
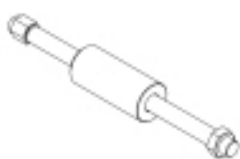


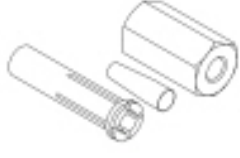


Fuel Rail

Special Tool(s) / General Equipment

| | |
|---|---|
|  E222987 | 303-1567 Sizer, Teflon Seal TKIT-2010C-FLM |
|  E222982 | 307-005 (T59L-100-B) Slide Hammer |
|  E223046 | 310-205 Fuel Injector Brush |
|  E168032 | 310-206 Remover, Fuel Injector TKIT-2009A-FLM |
|  E223047 | 310-207 Installer, Fuel Injector Seal Assembly TKIT-2009A-FLM |

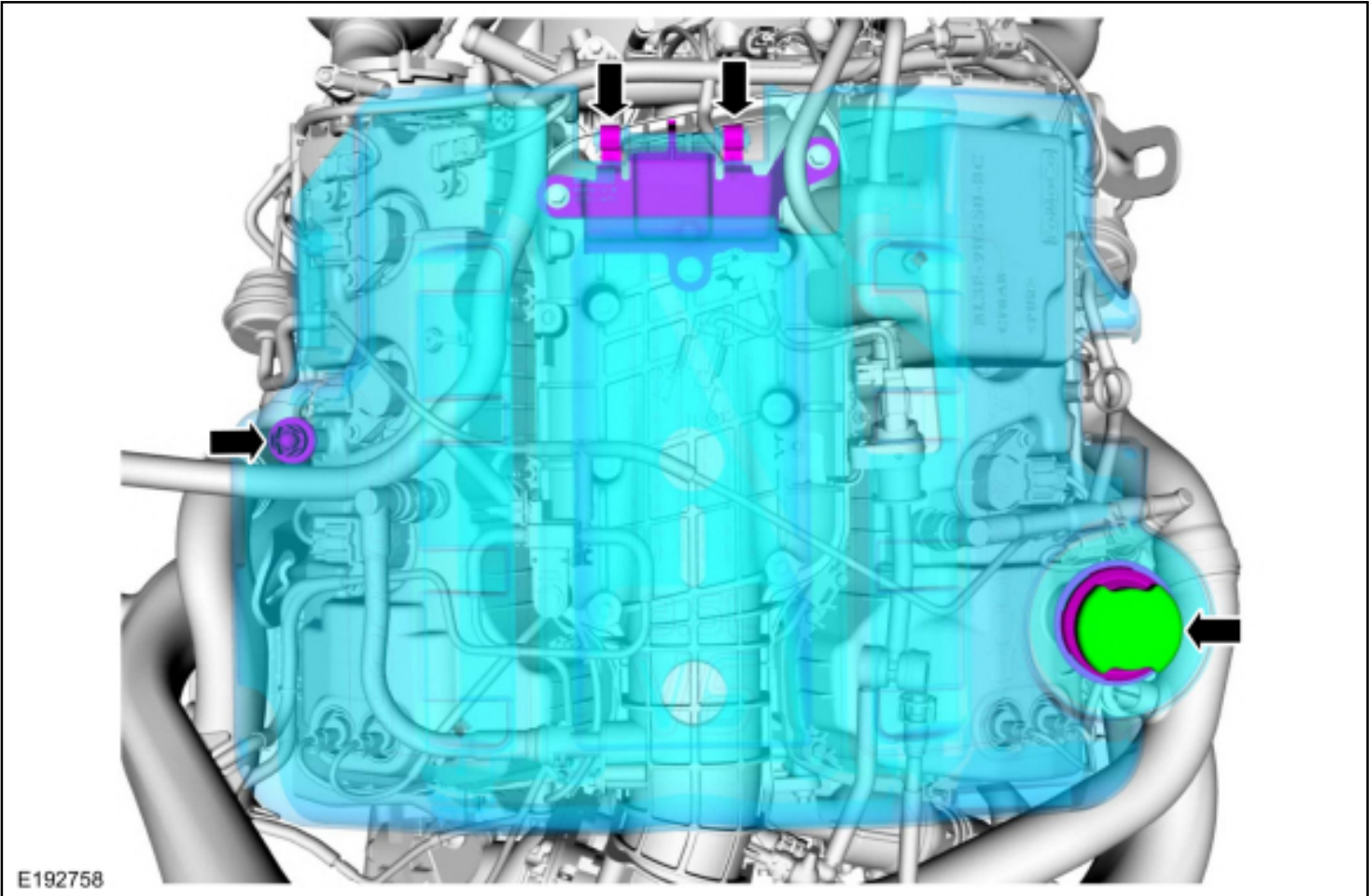
Materials

| Name | Specification |
|------|---------------|
|------|---------------|

| | |
|--|--------------|
| Motorcraft® SAE 5W-30 Synthetic Blend Motor Oil XO-5W30-QSP | WSS-M2C946-A |
| Motorcraft® Orange Concentrated Antifreeze/Coolant VC-3-B | WSS-M97B44-D |

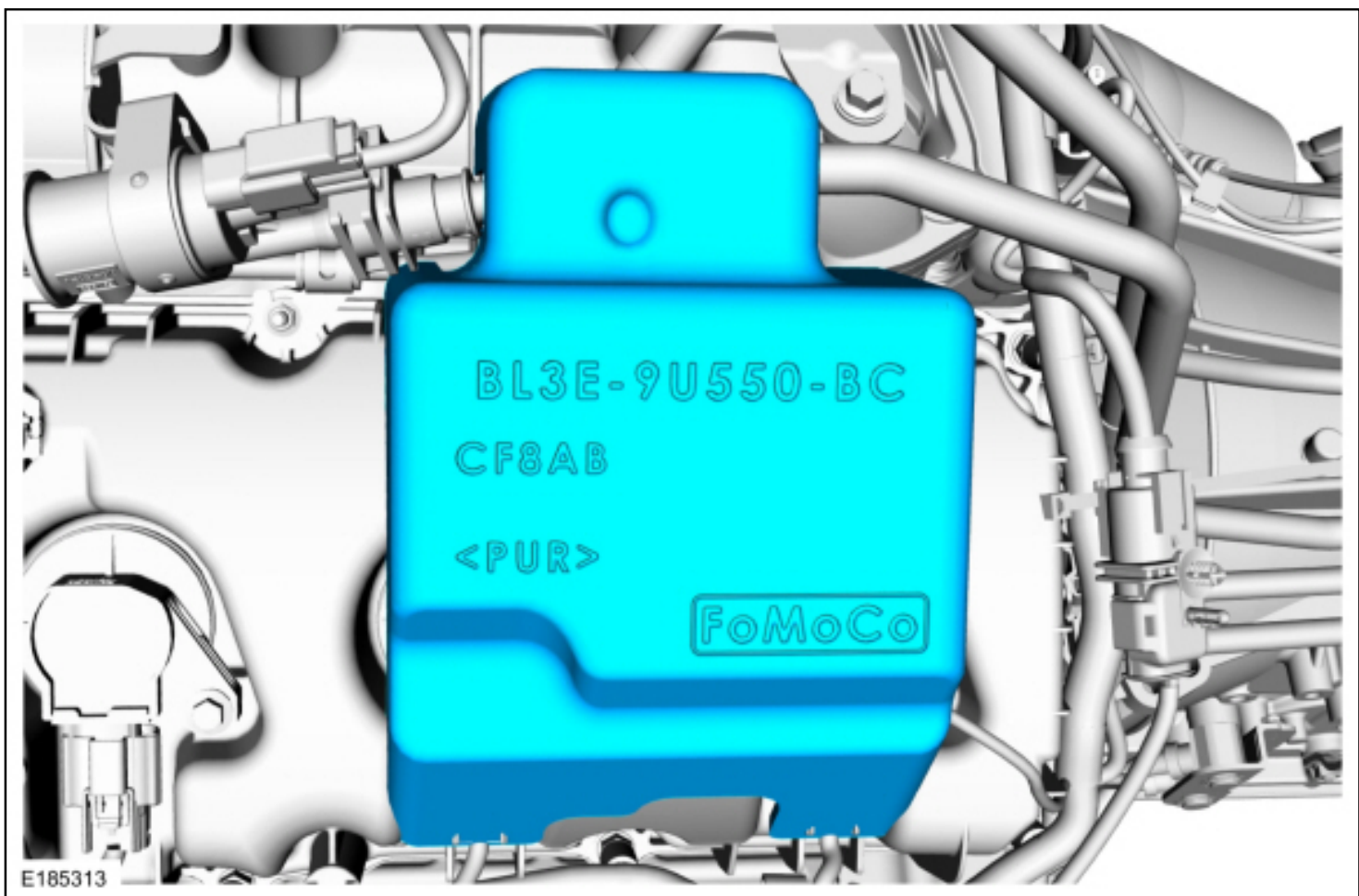
Removal

1. Remove the oil filler cap and then remove the engine appearance cover. Install the oil filler cap.



2. **NOTE:** When removing or installing the high-pressure fuel pump noise insulator, spreading the openings will reduce the risk of damage.

Remove the high-pressure fuel pump noise insulator.



3. Release the fuel system pressure.

Refer to: [Fuel System Pressure Release](#) (310-00C Fuel System - General Information - 3.5L EcoBoost (272kW/370PS), General Procedures).

4. Disconnect the battery.

Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).

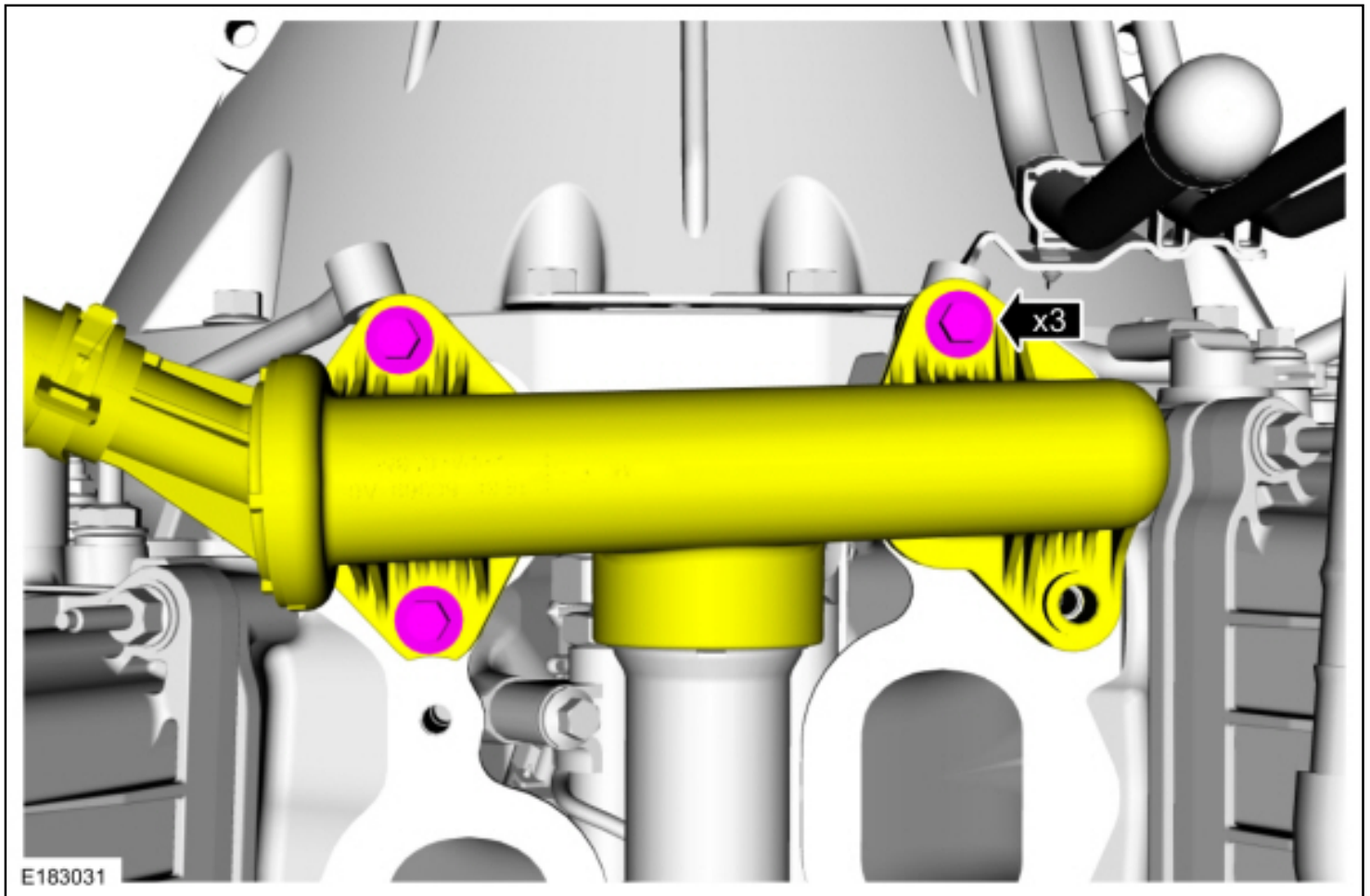
5. Remove the intake manifold.

Refer to: [Intake Manifold](#) (303-01C Engine - 3.5L EcoBoost (272kW/370PS), Removal and Installation).

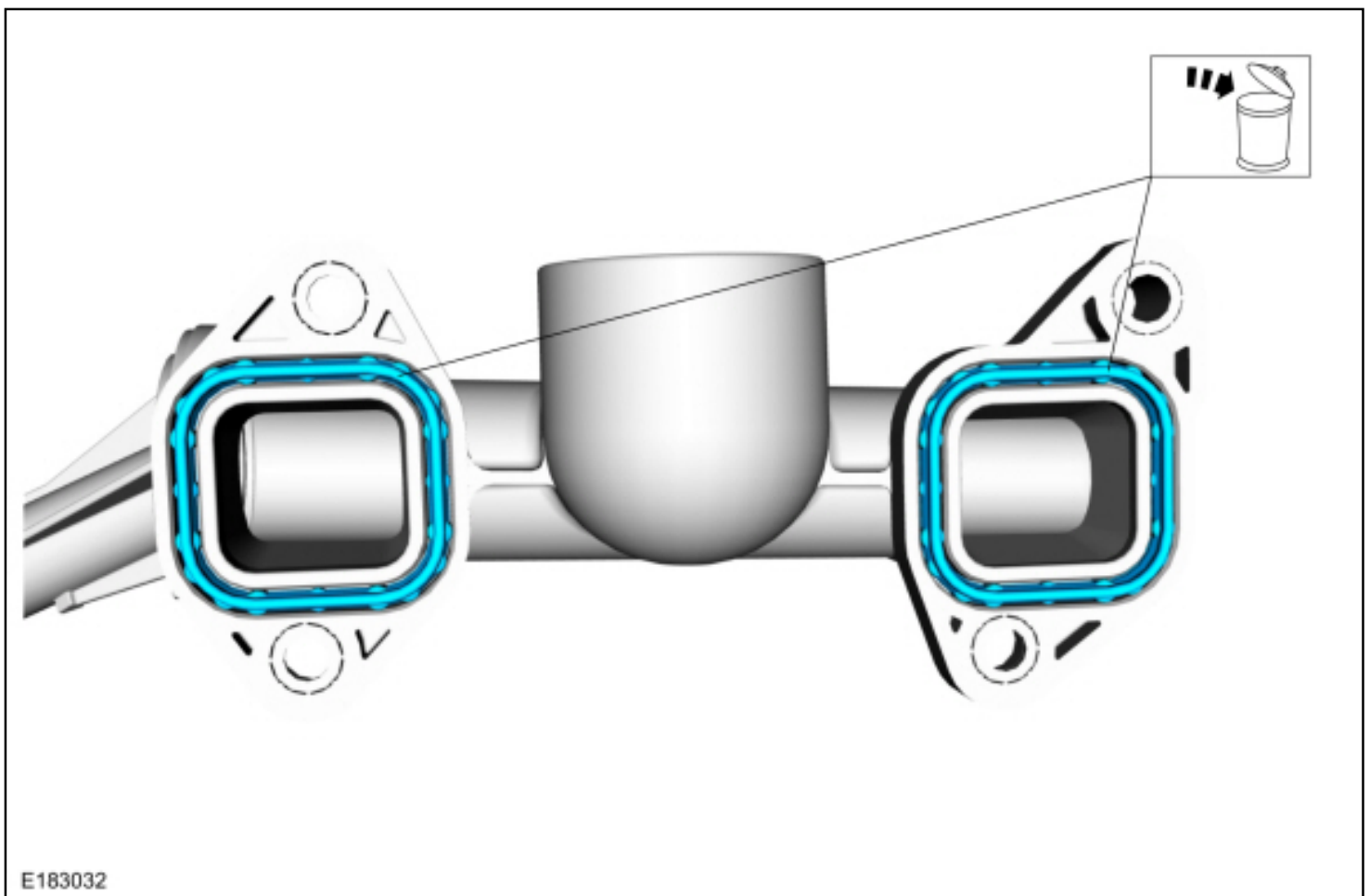
6. Drain the cooling system.

