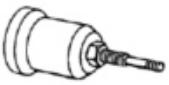
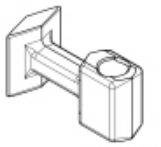
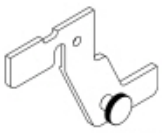
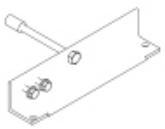
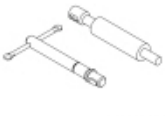
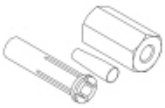
Engine

Base Part Number: 6L084

Special Tool(s) / General Equipment

 E139373	100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge
 E133913	205-153 (T80T-4000-W) Handle
	303-096 (T74P-6150-A) Installer, Camshaft Front Oil Seal TKIT-2009TC-F
 E222983	303-103 (T74P-6375-A) Holding Tool, Flywheel T74P-77000-A TKIT-2009TC-F
 E121926	303-1521 Alignment Tool, Crankshaft Position Sensor TKIT-2010C-FLM
 E133912	303-1565 Alignment Tool, Camshaft TKIT-2010C-FLM
 E222987	303-1567 Sizer, Teflon Seal TKIT-2010C-FLM
	303-1687 Installer, VCT Solenoid Seal

 E274104	
 E274105	303-1688 Preload Tool, Balance Shaft
 E274106	303-1689 Holding Tool, Crank Damper
 E134675	303-328 (T88P-6701-B1) Replacer, Rear Seal TKIT-1988-FLM TKIT-1988-F TKIT-1988-LM
 PZ21210	303-507 Timing Peg, Crankshaft TDC TKIT-2001N-FLM TKIT-2001N-ROW
 E223046	310-205 Fuel Injector Brush
 E223047	310-207 Installer, Fuel Injector Seal Assembly TKIT-2009A-FLM
Feeler Gauge	
Strap Wrench	
Mounting Stand	
Hose Clamp Remover/Installer	
Piston Ring Compressor	

Materials

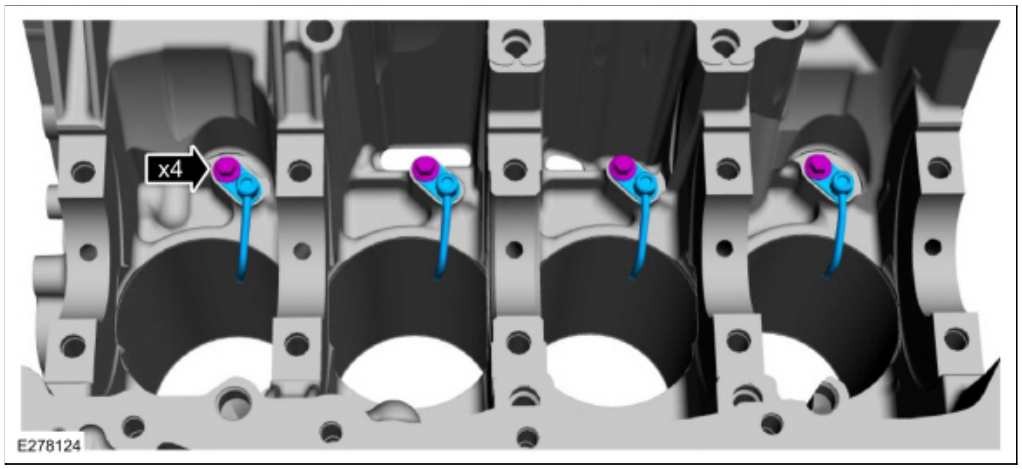
Name	Specification
Motorcraft® High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6

NOTICE: Do not loosen or remove the crankshaft pulley bolt without first installing the special tools as instructed in this procedure. The crankshaft pulley and the crankshaft timing sprocket are not keyed to the crankshaft. The crankshaft, the crankshaft sprocket and the pulley are fitted together by friction. For that reason, the crankshaft

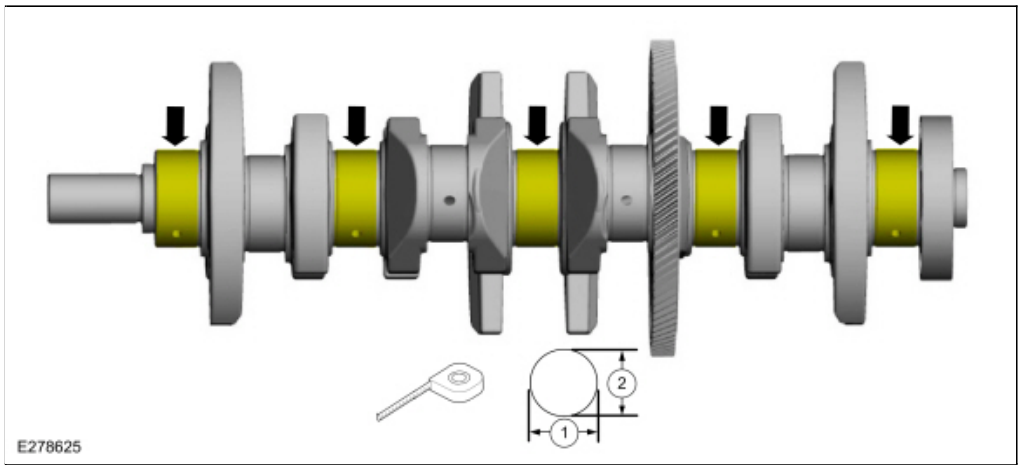
sprocket is also unfastened if the pulley bolt is loosened. Before any repair requiring loosening or removal of the crankshaft pulley bolt, the crankshaft and camshafts must be locked in place by the special service tools, otherwise severe engine damage can occur.

NOTICE: During engine repair procedures, cleanliness is extremely important. All parts must be thoroughly cleaned and 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.

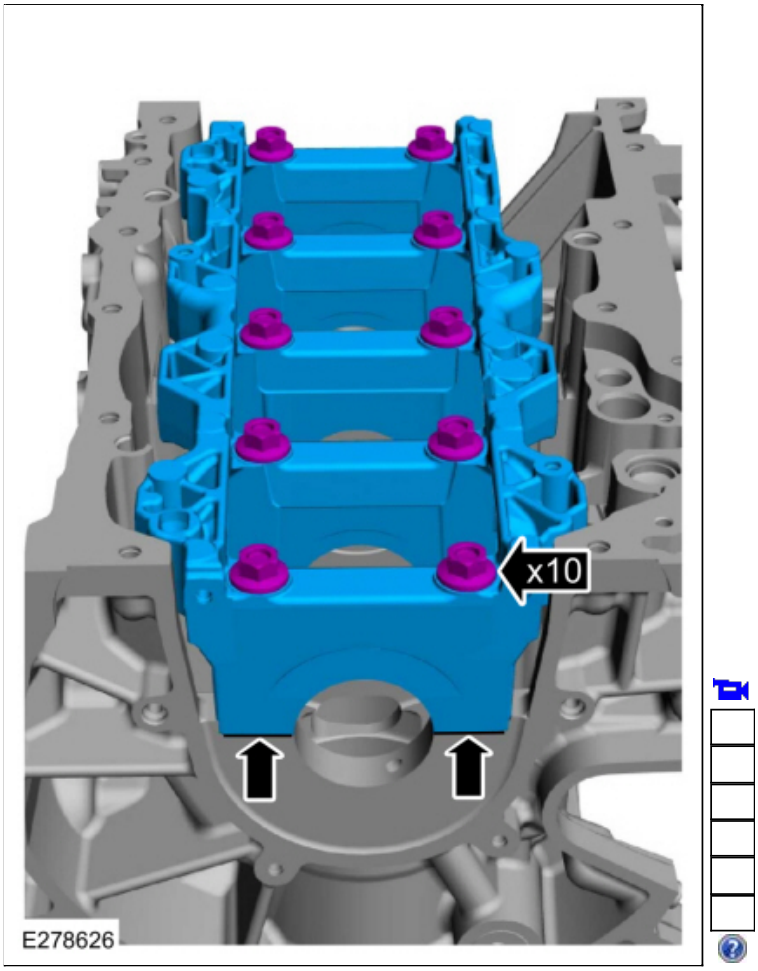
1. Install the engine piston oil cooler valves and the bolts.
   Torque: 89 lb.in (10 Nm)



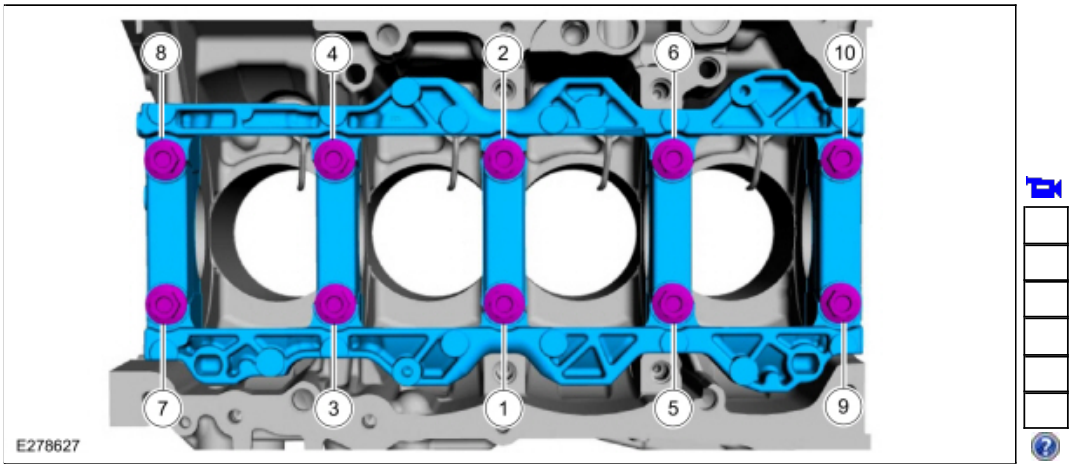
2.
   - Measure the length or distance in two directions.
   - Record the smallest measurement for each crankshaft main bearing journal.



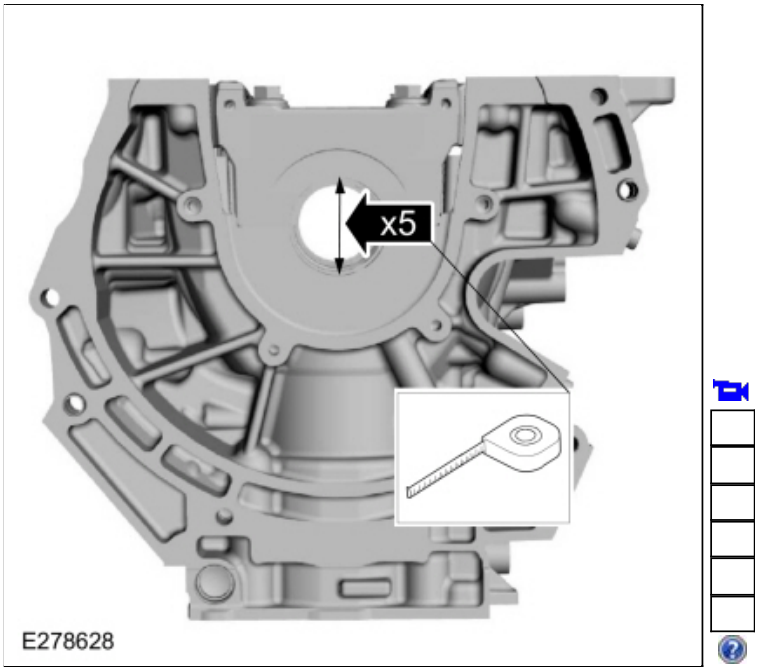
3. Mounted flush and install the original main bearing beam bolts finger tight.



4. Tighten in sequence shown.
   Torque:
   Stage 1: 44 lb.in (5 Nm)
   Stage 2: 18 lb.ft (25 Nm)
   Stage 3: 90°



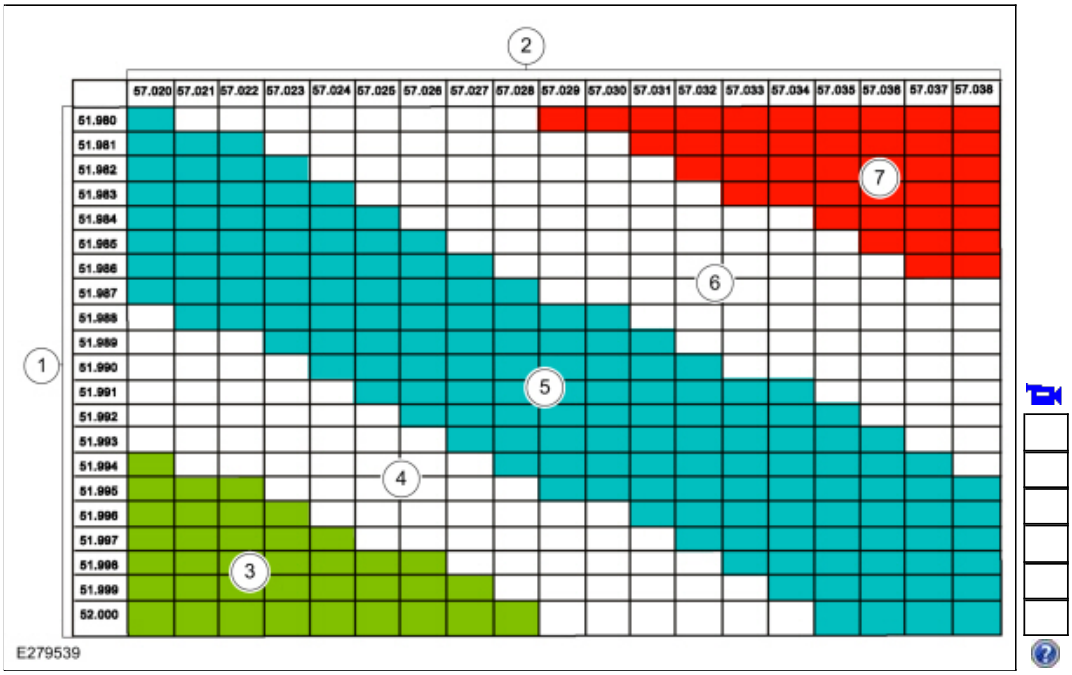
5. Measure each crankshaft block main bearing bore diameter.



6. **NOTE:** *This chart is for main bearings number 1, 2, 4 and 5.*

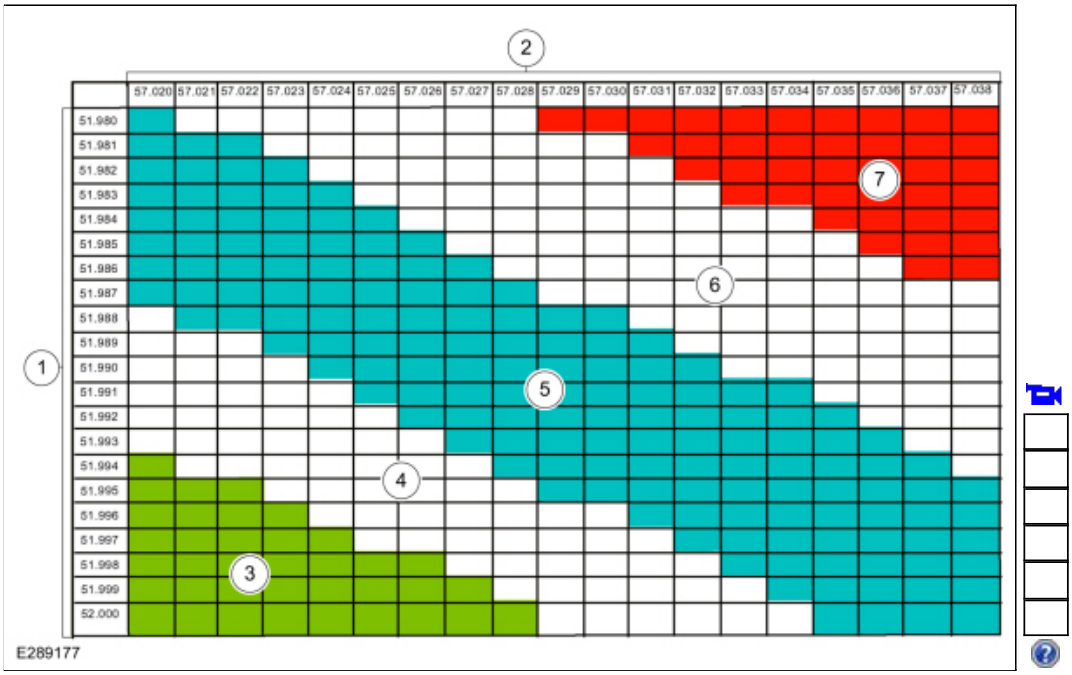
   NOTE: *The bearing color corresponds to the number marked on the bearing.*

   Using the chart, select the correct grade connecting rod bearings.
   1. Crankshaft journal diameter
   2. Cylinder block bore diameter
   3. Upper Bearing Green: 1 / Lower Bearing Green: 1
   4. Upper Bearing Blue: 2/ Lower Bearing Green: 1
   5. Upper Bearing Blue: 2 / Lower Bearing Blue: 2
   6. Upper Bearing Red: 3/ Lower Bearing Blue: 2
   7. Upper Bearing Red: 3 / Lower Bearing Red: 3

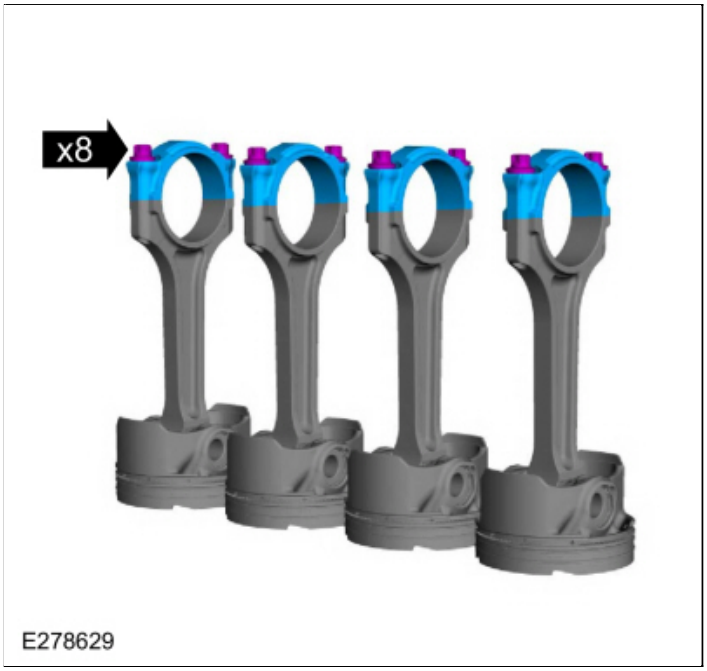


7. **NOTE:** *This chart is for main bearing number 3.*

    1. Crankshaft journal diameter
    2. Cylinder block bore diameter
    3. Green: Upper Bearing Blue: 2/ Lower Bearing Green: 1
    4. White: Upper Bearing Brown: 4/ Lower Bearing Green: 1
    5. Blue: Upper Bearing Brown: 4/ Lower Bearing Blue: 2
    6. Yellow: Upper Bearing Brown: 4/ Lower Bearing Red: 3
    7. Red: Upper Bearing Black: 6/ Lower Bearing Red: 3

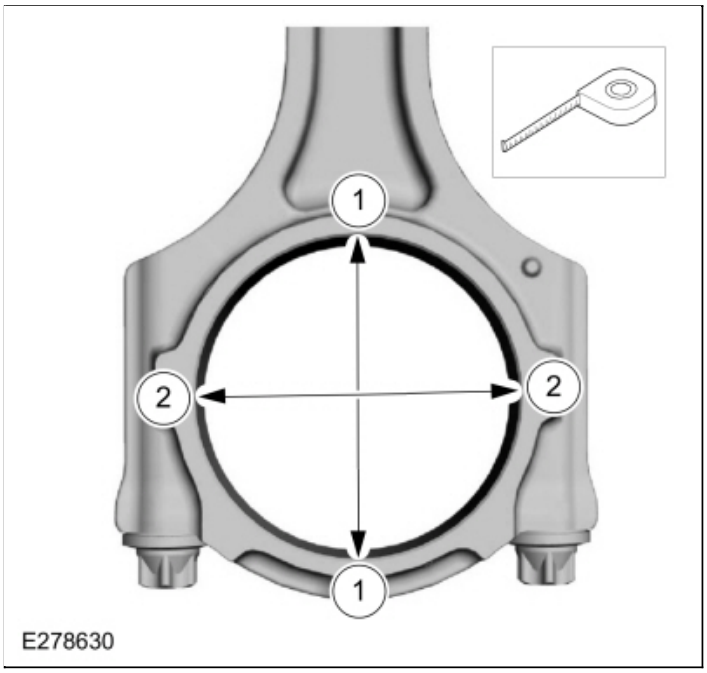


8. Using the original bolts, install the connecting rod caps.
   Torque:
   Stage 1: 177 lb.in (20 Nm)
   Stage 2: 30 lb.ft (40 Nm)
   Stage 3: 90°



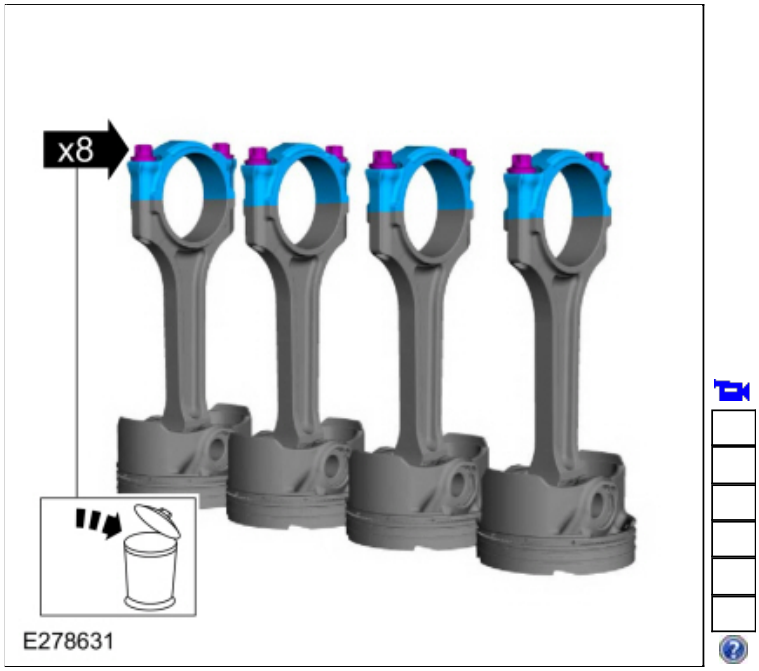
9.

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



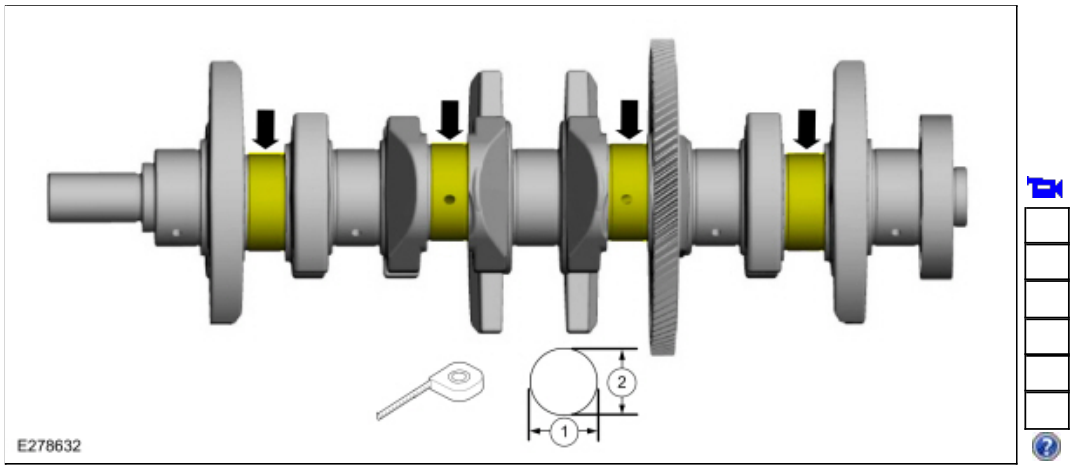
10.

- Remove the bolts and the connecting rod caps.
- Discard the bolts.



11.

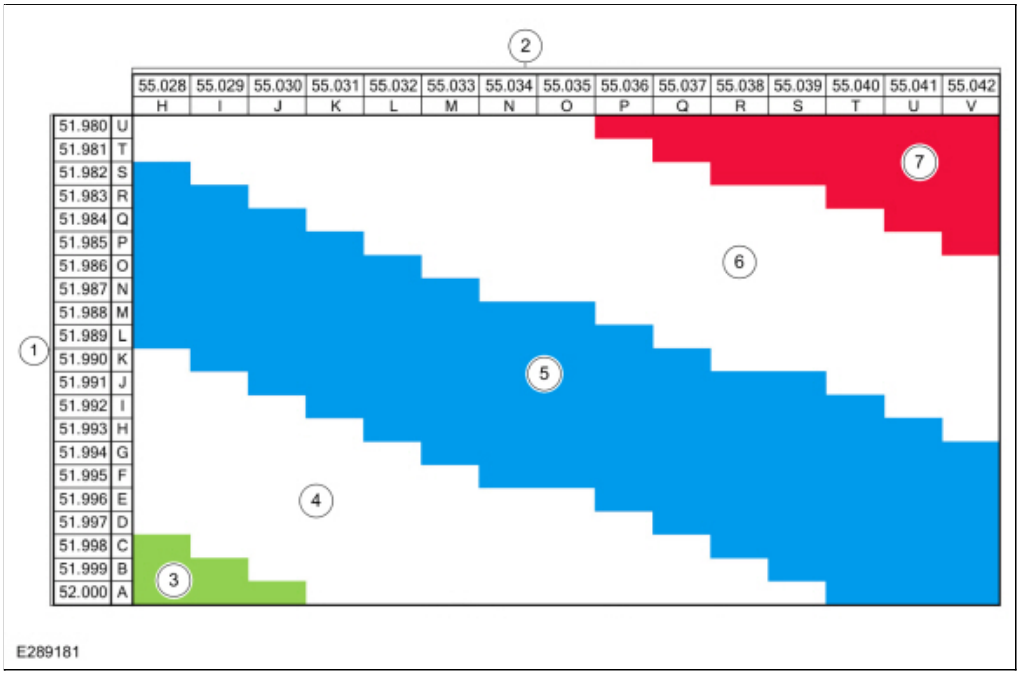
- Measure the length or distance in two directions.
- Record the smallest measurement for each connecting rod journal.



12. **NOTE:** *The bearing color corresponds to the number marked on the bearing.*

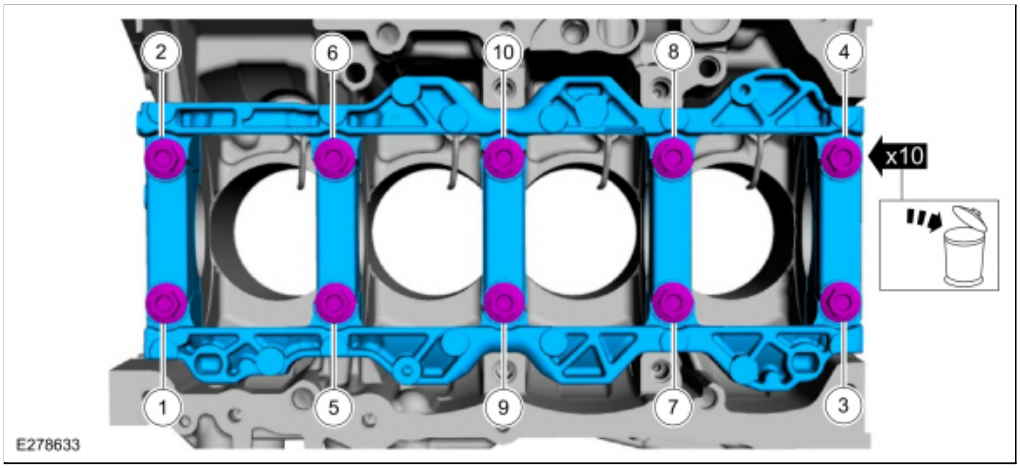
Using the chart, select the correct grade connecting rod bearings.

1. Crankshaft journal diameter
2. Connecting rod diameter
3. Upper Bearing Green: 1 / Lower Bearing Green: 1
4. Upper Bearing Blue: 2/ Lower Bearing Green: 1
5. Upper Bearing Blue: 2 / Lower Bearing Blue: 2
6. Upper Bearing Red: 3/ Lower Bearing Blue: 2
7. Upper Bearing Red: 3 / Lower Bearing Red: 3



13.

- Remove the bolts in sequence shown and discard.
- Remove the main bearing beam.



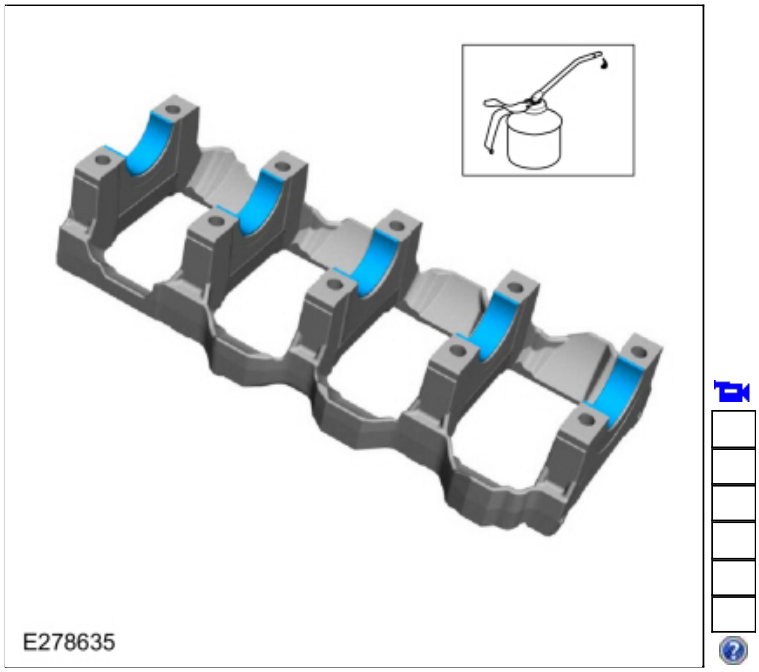
14. **NOTE:** *Before assembling the cylinder block, all sealing surfaces must be free of chips, dirt, paint and foreign material. Also, make sure the coolant and oil passages are clear.*

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

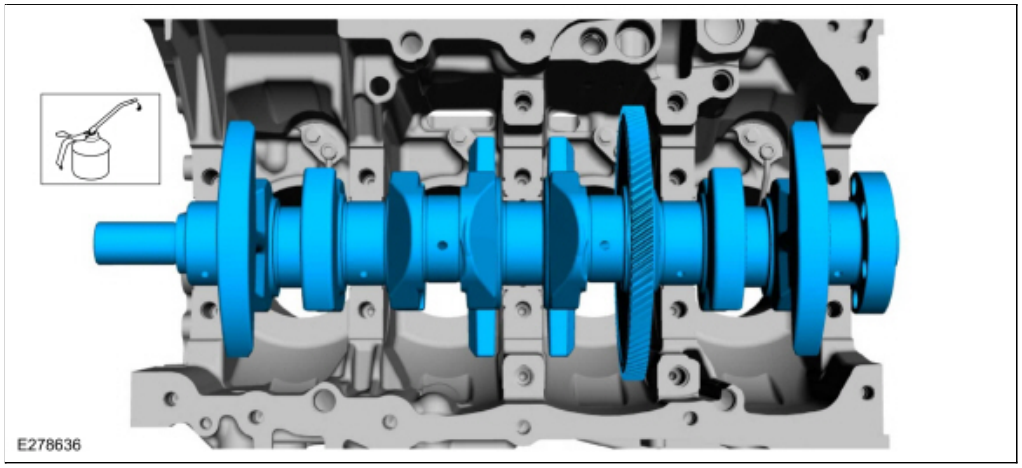
Lubricate with clean engine oil and install the crankshaft main bearings.

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

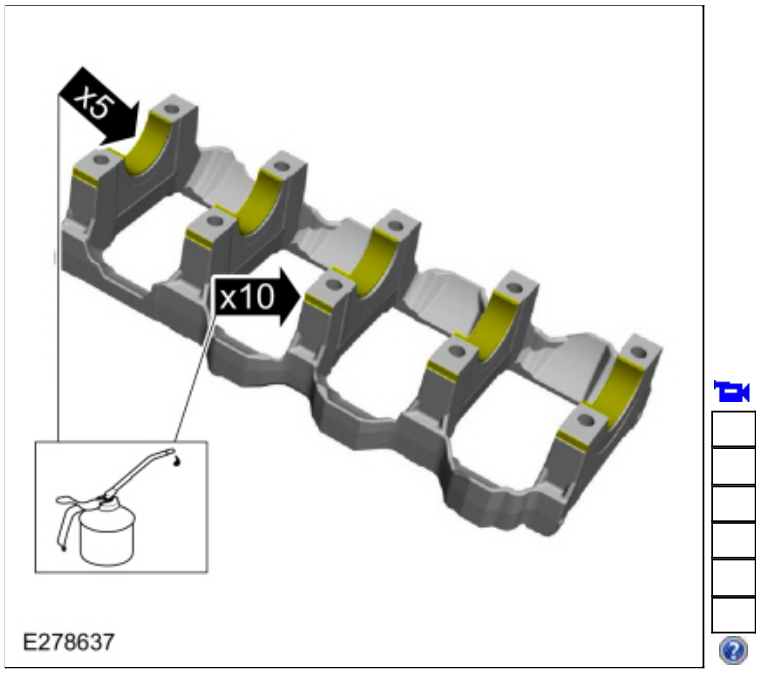
    Lubricate with clean engine oil and install the main bearing beam bearings.



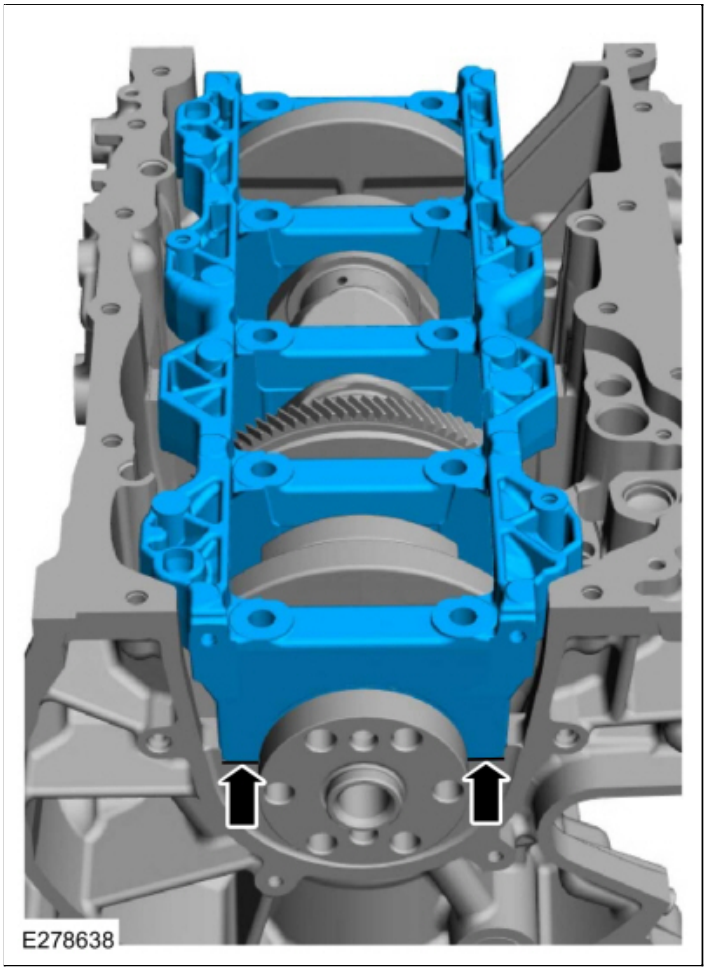
16. Lubricate with clean engine oil and install the crankshaft.



17. Lubricate with clean engine oil.



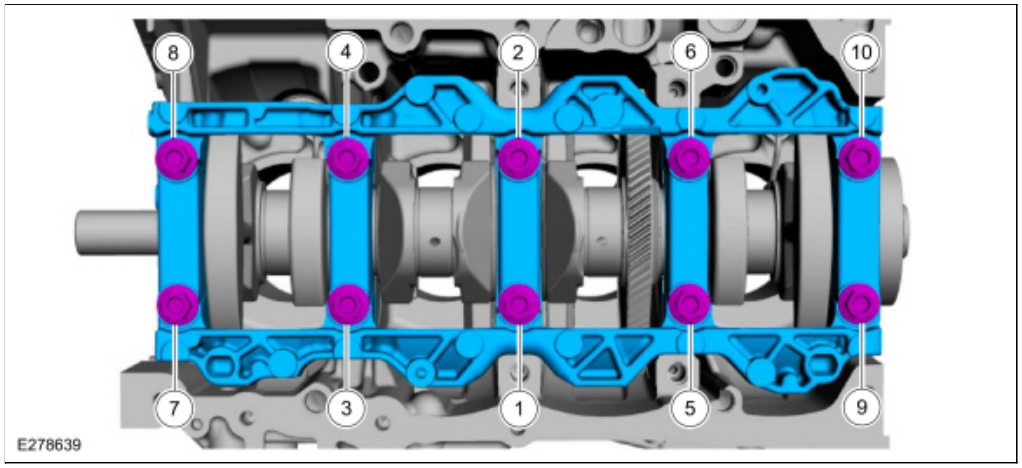
18. Install the main bearing beam flush.



19. **NOTE:** *Lubricate the new main bearing beam bolts threads and under the bolt heads with clean engine oil.*

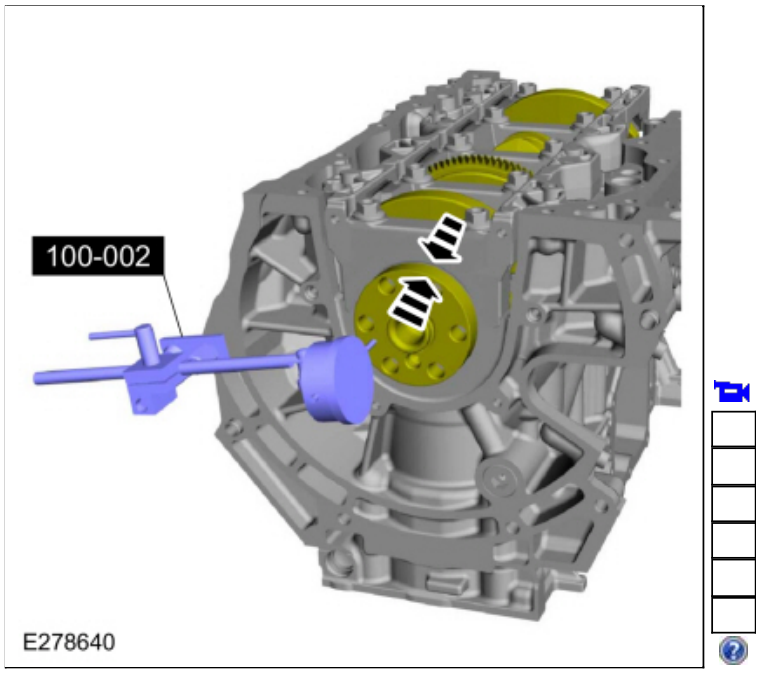
NOTE: *Position the crankshaft to the rear of the cylinder block, then position the crankshaft to the front of the cylinder block before tightening the main bearing beam bolts.*

Install the bolts and tighten in sequence shown.
Torque:
Stage 1: 44 lb.in (5 Nm)
Stage 2: 18 lb.ft (25 Nm)
Stage 3: 90°



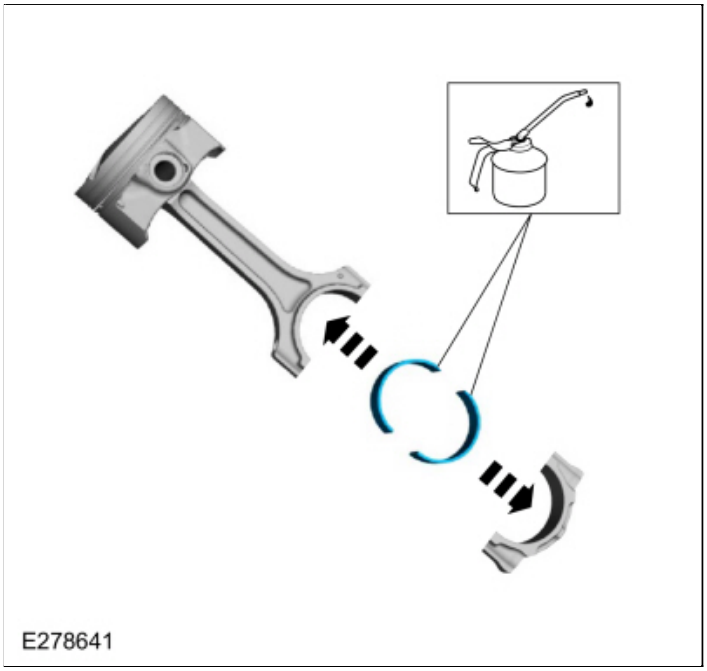
20.

