

PUBLISHED: 24-JAN-2020
2020.0 DEFENDER (LE), 303-01C

ENGINE – INGENIUM I6 3.0L PETROL

CYLINDER HEAD (G2300592)

REMOVAL AND INSTALLATION

12.29.04	CYLINDER HEAD – ASSEMBLY – LEFT/ONE ONLY – RENEW	2000 CC, INGENIUM DIESEL	9.70	USED WITHINS	
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SPECIAL TOOL(S)



E115267

303-1449-01

Supercharger Installation Guide Pins - Threaded



E115267

303-1449-02

Supercharger Installation Guide Pins - Unthreaded



E115268

303-1450

Spark Plug Remover/Installer



E237508

JLR-303-1683

Exhaust Manifold Bolt Socket

PART(S)

STEP	PART NAME	QUANTITY
Installation Step 3	Cylinder head gasket	1
Installation Step 5	Cylinder head bolts	14
Installation Step 9	Cylinder head bolts	2
Installation Step 10	Cylinder head bolts	3
Installation Step 15	Oil supply pipe sealing washers	2
Installation Step 15	Turbocharger oil supply pipe banjo bolt	1

STEP	PART NAME	QUANTITY
Installation Step 17	Exhaust manifold gasket	1
Installation Step 18	Exhaust manifold bolts	2
Installation Step 20	Exhaust manifold bolts	11
Installation Step 22	Oil return pipe O-ring seal	2
Installation Step 23	Oil supply pipe sealing washers	2
Installation Step 23	Turbocharger oil supply pipe banjo bolt	1
Installation Step 27	Turbocharger coolant pipe O-ring seal	2
Installation Step 31	Cylinder head temperature sensor	1
Installation Step 32	Cylinder head temperature sensor	1
Installation Step 34	Intake manifold seals	6

REMOVAL

⚠ CAUTION:

Before disconnecting any components, make sure the area is clean and free from foreign material. When disconnected all components must be sealed.

△ NOTE:

- This procedure contains some variation in the illustrations depending on the vehicle specification, but the essential information is always correct.
- This procedure contains illustrations showing certain components removed to provide extra clarity.

1. Disconnect the startup battery ground cable.
Refer to: Specifications (414-00, Specifications).

2. Raise and support the vehicle on a suitable 2 post lift.
Refer to: Jacking and Lifting (100-02, Description and Operation).

3. Remove the charge air cooler inlet pipe.
Refer to: Charge Air Cooler Inlet Pipe (303-12C, Removal and Installation).

4. Remove the oil filter element.
Refer to: [Oil Filter Element](#) (303-01C Engine - INGENIUM I6 3.0L Petrol, Removal and Installation).

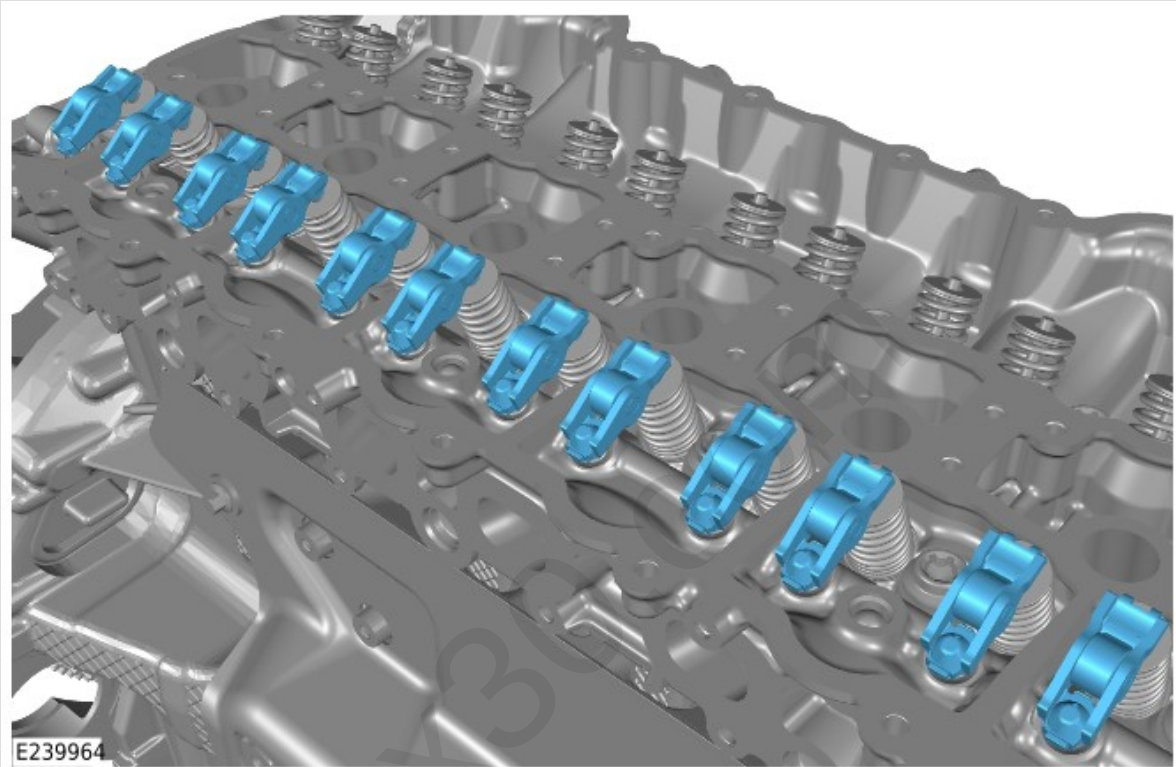
5. Remove the camshaft carrier.

Refer to: [Camshaft Carrier](#) (303-01C Engine - INGENIUM I6 3.0L Petrol, Removal and Installation).

6.

ⓘ CAUTION:

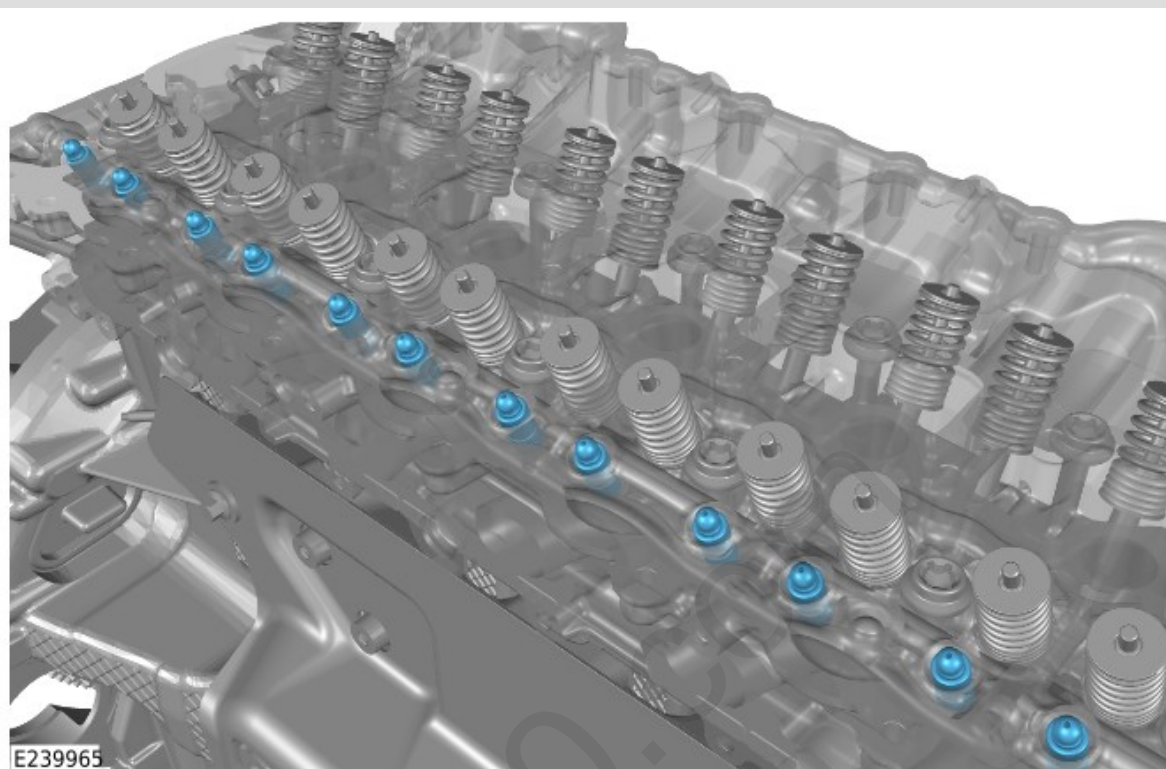
Mark each camshaft follower. Make sure each component is returned to its original installed position.



Remove the 12 camshaft follower roller fingers.

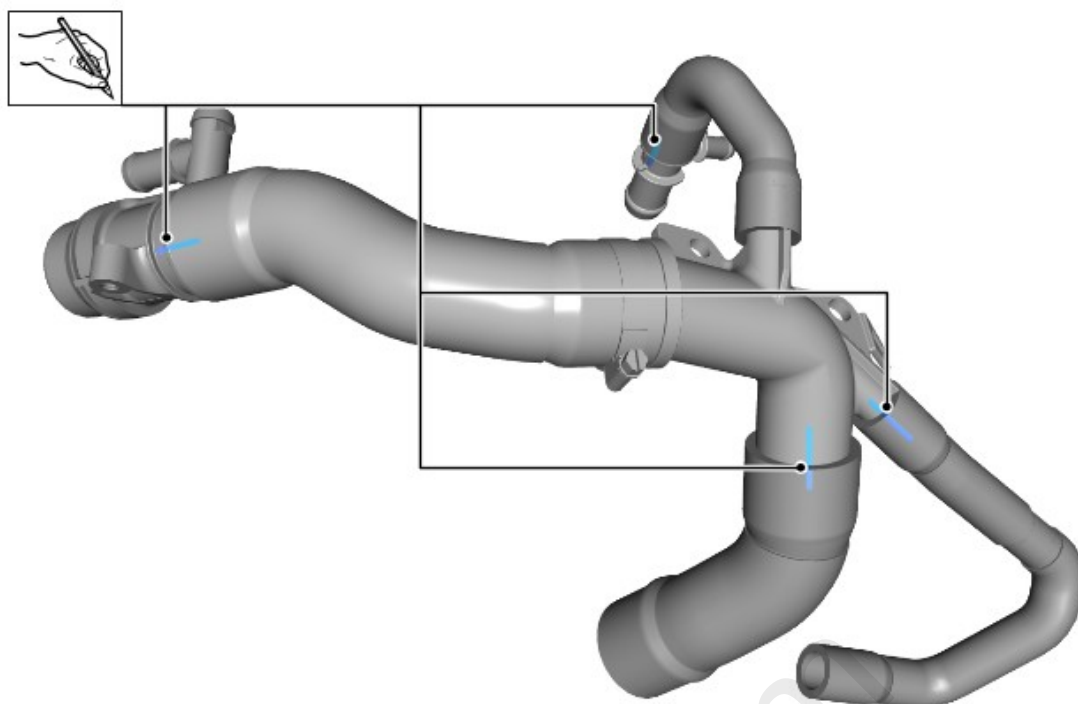
ⓘ CAUTION:

Mark each hydraulic lash adjuster. Make sure each component is returned to its original installed position.



Remove the 12 hydraulic lash adjusters.

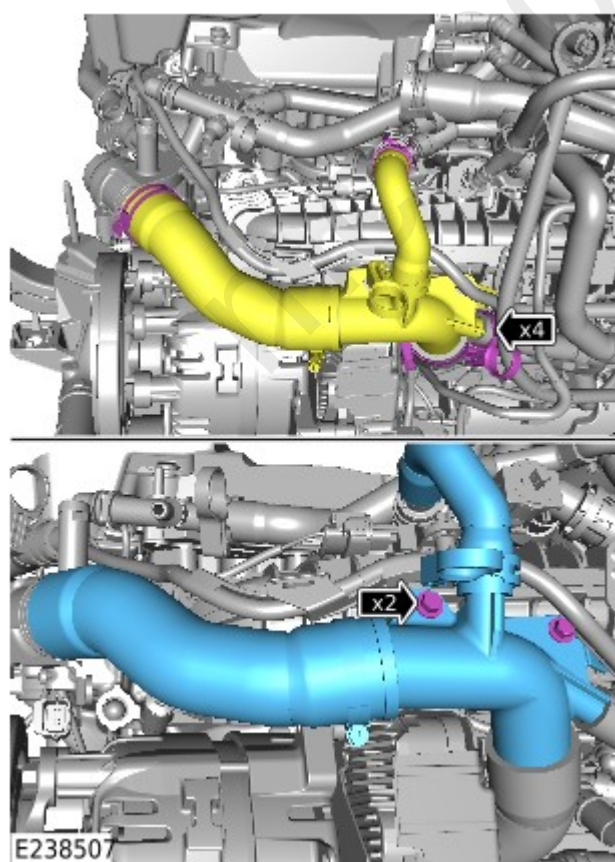
8.



E255951

Mark the installed position of the components prior to removal.

9.

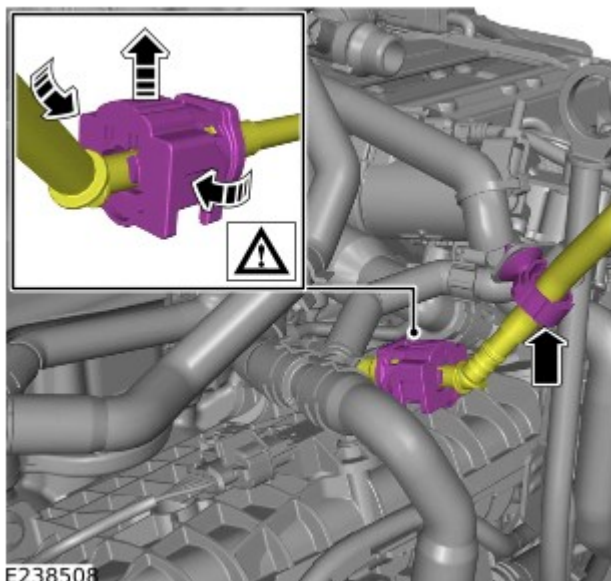


E238507

- Release the 4 clamps.