Refer to: [Cooling System Draining, Vacuum Filling and Bleeding](#) (303-03C Engine Cooling - 3.5L EcoBoost (272kW/370PS), General Procedures).

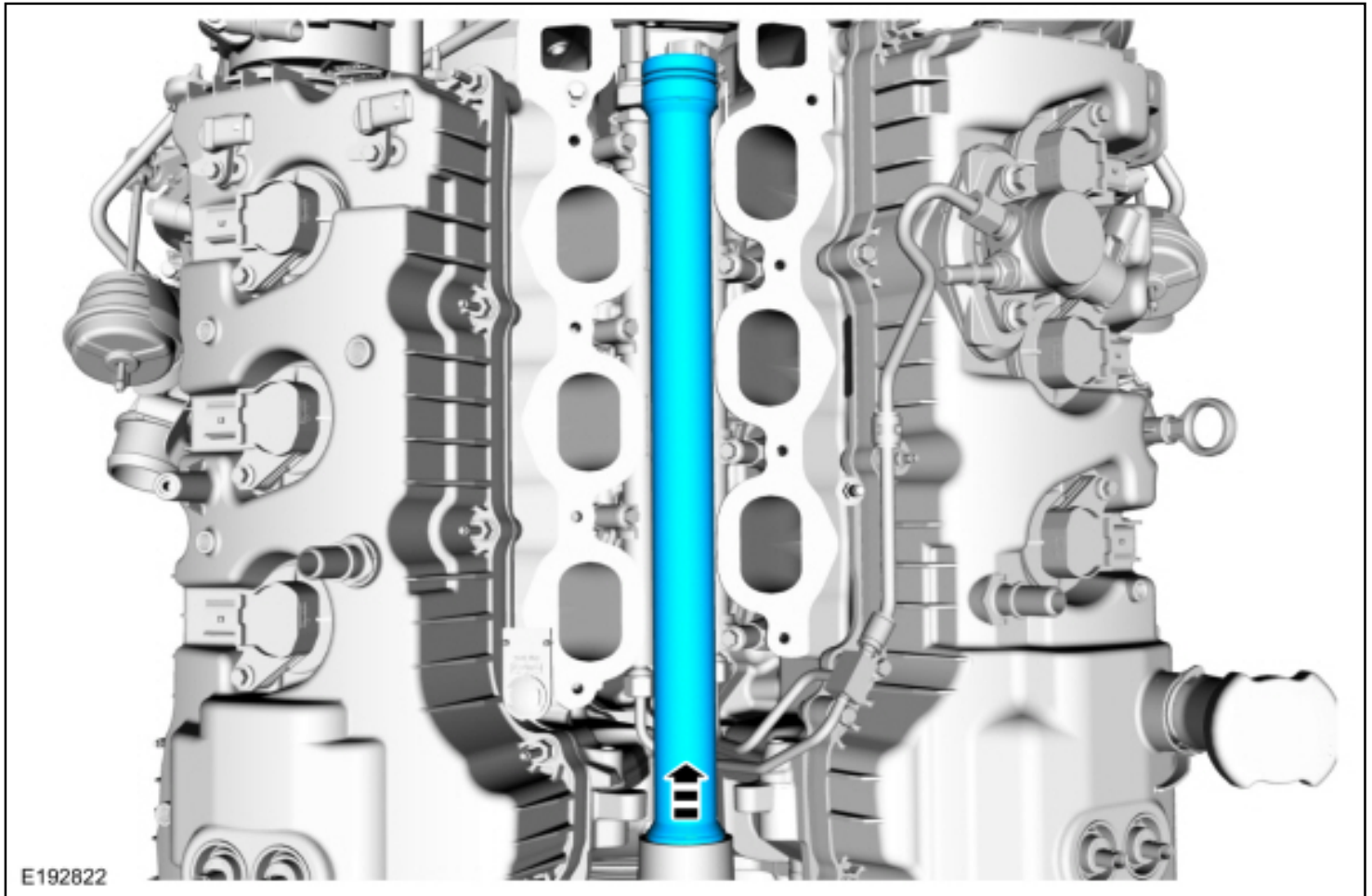
7. Remove the bolts and then position the coolant crossover assembly aside.



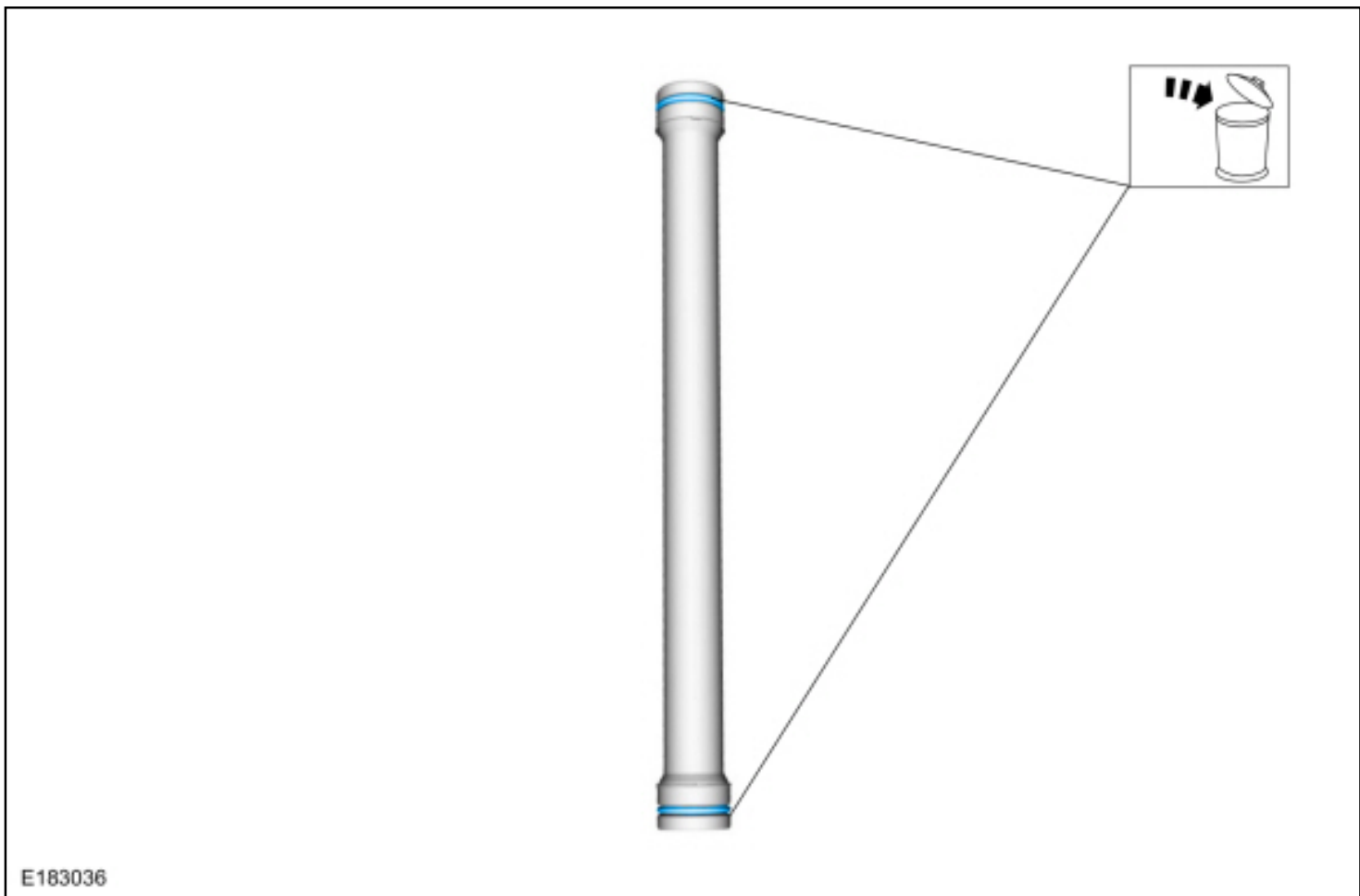
8. Remove the coolant crossover assembly gaskets and discard.



9. Remove the coolant inlet pipe.

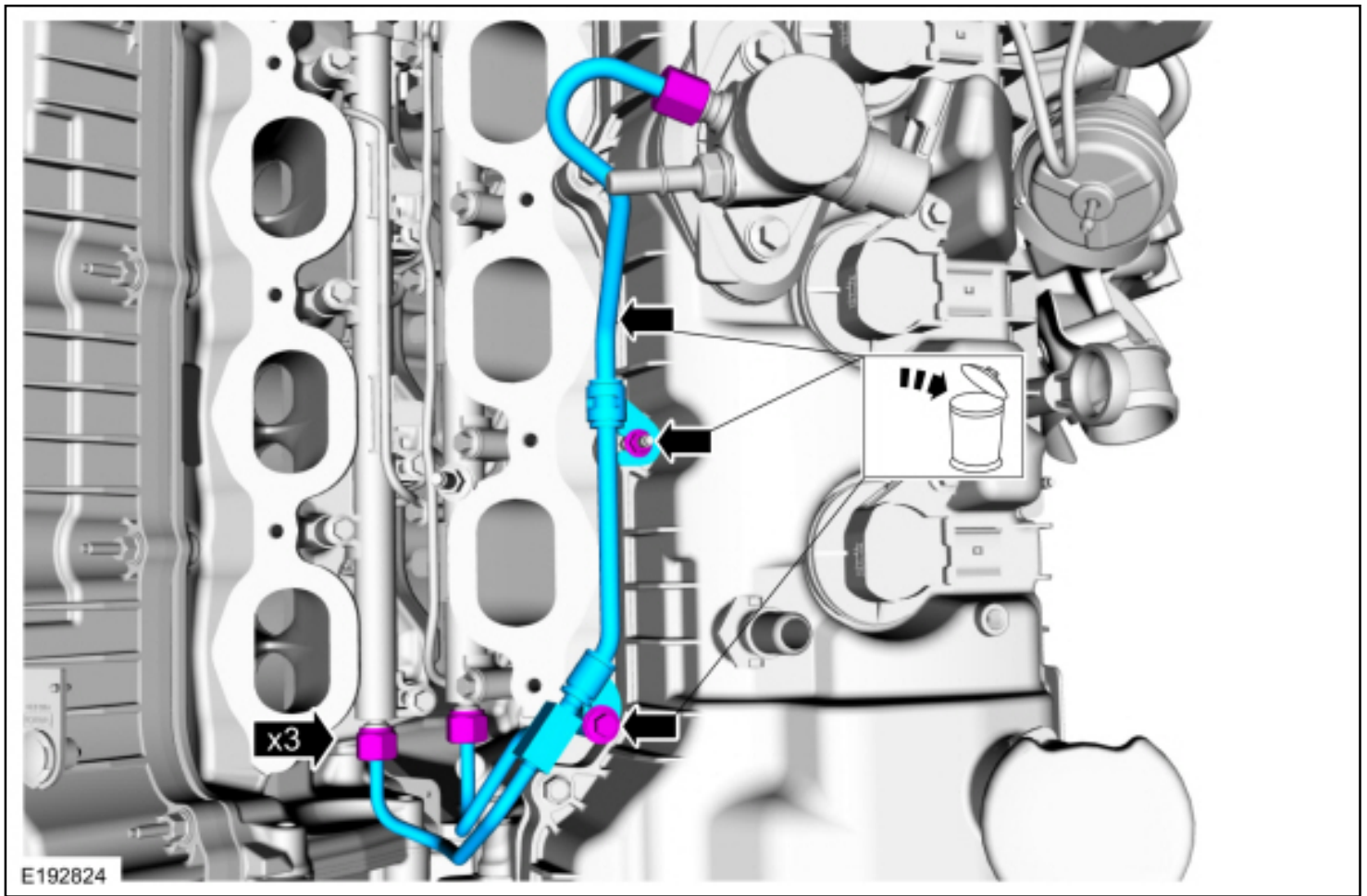


10. Remove the coolant inlet pipe O-ring seals and discard.

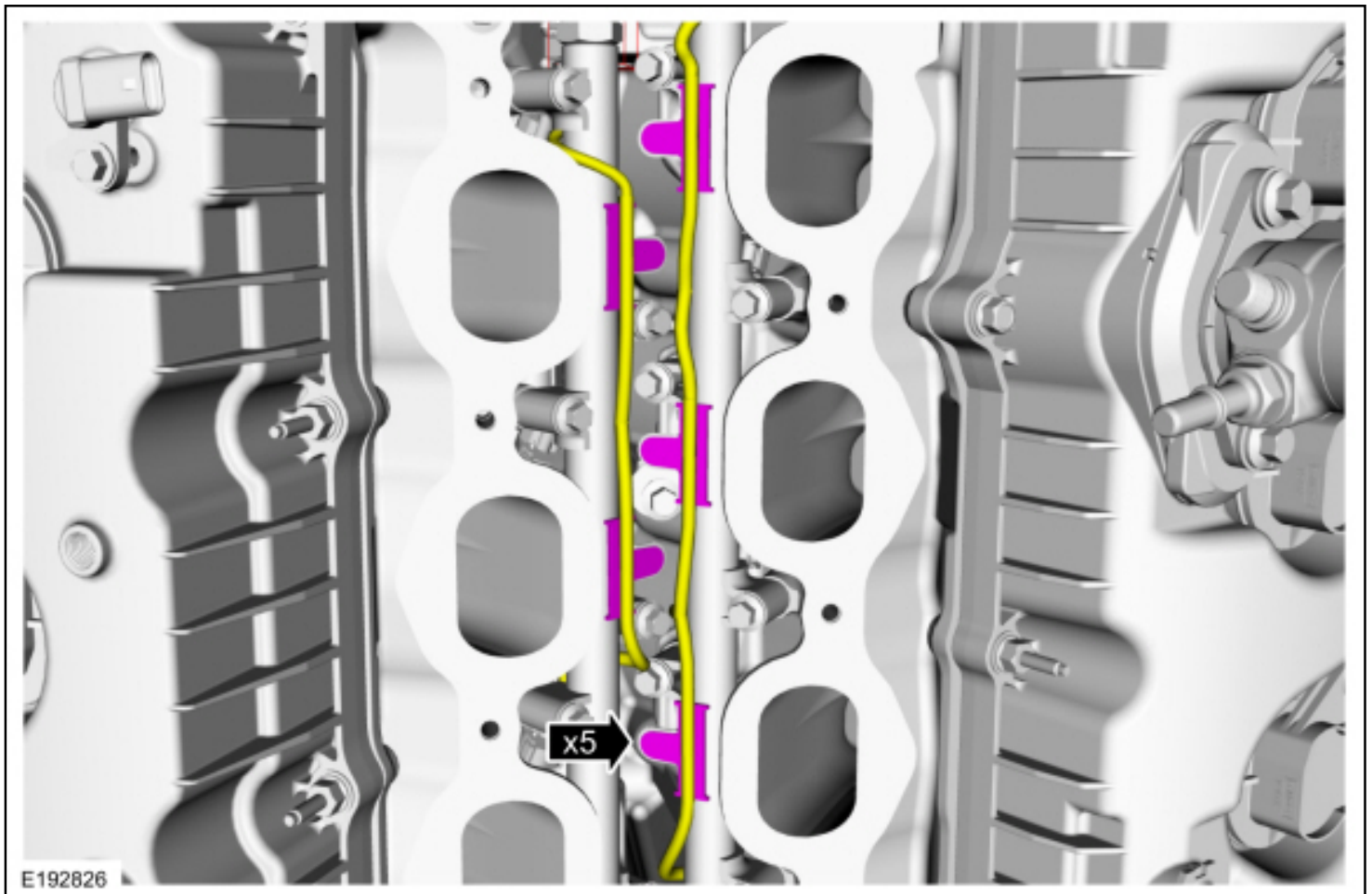


- 11. NOTICE: To release the fuel pressure in the high-pressure fuel tube, wrap the high-pressure fuel pump flare nut with a shop towel to absorb any residual fuel pressure during the loosening of high-pressure fuel pump flare nut.**

