

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion

2013 ENGINE**Engine Mechanical - 1.6L - Fusion****SPECIFICATIONS****ENGINE SPECIFICATIONS**

Item	Specification
Displacement	1.6L Gasoline Turbocharged Direct Injection (GTDI)
No. of cylinders	4
Bore/stroke	3.1-3.2 in (79-81.4 mm)
Firing order	1-3-4-2
Compression ratio	10:1
Engine weight - (with flexplate)	178.6 lb (81 kg)
Engine and transaxle weight - automatic transaxle	346.6 lb (157.2 kg)
Engine weight - (with dual mass flywheel)	203.7 lb (92.4 kg)
Engine and transaxle weight - manual transaxle	371.7 lb (168.6 kg)

LUBRICANTS SPECIFICATIONS

Item	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil (Canada)	XO-5W20-QSP (US); CXO-5W20-LSP12 (Canada)

ENGINE OIL CAPACITY SPECIFICATIONS

Item	Specification
Service fill including oil filter	4.54 qt (4.3 L)
Service fill without oil filter	3.96 qt (3.75 L)

OIL PRESSURE SPECIFICATIONS

Item	Specification
Oil pressure (hot @ 800 rpm)	14.5 psi (100 kPa)
Oil pressure (hot @ 2, 000 rpm)	29.0 psi (200 kPa)

CYLINDER BLOCK SPECIFICATIONS

Item	Specification
Cylinder bore diameter	3.110-3.111 in (79.005-79.025 mm)
Cylinder bore maximum out-of-round	0.0003 in (.008 mm)
Main bearing bore diameter	2.126-2.127 in (54-54.018 mm)
Head gasket surface flatness	0.1 mm/general 0.05 mm/200 x 200 (0.004 in/general) (0.0019 in/7.87 x 7.87)

PISTON SPECIFICATIONS

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Item	Specification
Piston grade - single	3.1090-3.1095 in (78.9675-78.9825 mm)
Piston-to-bore clearance	0.0009-0.0023 in (.0225-.0575 mm)
Ring groove width - top	0.049-0.050 in (1.25-1.27 mm)
Ring groove width - 2nd	0.048-0.049 in (1.22-1.24 mm)
Ring groove width - oil	0.079-0.080 in (2.01-2.03 mm)
Piston skirt coating thickness	0.0004 in (.011 mm)

PISTON PIN SPECIFICATIONS

Item	Specification
Diameter	0.827-0.827 in (20.994-21 mm)
Length	1.80-1.81 in (45.7-46 mm)
Piston-to-pin clearance	0.0002-0.0007 in (.006-.017 mm)
Pin-to-rod clearance	Floating pin

CYLINDER HEAD SPECIFICATIONS

Item	Specification
Cylinder head flatness	0.004 in (.1 mm)overall
Valve lift @ zero lash (exhaust)	0.260 in (6.6 mm)
Valve lift @ zero lash (intake)	0.311 in (7.9 mm)

Item	Specification
Valve guide diameter - bore	0.197-0.198 in (5-5.02 mm)
Valve seat width - intake/exhaust	0.0394 ± 0.0059 in (1 ±.15 mm)
Valve seat angle - intake	45
Valve seat angle - exhaust	59.75
Valve seat runout	0.001 in (.029 mm)
Valve tappet bore diameter	1.10-1.10 in (28-28.03 mm)
Cam bore diameter	0.984-0.985 in (25-25.03 mm)

VALVE SPECIFICATIONS

Item	Specification
Valve head diameter - intake	1.185 ± 0.006 in (30.1 ±.15 mm)
Valve head diameter - exhaust	0.961 ± 0.006 in (24.4 ±.15 mm)
Valve stem diameter - intake	0.1956 ± 0.0003 in (4.968 ±.0075 mm)
Valve stem diameter - exhaust	0.1952 ± 0.0003 in (4.958 ±.0075 mm)
Valve stem-to-guide clearance - intake	0.0010-0.0027 in (.0245-.0695 mm)
Valve stem-to-guide clearance - exhaust	0.0012-0.0029 in (.0295-.0745 mm)
Valve face runout	0.001 in (.03 mm)
Valve face angle - intake	45.3
Valve face angle - exhaust	60.1

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CRANKSHAFT SPECIFICATIONS

Item	Specification
Main bearing journal diameter	1.889-1.890 in (47.98-48 mm)
Production repair	1, 879.134-1, 879.921 in (47.73-47.75 m)
Main bearing clearance	0.0009-0.0020 in (.022-.051 mm)
Connecting rod journal diameter	1.731-1.732 in (43.98-44 mm)
Production repair	1.722-1.722 in (43.73-43.75 mm)
End play	0.005-0.017 in (.12-.43 mm)

RINGS SPECIFICATIONS

Item	Specification
Width - top	0.0461-0.0469 in (1.17-1.19 mm)
Width - 2nd	0.0461-0.0470 in (1.17-1.195 mm)
Width - oil	0.079 in (2 mm)
Ring gap (in bore) - top	0.0071-0.0110 in (.18-.28 mm)
Ring gap (in bore) - 2nd	0.0276-0.0354 in (.7-.9 mm)
Ring gap (in bore) - oil	0.0079-0.0354 in (.2-.9 mm)

VALVE TAPPET SPECIFICATIONS

Item	Specification
Diameter	1.101-1.102 in (27.965-27.98 mm)
Tappet-to-valve clearance - intake	0.007-0.009 in (.17-.23 mm)
Tappet-to-valve clearance - exhaust	0.012-0.015 in (.31-.37 mm)
Tappet-to-bore clearance	0.0008-0.0026 in (.02-.065 mm)

CAMSHAFT SPECIFICATIONS

Item	Specification
End play	0.003-0.008 in (.07-.2 mm)
Lobe lift - intake	0.31 in (7.9 mm)
Lobe lift - exhaust	0.260 in (6.6 mm)
Runout (1) ⁽¹⁾	0.0008 in (.02 mm)
Thrust clearance	1.22-1.22 in (30.96-30.98 mm)
Journal diameter	0.9831 ± 0.0004 in (24.97 ± .01 mm)
Journal-to-bore clearance	0.0008-0.0028 in (.02-.07 mm)
(1) No. 3 Journal - Supported by No. 1 and No. 5 journals.	

CONNECTING ROD SPECIFICATIONS

Item	Specification
Running clearance	0.0009-0.0020 in (.024-.05 mm)
Bearing clearance	0.0009-0.0017 in (.024-.044 mm)
Bearing thickness (grade 1)	0.0590-0.0593 in (1.499-1.506 mm)

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Bearing thickness (grade 2)	0.0593-0.0596 in (1.506-1.513 mm)
Bearing thickness (grade 3)	0.0596-0.0598 in (1.513-1.52 mm)
Bearing thickness (grade 4)	0.0598-0.0601 in (1.52-1.527 mm)
Crank bore diameter	1.851-1.852 in (47.025-47.045 mm)
Pin bore diameter	0.8275-0.8277 in (21.018-21.024 mm)
Length (center to center)	5.276 in (134 mm)

DESCRIPTION AND OPERATION

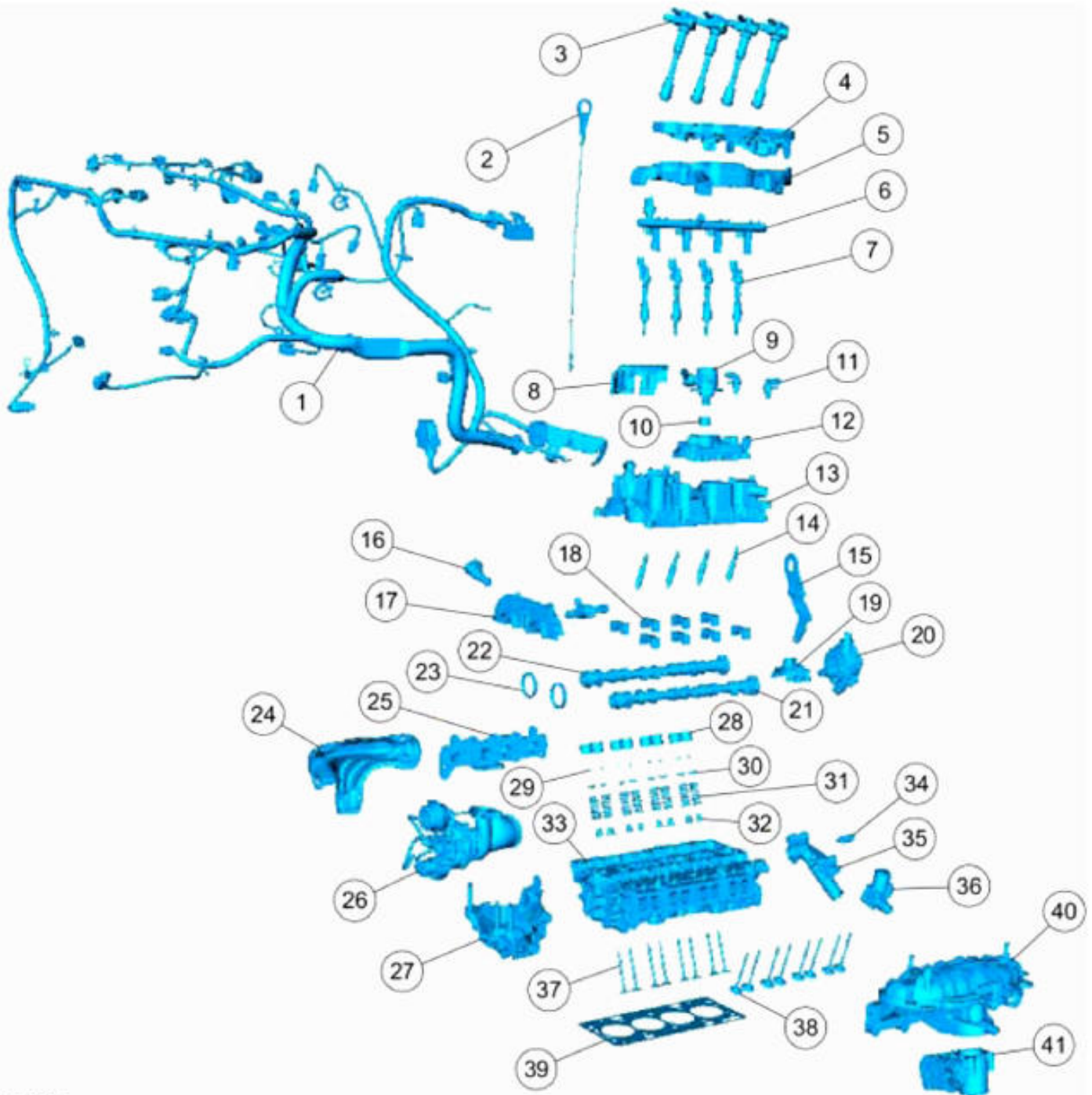
ENGINE COMPONENT VIEW

Upper Engine



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Item	Part Number	Description
1	12A690	Engine wiring harness
2	6750	Oil indicator
3	12A366	Ignition coil on plug (4 required)
4	12257	Ignition coil mounting bracket

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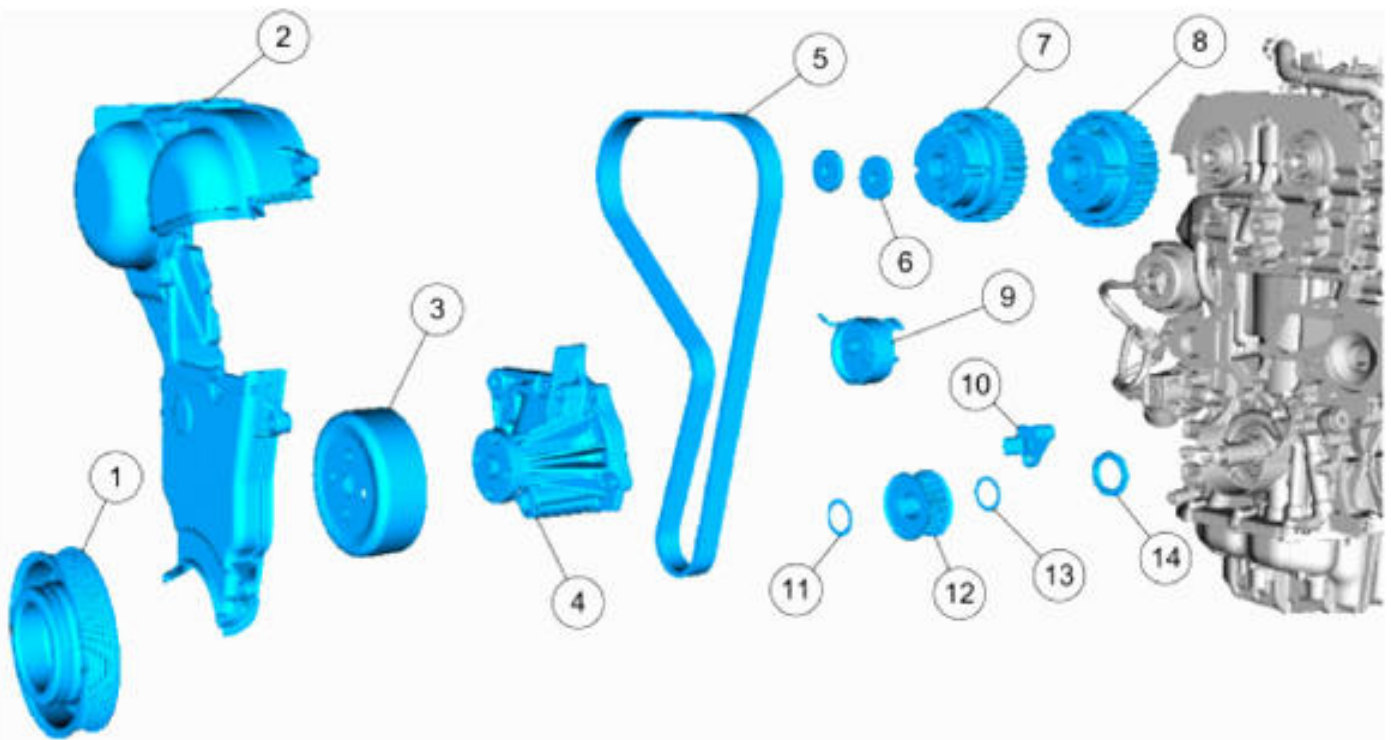
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5	9U550	Ignition coil mounting bracket insulator
6	9H487	Fuel rail
7	9F593	Fuel injector (4 required)
8	9A413	Fuel injection pump cover
9	9D376	Fuel injection pump
10	6C287	Fuel injection pump tappet
11	12K073	Camshaft Position (CMP) sensor (2 required)
12	9346	Fuel injection pump mounting bracket
13	6M293	Cover assembly
14	12405	Spark plug (4 required)
15	17K078	Lift eye bracket
16	6L713	Variable valve timing (VVT) unit oil control solenoid
17	-	Variable valve timing (VVT) unit bridge (part of 6049)
18	-	Camshaft cap (8 required) (part of 6049)
19	-	Vacuum pump mounting bracket (part of 6069)
20	2A451	Vacuum pump
21	6A270	Intake camshaft
22	6A272	Exhaust camshaft
23	6K292	Camshaft oil seals
24	9N454	Turbocharger heat shield
25	9431	Exhaust manifold
26	6K682	Turbocharger
27	6F001	Engine mounting bracket assembly
28	6500	Valve tappet (16 required)
29	6518	Valve collet (16 required)
30	6514	Valve spring retainer (16 required)
31	6513	Valve spring (16 required)
32	6571	Valve seal (16 required)
33	6049	Cylinder head
34	12A648	Engine Coolant Temperature (ECT) sensor
35	8K556	Coolant outlet
36	18495	Bitron valve
37	6505	Exhaust valve (8 required)
38	6507	Intake valve (8 required)
39	6051	Cylinder head gasket
40	9424	Intake manifold
41	9F991	Throttle body

Front Engine

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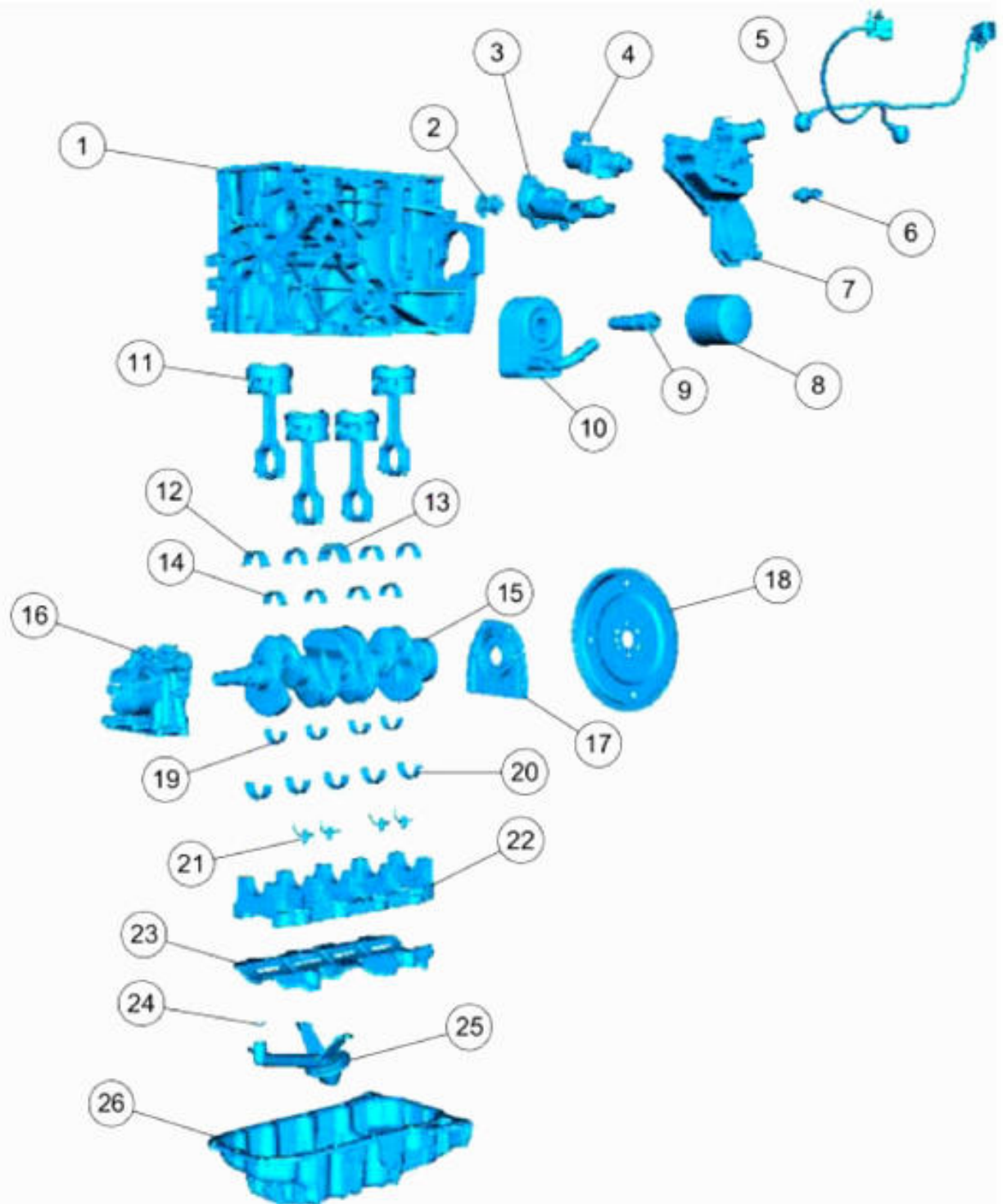
E147636

Item	Part Number	Description
1	6B319	Crankshaft pulley
2	6P073	Timing belt cover
3	8509	Coolant pump pulley
4	8501	Coolant pump
5	6K288	Timing belt
6	W710954	Camshaft phaser and sprocket plug and seal (2 required)
7	6C524	Exhaust VVT unit
8	6C524	Intake VVT unit
9	6K254	Timing belt tensioner
10	6C315	Crankshaft Position (CKP) sensor
11	-	Diamond washer (part of 6306)
12	6306	Crankshaft sprocket gear
13	-	Diamond washer (part of 6306)
14	6700	Crankshaft oil seal

Lower Engine

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E147637

Item	Part Number	Description
1	6010	Engine block
2	-	Thermostat (part of 9K478)

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3	9K478	Thermostat housing
4	8C605	Bitron valve
5	12A699	Knock Sensor (KS) (2 required)
6	9278	Engine Oil Pressure (EOP) sensor
7	6A785	Crankcase vent oil separator
8	6714	Oil filter
9	6L626	Oil cooler mounting bolt
10	6B856	Oil cooler
11	6100	Piston and connecting rod (4 required)
12	6333	Upper main bearing (4 required)
13	6337	Upper main bearing
14	6211	Upper connecting rod bearing (4 required)
15	6303	Crankshaft
16	6600	Oil pump
17	6K301	Crankshaft rear oil seal with retainer plate
18	6375	Flexplate
19	6211	Lower connecting rod bearing (4 required)
20	6A338	Lower main bearing (4 required)
21	6K868	Piston oil cool valve
22	6334	Main bearing beam
23	6B660	Windage tray
24	6625	Oil pump screen and pickup tube O-ring seal
25	6K621	Oil pump screen and pickup tube
26	6675	Oil pan

ENGINE

Overview

The 1.6L GTDI 4-cylinder engine has the following features:

- Dual overhead camshafts
- Four valves per cylinder
- Composite intake manifold
- Aluminum cylinder head
- Aluminum cylinder block
- Gasoline turbocharged direct injection (GTDI)
- Twin independent variable cam timing (Ti-VCT)

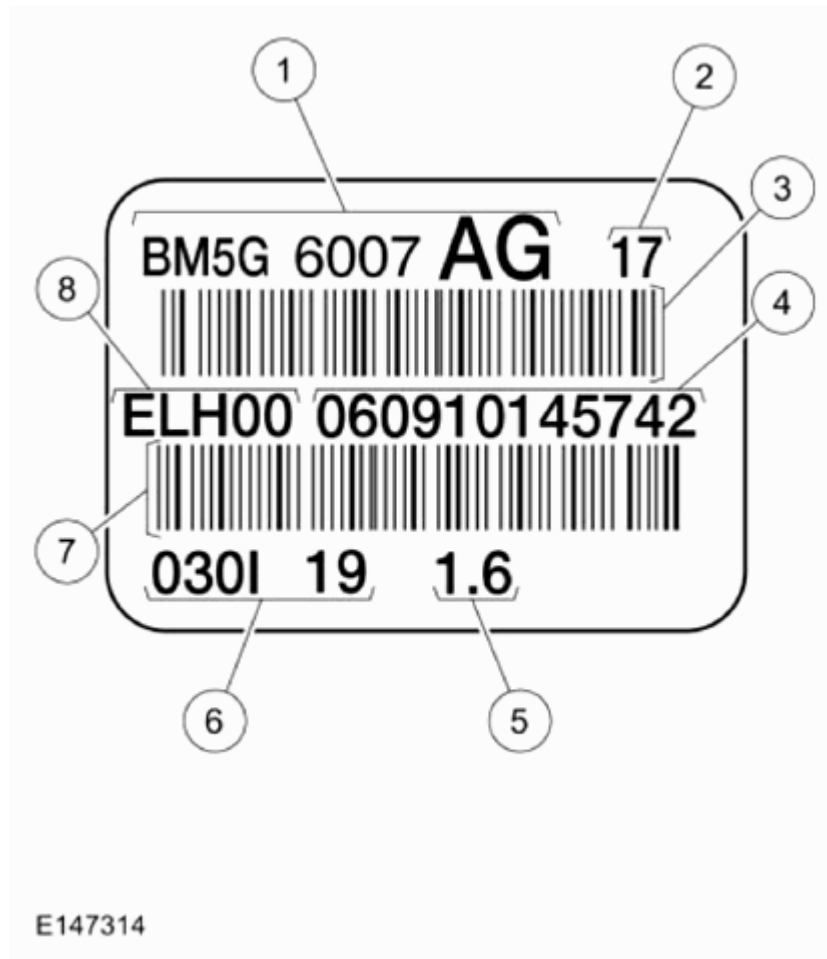
Engine Identification

Always refer to these labels when installation of new parts is necessary or when checking engine calibrations.

The engine parts often differ within a CID family. Verification of the identification codes will make sure the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions.

Engine Code Information Label

The engine code information label, located on the front side of the timing cover, contains the following:

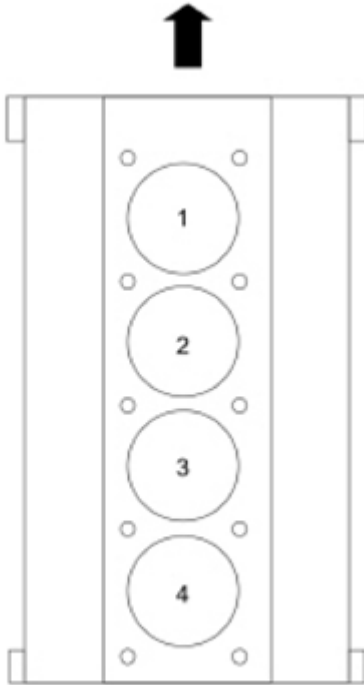


E147314

Fig. 1: Identifying Engine Code Information Label
Courtesy of FORD MOTOR CO.

Item	Description
1	Engine part number
2	Derivative of build
3	Bar code
4	Engine build date and time
5	Engine displacement
6	Engine build date (YYMMDD)
7	Bar code

8 | Plant code (Bridgend)

Engine Cylinder Identification

E148703

Fig. 2: Identifying Engine Cylinder Identification
Courtesy of FORD MOTOR CO.

System Operation**Lubrication System**

The engine lubrication system is of the force-feed type in which oil is supplied under full pressure to the crankshaft, connecting rod bearings, camshaft bearing caps and variable camshaft timing (VCT) solenoids. The flow of oil to the valve tappets and valve train is controlled by a restricting orifice located in the cylinder head gasket.

The lubrication system is designed to provide optimum oil flow to critical components of the engine through its entire operating range.

The heart of the system is a positive displacement internal gear oil pump.

Generically, this design is known as a variable oil pump or vane-type pump, which operates as follows:

- The oil pump is driven from the crankshaft.
- System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil

back to the inlet side of the oil pump.

- Oil pump displacement has been selected to provide adequate volume to make sure of correct oil pressure both at hot idle and maximum speed.
- The relief valve calibration protects the system from excessive pressure during high-viscosity conditions.
- The relief valve is designed to provide adequate connecting rod bearing lubrication under high temperature and high-speed conditions.

Valve Train

The valve train uses direct acting mechanical buckets (DAMB). The camshaft lobes are positioned directly above mechanical buckets which are positioned on top of the valves.

Twin Independent Variable Cam Timing (Ti-VCT)

The Ti-VCT system allows variable control of the valves which optimizes combustion at full load providing improved power and low speed torque (broadening the torque curve) which enables variable valve overlap which provides better fuel economy and emissions and provides optimized cold start operation with improved exhaust emissions.

DIAGNOSIS AND TESTING

ENGINE

1. REFER to: **ENGINE - OVERVIEW** .

for basic mechanical concerns or to the **ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) (SECTION 0)** for driveability concerns.

GENERAL PROCEDURES

VALVE CLEARANCE CHECK

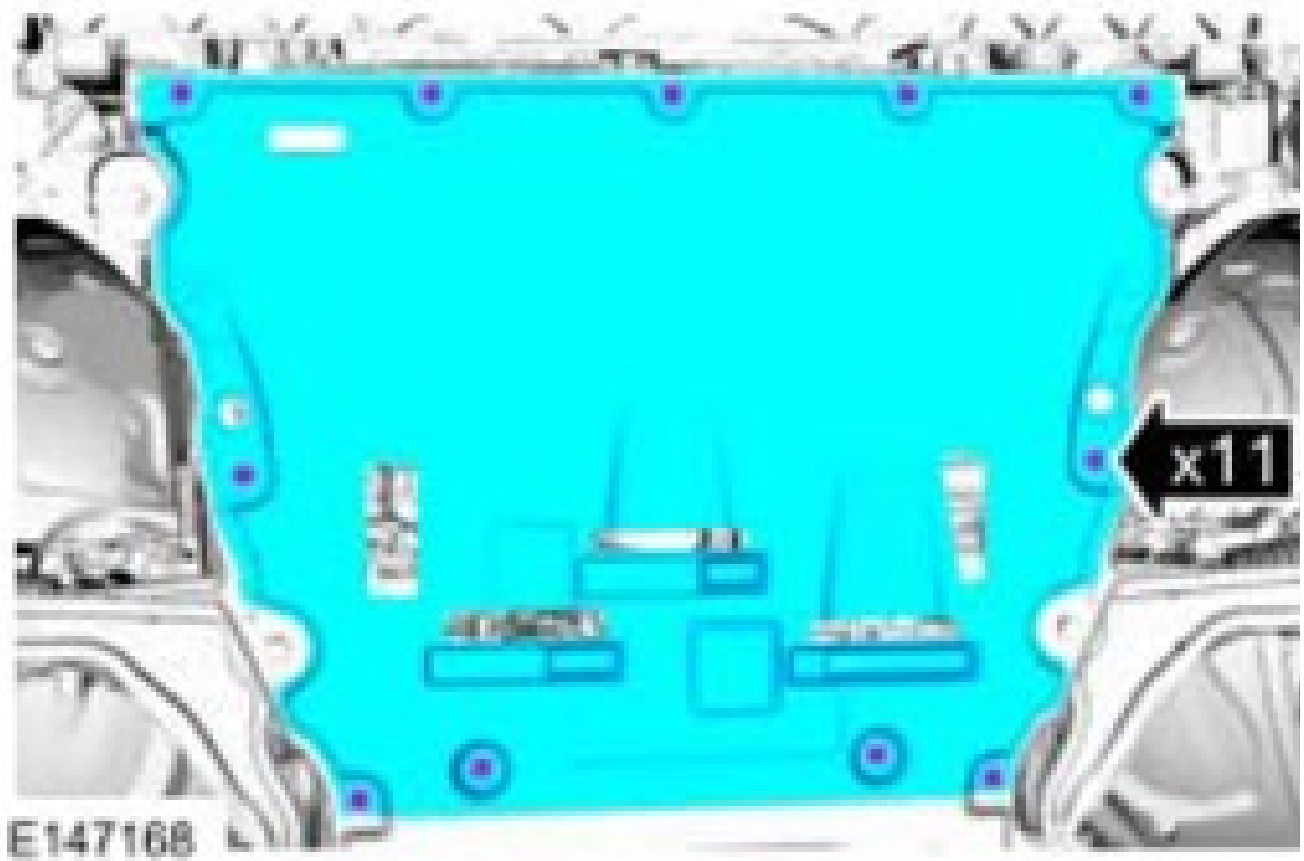
Special Tool(s)/General Equipment

Feeler Gauge

Check

1. Refer to: **VALVE COVER** .
2. Refer to: **SPARK PLUGS** .

3. |



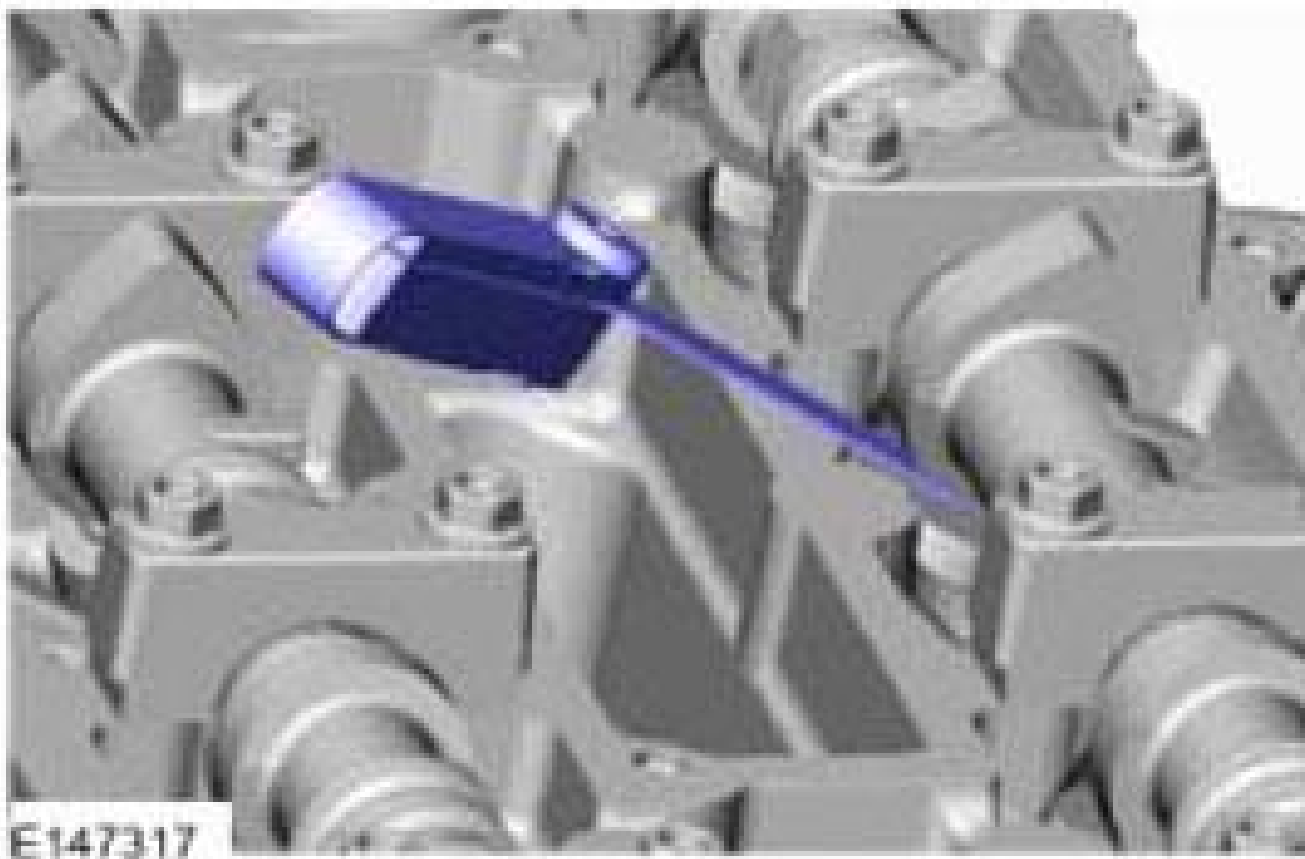
3.

4. **NOTE:** Turn the engine clockwise only, and use the crankshaft bolt only.

NOTE: Measure each valve's clearance at base circle, with the lobe pointed away from the tappet.

Measure each valve's clearance and record its location.

General Equipment : Feeler Gauge



NOTE: The number on the valve tappet only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 0.14 in (3.65 mm).

5.

NOTE: The nominal clearance is 0.0079 in (.2 mm) for intake and 0.0134 in (.34 mm) for exhaust.

NOTE: The acceptable clearances after being fully installed is 0.007-0.009 in (.17-.23 mm) for intake and 0.012-0.015 in (.31-.37 mm) for exhaust.

Select tappets using this formula: tappet thickness = measured clearance + the existing tappet thickness - nominal clearance. Select the closest tappet size to the ideal tappet thickness available and mark the installation location.

6. If any tappets do not measure within specifications, install new tappets in these locations. Refer to: **VALVE TAPPETS**.

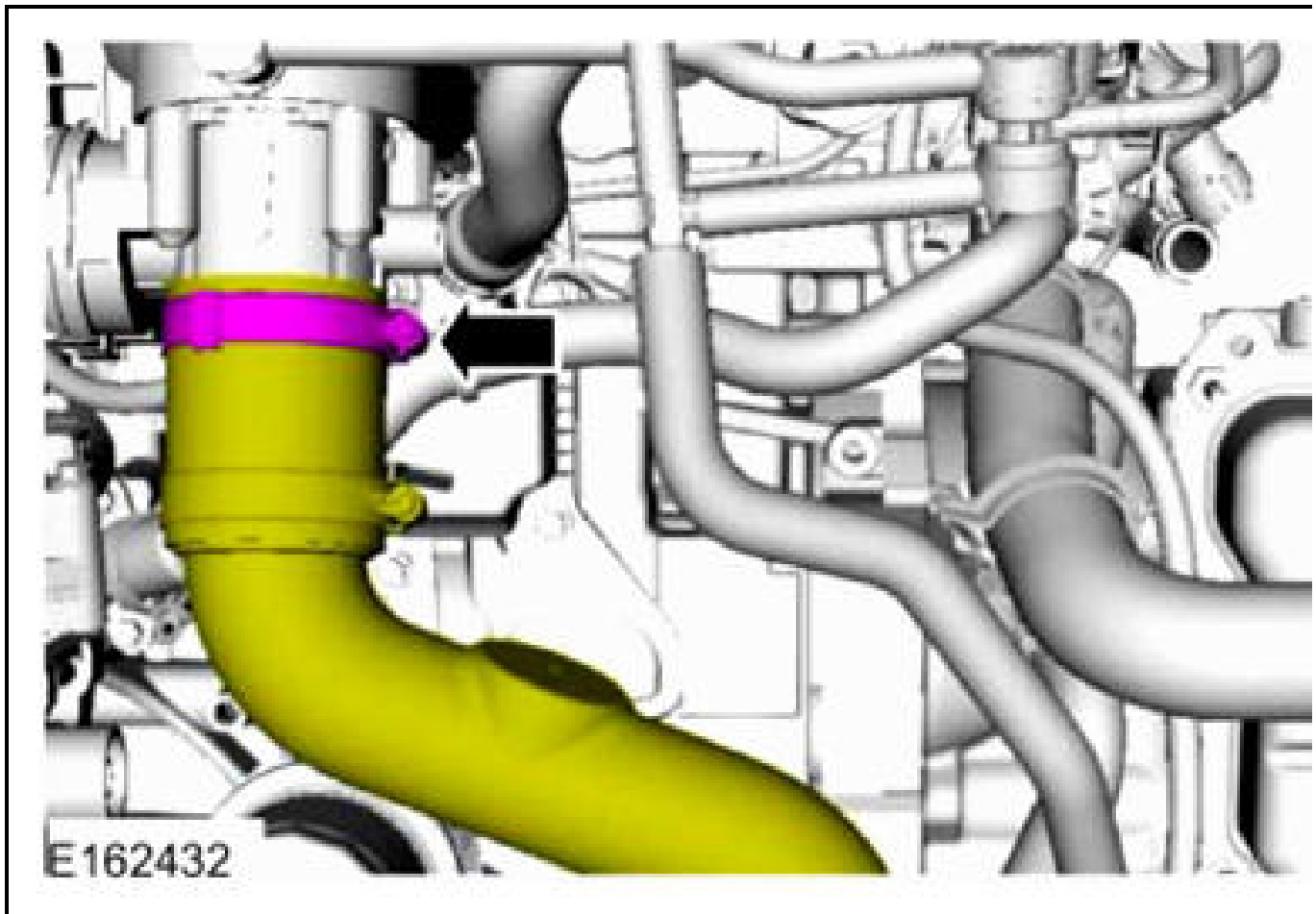
REMOVAL AND INSTALLATION

INTAKE MANIFOLD**Special Tool(s)/General Equipment**

Hose Clamp Remover/Installer

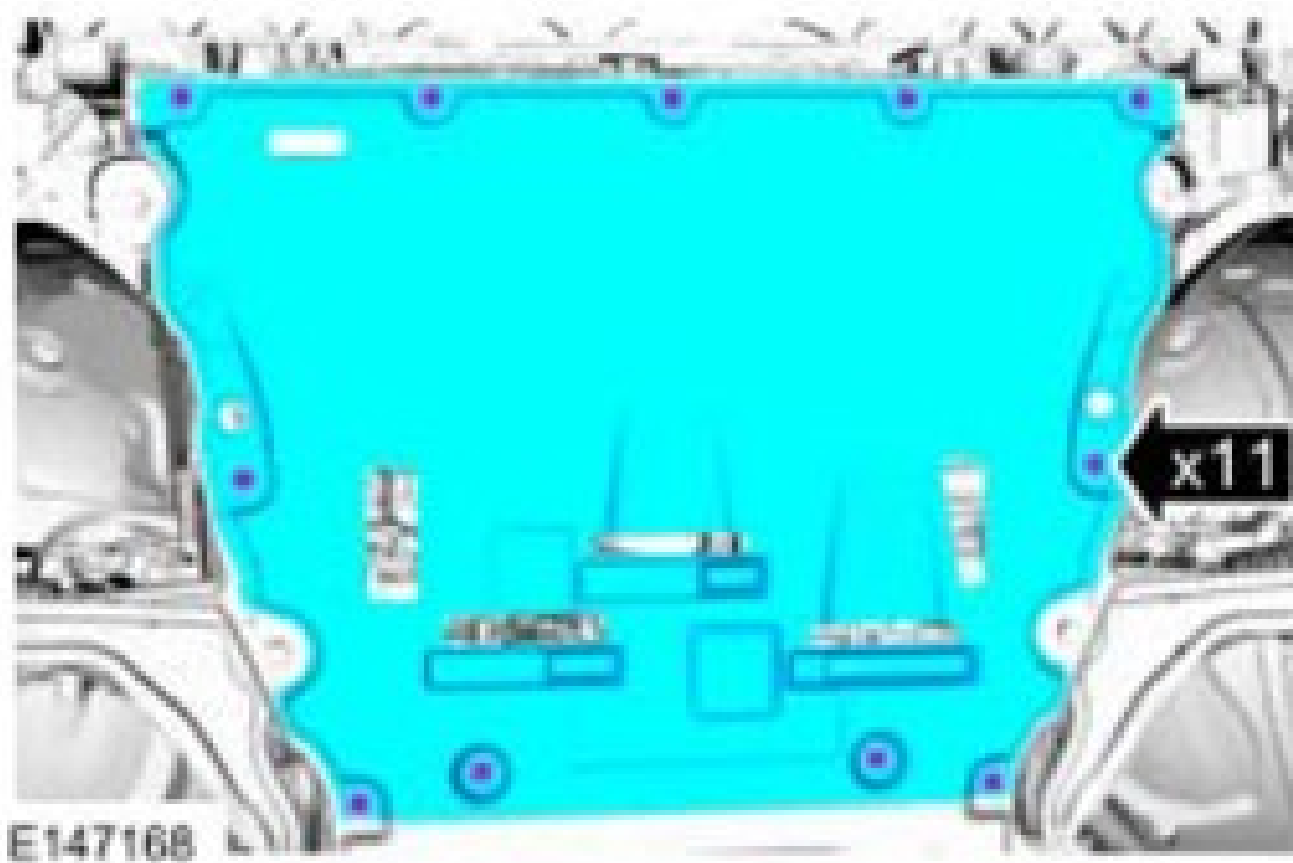
Removal

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .
2. Refer to: **BATTERY DISCONNECT AND CONNECT** .

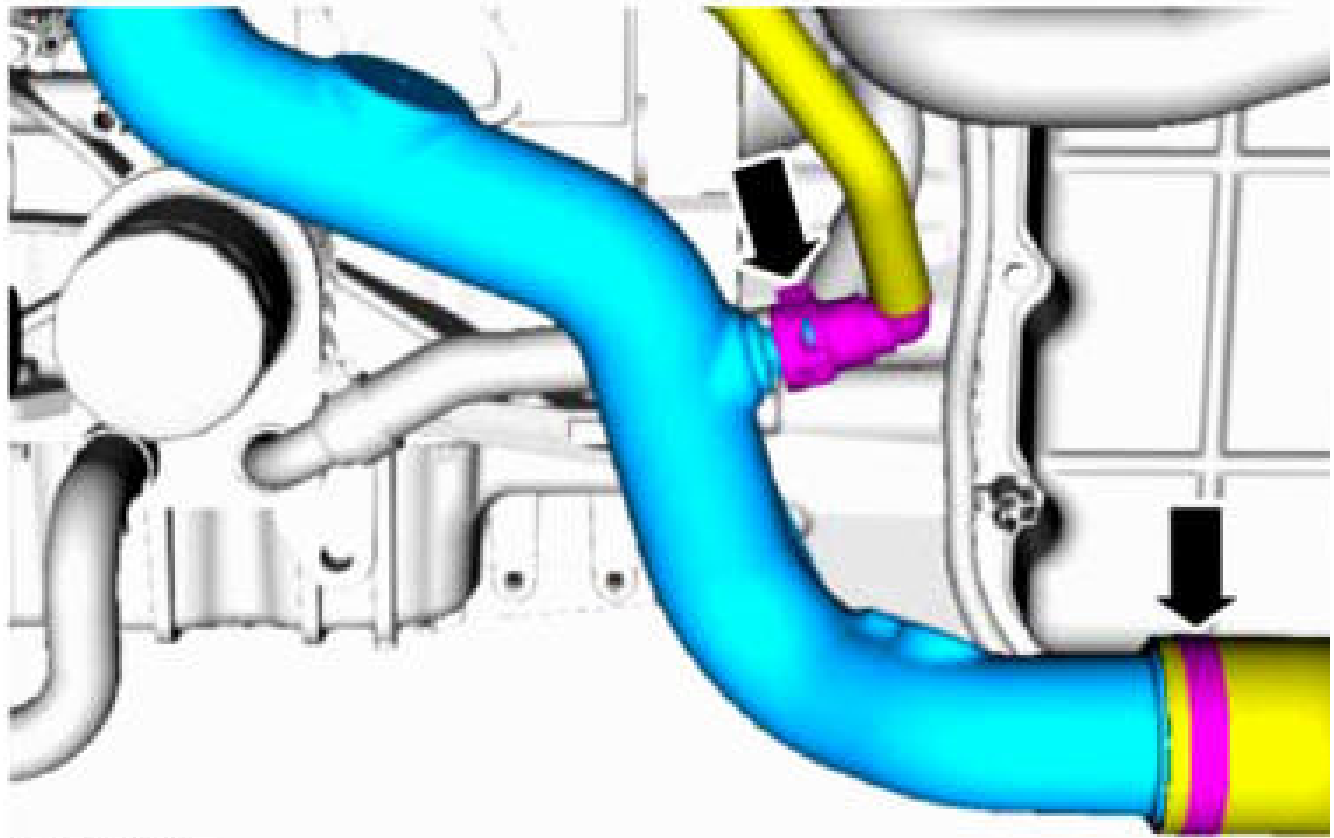


3.

4.



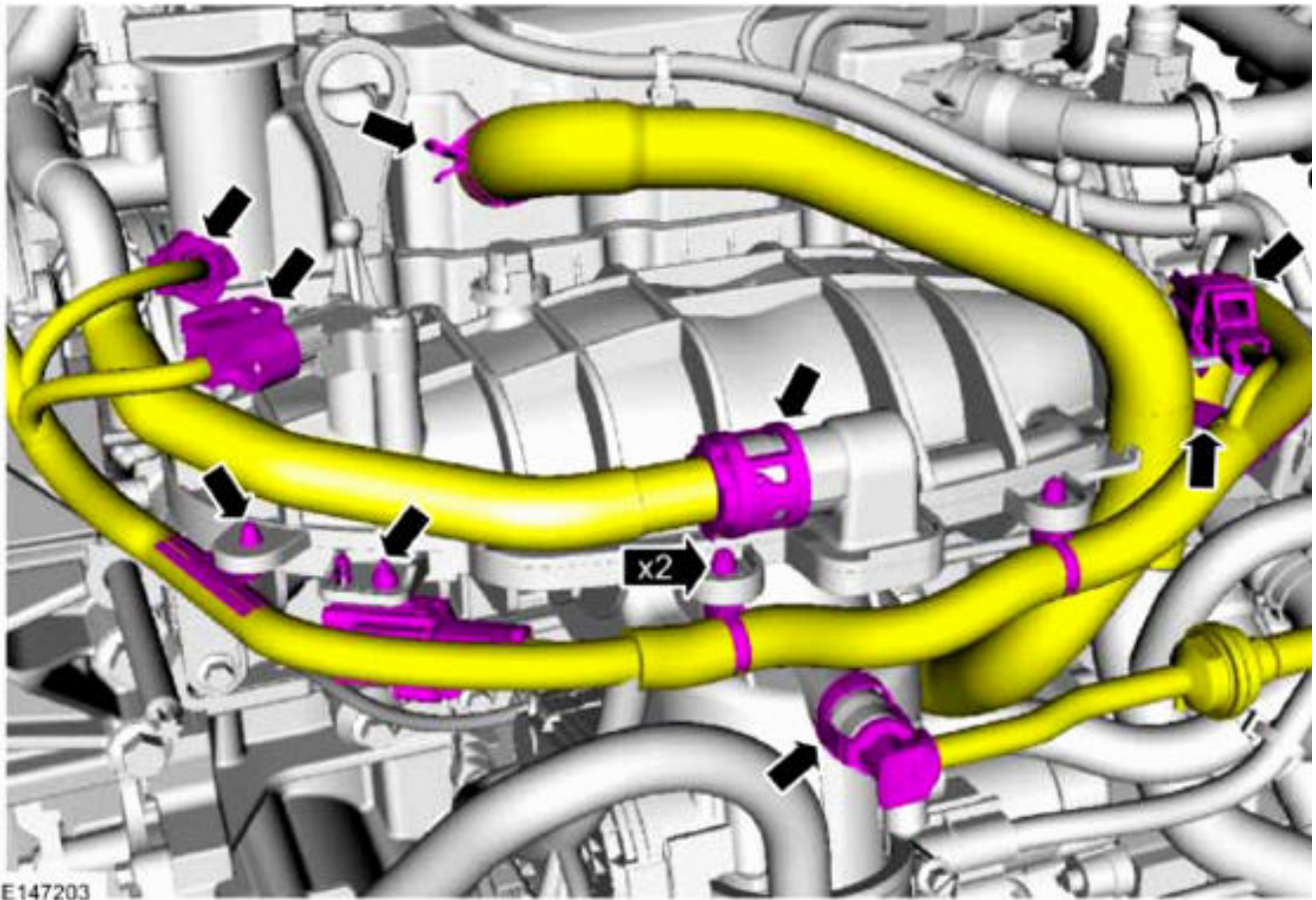
- 4.
5. Refer to: **QUICK RELEASE COUPLING** .

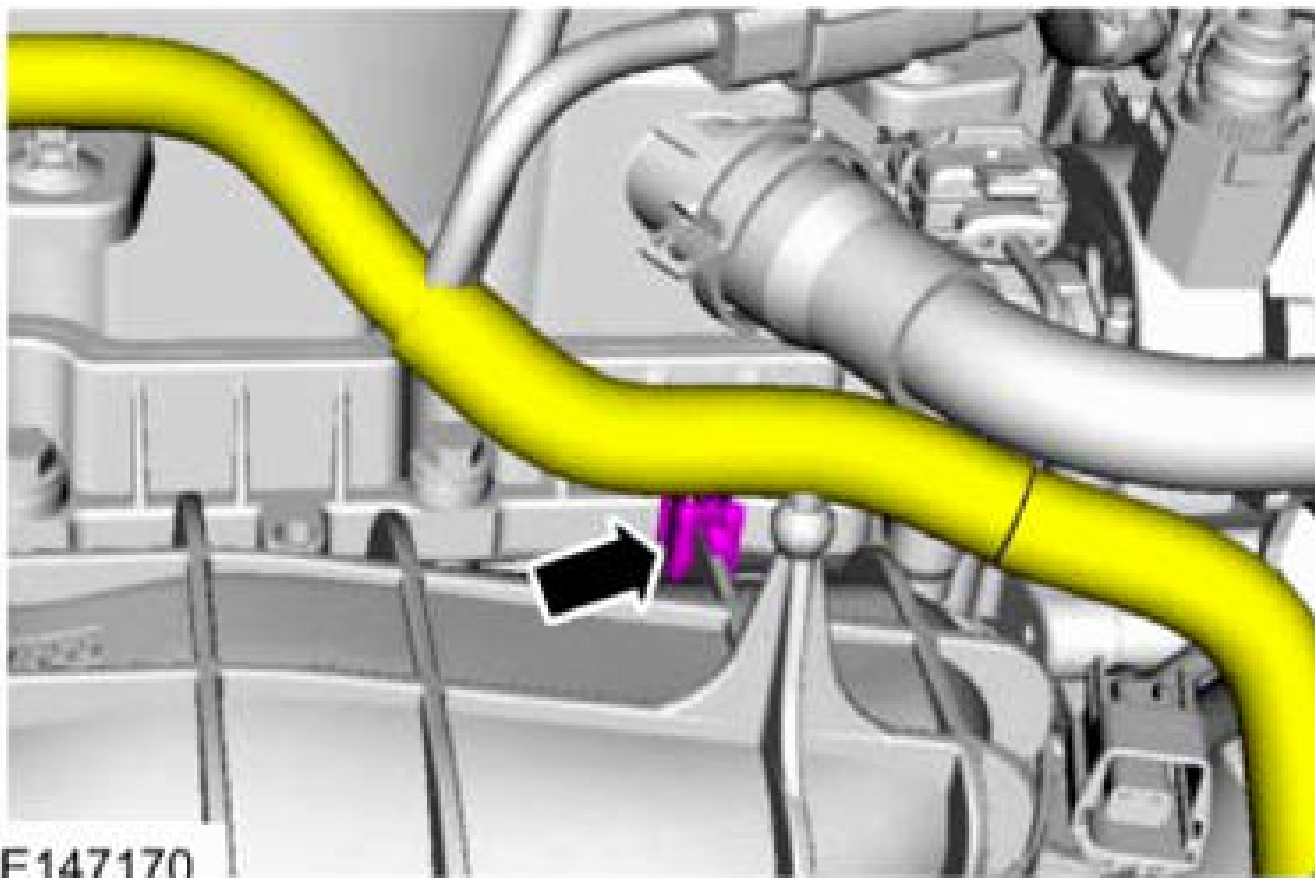


E162433

6. Refer to: **GENERATOR - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .
7. Refer to: **QUICK RELEASE COUPLING** .

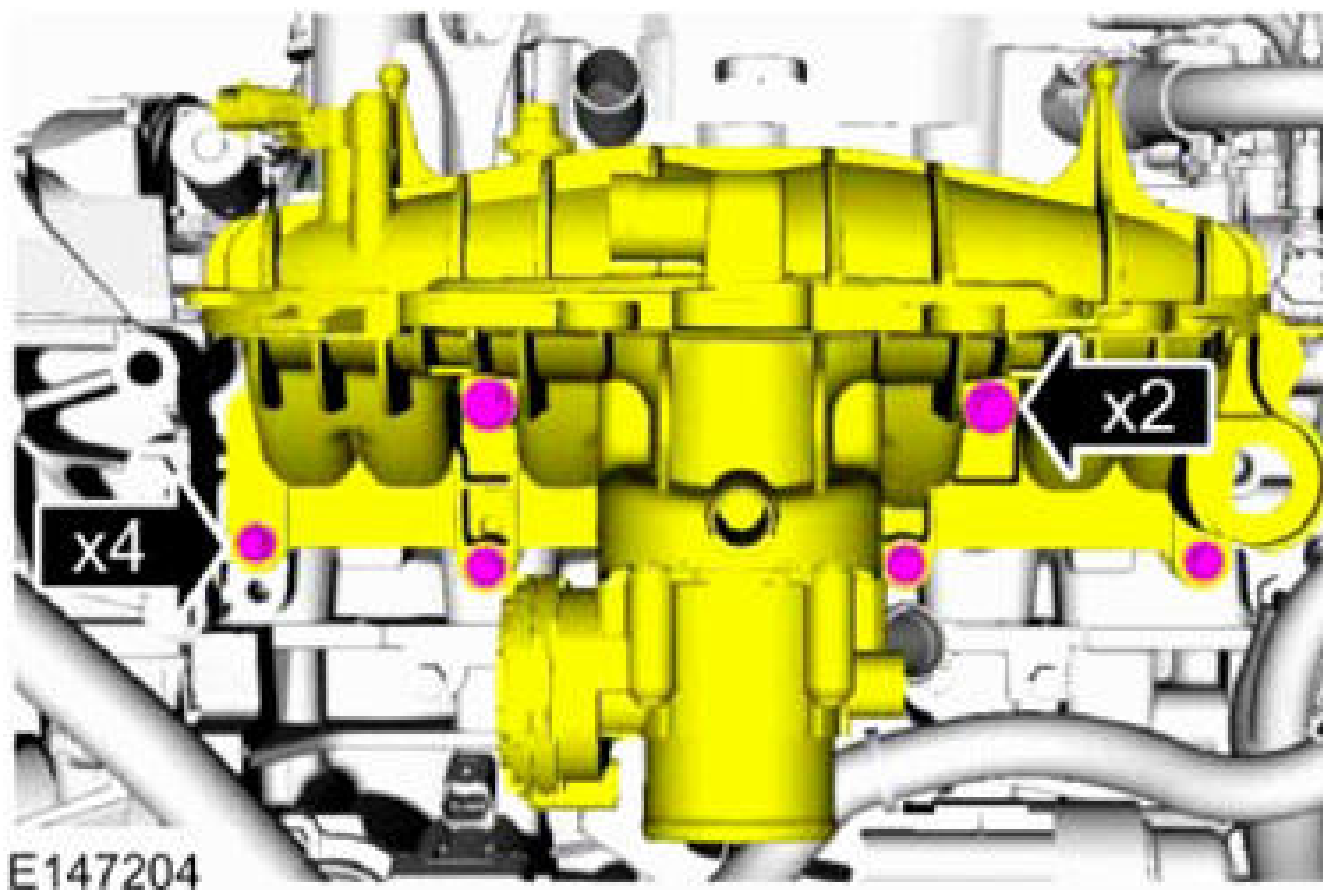
General Equipment : Hose Clamp Remover/Installer

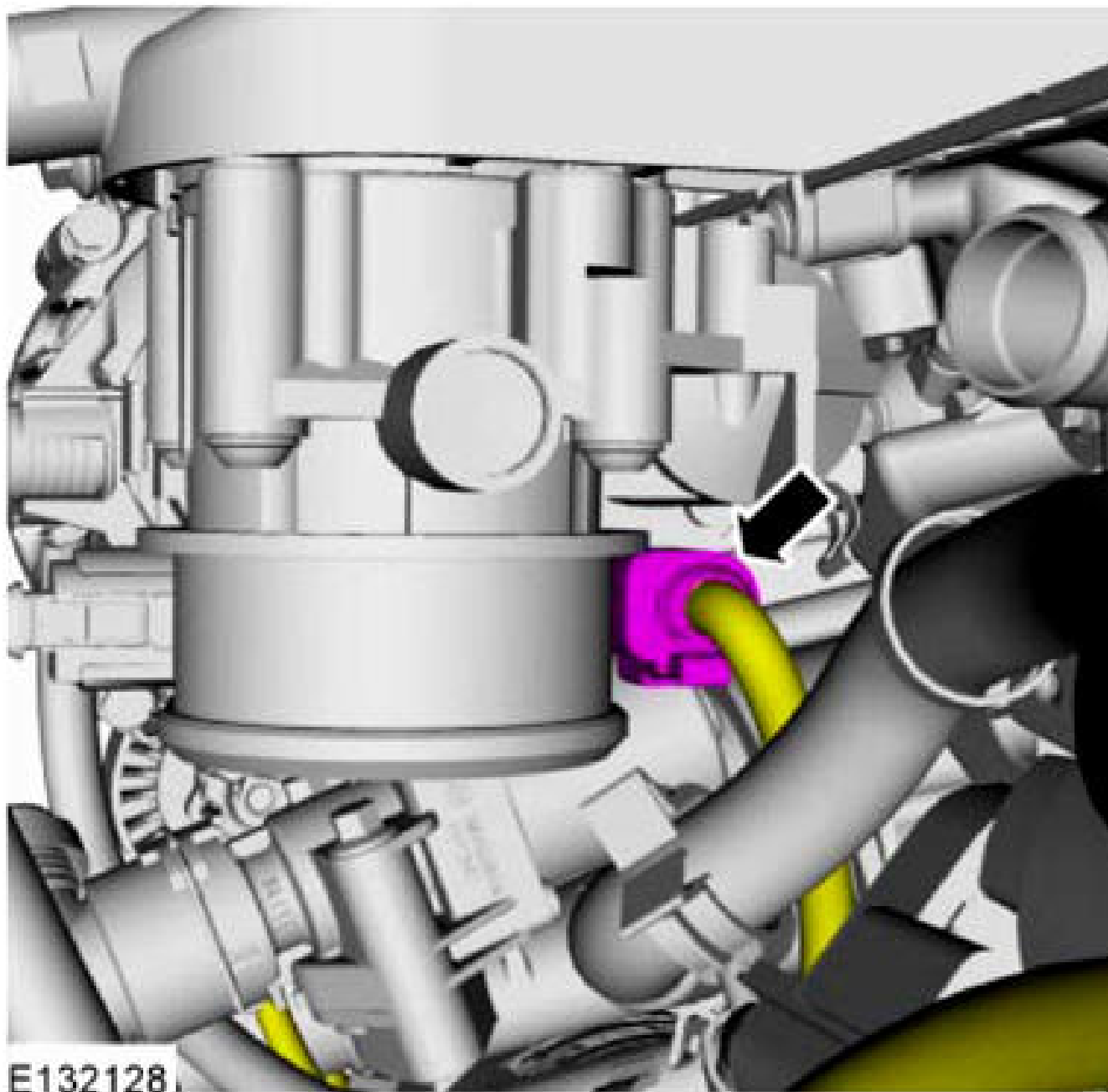




8.

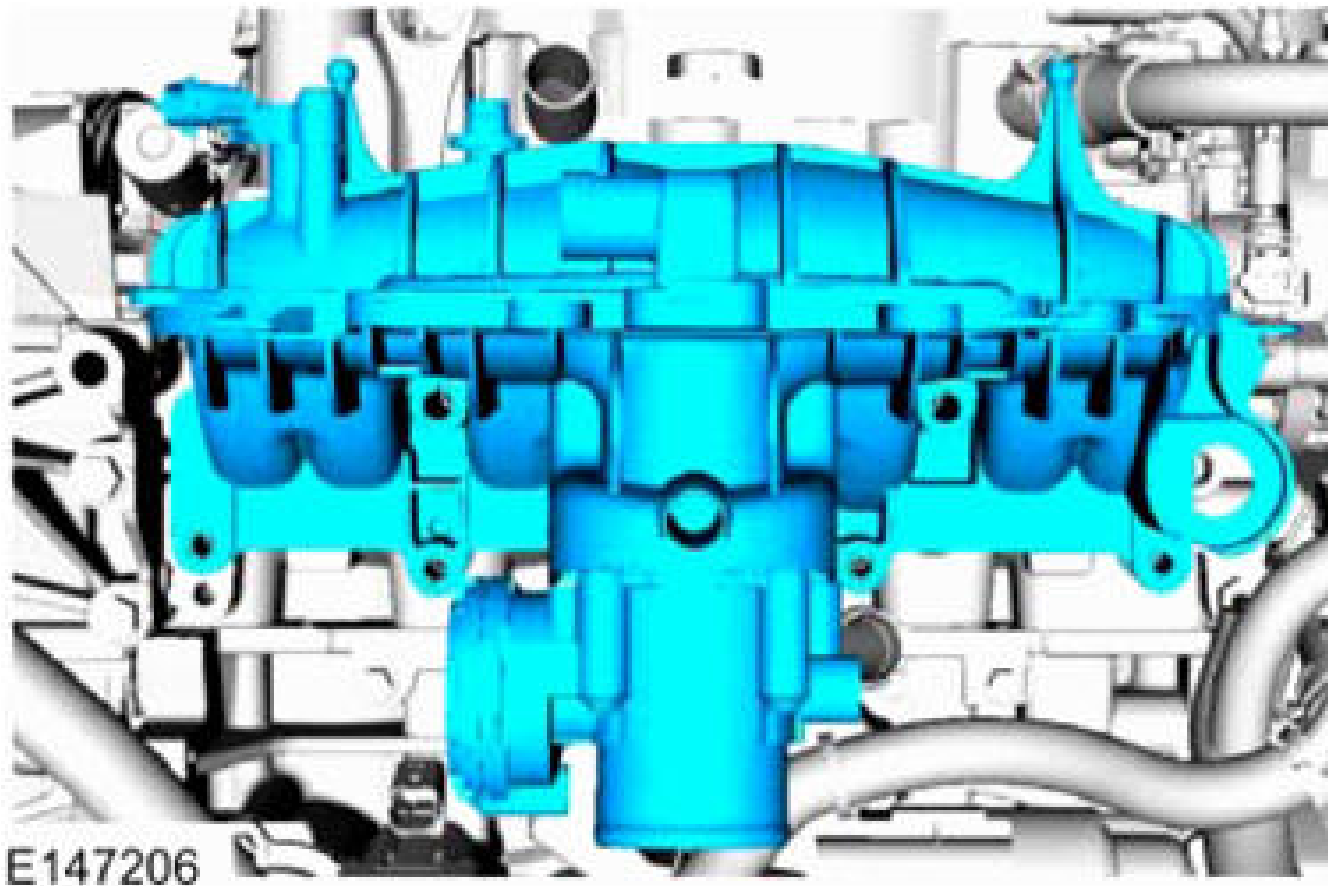
9. **NOTE:** Note the different lengths of the bolts for installation.





10.

11.

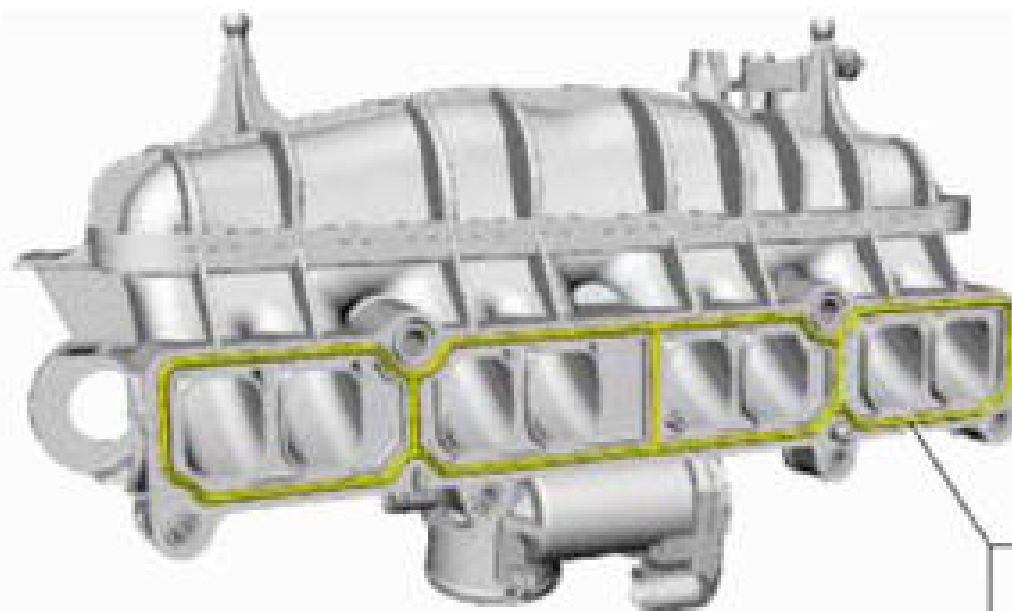


11.

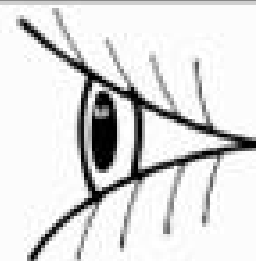
Installation

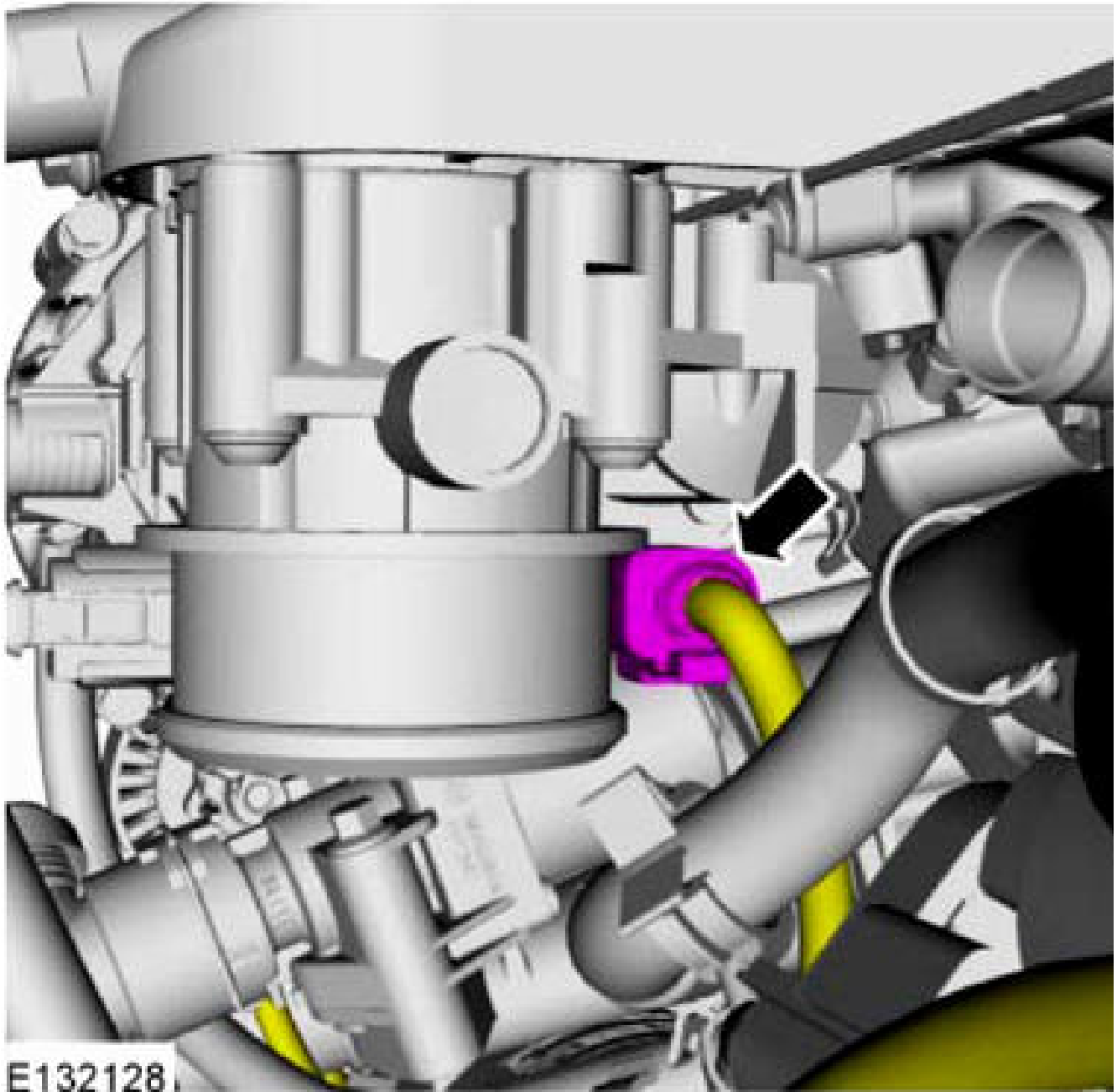
NOTE: If the engine is repaired or replaced because of upper engine failure, typically including valve or piston damage, check the intake manifold for metal debris. If metal debris is found, install a new intake manifold. Failure to follow these instructions can result in engine damage.

1. **NOTE:** Visually inspect the intake manifold gaskets for nicks, cuts and abrasions. If these conditions are not present, the gaskets may be re-used.



E147207



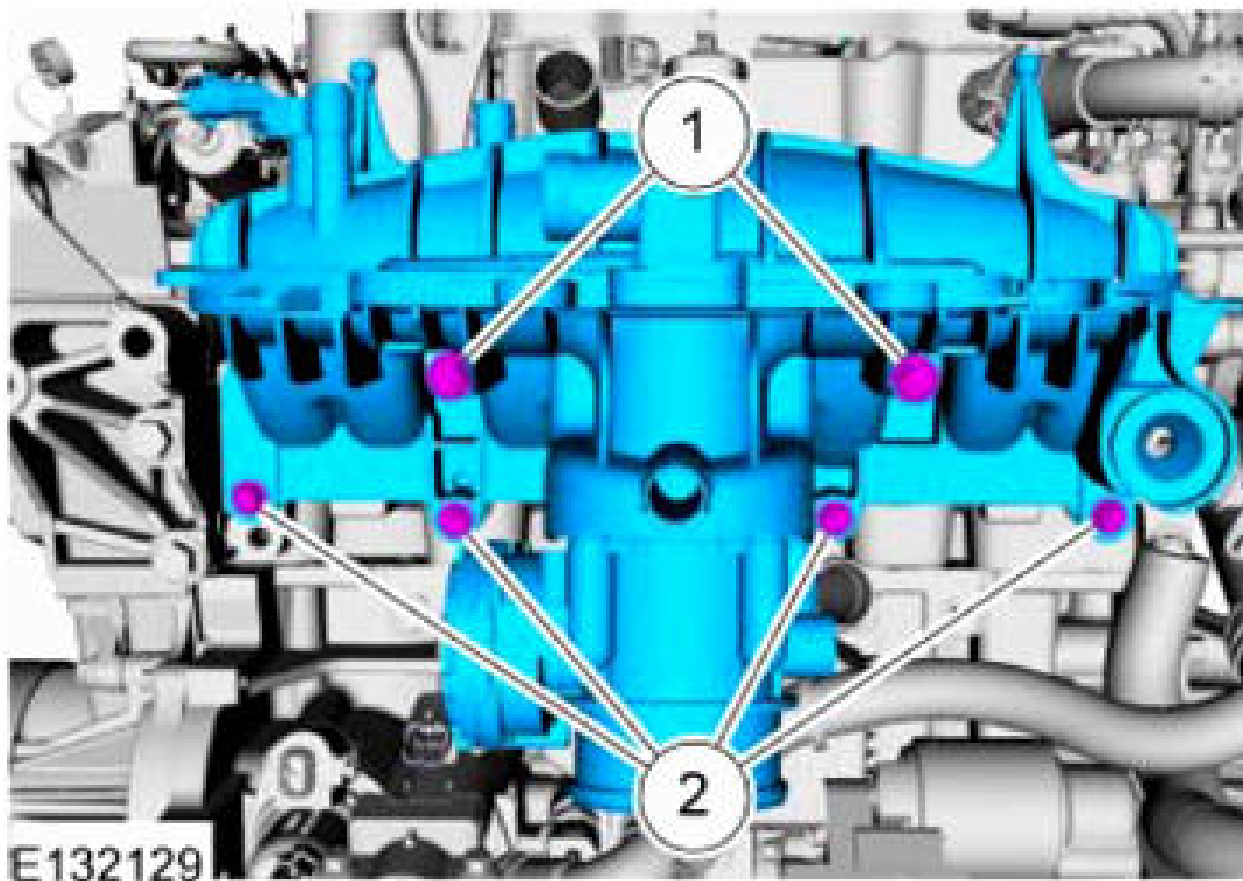


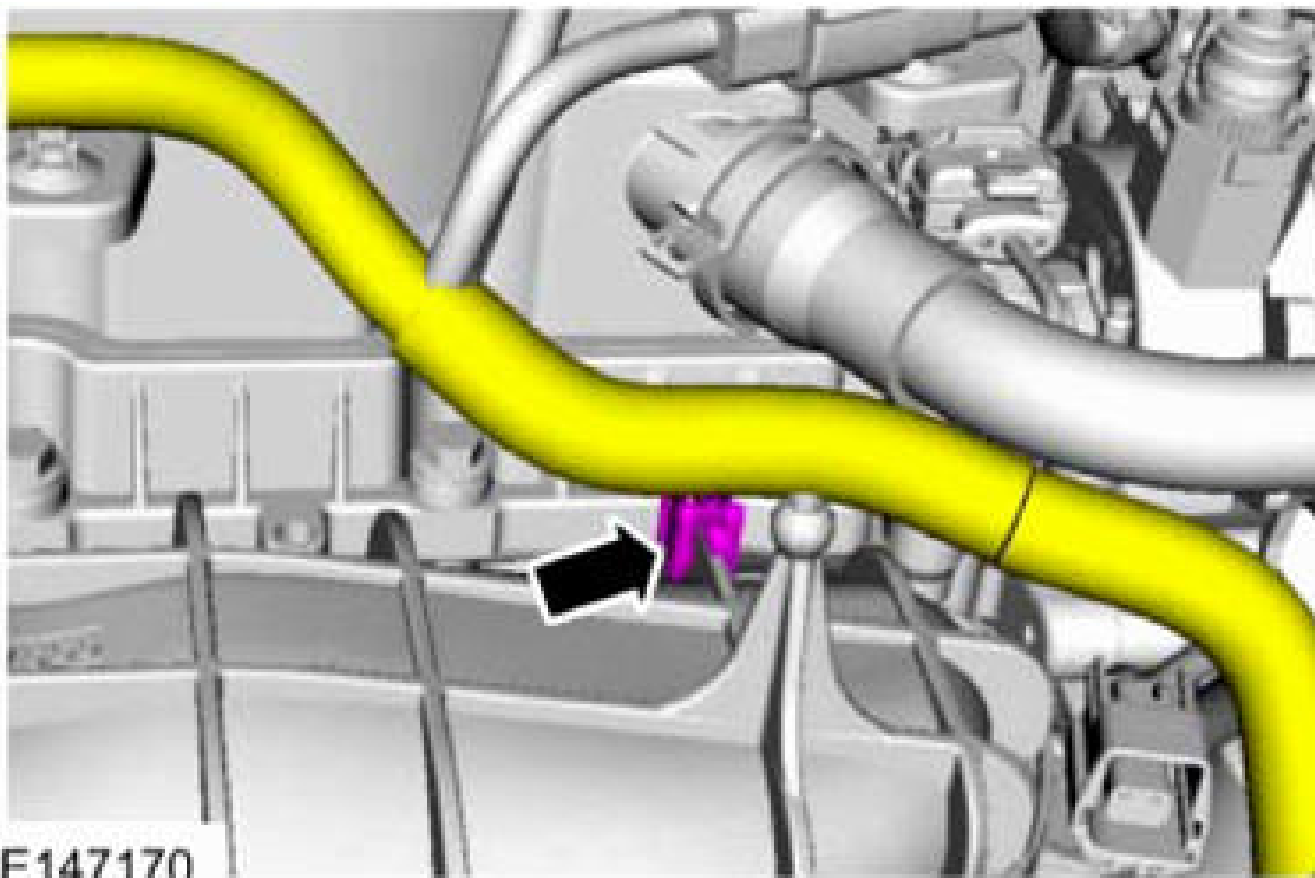
2.

3. **NOTE:** There are different length of bolts noted in removal.

1. *Torque* : 17 Nm

2. *Torque* : 10 Nm

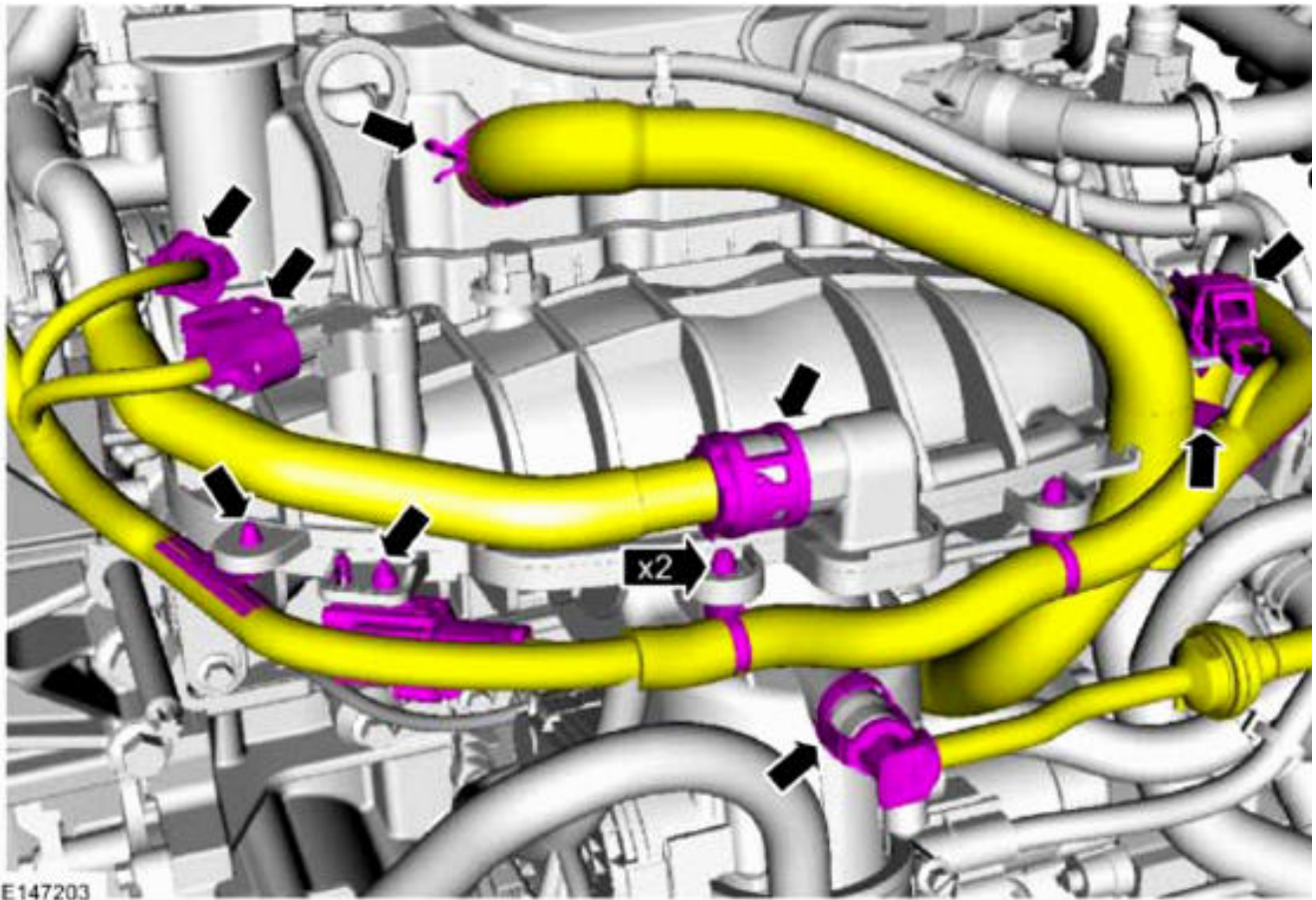




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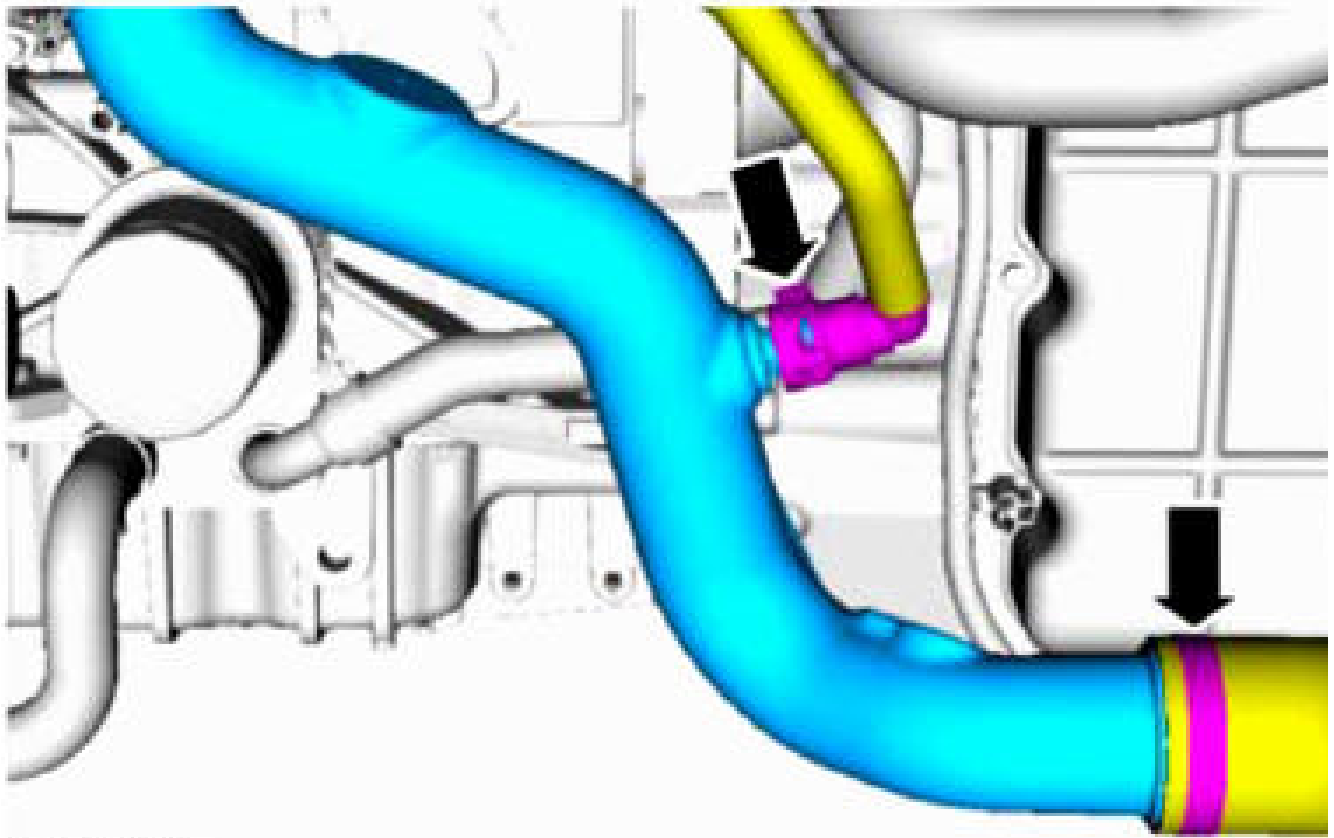
5. Refer to: **QUICK RELEASE COUPLING** .

General Equipment : Hose Clamp Remover/Installer

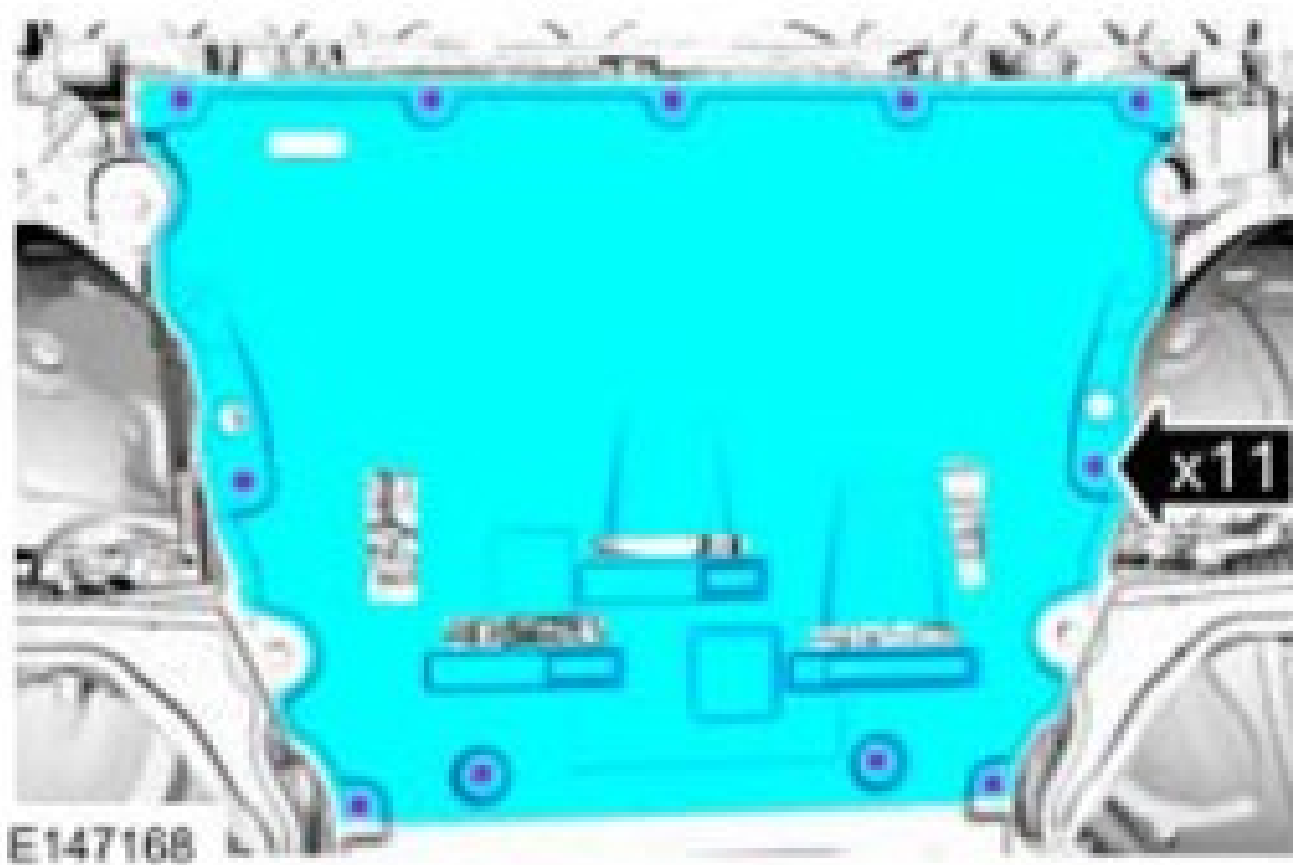


6. Refer to: **GENERATOR - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .
7. Refer to: **QUICK RELEASE COUPLING** .

Torque : 5 Nm

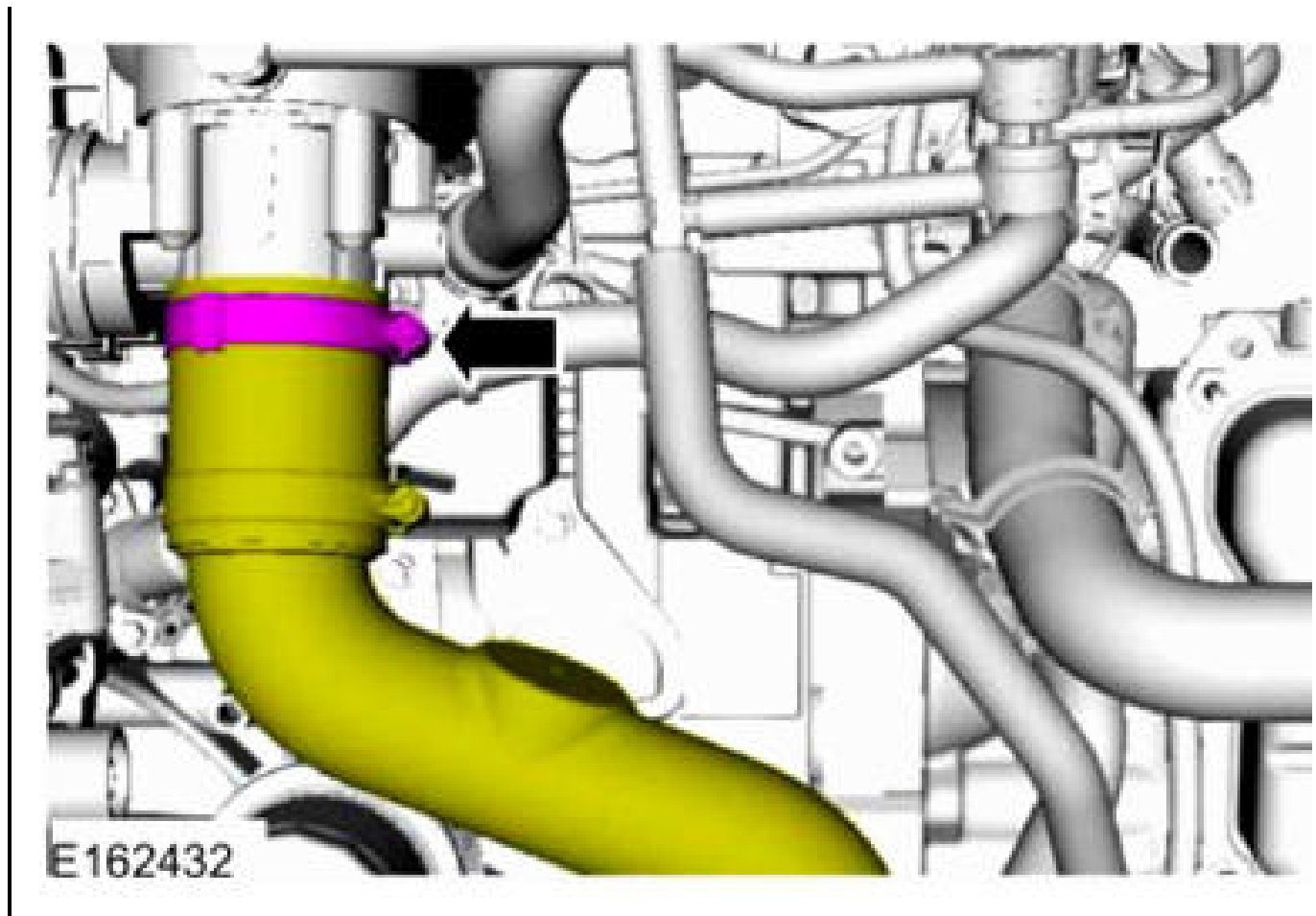


E162433



8.

9. *Torque* : 5 Nm



10. Refer to: **BATTERY DISCONNECT AND CONNECT** .

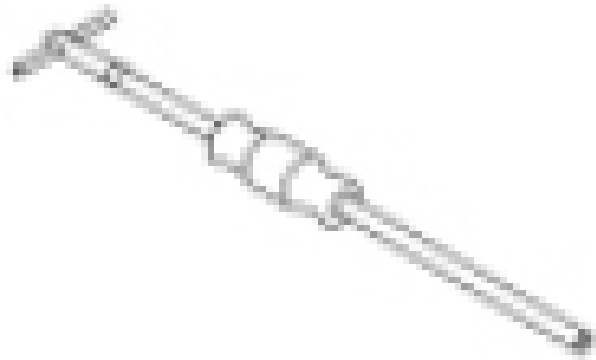
CRANKSHAFT FRONT SEAL

SPECIAL TOOLS/GENERAL EQUIPMENT

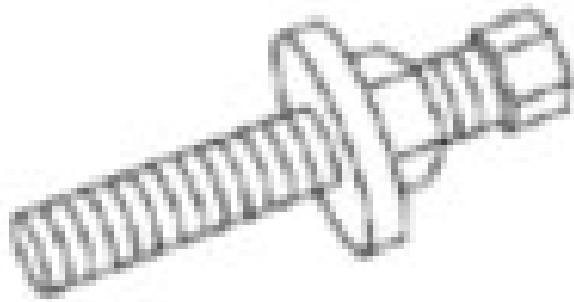
100-001 (T50T-100-A)
Slide Hammer

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E123694



303-175 (T82L-6316-A)

Installer, Crankshaft Vibration Damper TKIT-1982-F



303-335 (T88T-6701-A)

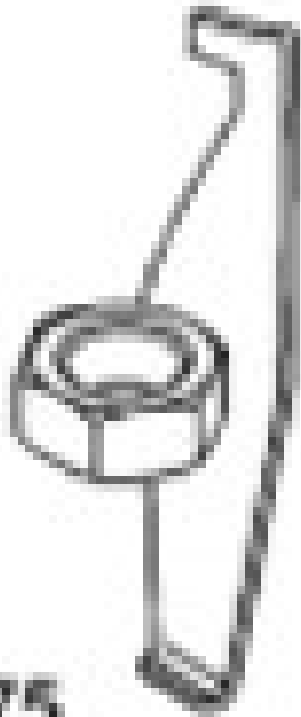
Installer, Front Cover Oil Seal
TKIT-1988-F
TKIT-1988-FLM

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303-420 (T92P-6701-BH)
Installer, Crankshaft Front Oil Seal
TKIT-1992-FLMH/LMH
TKIT-1992-LMH/MH



308-375

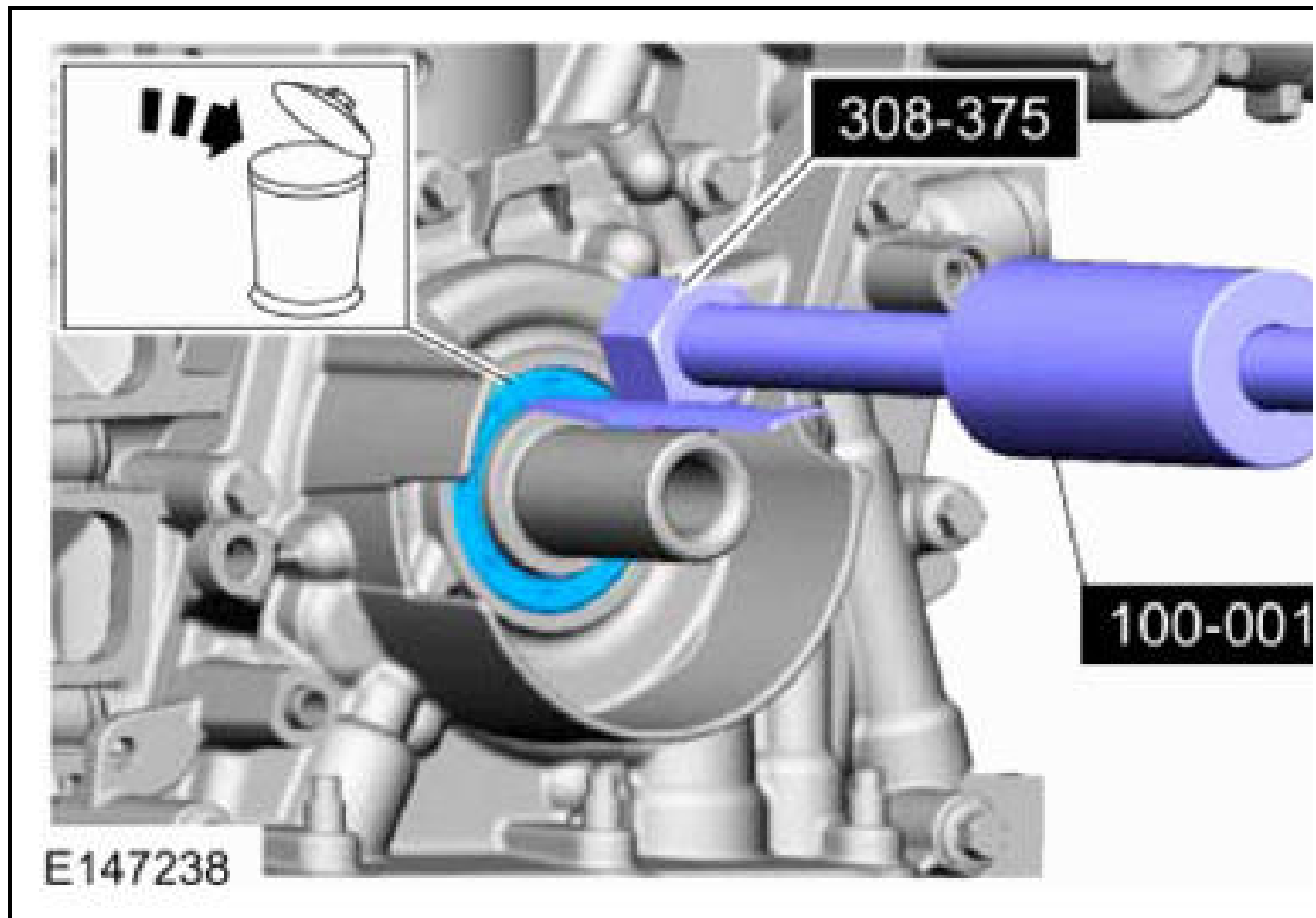
308-375
Remover, Input Shaft Seal
TKIT-1999-F/FLM/LT
TKIT-2005U-M

MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

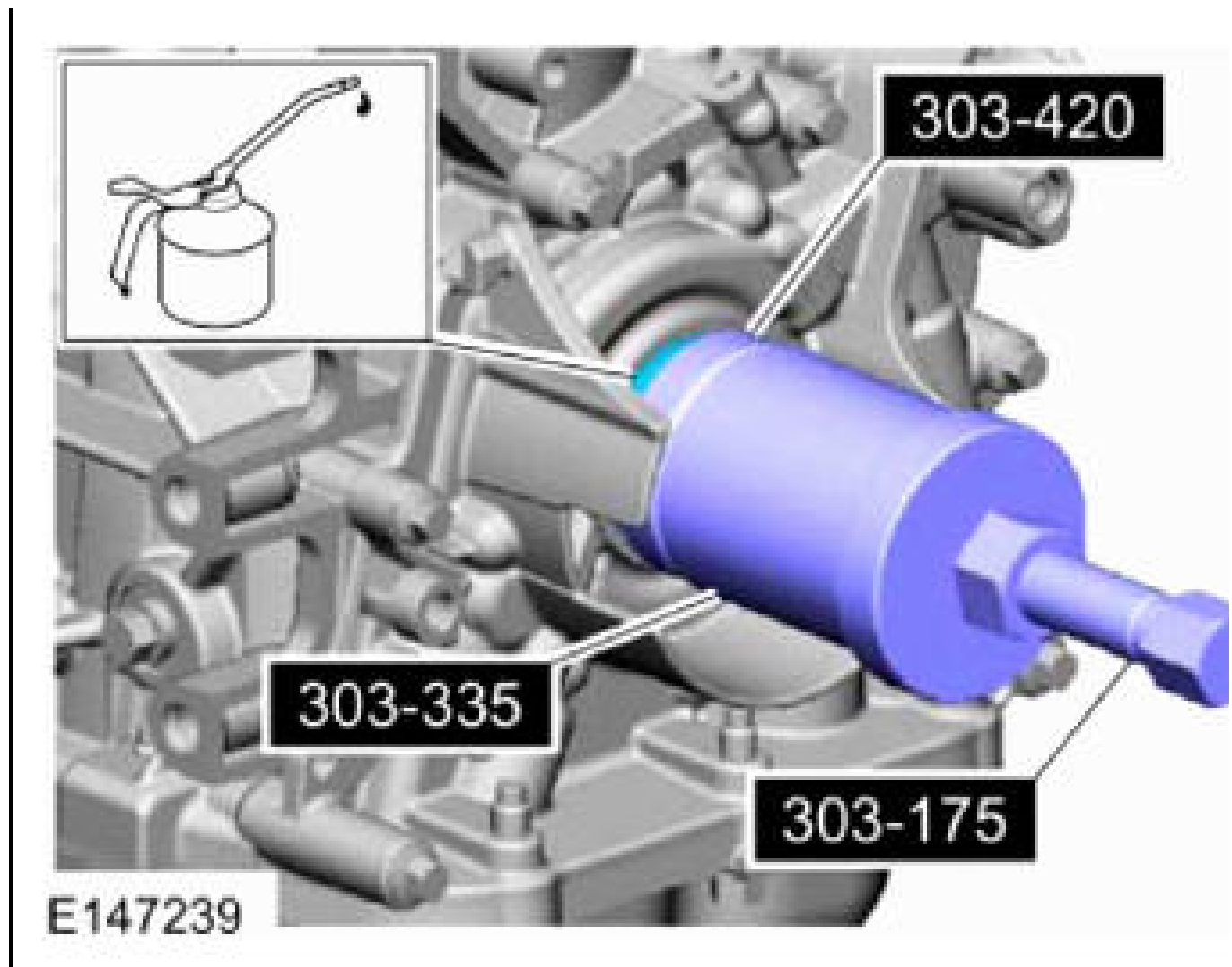
Removal

1. Refer to: **CRANKSHAFT PULLEY** .
2. *Install Special Service Tool : 308-375 Remover, Input Shaft Seal , 100-001 (T50T-100-A) Slide Hammer*

**Installation**

1. **NOTE:** Make sure that the mating faces are clean and free of foreign material.

Special Tool(s) : 303-175 (T82L-6316-A) Installer, Crankshaft Vibration Damper , 303-335 (T88T-6701-A) Installer, Front Cover Oil Seal , 303-420 (T92P-6701-BH) Installer, Crankshaft Front Oil Seal Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



2. Refer to: **CRANKSHAFT PULLEY** .

CRANKSHAFT REAR SEAL

Removal

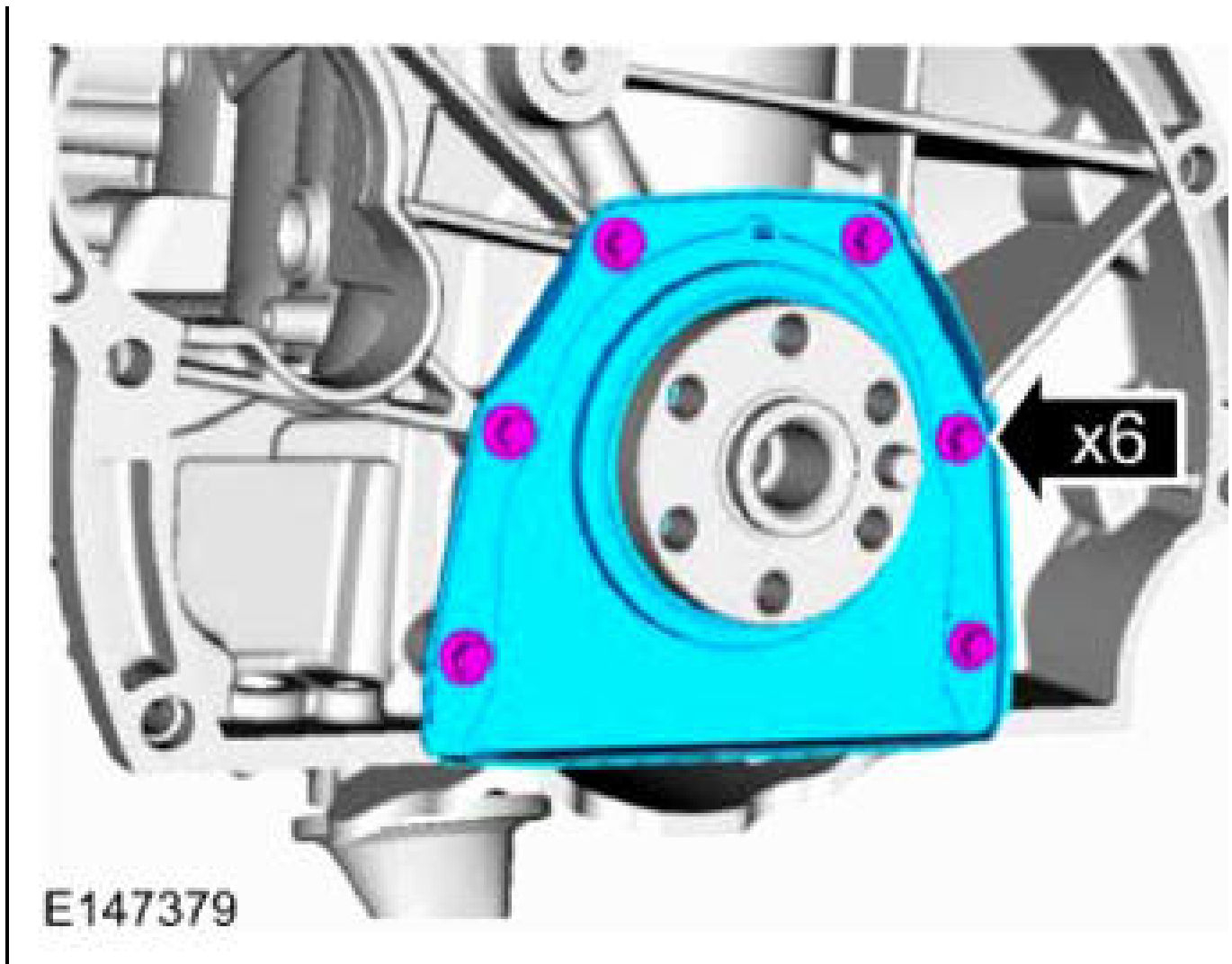
1. Remove the following items:
 1. Remove the flexplate or flywheel.

Refer to: **FLEXPLATE** .

Refer to: **FLYWHEEL** .

2. Refer to: **OIL PAN** .

2.



2.

Installation

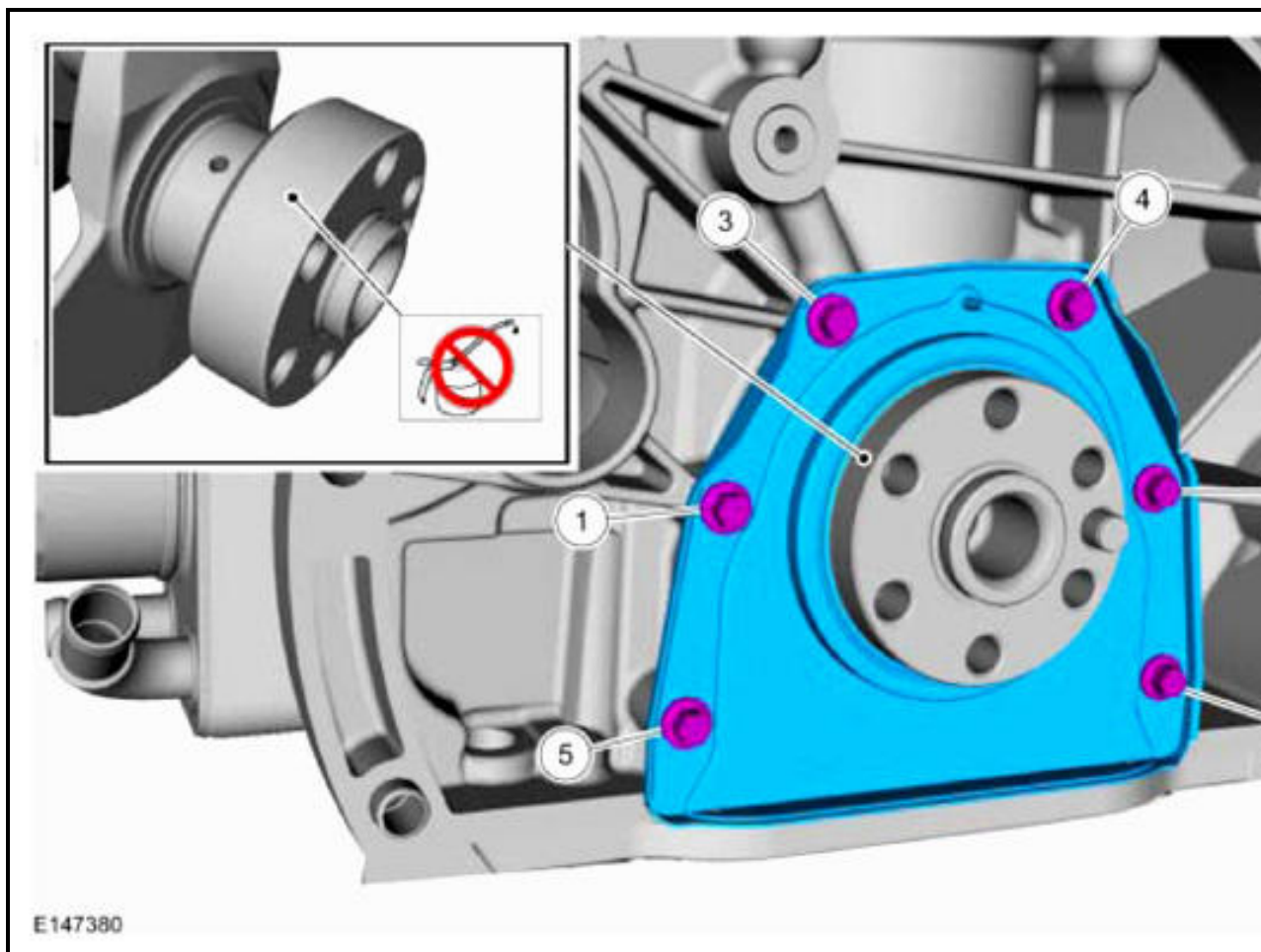
1. **NOTE:** Make sure that the mating faces are clean and free of foreign material.
- NOTE:** The new crankshaft rear seal is supplied with an alignment sleeve which must be removed after installation.
- NOTE:** Do not remove the alignment sleeve from the crankshaft rear seal prior to installation on the crankshaft.
1. Align the crankshaft rear seal and alignment sleeve on the crankshaft and push the crankshaft rear seal off the alignment sleeve onto the crankshaft without stopping until the crankshaft rear seal meets the cylinder block.

Torque :

Stage 1: Tighten bolts 1 through 6 to 4 Nm

Stage 2: Tighten bolts 1 through 6 to 10 Nm

2. Remove the alignment sleeve.



2. Install the following items:

1. Refer to: **OIL PAN** .
2. Install the flexplate or flywheel.

Refer to: **FLEXPLATE** .

Refer to: **FLYWHEEL** .

TIMING BELT

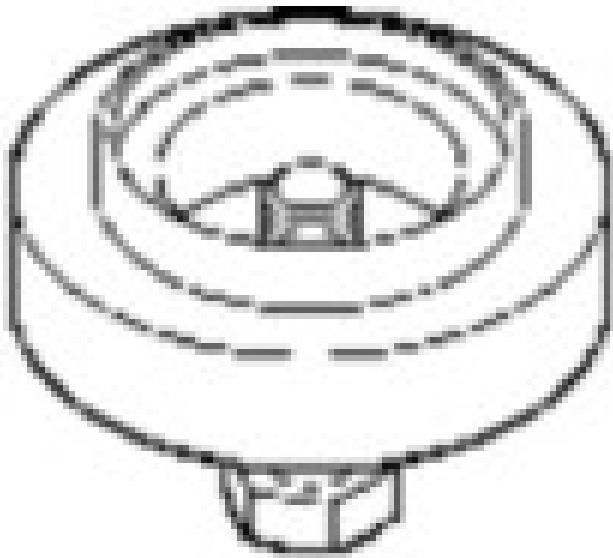
Removal

1. The timing belt is serviced with the crankshaft pulley.

Refer to: **CRANKSHAFT PULLEY** .

Installation

1.

CAMSHAFTS**SPECIAL TOOLS/GENERAL EQUIPMENT****303-1532**

Installer, Camshaft Seal

TKIT-2001B-FLM

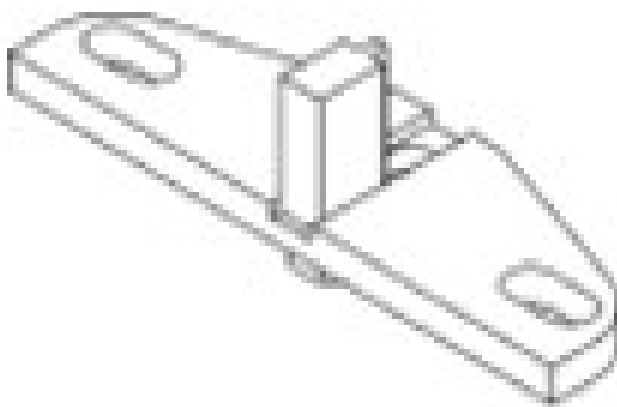
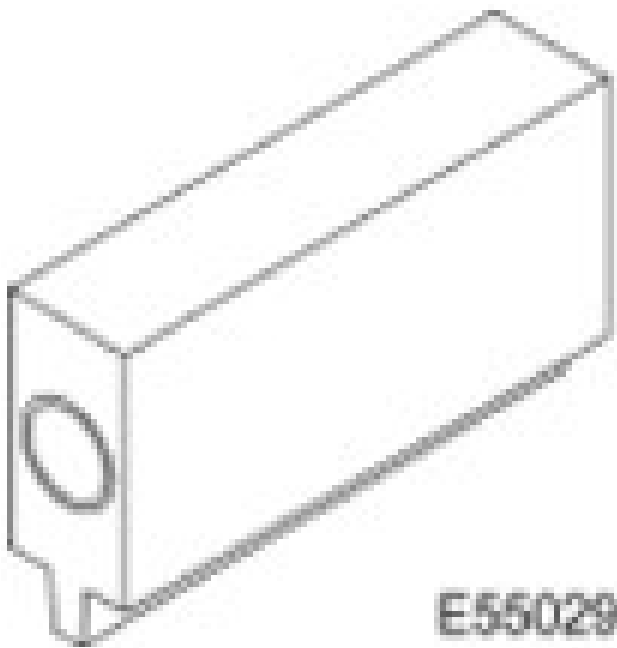
TKIT-2001B-ROW

303-393-02

Adapter for 303-393

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion

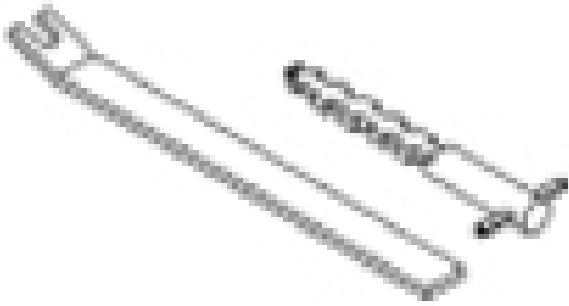


303-393A
Locking Tool, Flywheel

303-409 (T92C-6700-CH)
Remover, Crankshaft Seal
TKIT-1992-FH/FMH/FLMH

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion

**E134603**

TKIT-1993-LMH/MH

**303748****303-748**

Locking Tool, Crankshaft

TKIT-2001B-FLM

TKIT-2001B-ROW

Feeler Gauge

MATERIALS SPECIFICATIONS

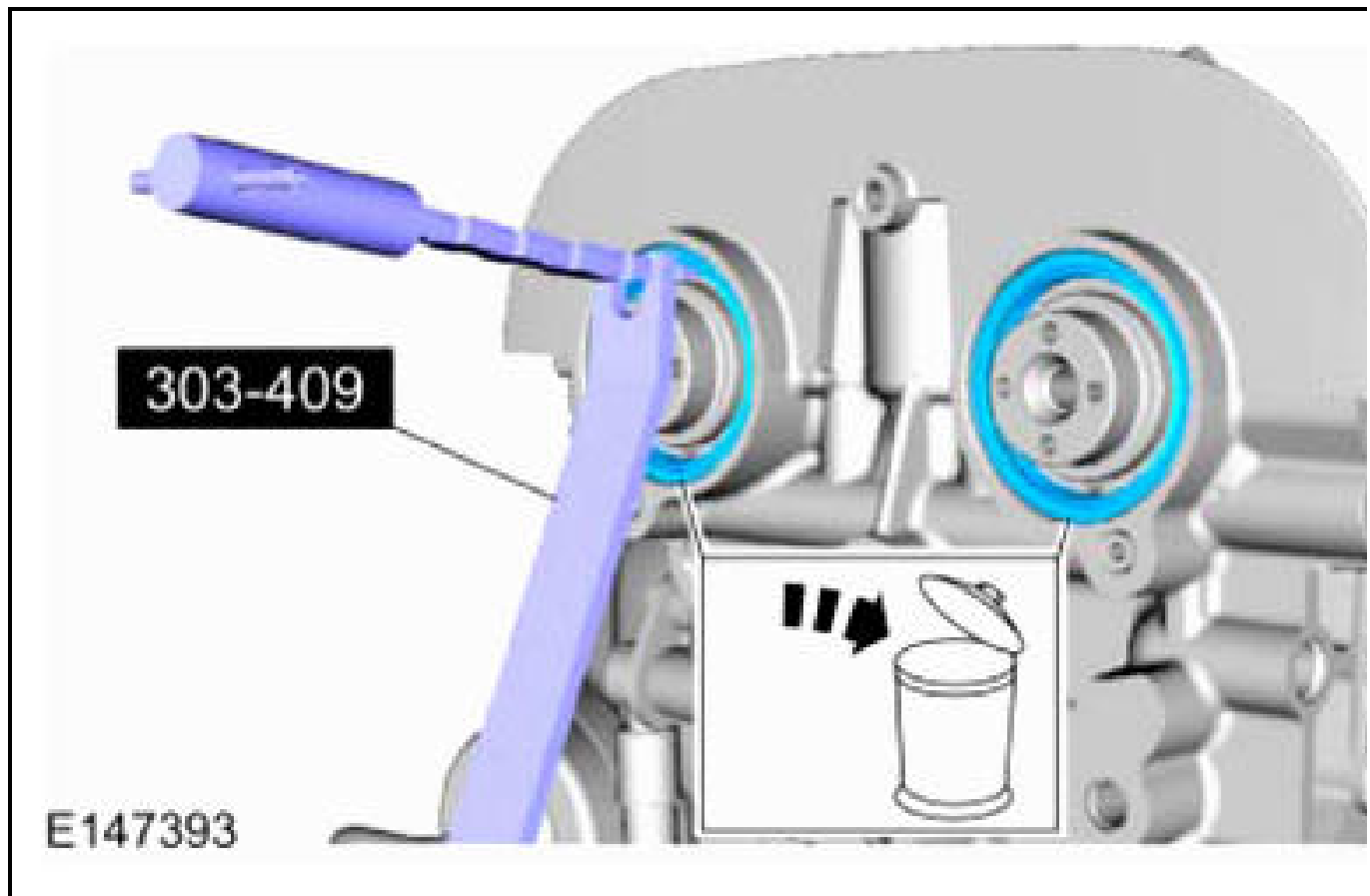
Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A
Motorcraft® Metal Surface Prep ZC-31-A	-
Flange Sealant CU7Z-19B508-A	WSS-M2G348-A11

Removal

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

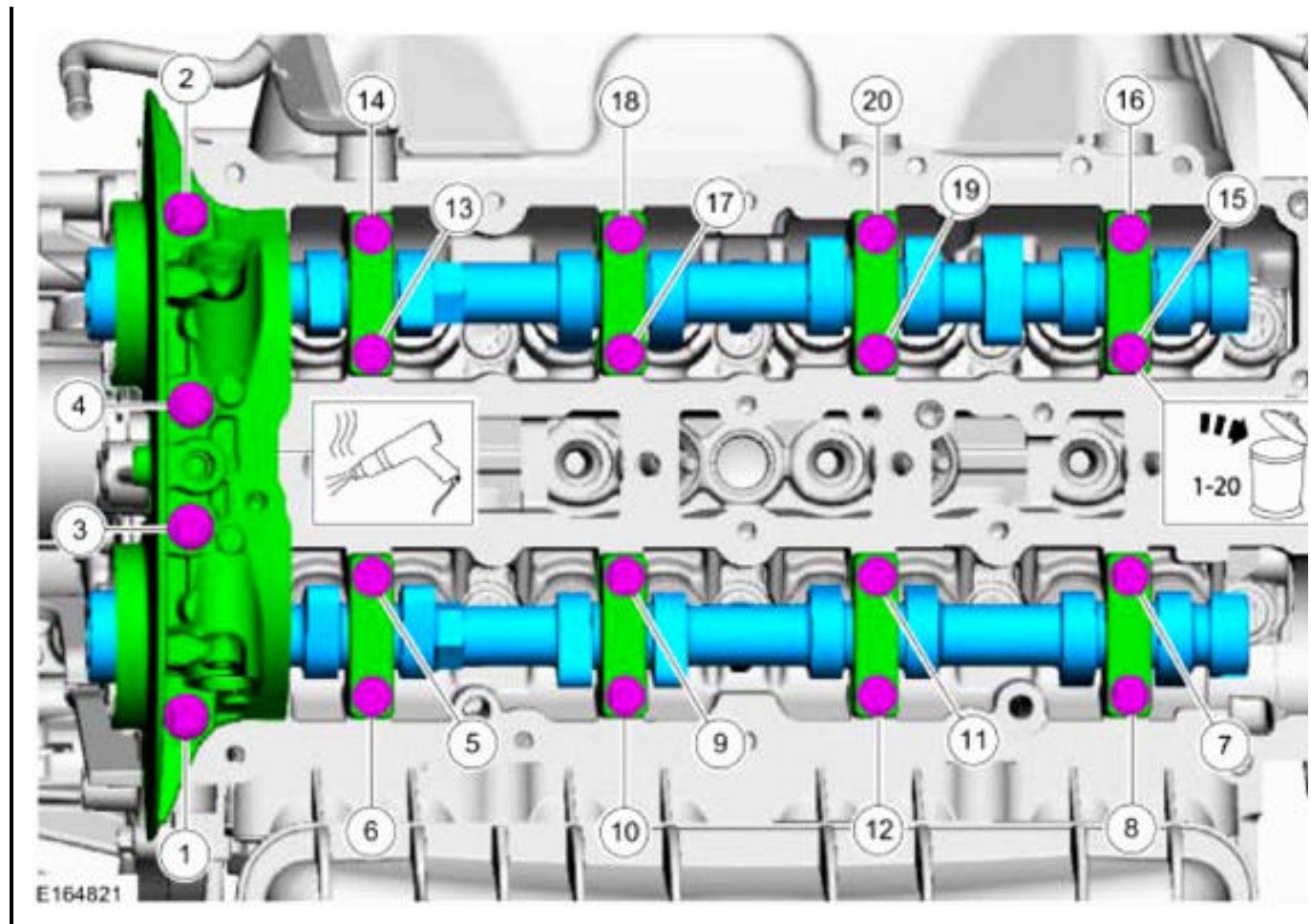
NOTE: Do not rotate the camshafts unless instructed to in this procedure. Rotating the camshafts or crankshaft with timing components loosened or removed can cause serious damage to the valves and pistons.

1. Refer to: **VARIABLE VALVE TIMING (VVT) UNIT** .
2. *Special Tool(s)* : 303-409 (T92C-6700-CH) Remover, Crankshaft Seal

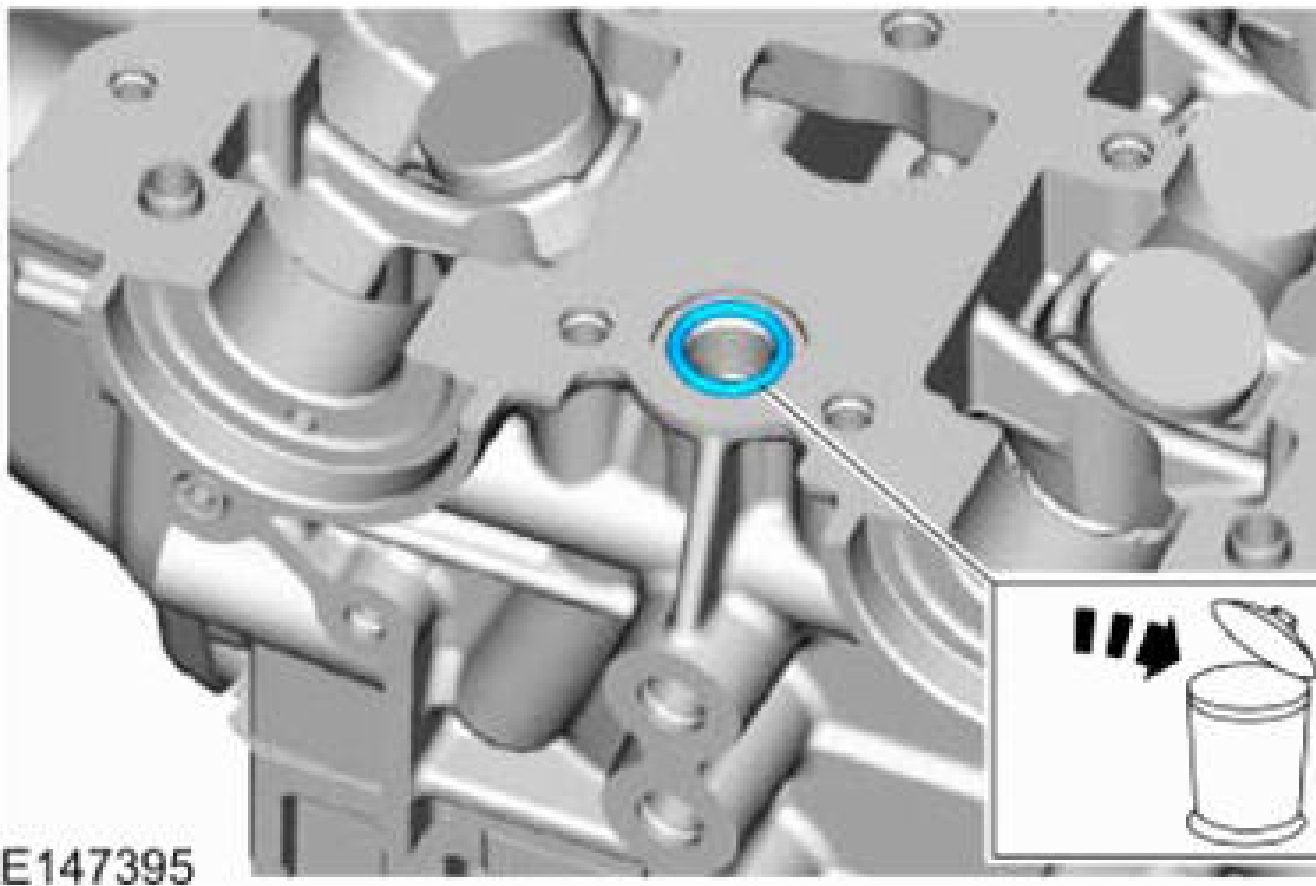


- NOTE:** Use a heat gun to soften the flange sealant, this will aid in the removal of the camshaft mega cap. Failure to follow these directions may result in damage to the camshaft mega cap.
- 3.

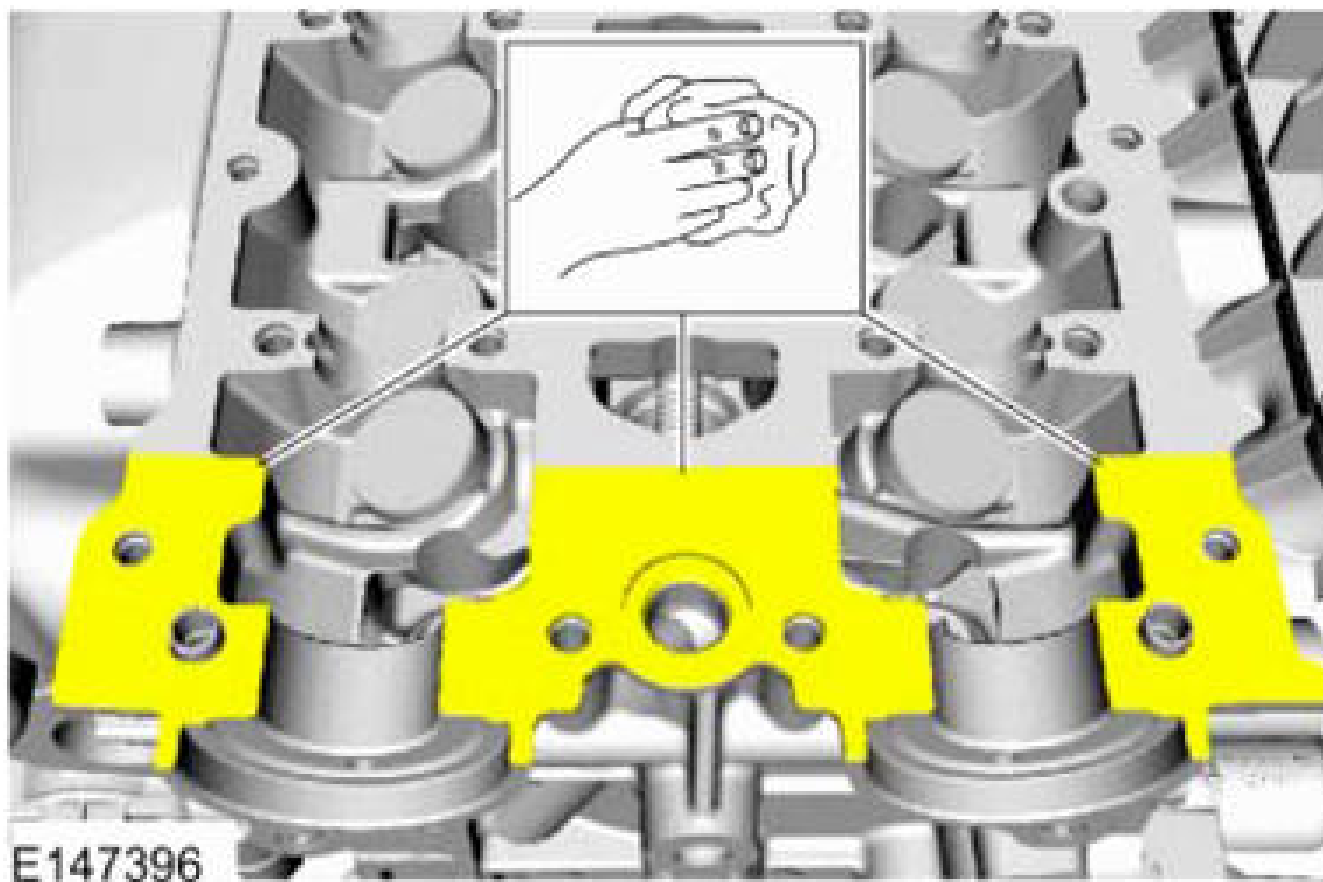
NOTE: Note the position of the components before removal.



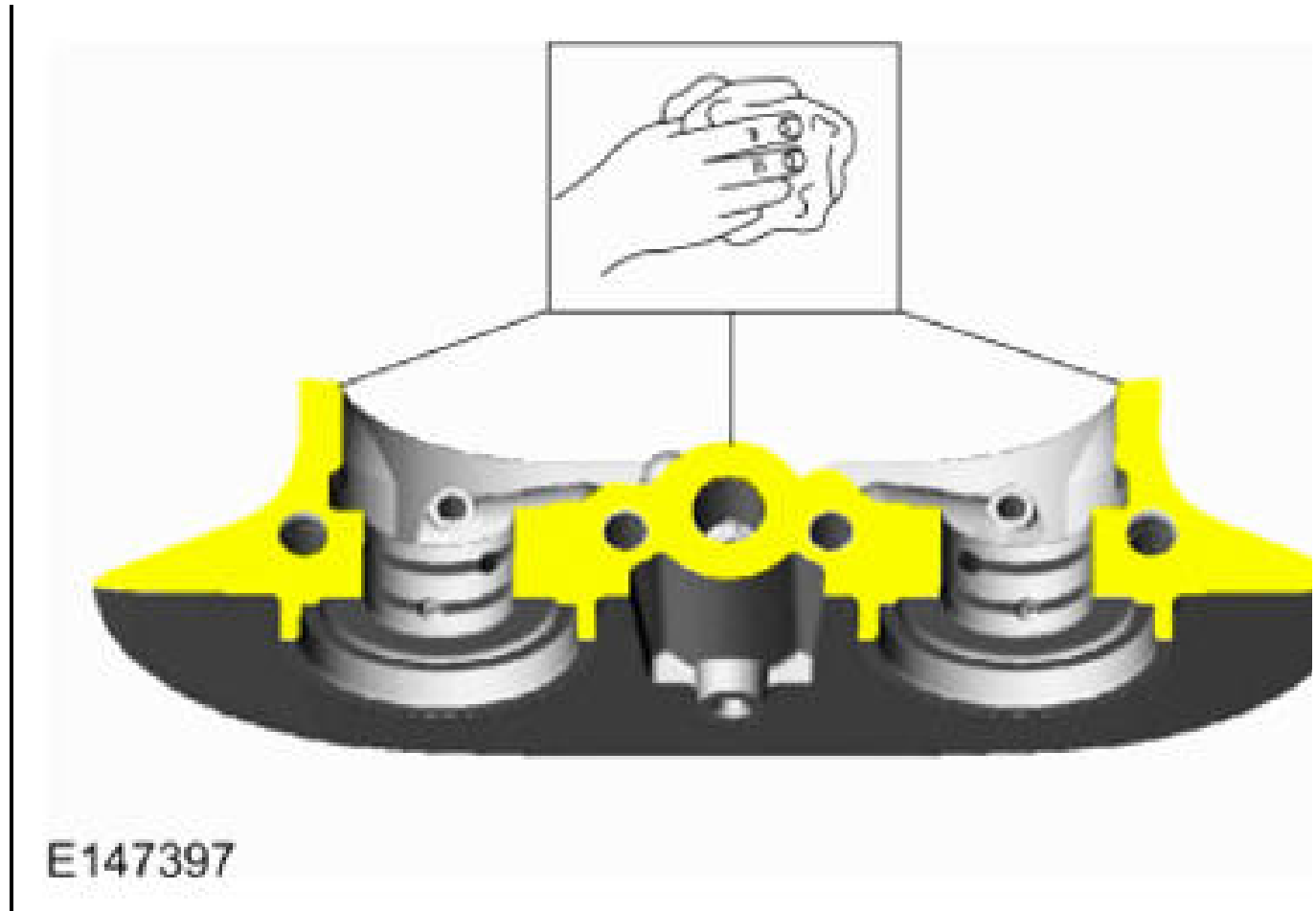
4.



- 4.
5. *Material* : Motorcraft® Metal Surface Prep/ZC-31-A

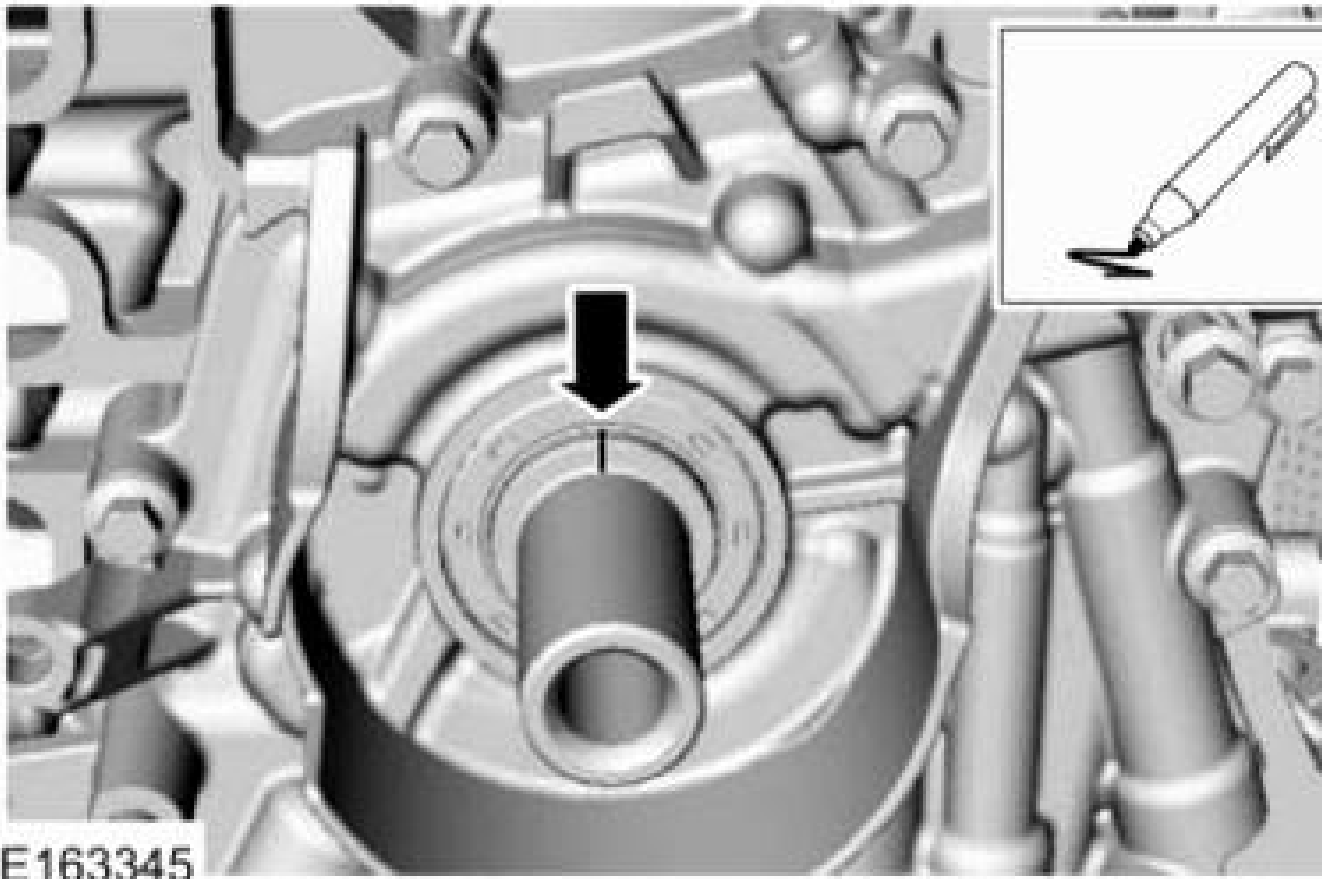


6. *Material* : Motorcraft® Metal Surface Prep/ZC-31-A

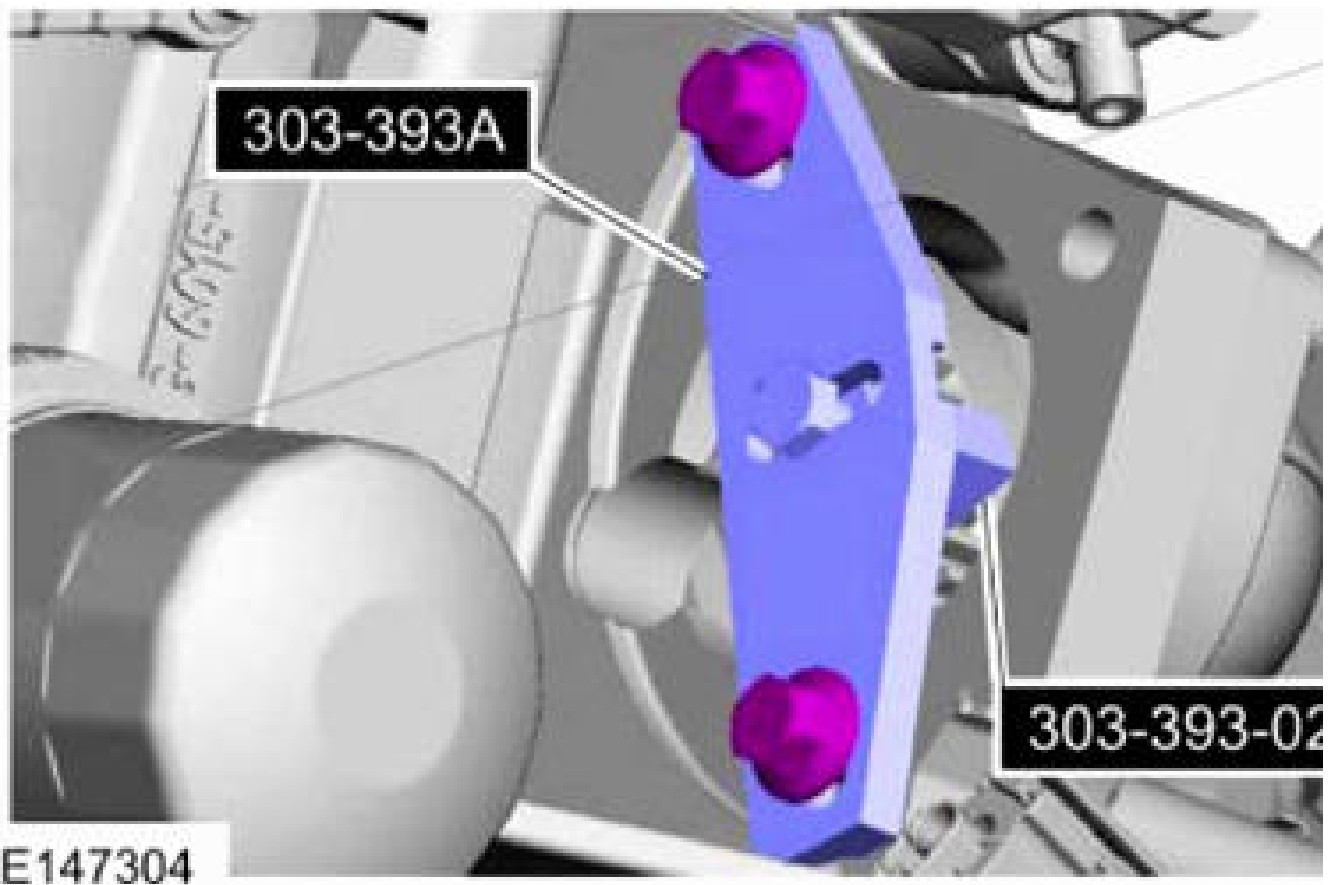
**Installation**

- NOTE:** If any new parts are being installed (cylinder head, valves, tappets, camshafts) it is necessary to check the valve clearance, follow the next 12 steps exactly or serious damage to the engine may occur. If the original parts are being installed it is not necessary to check the valve clearance so proceed to step 13.
- 1.

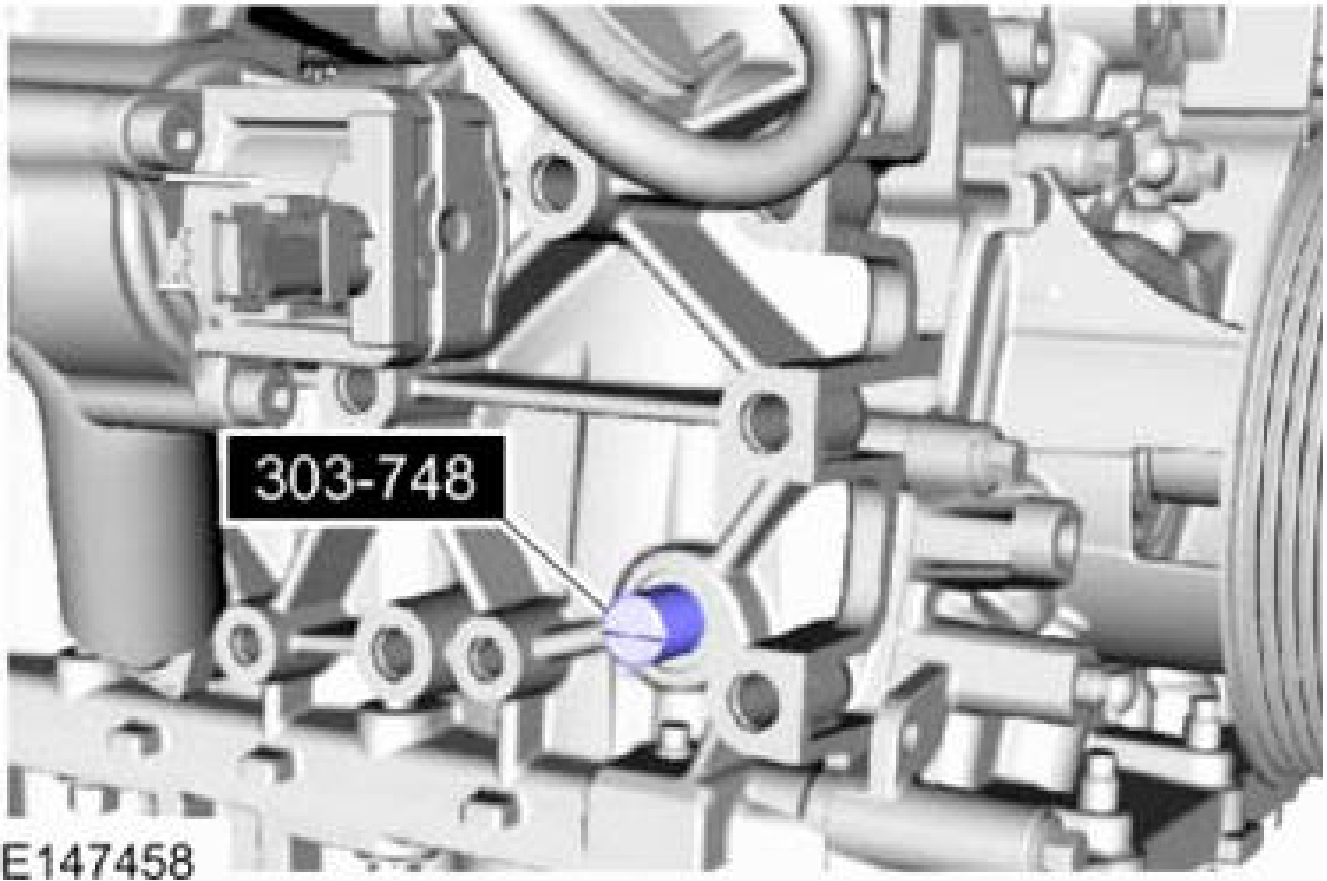
Place a paint mark on the crankshaft at the 12 o'clock position.



2. *Remove Special Service Tool : 303-393A Locking Tool, Flywheel , 303-393-02 Adapter for 303-393*



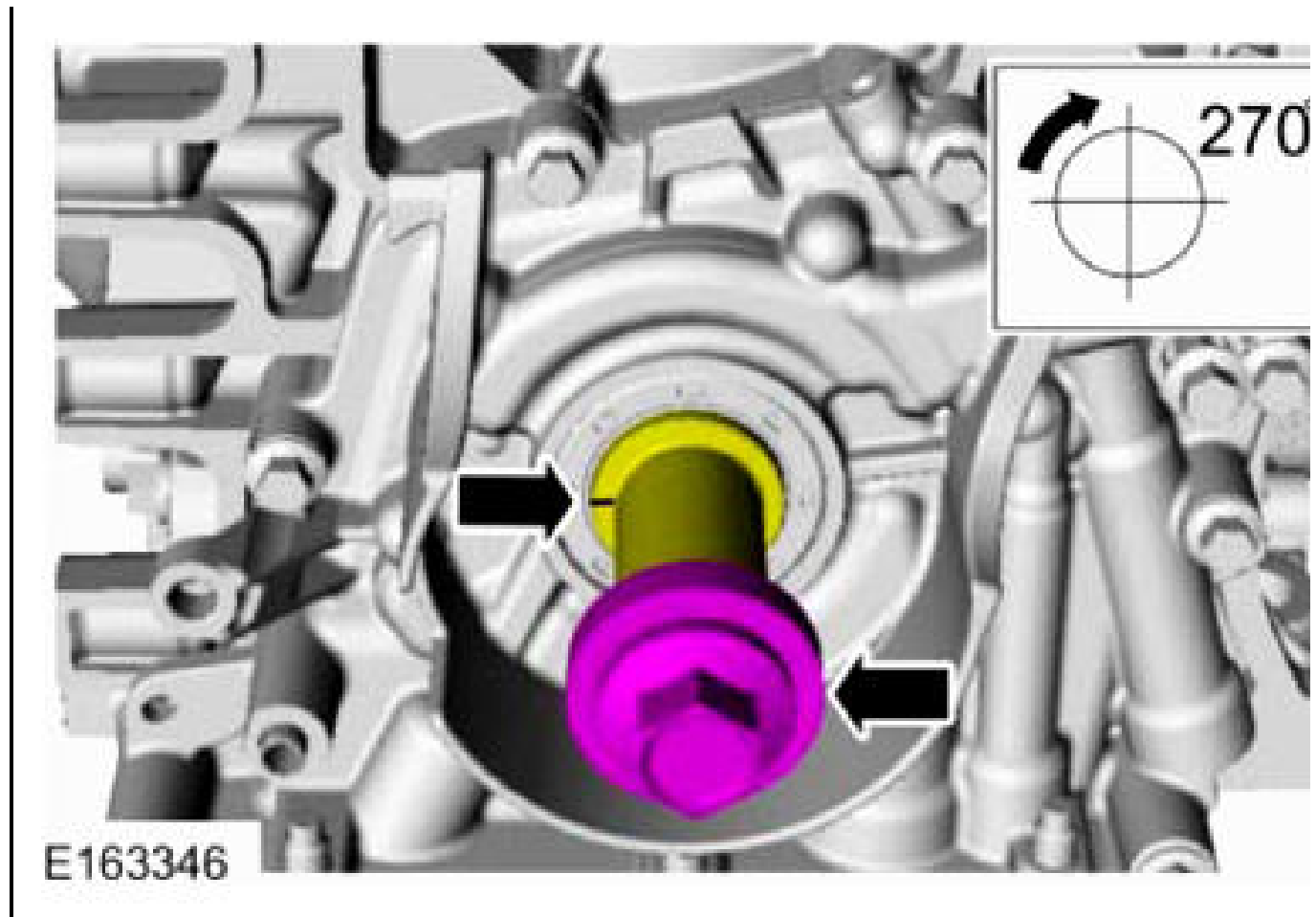
3. *Remove Special Service Tool : 303-748 Locking Tool, Crankshaft*



NOTE: Rotating the crankshaft will position all of the pistons below the deck of the cylinder block and allow the camshafts to be installed and the valve clearance checked without the possibility of damage to the valves or pistons.

4.

Using the crankshaft bolt and washer, rotate the crankshaft clockwise 270 degrees until the paint mark is at the 9 o'clock position



5. **NOTE:** Failure to follow the camshaft tightening procedure can result in damage to the camshafts.
- NOTE:** Make sure that the camshafts and camshaft bearing caps are installed in their original locations or damage to the engine may occur.
- NOTE:** Make sure that the components are installed to the position noted before removal.
- NOTE:** Make sure that new bolts are installed.
- NOTE:** Apply clean engine oil to the bearing surfaces of the camshafts, camshaft bearing caps and the VCT bridge.

Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-

M2C945-A)

Torque :

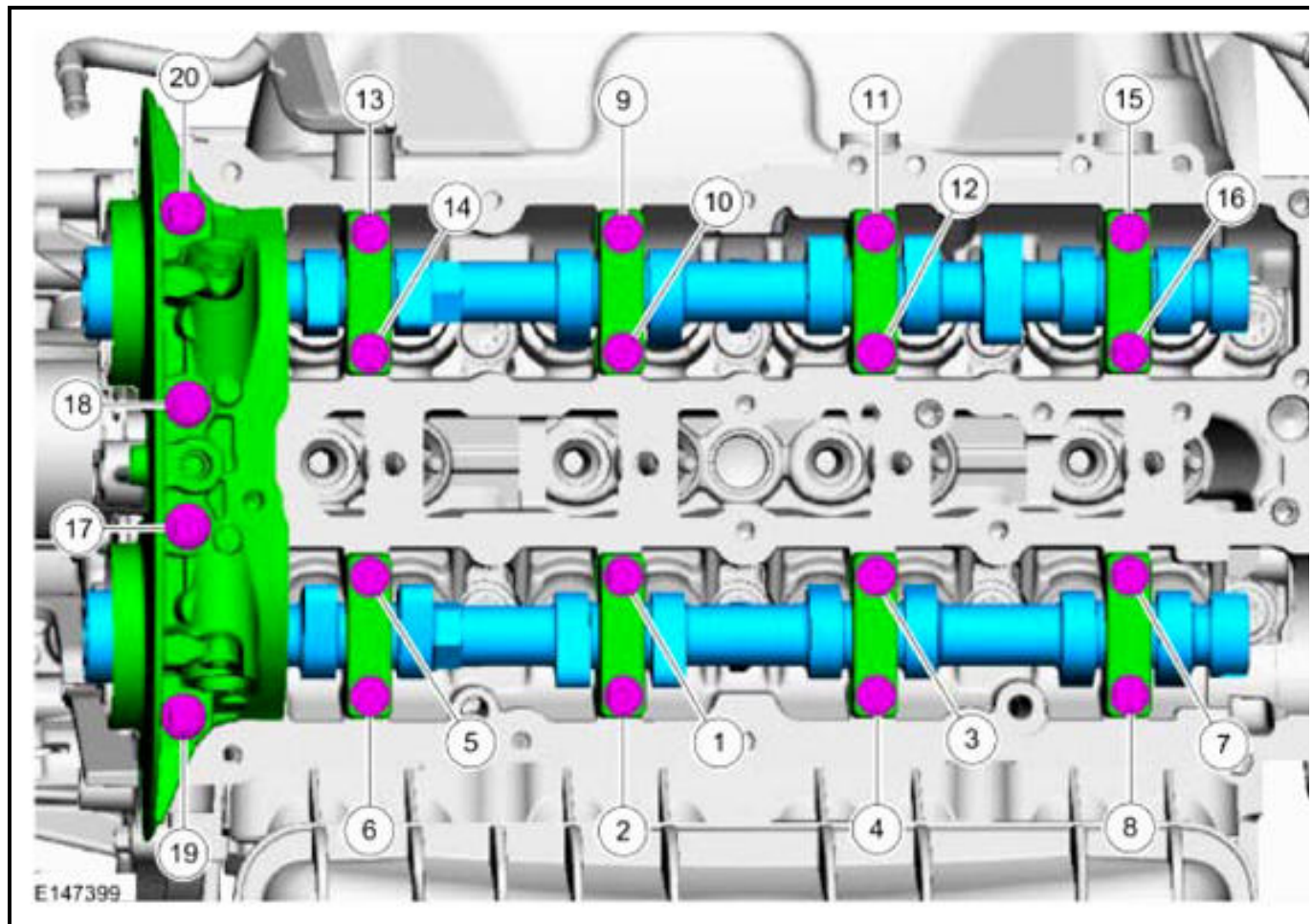
Stage 1: Tighten bolts 1 through 16 to 7 Nm

Stage 2: Tighten bolts 17 through 20 to 10 Nm

Stage 3: Tighten bolts 1 through 16 an additional 45°

Stage 4: Tighten bolts 17 and 18 an additional 70°

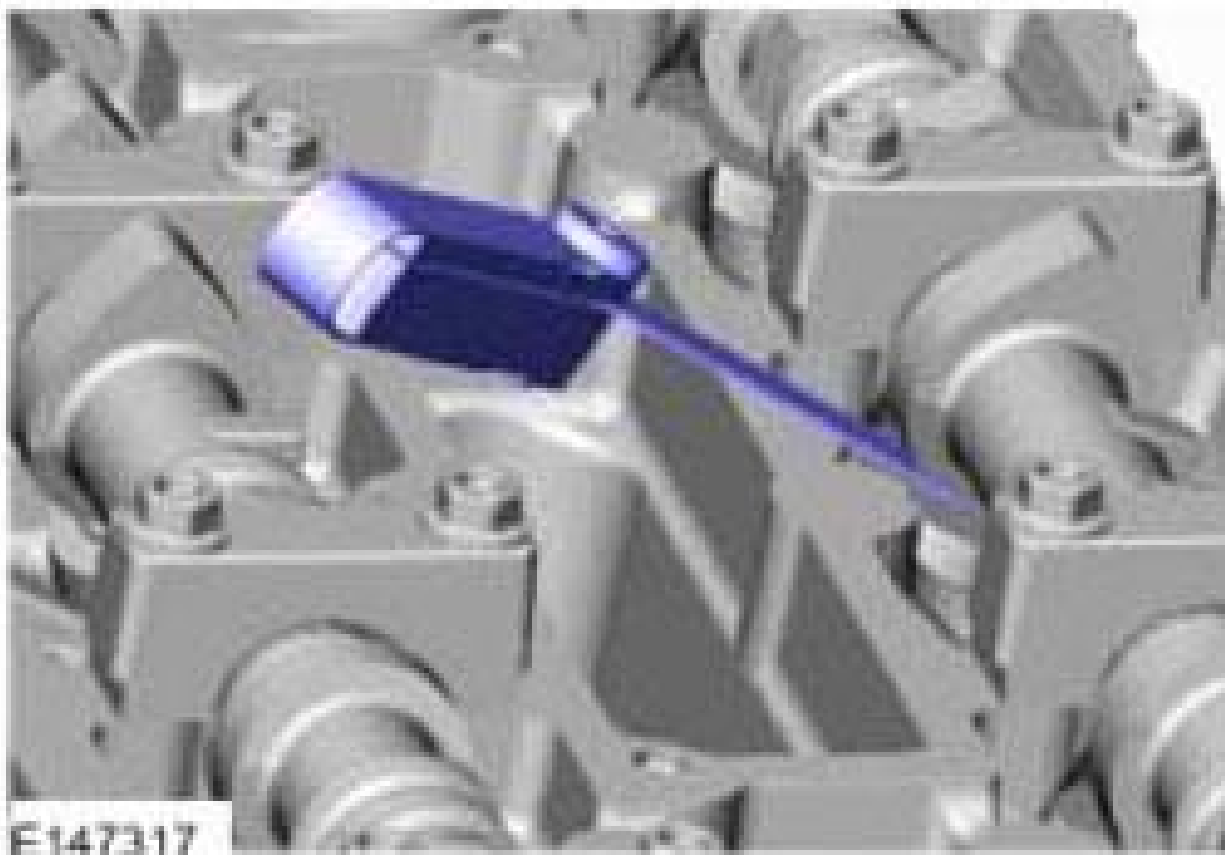
Stage 5: Tighten bolts 19 and 20 an additional 53°



6.
 1. Using the flats of the camshaft, rotate the camshaft to place the cam lobe at base circle, with the lobe pointed away from the tappet.
 2. Use a feeler gauge to measure the clearance of each valve and record its location.

General Equipment : Feeler Gauge

3. Repeat to measure all of the lobe/tappet clearances.



NOTE: Select tappets using this formula: ideal tappet thickness = measured clearance + the existing tappet thickness - nominal clearance. Select the closest tappet size to the ideal tappet thickness available and mark the installation location.

7.

NOTE: The nominal clearance is 0.0079 in (.2 mm) for intake and 0.0134 in (.34 mm) for exhaust.

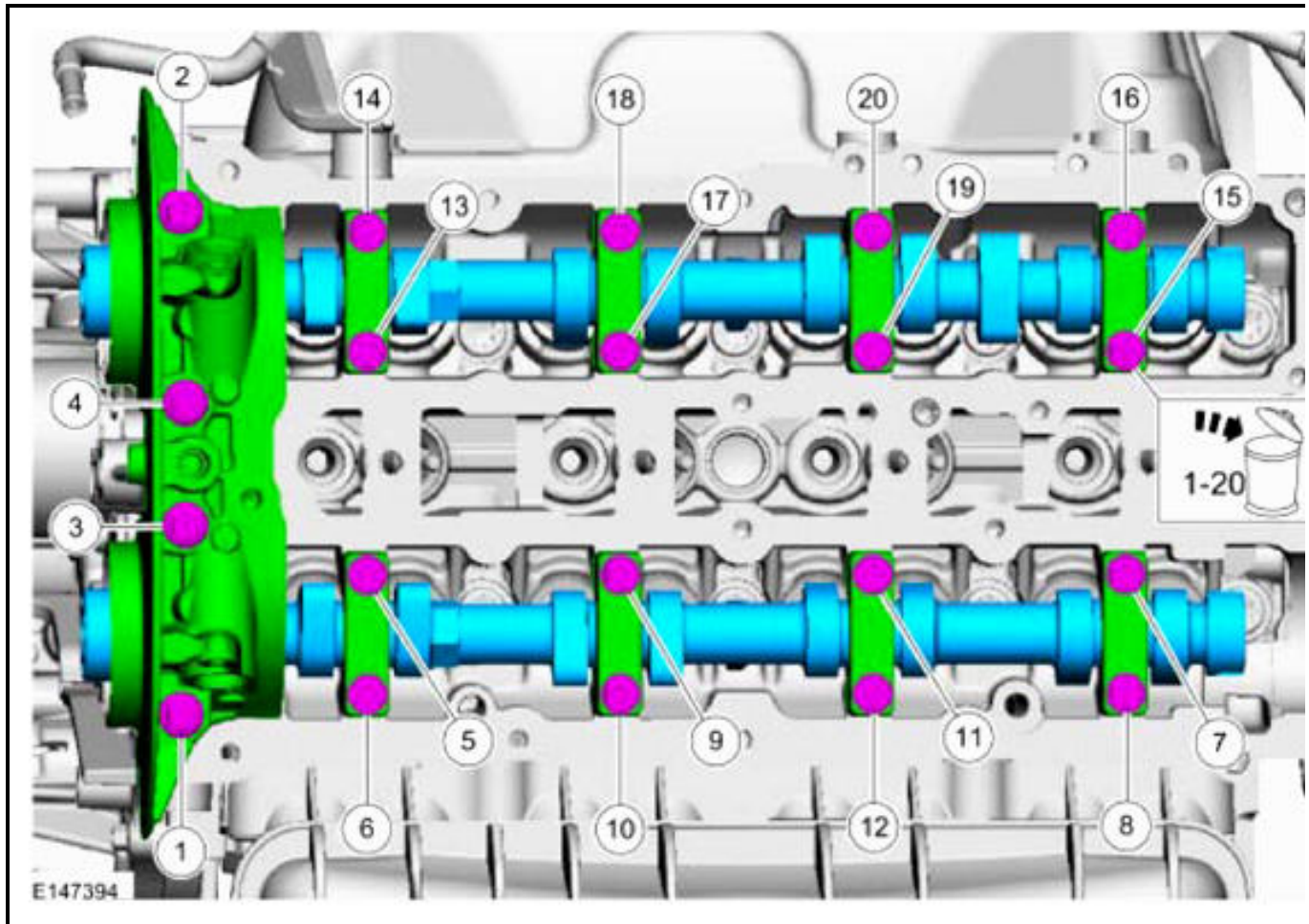
NOTE: The acceptable clearances after being fully installed is 0.007-0.009 in (.17-.23 mm) for intake and 0.012-0.015 in (.31-.37 mm) for exhaust.

NOTE: Failure to follow the camshaft loosening procedure can result in damage to the camshafts.

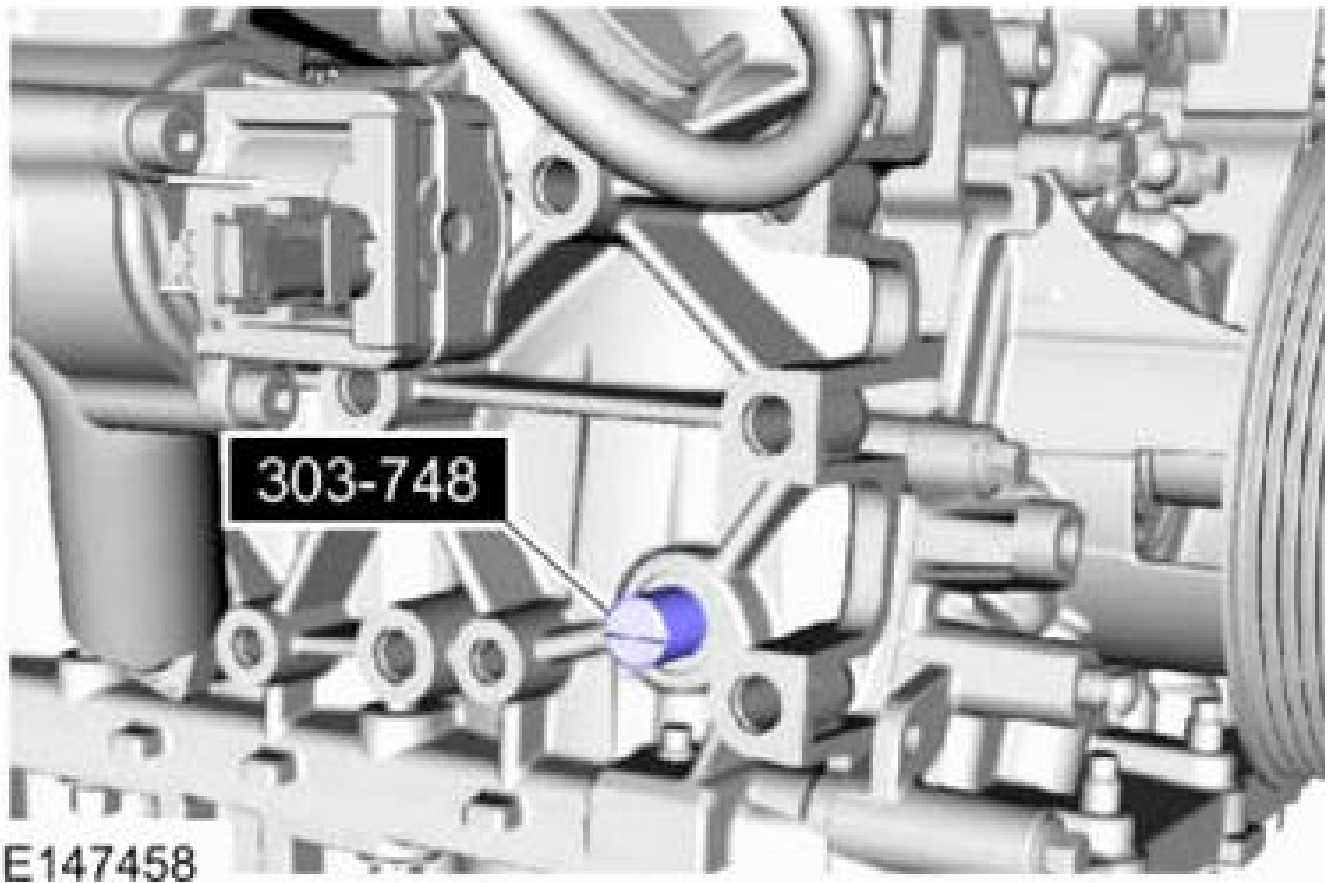
8.

NOTE: Note the location and orientation of each camshaft bearing cap and the position of the camshaft lobes on the No. 1 cylinder for installation reference.

Loosen the camshaft bearing caps in sequence 2 turns at a time until all tension is released from the camshaft bearing caps in sequence shown in illustration.



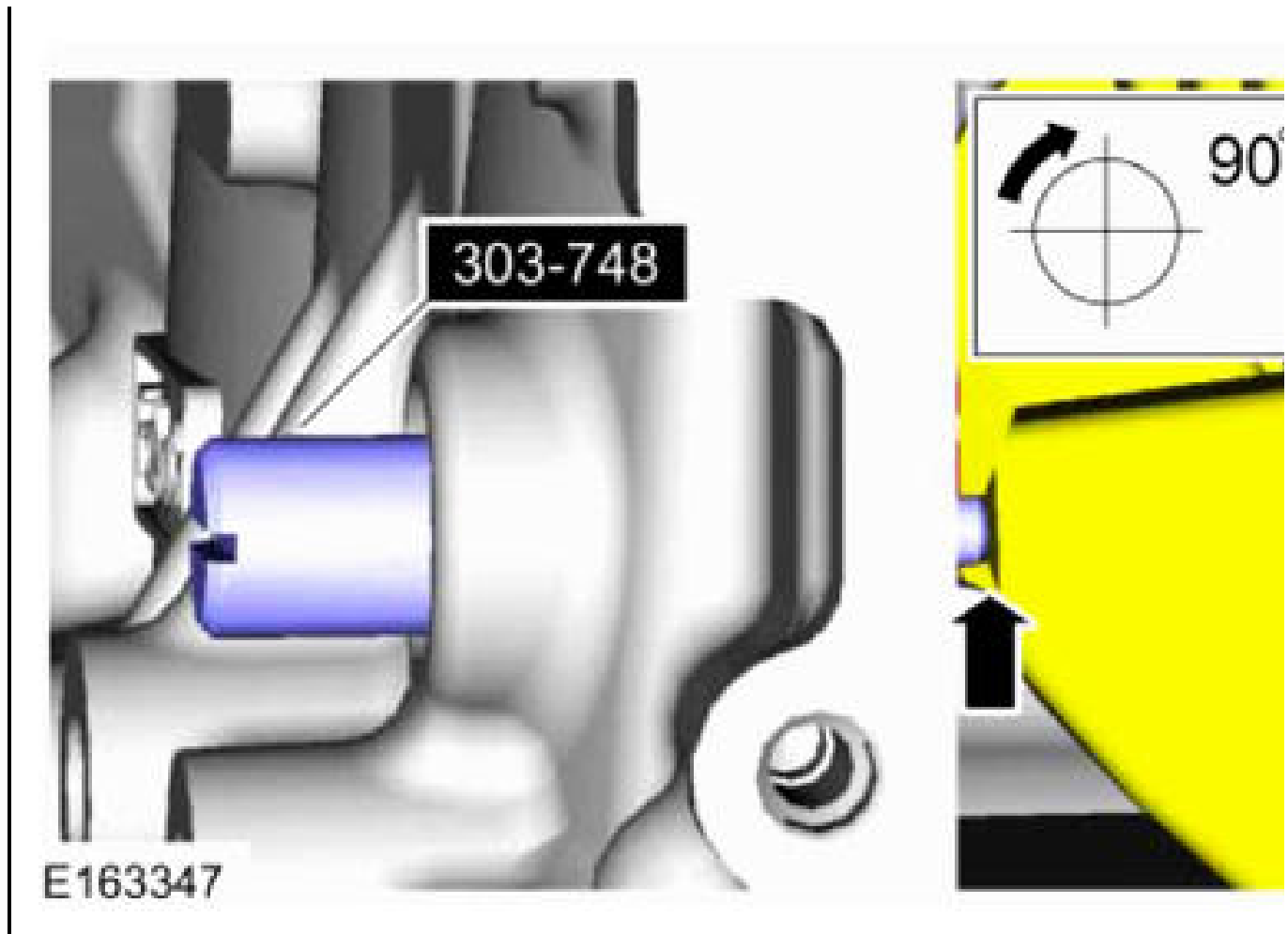
9. *Install Special Service Tool : 303-748 Locking Tool, Crankshaft*



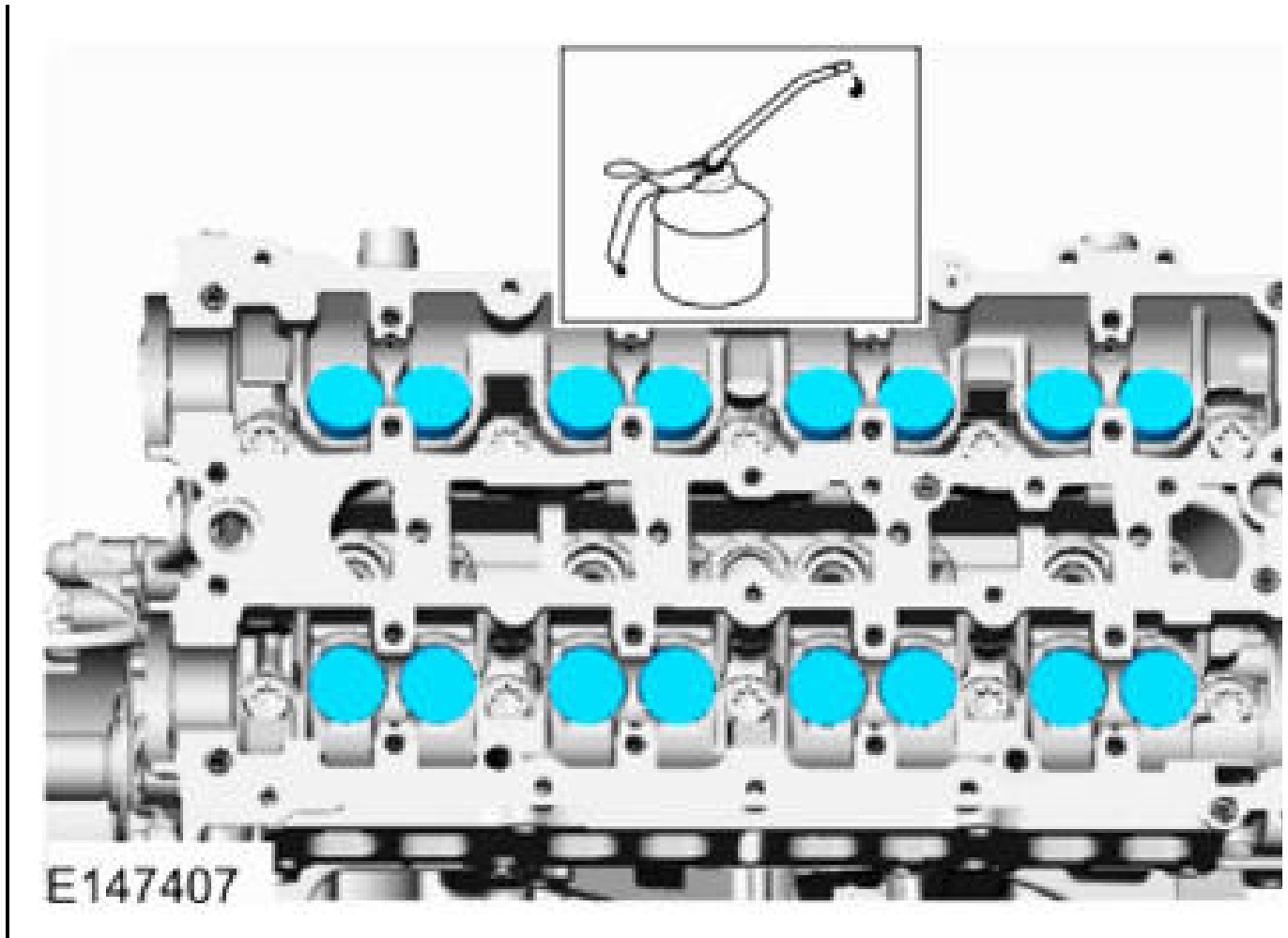
NOTE: Rotating the crankshaft will position the engine at TDC and allow you to install the camshafts in the same position as noted during the disassembly.

10.

Rotate the crankshaft clockwise 90 degrees so the crankshaft contacts the Timing Peg, Crankshaft TDC 303-748.

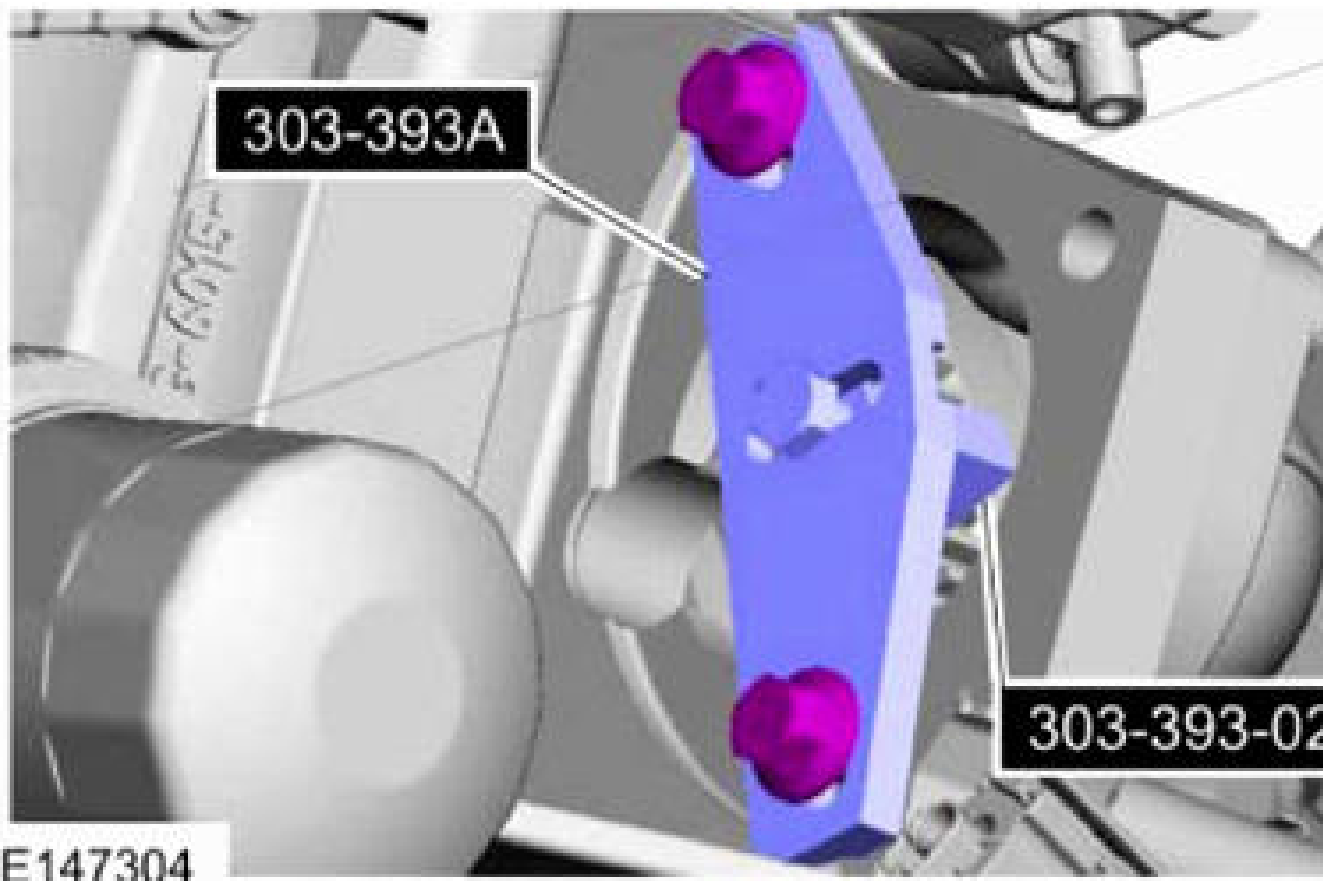


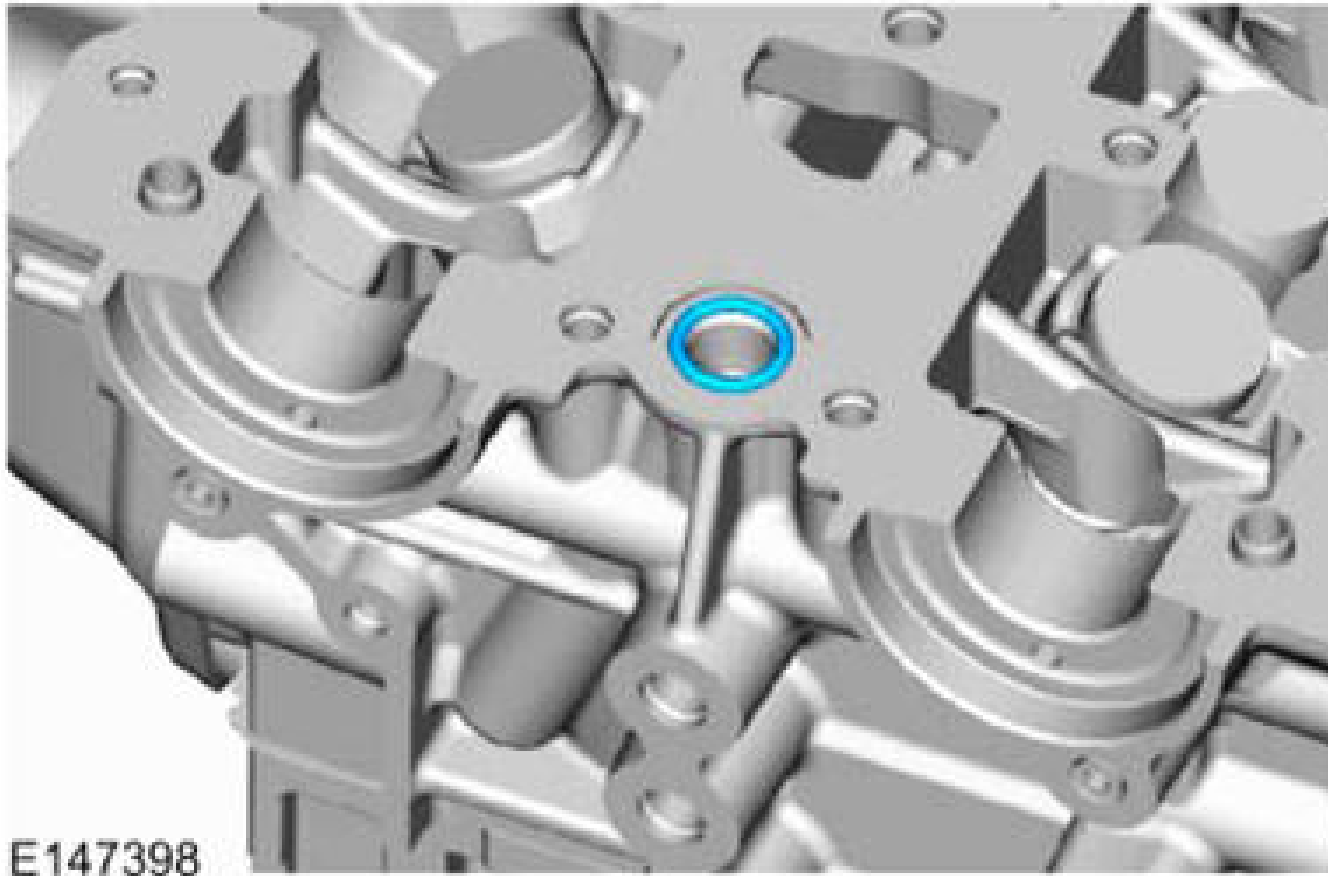
11. If necessary, replace any tappets with the correct tappets selected during the valve clearance check.



12. **NOTE:** Verify the crankshaft contacts the Timing Peg and the engine is still at TDC

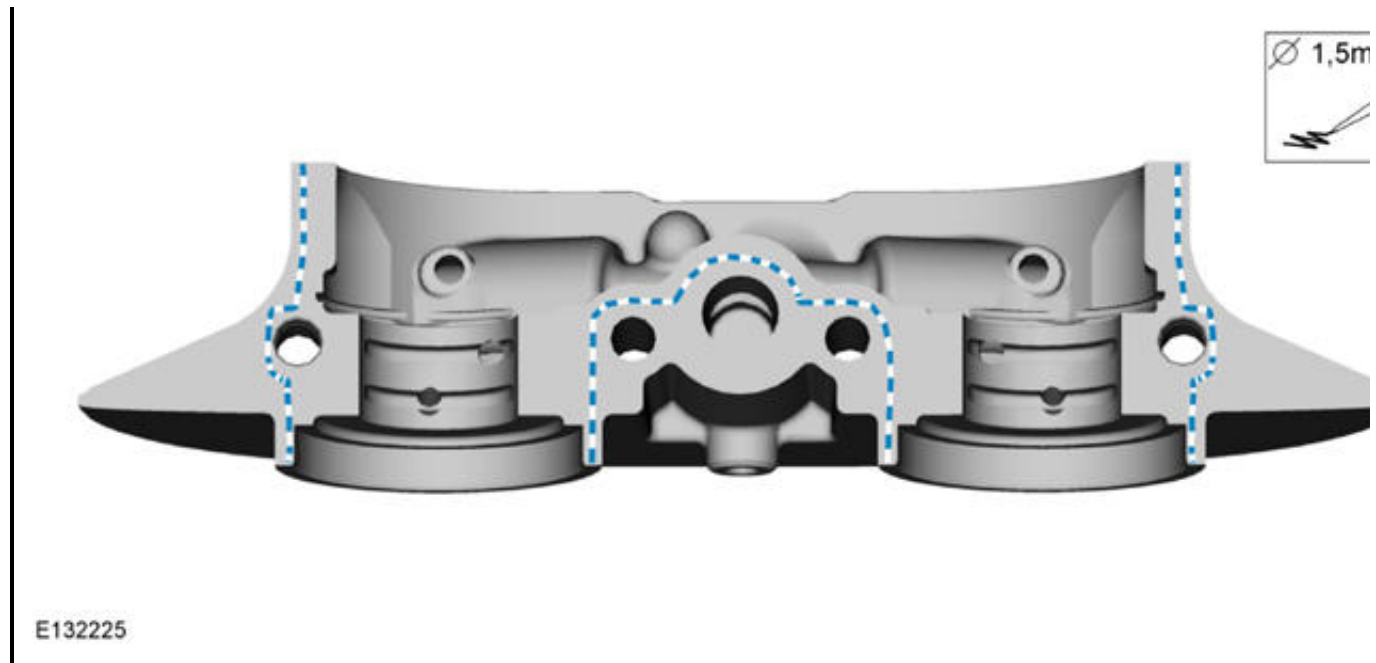
Install Special Service Tool : 303-393A Locking Tool, Flywheel , 303-393-02 Adapter for 303-393





- 13.
14. **NOTE:** The component must be installed within 5 minutes of applying the sealant.

Material : Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)



15. **NOTE:** Make sure that the components are installed to the position noted before removal.
- NOTE:** Make sure that new bolts are installed.
- NOTE:** Apply clean engine oil to the bearing surfaces of the camshafts, camshaft bearing caps and the VCT bridge.

Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

Torque :

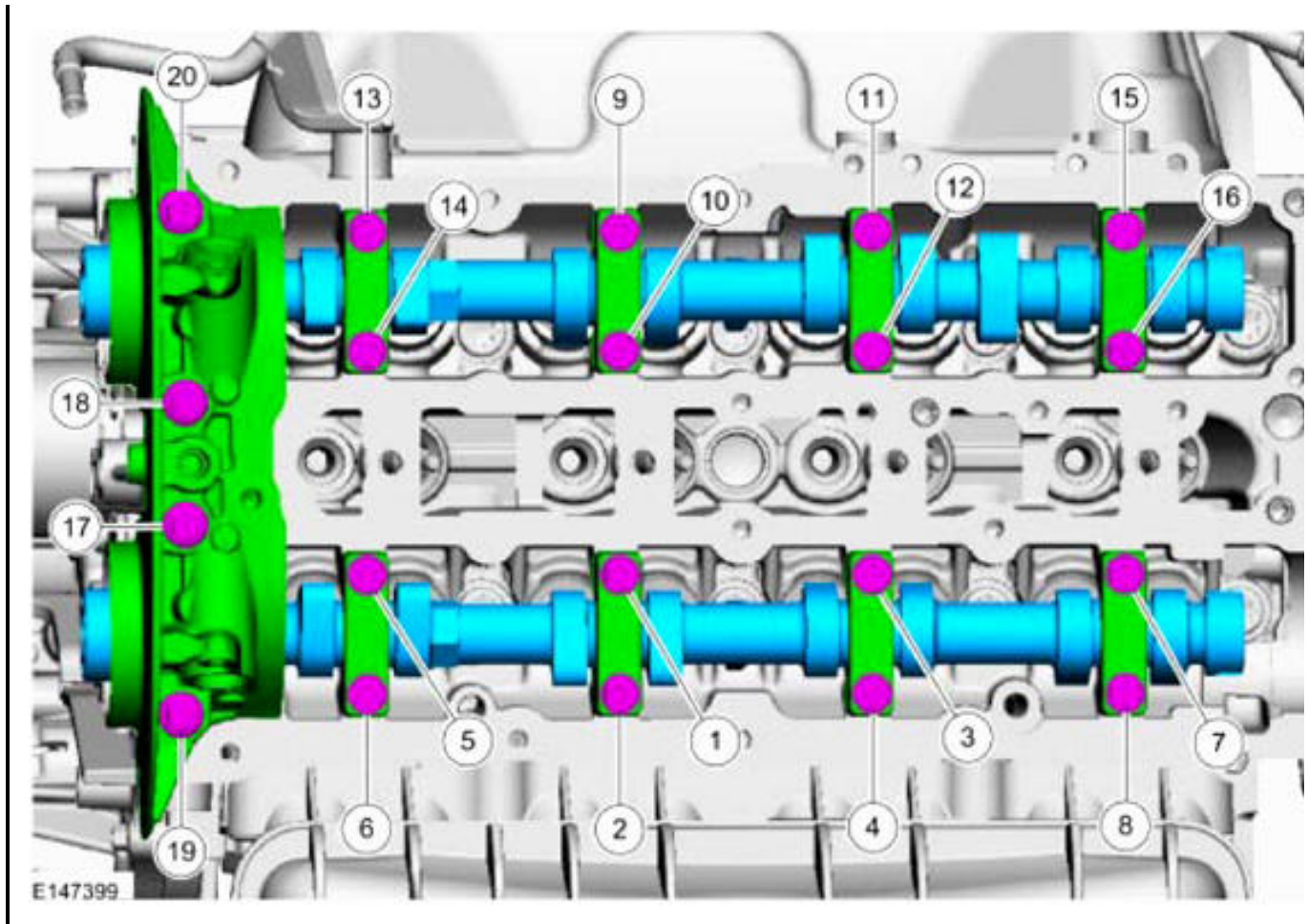
Stage 1: Tighten bolts 1 through 16 to 7 Nm

Stage 2: Tighten bolts 17 through 20 to 10 Nm

Stage 3: Tighten bolts 1 through 16 an additional 45°

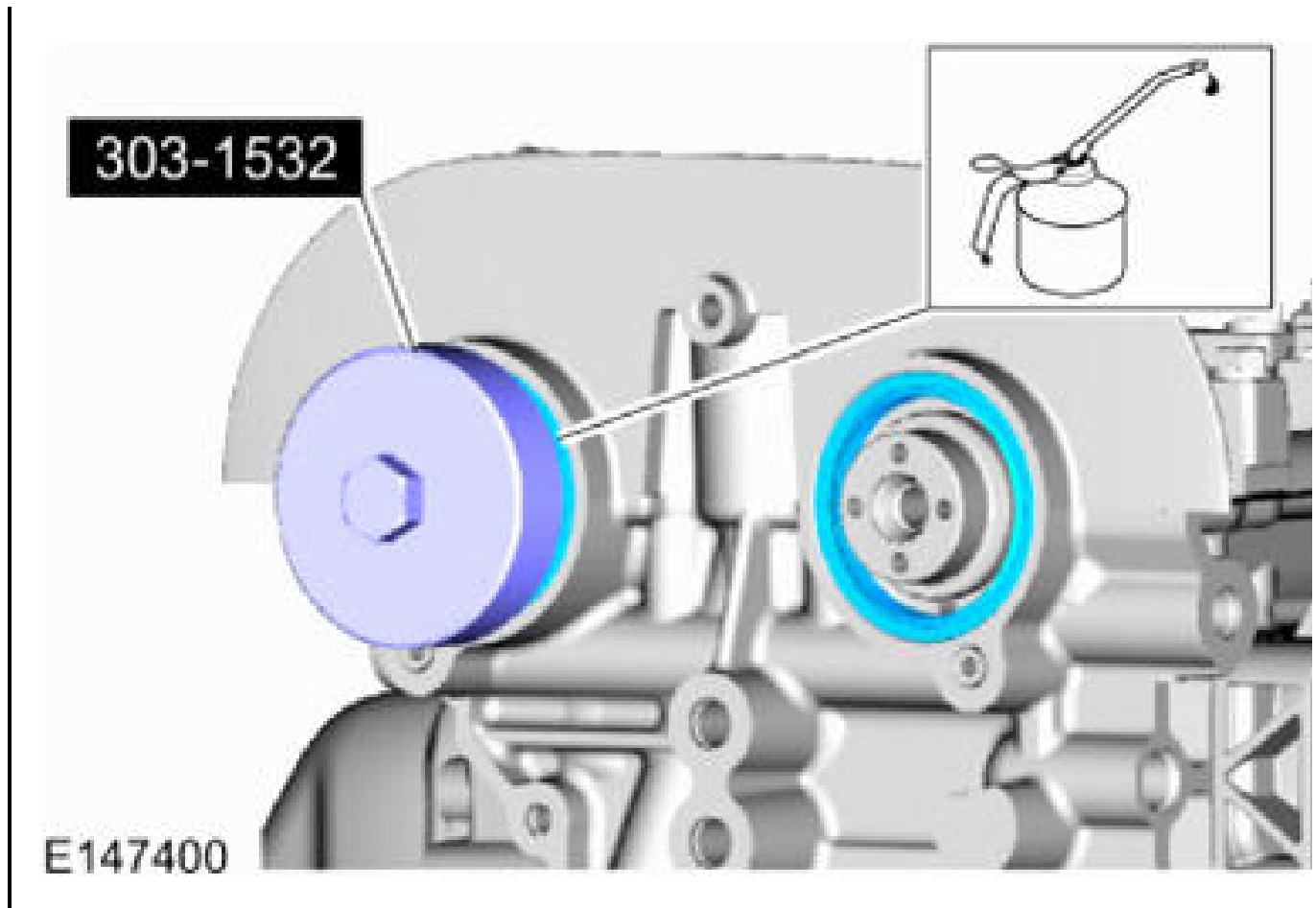
Stage 4: Tighten bolts 17 and 18 an additional 70°

Stage 5: Tighten bolts 19 and 20 an additional 53°



16. *Special Tool(s)* : **303-1532 Installer, Camshaft Seal**

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



17. Refer to: **VARIABLE VALVE TIMING (VVT) UNIT** .

VALVE COVER

Special Tool(s)/General Equipment

Hose Clamp Remover/Installer

MATERIALS SPECIFICATIONS

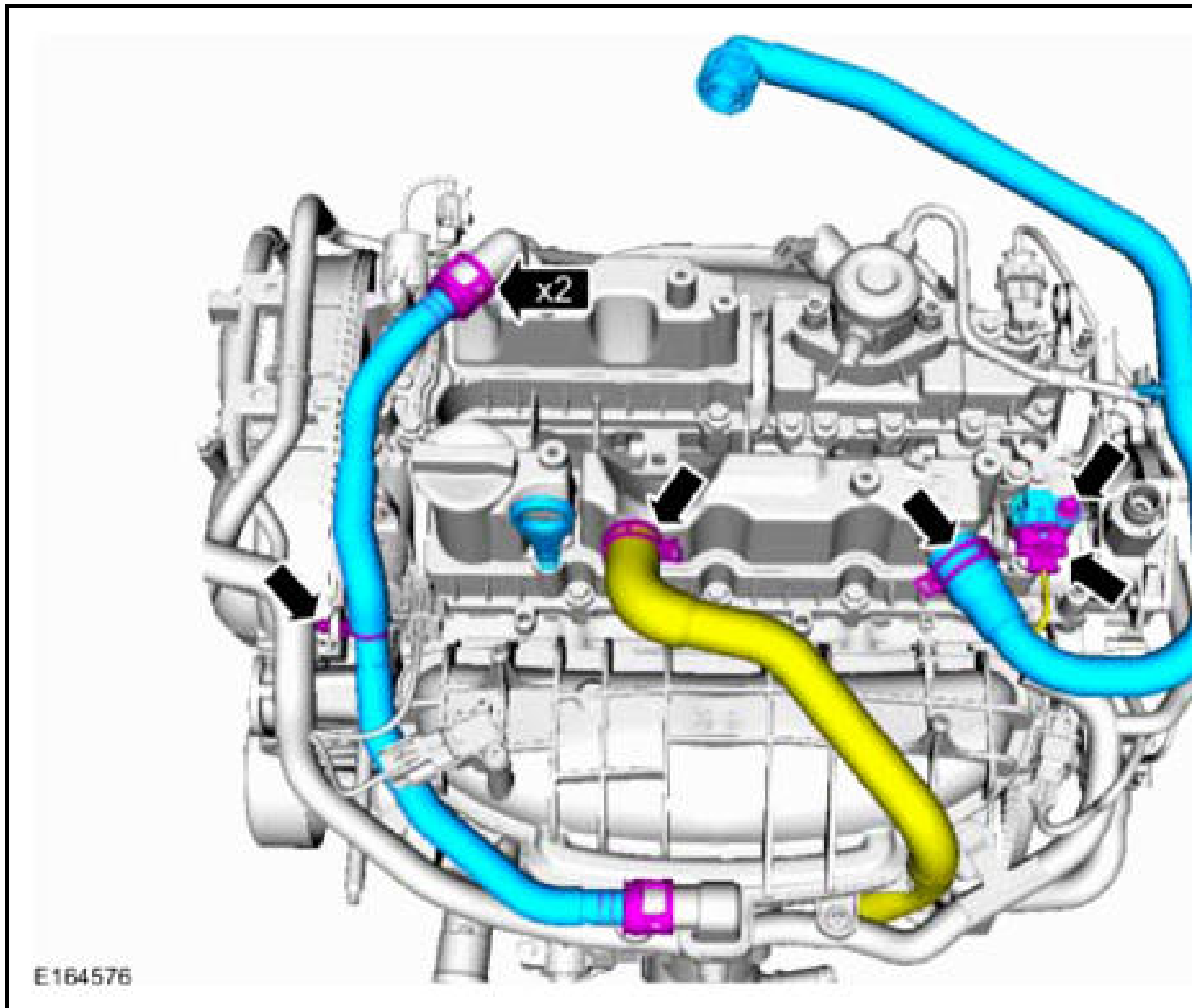
Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A
Motorcraft® Metal Surface Prep ZC-31-A	-
Flange Sealant CU7Z-19B508-A	WSS-M2G348-A11

Removal

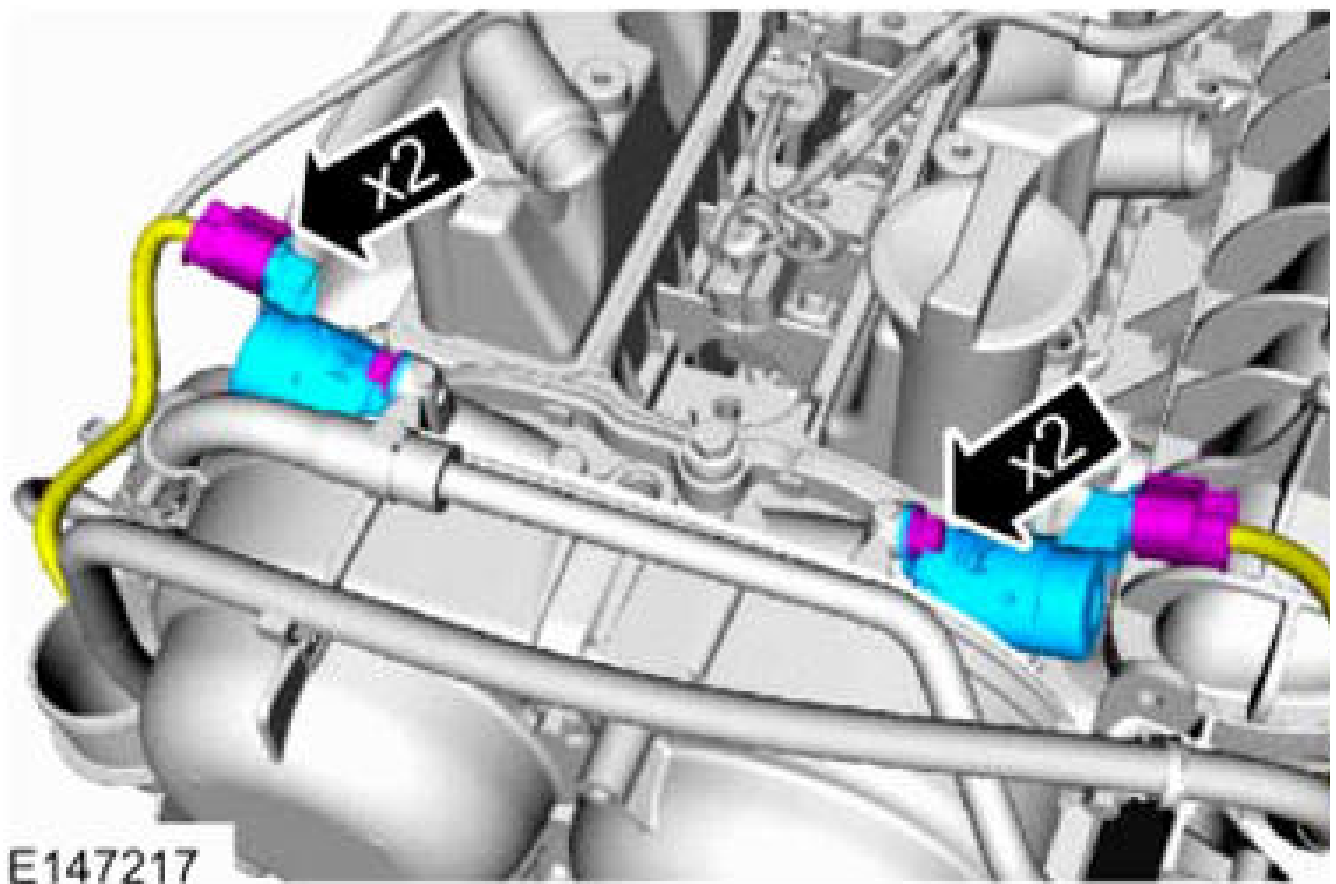
Valve Cover Only

1. Refer to: FUEL RAIL .
2. Refer to: QUICK RELEASE COUPLING .

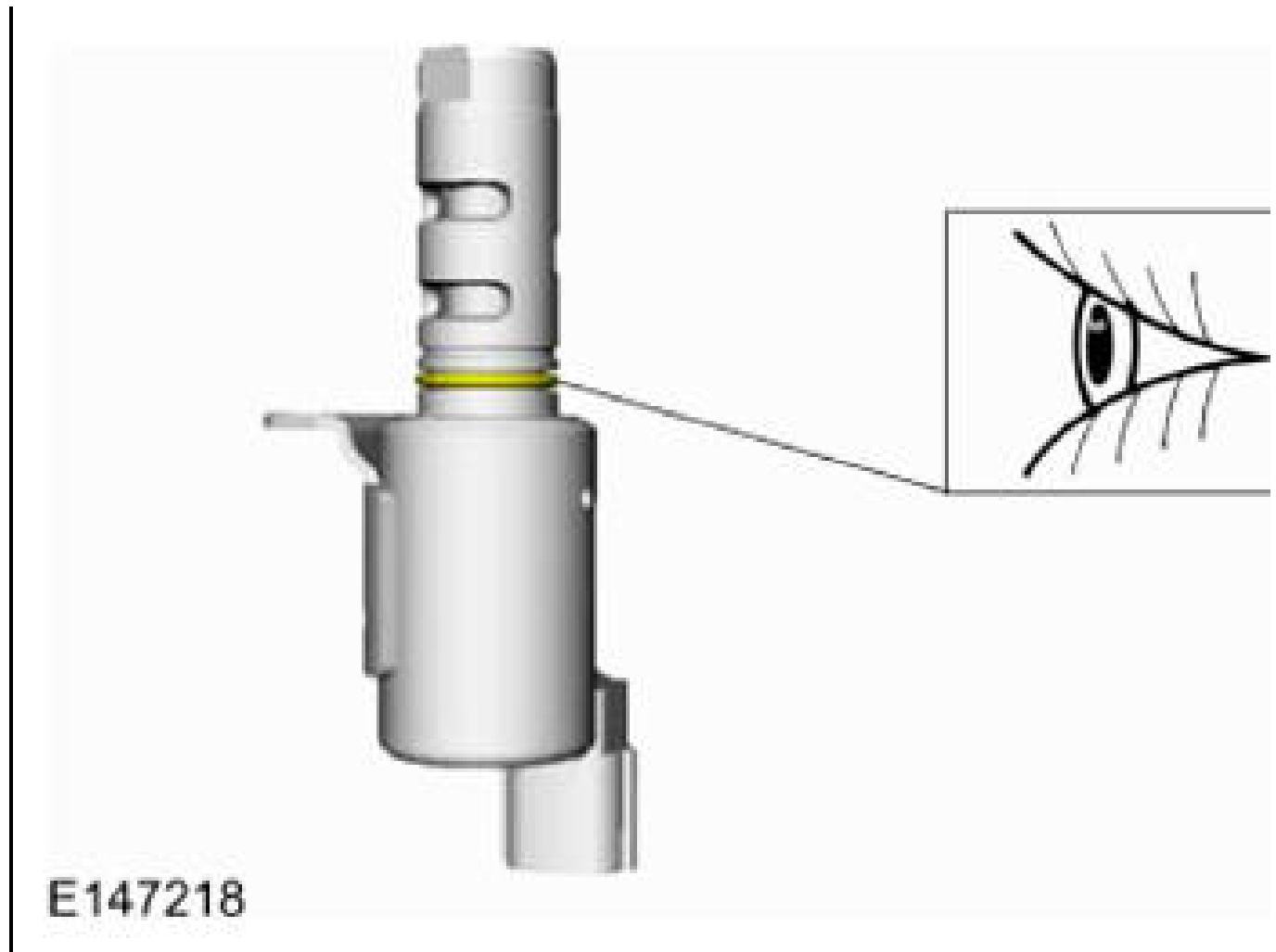
General Equipment : Hose Clamp Remover/Installer



3. **NOTE:** Note the position of the components before removal.

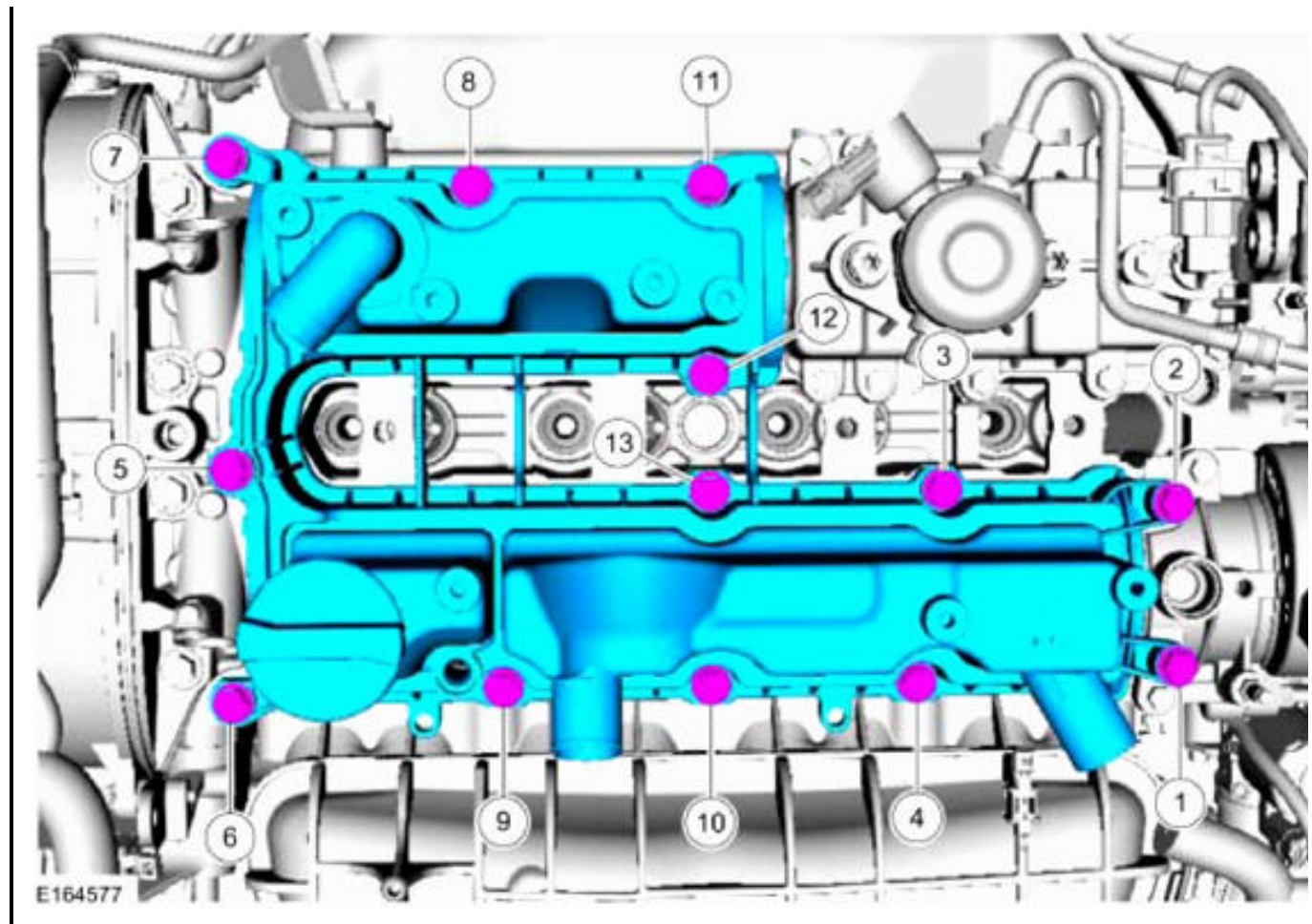


4. **NOTE:** The O-ring seals are to be reused unless damaged.

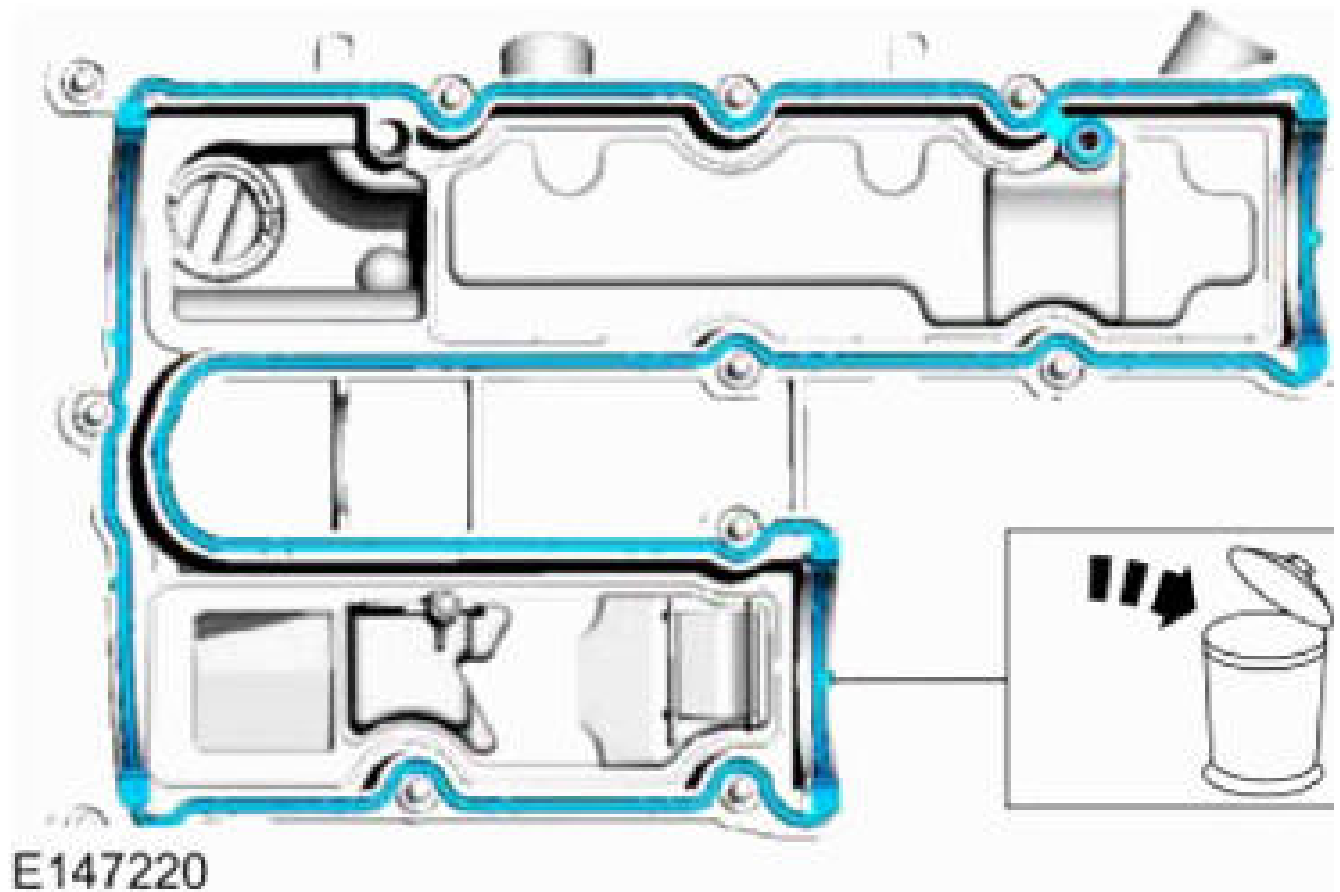


NOTE: Do not set the valve cover sealing surface face down on a bench as the check valve and splitter leg is susceptible to breakage.

5.



6.



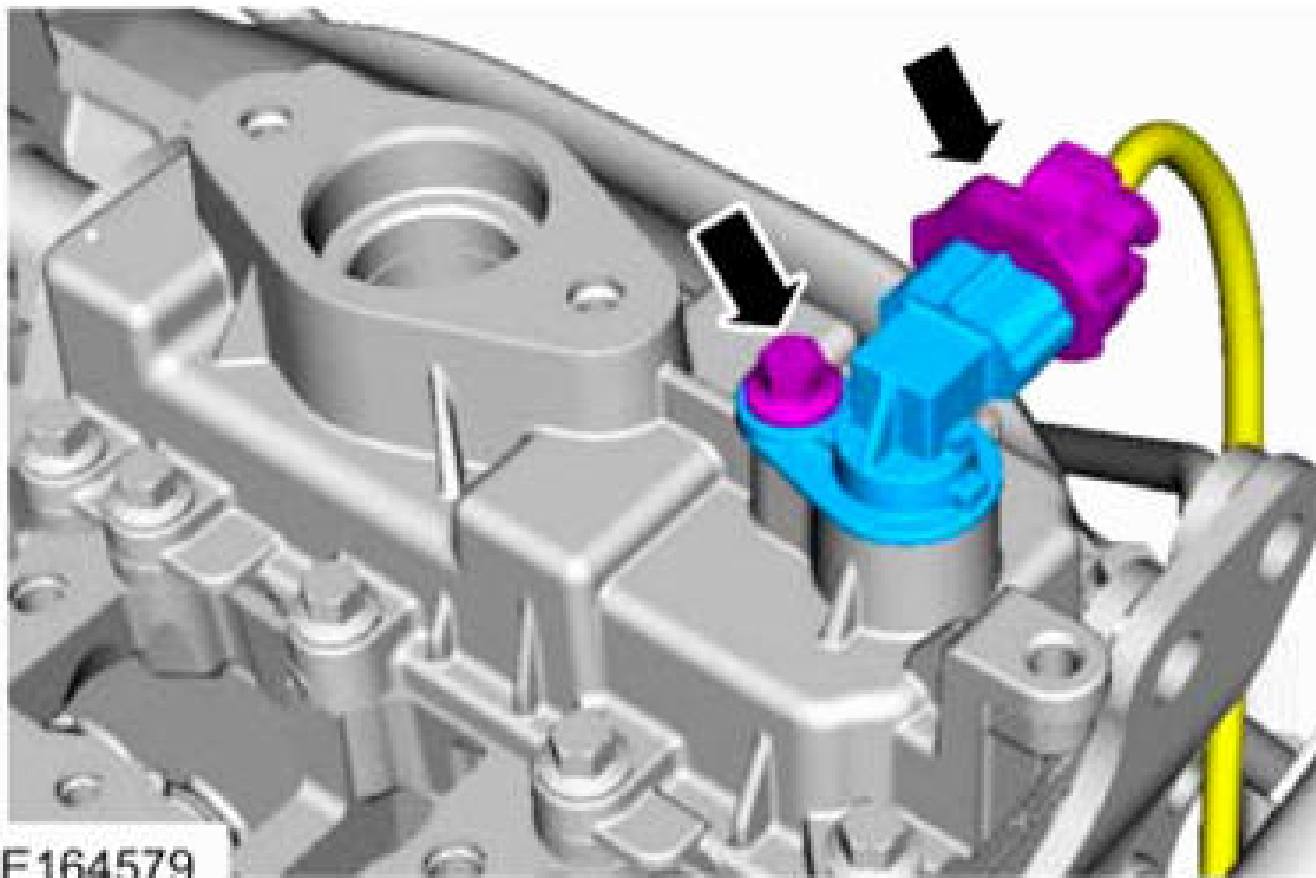
6.

Fuel Pump and Brake Vacuum Pump Mounting Brackets

7. Remove the following items:

1. Refer to: **FUEL PUMP** .
2. Refer to: **BRAKE VACUUM PUMP - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .

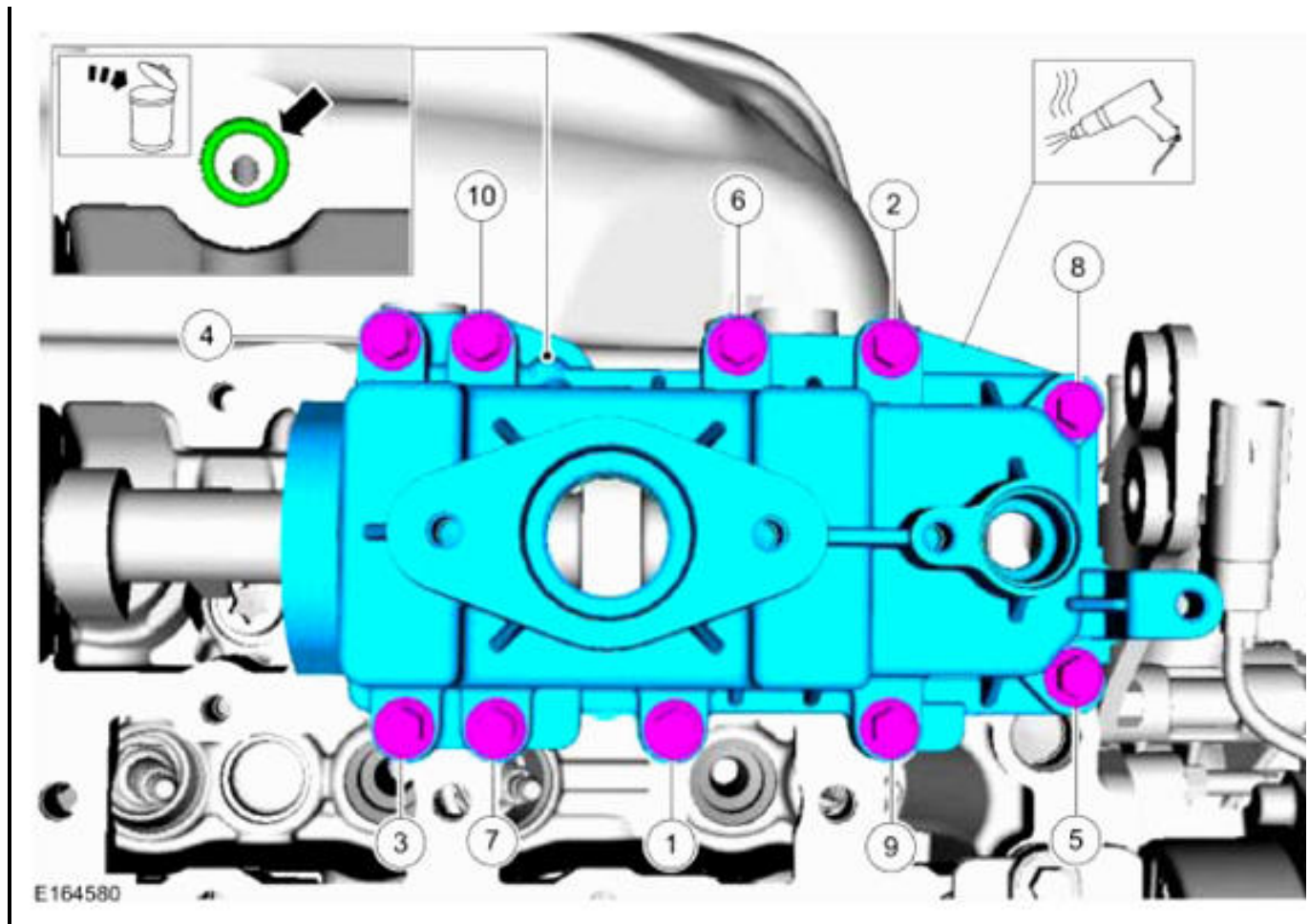
8.



8.

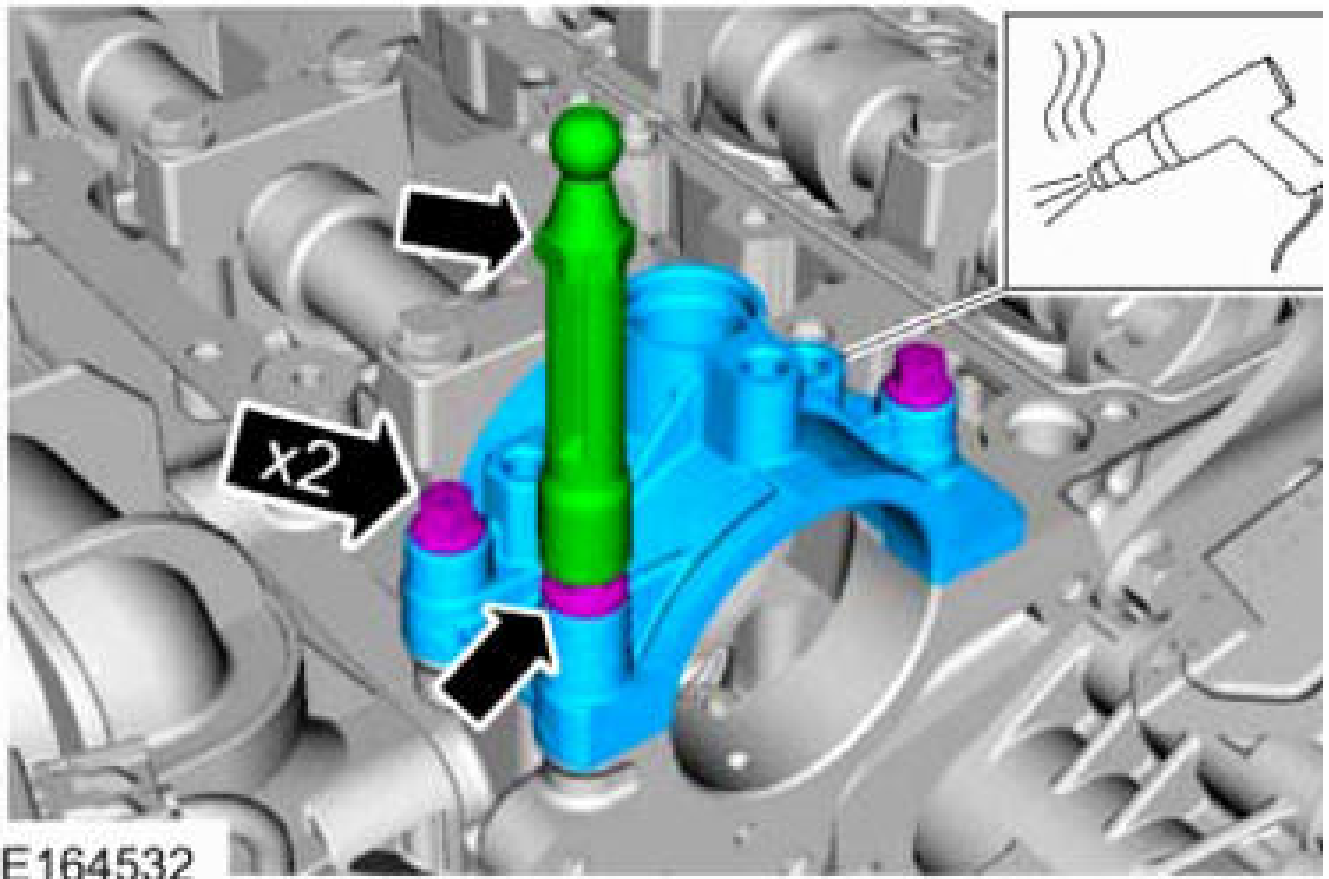
NOTE: Use a heat gun to soften the flange sealant, this will aid in the removal of the fuel pump mounting bracket. Failure to follow these directions may result in damage to the fuel pump mounting bracket.

9.



NOTE: Use a heat gun to soften the flange sealant, this will aid in the removal of the brake vacuum pump mounting bracket. Failure to follow these directions may result in damage to the brake vacuum pump mounting bracket.

10.



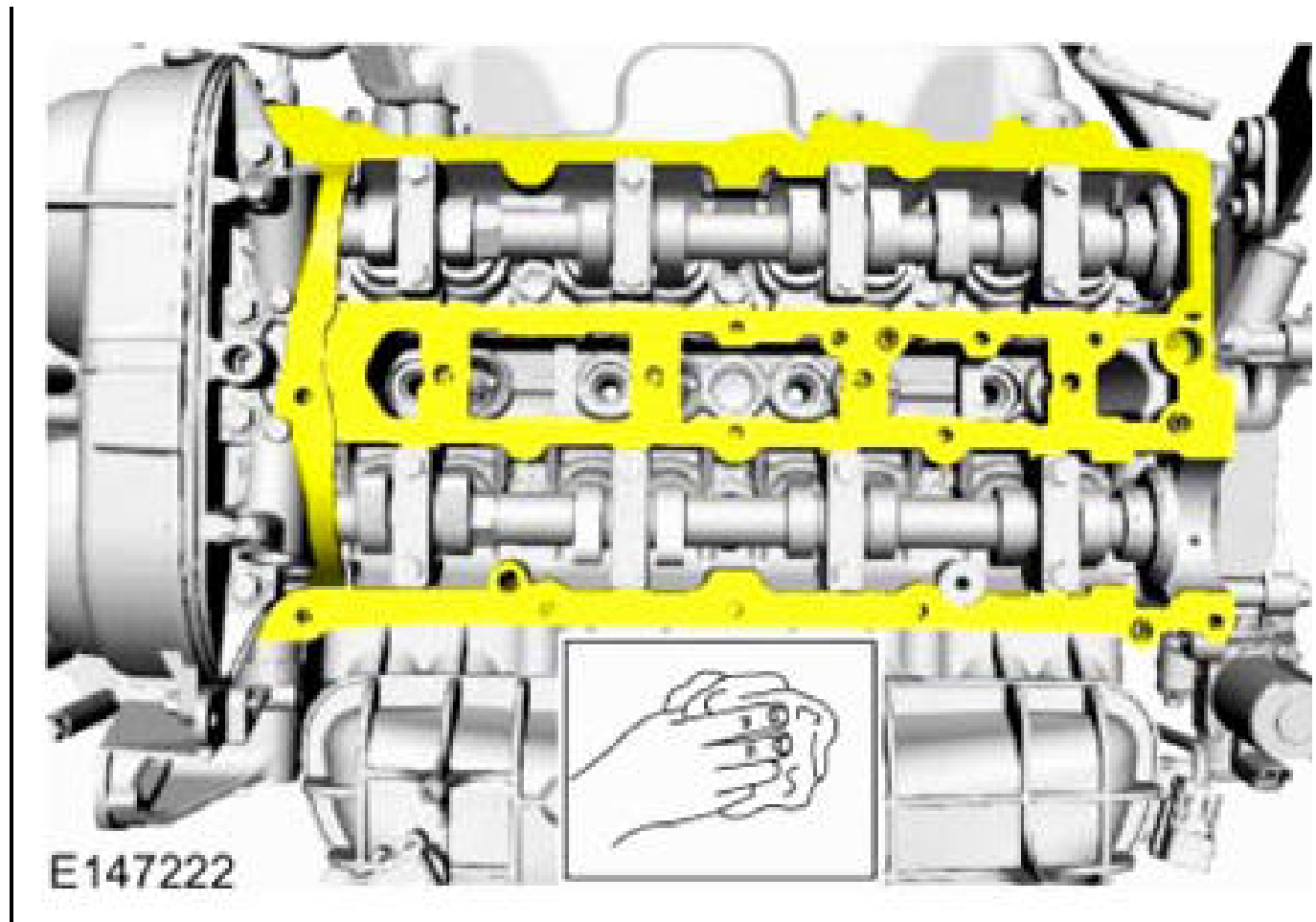
Installation

Fuel Pump and Brake Vacuum Pump Mounting Brackets

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

1.

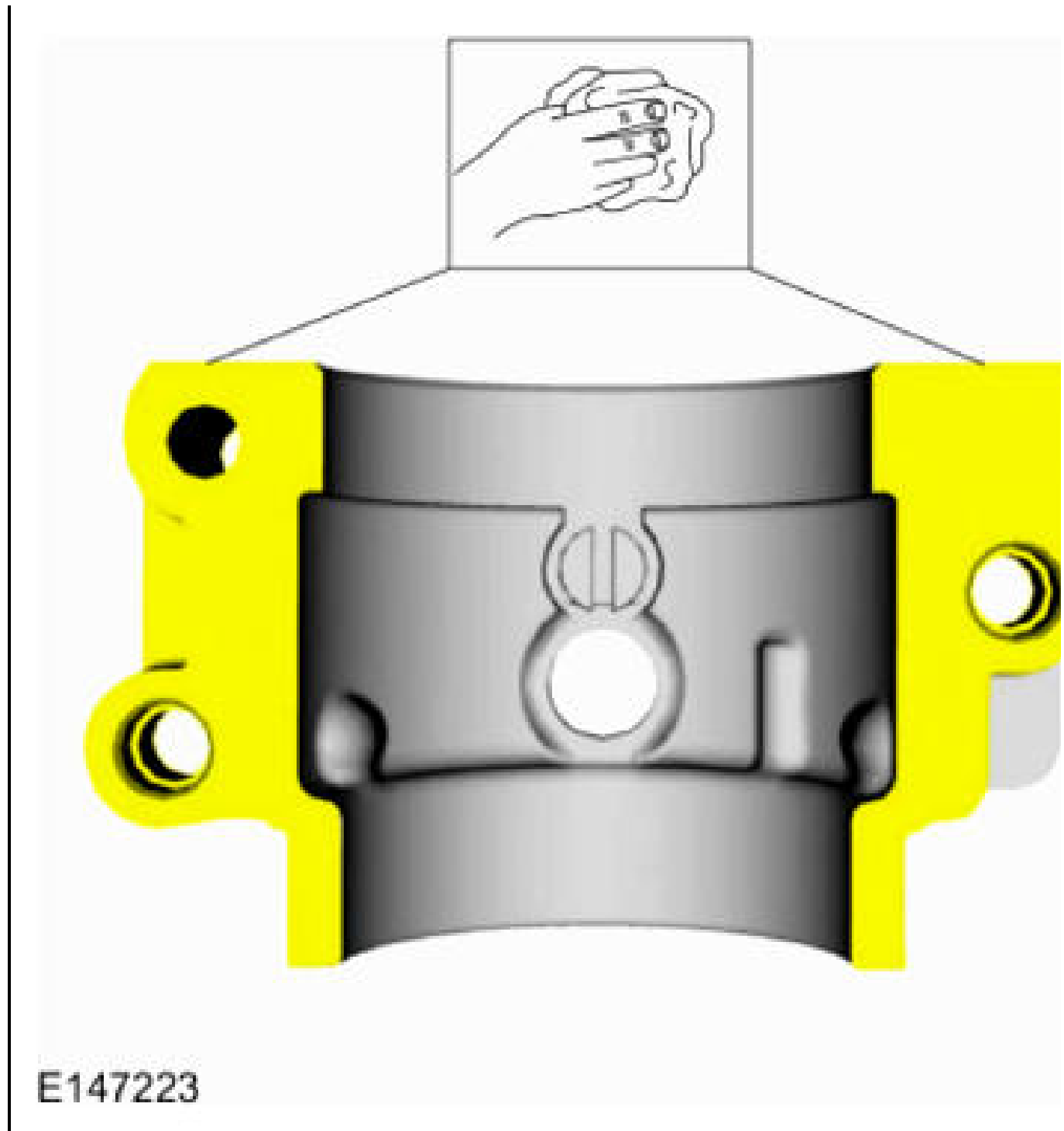
Material : Motorcraft® Metal Surface Prep/ZC-31-A



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

2.

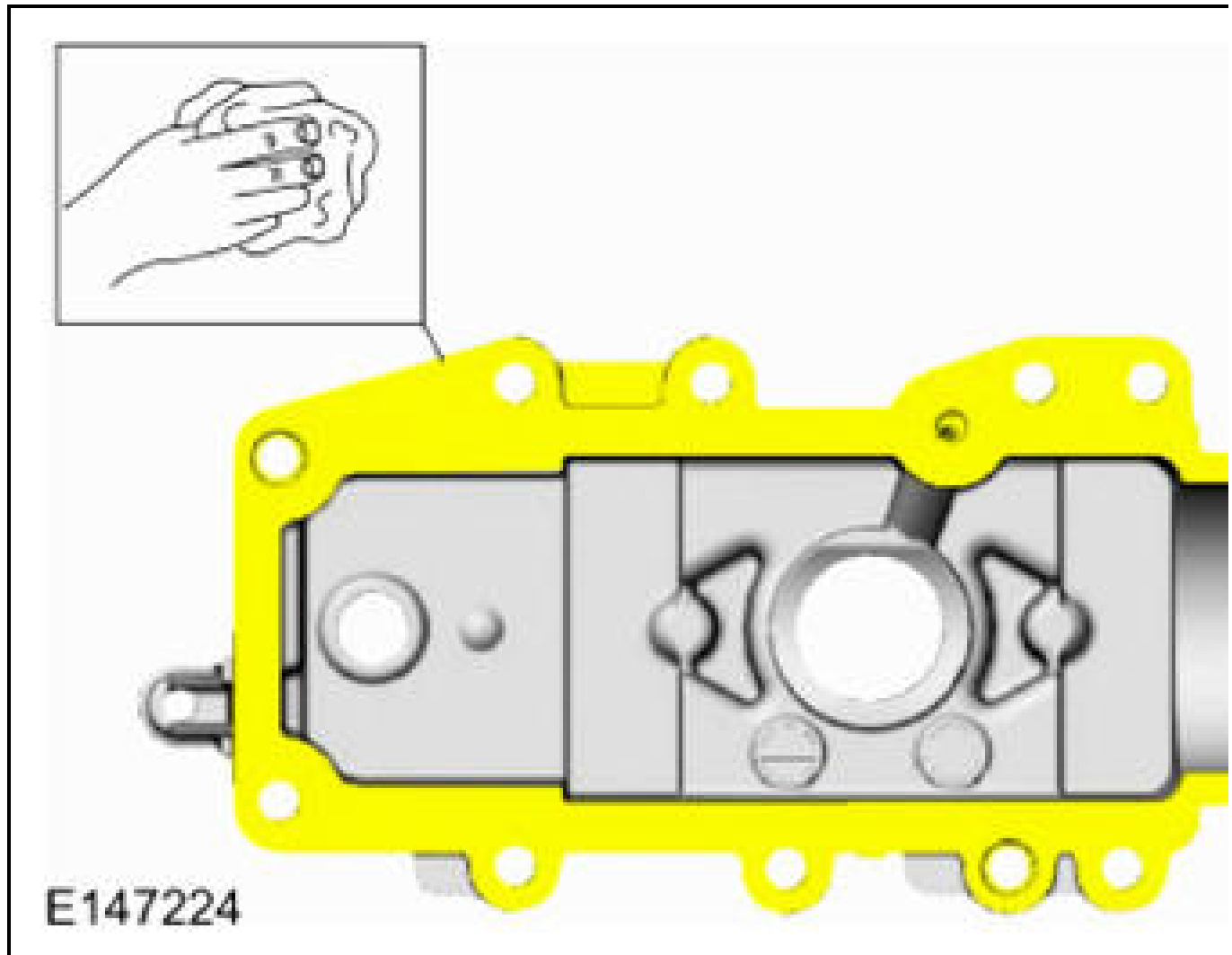
Material : Motorcraft® Metal Surface Prep/ZC-31-A



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

3.

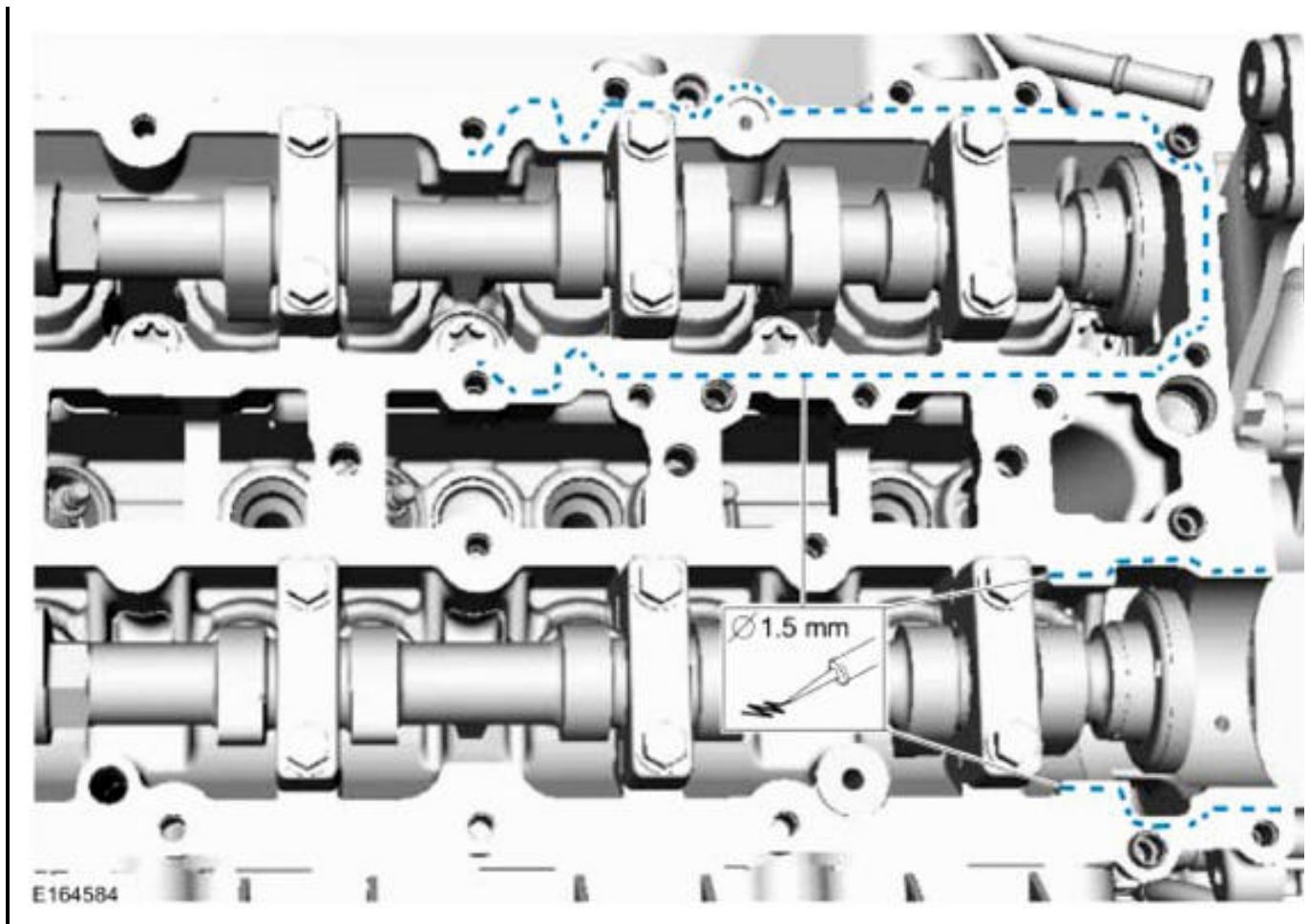
Material : Motorcraft® Metal Surface Prep/ZC-31-A



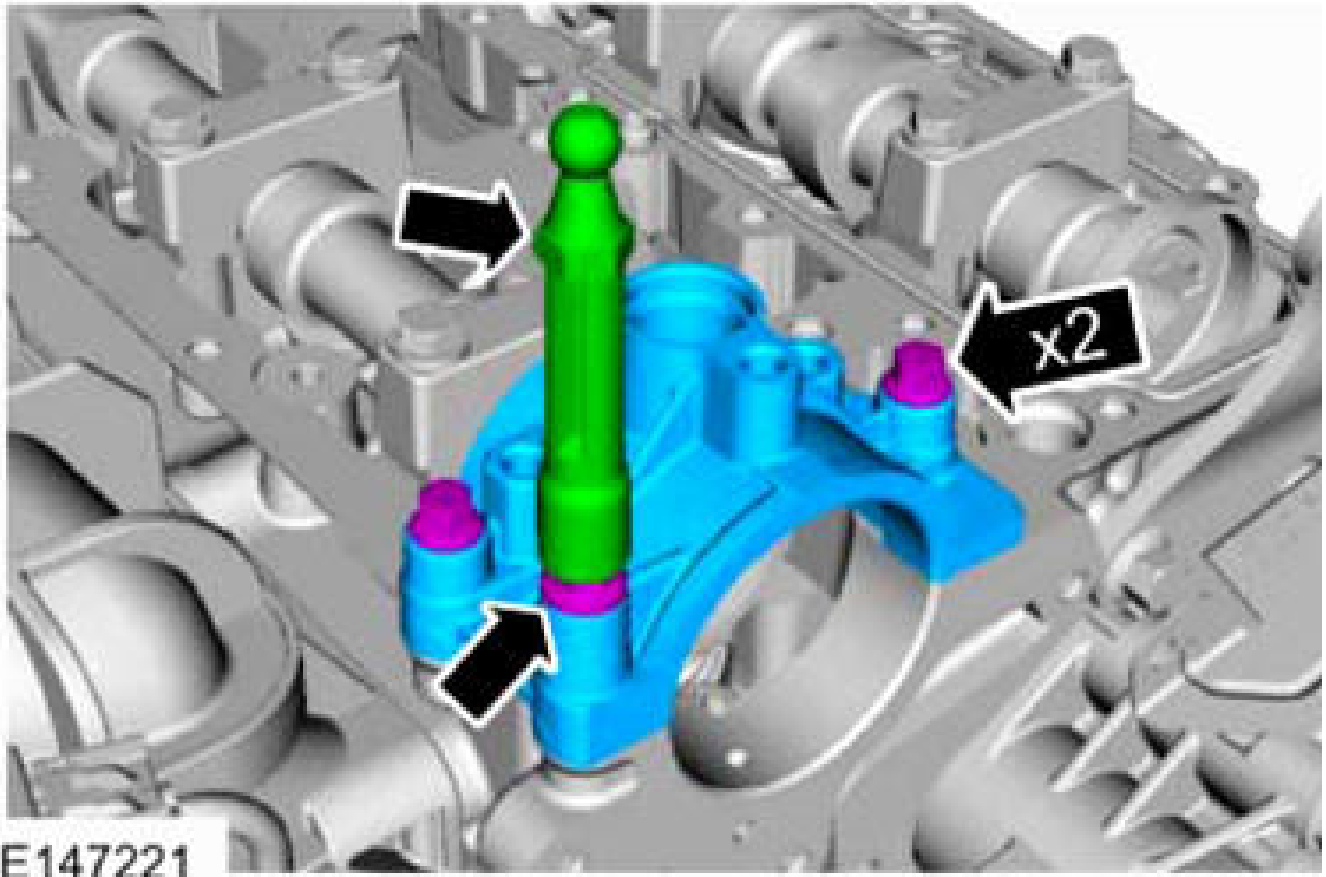
NOTE: The components must be installed within 5 minutes of applying the sealant.

4.

Material : Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)



5. *Torque* : 10 Nm



6. **NOTE:** Use a new O-ring seal.

Tighten bolts 1 through 10 to:

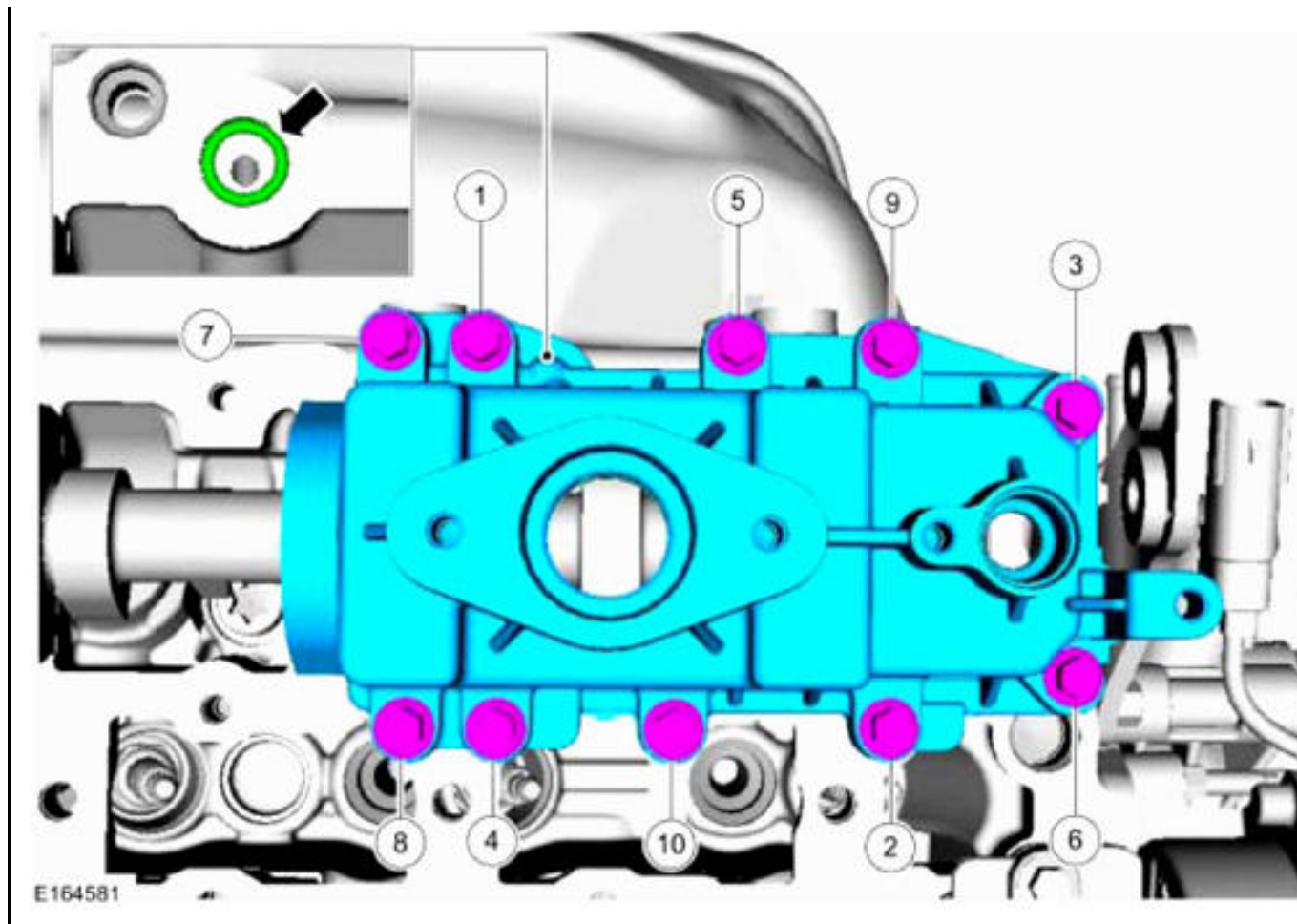
Torque :

Stage 1: 3 Nm

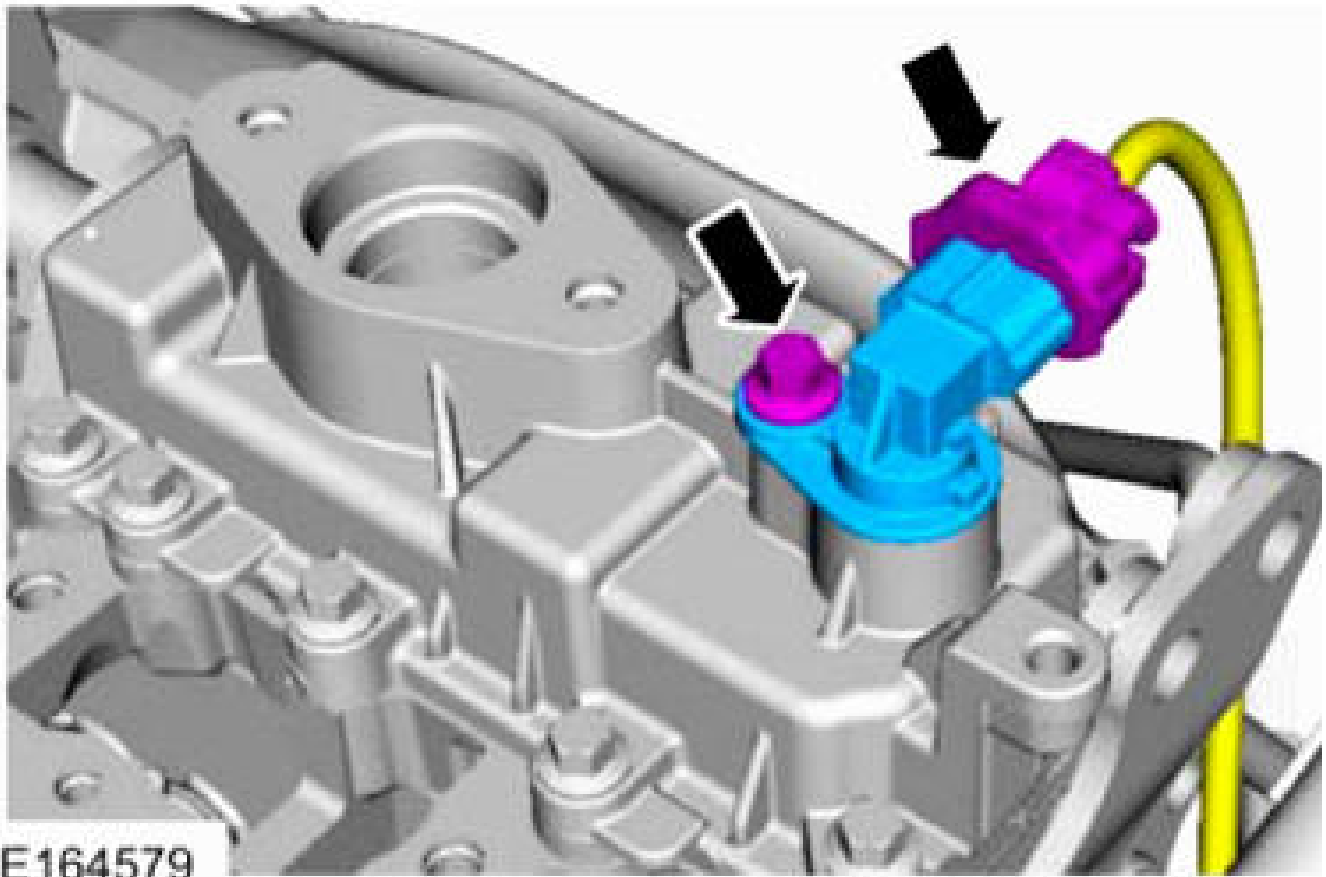
Stage 2: 9 Nm

Stage 3: 11 Nm

Stage 4: Tighten bolts 1, 2, 5, 6, 7, 8, 9 and 10 to 14 Nm



7. Torque : 8 Nm



8. Install the following items:

1. Refer to: **BRAKE VACUUM PUMP - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .
2. Refer to: **FUEL PUMP** .

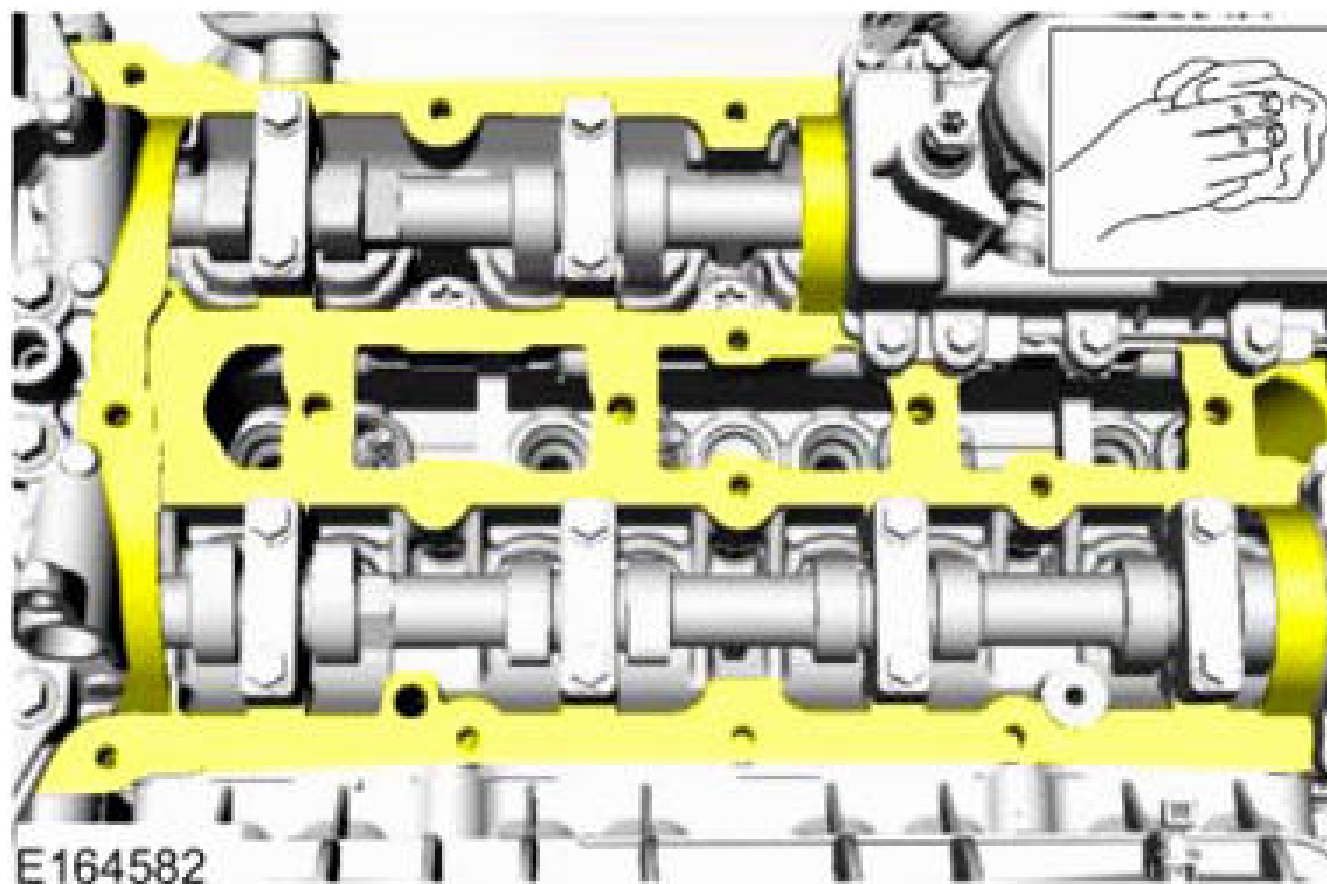
Valve Cover Only

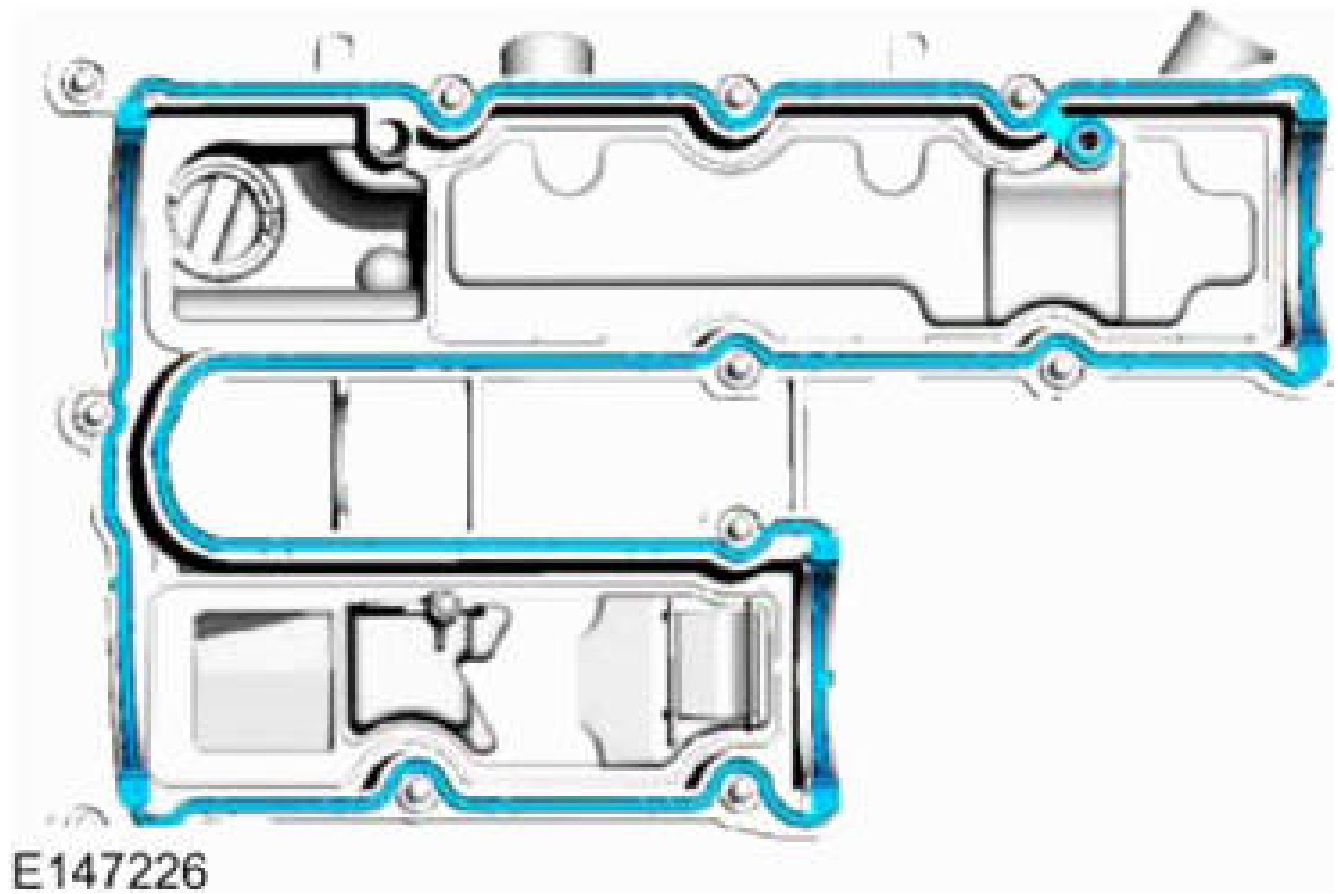
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

9.

NOTE: Clean if replacing the valve cover gasket only.

Material : Motorcraft® Metal Surface Prep/ZC-31-A



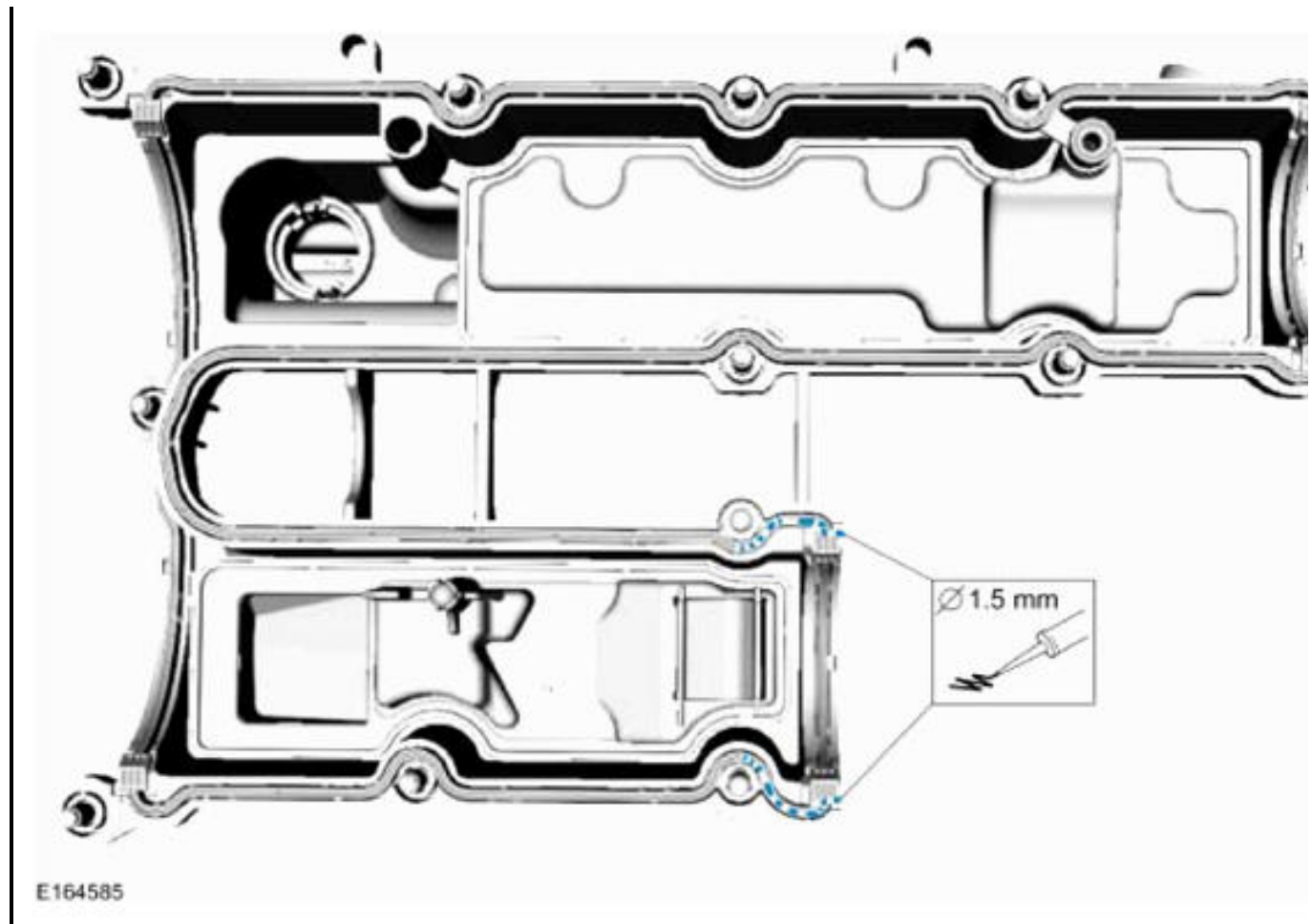


10.

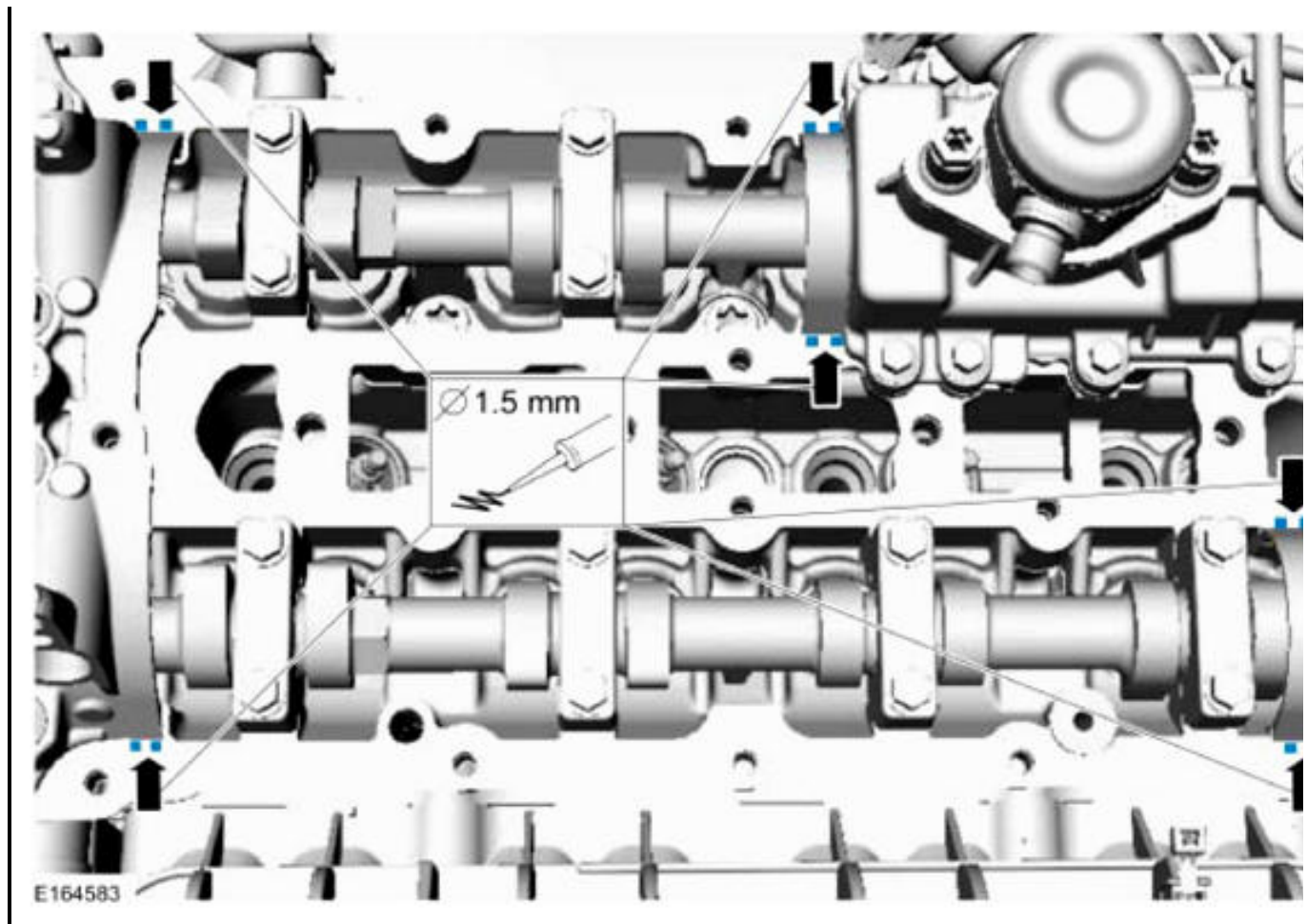
NOTE: The components must be installed within 5 minutes of applying the sealant.

11.

Material : Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)



12. *Material* : Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)

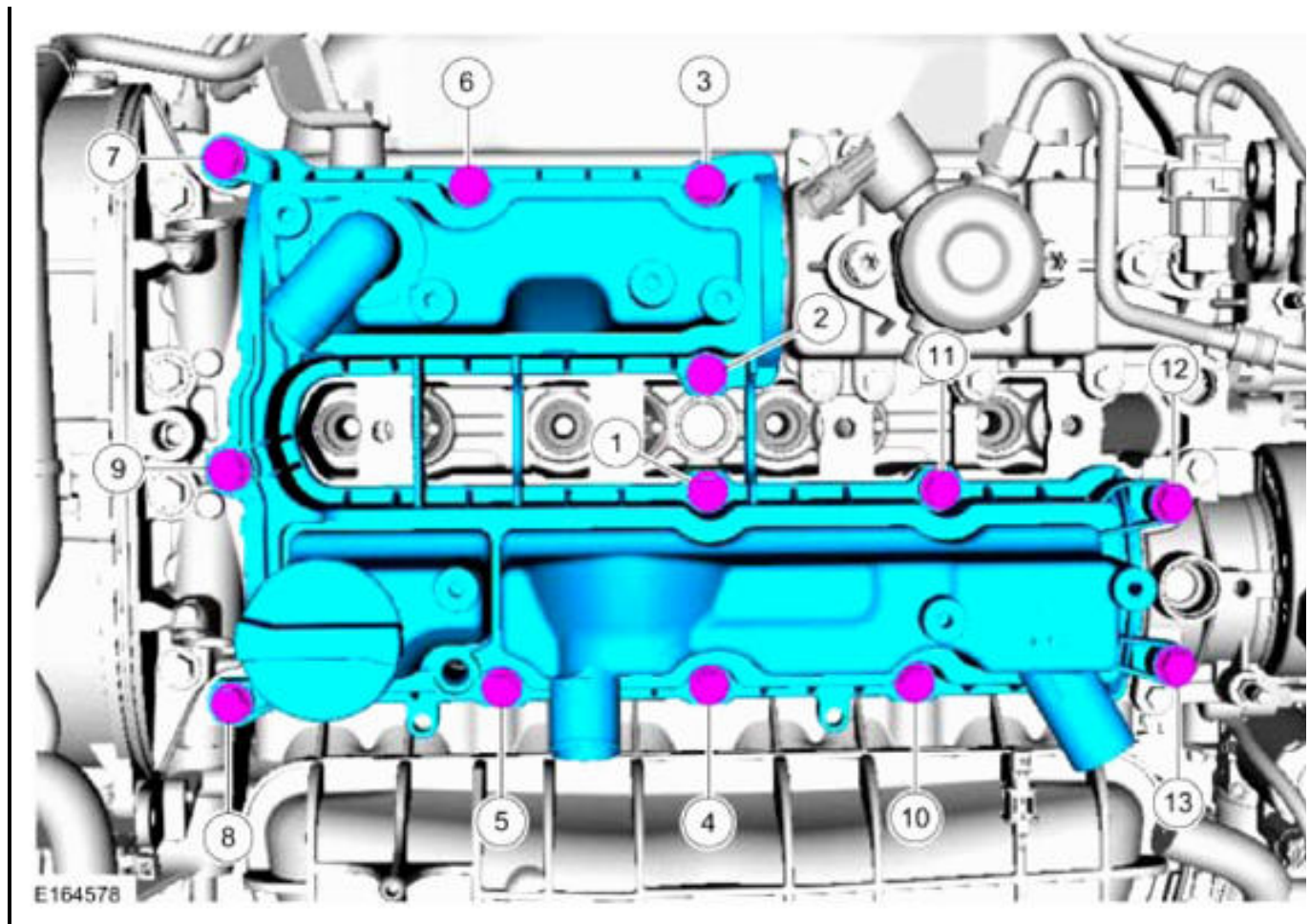


13. *Torque :*

Stage 1: 5 Nm

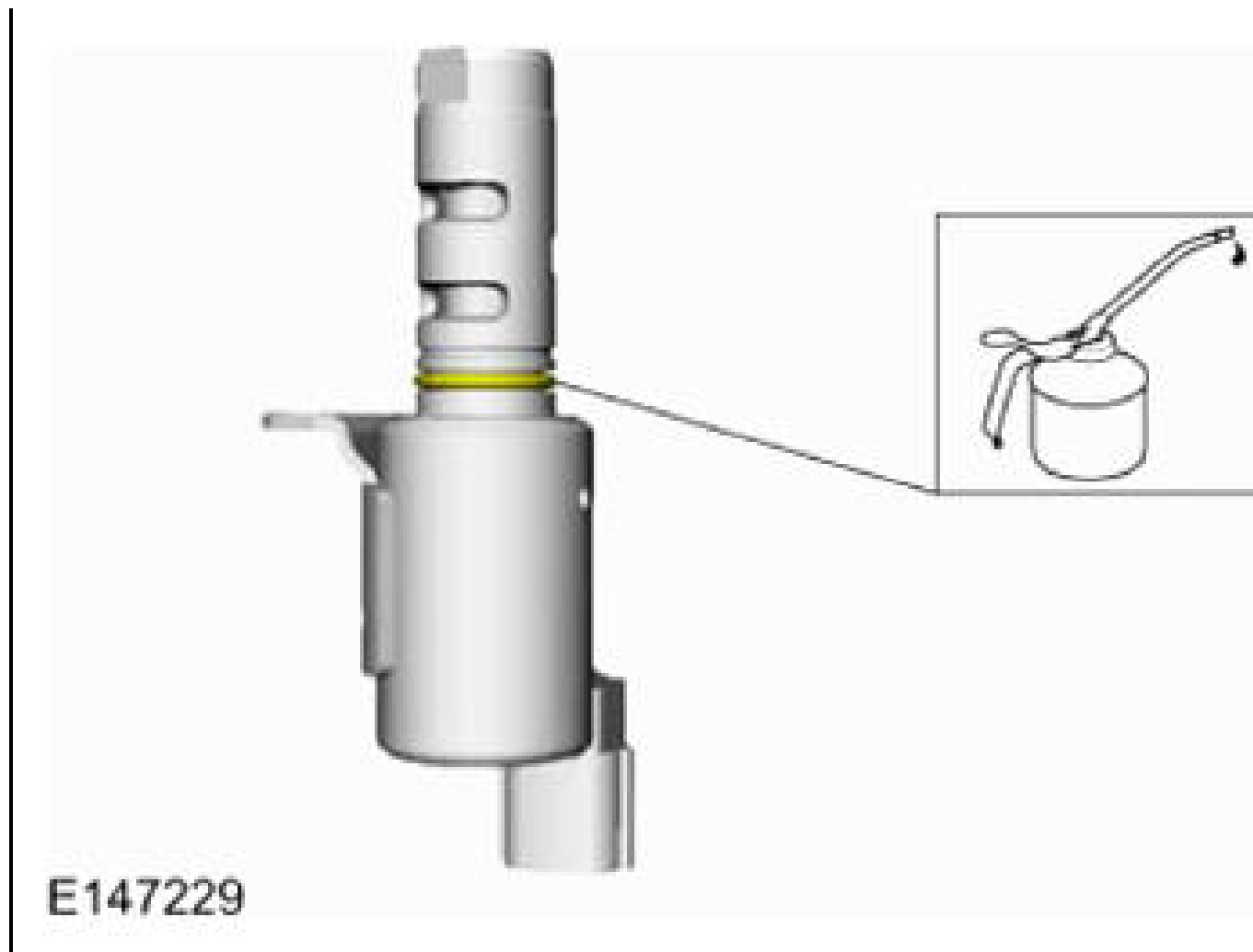
Stage 2: 9 Nm

Stage 3: 10 Nm

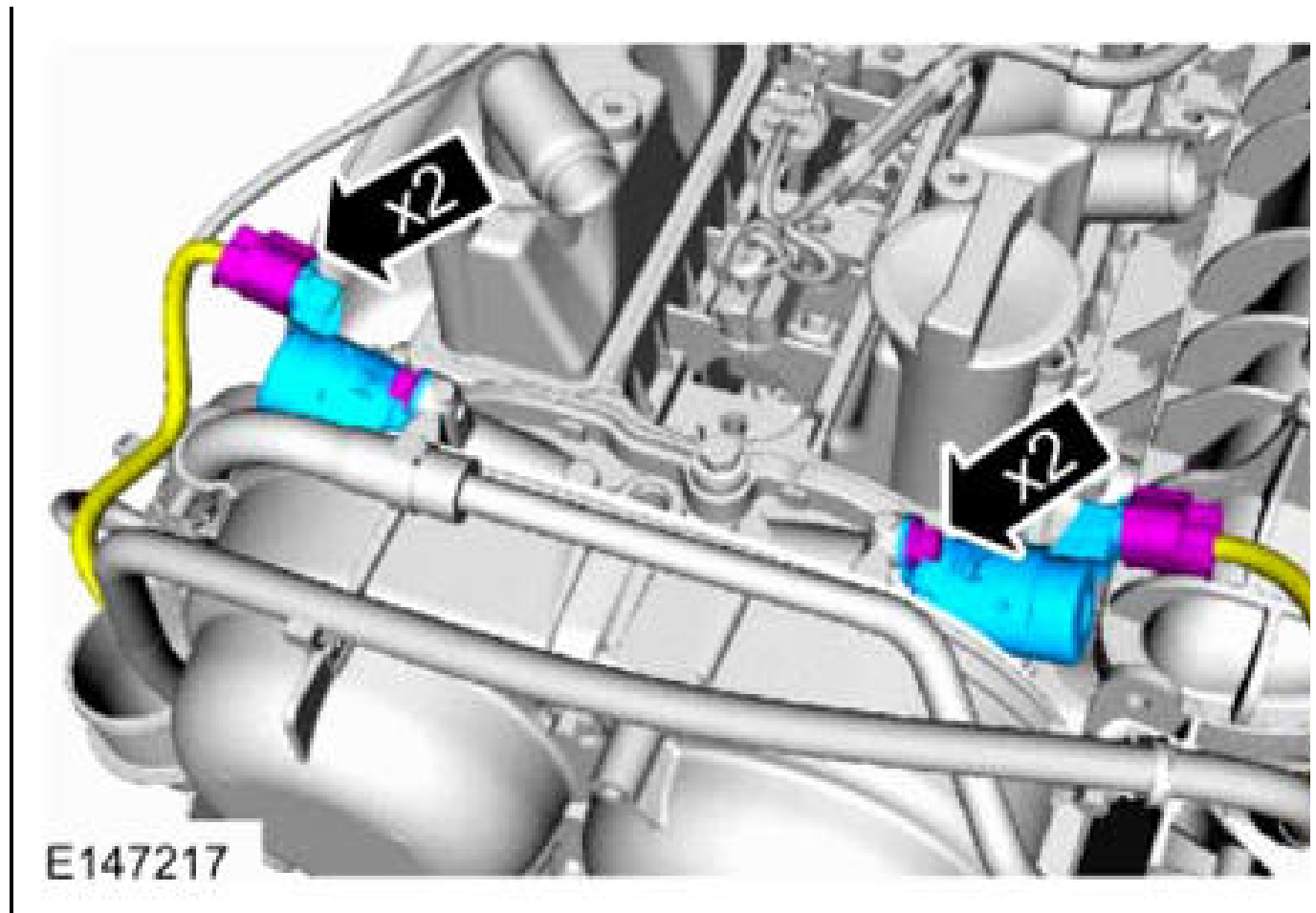


14. **NOTE:** The O-ring seals are to be reused unless damaged.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



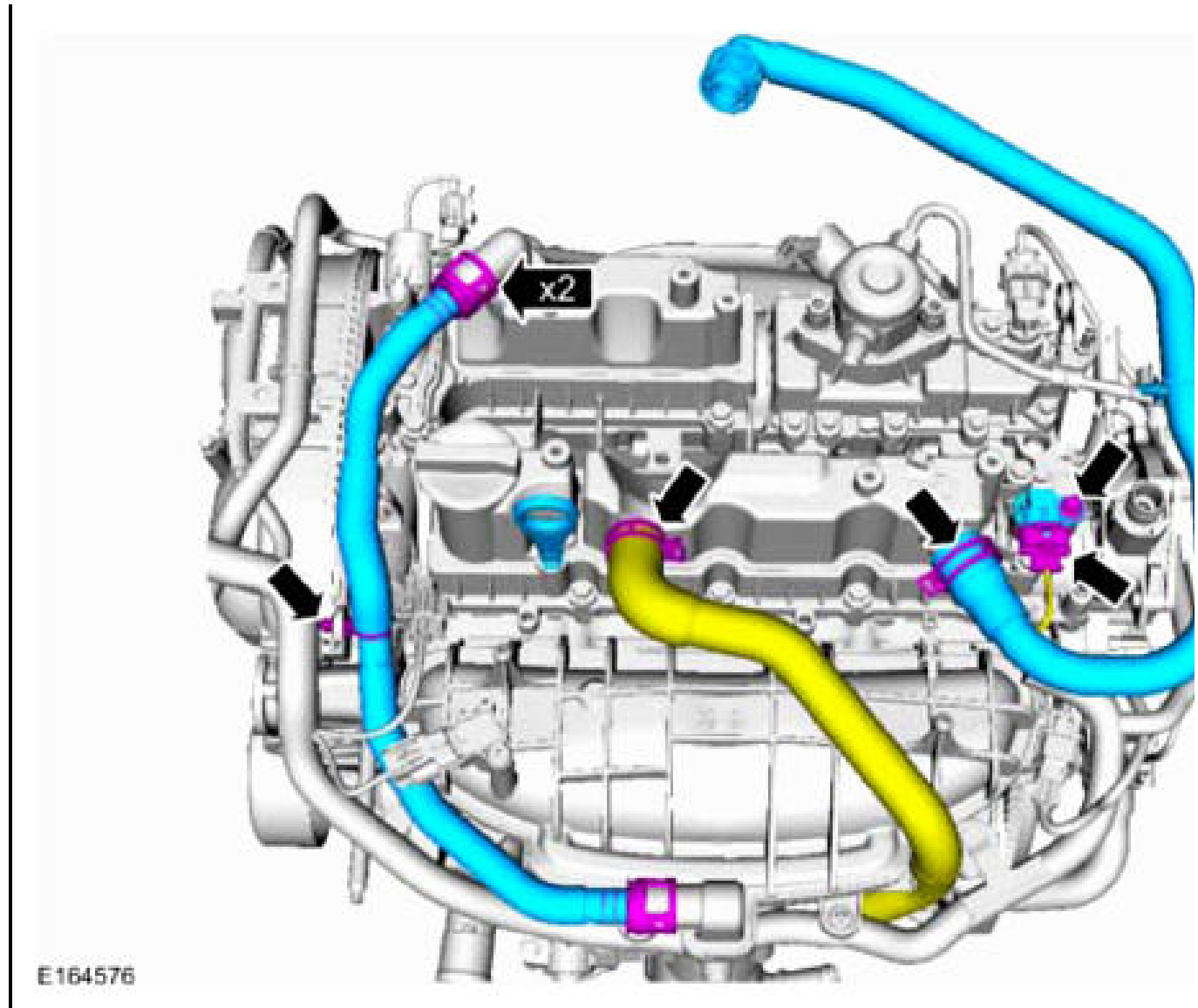
15. *Torque* : 8 Nm



16. Refer to: **QUICK RELEASE COUPLING** .

General Equipment : Hose Clamp Remover/Installer

Torque : 8 Nm

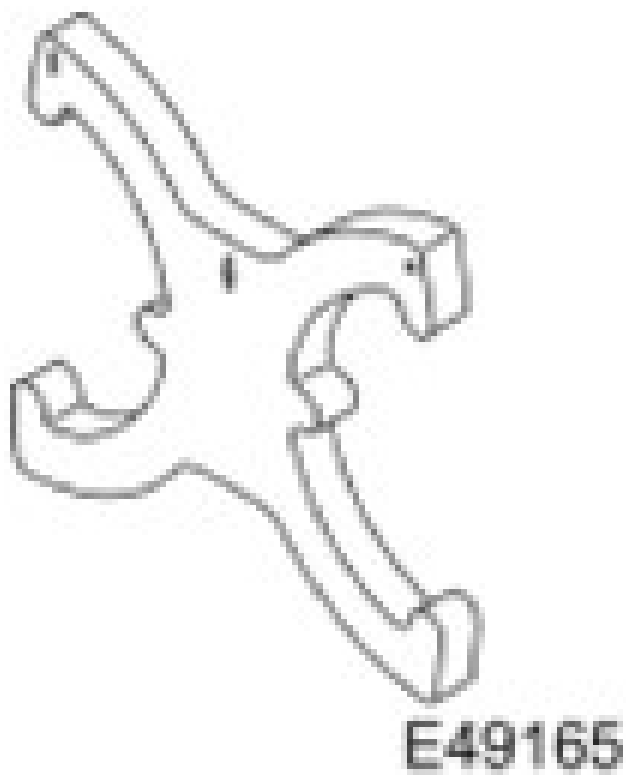
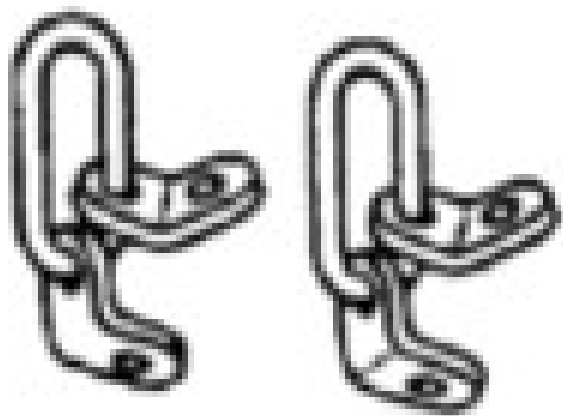


17. Refer to: **FUEL RAIL** .

CRANKSHAFT PULLEY

SPECIAL TOOLS/GENERAL EQUIPMENT

303-050 (T70P-6000)
Lifting Bracket, Engine



303-1097

Locking Tool, Variable Camshaft Timing Oil
Control Unit

TKIT-2001B-FLM

TKIT-2001B-ROW



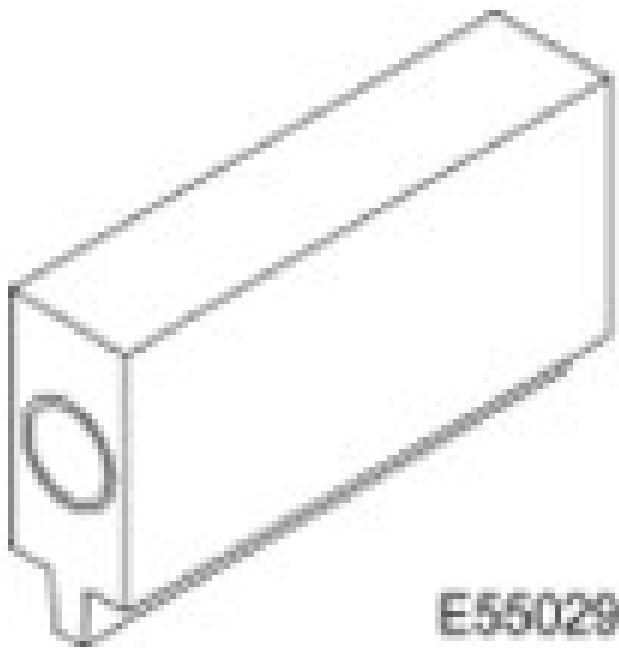
303-1502
Lifting Device Engine



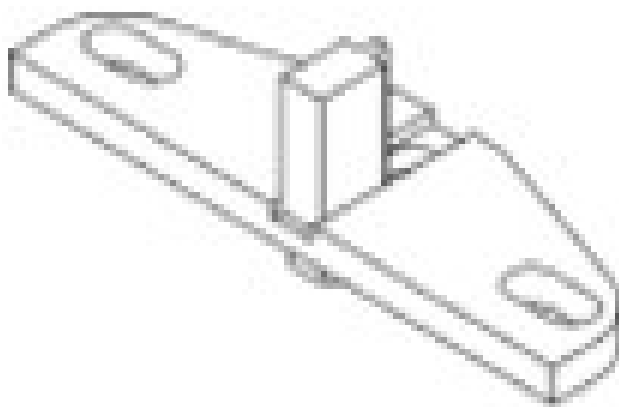
303-1550
Alignment Tool, Crankshaft Vibration Damper

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



303-393-02
Adapter for 303-393



303-393A
Locking Tool, Flywheel

303-748
Locking Tool, Crankshaft

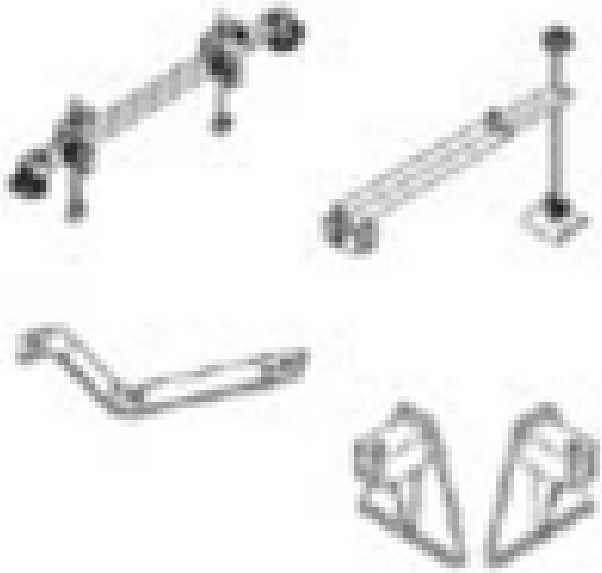
2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



303748

TKIT-2001B-FLM
TKIT-2001B-ROW



303-F072
Support Bar, Engine

Trolley Jack

Hose Clamp Remover/Installer

Wooden Block

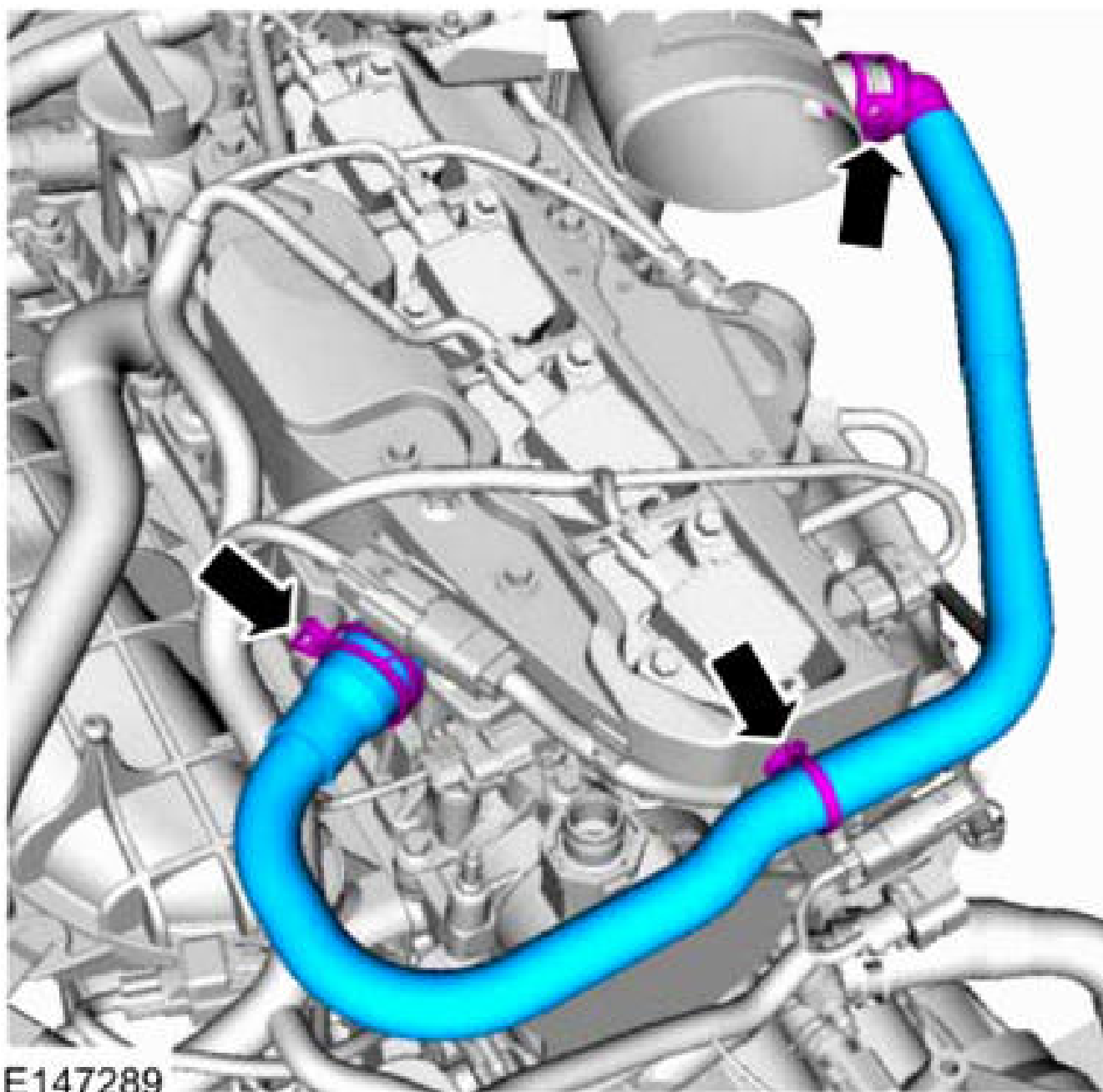
Removal

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the

crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

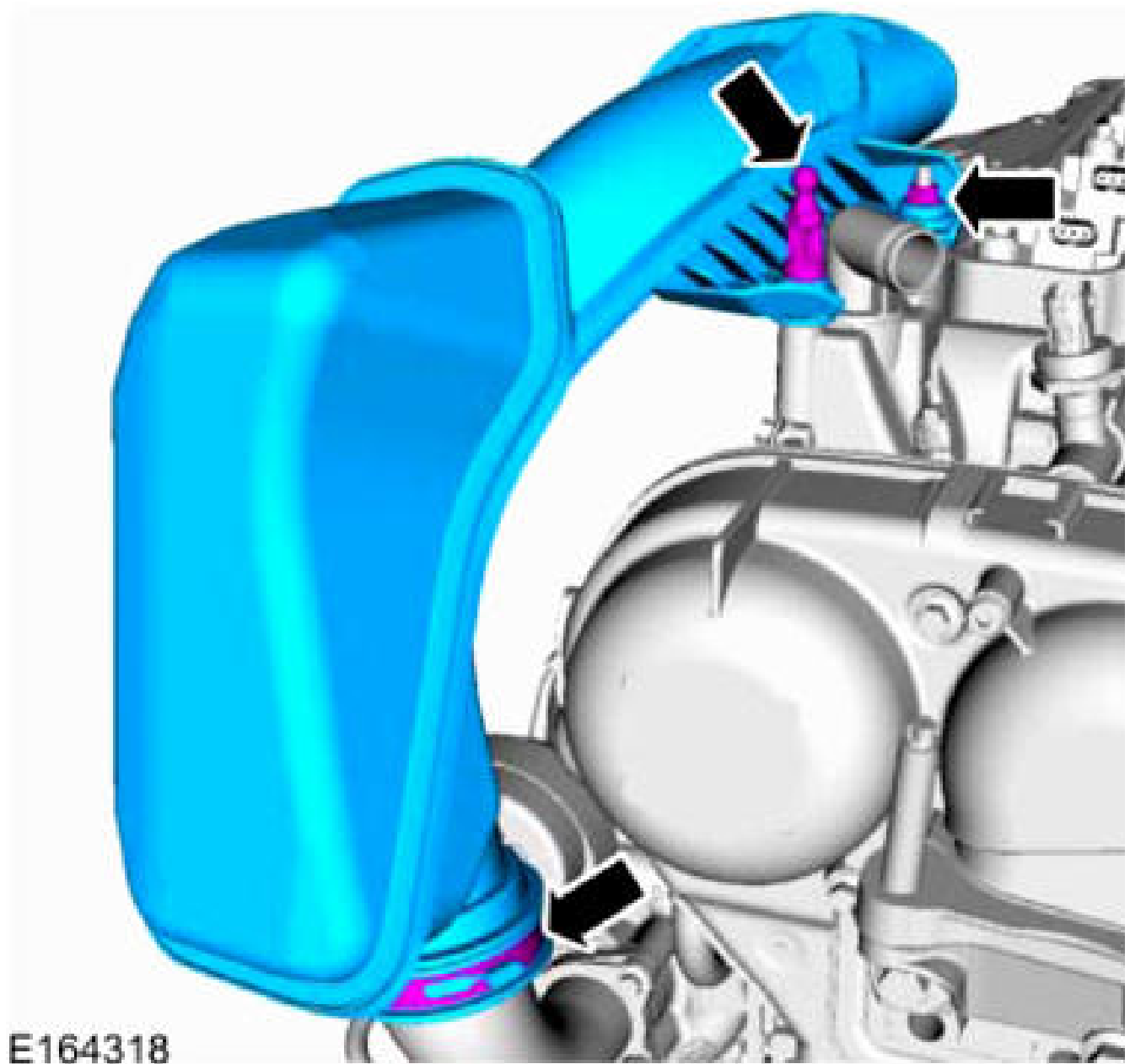
NOTE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .
2. Remove the following items:
 1. Refer to: **AIR CLEANER OUTLET PIPE** .
 2. Refer to: **DEGAS BOTTLE** .
3. *General Equipment* : Hose Clamp Remover/Installer



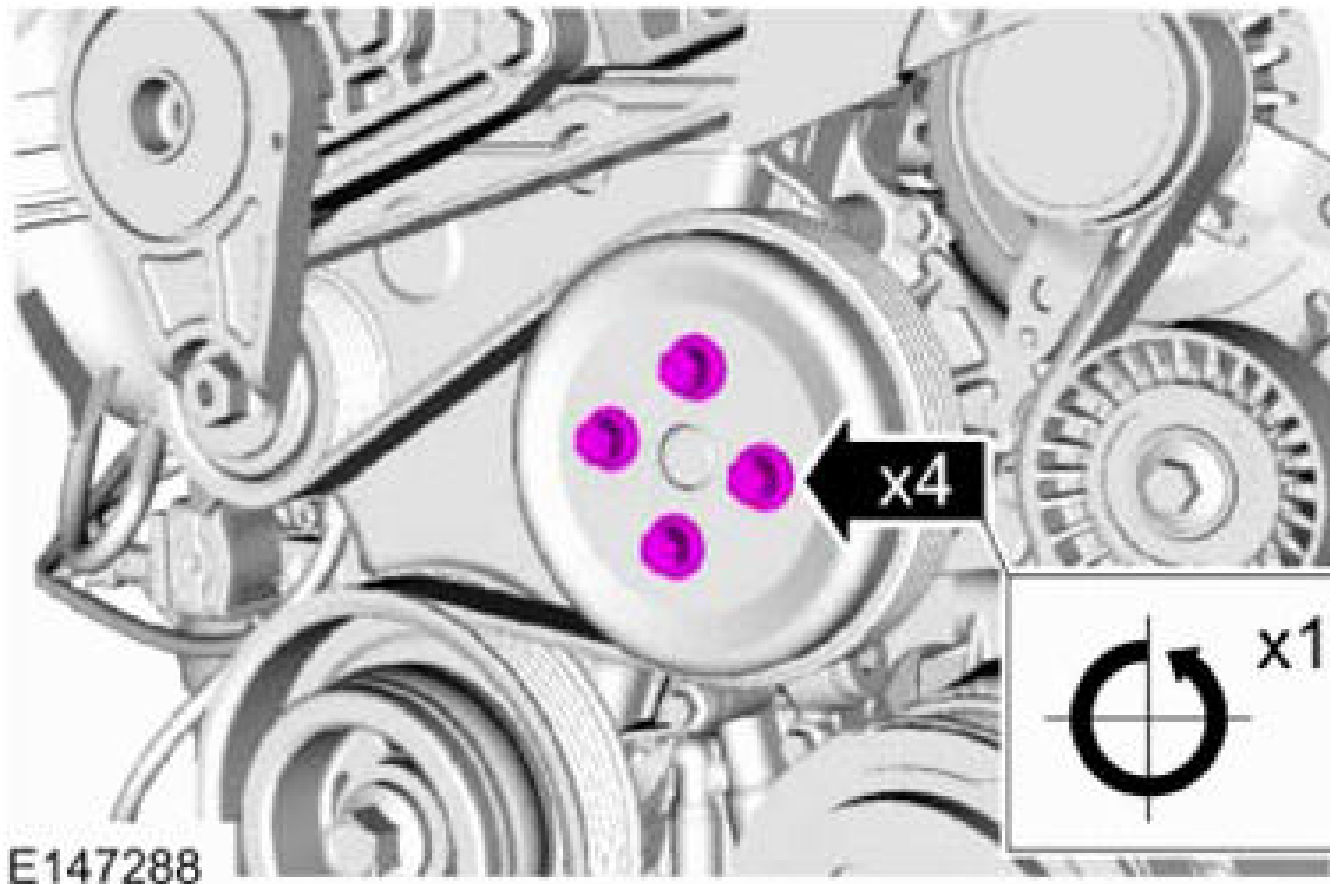
E147289

4.



4.

5.



5.

6. Remove the following items:

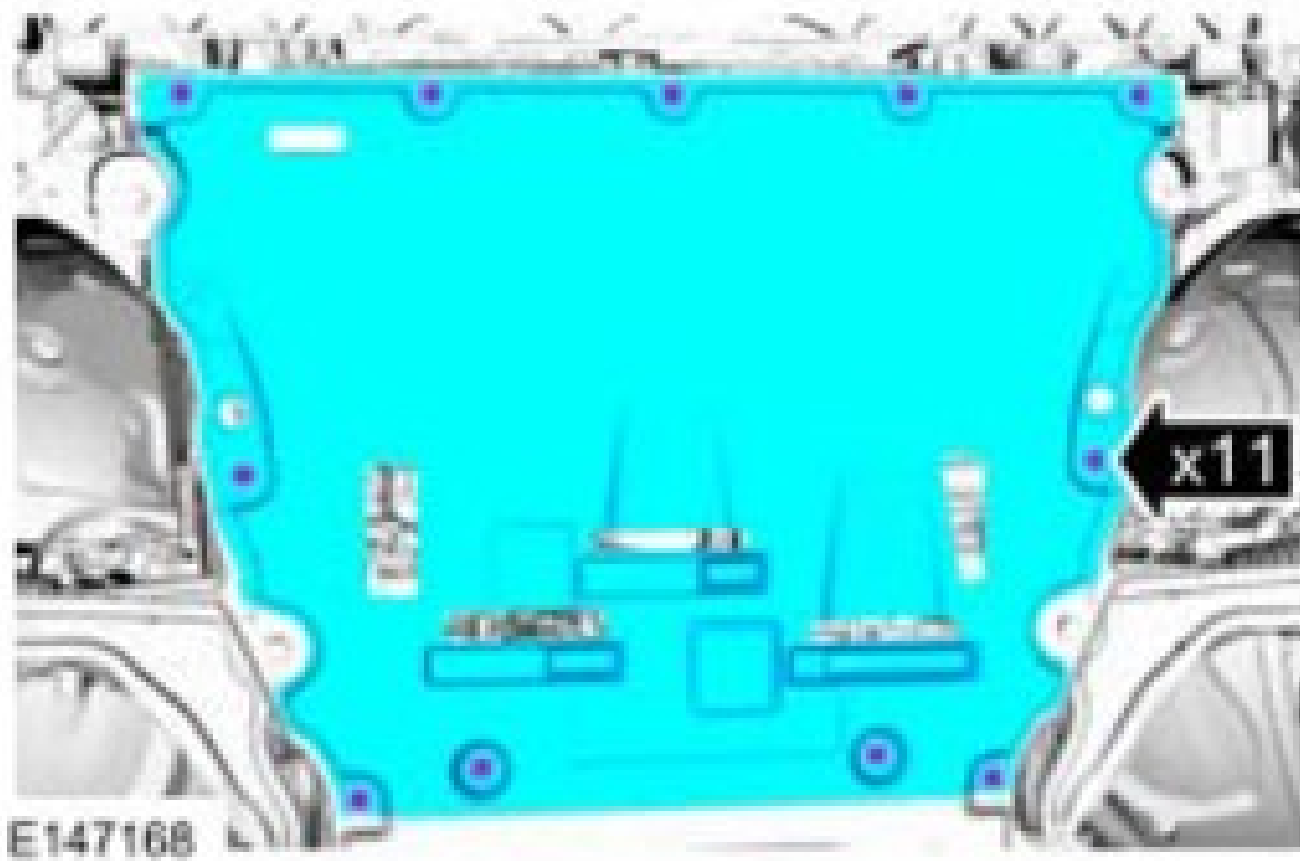
1. Remove the **RH** front wheel and tire.

Refer to: **WHEEL AND TIRE** .

2. Remove the **RH** front fender splash shield.

Refer to: **FENDER SPLASH SHIELD** .

7.

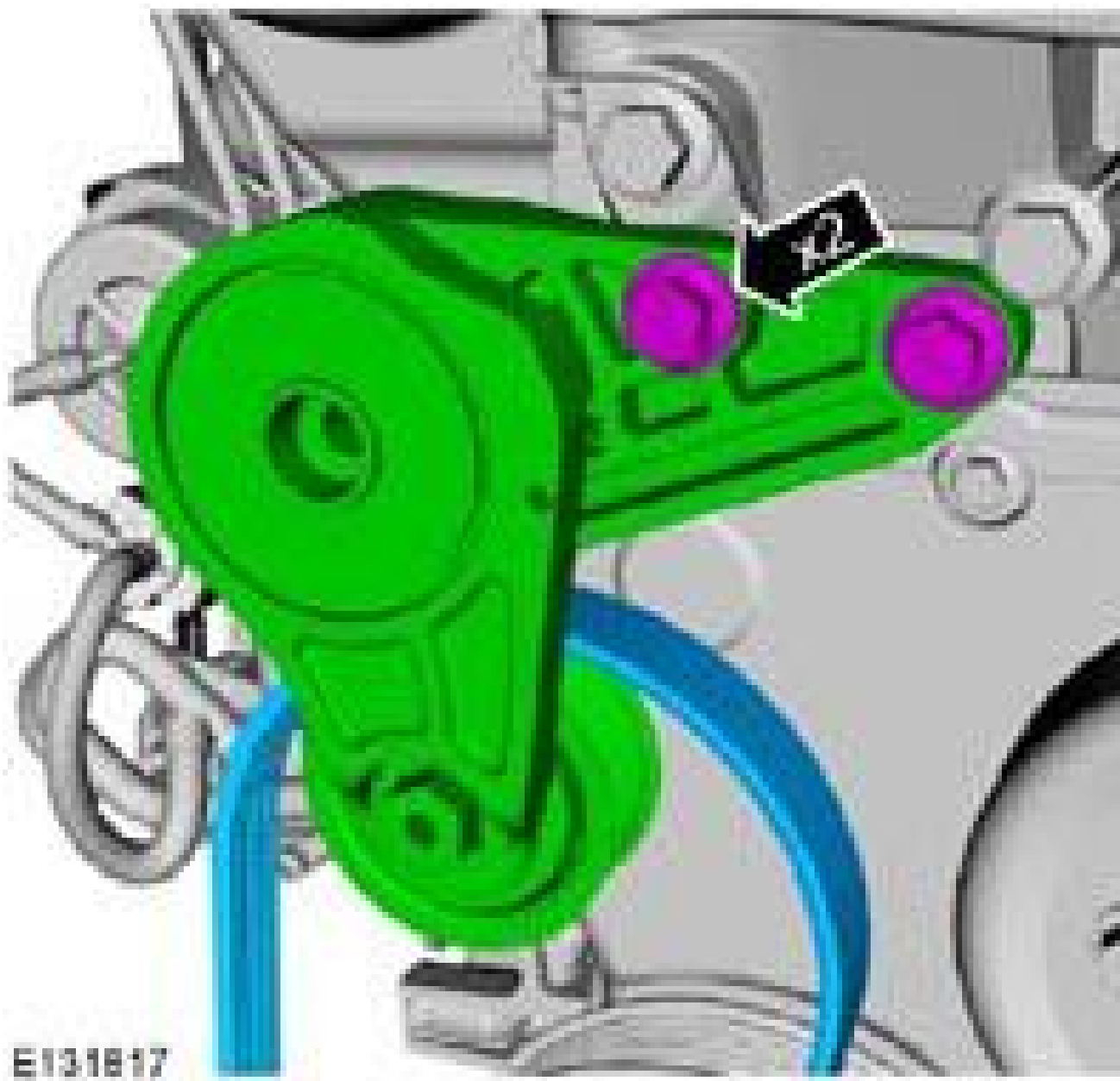


7.

8. Remove the following items:

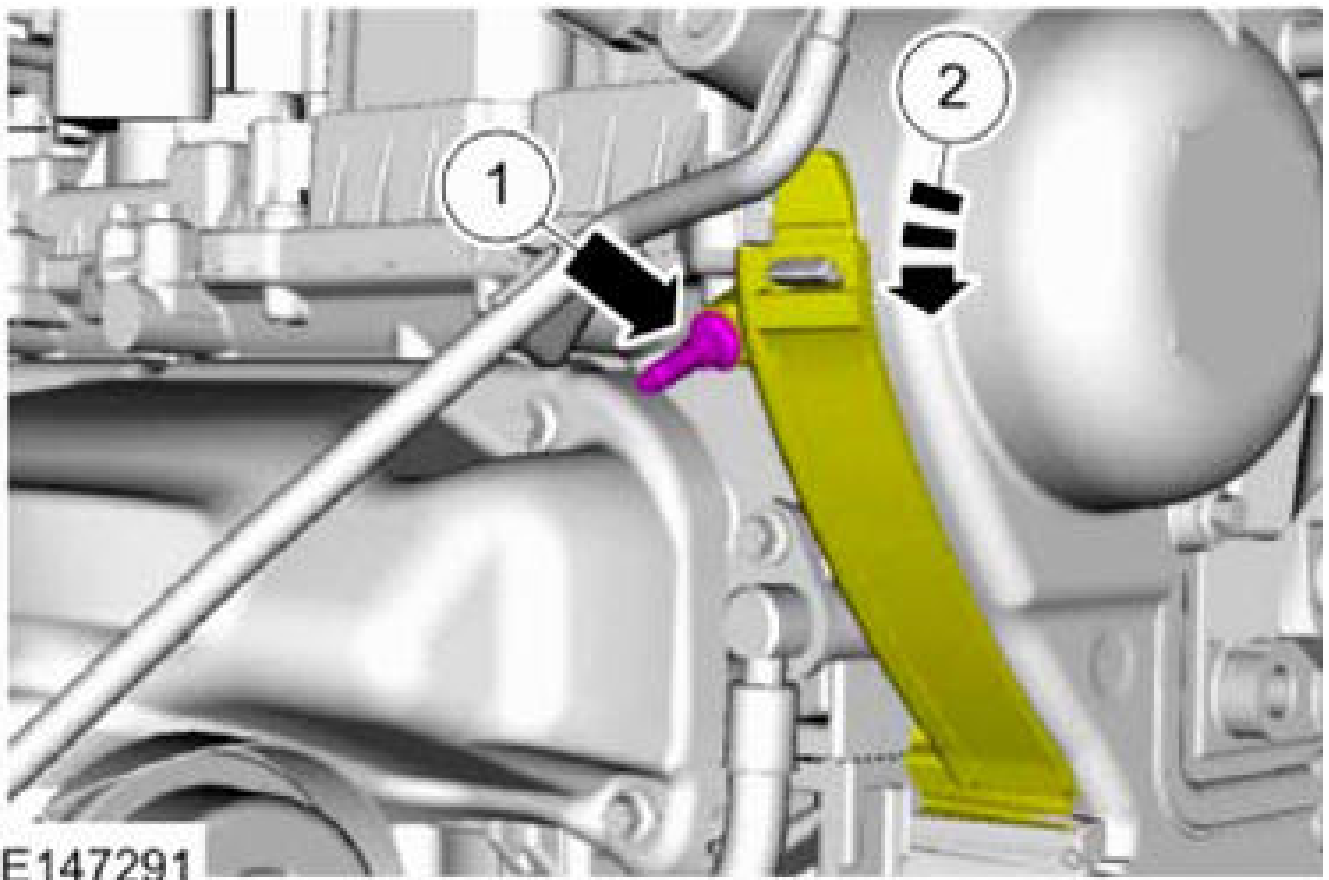
1. Refer to: **STARTER MOTOR** .
2. Refer to: **GENERATOR - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .
3. Refer to: **ENGINE MOUNT** .

9.



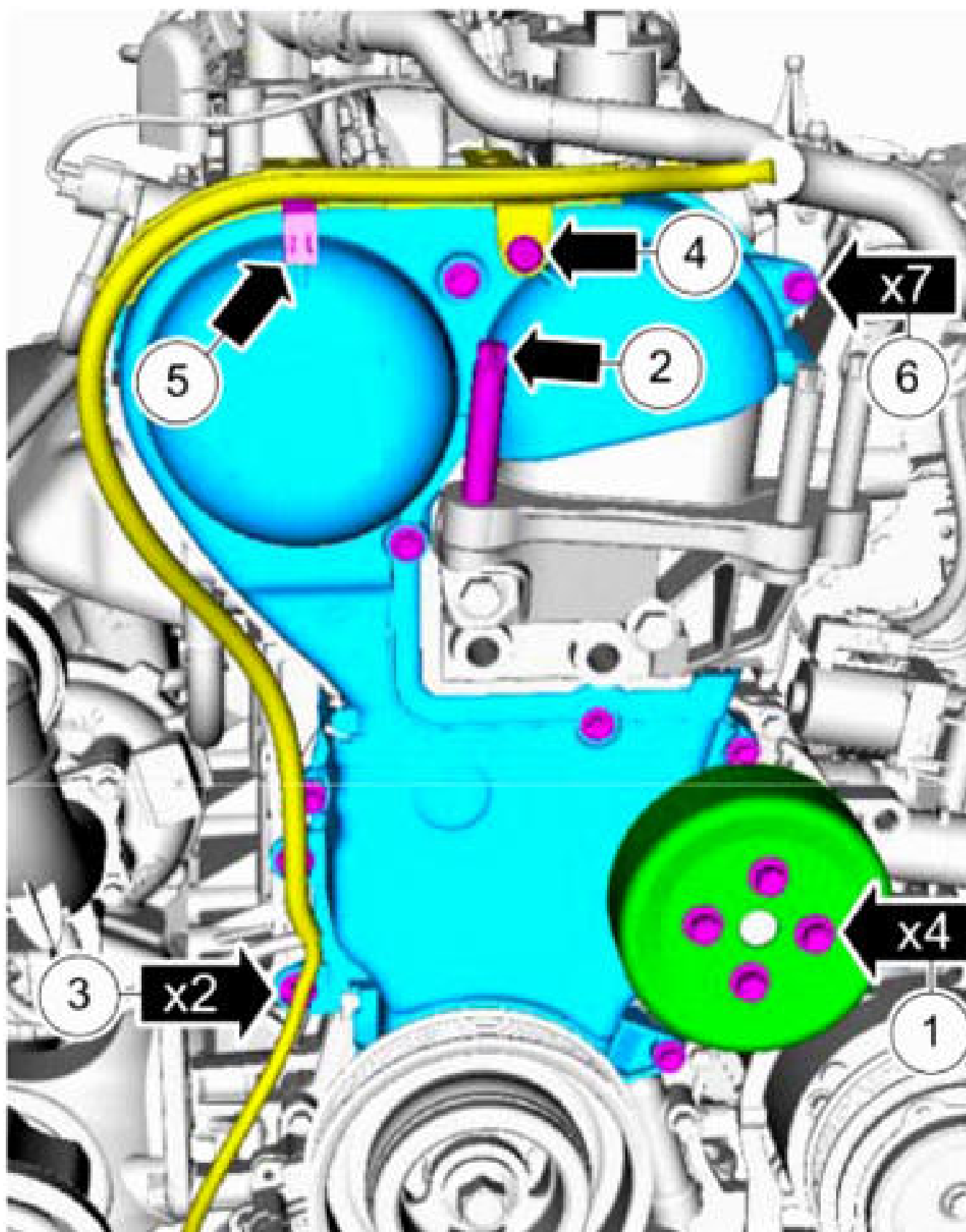
9.

10.

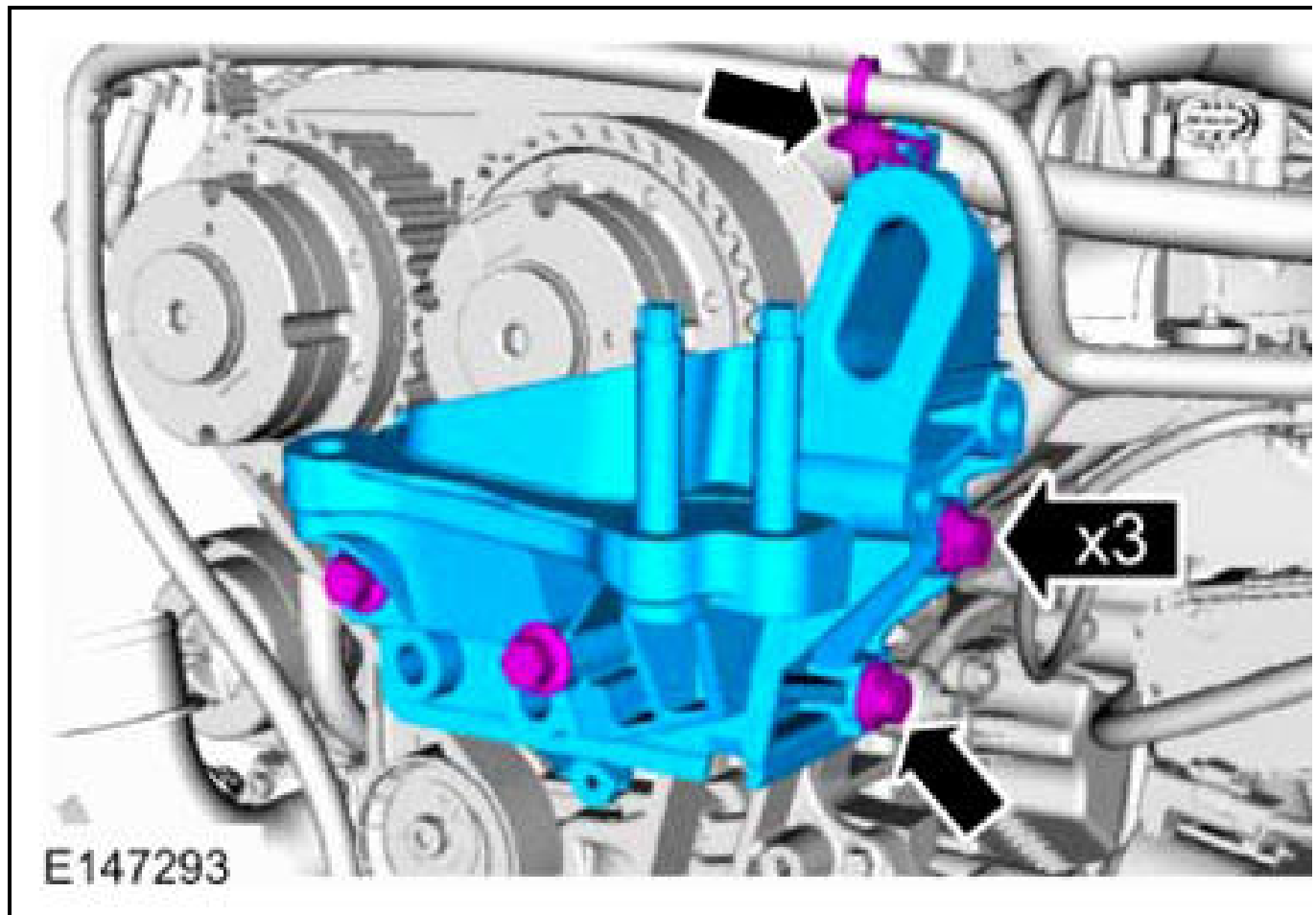


10.

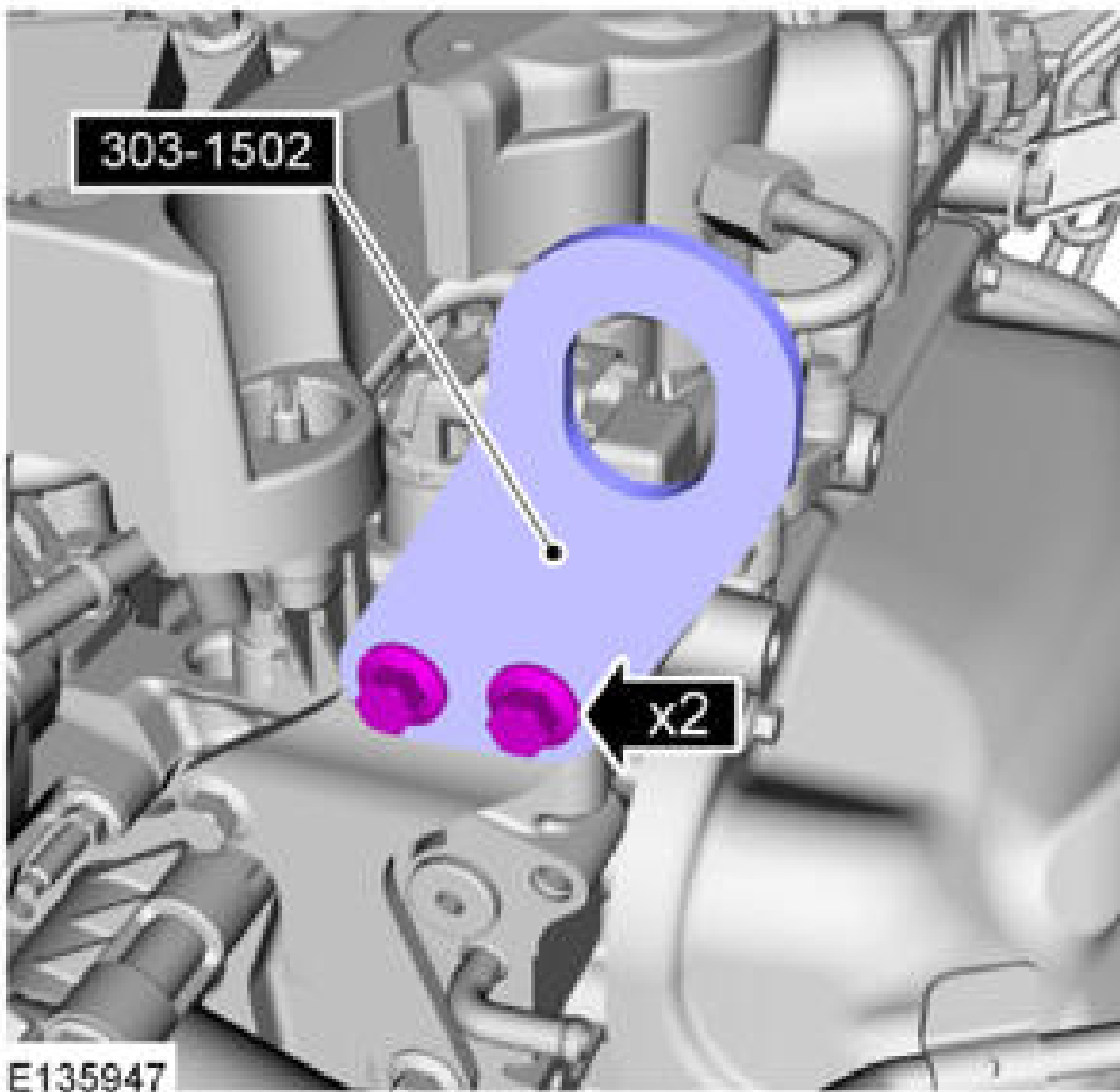
11.



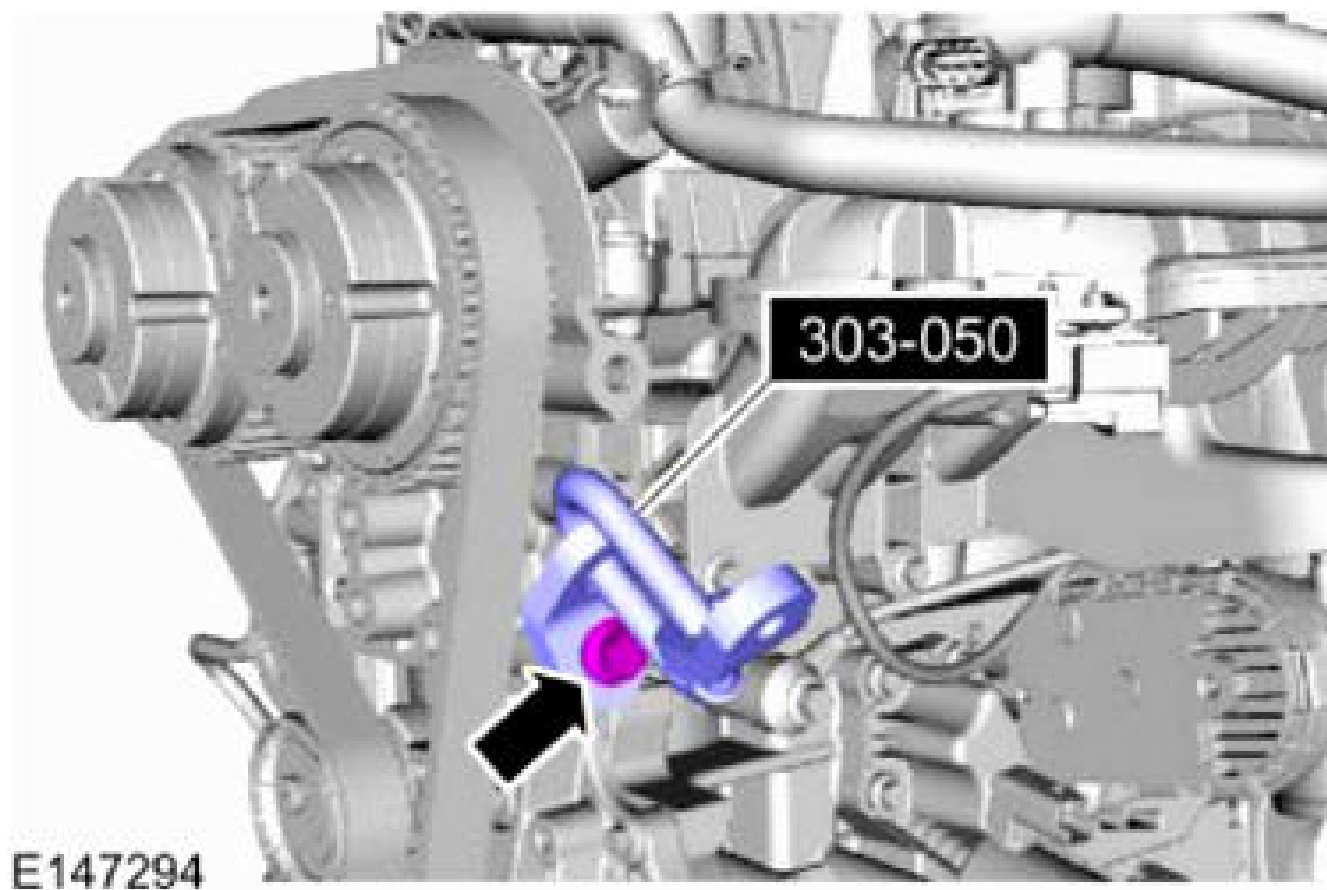
12. **NOTE:** Note the different lengths of the bolts for installation.

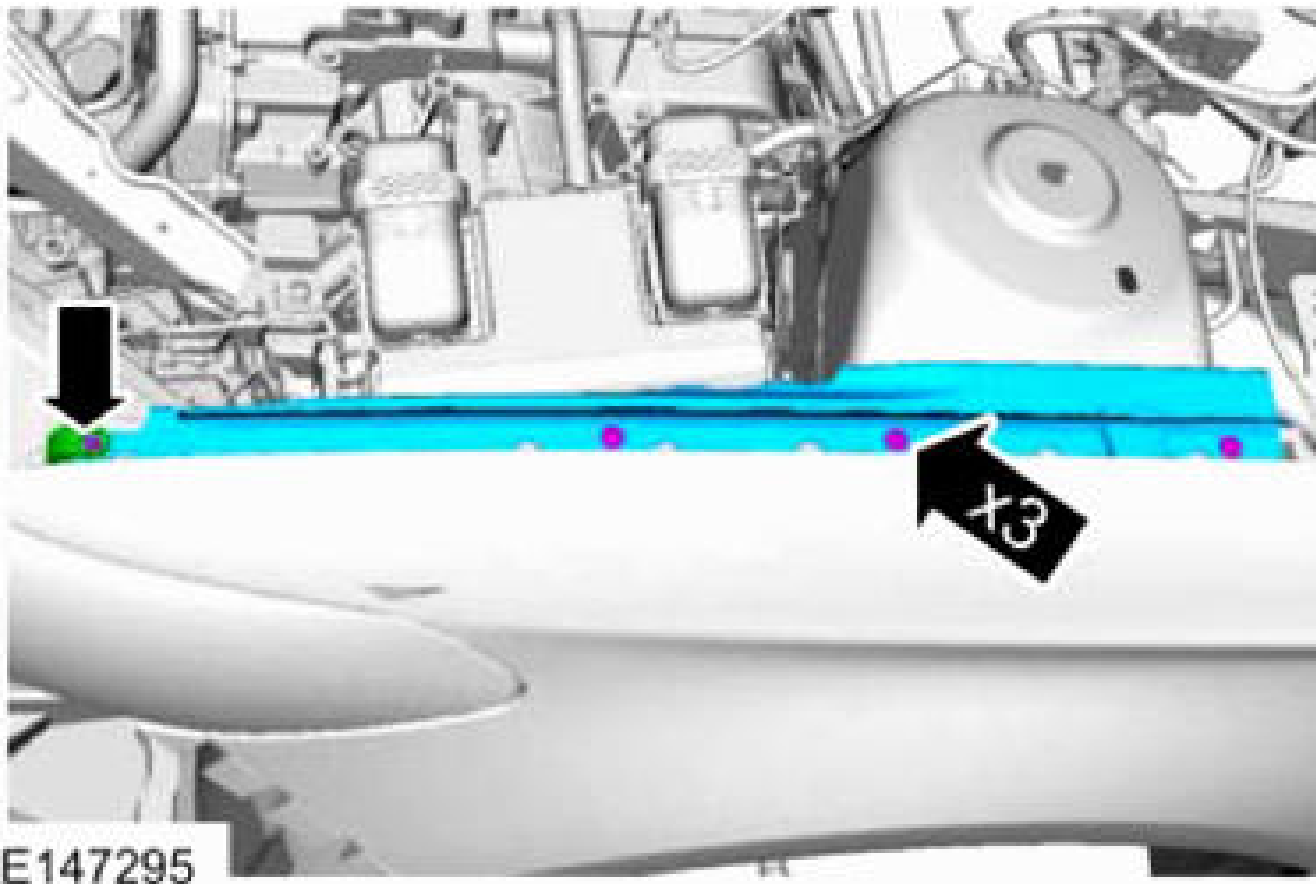


13. *Install Special Service Tool : 303-1502 Lifting Device Engine*



14. *Install Special Service Tool : 303-050 (T70P-6000) Lifting Bracket, Engine*





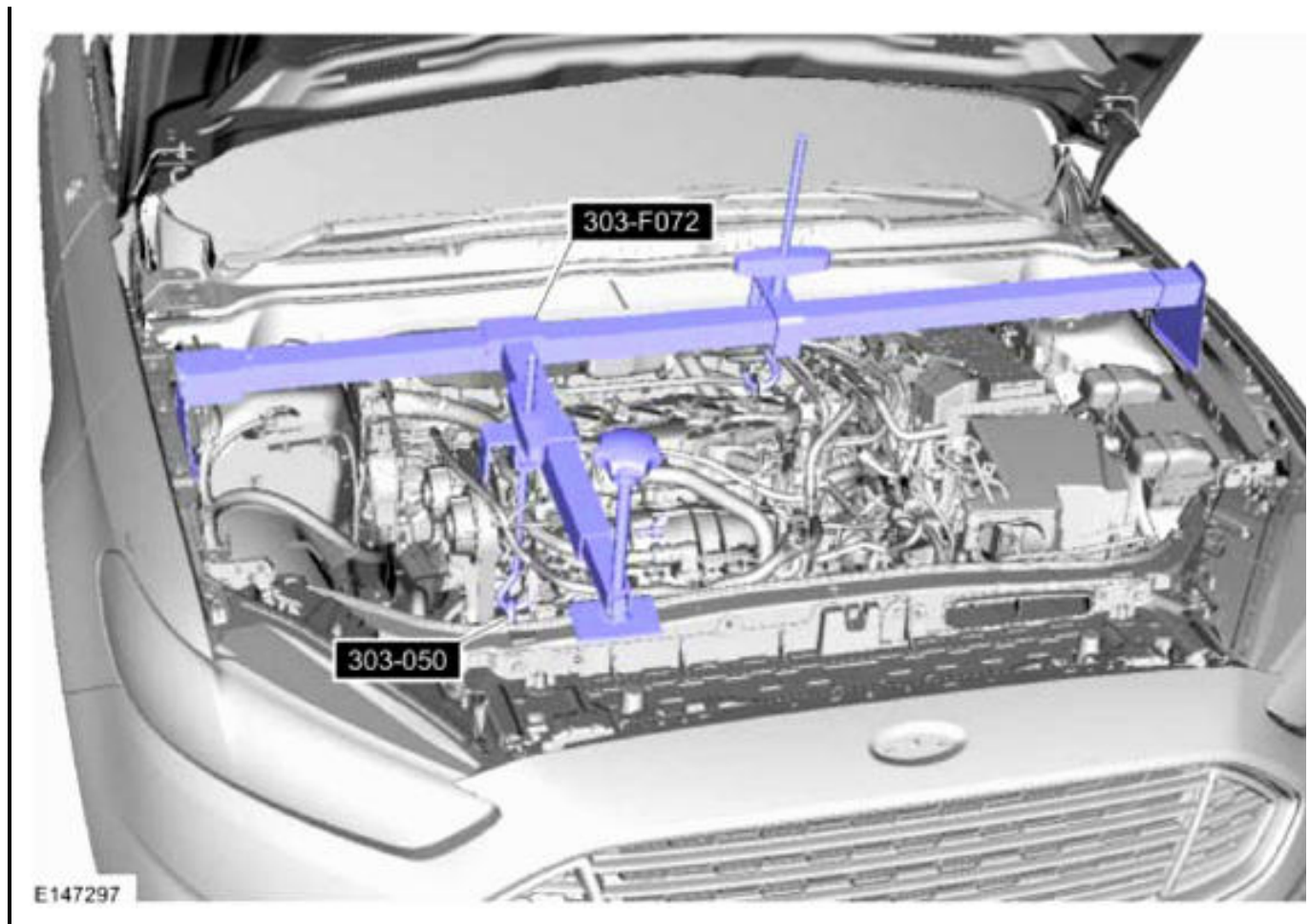
15.

16.



16.

