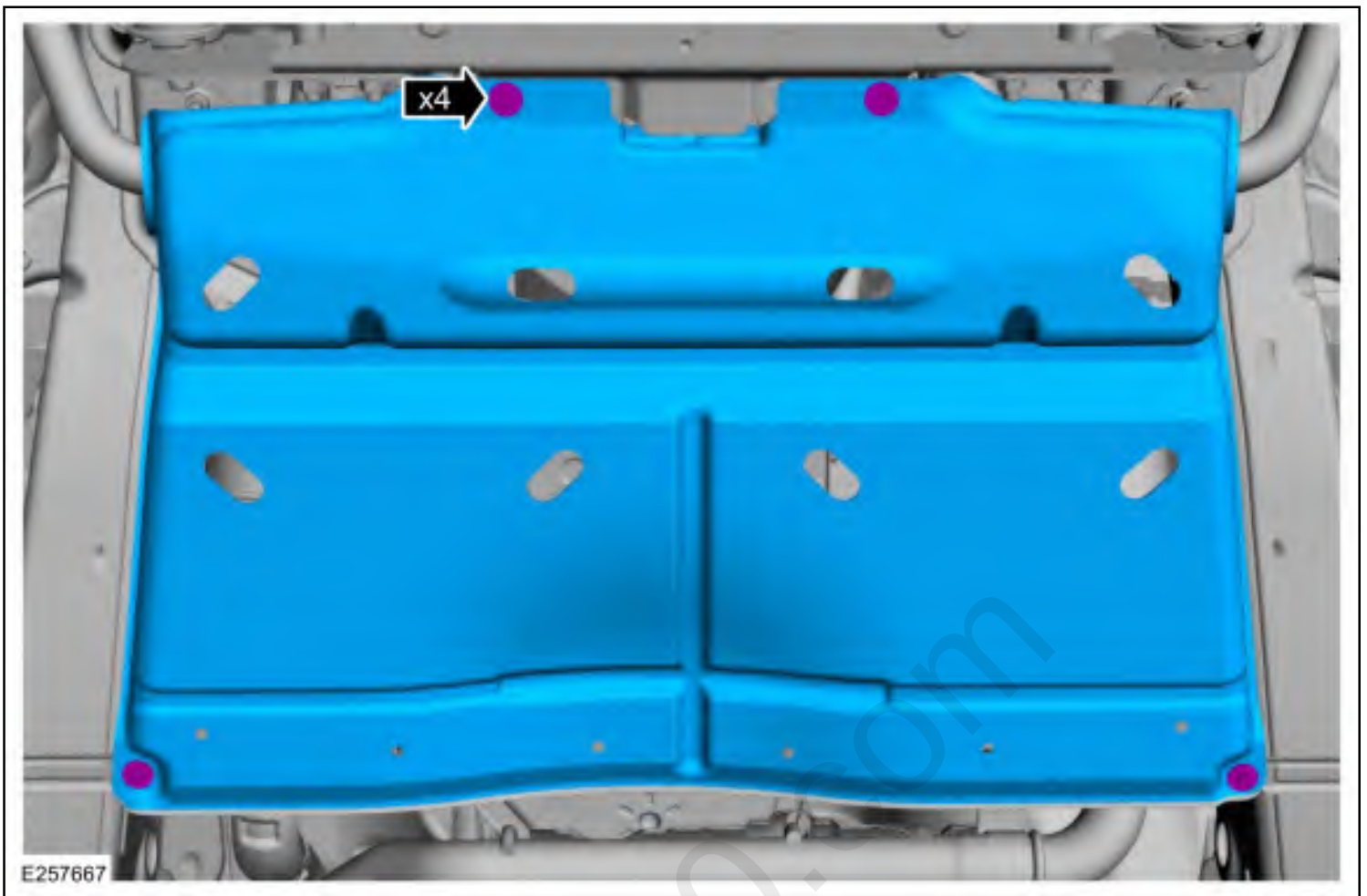
Torque: 30 lb.ft (40 Nm)



10. **NOTE:** *If equipped.*

Install the underbody shield and the bolts.

Torque: 71 lb.in (8 Nm)



11. Install the following items:

1. LH fender splash shield.

Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

2. LH wheel and tire.

Refer to: [Wheel and Tire](#) (204-04A Wheels and Tires, Removal and Installation).

3. **NOTE:** *It is not necessary to separate the air cleaner outlet pipe and the air cleaner, they can be installed as an assembly.*

Refer to: [Air Cleaner](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).

4. Refer to: [Air Cleaner Outlet Pipe](#) (303-12D Intake Air Distribution and Filtering - 5.0L 32V Ti-VCT, Removal and Installation).

12. Connect the battery ground cable.

Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .

13. Start the engine and check for exhaust leaks.

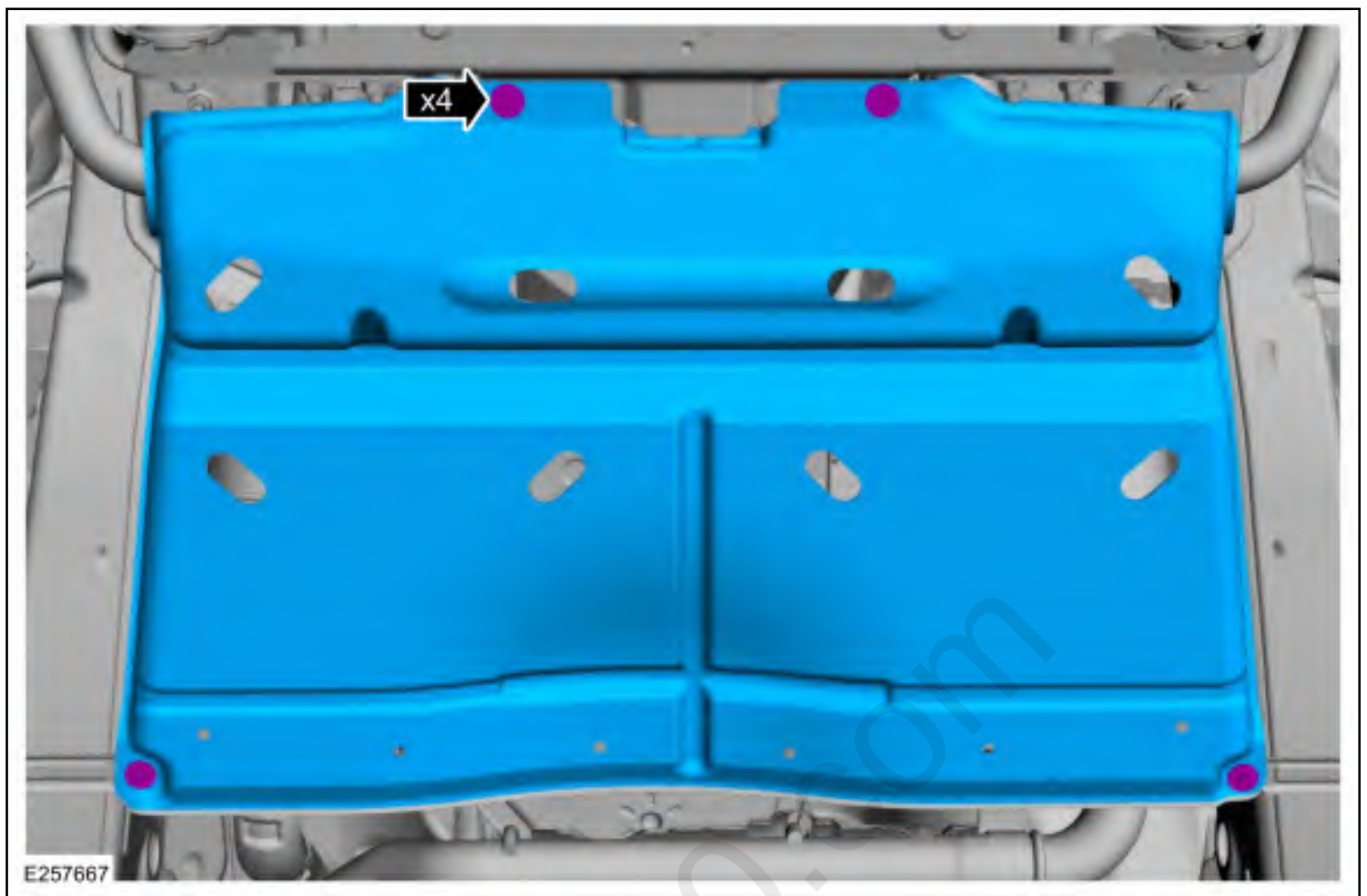
Exhaust Manifold RH

Base Part Number: Base Part Number: 9431

Removal

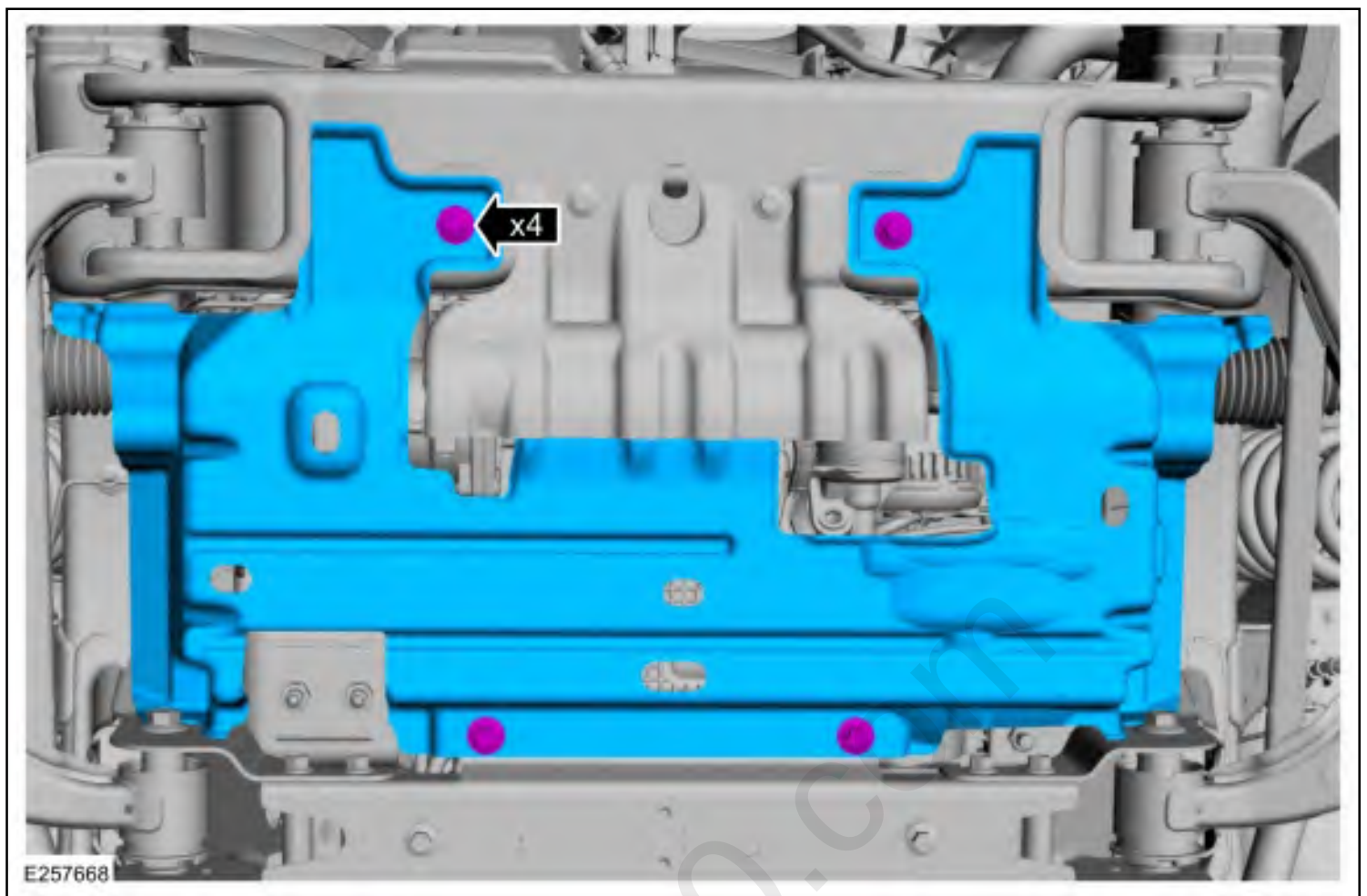
1. With the vehicle in NEUTRAL, position it on a hoist.
Refer to: [Jacking and Lifting - Overview](#) (100-02 Jacking and Lifting, Description and Operation).
2. Disconnect the battery ground cable.
Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .
3. **NOTE:** *If equipped.*

Remove the bolts and the underbody shield.



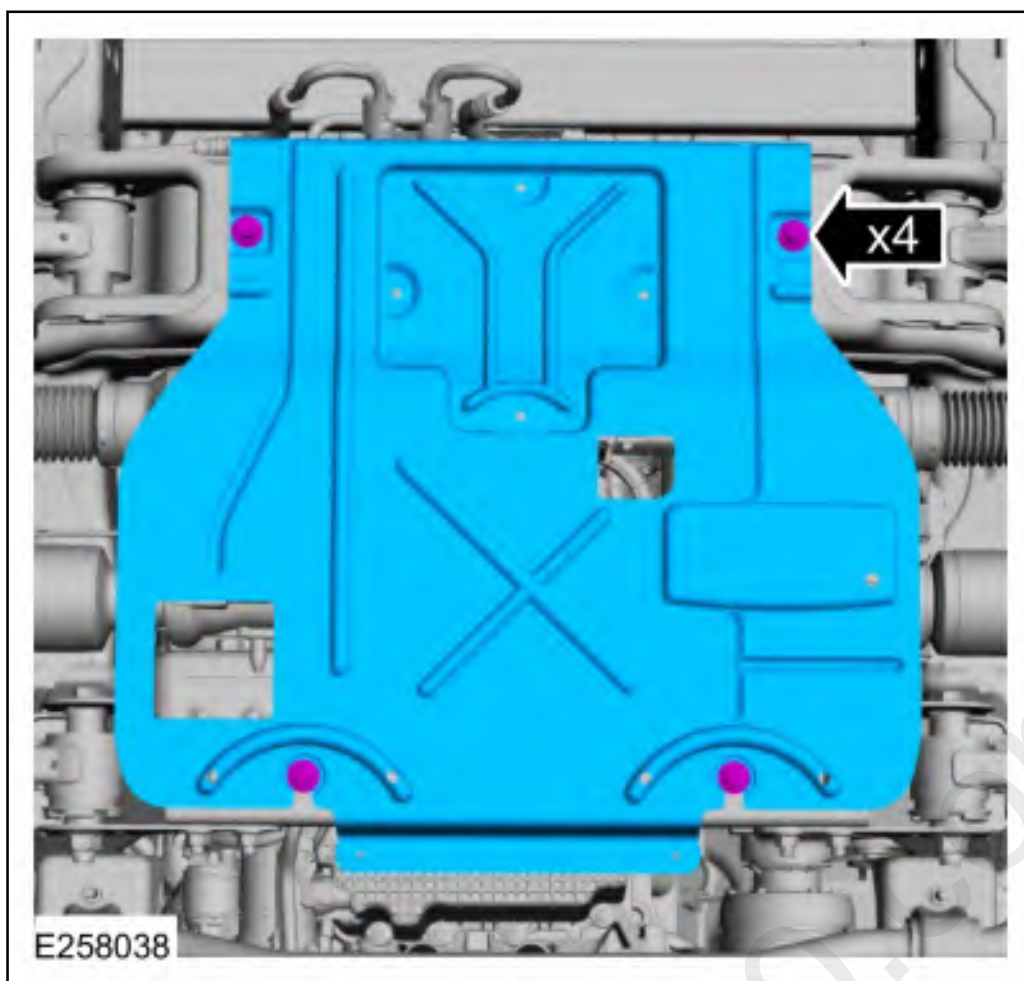
4. **NOTE:** *If equipped.*

Remove the bolts and the underbody shield.



5. **NOTE:** *If equipped.*

Remove the bolts and the skid plate.