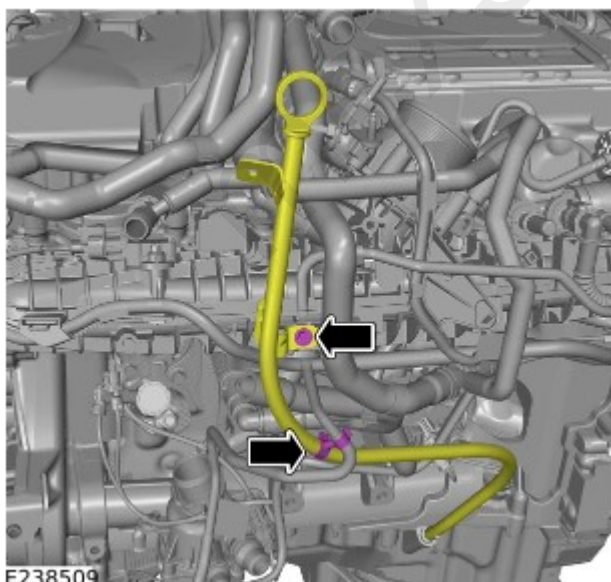
- Disconnect the 4 coolant hoses.
- Remove the 2 bolts.
- Remove the coolant pipe assembly.

10.



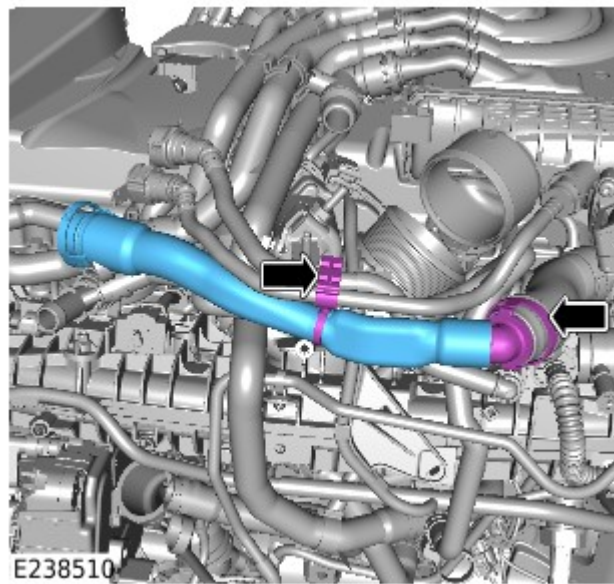
- Release the fuel line from the clip.
- Disconnect and reposition the fuel line away from the intake manifold.

11.



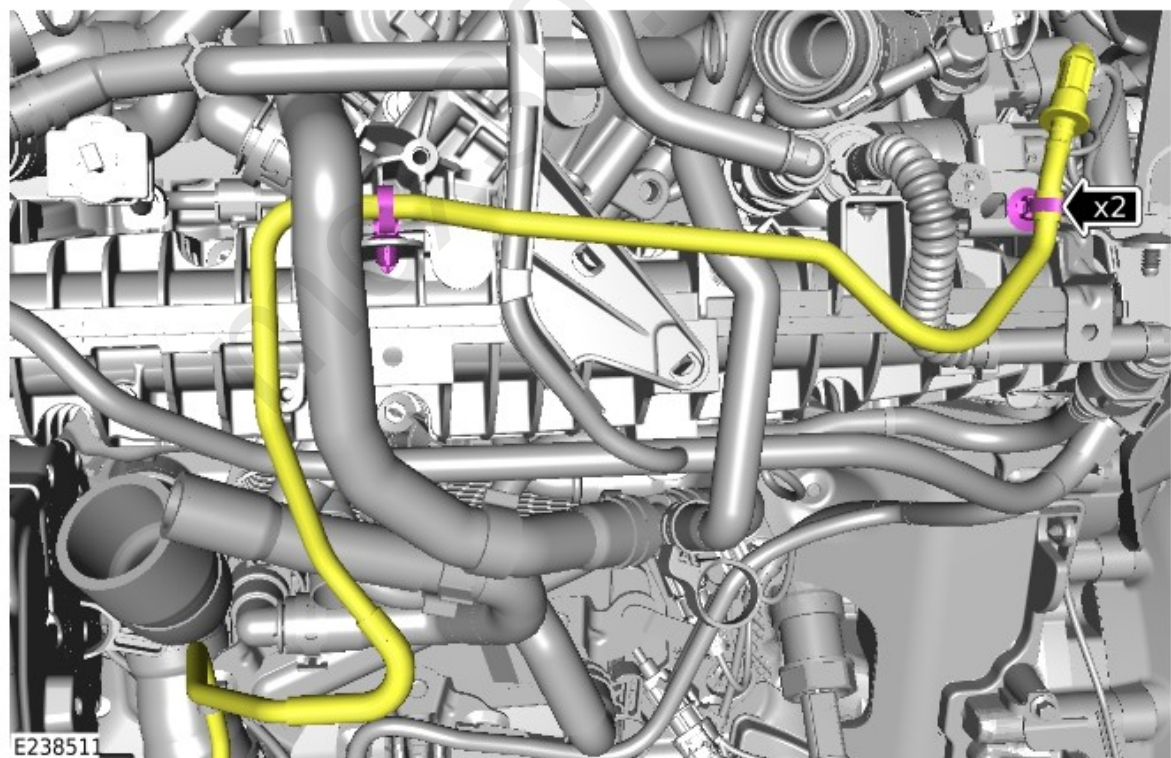
- Remove the bolt.
- Release the clip.

12.



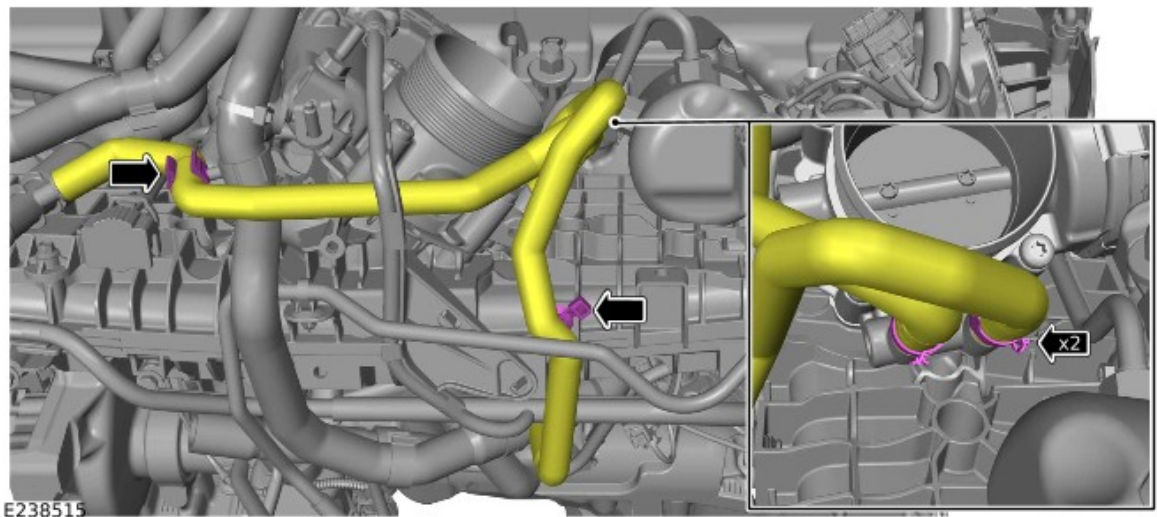
- Disconnect the charge air recirculation pipe.
- Release the clip.
- Remove the charge air recirculation pipe.

13.



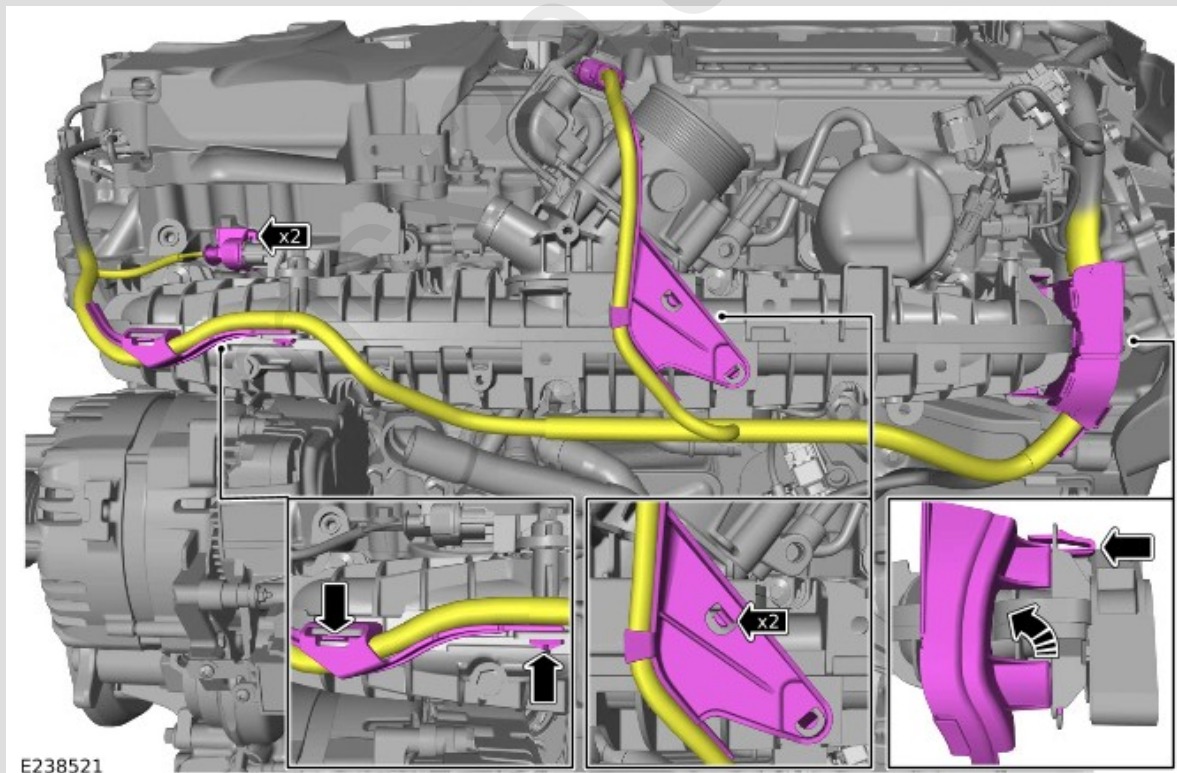
- Release the 2 clips.
- Reposition the vacuum pipe away from the intake manifold.

14.



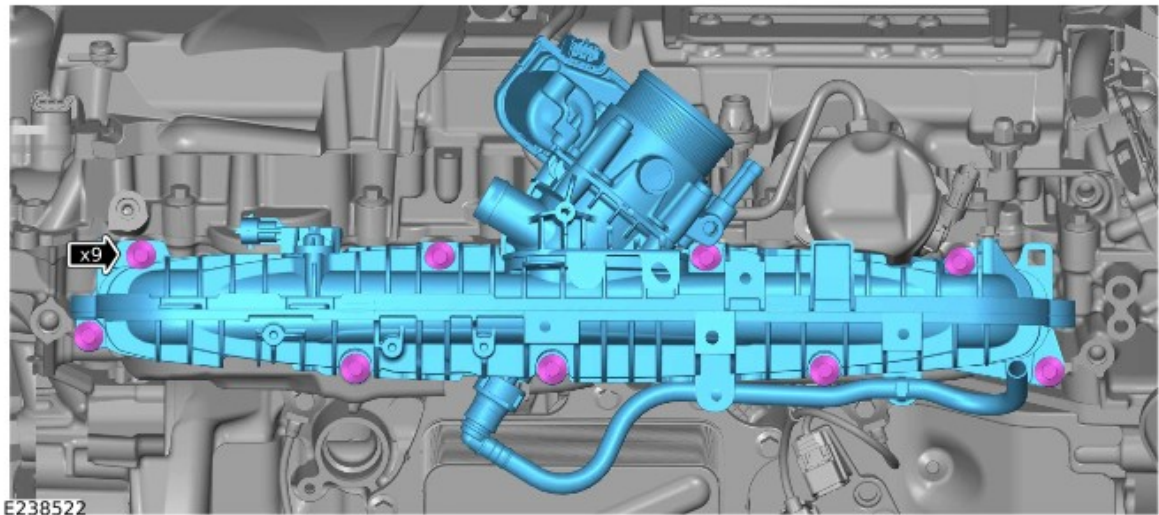
- Release the 2 clamps.
- Disconnect the 2 coolant hoses from the throttle body.
- Release the hose from the clip.
- Reposition the 2 hoses away from the intake manifold.

15.



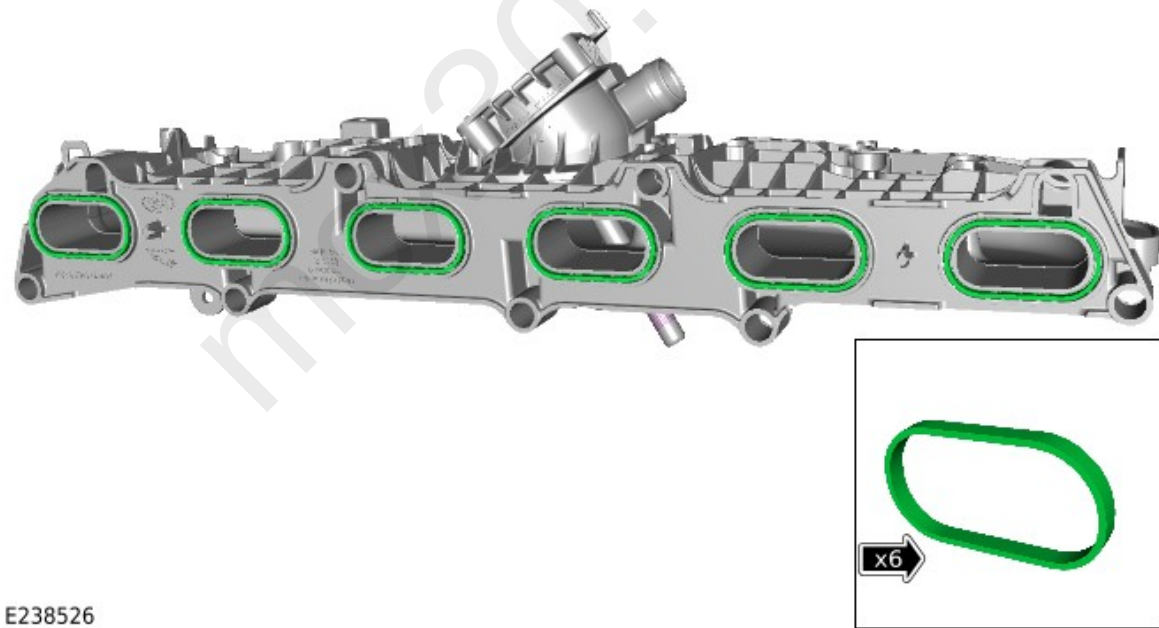
- Disconnect the 3 electrical connectors.
- Release the 3 clips.
- Reposition the wiring harness away from the intake manifold.