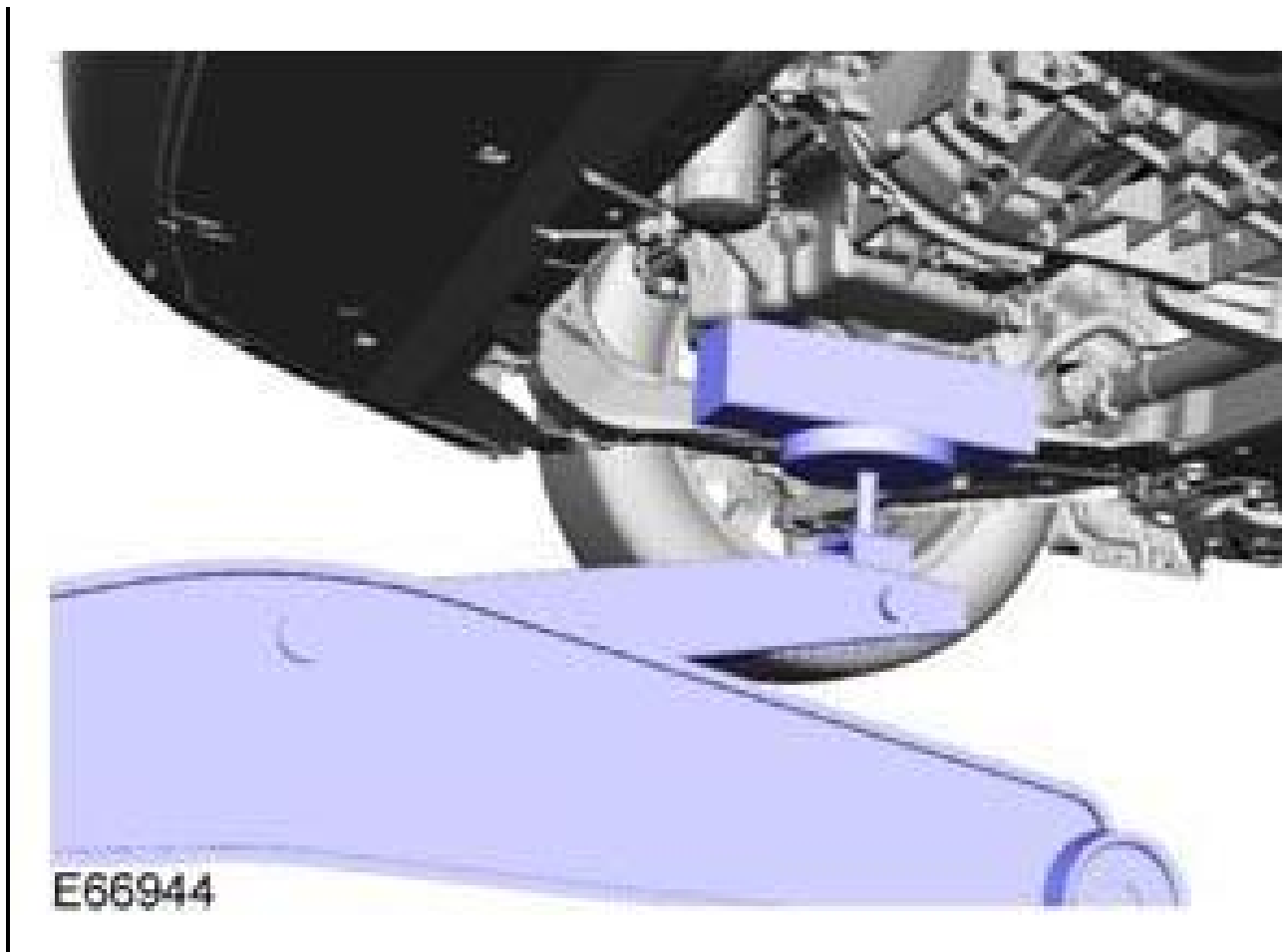
17. *Install Special Service Tool : 303-F072 Support Bar, Engine*



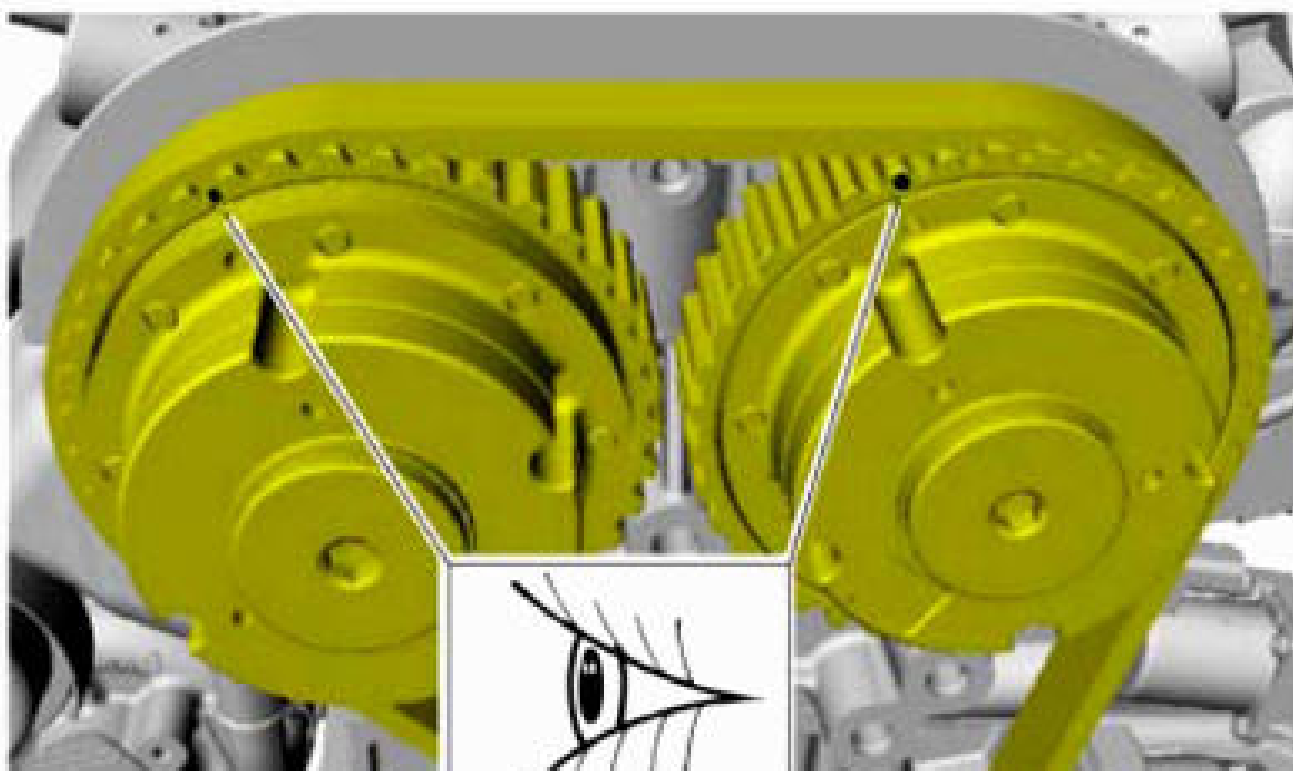
18. Remove the following items:

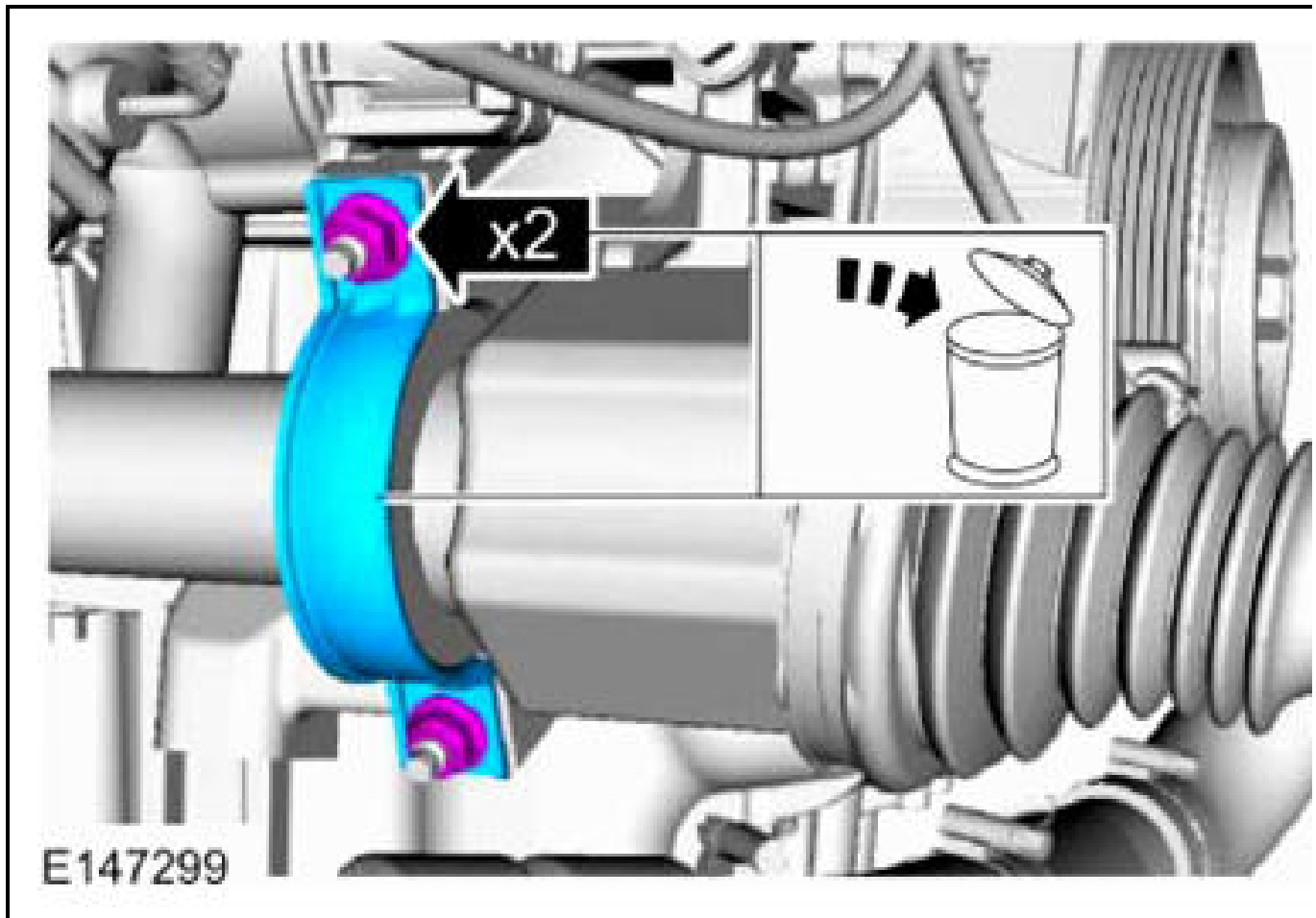
1. *General Equipment* : Trolley Jack

General Equipment : Wooden Block

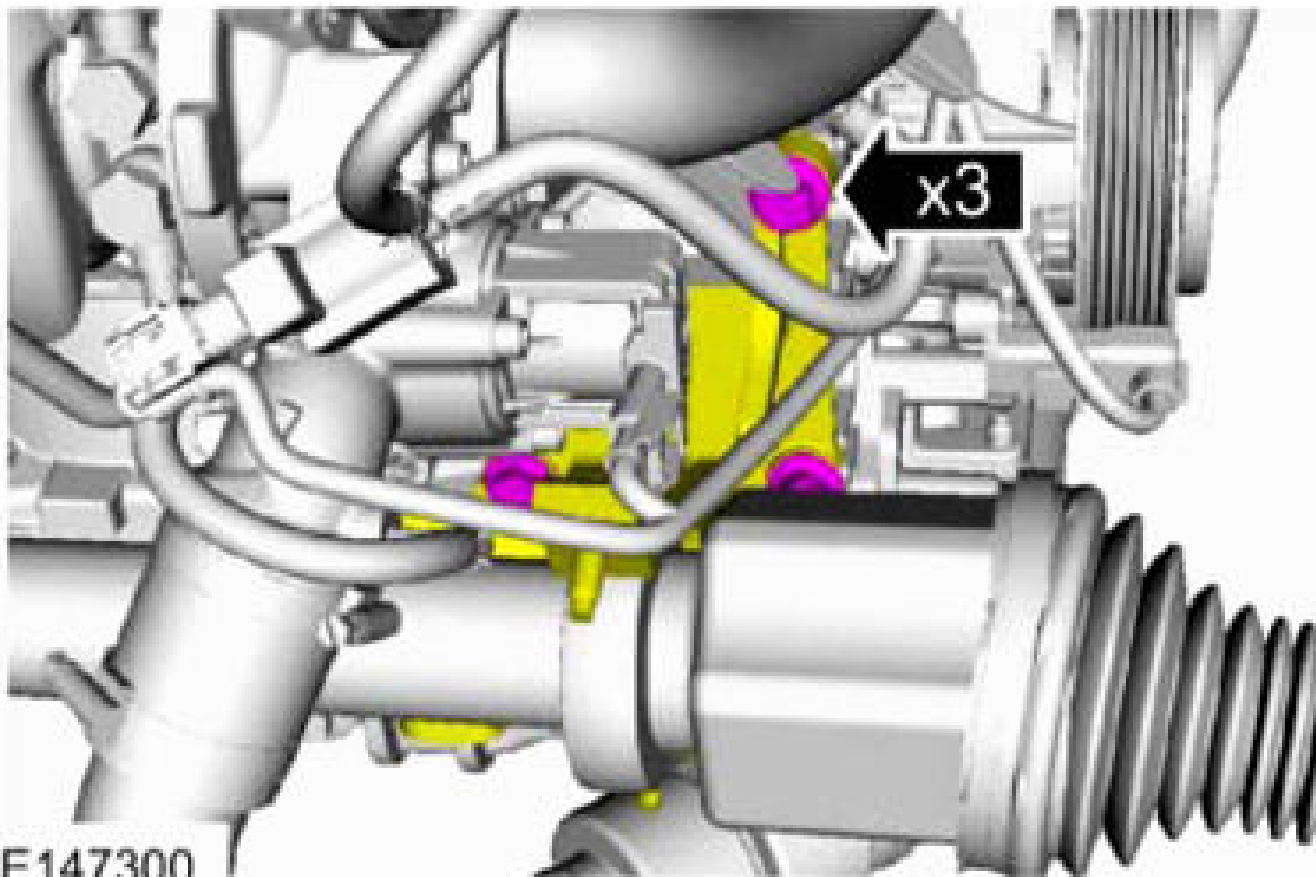


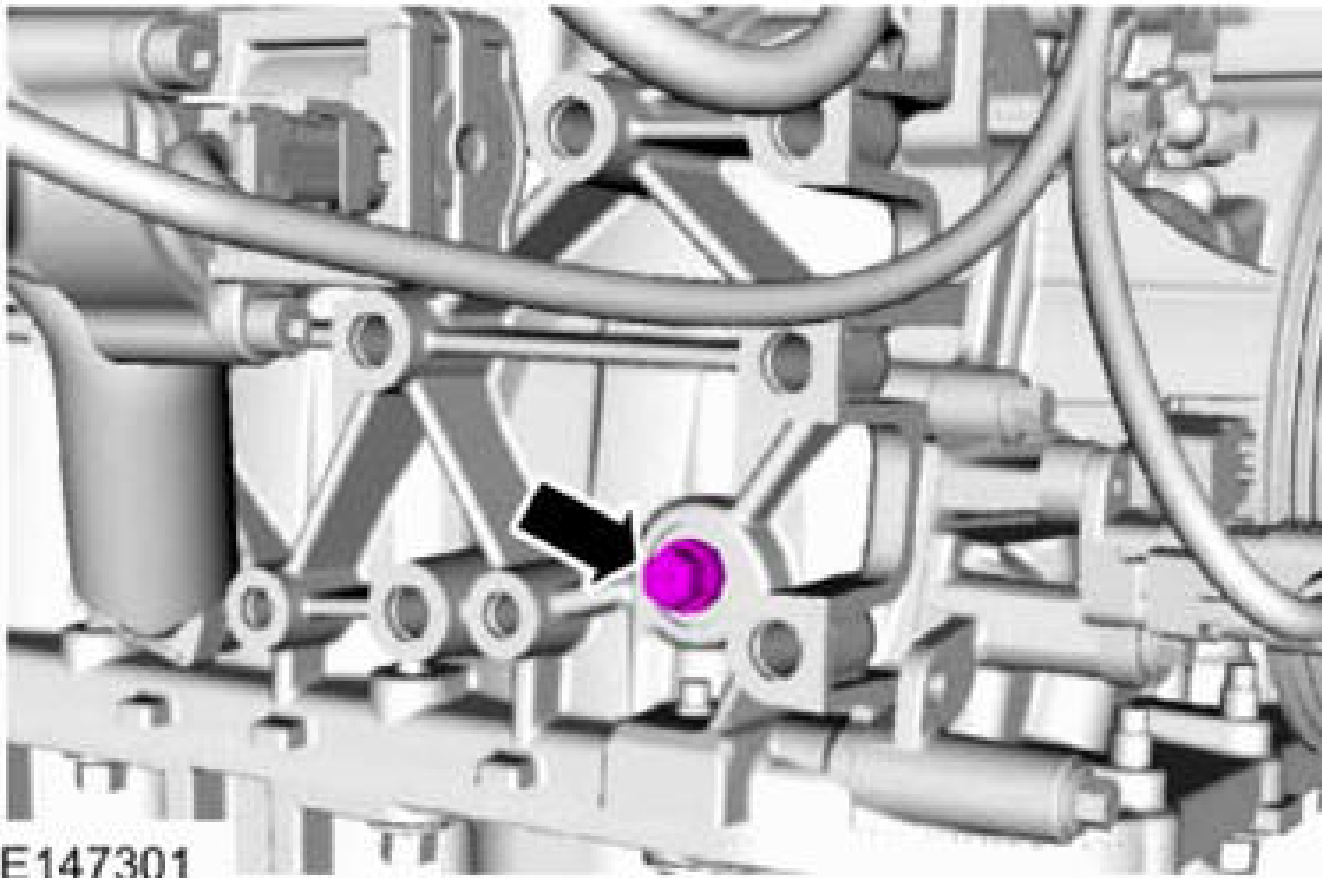
19. **NOTE:** Only rotate the crankshaft in a clockwise direction.
11 o'clock position.





- 20.
21. **NOTE:** It may be necessary to rotate the halfshaft to remove the front lower bolt.



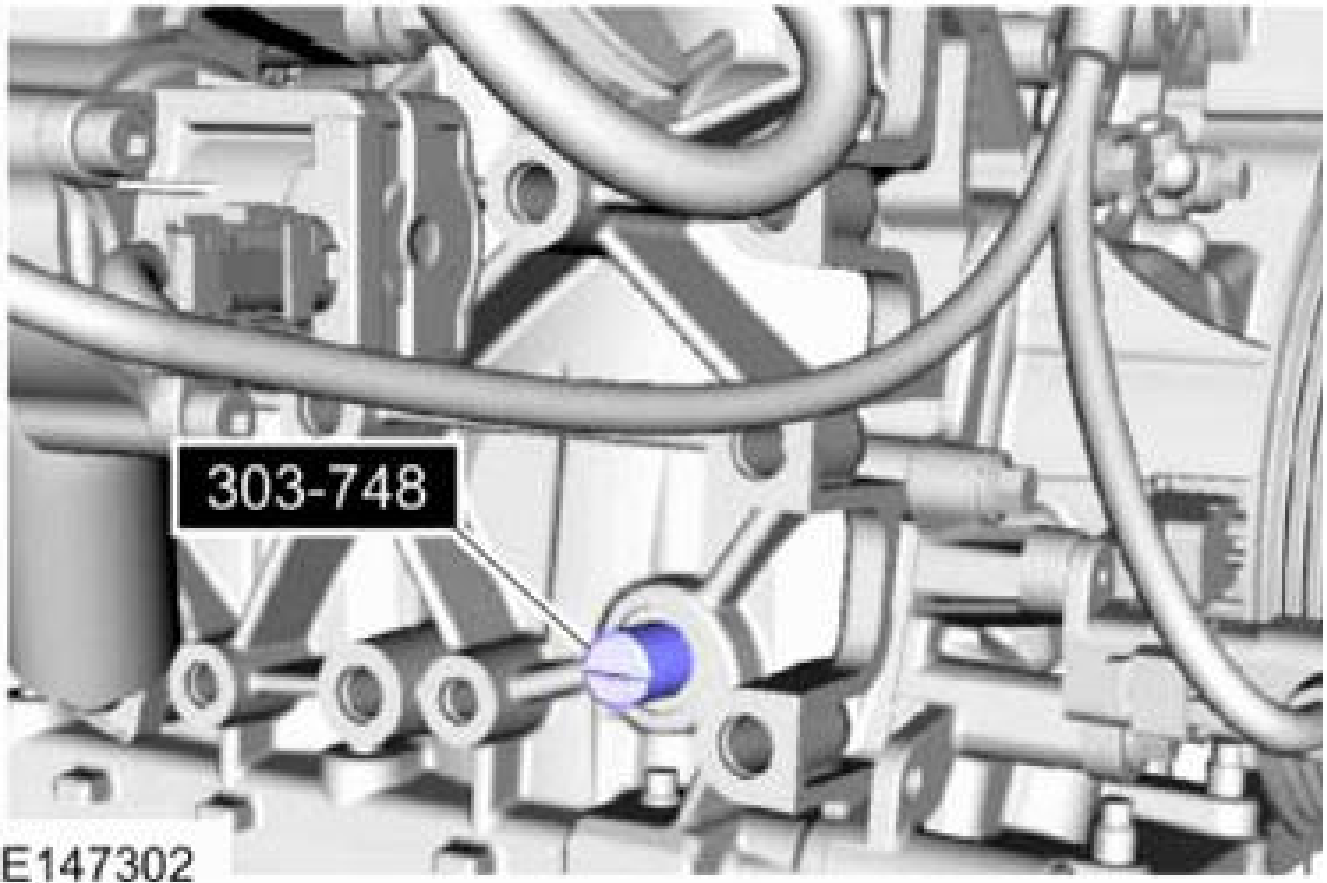


22.

NOTE: The Crankshaft TDC Timing Pin will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the crankshaft pulley removal and installation.

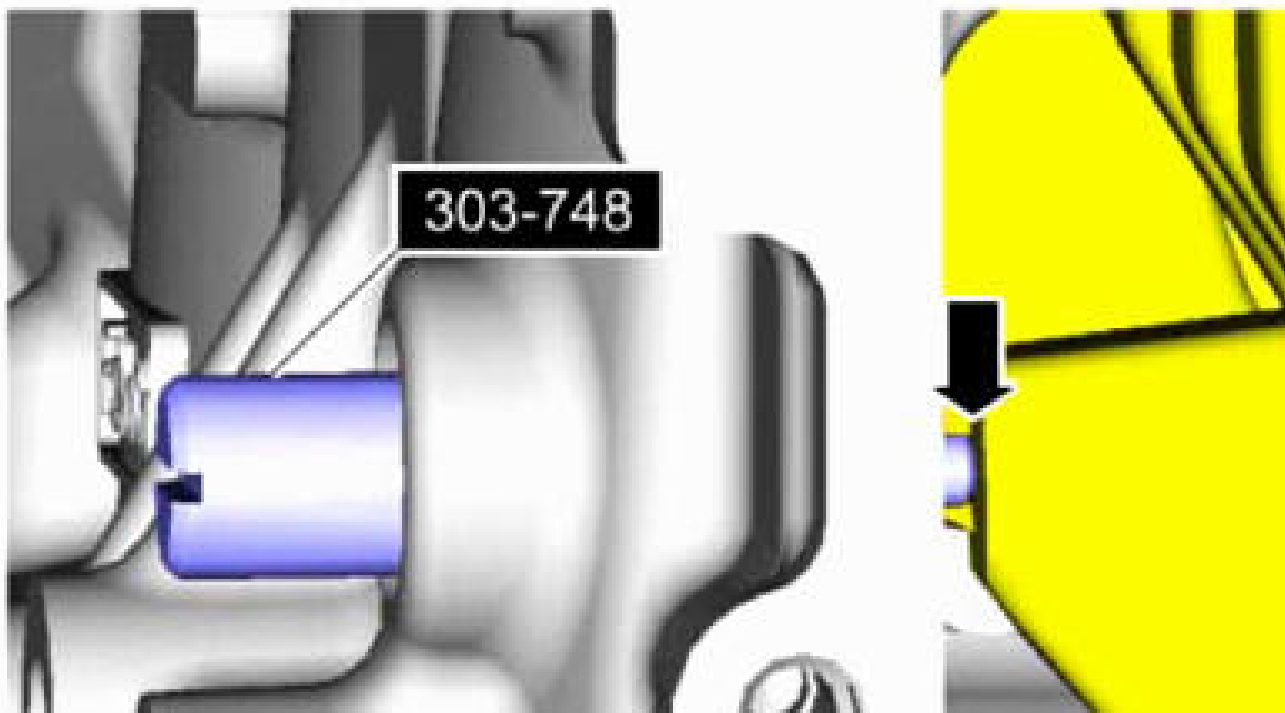
23.

Install Special Service Tool : 303-748 Locking Tool, Crankshaft

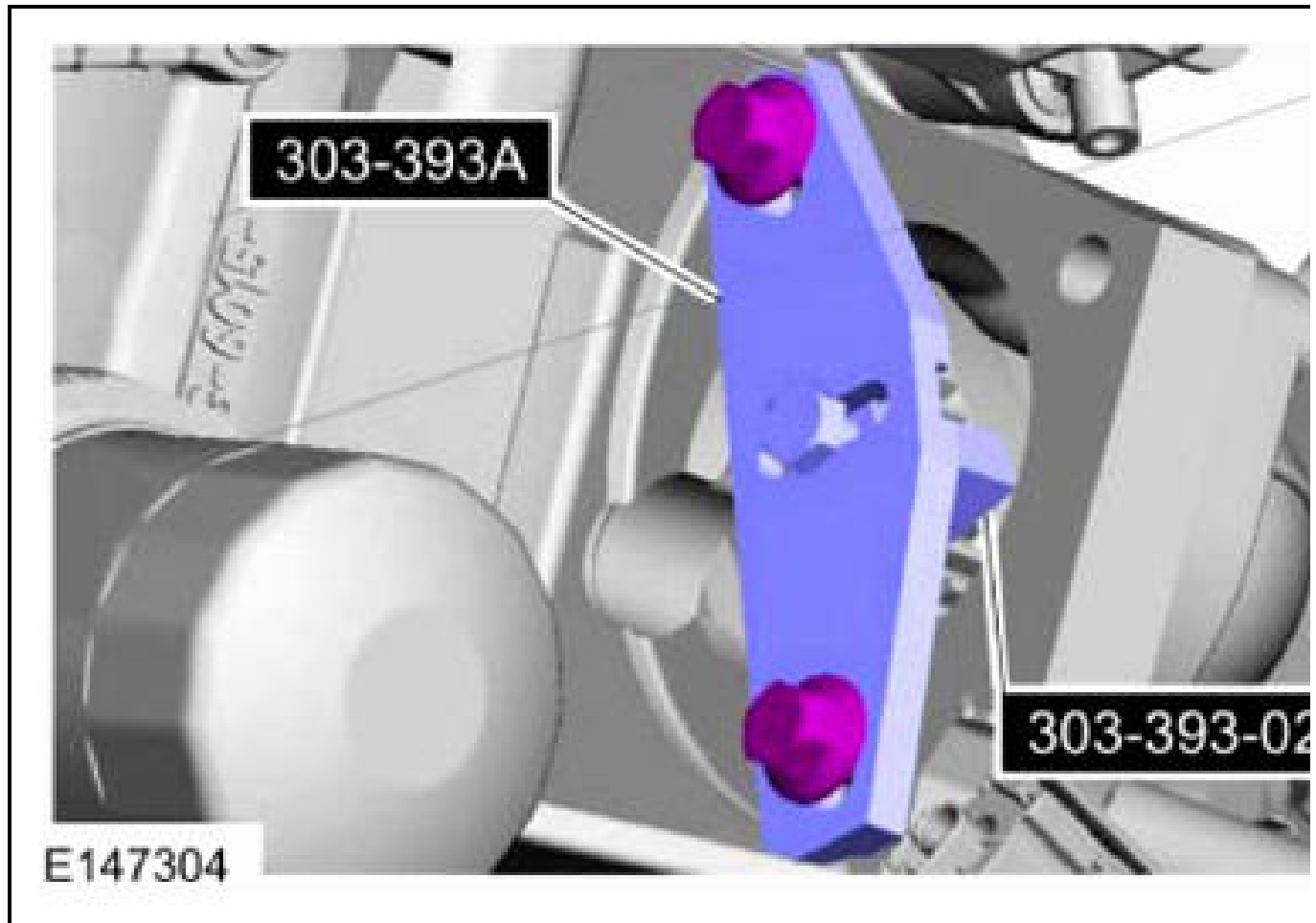


24. **NOTE:** Only rotate the crankshaft clockwise direction.

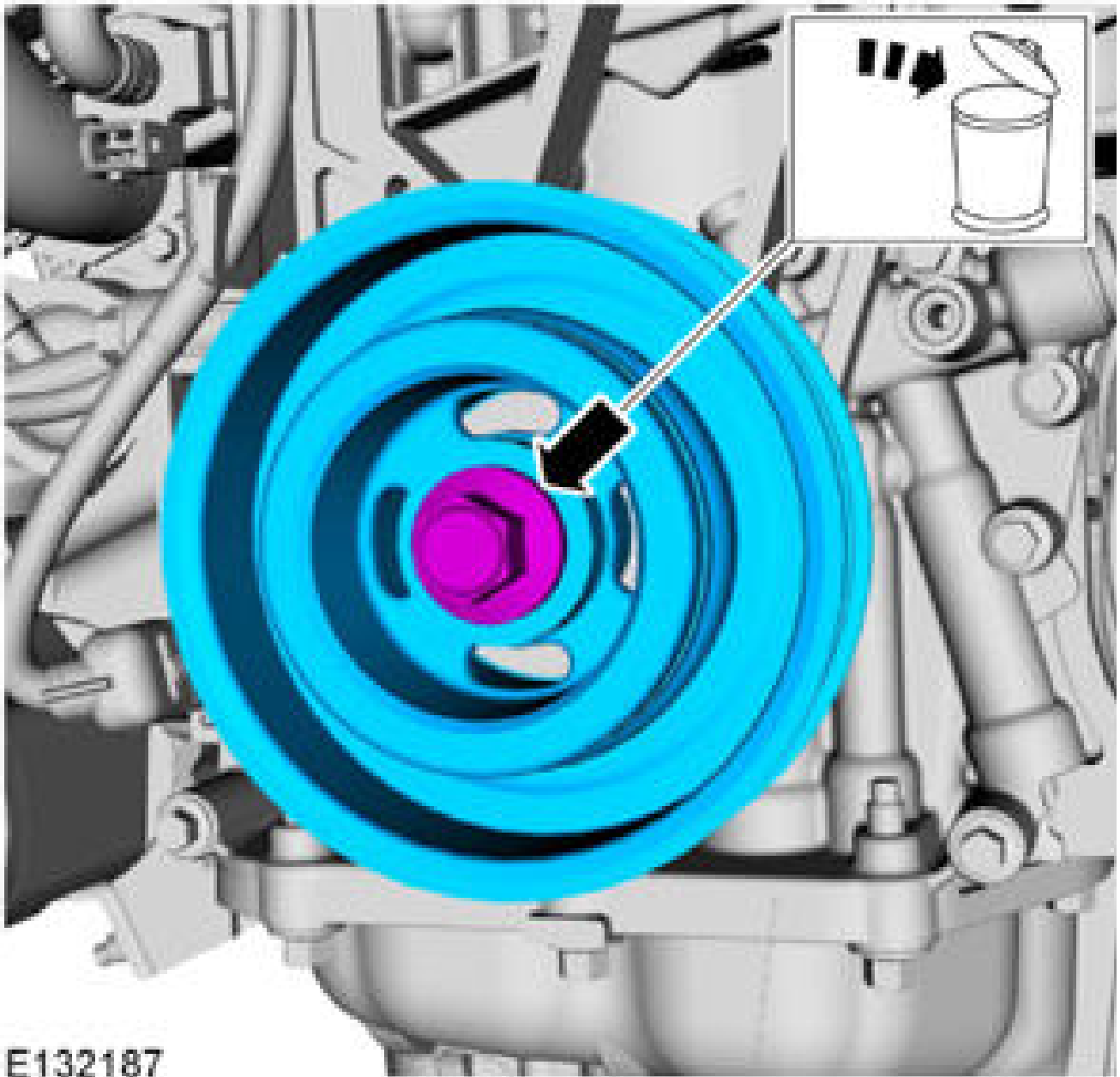
Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the crankshaft locking tool. The engine is now at **TDC**.



25. *Install Special Service Tool : 303-393-02 Adapter for 303-393 , 303-393A Locking Tool, Flywheel*



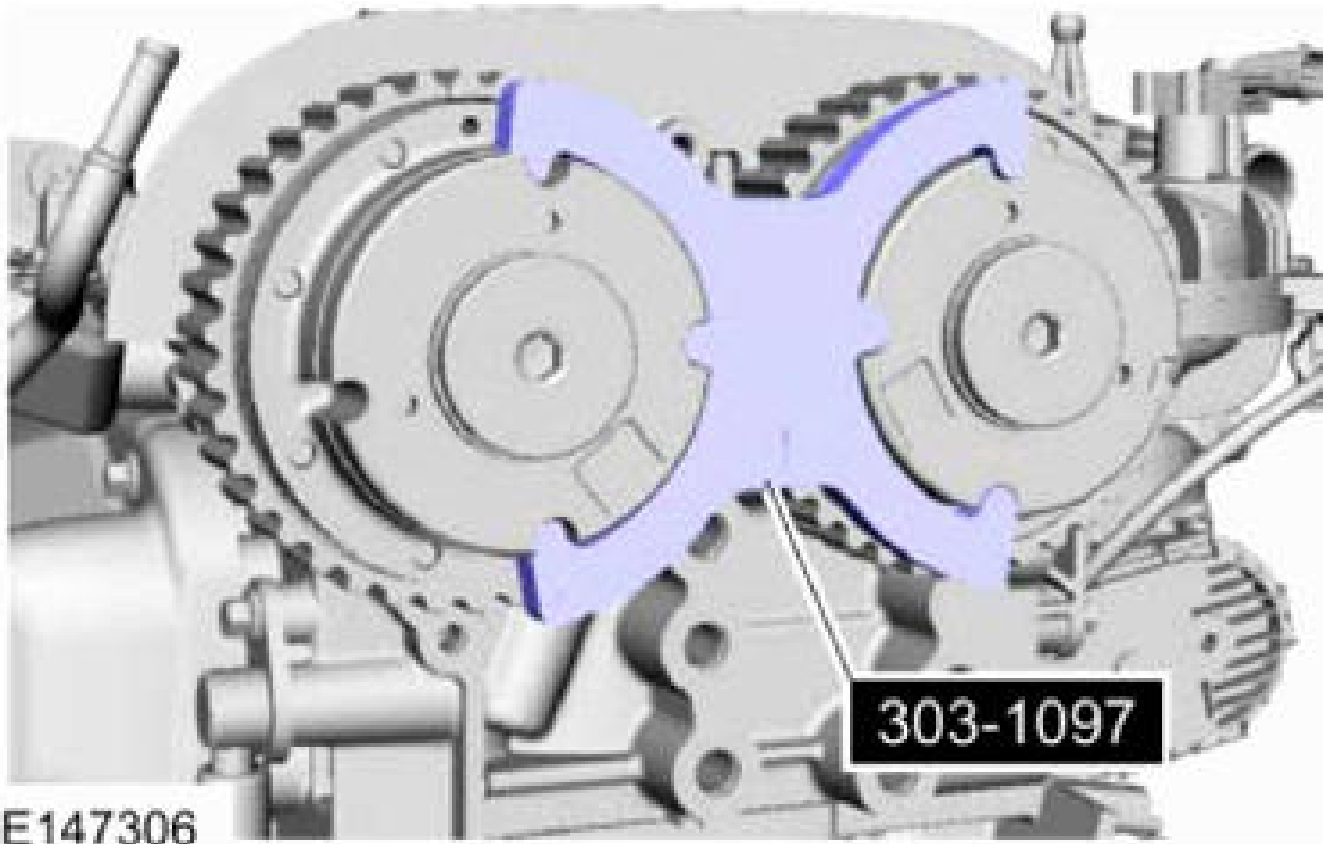
26.



26.

27. **NOTE:** It may necessary to rotate the camshafts slightly to install the special tool.

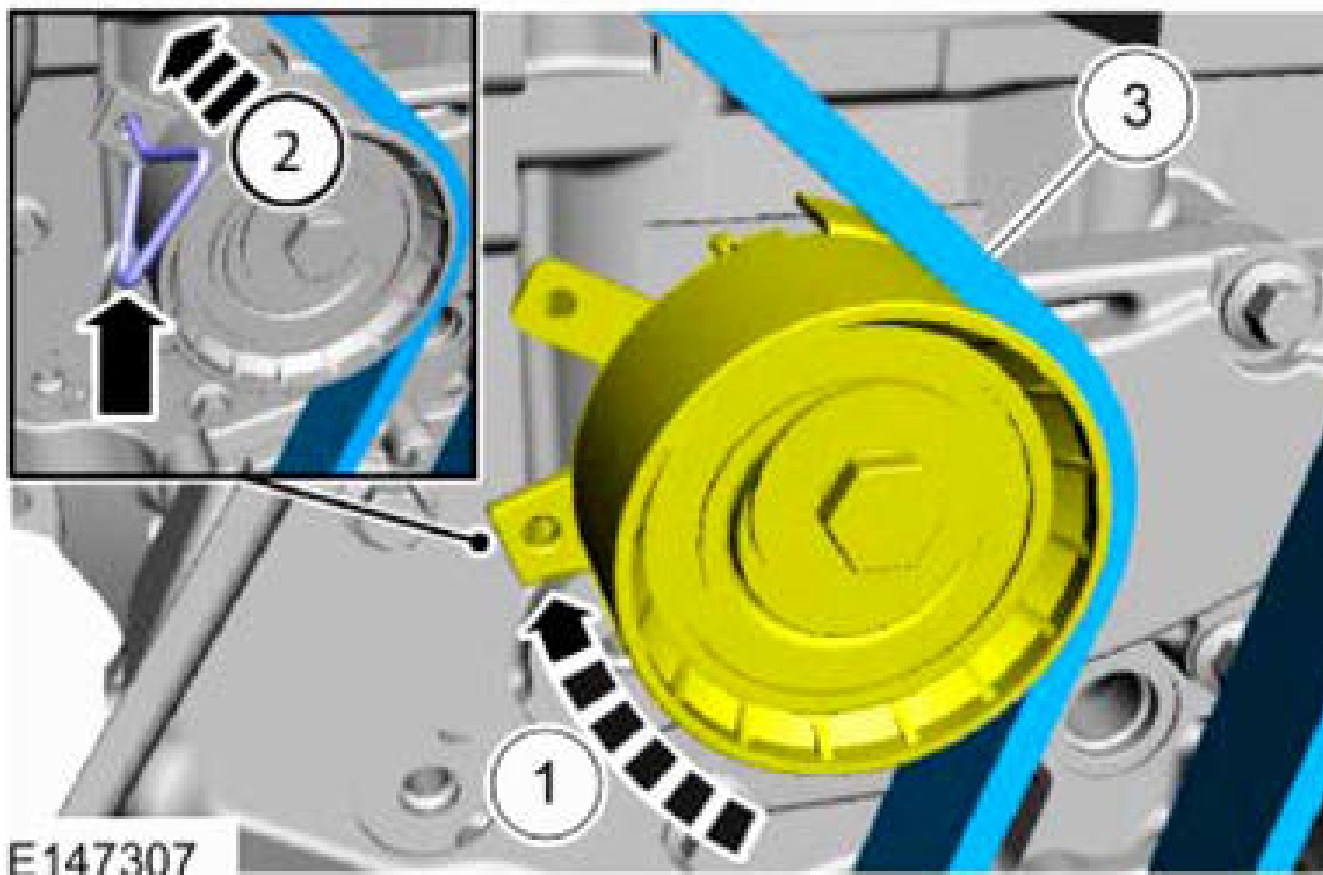
Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit

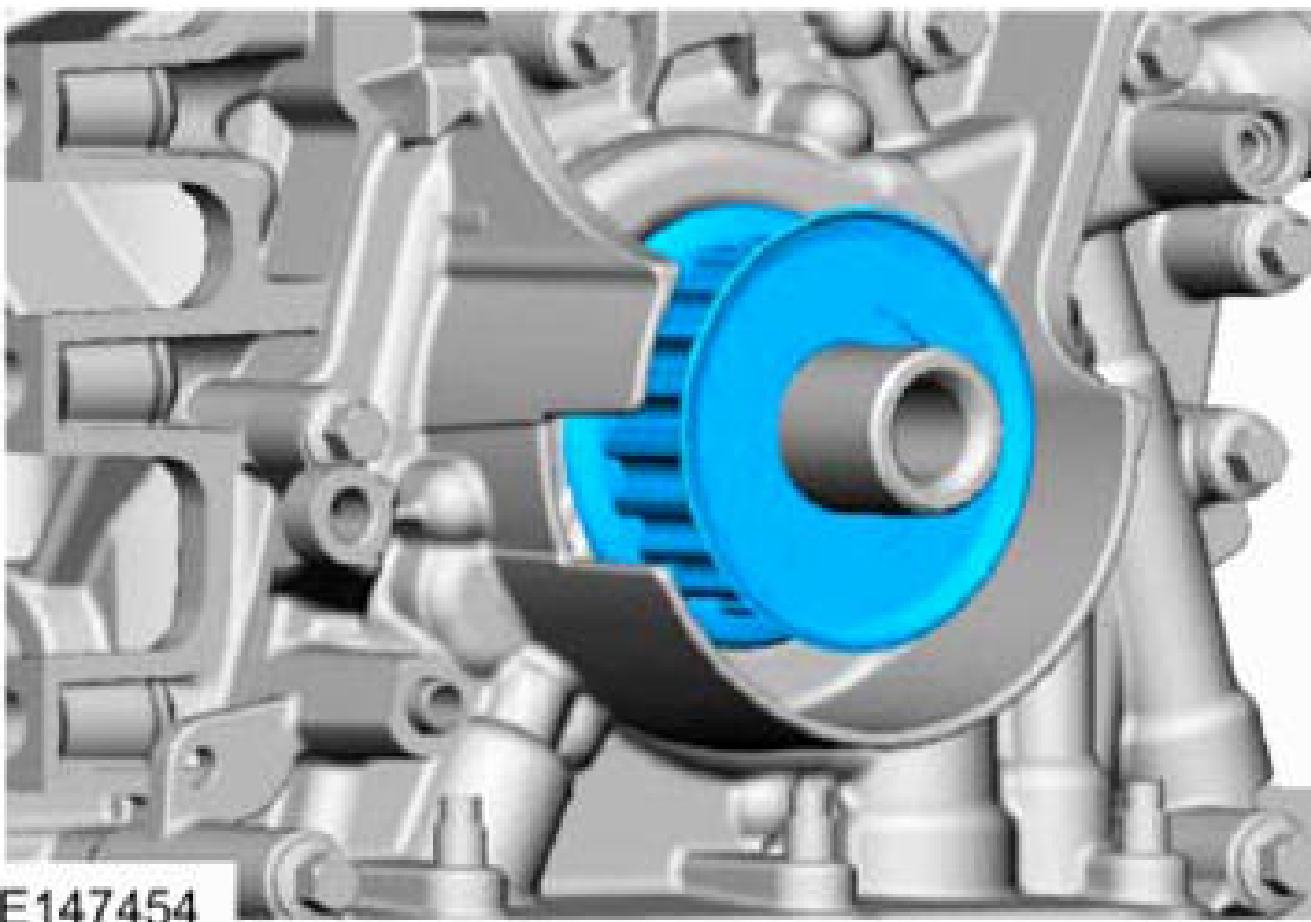


WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

28.

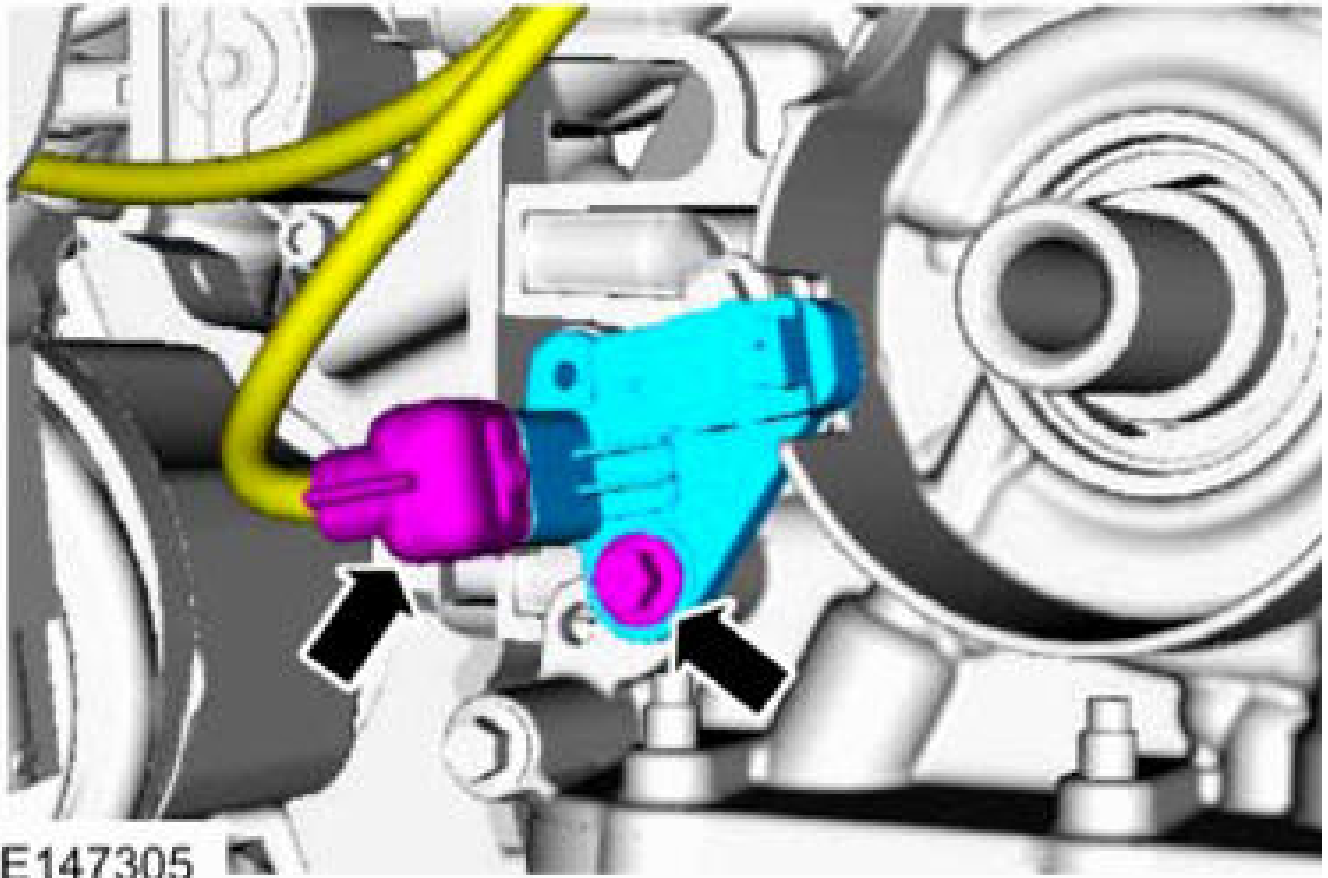
Install a holding pin.





29.

30.

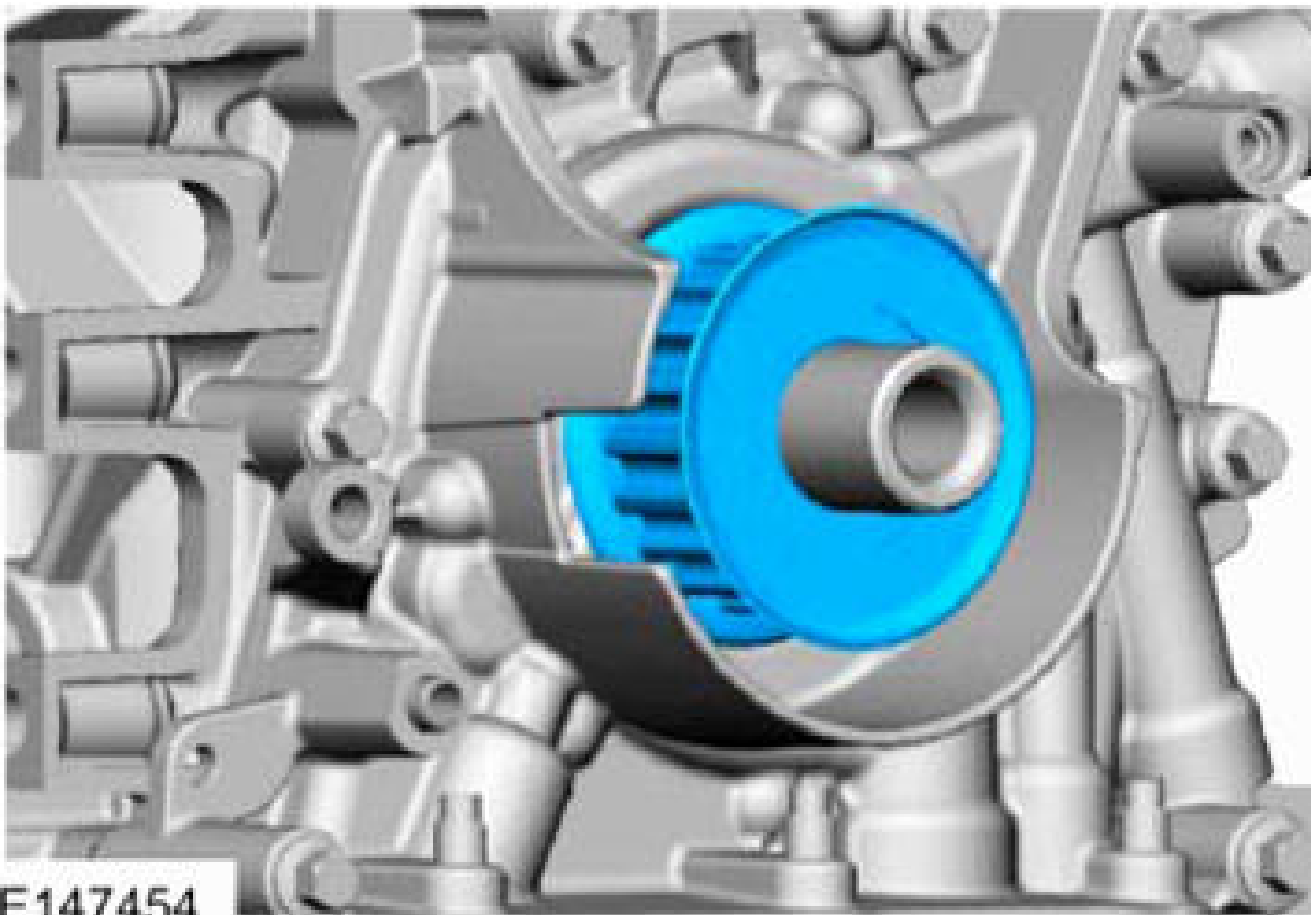


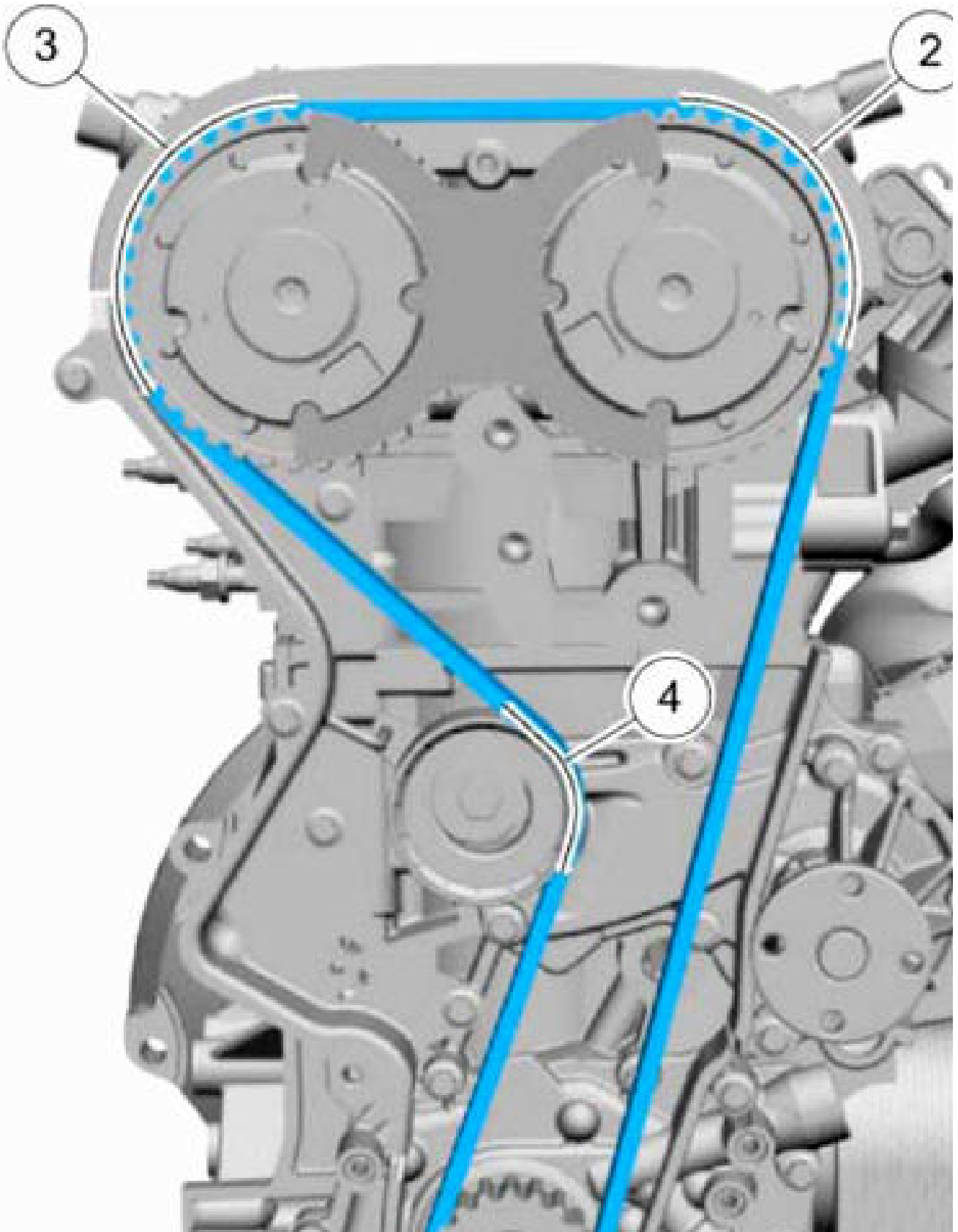
30.

Installation

NOTE: Before installation, clean and inspect the sprocket for any damage. If damage is evident, replace the sprocket. If no damage, the sprocket is to be reused.

1.

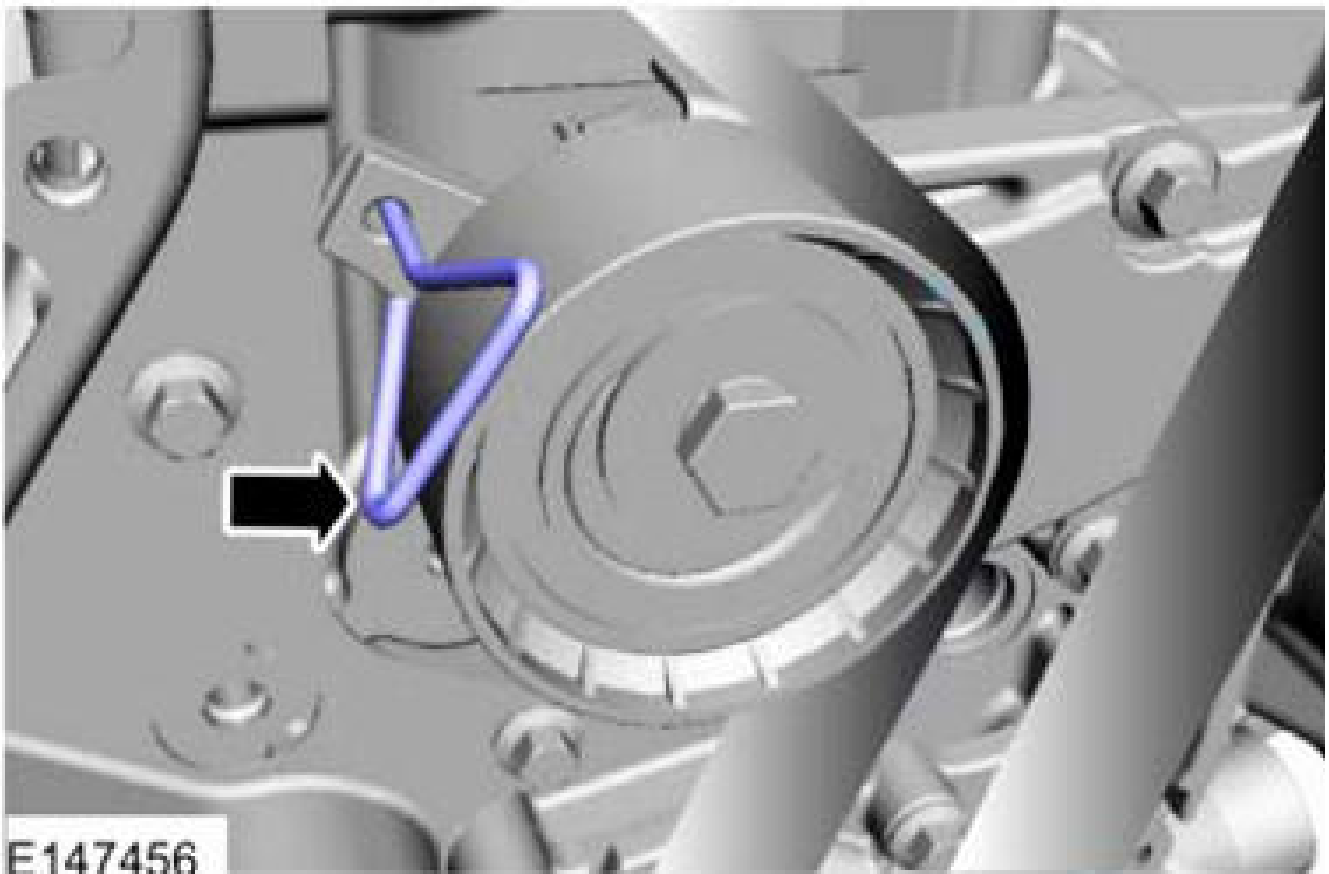




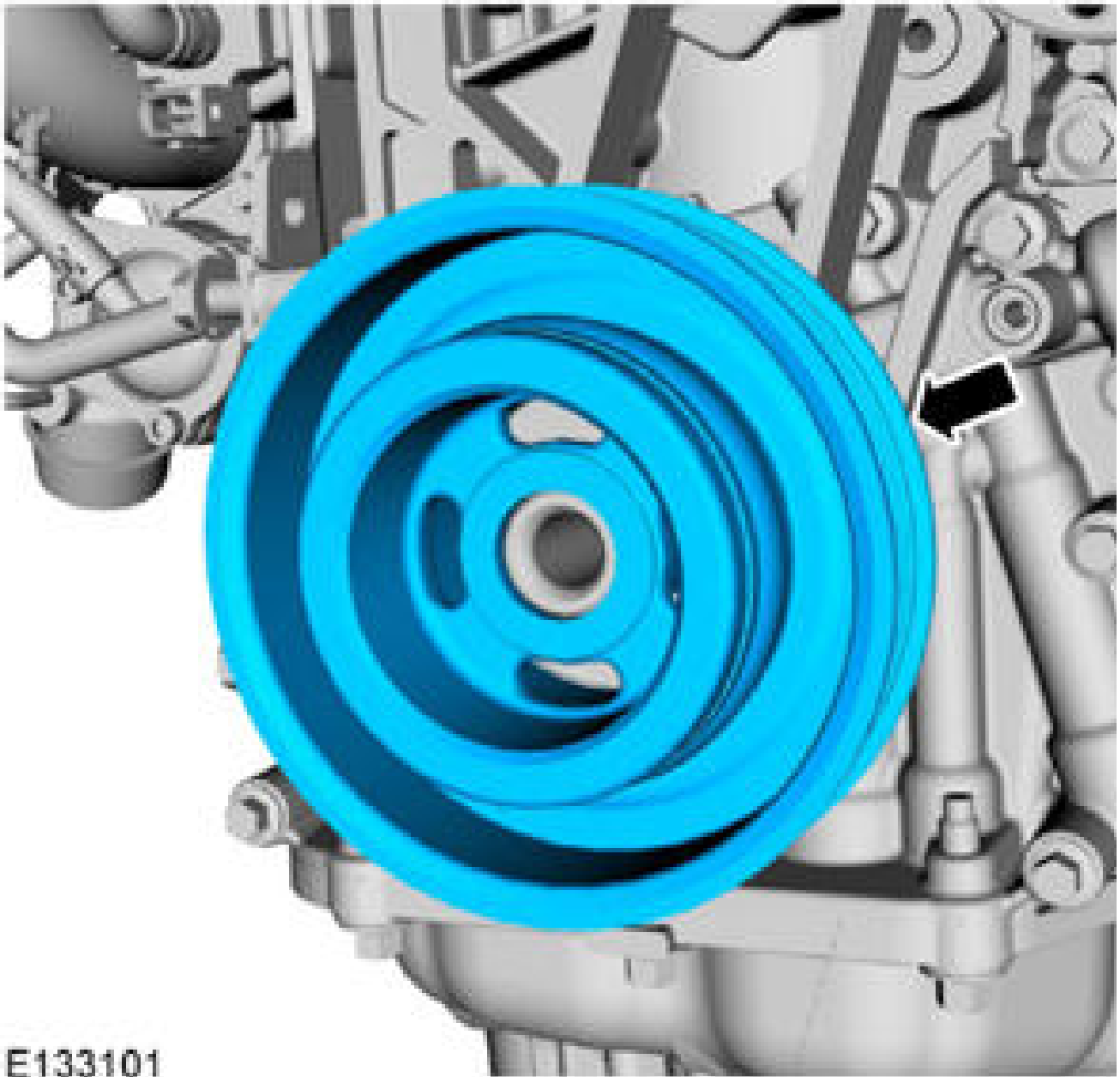
WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

3.

Remove the holding pin.



4.



4.

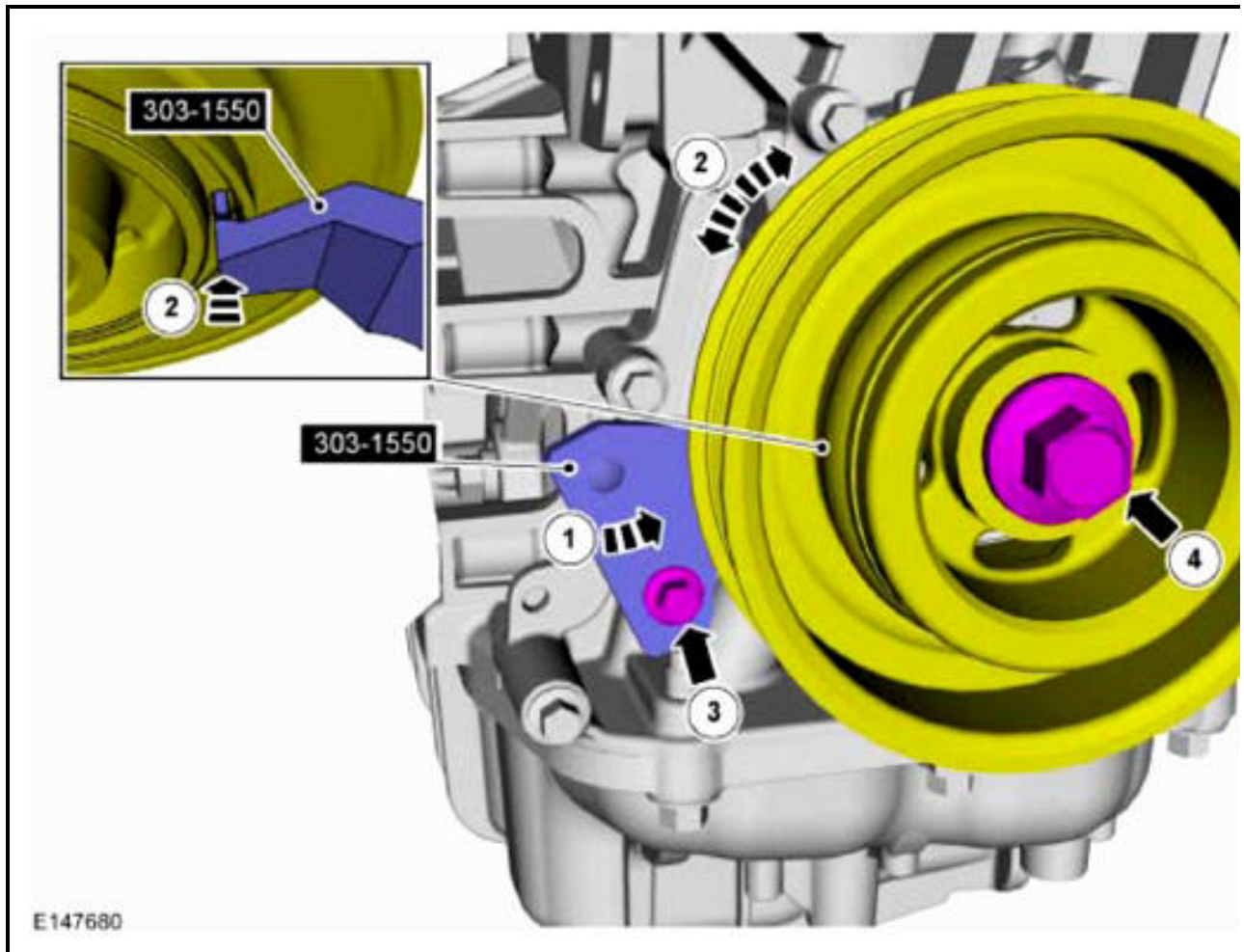
5.

1. *Install Special Service Tool : 303-1550 Alignment Tool, Crankshaft Vibration Damper*
2. Rotate crankshaft pulley to align the Special Tool:

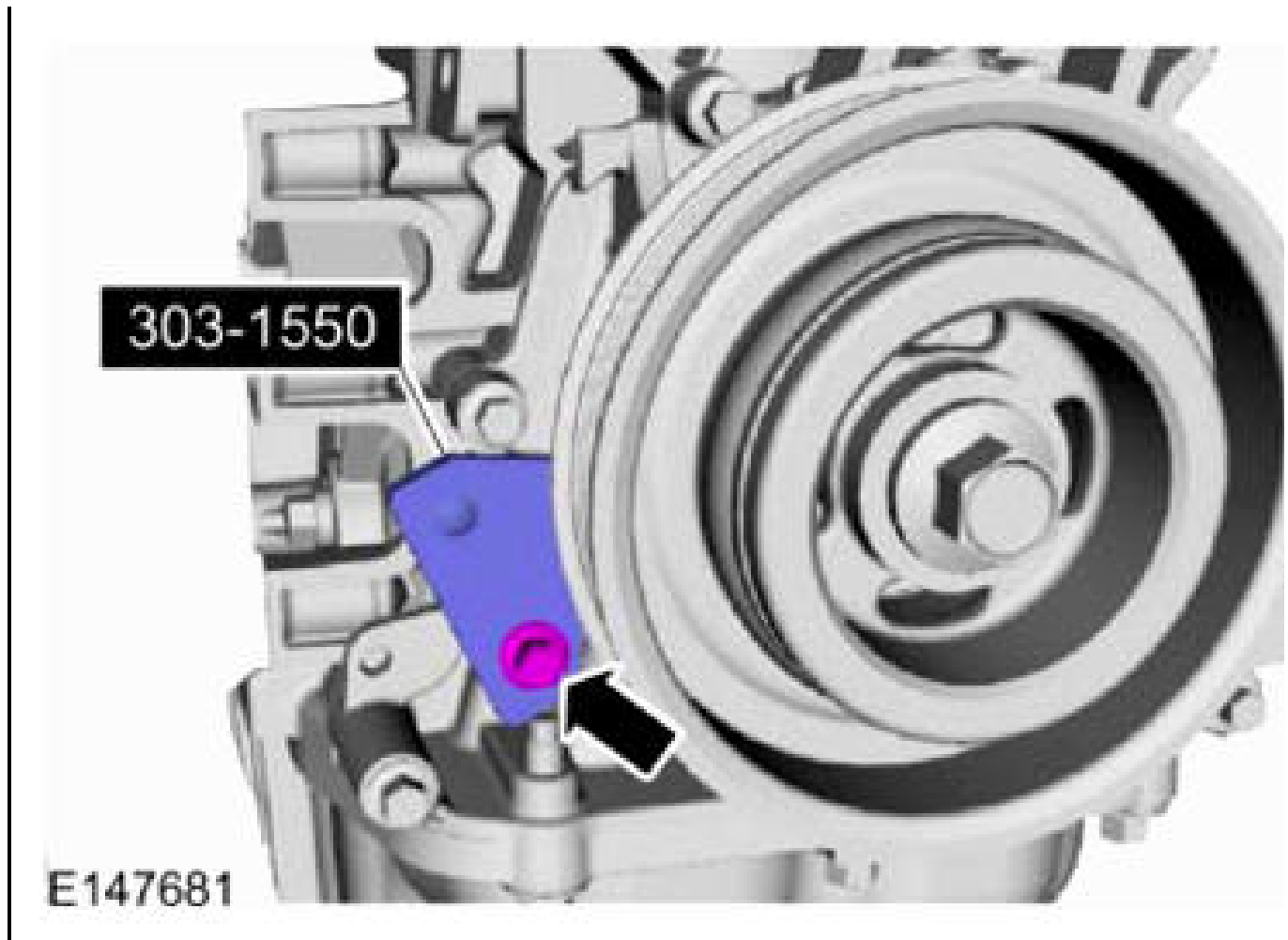
Special Tool(s) : 303-1550 Alignment Tool, Crankshaft Vibration Damper

3. Finger tight at this stage.

4. Using a new bolt, finger tight at this stage.



6. *Remove Special Service Tool : 303-1550 Alignment Tool, Crankshaft Vibration Damper*



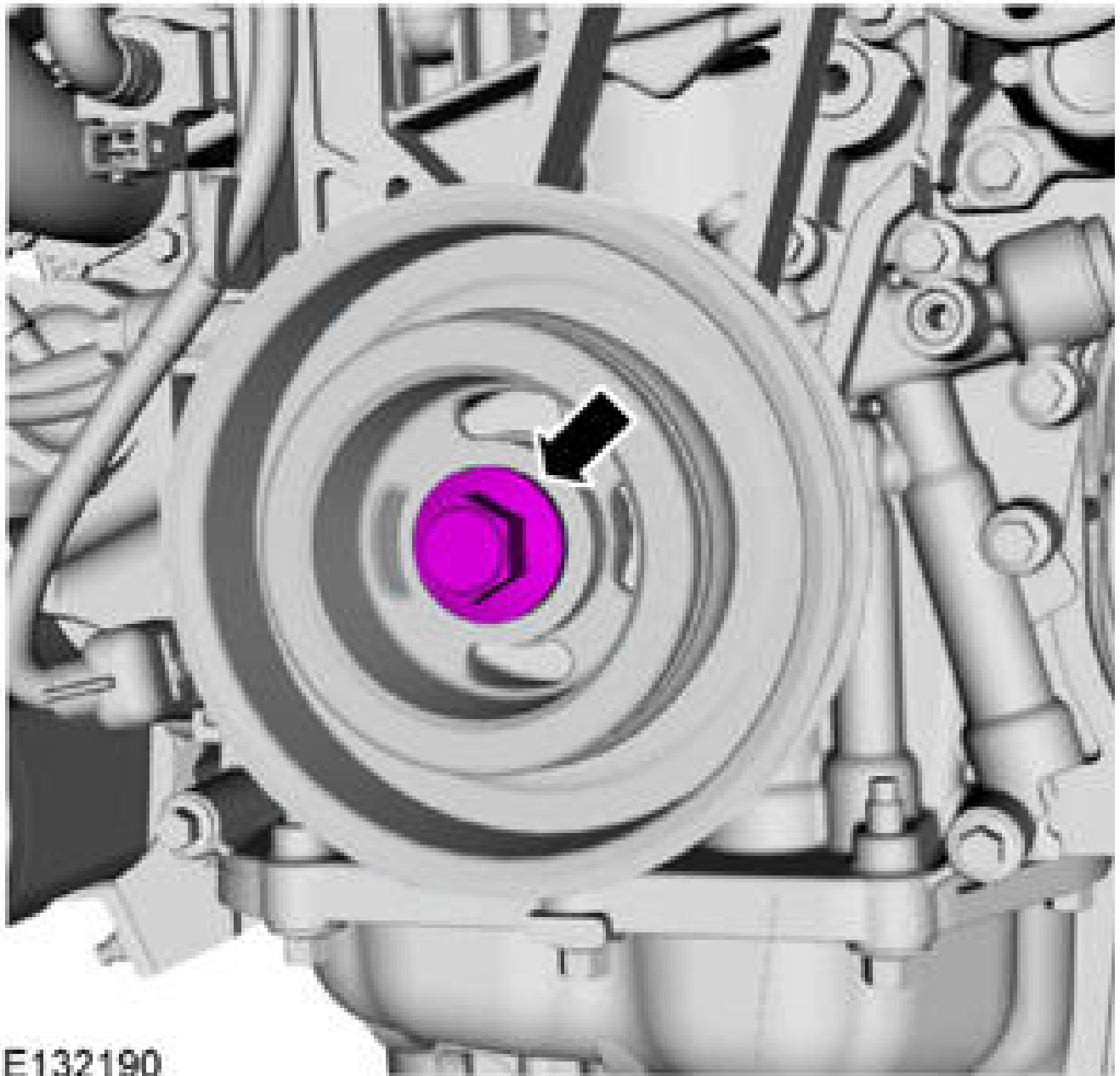
7. *Torque :*

Stage 1: 100 Nm

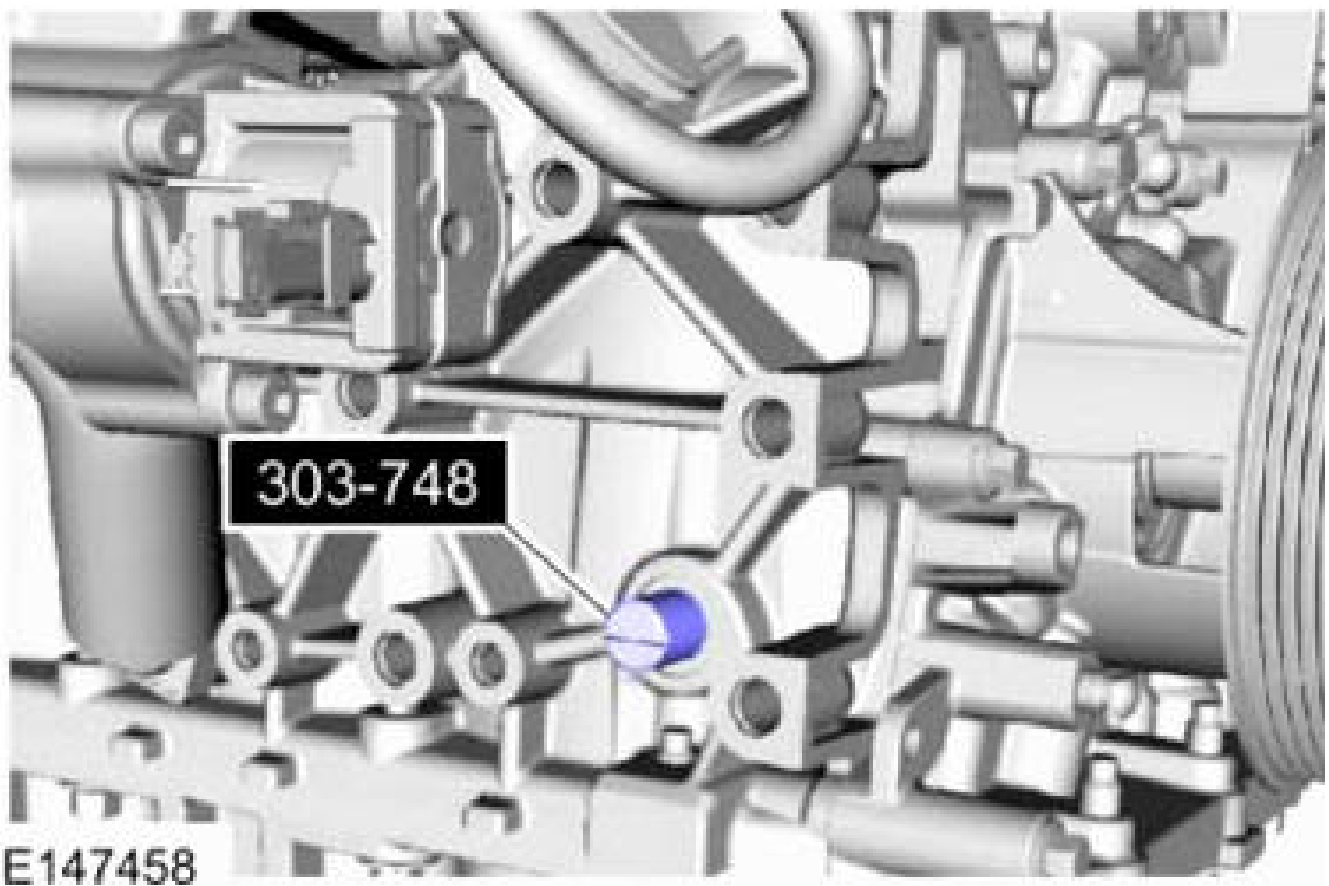
Stage 2: 90°

Stage 3: Wait 2s

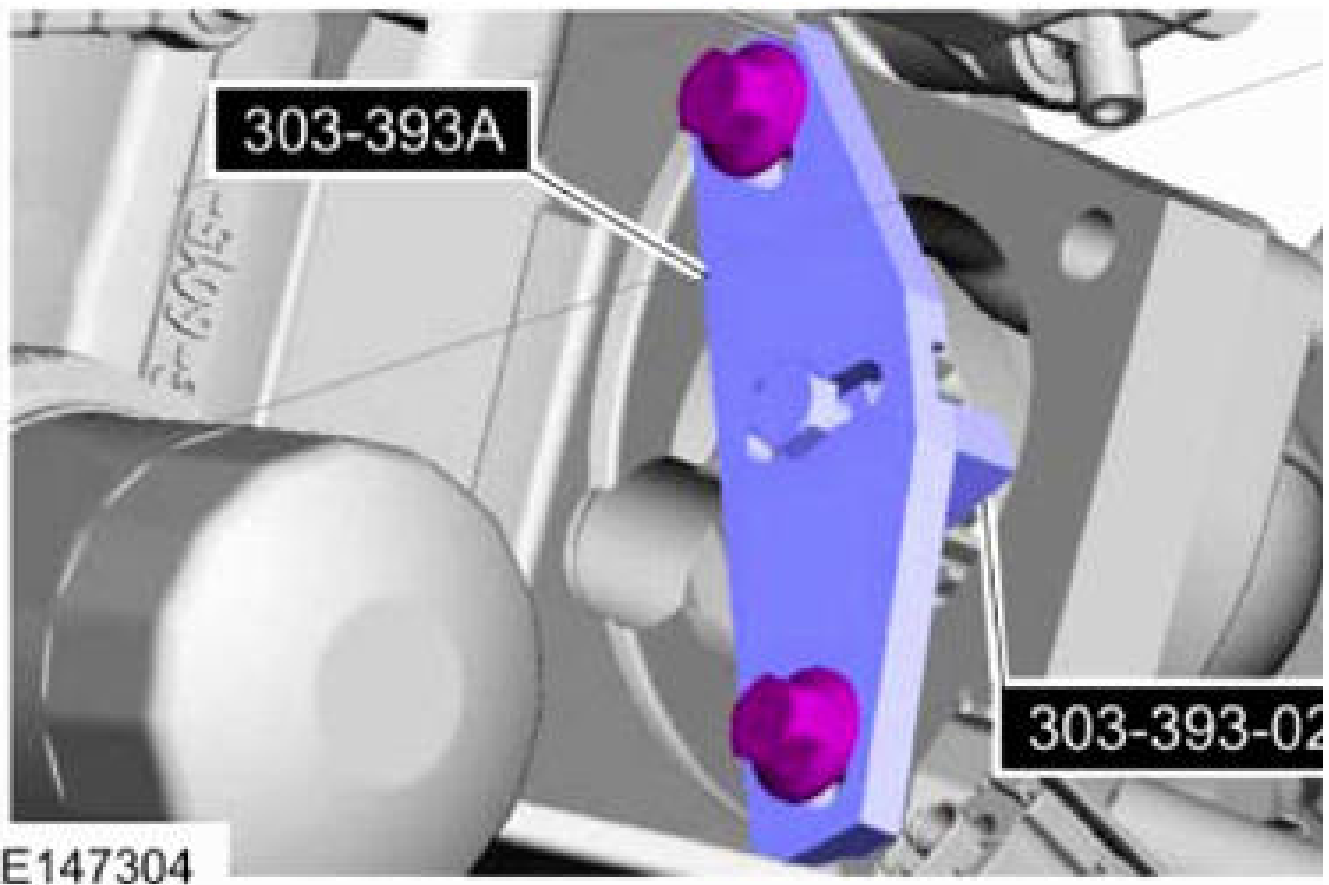
Stage 4: Tighten an additional 15°



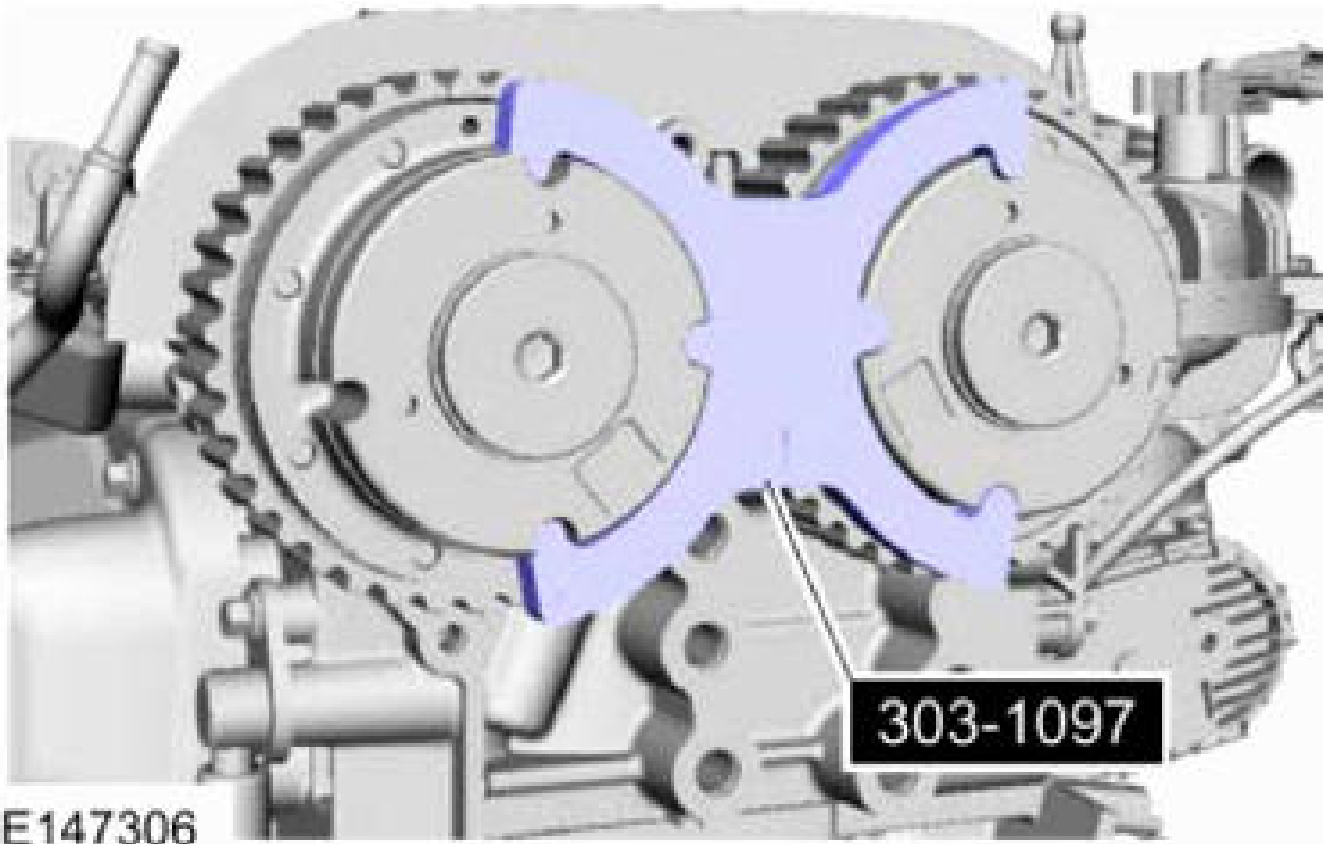
8. *Remove Special Service Tool : 303-748 Locking Tool, Crankshaft*



9. *Remove Special Service Tool : 303-393-02 Adapter for 303-393 , 303-393A Locking Tool, Flywheel*



10. *Remove Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*

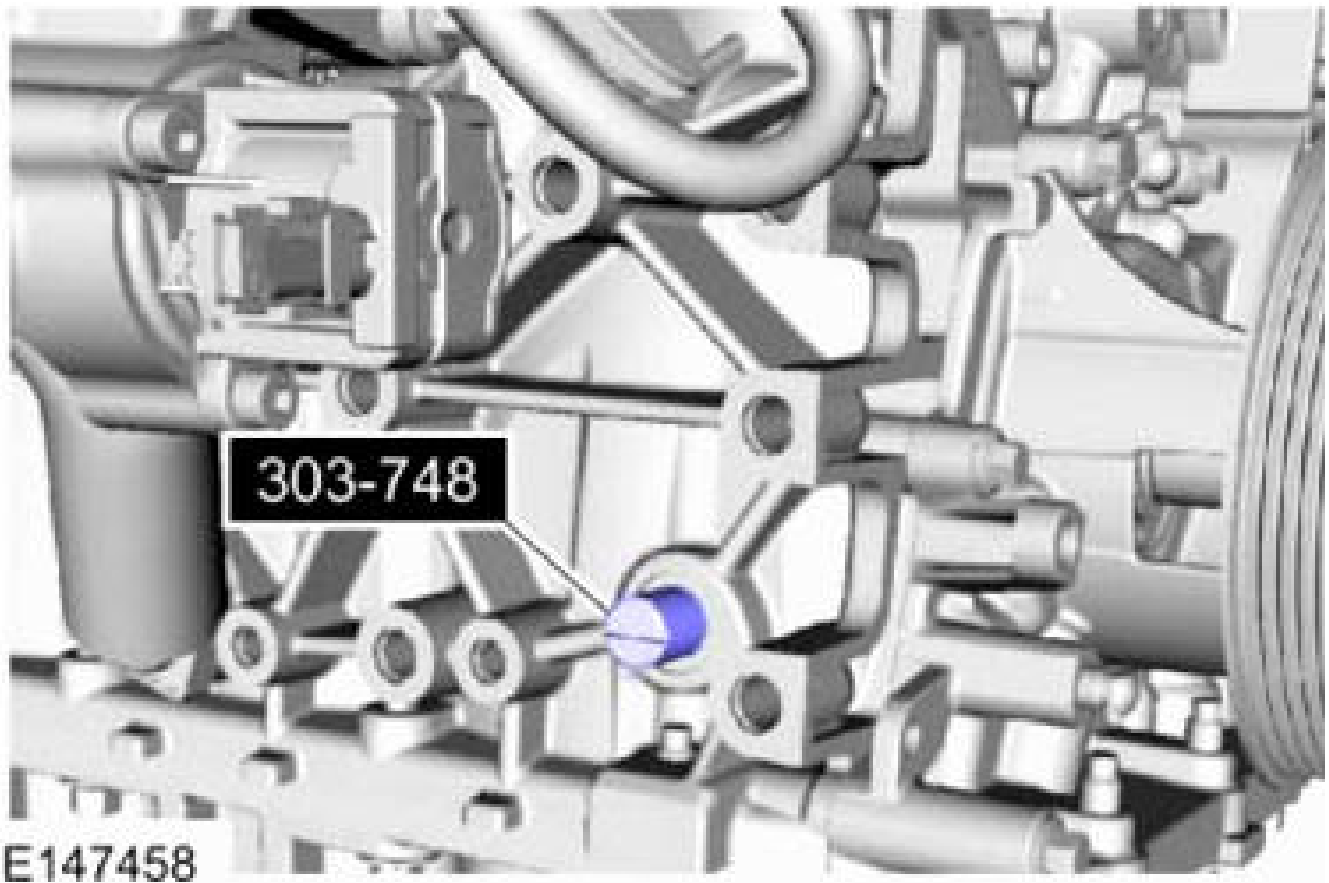


11. **NOTE:** Only rotate the crankshaft in a clockwise direction.

Rotate about 1 3/4 turns.

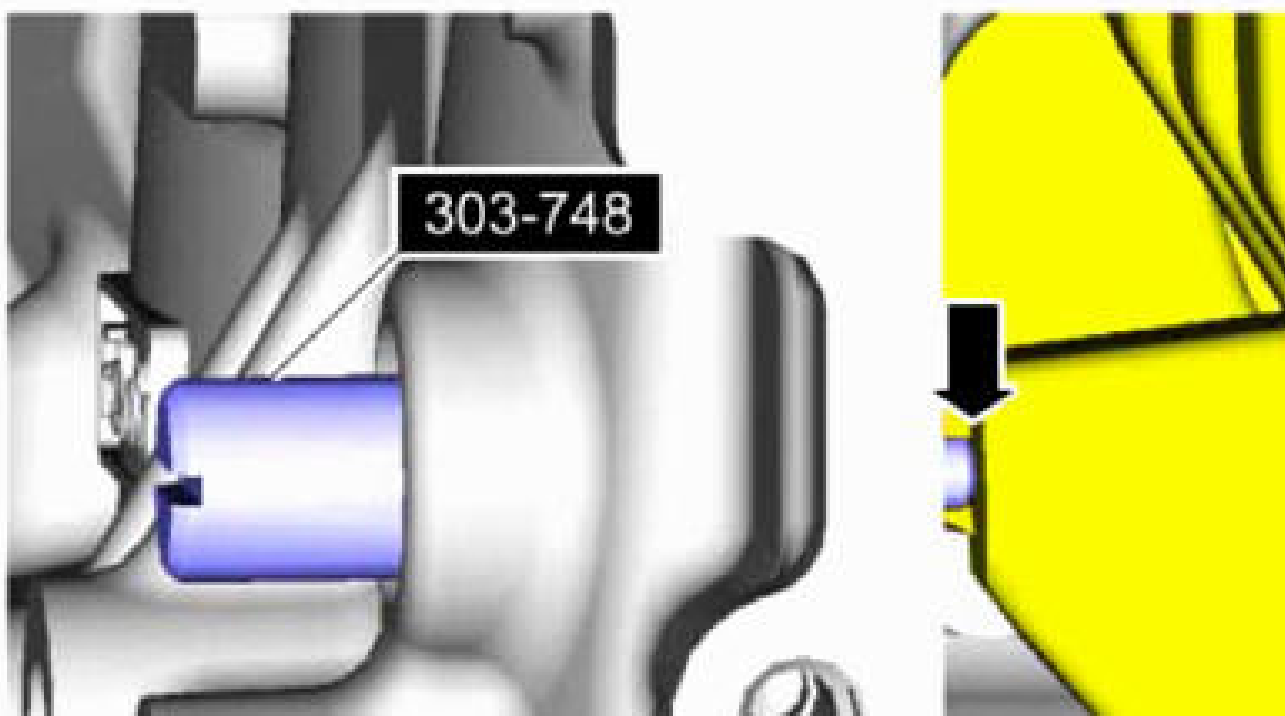


12. *Install Special Service Tool : 303-748 Locking Tool, Crankshaft*



13. **NOTE:** Only rotate the crankshaft in a clockwise direction.

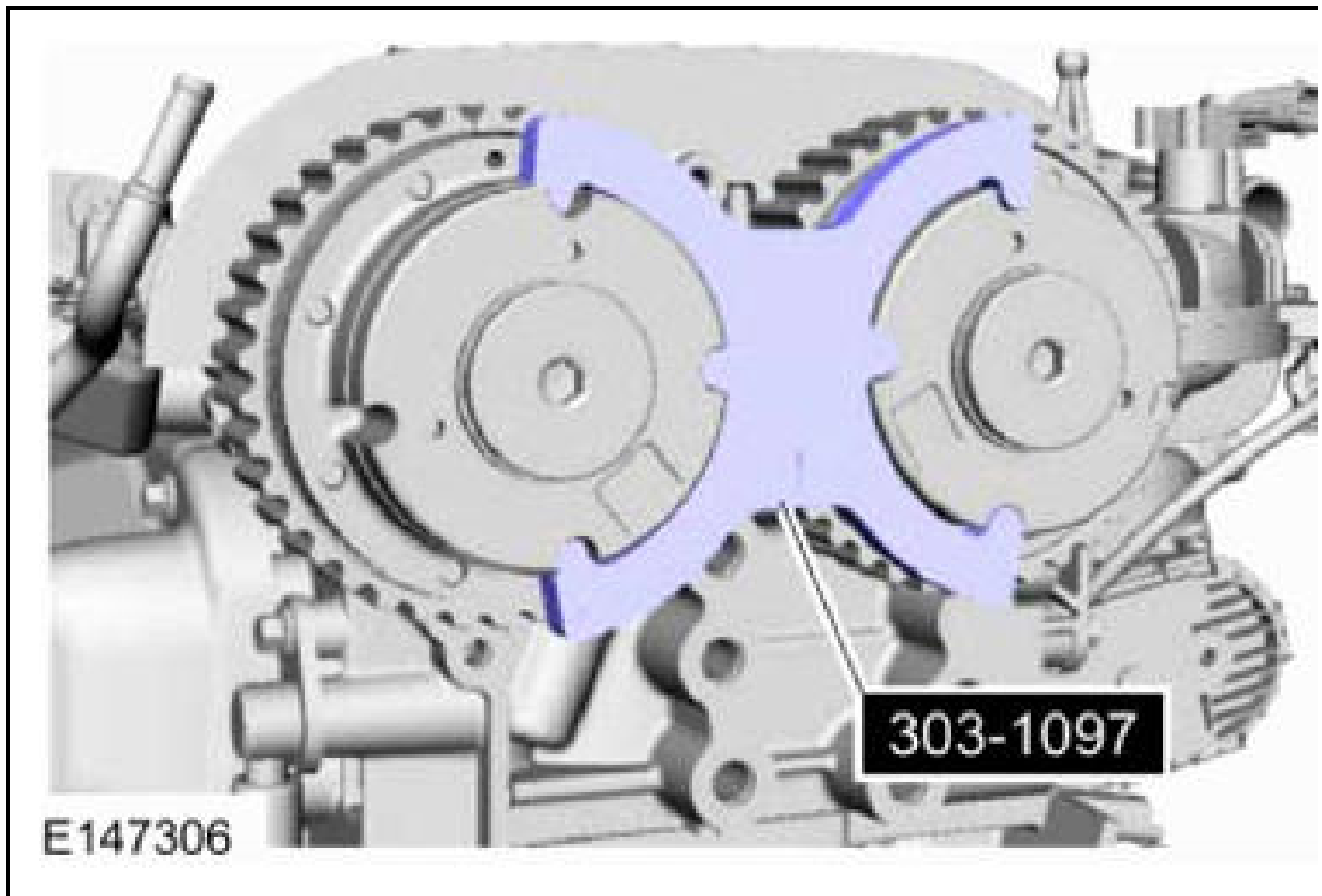
Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the crankshaft locking tool. The engine is now at **TDC** .



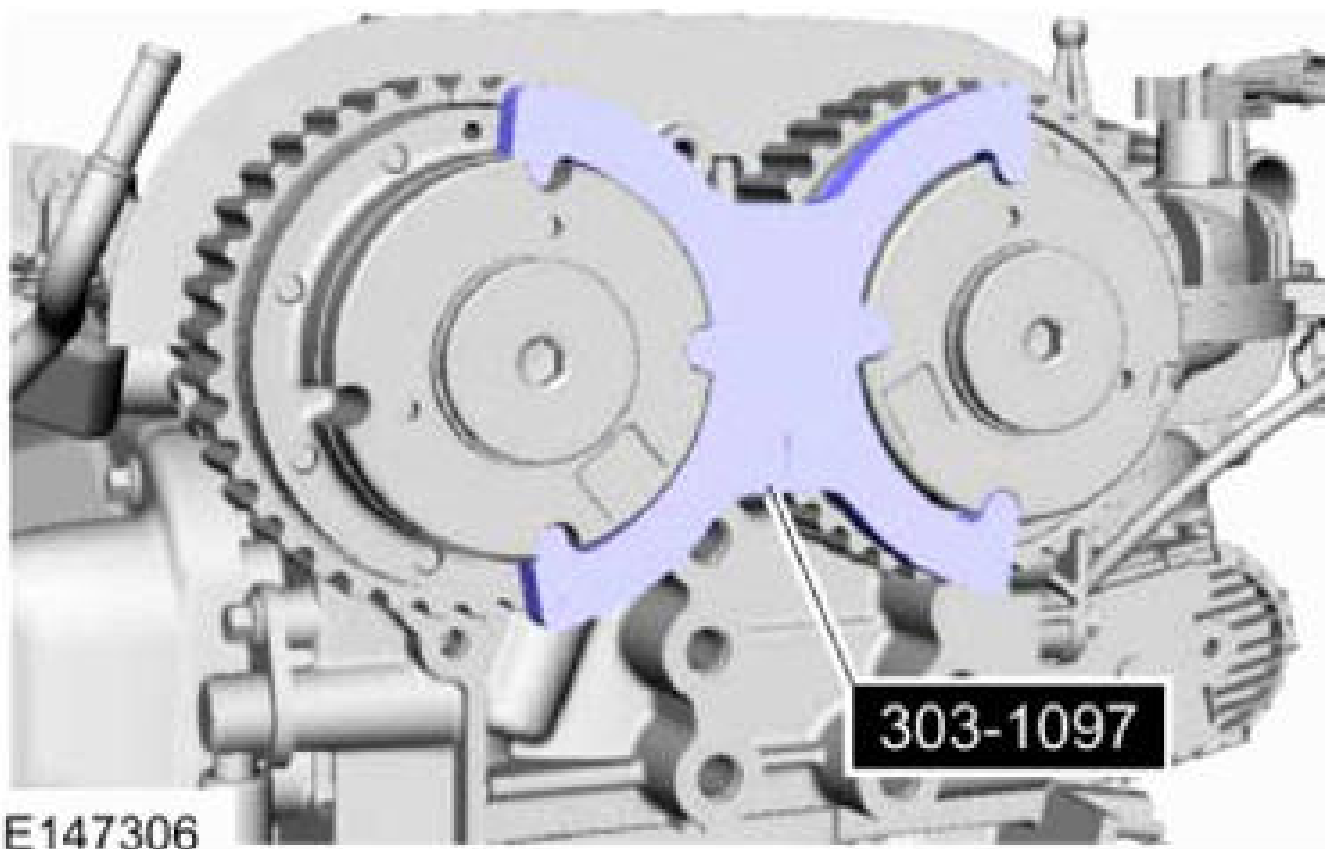
14. **NOTE:** It may necessary to rotate the camshafts slightly to install the special tool.

NOTE: The special tool can only be installed if the valve timing is correct.

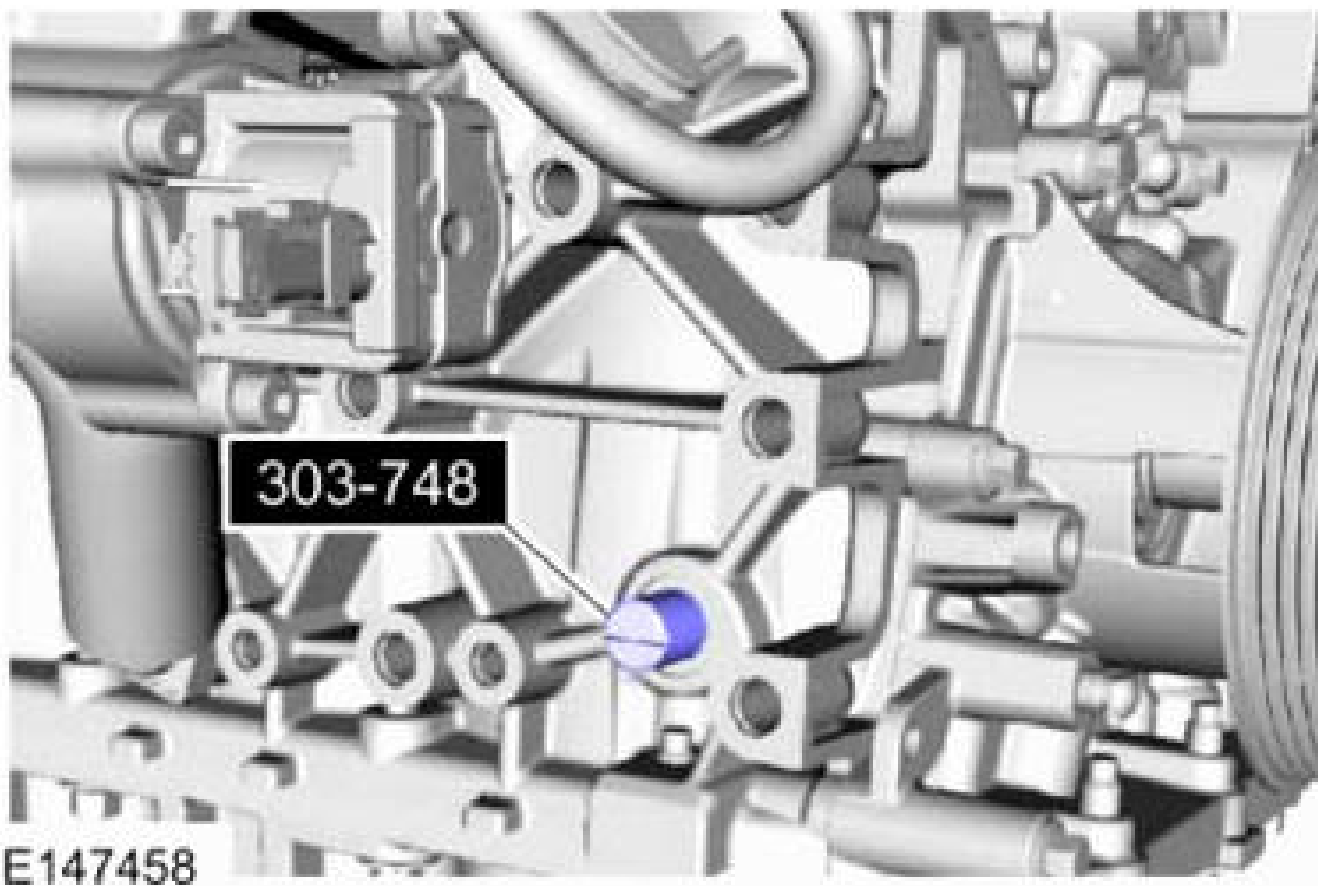
If the special tool cannot be installed, repeat the adjustment according to the preceding steps. *Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



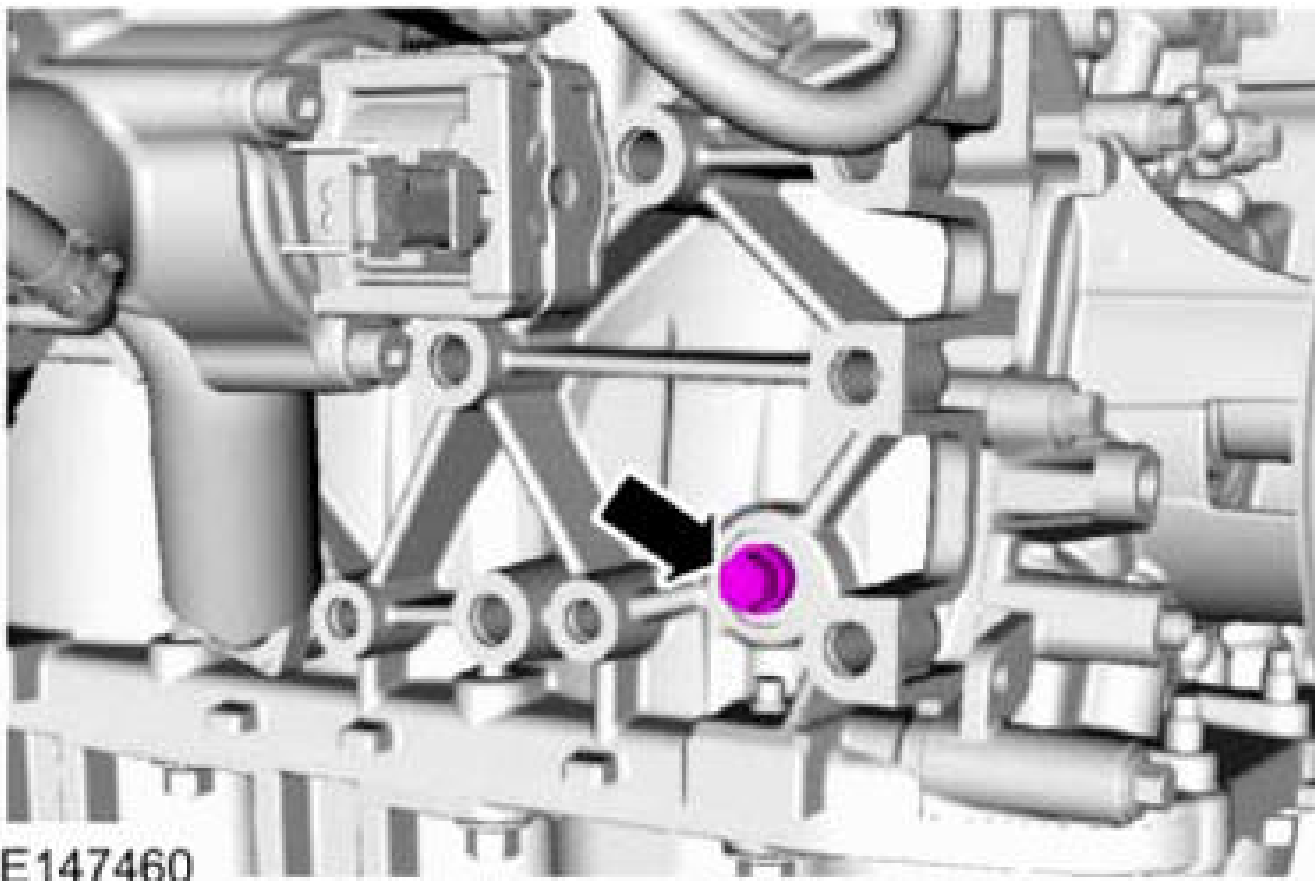
15. *Remove Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



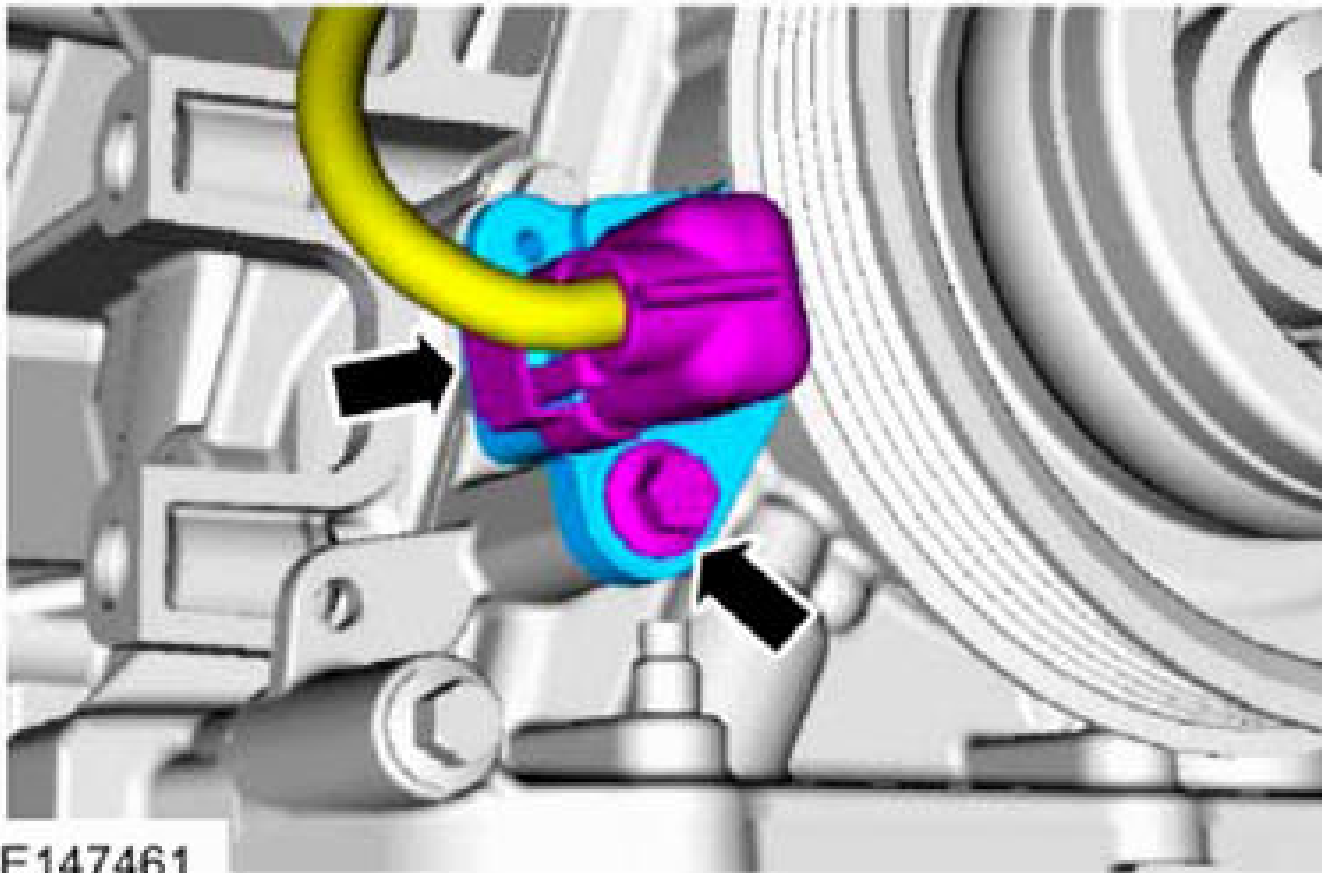
16. *Remove Special Service Tool : 303-748 Locking Tool, Crankshaft*



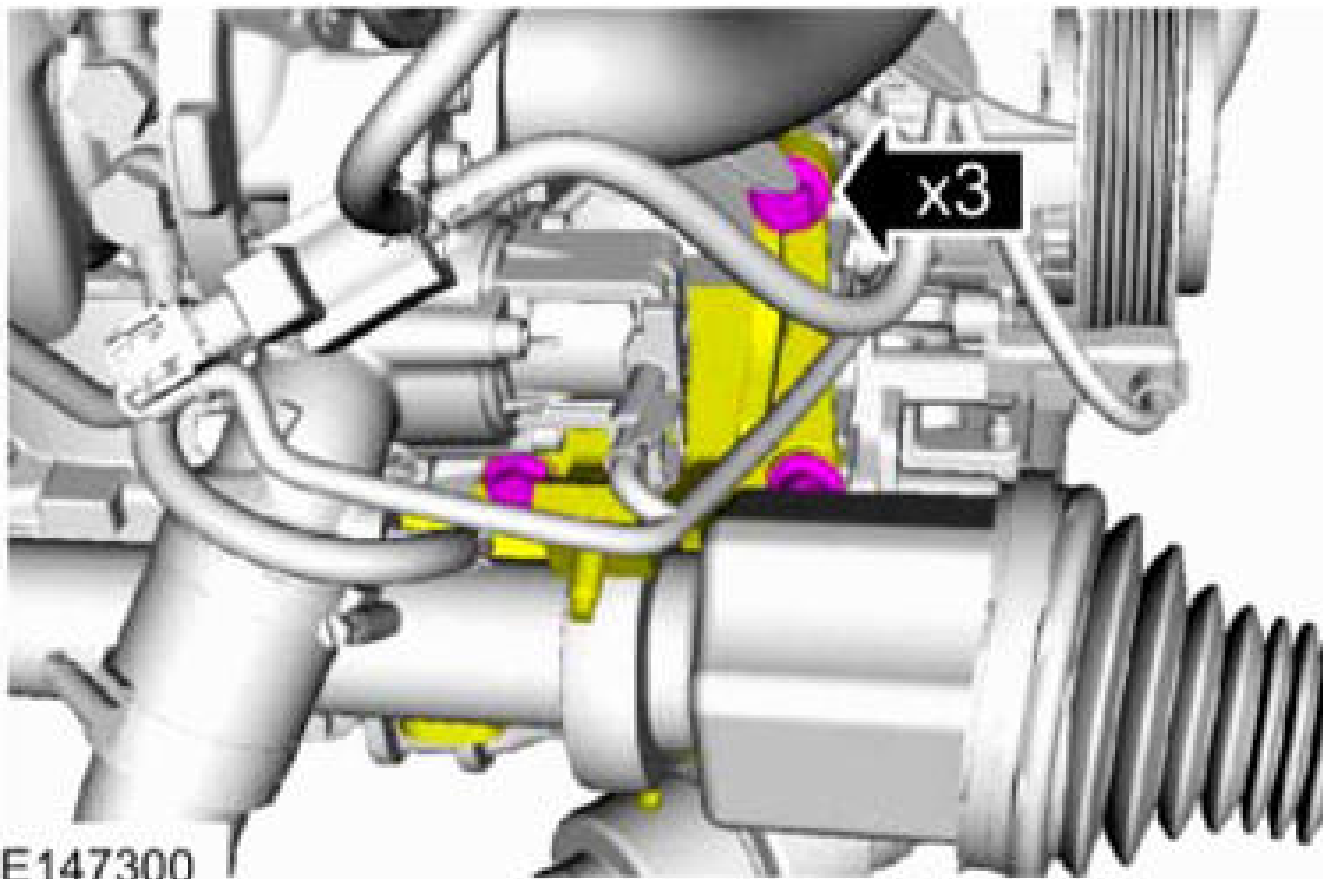
17. *Torque* : 20 Nm



18. *Torque* : 8 Nm

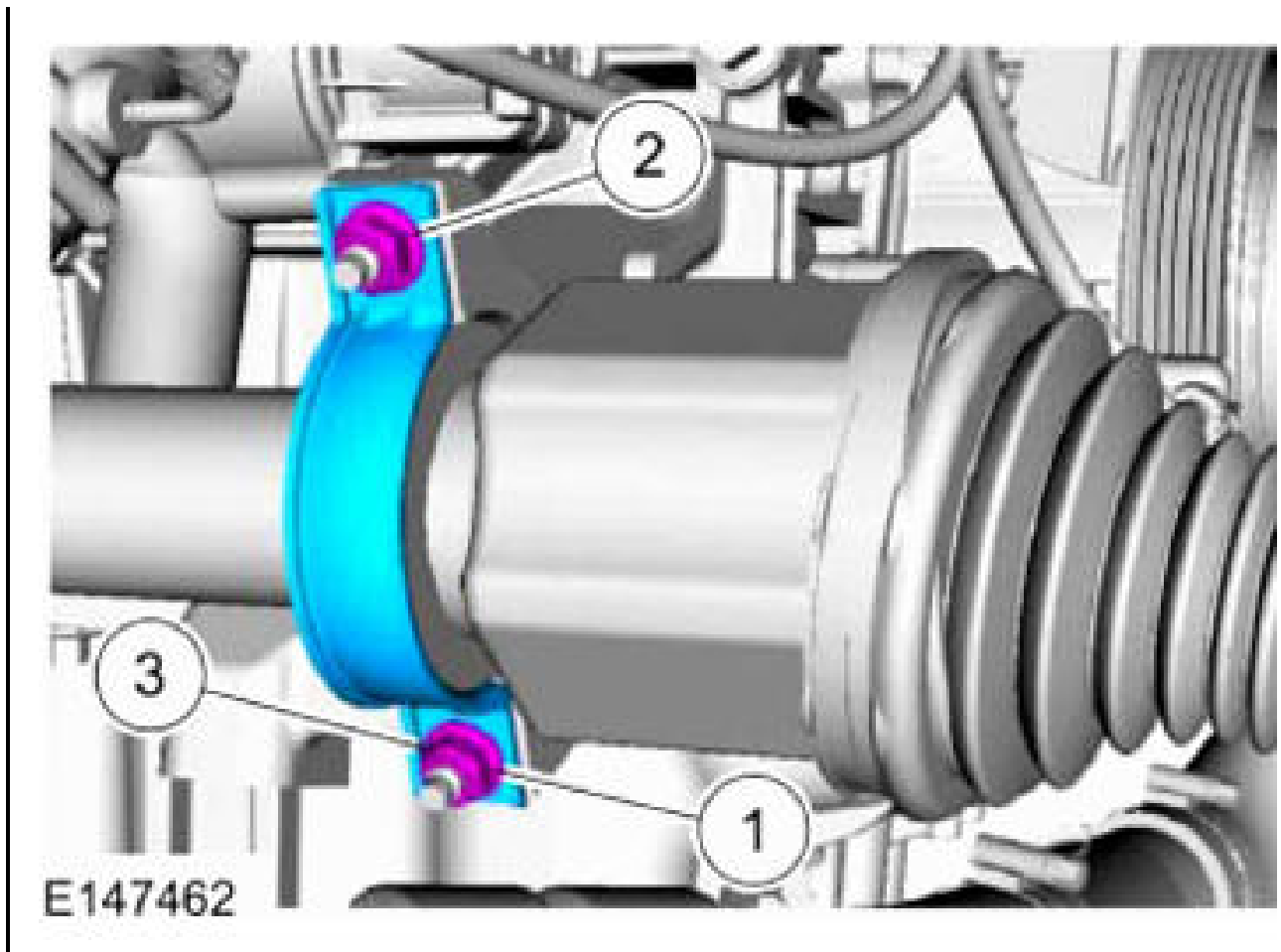


19. *Torque* : 48 Nm



20.

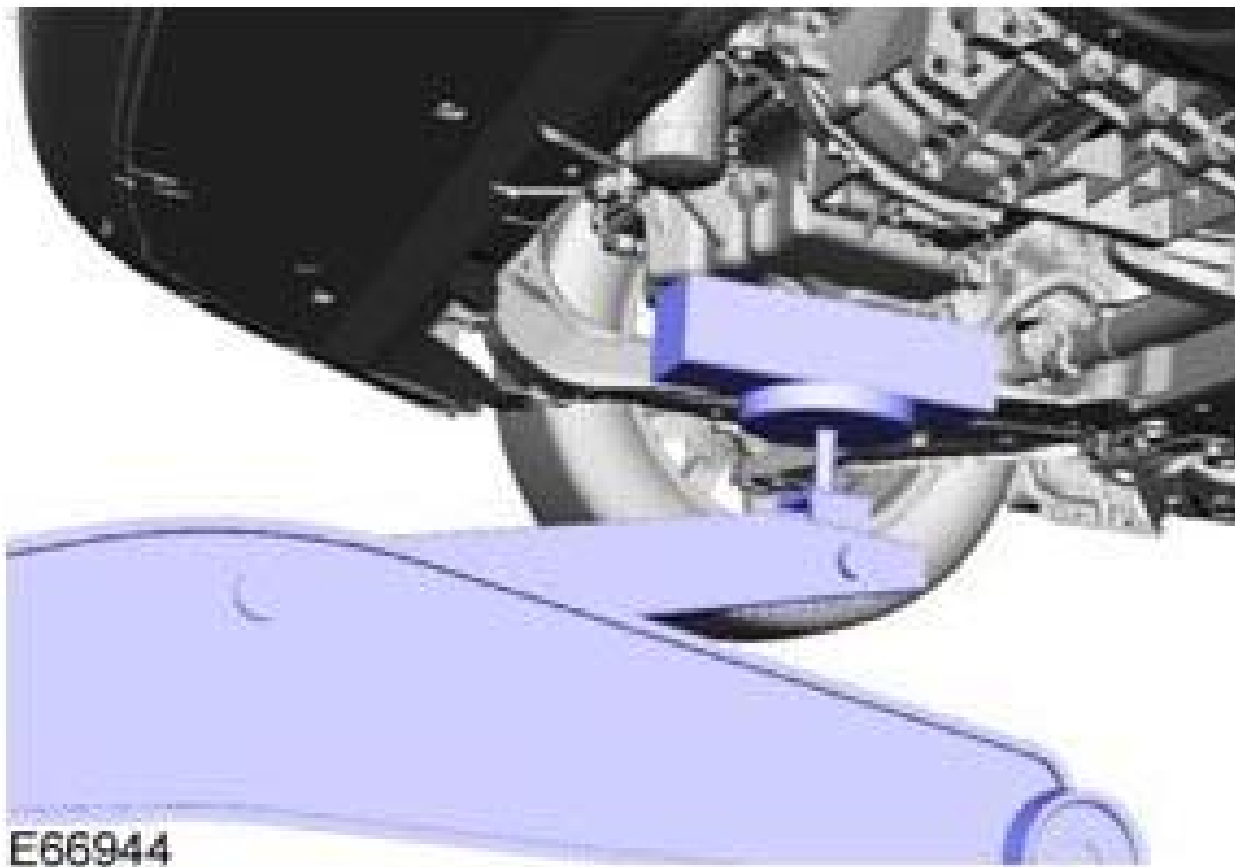
1. *Torque* : 5 Nm
2. *Torque* : 25 Nm
3. *Torque* : 25 Nm



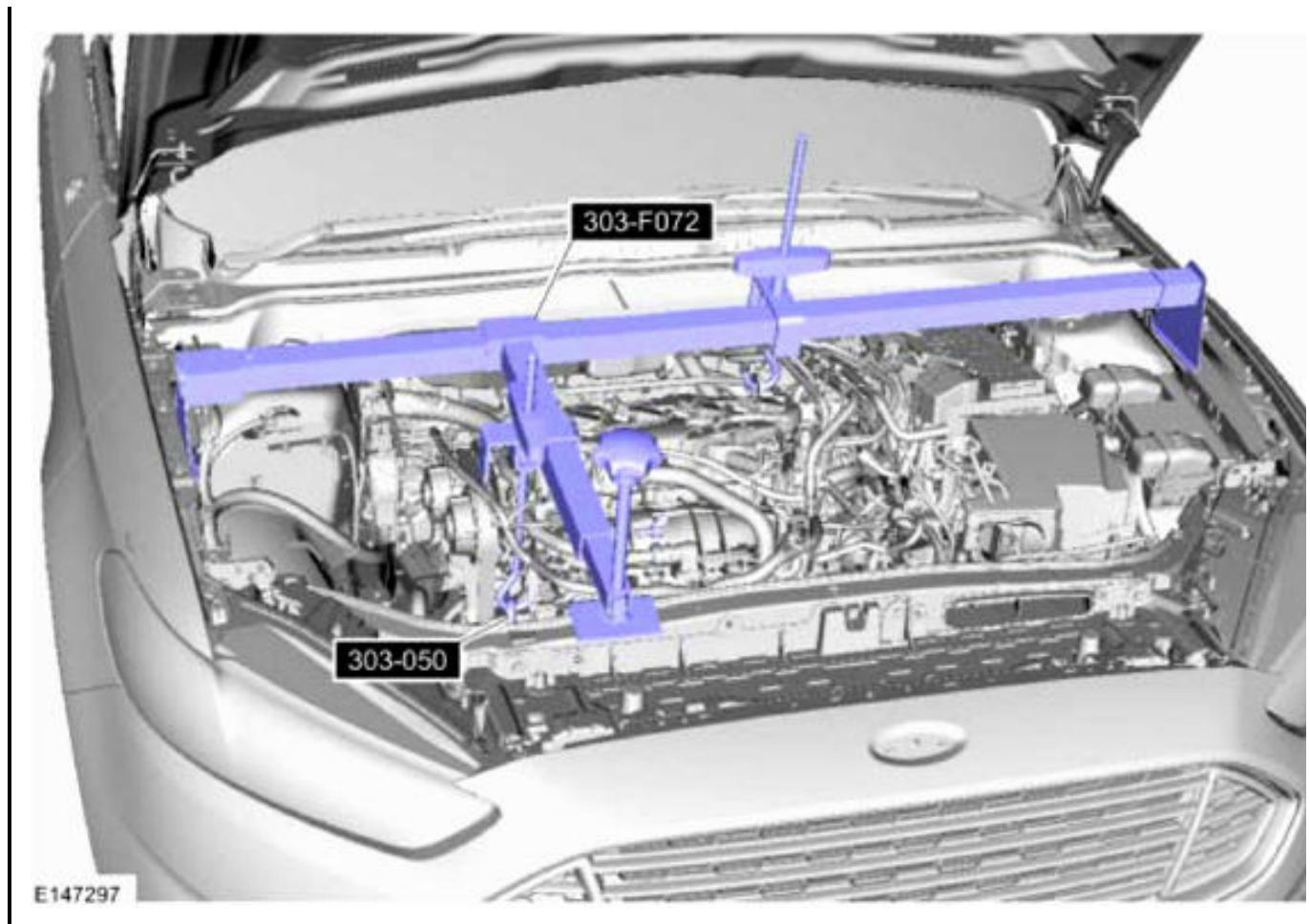
21. Install the following items:

1. *General Equipment* : Wooden Block

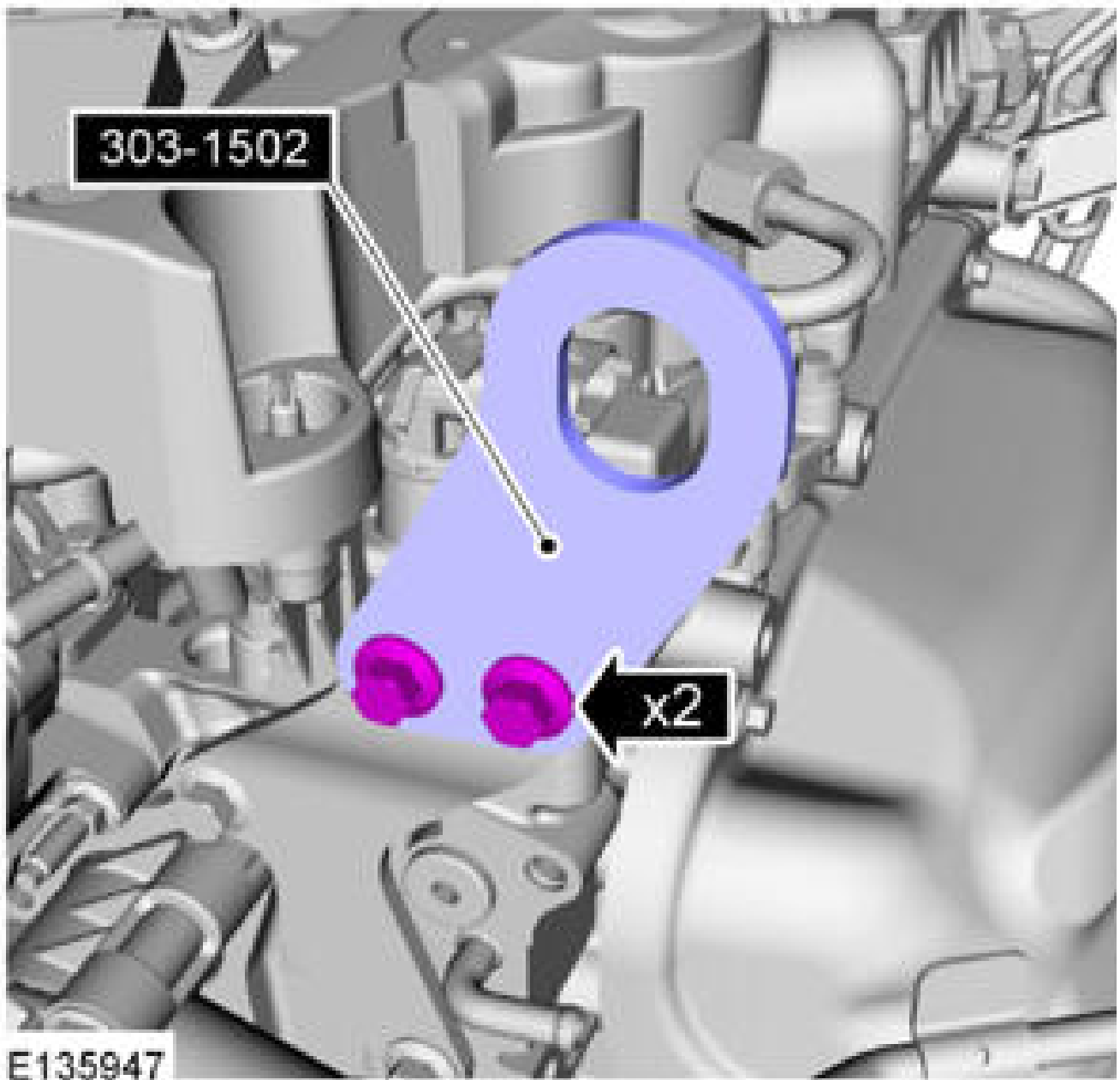
General Equipment : Trolley Jack

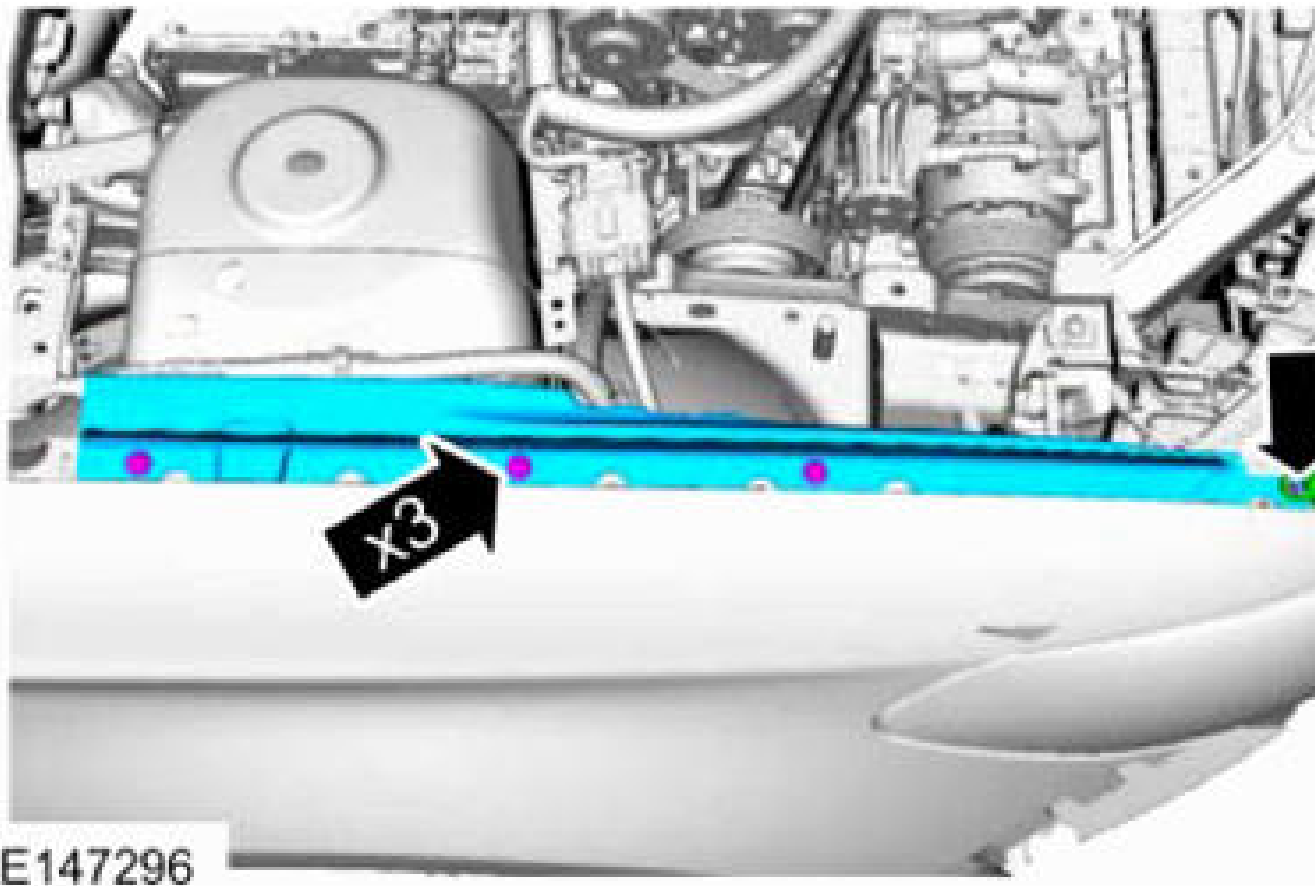


22. *Remove Special Service Tool : 303-F072 Support Bar, Engine*



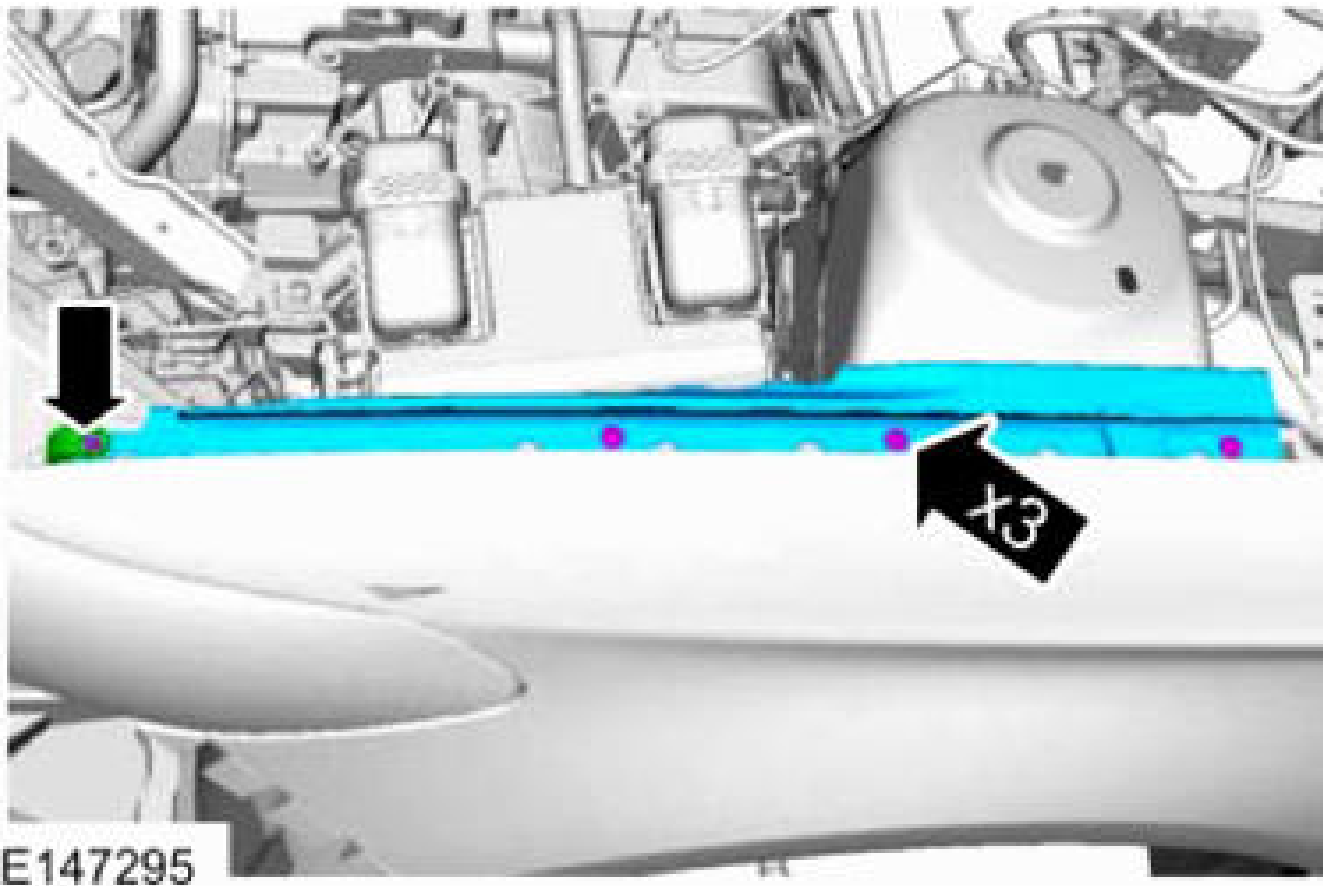
23. *Remove Special Service Tool : 303-1502 Lifting Device Engine*





24.

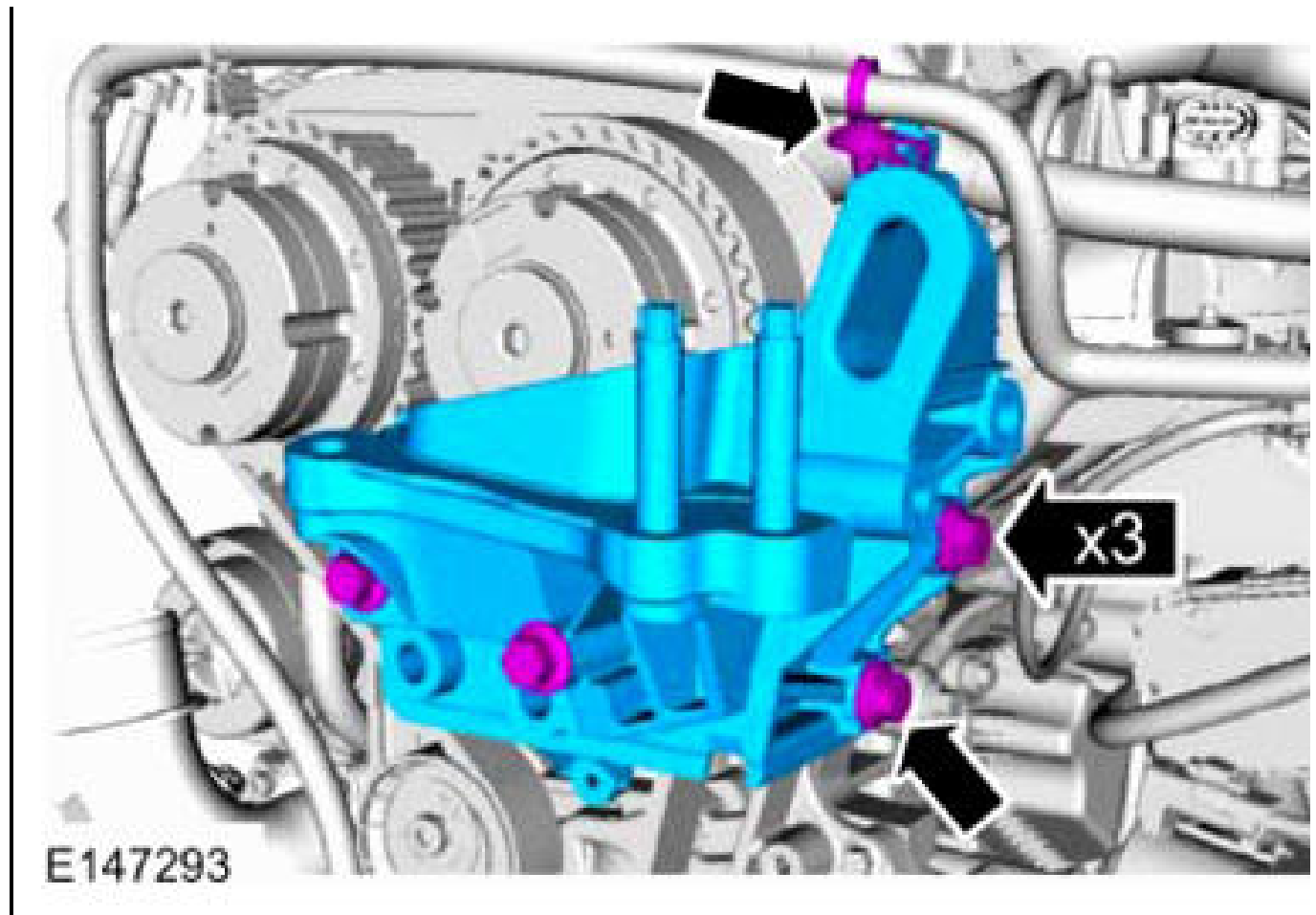
25.



25.

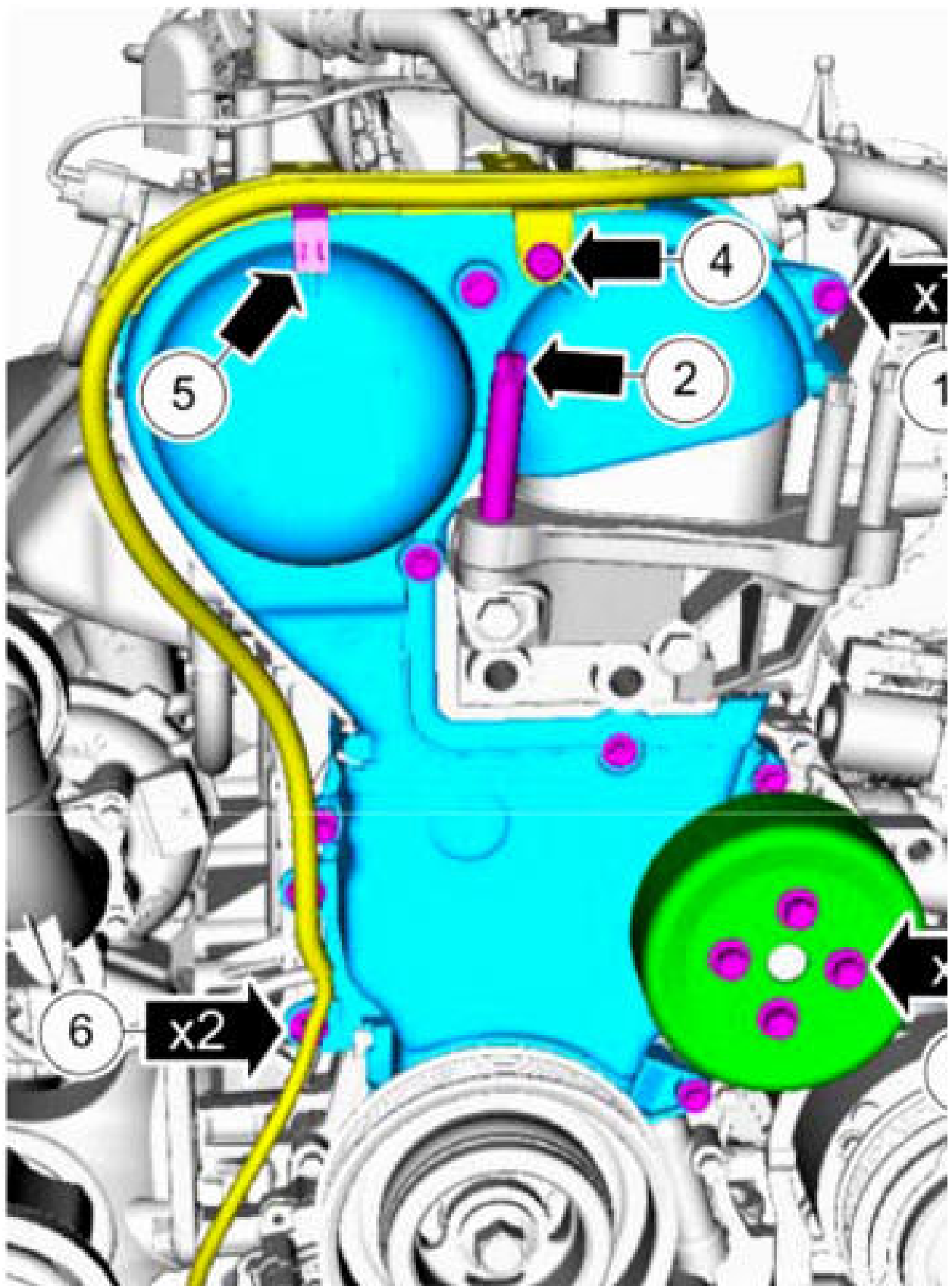
26. **NOTE:** There are different length of bolts noted in removal.

Torque : 55 Nm

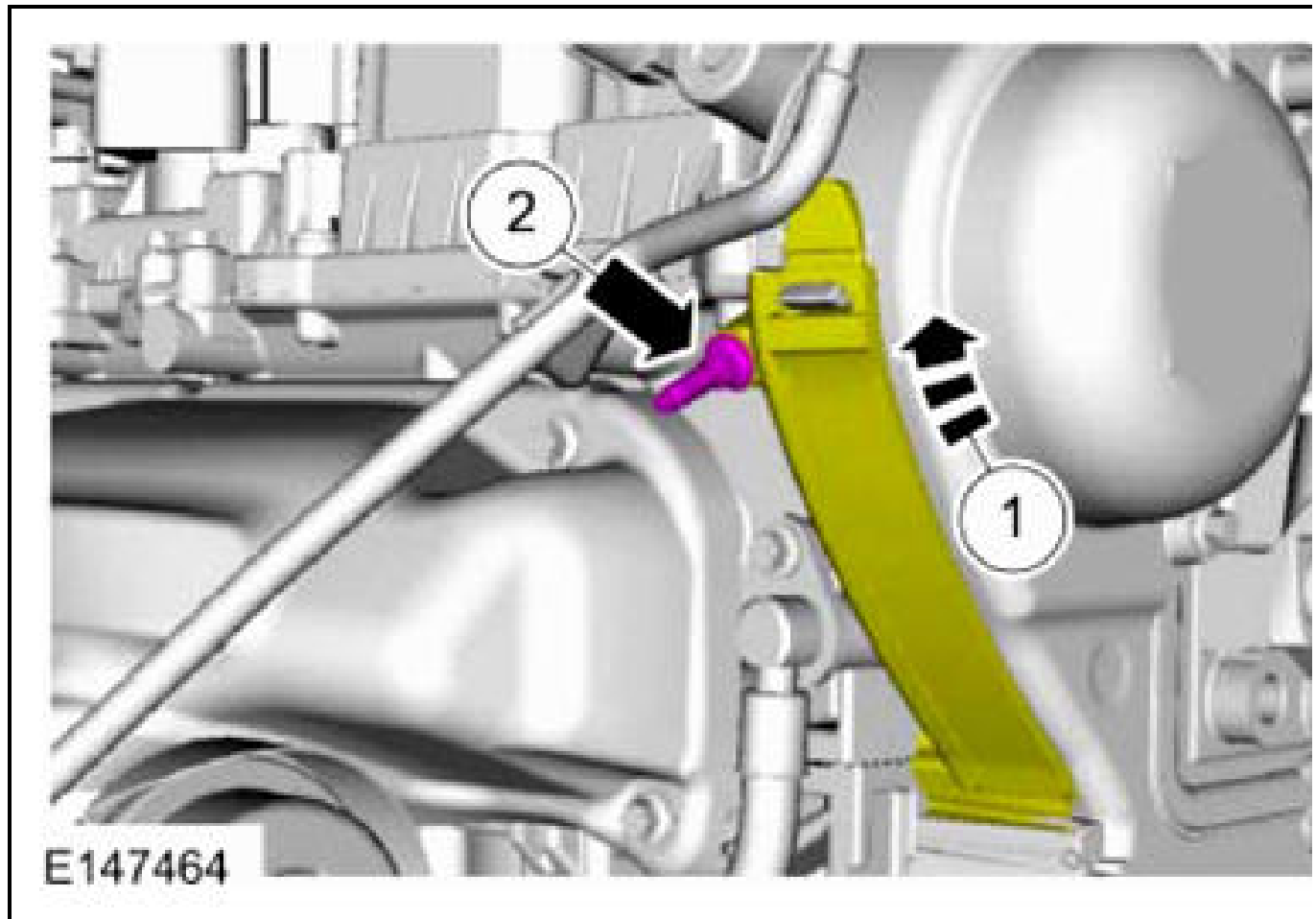


27.

1. *Torque* : 10 Nm
2. Finger tight.
3. Finger tight.

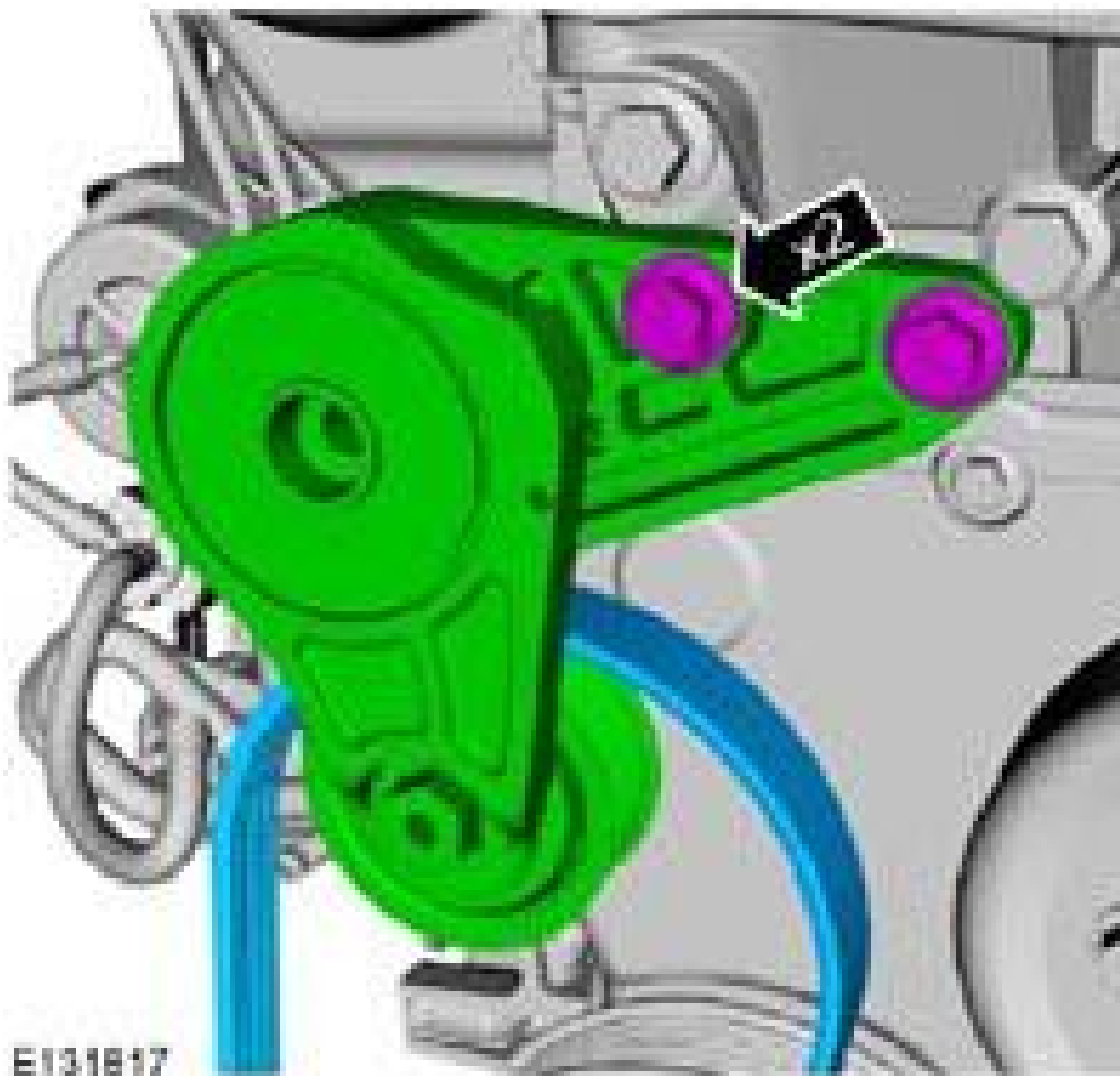


28. Torque : 10 Nm



29. Torque : 48 Nm

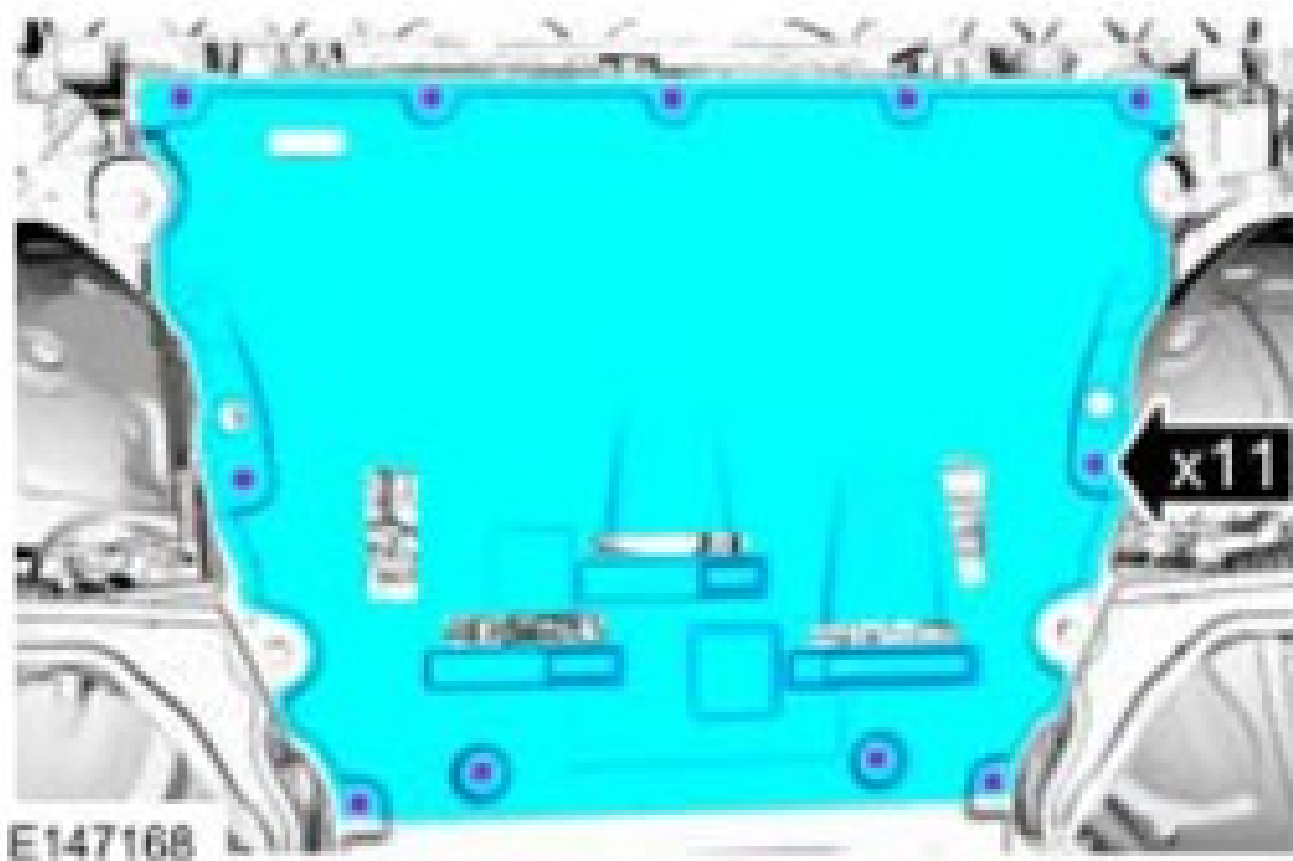




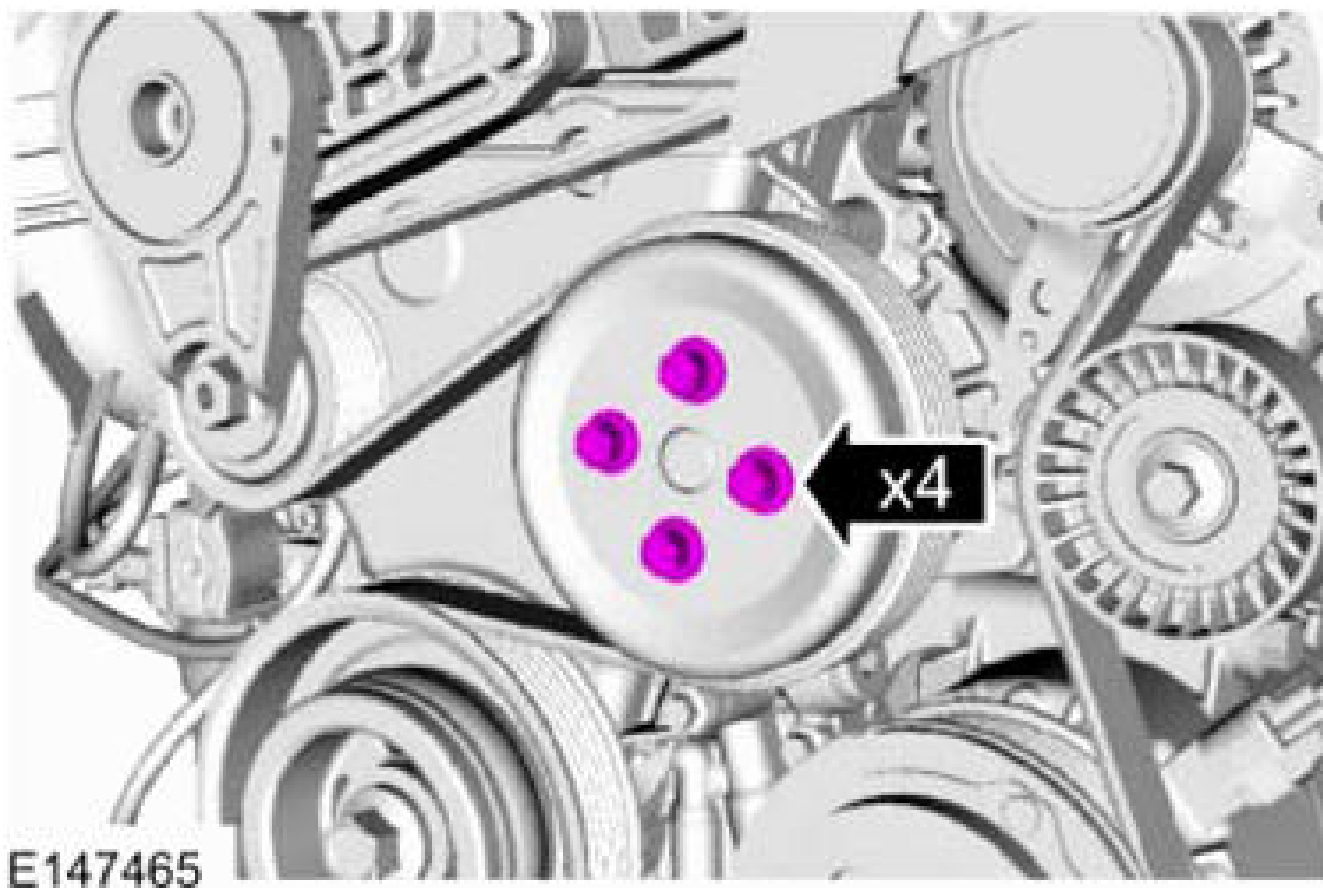
30. Install the following items:

1. Refer to: **ENGINE MOUNT** .
2. Refer to: **GENERATOR - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .
3. Refer to: **STARTER MOTOR** .

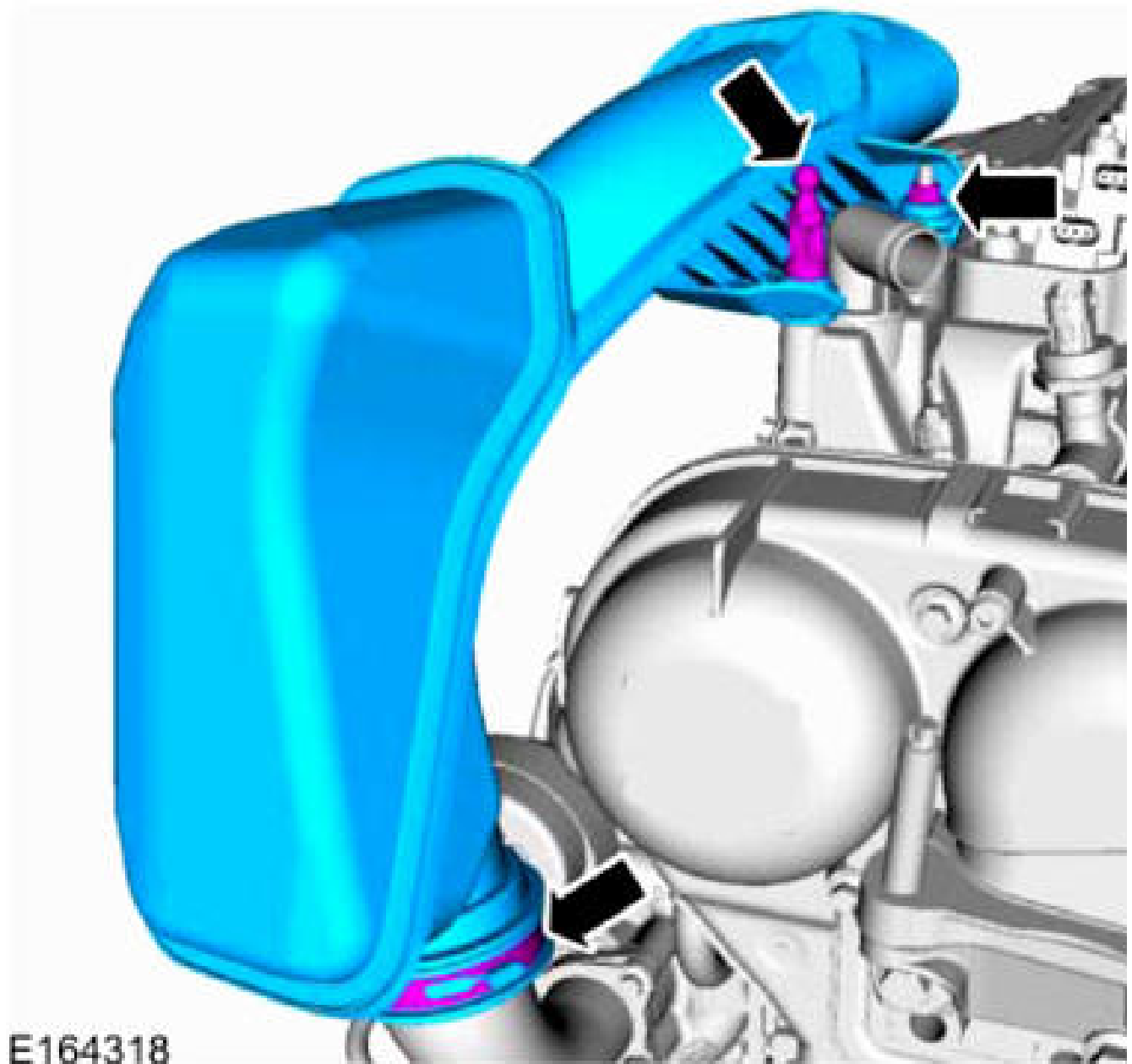
31.

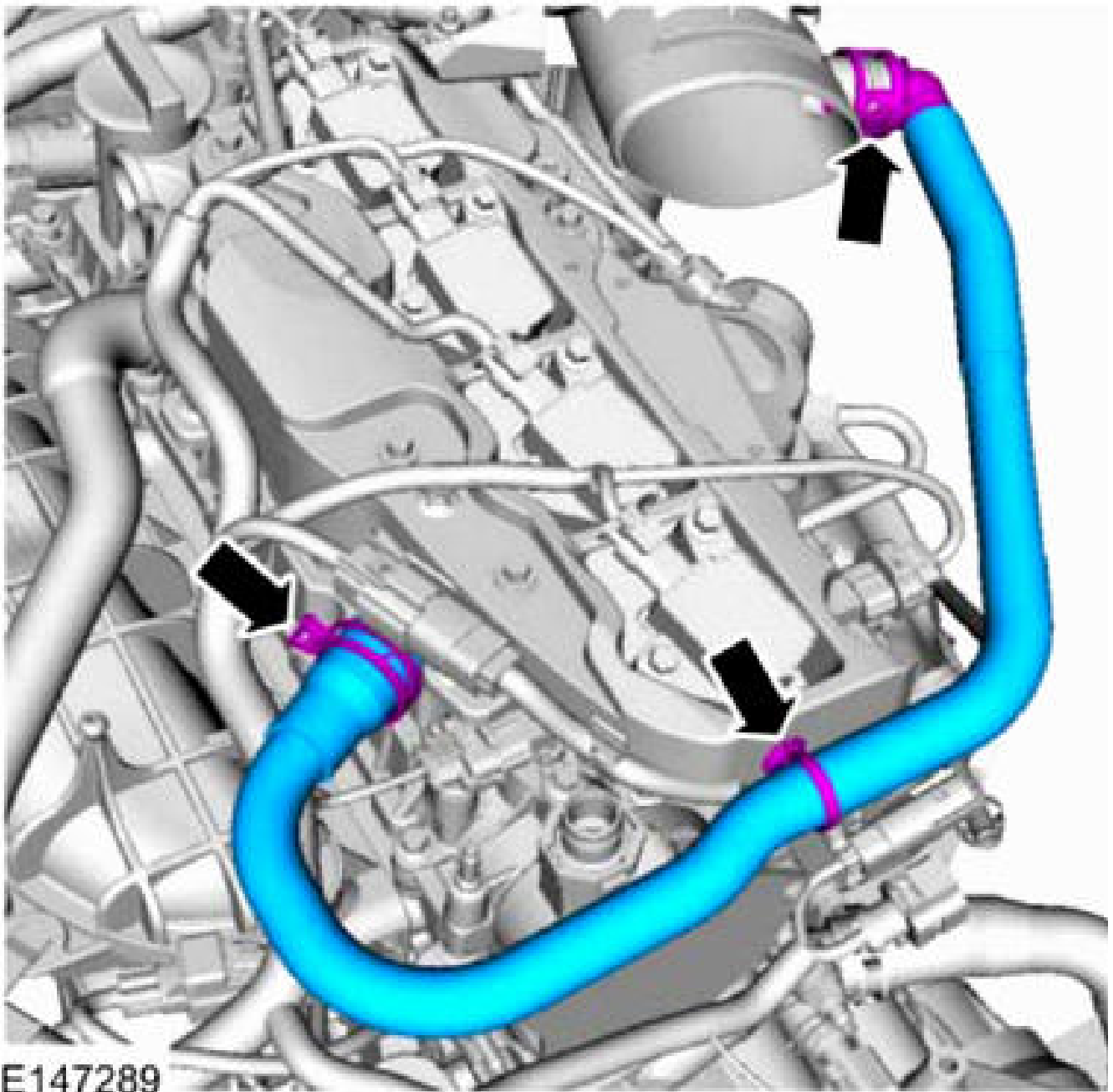


- 31.
32. Install the following items:
1. Install the **RH** front fender splash shield.
Refer to: **FENDER SPLASH SHIELD** .
 2. Install the **RH** front wheel and tire.
Refer to: **WHEEL AND TIRE** .
33. *Torque* : 20 Nm



34. *Torque* : 5 Nm





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35.

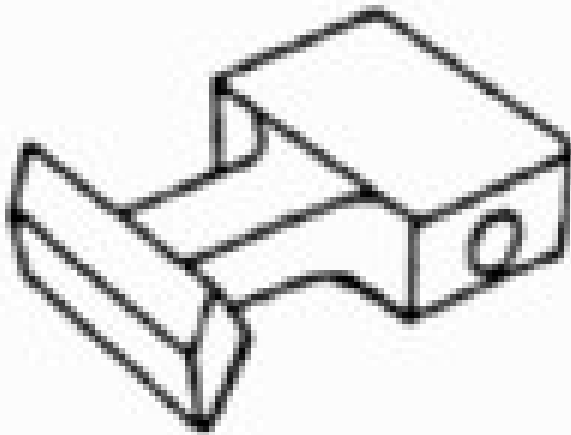
36. Install the following items:

1. Refer to: **AIR CLEANER OUTLET PIPE** .
2. Refer to: **DEGAS BOTTLE** .

37. After completing the repairs, perform the Misfire Monitor Neutral Profile Correction procedure.

FLEXPLATE

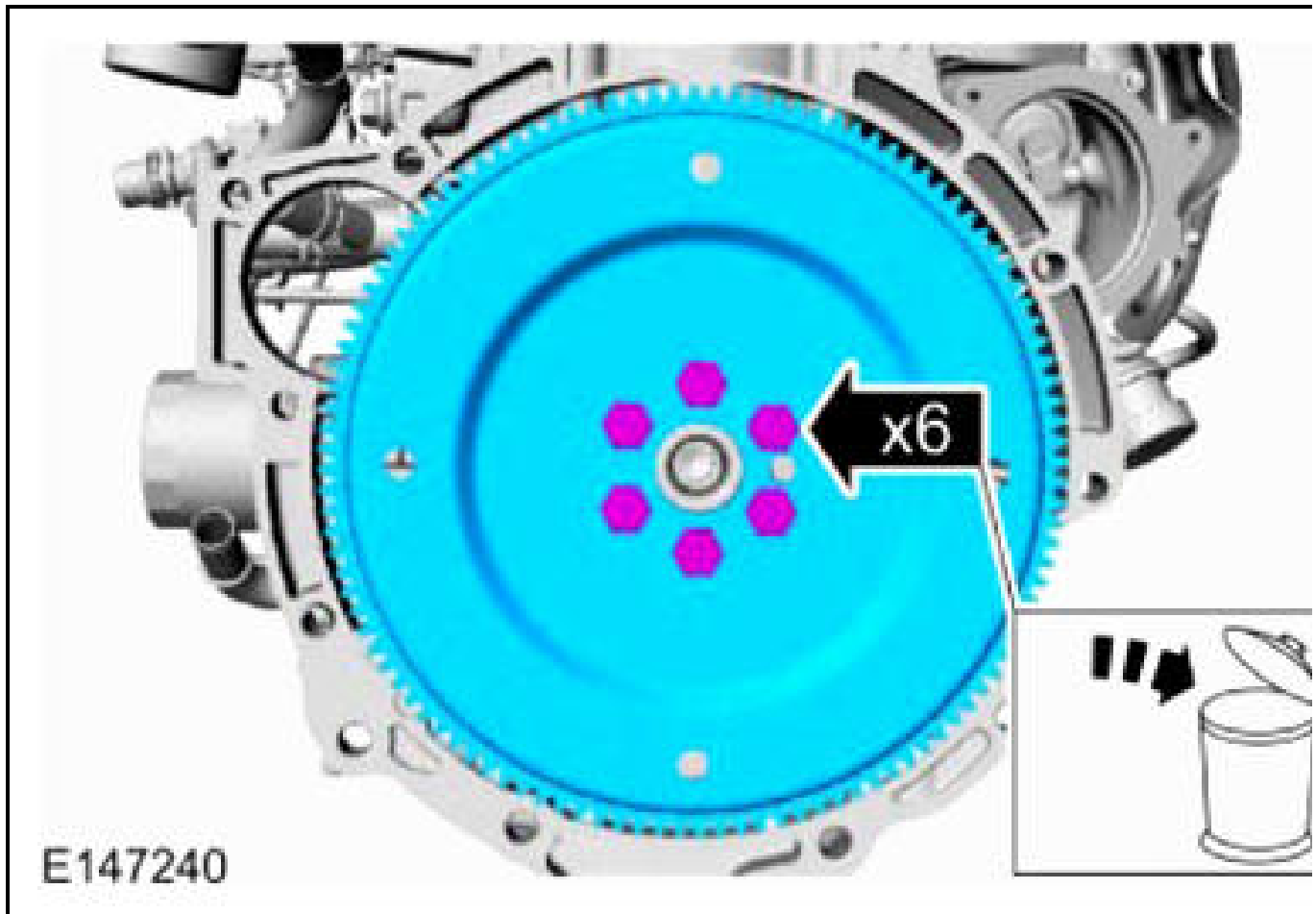
SPECIAL TOOLS/GENERAL EQUIPMENT



303-103 (T74P-6375-A)
Holding Tool, Flywheel
TKIT-2009TC-F
T74P-77000-A

Removal

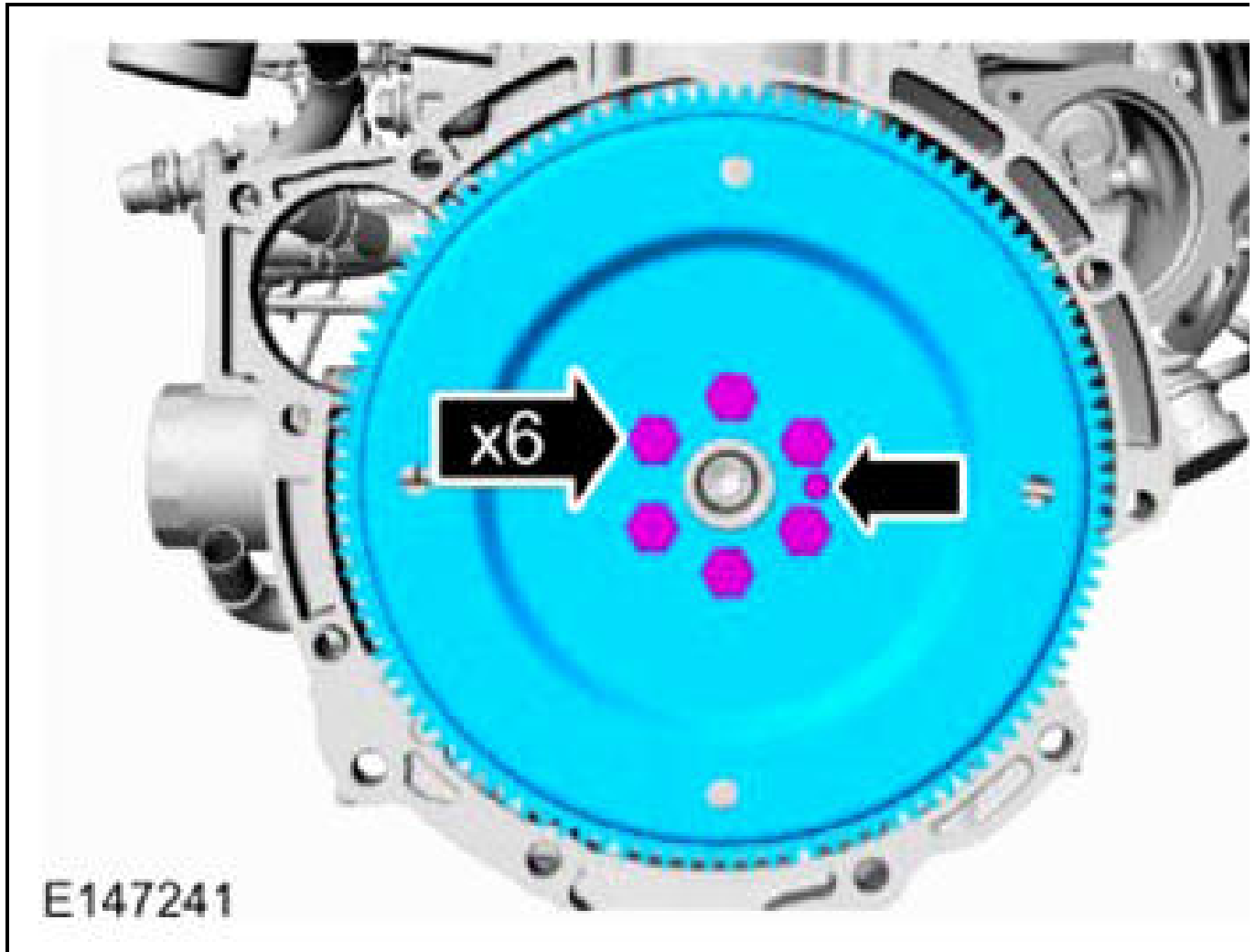
1. Refer to: **TRANSMISSION - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .



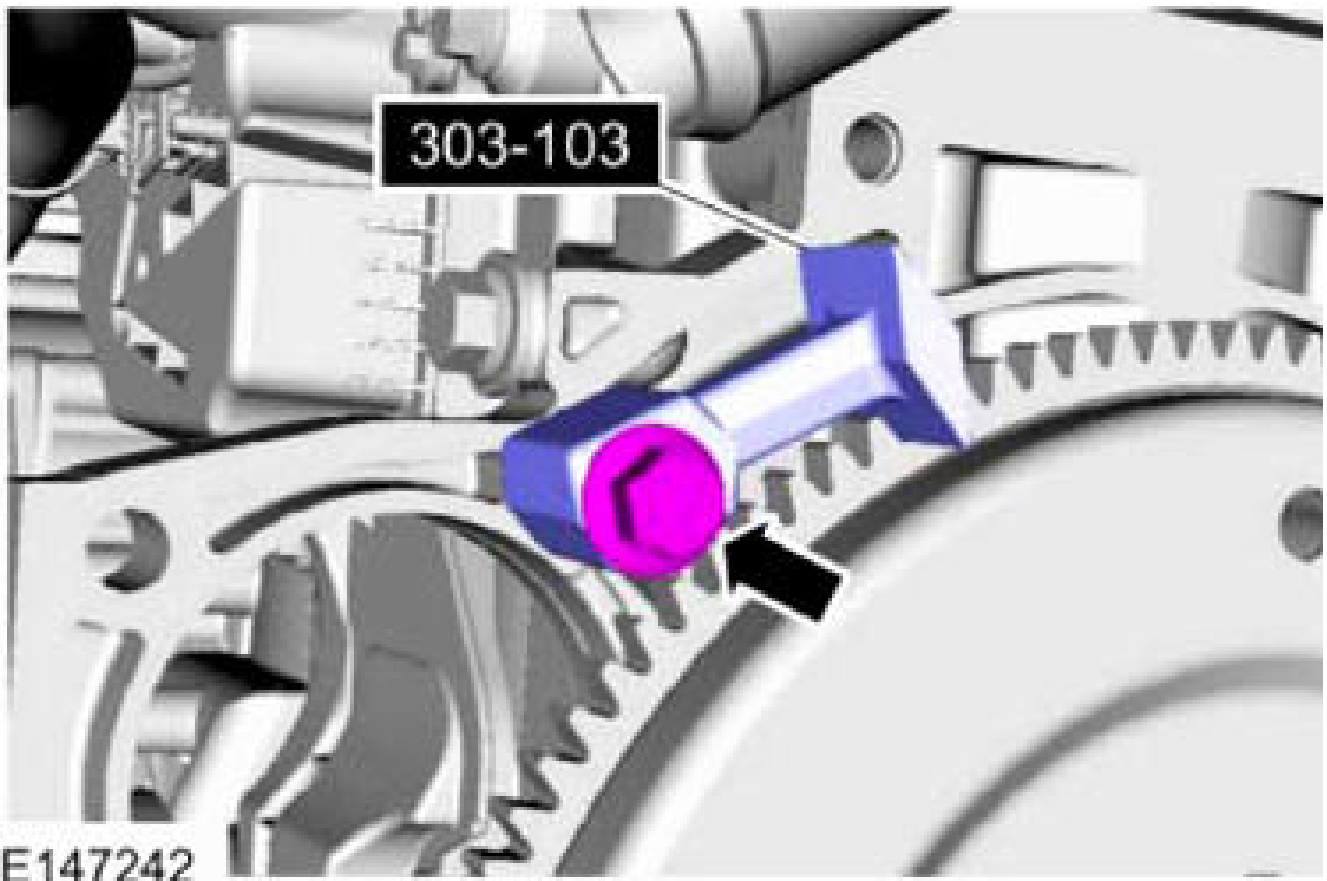
- 2.

Installation

1. Finger tight.



2. *Install Special Service Tool : 303-103 (T74P-6375-A) Holding Tool, Flywheel*



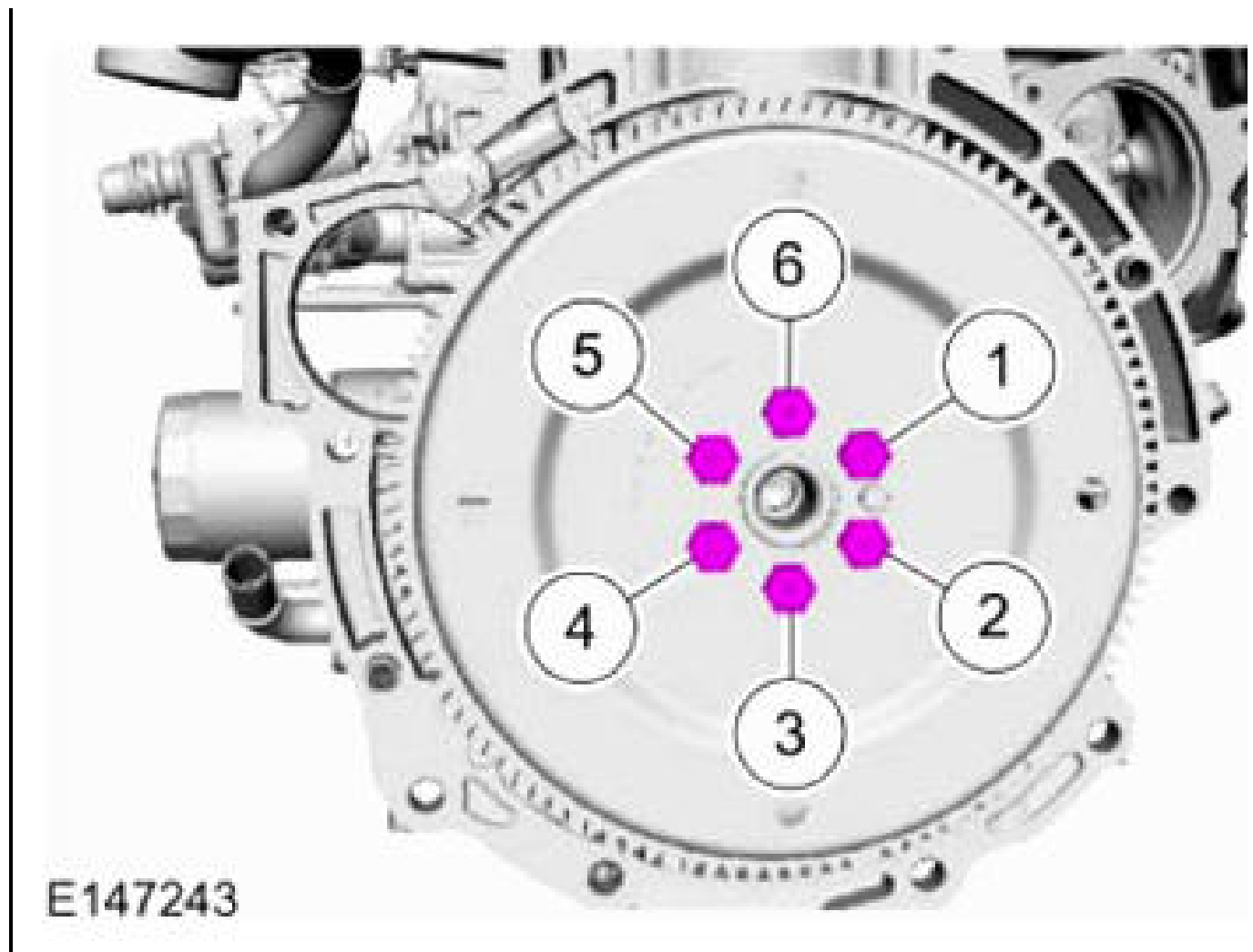
3. *Torque :*

Stage 1: 15 Nm

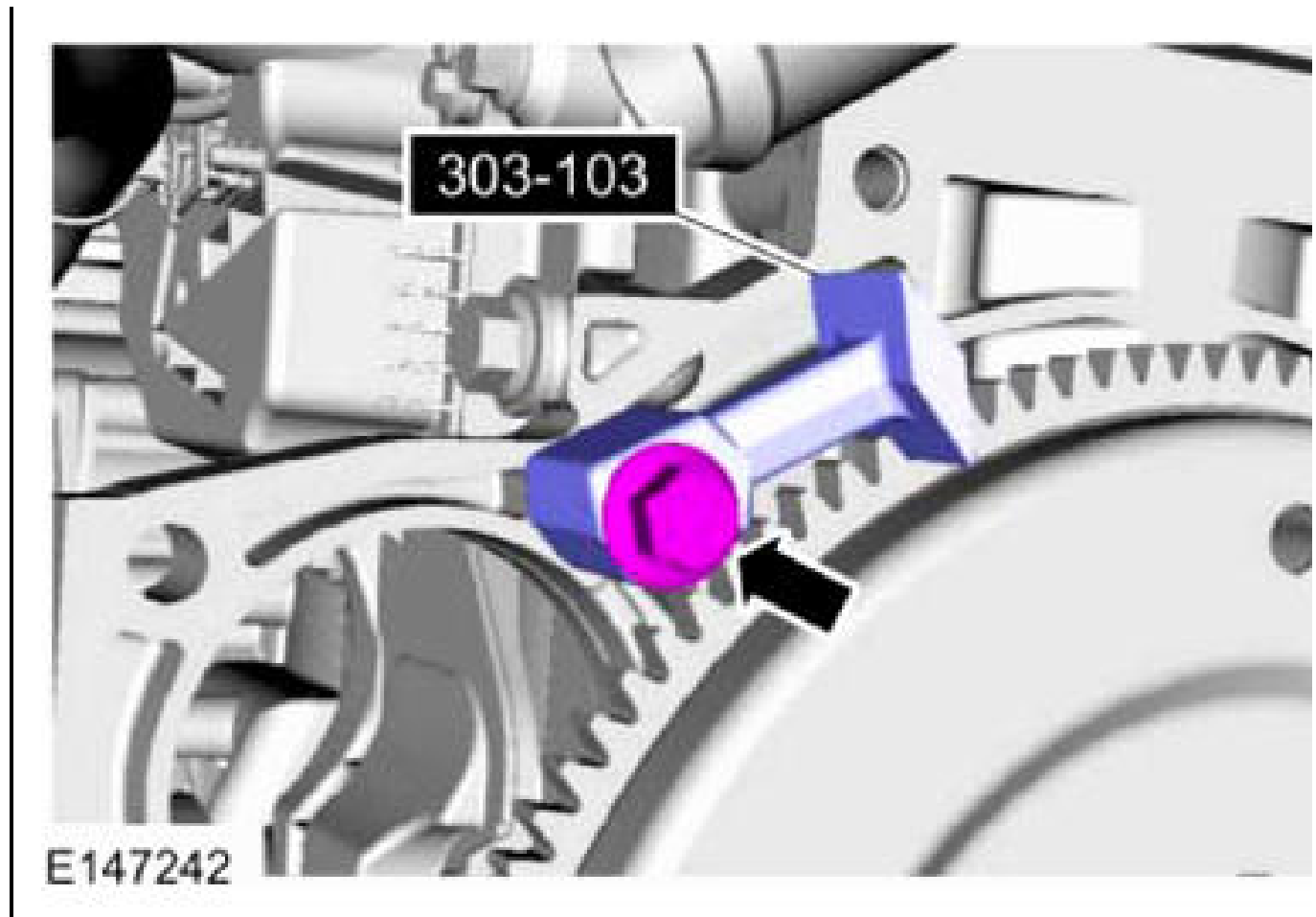
Stage 2: 25 Nm

Stage 3: 30 Nm

Stage 4: Tighten an additional 90°



4. Remove *Special Service Tool* : 303-103 (T74P-6375-A) Holding Tool, Flywheel

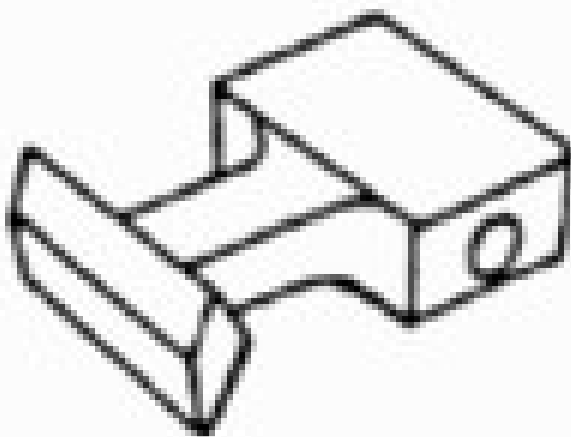


5. Refer to: **TRANSMISSION - 1.6L ECOBOOST (132KW/180PS) - SIGMA** .
6. After completing the repairs, perform the Misfire Monitor Neutral Profile Correction procedure.

FLYWHEEL

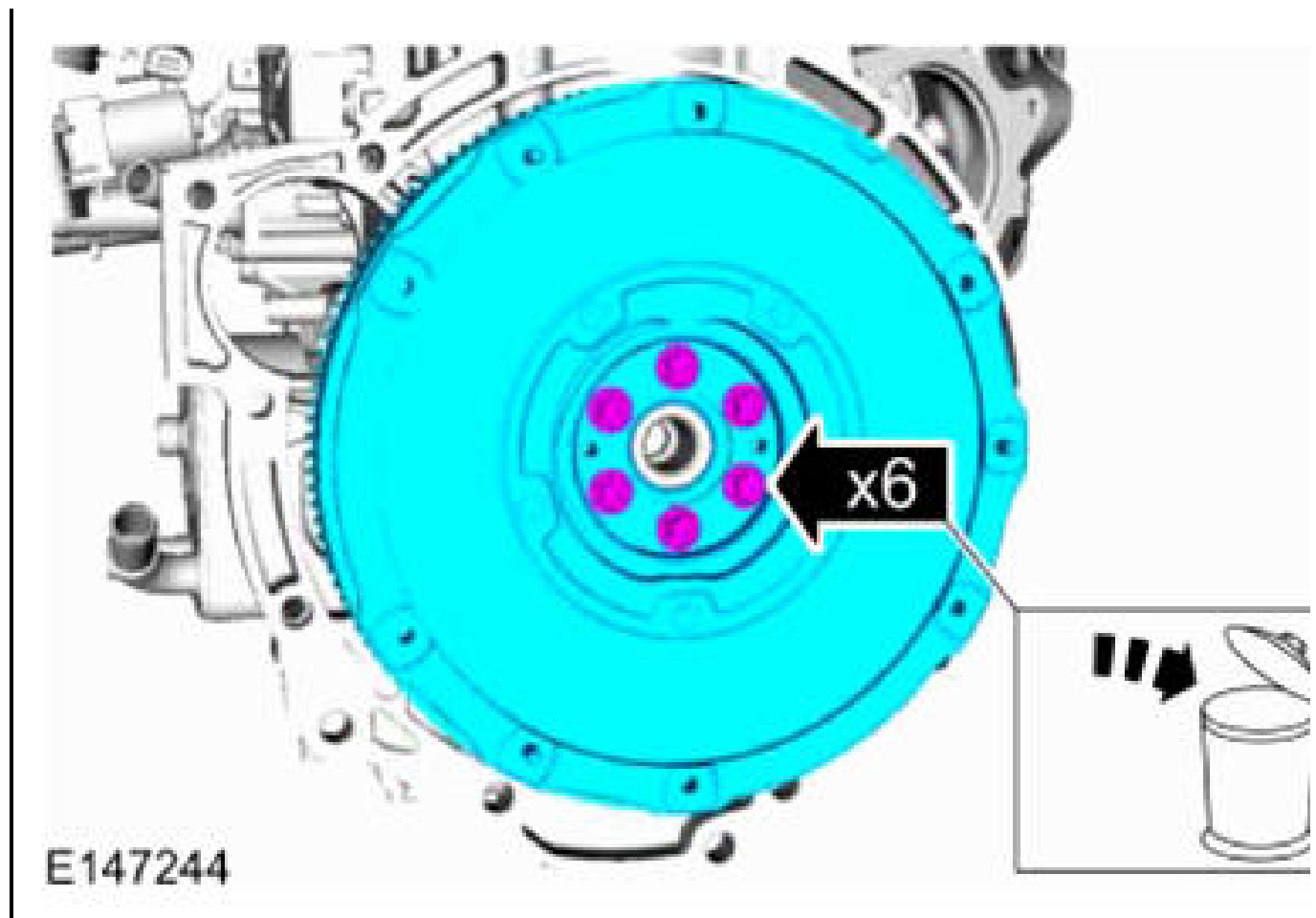
SPECIAL TOOLS/GENERAL EQUIPMENT

303-103 (T74P-6375-A)
Holding Tool, Flywheel
TKIT-2009TC-F
T74P-77000-A

**Removal**

1. Refer to: **CLUTCH DISC AND PRESSURE PLATE** .
2. Refer to: **FLYWHEEL INSPECTION** .

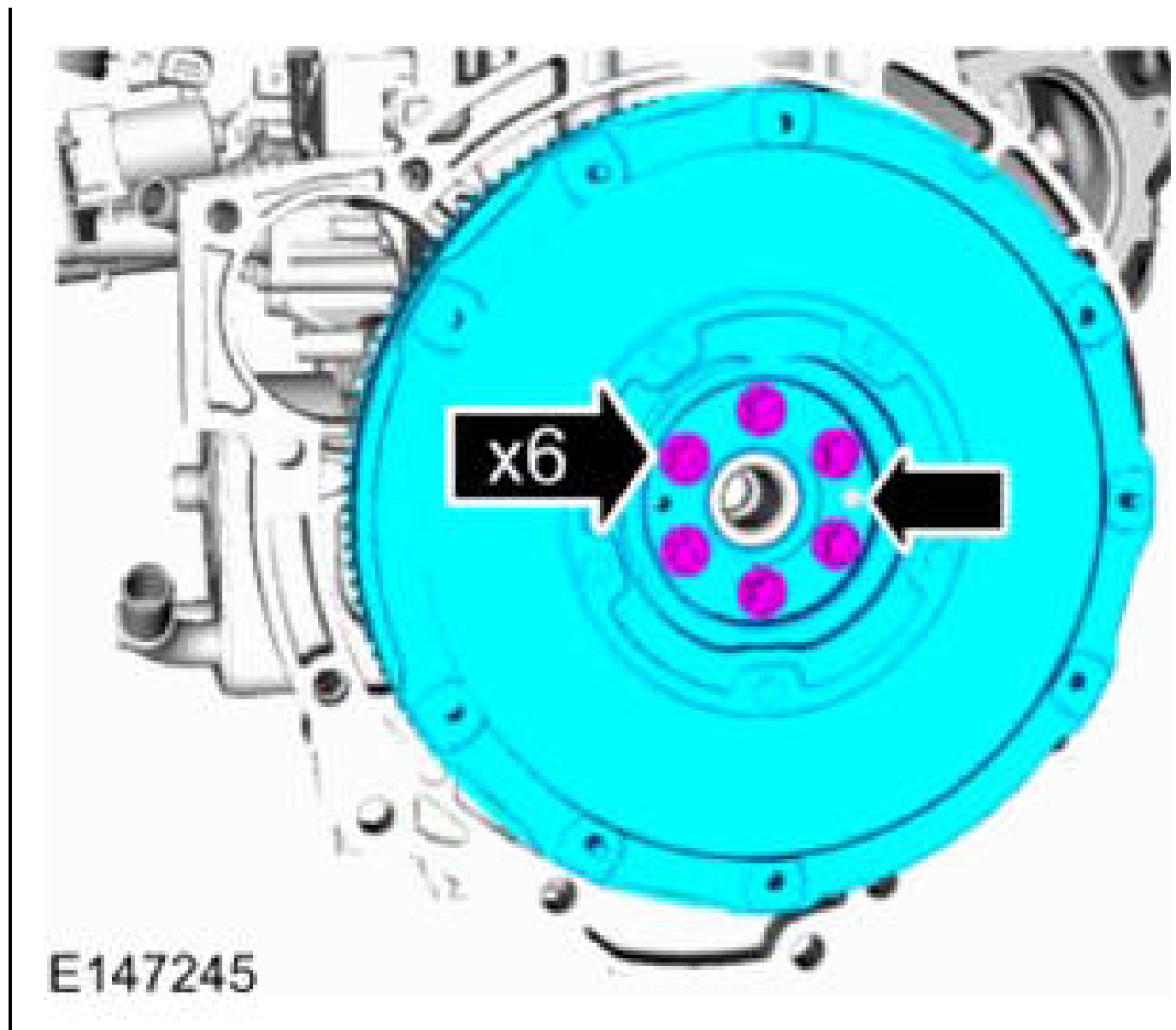
3.



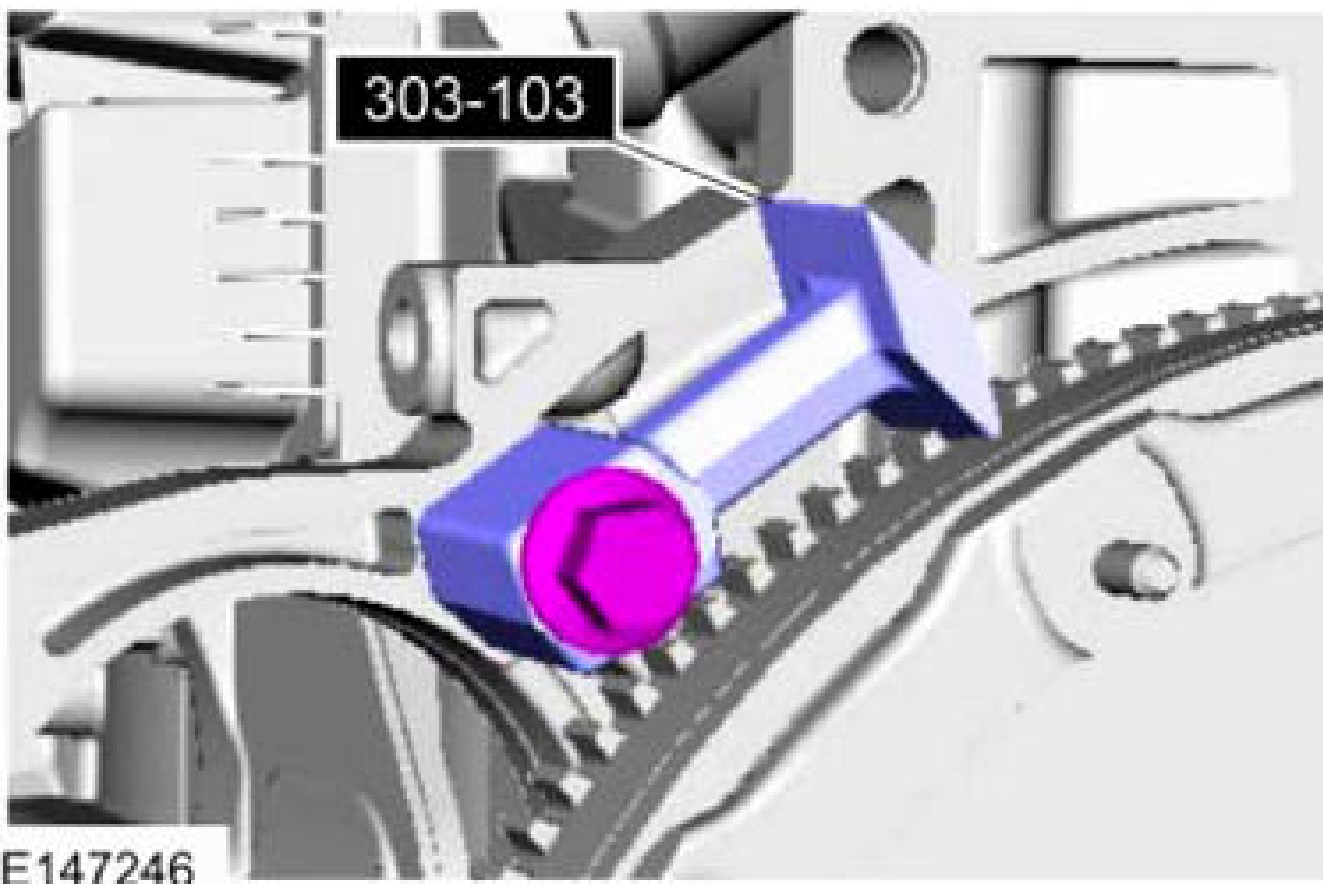
3.

Installation

1. Finger tight.



2. *Install Special Service Tool : 303-103 (T74P-6375-A) Holding Tool, Flywheel*



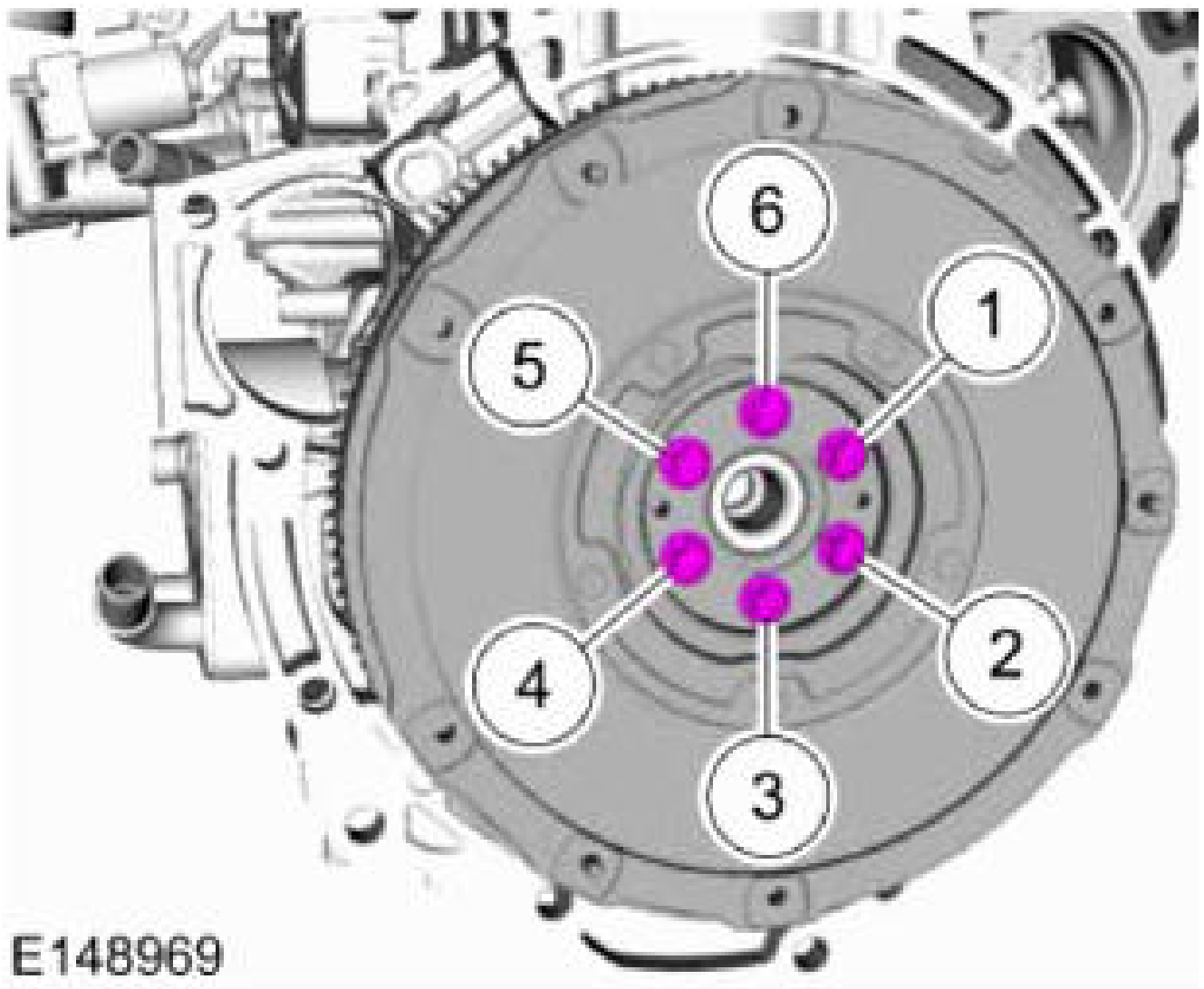
3. *Torque :*

Stage 1: 15 Nm

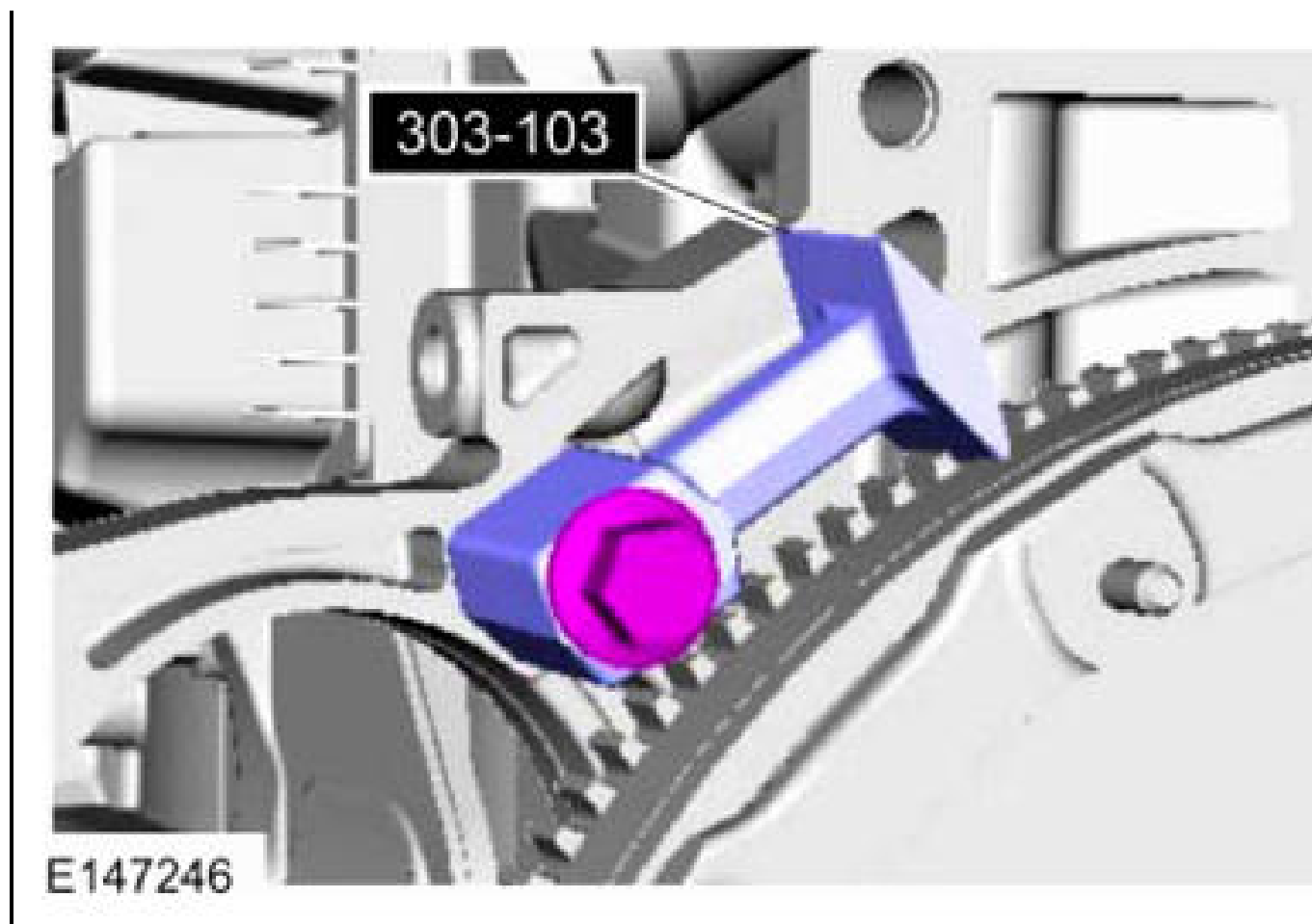
Stage 2: 25 Nm

Stage 3: 30 Nm

Stage 4: Tighten an additional 90°



4. Remove *Special Service Tool* : 303-103 (T74P-6375-A) Holding Tool, Flywheel



5. Refer to: **CLUTCH DISC AND PRESSURE PLATE** .
6. Perform the Misfire Monitor Neutral Profile Correction procedure.

TIMING DRIVE COMPONENTS

Removal

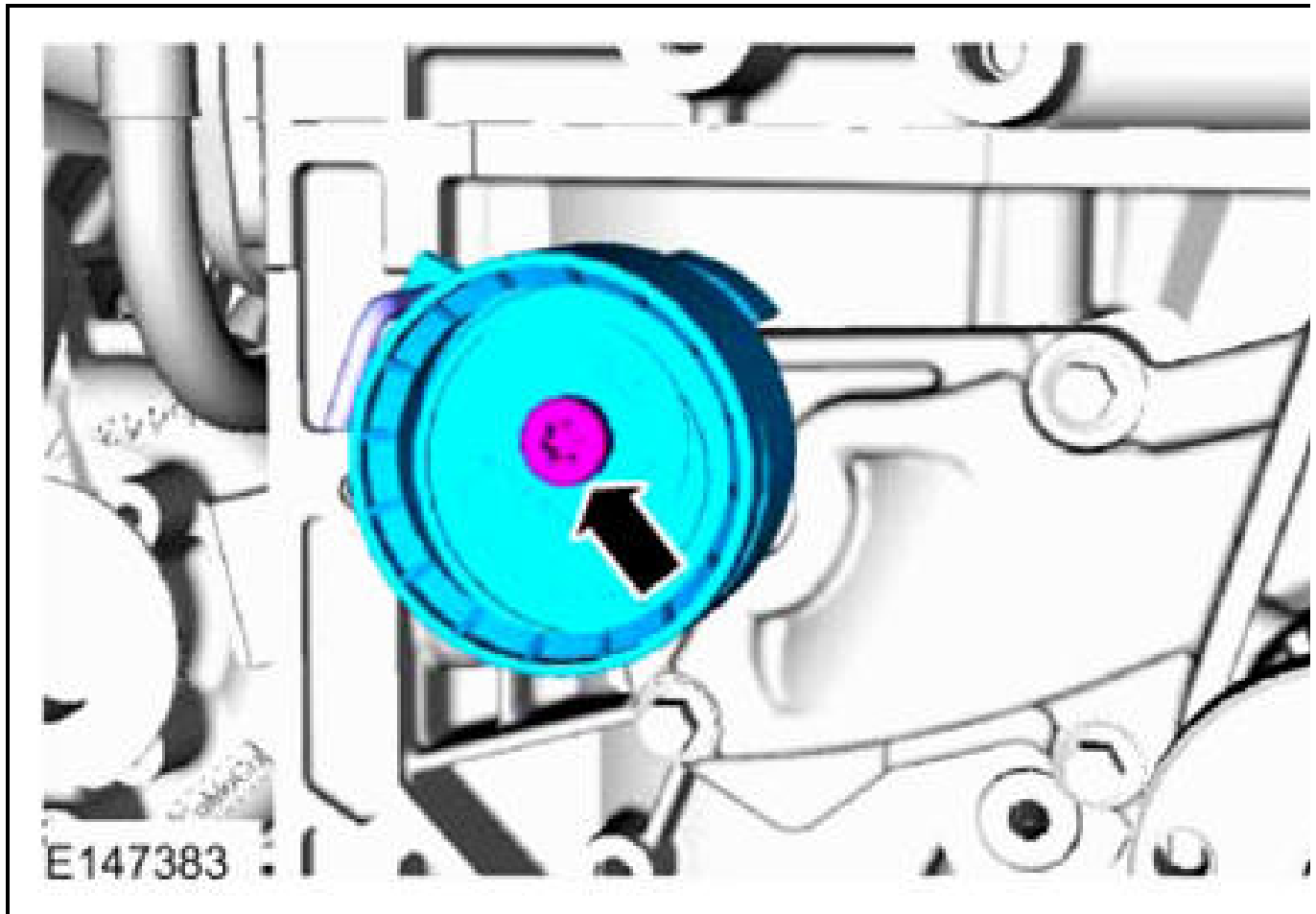
NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

NOTE: This procedure covers the timing belt tensioner, the remaining timing drive components will be removed in the VVT unit and crankshaft pulley procedures.

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .
2. Refer to: **VARIABLE VALVE TIMING (VVT) UNIT** .
- 3.

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

3.

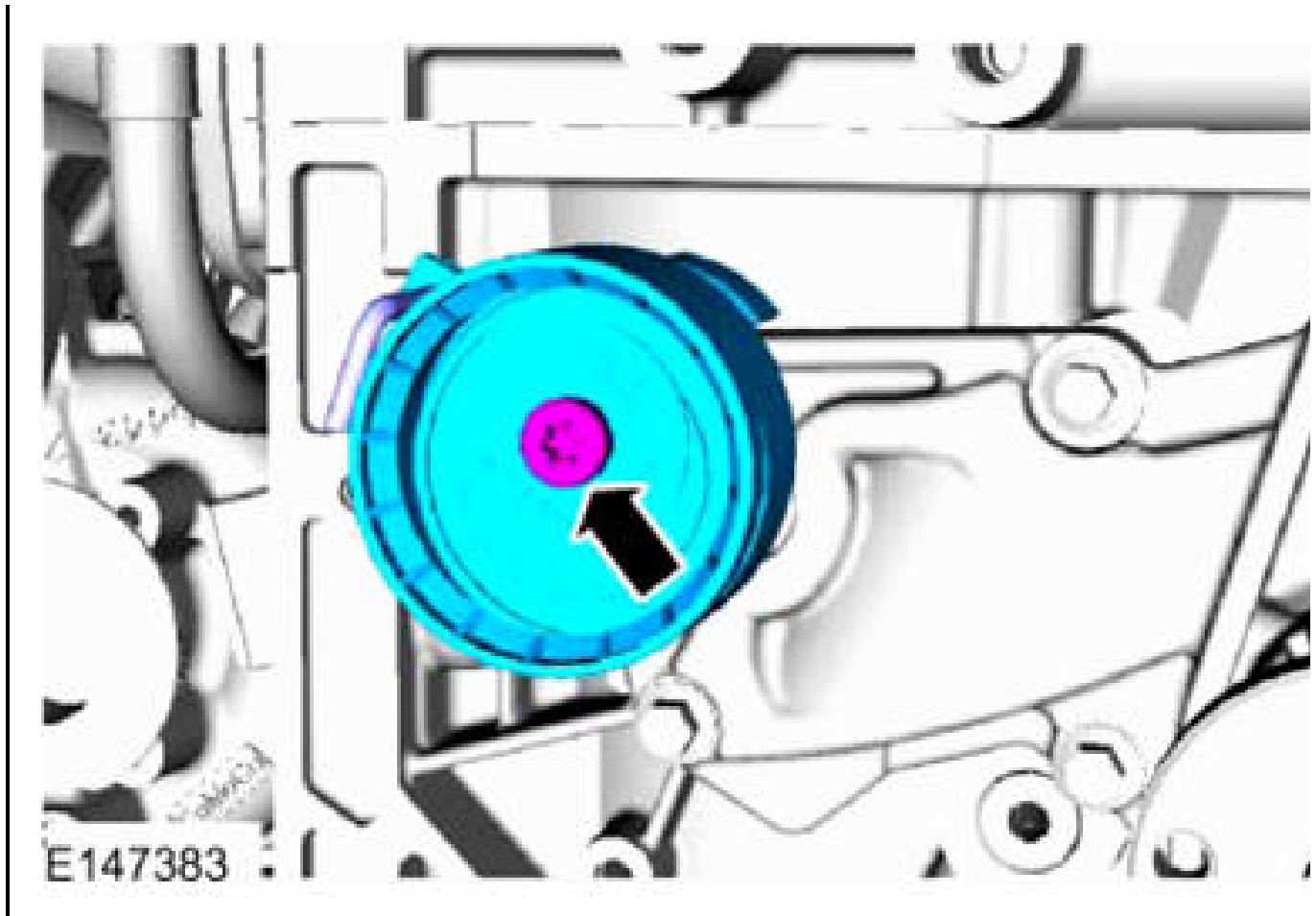


Installation

WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

1.

Torque : 25 Nm



2. Refer to: VARIABLE VALVE TIMING (VVT) UNIT .

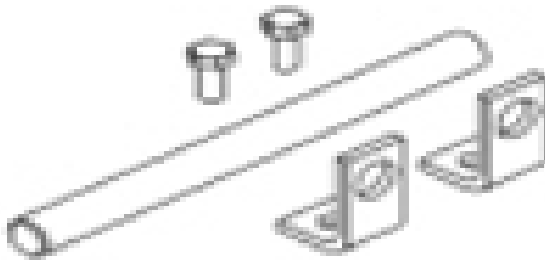
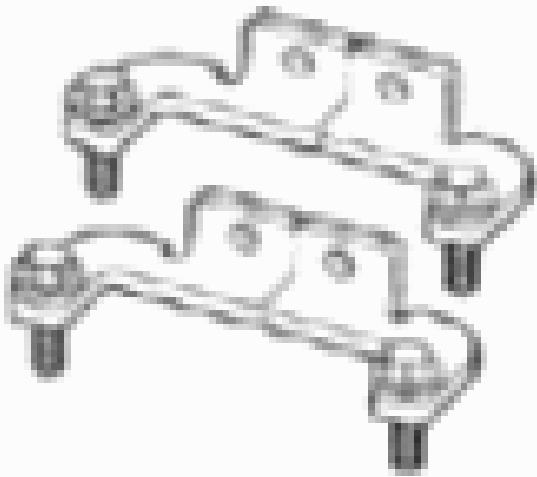
VALVE SPRINGS

SPECIAL TOOLS/GENERAL EQUIPMENT

303-1249
Valve Spring Compressor
TKIT-2006UF-FLM
TKIT-2006UF-ROW

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion

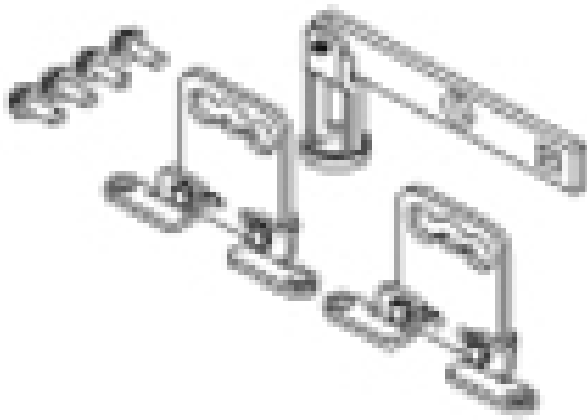


303-300 (T87C-6565-A)
Set, Valve Spring Compressor
TKIT-2009TC-F
T88C-1000-ST
TKIT-1988-FESTIVA
TKIT-1988-TRACER

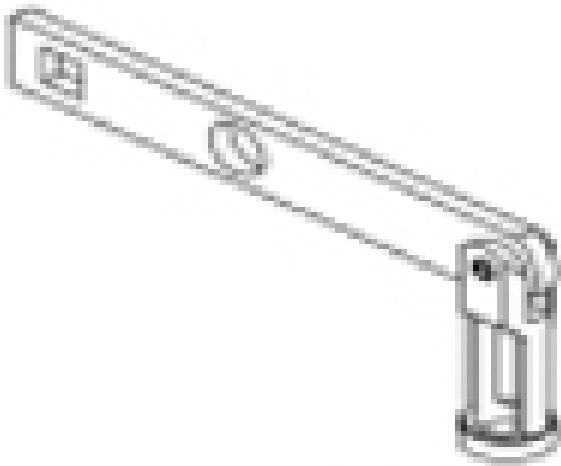
303-350 (T89P-6565-A)
Compressor, Valve Spring
TKIT-1989-F
TKIT-1989-FM
TKIT-1989-FLM
TKIT-1990-LMH

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



E134678



E134679

303-472 (T94P-6565-AH)
Adapter, Valve Spring Compressor
TKIT-1994-FH/FMH/FLMH
TKIT-1994-LMH/MH2

MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

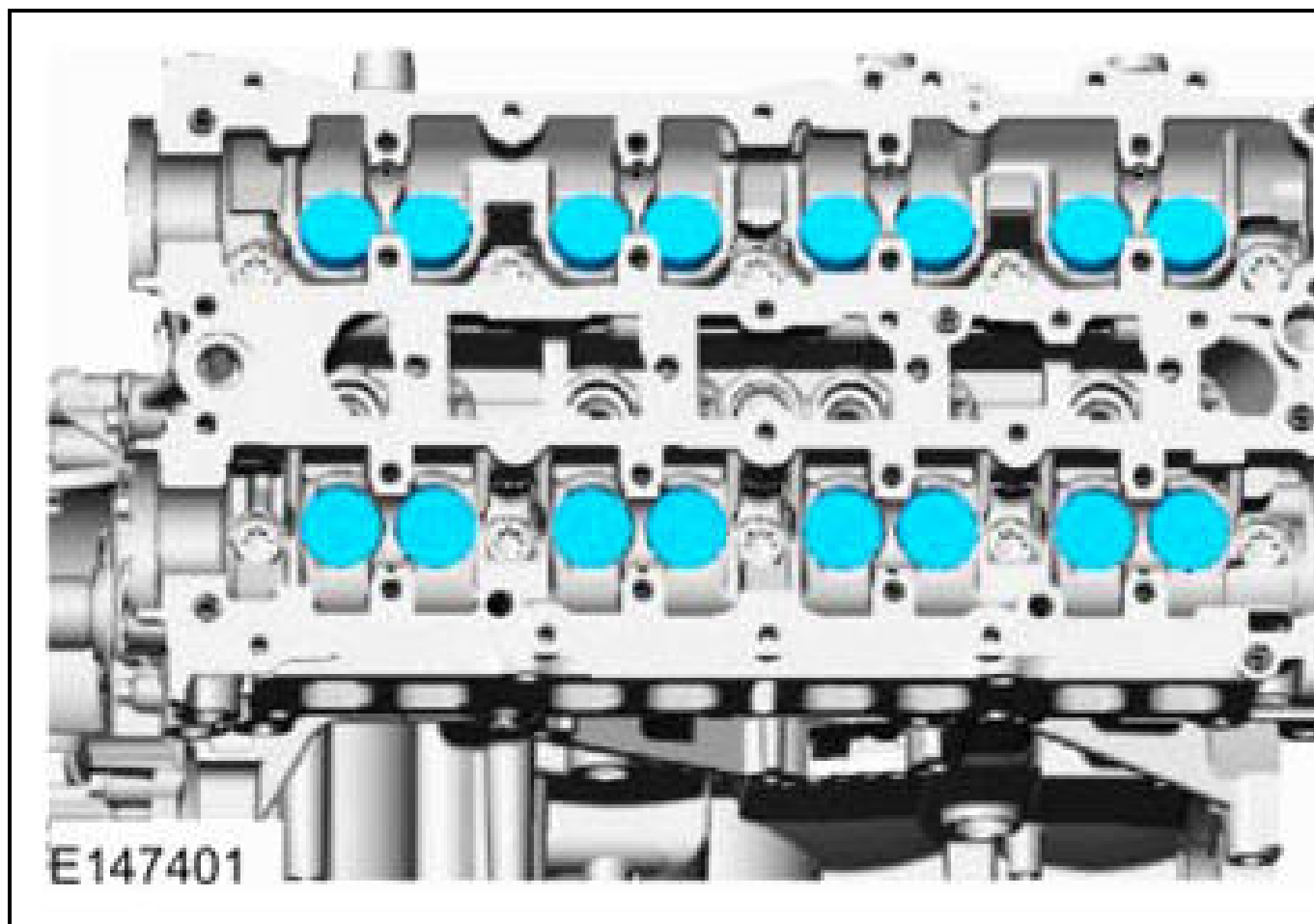
Removal

NOTE: During engine repair procedures, cleanliness is extremely important. Any

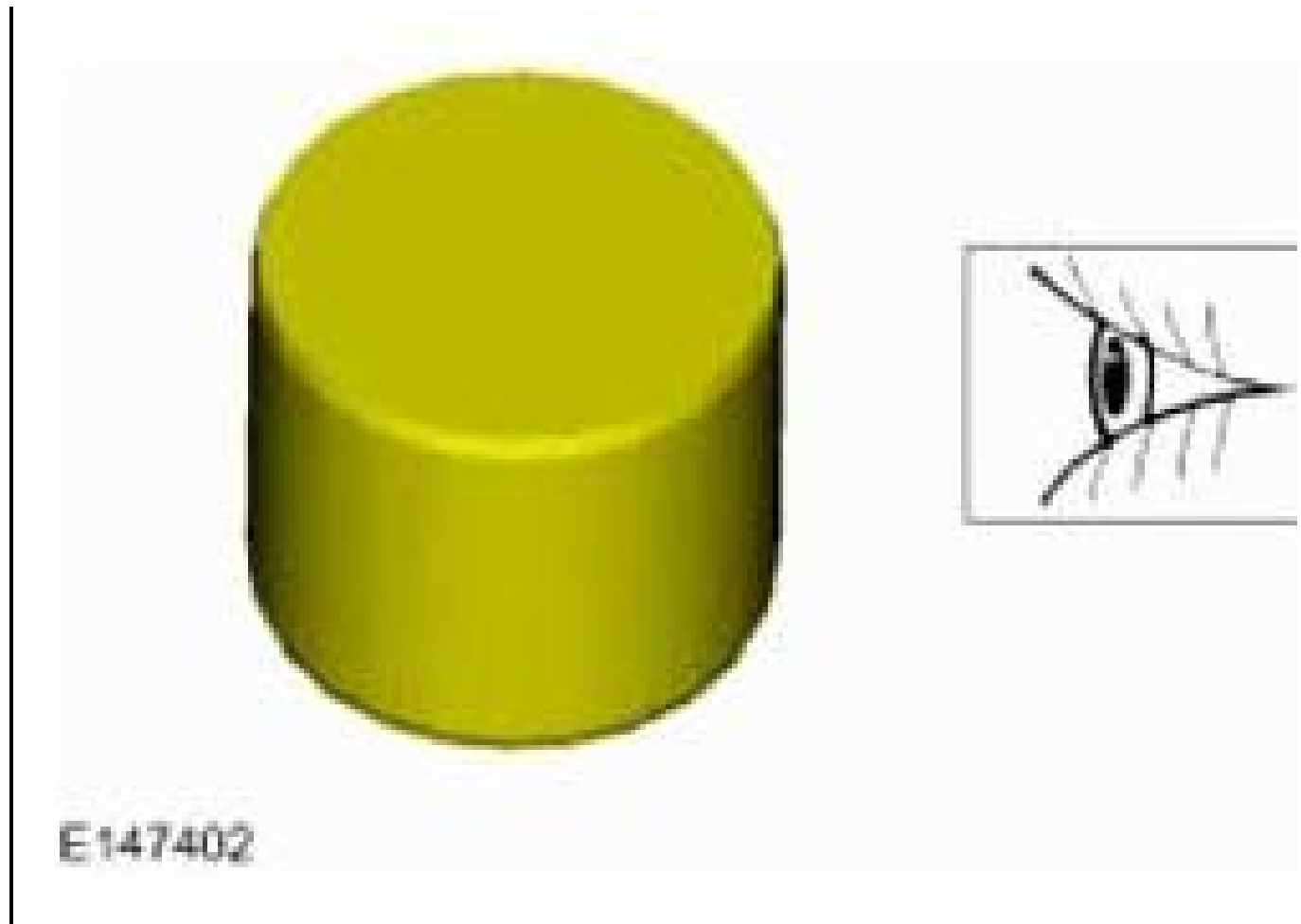
foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. Refer to: JACKING AND LIFTING - OVERVIEW .
2. Refer to: CAMSHAFTS .
3. **NOTE:** Note the position of the components before removal.

NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

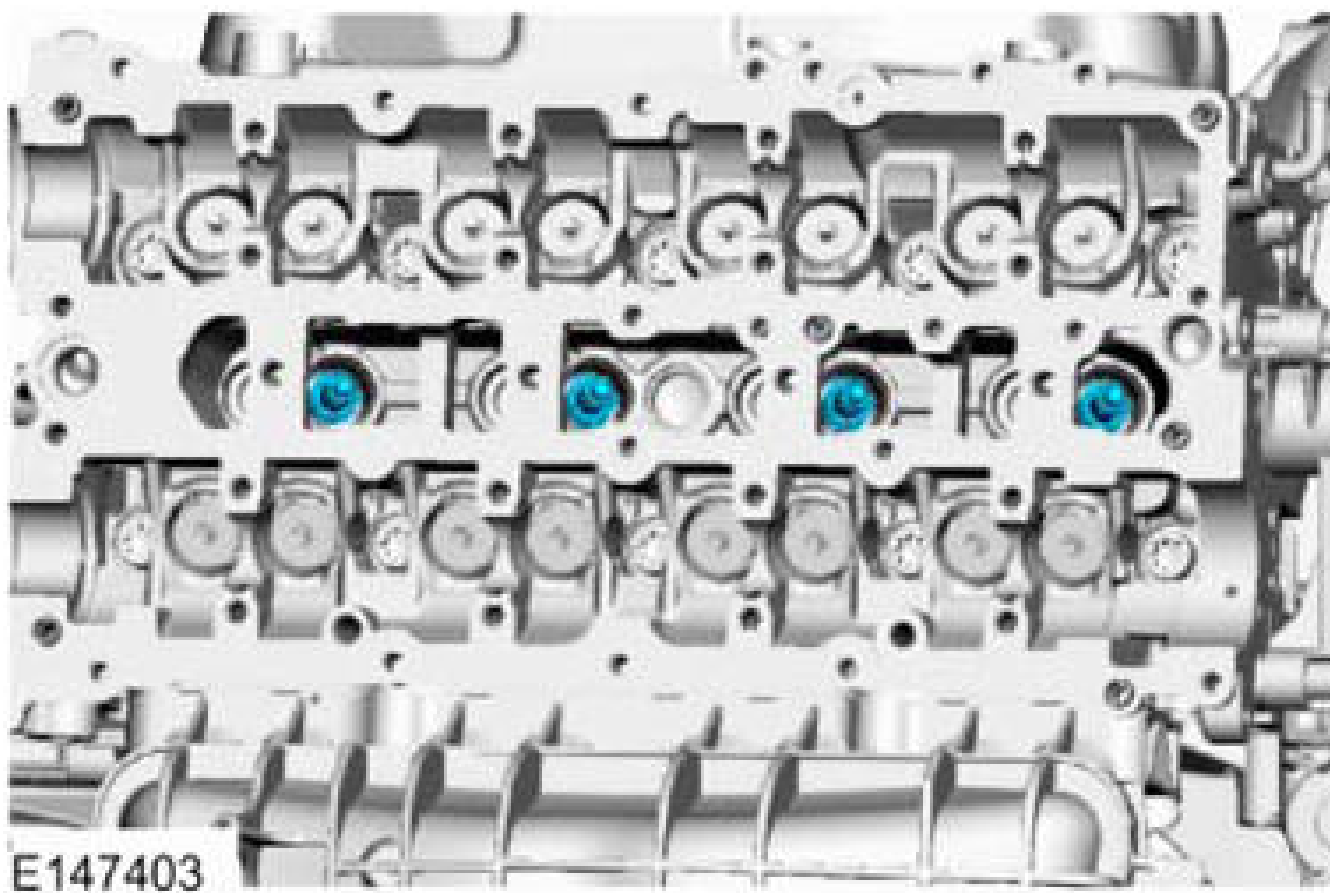


4. Install new components as necessary.

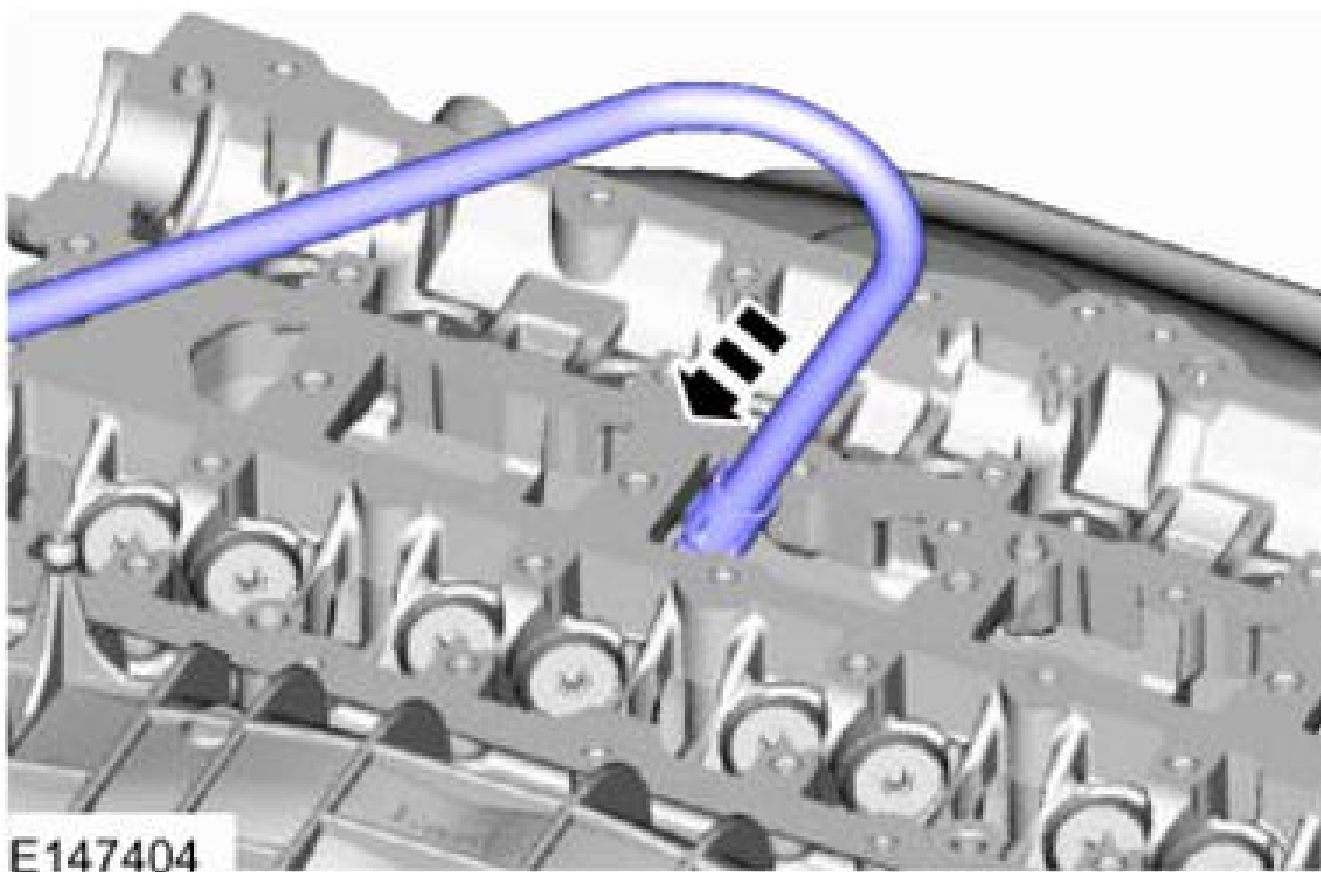


5. **NOTE:** Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.

NOTE: Use compressed air to remove any foreign material in the spark plug well before removing the spark plugs.



6. **NOTE:** Place all parts in order to one side.

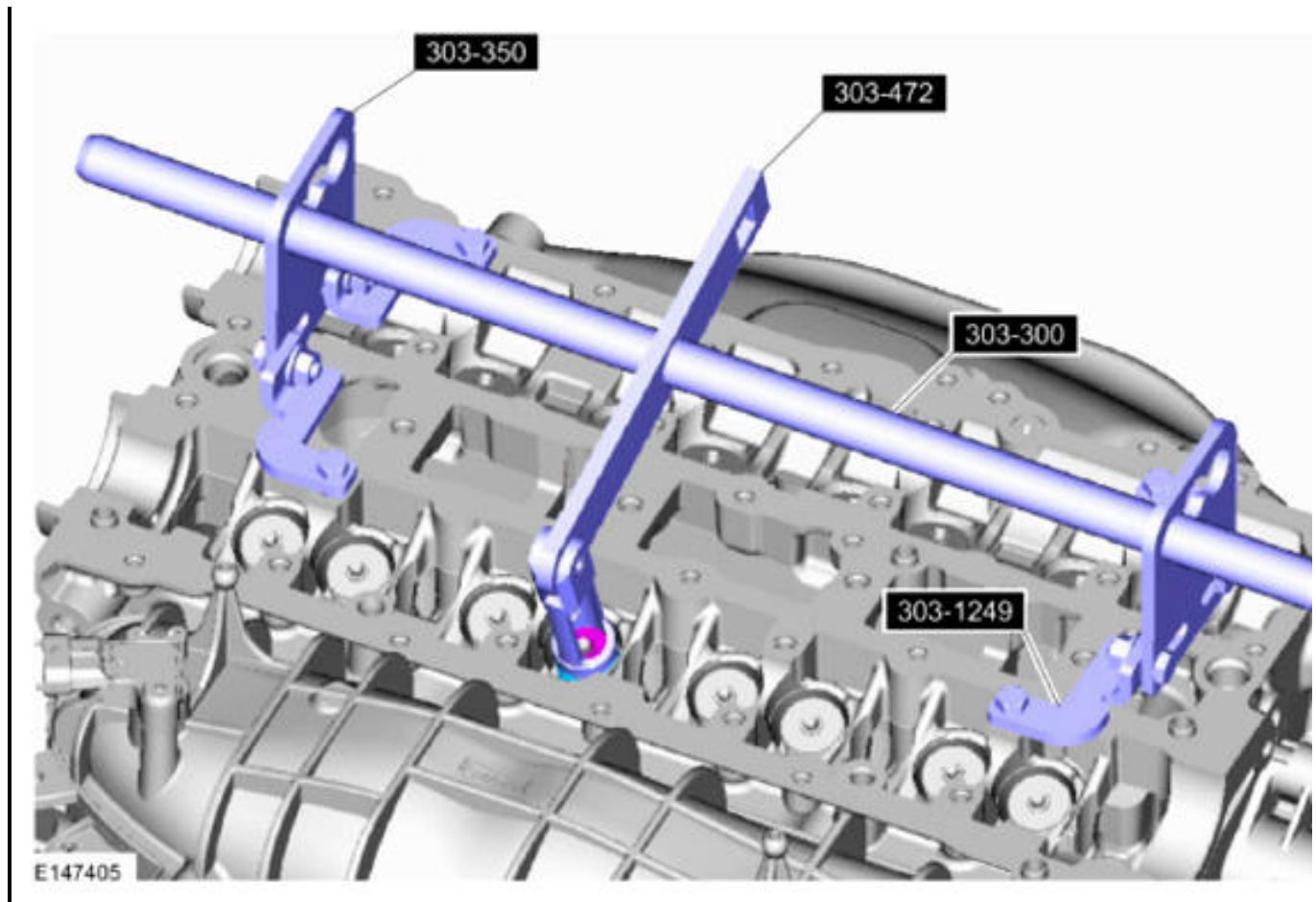


NOTE: Use compressed air at 7 to 10 bars (100-150 psi). Do not disconnect the compressed air from the cylinder until the valve spring, valve spring retainer and valve collet is installed. Any loss of air pressure will allow the valve to fall into the cylinder.

7.

Apply compressed air to the cylinder and remove the valve spring. Remove the valve collet, valve spring retainer and the valve spring.

Special Tool(s) : 303-300 (T87C-6565-A) Set, Valve Spring Compressor , 303-350 (T89P-6565-A) Compressor, Valve Spring , 303-472 (T94P-6565-AH) Adapter, Valve Spring Compressor , 303-1249 Valve Spring Compressor



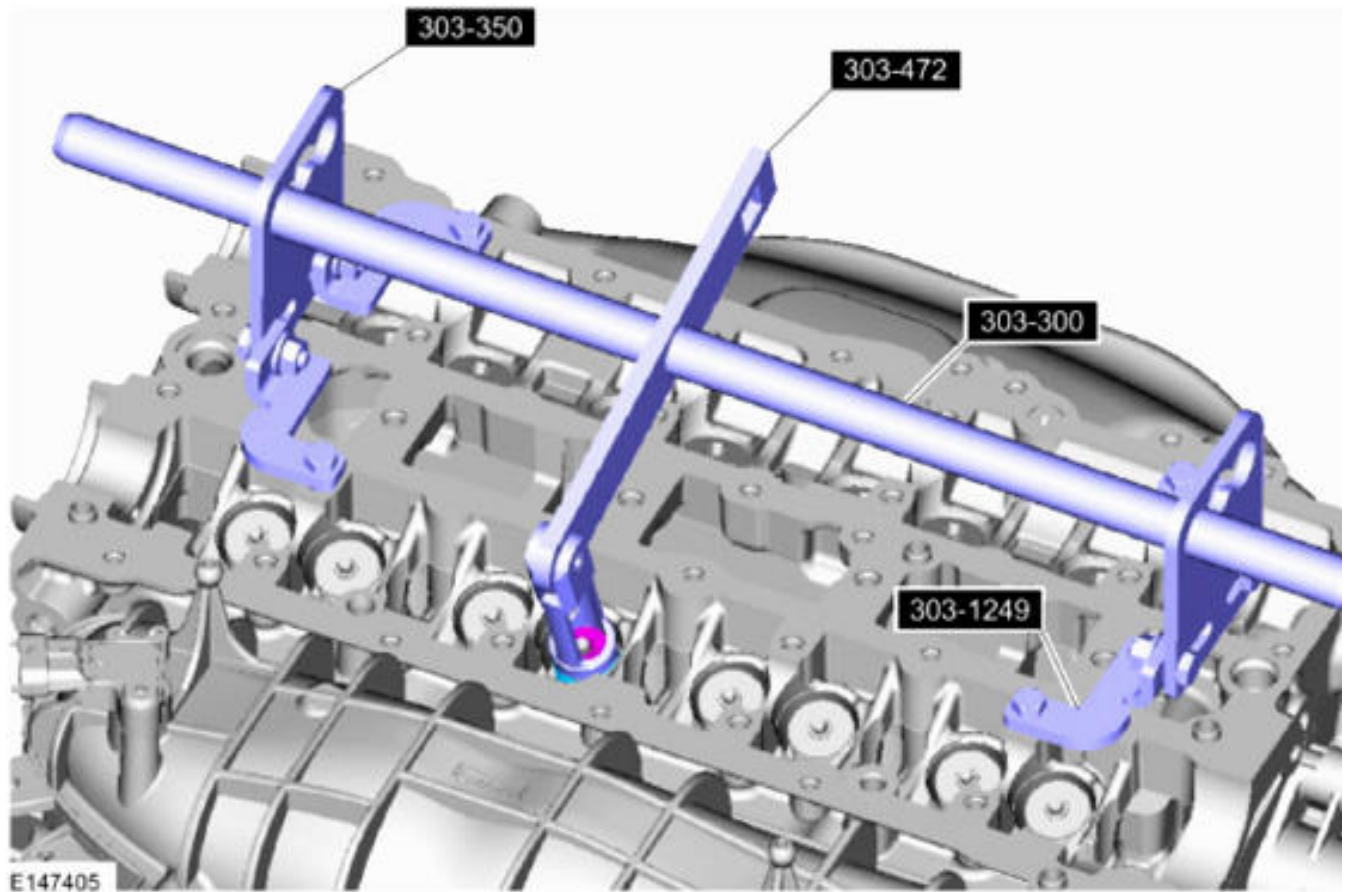
8. Repeat the appropriate removal steps for all of the other cylinders.

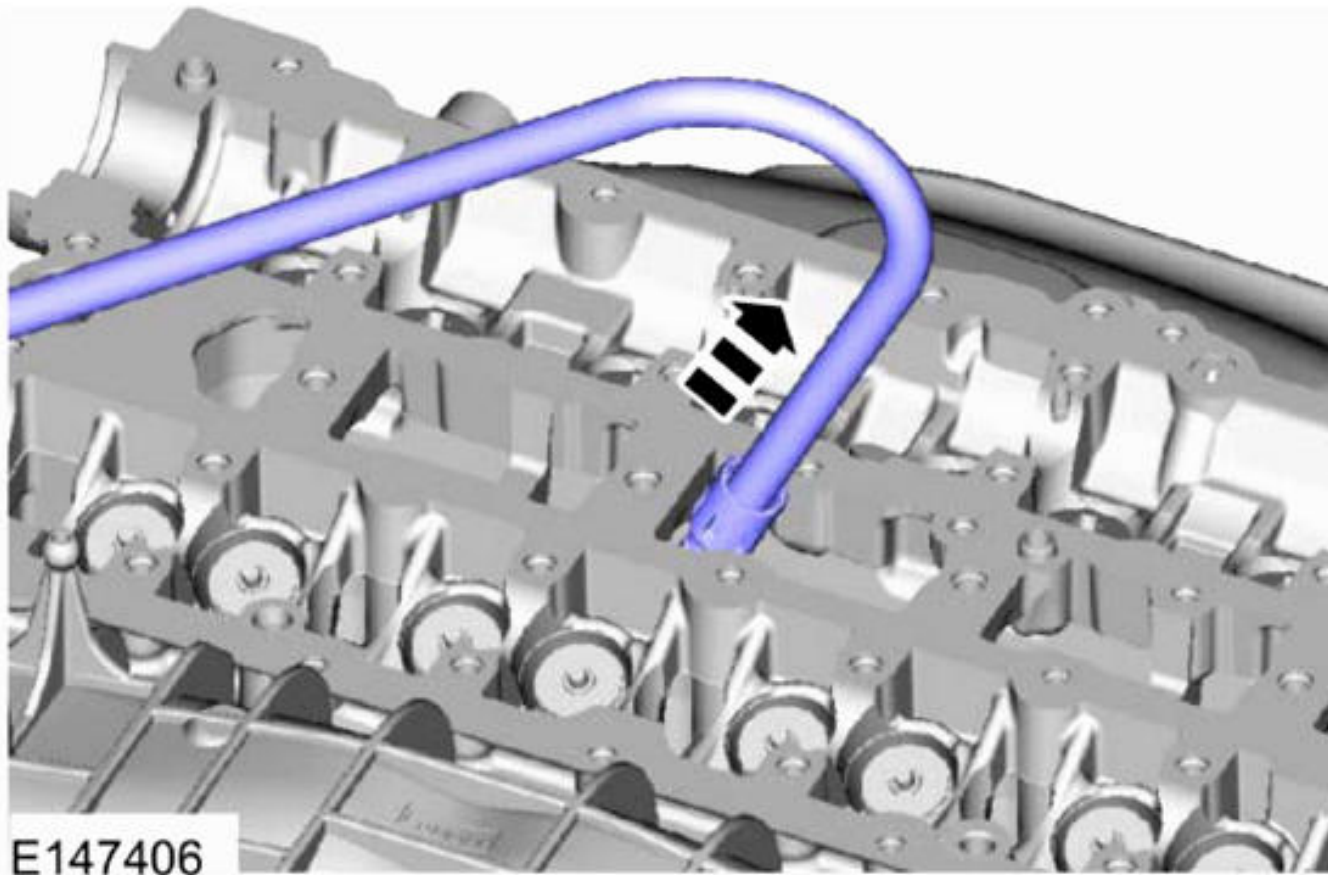
Installation

1. **NOTE:** Check the seating of the valve collet.

Insert the valve spring and the valve spring retainer. Compress the valve spring and install the valve collet.

Special Tool(s) : 303-300 (T87C-6565-A) Set, Valve Spring Compressor , 303-350 (T89P-6565-A) Compressor, Valve Spring , 303-472 (T94P-6565-AH) Adapter, Valve Spring Compressor , 303-1249 Valve Spring Compressor



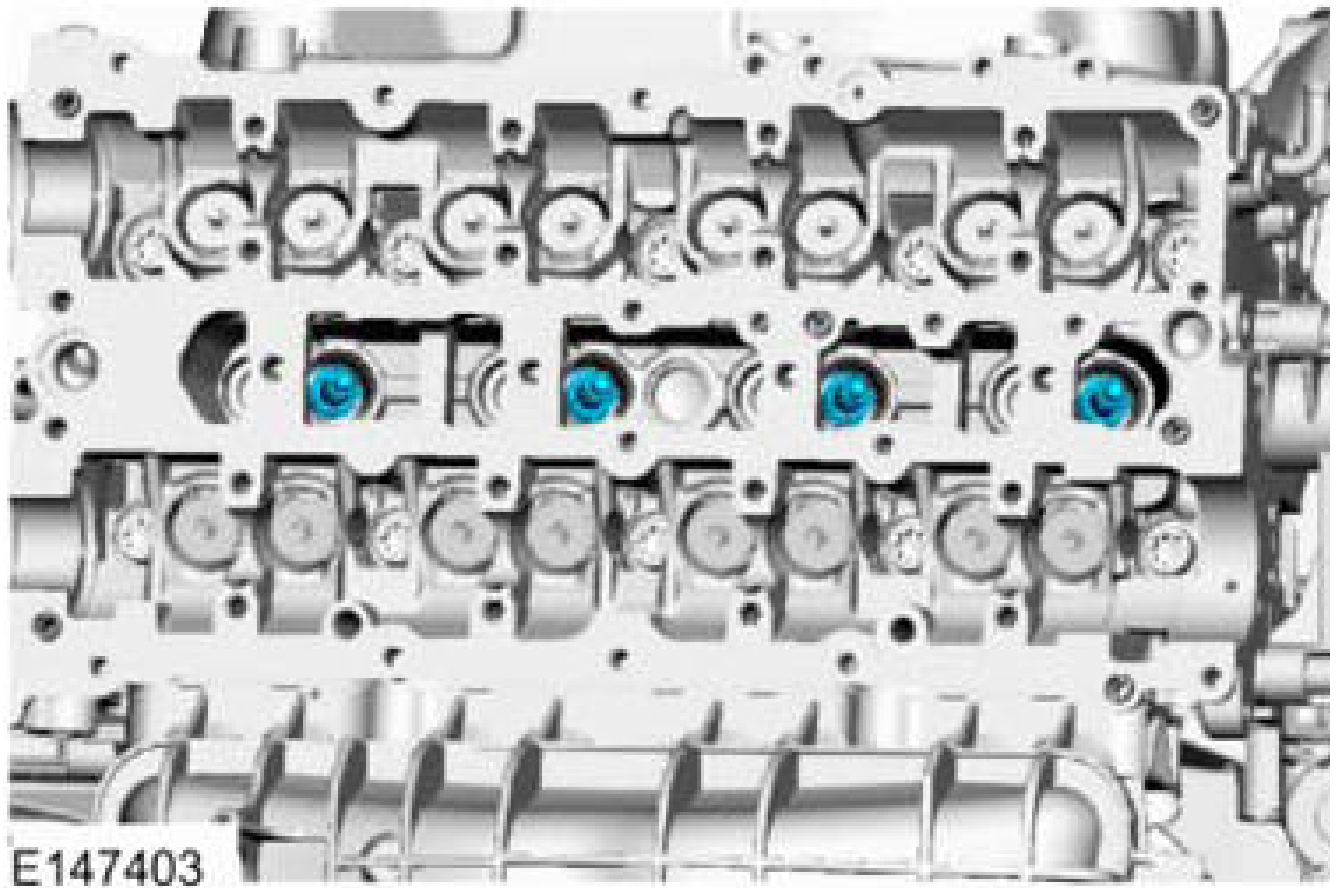


- 2.
3. Repeat the appropriate installation steps for all of the other cylinders.

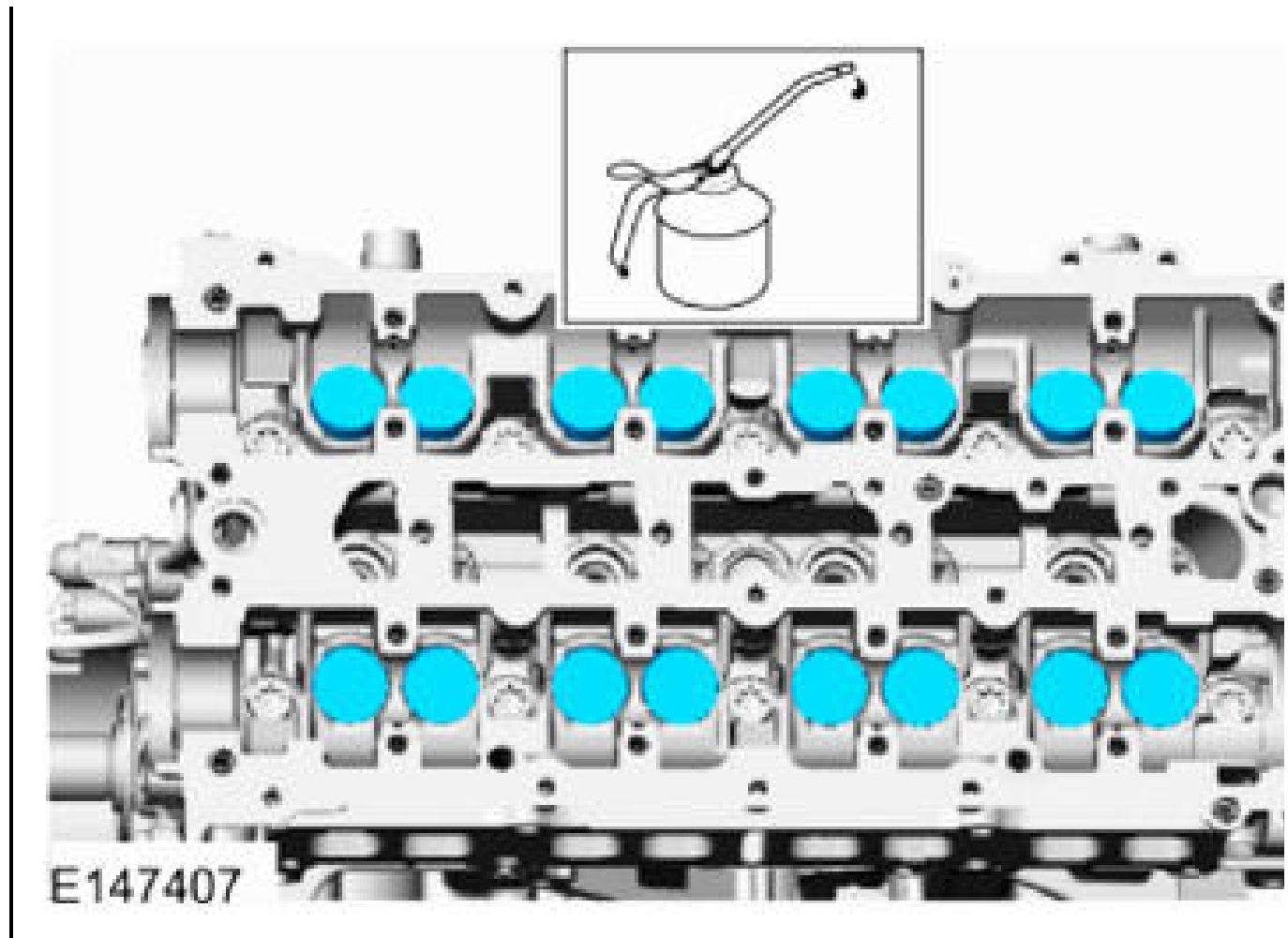
NOTE: Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.

4.

Torque : 12 Nm



5. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



6. Refer to: CAMSHAFTS .

VALVE STEM SEALS

SPECIAL TOOLS/GENERAL EQUIPMENT

	303-468 (T94P-6510-AH) Remover, Valve Stem Oil Seal TKIT-1994-FH/FMH/FLMH TKIT-1994-LMH/MH2
---	---

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



303-470 (T94P-6510-CH)
Installer, Valve Stem Oil Seal
TKIT-2009TC-F
TKIT-1994-FH/FMH/FLMH
TKIT-1994-LMH/MH2



307-005 (T59L-100-B)
Slide Hammer

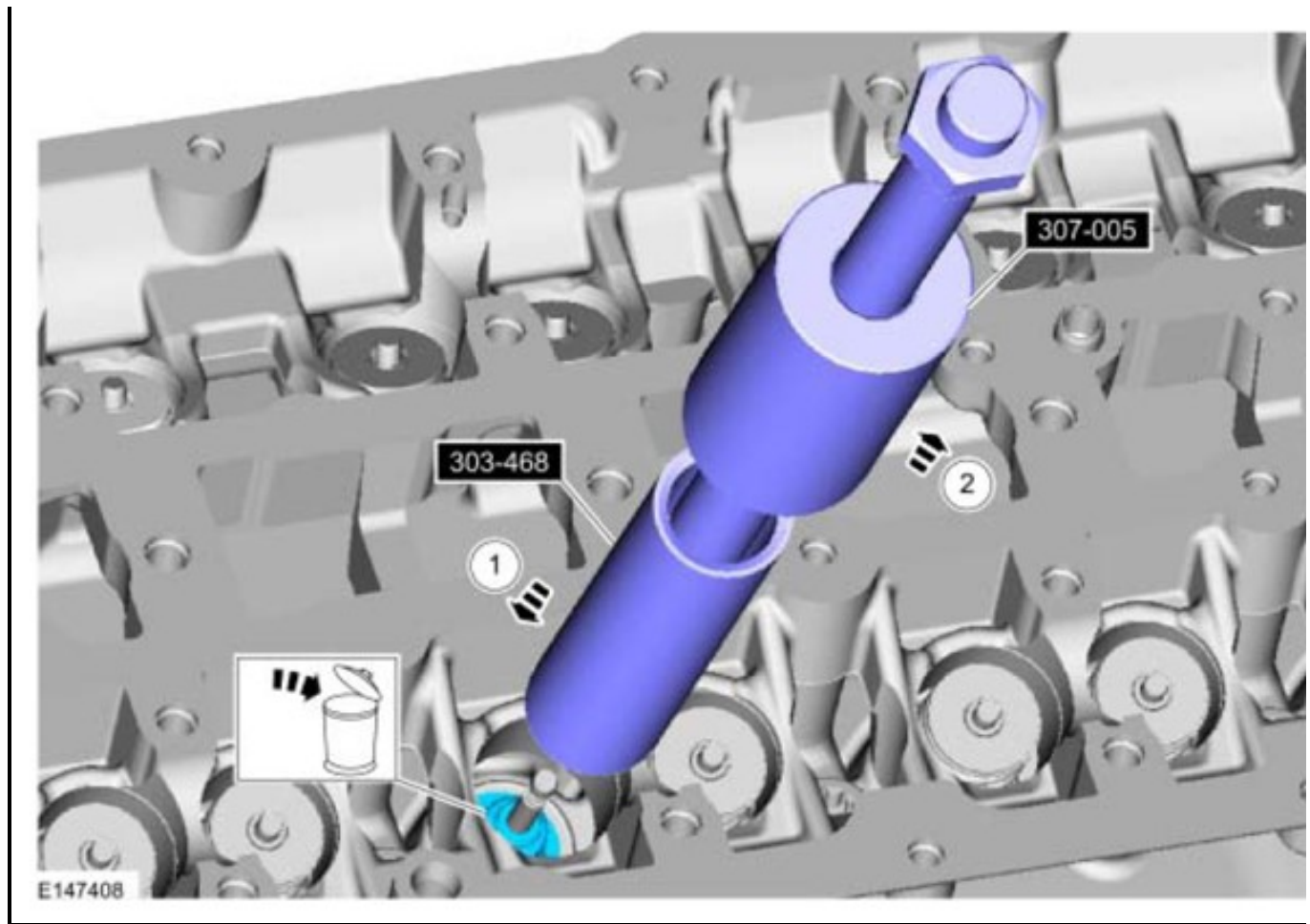
MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

Removal

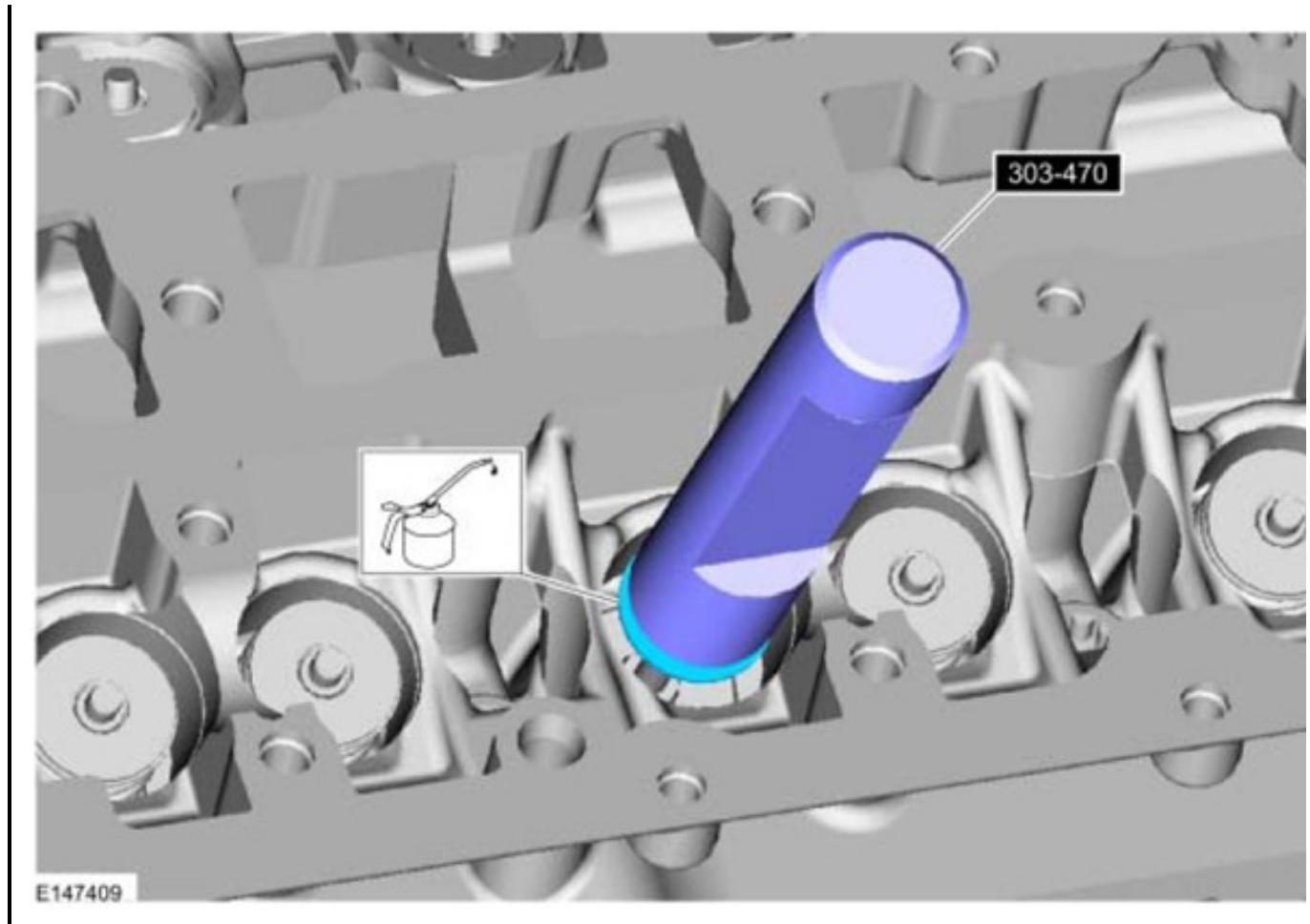
NOTE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

1. Refer to: **VALVE SPRINGS** .
2. *Special Tool(s)* : **303-468 (T94P-6510-AH) Remover, Valve Stem Oil Seal , 307-005 (T59L-100-B) Slide Hammer**

**Installation**

1. *Special Tool(s)* : **303-470 (T94P-6510-CH) Installer, Valve Stem Oil Seal**

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



2. Refer to: **VALVE SPRINGS** .

OIL COOLER

SPECIAL TOOLS/GENERAL EQUIPMENT

Strap Wrench
Oil Drain Equipment
Locking Pliers

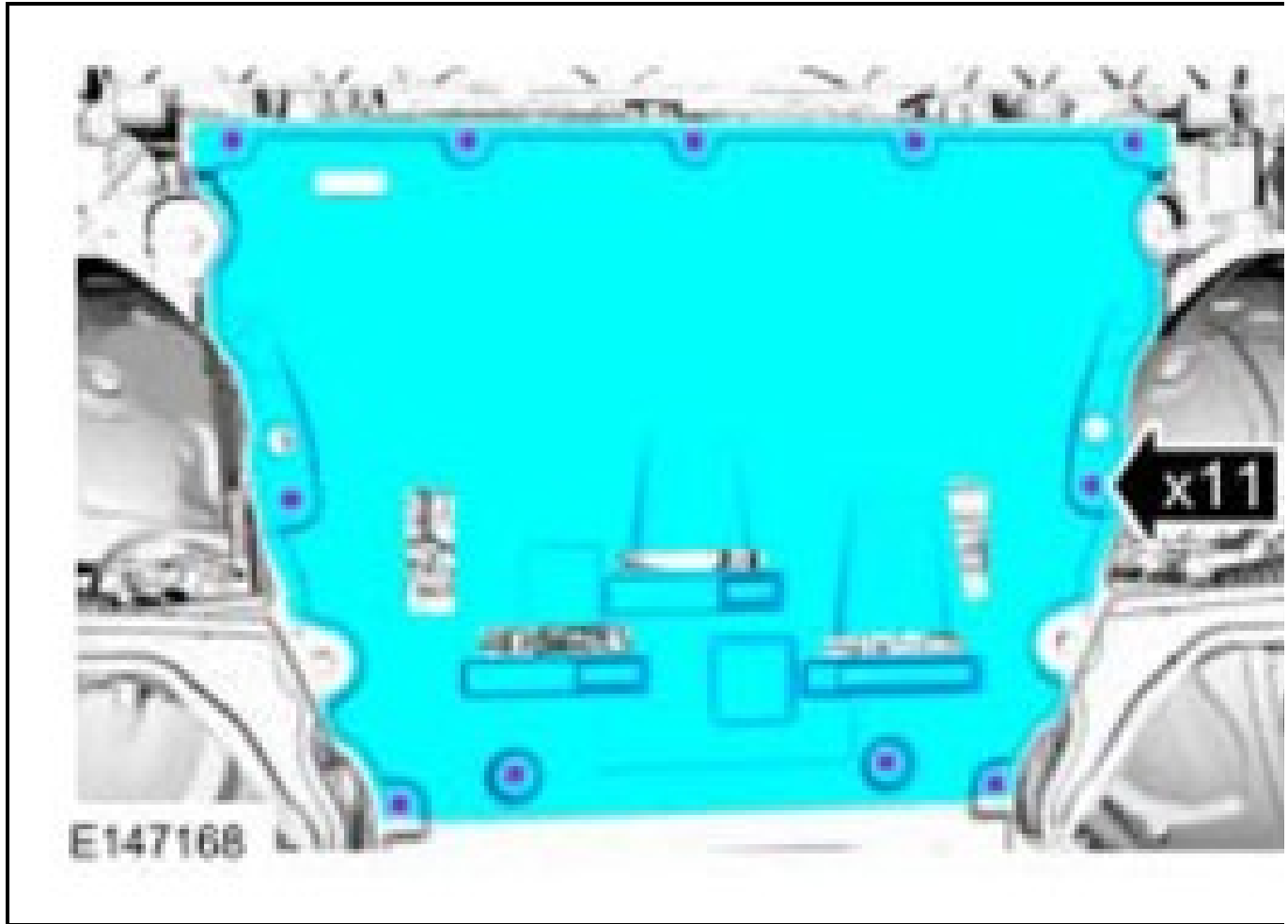
MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

Removal

NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .



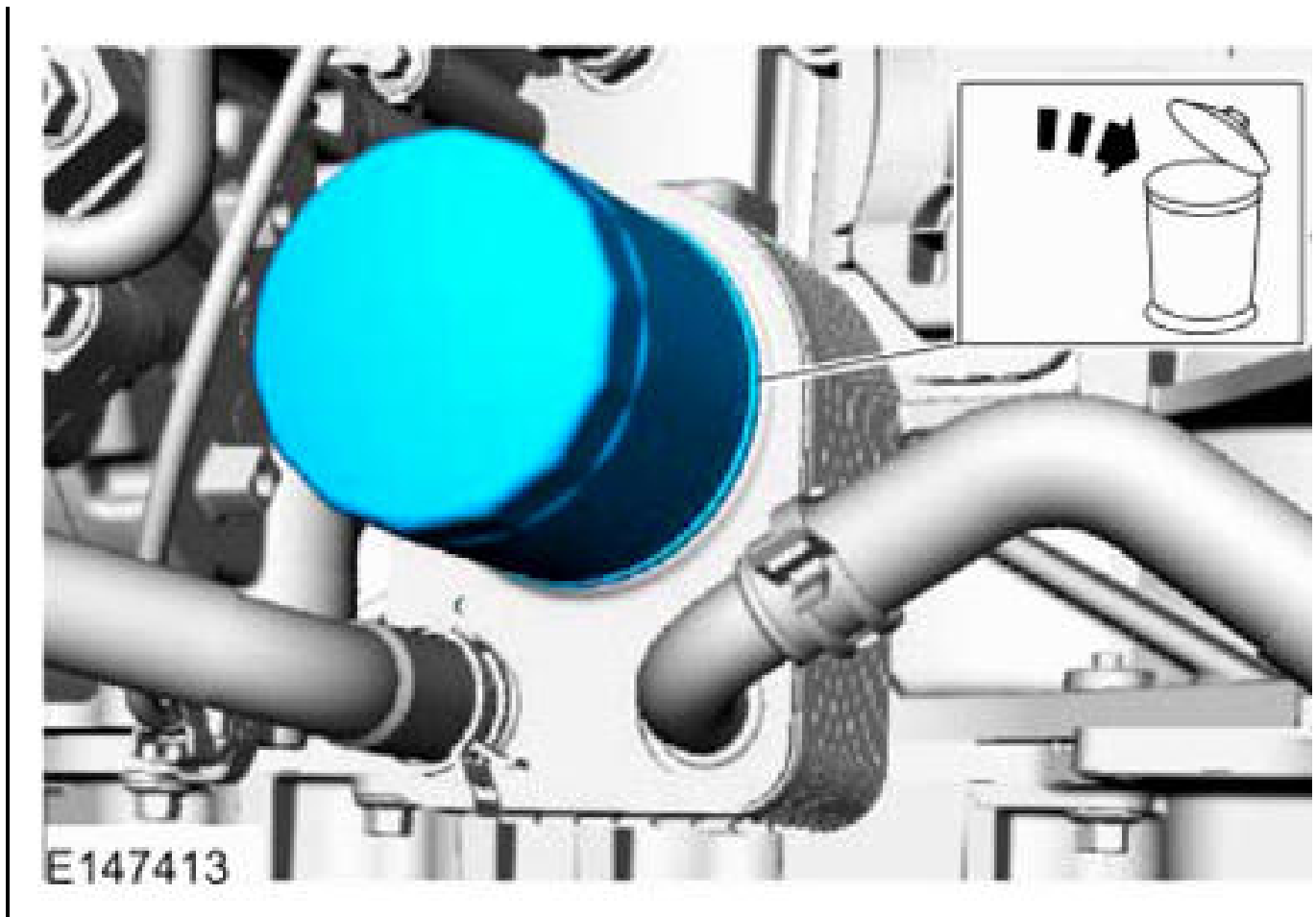
- 2.
3. **NOTE:** Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

General Equipment : Oil Drain Equipment

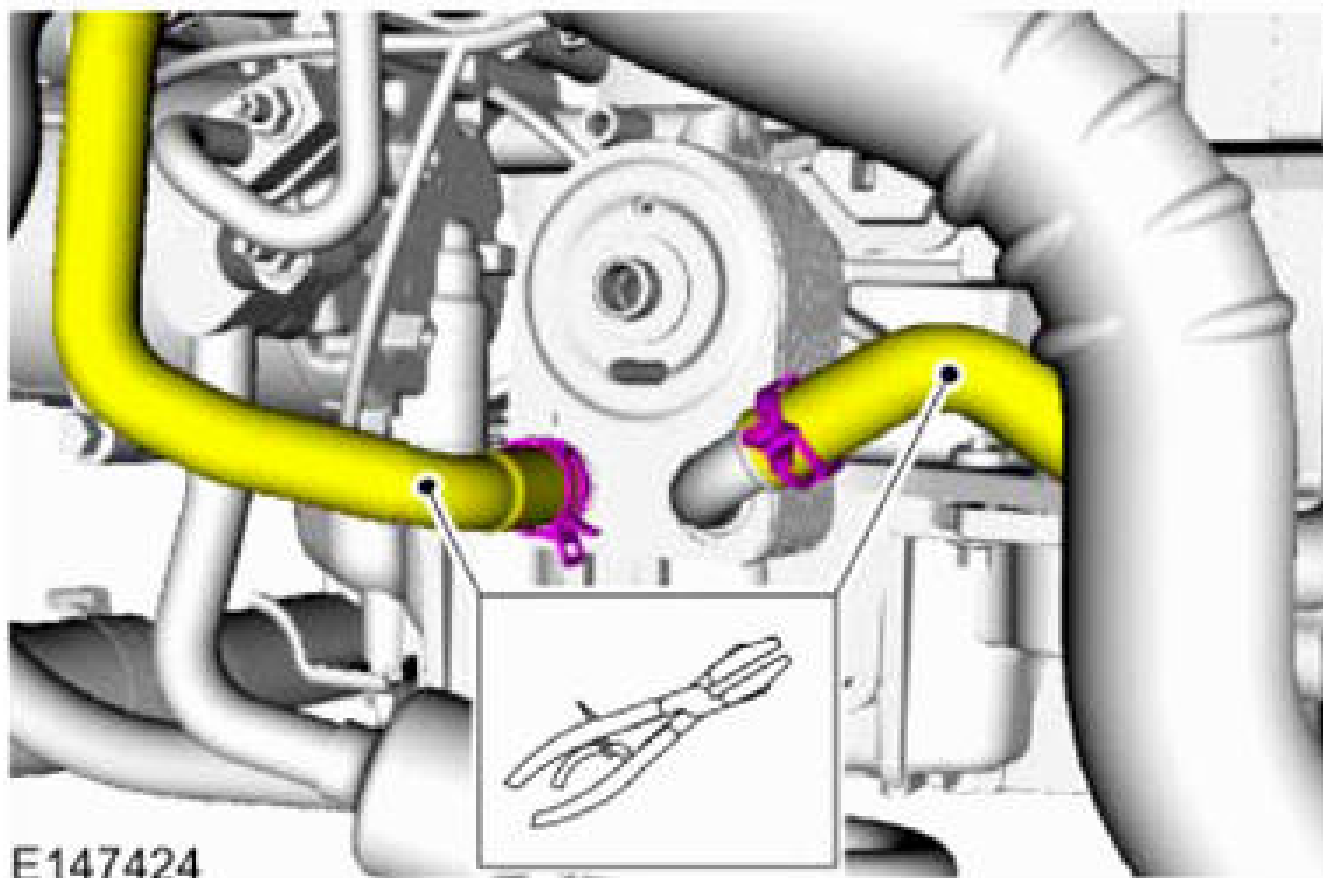
General Equipment : Strap Wrench

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

Torque : 14.5 Nm



4. *General Equipment* : Locking Pliers



NOTE: If metal or aluminum material is present in the oil cooler, mechanical concerns exist. Failure to correct these concerns may cause engine failure.

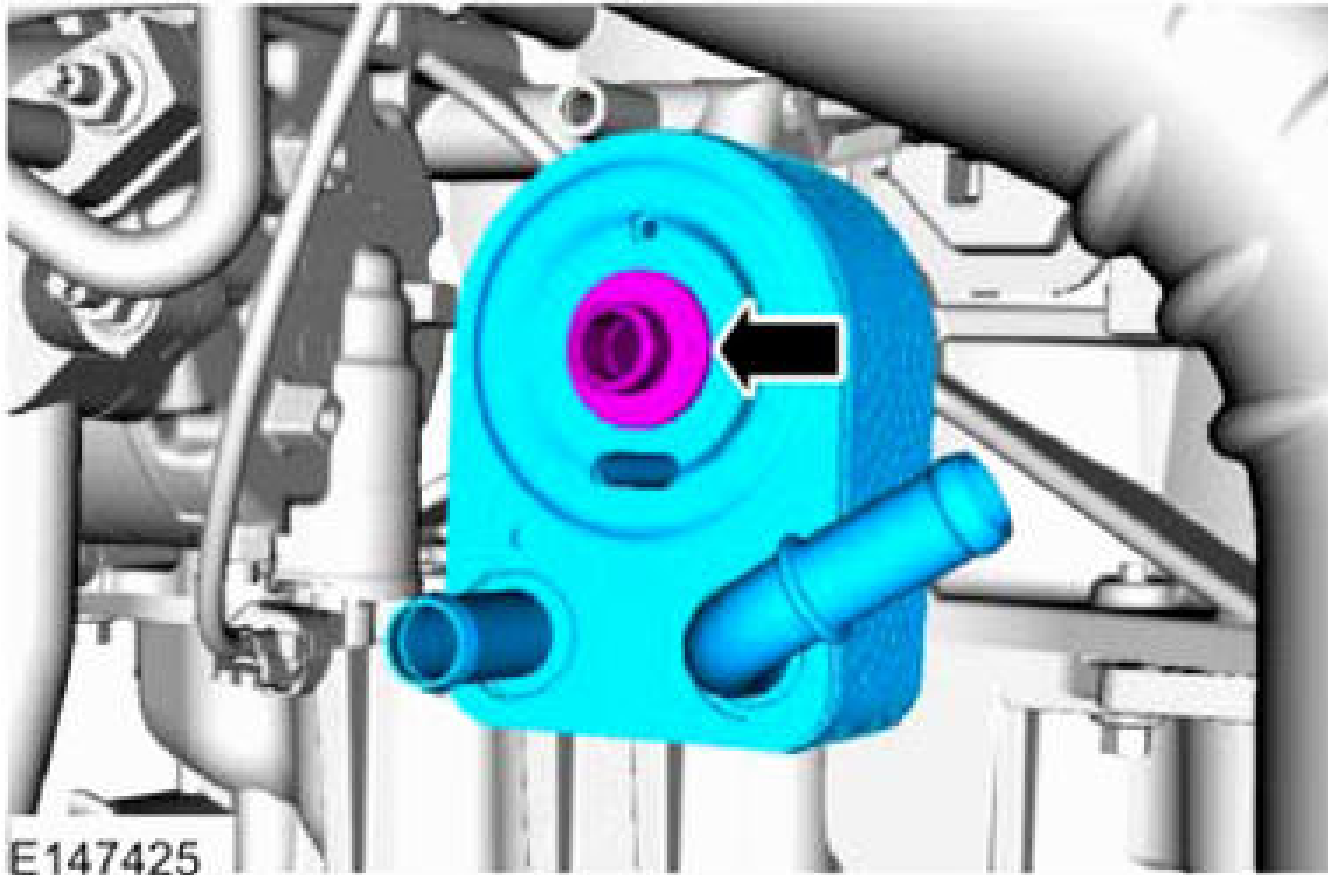
5.

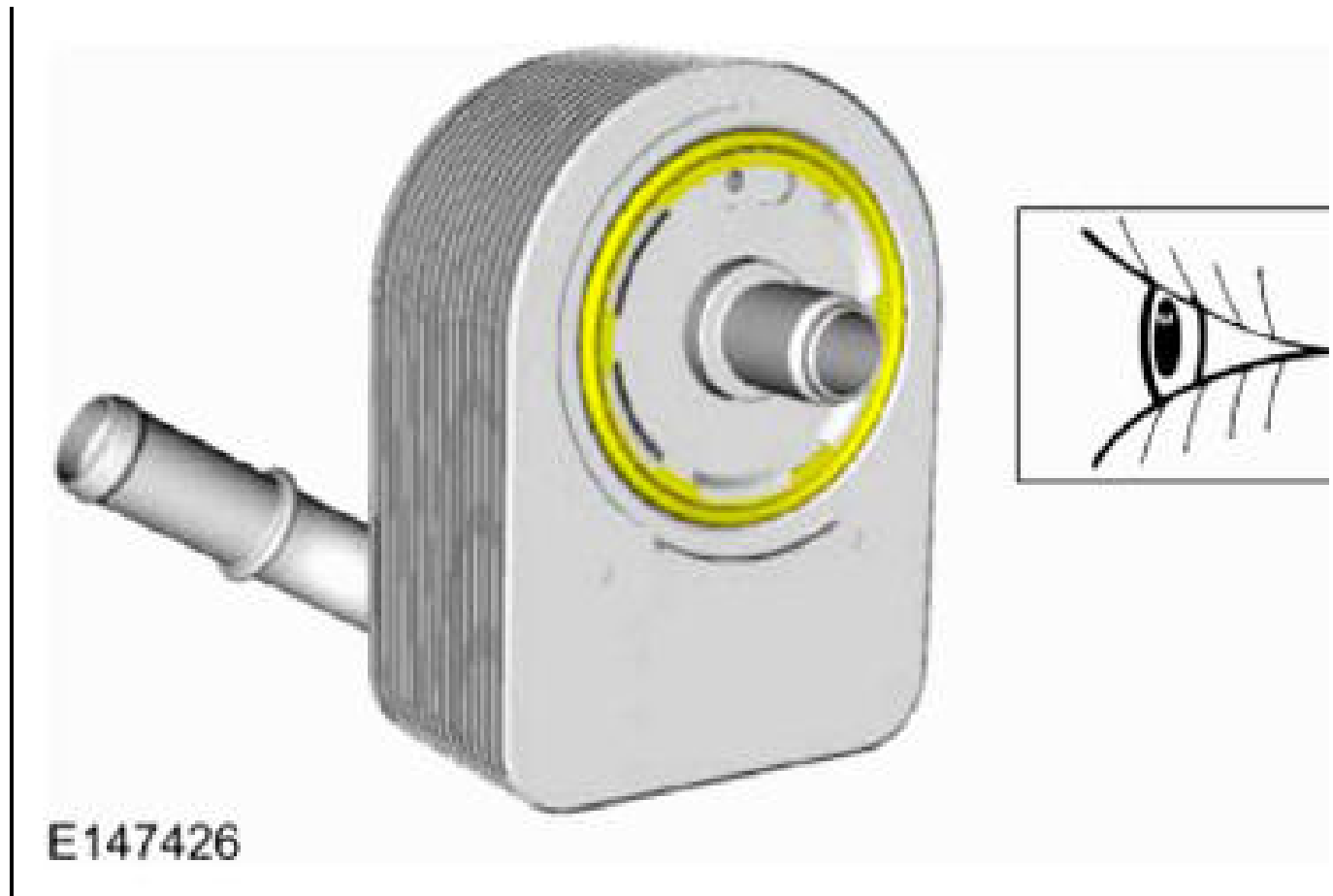
To diagnose mechanical concerns.

Refer to: **ENGINE** .

General Equipment : Oil Drain Equipment

Torque : 55 Nm





6.

Installation

1. To install, reverse the removal procedure.

CYLINDER HEAD**SPECIAL TOOLS/GENERAL EQUIPMENT**

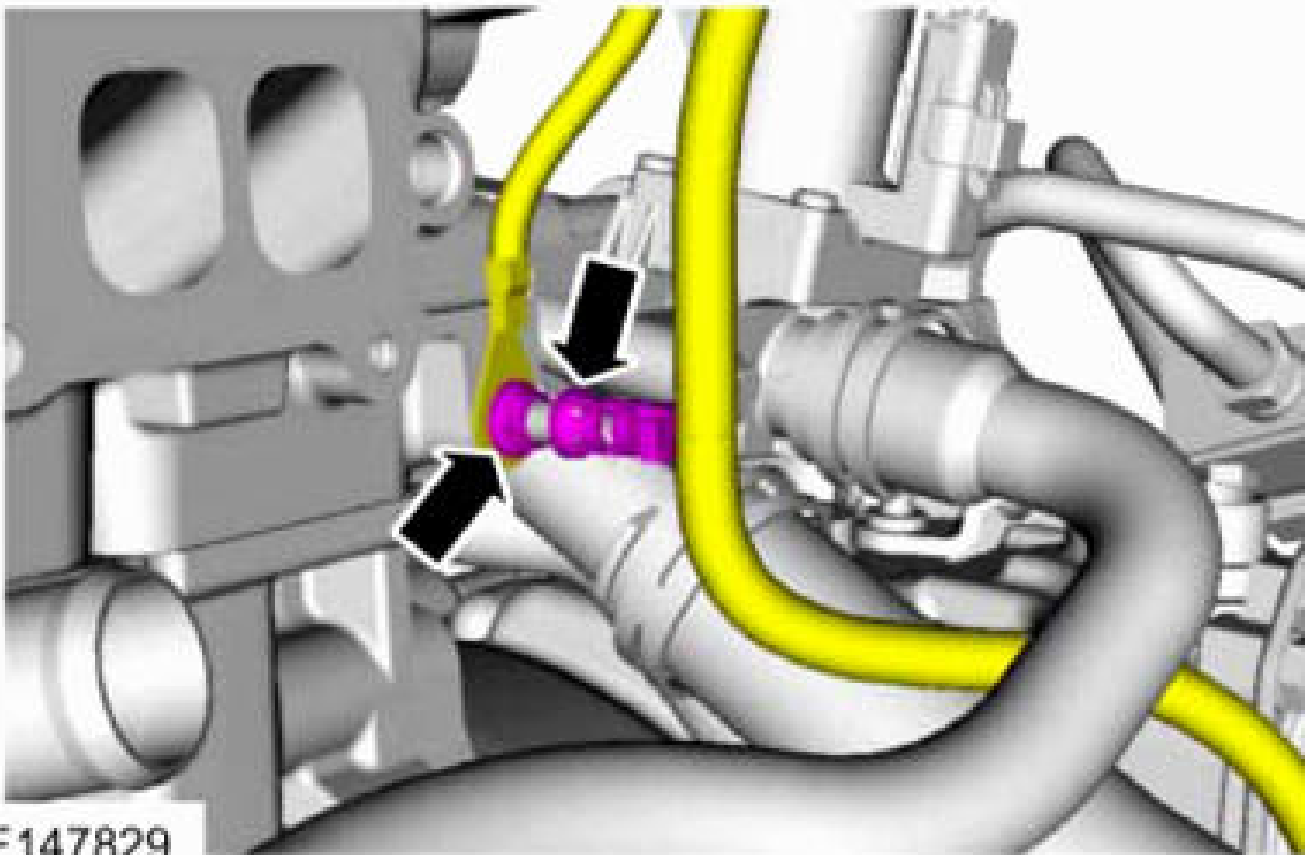
Strap Wrench
Oil Drain Equipment
Hose Clamp Remover/Installer

MATERIALS SPECIFICATIONS

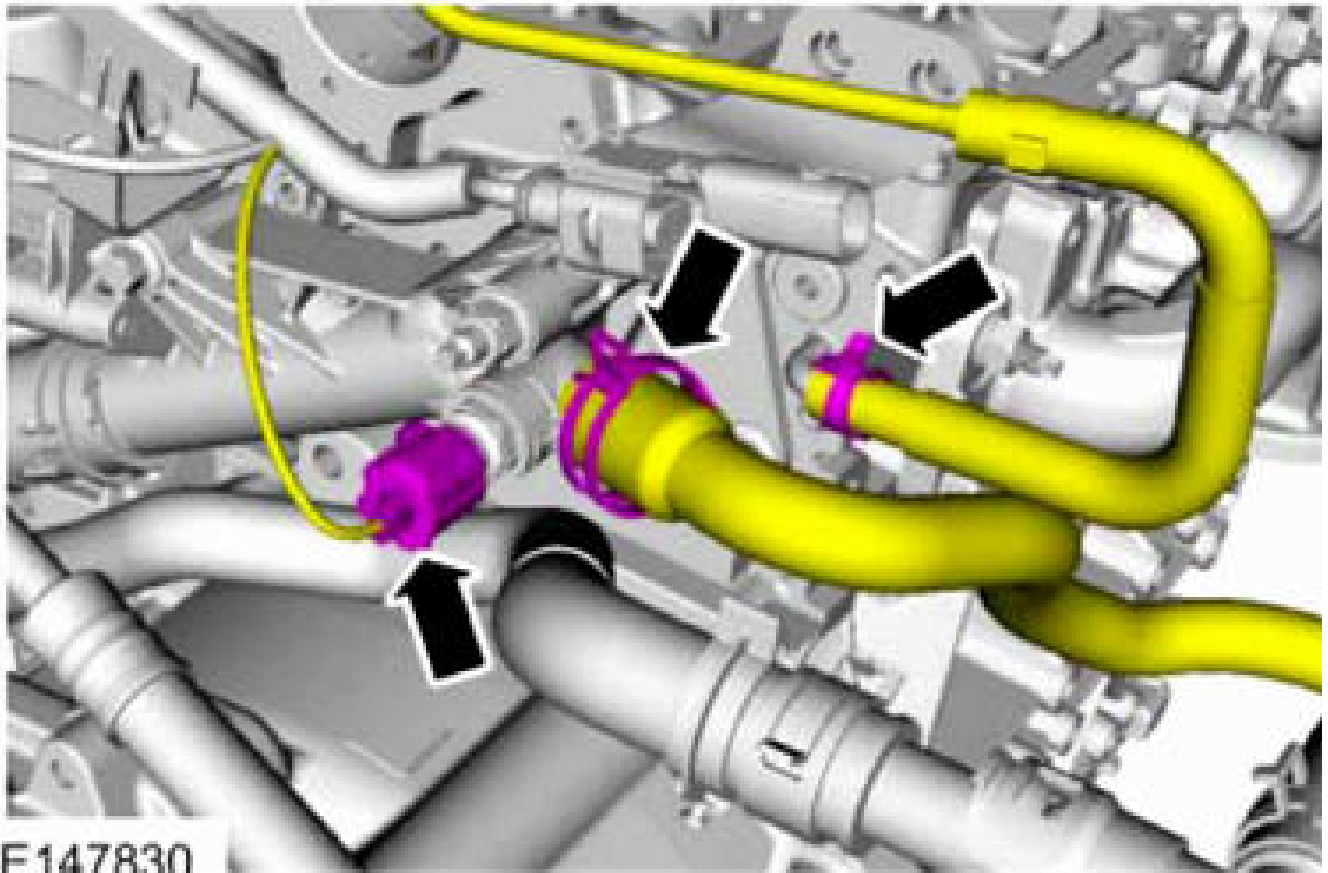
Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A
Motorcraft® Metal Surface Prep ZC-31-A	-

Removal

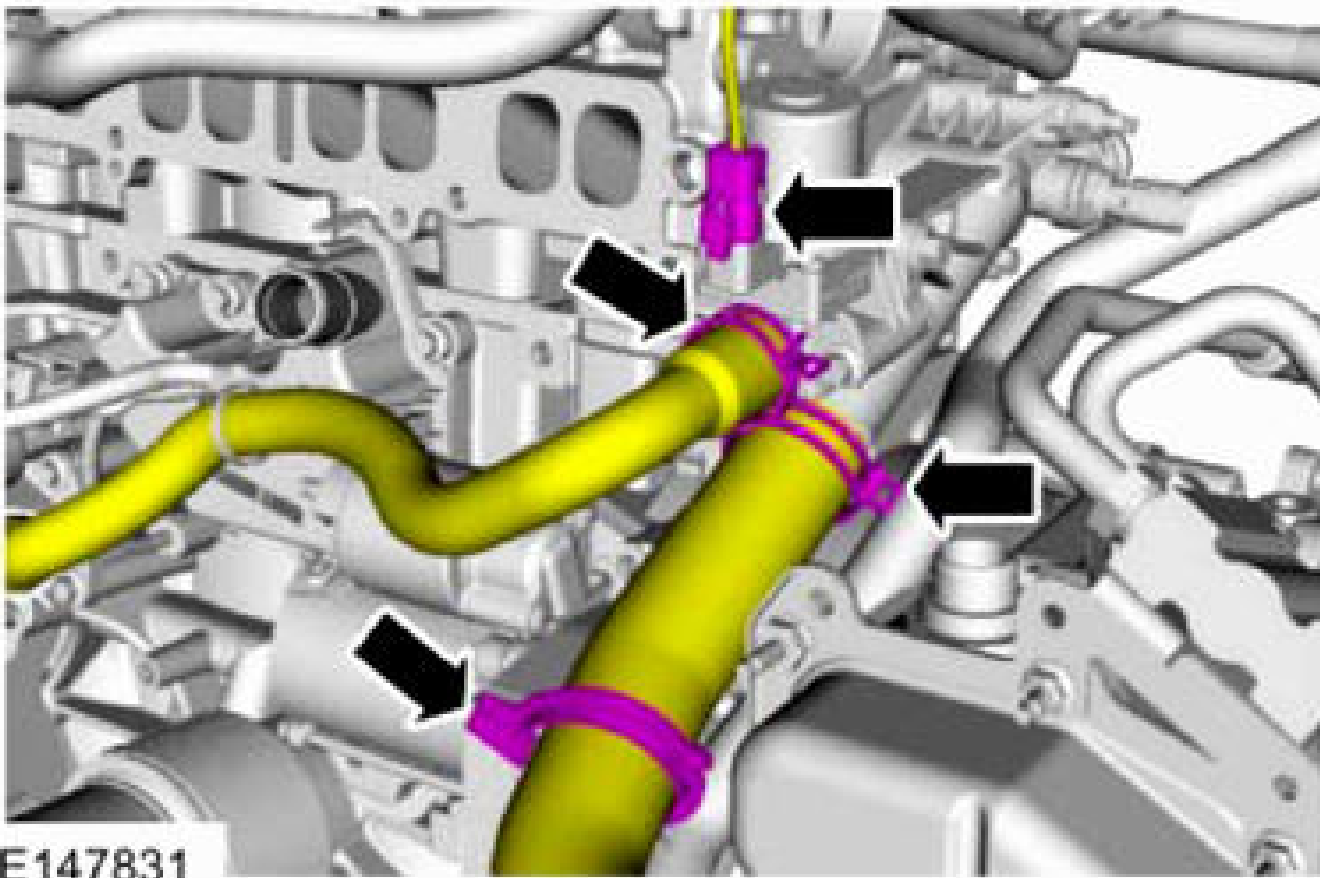
1. Refer to: **JACKING AND LIFTING - OVERVIEW** .
2. Refer to: **FUEL SYSTEM PRESSURE RELEASE** .
3. Remove the following items:
 1. Refer to: **TURBOCHARGER** .
 2. Refer to: **CAMSHAFTS** .
 3. Refer to: **INTAKE MANIFOLD** .
4. **NOTE:** **Automatic transmission shown in illustration, manual similar.**



5. *General Equipment* : Hose Clamp Remover/Installer

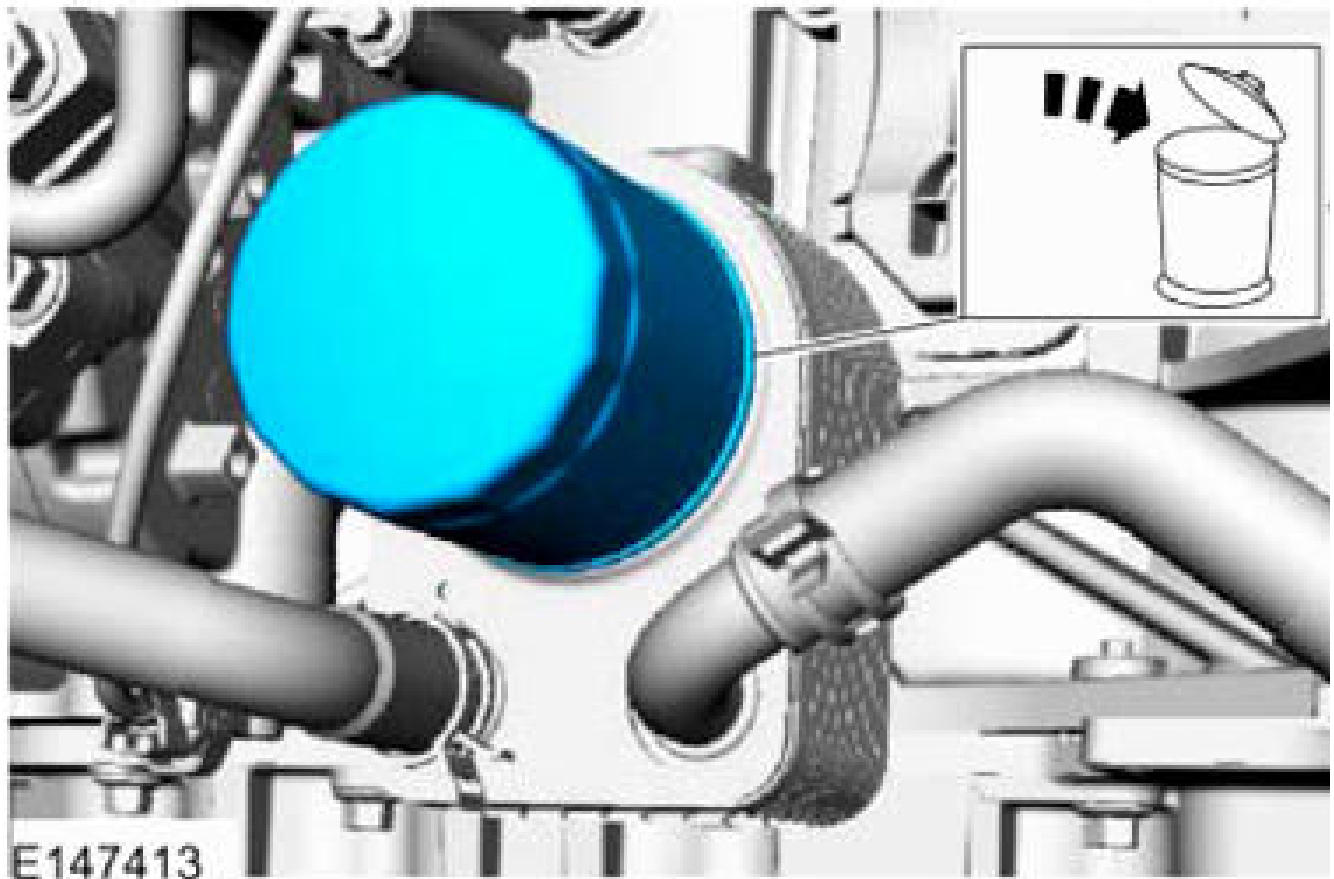


6. *General Equipment* : Hose Clamp Remover/Installer



7. *General Equipment* : Oil Drain Equipment

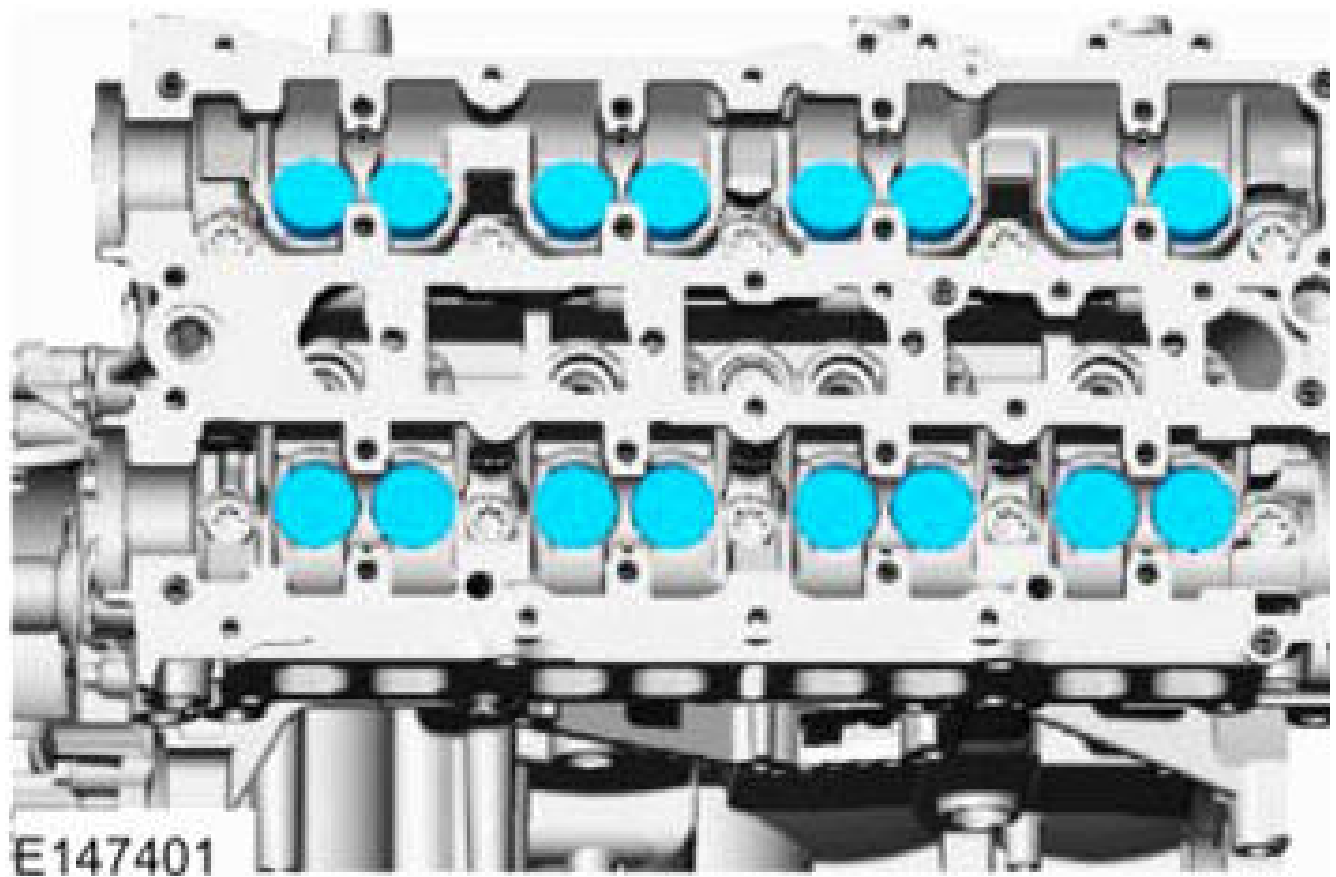
General Equipment : Strap Wrench



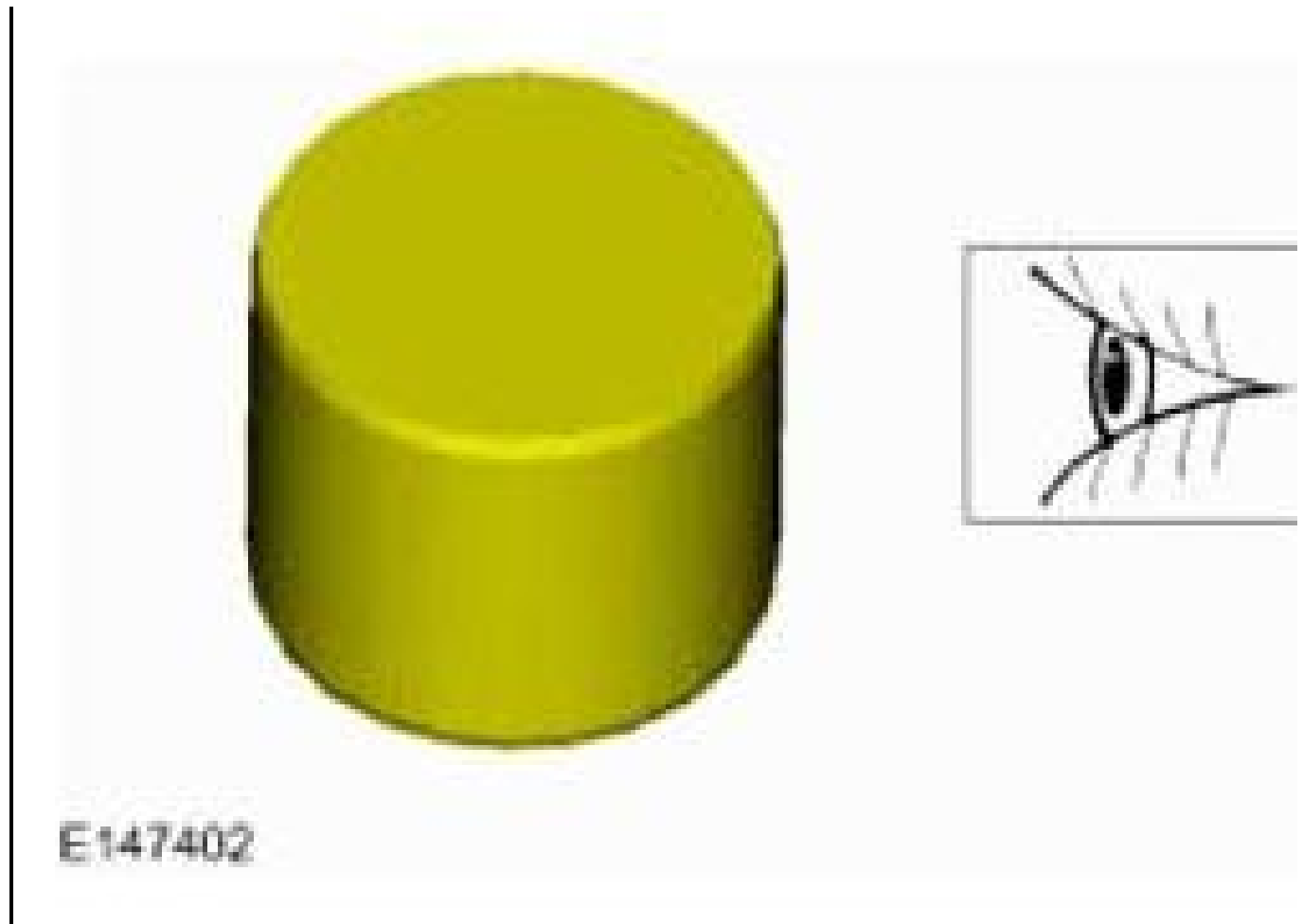
NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

8.

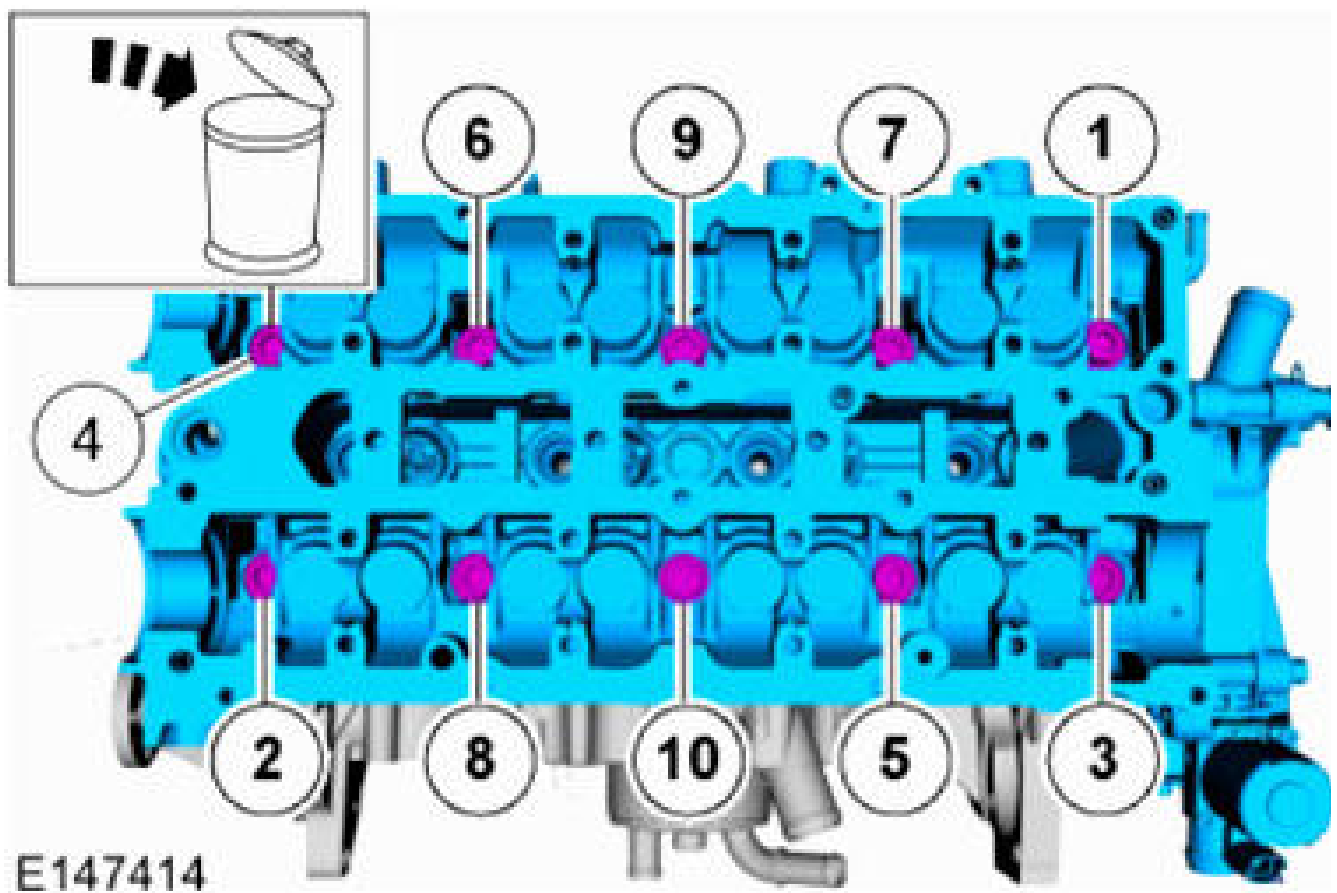
NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 0.1437 in (3.65 mm).

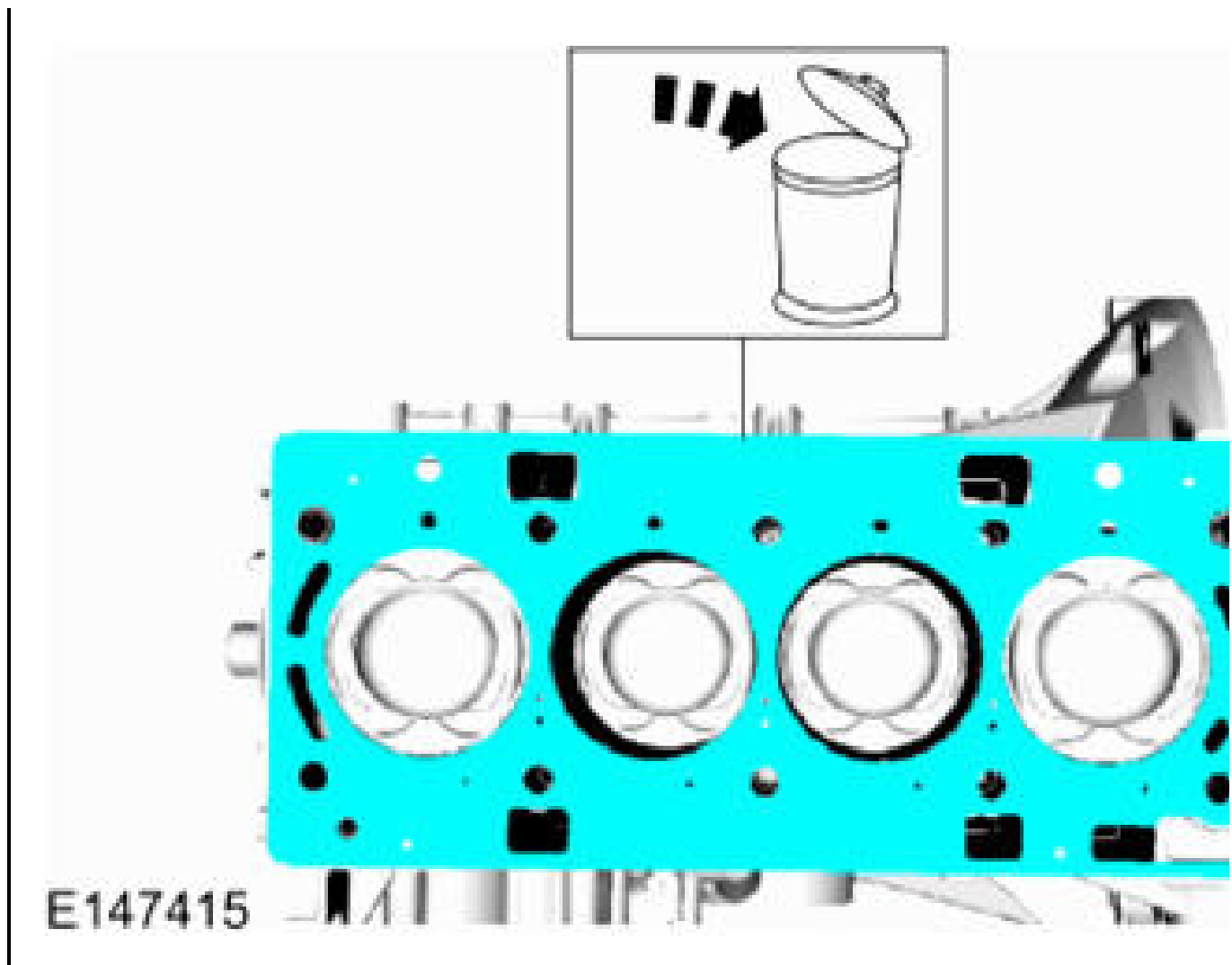


9. Install new components as necessary.



10. **NOTE:** Make sure that the cylinder head is at ambient air temperature before removing the cylinder head bolts.





- 11.
12. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion.

Refer to: **CYLINDER HEAD DISTORTION** .

Refer to: **CYLINDER BLOCK DISTORTION** .

Installation

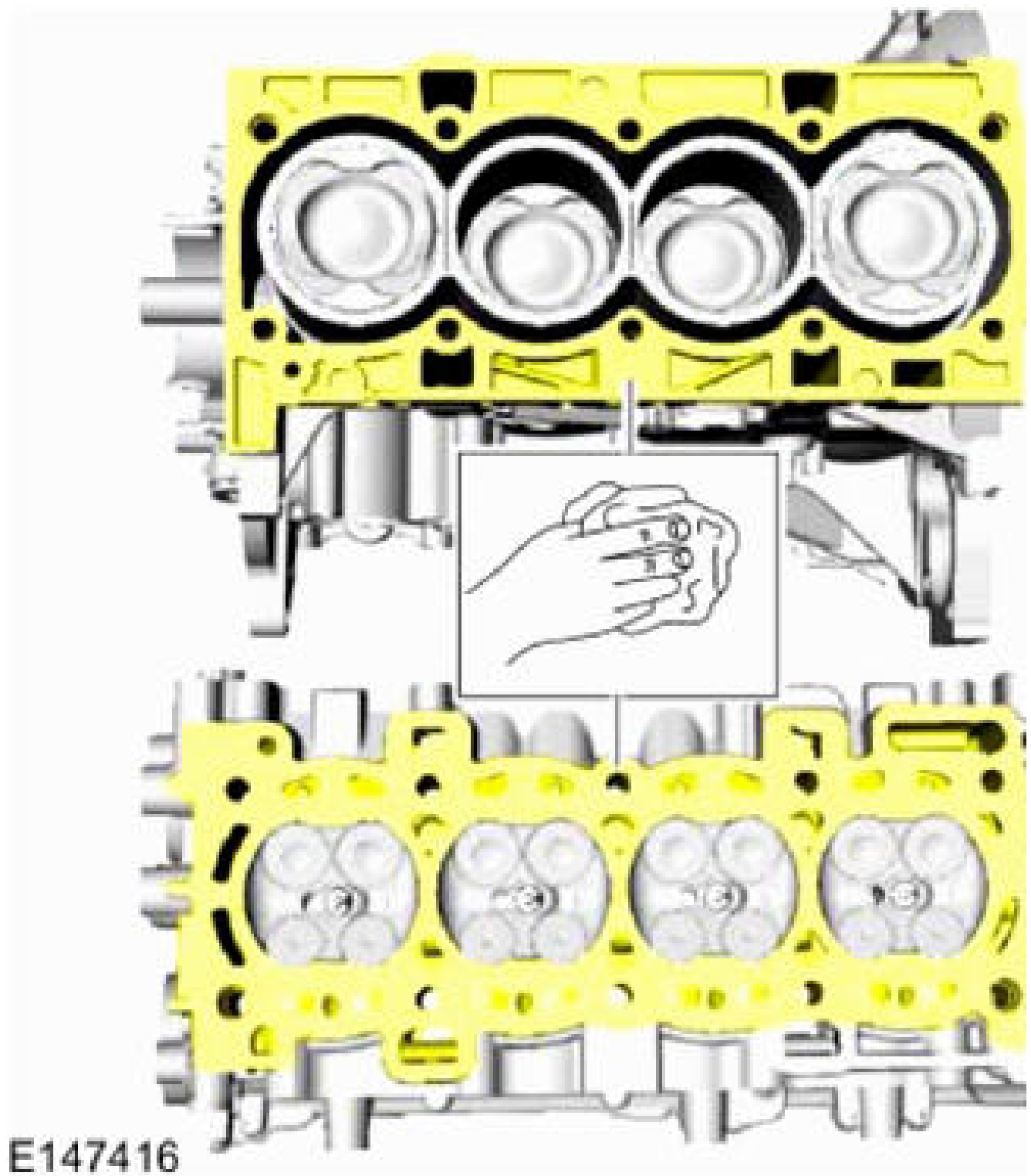
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

1.

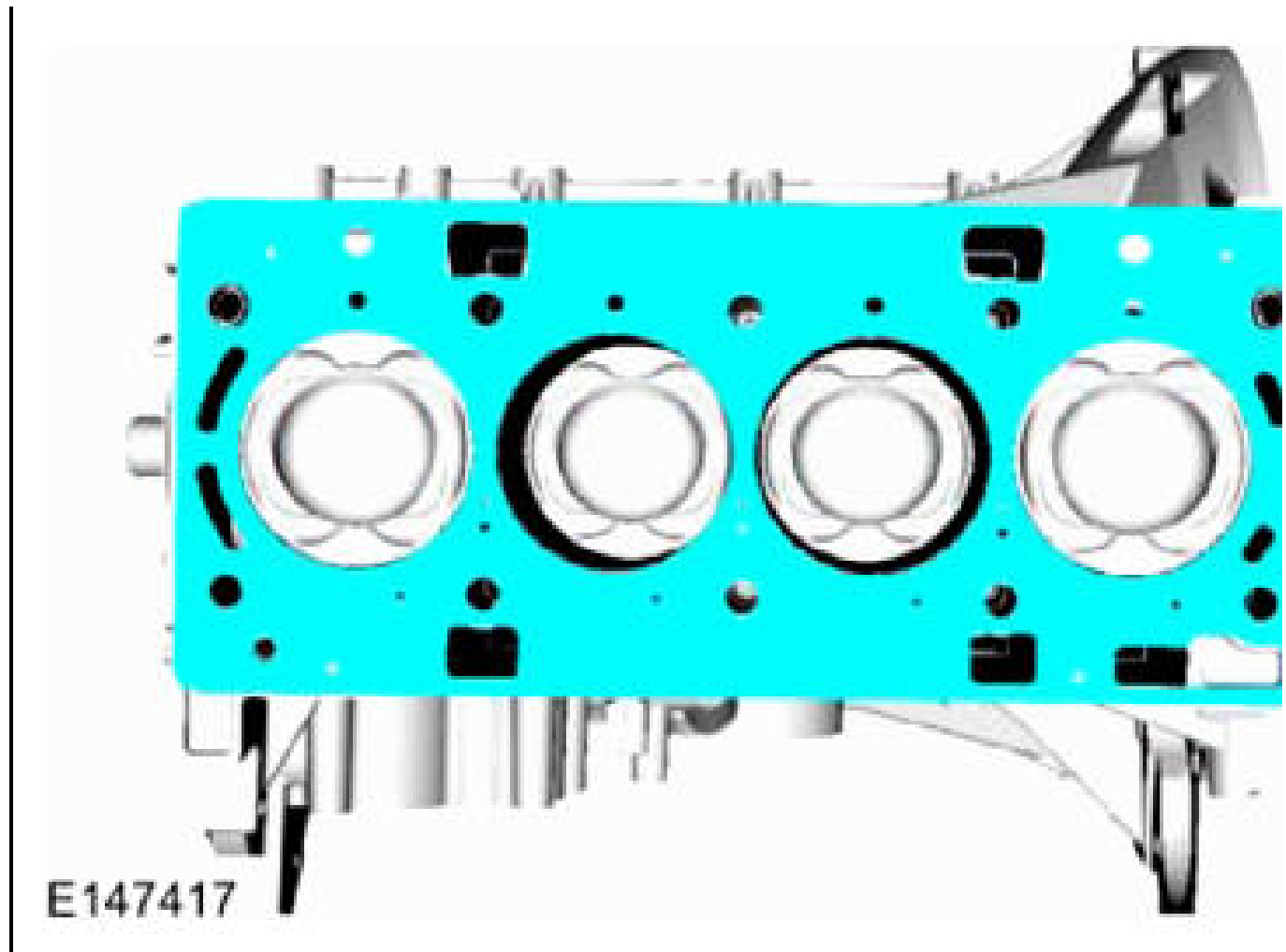
NOTE: If there is no residual gasket material present, metal surface prep can be

used to clean and prepare the surfaces.

NOTE: ***Material : Motorcraft® Metal Surface Prep/ZC-31-A***



2.



2.

3. **NOTE:** Lubricate the bolts with clean engine oil prior to installation.

NOTE: Make sure that new bolts are installed.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

Torque :

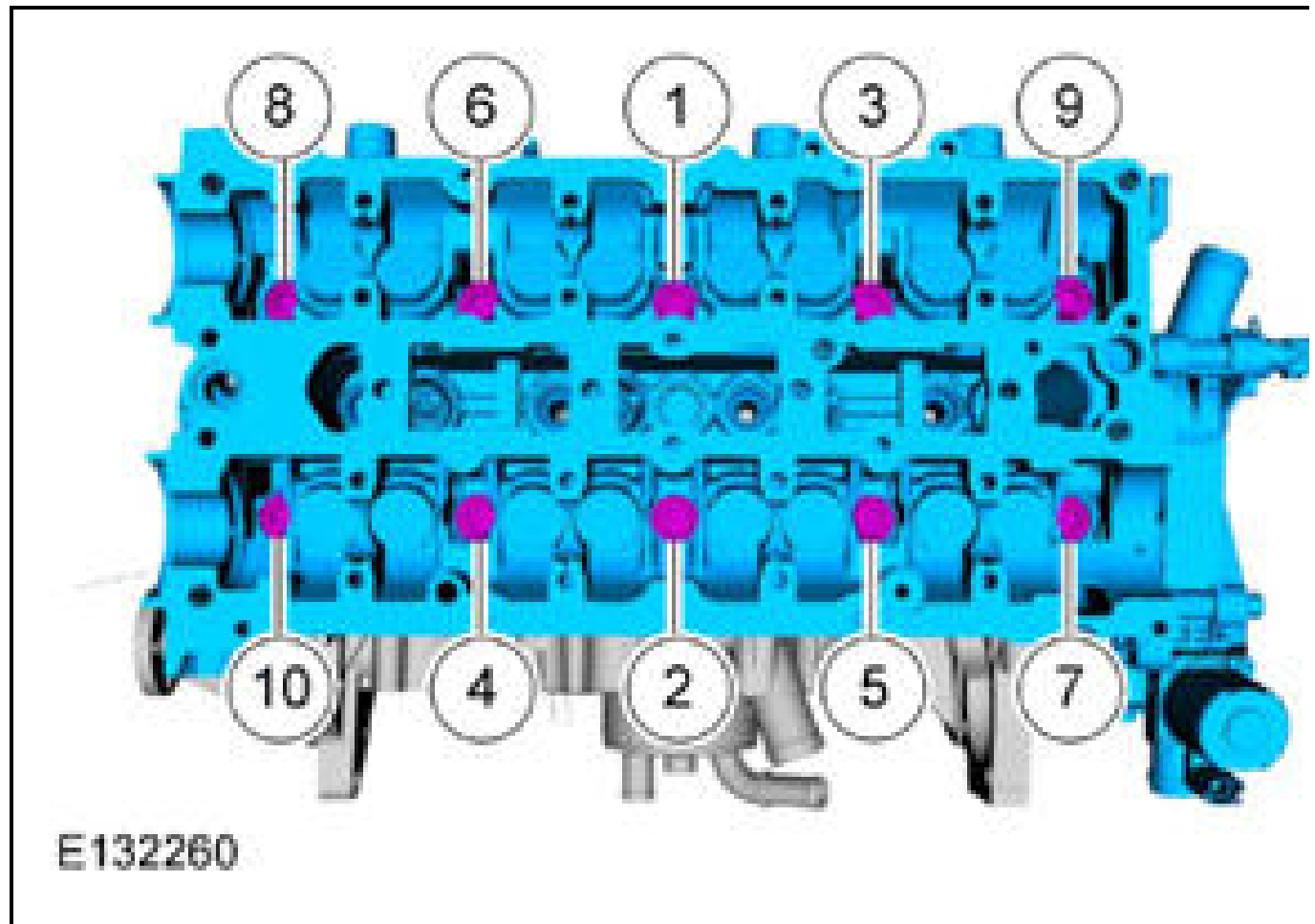
Stage 1: 5 Nm

Stage 2: 15 Nm

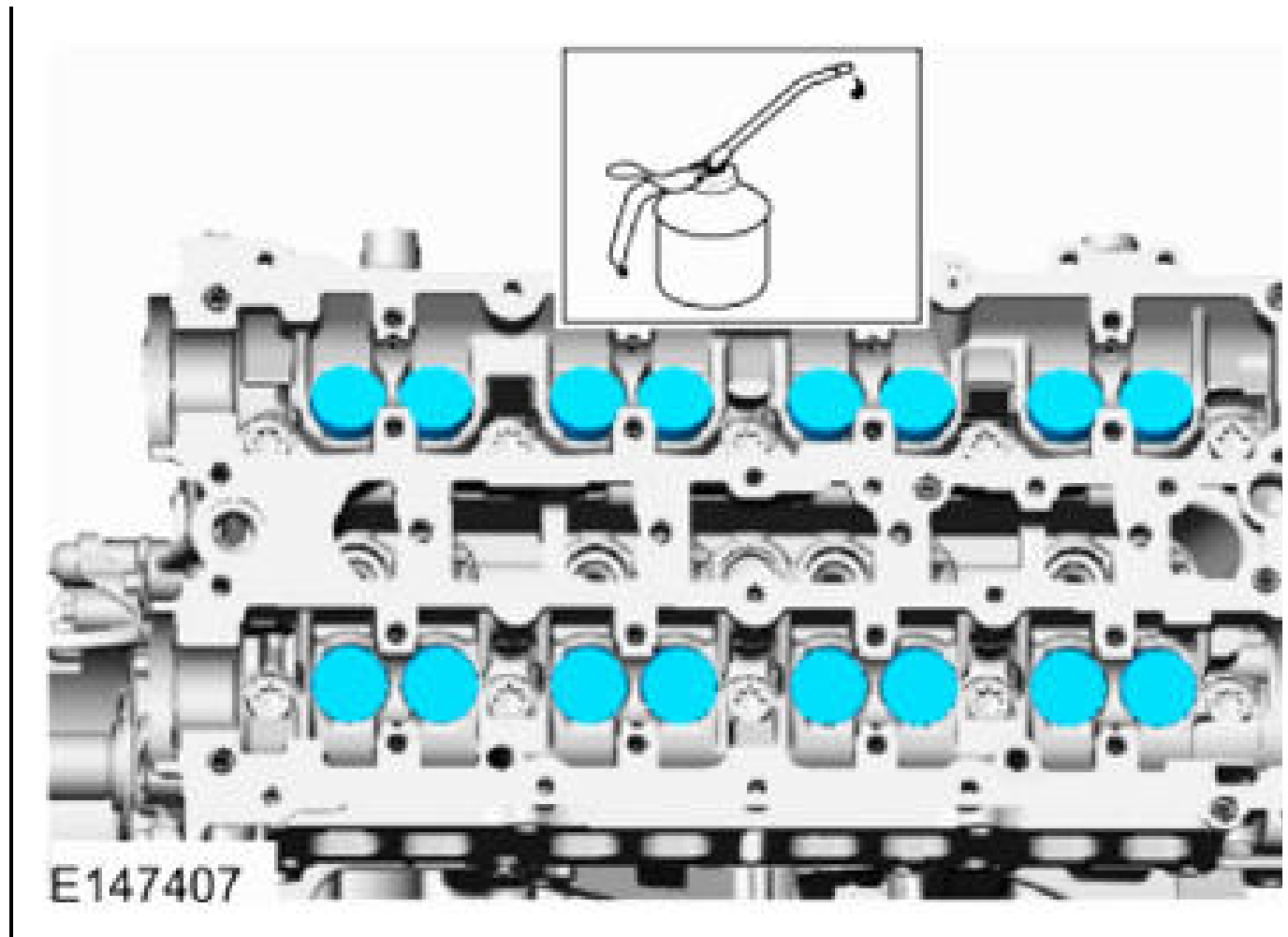
Stage 3: 35 Nm

Stage 4: 90°

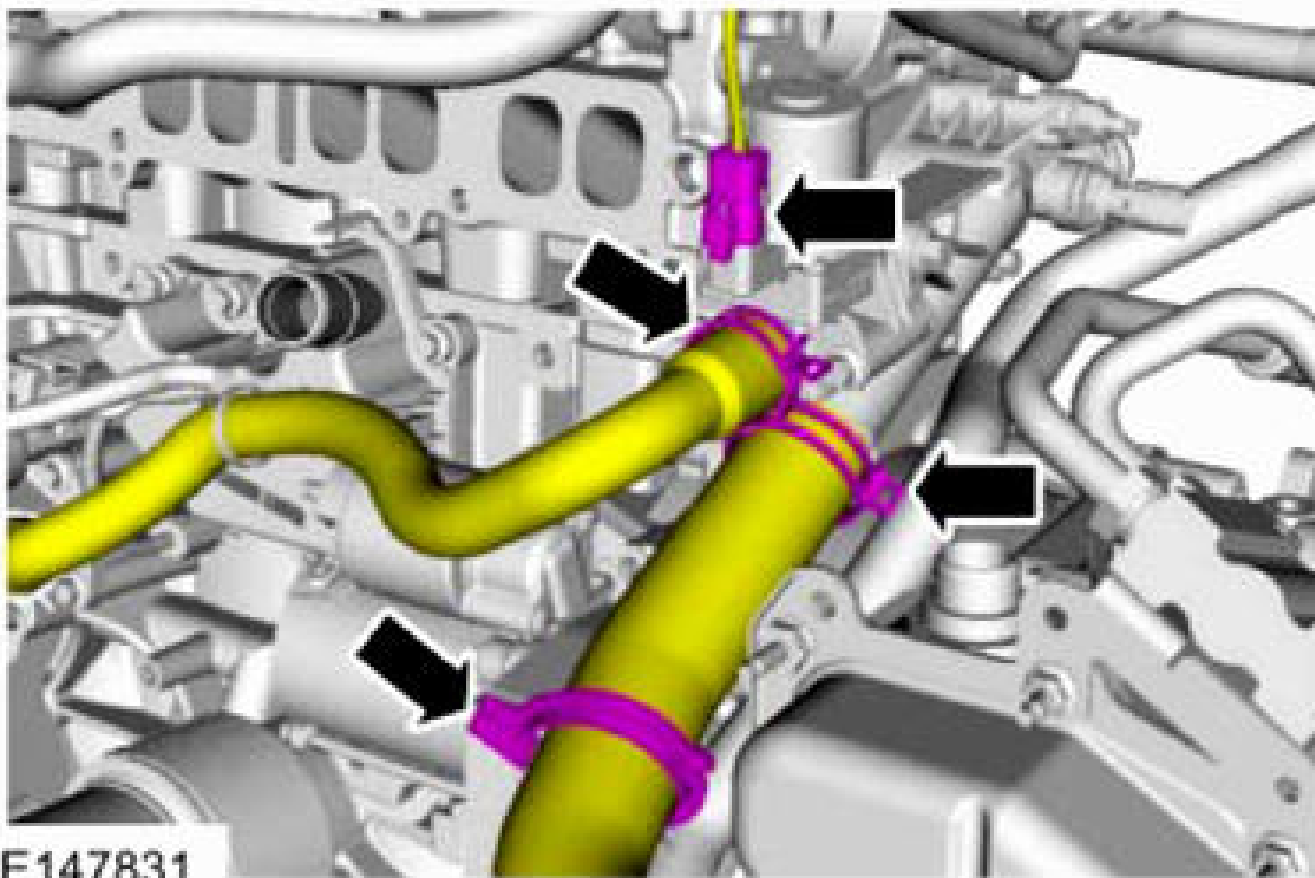
Stage 5: Tighten an additional 90°



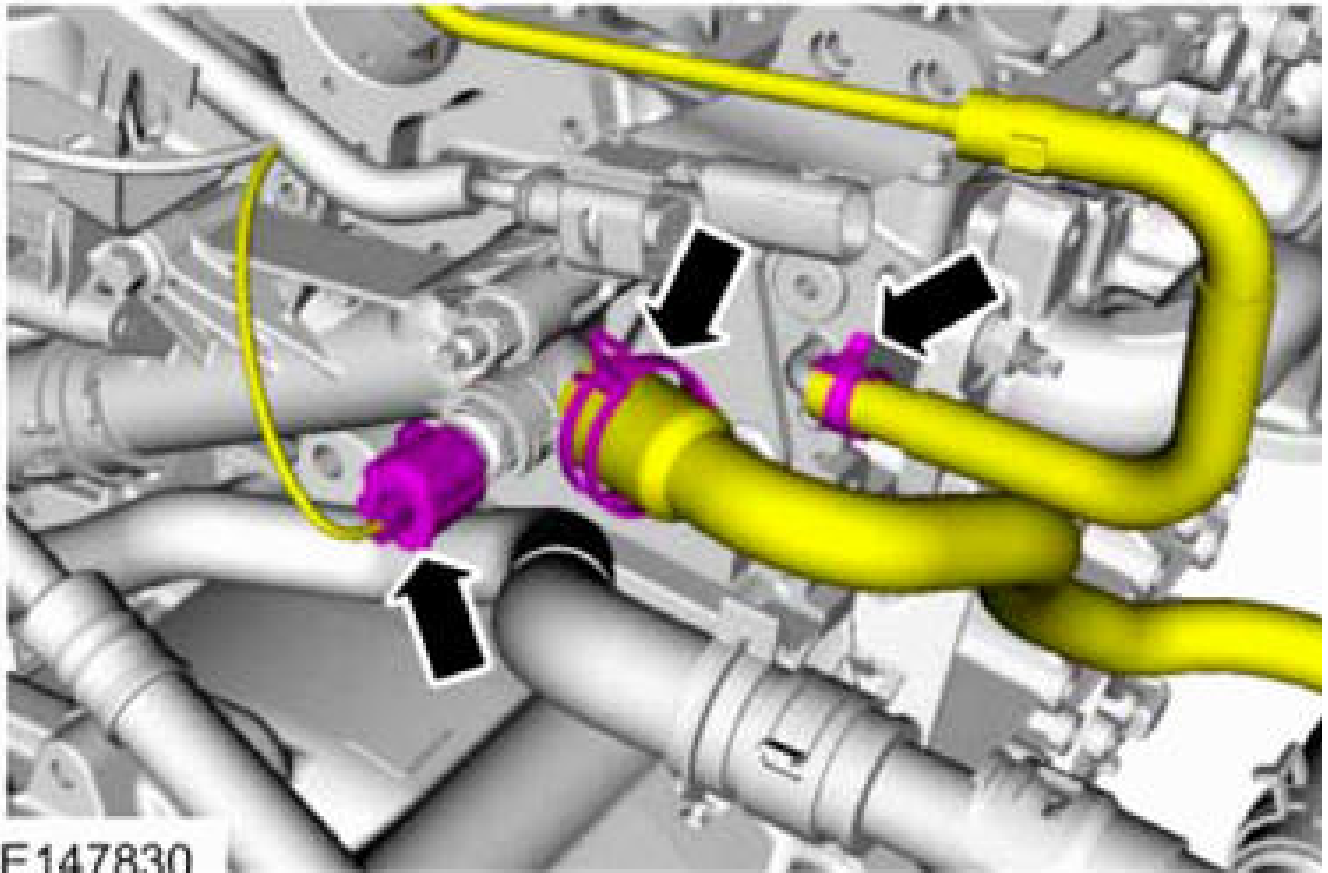
4. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



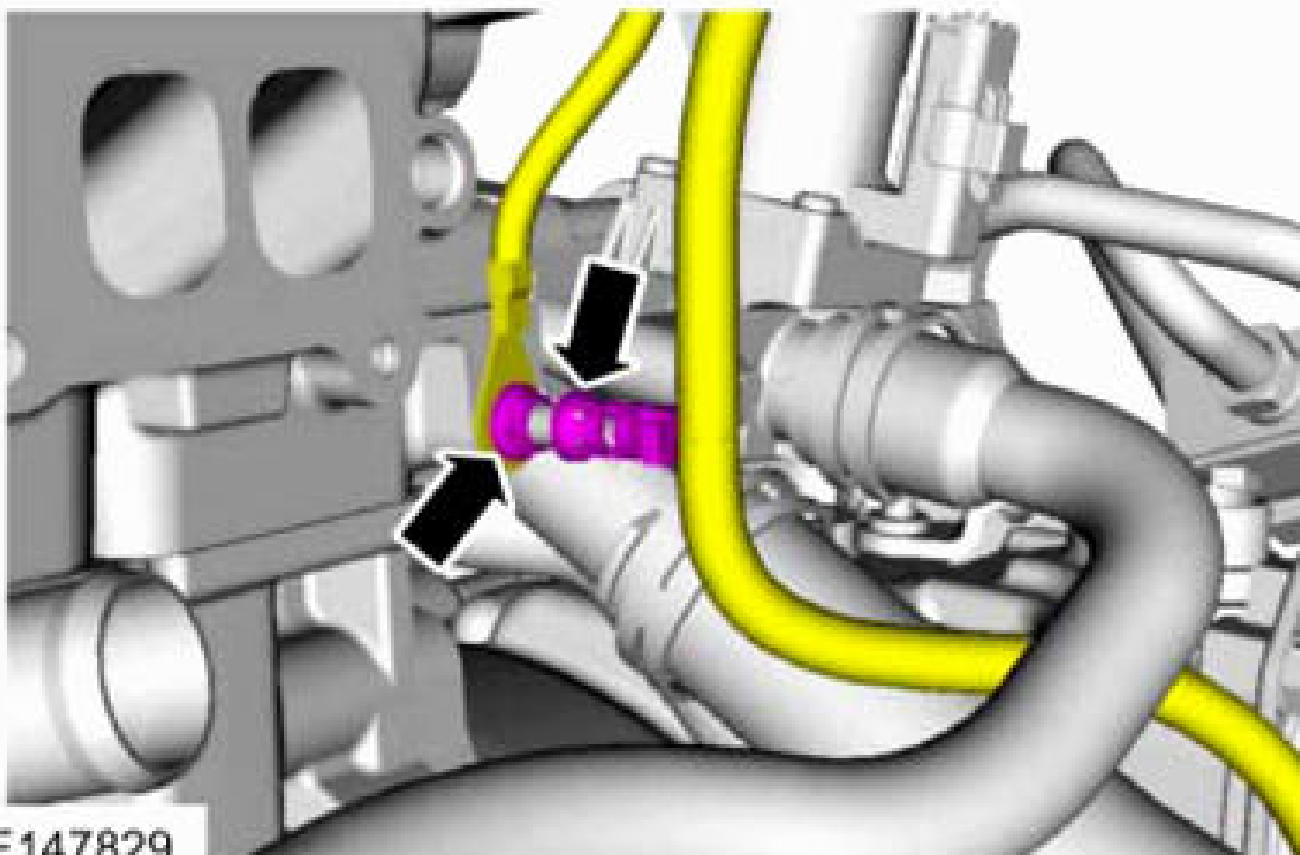
5. *General Equipment* : Hose Clamp Remover/Installer



6. *General Equipment* : Hose Clamp Remover/Installer

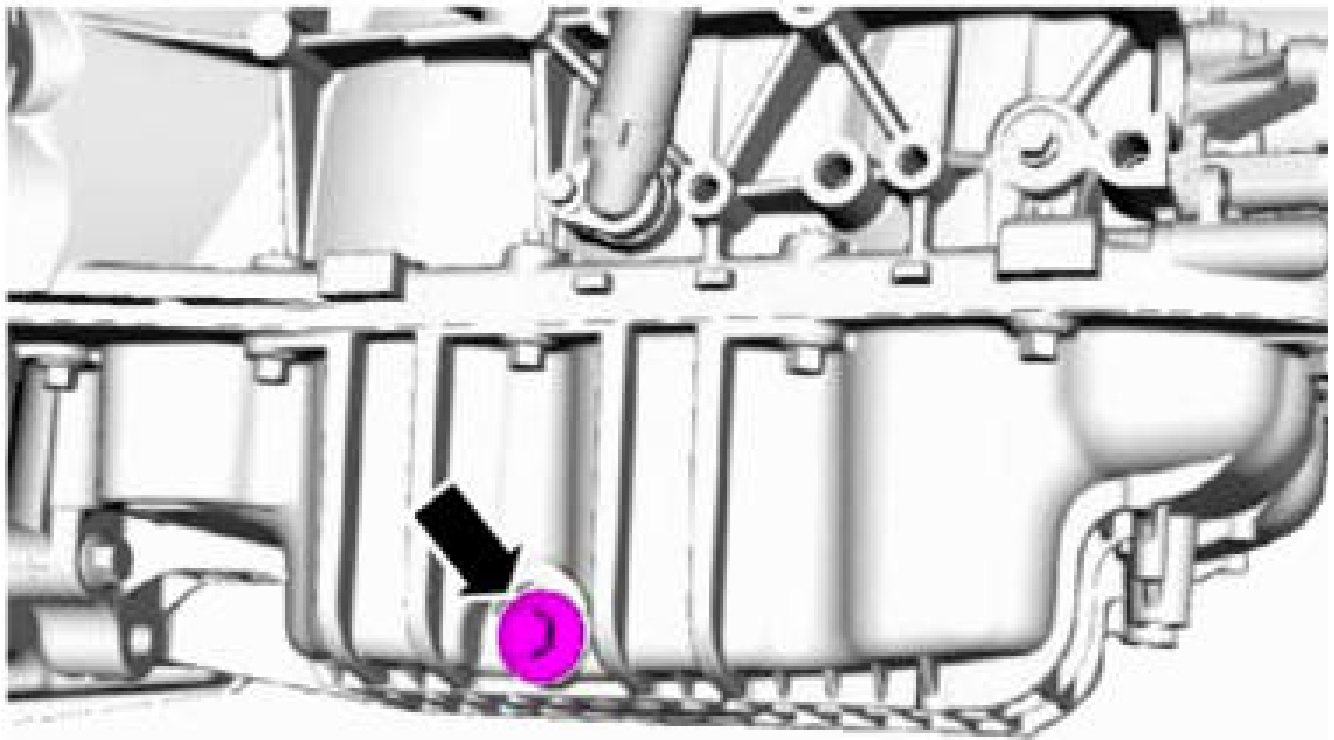


7. **NOTE:** Automatic transmission shown in illustration, manual similar.