6. Remove the following items:

1. RH wheel and tire.

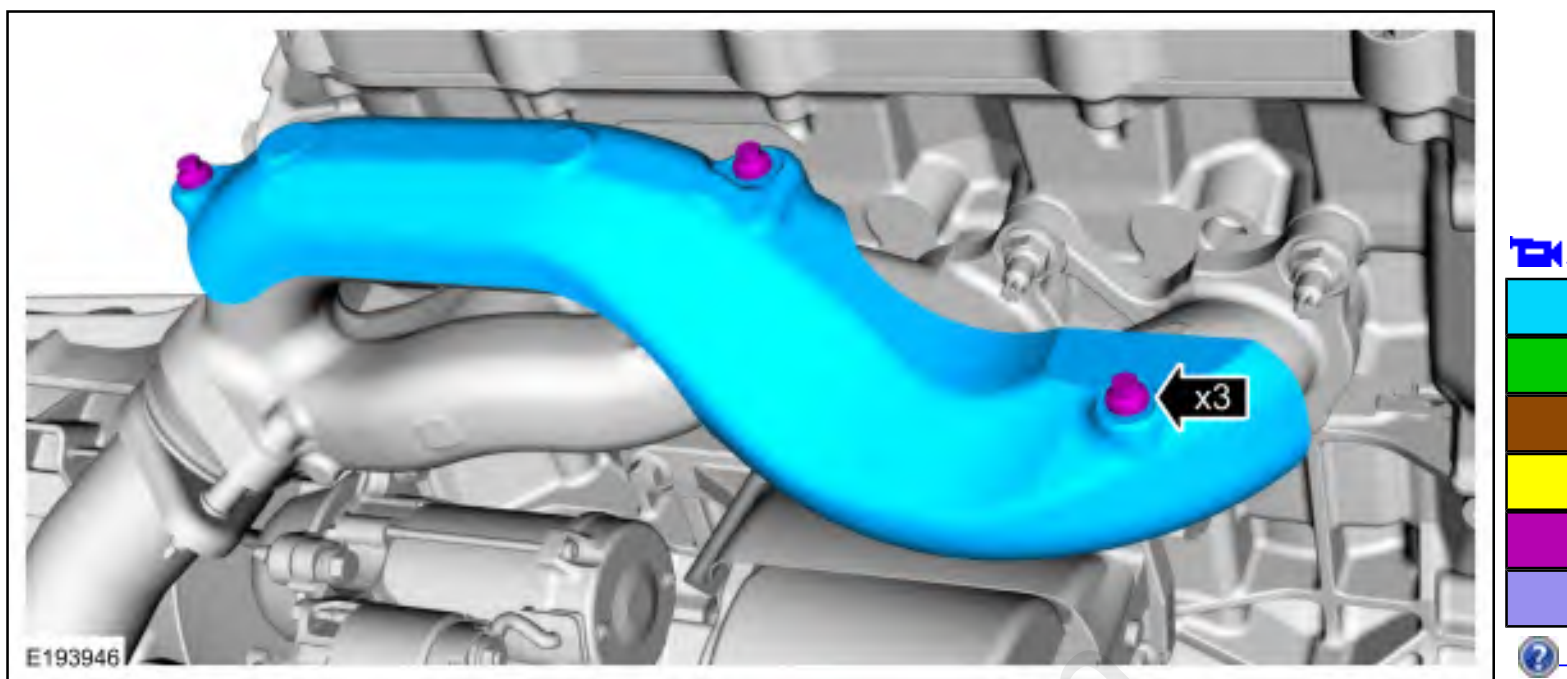
Refer to: [Wheel and Tire](#) (204-04A Wheels and Tires, Removal and Installation).

2. RH fender splash shield.

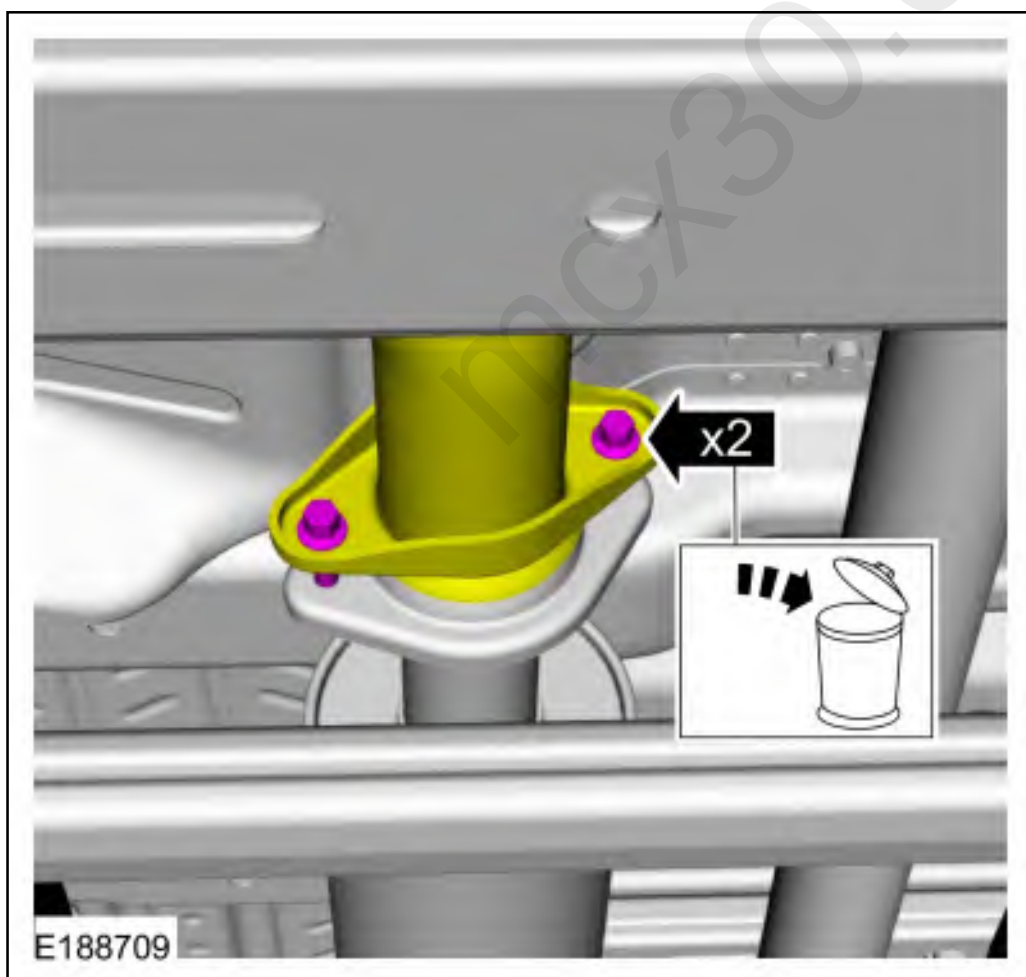
Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).

3. Refer to: Air Conditioning (A/C) Compressor - 5.0L 32V Ti-VCT (412-00 Climate Control System - General Information) .

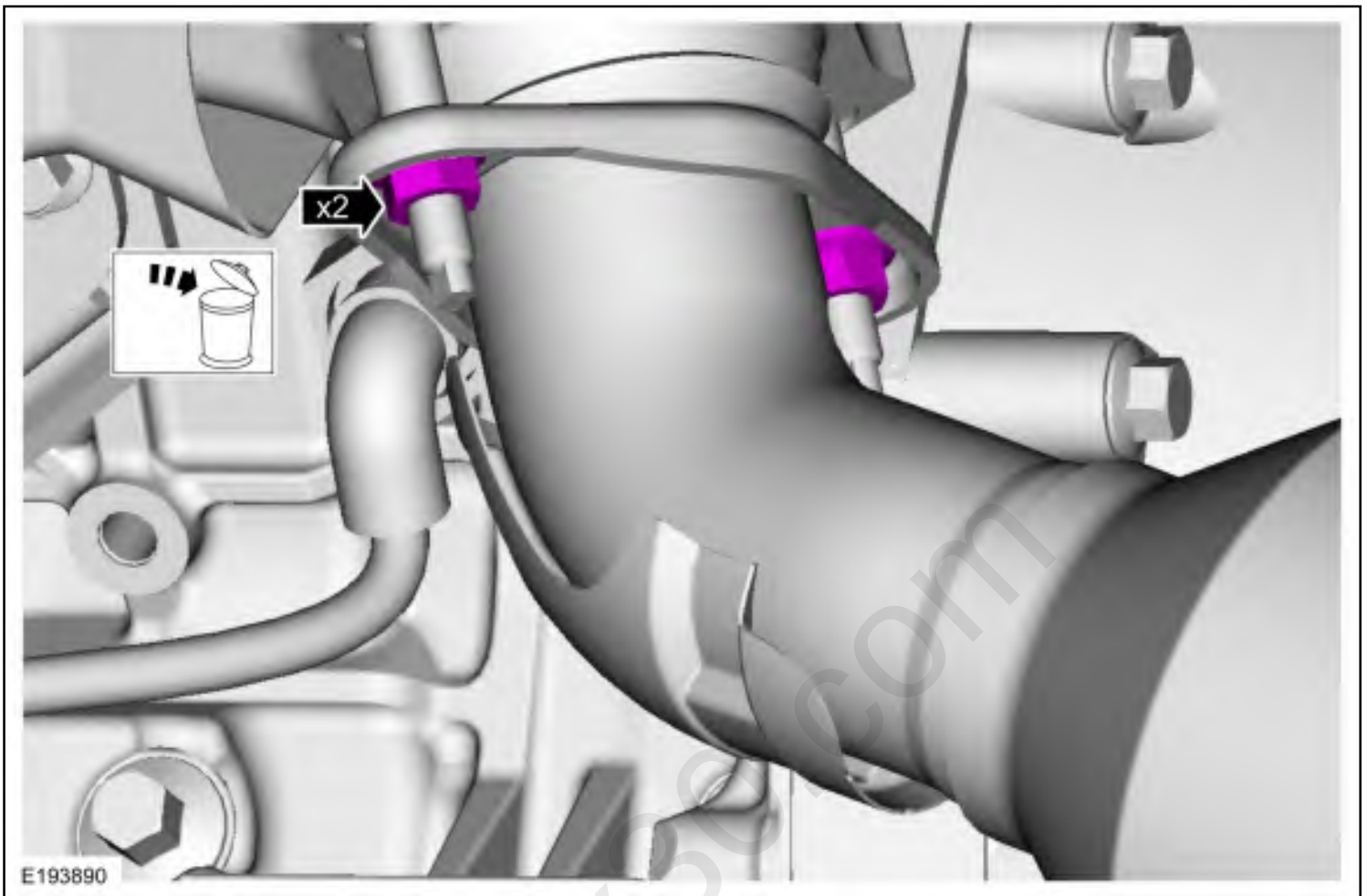
7. Remove the bolts and the RH exhaust manifold heat shield.



8. Remove and discard the exhaust Y-pipe dual catalytic converter-to-exhaust intermediate pipe bolts.
- Separate the pipe from the converter.
 - Clean the exhaust mating surfaces.