16.



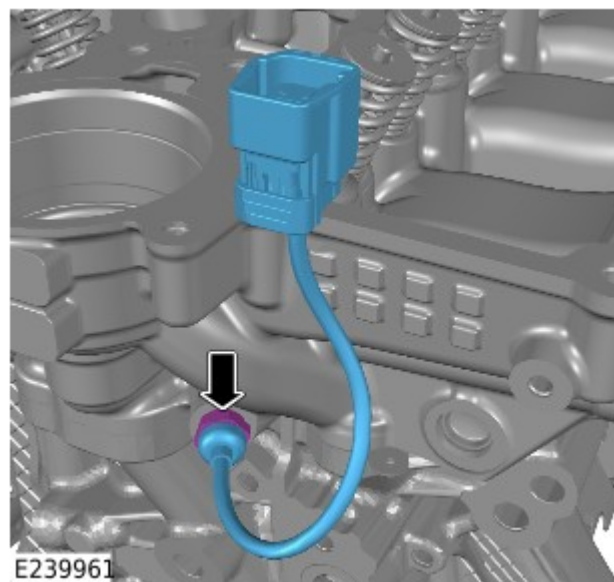
- Remove the 9 bolts.
- Remove the intake manifold.

17.



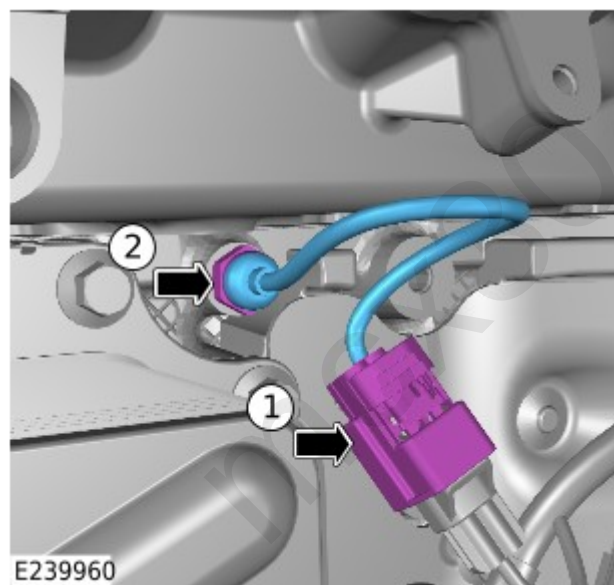
Remove and discard the 6 intake manifold seals.

18.



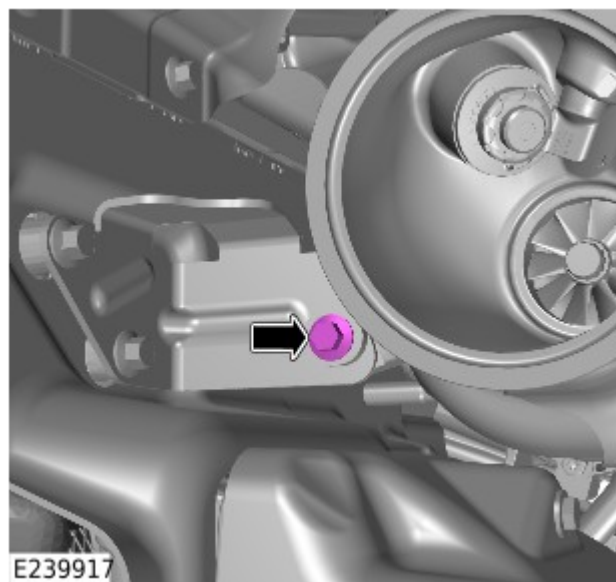
Remove and discard the cylinder head temperature sensor.

19.



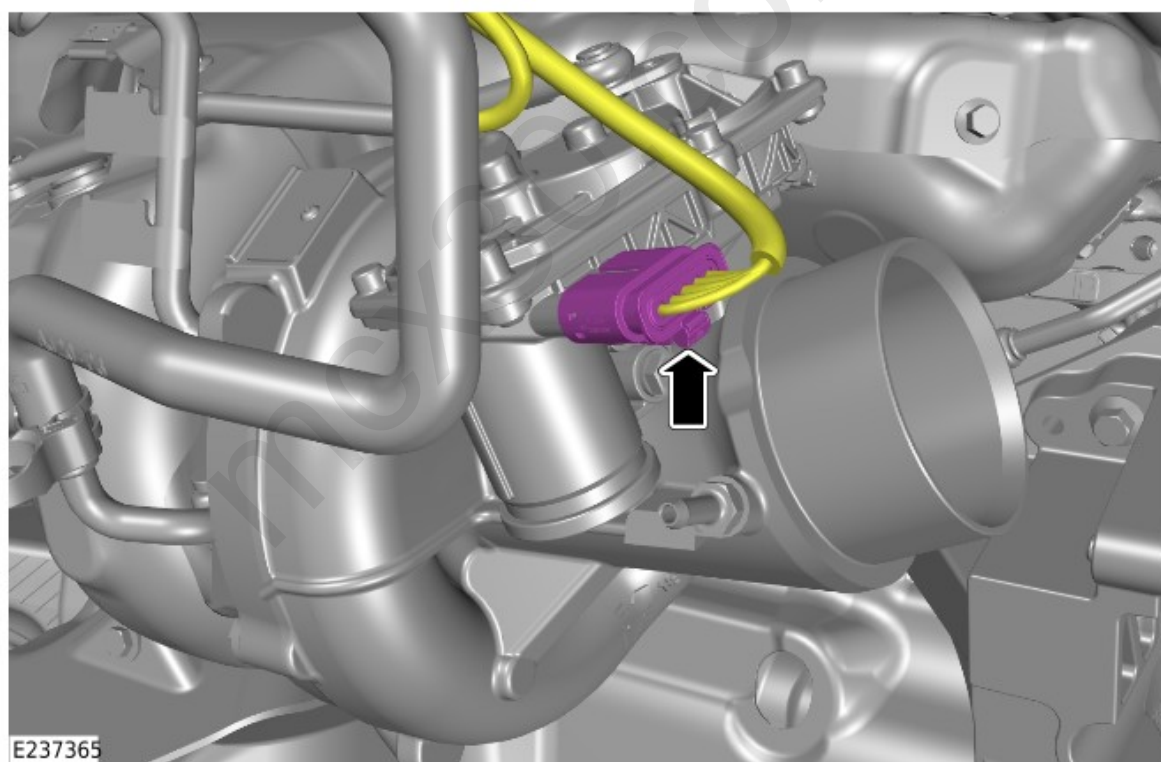
- Disconnect the electrical connector from the cylinder head temperature sensor.
- Remove and discard the cylinder block temperature sensor.

20.



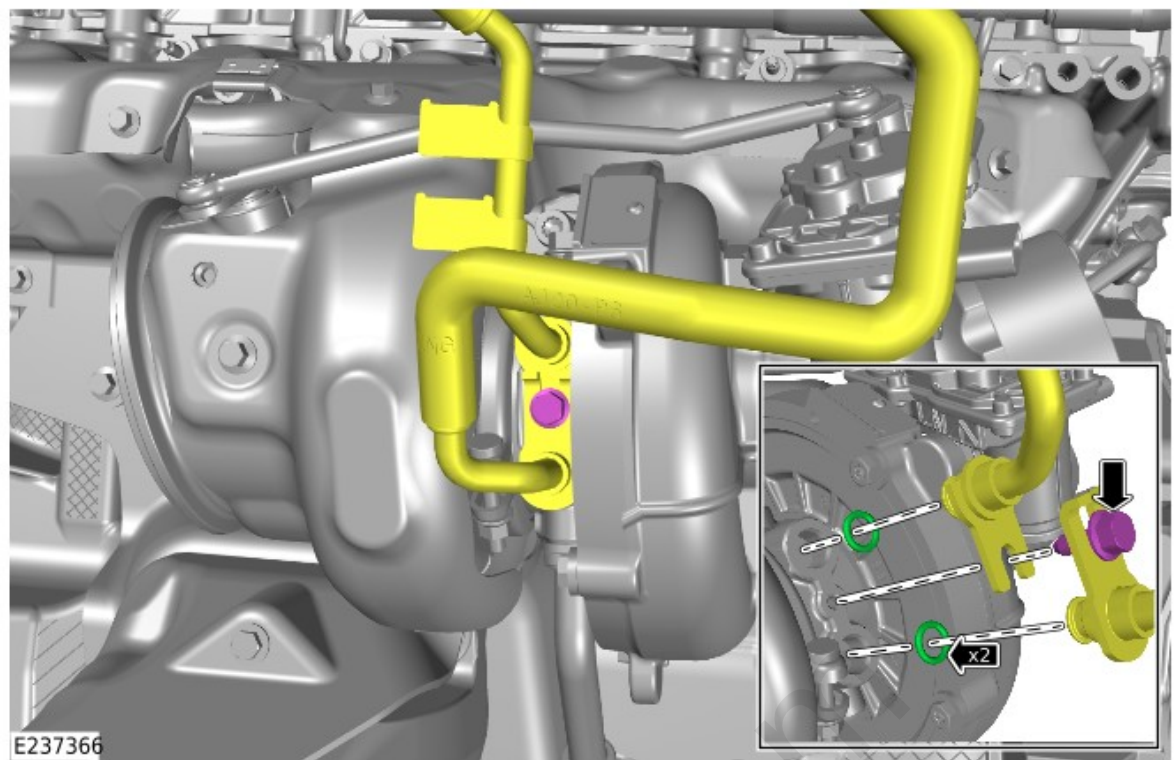
Remove the bolt from the turbocharger mounting bracket.

21.



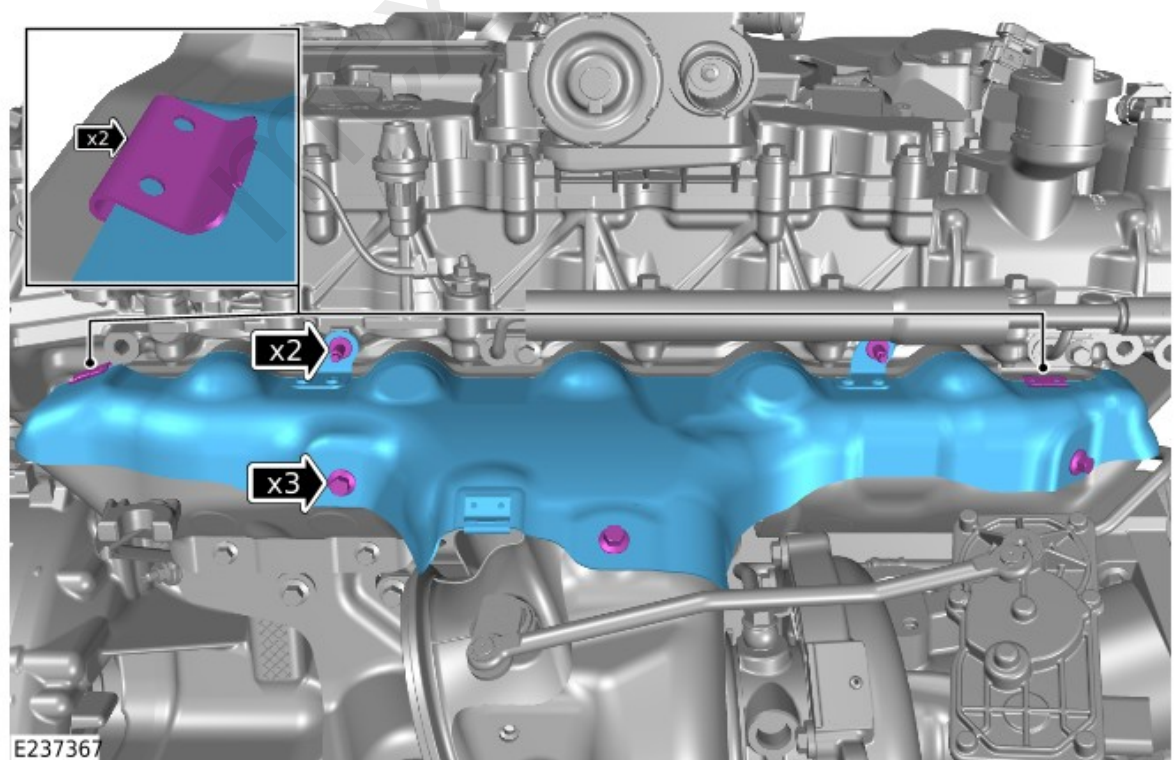
Disconnect the turbocharger actuator electrical connector.

22.



- Remove the bolt.
- Disconnect the 2 coolant pipes from the turbocharger.
- Inspect the 2 O-ring seals and replace if damaged.

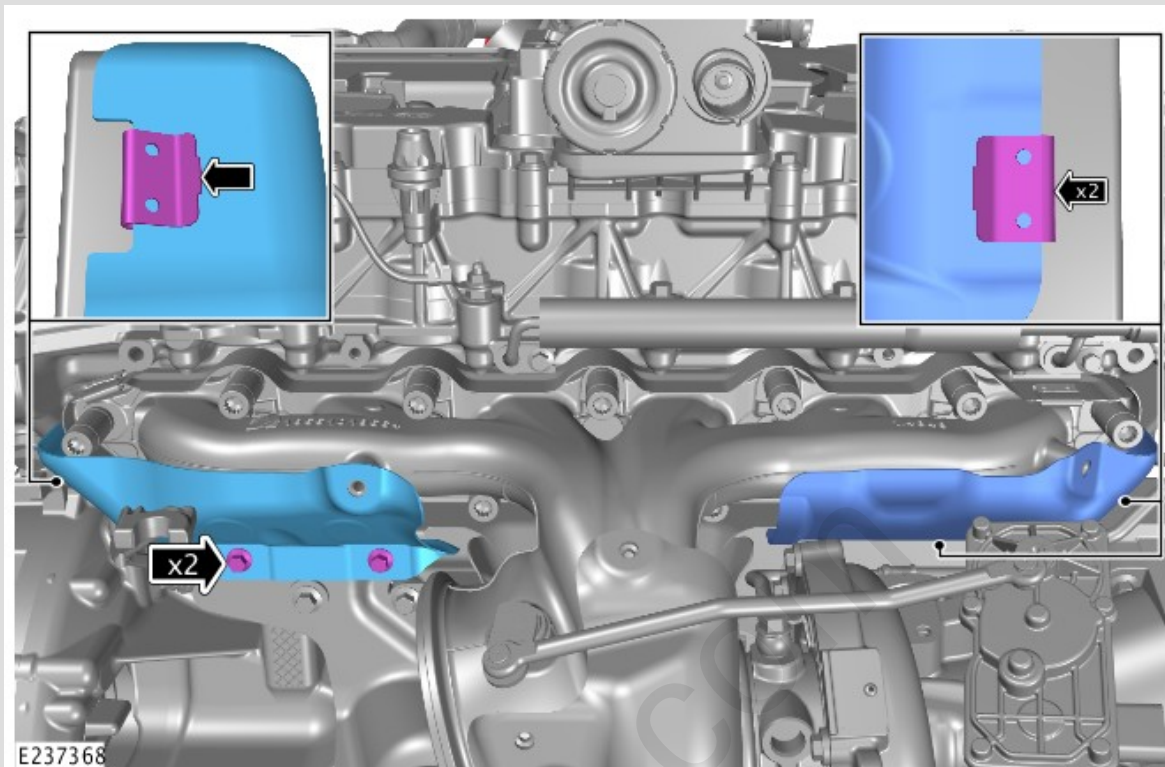
23.