8. Install the following items:
 1. Refer to: **INTAKE MANIFOLD** .
 2. Refer to: **CAMSHAFTS** .
 3. Refer to: **TURBOCHARGER** .
9. *General Equipment* : Oil Drain Equipment

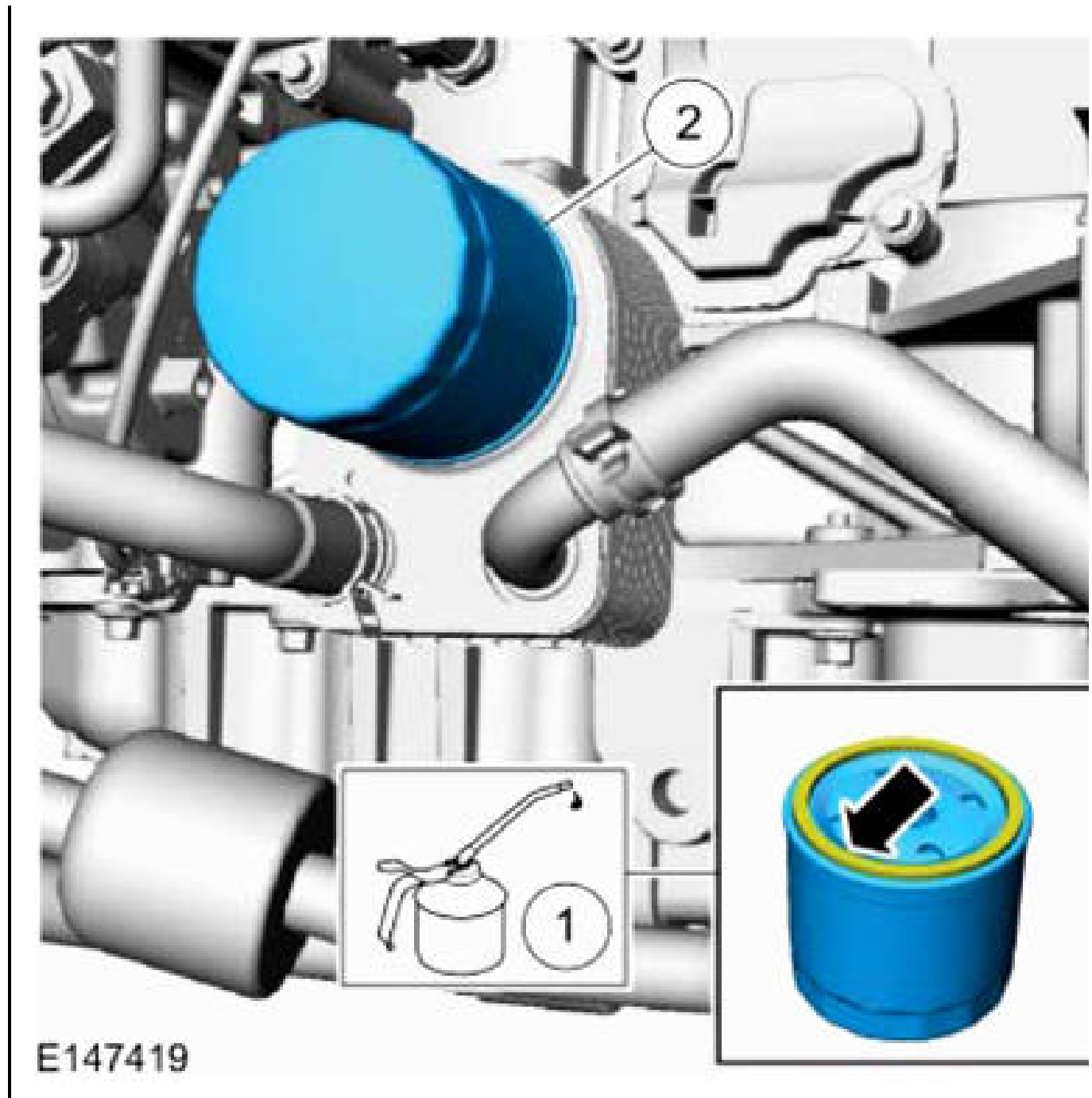
Torque : 28 Nm



E147418

10. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

Torque : 14.5 Nm



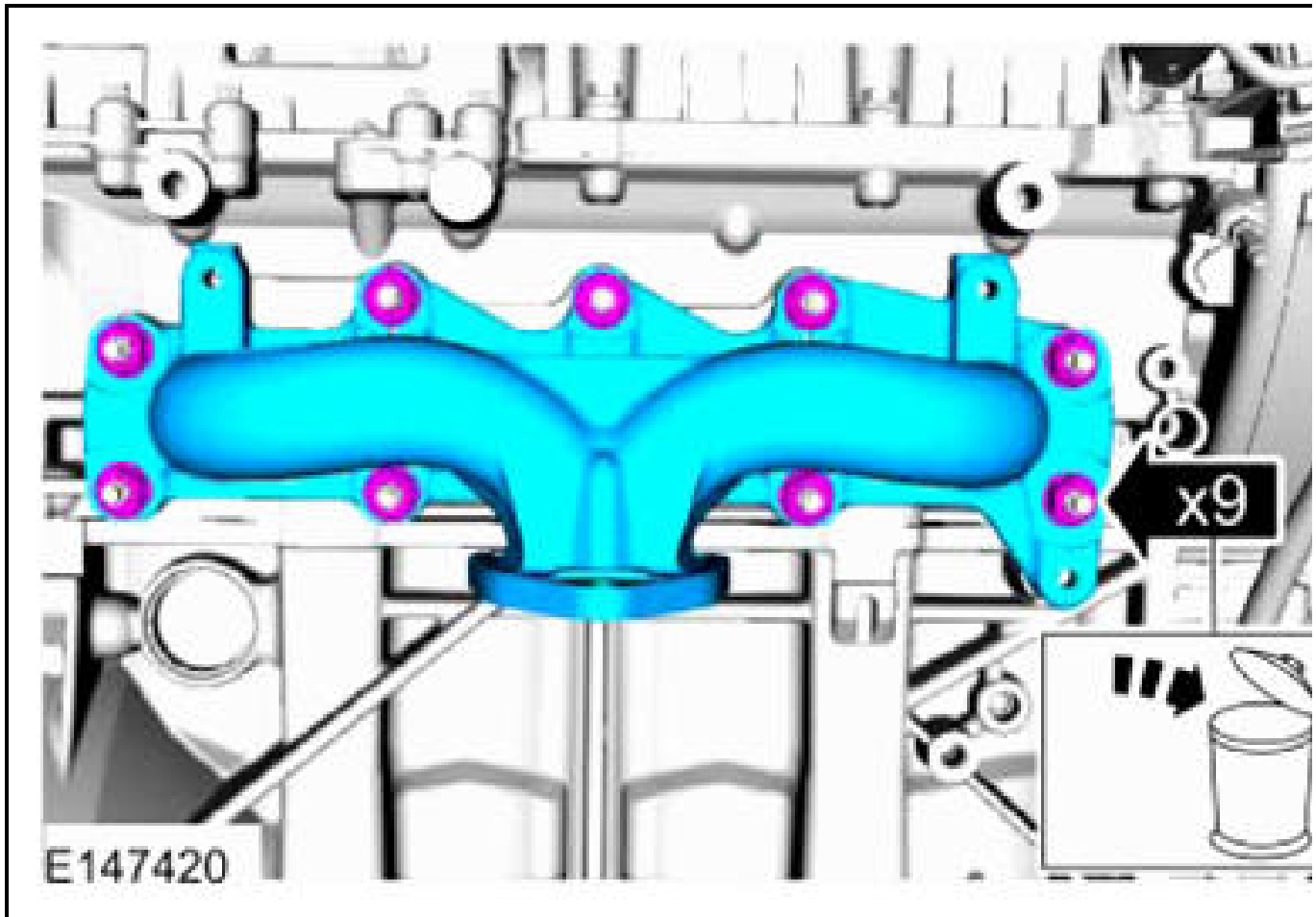
11. Fill the engine with clean engine oil.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

EXHAUST MANIFOLD

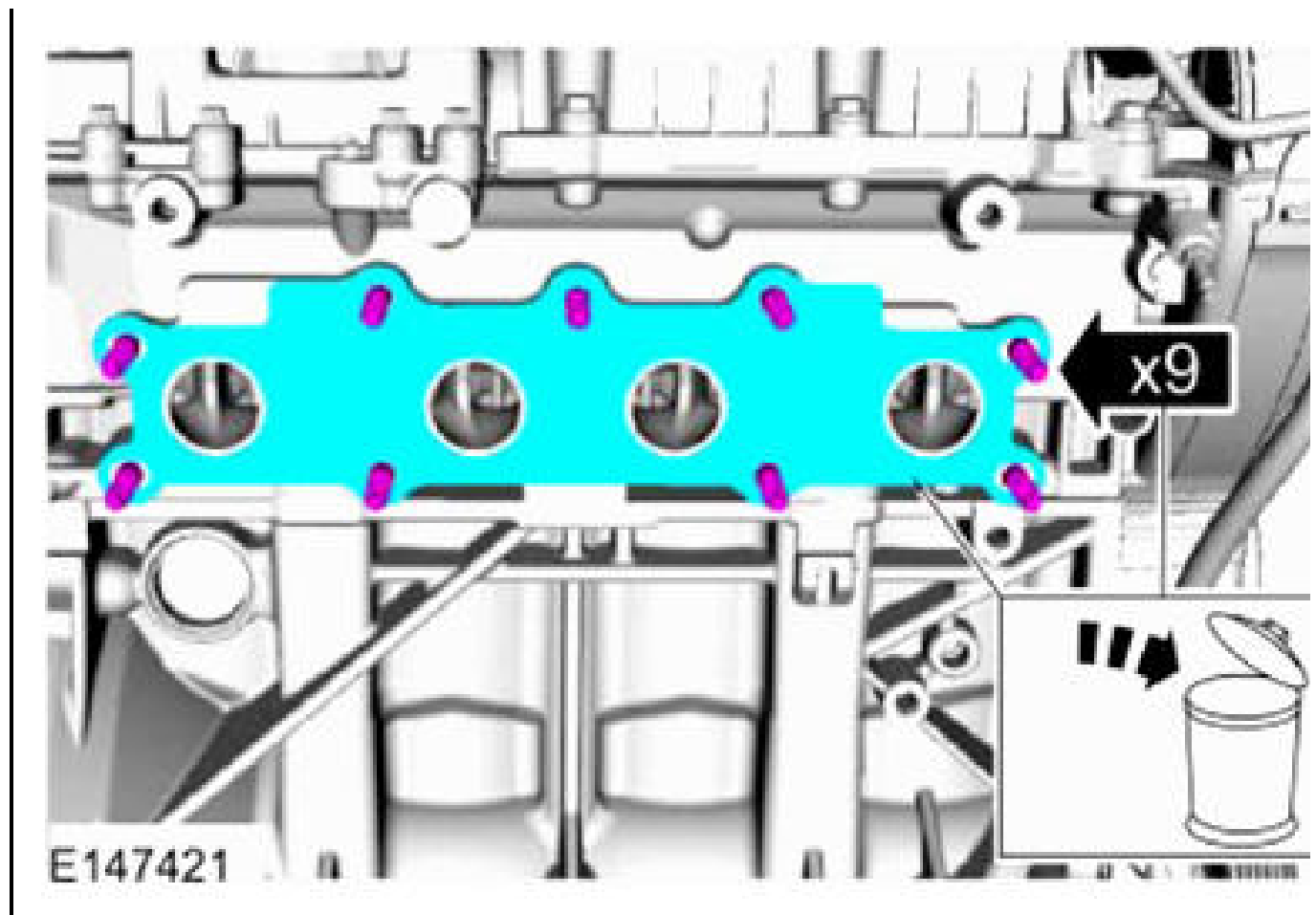
Removal

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .
2. Refer to: **TURBOCHARGER** .



- 3.
4. Refer to: **EXHAUST MANIFOLD CLEANING AND INSPECTION** .

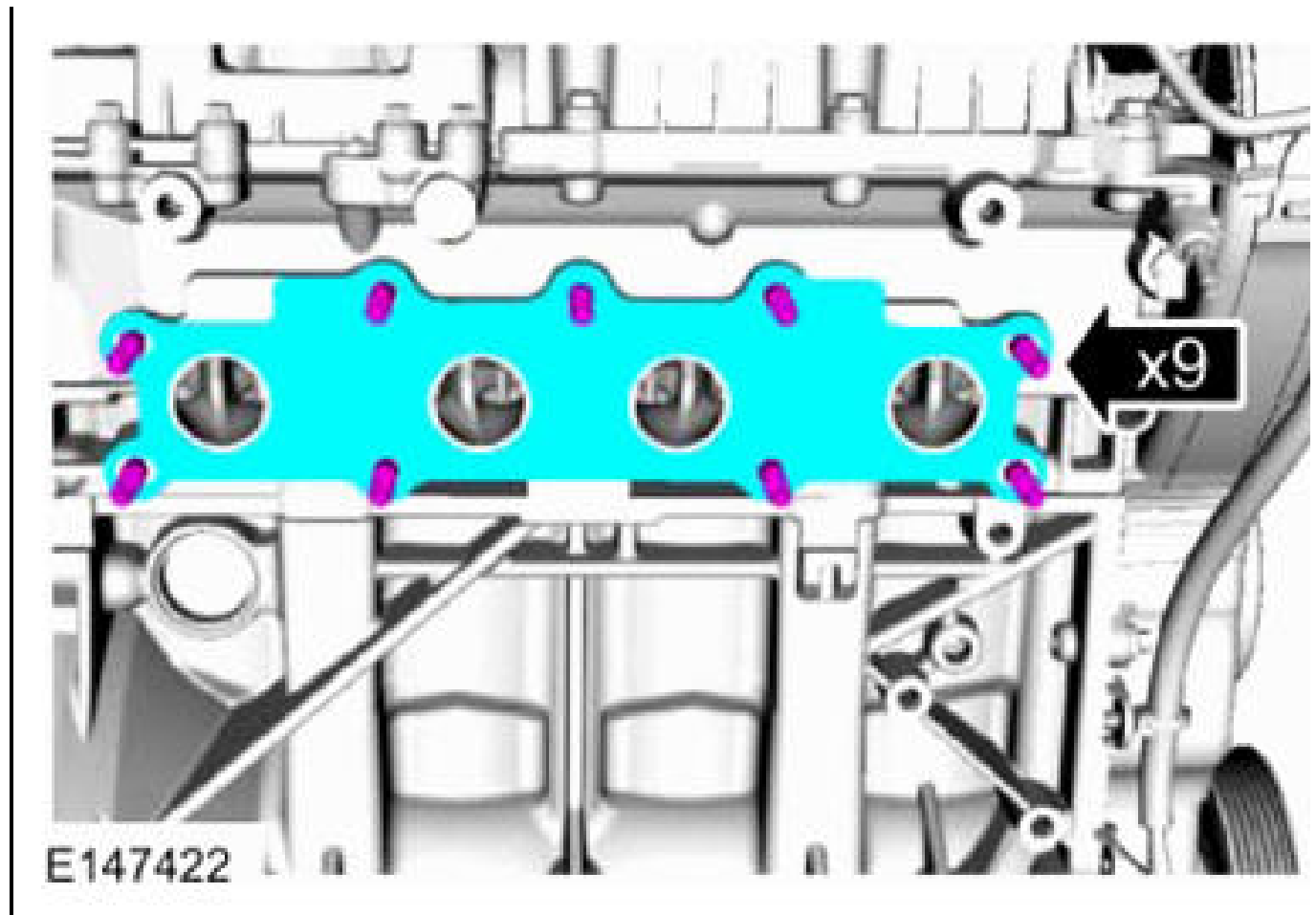
- 5.



5.

Installation

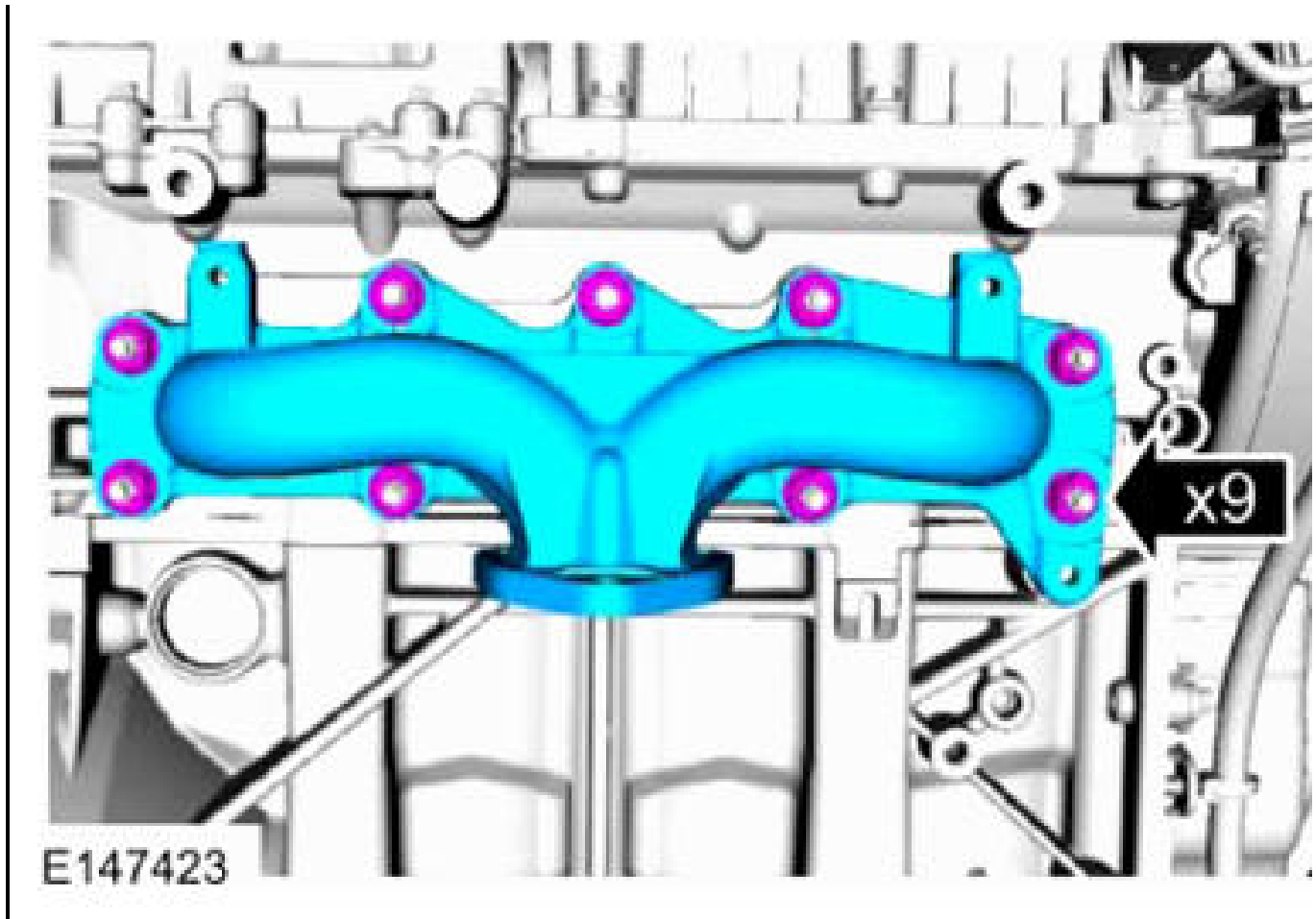
1. *Torque* : 10 Nm



2. *Torque :*

Stage 1: 21 Nm

Stage 2: Retighten to 21 Nm



3. Refer to: **TURBOCHARGER** .

OIL PAN

SPECIAL TOOLS/GENERAL EQUIPMENT

Strap Wrench

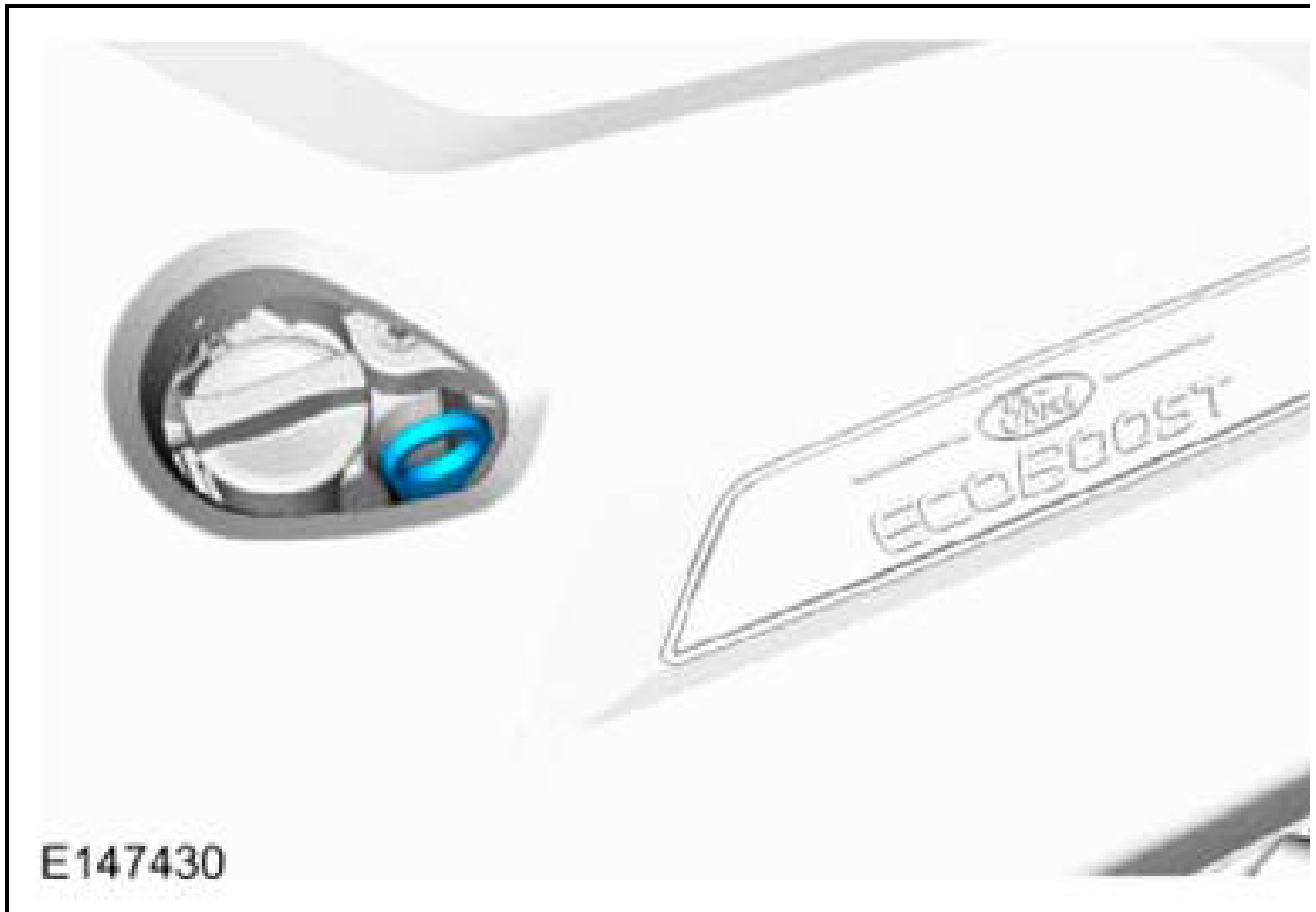
Oil Drain Equipment

MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A
Motorcraft® Silicone Gasket Remover ZC-30	-
Motorcraft® Metal Surface Prep ZC-31-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

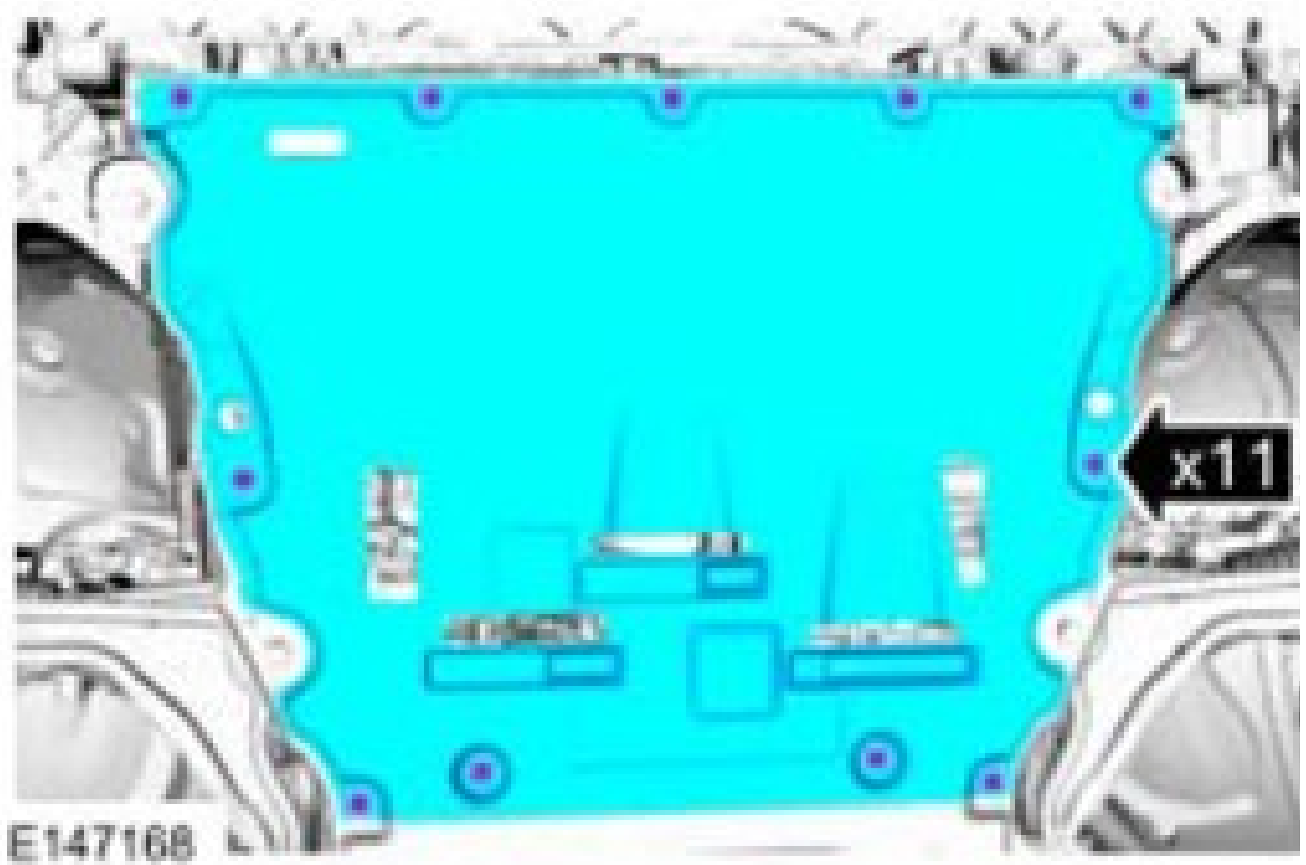
Removal

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .



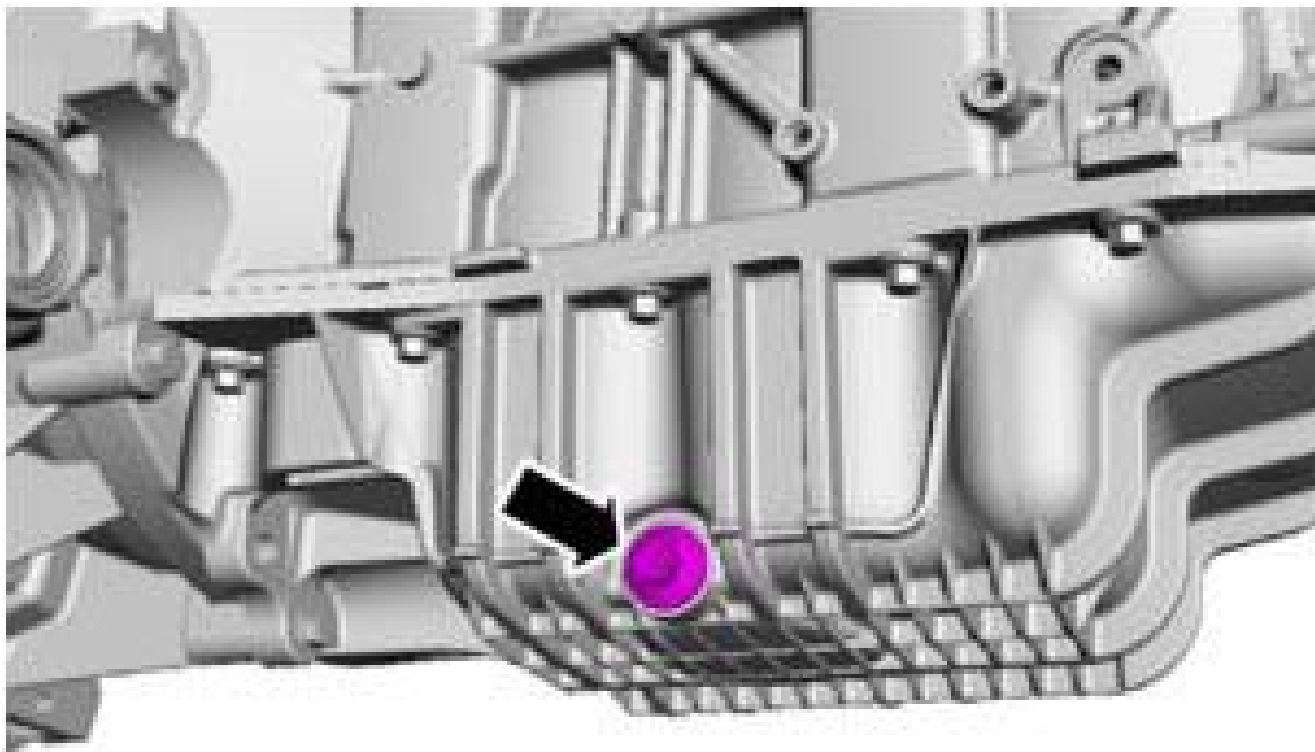
2.

3.



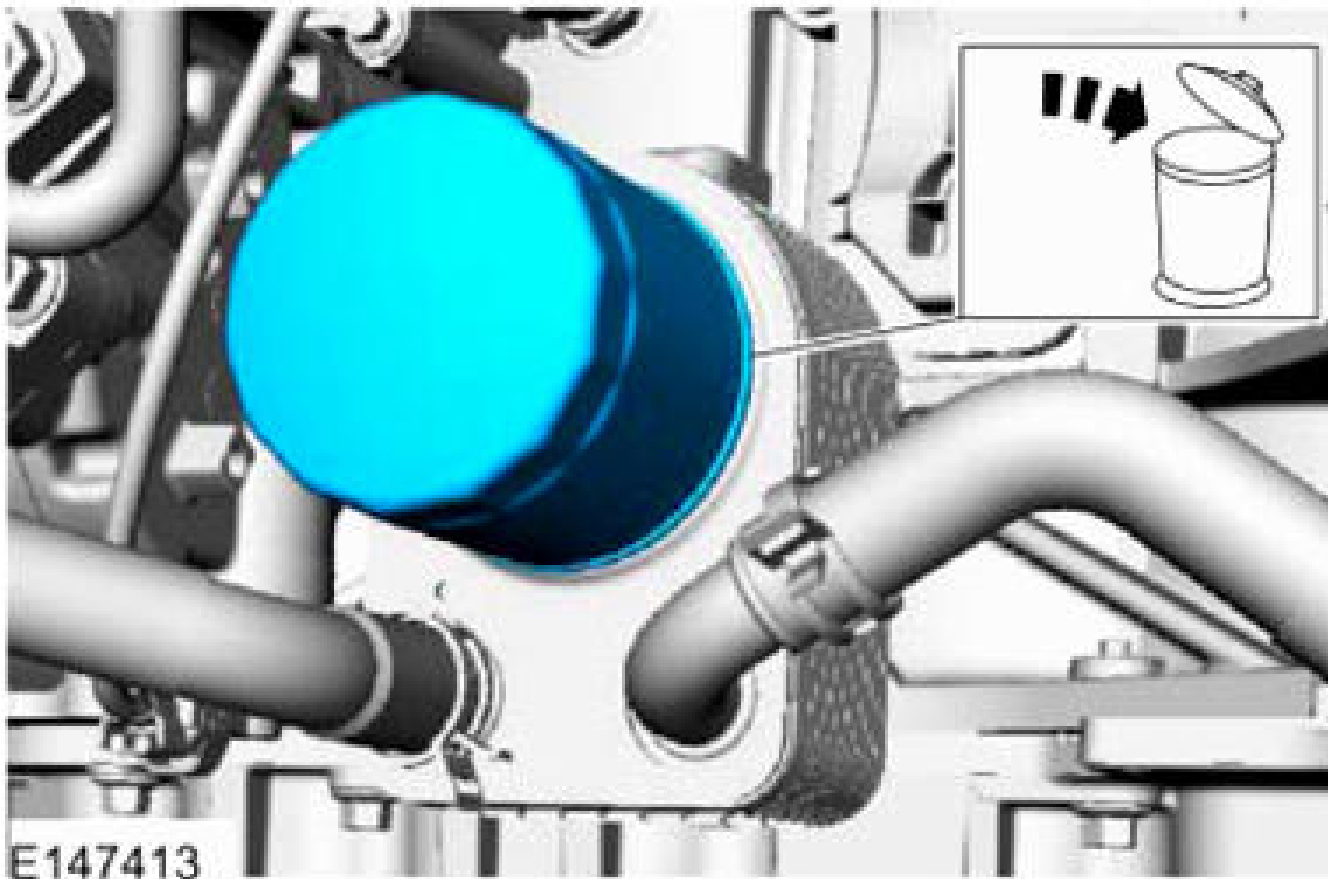
- 3.
4. *General Equipment* : Oil Drain Equipment

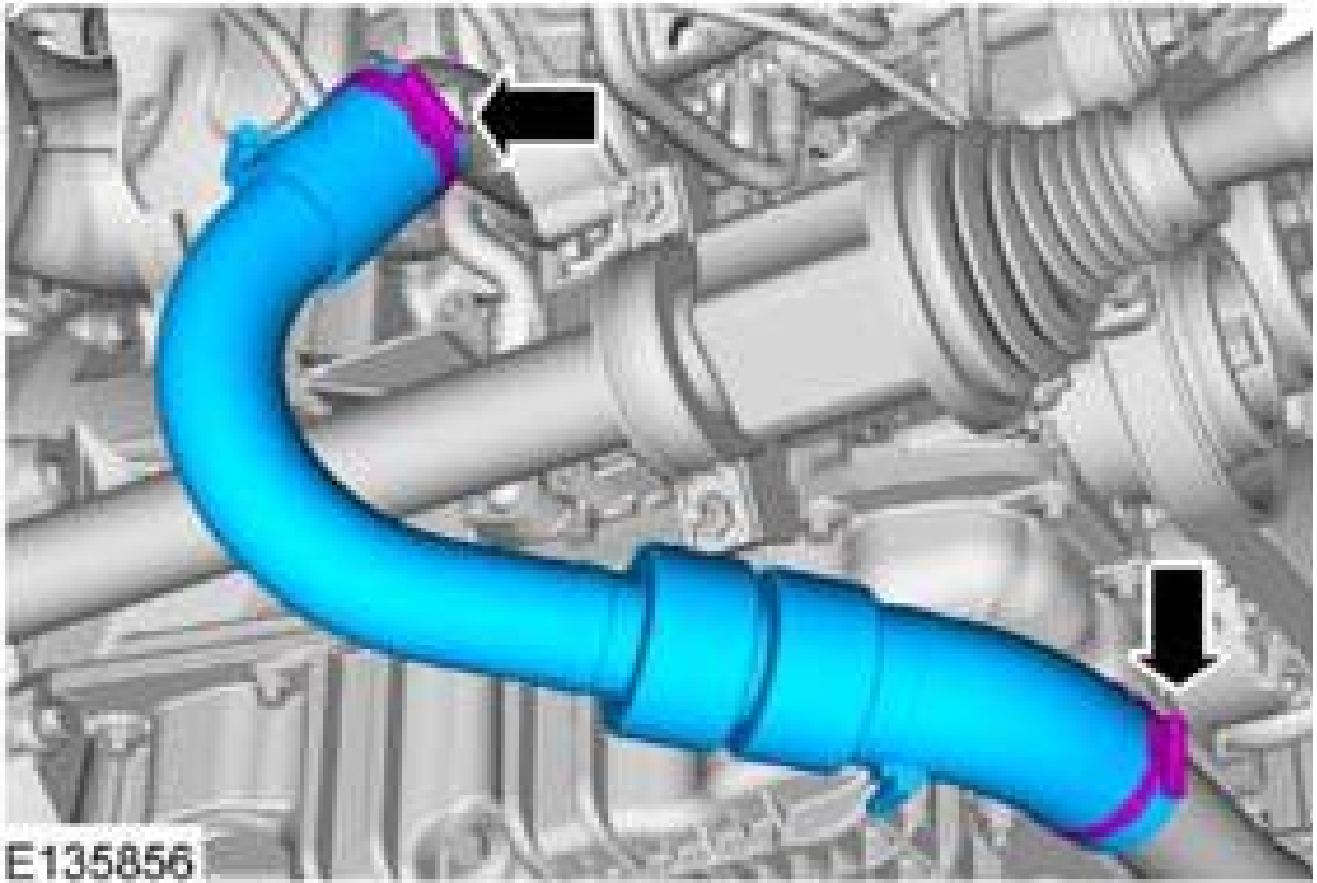
Torque : 28 Nm



E79660

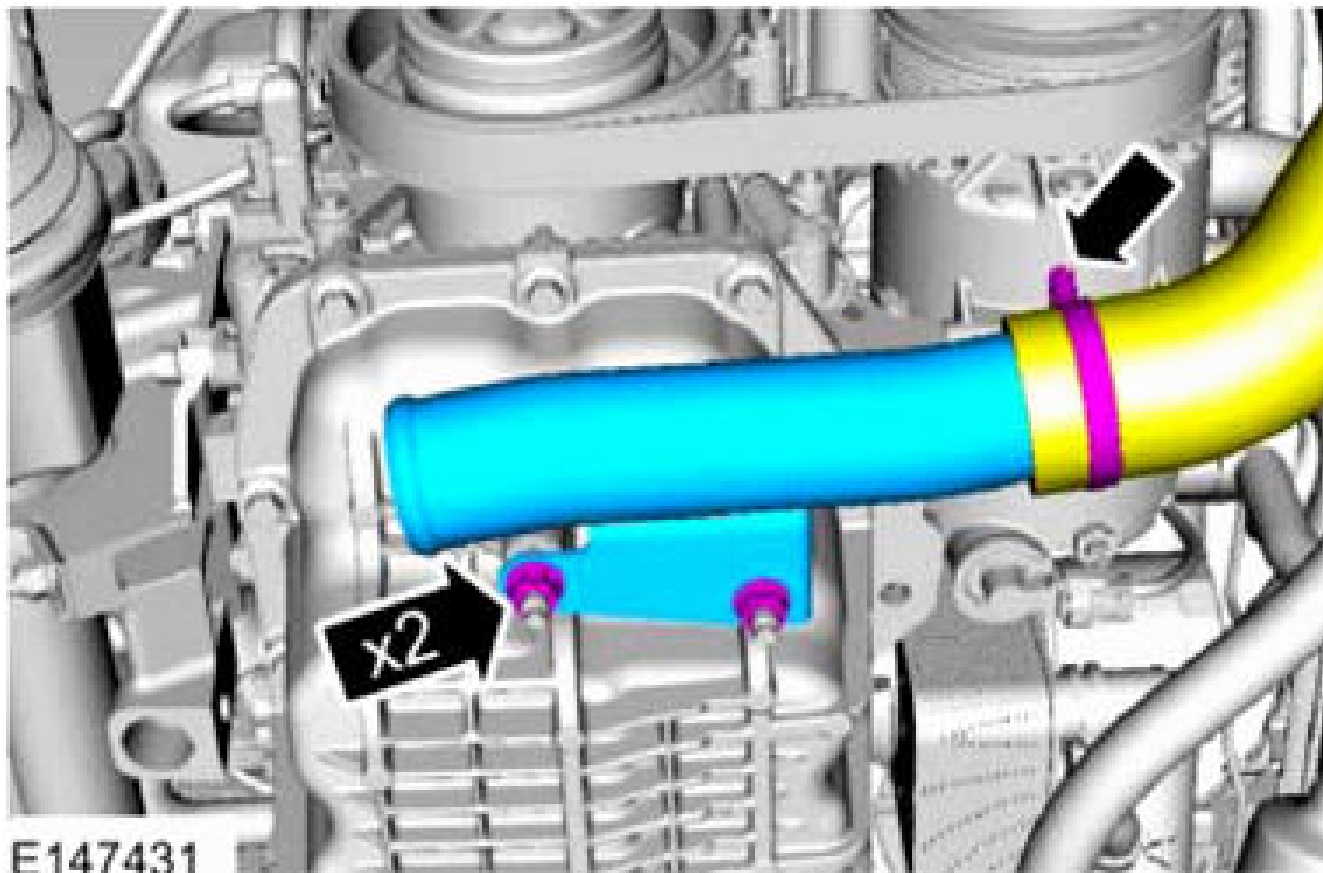
5. *General Equipment* : Strap Wrench





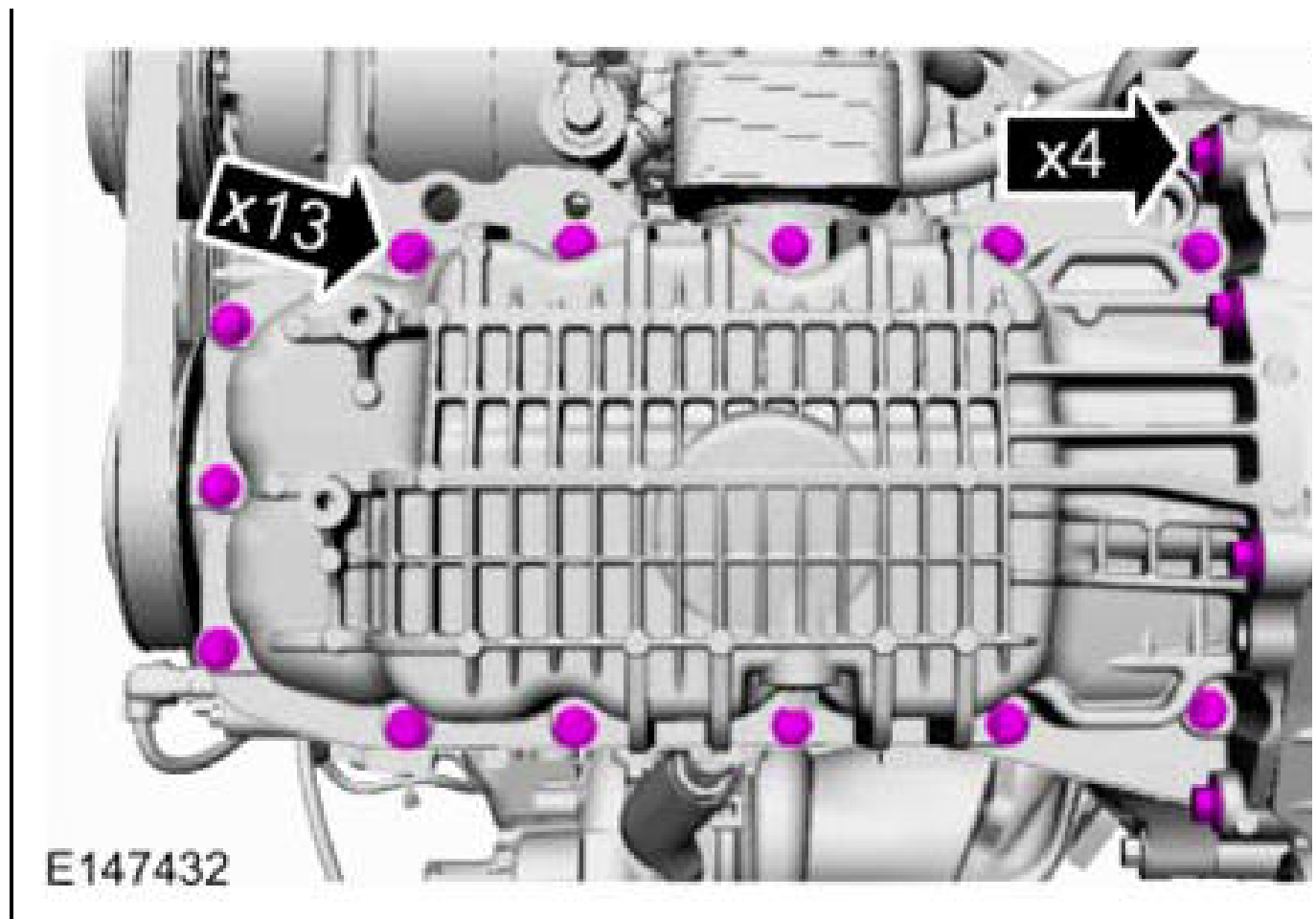
6.

7.

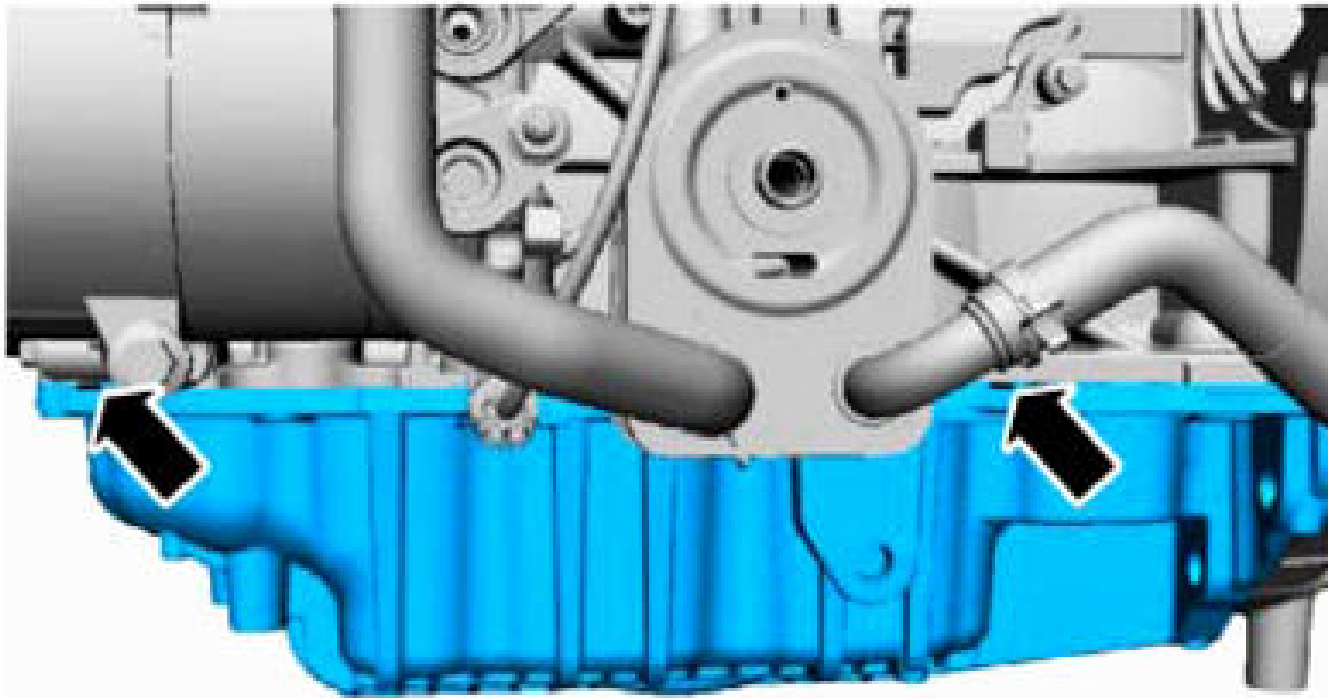


7.

8.



- 8.
9. Pry pads.

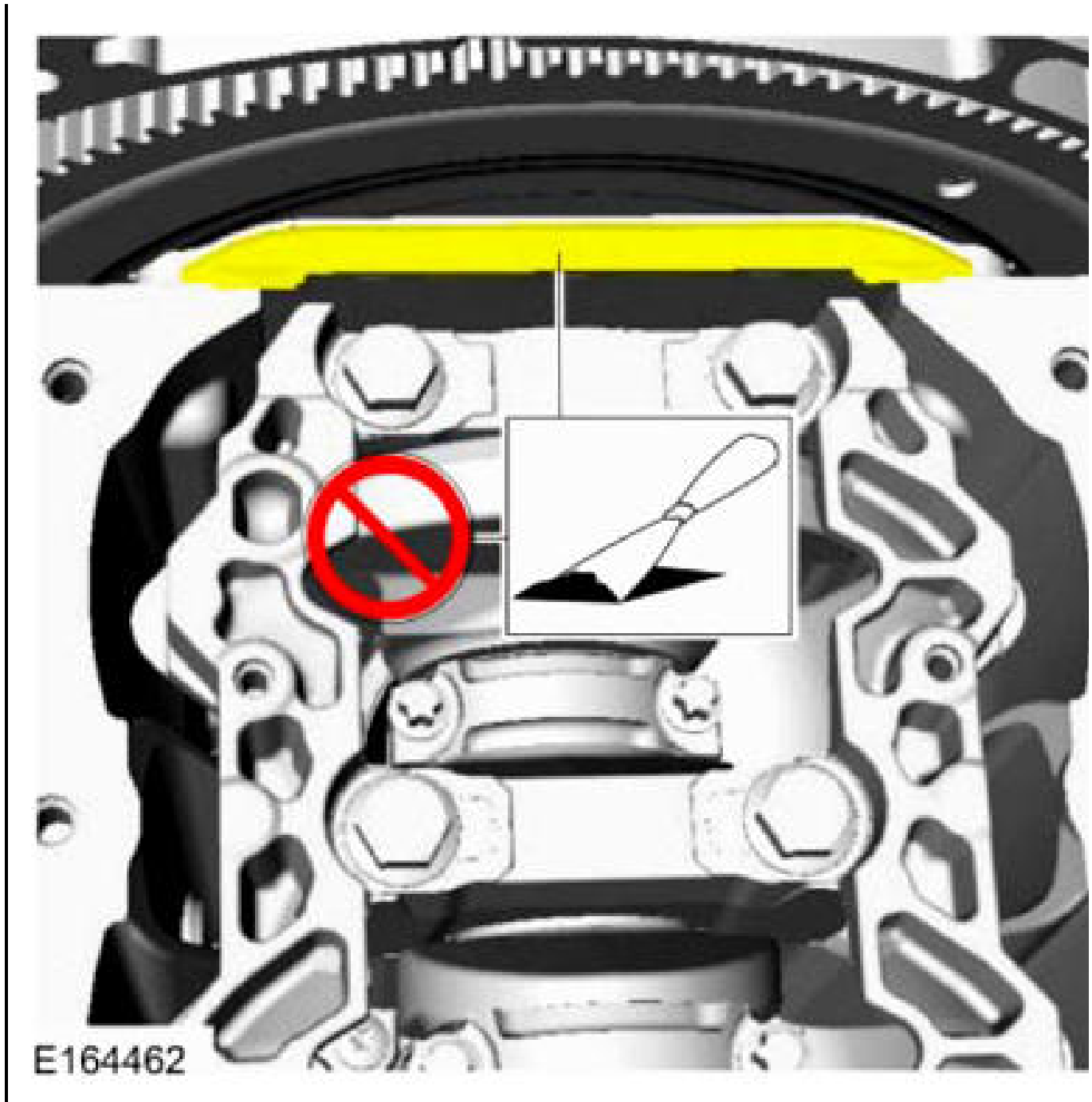
**E147433****Installation**

NOTE: Do not use metal scrapers, plastic 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.

1.

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

Do not use any type of scrapers . There is a rubber sealing surface on the bottom of the crankshaft rear seal, take extra care when cleaning the specified area by peeling off the old sealant by hand.



NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove traces of sealant.

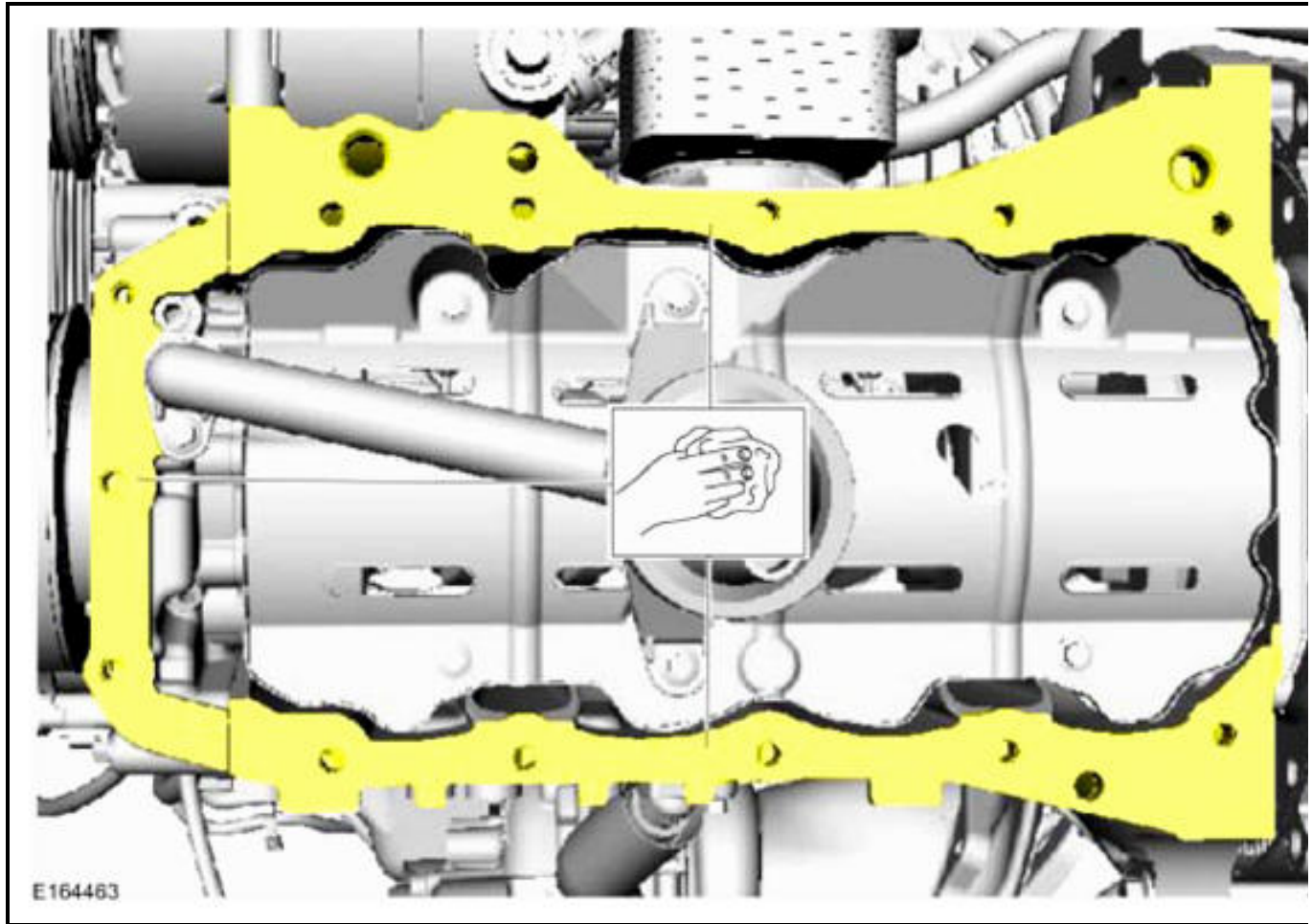
2.

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

Clean only the specified area with the specified material and a plastic scraping tool to remove traces of sealant.

Material : Motorcraft® Metal Surface Prep/ZC-31-A

Material : Motorcraft® Silicone Gasket Remover/ZC-30



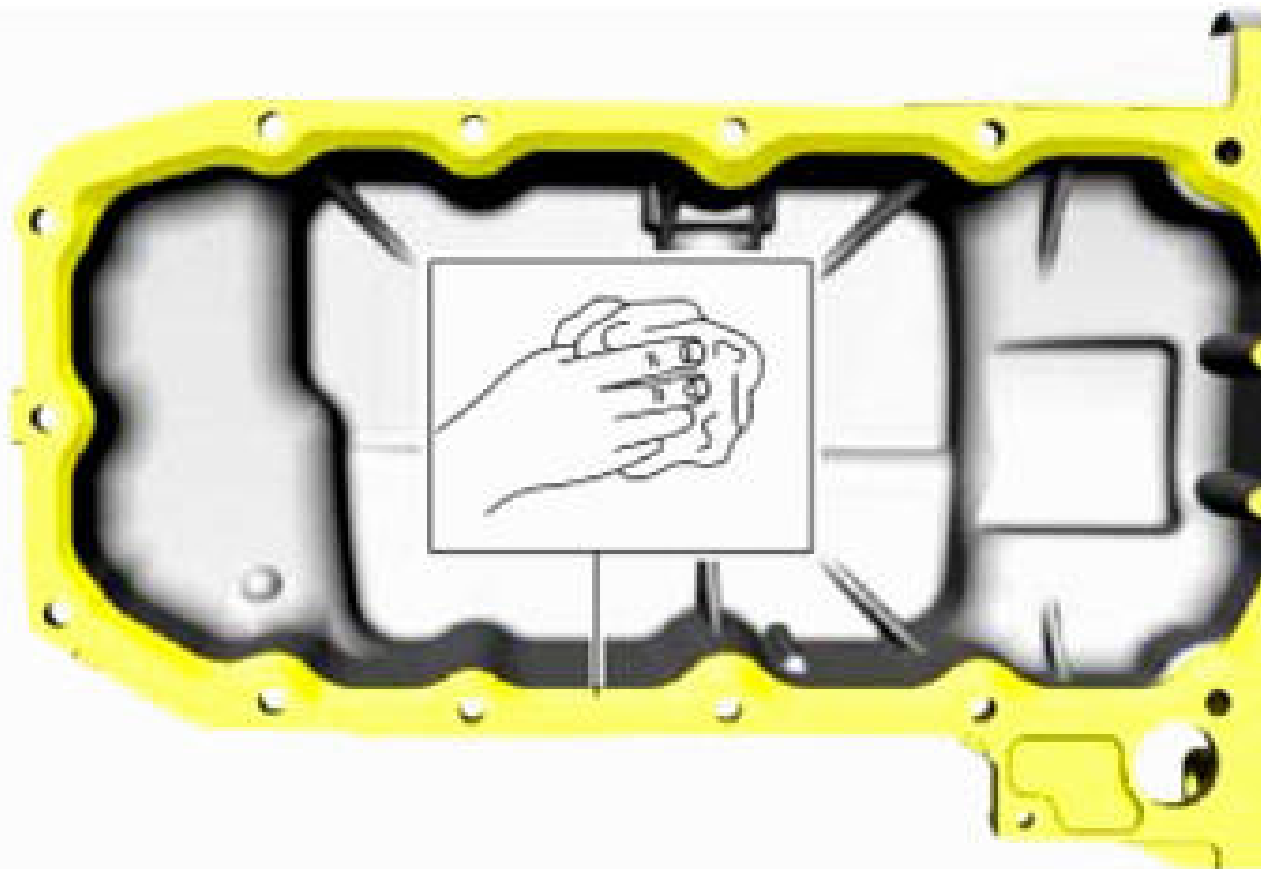
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove traces of sealant.

3.

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

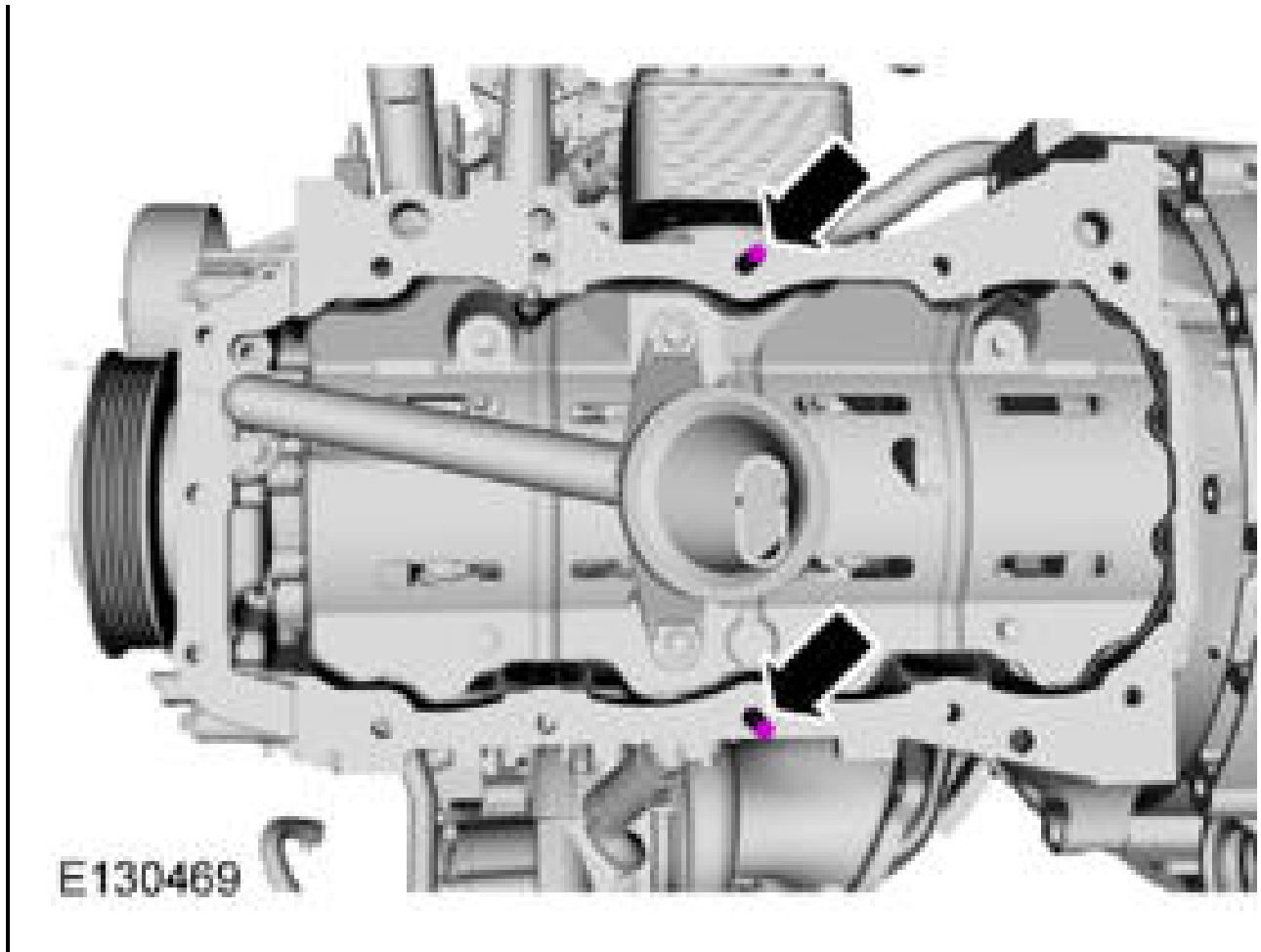
Material : Motorcraft® Metal Surface Prep/ZC-31-A

Material : Motorcraft® Silicone Gasket Remover/ZC-30



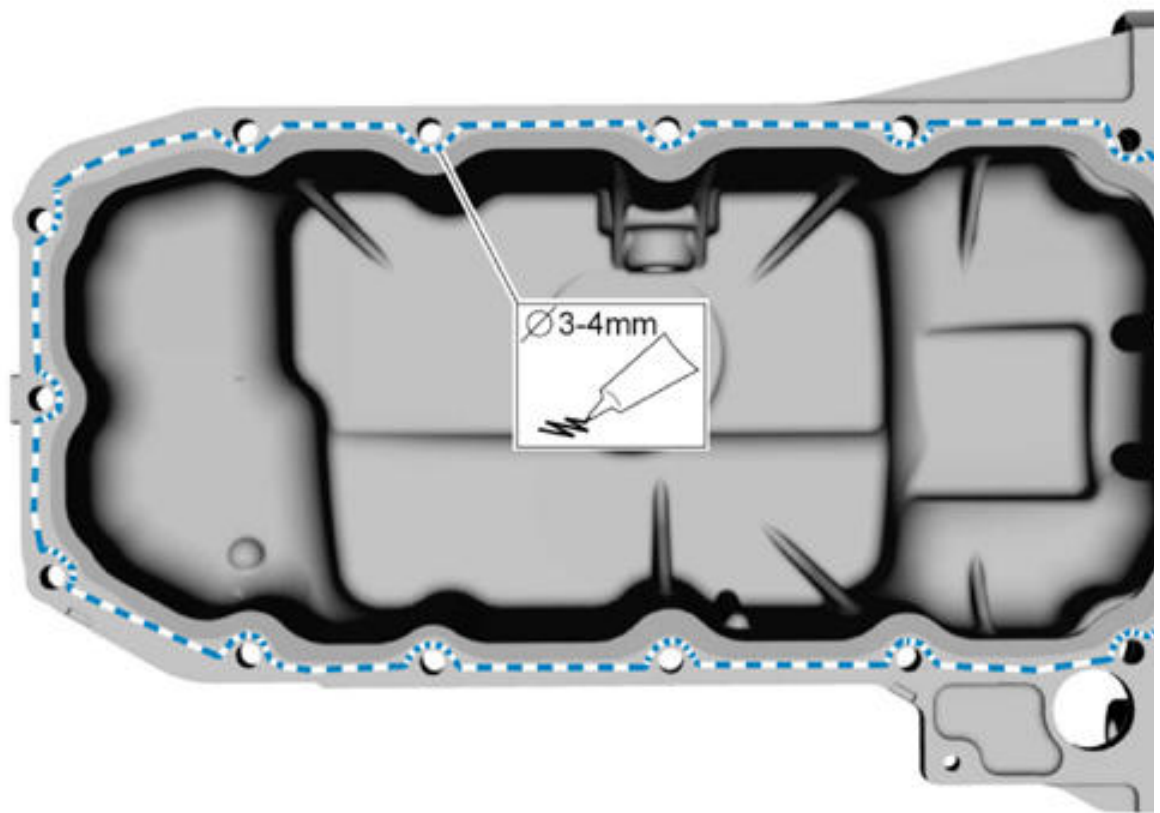
E147435

4. Install the following items:
- Two M8x20 studs



5. **NOTE:** The component must be installed within 5 minutes of applying the sealant.

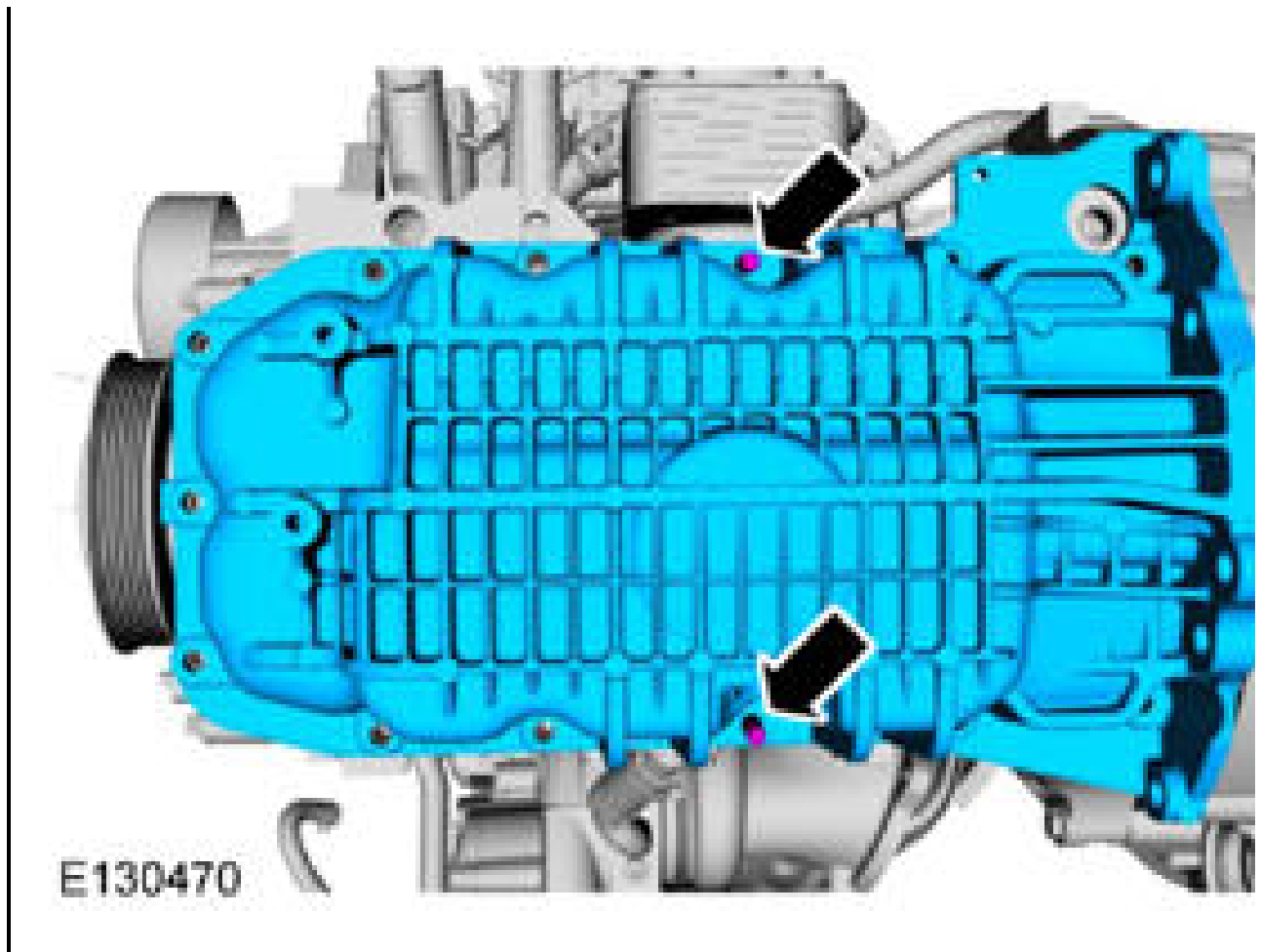
Material : Silicone Gasket and Sealant/TA-30 (WSE-M4G323-A4)



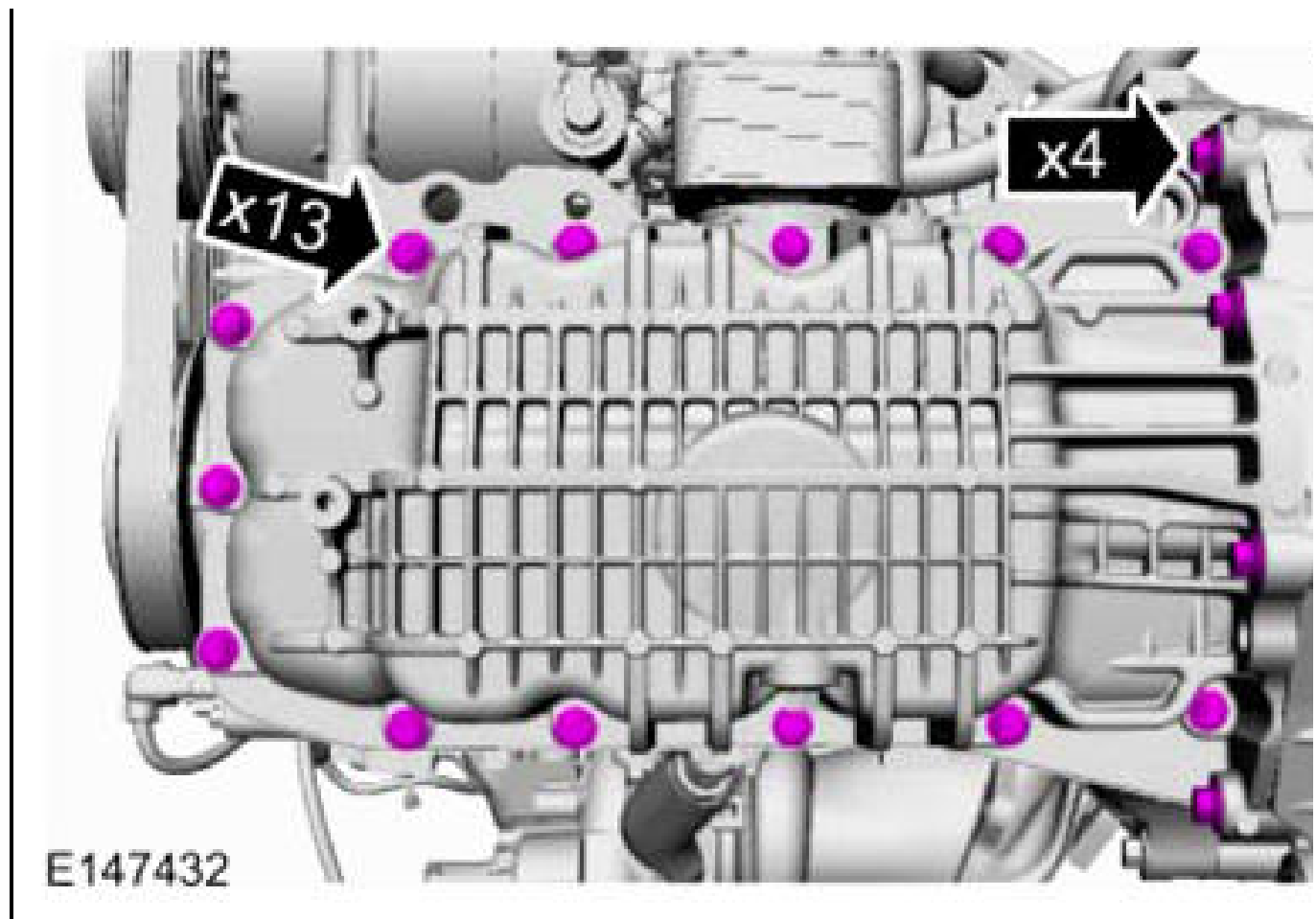
E132412

6. Remove the following items:

- Two M8x20 studs



7. **NOTE:** Only tighten the bolts finger tight at this stage.

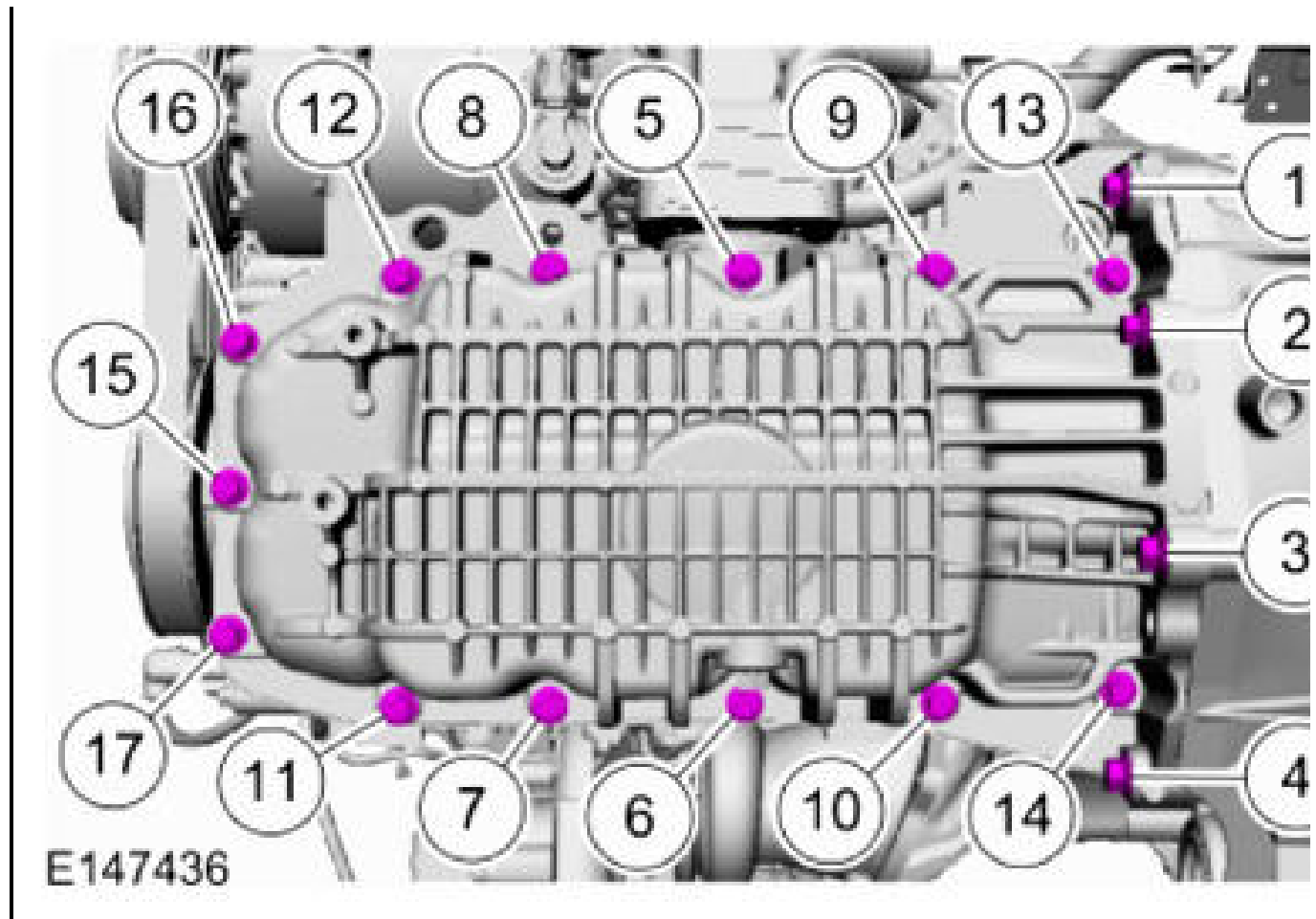


8. *Torque :*

1 - 4 47 Nm

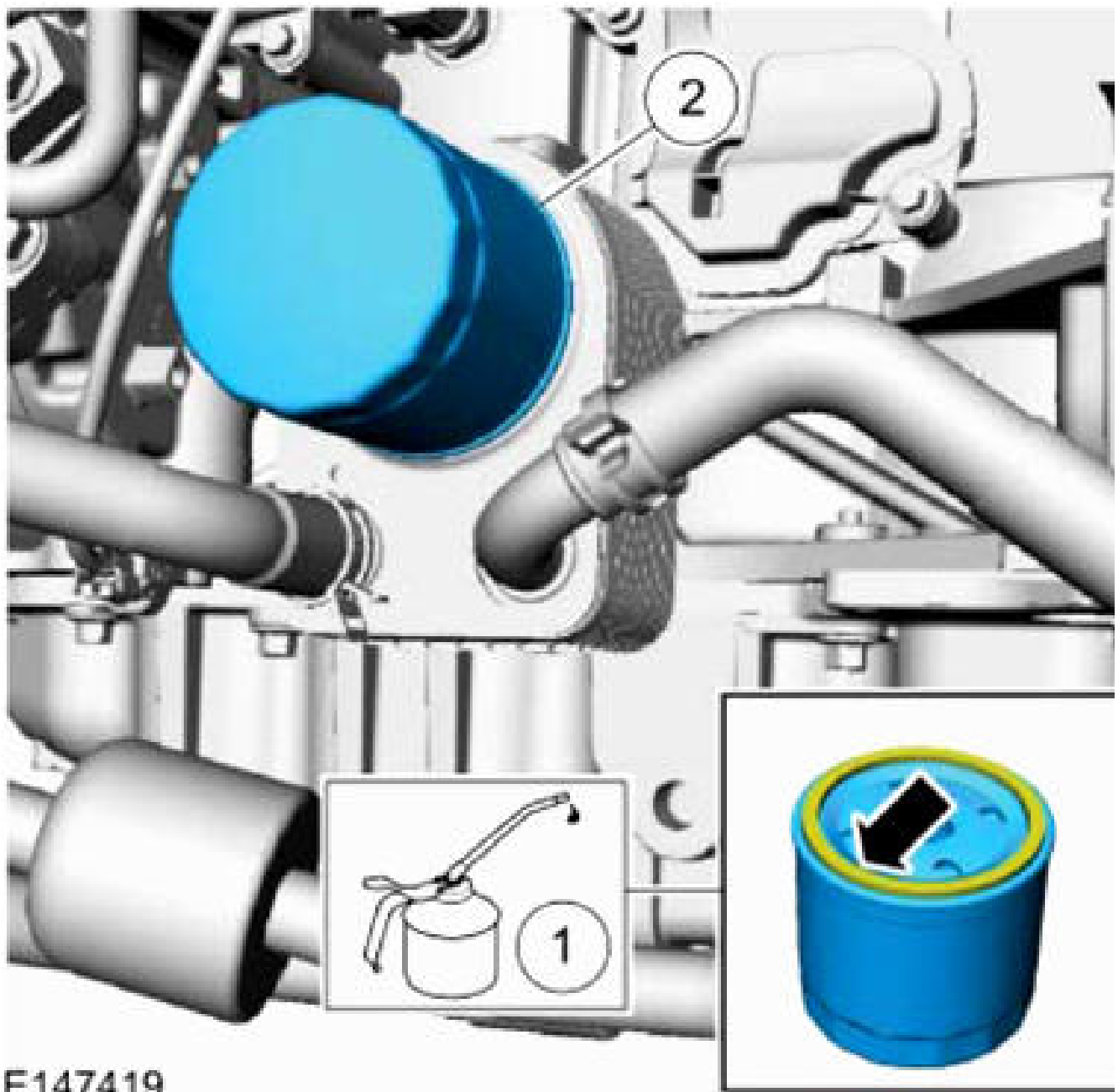
5 - 17 10 Nm

5 - 17 20 Nm



9. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

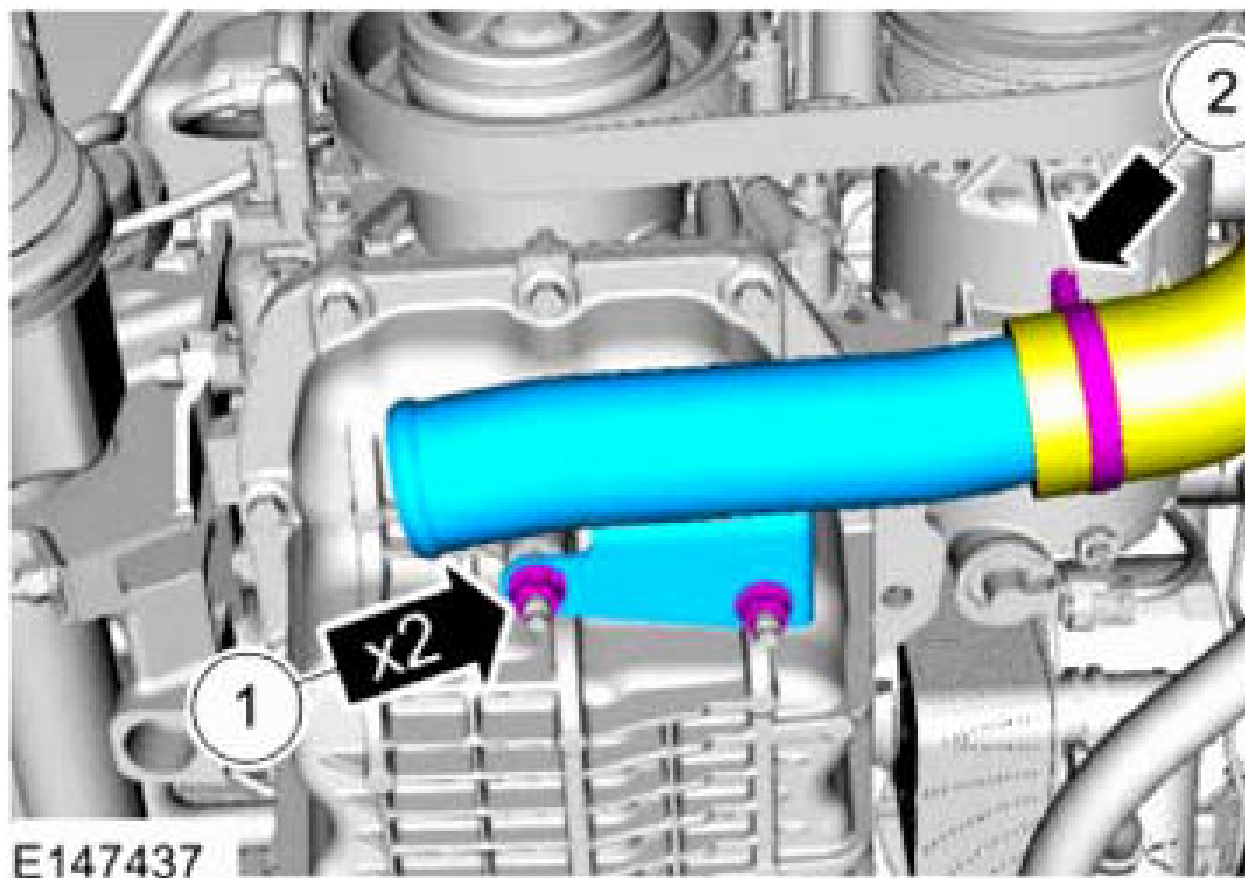
Torque : 14.5 Nm



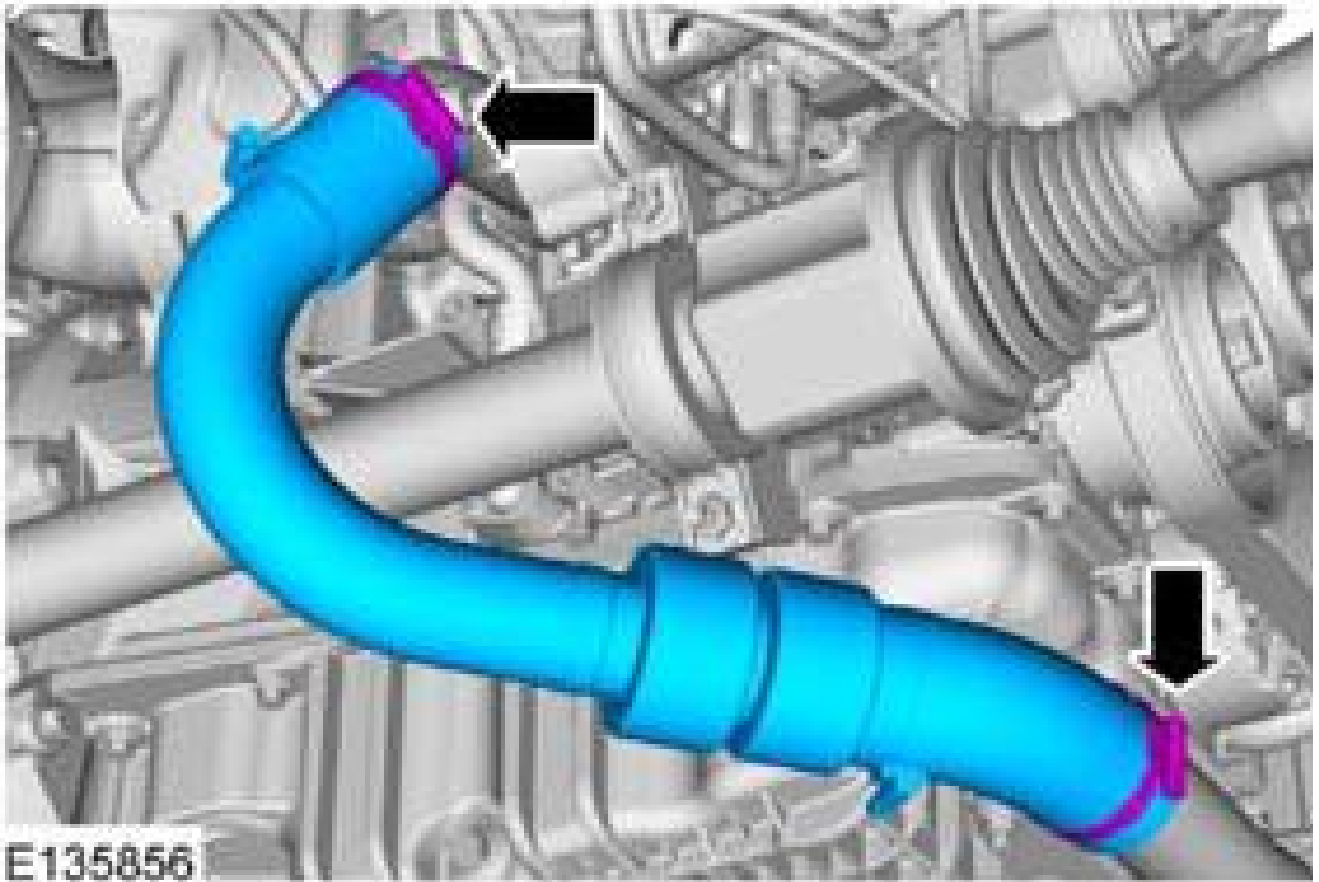
10.

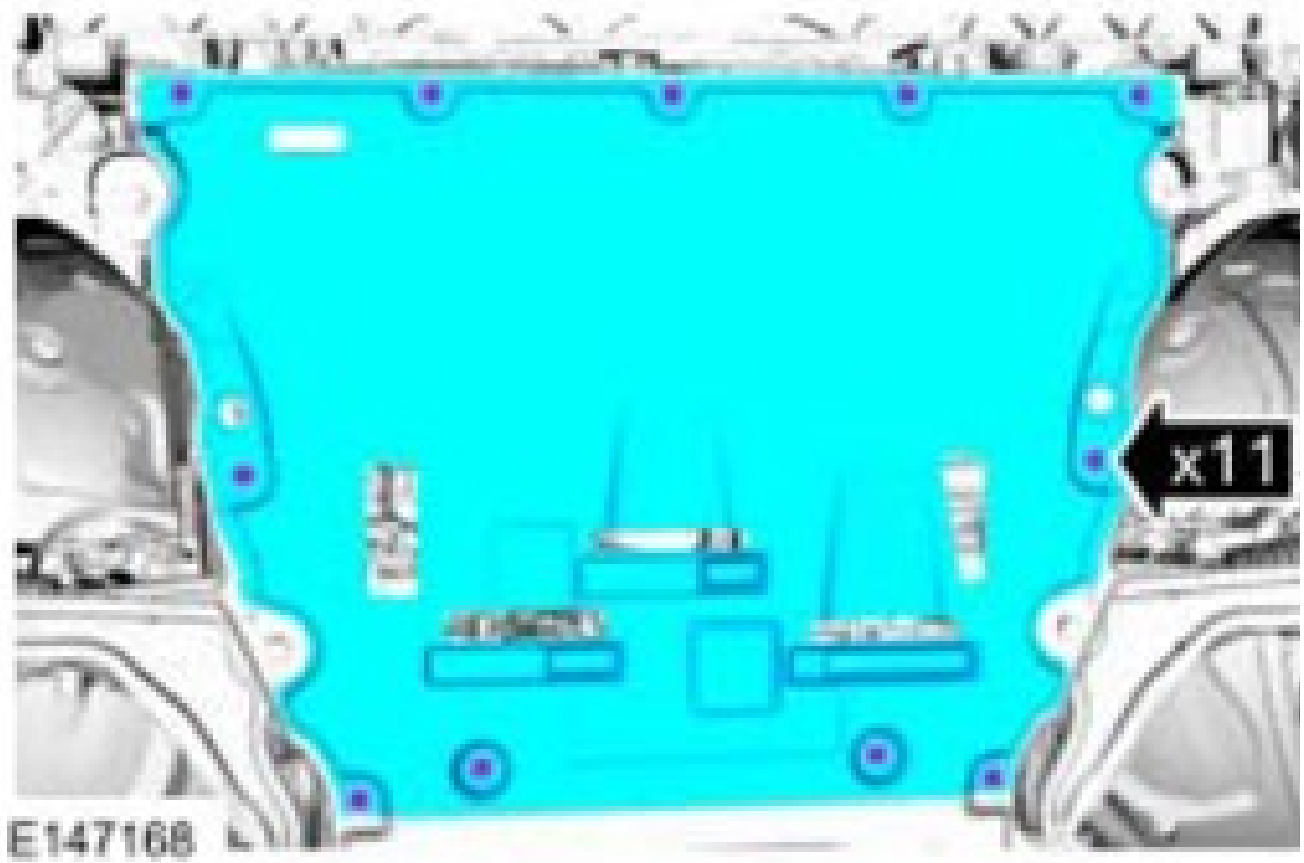
1. Torque : 18 Nm

2. Torque : 5 Nm



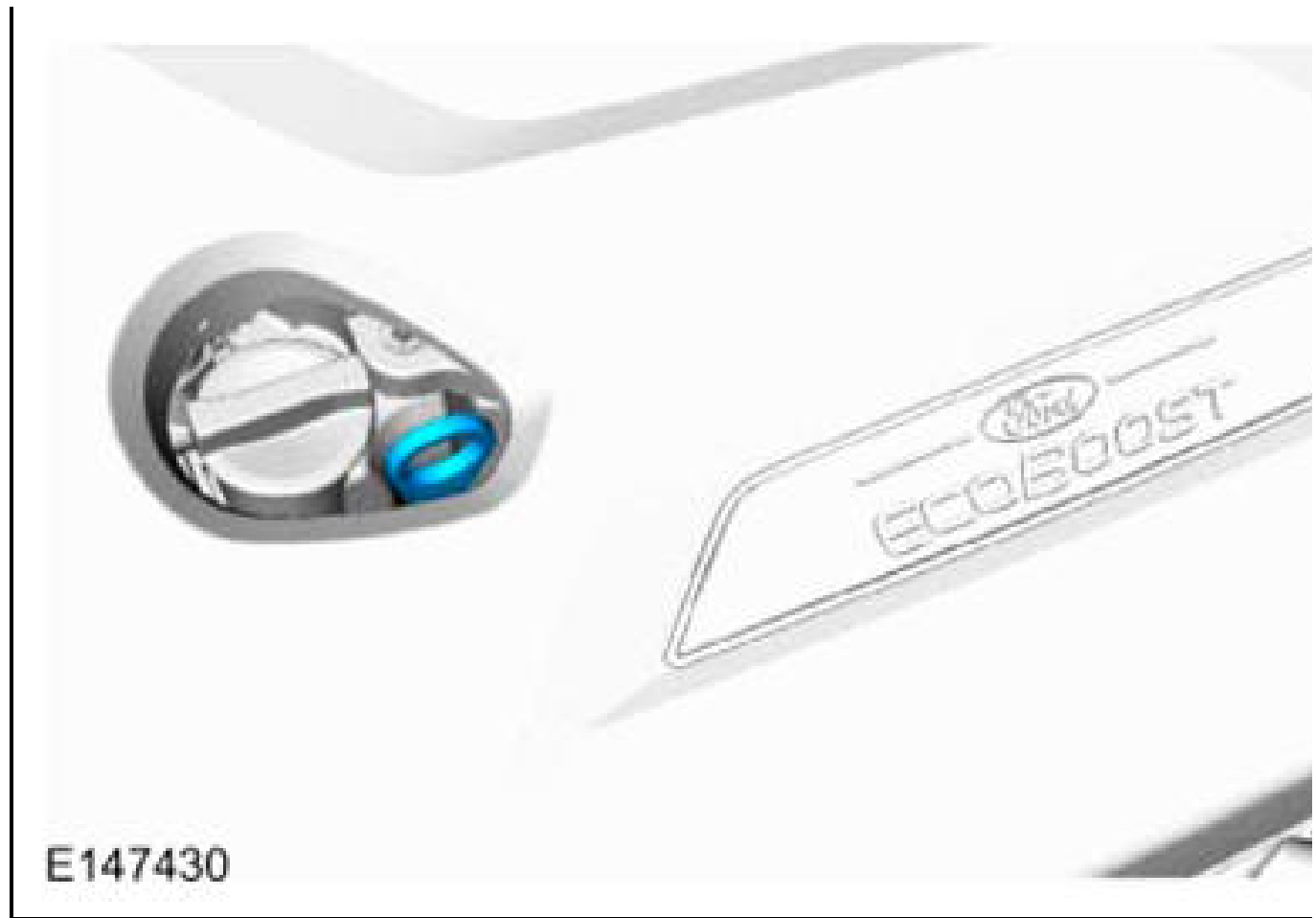
11. *Torque* : 5 Nm





12.

13.



13.

14. Fill the engine with engine oil.

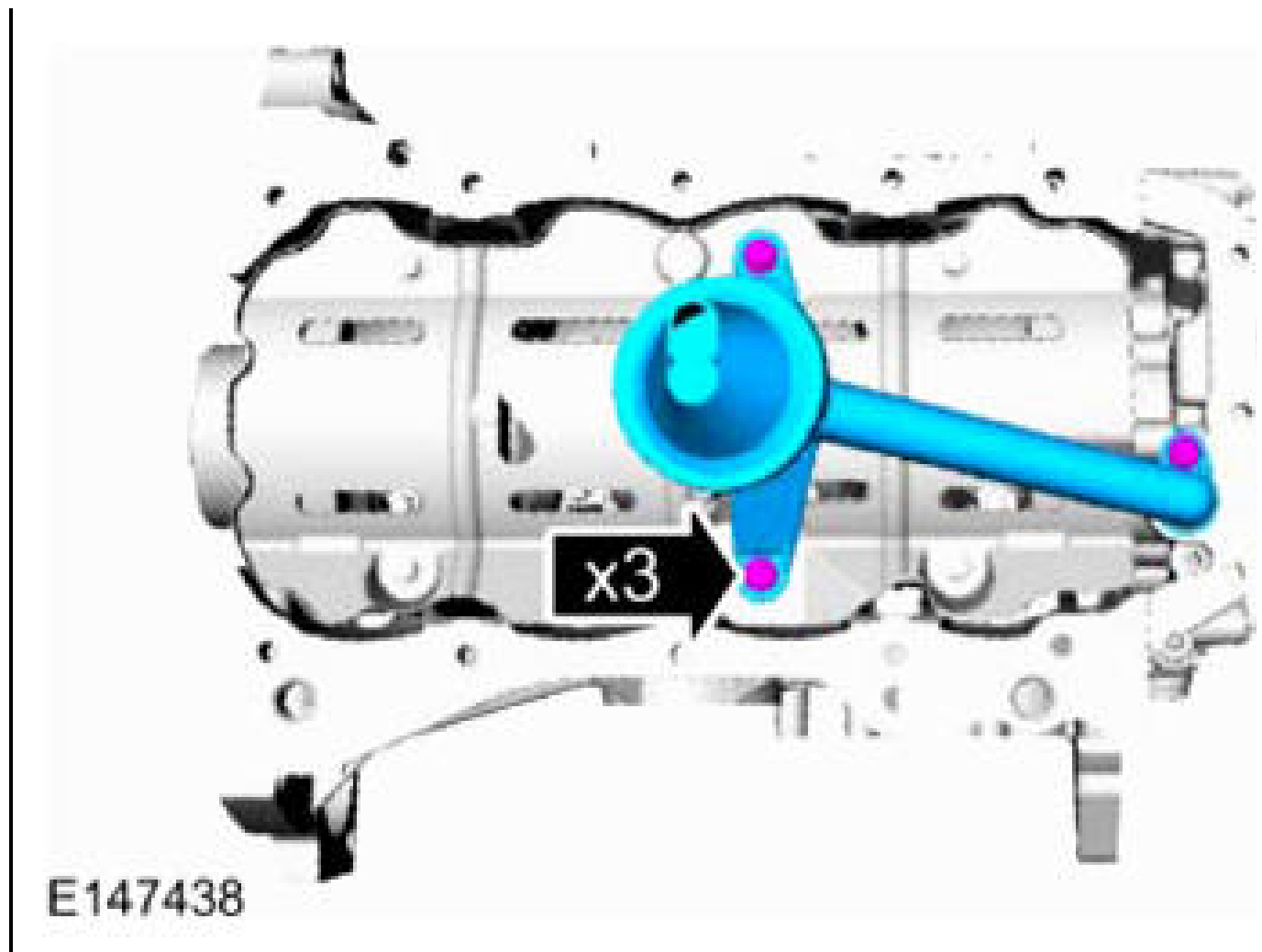
Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

OIL PUMP

Removal

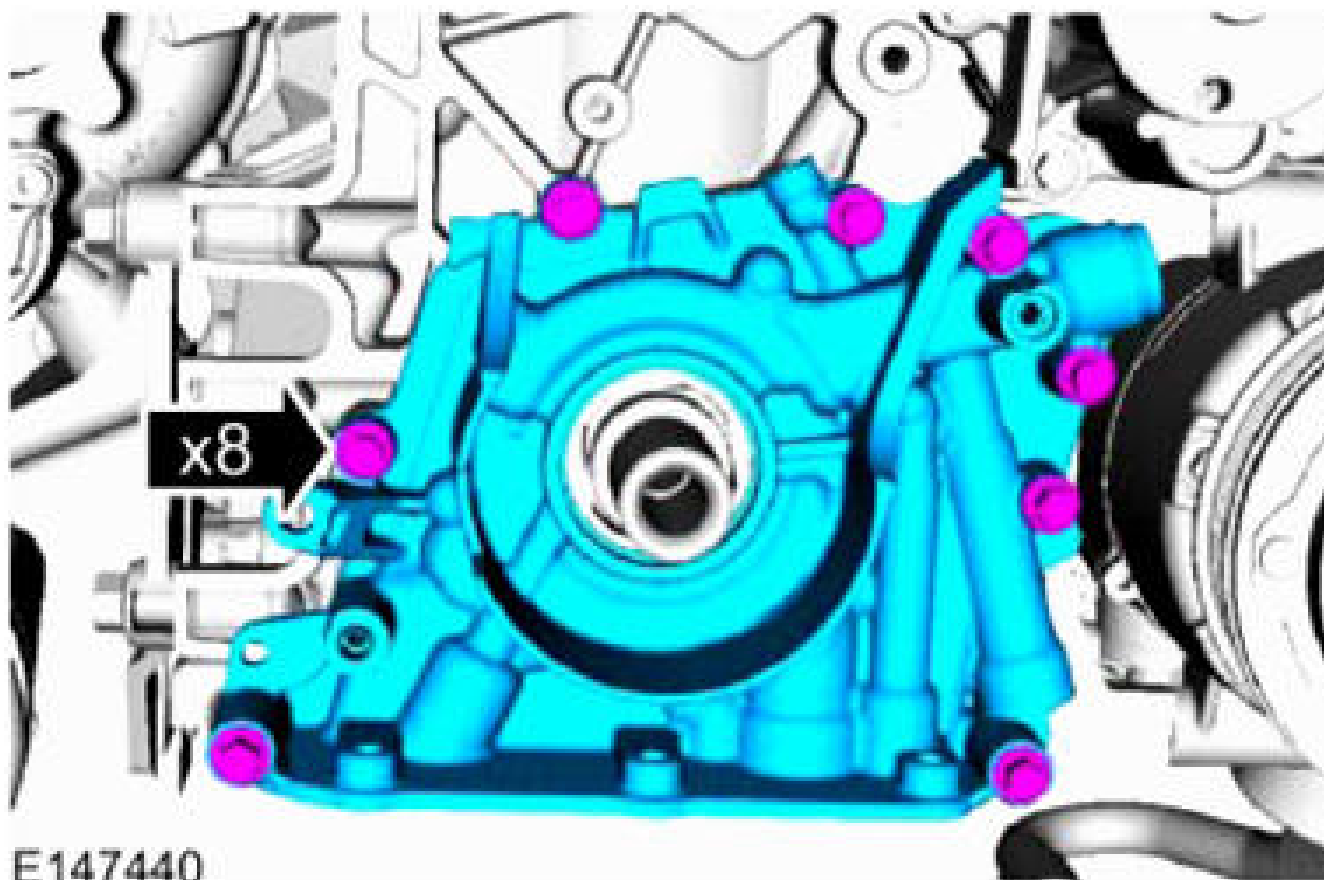
1. Remove the following items:
 1. Refer to: **CRANKSHAFT FRONT SEAL** .
 2. Refer to: **OIL PAN** .

2.

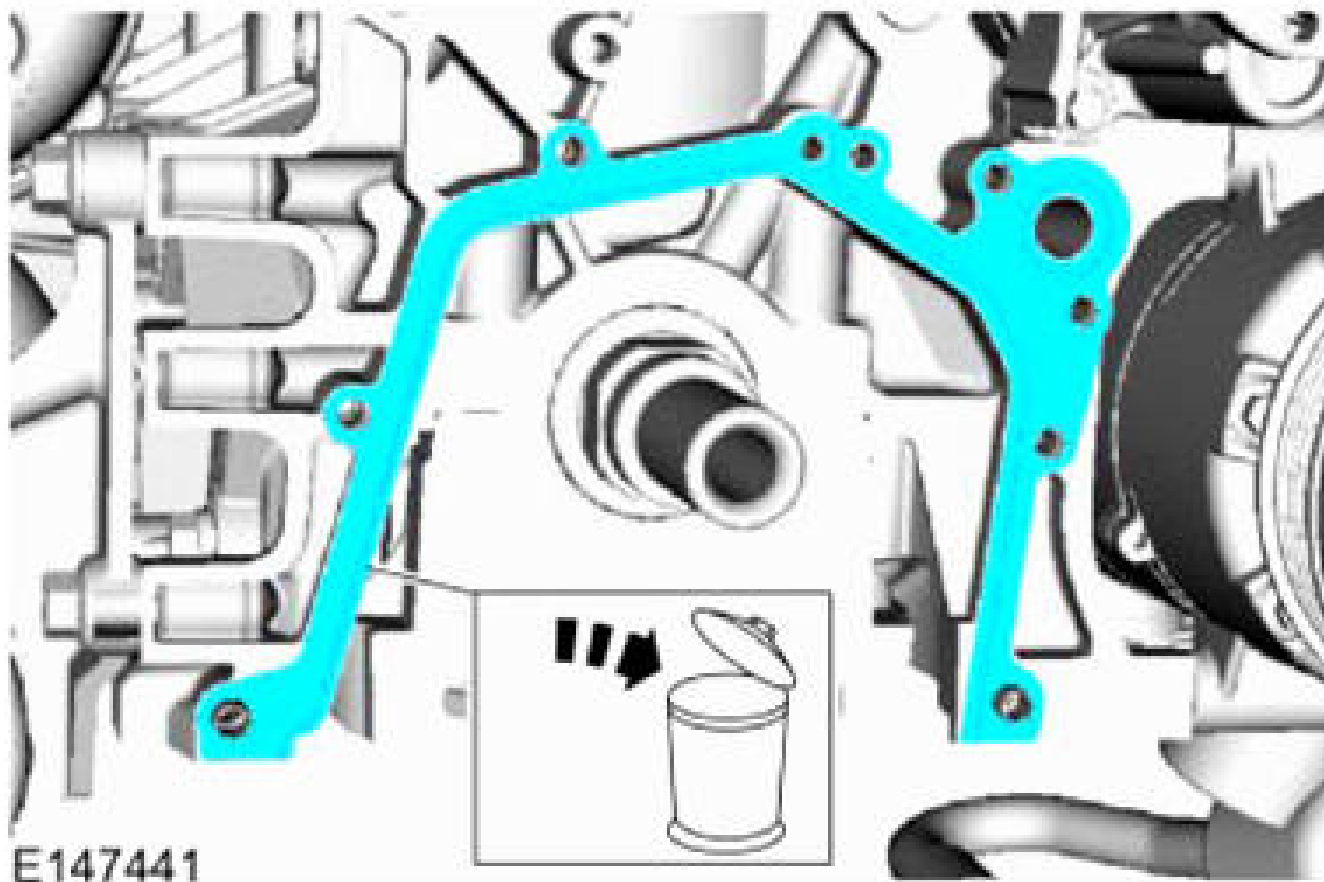


2.

3. **NOTE:** Note the different lengths of the bolts.



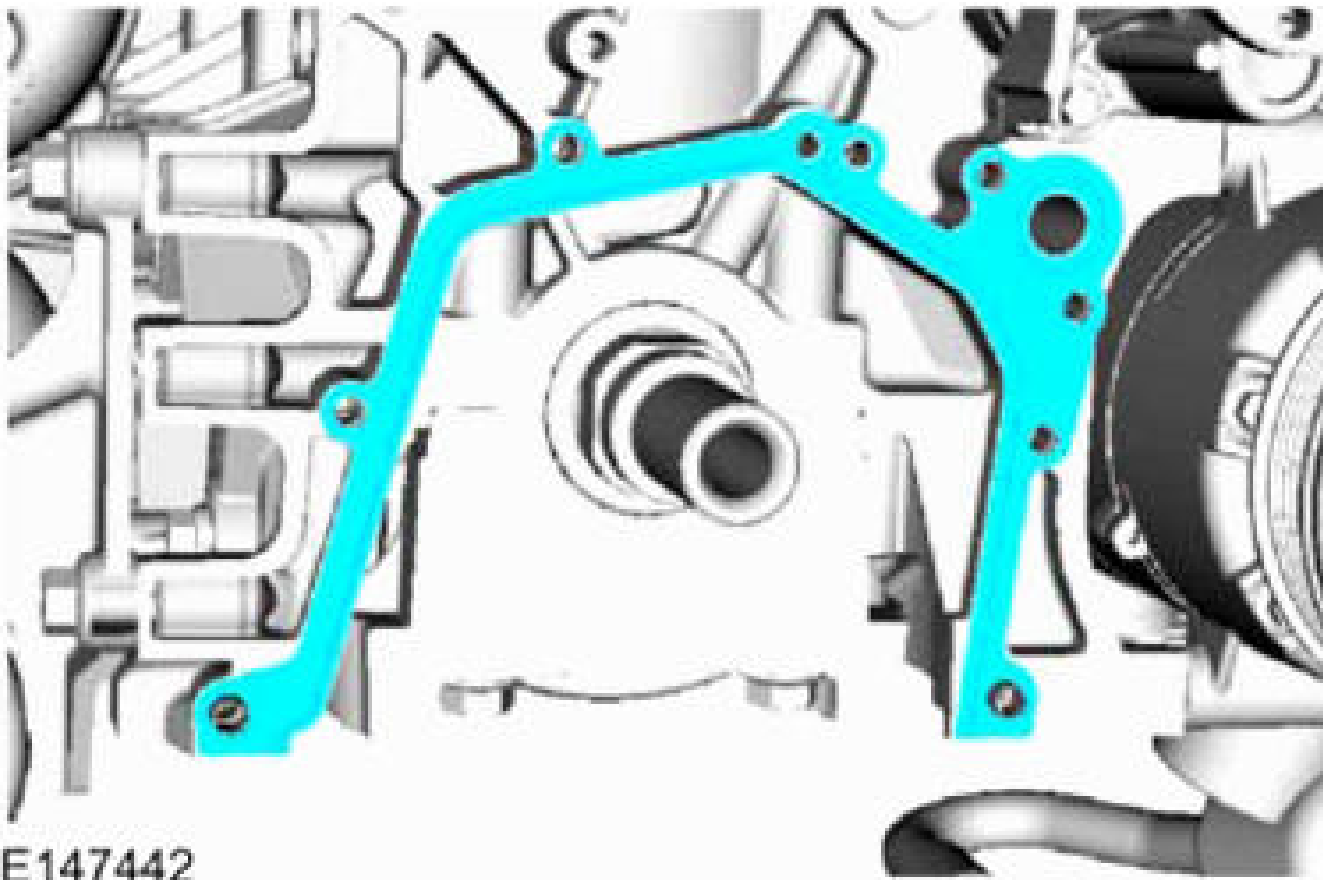
4.



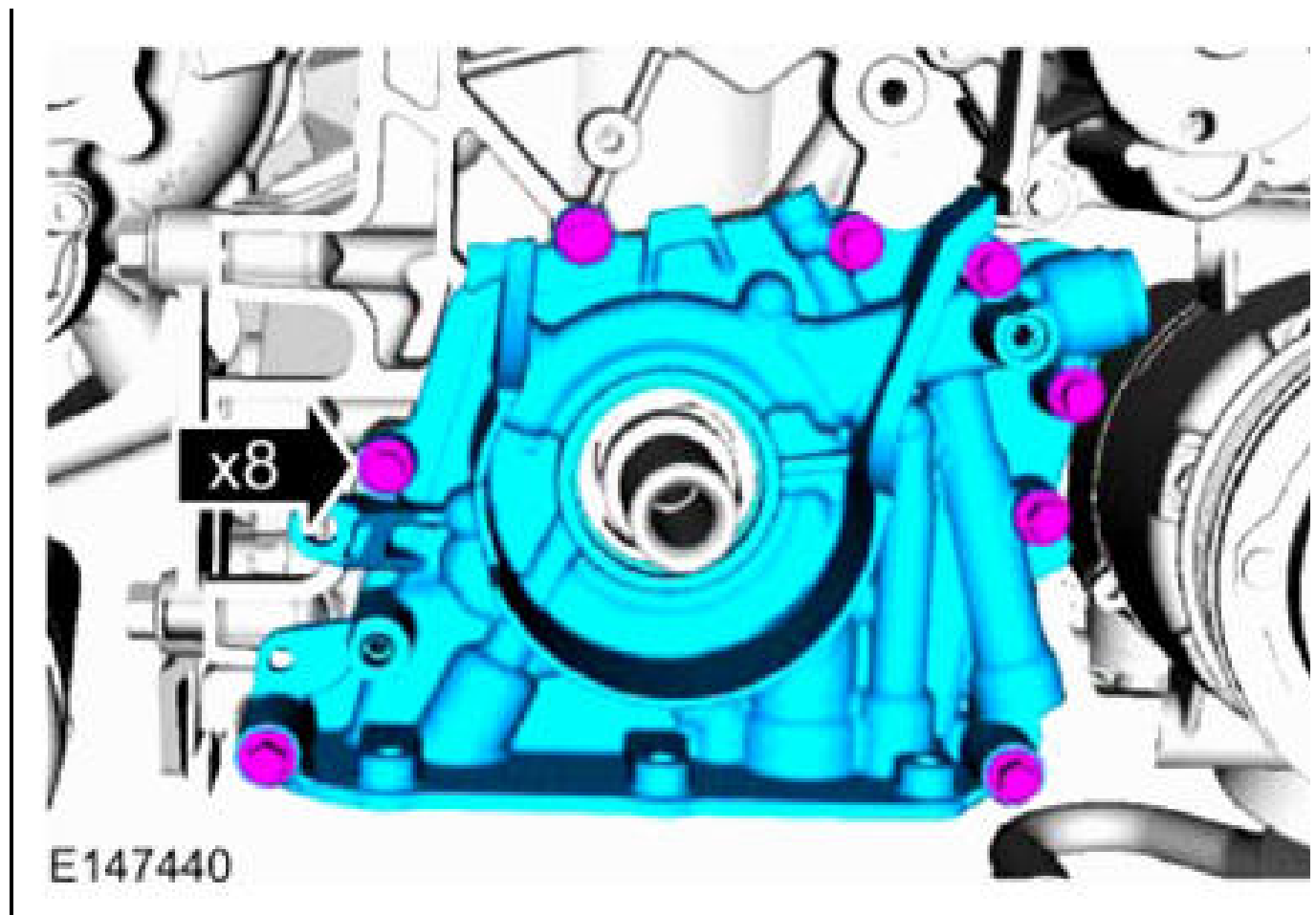
4.

Installation

1.



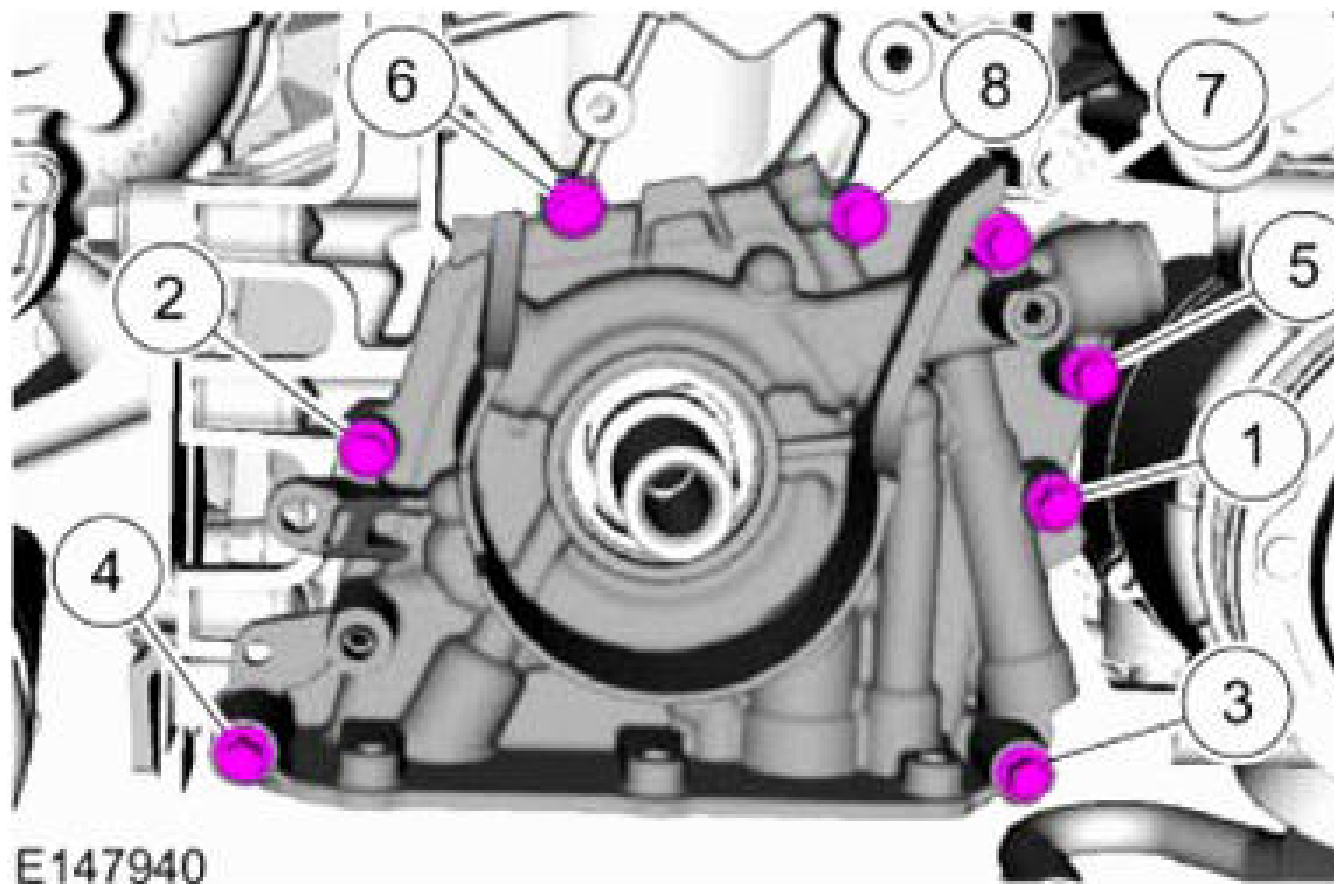
- 1.
2. **NOTE:** Only tighten the bolts finger tight at this stage.



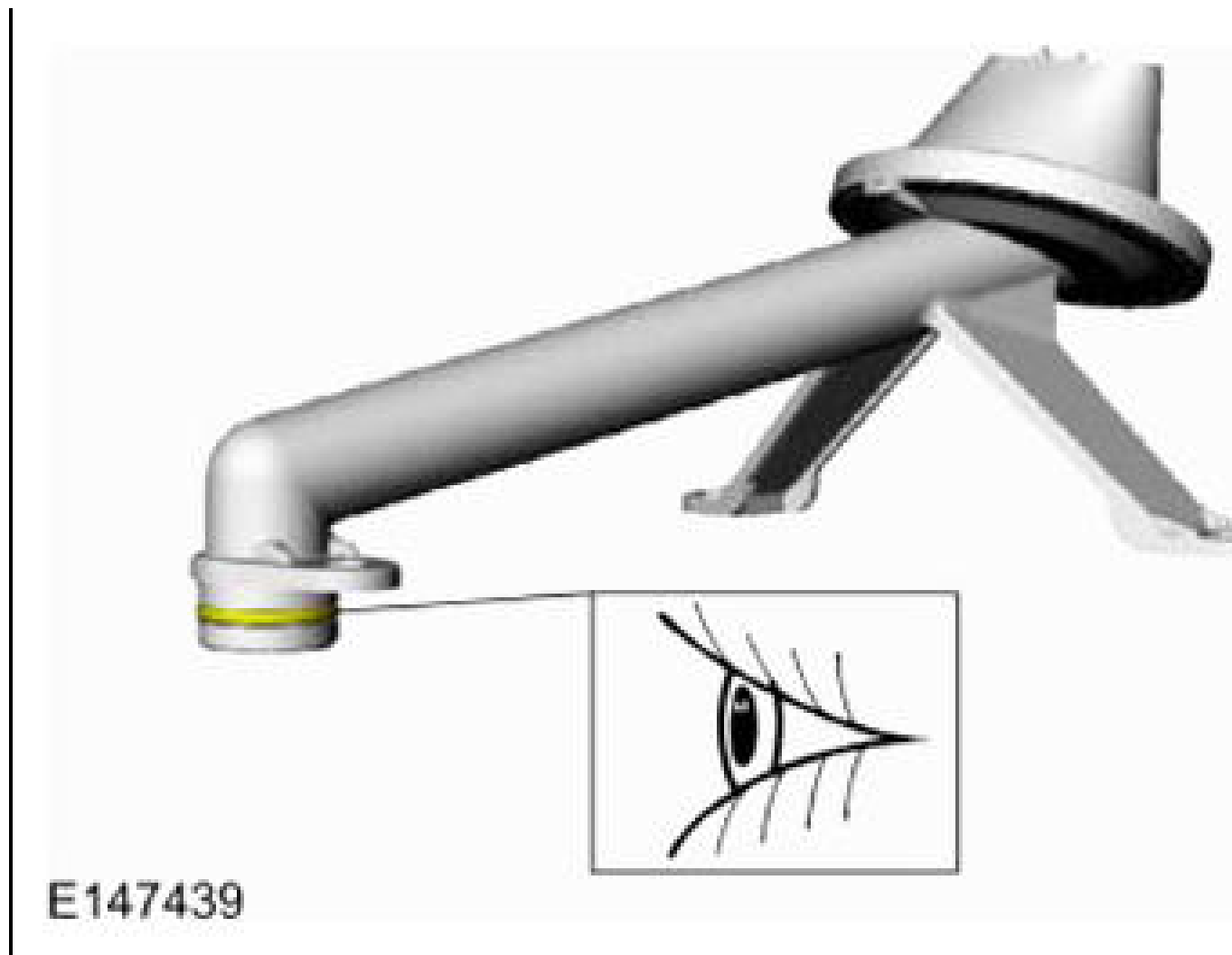
3. *Torque :*

Stage 1: 5.5 Nm

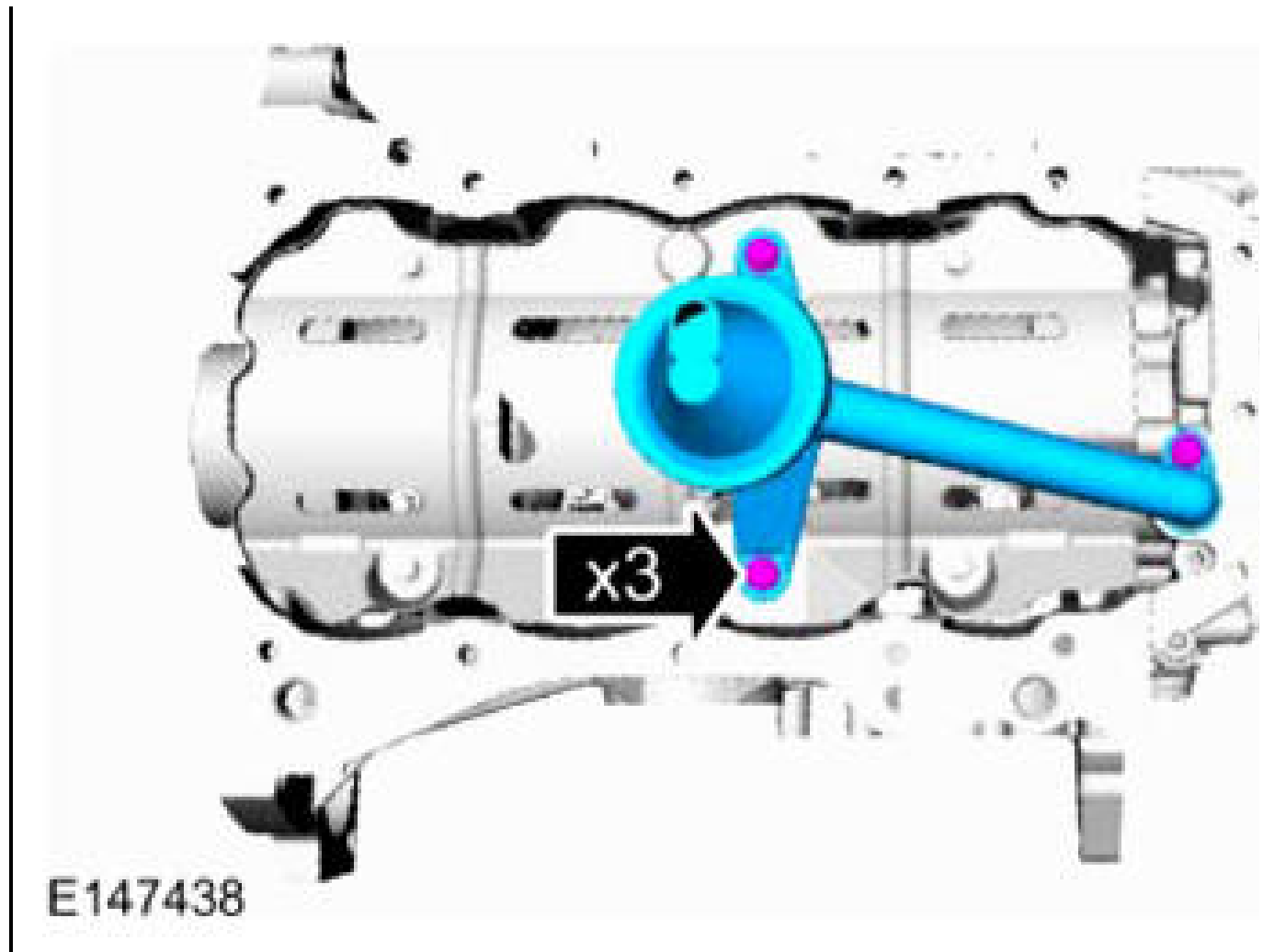
Stage 2: 9.5 Nm



4. **NOTE:** The O-ring seal is to be reused unless damaged.



5. *Torque* : 9.5 Nm



6. Install the following items:

1. Refer to: **OIL PAN** .
2. Refer to: **CRANKSHAFT FRONT SEAL** .

VALVE TAPPETS

MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

Removal

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

failure.

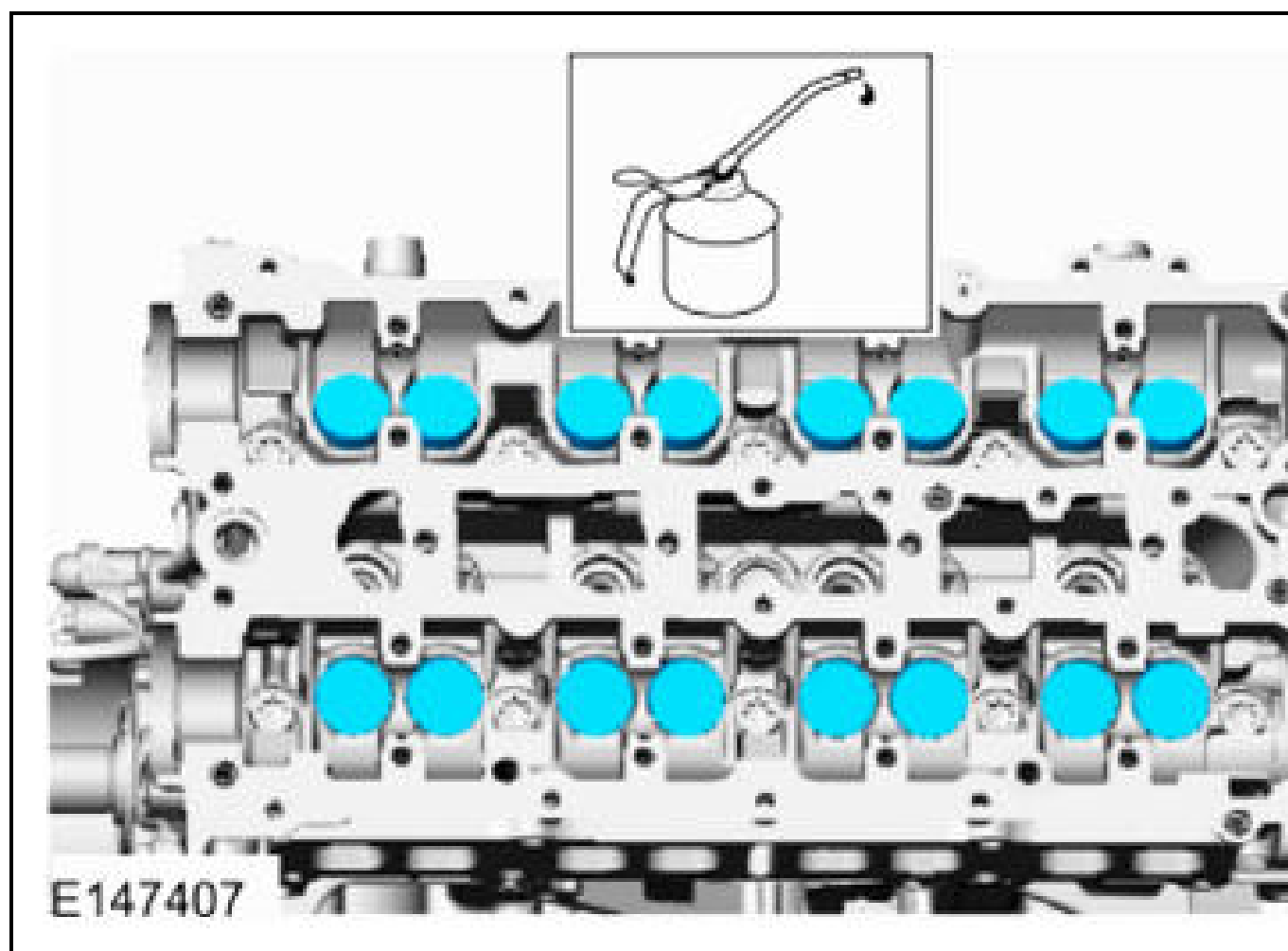
NOTE: Removal steps in this procedure may contain installation details.

1. Refer to: CAMSHAFTS .

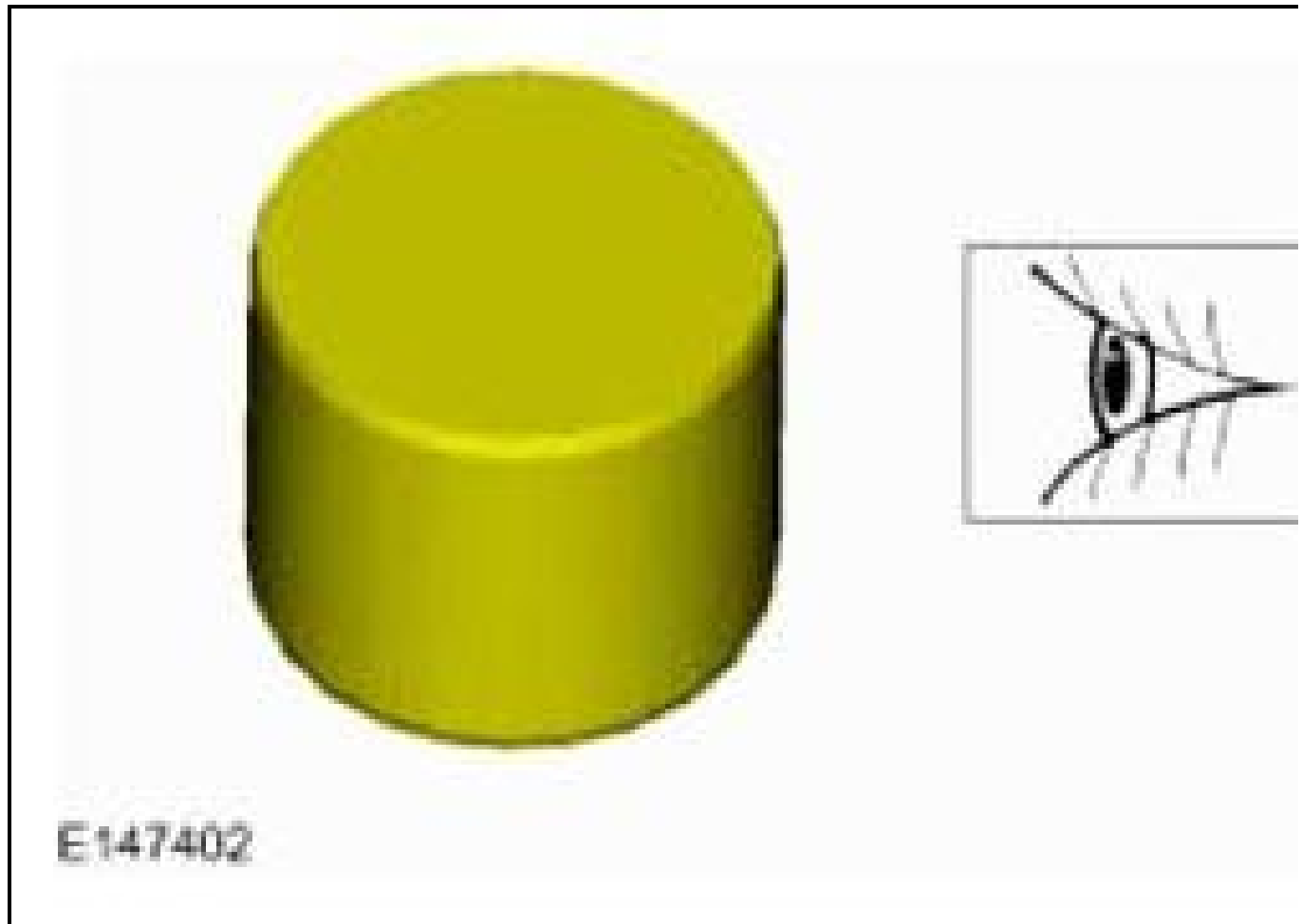
NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

2.
NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



3. Install new components as necessary.

**Installation**

1. To install, reverse the removal procedure.

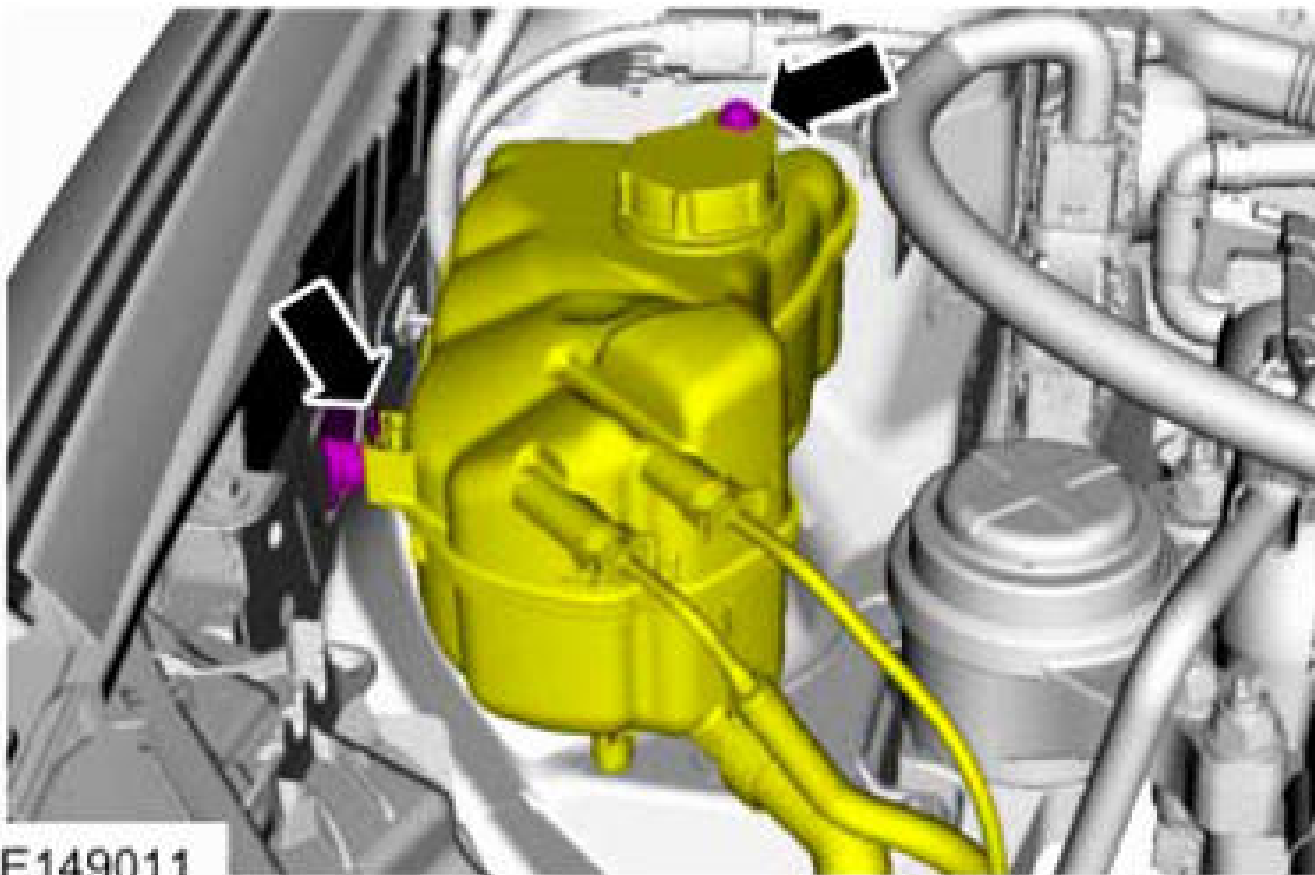
ENGINE MOUNT**SPECIAL TOOLS/GENERAL EQUIPMENT**

Trolley Jack
Wooden Block

Removal

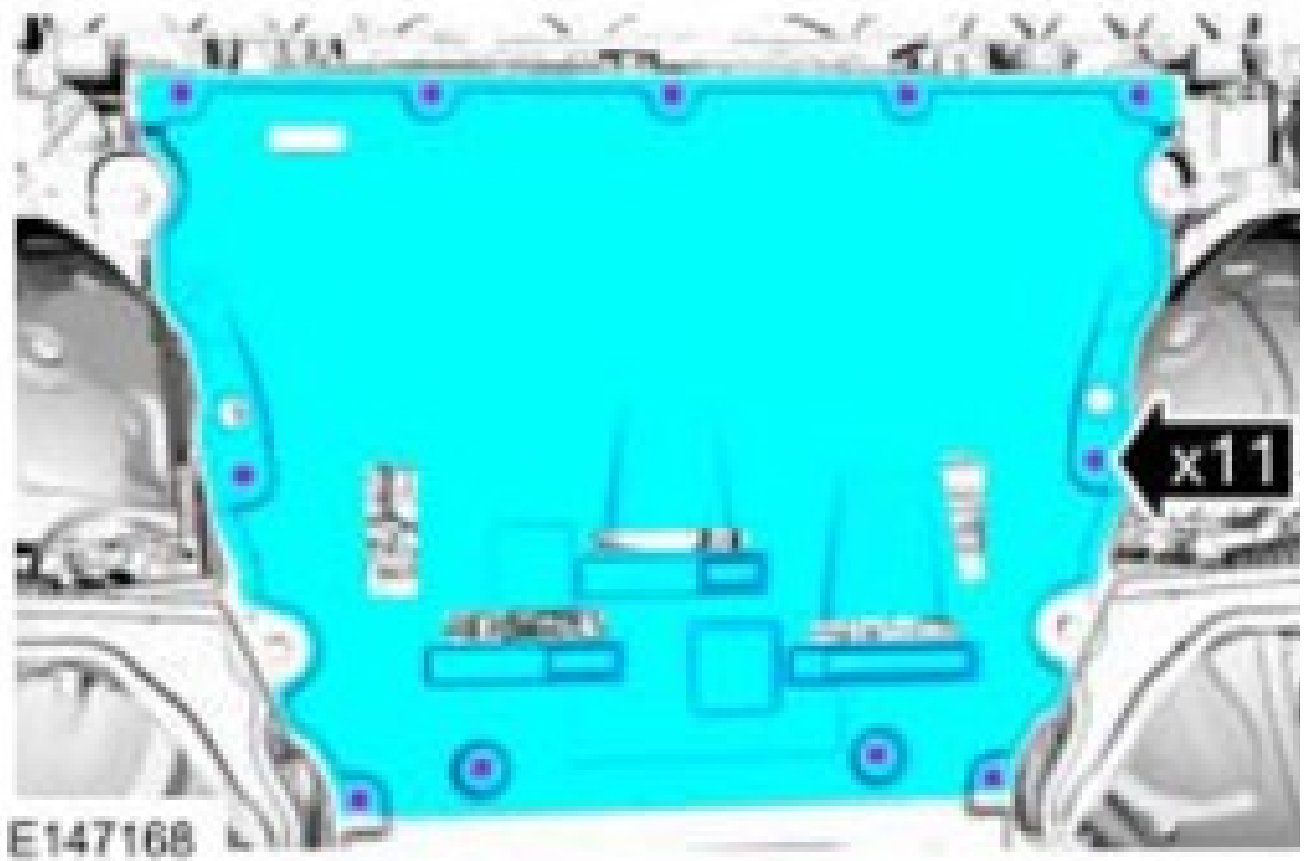
1. Refer to: **JACKING AND LIFTING - OVERVIEW** .

- 2.



2.

3.

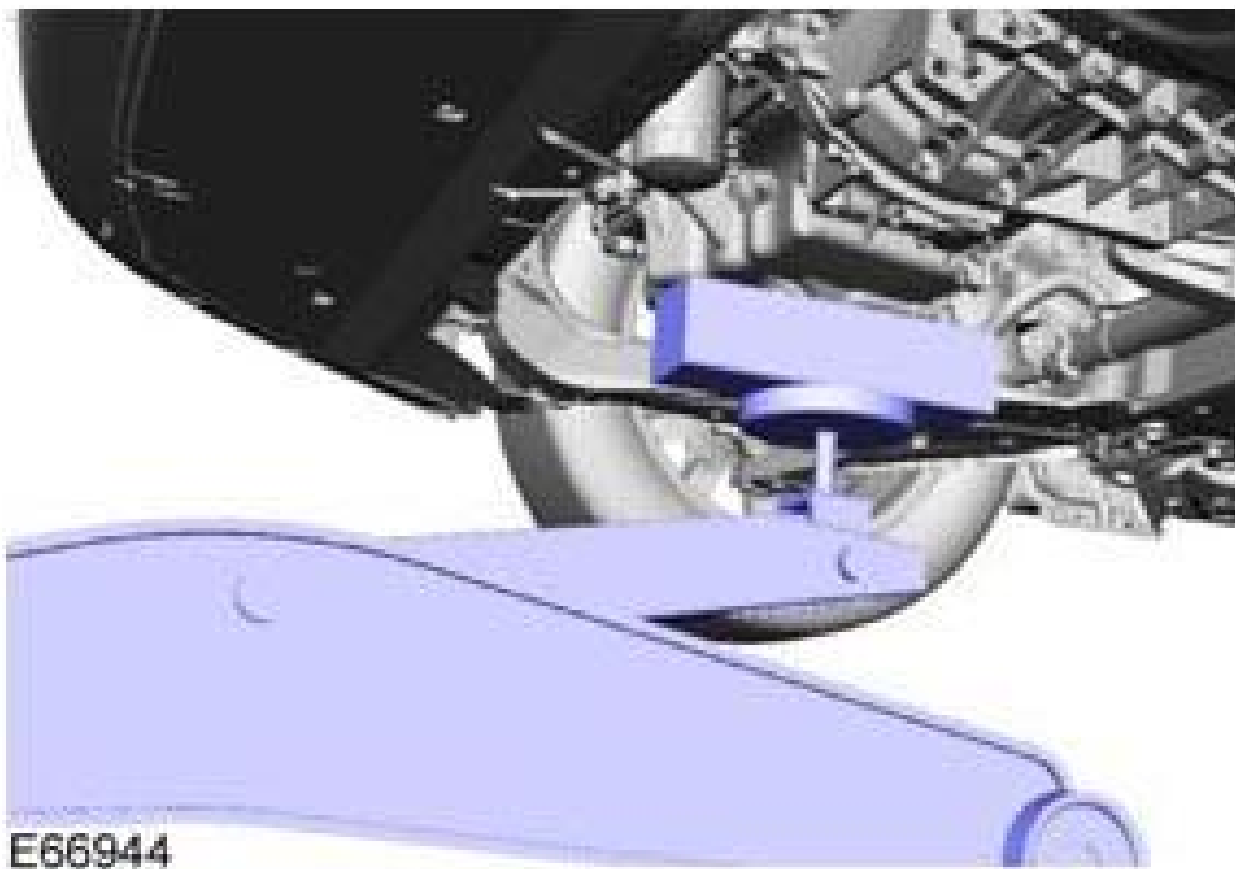


3.

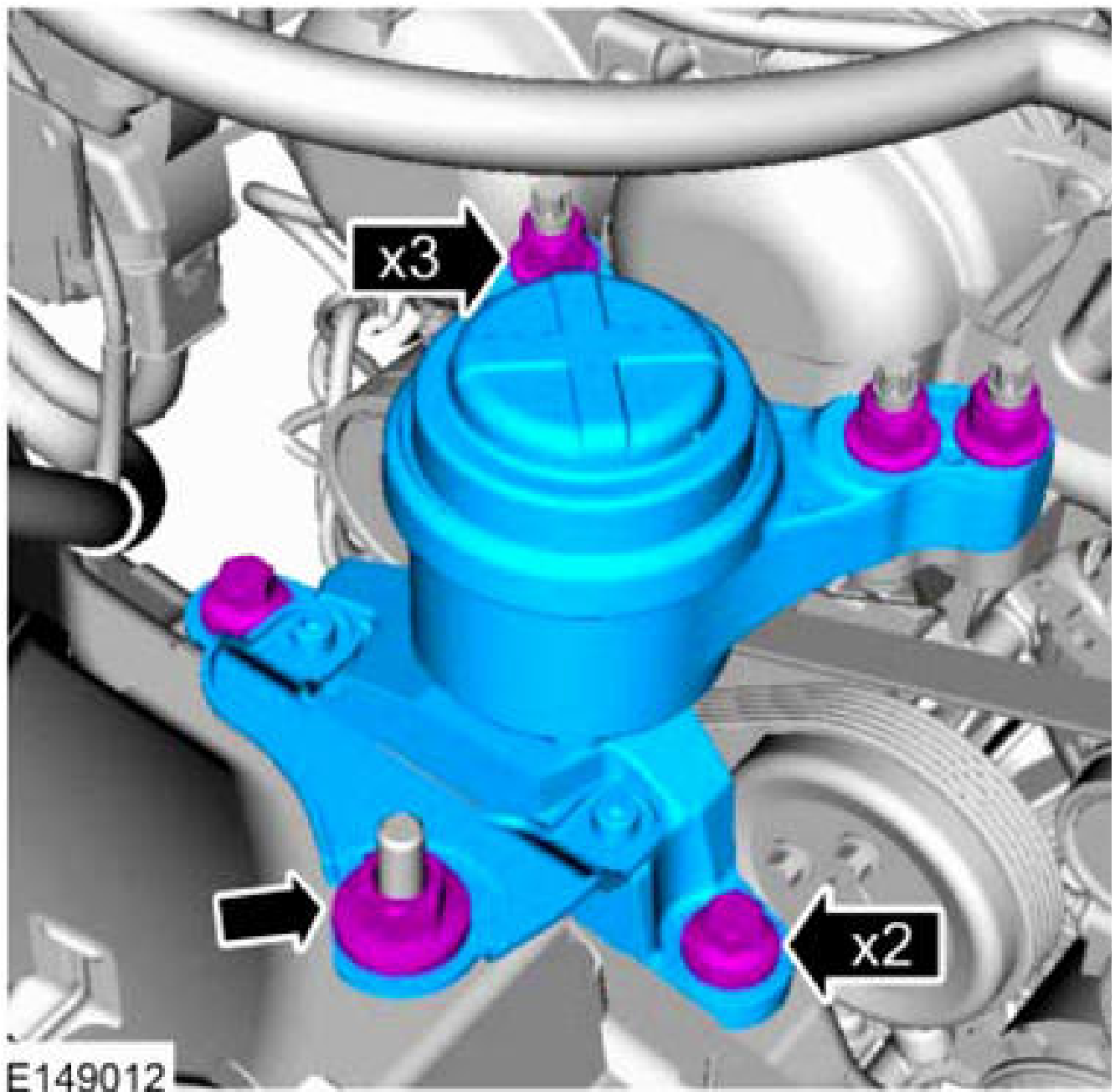
4. Install the following items:

- *General Equipment* : Trolley Jack

General Equipment : Wooden Block



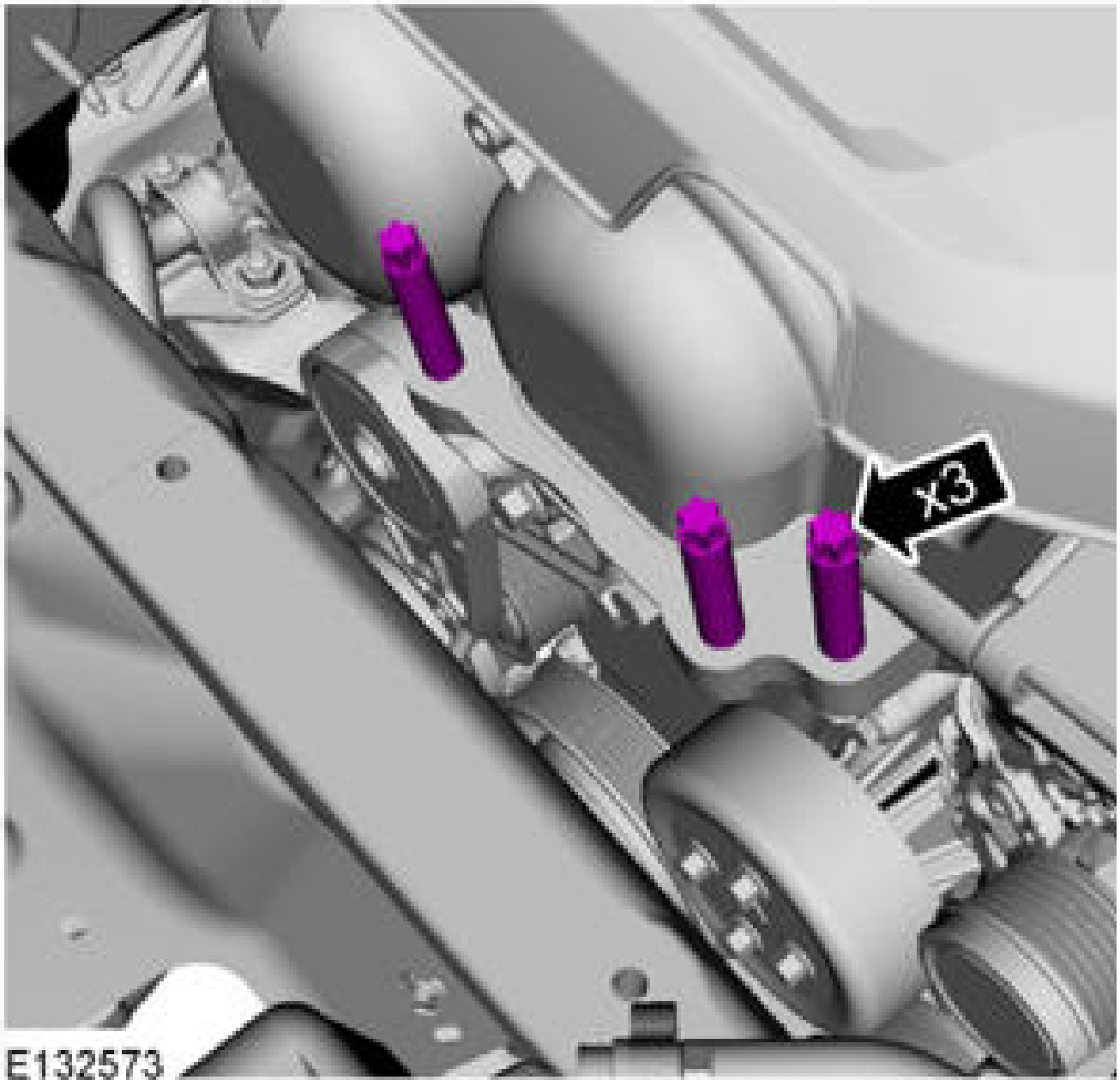
5.



5.

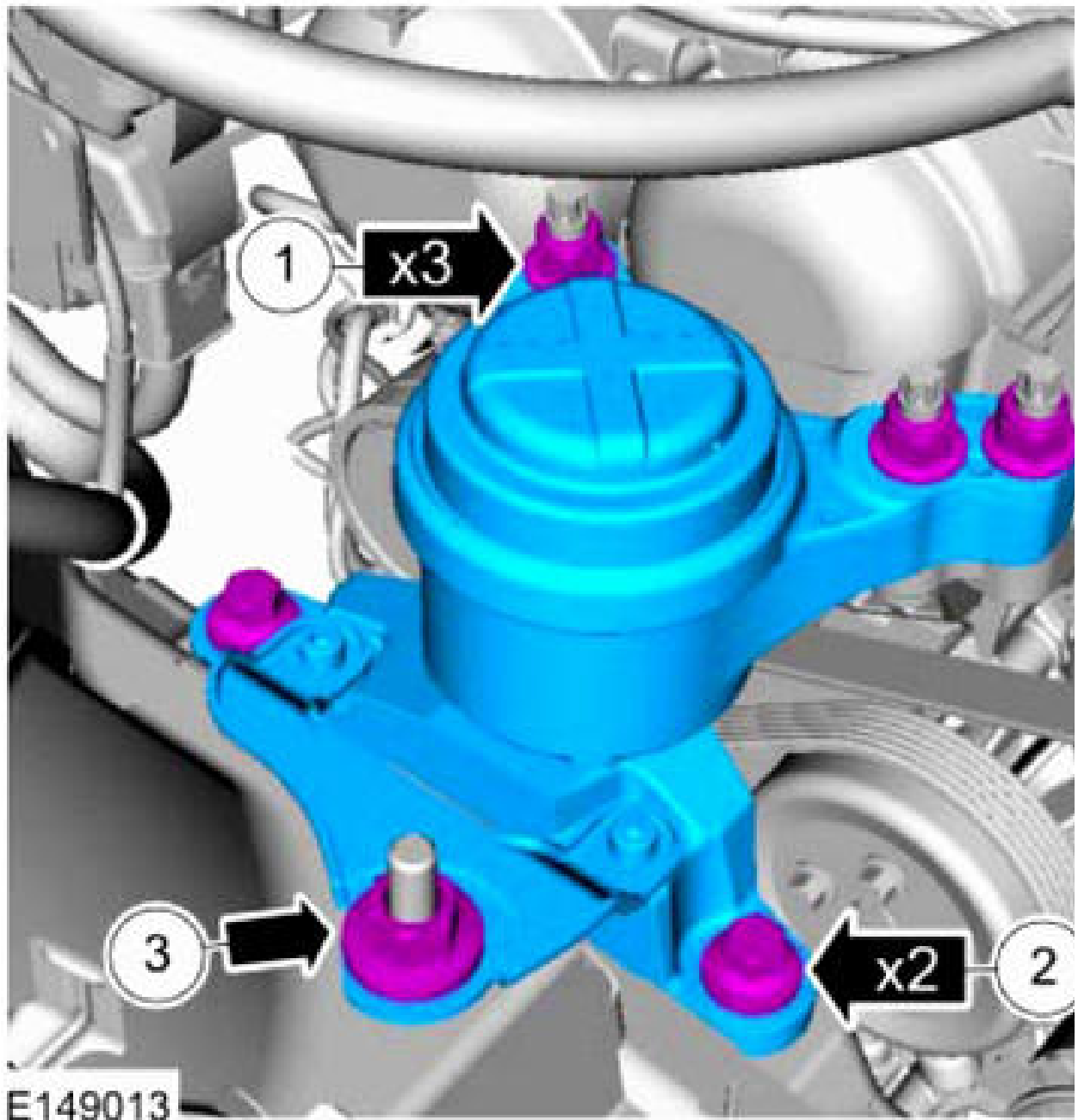
Installation

1. *Torque* : 12 Nm



2.

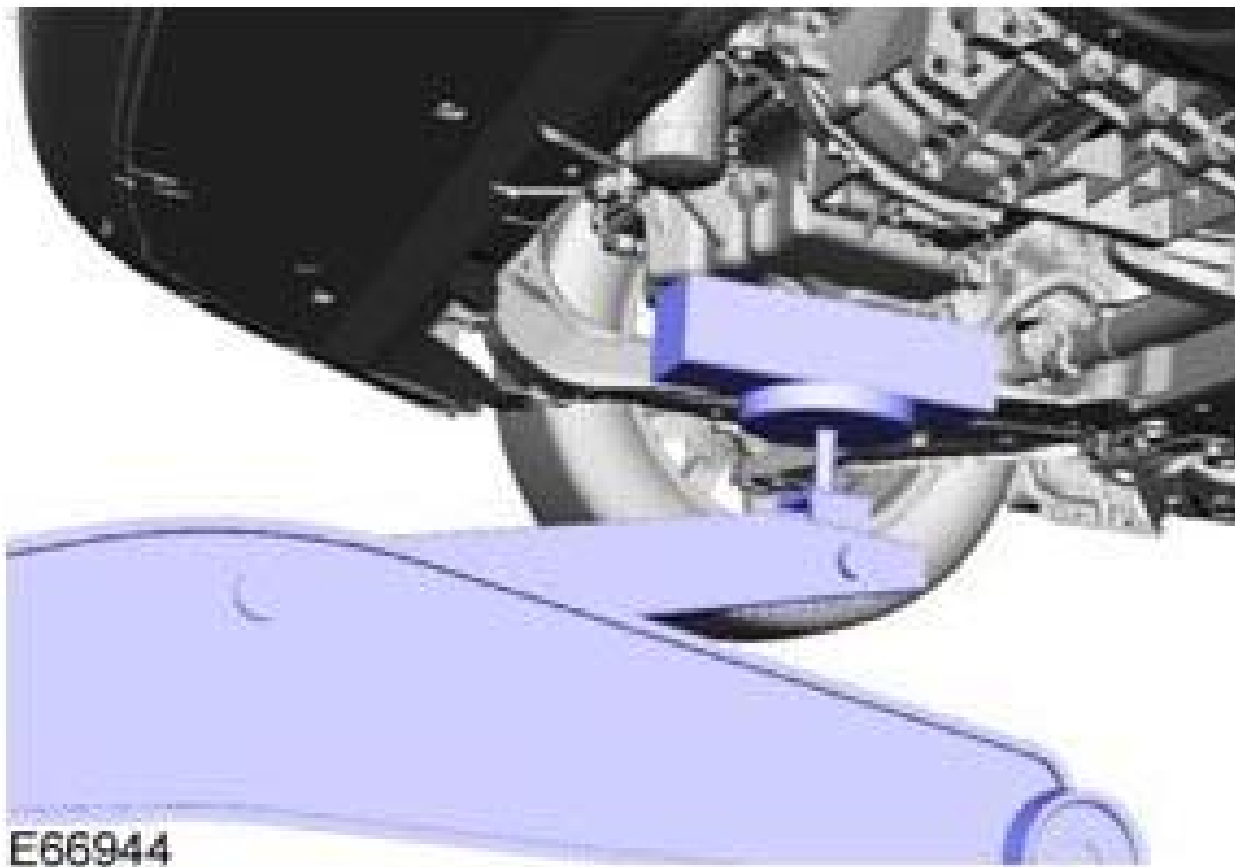
1. *Torque* : 90 Nm
2. Finger tight.
3. Finger tight.



3. Remove the following items:

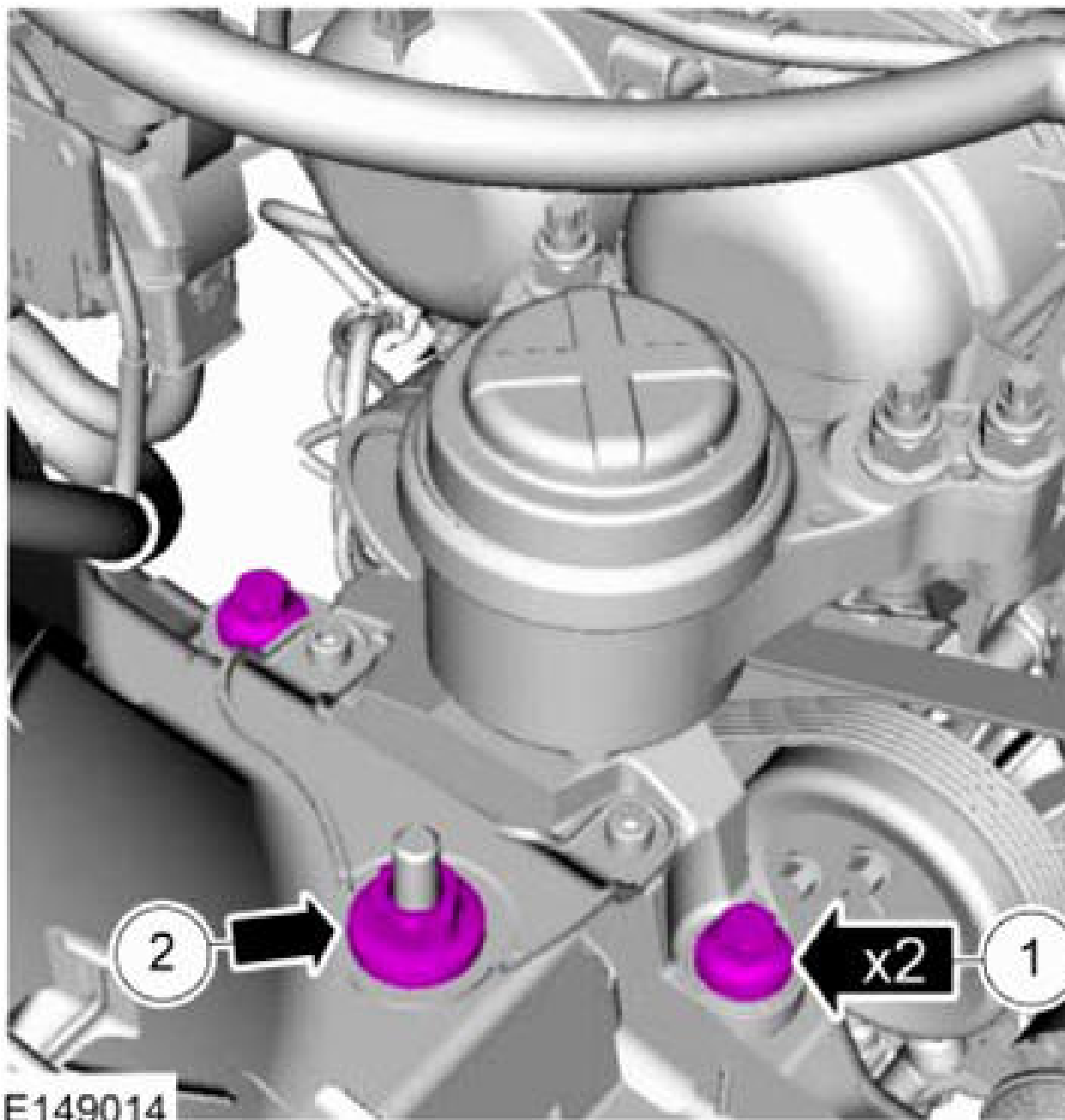
- *General Equipment* : Trolley Jack

General Equipment : Wooden Block

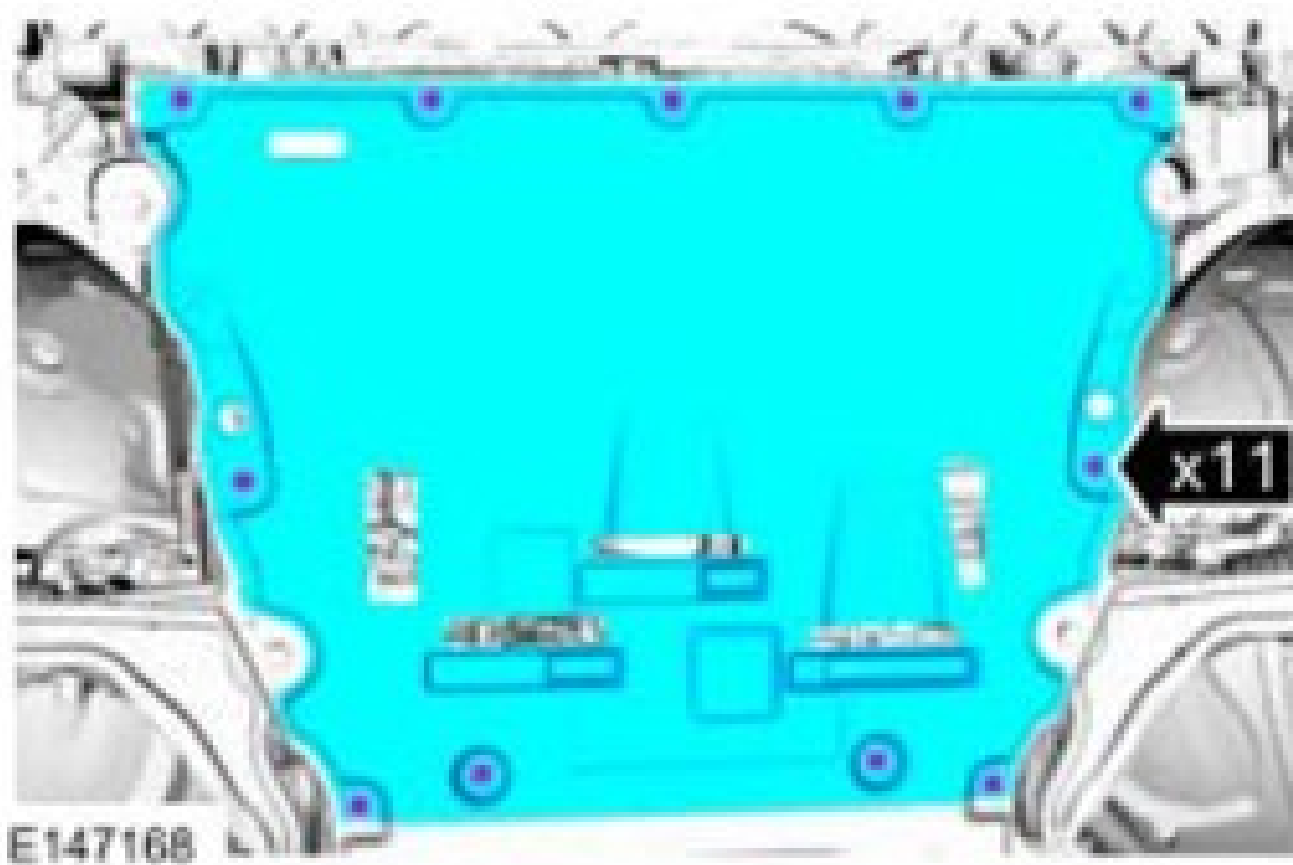


4.

1. *Torque* : 90 Nm
2. *Torque* : 90 Nm

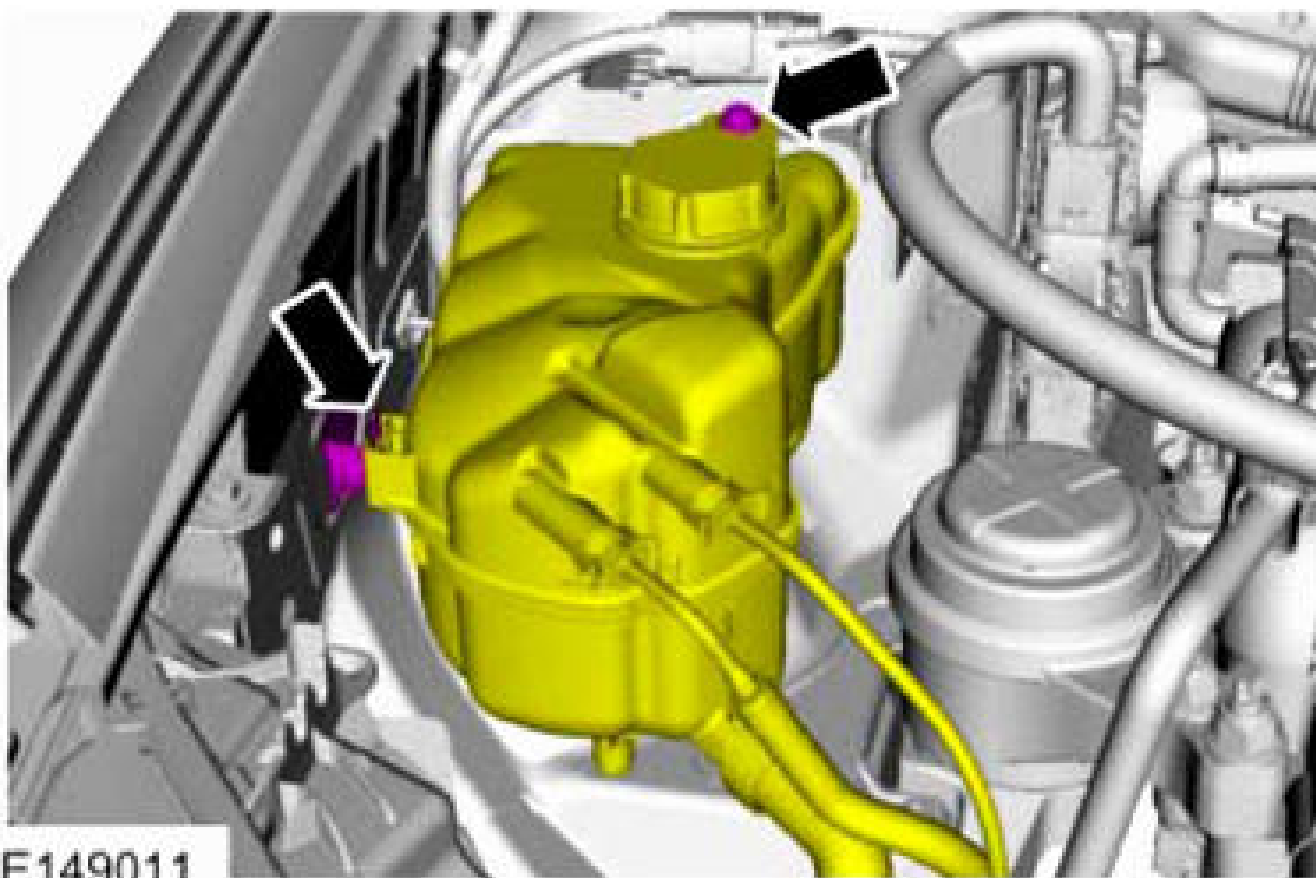


5.



5.

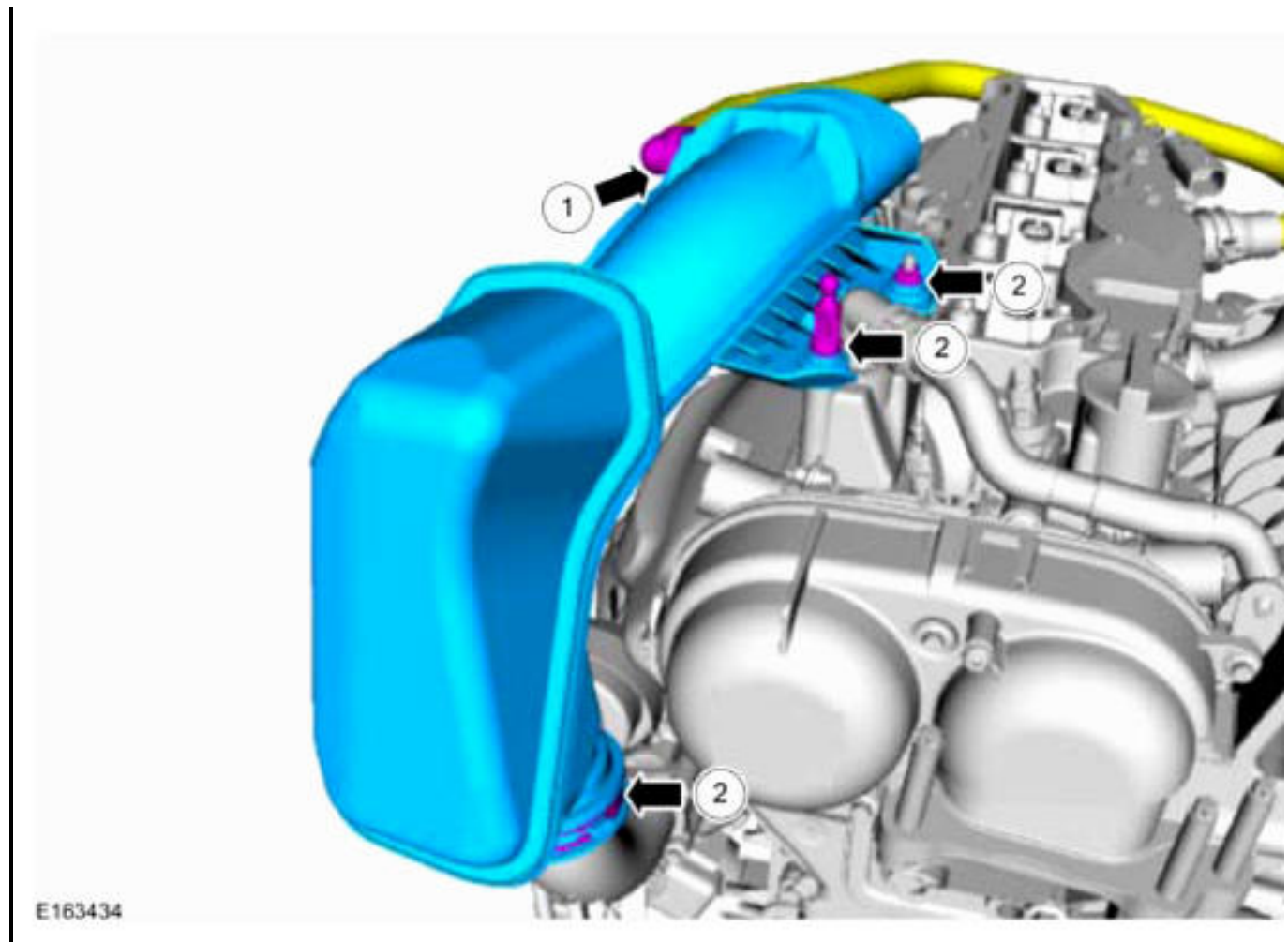
6. *Torque* : 5 Nm



TIMING BELT COVER

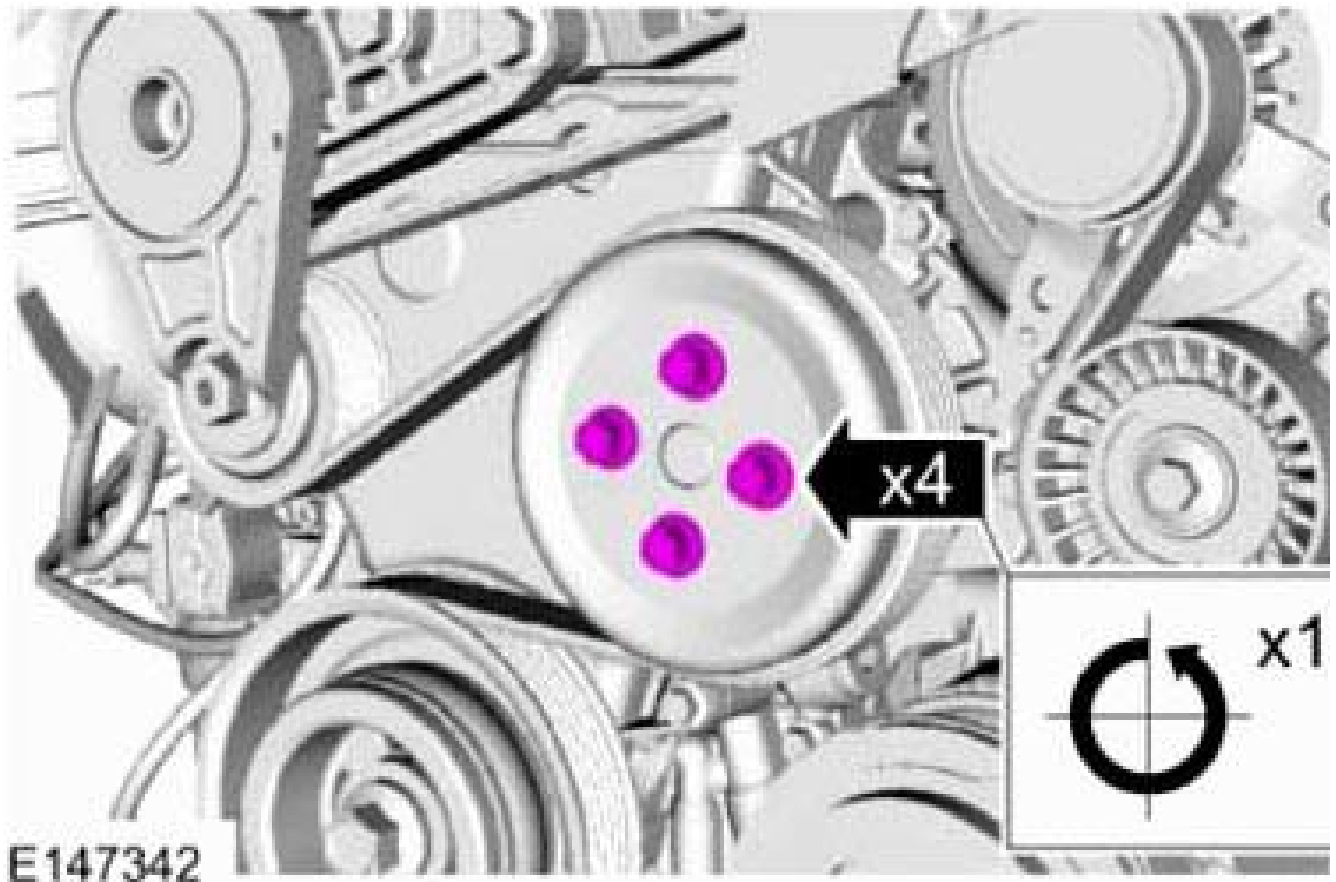
Removal

1. Refer to: AIR CLEANER OUTLET PIPE .
2. Refer to: QUICK RELEASE COUPLING .



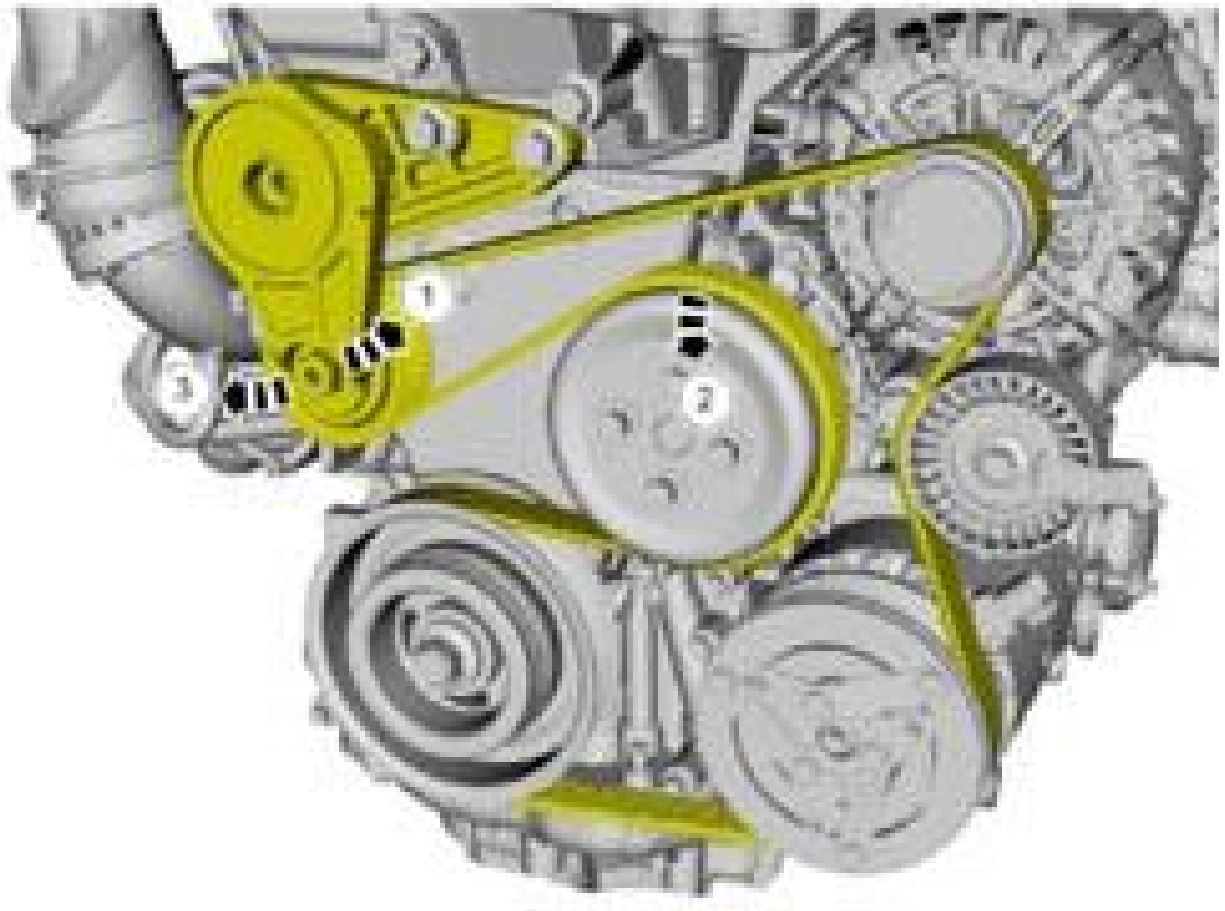
3. Refer to: ENGINE MOUNT .

4.



4.

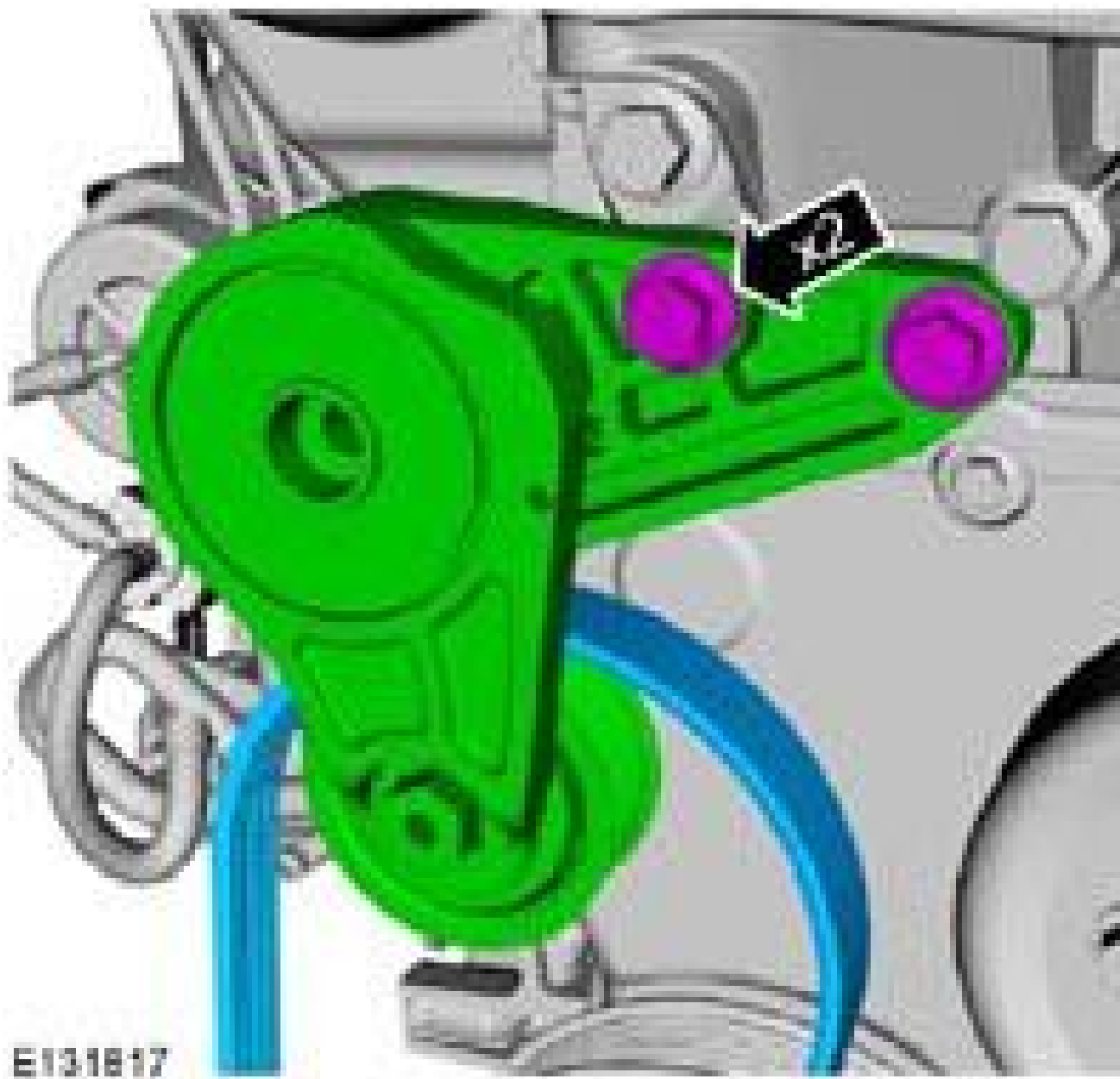
5.



0131014

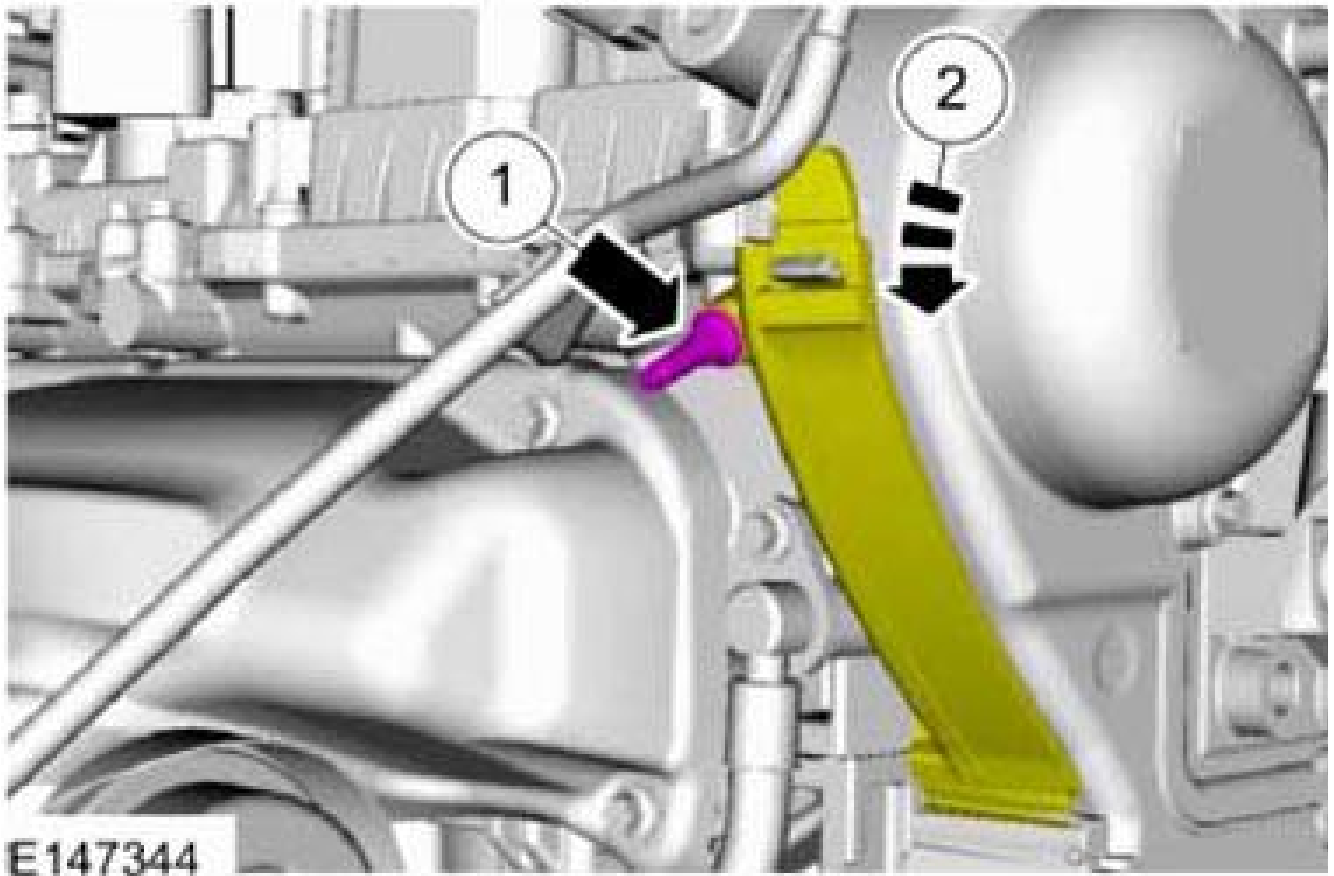
5.

6.



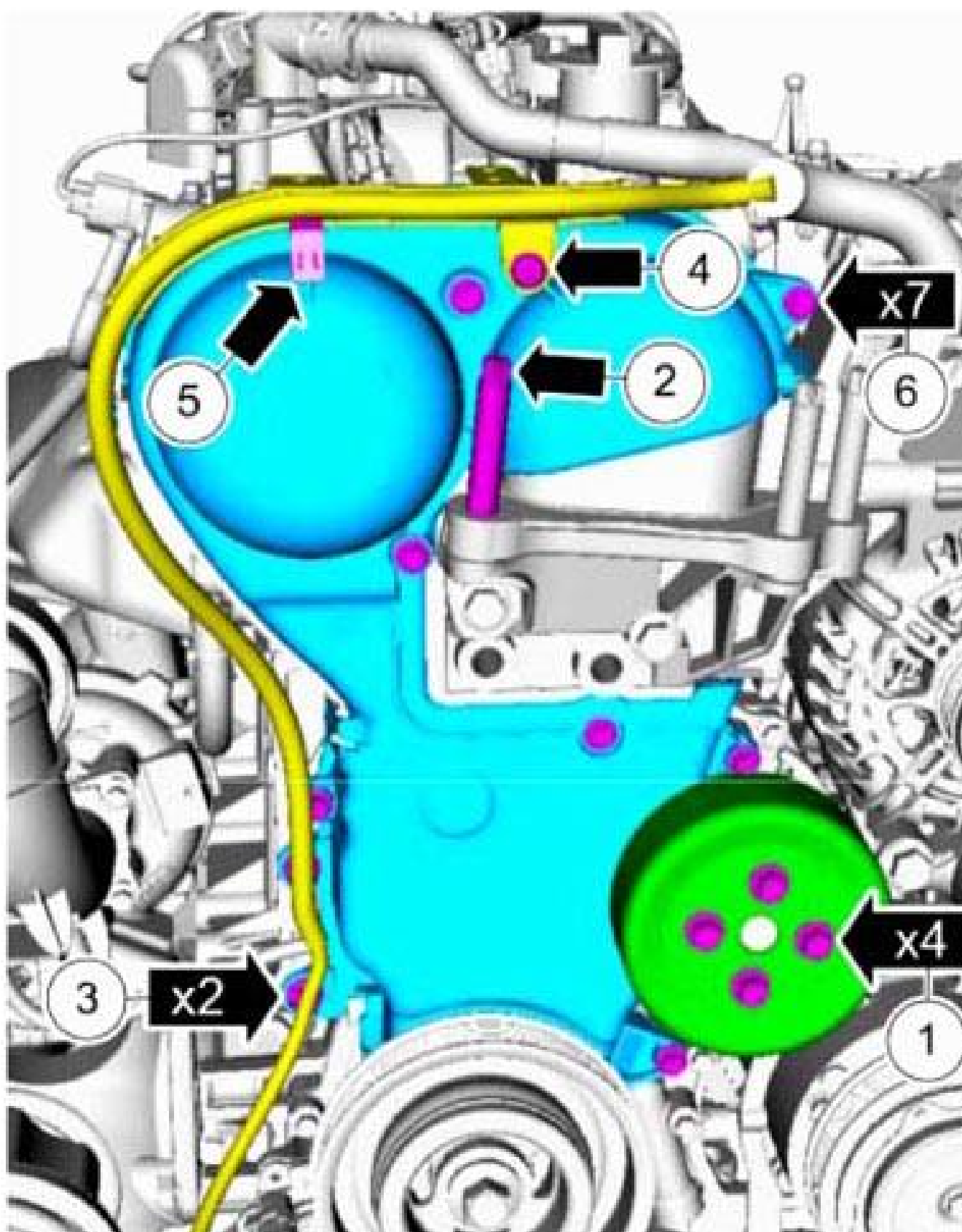
6.

7.



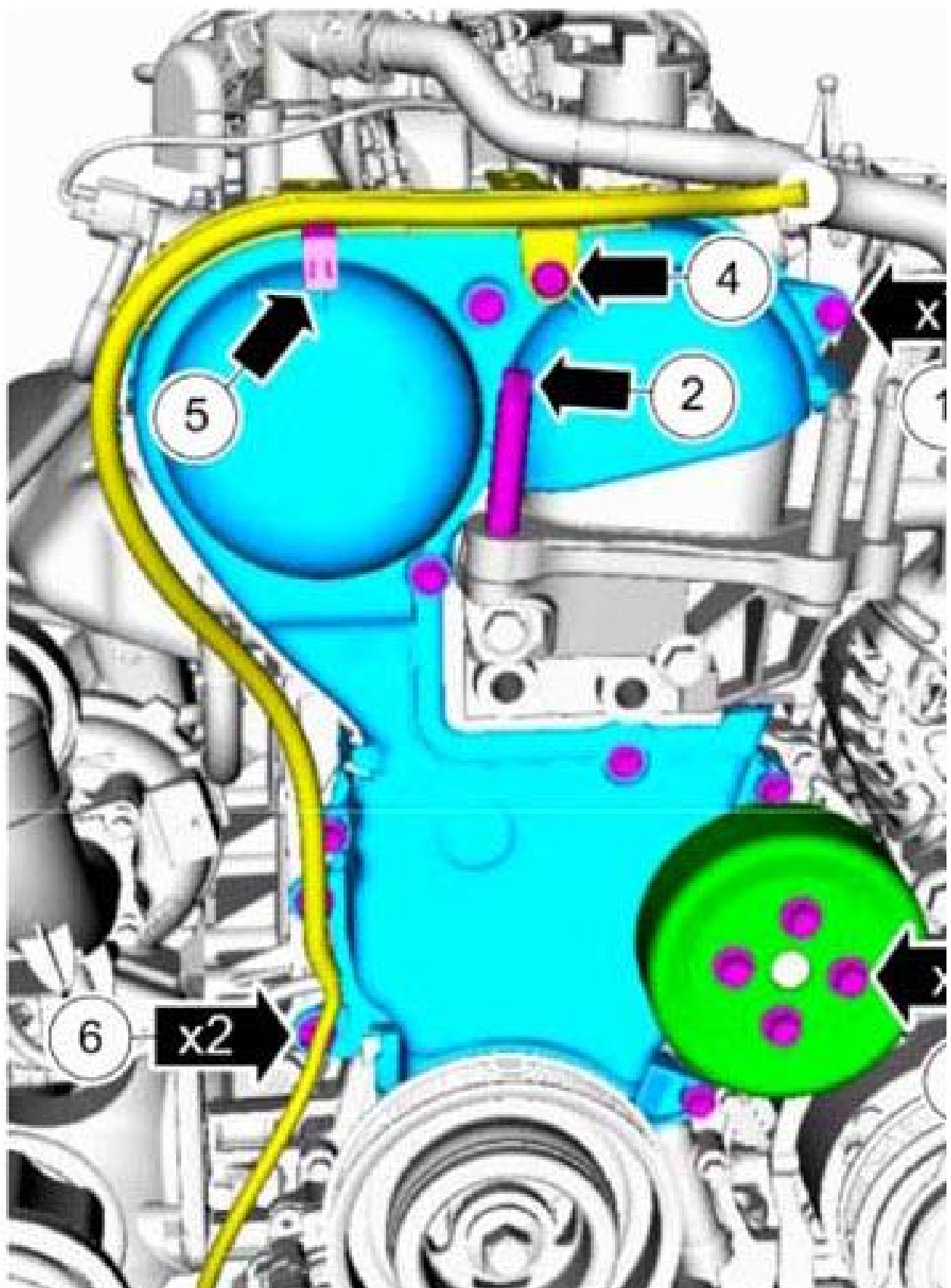
7.

8.

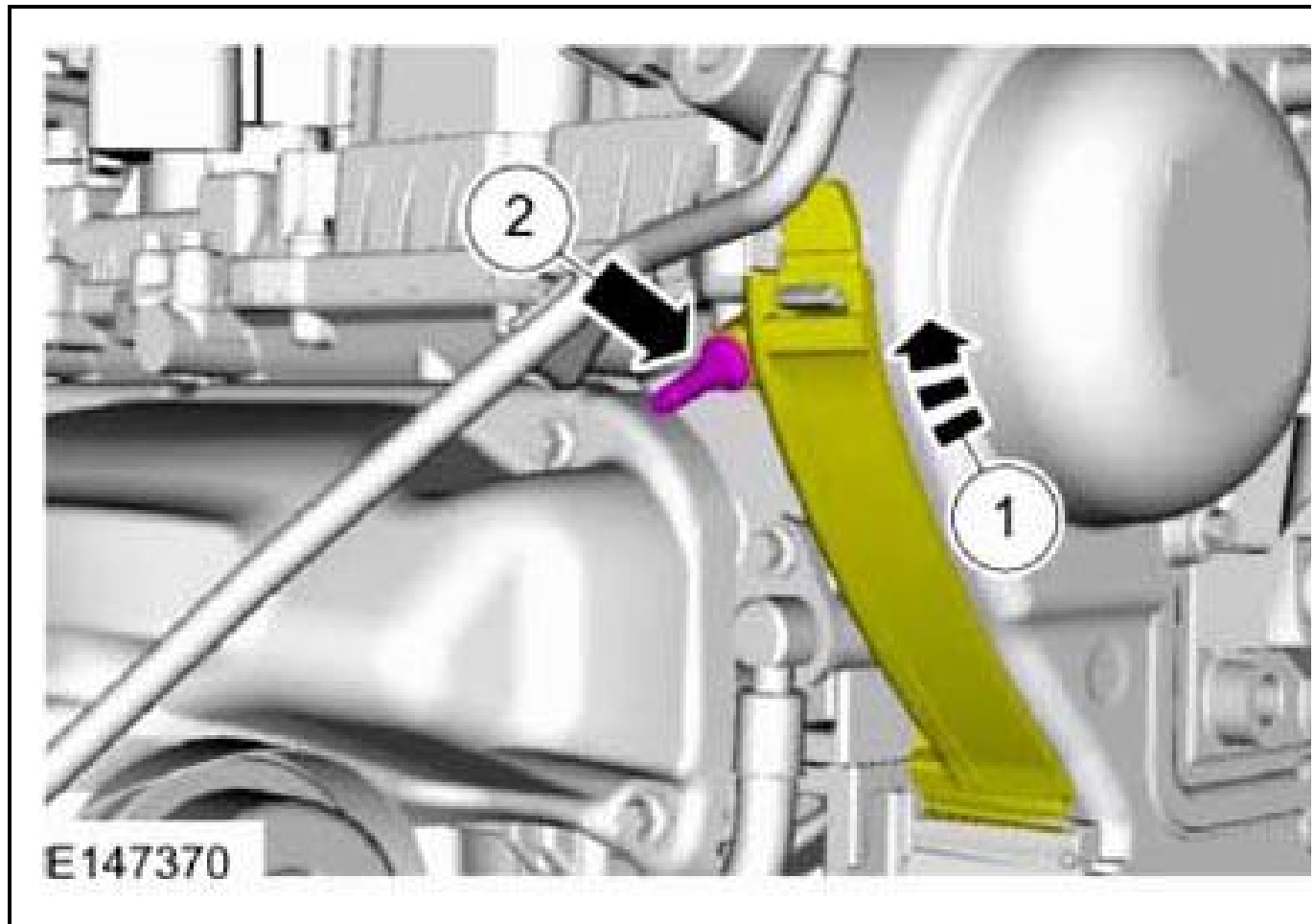


Installation

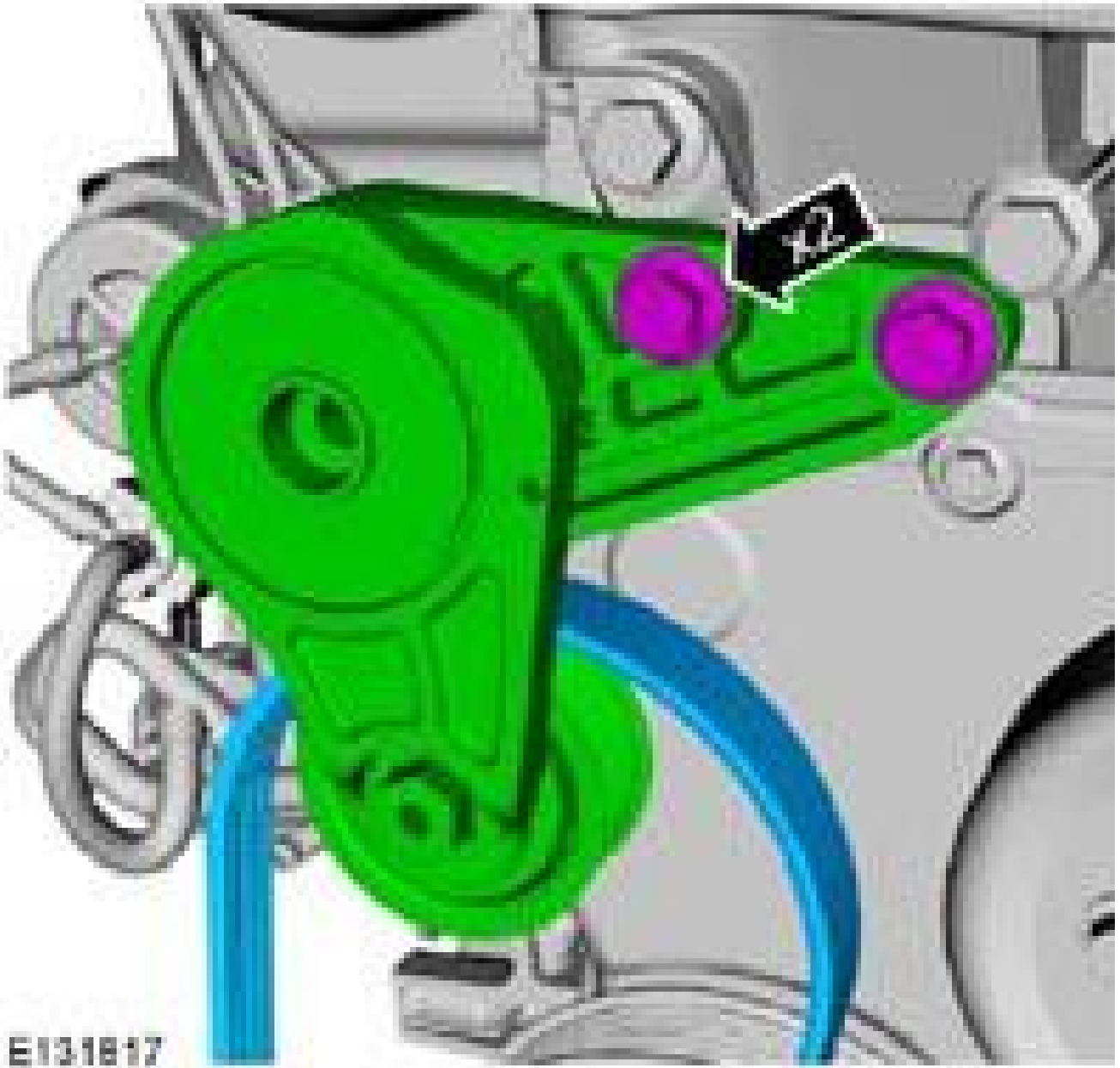
1.
 1. *Torque* : 10 Nm
 2. Finger tight.
 3. Finger tight.

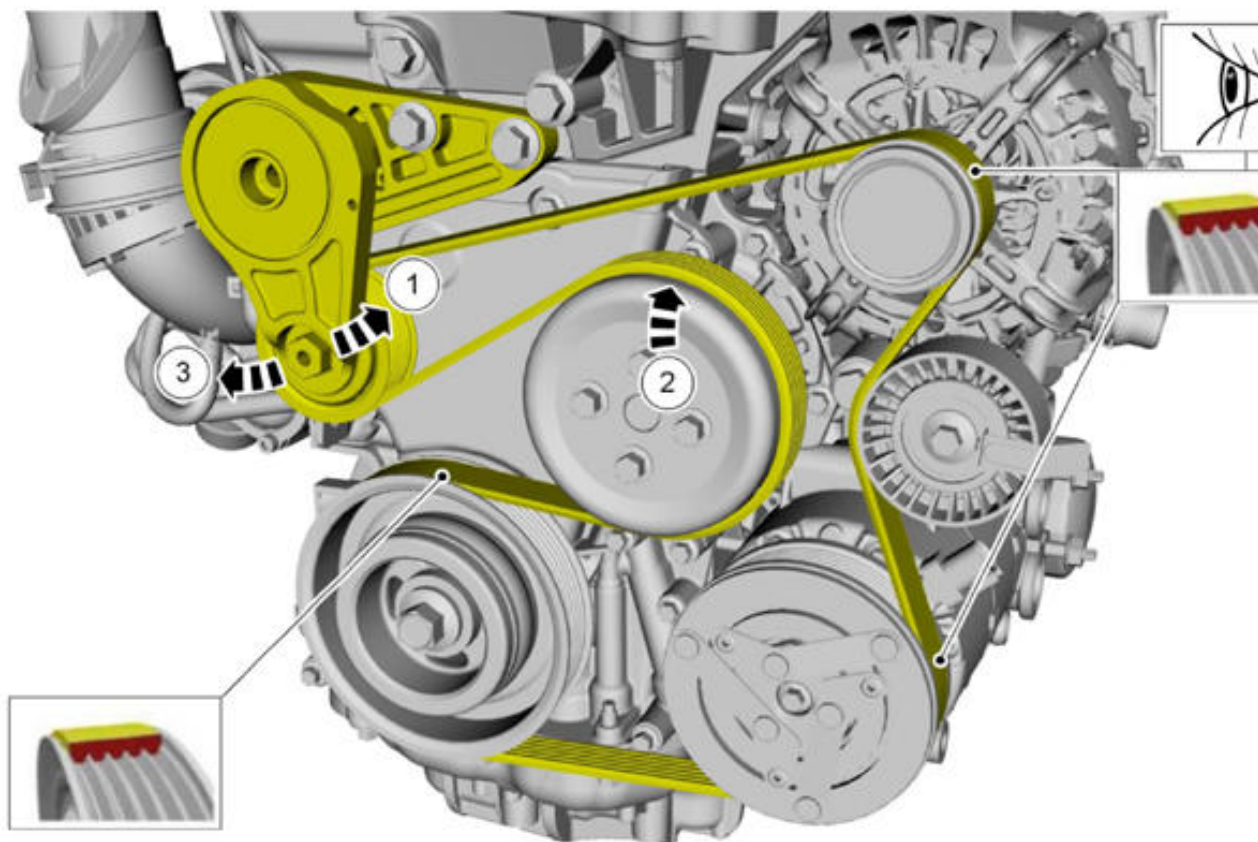


2. *Torque* : 10 Nm



3. *Torque* : 48 Nm

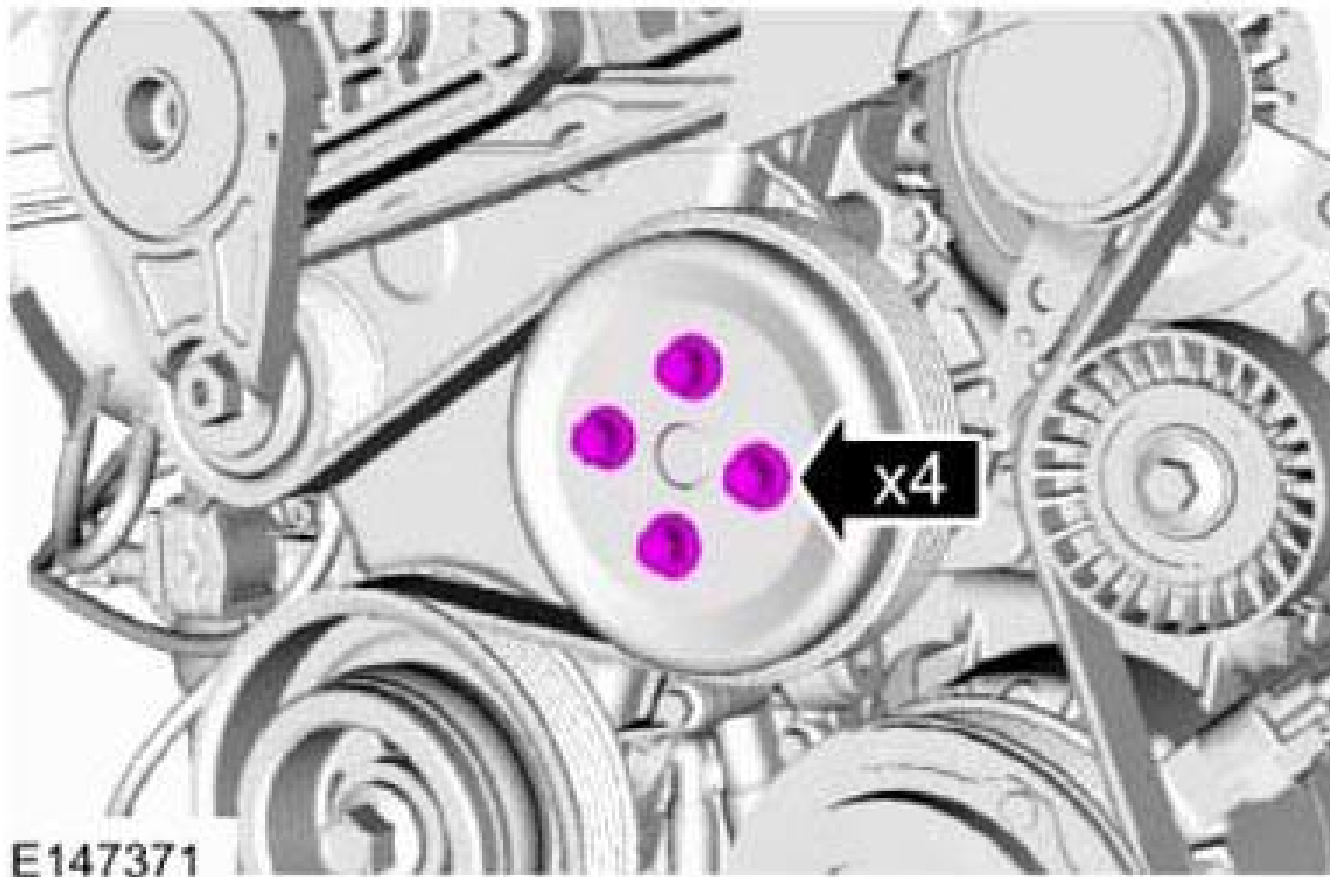




E131829

4.

5. *Torque* : 24 Nm

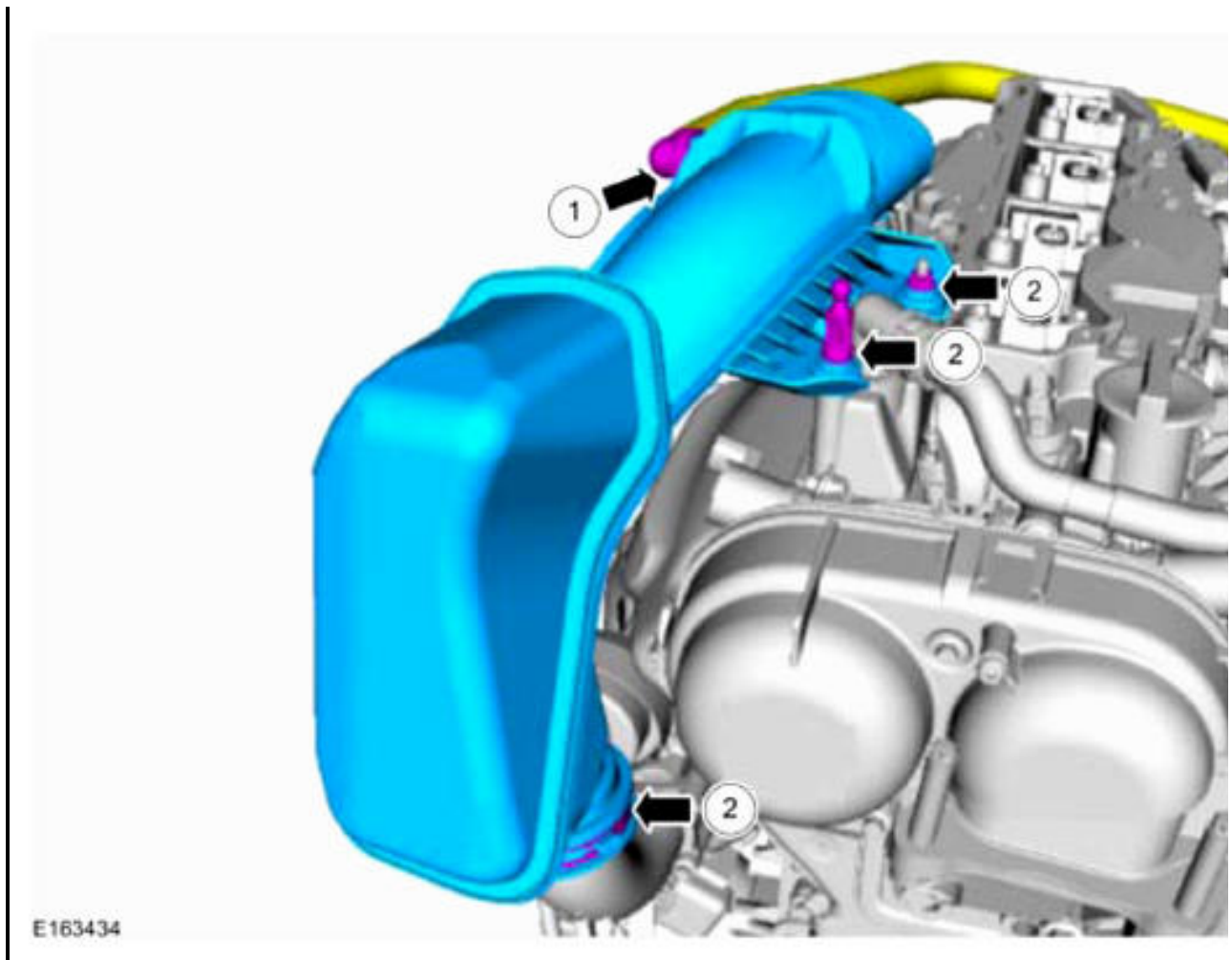


6. Refer to: **ENGINE MOUNT** .

7.

1. Refer to: **QUICK RELEASE COUPLING** .

2. *Torque* : 5 Nm



8. Refer to: **AIR CLEANER OUTLET PIPE** .

OIL PRESSURE SWITCH

SPECIAL TOOLS/GENERAL EQUIPMENT

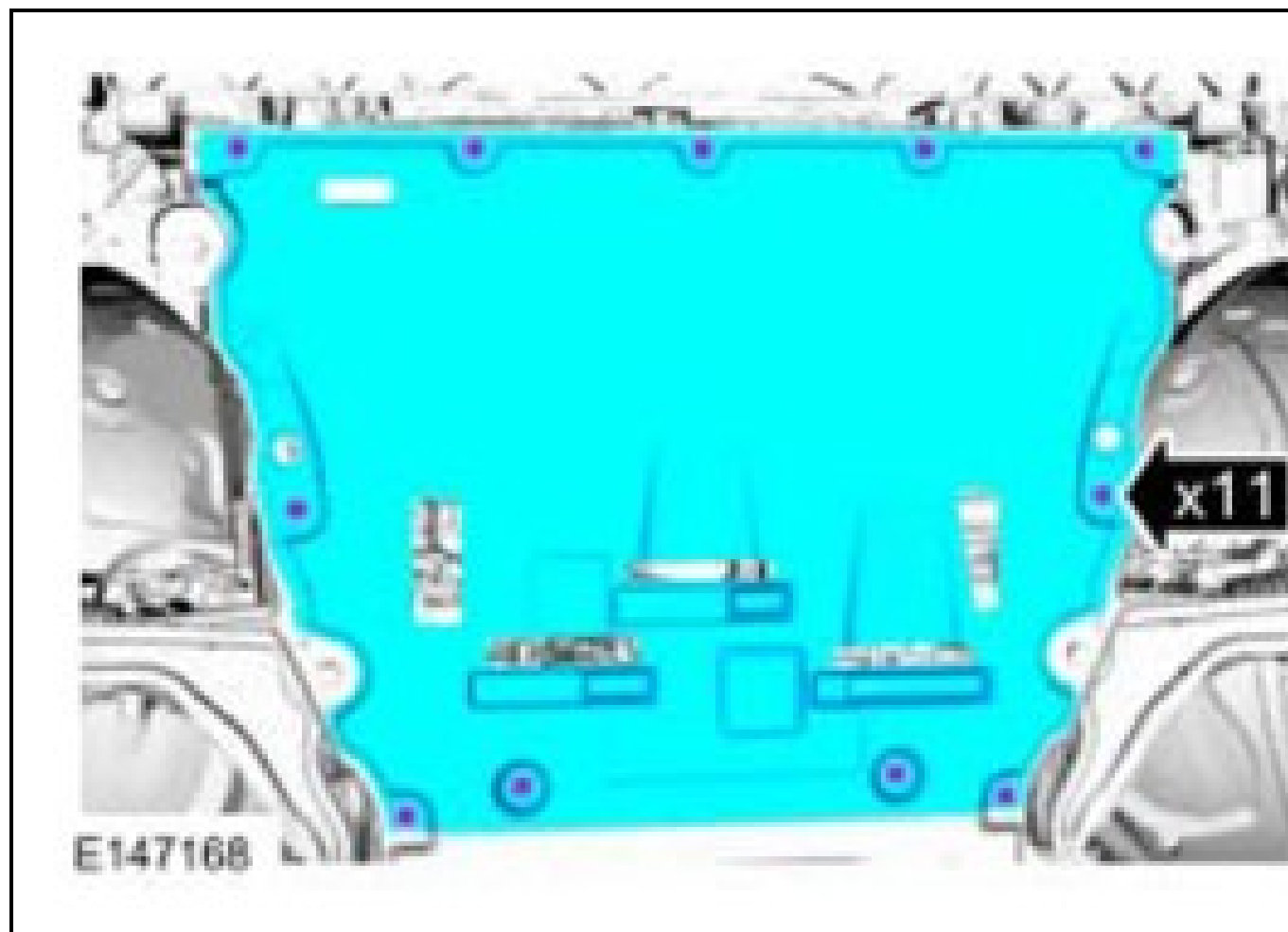
Strap Wrench
Oil Drain Equipment

MATERIALS SPECIFICATIONS

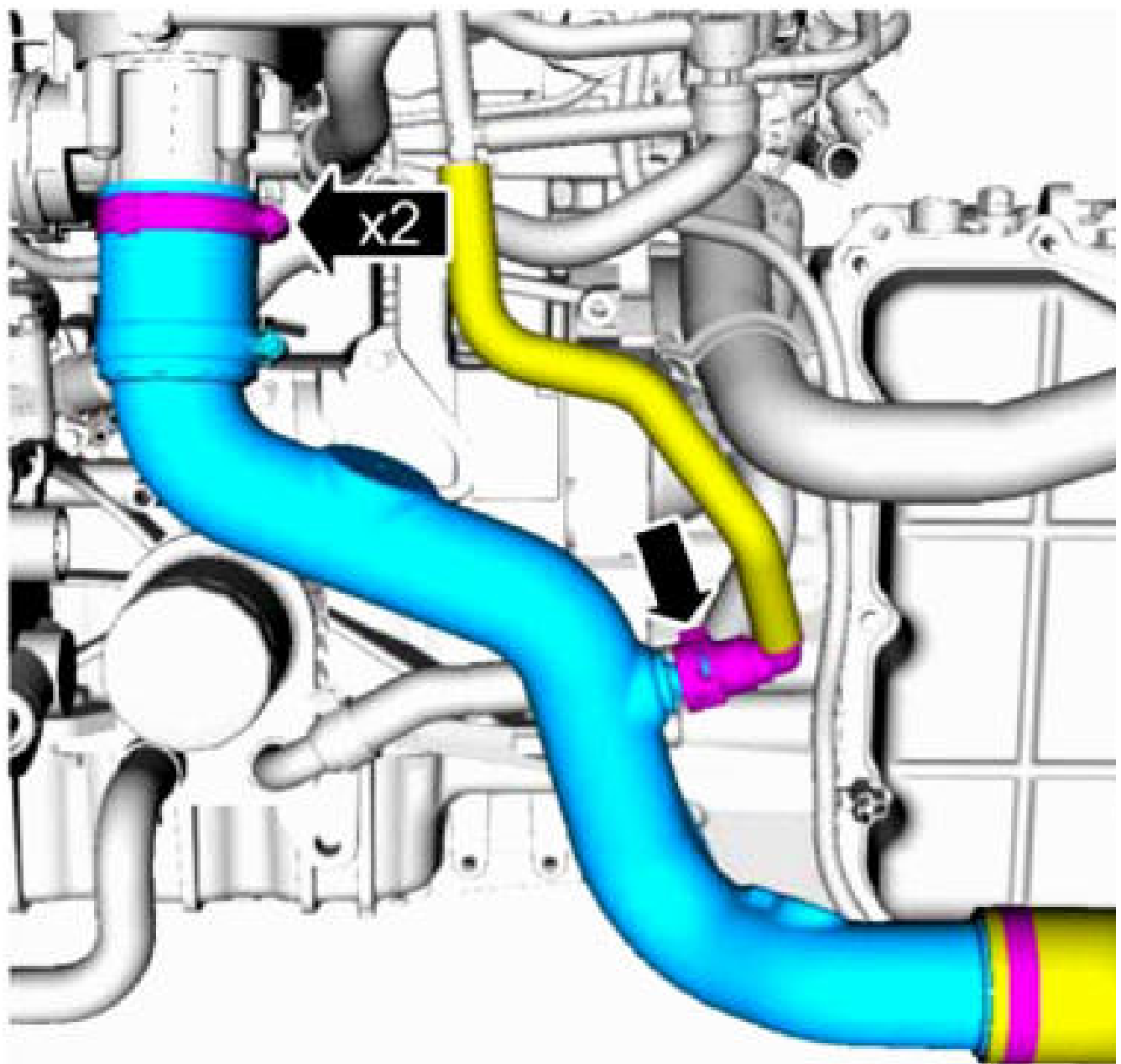
Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

Removal

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .



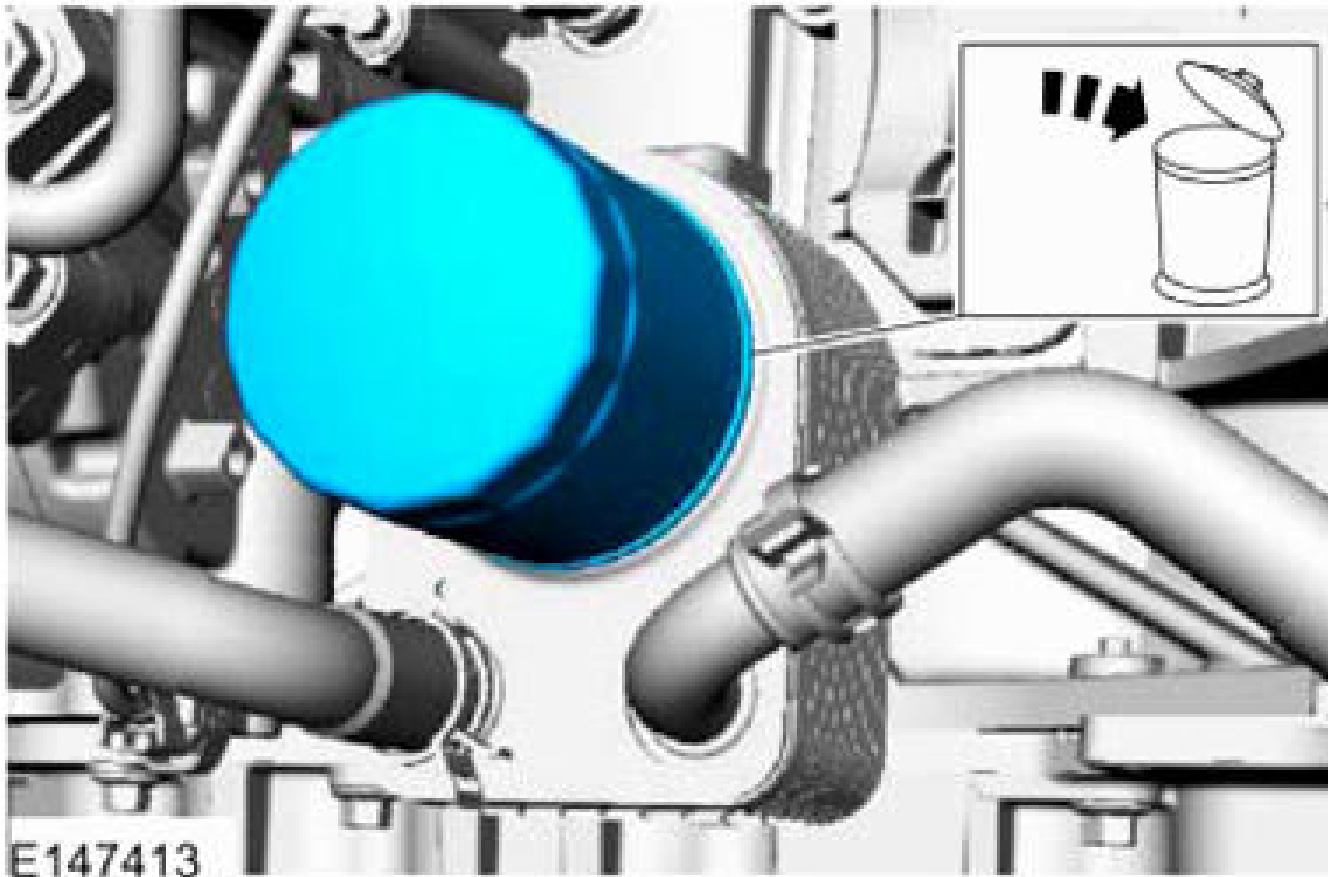
- 2.
3. Refer to: **QUICK RELEASE COUPLING** .

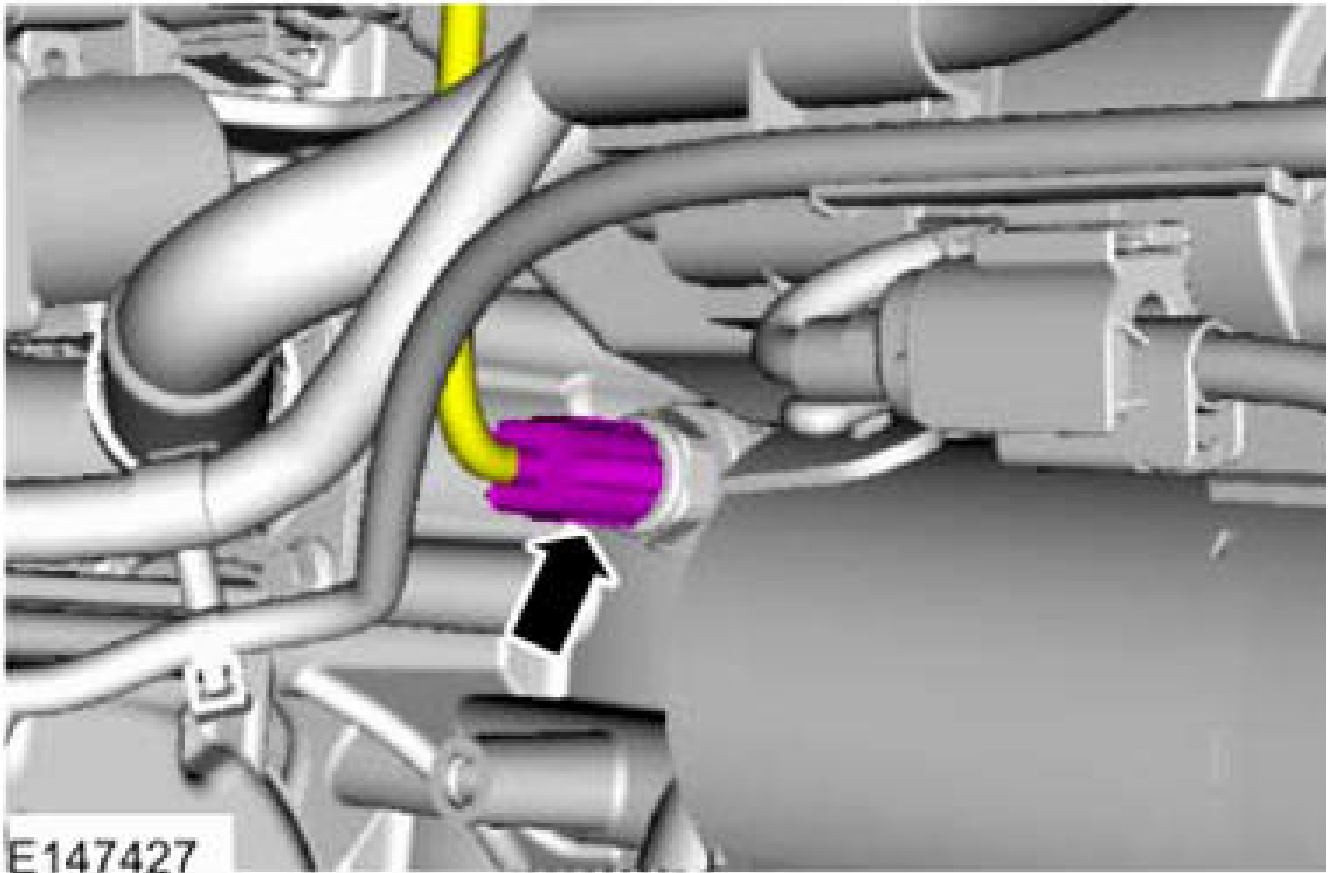


E147169

4. *General Equipment* : Oil Drain Equipment

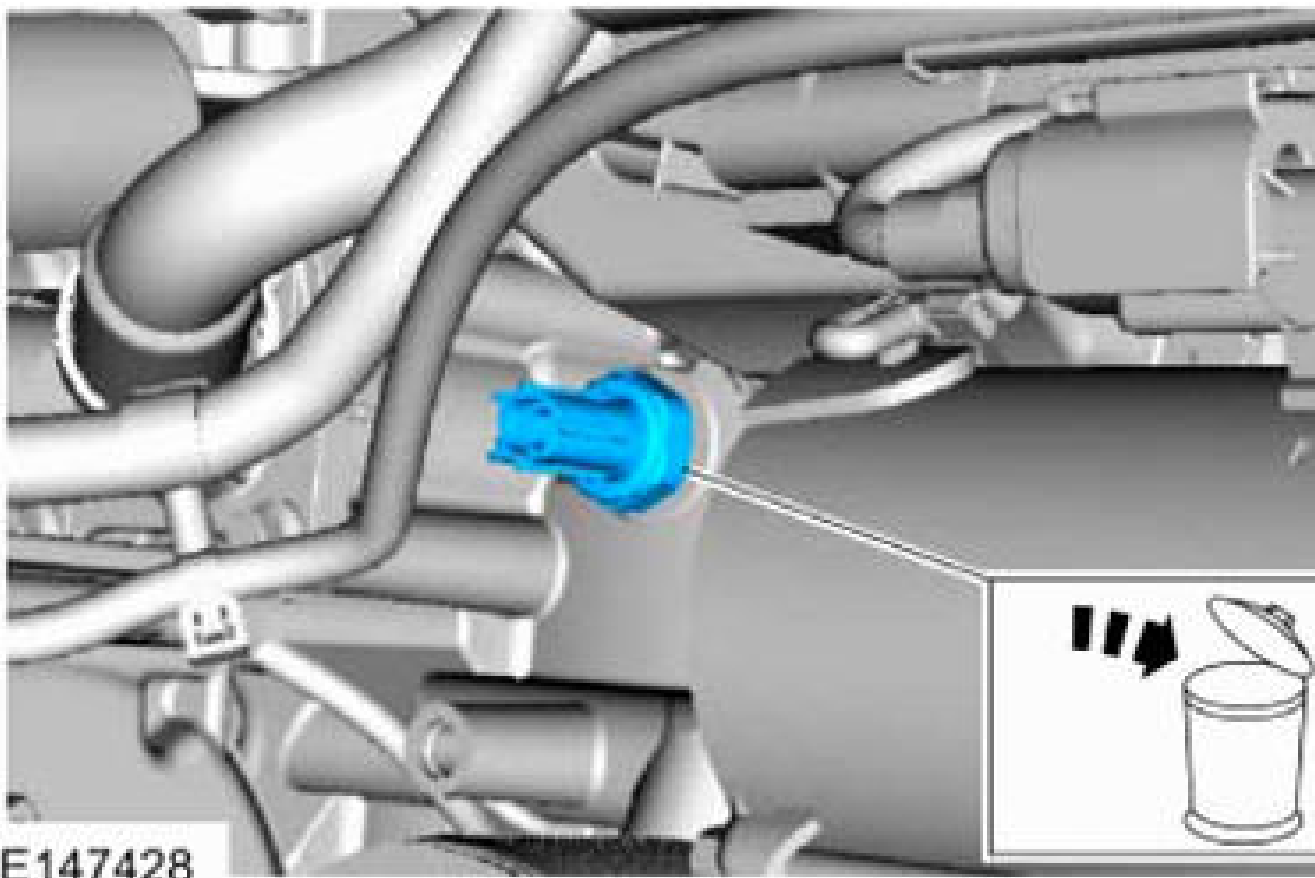
General Equipment : Strap Wrench





5.

6.

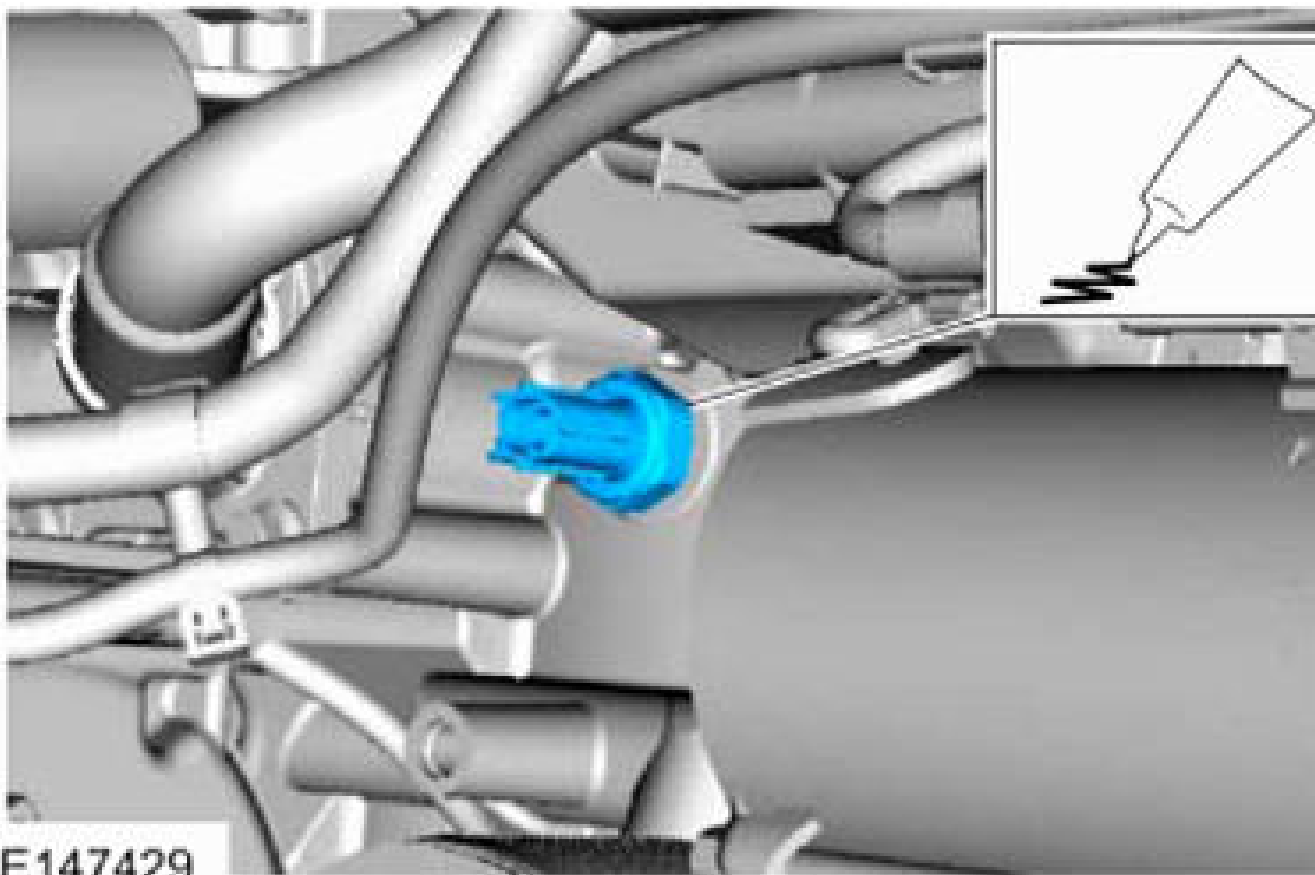


6.

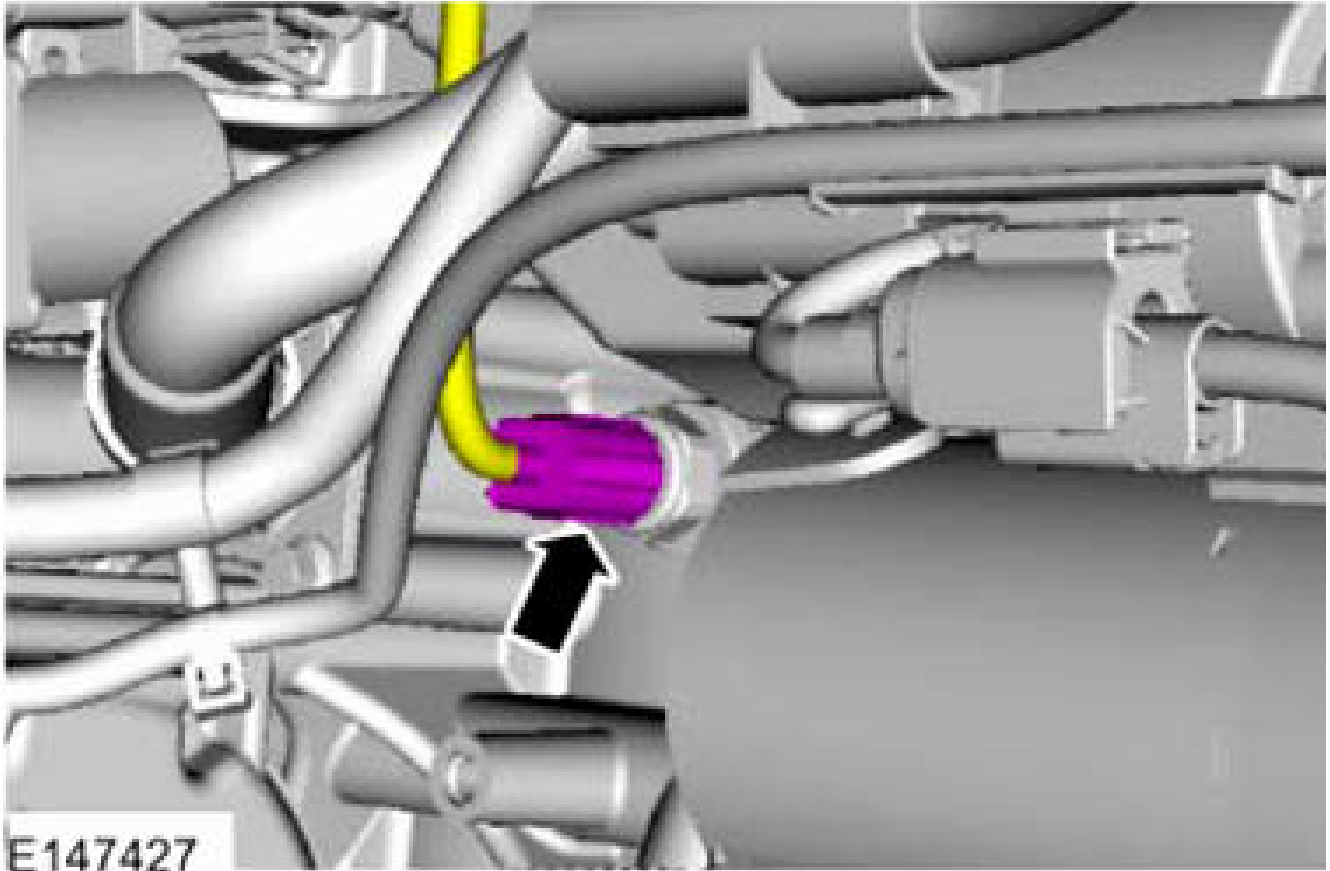
Installation

1. *Material* : Thread Sealant with PTFE/TA-24 (WSK-M2G350-A2)

Torque : 18 Nm



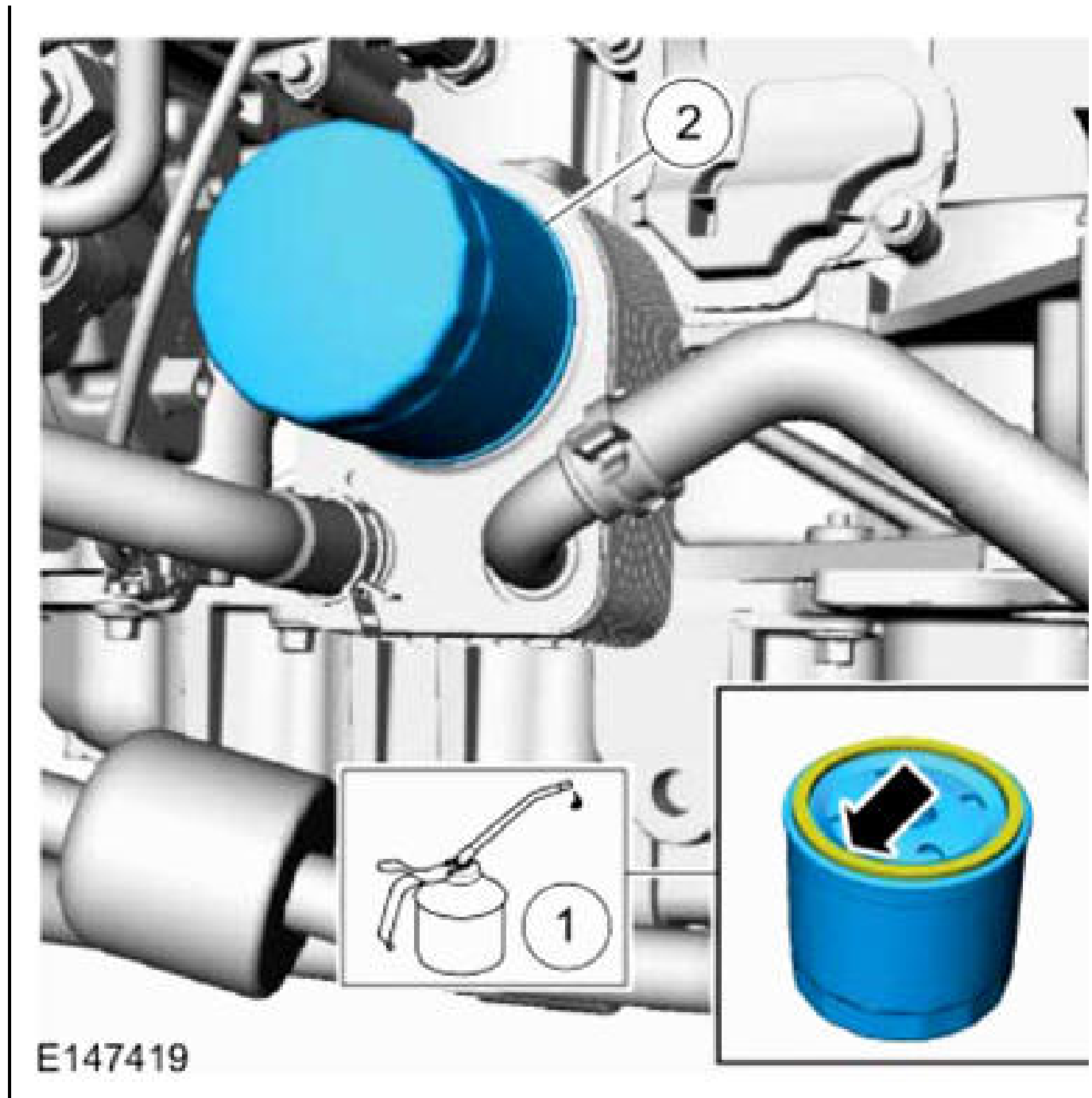
2.



2.

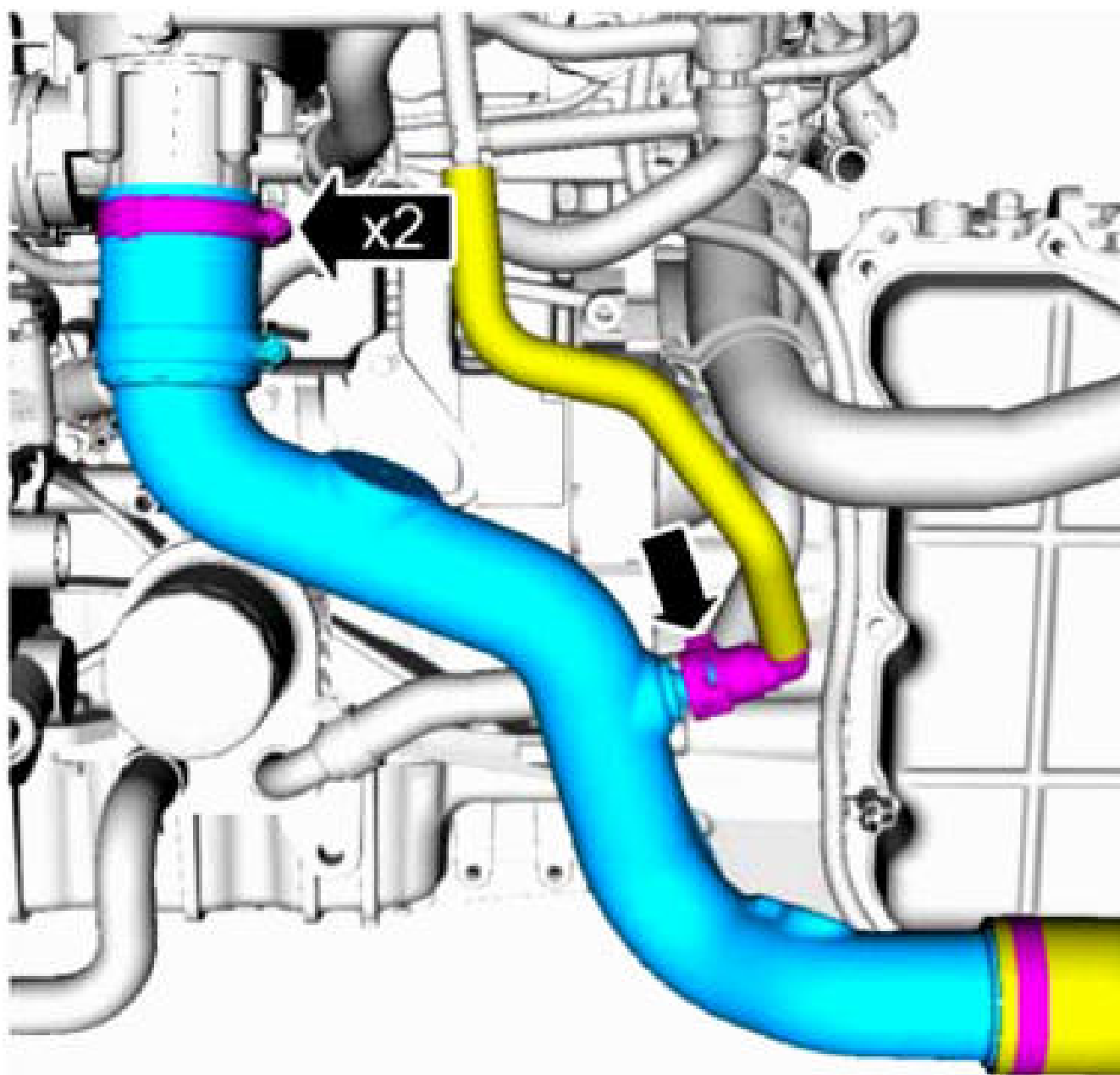
3. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

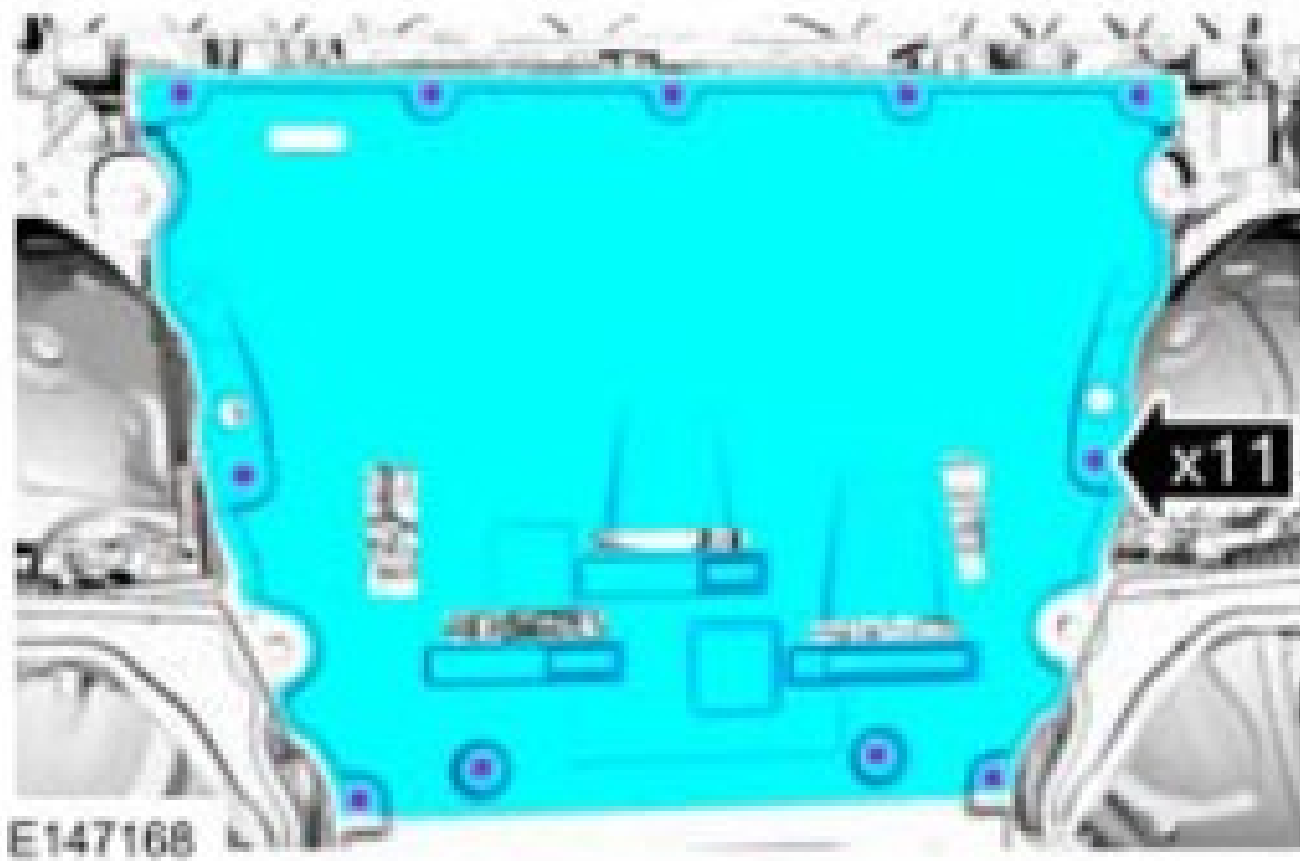
Torque : 14.5 Nm



4. Refer to: **QUICK RELEASE COUPLING** .

Torque : 5 Nm

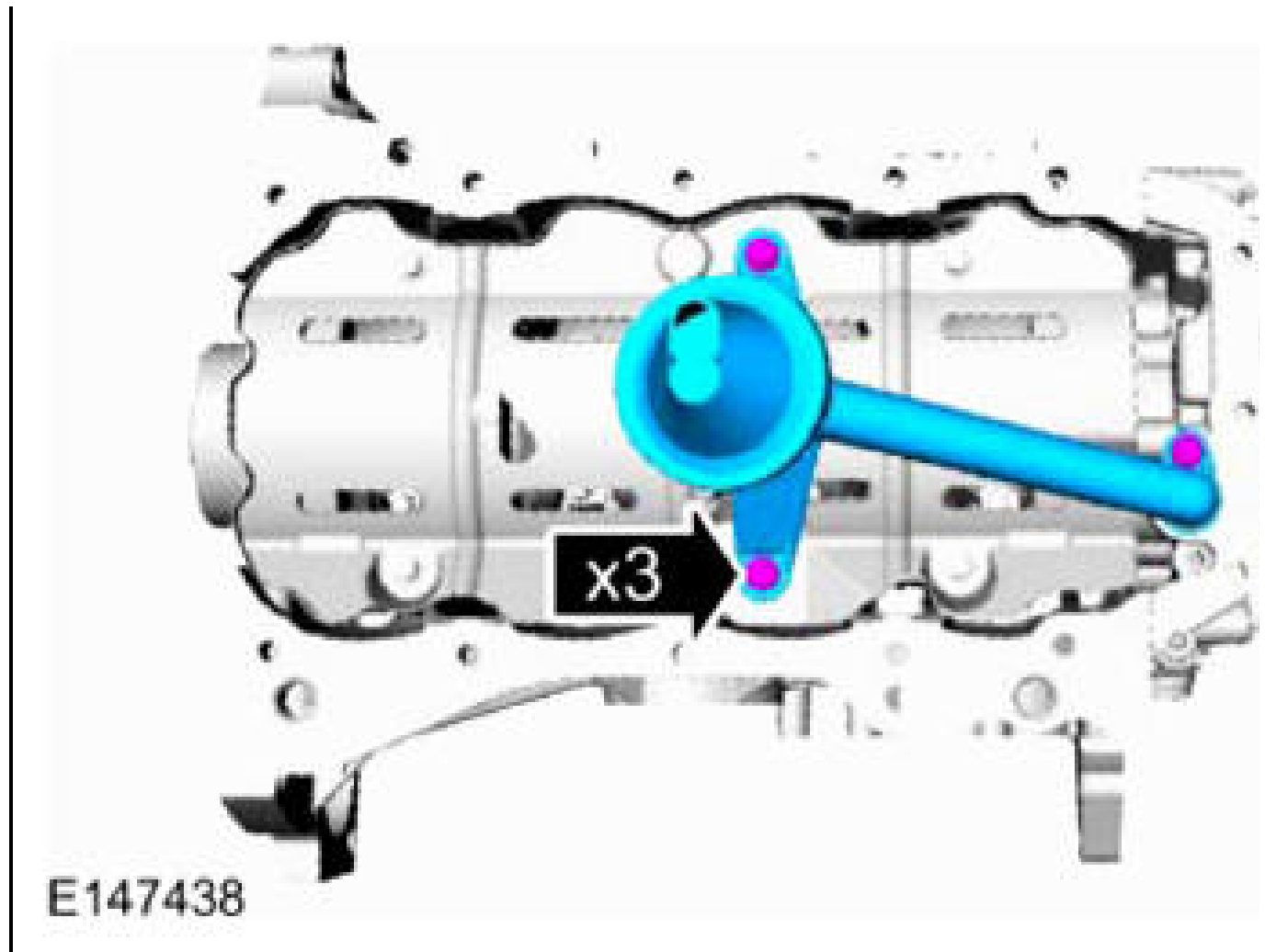




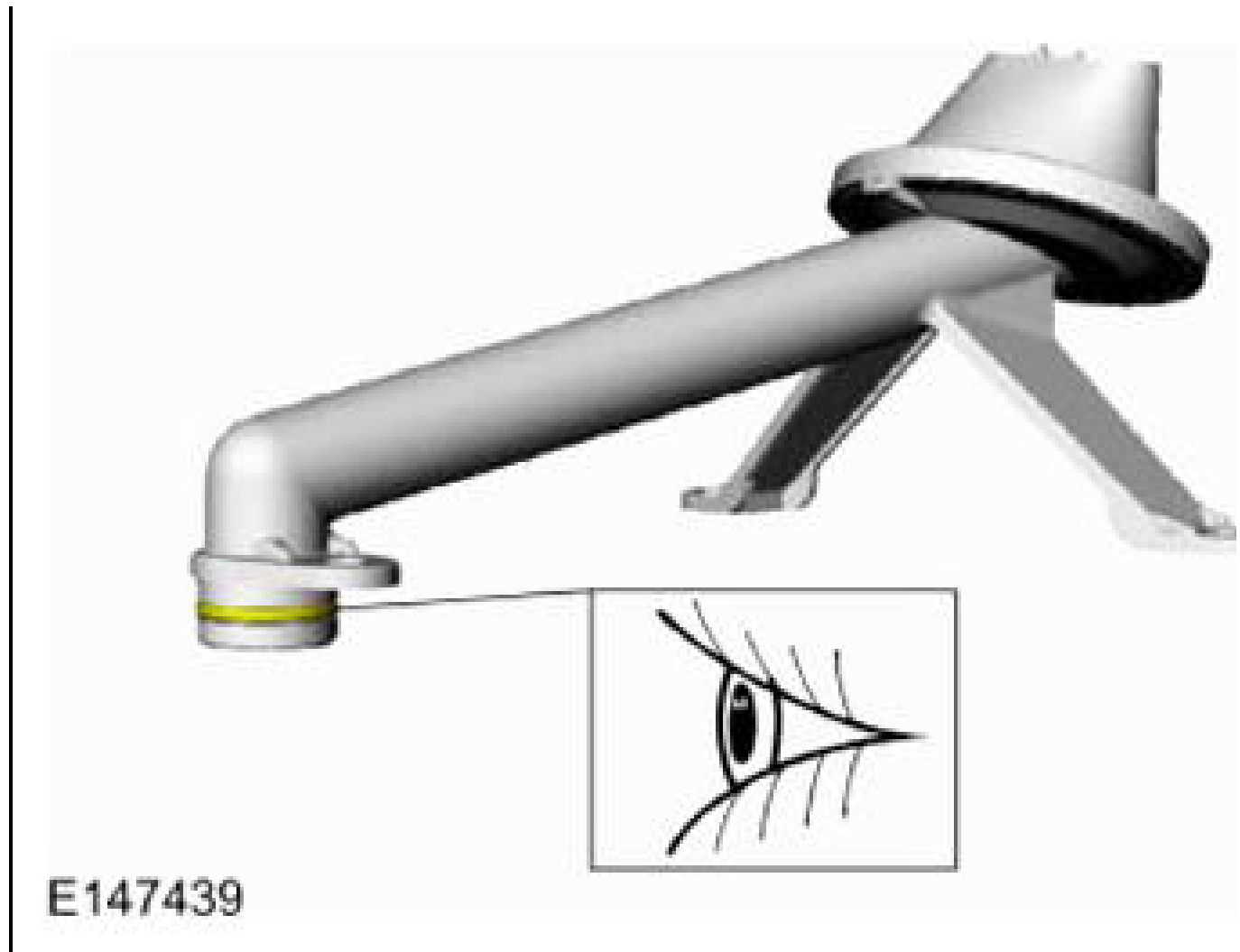
5.

OIL PUMP SCREEN AND PICKUP TUBE**Removal**

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .
2. Refer to: **OIL PAN** .
3. *Torque* : 9.5 Nm



4. **NOTE:** The O-ring seal is to be reused unless damaged.



Installation

1. To install, reverse the removal procedure.

VARIABLE VALVE TIMING (VVT) UNIT

SPECIAL TOOLS/GENERAL EQUIPMENT

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2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



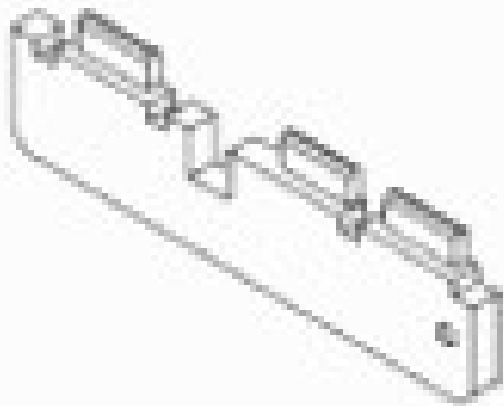
E49165

303-1097

Locking Tool, Variable Camshaft Timing Oil
Control Unit

TKIT-2001B-FLM

TKIT-2001B-ROW



E126214

303-1552

Alignment Tool, Camshaft

Trolley Jack

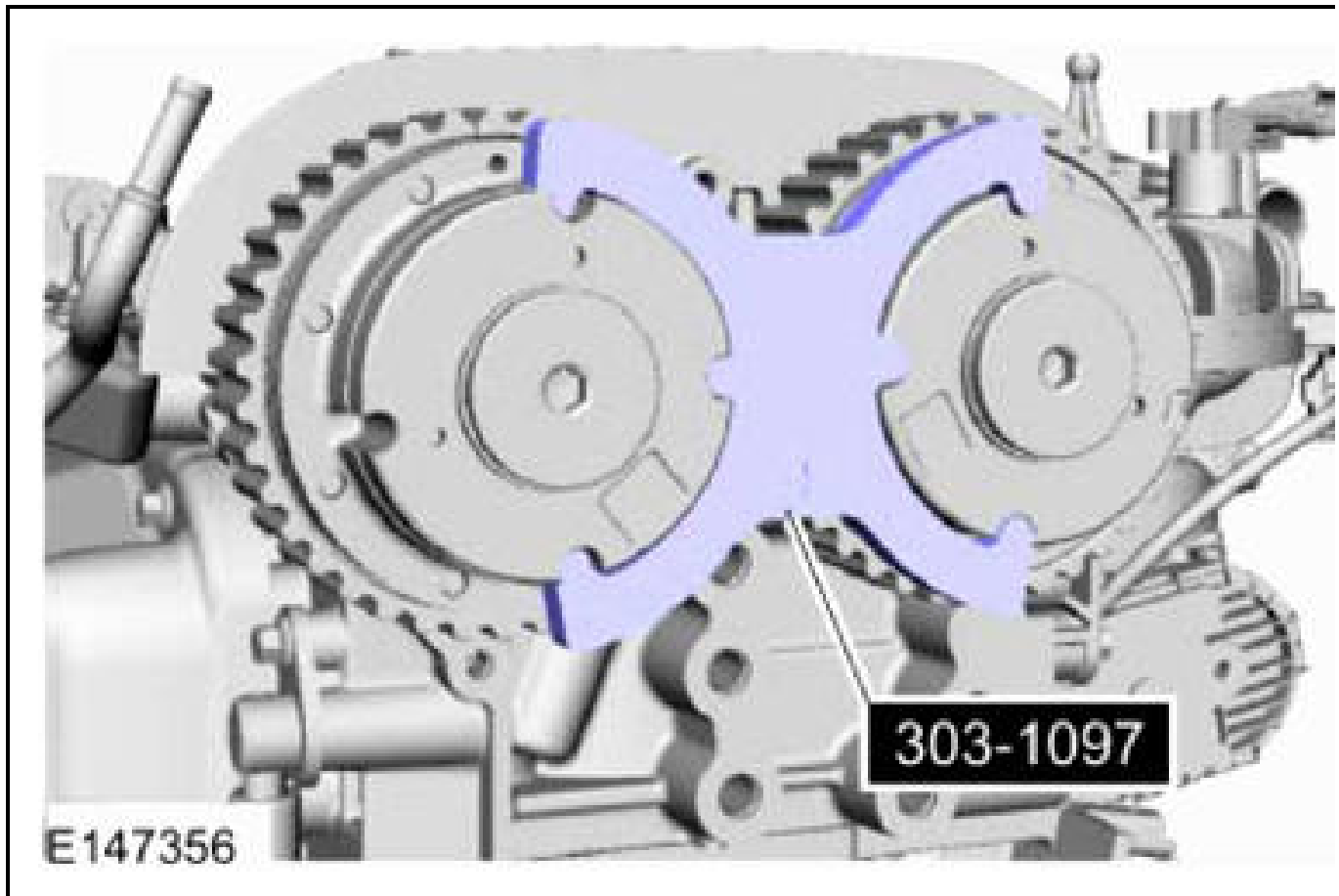
Wooden Block

Removal

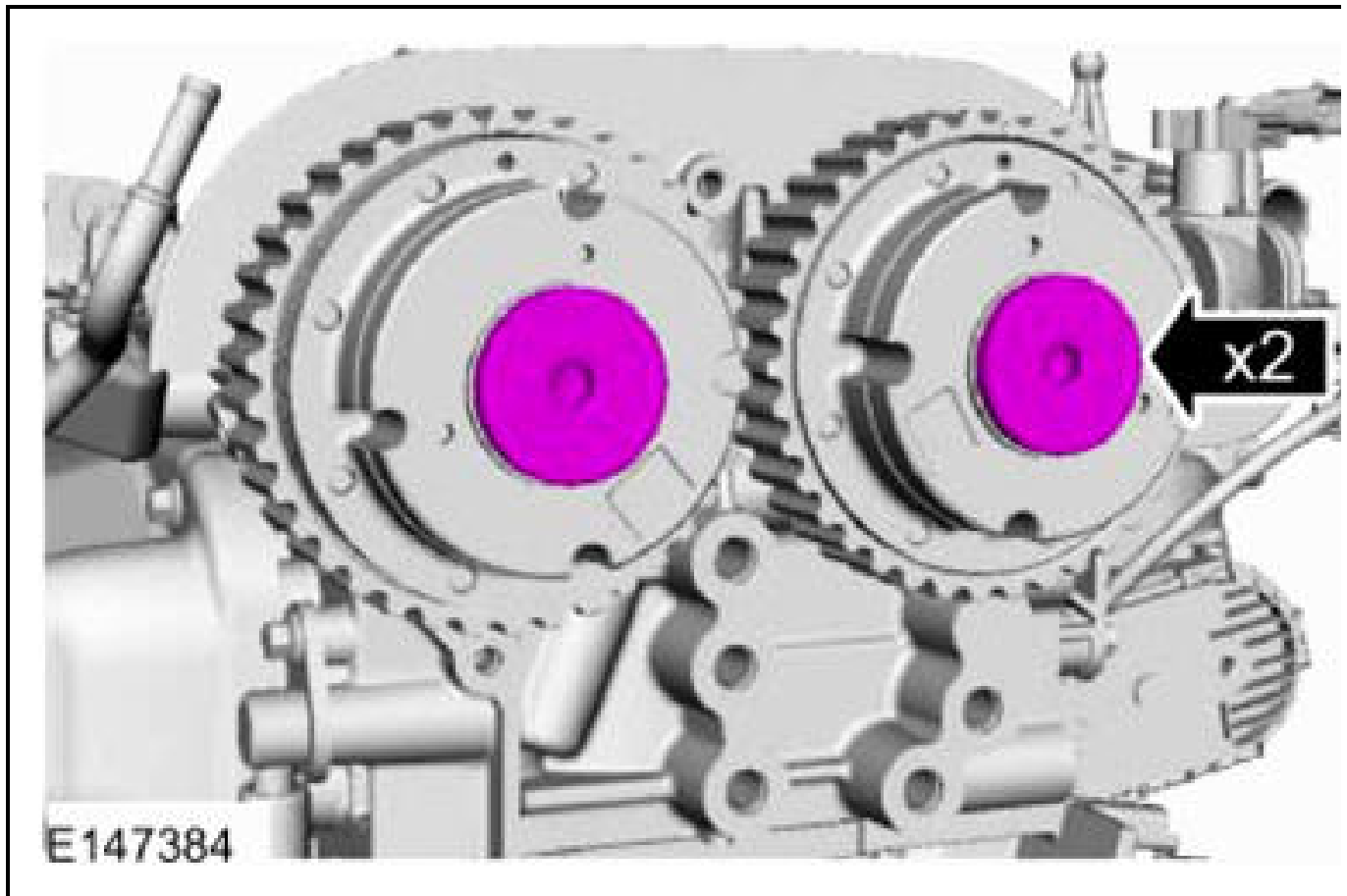
NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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

1. Refer to: **JACKING AND LIFTING - OVERVIEW** .
2. Remove the following items:
 1. Refer to: **VALVE COVER** .
 2. Refer to: **CRANKSHAFT PULLEY** .
3. Remove *Special Service Tool* : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit

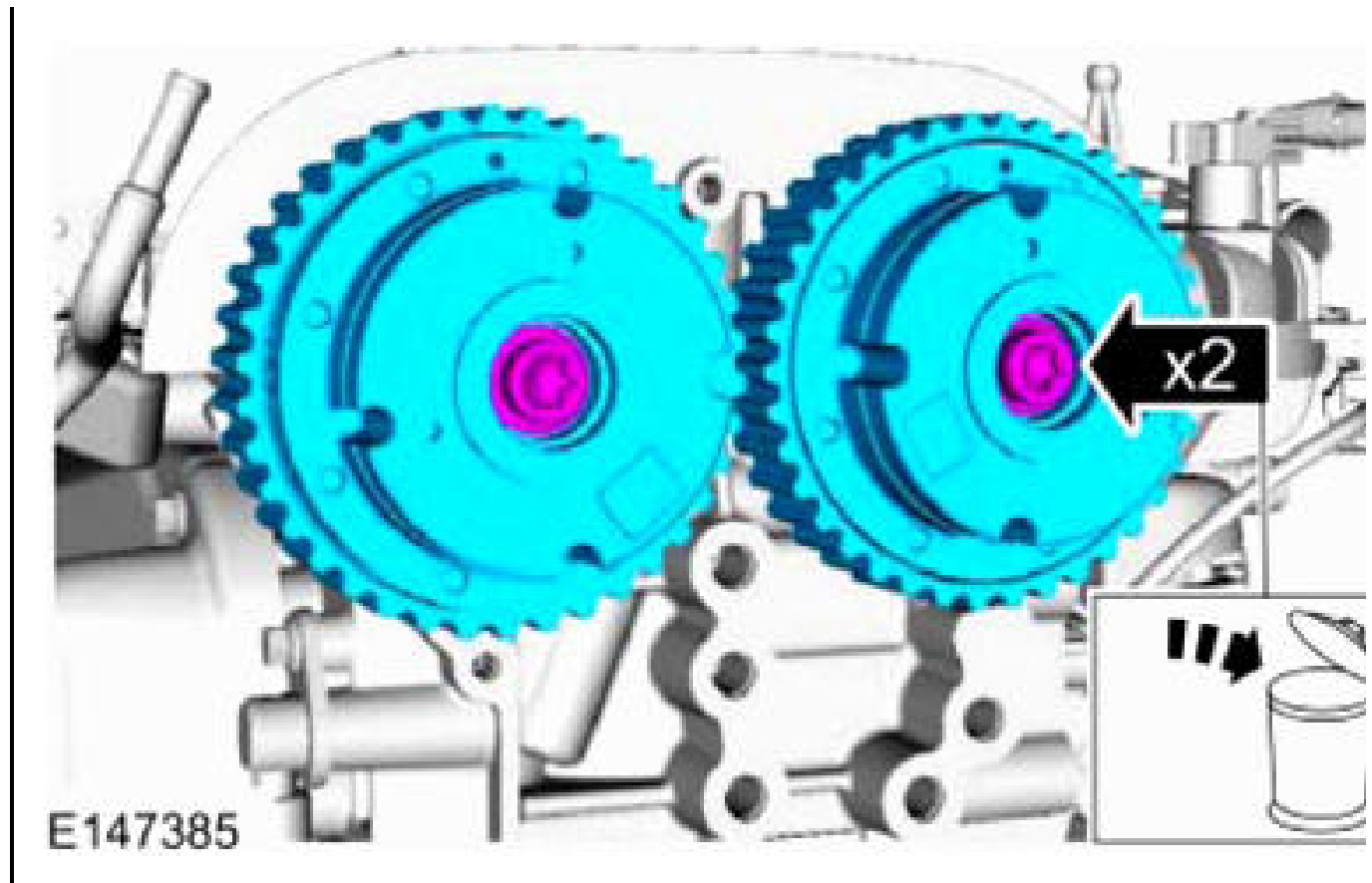


- NOTE:** Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.
- 4.



NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

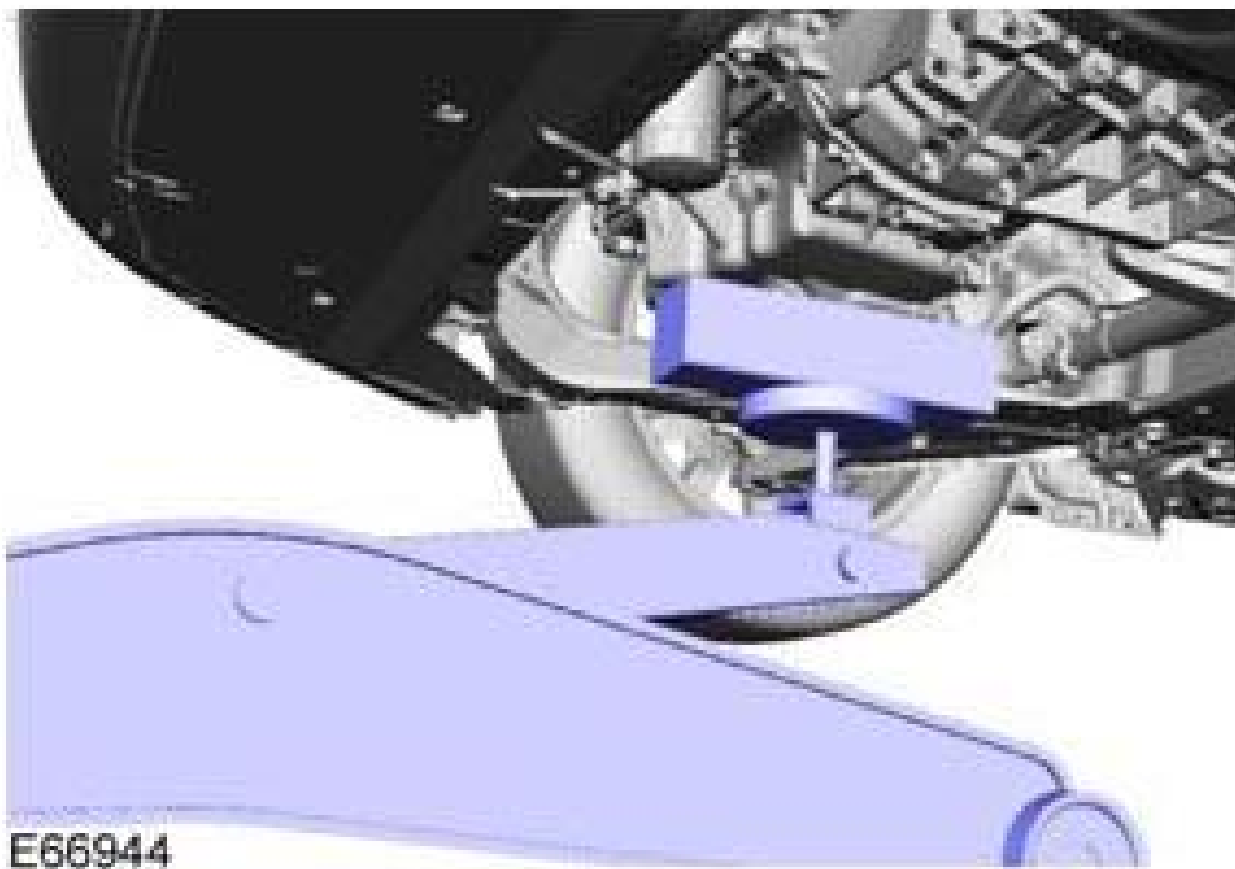
5.



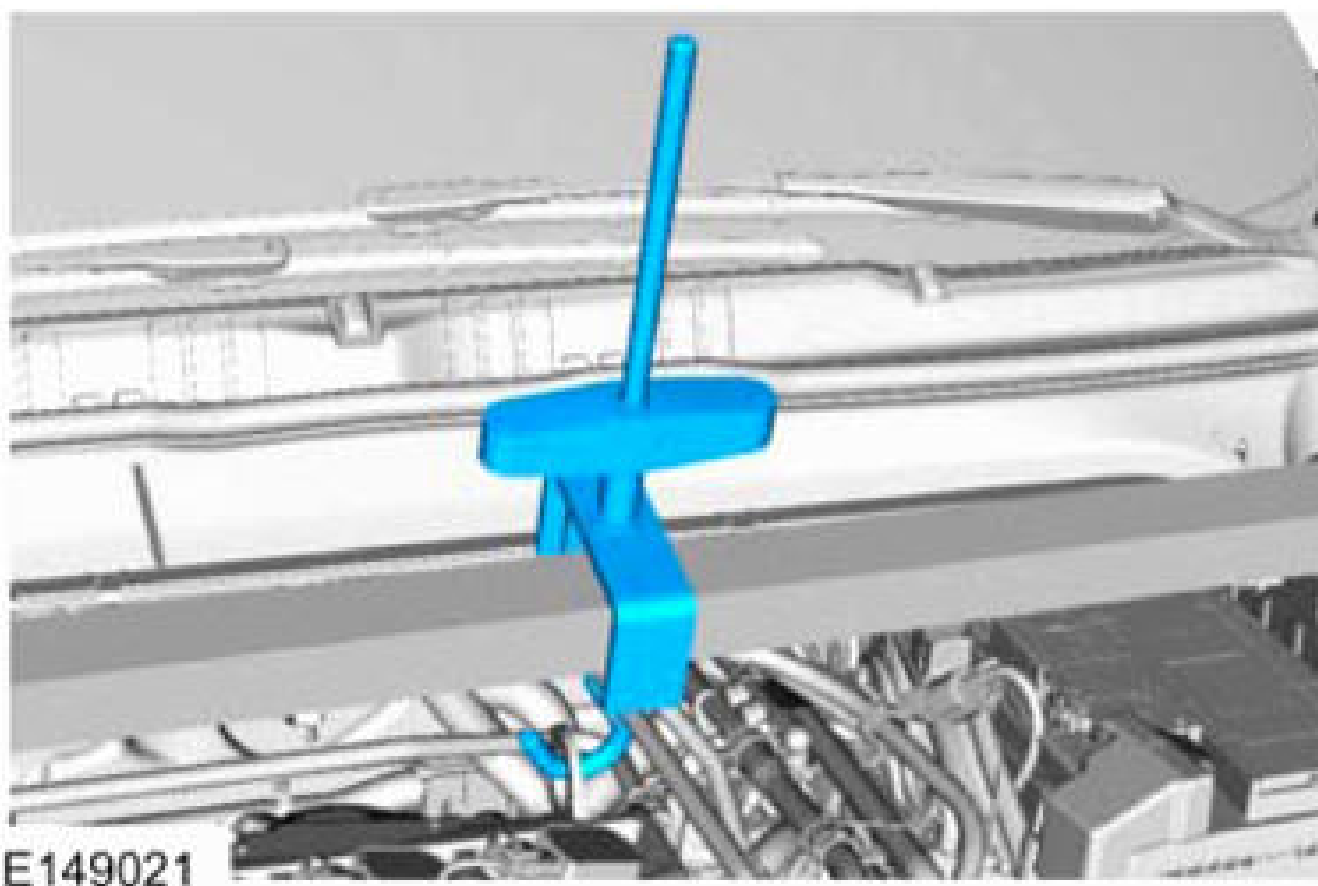
6. Install the following items:

- *General Equipment* : Trolley Jack

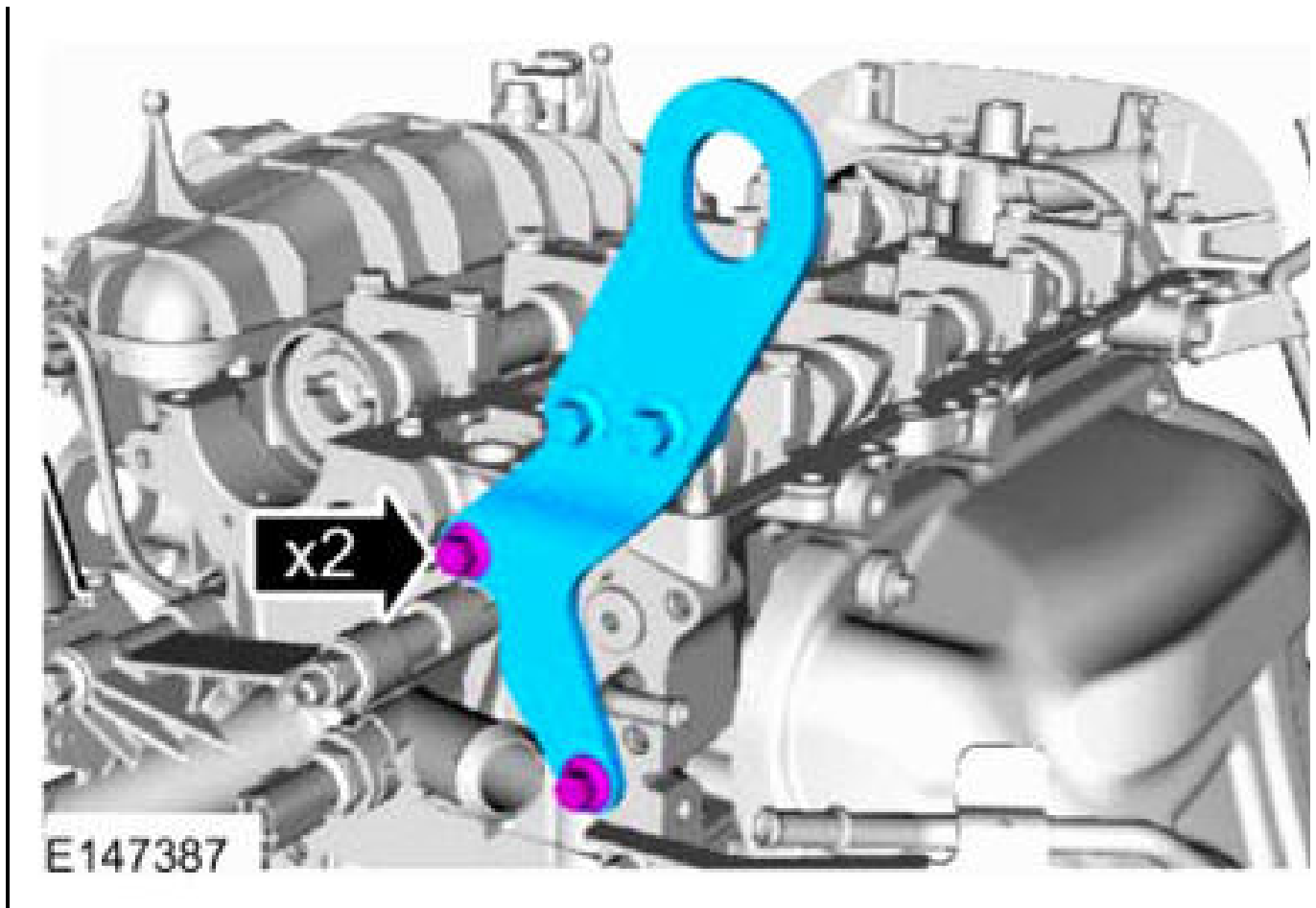
General Equipment : Wooden Block



7. Remove.



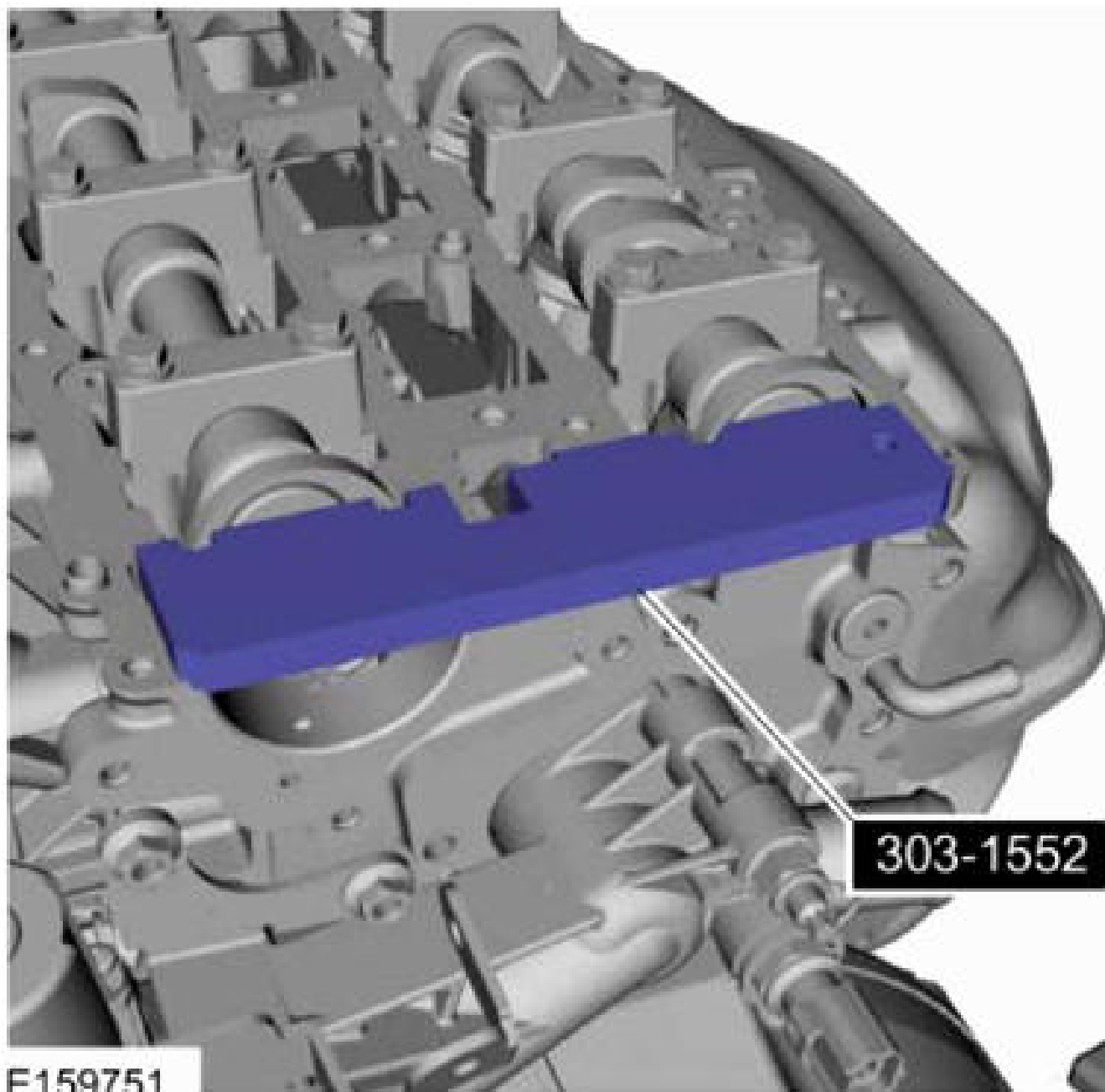
8. Remove.



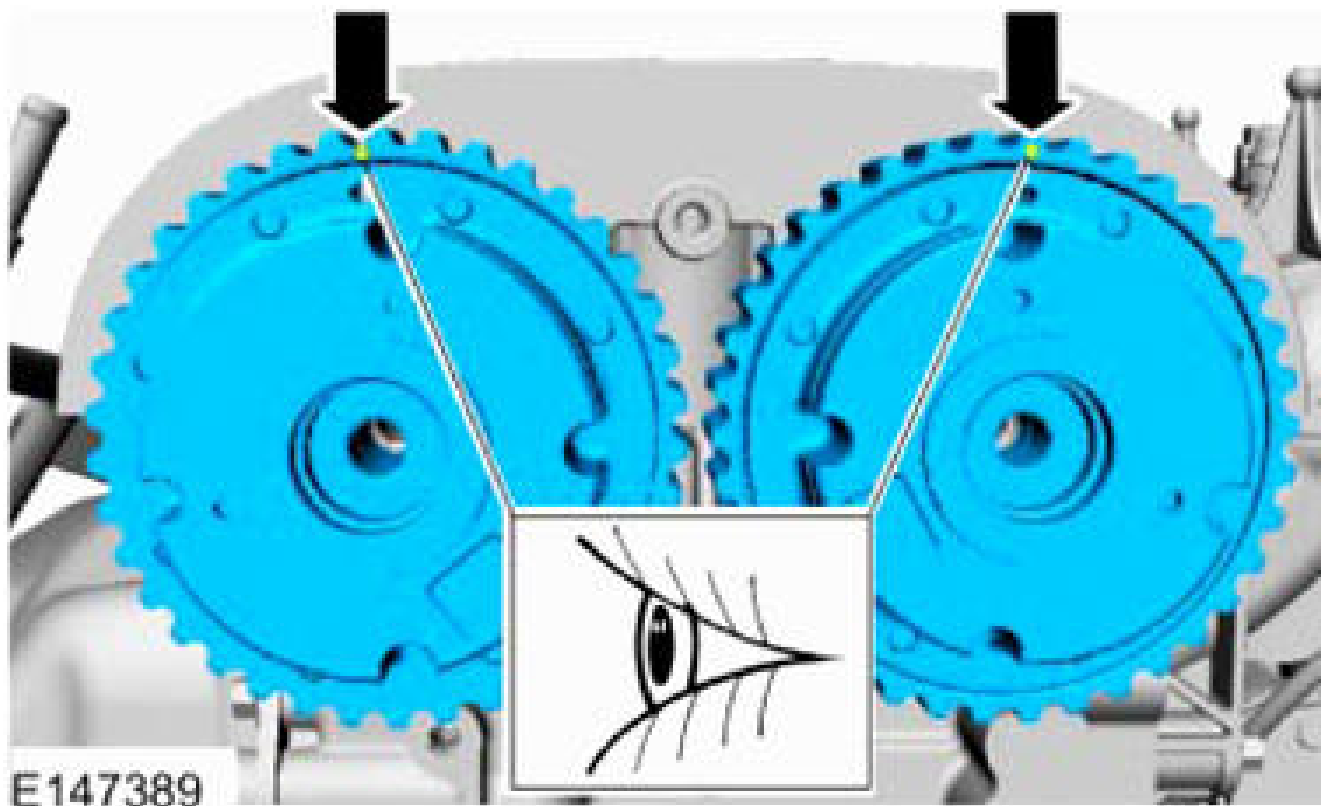
Installation

- NOTE:** It may be necessary to use an open-ended wrench to turn the camshafts by the hexagon to align the camshafts.
- 1.

Install Special Service Tool : 303-1552 Alignment Tool, Camshaft



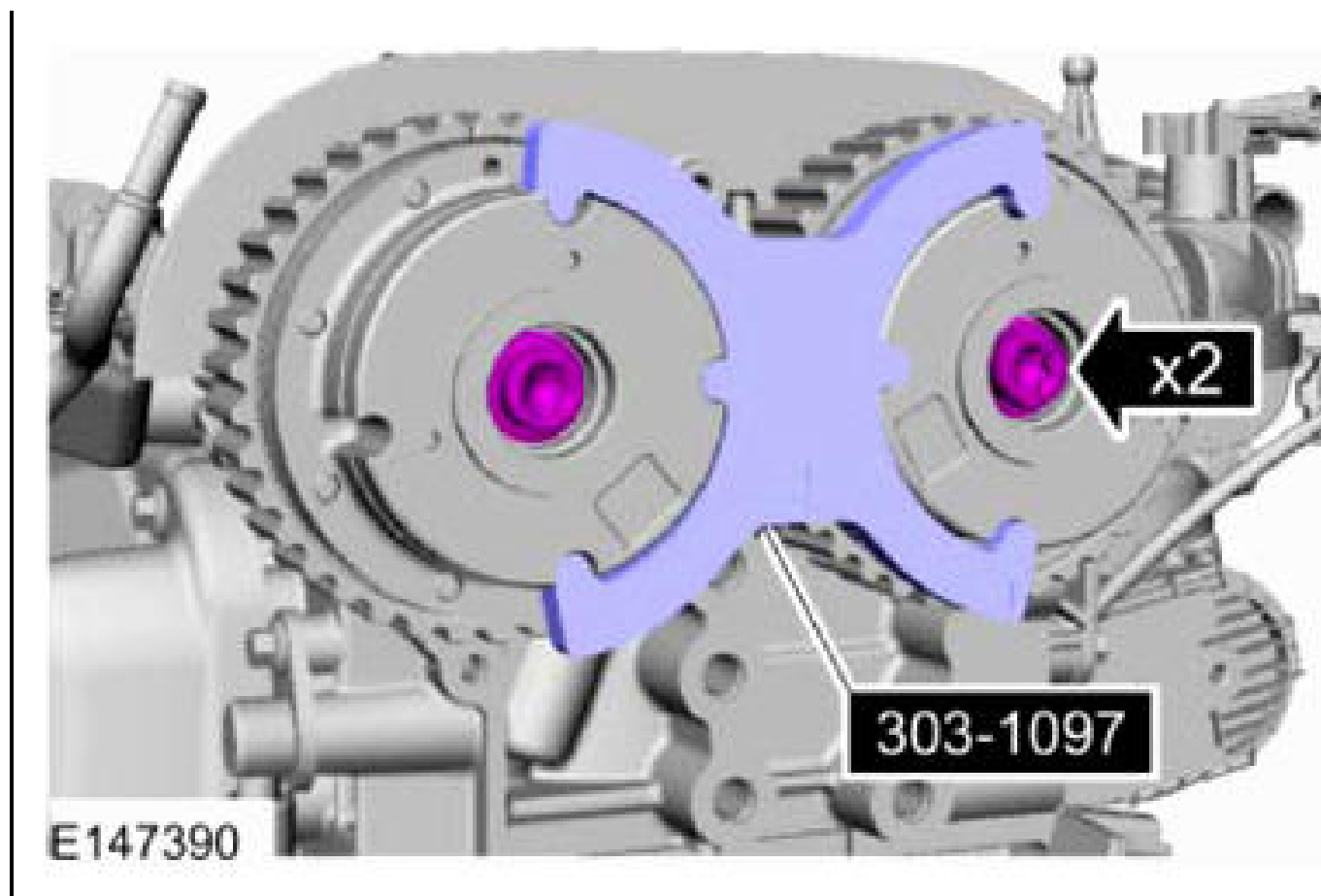
2. 12 o'clock position.



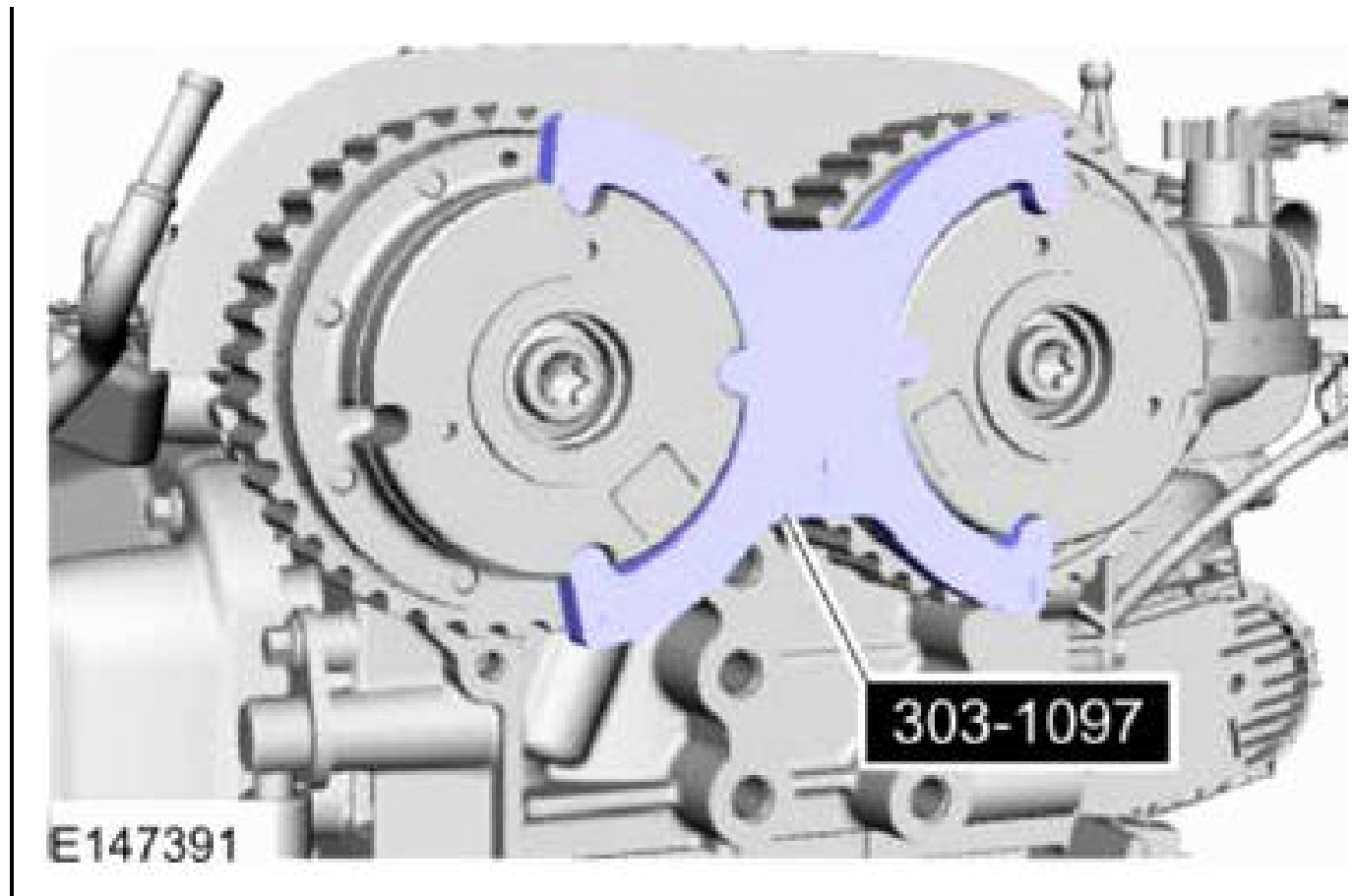
3. **NOTE:** Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

NOTE: The timing marks of the VCT unit must be at the 12 o'clock position.

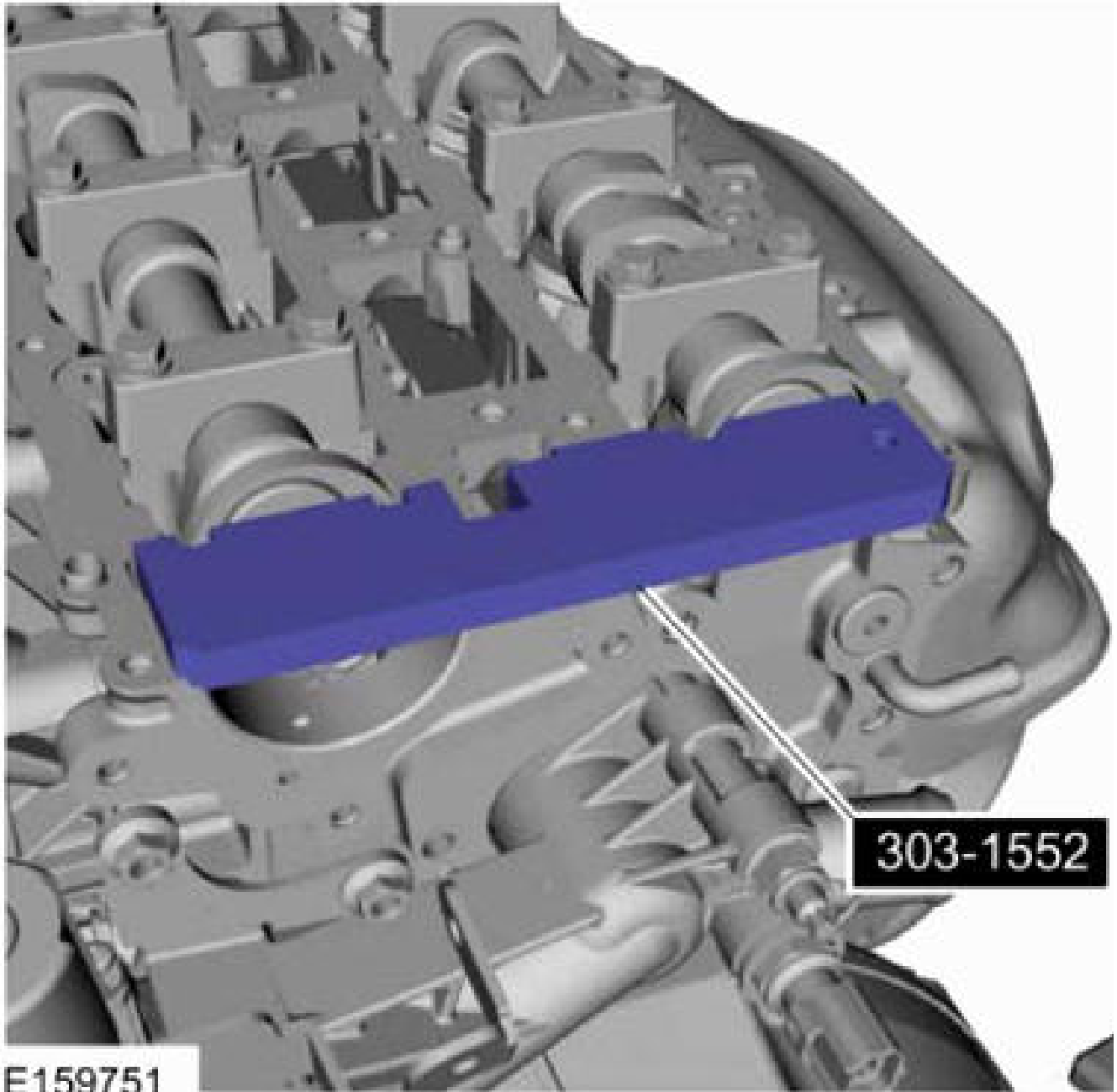
Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit
Torque : 25 Nm



4. Remove *Special Service Tool* : **303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit**



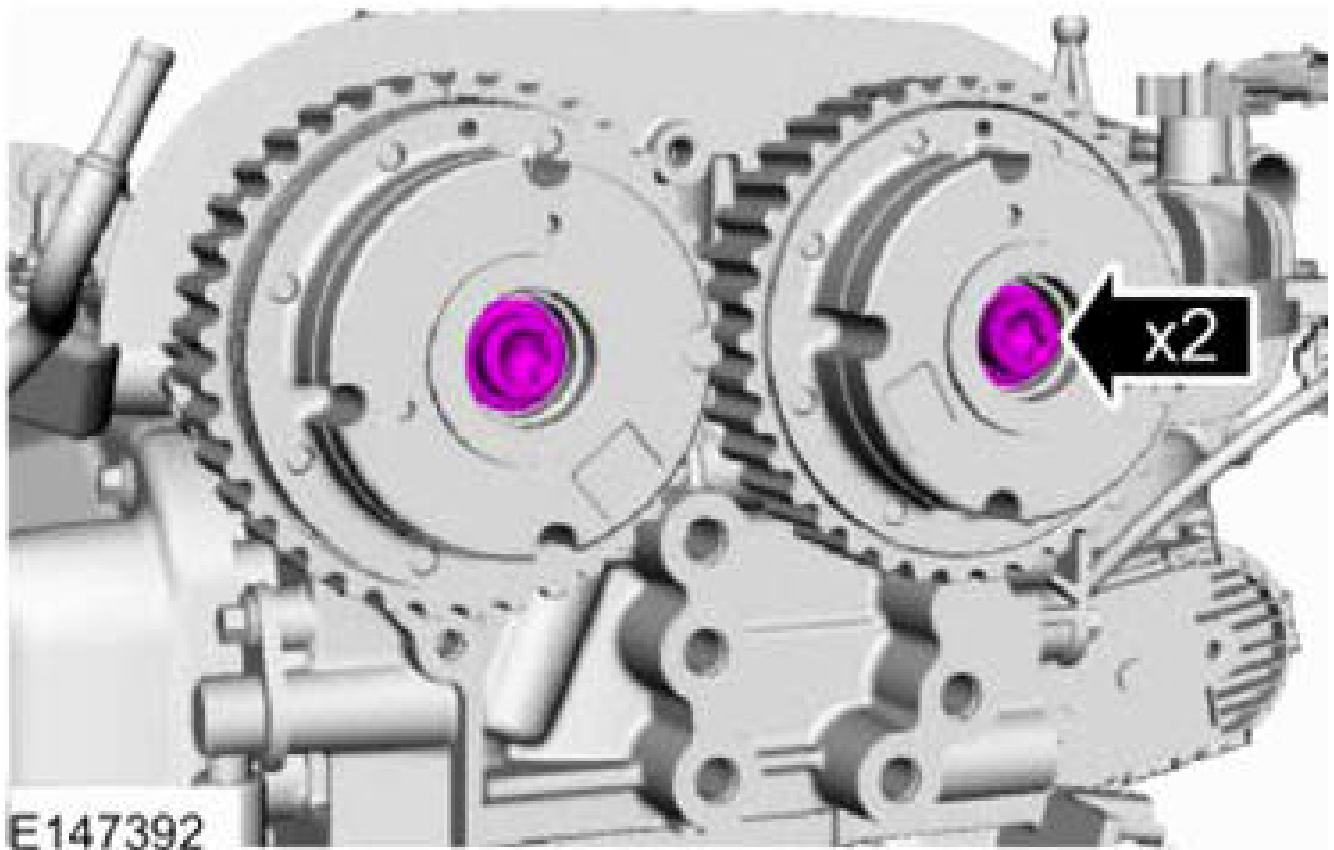
5. *Remove Special Service Tool : 303-1552 Alignment Tool, Camshaft*



NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

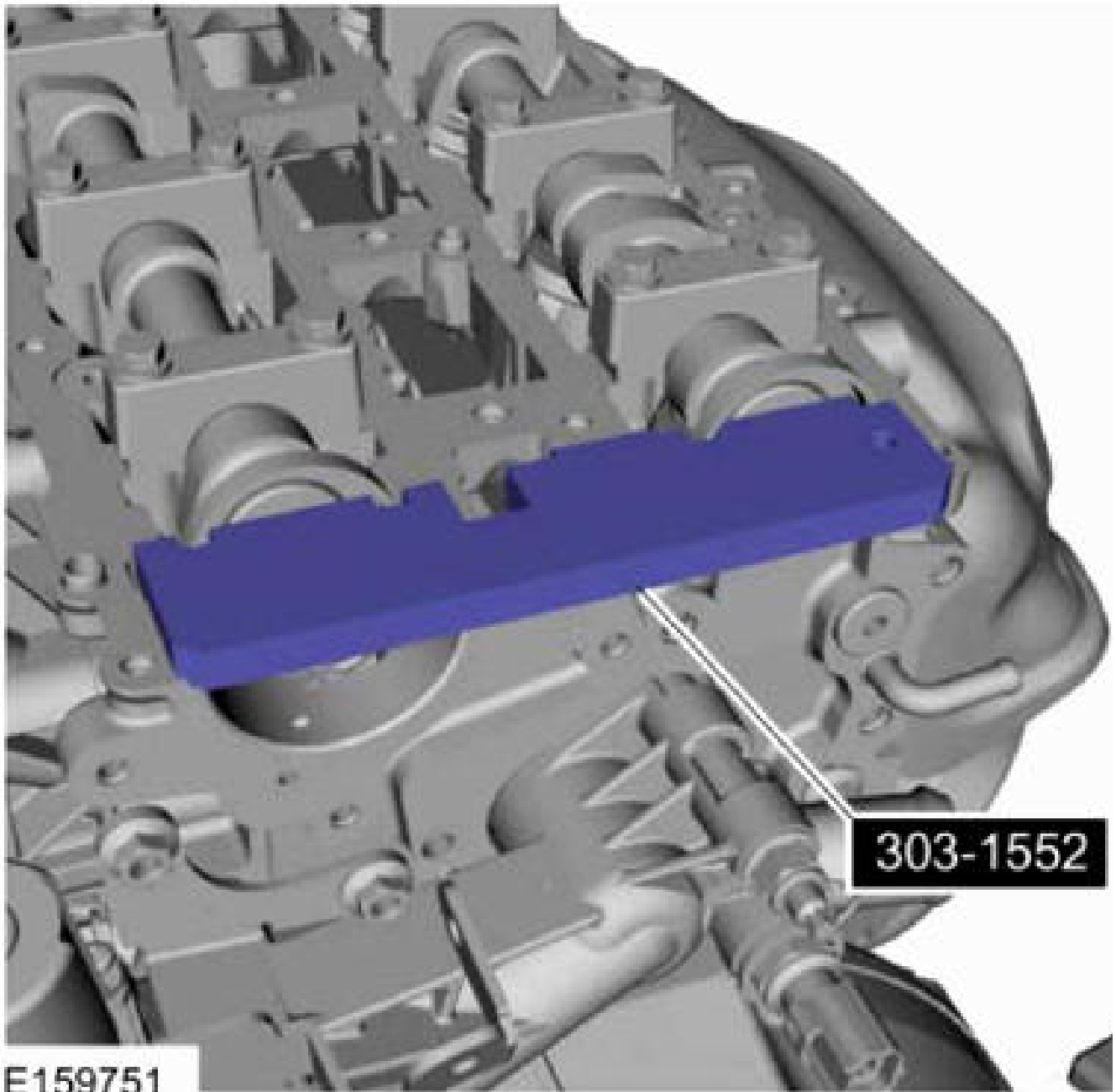
6.

Torque : Tighten an additional 75°



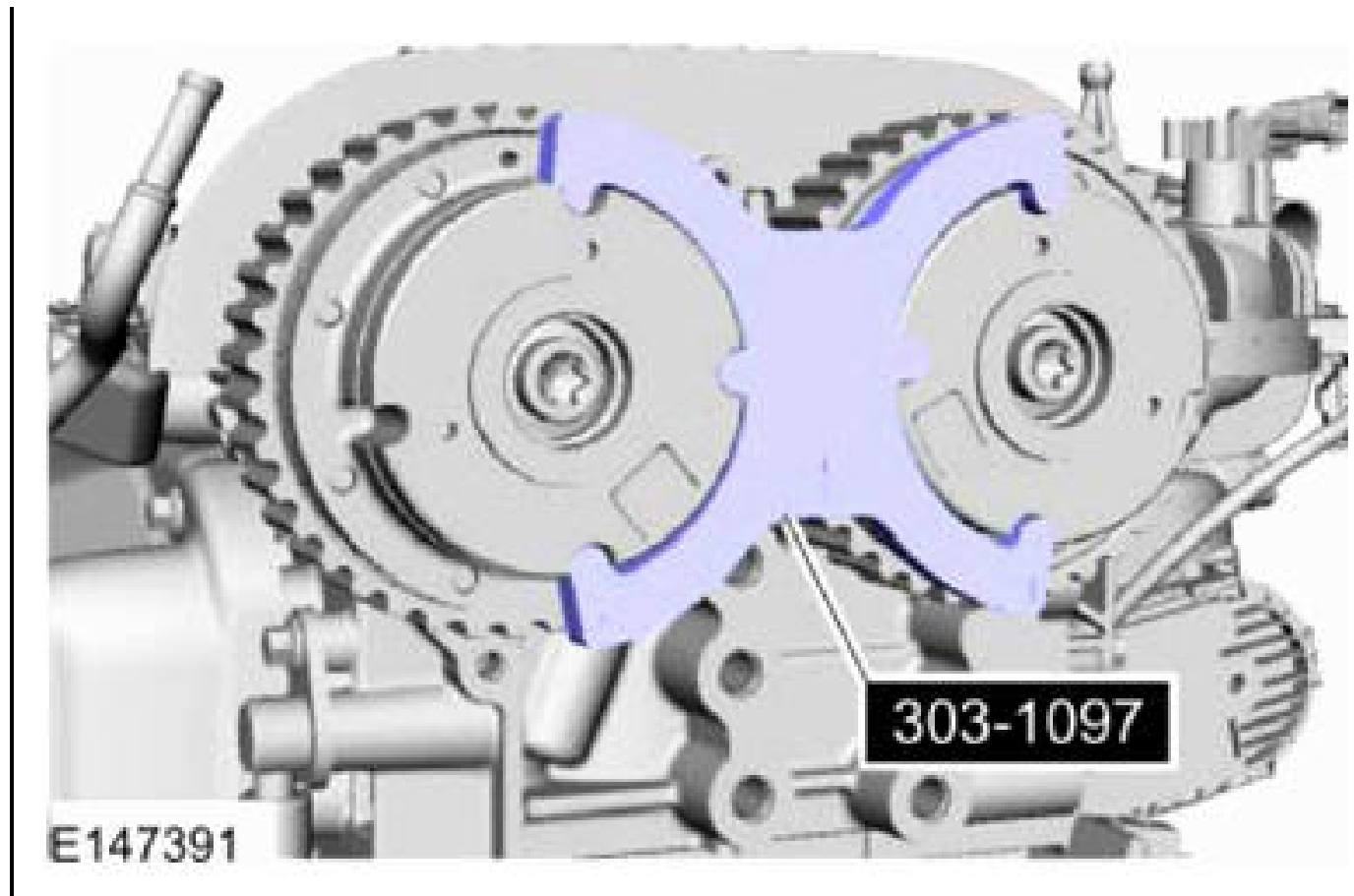
7. **NOTE:** The special tool can only be installed if the valve timing is correct.

Install Special Service Tool : 303-1552 Alignment Tool, Camshaft

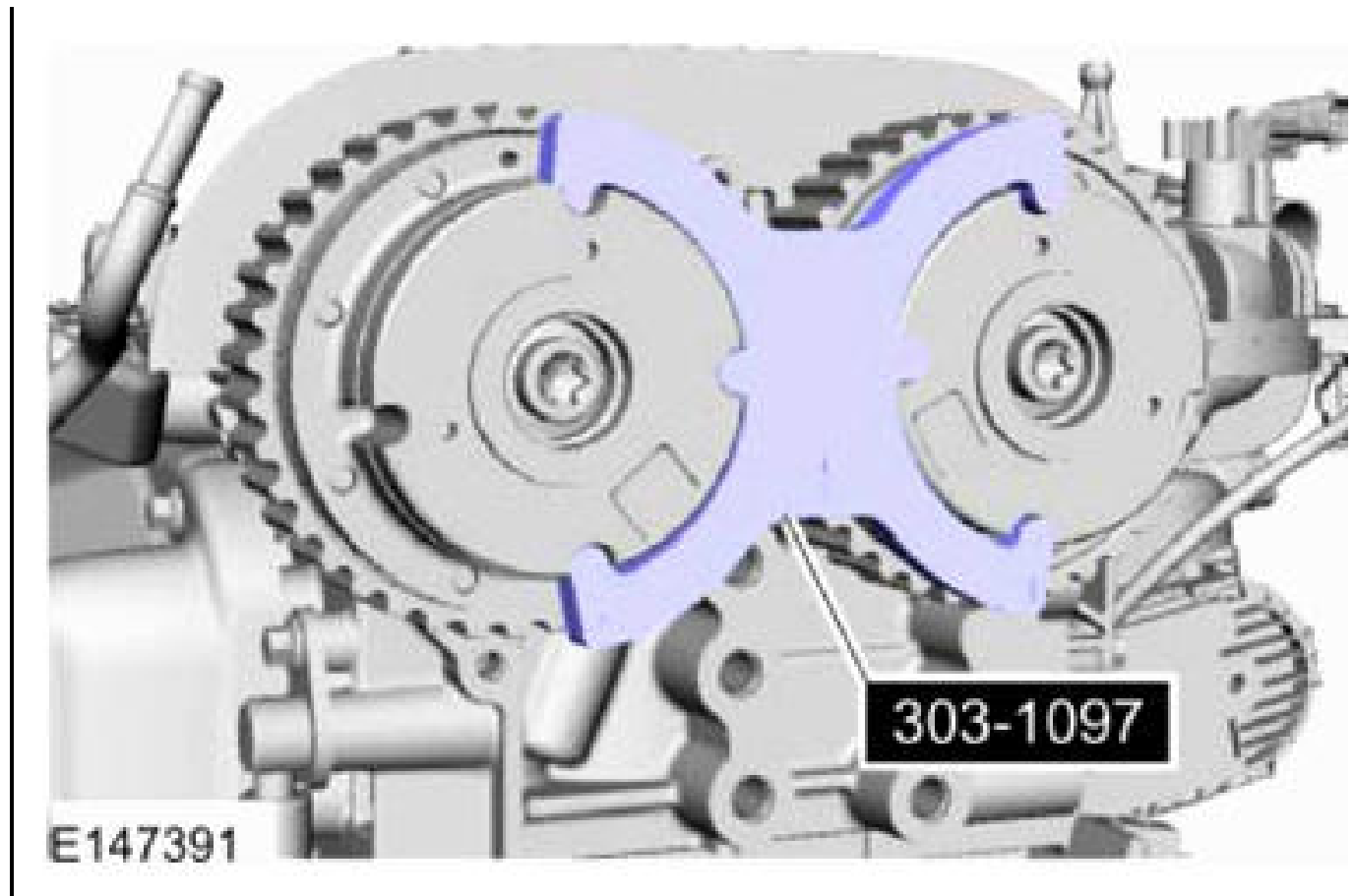


8. **NOTE:** The special tool can only be installed if the valve timing is correct.

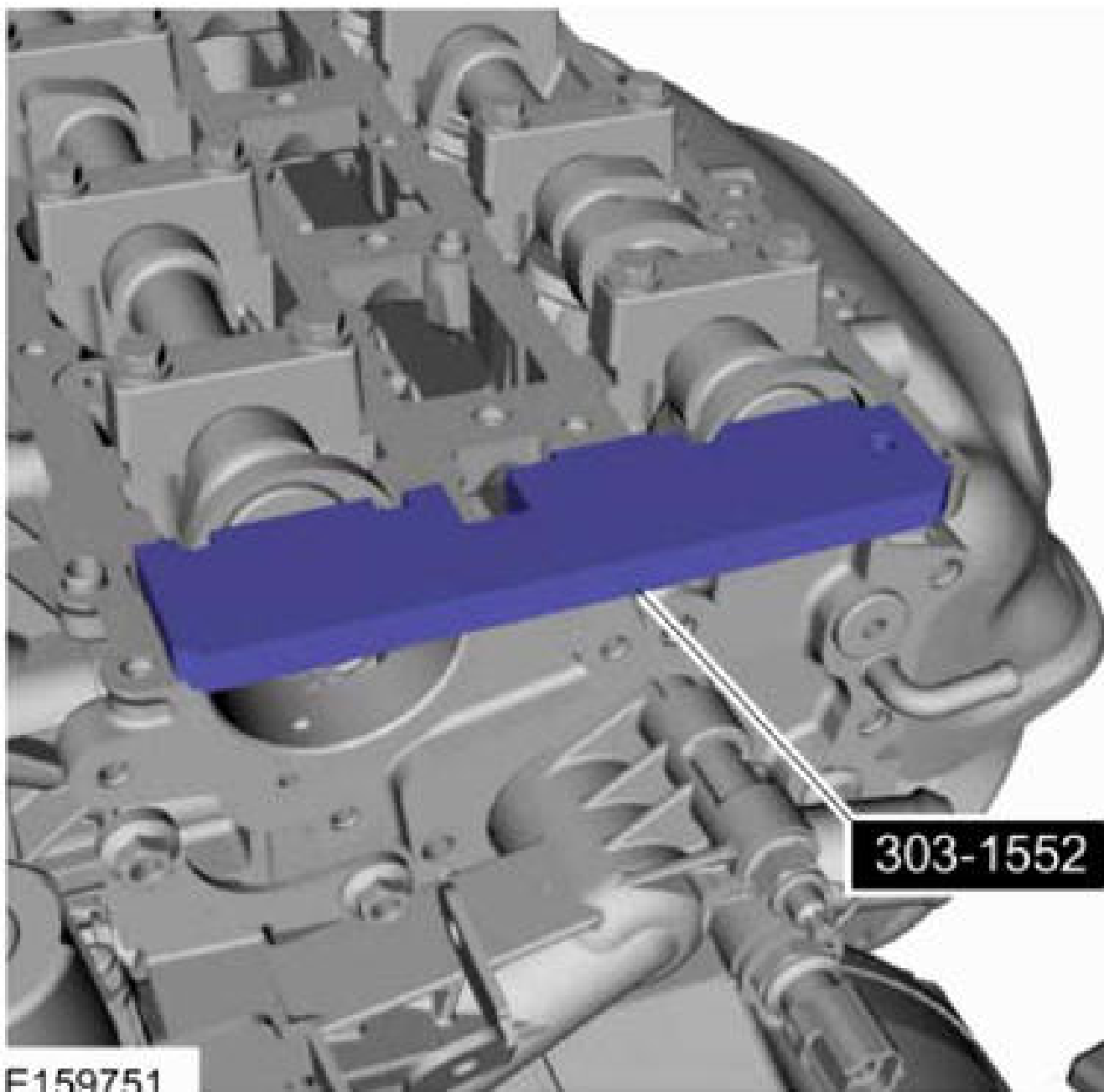
If the special tools cannot be installed, repeat the adjustment according to the preceding steps.



9. *Remove Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*

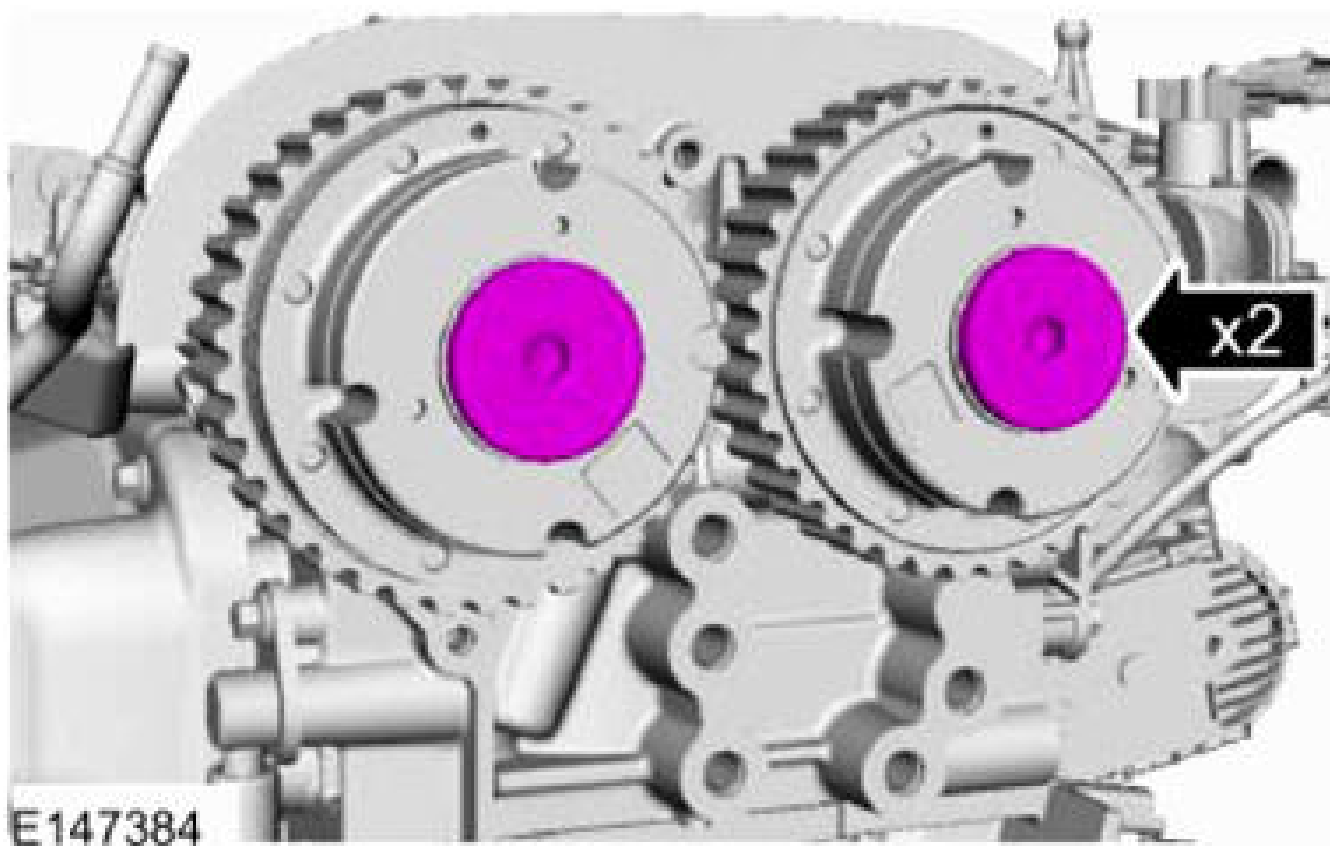


10. *Remove Special Service Tool : 303-1552 Alignment Tool, Camshaft*

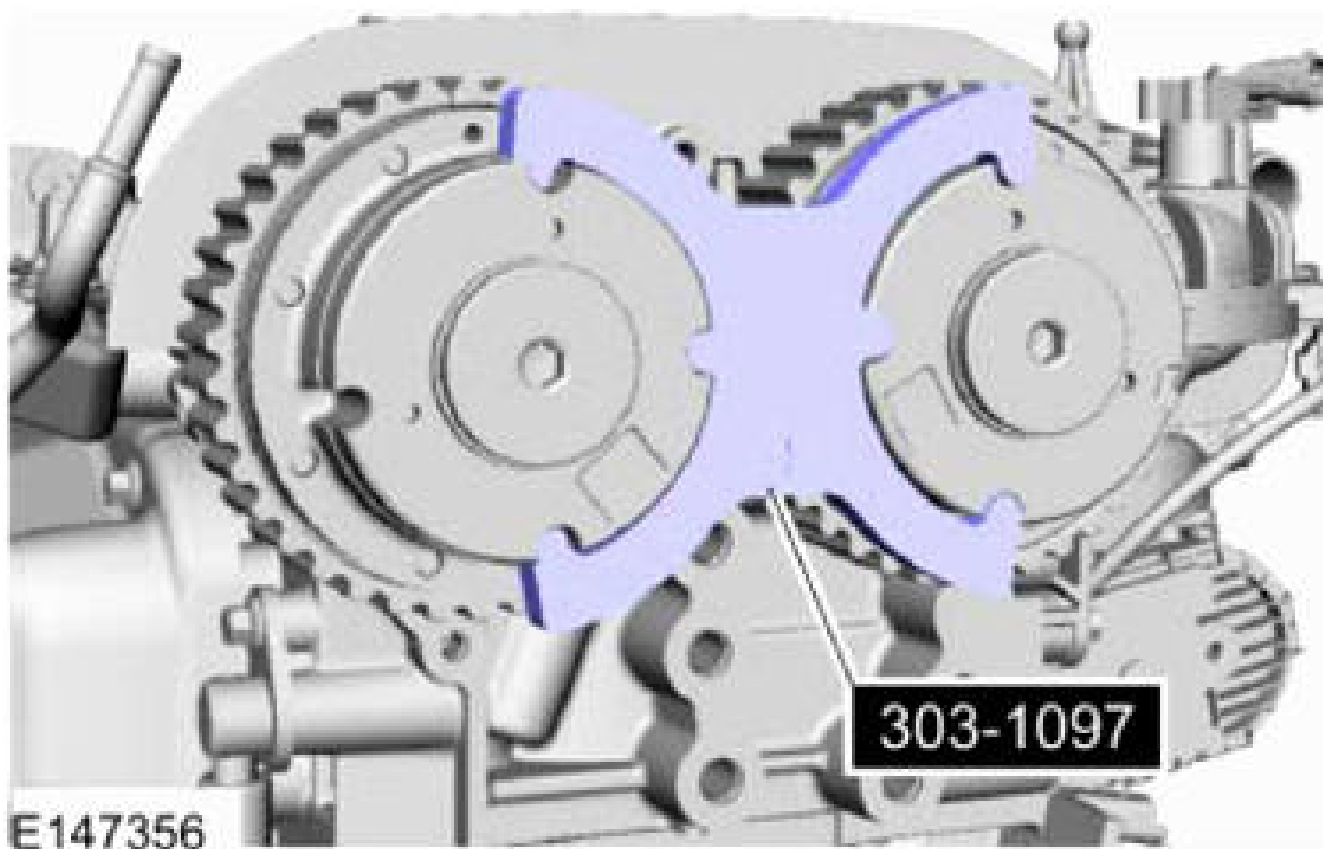


11. **NOTE:** Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

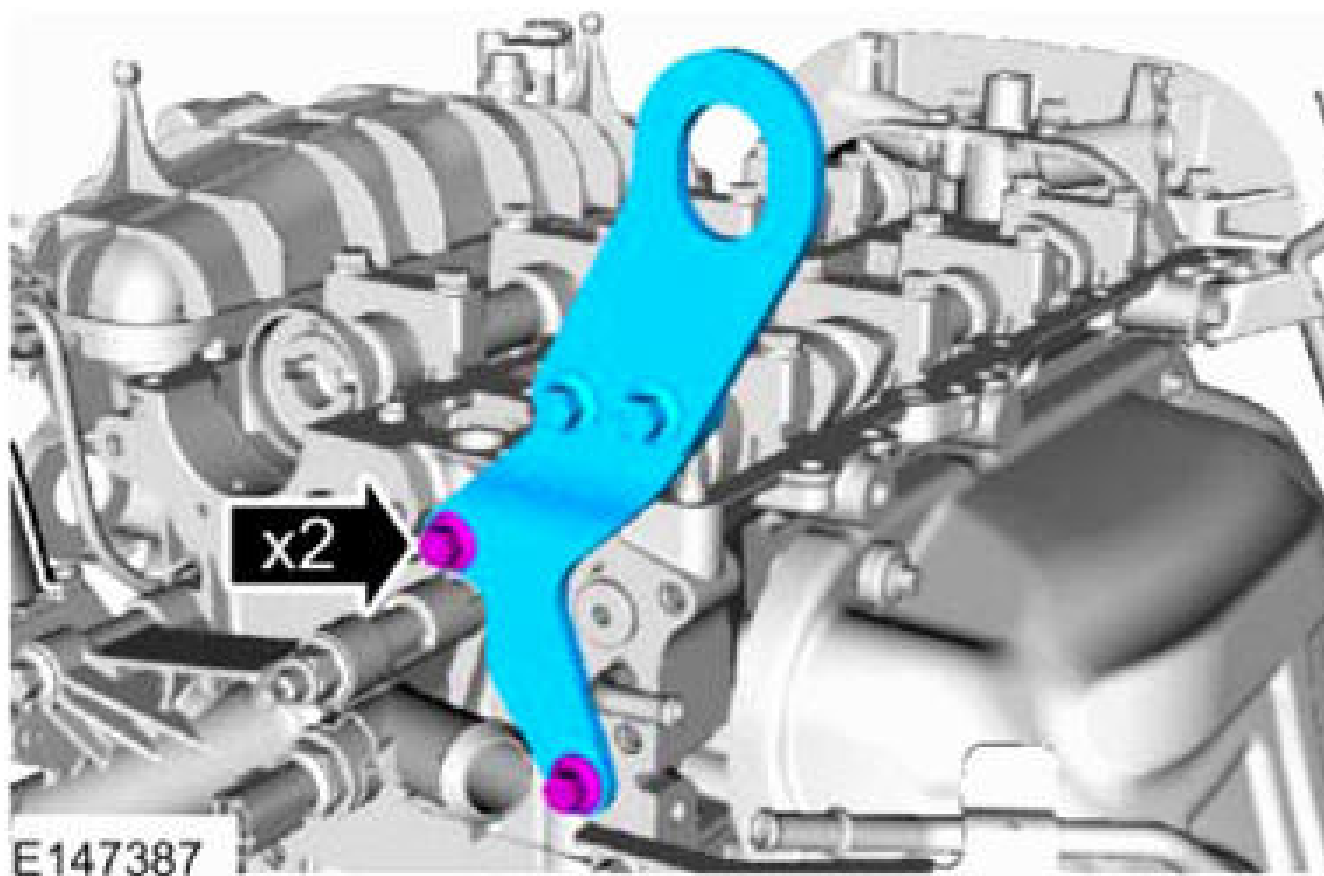
Torque : 16 Nm



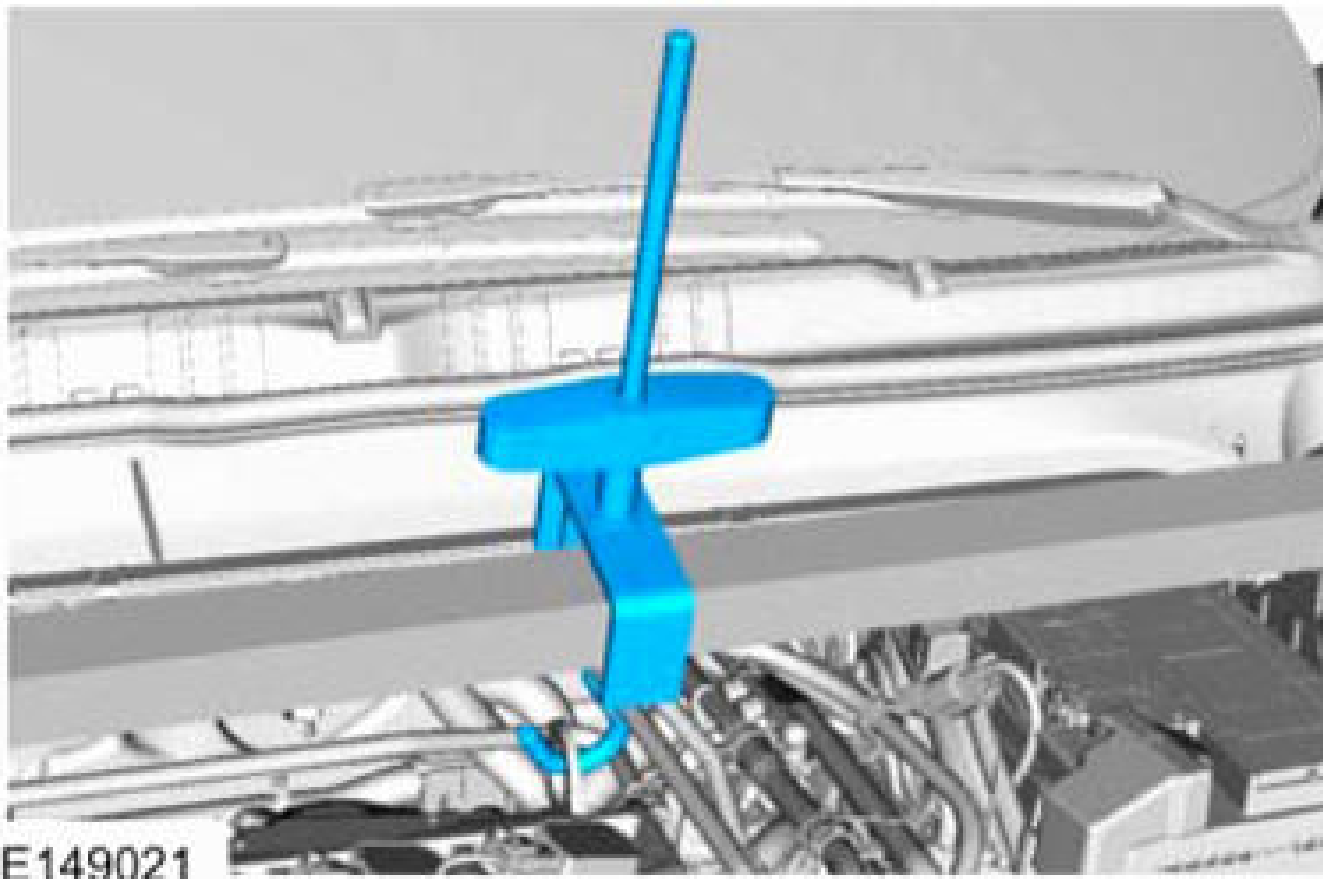
12. *Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



13. *Torque* : 19 Nm



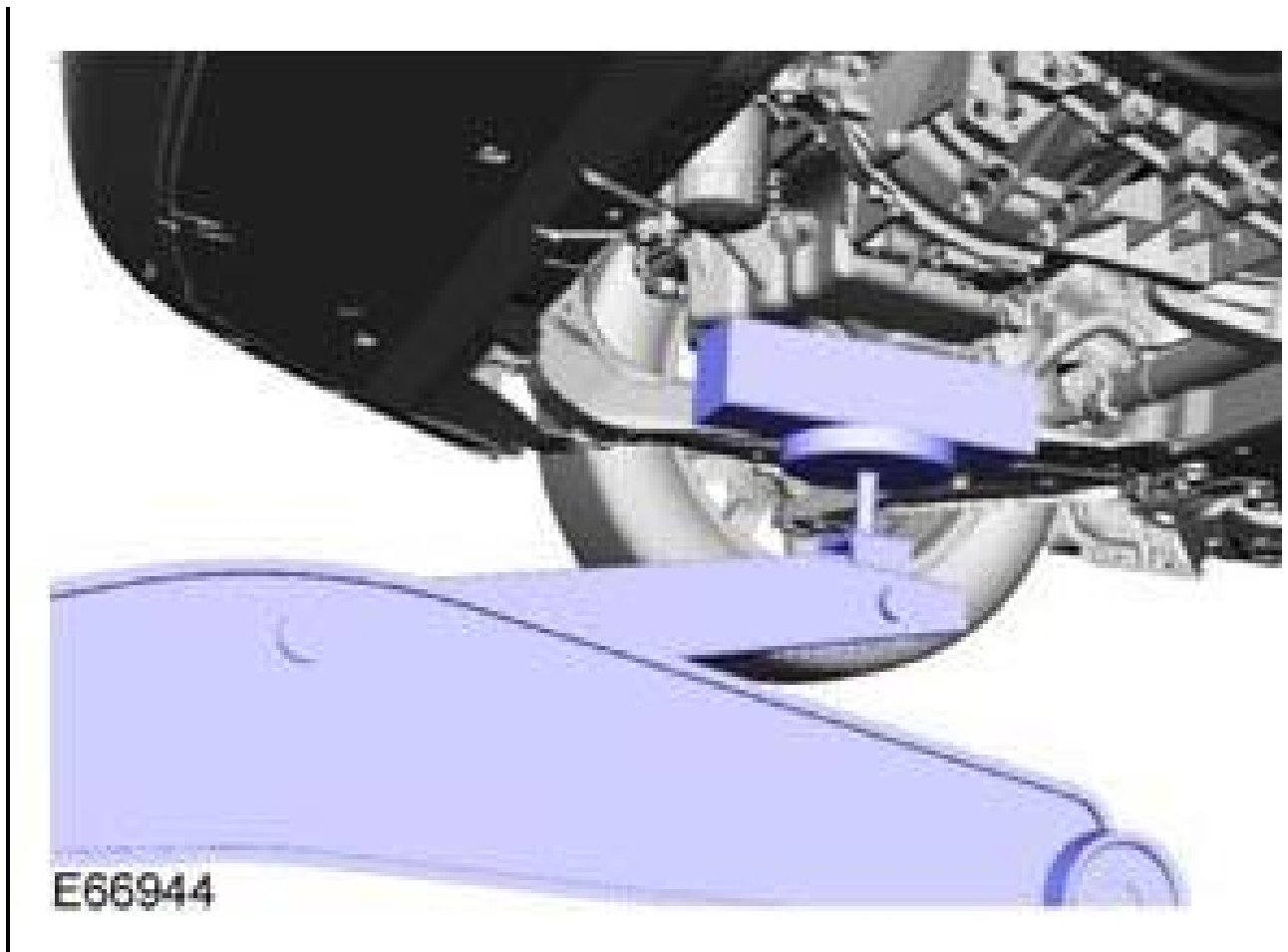
14. Install.