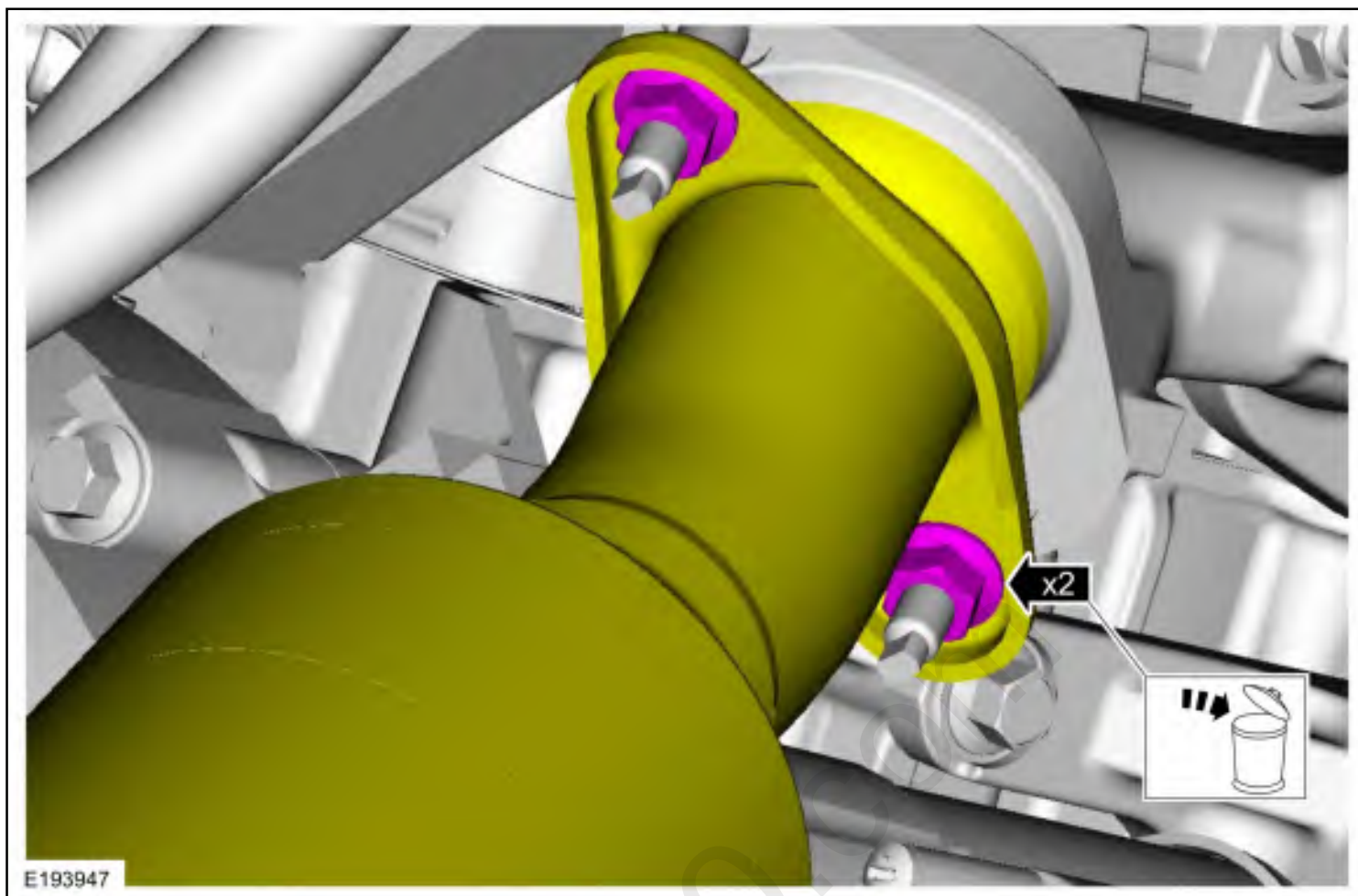


9. Remove and discard the catalytic converter-to-LH exhaust manifold nuts.

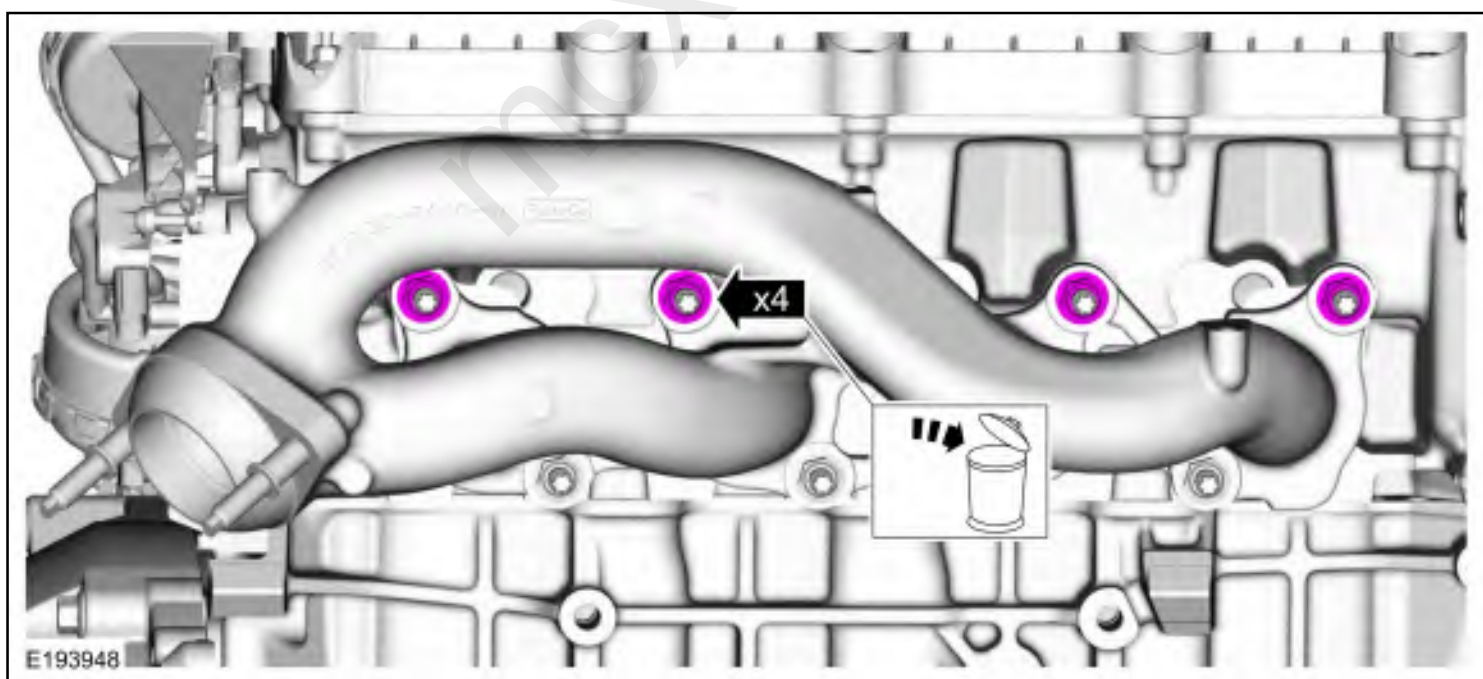


10. Remove and discard the catalytic converter-to-RH exhaust manifold nuts.

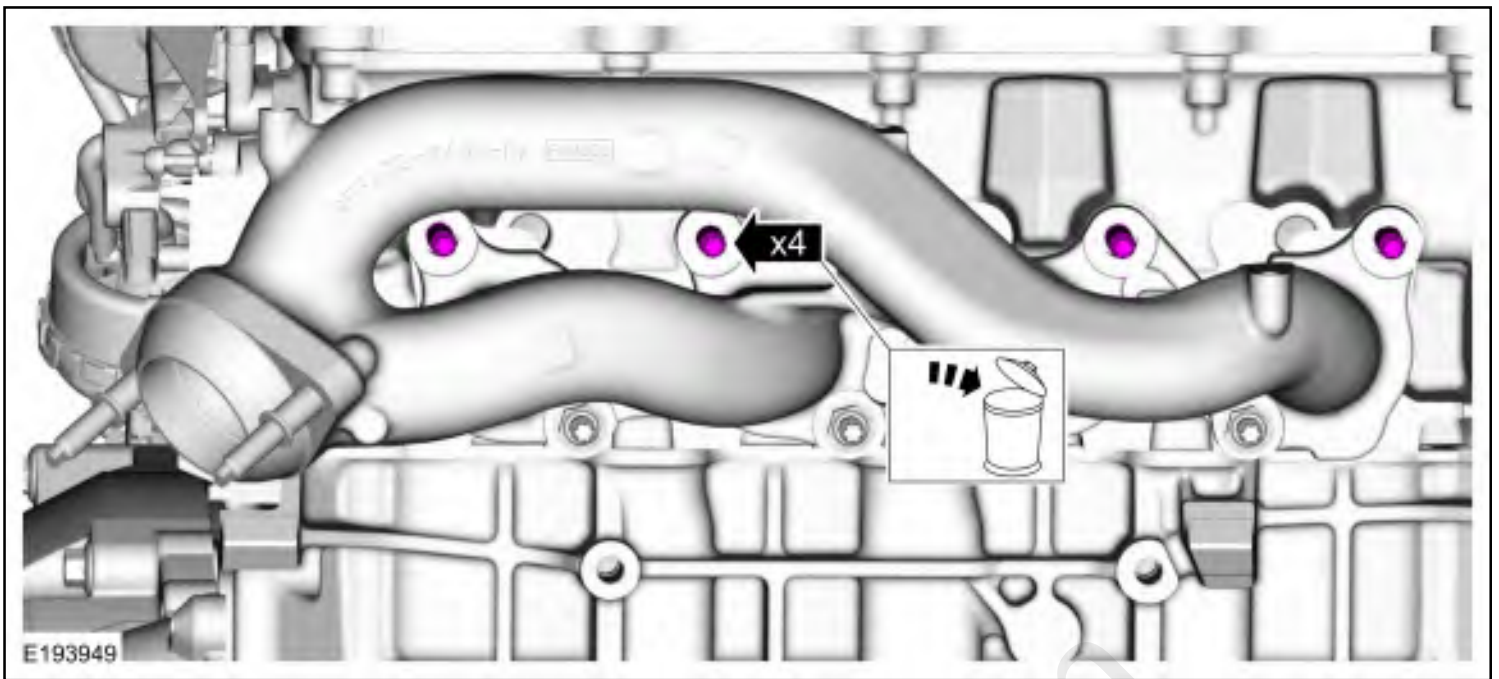
- Separate the exhaust Y-pipe dual catalytic converter from the exhaust manifolds.
- Clean the exhaust mating surfaces.



11. Remove and discard the RH exhaust manifold nuts.



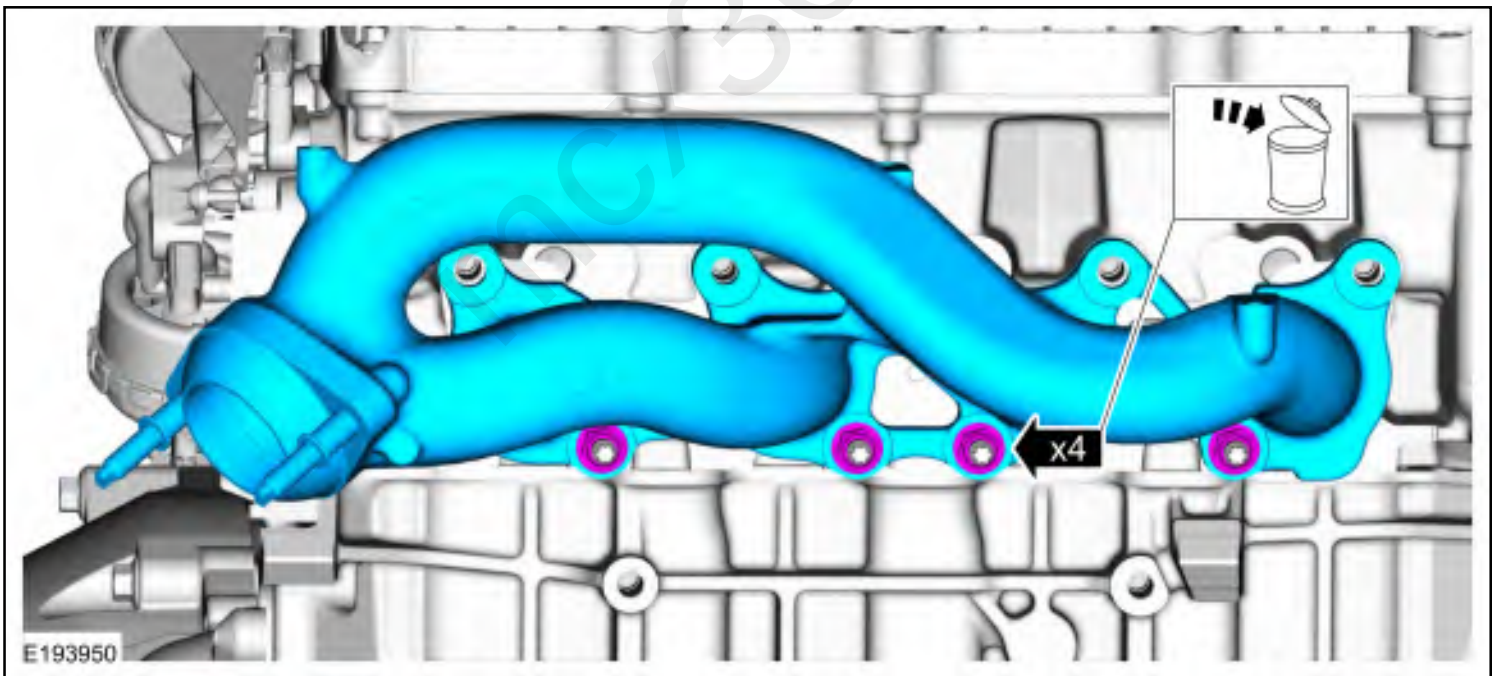
12. Remove and discard the RH exhaust manifold studs.



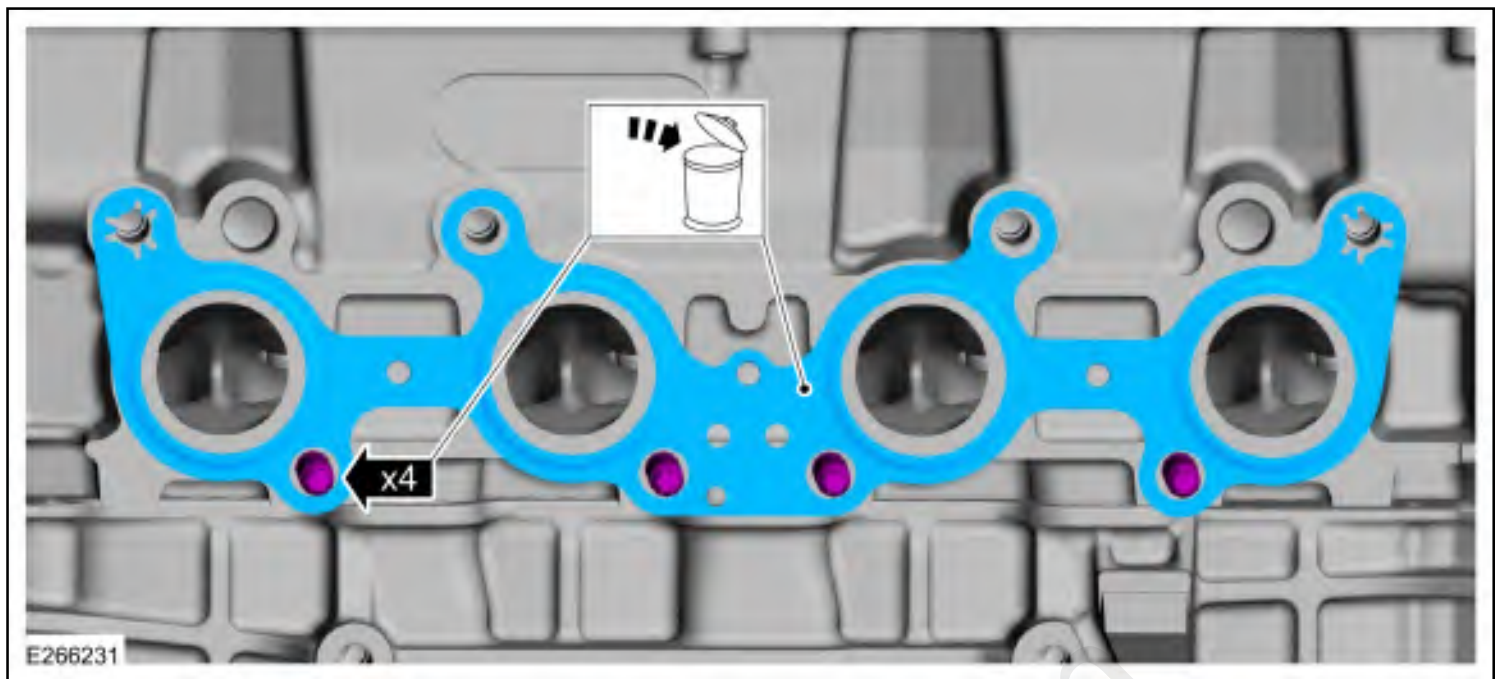
13. Remove and discard the nuts.