- Remove the 5 bolts from the turbocharger upper heatshield.

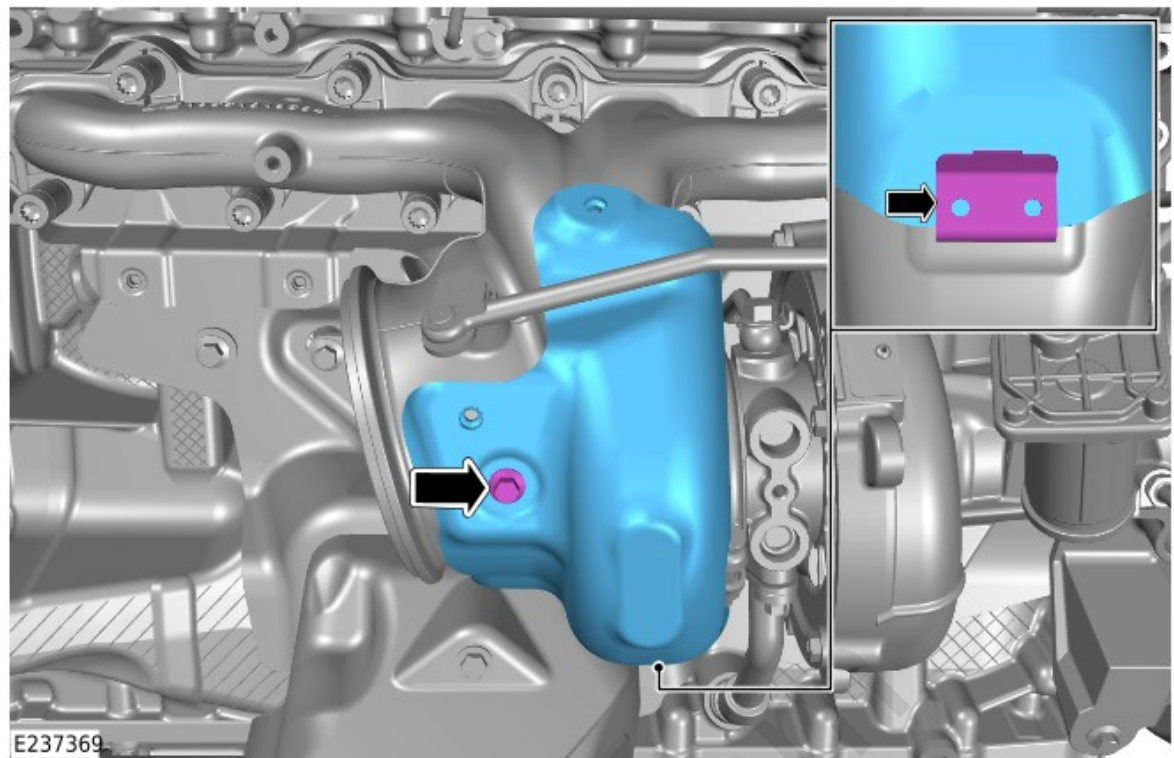
- Release the turbocharger upper heatshield from the 2 clips.
- Remove the turbocharger upper heatshield.

24.



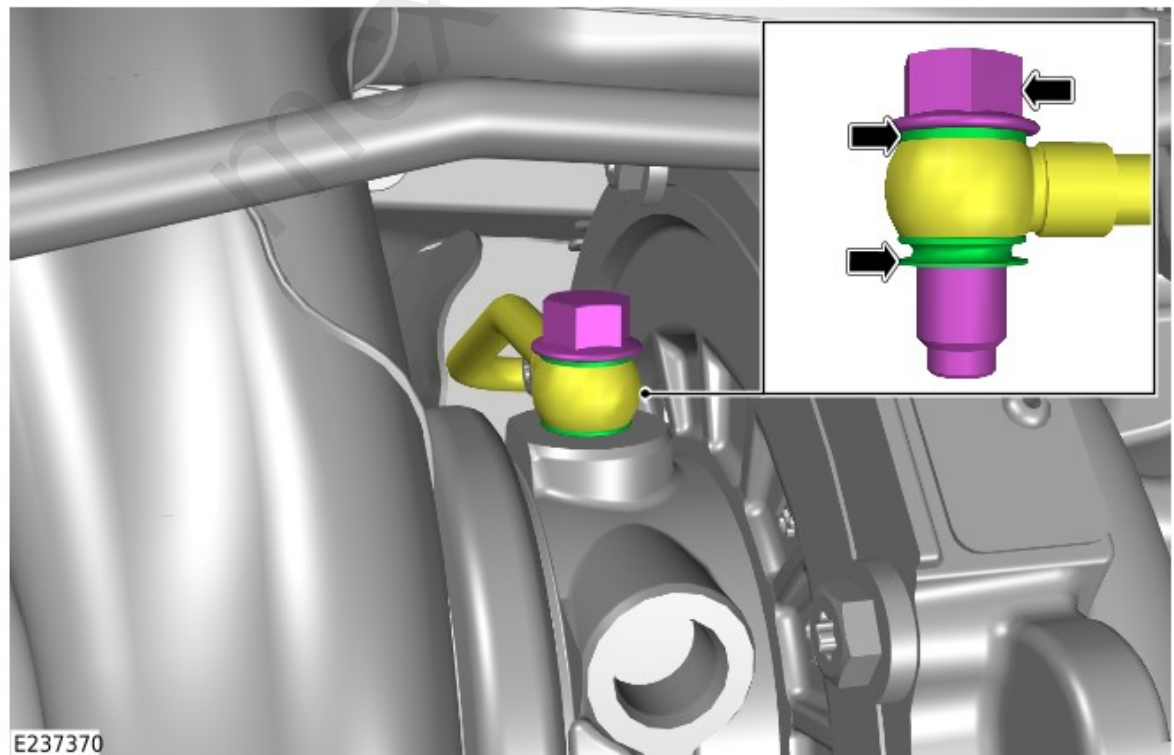
- Remove the 2 bolts from the turbocharger rear heatshield.
- Release the turbocharger rear heatshield from the clip.
- Remove the turbocharger rear heatshield.
- Release the turbocharger front heatshield from the 2 clips.
- Remove the turbocharger front heatshield.

25.



- Remove the bolt from the turbocharger inner heatshield.
- Release the turbocharger inner heatshield from the clip.
- Remove the turbocharger inner heatshield.

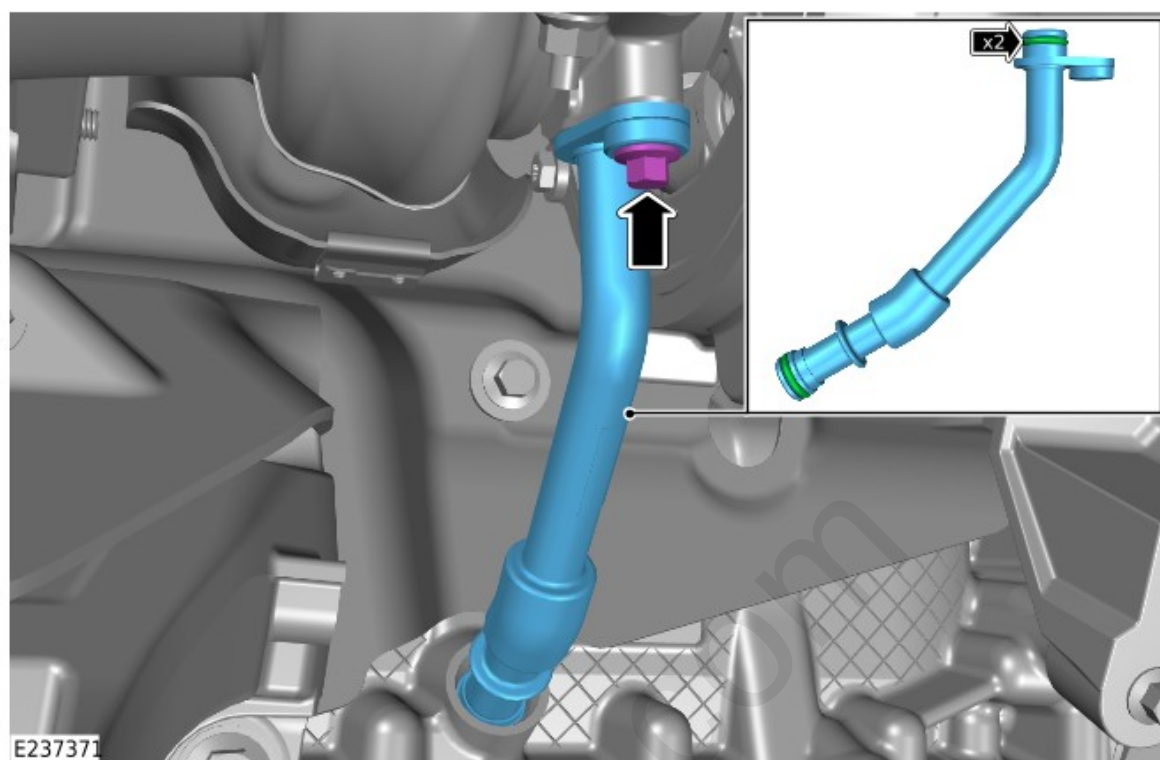
26.



- Remove and discard the bolt from the oil supply pipe.

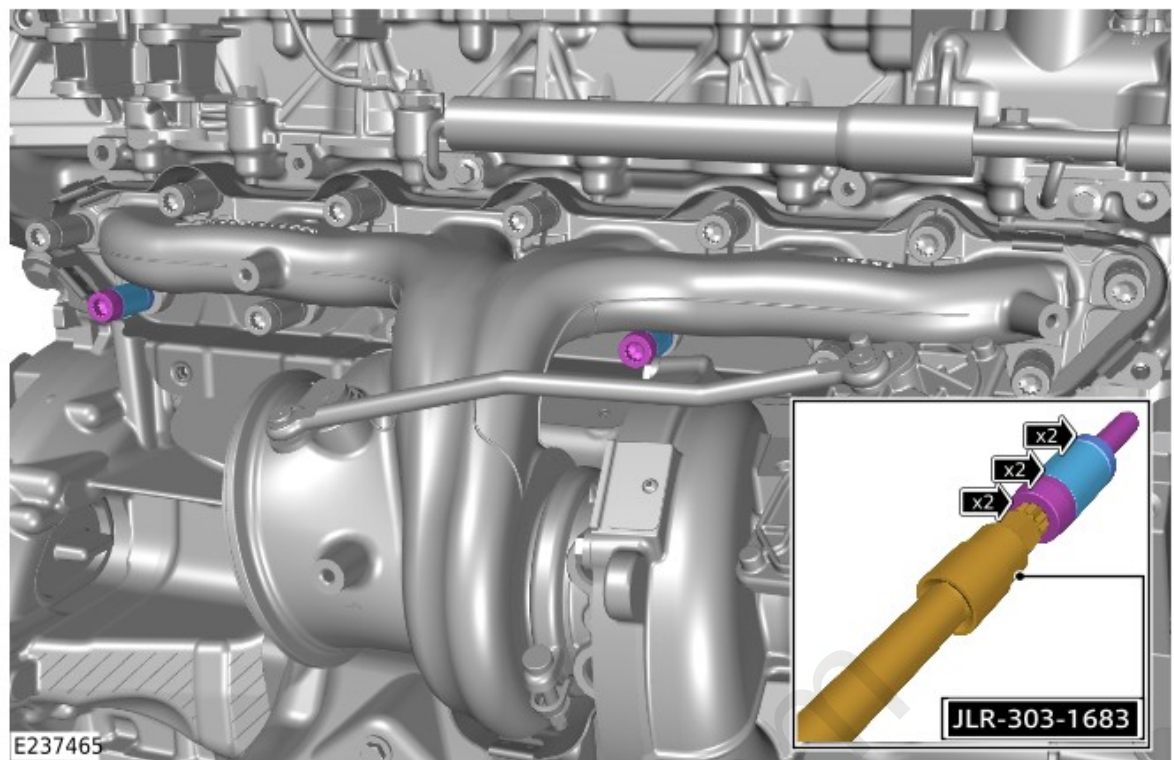
- Remove and discard the 2 sealing washers.
- Reposition the oil supply pipe away from the turbocharger.

27.



- Remove the bolt.
- Remove the oil return pipe.
- Remove and discard the 2 O-ring seals.