15. Remove the following items:

- *General Equipment* : Trolley Jack

General Equipment : Wooden Block



16. Install the following items:

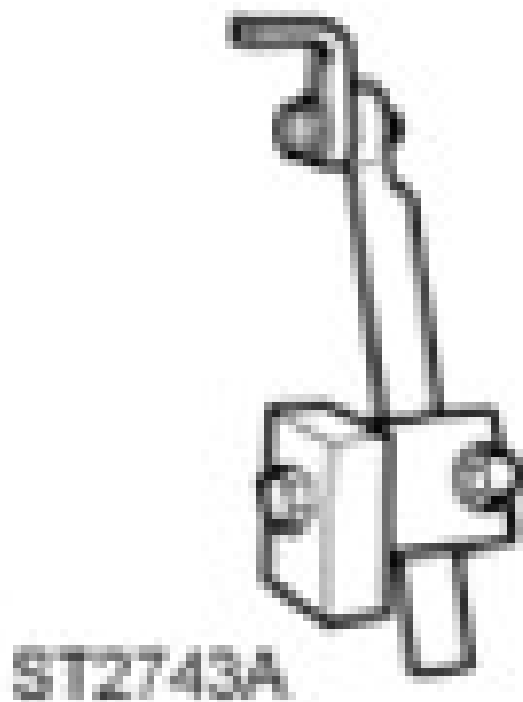
1. Refer to: **CRANKSHAFT PULLEY** .
2. Refer to: **VALVE COVER** .

REMOVAL

ENGINE

SPECIAL TOOLS/GENERAL EQUIPMENT

--	--



014-00001
ADJUSTABLE GRIP 1735A



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

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



205-241

205-241 (T86P-3514-A)
Remover, Halfshaft
TKIT-2009TC-F
T86P-1000-S
TKIT-1986-F



205-290 (T89P-3415-B)
Remover, Halfshaft (Plate)
TKIT-1989-FLM
TKIT-1989-LM

300-OTC1585AE
Powertrain Lift



ST1293-A



ST1341-A

300-OTC1819E

2, 200# Floor Crane, Fold Away



303-1502
Lifting Device Engine



307-569
Disconnect Tool TOC Line (1/2)
TKIT-2006U-F/FM
TKIT-2006U-FLM/LM
TKIT-2006U-ROW1
TKIT-2006U-ROW2

Strap Wrench

Oil Drain Equipment

Hose Clamp Remover/Installer

Wooden Block

WARNING: Before beginning any service procedure, refer to Safety Warnings in

GENERAL INFORMATION -- FUSION . Failure to follow this instruction may result in serious personal injury.

All vehicles

WARNING: Before beginning any service procedure, refer to Safety Warnings in **GENERAL INFORMATION -- FUSION** . Failure to follow this instruction may result in serious personal injury.

1.

Refer to: **HEALTH AND SAFETY PRECAUTIONS** .

2. Refer to: **JACKING AND LIFTING - OVERVIEW** .

3. Refer to: **FUEL SYSTEM PRESSURE RELEASE** .

4. Refer to: **AIR CONDITIONING (A/C) SYSTEM RECOVERY, EVACUATION AND CHARGING** .

5. Refer to: **COOLING SYSTEM DRAINING AND VACUUM FILLING** .

6. Remove the following items:

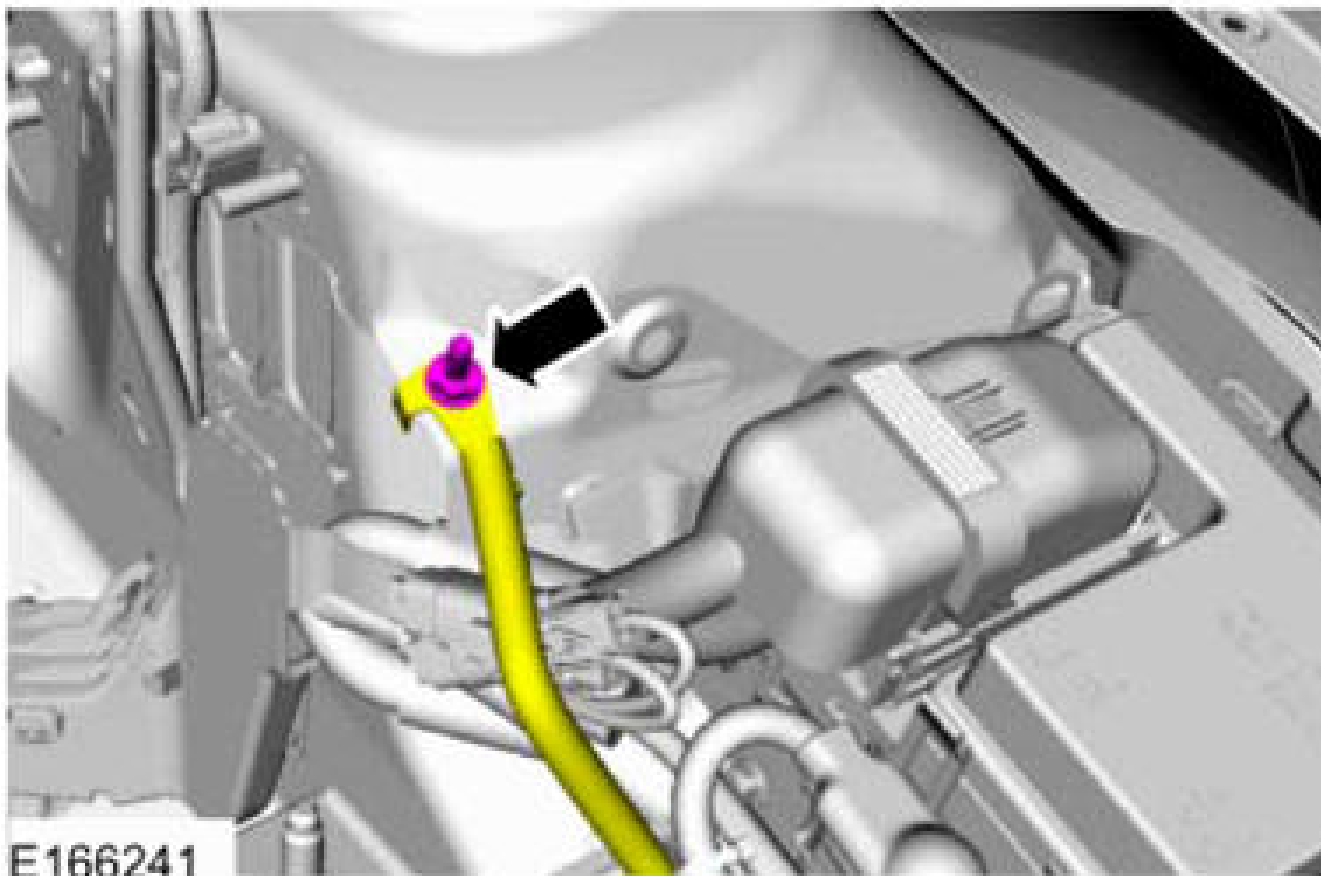
1. Refer to: **DEGAS BOTTLE** .

2. Refer to: **AIR CLEANER OUTLET PIPE** .

Refer to: **AIR CLEANER** - 1.6L EcoBoost (132kW/180PS) - Sigma .

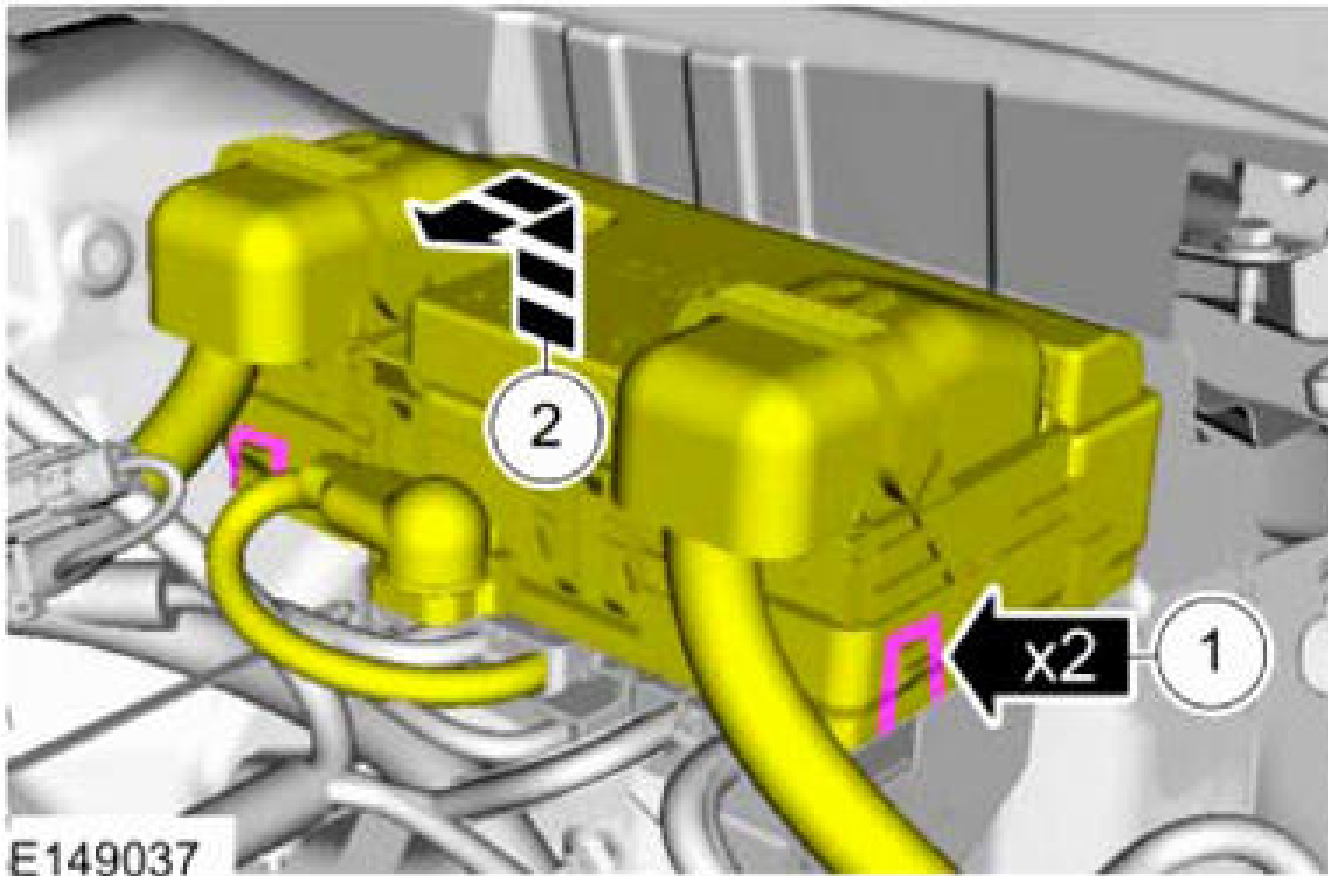
3. Refer to: **BATTERY TRAY** .

7.



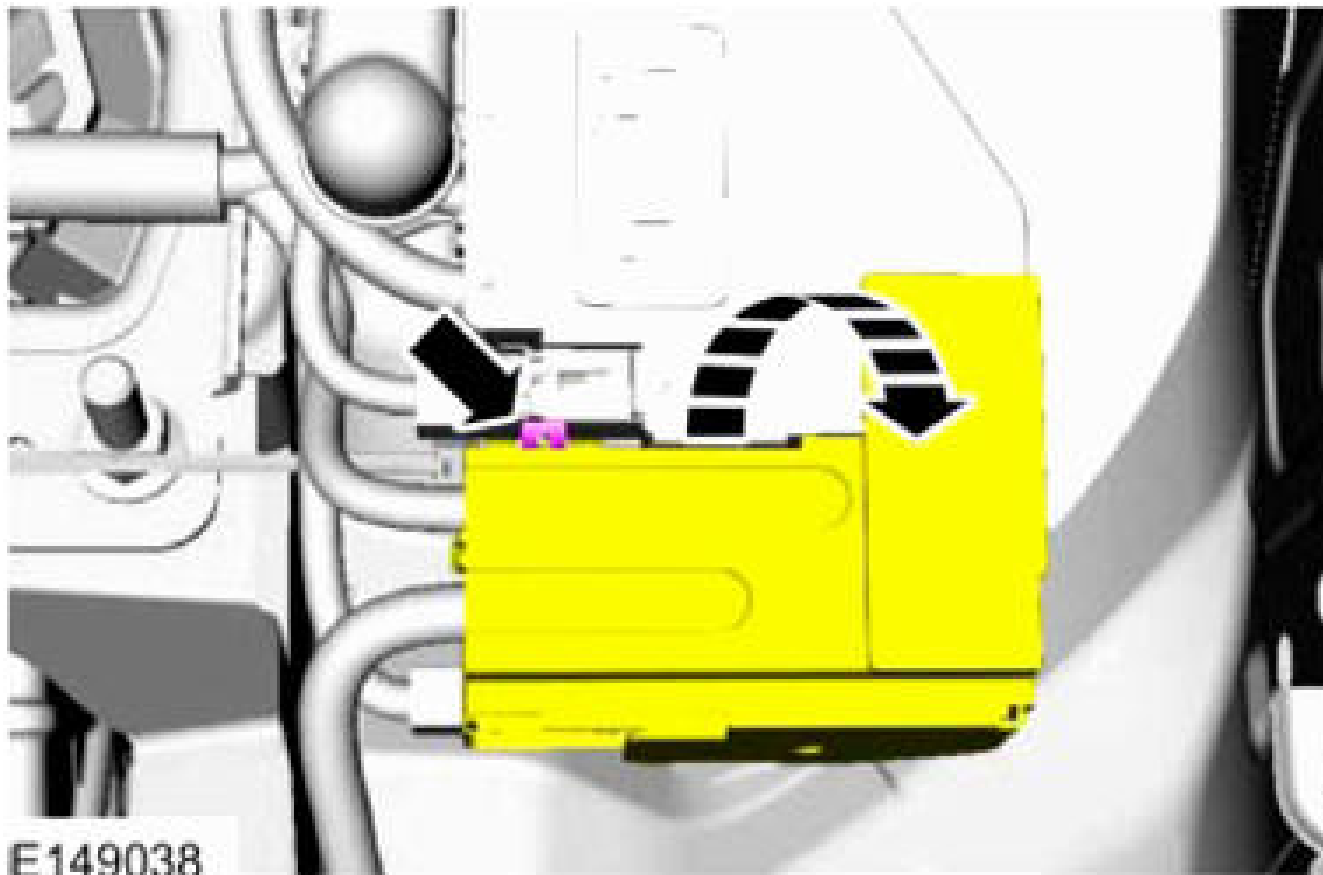
7.

8.



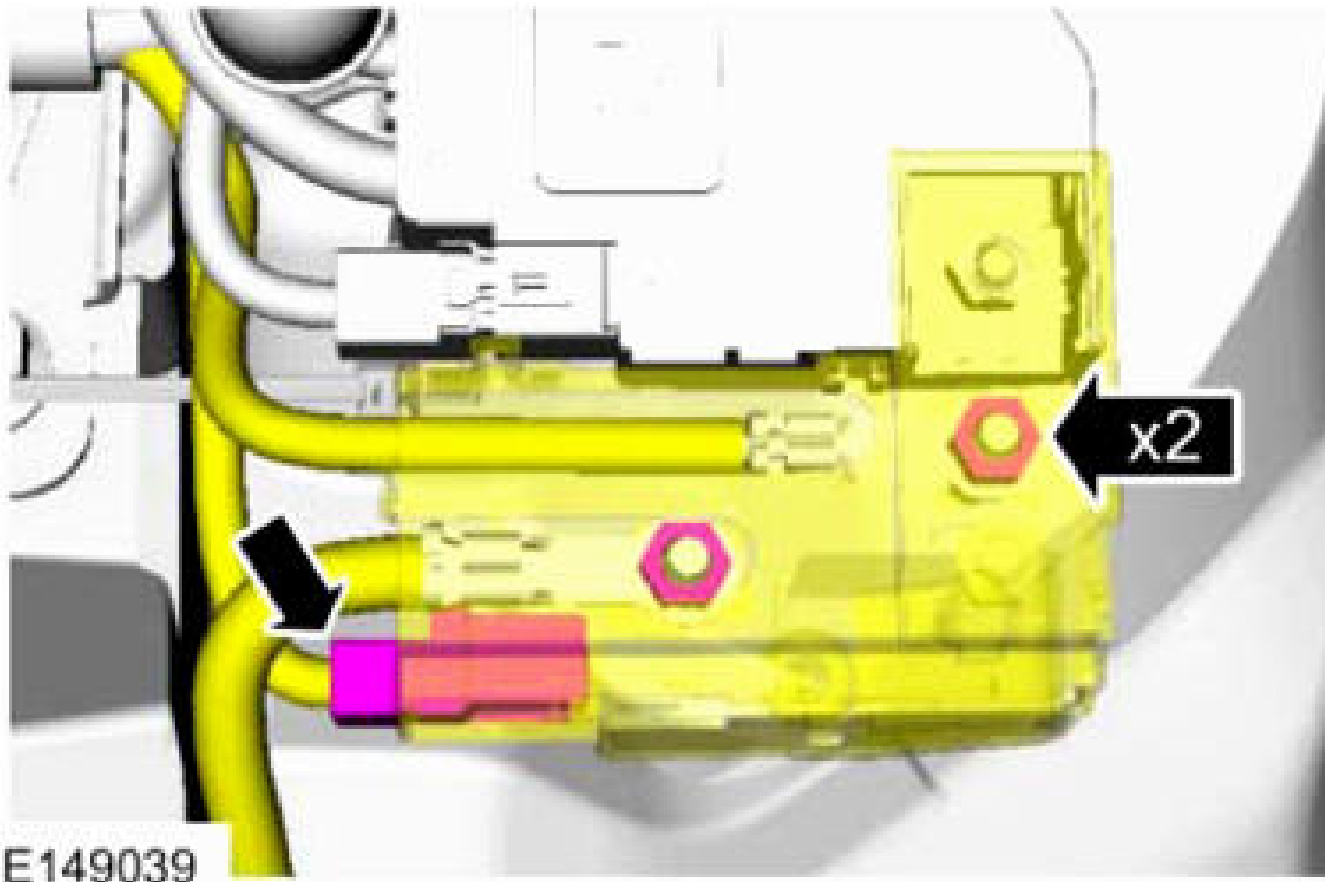
8.

9.



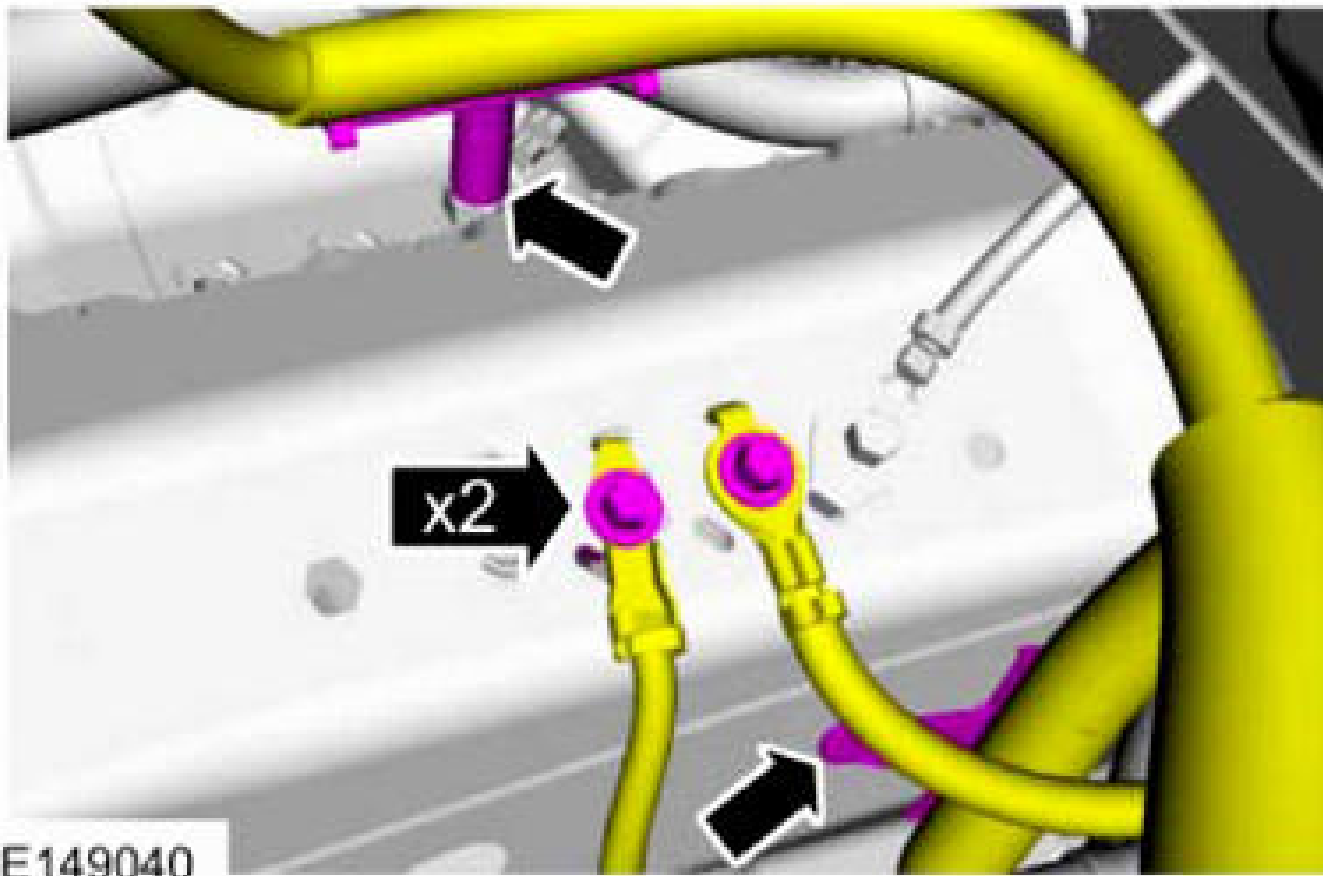
9.

10.

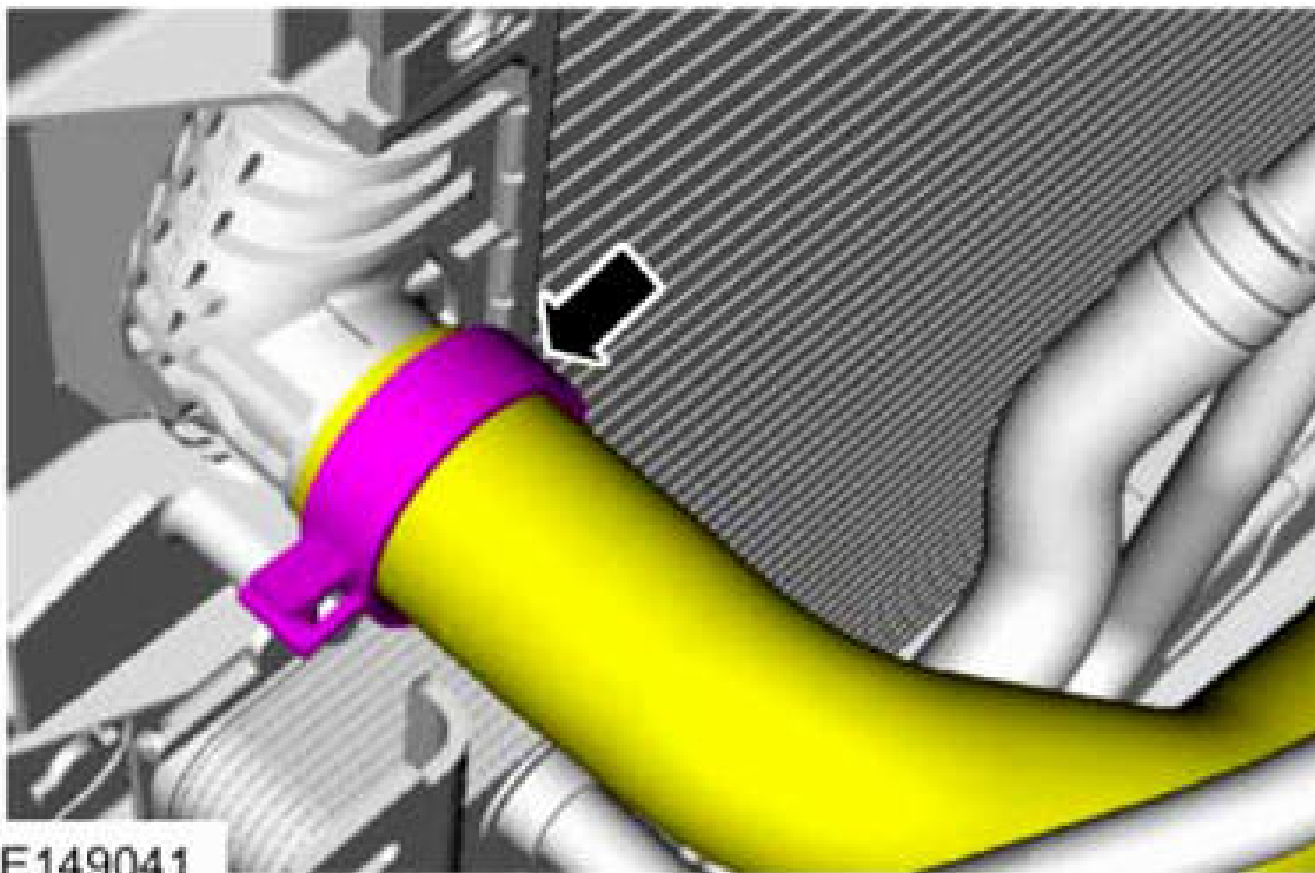


10.

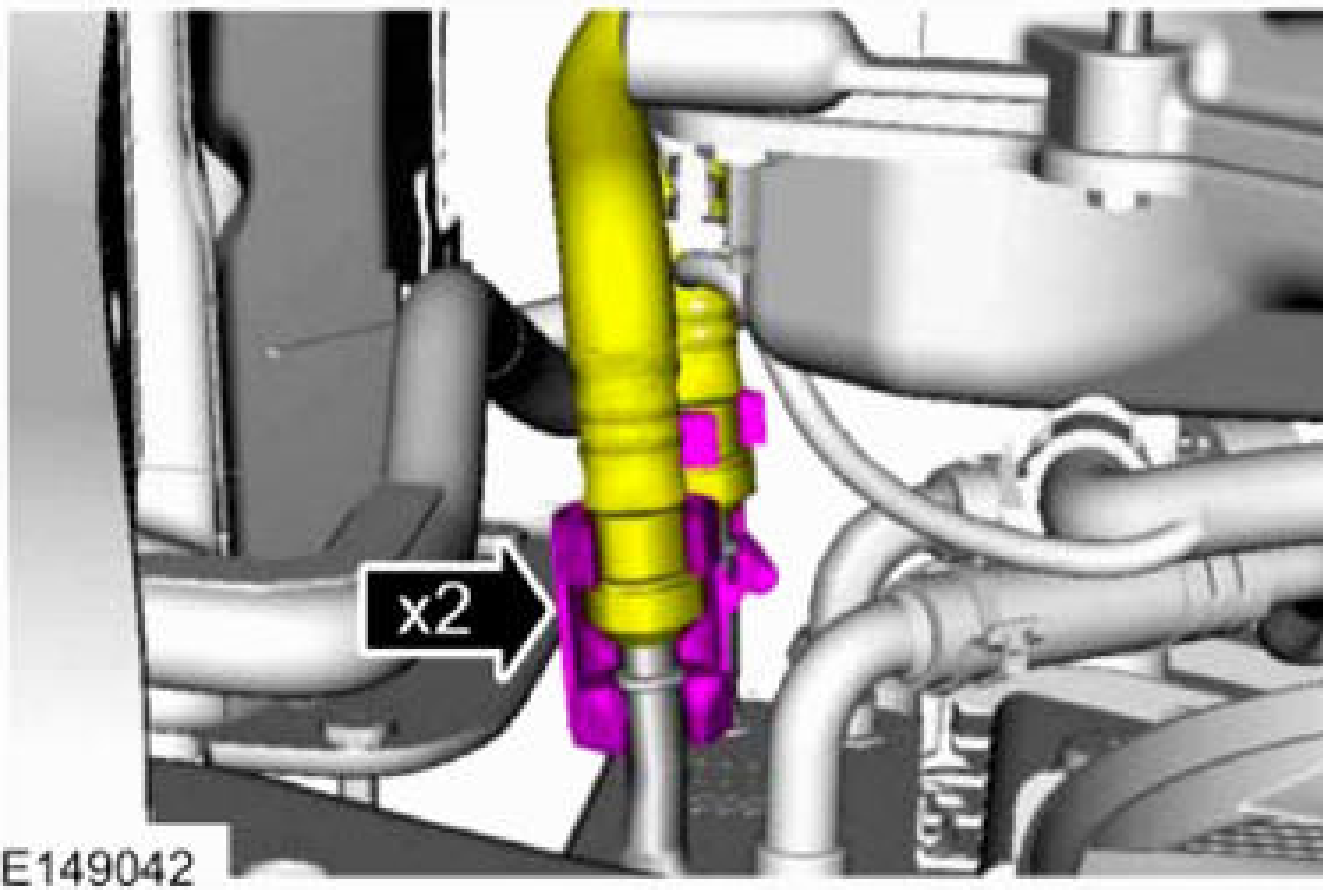
11.



- 11.
12. *General Equipment* : Hose Clamp Remover/Installer

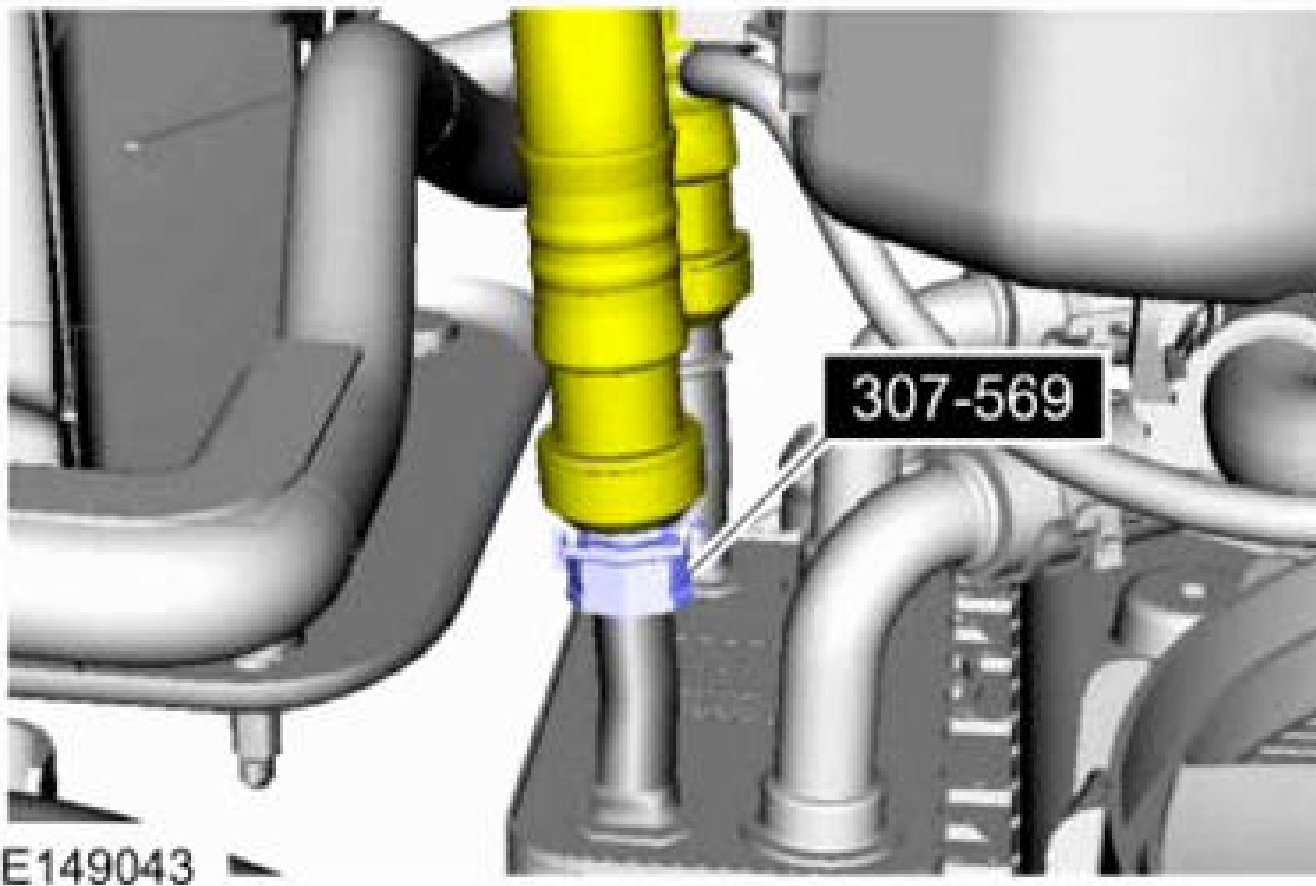


Vehicles with automatic transmission



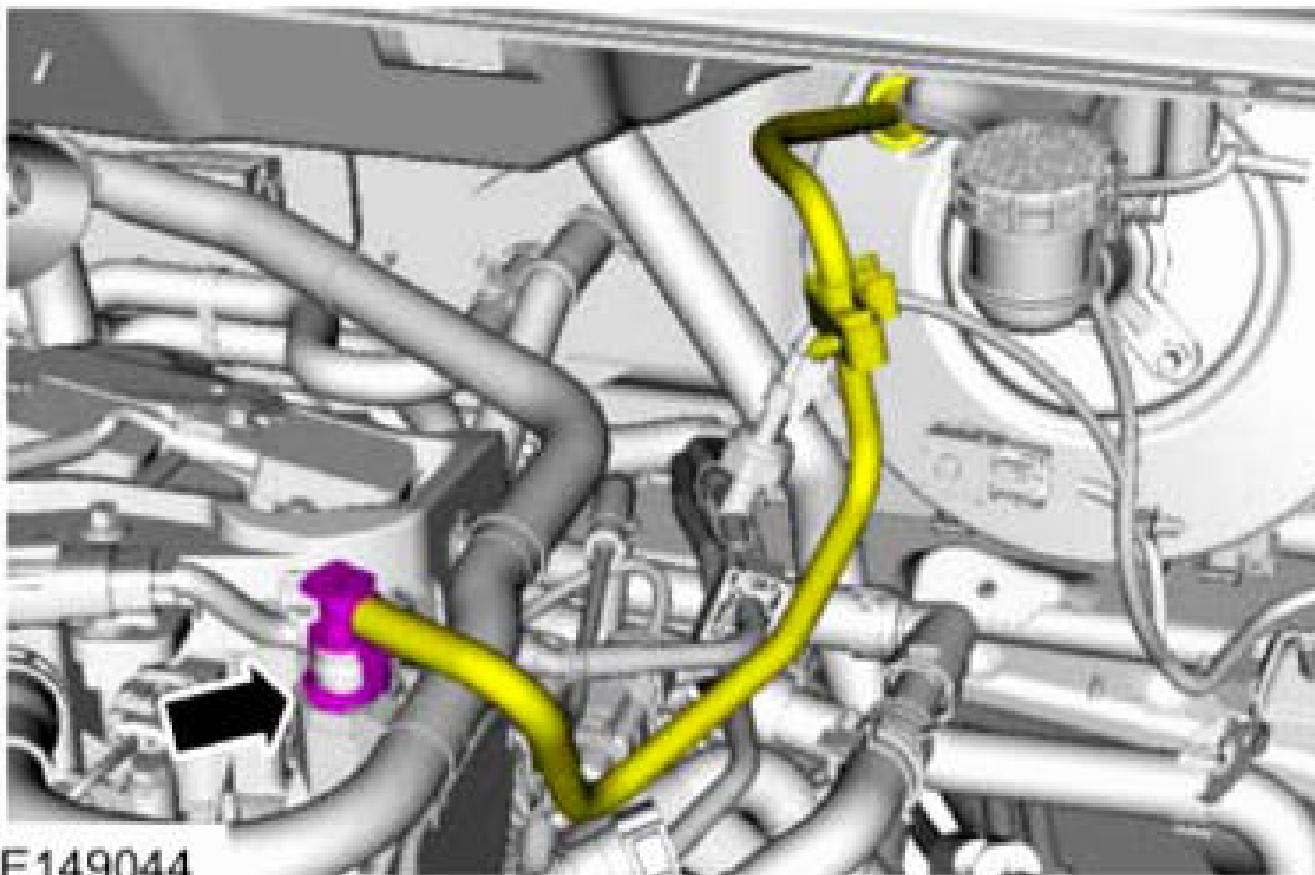
13.

14. *Special Tool(s)* : **307-569 Disconnect Tool** TOC Line (1/2)



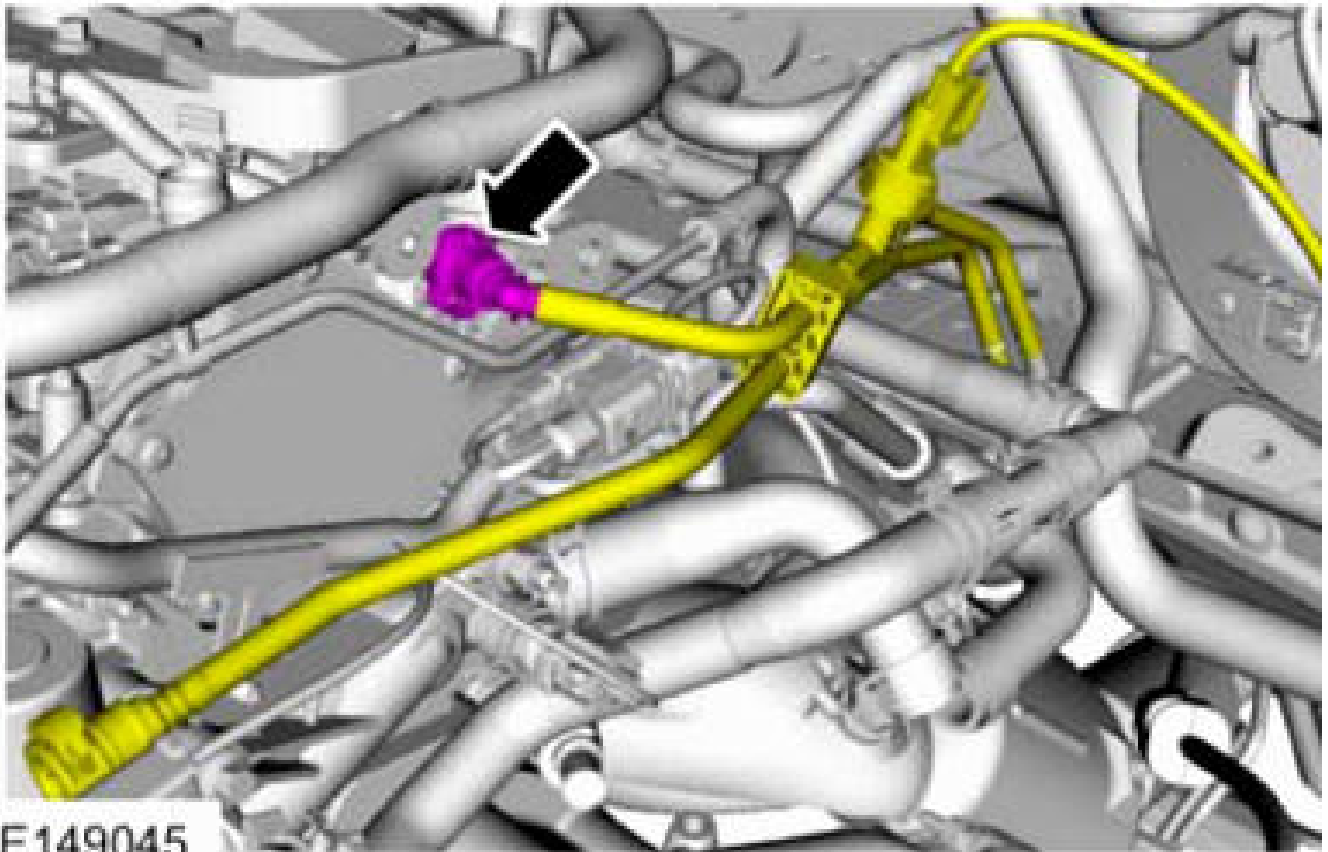
All Vehicles

15. Refer to: **QUICK RELEASE COUPLING** .

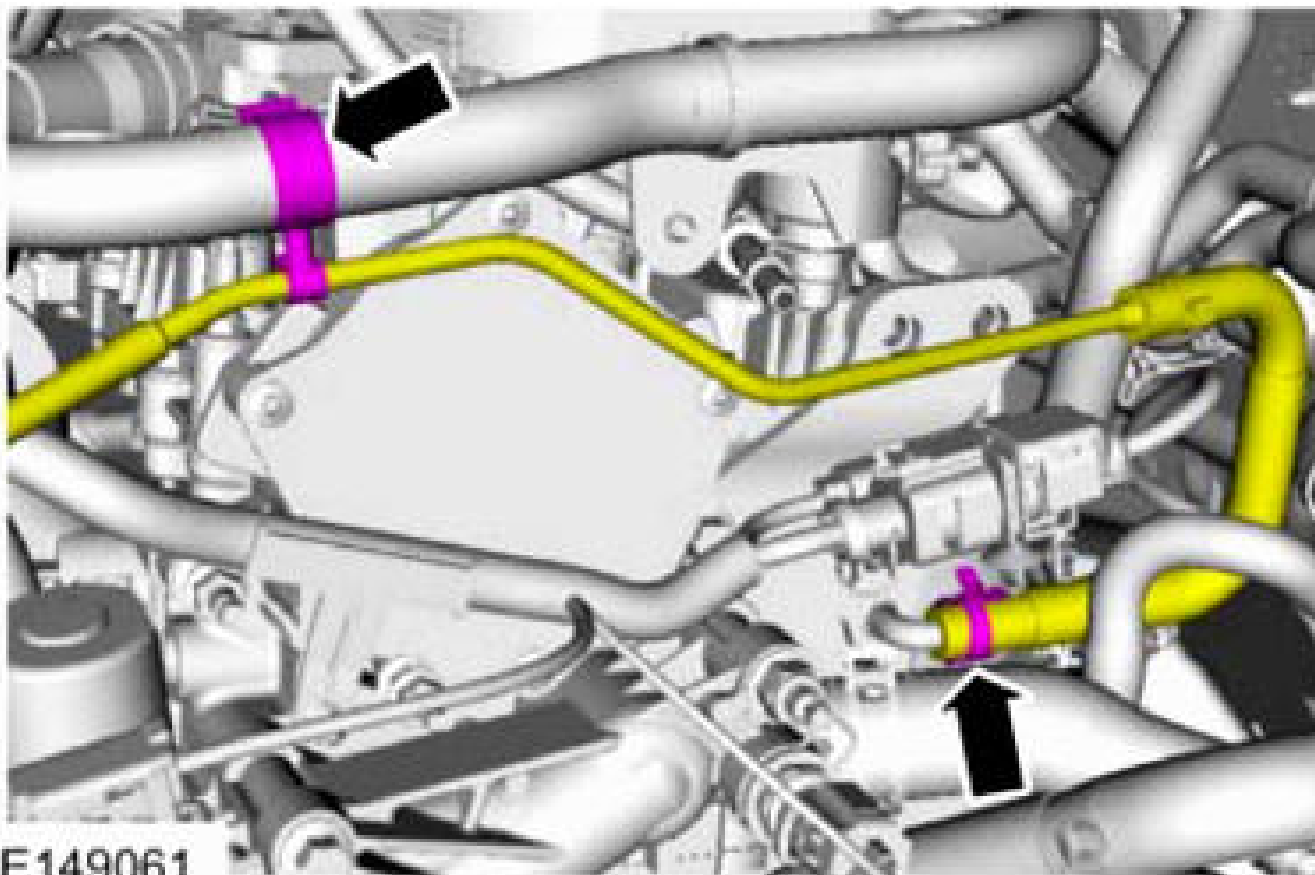


16. Refer to: EVAPORATIVE EMISSION CANISTER PURGE VALVE .
17. **NOTE:** Always wrap the fuel line connection with a towel before disconnecting it.

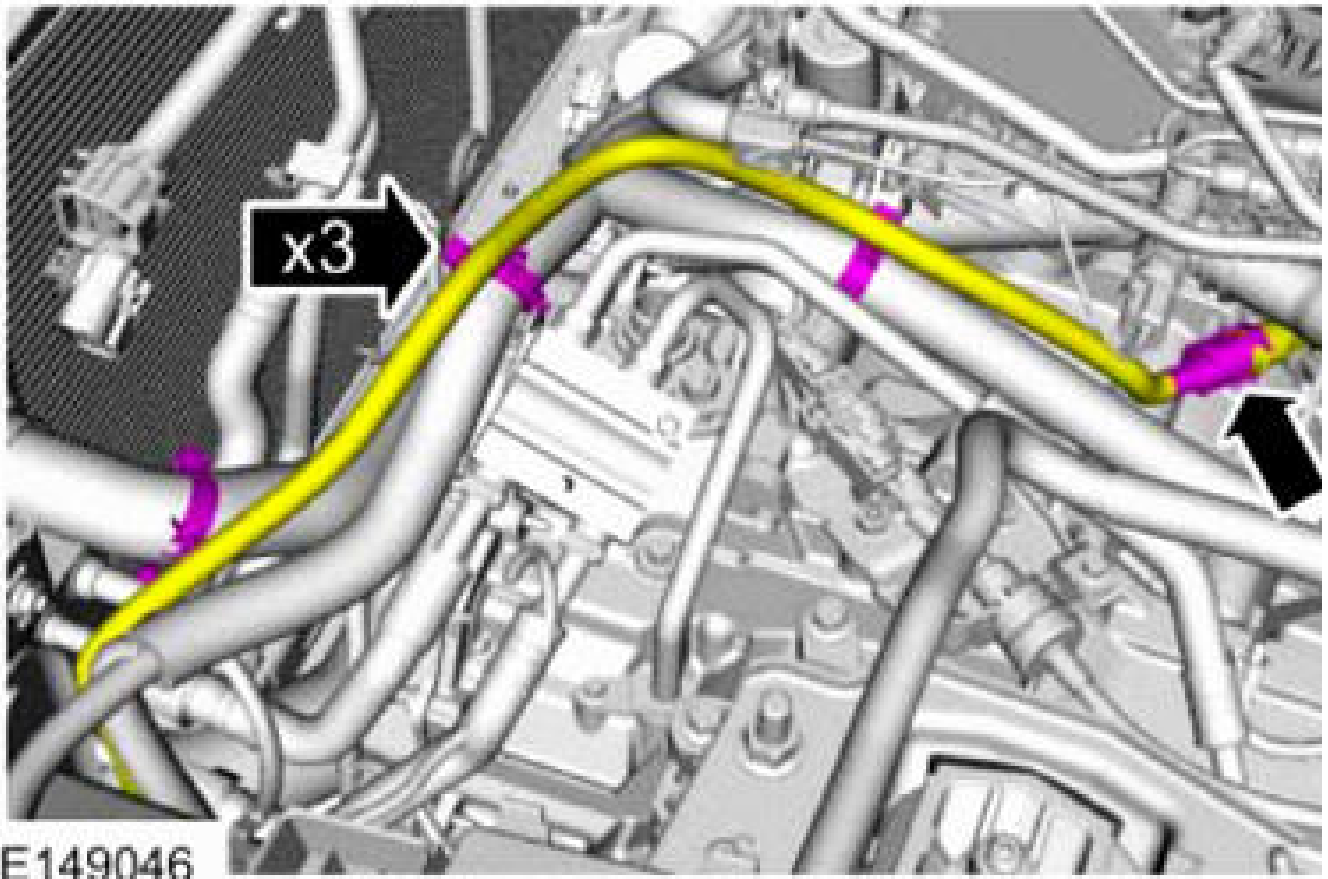
Refer to: SPRING LOCK COUPLINGS .



18. *General Equipment* : Hose Clamp Remover/Installer

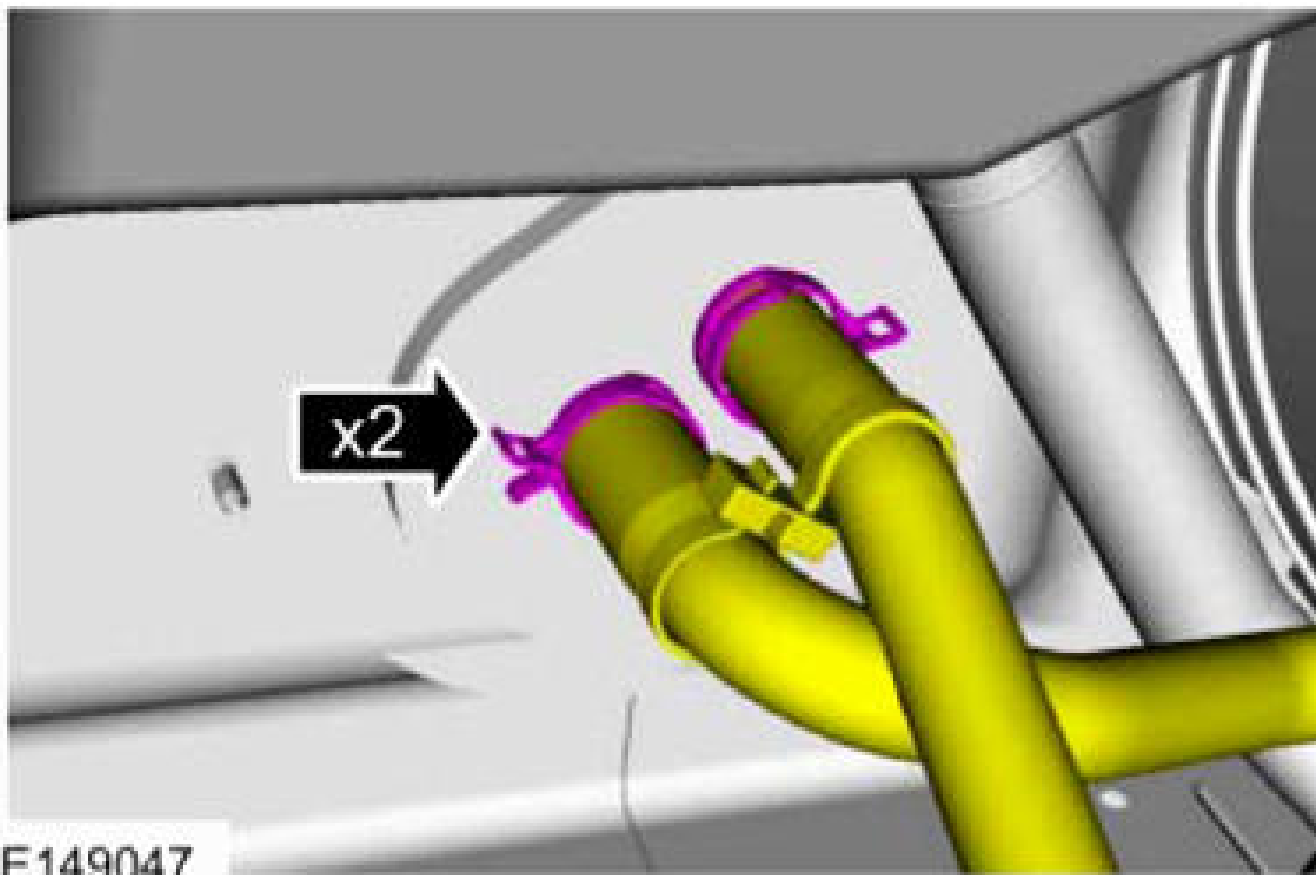


19. If equipped with block heater.

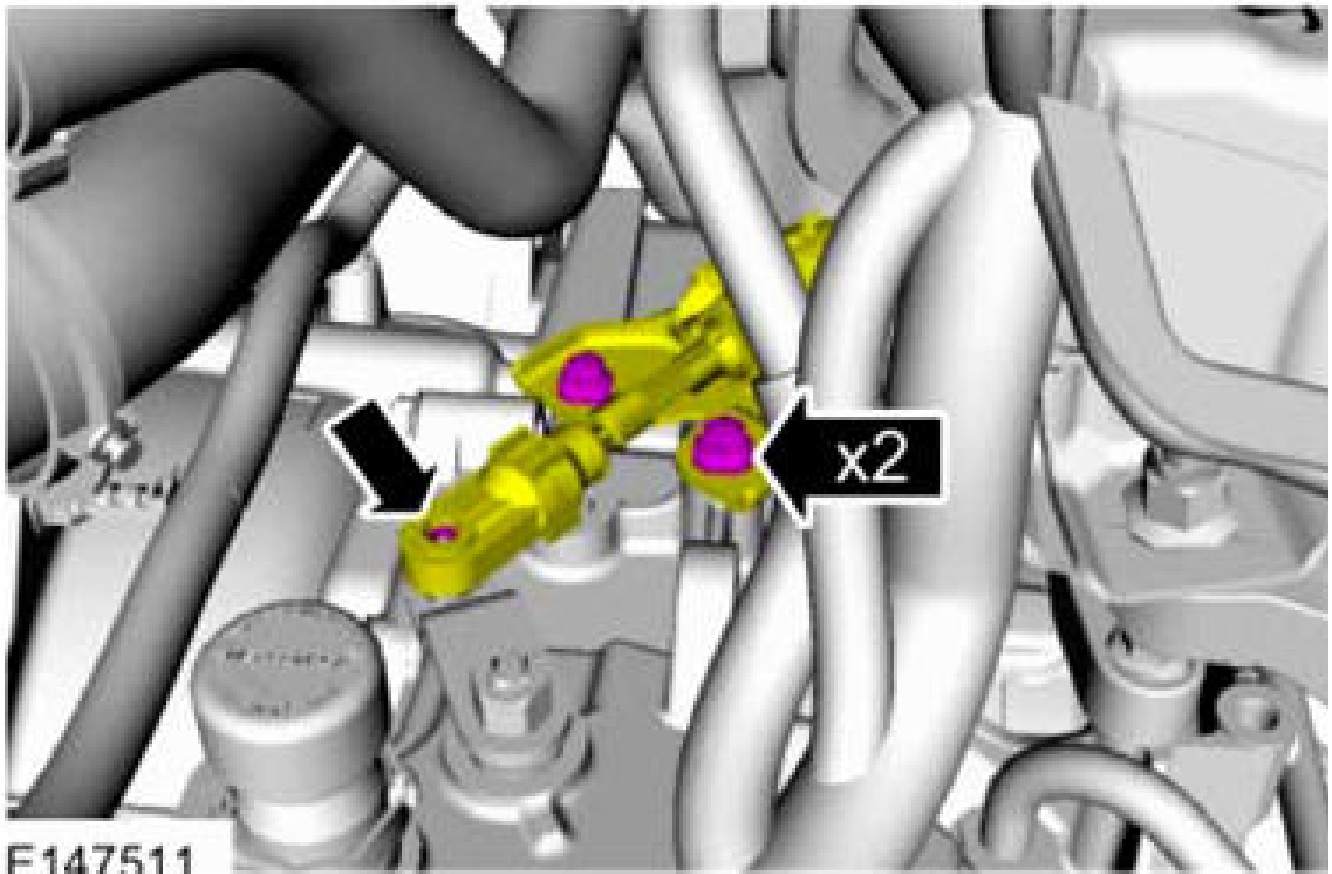


20. **NOTE:** Note the position of the coolant hoses for installation.

General Equipment : Hose Clamp Remover/Installer



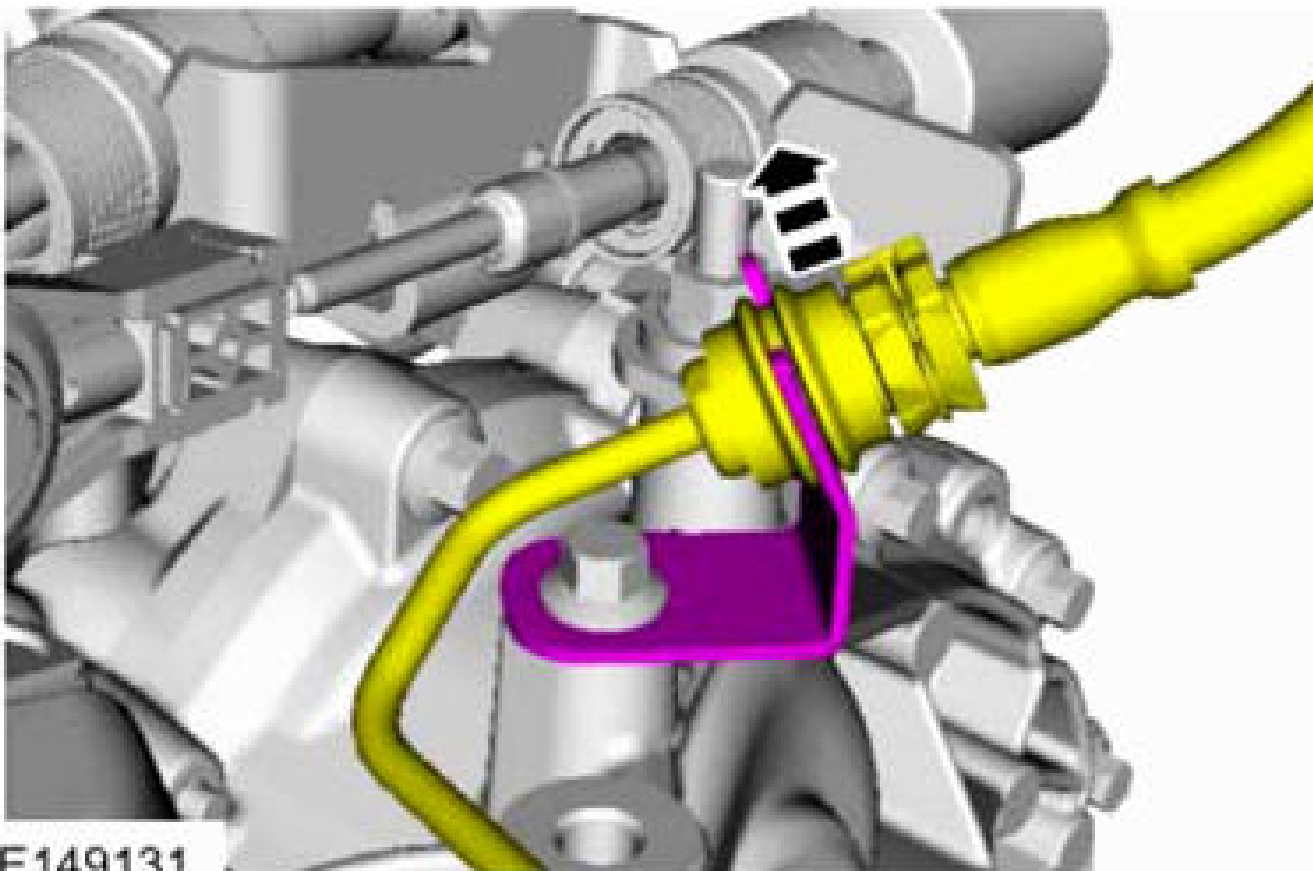
Vehicles with automatic transmission



21.

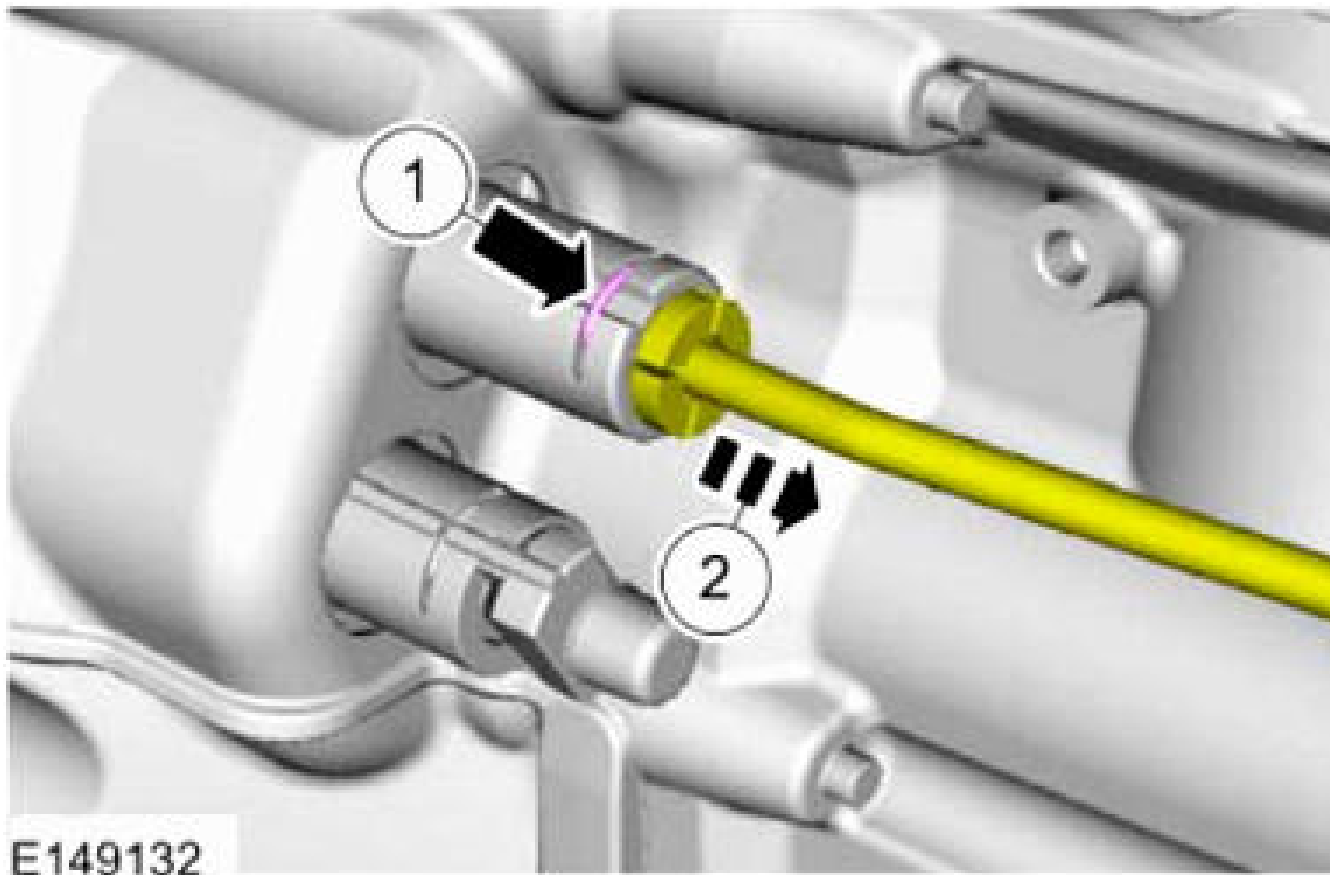
Vehicles with manual transmission

22.

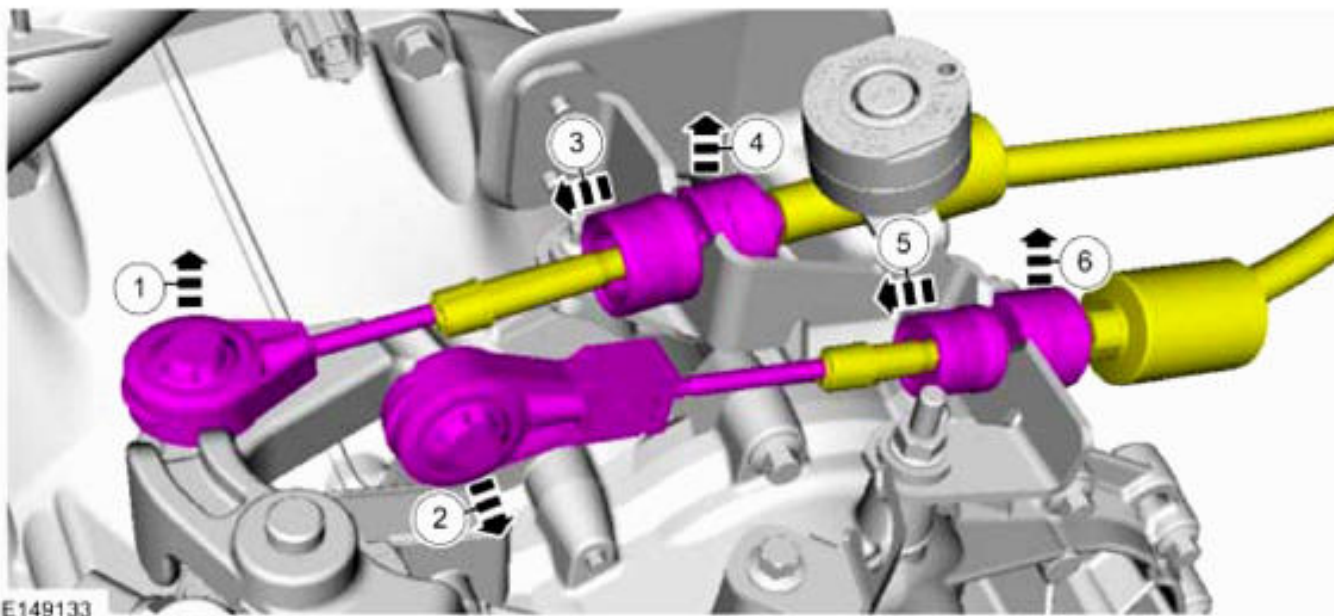


22.

23.

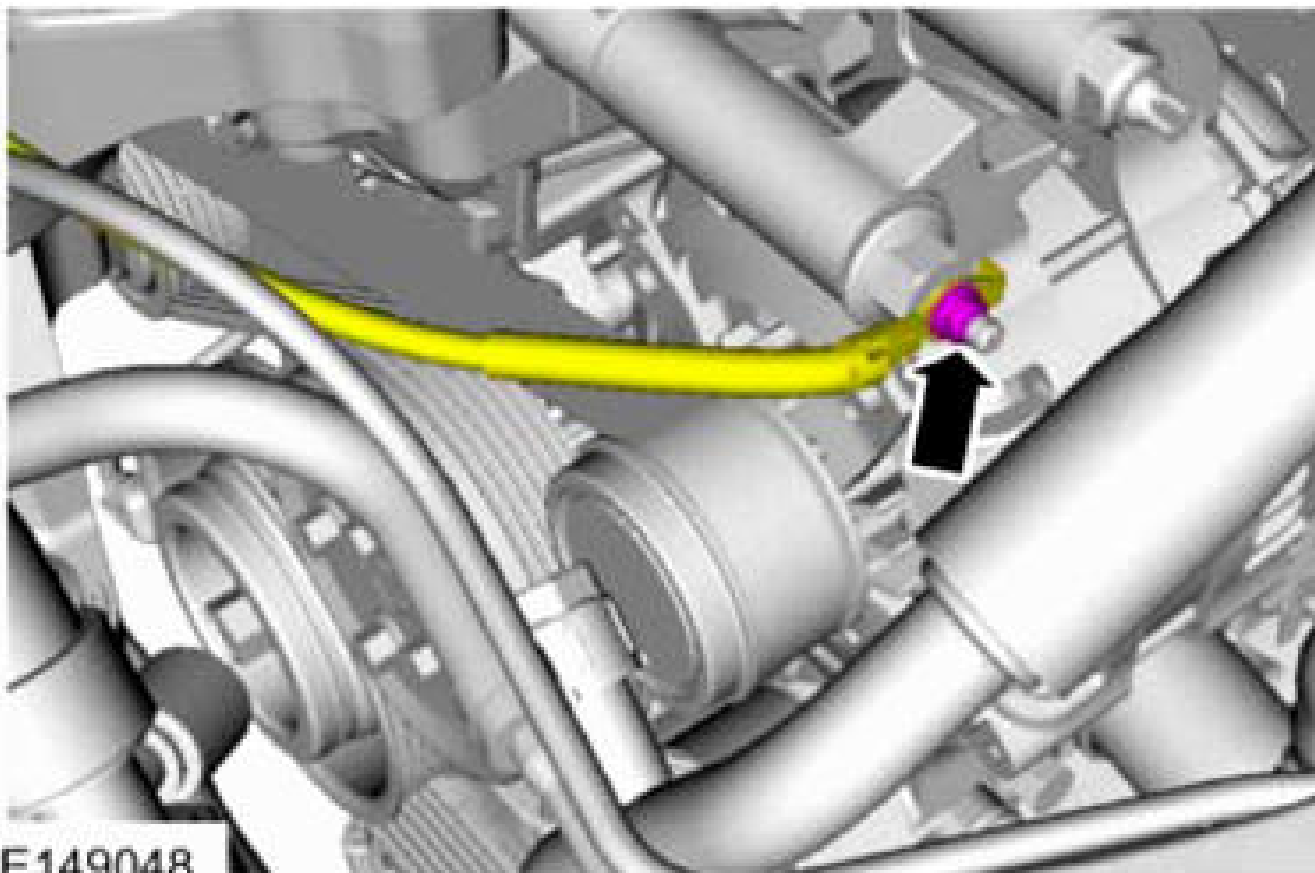


23.



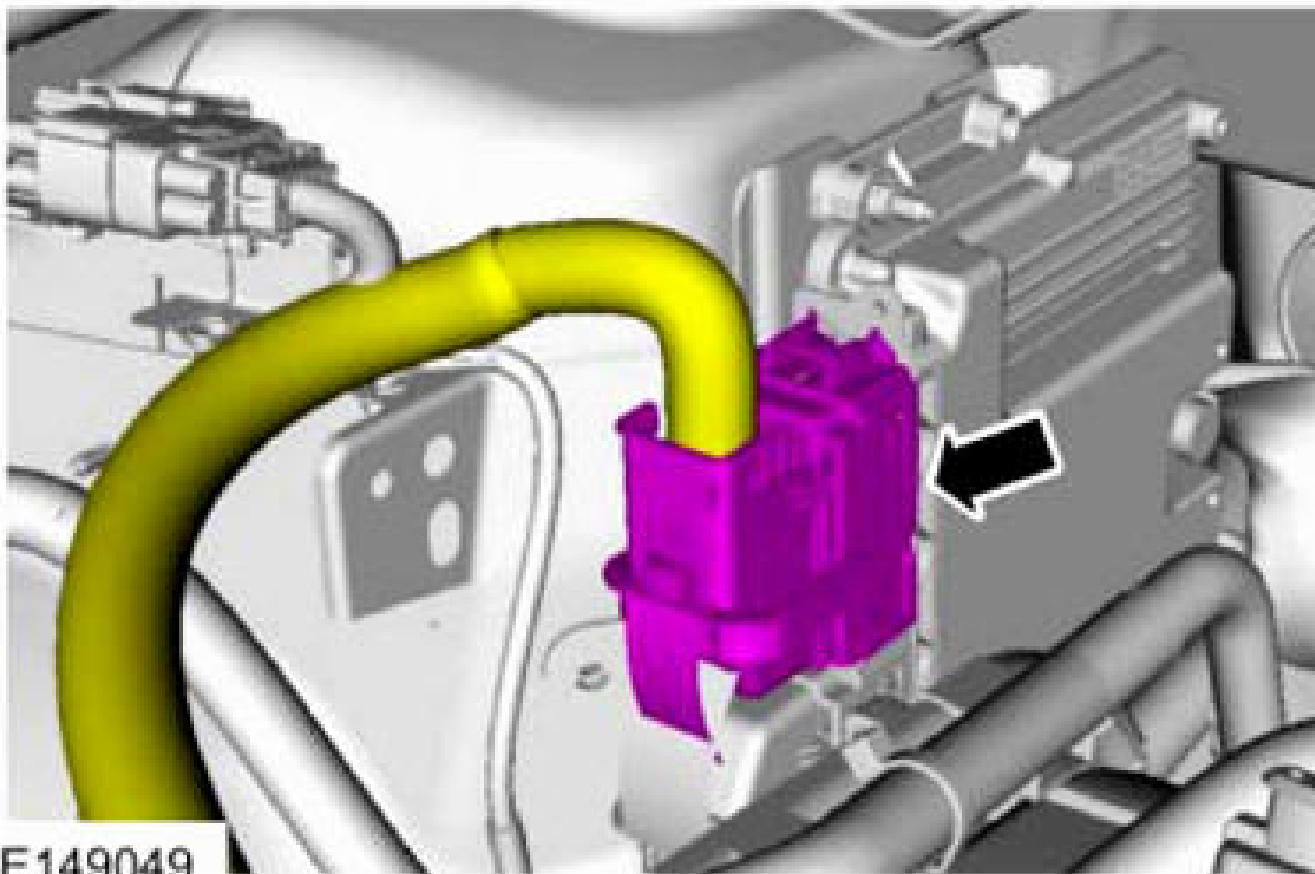
24.

All vehicles



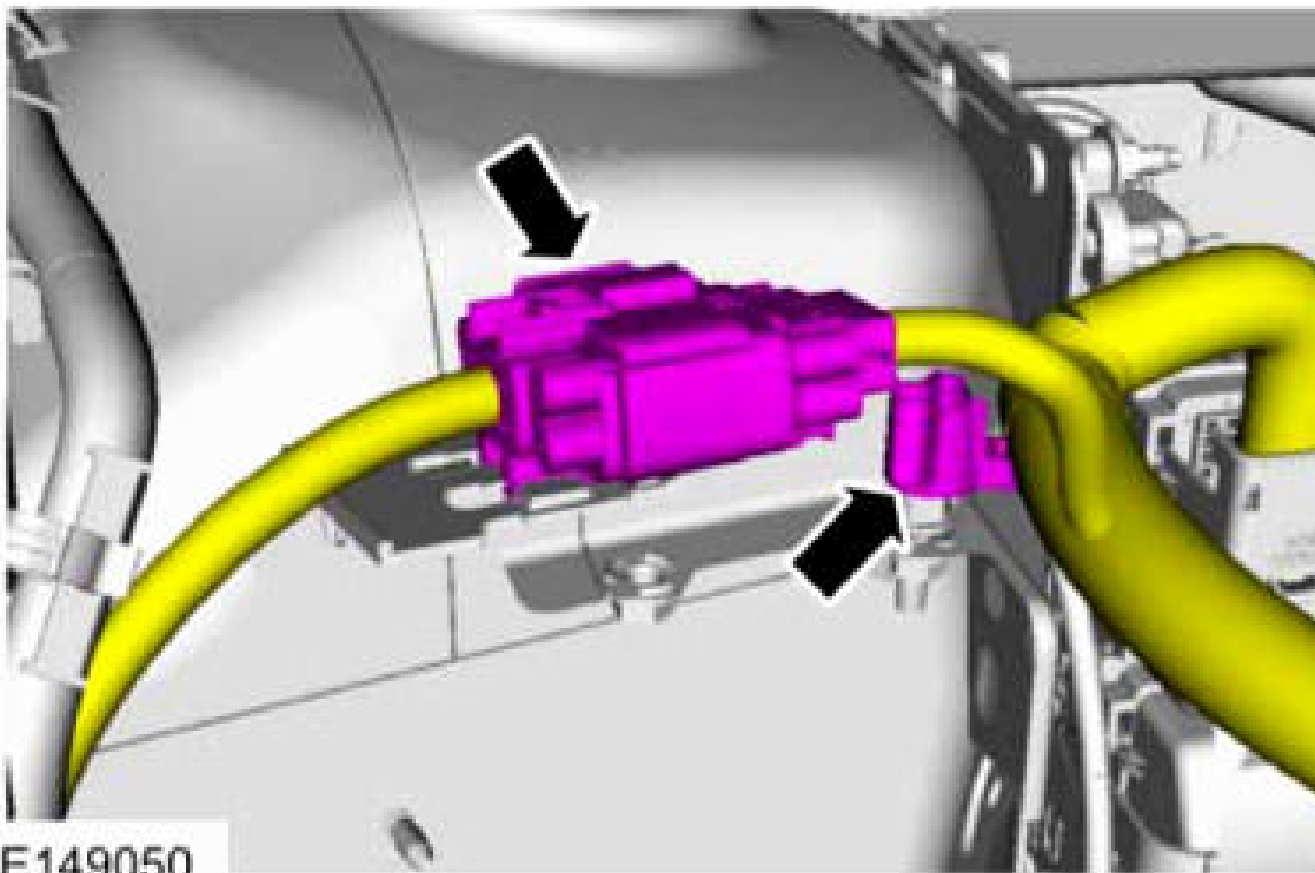
25.

26.



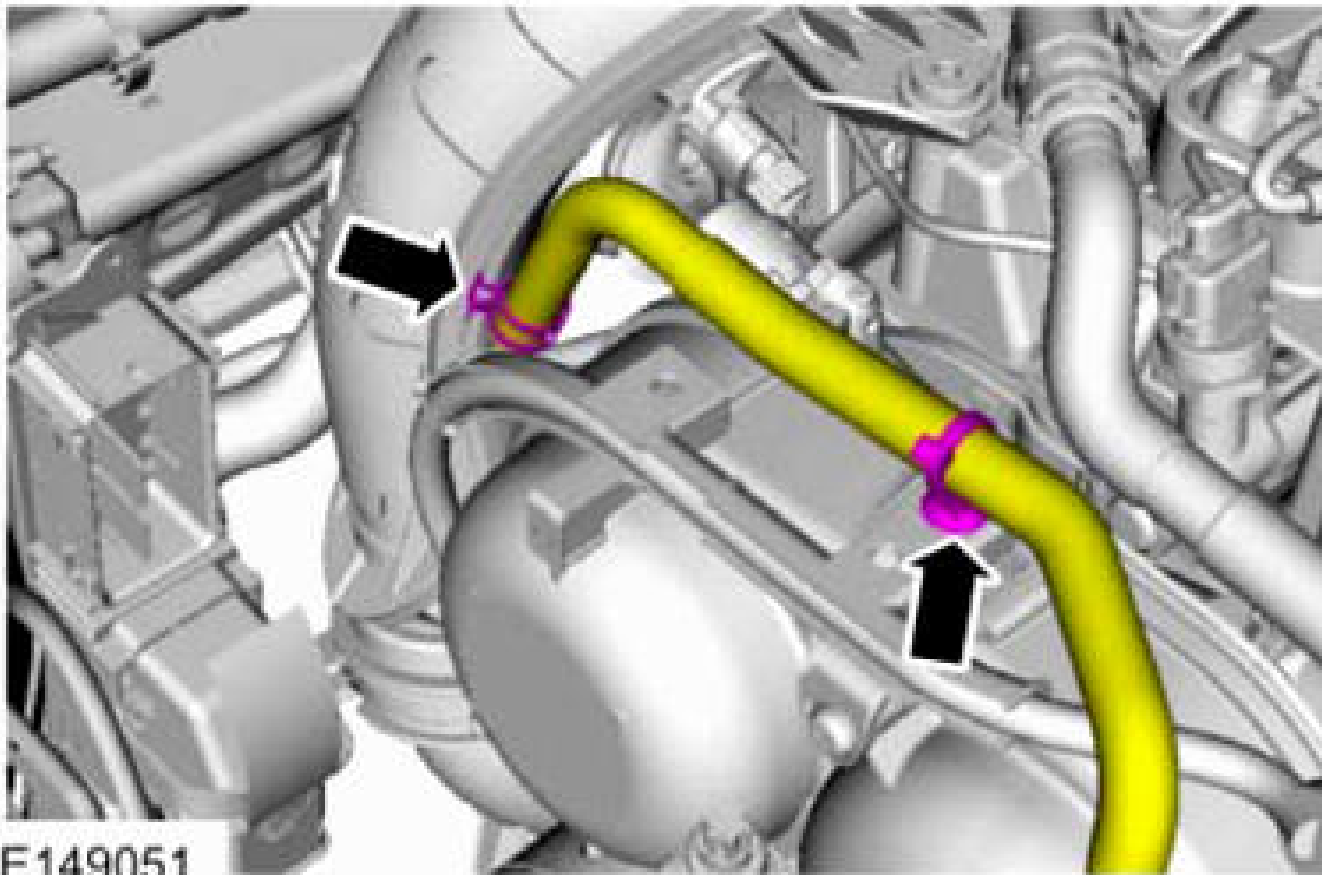
26.

27.



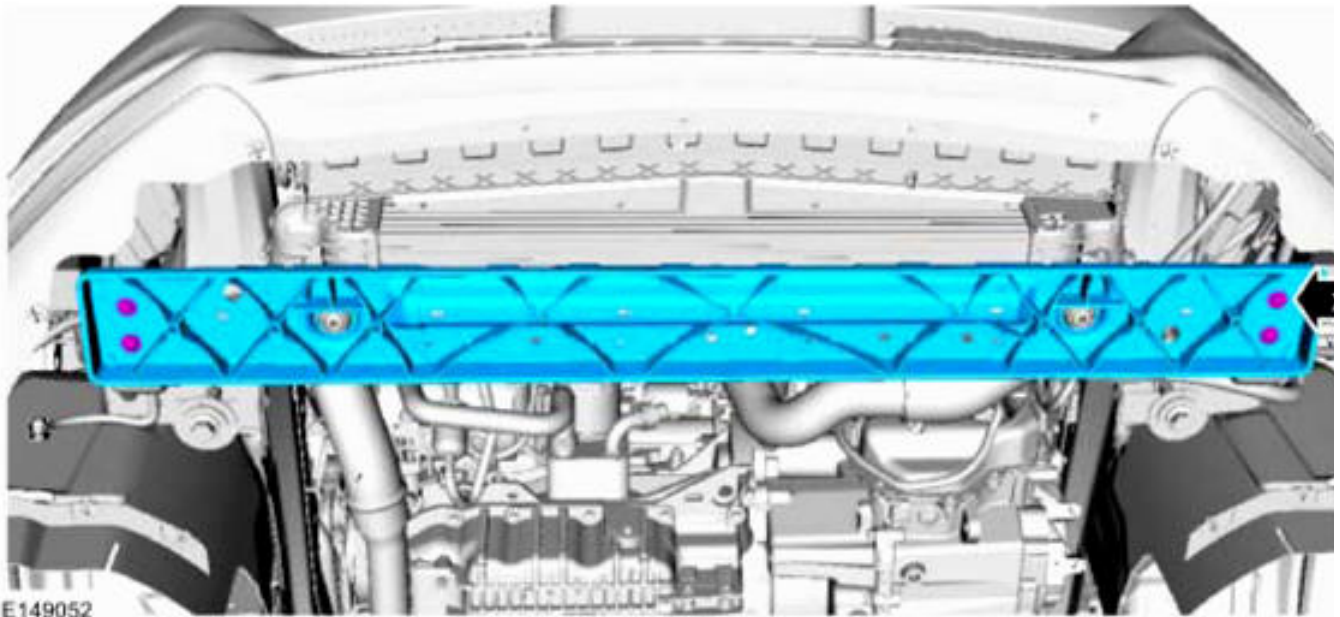
27.

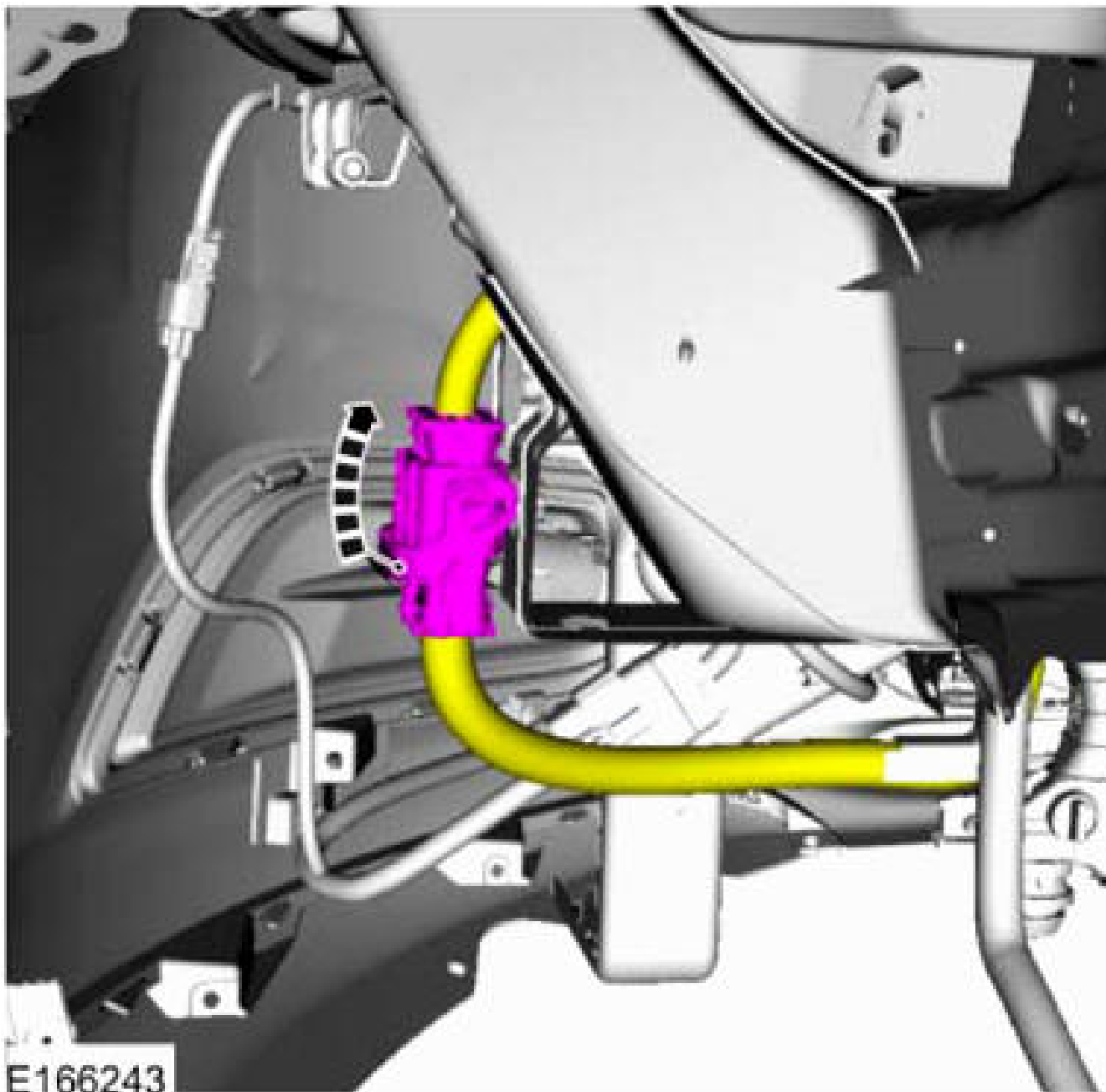
28. *General Equipment* : Hose Clamp Remover/Installer



29. Refer to: **FRONT SUBFRAME** .
30. Install to support cooling module.

Torque : 24 Nm





31.

32. Refer to: CATALYTIC CONVERTER .

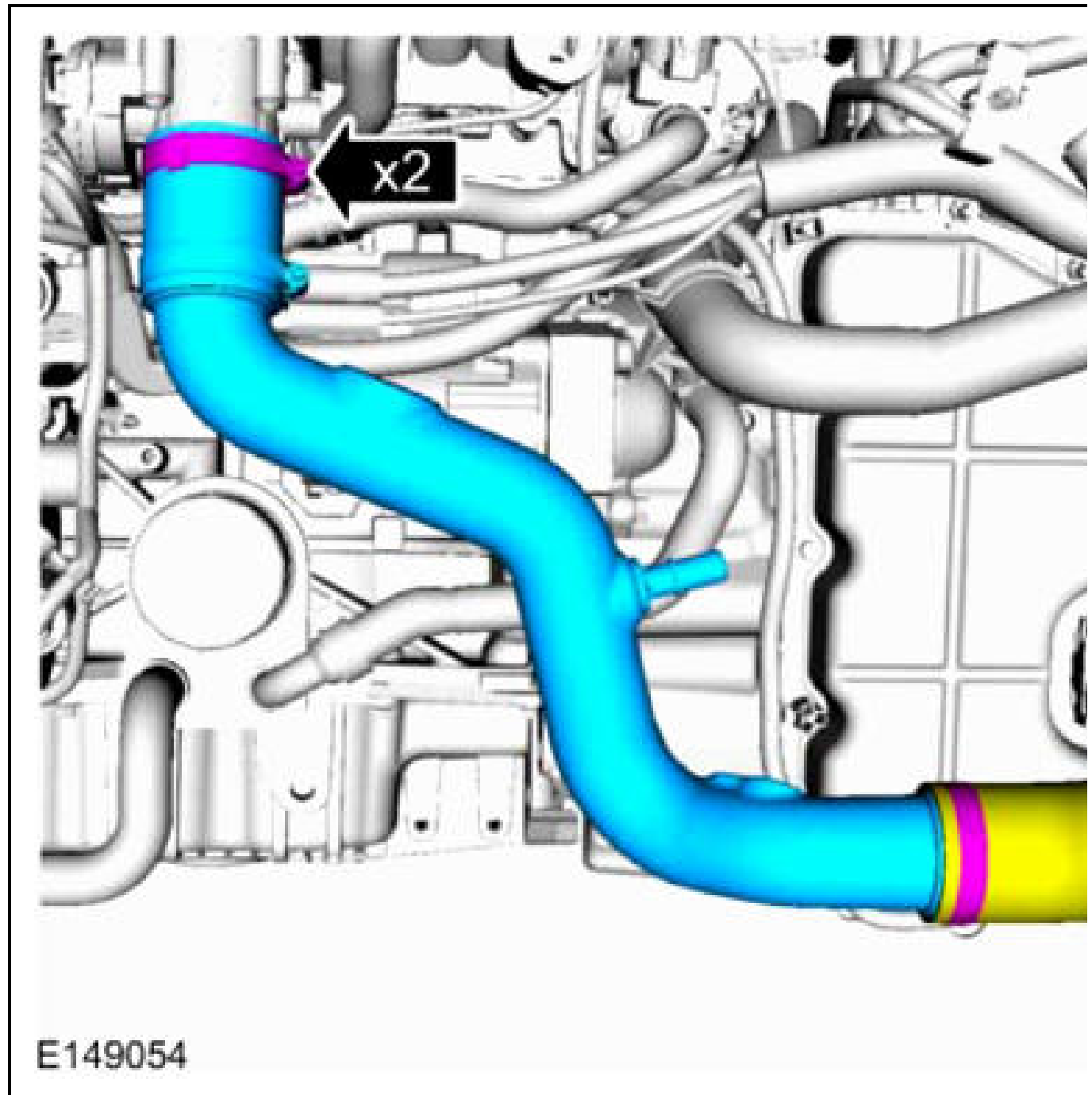
Vehicles with automatic transmission

33. Refer to: TRANSMISSION FLUID DRAIN AND REFILL .

Vehicles with manual transmission

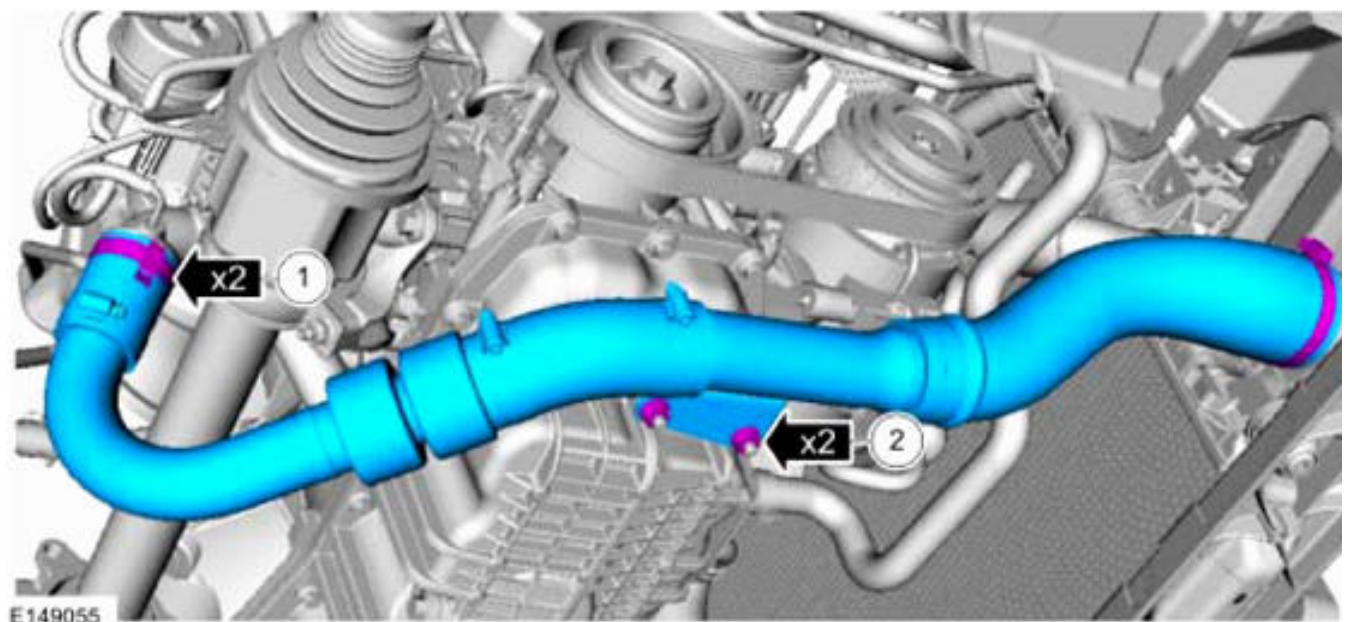
34. Refer to: **TRANSMISSION DRAINING AND FILLING** .

All Vehicles

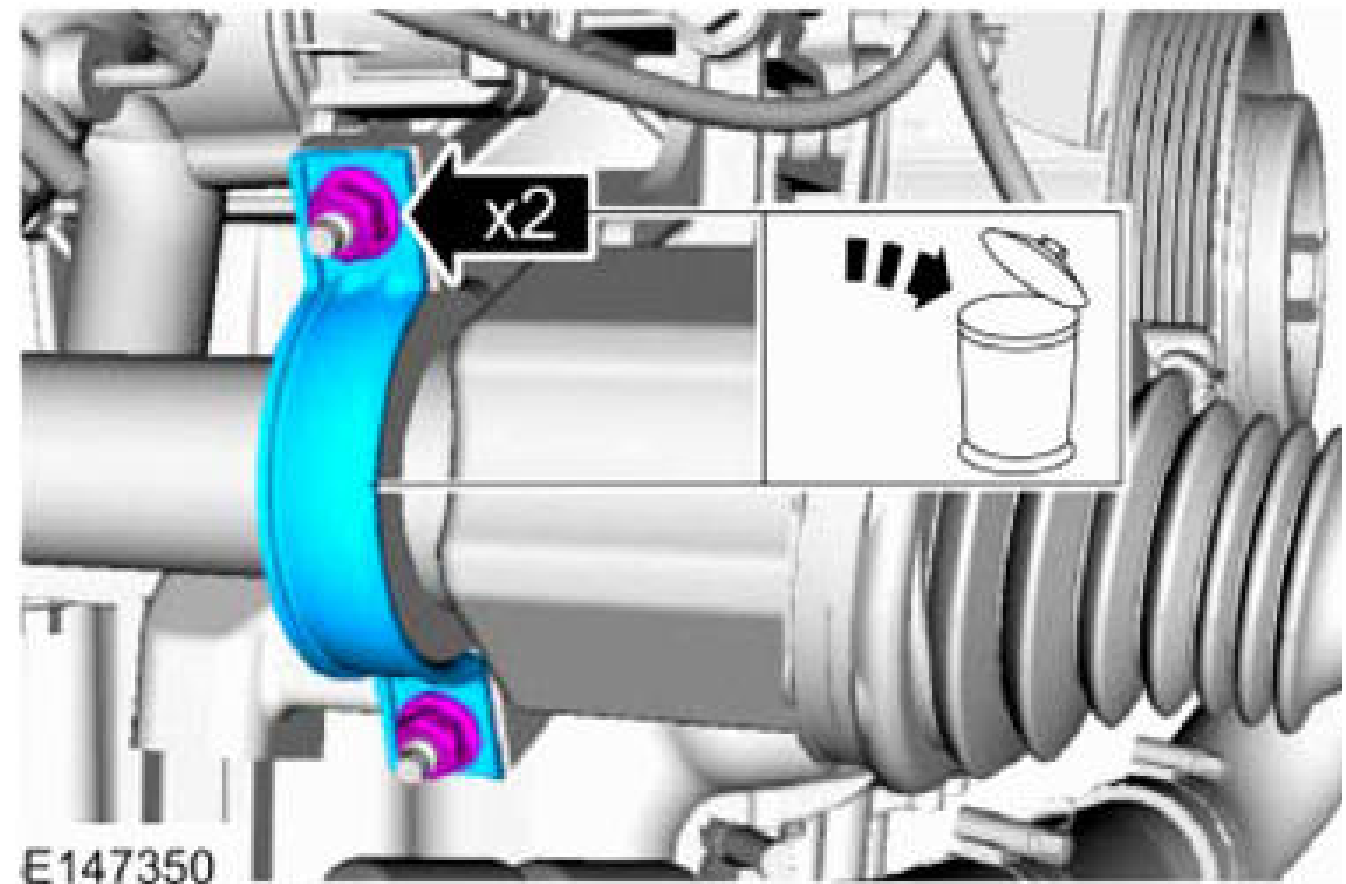


35.

36.



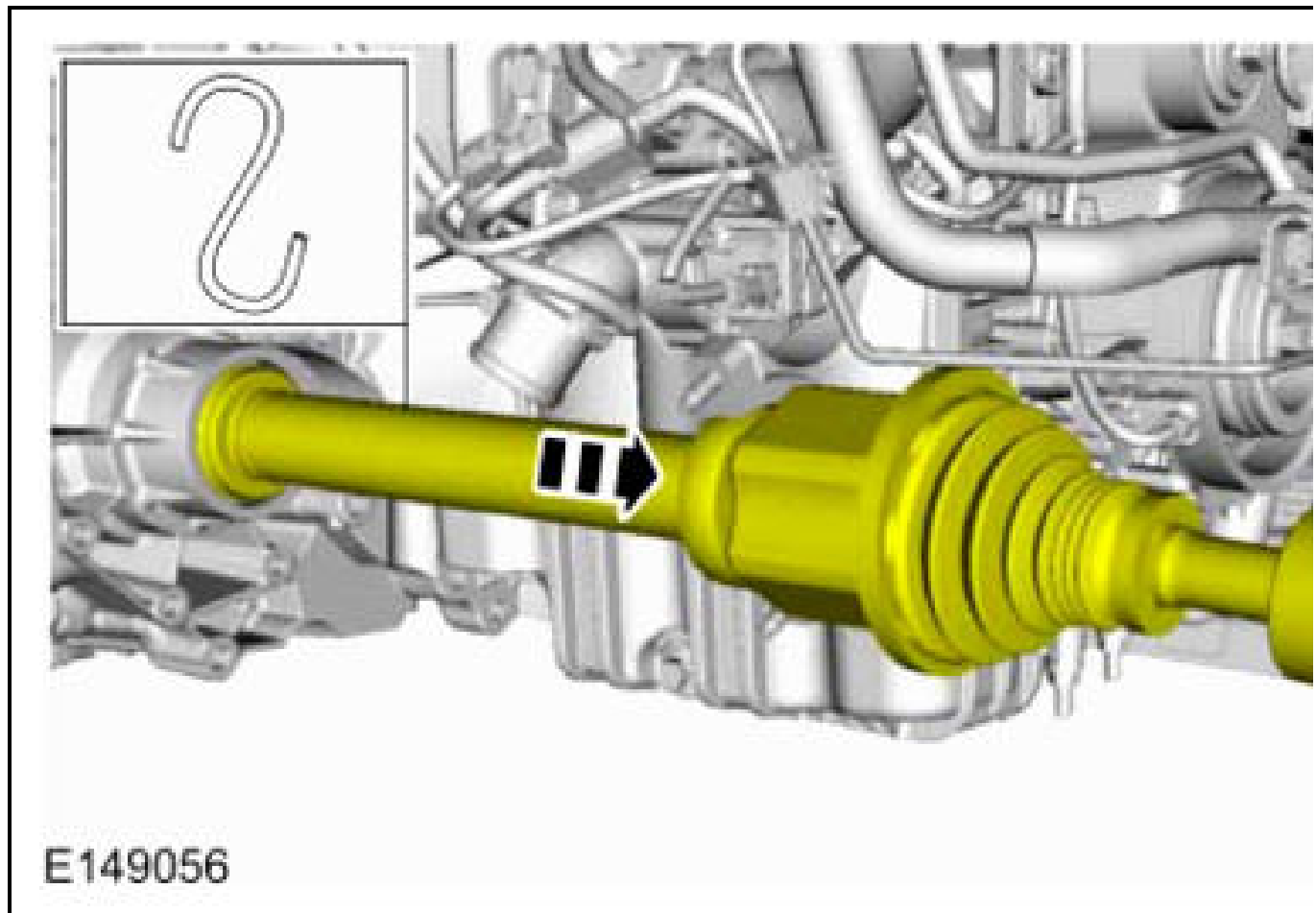
36.



37.

NOTE: Automatic transmission shown in illustration, manual transmission similar.

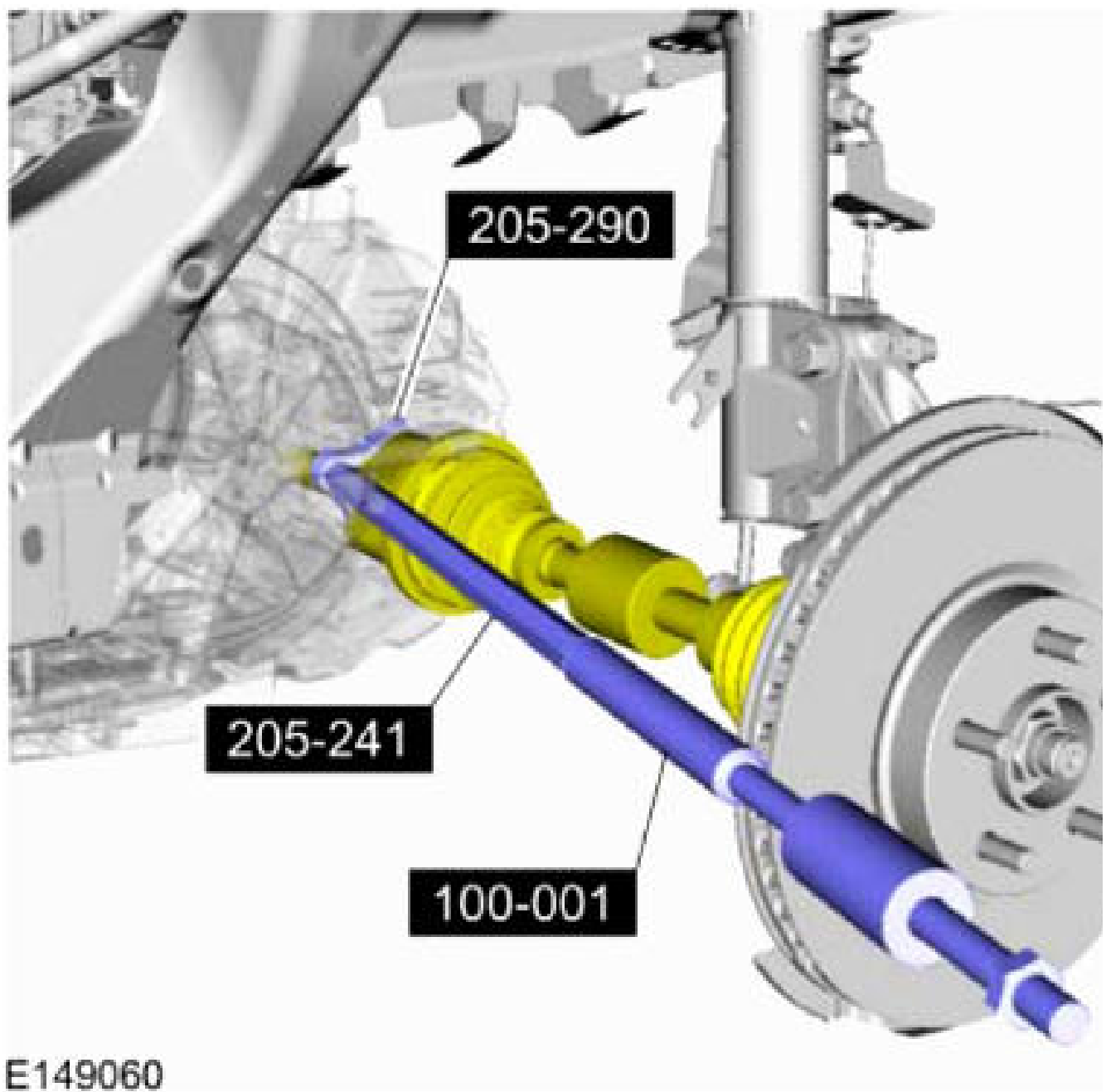
38.



NOTE: Automatic transmission shown in illustration, manual transmission similar.

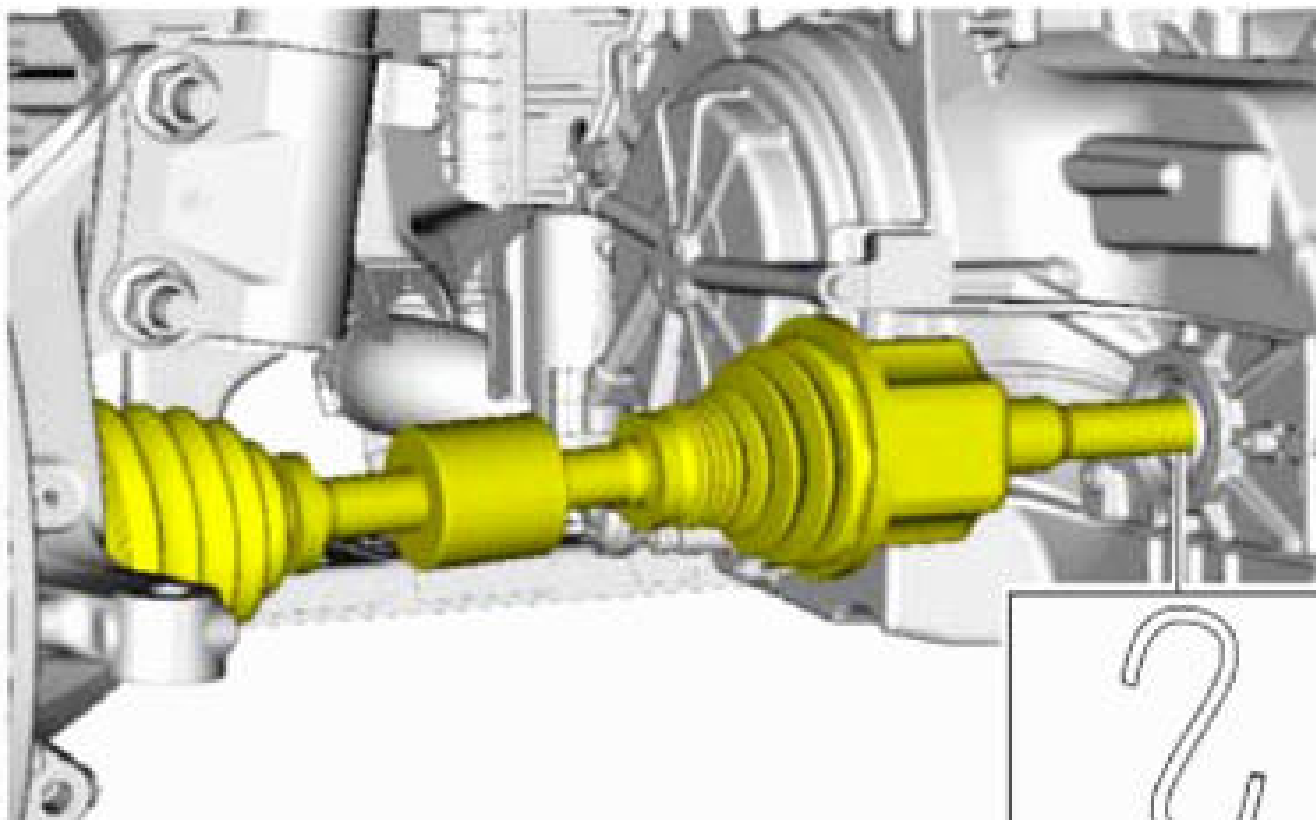
39.

Special Tool(s) : 100-001 (T50T-100-A) Slide Hammer , 205-241 (T86P-3514-A) Remover, Halfshaft , 205-290 (T89P-3415-B) Remover, Halfshaft (Plate)

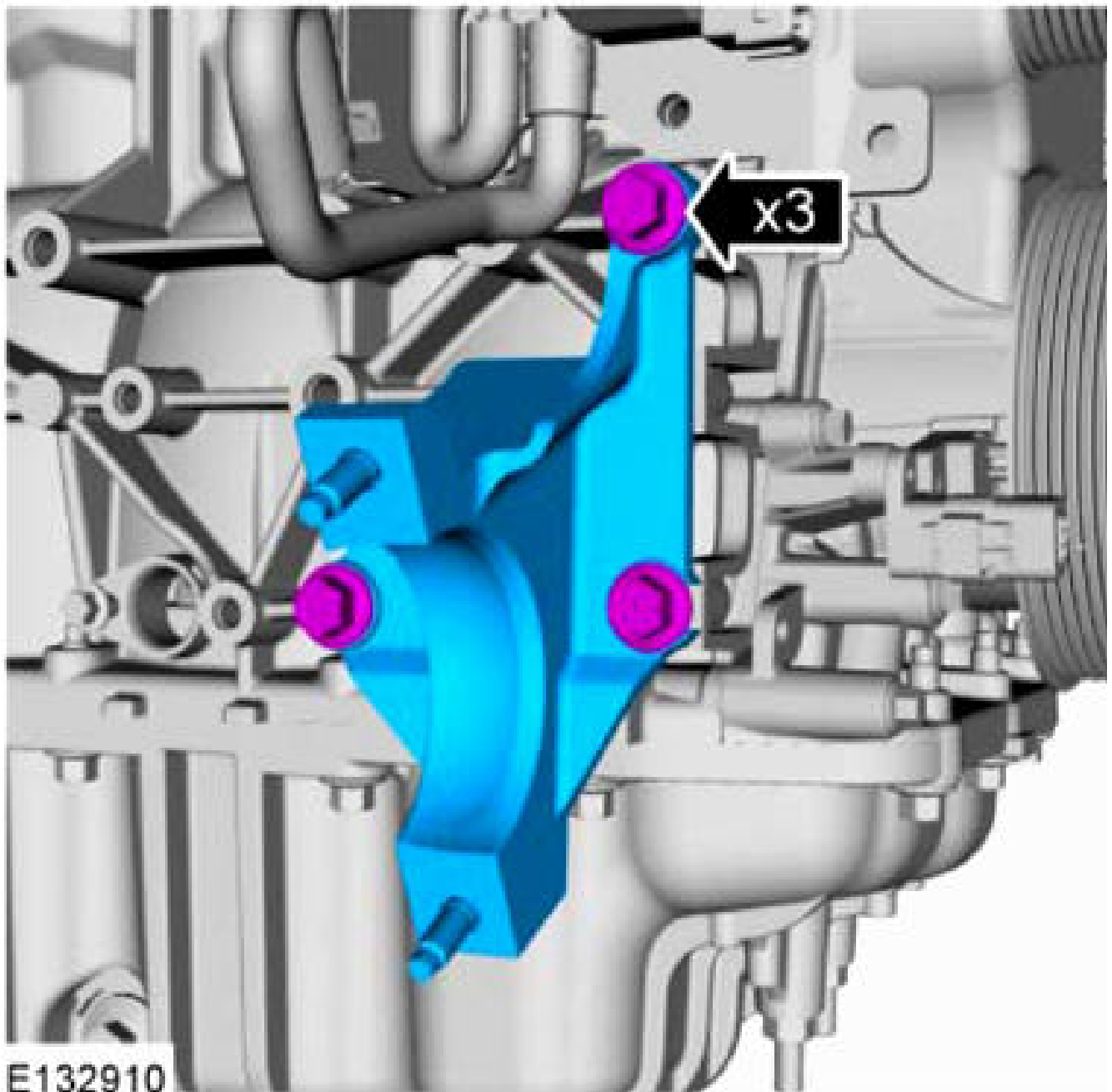


NOTE: Automatic transmission shown in illustration, manual transmission similar.

40.

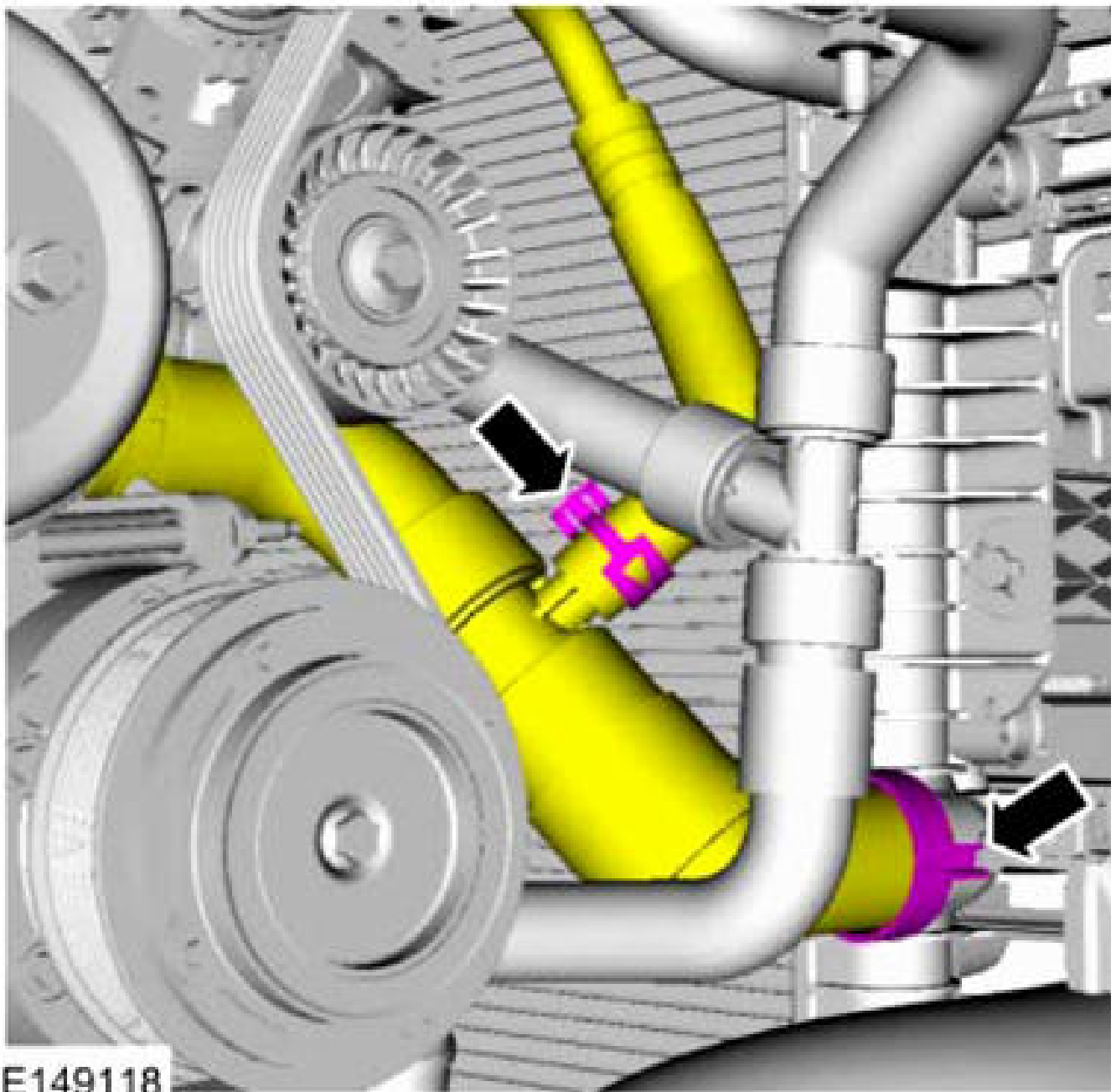


E149117

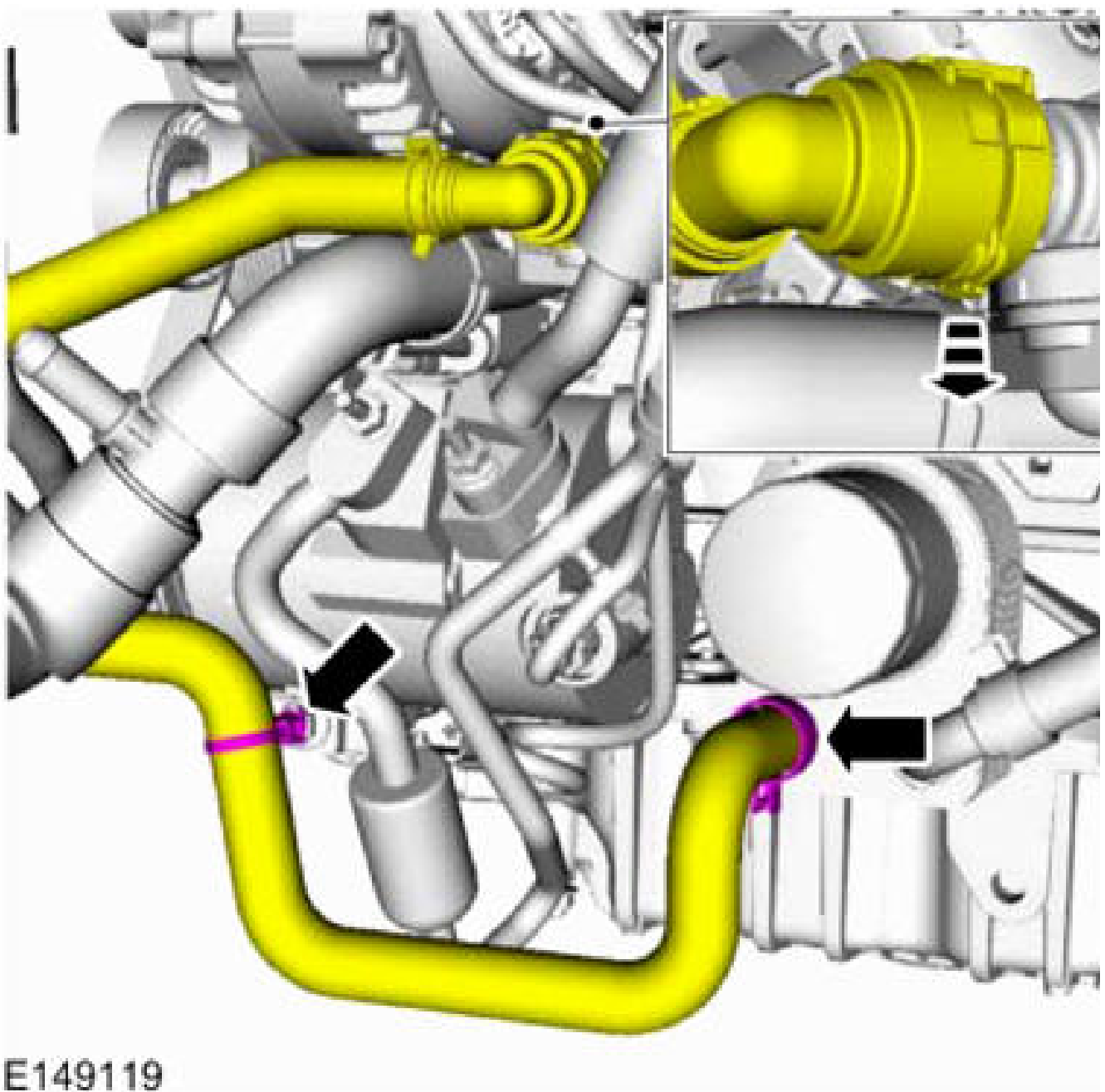


41.

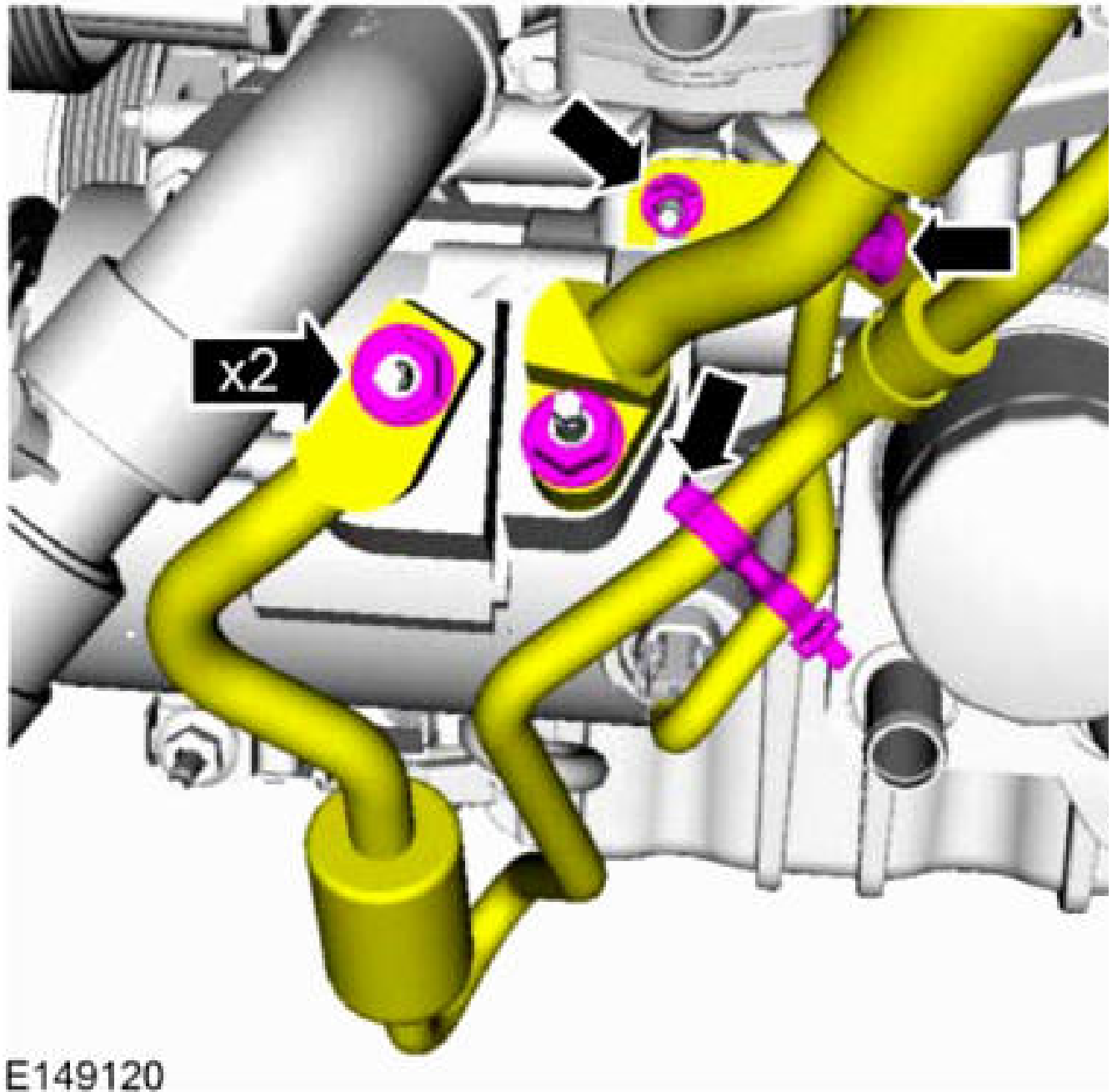
42. *General Equipment* : Hose Clamp Remover/Installer



43. *General Equipment* : Hose Clamp Remover/Installer

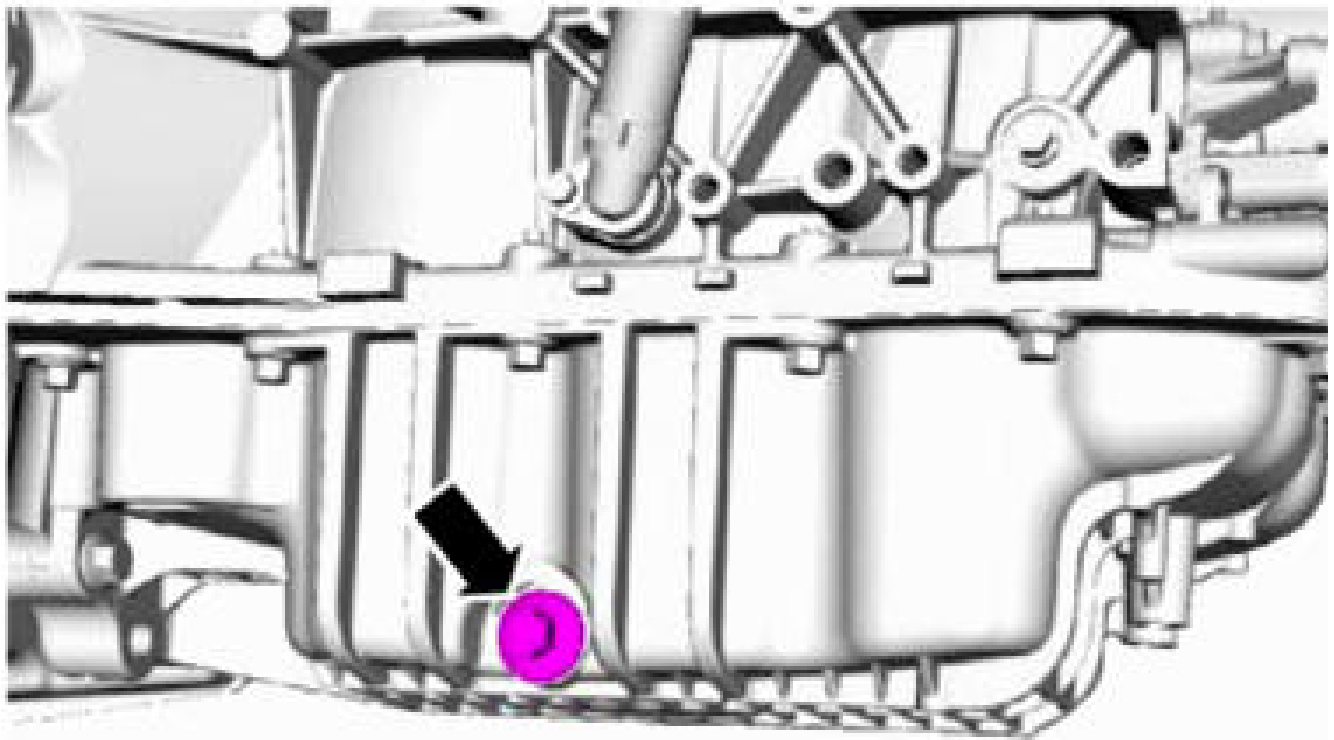


44. **NOTE:** Discard the O-ring seals and gasket seals.



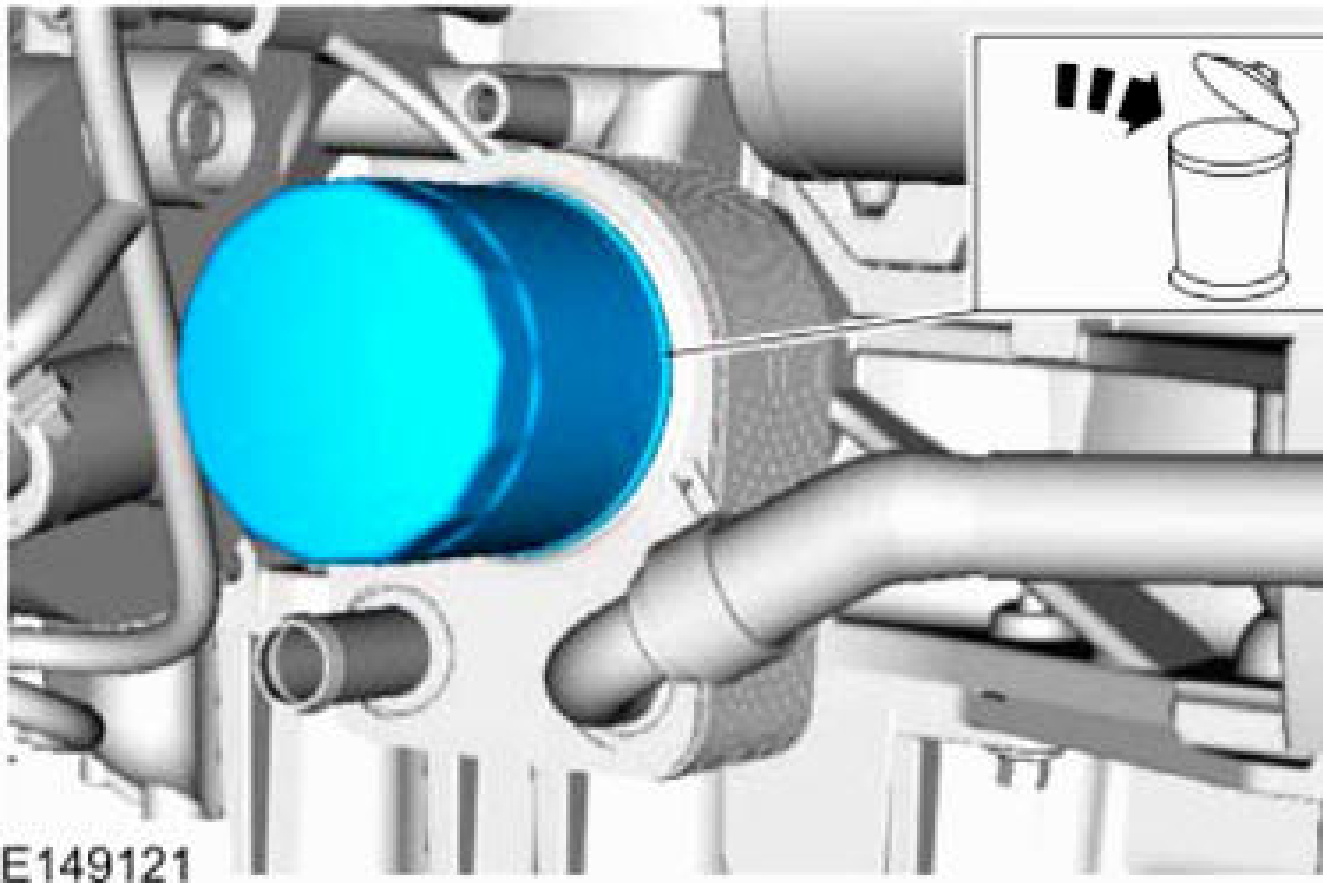
45. *General Equipment* : Oil Drain Equipment

Torque : 28 Nm



E147418

46. *General Equipment* : Strap Wrench

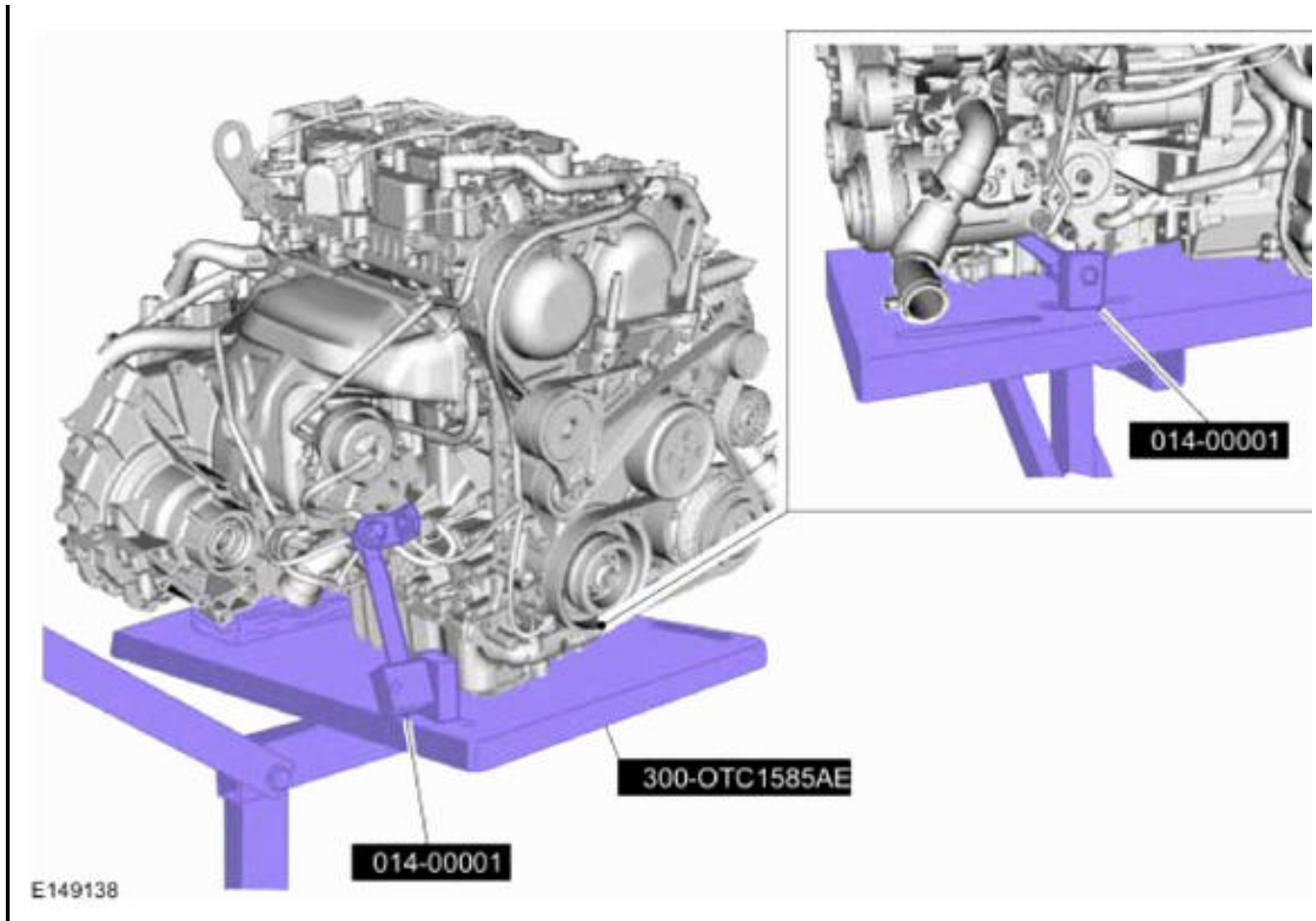


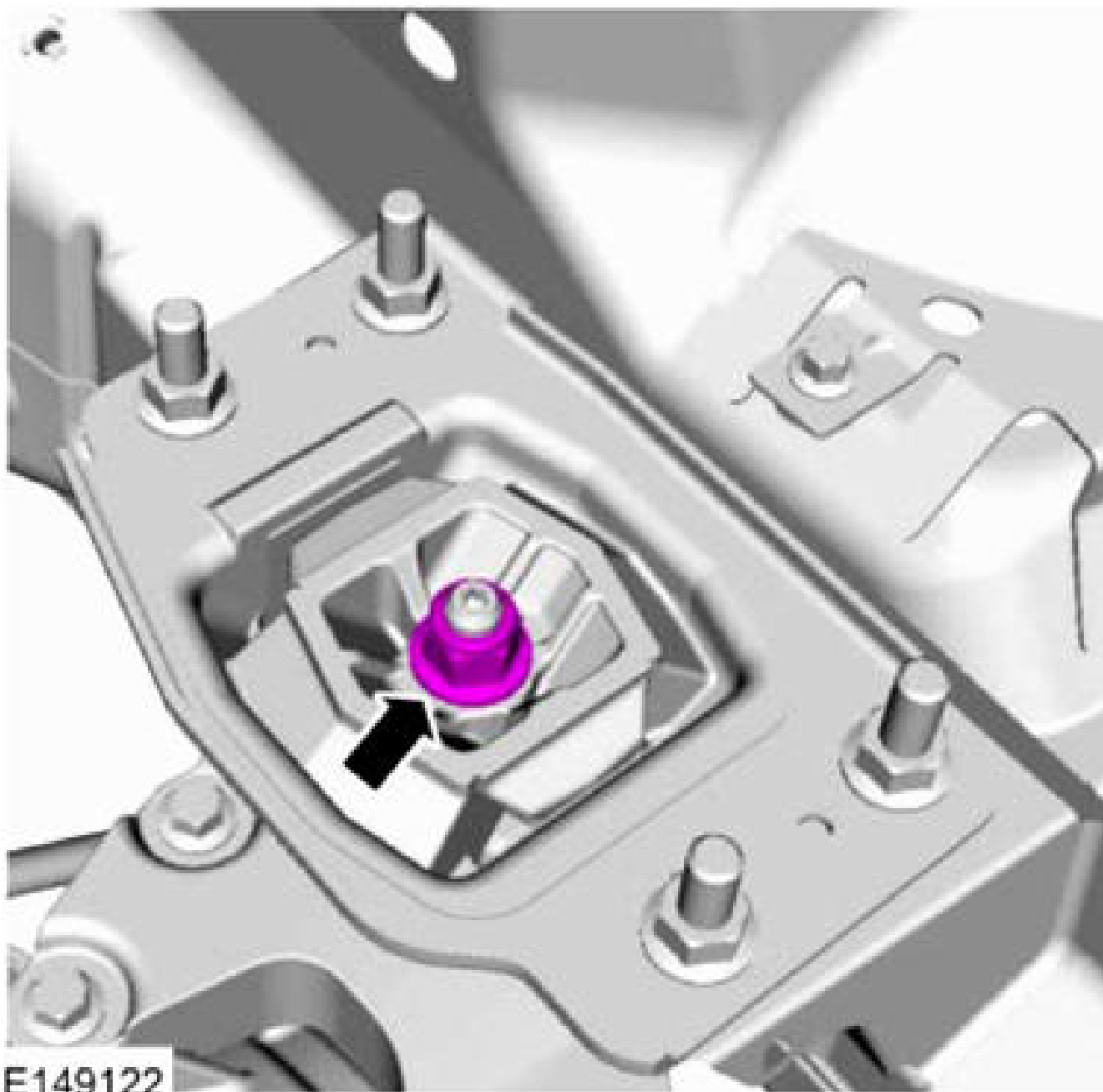
47. *Install Special Service Tool* : **014-00001 ADJUSTABLE GRIP 1735A , 300-OTC1585AE Powertrain Lift**

General Equipment : Wooden Block

2013 Ford Fusion SE

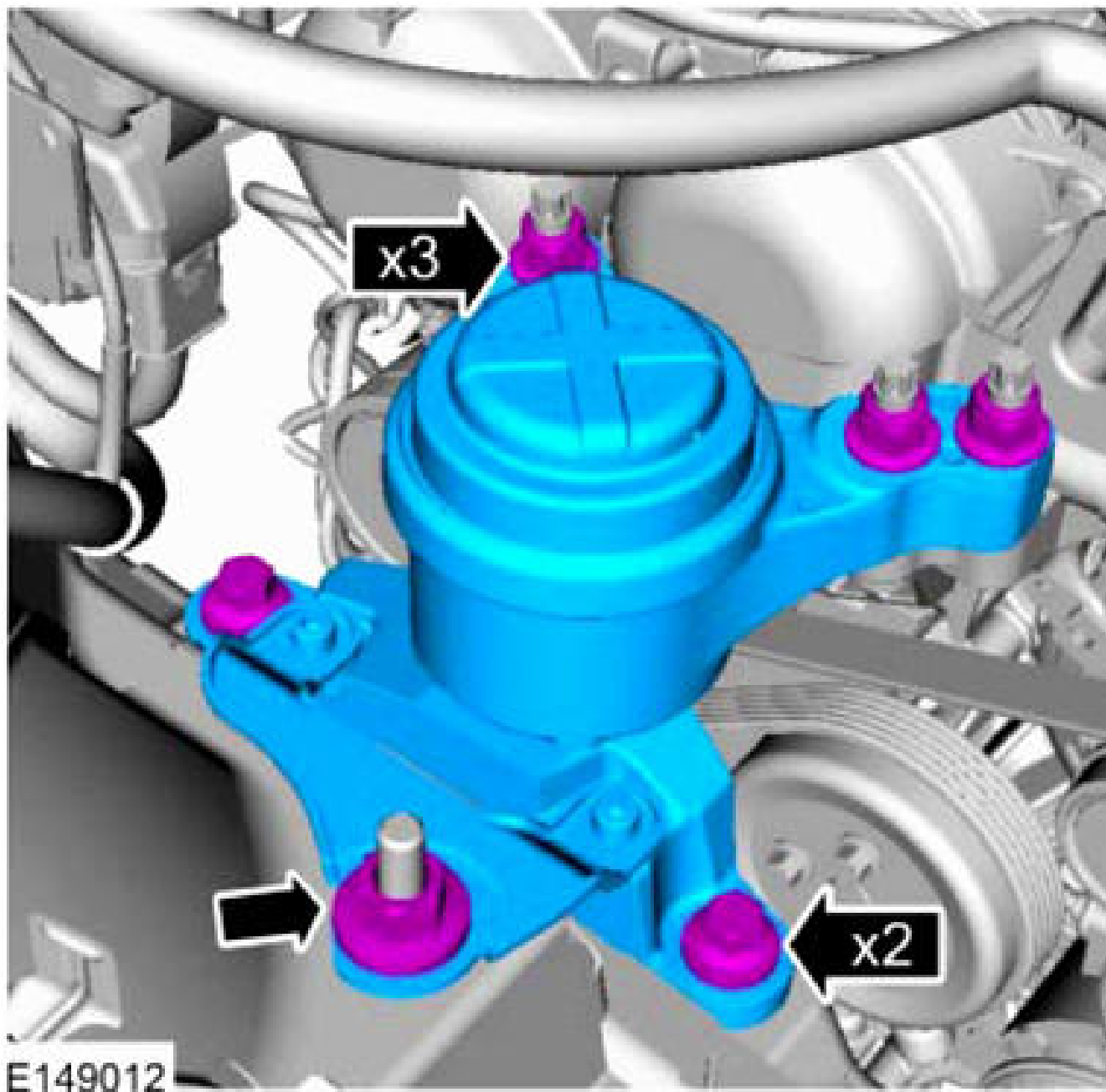
2013 ENGINE Engine Mechanical - 1.6L - Fusion





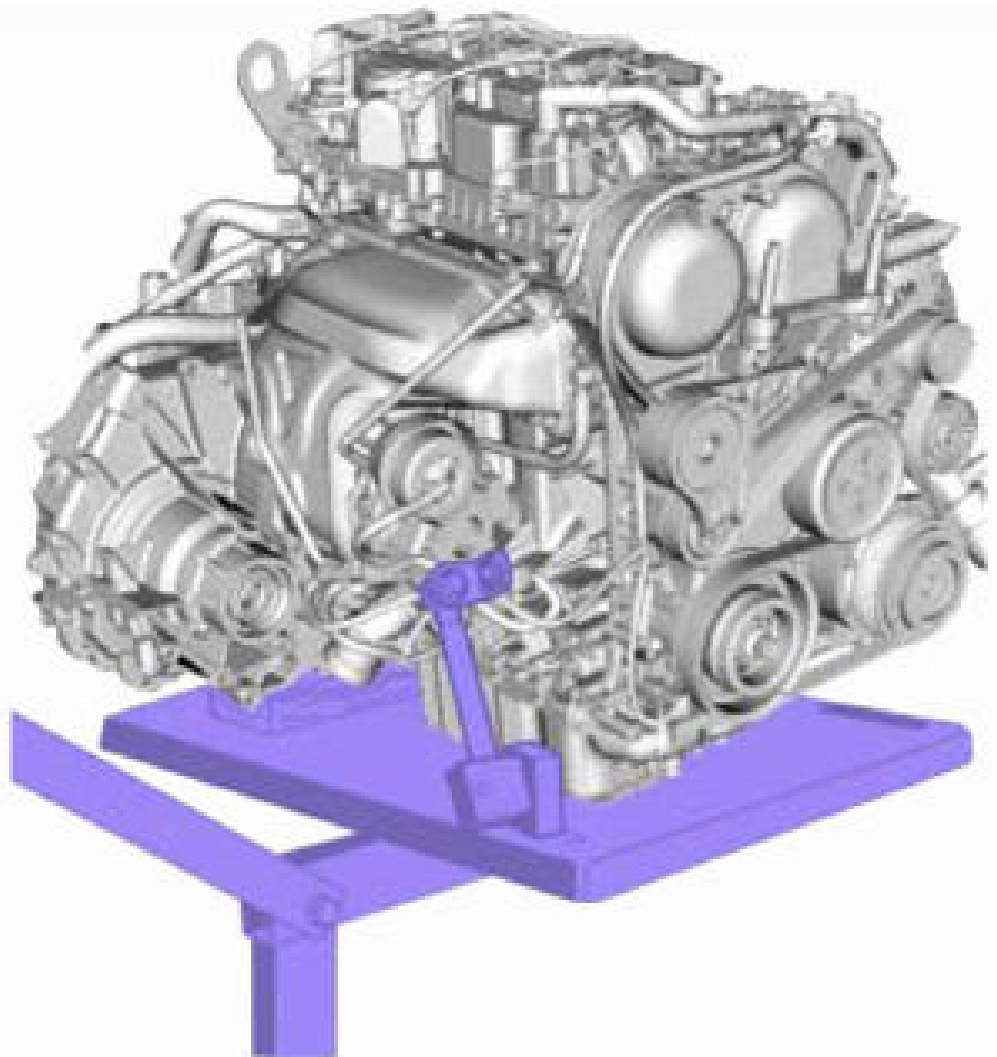
48.

49.



49.

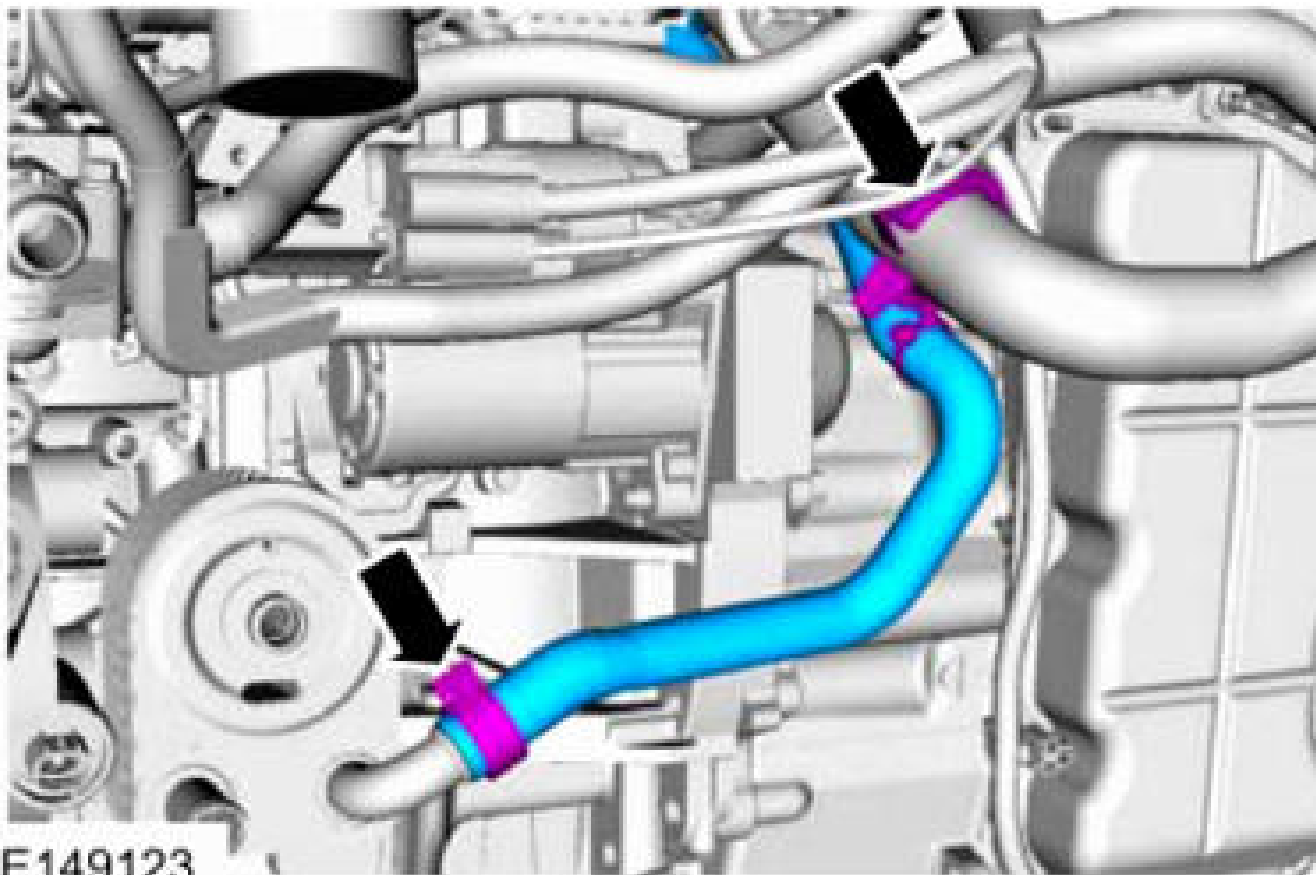
50.



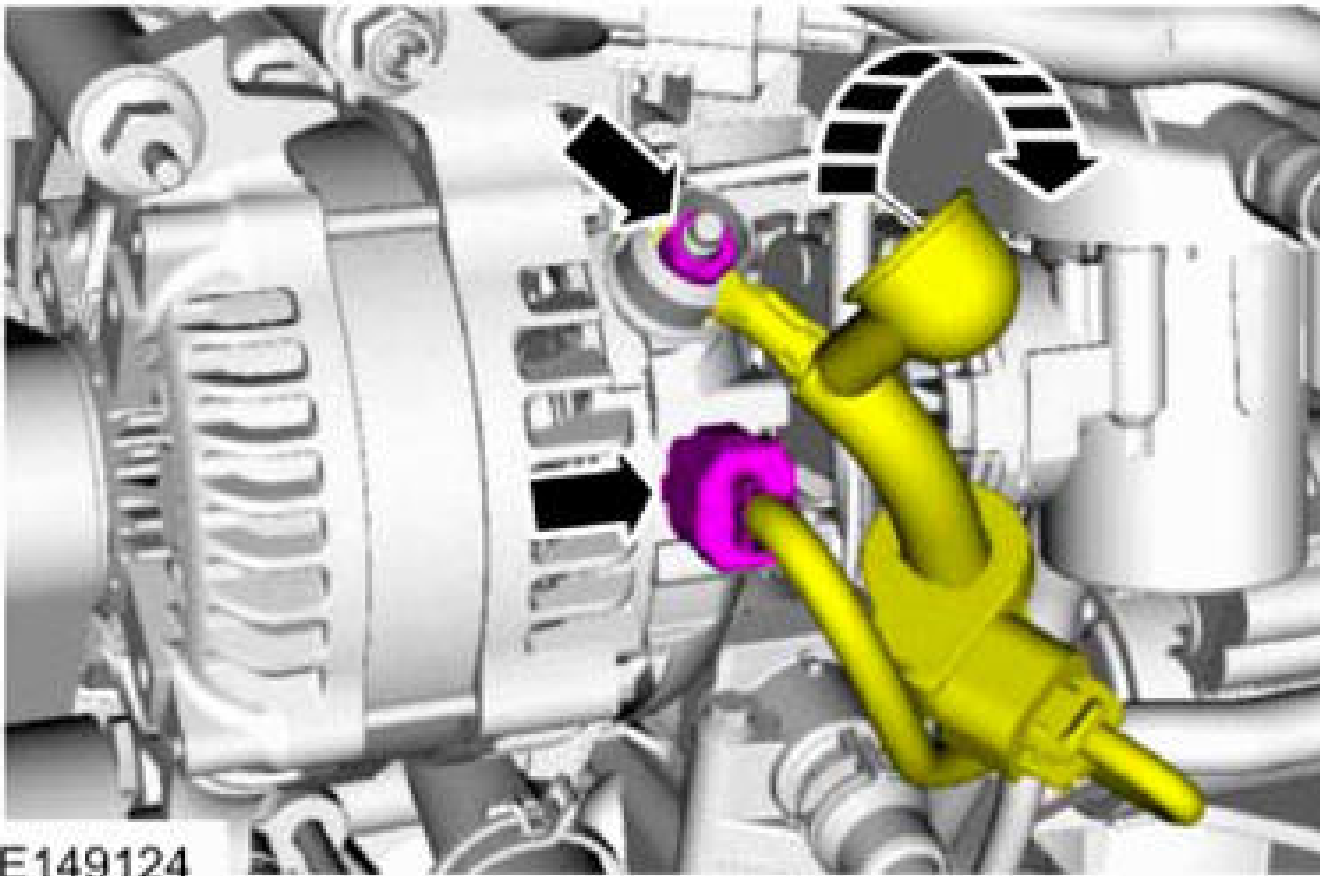
E149139

50.

51. *General Equipment* : Hose Clamp Remover/Installer

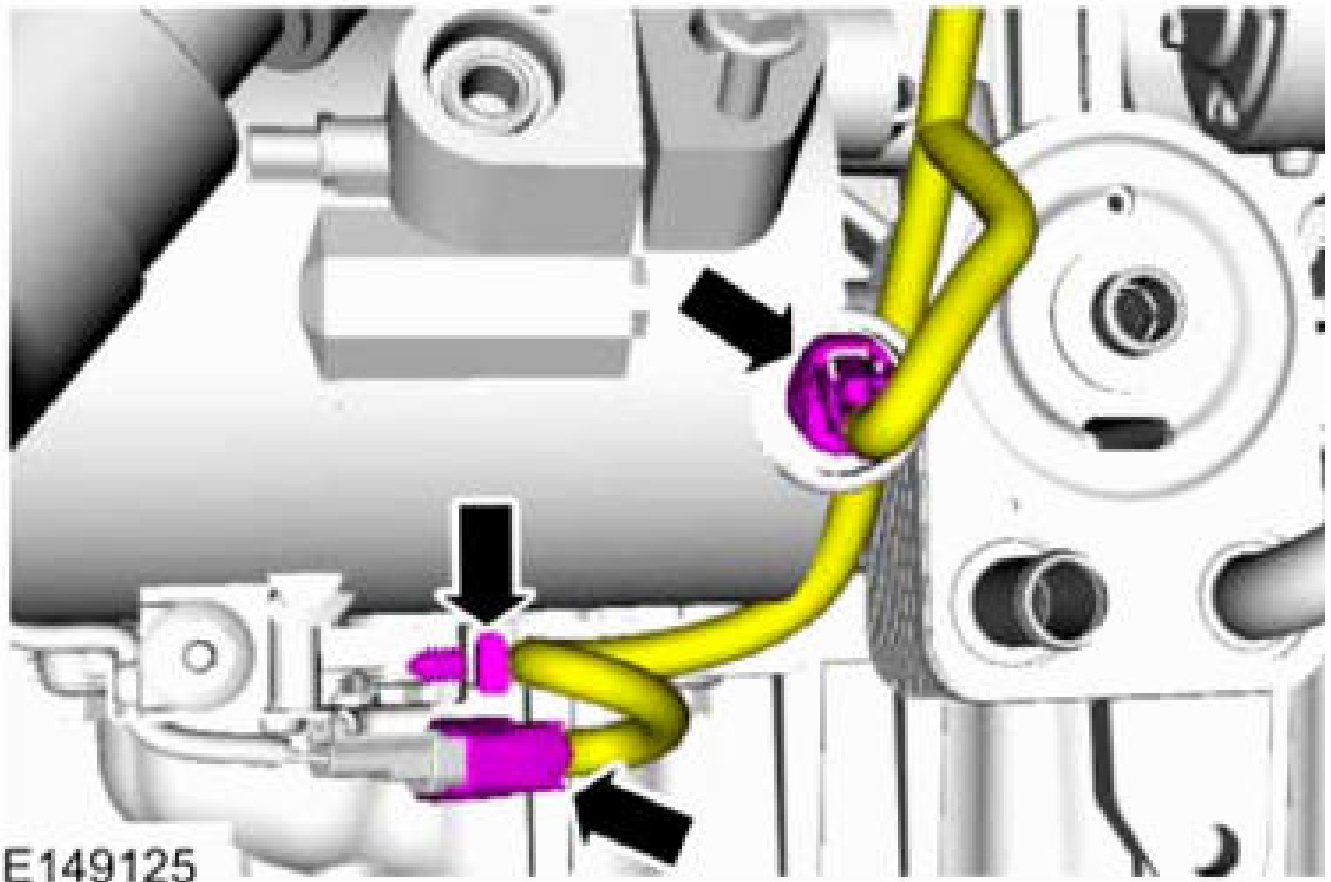


E149123



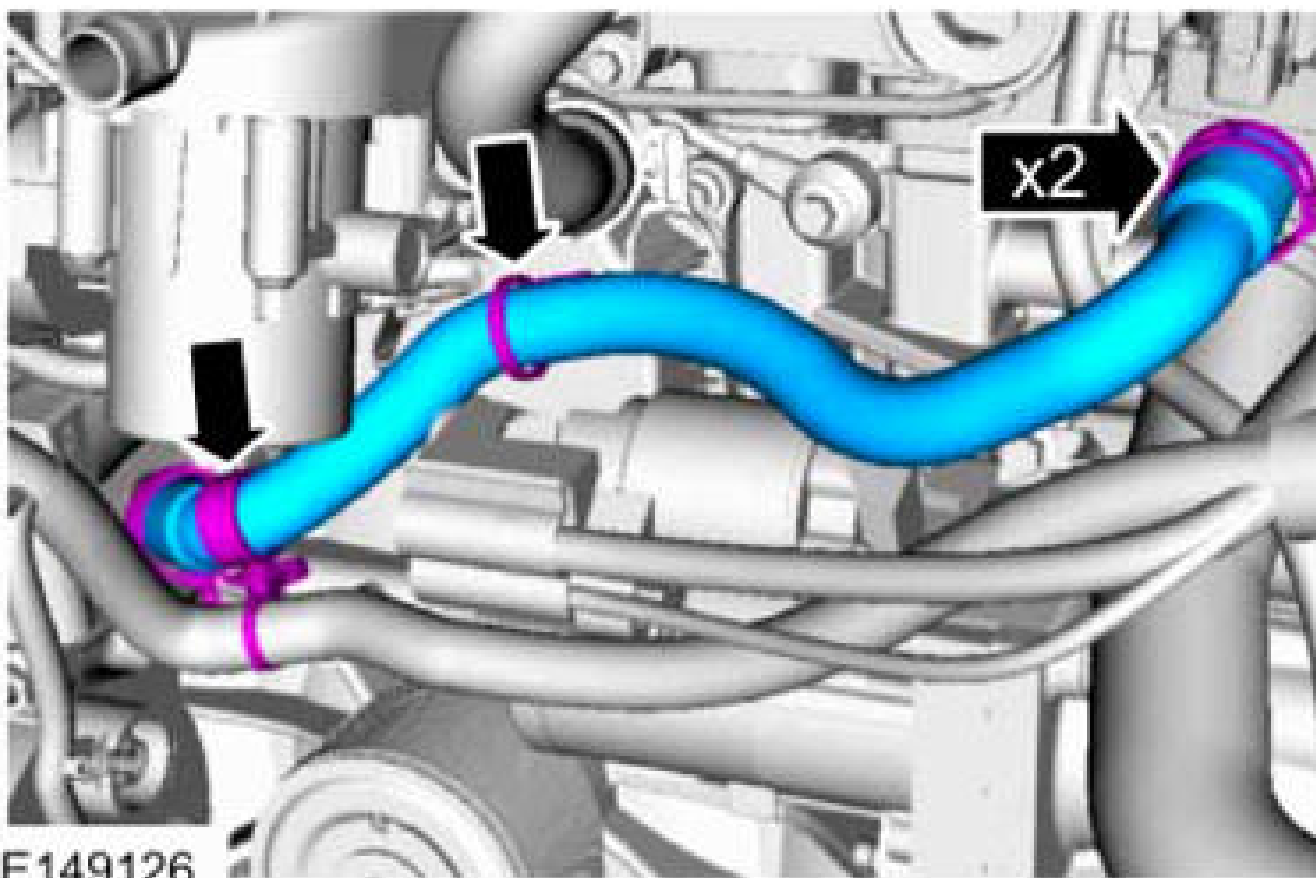
52.

53.

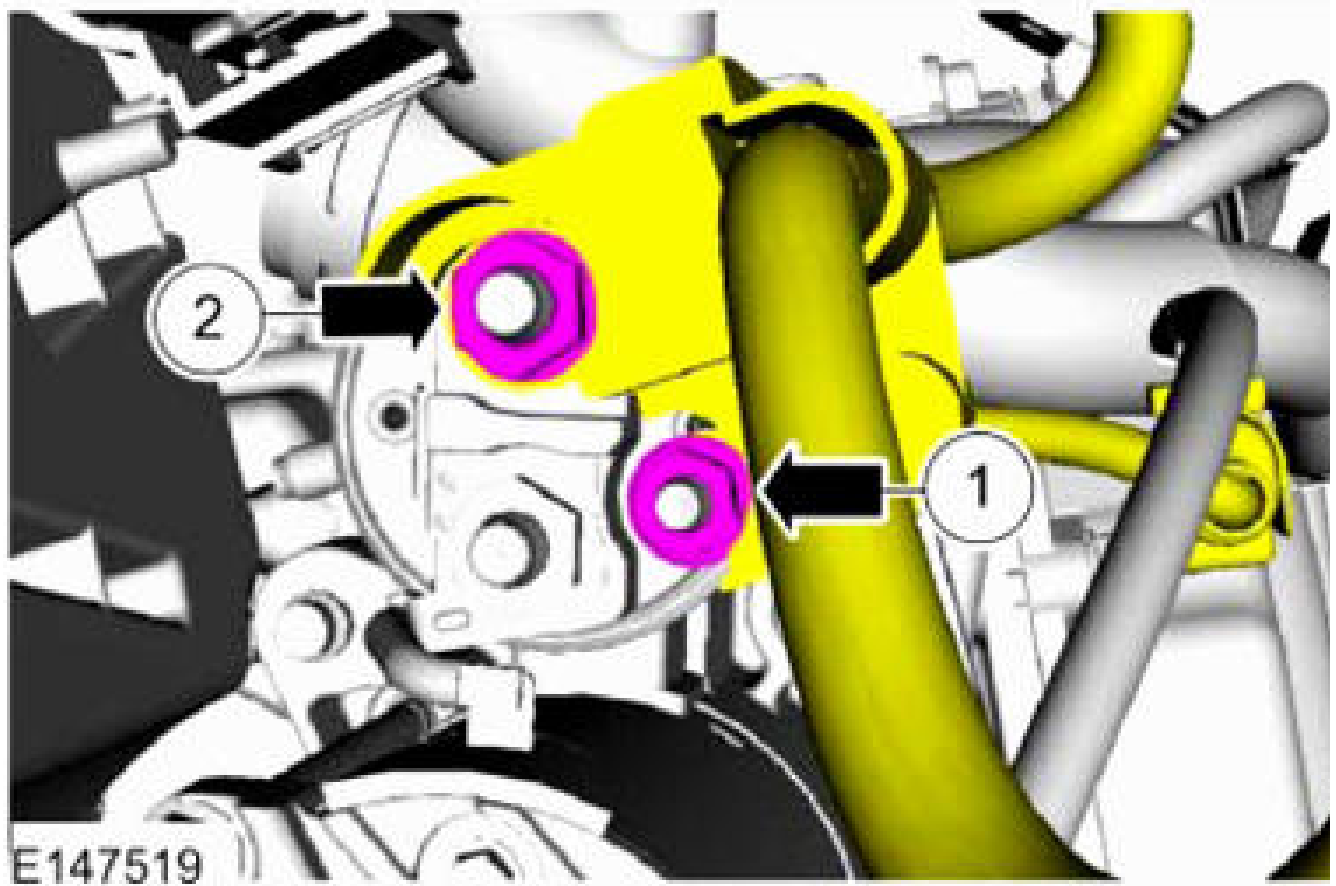


53.

54. *General Equipment* : Hose Clamp Remover/Installer



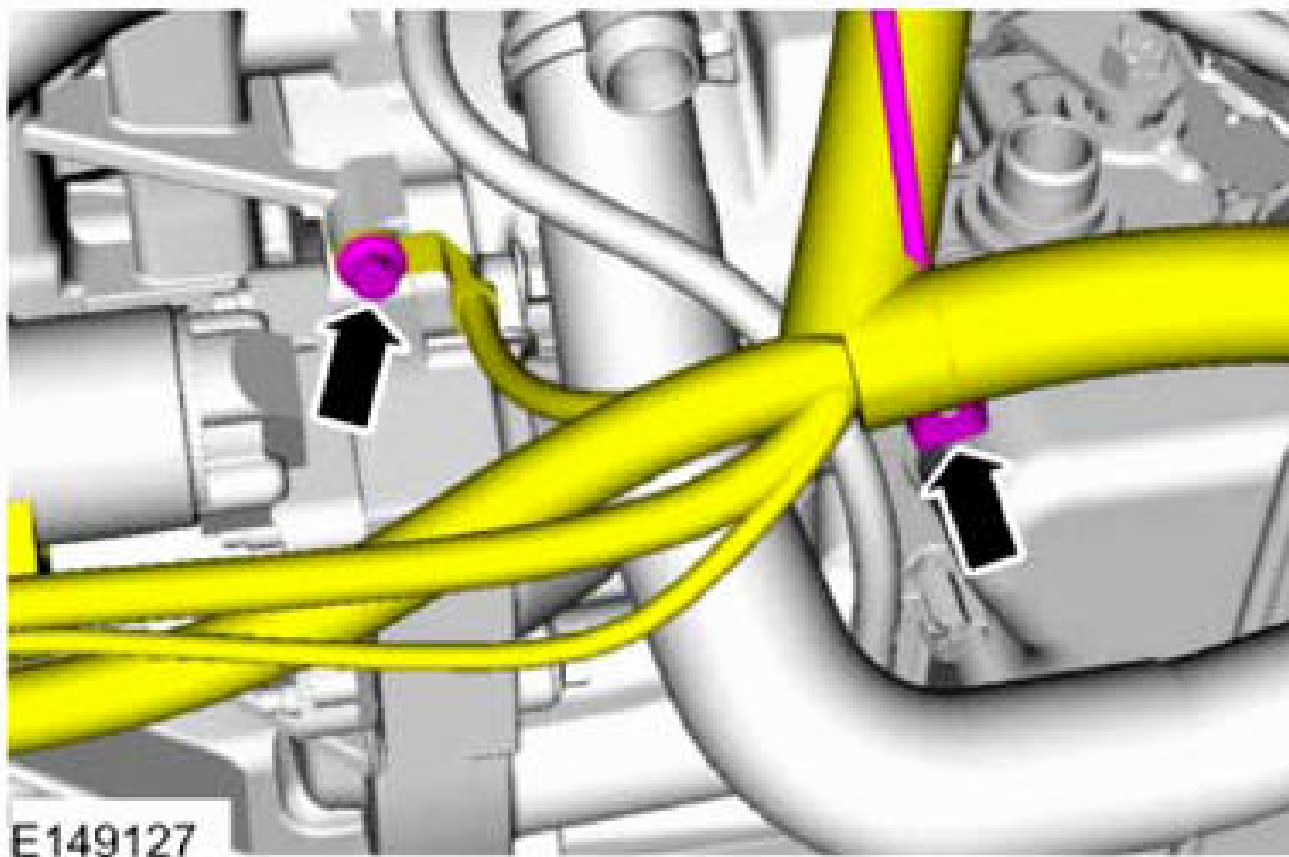
E149126

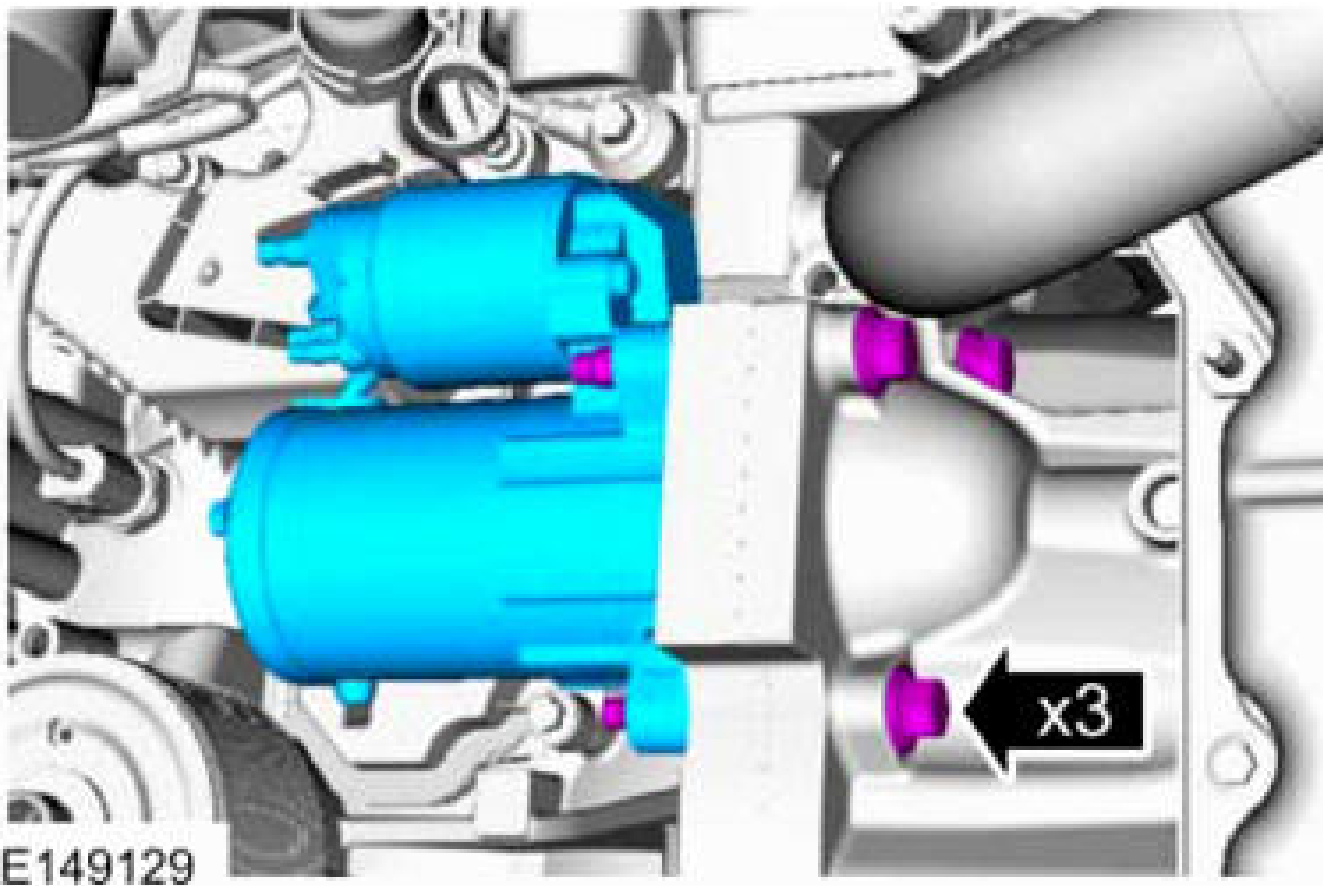


55.

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

56.

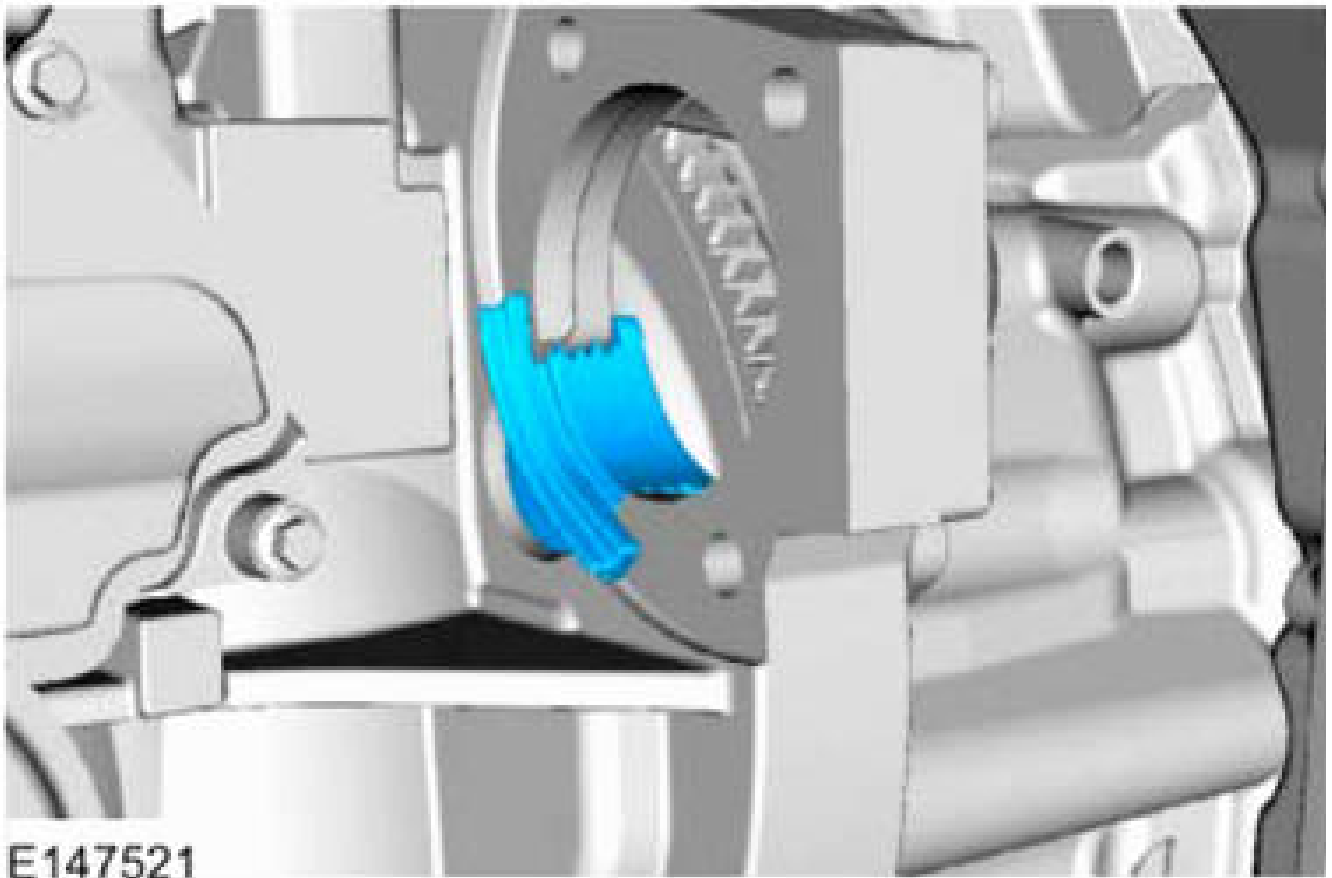




57.

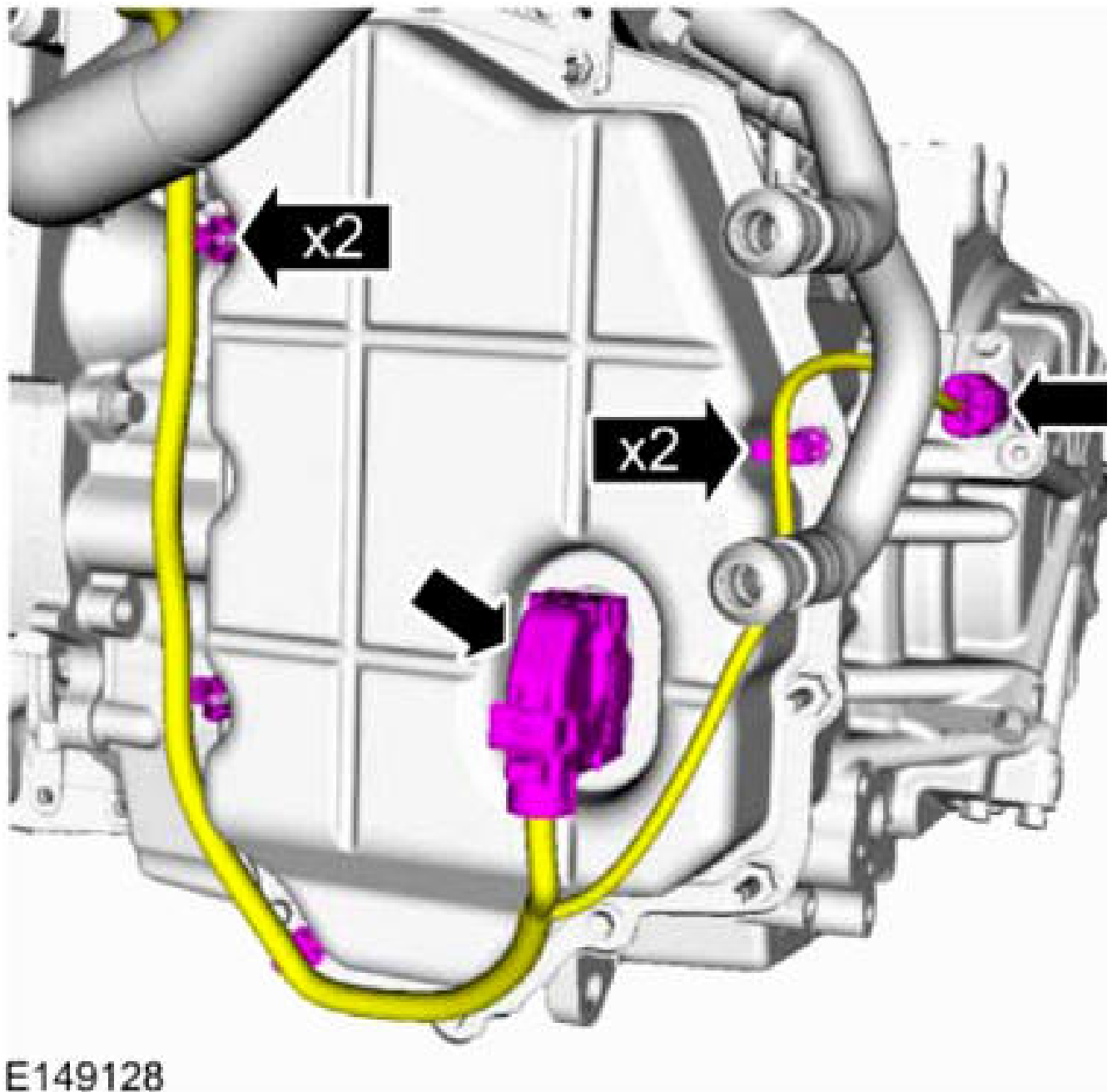
Vehicles with automatic transmission

58.



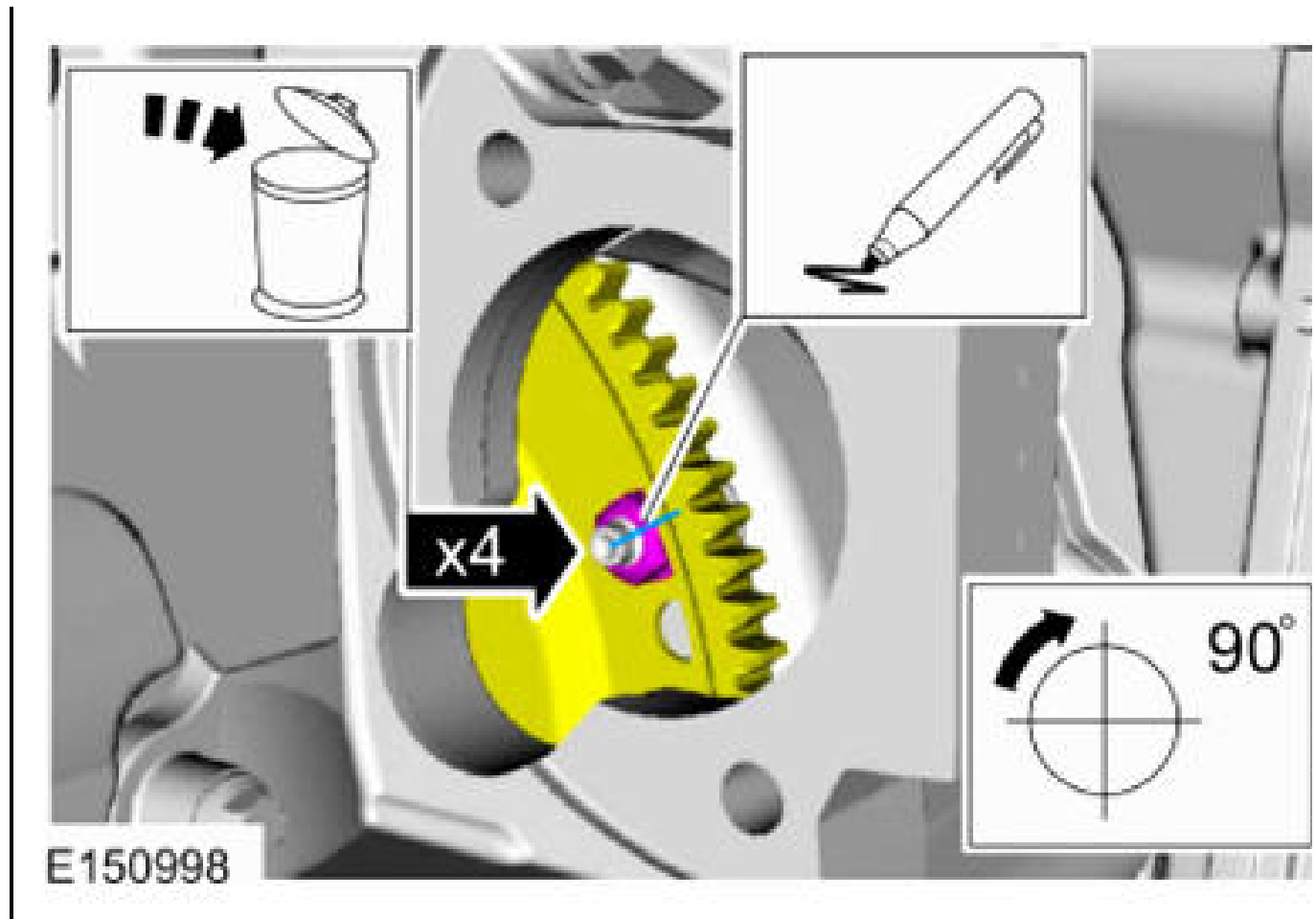
58.

59.



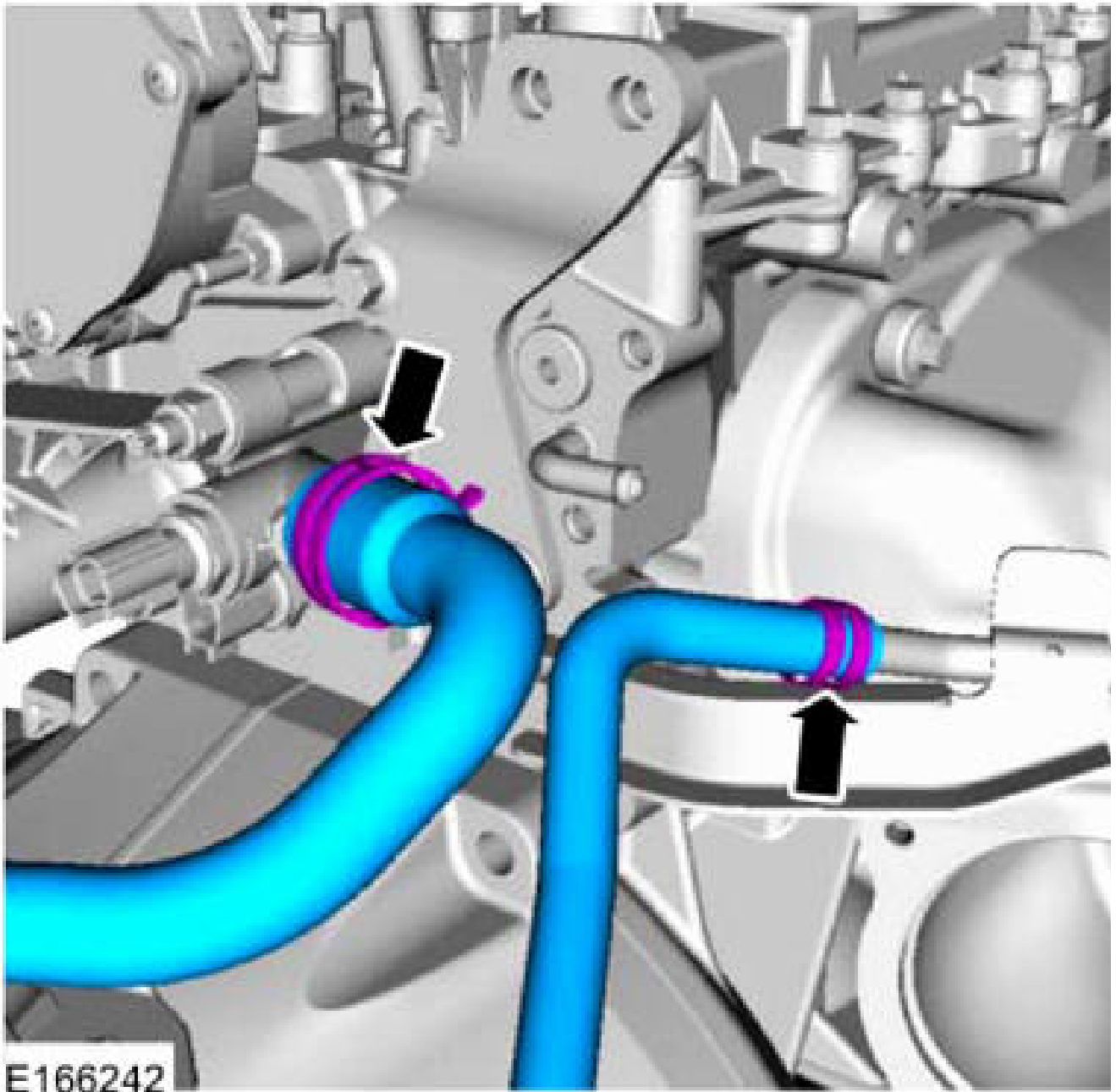
59.

60. **NOTE:** Only rotate the crankshaft in a clockwise direction.



Vehicles with automatic start-stop

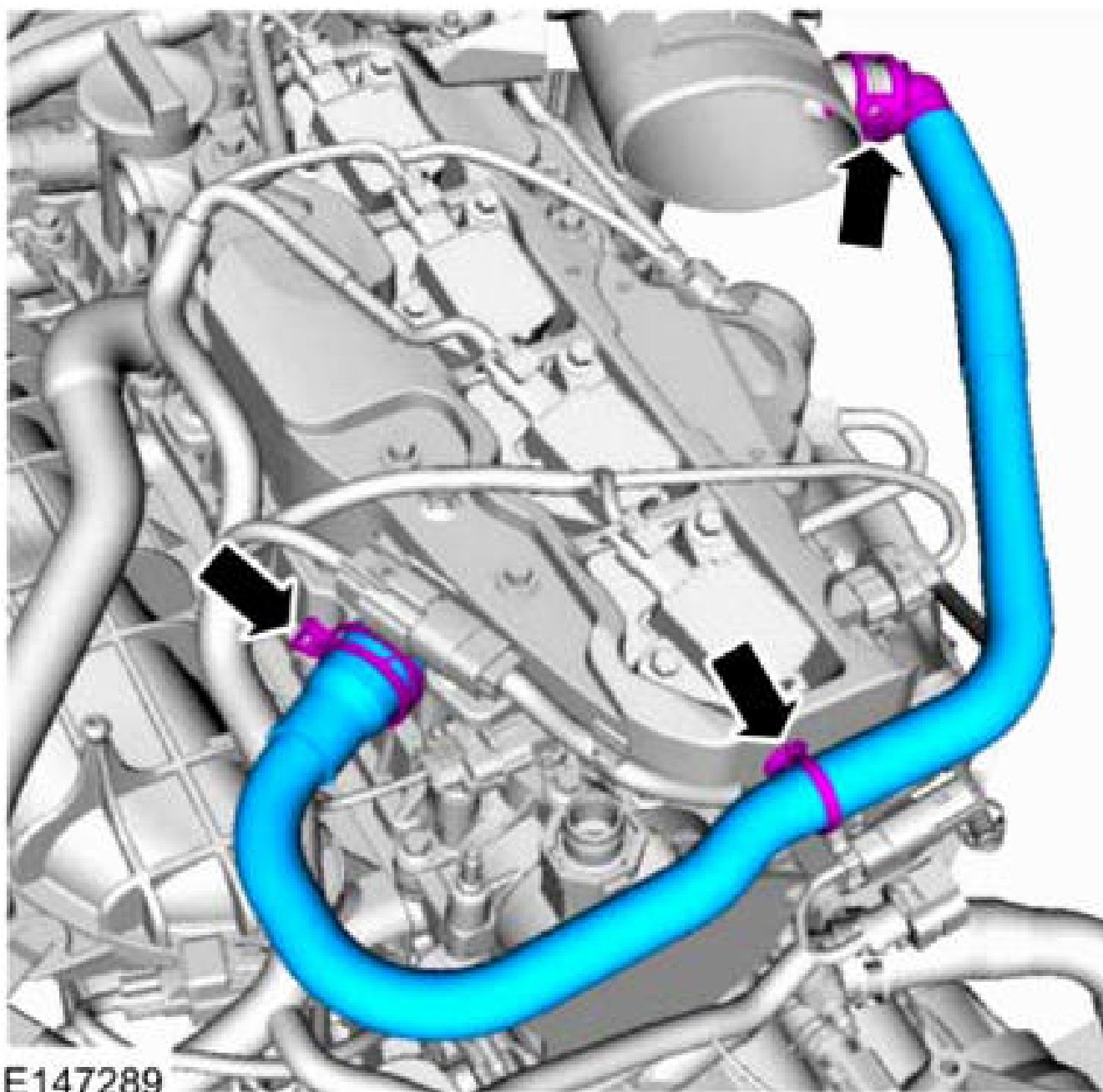
61. *General Equipment* : Hose Clamp Remover/Installer



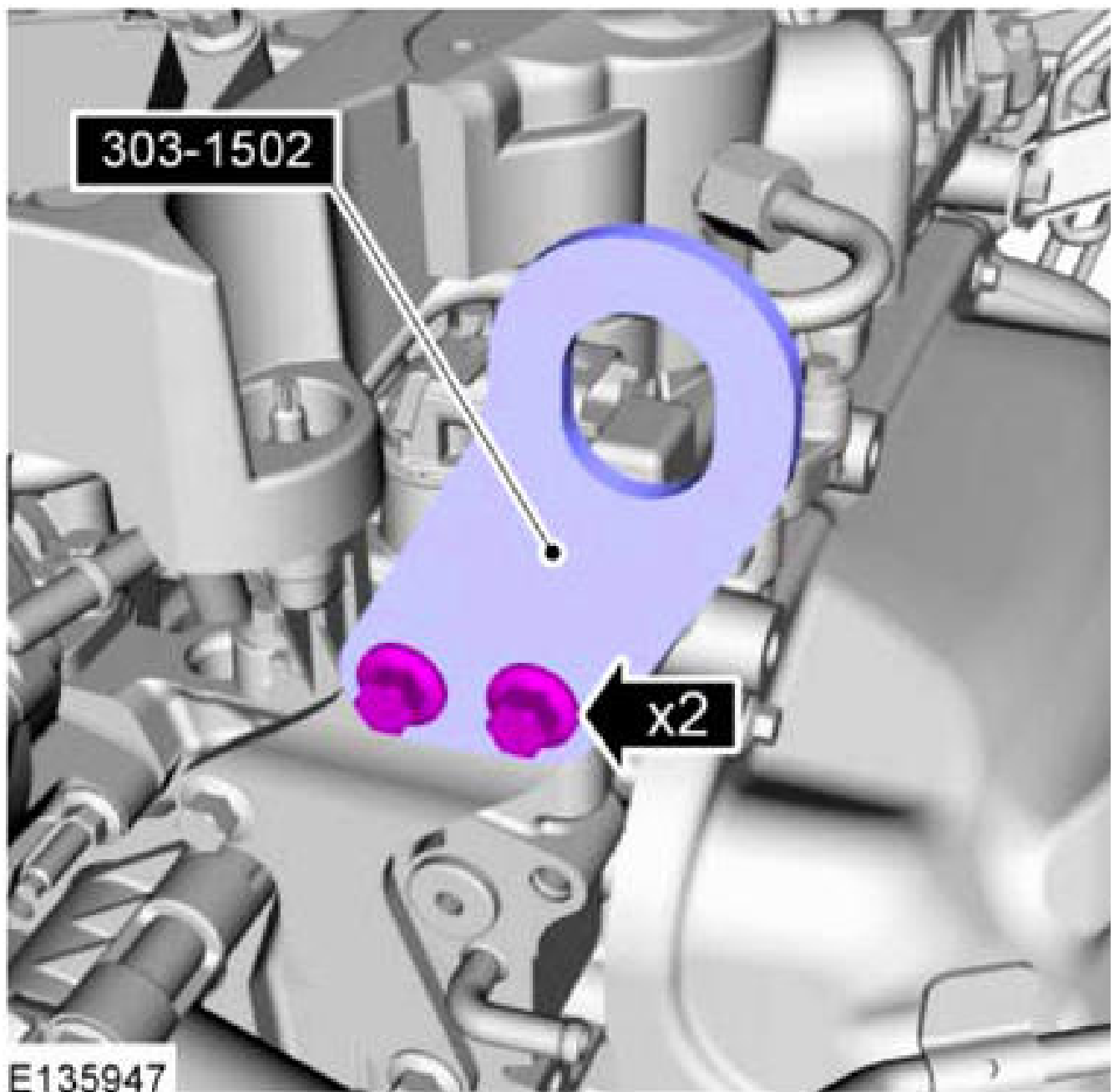
All vehicles

62. Refer to: **QUICK RELEASE COUPLING** .

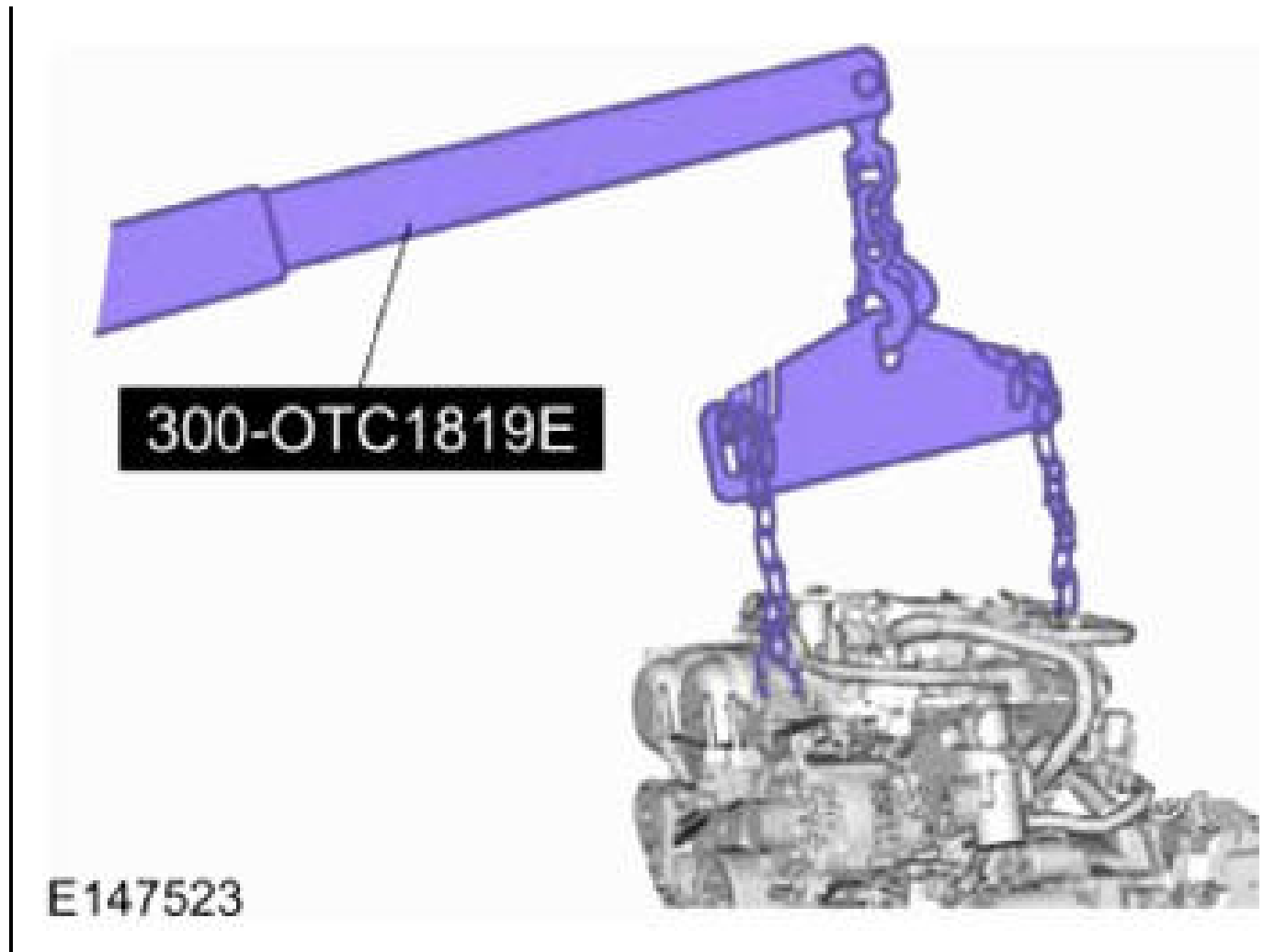
General Equipment : Hose Clamp Remover/Installer



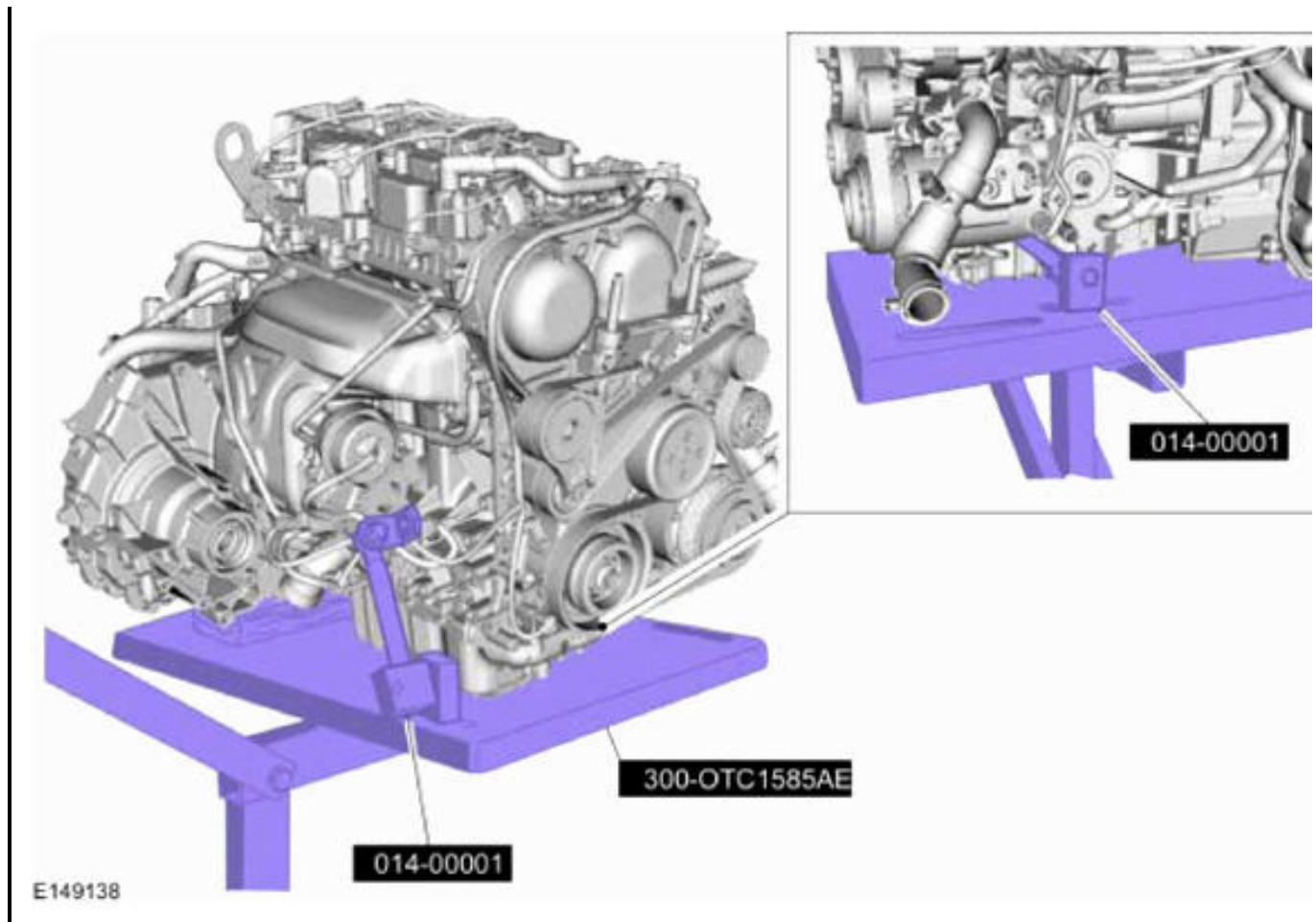
63. *Install Special Service Tool : 303-1502 Lifting Device Engine*



64. *Install Special Service Tool : 300-OTC1819E 2, 200# Floor Crane, Fold Away*

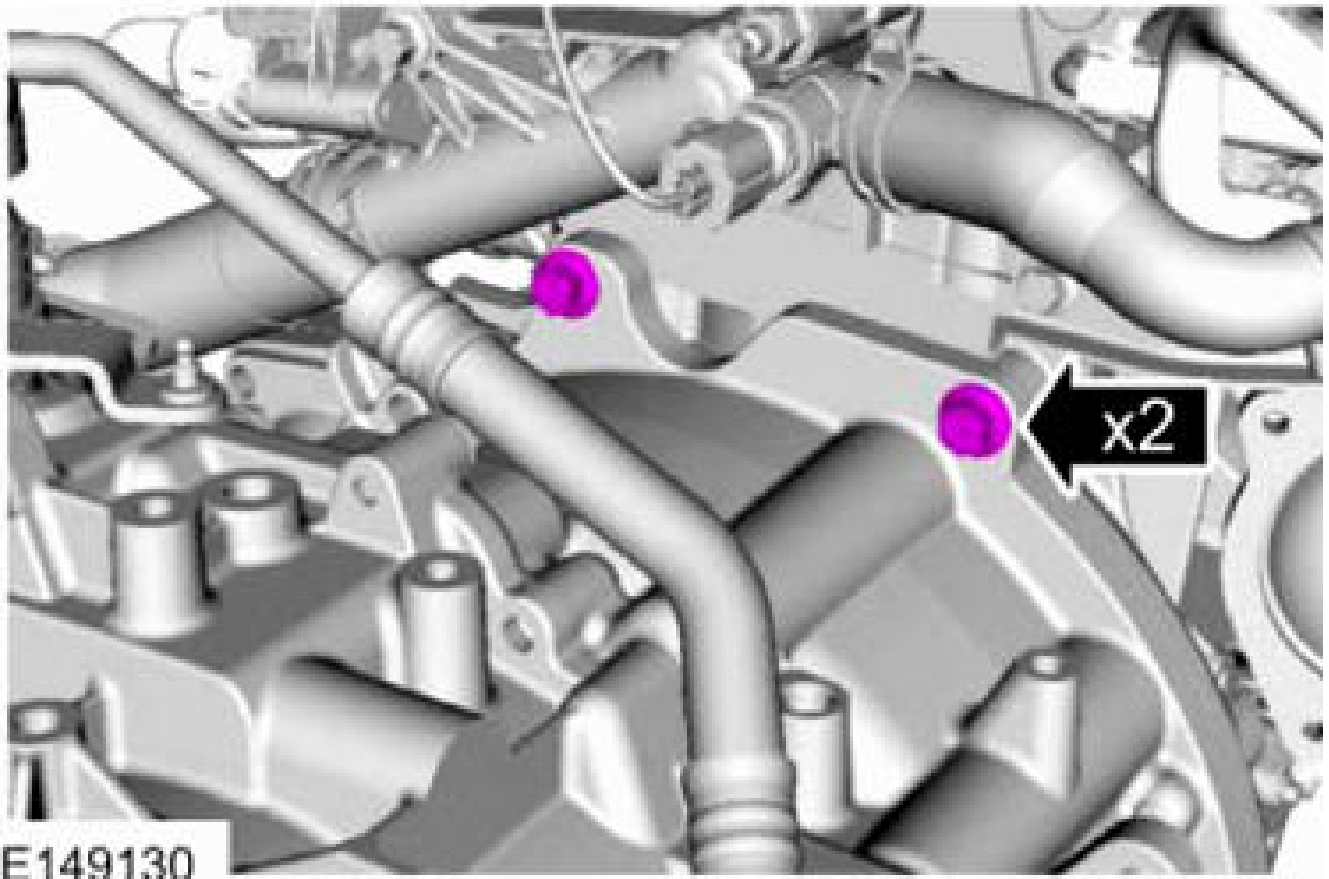


65. Remove Special Service Tool : 014-00001 ADJUSTABLE GRIP 1735A , 300-OTC1585AE
Powertrain Lift



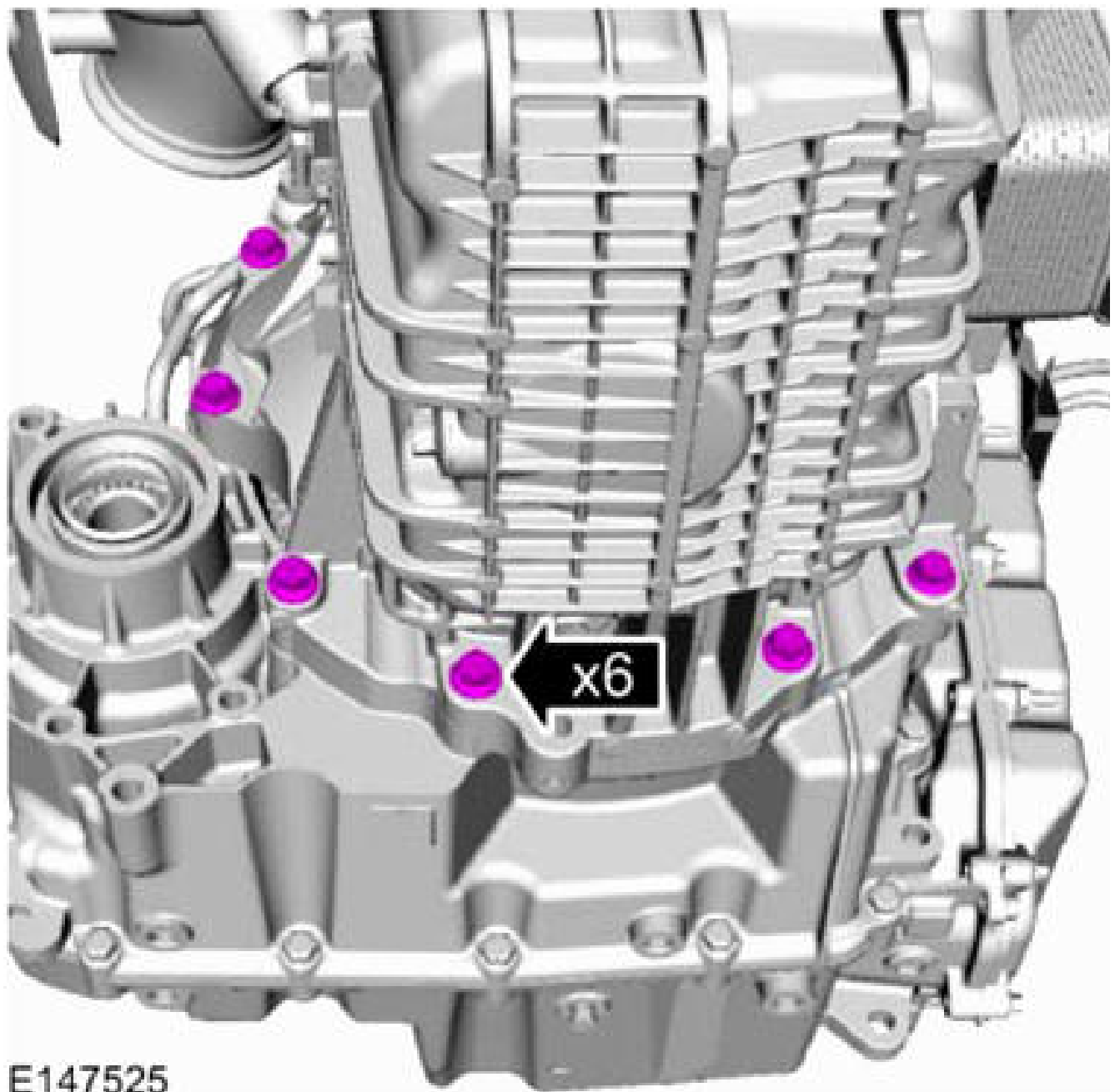
NOTE: Automatic transmission shown in illustration, manual transmission similar.

66.



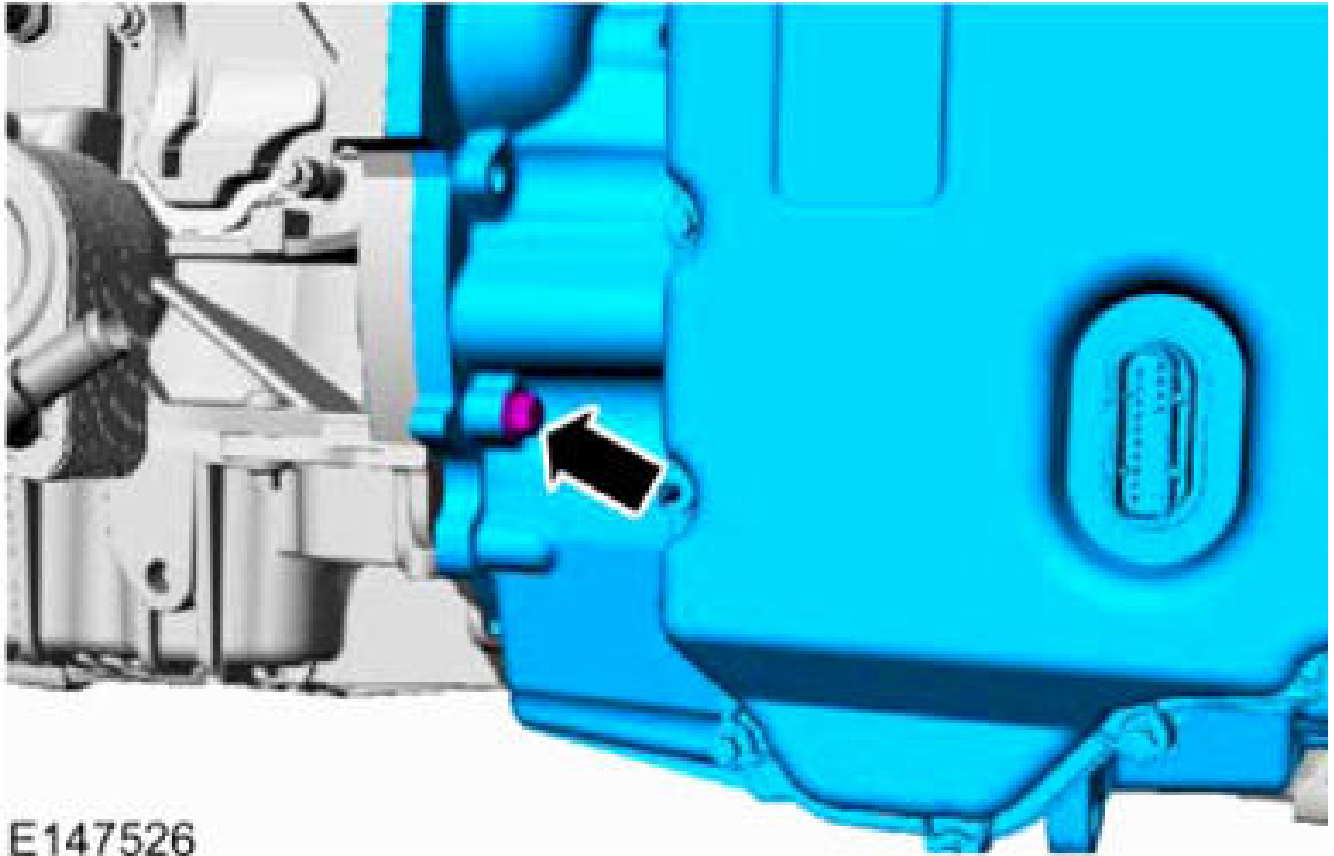
NOTE: Automatic transmission shown in illustration, manual transmission similar.

67.



NOTE: Automatic transmission shown in illustration, manual transmission similar.

68.



DISASSEMBLY

ENGINE

SPECIAL TOOLS/GENERAL EQUIPMENT

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

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



E1254094



ST1341-A

300-OTC1819E

2, 200# Floor Crane, Fold Away

**E49165****303-1097**Locking Tool, Variable Camshaft Timing Oil
Control Unit

TKIT-2001B-FLM

TKIT-2001B-ROW

**E116729****303-1502**

Lifting Device Engine

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



E134603

303-409 (T92C-6700-CH)
Remover, Crankshaft Seal
TKIT-1992-FH/FMH/FLMH
TKIT-1993-LMH/MH



303748

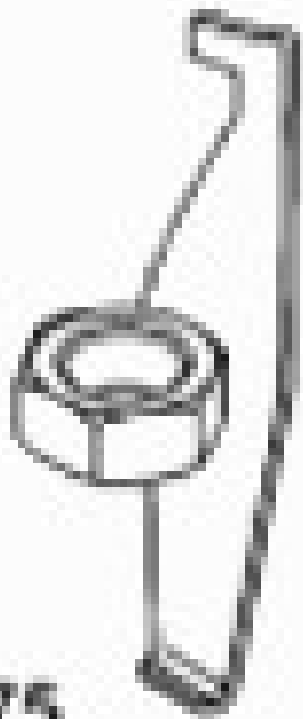
303-748
Locking Tool, Crankshaft
TKIT-2001B-FLM
TKIT-2001B-ROW



307-005 (T59L-100-B)
Slide Hammer

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



308-375

Remover, Input Shaft Seal
TKIT-1999-F/FLM/LT
TKIT-2005U-M



310-206

Remover, Fuel Injector
TKIT-2009A-FLM

Hot Air Gun

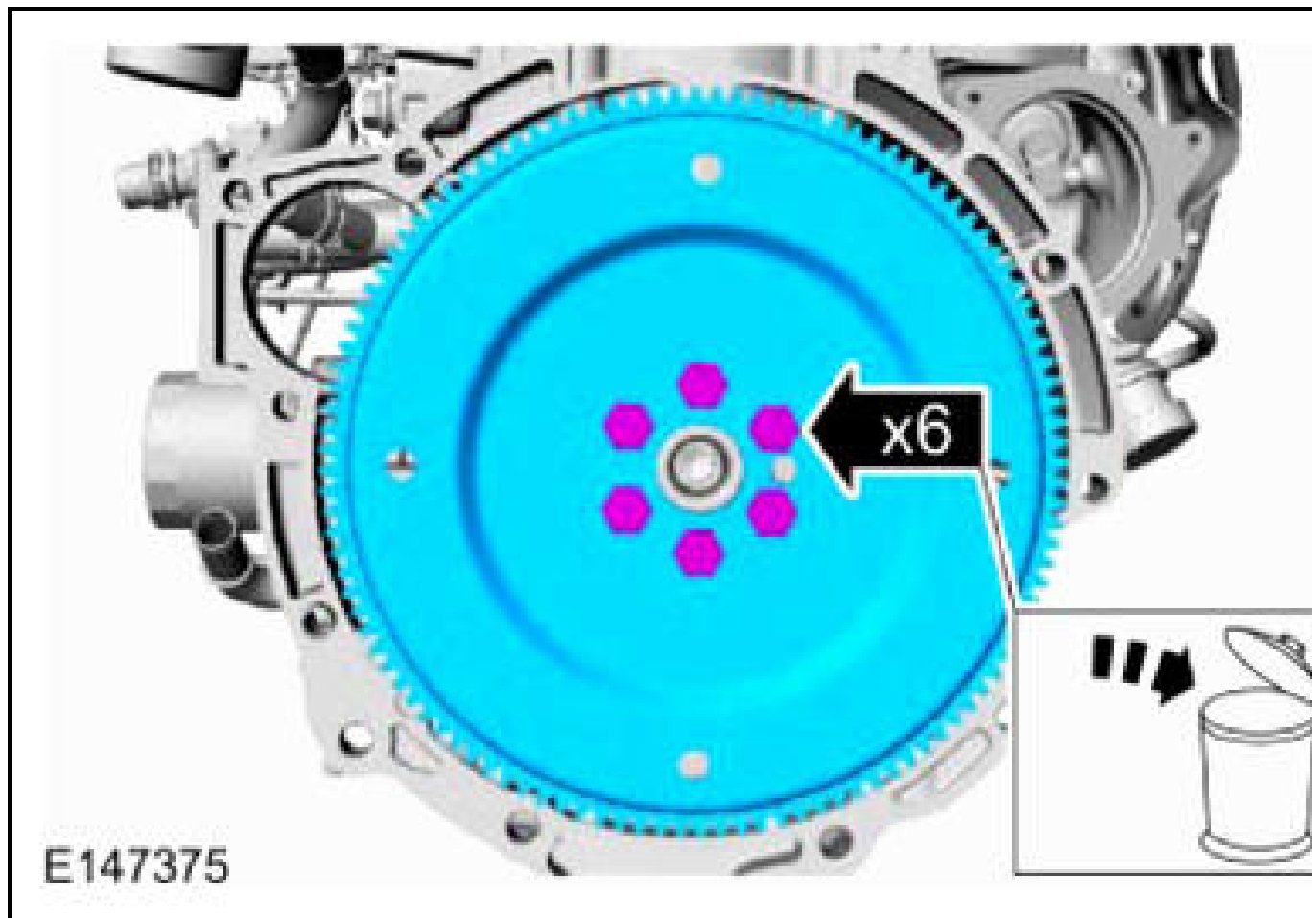
Hose Clamp Remover/Installer

NOTE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

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

NOTE: Refer to exploded views in Description and Operation.

Vehicles with automatic transmission



1.

Vehicles with manual transmission

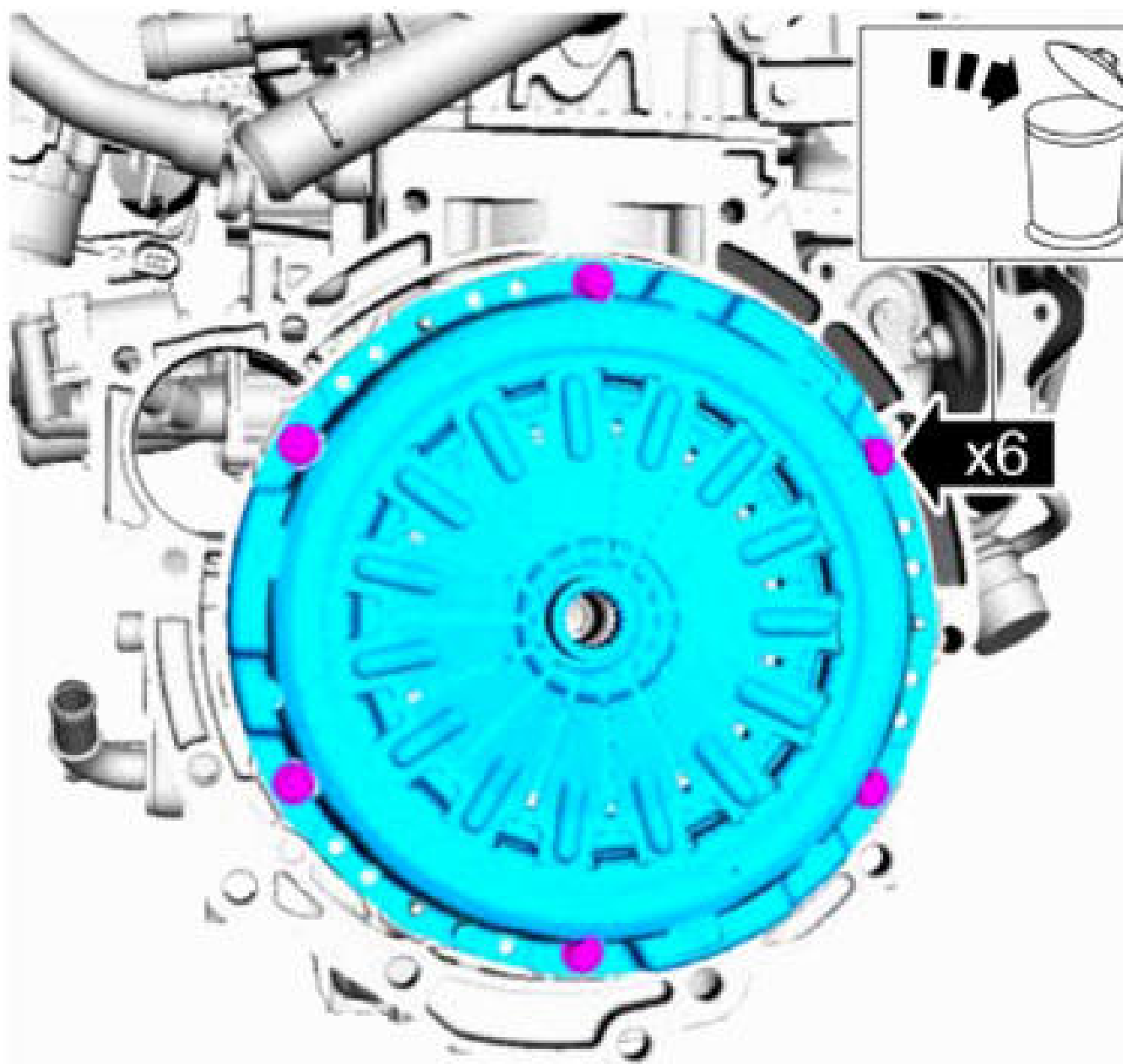
NOTE: Do not breathe dust or use compressed air to blow dust from storage

2.

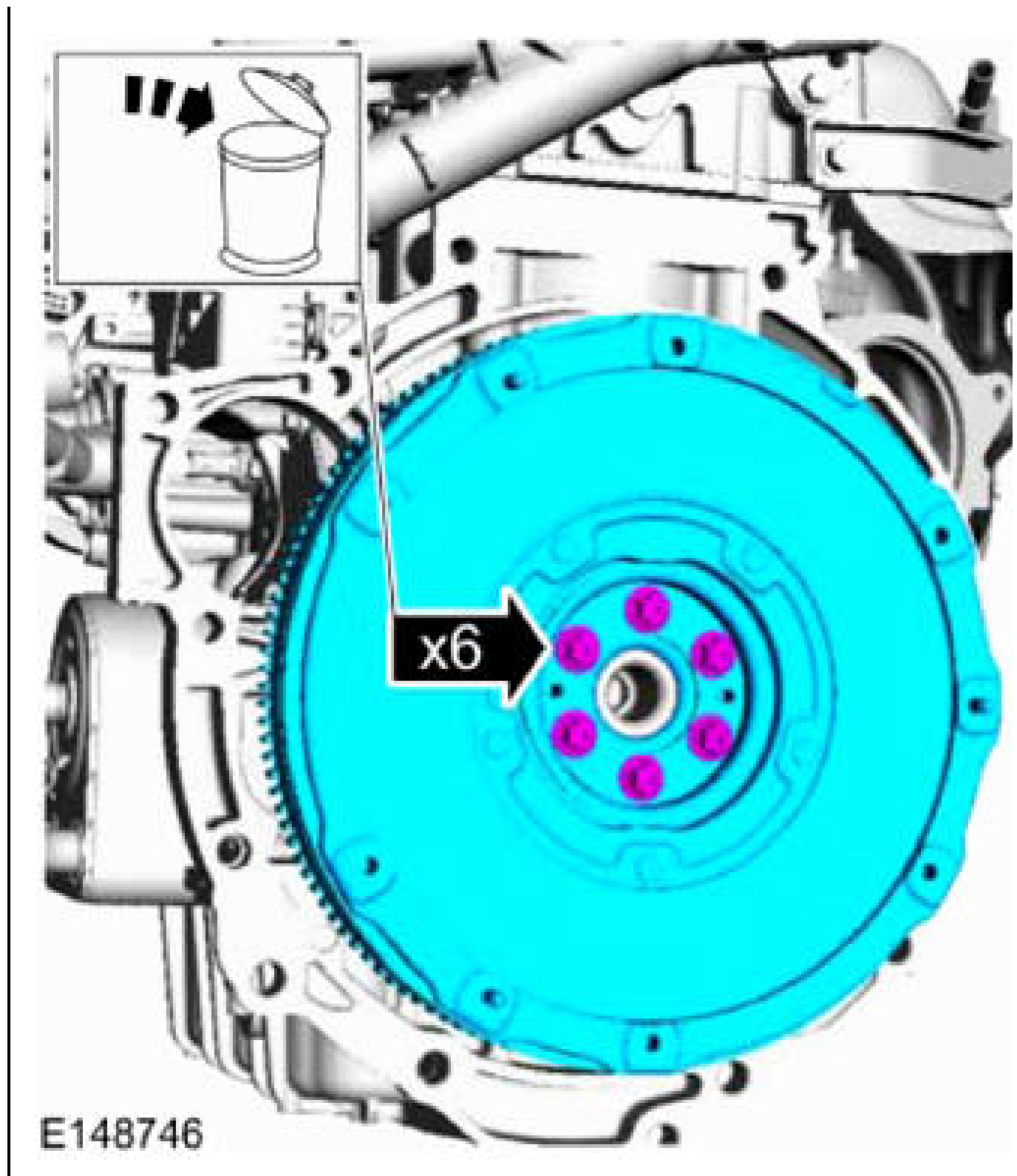
containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs.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

2.

Loosen the 6 clutch pressure plate-to-flywheel bolts evenly, by 2 turns at a time.



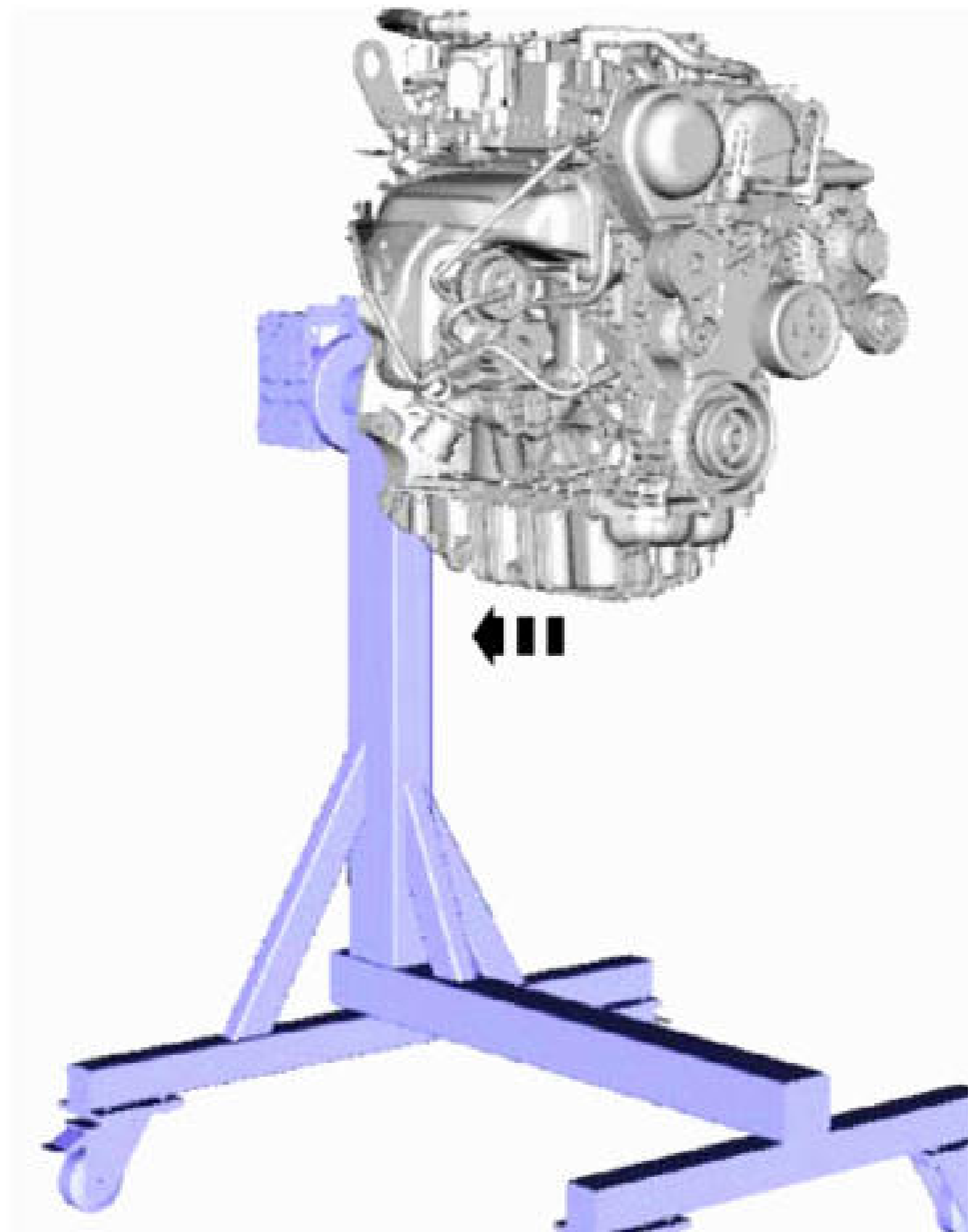
E148745



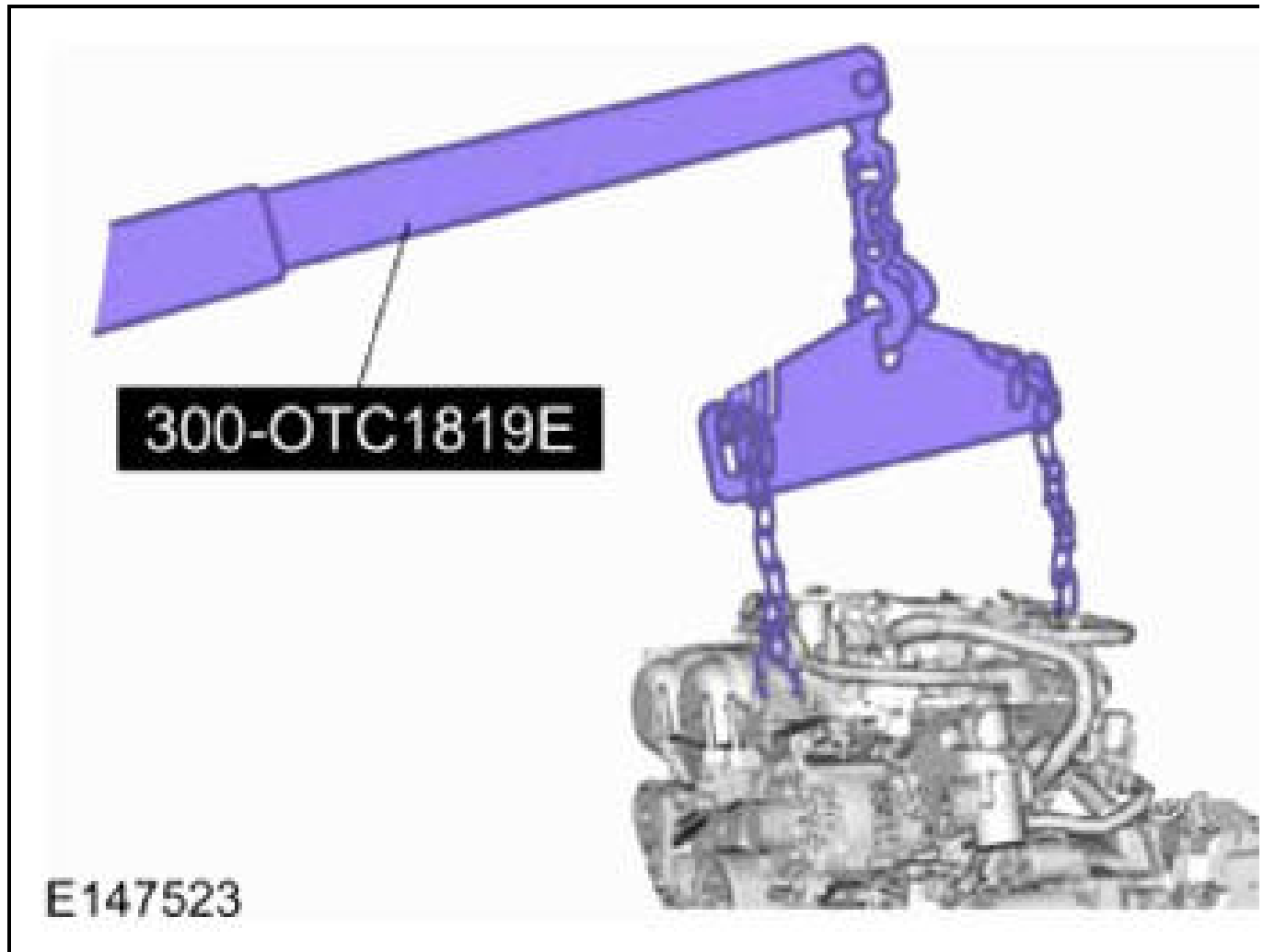
3.

All vehicles

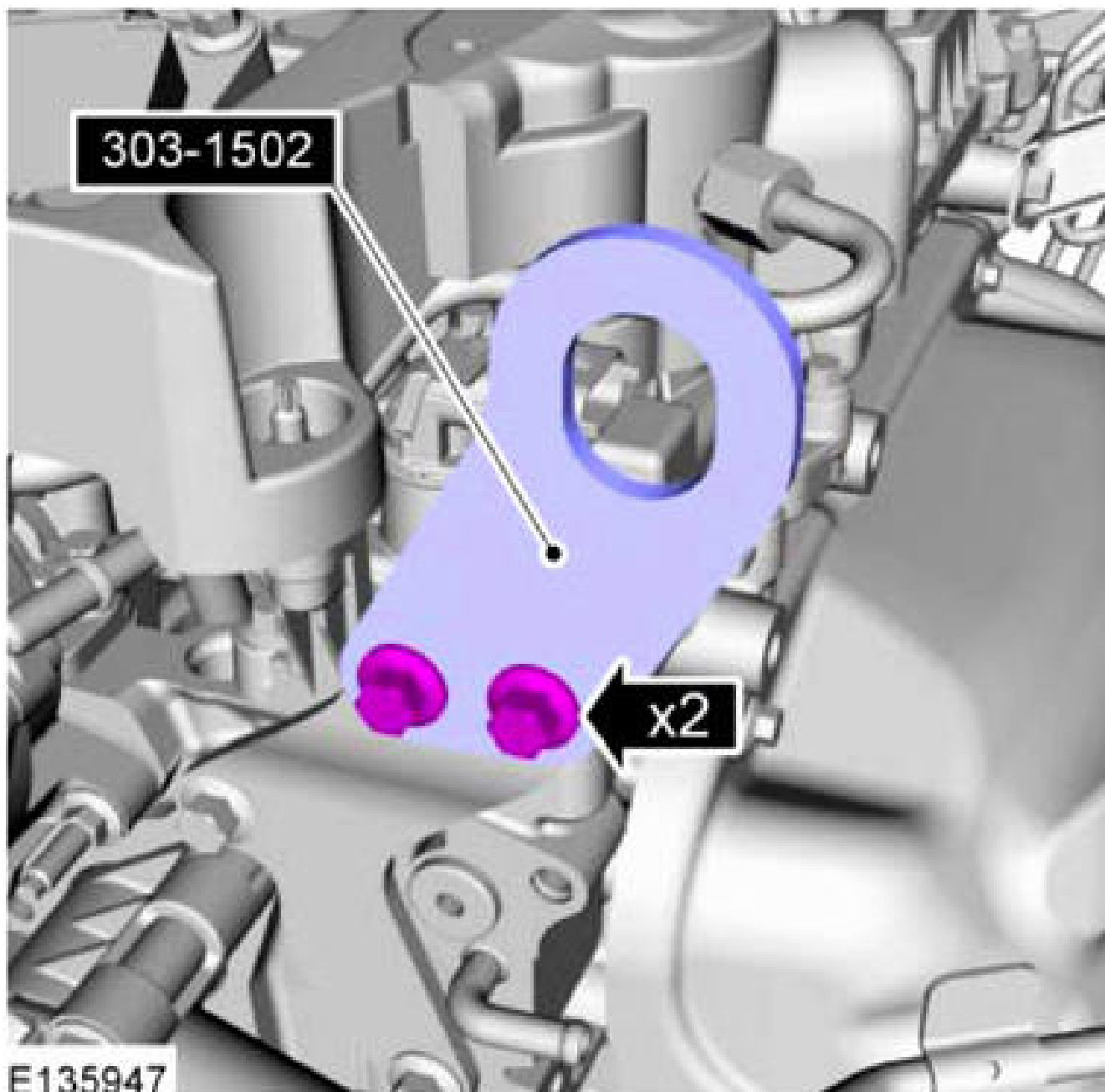
4. Mount to engine stand.



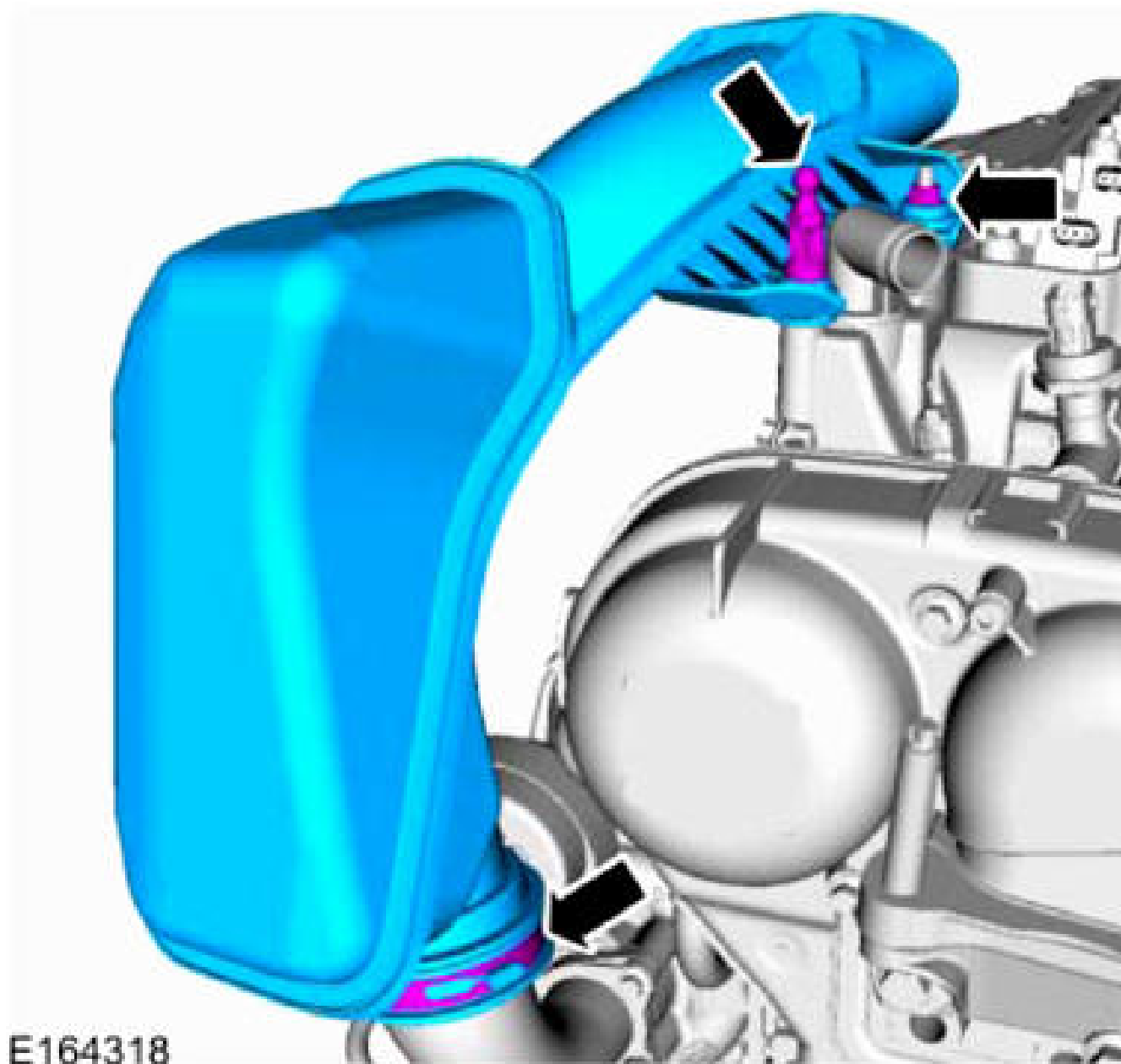
5. *Remove Special Service Tool : 300-OTC1819E 2, 200# Floor Crane, Fold Away*



6. *Remove Special Service Tool : 303-1502 Lifting Device Engine*

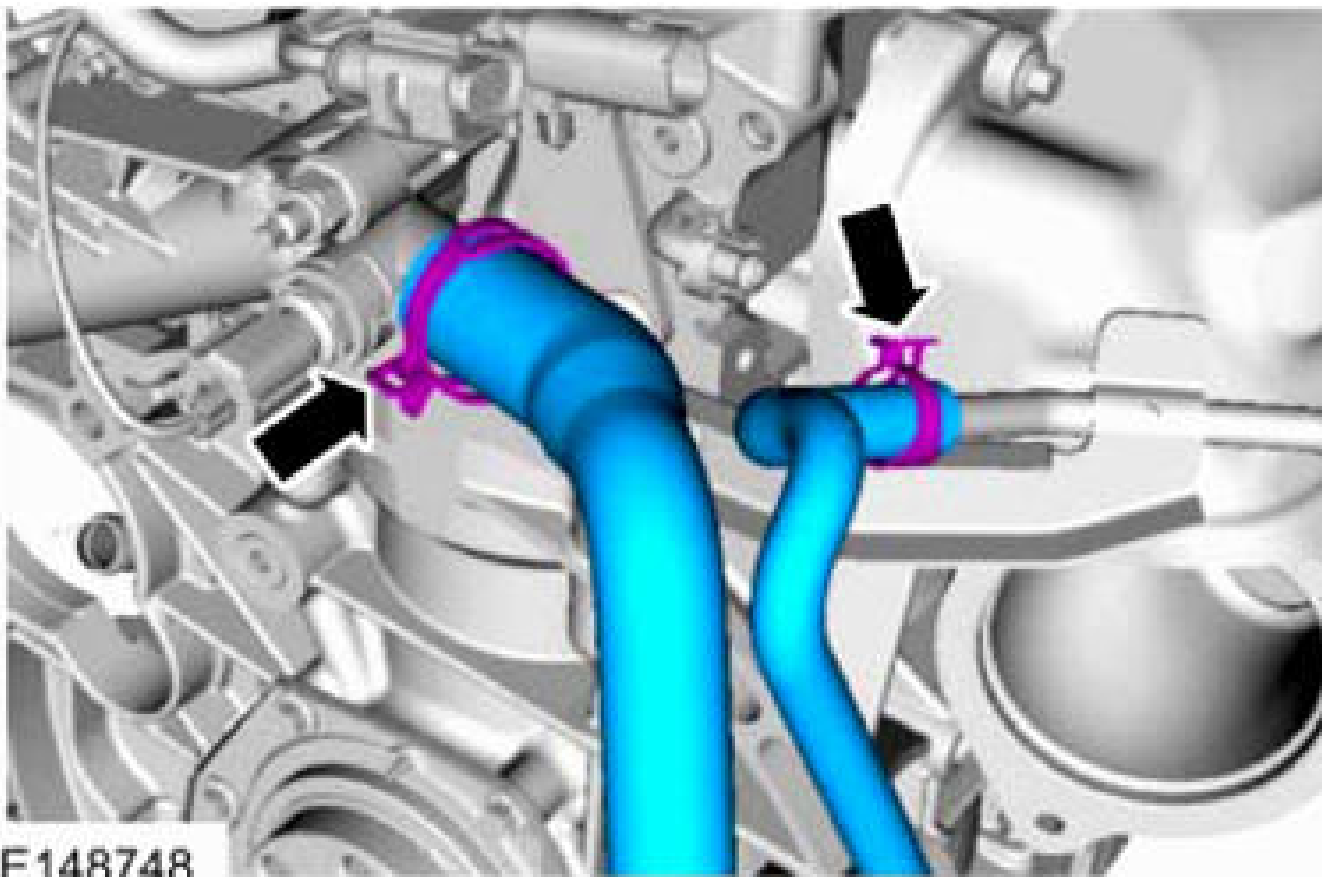


7.

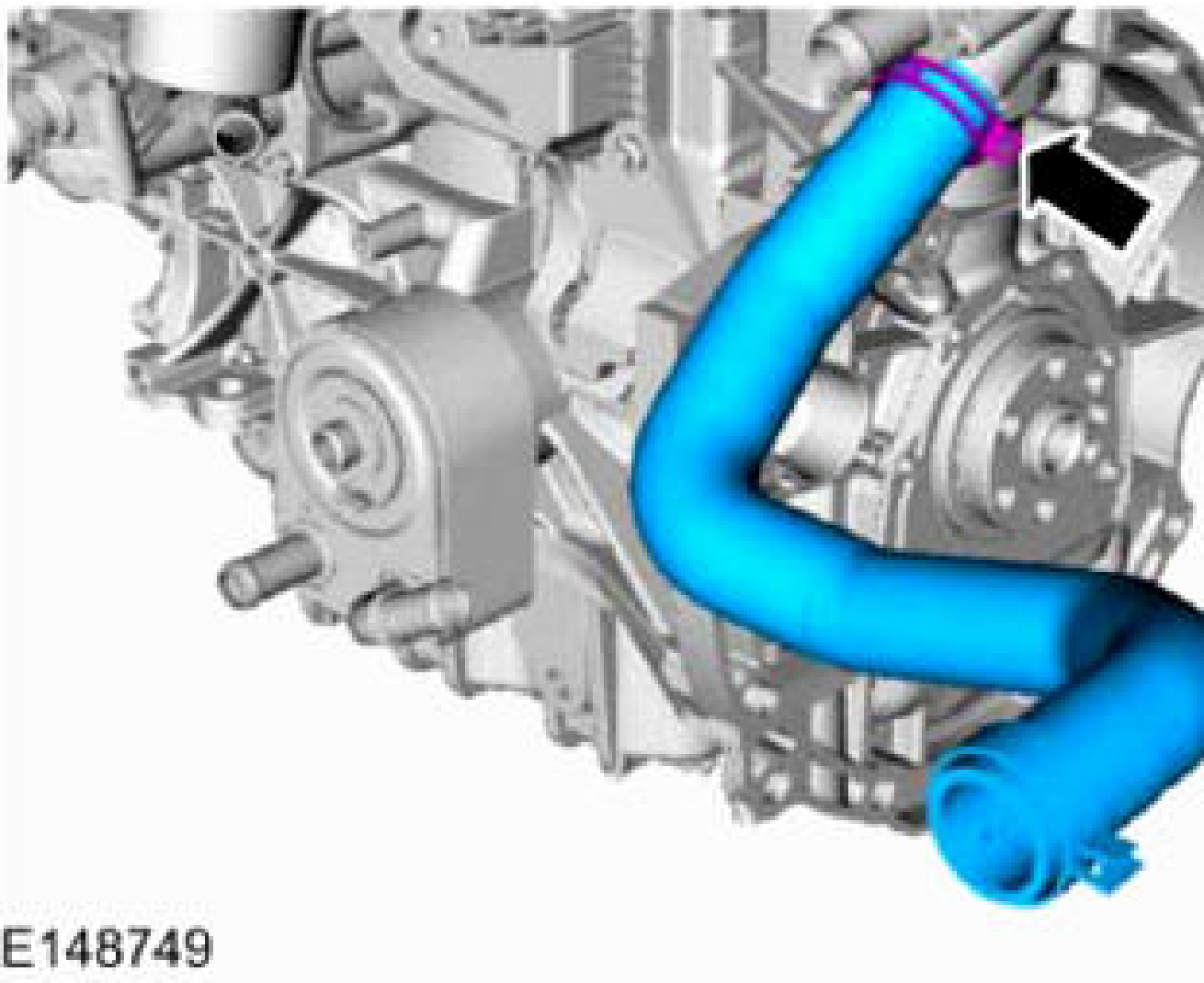


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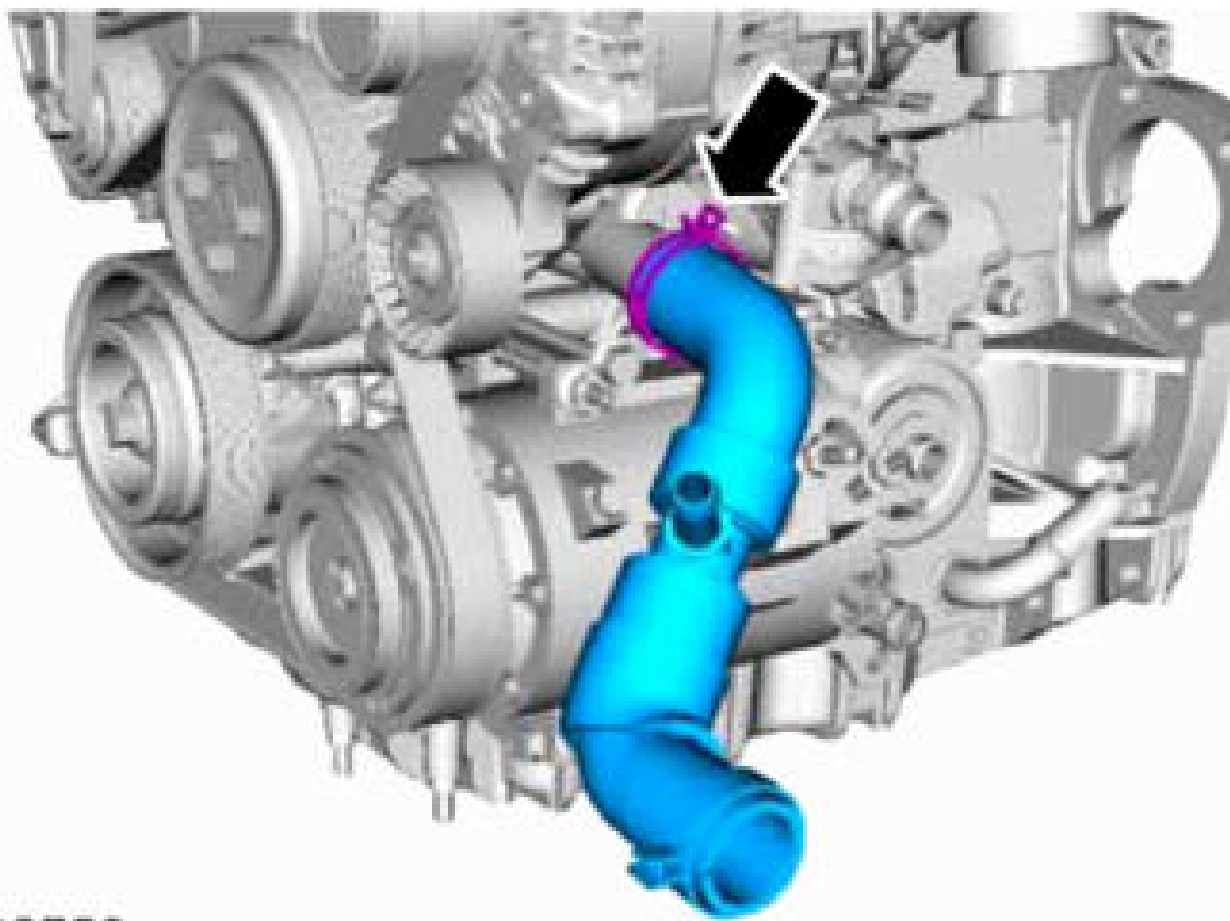
8. *General Equipment* : Hose Clamp Remover/Installer



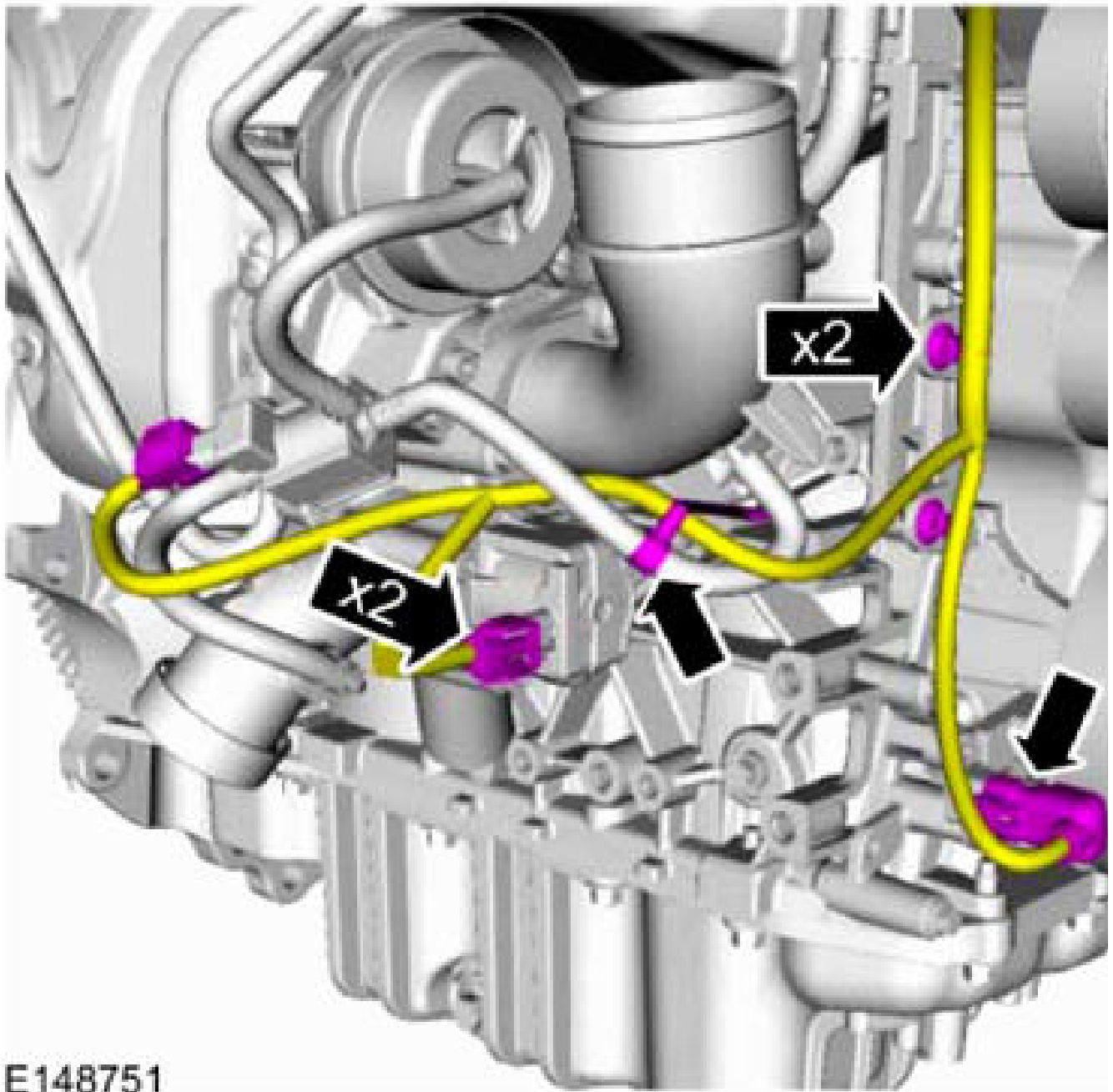
9. *General Equipment* : Hose Clamp Remover/Installer



10. *General Equipment* : Hose Clamp Remover/Installer

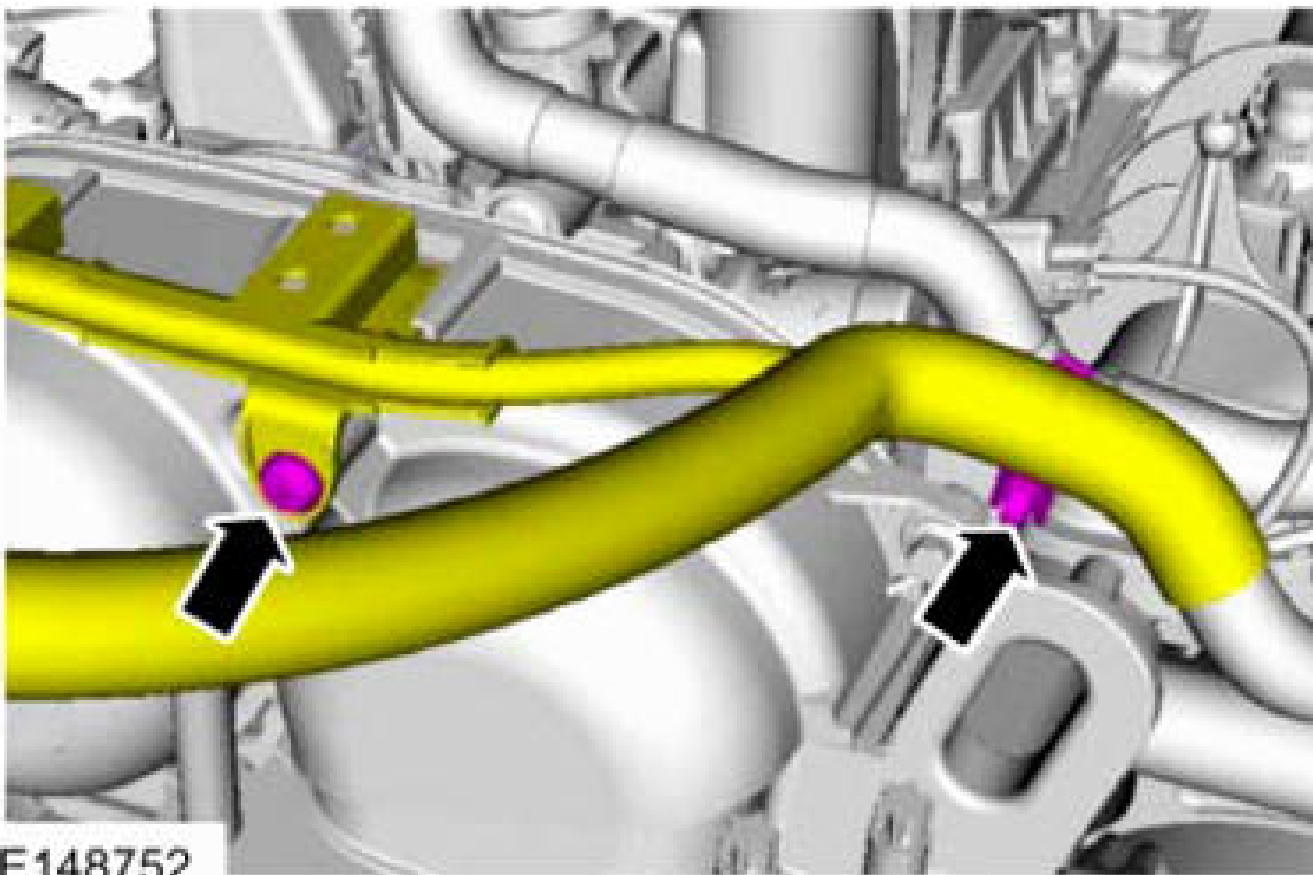


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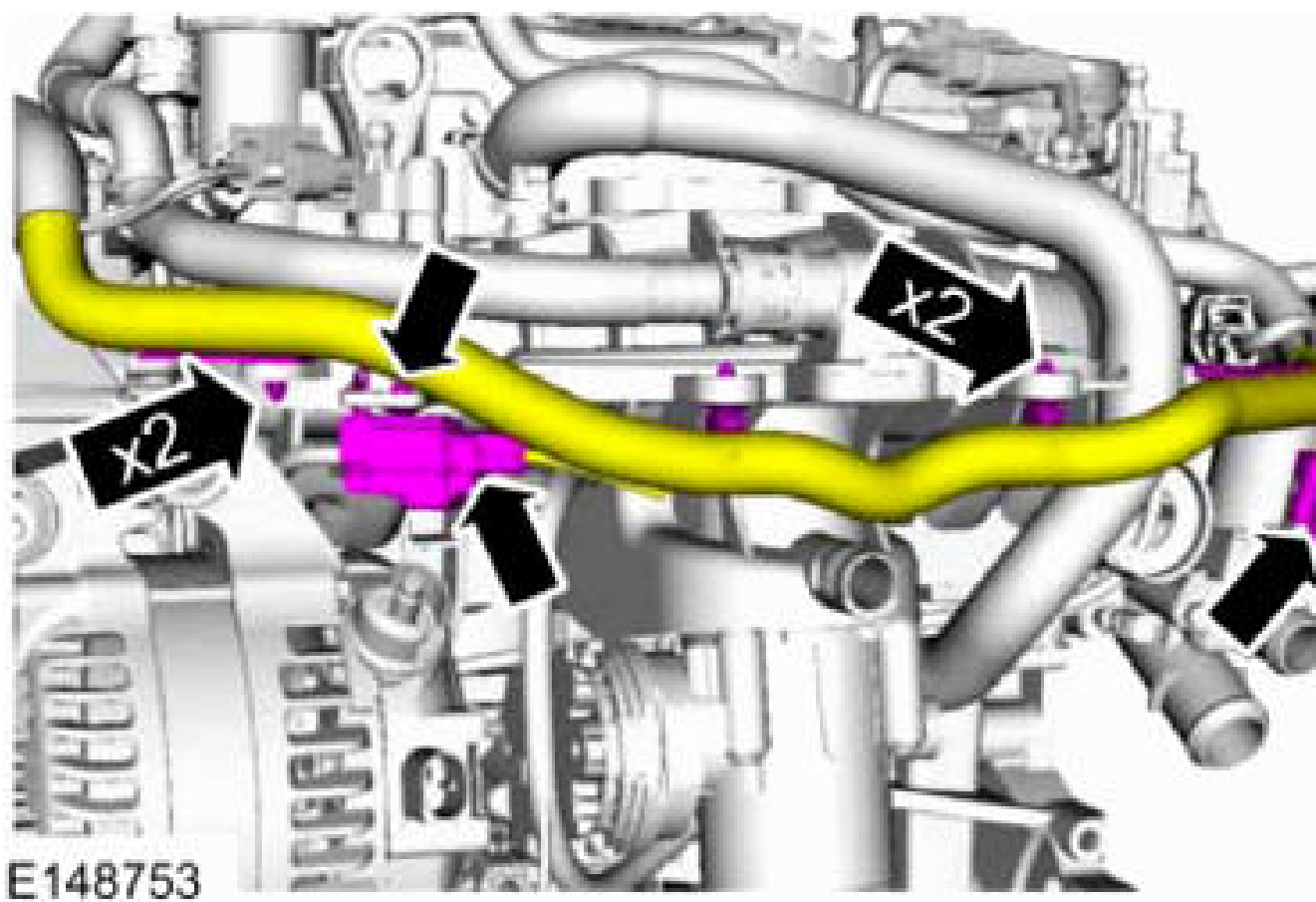
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12.



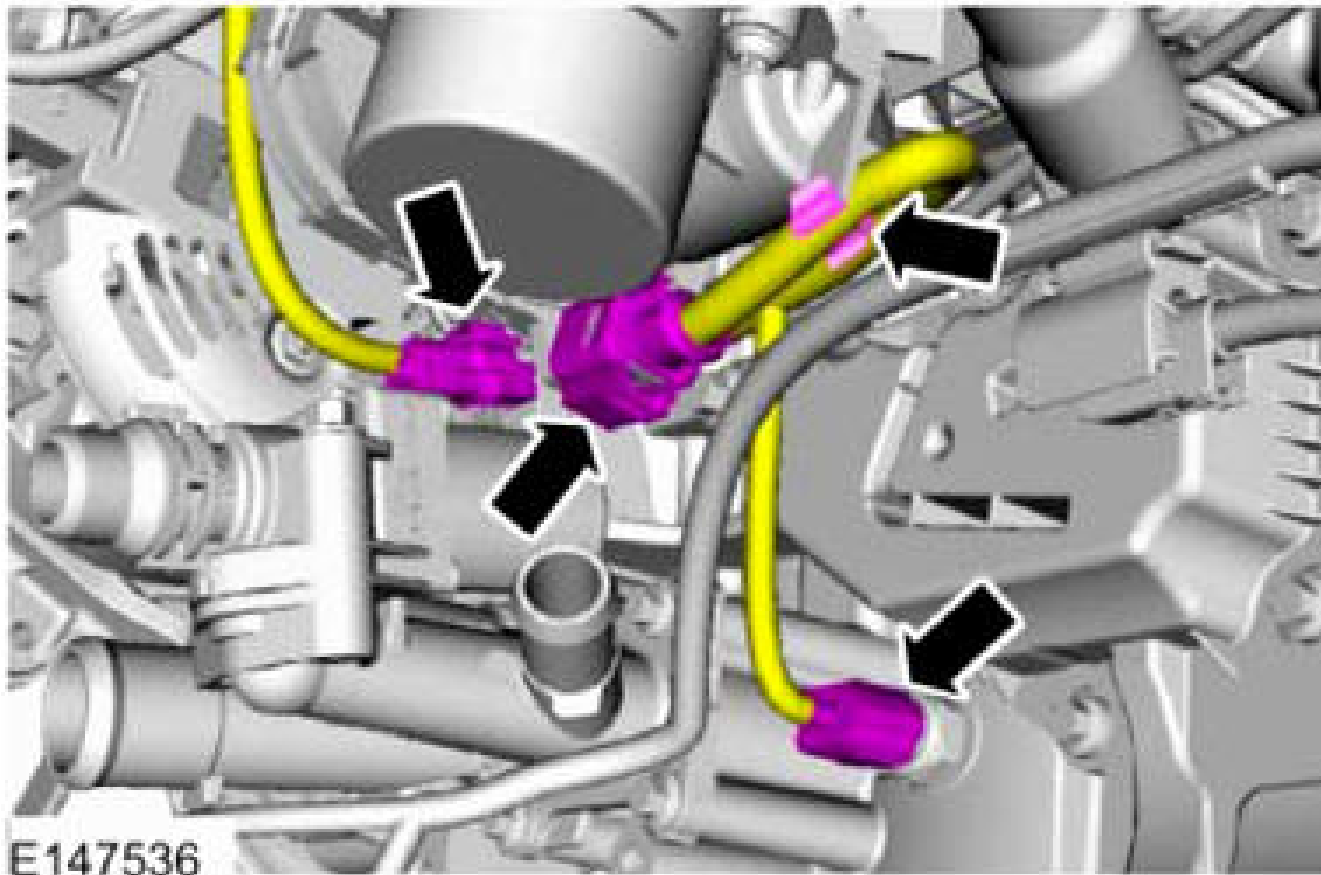
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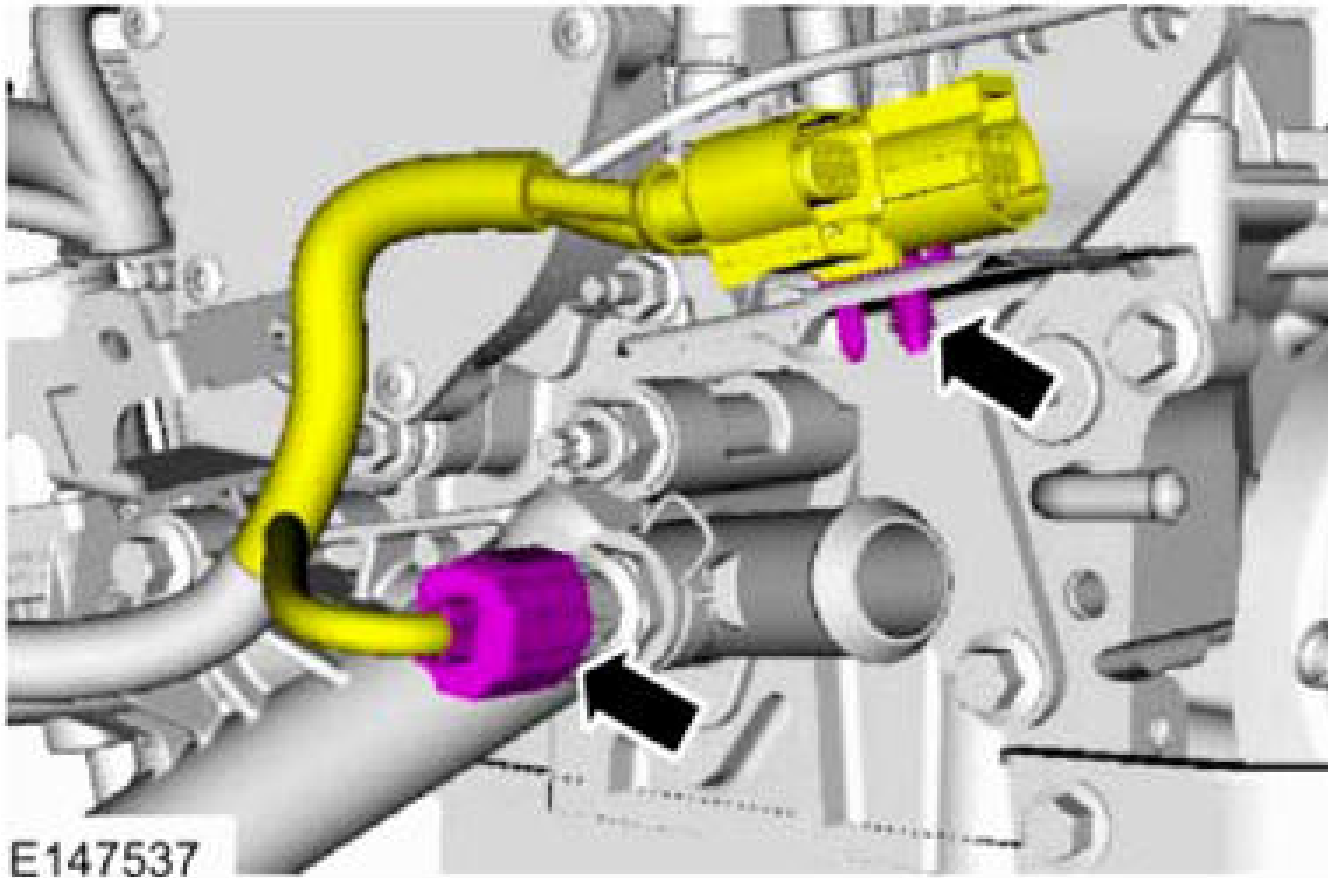
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14.



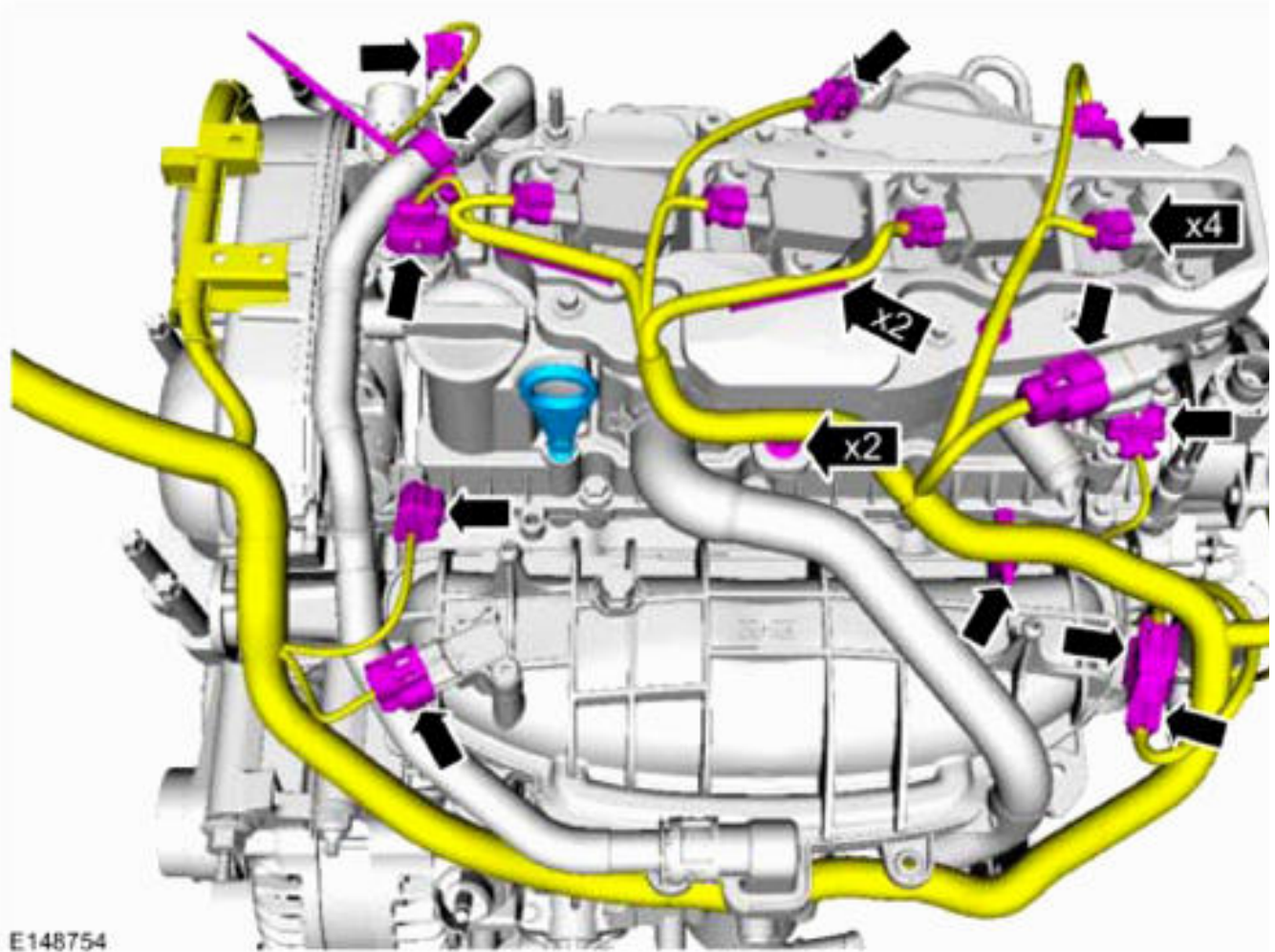
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15.



15.

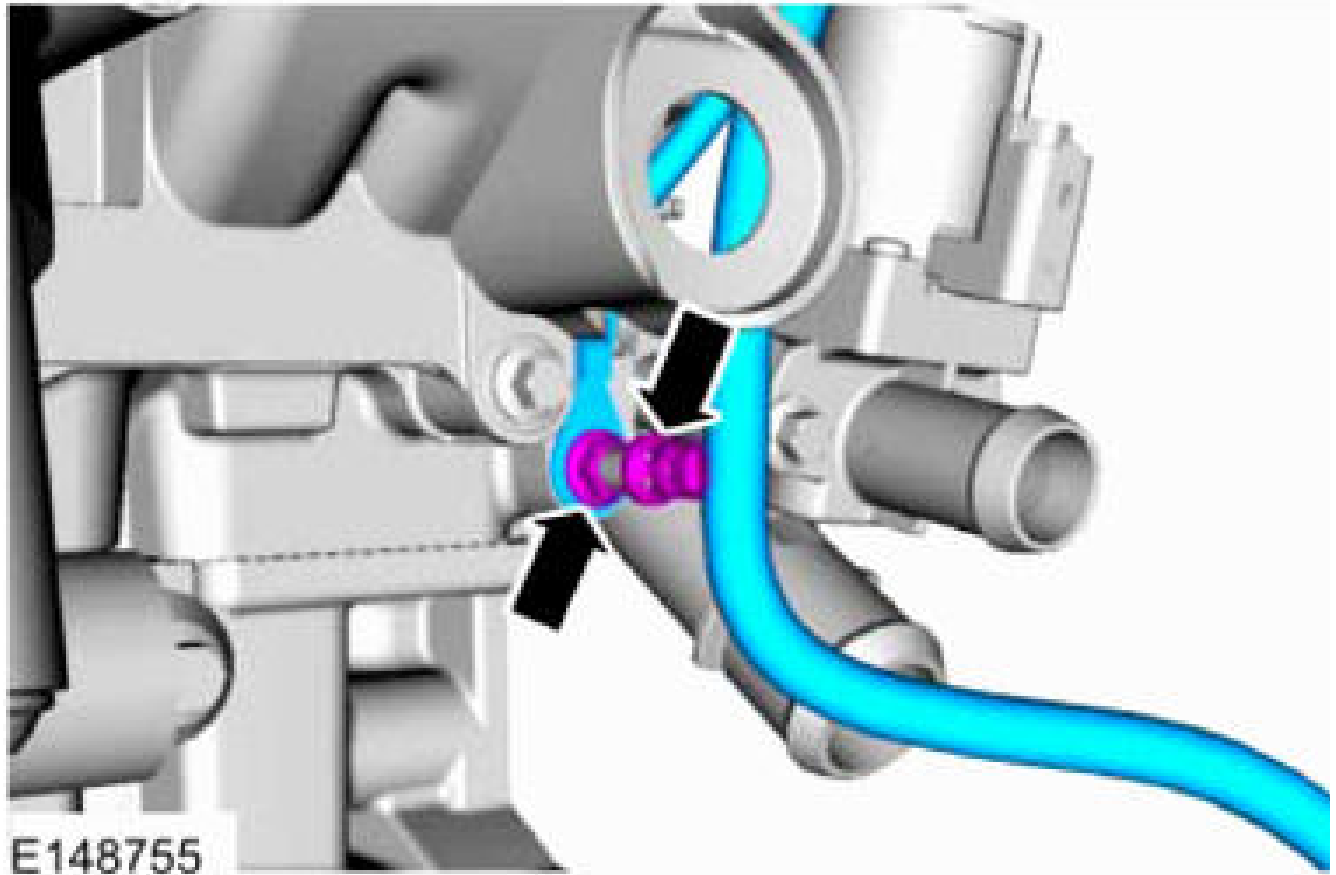
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16.

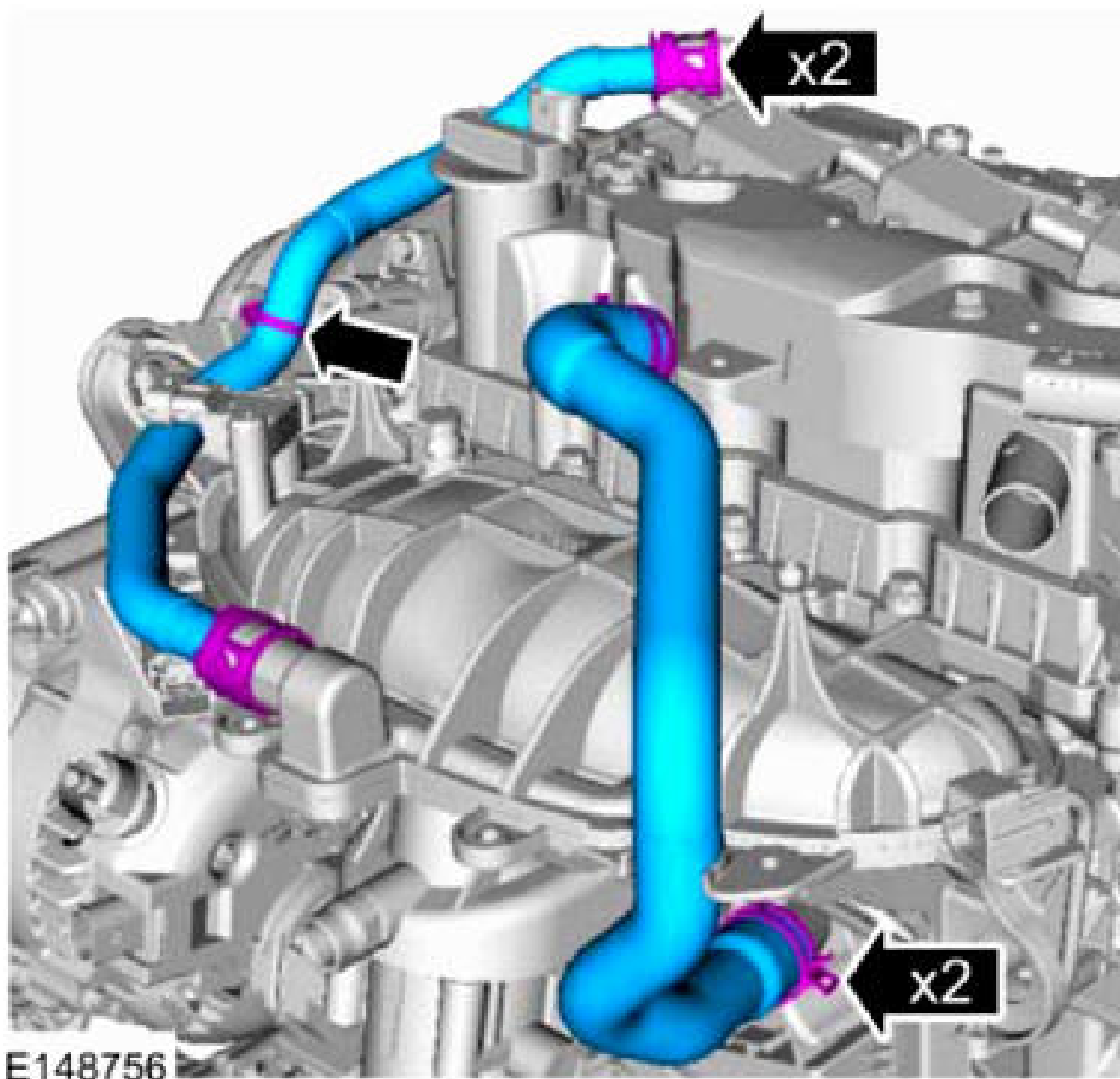
NOTE: Engine with automatic transmission shown in illustration, manual transmission similar.

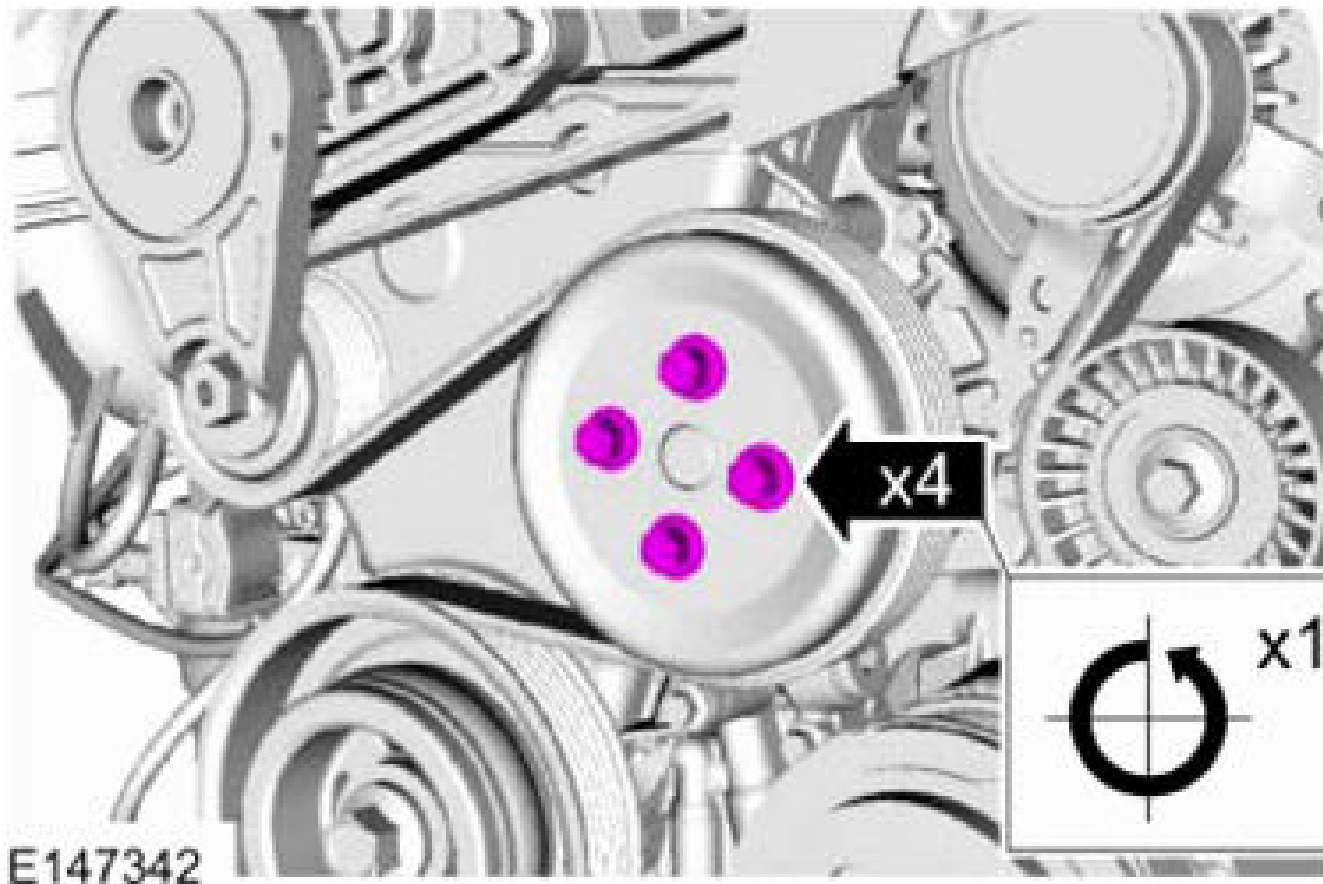
17.



18. Refer to: **QUICK RELEASE COUPLING** .

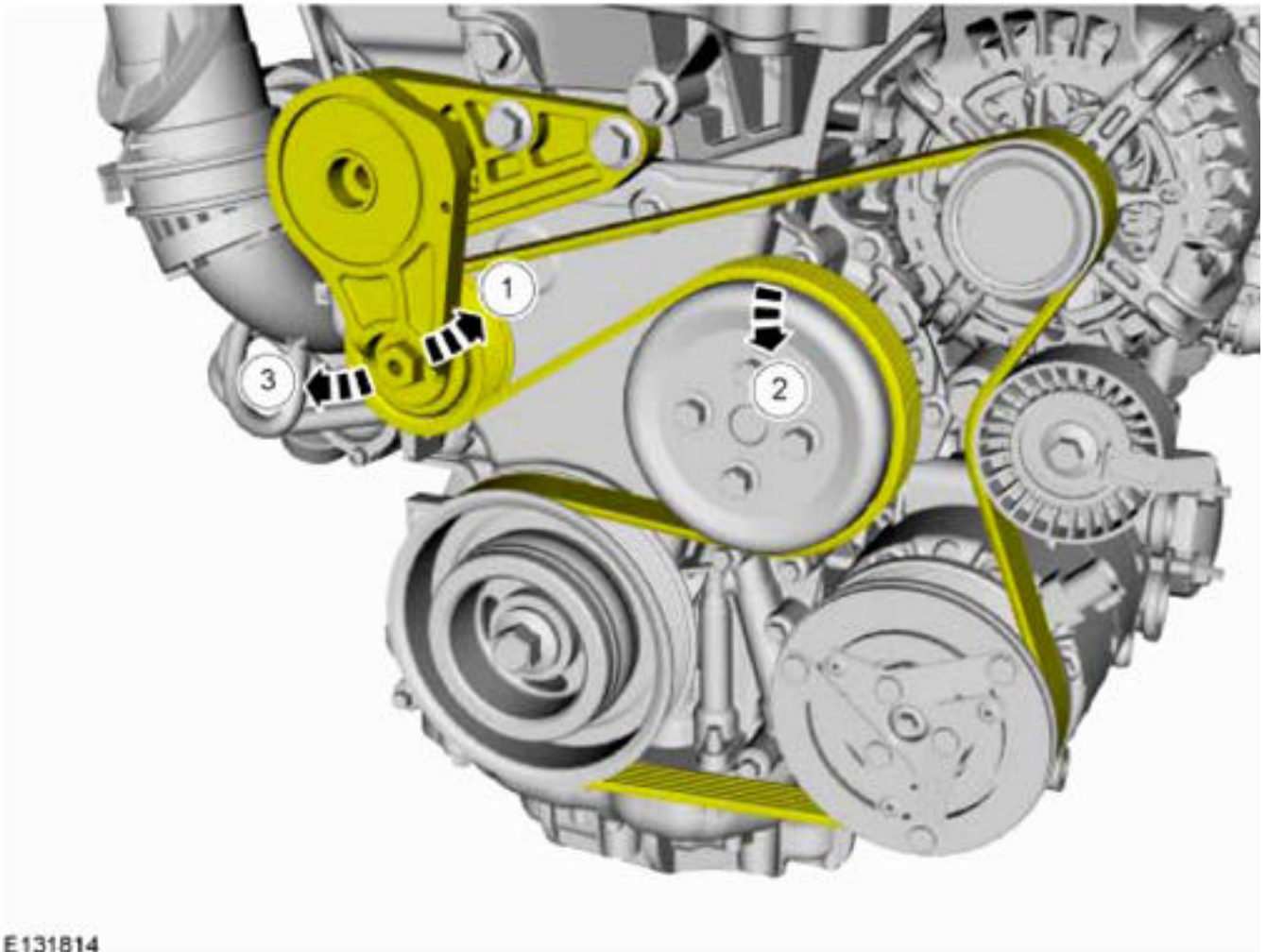
General Equipment : Hose Clamp Remover/Installer





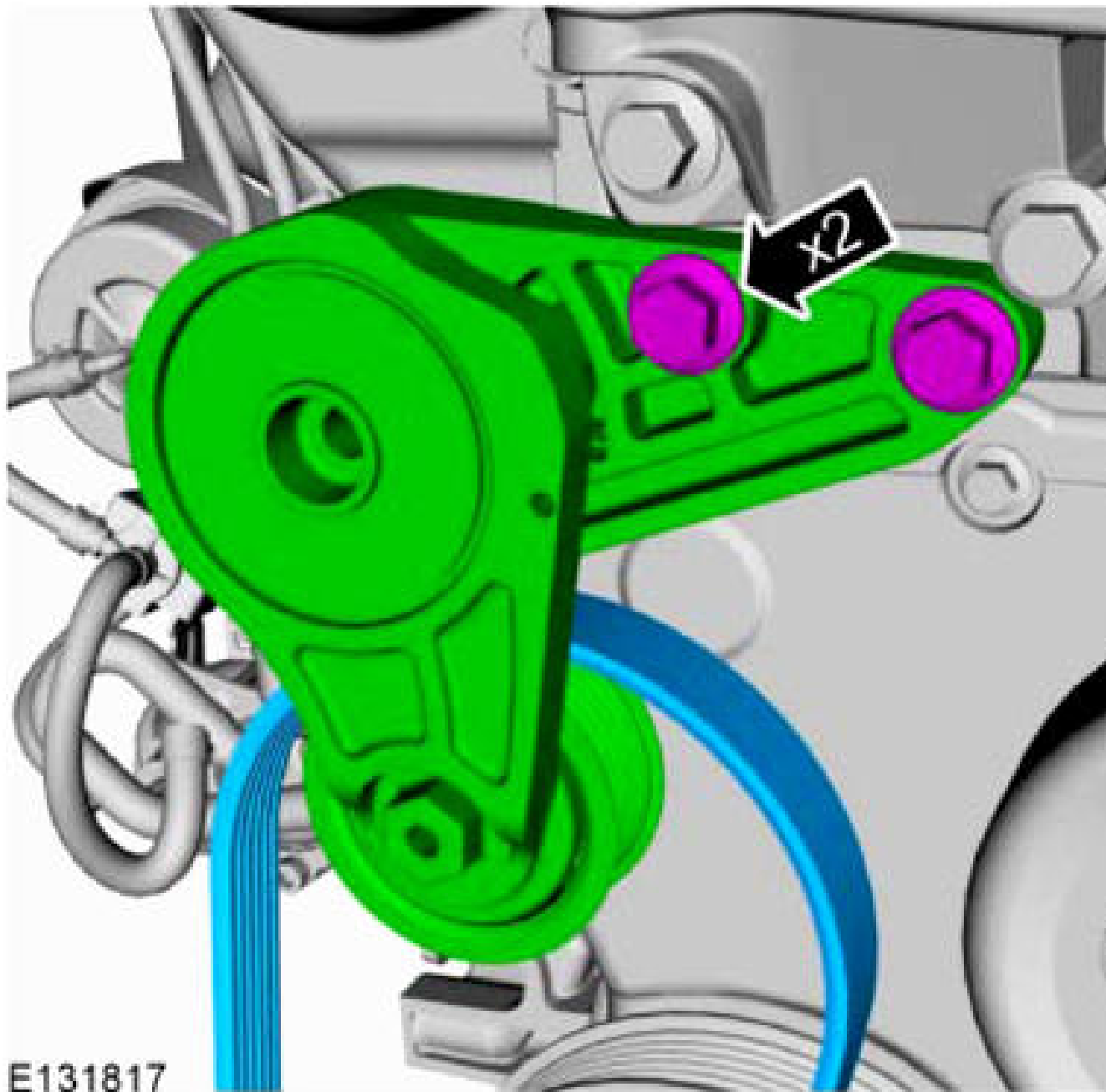
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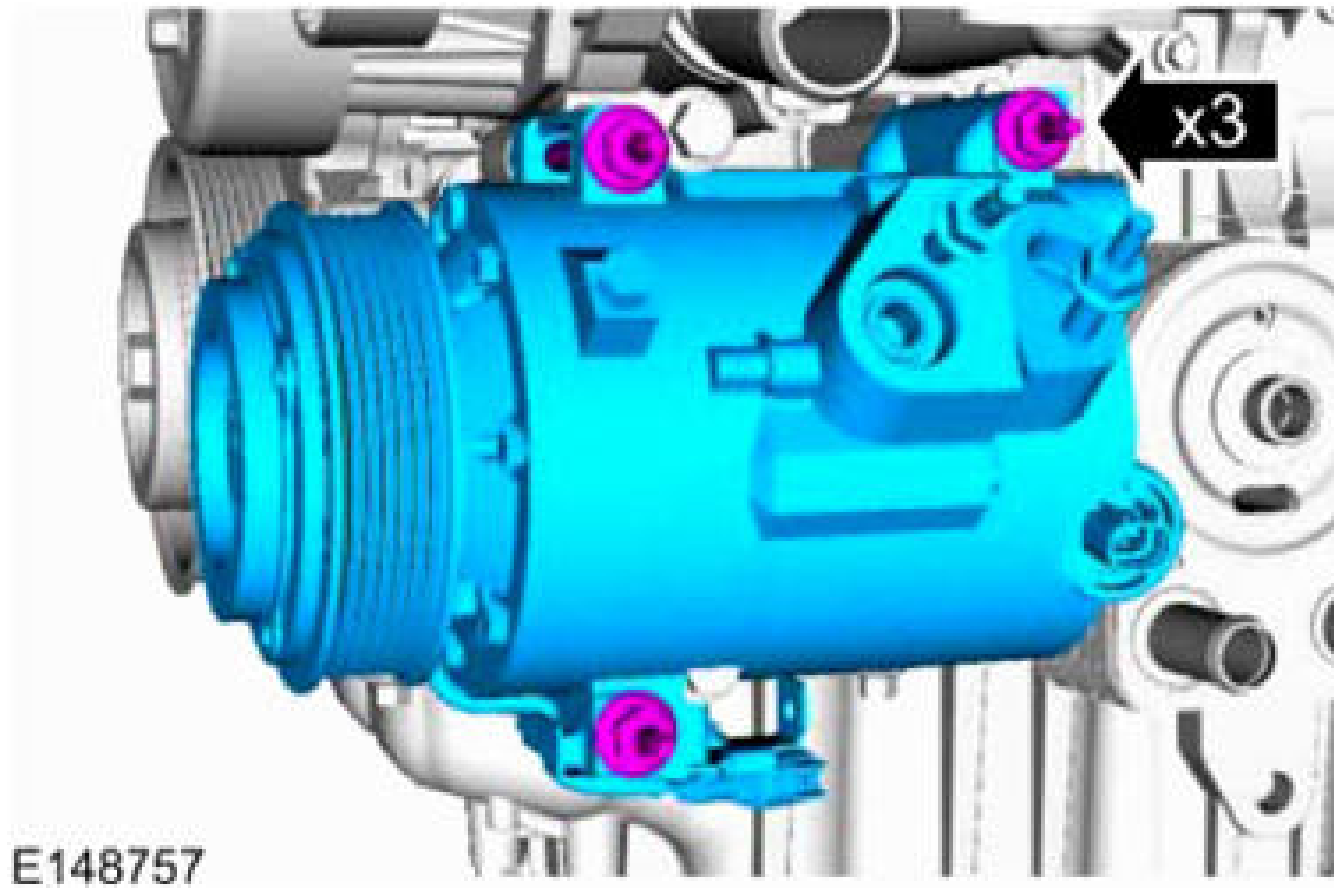
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21.



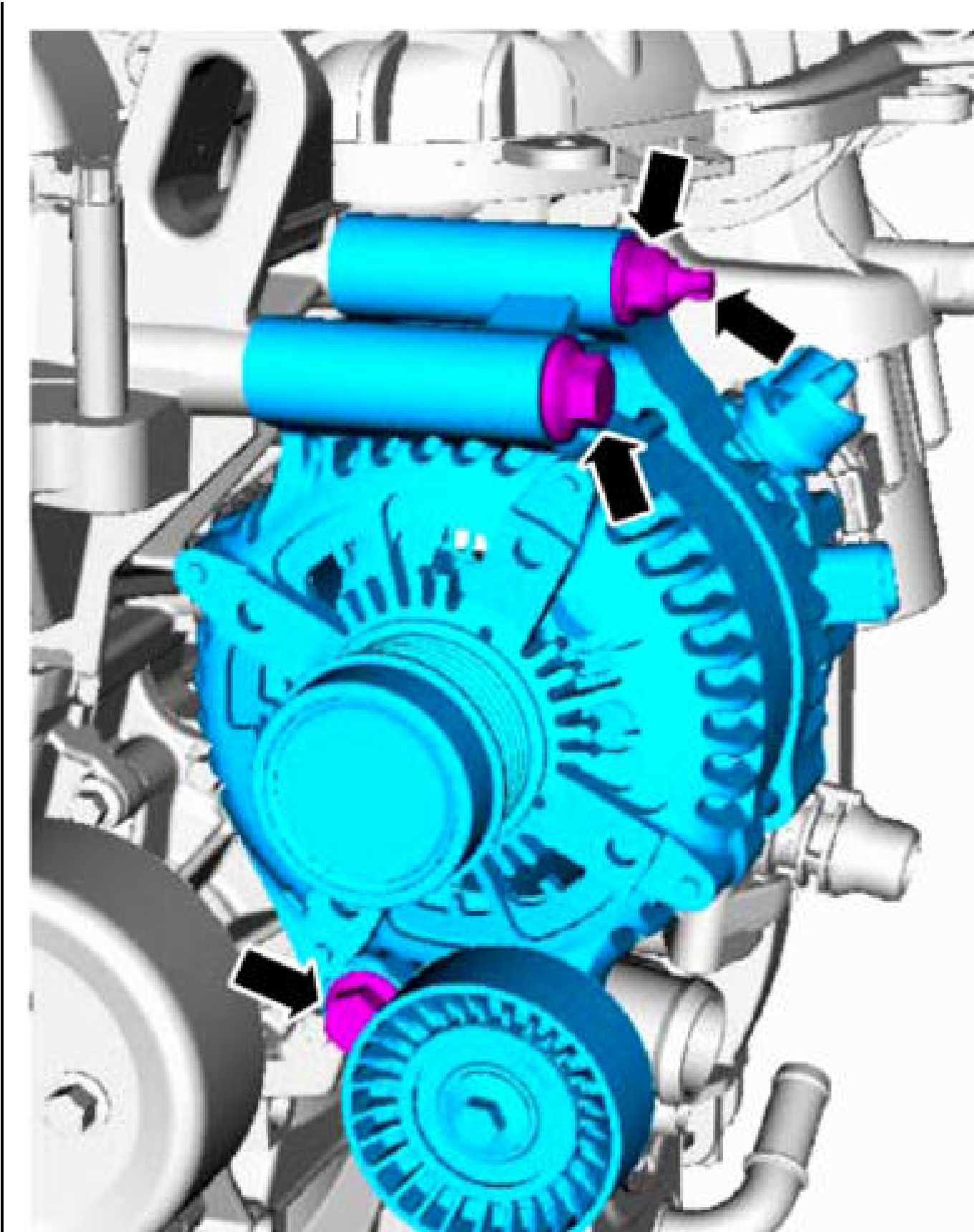
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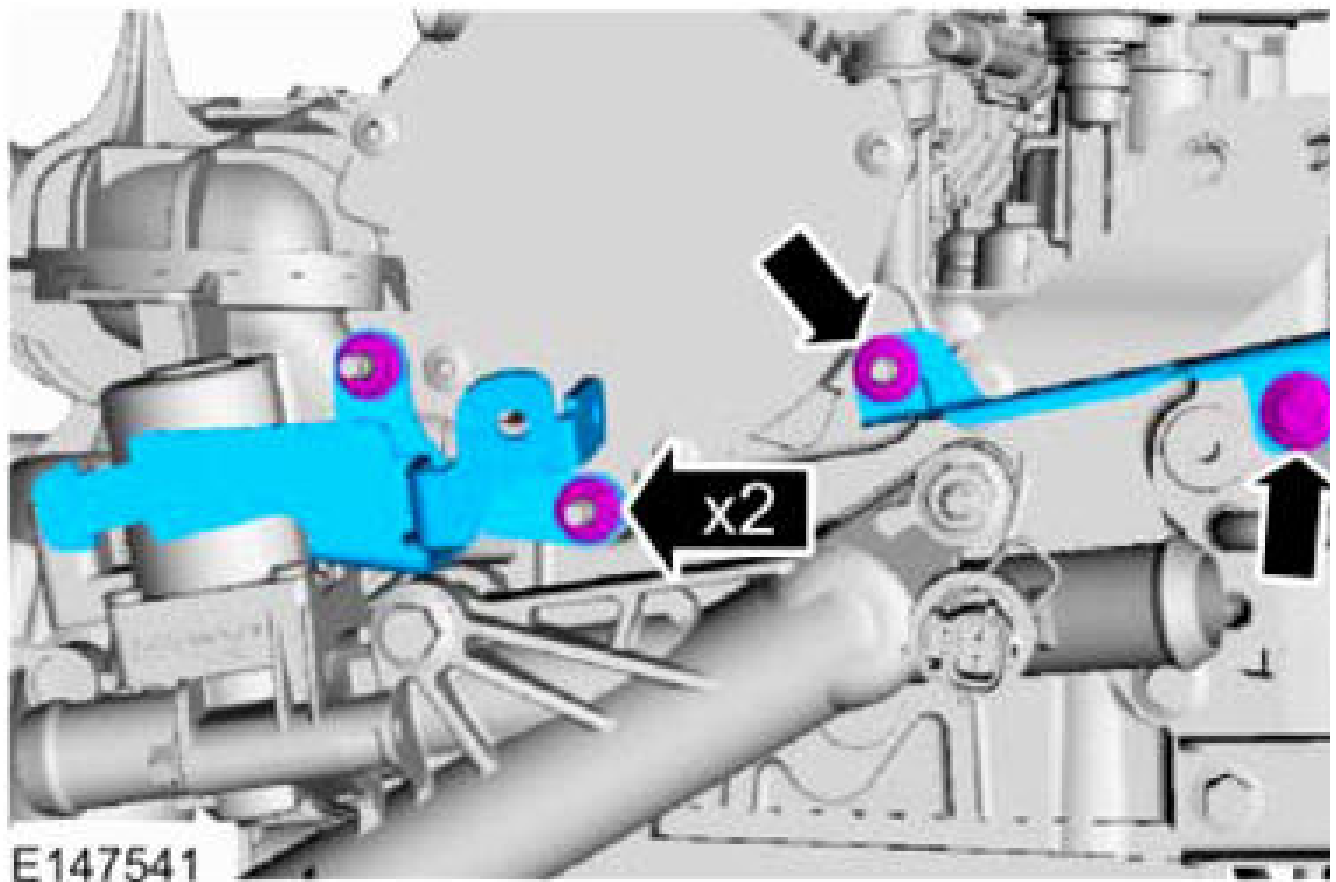
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22.

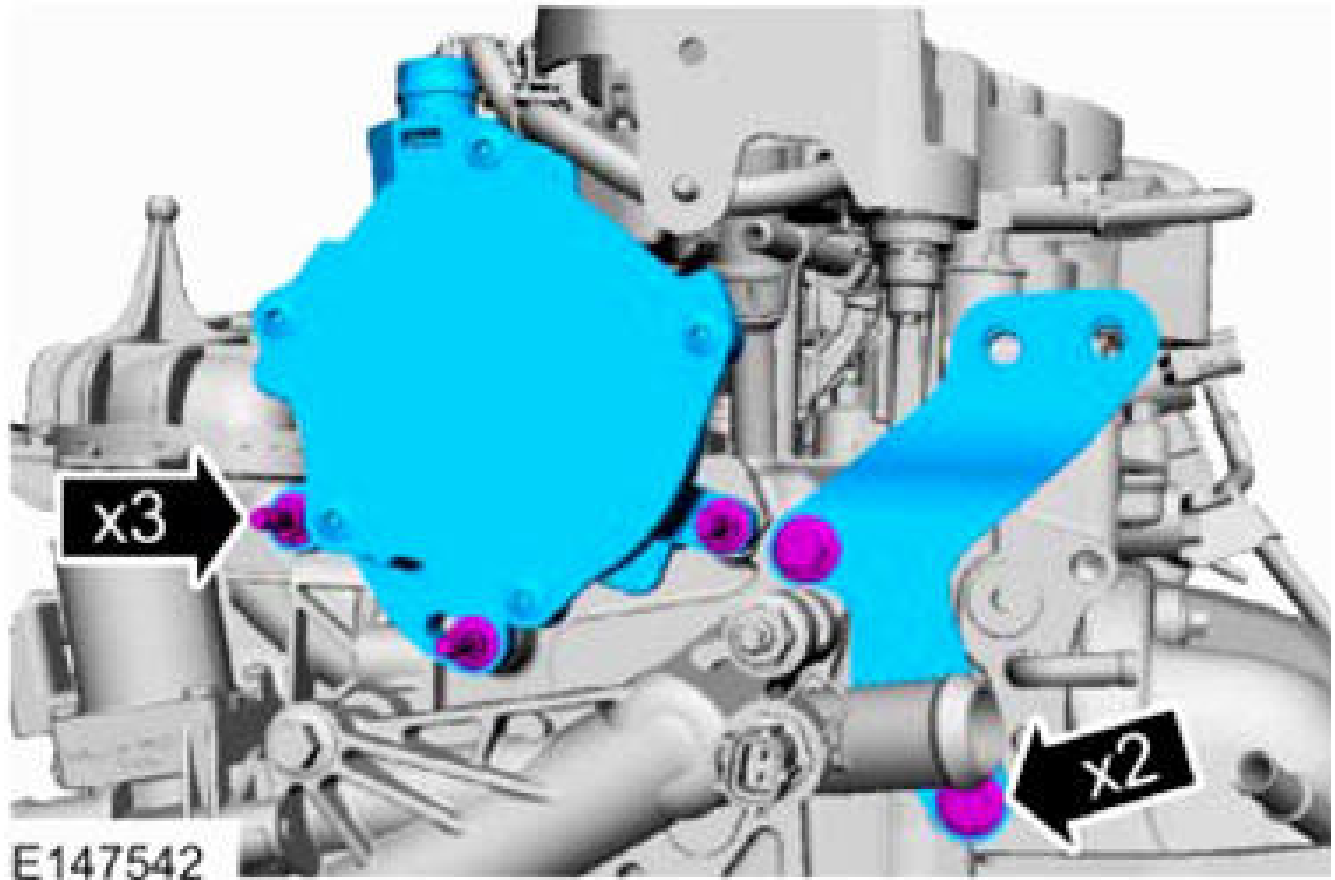
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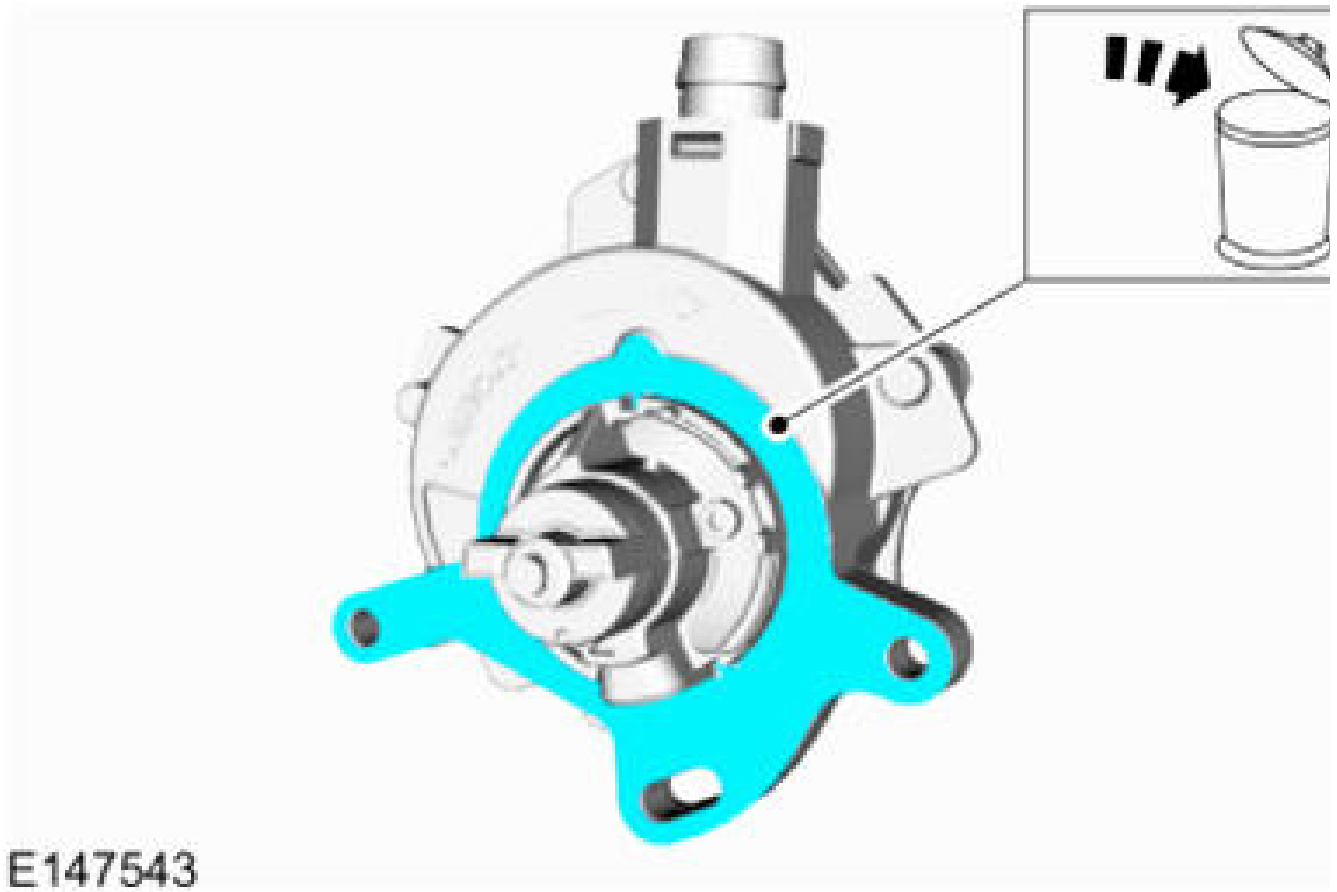
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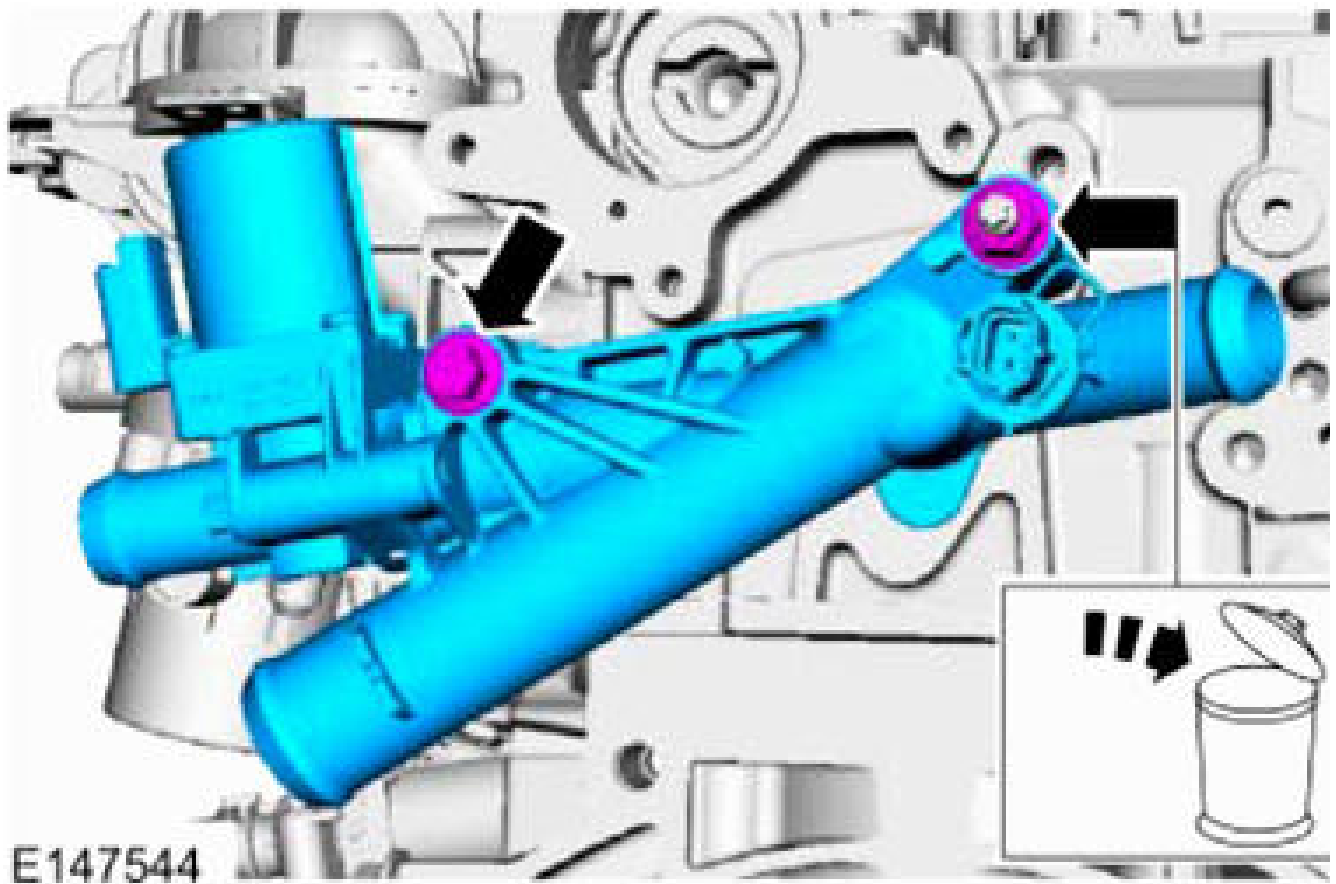
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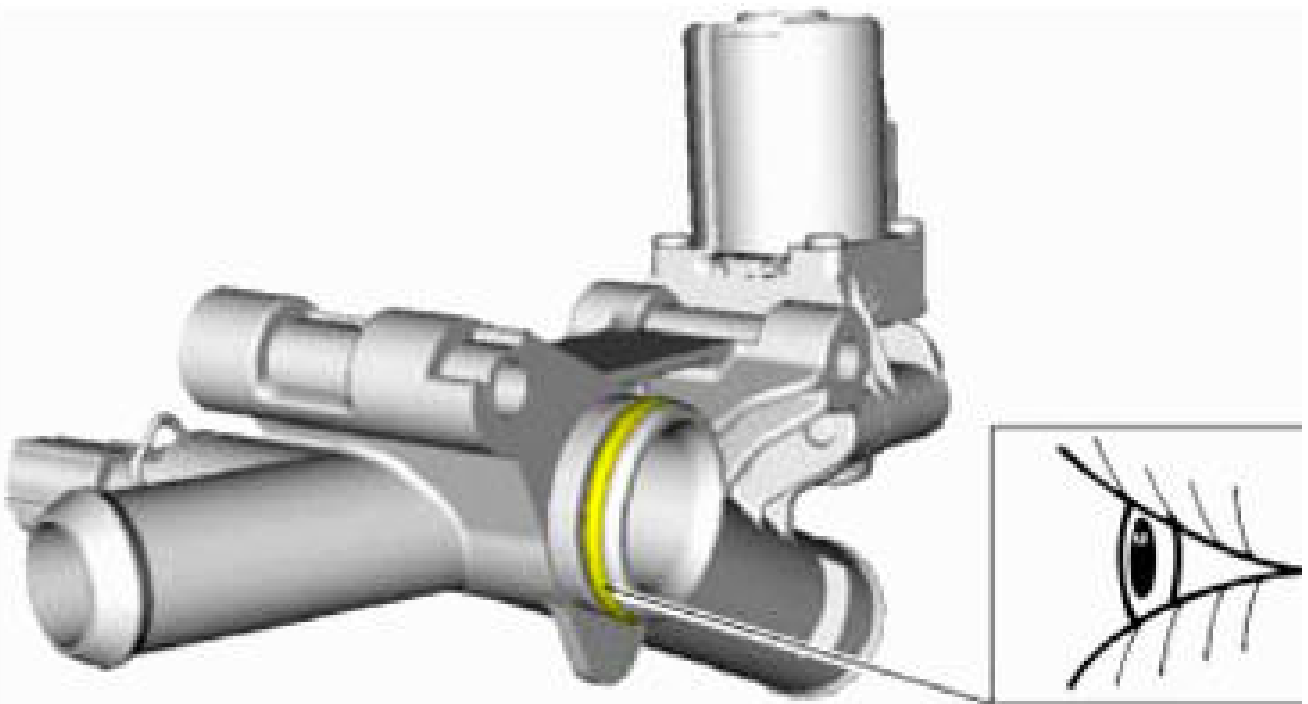
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27.



27.

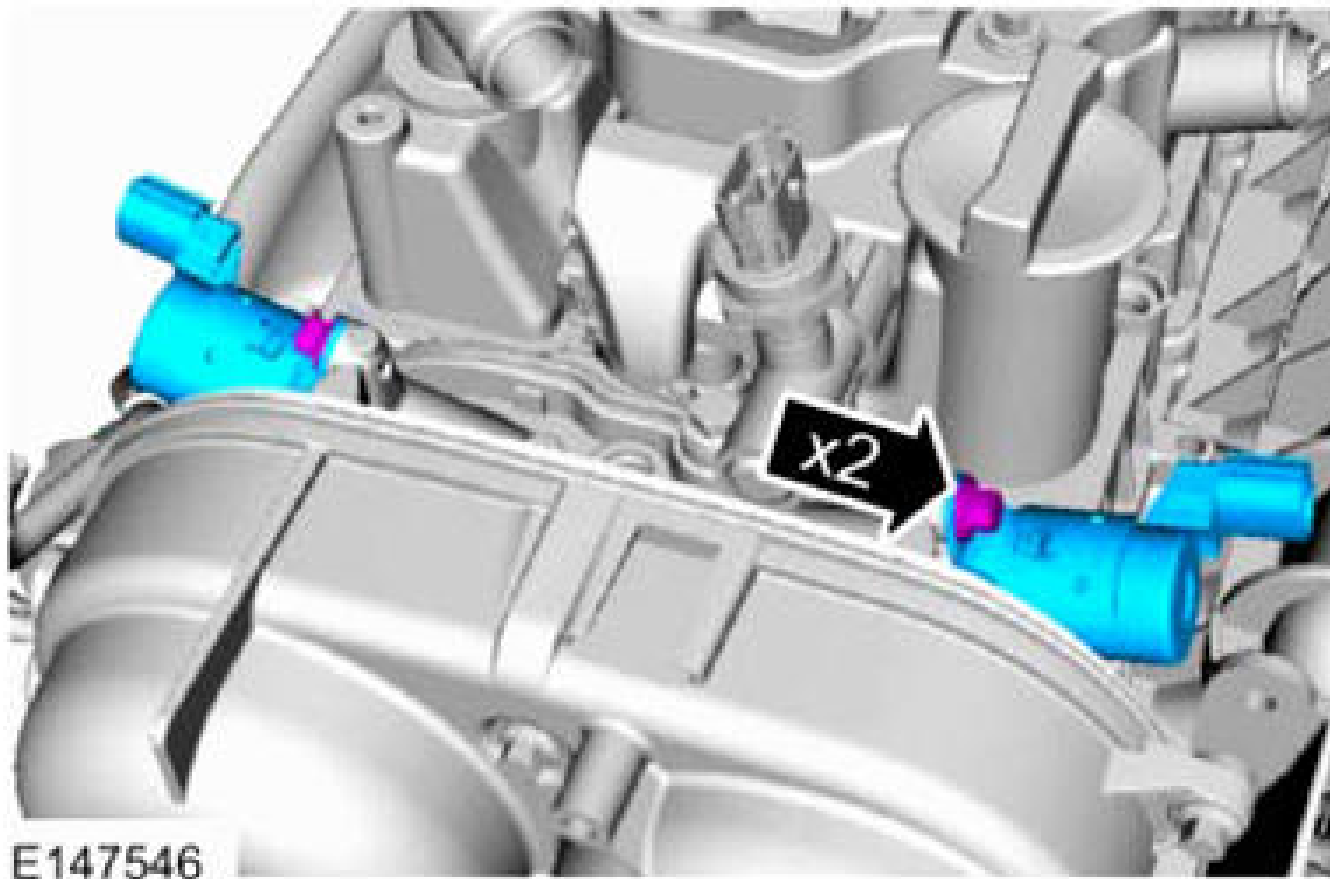
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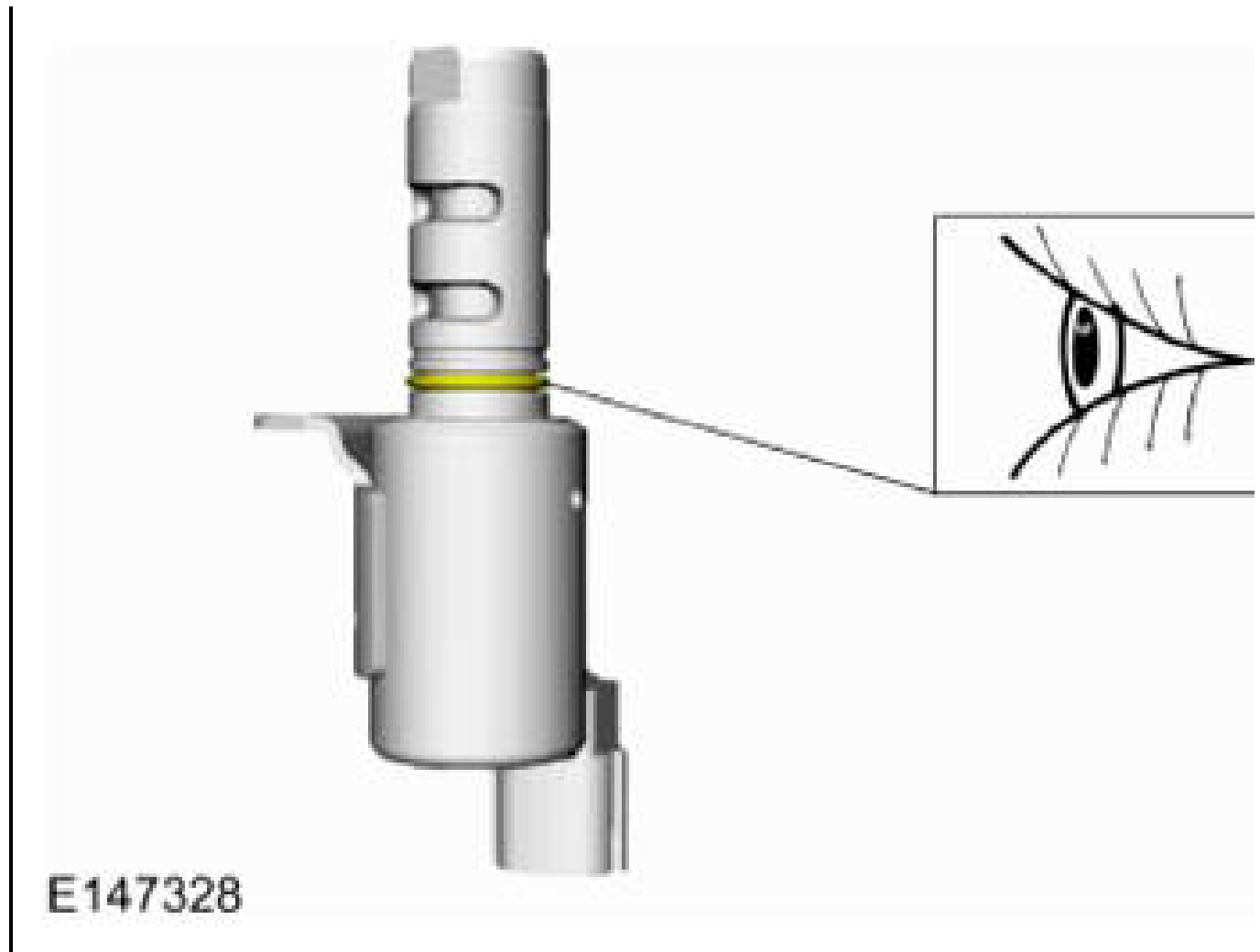
E147545

28.

29. **NOTE:** Note the position of the component before removal.

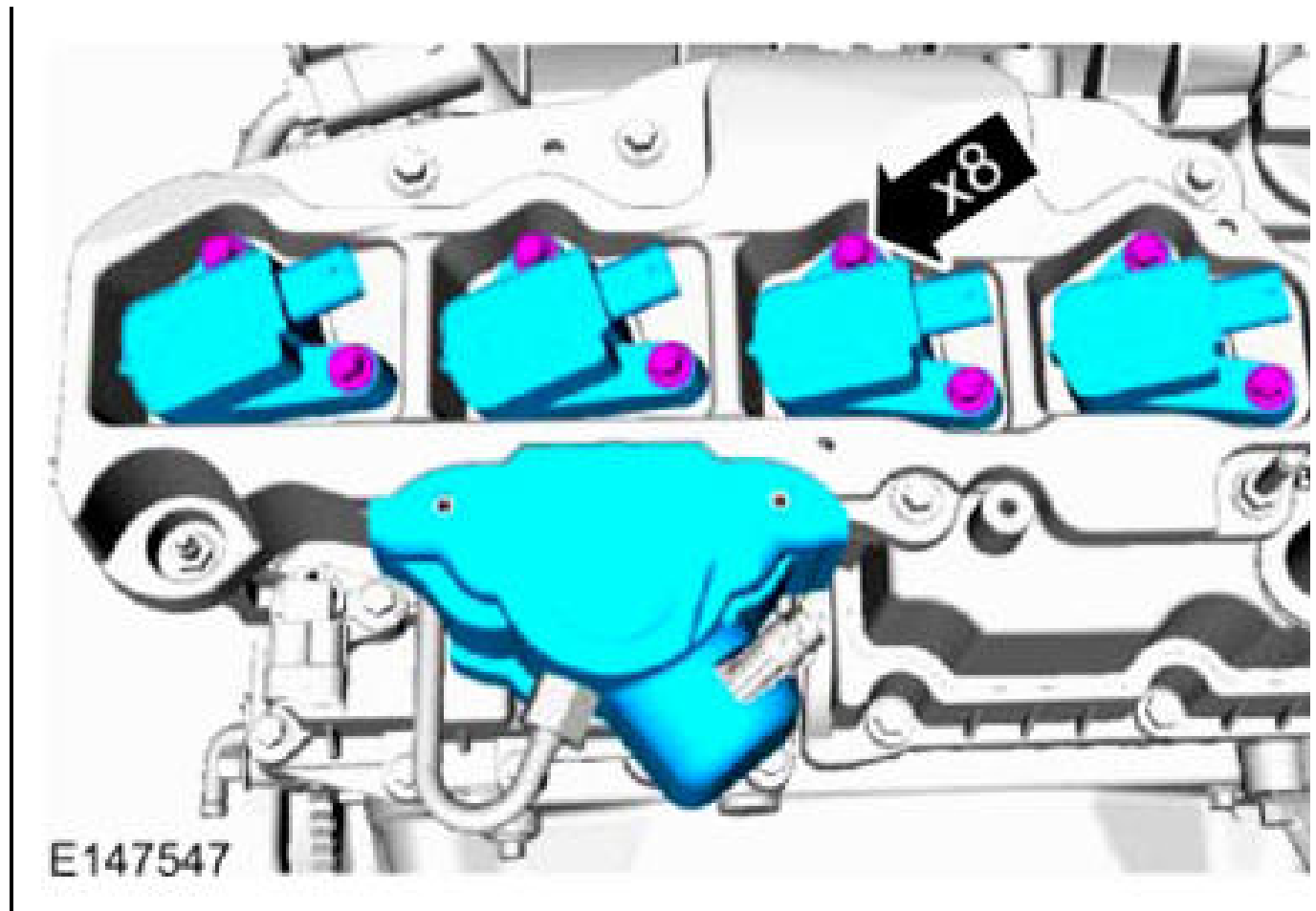


30. **NOTE:** The O-ring seals are to be reused unless damaged.

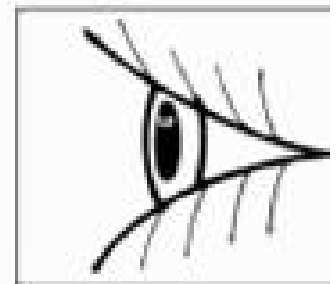
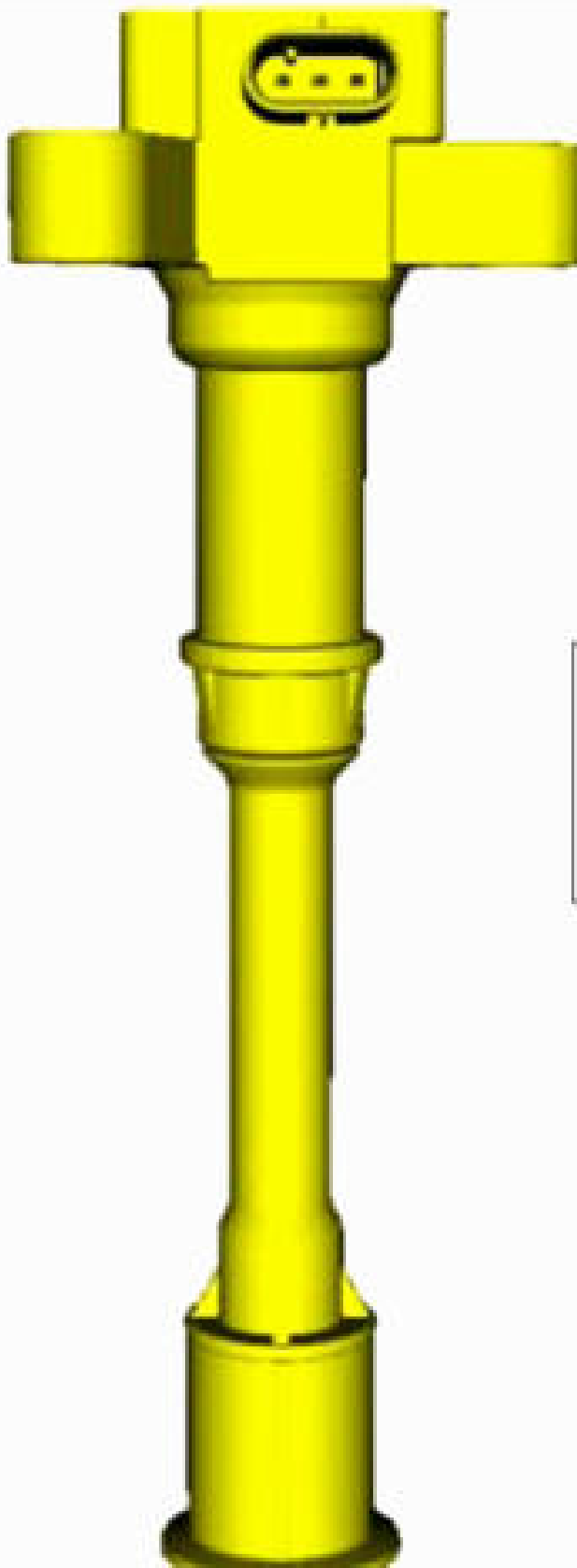


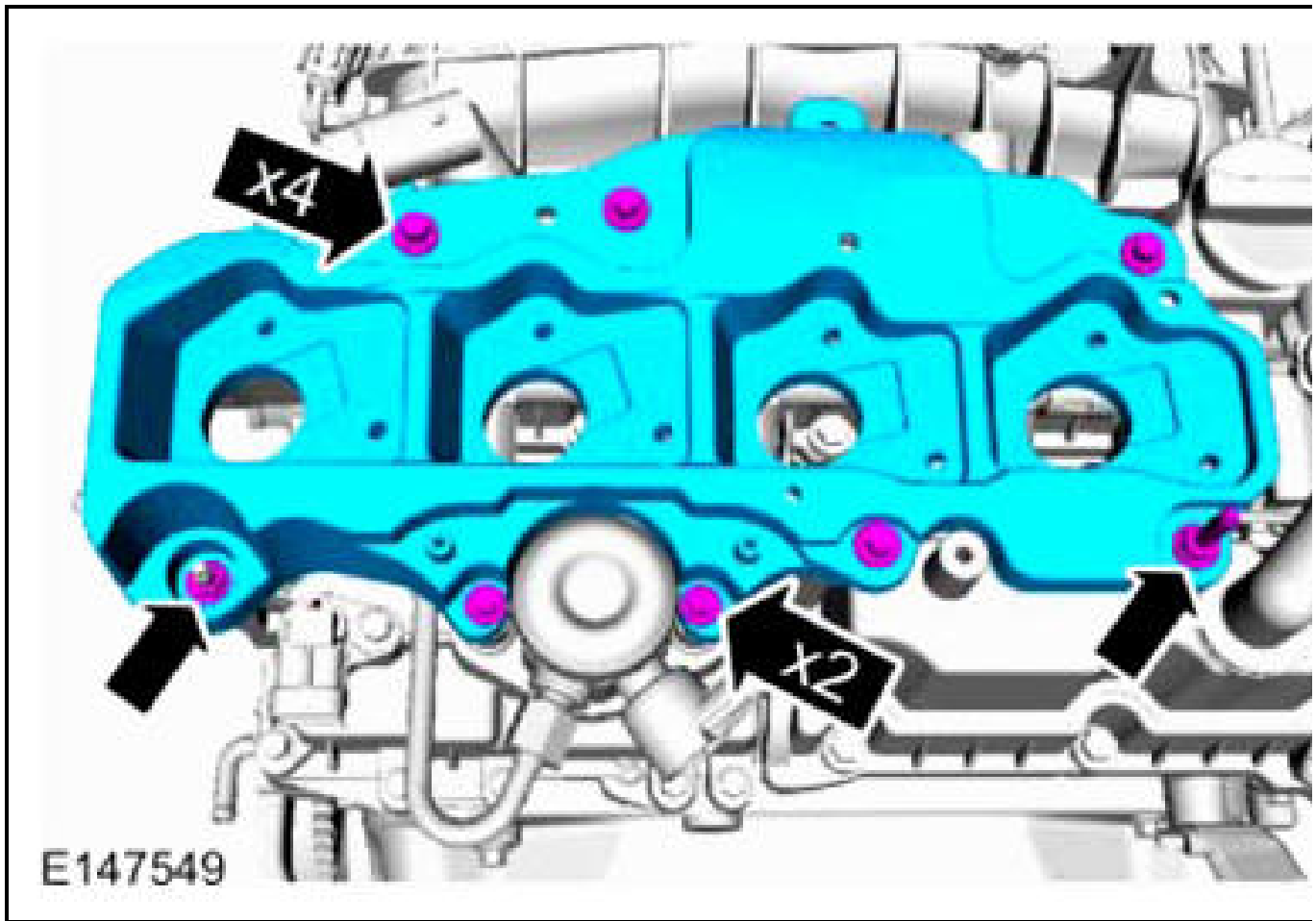
NOTE: When removing or installing the fuel injection pump noise insulator, spreading the openings will reduce the risk of damage.