1. Remove the exhaust manifold.
2. Clean and inspect the exhaust manifold.

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

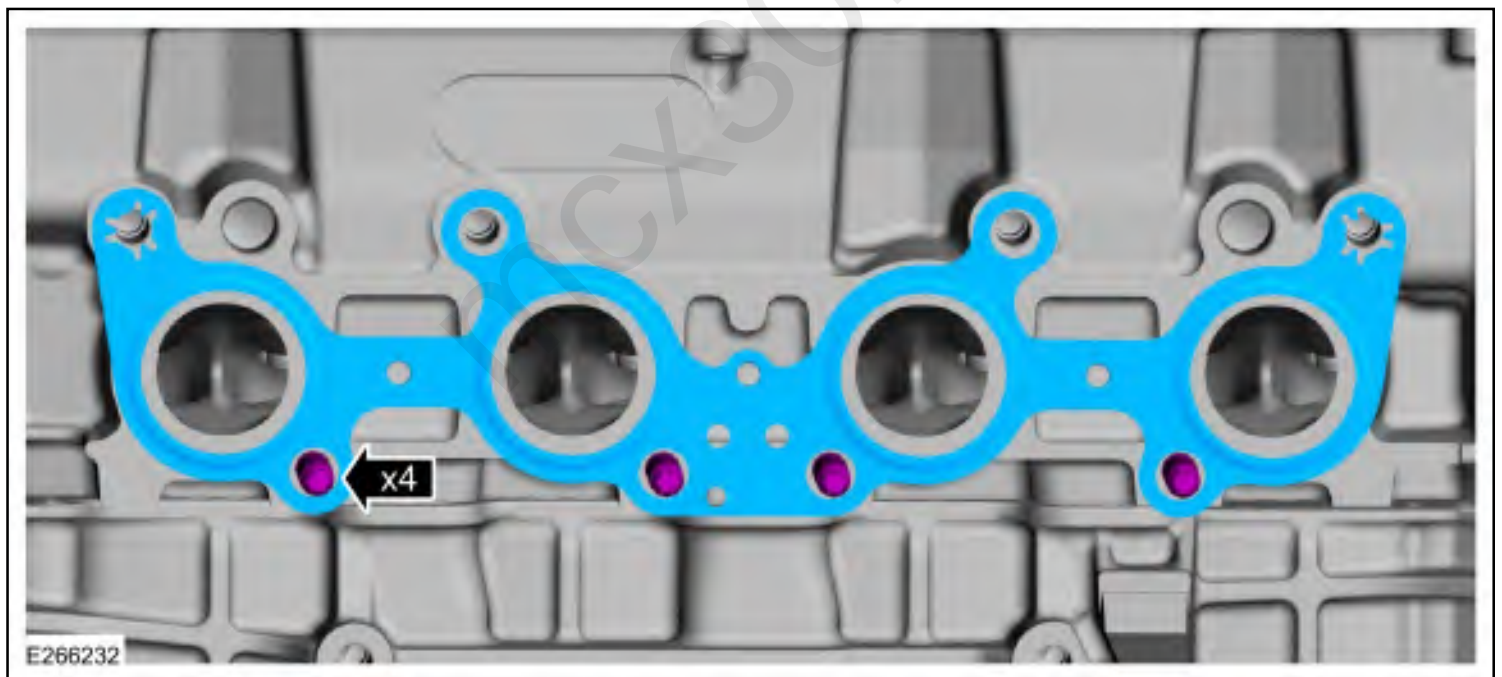


14. Remove and discard the gasket and studs.



Installation

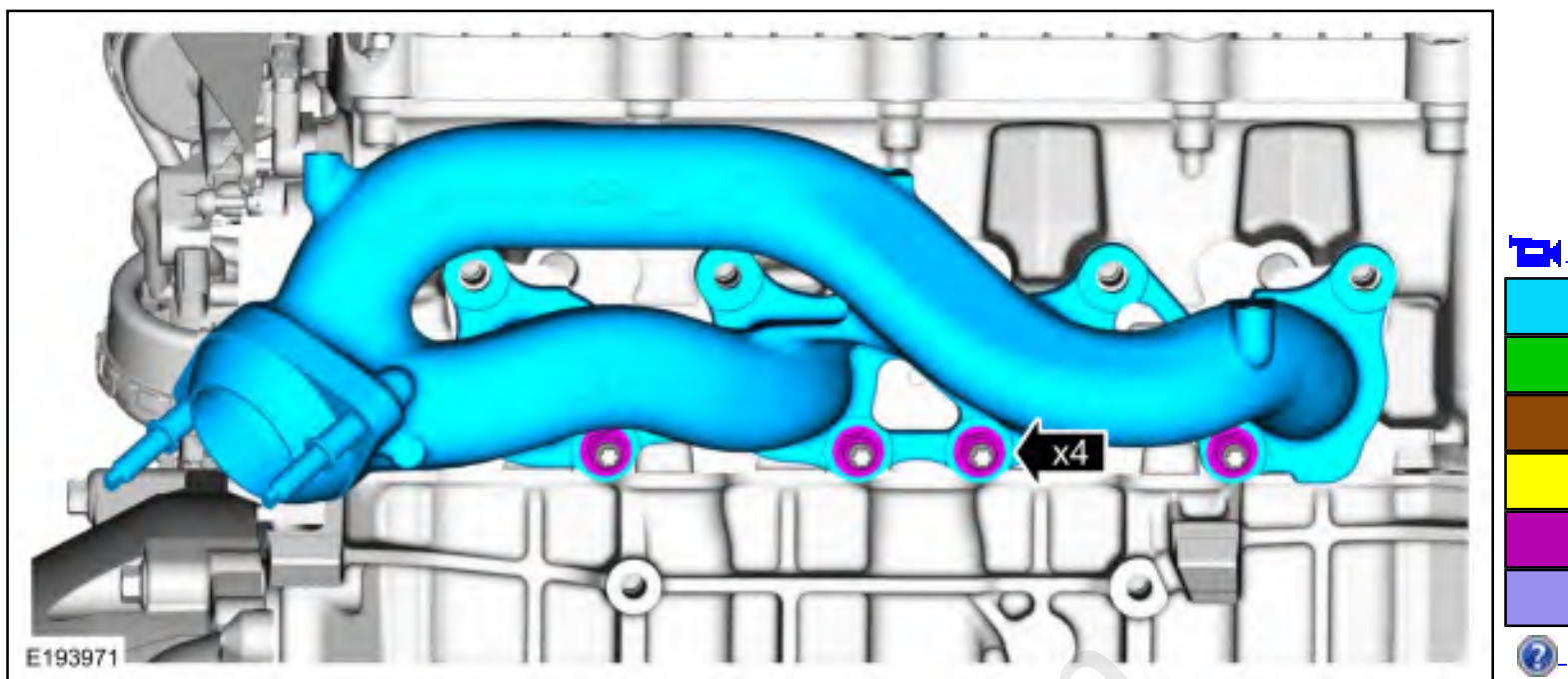
1. Install new studs and new gasket.
Torque: 18 lb.ft (25 Nm)



2. **NOTE:** *Do not tighten the exhaust manifold nuts at this time.*

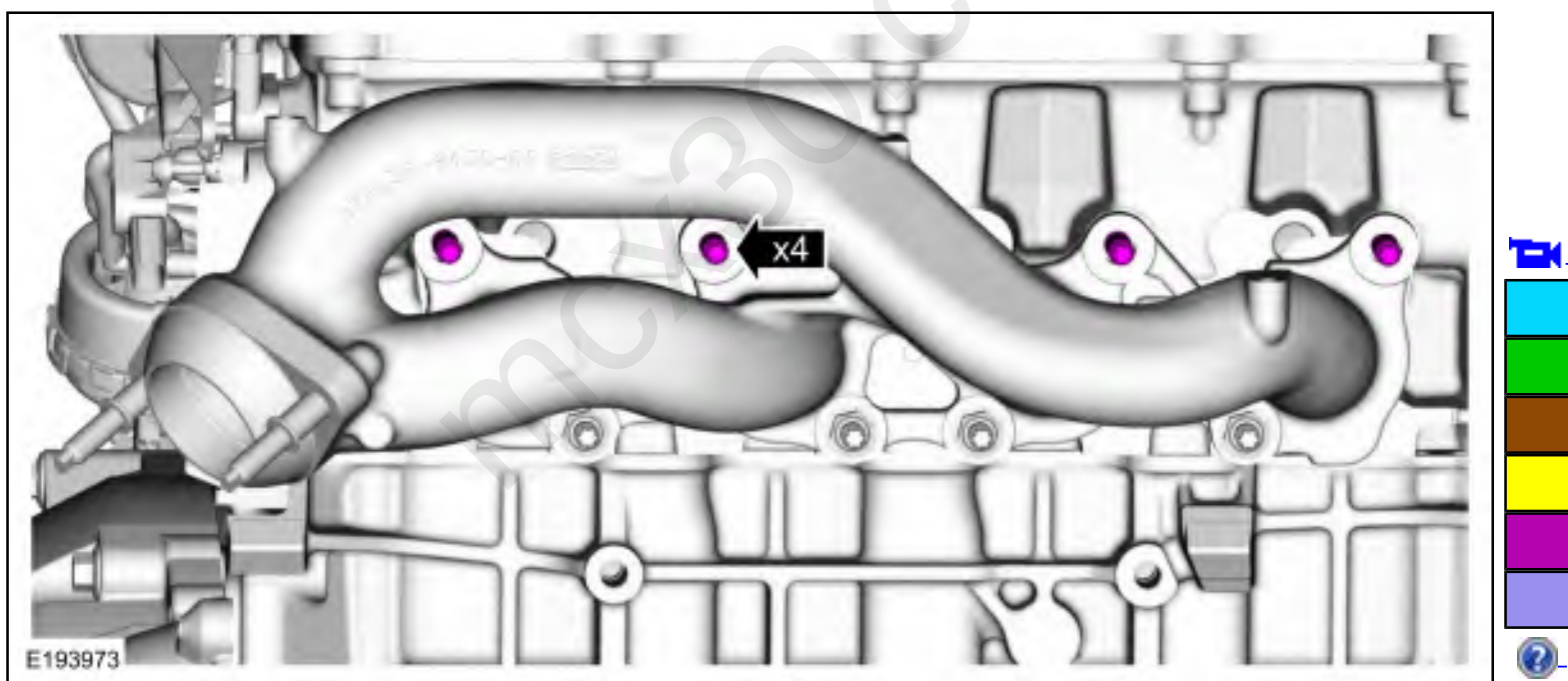
Install the exhaust manifold.

- Install the new nuts.



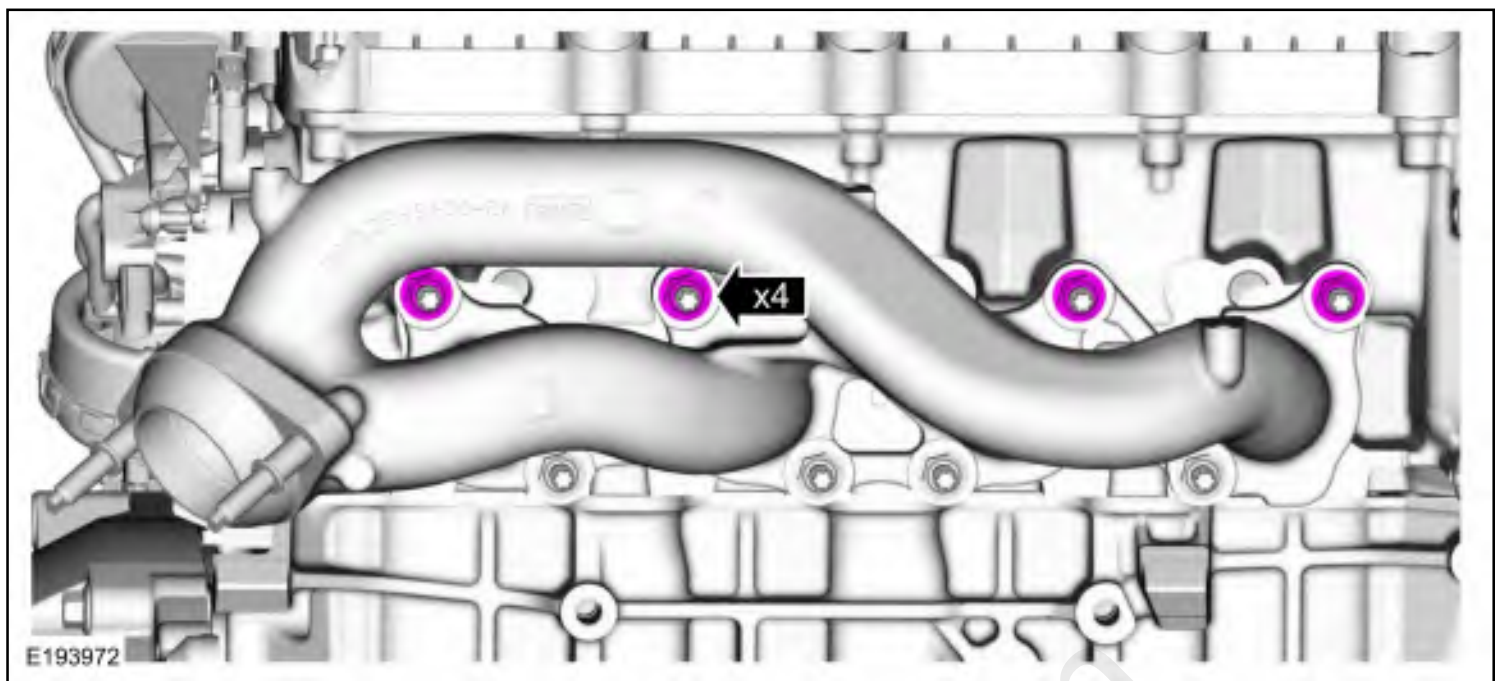
3. Install new studs.

Torque: 18 lb.ft (25 Nm)



4. **NOTE:** *Do not tighten the exhaust manifold nuts at this time.*

Install the remaining new nuts.

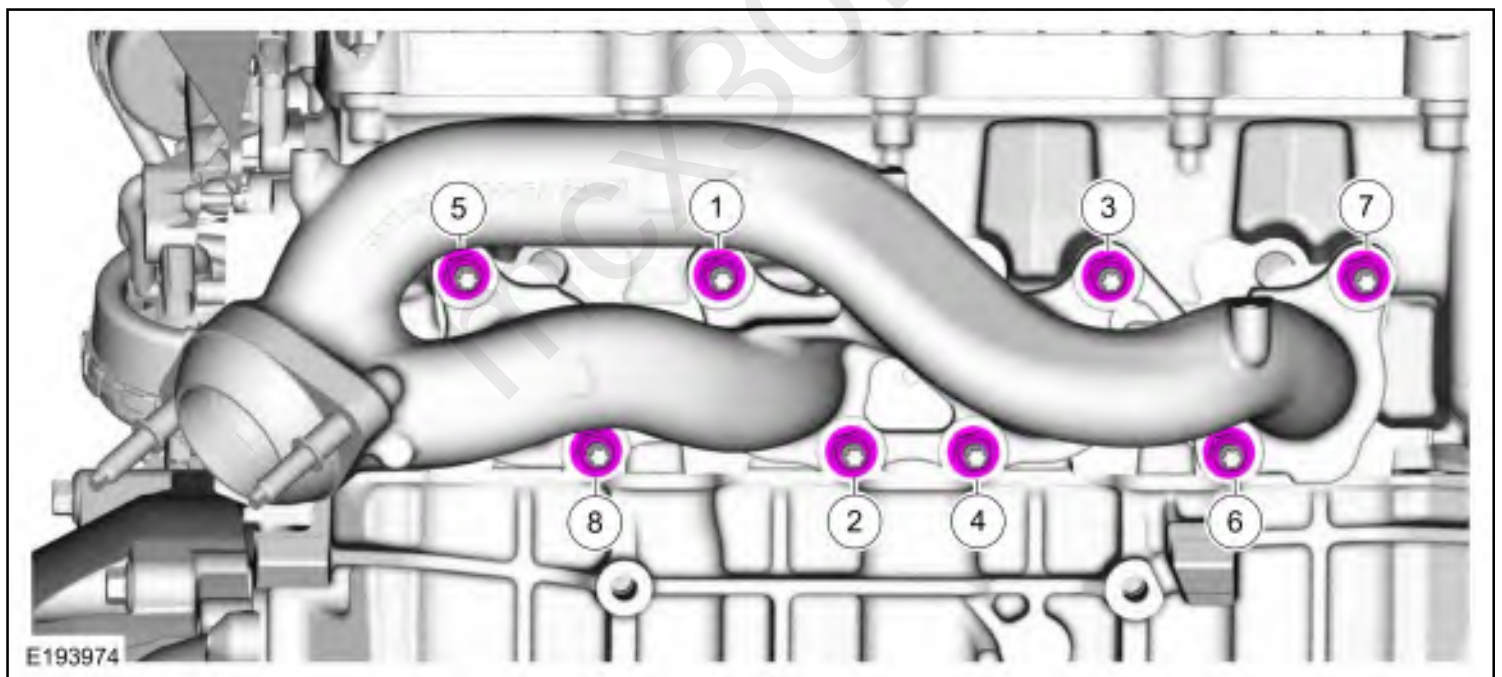


5. Tighten the nuts.

Torque:

Stage 1: 18 lb.ft (24 Nm)

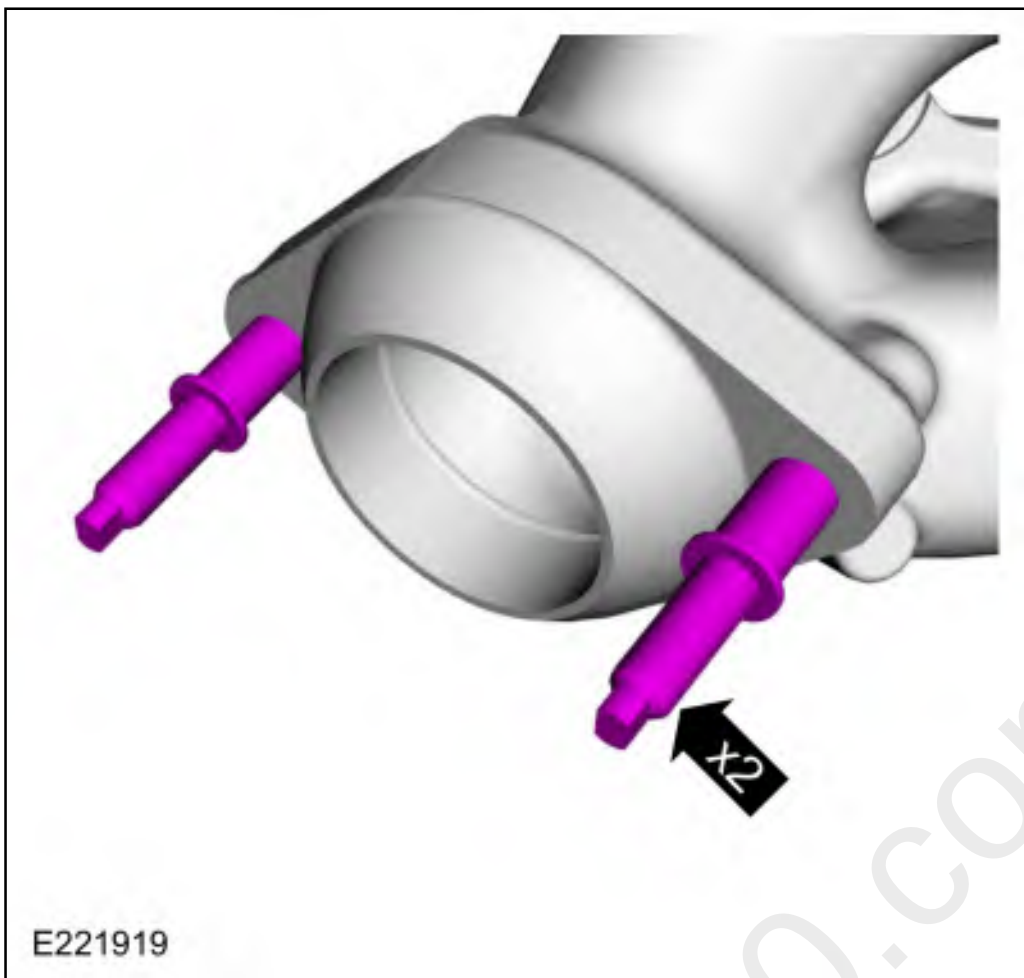
Stage 2: 24 lb.ft (32 Nm)