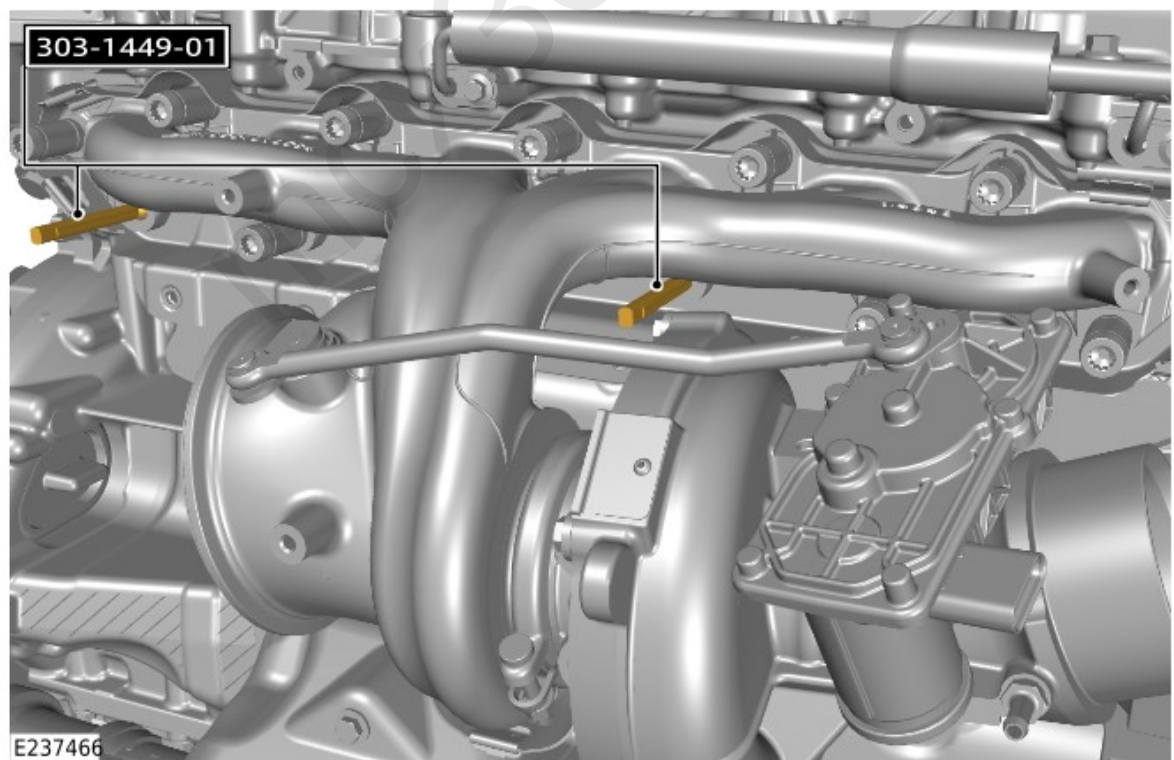
28.



Use the special tool to remove the 2 bolts, spacers and washers.

Special Tool(s): [JLR-303-1683](#)

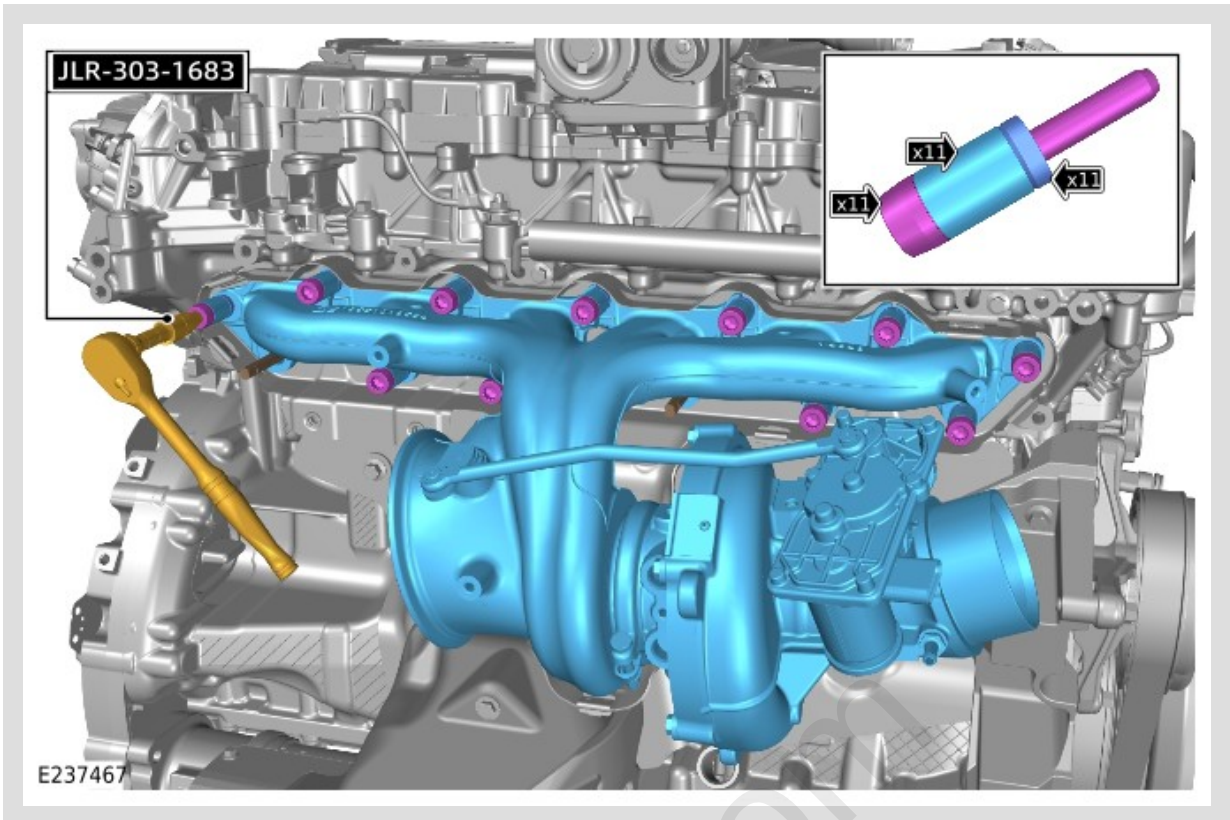
29.



Install the special tools.

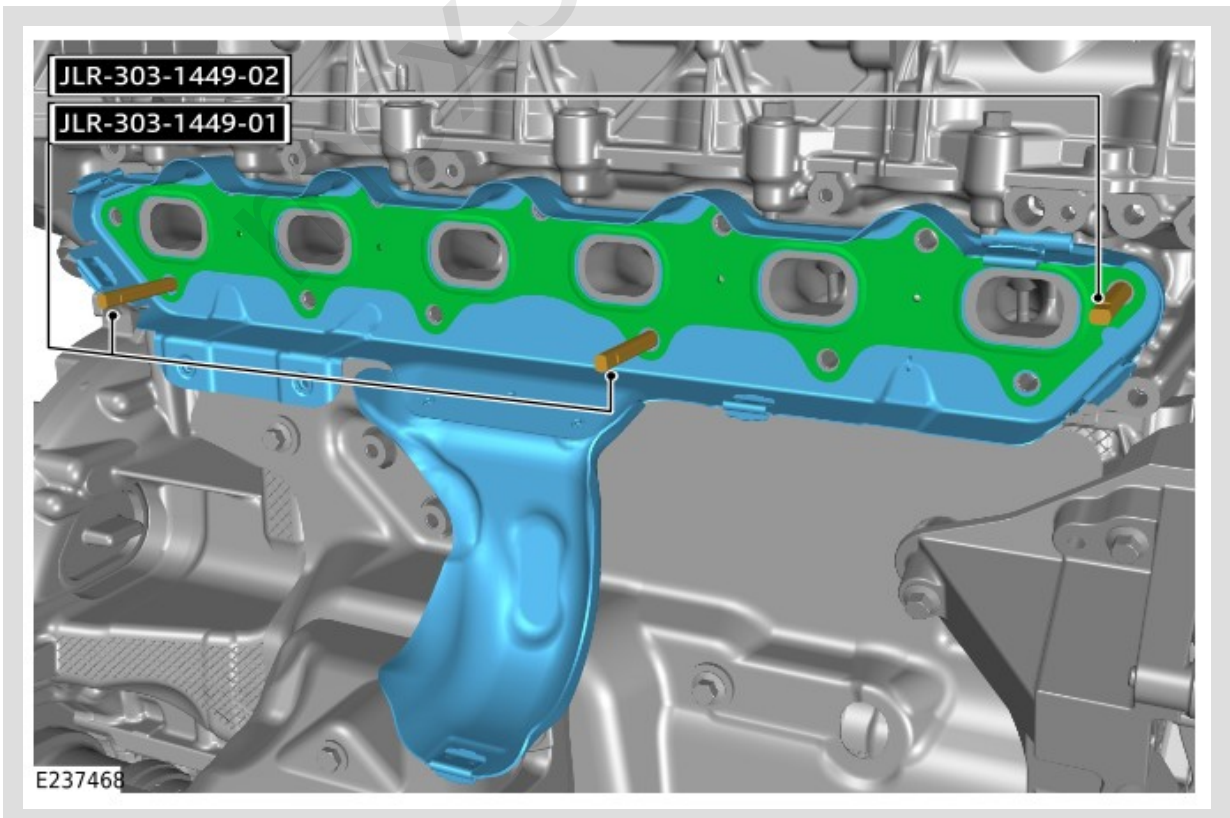
Special Tool(s): [303-1449-01](#)

30.



- Use the special tool to remove the 11 bolts, spacers and washers.
Special Tool(s): JLR-303-1683
- Remove the turbocharger.

31.

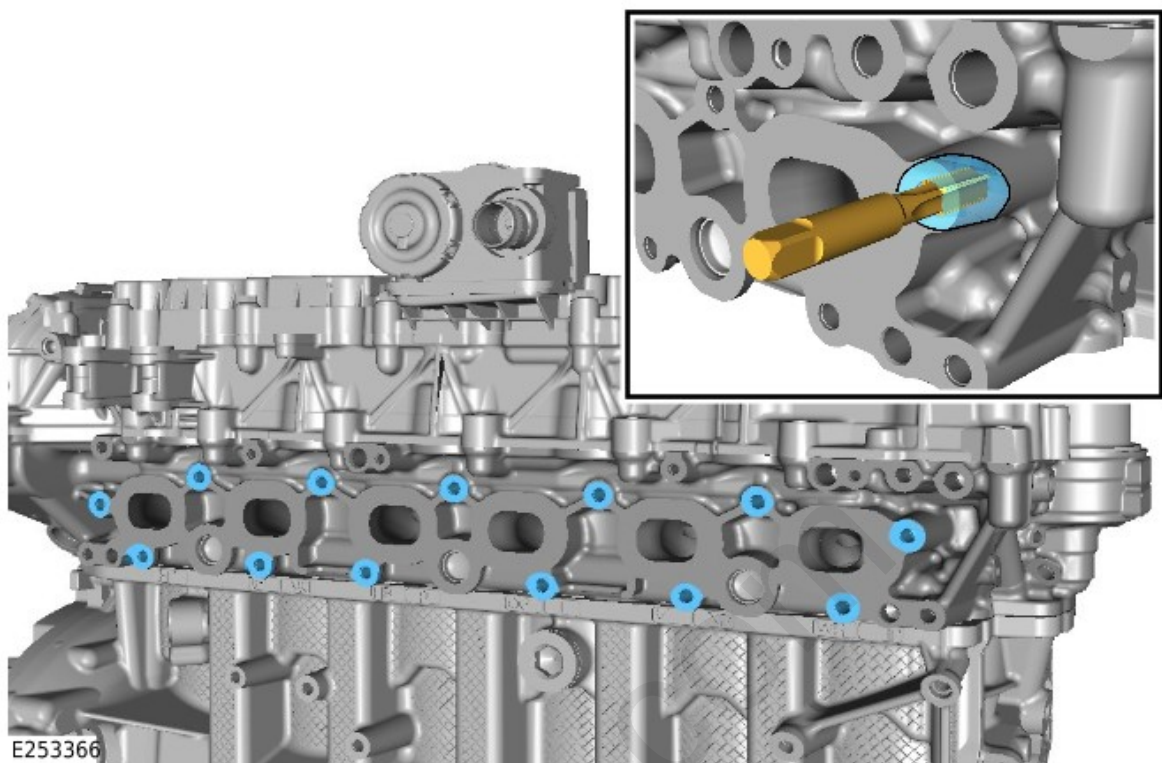


- Remove the special tools.

Special Tool(s): [303-1449-01](#)

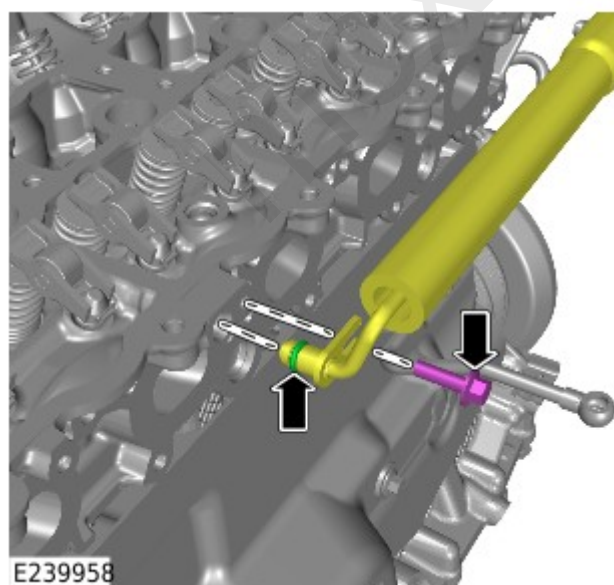
- Remove and discard the exhaust manifold gasket.

32.



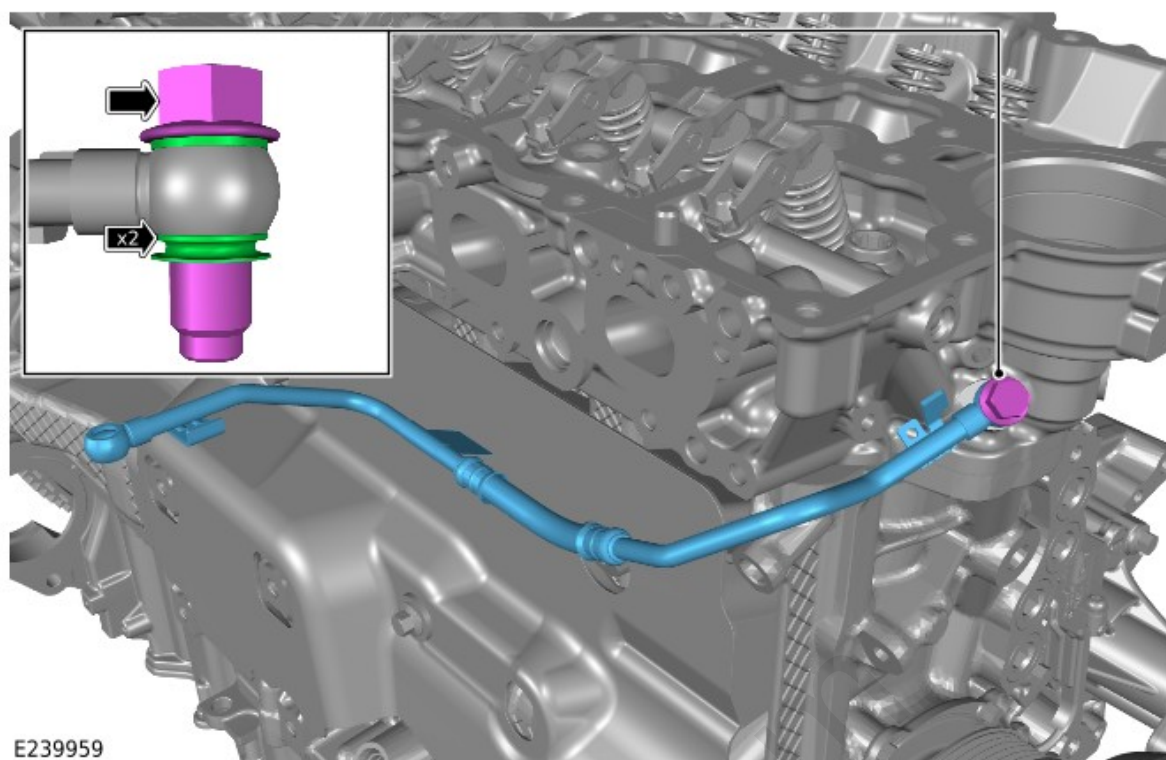
Use an M8 x 1.5 bottoming tap to clean the threads.