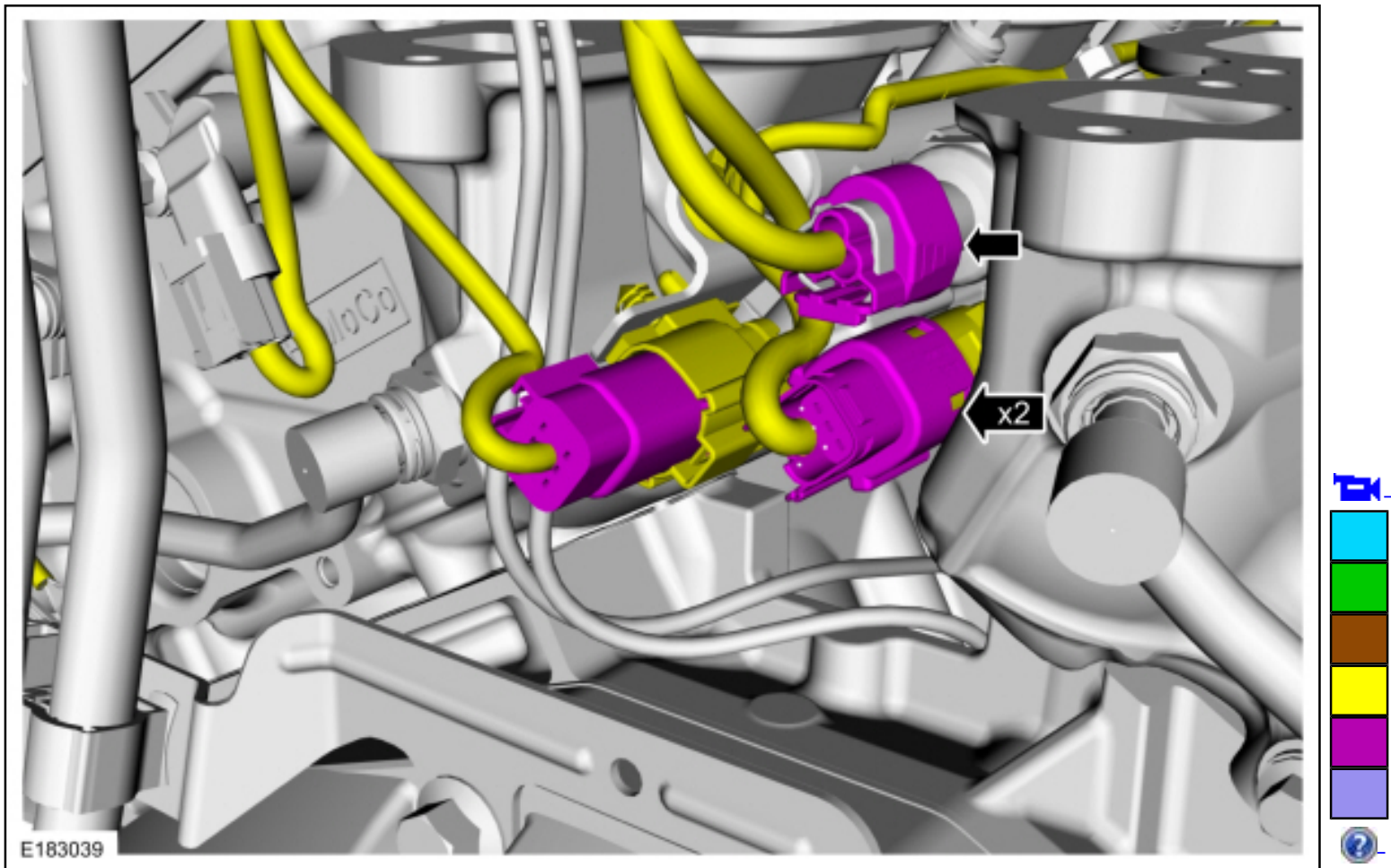
Remove the high-pressure fuel tube bracket nut, the high-pressure fuel tube bracket bolt and discard. Disconnect the high-pressure fuel tube flare nuts, remove the high-pressure fuel tube and discard.



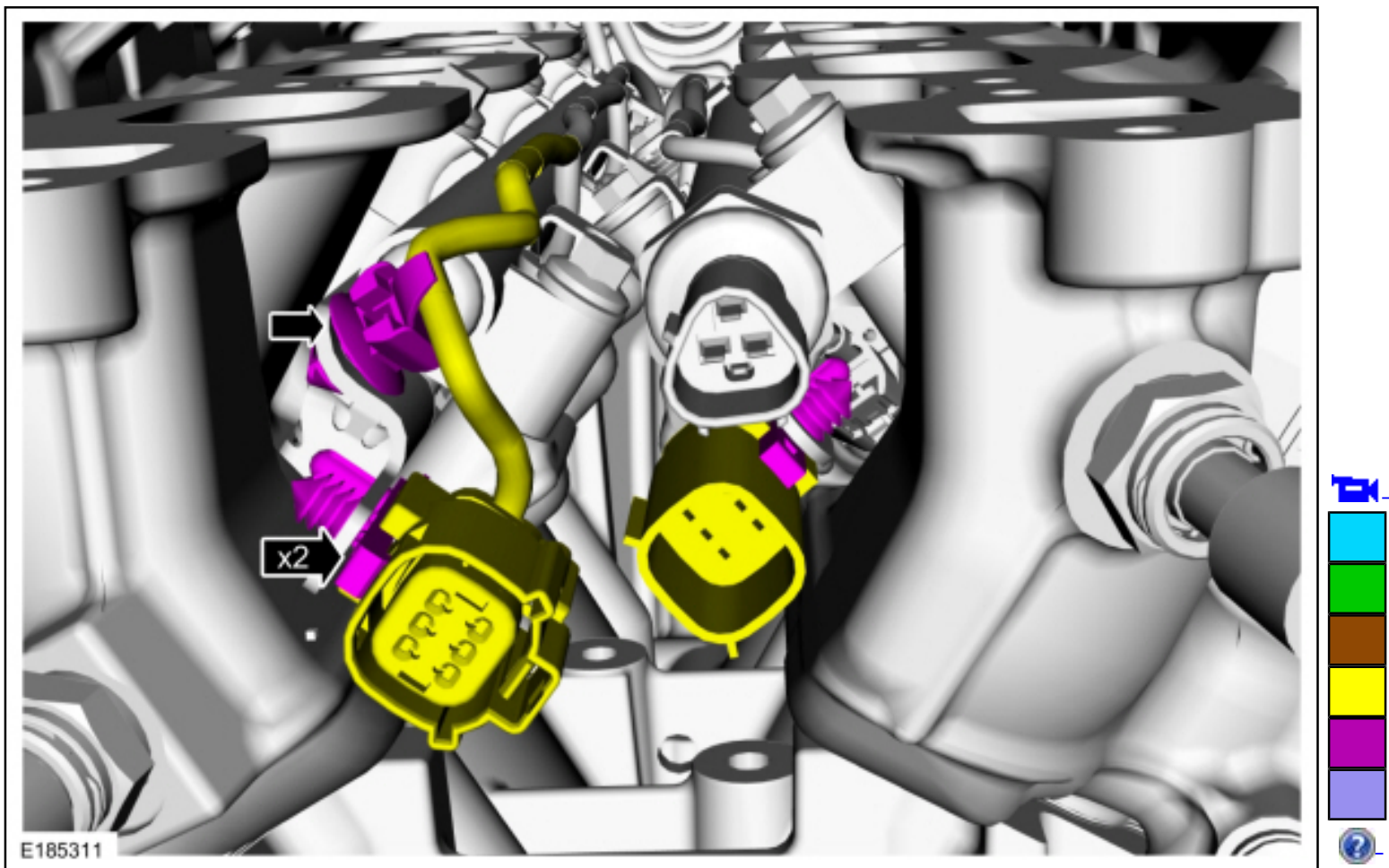
12. Release the fuel injector wire harness retainers from the fuel rail.



13. Disconnect the fuel injector wire harness connectors and the fuel rail pressure sensor wire connector.



14. Detach the fuel injector wire harness electrical connector retainers and the fuel injector wire harness retainer from the fuel rail.



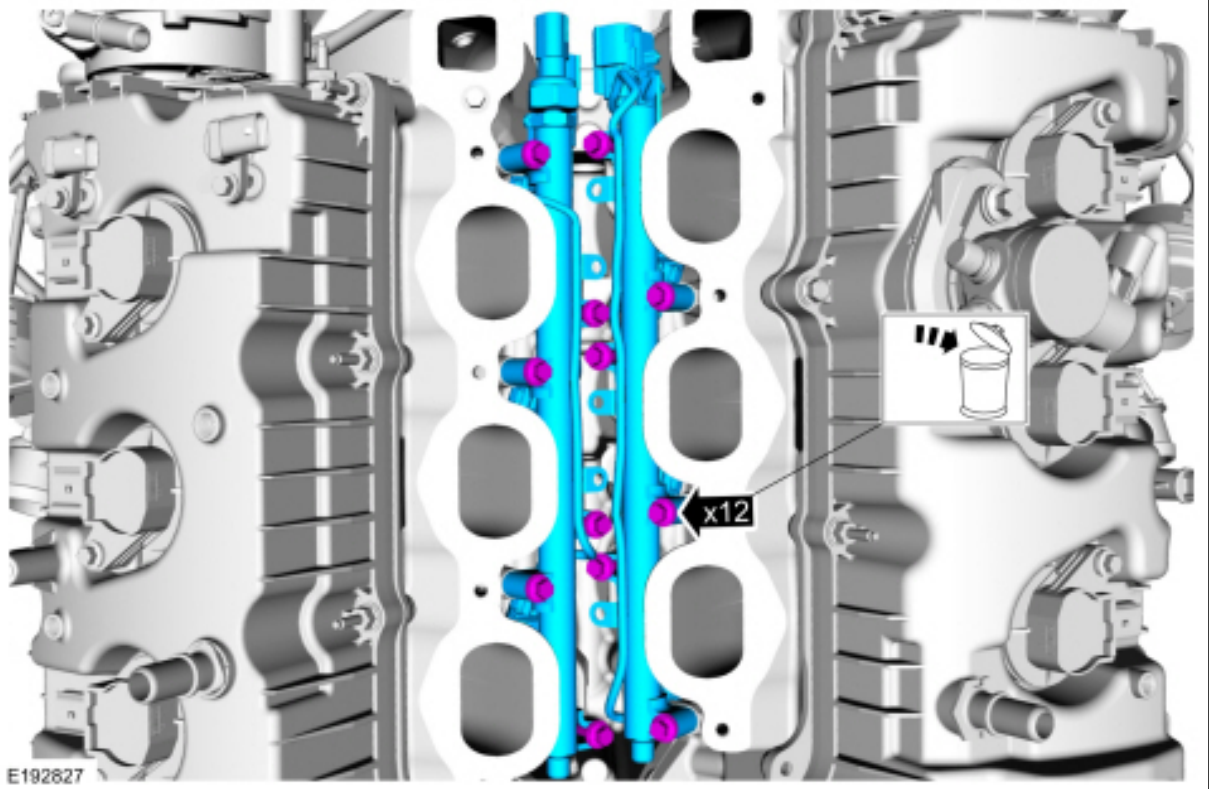
15. **NOTICE:** Pull out the fuel rails in the direction of the fuel injector axis or damage may occur to the fuel injectors.

NOTE: Use compressed air and remove any dirt or foreign material from the cylinder head, block and general surrounding area of the fuel rail and injectors.

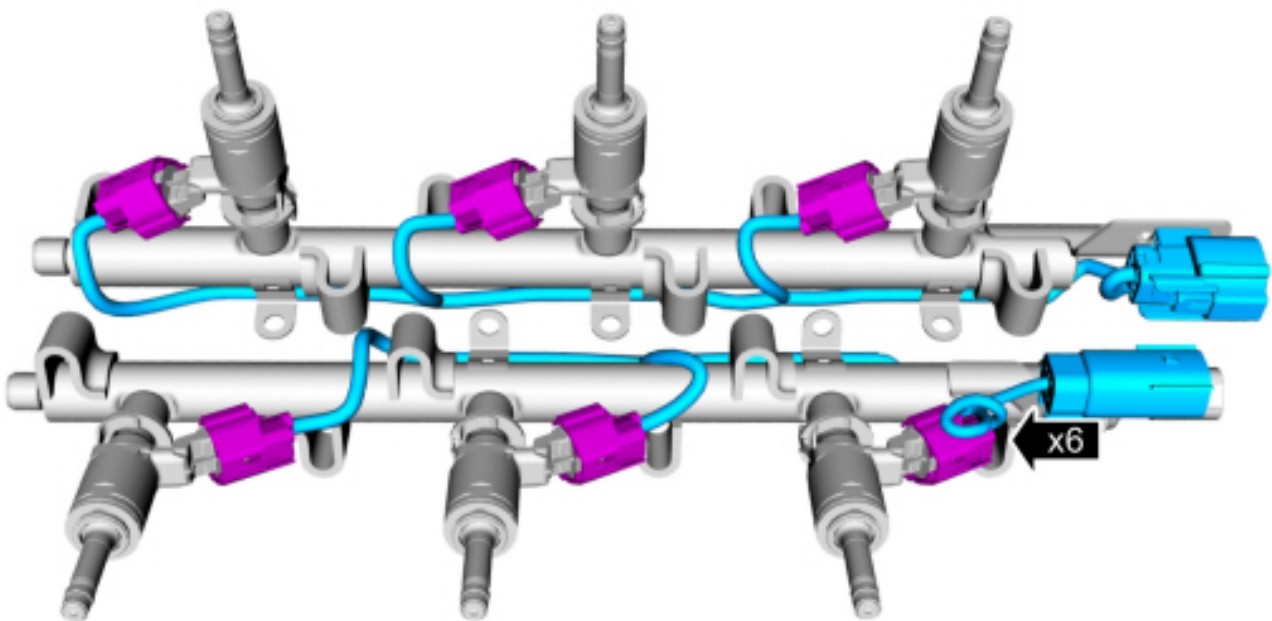
NOTE: When removing the fuel rails, the fuel injectors may remain in the cylinder heads and require the use of a Fuel Injector Remover tool to extract. Wiggling the injector by hand to break it loose may allow the injector to be removed by hand.

NOTE: Should any of the fuel injectors remain in the head, then the fuel injector electrical connectors will need to be disconnected as the fuel rail is being removed.

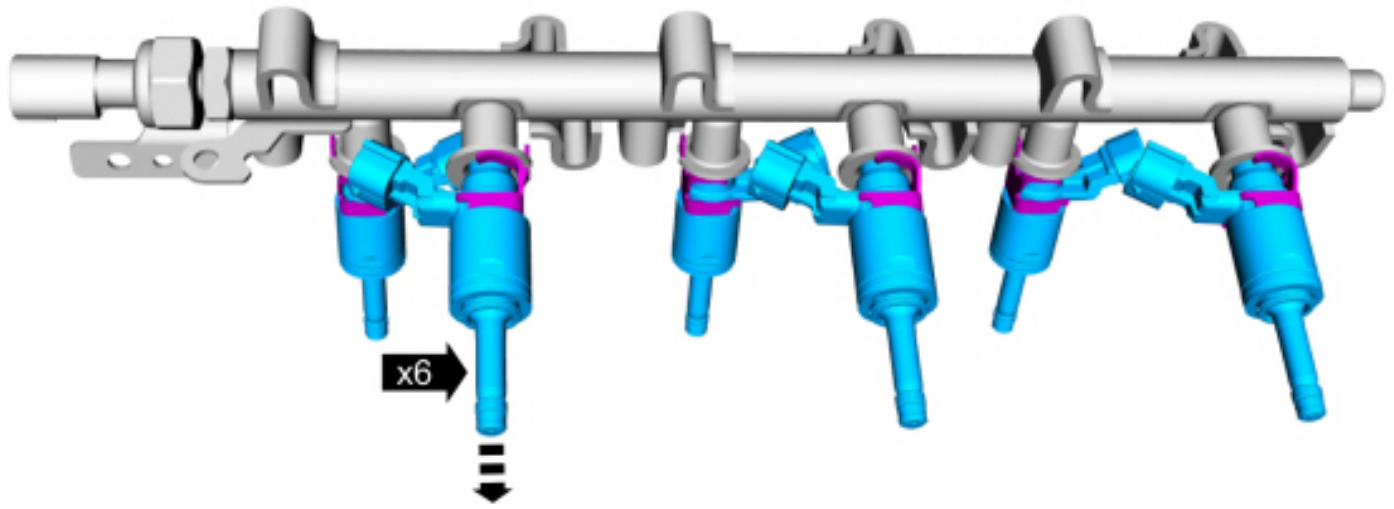
Remove the fuel rail bolts and discard, then remove the fuel rails.