1. Position the crankshaft to the rear of the cylinder block.
2. Zero the Dial Indicator Gauge with Holding Fixture.
   Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.
3. Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.
4. Acceptable crankshaft end play is 0.220-0.450 mm (0.0087-0.0177 in). If the crankshaft end play exceeds the specified range, install new parts as necessary.



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

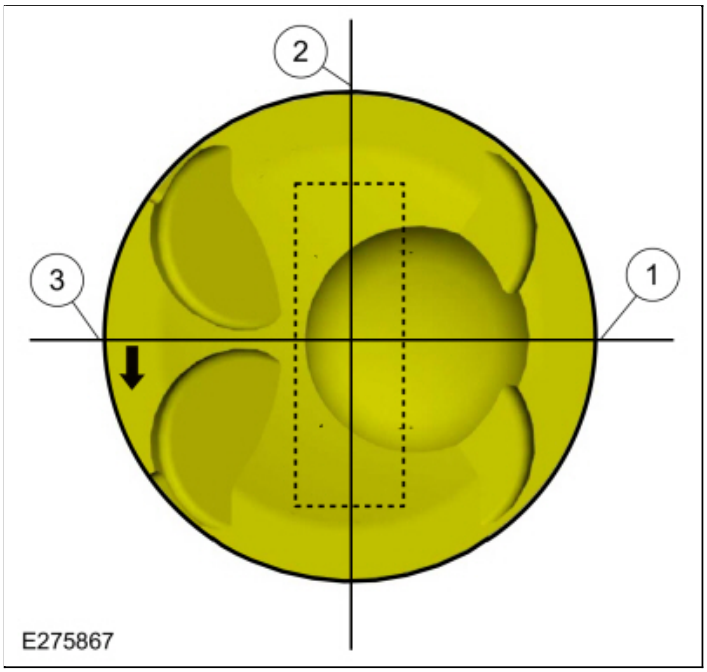
    Lubricate with clean engine oil and install the connecting rod bearings.



22. **NOTE:** *Align the piston rings on the piston.*

    NOTE: *Arrow indicates front of engine.*

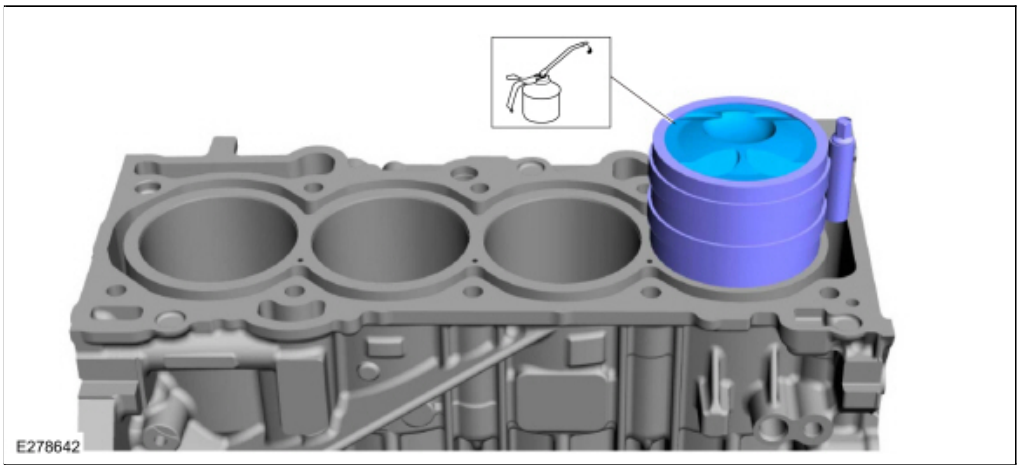
    1. Upper oil control segment ring gap location.
    2. Oil control spacer gap location.
    3. Lower oil control segment ring gap location.



23. **NOTICE: Be sure 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 arrow on top is facing toward the front of the engine.*

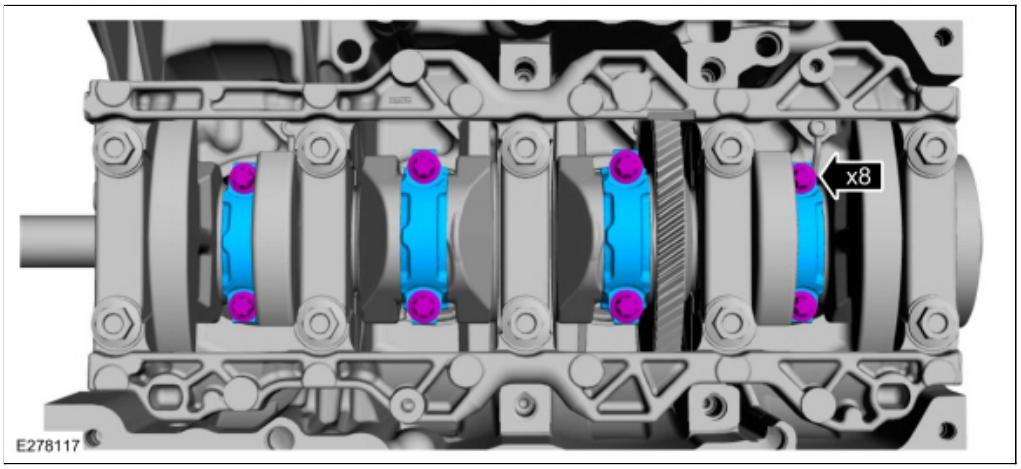
Lubricate with clean engine oil. Using a piston ring compressor, install the pistons.
Use the General Equipment: Piston Ring Compressor



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

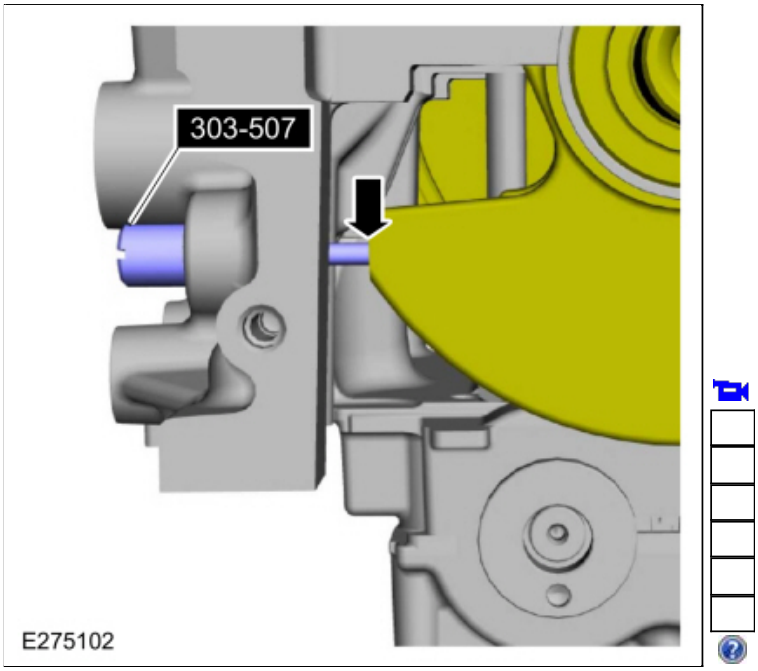
NOTE: *After installation of each connecting rod cap, rotate the crankshaft to verify smooth operation.*

Install the connecting rod caps, bolts and tighten in 3 stages.
Torque:
Stage 1: 177 lb.in (20 Nm)
Stage 2: 30 lb.ft (40 Nm)
Stage 3: 90°



25.

- Install Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.
- Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the special tool. The engine is now at TDC.



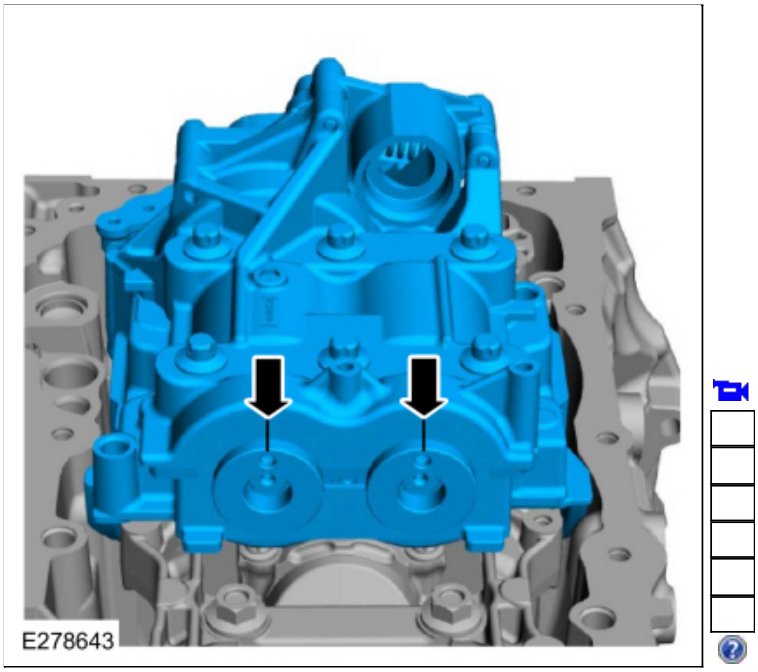
26. Prime the oil pump. Add 2 tablespoons of clean engine oil to the oil pump and rotate the oil pump by hand.

27. **NOTE:** *Due to the precision interior construction of the balancer unit, it should not be disassembled.*

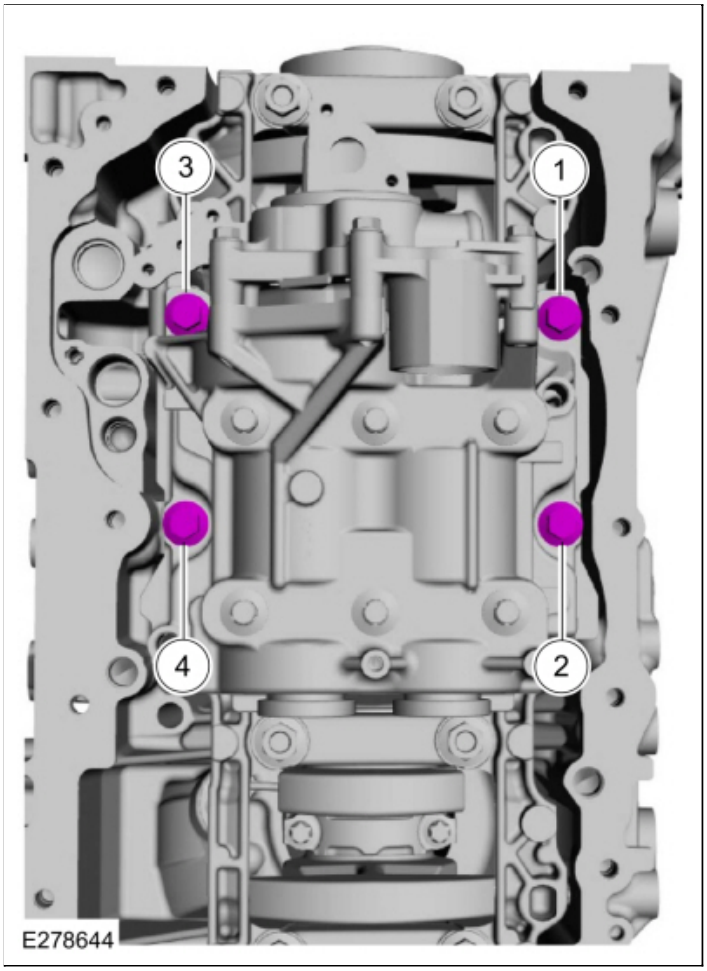
    NOTE: *The original adjustment shims must be installed in their original positions.*

    NOTE: *Confirm by visual inspection that there is no damage to the balancer unit gear and verify that the shaft turns smoothly. If there is any damage or malfunction, replace the balancer unit.*

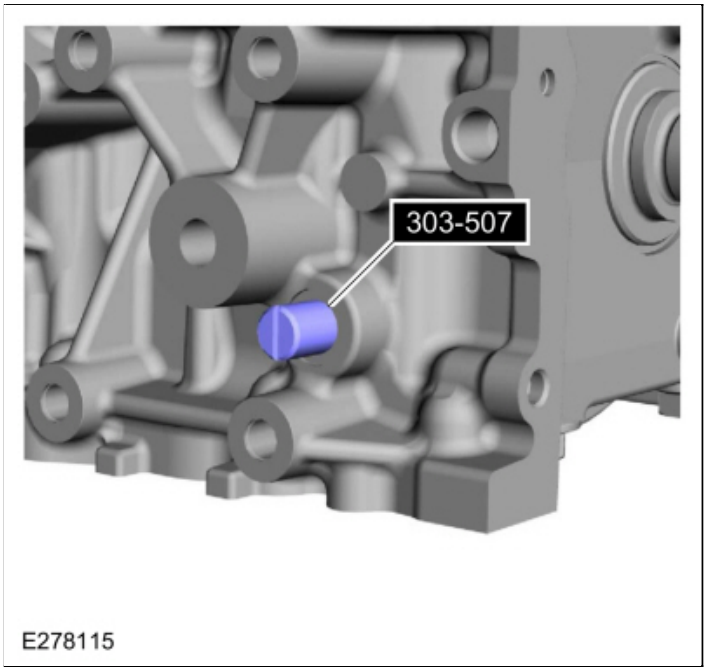
    Install the adjustment shims in their original positions on the seat faces of the balancer unit. With the balancer unit shaft marks in the TDC position, slowly install the balancer unit to the cylinder block to avoid interference between the crankshaft drive gear and the balancer unit driven gear.



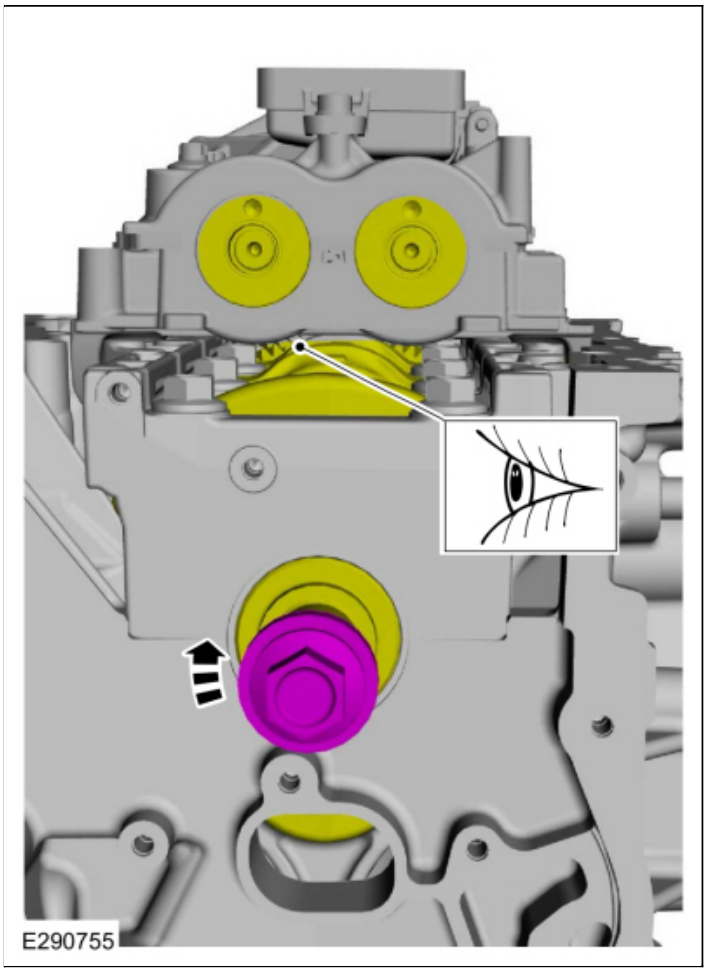
28. Install the bolts and tighten in 2 stages.
Torque:
Stage 1: 133 lb.in (15 Nm)
Stage 2: 45°



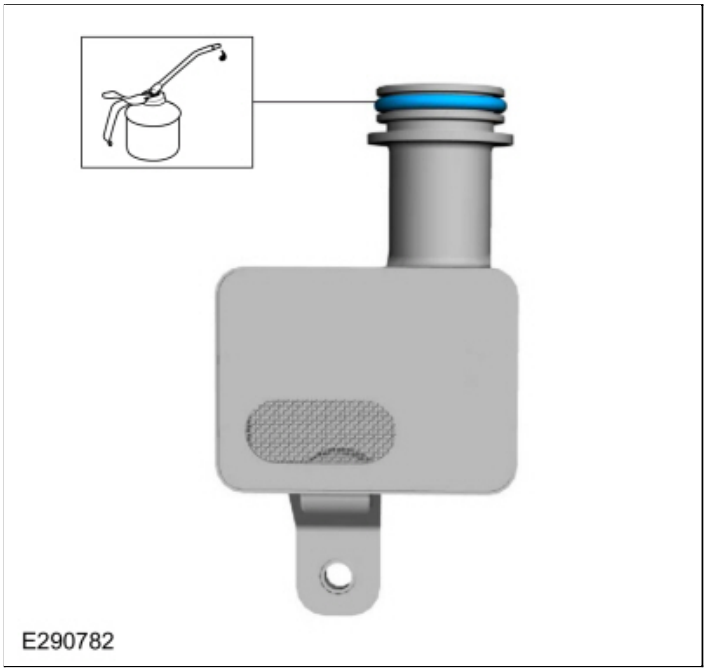
29. Remove Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



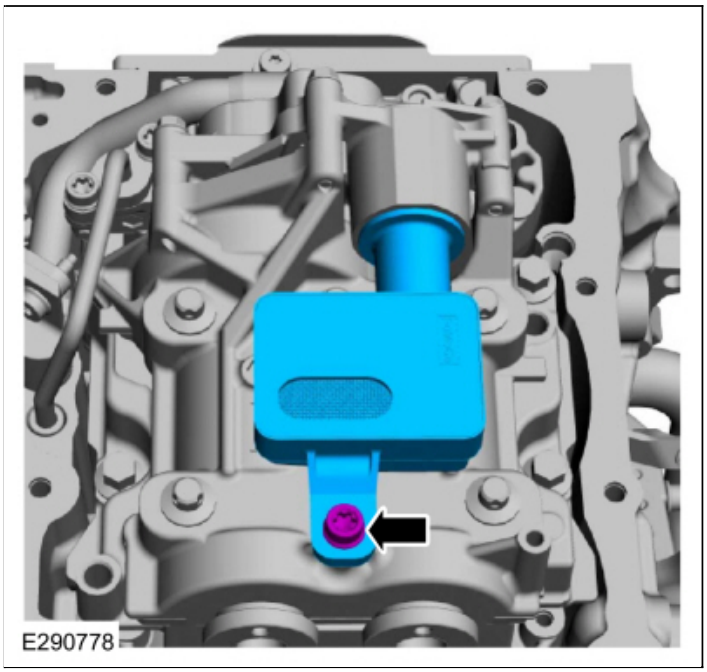
30. Install the crankshaft bolt and rotate the crankshaft to confirm that there are no meshing problems between the balancer unit gear and the crankshaft gear.



31. Lubricate the oil screen and pickup tube O-ring seal with clean engine oil.

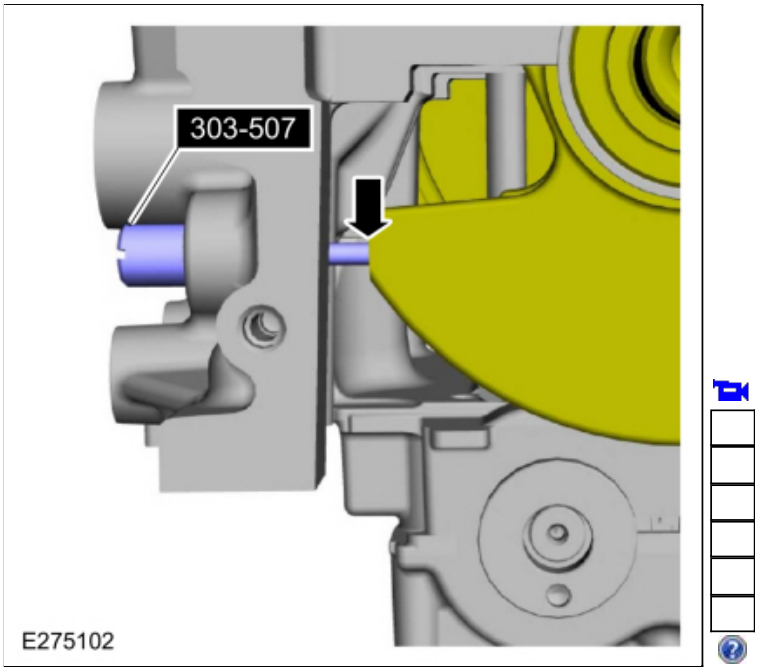


32. Install the oil pickup and screen and the bolt.
Torque: 97 lb.in (11 Nm)

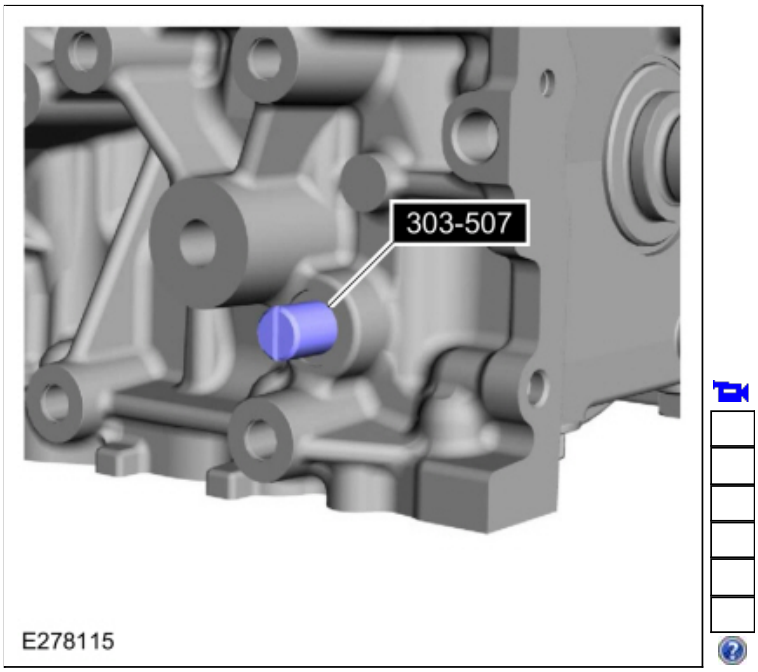


33.

- Install Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.
- Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the special tool. The engine is now at TDC.



34. Remove Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



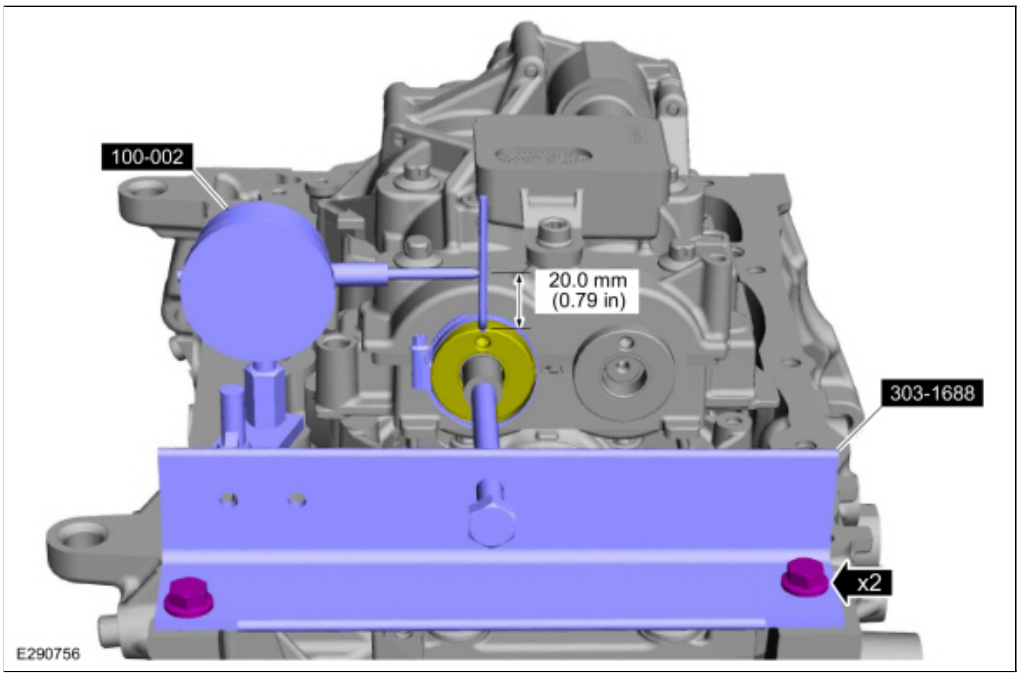
35. **NOTE:** *Measure the backlash and verify that it is within specified range at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees. It will be necessary to reset the measuring equipment between measurements.*

    NOTE: *The measurement must be taken with the Dial Indicator Gauge with Holding Fixture, a 5-mm Allen wrench and worm clamp set up as shown.*

    - **NOTE:** *Make sure the worm clamp and Allen wrench are not touching the balance shaft housing.*

      Install the 5-mm Allen wrench and tighten worm clamp as shown.

- Mark the Allen wrench with a file 20 mm (0.79 in) above the driven gear top surface.
- Install the balance shaft preload tool and bolts as shown.
  Use Special Service Tool: 303-1688 Preload Tool, Balance Shaft.
- Install and position the dial indicator gauge with holding fixture on the Allen wrench 20 mm (0.79 in) as shown.
  Use Special Service Tool: 100-002 (TOOL-4201-C) Holding Fixture with Dial Indicator Gauge.
- Rotate the crankshaft clockwise and measure the backlash at all of the following 6 positions: 10 degrees, 30 degrees, 100 degrees, 190 degrees, 210 degrees and 280 degrees.
- Backlash specifications are 0.040 to 0.140 mm (0.00157 to 0.0055 in).
- If the backlash exceeds the specified range, carry out the Balance Shaft Backlash procedure.
  Refer to: Balance Shaft Backlash (303-01 Engine - 2.3L EcoBoost (201kW/273PS), General Procedures).



36. Using the backlash measurement, select the proper shims from the Adjustment Shim Selection Table.
    1. Backlash
    2. Selection shim (No.)
    3. Shim thickness

1	2	3
0.267-0.273 mm (0.0105-0.0107 in)	15	1.15 mm (0.0452 in)
0.260-0.266 mm (0.0102-0.0104 in)	16	1.16 mm (0.0456 in)
0.253-0.259 mm (0.0100-0.0101 in)	17	1.17 mm (0.0460 in)
0.246-0.252 mm (0.0097-0.0099 in)	18	1.18 mm (0.0464 in)
0.239-0.245 mm (0.0094-0.0096 in)	19	1.19 mm (0.0468 in)
0.232-0.238 mm (0.0091-0.0093 in)	20	1.20 mm (0.0472 in)
0.225-0.231 mm (0.0089-0.0090 in)	21	1.21 mm (0.0476 in)
0.218-0.224 mm (0.0086-0.0088 in)	22	1.22 mm (0.0480 in)
0.211-0.217 mm (0.0083-0.0085 in)	23	1.23 mm (0.0484 in)
0.204-0.210 mm (0.0080-0.0082 in)	24	1.24 mm (0.0488 in)
0.197-0.203 mm (0.0078-0.0079 in)	25	1.25 mm (0.0492 in)
0.190-0.196 mm (0.0075-0.0077 in)	26	1.26 mm (0.0496 in)
0.183-0.189 mm (0.0072-0.0074 in)	27	1.27 mm (0.0499 in)
0.176-0.182 mm (0.0069-0.0071 in)	28	1.28 mm (0.0503 in)
0.169-0.175 mm (0.0066-0.0068 in)	29	1.29 mm (0.0507 in)
0.162-0.168 mm (0.0064-0.0066 in)	30	1.30 mm (0.0511 in)
0.155-0.161 mm (0.0061-0.0063 in)	31	1.31 mm (0.0515 in)
0.148-0.154 mm (0.0058-0.0060 in)	32	1.32 mm (0.0519 in)
0.141-0.147 mm (0.0056-0.0057 in)	33	1.33 mm (0.0523 in)
0.134-0.140 mm (0.0053-0.0055 in)	34	1.34 mm (0.0527 in)

1	2	3
0.127-0.133 mm (0.0050-0.0052 in)	35	1.35 mm (0.0531 in)
0.120-0.126 mm (0.0047-0.0049 in)	36	1.36 mm (0.0535 in)
0.113-0.119 mm (0.0045-0.0046 in)	37	1.37 mm (0.0539 in)
0.106-0.112 mm (0.0042-0.0044 in)	38	1.38 mm (0.0543 in)
0.099-0.105 mm (0.0040-0.0041 in)	39	1.39 mm (0.0547 in)
0.092-0.098 mm (0.0037-0.0039 in)	40	1.40 mm (0.0551 in)
0.085-0.091 mm (0.0034-0.0036 in)	41	1.41 mm (0.0555 in)
0.078-0.084 mm (0.0031-0.0033 in)	42	1.42 mm (0.0559 in)
0.071-0.077 mm (0.0028-0.0030 in)	43	1.43 mm (0.0562 in)
0.064-0.070 mm (0.0025-0.0027 in)	44	1.44 mm (0.0566 in)
0.057-0.063 mm (0.0023-0.0024 in)	45	1.45 mm (0.0570 in)
0.050-0.056 mm (0.0020-0.0022 in)	46	1.46 mm (0.0574 in)
0.043-0.049 mm (0.0017-0.0019 in)	47	1.47 mm (0.0578 in)
0.036-0.042 mm (0.0014-0.0016 in)	48	1.48 mm (0.0582 in)
0.029-0.035 mm (0.0011-0.0013 in)	49	1.49 mm (0.0586 in)
0.022-0.028 mm (0.0009-0.0011 in)	50 (master)	1.50 mm (0.0590 in)
0.015-0.021 mm (0.0006-0.0008 in)	51	1.51 mm (0.0594 in)
0.008-0.014 mm (0.0003-0.0005 in)	52	1.52 mm (0.0598 in)
0.001-0.007 mm (0.0001-0.0002 in)	53	1.53 mm (0.0602 in)
0.000-0.000 mm (0.0000-0.0000 in)	54	1.54 mm (0.0606 in)

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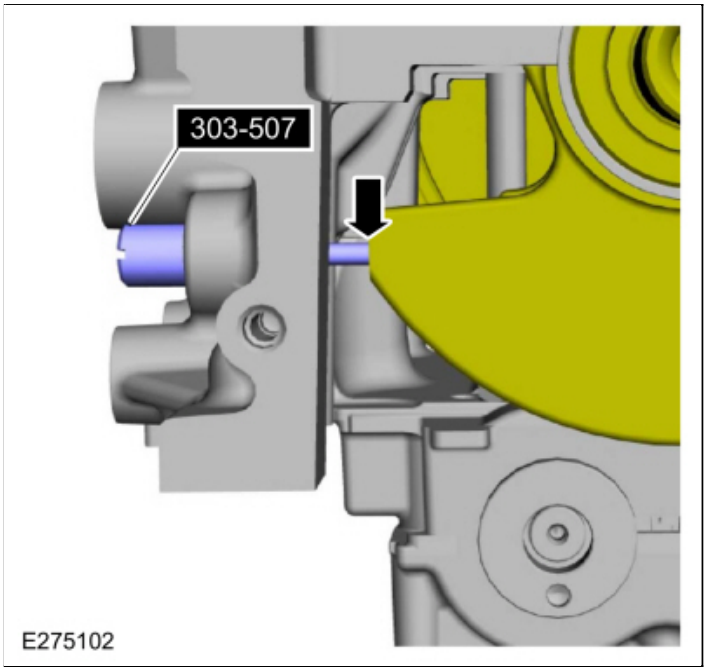
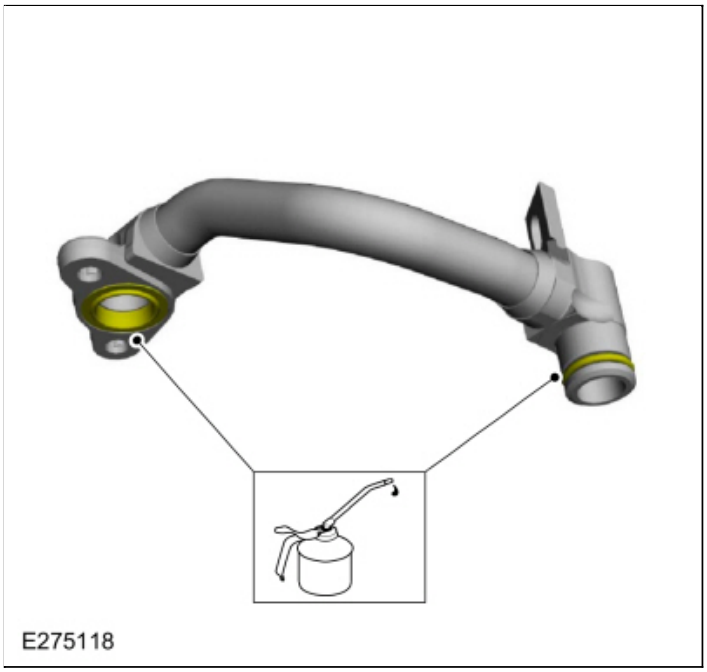
37.

- Install Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.
- Rotate the crankshaft slowly clockwise until the crankshaft balance weight is up against the special tool. The engine is now at TDC and must remain at the TDC position until the timing drive components and crankshaft pulley are installed.

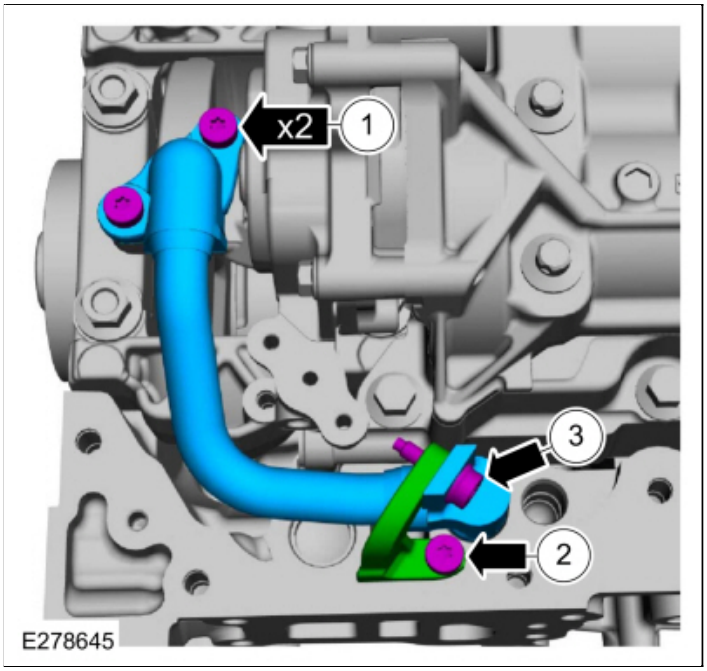


38. Lubricate the oil inlet tube O-ring seals with clean engine oil.

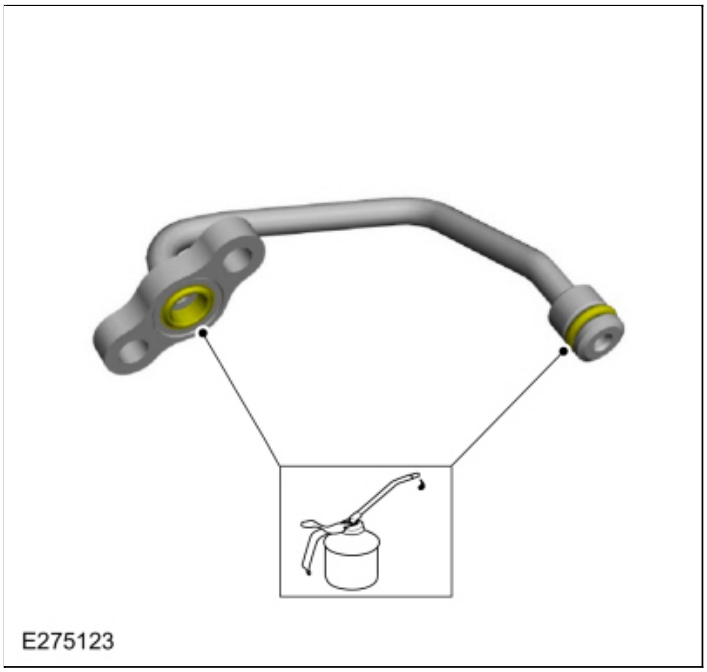


39.