33.



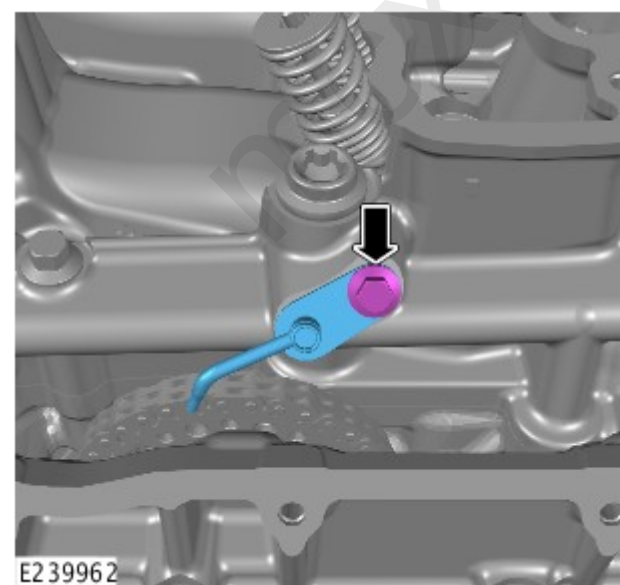
- Remove the bolt.
- Disconnect the coolant pipe from the cylinder head.
- Inspect the 2 O-ring seals and replace if damaged.

34.



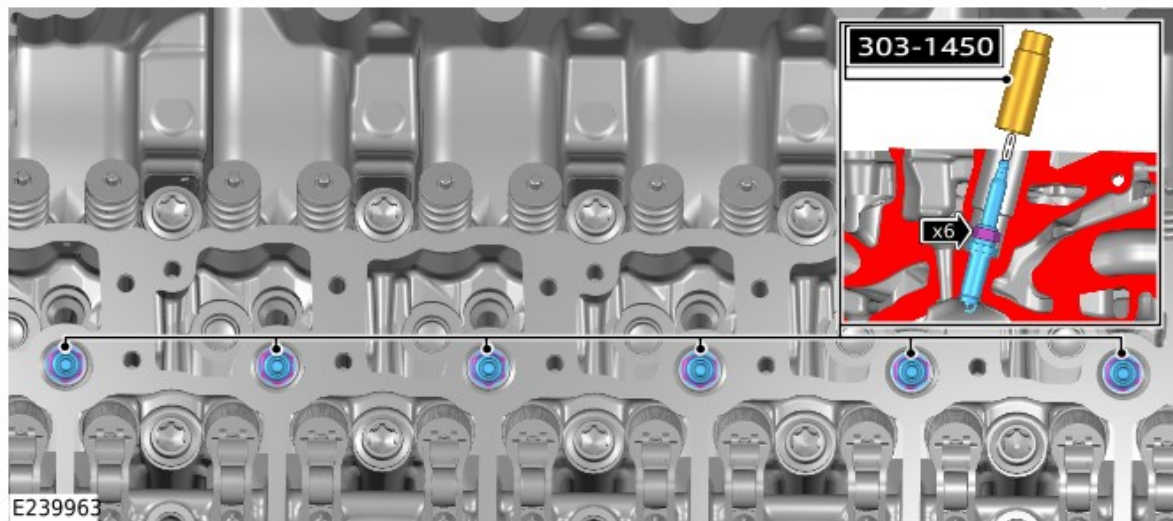
- Remove and discard the bolt.
- Remove and discard the 2 sealing washers.
- Remove the oil supply pipe.

35.



- Remove the bolt.
- Remove the timing chain oil supply pipe.

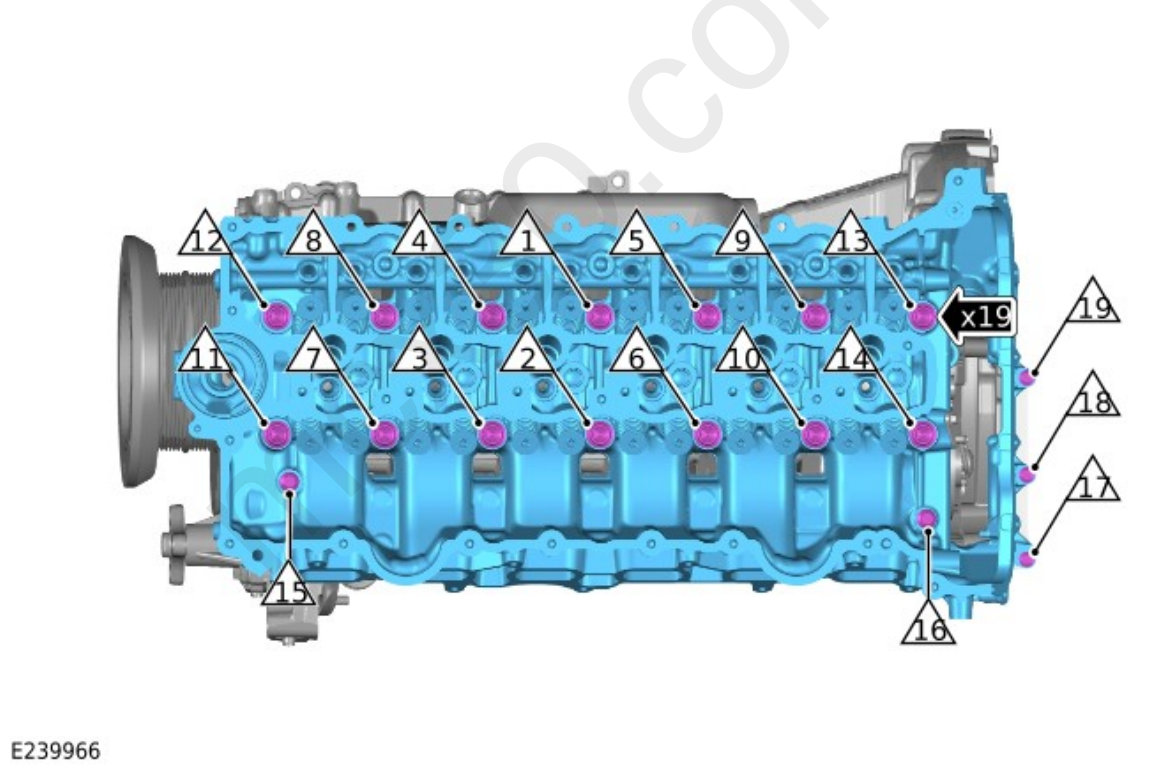
36.



Use the special tool to remove the 6 spark plugs.

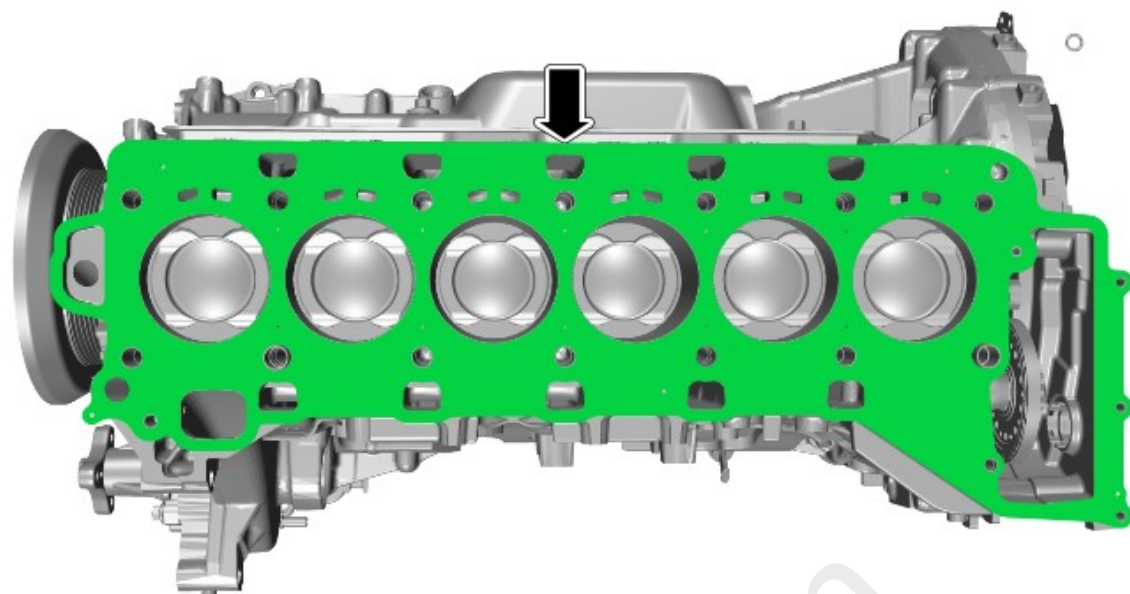
Special Tool(s): [303-1450](#)

37.



- Remove the 19 bolts in the illustrated sequence.
- Discard the 19 bolts.
- With the aid of another technician, remove the cylinder head.

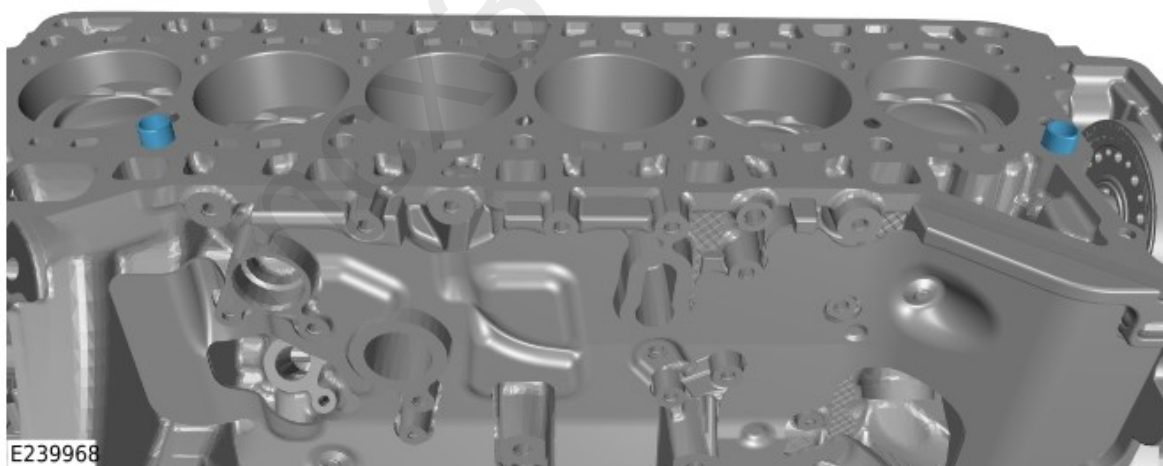
38.



E239967

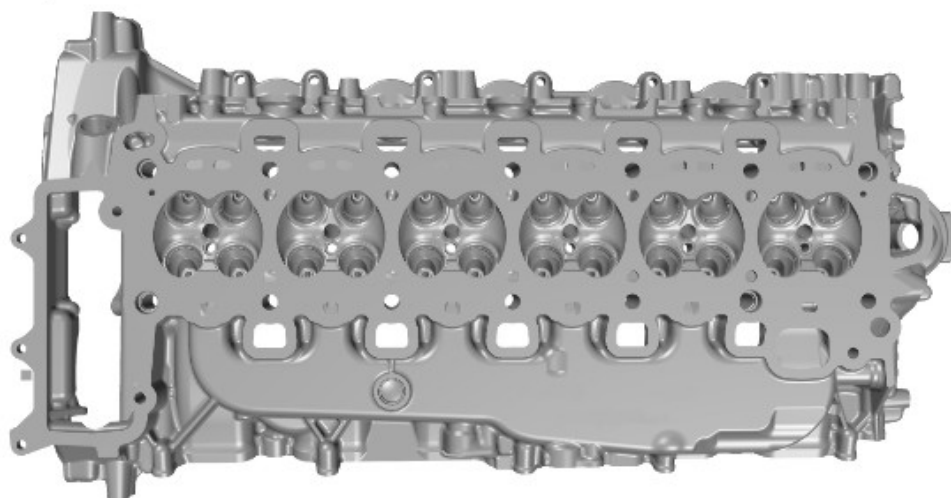
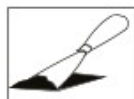
Remove and discard the cylinder head gasket.

39.



E239968

Remove the 2 dowels.



E239969

Use a suitable plastic tool to clean the cylinder head mating surface.

INSTALLATION

1. Check cylinder head face for distortion, across the center and from corner to corner.
Refer to: Cylinder Head Distortion (303-00 Engine System - General Information, General Procedures).

2.  **CAUTION:**

Make sure that the dowels and dowel holes are clean and free from debris and foreign material.

Install the 2 dowels.

3.  **CAUTIONS:**

- Make sure that the mating surfaces are clean and free from debris and foreign material.
- The cylinder head gasket must be installed over the cylinder head to the 2 dowels

Install a new cylinder head gasket.