16. Disconnect the fuel injector electrical connectors.

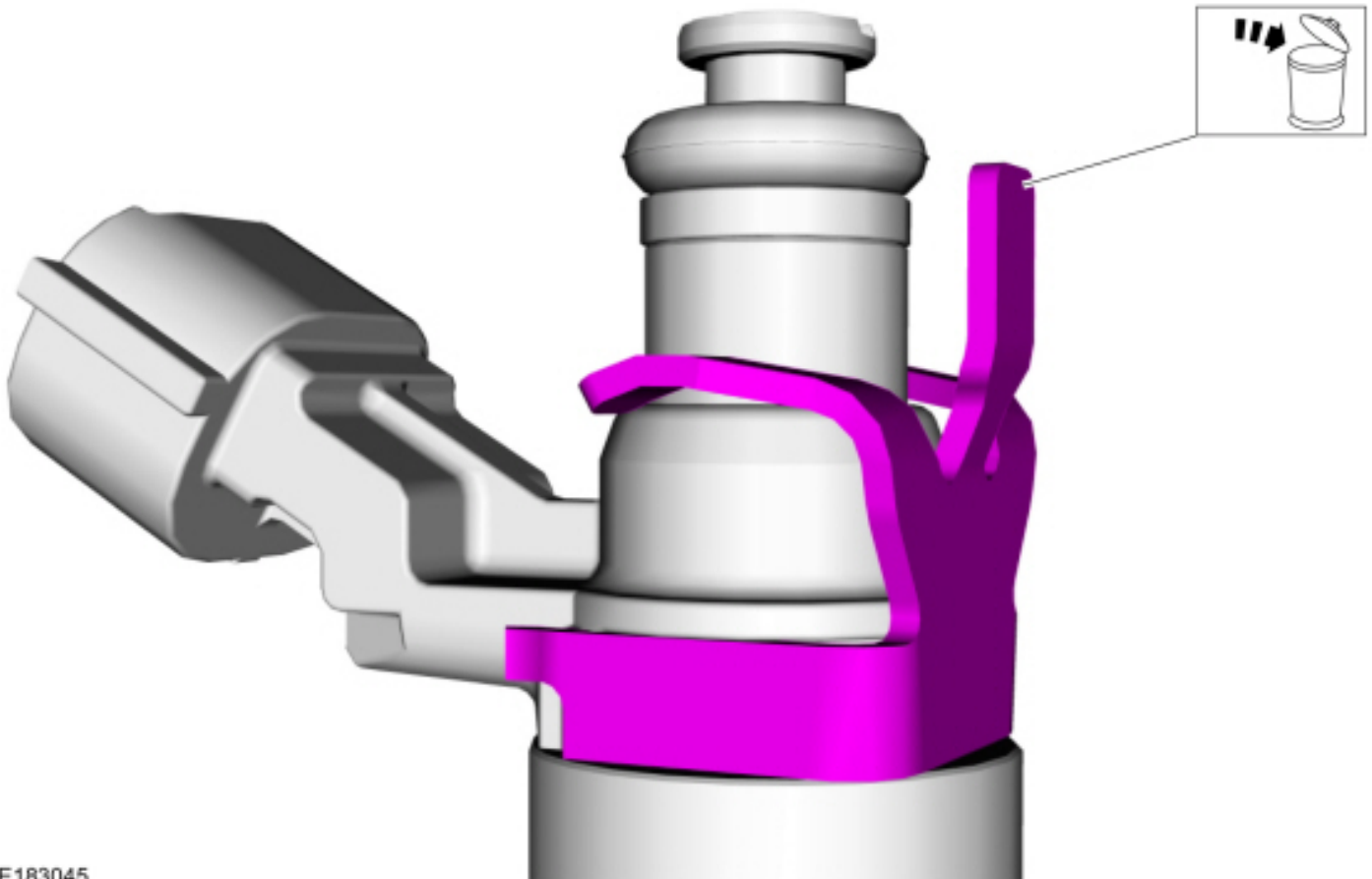


17. Remove the fuel injectors from the fuel rail.



E183043

18. Remove and discard the fuel injector clips.

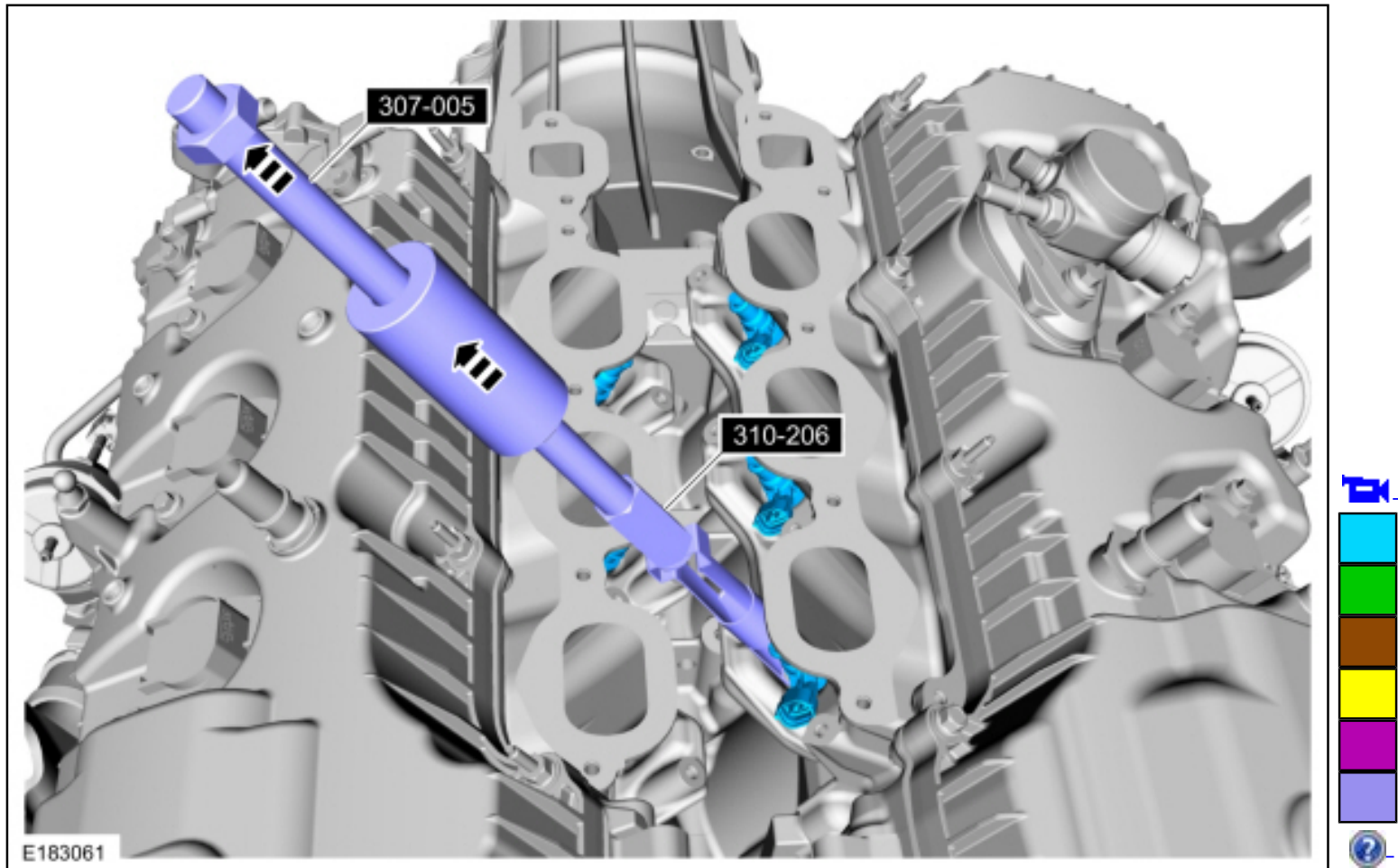


E183045

19. **NOTICE:** Use minimal force to remove the fuel injectors that remained in the cylinder head with the Fuel Injector Remover tool or damage to the fuel injector assembly may occur. Wiggling the injector by hand to break it loose may allow the injector to be removed by hand.

Using the special tools, remove any of the fuel injectors that remained in the cylinder head.

Use Special Service Tool: 307-005 (T59L-100-B) Slide Hammer. , 310-206 Remover, Fuel Injector.



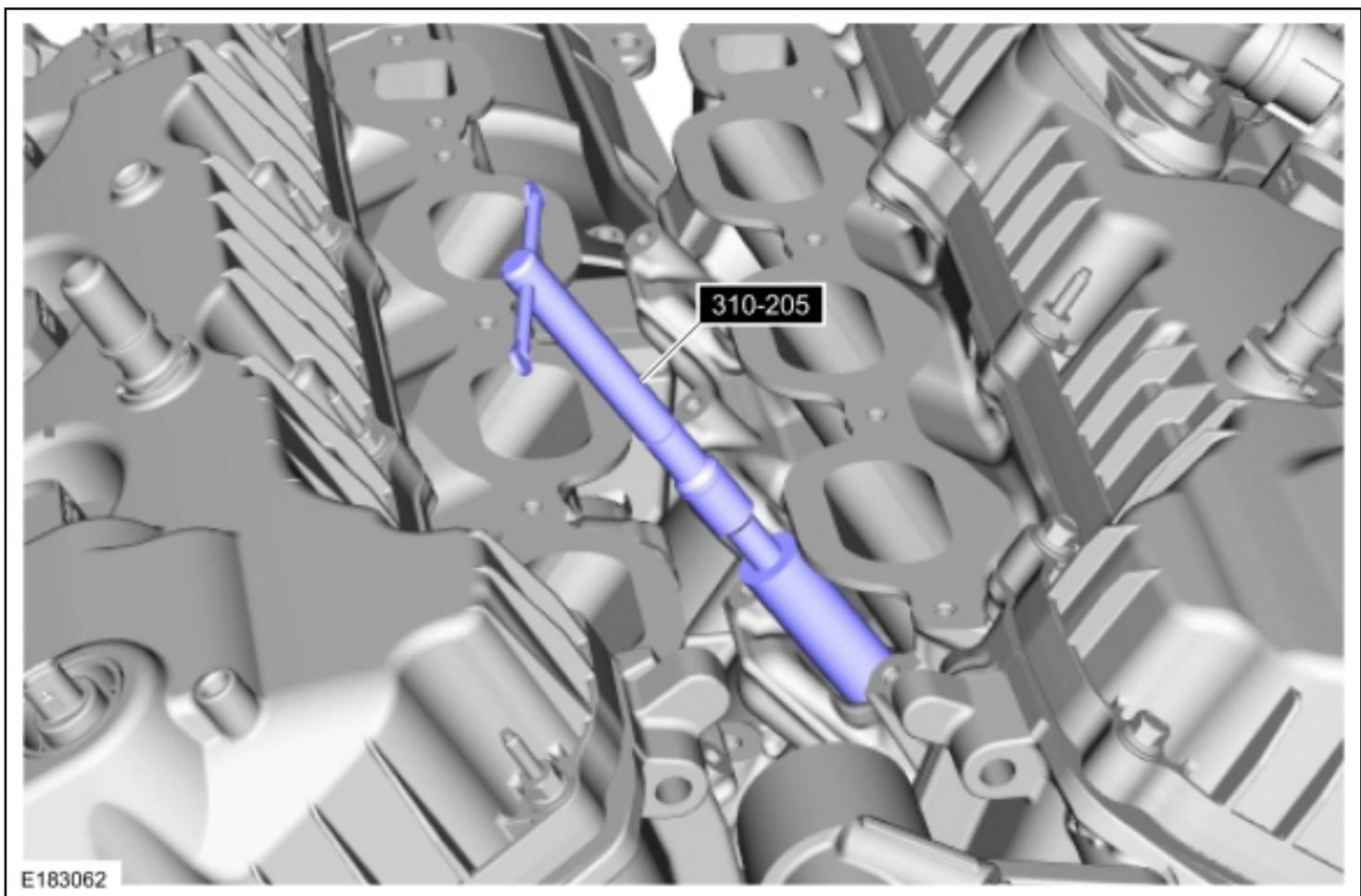
20. **NOTICE:** Make sure to thoroughly clean any residual fuel or foreign material from the cylinder head, block and the general surrounding area of the fuel rails and injectors.

NOTICE: Do not use compressed air to clean the tip of the fuel injector.

NOTICE: Do not use a brush to clean the tip of the fuel injector.

Using the special tool, clean the cylinder head fuel injector bores.

Use Special Service Tool: 310-205 Fuel Injector Brush.

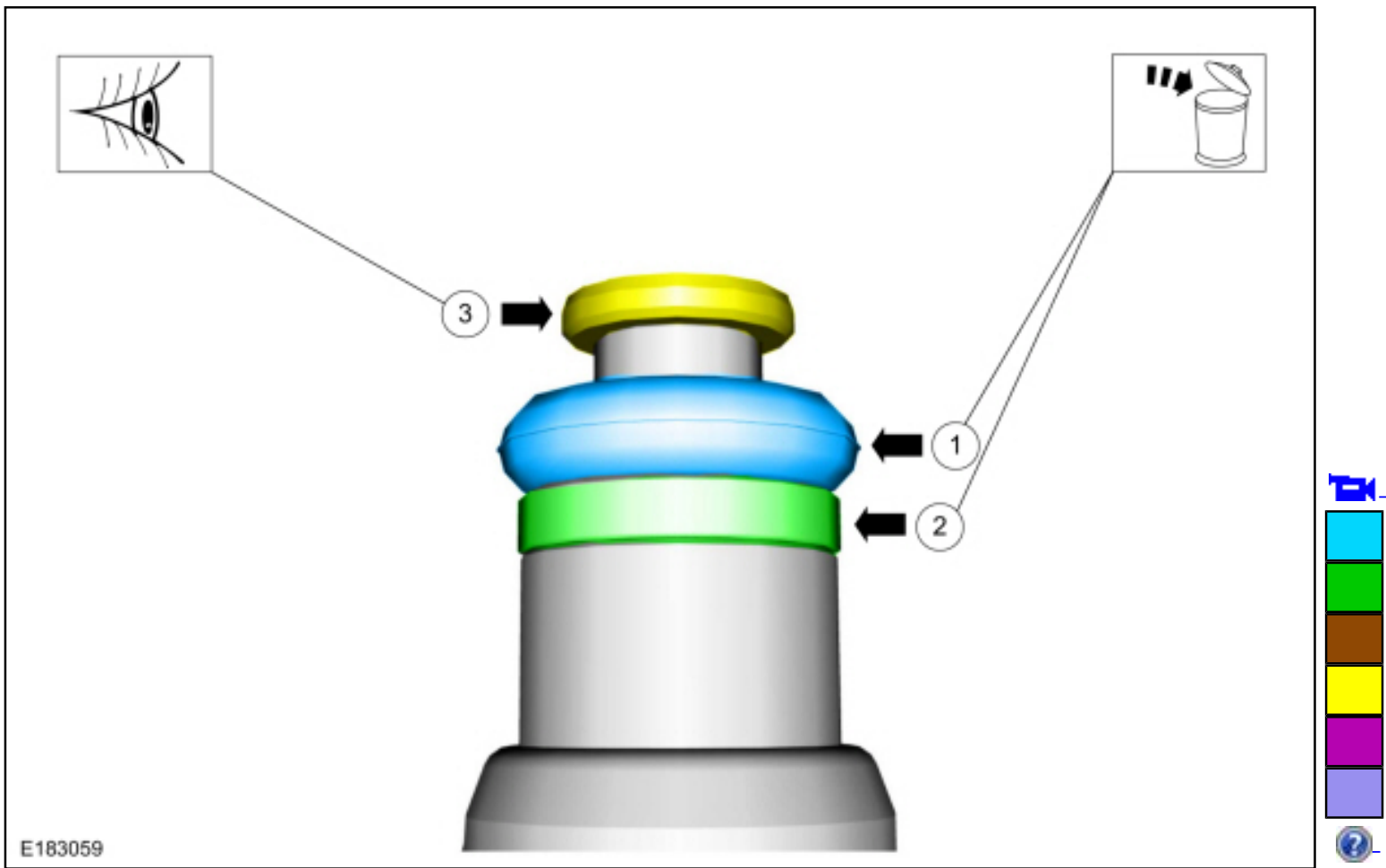


Installation

1. Remove and discard the fuel injector O-ring seals.
2. **NOTICE: Note the correct orientation of the fuel injector support rings for correct installation of the new fuel injector support rings.**

Remove and discard the fuel injector support rings.

3. Inspect the inlet stopper, if it is damaged or comes off then discard the inlet stopper. The inlet stopper is not necessary for proper function. Ensure that any debris from the inlet stopper are removed. If the inlet stopper is intact and undamaged do not remove the inlet stopper from the fuel injector.