31.



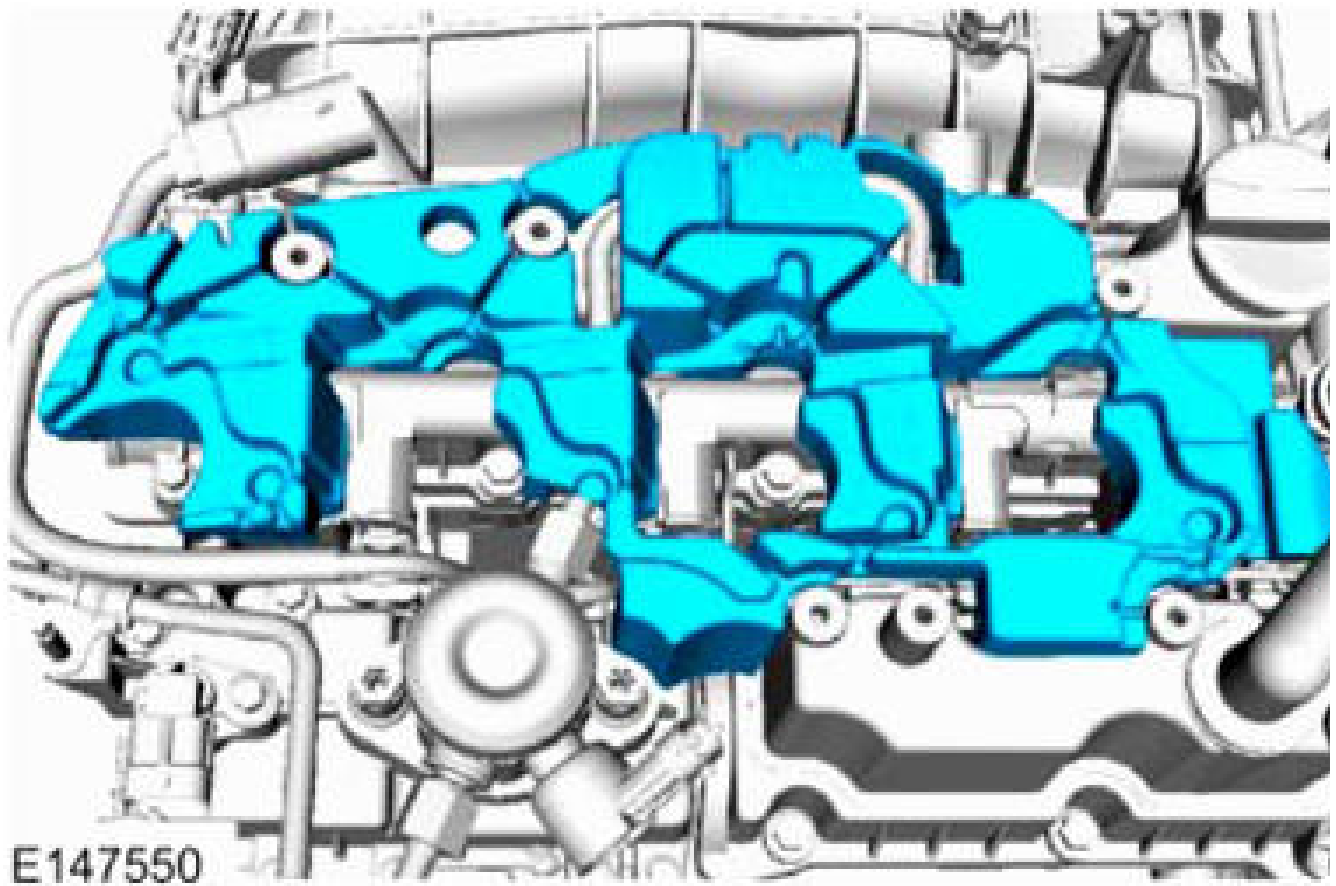
32. **NOTE:** Replace any damaged coil-on-plug assemblies.





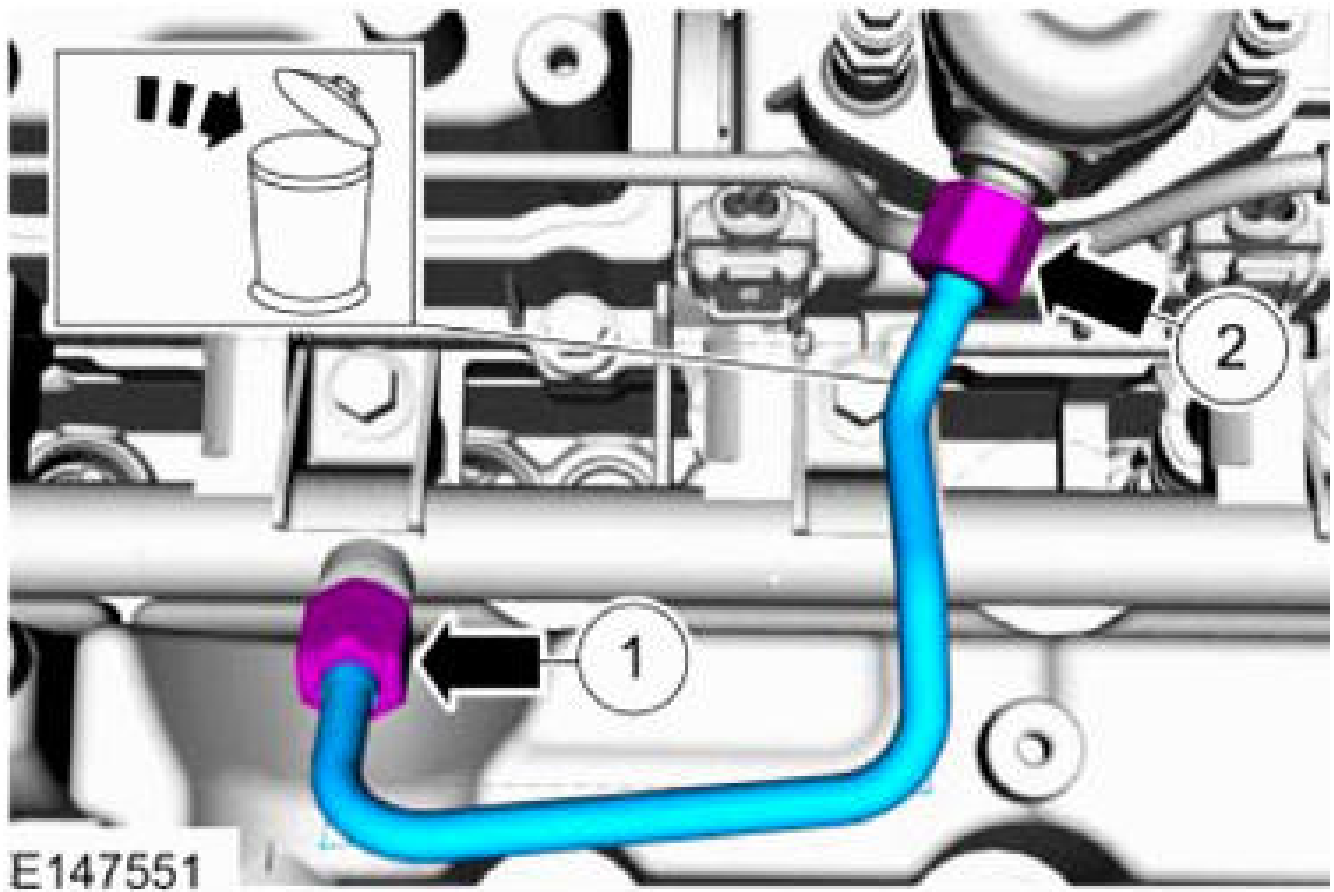
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34.



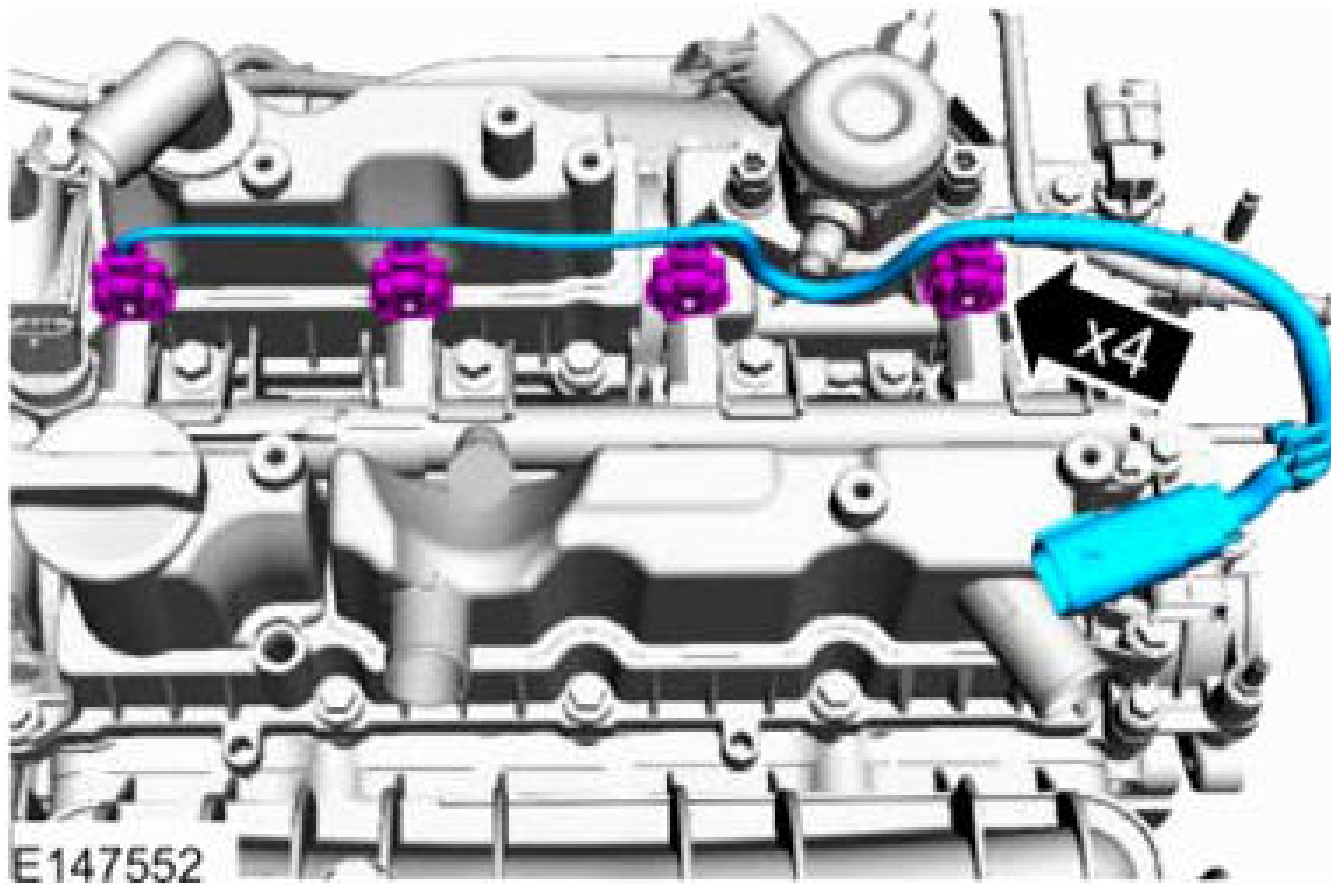
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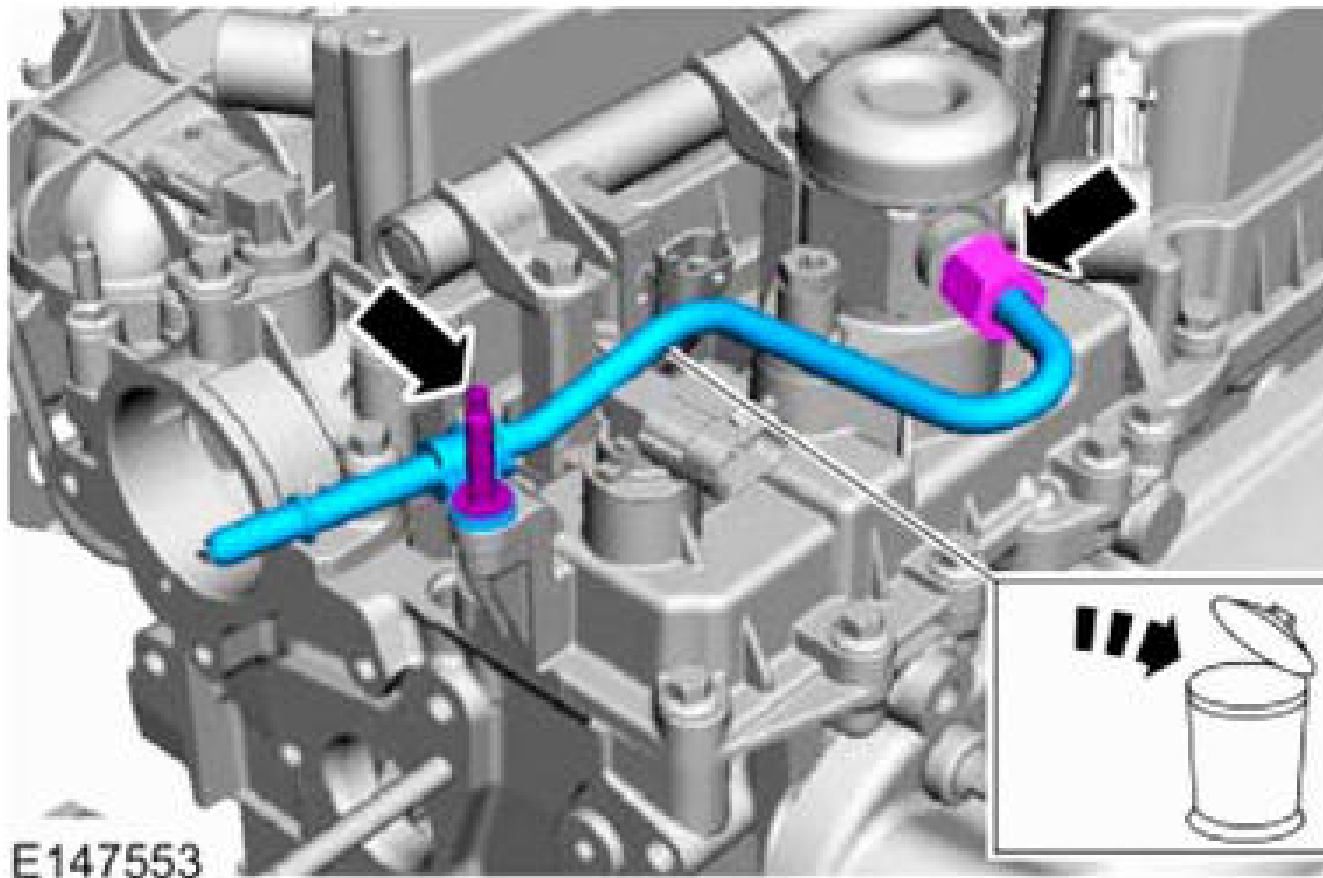
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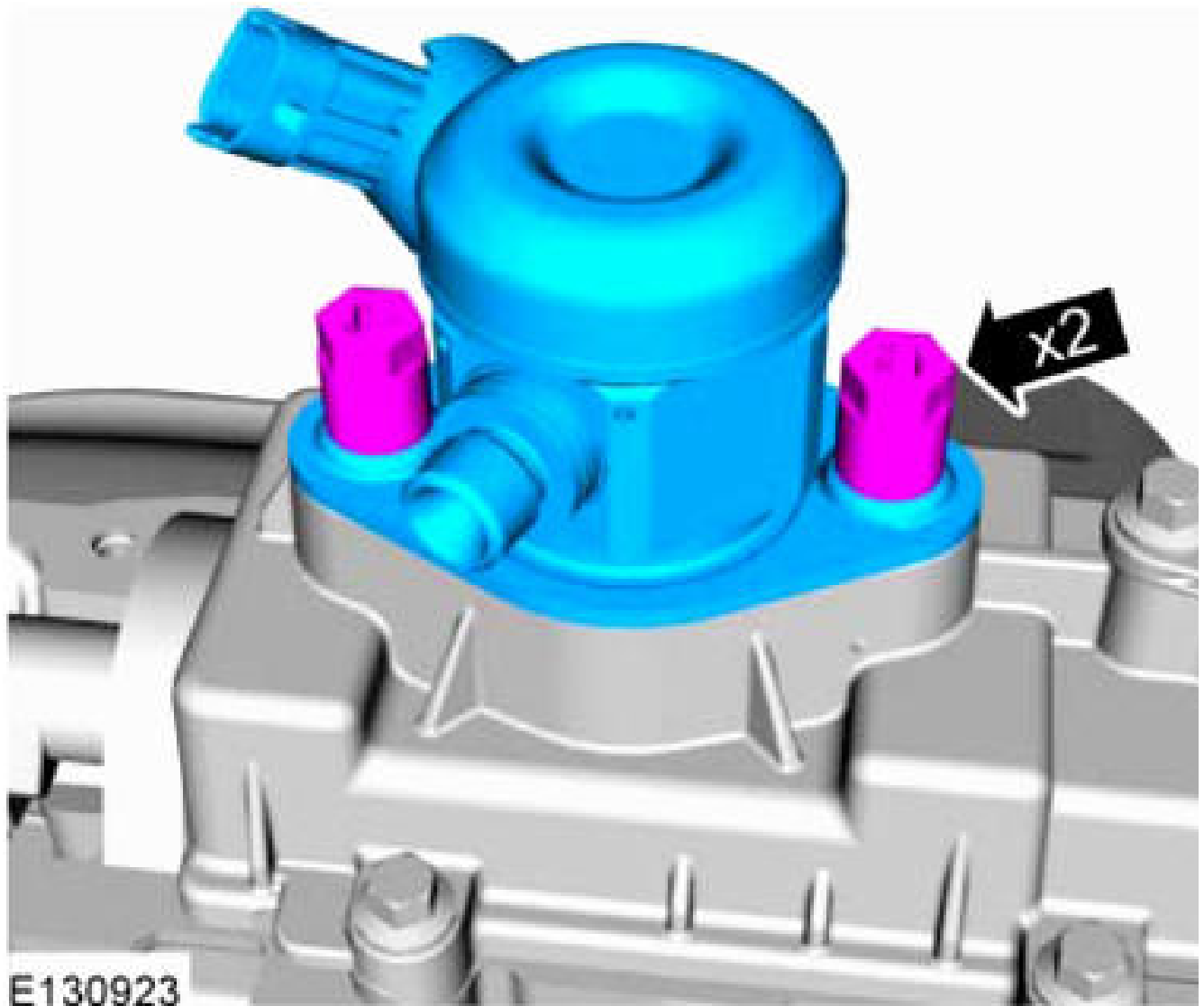
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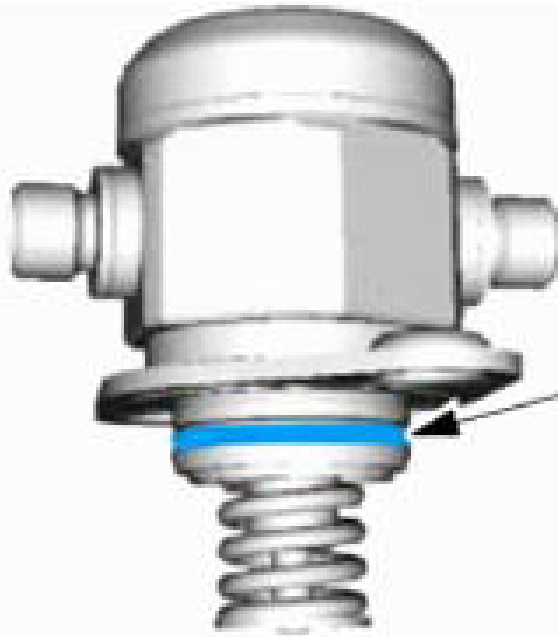
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38.



38.

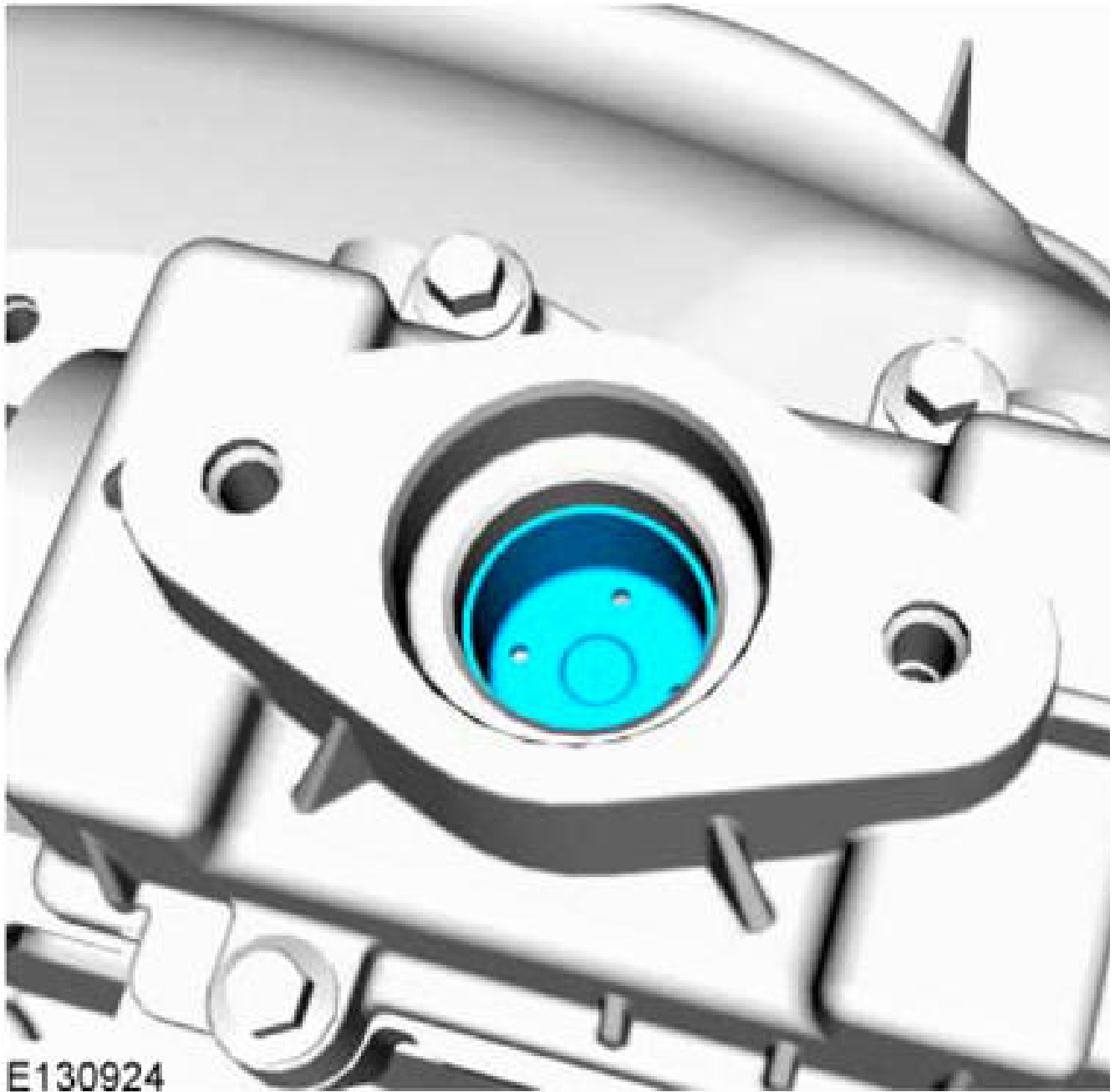
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E148832

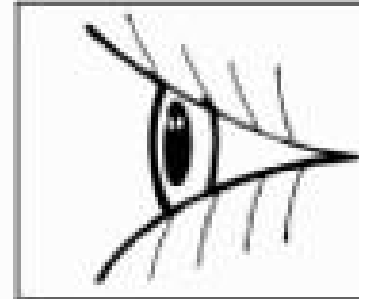
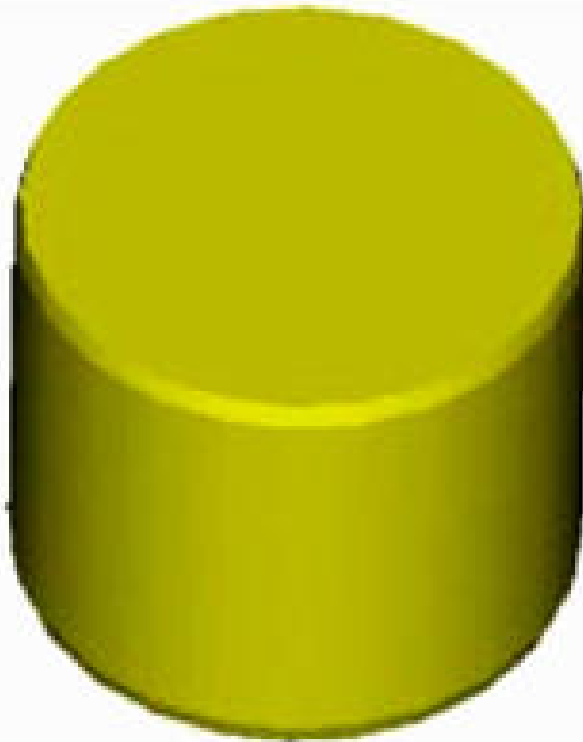
39.

40.



40.

41.



E147402

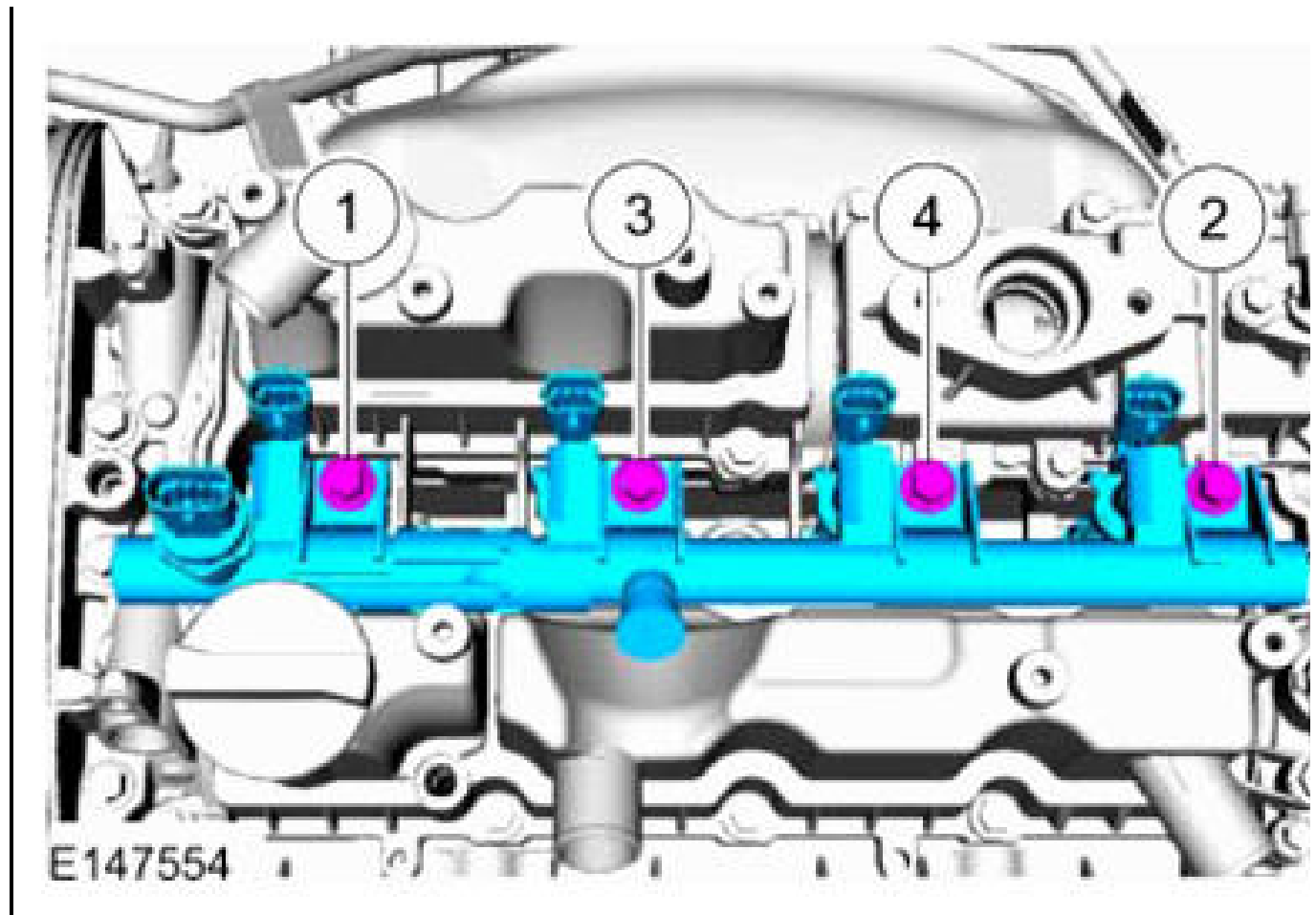
41.

42.

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

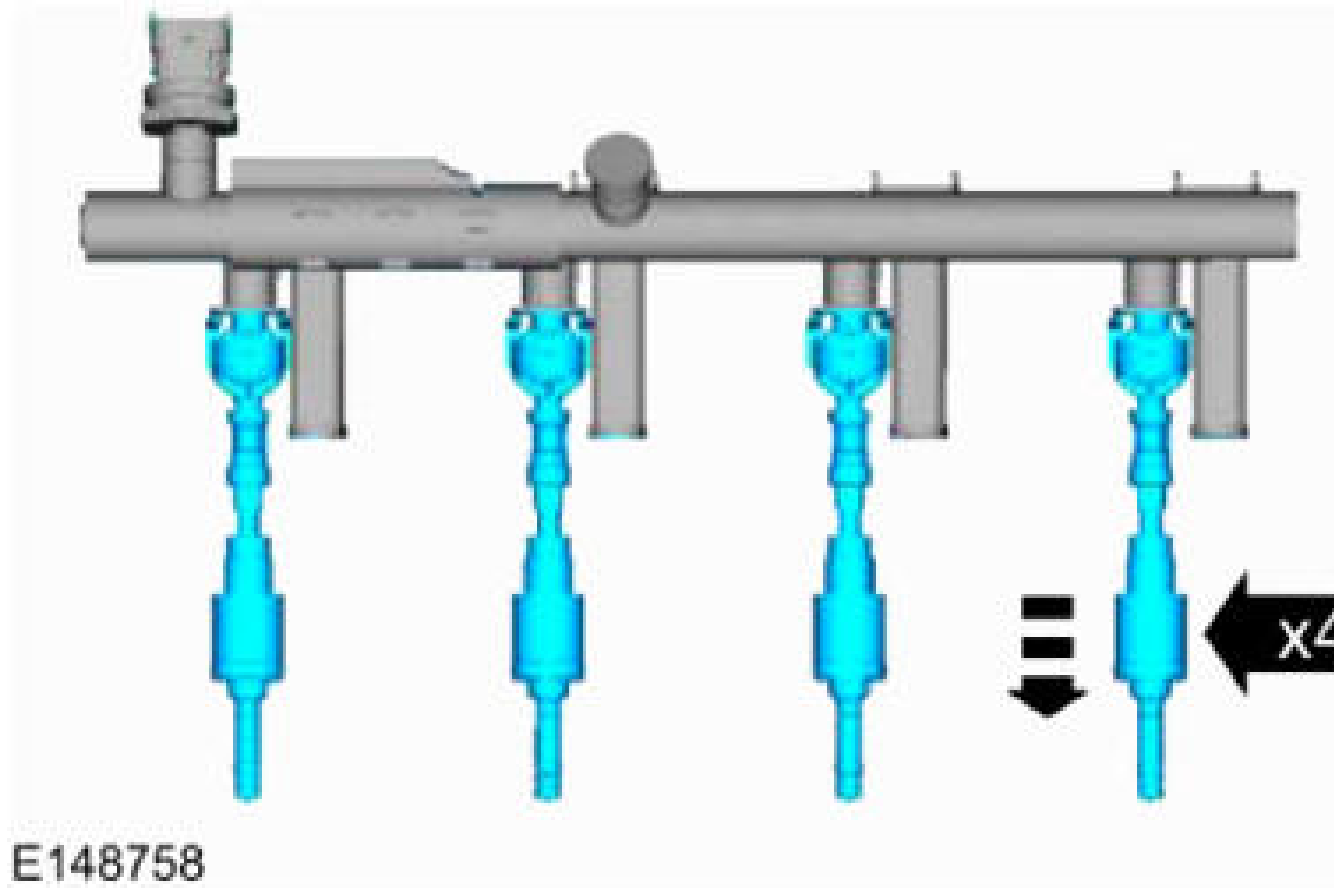
NOTE: Use compressed air and remove any dirt or foreign material from the cylinder head, block and general surrounding area of the fuel rail and injectors.

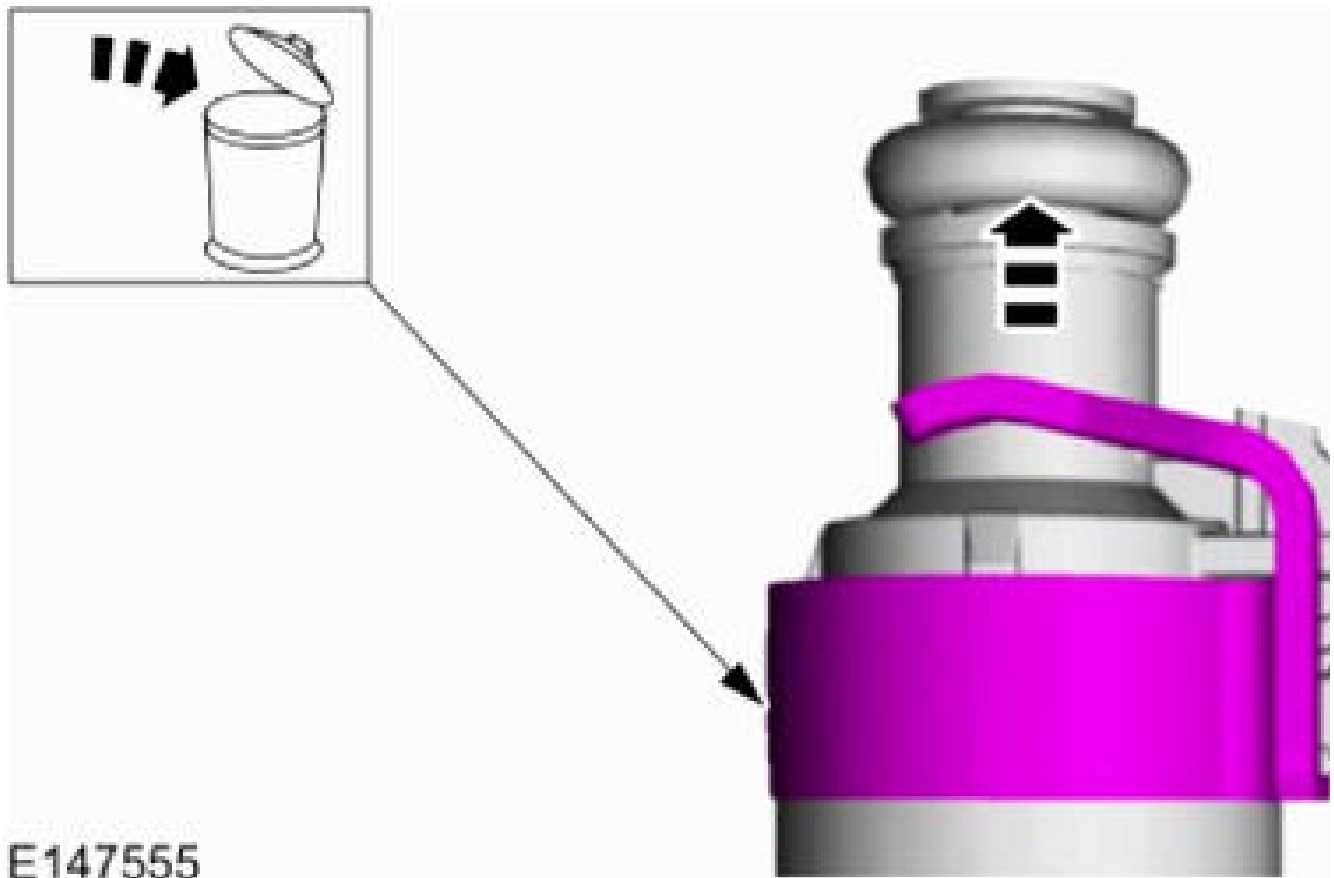
NOTE: When removing the fuel rails, the fuel injectors may remain in the fuel rails but normally remain in the cylinder heads and require the use of a Fuel Injector Remover tool to extract.



43. **NOTE:** Take extra care when handling the components.

Remove any of the fuel injectors that remained in the fuel rail.

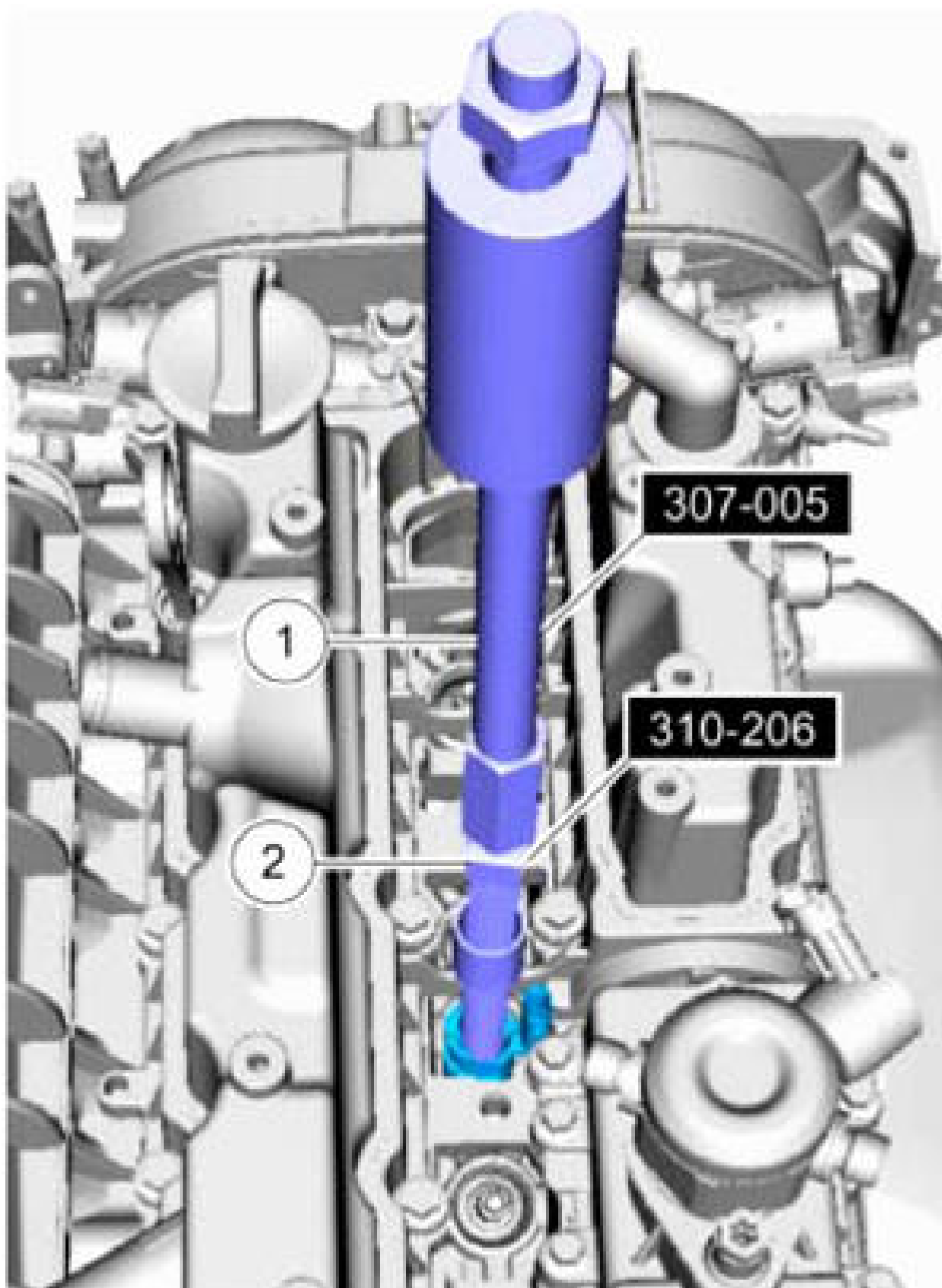




44.

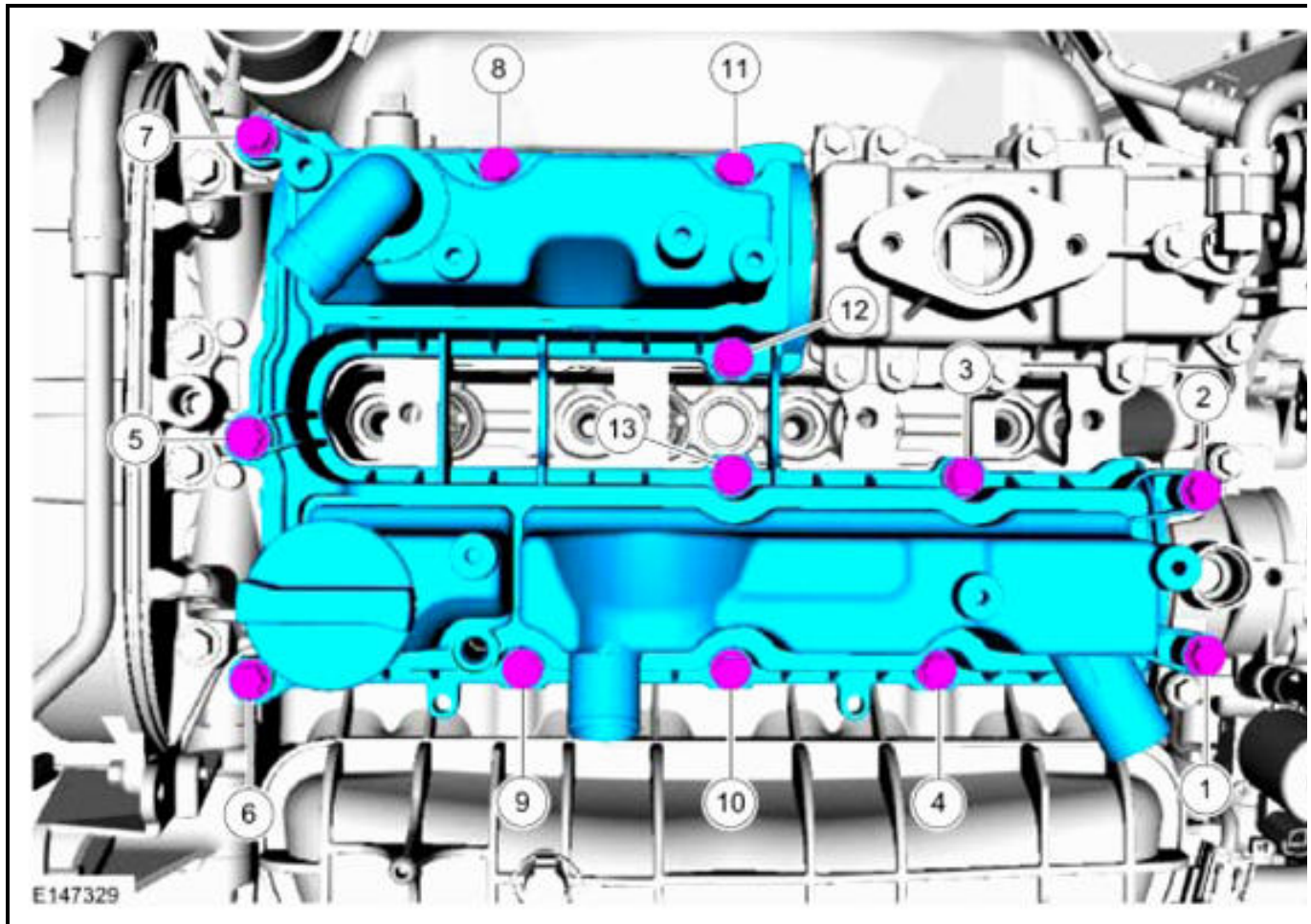
45. **NOTE:** Remove the fuel injectors that remained in the head.

- *Special Tool(s)* : 307-005 (T59L-100-B) Slide Hammer
- *Special Tool(s)* : 310-206 Remover, Fuel Injector

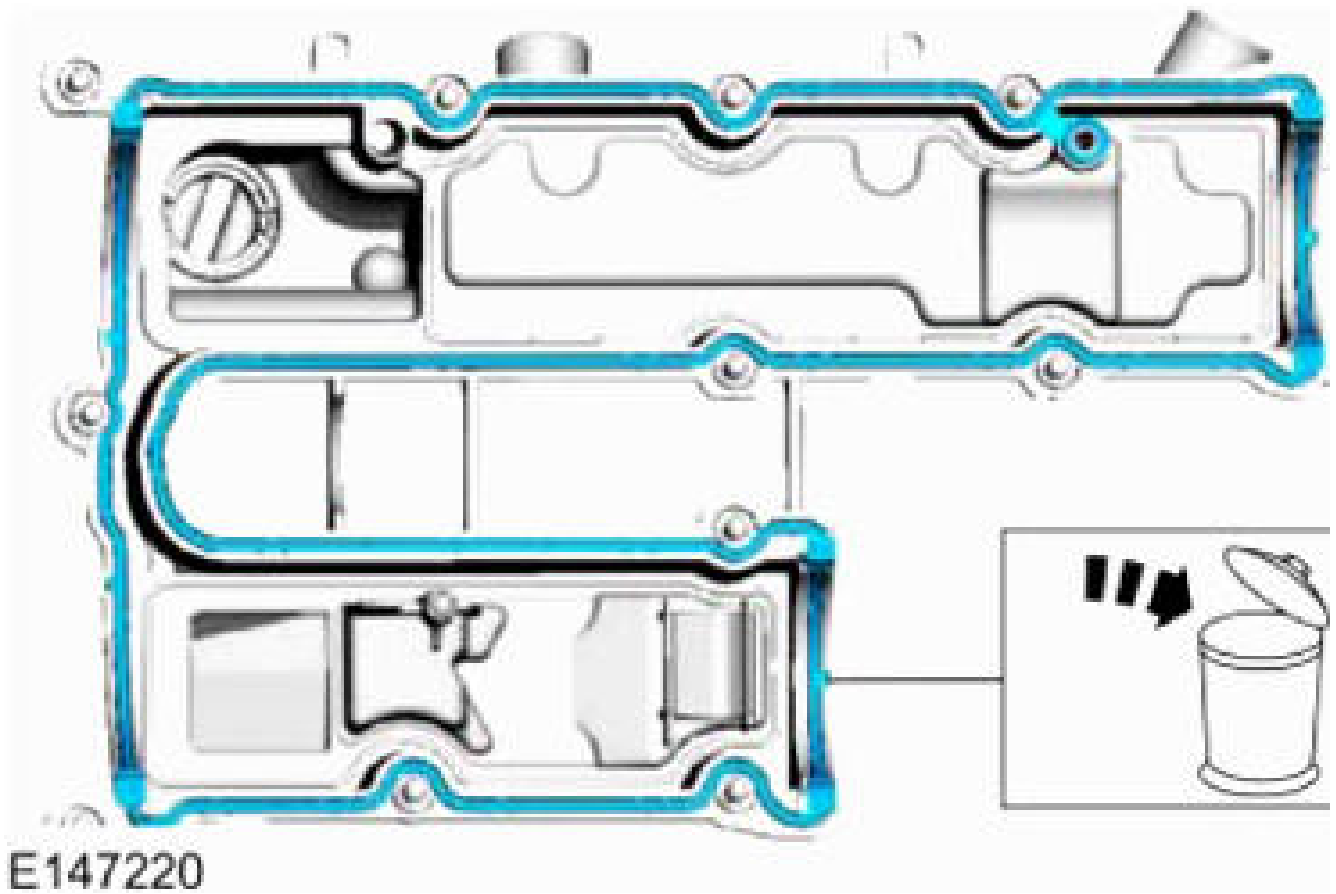


NOTE: Do not set the valve cover sealing surface face down on a bench as the check valve and splitter leg is susceptible to breakage.

46.

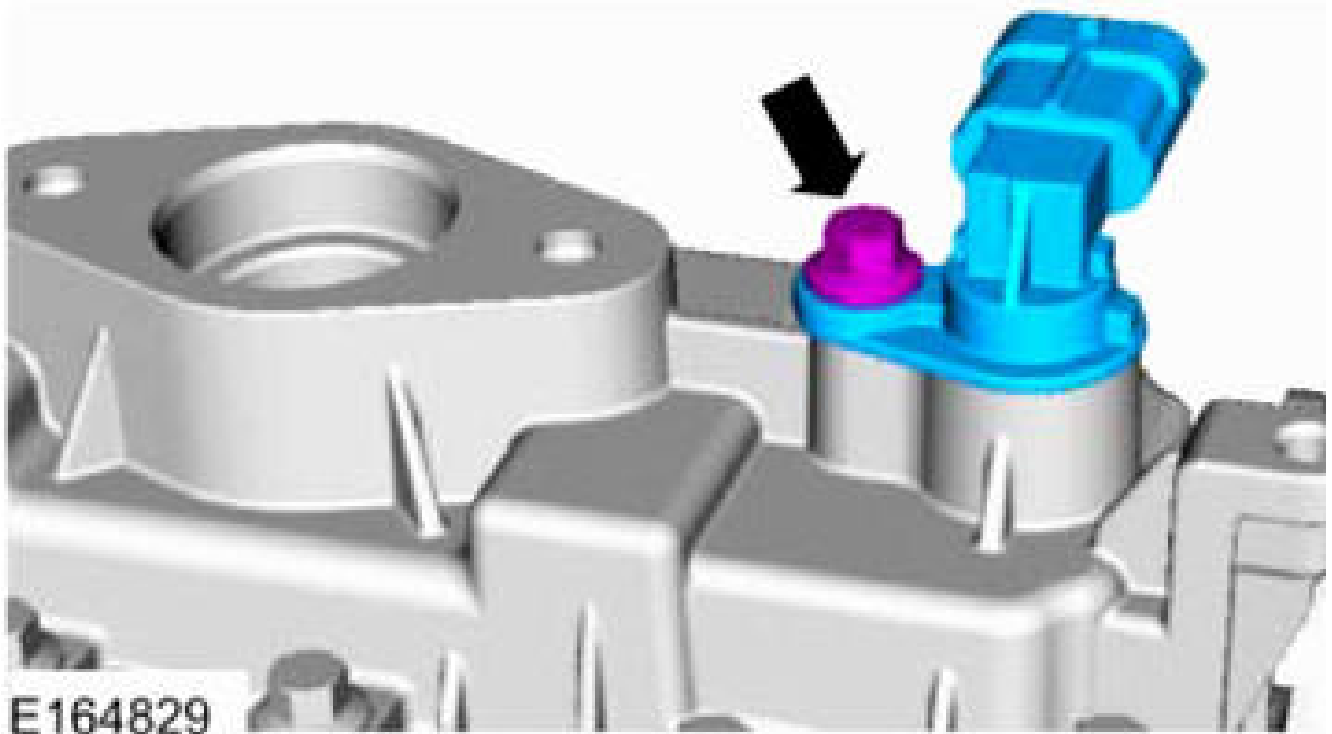


47.



47.

48.

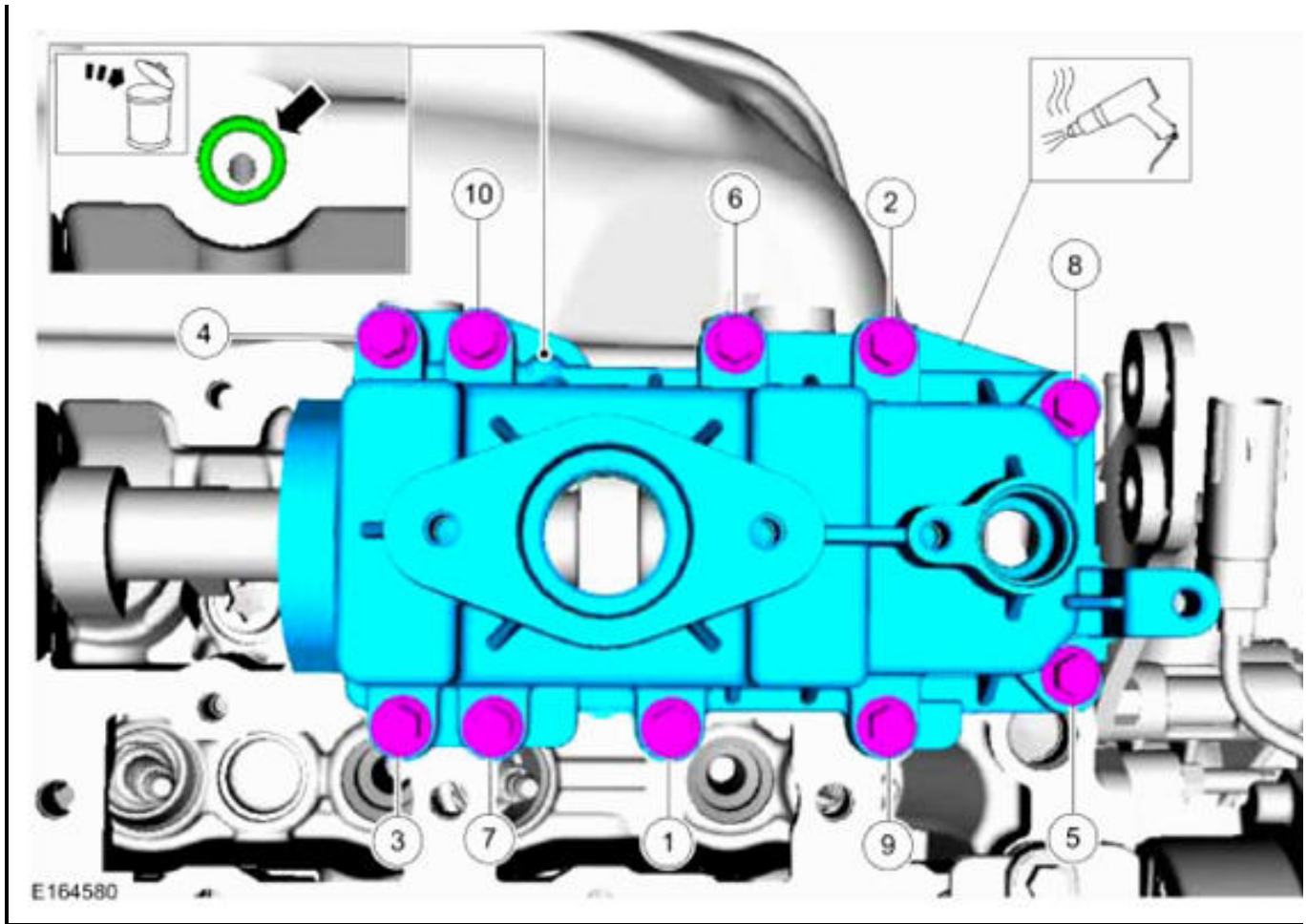


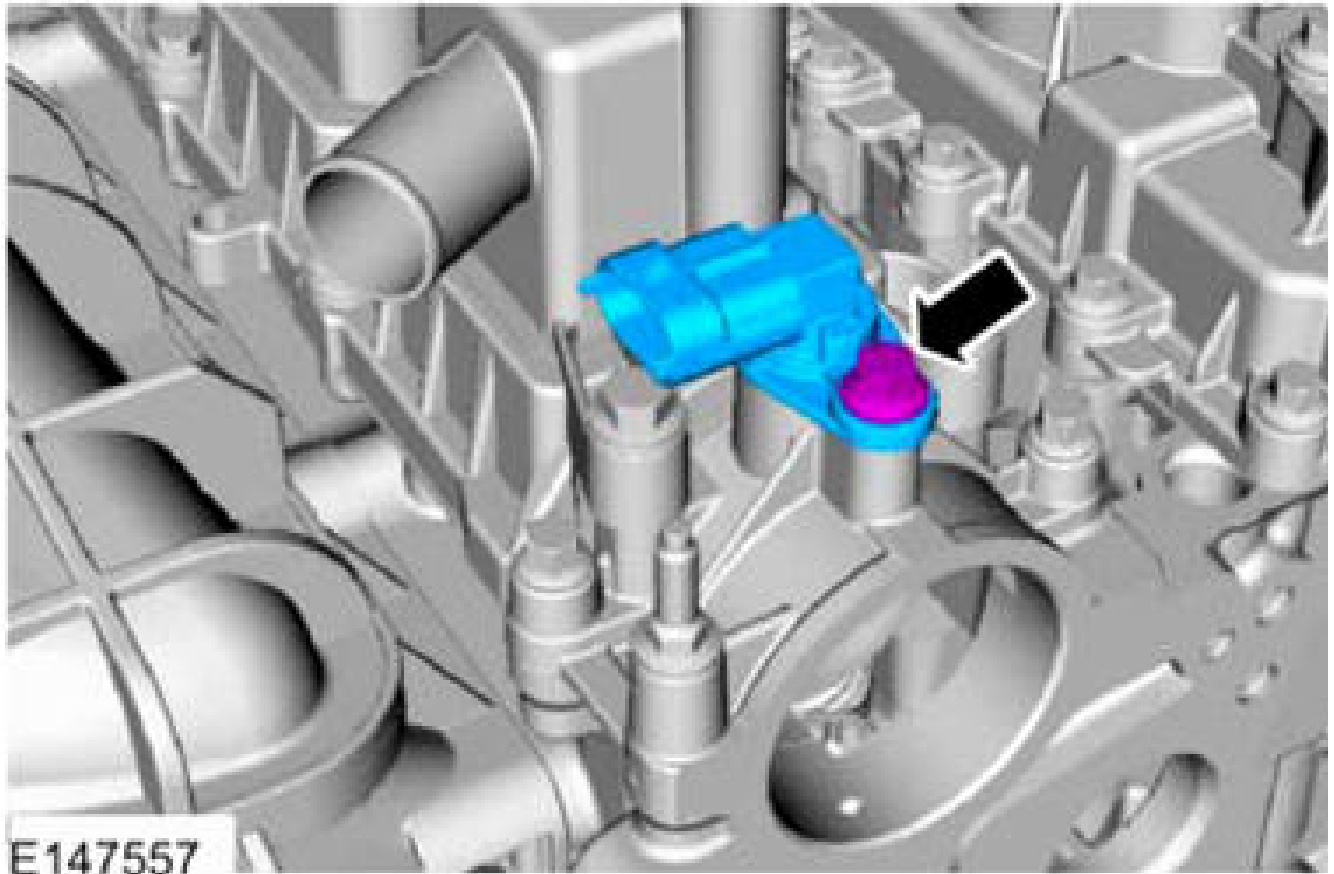
48.

NOTE: Use a heat gun to soften the flange sealant, this will aid in the removal of the fuel pump mounting bracket. Failure to follow these directions may result in damage to the fuel pump mounting bracket.

49.

General Equipment : Hot Air Gun



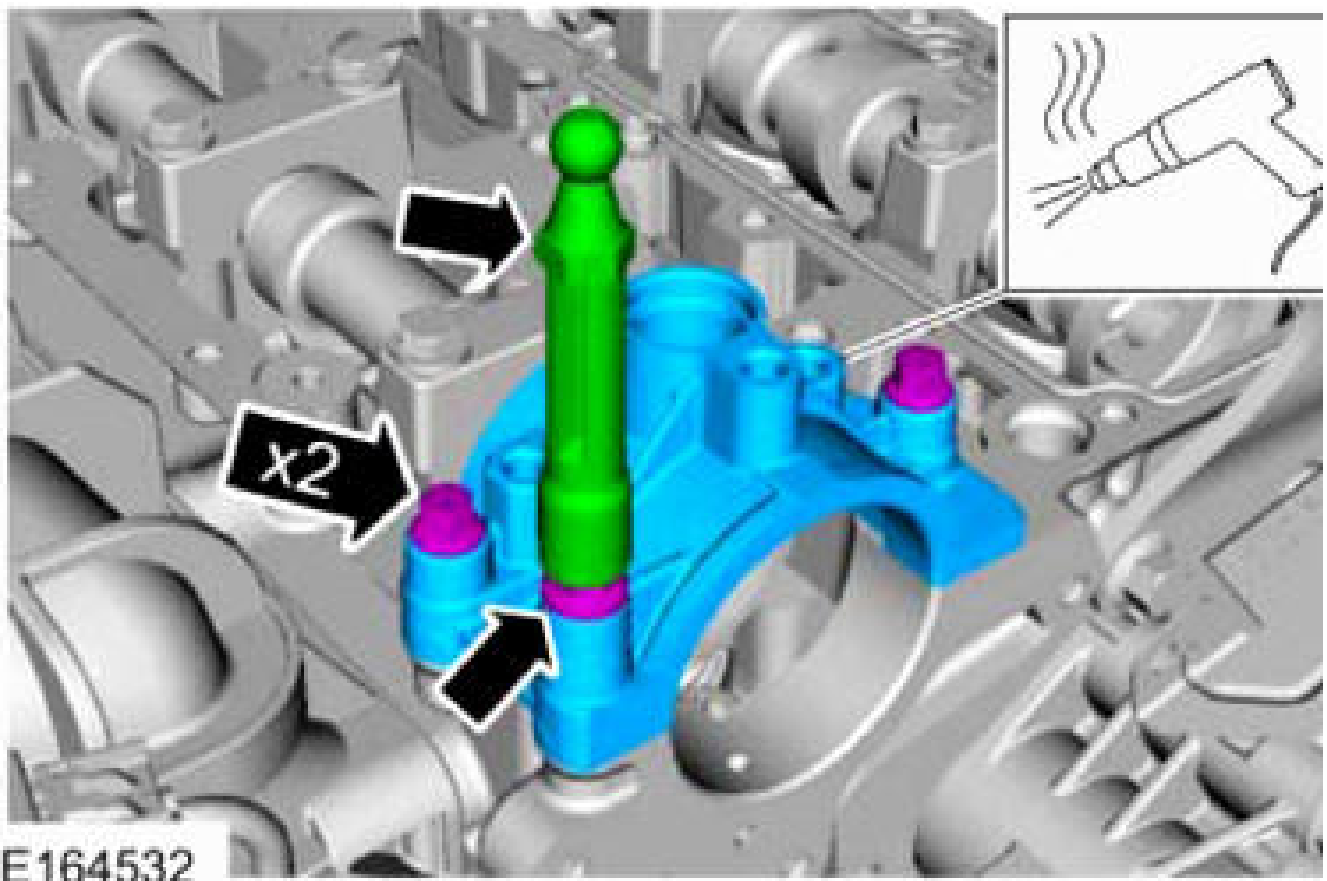


50.

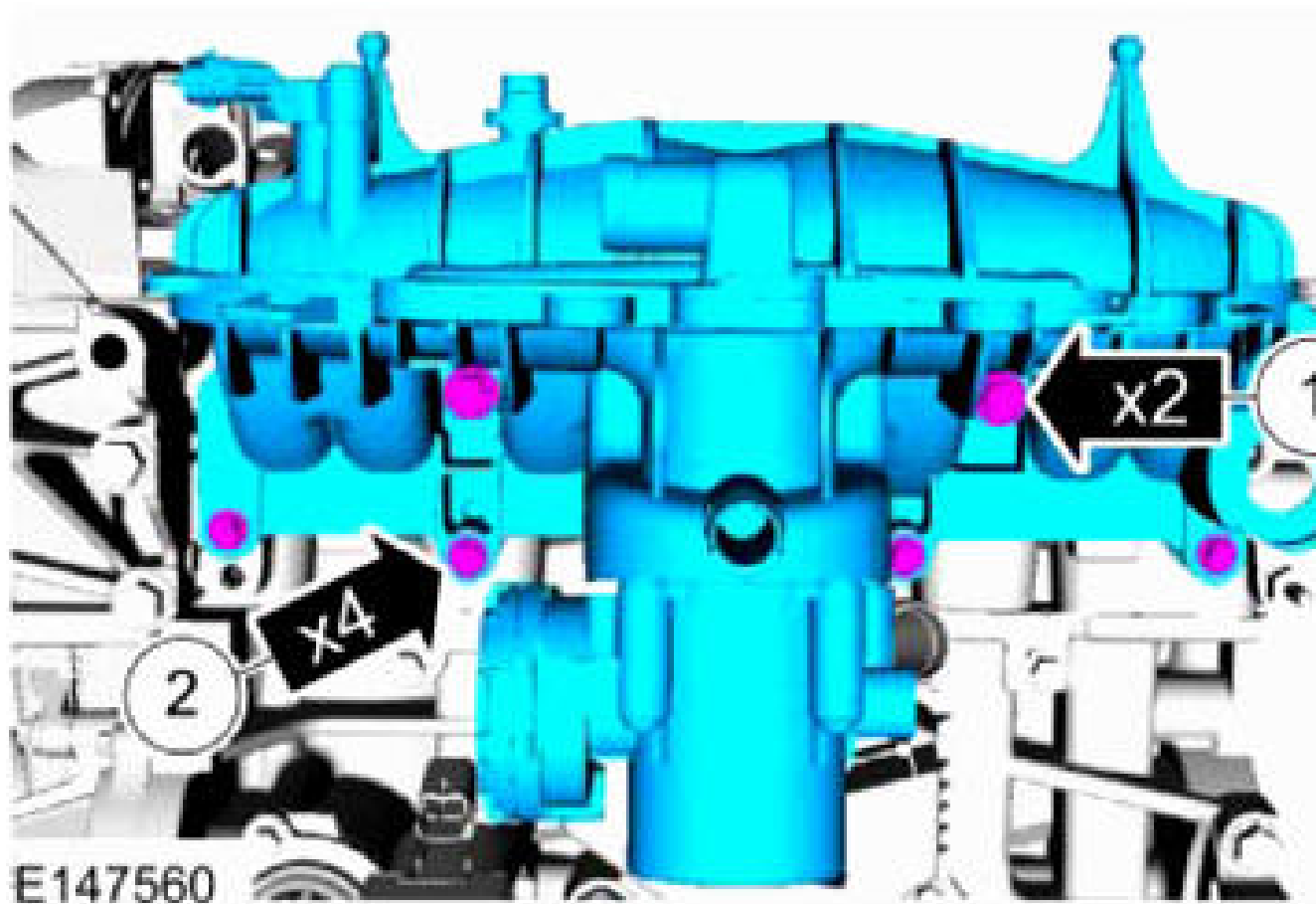
NOTE: Use a heat gun to soften the flange sealant, this will aid in the removal of the brake vacuum pump mounting bracket. Failure to follow these directions may result in damage to the brake vacuum pump mounting bracket.

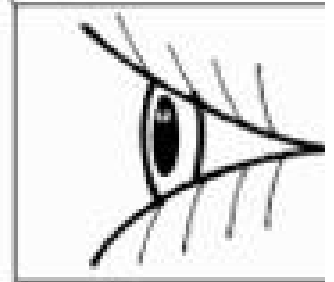
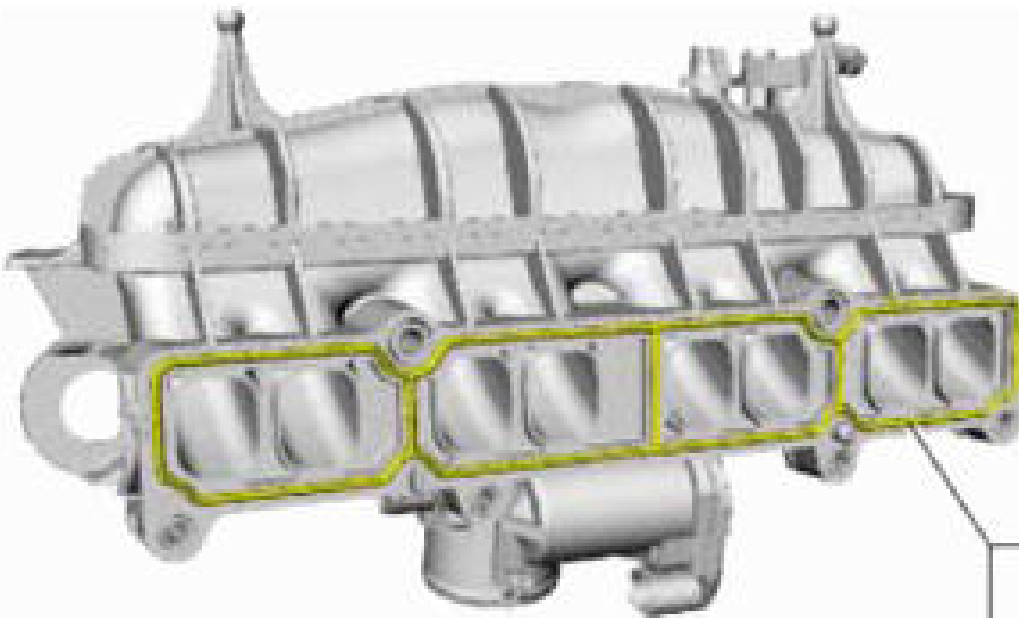
51.

General Equipment : Hot Air Gun



52. **NOTE:** Note the different lengths of the bolts.

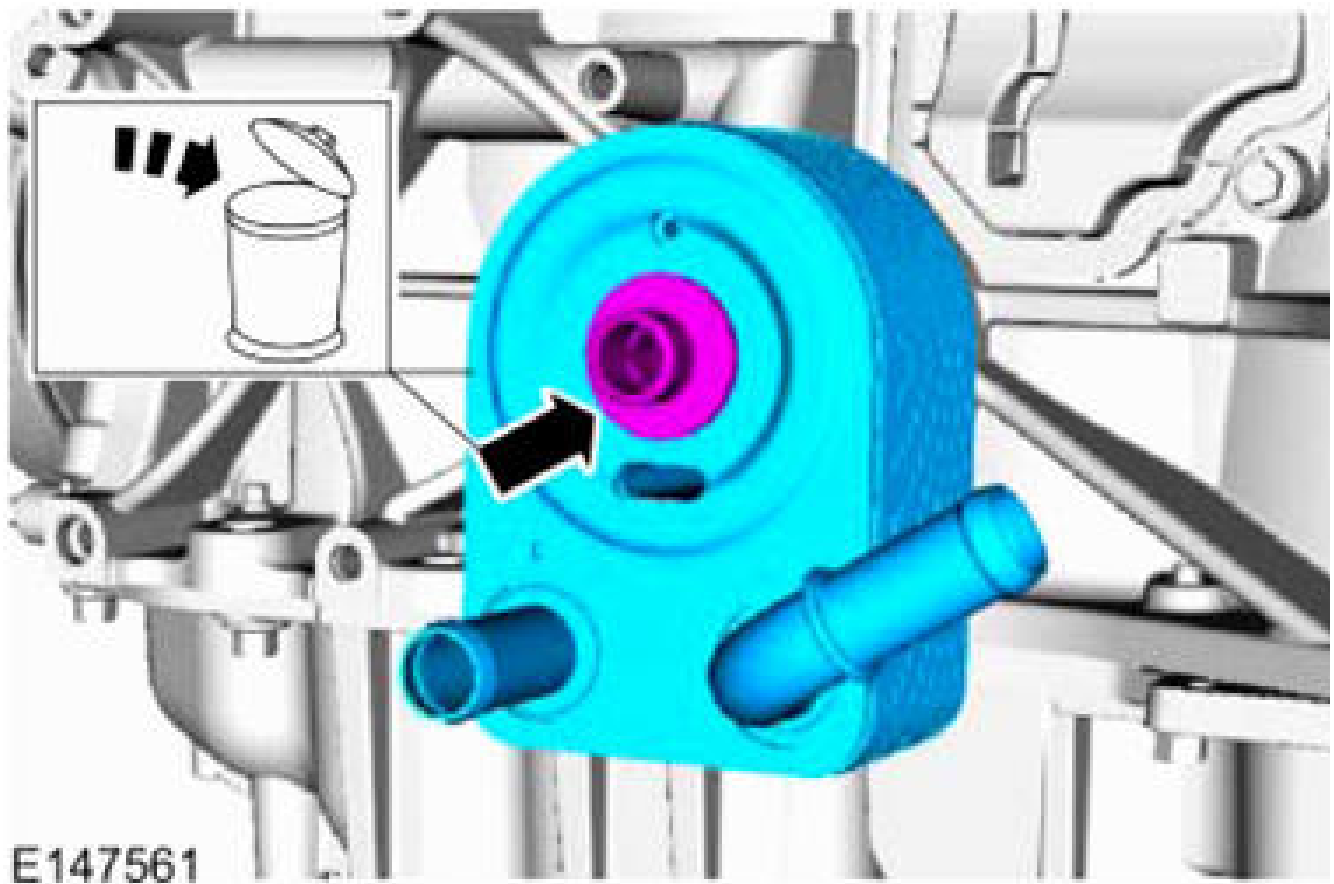




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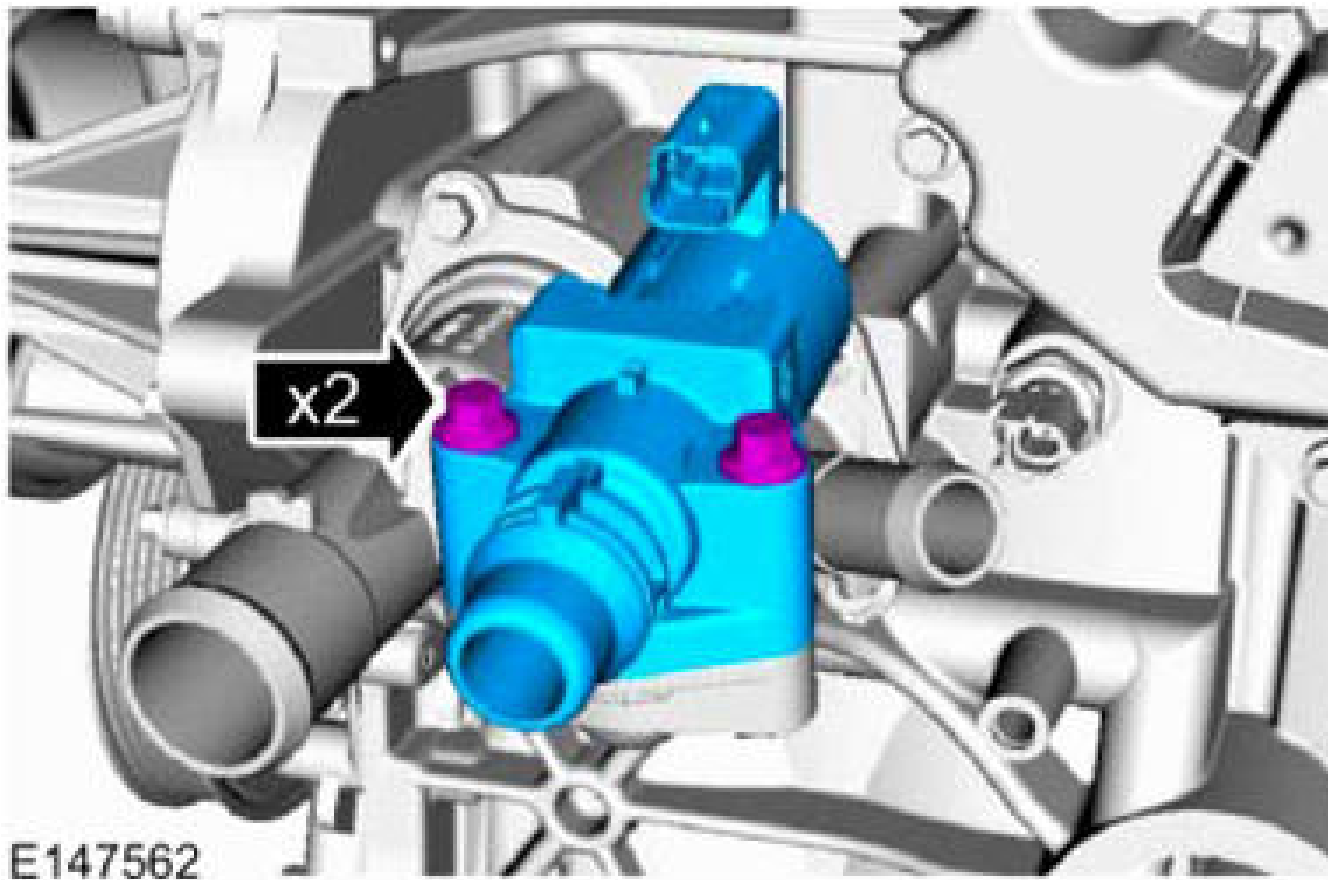
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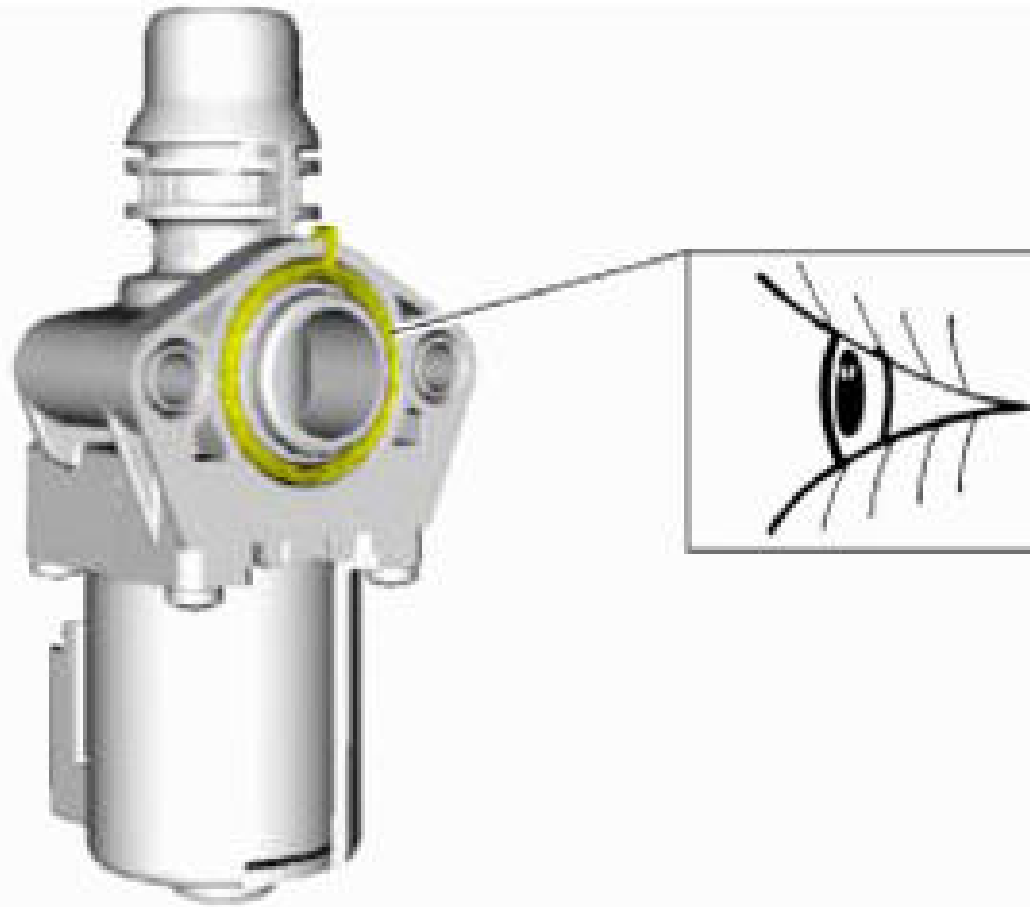
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55.



55.

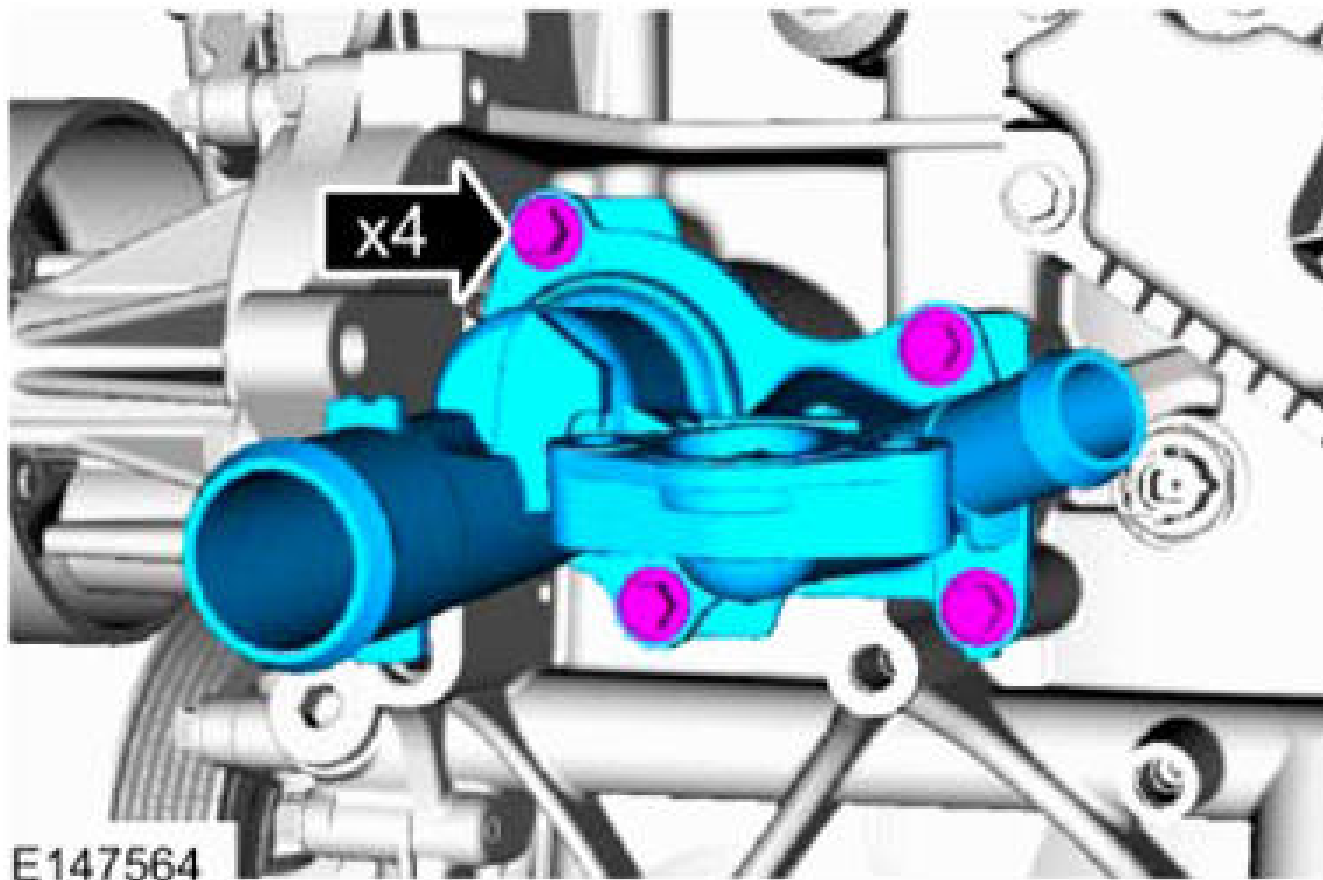
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E147563

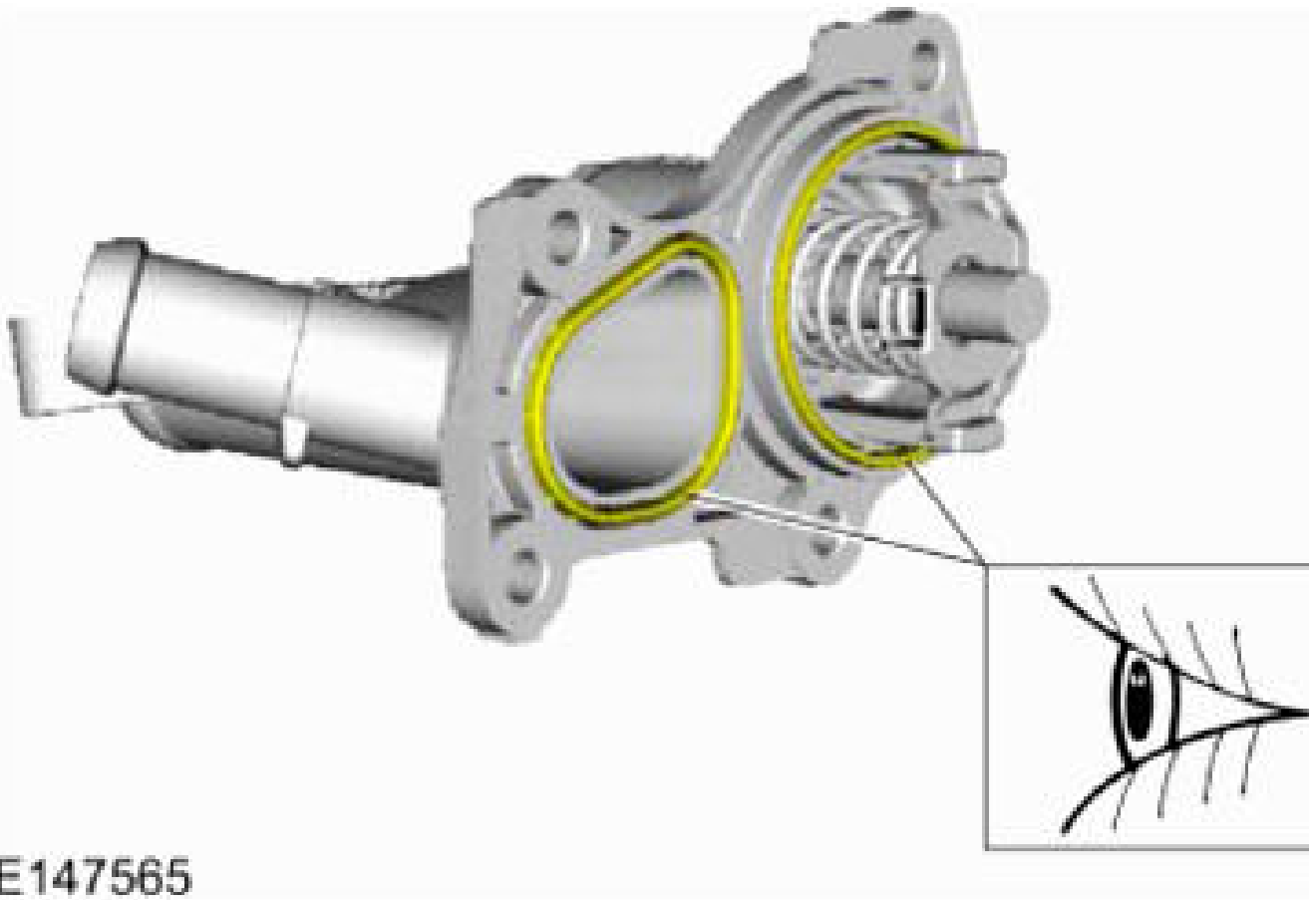
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57.



57.

58.



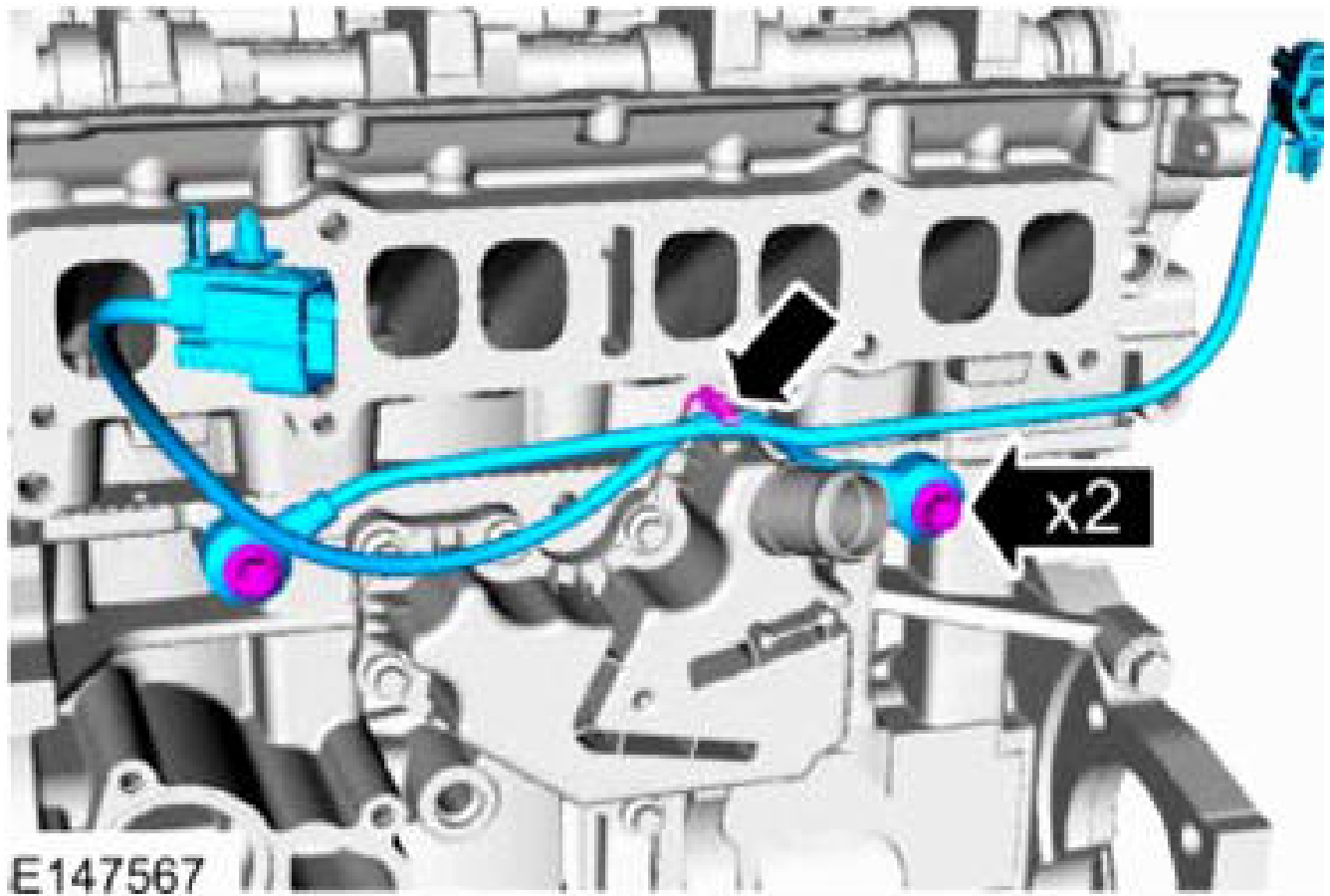
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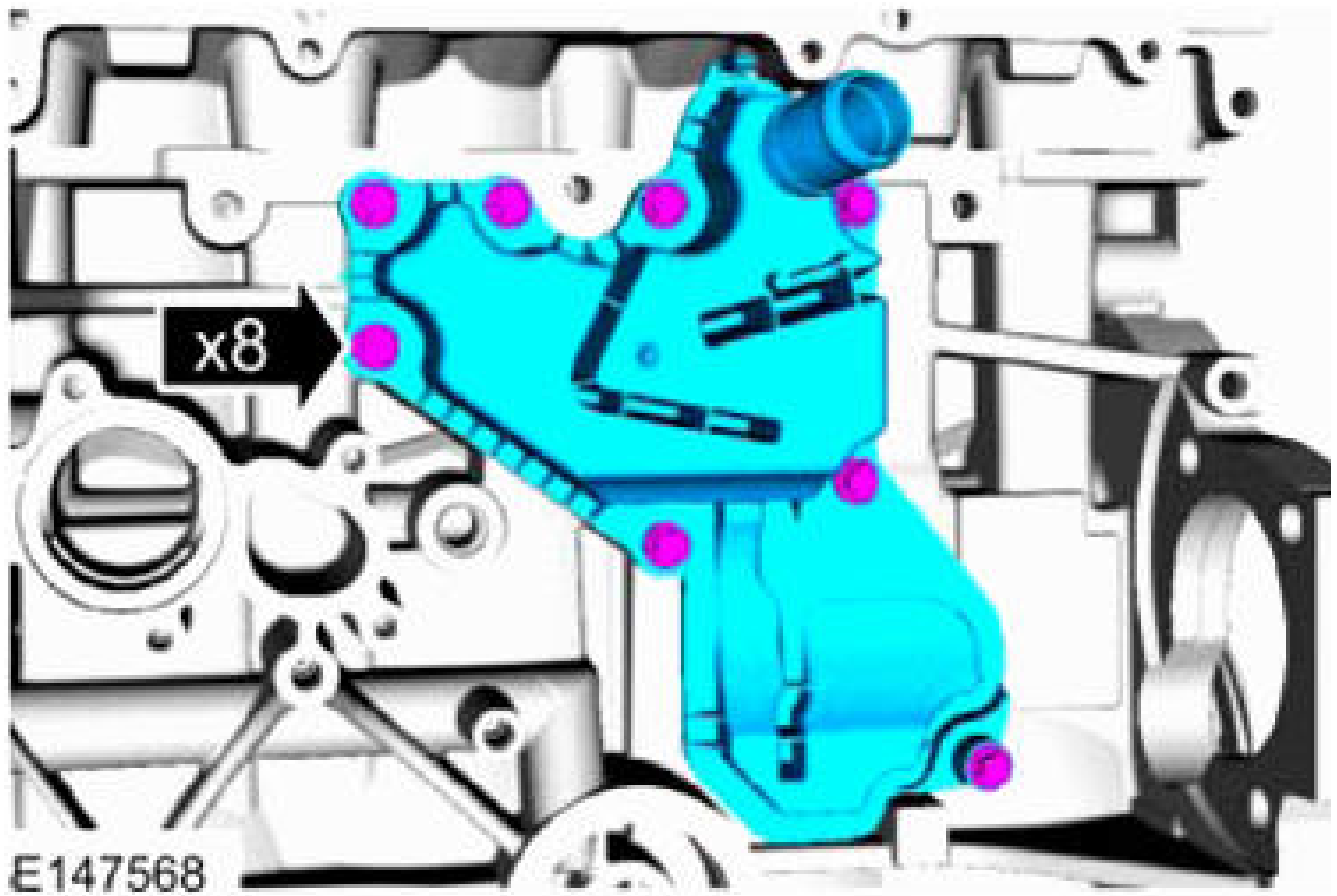
59.



59.

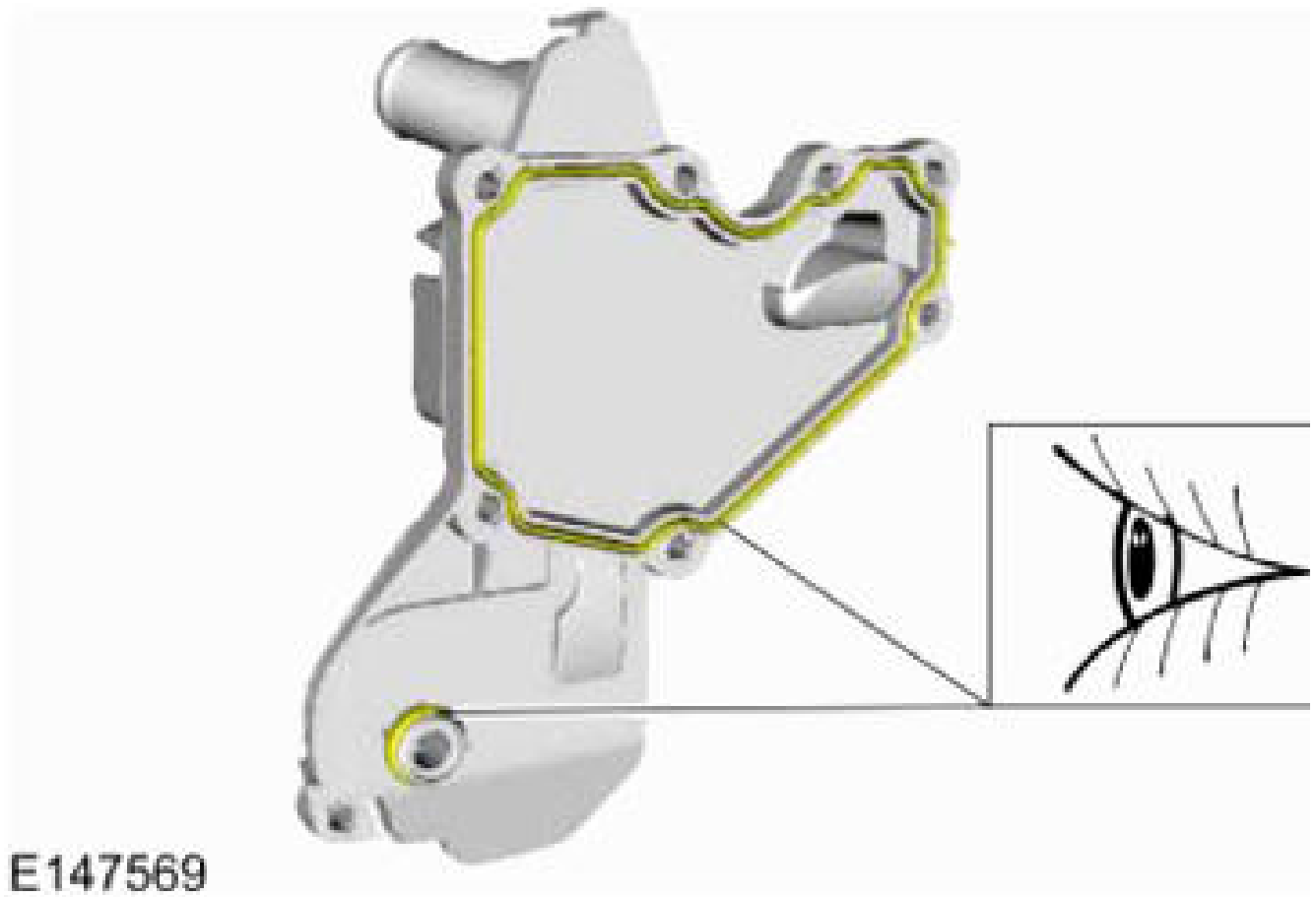
60. **NOTE:** Note the position for installation.





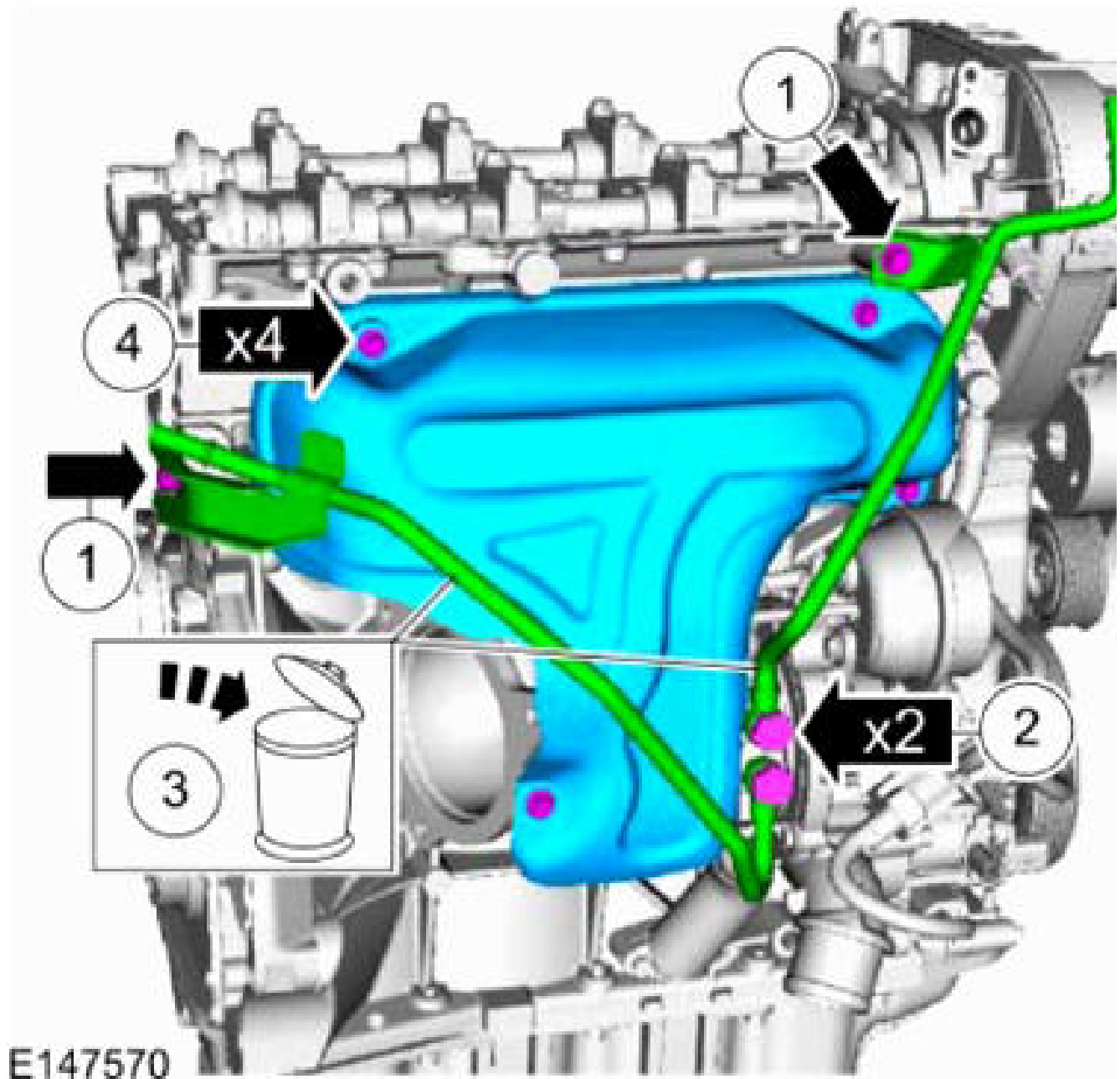
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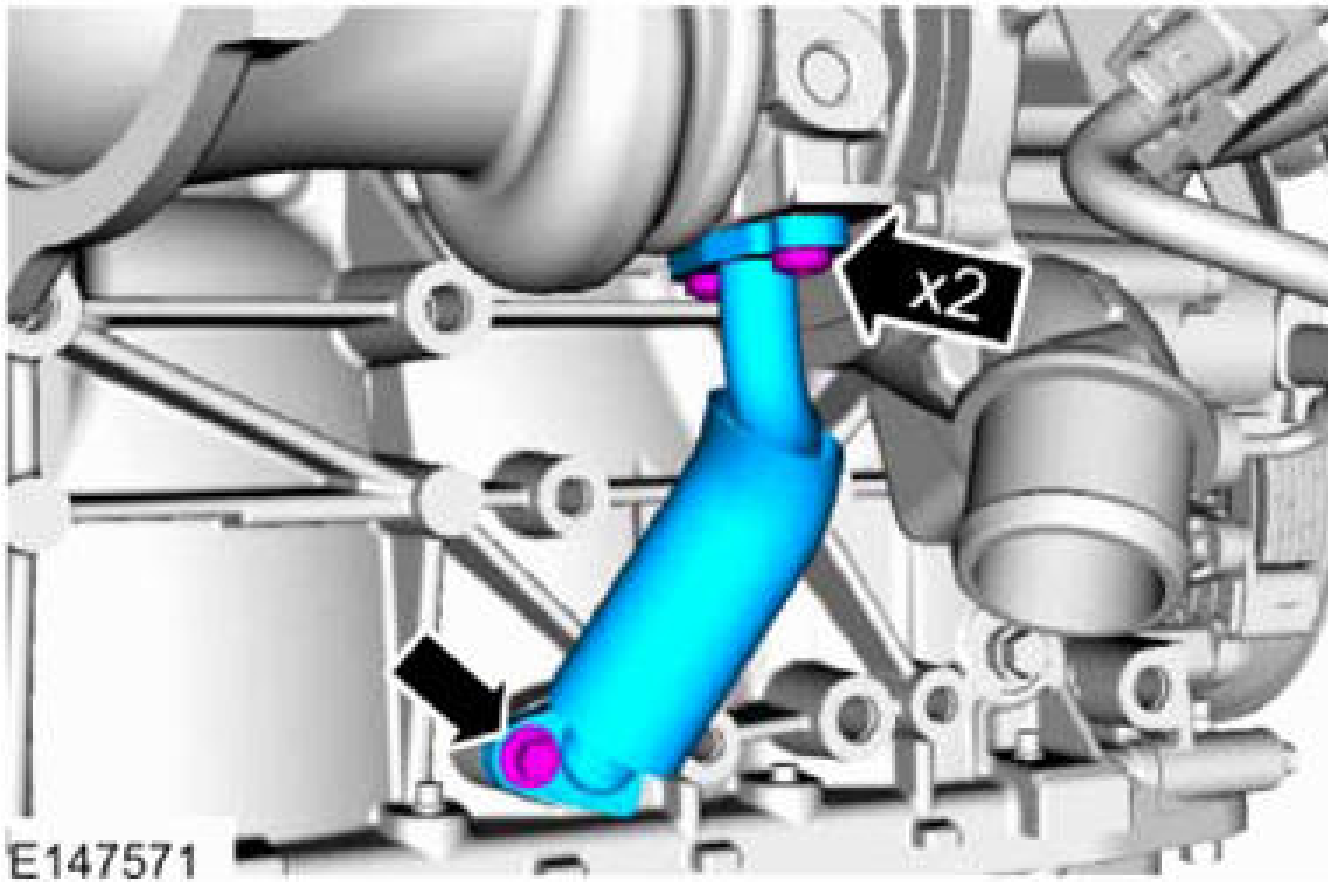
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63.



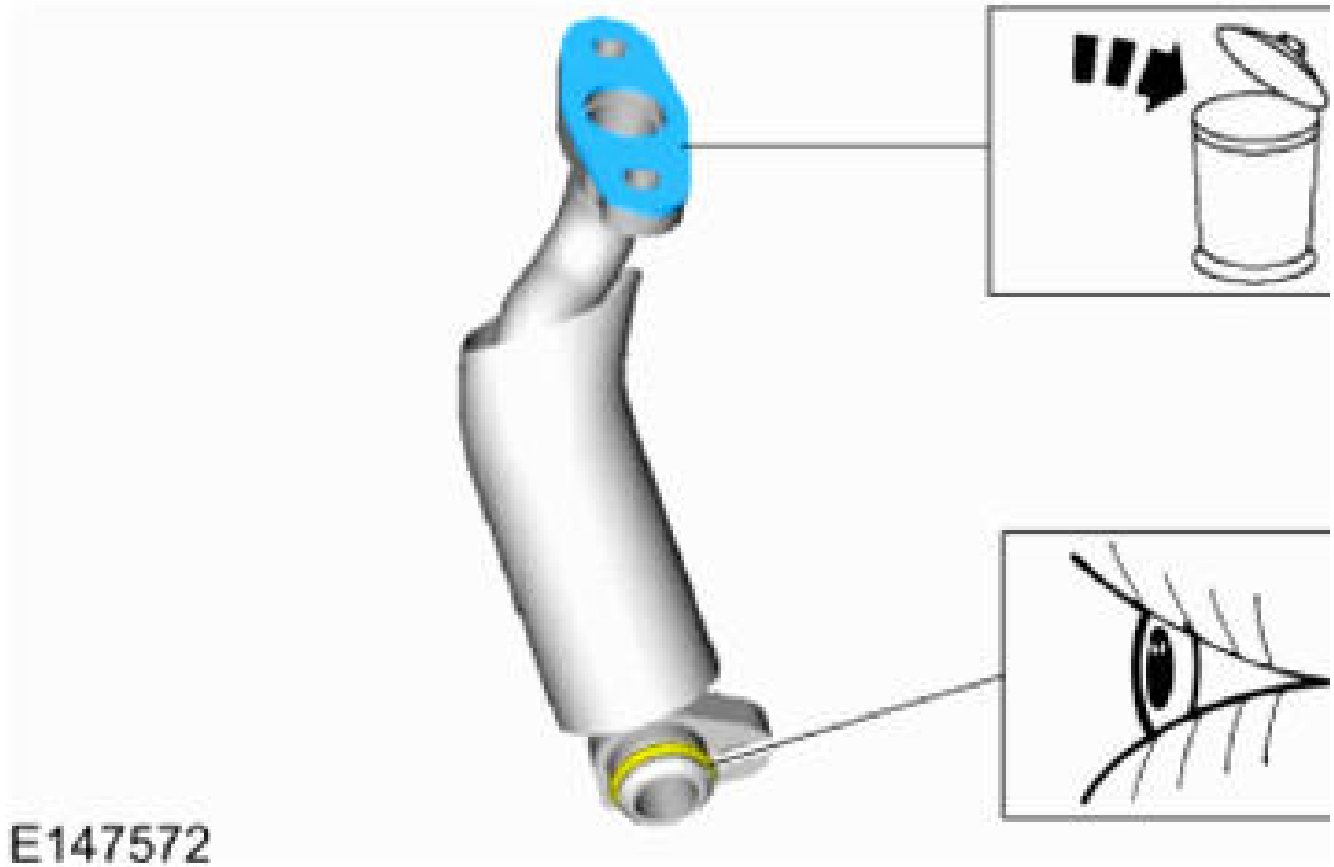
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64.



64.

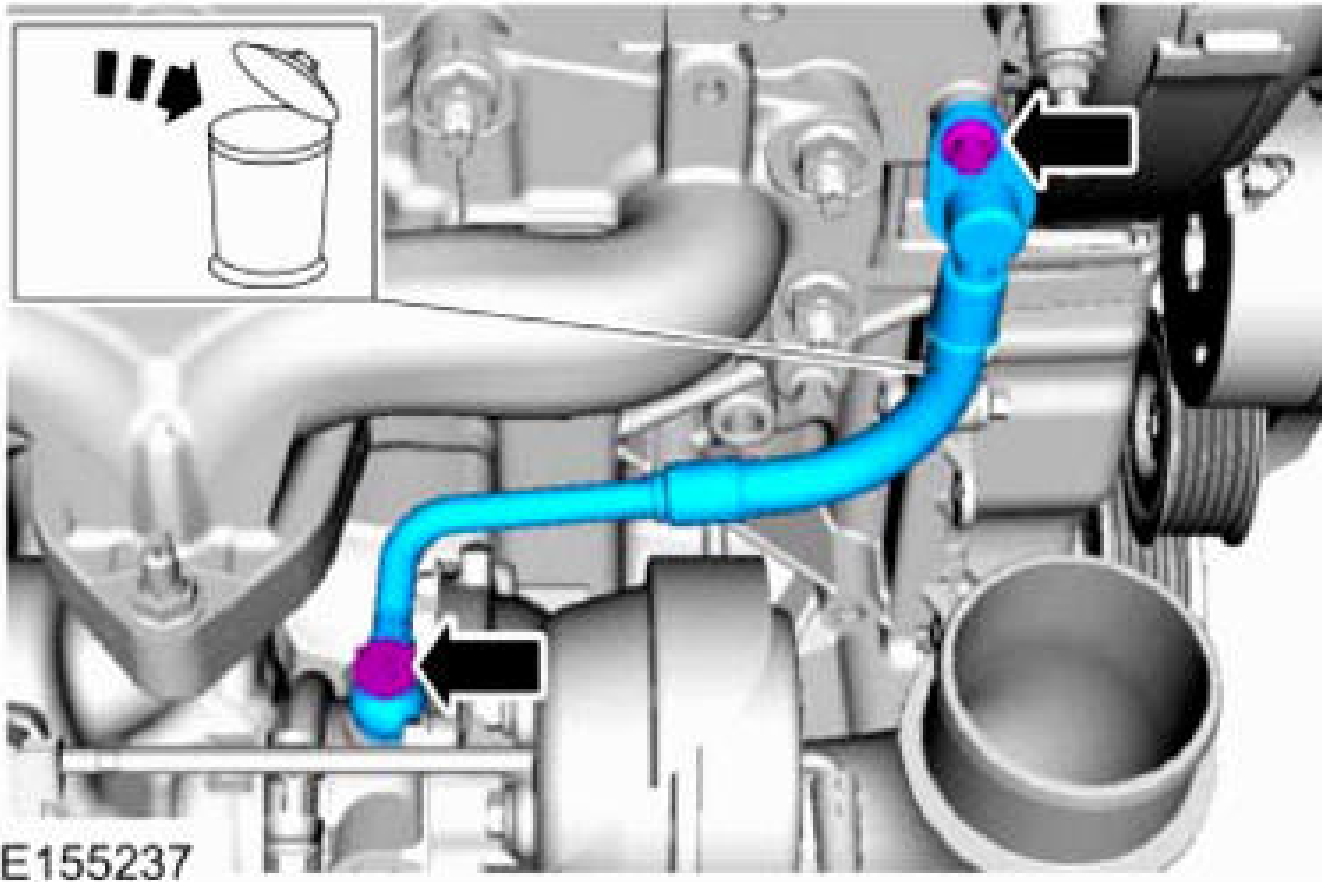
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E147572

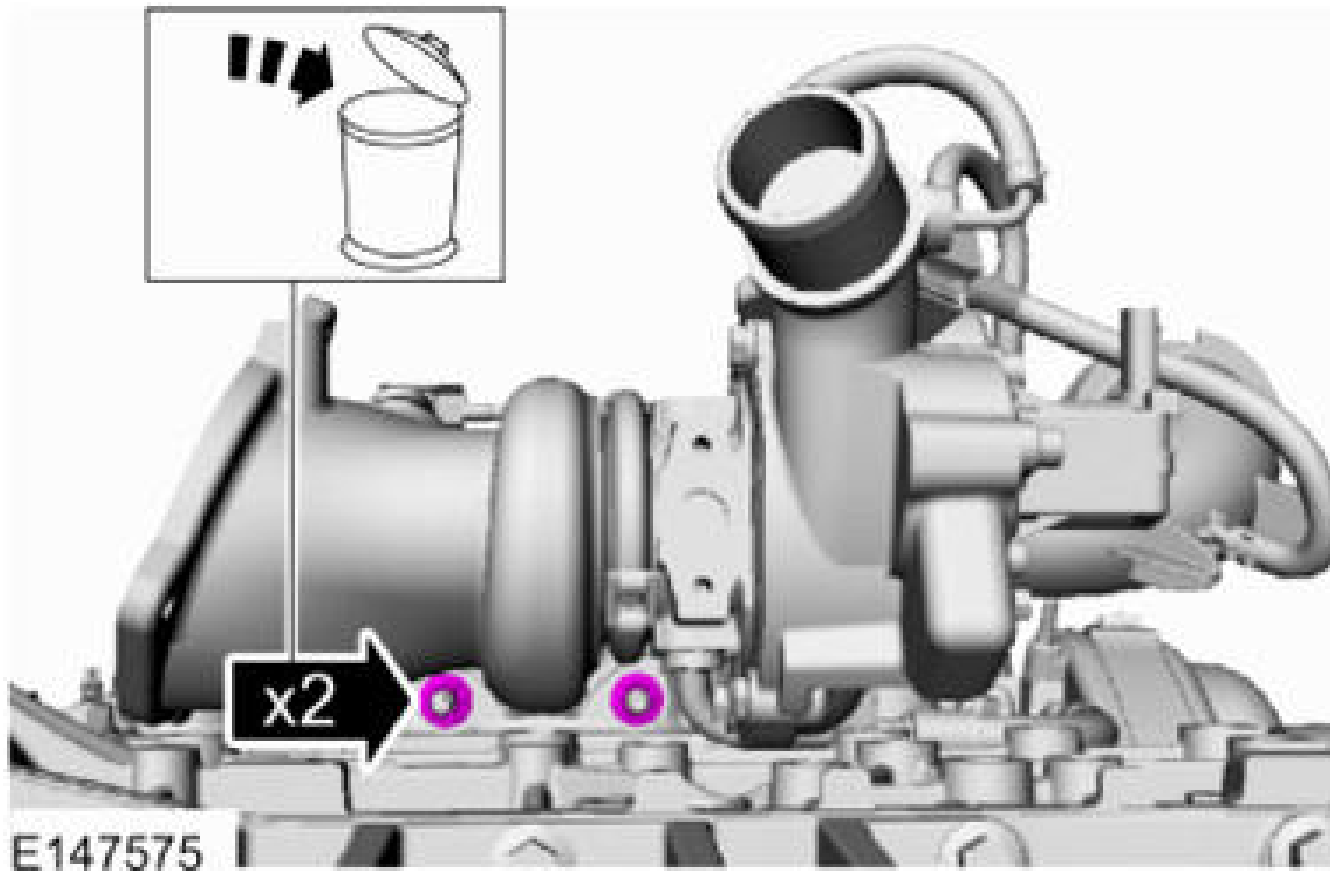
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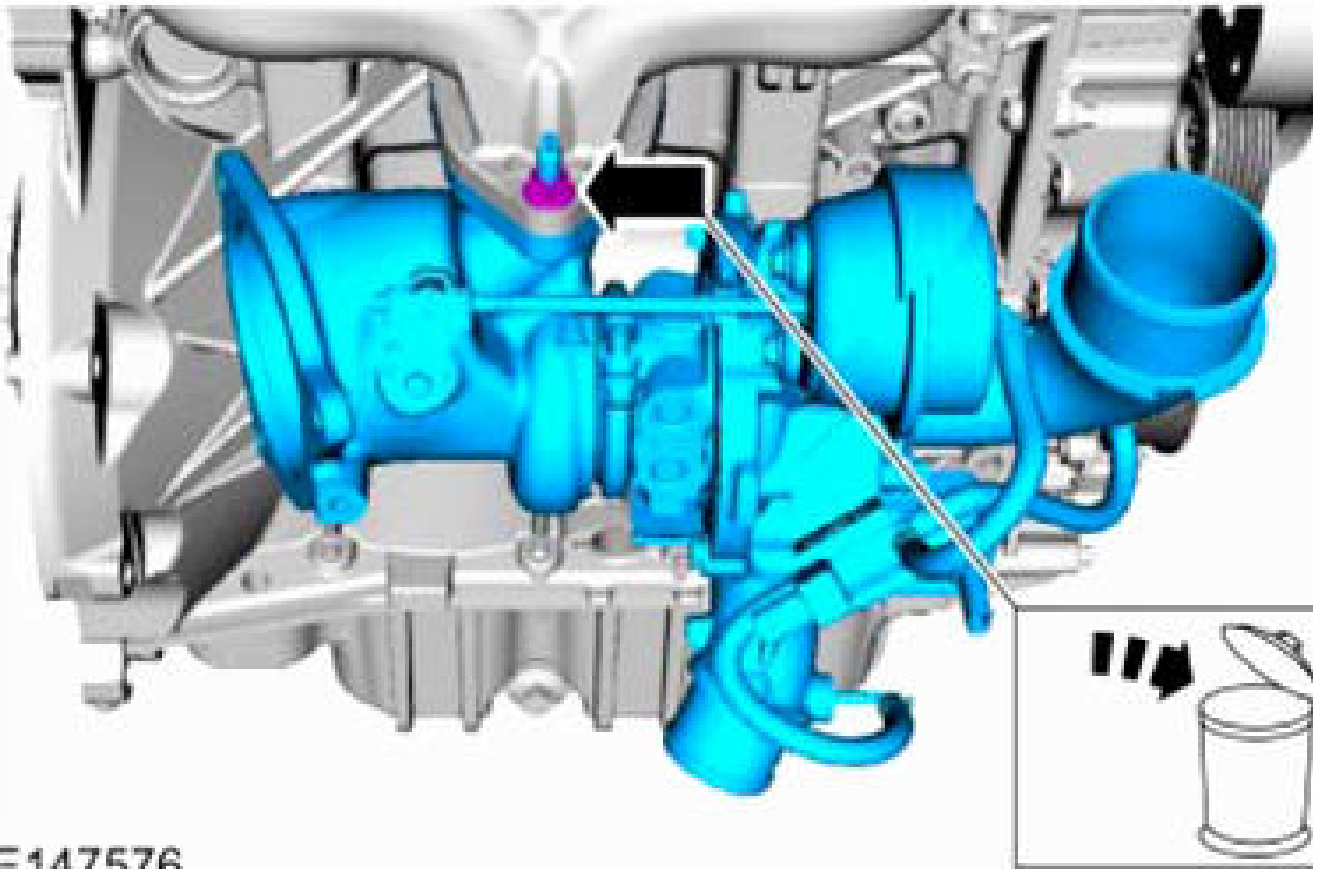
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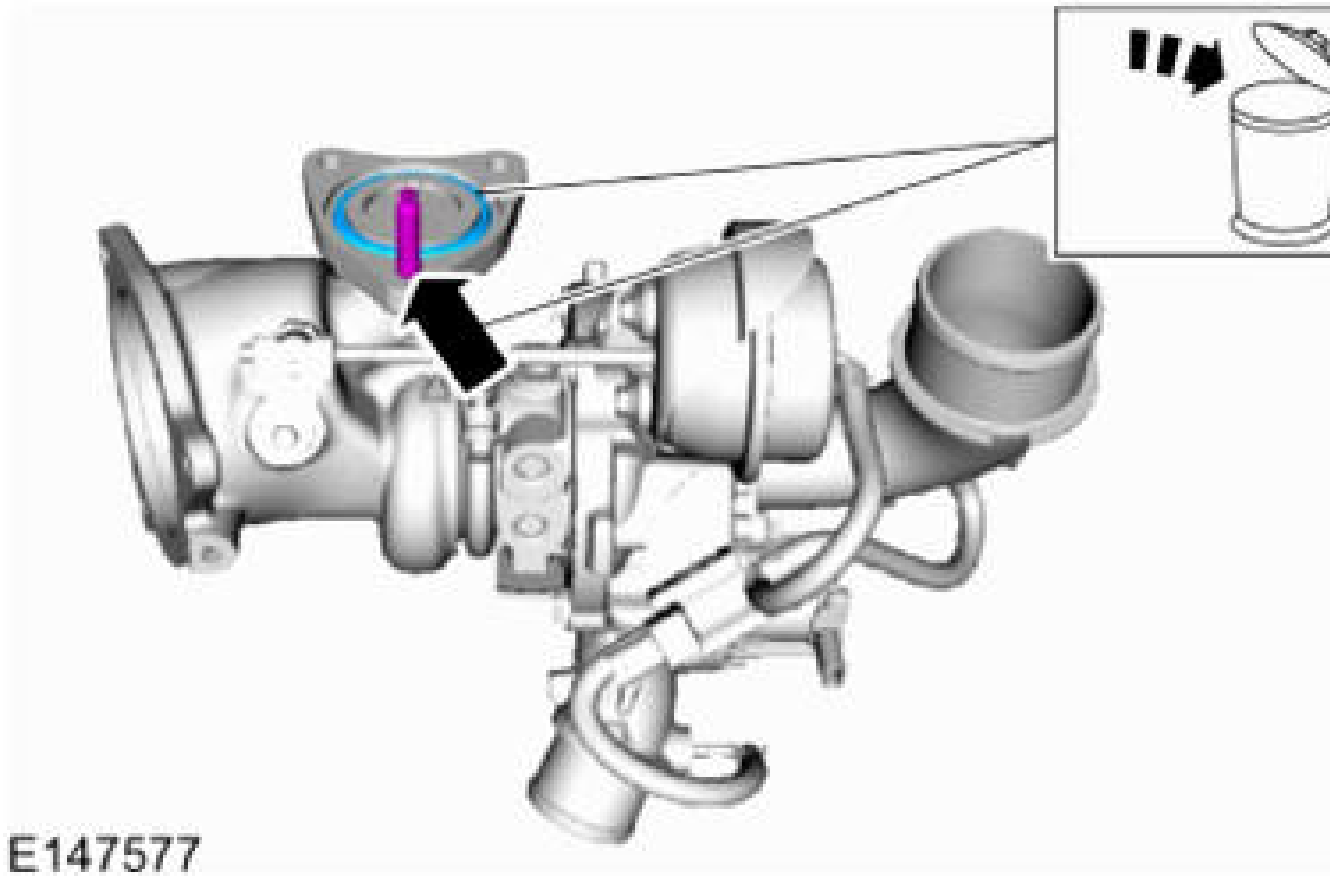
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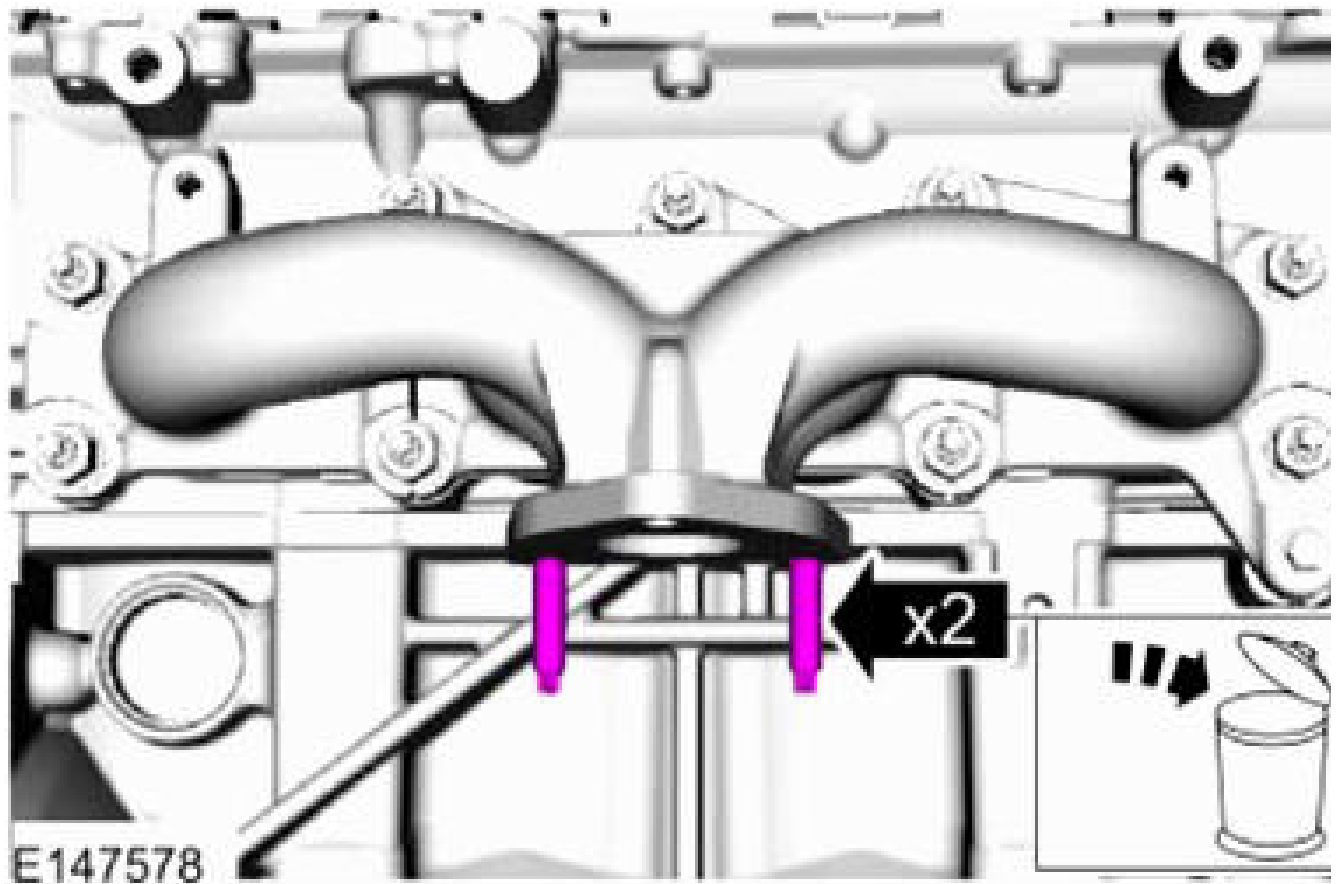
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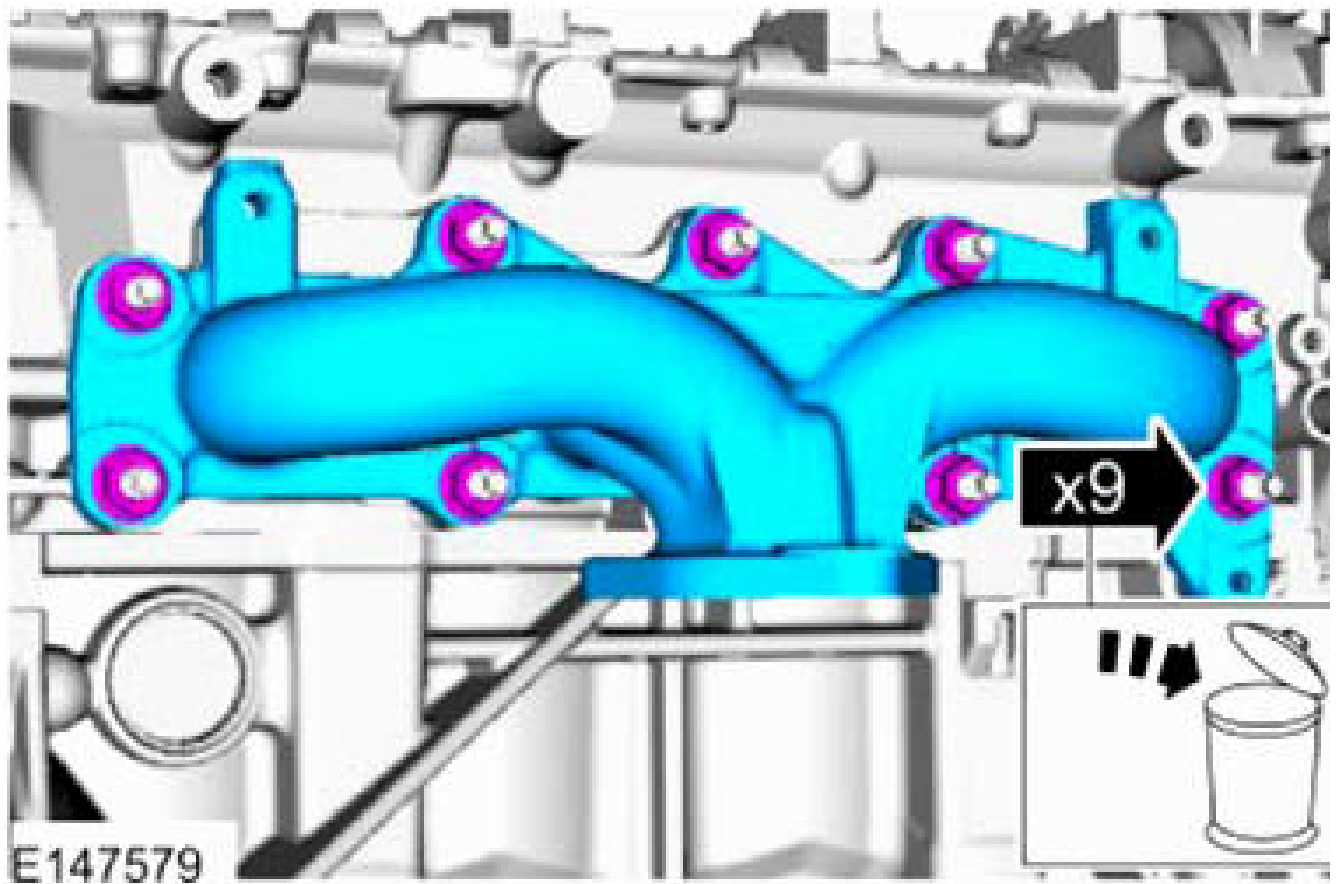
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70.



70.

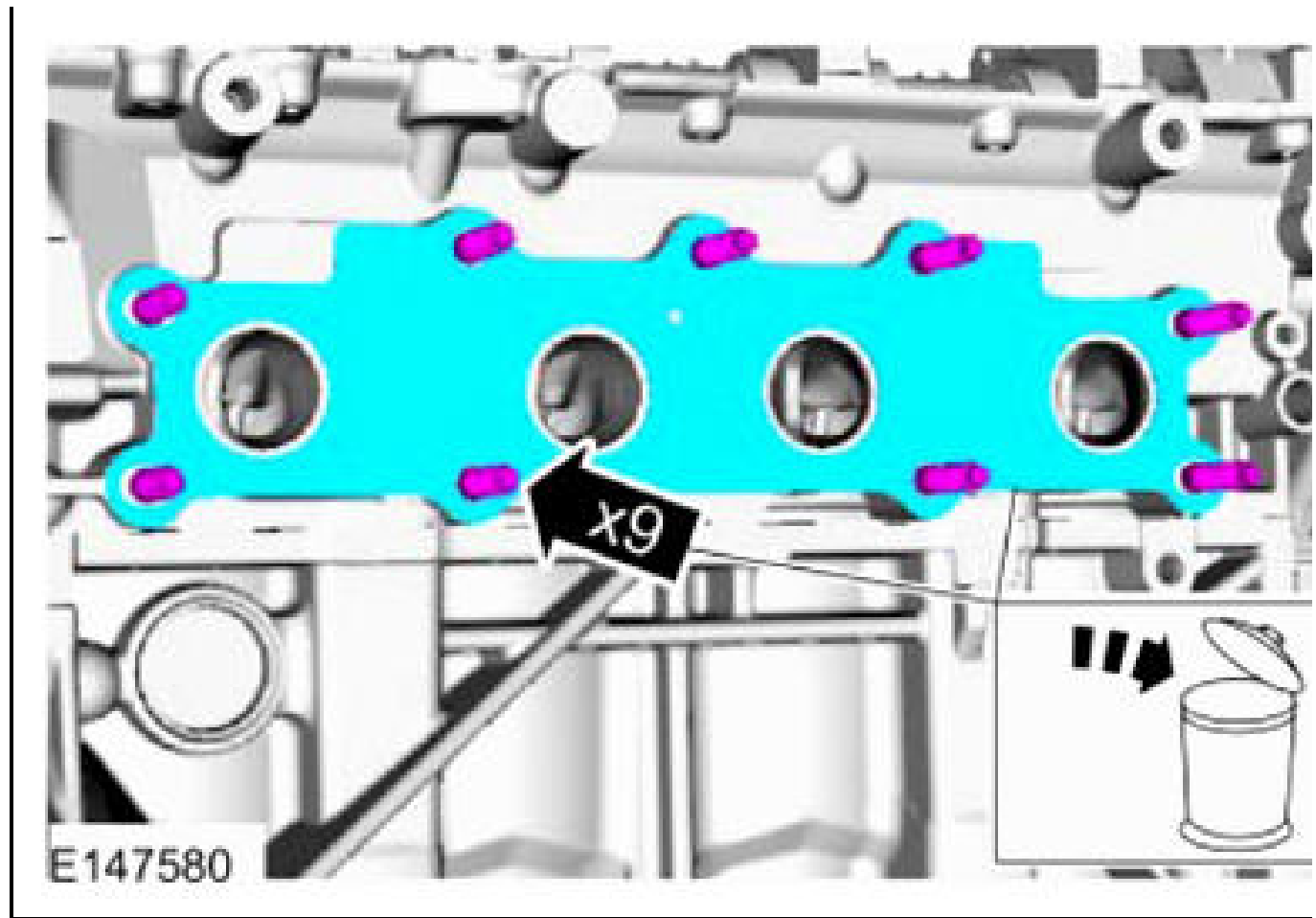
71.



71.

72. Refer to: **EXHAUST MANIFOLD CLEANING AND INSPECTION** .

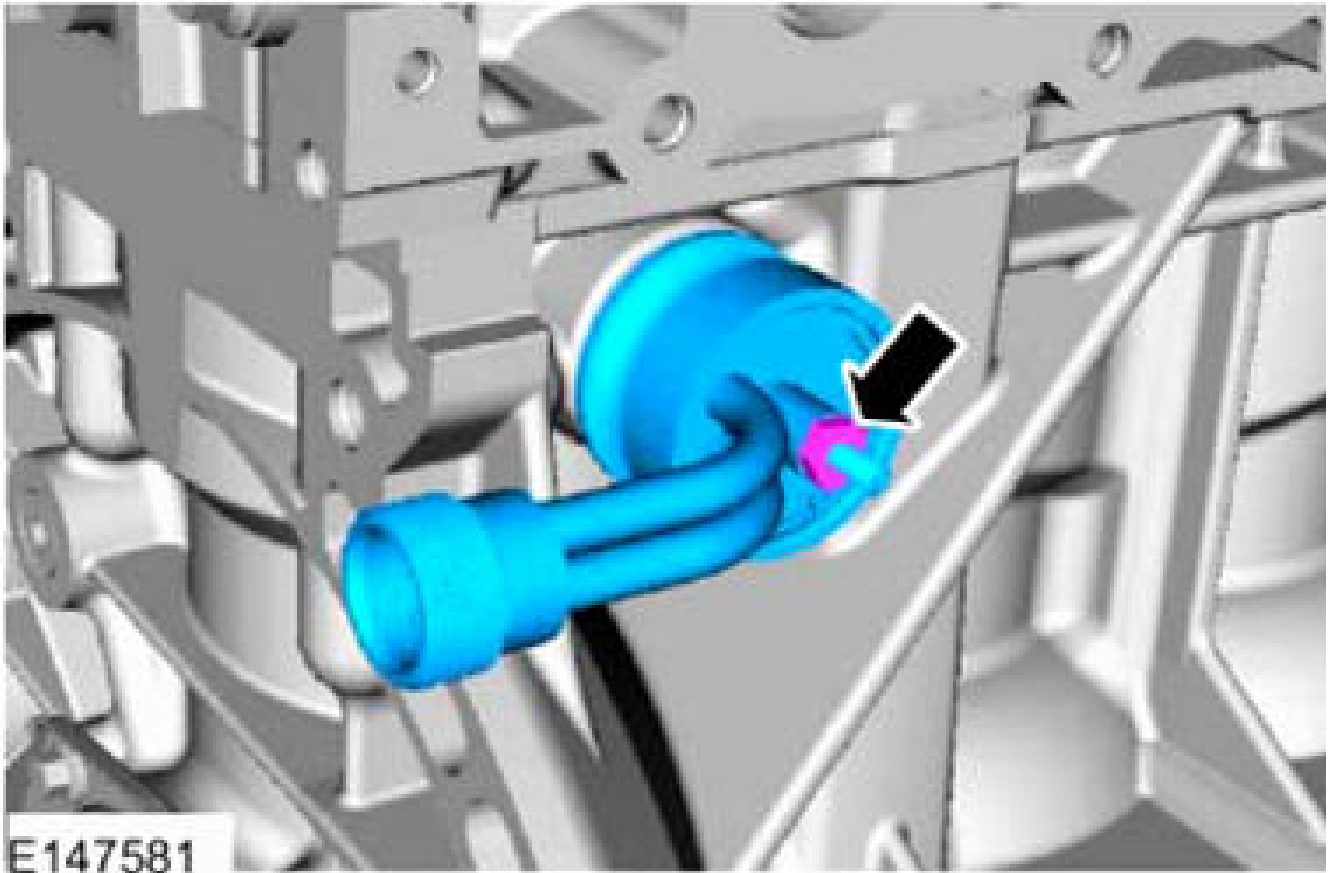
73.

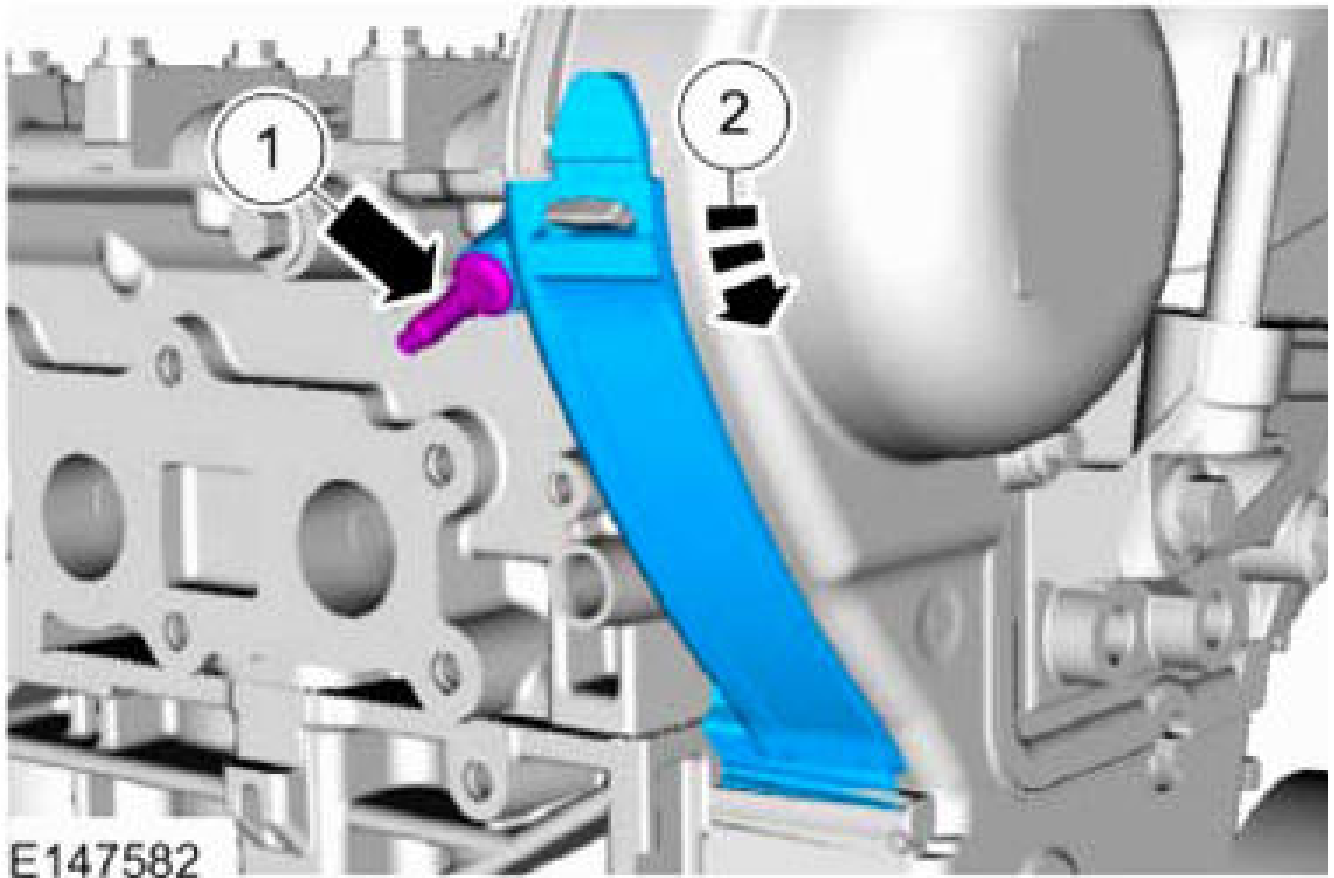


73.

74. **NOTE:** Note the position for installation.

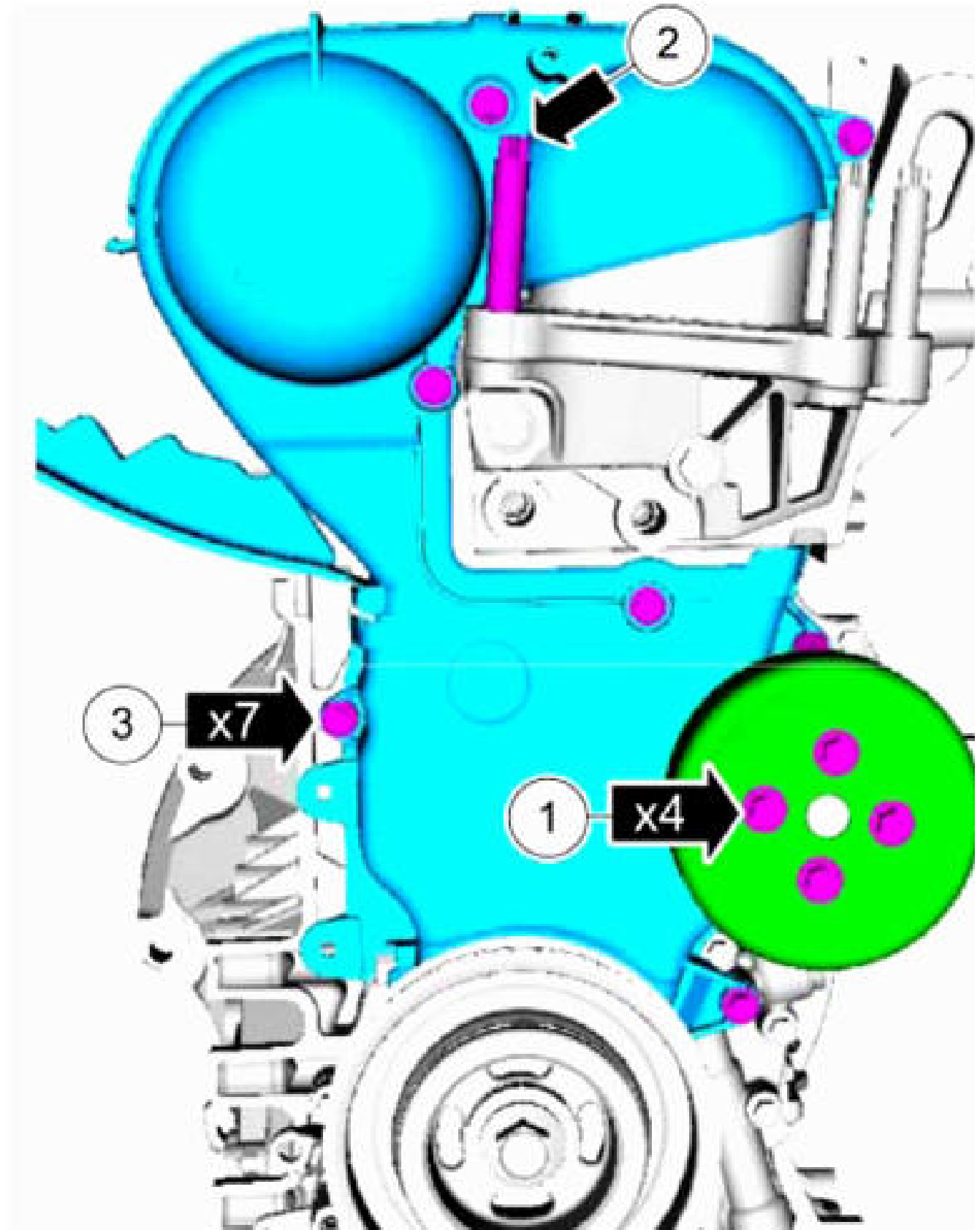
If equipped with block heater.



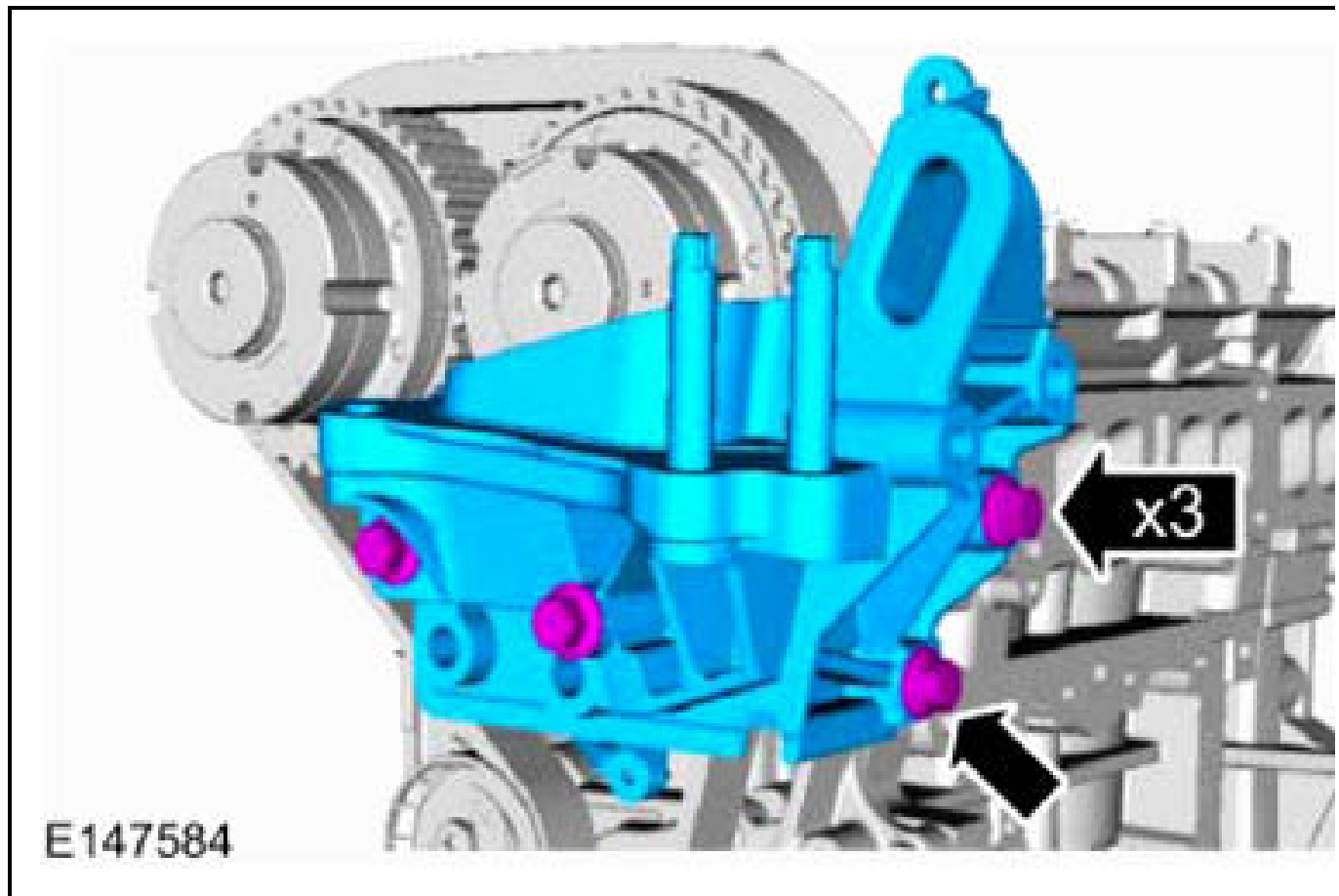


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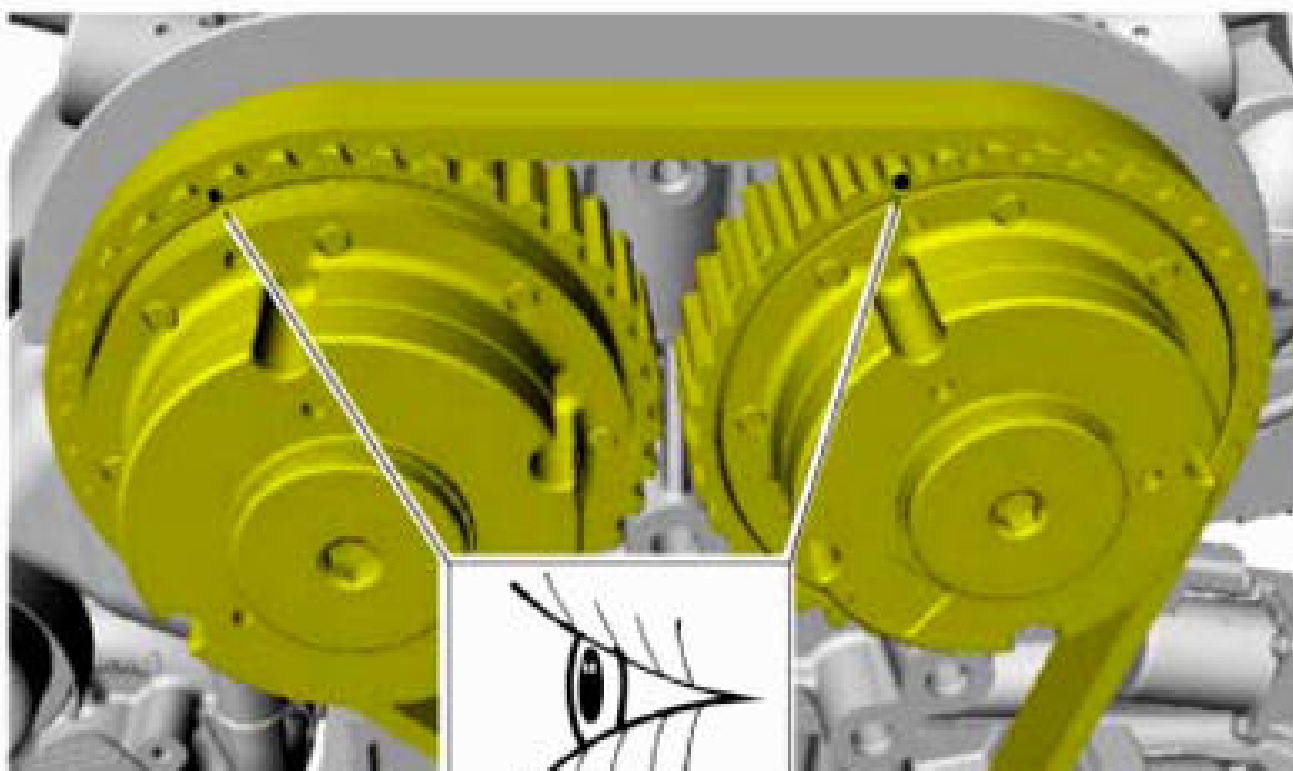
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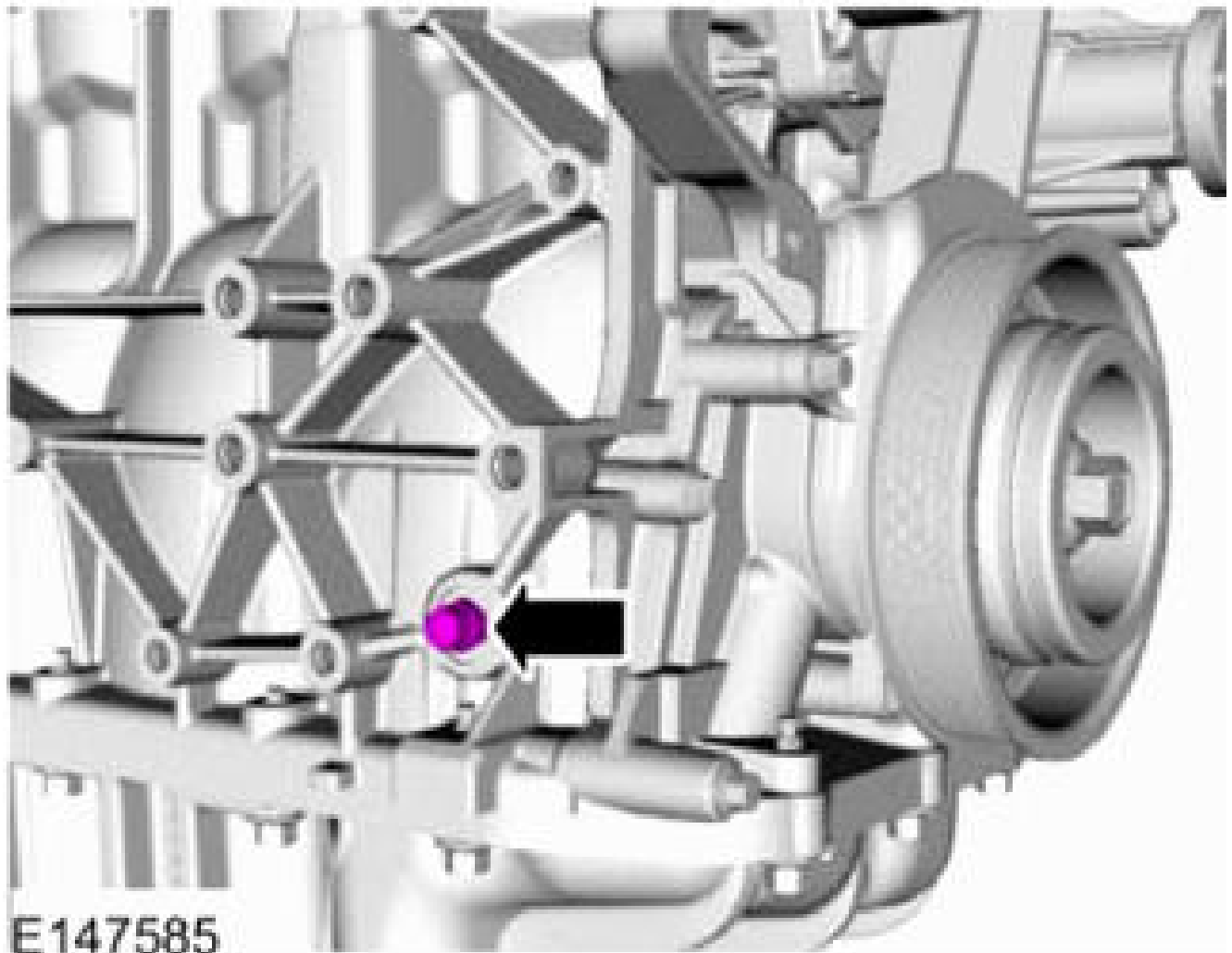


77. **NOTE:** Note the different lengths of the bolts.



78. **NOTE:** Only rotate the crankshaft in a clockwise direction.
11 o'clock position.



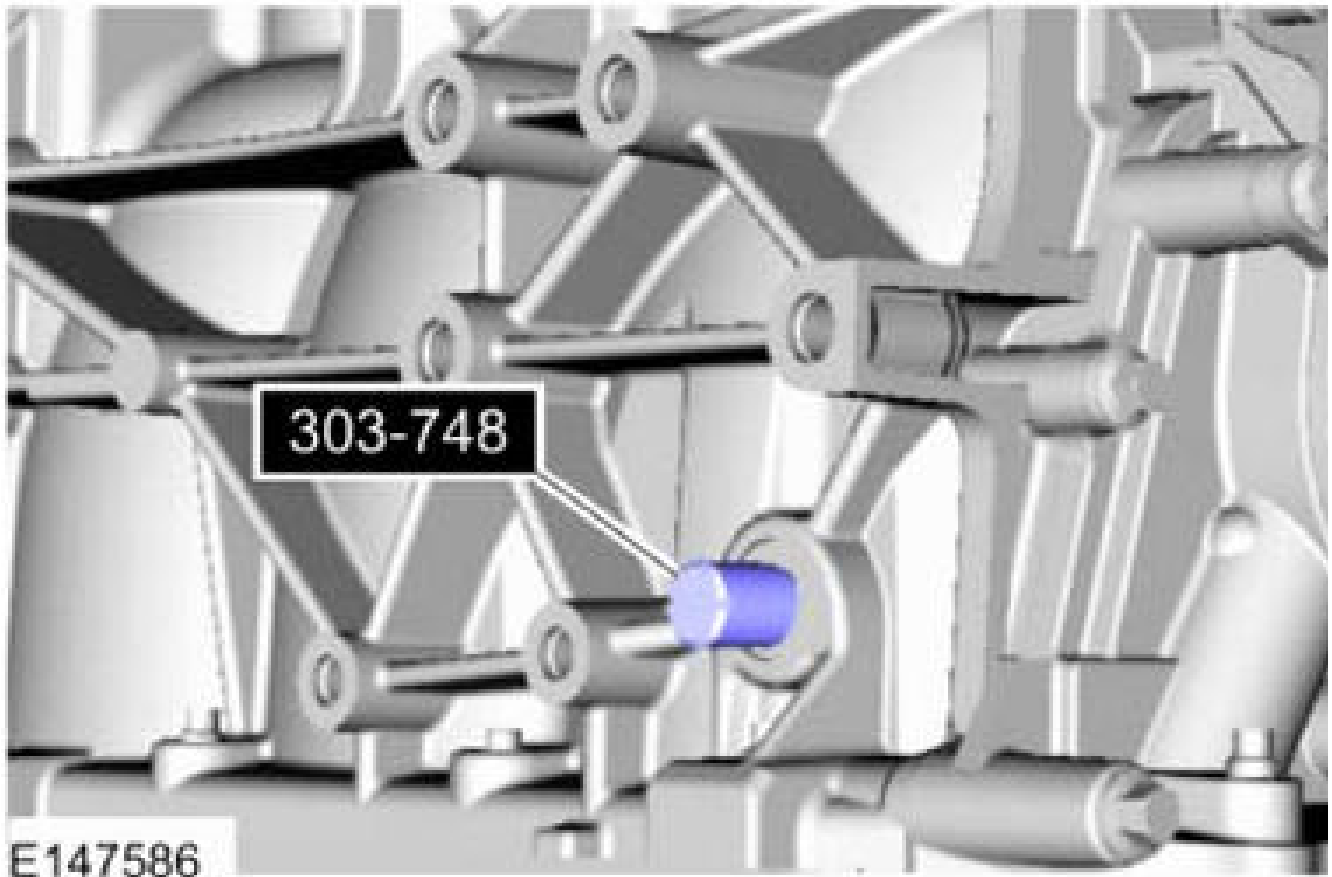


79.

NOTE: The Crankshaft TDC Timing Pin will contact the crankshaft and prevent it from turning past TDC . However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the crankshaft pulley removal and installation.

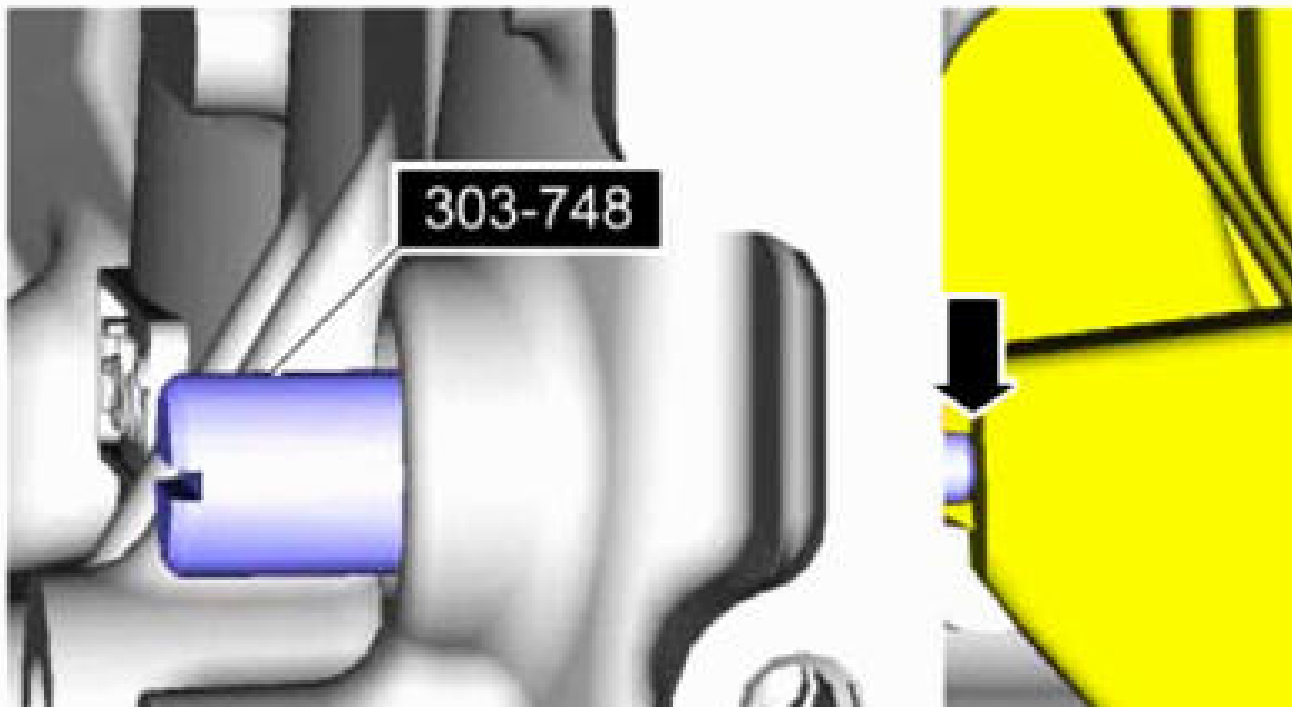
80.

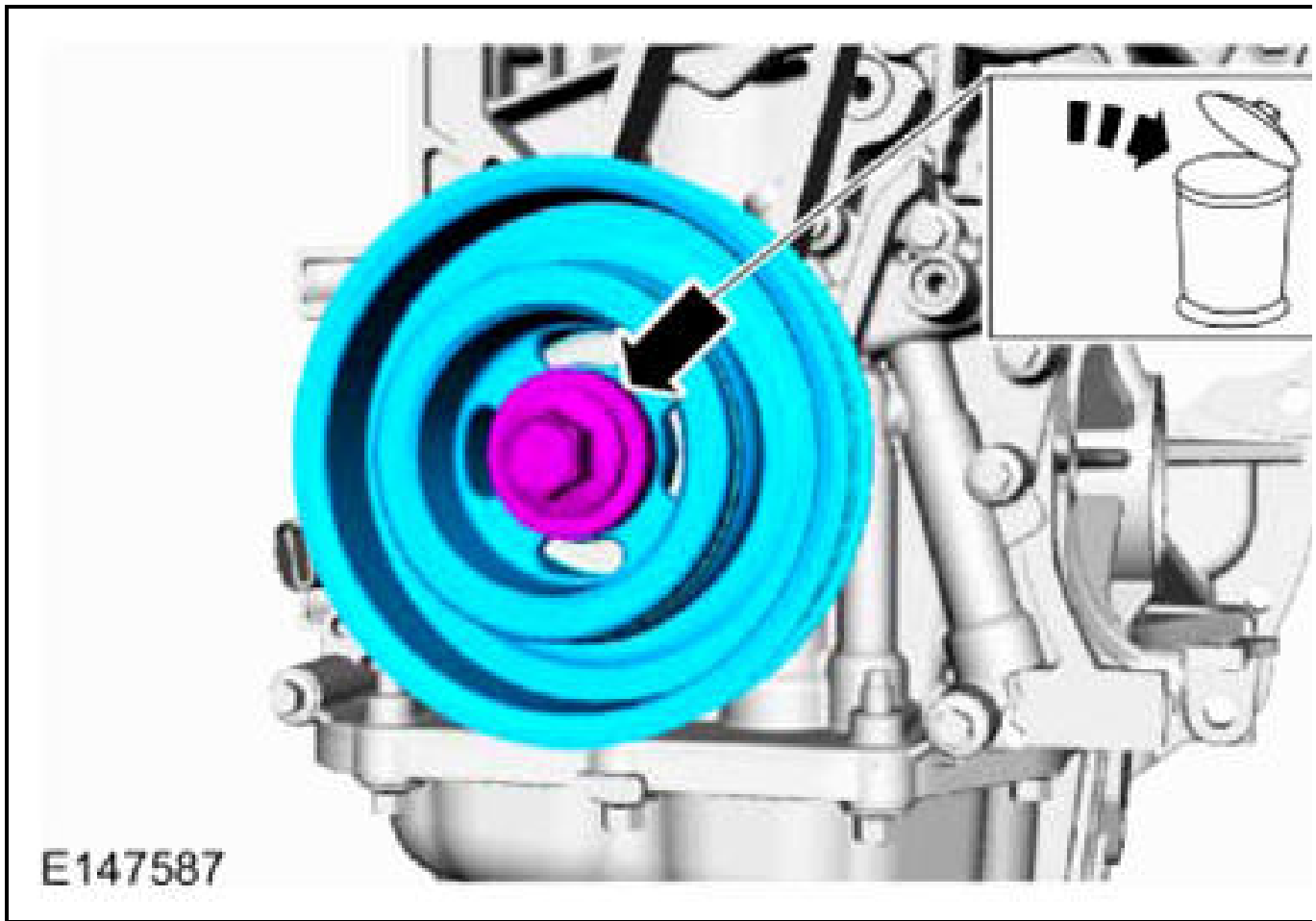
Install Special Service Tool : 303-748 Locking Tool, Crankshaft



81. **NOTE:** Only rotate the crankshaft clockwise direction.

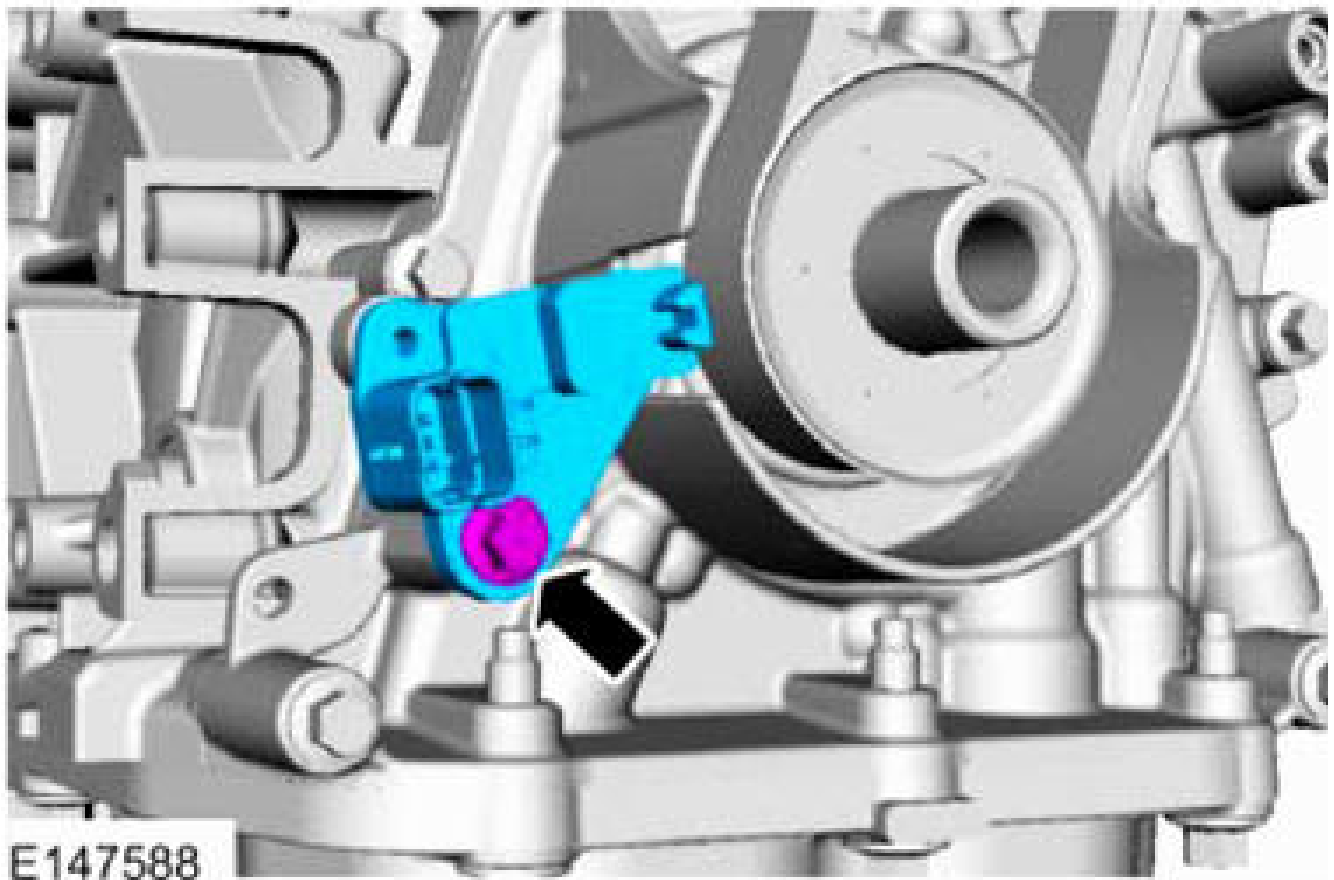
Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the **TDC** Timing Peg. The engine is now at **TDC** .



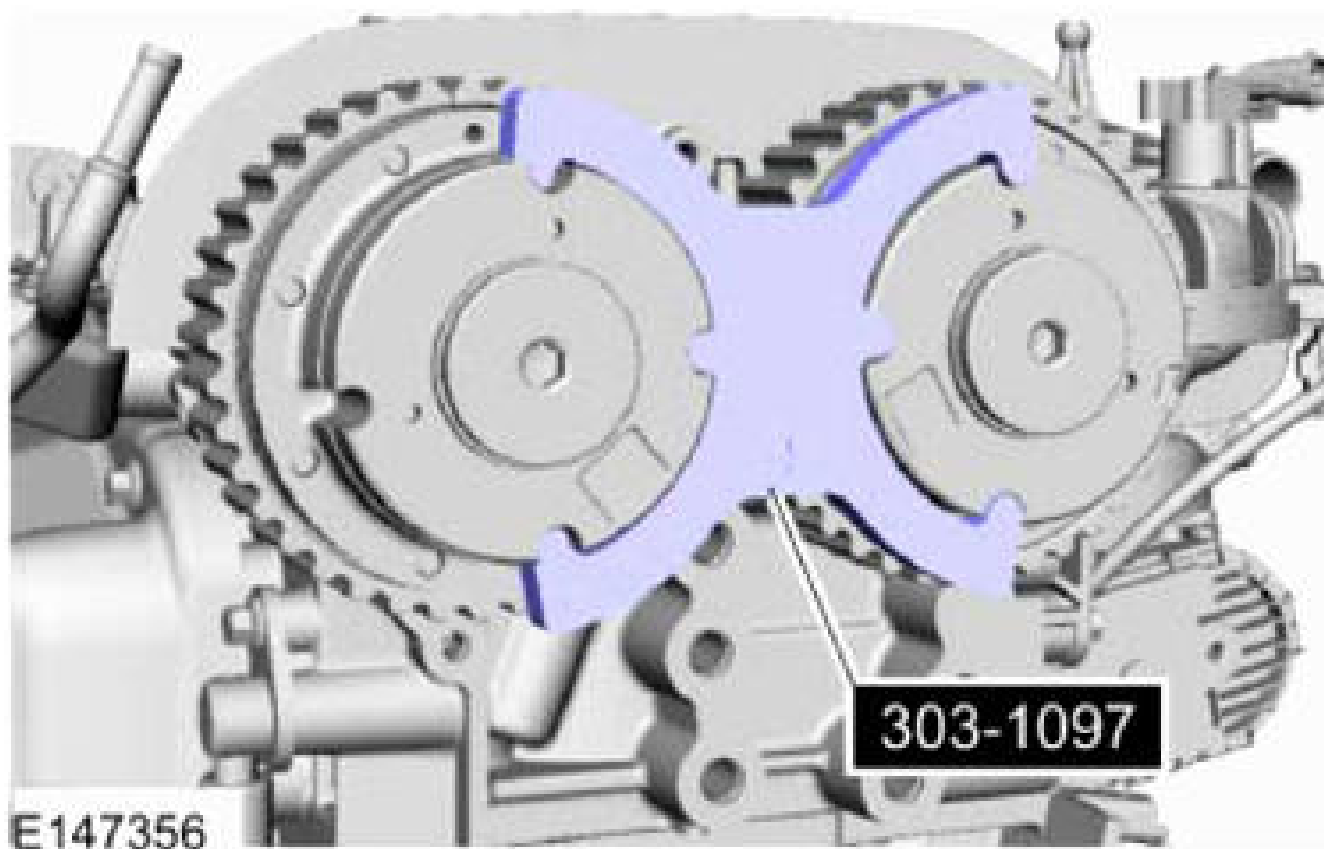


82.

83.



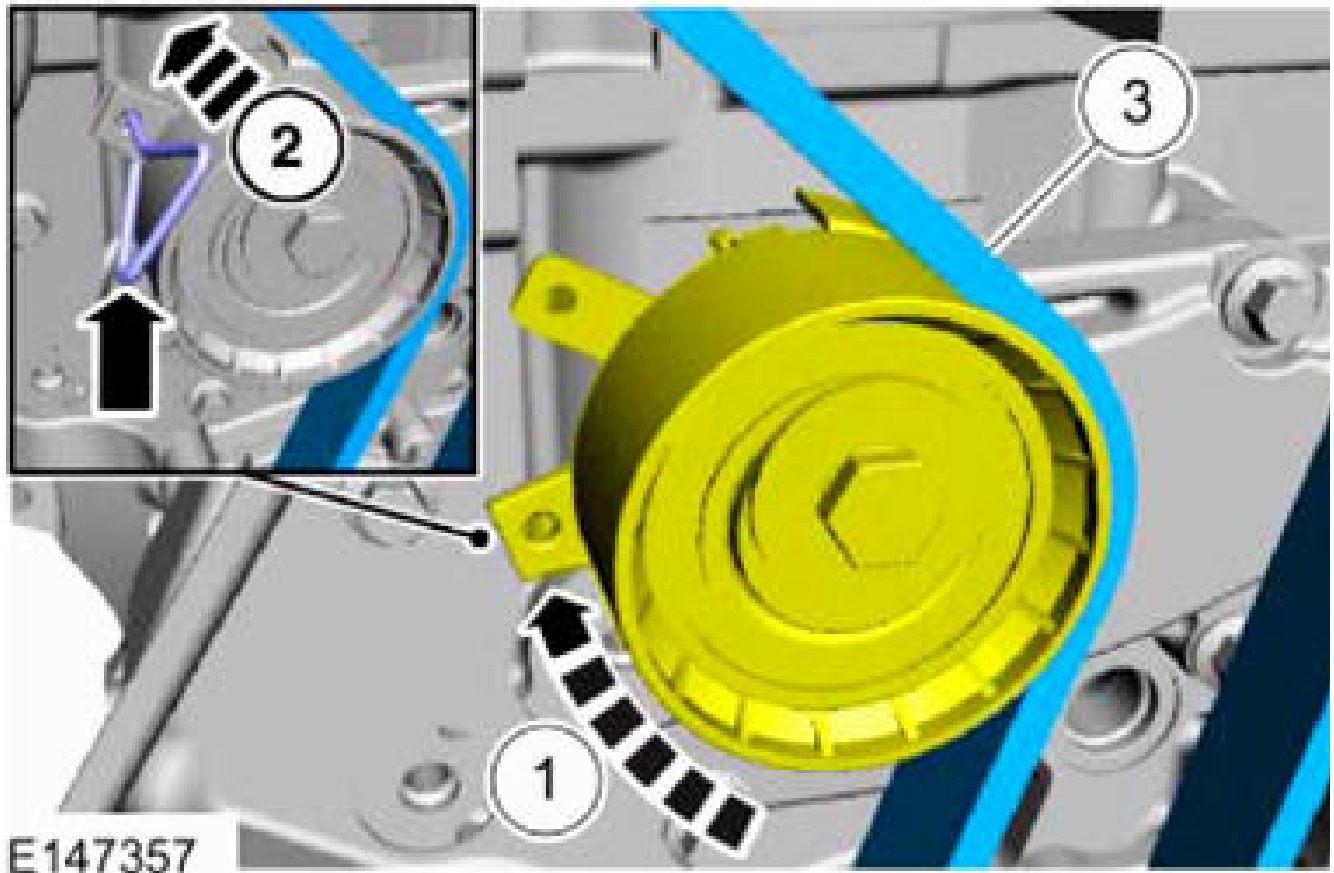
- 83.
84. *Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

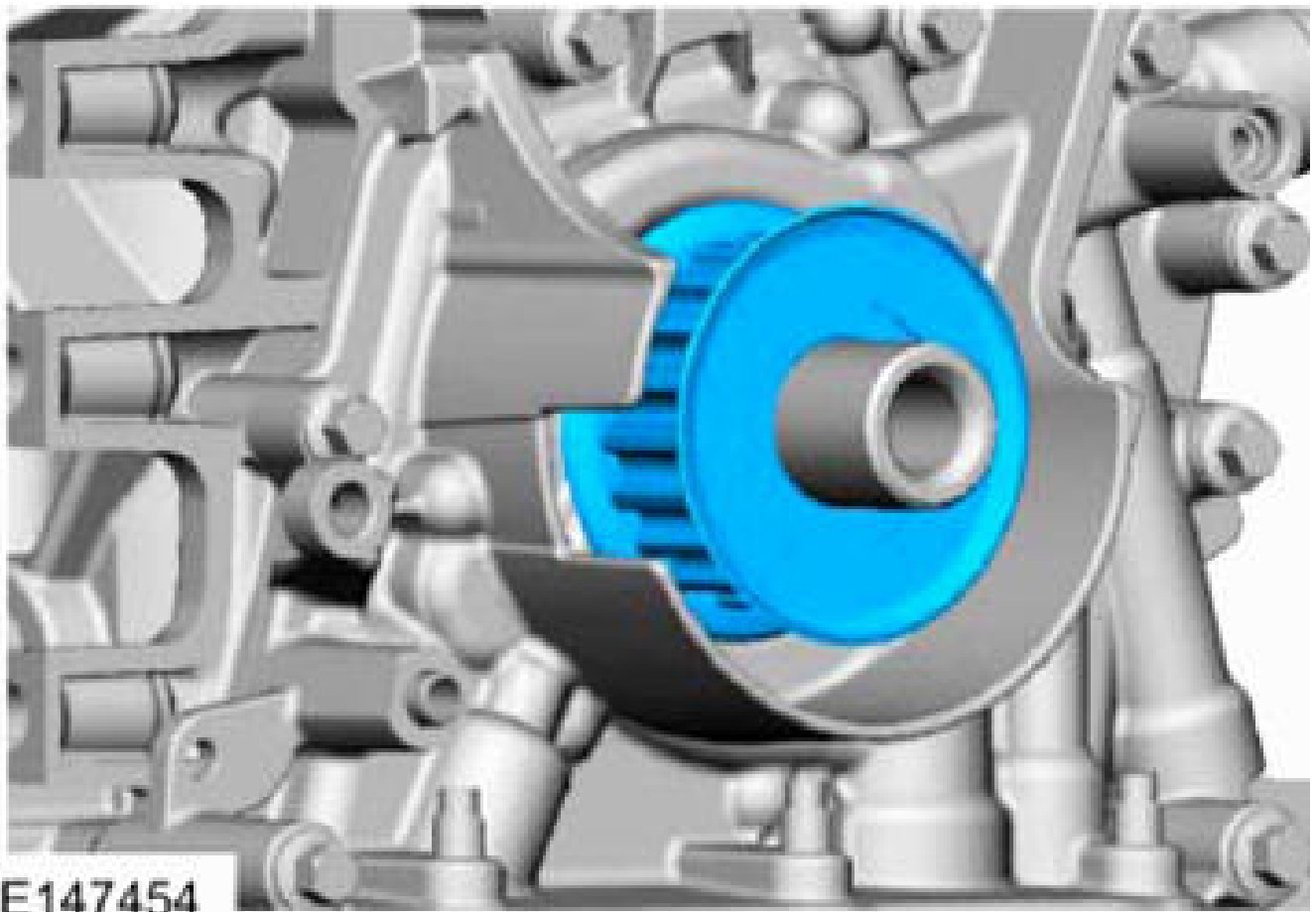
85.

Install a holding pin.

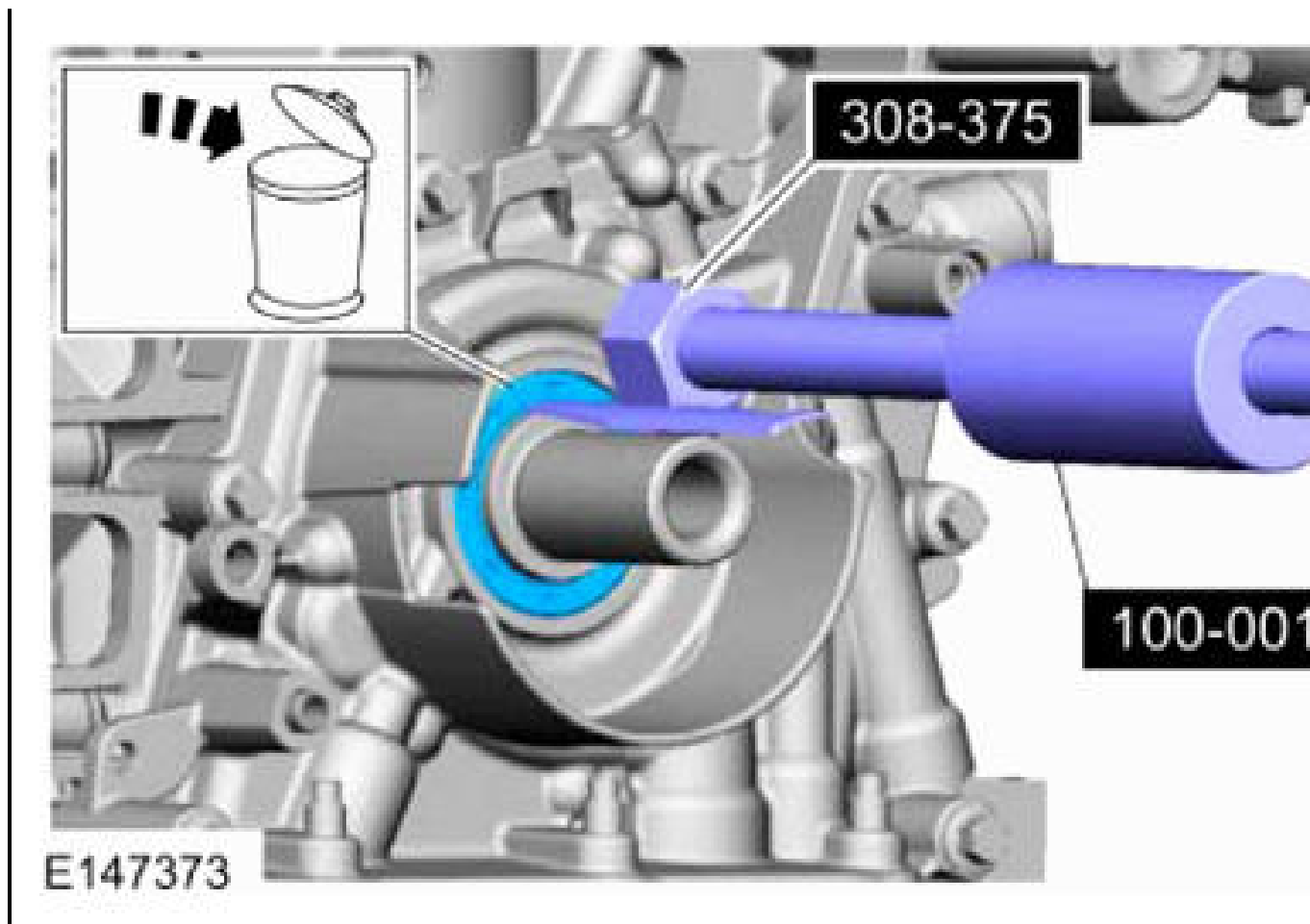


NOTE: Inspect the sprocket for damage. If damage is evident, replace the sprocket. If no damage, the sprocket is to be reused.

86.

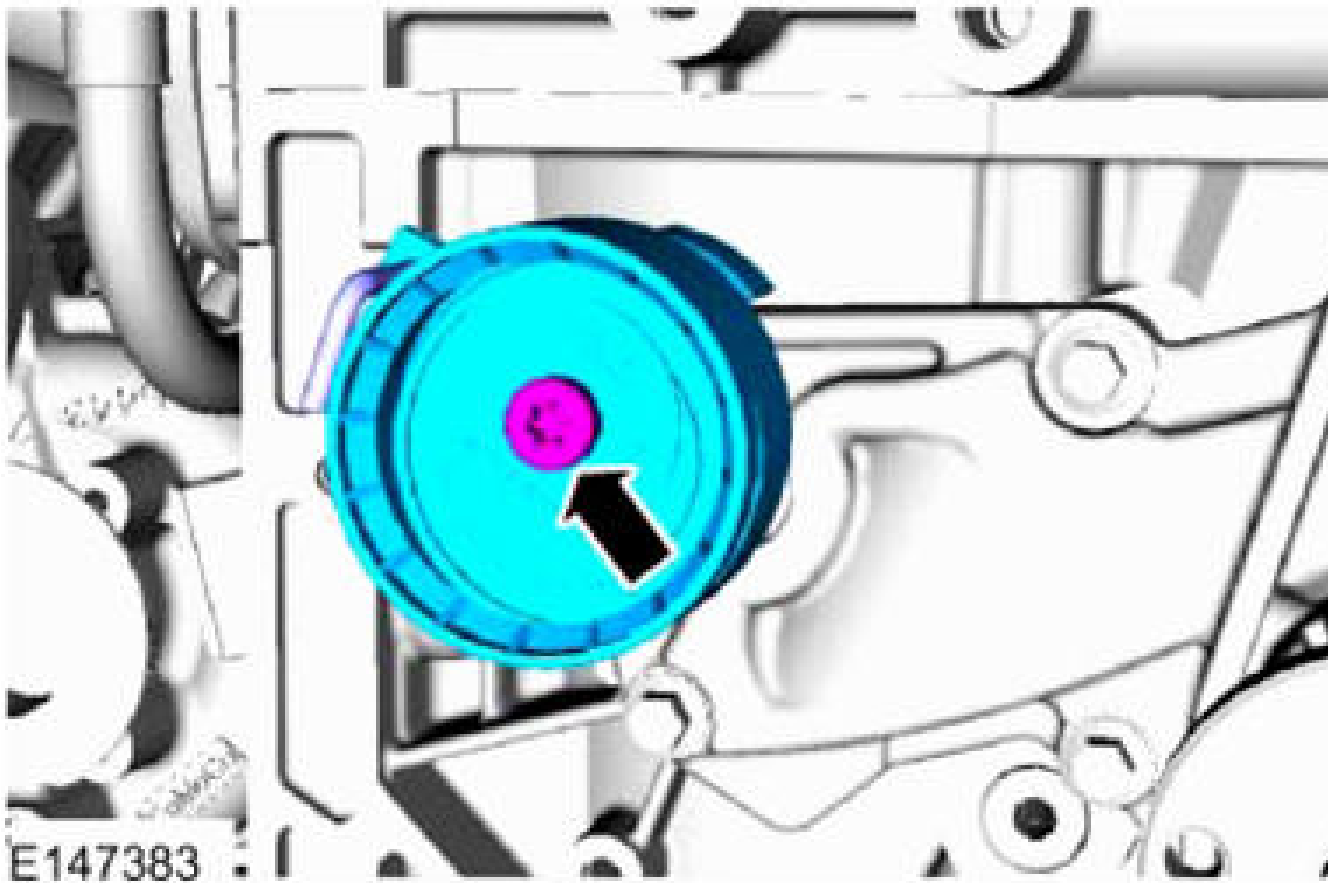


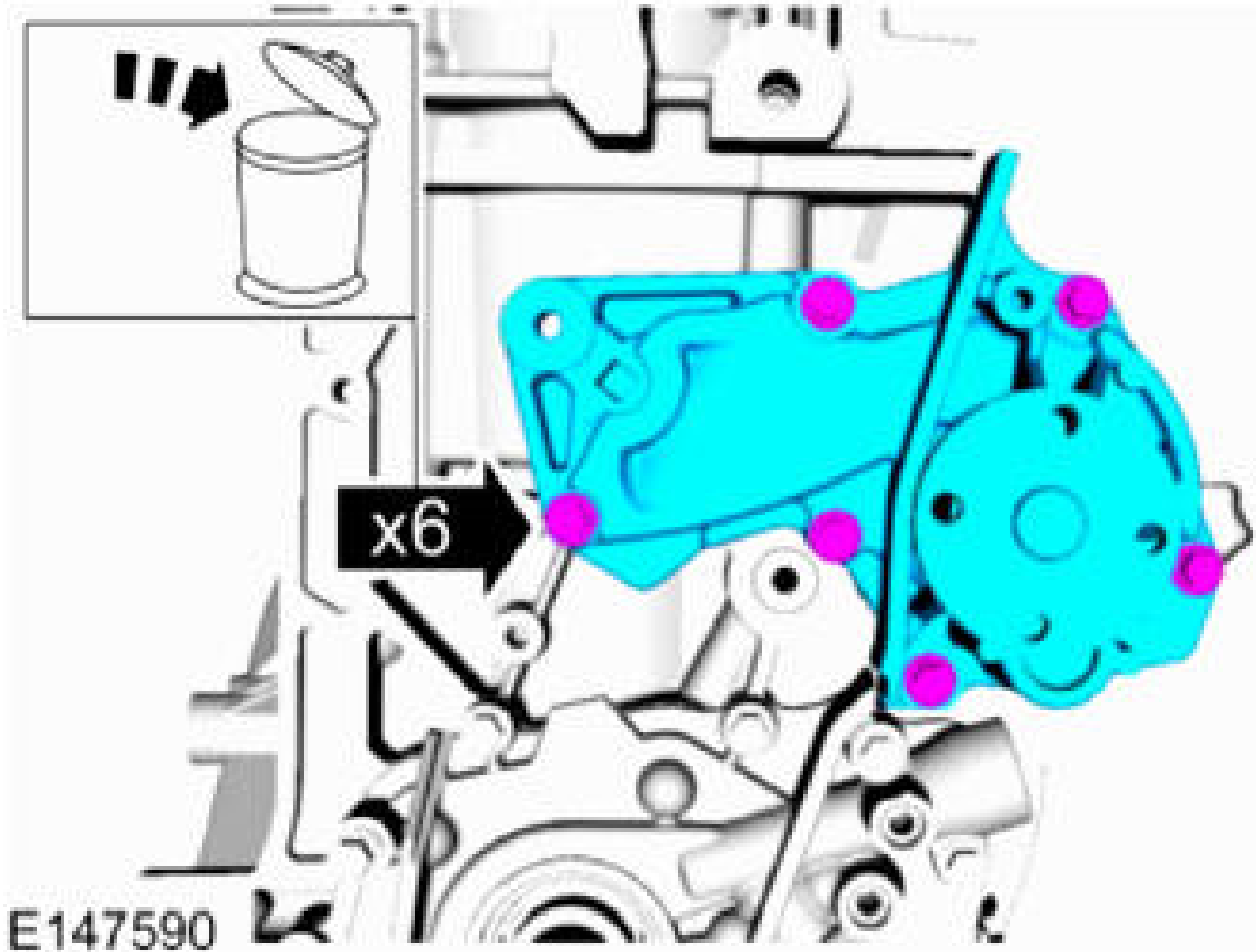
87. *Special Tool(s)* : **308-375 Remover, Input Shaft Seal , 100-001 (T50T-100-A) Slide Hammer**



WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

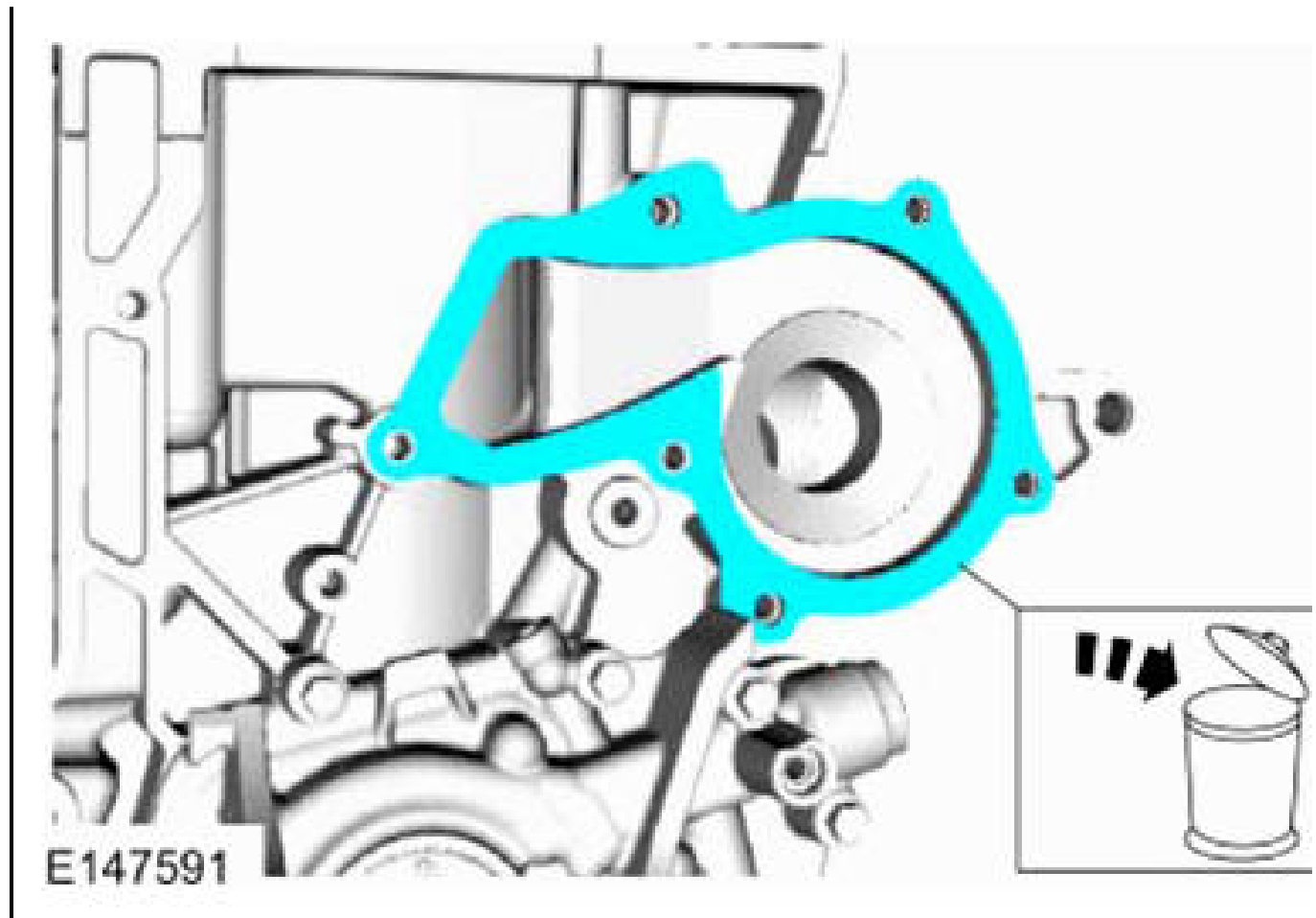
88.



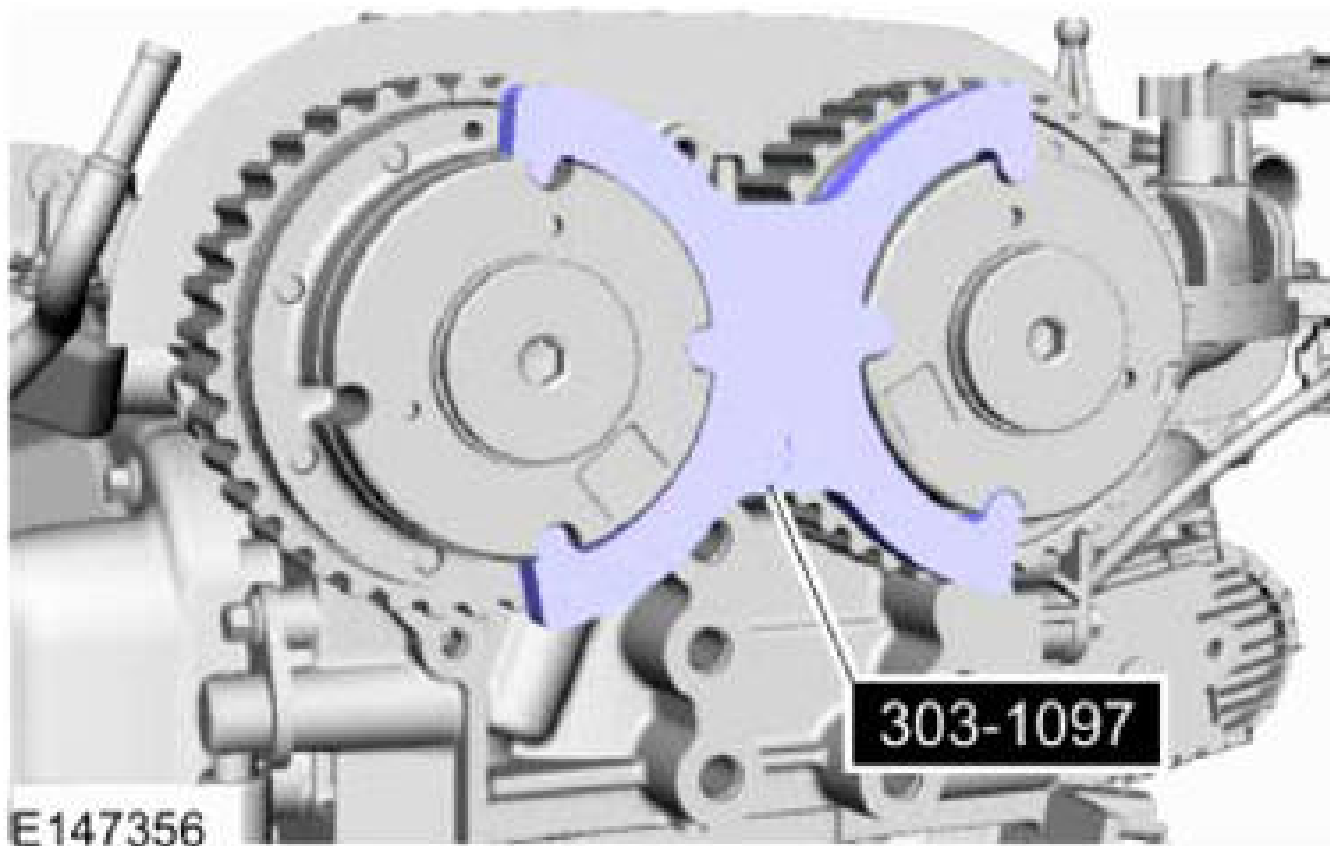


89.

90.

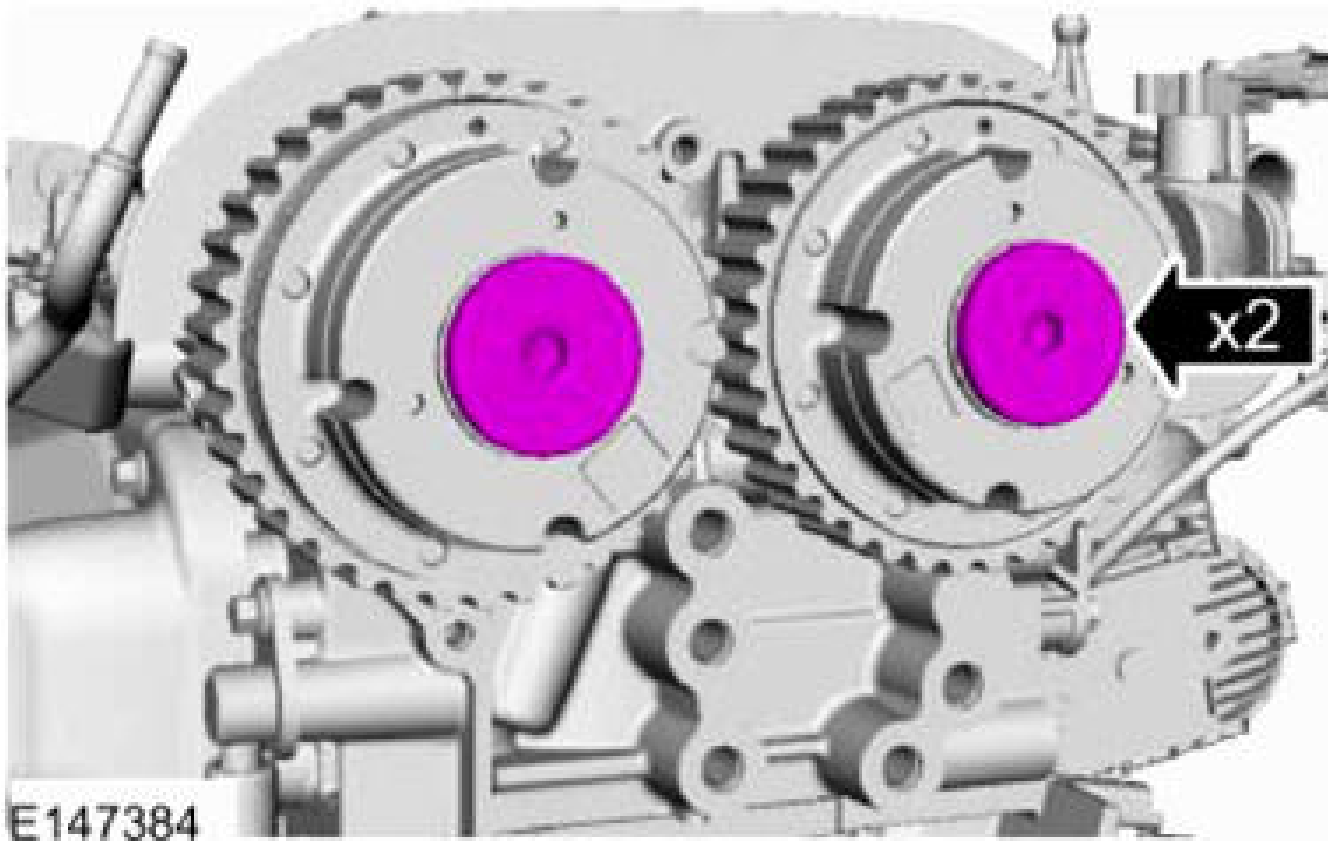


- 90.
91. *Remove Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



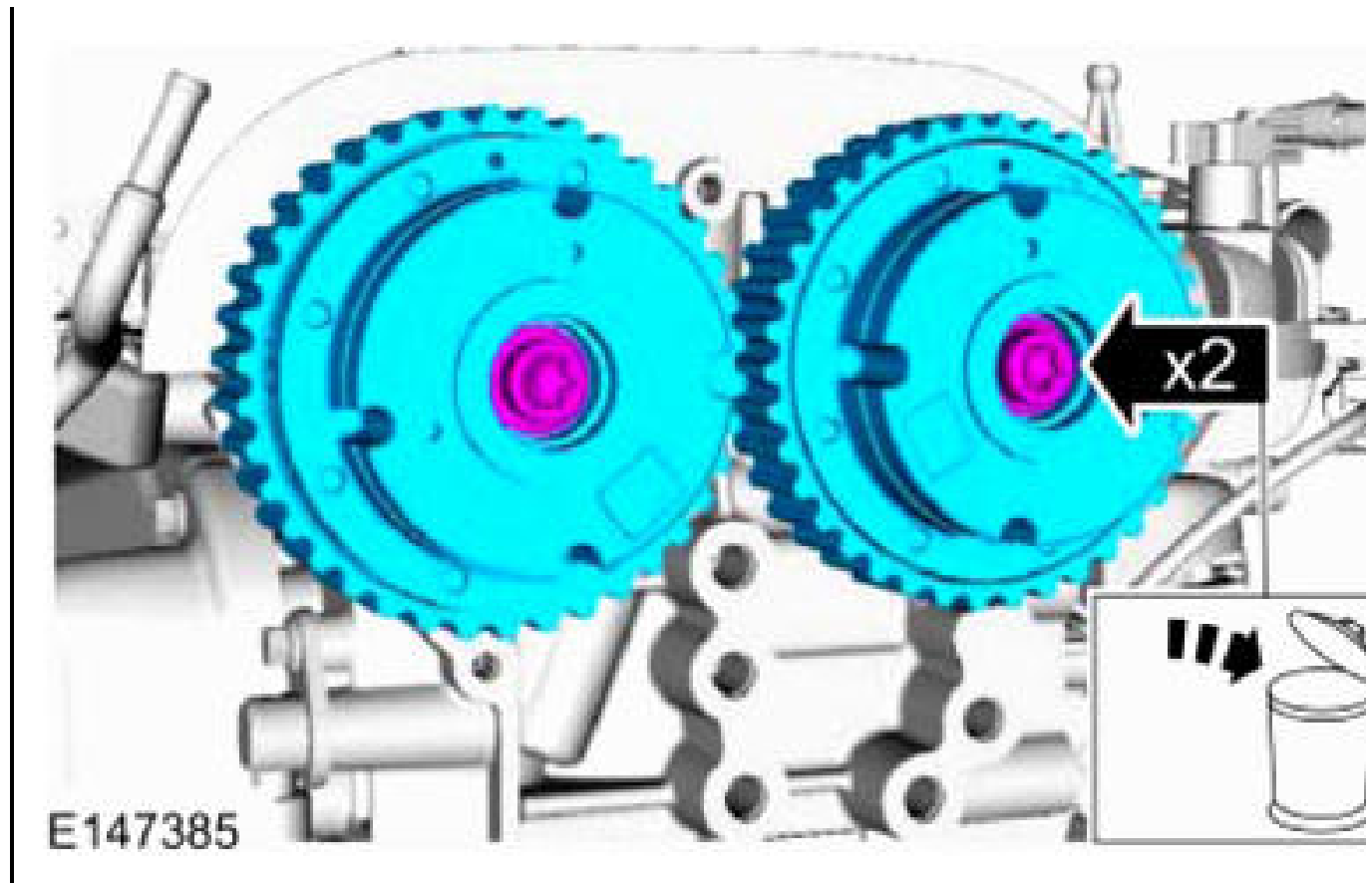
NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

92.

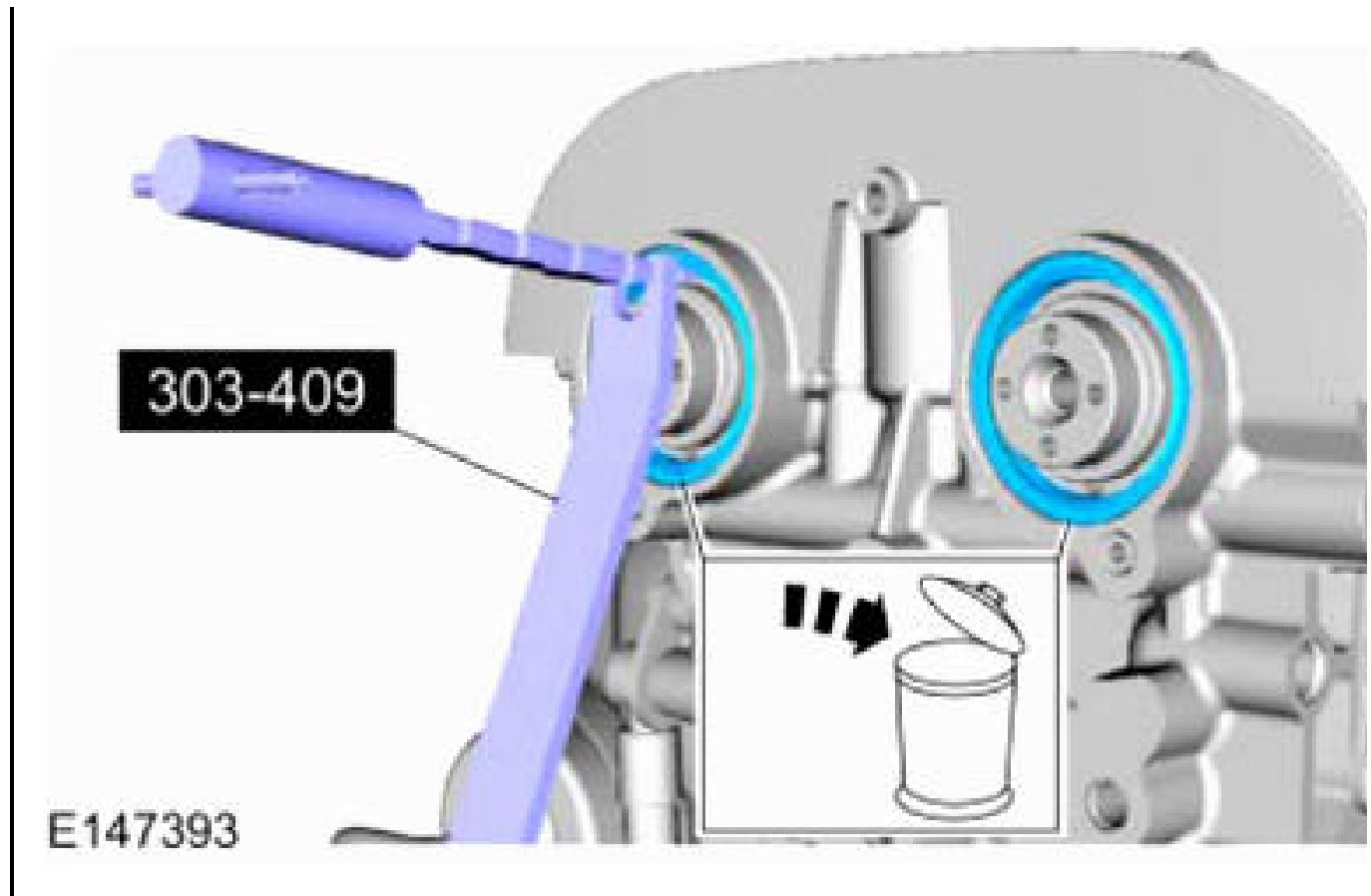


NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

93.



94. *Special Tool(s)* : 303-409 (T92C-6700-CH) Remover, Crankshaft Seal



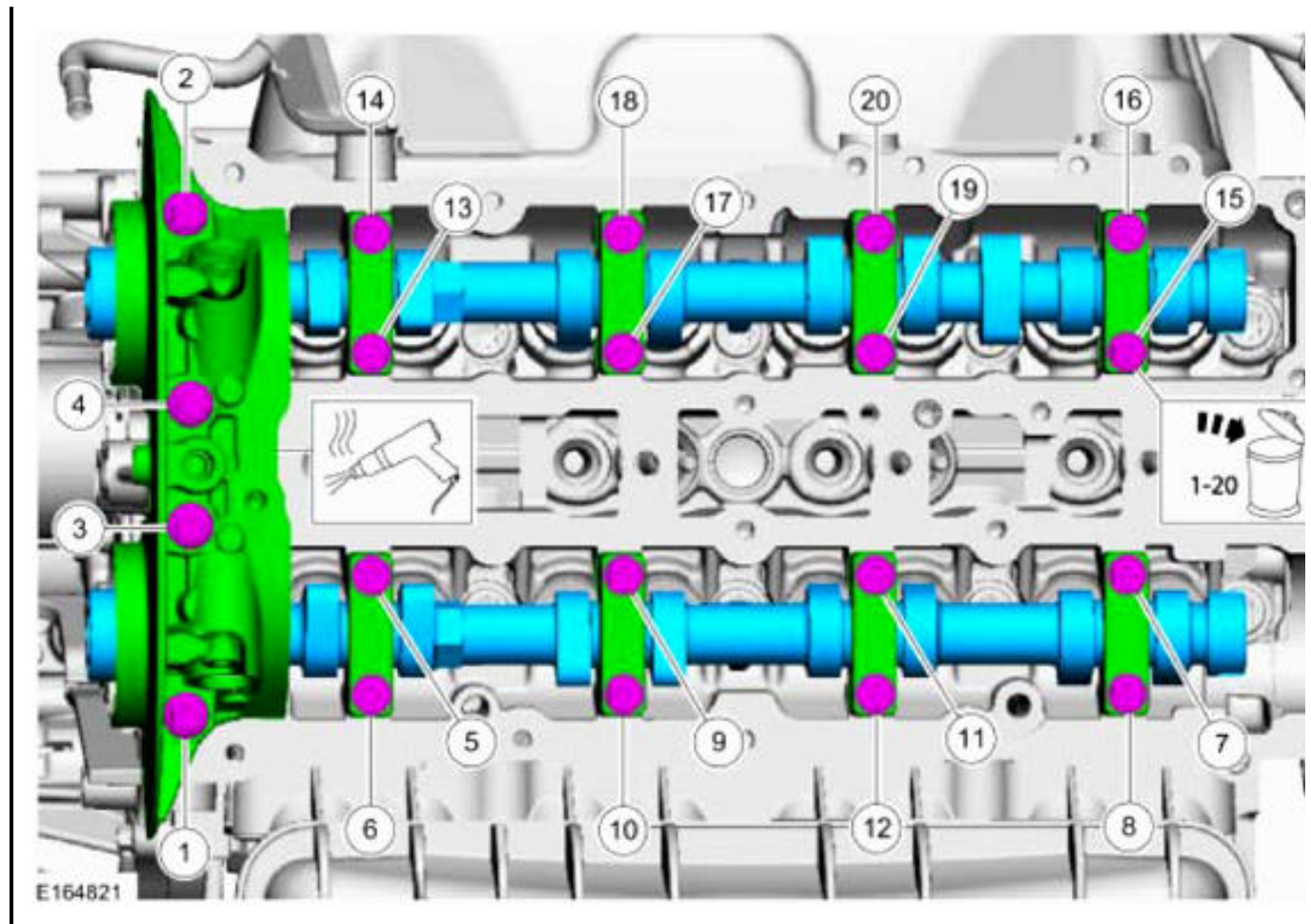
95.

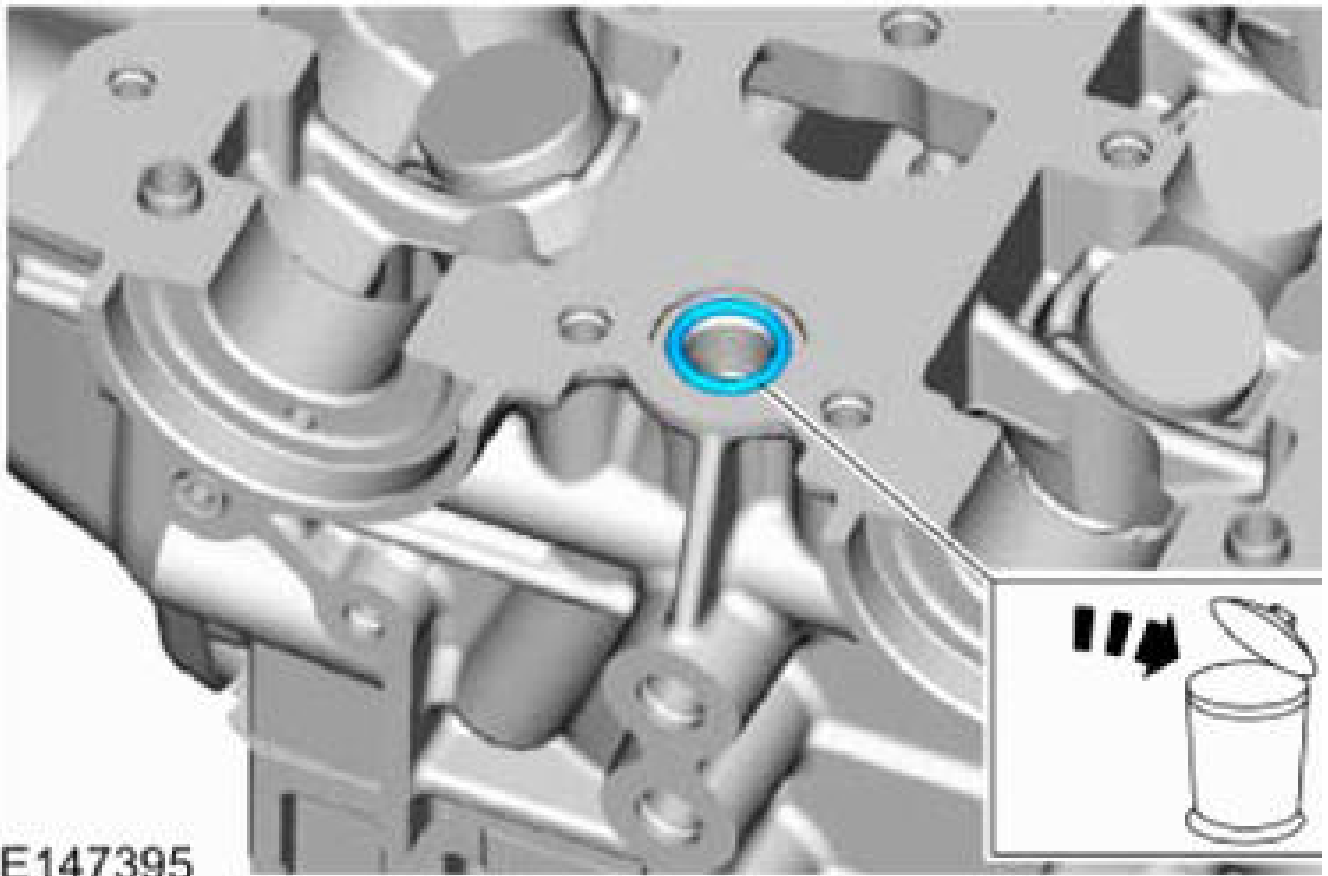
NOTE: Use a heat gun to soften the flange sealant, this will aid in the removal of the camshaft mega cap. Failure to follow these directions may result in damage to the camshaft mega cap.

NOTE: Do not pry on camshafts when removing or damage to the camshafts may occur.

NOTE: Mark the position of each component before removal.

General Equipment : Hot Air Gun



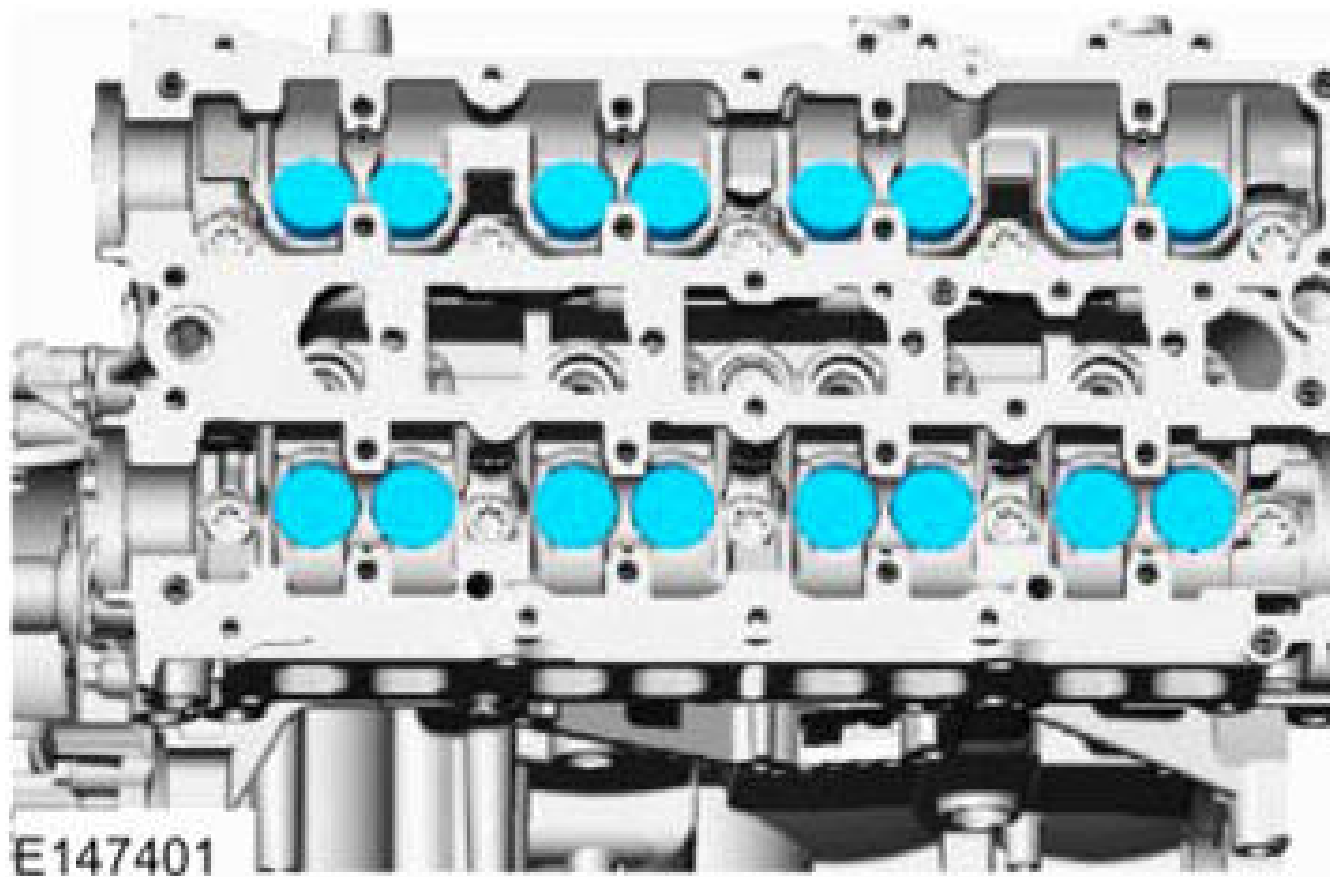


96.

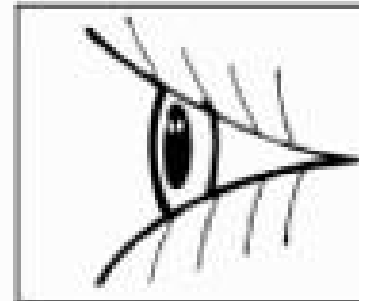
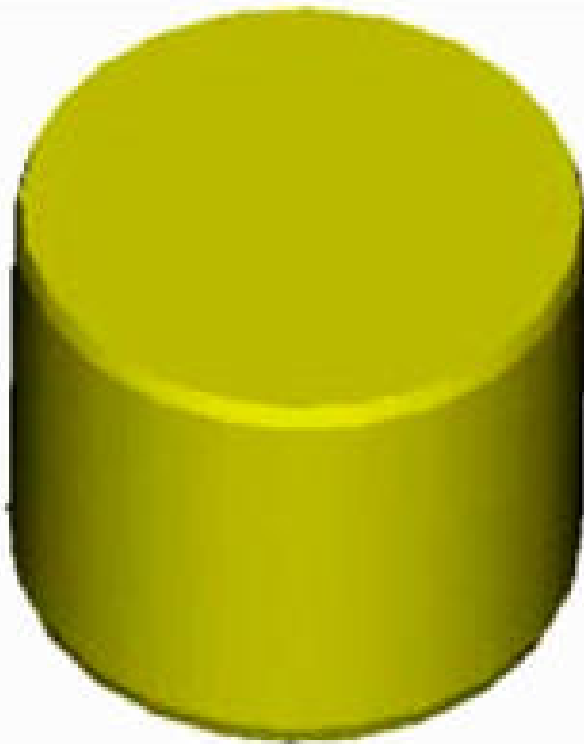
NOTE: If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

97.

NOTE: The number on the valve tappets only reflects the digits that follow the decimal. For example, a tappet with the number 0.650 has the thickness of 3.650 mm.

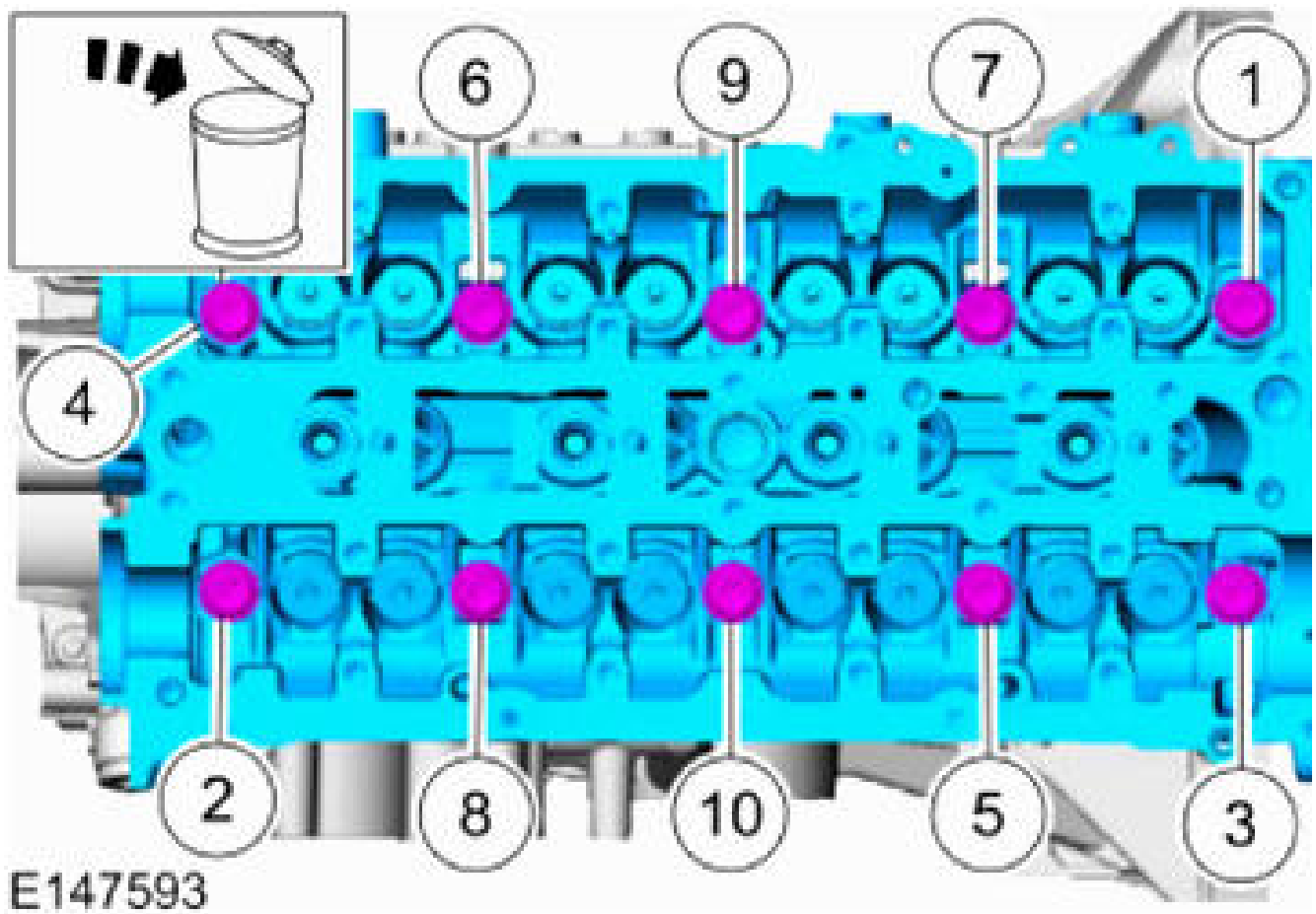


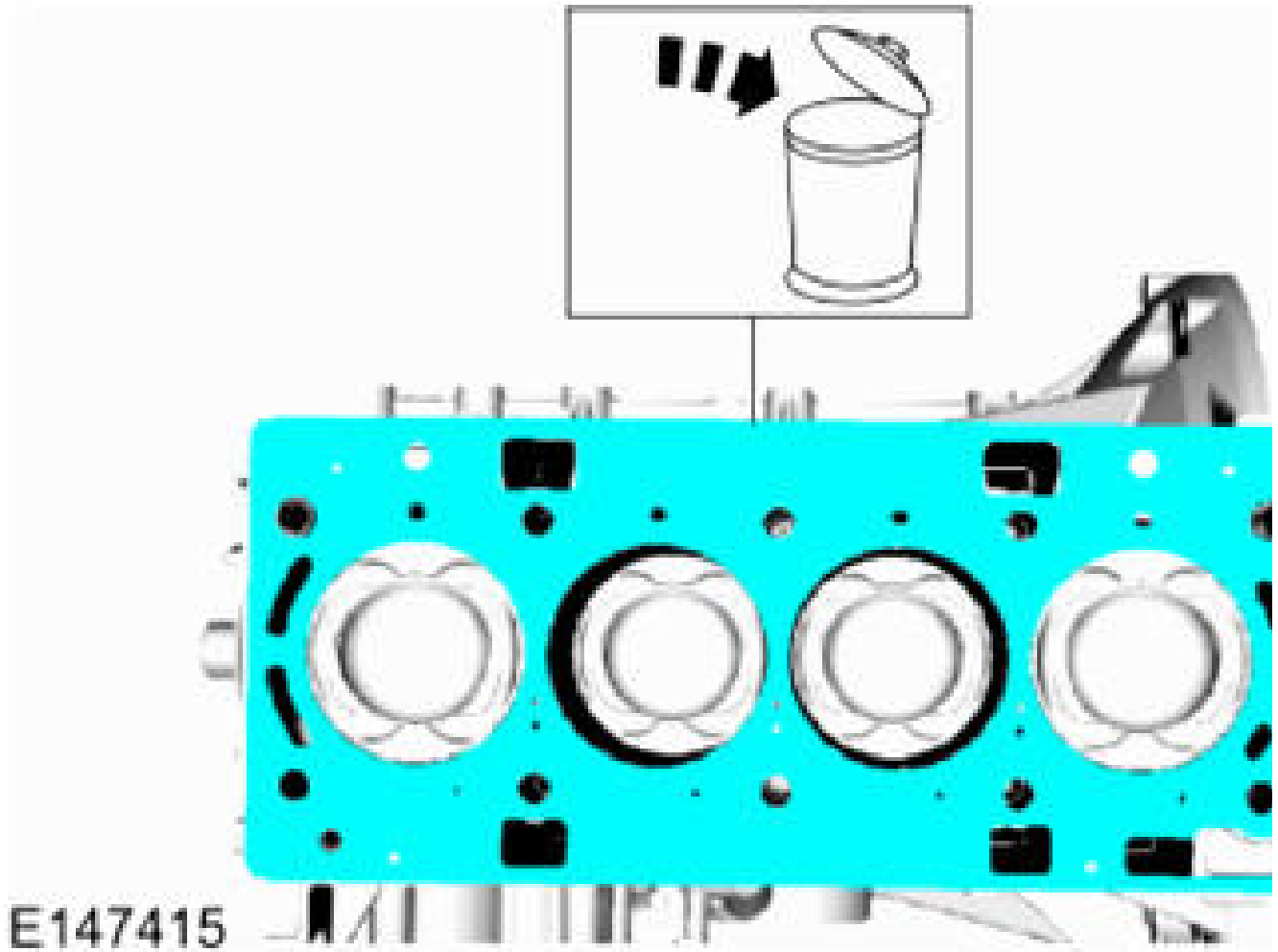
98. Install new components as necessary.



E147402

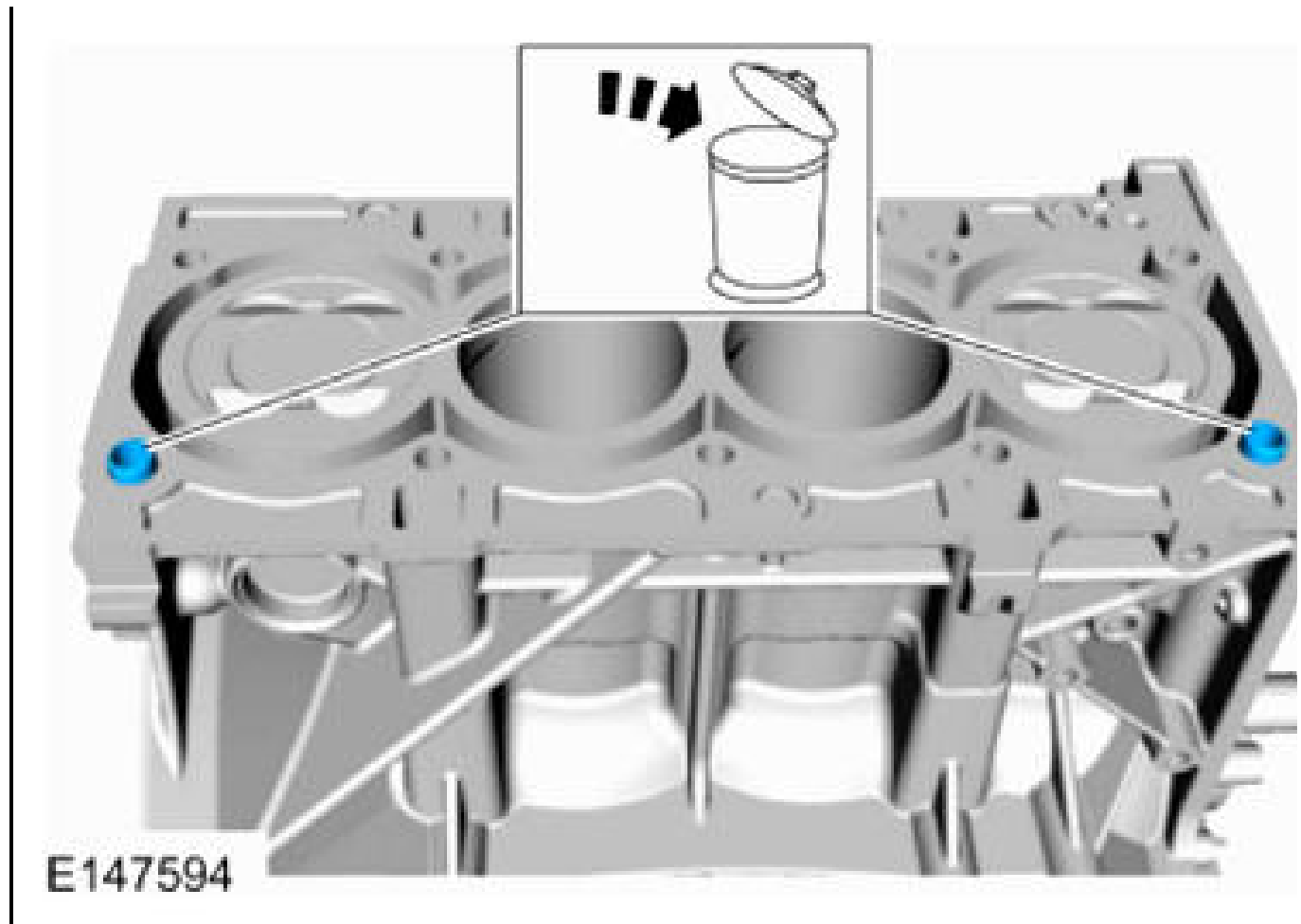
99. **NOTE:** Make sure that the cylinder head is at ambient air temperature before removing the cylinder head bolts.





100.

101.

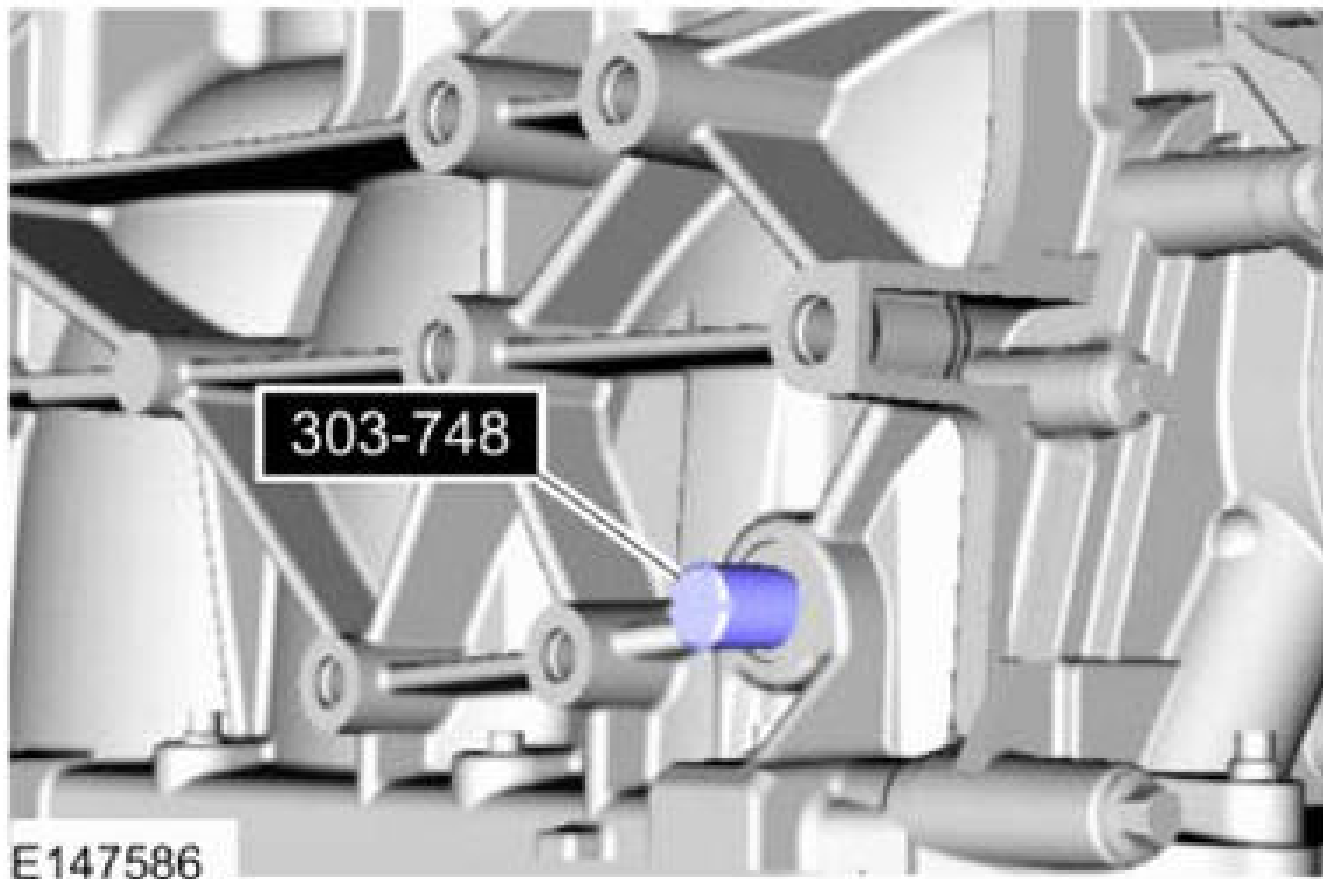


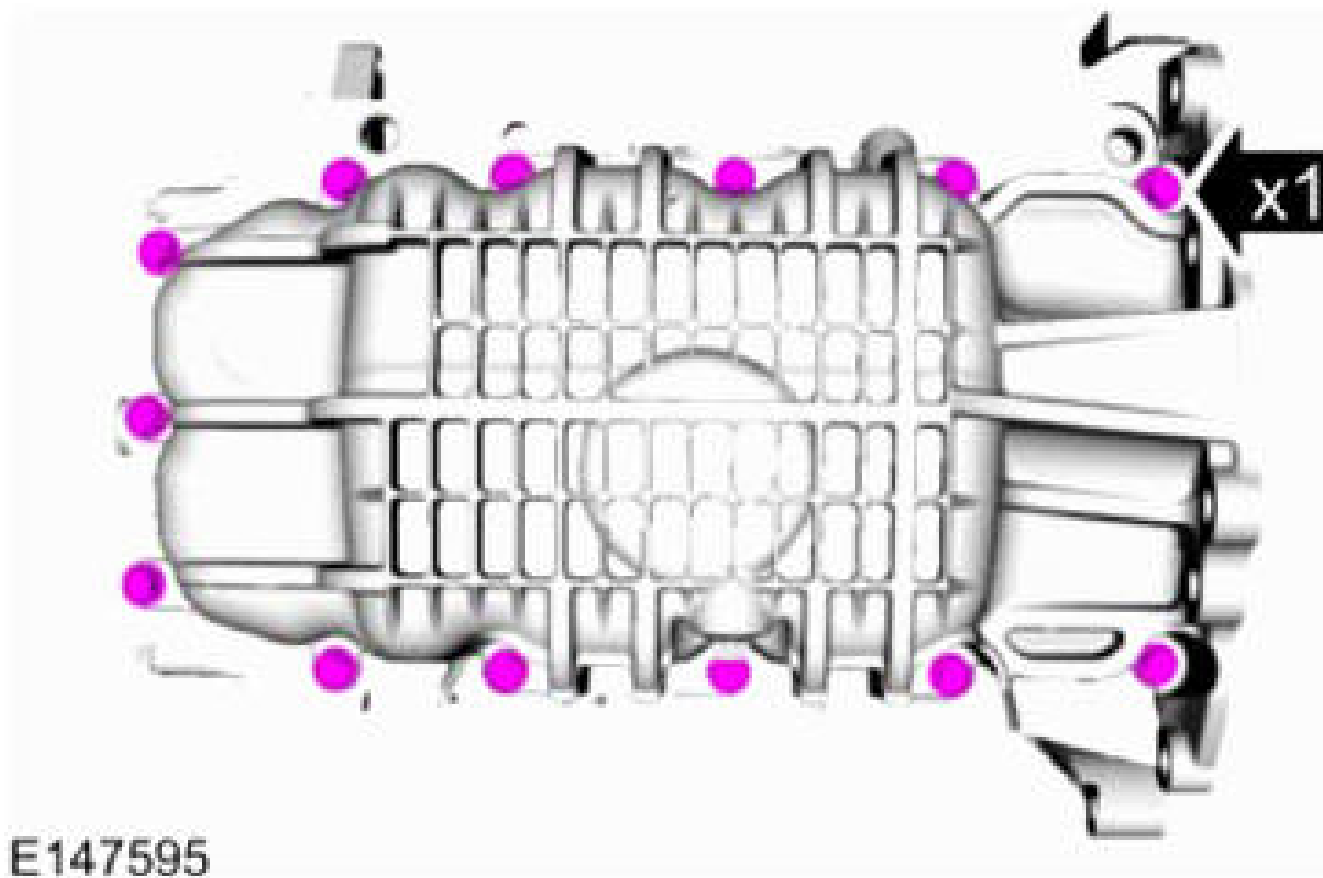
101.

102. Refer to: **CYLINDER HEAD DISTORTION** .

Refer to: **CYLINDER BLOCK DISTORTION** .

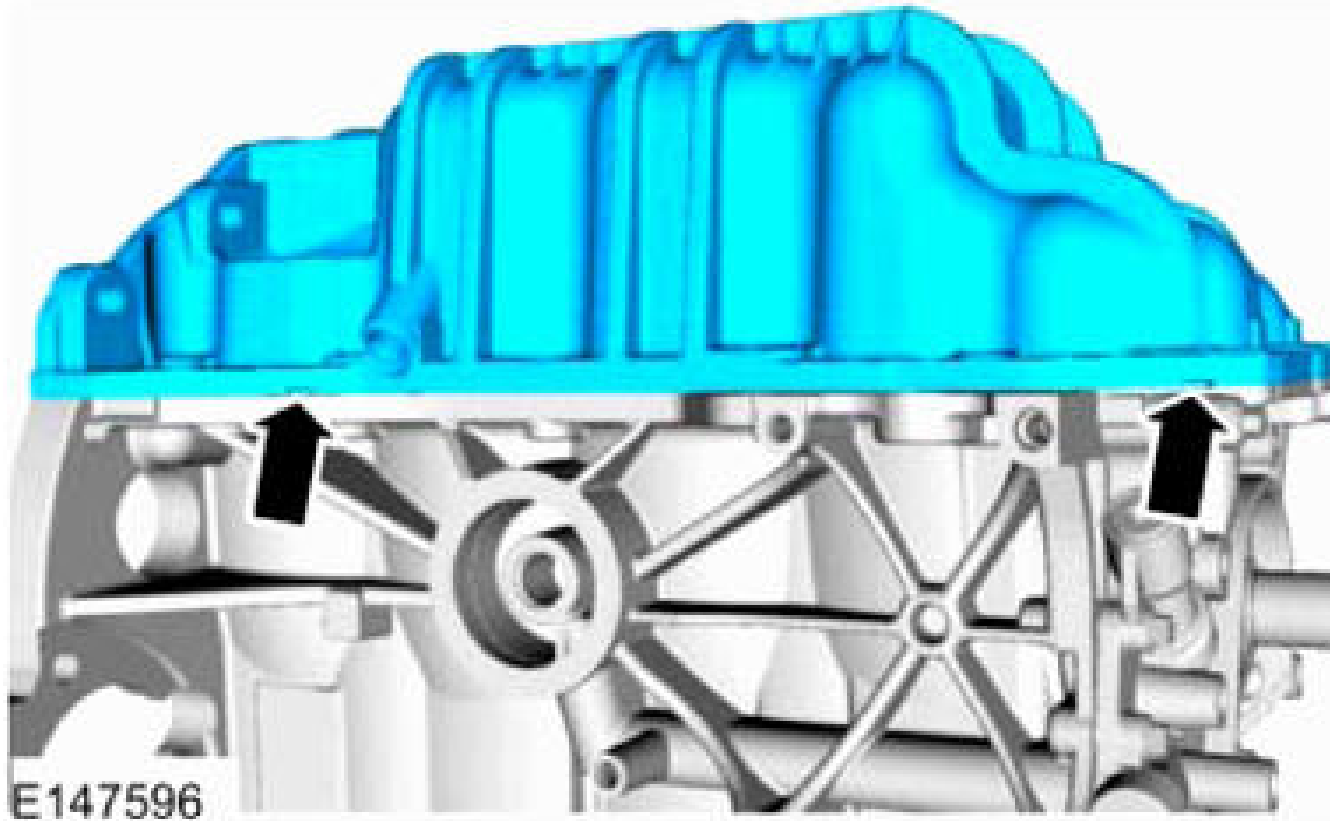
103. *Remove Special Service Tool : 303-748 Locking Tool, Crankshaft*

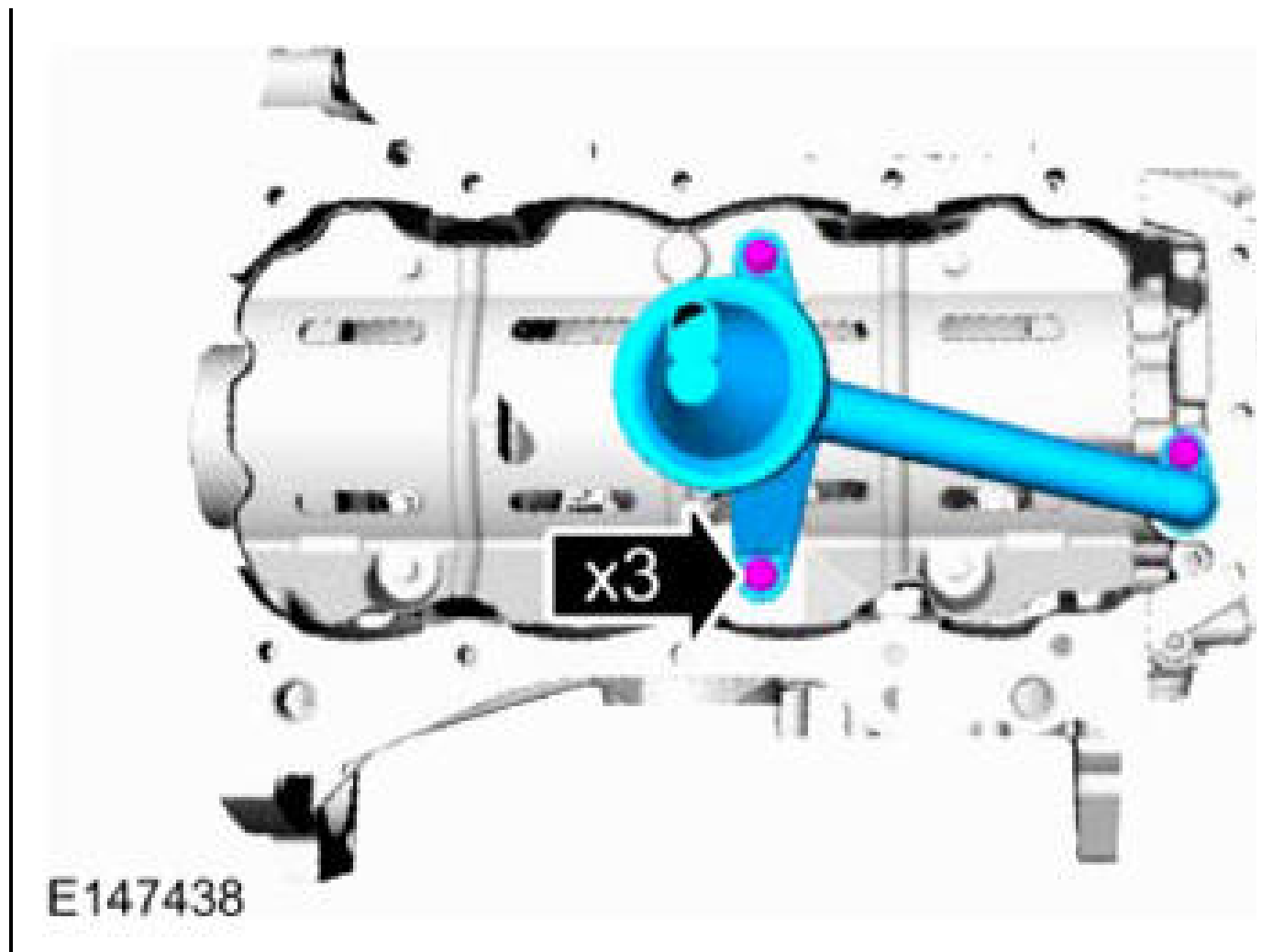




104.

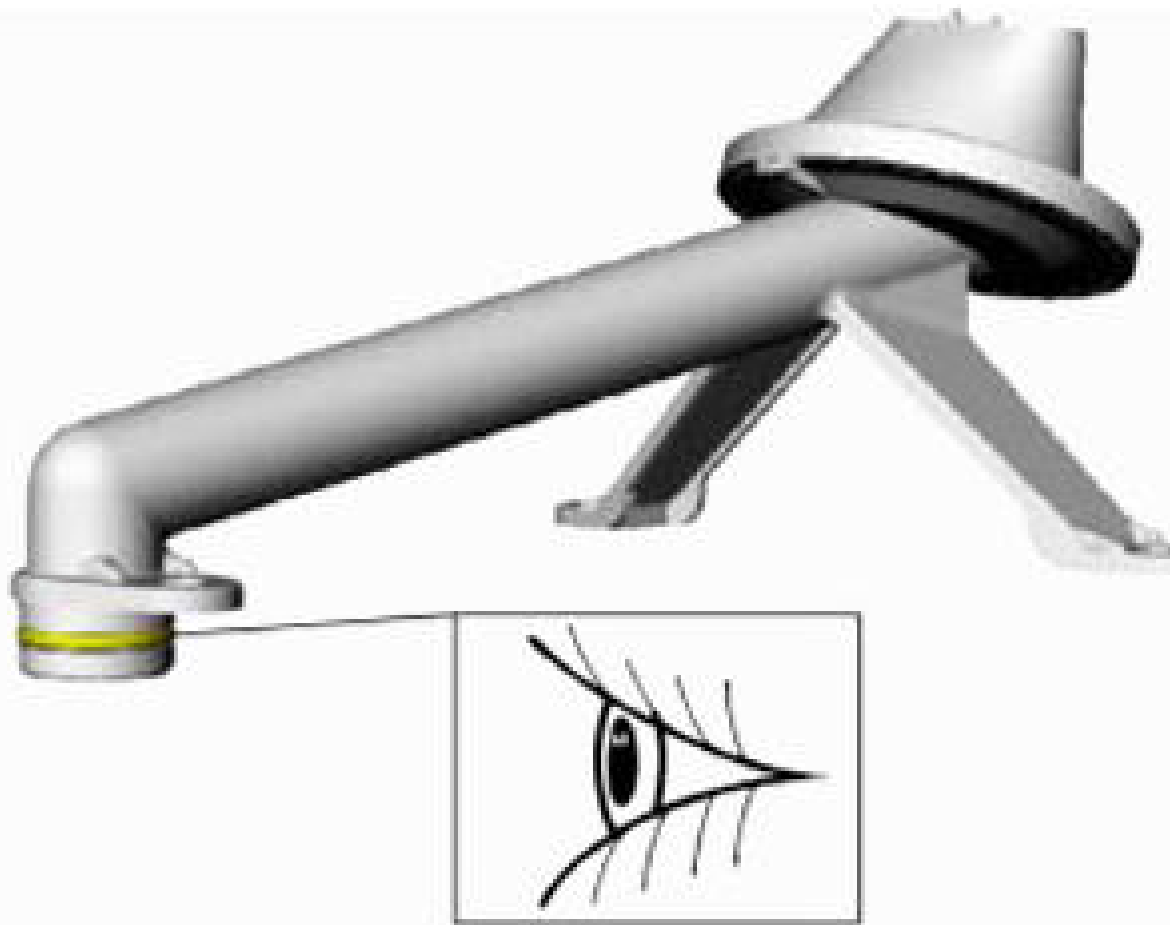
105. Pry pads.



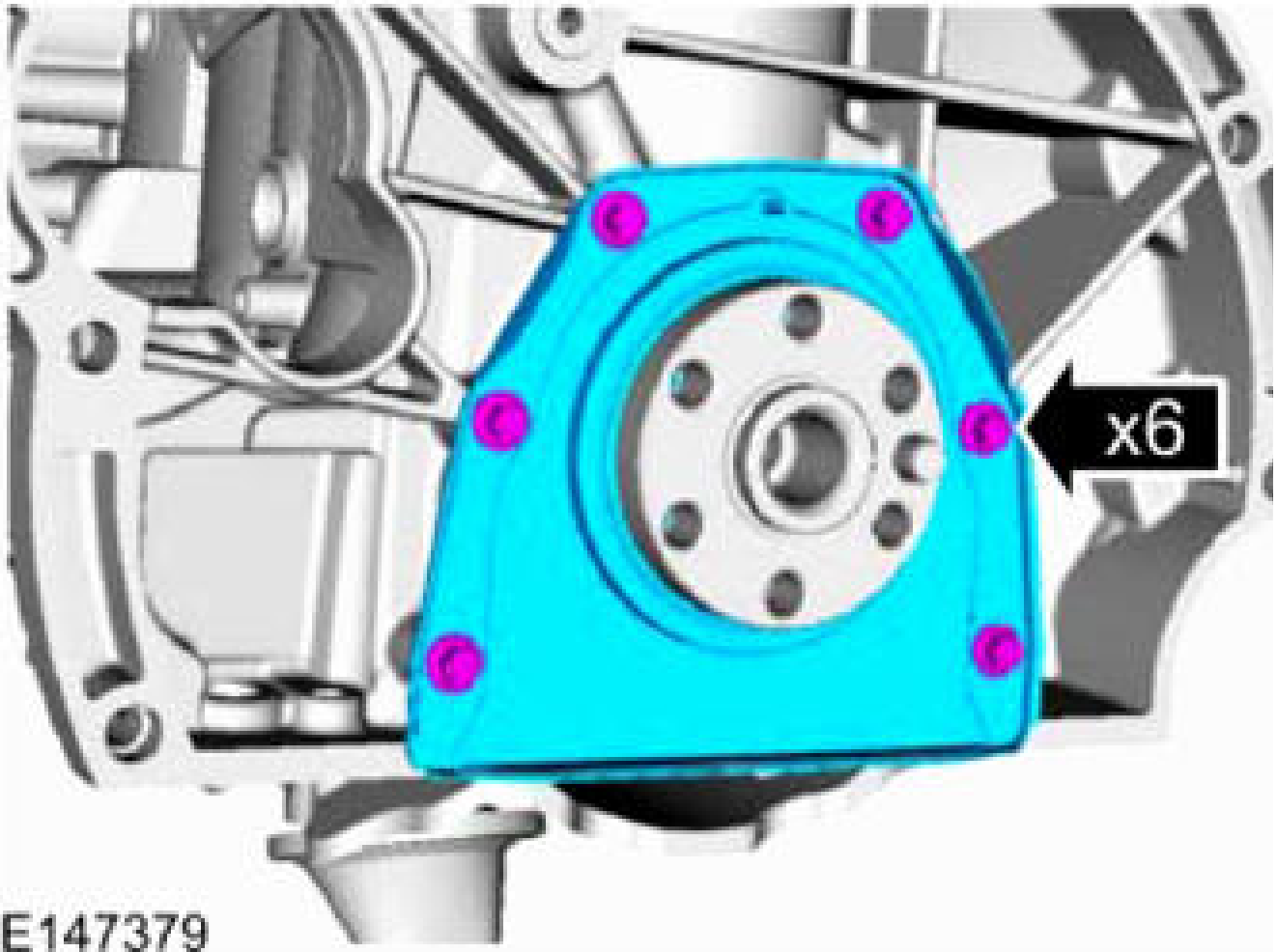


106.

107. **NOTE:** The O-ring seal is to be reused unless damaged.

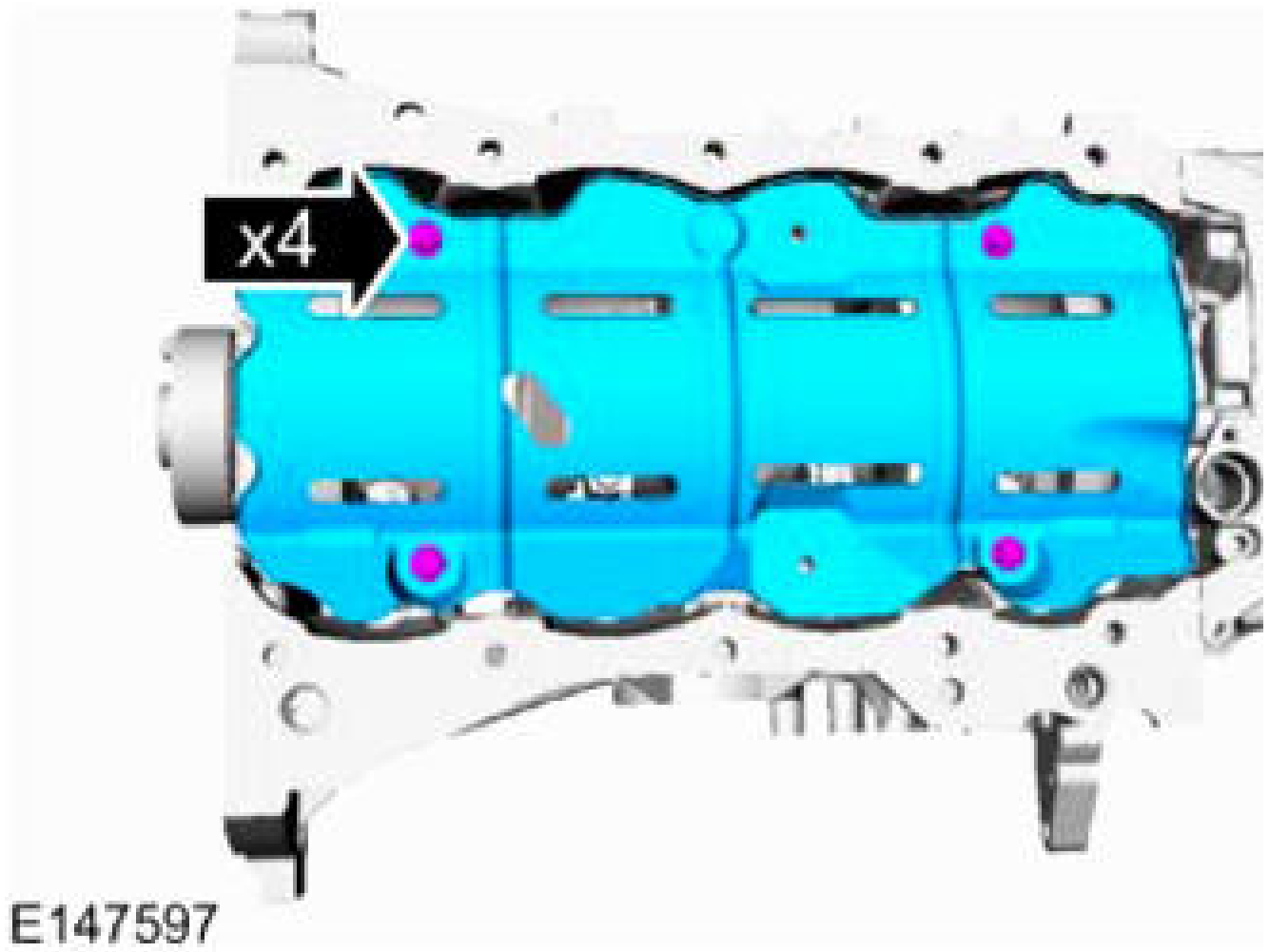


E147439



108.

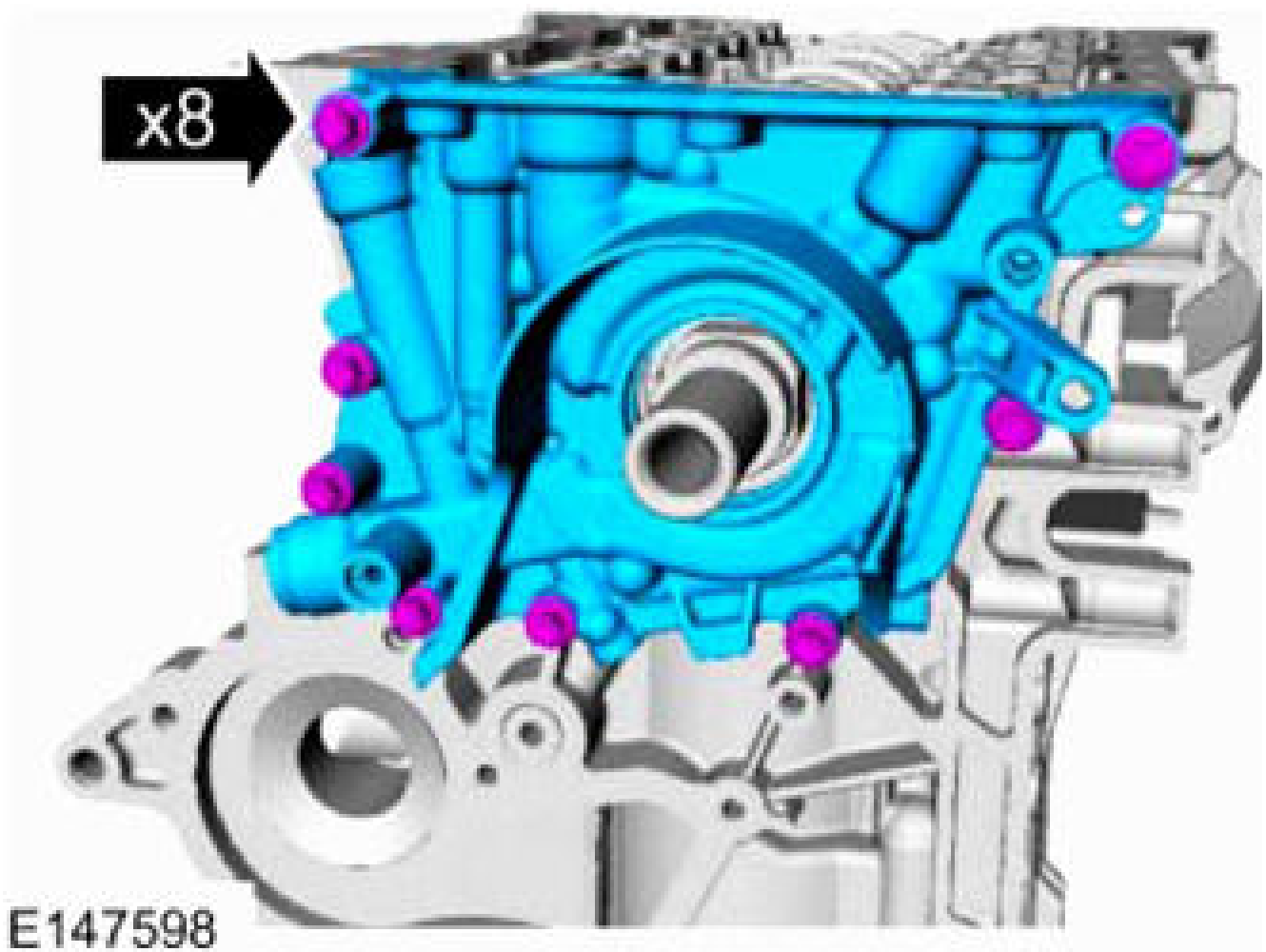
109.

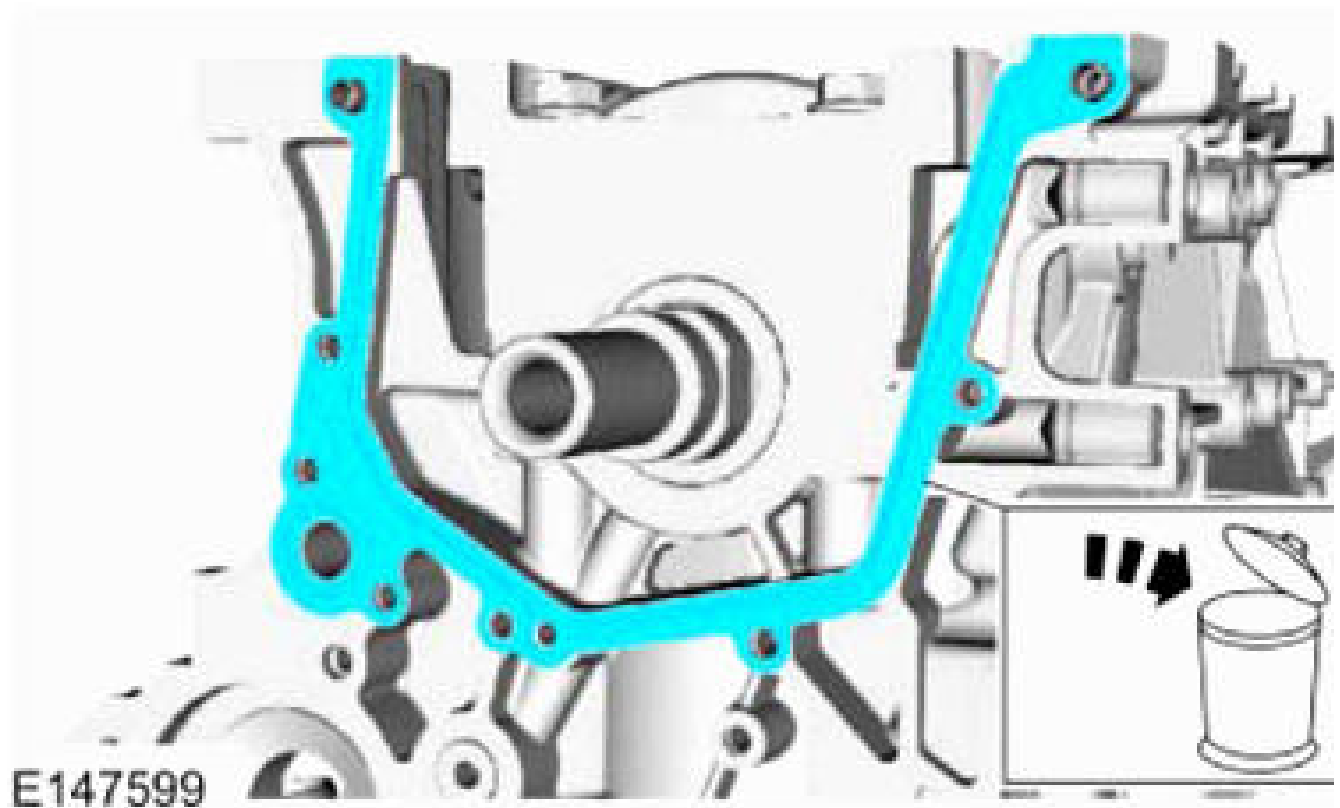


109.

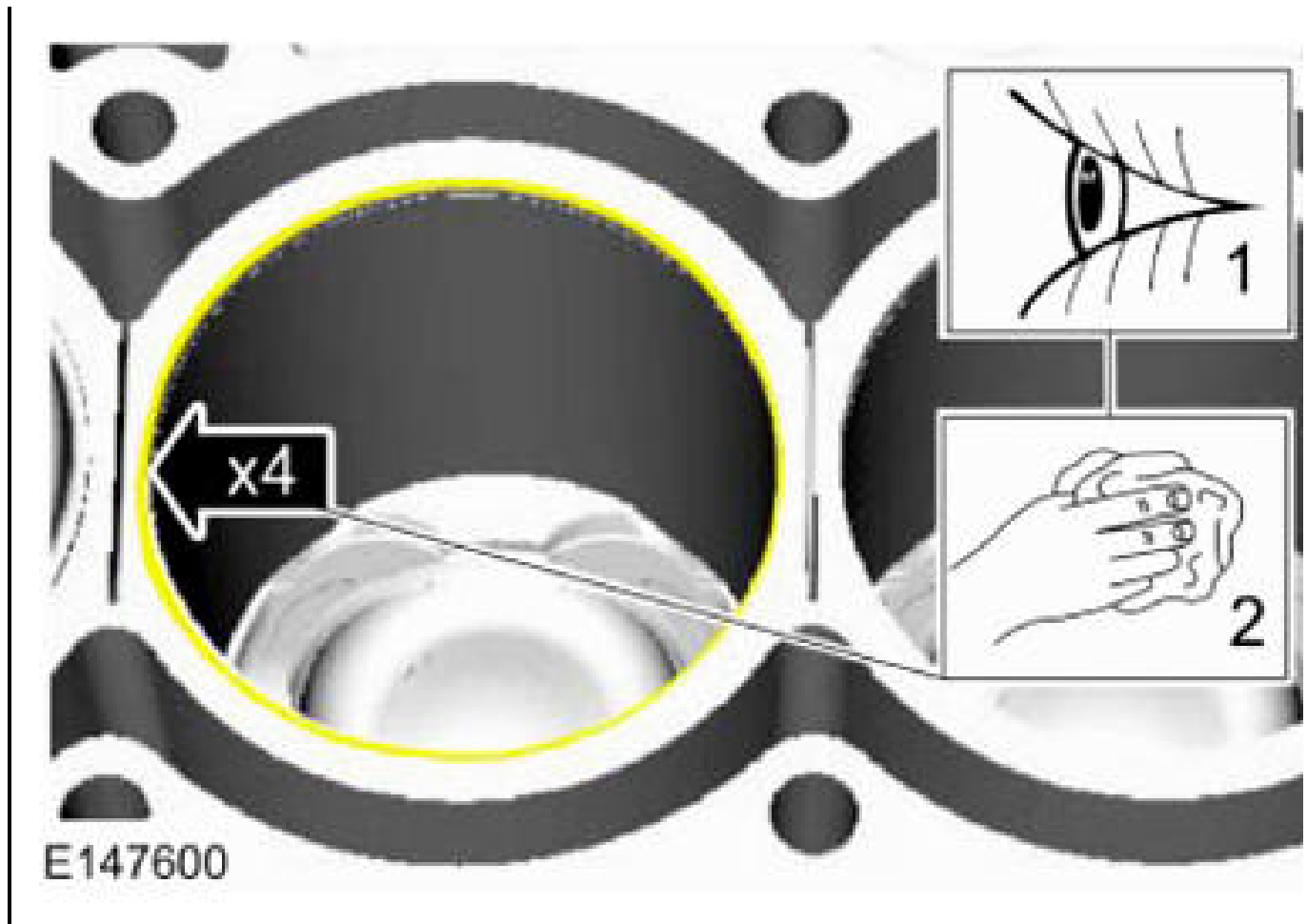
110.

NOTE: Mark the location of the 3 different length bolts.





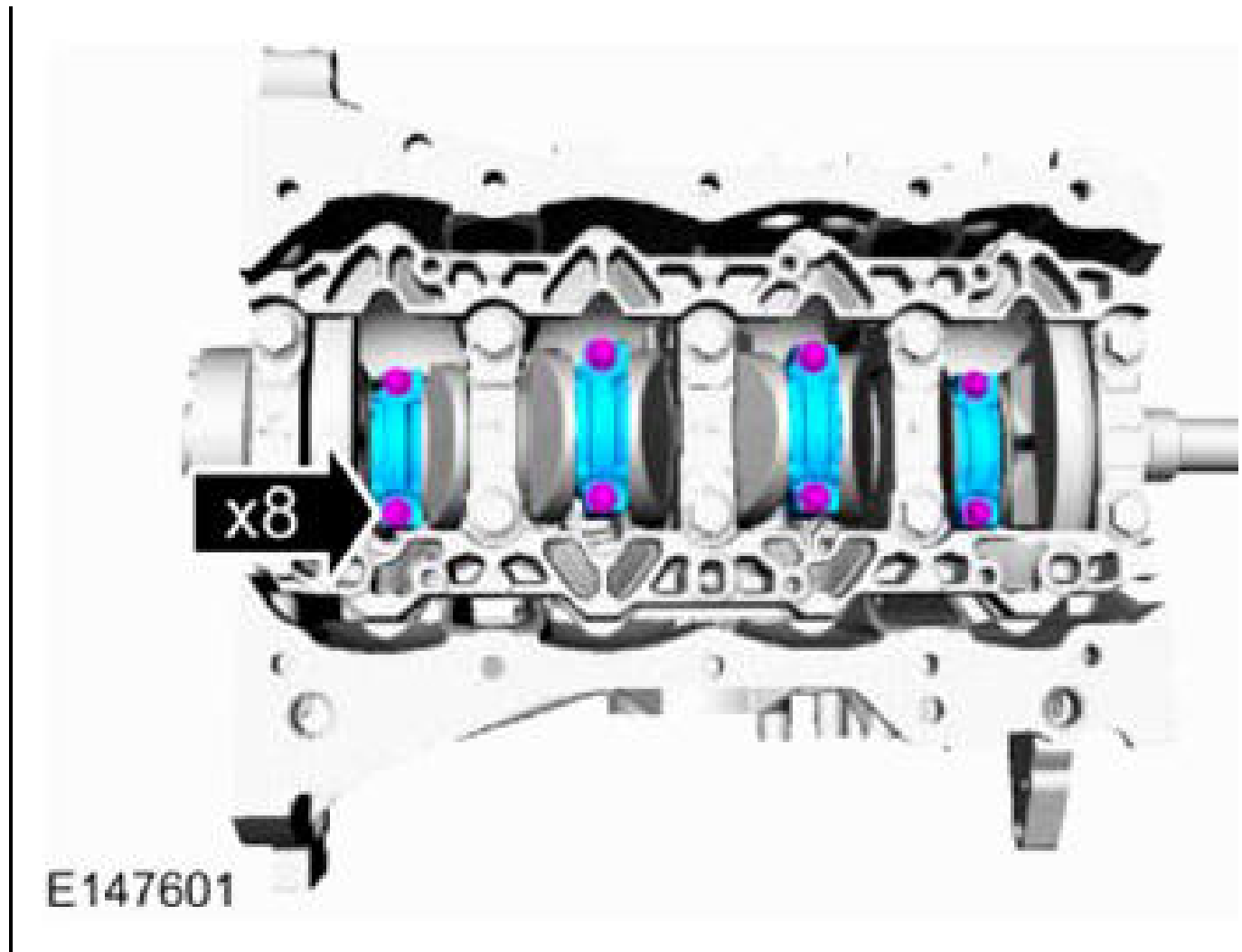
- 111.
112. Clean the specified component with an abrasive pad.



NOTE: The connecting rod cap bolts are a torque-to-yield design. The original connecting rod cap bolts will be used when measuring the connecting rod large end bore during assembly. The connecting rod cap bolts will be discarded after measurement.

113.

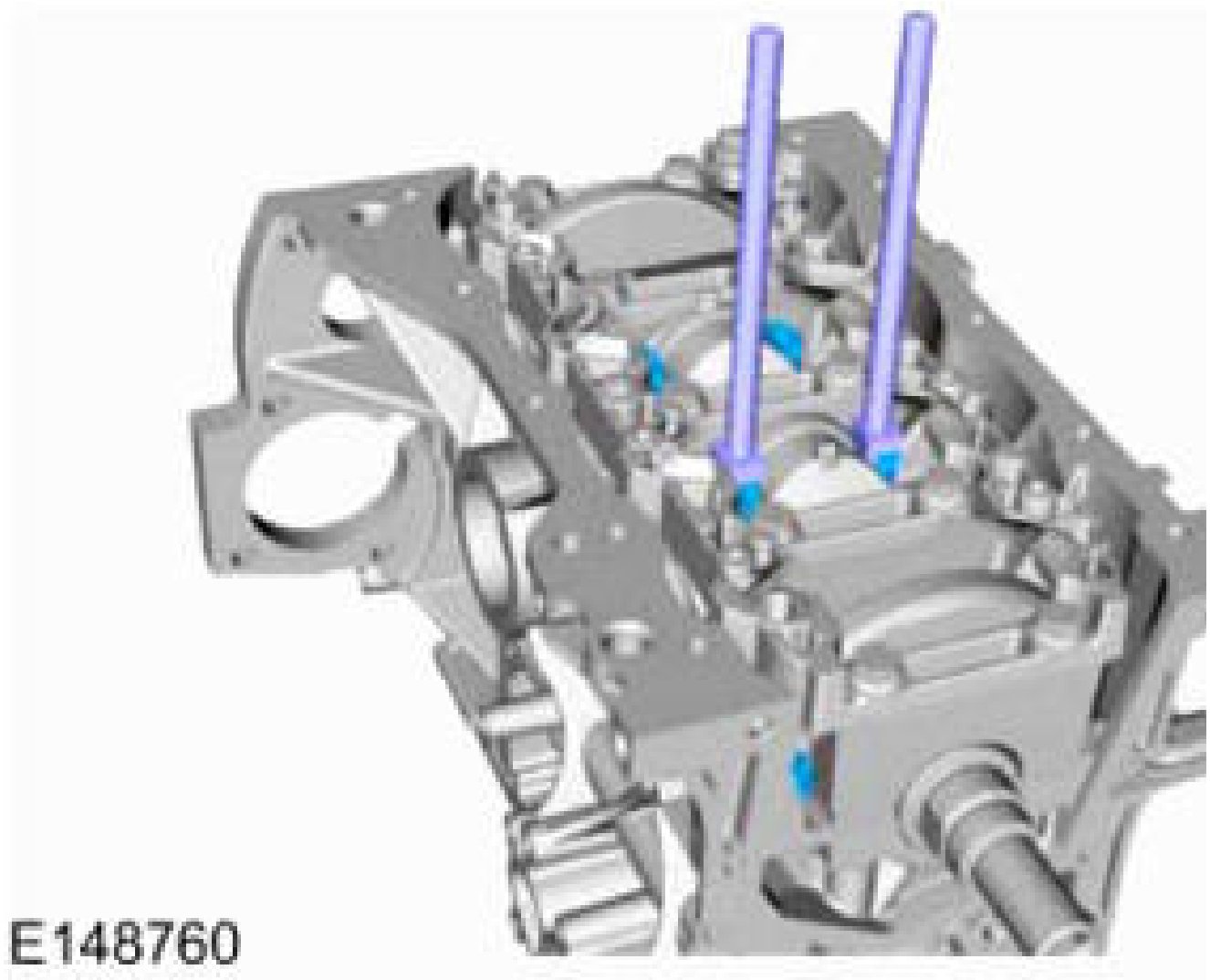
NOTE: Clearly mark the connecting rods, connecting rod caps and connecting rod bearings in numerical order for correct orientation for reassembly.



NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod.

114.

Using a connecting rod installer, repeat until all the piston/rod assemblies are removed from the engine block.



NOTE: Mark the position of the parts, so they can be installed in their original positions.

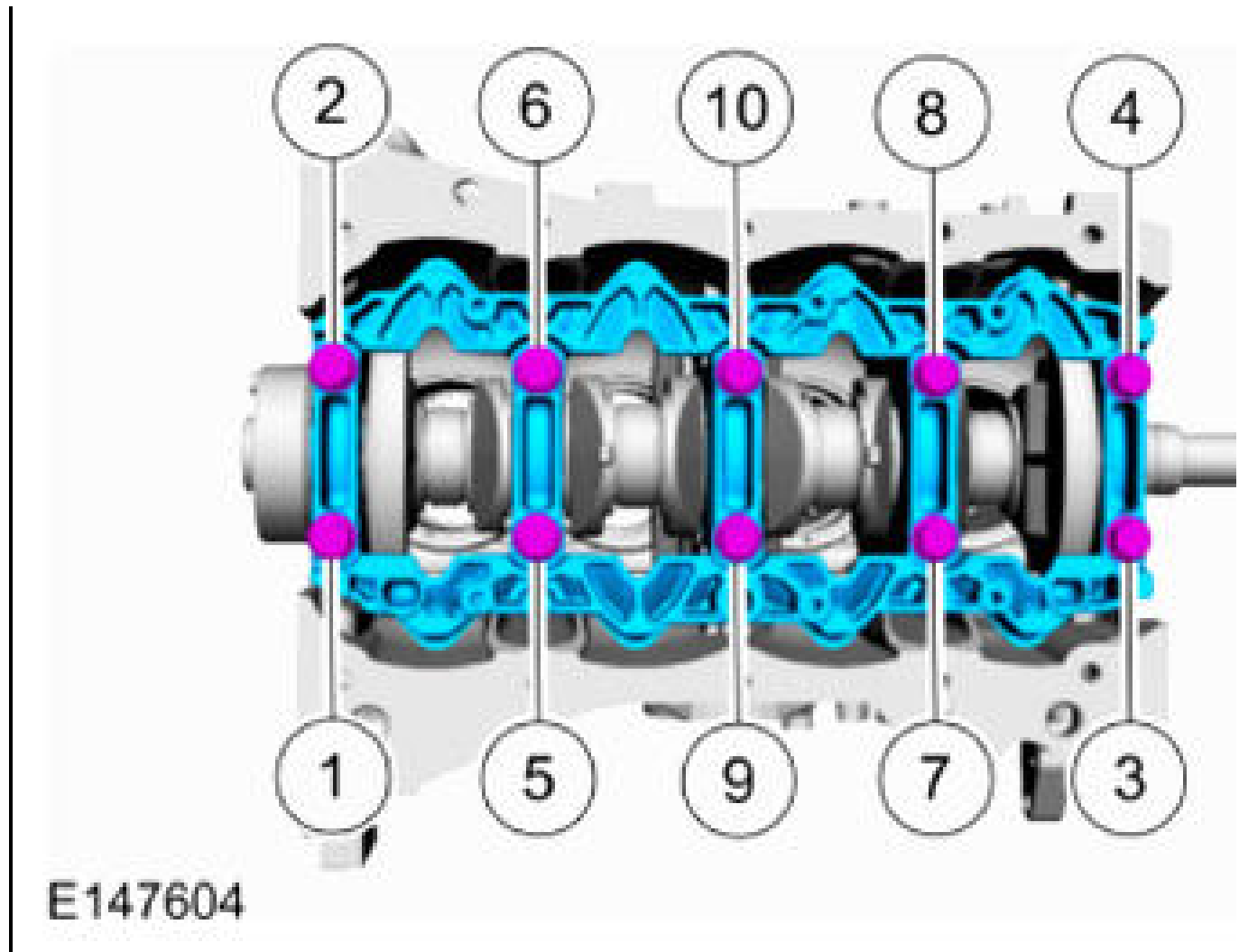
115.



116. Refer to: **PISTON INSPECTION** .

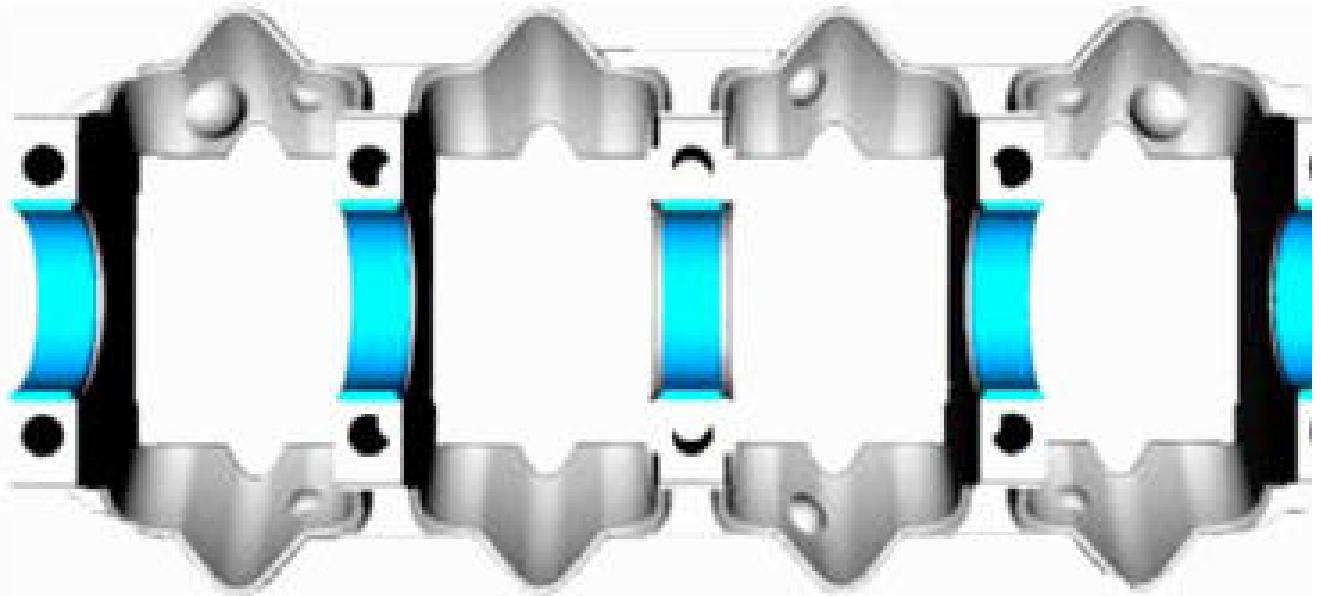
NOTE: The main bearing beam has 2 arrows pointing towards the front of engine for correct orientation for reassembly.

117.

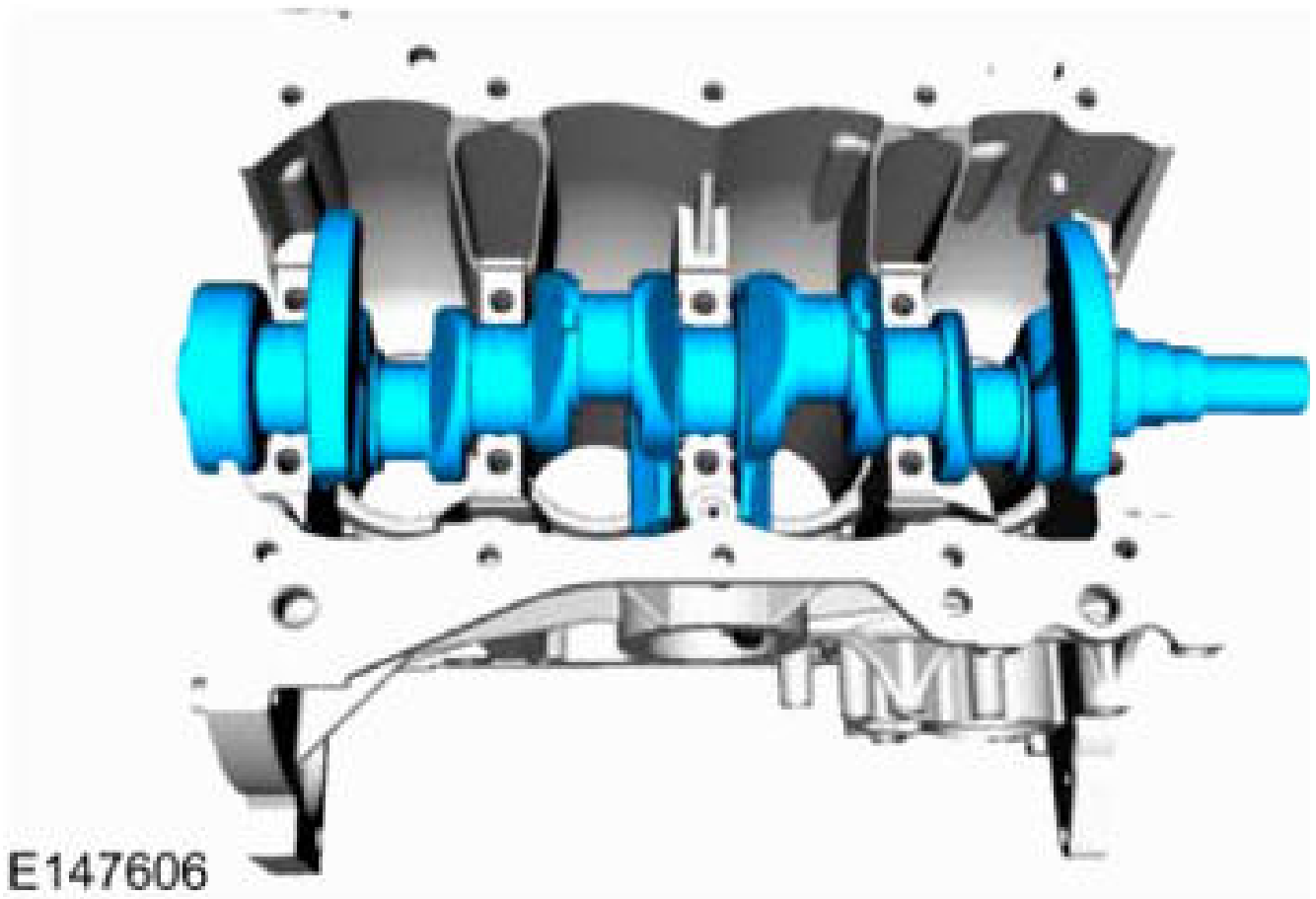


NOTE: If the main bearings are being reused, mark them in order for correct orientation and reassembly.

118.



E147605

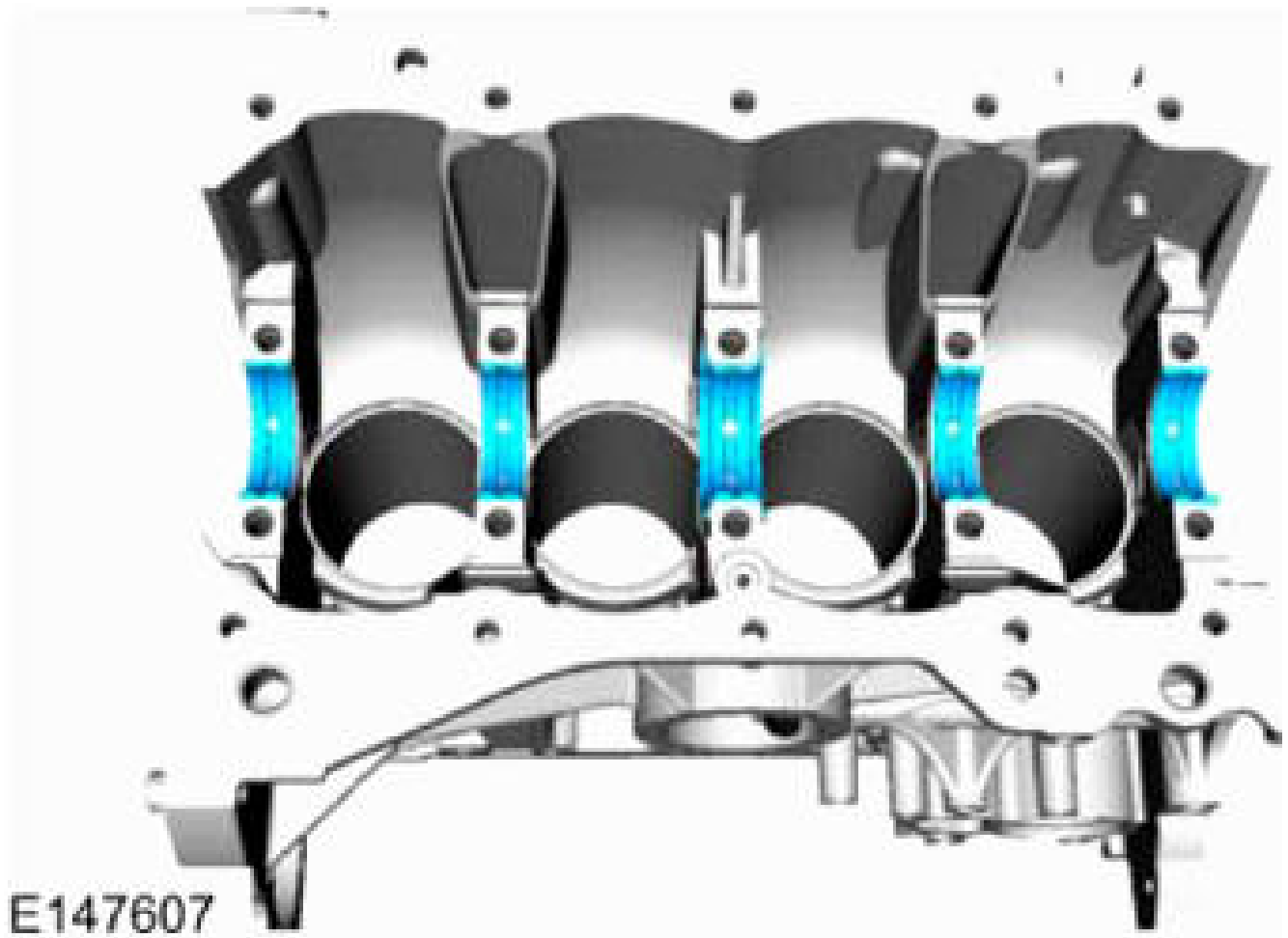


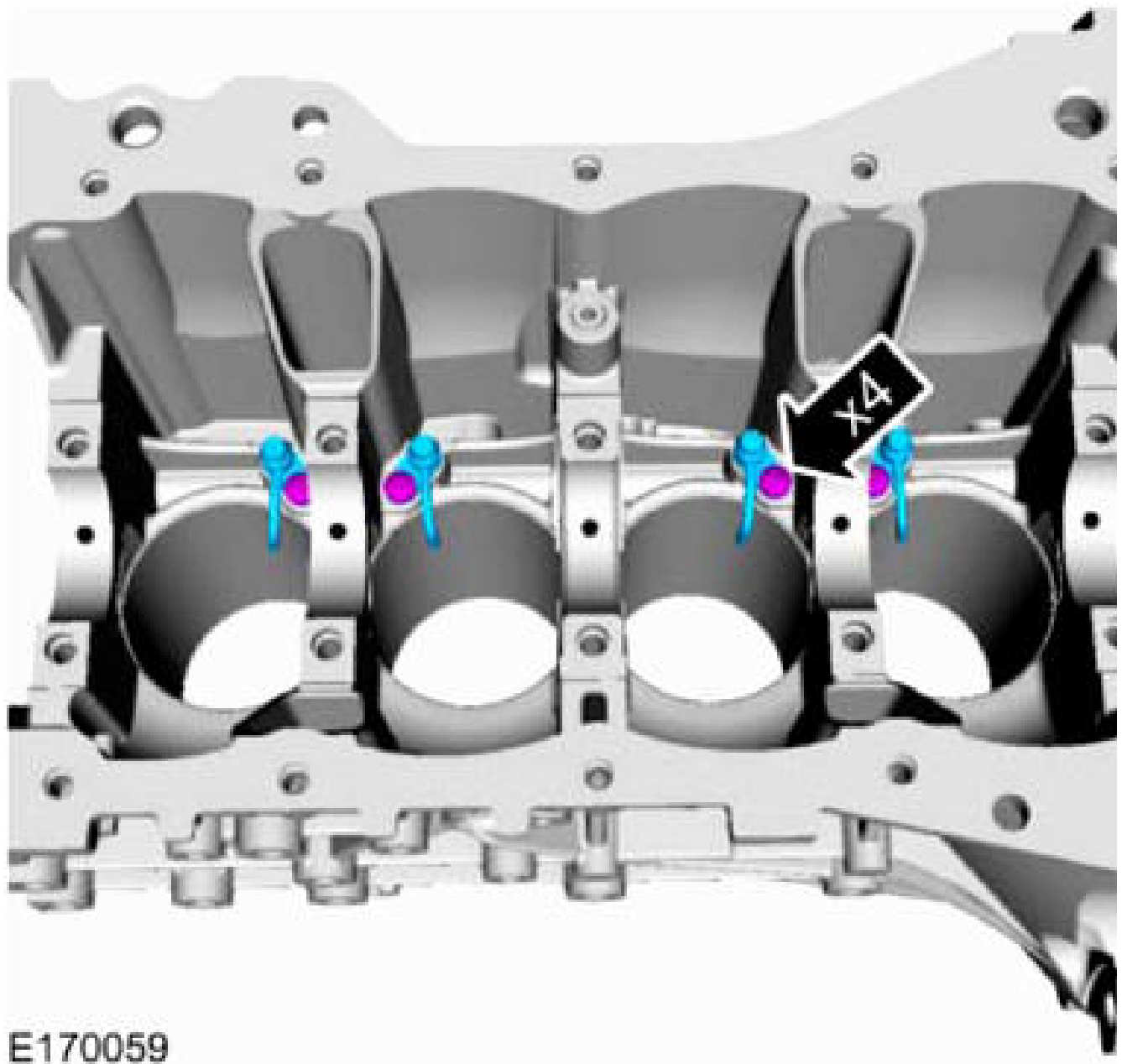
119.

NOTE: If the main bearings are being reused, mark them in order for correct orientation and reassembly.

120.

NOTE: The center bulkhead has the thrust bearing.





121.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

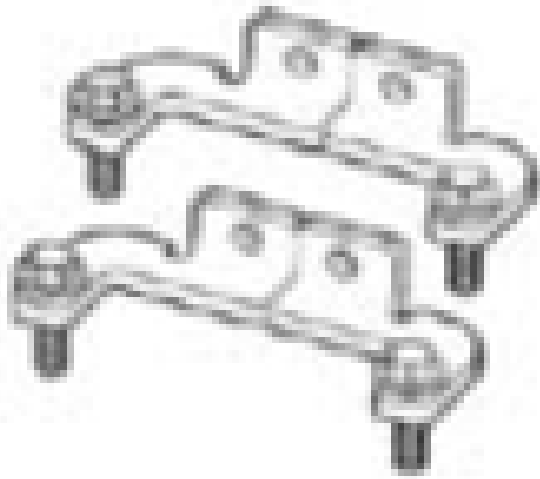
CYLINDER HEAD

SPECIAL TOOLS/GENERAL EQUIPMENT

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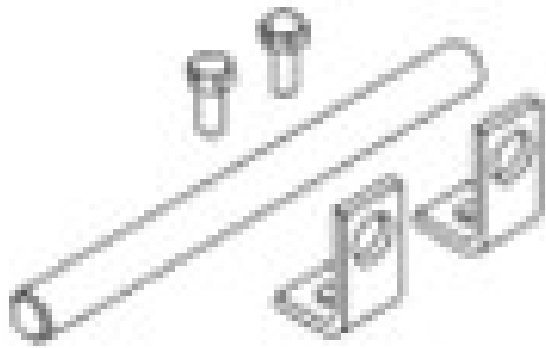
2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



303-1249

Valve Spring Compressor
TKIT-2006UF-FLM
TKIT-2006UF-ROW

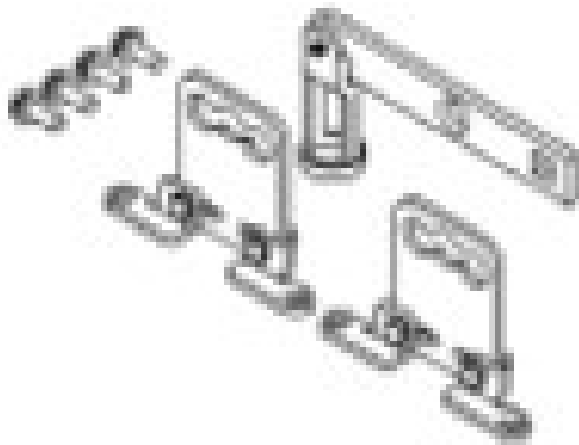


E134677

303-300 (T87C-6565-A)

Set, Valve Spring Compressor
TKIT-2009TC-F
T88C-1000-ST
TKIT-1988-FESTIVA
TKIT-1988-TRACER

303-350 (T89P-6565-A) Compressor, Valve Spring
TKIT-1989-F
TKIT-1989-FM
TKIT-1989-FLM



E134678

TKIT-1990-LMH



303-468 (T94P-6510-AH)
Remover, Valve Stem Oil Seal
TKIT-1994-FH/FMH/FLMH
TKIT-1994-LMH/MH2



303-470 (T94P-6510-CH)
Installer, Valve Stem Oil Seal
TKIT-2009TC-F
TKIT-1994-FH/FMH/FLMH
TKIT-1994-LMH/MH2

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



303-472 (T94P-6565-AH)
Adapter, Valve Spring Compressor
TKIT-1994-FH/FMH/FLMH
TKIT-1994-LMH/MH2



307-005 (T59L-100-B)
Slide Hammer

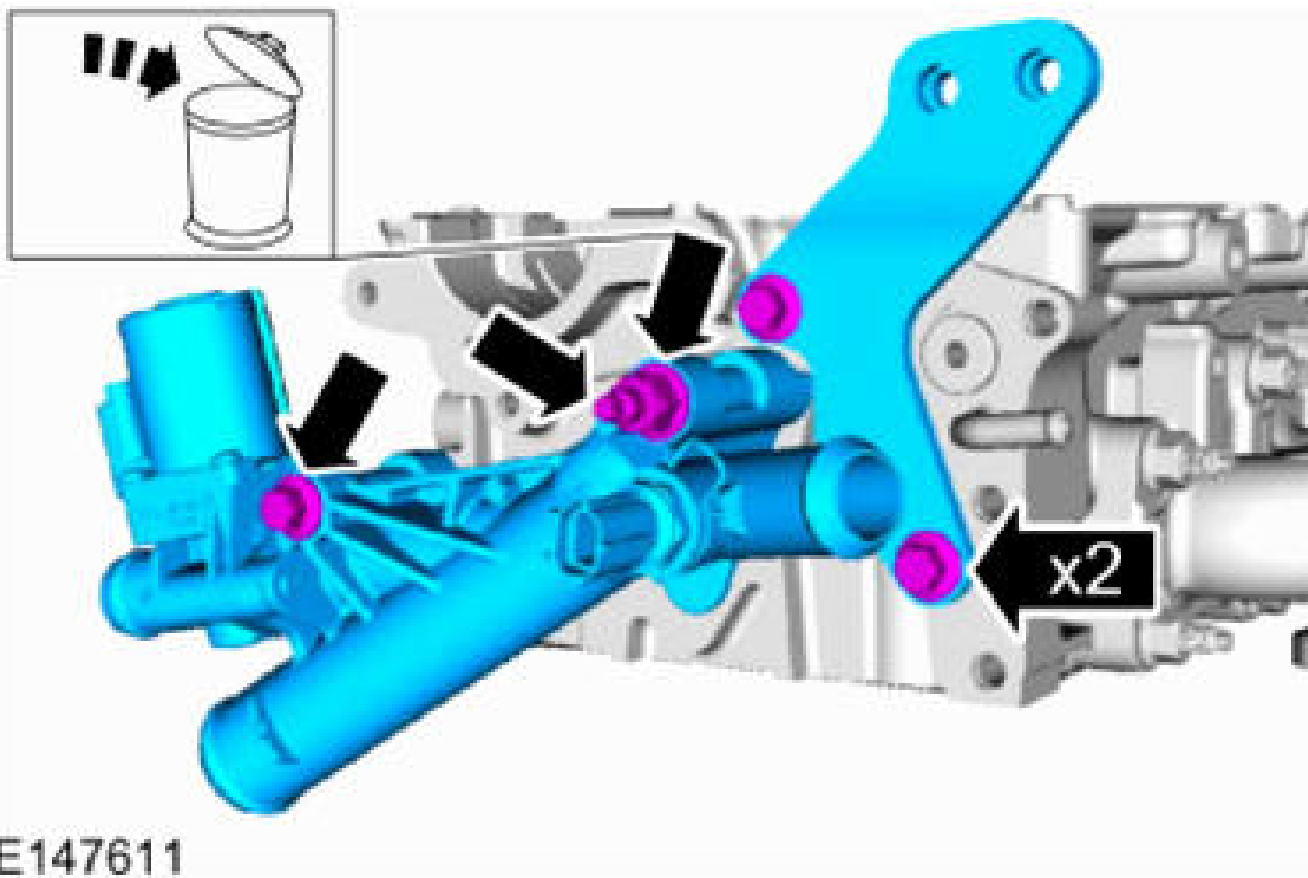
MATERIALS SPECIFICATIONS

Name	Specification
Multi-Purpose Grease Motorcraft® XL-5 (aerosol), CRC® SL3151	ESB-M1C93-B
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

DISASSEMBLY

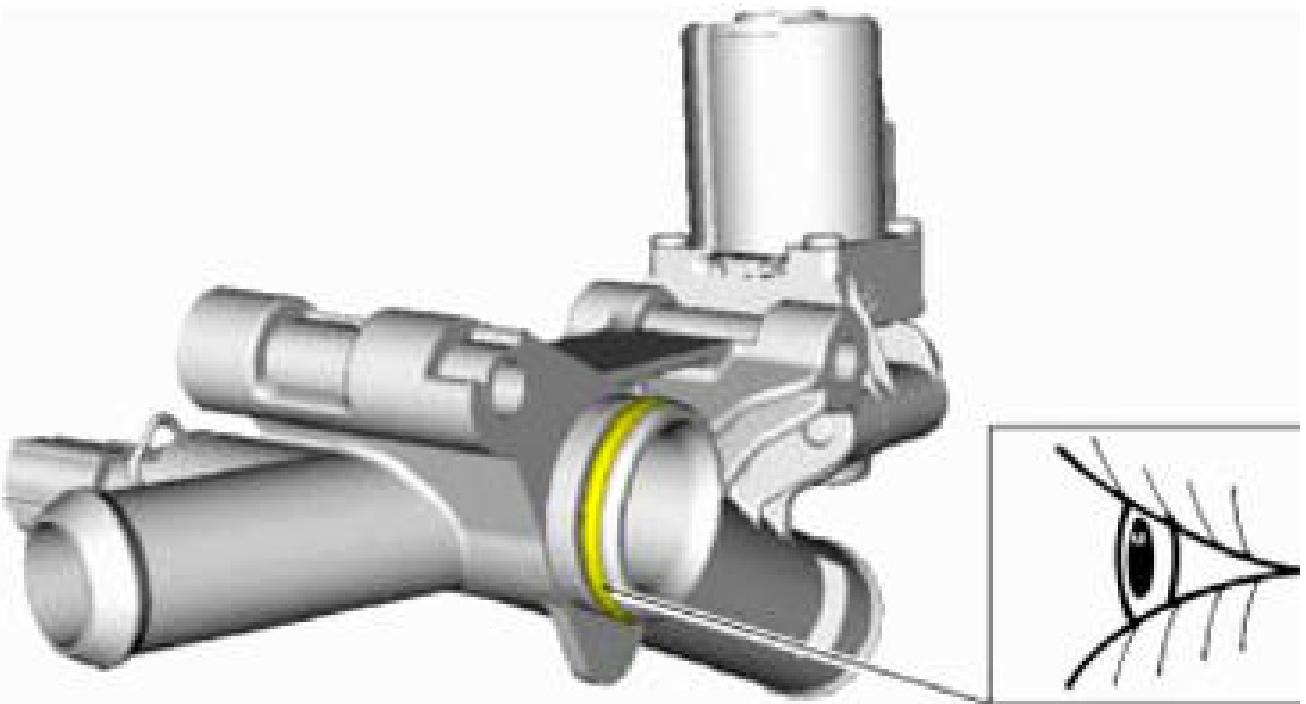
NOTE: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces, that enters the oil passages, coolant passages or the oil pan can cause engine failure.

NOTE: If the components are to be reinstalled, mark the location of the components removed, they must be installed in the same location.



1.

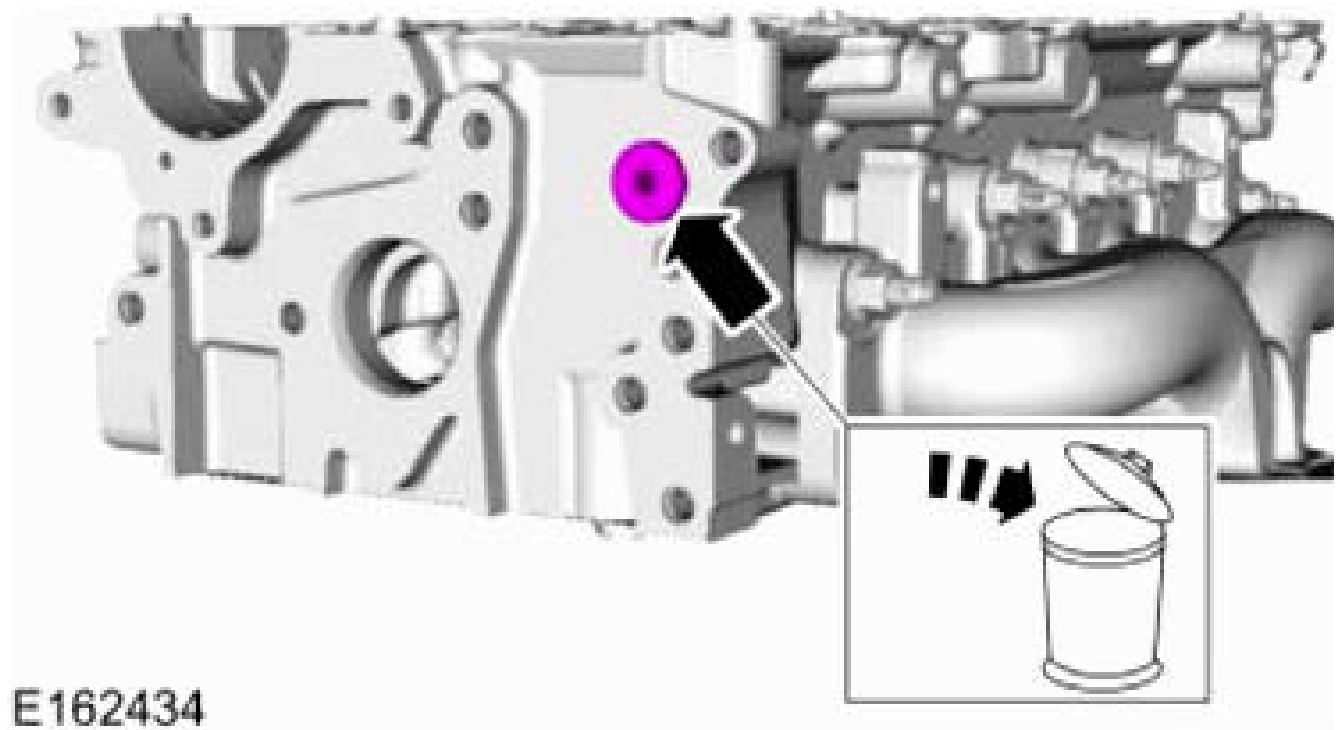
2.



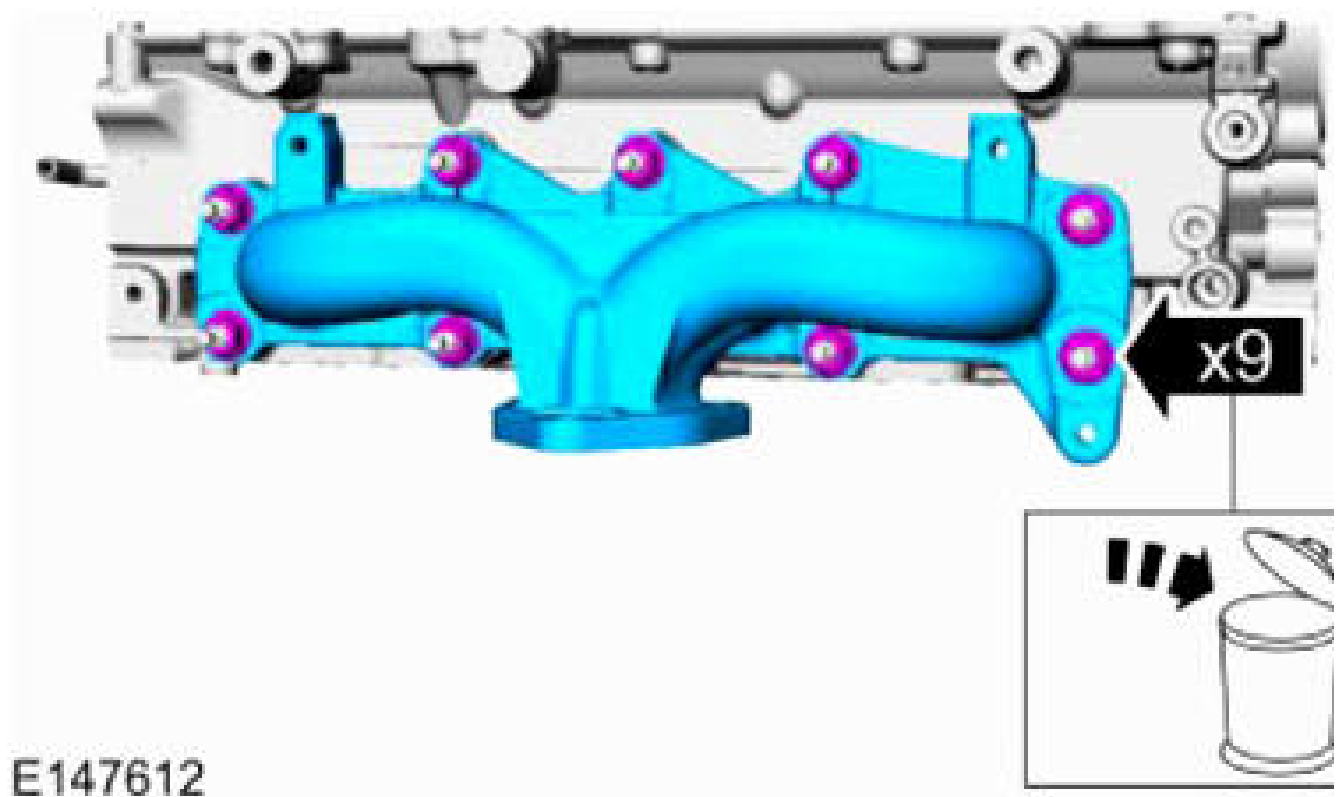
E147545

2.

3.

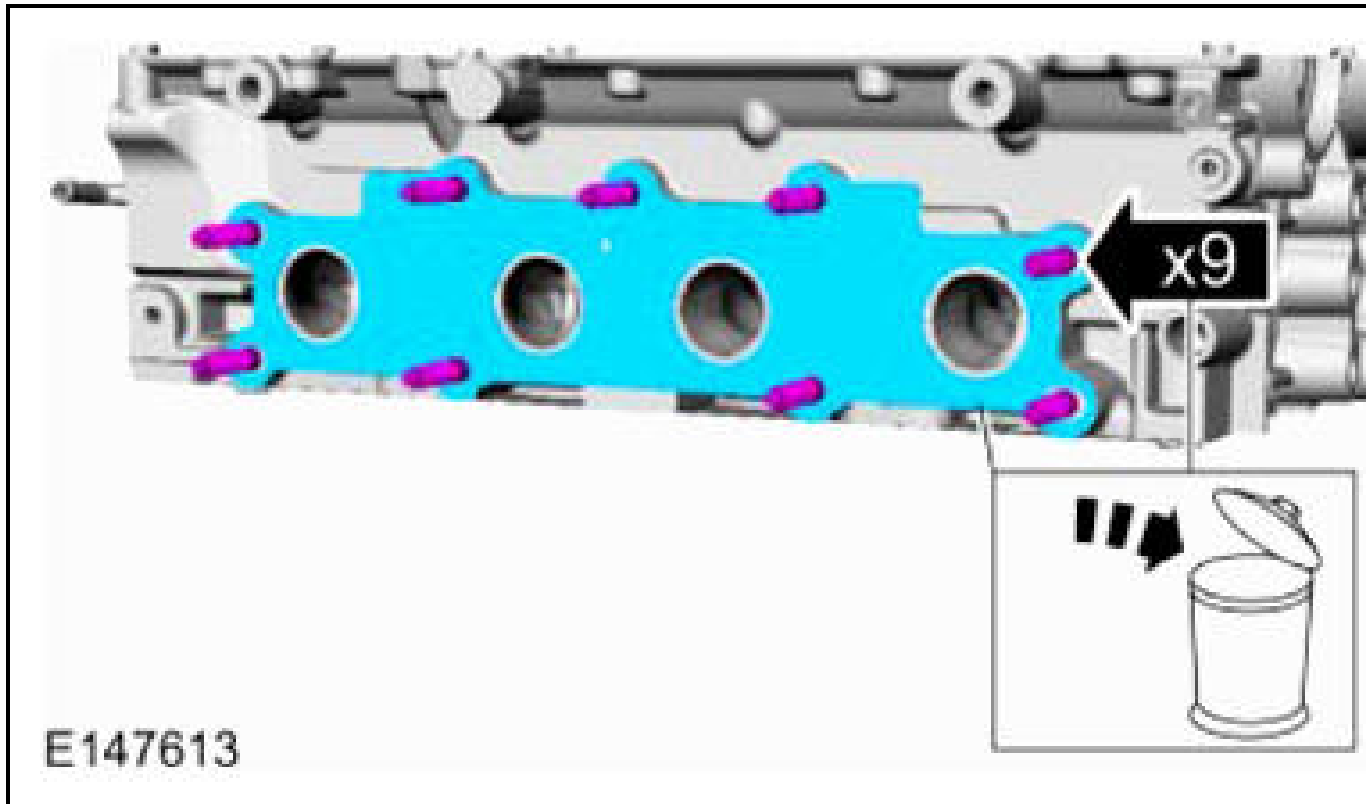


3.

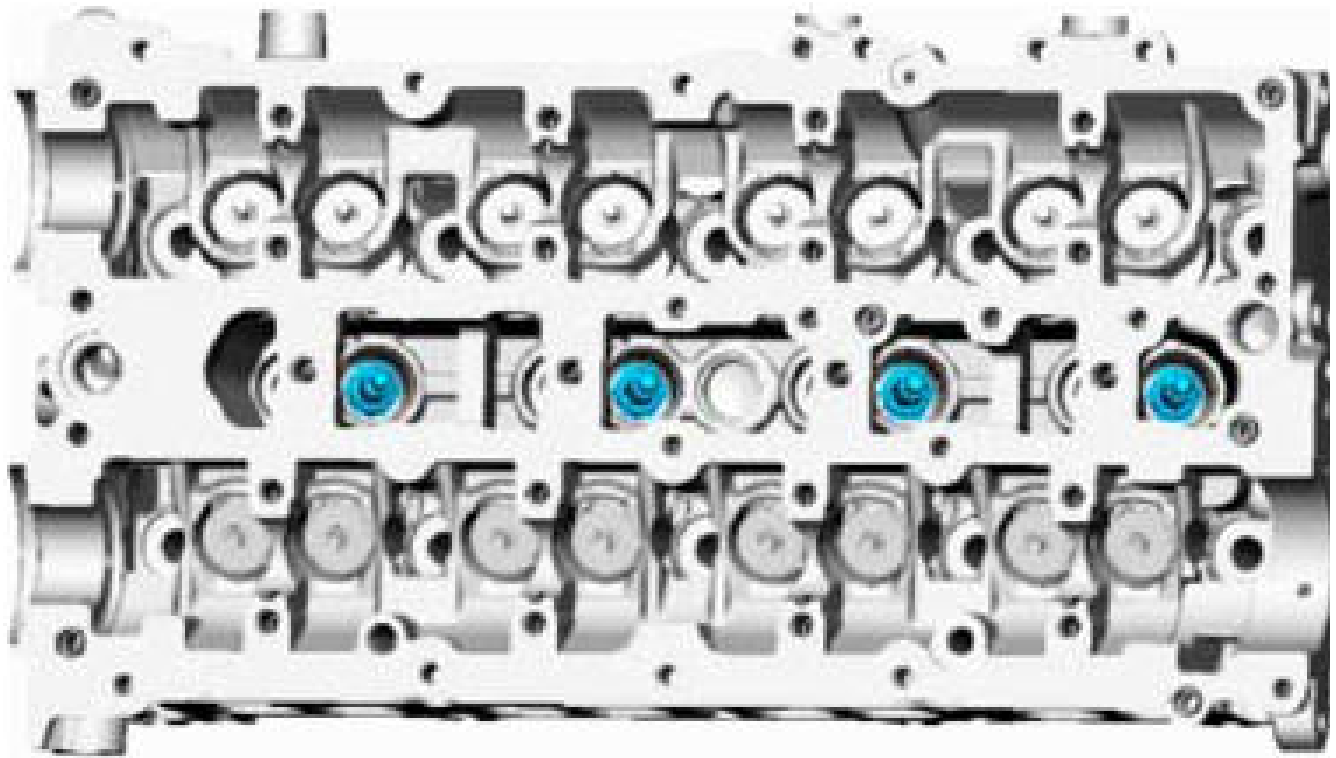


4.

5. Refer to: EXHAUST MANIFOLD CLEANING AND INSPECTION .



- 6.
- NOTE:** Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.
- 7.
- NOTE:** Use compressed air to remove any foreign material in the spark plug well before removing the spark plugs.



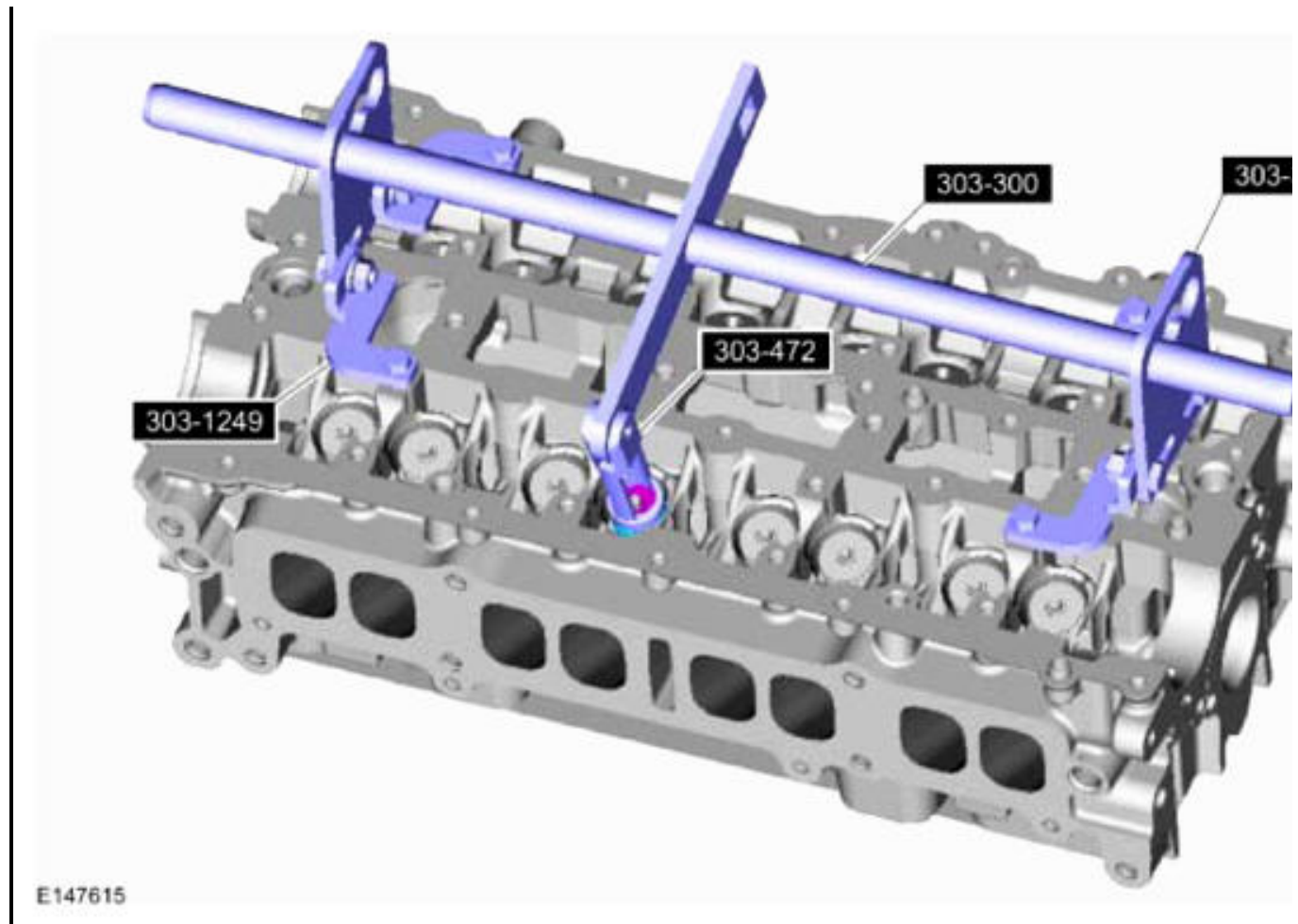
E147614

NOTE: Use a small screwdriver and multi-purpose grease to remove the valve collets.

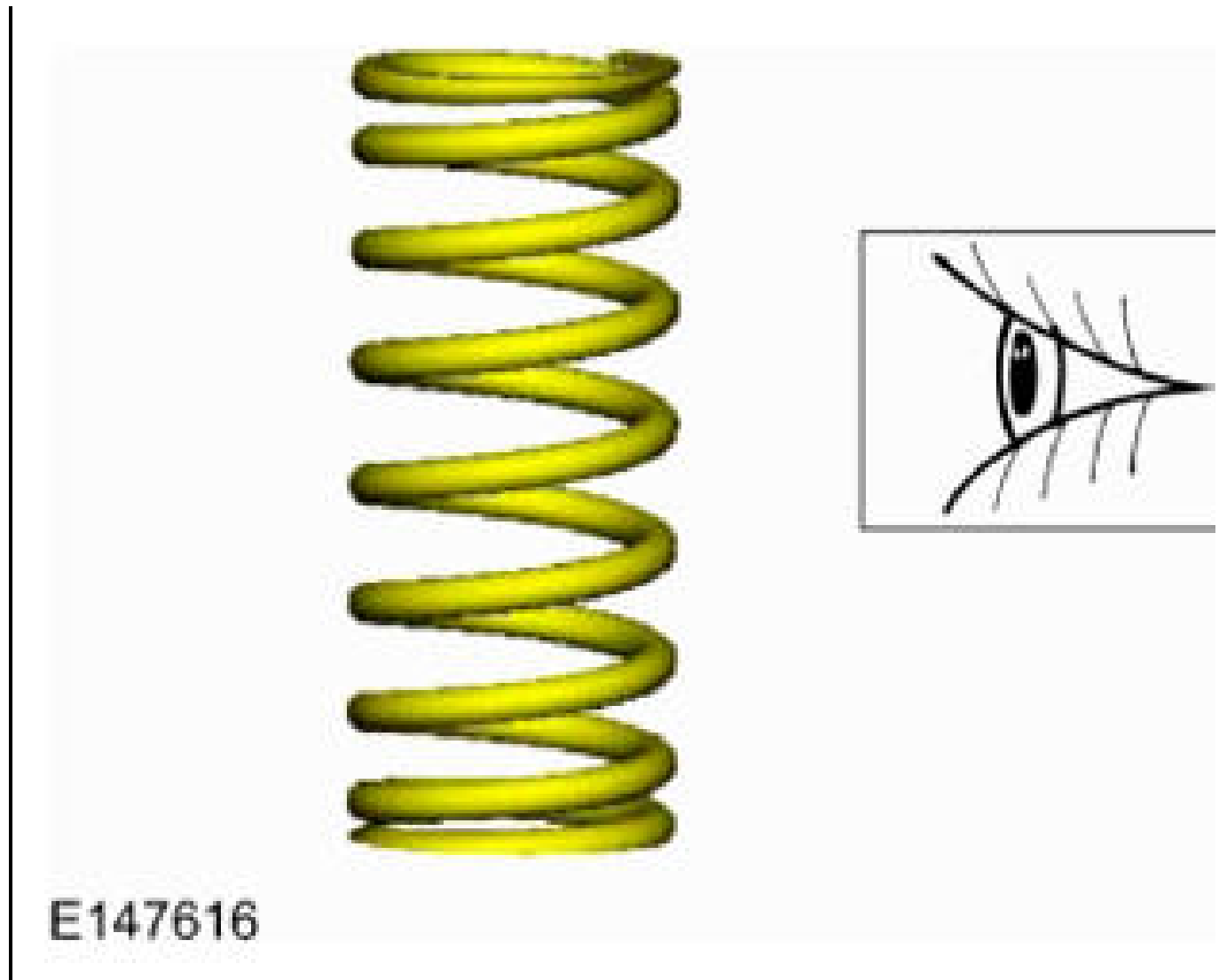
8.

Special Tool(s) : 303-300 (T87C-6565-A) Set, Valve Spring Compressor , 303-350 (T89P-6565-A) Compressor, Valve Spring , 303-472 (T94P-6565-AH) Adapter, Valve Spring Compressor , 303-1249 Valve Spring Compressor

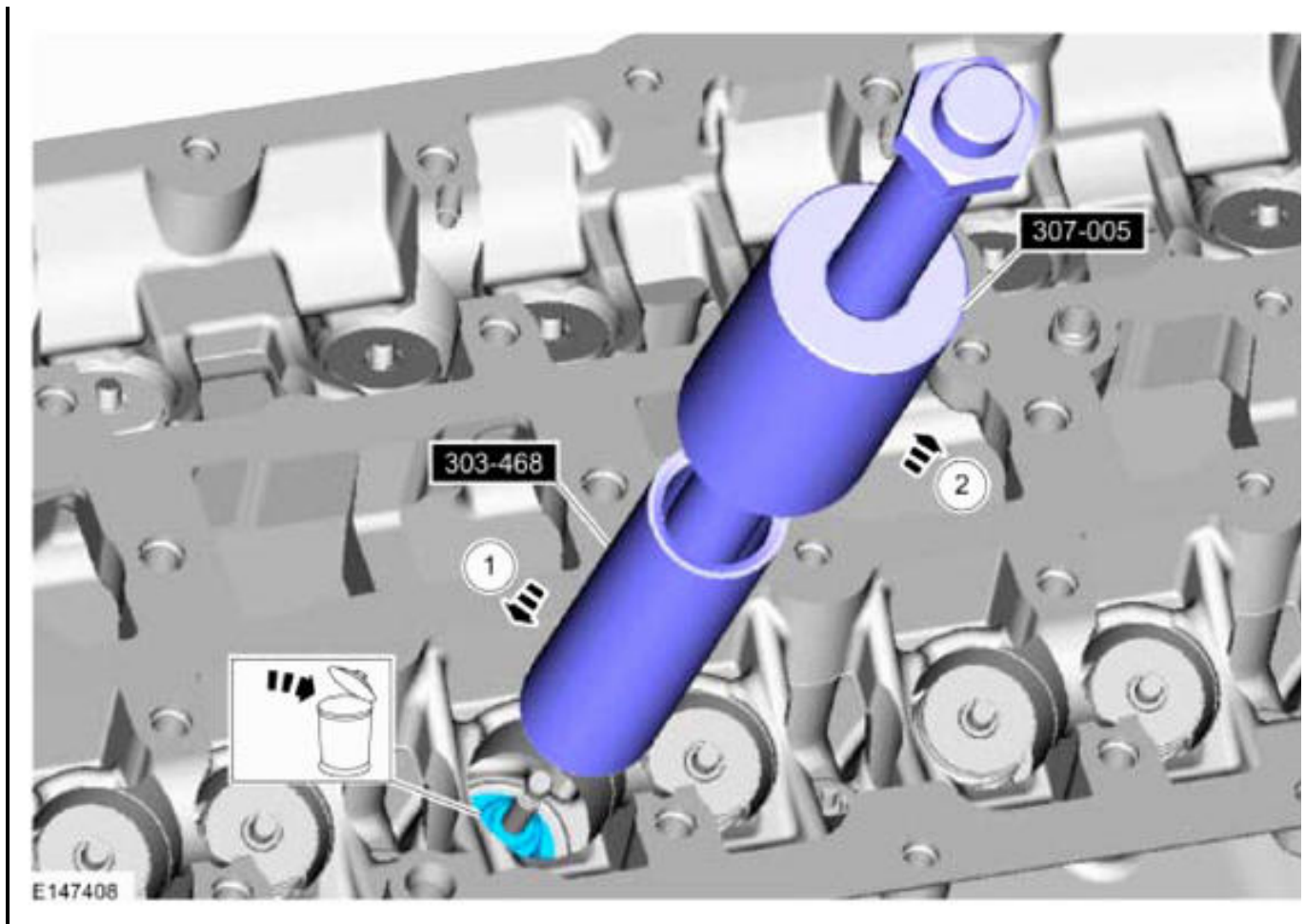
Material : Multi-Purpose Grease/Motorcraft® XL-5 (aerosol), CRC® SL3151 (ESB-M1C93-B)



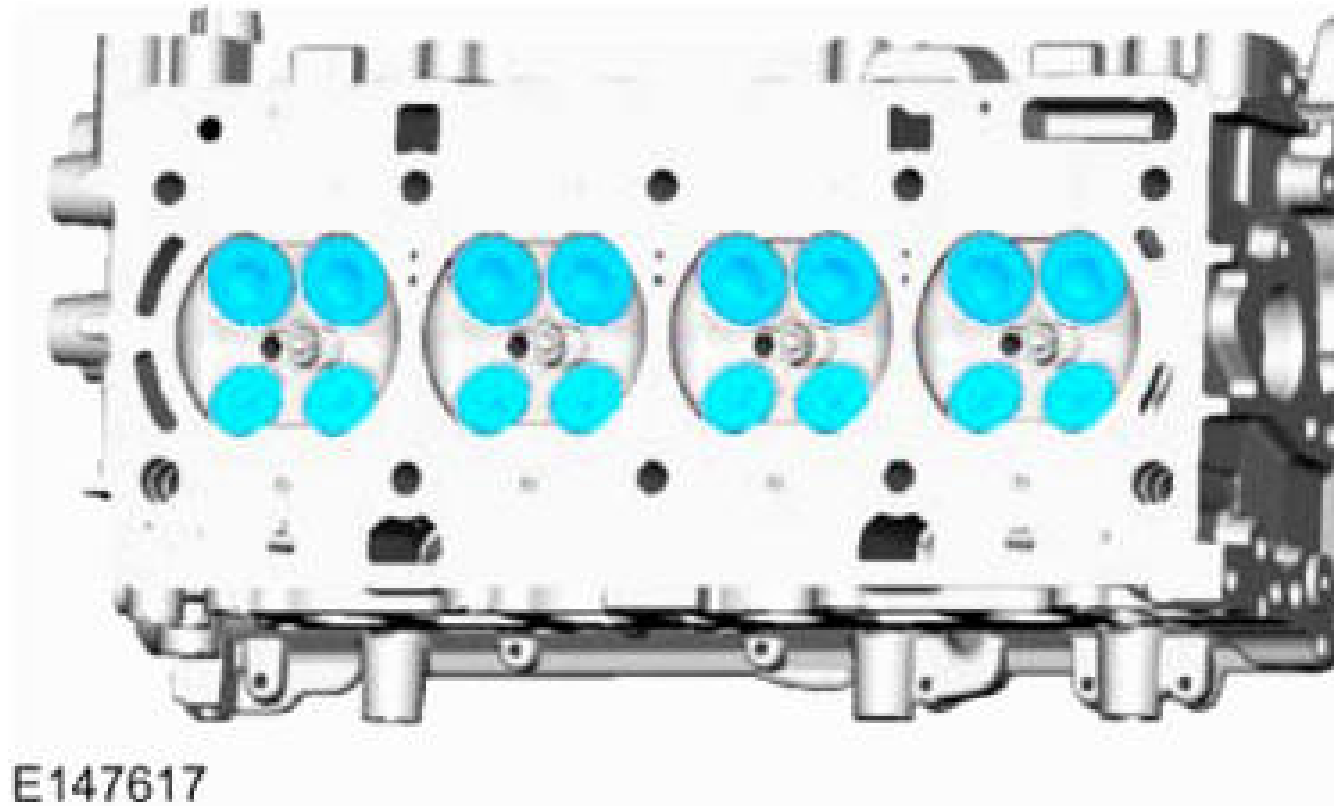
9. Install new parts, as necessary.