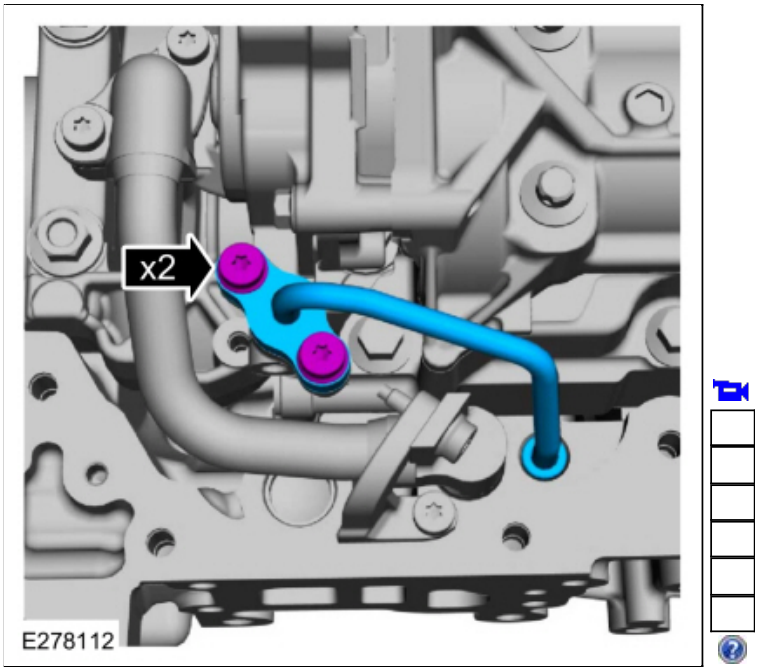
1. Install the oil inlet tube and the bolts.
   Torque: 97 lb.in (11 Nm)
2. Install the oil inlet tube bracket and the bolt.
   Torque: 97 lb.in (11 Nm)
3. Install the oil inlet tube-to-bracket bolt.
   Torque: 97 lb.in (11 Nm)



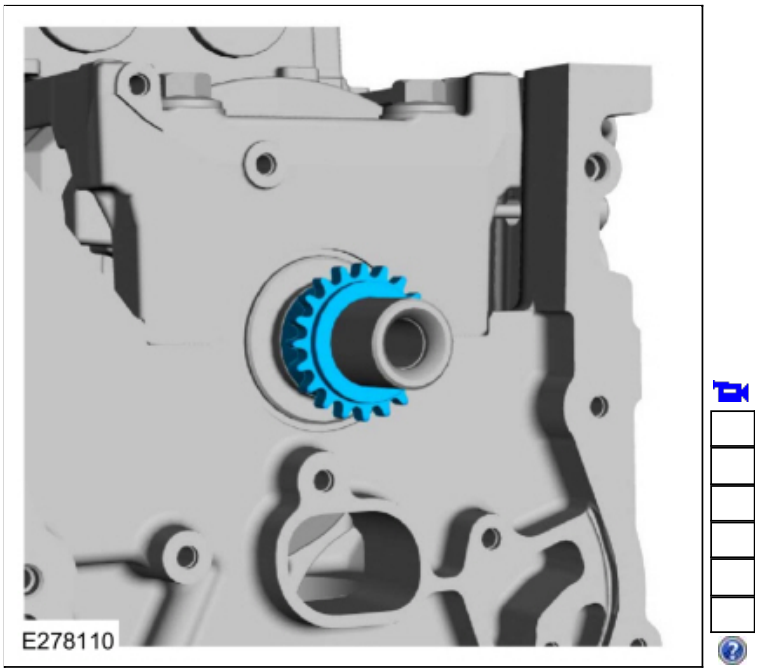
40. Lubricate the oil outlet tube O-ring seals with clean engine oil.



41. Install the oil outlet tube and the bolts.
Torque: 97 lb.in (11 Nm)

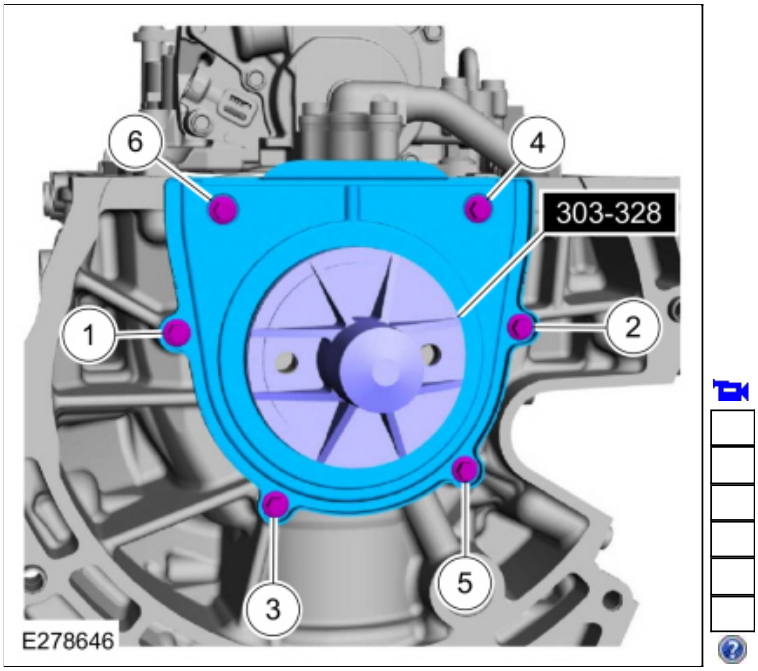


42. Install the crankshaft sprocket.



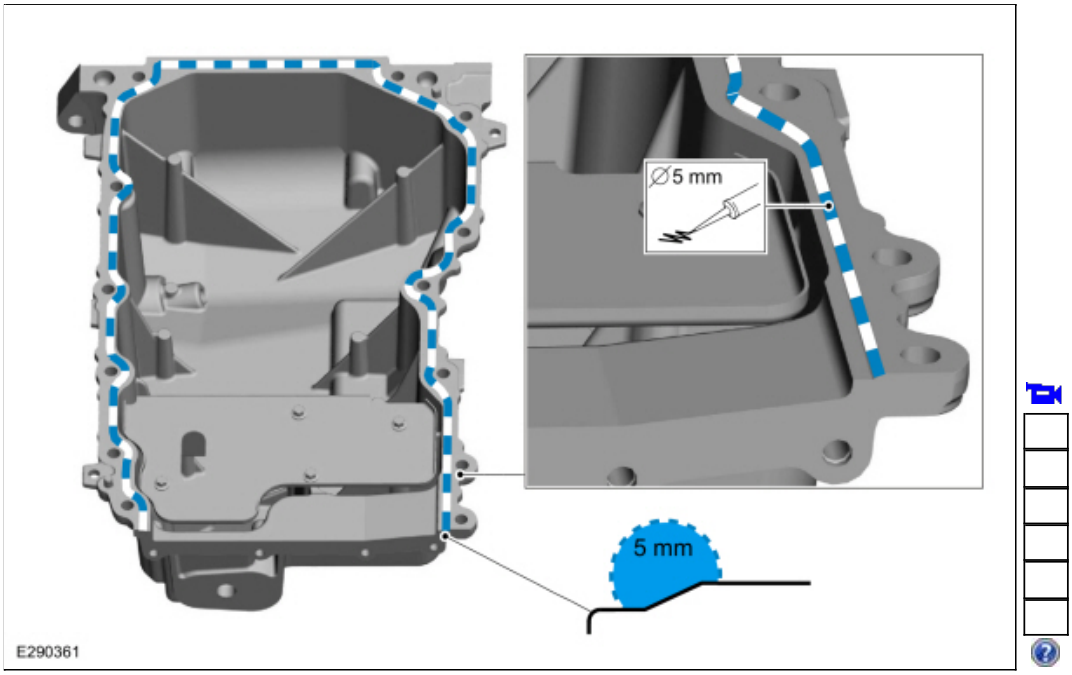
43.

- Using the special tool, position the crankshaft rear oil seal onto the crankshaft.
  Use Special Service Tool: 303-328 (T88P-6701-B1) Replacer, Rear Seal.
- Install the bolts and tighten in sequence shown.
  Torque: 97 lb.in (11 Nm)

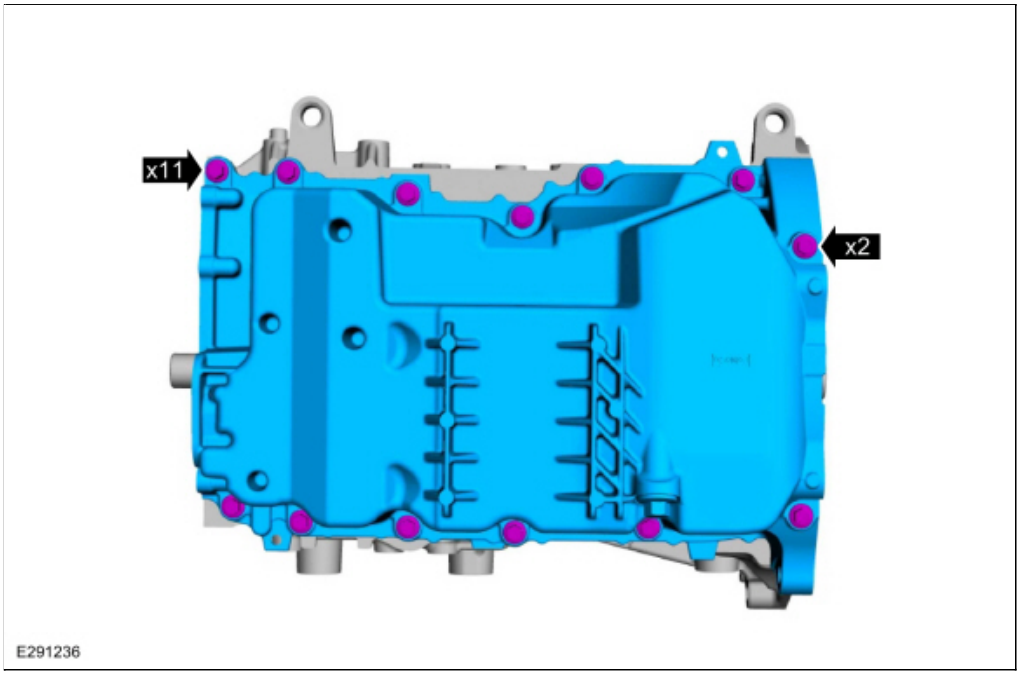


44. **NOTE:** *If the oil pan is not secured within 10 minutes of silicone sealant application, the silicone sealant must be removed and the sealing area cleaned. Allow to dry until there is no sign of wetness, or 10 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.*

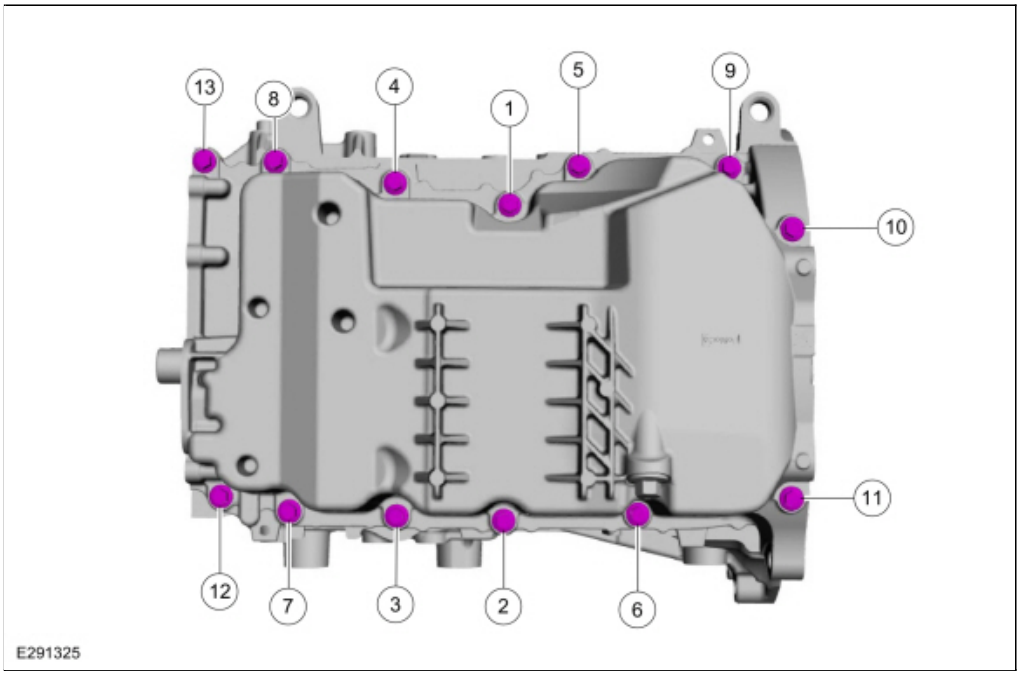
    Apply a 5 mm bead of silicone sealant on the chamfer, as shown.
    Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)



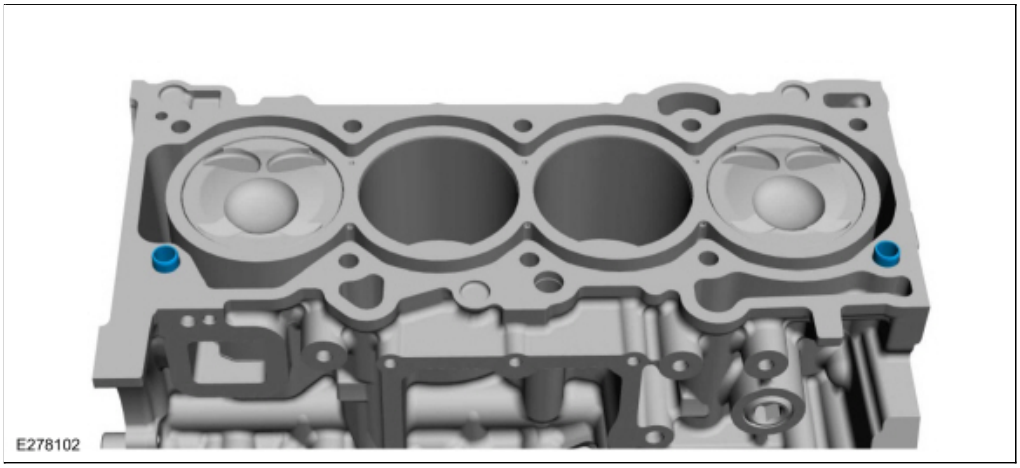
45. Install the oil pan and the new bolts finger tight.



46. Tighten the bolts in sequence shown.
Torque: 18 lb.ft (25 Nm)



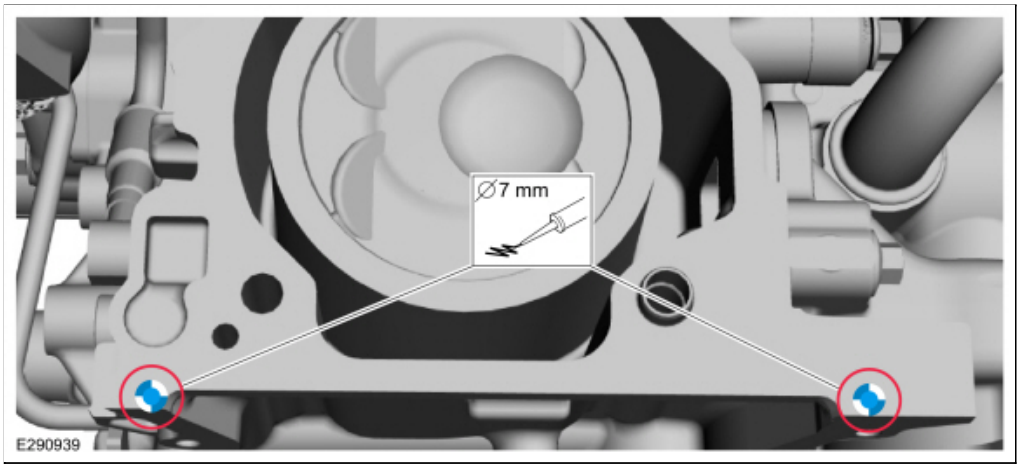
47. Install the cylinder block bushings.



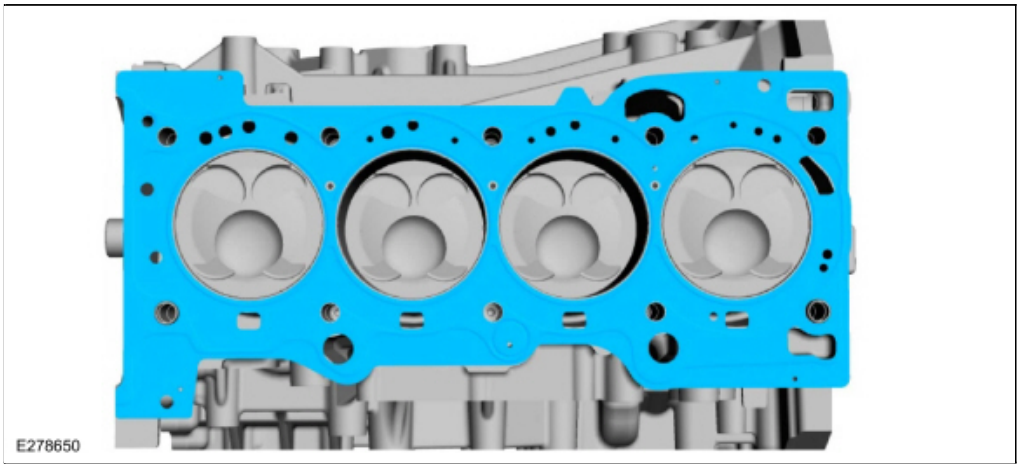
48. **NOTICE: Do not allow silicone sealant in or near the high-pressure oil feed hole. Any restriction in the high-pressure oil feed may result in engine damage.**

    NOTE: *The cylinder head must be installed within 10 minutes of applying the sealant.*

    Apply a 7 mm (0.28 in) drop of silicone sealant at positions shown on the cylinder block.
    Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)



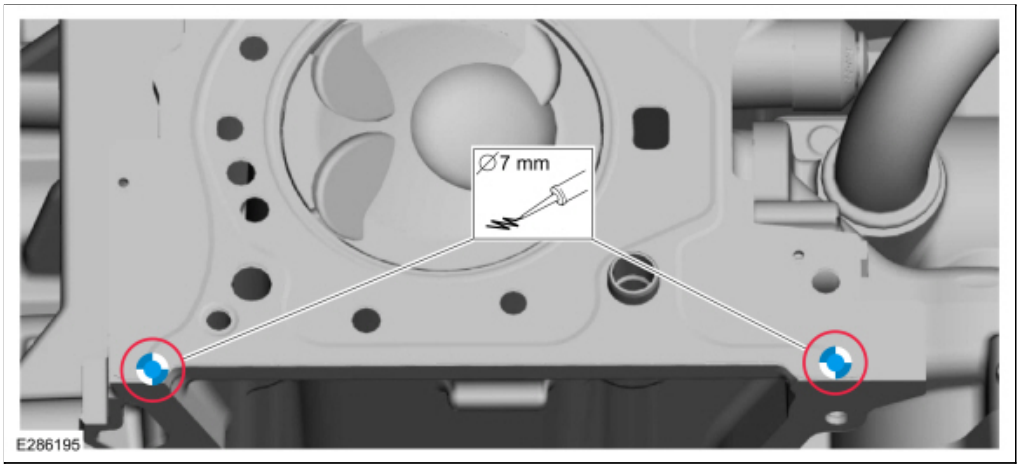
49. Install a new cylinder head gasket.



50. **NOTICE: Do not allow silicone sealant in or near the high-pressure oil feed hole. Any restriction in the high-pressure oil feed may result in engine damage.**

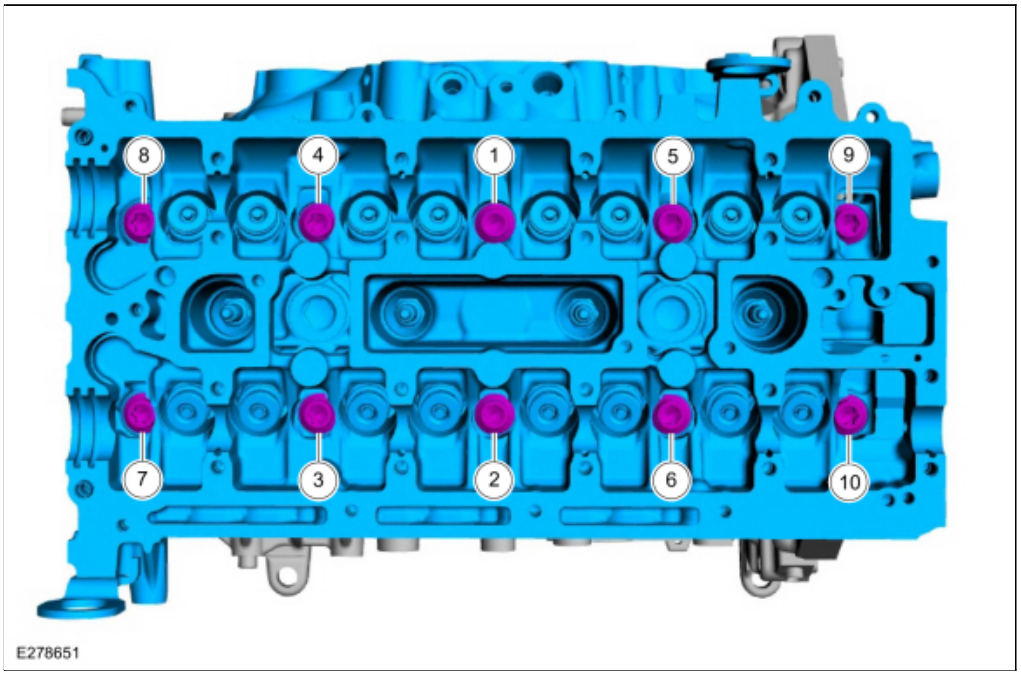
    NOTE: *The cylinder head must be installed within 10 minutes of applying the sealant.*

    Apply a 8 mm (0.31 in) drop of silicone sealant at positions shown.
    Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)

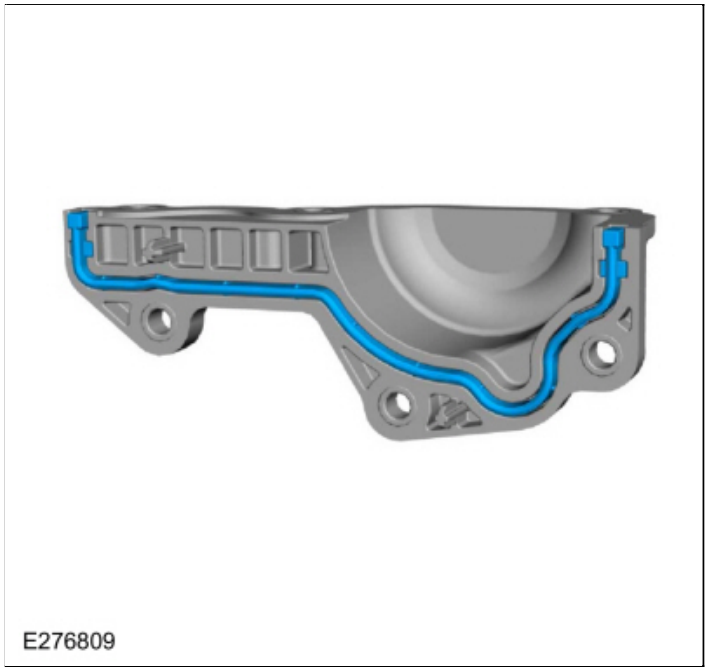


51. **NOTE:** *The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.*

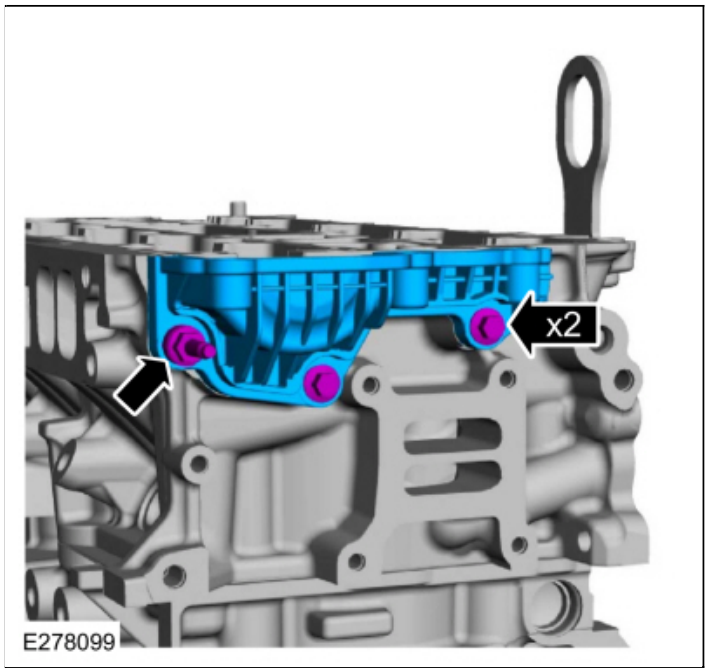
    Install the cylinder head and bolts and tighten in sequence shown in 5 stages.
    Torque:
    Stage 1: 62 lb.in (7 Nm)
    Stage 2: 133 lb.in (15 Nm)
    Stage 3: 41 lb.ft (55 Nm)
    Stage 4: 90°
    Stage 5: 90°



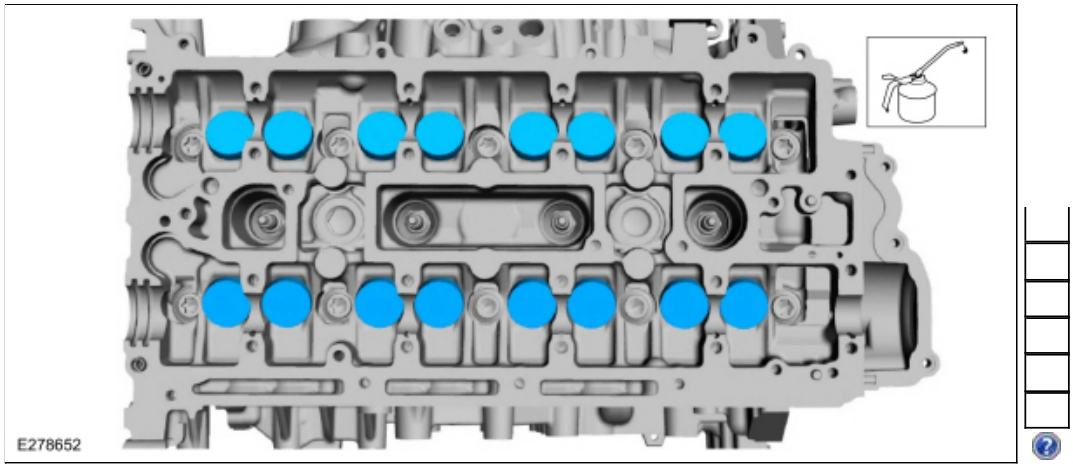
52. Install a new cylinder head cover gasket.



53. Install the cylinder head cover, bolts and stud bolt.
Torque: 97 lb.in (11 Nm)

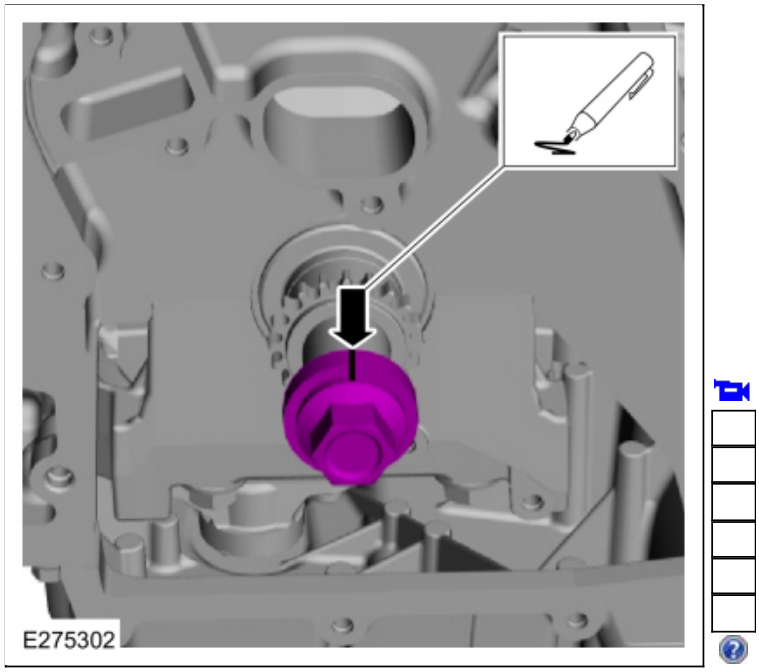


54. Lubricate with clean engine oil and install the valve tappets in their original position.



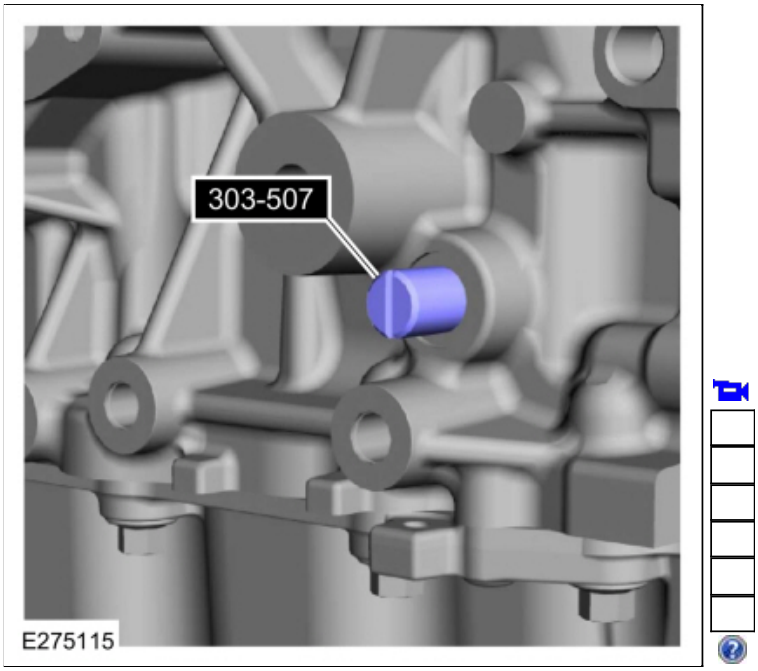
55. **NOTICE: If any new parts are being installed (cylinder head, valves, tappets, camshafts) it is necessary to check the valve clearance, follow the next 15 steps exactly or serious damage to the engine may occur. If the original parts are being installed it is not necessary to check the valve clearance so proceed to step 69.**

    Install the crankshaft bolt and place a paint mark on the crankshaft bolt at the 12 o'clock position.



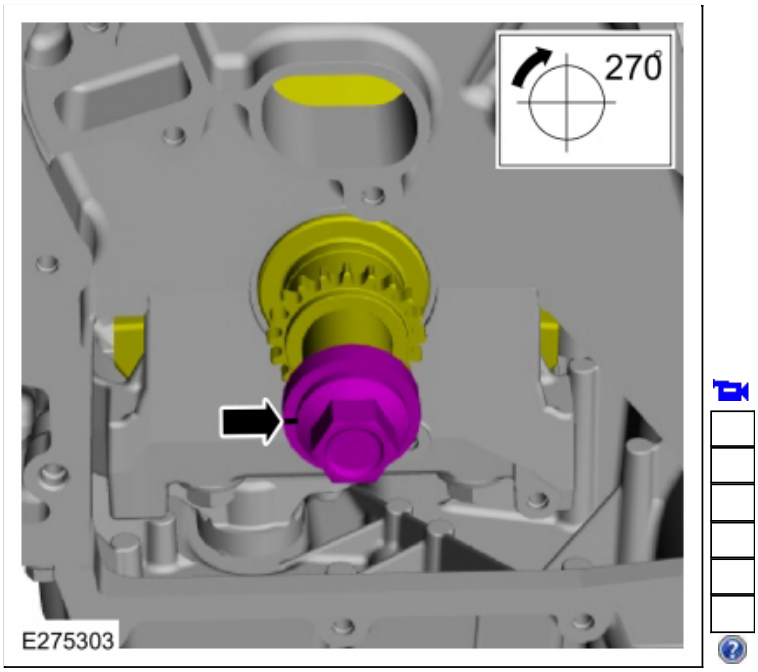
56.

- Remove Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



57. **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.*

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

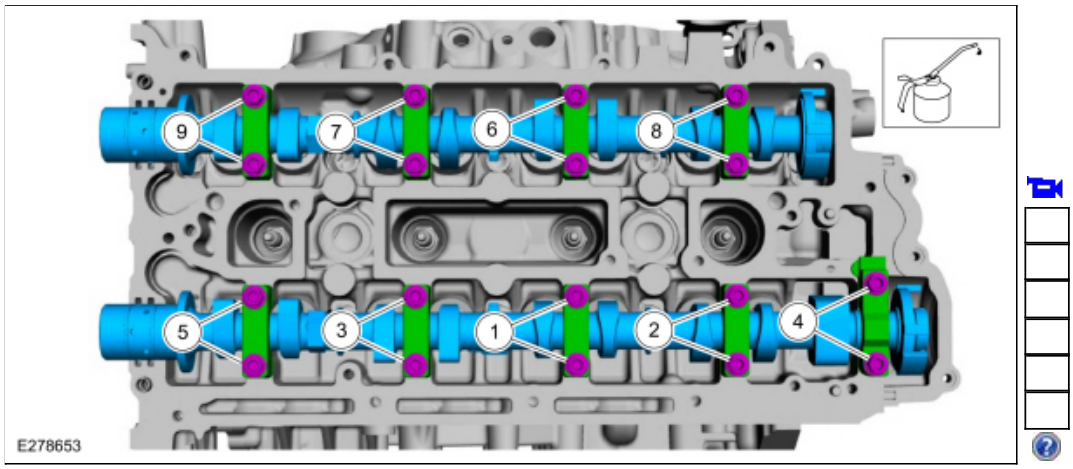


58. **NOTICE: Failure to follow the camshaft tightening procedure can result in damage to the camshafts.**

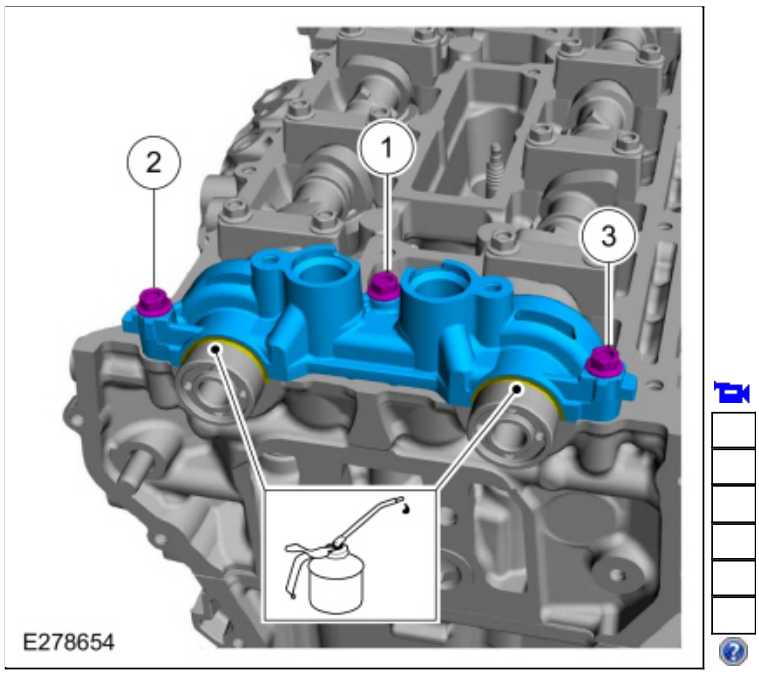
    NOTE: *Lubricate the camshaft journals and camshaft bearing caps with clean engine oil.*

    - Lubricate the camshafts and caps with clean engine oil and install the camshafts, caps and bolts.
    - Tighten 2 turns at a time in the sequence shown in 2 stages.

Torque:
Stage 1: 62 lb.in (7 Nm)
Stage 2: 142 lb.in (16 Nm)



59. Lubricate the camshaft journals with clean engine oil and install the front camshaft bearing cap and bolts.
Torque:
Stage 1: 62 lb.in (7 Nm)
Stage 2: 142 lb.in (16 Nm)

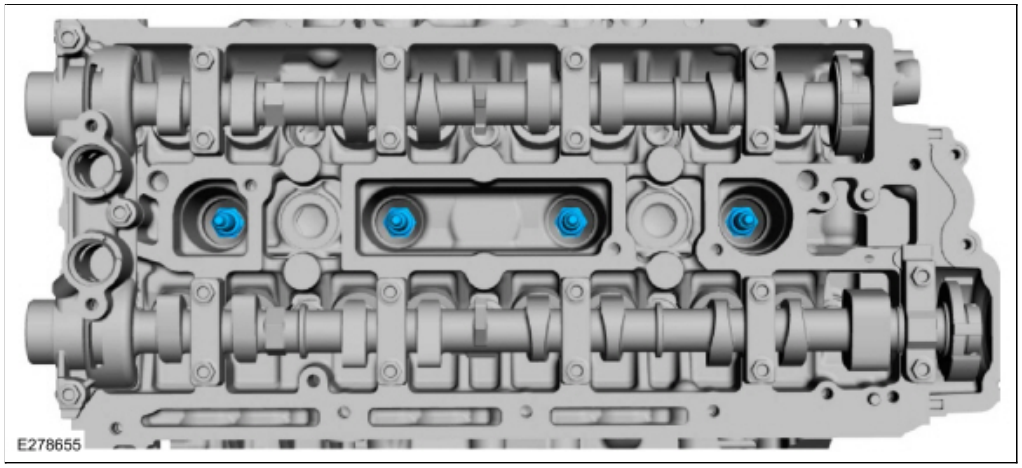


60. **NOTICE: Do not remove the spark plugs when the engine is hot or cold soaked. Spark plug thread or cylinder head damage can occur. Make sure the engine is warm (hand touch after cooling down) prior to spark plug removal.**

NOTICE: If a spark plug is dropped, internal damage may result and the spark plug must be discarded. The use of a damaged spark plug may cause cylinder misfire resulting in engine damage.

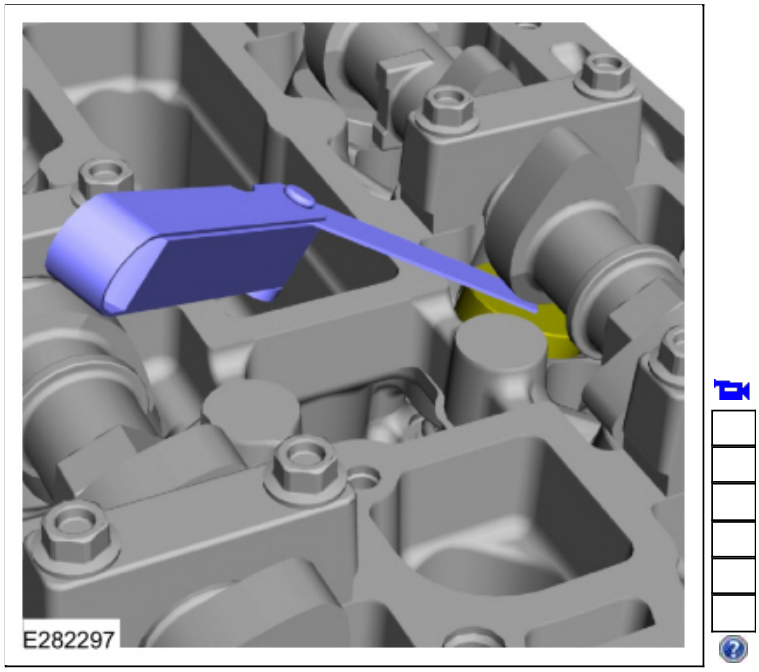
NOTE: *Only use hand tool to remove the spark plugs.*

Remove the spark plugs.



61.

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.
   Use the General Equipment: Feeler Gauge
3. Repeat to measure all of the lobe/tappet clearances.