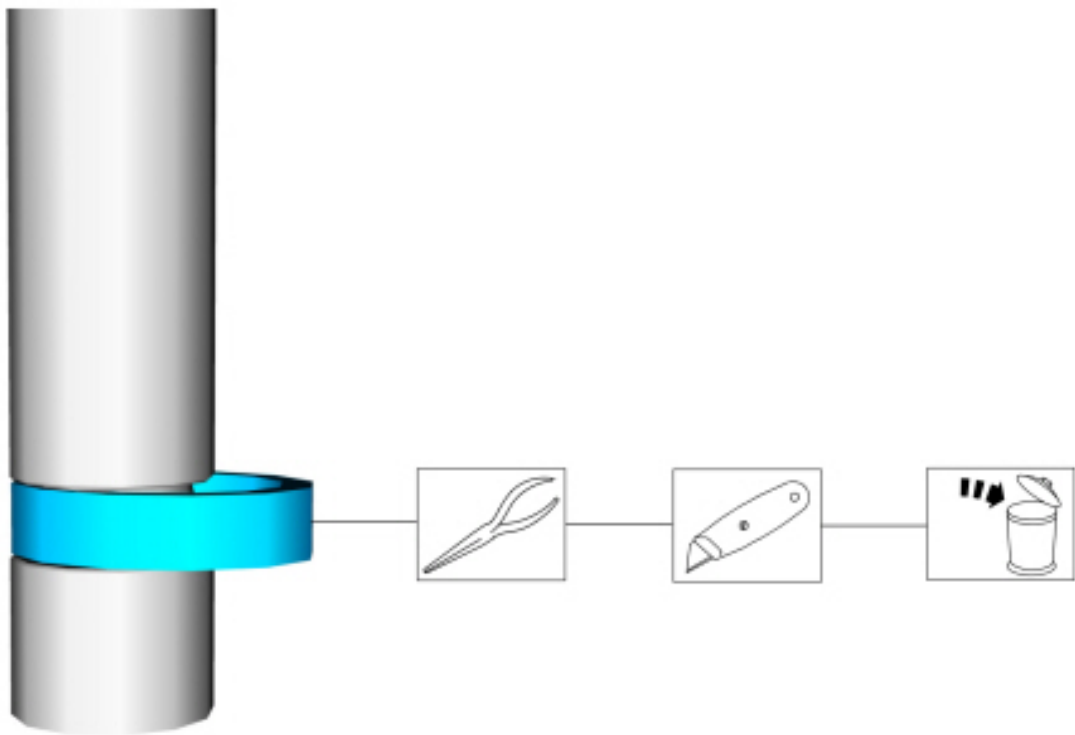


E183059

2. **NOTICE:** Use care when removing the lower Teflon® seals, to not scratch, nick or gouge the fuel injectors.

NOTICE: Do not attempt to cut the lower Teflon® seal without first pulling it away from the fuel injector or damage to the injector may occur.

1. Pull the lower Teflon® seal away from the injector with narrow tip pliers.
2. Carefully cut, remove and discard the lower fuel injector Teflon® seals.



E168006



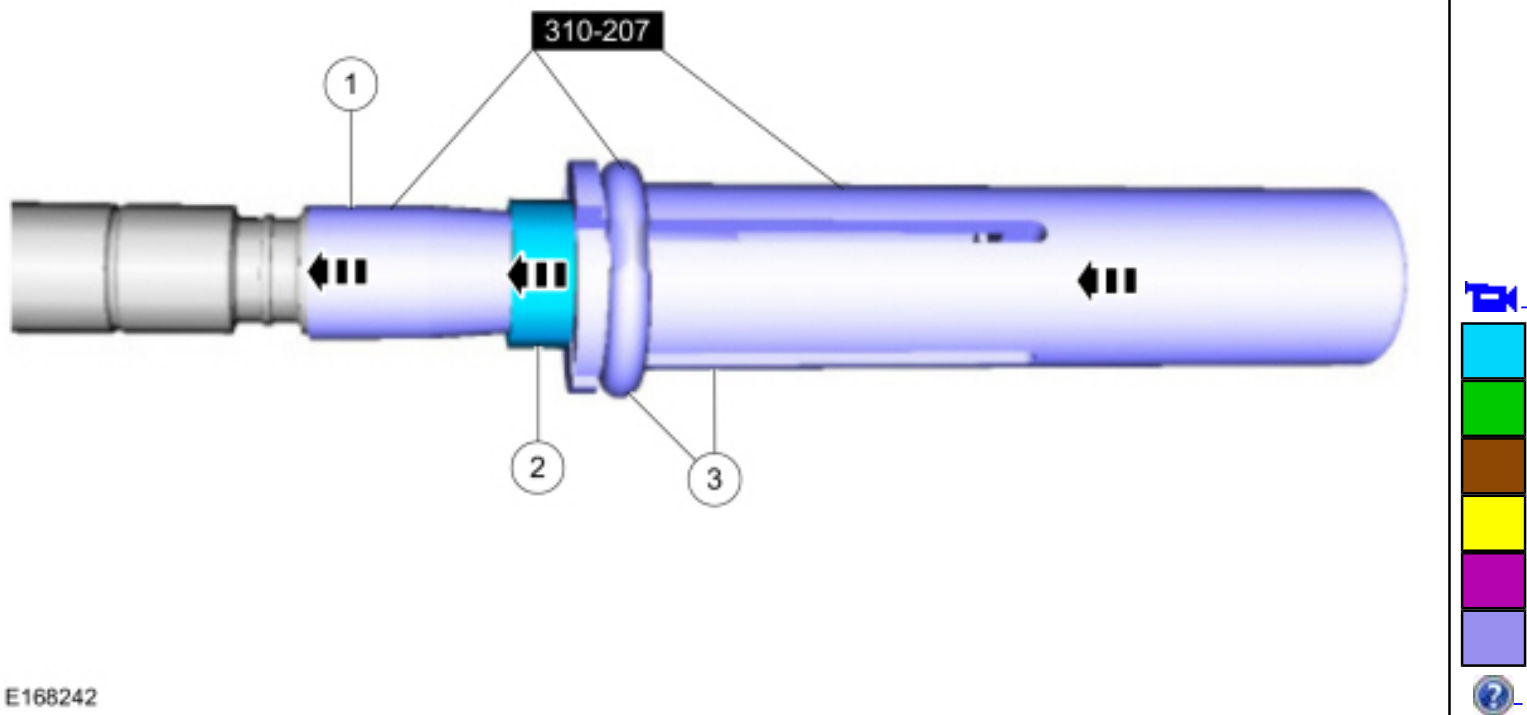
3. **NOTICE: Do not lubricate the new lower Teflon® fuel injector seals.**

1. Install the Arbor on the fuel injector tips.
Use Special Service Tool: 310-207 Installer, Fuel Injector Seal Assembly.
2. **NOTICE: Once the Teflon® seal is installed on the Teflon® Seal Guide, it should immediately be installed onto the fuel injector to avoid excessive expansion of the Teflon® seal.**

NOTE: *Make sure that new lower fuel injector Teflon® seals are installed.*

Install the new Teflon® seals onto the Arbor, using the Pusher Tool (part of the Fuel Injector Seal Installer), slide the Teflon® seals along the Arbor.

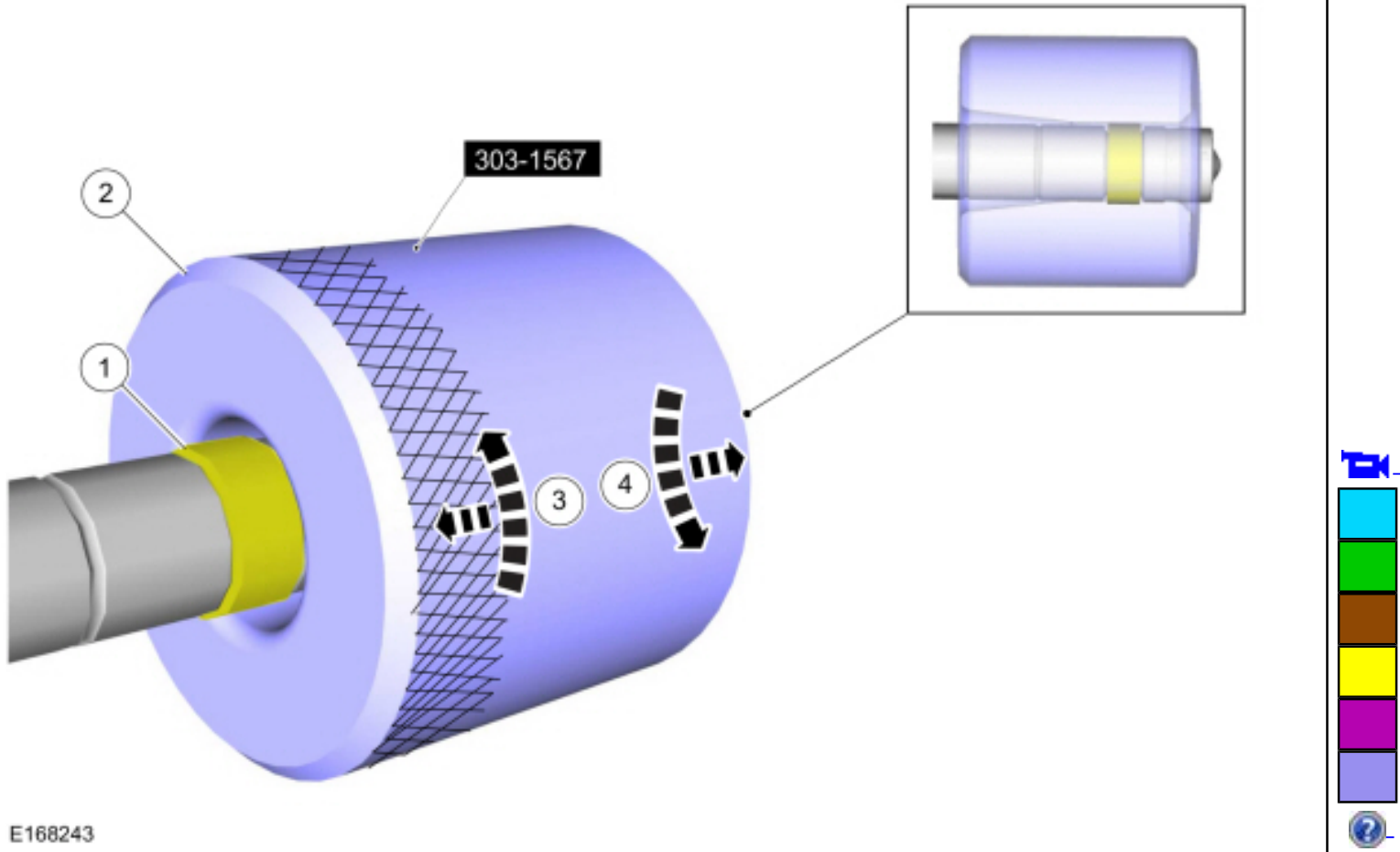
3. Using the Pusher Tool, slide the Teflon® seals off of the Teflon® Seal Guide and into the groove on the fuel injectors.
Use Special Service Tool: 310-207 Installer, Fuel Injector Seal Assembly.



4. **NOTICE: Install the fuel injectors into the cylinder head within 15 minutes of sizing the seals due to Teflon® seal expansion.**

NOTE: *Make sure the Teflon® seal is fully seated in the groove on the fuel injector before sizing the Teflon® seal.*

1. Some Teflon® seal massaging with your fingers before the Teflon® seal sizer tool is installed will aid in installing the Teflon® seal sizer tool.
2. Position the Teflon® seal sizer tool with the larger opening towards the Teflon® seal. Push while turning the Teflon® seal sizer tool 180 degrees.
Use Special Service Tool: 303-1567 Sizer, Teflon Seal.
3. Once the Teflon® seal sizer tool is installed, check and make sure the Teflon® seal is in the sizing portion of the Teflon® seal sizer tool.
4. After one minute, turn the Teflon® seal sizer tool back 180 degrees and remove.



5. **NOTE:** Make sure that new fuel injector support rings and new fuel injector O-ring seals are installed.

1. **NOTICE:** The new the fuel injector support rings must be installed in the correct orientation with the larger surface facing up against the fuel injector O-ring seals. Improperly installed support rings may cause the fuel system to leak.

Install the new the fuel injector support rings.

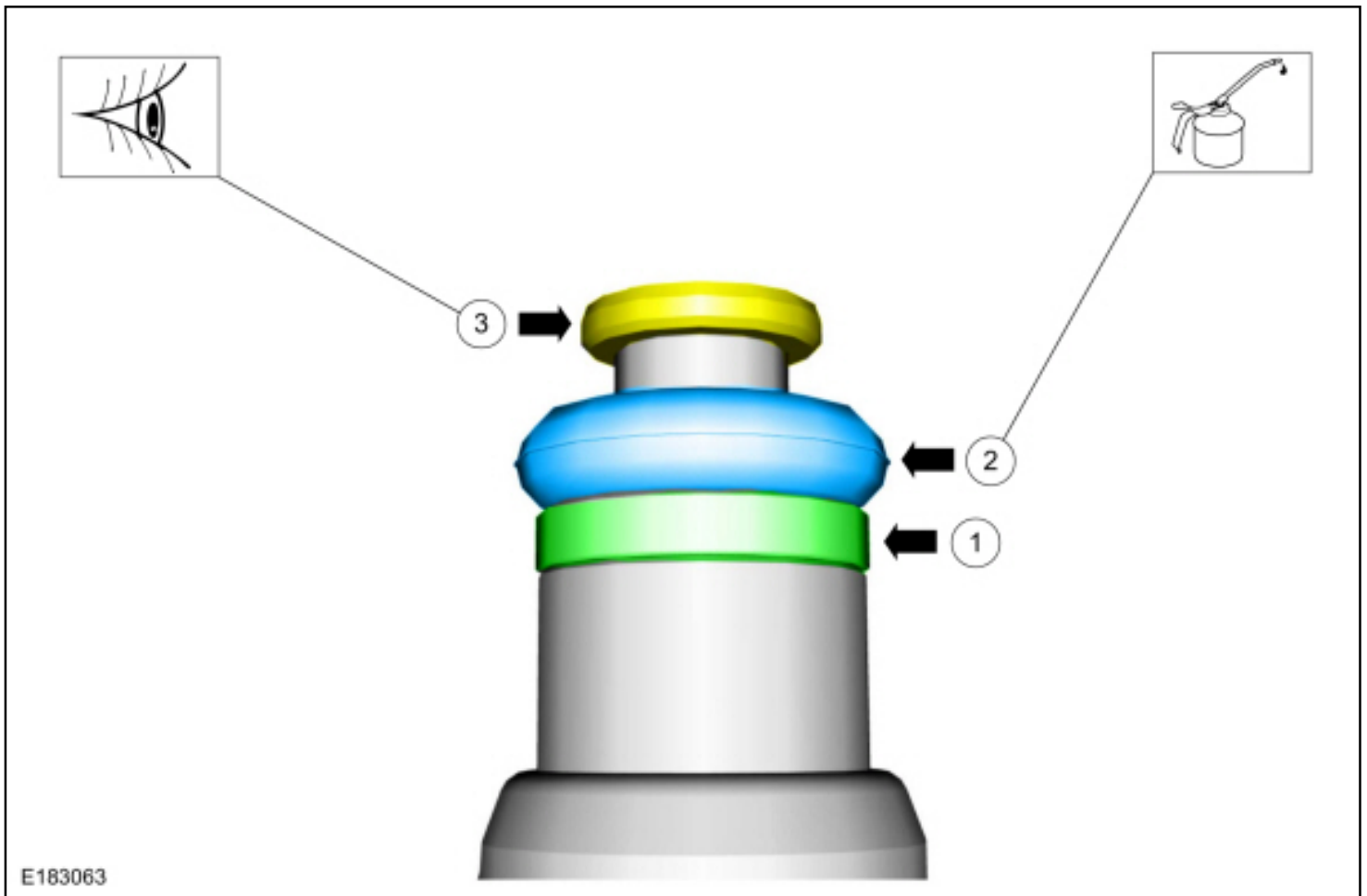
2. **NOTICE:** Use fuel injector O-ring seals that are made of special fuel-resistant material. The use of ordinary O-ring seals may cause the fuel system to leak. Do not reuse the old O-ring seals.

NOTICE: Do not lubricate the new lower Teflon® fuel injector seals.

Install the new fuel injector O-rings and lubricate with clean engine oil.