10. *Special Tool(s)* : 303-468 (T94P-6510-AH) Remover, Valve Stem Oil Seal , 307-005 (T59L-100-B) Slide Hammer

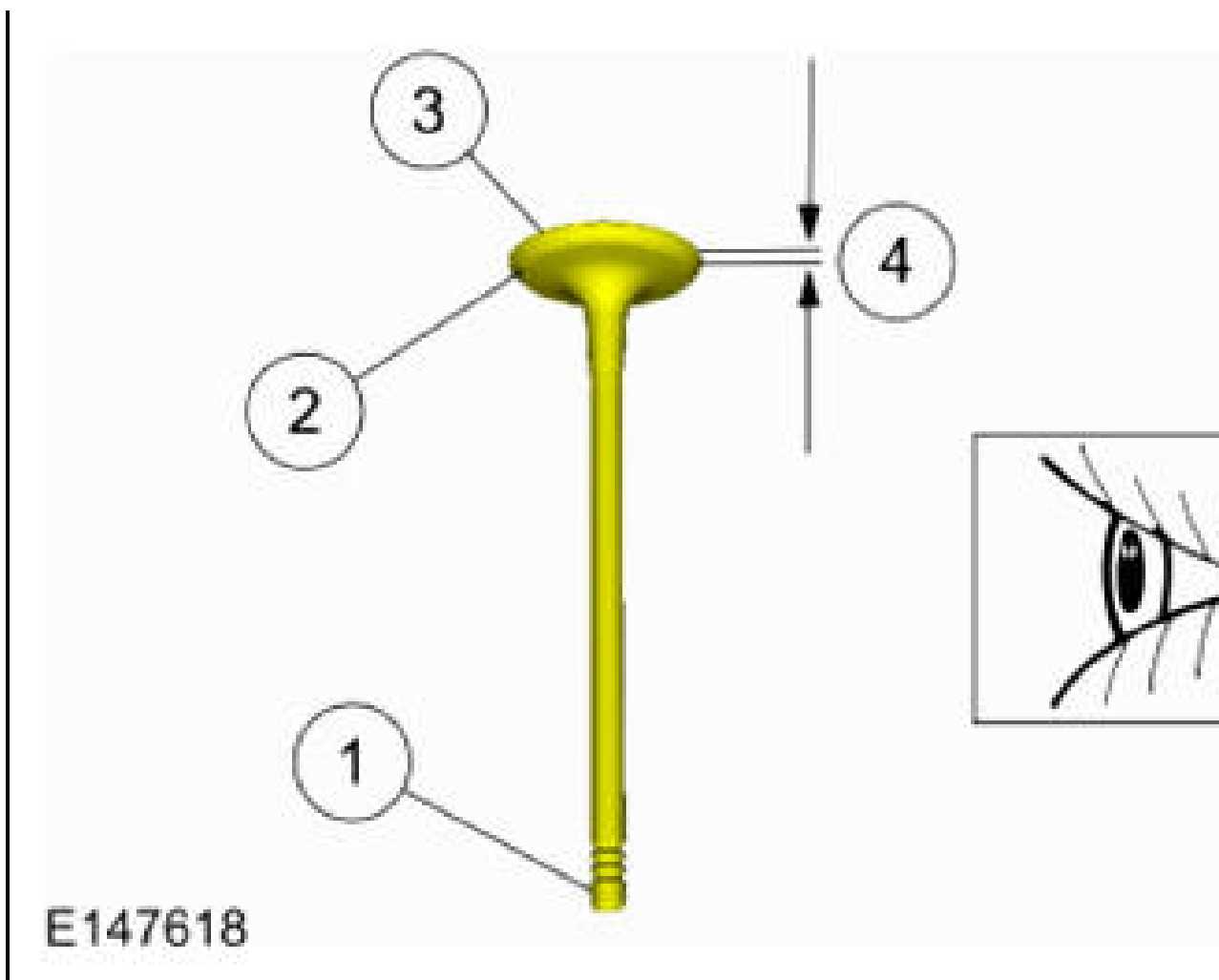


11. **NOTE:** Note the location of the valves if they are to be reused.



12. **NOTE:** **Install new parts, as necessary.**

1. The end of the stem for grooves or scoring.
2. The valve face and the edge for pits, grooves or scores.
3. The valve head for signs of burning, erosion, warpage and cracking.
4. The valve margin for wear.

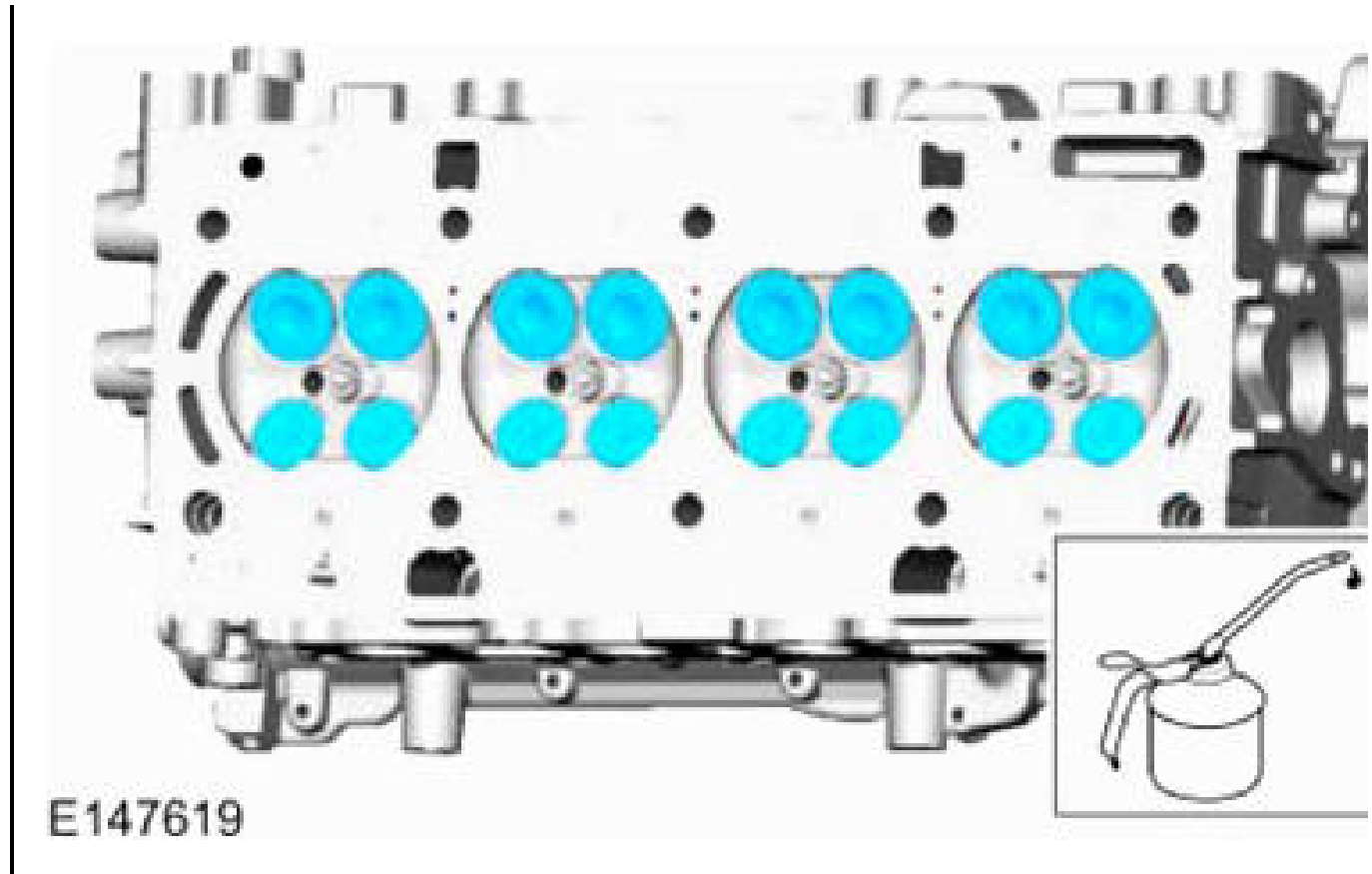


ASSEMBLY

NOTE: If installing the original valves, make sure the valves are installed in the same position from which they were removed. Coat the valve stems with clean engine oil.

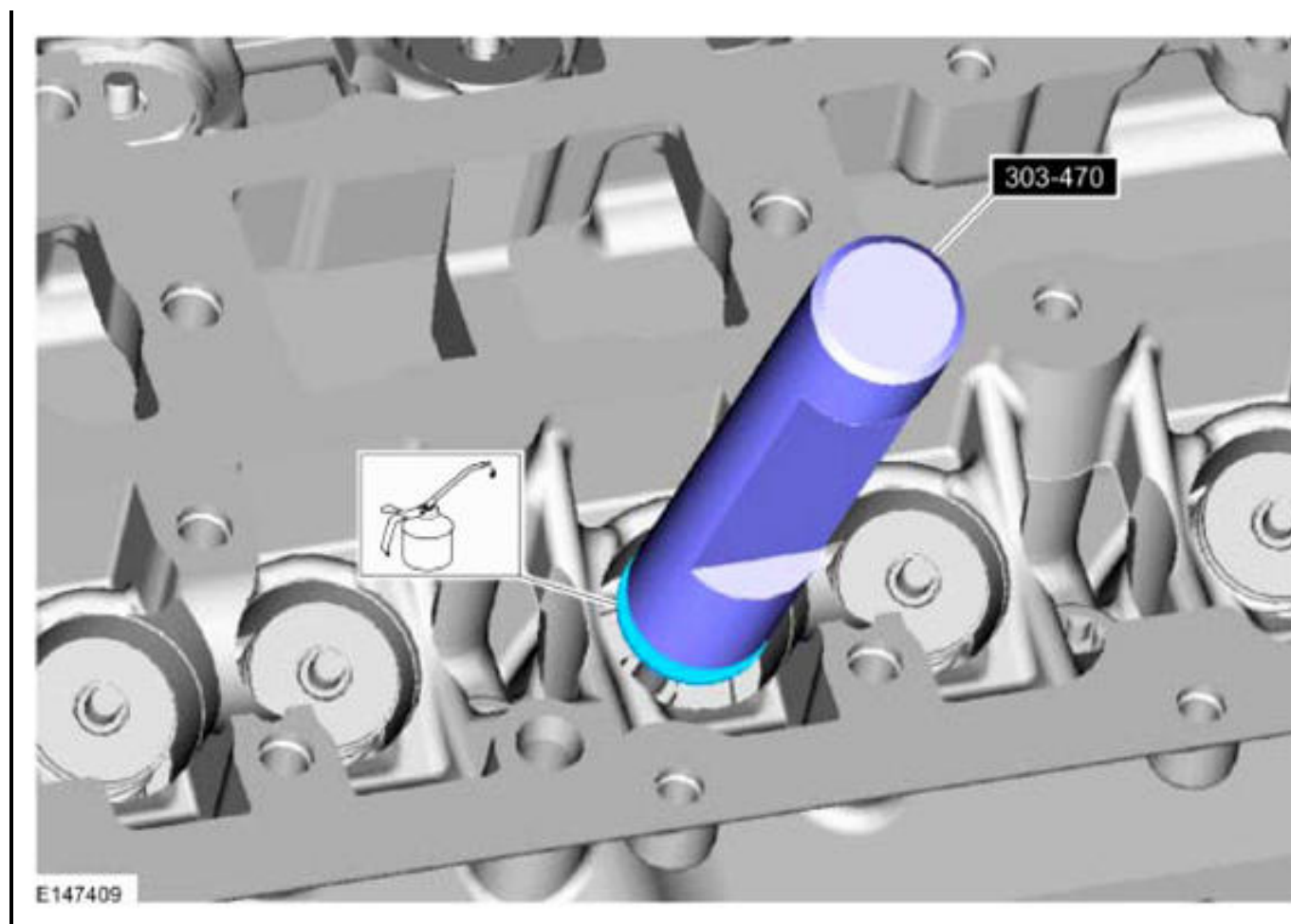
1.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



2. *Special Tool(s)* : **303-470 (T94P-6510-CH) Installer, Valve Stem Oil Seal**

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

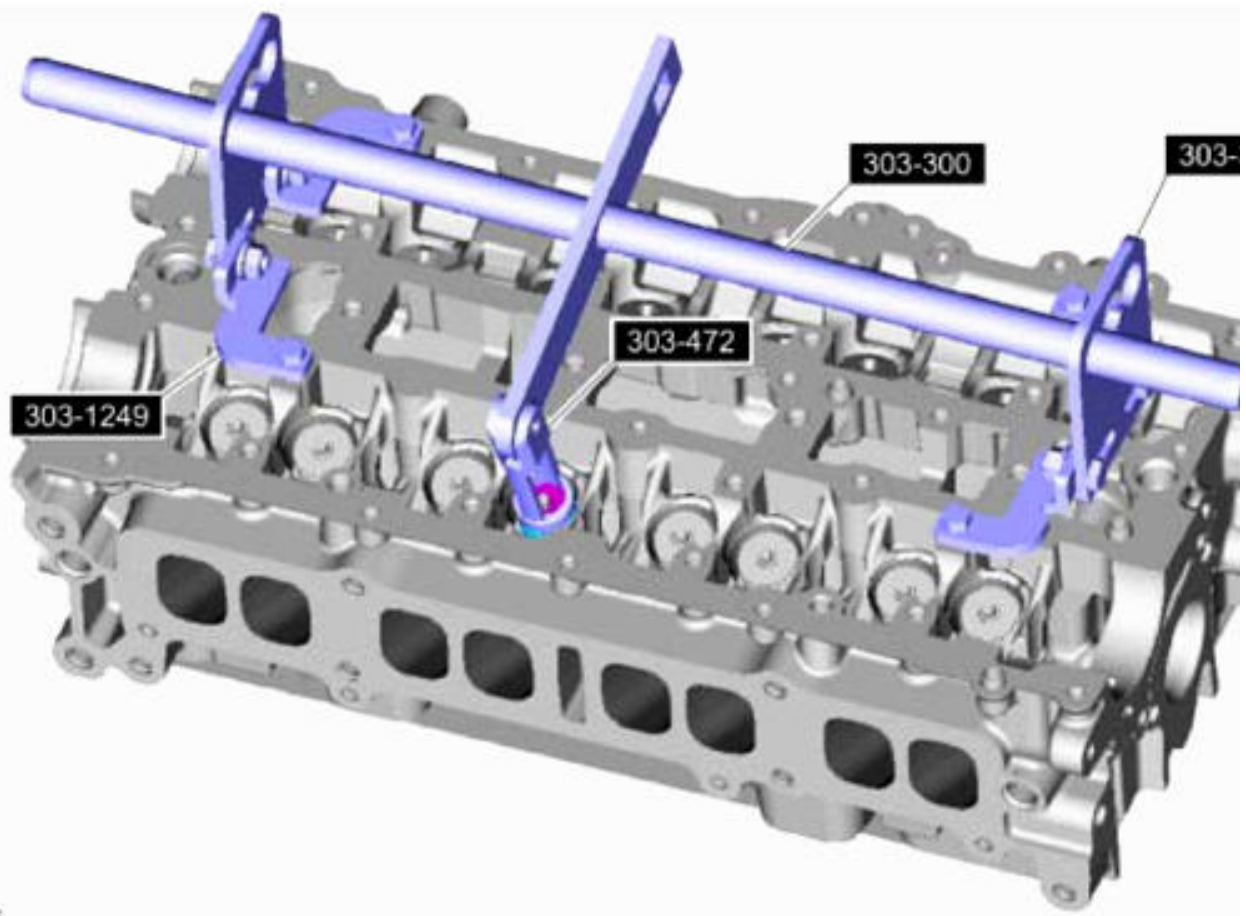


3. **NOTE:** Use a small screwdriver and multi-purpose grease to install the valve collets.

Check the seating of the valve collet.

Special Tool(s) : 303-300 (T87C-6565-A) Set, Valve Spring Compressor , 303-350 (T89P-6565-A) Compressor, Valve Spring , 303-472 (T94P-6565-AH) Adapter, Valve Spring Compressor , 303-1249 Valve Spring Compressor

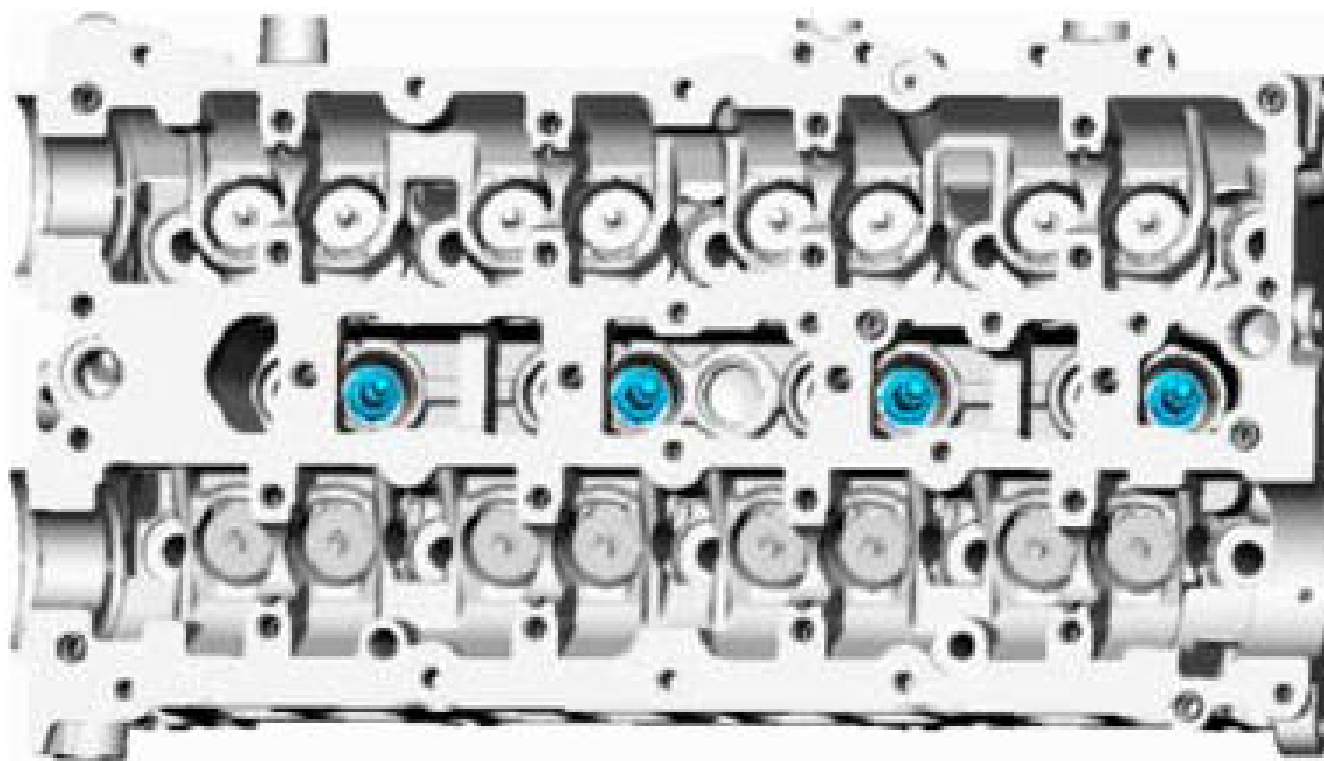
Material : Multi-Purpose Grease/Motorcraft® XL-5 (aerosol), CRC® SL3151 (ESB-M1C93-B)



NOTE: Only use hand tools when removing or installing the spark plugs, or damage can occur to the cylinder head or spark plug.

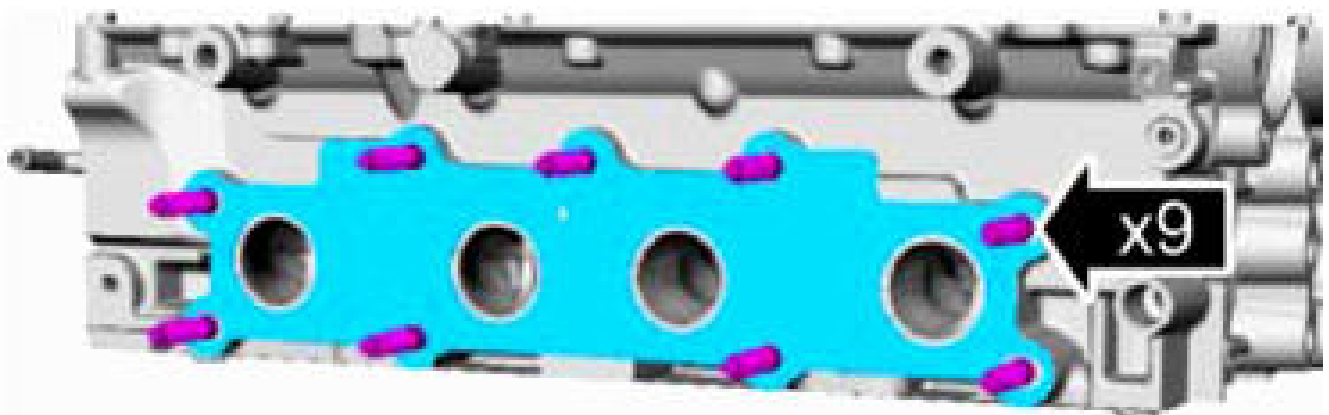
4.

Torque : 12 Nm



E147614

5. *Torque* : 10 Nm

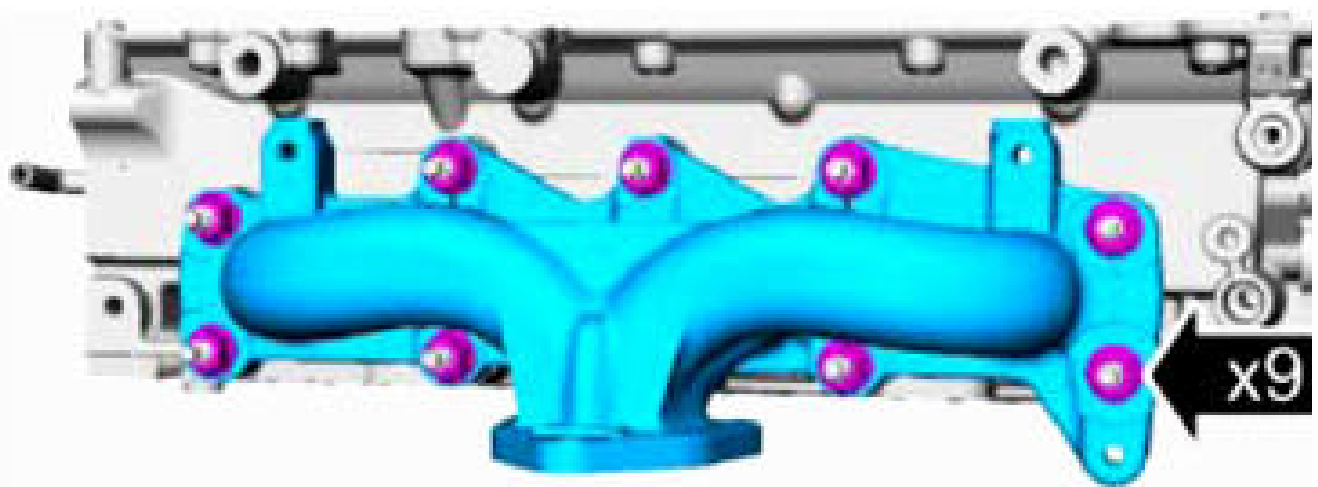


E147620

6. *Torque :*

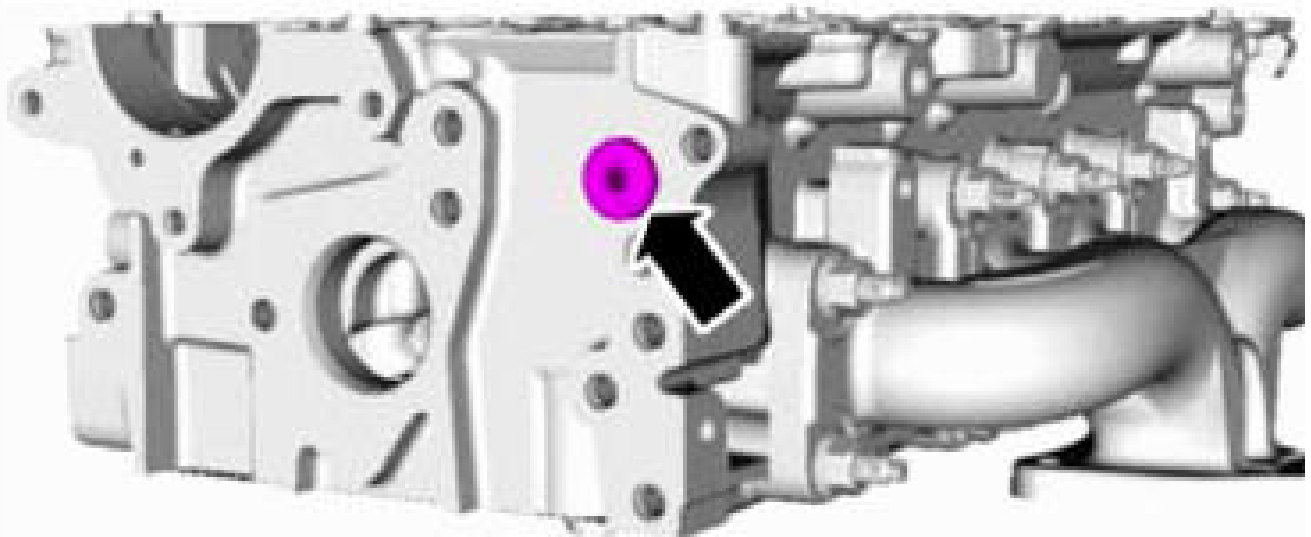
Stage 1: 21 Nm

Stage 2: Retighten to 21 Nm



E147621

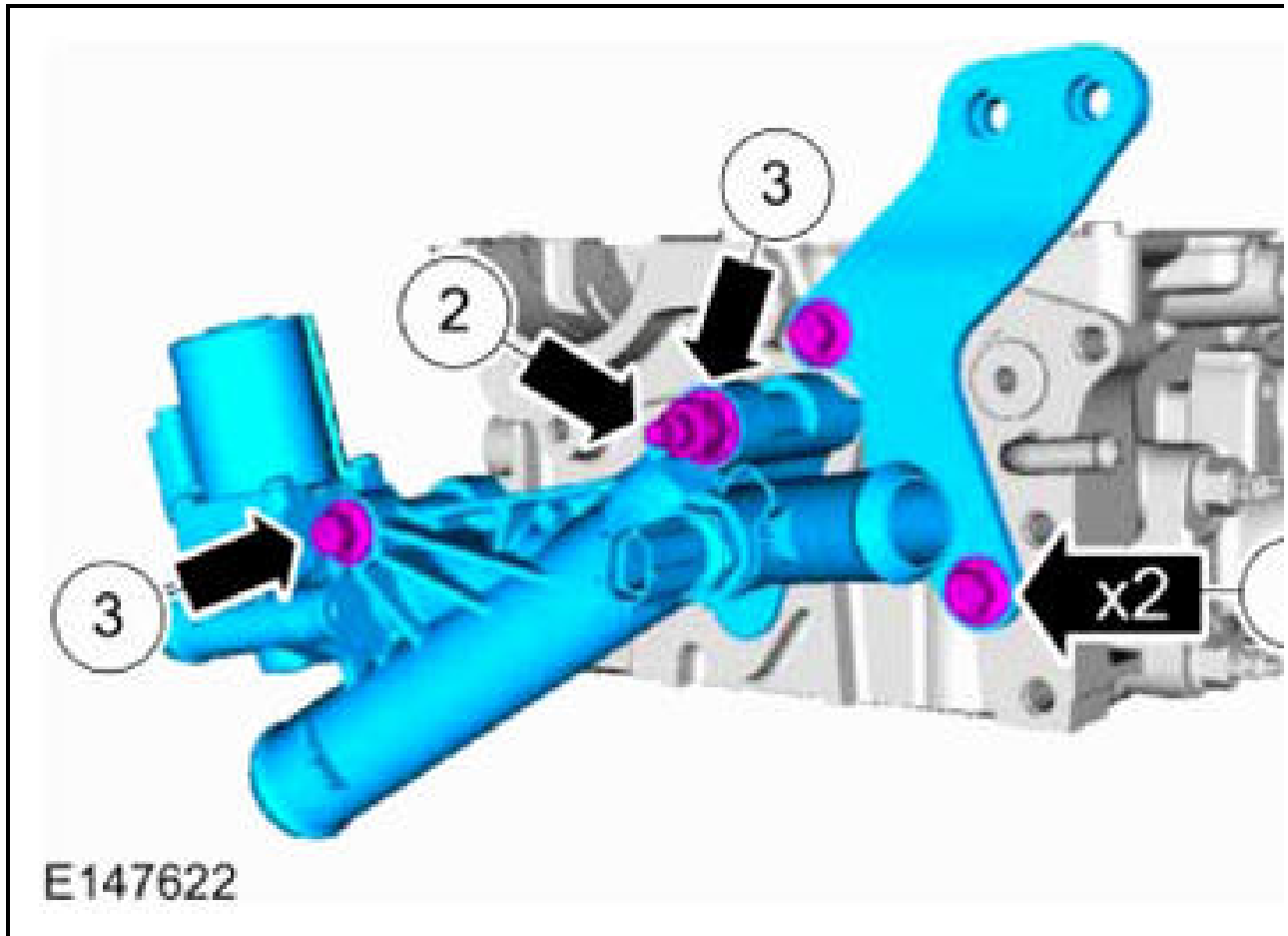
7. Torque : 29 Nm



E162435

8.

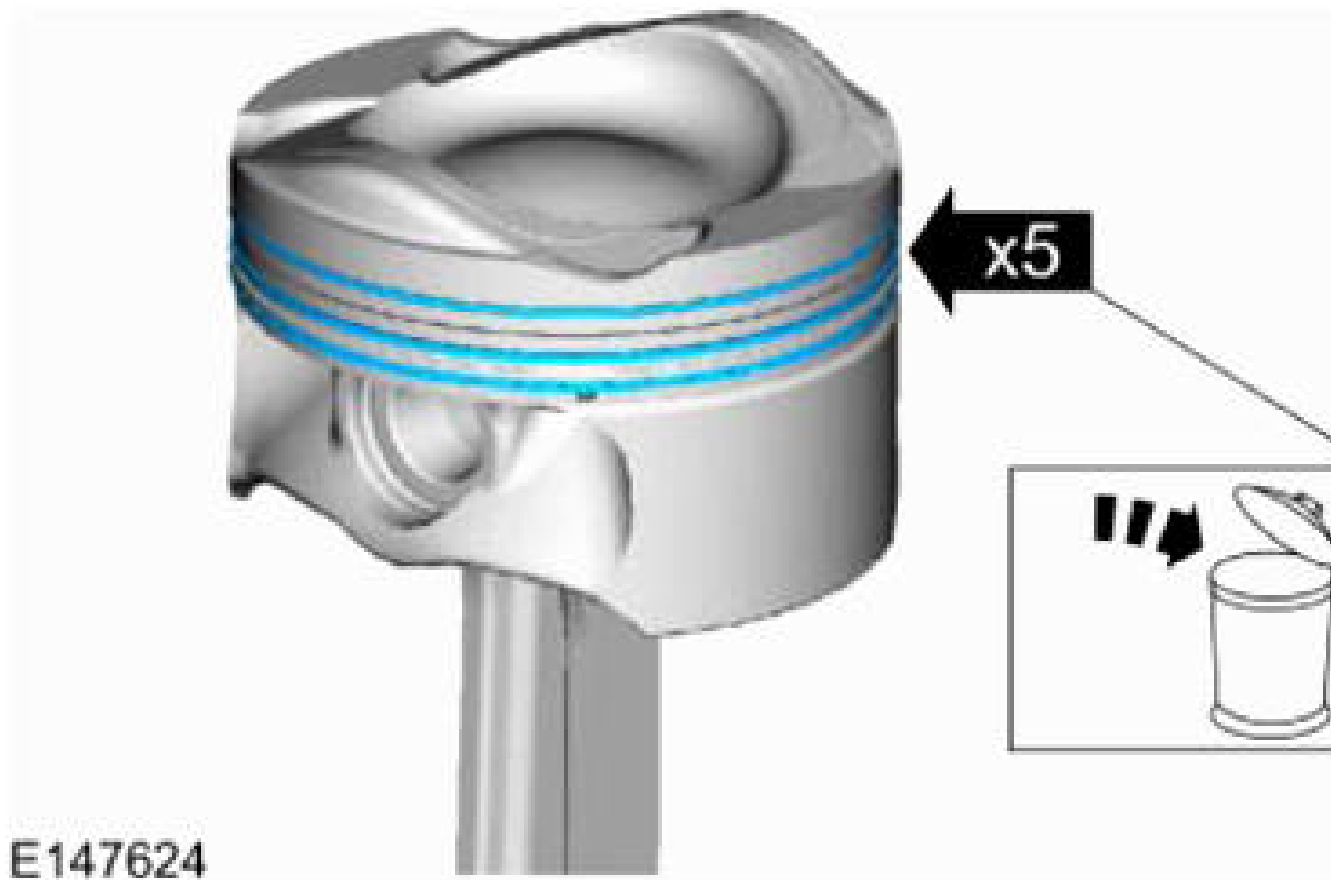
1. Torque : 19 Nm
2. Torque : 5 Nm
3. Torque : 18 Nm

**PISTON****MATERIALS SPECIFICATIONS**

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

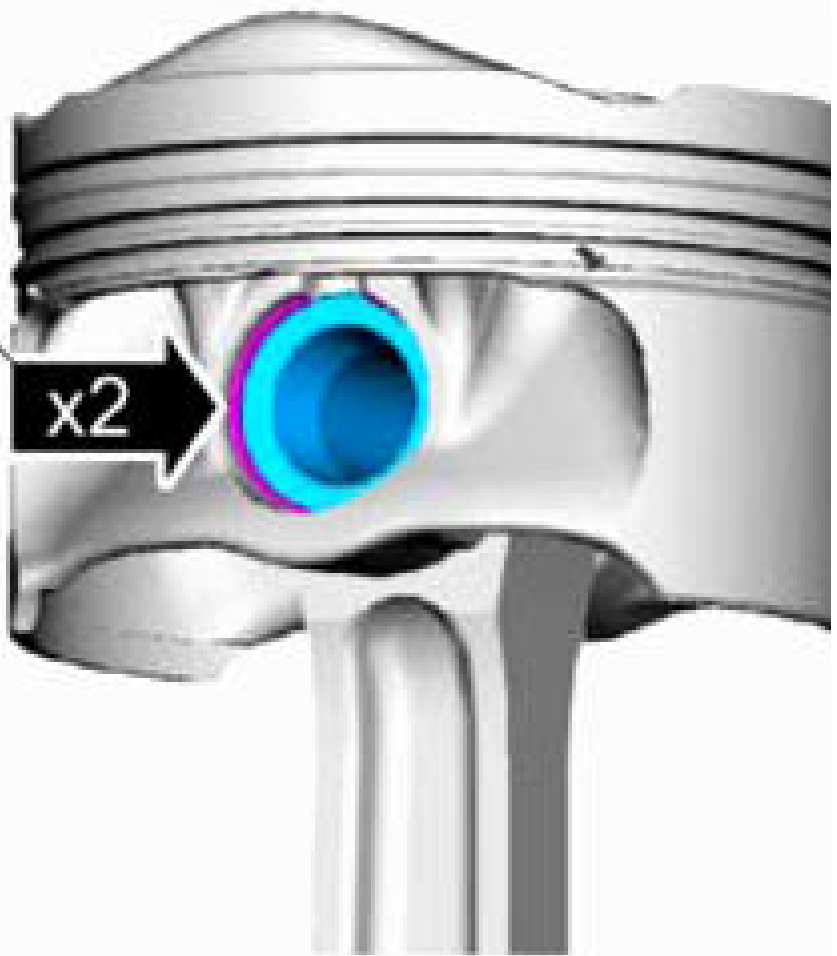
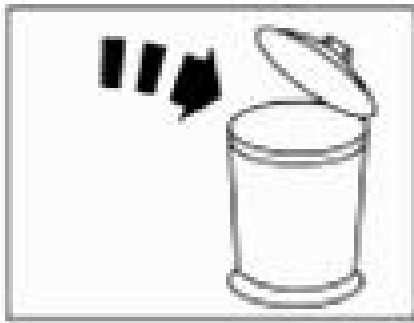
DISASSEMBLY

1.



1.

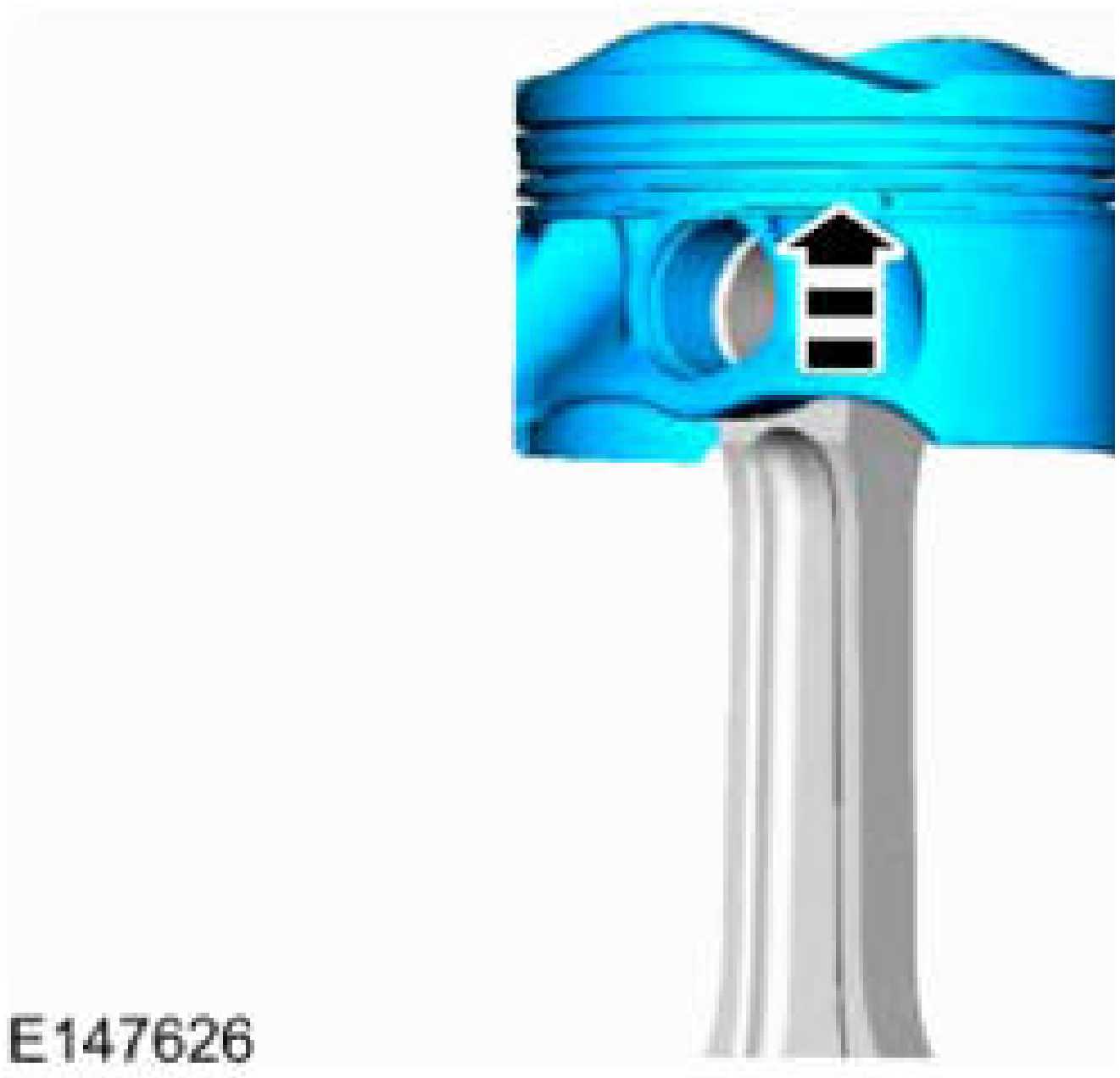
2.



E147625

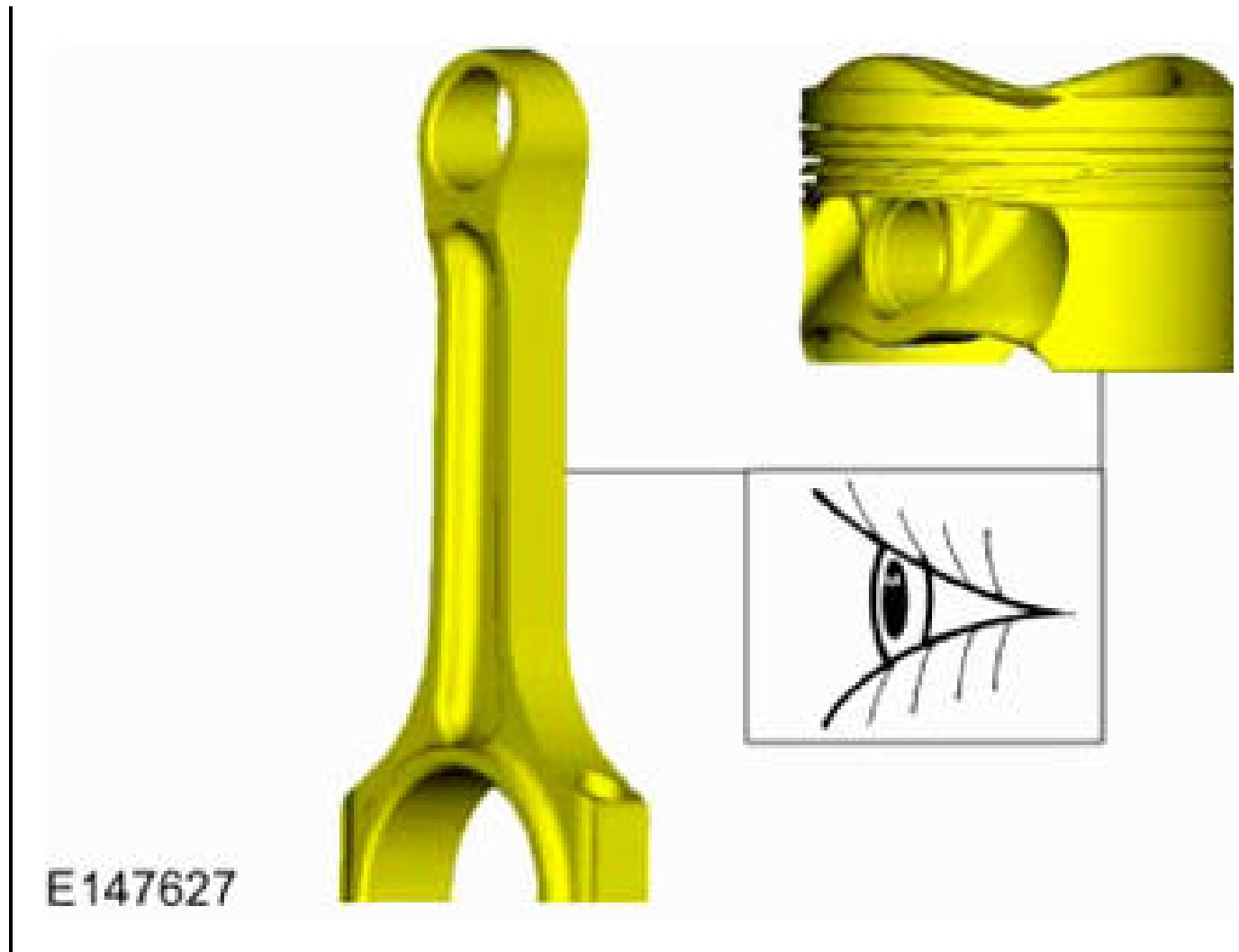
2.

3.



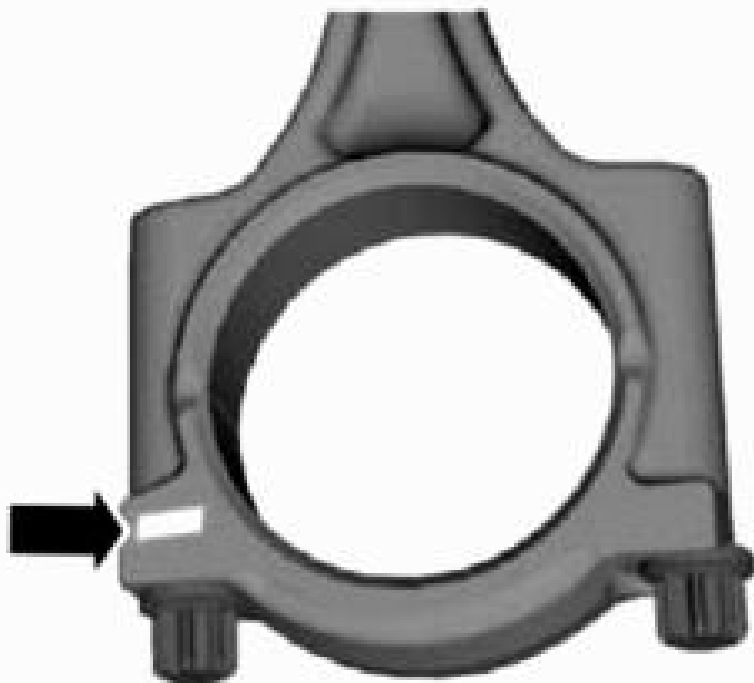
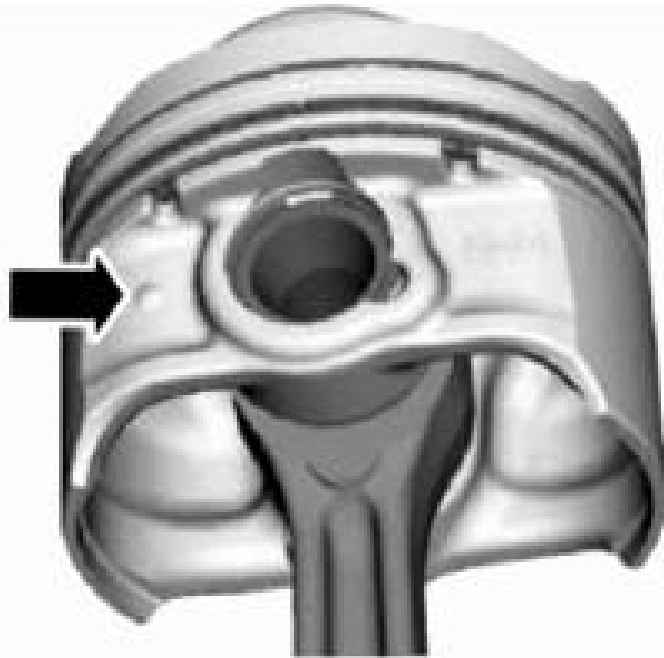
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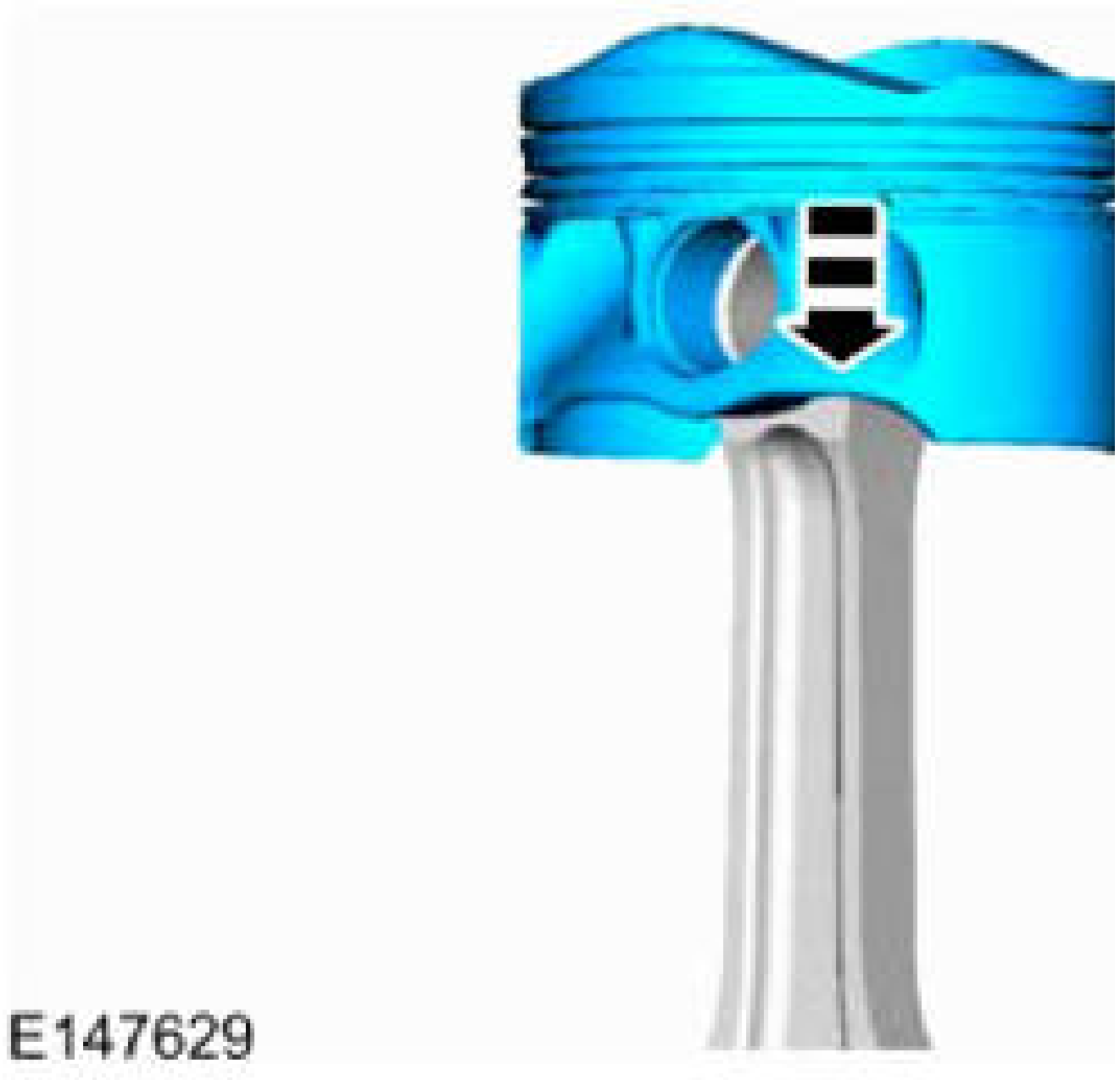
4. Refer to: **PISTON INSPECTION** .



ASSEMBLY

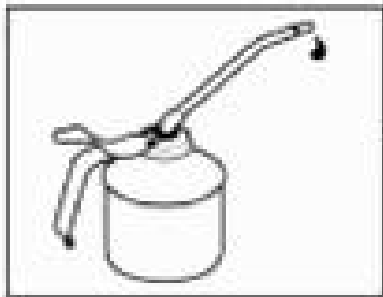
1. Indicates front of engine.



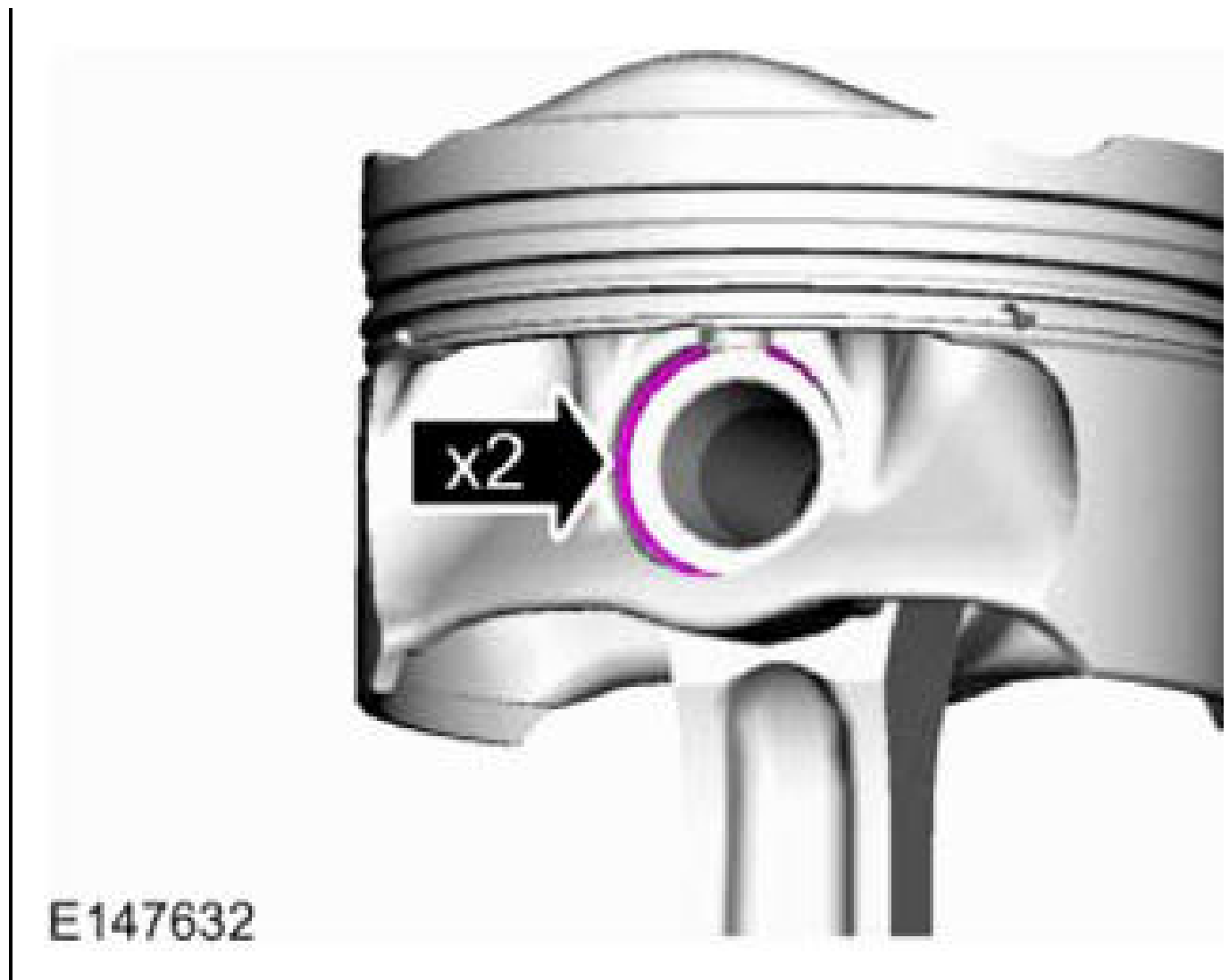


2.

3. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

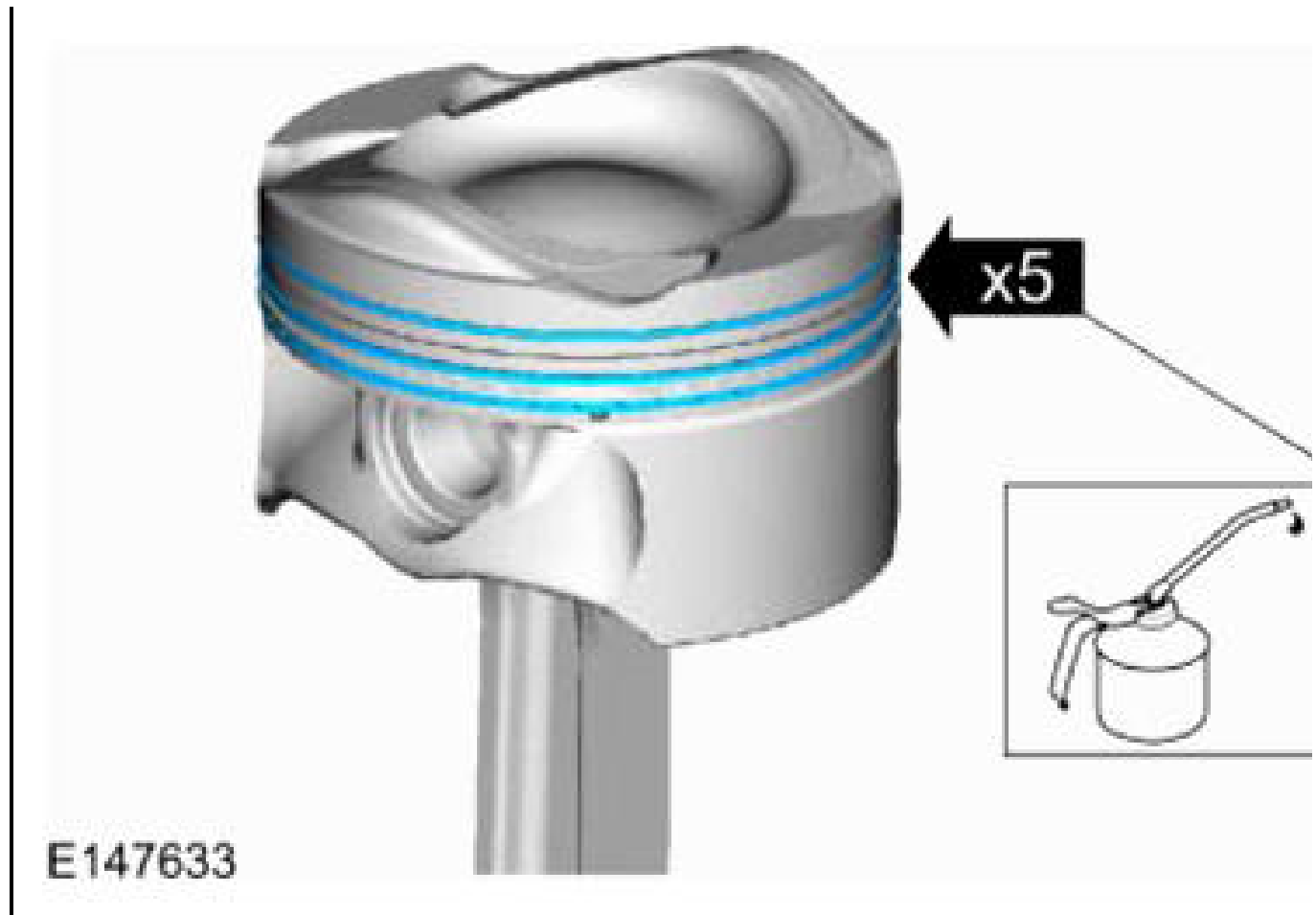


E147630



4.

5. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

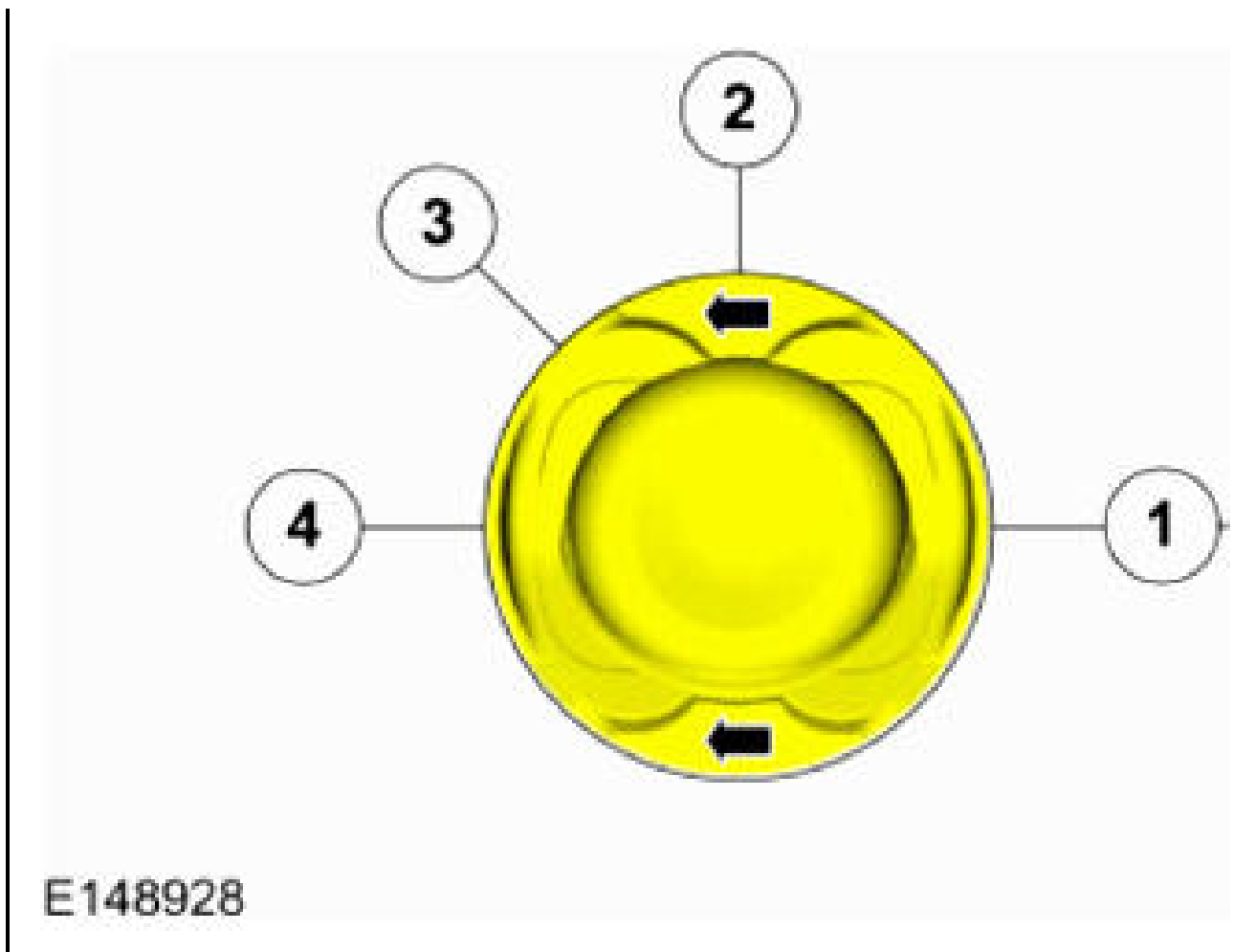


6. **NOTE:** The upper and lower compression rings are to be fitted with the identification marks on the upper side.

NOTE: Arrows faces the front of the engine.

NOTE: Align the piston rings on the piston.

1. Upper compression ring gap location.
2. Lower compression ring gap location.
3. Upper oil control segment ring gap location.
4. Expander ring gap location.
5. Lower oil control segment ring gap location.



ASSEMBLY

ENGINE

SPECIAL TOOLS/GENERAL EQUIPMENT

100-002 (TOOL-4201-C)
Holding Fixture with Dial Indicator Gauge

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion

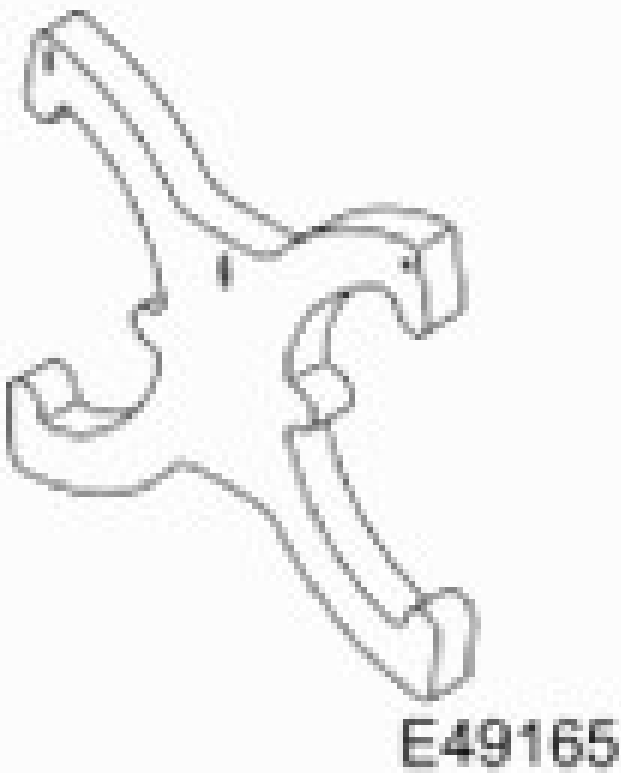


300-OTC1819E
2, 200# Floor Crane, Fold Away

303-103 (T74P-6375-A)



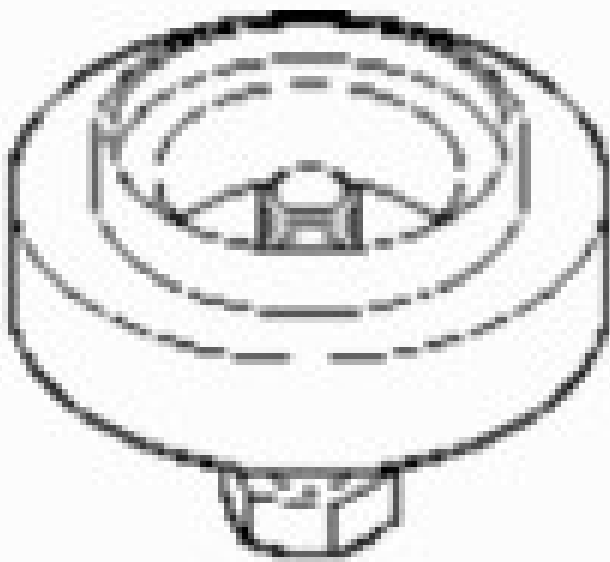
Holding Tool, Flywheel
TKIT-2009TC-F
T74P-77000-A



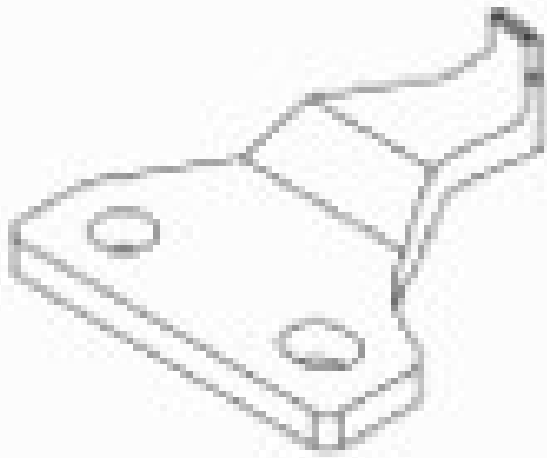
303-1097
Locking Tool, Variable Camshaft Timing Oil
Control Unit
TKIT-2001B-FLM
TKIT-2001B-ROW



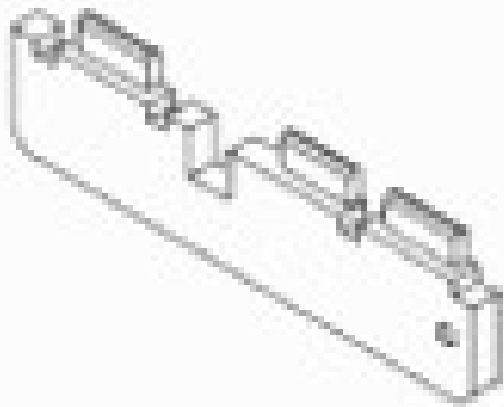
303-1502
Lifting Device Engine



303-1532
Installer, Camshaft Seal
TKIT-2001B-FLM
TKIT-2001B-ROW

**E126212****303-1550**

Alignment Tool, Crankshaft Vibration Damper

**E126214****303-1552**

Alignment Tool, Camshaft

303-1567



ST3266-A

Sizer, Teflon Seal
TKIT-2001C-FLM
TKIT-2001C-ROW

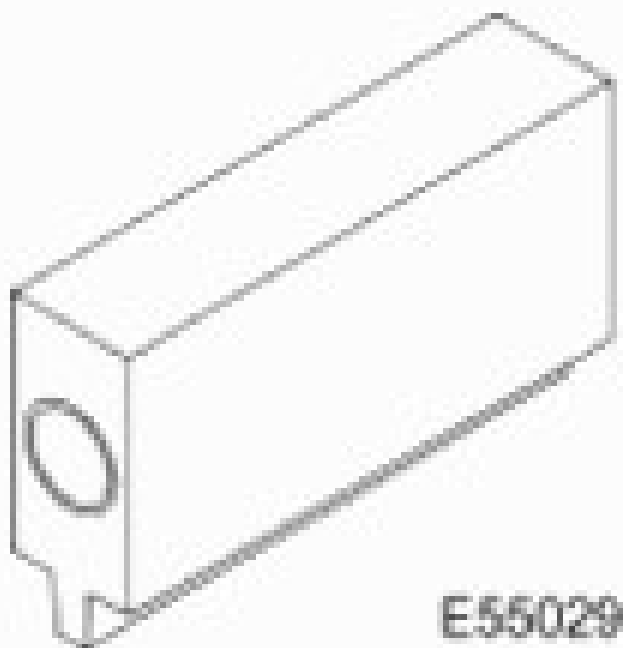


303-175 (T82L-6316-A)
Installer, Crankshaft Vibration Damper
TKIT-1982-F

303-335 (T88T-6701-A)
Installer, Front Cover Oil Seal
TKIT-1988-F
TKIT-1988-FLM

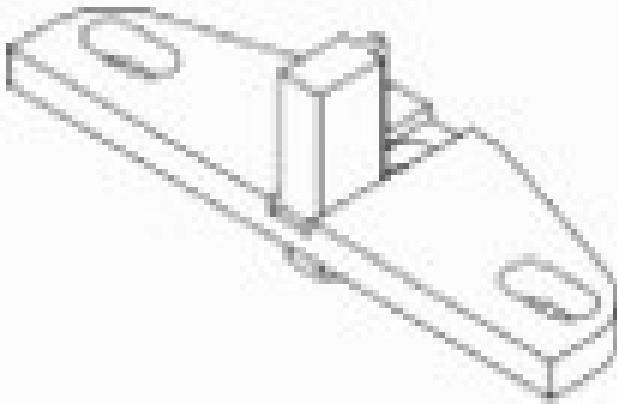
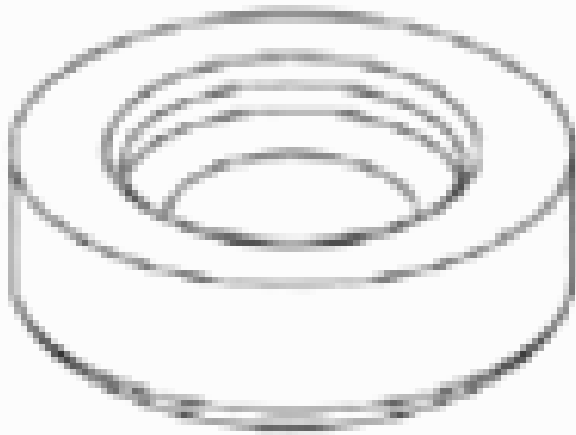
2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



303-393-02
Adapter for 303-393

303-393A
Locking Tool, Flywheel

**E63417**

303-420 (T92P-6701-BH)
Installer, Crankshaft Front Oil Seal
TKIT-1992-FLMH/LMH
TKIT-1992-LMH/MH

303-748
Locking Tool, Crankshaft
TKIT-2001B-FLM
TKIT-2001B-ROW

**303748****ST3096-A****310-205**
Fuel Injector Brush
TKIT-2009A-FLM

2013 Ford Fusion SE

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310-207

Installer, Fuel Injector Seal Assembly
TKIT-2009A-FLM

Feeler Gauge

Hose Clamp Remover/Installer

Piston Ring Compressor

MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A
Thread Sealant with PTFE TA-24	WSK-M2G350-A2
Motorcraft® Silicone Gasket Remover ZC-30	-
Motorcraft® Metal Surface Prep ZC-31-A	-
Flange Sealant CU7Z-19B508-A	WSS-M2G348-A11
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A

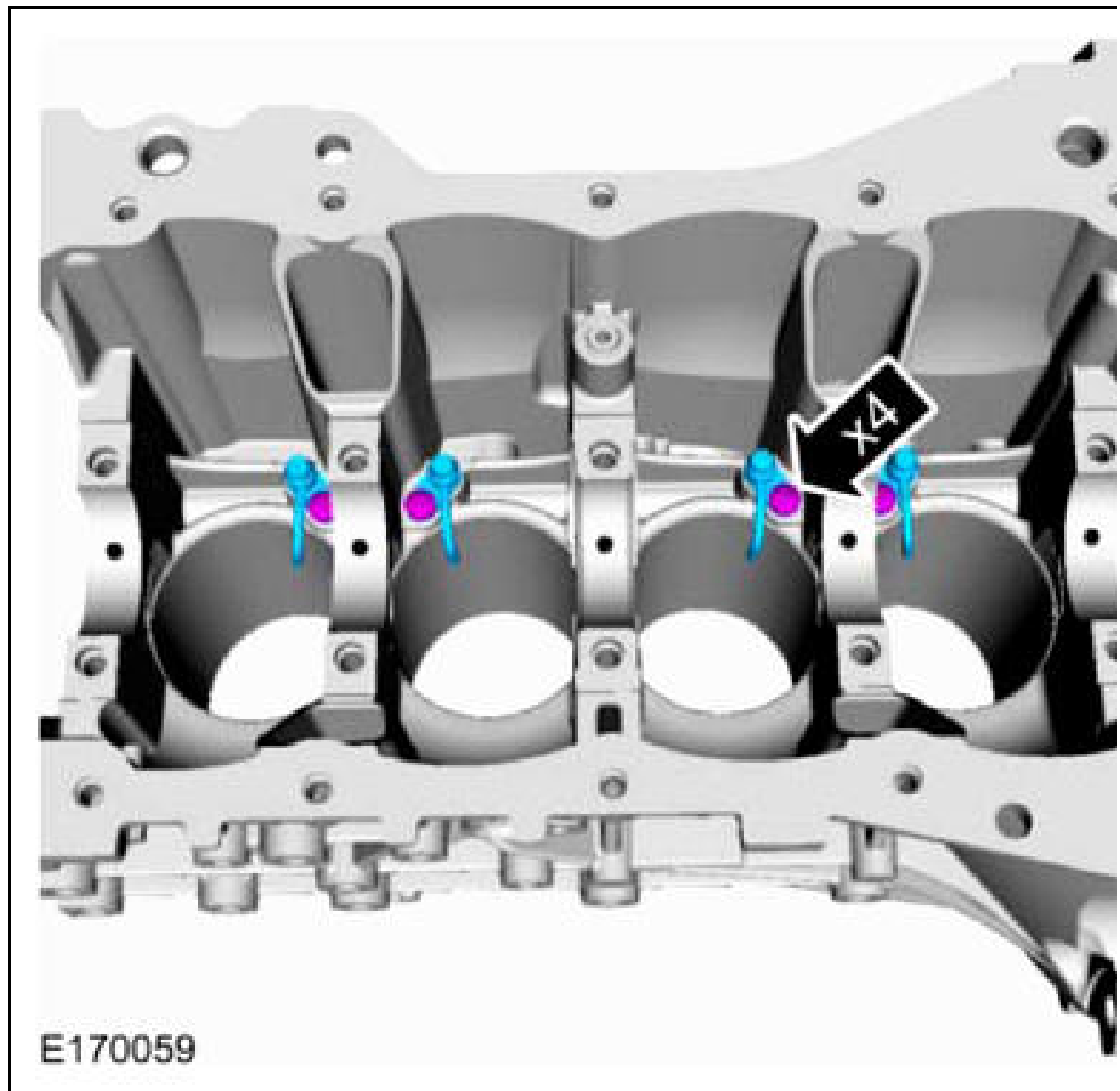
All vehicles

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

failure.

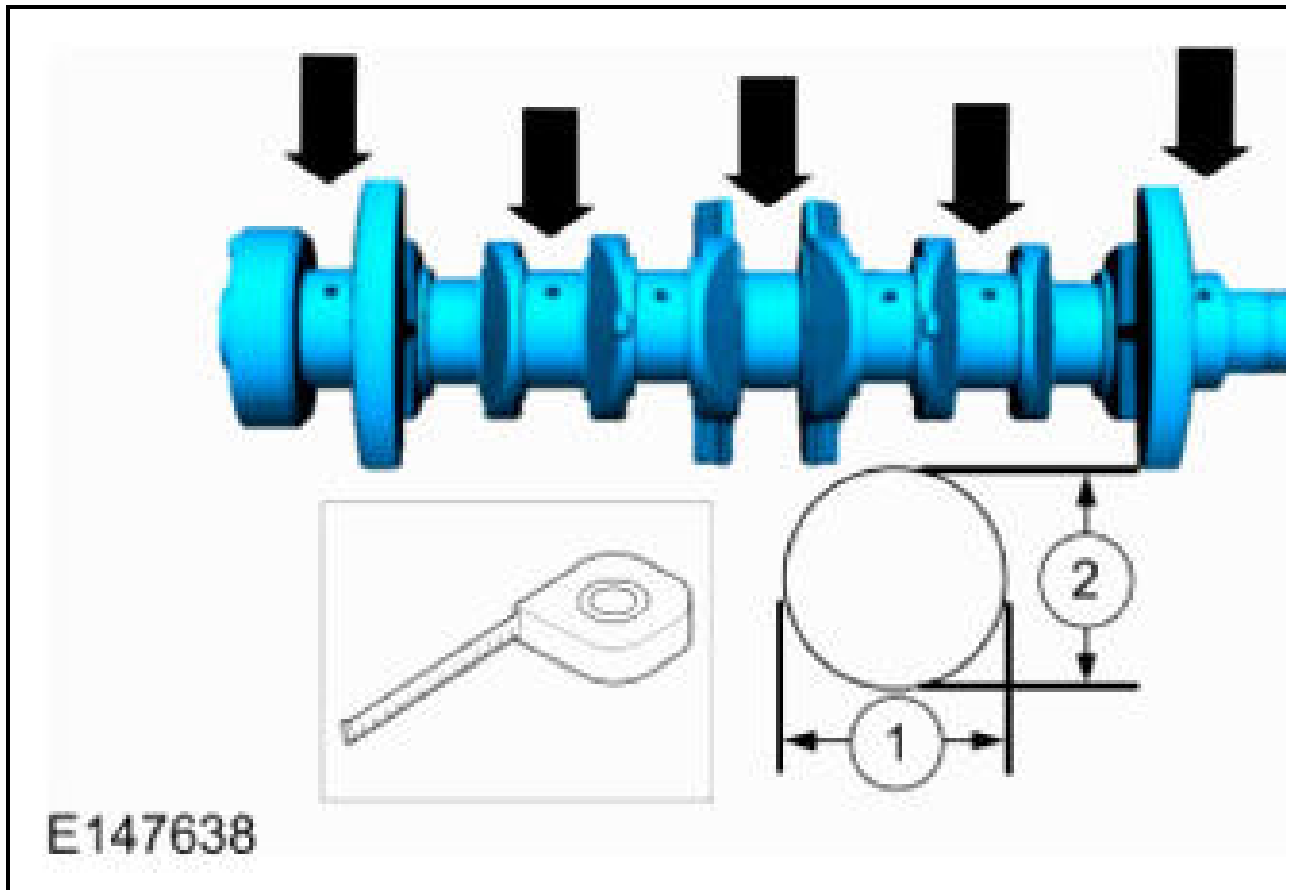
NOTE: Refer to exploded views in Description and Operation.

1. *Torque* : 9 Nm

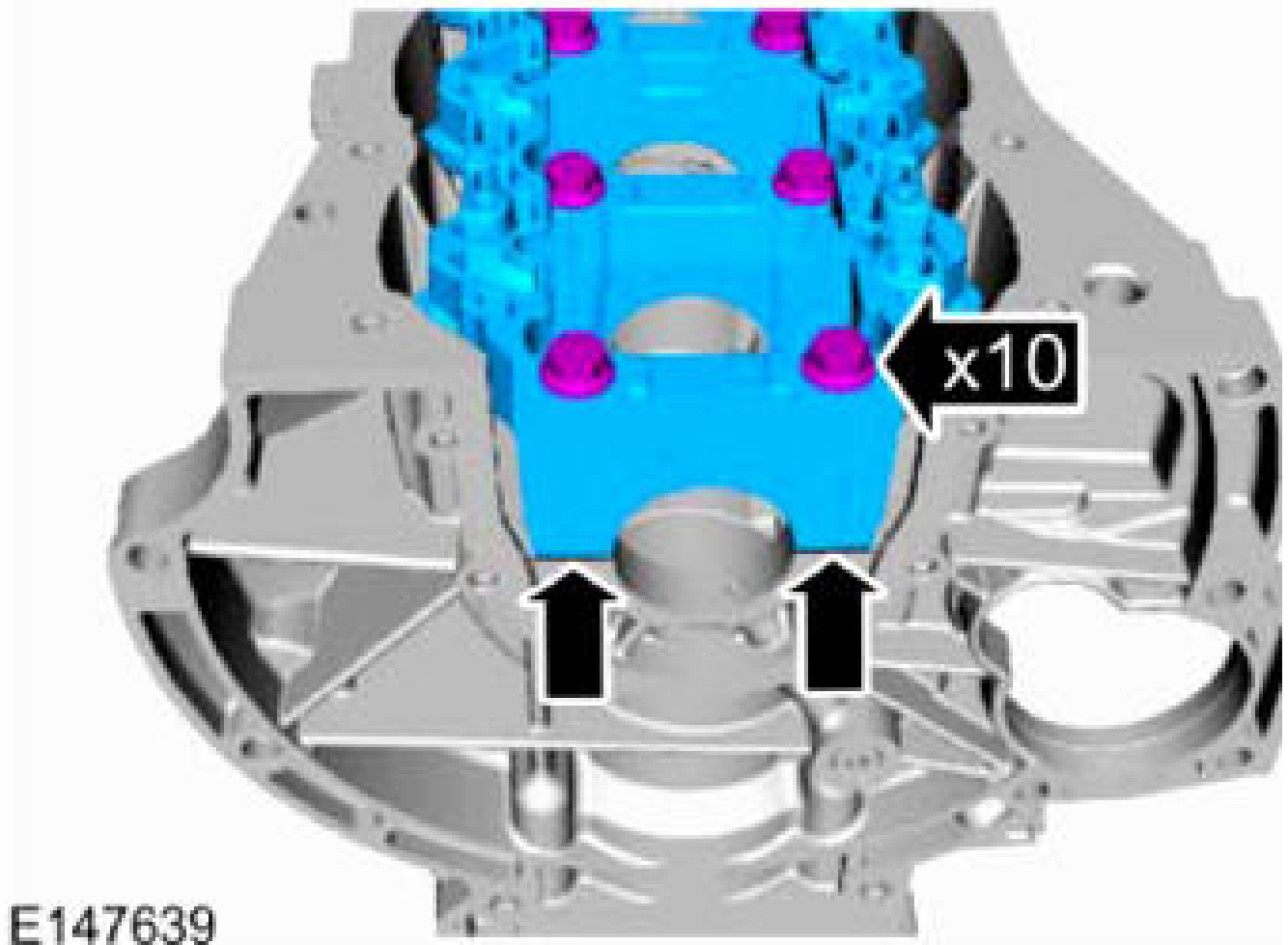


2.
 - Measure the length in two directions.

- Record the smallest measurement for each crankshaft main bearing journal.



3. Mounted flush and finger tight.



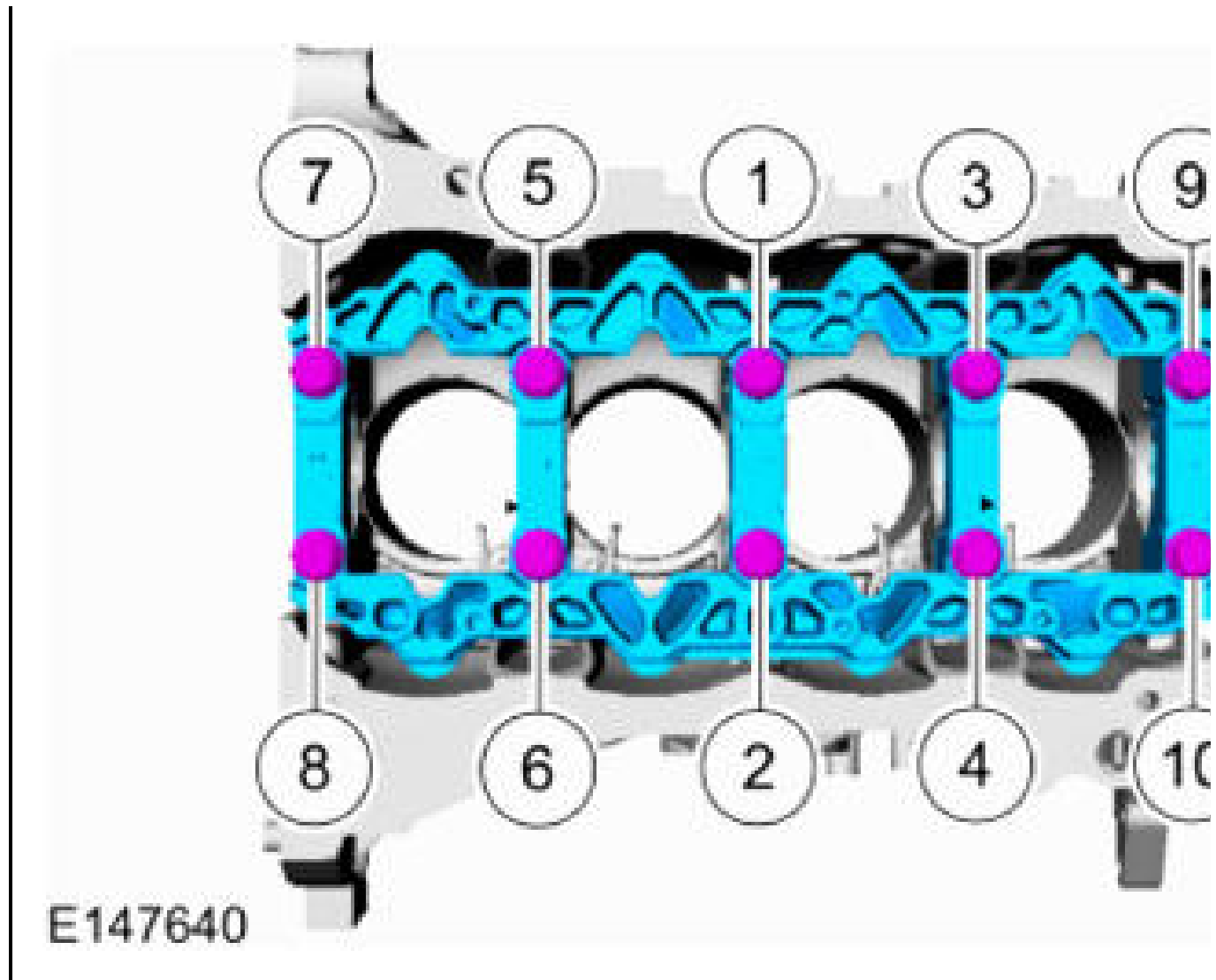
4. *Torque :*

Stage 1: 30 Nm

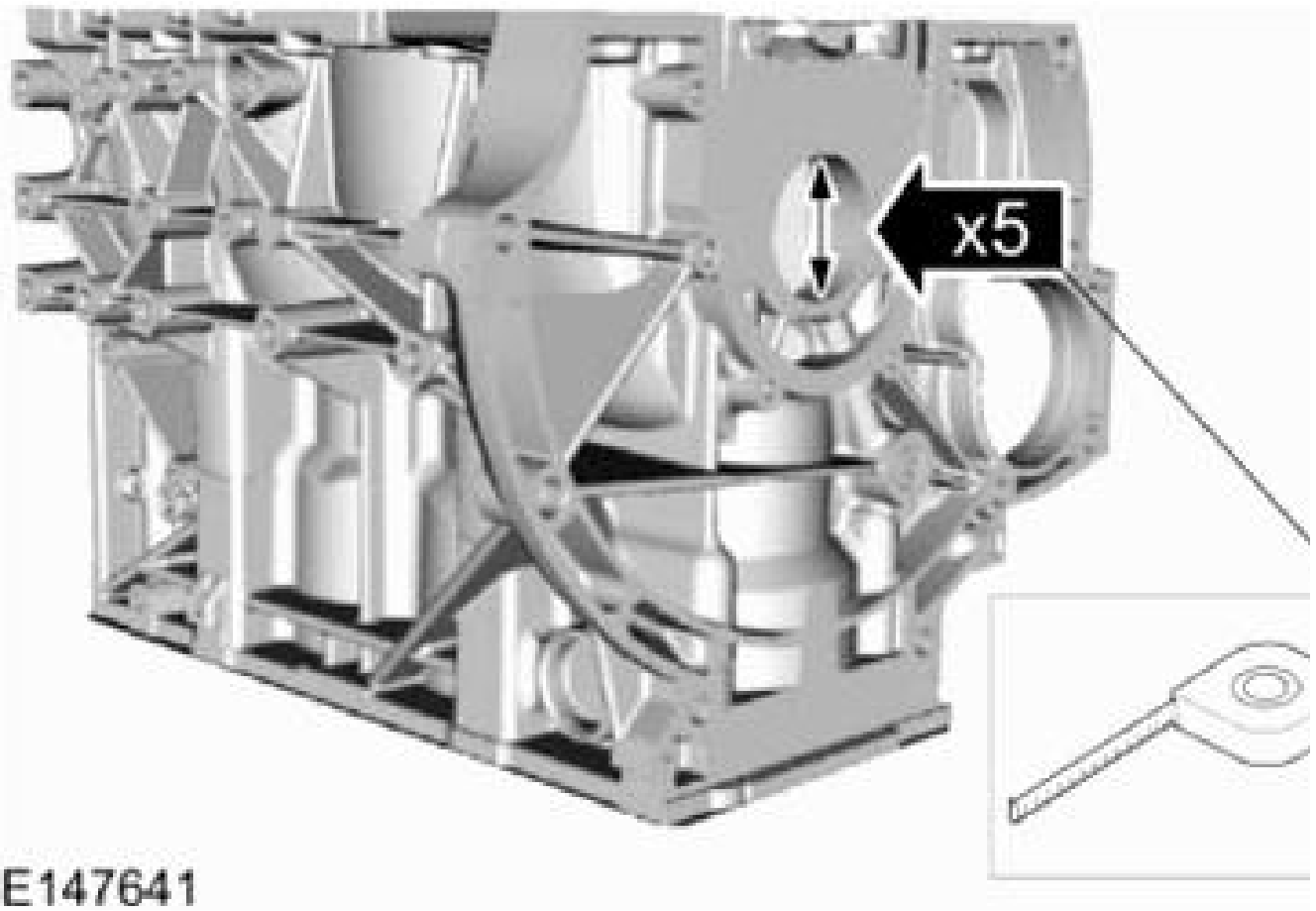
Stage 2: 50 Nm

Stage 3: 45°

Stage 4: Tighten an additional 45°



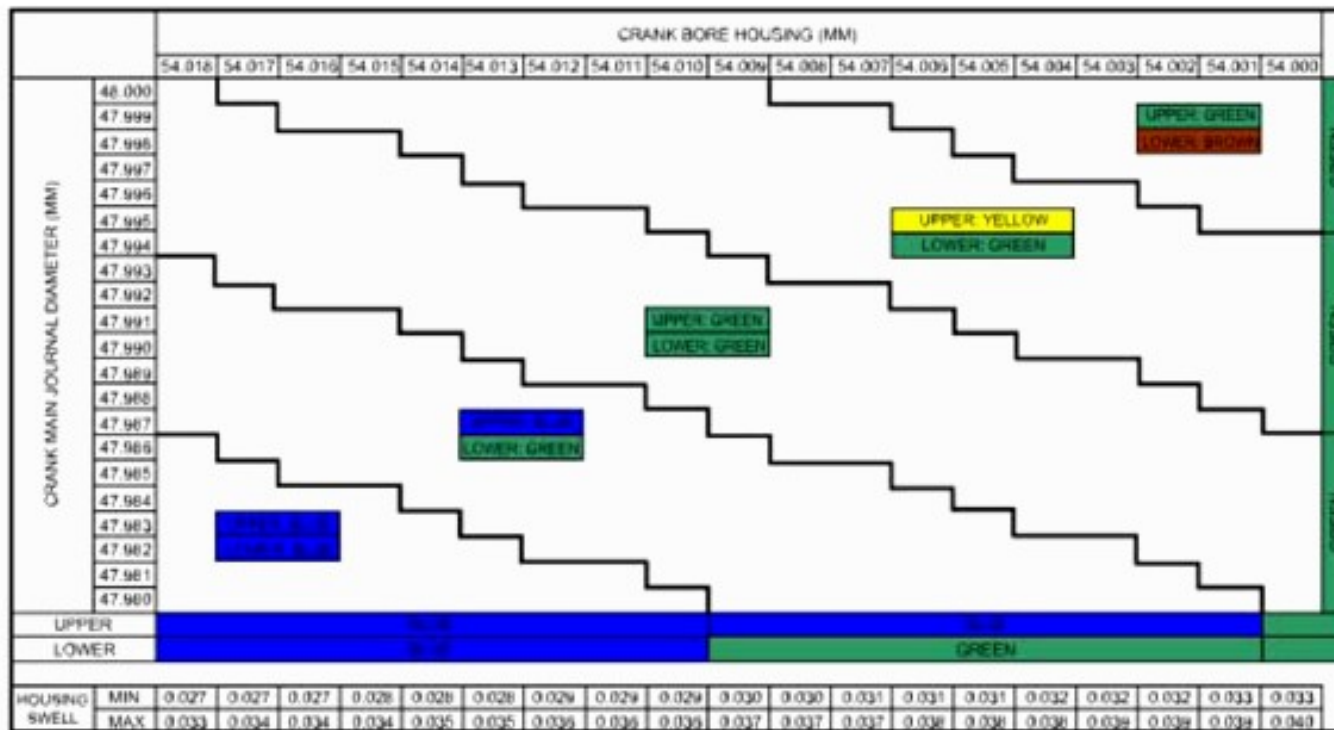
5. Measure the length in five places.



6. Using the chart, select the crankshaft main bearings.

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



E148926

NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

7.

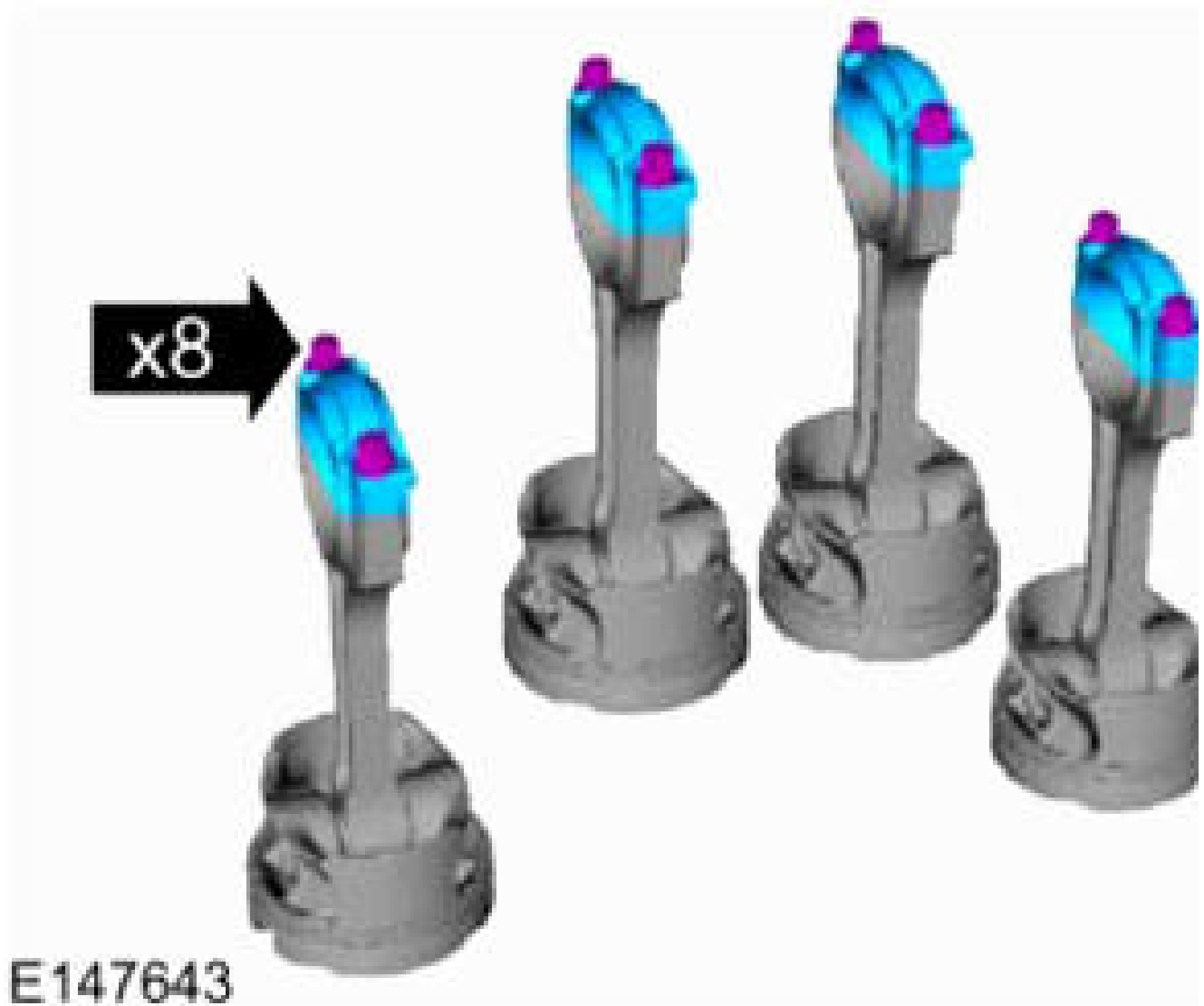
Use the original connecting rod cap bolts.

Torque :

Stage 1: 18 Nm

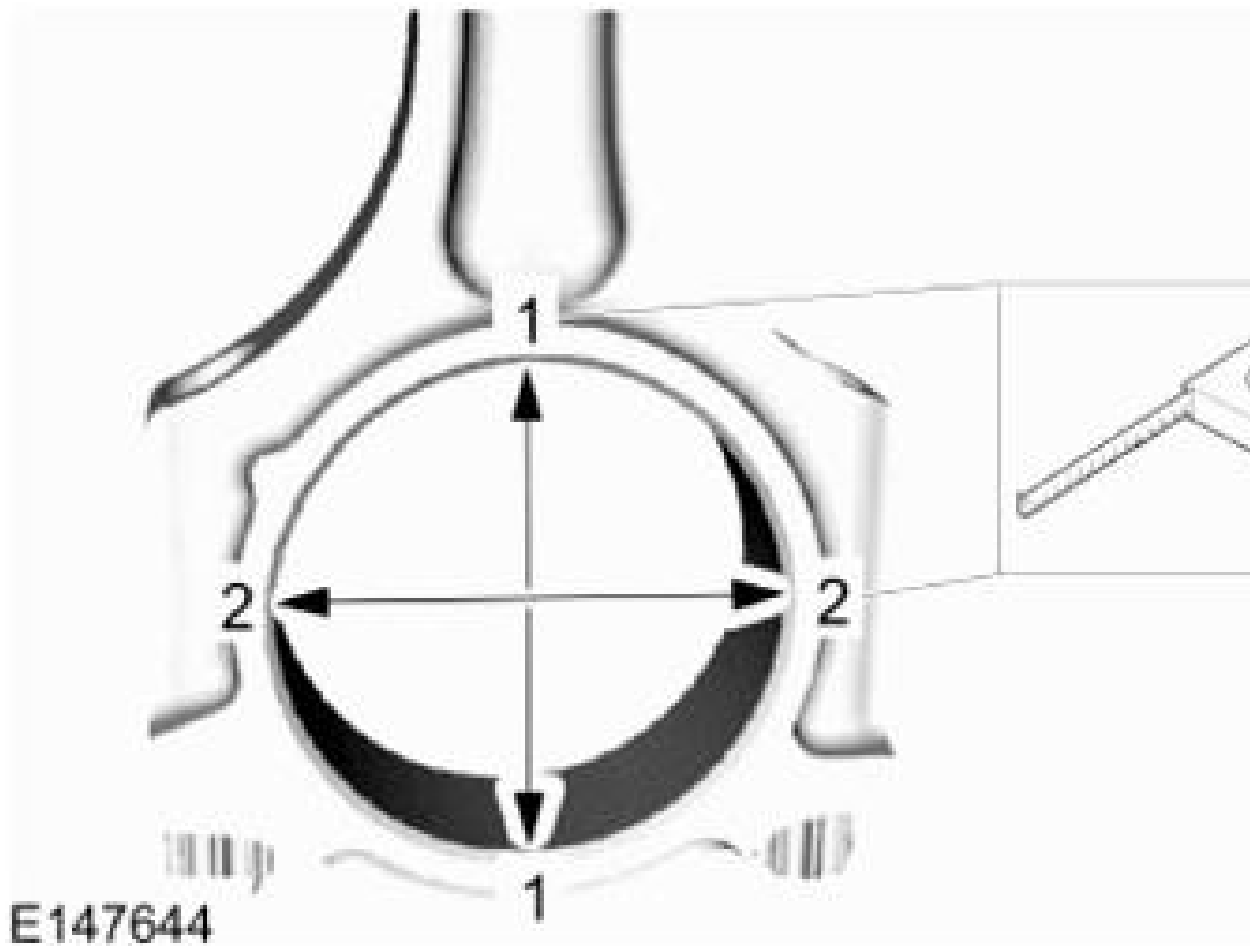
Stage 2: 45°

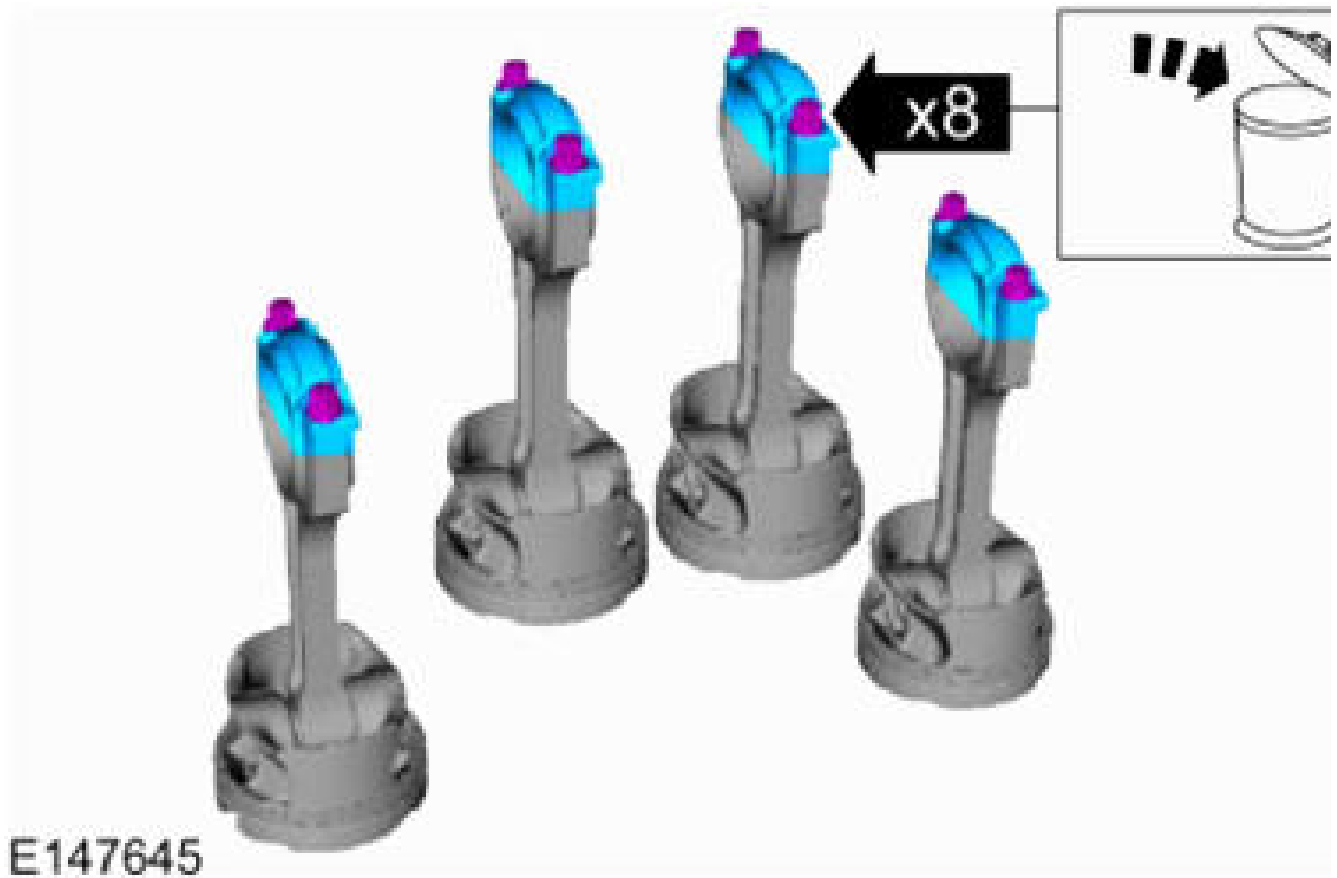
Stage 3: Tighten an additional 45°



8.

- Measure the length or distance in two directions.
- Record the smallest measurement for each connecting rod.

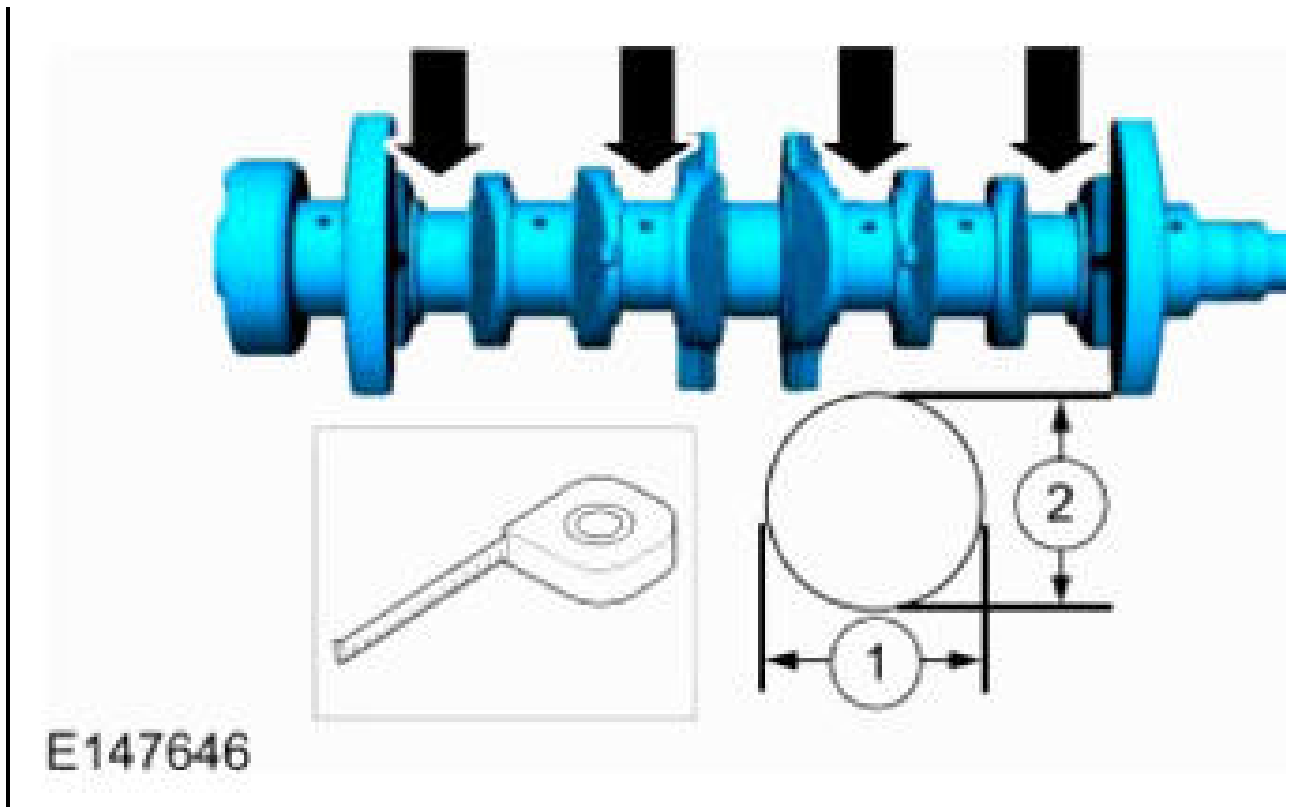




9.

10.

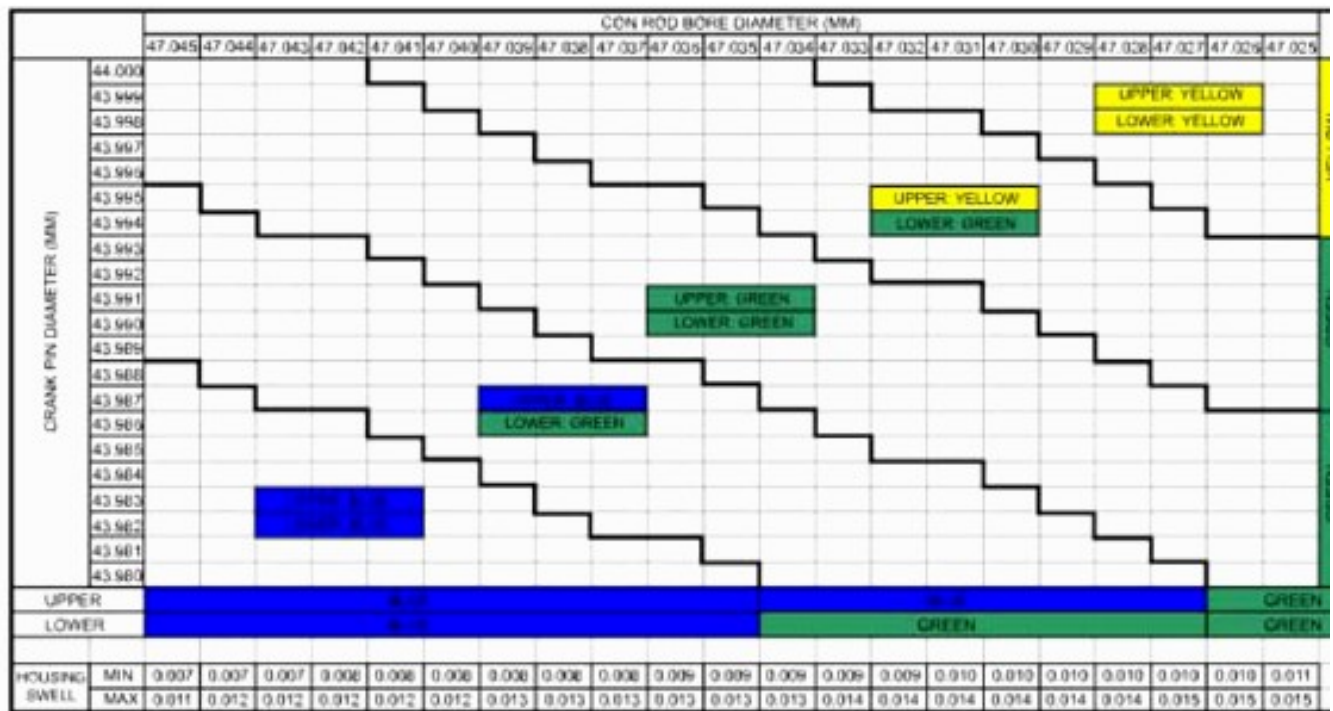
- Measure the length in two directions.
- Record the smallest measurement for each connecting rod journal.



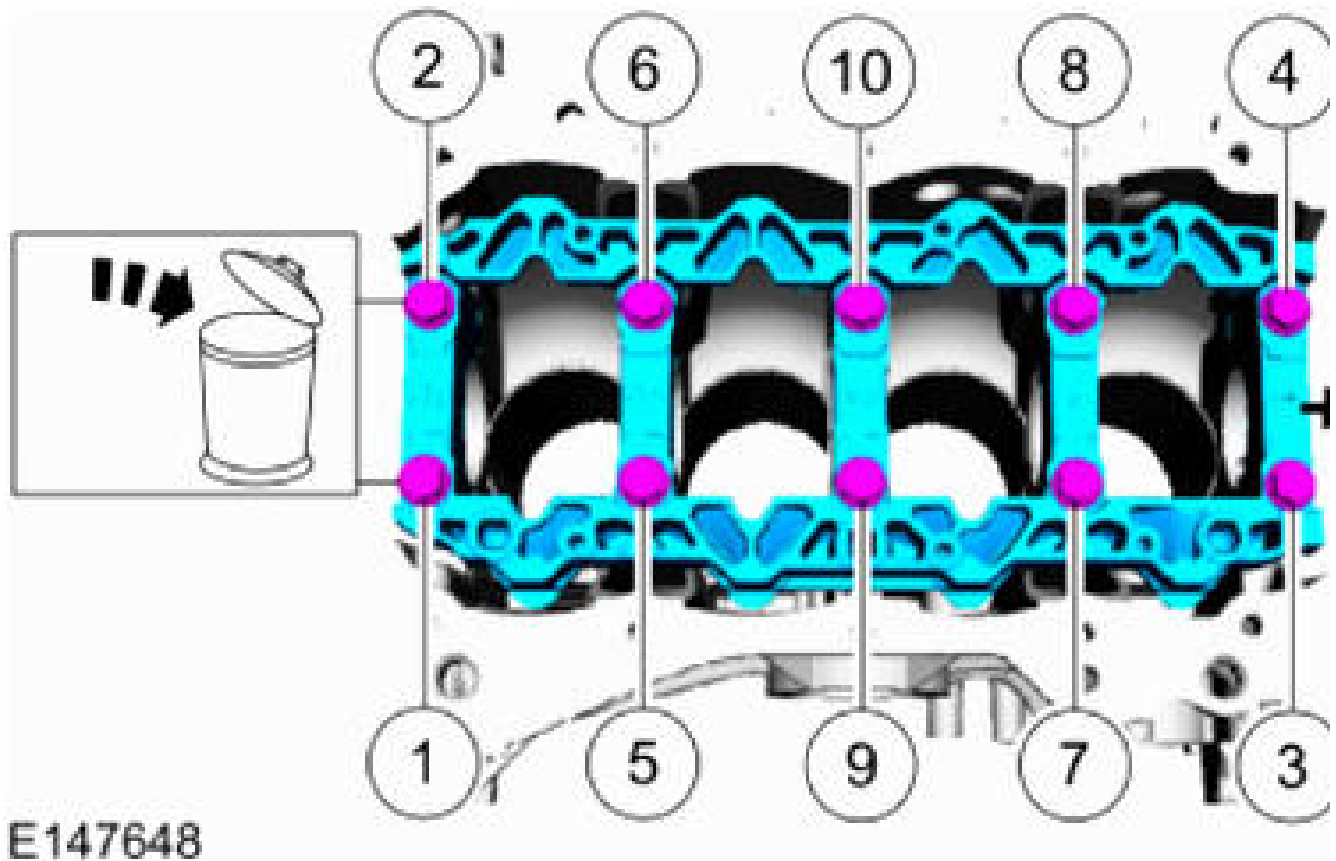
11. Using the chart, select the correct connecting rod bearings for each crankshaft connecting rod journal

2013 Ford Fusion SE

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E148927



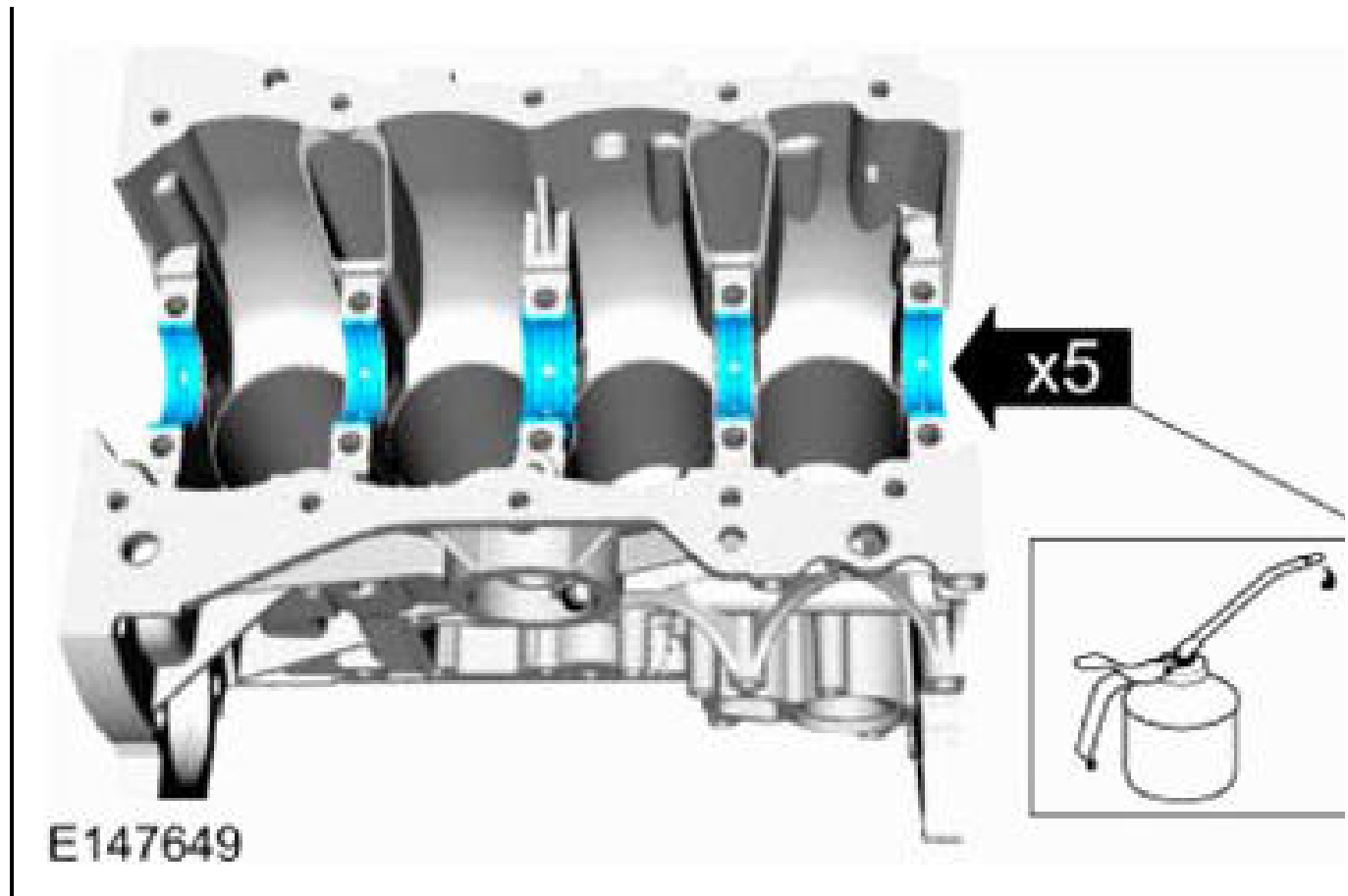
12.

NOTE: Before assembling the cylinder block, all sealing surfaces must be free of chips, dirt, paint and foreign material. Also, make sure the coolant and oil passages are clear.

13.

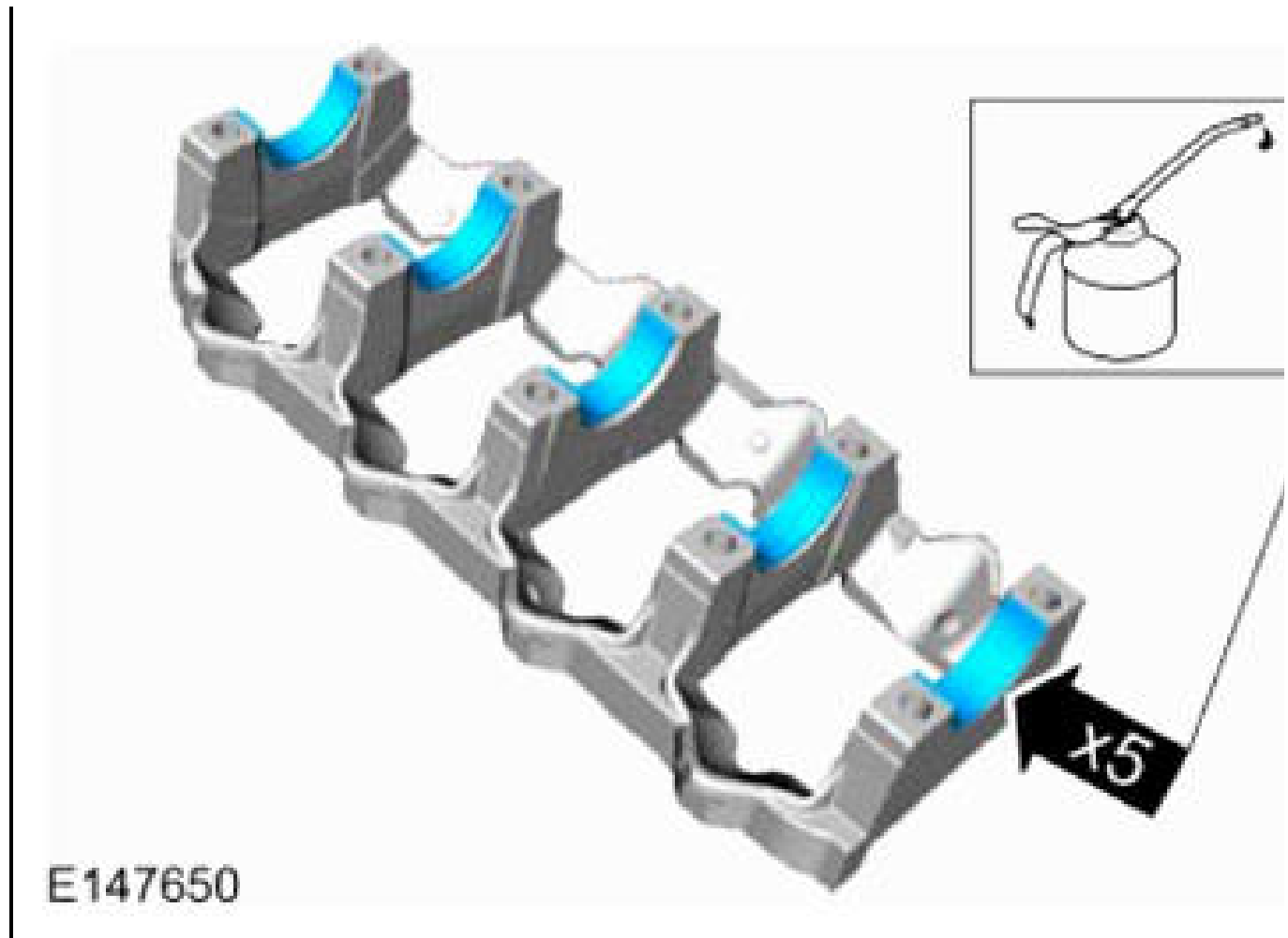
NOTE: If reusing the crankshaft main bearings, install them in their original positions and orientation as noted during disassembly.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

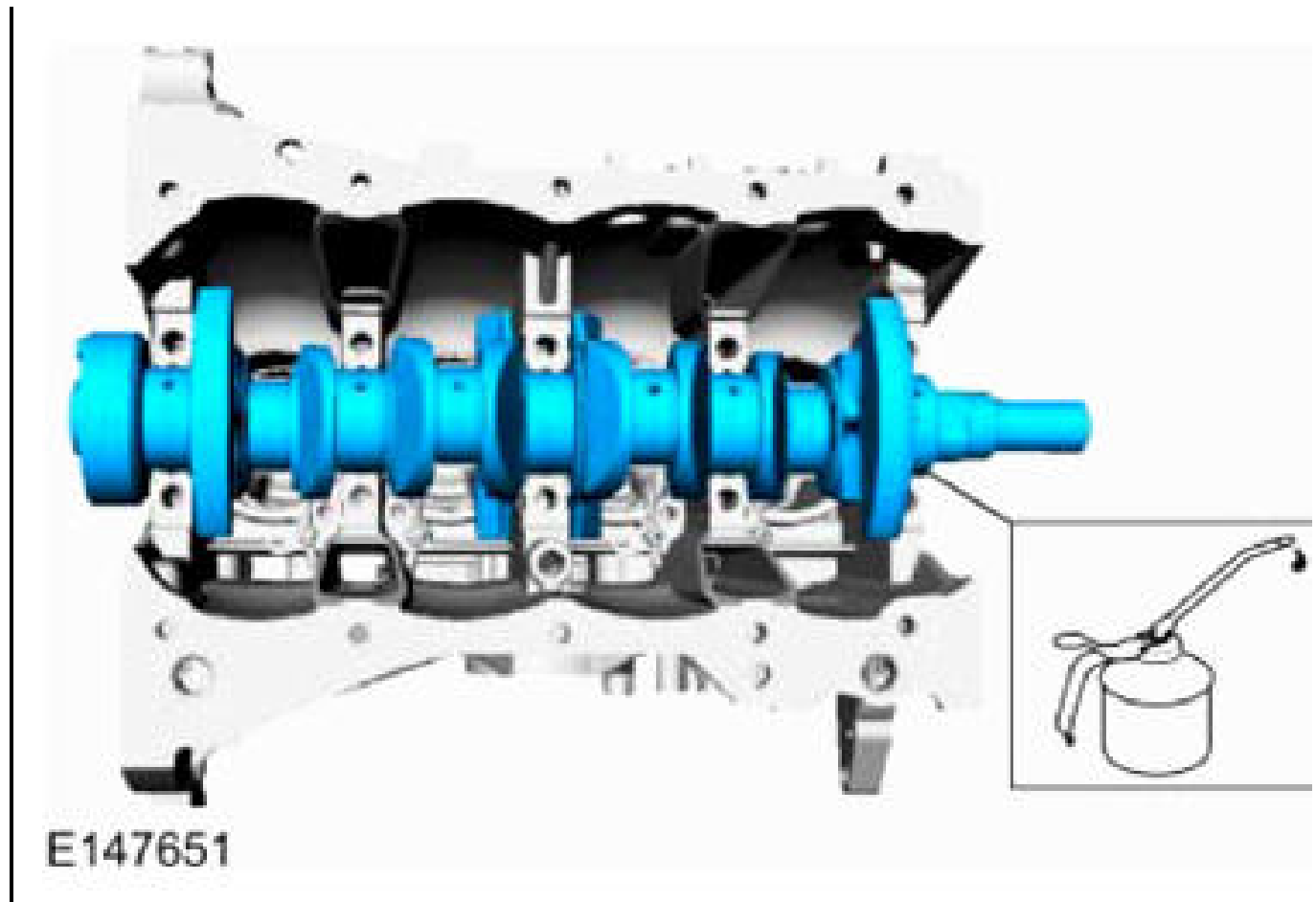


14. **NOTE:** If reusing the crankshaft main bearings, install them in their original positions and orientation as noted during disassembly.

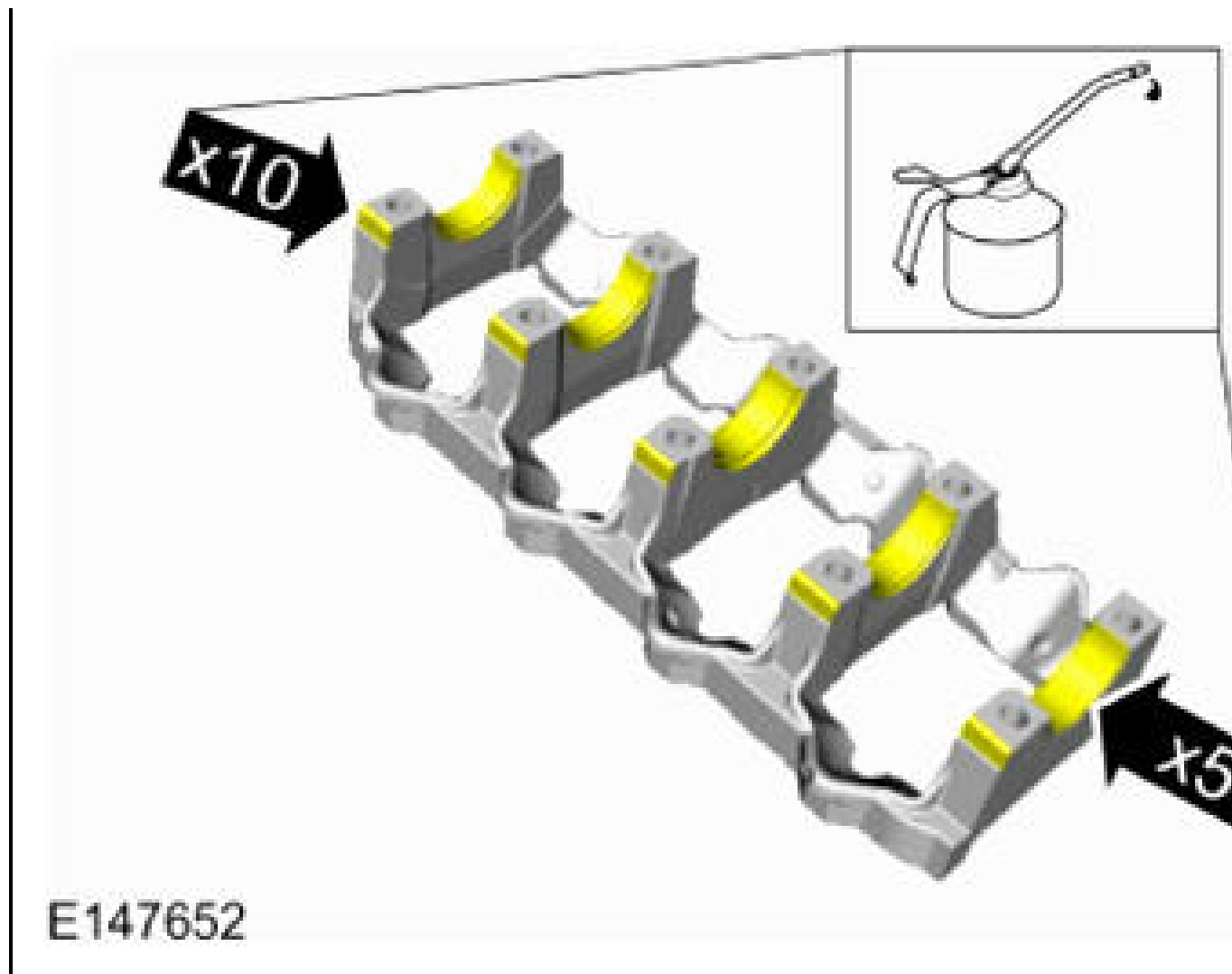
Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



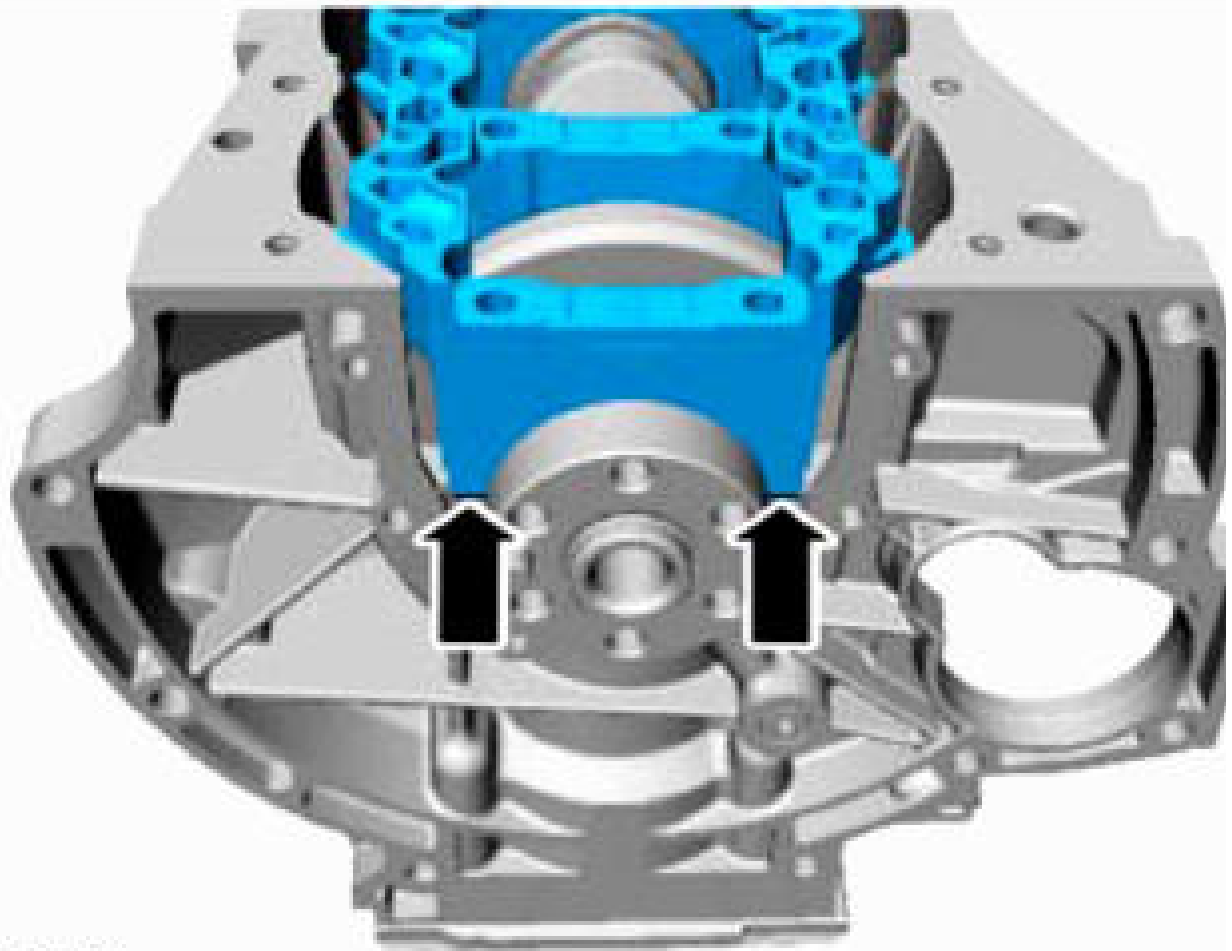
15. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



16. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



17. Mounted flush.

**E147653**

18. **NOTE:** Lubricate the main bearing beam bolts threads with clean engine oil.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

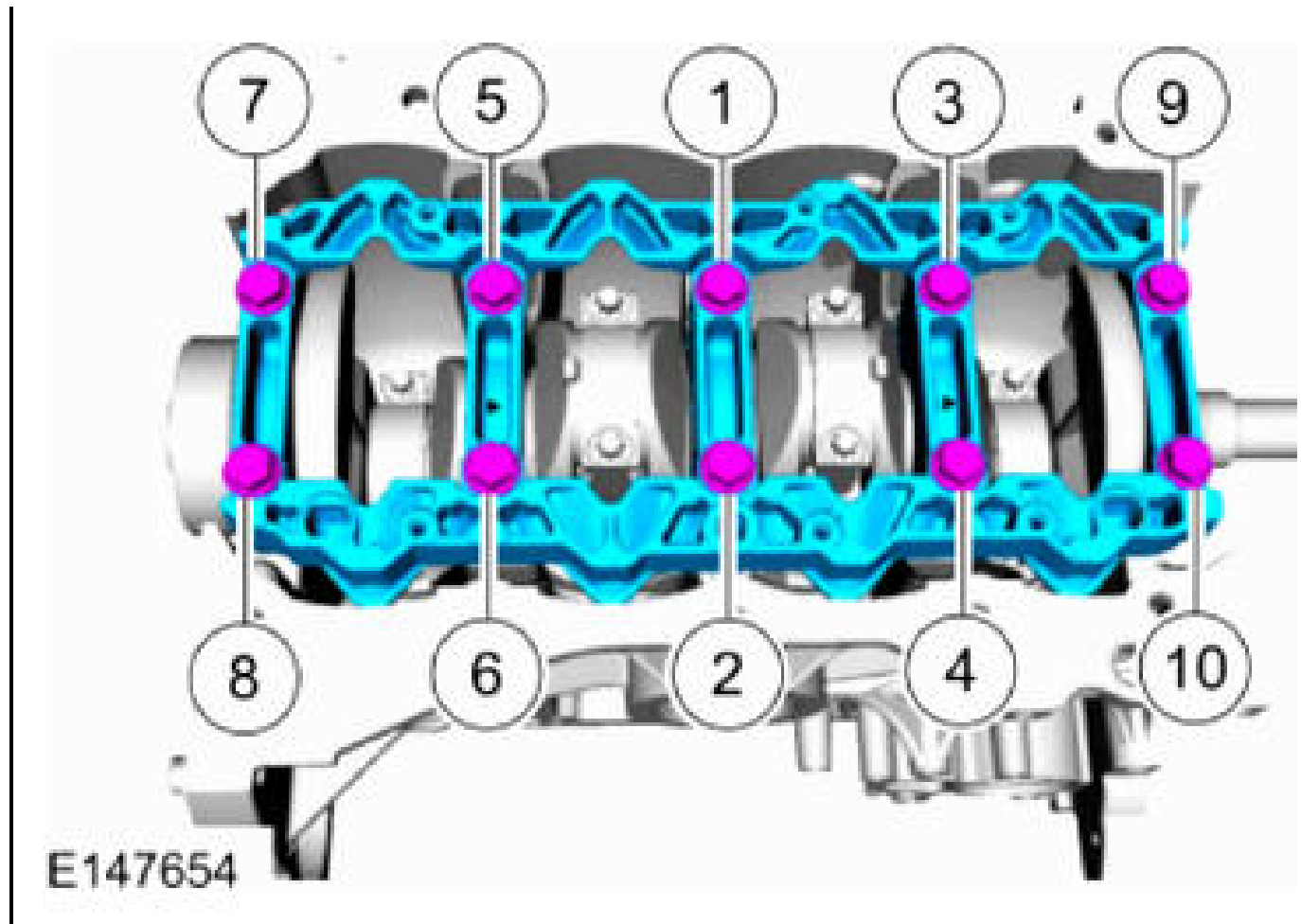
Torque :

Stage 1: 30 Nm

Stage 2: 50 Nm

Stage 3: 45°

Stage 4: Tighten an additional 45°

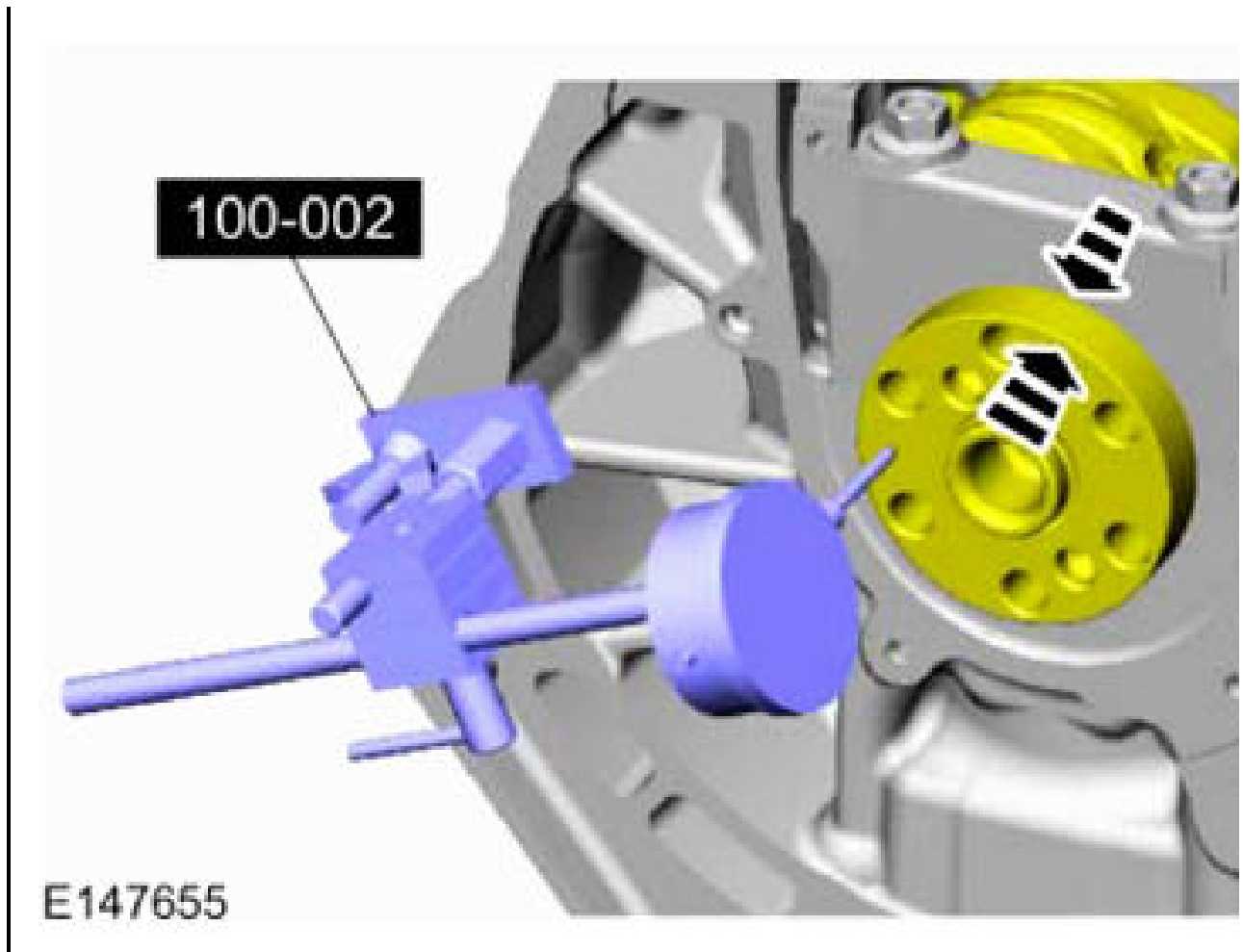


19.

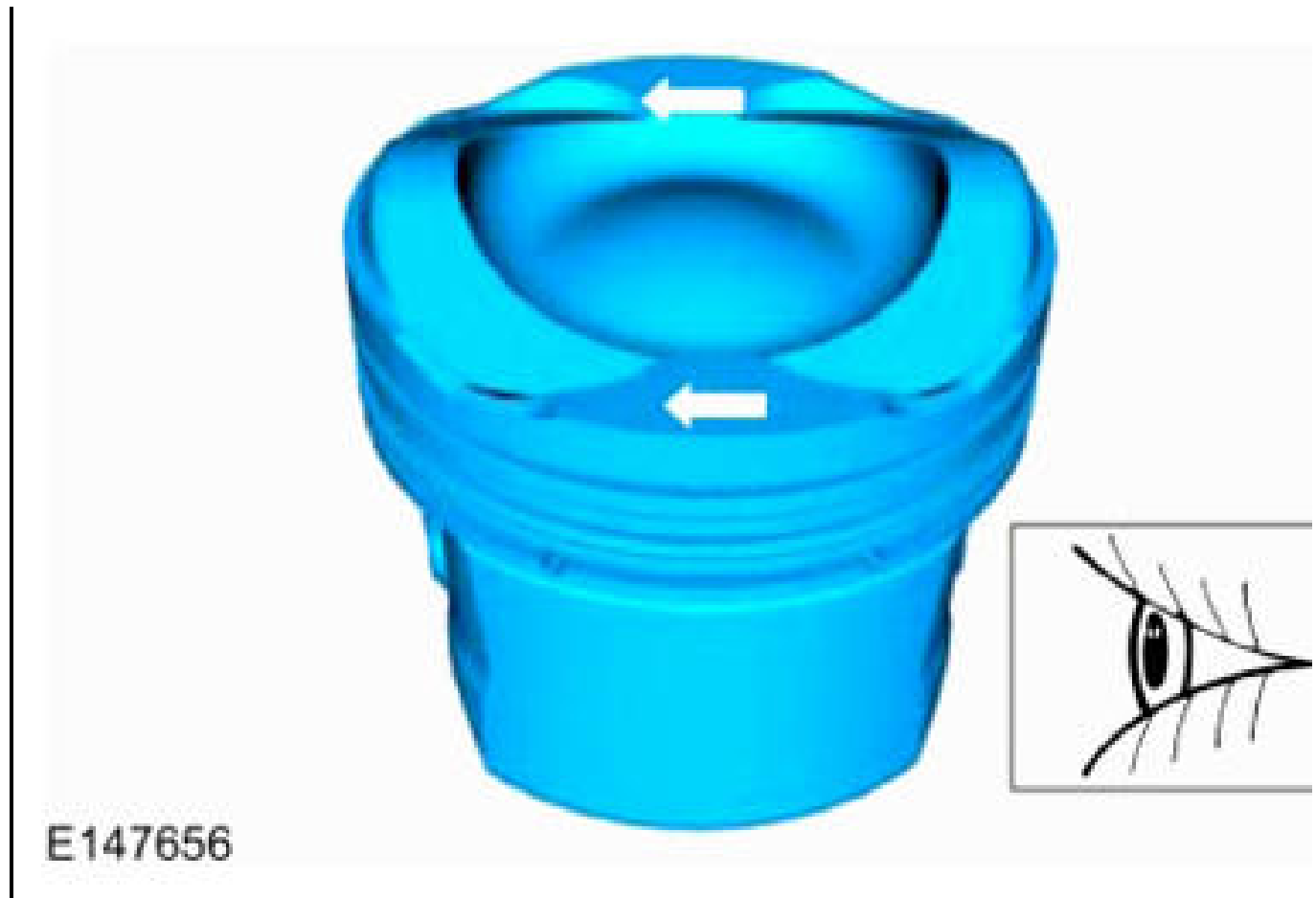
- Position the crankshaft to the rear of the cylinder block.
- Zero the Dial Indicator Gauge with Holding Fixture.

Special Tool(s) : **100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge**

- Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.
- Acceptable crankshaft end play is 0.12-0.43 mm (0.008-0.017 in). If the crankshaft end play exceeds the specified range, install new parts as necessary.

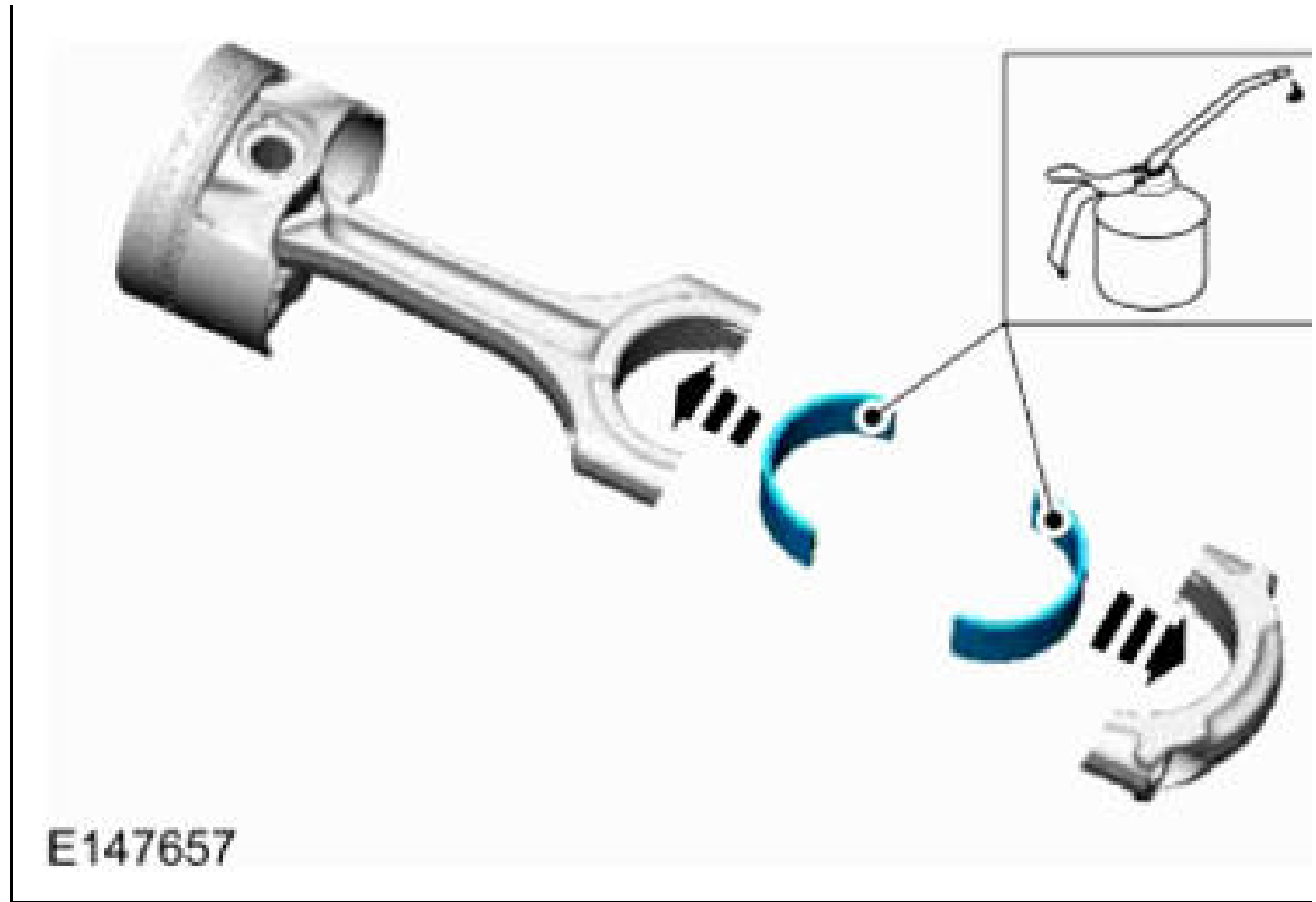


20. Arrows faces the front of the engine.



21. **NOTE:** If reusing the connecting rod bearings, install them in their original positions and orientation as noted during disassembly.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



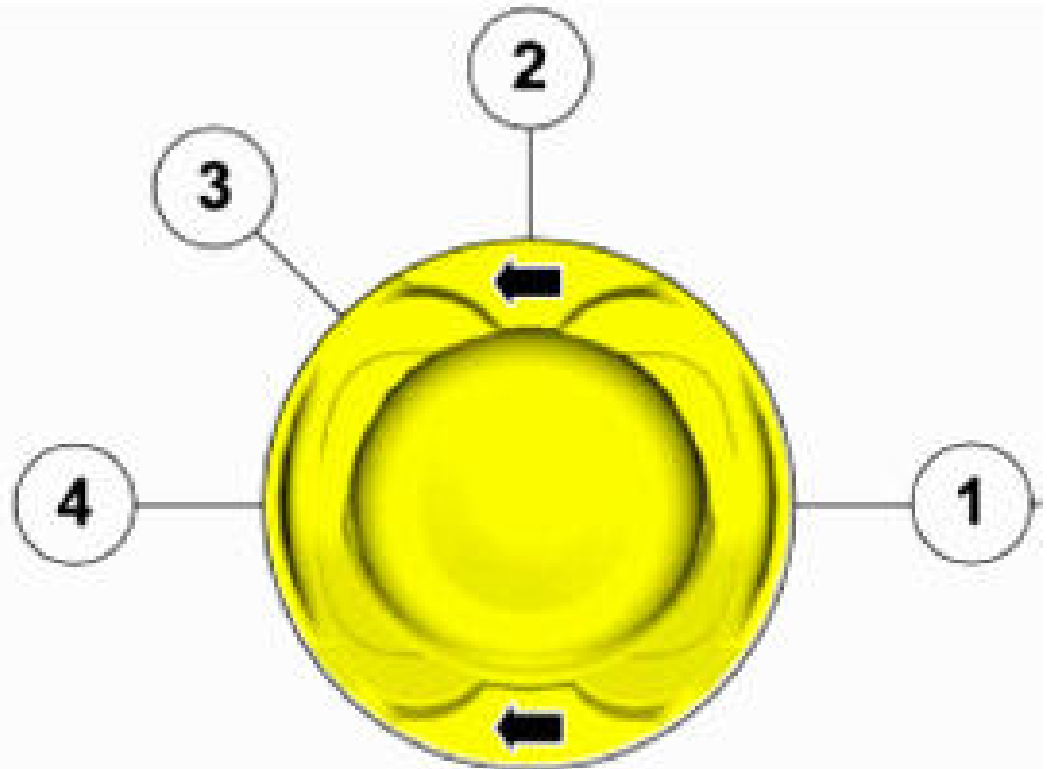
22.

NOTE: The upper and lower compression rings are to be fitted with the identification marks on the upper side.

23.

NOTE: Arrows faces the front of the engine.

1. Upper compression ring gap location.
2. Lower compression ring gap location.
3. Upper oil control segment ring gap location.
4. Expander ring gap location.
5. Lower oil control segment ring gap location.



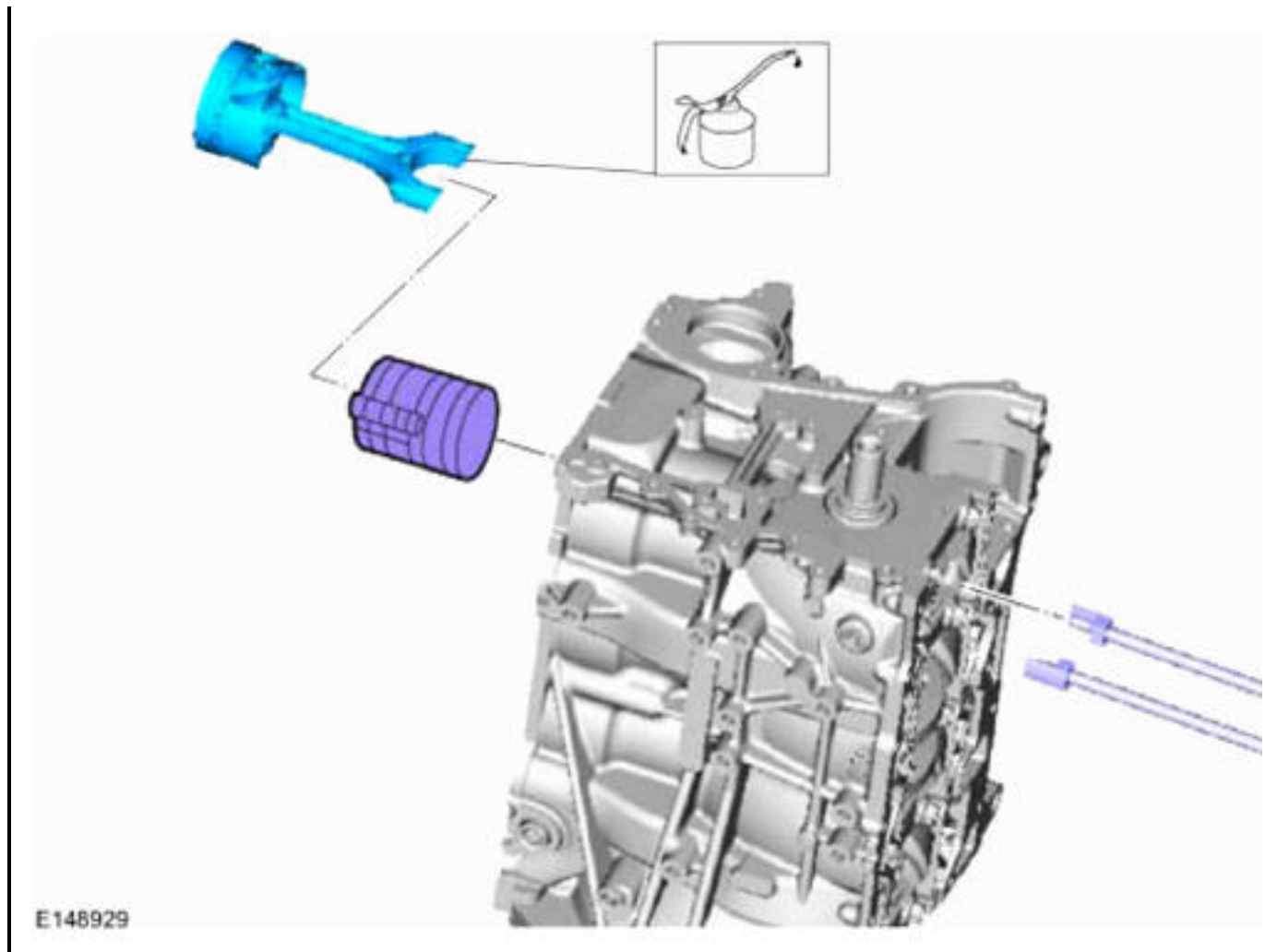
E148928

24. **NOTE:** Using a connecting rod installer will ensure not to scratch the cylinder wall or crankshaft journal with the connecting rod. Push the piston down until the connecting rod bearing seats on the crankshaft journal.

NOTE: Make sure the piston arrows on top is facing toward the front of the engine.

General Equipment : Piston Ring Compressor

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



25.

NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

NOTE: Install connecting rod caps and bolts on the connecting rods for cylinders 1 and 4 first and tighten. Then rotate crankshaft 180 degrees and install connecting rod caps and bolts on connecting rods for cylinders 2 and 3 and tighten.

NOTE: After installation of each connecting rod cap, rotate the crankshaft to verify smooth operation.

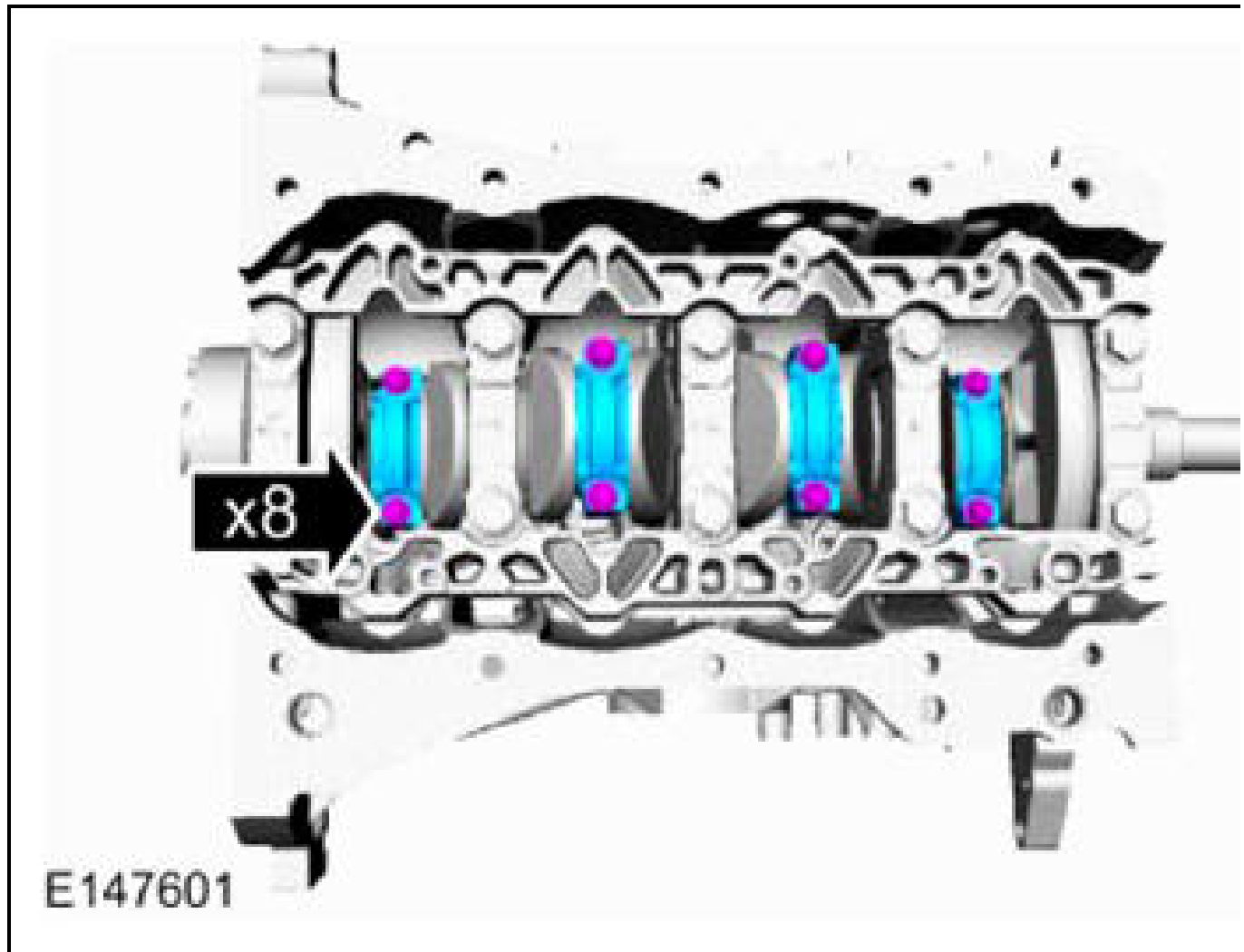
Use new connecting rod caps bolts.

Torque :

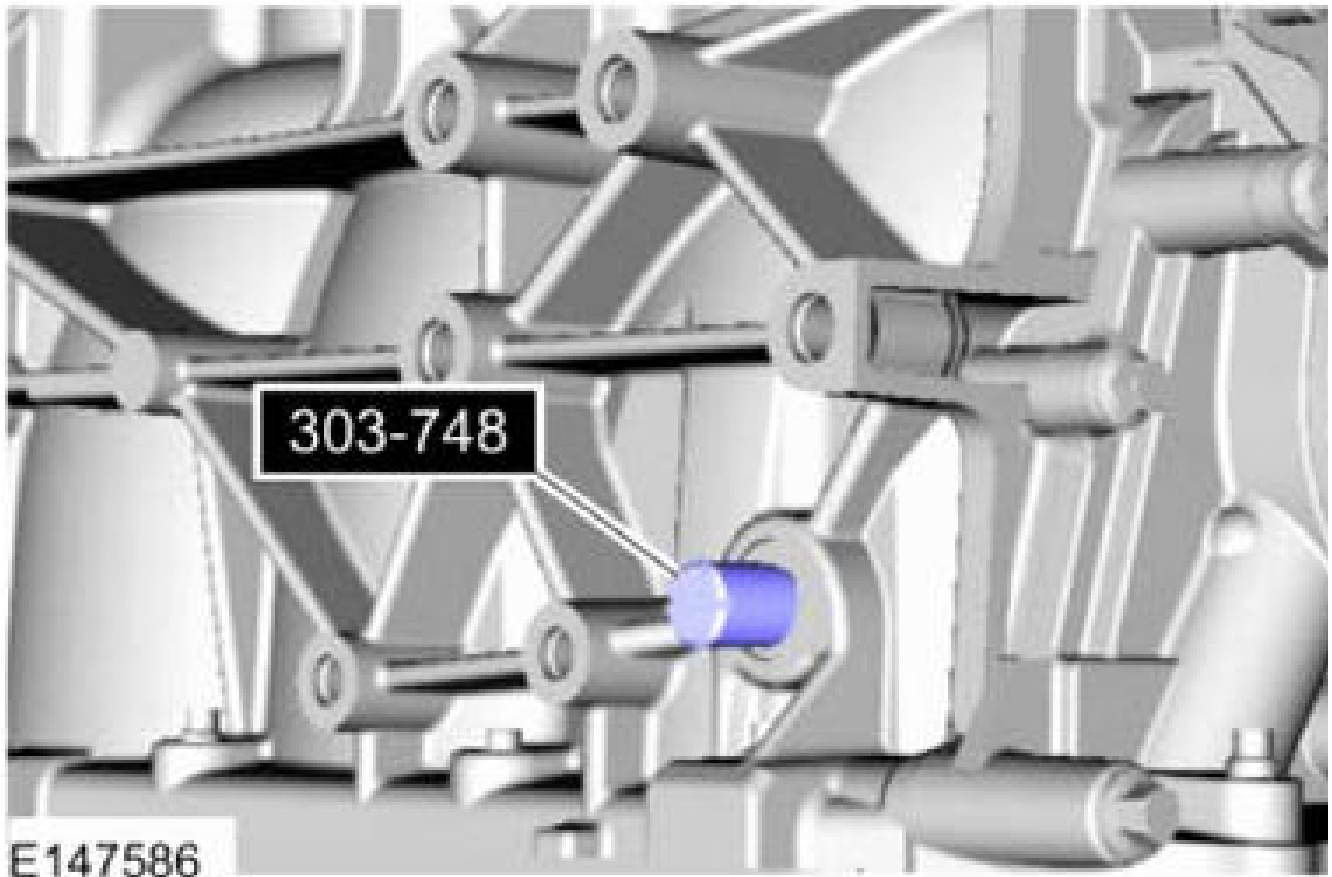
Stage 1: 18 Nm

Stage 2: 45°

Stage 3: Tighten an additional 45°

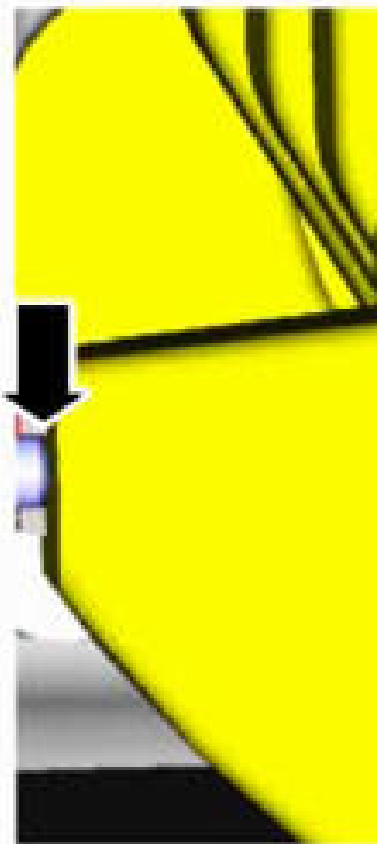
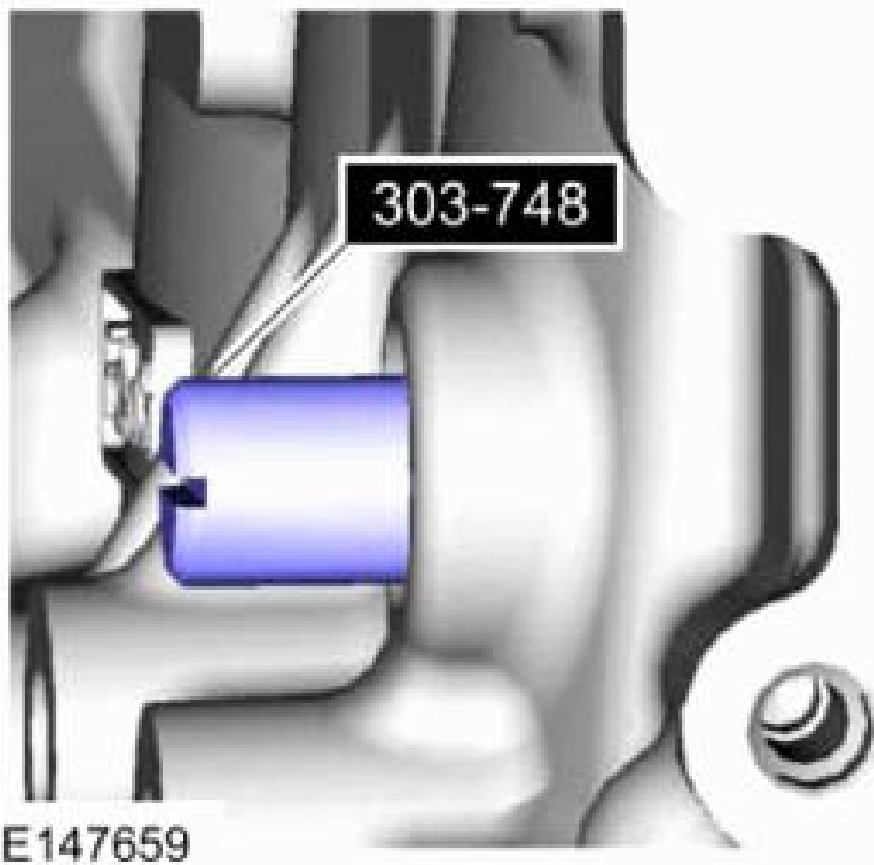


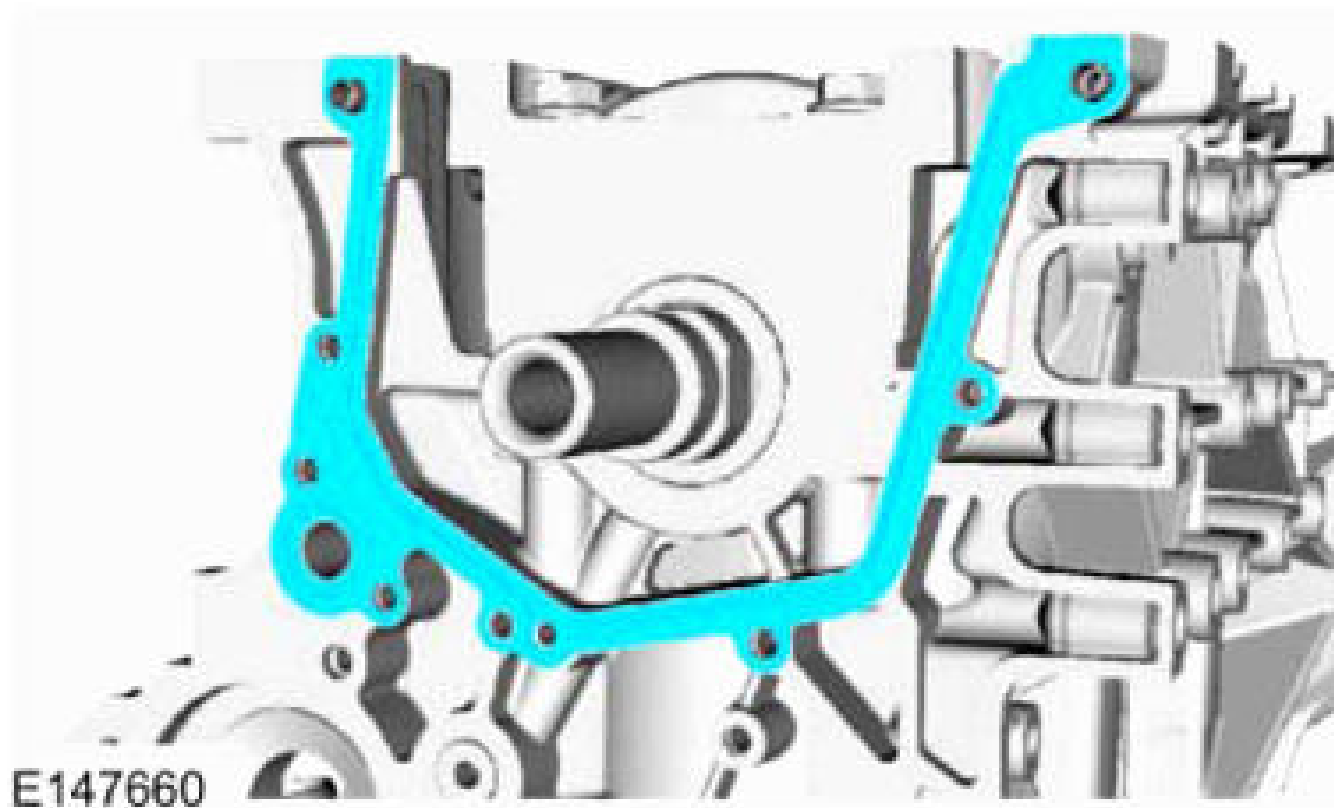
26. *Install Special Service Tool : 303-748 Locking Tool, Crankshaft*



27. **NOTE:** Only rotate the crankshaft clockwise direction.

Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the crankshaft locking tool. The engine is now at **TDC** .

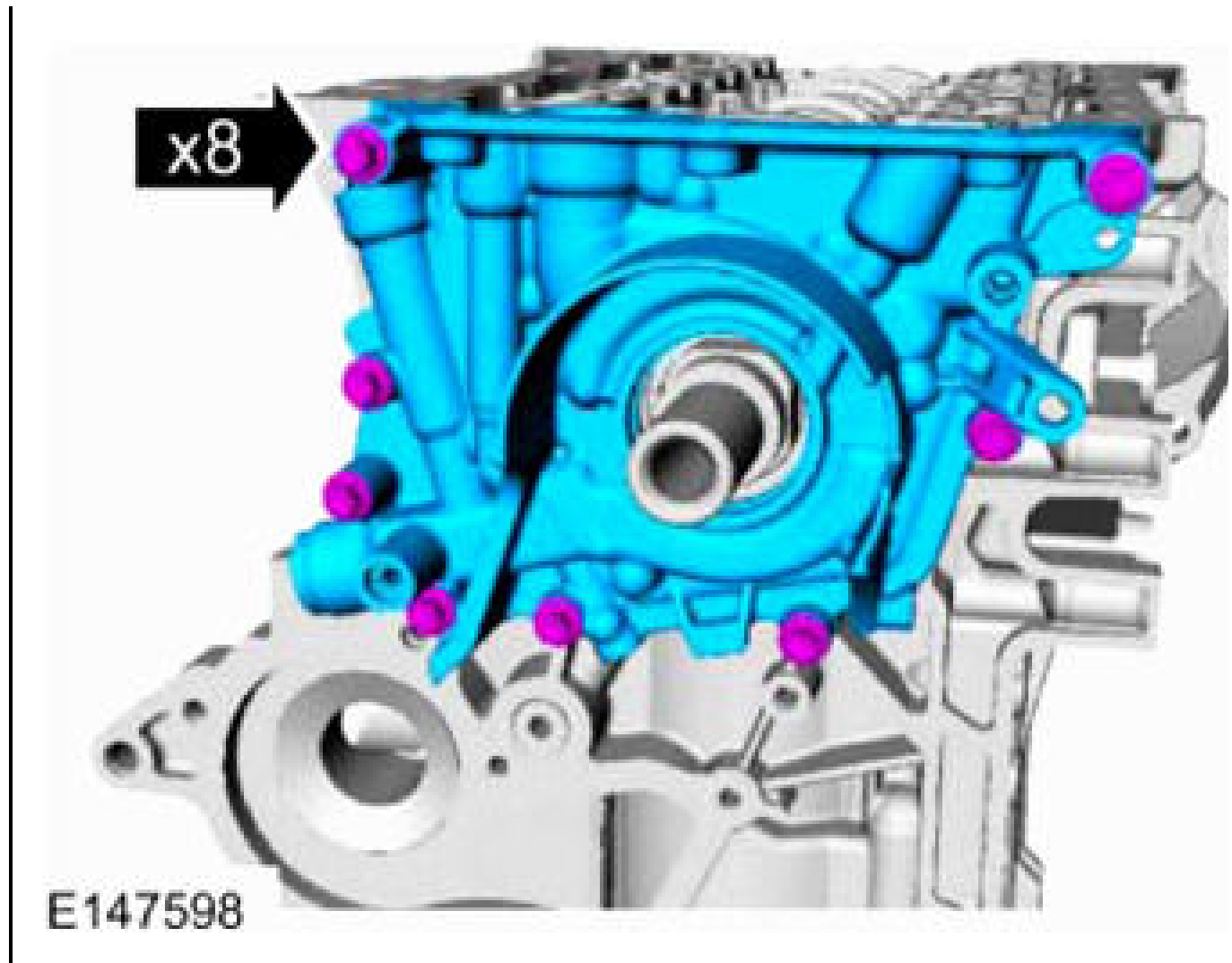




28.

29. **NOTE:** There are different length of bolts noted in disassembly.

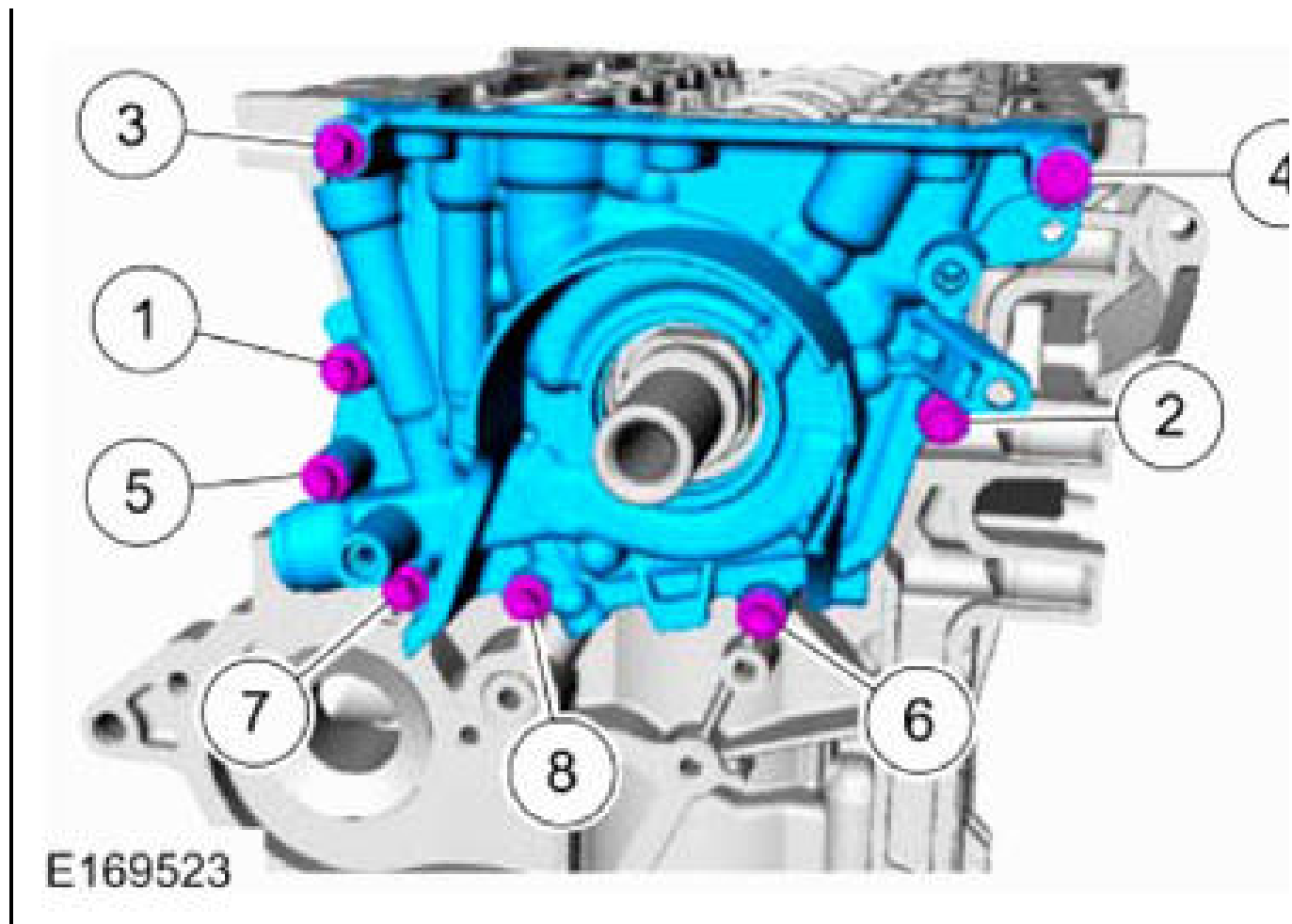
Finger tight at this stage.



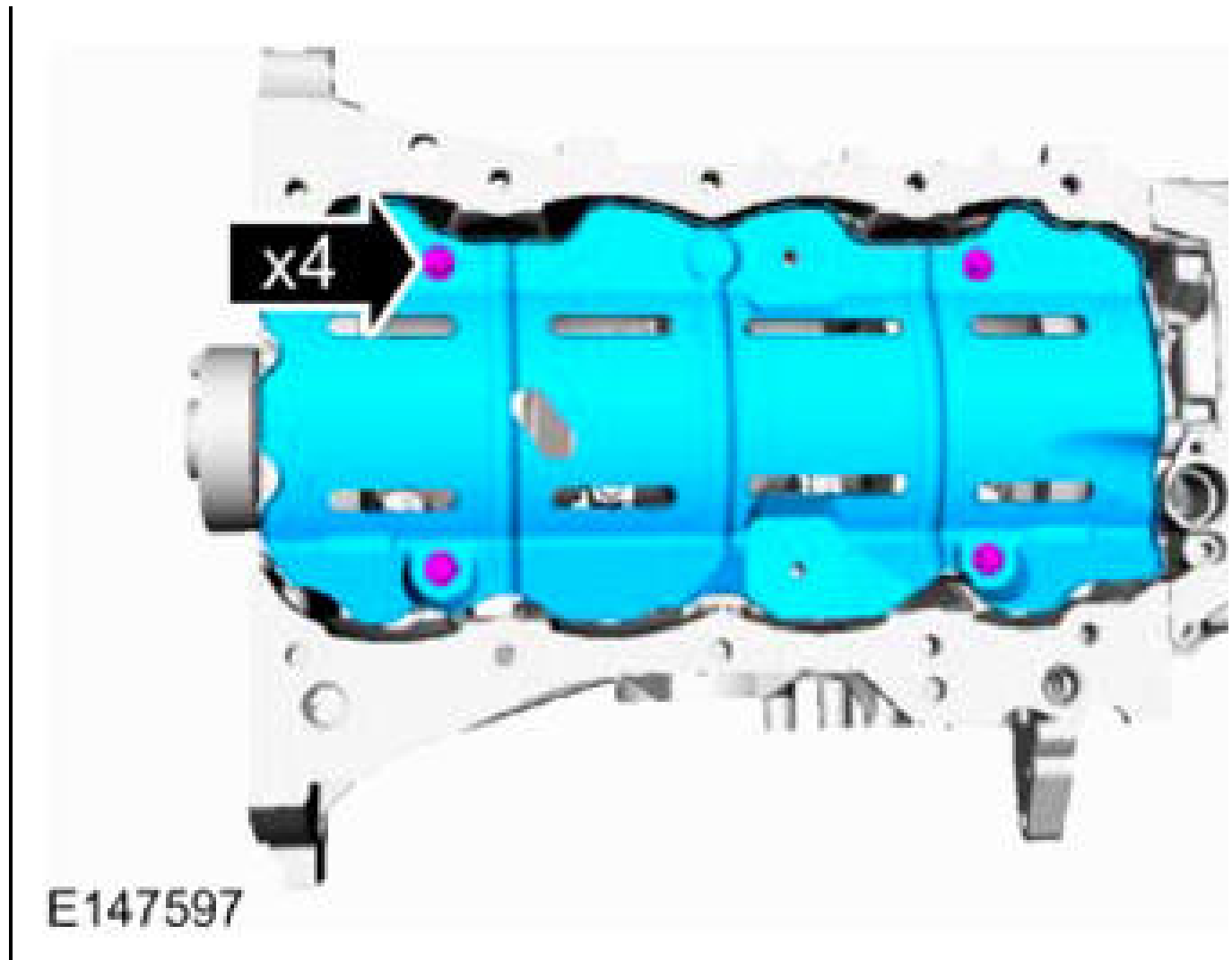
30. *Torque :*

Stage 1: 5.5 Nm

Stage 2: 9.5 Nm



31. *Torque* : 9.5 Nm



32. **NOTE:** New crankshaft rear seal is supplied with an alignment sleeve which must be removed after installation.

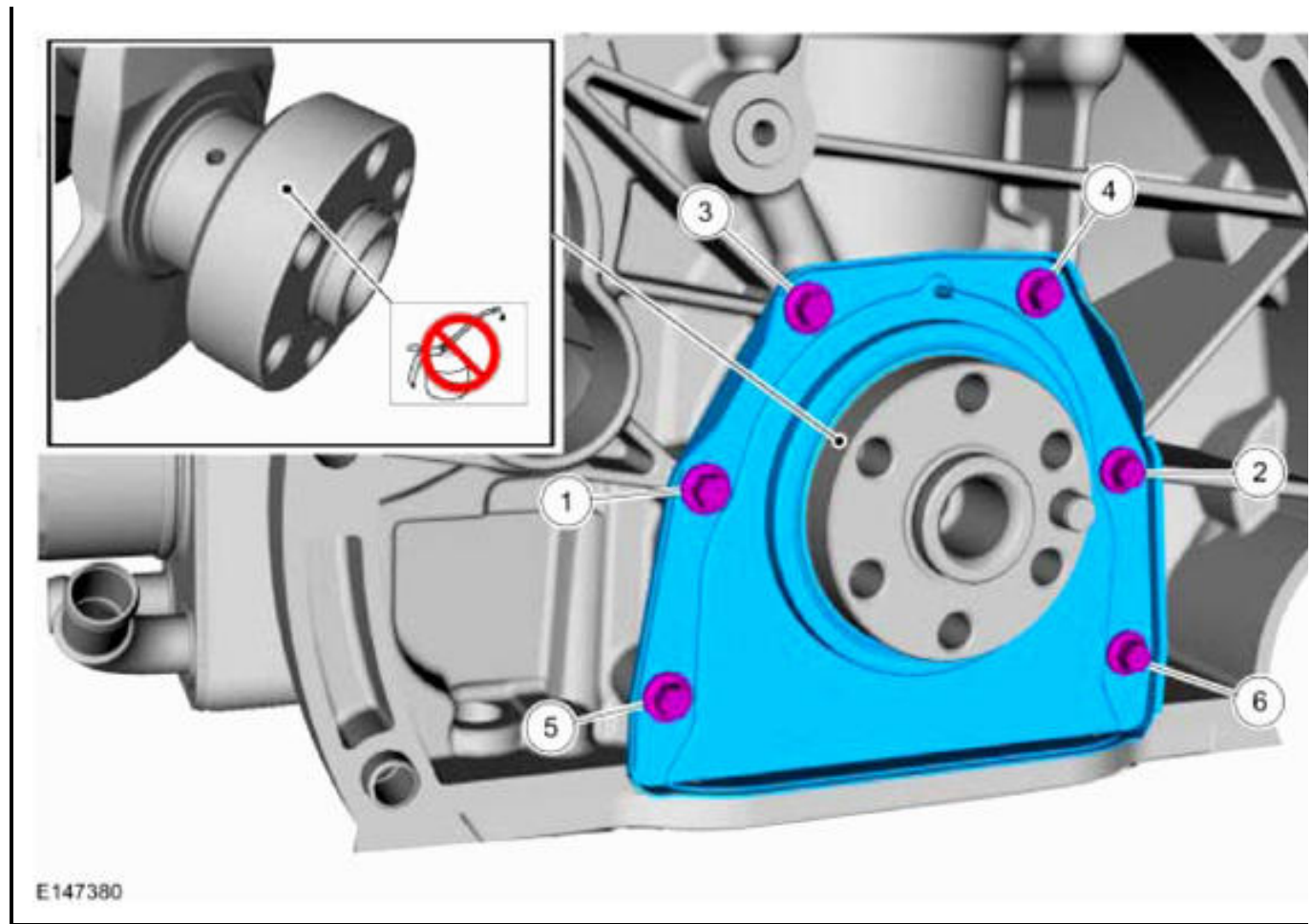
NOTE: Do not remove the alignment sleeve from the crankshaft rear seal prior to installation on the crankshaft.

Align the crankshaft rear seal and alignment sleeve on the crankshaft and push the crankshaft rear seal off the alignment sleeve onto the crankshaft without stopping until the crankshaft rear seal meets the cylinder block.

Torque :

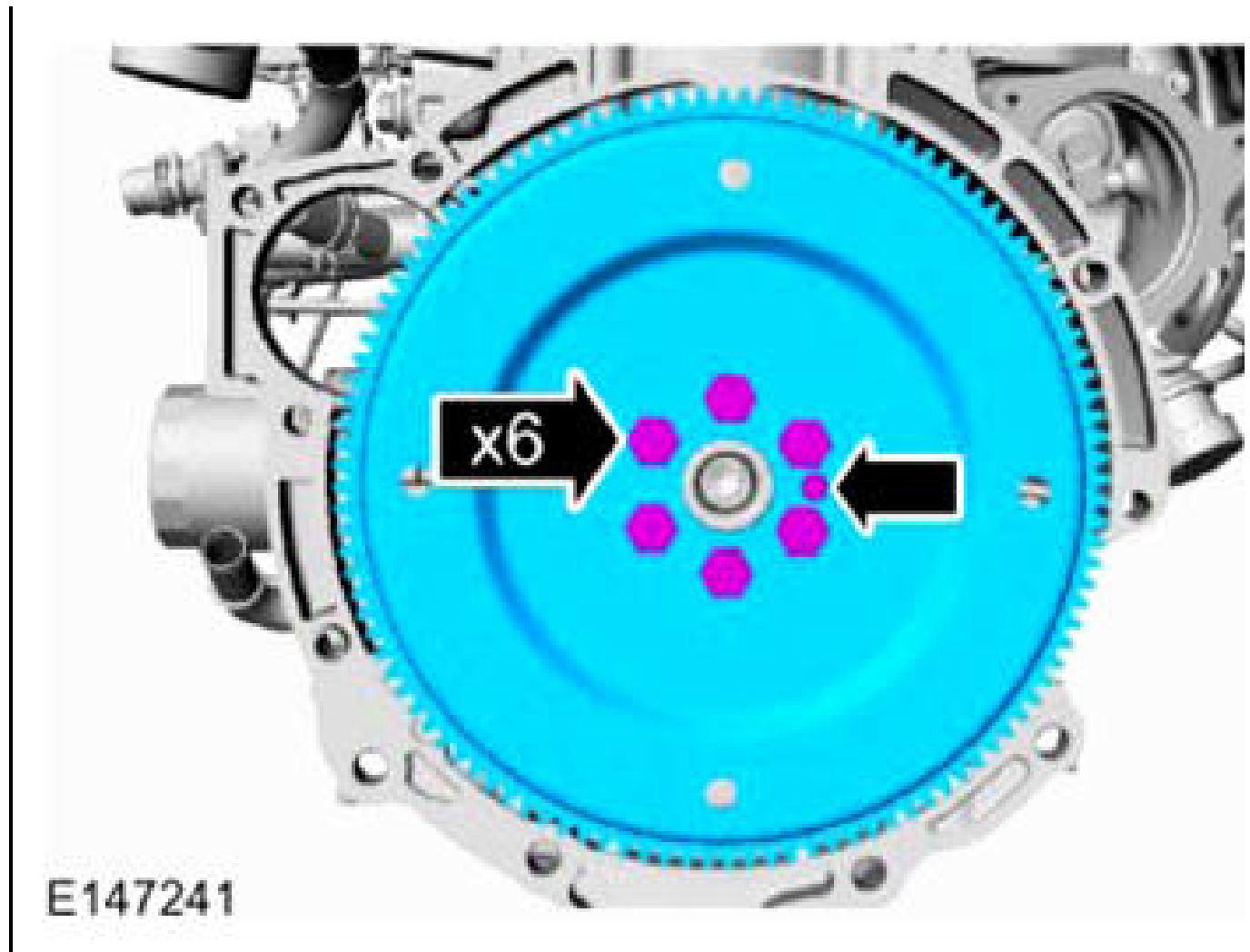
Stage 1: 4 Nm

Stage 2: 9 Nm

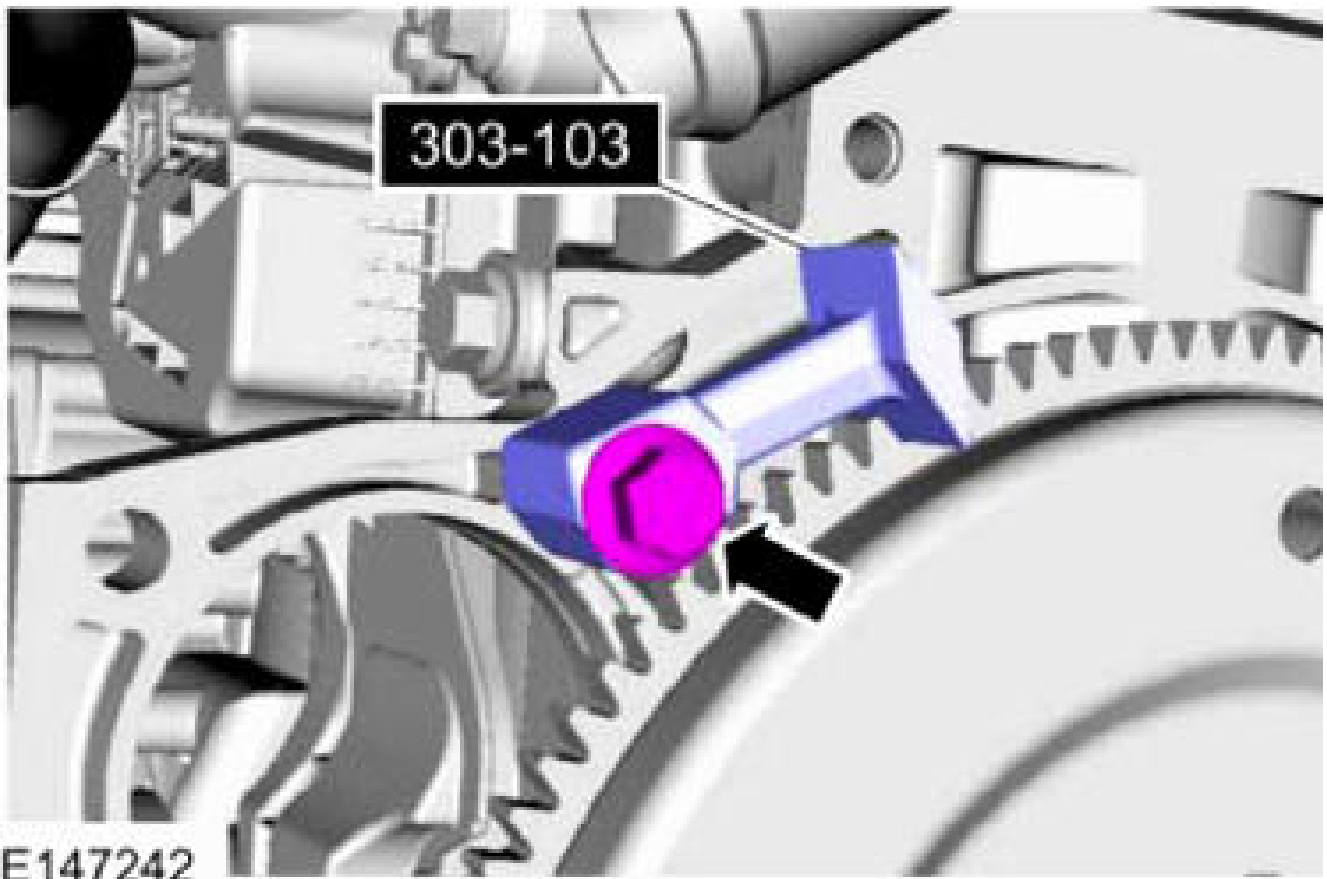


Vehicles with automatic transmission

33. Finger tight.



34. *Install Special Service Tool : 303-103 (T74P-6375-A) Holding Tool, Flywheel*



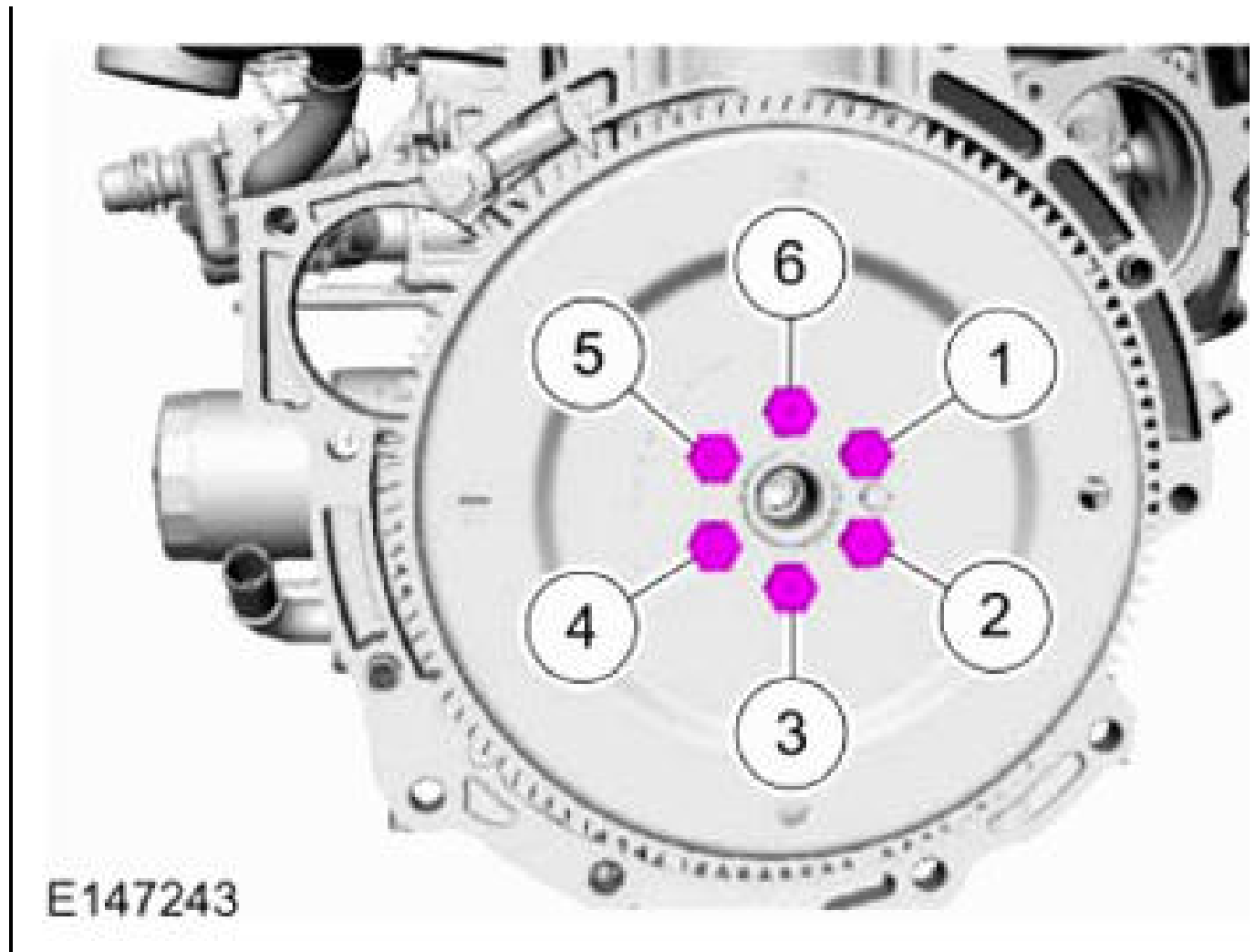
35. *Torque :*

Stage 1: 15 Nm

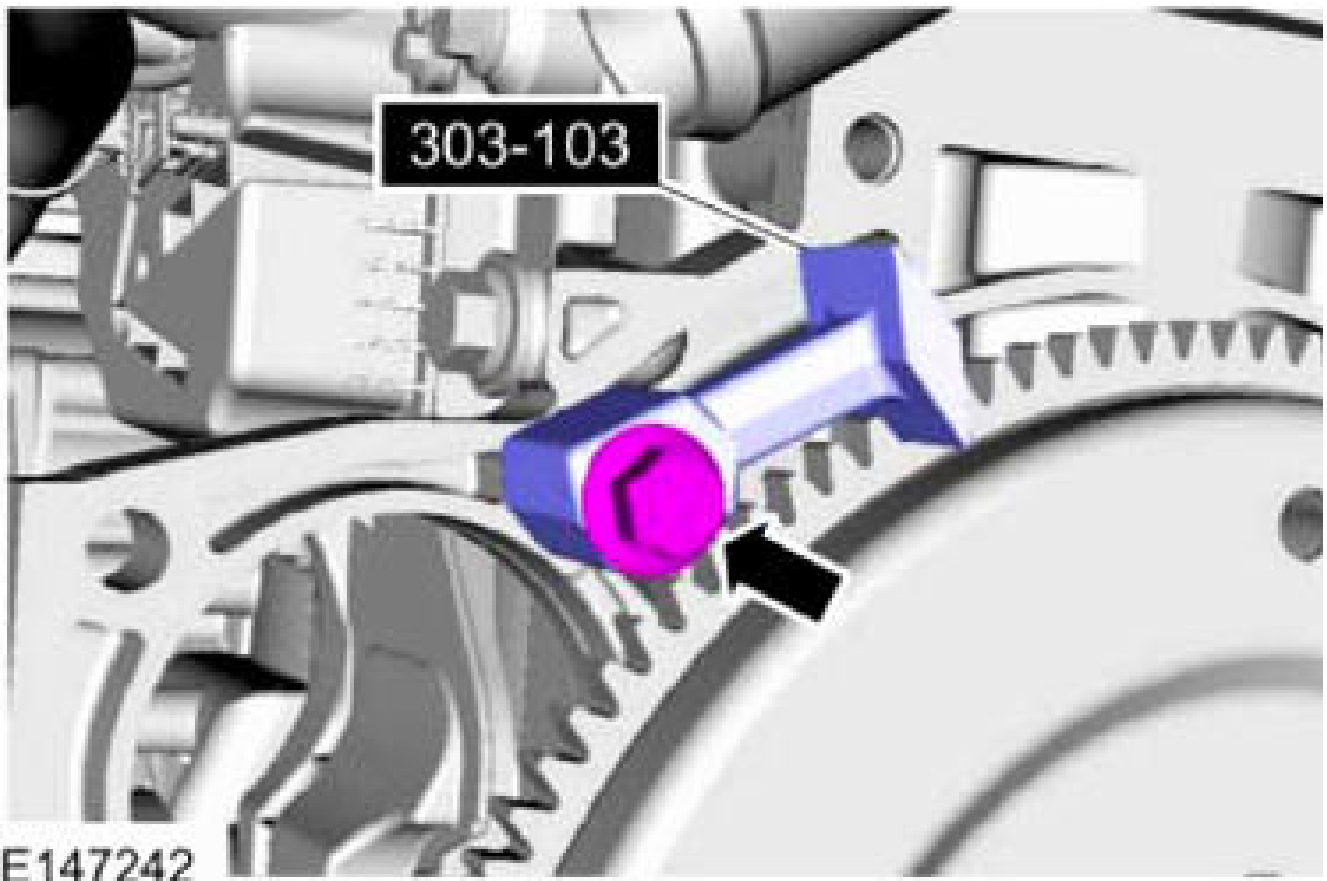
Stage 2: 25 Nm

Stage 3: 30 Nm

Stage 4: Tighten an additional 90°

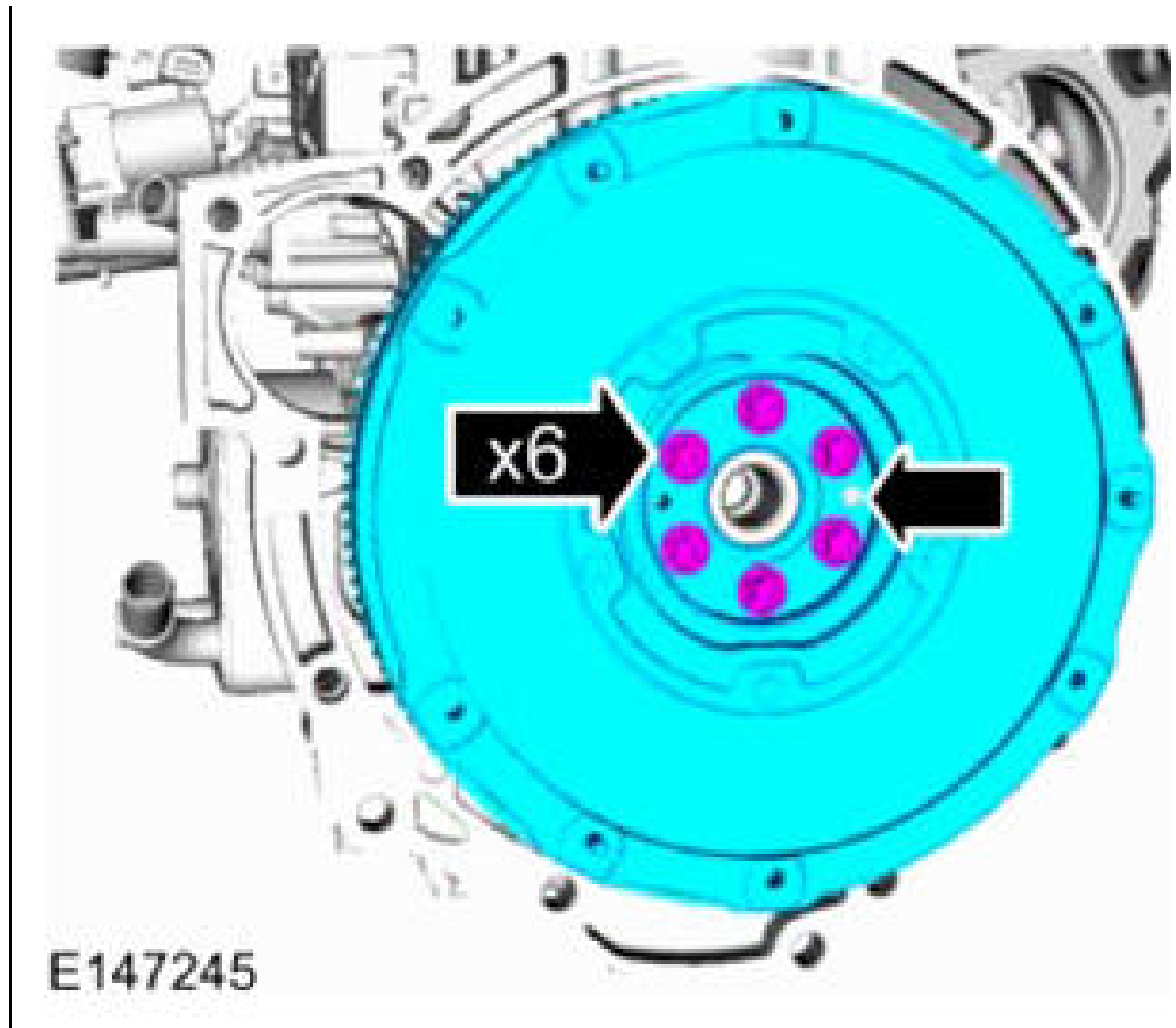


36. Remove Special Service Tool : 303-103 (T74P-6375-A) Holding Tool, Flywheel

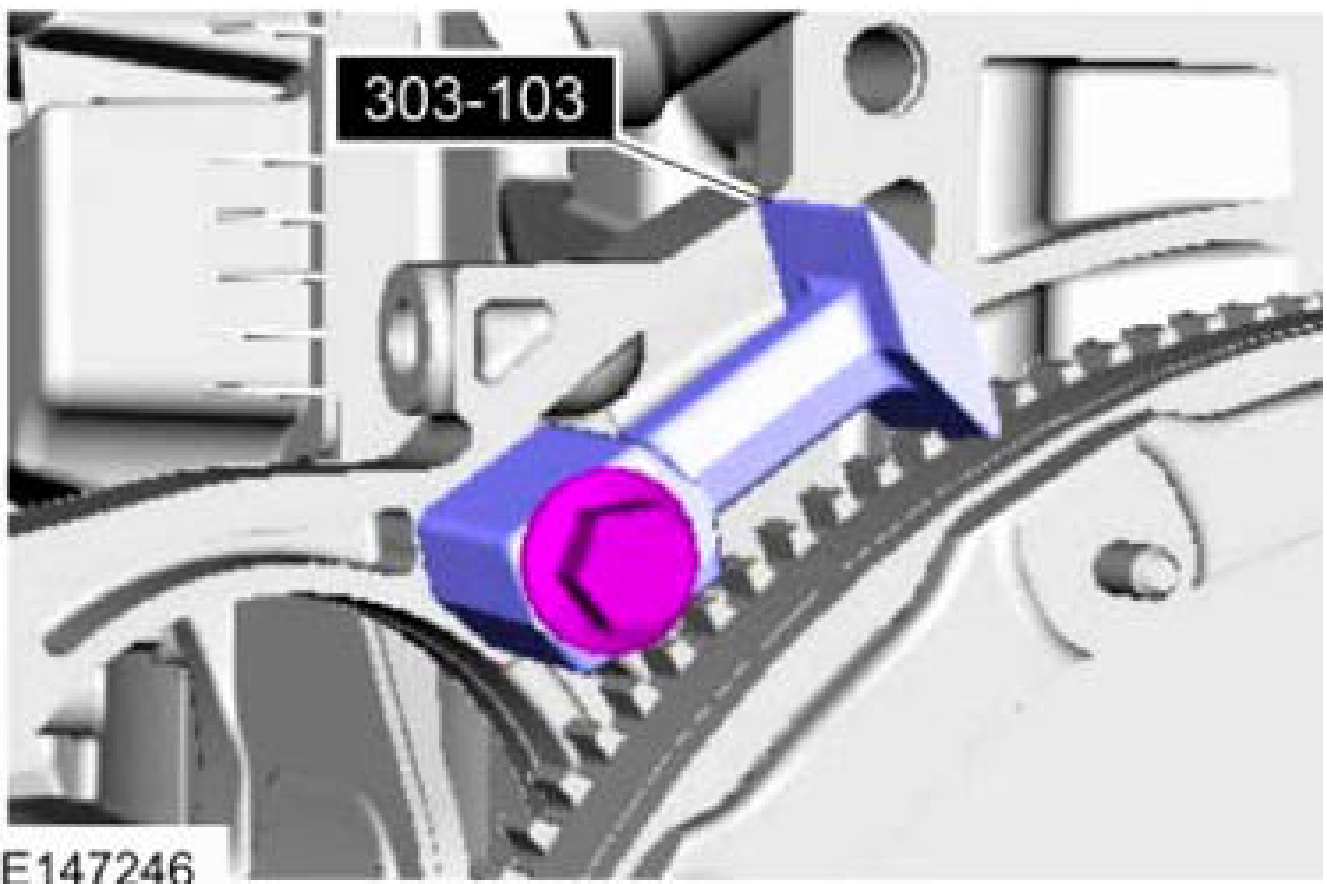


Vehicles with manual transmission

37. Finger tight.



38. *Install Special Service Tool : 303-103 (T74P-6375-A) Holding Tool, Flywheel*



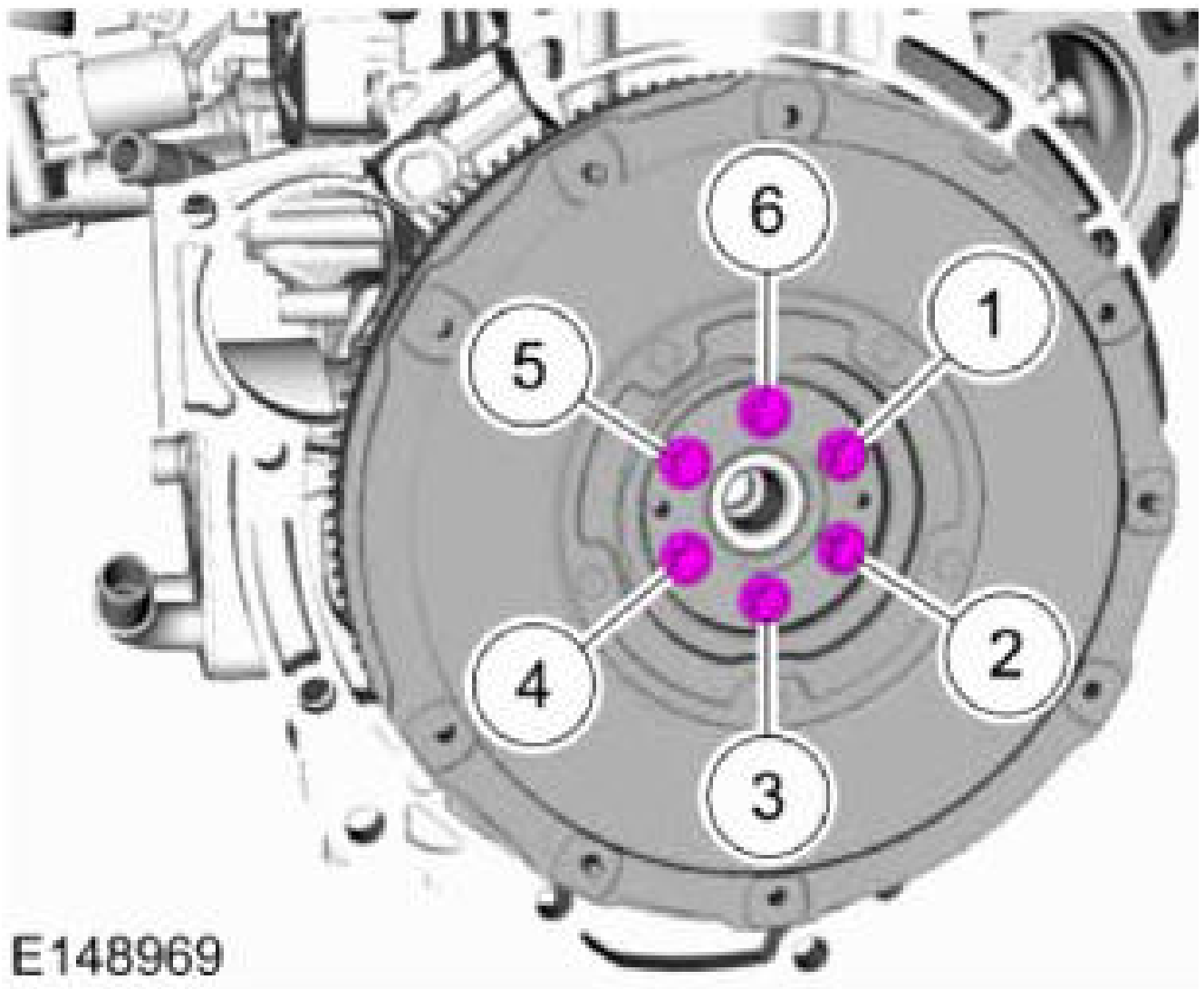
39. *Torque :*

Stage 1: 15 Nm

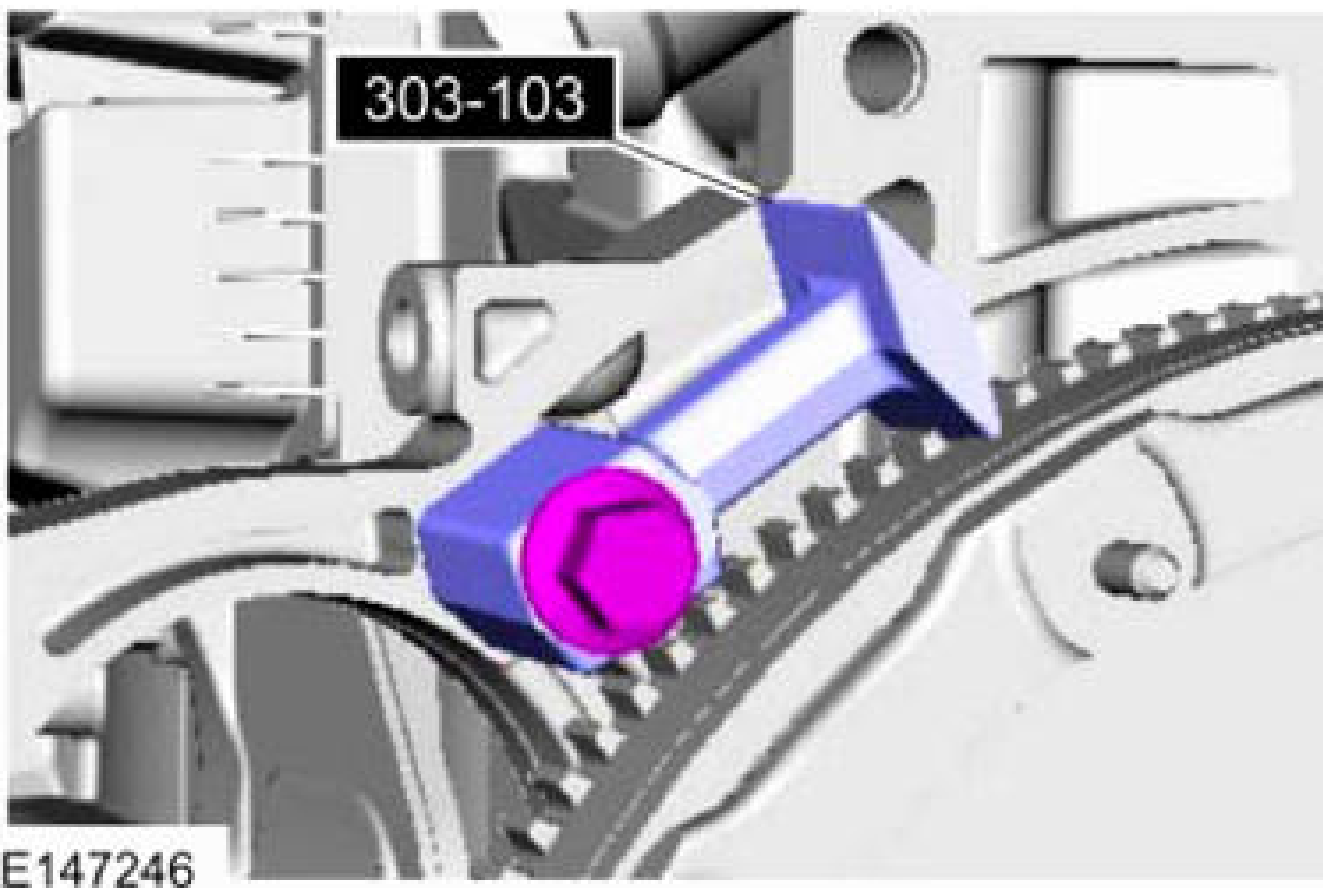
Stage 2: 25 Nm

Stage 3: 30 Nm

Stage 4: Tighten an additional 90°



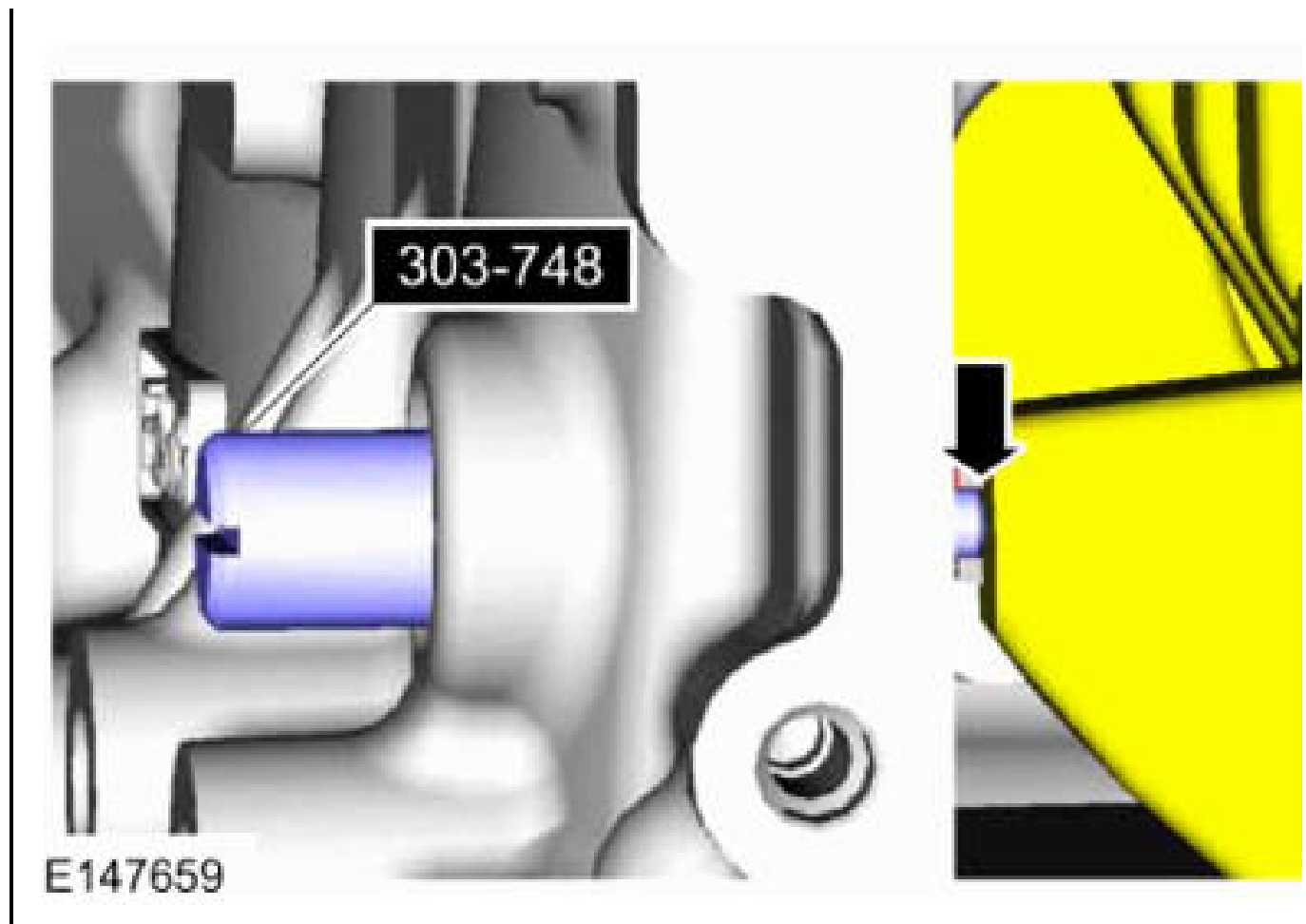
40. Remove *Special Service Tool* : 303-103 (T74P-6375-A) Holding Tool, Flywheel



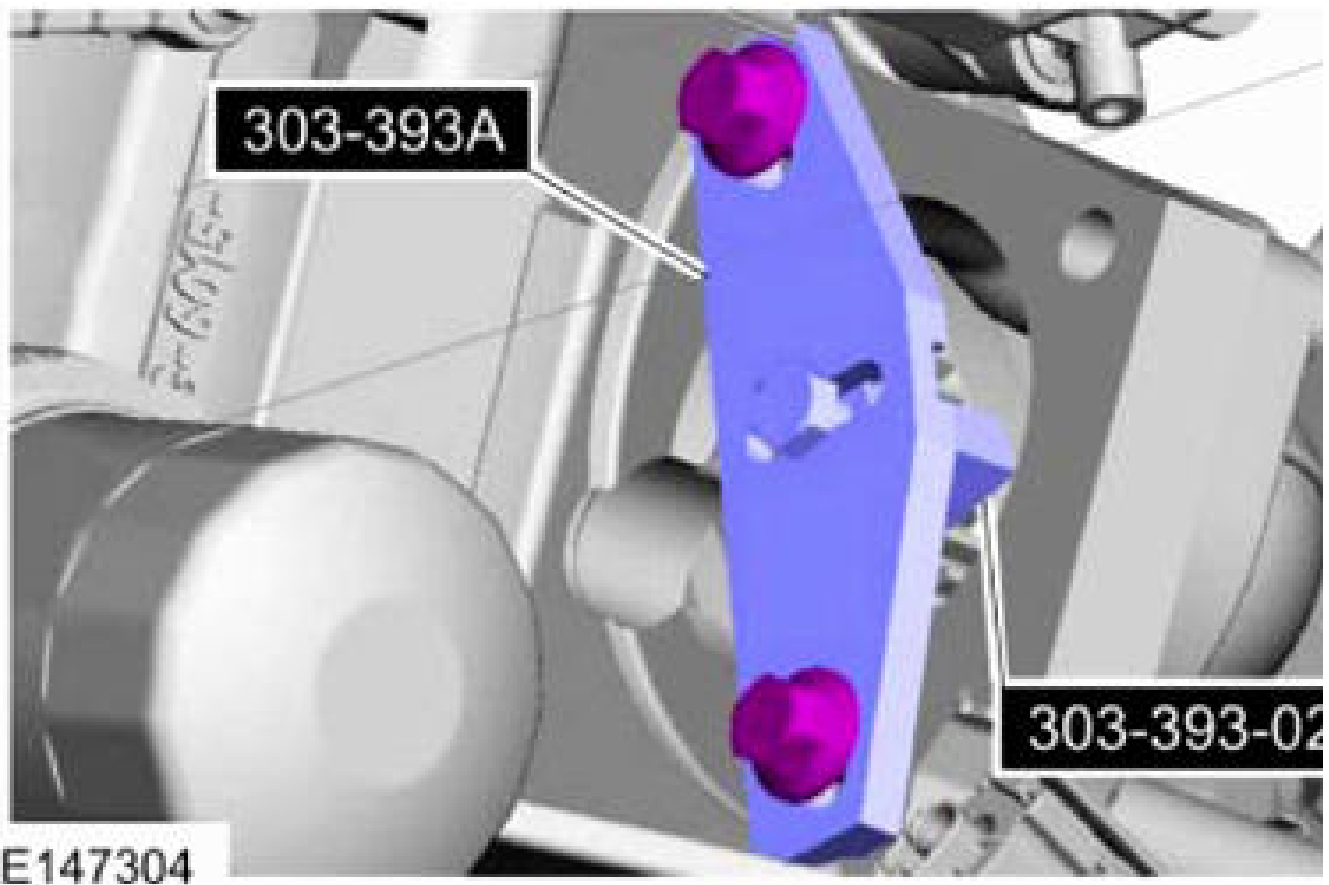
All vehicles

41. **NOTE:** Only rotate the crankshaft clockwise direction.

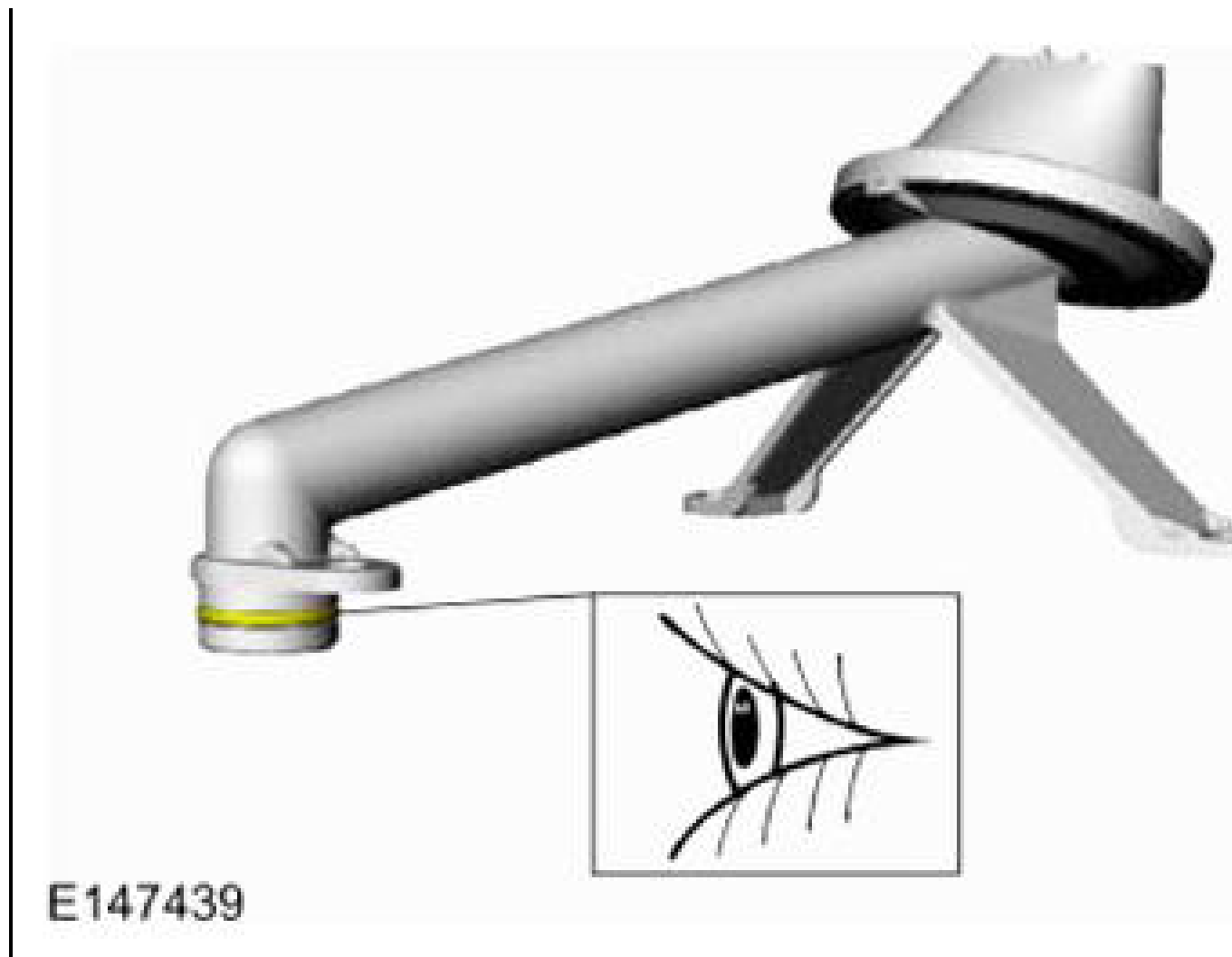
Verify the crankshaft balance weight is up against the crankshaft locking tool.



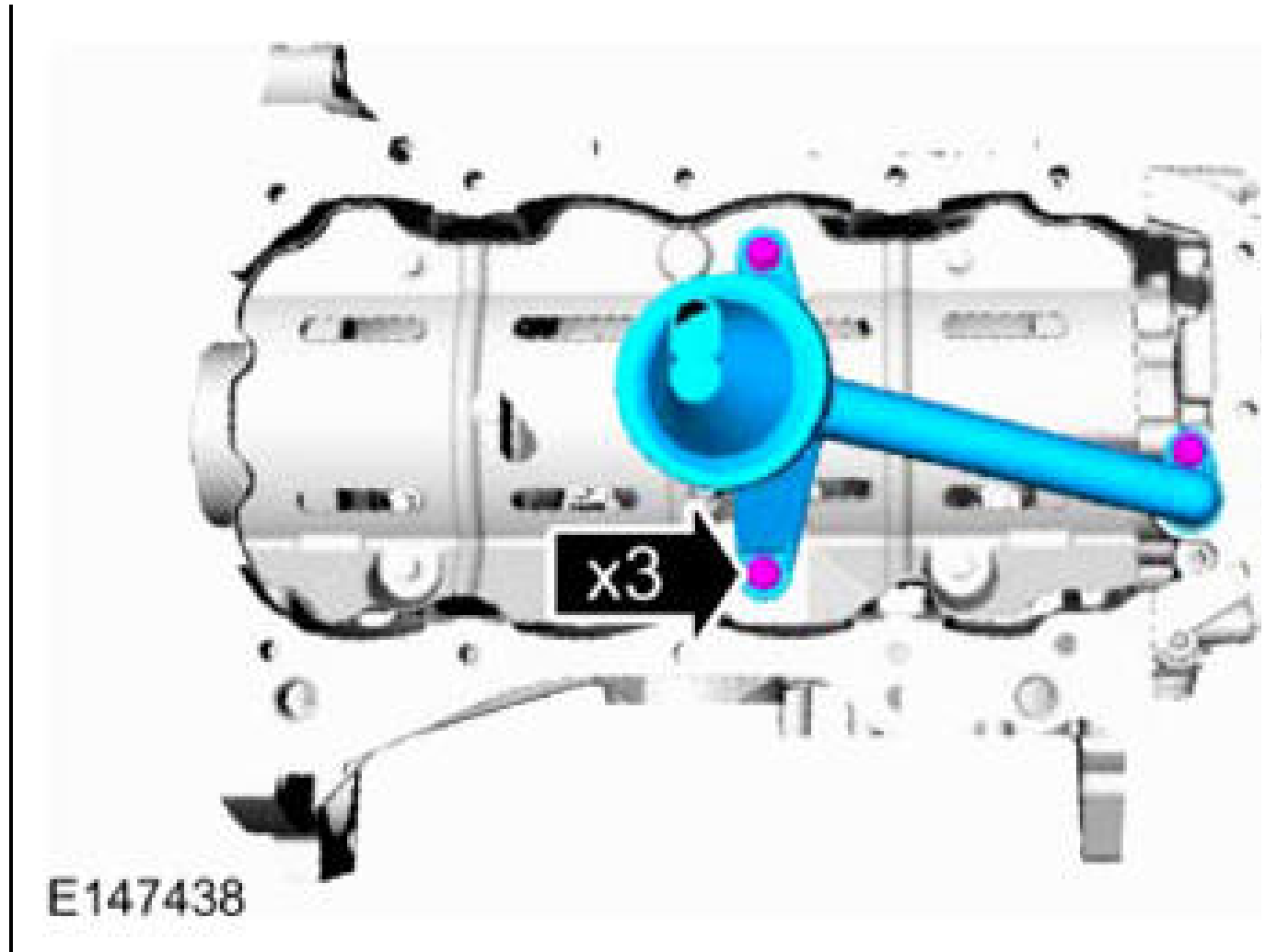
42. *Install Special Service Tool : 303-393-02 Adapter for 303-393 , 303-393A Locking Tool, Flywheel*



43. **NOTE:** The O-ring seal is to be reused unless damaged.



44. *Torque* : 9.5 Nm



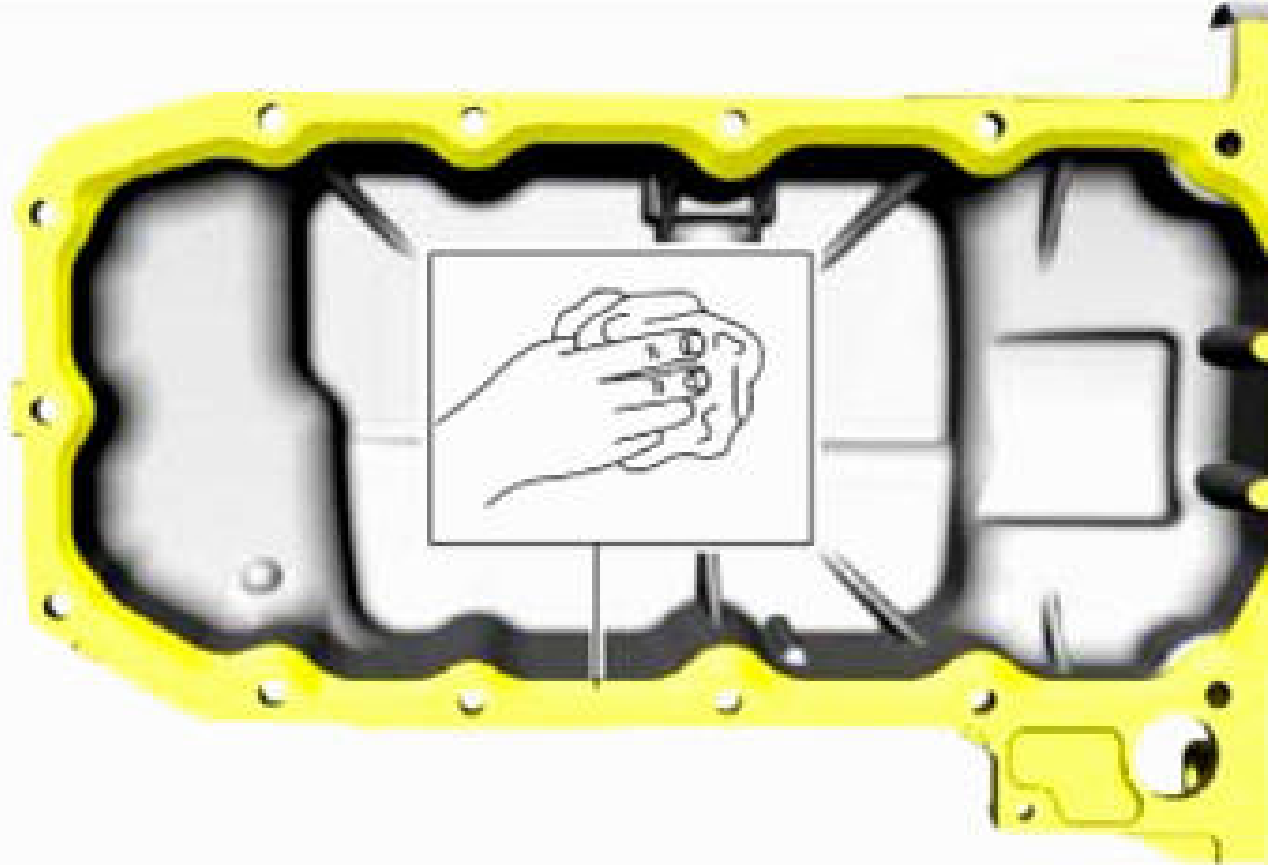
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove traces of sealant.

45.

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

Material : Motorcraft® Metal Surface Prep/ZC-31-A

Material : Motorcraft® Silicone Gasket Remover/ZC-30



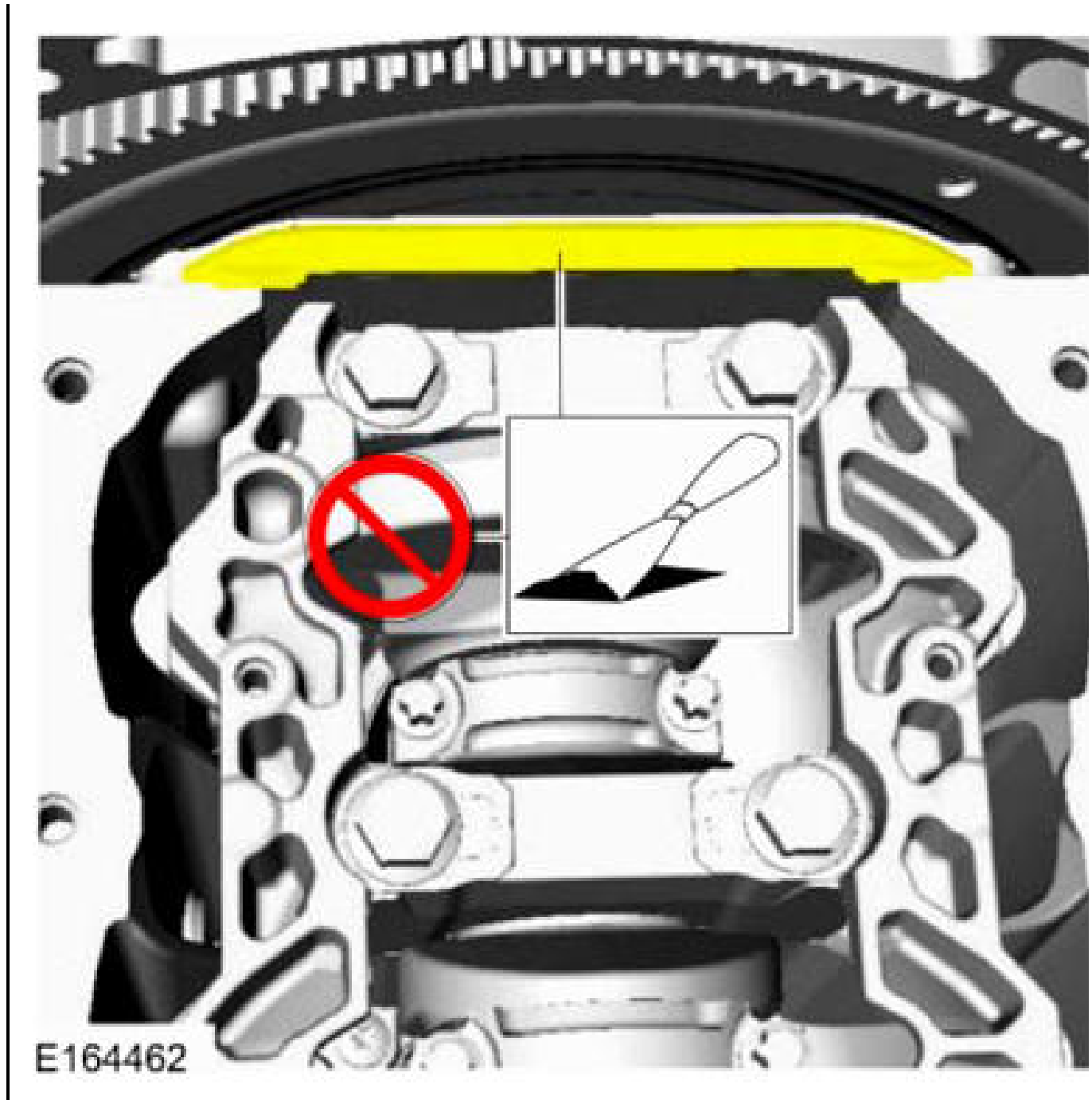
E147435

46.

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

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

Do not use any type of scrapers. There is a rubber sealing surface on the bottom of the crankshaft rear seal, take extra care when cleaning the specified area by peeling off the old sealant by hand.



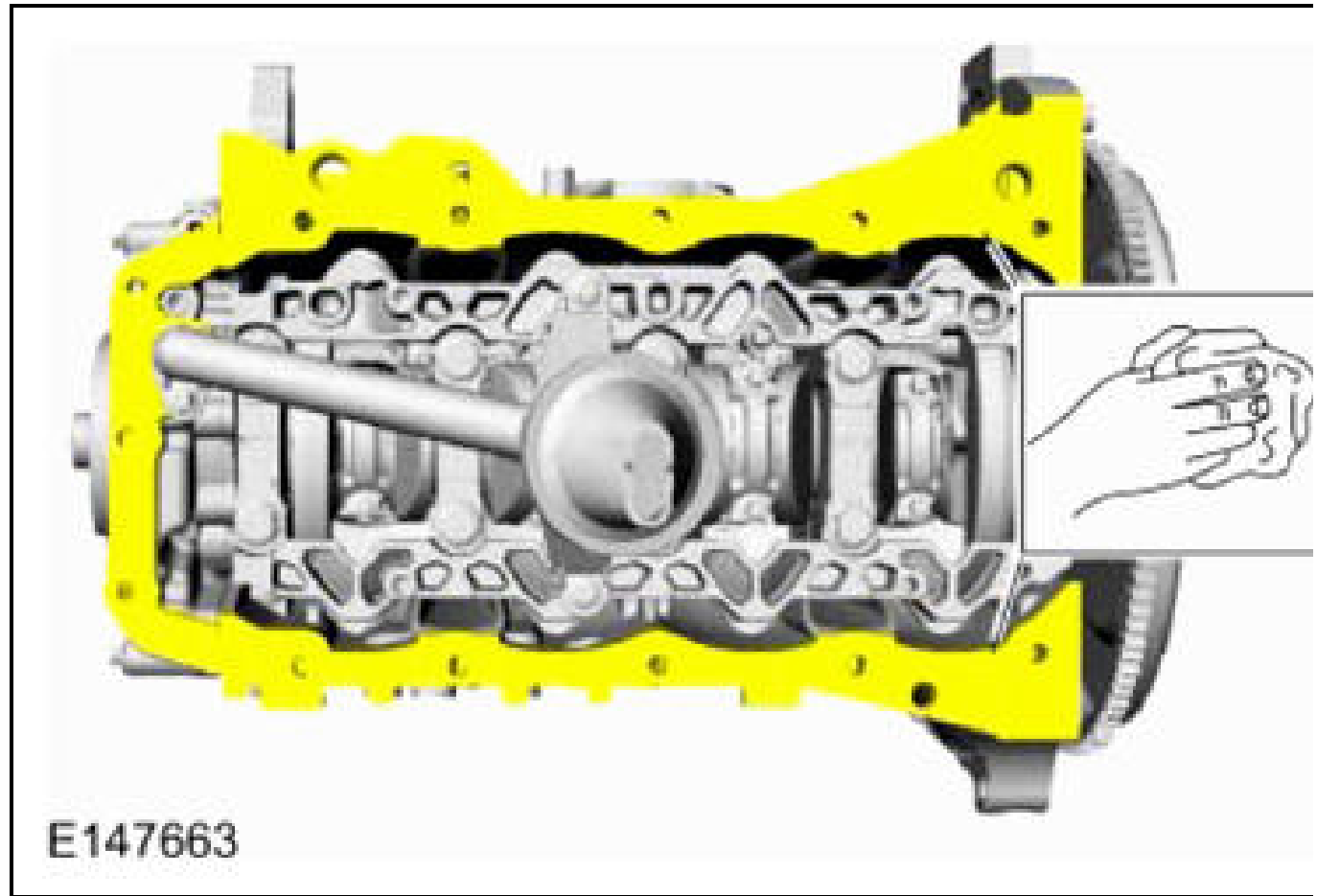
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove traces of sealant.

47.

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

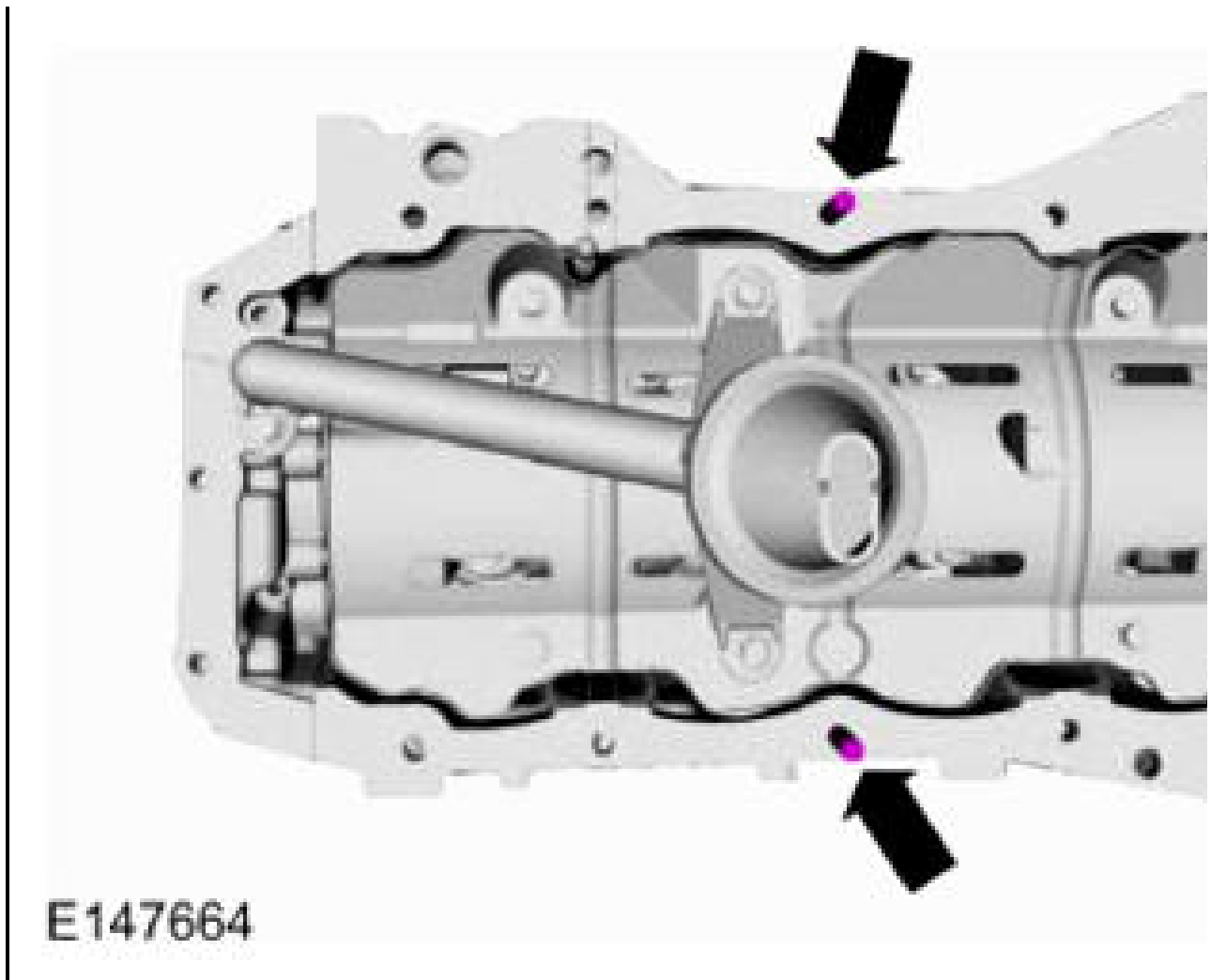
Material : Motorcraft® Metal Surface Prep/ZC-31-A

Material : Motorcraft® Silicone Gasket Remover/ZC-30



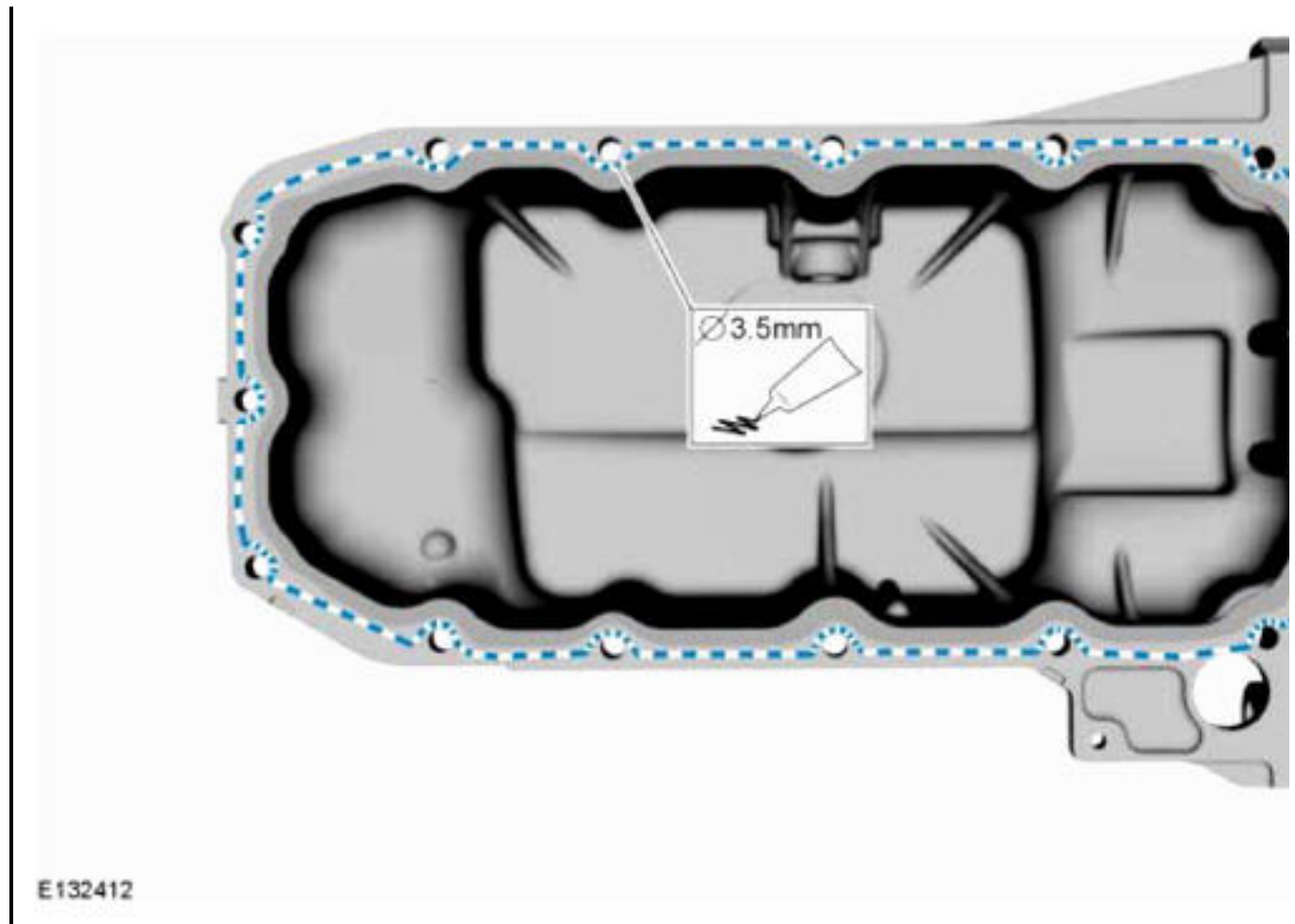
48. Install the following items:

- Two M8x20 studs



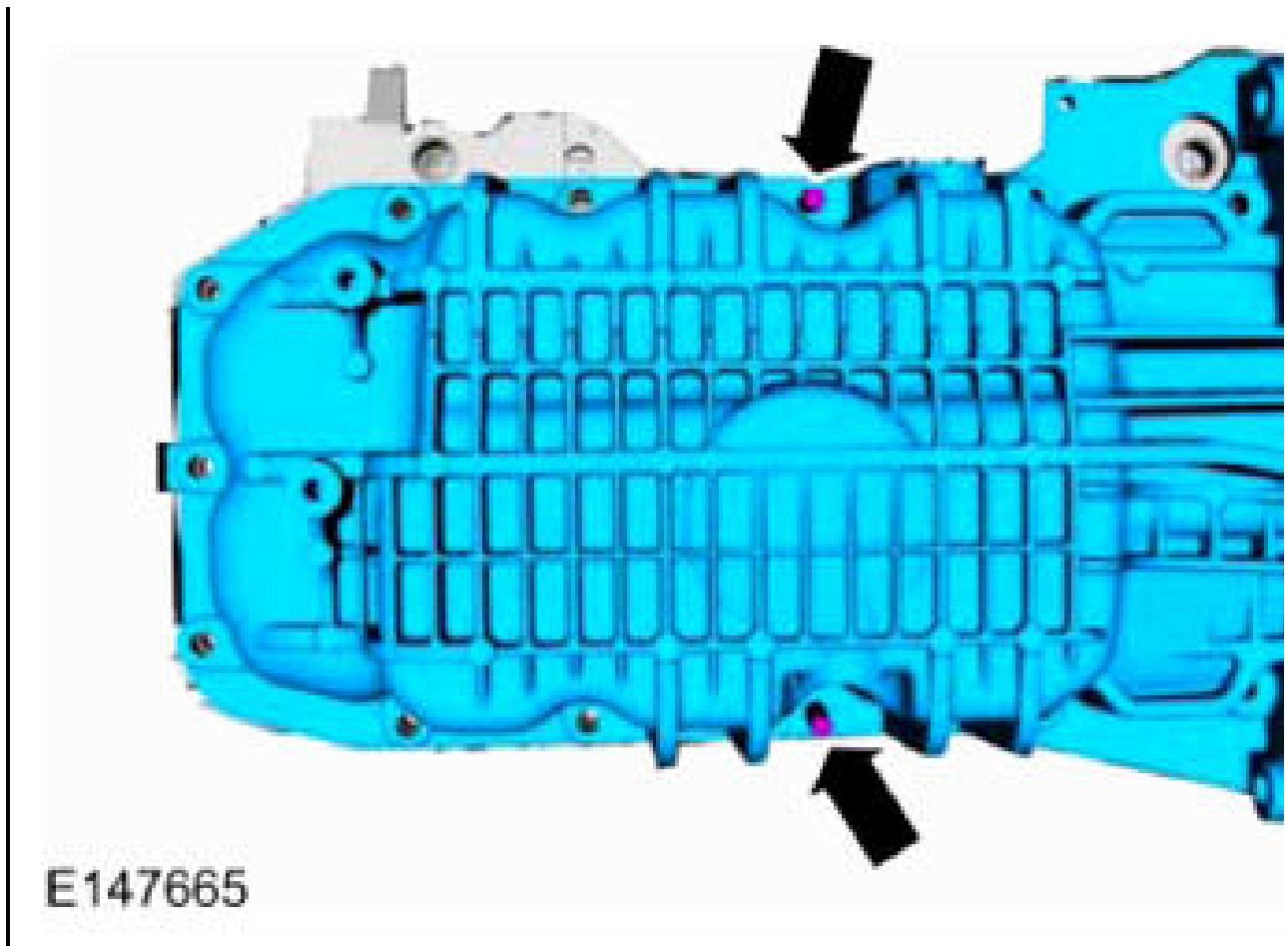
49. **NOTE:** The component must be installed within 5 minutes of applying the sealant.

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

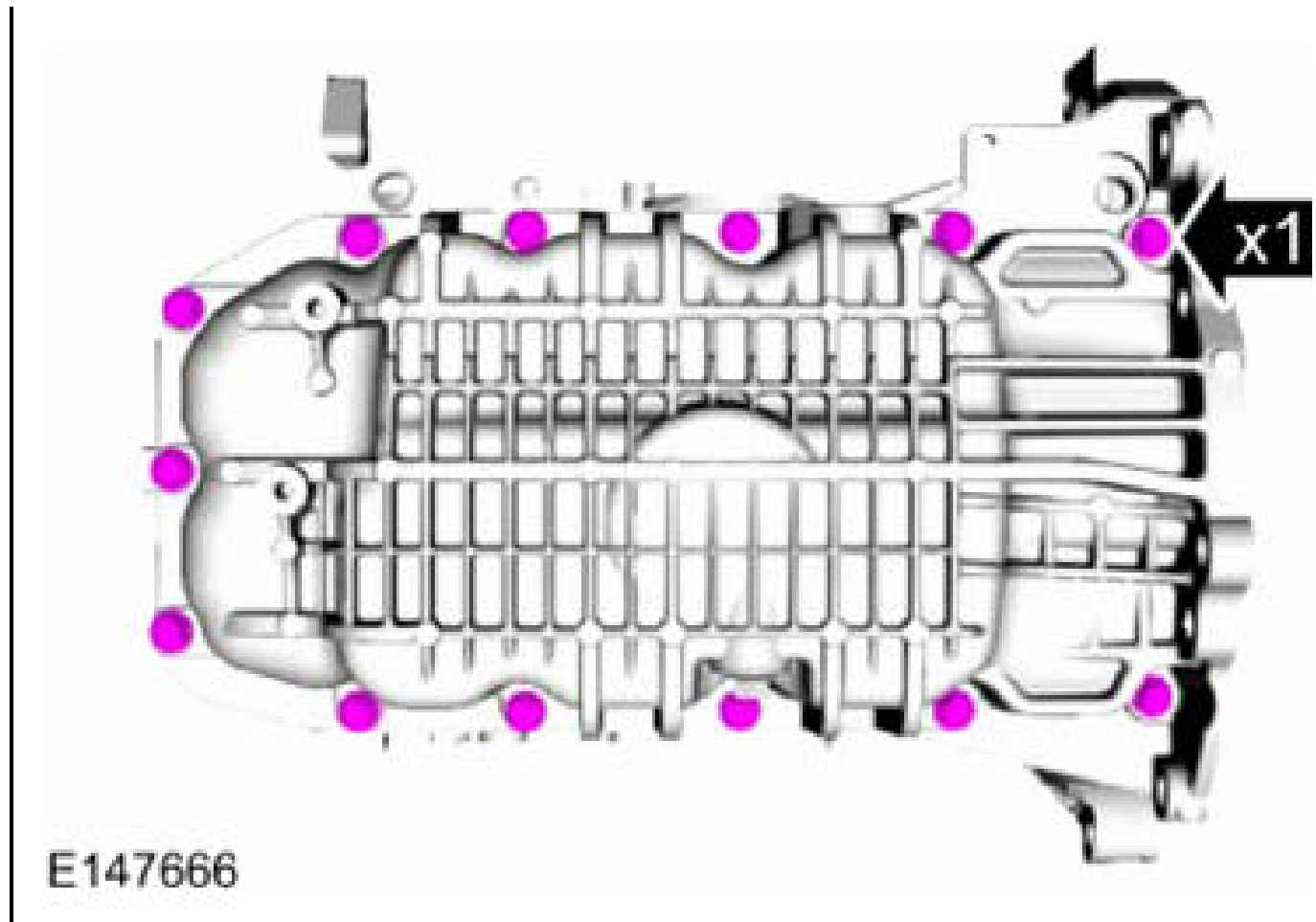


50. Remove the following items:

- Two M8x20 studs



51. **NOTE:** Only tighten the bolts finger tight at this stage.



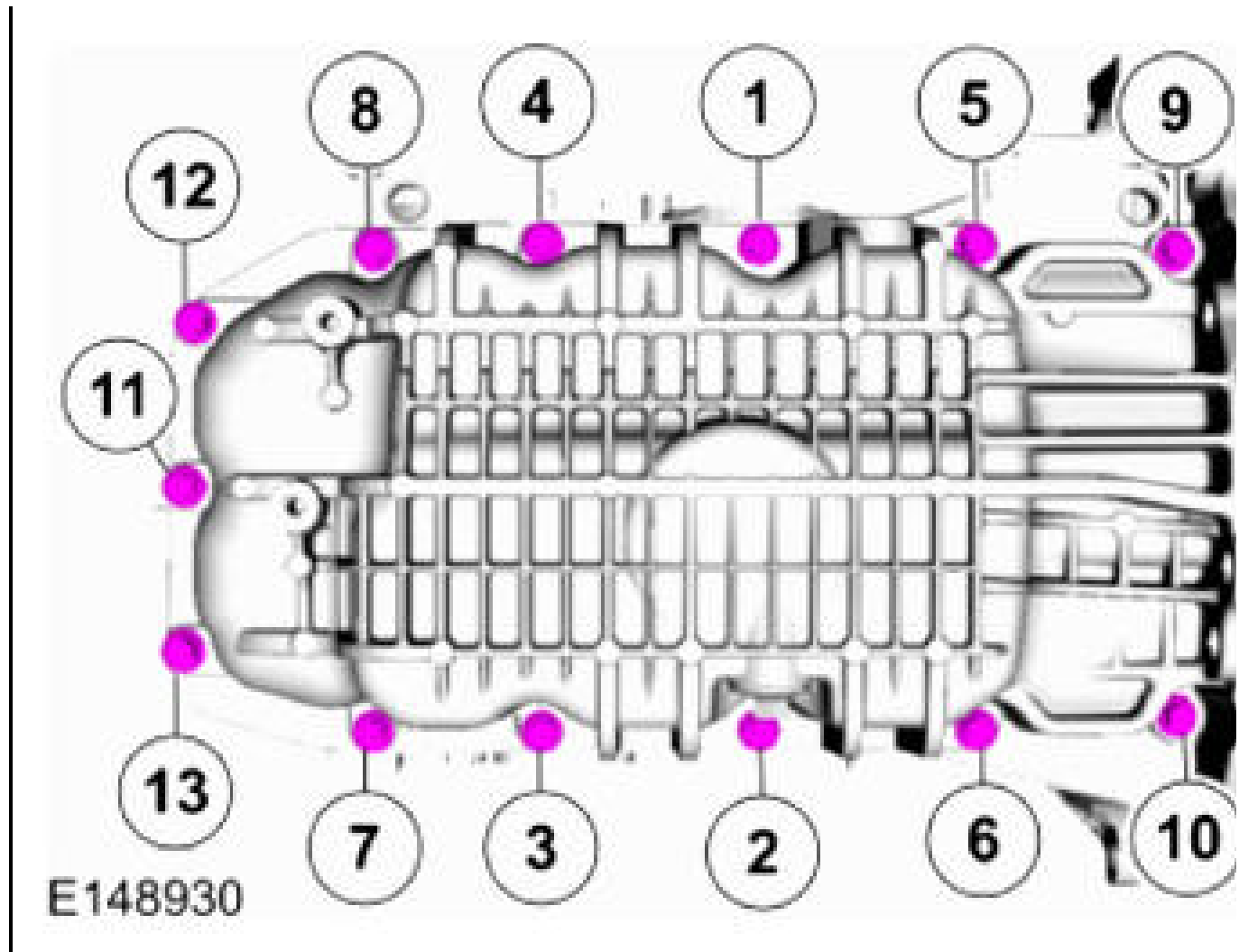
52. *Torque :*

Stage 1:

1 - 13 10 Nm

Stage 2:

1 - 13 20 Nm

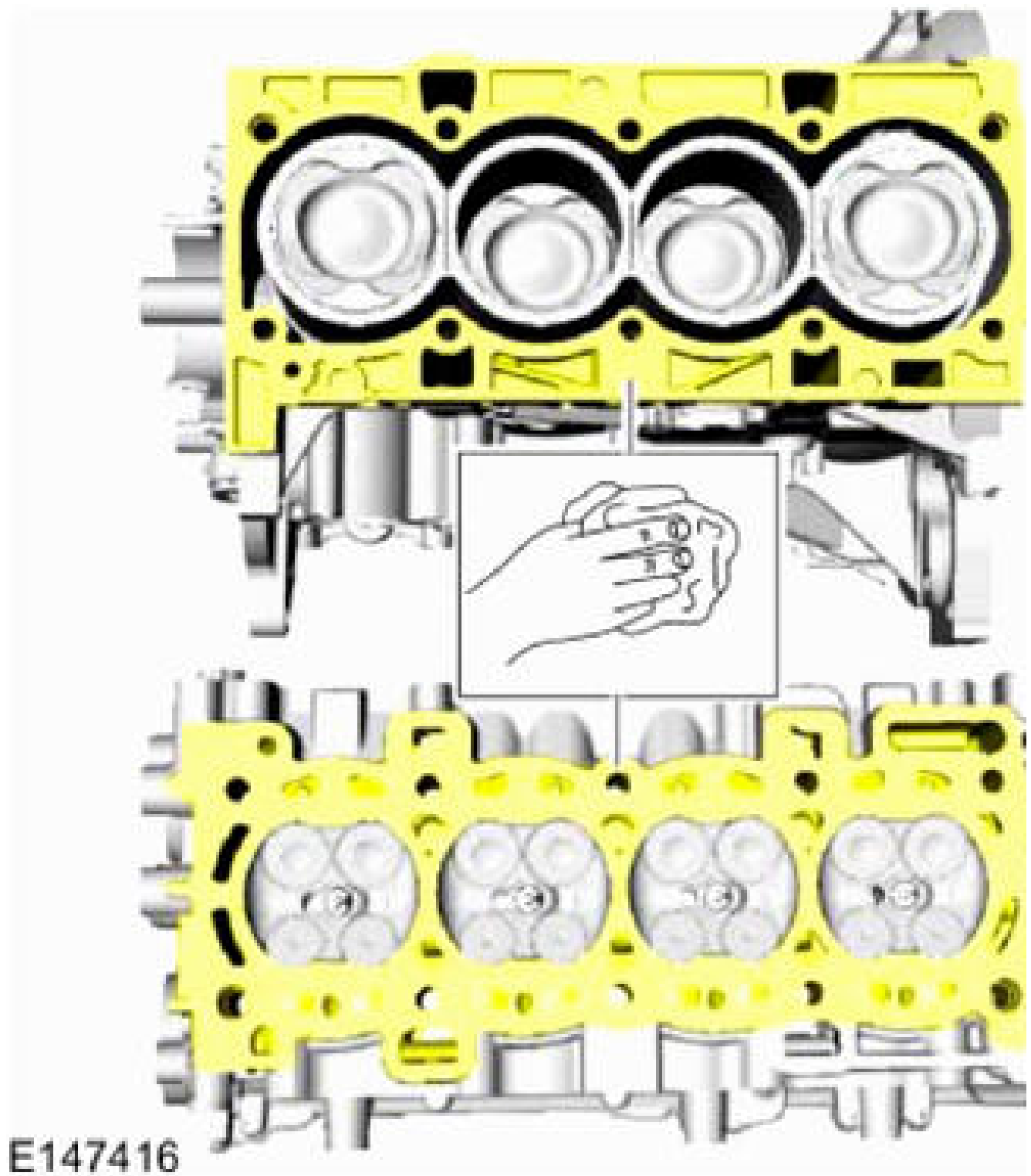


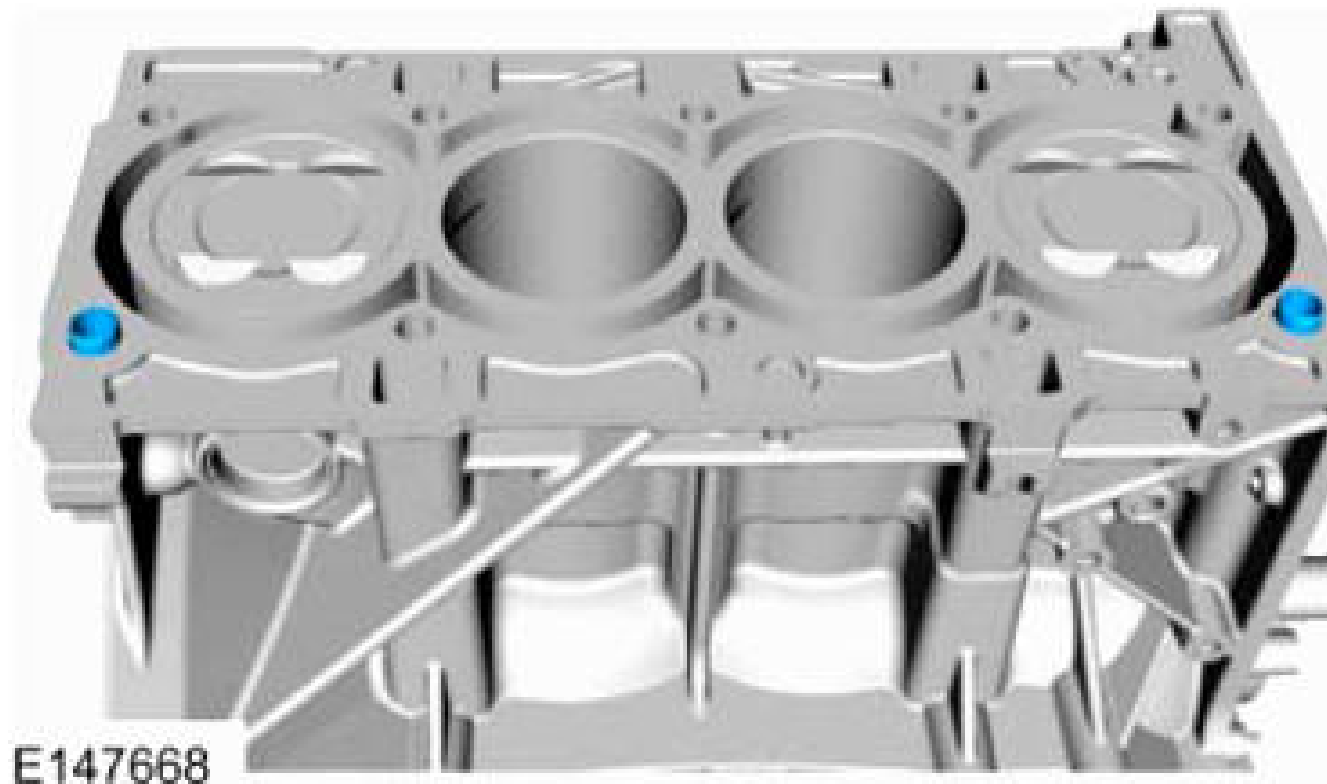
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

53.

NOTE: If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

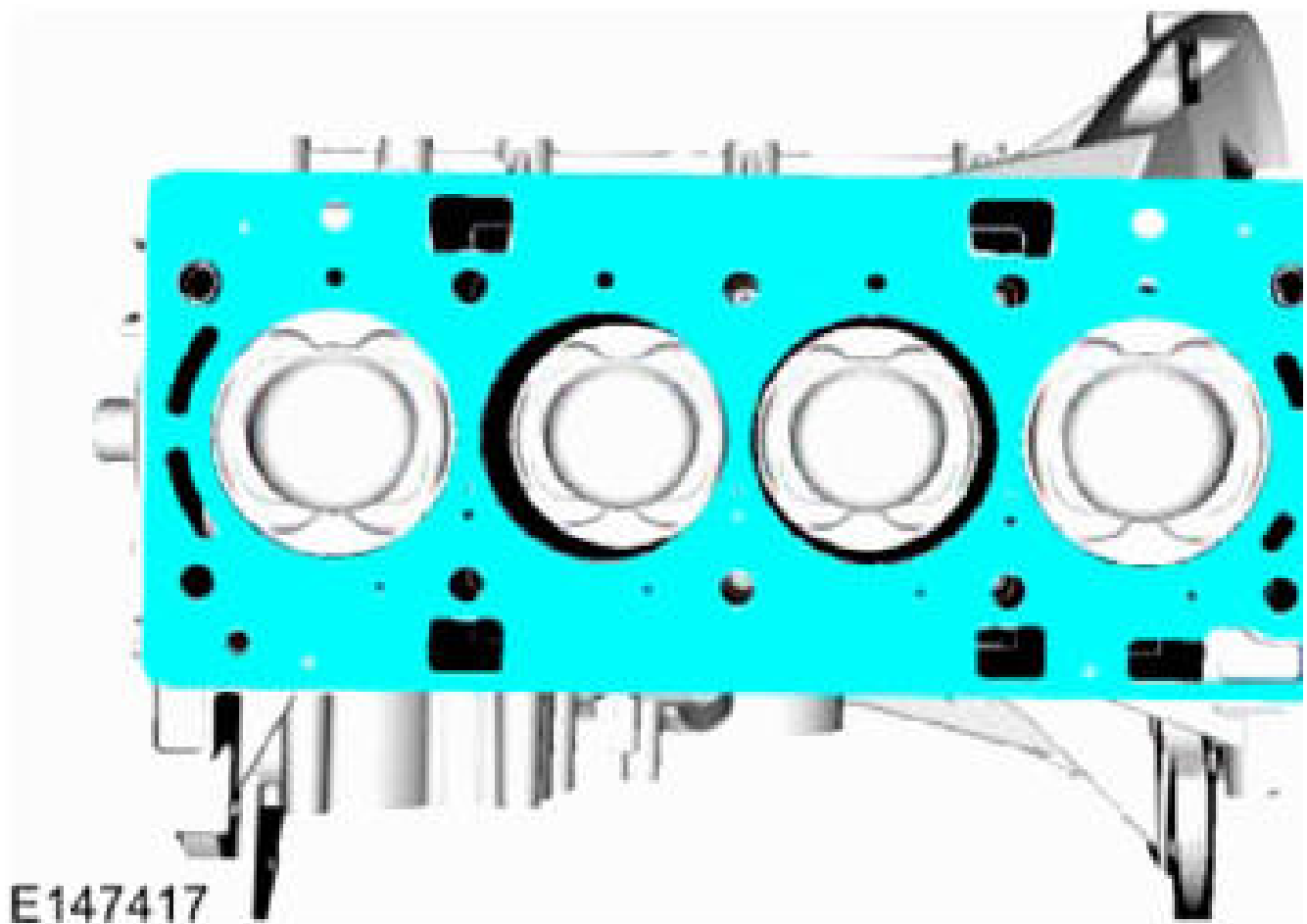
Material : Motorcraft® Metal Surface Prep/ZC-31-A





54.

55.



55.

NOTE: The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.

56.

NOTE: Lubricate the bolts with clean engine oil prior to installation.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

Torque :

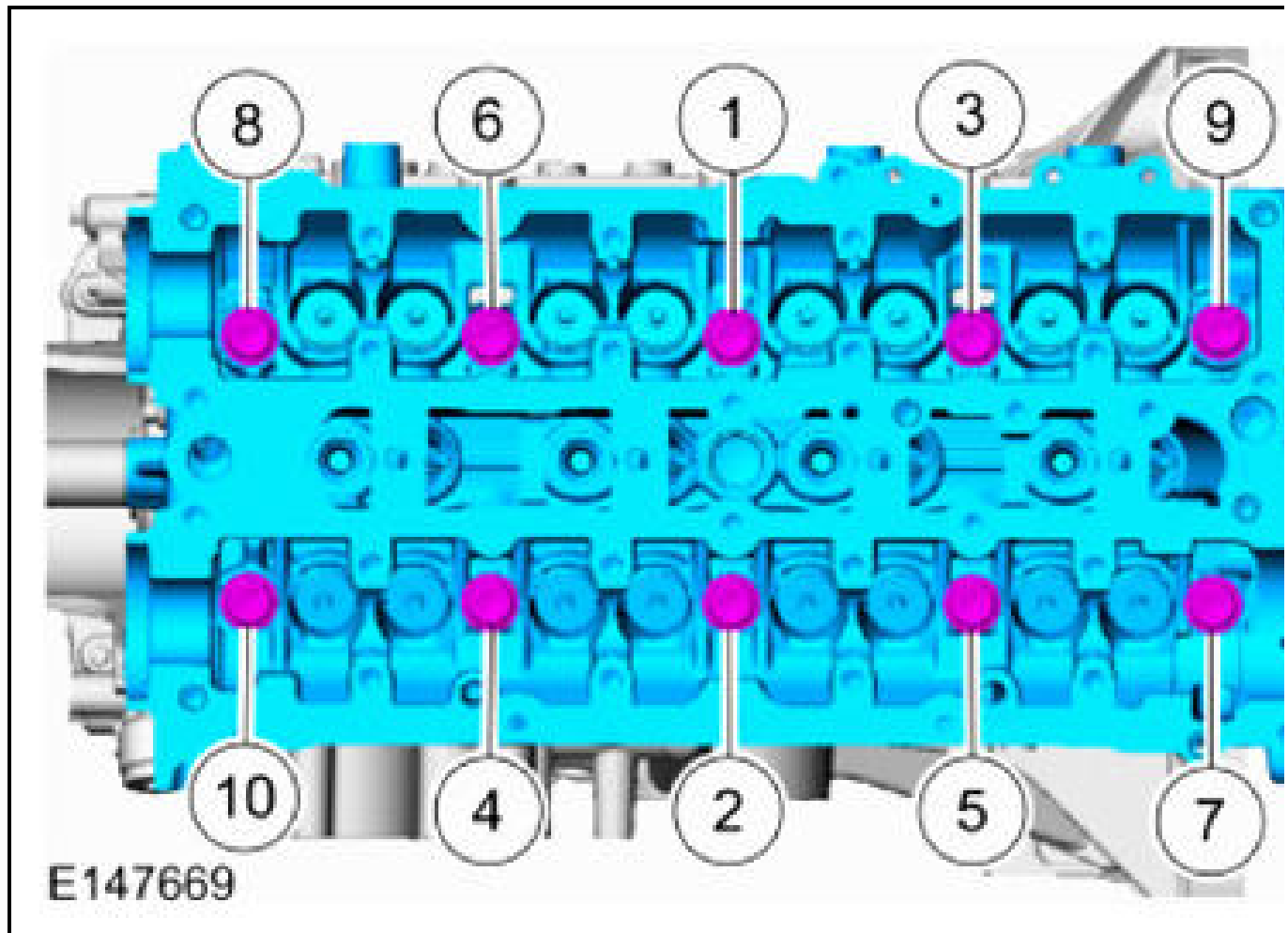
Stage 1: 5 Nm

Stage 2: 15 Nm

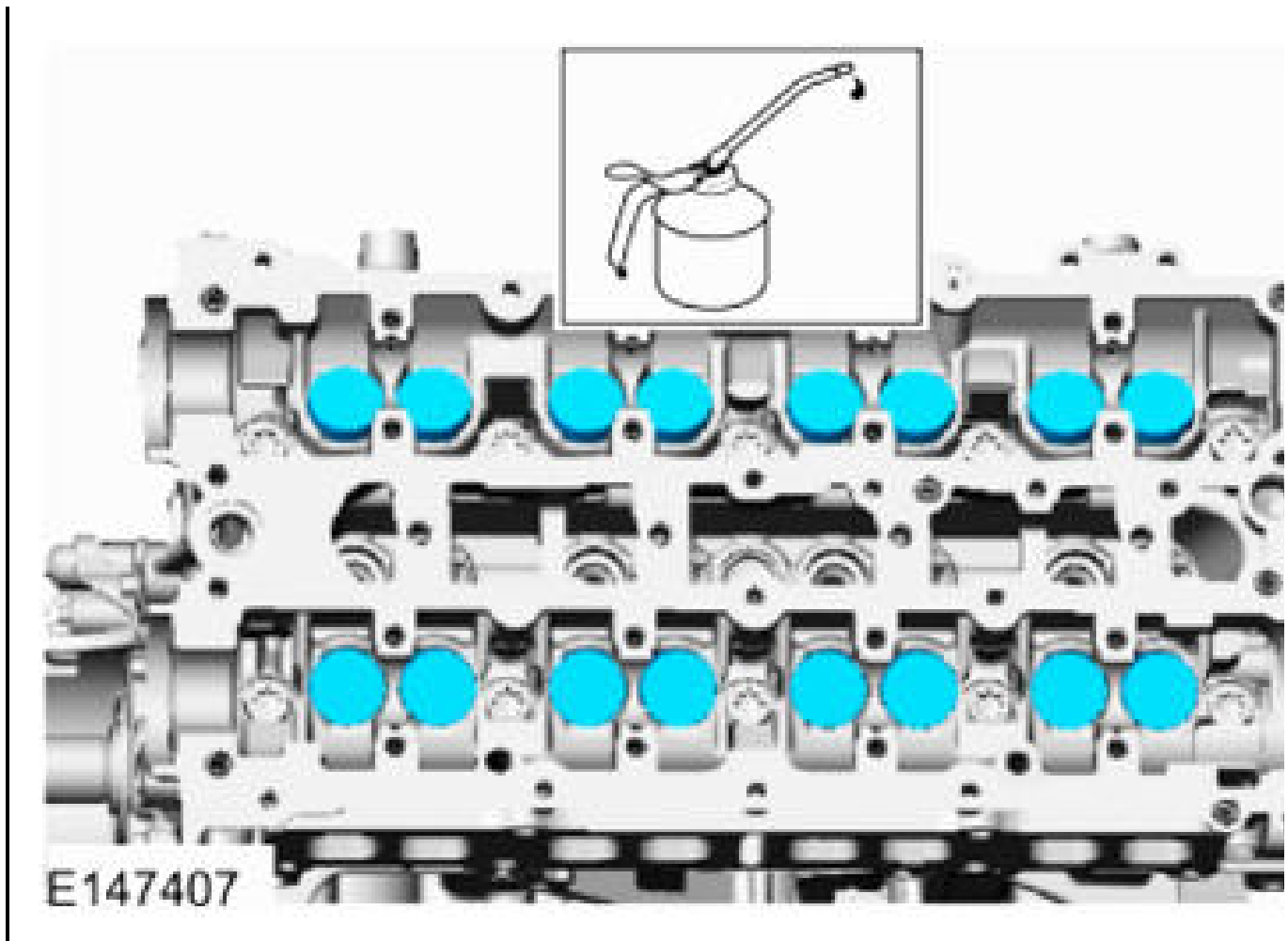
Stage 3: 35 Nm

Stage 4: 90°

Stage 5: Tighten an additional 90°



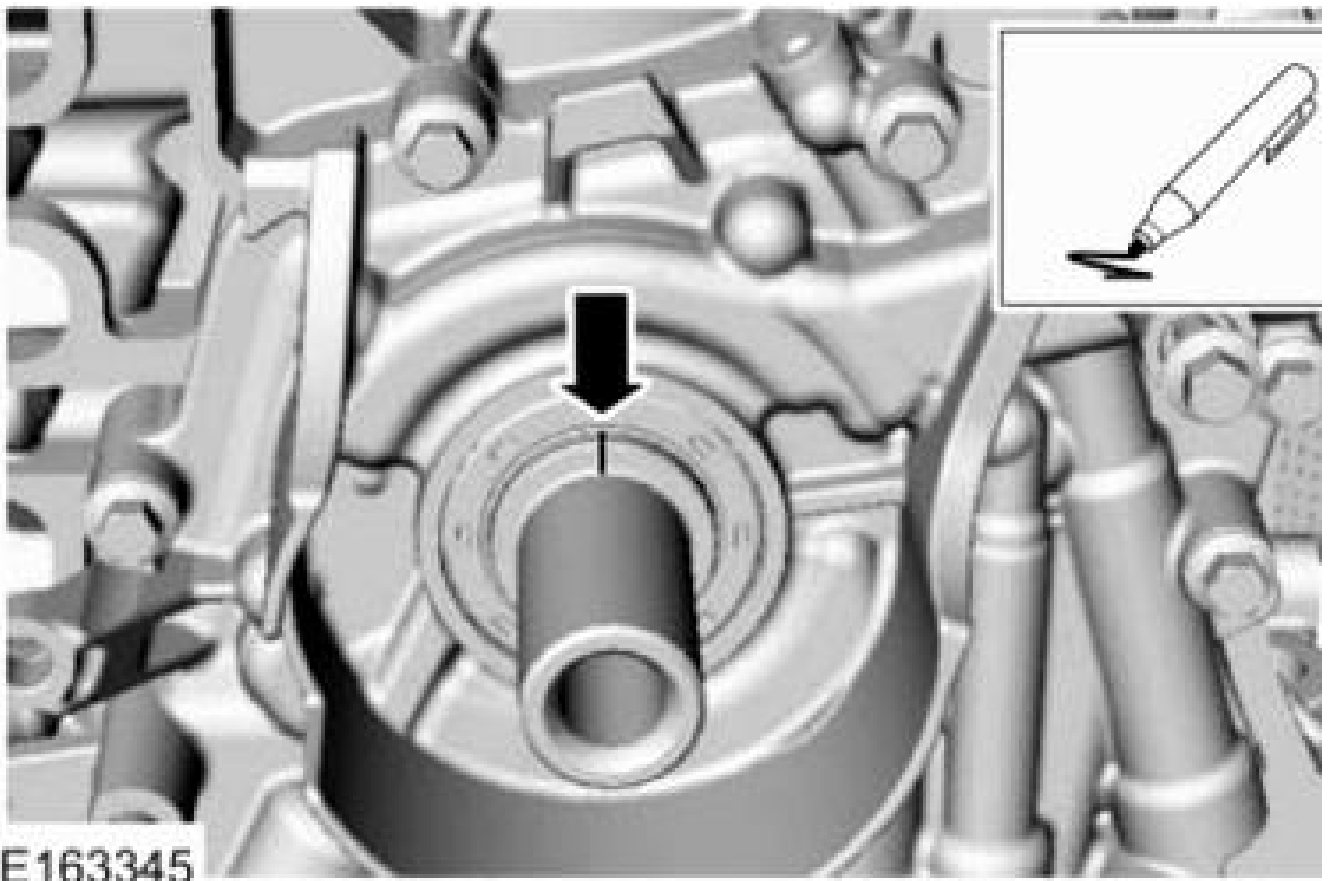
57. *Material* : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



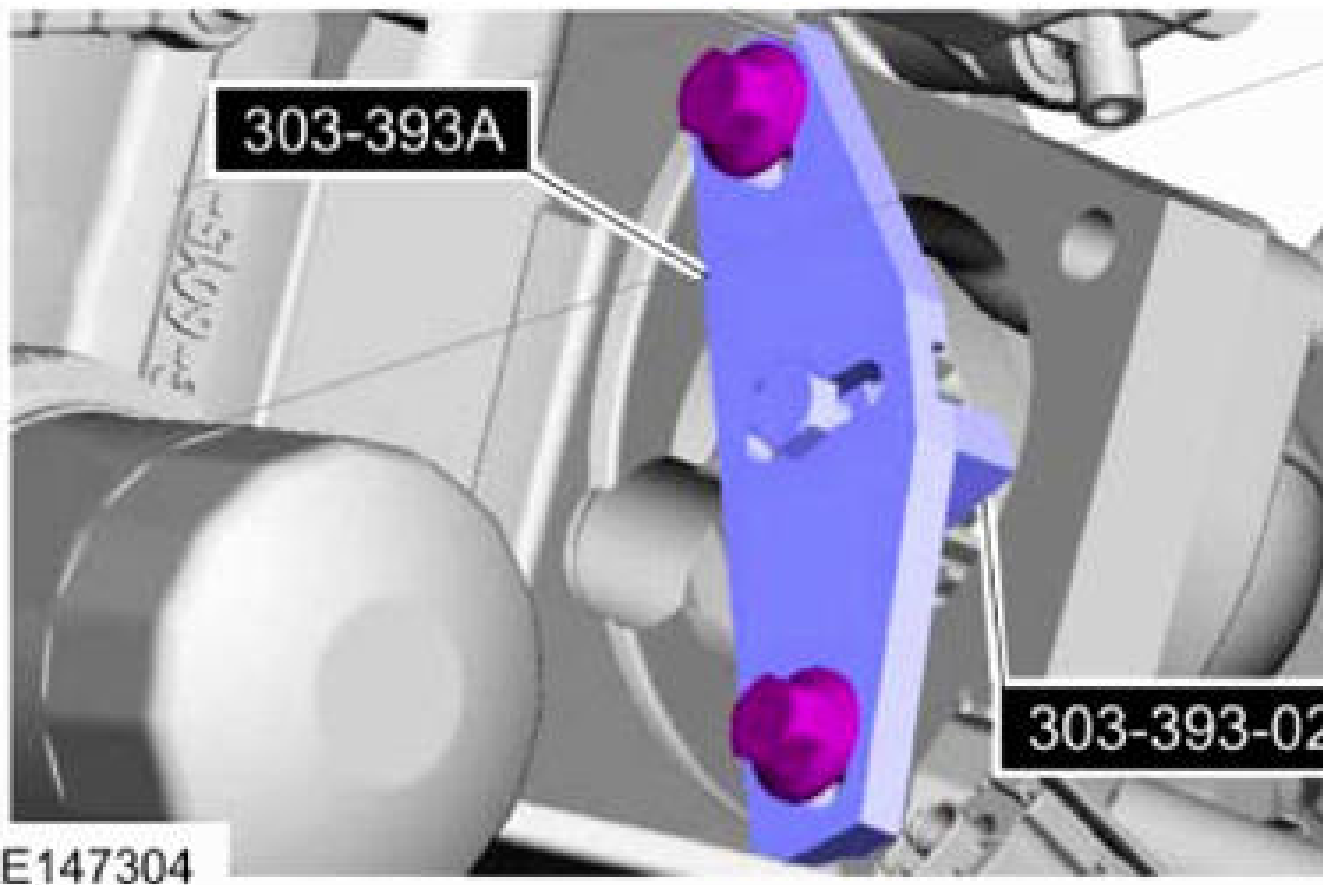
NOTE: If any new parts are being installed (cylinder head, valves, tappets, camshafts) it is necessary to check the valve clearance, follow the next 10 steps exactly or serious damage to the engine may occur. If the original parts are being installed it is not necessary to check the valve clearance so proceed to step 68.

58.

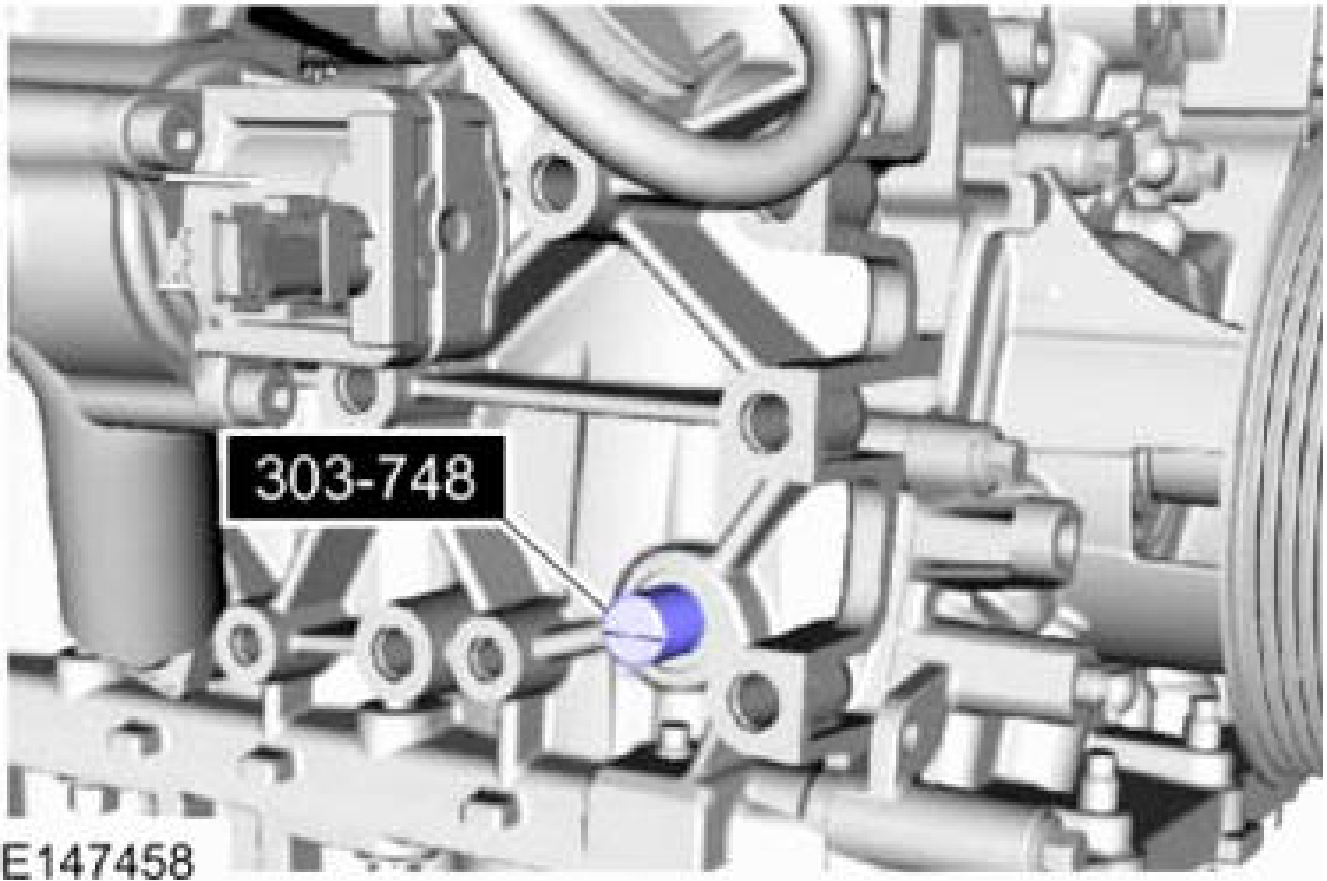
Place a paint mark on the crankshaft at the 12 o'clock position.



59. Remove Special Service Tool : 303-393-02 Adapter for 303-393 , 303-393A Locking Tool, Flywheel



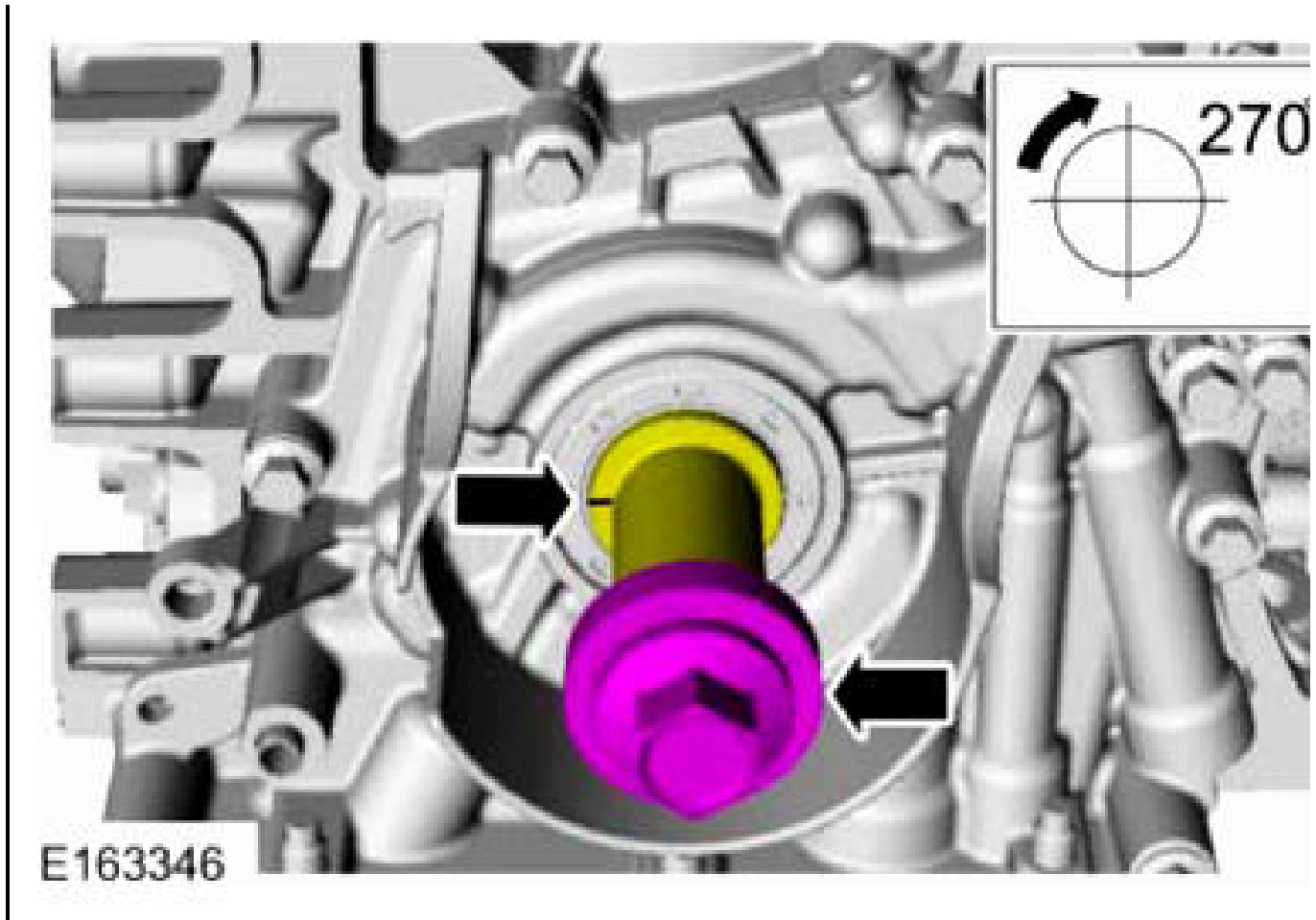
60. *Remove Special Service Tool : 303-748 Locking Tool, Crankshaft*



NOTE: Rotating the crankshaft will position all of the pistons below the deck of the cylinder block and allow the camshafts to be installed and the valve clearance checked without the possibility of damage to the valves or pistons.

61.

Using the crankshaft bolt and washer, rotate the crankshaft clockwise 270 degrees until the paint mark is at the 9 o'clock position



62. **NOTE:** Failure to follow the camshaft tightening procedure can result in damage to the camshafts.
- NOTE:** Make sure that the camshafts and camshaft bearing caps are installed in their original locations or damage to the engine may occur.
- NOTE:** Make sure that the components are installed to the position noted before removal.
- NOTE:** Make sure that new bolts are installed.
- NOTE:** Apply clean engine oil to the bearing surfaces of the camshafts, camshaft bearing caps and the VCT bridge.

Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.

Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-

M2C945-A)

Torque :

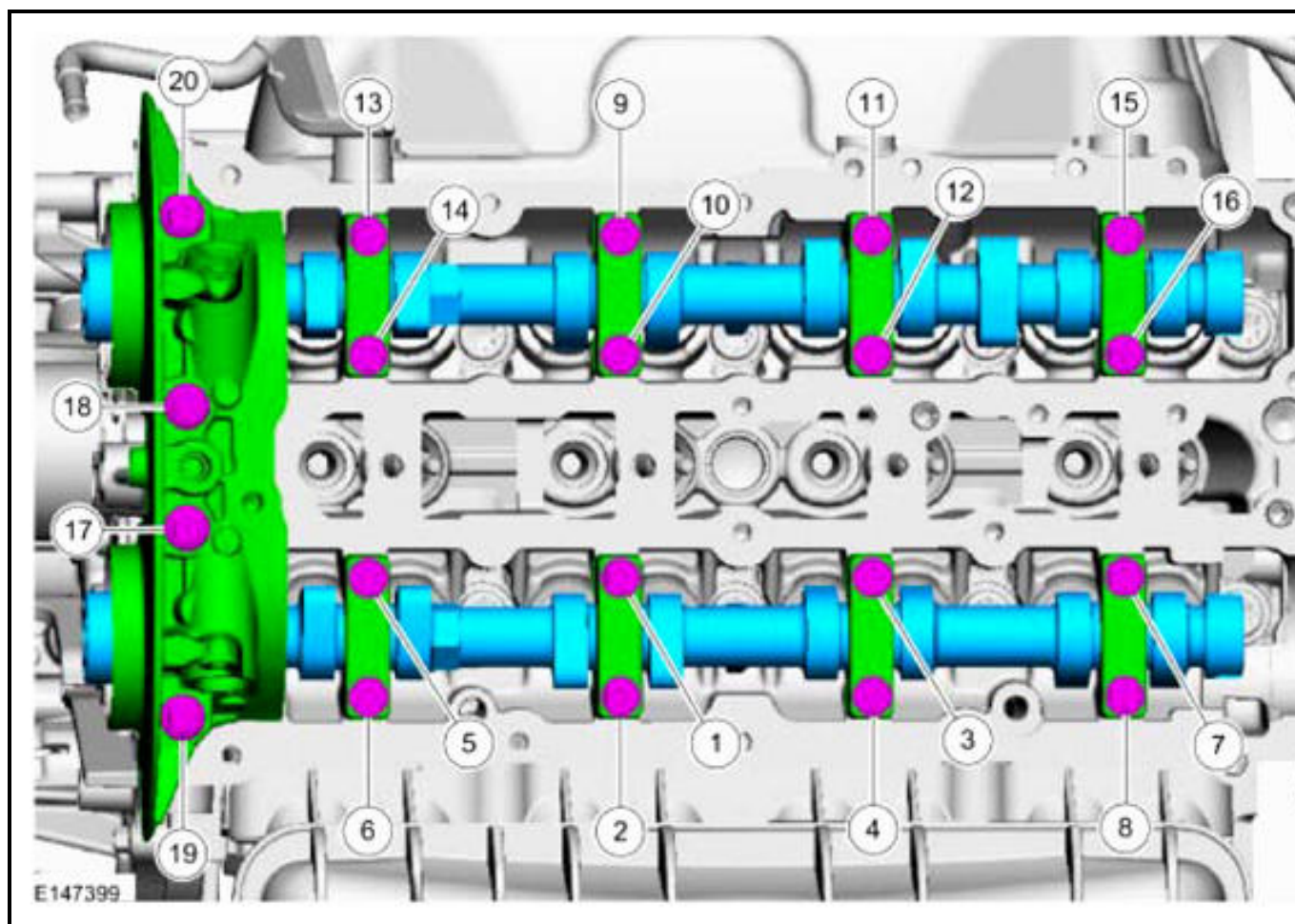
Stage 1: Tighten bolts 1 through 16 to 7 Nm

Stage 2: Tighten bolts 17 through 20 to 10 Nm

Stage 3: Tighten bolts 1 through 16 an additional 45°

Stage 4: Tighten bolts 17 and 18 an additional 70°

Stage 5: Tighten bolts 19 and 20 an additional 53°

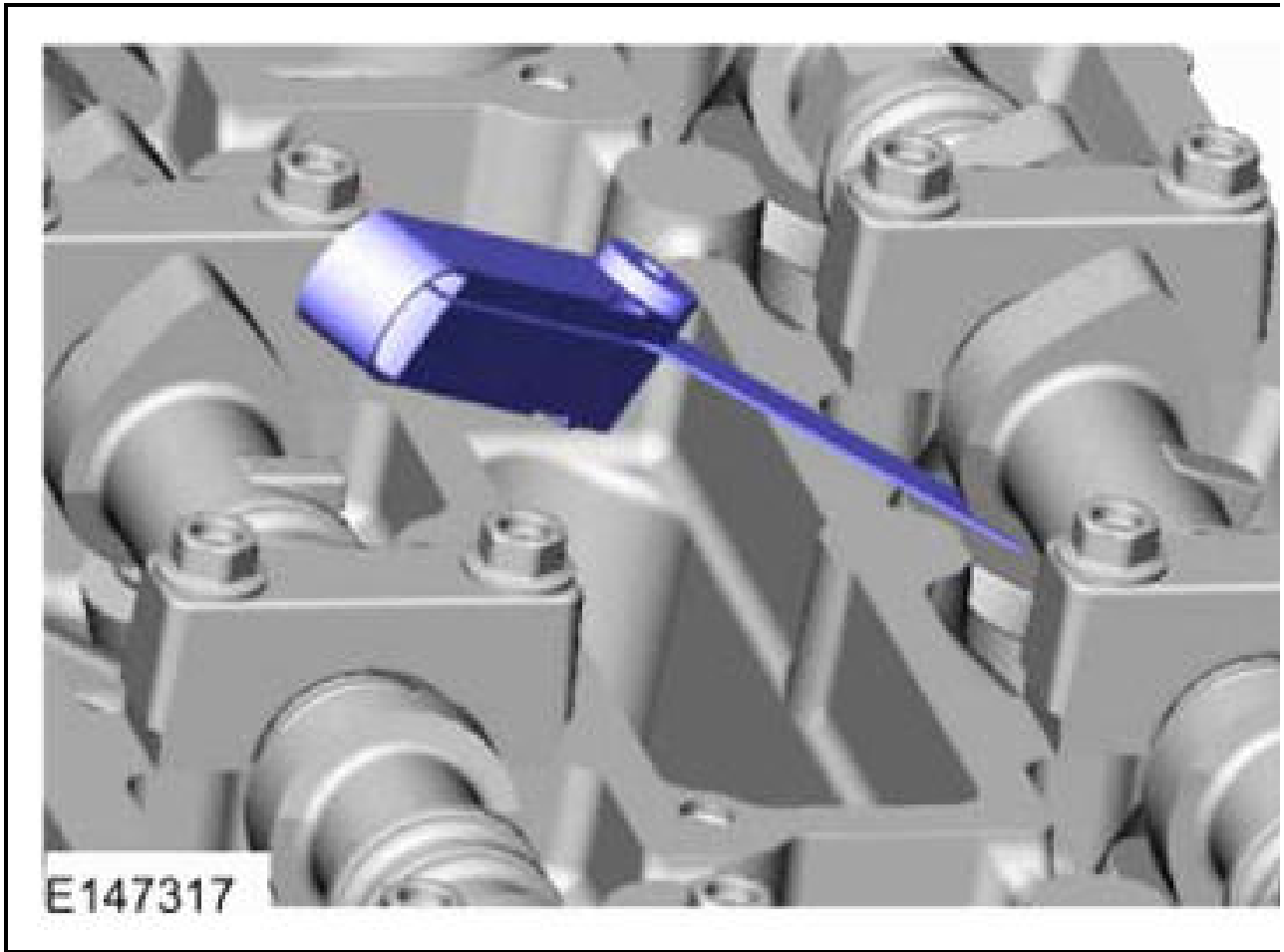


63.

1. Using the flats of the camshaft, rotate the camshaft to place the cam lobe at base circle, with the lobe pointed away from the tappet.
2. Use a feeler gauge to measure the clearance of each valve and record its location.

General Equipment : Feeler Gauge

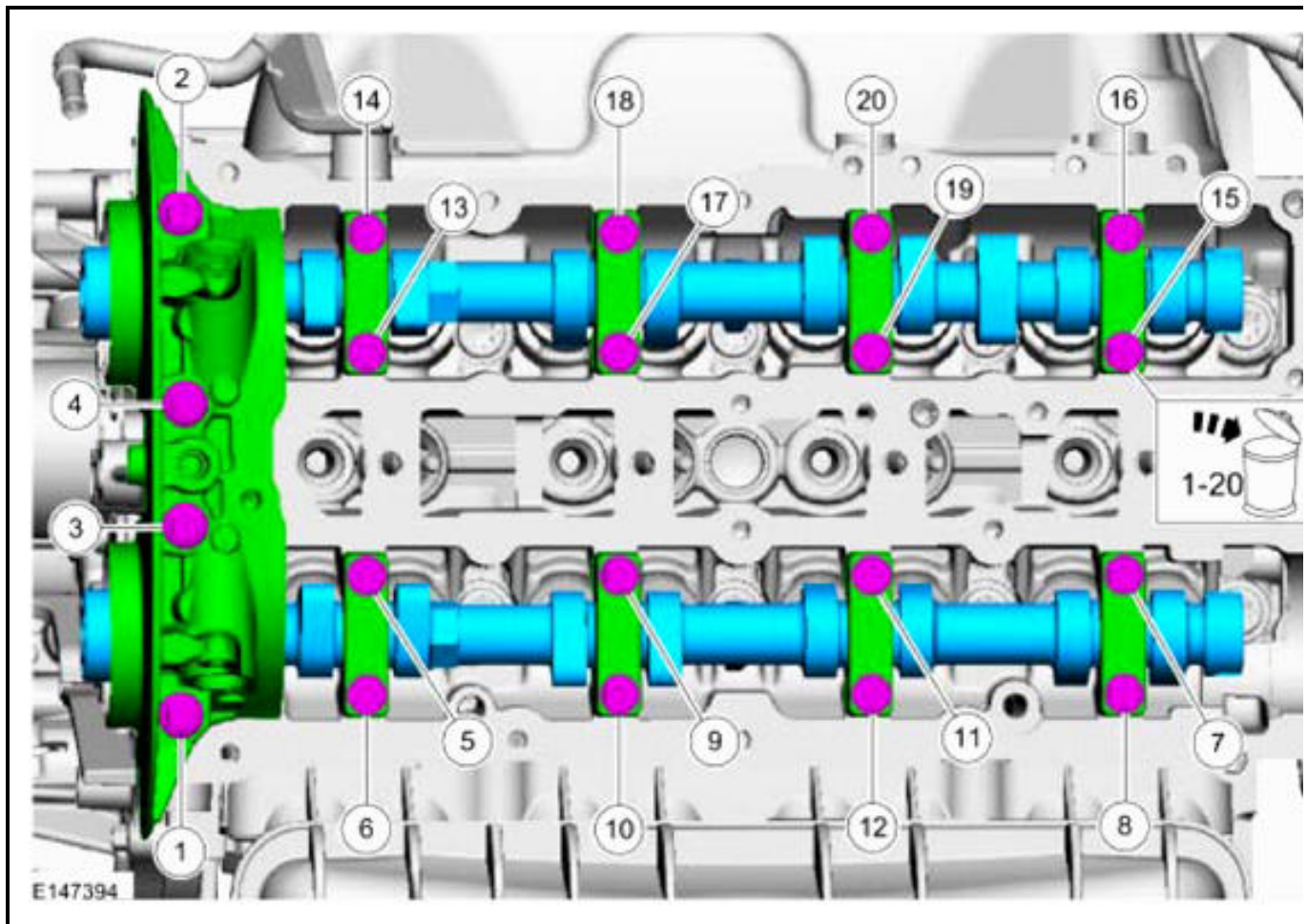
3. Repeat to measure all of the lobe/tappet clearances.



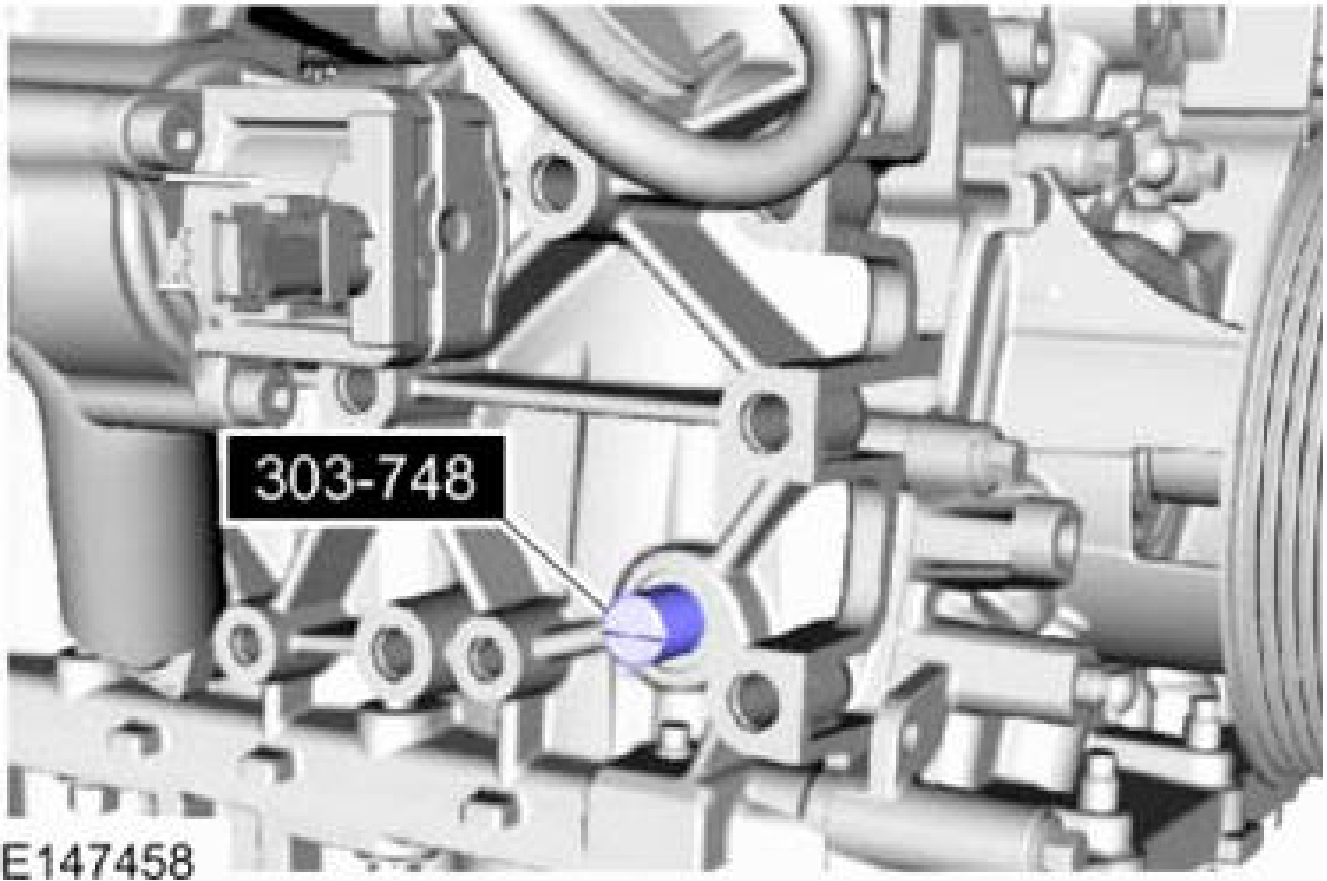
64. **NOTE:** Select tappets using this formula: ideal tappet thickness = measured clearance + the existing tappet thickness - nominal clearance. Select the closest tappet size to the ideal tappet thickness available and mark the installation location.
- NOTE:** The nominal clearance is 0.0079 in (.2 mm) for intake and 0.0134 in (.34 mm) for exhaust.
- NOTE:** The acceptable clearances after being fully installed is 0.007-0.009 in (.17-.23 mm) for intake and 0.012-0.015 in (.31-.37 mm) for exhaust.
65. **NOTE:** Failure to follow the camshaft loosening procedure can result in damage to the camshafts.

NOTE: Note the location and orientation of each camshaft bearing cap and the position of the camshaft lobes on the No. 1 cylinder for installation reference.

Loosen the camshaft bearing caps in sequence 2 turns at a time until all tension is released from the camshaft bearing caps in sequence shown in illustration.



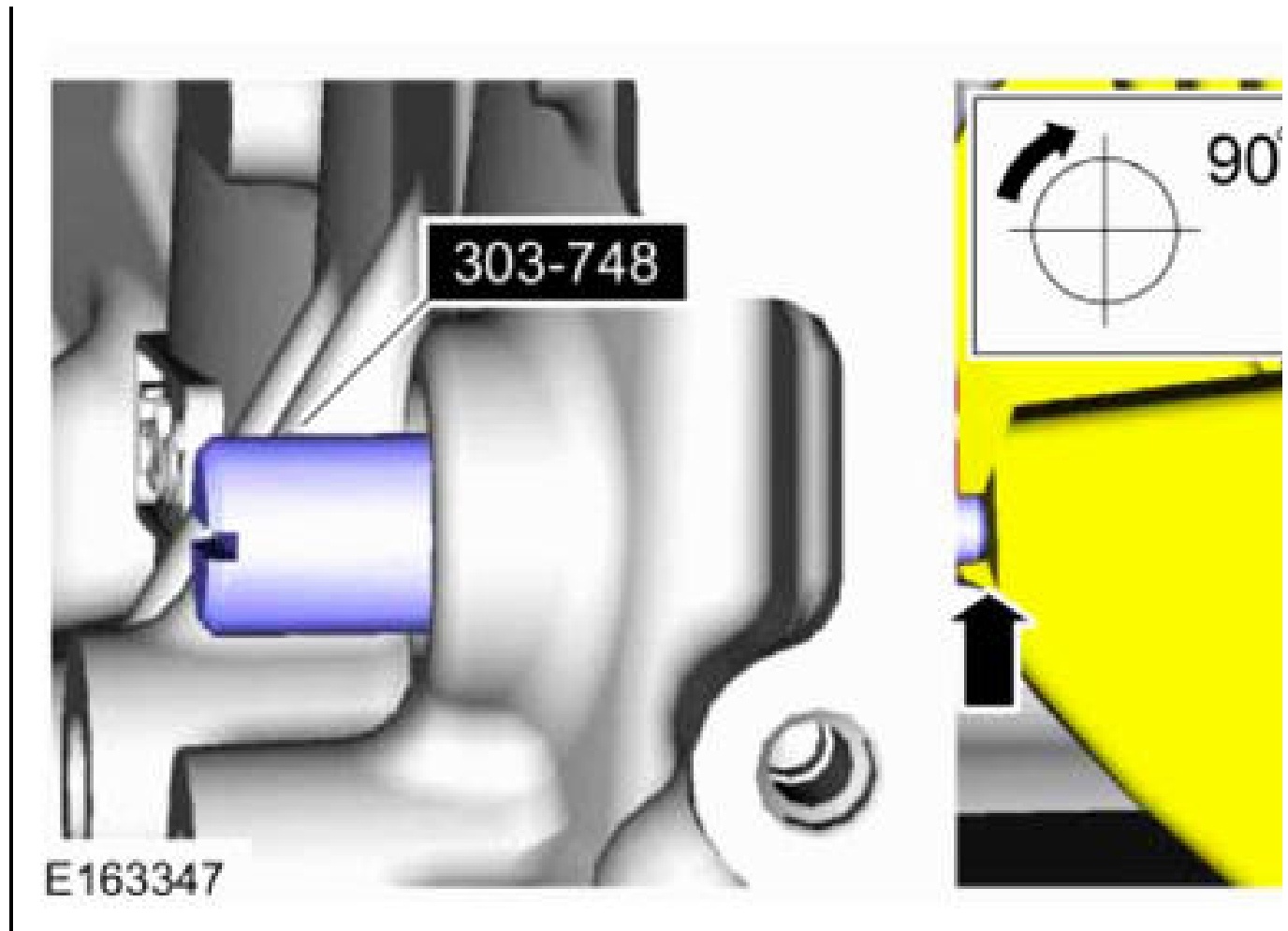
66. *Install Special Service Tool : 303-748 Locking Tool, Crankshaft*



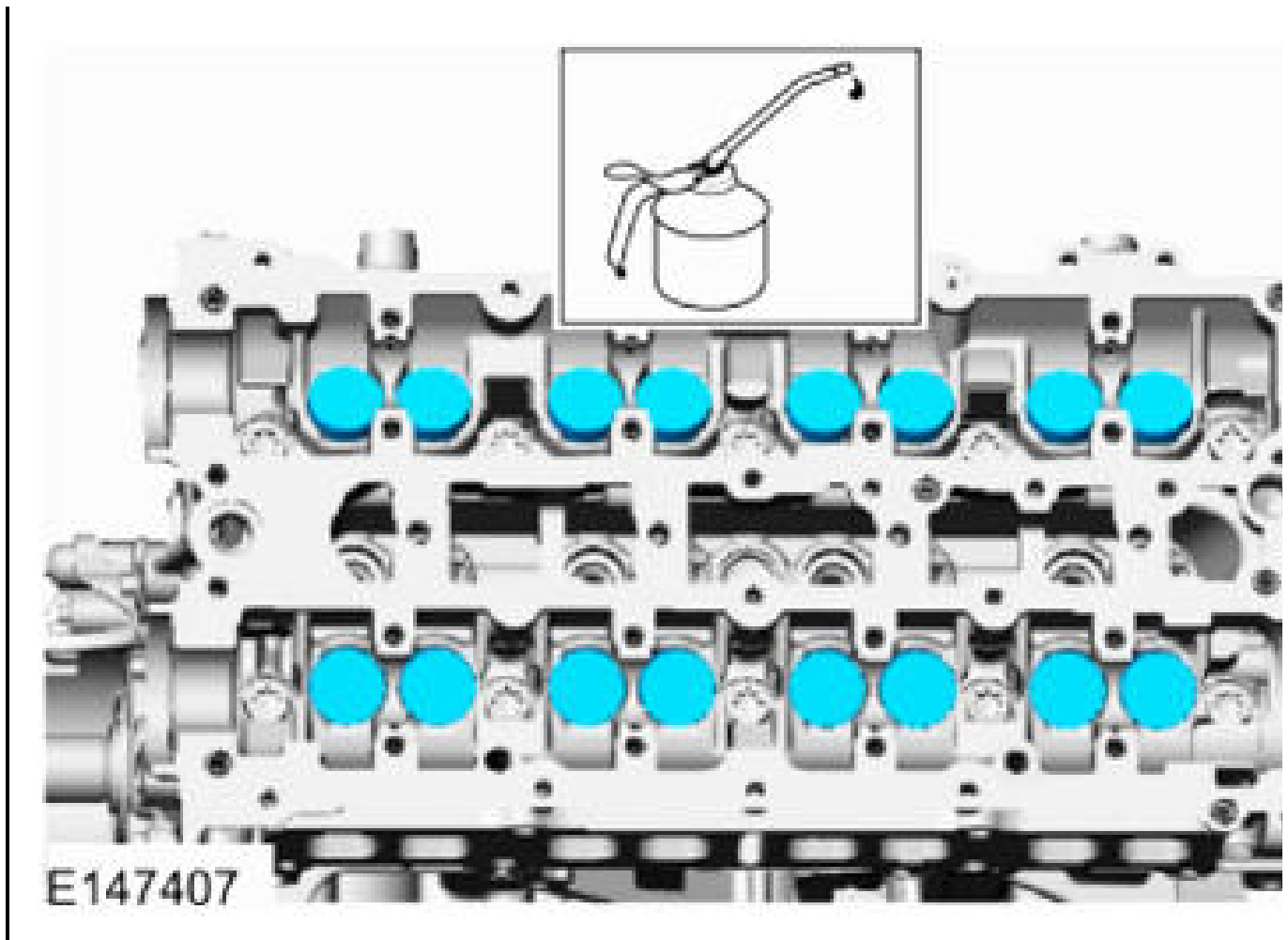
NOTE: Rotating the crankshaft will position the engine at TDC and allow you to install the camshafts in the same position as noted during the disassembly.

67.

Rotate the crankshaft clockwise 90 degrees so the crankshaft contacts the Timing Peg, Crankshaft TDC 303-748.

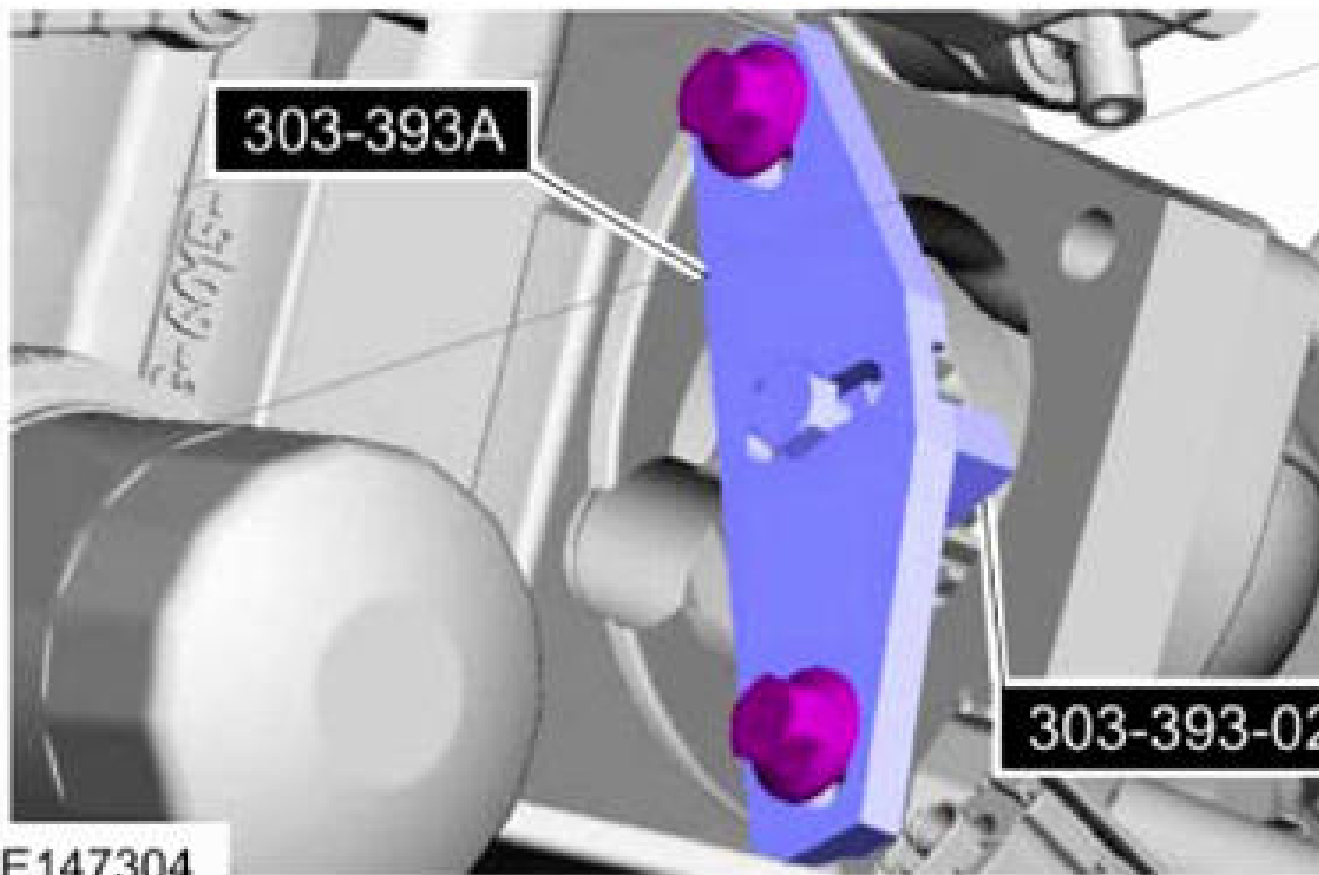


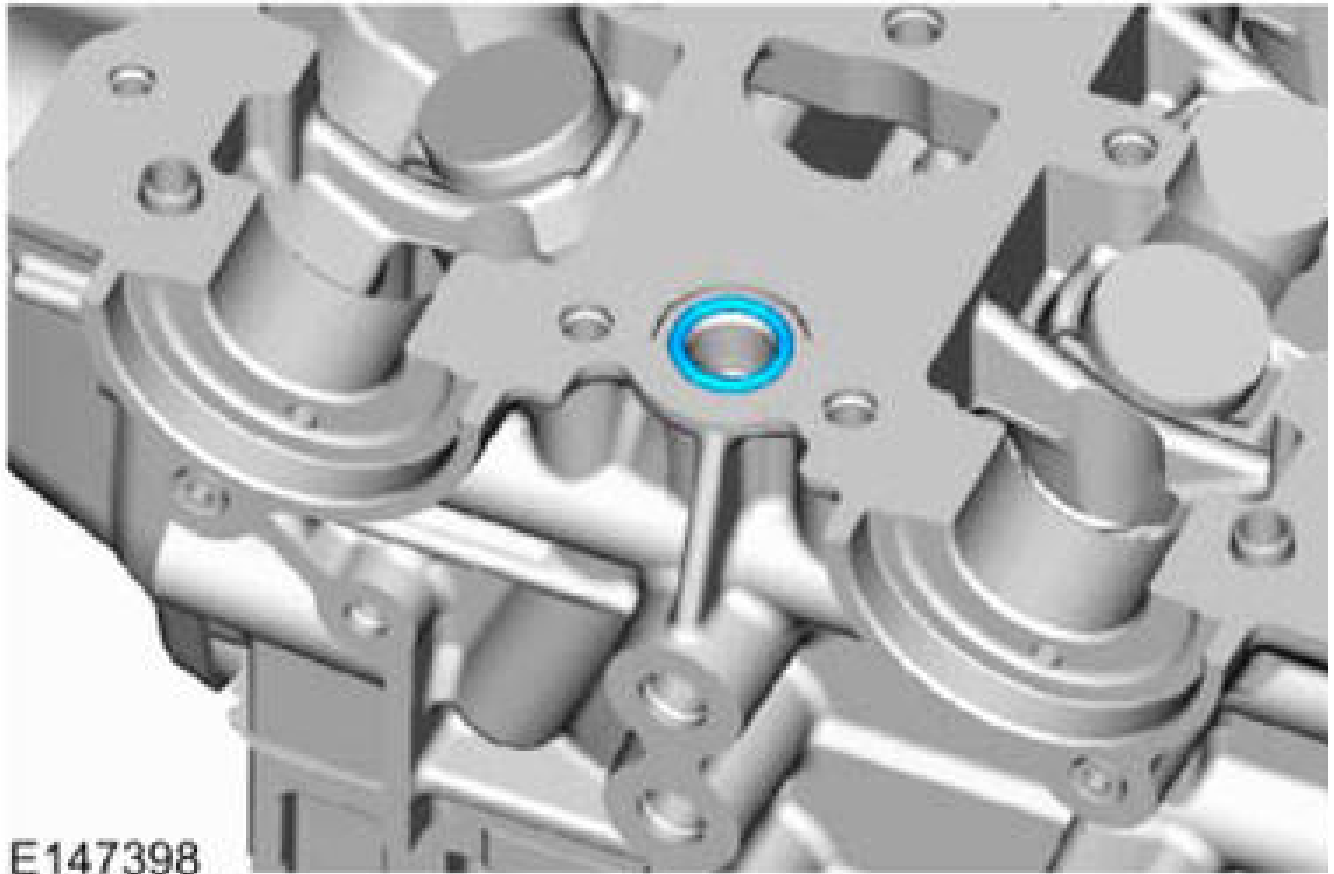
68. If necessary, replace any tappets with the correct tappets selected during the valve clearance check.



69. **NOTE:** Verify the crankshaft contacts the Timing Peg and the engine is still at TDC

Install Special Service Tool : 303-393A Locking Tool, Flywheel , 303-393-02 Adapter for 303-393



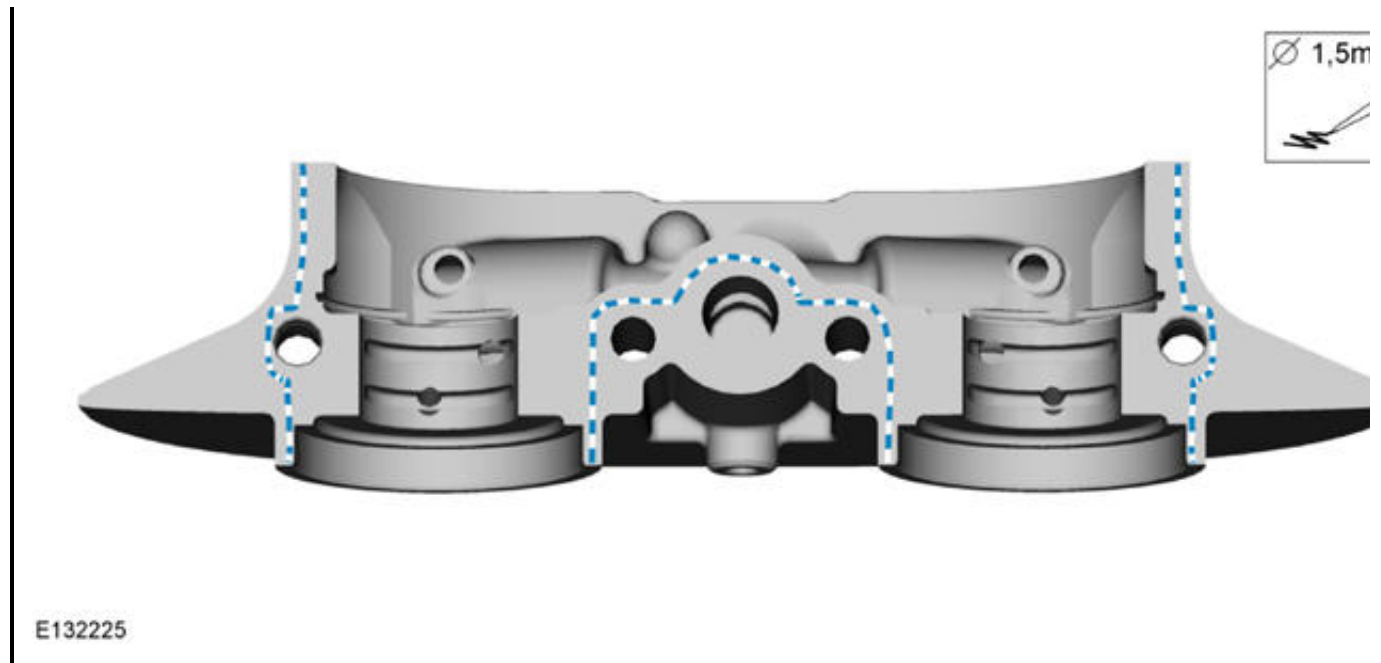


70.

NOTE: The VCT bridge must be installed within 5 minutes of applying the gasket maker.

71.

Material : Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)



72. Tighten the bolts evenly, half a turn at a time, until the camshaft bearing caps and the VCT bridge are seated against the cylinder head.