62. Valve tappet assembly grade chart
    1. Grade
    2. Id Mark
    3. Thickness (mm)

1	2	3	1	2	3
1	N000	3.000	21	N422	3.422
2	N025	3.025	22	N442	3.442
3	N050	3.050	23	N462	3.462
4	N075	3.075	24	N482	3.482
5	N100	3.100	25	N502	3.502
6	N122	3.122	26	N522	3.522
7	N142	3.142	27	N542	3.542
8	N162	3.162	28	N562	3.562
9	N182	3.182	29	N582	3.582
10	N202	3.202	30	N602	3.602
11	N222	3.222	31	N625	3.625
12	N242	3.242	32	N650	3.650
13	N262	3.262	33	N675	3.675
14	N282	3.282	34	N700	3.700
15	N302	3.302	35	N725	3.725
16	N322	3.322			
17	N342	3.342			
18	N362	3.362			
19	N382	3.382			
20	N402	3.402			

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63. **NOTE:** *There are two numbers on the valve tappet, one is date code and the other is valve tappet thickness.*

    NOTE: *The date code "R0605" represents the year made (R), the month (06) and the day (05).*

    NOTE: *A tappet with the number N650 has the thickness of 3.650 mm.*

    NOTE: *Select tappets using this formula: tappet thickness = measured clearance + the existing tappet thickness - nominal clearance.*

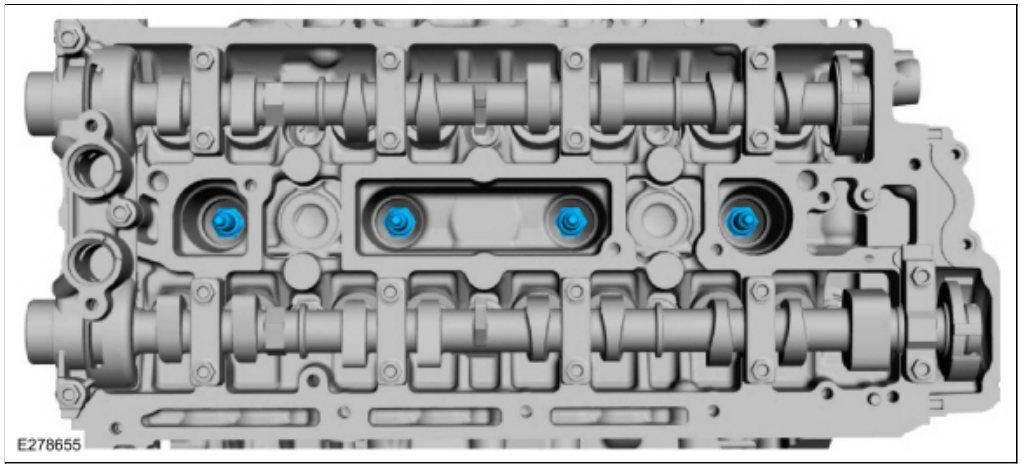
    NOTE: *The nominal clearance is:*
    - *intake: 0.25 mm (0.0095 in).*
    - *exhaust: 0.36 mm (0.0142 in).*

    NOTE: *The acceptable clearances after being fully installed are:*
    - *intake: 0.19-0.31 mm (0.0075-0.0122 in).*
    - *exhaust: 0.30-0.42 mm (0.0118-0.0165 in).*

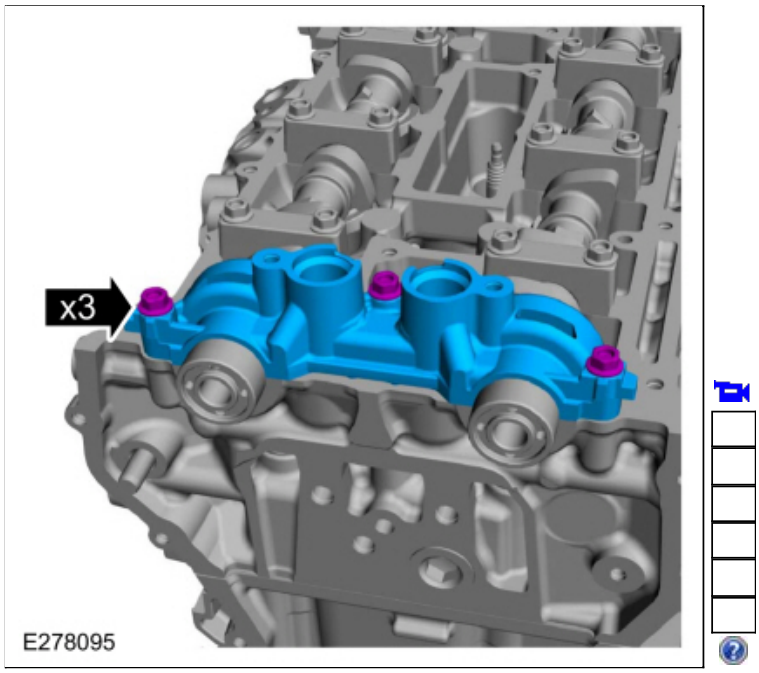
    Select the closest tappet size to the ideal tappet thickness available and mark the installation location.

64. **NOTE:** *Only use hand tool to install the spark plugs.*

    Install the spark plugs.
    Torque: 106 lb.in (12 Nm)



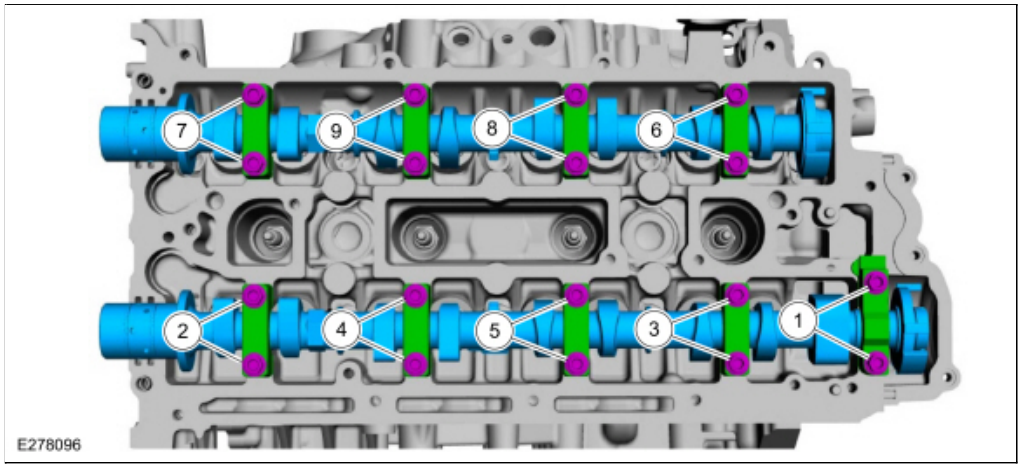
65. Remove the bolts and the front camshaft bearing cap.



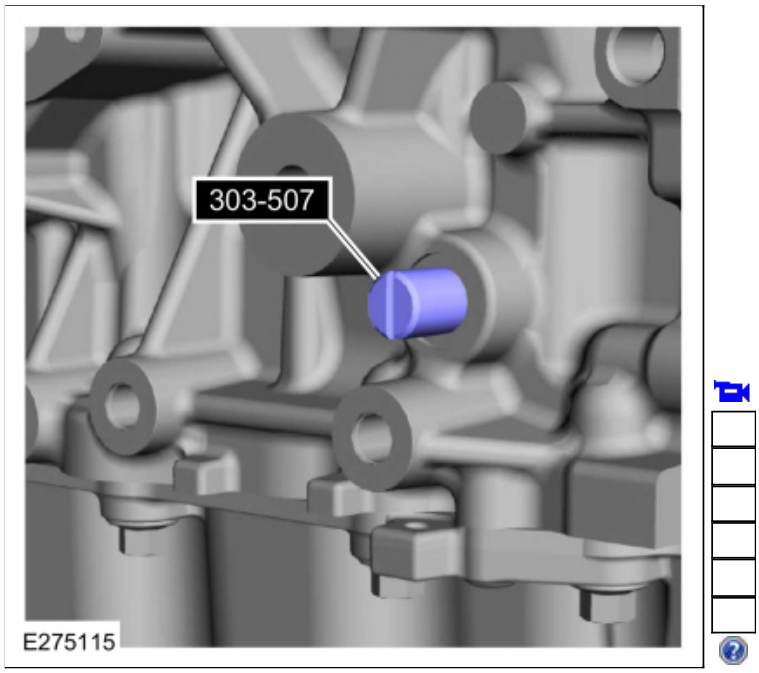
66. **NOTICE: Failure to follow the camshaft loosening procedure can result in damage to the camshafts.**

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. Remove the bolts, caps and camshafts.

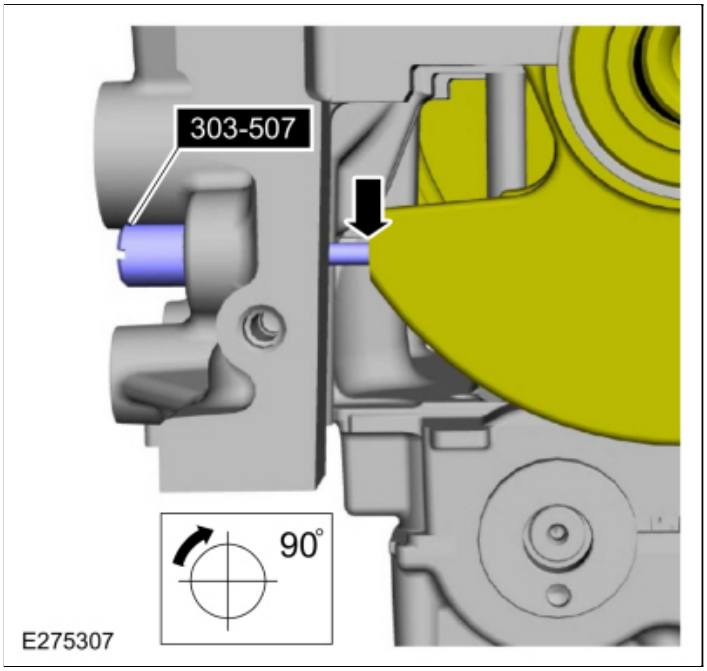


67. Install Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.

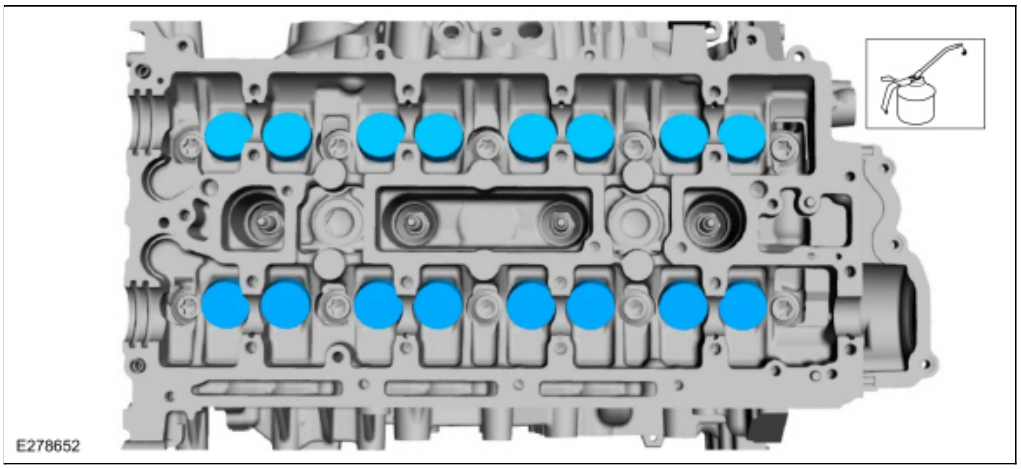


68. **NOTE:** *Rotating the crankshaft will position the engine at TDC and allow you to install the camshafts in the same position as noted during the disassembly.*

Rotate the crankshaft clockwise 90 degrees so the crankshaft contacts the special tool.

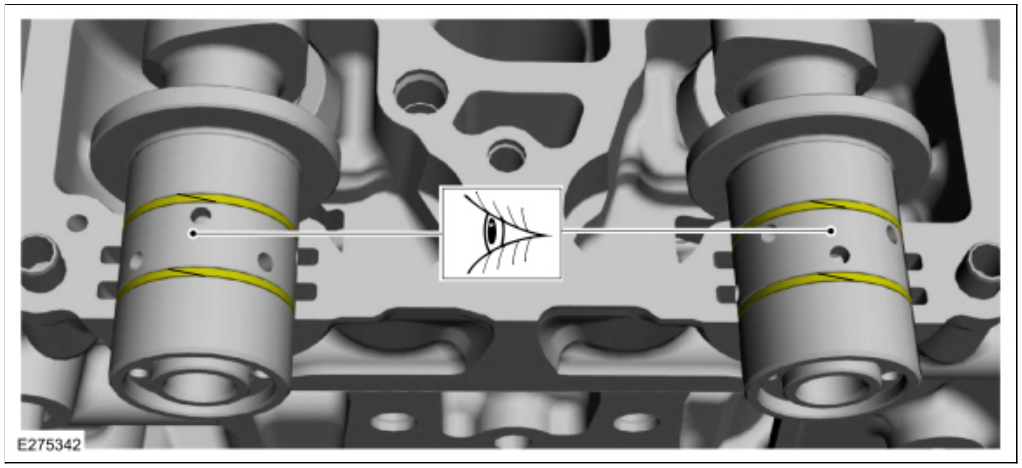


69. If necessary, replace any tappets with the correct tappets selected during the valve clearance check and lubricate with clean engine oil.



70. **NOTICE: The camshaft seal gaps must be at the 12 o'clock position or damage to the engine may occur.**

Inspect and position the camshaft seals gaps at the 12 o'clock position as shown.



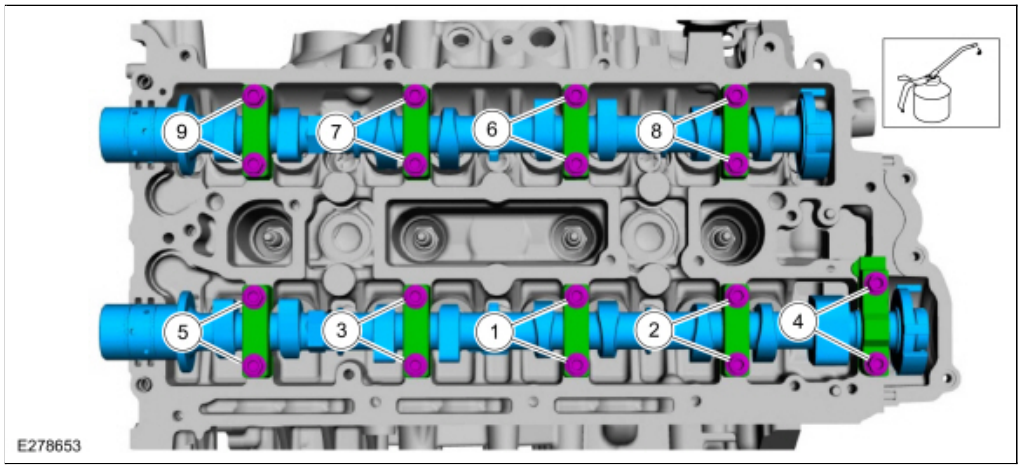
71. **NOTICE: Install the camshafts with the alignment slots in the camshafts lined up so the Camshaft Alignment Plate can be installed without rotating the camshafts. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the removal procedure. Rotating the camshafts when the timing chain is removed, or installing the camshafts 180 degrees out of position can cause severe damage to the valves and pistons.**

NOTICE: Failure to follow the camshaft tightening procedure can result in damage to the camshafts.

NOTICE: Wipe off any excess gasket maker from the fuel injection pump housing sealing surface of the cylinder head and rear camshaft cap.

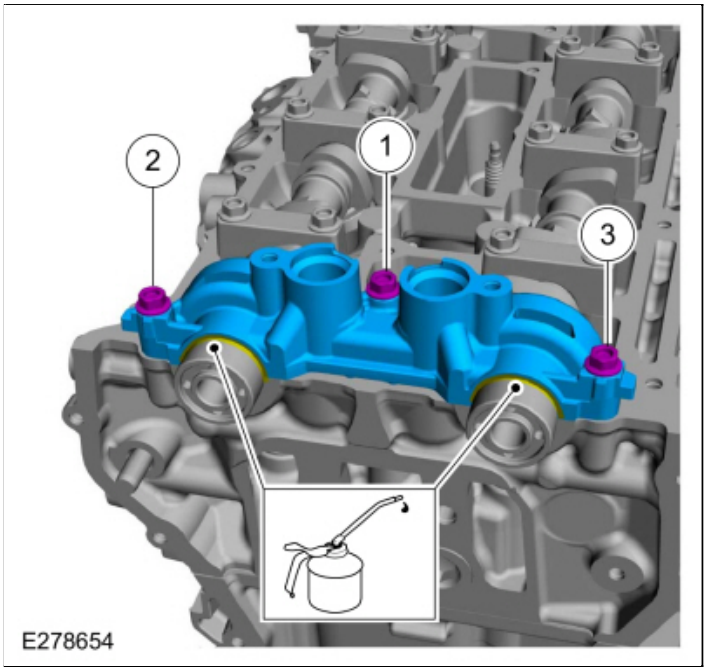
NOTE: *Lubricate the camshaft journals and camshaft bearing caps with clean engine oil.*

- Lubricate with clean engine oil and install the camshafts, caps and bolts.
- Tighten the camshaft bearing cap bolts one turn at a time, until finger-tight.
- Tighten 2 turns at a time in the sequence shown in 2 stages.
  Torque:
  Stage 1: 62 lb.in (7 Nm)
  Stage 2: 142 lb.in (16 Nm)

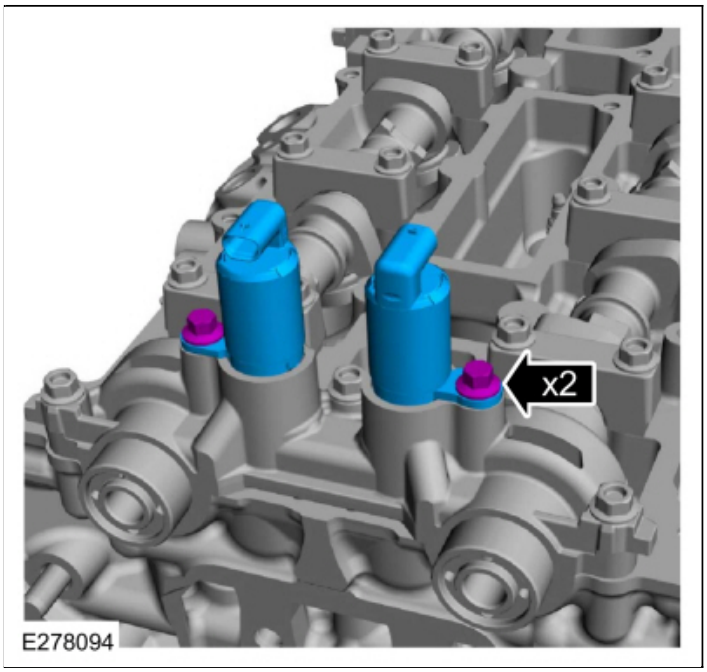


72.

- Lubricate the camshaft journals with clean engine oil.
- Install the front camshaft bearing cap and the bolts and tighten in 2 stages.
  Torque:
  Stage 1: 62 lb.in (7 Nm)
  Stage 2: 142 lb.in (16 Nm)

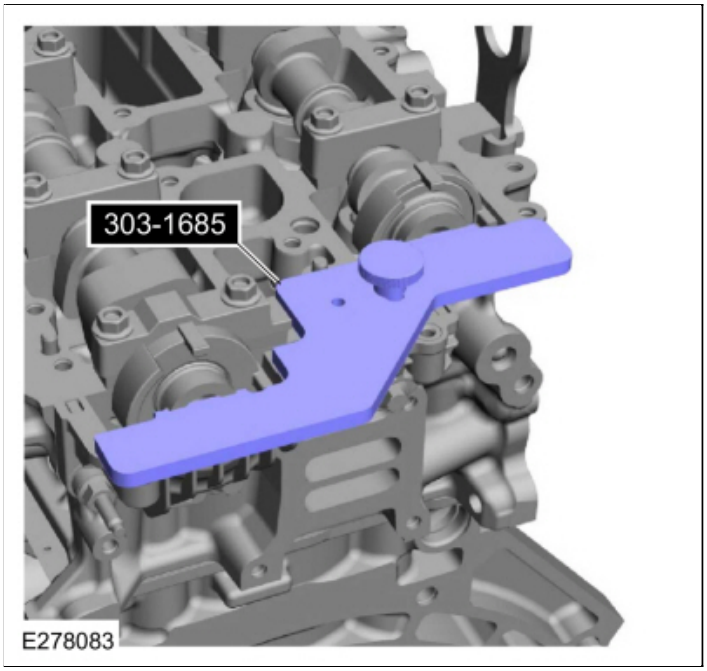


73. Install the VCT oil control solenoids and the bolts.
Torque: 97 lb.in (11 Nm)



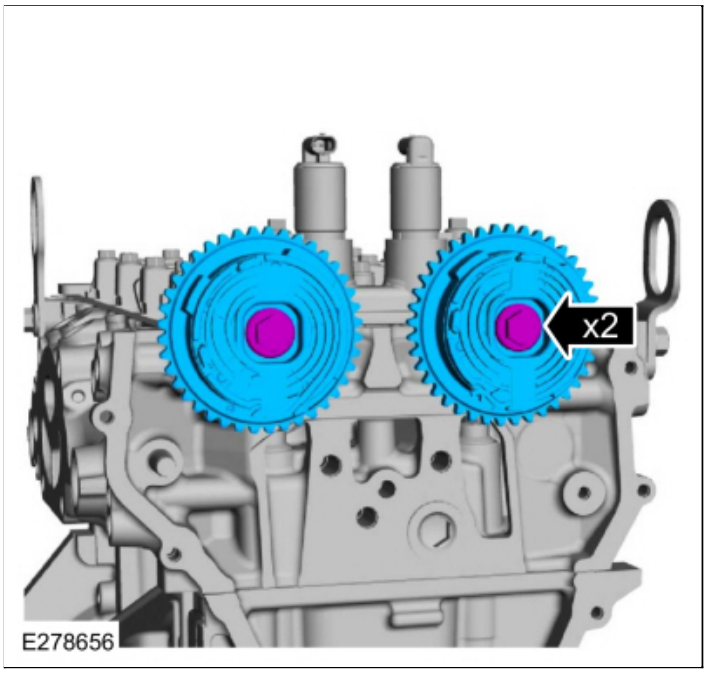
74. **NOTICE: The special tool is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.**

Install Special Service Tool: 303-1565 Alignment Tool, Camshaft.

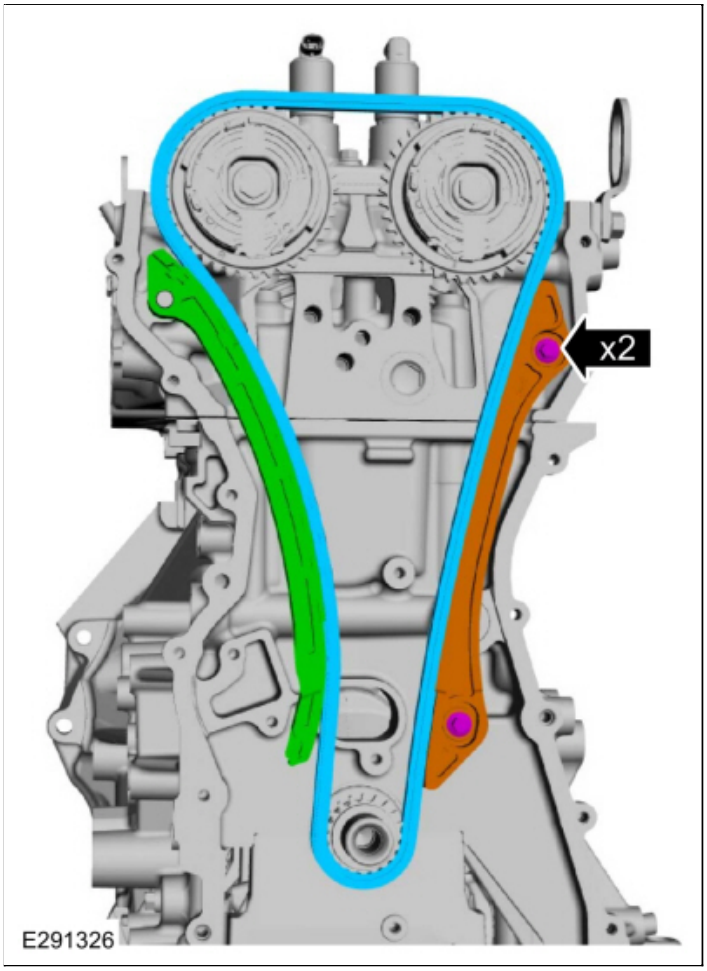


75. **NOTE:** *Do not tighten the VCT unit bolts at this time.*

- Install the VCT units and the new bolts finger-tight.

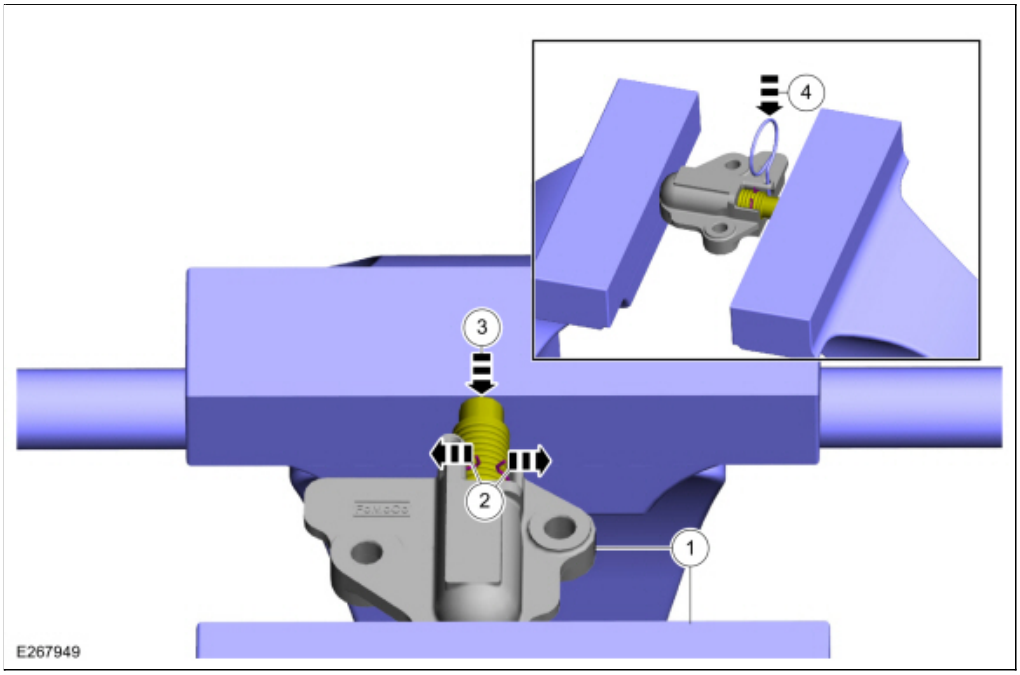


76. Install the tensioner arm, timing chain, timing chain guide and the bolts.
Torque: 97 lb.in (11 Nm)



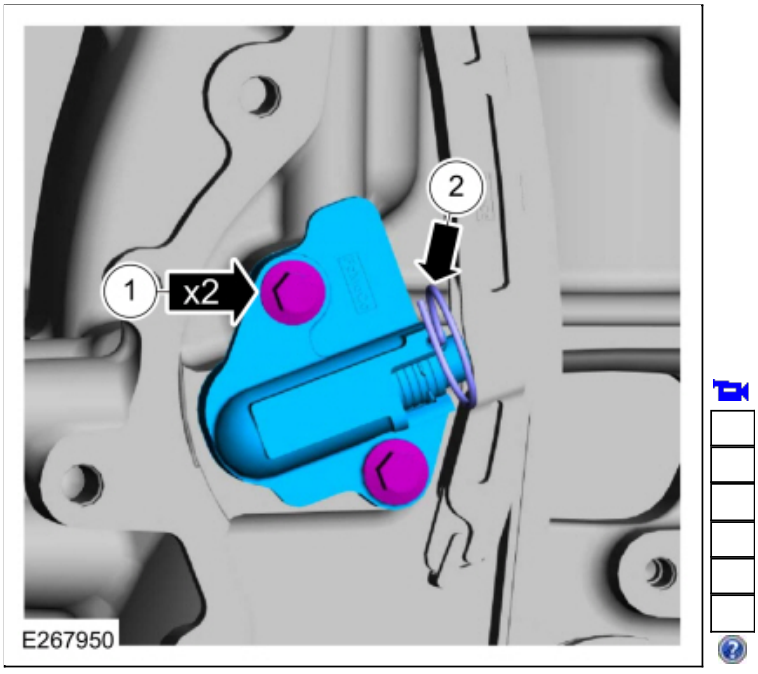
NOTE: *If the timing chain tensioner plunger is not pinned in the compressed position, follow the next step.*

77. Reset the timing chain tensioner.
    1. Position the timing chain tensioner in a soft-jawed vise.
    2. Spread the ends of the ratchet wire clip apart.
    3. Using the soft-jawed vise, compress the plunger to the reset position.
    4. Install a locking pin in the 2 holes of the timing chain tensioner body to hold the plunger in place.



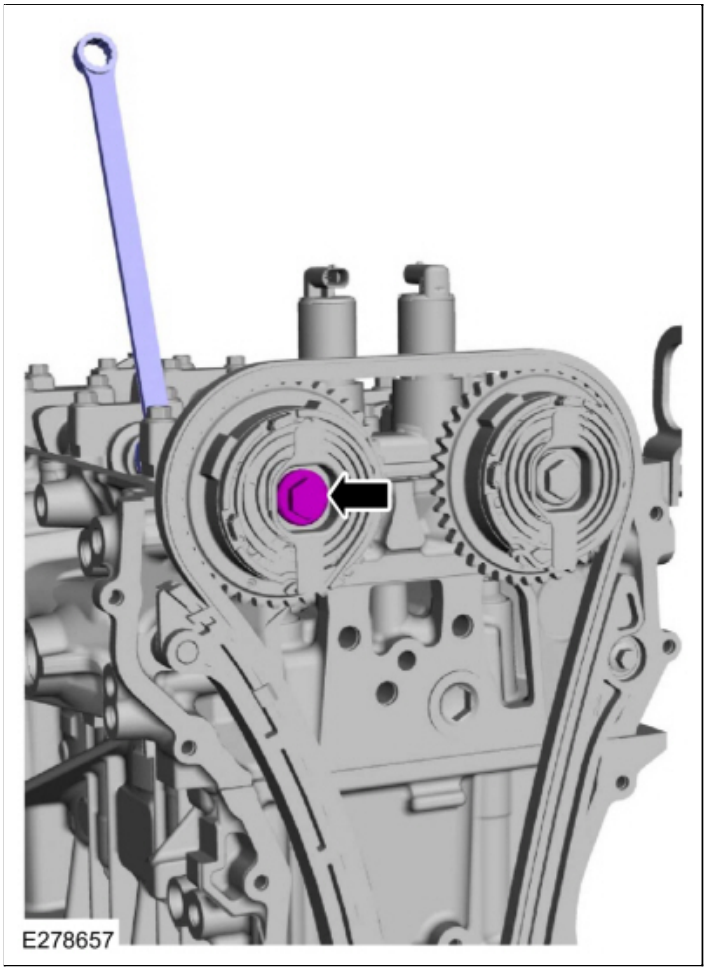
78. **NOTE:** *Do not remove the locking pin until the tensioner bolts are tightened.*

1. Install the timing chain tensioner and the bolts.
   Torque: 89 lb.in (10 Nm)
2. Remove the locking pin.



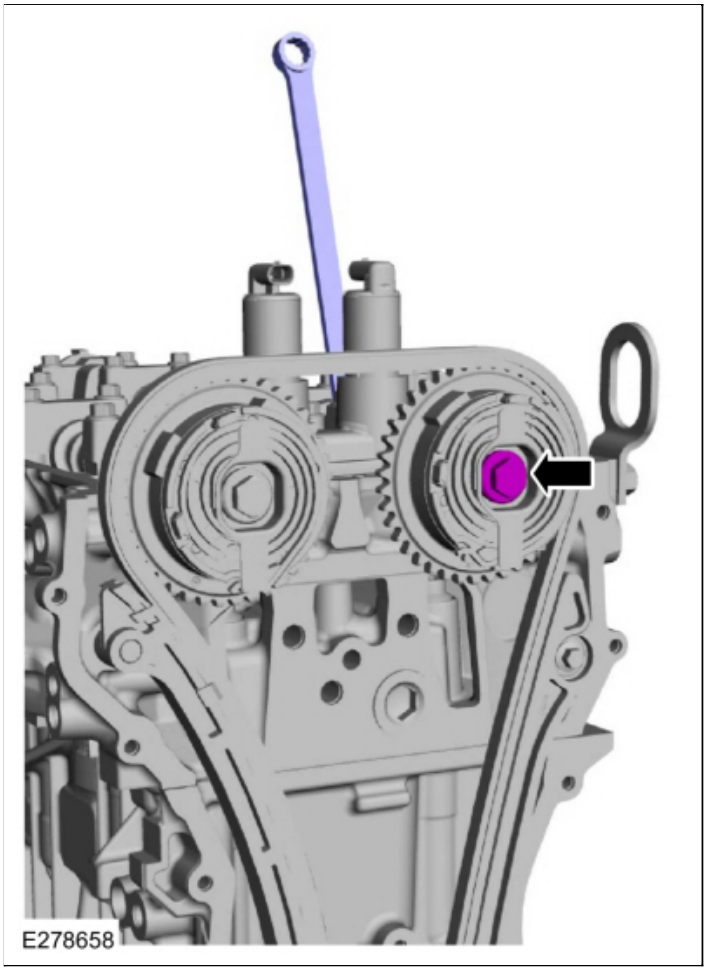
79. **NOTICE: Use an open-ended wrench to prevent the component from turning.**

Tighten the exhaust VCT unit bolt in 2 stages.
Torque:
Stage 1: 26 lb.ft (35 Nm)
Stage 2: 135°



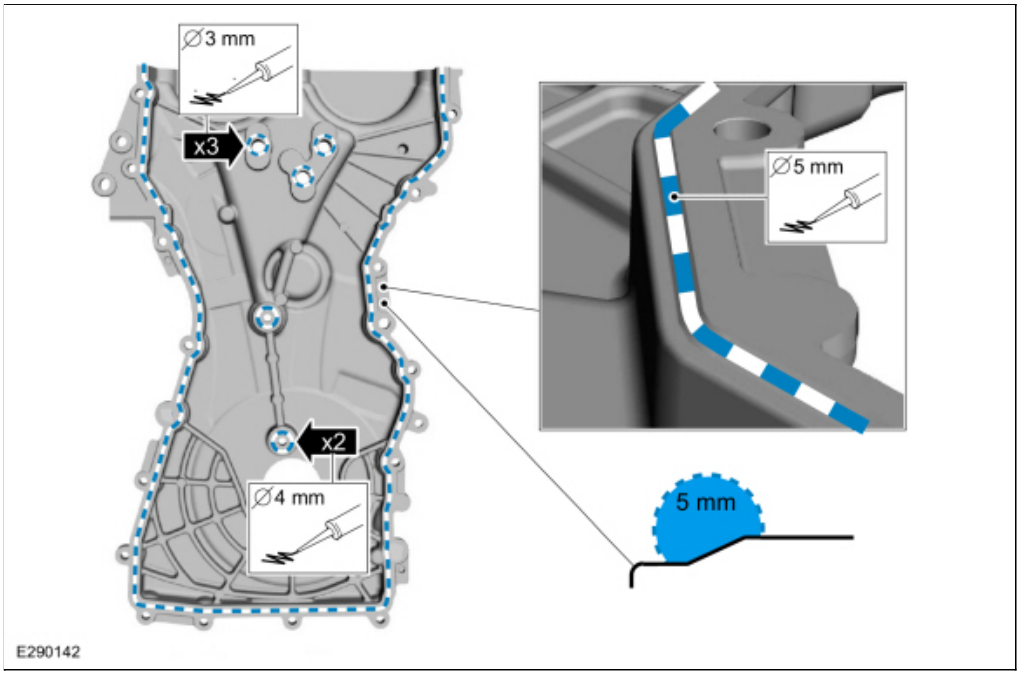
80. **NOTICE: Use an open-ended wrench to prevent the component from turning.**

Tighten the intake VCT unit bolt in 2 stages.
Torque:
Stage 1: 26 lb.ft (35 Nm)
Stage 2: 135°



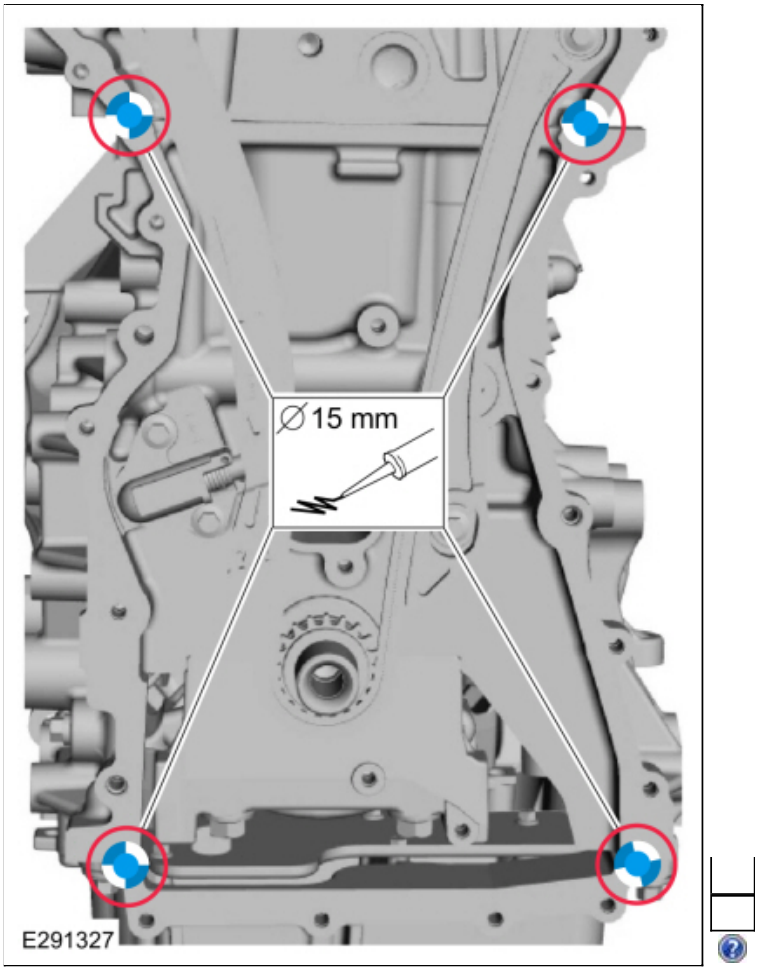
81. **NOTE:** *The engine front cover must be secured within 10 minutes of Silicone Gasket and Sealant application. If the engine front cover is not secured within 10 minutes, the sealant must be removed and the sealing area cleaned.*

- Apply a 3 mm (0.12 in) bead of silicone sealant on the 3 upper bosses, as shown.
  Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)
- Apply a 4 mm (0.16 in) bead of silicone sealant on the chamfer on the 2 lower bosses, as shown.
  Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)
- Apply a 5 mm (0.19 in) bead of silicone sealant on the chamfer, as shown.
  Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)

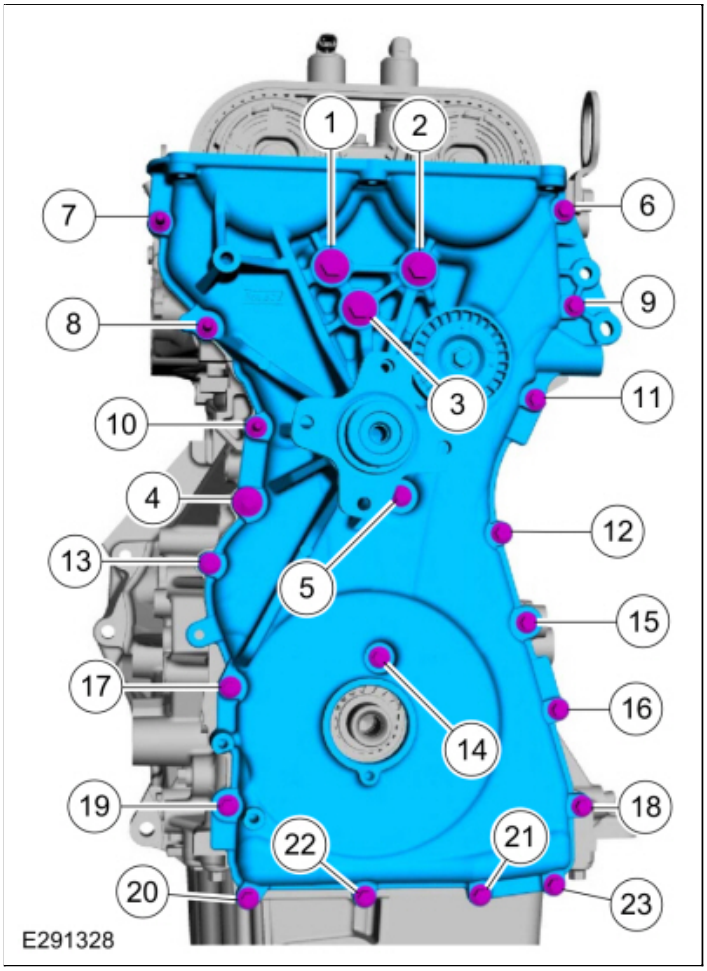


82. **NOTE:** *The engine front cover must be secured within 10 minutes of Silicone Gasket and Sealant application. If the engine front cover is not secured within 10 minutes, the sealant must be removed and the sealing area cleaned.*