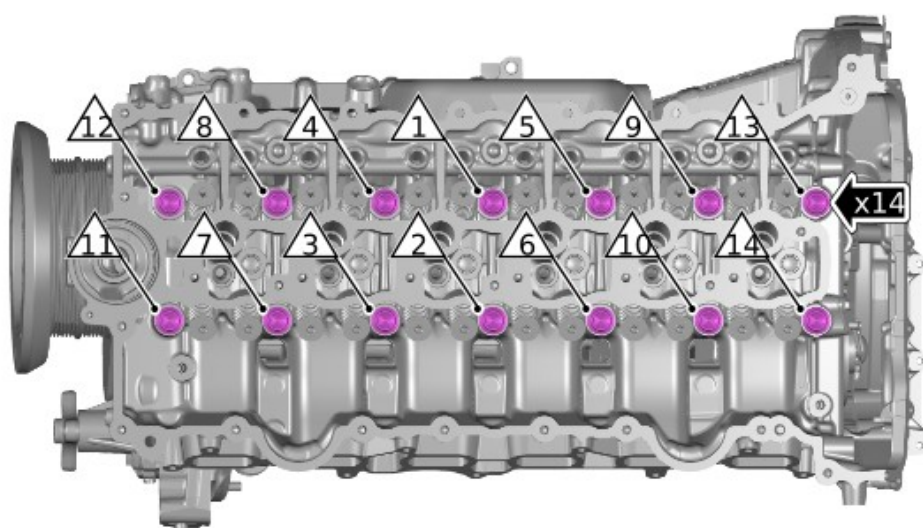
Renew Part: [Cylinder head gasket](#) Quantity: 1.

4.  **CAUTIONS:**

- Make sure that the mating surfaces are clean and free from debris and foreign material.
- Make sure the cylinder head is correctly located on the 2 dowels.

Install the cylinder head.

5.



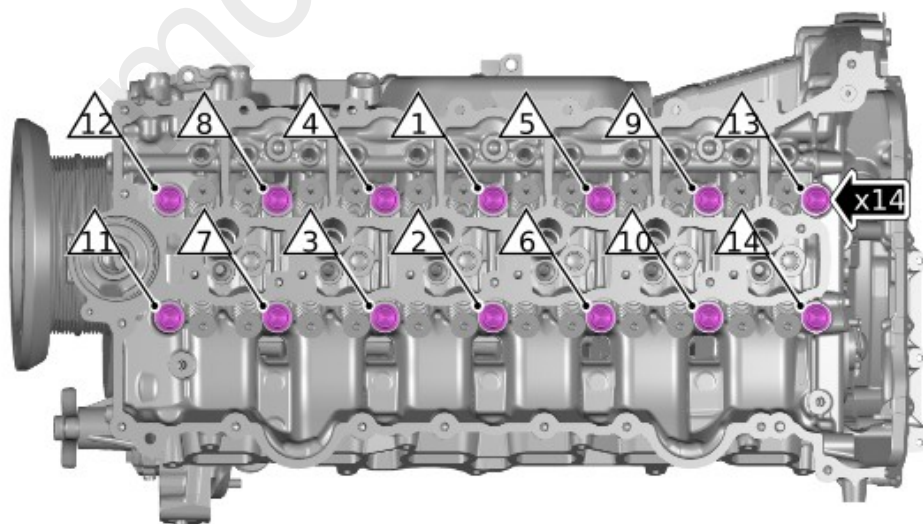
E239970

- Install and tighten the 14 new cylinder head bolts in the illustrated sequence.

Renew Part: *Cylinder head bolts* Quantity: *14*.

Torque: **30Nm**

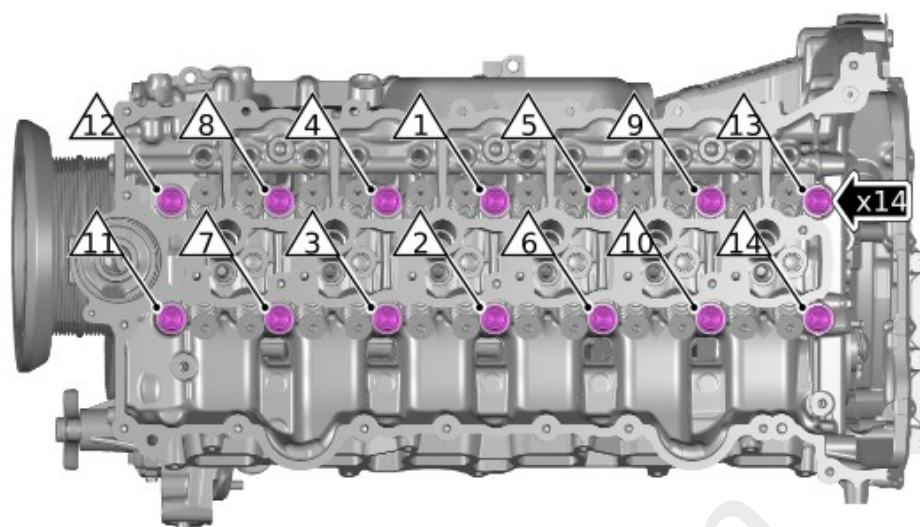
6.



E239970

Tighten the 14 bolts in the illustrated sequence.

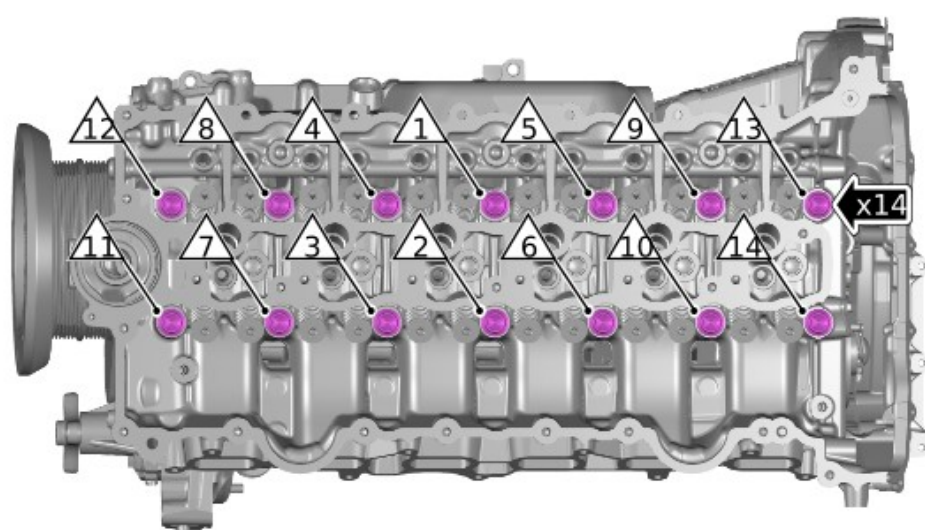
Torque: **62Nm**



E239970

- Loosen the first bolt.
Torque: 180°
- Tighten the first bolt.
Torque: 62Nm
- Repeat this step for bolts 2-14 in the illustrated sequence.

8.

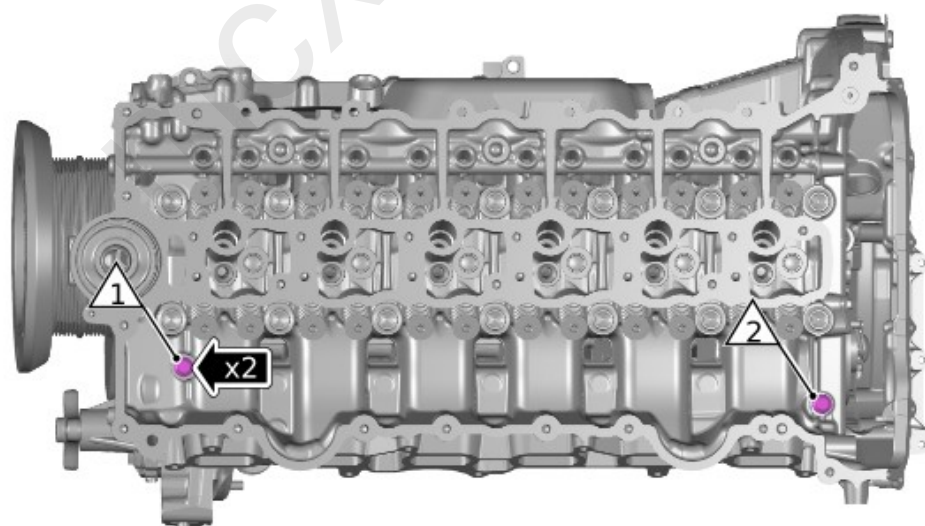


E239970

Tighten the 14 bolts in the illustrated sequence.

Torque: 125°

9.



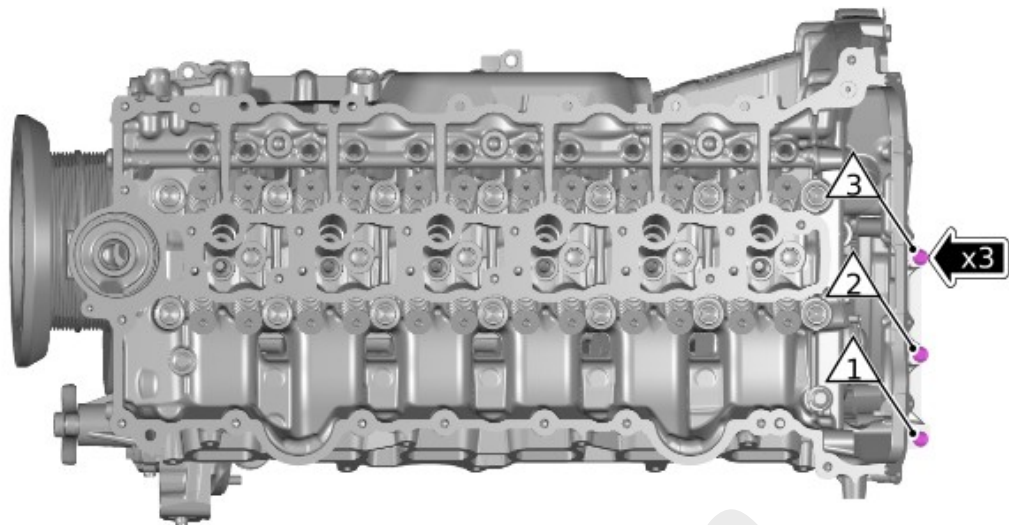
E239971

Install and tighten 2 new cylinder head bolts in the illustrated sequence.

Renew Part: [Cylinder head bolts](#) Quantity: 2.

Torque: 26Nm

10.



E239972

Install and tighten the 3 new cylinder head bolts in the illustrated sequence.

Renew Part: [Cylinder head bolts](#) Quantity: [3](#).

Torque: **11Nm**

11.

⚠ CAUTIONS:

- Check all timing components for wear and install new components if required.
- Make sure that the components are clean, dry and free from corrosion and foreign material.

Install the 12 hydraulic lash adjusters to their noted removal position.

12.

⚠ CAUTIONS:

- Check all timing components for wear and install new components if required.
- Make sure that the components are clean, dry and free from corrosion and foreign material.

Install the 12 camshaft follower roller fingers to their noted removal position.

13.

Use the special tool to install and tighten the 6 spark plugs.

Special Tool(s): [303-1450](#)

Torque: **22.5Nm**

14.

- Install the timing chain oil supply pipe.
- Install and tighten the bolt.

Torque

Stage1: **11Nm**

Stage2: **62°**

15.

- Install 2 sealing washers to the oil supply pipe.

Renew Part: [Oil supply pipe sealing washers](#) Quantity: 2.

- Install a new bolt to the oil supply pipe.

Renew Part: [Turbocharger oil supply pipe banjo bolt](#) Quantity: 1.

- Connect the oil supply pipe to the cylinder head.
- Tighten the bolt.

*Torque: **18Nm***

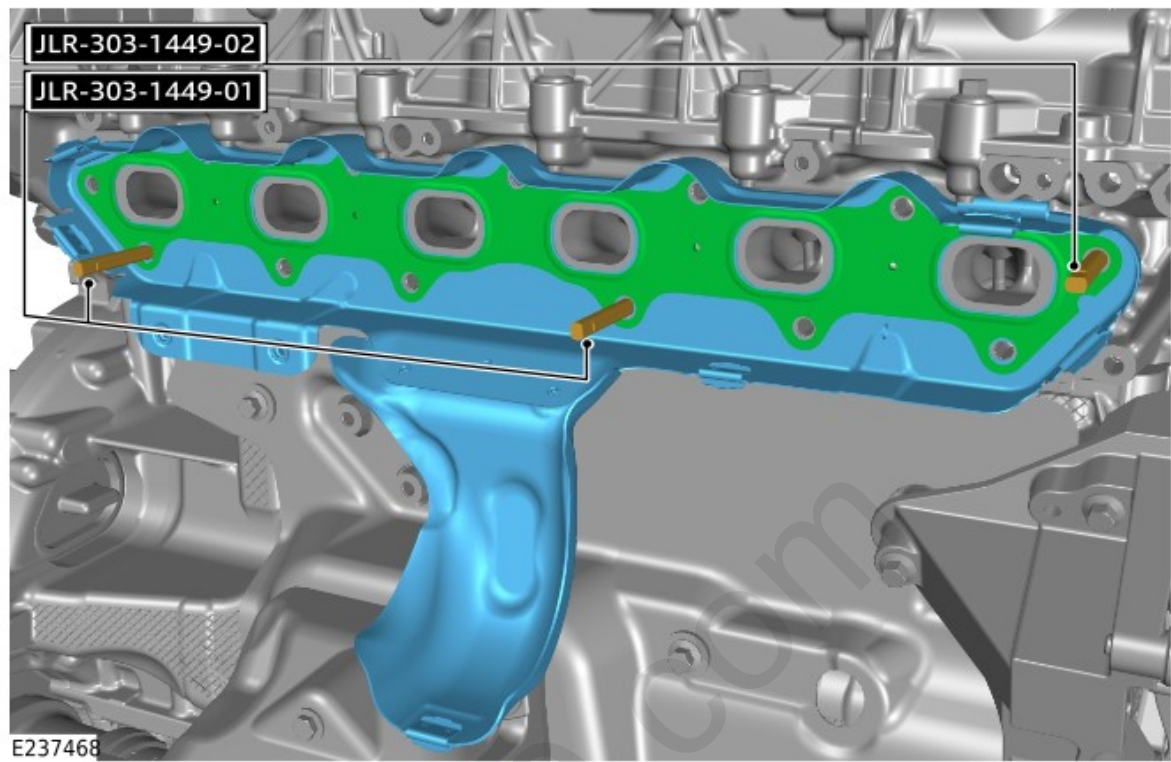
16.

- Connect the coolant pipe to the cylinder head.
- Install and tighten the bolt.