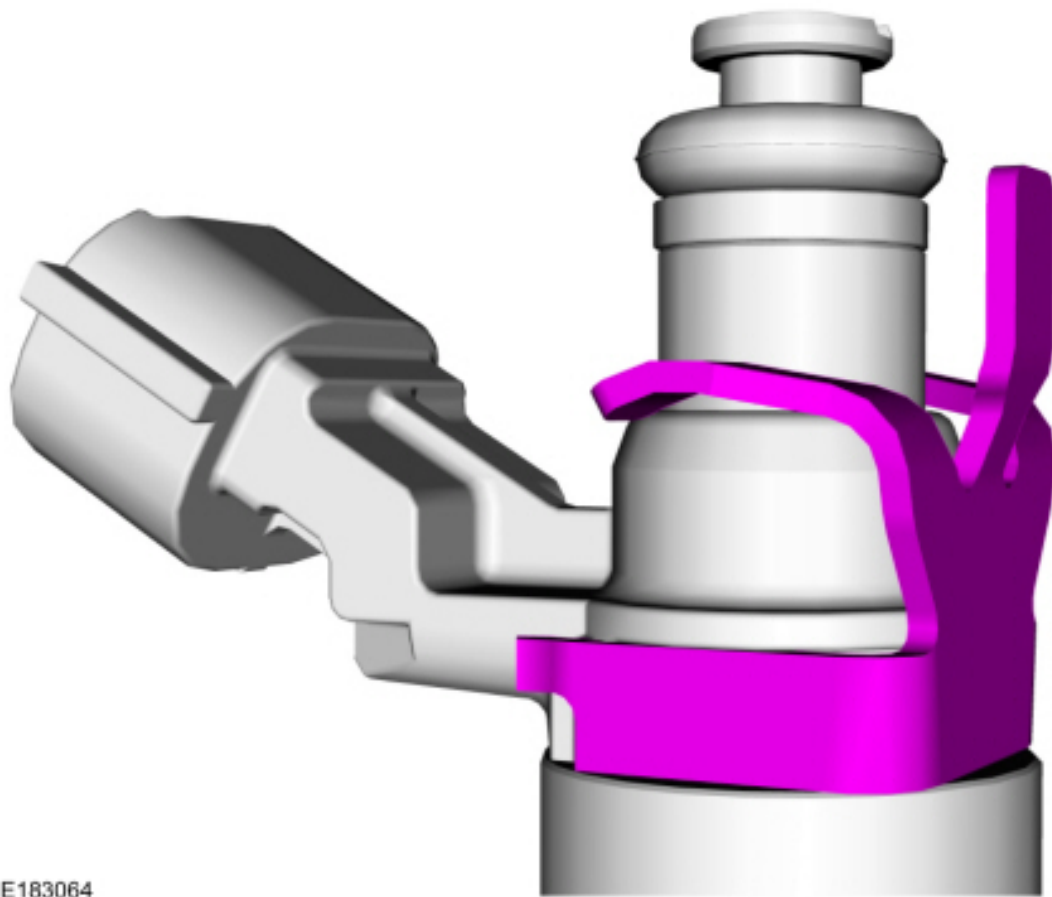
Material: Motorcraft® SAE 5W-30 Synthetic Blend Motor Oil / XO-5W30-QSP (WSS-M2C946-A)

3. Inspect the inlet stopper, if it is damaged or comes off discard the inlet stopper. The inlet stopper is not necessary for proper function. Ensure that any debris from the inlet stopper are removed. If the inlet stopper is intact and undamaged do not remove the inlet stopper from the fuel injector.



6. **NOTE:** *Make sure that new fuel injector clips are installed.*

Install the new the fuel injector clips.



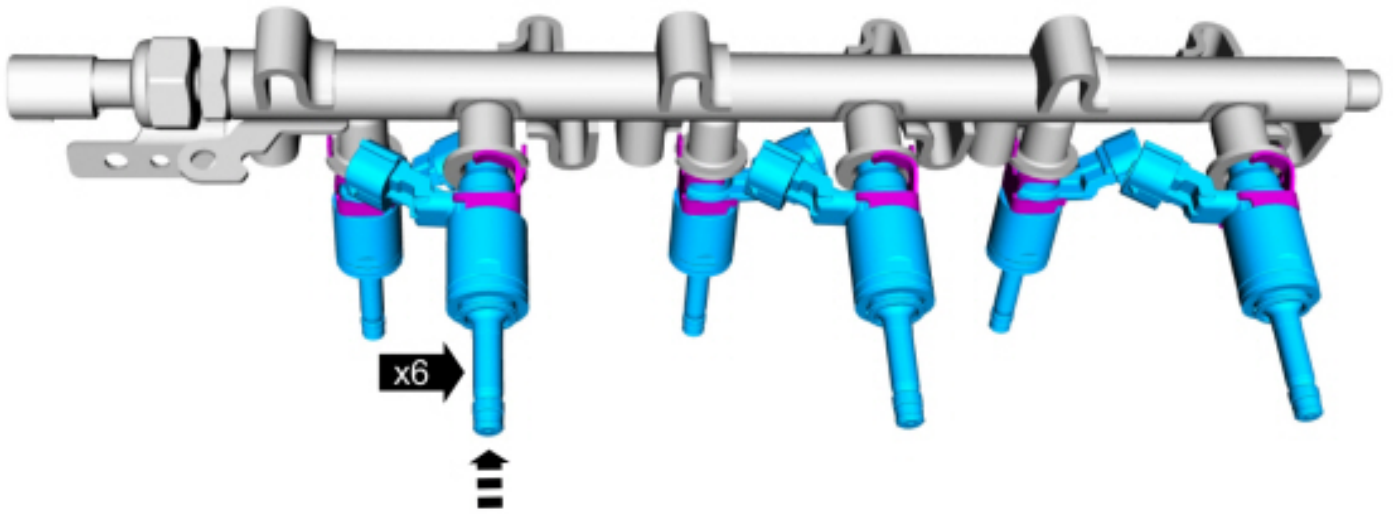
E183064



7. NOTICE: The FRP sensor must be replaced if it is removed from the fuel rail.

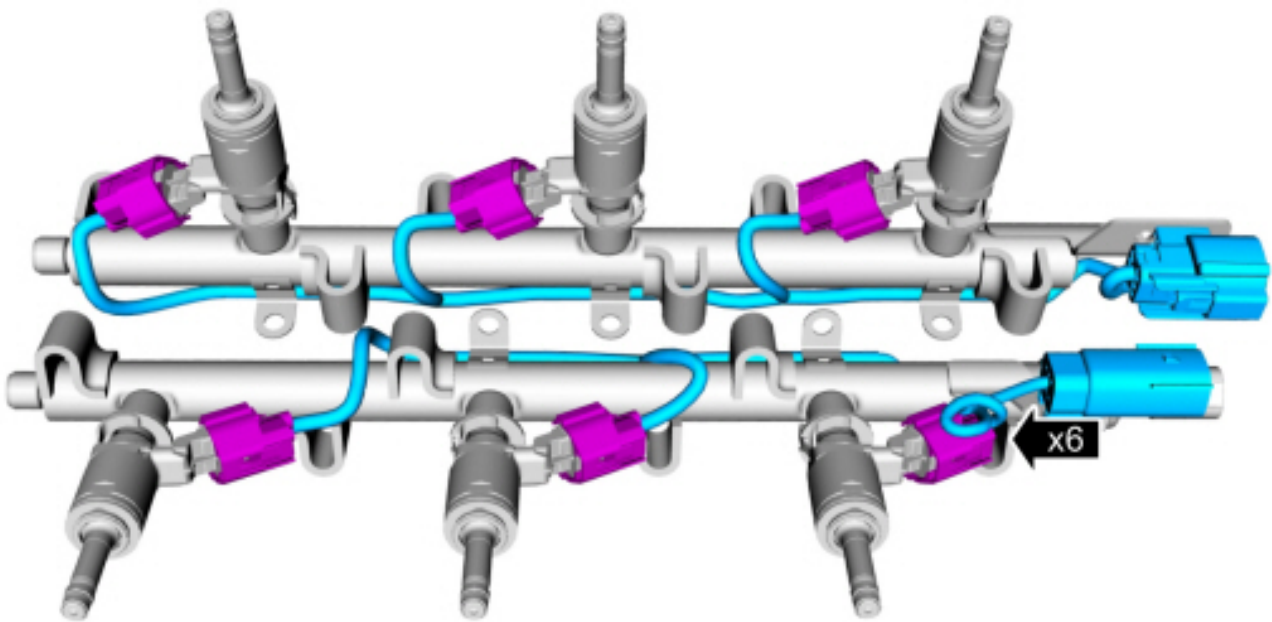
NOTE: *The anti-rotation finger of the new fuel injector clip must slip into the groove of the fuel rail cup.*

Install the fuel injectors to the fuel rail.



E183044

8. Connect the fuel injector electrical connectors.



E185312

9. **NOTE:** Do not lubricate the new lower Teflon® fuel injector seals.

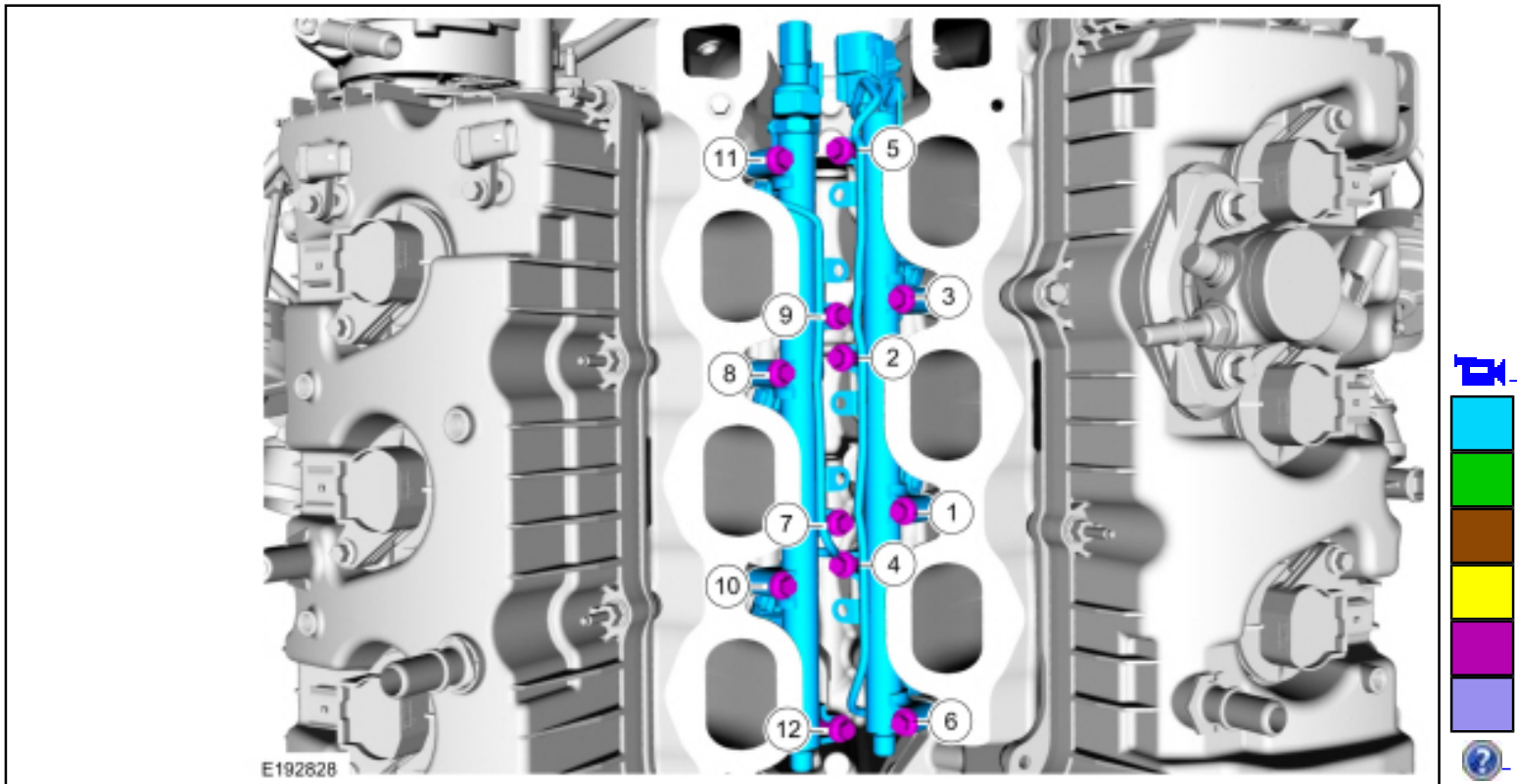
NOTE: Make sure that new fuel rail bolts are installed.

Push down on the fuel rail above the injectors. Tighten the fuel rail bolts in the sequence shown.

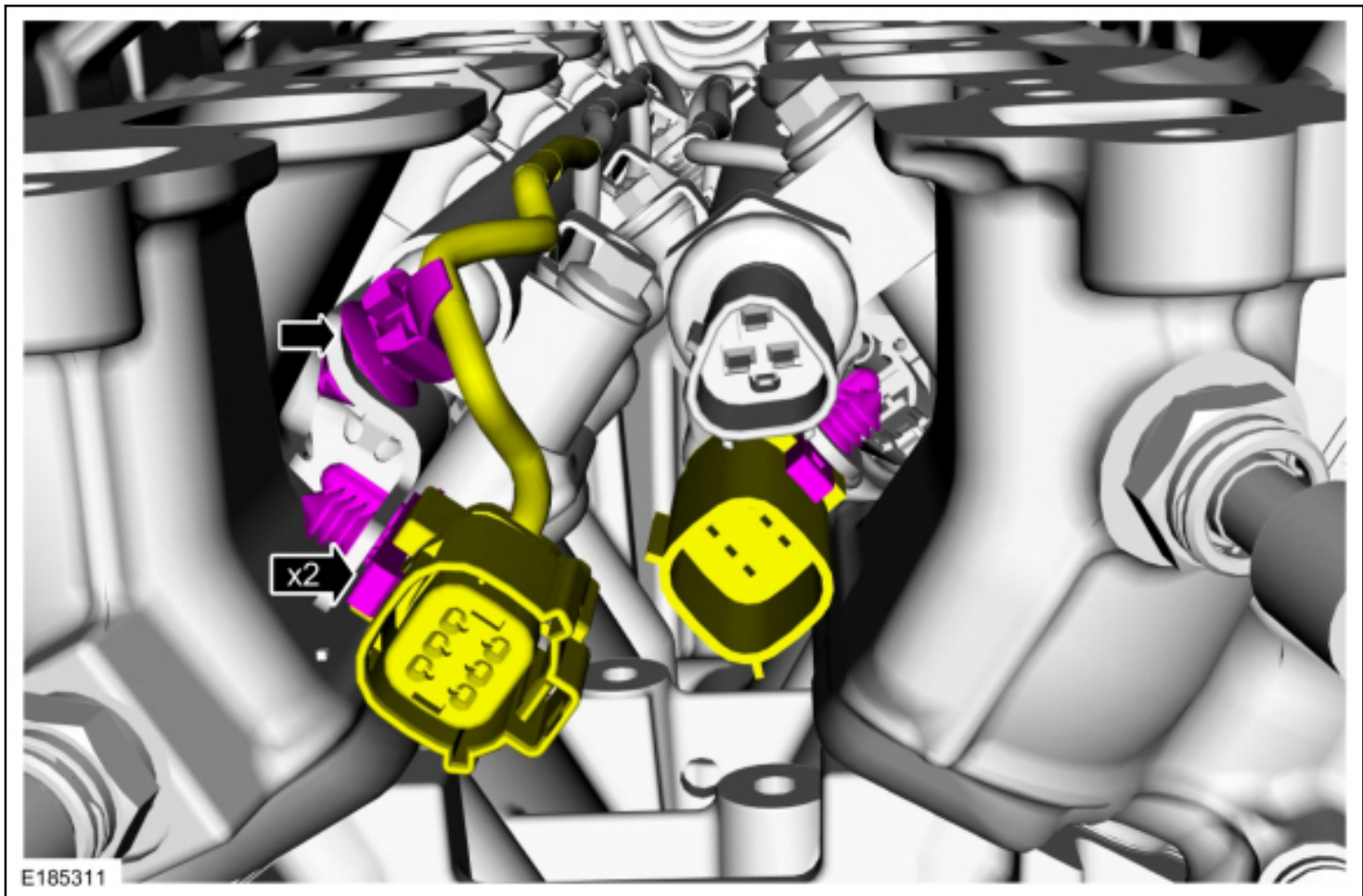
Torque:

Stage 1: 89 lb.in (10 Nm)