Apply a 15 mm (0.59 in) drop of silicone sealant at the cylinder head-to-cylinder block and cylinder block-to-oil pan joint areas.
Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)

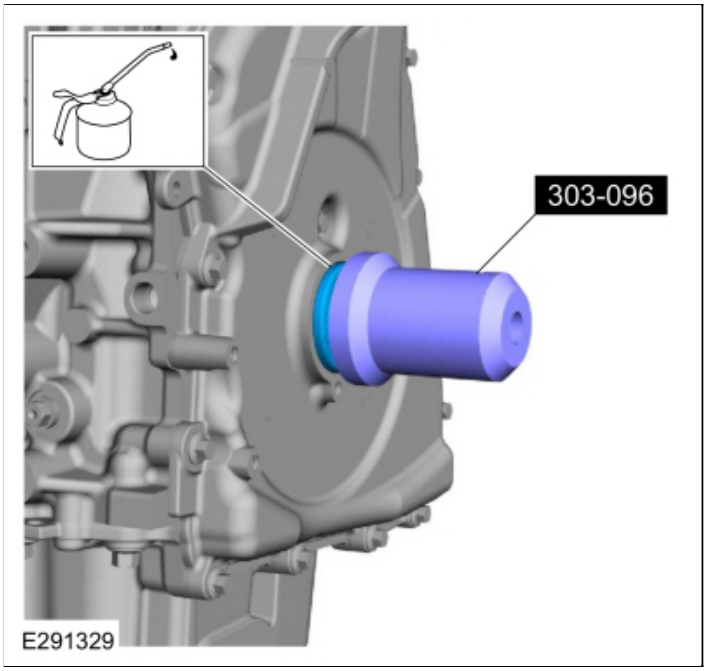


83. Install the engine front cover and the fasteners and tighten in the sequence shown.
Torque:
Bolts 1 - 3: 35 lb.ft (48 Nm)
Bolt 4 : 18 lb.ft (25 Nm)
Bolts 5 - 22: 97 lb.in (11 Nm)

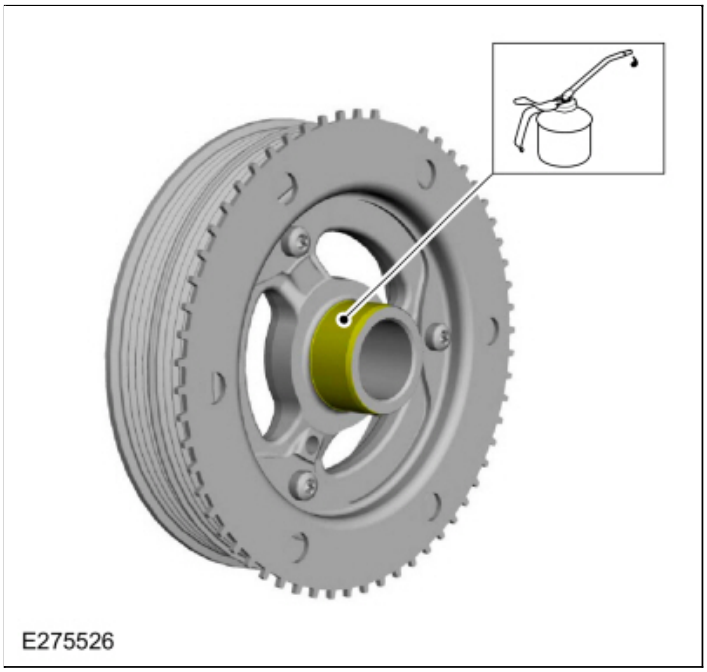


84. **NOTE:** *Remove the through-bolt from the Camshaft Front Oil Seal Installer.*

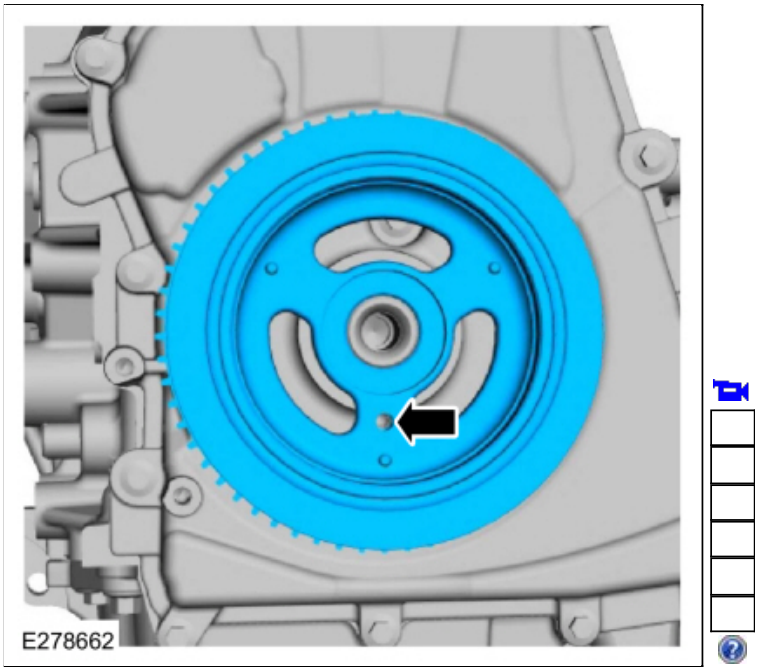
Lubricate with clean engine oil and using the special tool, install the crankshaft front seal.
Use Special Service Tool: 303-096 (T74P-6150-A) Installer, Camshaft Front Oil Seal.



85. Lubricate the crankshaft pulley with clean engine oil.

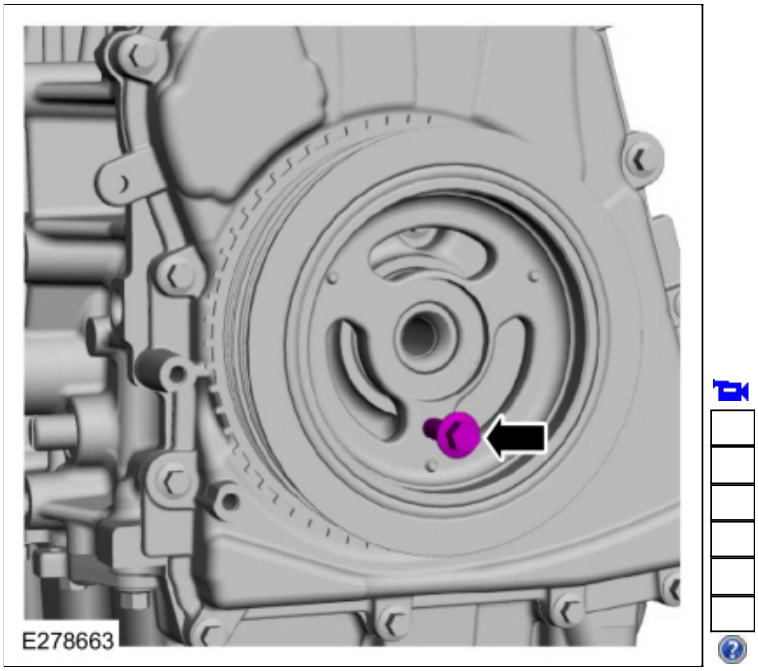


86. Install the crankshaft pulley as shown.



87. **NOTE:** *This step will correctly align the crankshaft pulley to the crankshaft.*

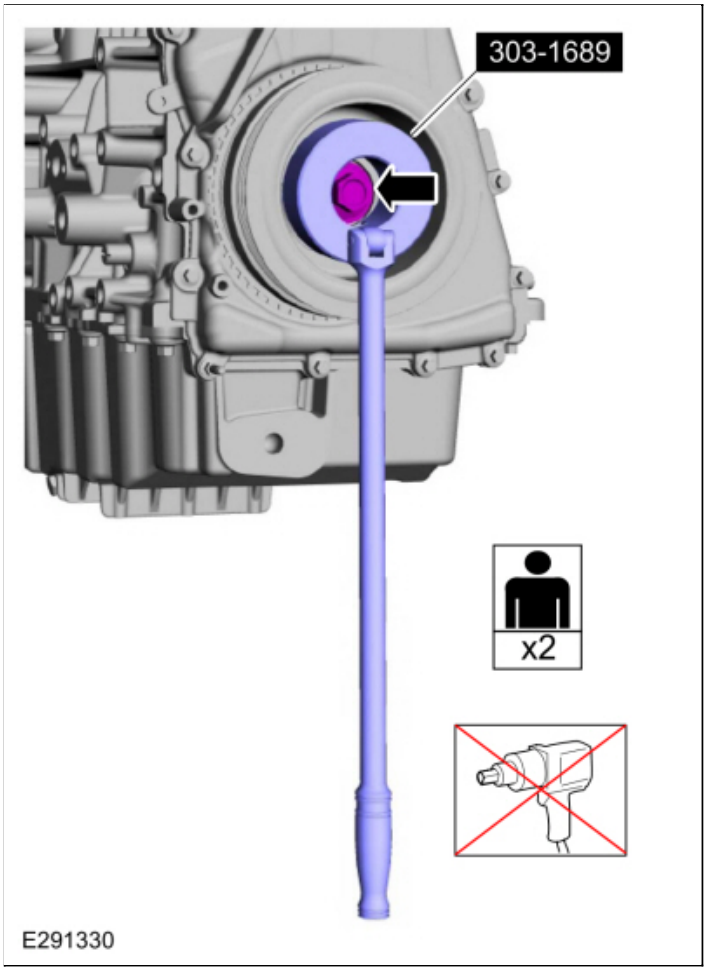
Install an M6 bolt.



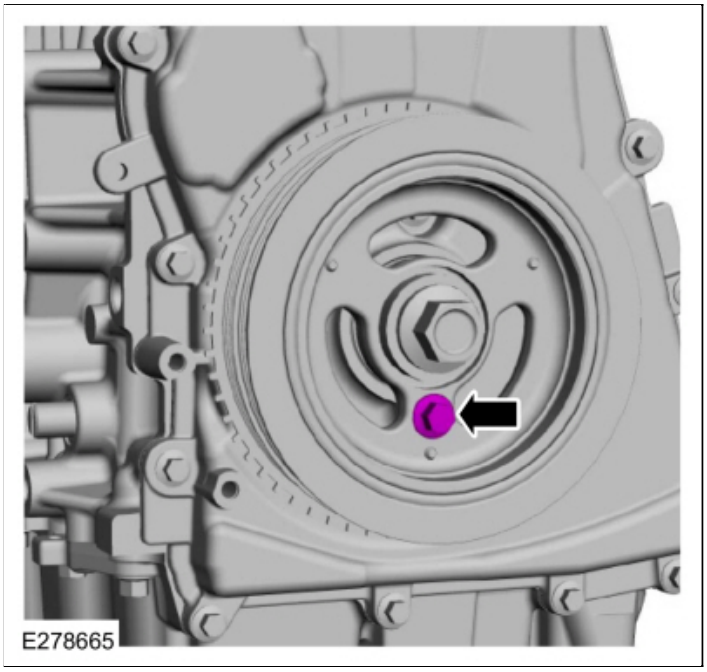
88. **NOTICE: The crankshaft must remain in the TDC position during installation of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the crank damper holding tool and the bolt should be installed using hand tools only.**

Using the special tool and breaker bar, tighten the crankshaft pulley.
Use Special Service Tool: 303-1689 Holding Tool, Crank Damper.
Use the General Equipment: Strap Wrench
Torque:
Stage 1: 74 lb.ft (100 Nm)

Stage 2: 90°

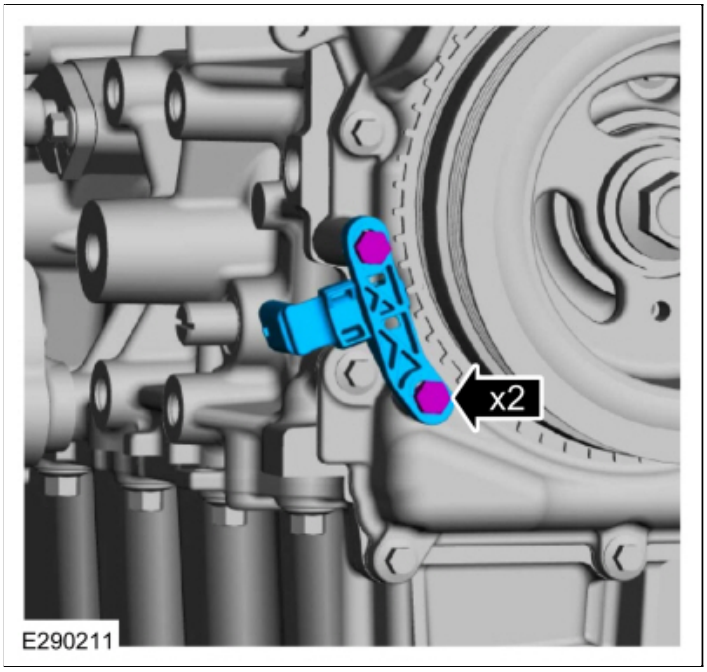


89. Remove the M6 bolt.

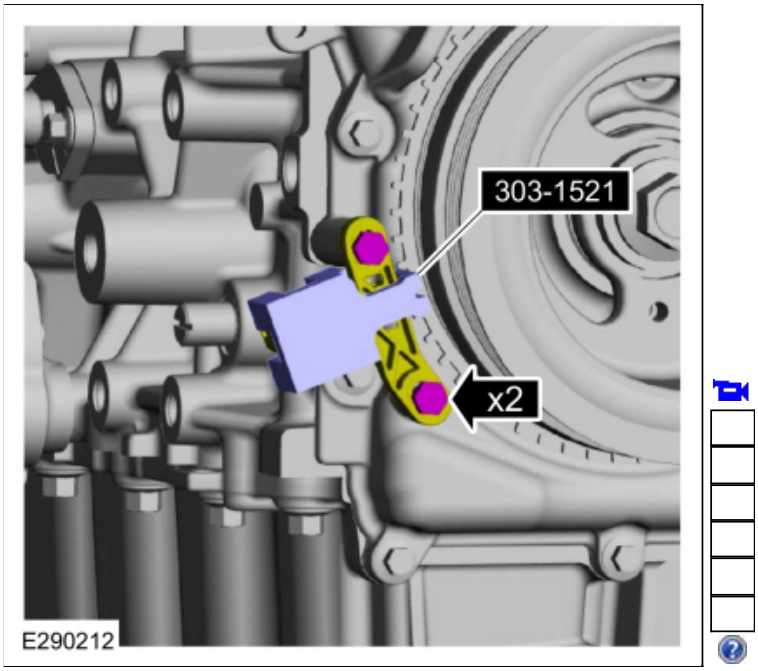


90. **NOTE:** *Do not tighten the CKP sensor bolts at this time.*

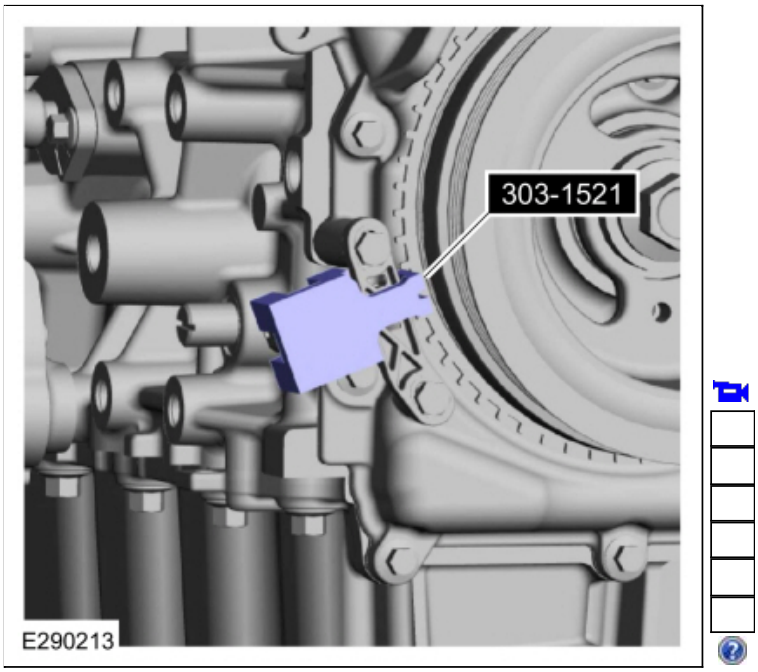
    Install the CKP sensor and the bolts finger-tight.



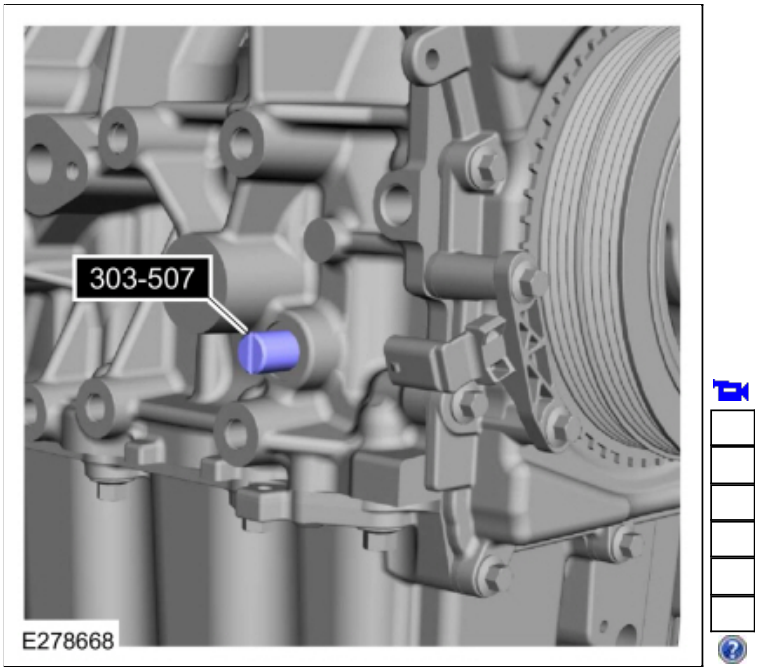
91. Install the Special Tool onto the CKP sensor and the tooth of the crankshaft pulley trigger wheel.
    Use Special Service Tool: 303-1521 Alignment Tool, Crankshaft Position Sensor.
    Torque: 97 lb.in (11 Nm)



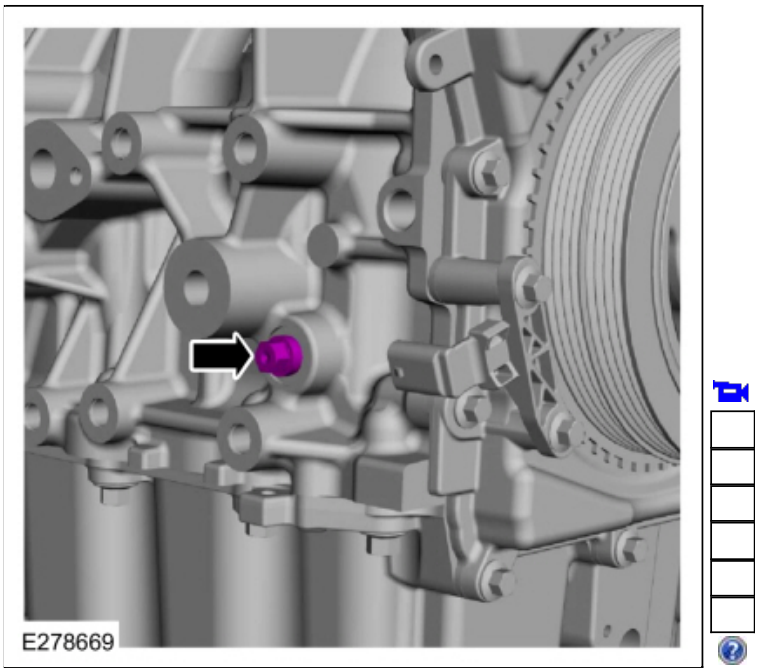
92. Remove Special Service Tool: 303-1521 Alignment Tool, Crankshaft Position Sensor.



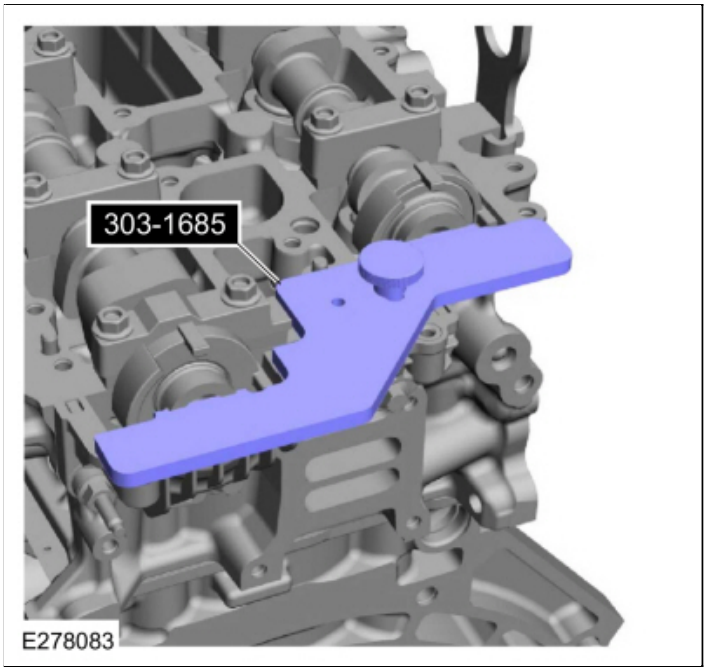
93. Remove Special Service Tool: 303-507 Timing Peg, Crankshaft TDC.



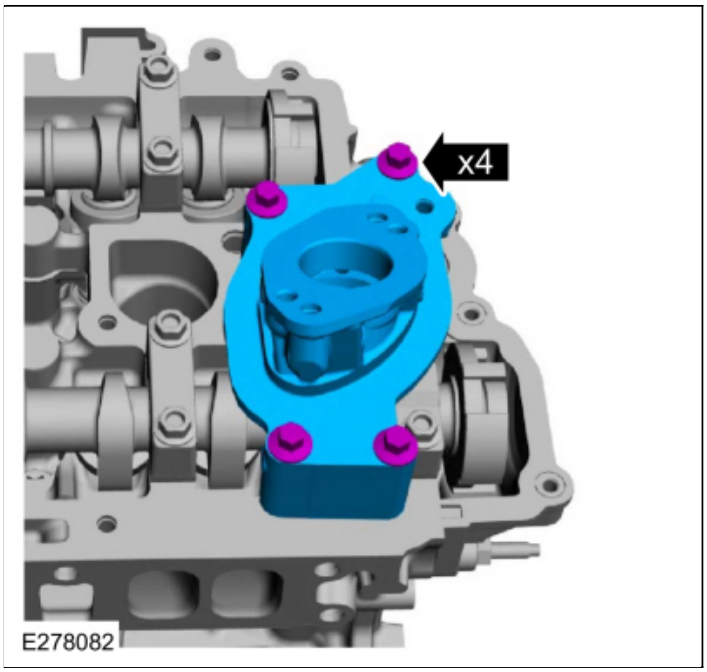
94. Install the engine plug bolt.
Torque: 177 lb.in (20 Nm)



95. Remove Special Service Tool: 303-1565 Alignment Tool, Camshaft.

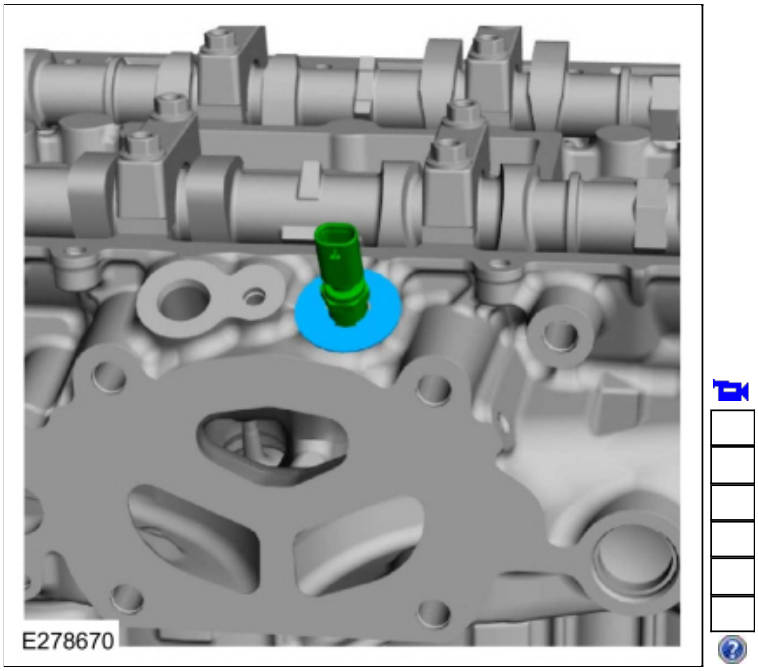


96. Install the high-pressure fuel pump drive unit and the bolts.
Torque: 97 lb.in (11 Nm)



97.

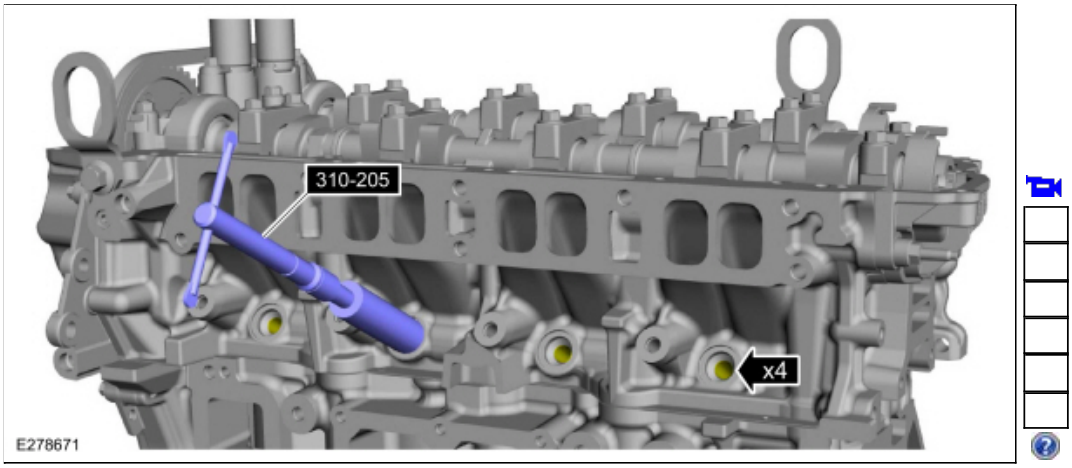
- Install the exhaust manifold heat shield on the new CHT sensor.
- Install the CHT sensor.
Torque: 97 lb.in (11 Nm)



98. **NOTICE: Do not use compressed air or the Fuel Injector Brush to clean the tip of the fuel injectors. Failure to follow this instruction may result in damage to the fuel injectors.**

    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.*

    Using the special tool, clean the fuel injector bores.
    Use Special Service Tool: 310-205 Fuel Injector Brush.



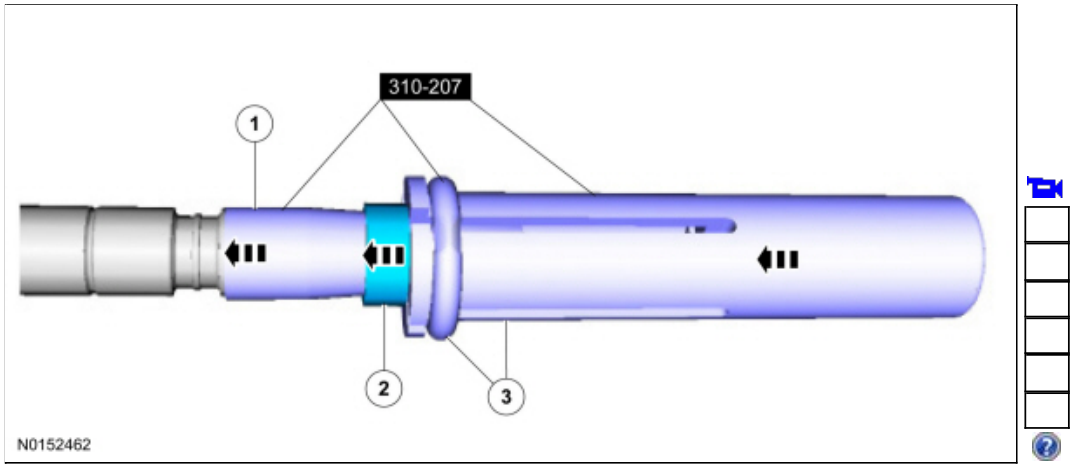
99. **NOTICE: Do not lubricate the new lower Teflon® fuel injector seals.**

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

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

       Install the new Teflon® seals onto the Teflon® Seal Guide, using the Pusher Tool, slide the Teflon® seals along the Teflon® Seal Guide

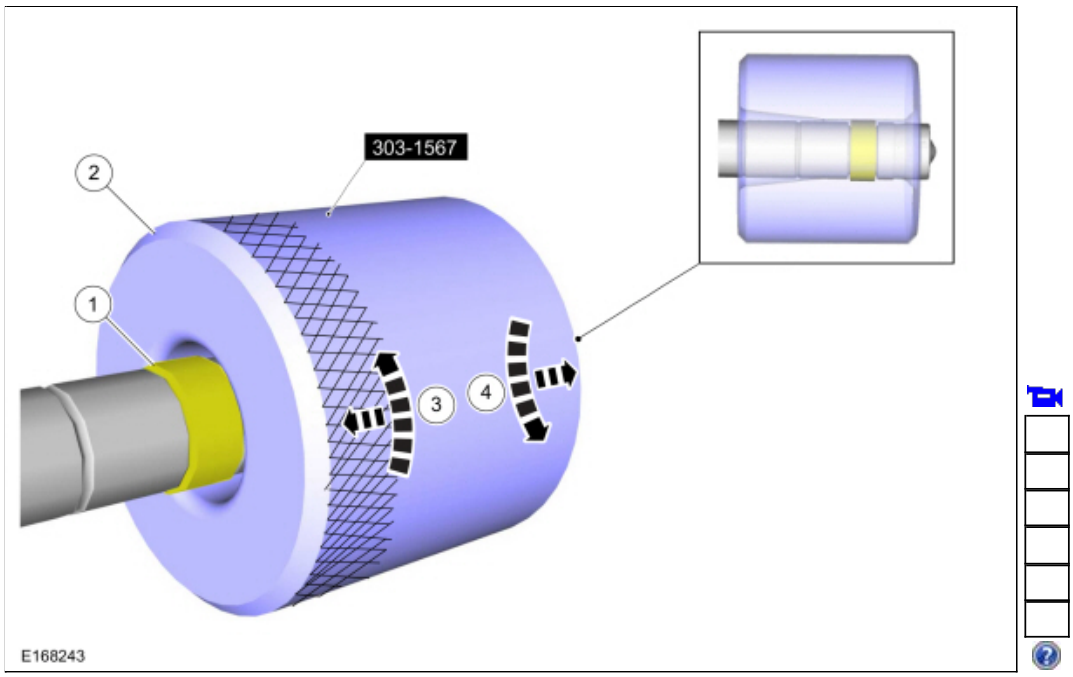
3. Using the Pusher Tool, slide the Teflon® seals off of the Teflon® Seal Guide and into the groove on the fuel injectors.
4. Remove the special tool.
   Use Special Service Tool: 310-207 Installer, Fuel Injector Seal Assembly.



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

1. Massage and warm the Teflon® seal with your fingers before the Teflon® seal sizer tool is installed. This will aid in installing the Teflon® seal sizer tool.
2. **NOTE:** *The beveled opening of the Teflon® seal sizer tool goes away from the seal.*

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



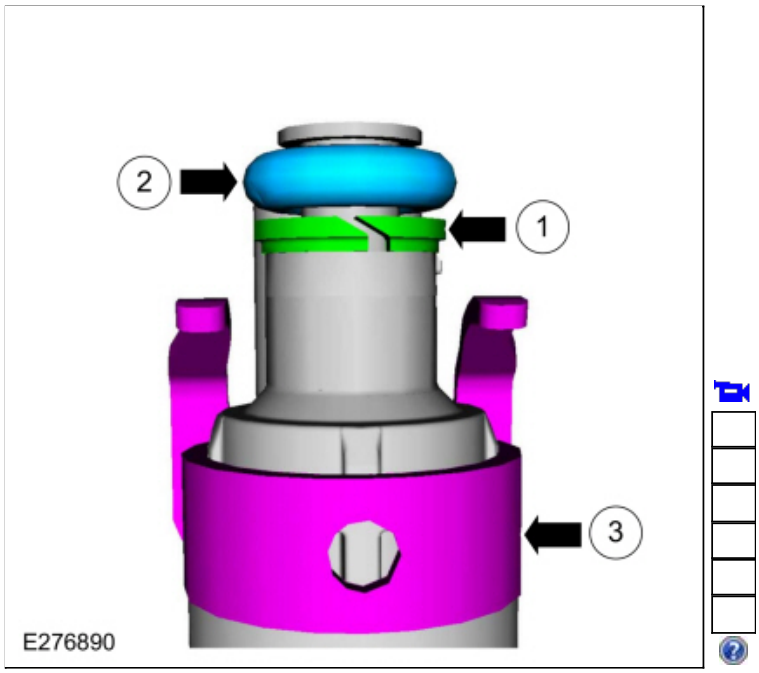
101. **NOTICE: The new the fuel injector support rings must be installed in the correct orientation with the wide surface area facing up against the fuel injector O-ring seals. Improperly installed support rings may cause the**

fuel system to leak.

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

1. Install the new the fuel injector support rings.
2. **NOTE:** *Do not lubricate the new lower Teflon® fuel injector seals.*

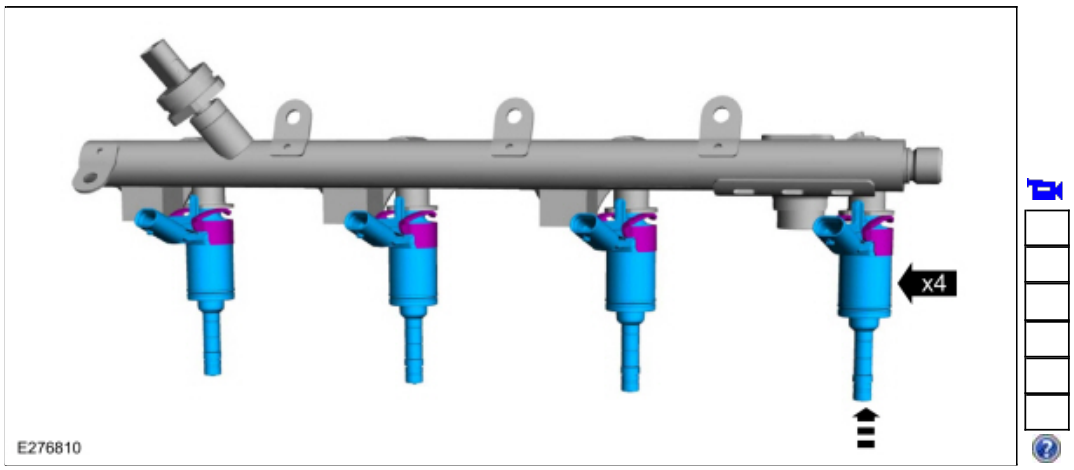
   Install the new fuel injector O-rings.
3. Install the new the fuel injector clips.



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

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

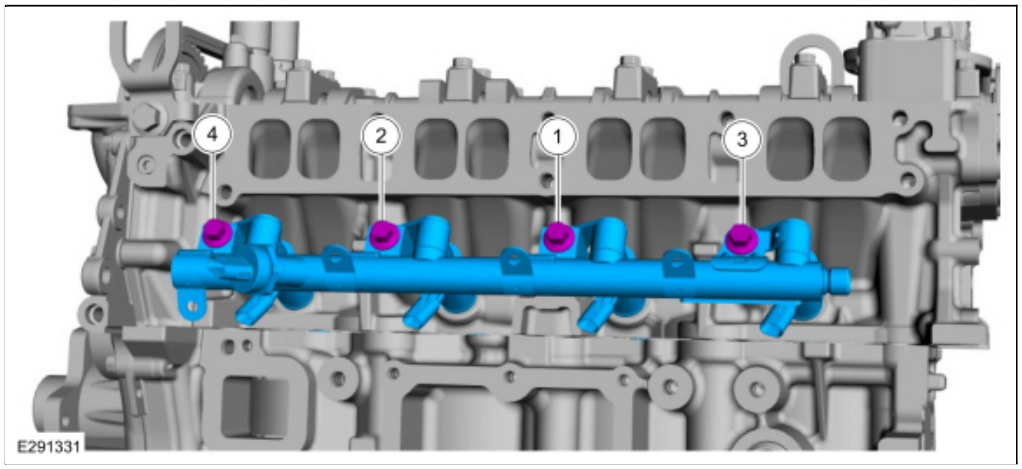
Install the fuel injectors in the fuel rail.