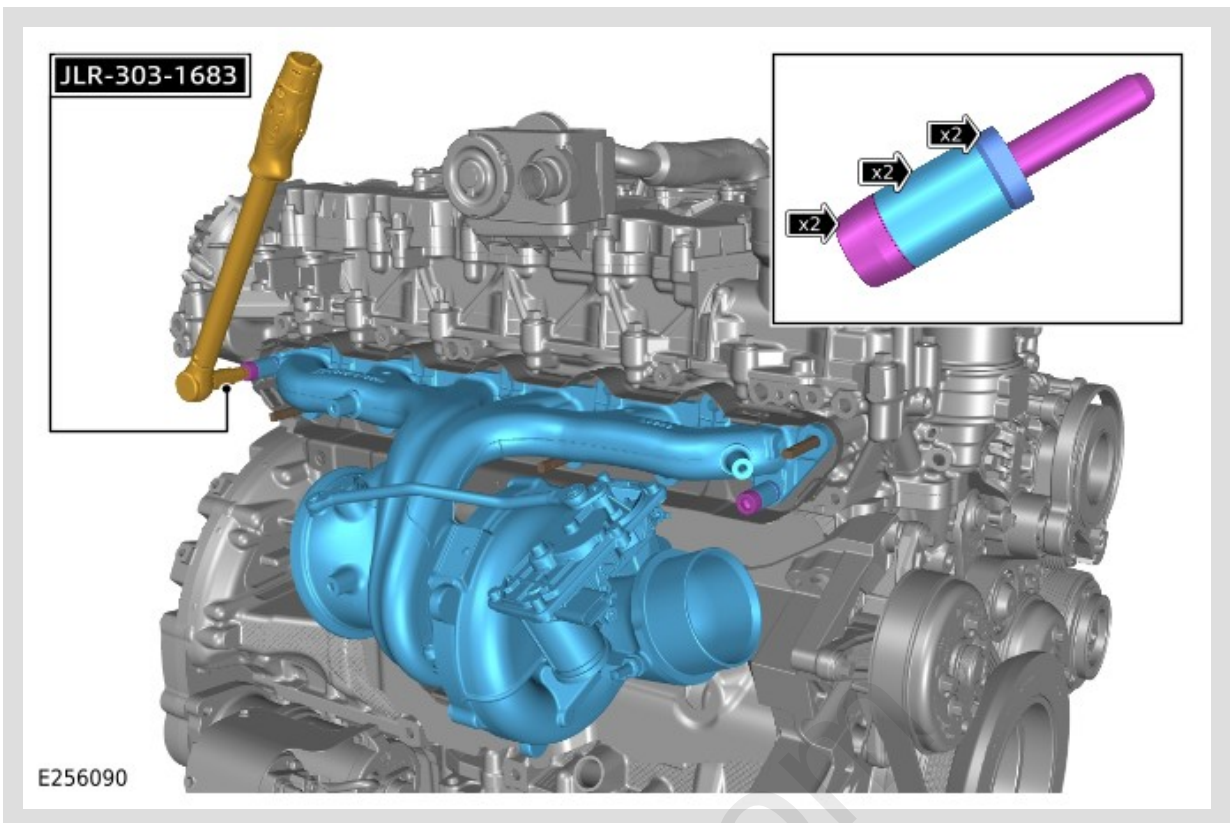
*Torque: **11Nm***

 NOTE:

If a new cylinder head is installed only 303-1449-02 must be used.



- Install the special tools.
Special Tool(s): [303-1449-01](#), [303-1449-02](#)
- Install the exhaust manifold gasket.
Renew Part: [Exhaust manifold gasket](#) *Quantity:* [1](#).



- Install the turbocharger.
- Install 2 new bolts, spacers and washers in the illustrated positions.
Renew Part: [Exhaust manifold bolts](#) Quantity: 2.
- Use the special tool to tighten the 2 bolts, spacers and washers.
Special Tool(s): [JLR-303-1683](#)
Torque: 5Nm

19.

JLR-303-1449-02

JLR-303-1449-01

E256091

Remove the special tools.

Special Tool(s): [303-1449-01](#), [303-1449-02](#)

20.

JLR-303-1683

E256092

- Install 11 new bolts, spacers and washers in the illustrated positions.

Renew Part: [Exhaust manifold bolts](#) Quantity: 11.

- Use the special tool to tighten the 11 bolts, spacers and washers.

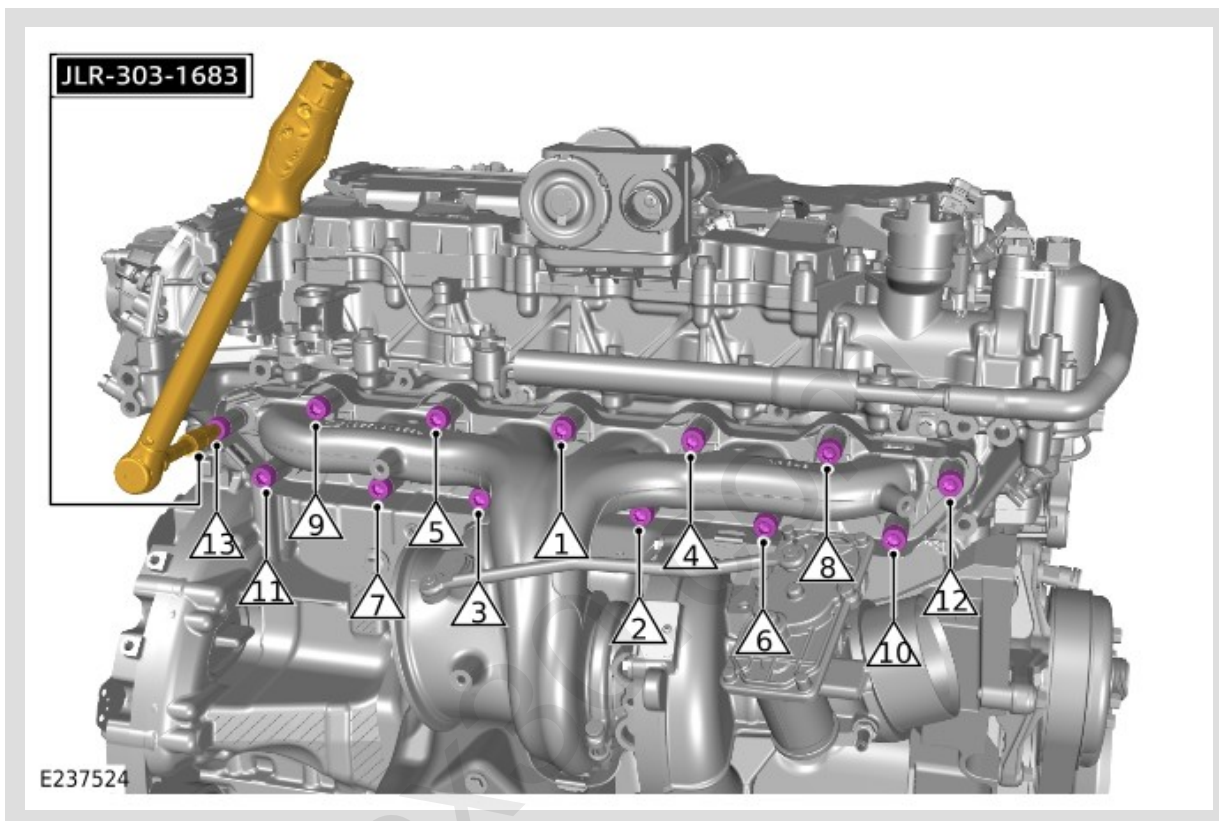
Special Tool(s): [JLR-303-1683](#)

Torque: 720°

21.

ⓘ CAUTION:

Allow 4 hours for the thread locking compound to cure.



- Use the special tool to tighten the 13 bolts in the illustrated sequence.

Special Tool(s): [JLR-303-1683](#)

Torque

Stage1: 8Nm

Stage2: 12Nm

Stage3: 15Nm

Stage4: 135°

22.

- Install 2 new O-ring seals to the oil return pipe.

Renew Part: [Oil return pipe O-ring seal](#) Quantity: 2.

- Install the oil return pipe.

- Install and tighten the bolt.

Torque: 10Nm

23.

- Install 2 sealing washers to the oil supply pipe.
Renew Part: [Oil supply pipe sealing washers](#) Quantity: 2.
- Install a new bolt to the oil supply pipe.
Renew Part: [Turbocharger oil supply pipe banjo bolt](#) Quantity: 1.
- Connect the oil supply pipe to the turbocharger.
- Tighten the bolt.
Torque: 18Nm

24.

- Install the turbocharger inner heatshield to the clip.
- Install and tighten the bolt.
Torque: 9Nm

25.

- Install the turbocharger front heatshield to the 2 clips.
- Install the turbocharger rear heatshield to the clip.
- Install and tighten the 2 bolts.
Torque: 9Nm

26.

- Install the turbocharger upper heatshield to the 2 clips.
- Install and tighten the 2 bolts.
Torque: 6.5Nm
- Install and tighten the 3 bolts.
Torque: 9Nm

27.

- Install 2 new O-ring seals to the 2 turbocharger coolant pipes.
Renew Part: [Turbocharger coolant pipe O-ring seal](#) Quantity: 2.
- Connect the 2 coolant pipes to the turbocharger.
- Install and tighten the bolt.
Torque: 11Nm

28.

Connect the turbocharger actuator electrical connector.

29.

- Install the bolt to the turbocharger mounting bracket.
 - Tighten the bolt.
Torque: 26Nm
-

30.

- Connect the electrical connector to the Camshaft Position Sensor (CMP) sensor.
- Install and tighten the bolt.
Torque: 10Nm

31.

Install and tighten a new cylinder head temperature sensor.

Renew Part: [Cylinder head temperature sensor](#) Quantity: 1.

Torque: 10.5Nm

32.

- Install and tighten a new cylinder head temperature sensor.
Renew Part: [Cylinder head temperature sensor](#) Quantity: 1.
Torque: 10.5Nm
- Connect the cylinder head temperature sensor electrical connector.

33.

- Connect the electrical connector to the cylinder head temperature sensor.
- Install the clip.

34.

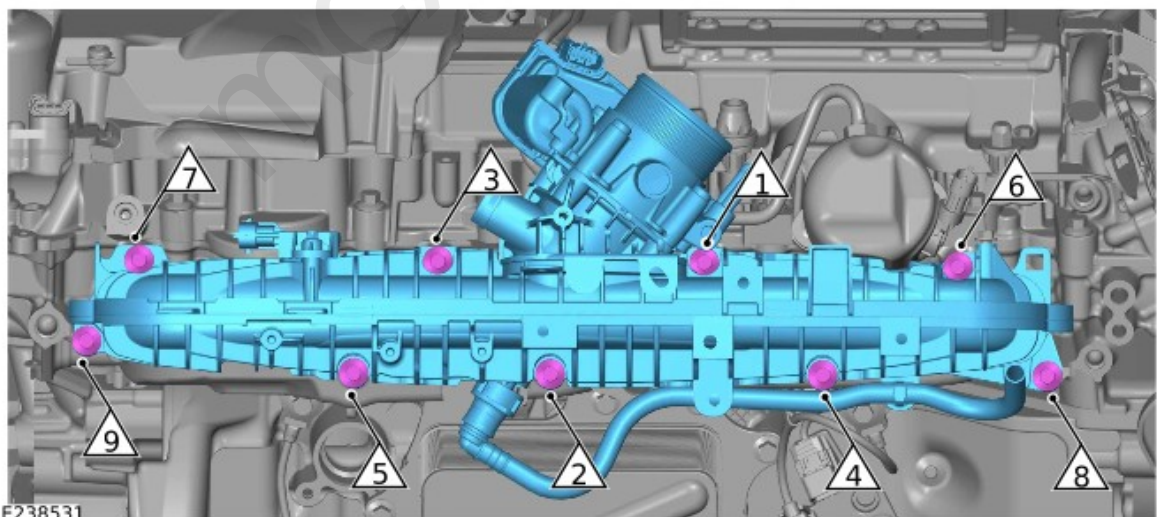
⚠ CAUTION:

Make sure the seals are fully installed.

Install the 6 new seals to the intake manifold.

Renew Part: [Intake manifold seals](#) Quantity: 6.

35.



- Install the intake manifold.
- Install and tighten the 9 bolts in the illustrated sequence.
Torque: 12Nm

36.

- Reposition the wiring harness in the correct location.
- Install the 3 clips.
- Connect the 3 electrical connectors.

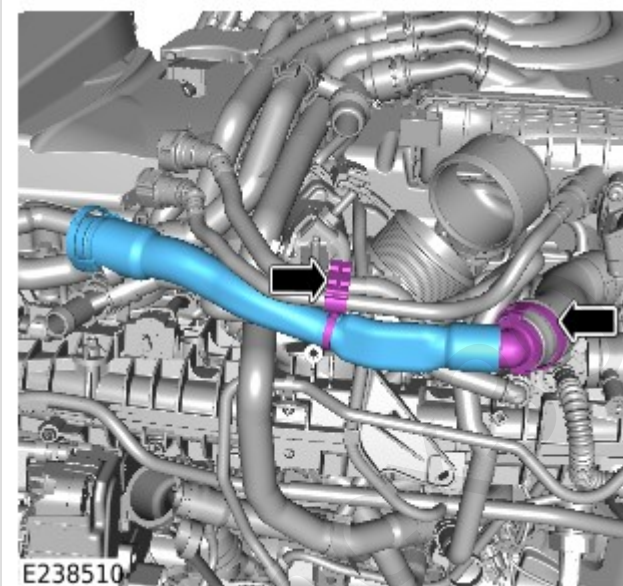
37.

- Connect the 2 coolant hoses to the throttle body.
- Install the 2 clamps.
- Install the coolant hose to the clip.

38.

- Reposition the vacuum pipe in the correct location.
- Install the 2 clips.

39.



- Connect the charge air recirculation pipe.
- Install the clip.

40.

- Reposition the oil level gauge in the correct location.
 - Install and tighten the bolt.
 - Install the clip.
- Torque: 7Nm*

41.

- Connect the fuel line.
- Install the clip.

42.

⚠ CAUTION:

Make sure the components are installed to the positions marked in the removal section.

- Install the coolant pipe assembly.
- Connect the 4 coolant hoses.
- Install the 4 clamps.
- Install and tighten the 2 bolts.

Torque: 7Nm

43.

Install the camshaft carrier.

Refer to: [Camshaft Carrier](#) (303-01C Engine - INGENIUM I6 3.0L Petrol, Removal and Installation).

44.

Install the oil filter element.

Refer to: [Oil Filter Element](#) (303-01C Engine - INGENIUM I6 3.0L Petrol, Removal and Installation).

45.

Install the charge air cooler inlet pipe.

Refer to: Charge Air Cooler Inlet Pipe (303-12C, Removal and Installation).

46.

Connect the startup battery ground cable.

Refer to: Specifications (414-00, Specifications).