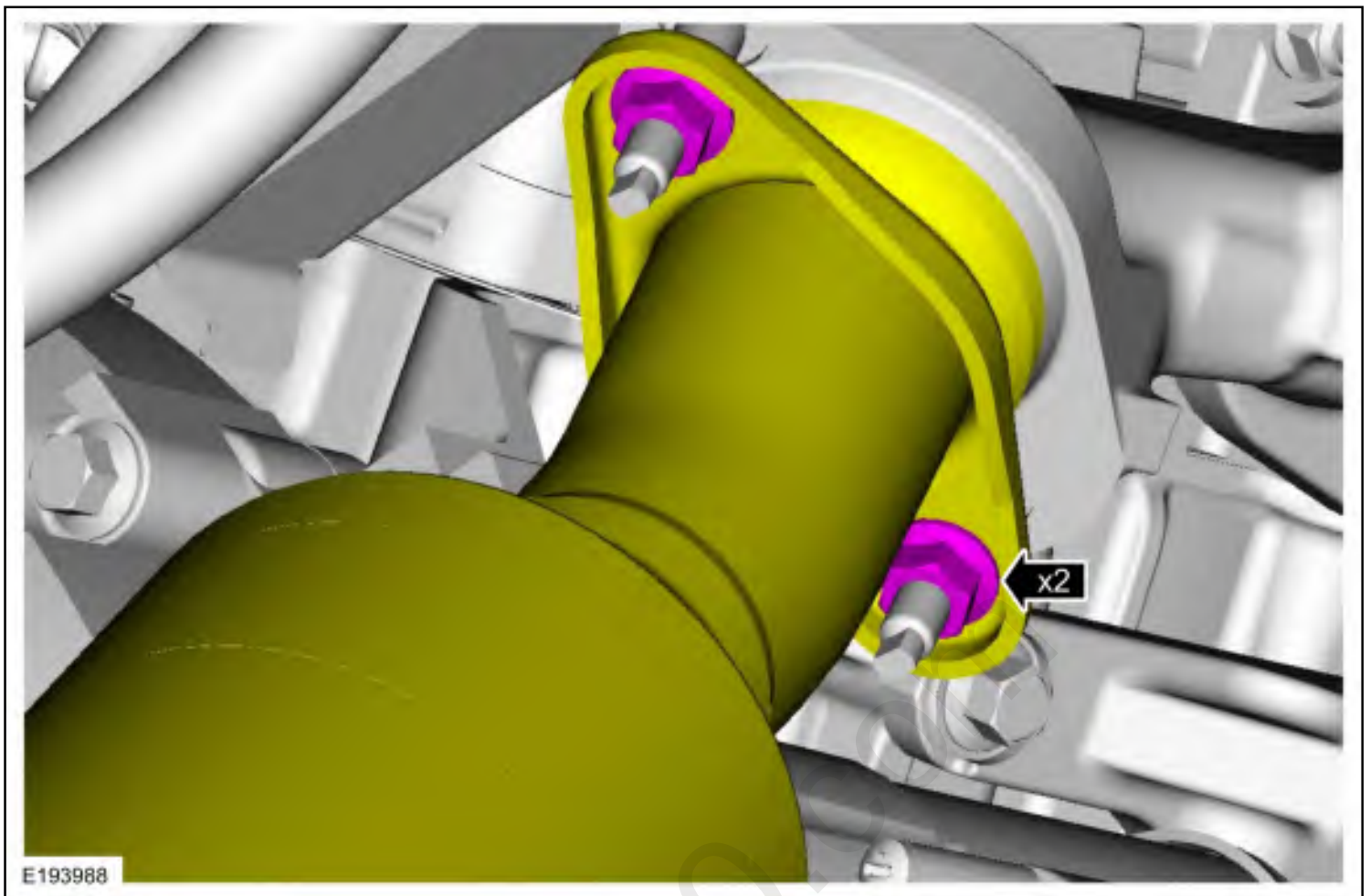
6. **NOTE:** Some replacement exhaust manifolds do not come with studs.

If necessary, install new studs.

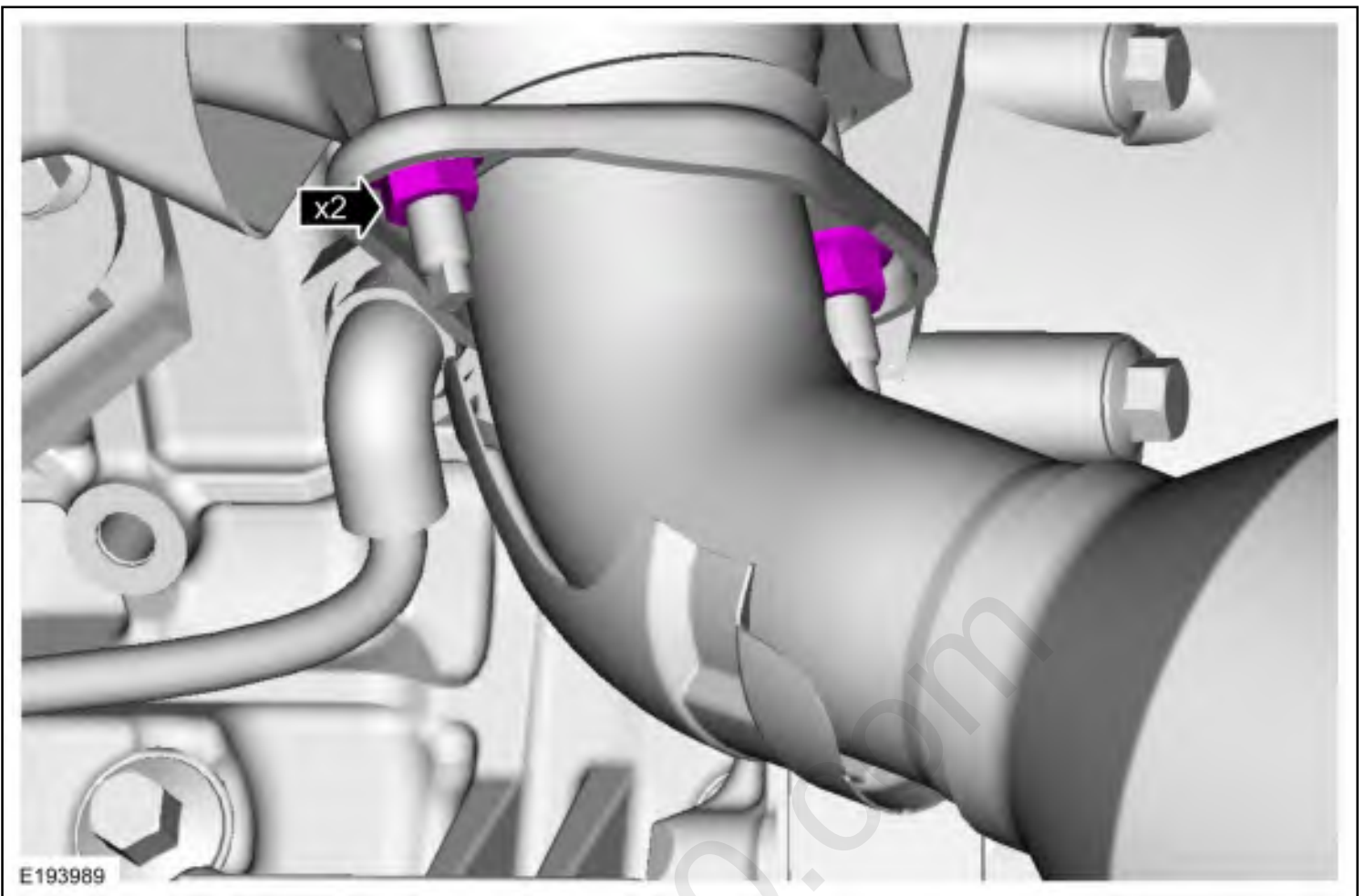
Torque: 30 lb.ft (40 Nm)



7. Position the exhaust Y-pipe dual catalytic converter onto the exhaust manifolds and loosely install new RH catalytic converter-to-exhaust manifold nuts.



8. Loosely install new LH catalytic converter-to-exhaust manifold nuts.

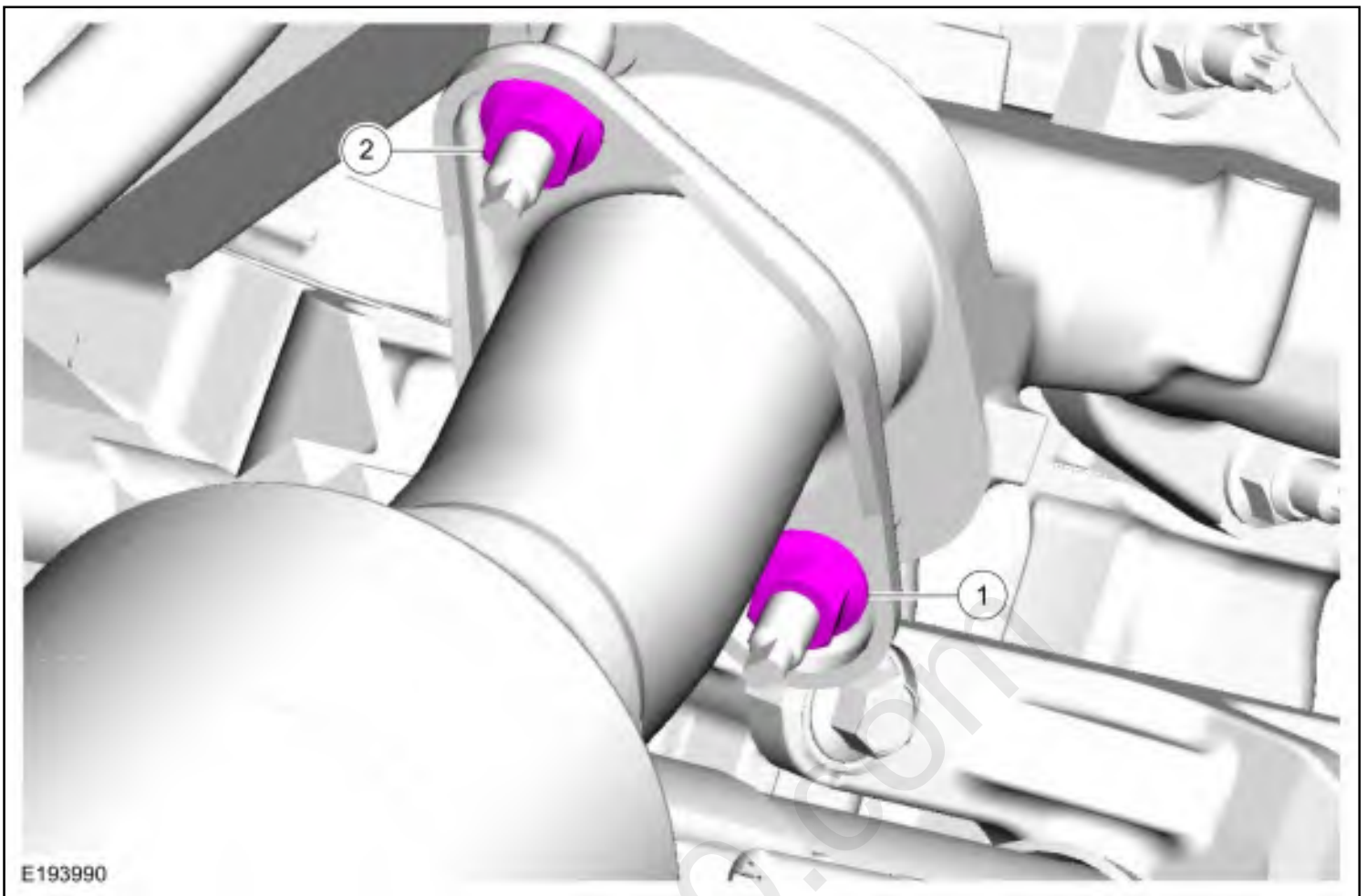


9. Tighten the nuts.

Torque:

1: 30 lb.ft (40 Nm)

2: 30 lb.ft (40 Nm)

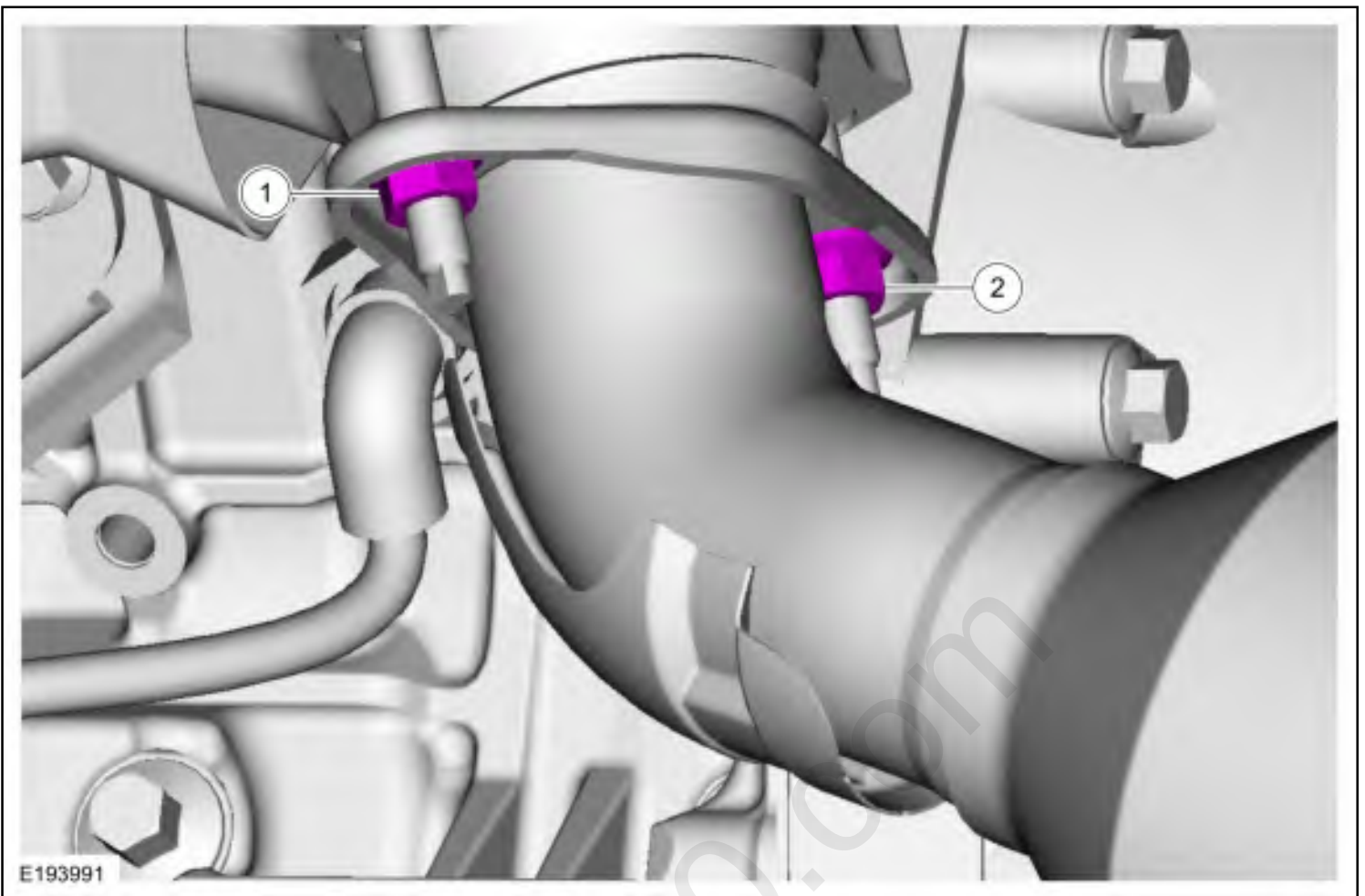


10. Tighten the nuts.

Torque:

1: 30 lb.ft (40 Nm)

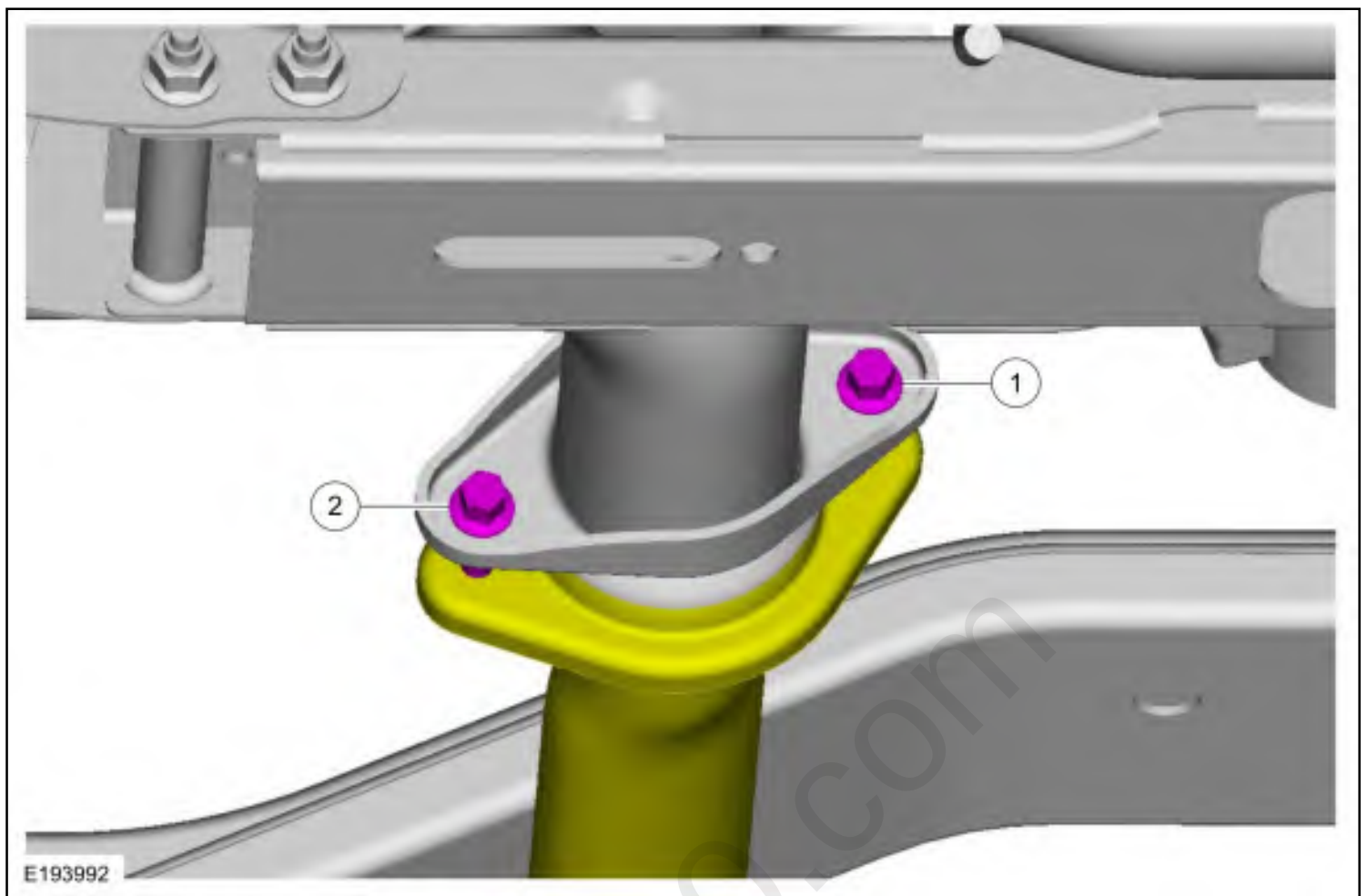
2: 30 lb.ft (40 Nm)



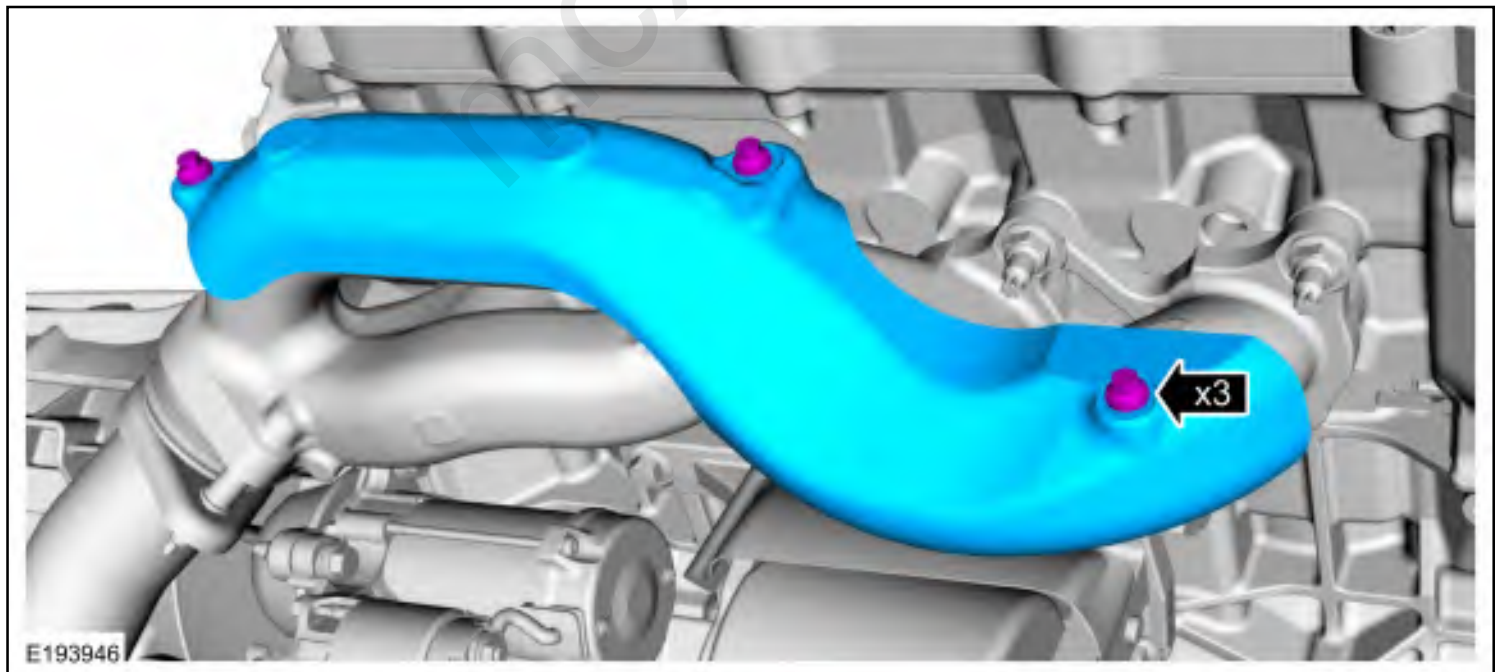
11. Position the exhaust Y-pipe dual catalytic converter-to-exhaust intermediate pipe and install new bolts.

Torque:

- 1: 46 lb.ft (63 Nm)
- 2: 46 lb.ft (63 Nm)



12. Install the heat shield and bolts.
Torque: 106 lb.in (12 Nm)



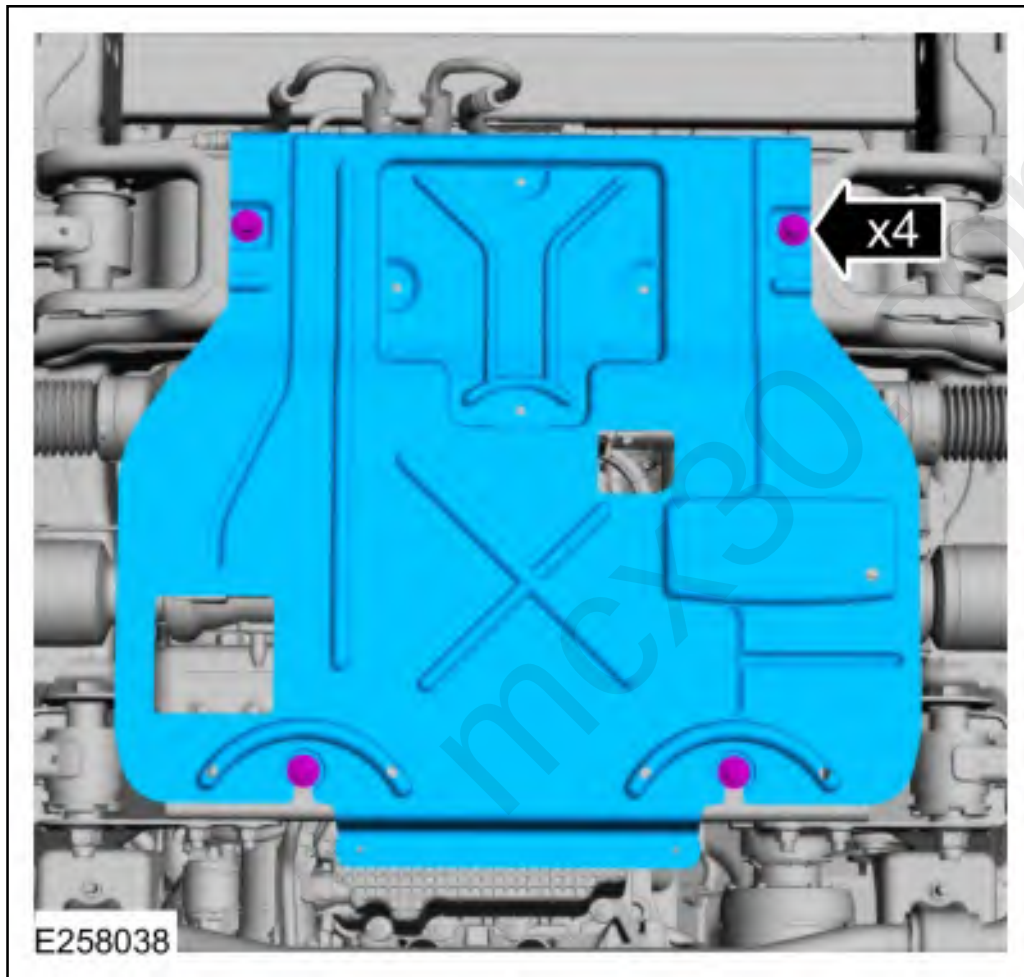
13. Install the following items:

1. Refer to: Air Conditioning (A/C) Compressor - 5.0L 32V Ti-VCT (412-00 Climate Control System - General Information) .
2. RH fender splash shield.
Refer to: [Fender Splash Shield](#) (501-02 Front End Body Panels, Removal and Installation).
3. RH wheel and tire.
Refer to: [Wheel and Tire](#) (204-04A Wheels and Tires, Removal and Installation).

14. **NOTE:** *If equipped.*

Install the skid plate and bolts.

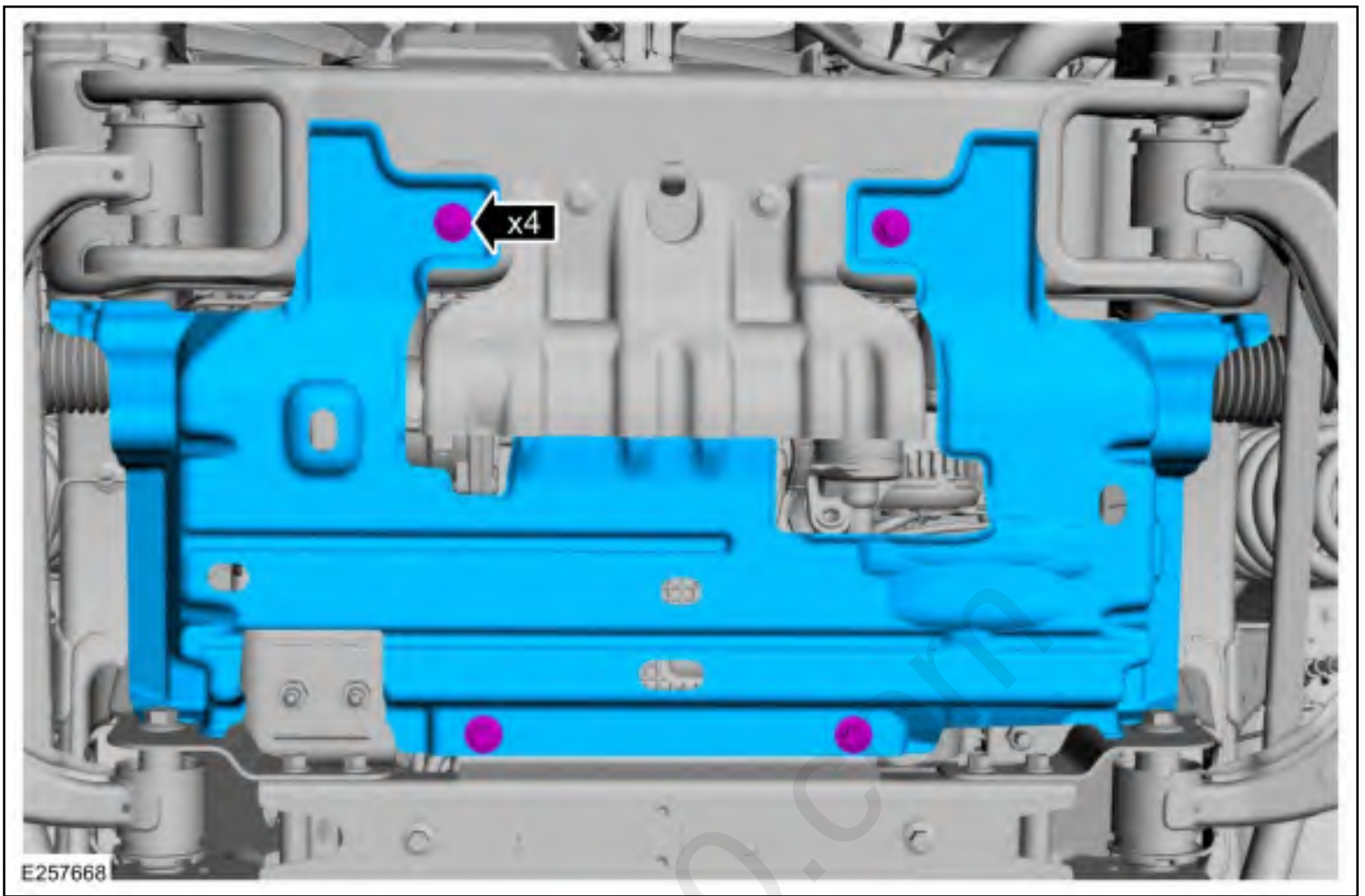
Torque: 30 lb.ft (40 Nm)



15. **NOTE:** *If equipped.*

Install the underbody shield and fasteners.