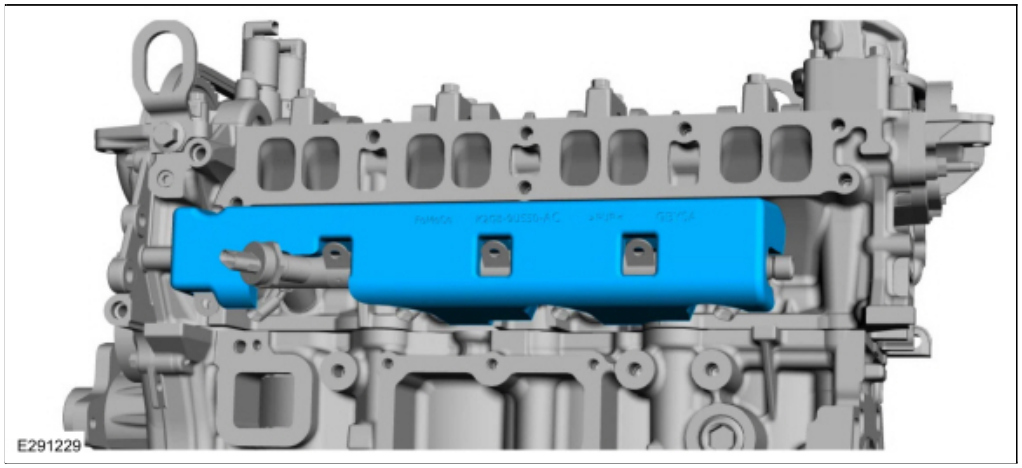
103. **NOTE:** *Do not lubricate the new lower Teflon® fuel injector seals.*

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

- Install the fuel rail by push down on the fuel rail above the injectors.
- Install the bolts and tighten in sequence shown in 5 stages.
  Torque:
  Stage 1: Tighten to: 89 lb.in (10 Nm)
  Stage 2: Back off to: 0 lb.in (0 Nm)
  Stage 3: Wait 5s
  Stage 4: Tighten to: 124 lb.in (14 Nm)
  Stage 5: Tighten an additional: 30°

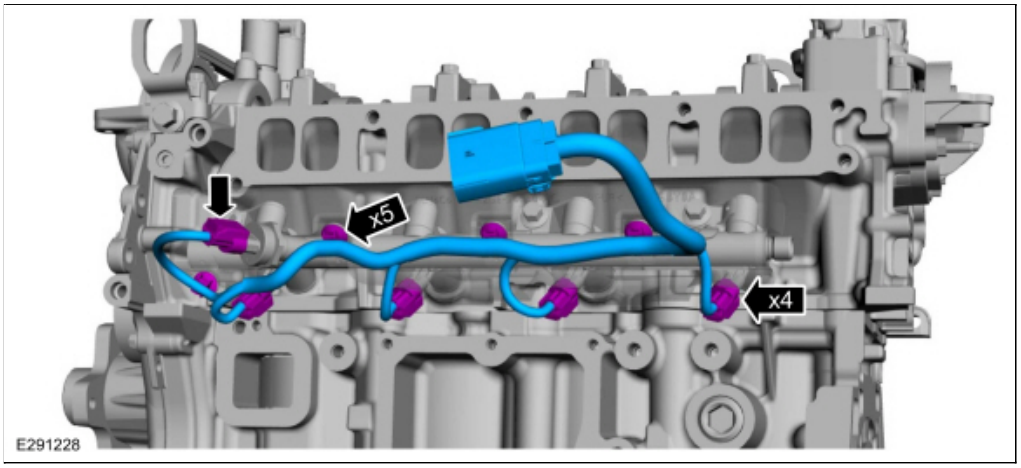


104. Install the fuel rail insulator.



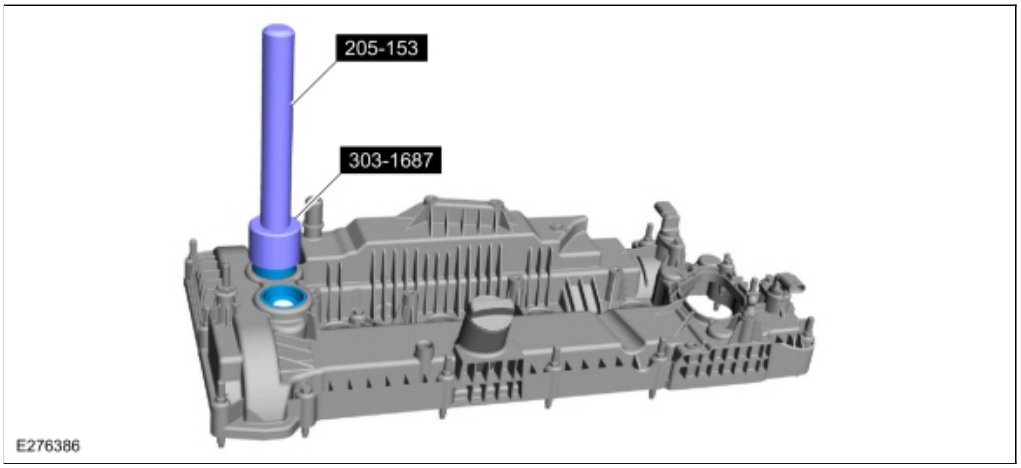
105.

- Install the harness and attach the fuel rail wiring harness retainers.
- Connect the fuel rail wiring harness electrical connectors.

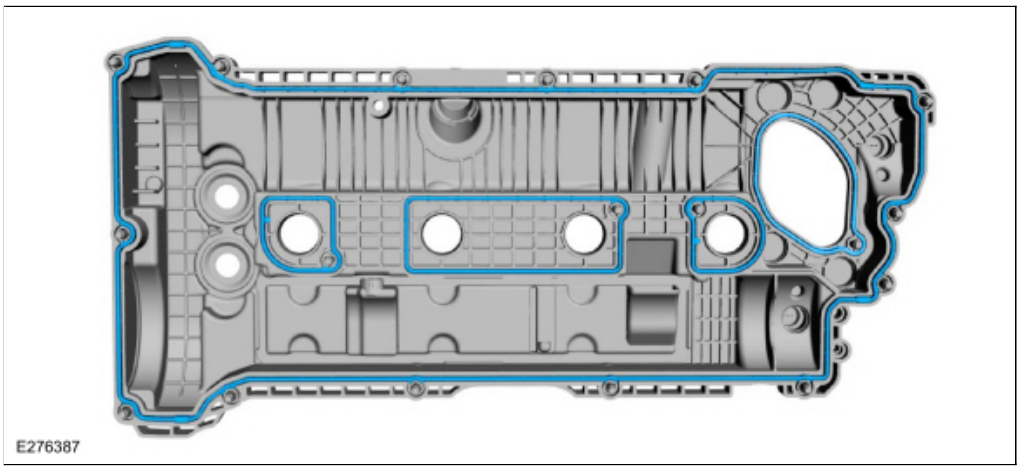


106. **NOTE:** *Installation of new seals is only required if damaged seals were removed during disassembly of the engine.*

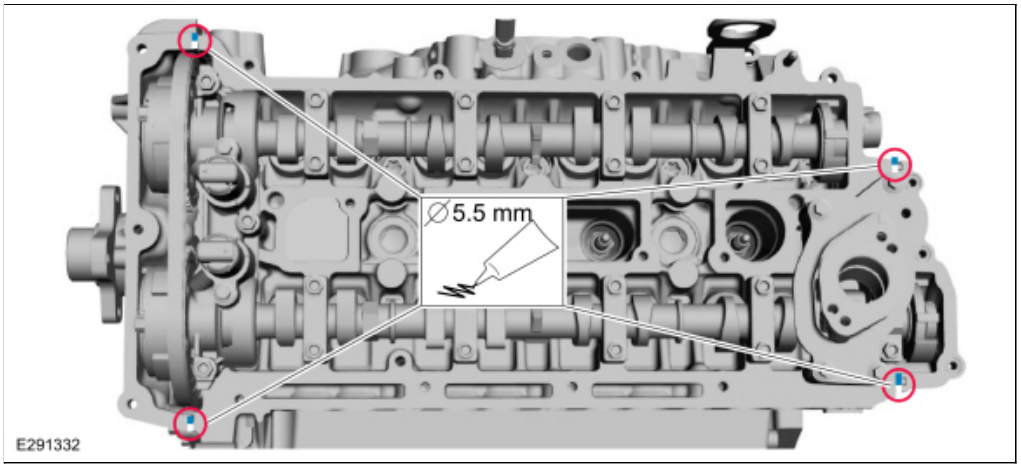
If removed, using the special tools, install the VCT seals.
Use Special Service Tool: 205-153 (T80T-4000-W) Handle. , 303-1687 Installer, VCT Solenoid Seal.



107. Install new valve cover gaskets.

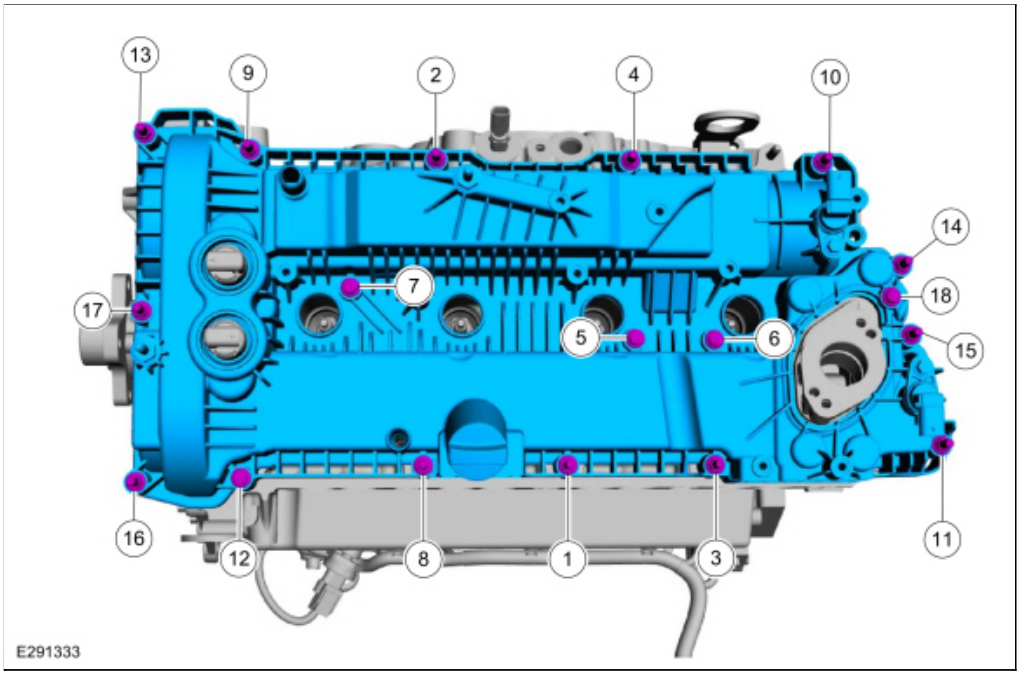


108. Apply a 5.5 mm bead of silicone sealant.
Material: Motorcraft® High Performance Engine RTV Silicone / TA-357 (WSE-M4G323-A6)

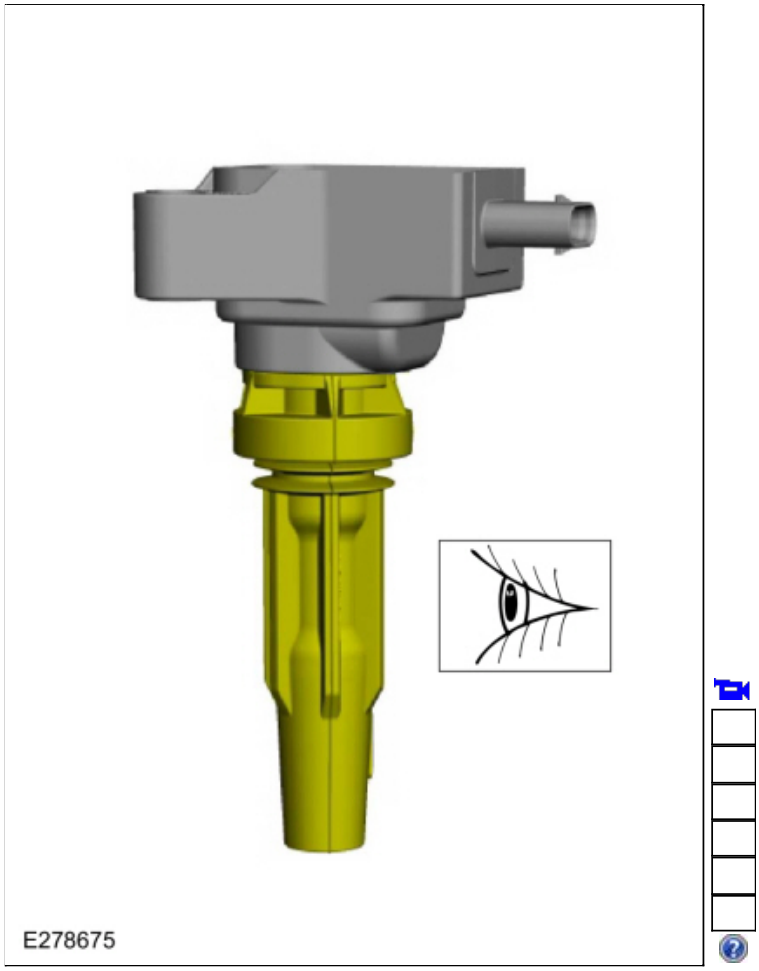


109. **NOTE:** *The valve cover must be secured within 10 minutes of silicone gasket application. If the valve cover is not secured within 10 minutes, the silicone sealant must be removed and the sealing area cleaned.*

Install the valve cover and tighten the fasteners in the sequence shown.
Torque: 97 lb.in (11 Nm)

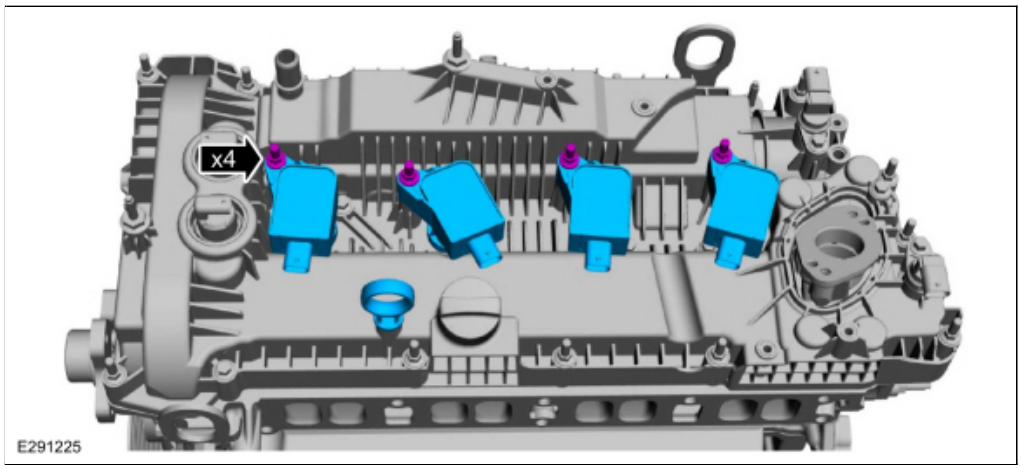


110. Inspect and replace any ignition coil-on-plug rubber boots with cracks, rips or tears.

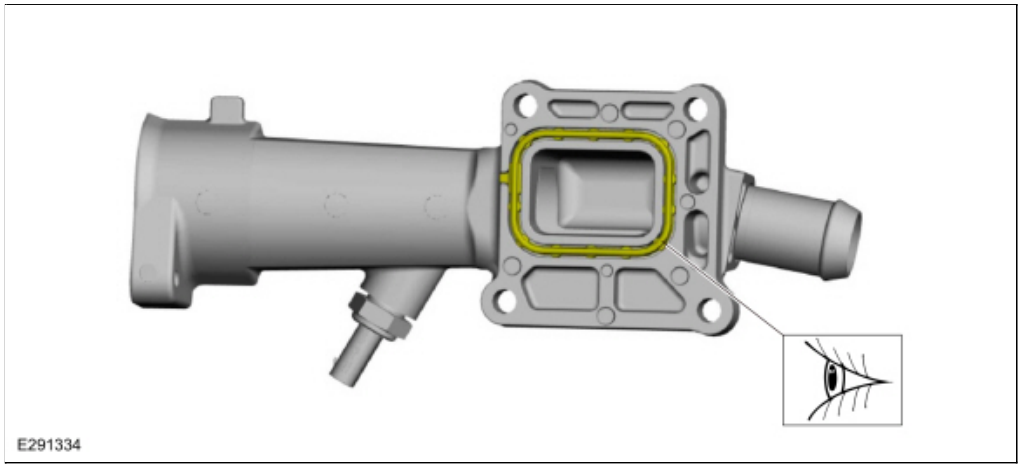


111.

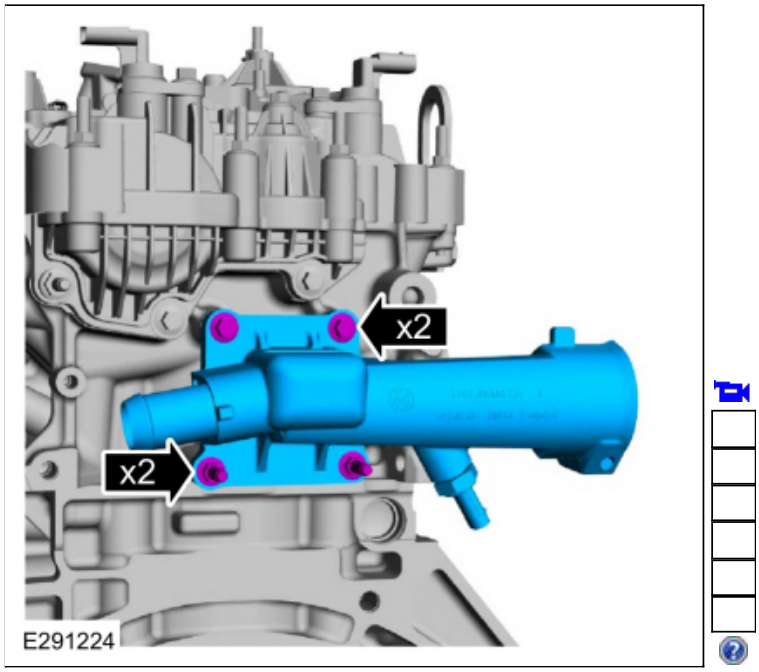
- Install the ignition coil-on-plugs and the fasteners.
  Torque: 97 lb.in (11 Nm)
- Install the oil level indicator.



112. Inspect and replace if damaged.

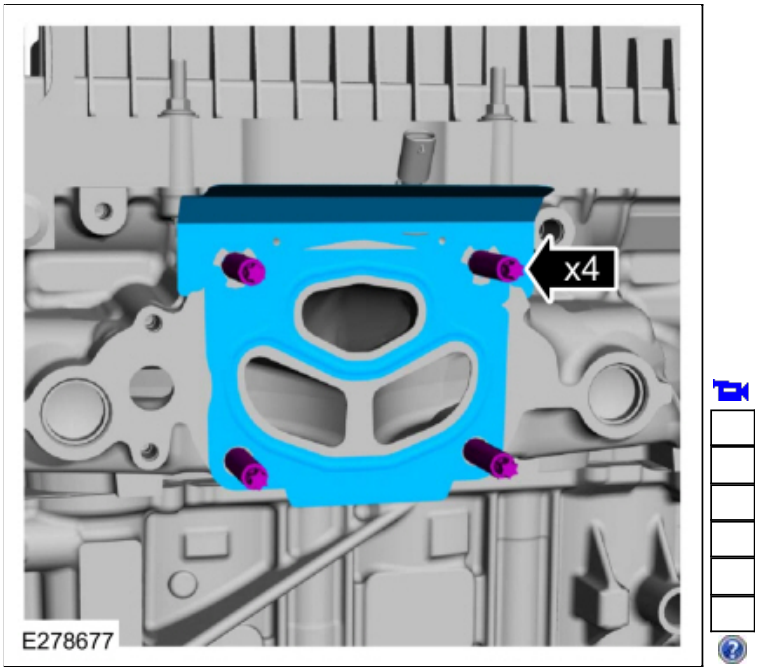


113. Install the coolant outlet, stud bolt and the bolts.
Torque: 97 lb.in (11 Nm)

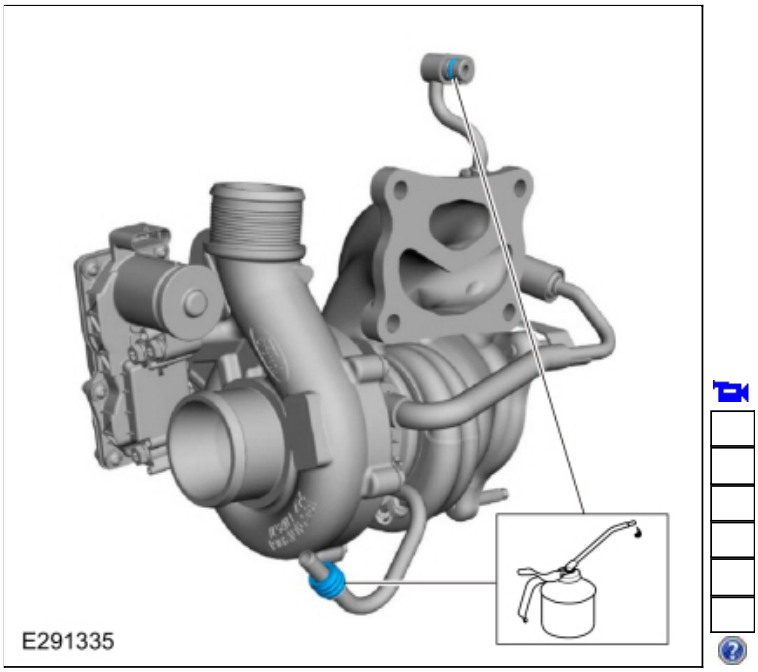


114.

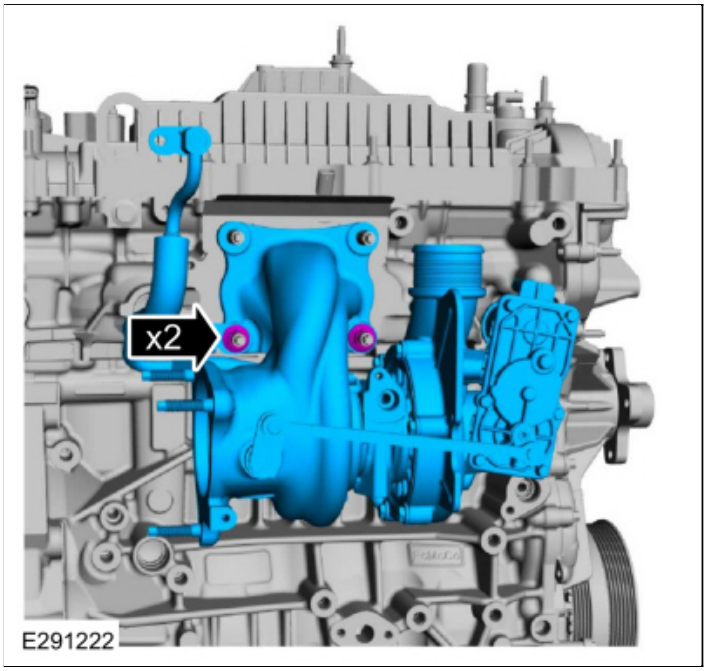
- If removed, install the studs.
Torque: 159 lb.in (18 Nm)
- Install the new gasket.



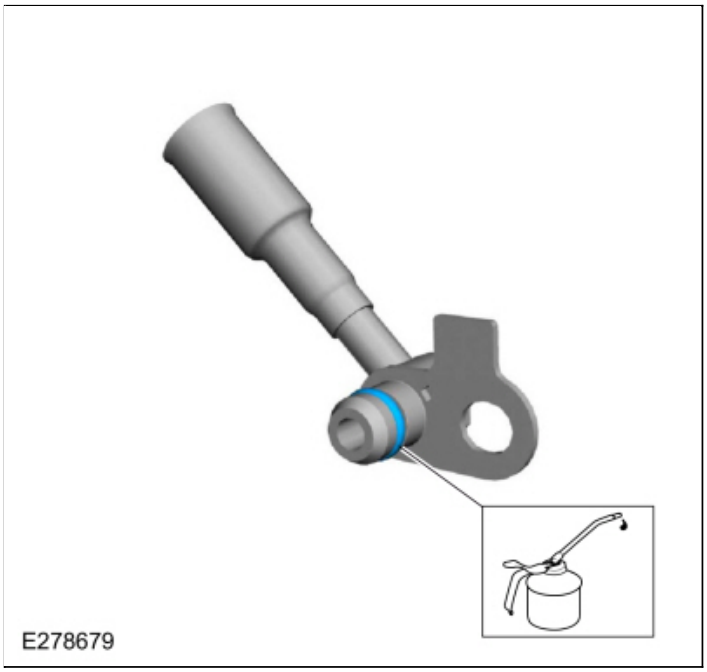
115. Install a coolant outlet tube seal, O-ring seal and lubricate with clean engine coolant.



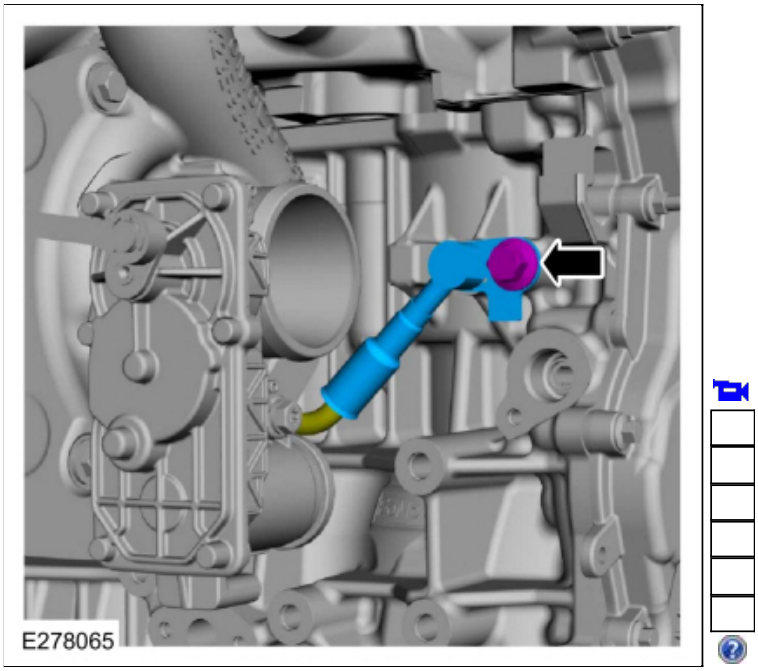
116. Install the turbocharger and the nuts.
Torque: 39 lb.ft (53 Nm)



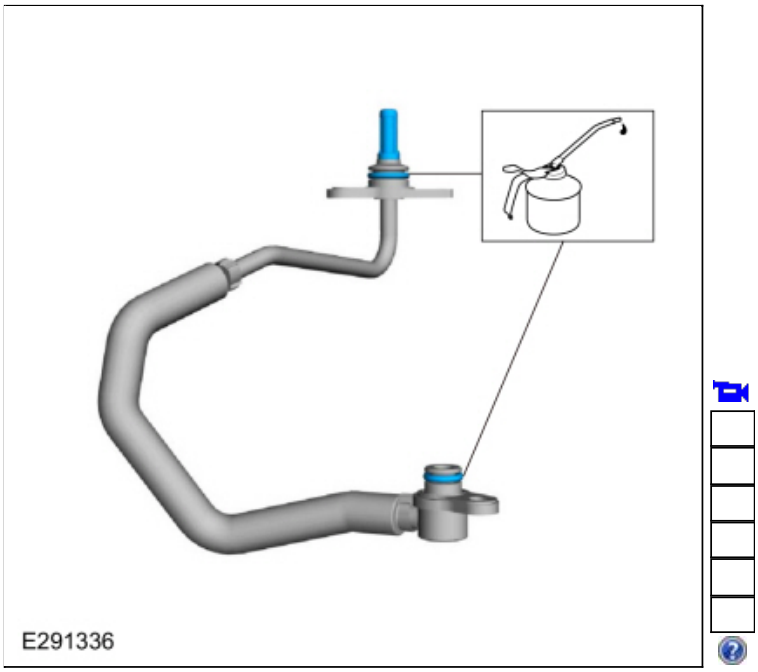
117. Install the coolant outlet tube O-ring seal and lubricate with clean engine oil.



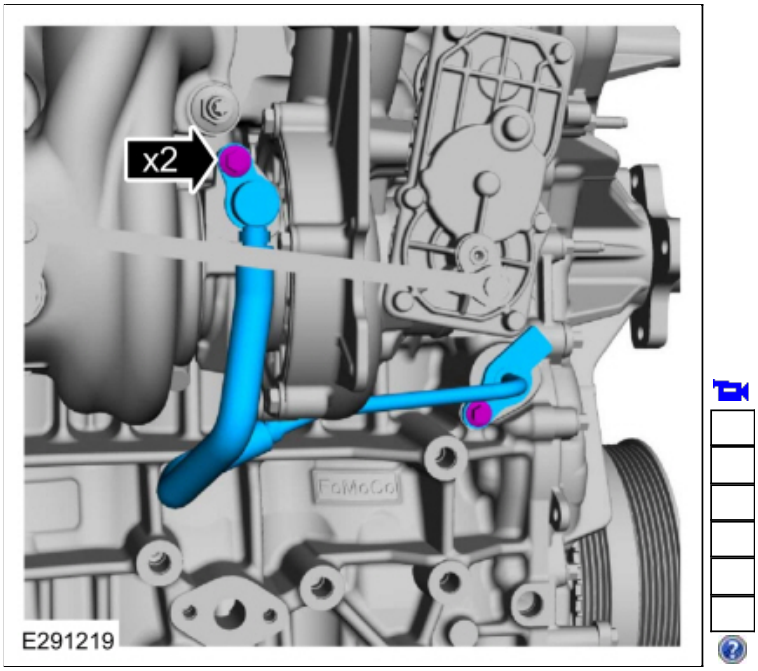
118. Install the coolant outlet tube and the bolt.
Torque: 35 lb.ft (48 Nm)



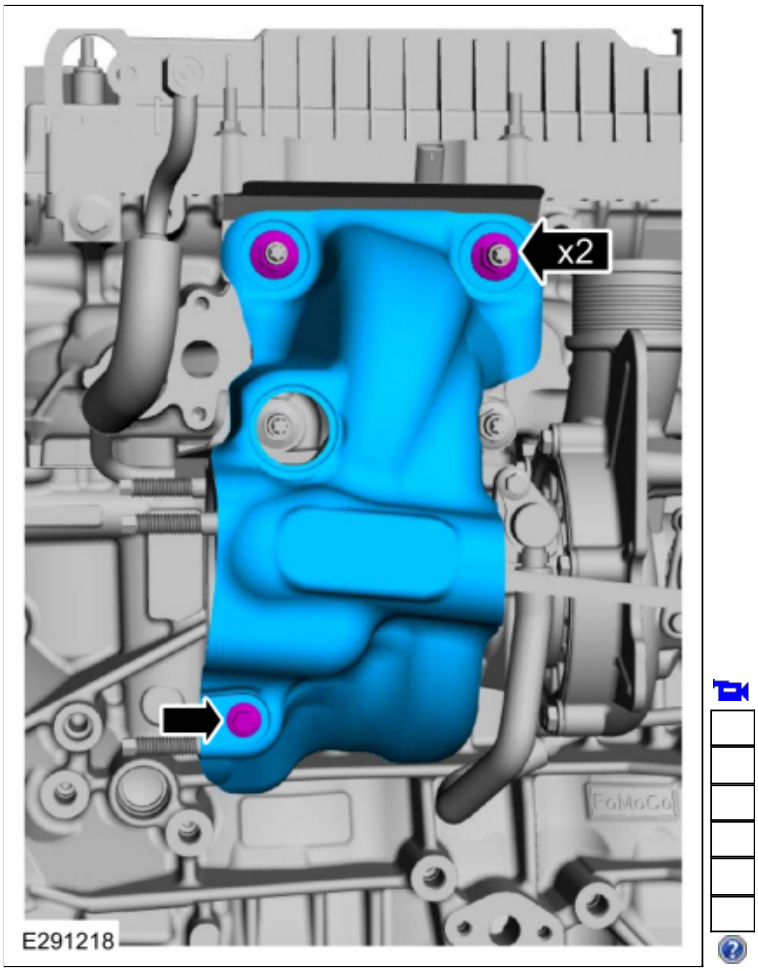
119. Lubricate the O-ring seals with clean engine oil.



120. Install the new cylinder block-to-turbocharger oil supply pipe and the bolts.
Torque: 97 lb.in (11 Nm)

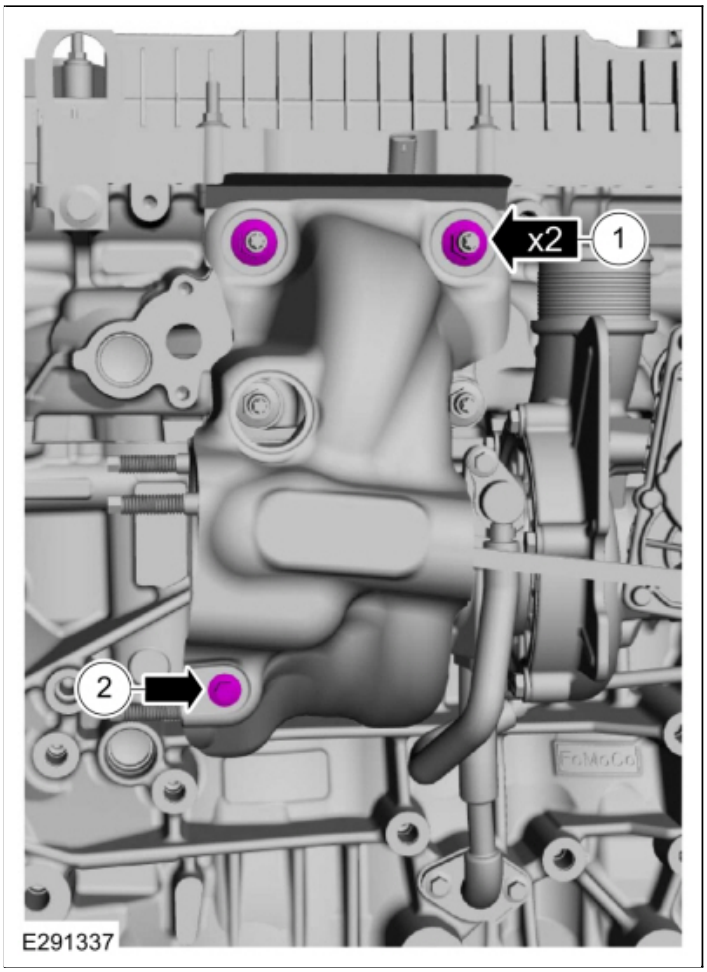


121. Install the heat shield, nuts and the bolt finger-tight.

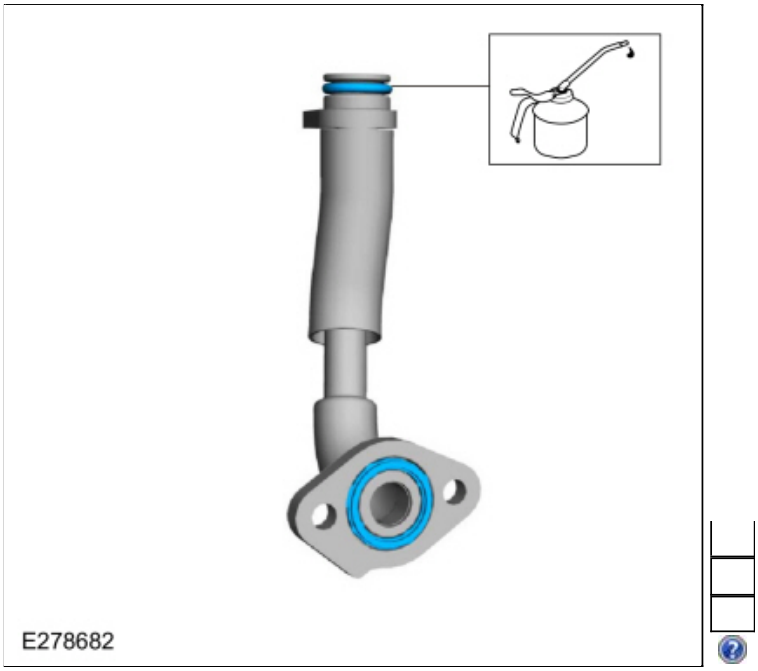


122.