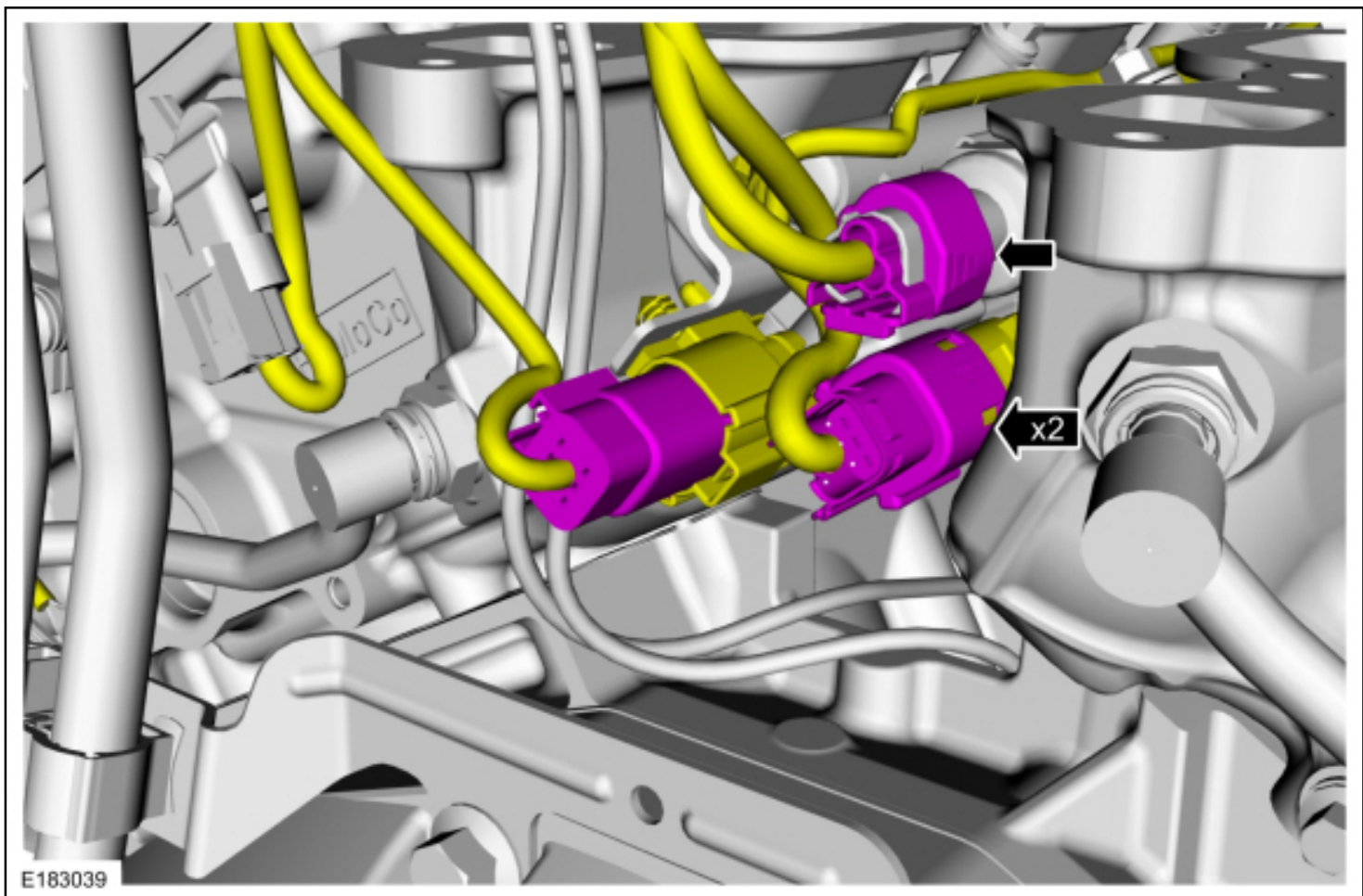
Stage 2: 45°



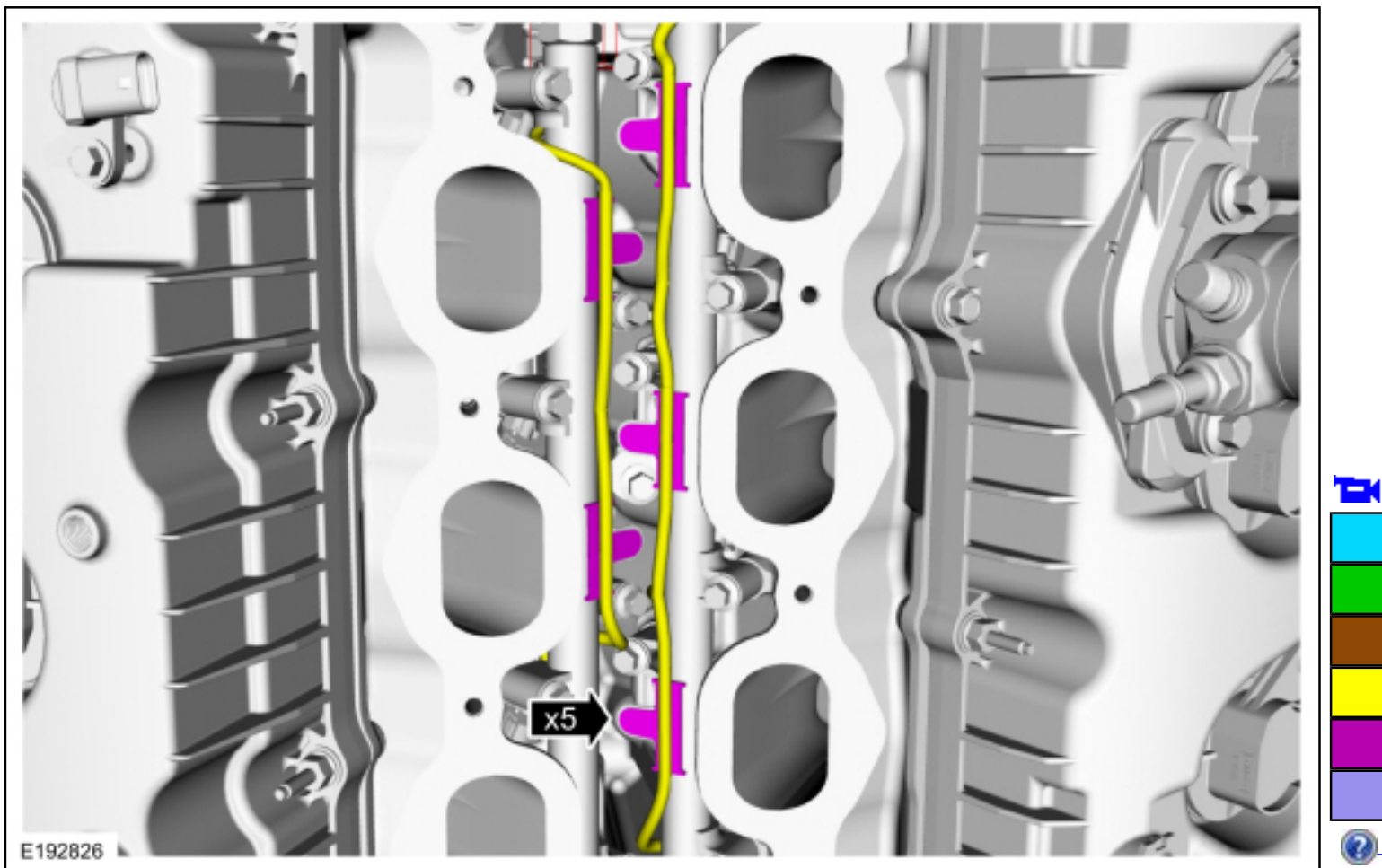
10. Attach the fuel injector wire harness electrical connector retainers and the fuel injector wire harness retainer to the fuel rail.



11. Connect the fuel injector wire harness connectors and the fuel rail pressure sensor wire connector.



- Attach the fuel injector wire harness retainers to the fuel rail.



- NOTE:** Make sure that a new high-pressure fuel tube, a new high-pressure fuel tube bracket nut and a new high-pressure fuel tube bracket bolt are installed.

NOTE: Install the new high-pressure fuel tube, the high-pressure fuel tube flare nuts, the new high-pressure fuel tube bracket nut, the new bracket bolt and tighten finger tight at this stage. Tighten in the sequence shown.

NOTE: Calculate the correct torque wrench setting for the following torque using the Torque Wrench Adapter Formulas.

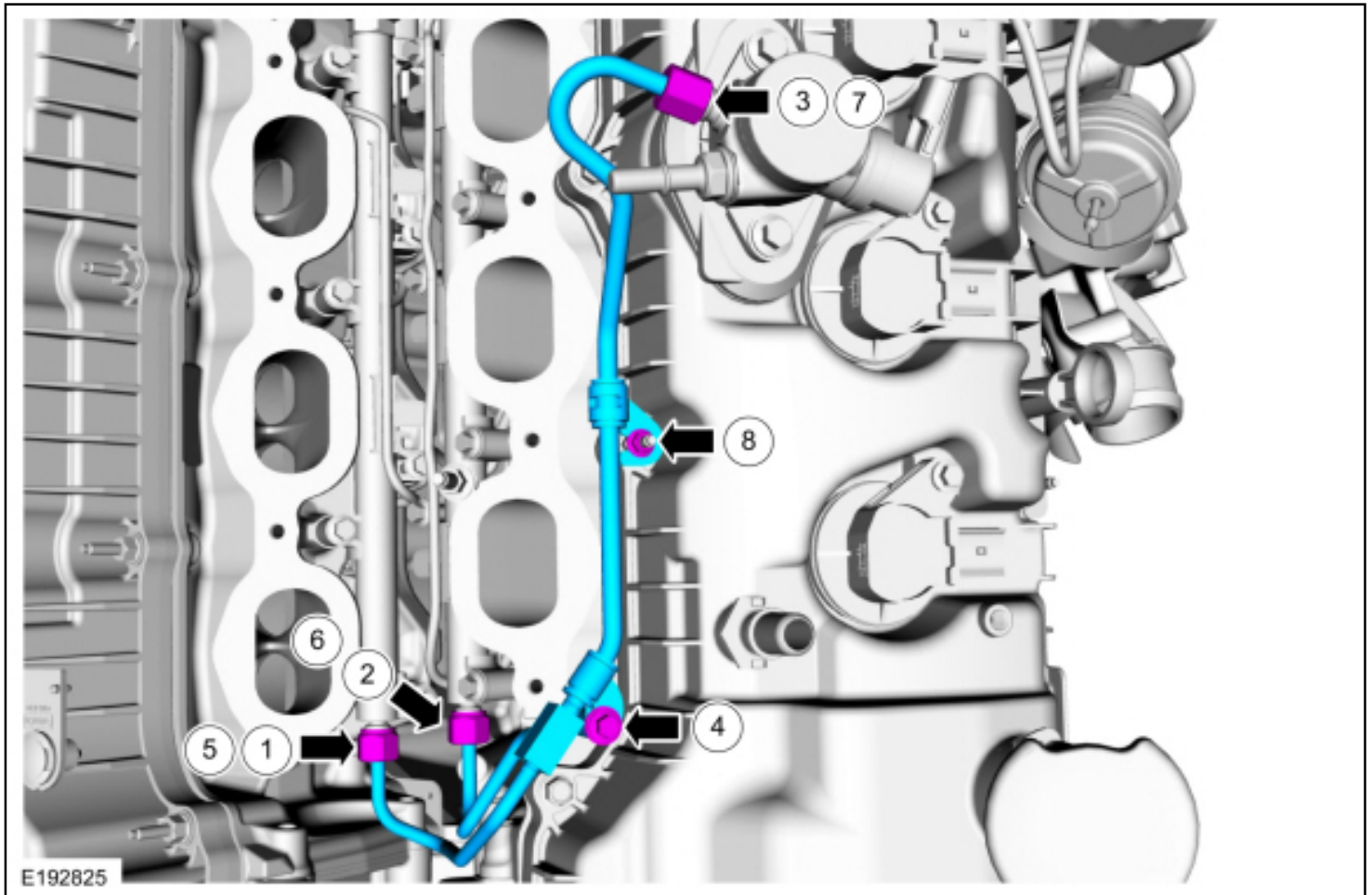
- Tighten the high-pressure fuel tube-to-RH fuel rail tube flare nut.
Torque:
Stage 1: 133 lb.in (15 Nm)
Stage 2: 45°
- Tighten the high-pressure fuel tube-to-LH fuel rail tube flare nut.
Torque:
Stage 1: 133 lb.in (15 Nm)
Stage 2: 45°
- Tighten the high-pressure fuel tube-to-high-pressure fuel pump flare nut.
Torque:
Stage 1: 133 lb.in (15 Nm)
Stage 2: 45°
- Tighten the high-pressure fuel tube bracket bolt.

Torque:

Stage 1: 89 lb.in (10 Nm)

Stage 2: 45°

5. Tighten the high-pressure fuel tube-to-RH fuel rail tube flare nut.
Torque: 24 lb.ft (32 Nm)
6. Tighten the high-pressure fuel tube-to-LH fuel rail tube flare nut.
Torque: 24 lb.ft (32 Nm)
7. Tighten the high-pressure fuel tube-to-high-pressure fuel pump flare nut.
Torque: 24 lb.ft (32 Nm)
8. Tighten the high-pressure fuel tube bracket nut.
Torque: 71 lb.in (8 Nm)



14. Install the new coolant inlet pipe O-ring seals. Lubricate the new O-ring seals with clean engine coolant.

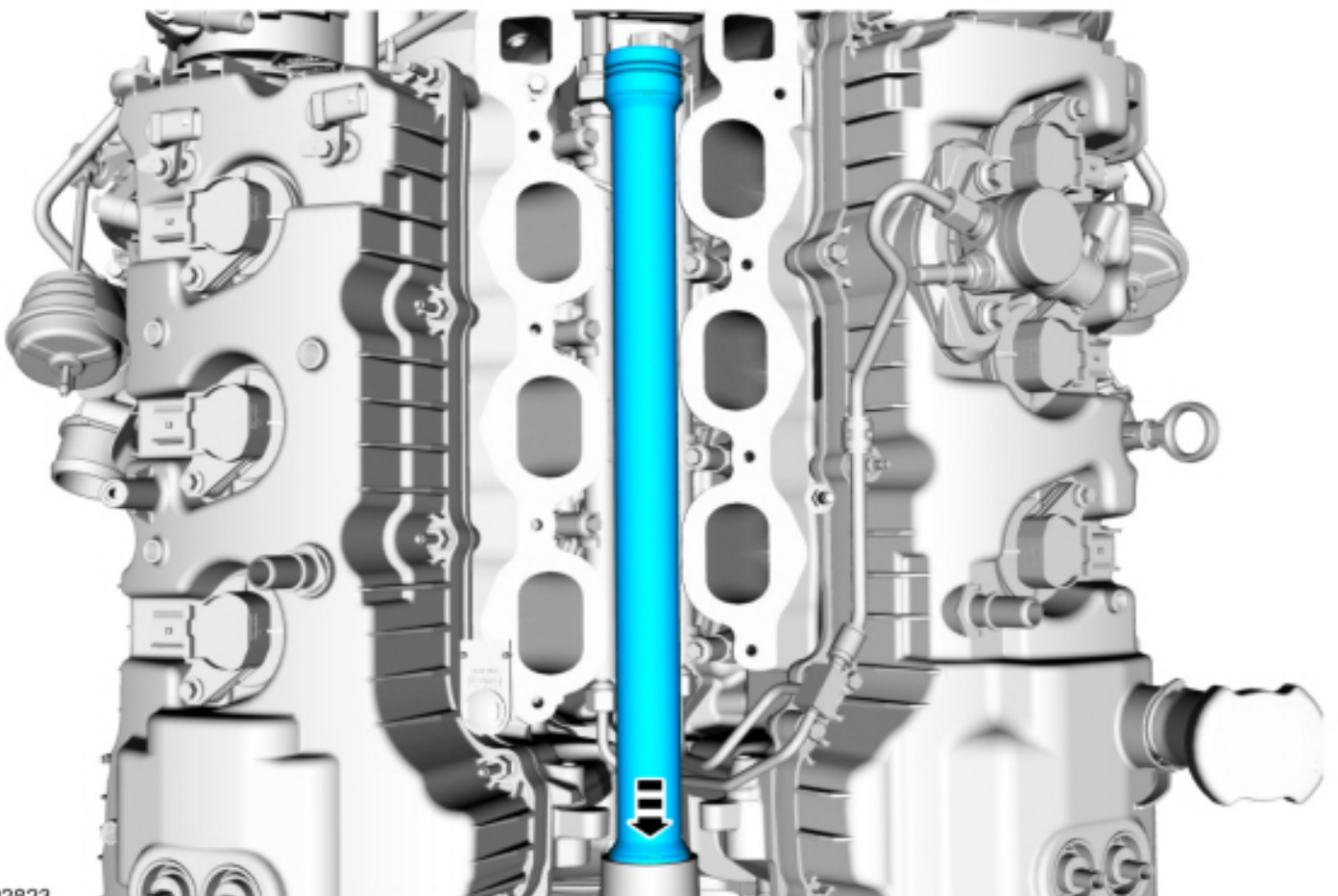
Material: Motorcraft® Orange Concentrated Antifreeze/Coolant / VC-3-B (WSS-M97B44-D)