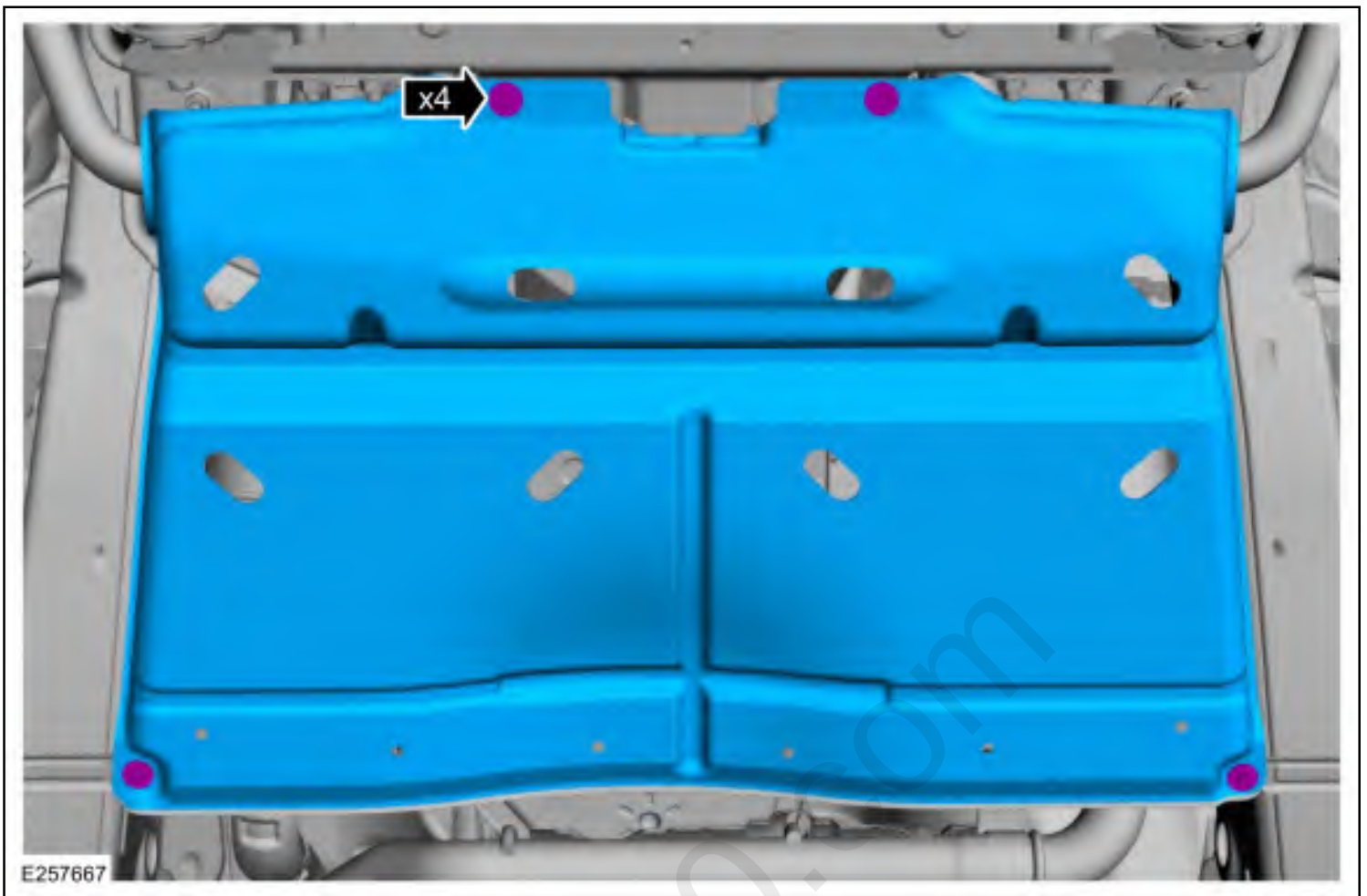
Torque: 30 lb.ft (40 Nm)



16. **NOTE:** *If equipped.*

Install the underbody shield and the bolts.

Torque: 71 lb.in (8 Nm)



17. Connect the battery ground cable.
Refer to: Battery Disconnect and Connect (414-01 Battery, Mounting and Cables) .
18. Start the engine and check for exhaust leaks.

Crankshaft Front Seal

Base Part Number: Base Part Number: 6700

Special Tool(s) / General Equipment

 E216458	303-1531 Installer, Front Crank Seal and Damper
 E222985	303-335 (T88T-6701-A) Installer, Front Cover Oil Seal TKIT-1988-F TKIT-1988-FLM
 E134603	303-409 (T92C-6700-CH) Remover, Crankshaft Seal TKIT-1992-FH/FMH/FLMH TKIT-1993-LMH/MH
Strap Wrench	
Three Leg Puller	

Materials

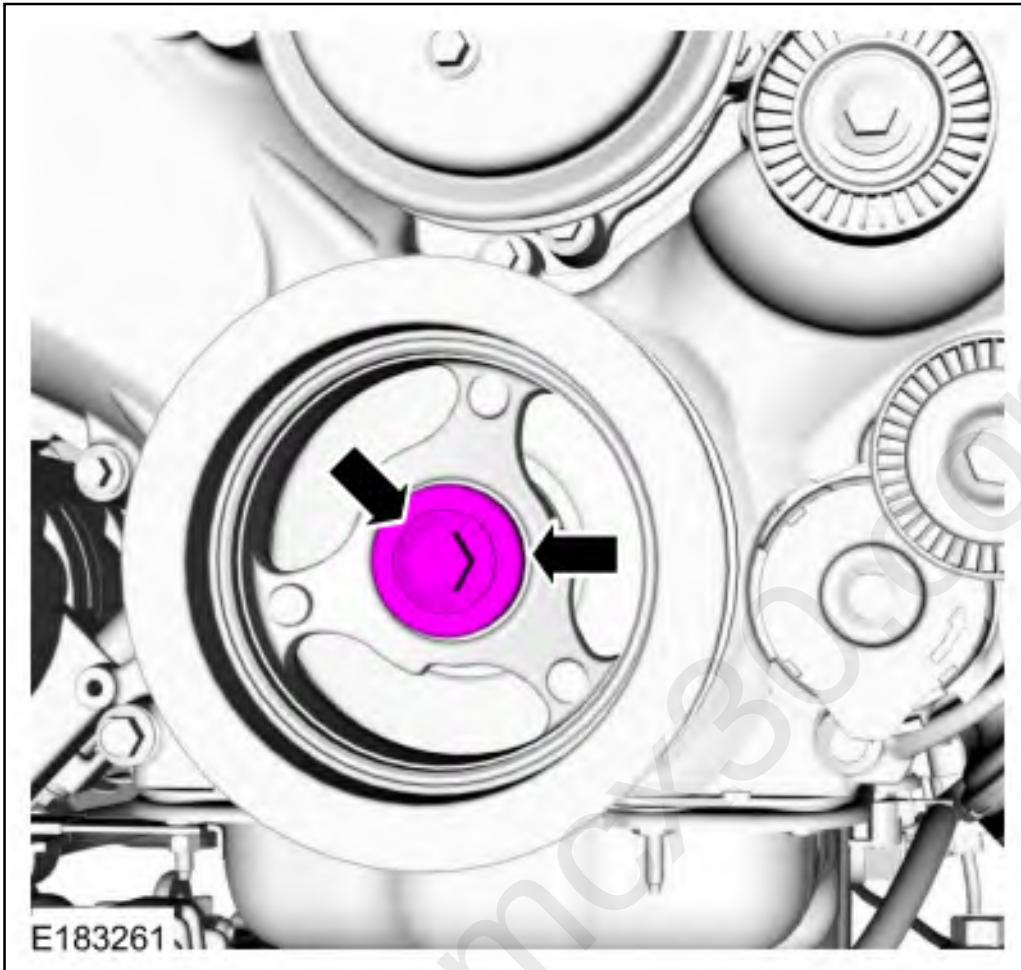
Name	Specification
Motorcraft® Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

Removal

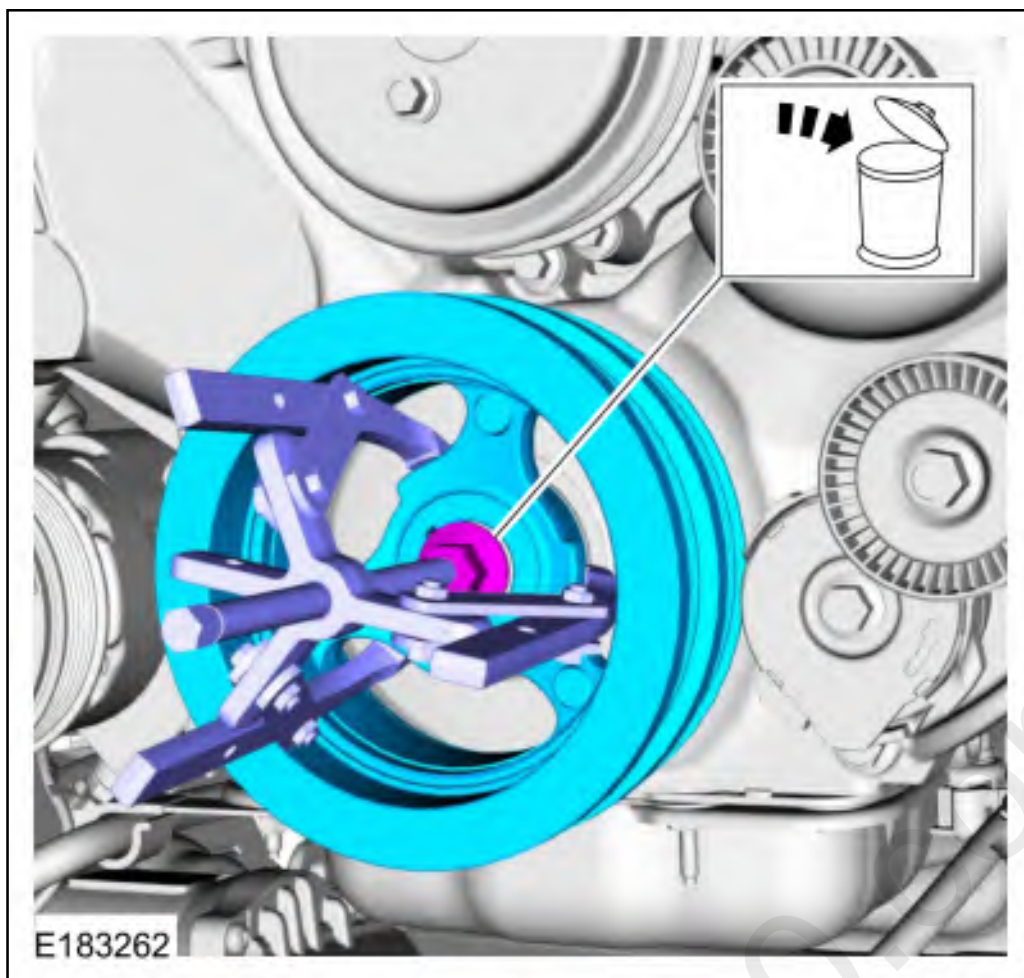
1. Remove the following items:

1. Refer to: Accessory Drive Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
2. Refer to: Air Conditioning (A/C) Compressor Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .

2. Remove the crankshaft pulley bolt and washer.



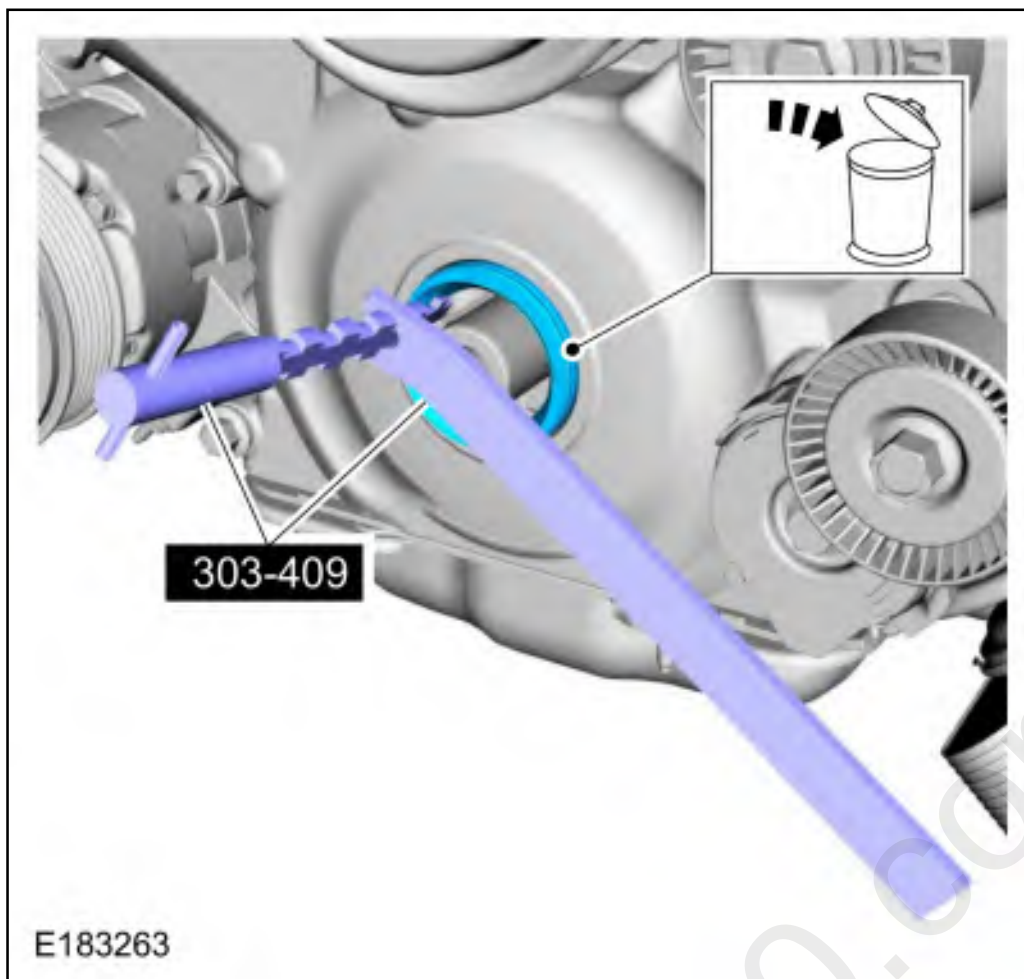
- Using the 3 Leg Puller and the crankshaft pulley bolt, remove the crankshaft pulley.
Use the General Equipment: Three Leg Puller
- Discard the crankshaft pulley bolt.



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

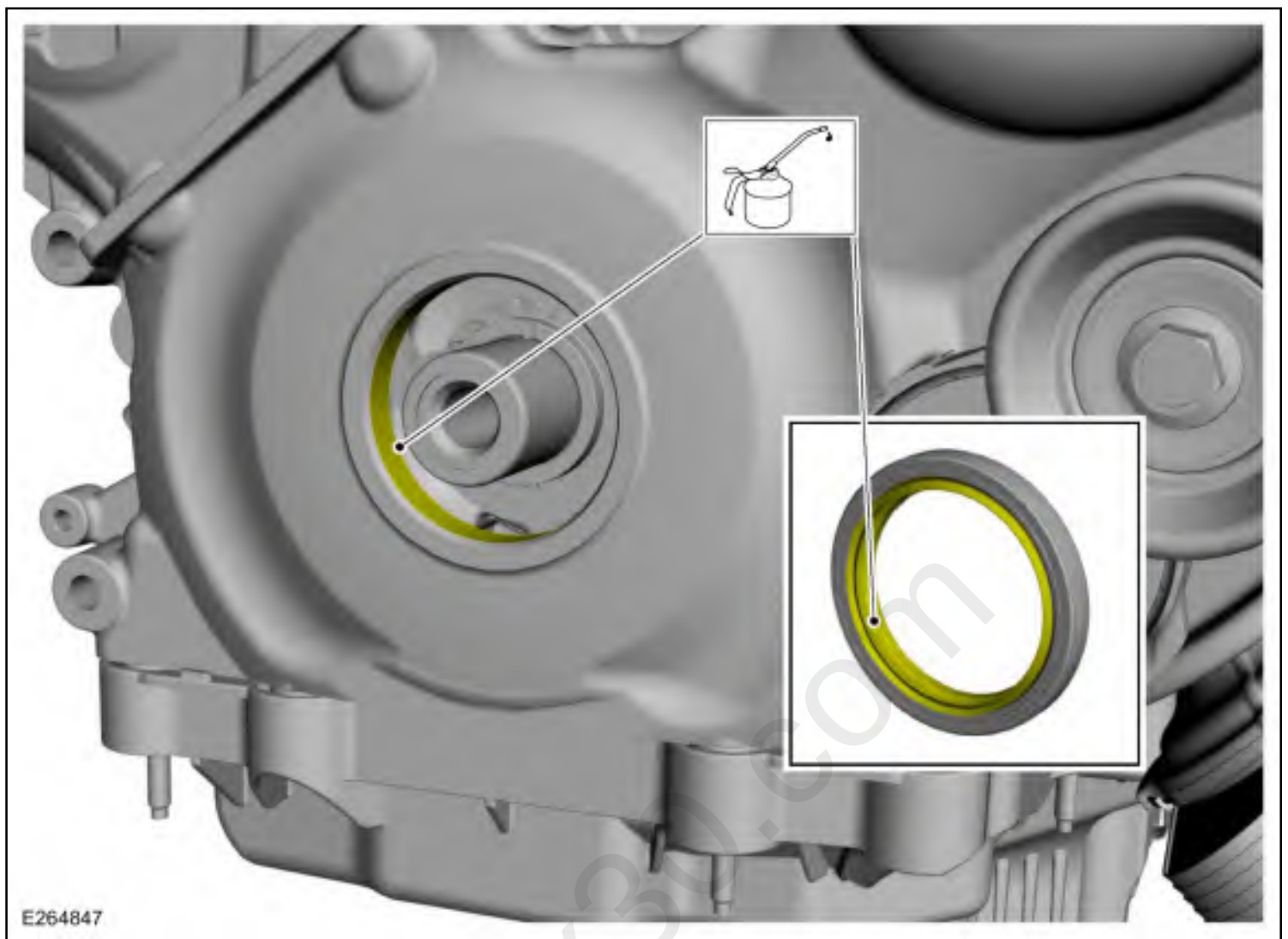
Using the special tool, remove and discard the crankshaft front oil seal.