1. Tighten.
   Torque: 39 lb.ft (53 Nm)
2. Tighten.
   Torque: 97 lb.in (11 Nm)

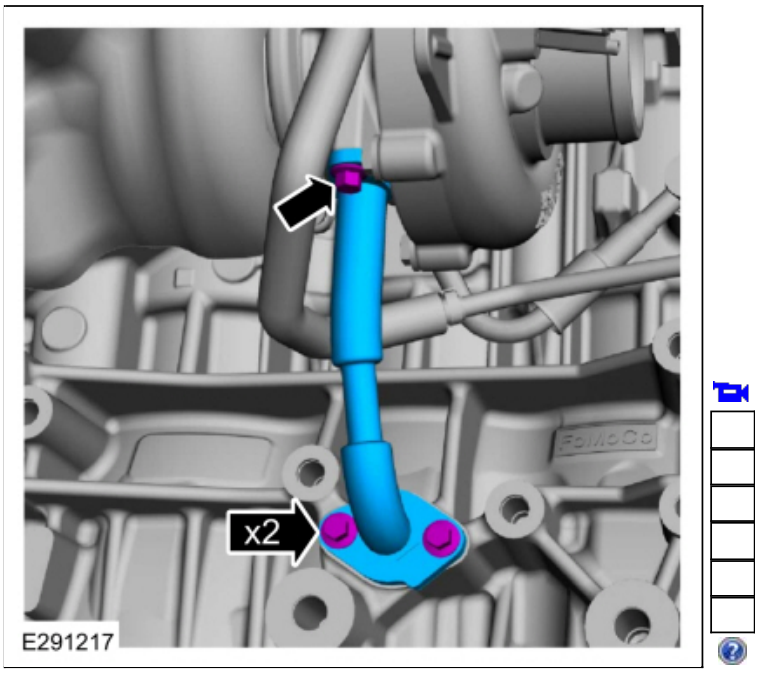


123. Lubricate the O-ring seal with clean engine oil.

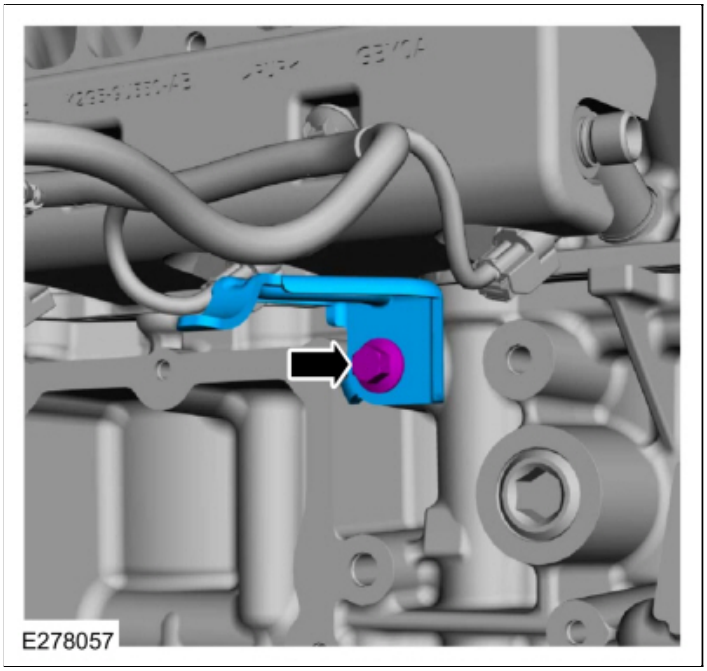


124. **NOTE:** *The oil drain hose must be fully seated prior to fastener rundown.*

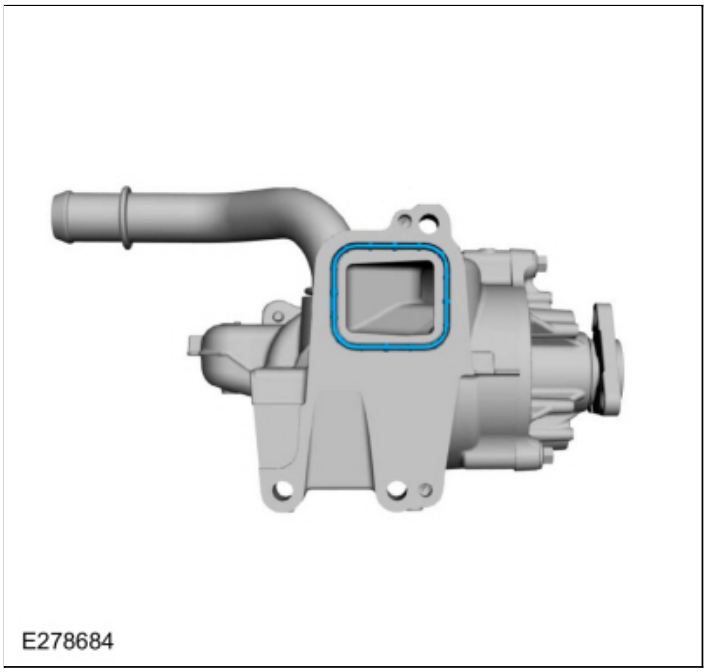
Install the new turbocharger-to-cylinder block oil return pipe and the bolts.
Torque: 97 lb.in (11 Nm)



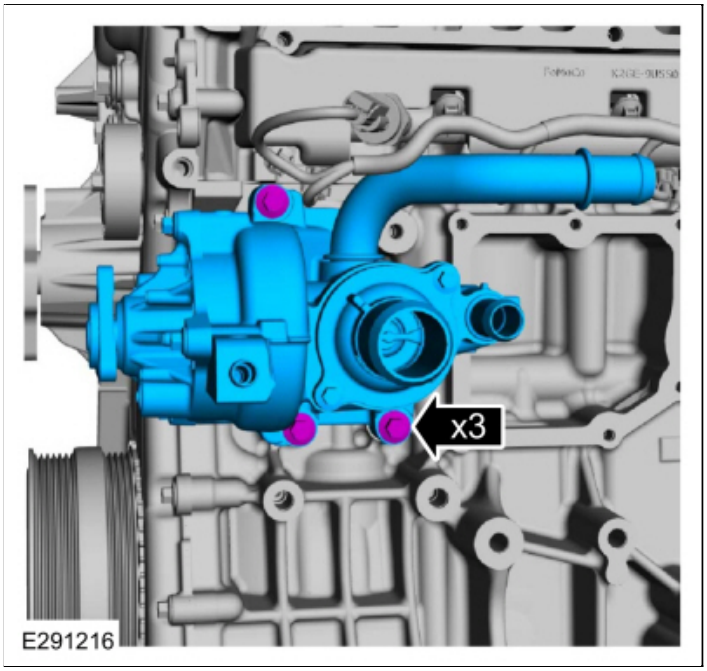
125. Install coolant hose bracket and the bolt.
Torque: 97 lb.in (11 Nm)



126. Install a new coolant pump adapter assembly gasket.

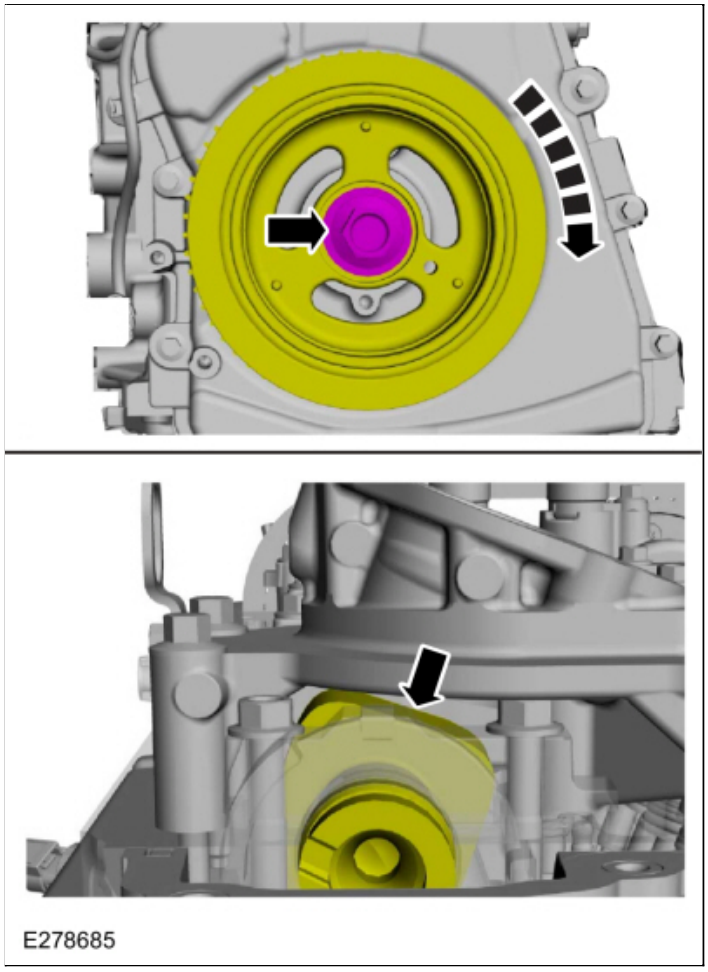


127. Install the coolant pump adapter assembly and the bolts.
Torque:
Stage 1: 18 lb.ft (25 Nm)
Stage 2: 45°

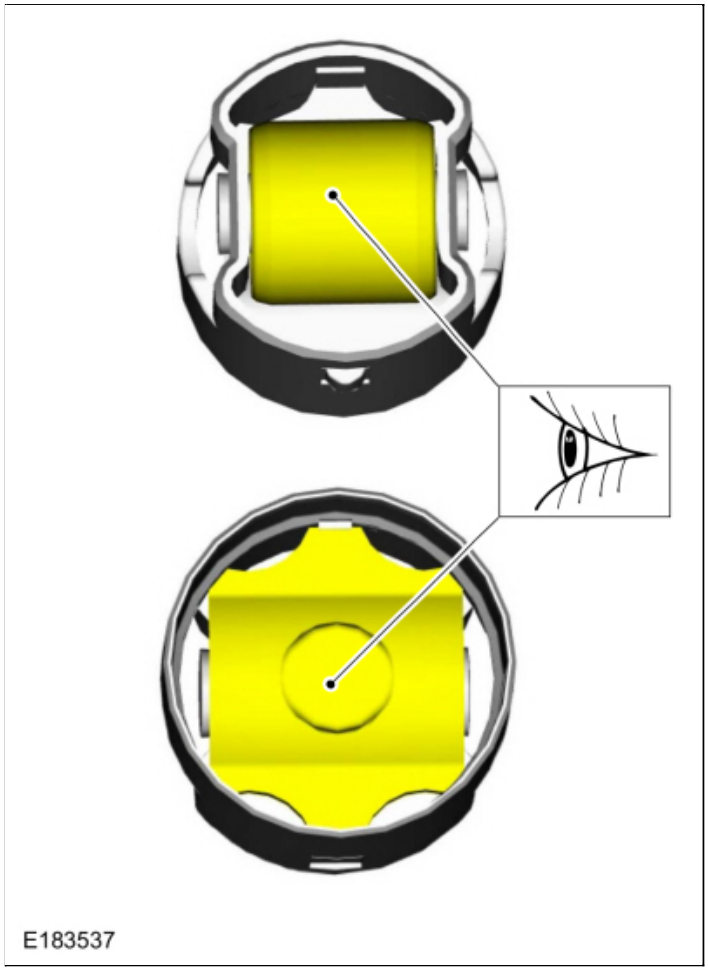


128. **NOTICE: The high-pressure fuel pump tappet cam lobe must be positioned at zero lift before installing the high-pressure fuel pump drive unit.**

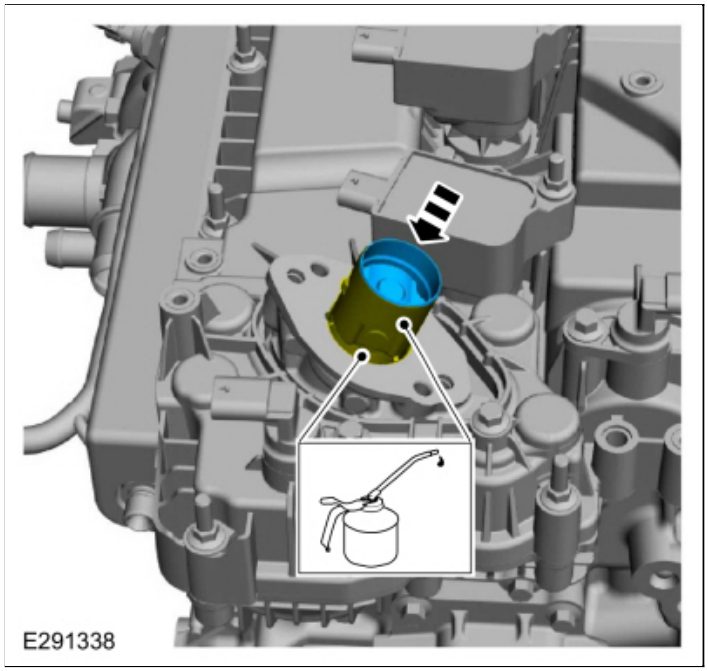
Rotate the crankshaft to position the camshaft at zero lift.



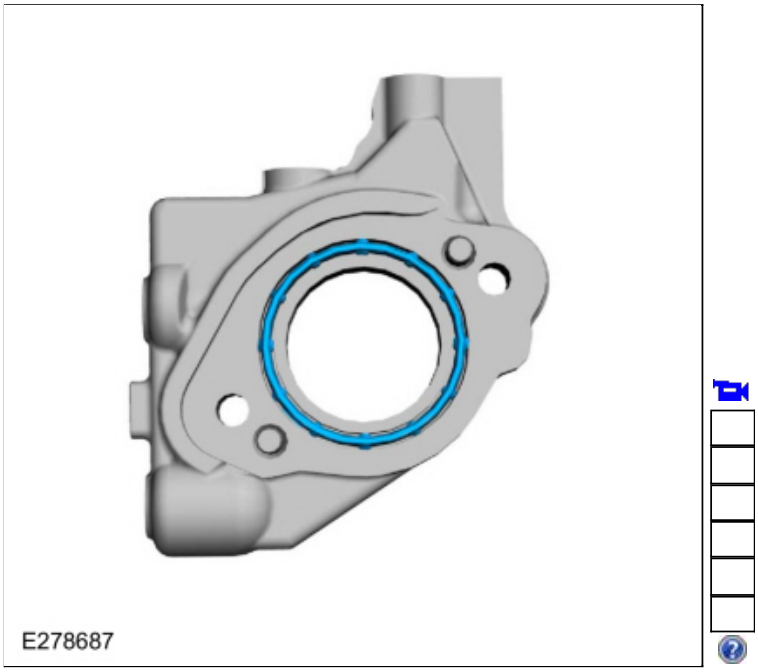
129. Inspect the high-pressure fuel pump tappet for flat spots or scoring, especially in the indicated areas. If any damage is found, inspect the high-pressure fuel pump and the high-pressure fuel pump tappet drive lobe. Install new components as necessary.



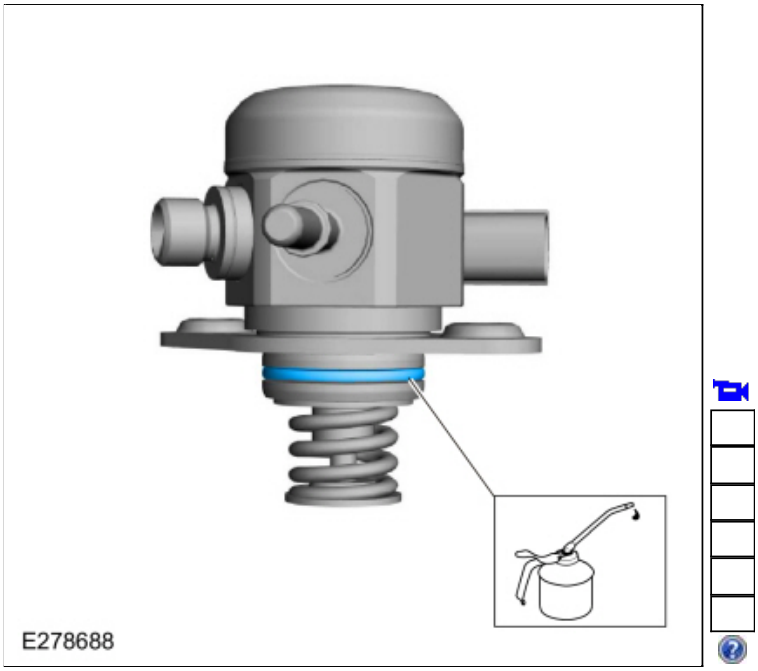
130. Lubricate the bore and the high-pressure fuel pump tappet with clean engine oil and install.



131. Install the fuel pump mounting plate O-ring seal.

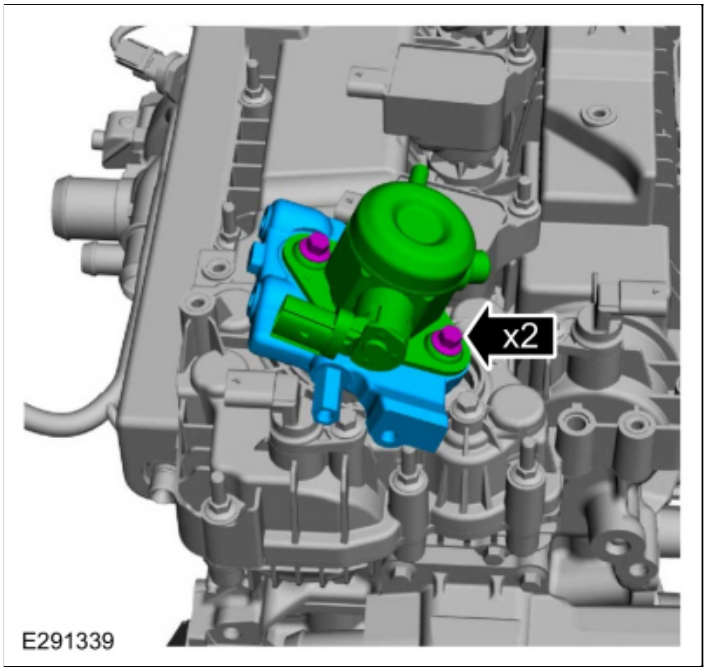


132. Install a new high-pressure fuel pump O-ring seal.



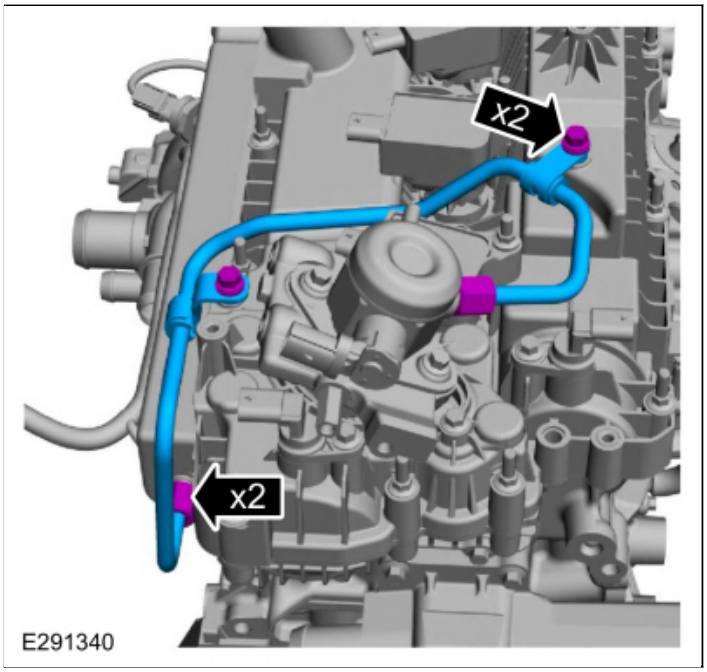
133. **NOTE:** *Install new bolts.*

Install the high-pressure fuel pump, mounting plate and alternately tighten each bolt one complete revolution until seated in 2 stages.
Torque:
Stage 1: 115 lb.in (13 Nm)
Stage 2: 45°

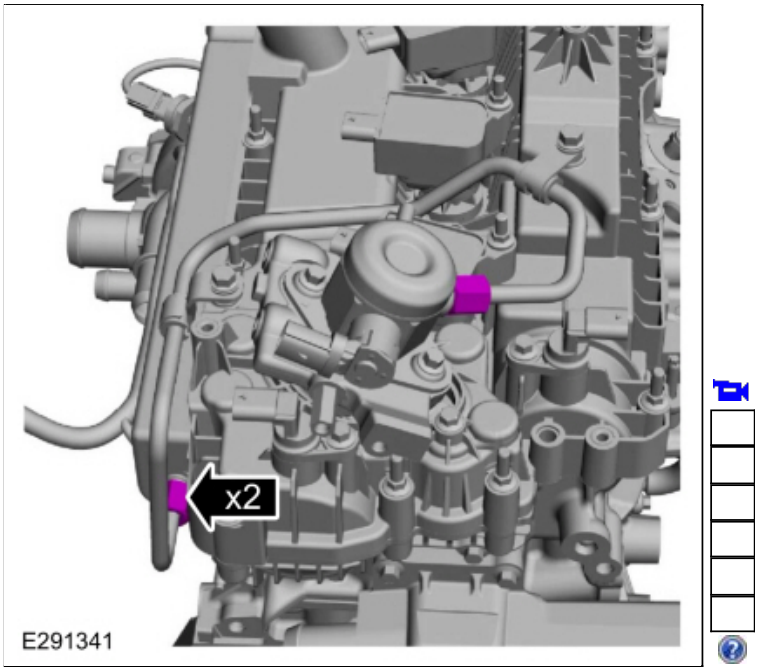


134. **NOTE:** *Install a new fuel tube.*

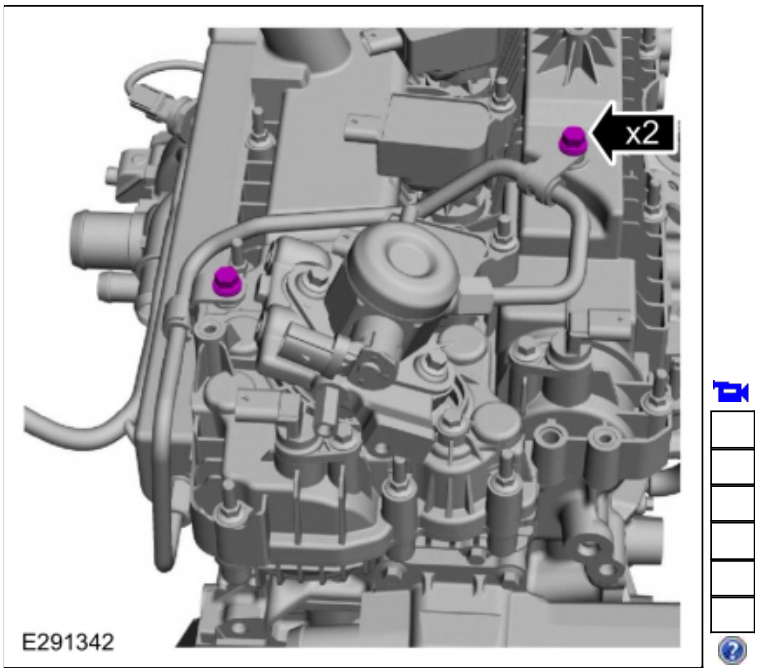
- Install the fuel tube and the bolts finger-tight.
- Install the flare nuts finger-tight.



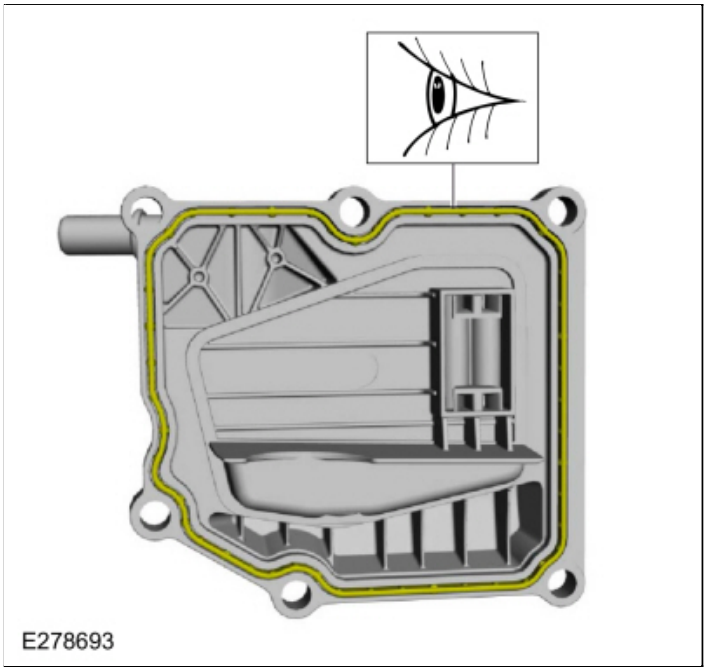
135. Tighten the flare nuts in 2 stages.
Torque:
Stage 1: 89 lb.in (10 Nm)
Stage 2: 38°



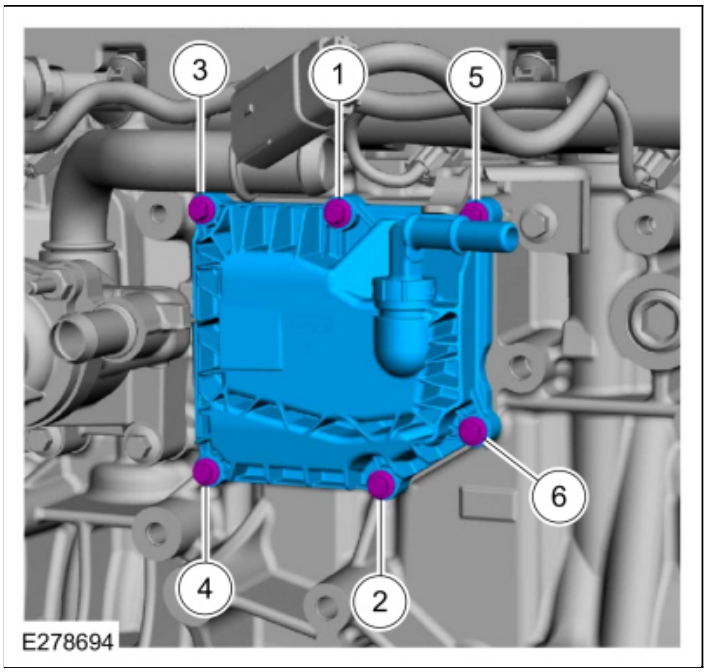
136. Tighten the bolts.
Torque: 97 lb.in (11 Nm)



137. Inspect and replace the crankcase vent separator gasket, if damaged.

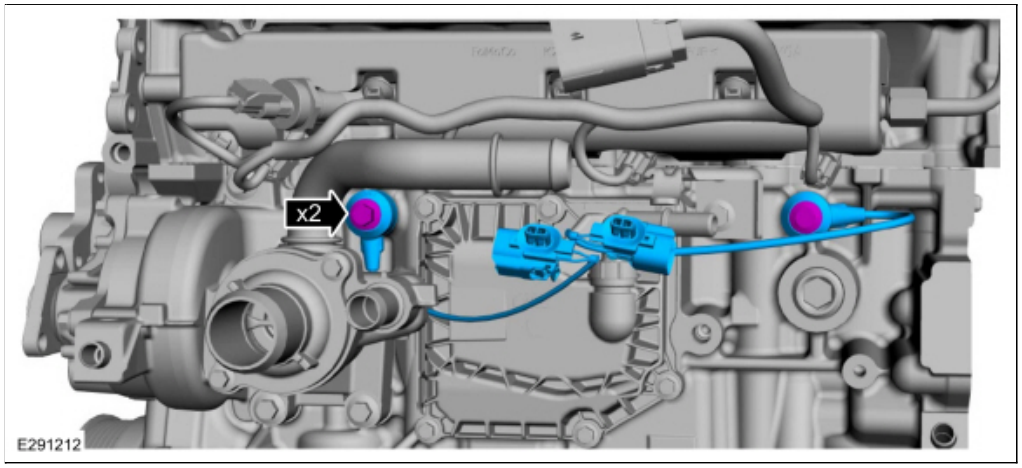


138. Install the crankcase vent separator and the bolts and tighten in sequence shown.
Torque: 97 lb.in (11 Nm)

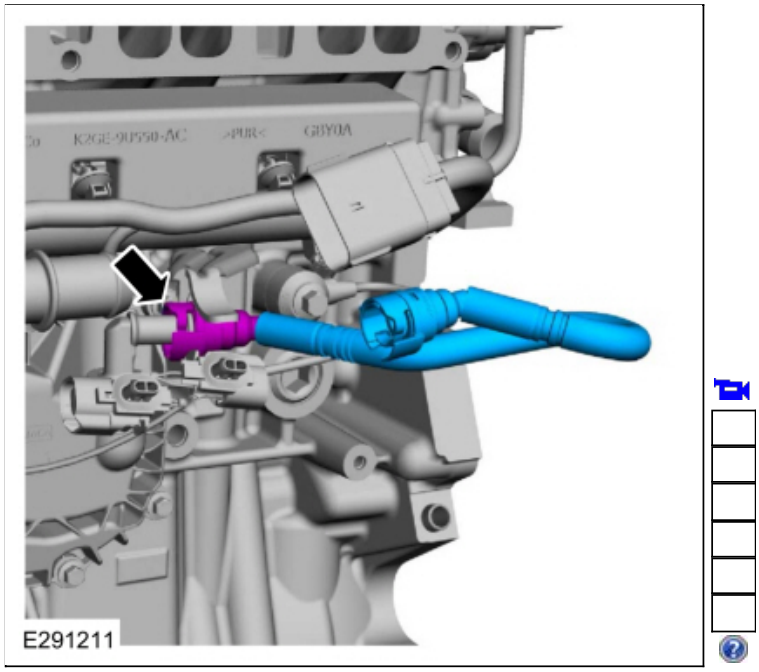


139. **NOTICE: The forward KS must be installed in the 5 o'clock position and the rearward KS must be installed in the 3 o'clock position as shown in the graphic. Failure to follow these instructions may result in damage to the engine.**

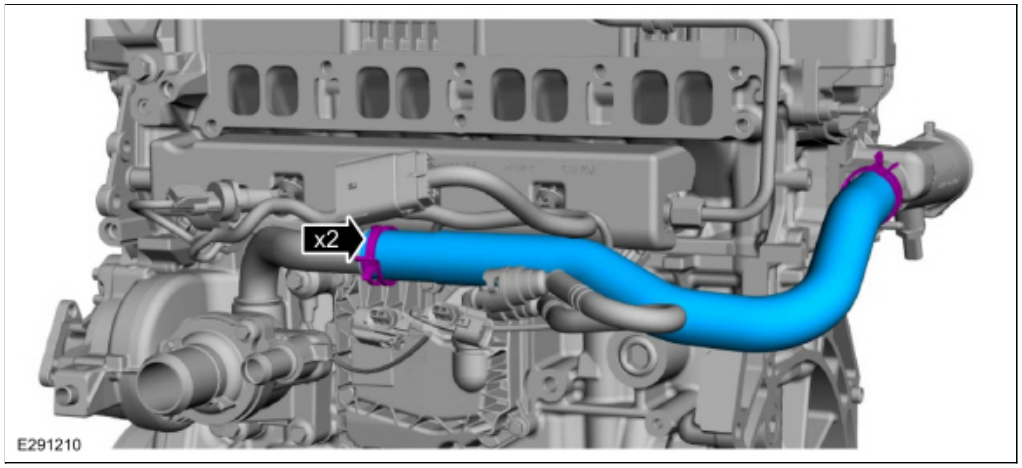
Install the KS in their original position and install the bolts.
Torque: 18 lb.ft (25 Nm)



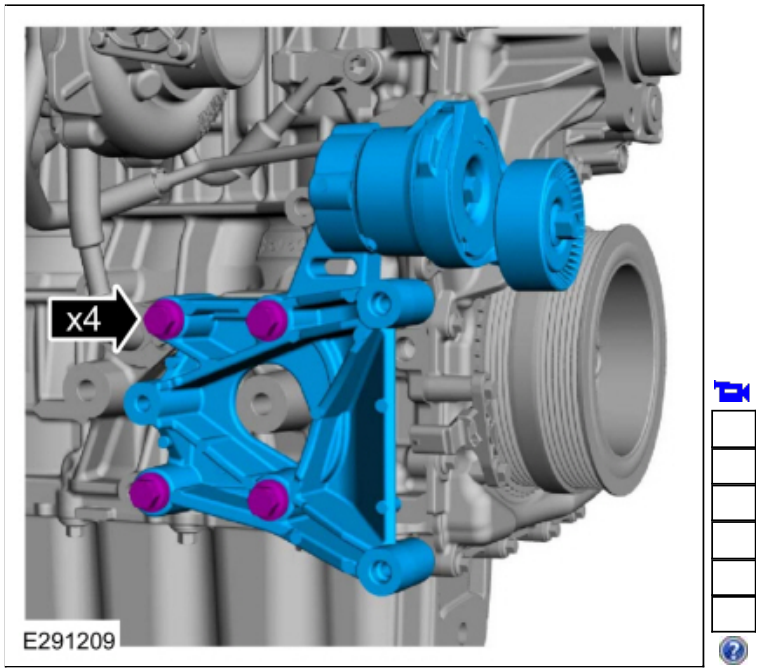
140. Connect the crankcase vent oil separator tube.
Refer to: Quick Release Coupling (310-00 Fuel System - General Information - 2.3L EcoBoost (201kW/273PS), General Procedures).



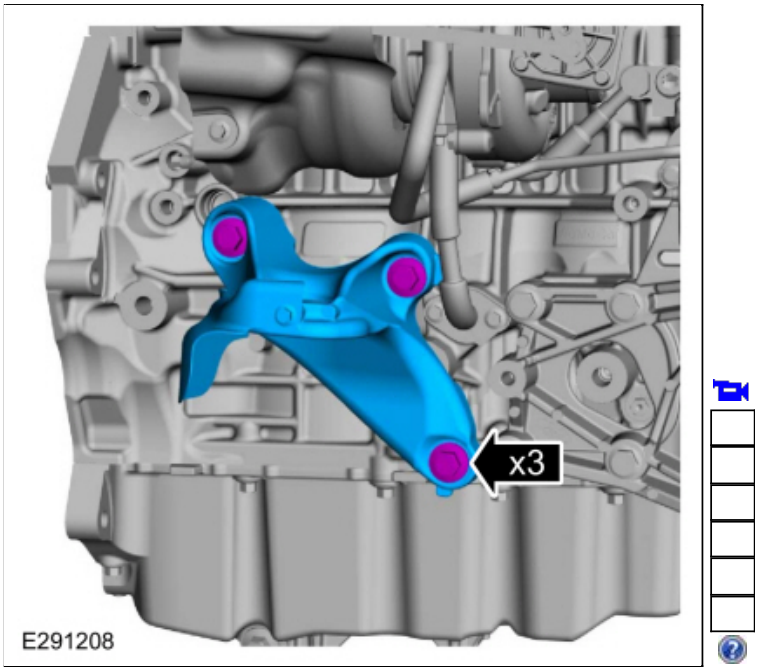
141. Install the coolant hose.
Use the General Equipment: Hose Clamp Remover/Installer



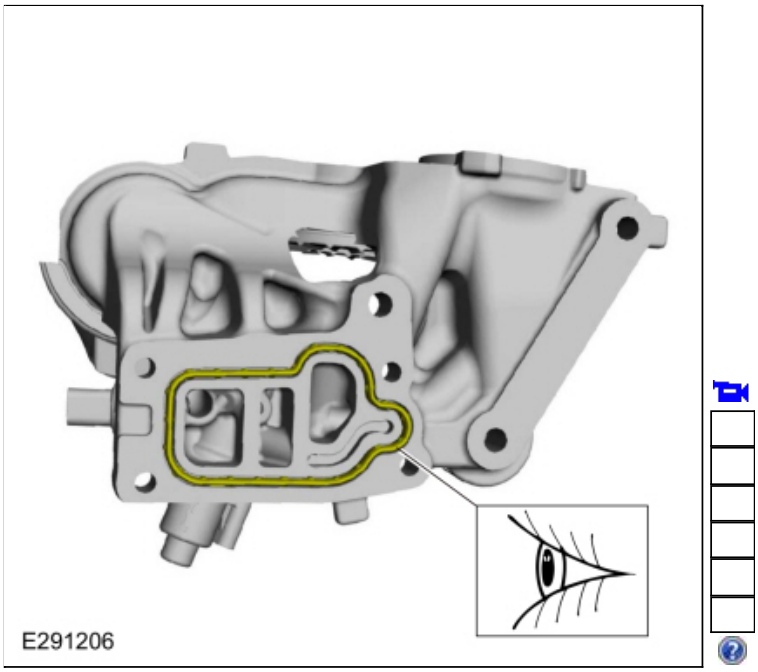
142. Install the A/C compressor bracket and the bolts.
Torque: 35 lb.ft (48 Nm)



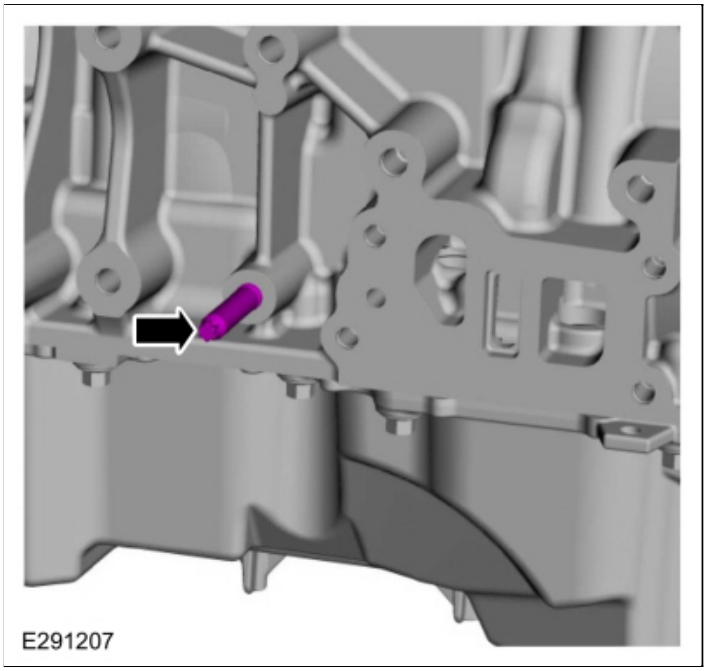
143. Install the RH engine mount bracket and the bolts.
Torque: 41 lb.ft (55 Nm)



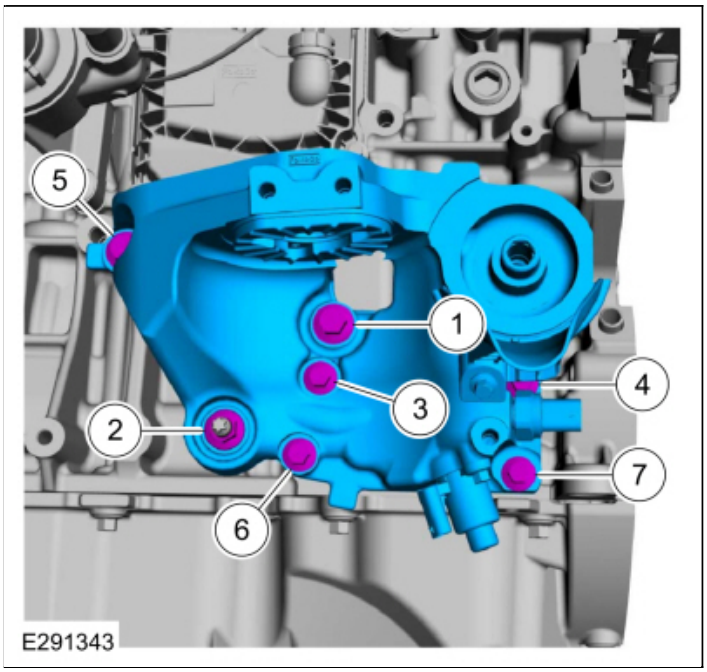
144. Inspect and replace if damaged.



145. Install the oil filter adapter assembly stud.
Torque: 106 lb.in (12 Nm)

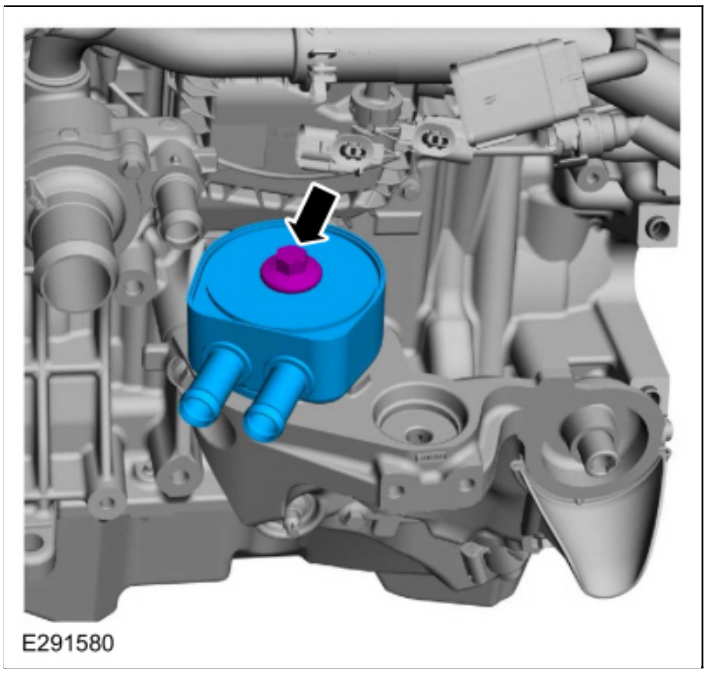


146. Install the oil filter adapter, nut and bolts and tighten in sequence shown.
Torque:
Stage 1: Tighten bolts 1 and 5 to: 33 lb.ft (45 Nm)
Stage 2: Tighten bolts 1 and 5 additional: 60°
Stage 3: Tighten the nut to: 33 lb.ft (45 Nm)
Stage 4: Tighten the nut additional: 60°
Stage 5: Tighten bolts 3, 4, 5 and 7 to: 177 lb.in (20 Nm)
Stage 6: Tighten bolts 3, 4, 5 and 7 additional: 45°



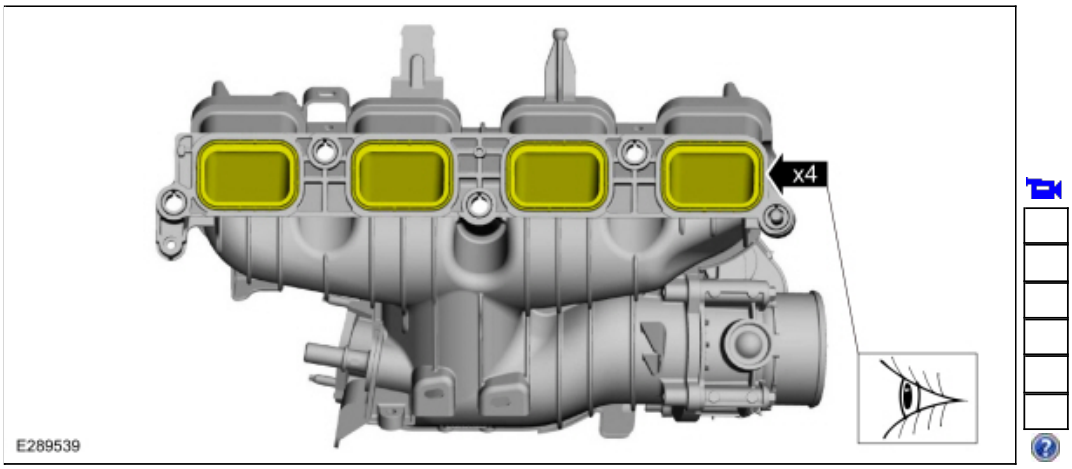
147. Install the oil cooler and the bolt.
Torque:
Stage 1: 17 lb.ft (22.5 Nm)
Stage 2: 75°

Stage 3: Wait 2s
Stage 4: 15°



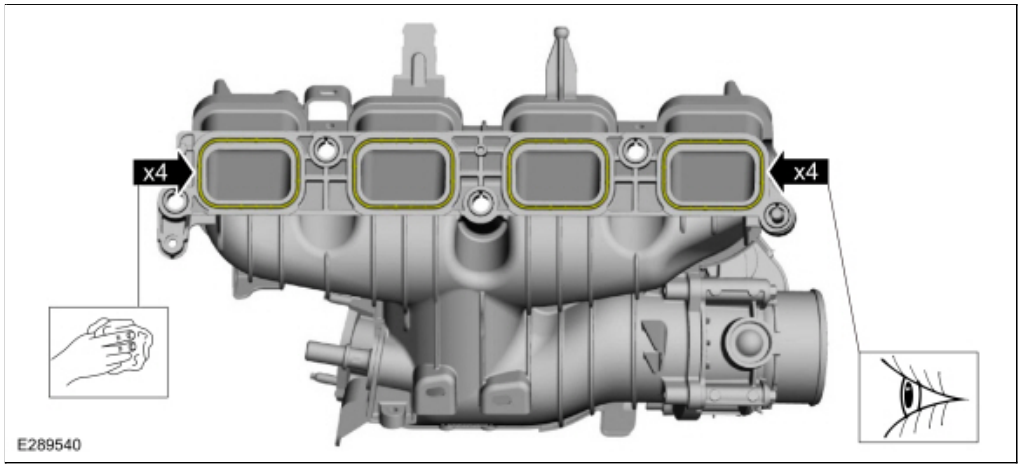
148. **NOTICE: If the engine is repaired or replaced because of upper engine failure, typically including valve or piston damage, check the intake manifold for metal debris. If metal debris is found, install a new intake manifold. Failure to follow these instructions can result in engine damage.**

- Visually inspect the intake manifold for metal debris.