Torque :

Stage 1:

1 - 16 7 Nm

Stage 2:

17 - 20 10 Nm

Stage 3:

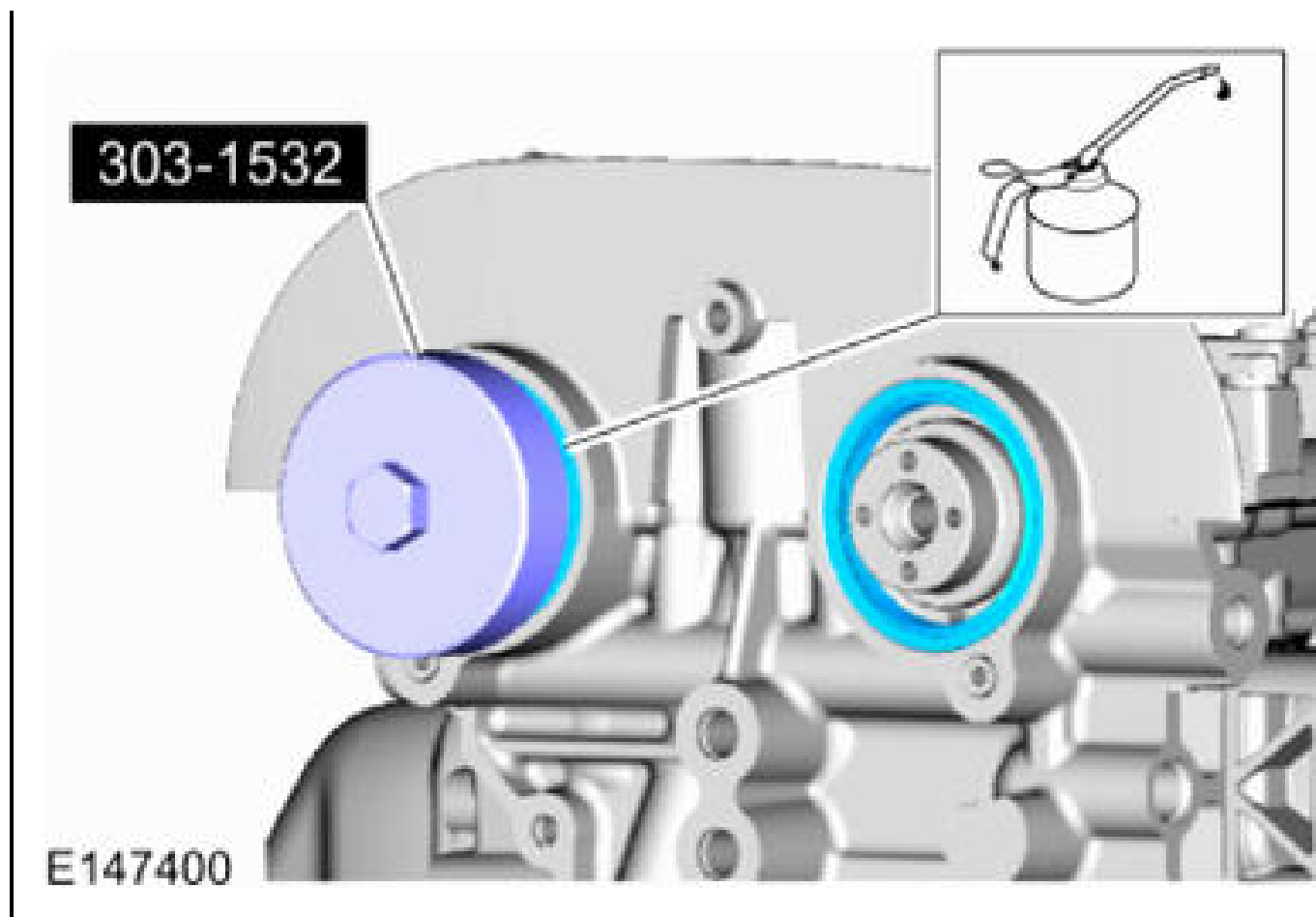
1 - 16 45°

Stage 4:

17 and 19 70°

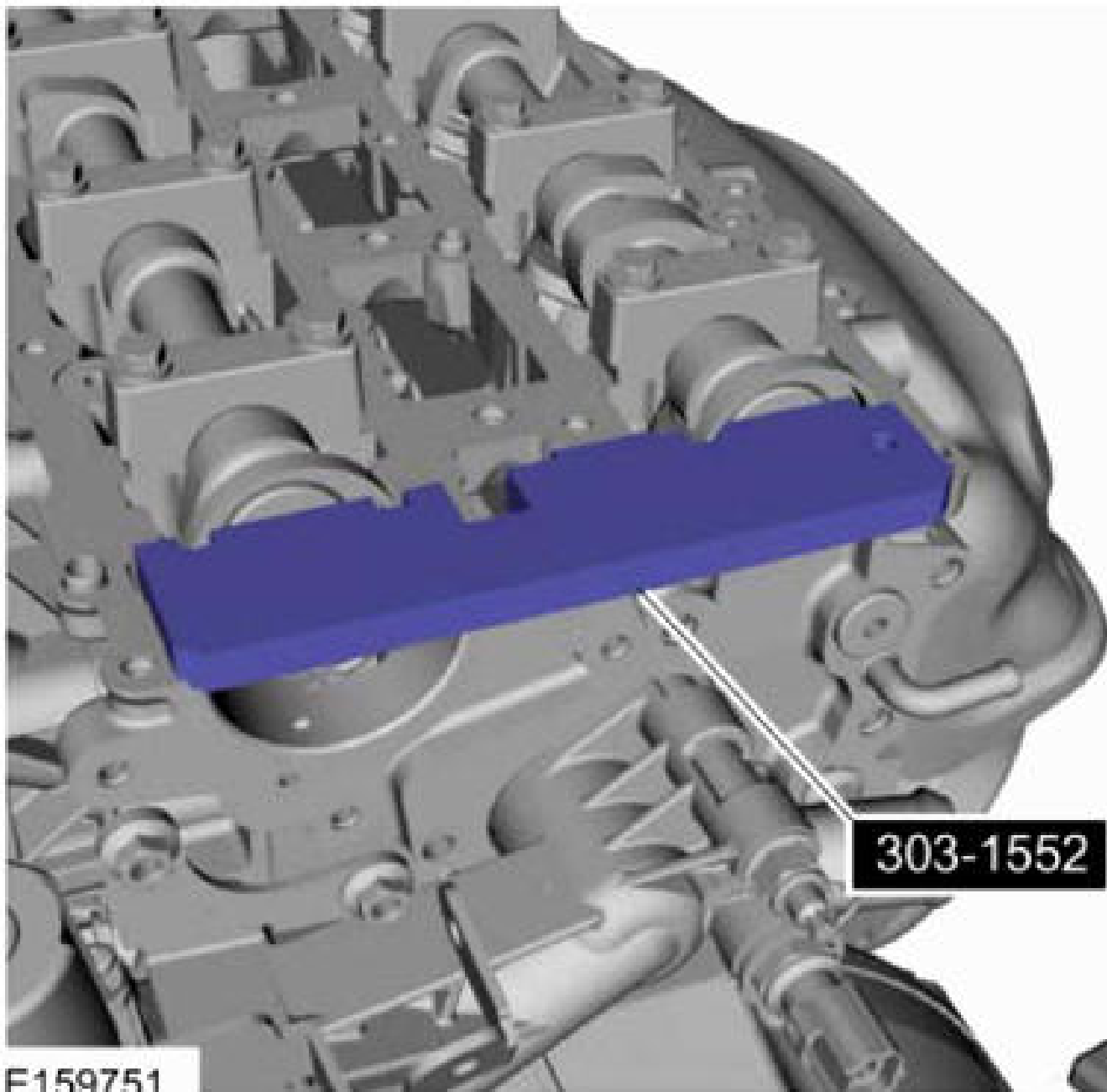
Stage 5:

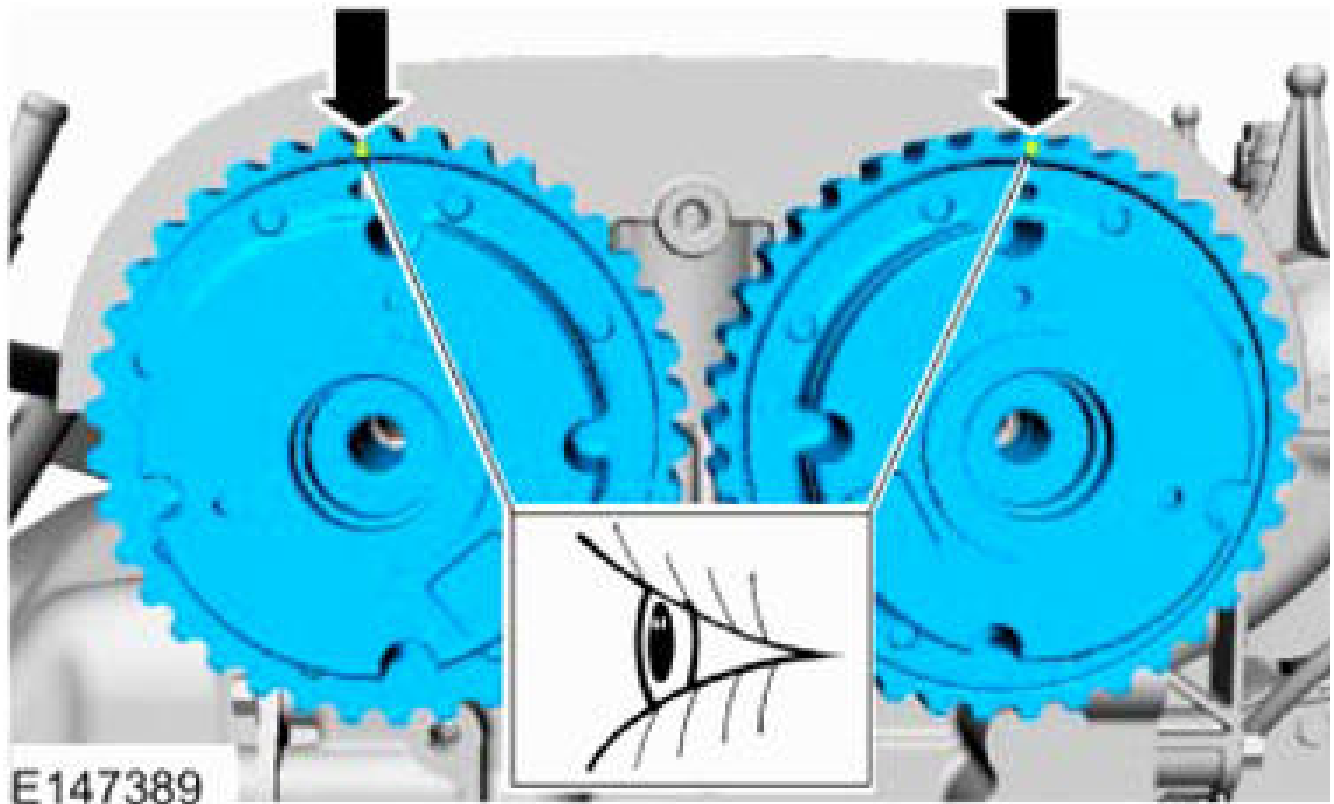
18 and 20 53°



74. **NOTE:** It may be necessary to use an open-ended wrench to turn the camshafts by the hexagon to align the camshafts.

Install Special Service Tool : 303-1552 Alignment Tool, Camshaft





E147389

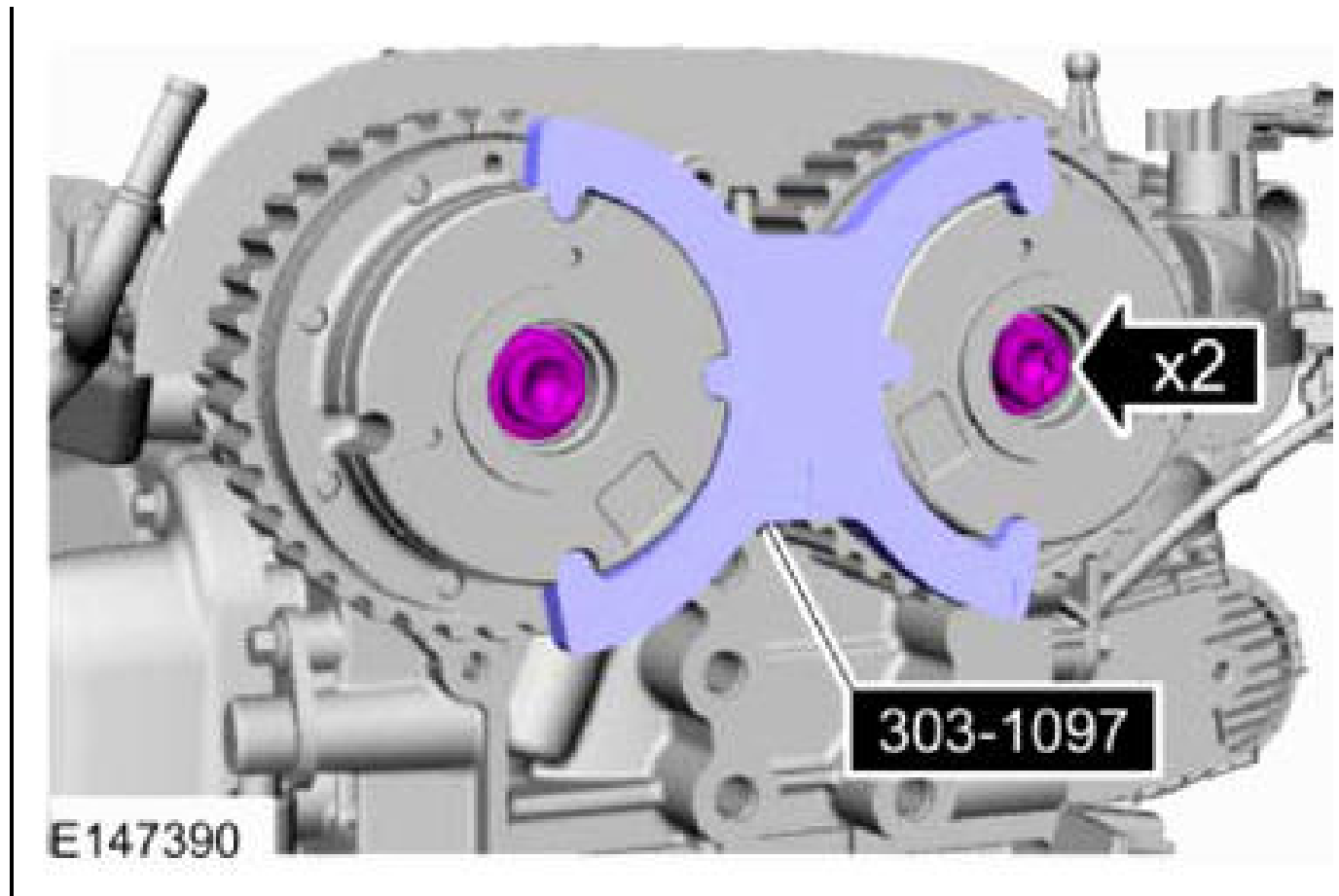
75.

NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

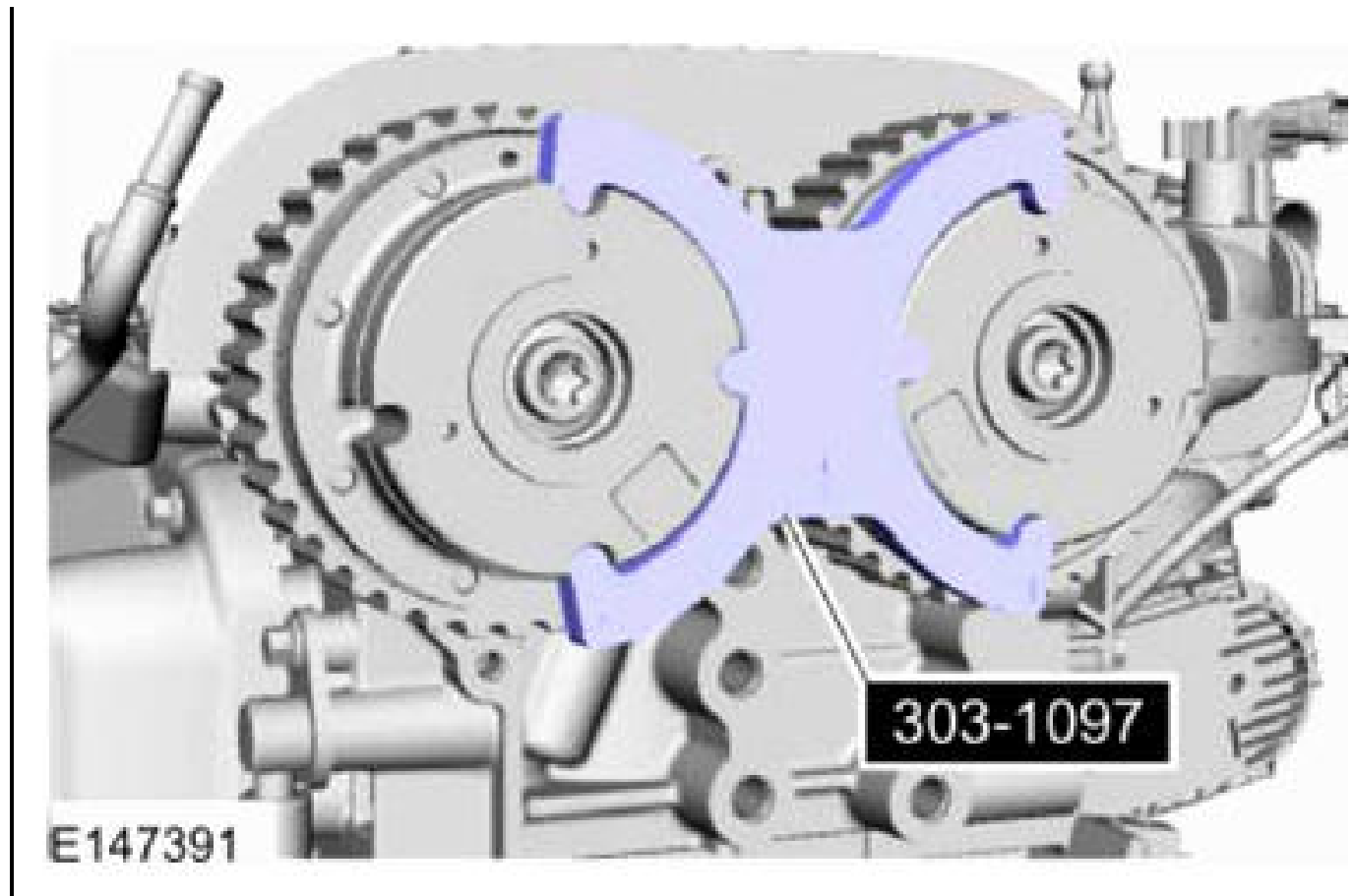
76.

Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit

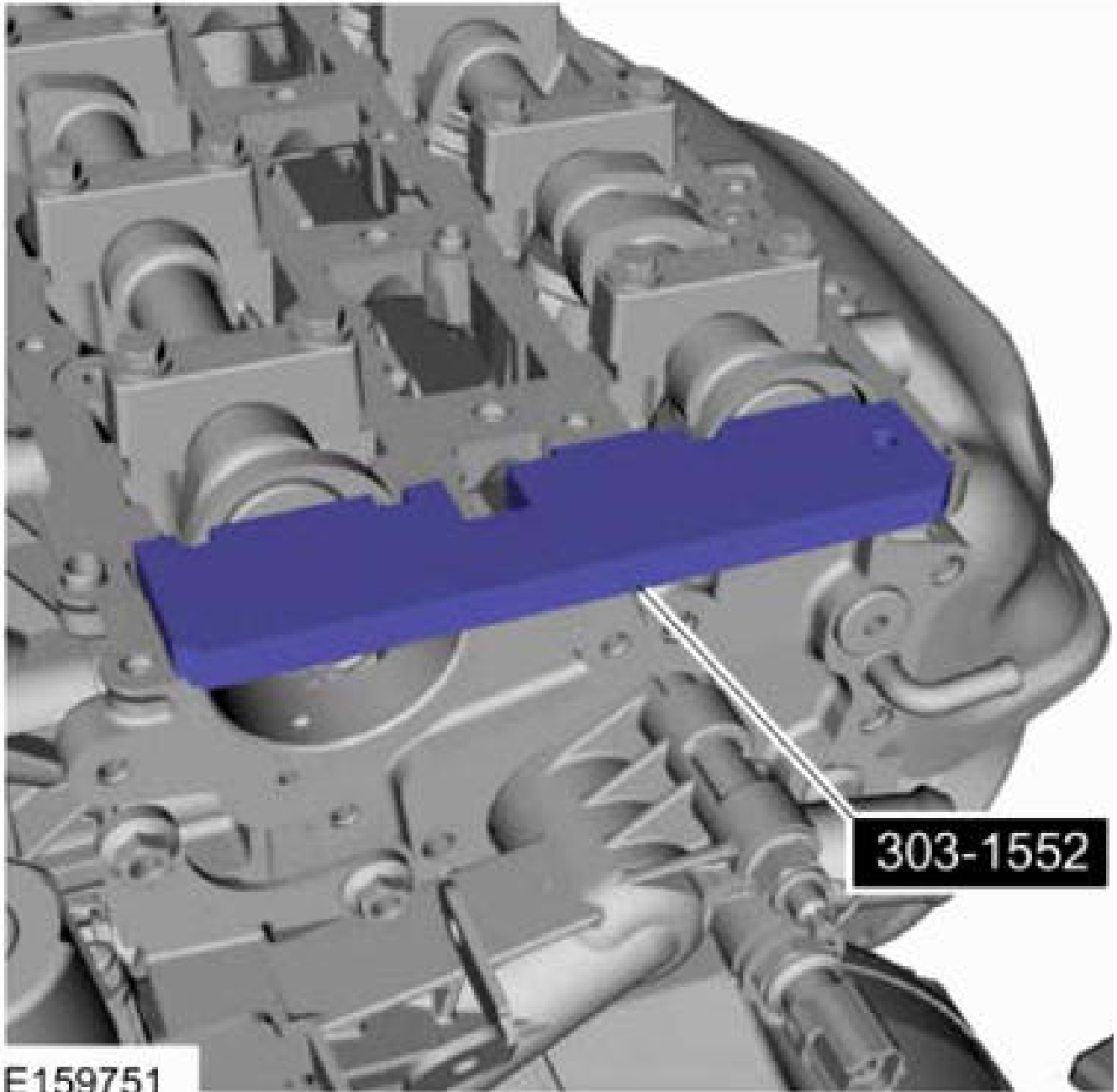
Torque : 25 Nm



77. Remove Special Service Tool : **303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit**



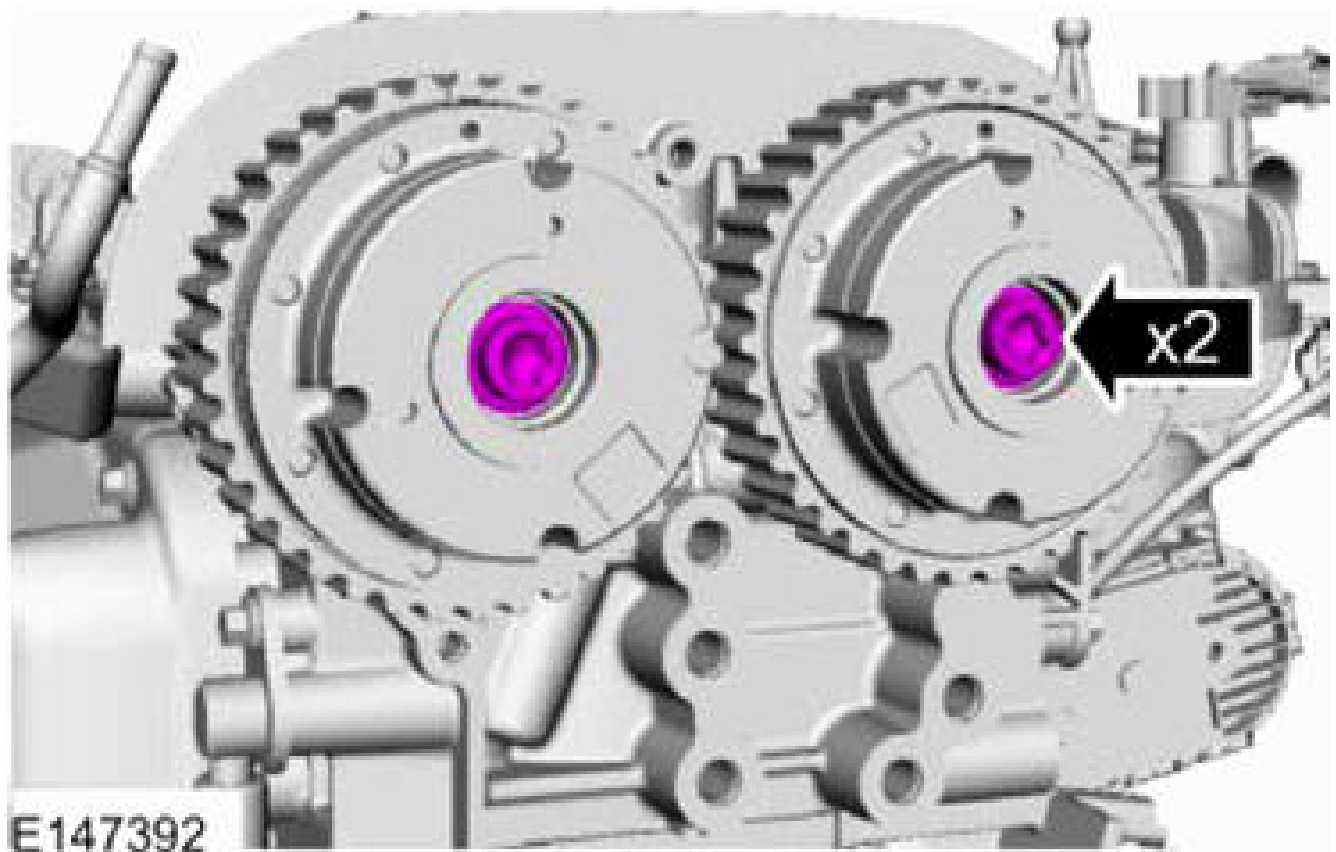
78. Remove Special Service Tool : **303-1552 Alignment Tool, Camshaft**



NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

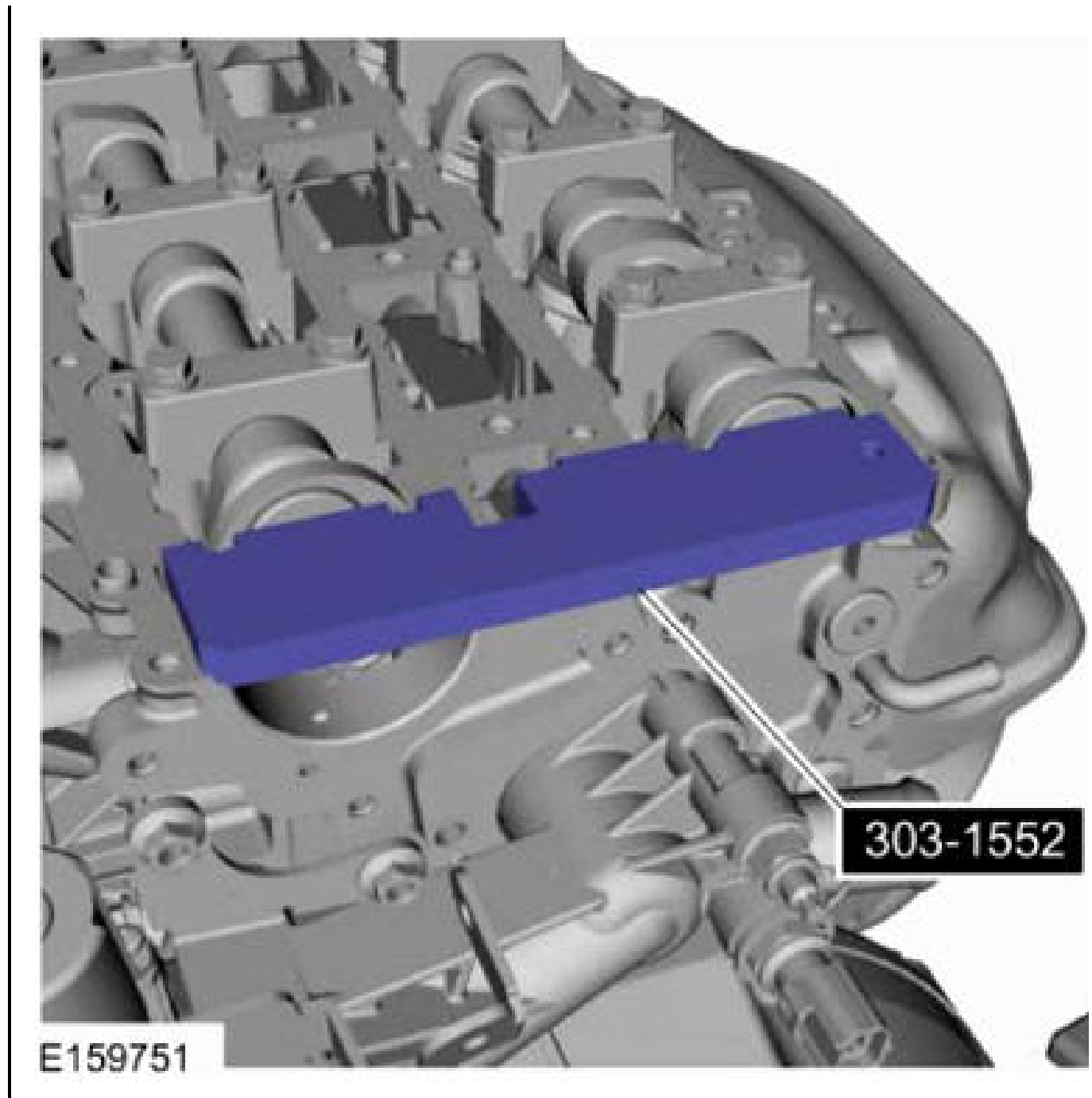
79.

Torque : Tighten an additional 75°



80. The special tool can only be installed if the valve timing is correct.

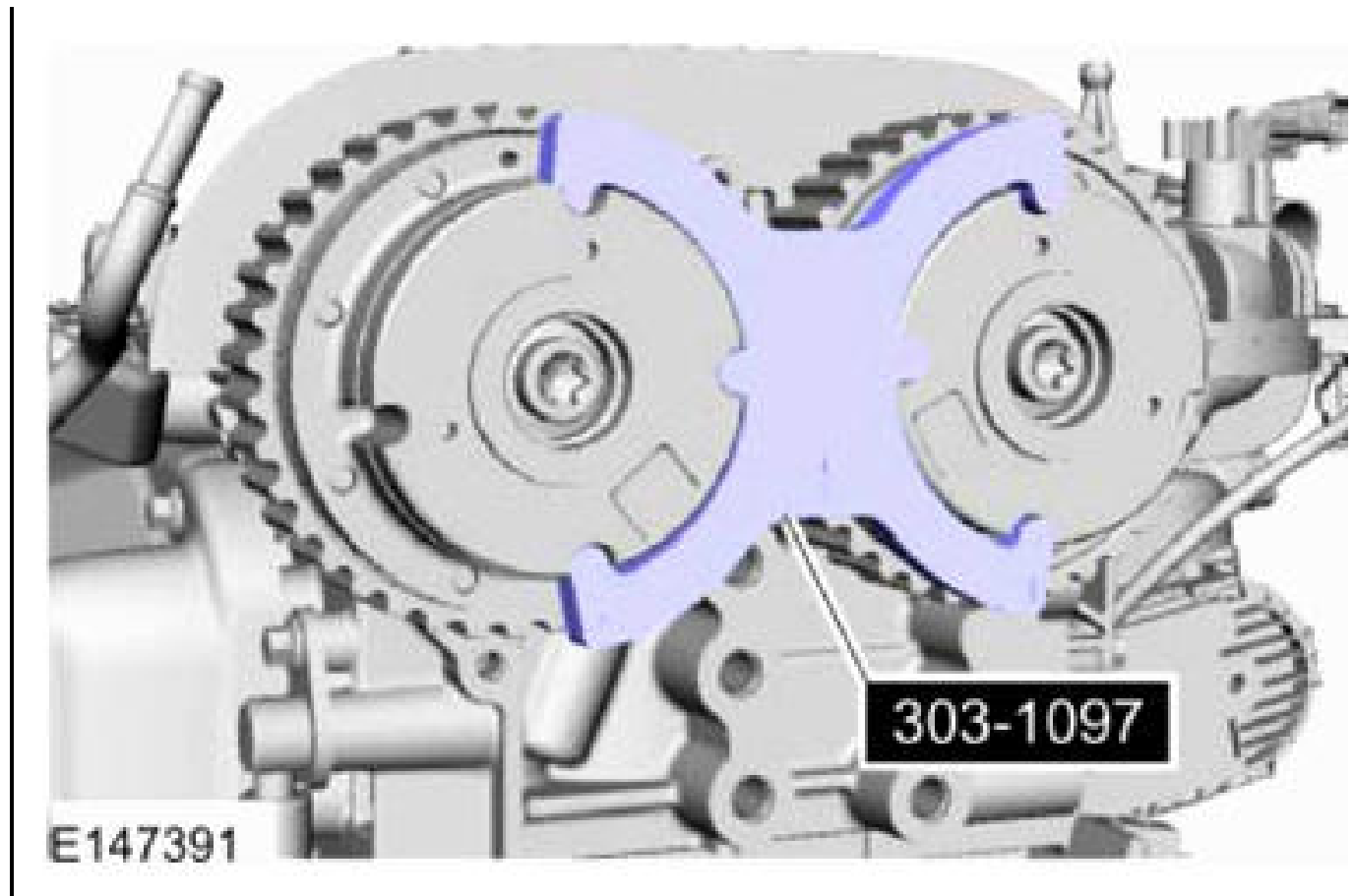
Install Special Service Tool : 303-1552 Alignment Tool, Camshaft



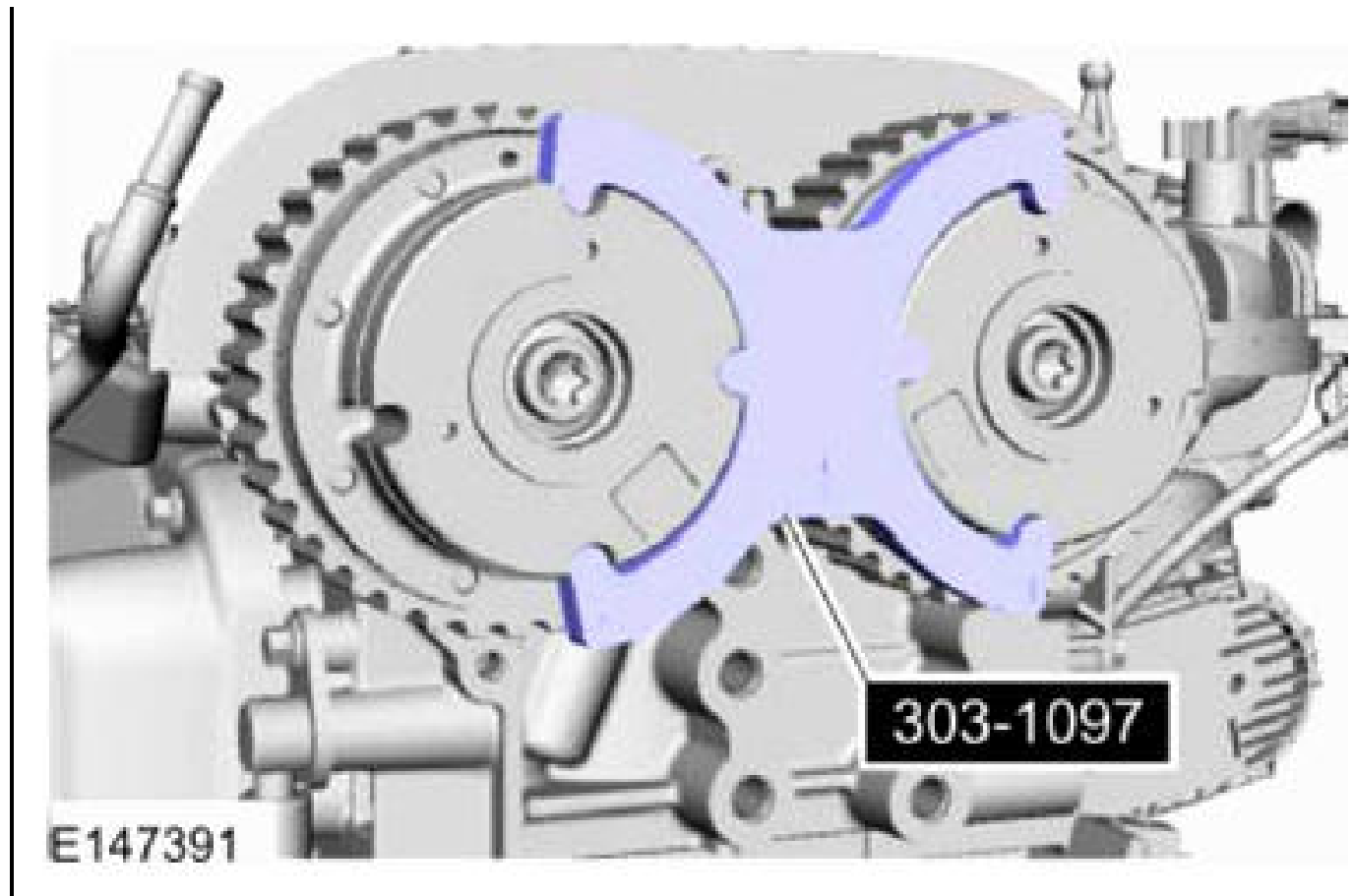
81. **NOTE:** The special tool can only be installed if the valve timing is correct.

If the special tools cannot be installed, repeat the adjustment according to the preceding steps.

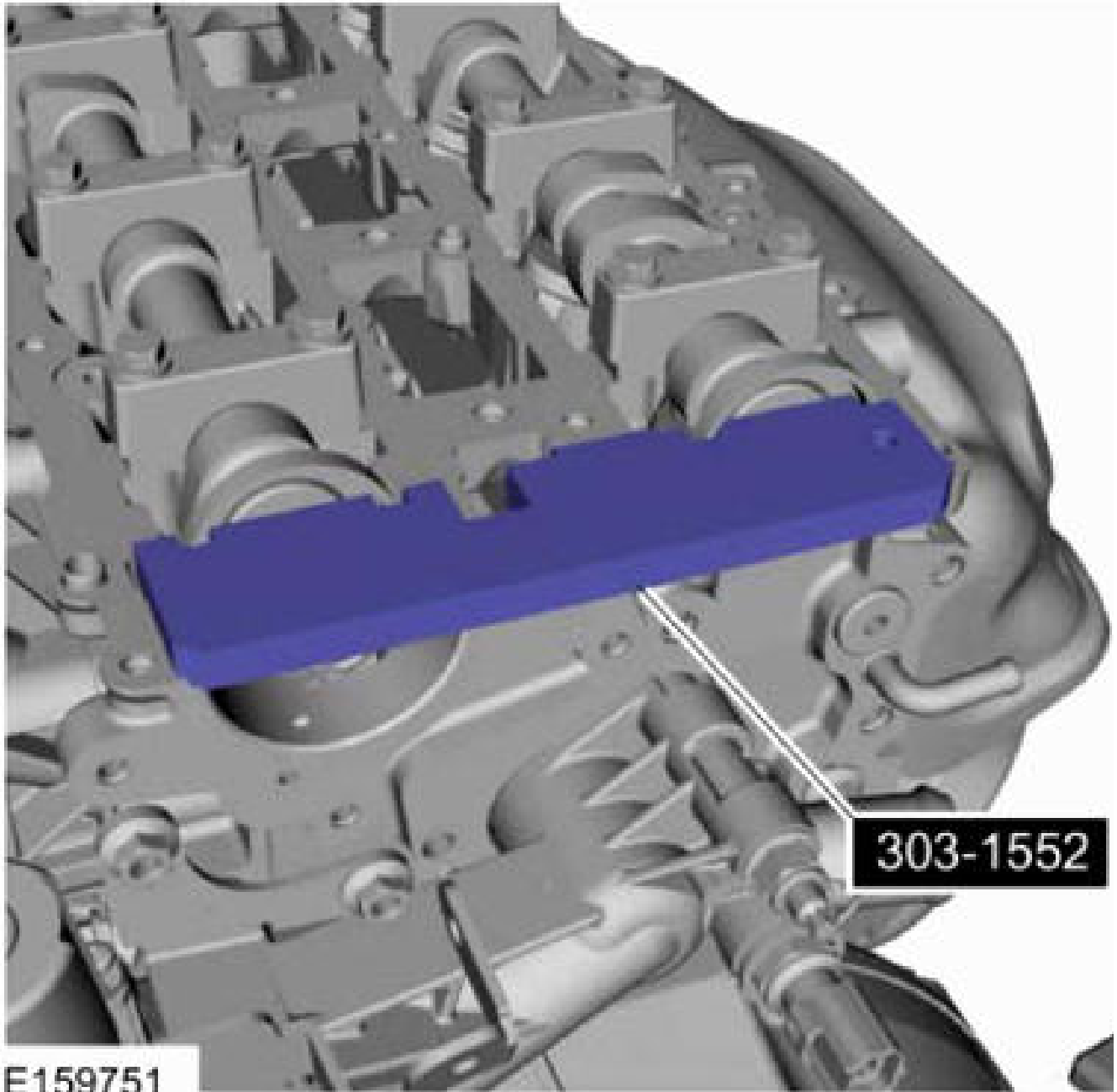
Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit



82. *Remove Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



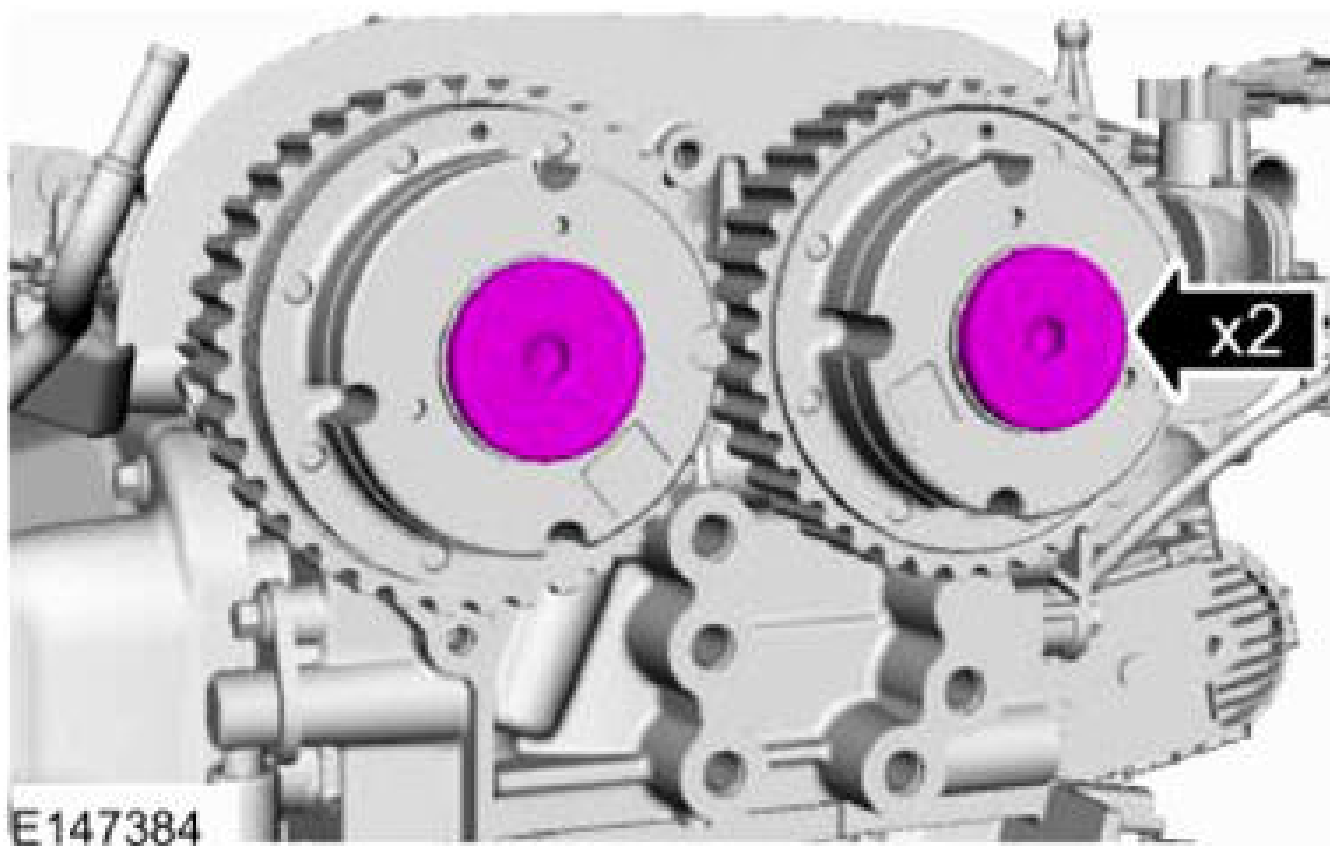
83. *Remove Special Service Tool : 303-1552 Alignment Tool, Camshaft*



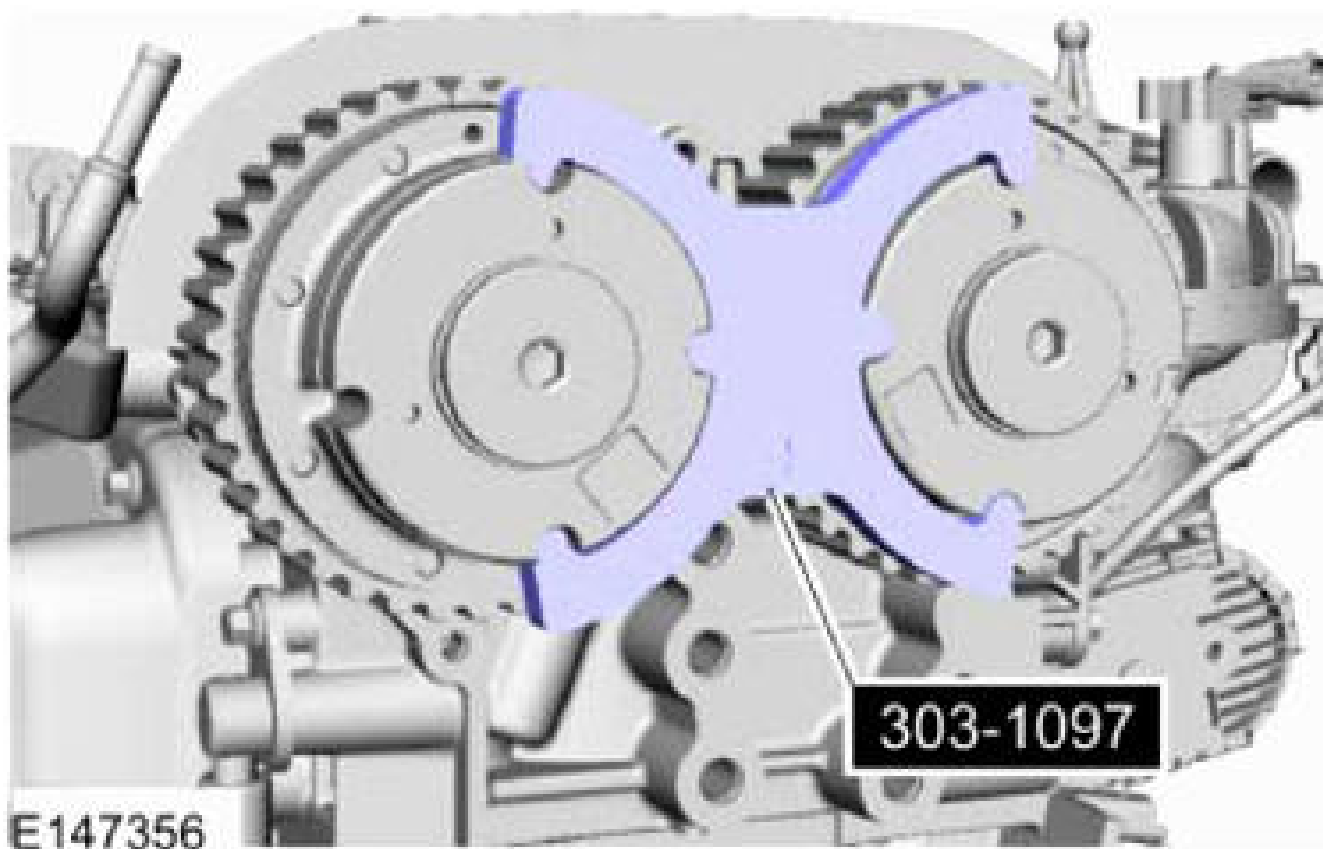
NOTE: Use an open-ended wrench to hold the camshafts by the hexagon to prevent the camshafts from turning.

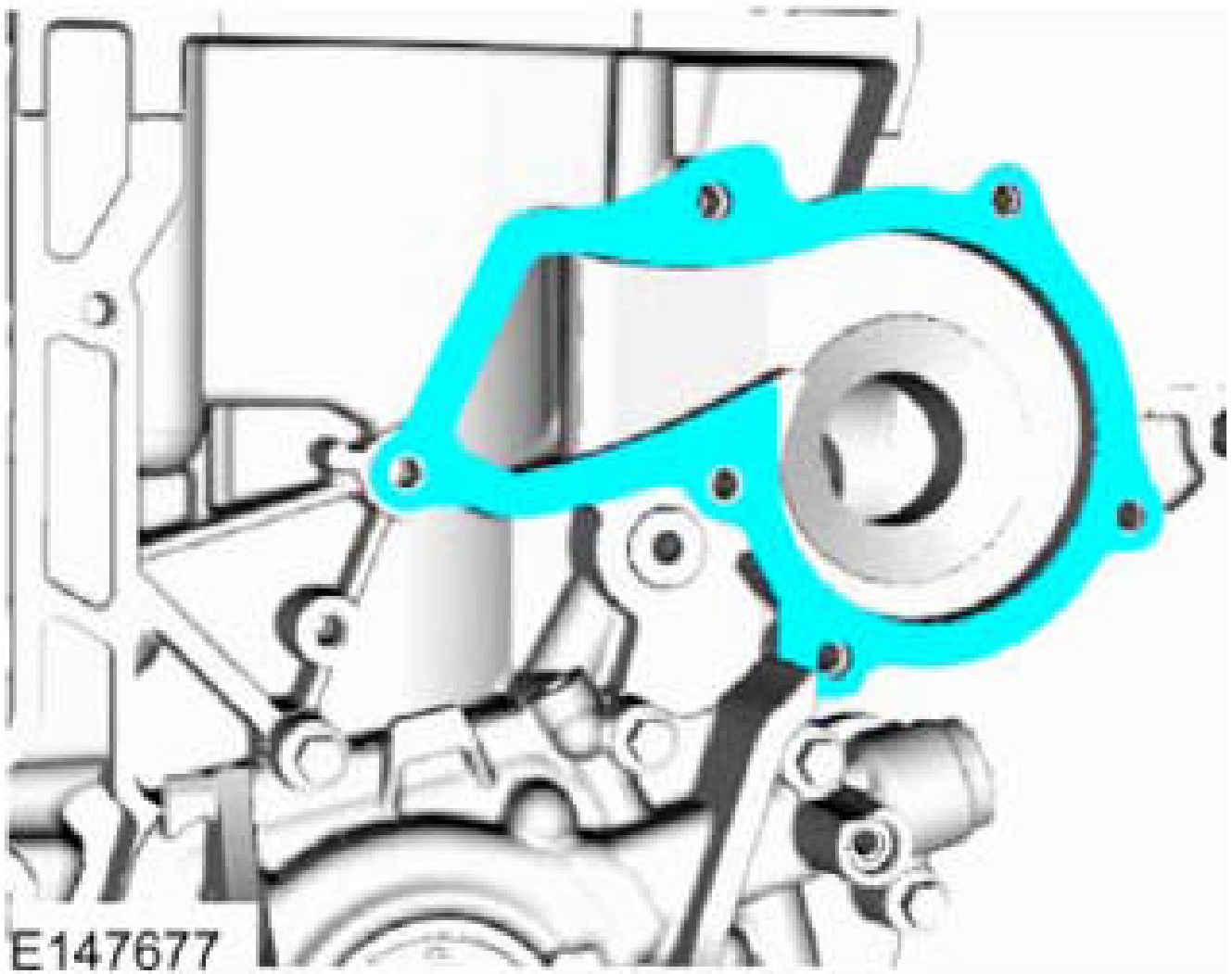
84.

Torque : 16 Nm



85. *Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



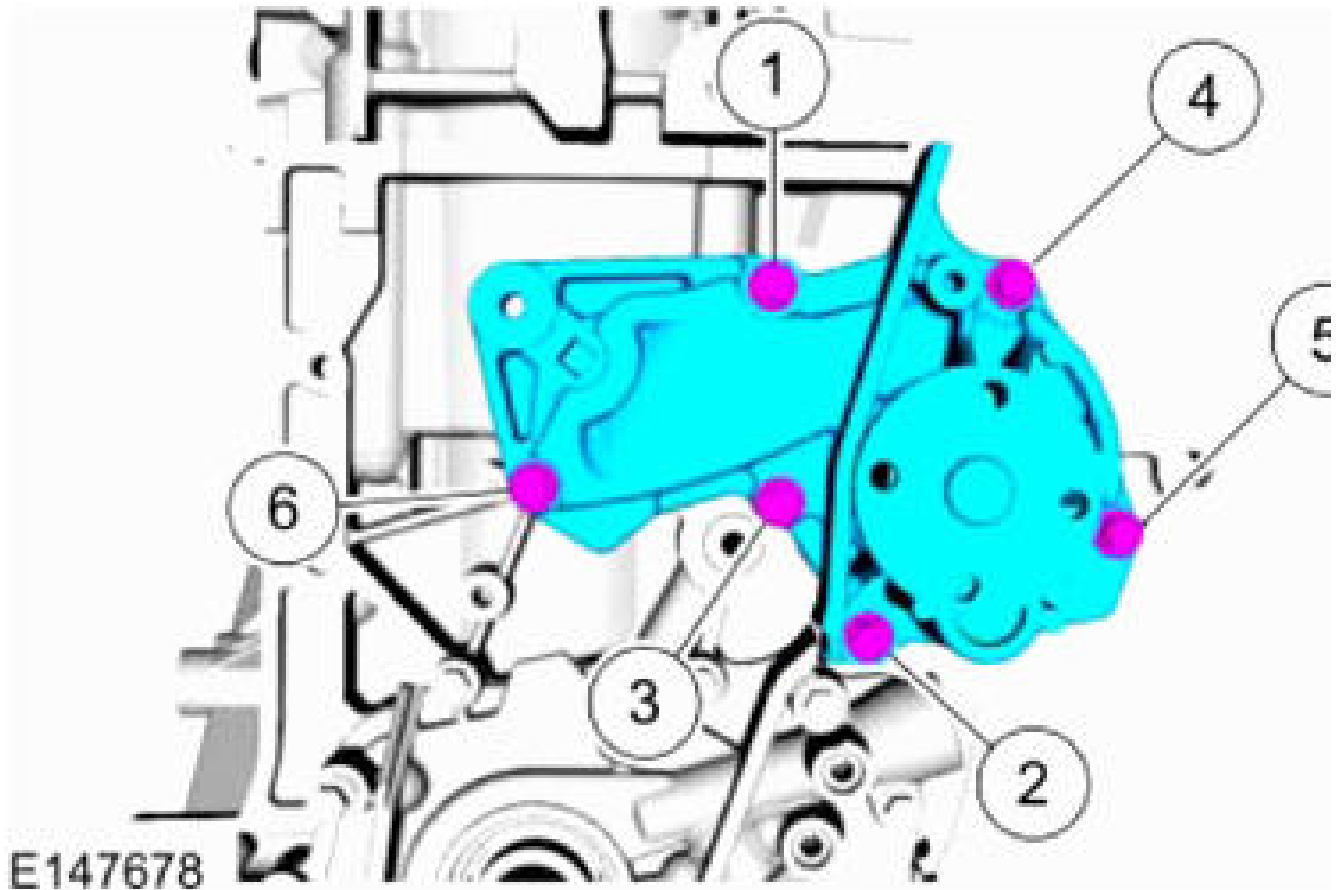


86.

87. *Torque :*

Stage 1: 6 Nm

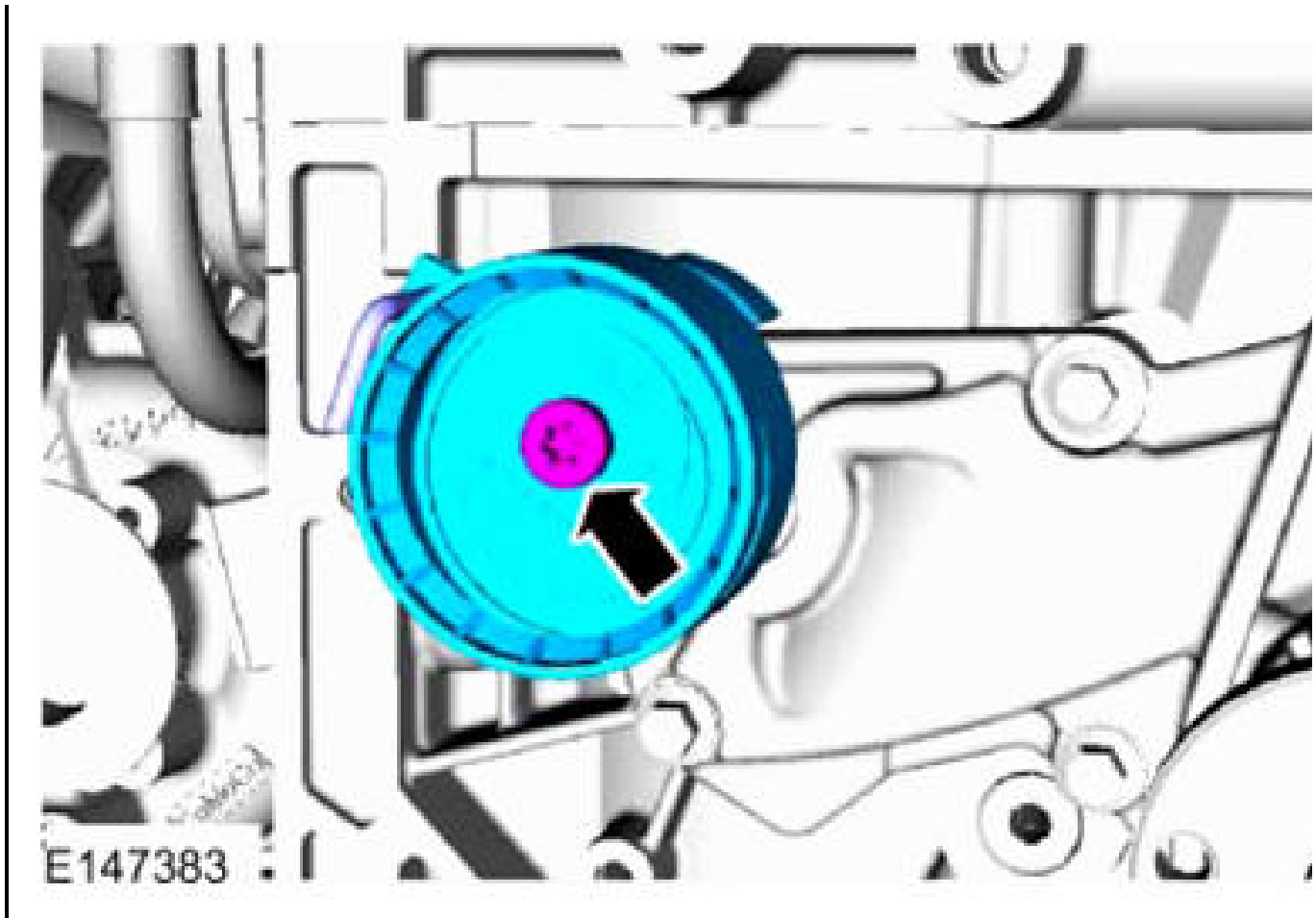
Stage 2: 10 Nm



WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

88.

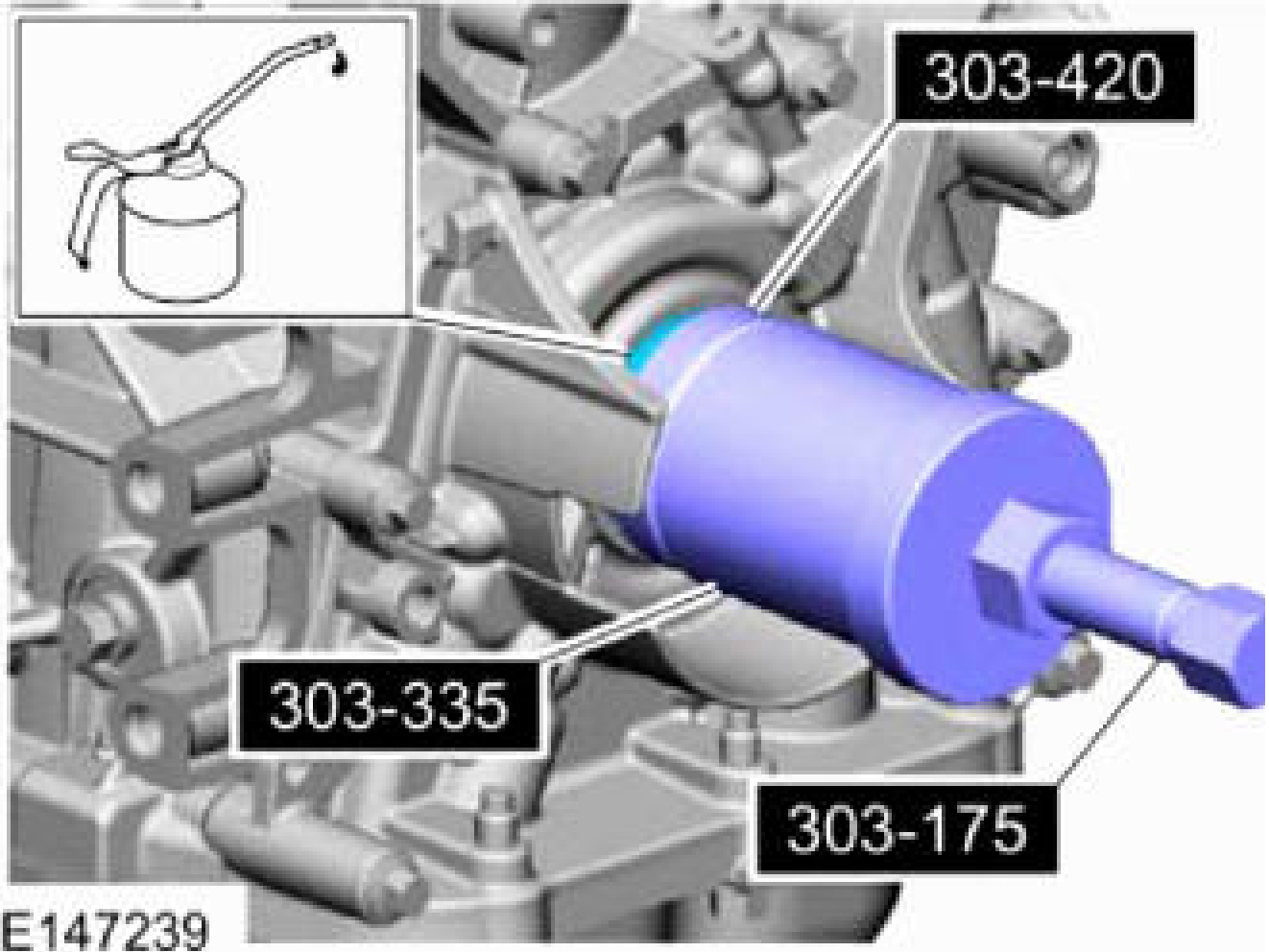
Torque : 25 Nm



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

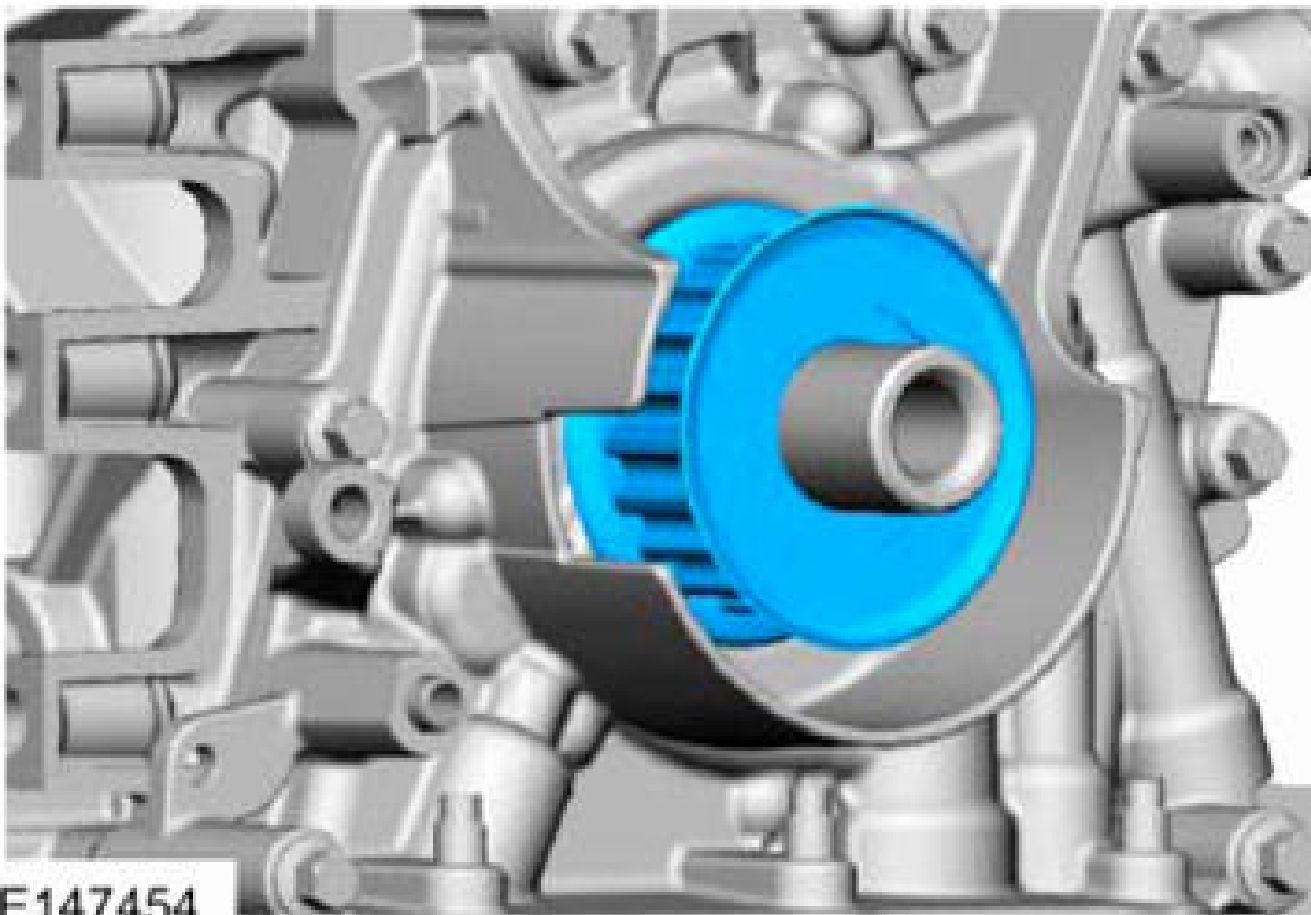
Special Tool(s) : 303-175 (T82L-6316-A) Installer, Crankshaft Vibration Damper , 303-335 (T88T-6701-A) Installer, Front Cover Oil Seal , 303-420 (T92P-6701-BH) Installer, Crankshaft Front Oil Seal

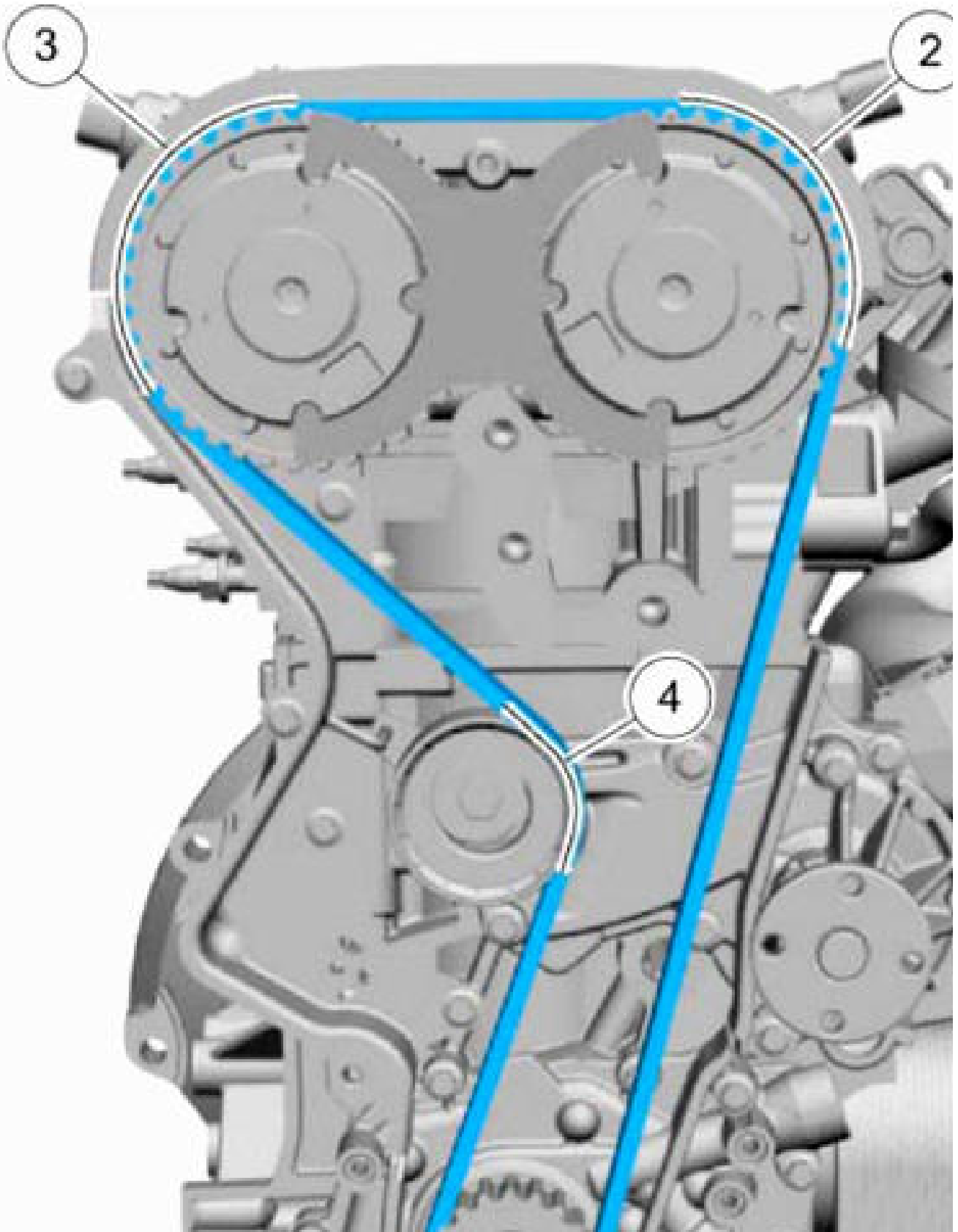
Material : Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



NOTE: Before installation, clean and inspect the sprocket for any damage. If damage is evident, replace the sprocket. If no damage, the sprocket is to be reused.

90.

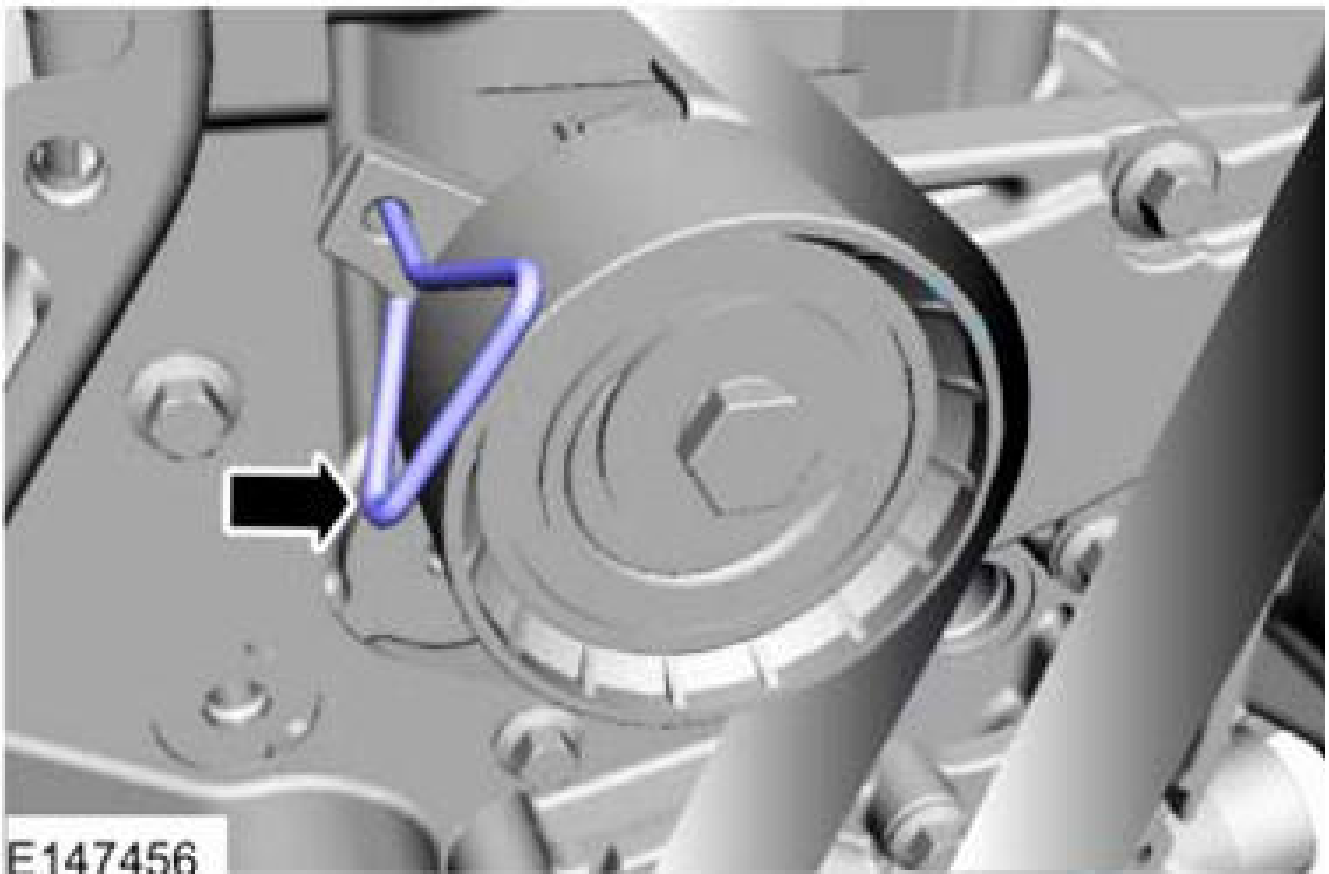




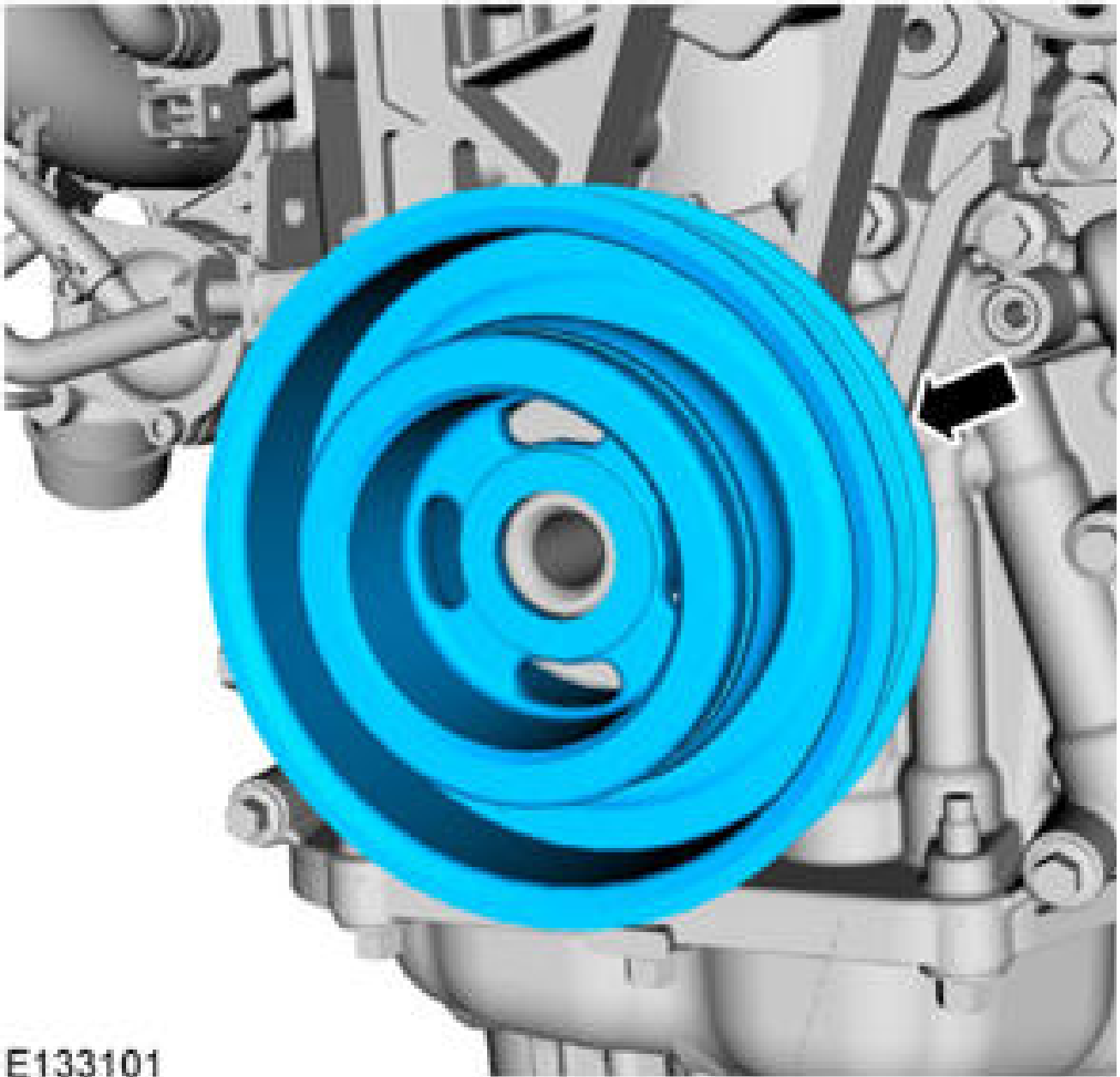
WARNING: The timing belt tensioner spring is under load. Extra care must be taken at all times when handling the tensioner. Failure to follow this instruction may result in personal injury.

92.

Remove the holding pin.



93.



93.

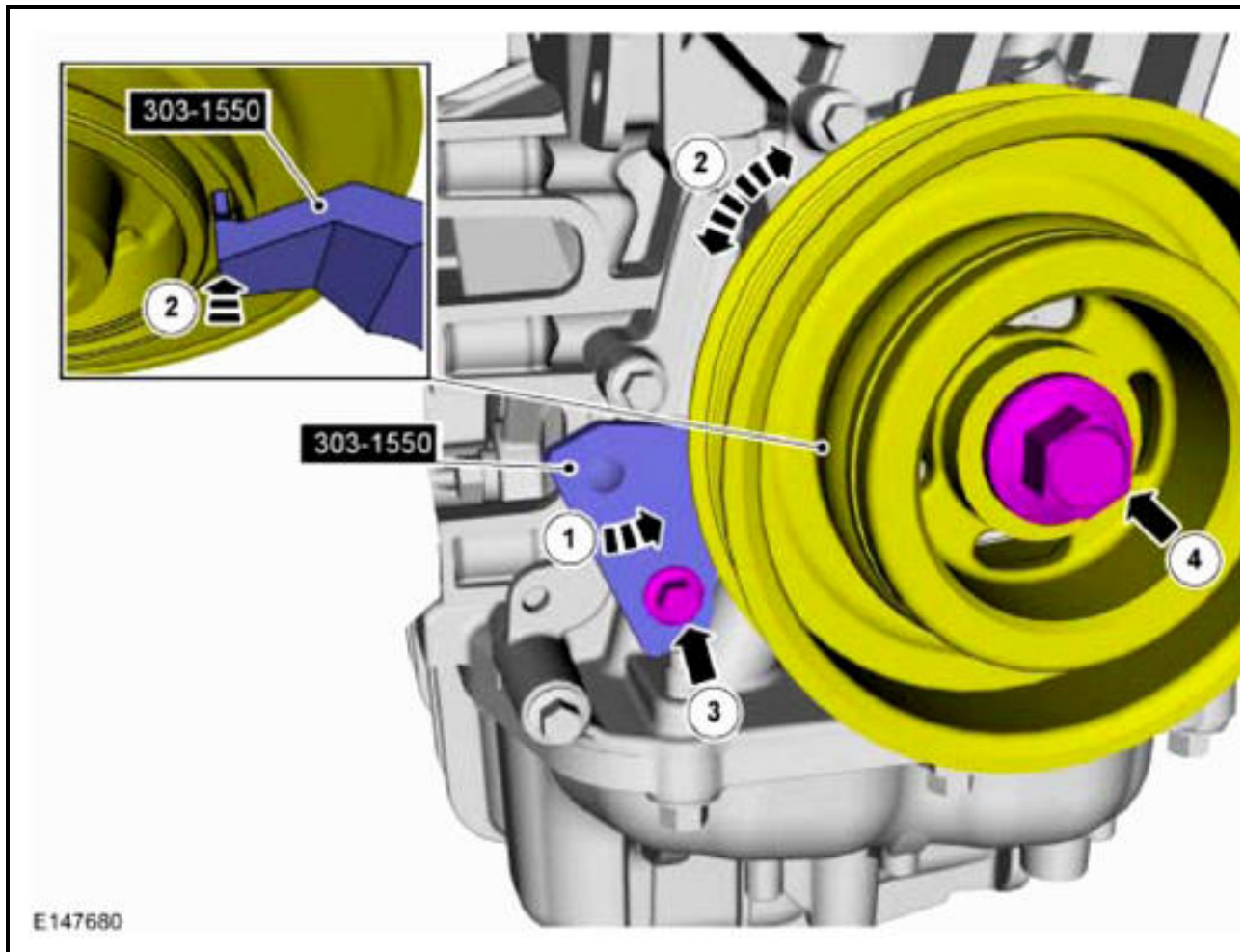
94.

1. *Install Special Service Tool : 303-1550 Alignment Tool, Crankshaft Vibration Damper*
2. Rotate crankshaft pulley to align the Special Tool:

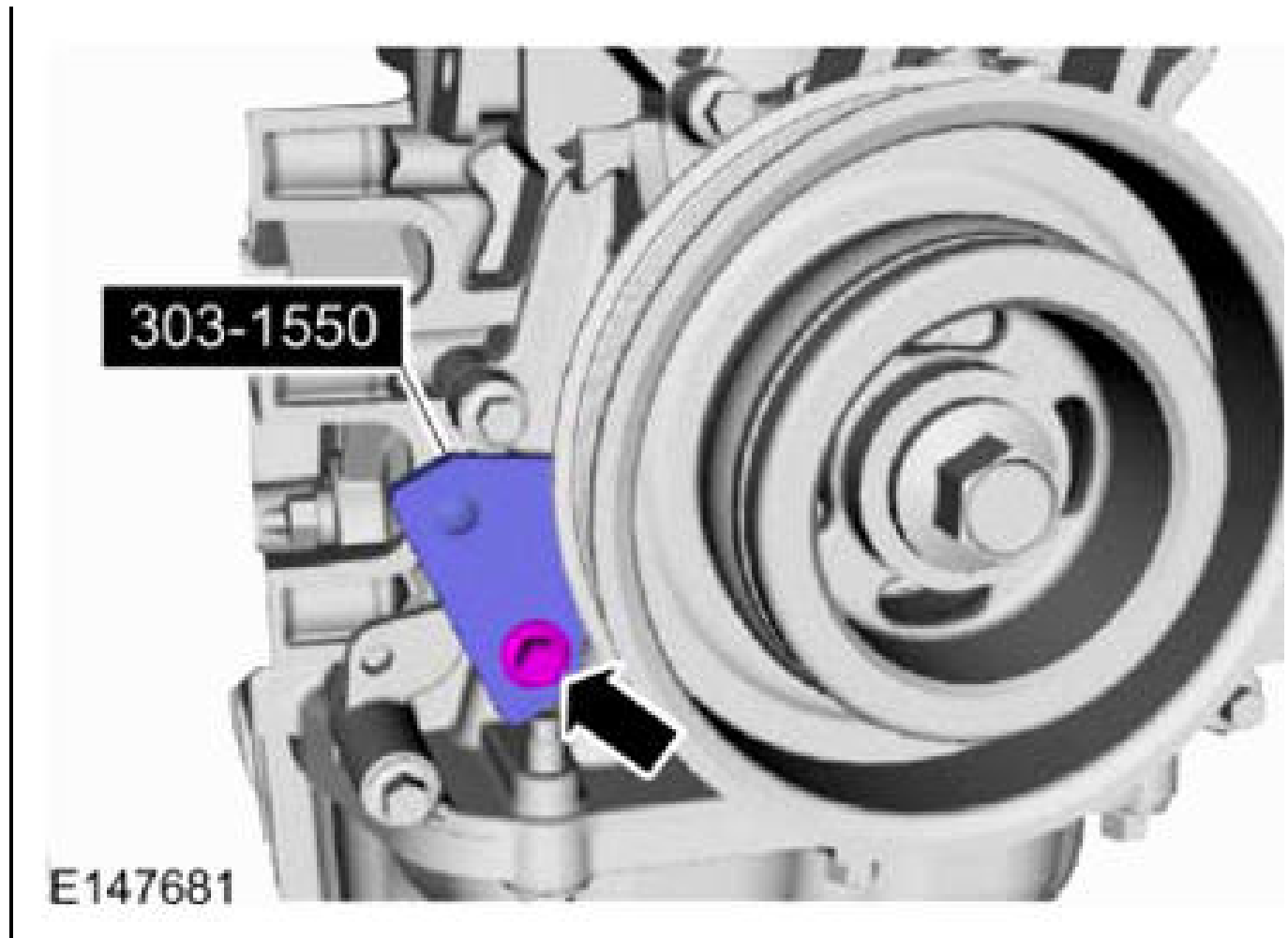
Special Tool(s) : 303-1550 Alignment Tool, Crankshaft Vibration Damper

3. Finger tight at this stage.

4. Using a new bolt, finger tight at this stage.



95. Remove Special Service Tool : 303-1550 Alignment Tool, Crankshaft Vibration Damper



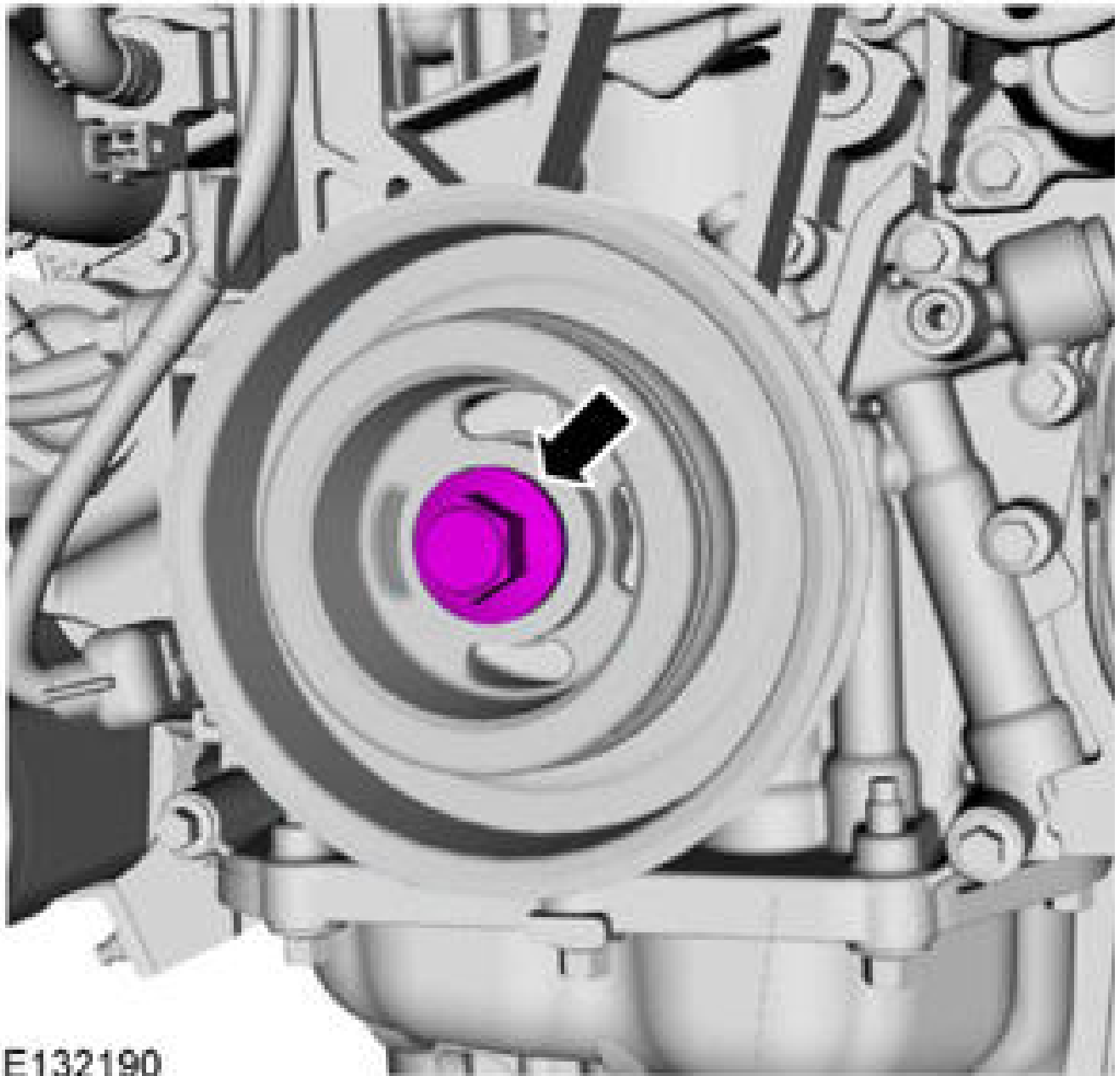
96. *Torque :*

Stage 1: 100 Nm

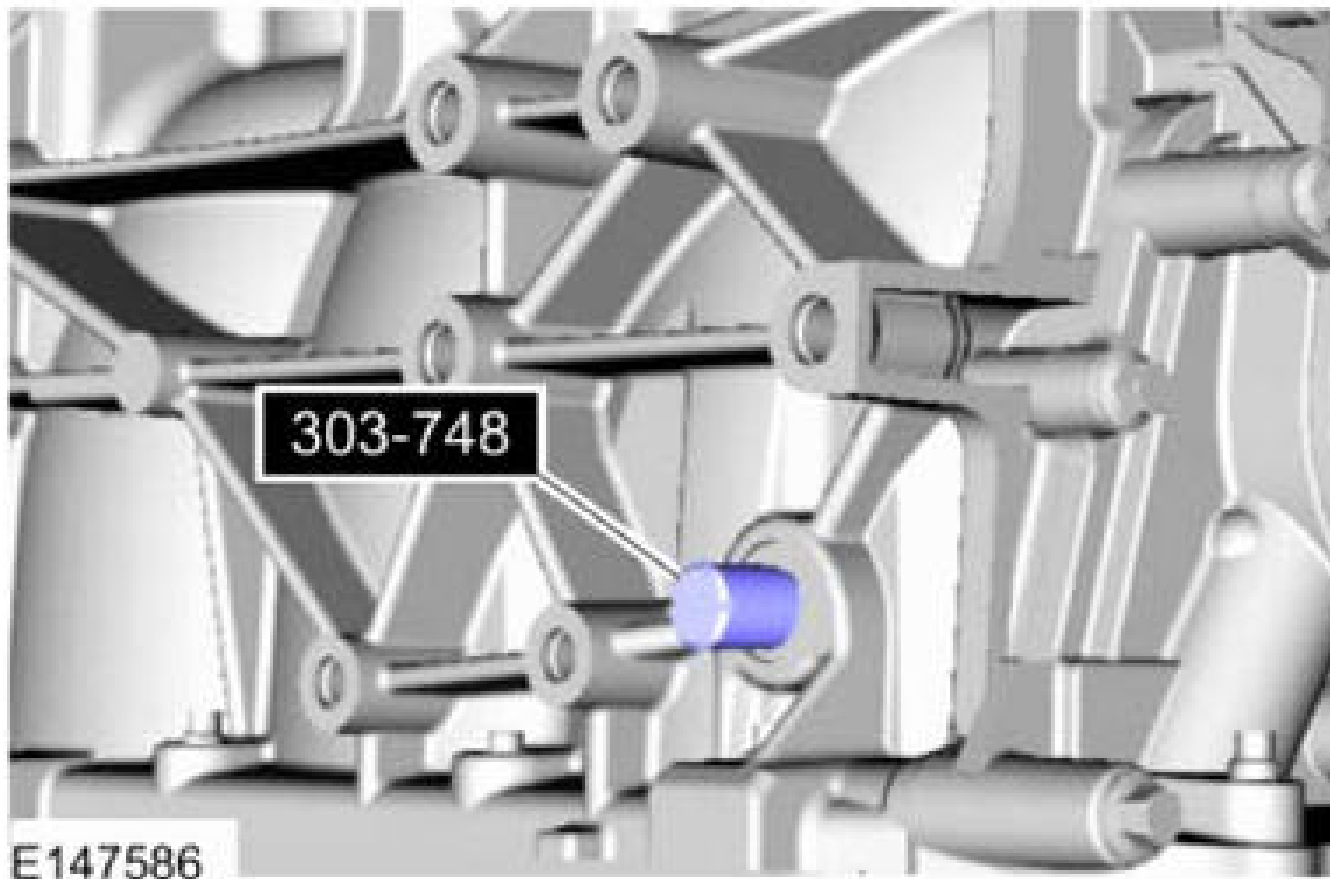
Stage 2: 90°

Stage 3: Wait 2s

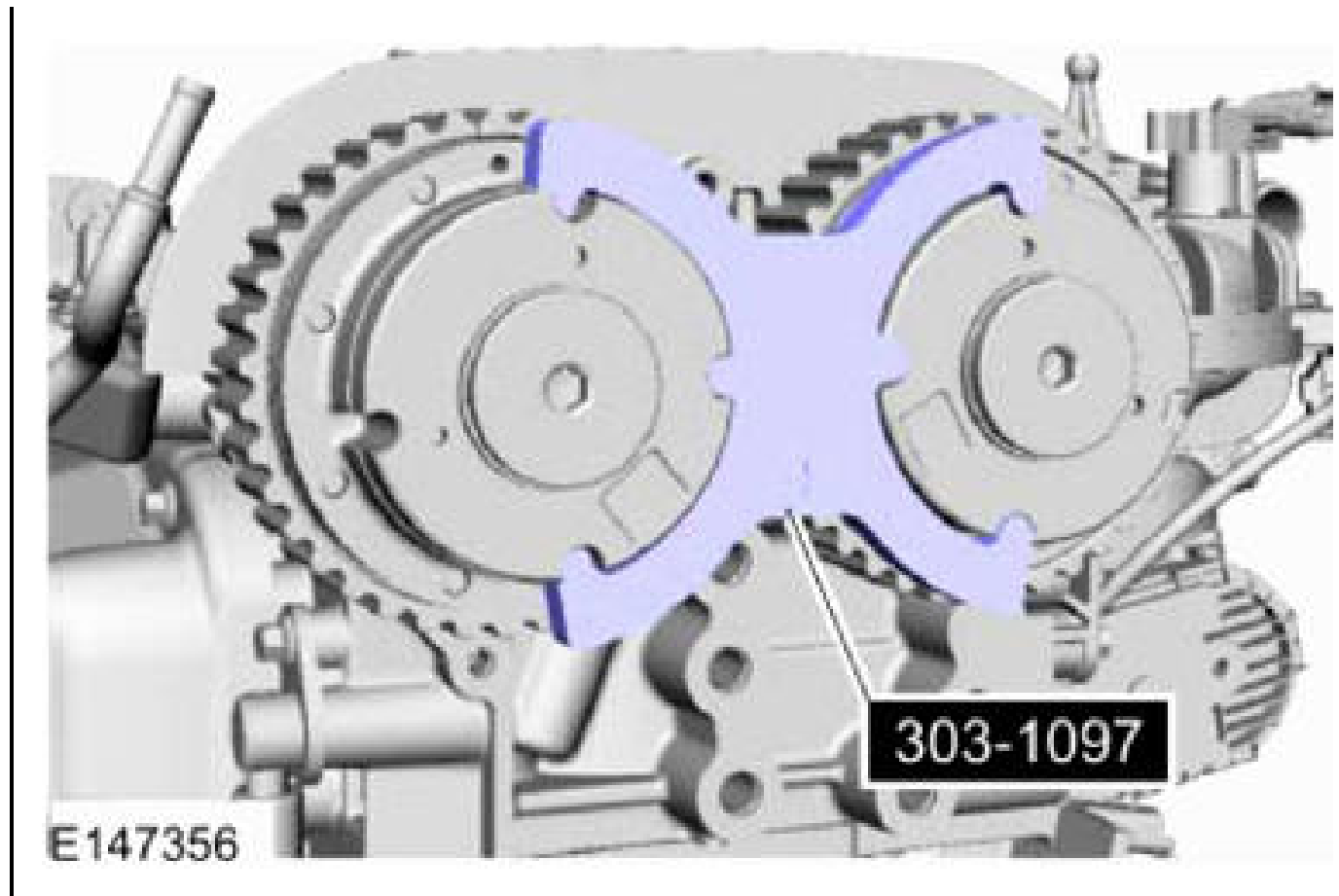
Stage 4: Tighten an additional 15°



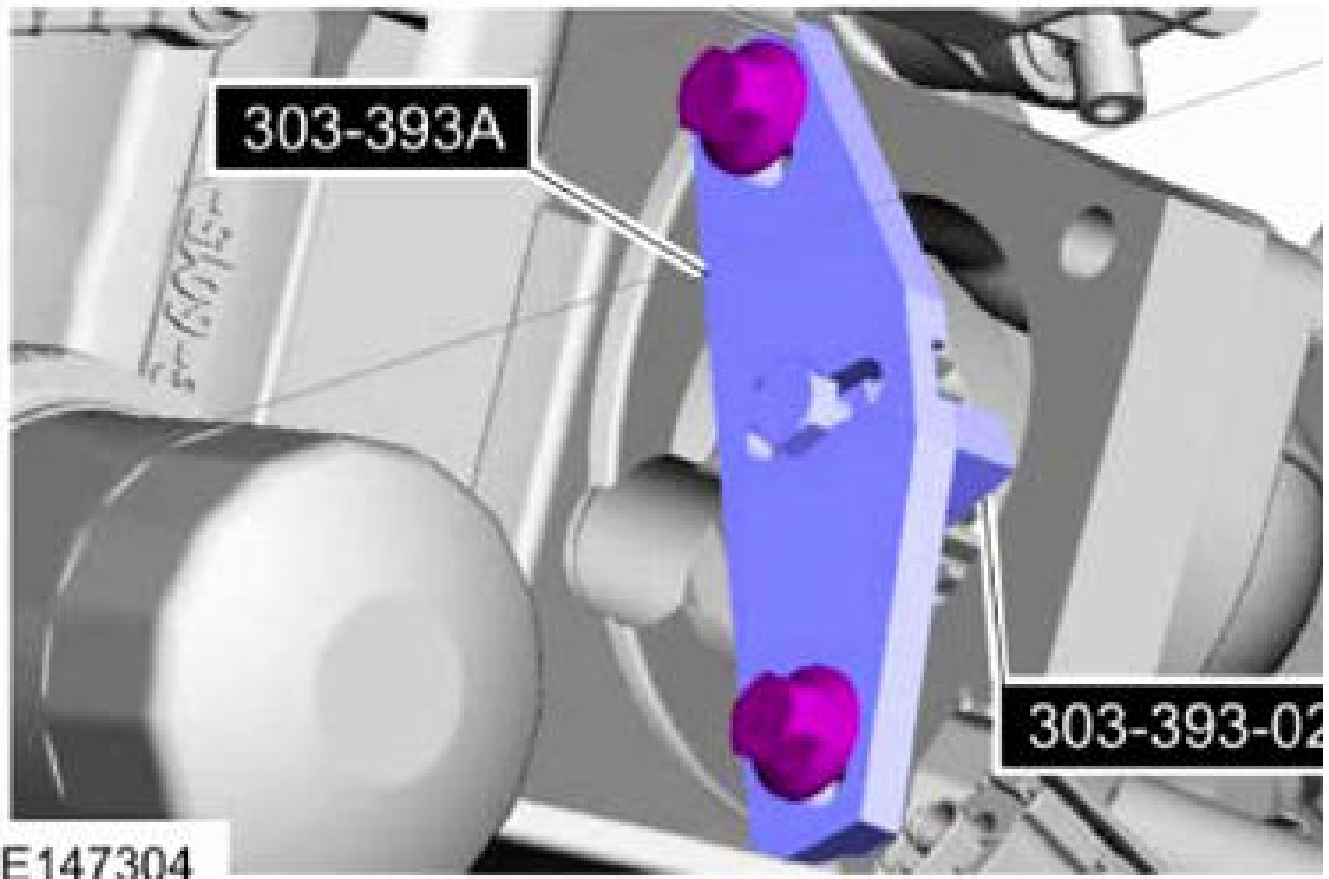
97. Remove Special Service Tool : 303-748 Locking Tool, Crankshaft



98. *Remove Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



99. *Remove Special Service Tool : 303-393-02 Adapter for 303-393 , 303-393A Locking Tool, Flywheel*

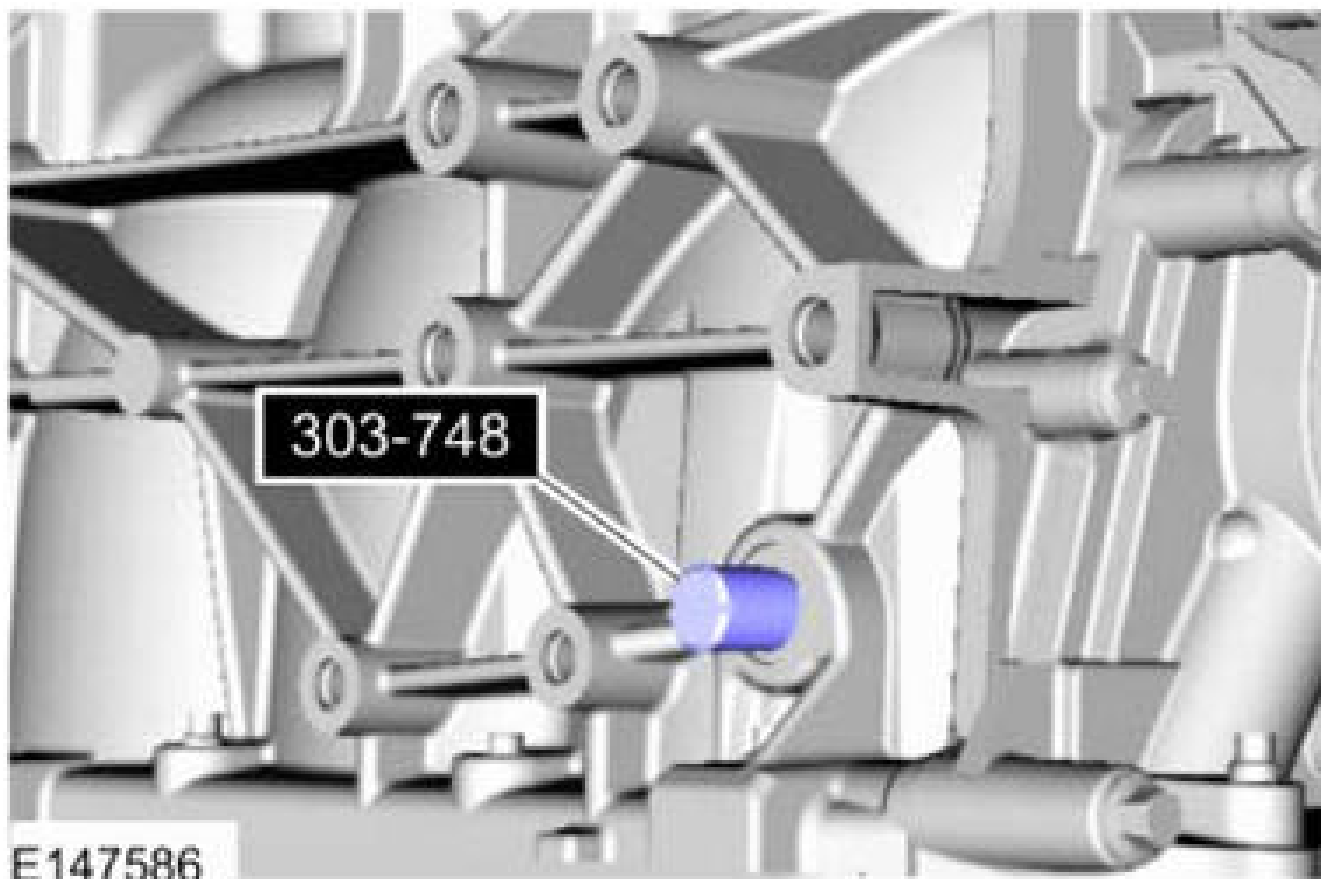


100. **NOTE:** Only rotate the crankshaft in a clockwise direction.

Rotate about 1 3/4 turns.

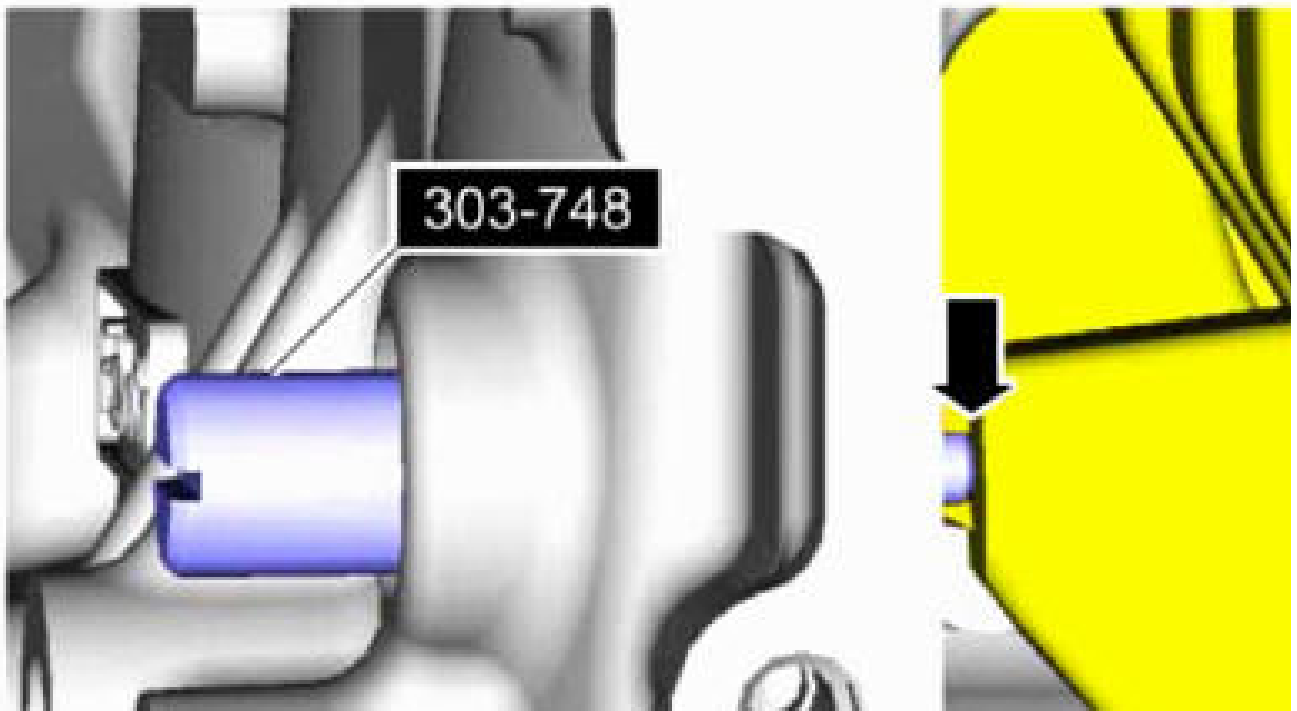


101. *Install Special Service Tool : 303-748 Locking Tool, Crankshaft*



102. **NOTE:** Only rotate the crankshaft in a clockwise direction.

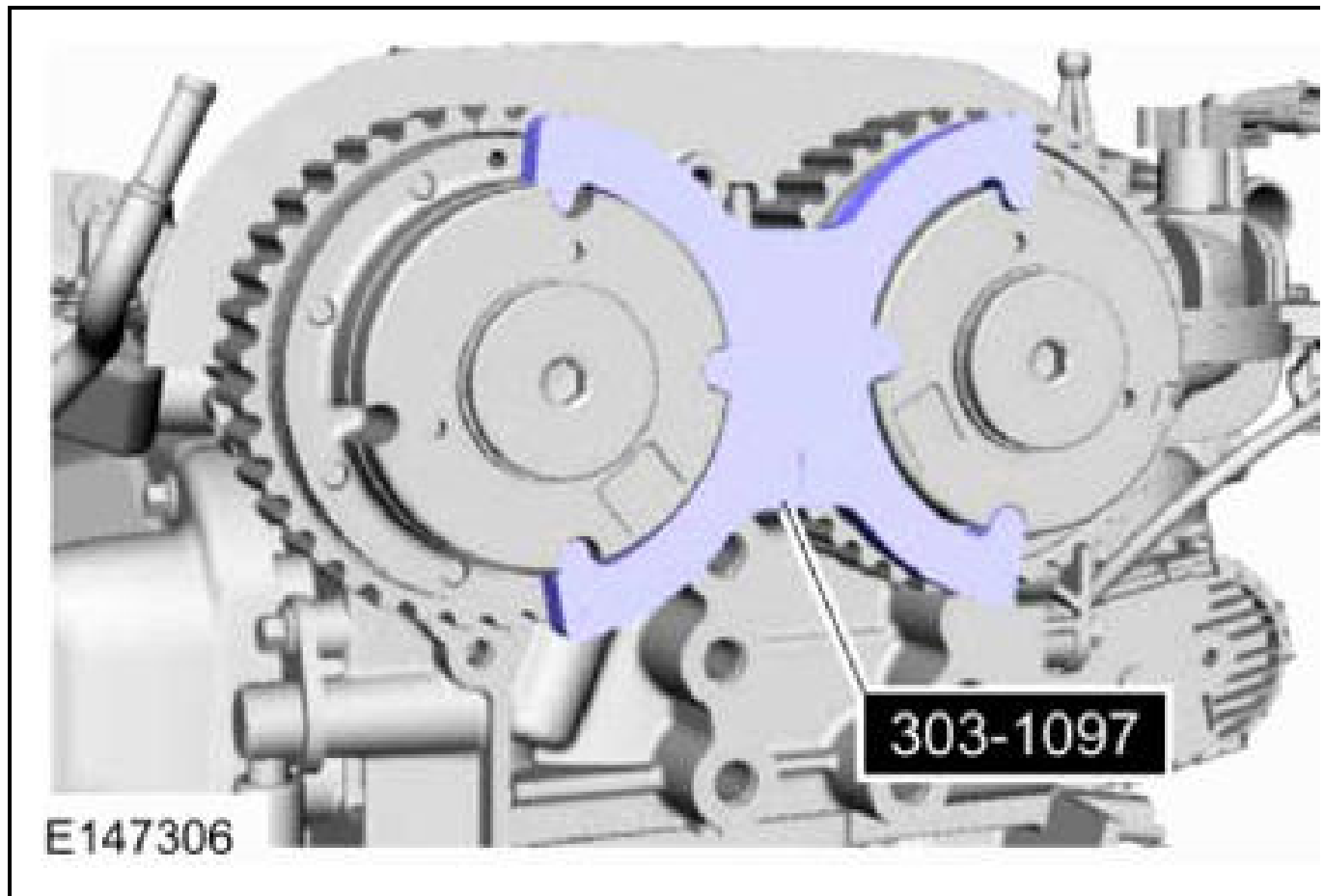
Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the crankshaft locking tool. The engine is now at **TDC** .



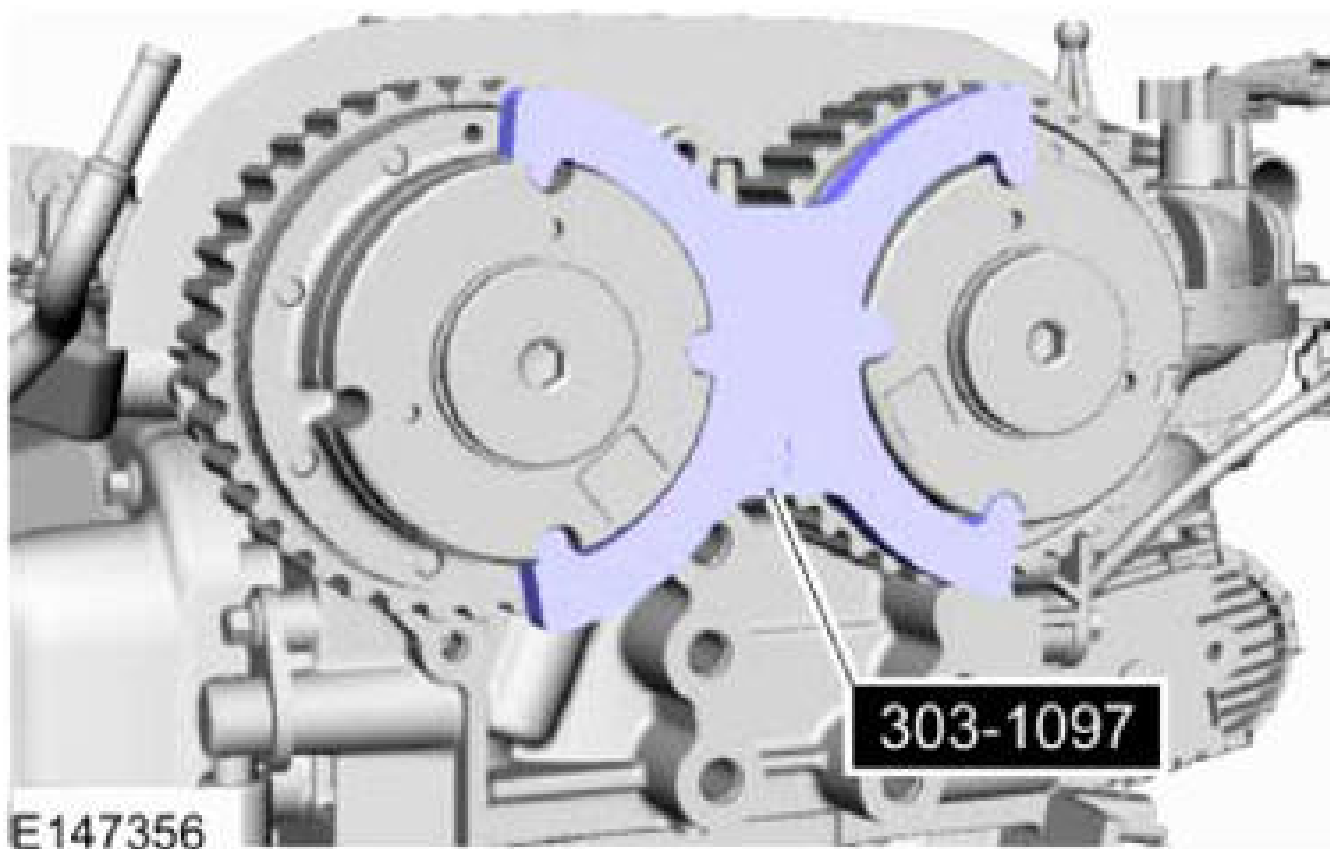
103. **NOTE:** It may necessary to rotate the camshafts slightly to install the special tool.

NOTE: The special tool can only be installed if the valve timing is correct.

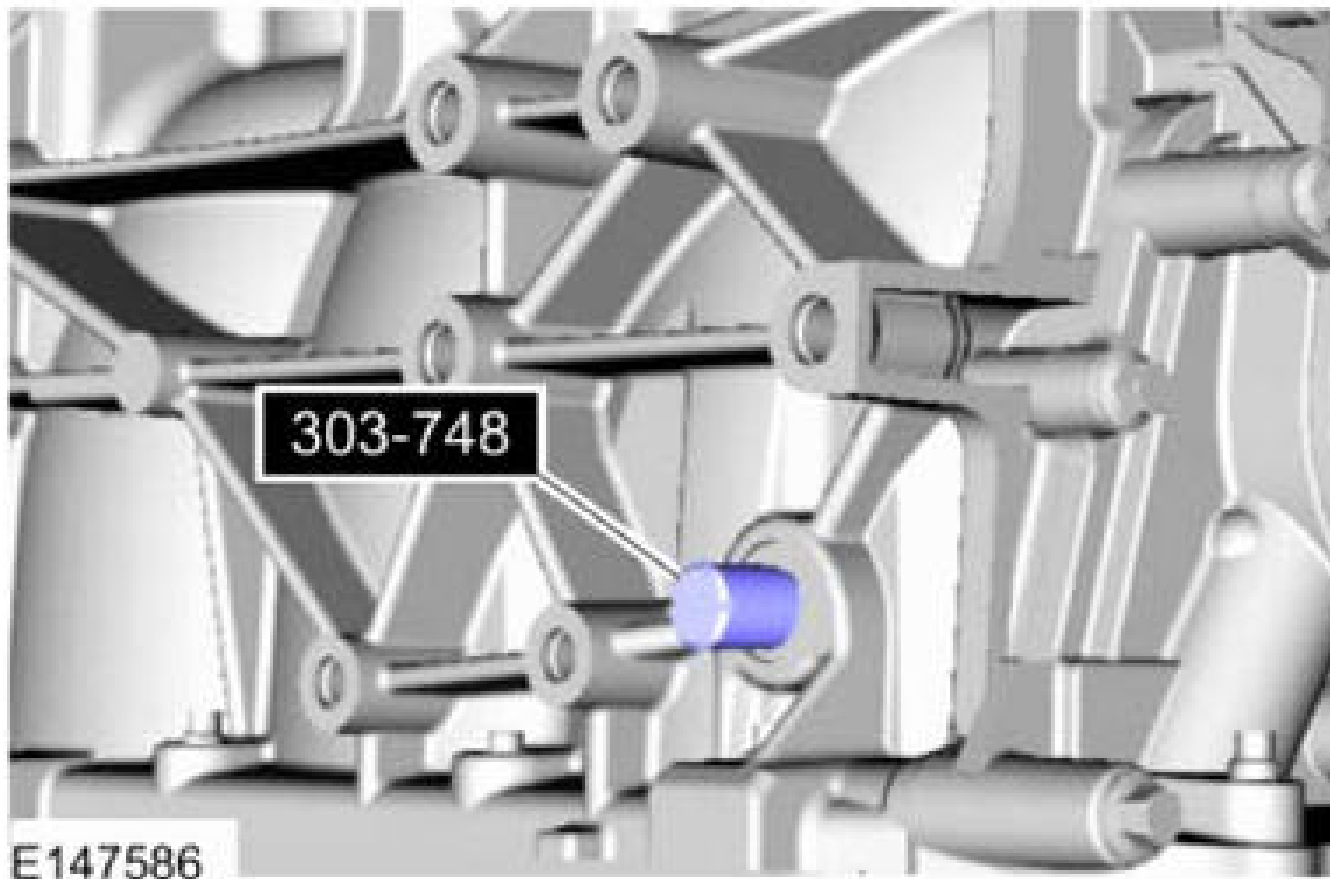
If the special tool cannot be installed, repeat the adjustment according to the preceding steps. *Install Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



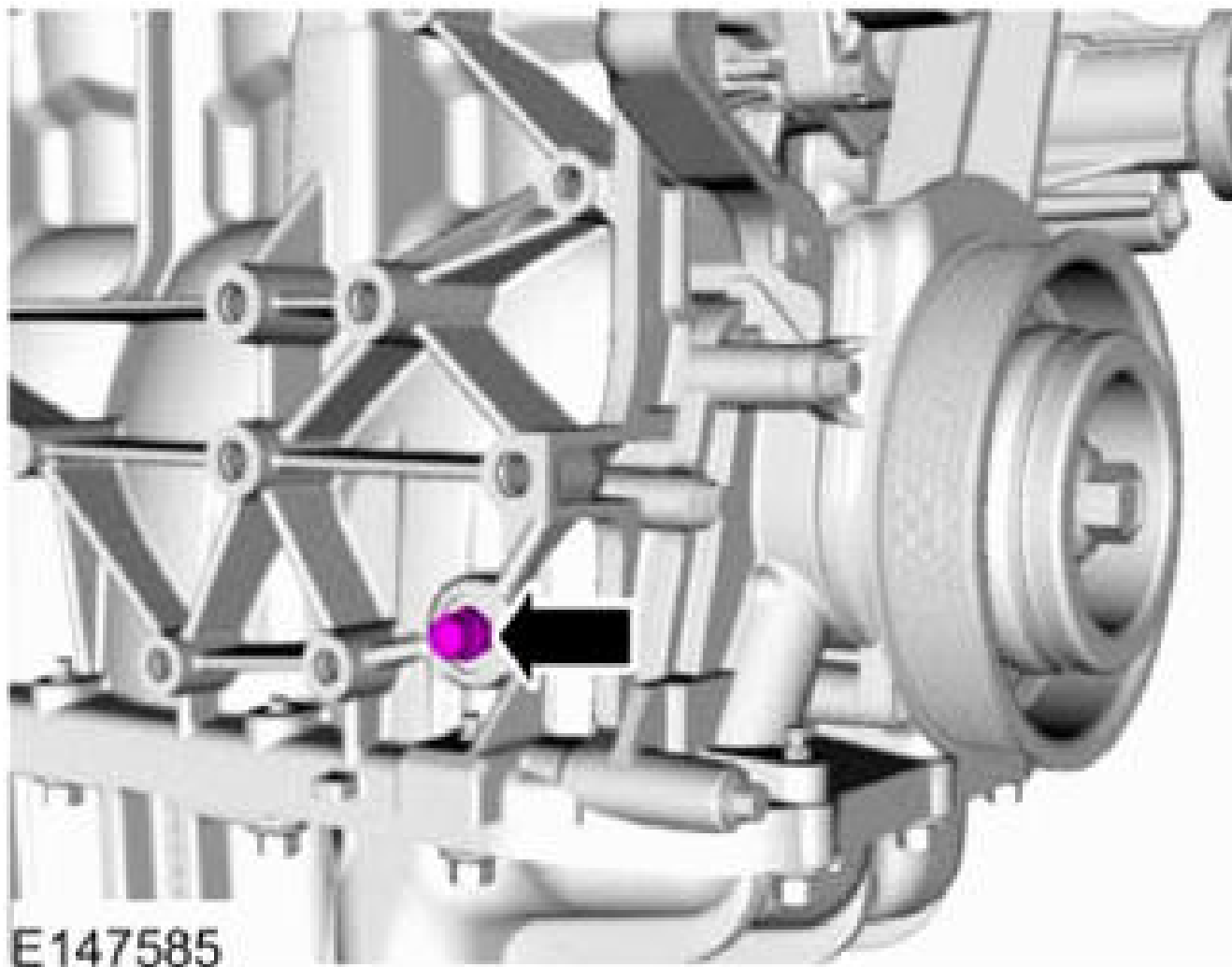
104. *Remove Special Service Tool : 303-1097 Locking Tool, Variable Camshaft Timing Oil Control Unit*



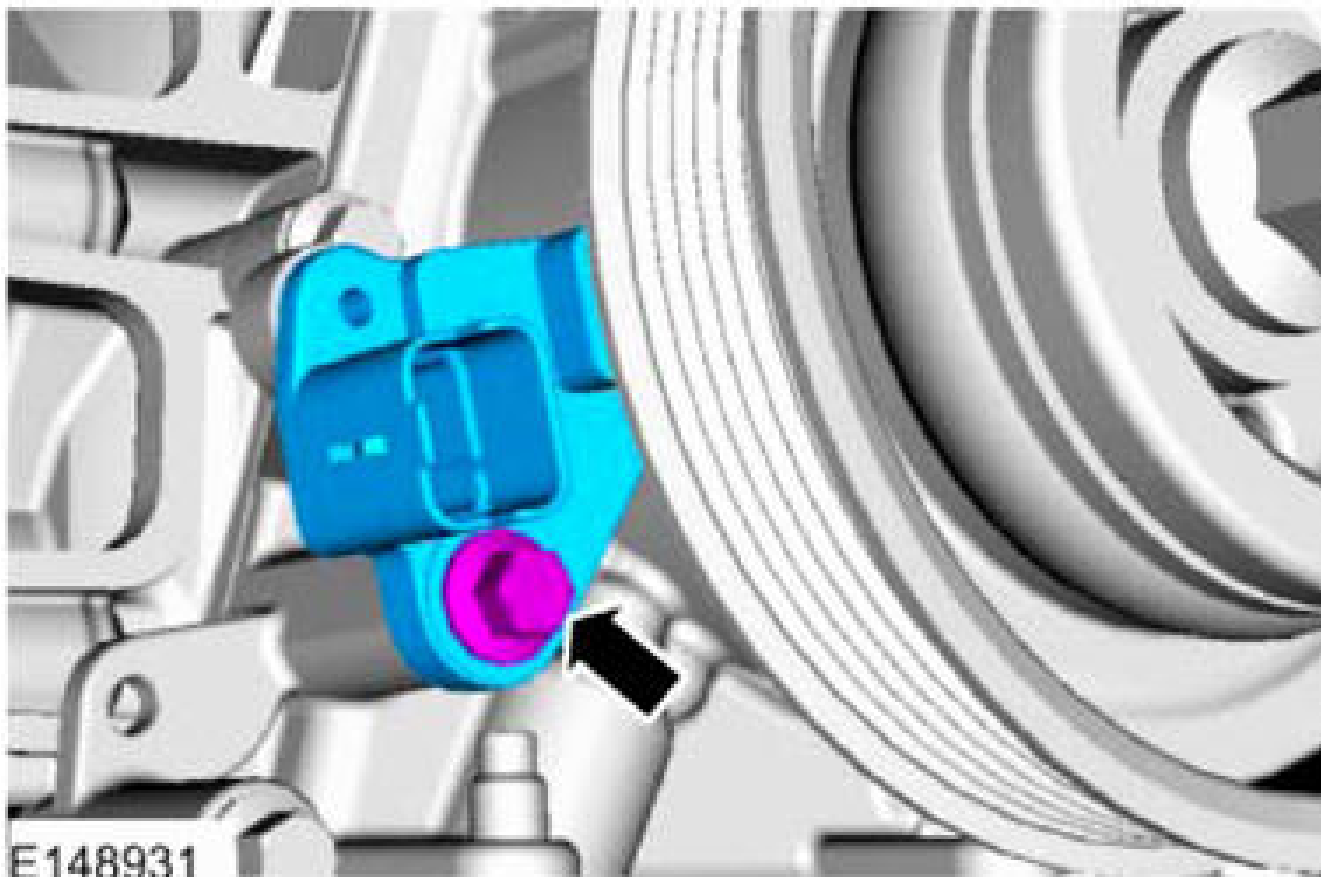
105. *Remove Special Service Tool : 303-748 Locking Tool, Crankshaft*



106. *Torque* : 20 Nm

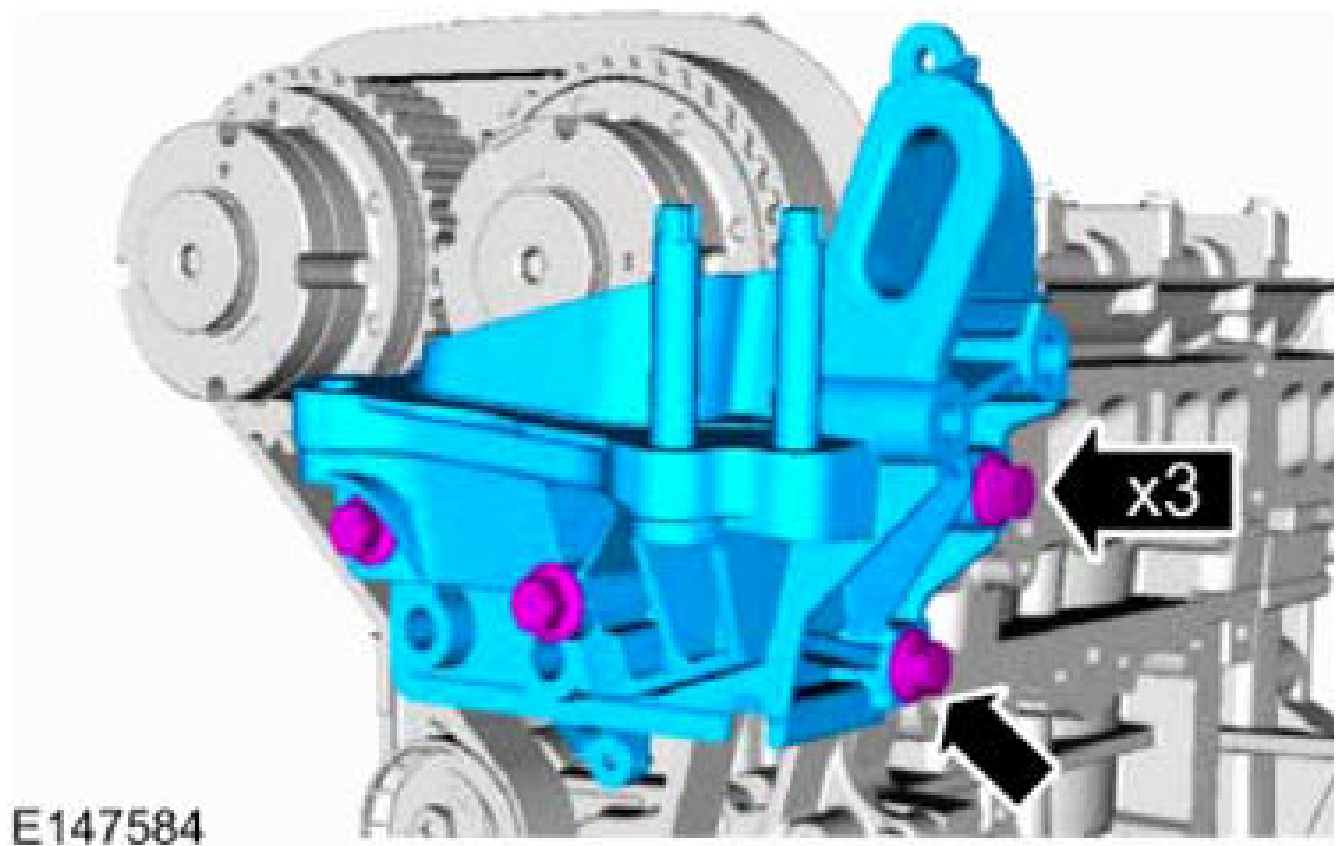


107. *Torque* : 8 Nm



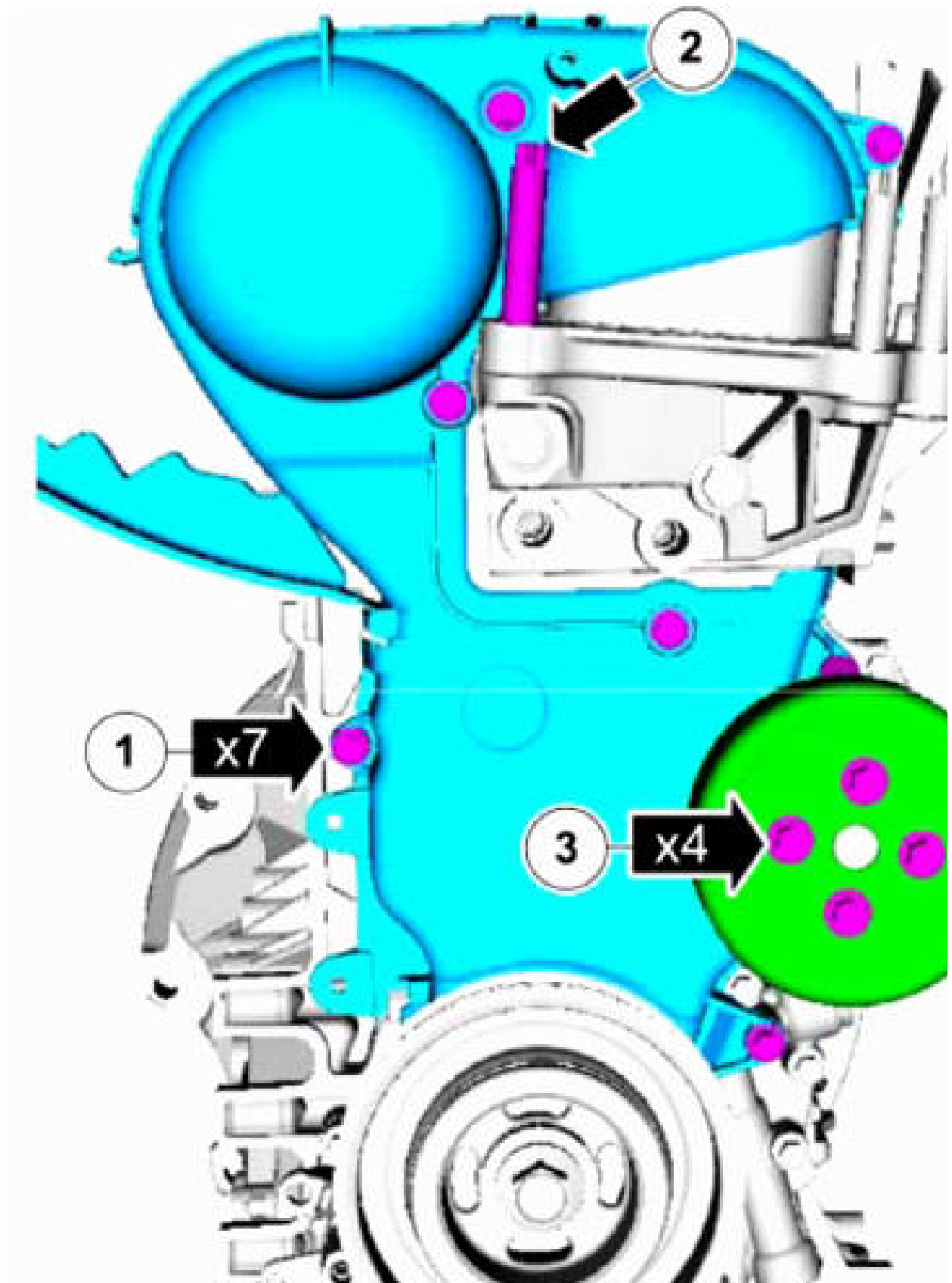
108. **NOTE:** There are different length of bolts noted in disassembly.

Torque : 55 Nm

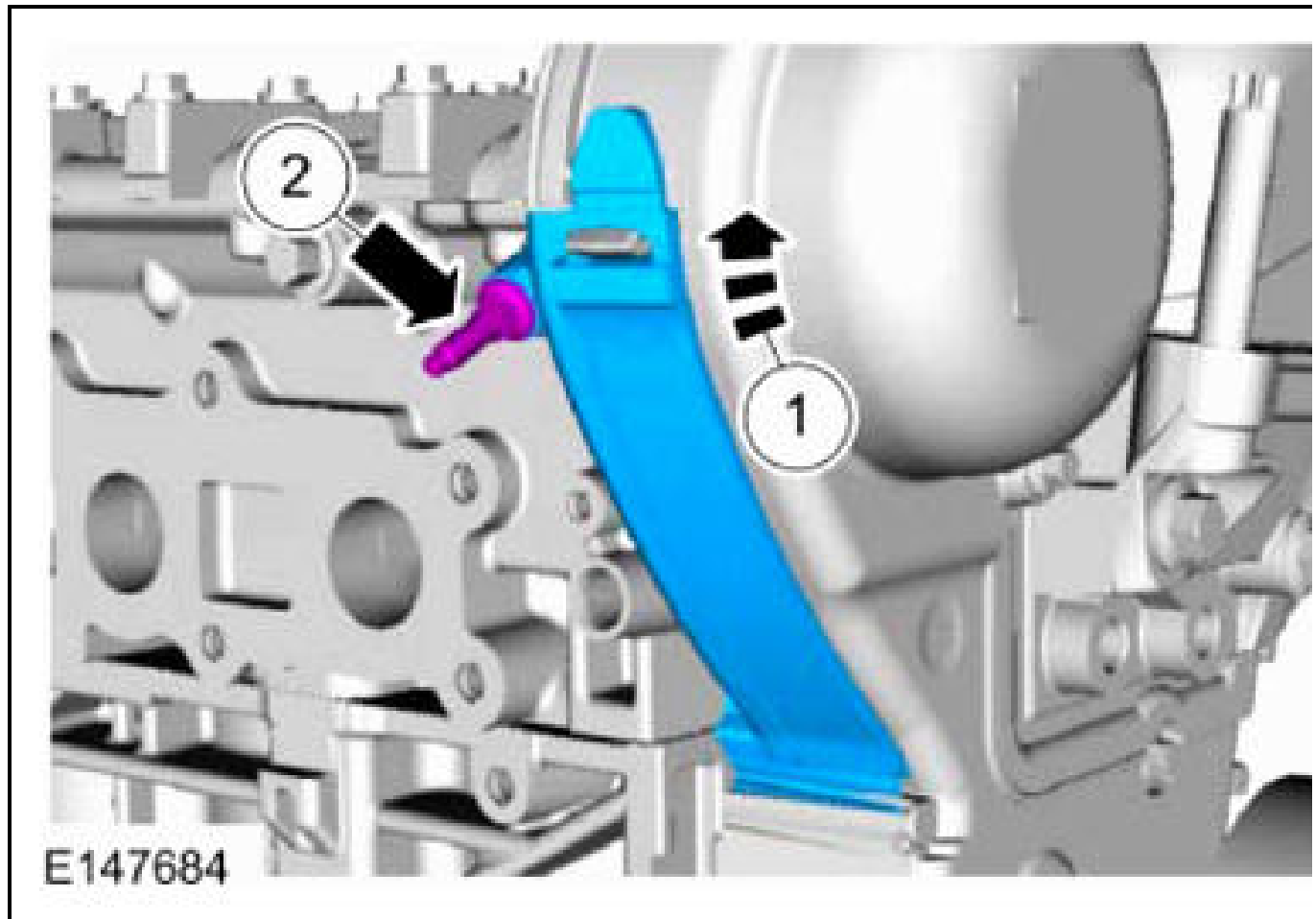


109.

1. *Torque* : 10 Nm
2. Finger tight.
3. Finger tight.

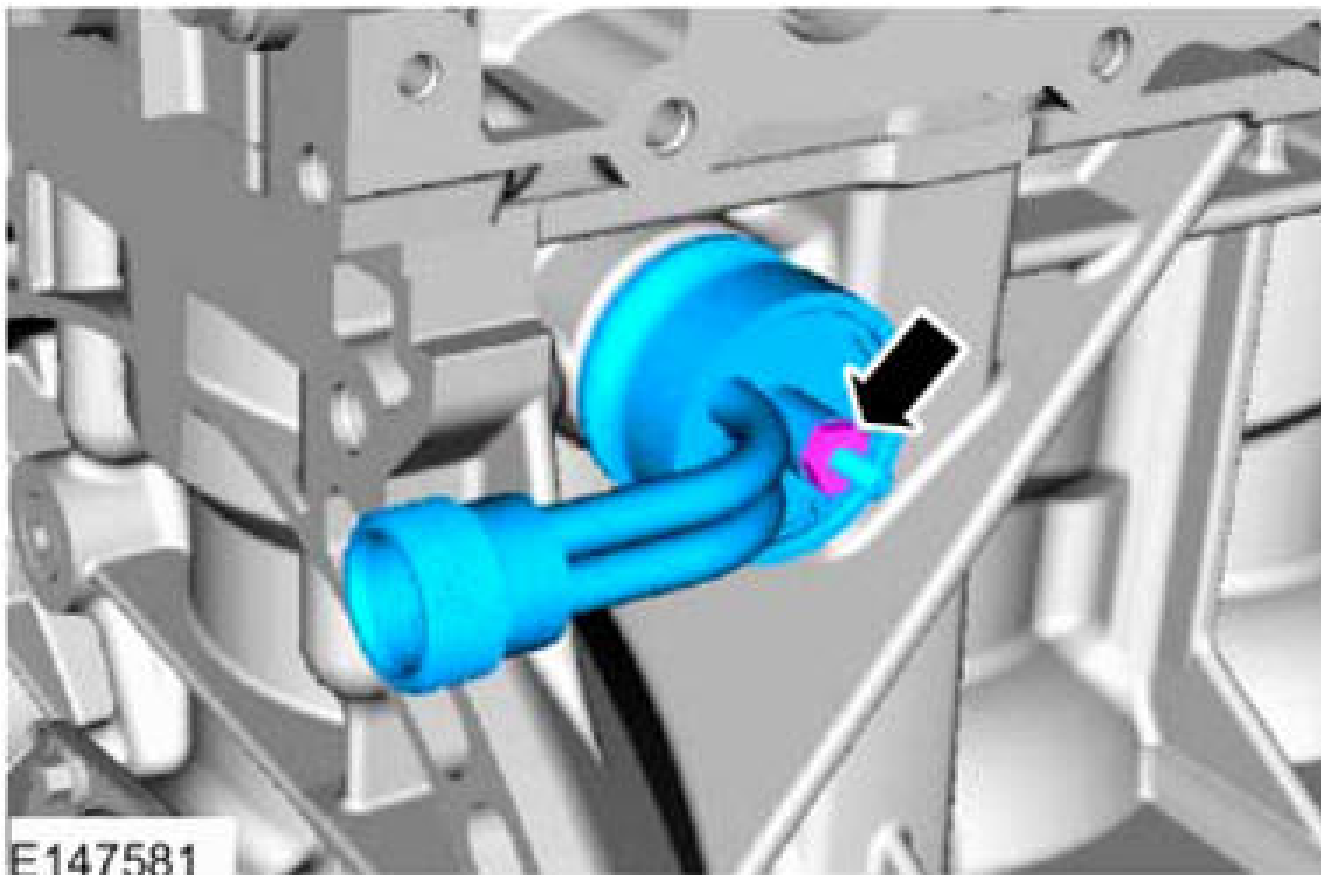


110. *Torque* : 10 Nm

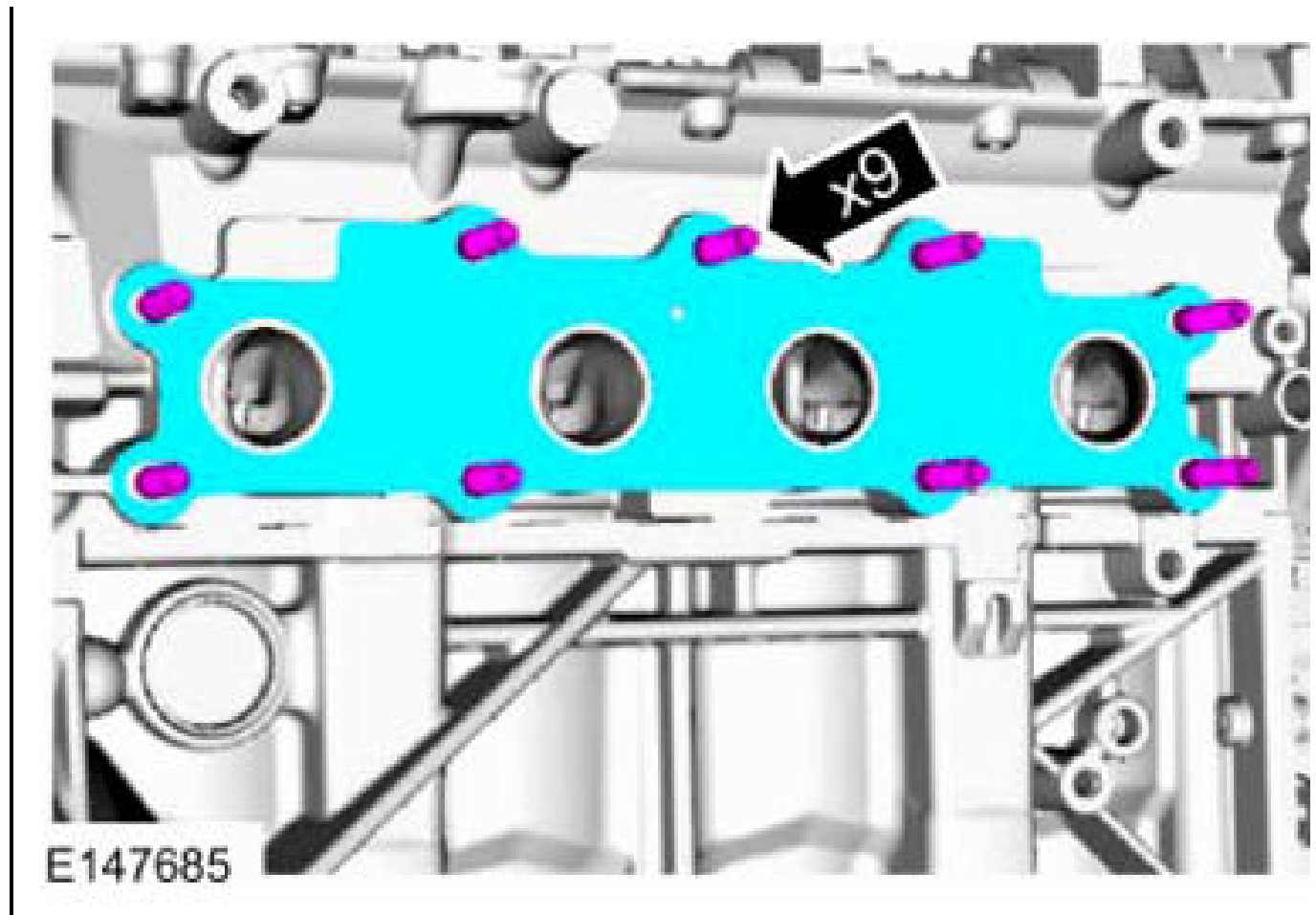


111. If equipped with block heater.

Torque : 3 Nm



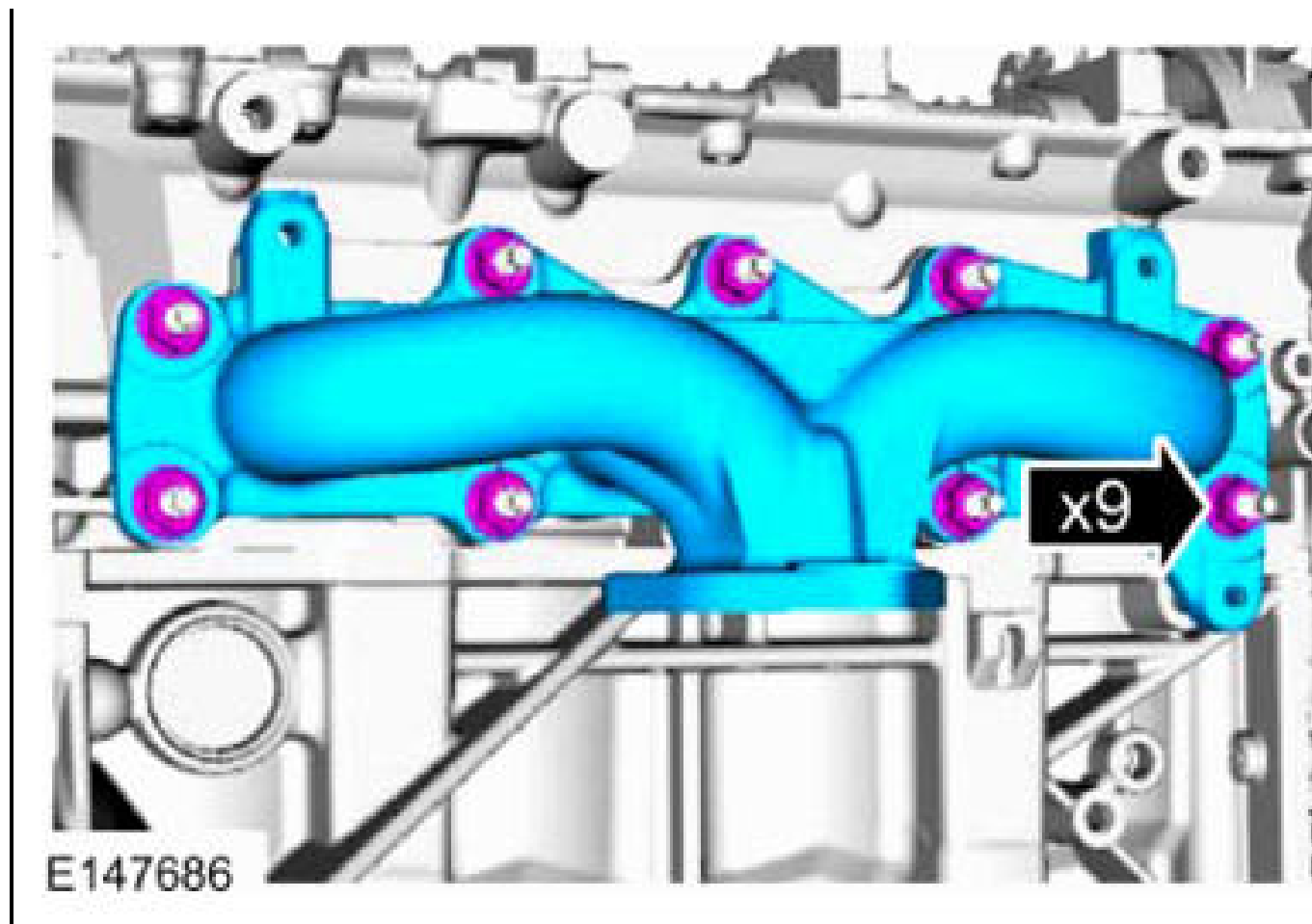
112. *Torque* : 10 Nm



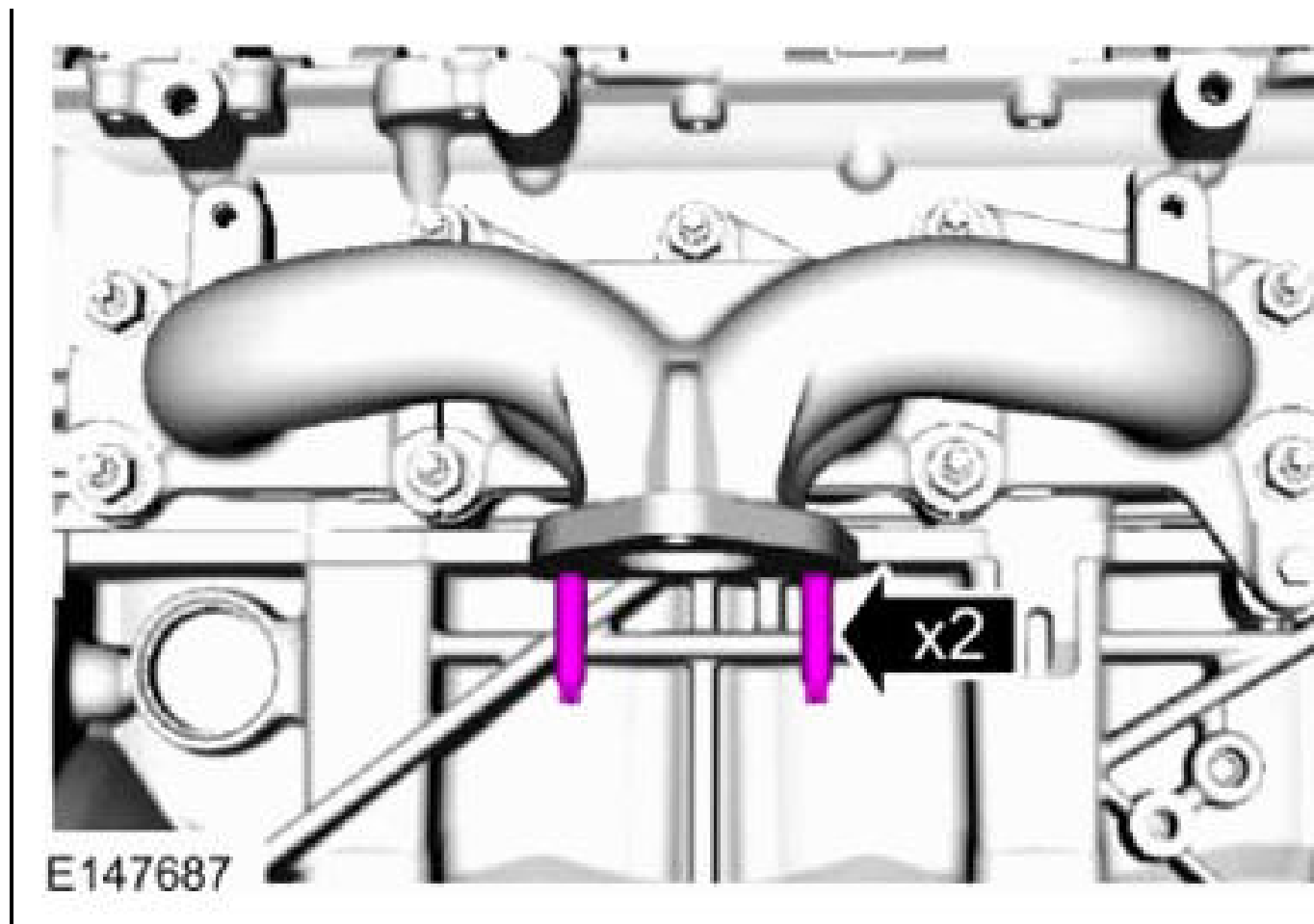
113. *Torque :*

Stage 1: 21 Nm

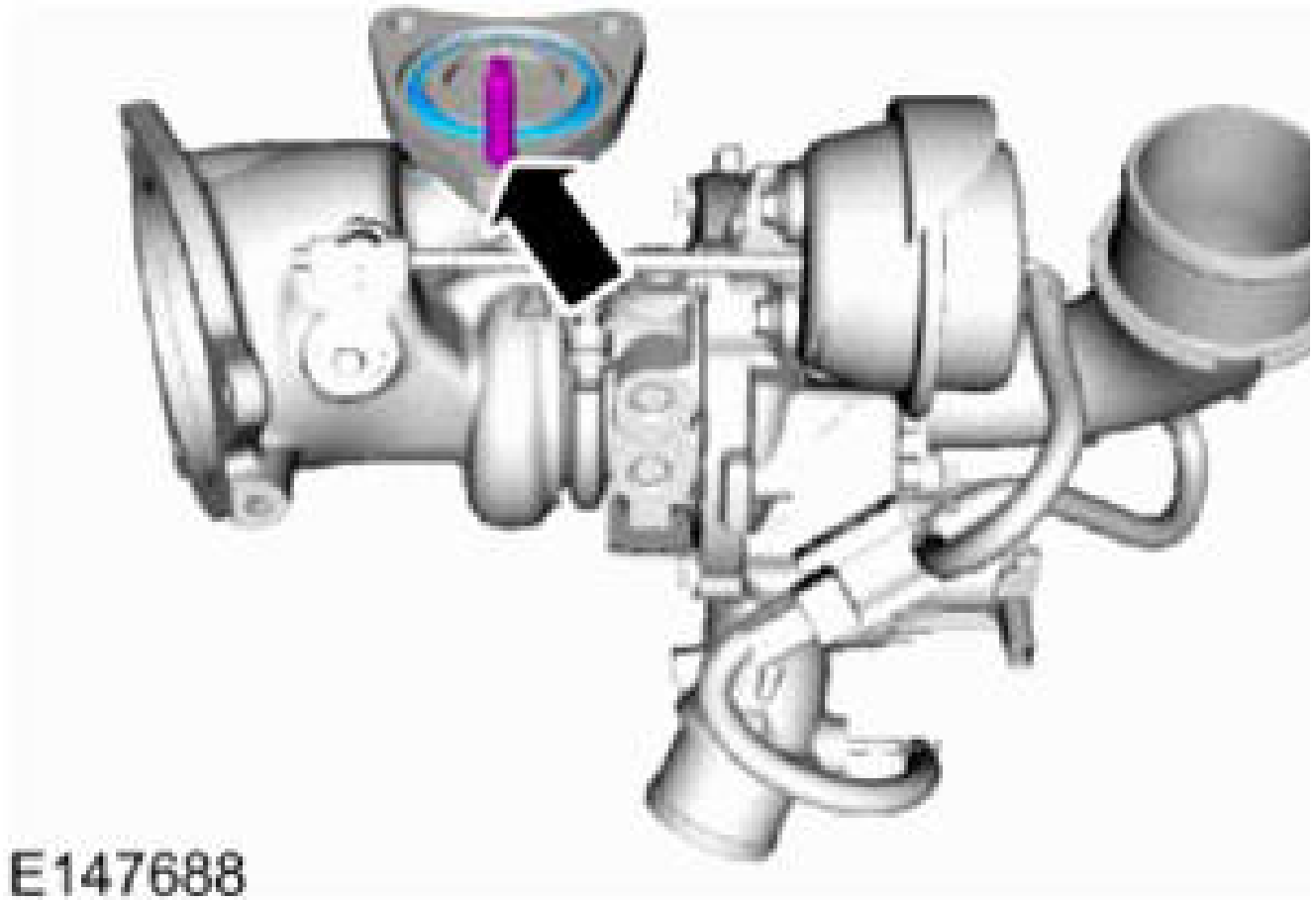
Stage 2: Retighten to 21 Nm



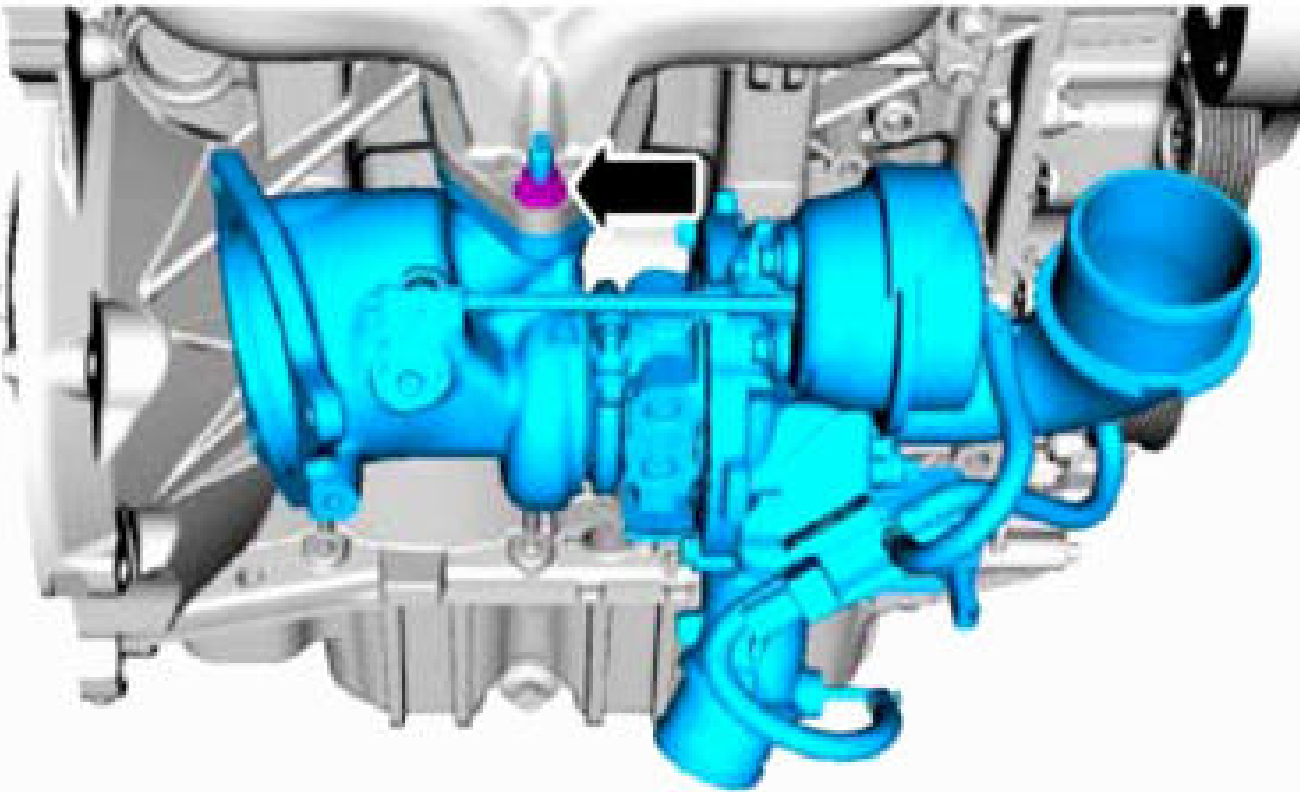
114. *Torque* : 20 Nm



115. *Torque* : 20 Nm



116. *Torque:* 25 Nm

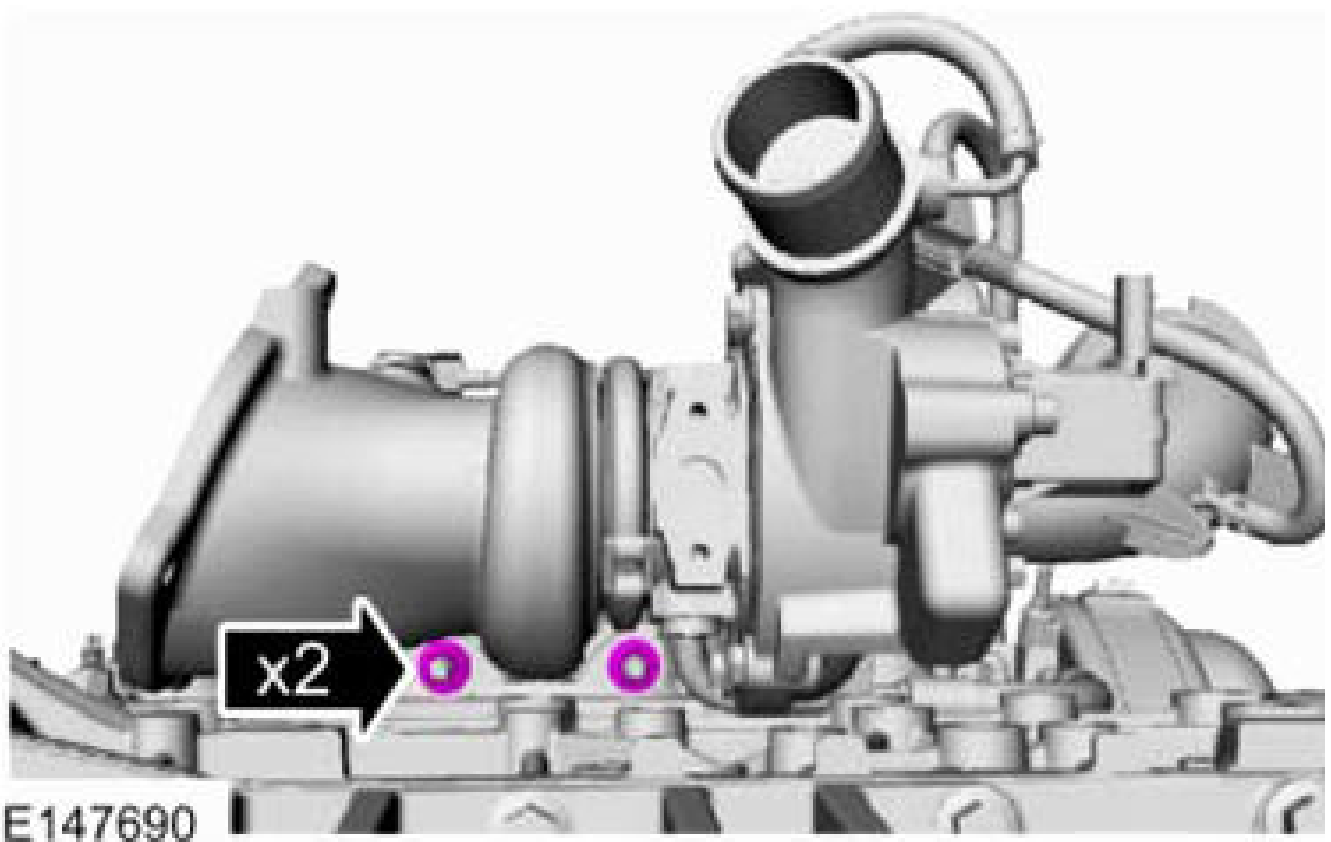


E147689

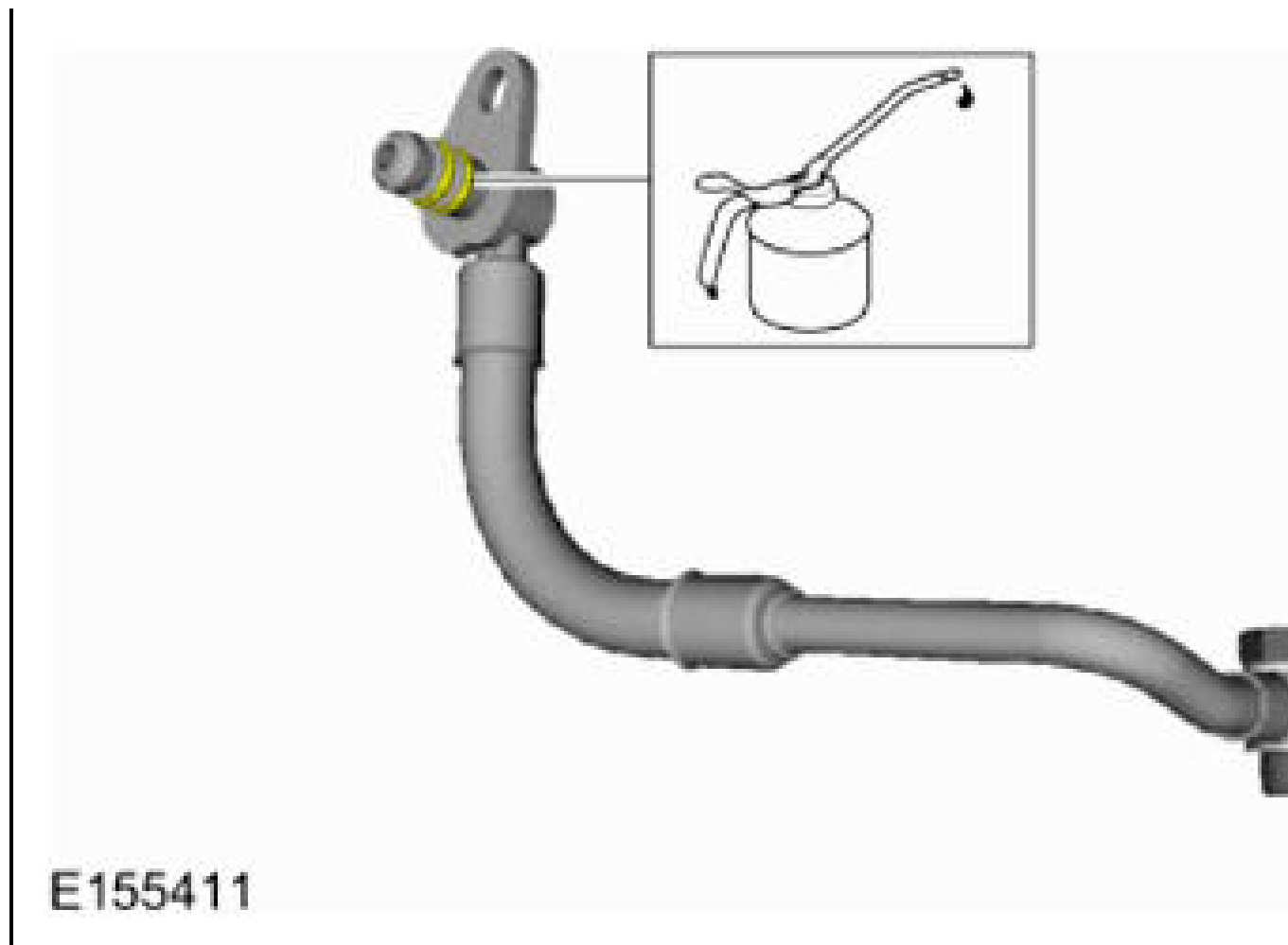
117. *Torque:*

Stage 1: 25 Nm

Stage 2: Retighten to 25 Nm

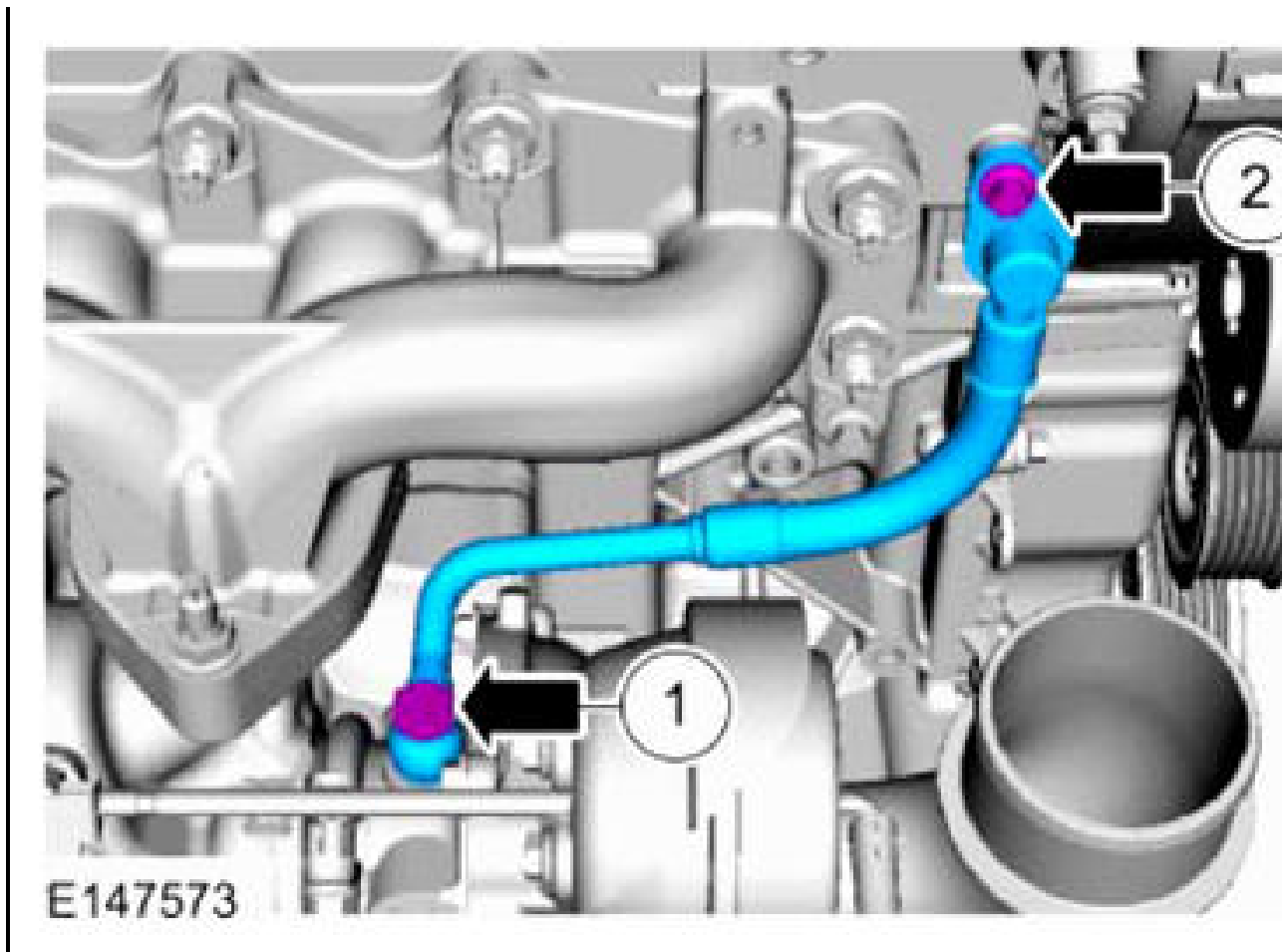


118. *Material:* Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

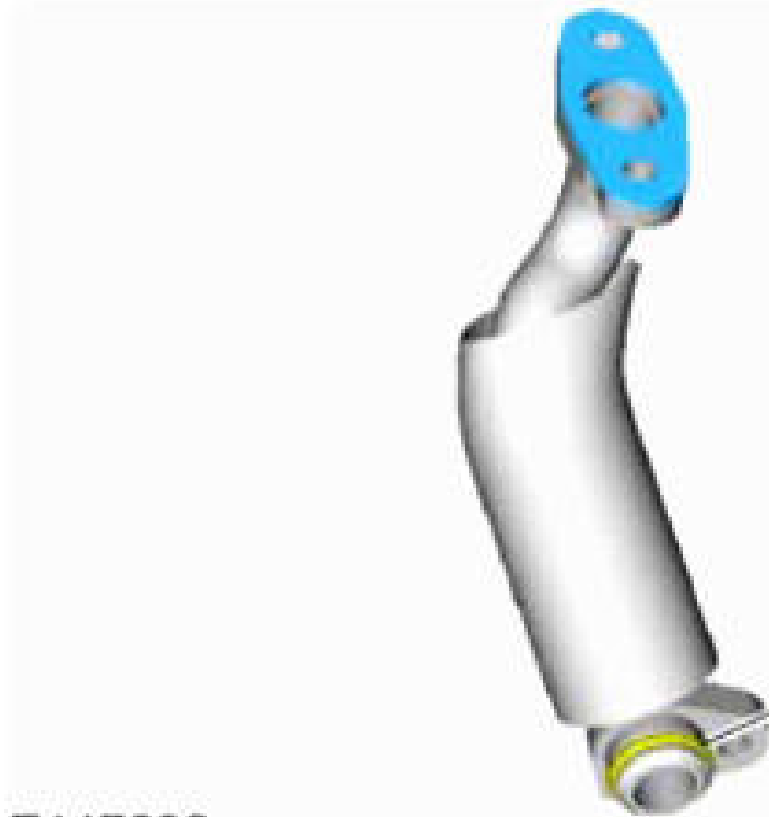


119.

1. *Torque:* 26 Nm
2. *Torque:* 9.5 Nm

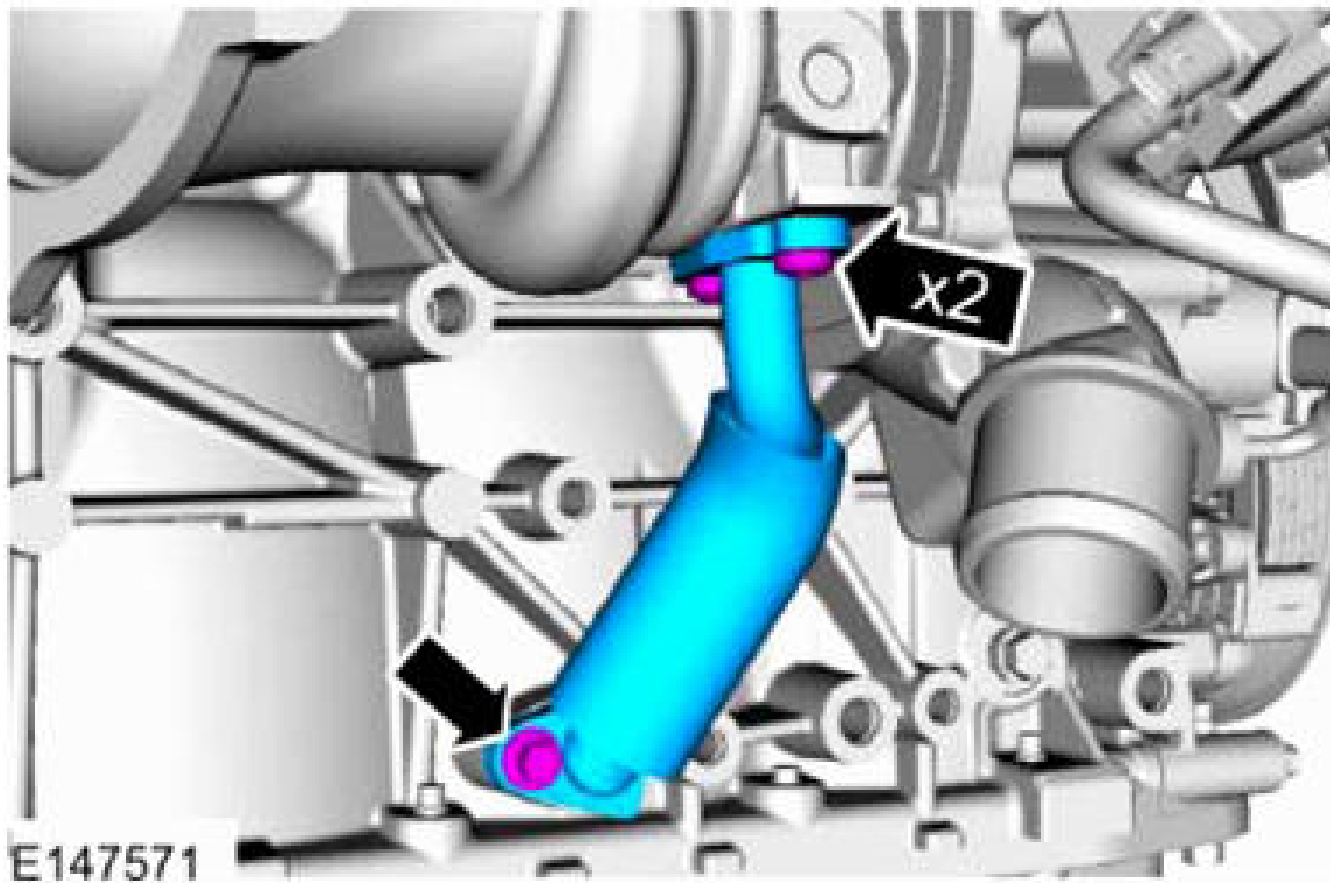


120. *Material:* Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



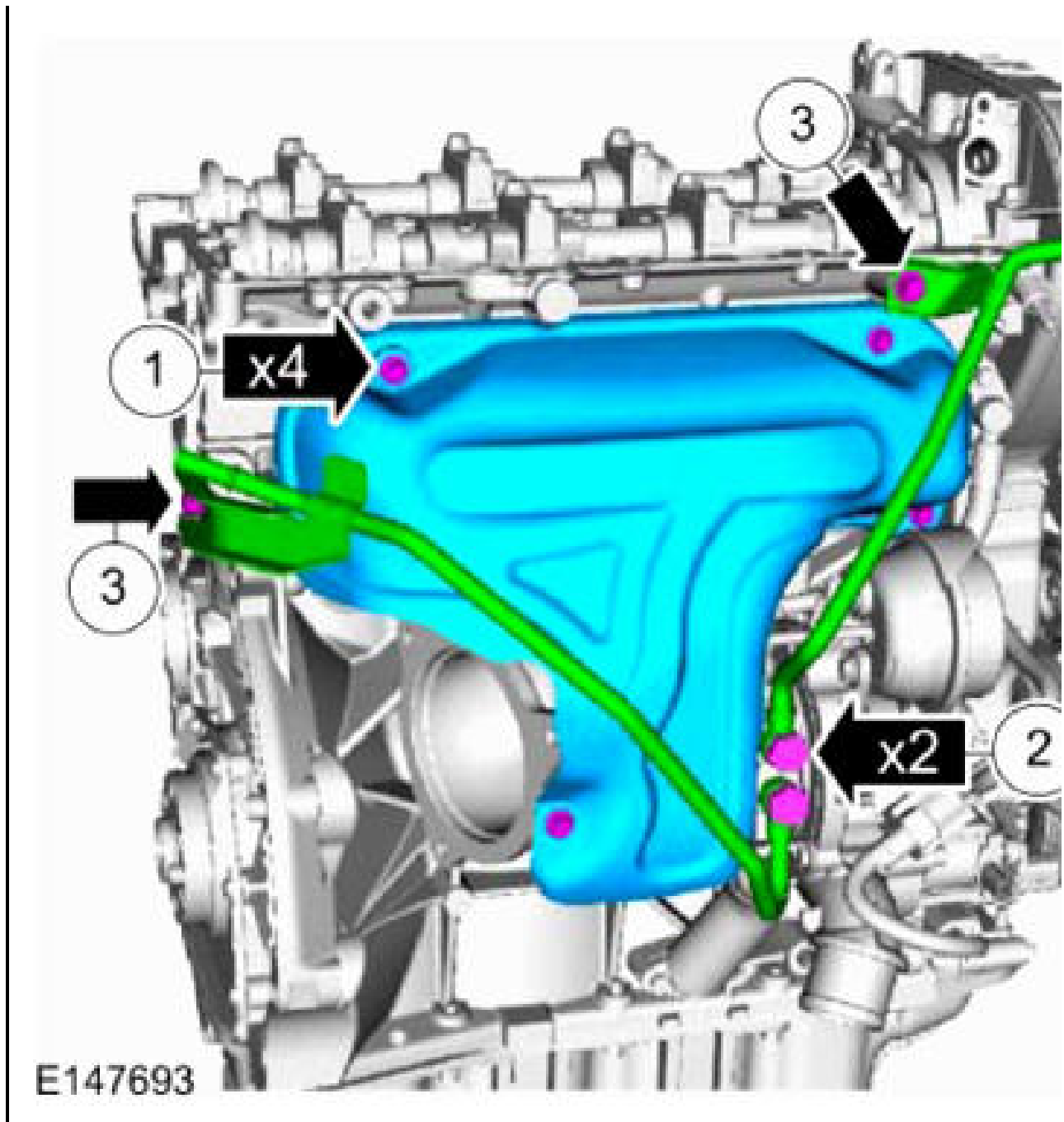
E147692

121. *Torque:* 9.5 Nm

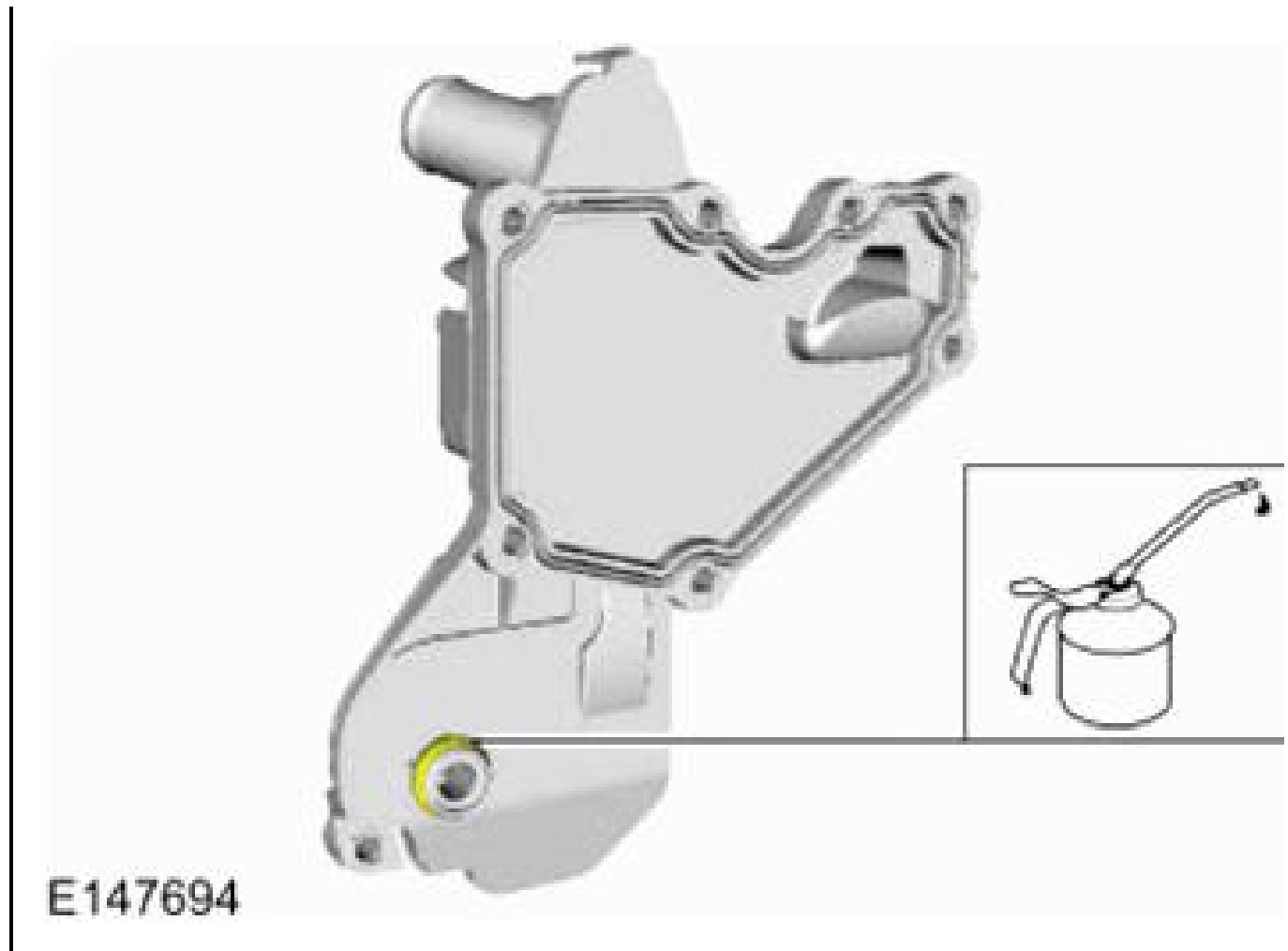


122.

1. *Torque:* 18 Nm
2. *Torque:* 25 Nm
3. *Torque:* 23 Nm

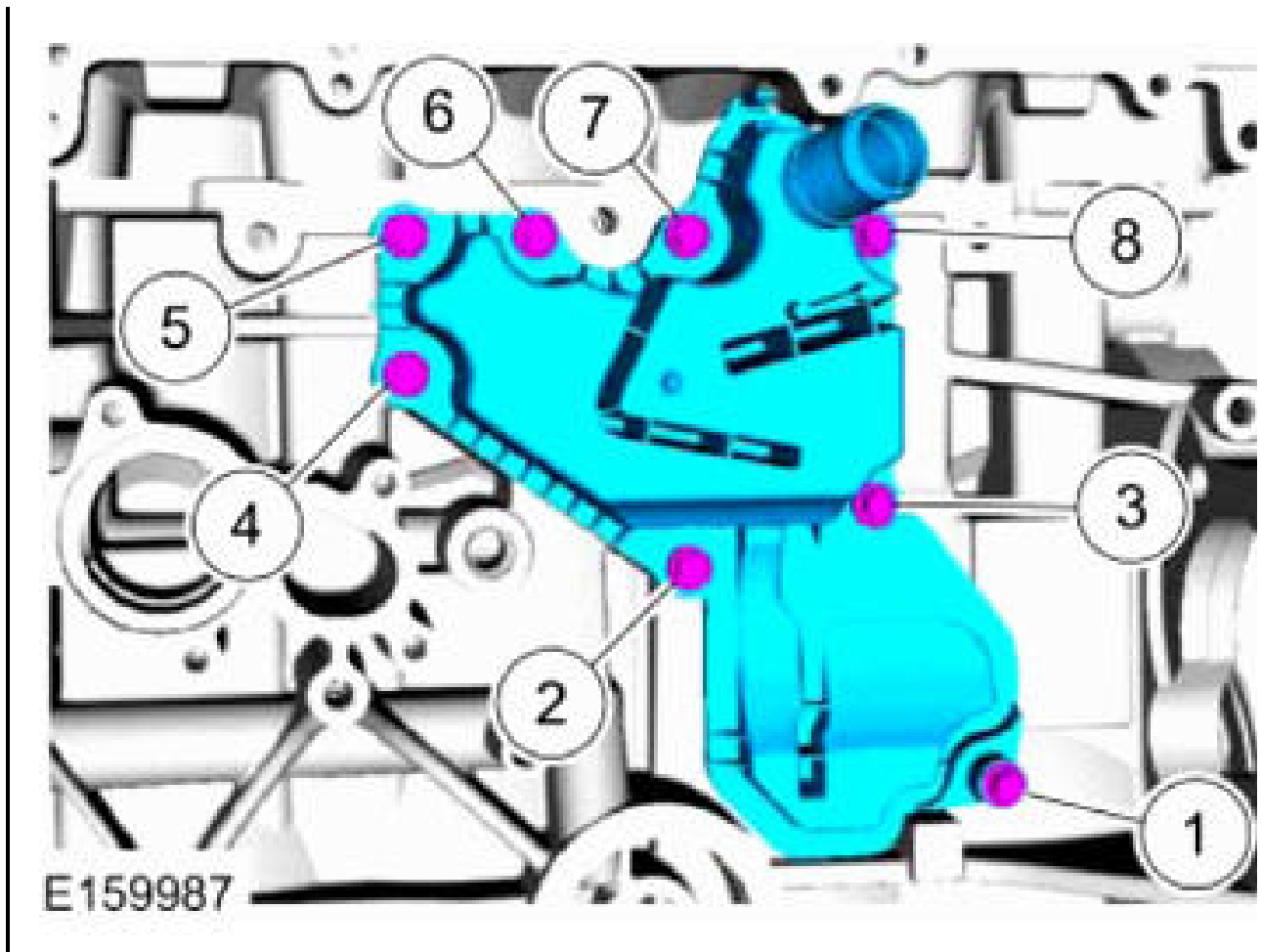


123. *Material:* Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



124.

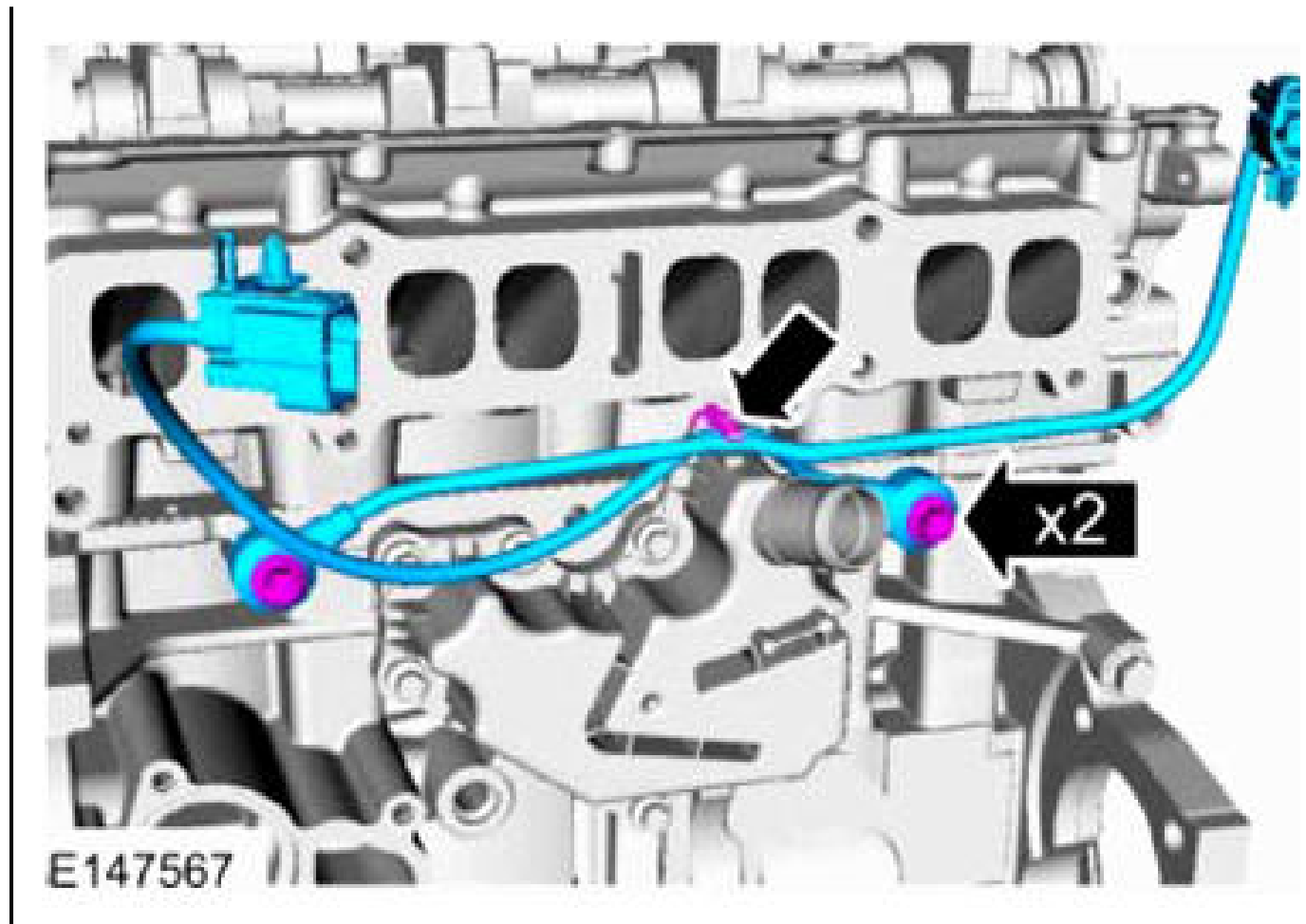
1. Tighten bolts 1, 2 and 3 finger tight.
2. Tighten bolts 4, 5, 6, 7 and 8 finger tight.
3. *Torque:* all bolts in sequence to 9.5 Nm



125. **NOTE:** The head of the KS should not touch any other component.

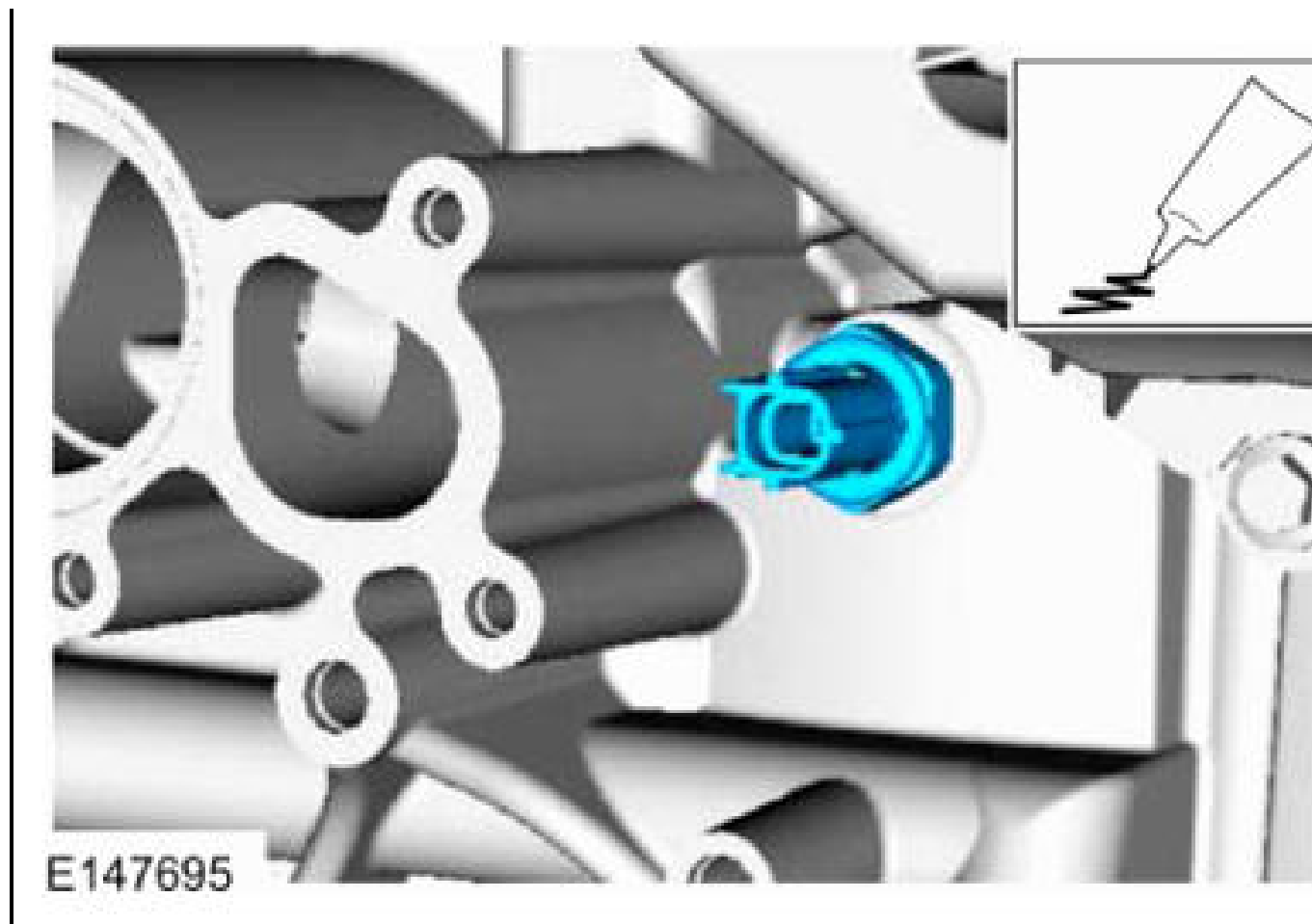
NOTE: The LH KS must be at the 10 o'clock position and the RH KS must be at the 2 o'clock position.

Torque: 18 Nm

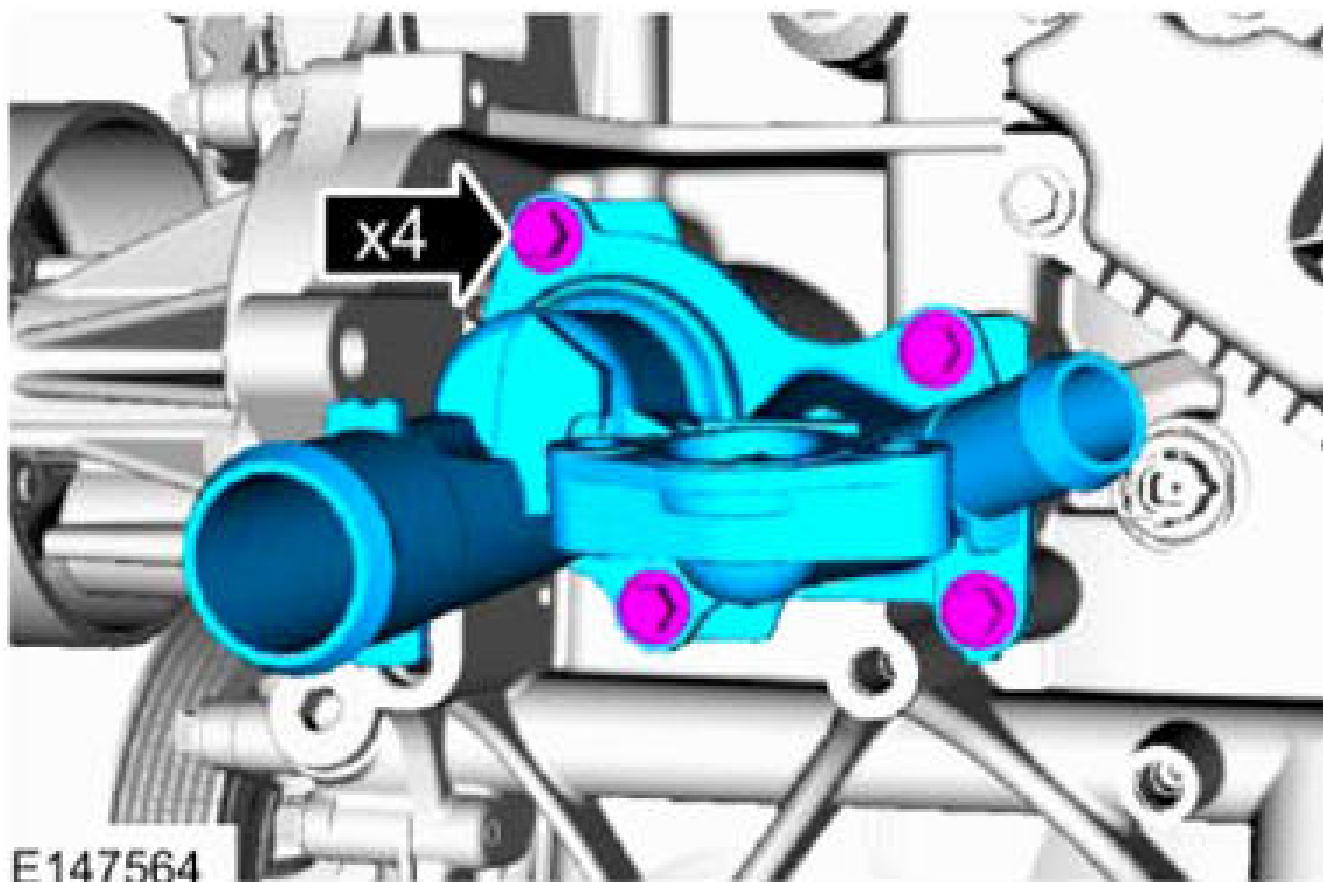


126. *Material:* Thread Sealant with PTFE/TA-24 (WSK-M2G350-A2)

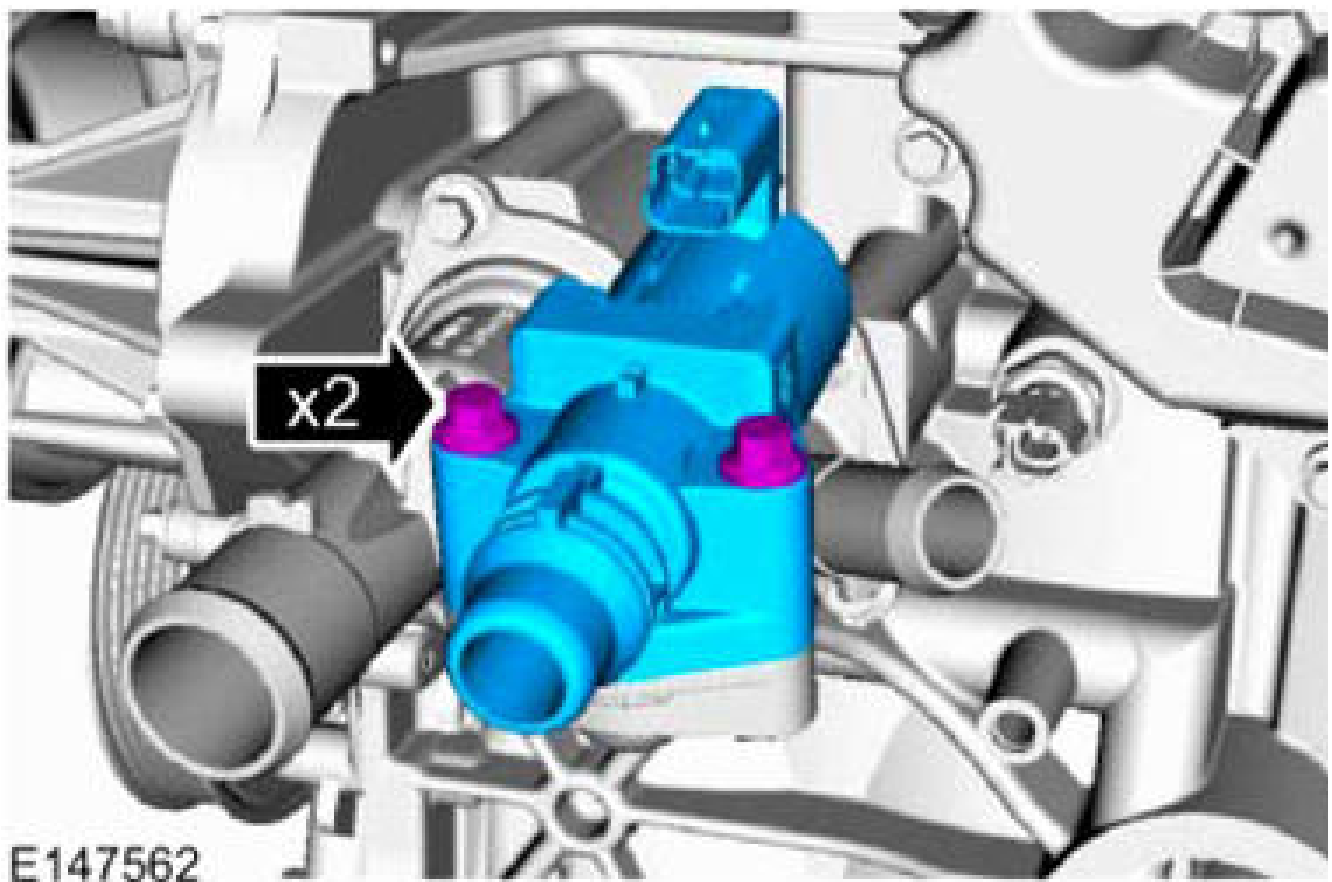
Torque: 18 Nm



127. *Torque:* 9 Nm



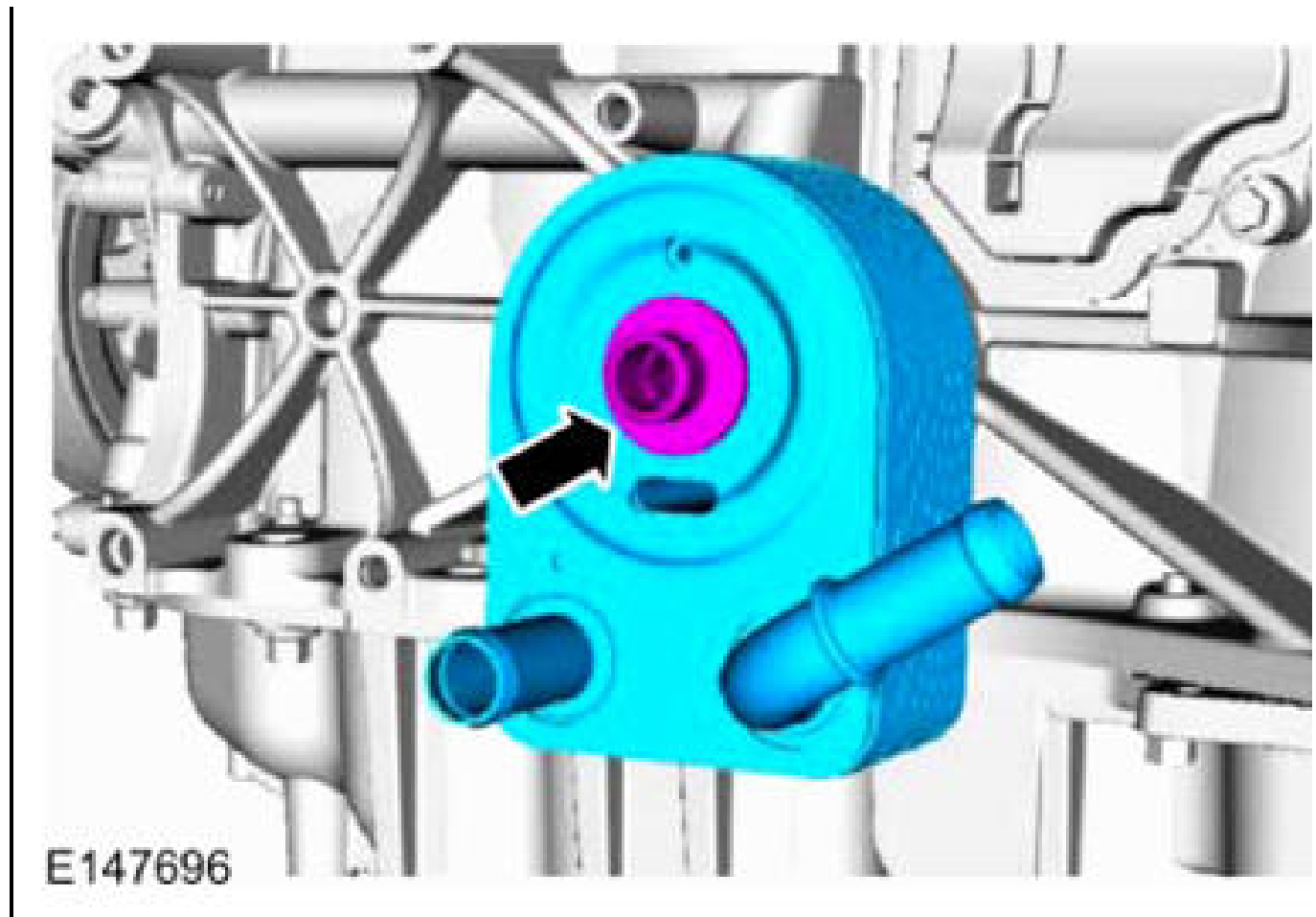
128. *Torque:* 10 Nm



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

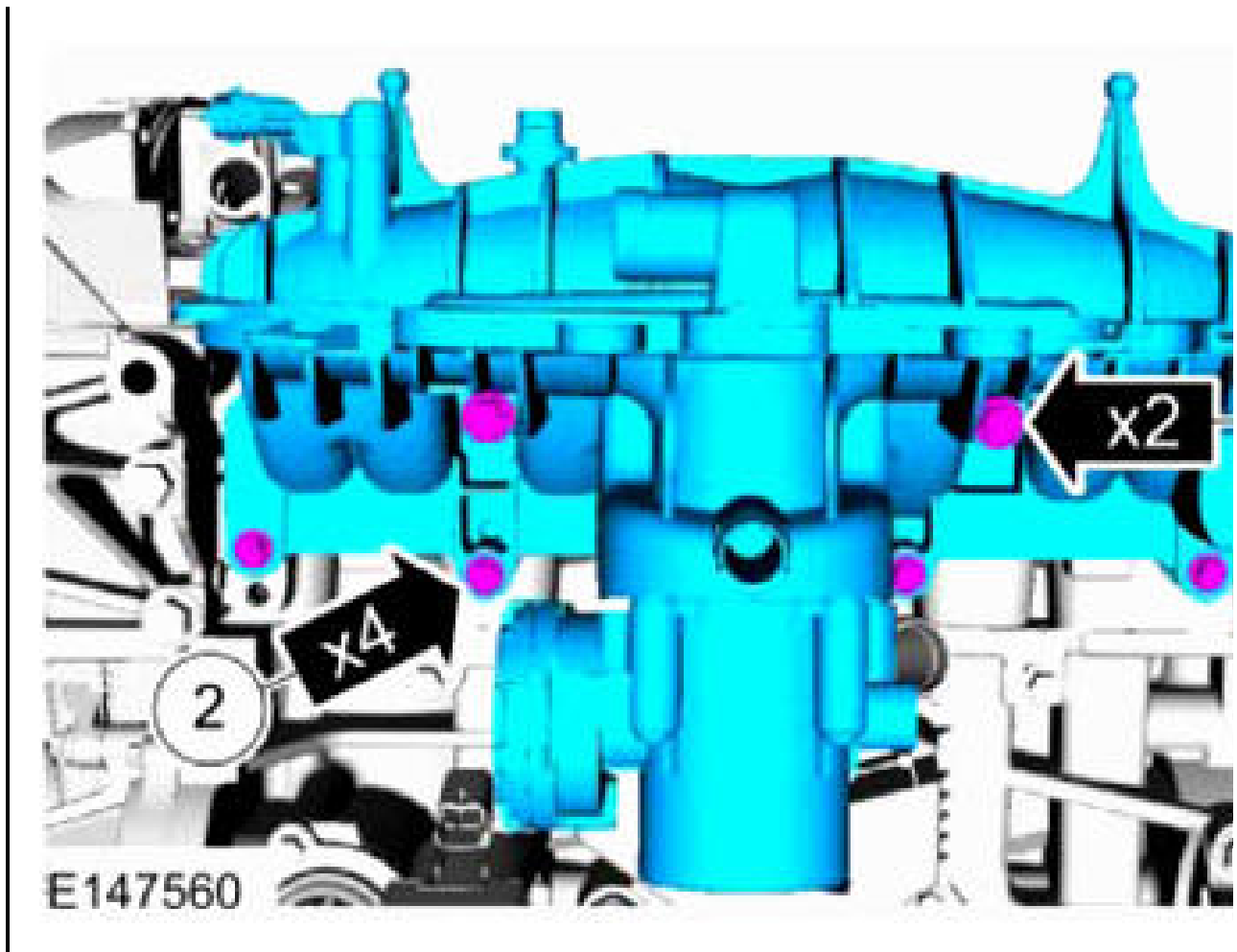
129.

Torque: 55 Nm



130. **NOTE:** There are different length of bolts noted in disassembly.

1. *Torque:* 17 Nm
2. *Torque:* 10 Nm

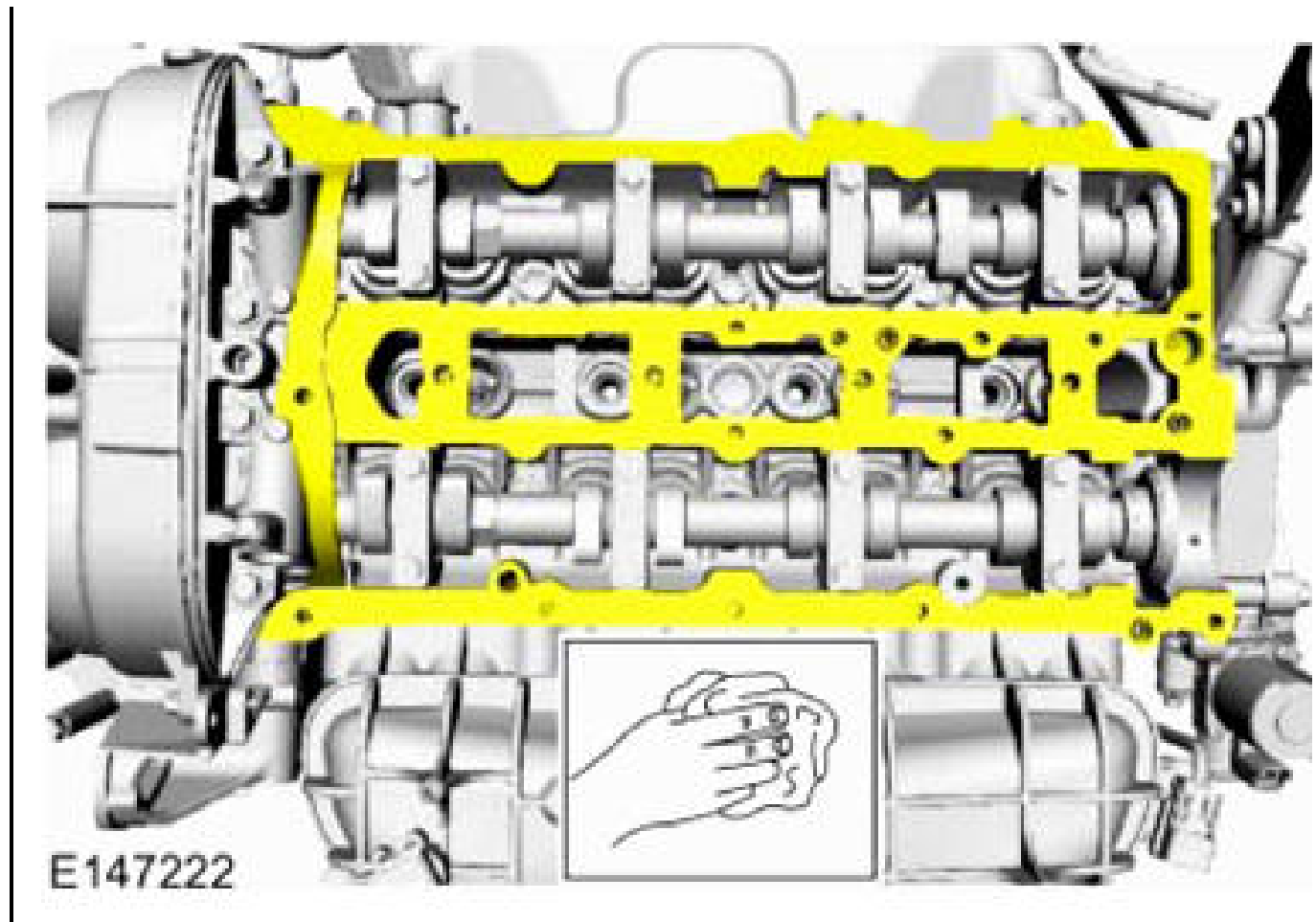


NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

131.

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

Material: Motorcraft® Metal Surface Prep/ZC-31-A

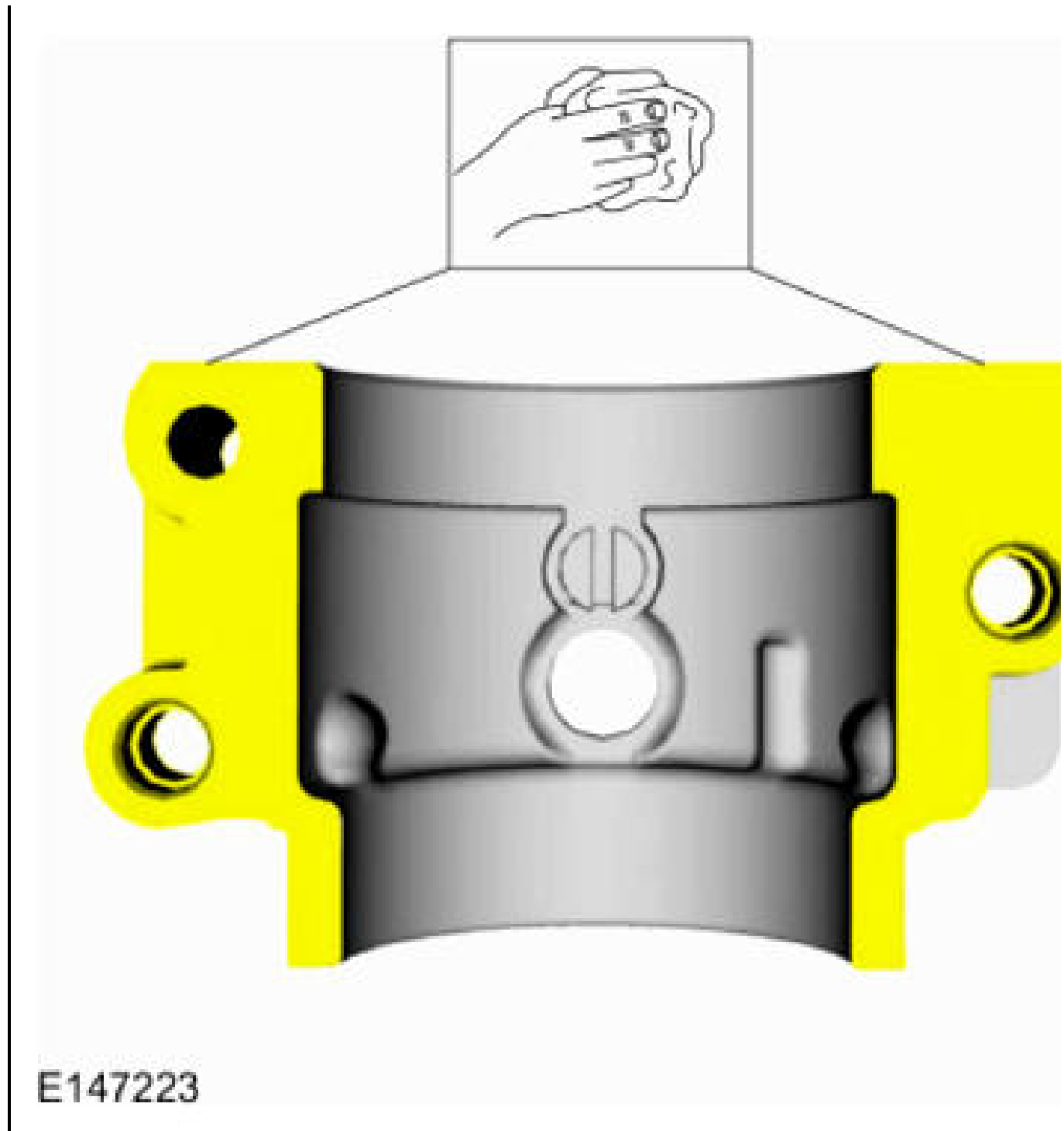


NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

132.

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

Material: Motorcraft® Metal Surface Prep/ZC-31-A

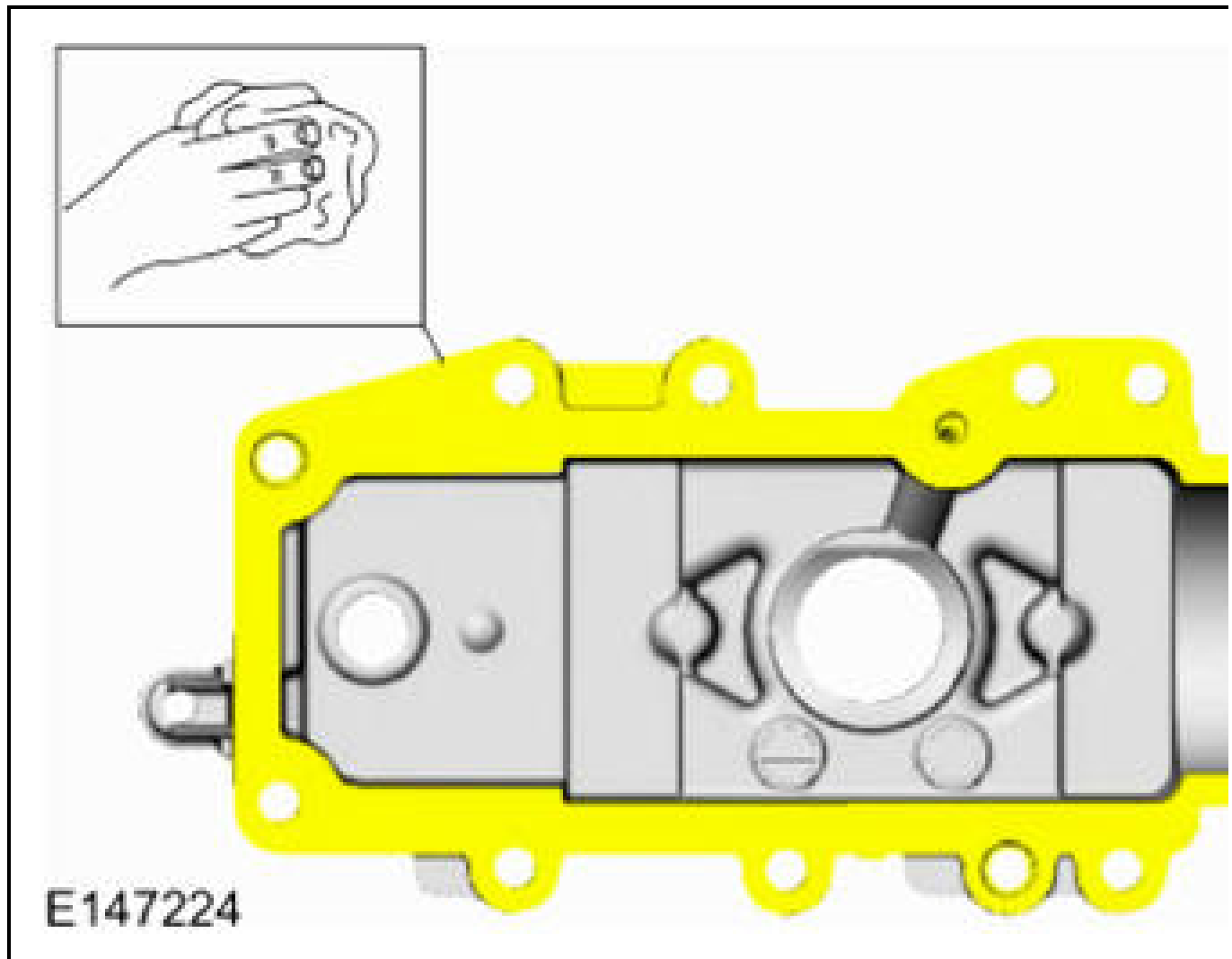


NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths.

133.

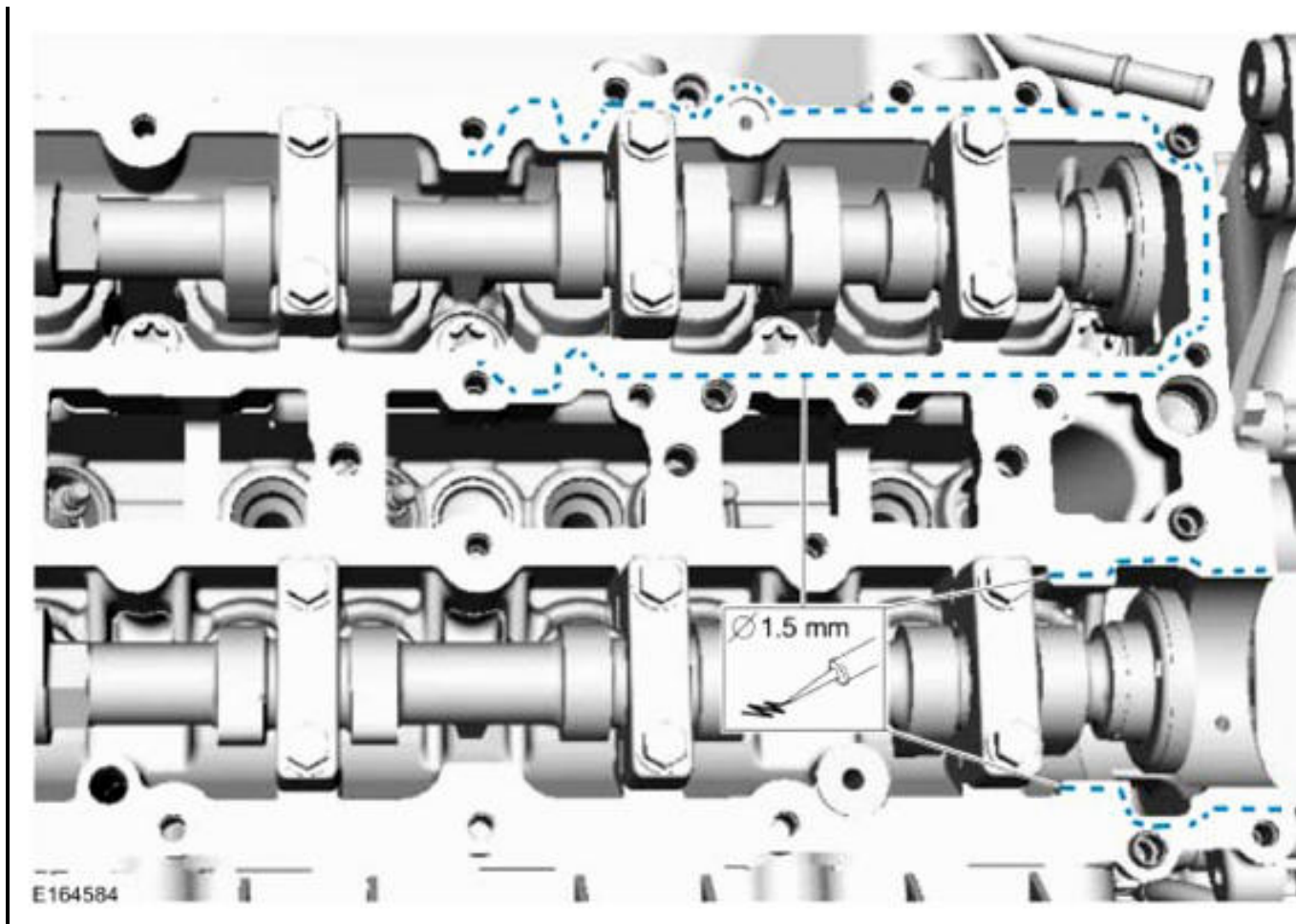
Make sure that the mating faces are clean and free of foreign material.

Material: Motorcraft® Metal Surface Prep/ZC-31-A

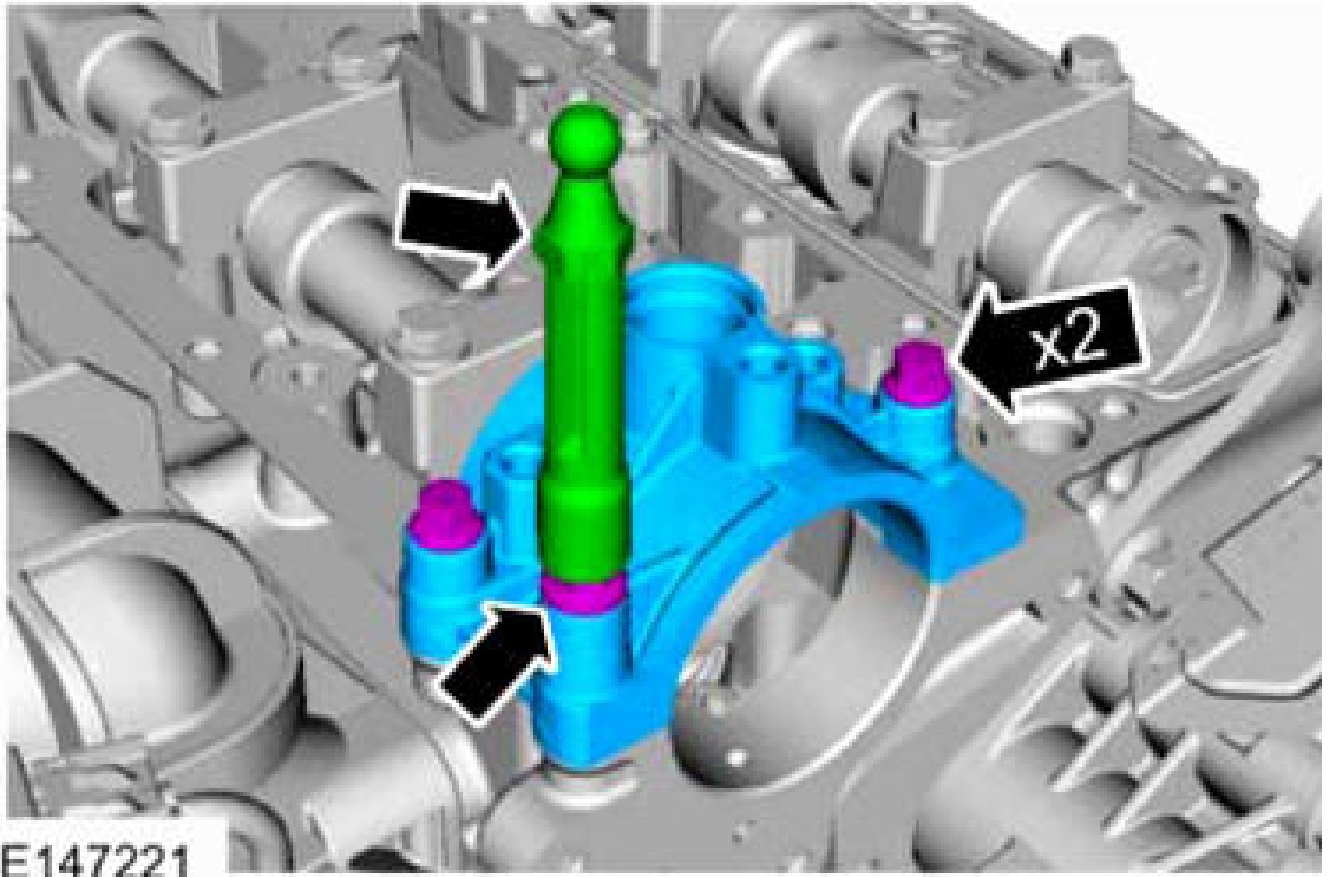


134. **NOTE:** The components 134. must be installed within 5 minutes of applying the sealant.

Material: Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)



135. *Torque:* 10 Nm



136. **NOTE:** Use a new O-ring seal.

Tighten bolts 1 through 10 to:

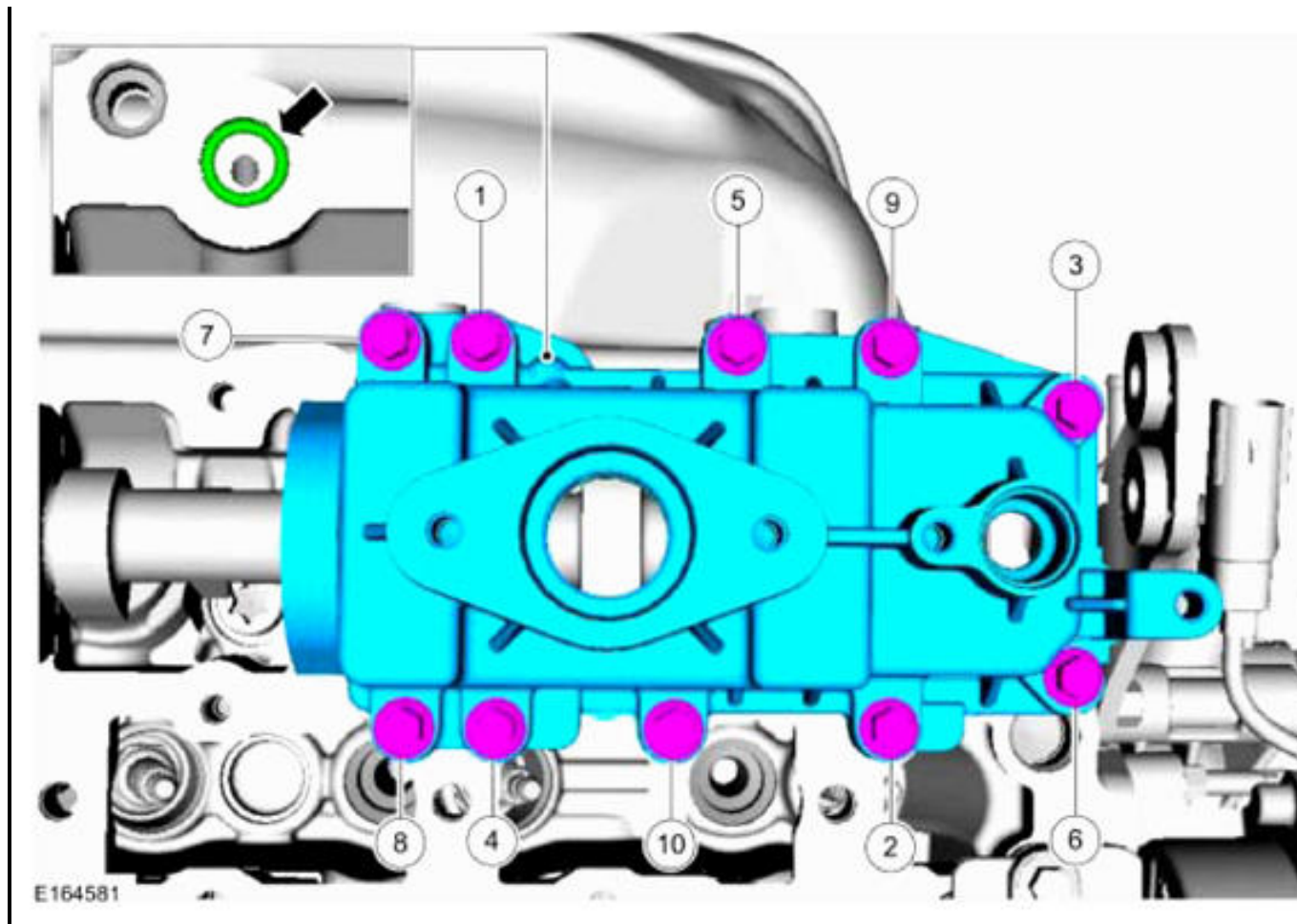
Torque:

Stage 1: 3 Nm

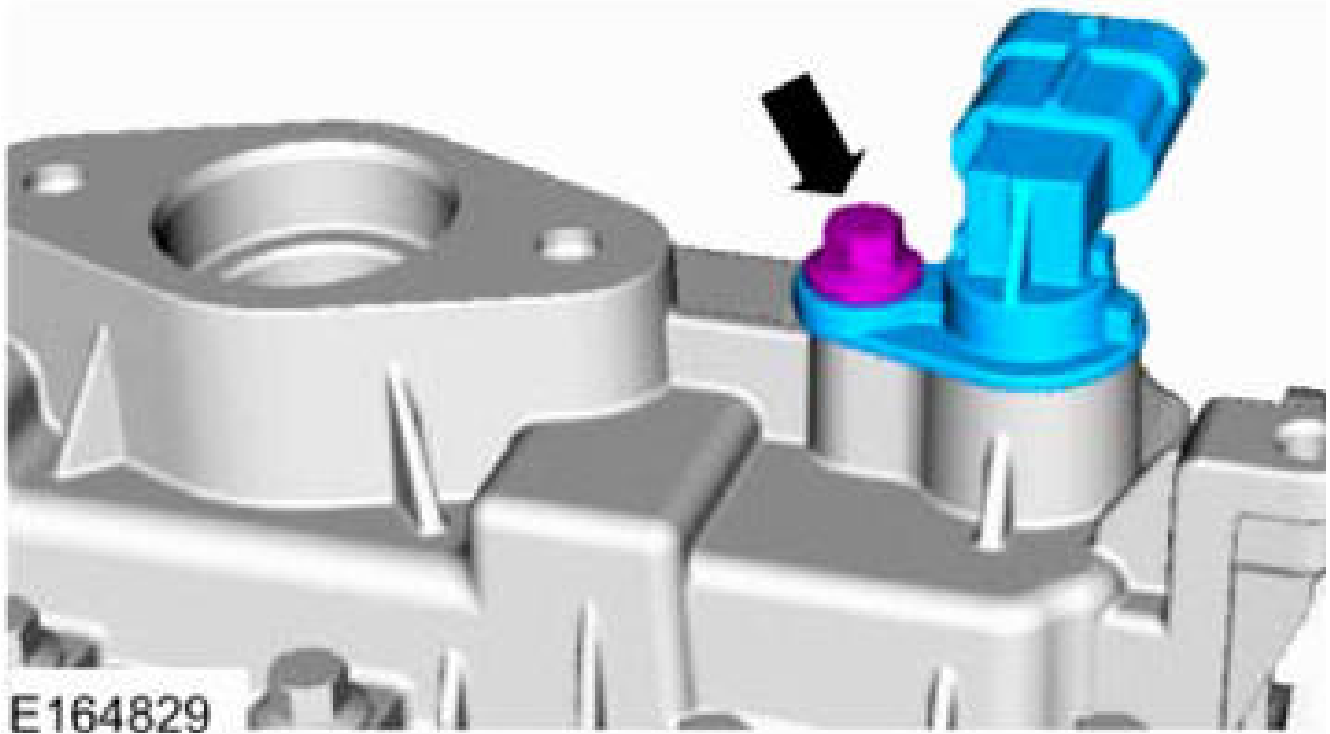
Stage 2: 9 Nm

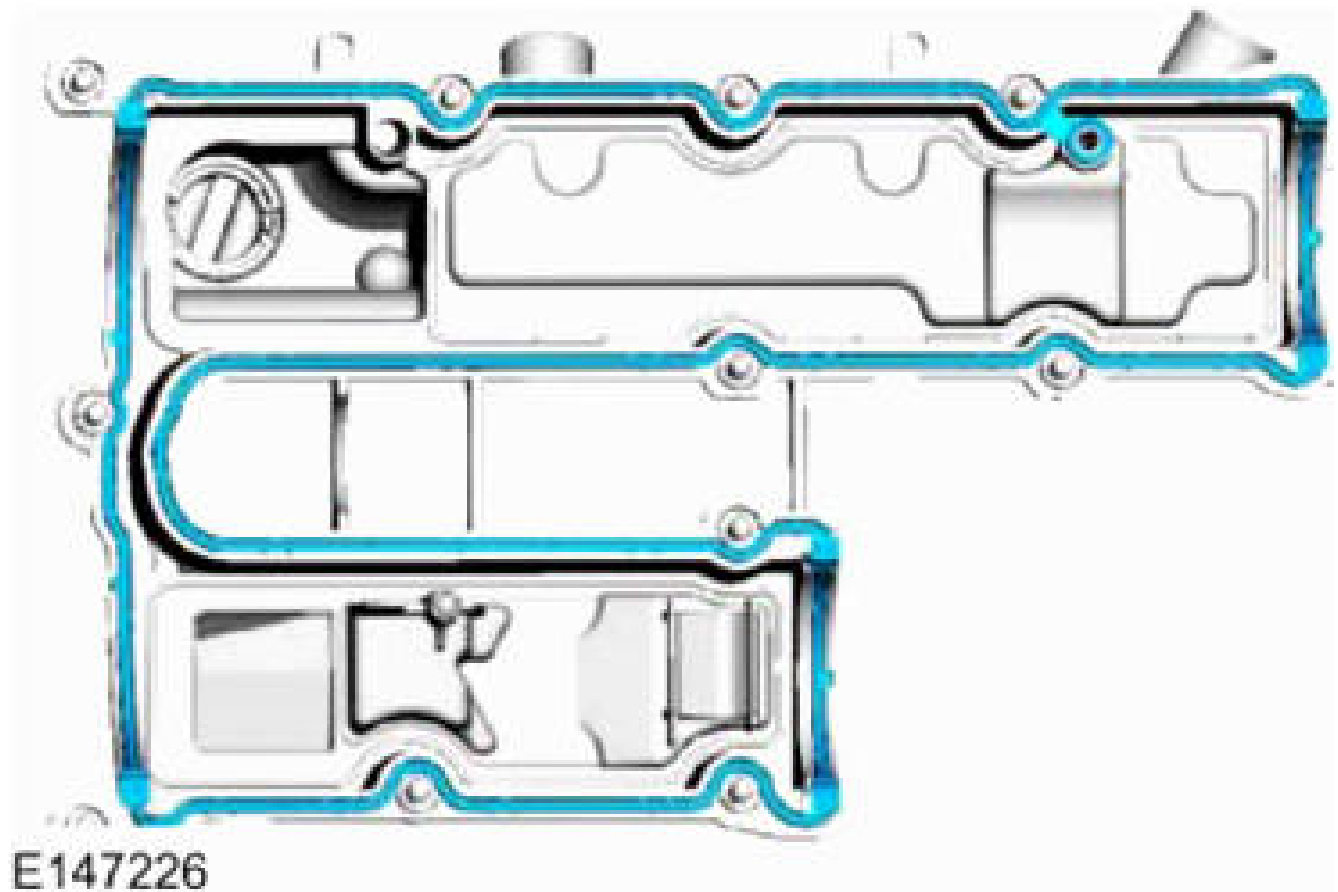
Stage 3: 11 Nm

Stage 4: Tighten bolts 1, 2, 5, 6, 7, 8, 9 and 10 to 14 Nm



137. Torque: 8 Nm



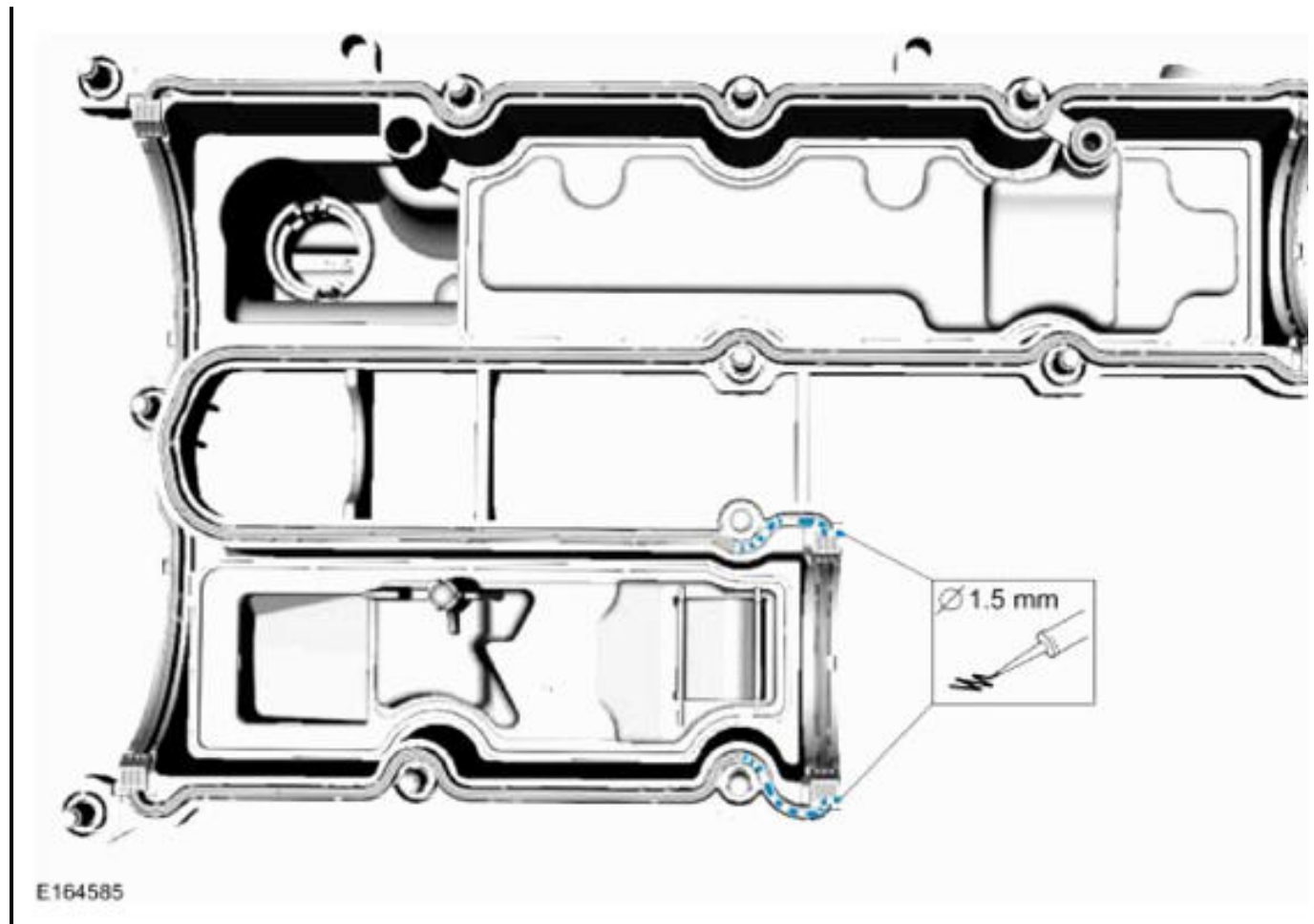


138.

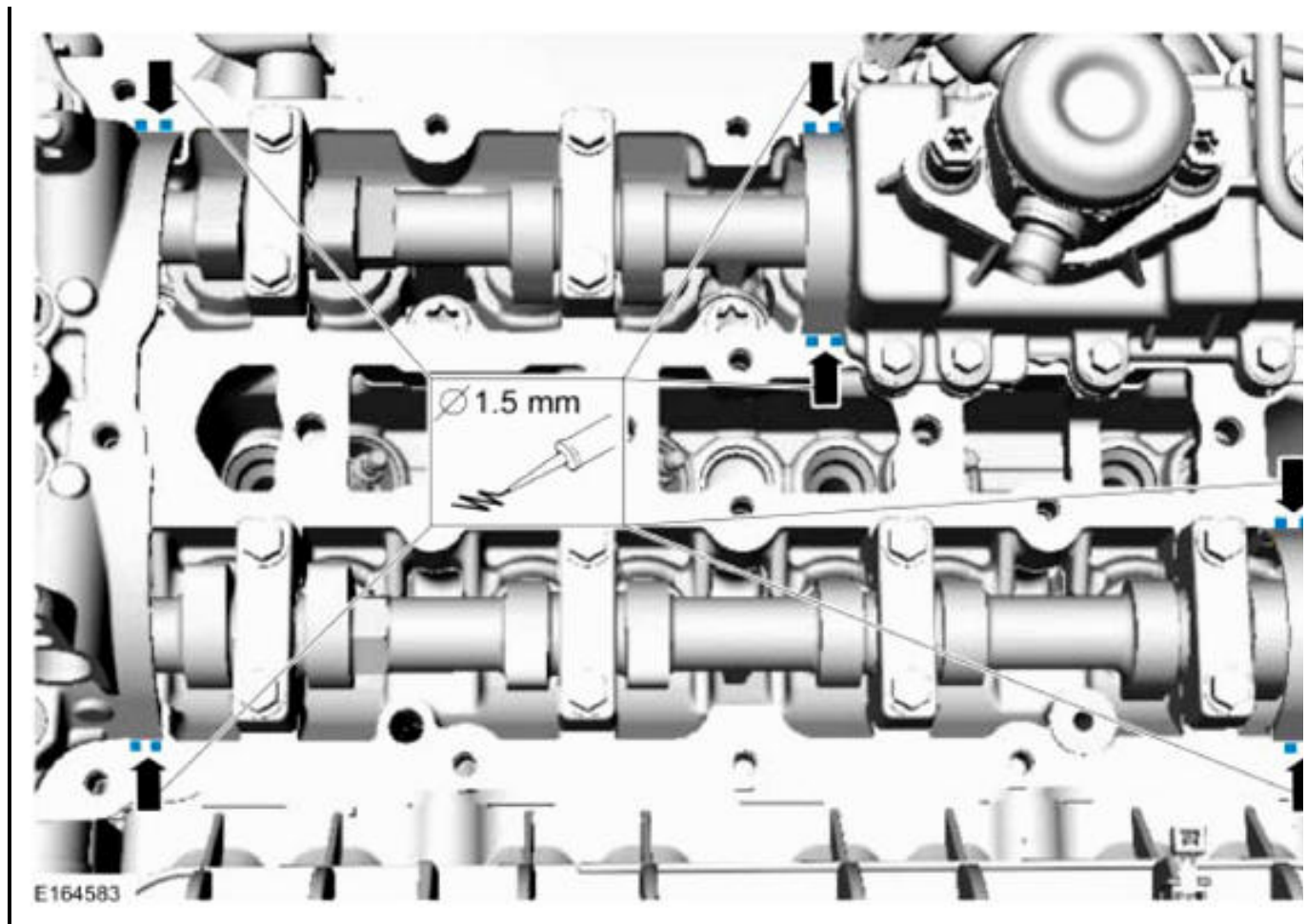
NOTE: The components must be installed within 5 minutes of applying the sealant.

139.

Material: Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)



140. *Material:* Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)

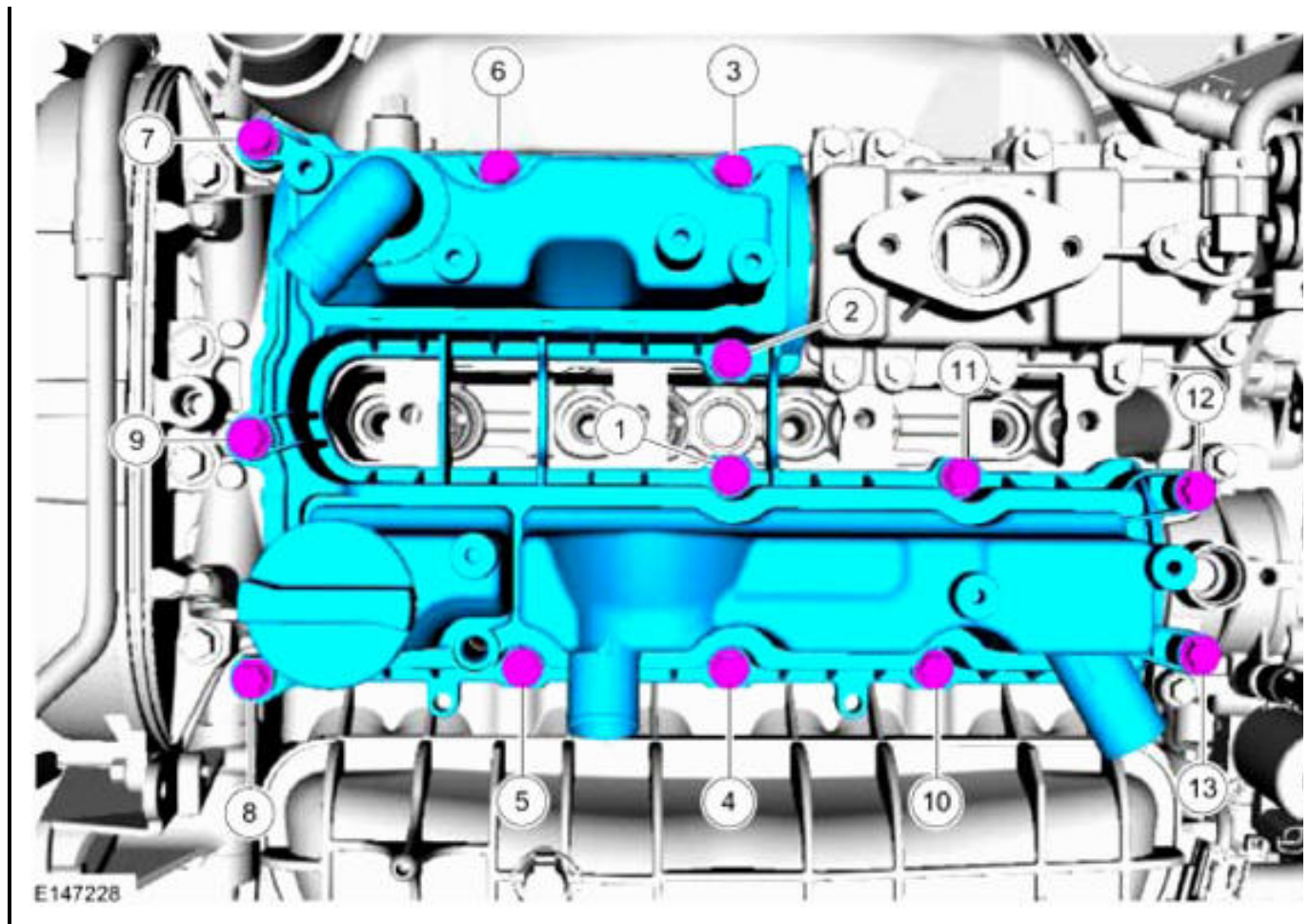


141. *Torque:*

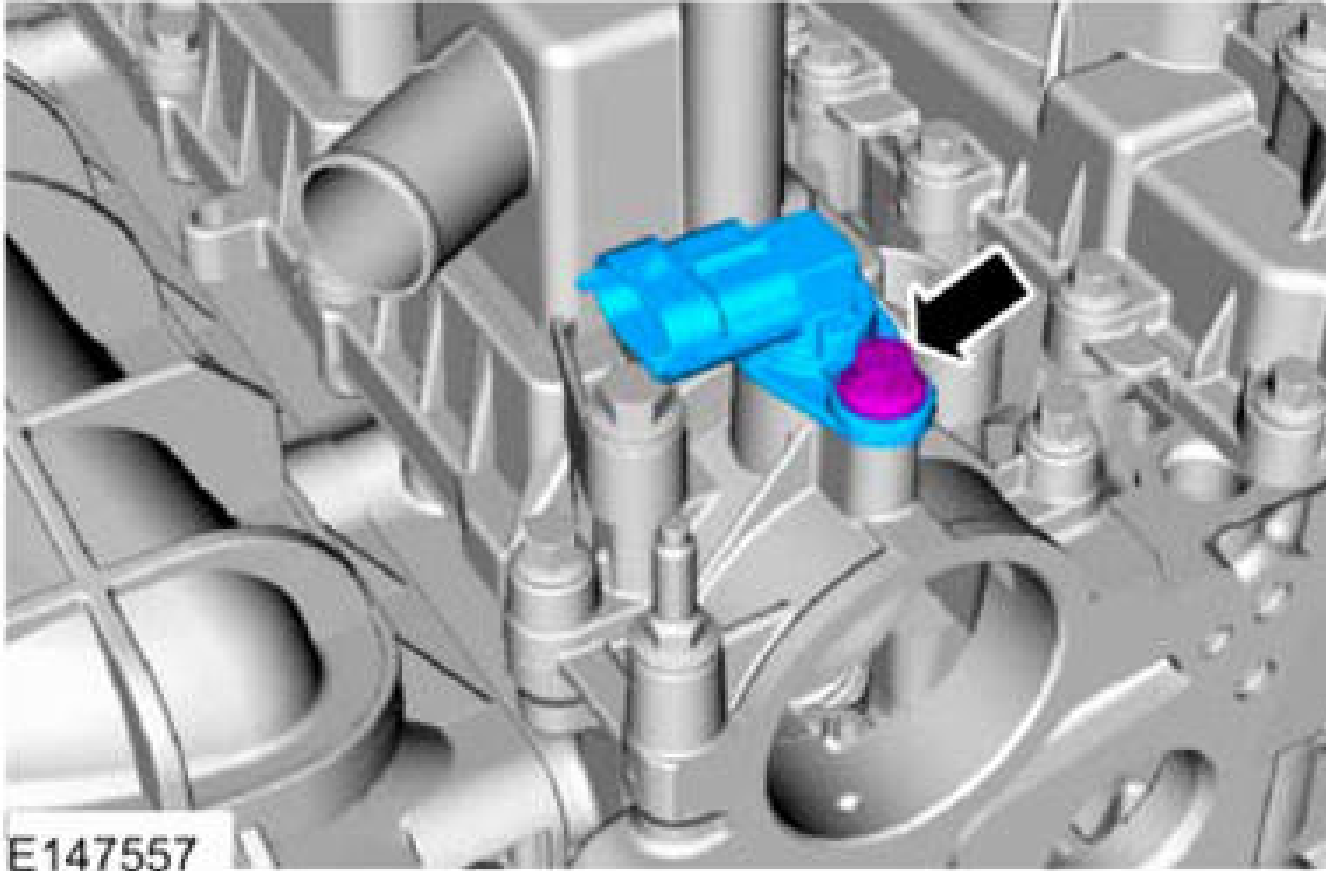
Stage 1: 5 Nm

Stage 2: 9 Nm

Stage 3: 10 Nm



142. Torque: 9 Nm



NOTE: A clean working environment is essential to prevent dirt or foreign material contamination.

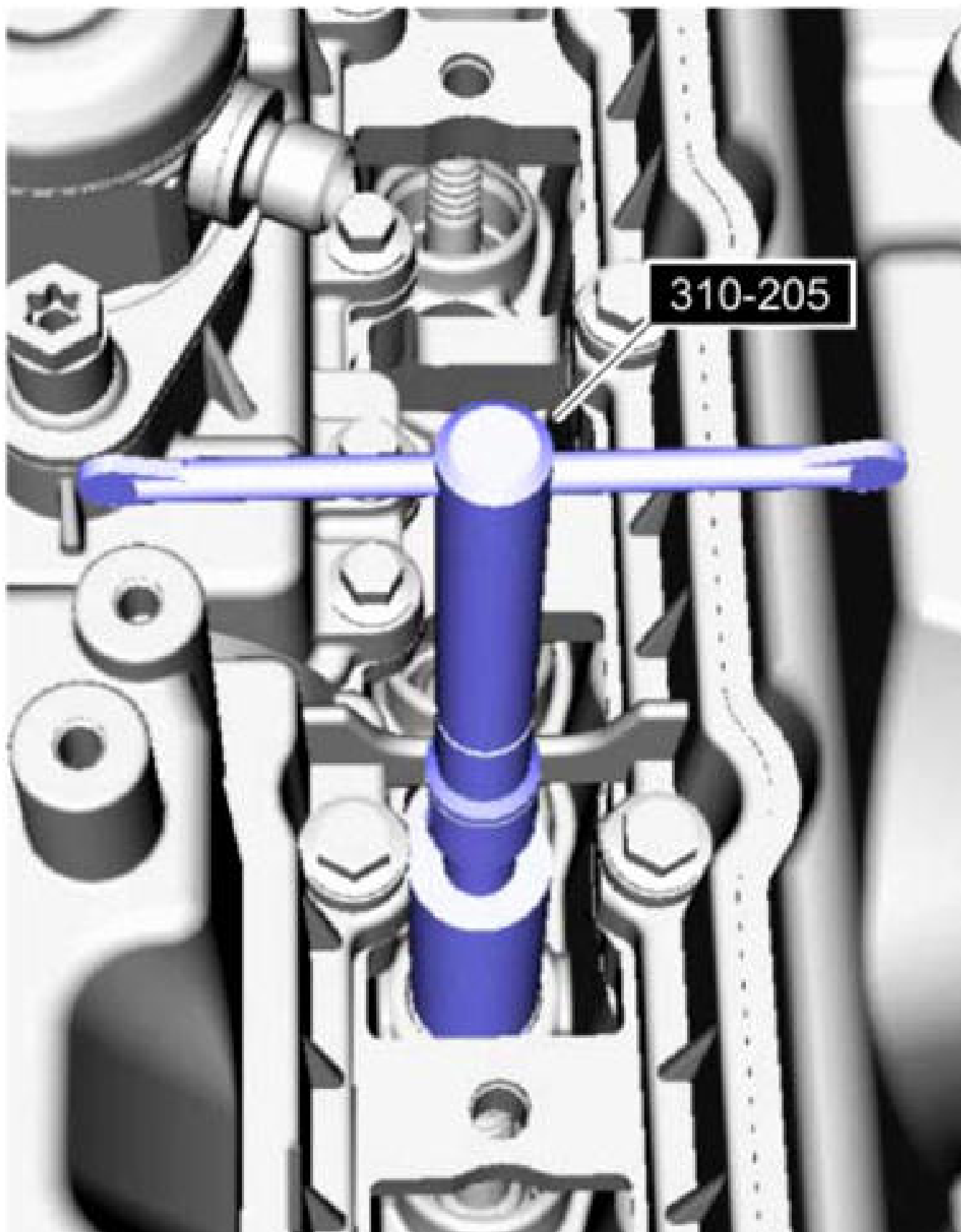
143.

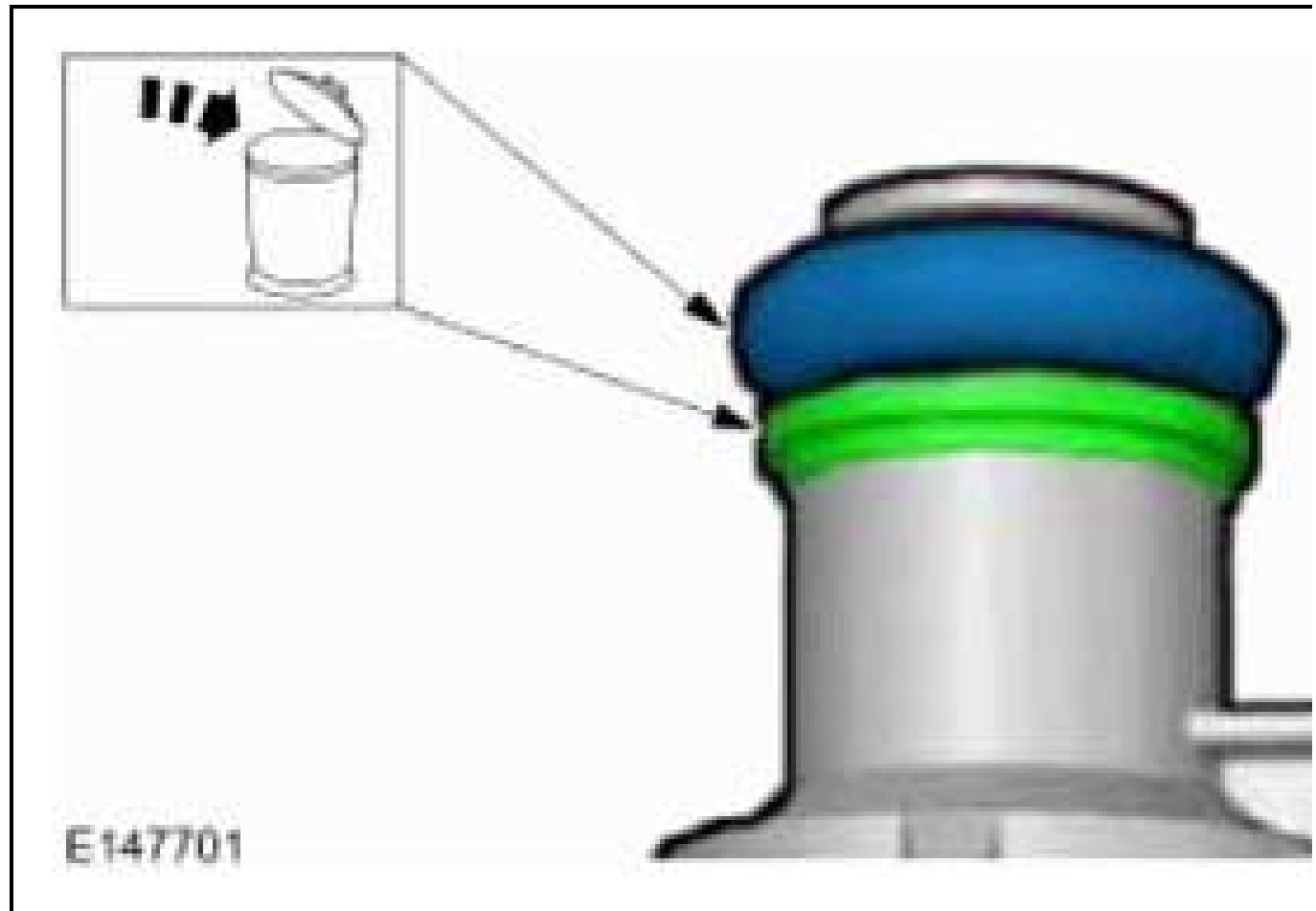
NOTE: Make sure to thoroughly clean any residual fuel or foreign material from the cylinder head, block and the general surrounding area of the fuel rails and injectors.

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

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

Special Tool(s): 310-205 Fuel Injector Brush





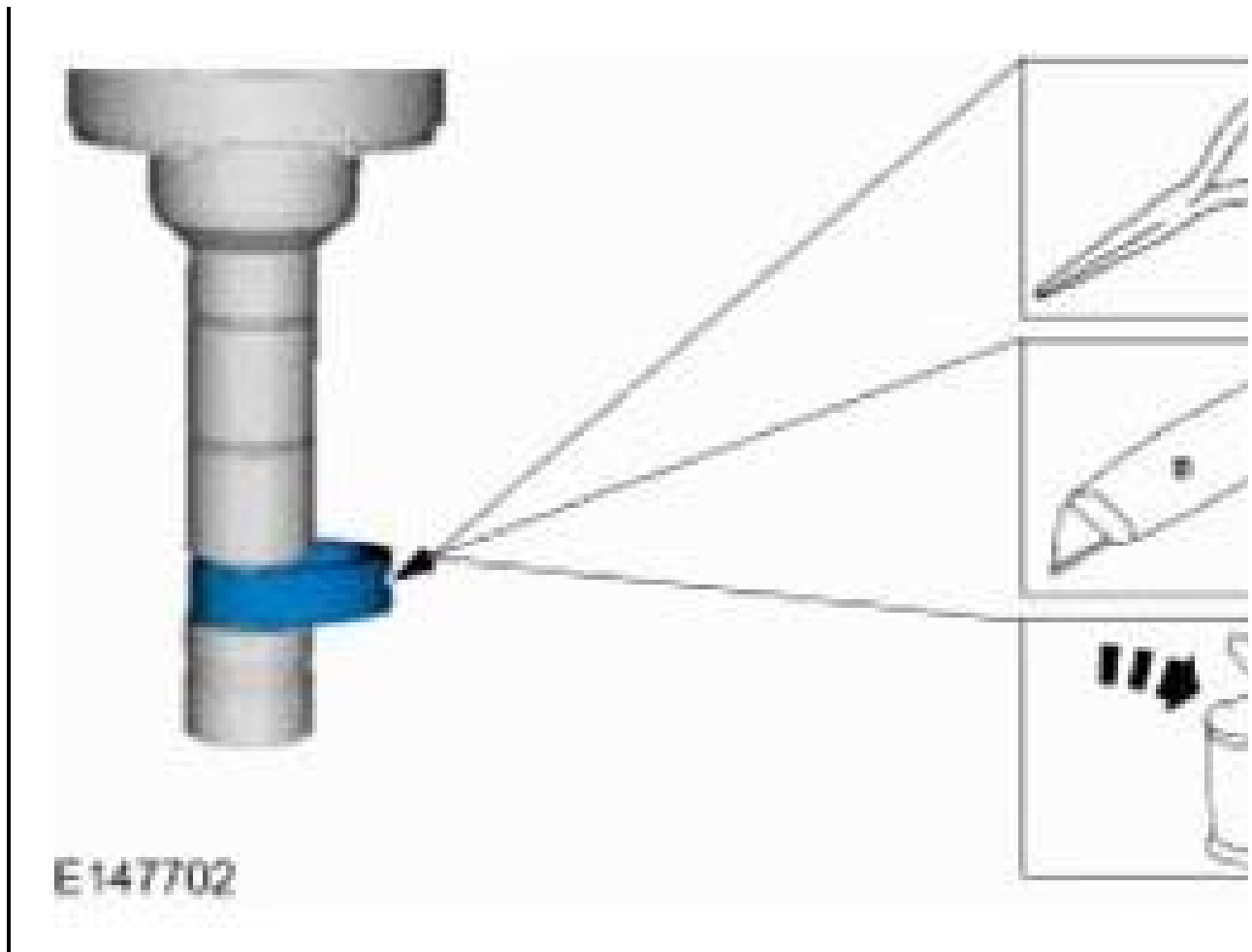
144.

NOTE: 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.

145.

NOTE: Be very careful when removing the lower Teflon® seals, not to scratch, nick or gouge the fuel injectors.

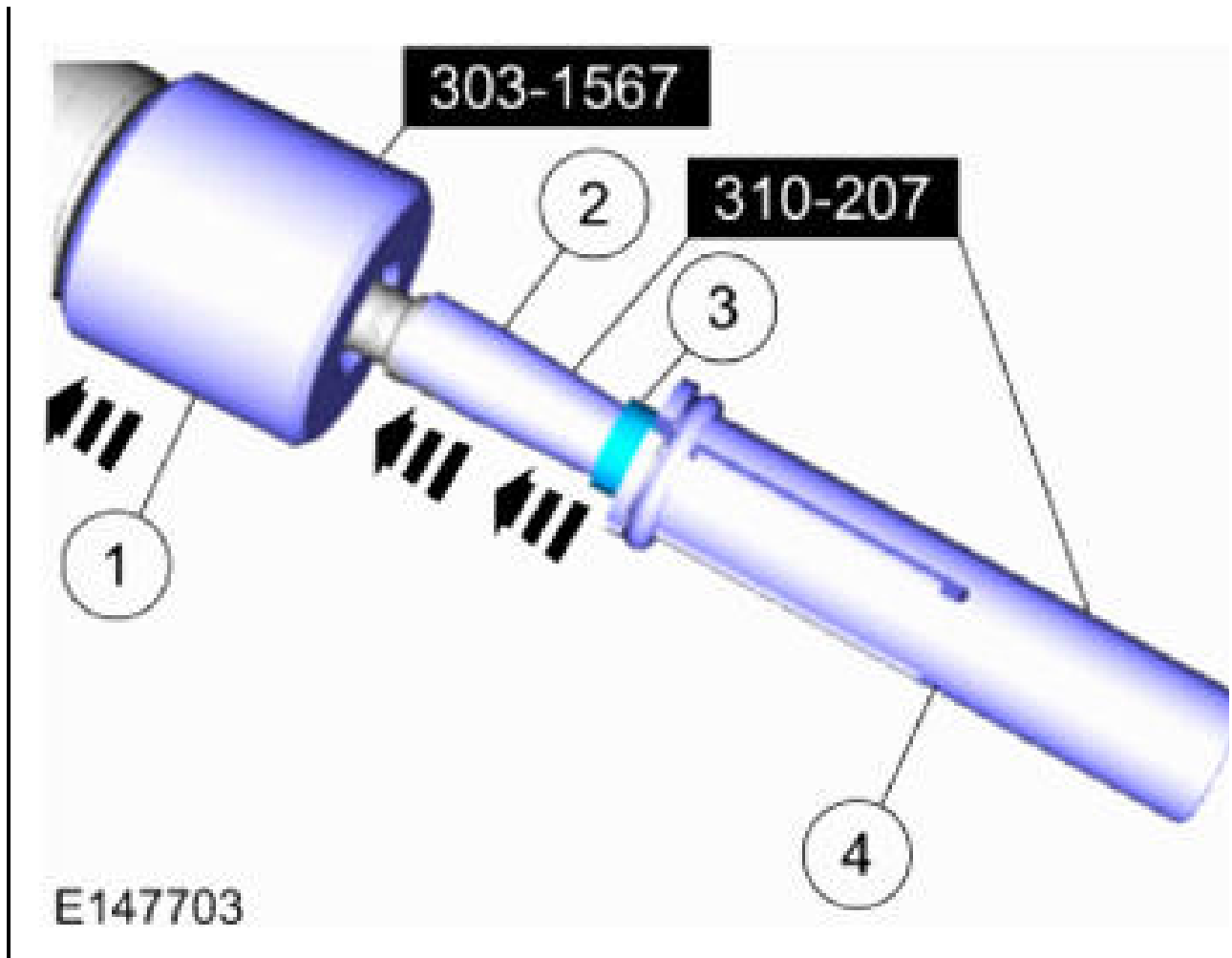
1. Pull the lower Teflon® seal away from the injector. Long-nosed pliers.
2. Carefully cut and discard the lower fuel injector Teflon® seals. Cutting knife.



NOTE: Place the Teflon® Seal Sizer, knurled side out, over the fuel injector tip until the fuel injector seal recess is exposed.

146.

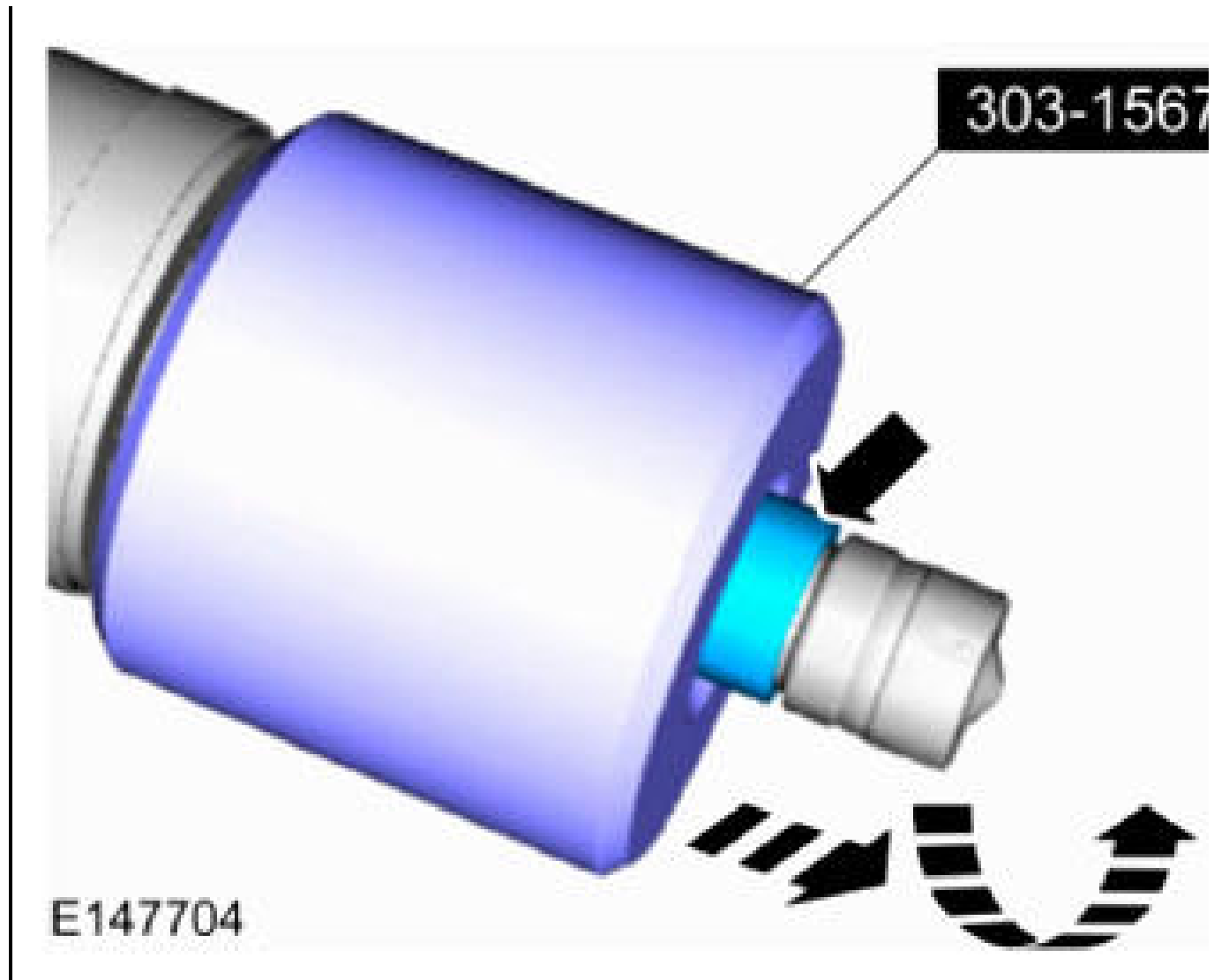
1. *Special Tool(s):* 303-1567 Sizer, Teflon Seal
2. *Special Tool(s):* 310-207 Installer, Fuel Injector Seal Assembly
3. Make sure that new lower fuel injector Teflon® seals are installed.
4. *Special Tool(s):* 310-207 Installer, Fuel Injector Seal Assembly



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

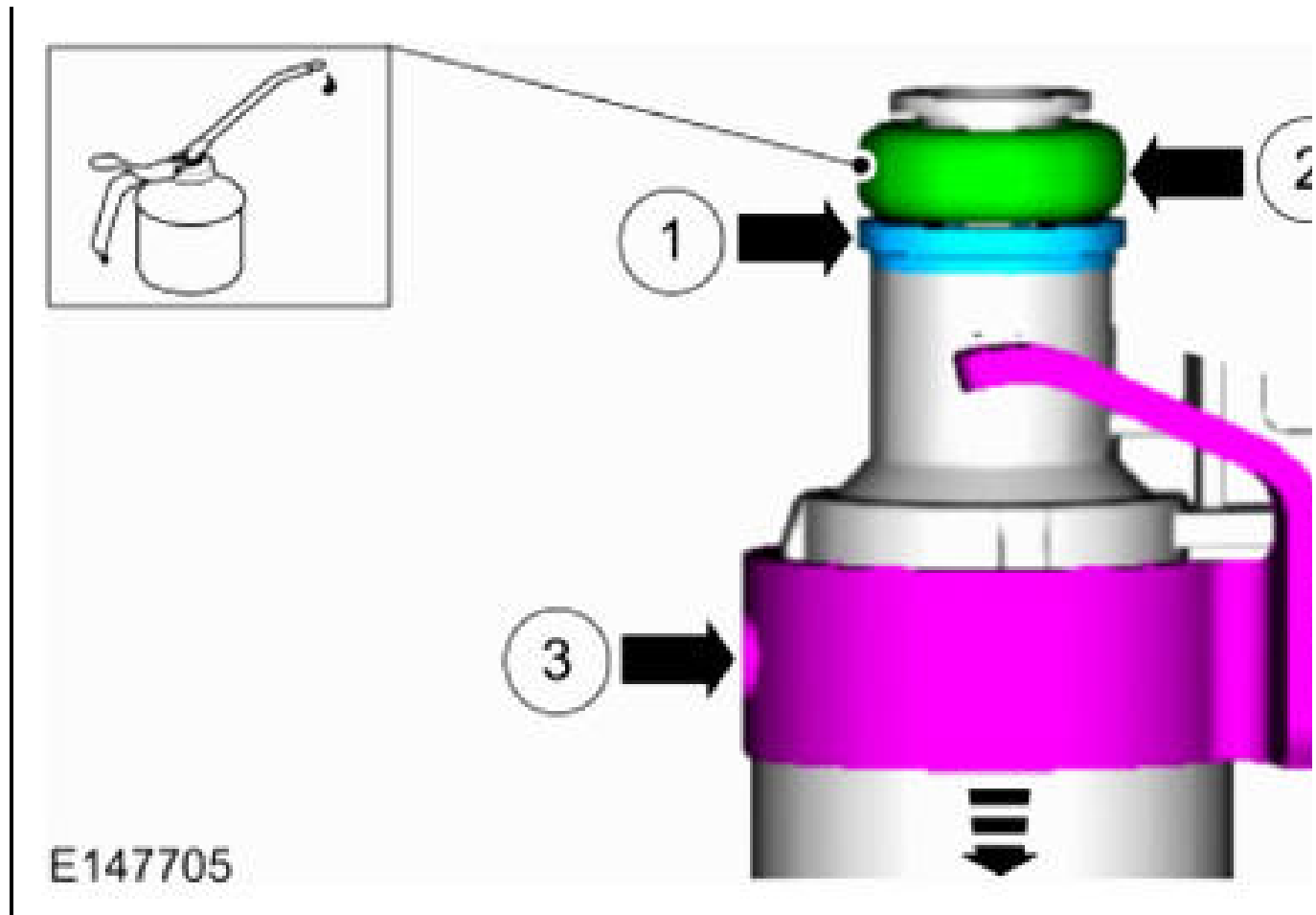
NOTE: Install the fuel injectors into the cylinder head within 15 minutes of sizing the seals due to Teflon® seal expansion.

Special Tool(s): 303-1567 Sizer, Teflon Seal



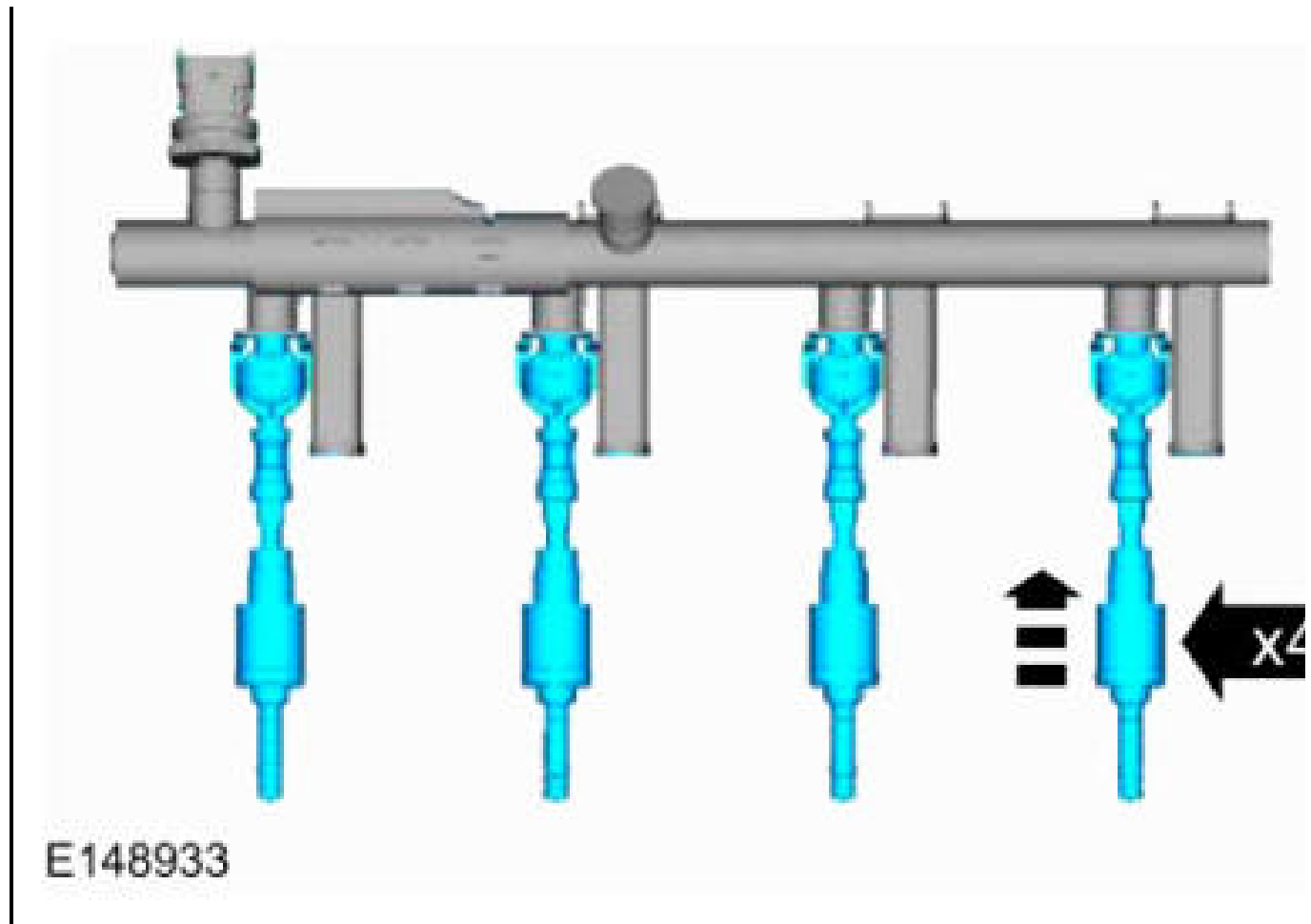
148. **NOTE:** Use fuel injector O-ring seals that are made of special fuel-resistant material. The use of ordinary O-ring seals may cause the fuel system to leak. Do not reuse the O-ring seals.
- NOTE:** Do not lubricate the new lower Teflon® fuel injector seals.
- NOTE:** Make sure that new upper fuel injector O-ring seals, upper fuel injector O-ring seal support rings and fuel injector retainer clips are installed.

Material: Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



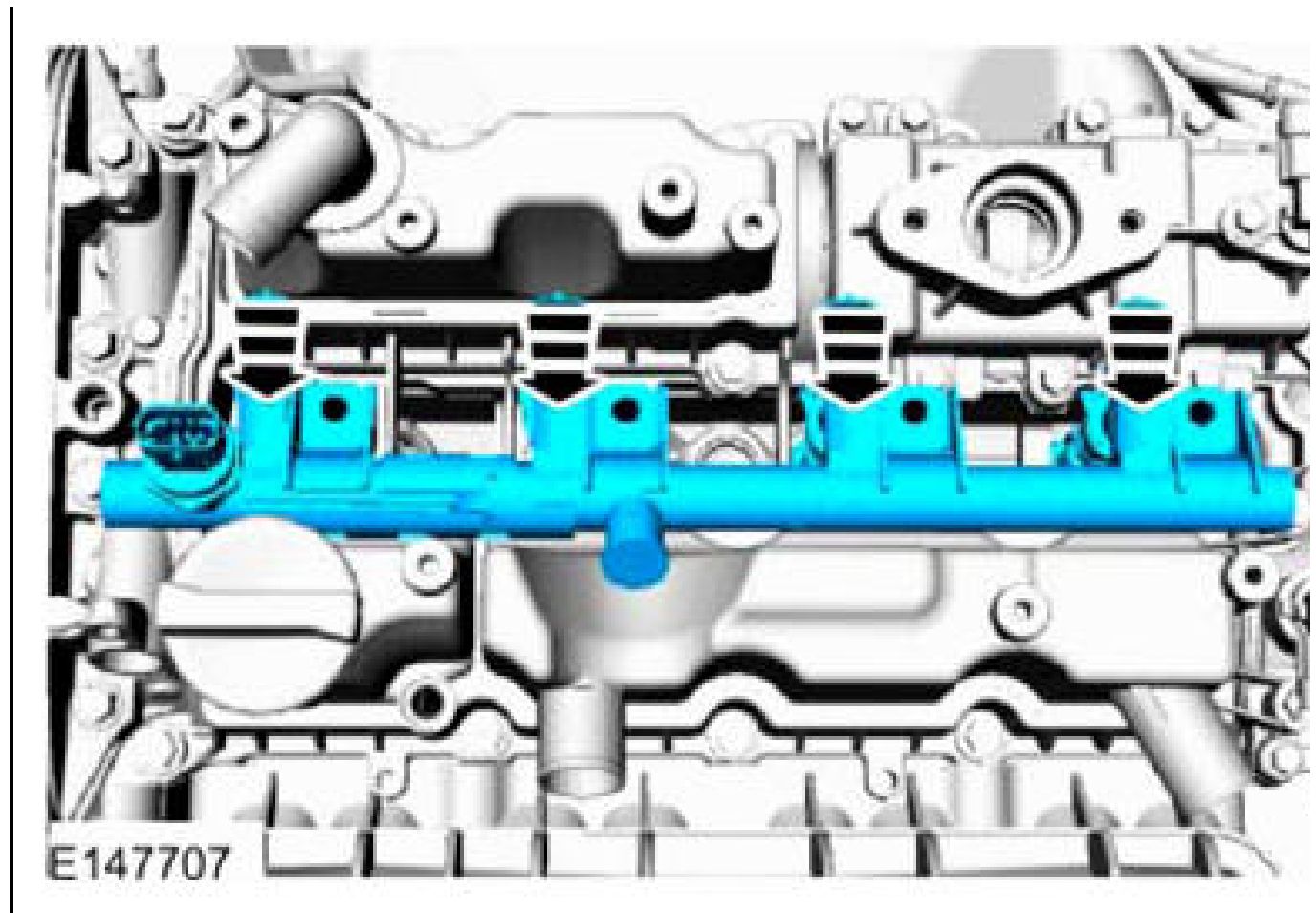
149. **NOTE:** The anti-rotation finger of the fuel injector clip must slip into the groove of the fuel rail cup.

NOTE: The fuel rail pressure sensor must be replaced if it is removed from the fuel rail.



150. **NOTE:** Take extra care when handling the components.

Only use moderate force.

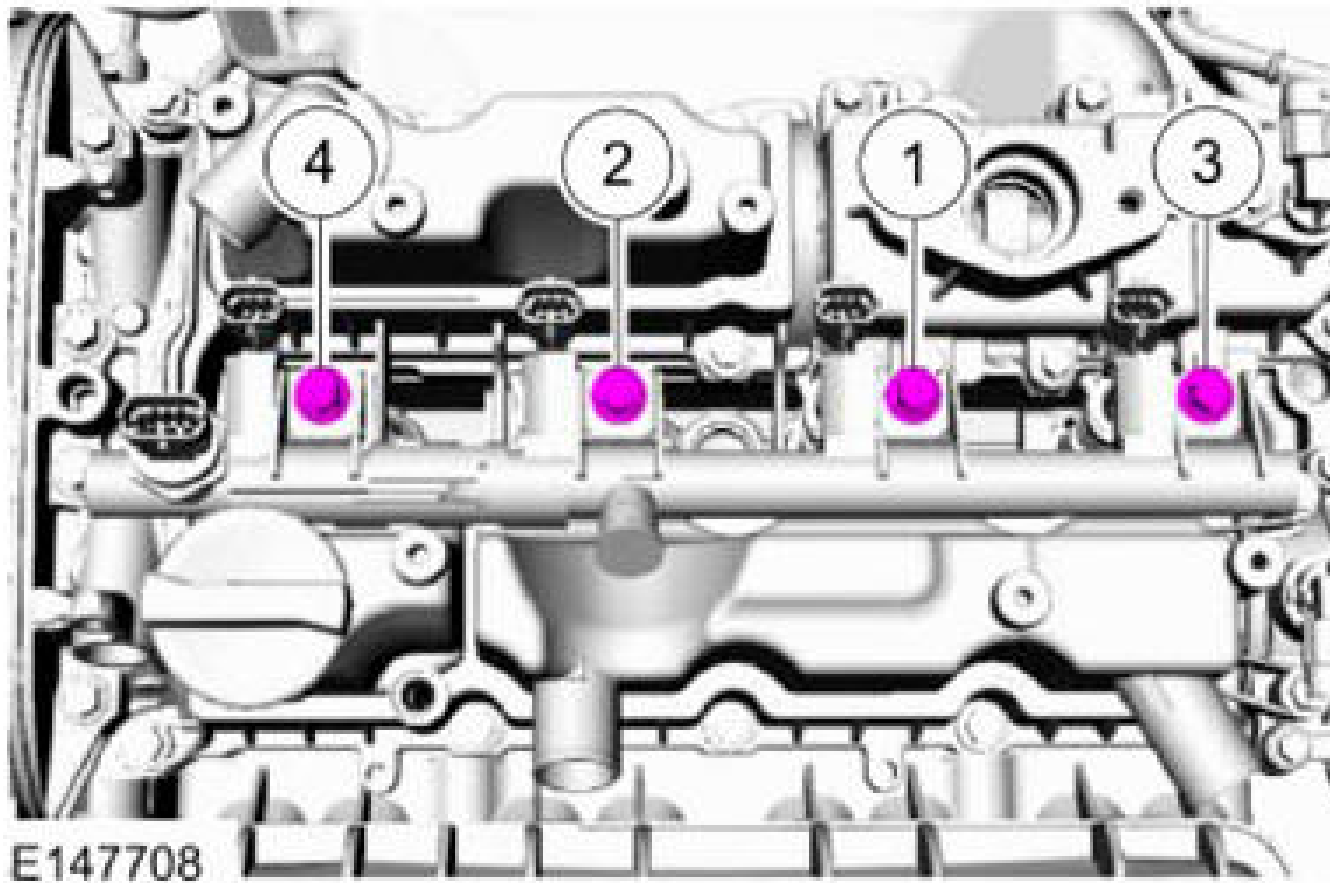


151. Install the 4 bolts finger tight.

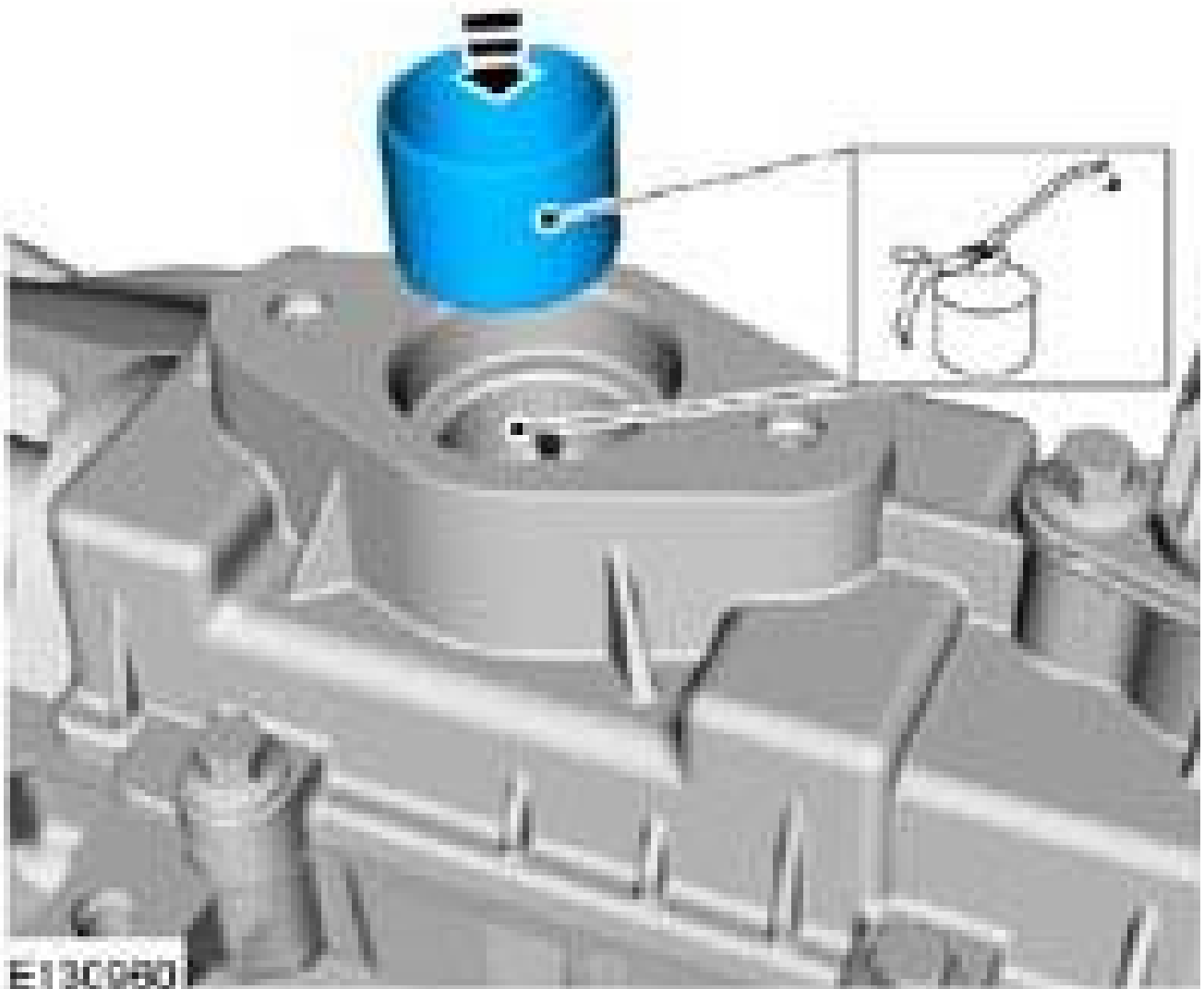
Torque:

Stage 1: 5 Nm

Stage 2: 23 Nm



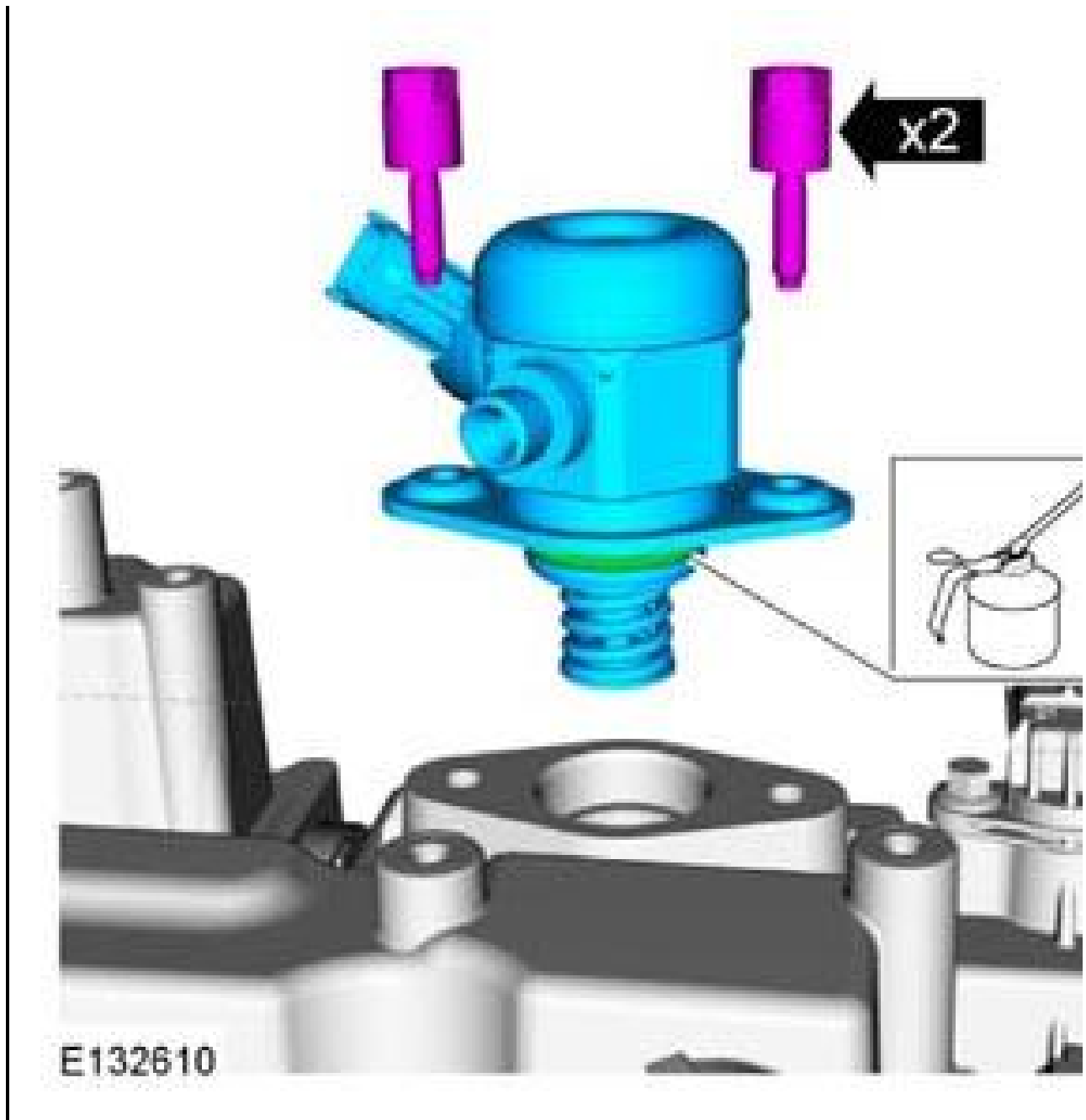
152. Material: Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)



153. **NOTE:** Install all the bolts finger tight before final tightening.

- *Material:* Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)
- Install the fuel injection pump and loosely install the 2 fuel injection pump bolts, alternately tighten each bolt one half of a revolution until seated.

Torque: 13 Nm



154. **NOTE:** Make sure that a new component is installed.

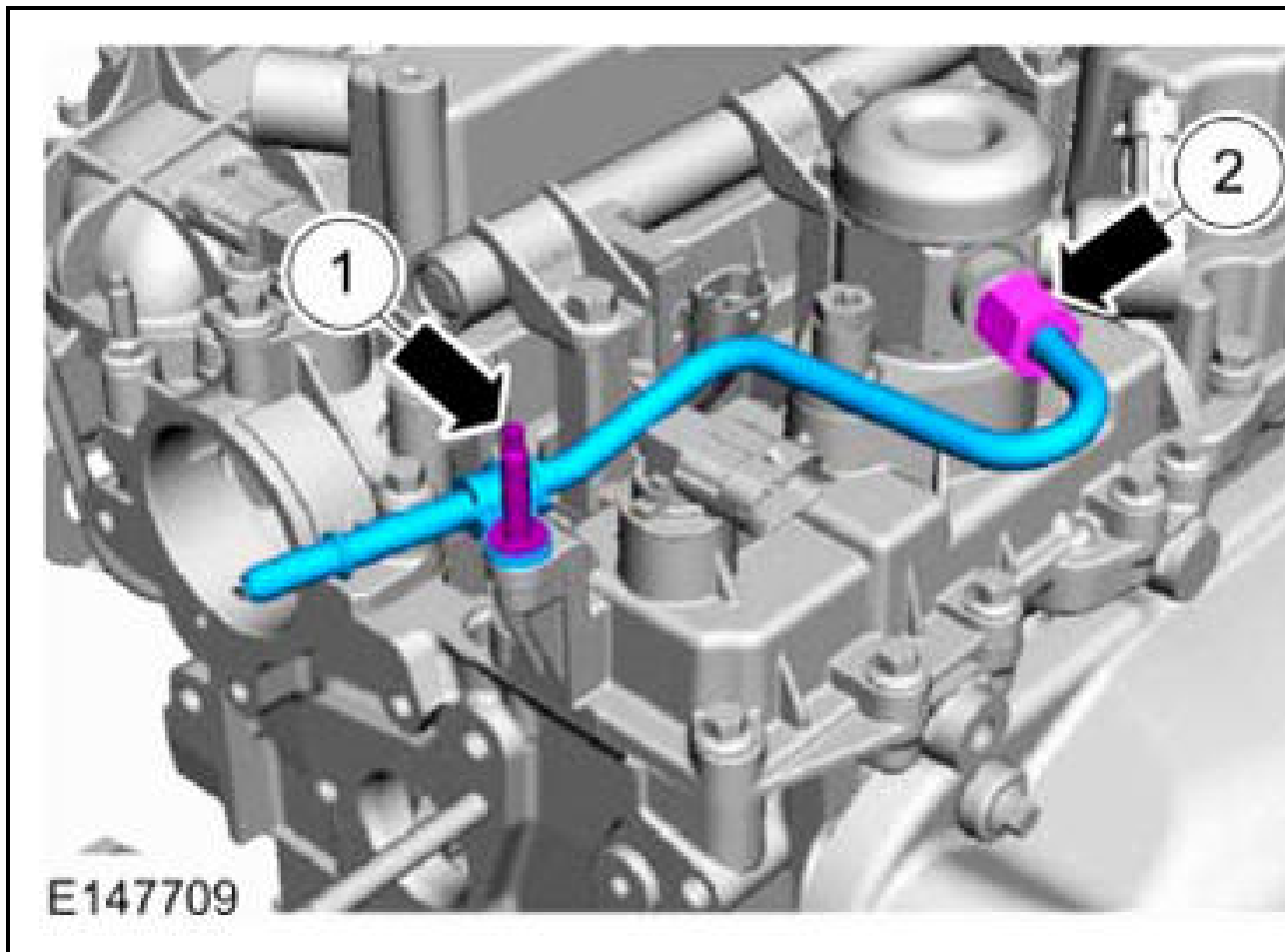
NOTE: Calculate the correct torque wrench setting for the following torque. Refer to Torque Wrench Adapter Formulas in illustration.

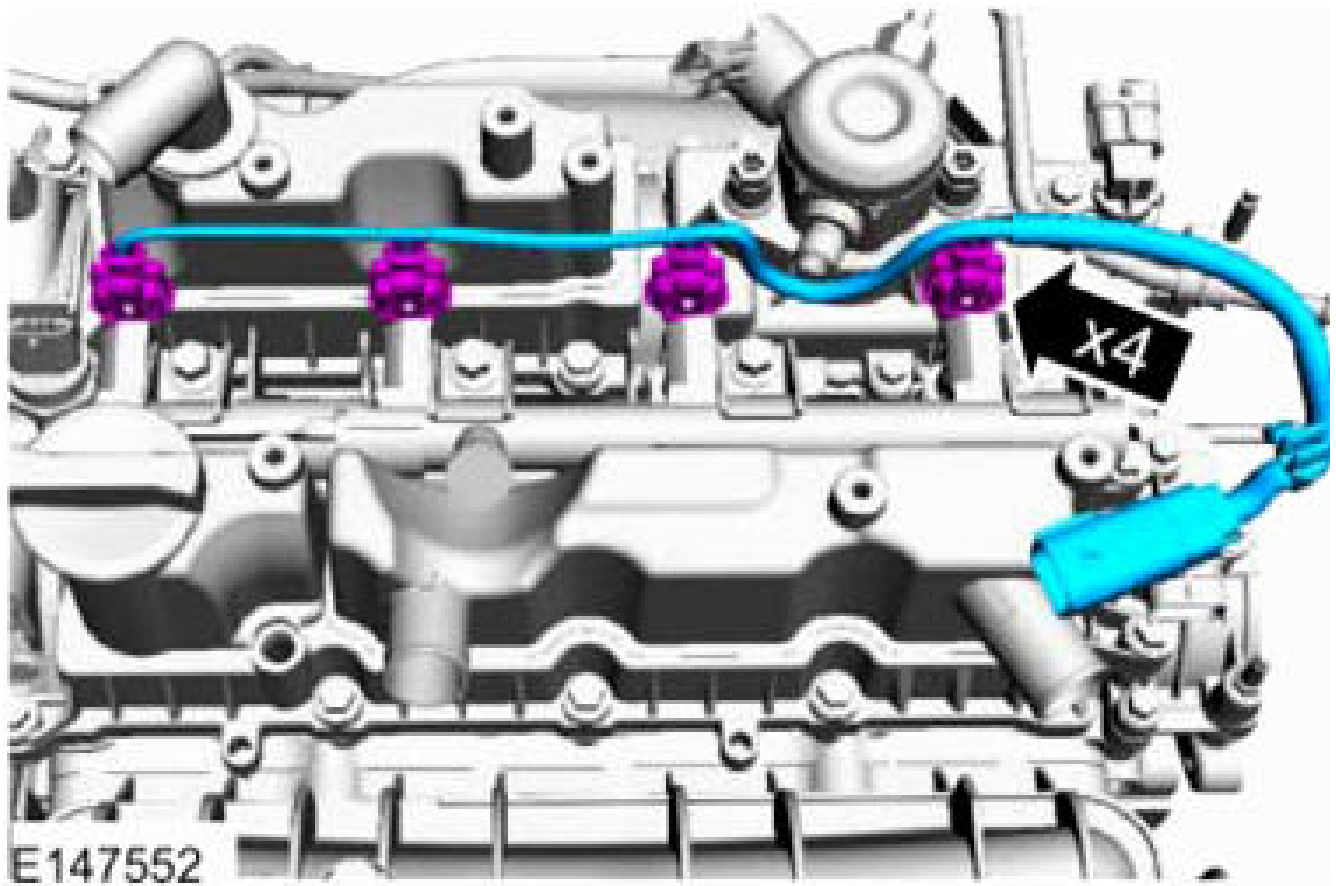
1. Torque: 7 Nm
2. Torque:

Stage 1: Using a torque adapter, tighten to 21 Nm

Stage 2: Wait 5 min

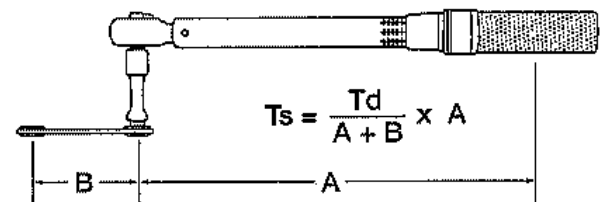
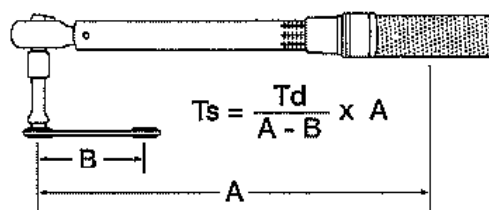
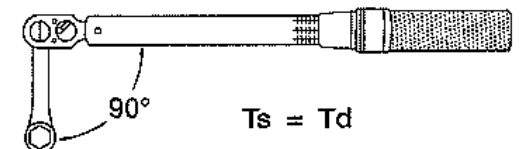
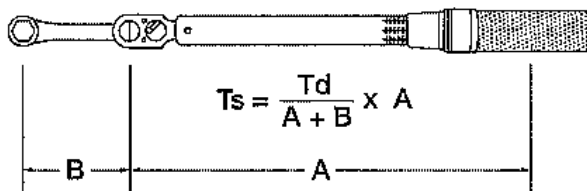
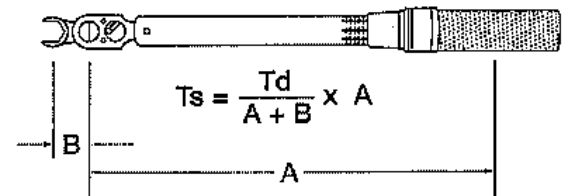
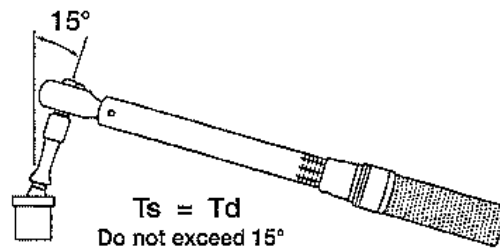
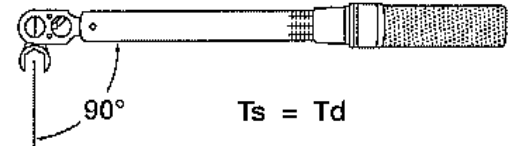
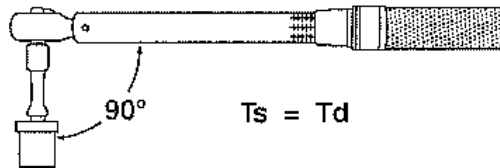
Stage 3: Using a torque adapter, tighten to 21 Nm





155.

Torque Wrench Adapter Formulas



TORQUE FORMULA LEGEND

T_s = Torque wrench setting
 T_d = Fastener torque desired

A = Torque wrench length
 B = Torque adapter length

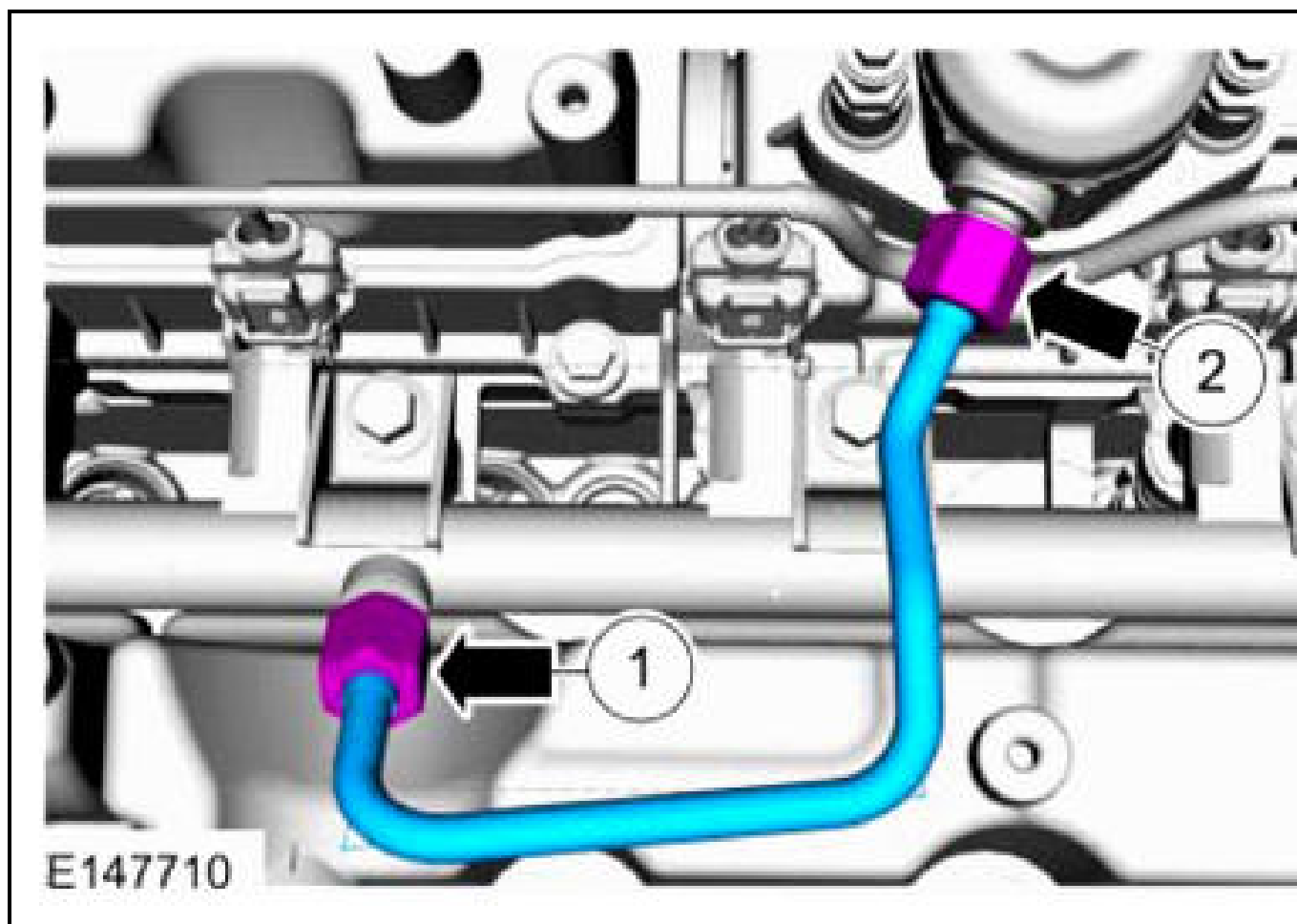
156. **NOTE:** Make sure that a new component is installed.
- NOTE:** Only tighten the 2 high pressure fuel tube flare nuts finger tight at this stage.
- NOTE:** Calculate the correct torque wrench setting for the following torque. Refer to Torque Wrench Adapter Formulas in illustration.

Torque:

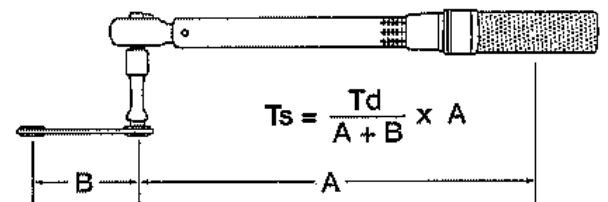
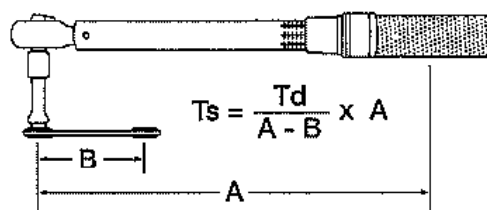
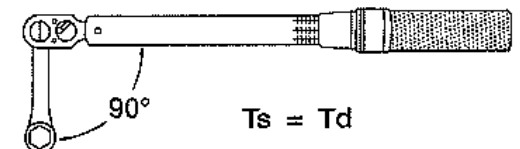
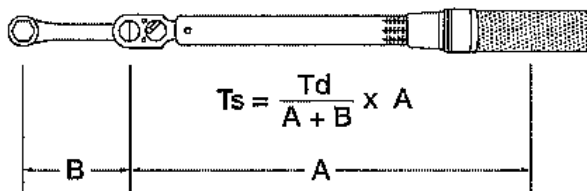
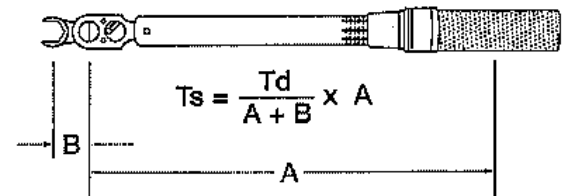
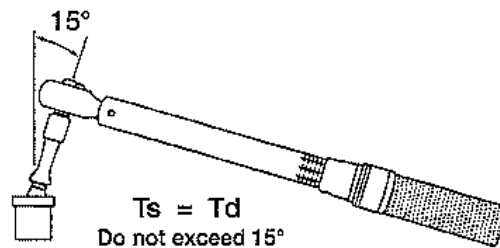
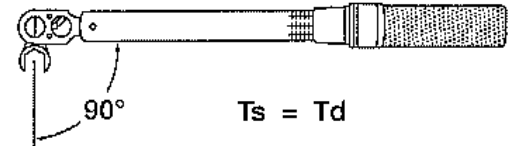
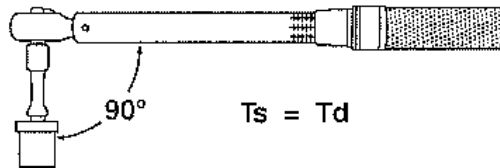
Stage 1: Using a torque adapter, tighten to 21 Nm

Stage 2: Wait 5 min

Stage 3: Using a torque adapter, tighten to 21 Nm



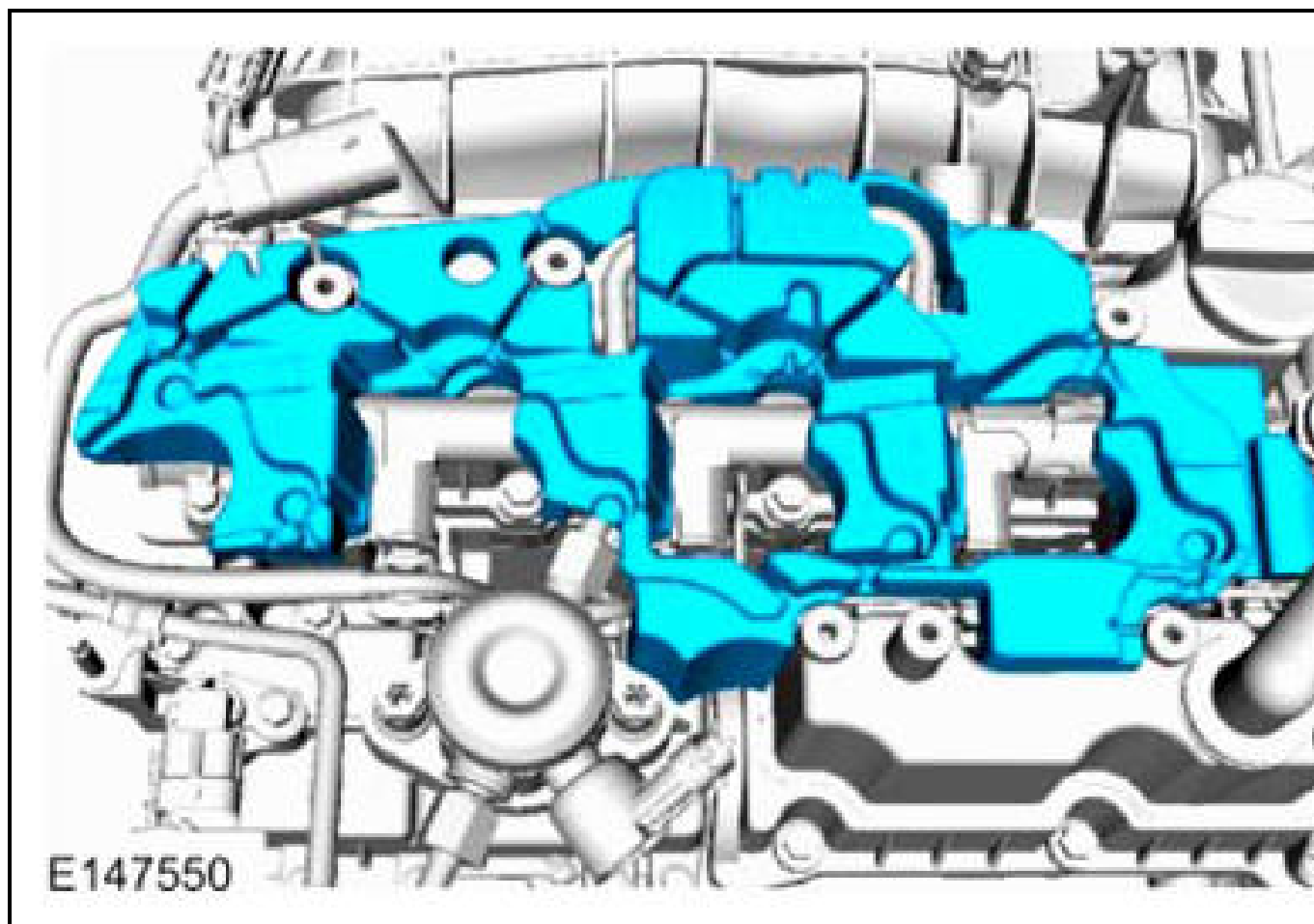
Torque Wrench Adapter Formulas



TORQUE FORMULA LEGEND

T_s = Torque wrench setting
 T_d = Fastener torque desired

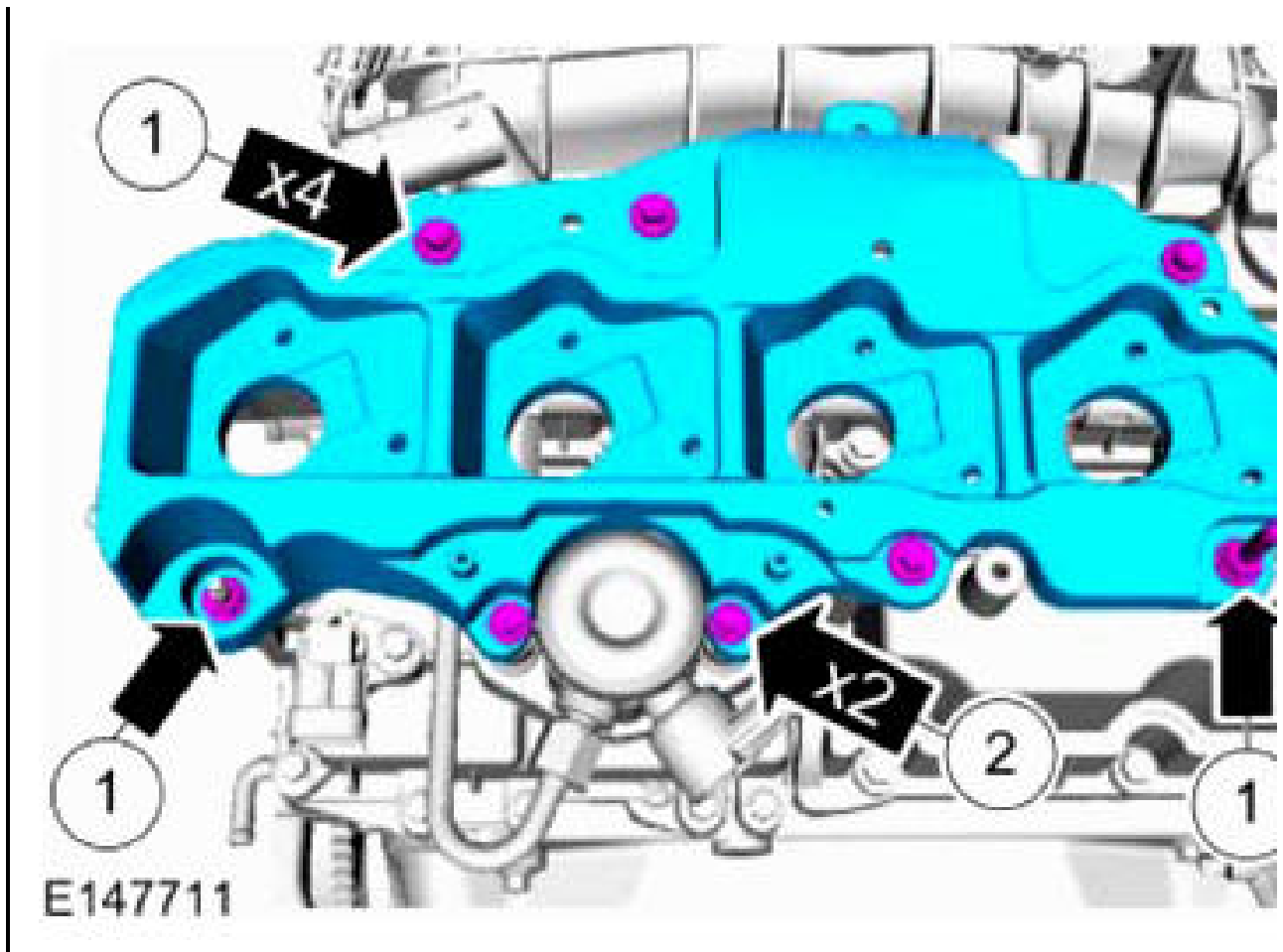
A = Torque wrench length
 B = Torque adapter length



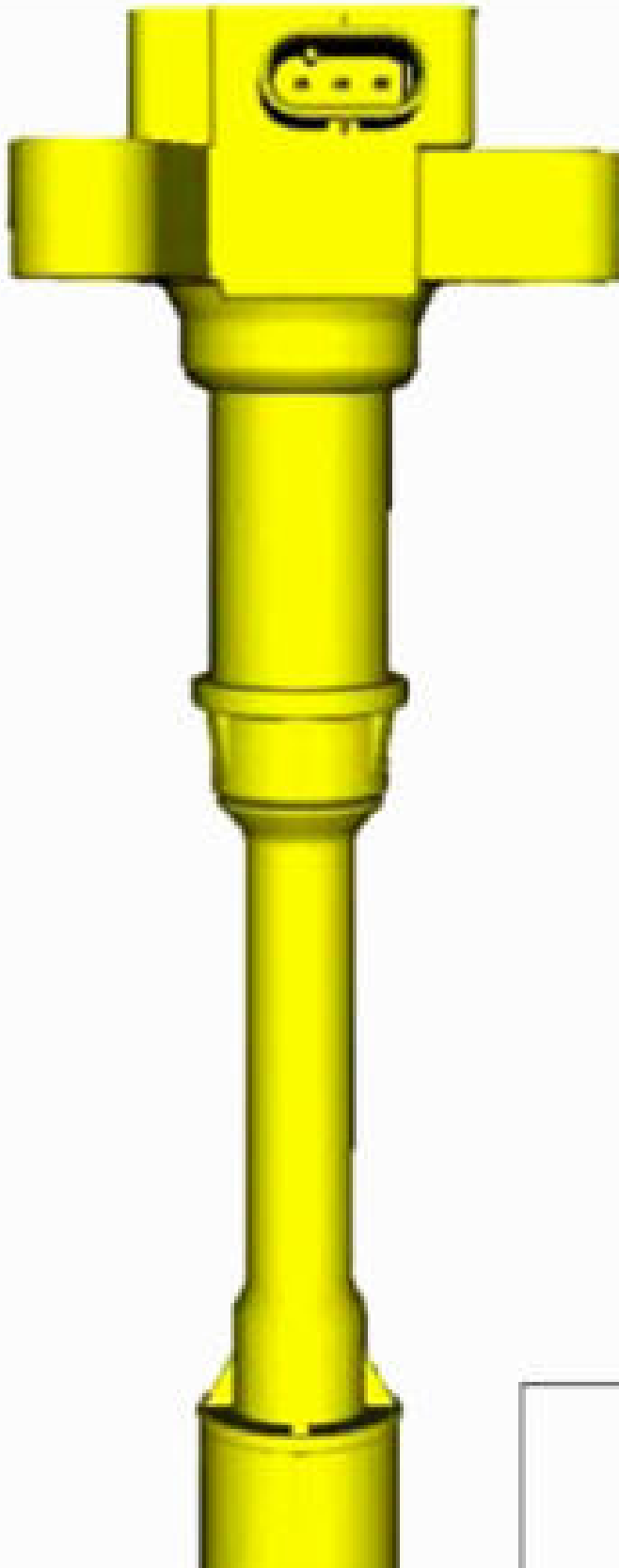
157.

158.

1. *Torque:* 10 Nm
2. *Torque:* 6 Nm

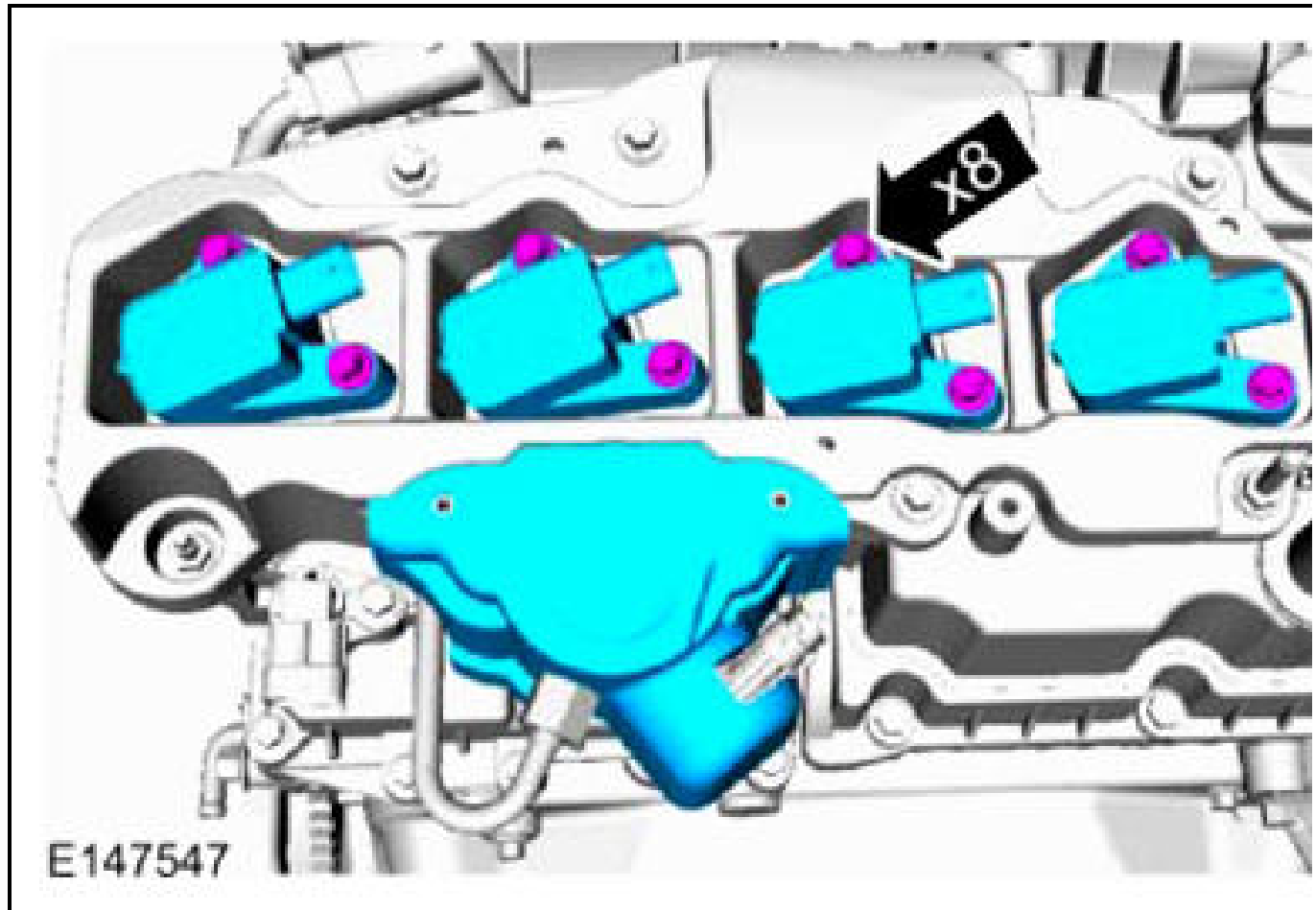


159. *Material:* Silicone Brake Caliper Grease and Dielectric Compound/XG-3-A (ESE-M1C171-A)



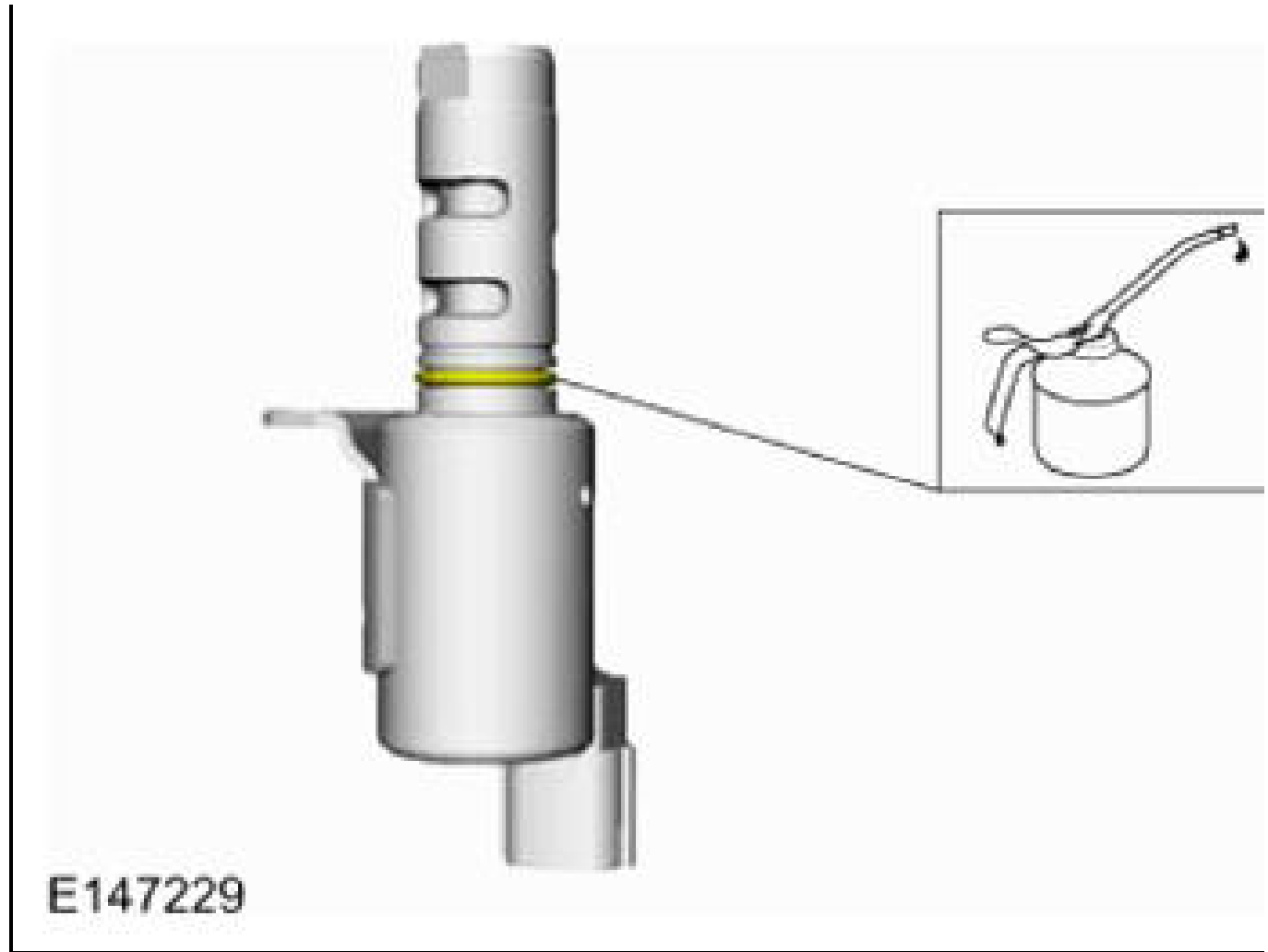
160. **NOTE:** When removing or installing the fuel injection pump noise insulator, spreading the openings will reduce the risk of damage.

Torque: 10 Nm

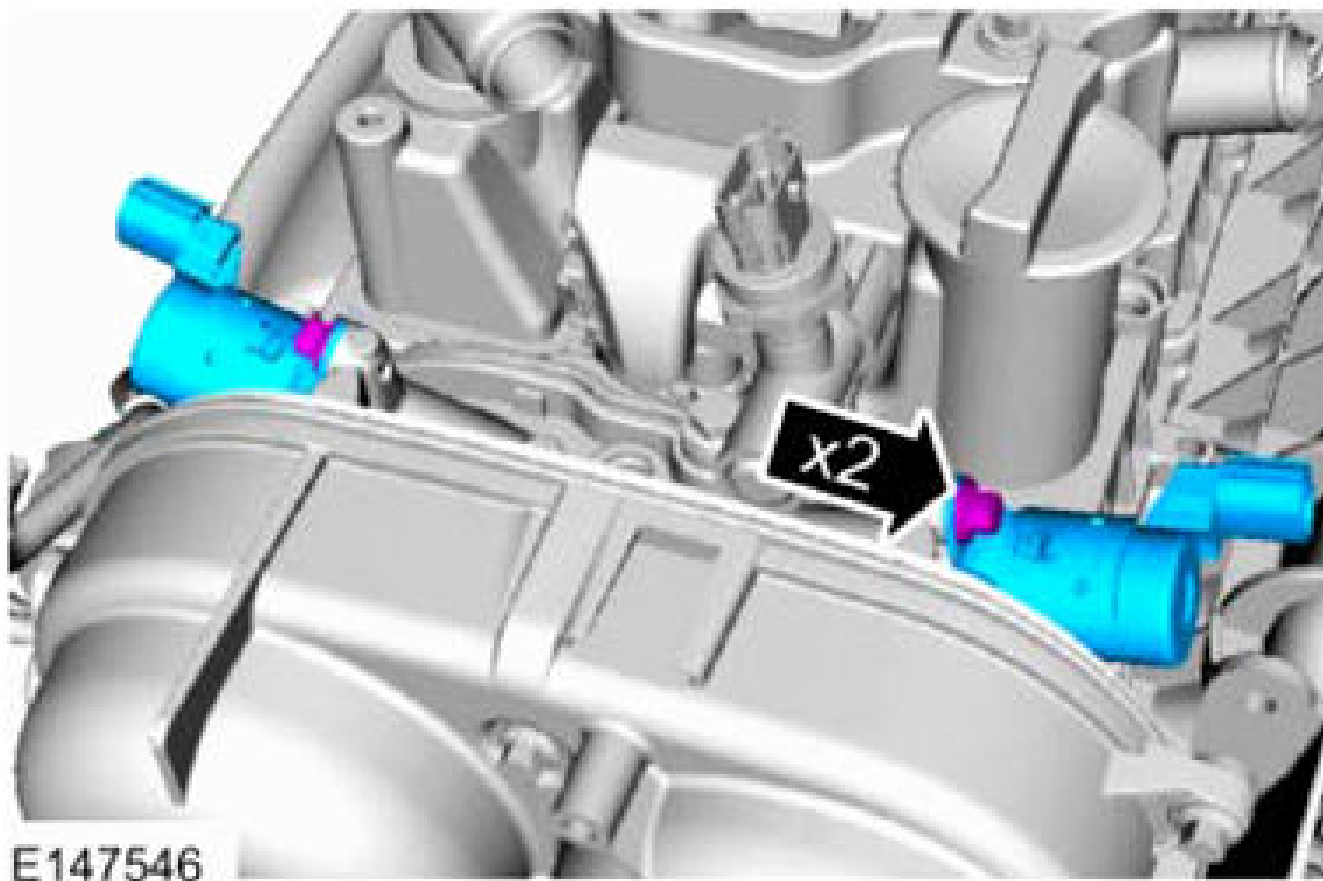


161. **NOTE:** The O-ring seals are to be reused unless damaged.