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

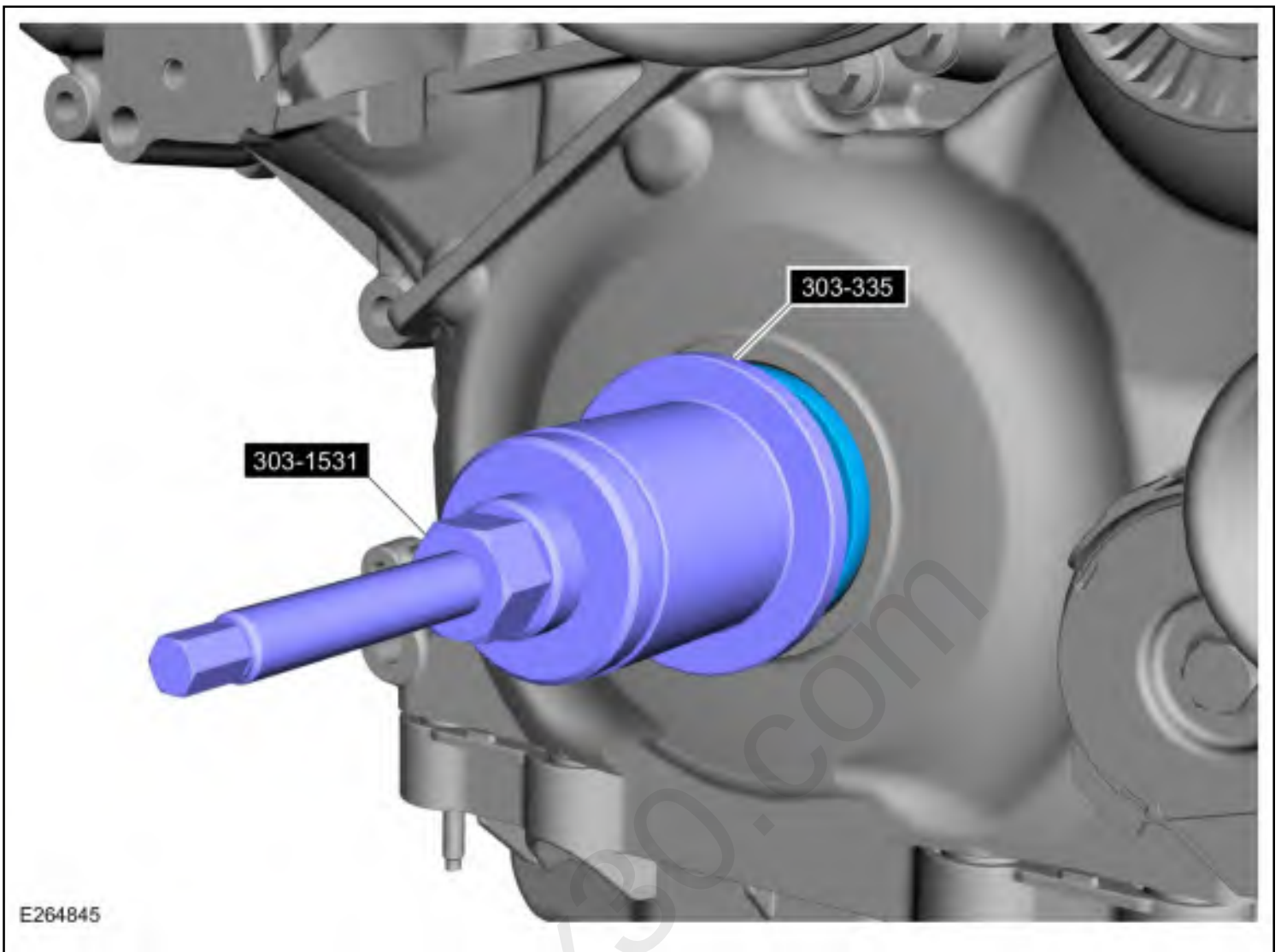


Installation

1. Lubricate the engine front cover bore and the crankshaft front oil seal inner lip with clean engine oil.



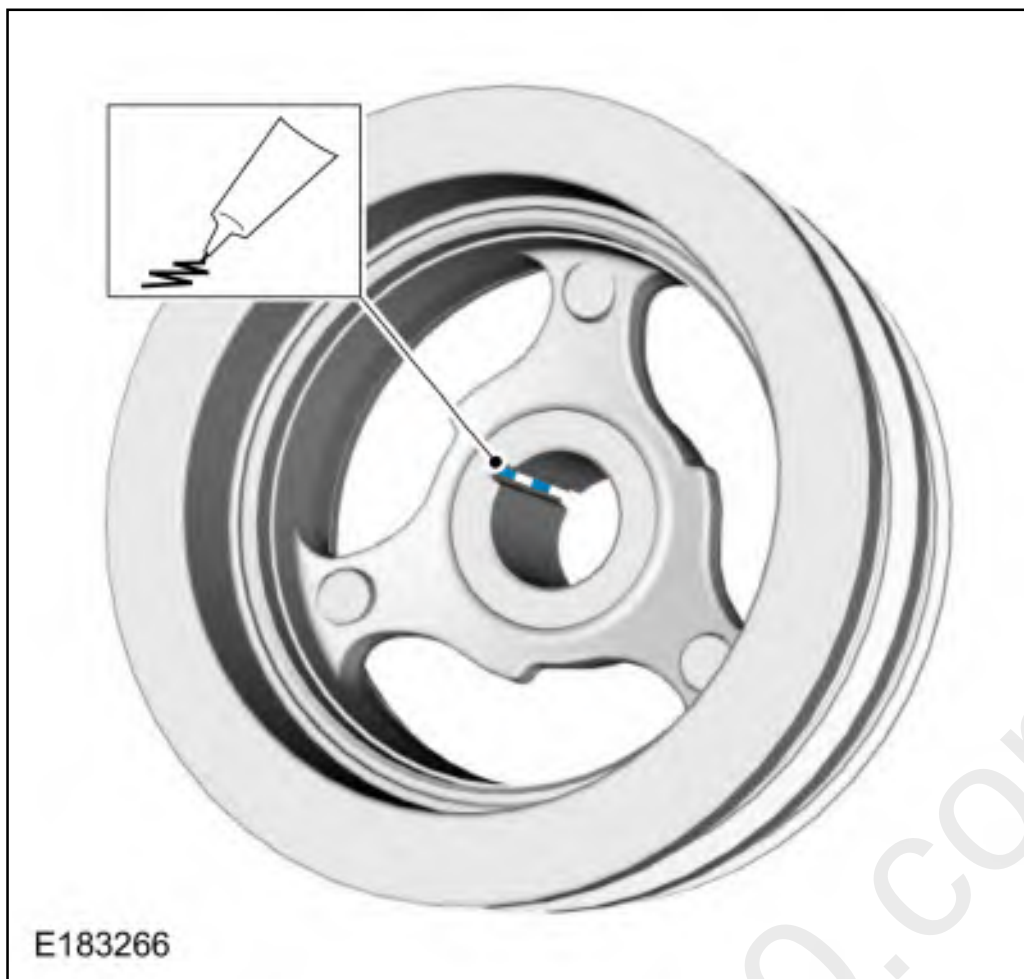
2. Using the special tools, install the new crankshaft front oil seal.
Use Special Service Tool: 303-335 (T88T-6701-A) Installer, Front Cover Oil Seal. , 303-1531
Installer, Front Crank Seal and Damper.



3. **NOTE:** *If not secured within 5 minutes, the sealant must be removed and the sealing area cleaned. Failure to follow this procedure can cause future oil leakage.*

Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.

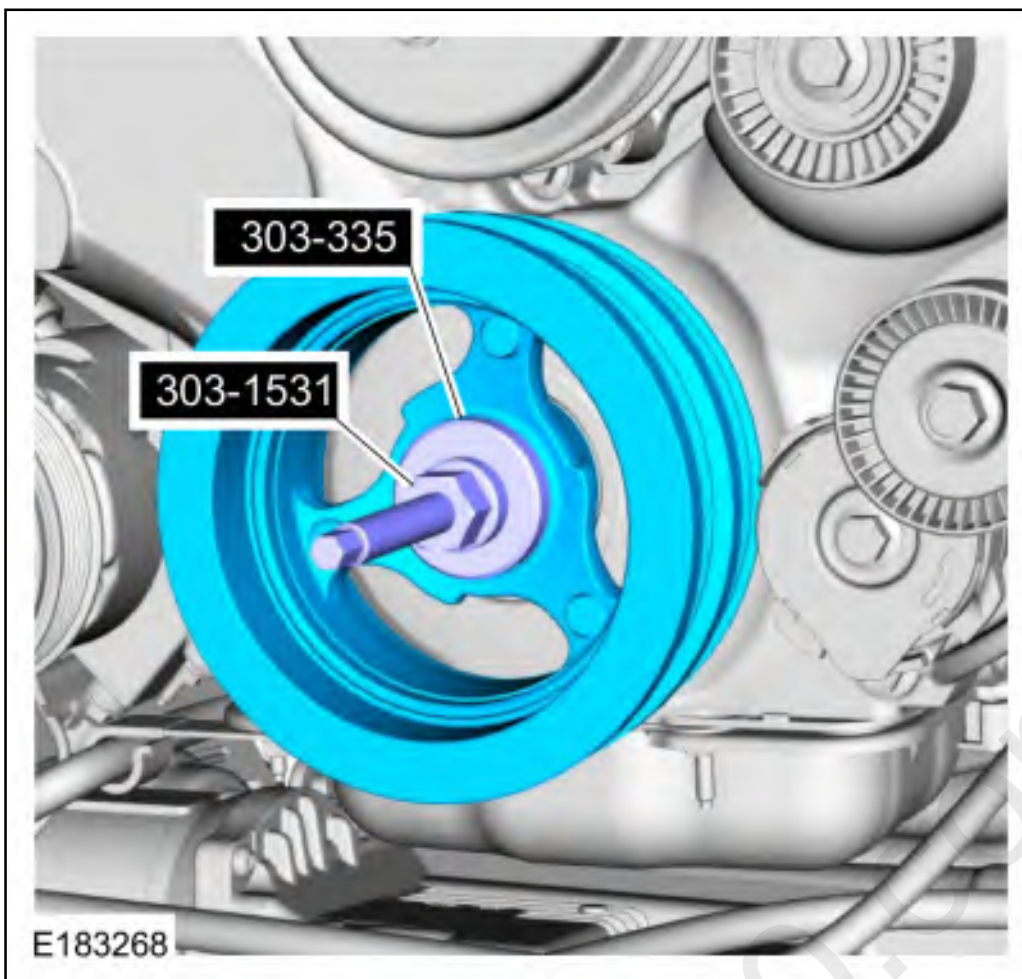
Material: Motorcraft® Silicone Gasket and Sealant / TA-30 (WSE-M4G323-A4)



4. Lubricate the crankshaft pulley sealing surface with clean engine oil prior to installation.



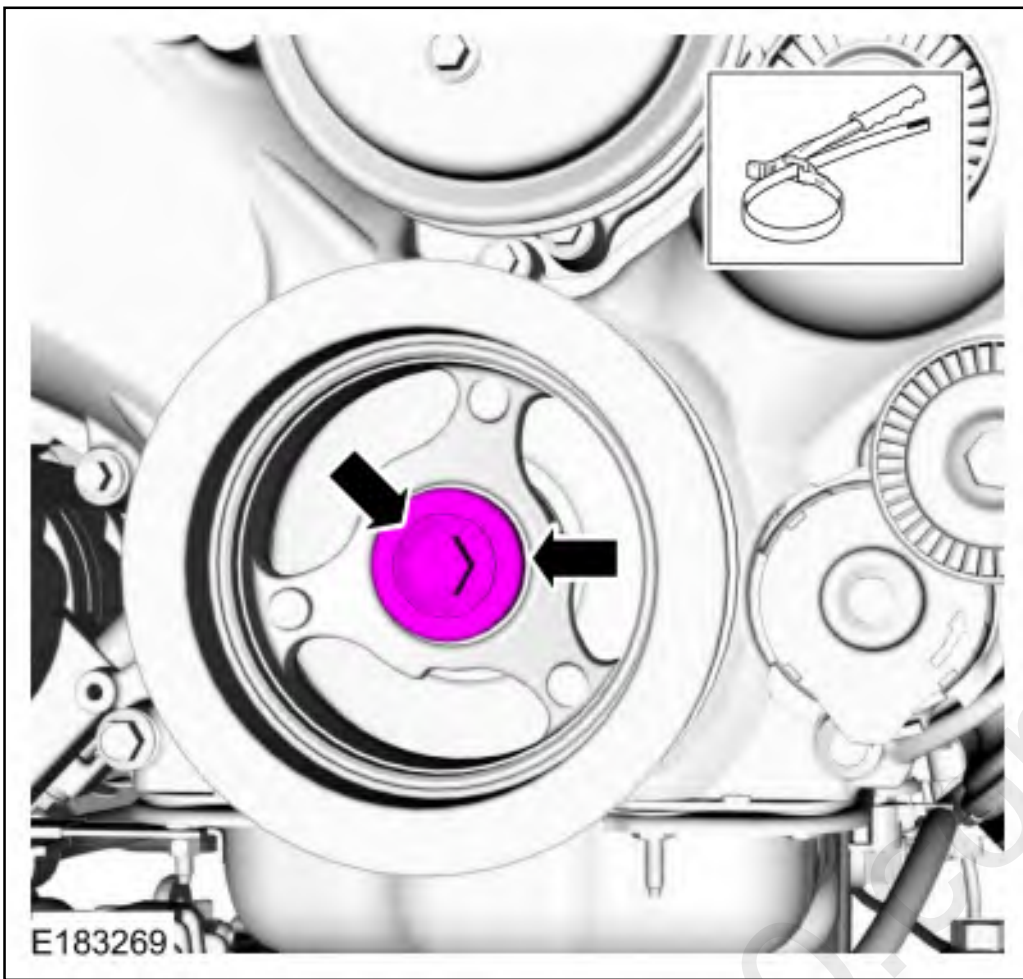
5. Using the special tools, install the crankshaft pulley.
Use Special Service Tool: 303-335 (T88T-6701-A) Installer, Front Cover Oil Seal. , 303-1531
Installer, Front Crank Seal and Damper.



6. Using the Strap Wrench, install a new crankshaft pulley bolt and the original washer.
Use the General Equipment: Strap Wrench

Torque:

- Stage 1: 103 lb.ft (140 Nm)
Stage 2: Loosen: 360°
Stage 3: 74 lb.ft (100 Nm)
Stage 4: 90°



7. Install the following items:

1. Refer to: Air Conditioning (A/C) Compressor Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .
2. Refer to: Accessory Drive Belt (303-05 Accessory Drive - 5.0L 32V Ti-VCT) .

8. Use the Powertrain Control Module (PCM) Misfire Monitor Profile Correction routine in the diagnostic scan tool.