E183037



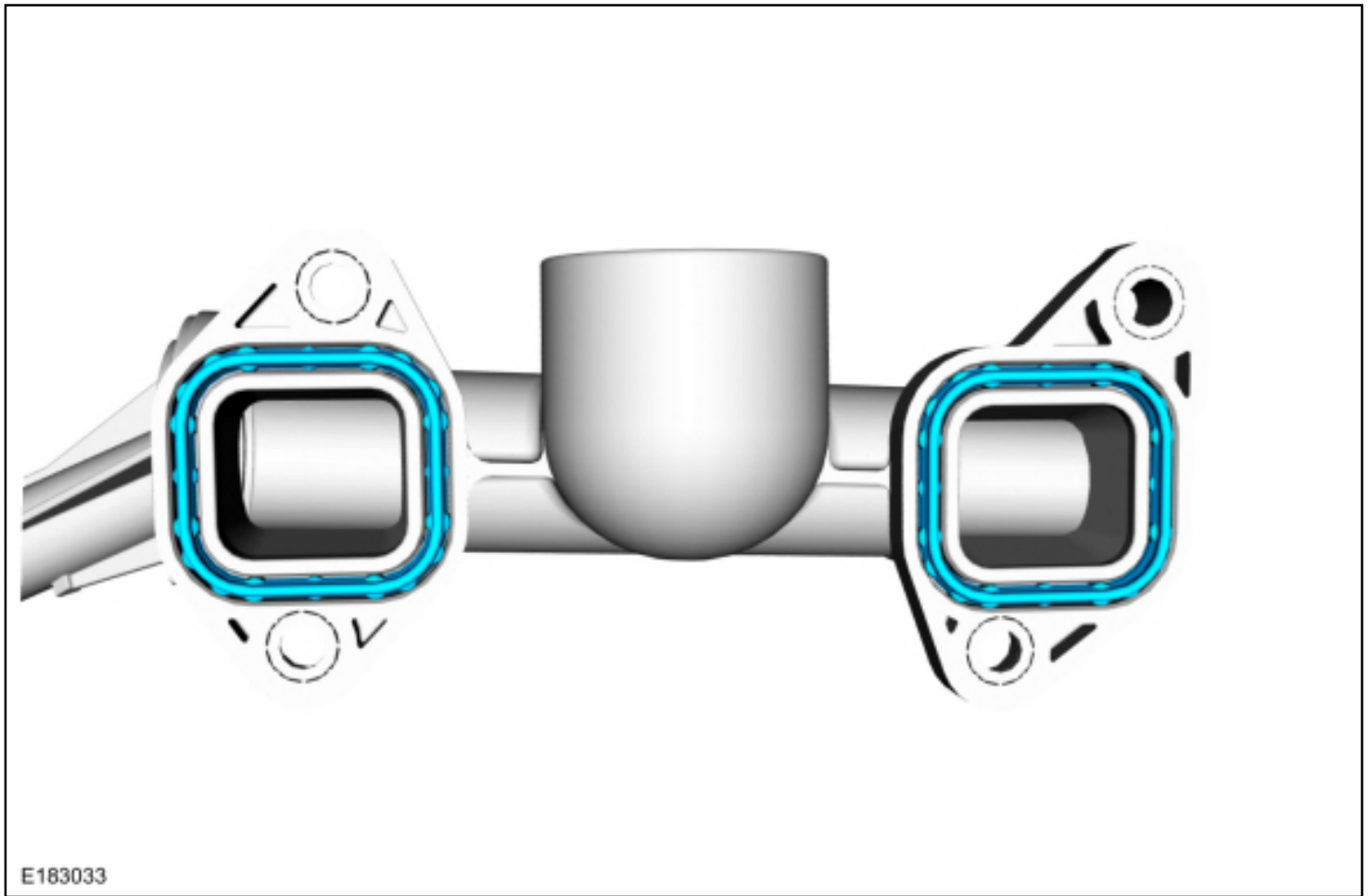
15. Install the coolant inlet pipe.



E192823

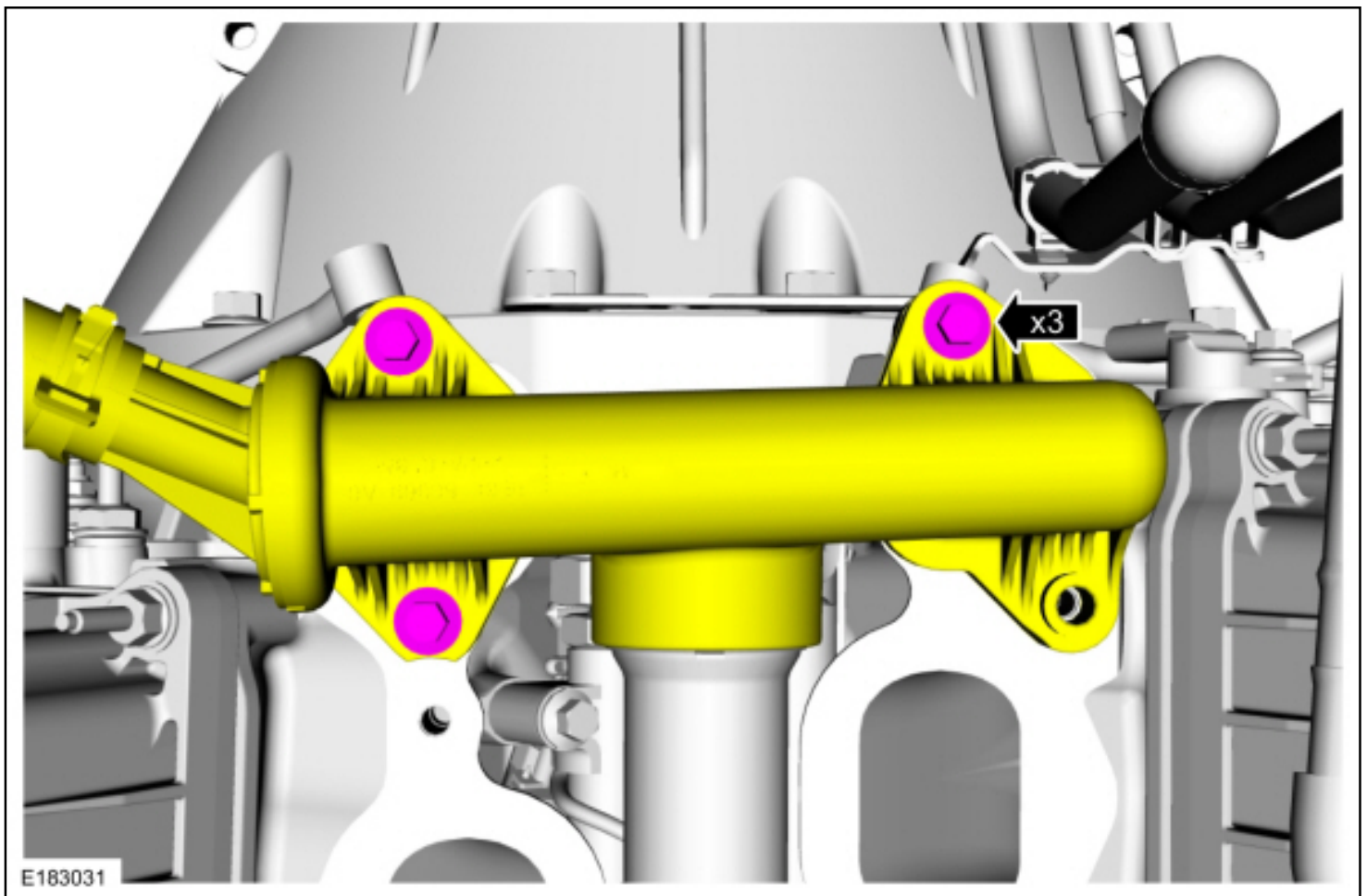


16. Install the new coolant crossover assembly gaskets.



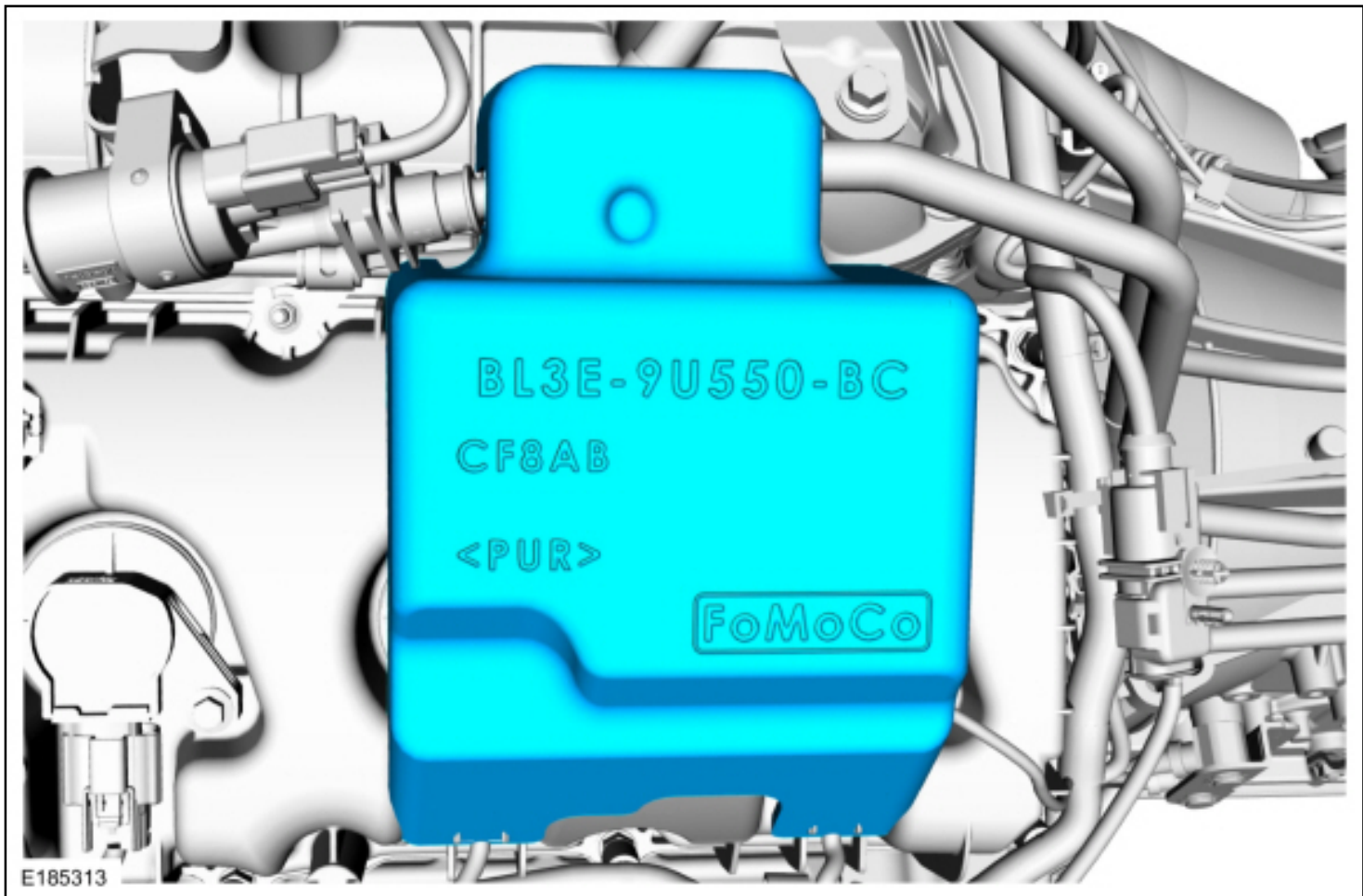
17. Install the coolant crossover assembly bolts and the coolant crossover assembly. Tighten the coolant crossover assembly bolts.

Torque: 89 lb.in (10 Nm)

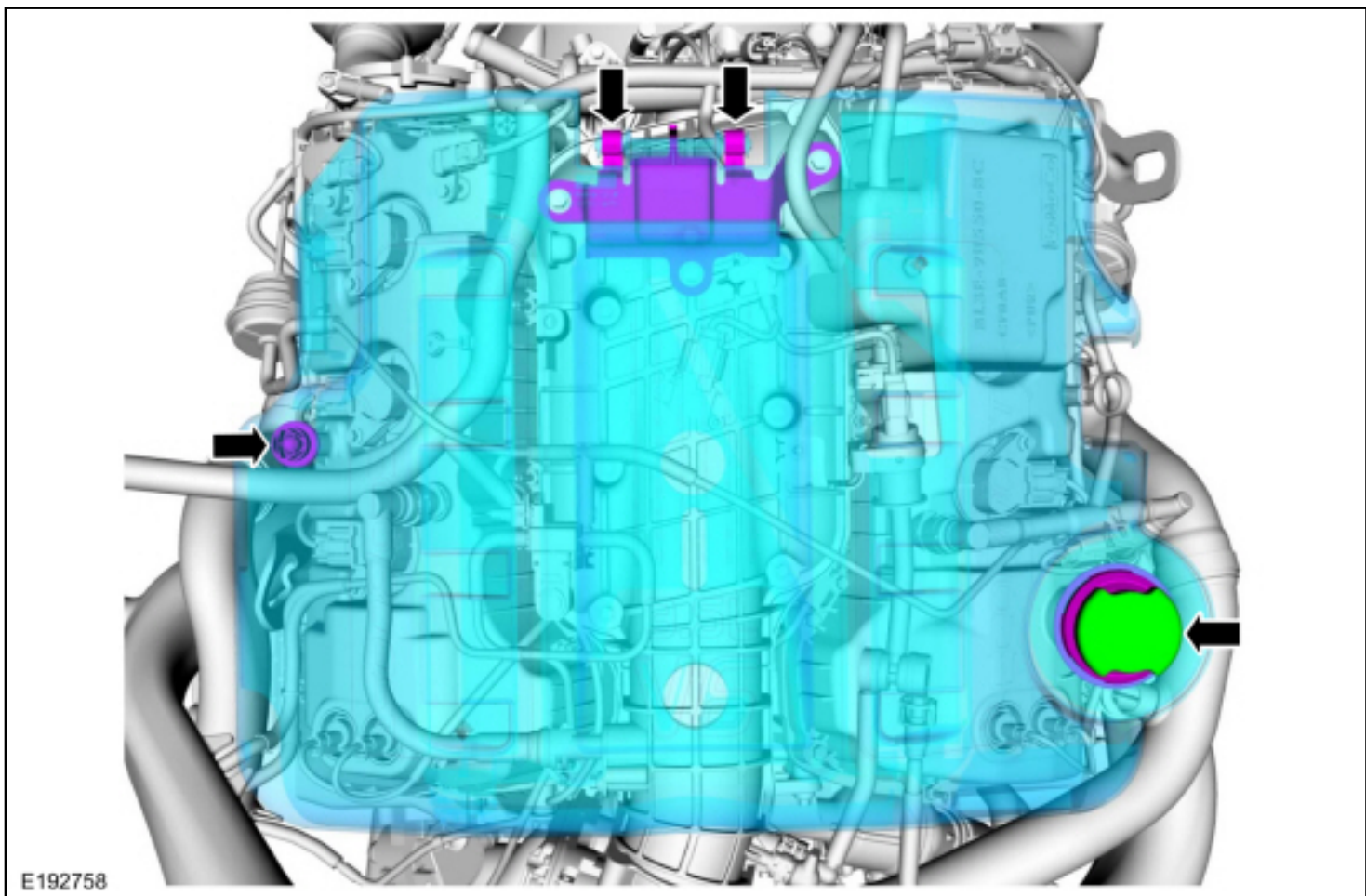


18. Install the intake manifold.
Refer to: [Intake Manifold](#) (303-01C Engine - 3.5L EcoBoost (272kW/370PS), Removal and Installation).
19. Connect the battery.
Refer to: [Battery Disconnect and Connect](#) (414-01 Battery, Mounting and Cables, General Procedures).
20. Pressurize the fuel system.
Refer to: [Fuel System Pressure Release](#) (310-00C Fuel System - General Information - 3.5L EcoBoost (272kW/370PS), General Procedures).
21. **NOTE:** *When removing or installing the high-pressure fuel pump noise insulator, spreading the openings will reduce the risk of damage.*

Install the high-pressure fuel pump noise insulator.



22. Remove the oil filler cap and install the engine appearance cover. Install the oil filler cap.



23. Fill the cooling system.

Refer to: [Cooling System Draining, Vacuum Filling and Bleeding](#) (303-03C Engine Cooling - 3.5L EcoBoost (272kW/370PS), General Procedures).

Copyright © 2019 Ford Motor Company