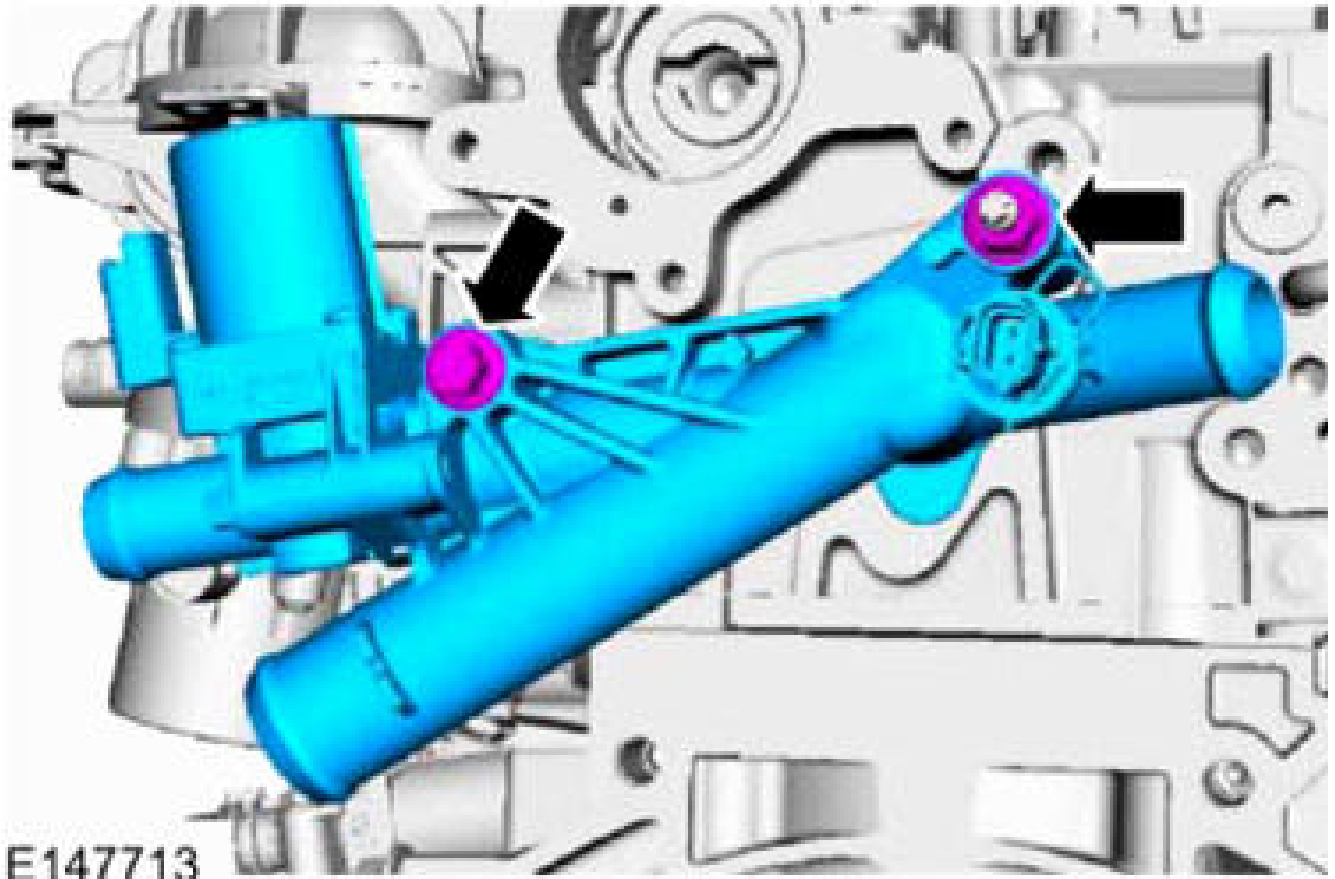
Material: Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

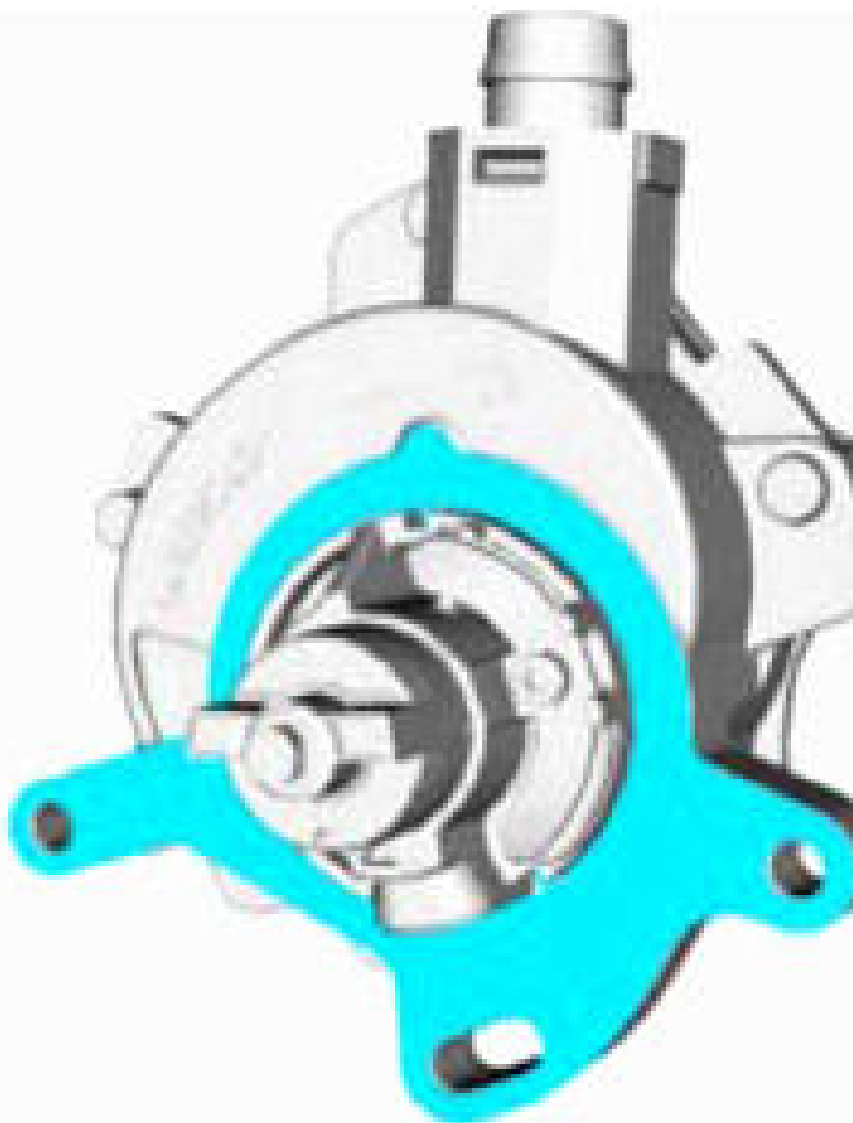


162. *Torque:* 8 Nm



163. *Torque:* 18 Nm

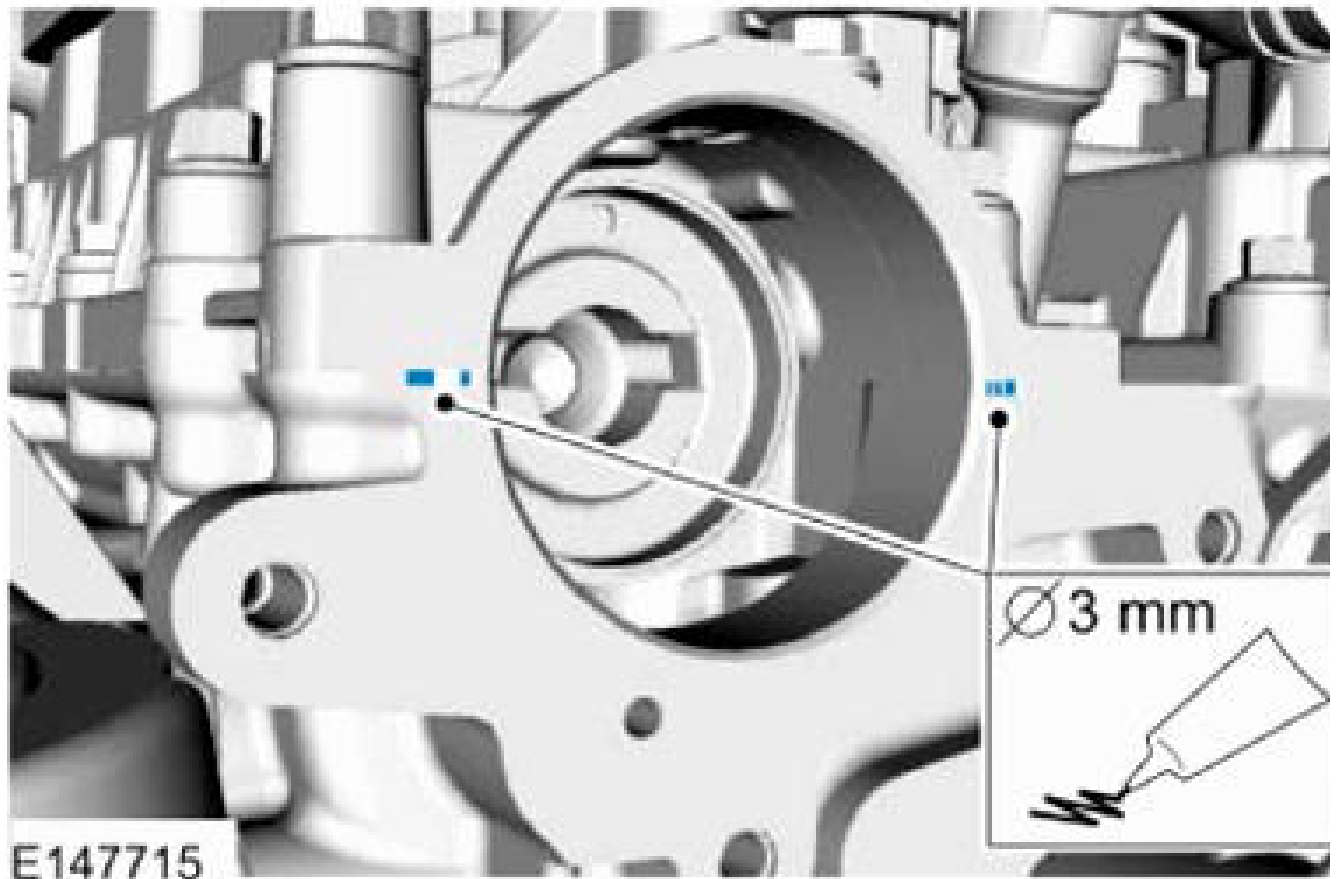




E147714

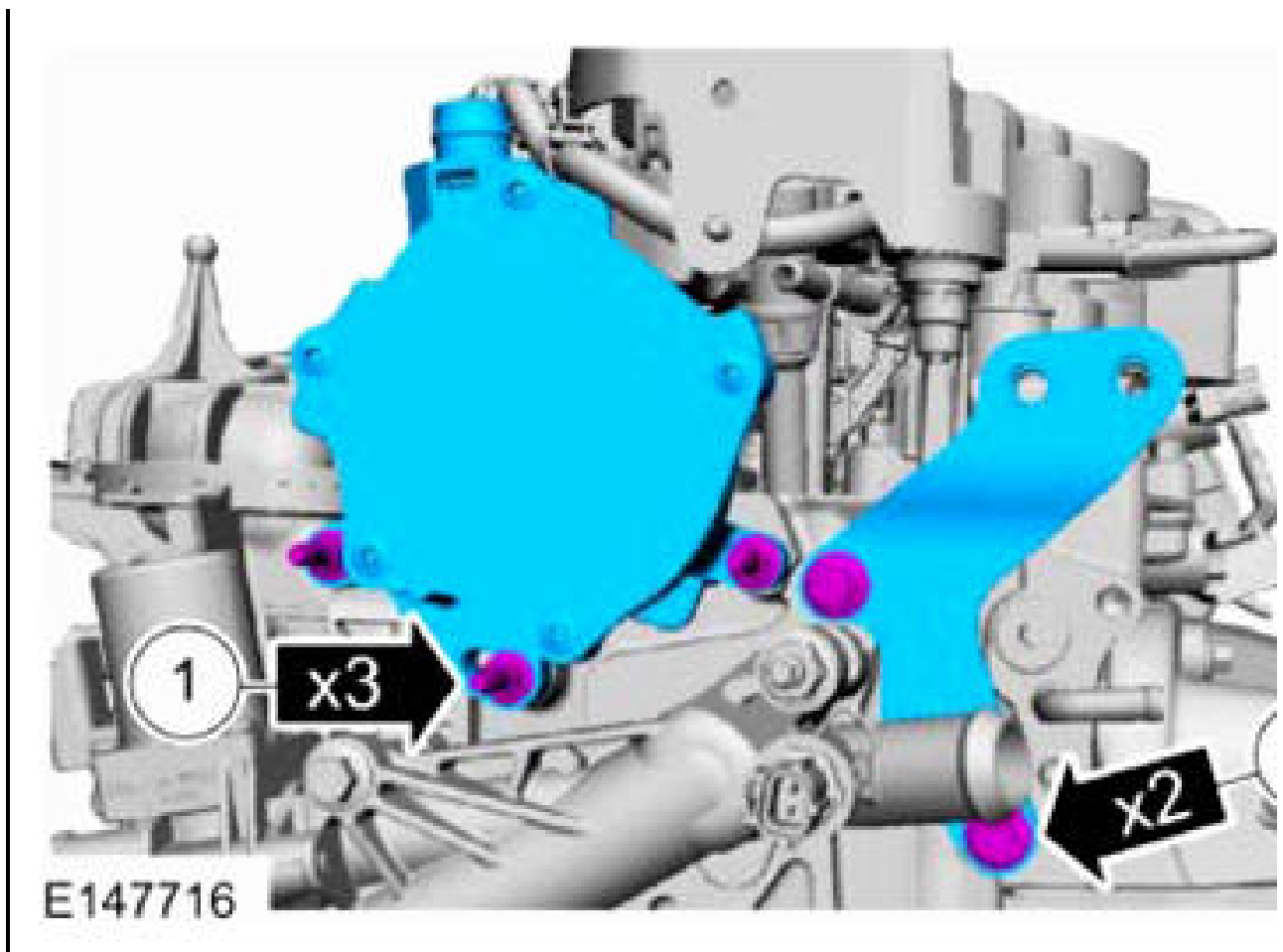
164.

165. *Material:* Flange Sealant/CU7Z-19B508-A (WSS-M2G348-A11)

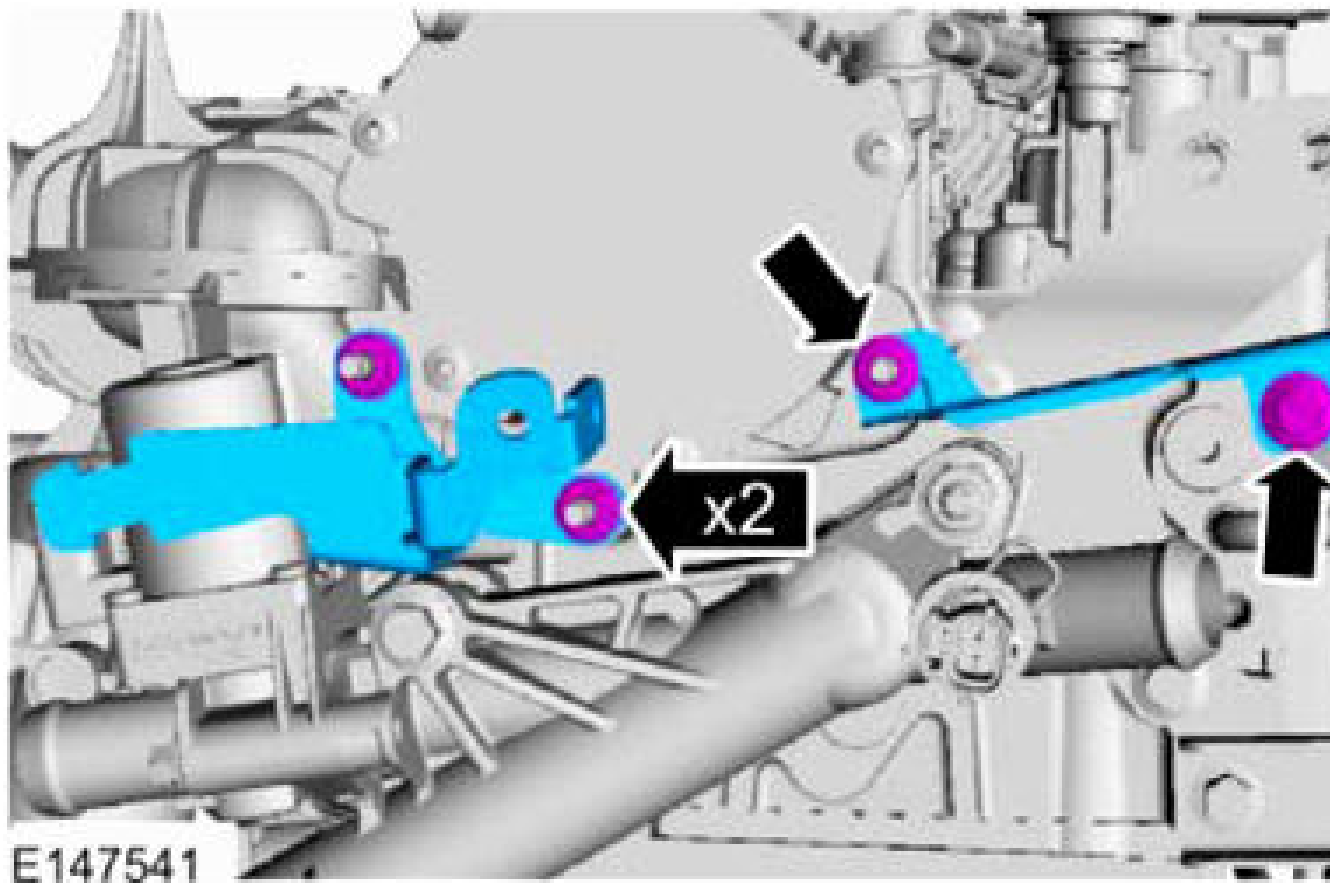


166.

1. *Torque:* 10 Nm
2. *Torque:* 19 Nm

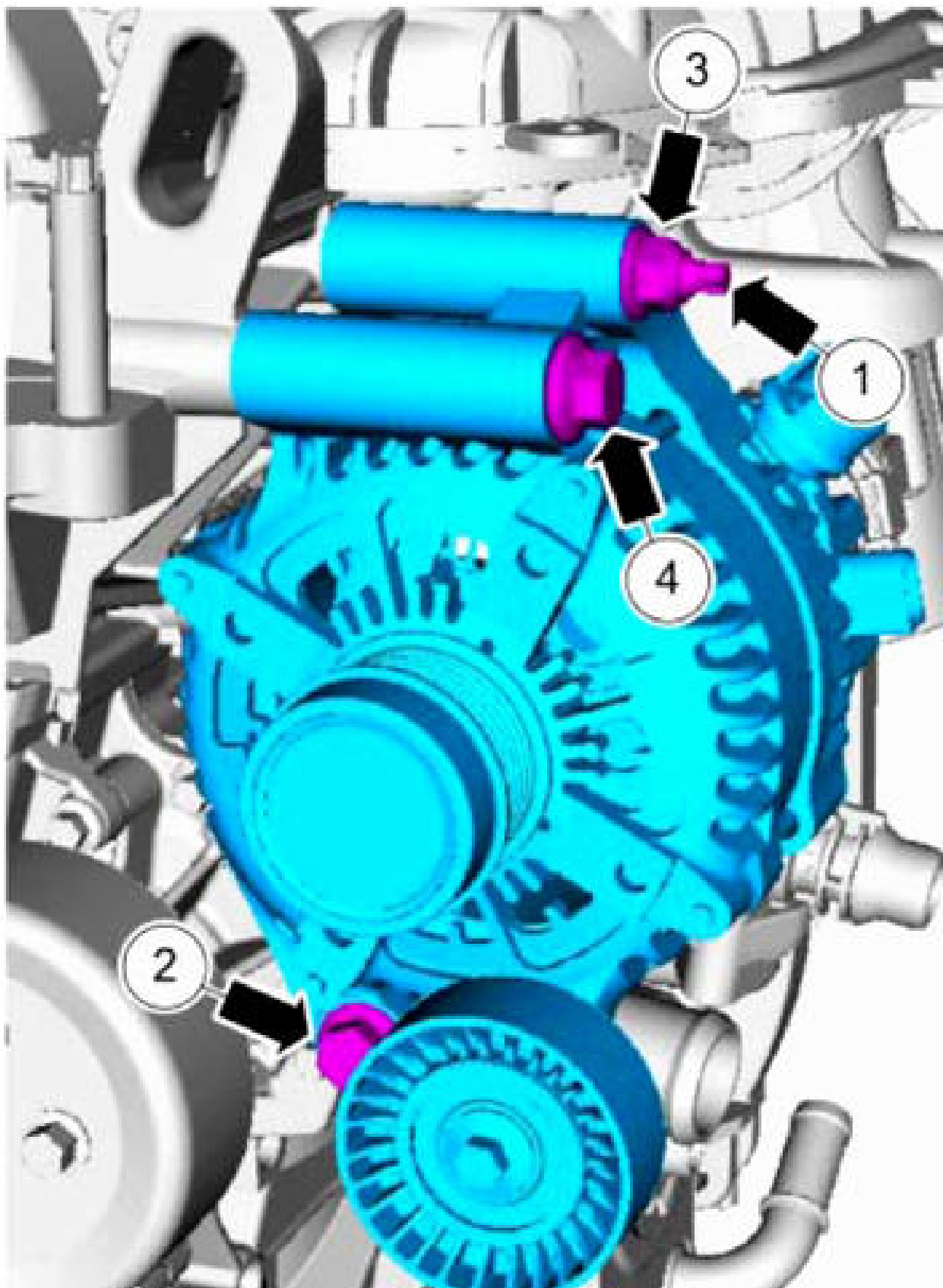


167. *Torque:* 10 Nm

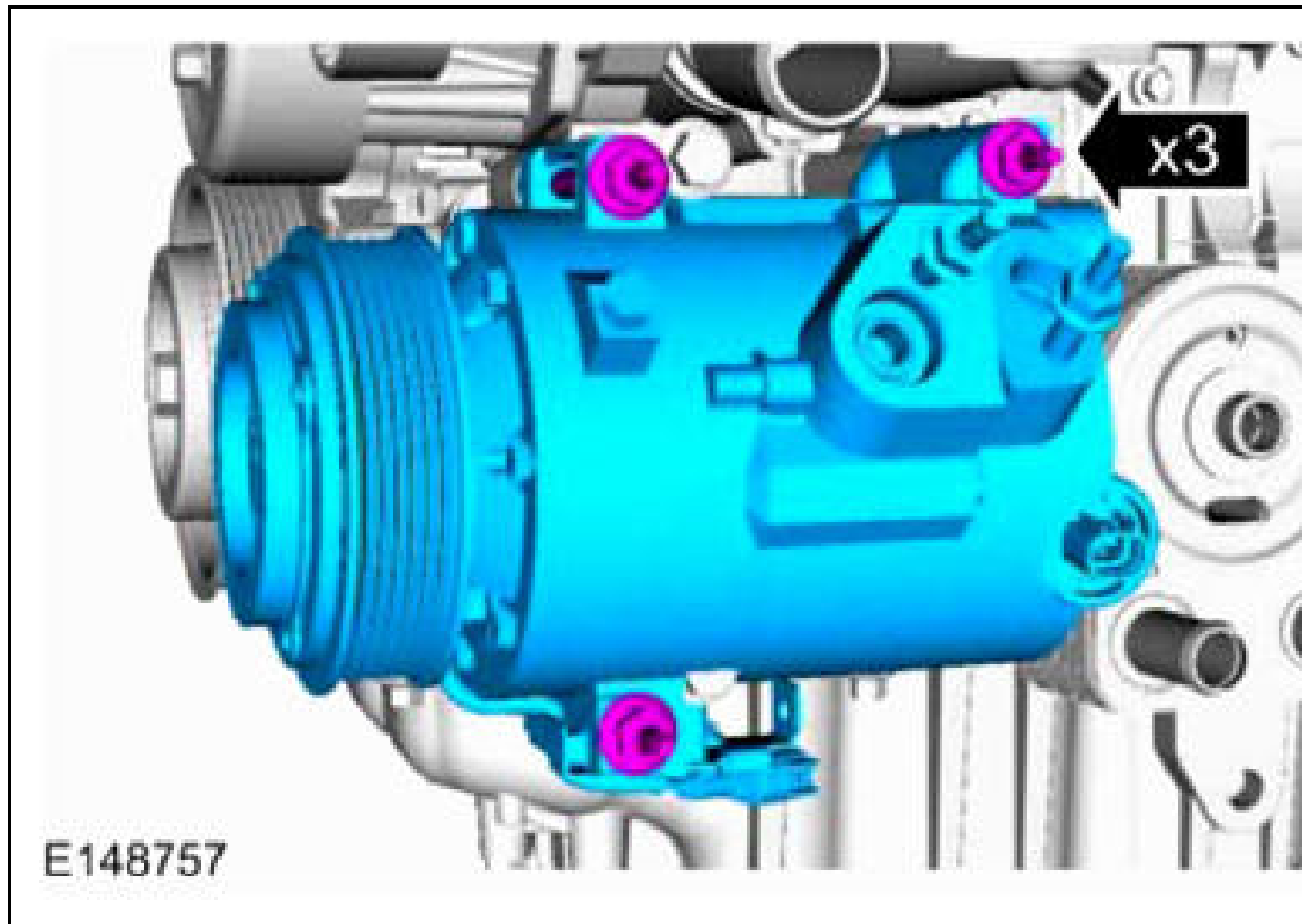


168.

1. Torque: 10 Nm
2. Torque: 48 Nm
3. Torque: 48 Nm
4. Torque: 48 Nm

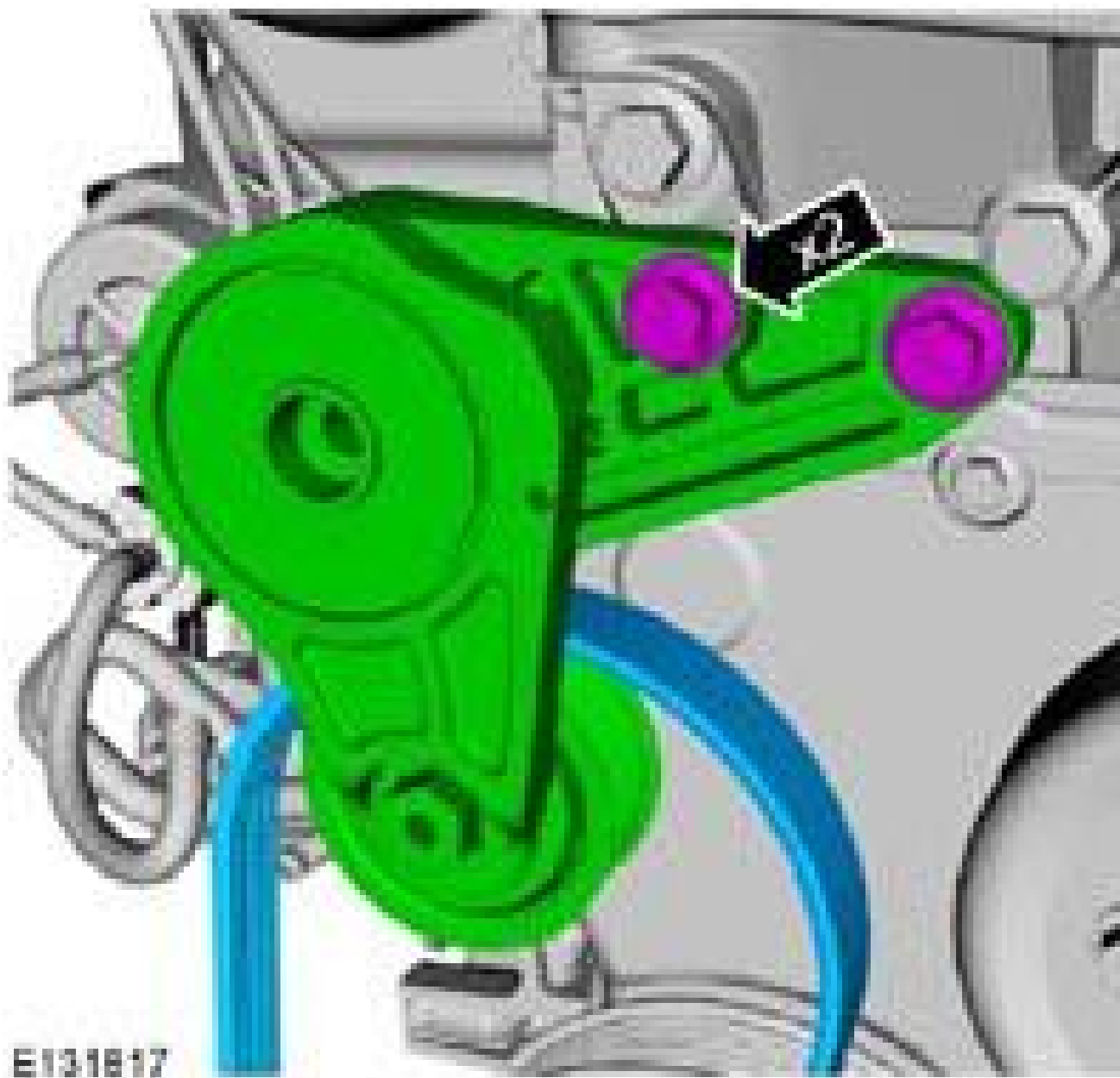


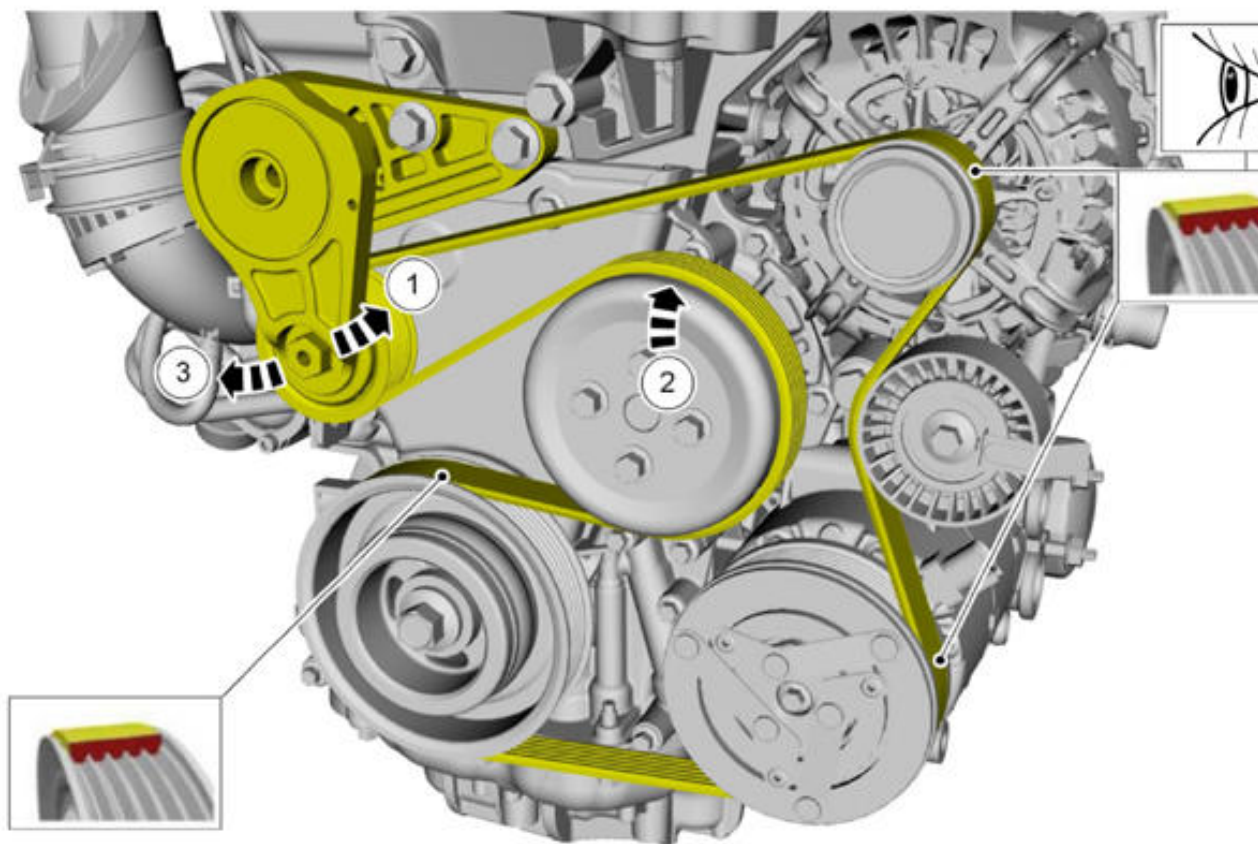
169. *Torque:* 25 Nm



170. *Torque:* 48 Nm



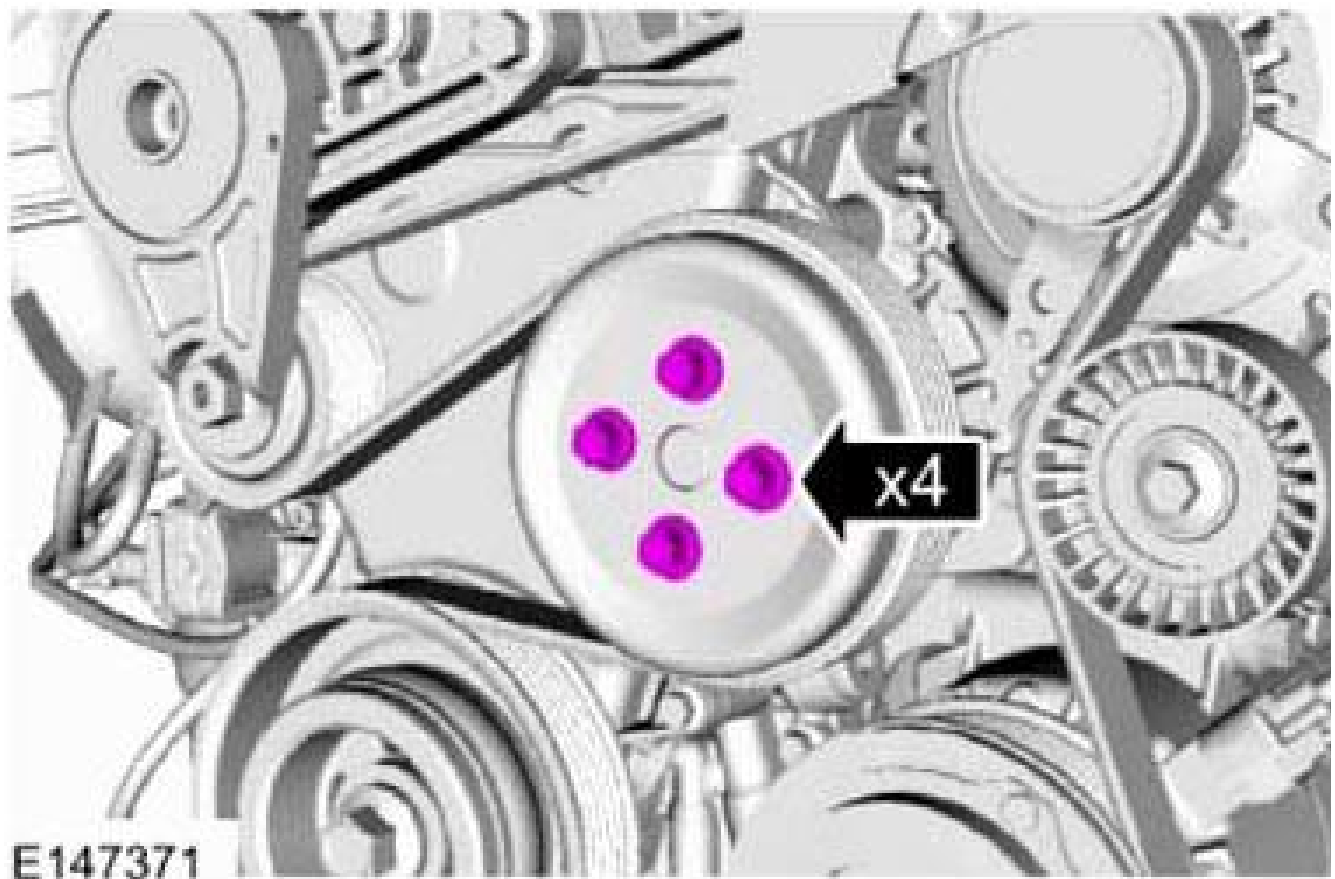




E131829

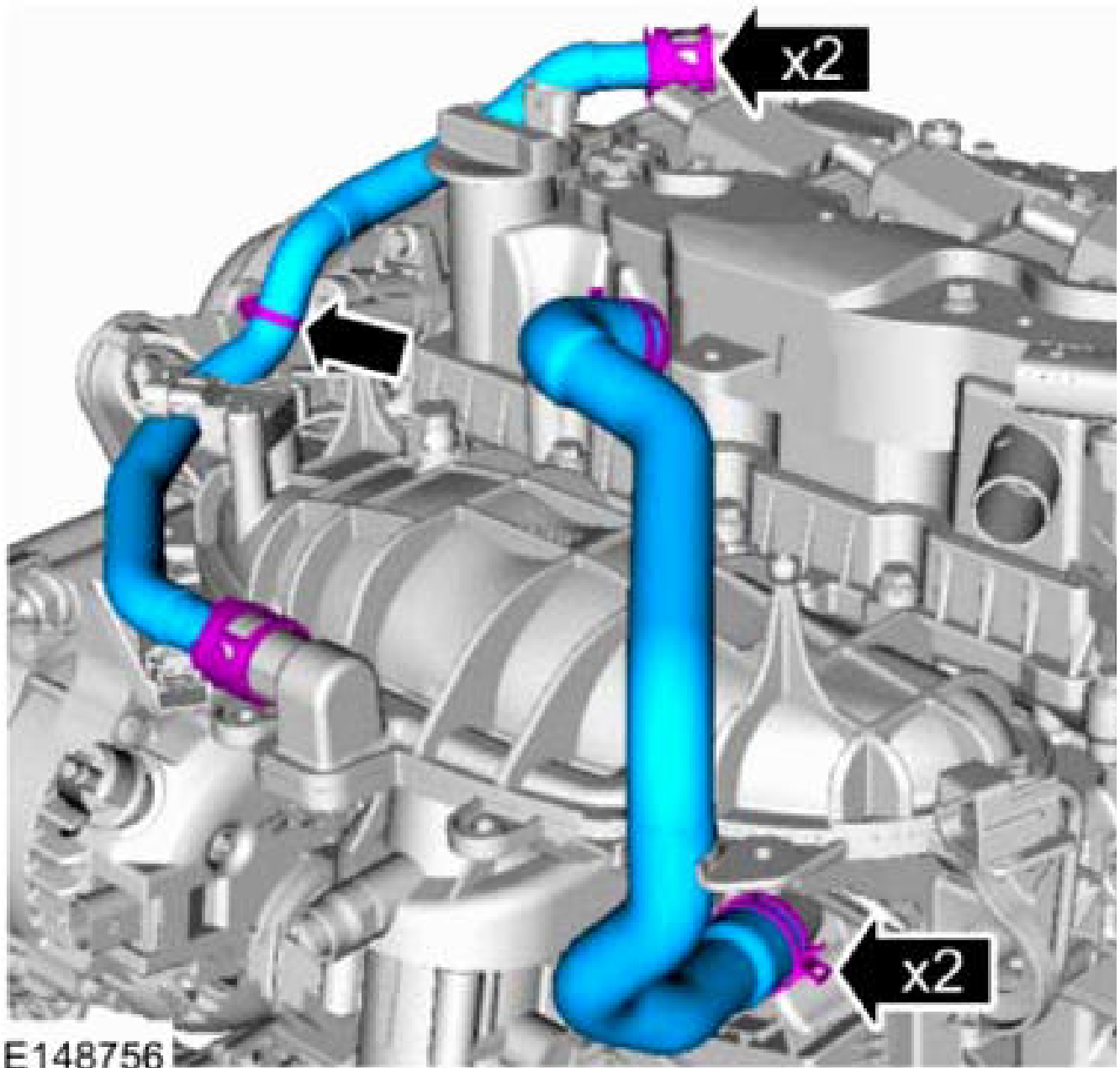
171.

172. *Torque:* 24 Nm



173. Refer to: **QUICK RELEASE COUPLING**.

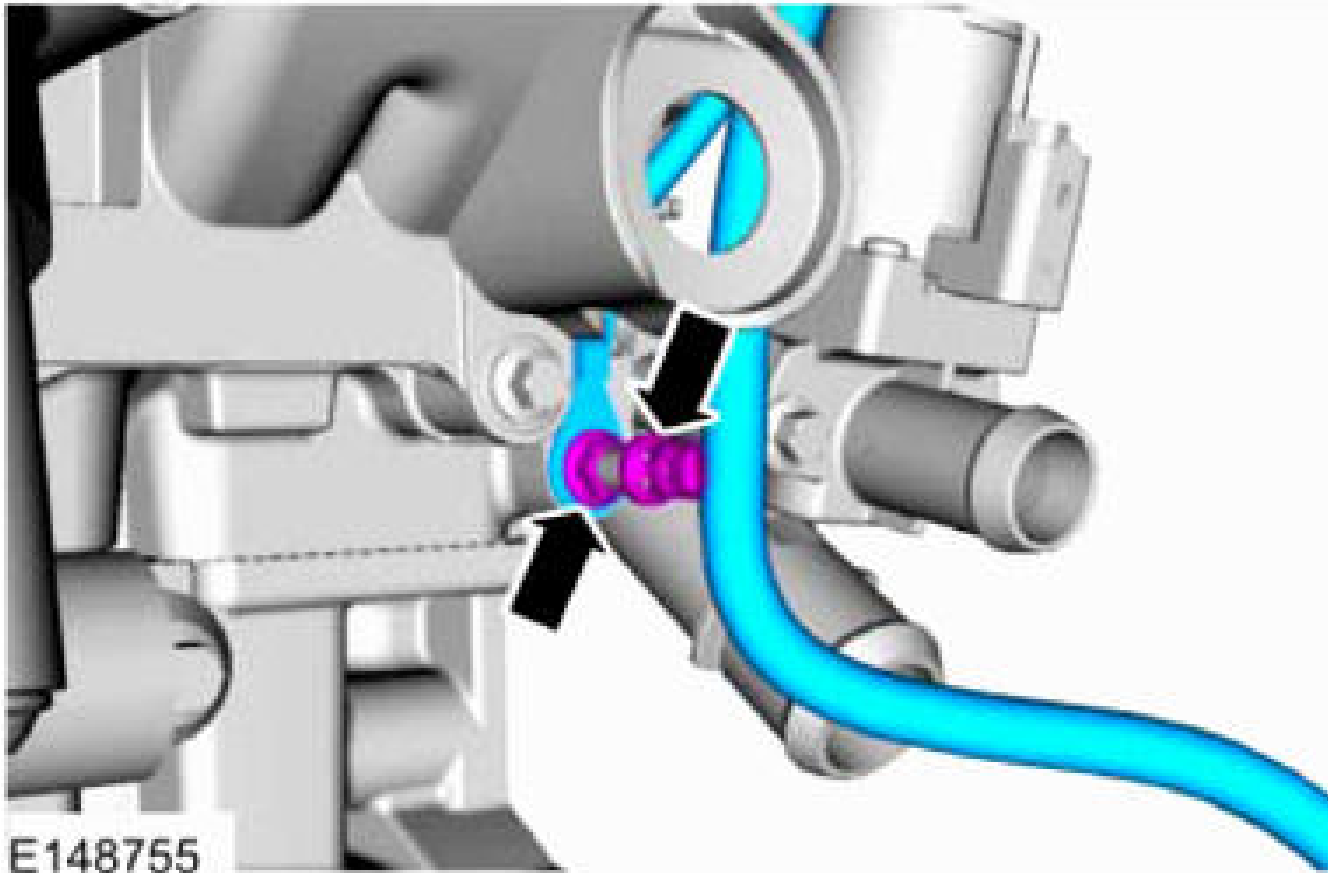
General Equipment: Hose Clamp Remover/Installer

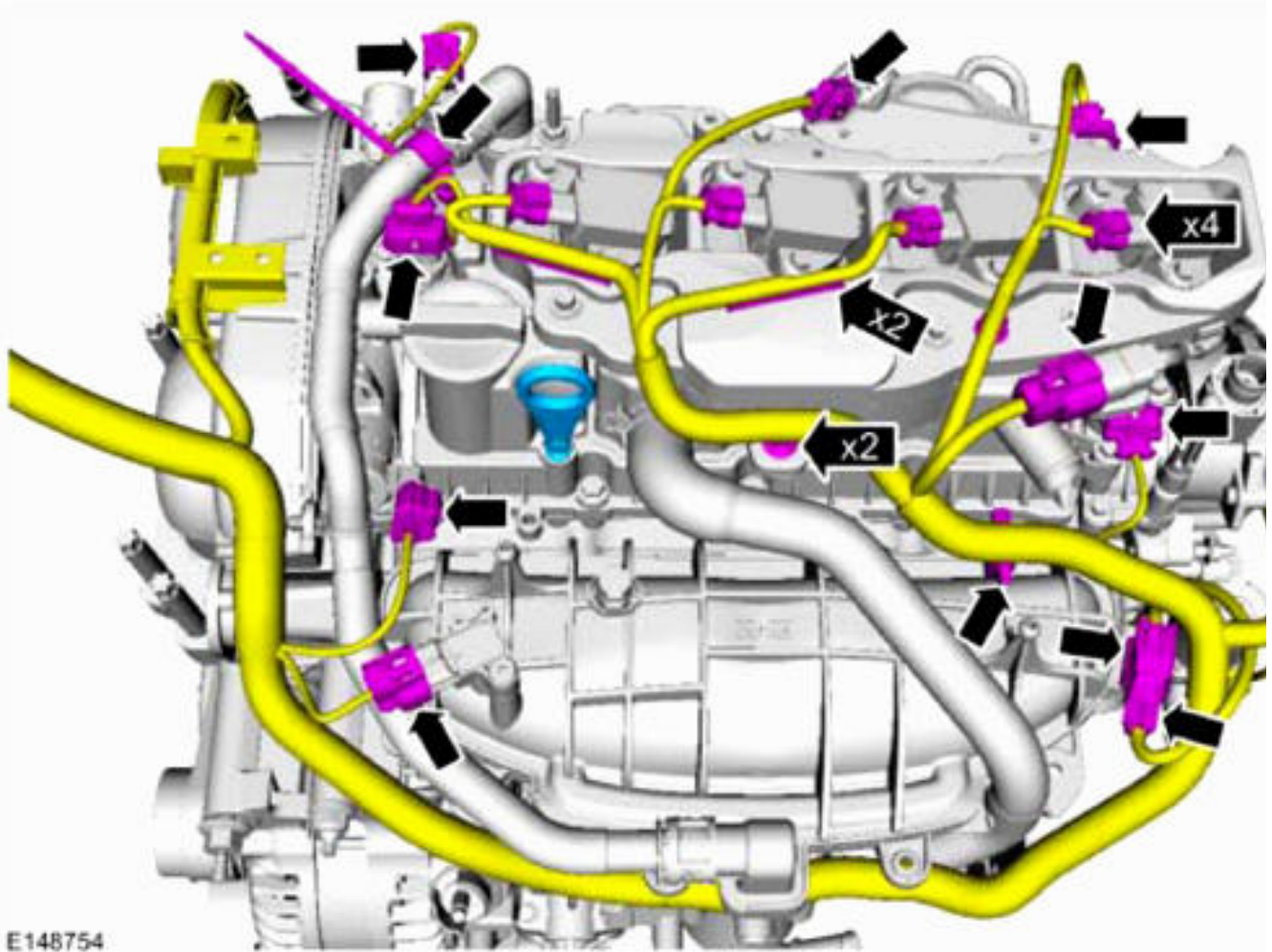


NOTE: Engines with automatic transmission shown in illustration, manual transmission similar.

174.

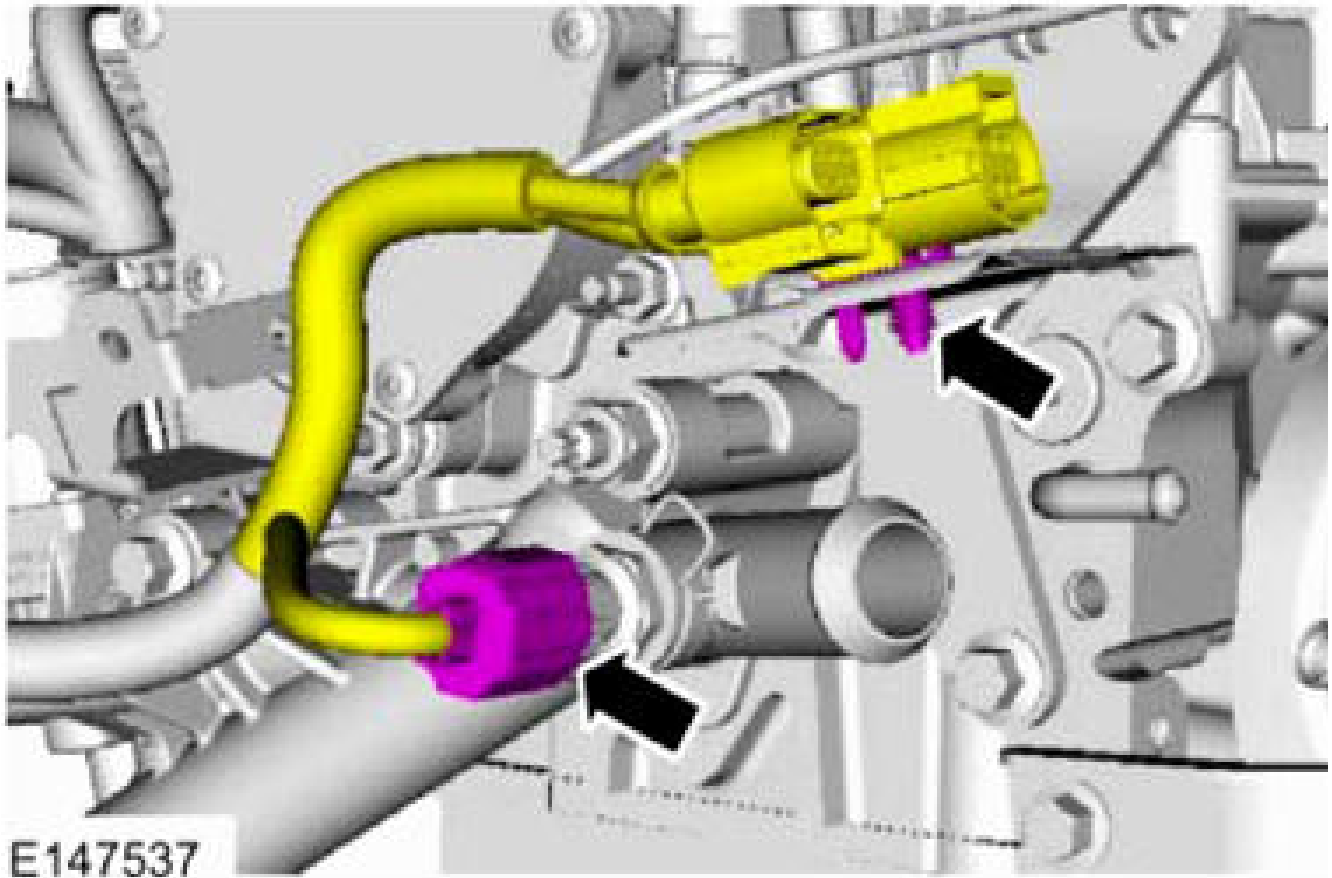
Torque: 10 Nm





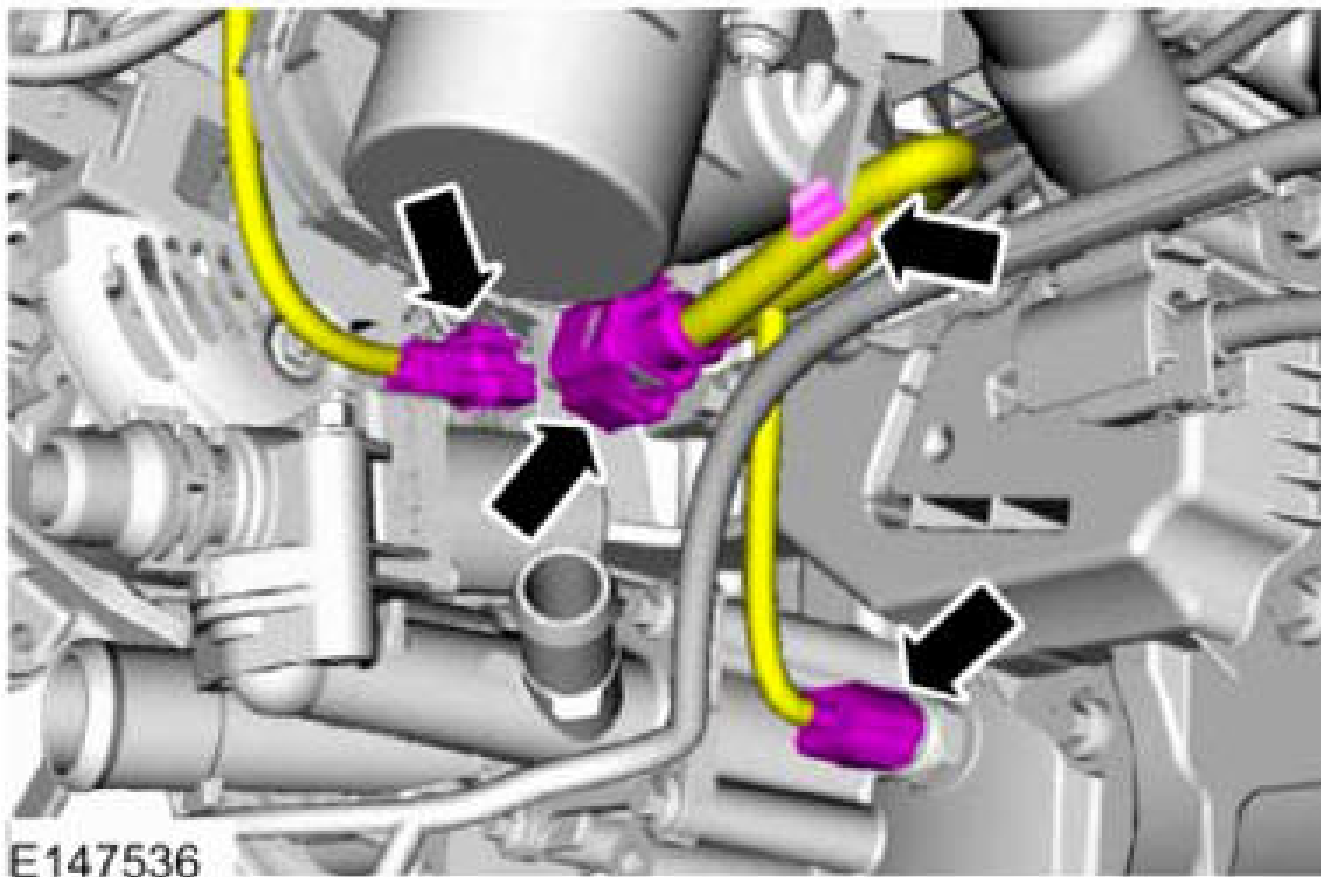
175.

176.



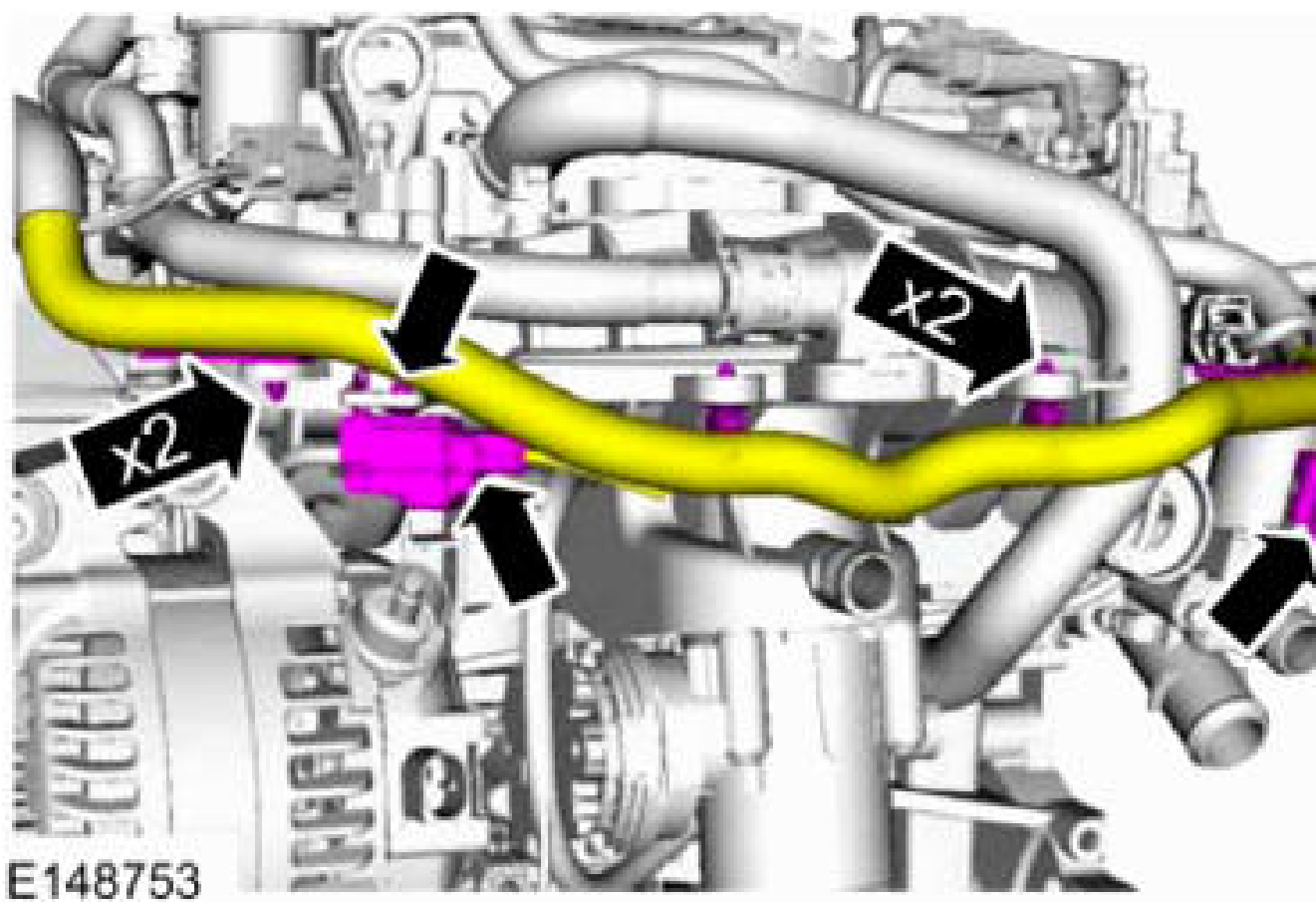
176.

177.



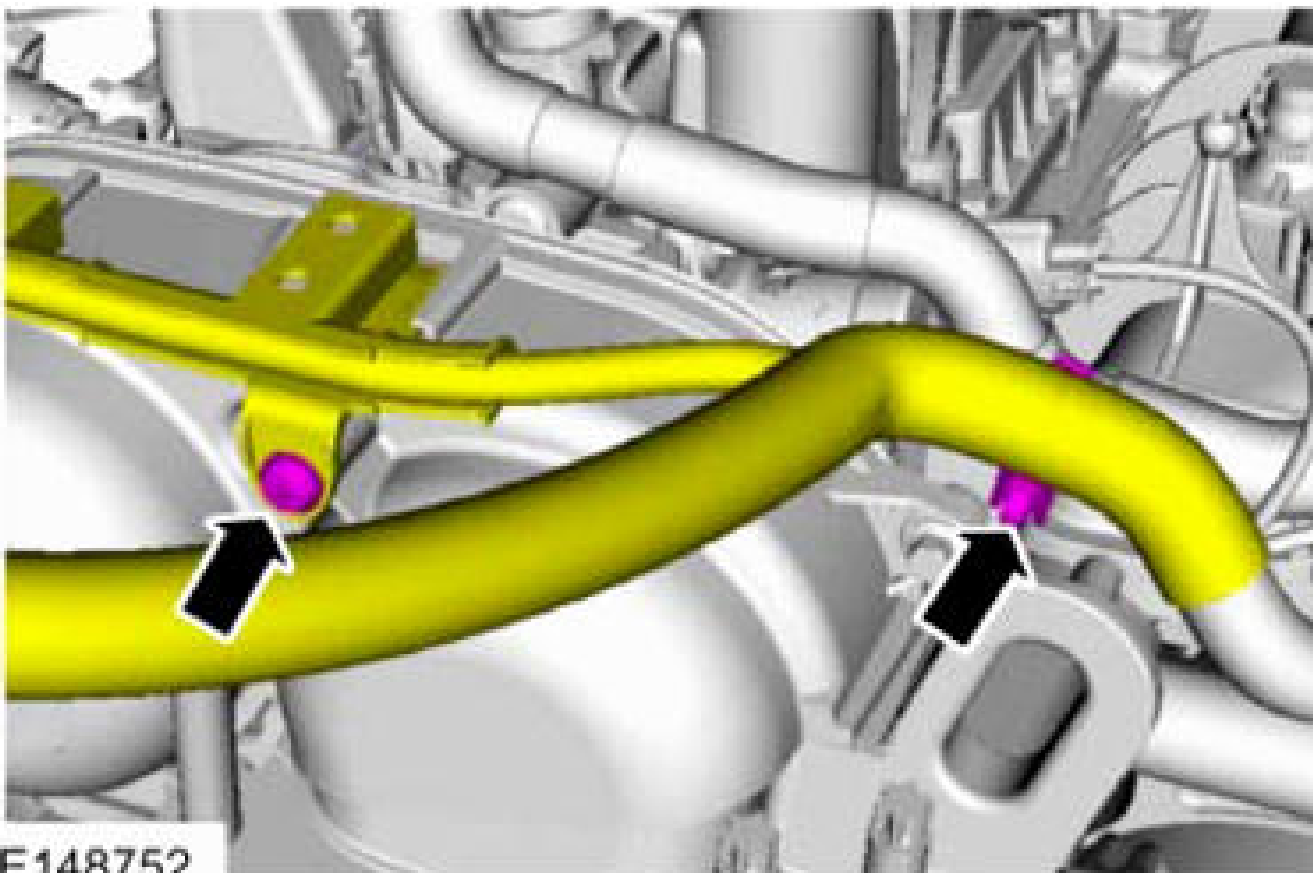
177.

178.



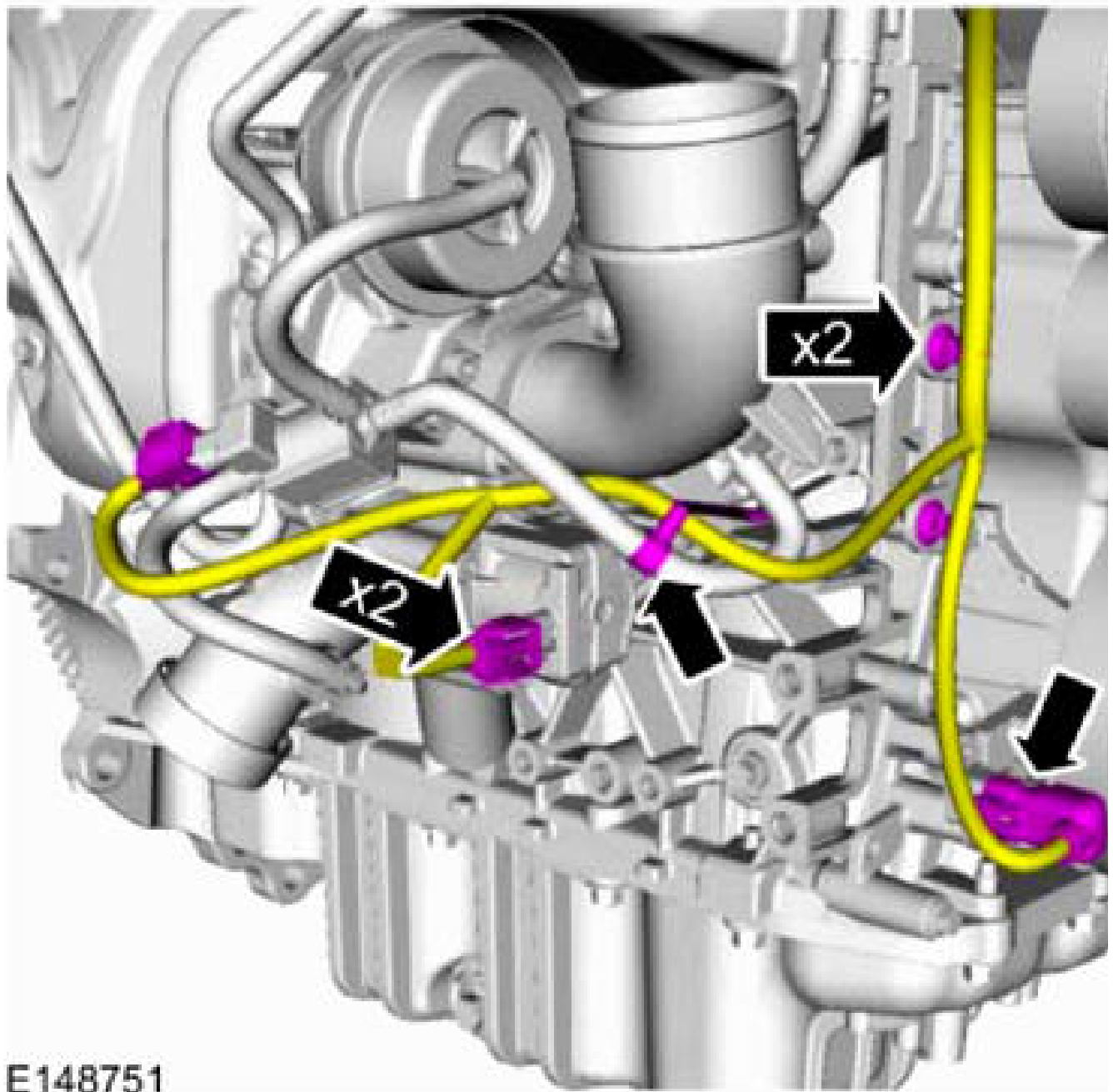
178.

179.



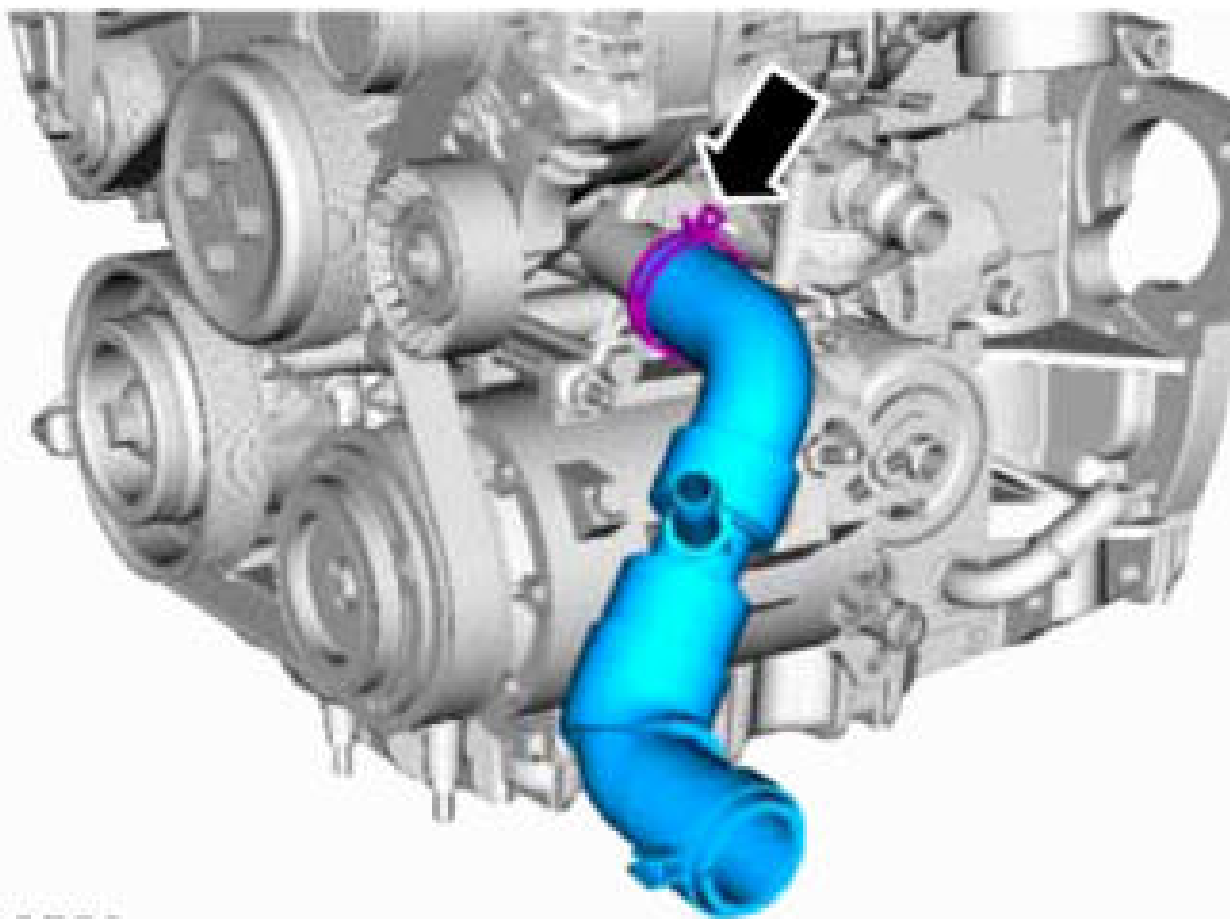
179.

180.



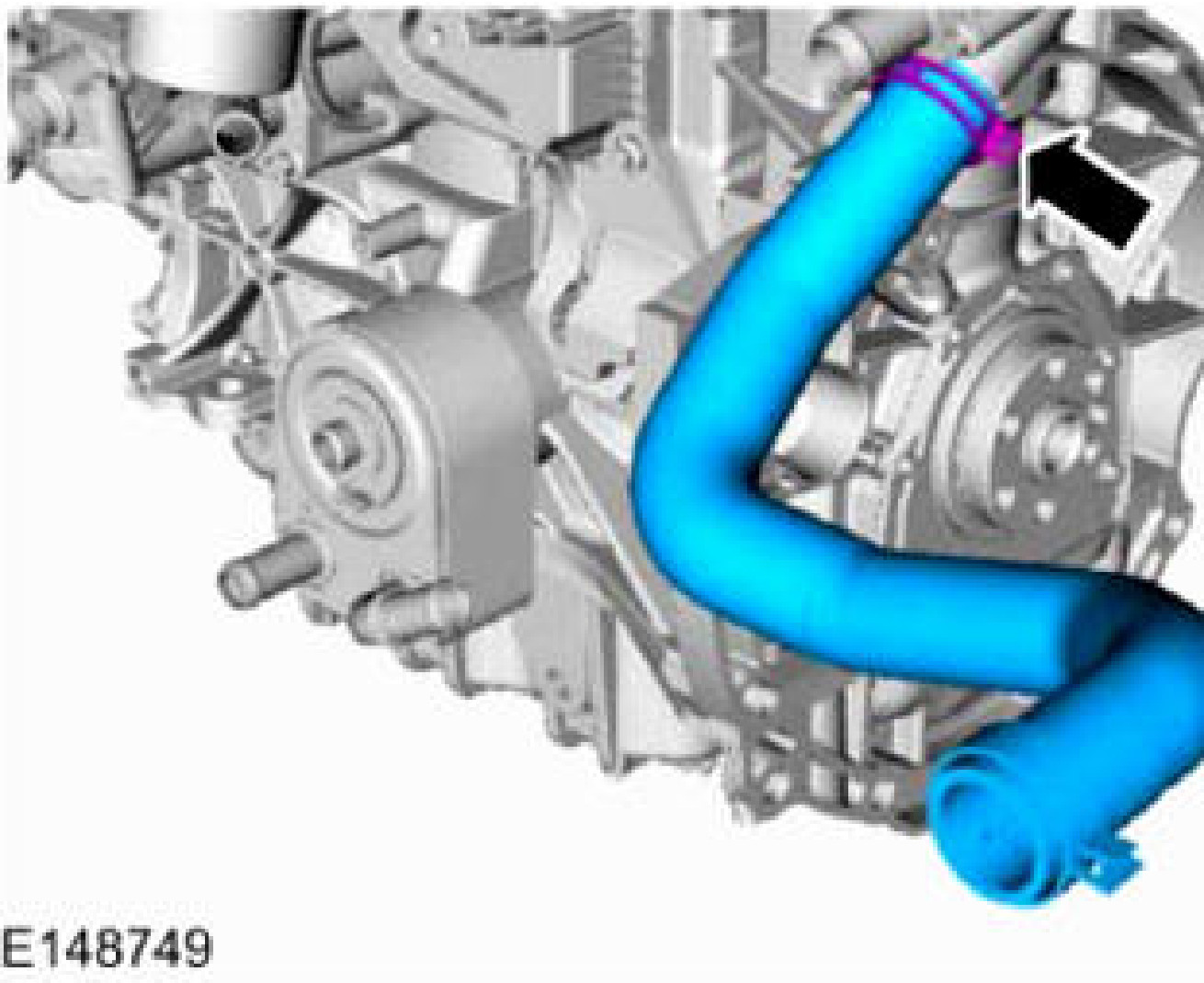
180.

181. *General Equipment:* Hose Clamp Remover/Installer

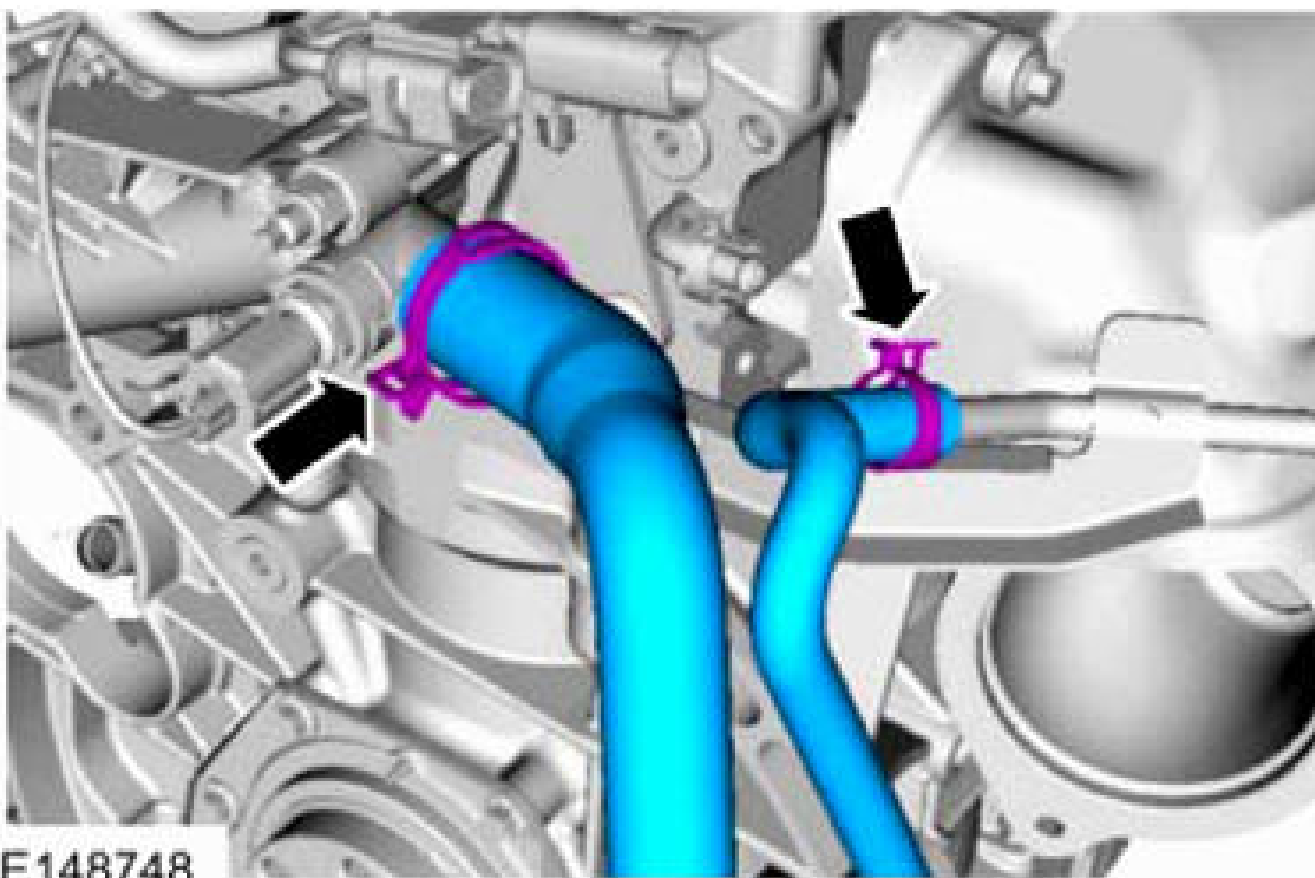


E148750

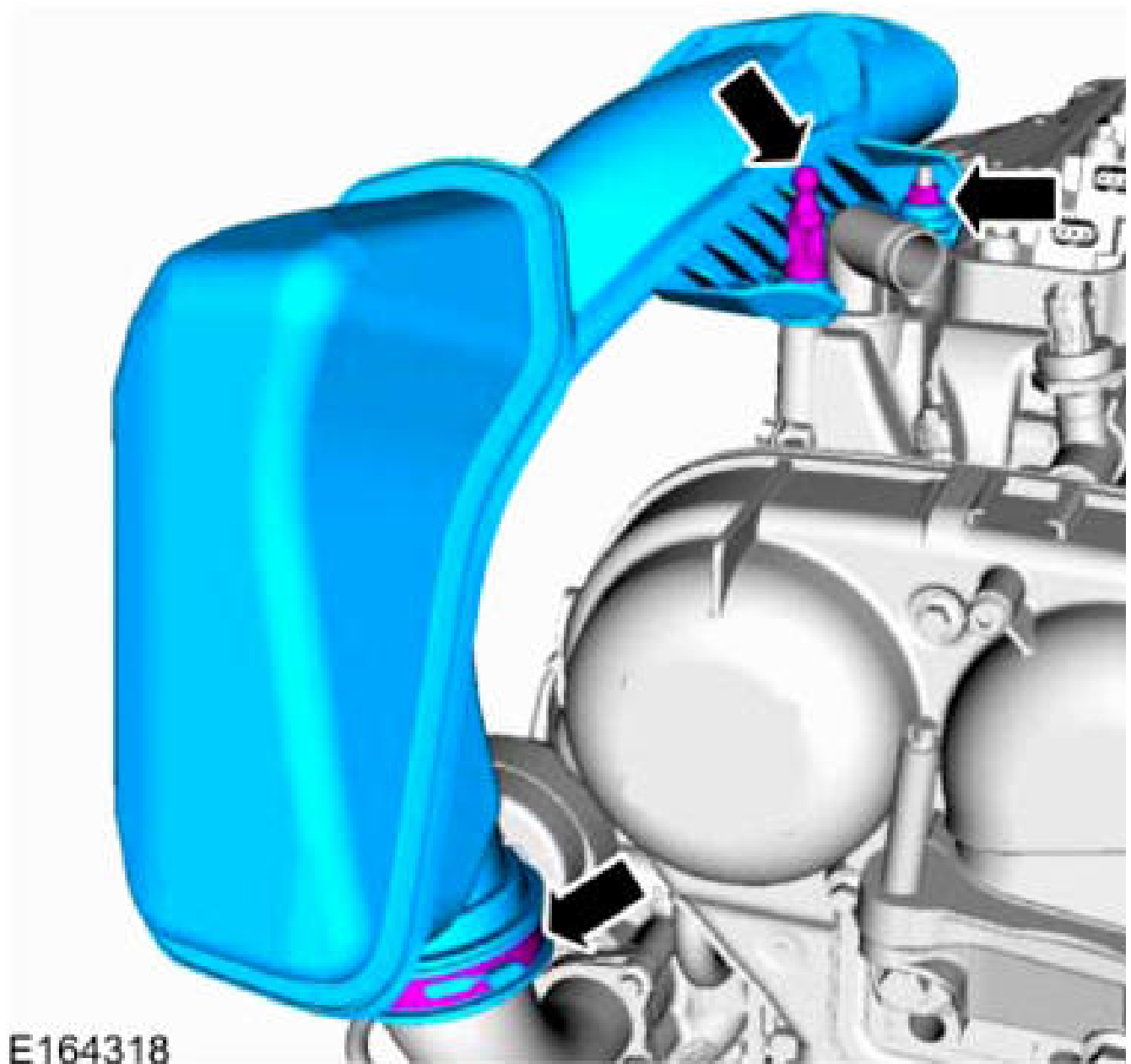
182. *General Equipment:* Hose Clamp Remover/Installer



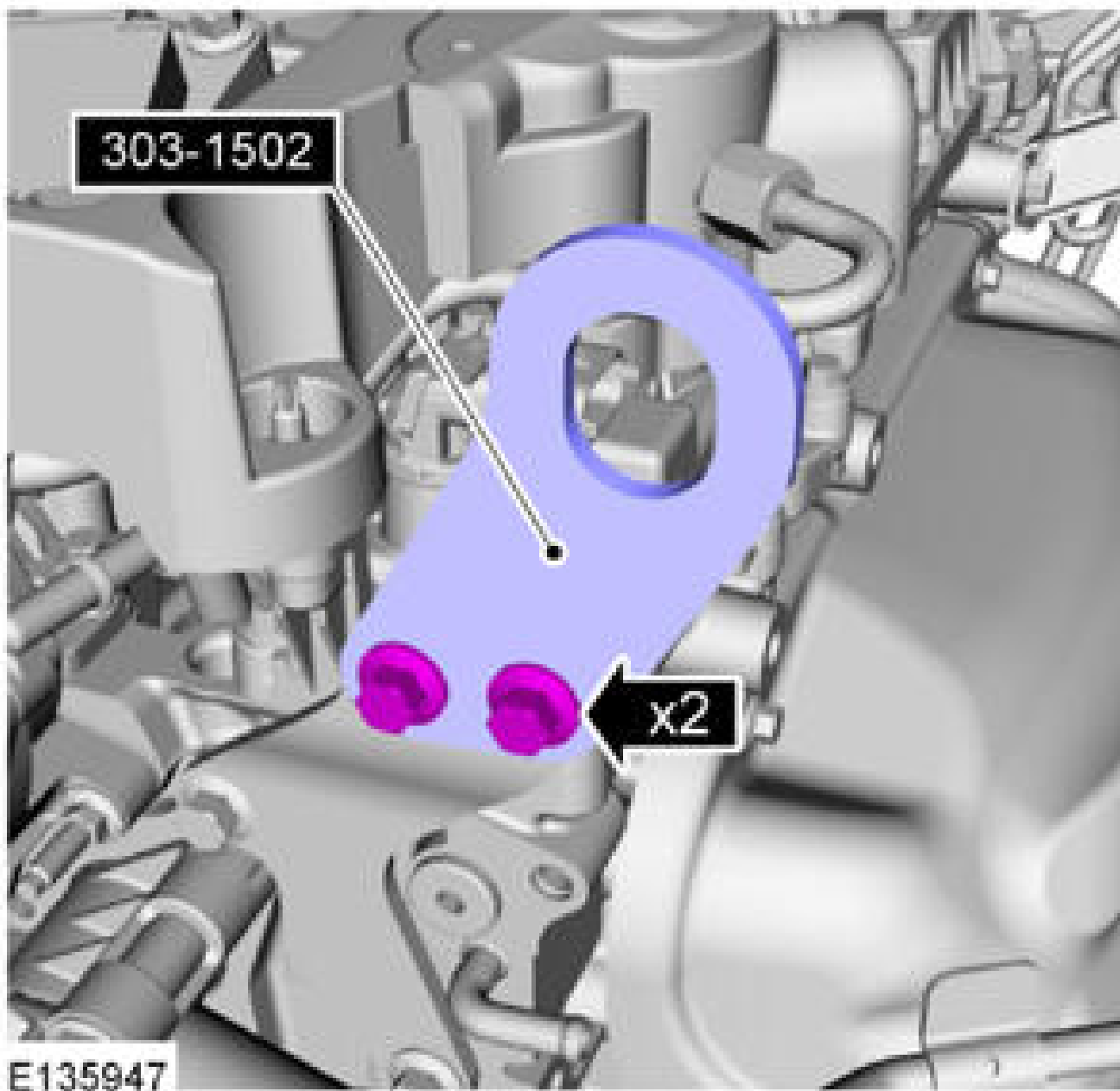
183. *General Equipment:* Hose Clamp Remover/Installer



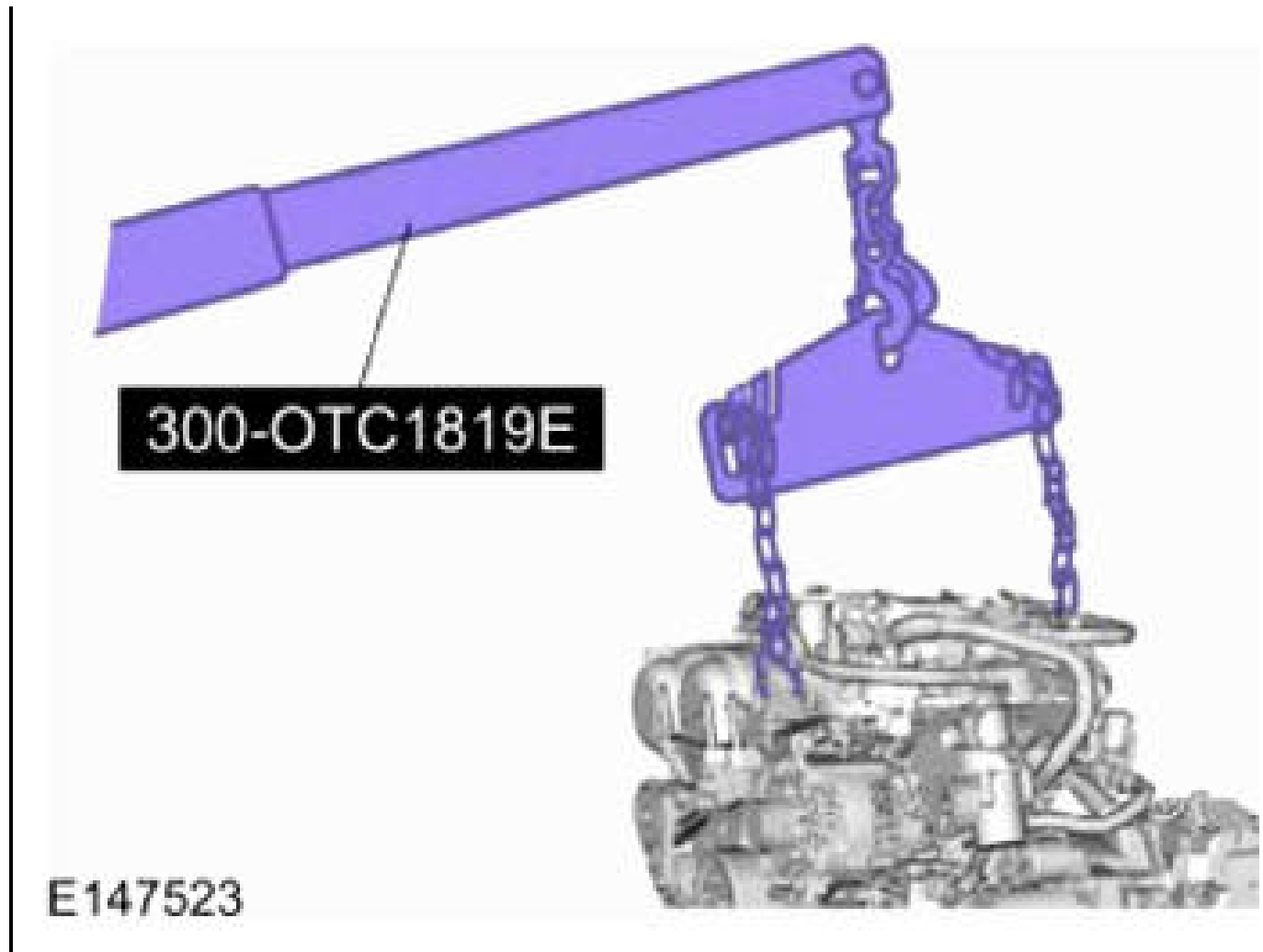
184. *Torque:* 5 Nm



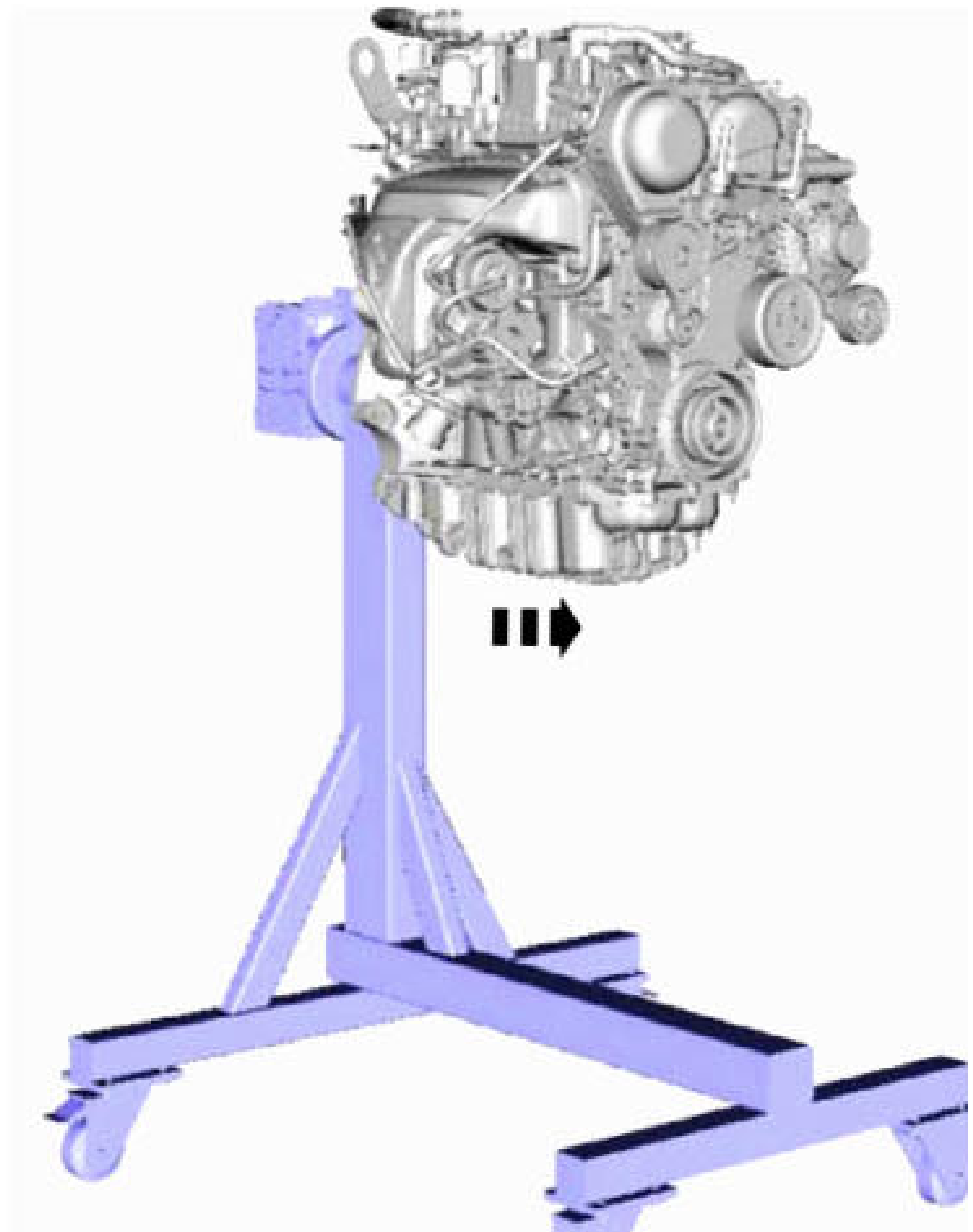
185. *Install Special Service Tool: 303-1502 Lifting Device Engine*



186. *Install Special Service Tool: 300-OTC1819E 2, 200# Floor Crane, Fold Away*



187. Remove from engine stand.

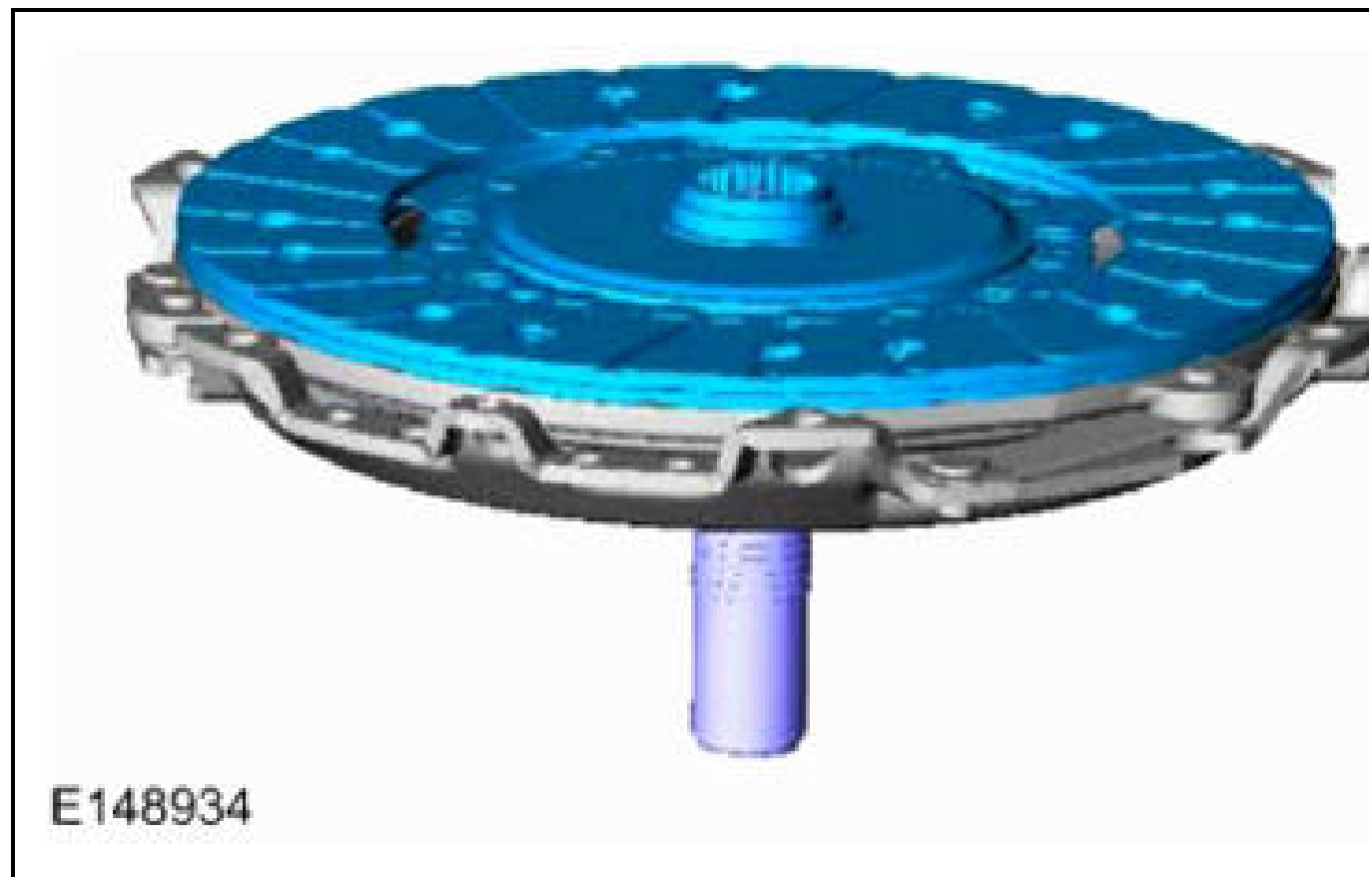


Vehicles with manual transmission

NOTE: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

188.

Using a clutch aligner, centralize the clutch disc to the clutch pressure plate.



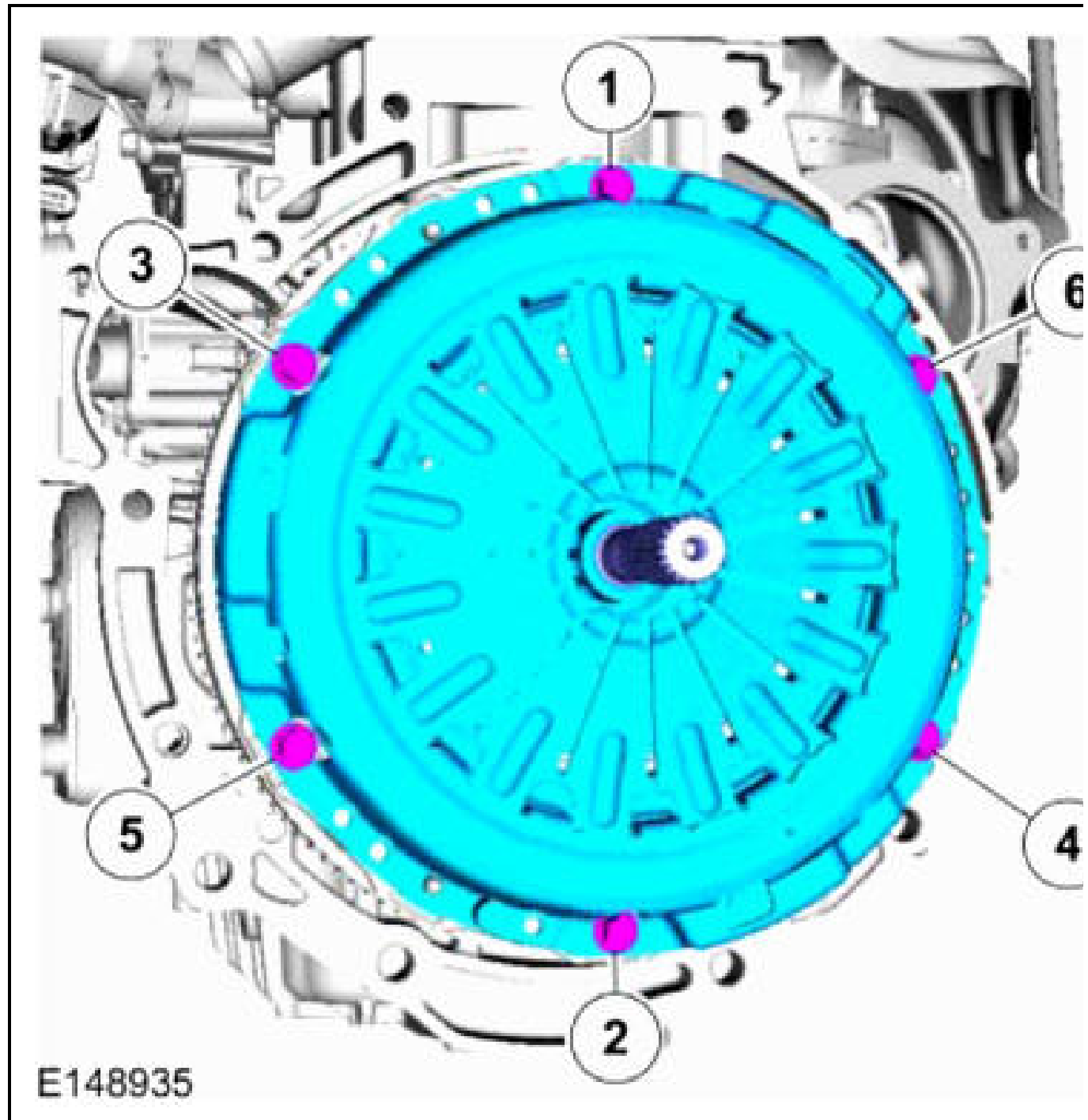
NOTE: Do not breathe dust or use compressed air to blow dust from storage containers or friction components. Remove dust using government-approved techniques. Friction component dust may be a cancer and lung disease hazard. Exposure to potentially hazardous components may occur if dusts are created during repair of friction components, such as brake pads and clutch discs. Exposure may also cause irritation to skin, eyes

189.

and respiratory tract, and may cause allergic reactions and/or may lead to other chronic health effects. If irritation persists, seek medical attention or advice. Failure to follow these instructions may result in serious personal injury.

189.

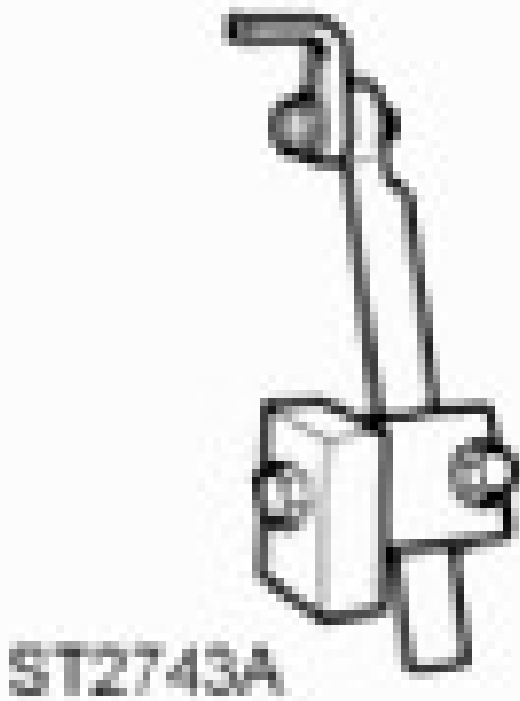
Torque: 29 Nm



INSTALLATION

ENGINE

SPECIAL TOOLS/GENERAL EQUIPMENT



014-00001
ADJUSTABLE GRIP 1735A



205-461 Protector, Differential Oil Seal (pair)
TKIT-2002-F/FM
TKIT-2000AP-FLM/LM

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



300-OTC1585AE
Powertrain Lift



300-OTC1819E
2, 200# Floor Crane, Fold Away

ST1341-A

2013 Ford Fusion SE

2013 ENGINE Engine Mechanical - 1.6L - Fusion



303-1502
Lifting Device Engine

Transmission Jack

Hose Clamp Remover/Installer

Wooden Block

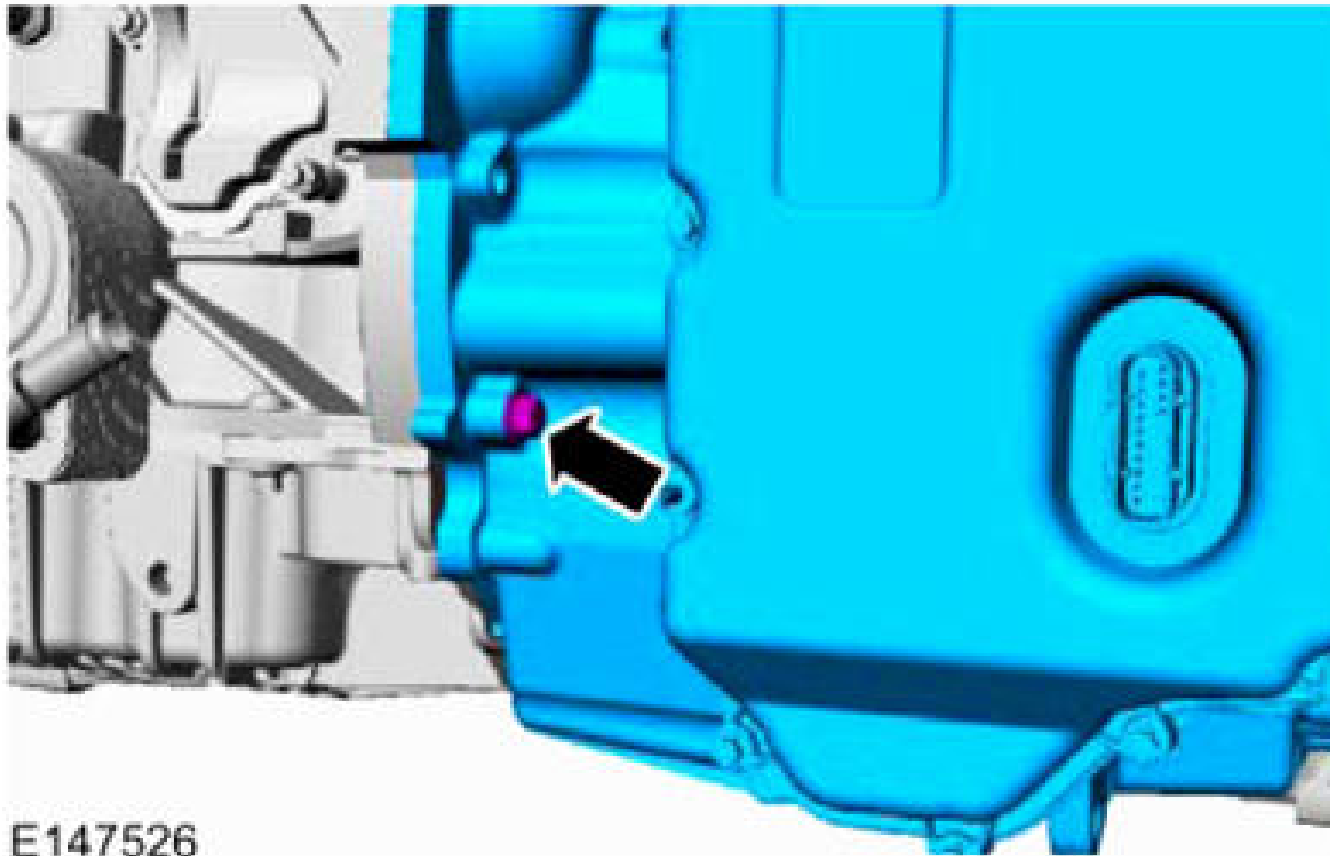
MATERIALS SPECIFICATIONS

Name	Specification
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP	WSS-M2C945-A

All vehicles

- NOTE:** Automatic transmission shown in illustration, manual transmission similar.
- 1.

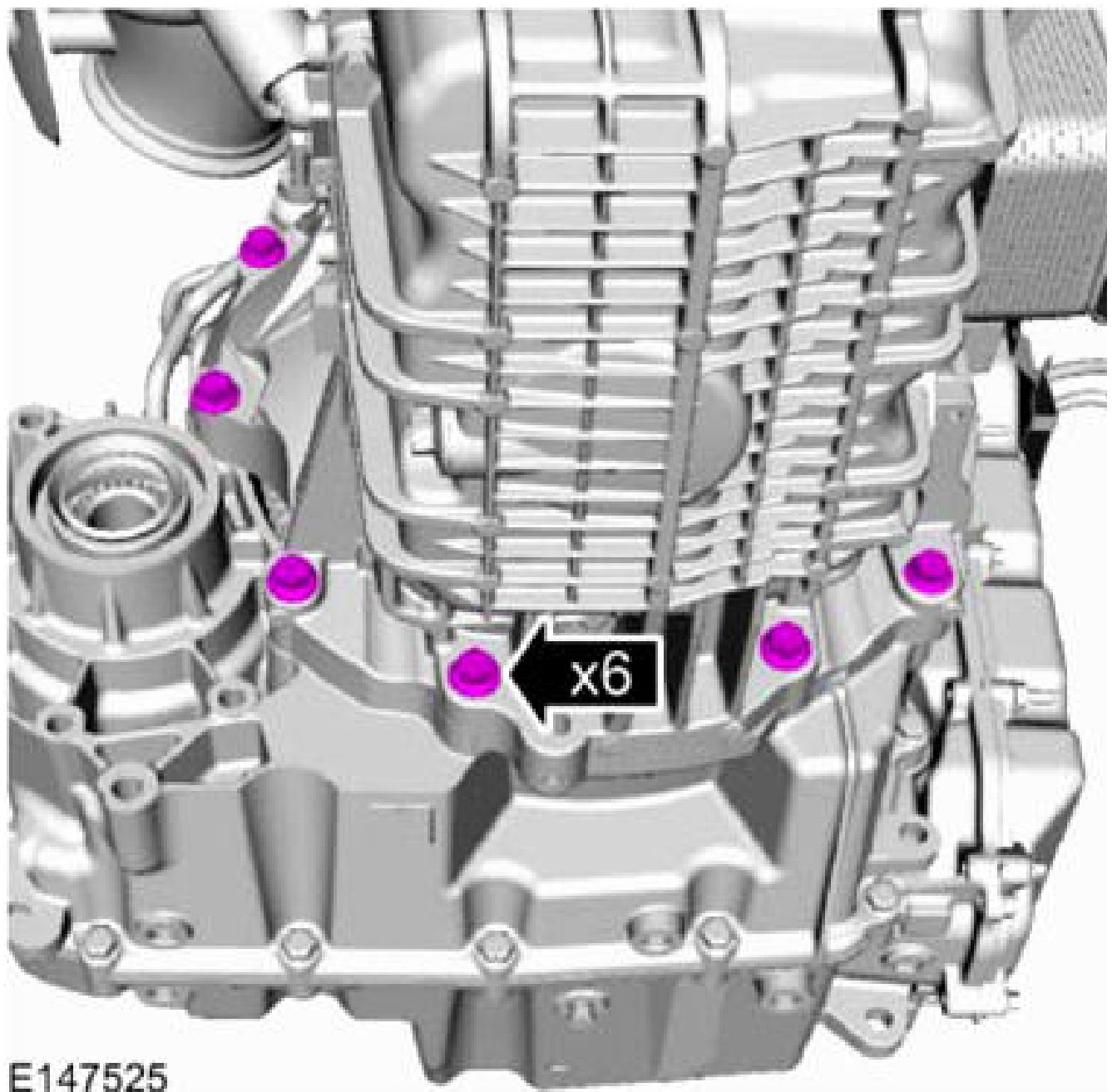
Torque: 48 Nm



NOTE: Automatic transmission shown in illustration, manual transmission similar.

2.

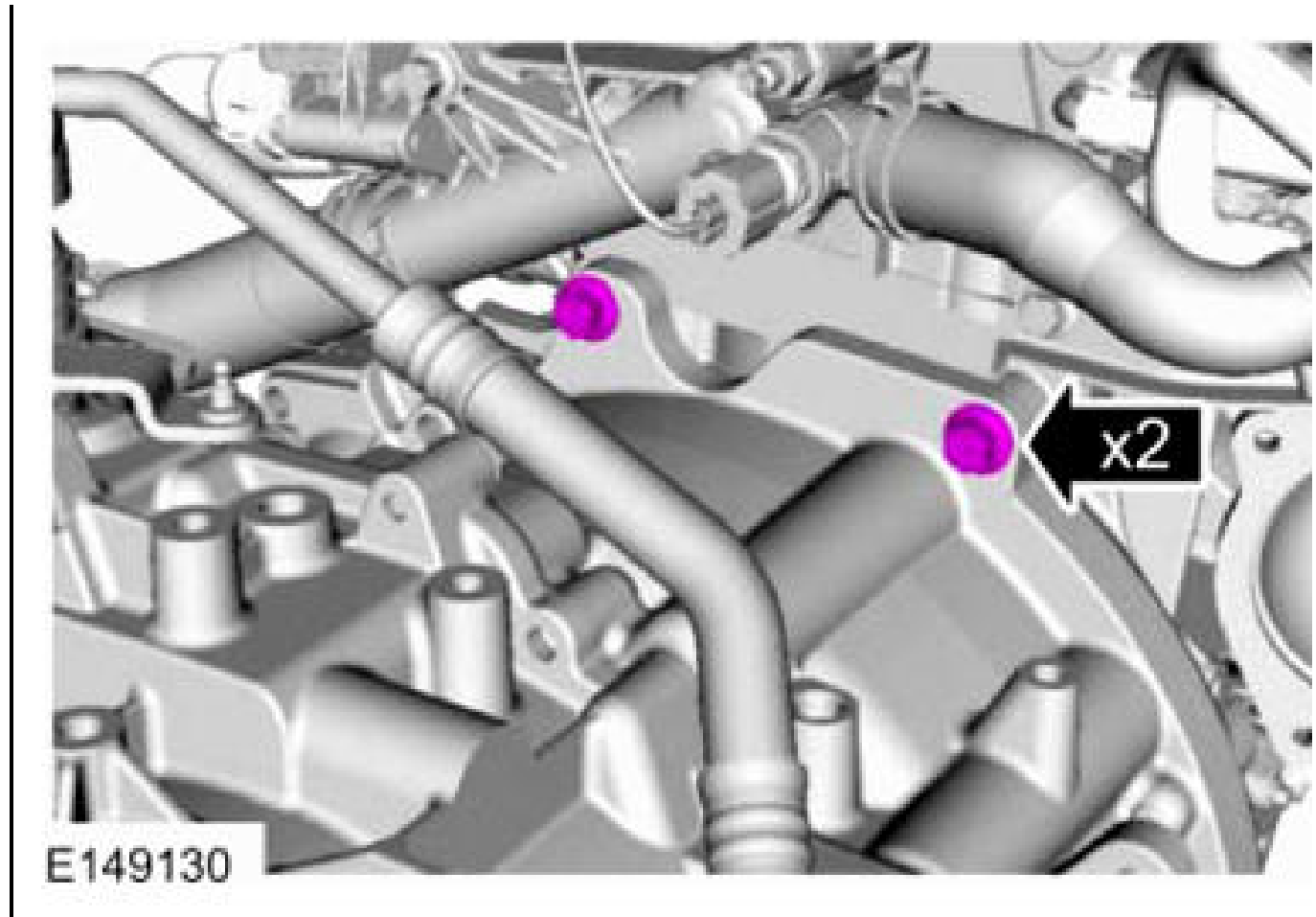
Torque: 48 Nm



NOTE: Automatic transmission shown in illustration, manual transmission similar.

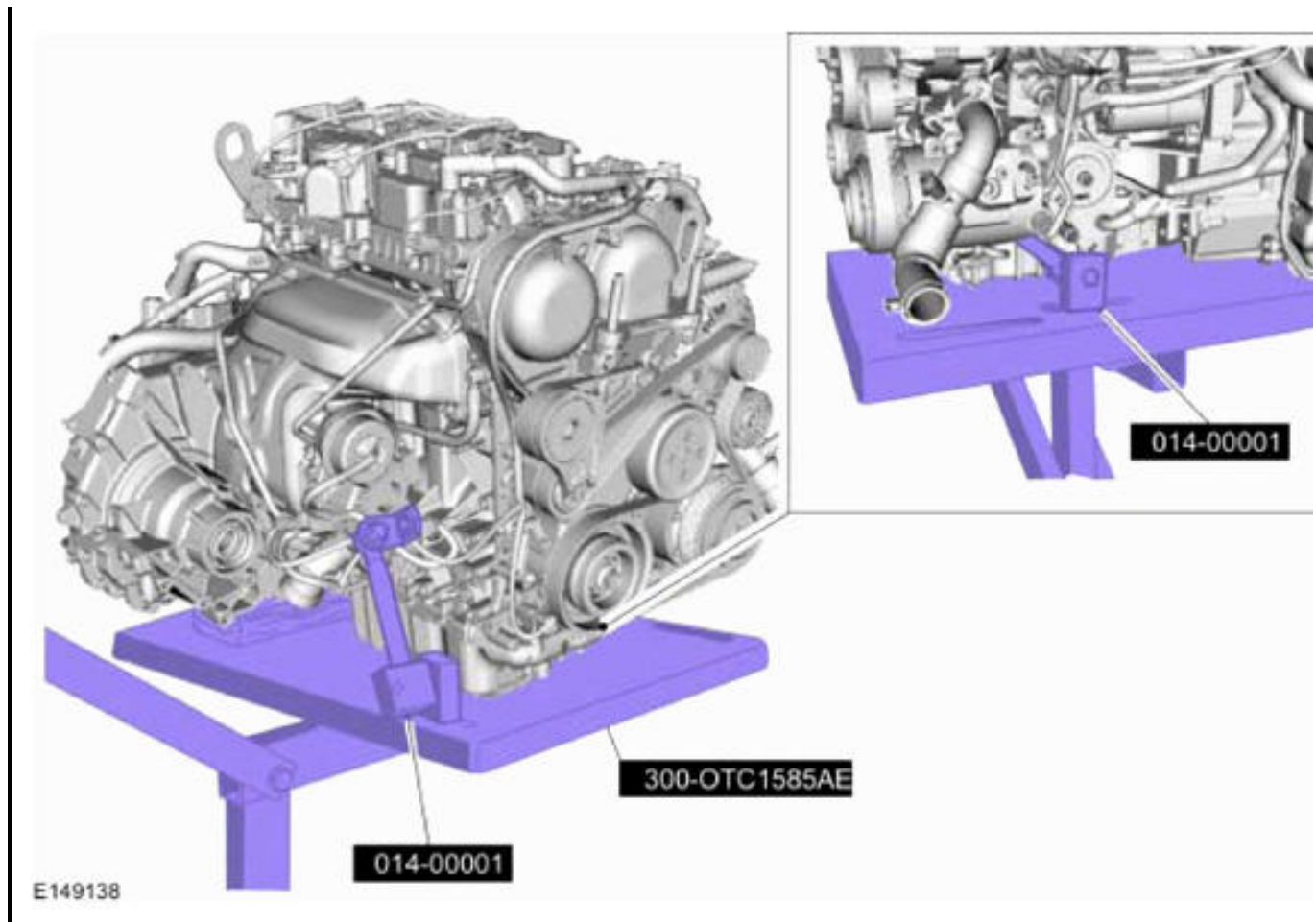
3.

Torque: 48 Nm

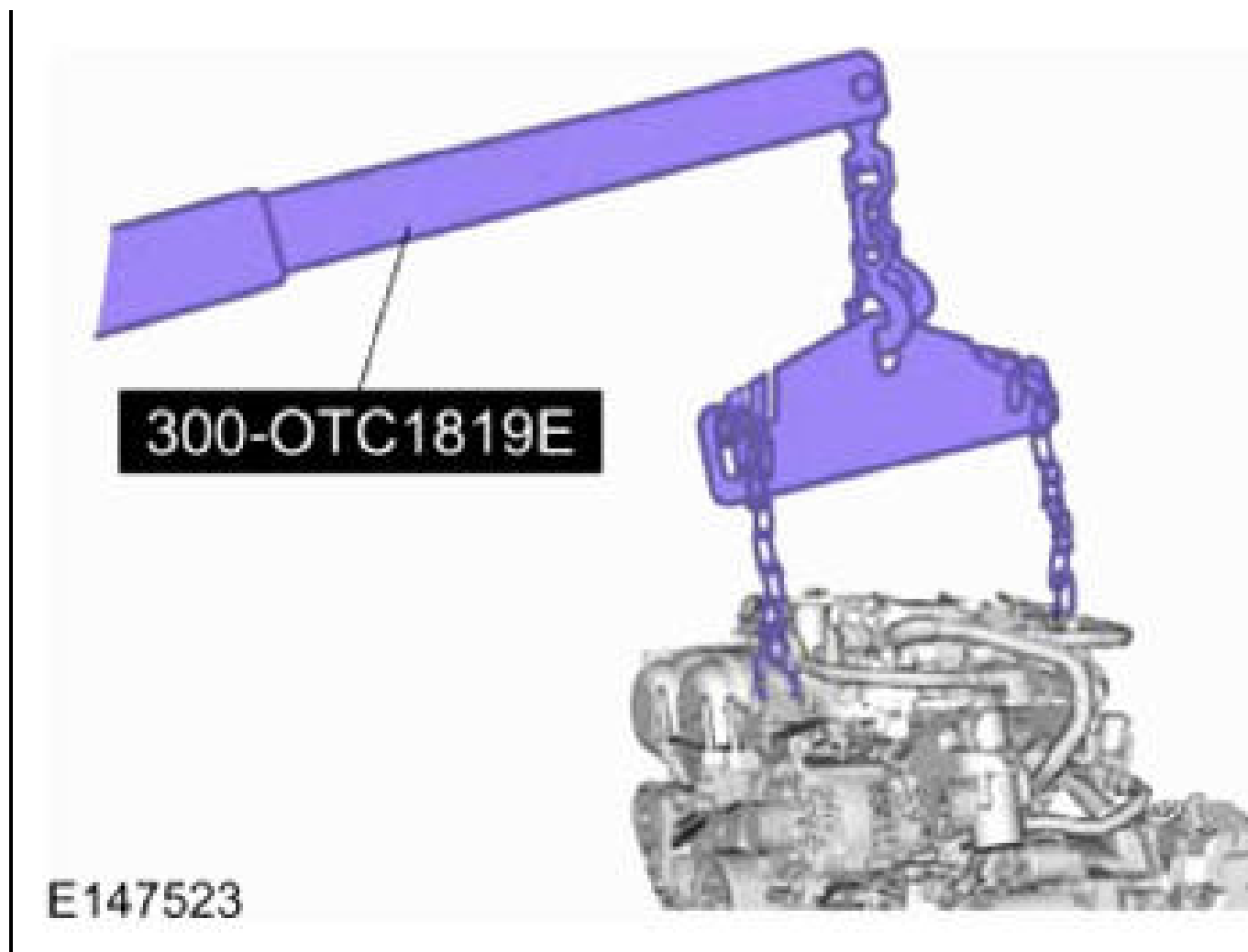


4. *Install Special Service Tool:* **014-00001 ADJUSTABLE GRIP 1735A , 300-OTC1585AE Powertrain Lift**

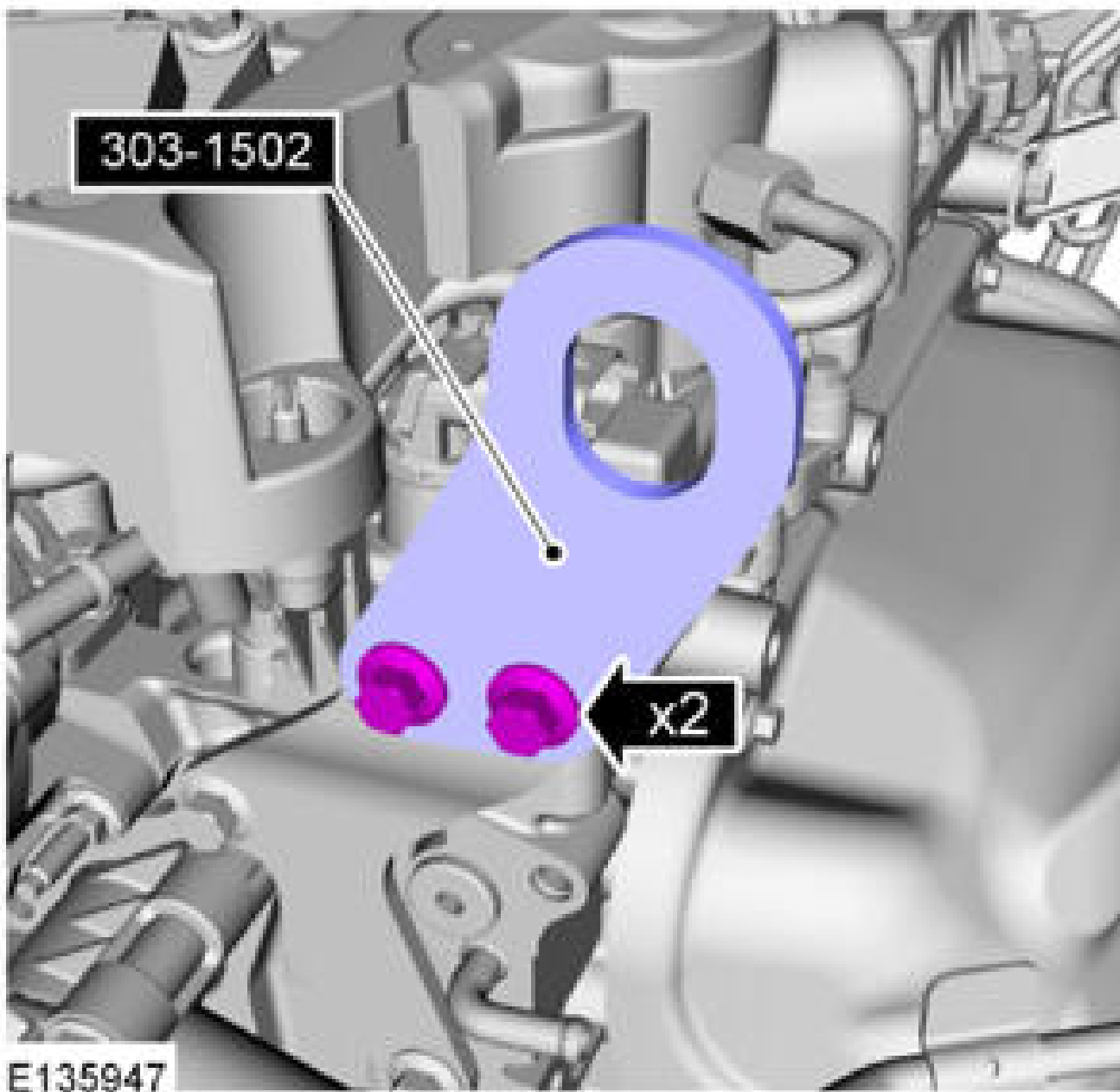
General Equipment: Wooden Block



5. *Remove Special Service Tool: 300-OTC1819E 2, 200# Floor Crane, Fold Away*

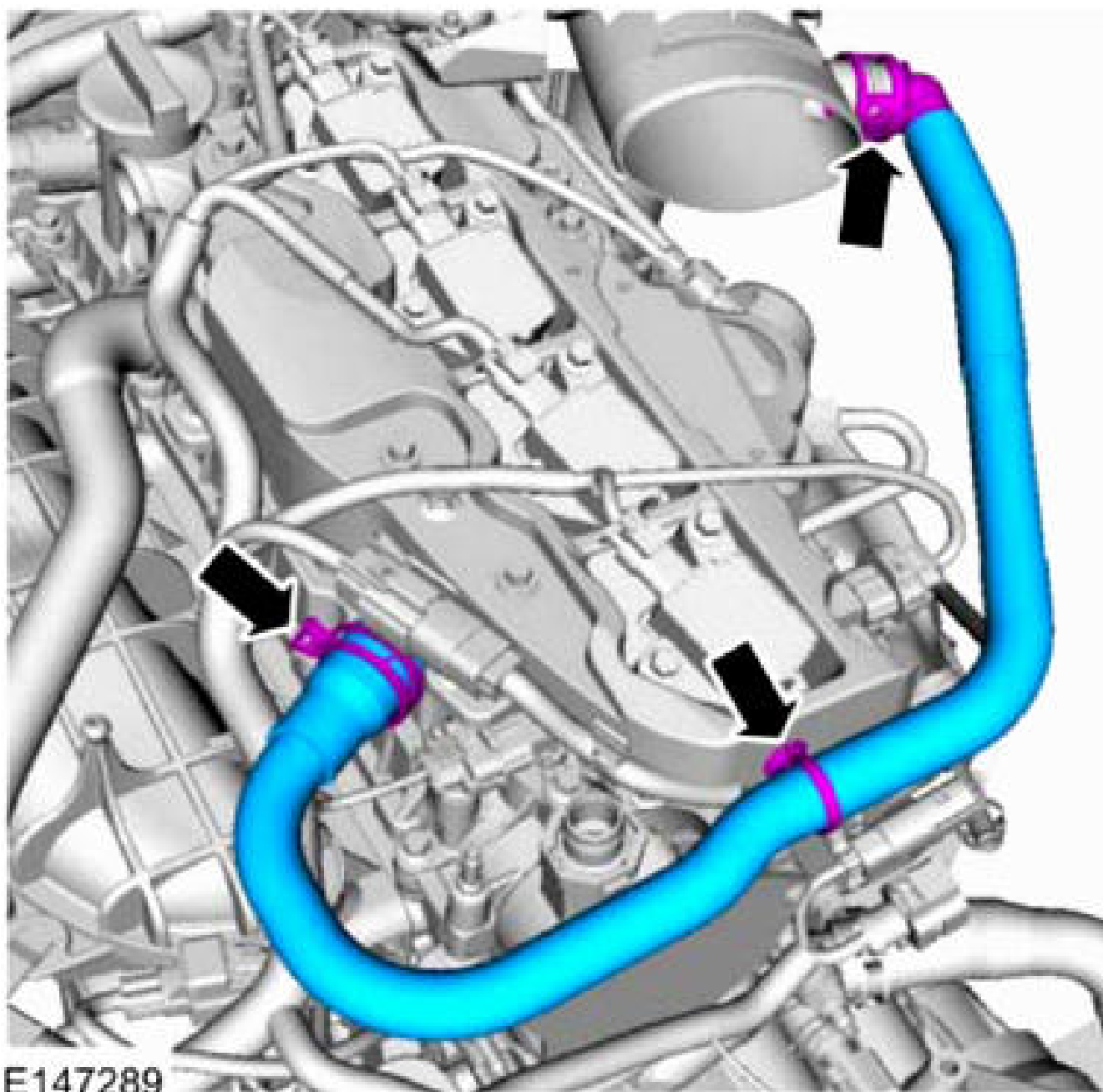


6. Remove Special Service Tool: **303-1502 Lifting Device Engine**



7. Refer to: **QUICK RELEASE COUPLING** .

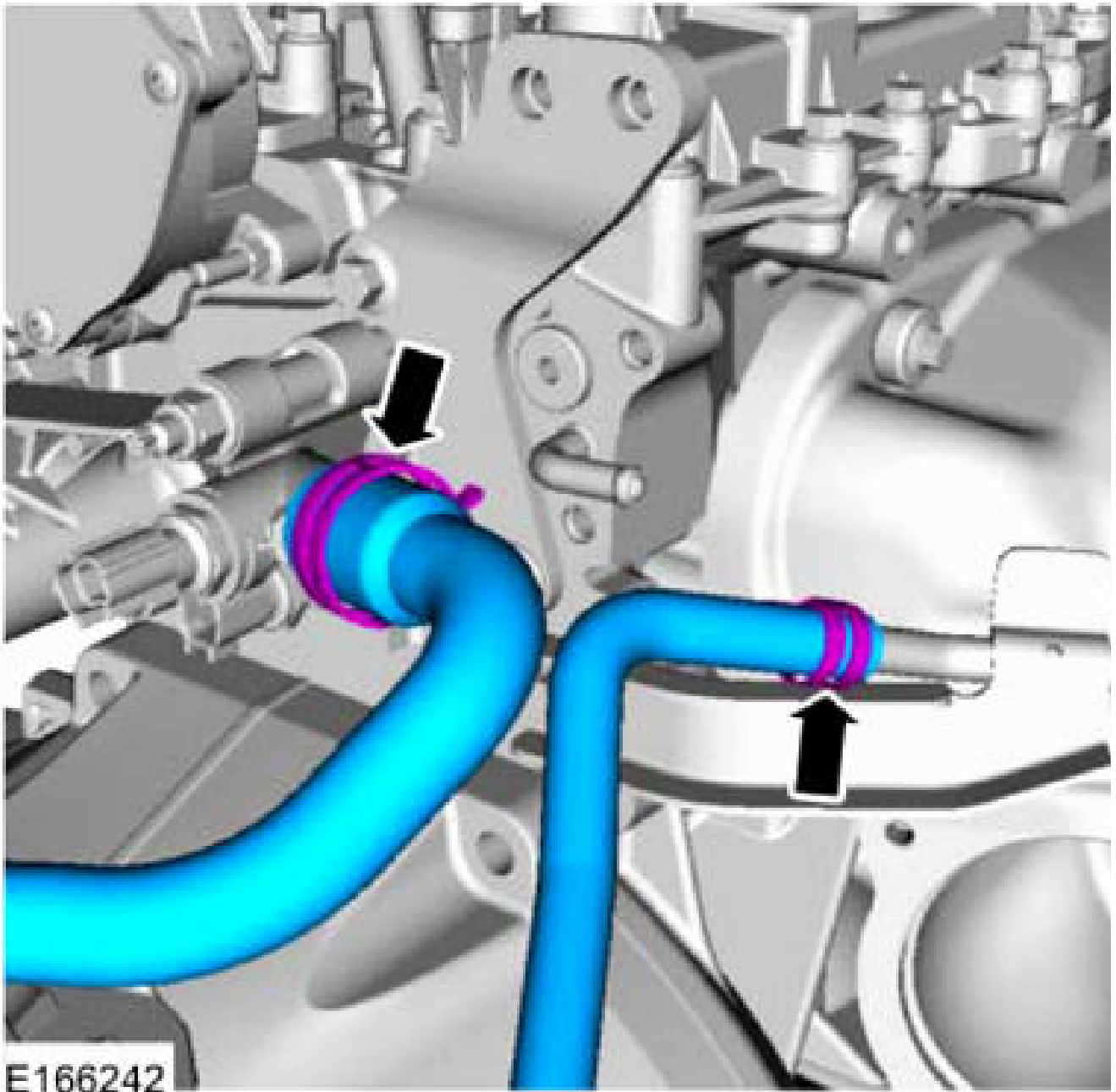
General Equipment: Hose Clamp Remover/Installer



E147289

Vehicles with automatic start-stop

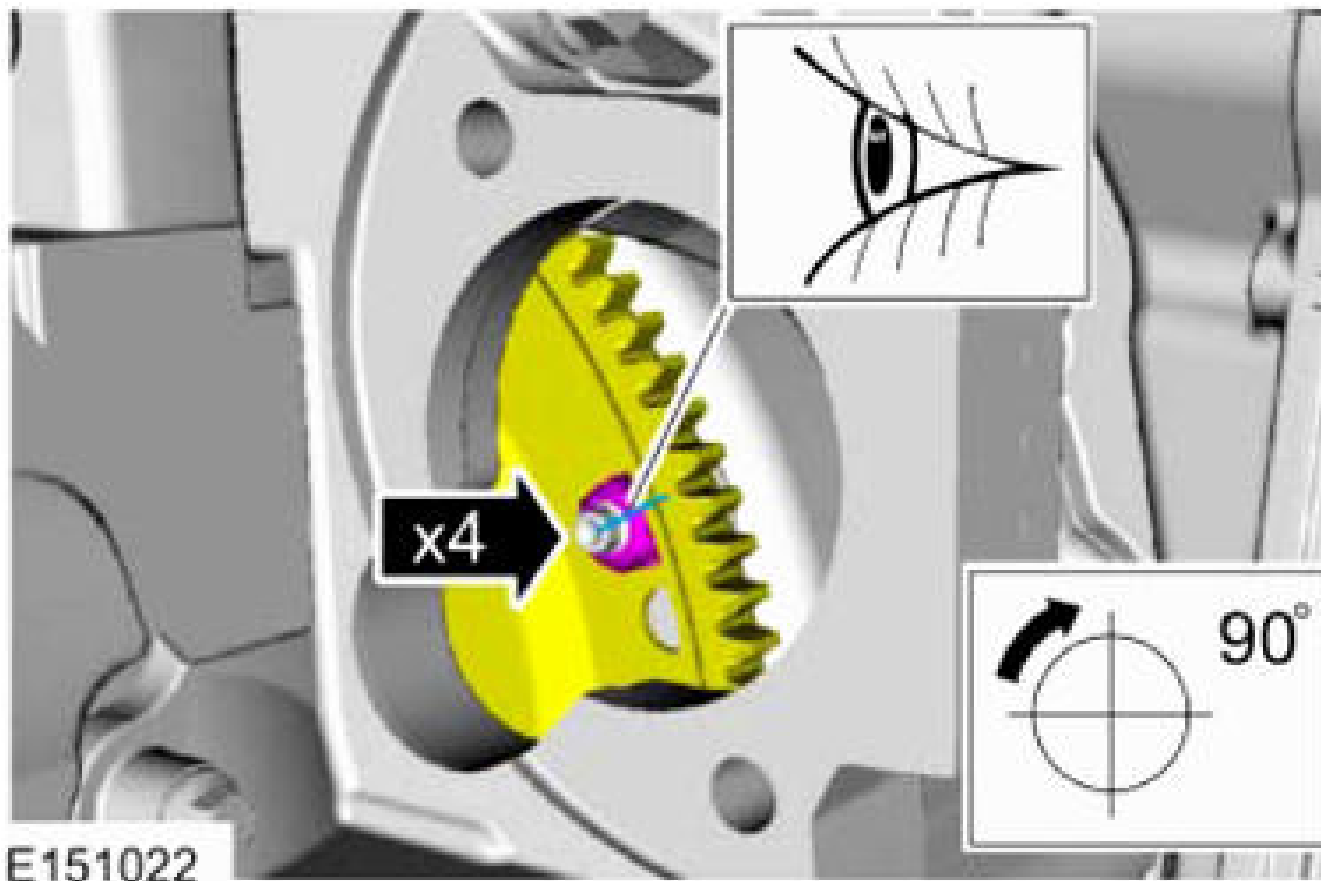
8. *General Equipment:* Hose Clamp Remover/Installer

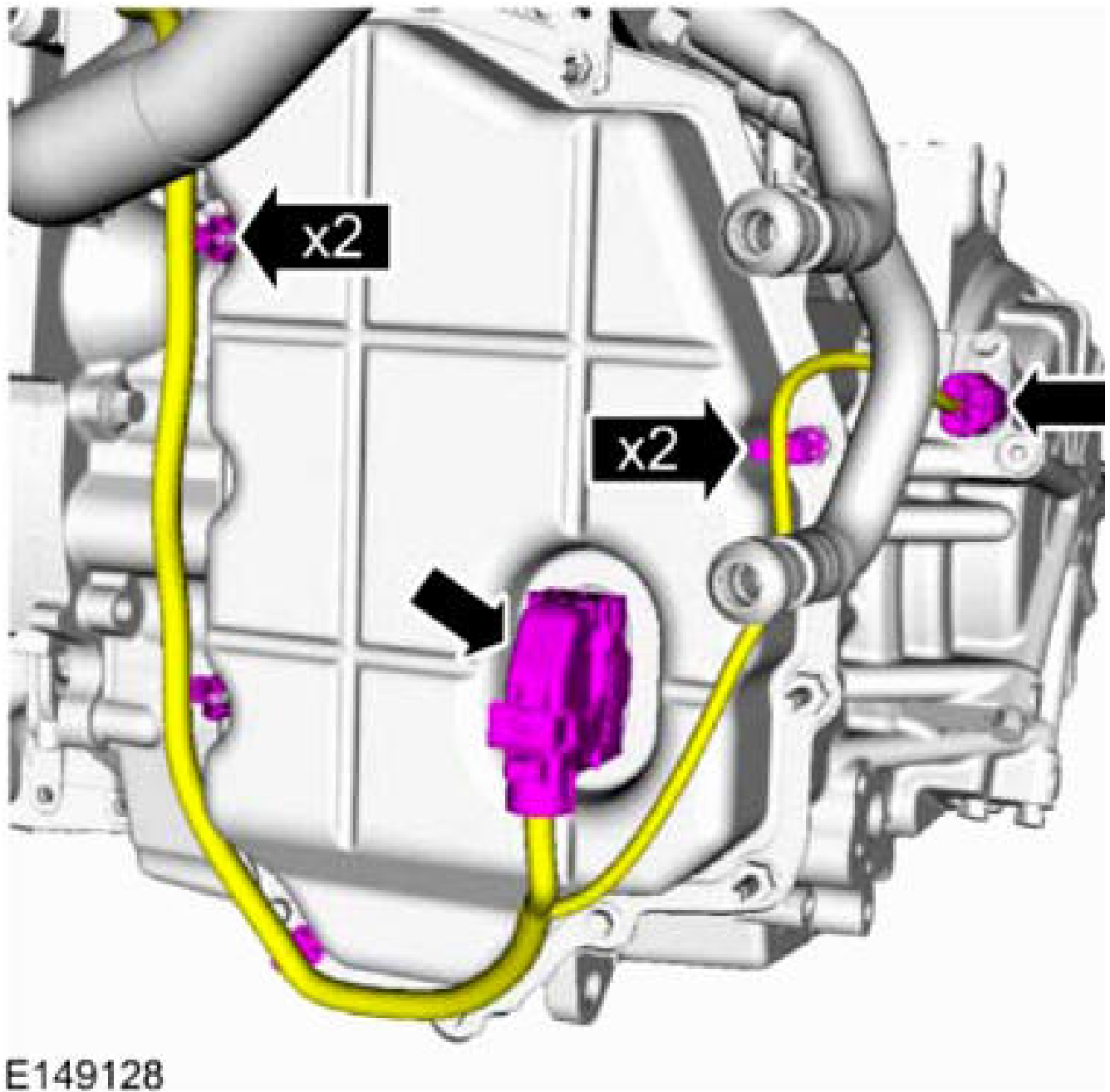


Vehicles with automatic transmission

9. **NOTE:** Install new torque converter nuts.

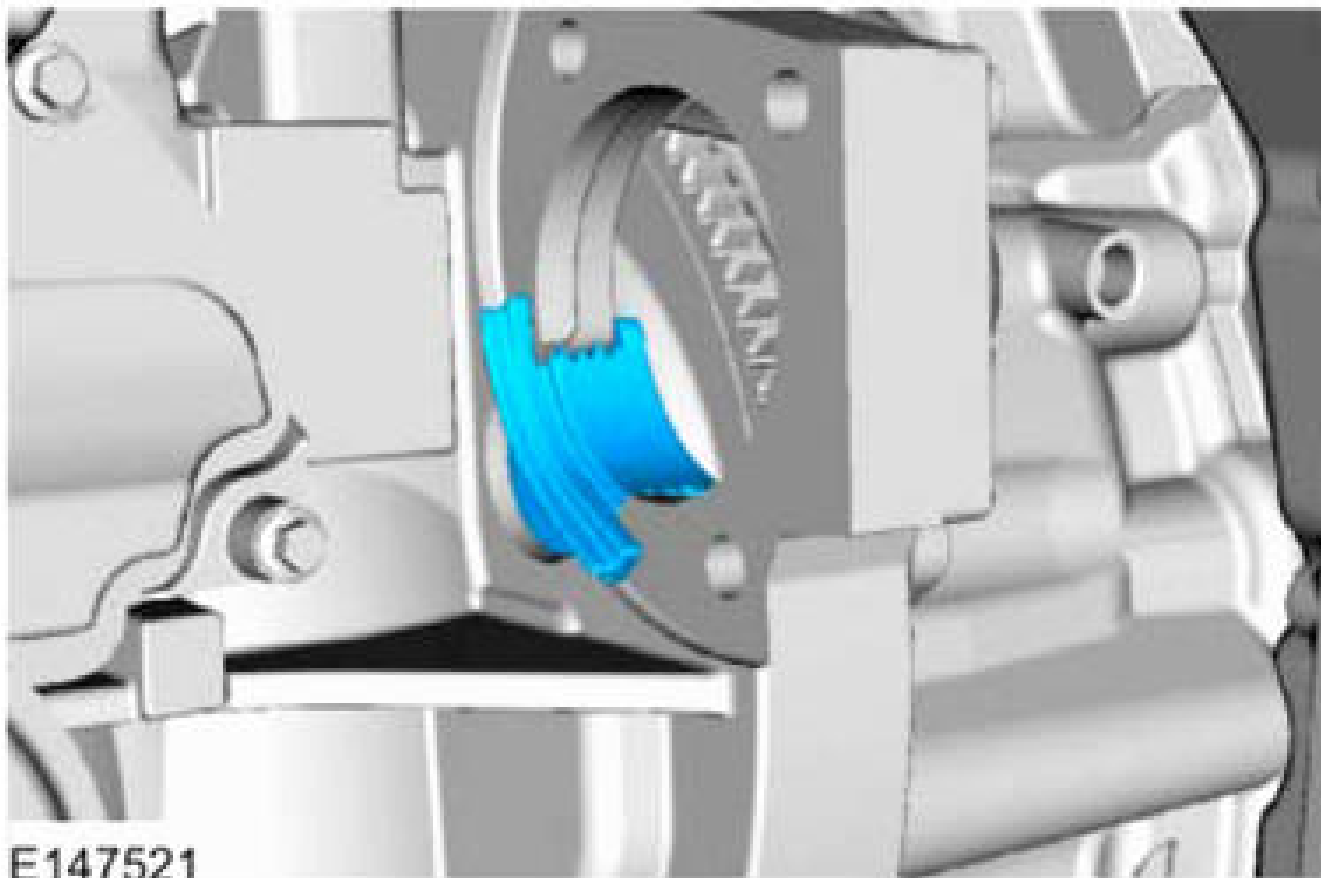
Torque: 48 Nm





10.

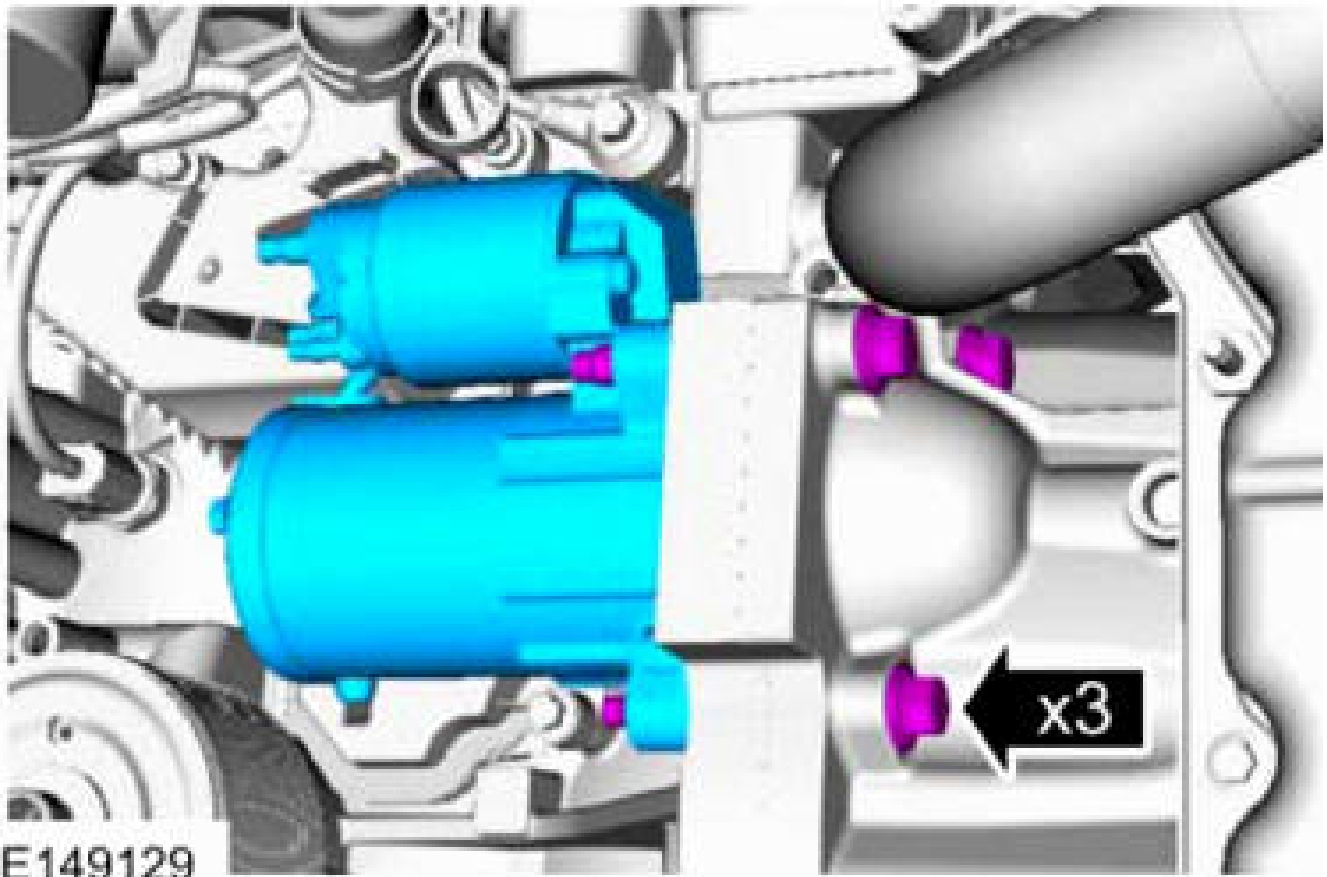
11.



11.

All vehicles

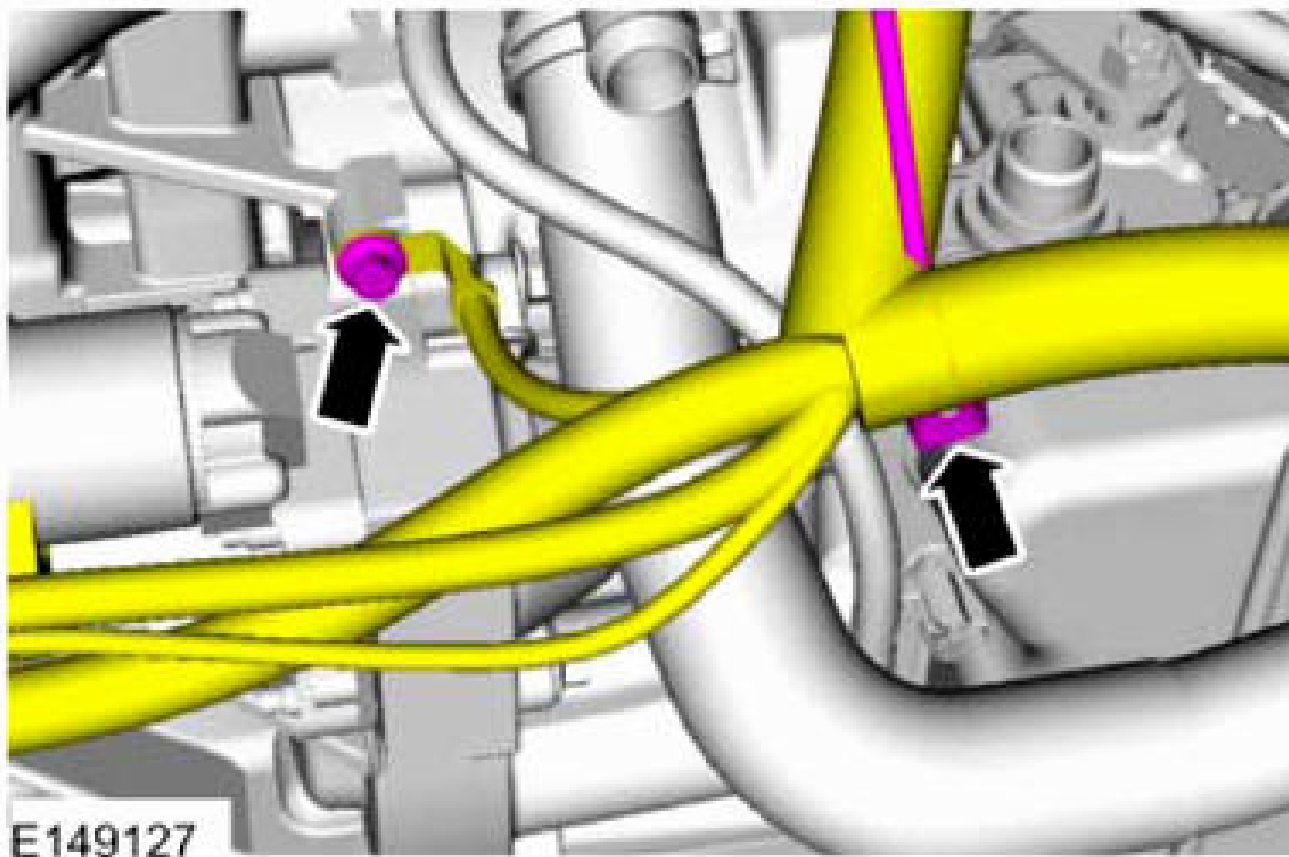
12. *Torque:* 35 Nm



NOTE: Engines with automatic transmission shown in illustration, manual transmission similar.

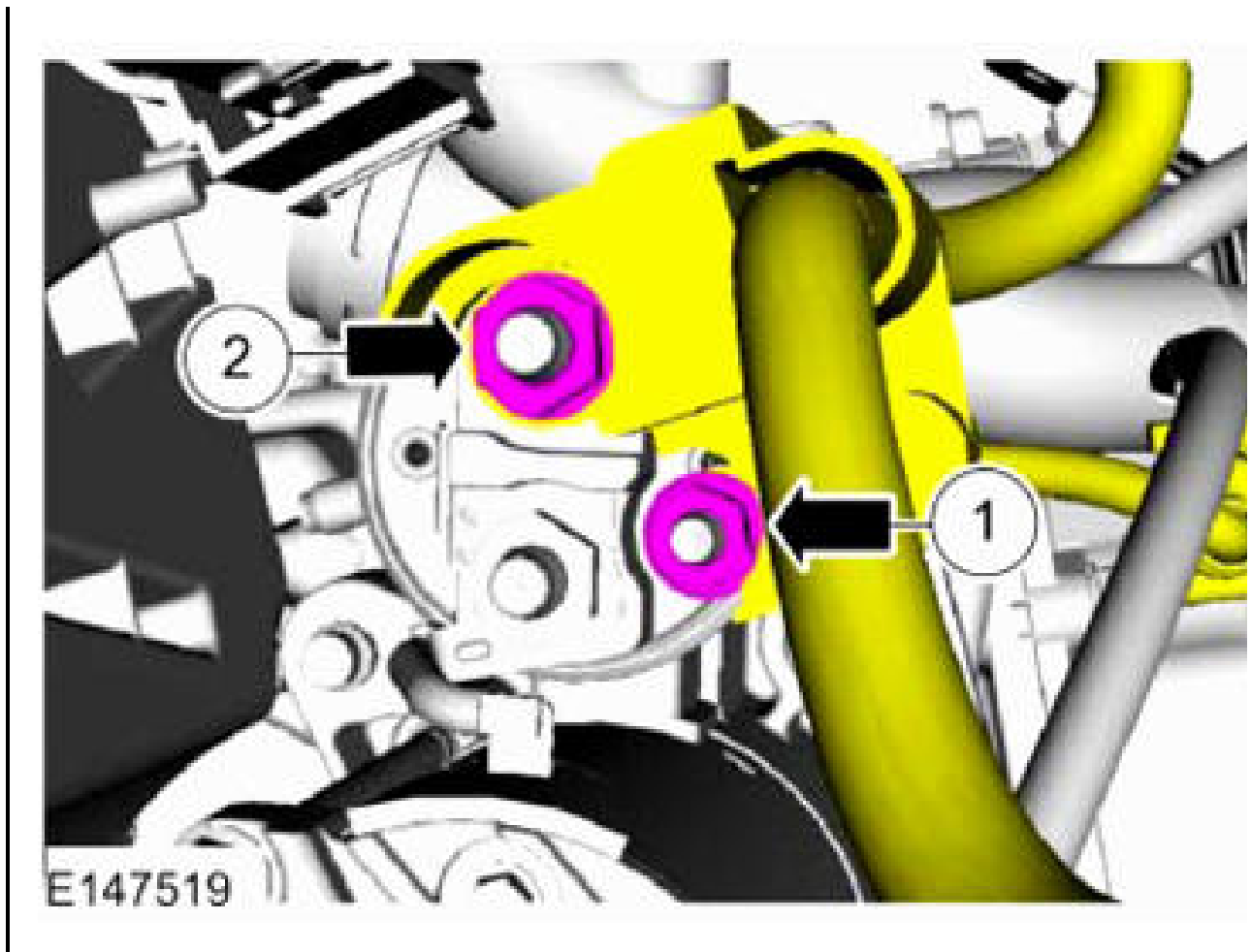
13.

Torque: 12 Nm

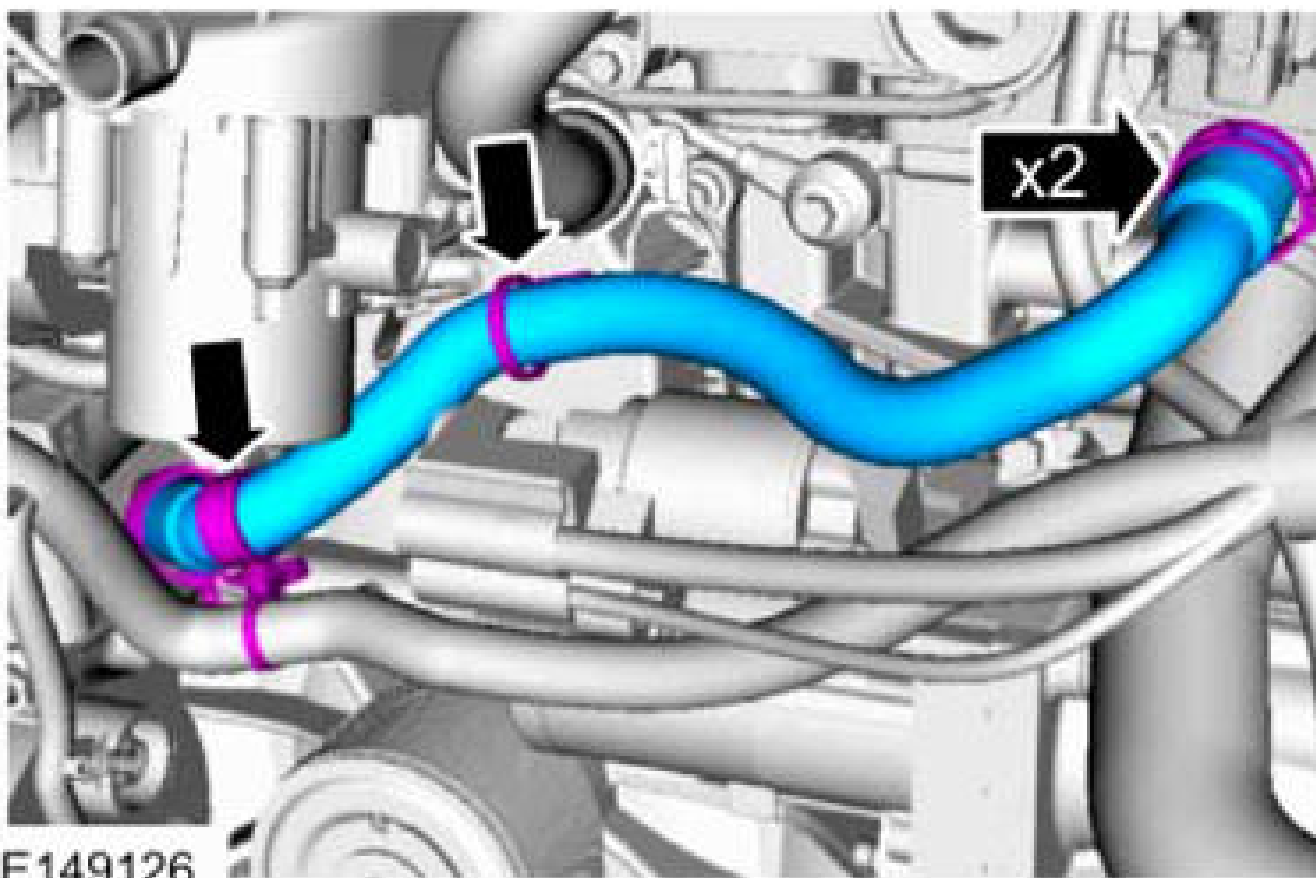


14.

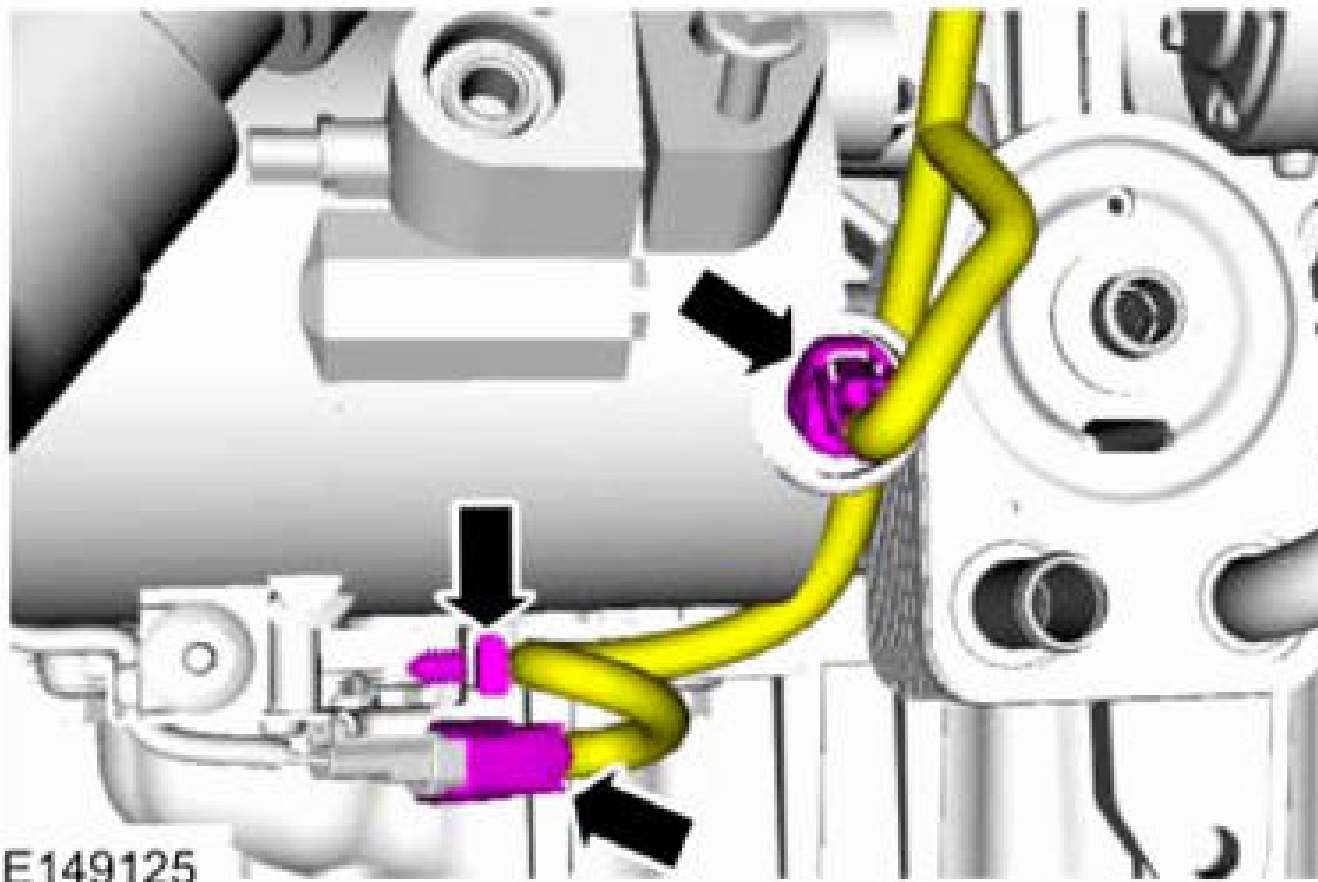
1. *Torque:* 6 Nm
2. *Torque:* 12 Nm



15. *General Equipment:* Hose Clamp Remover/Installer

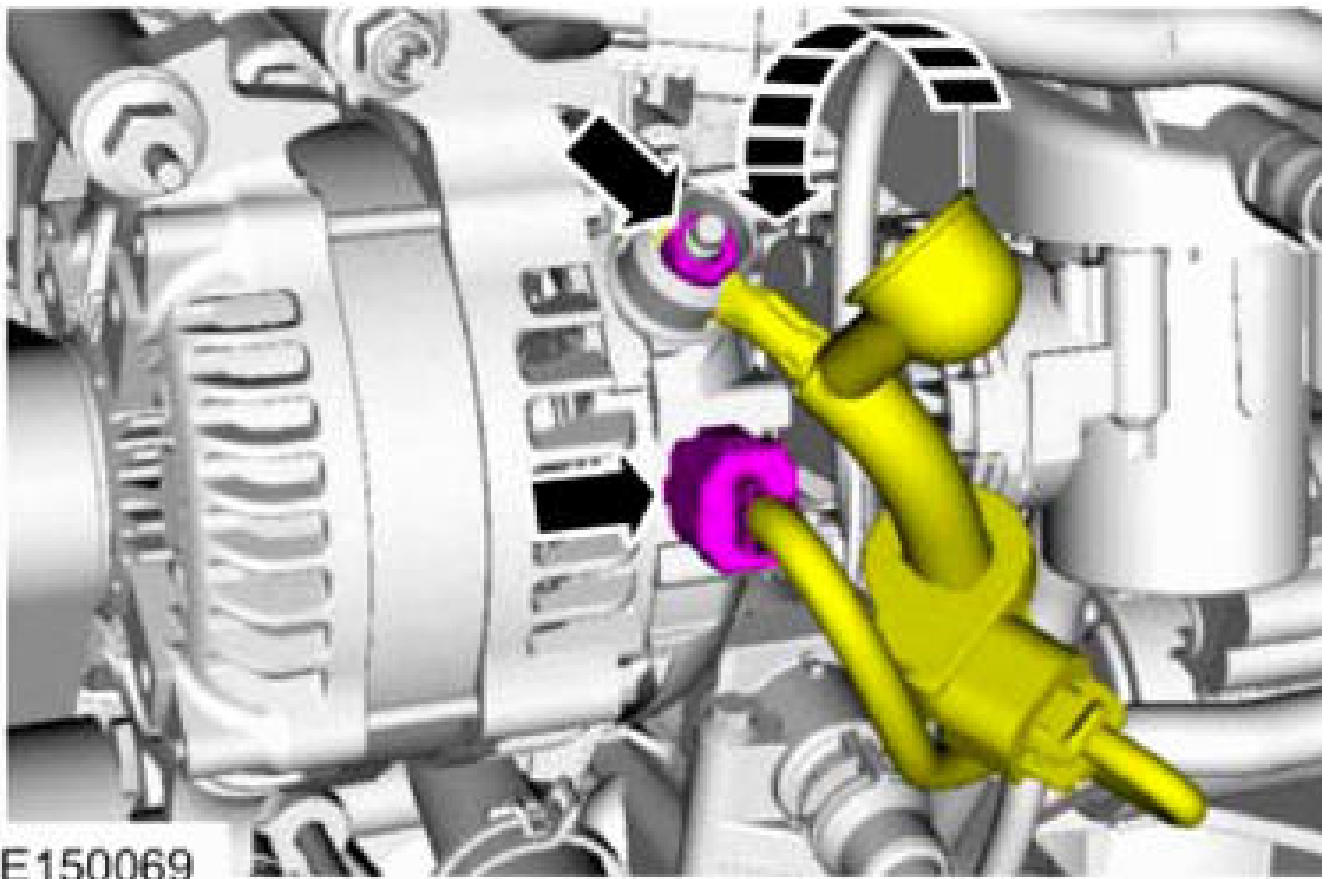


E149126

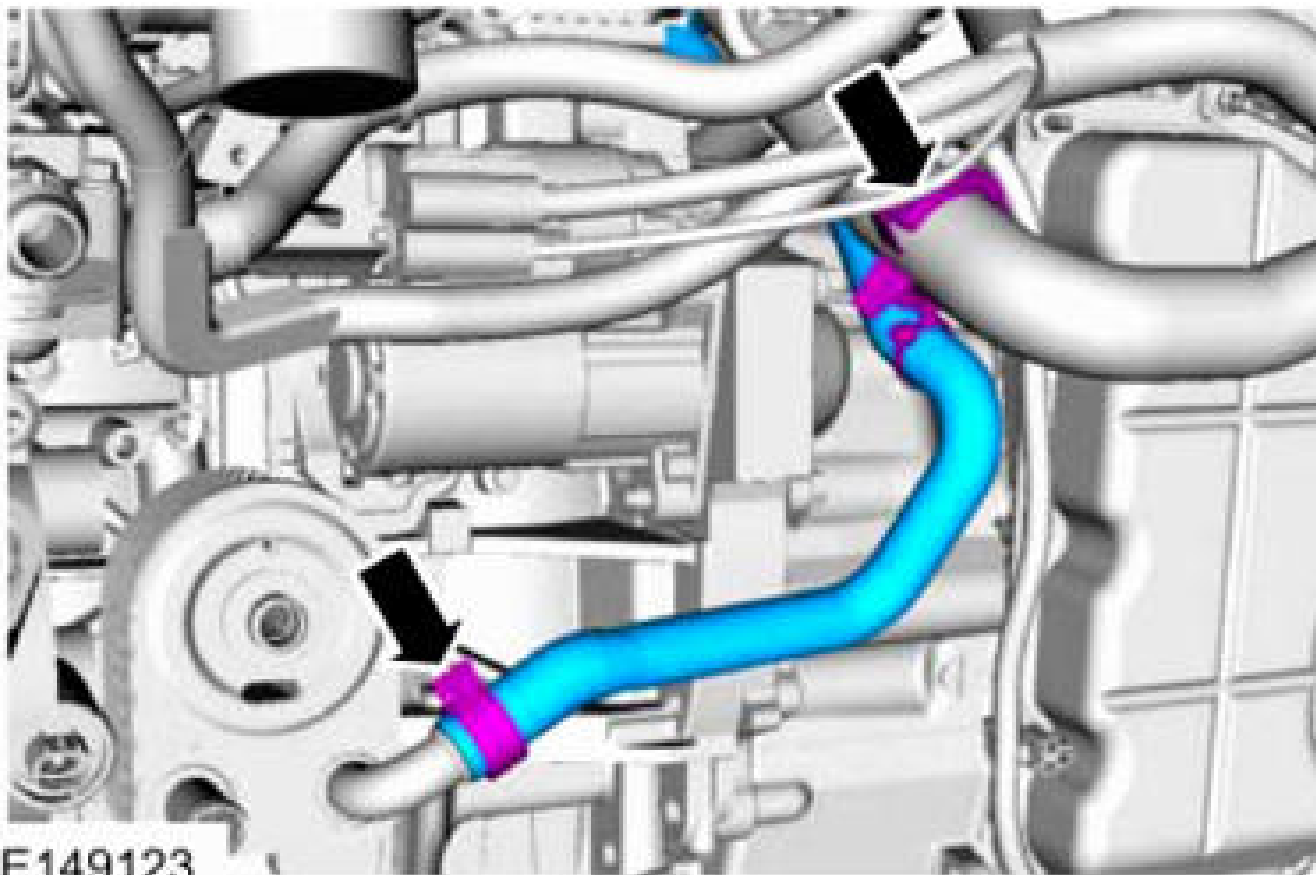


16.

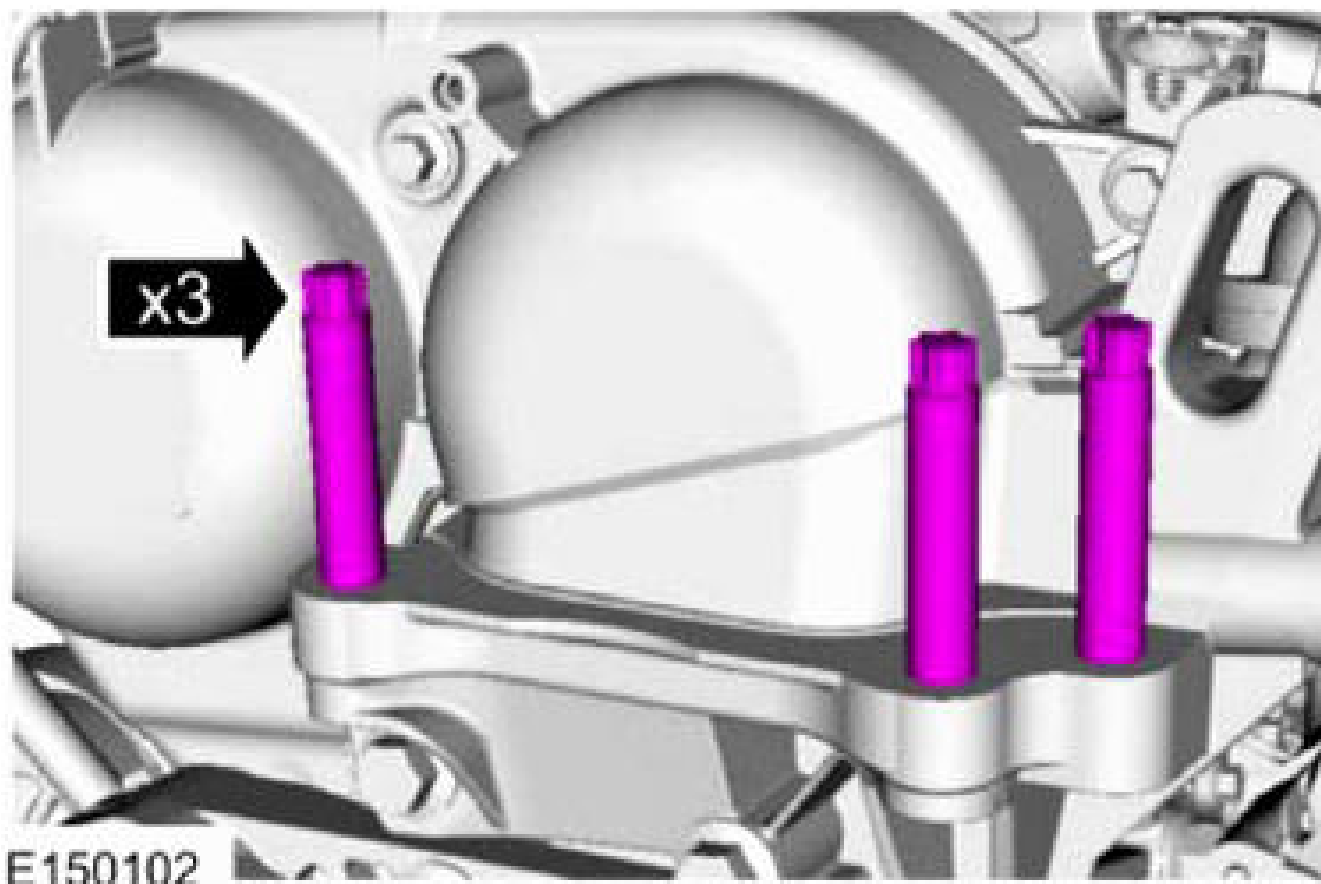
17. *Torque:* 17 Nm

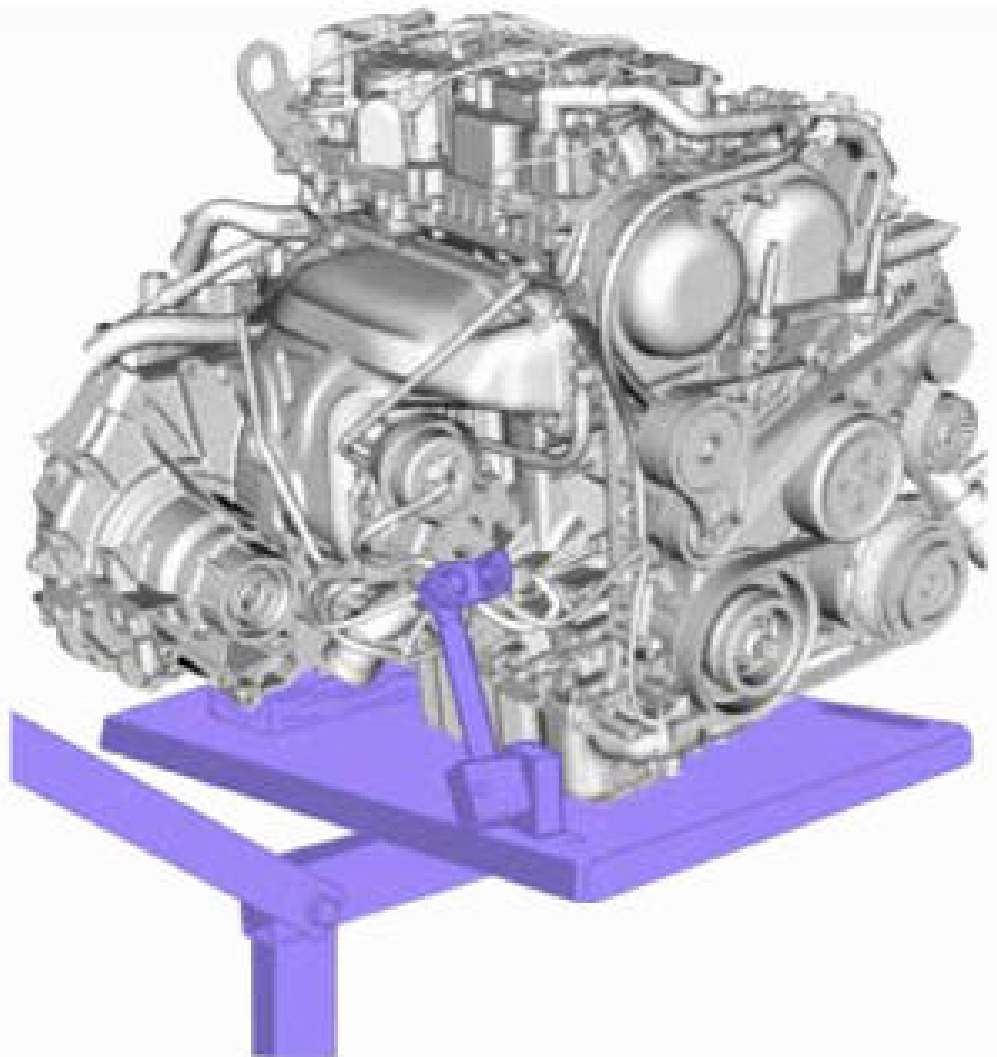


18. *General Equipment:* Hose Clamp Remover/Installer



19. *Torque:* 12 Nm



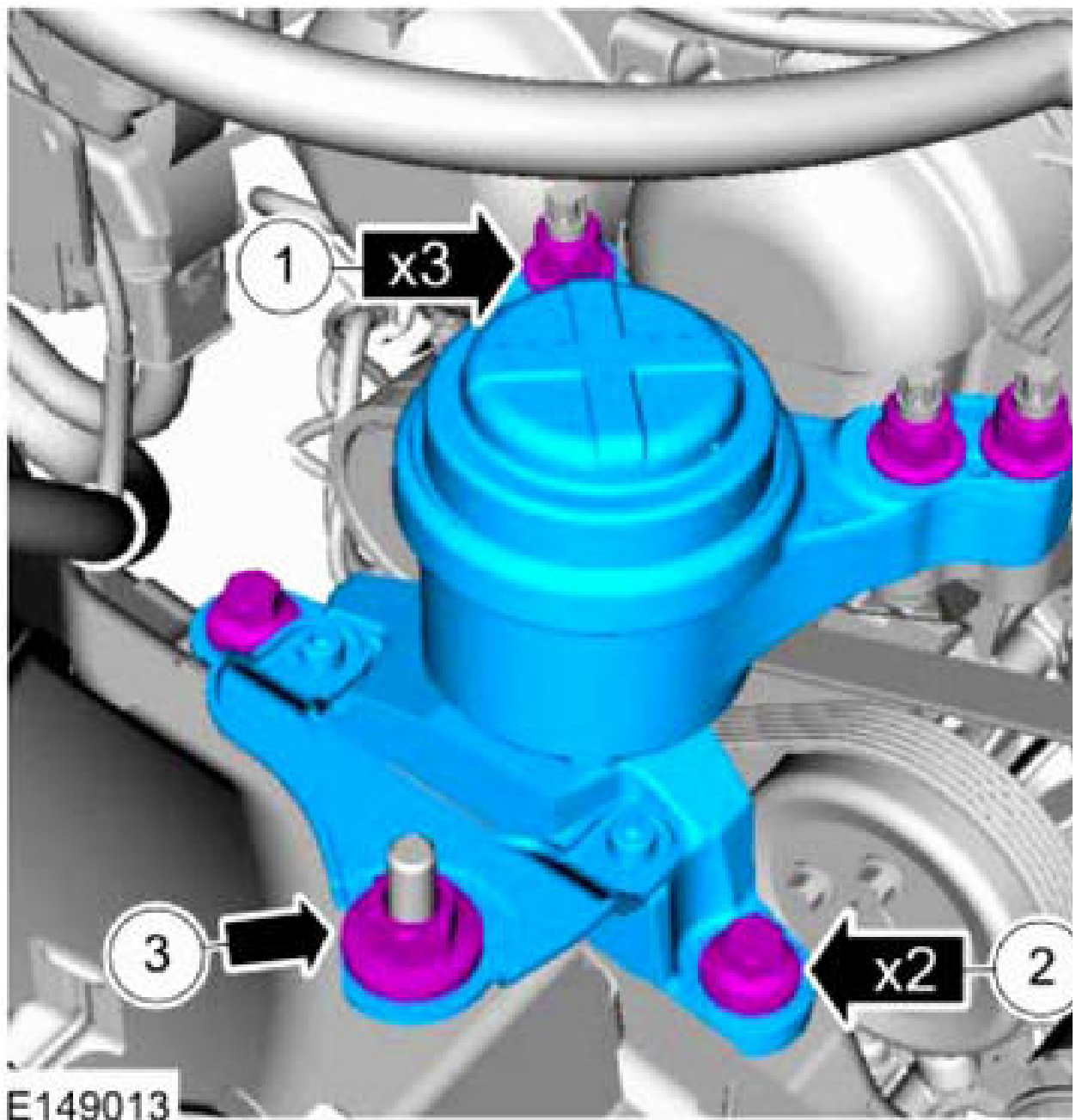


E149140

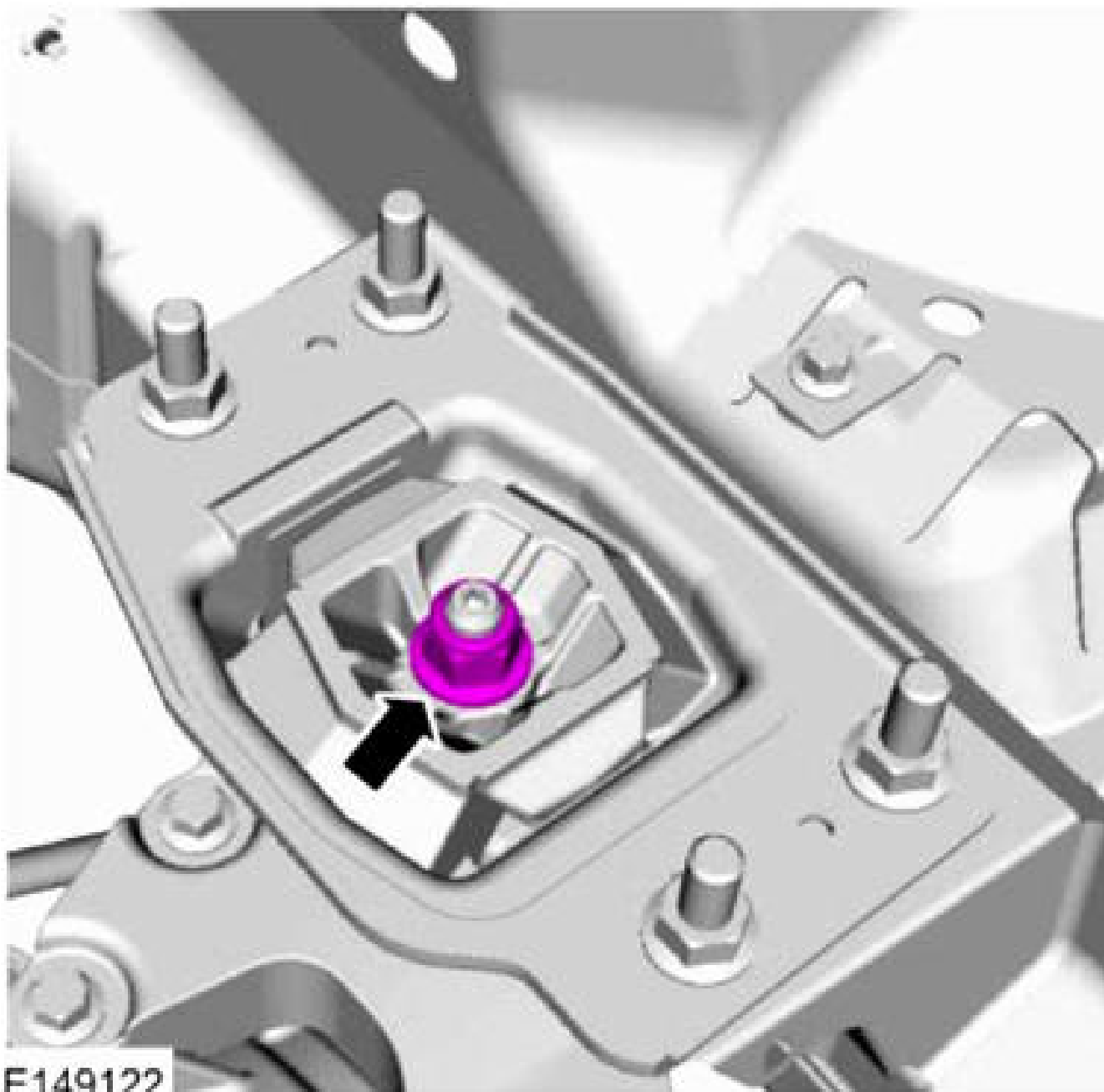
20.

21.

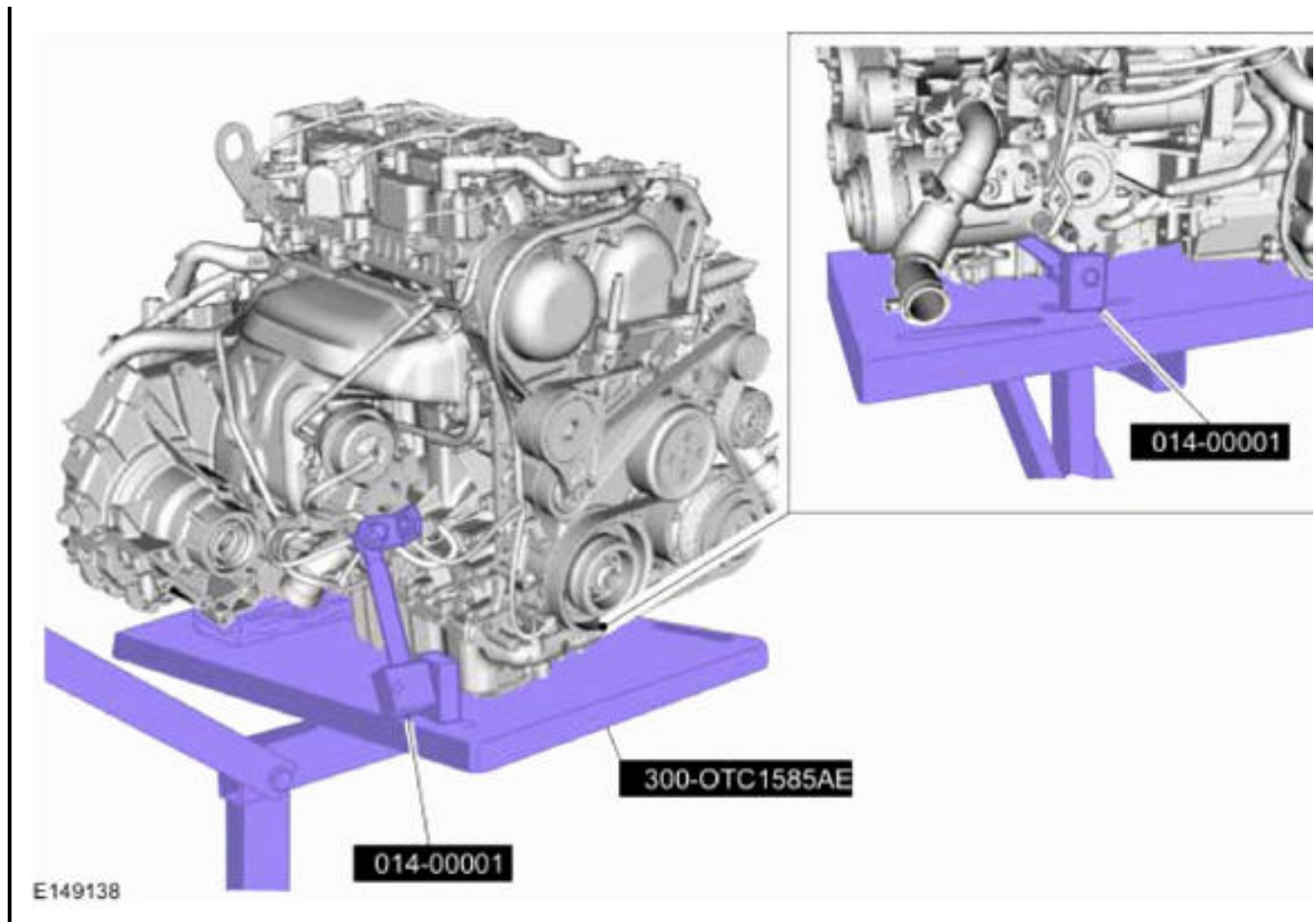
1. *Torque:* 90 Nm
2. Finger tight.
3. Finger tight.



22. *Torque:* 133 Nm

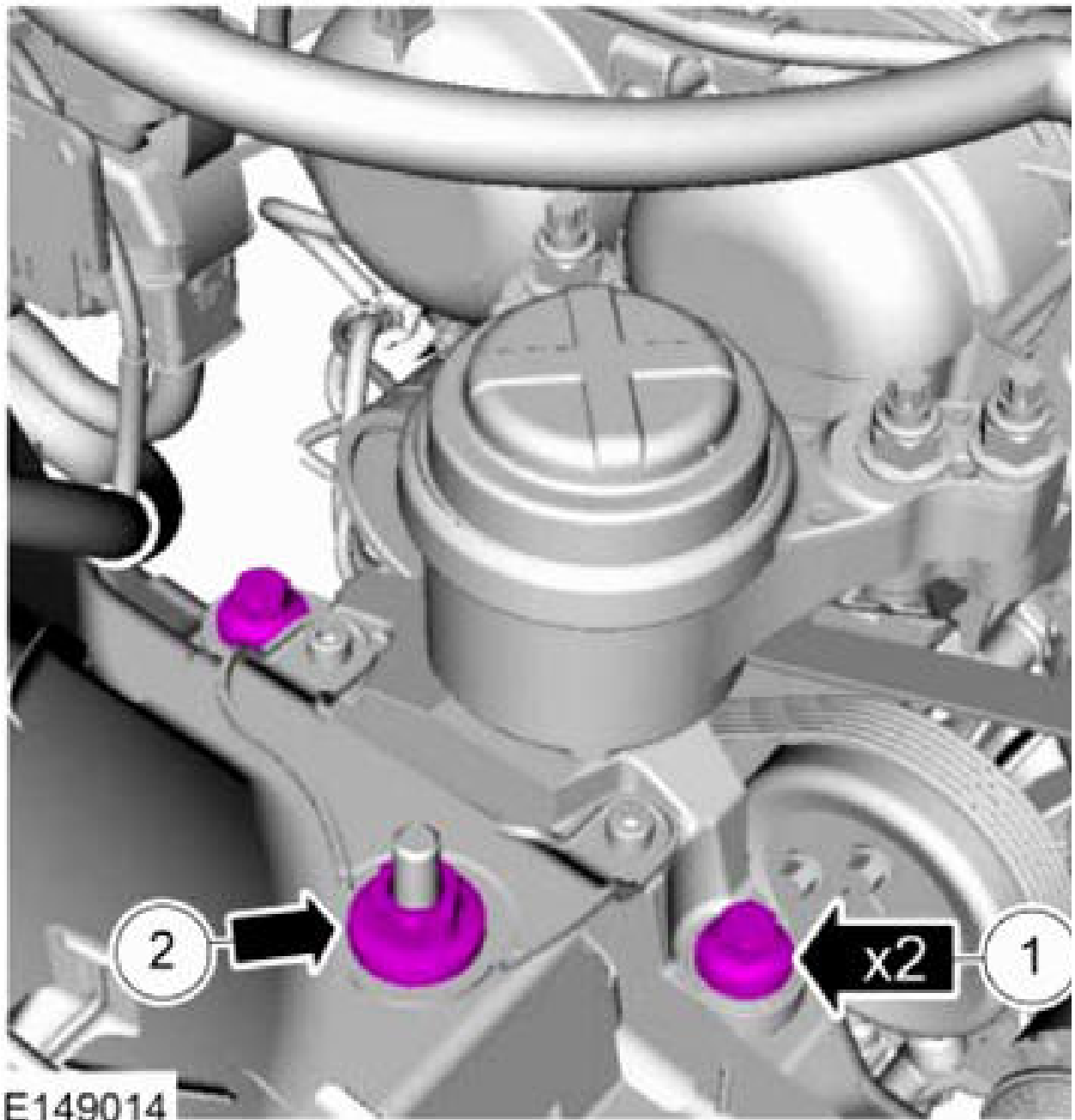


23. Remove Special Service Tool: **014-00001 ADJUSTABLE GRIP 1735A , 300-OTC1585AE Powertrain Lift**



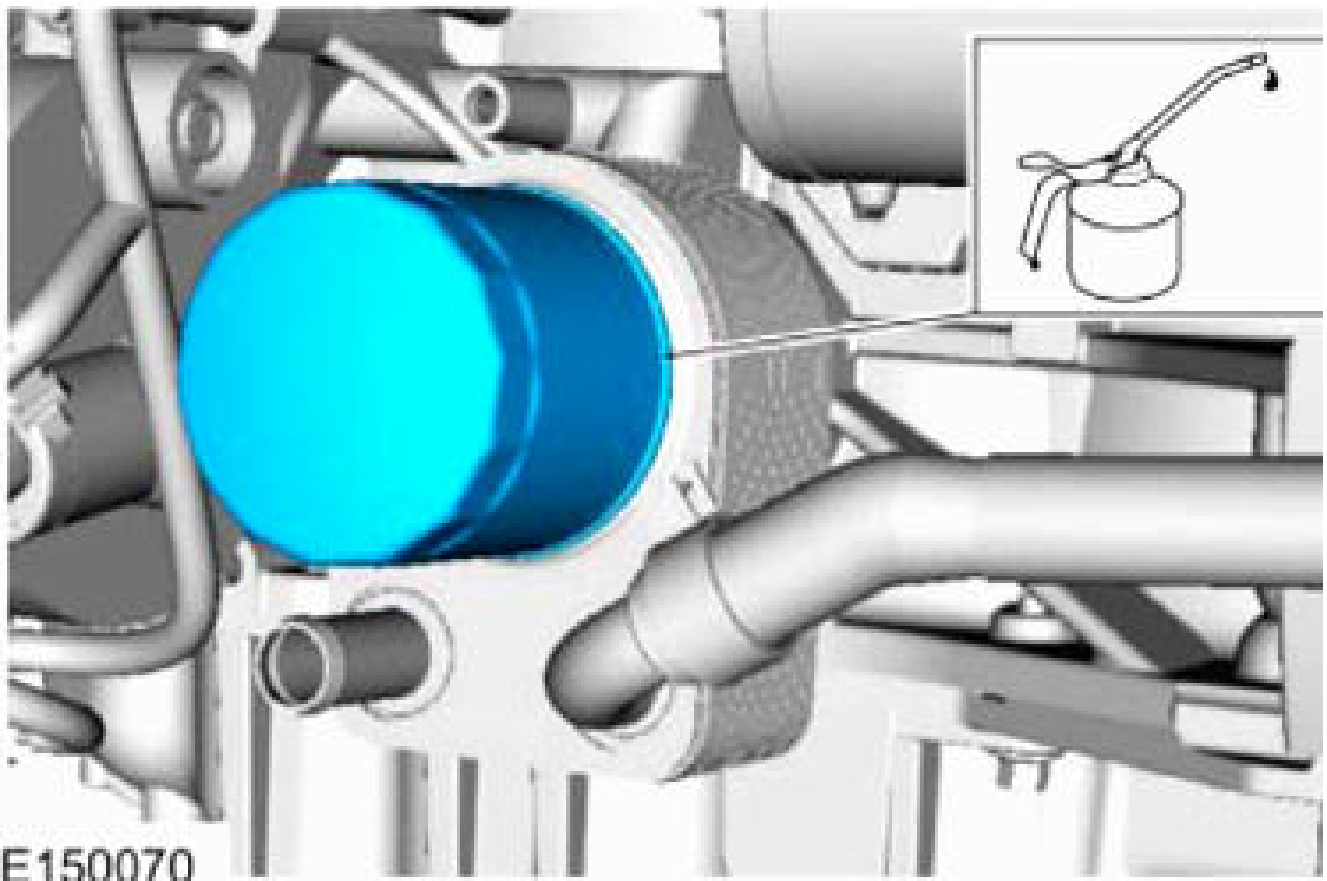
24.

1. *Torque:* 90 Nm
2. *Torque:* 90 Nm



25. *Material:* Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

Torque: 14.5 Nm

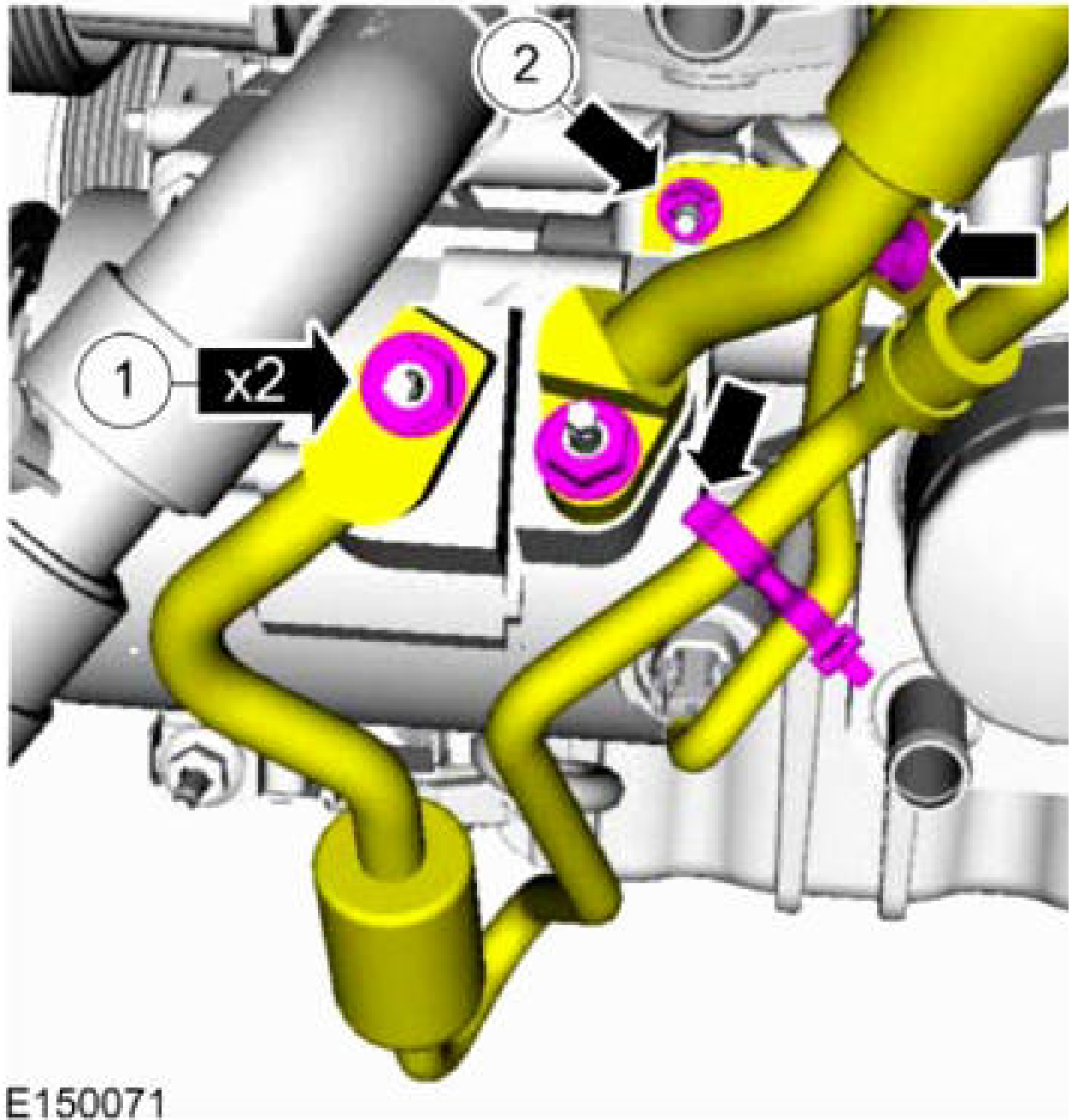


26.

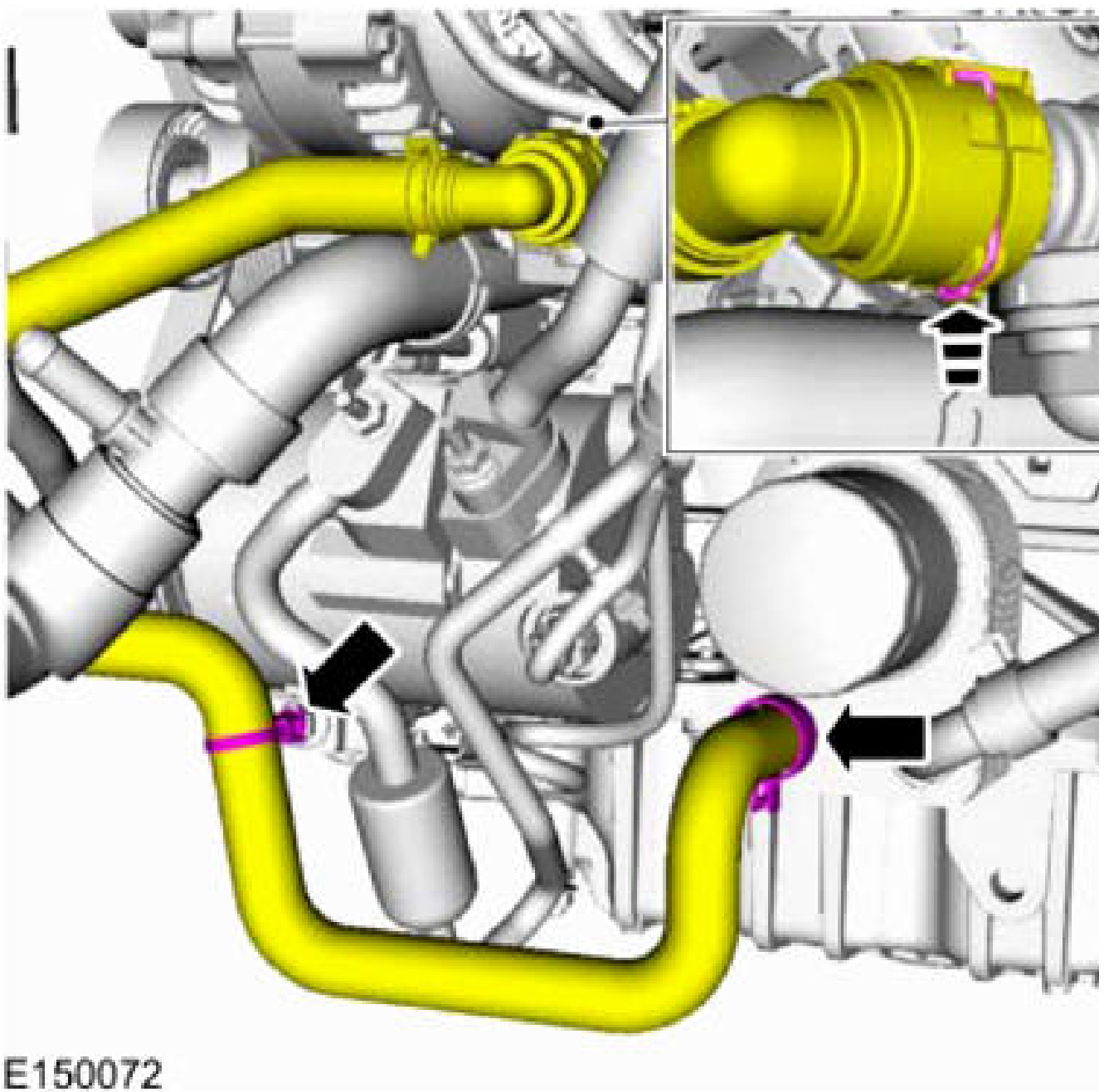
1. **NOTE:** Use new O-ring seals and gasket seals.

Torque: 15 Nm

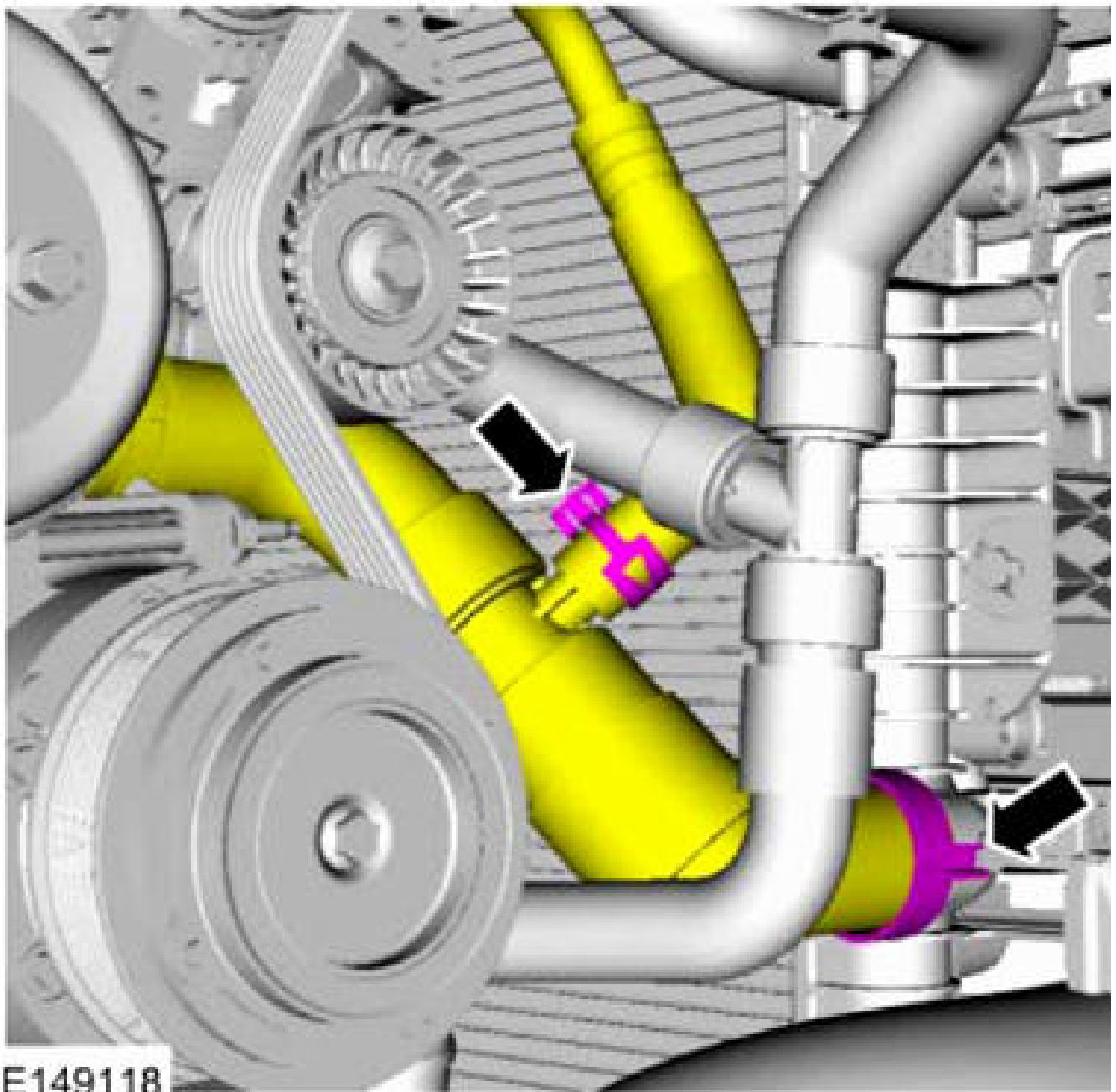
2. *Torque:* 10 Nm



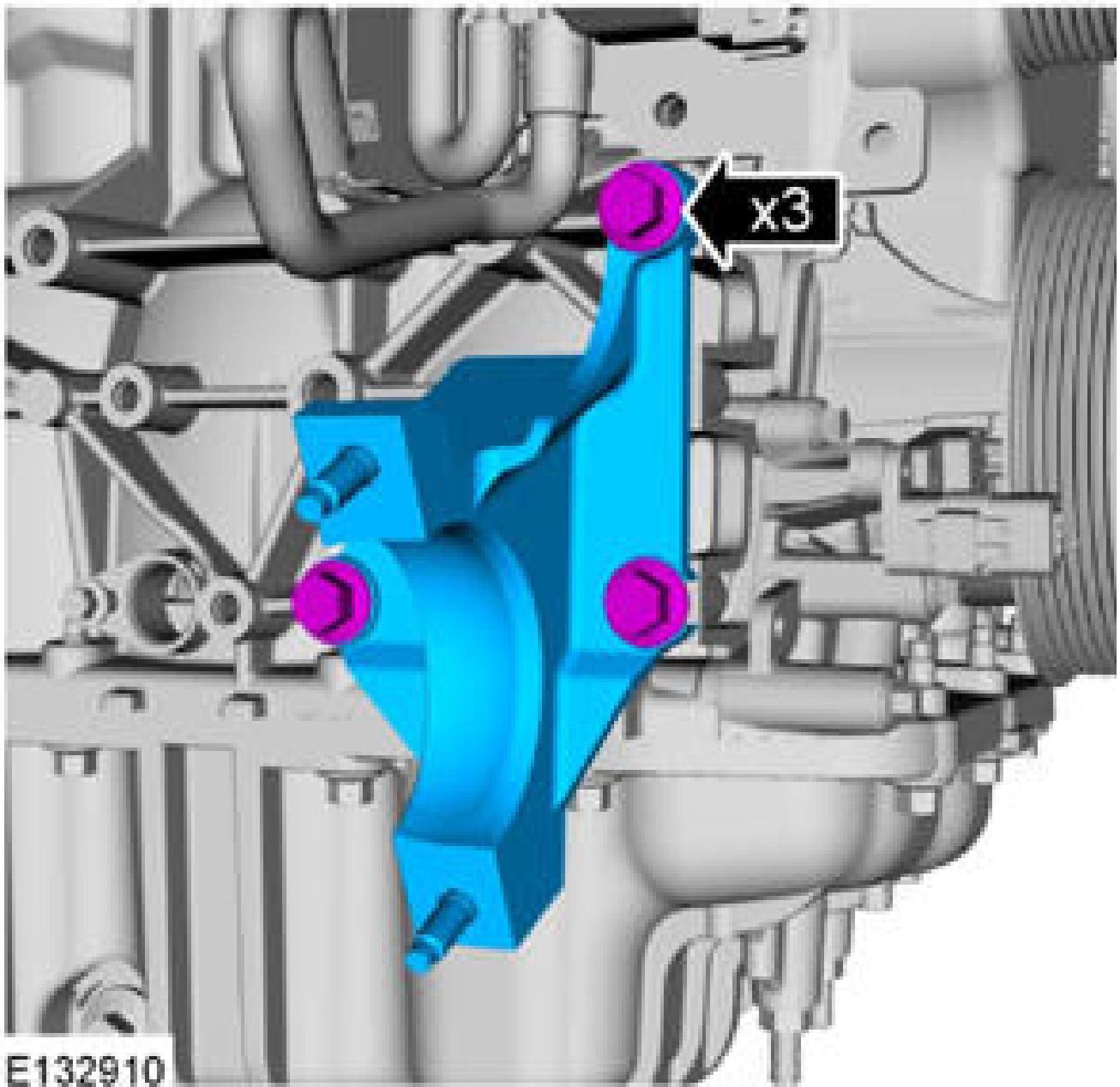
27. *General Equipment:* Hose Clamp Remover/Installer

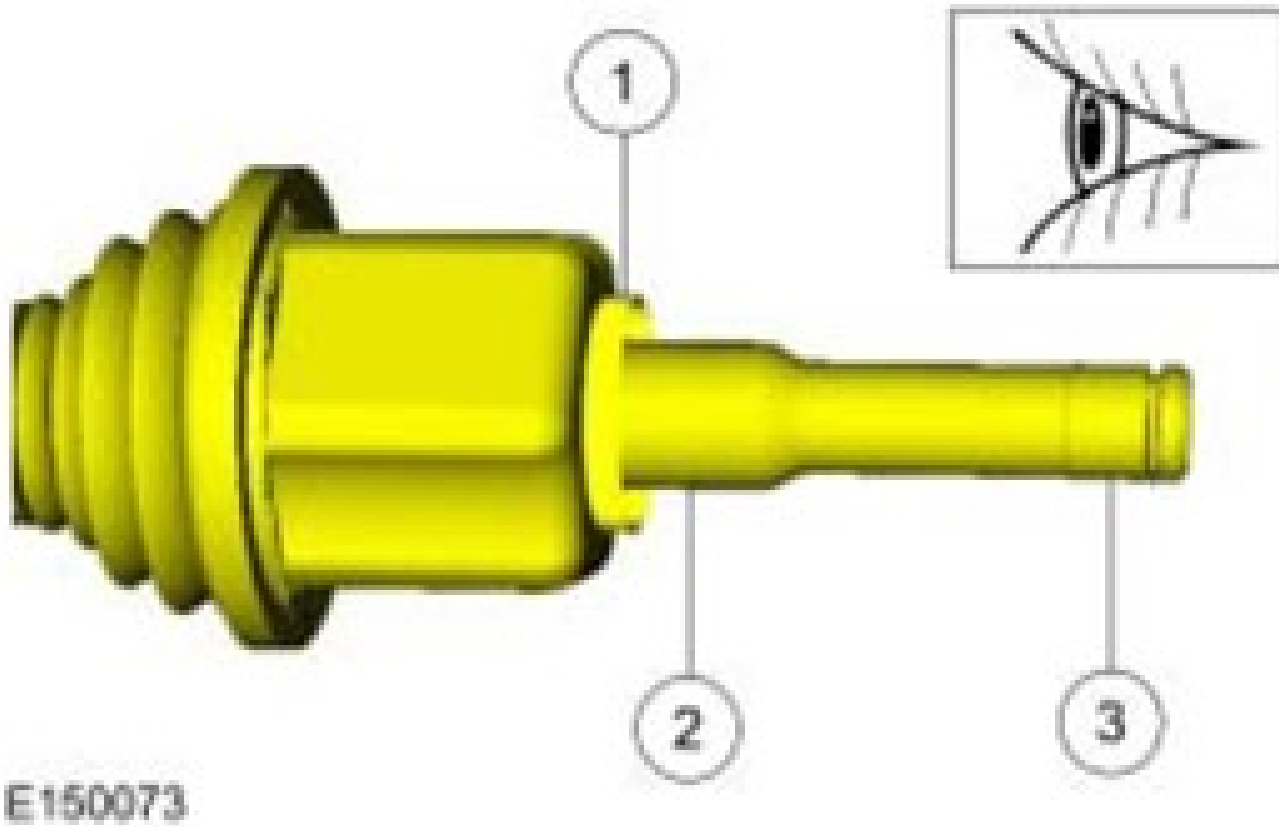


28. *General Equipment:* Hose Clamp Remover/Installer



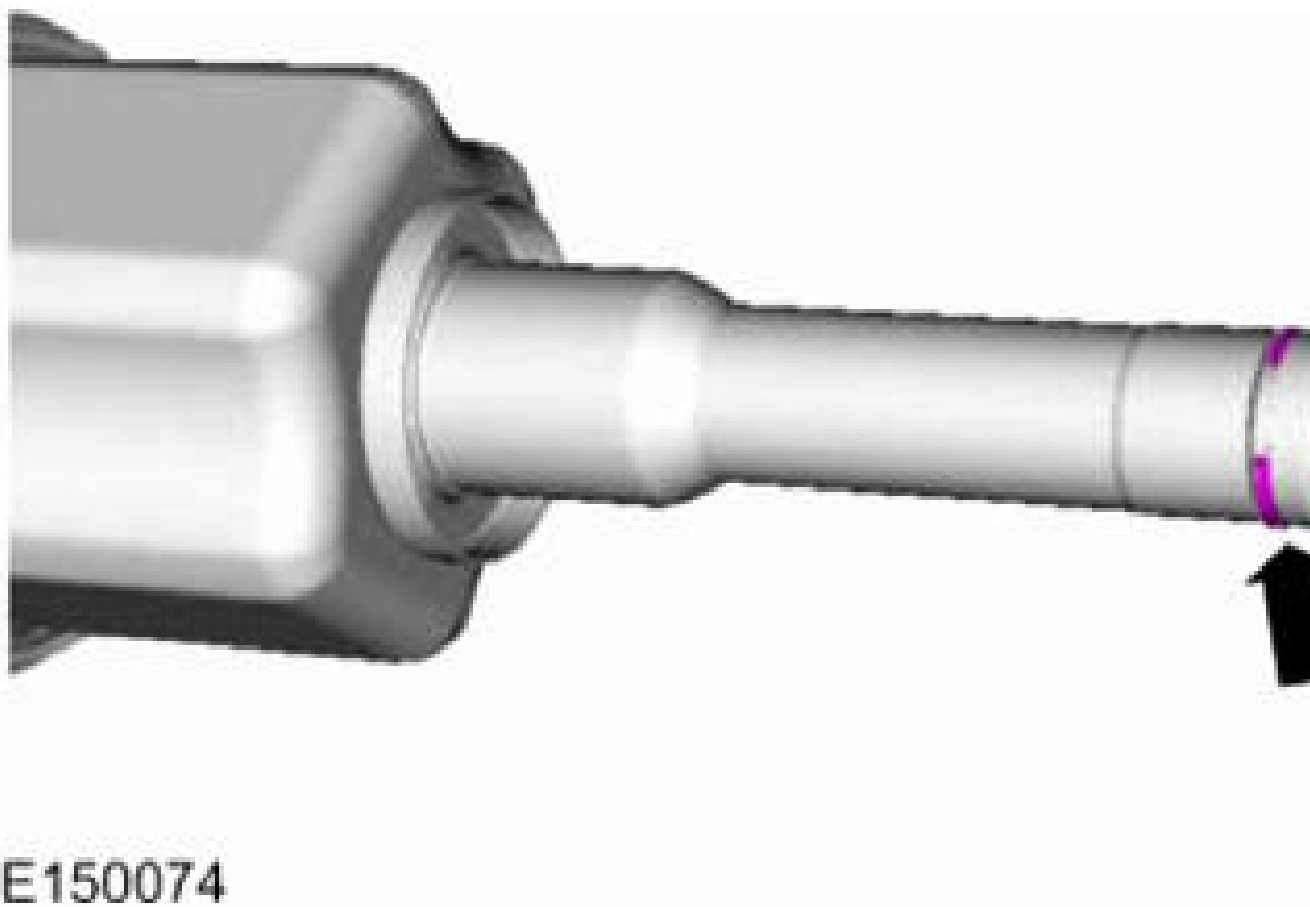
29. Torque: 48 Nm





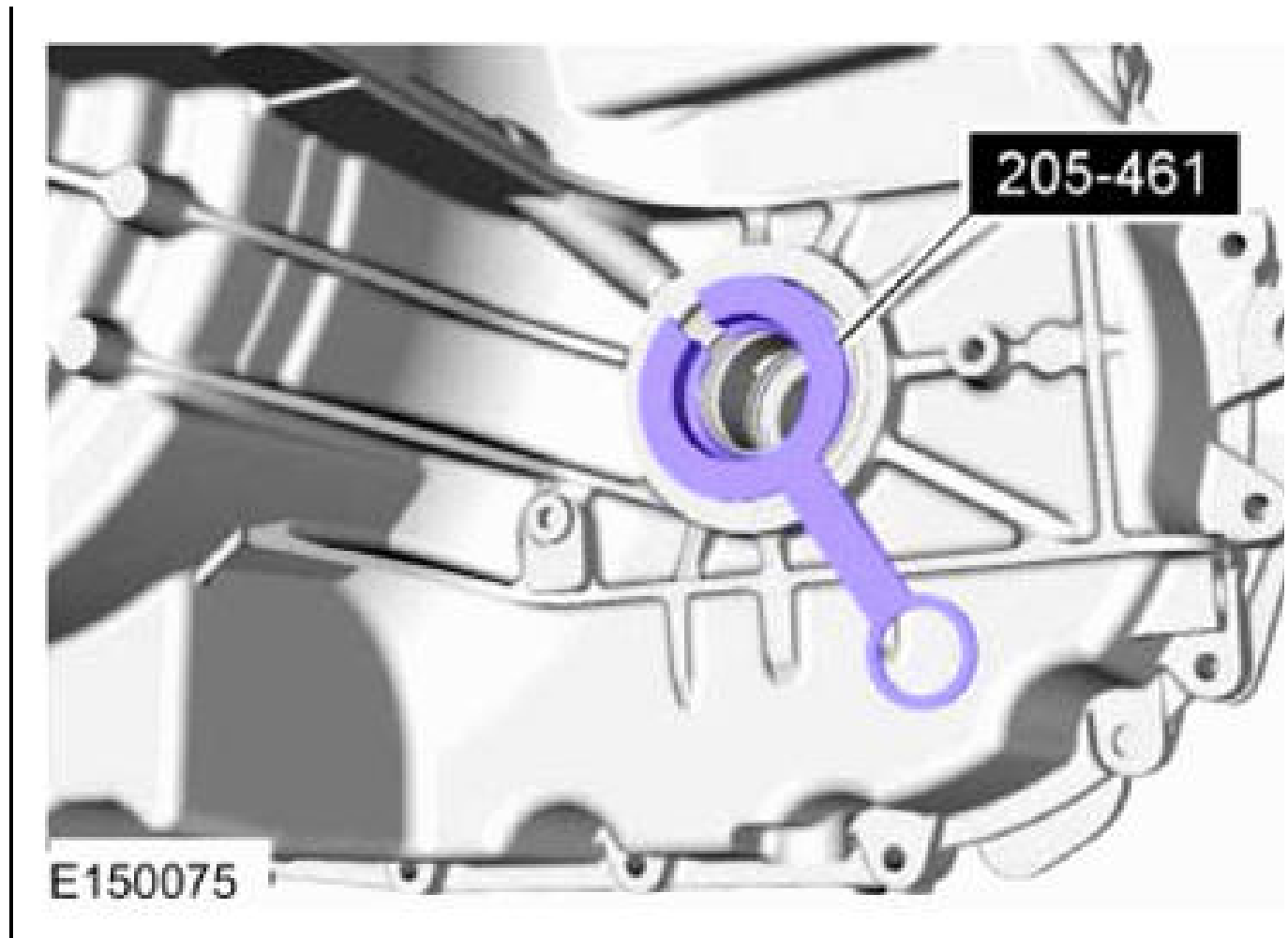
30.

31.

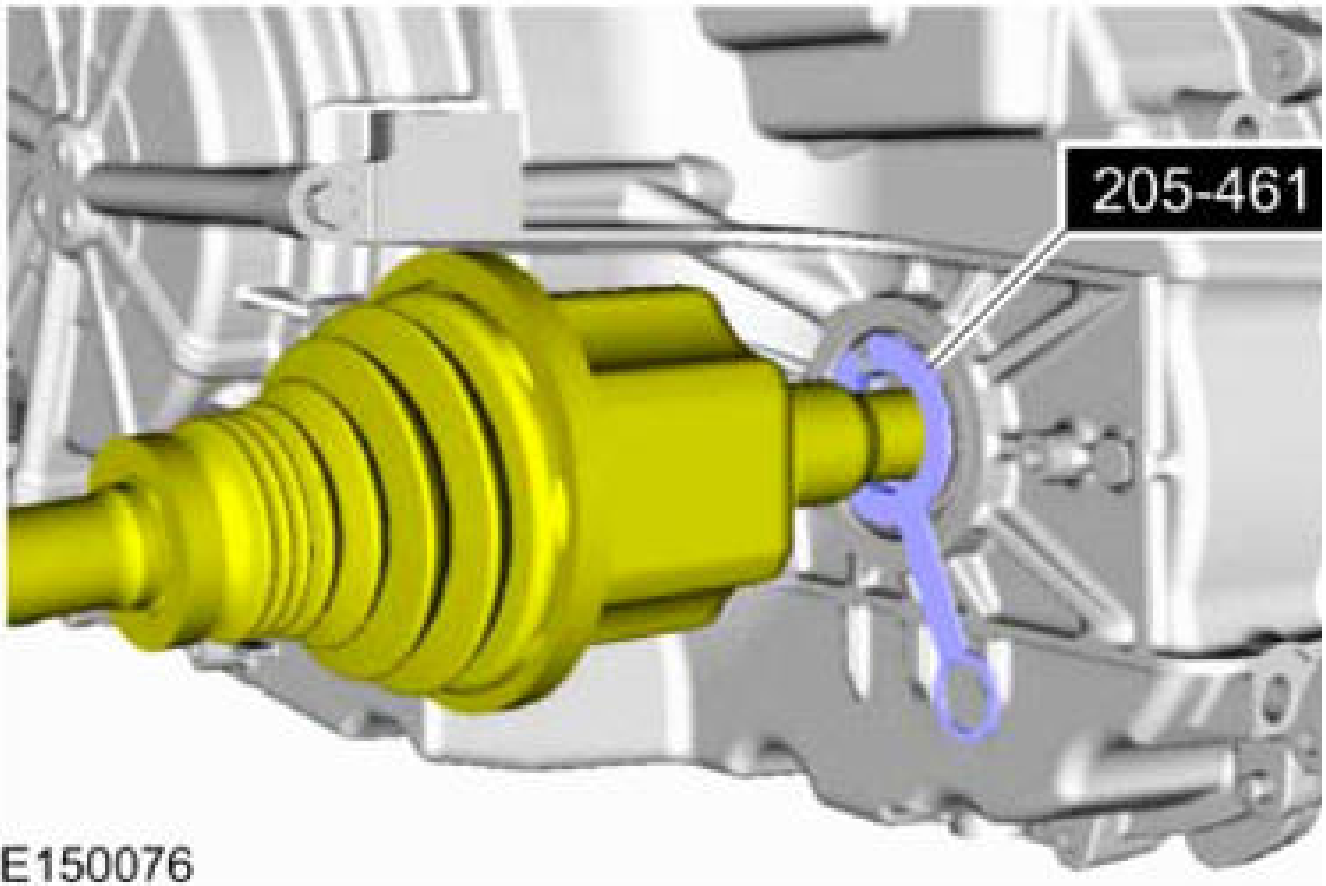


31.

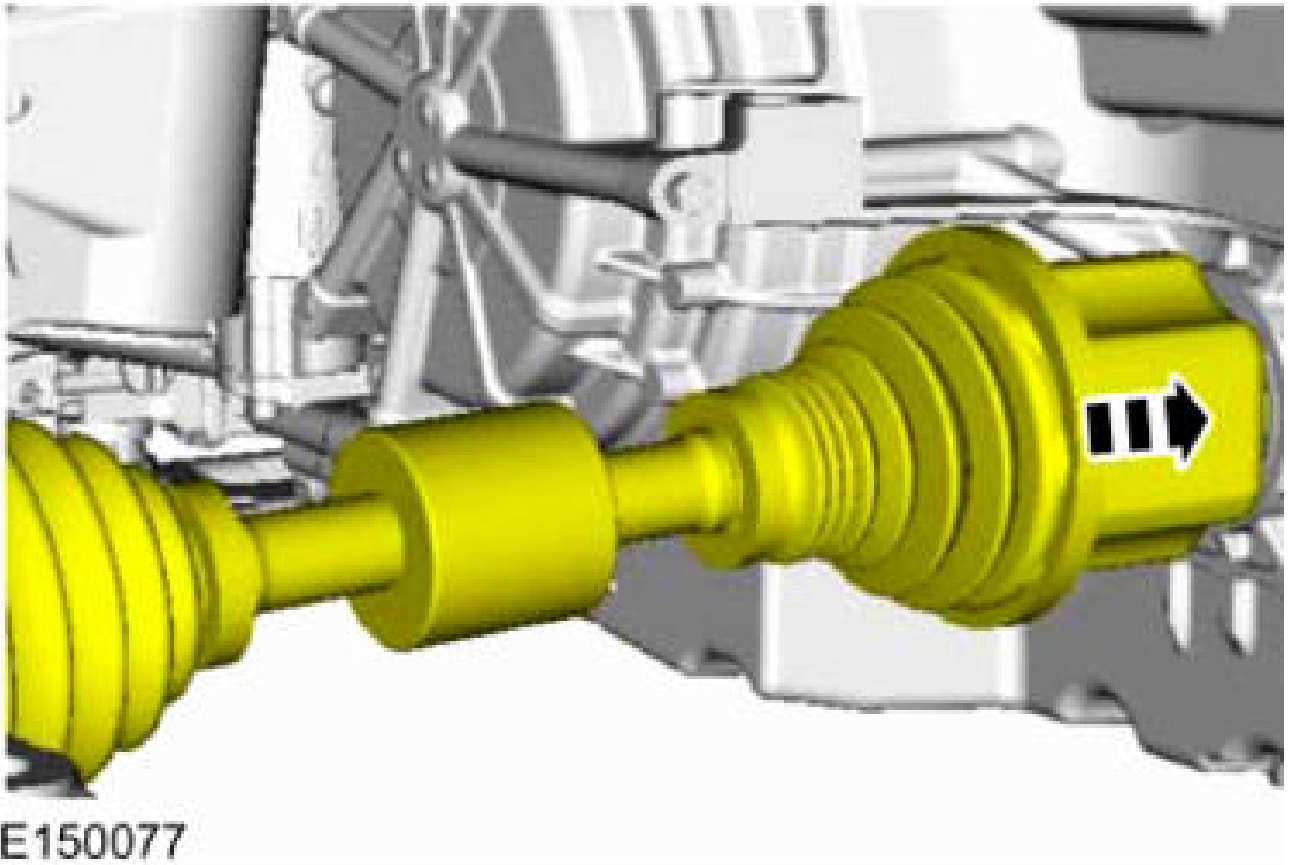
32. *Install Special Service Tool: 205-461 Protector, Differential Oil Seal (pair)*

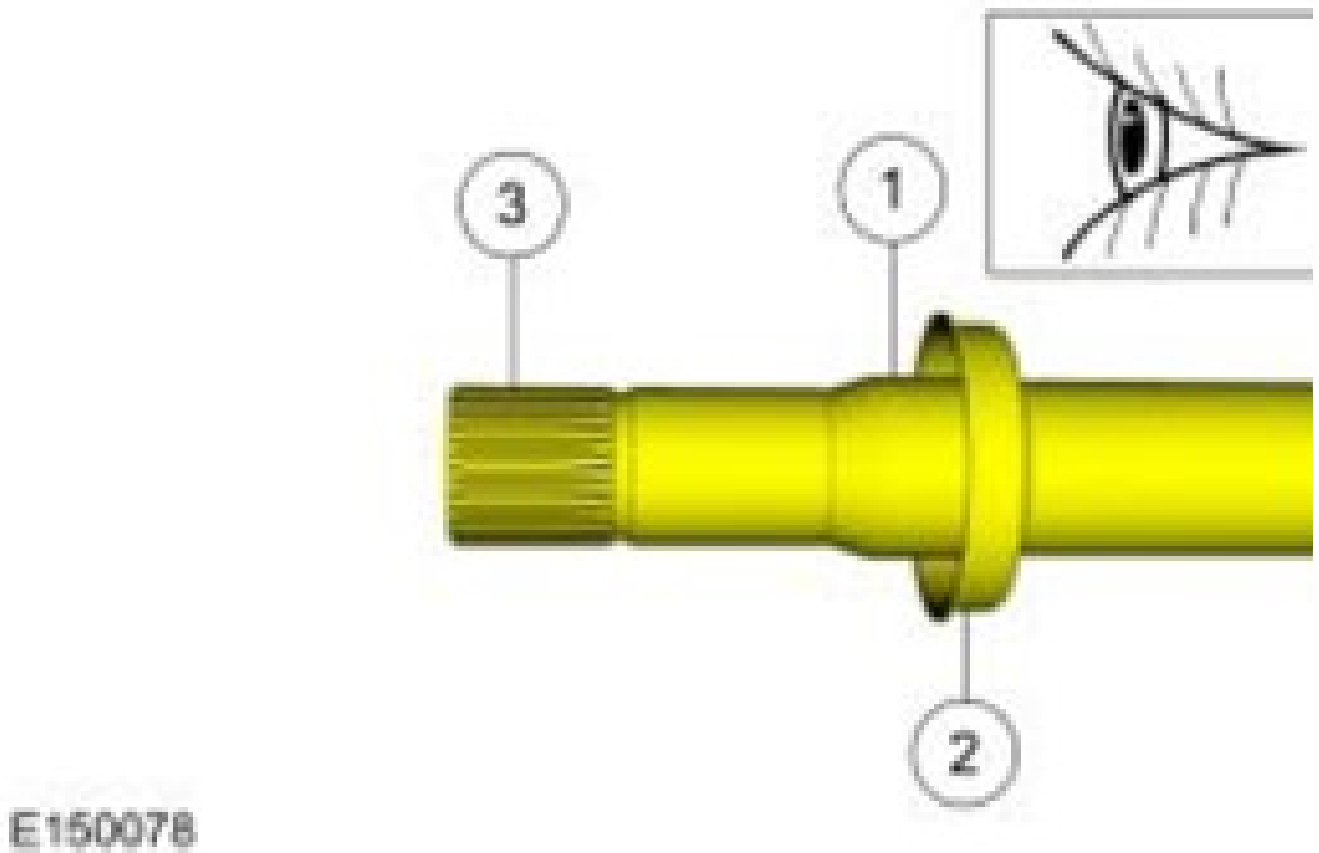


33. Remove *Special Service Tool*: **205-461 Protector, Differential Oil Seal (pair)**



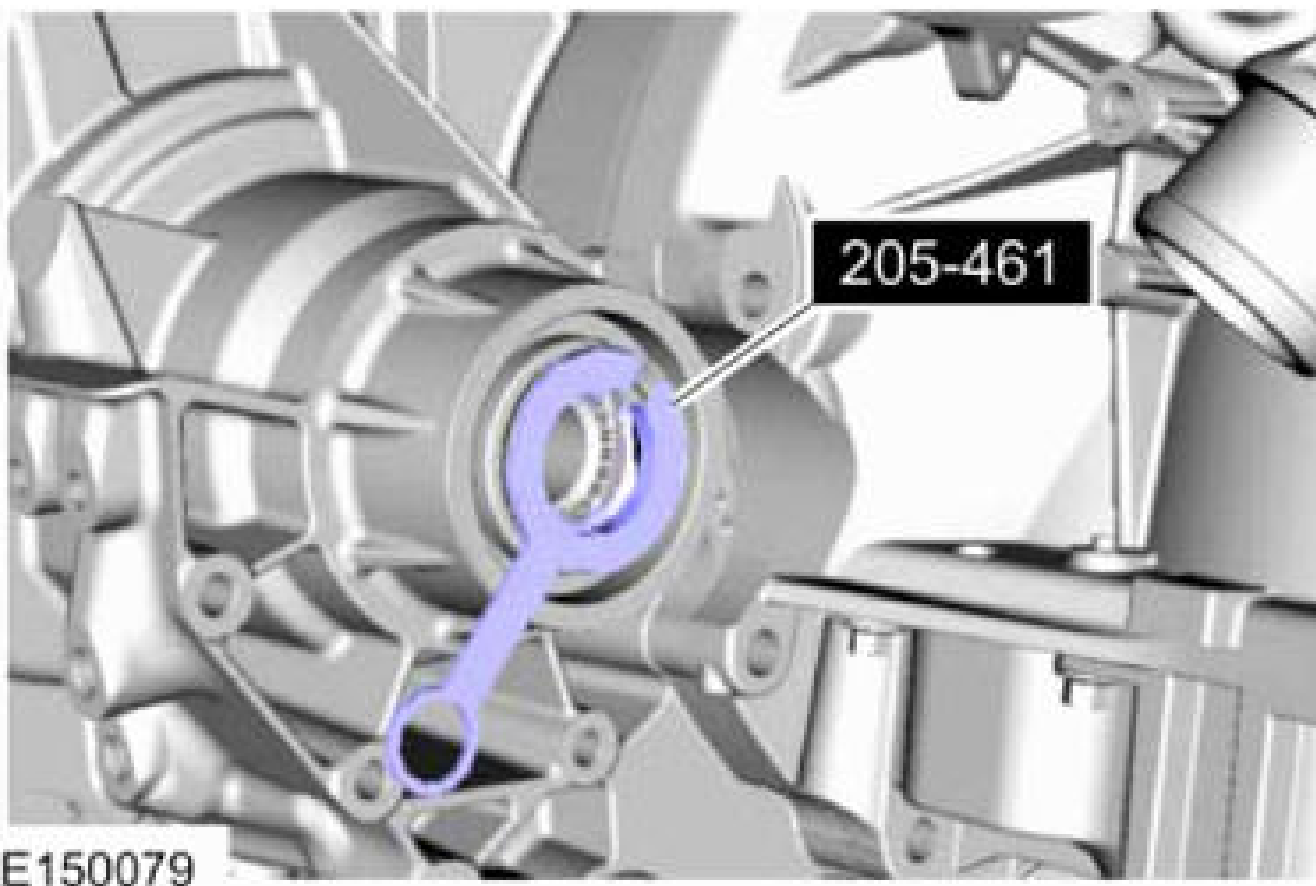
34. **NOTE:** When seated correctly, the halfshaft bearing retainer circlip can be felt as it snaps into the differential side gear groove.



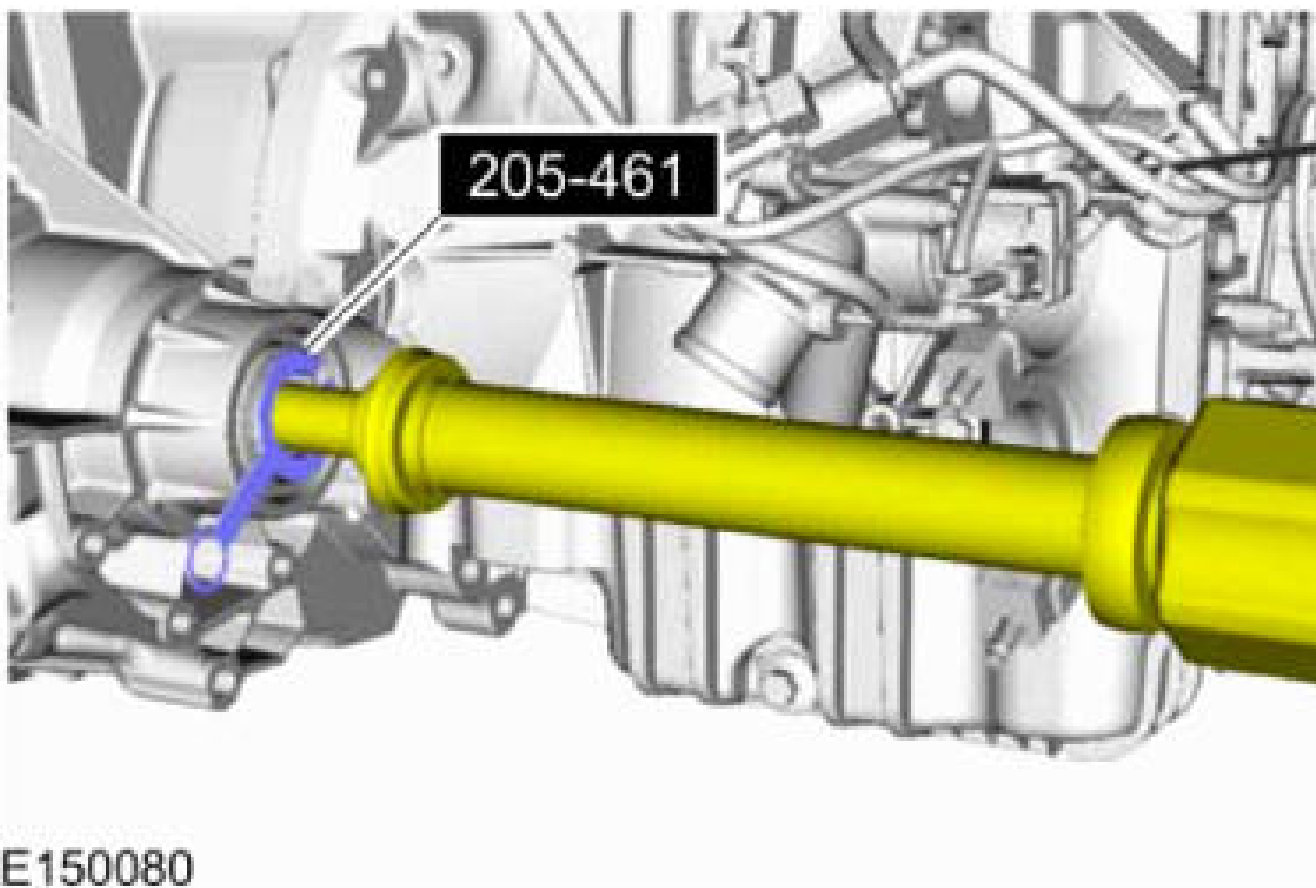


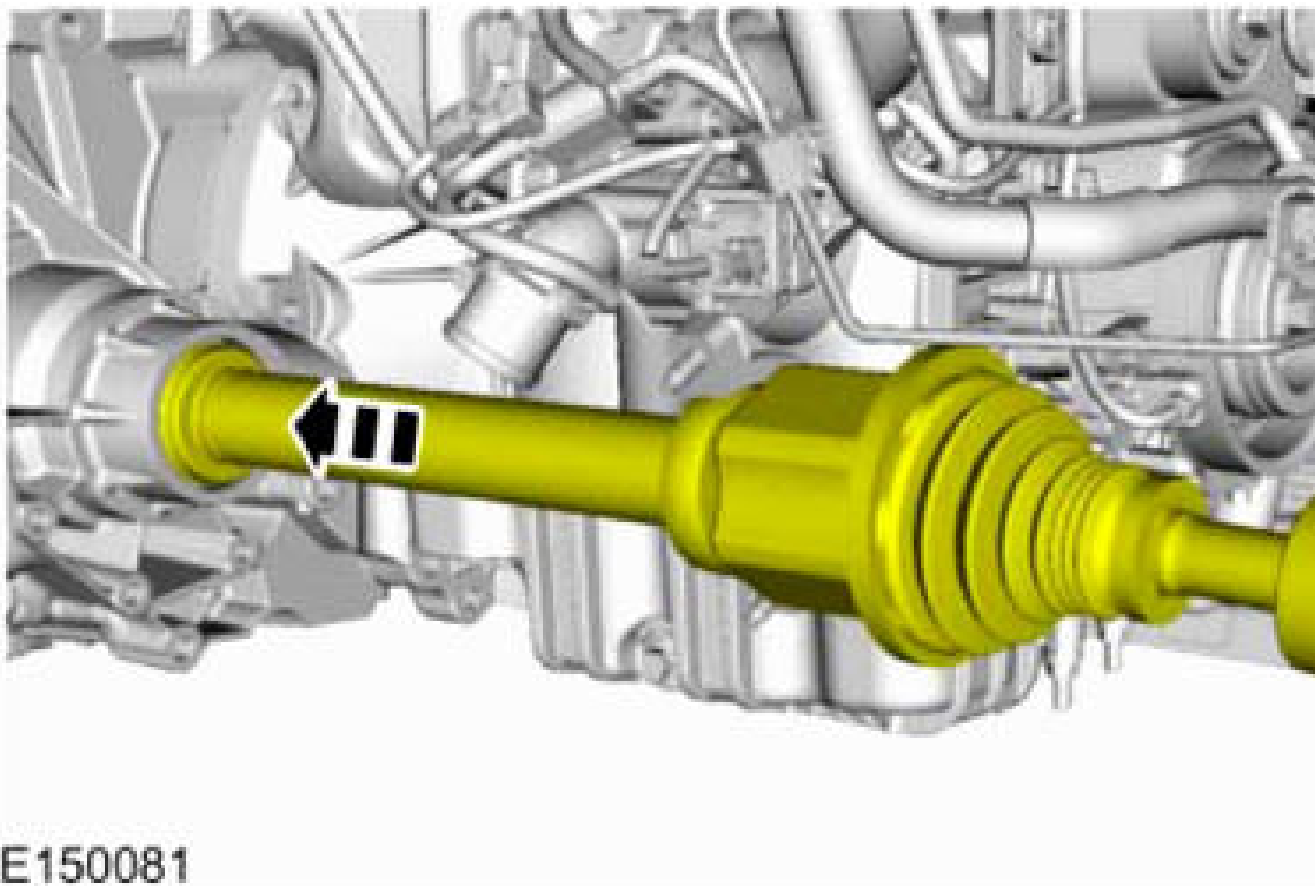
35.

36. *Install Special Service Tool: 205-461 Protector, Differential Oil Seal (pair)*



37. Remove *Special Service Tool: 205-461 Protector, Differential Oil Seal (pair)*

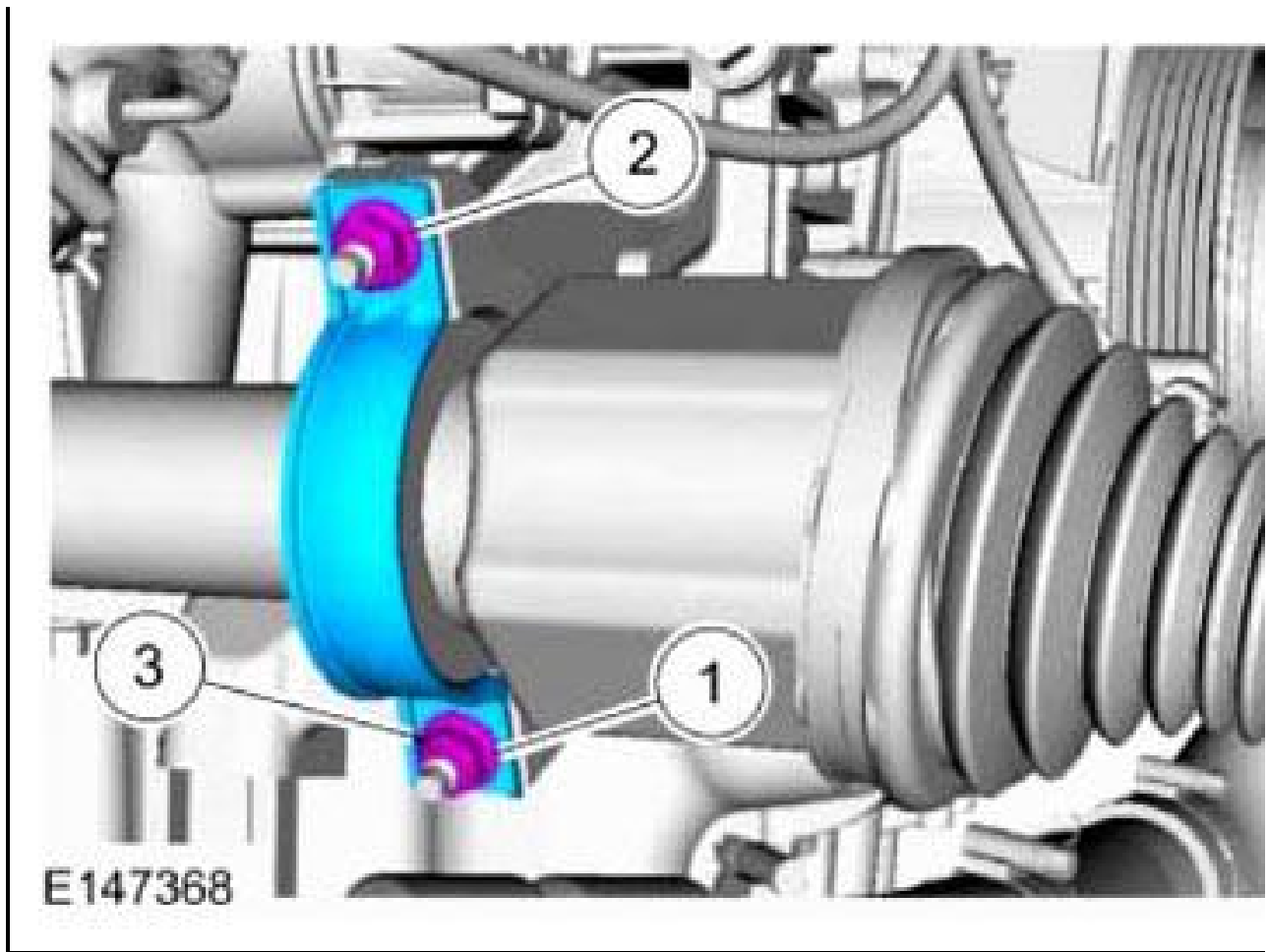




38.

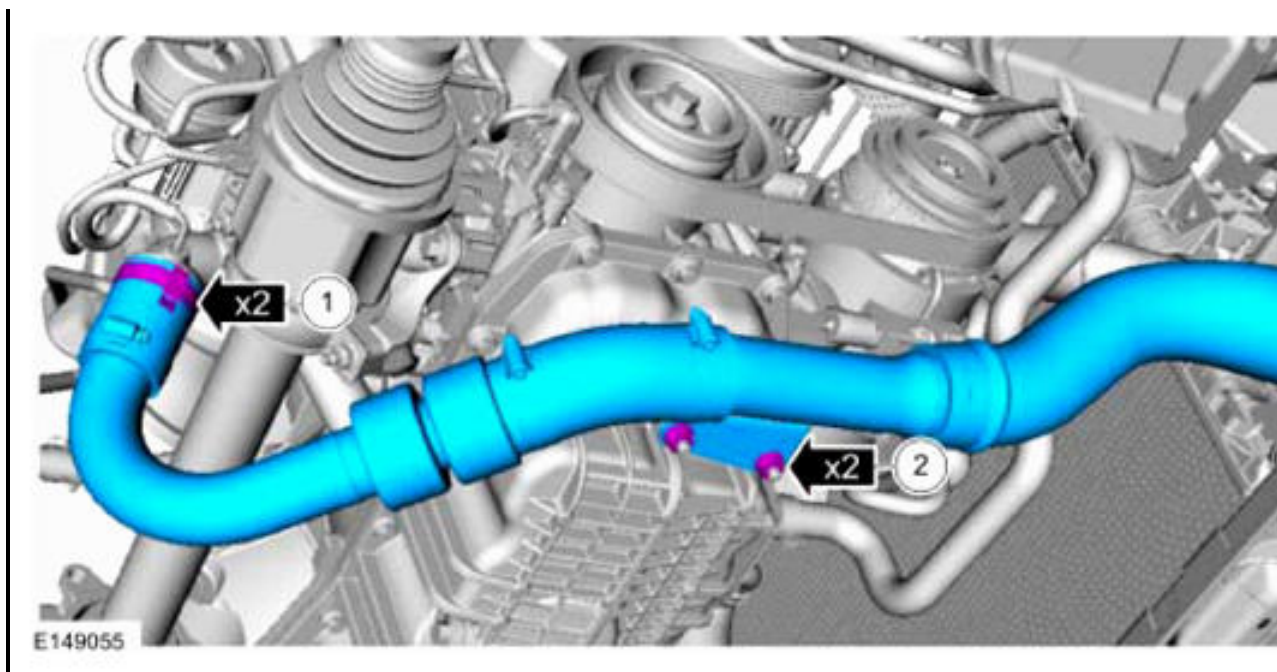
39.

1. *Torque:* 5 Nm
2. *Torque:* 25 Nm
3. *Torque:* 25 Nm

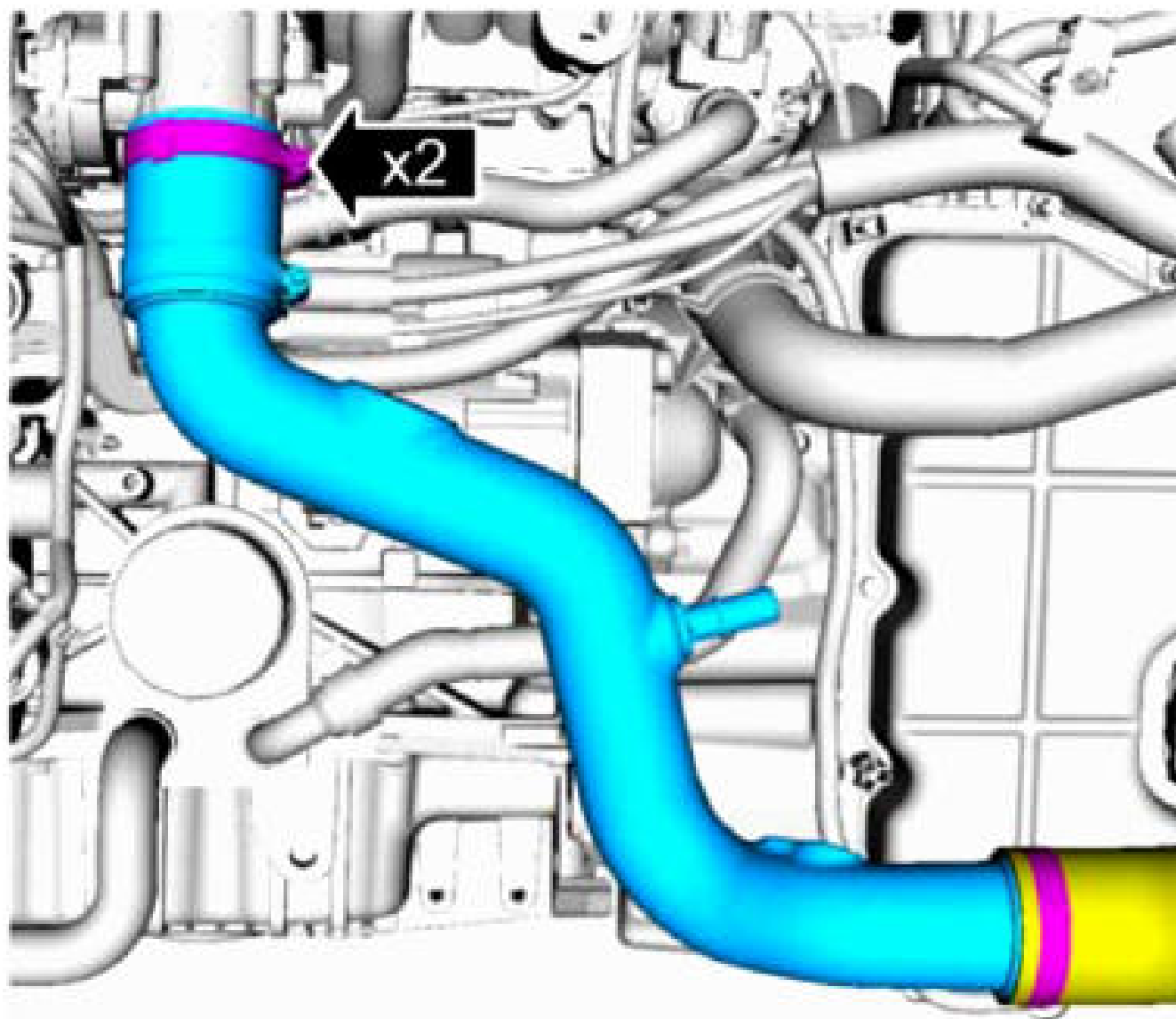


40.

1. *Torque:* 5 Nm
2. *Torque:* 20 Nm



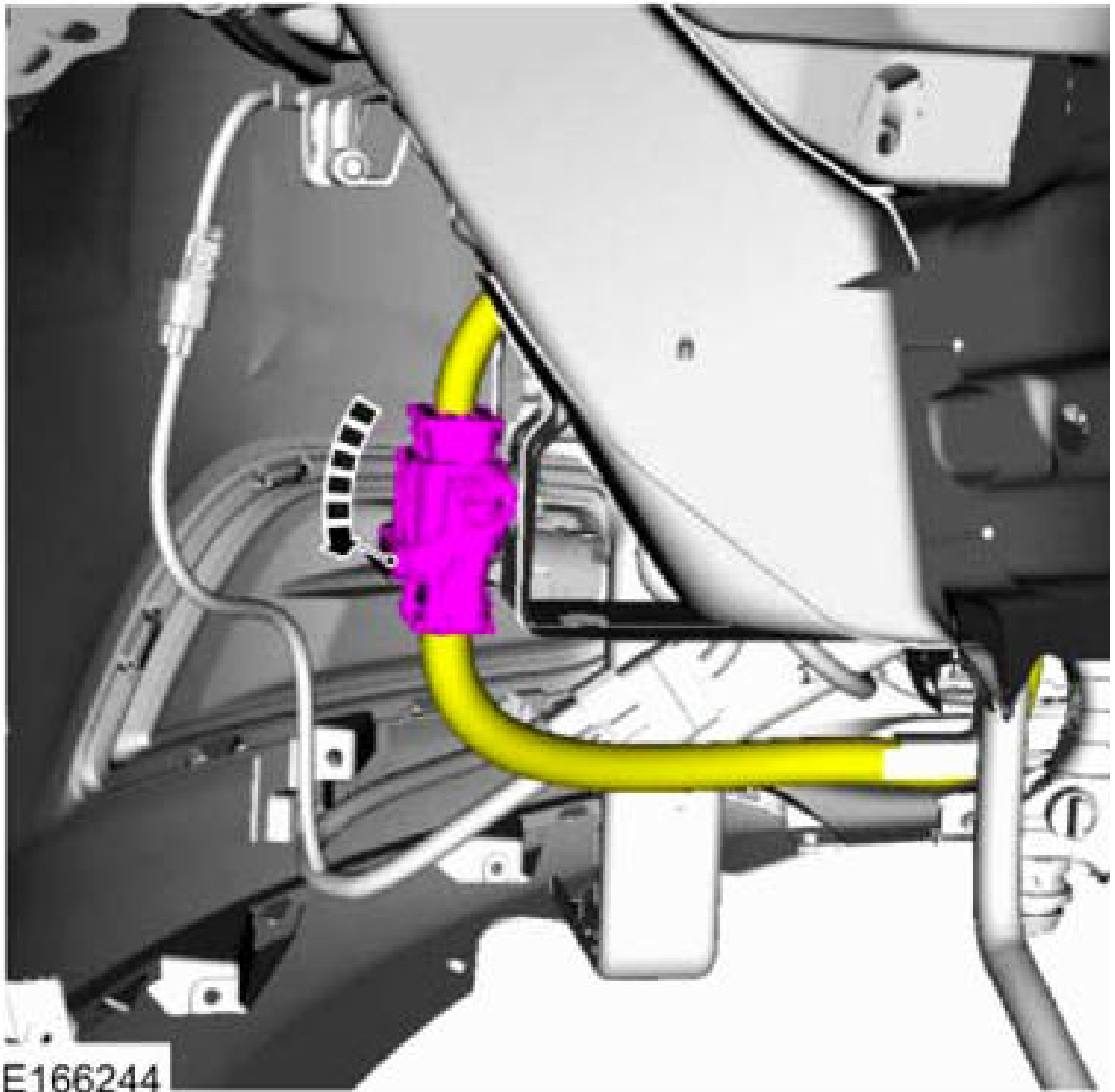
41. *Torque:* 5 Nm



E149054

42. Refer to: **CATALYTIC CONVERTER**.

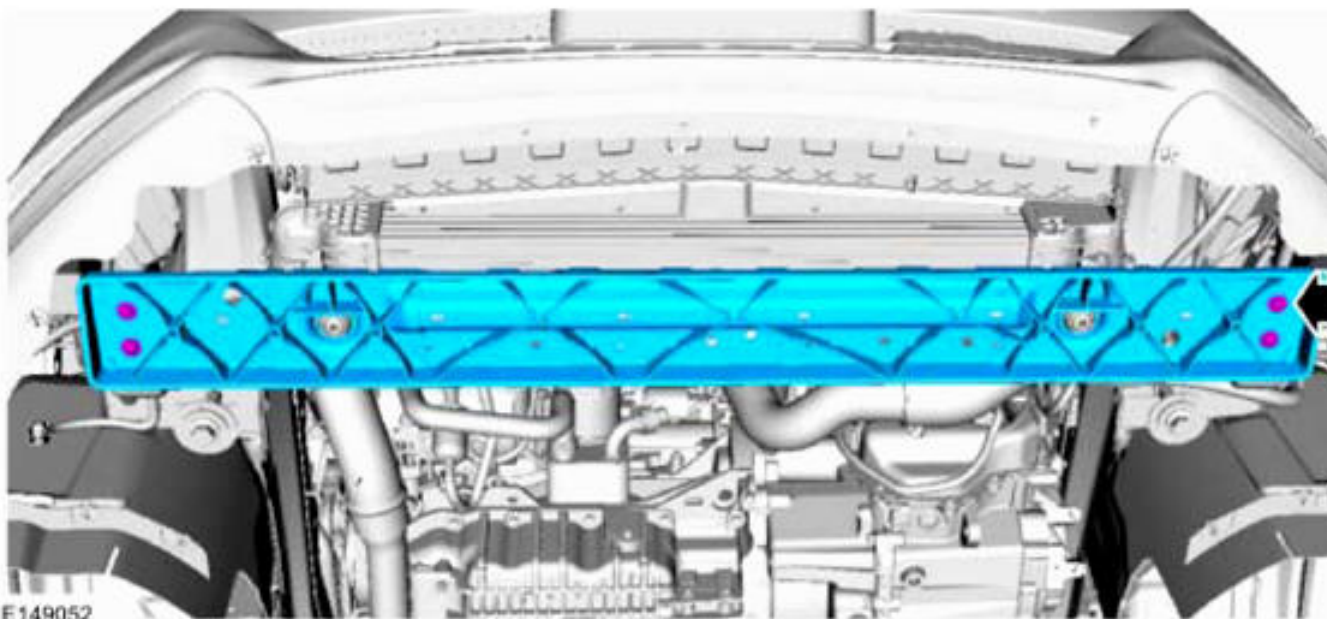
43.



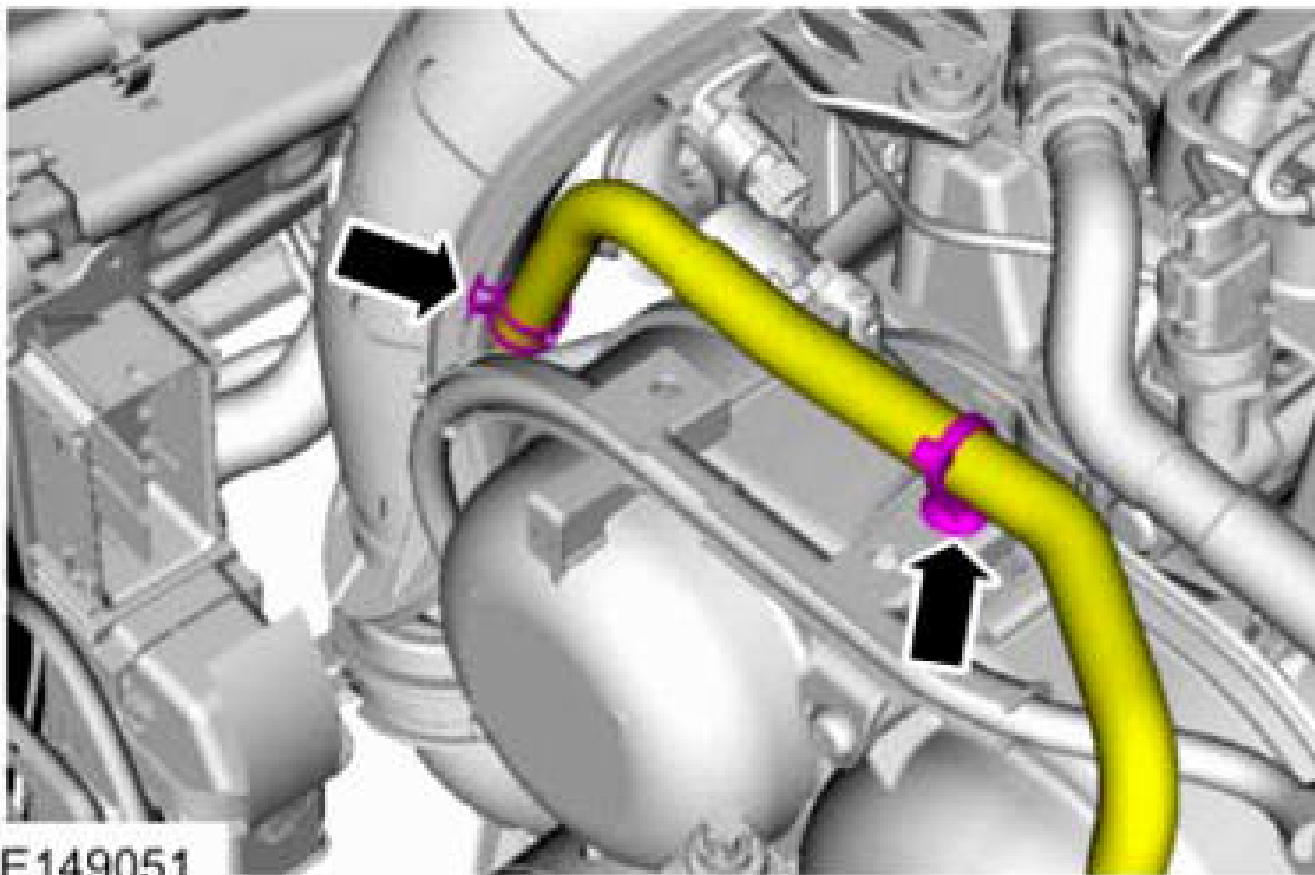
43.

44. Remove and support cooling module.

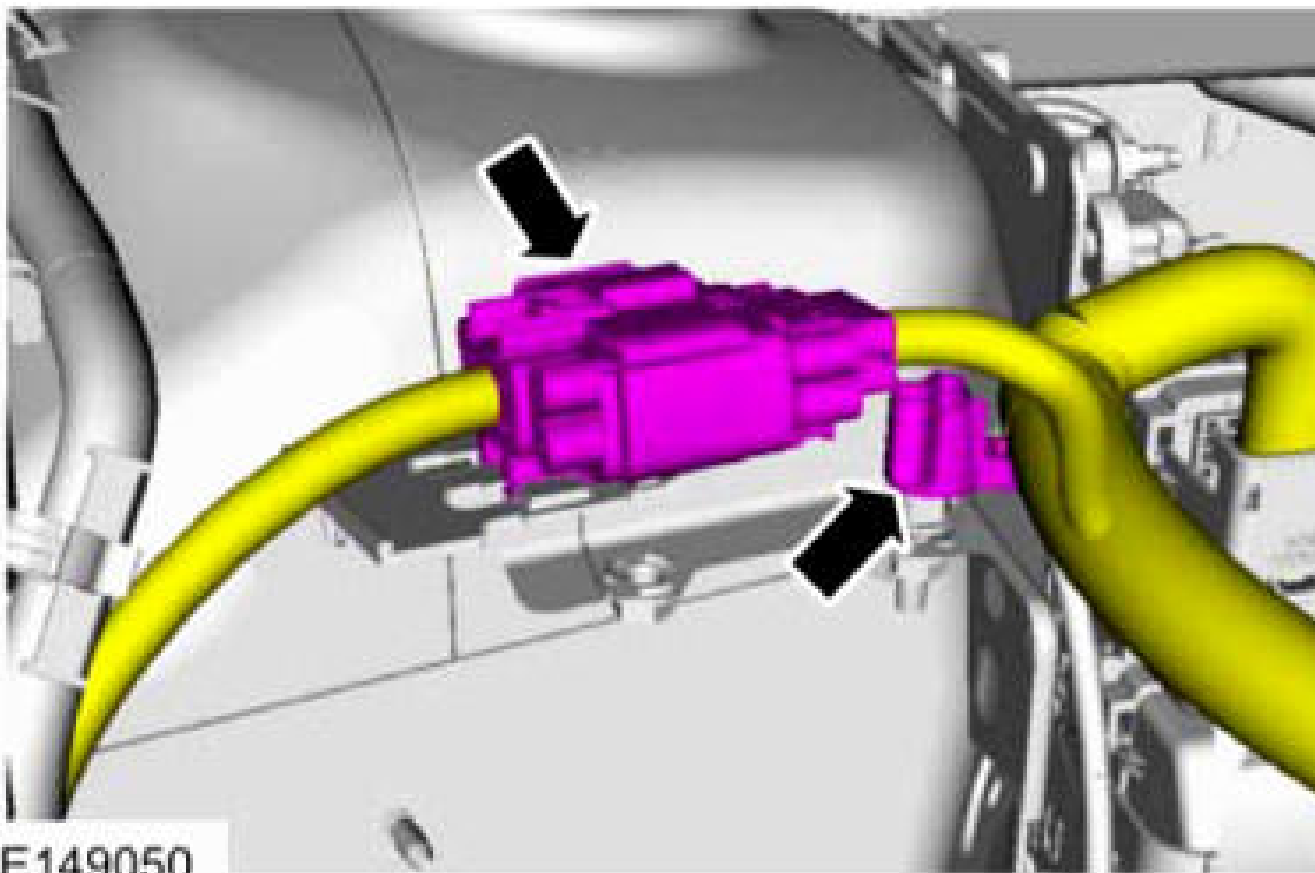
General Equipment: Transmission Jack



45. Refer to: **FRONT SUBFRAME** .
46. *General Equipment:* Hose Clamp Remover/Installer

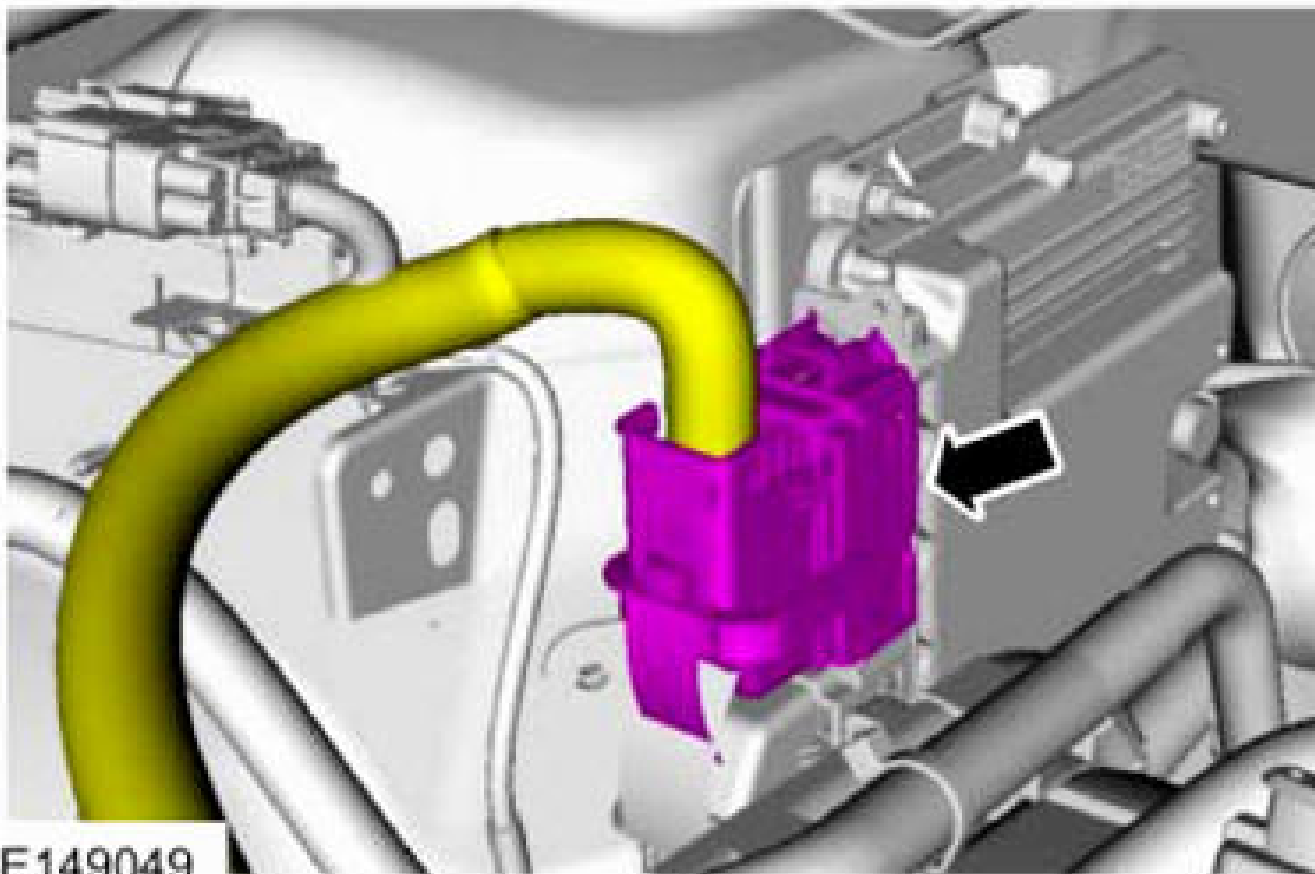


E149051



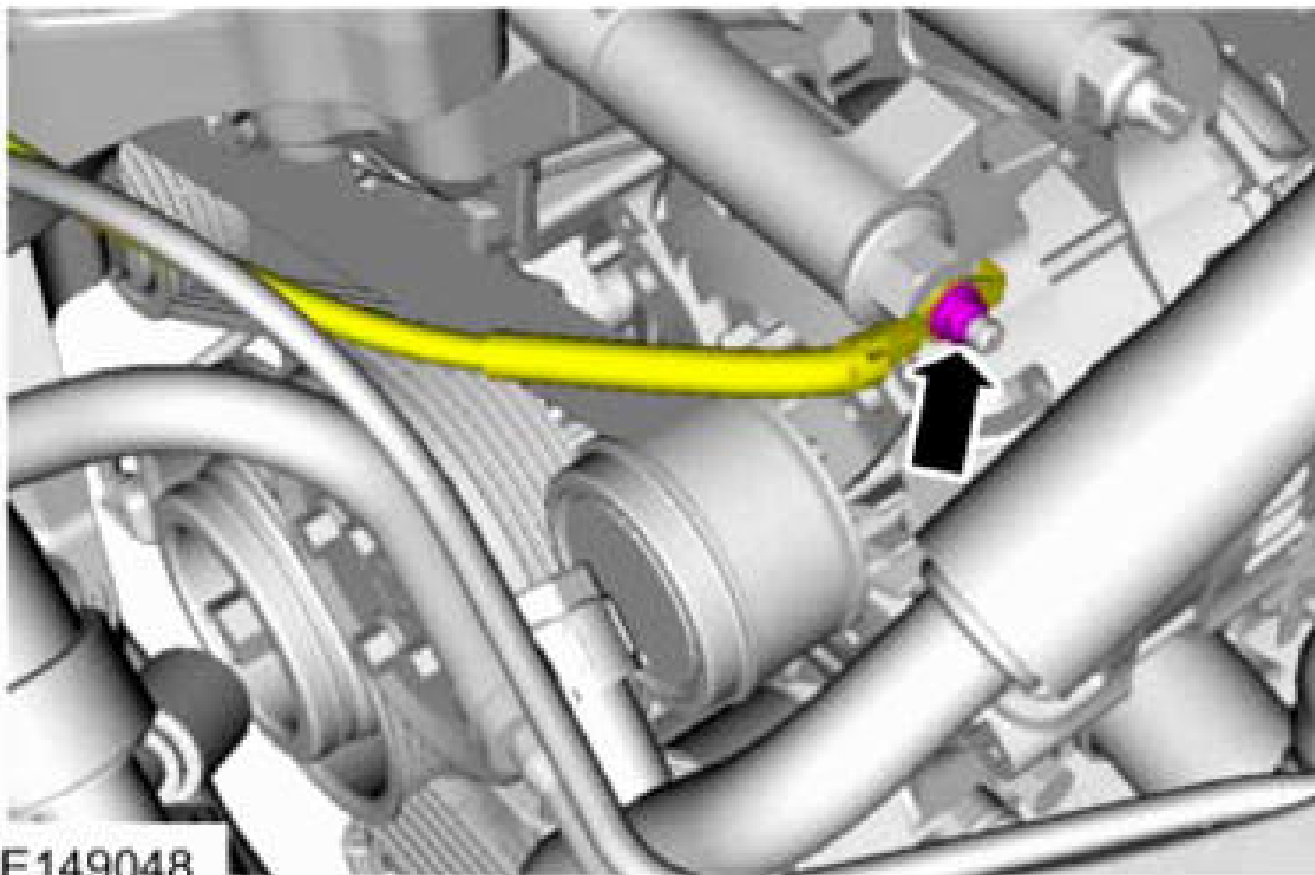
47.

48.

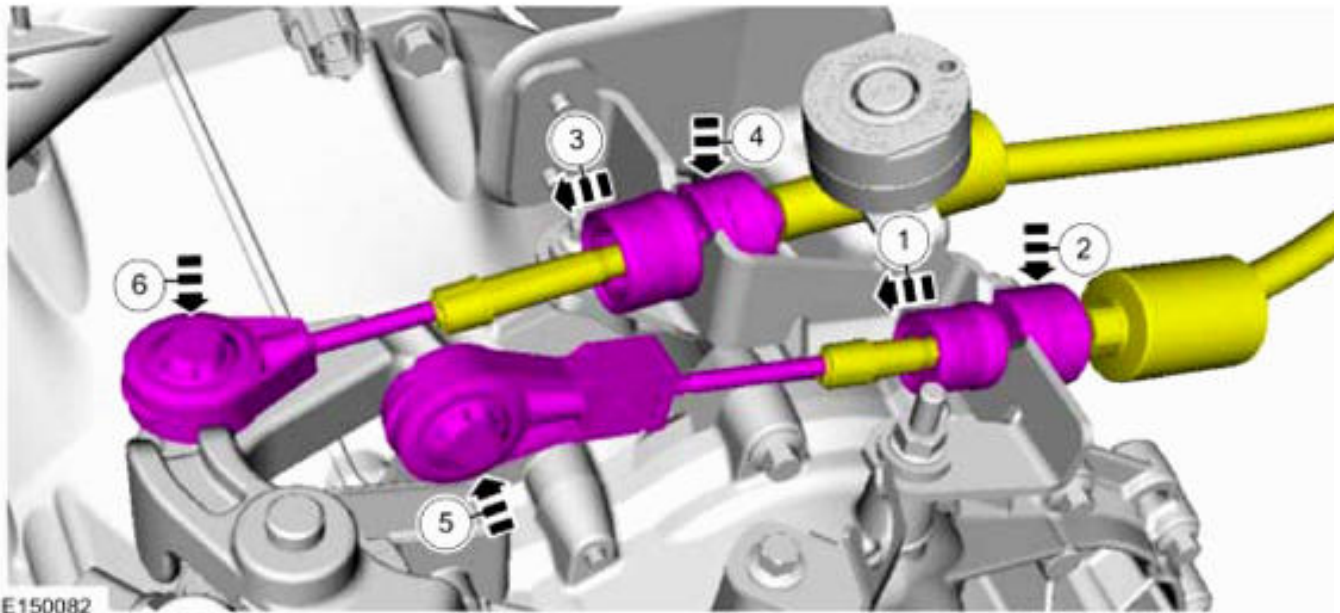


48.

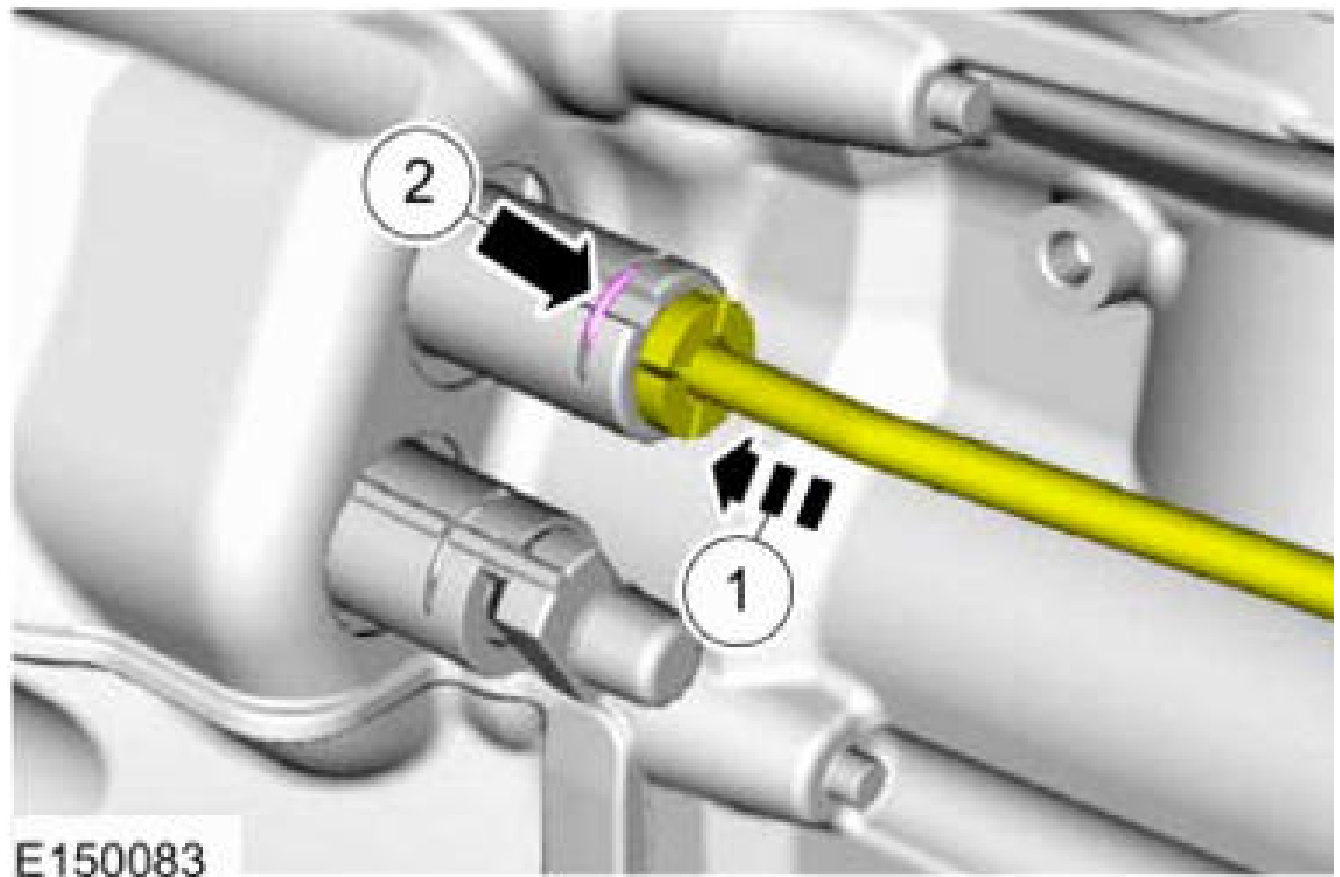
49. *Torque:* 15 Nm



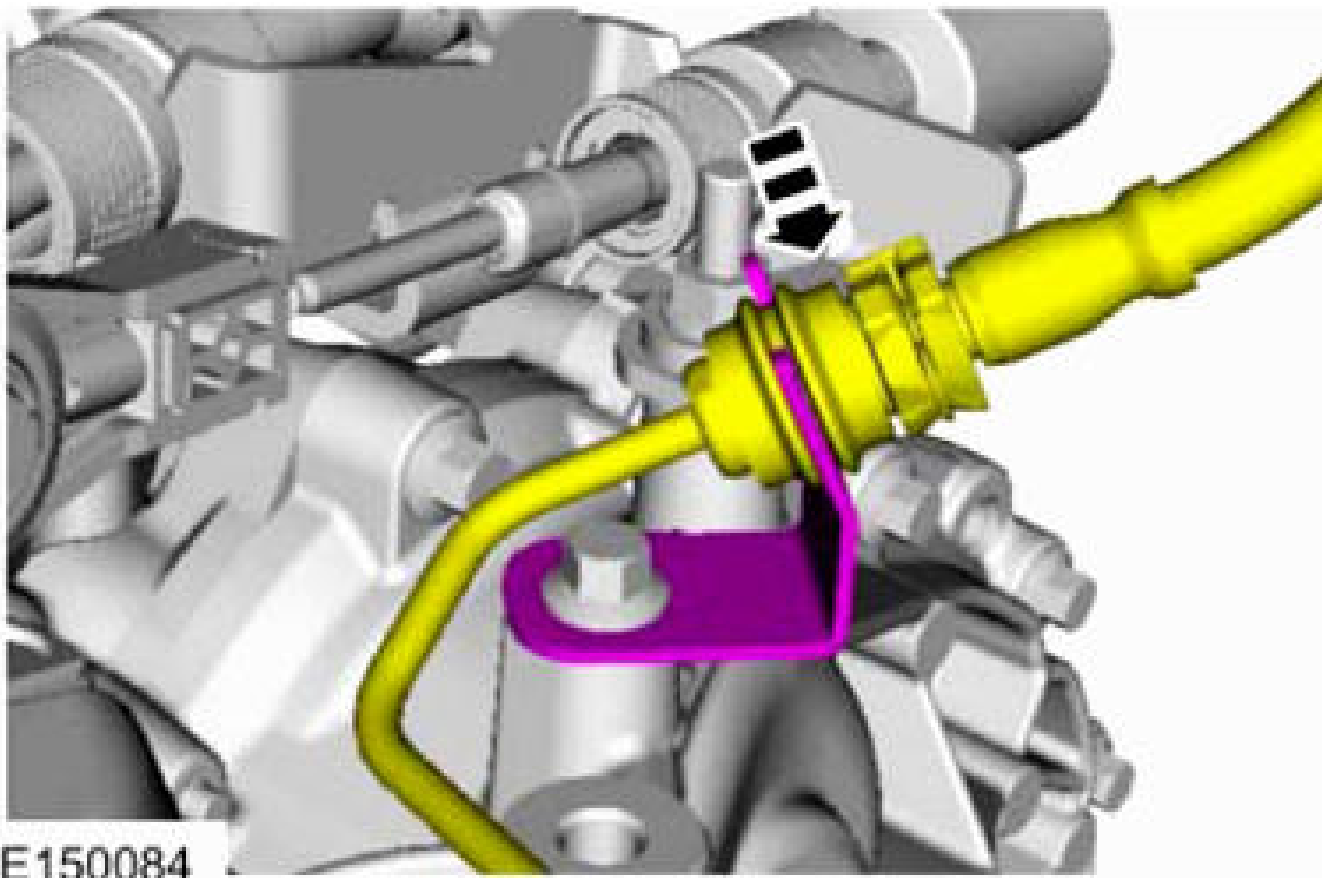
Vehicles with manual transmission



50.



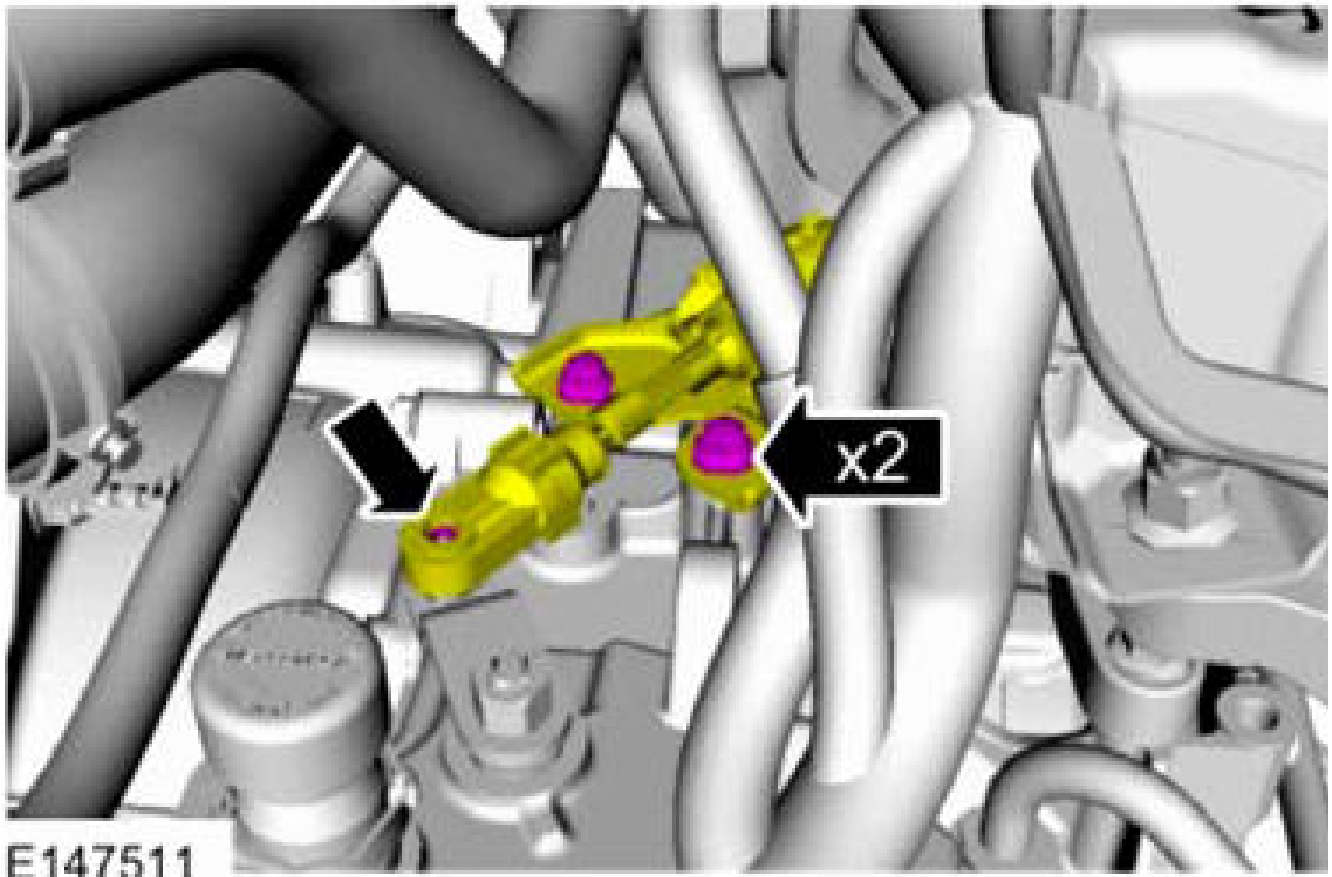
51.



52.

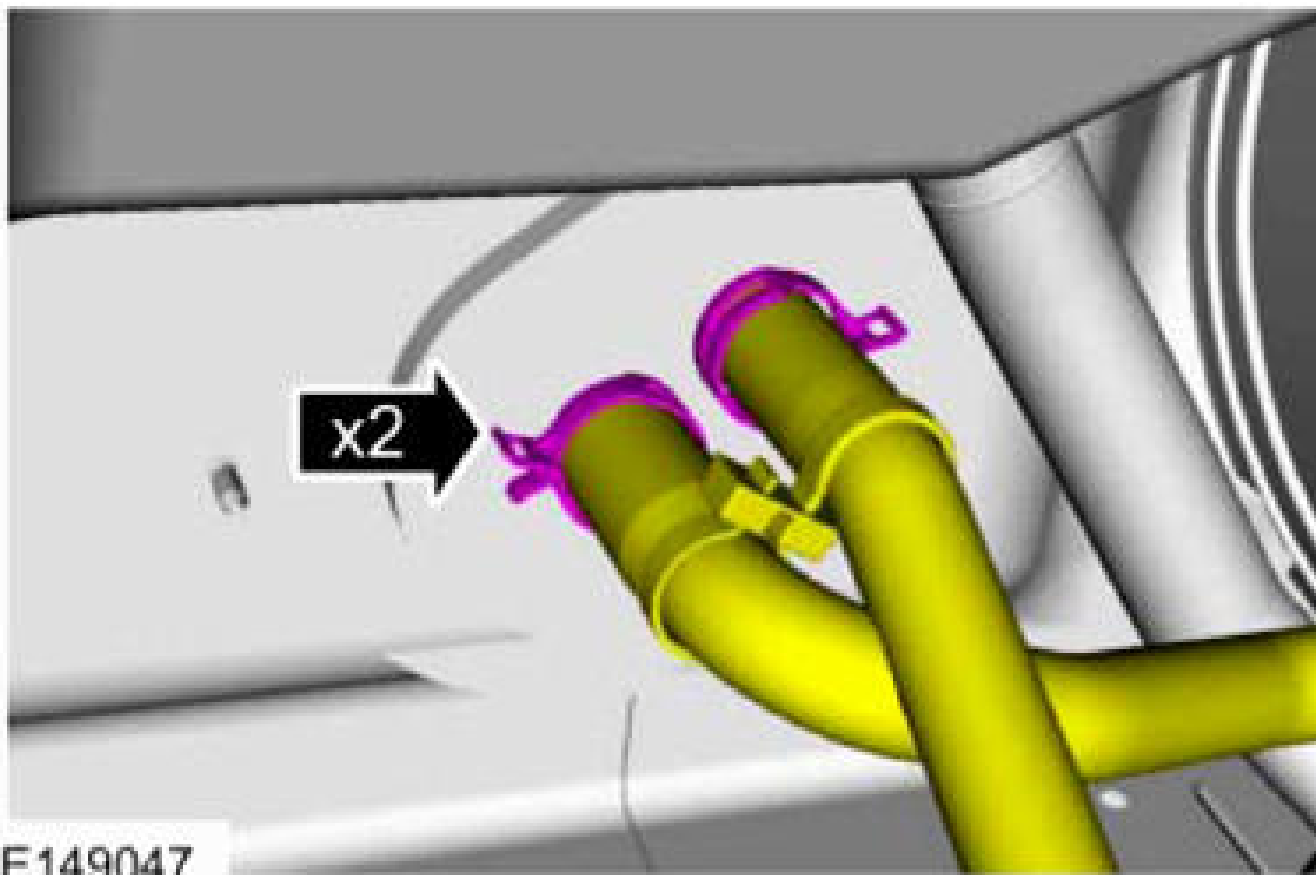
Vehicles with automatic transmission

53. *Torque:* 25 Nm

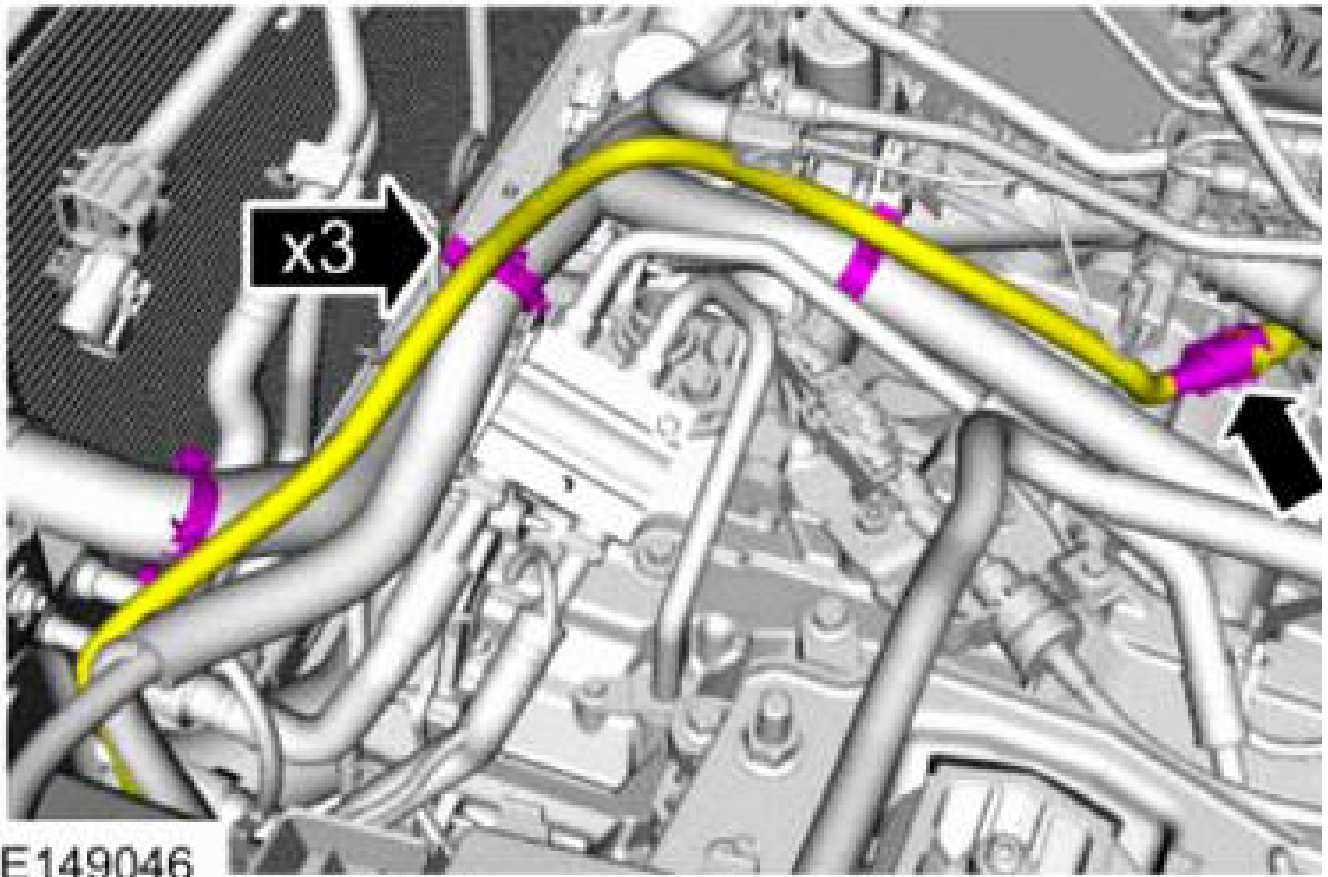


All vehicles

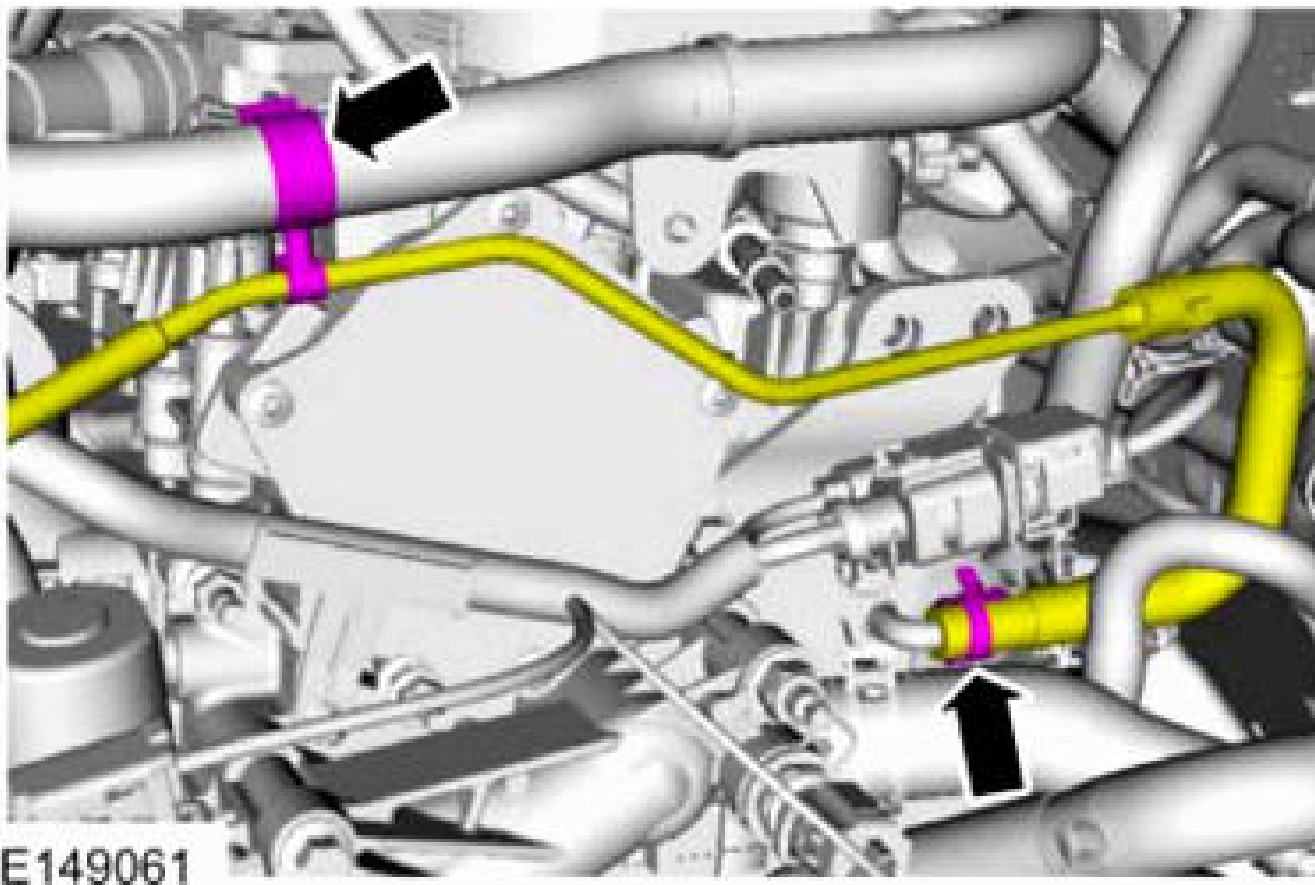
54. *General Equipment:* Hose Clamp Remover/Installer



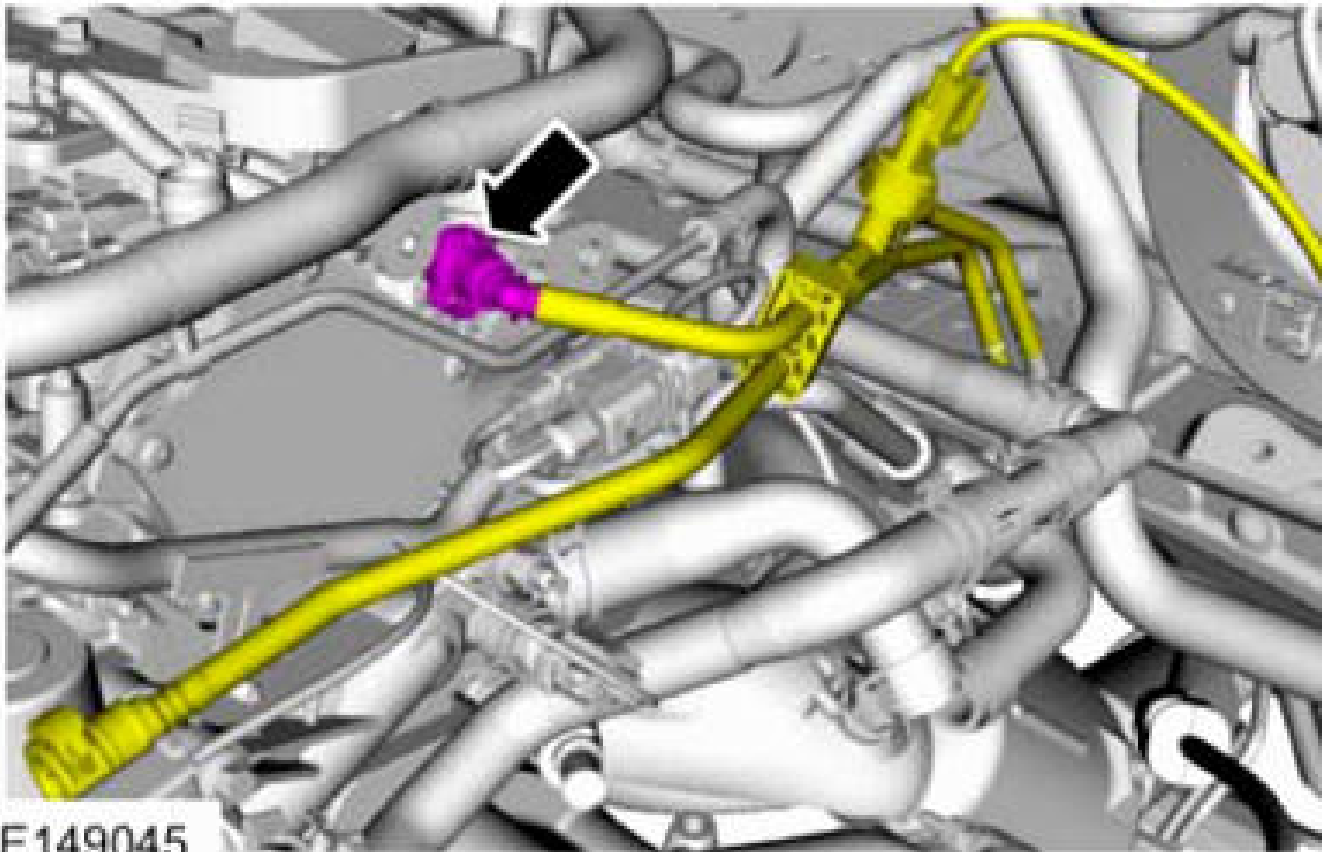
55. If equipped with block heater.



56. *General Equipment:* Hose Clamp Remover/Installer

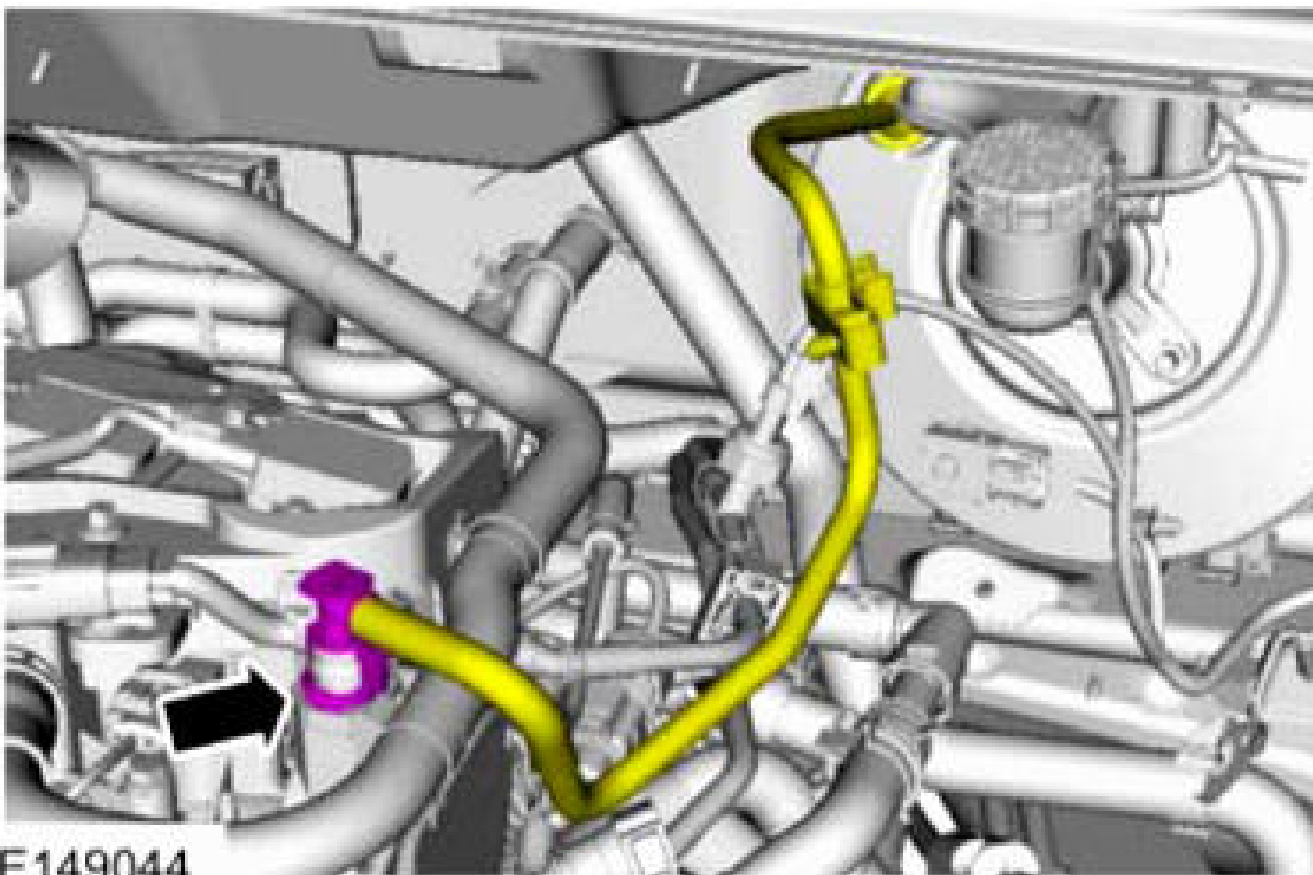


57. Refer to: **QUICK RELEASE COUPLING**.

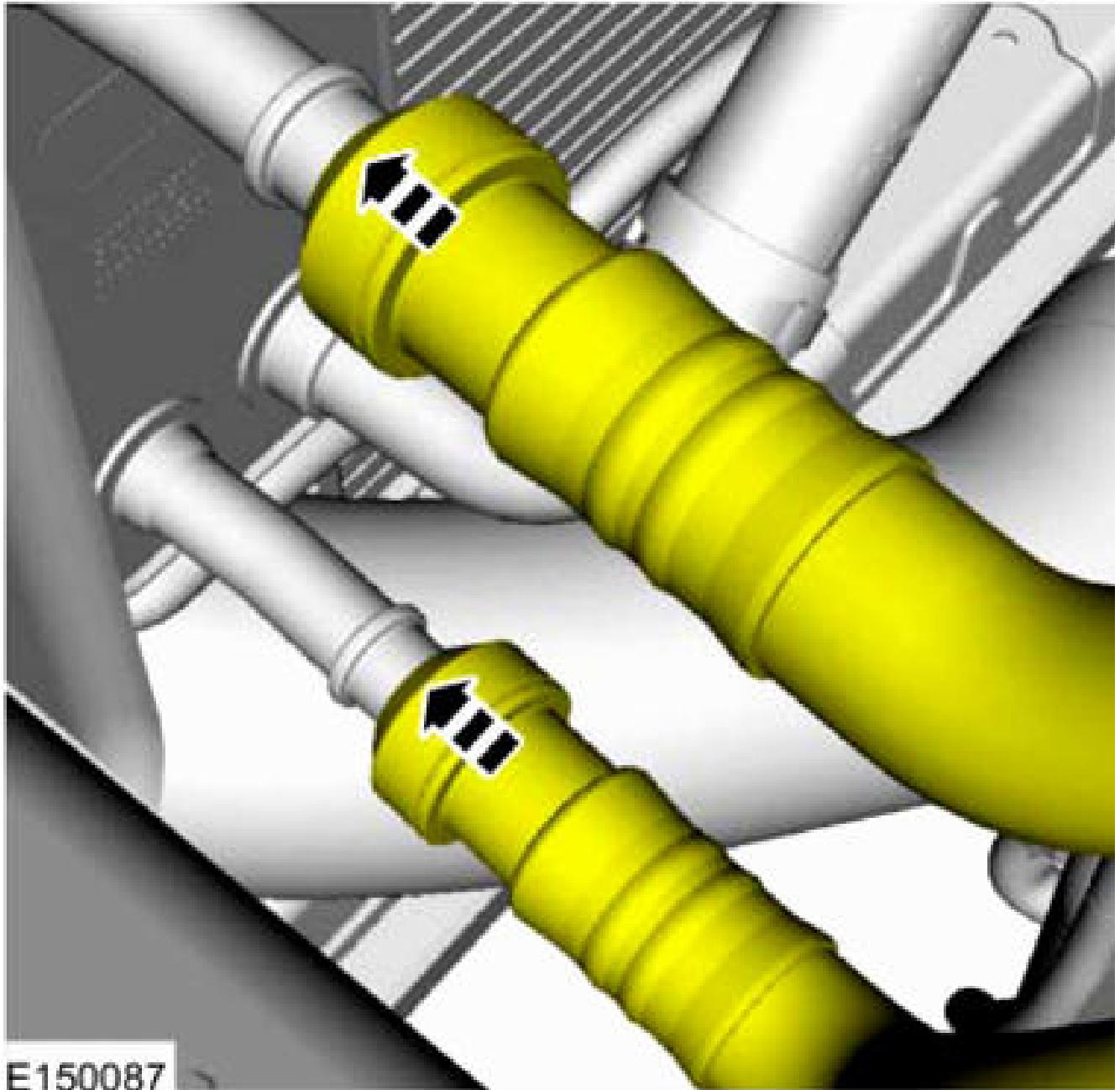


58. Refer to: EVAPORATIVE EMISSION CANISTER PURGE VALVE .

59. Refer to: QUICK RELEASE COUPLING .

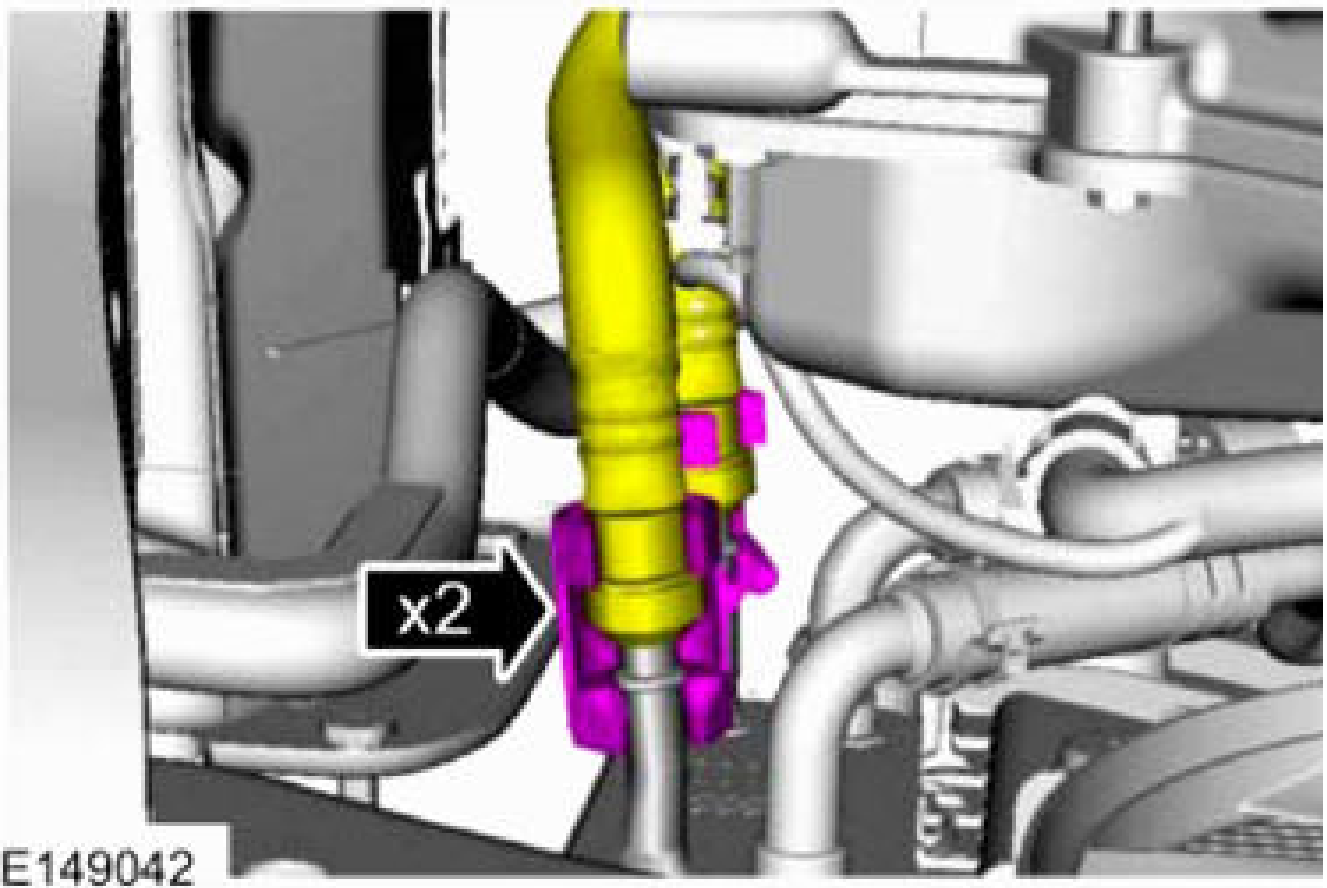


Vehicles with automatic transmission



60.

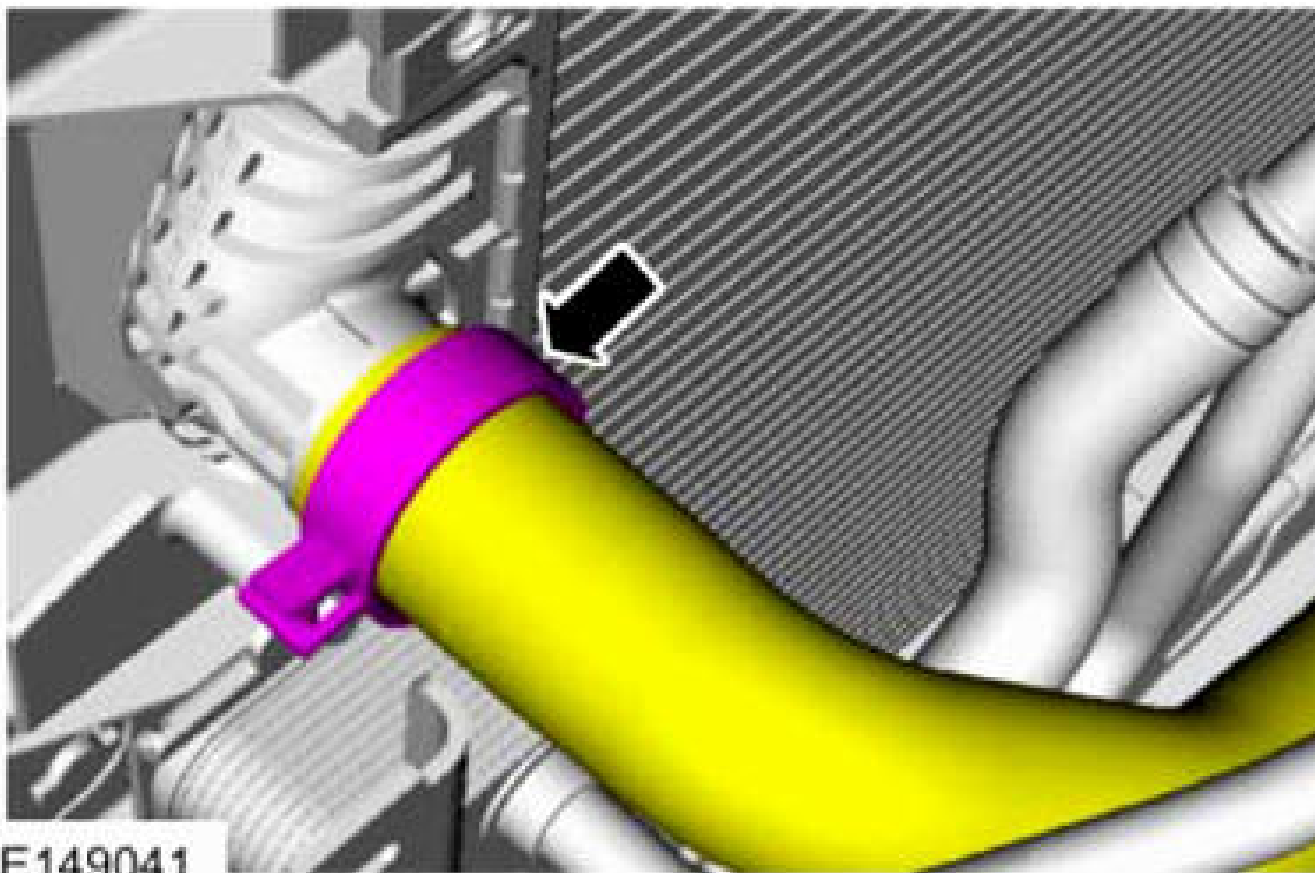
61.



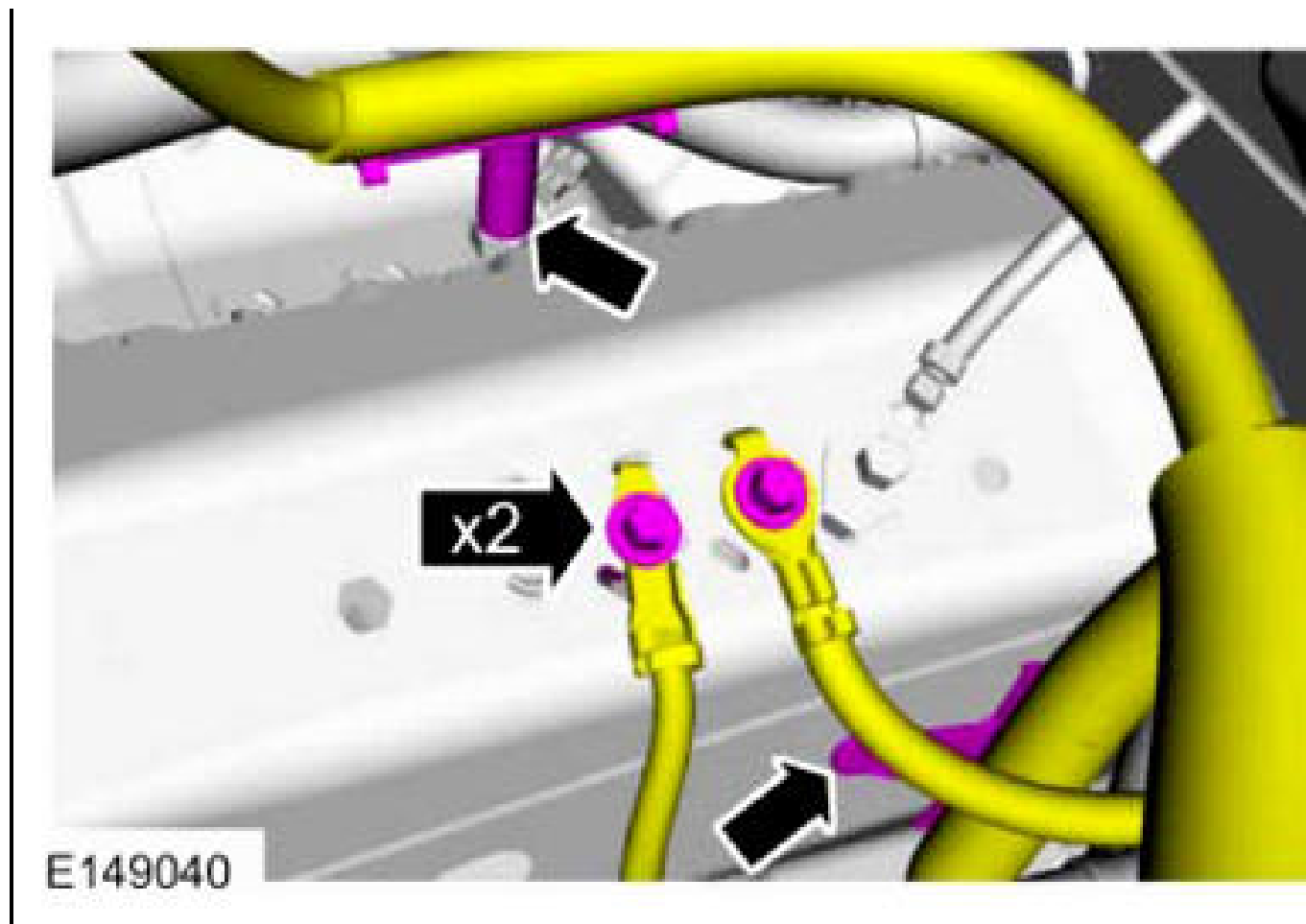
61.

All vehicles

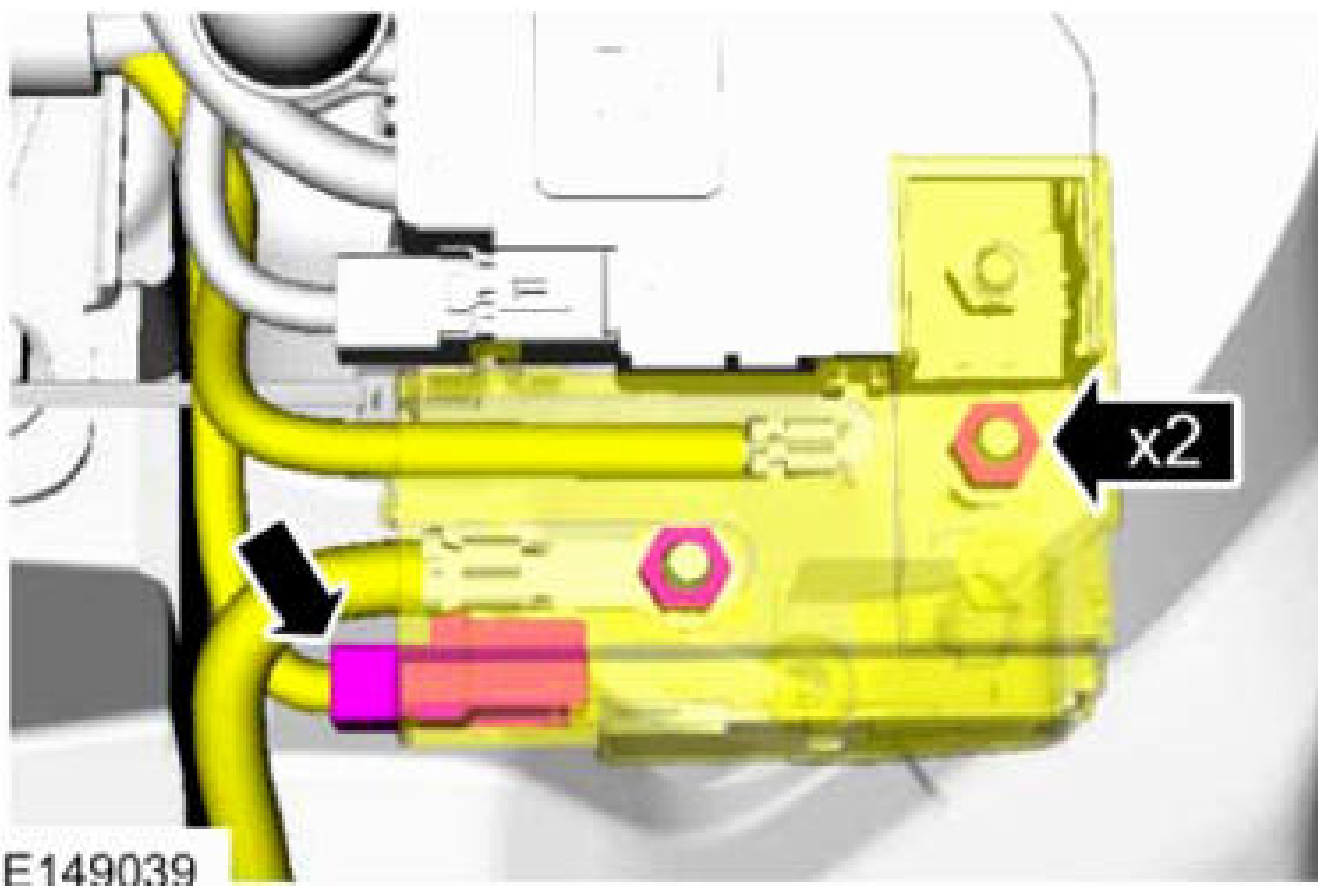
62. *General Equipment:* Hose Clamp Remover/Installer

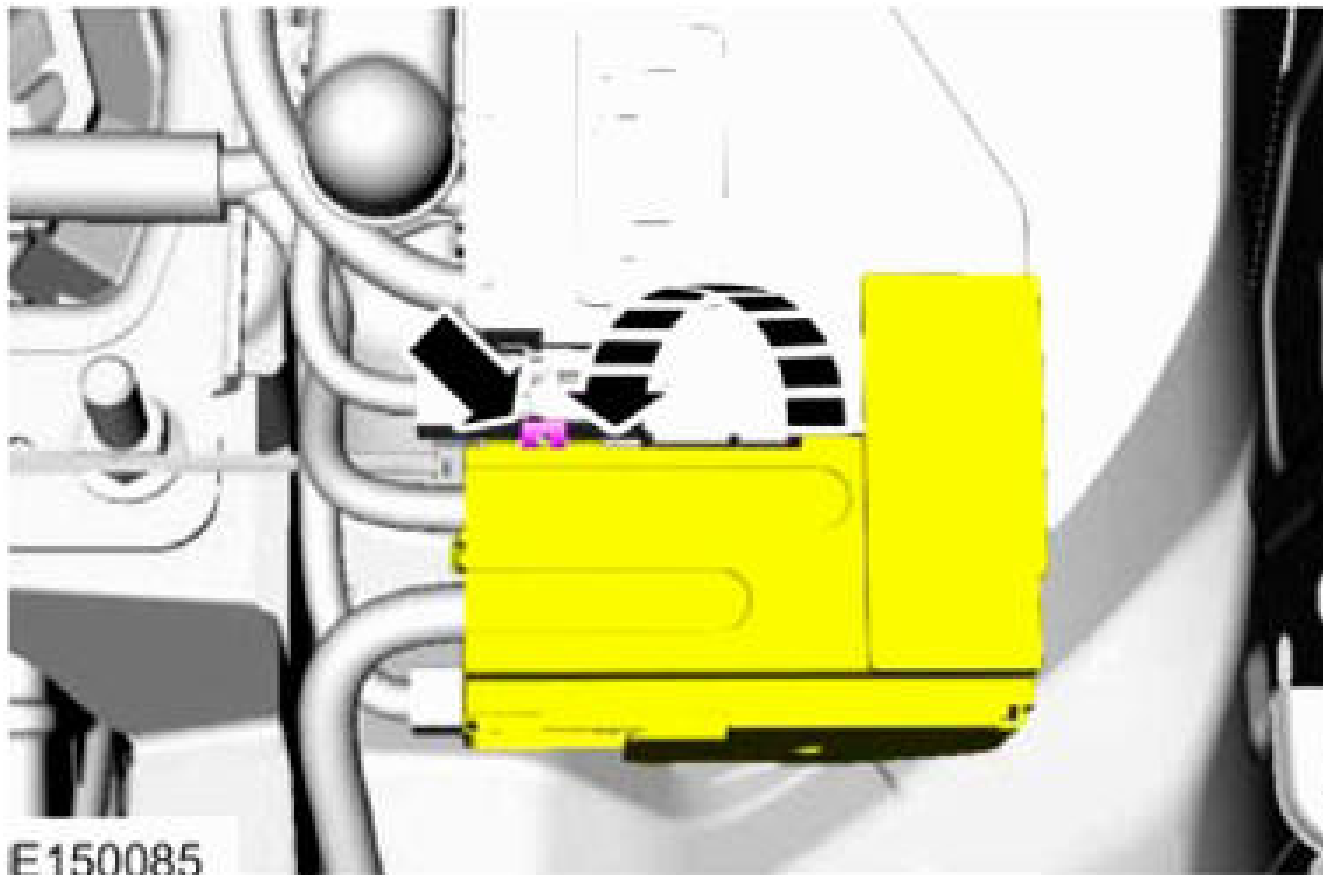


63. *Torque:* 12 Nm



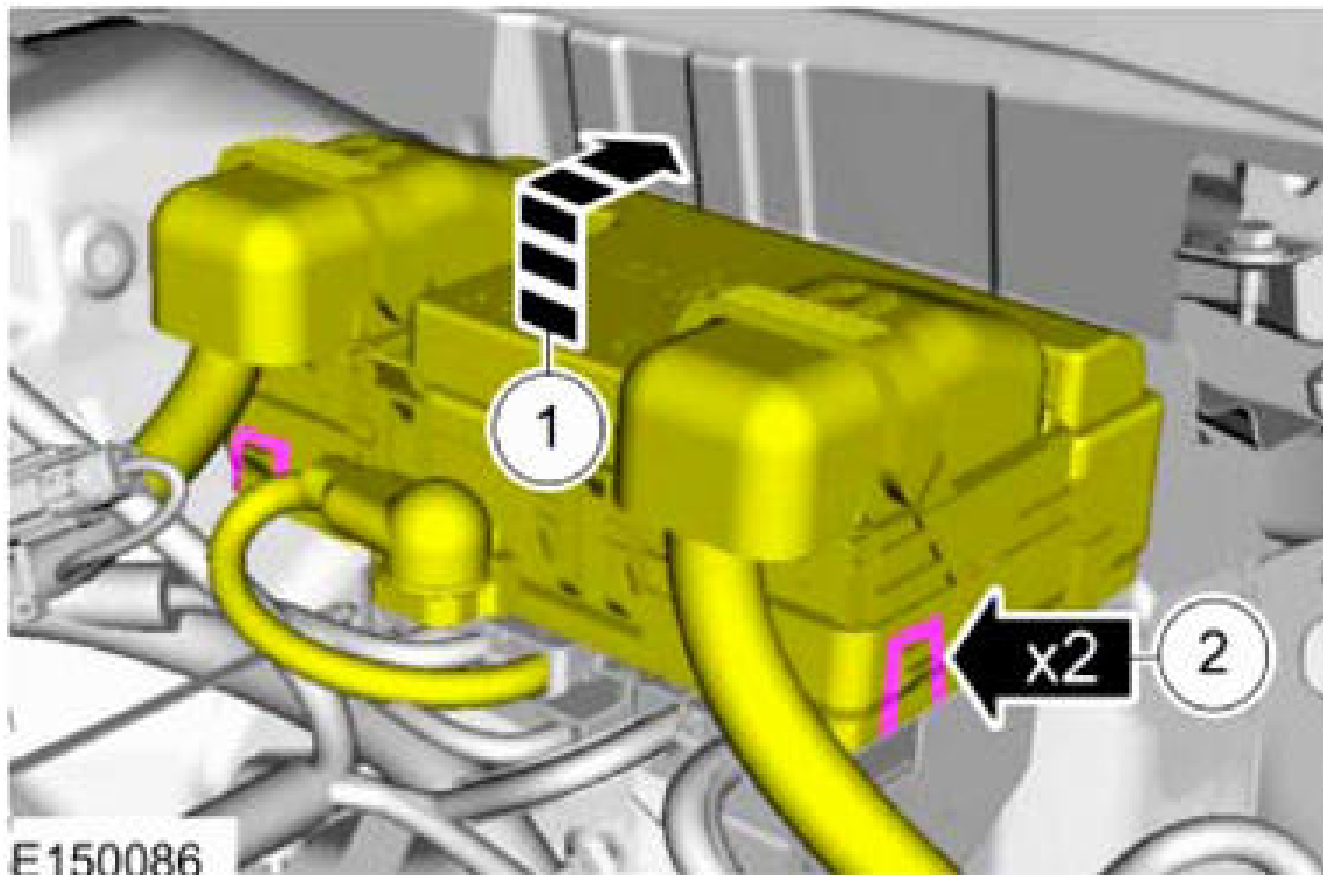
64. *Torque:* 12 Nm





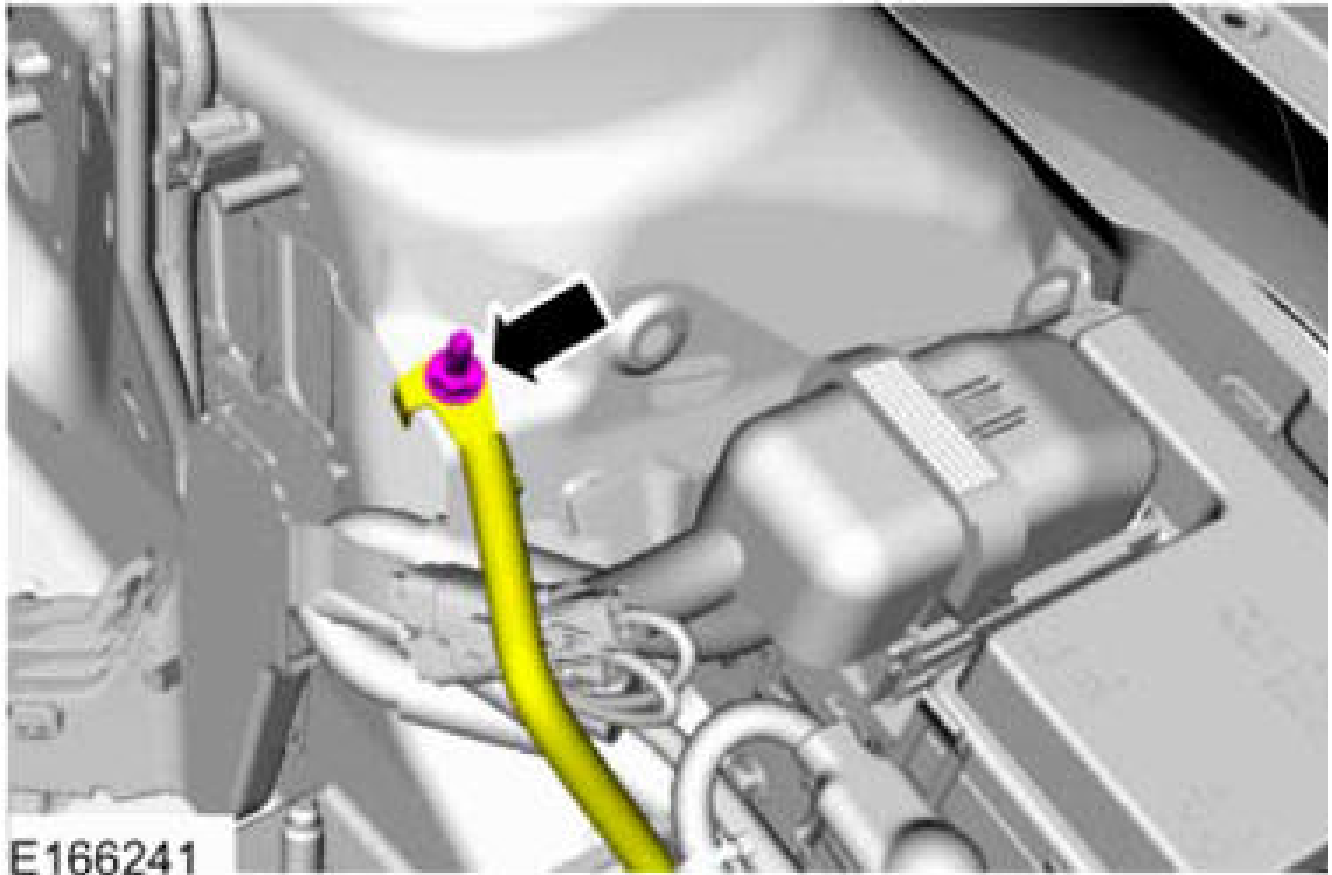
65.

66.



66.

67. *Torque:* 12 Nm



68. Refer to: **BATTERY TRAY** .

Vehicles with automatic transmission

69. Refer to: **SELECTOR LEVER CABLE ADJUSTMENT** .

Vehicles with manual transmission

70. Refer to: **GEARSHIFT CABLE ADJUSTMENT** .

All vehicles

71. Install the following items:

1. Refer to: **AIR CLEANER OUTLET PIPE** .

Refer to: **AIR CLEANER** - 1.6L EcoBoost (132kW/180PS) - Sigma .

2. Refer to: **DEGAS BOTTLE** .

72. Fill the engine with clean engine oil.

Material: Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil/XO-5W20-QSP (WSS-M2C945-A)

73. Refer to: **COOLING SYSTEM DRAINING AND VACUUM FILLING** .

Vehicles with automatic transmission

74. Refer to: **TRANSMISSION FLUID DRAIN AND REFILL** .

Vehicles with manual transmission

75. Refer to: **CLUTCH SYSTEM BLEEDING** .
76. Refer to: **TRANSMISSION DRAINING AND FILLING** .

All vehicles

77. Refer to: **AIR CONDITIONING (A/C) SYSTEM RECOVERY, EVACUATION AND CHARGING** .
78. After completing the repairs, perform the Misfire Monitor Neutral Profile Correction procedure.