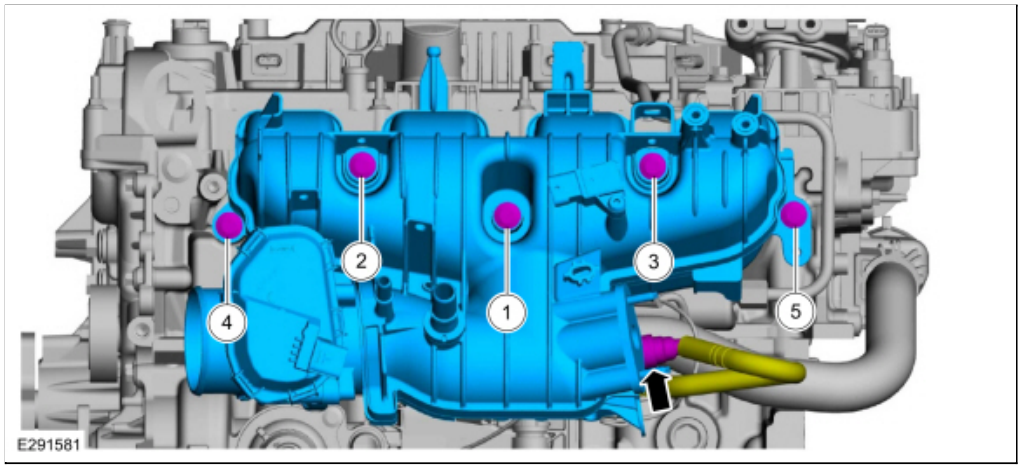
149.

- Visually inspect the intake manifold gaskets for nicks, cuts and abrasions. If these conditions are not present, the gaskets may be reused.
- Clean and inspect all of the sealing surfaces of the intake manifold.



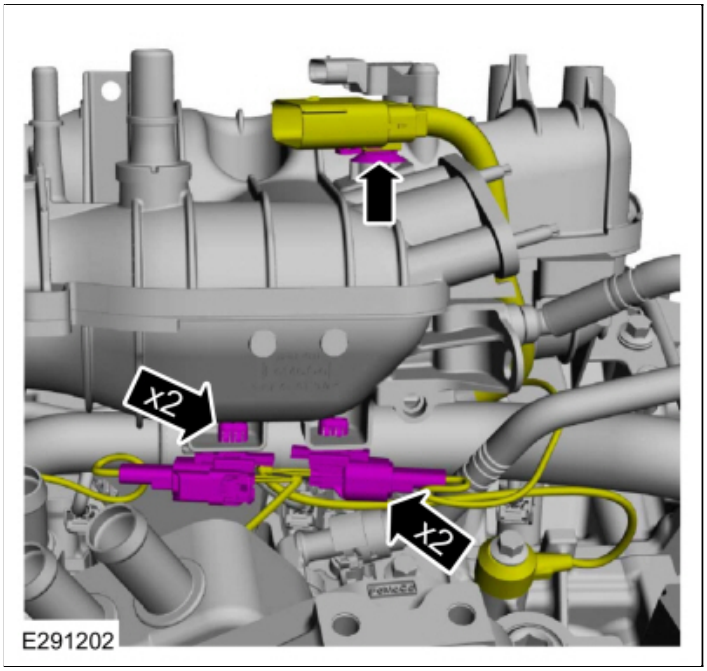
150.

- Install the intake manifold and the bolts and tighten in sequence shown.
  Torque: 18 lb.ft (25 Nm)
- Connect the crankcase vent oil separator tube quick release coupling to the intake manifold.
  Refer to: Quick Release Coupling (310-00 Fuel System - General Information - 2.3L EcoBoost (201kW/273PS), General Procedures).

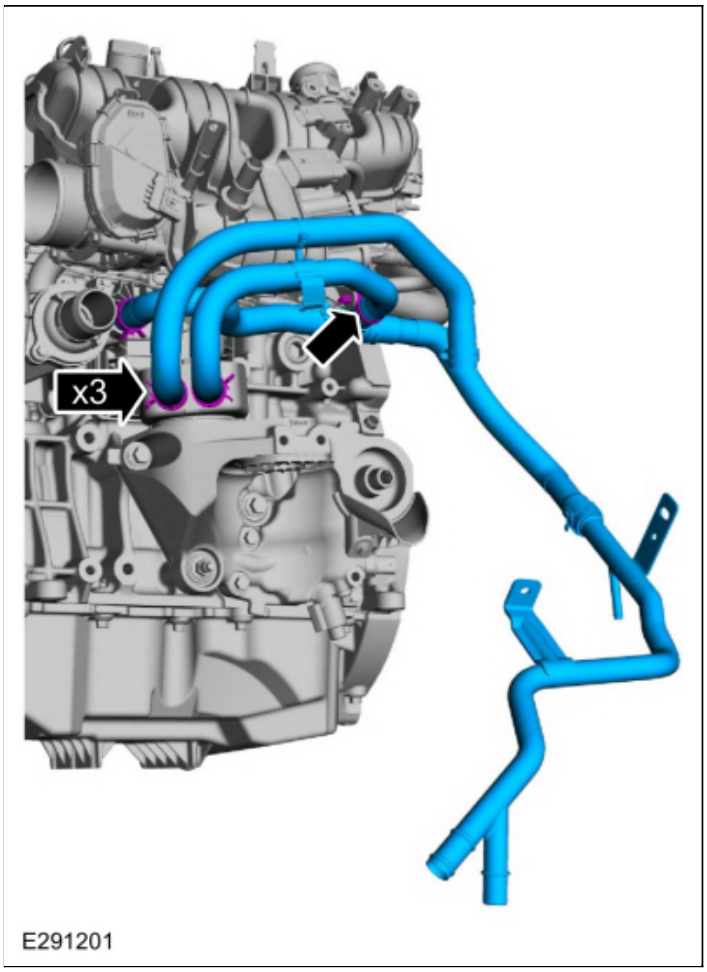


151.

- Connect and attach the KS electrical connectors.
- Attach the fuel rail harness electrical connector to the intake manifold.

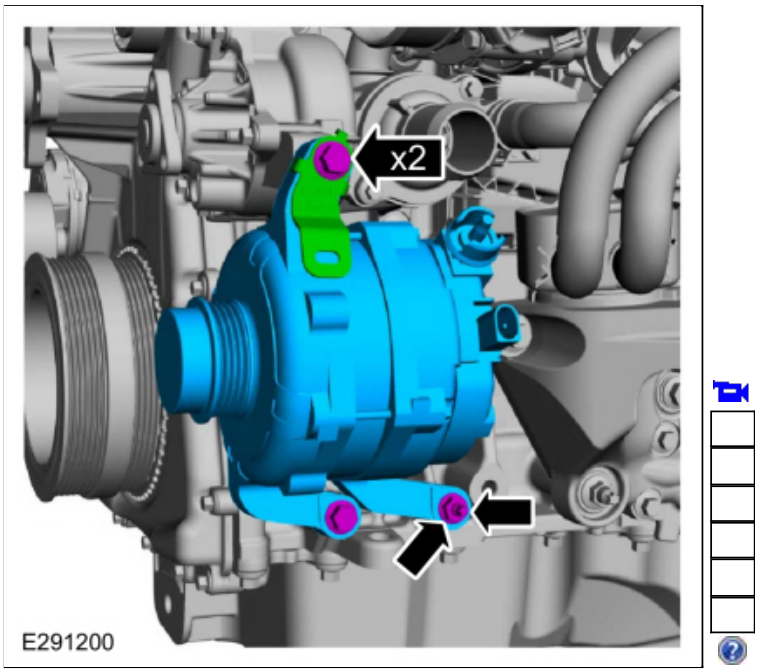


152. Install the coolant hoses and attach the retainer.
Use the General Equipment: Hose Clamp Remover/Installer

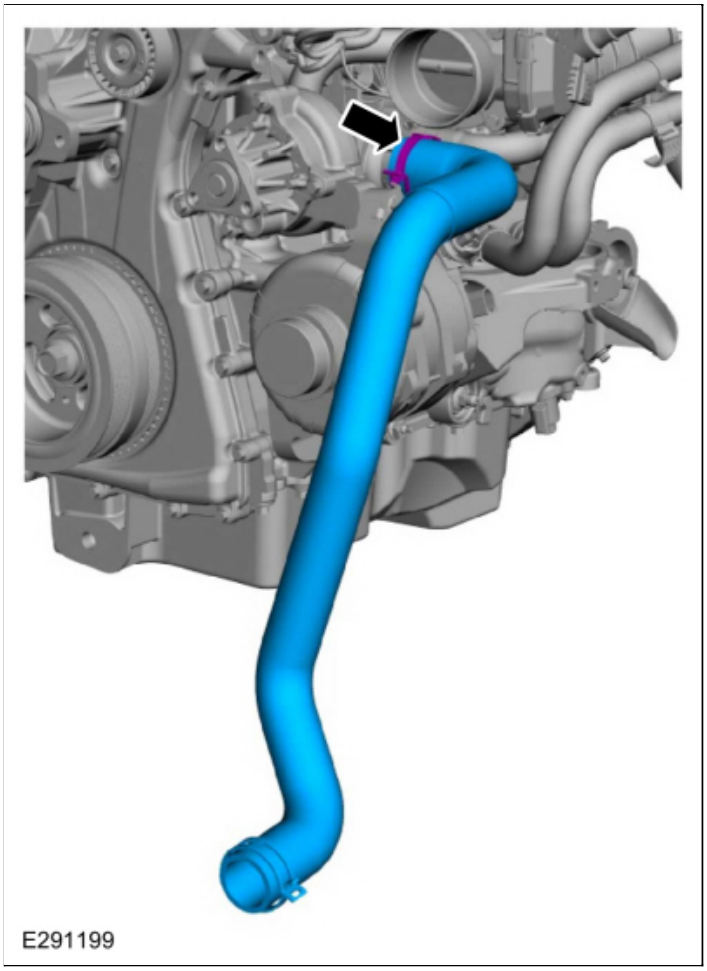


153.

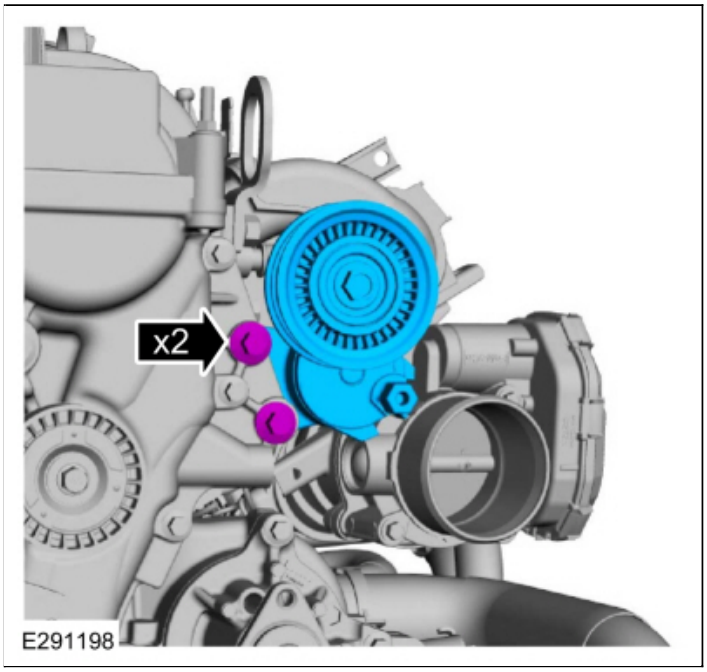
- Install the generator and the lower bolt.
  Torque: 18 lb.ft (25 Nm)
- Install the generator stud.
  Torque: 89 lb.in (10 Nm)
- Install the generator nut.
  Torque: 18 lb.ft (25 Nm)
- Install the bracket and the upper generator bolt.
  Torque: 18 lb.ft (25 Nm)



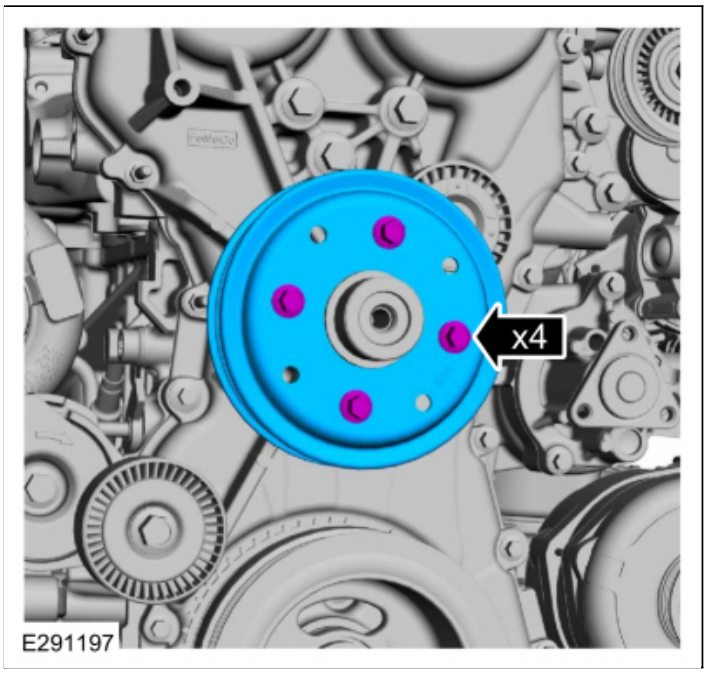
154. Install the lower radiator hose.
Use the General Equipment: Hose Clamp Remover/Installer



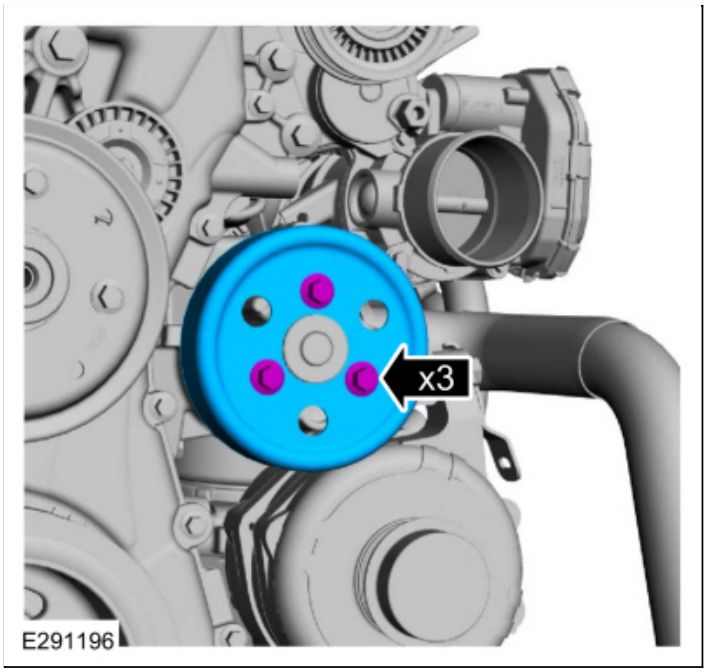
155. Install the accessory drive belt tensioner and the bolts.
Torque: 18 lb.ft (25 Nm)



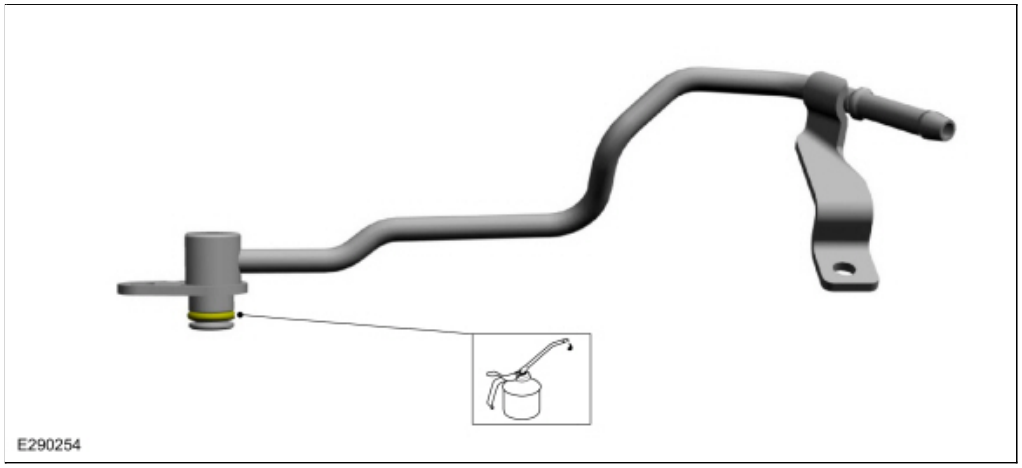
156. Install the accessory drive belt pulley and the bolts.
Torque: 18 lb.ft (25 Nm)



157. Install the coolant pump pulley and the bolts.
Torque: 18 lb.ft (25 Nm)

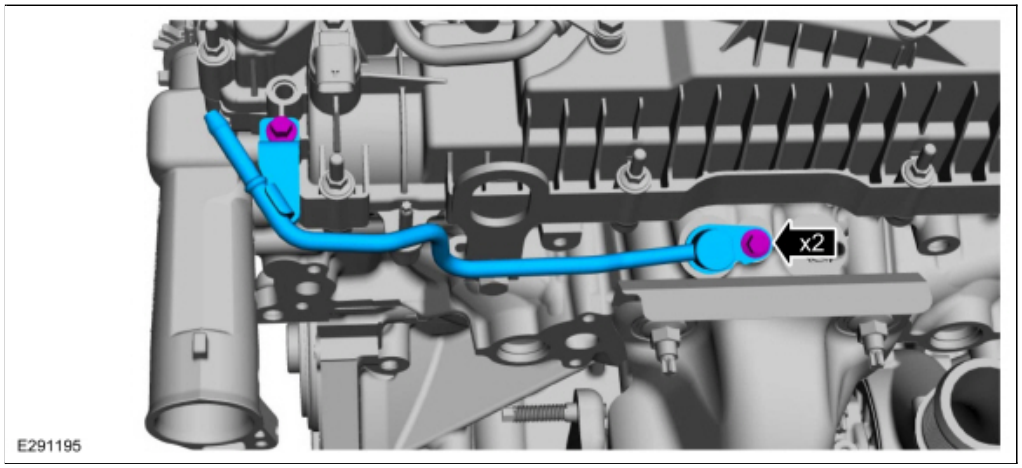


158. Lubricate the coolant tube O-ring seal with clean engine coolant.

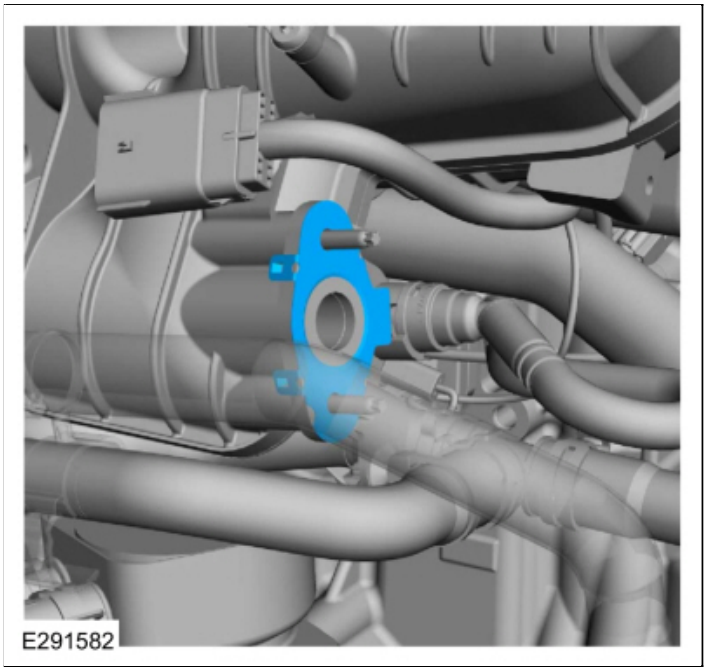


159. **NOTE:** *The coolant tube must be fully seated prior to tighten the bolt.*

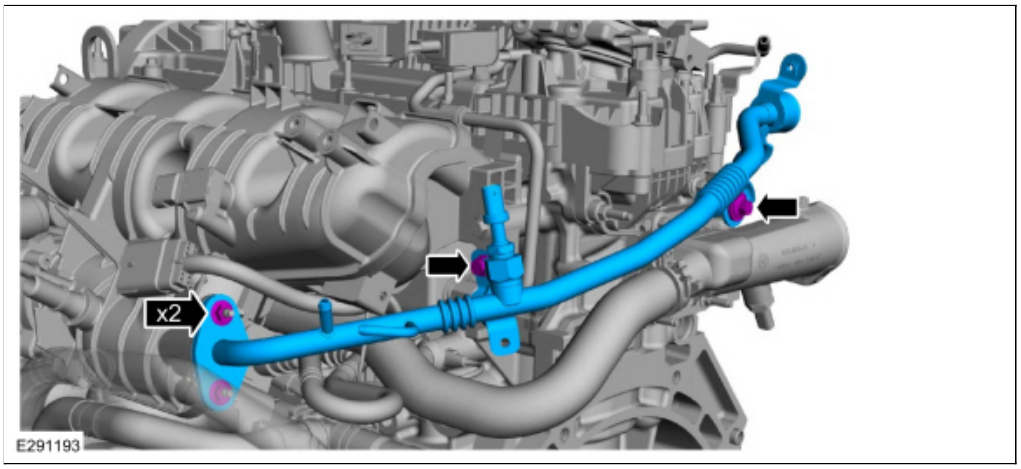
Install the coolant tube and the bolts.
Torque: 97 lb.in (11 Nm)



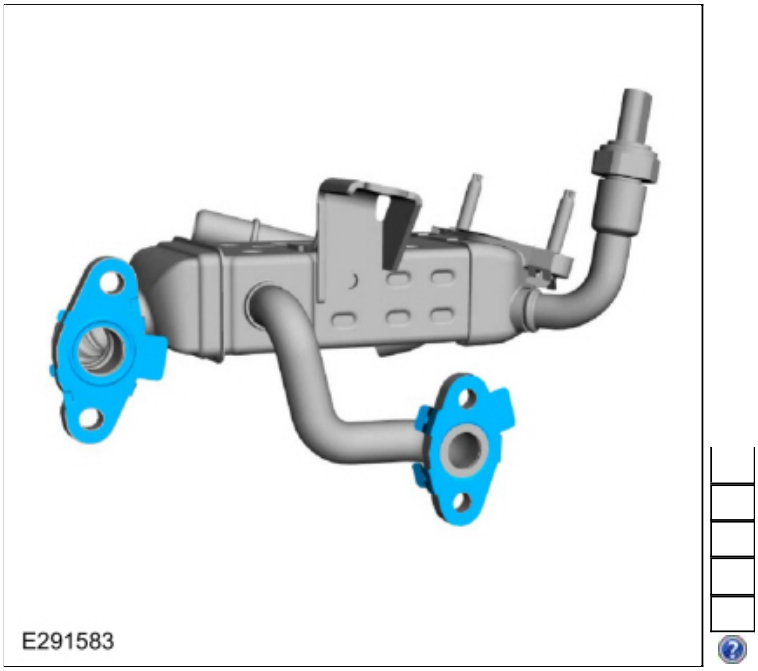
160. Install a new EGR inlet tube assembly gasket.



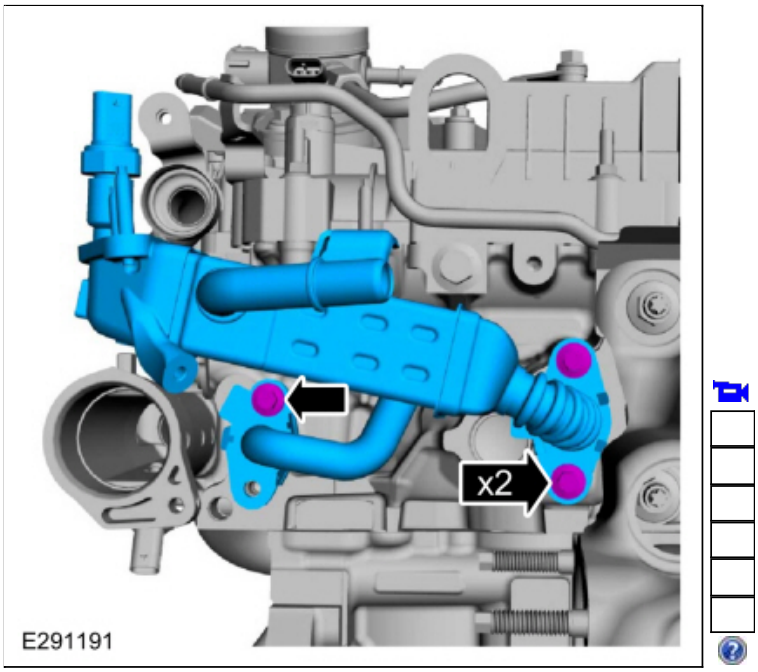
161. Install the EGR inlet tube assembly and the nuts and bolts finger tight.



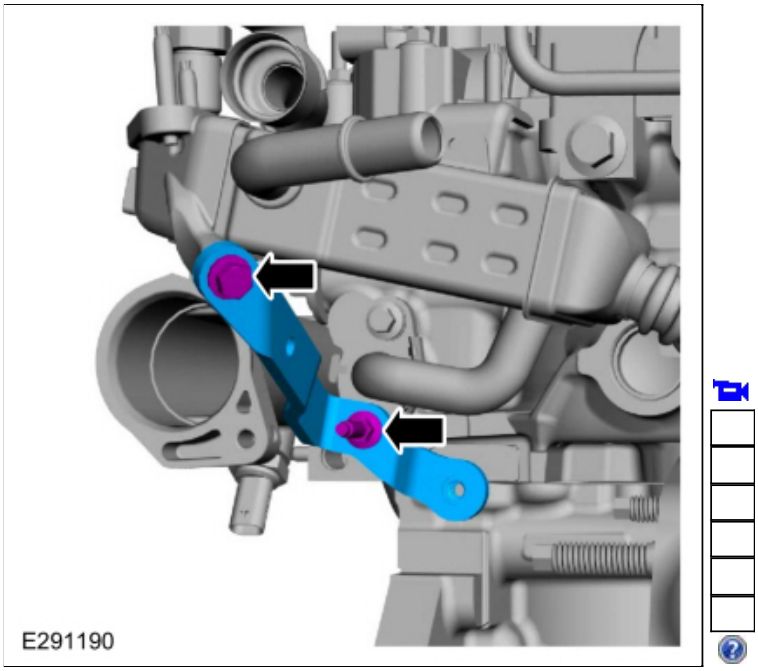
162. Install new EGR cooler gaskets.



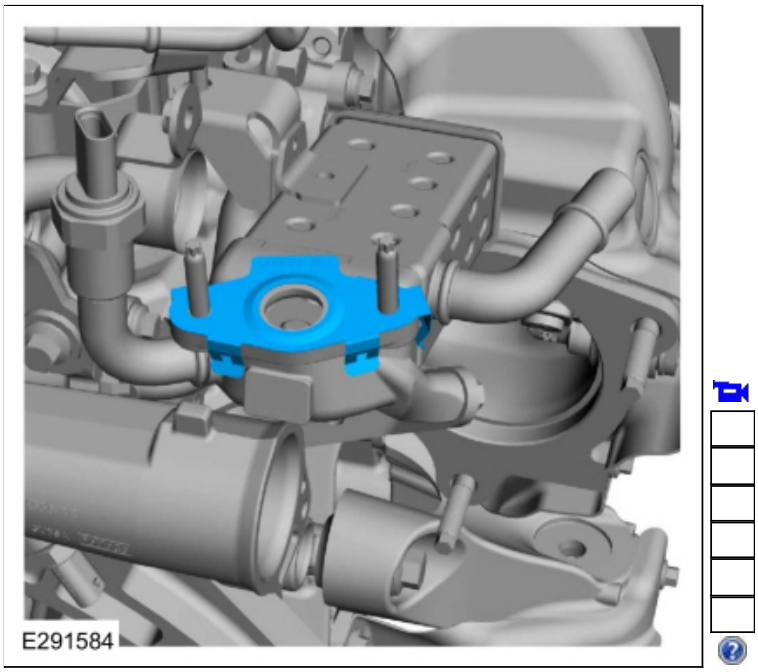
163. Install the EGR cooler and the bolts finger tight.



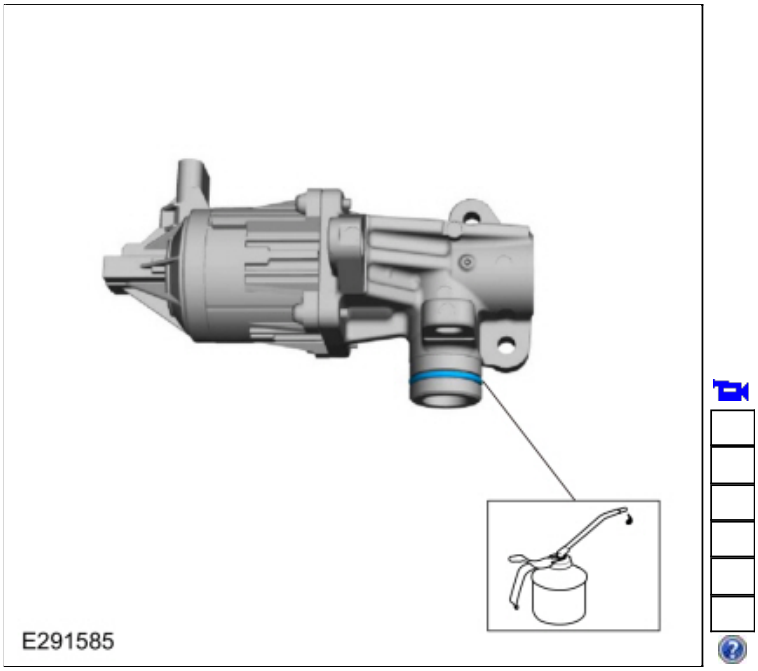
164. Install the EGR cooler bracket, bolt and stud bolt finger tight.



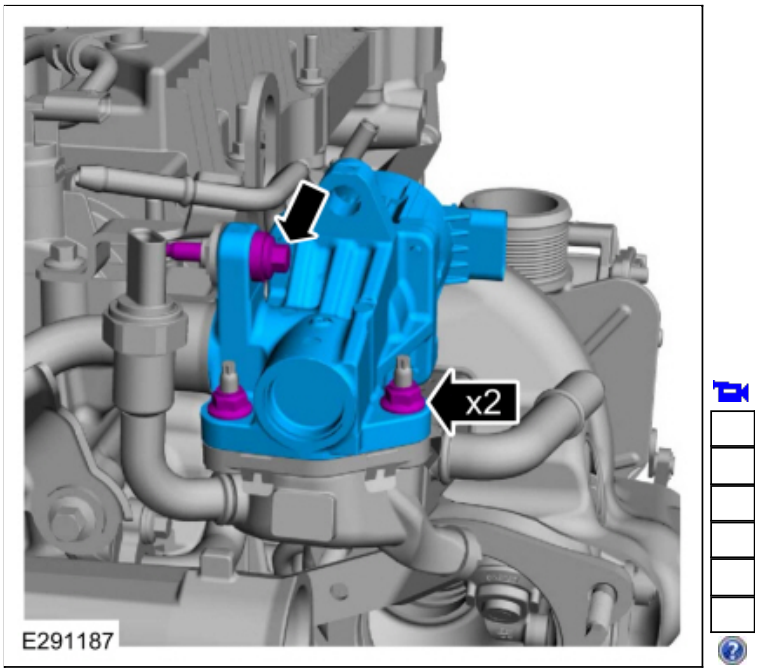
165. Install a new EGR valve gasket.



166. Install a new EGR valve O-ring seal and lubricate with clean engine oil.

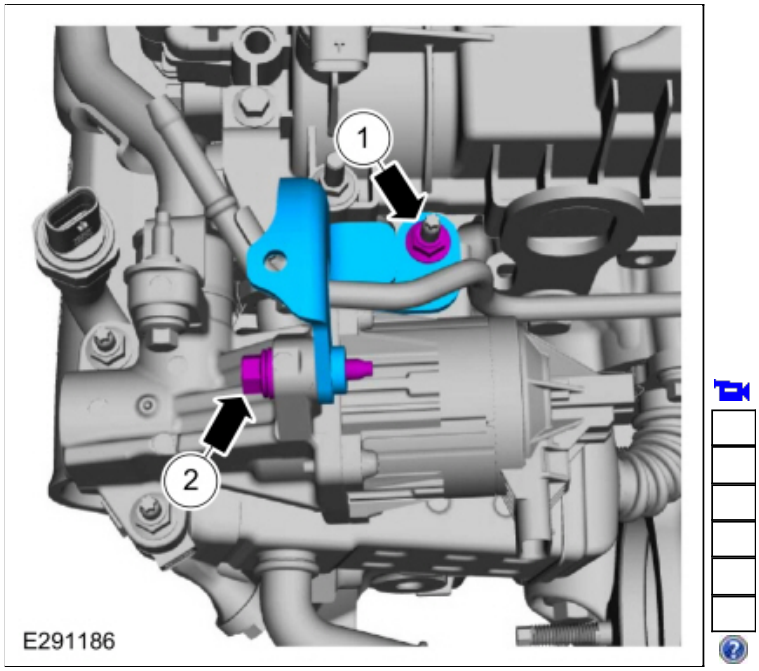


167. Install the EGR valve, nuts and the bolt finger tight.

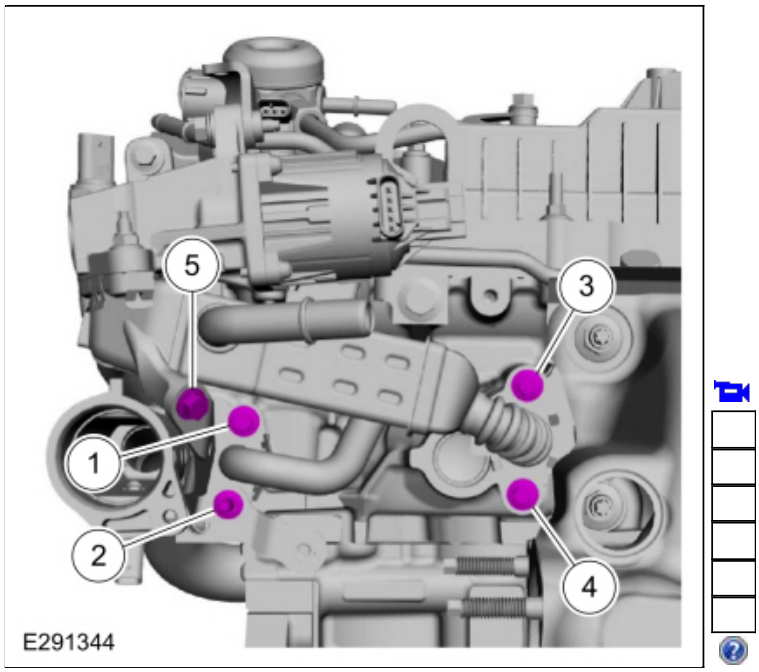


168.

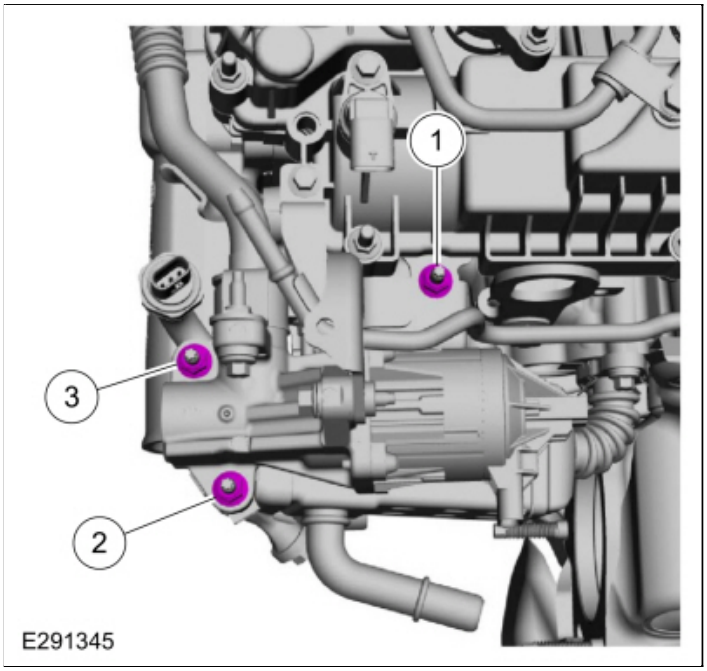
1. Install the EGR valve bracket and nut finger tight.
2. Install the EGR valve bracket bolt finger tight.



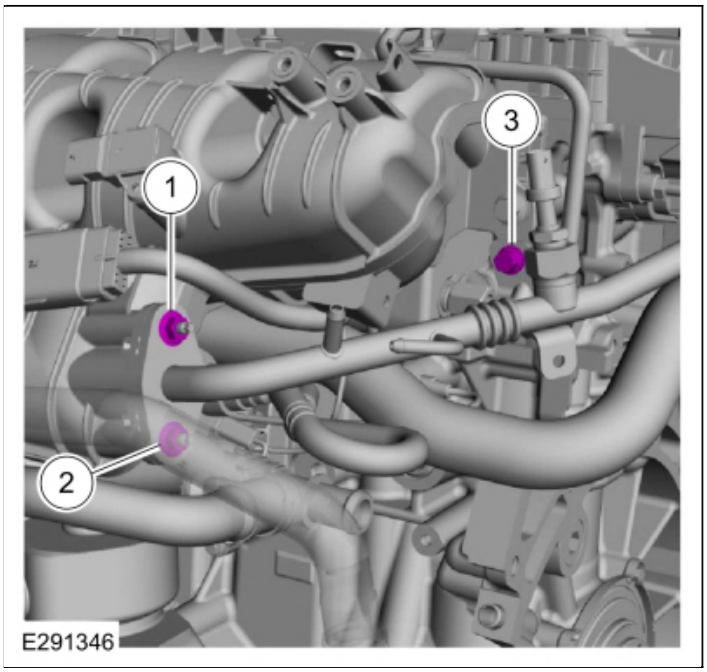
169. Tighten the bolts in sequence shown.
Torque: 97 lb.in (11 Nm)



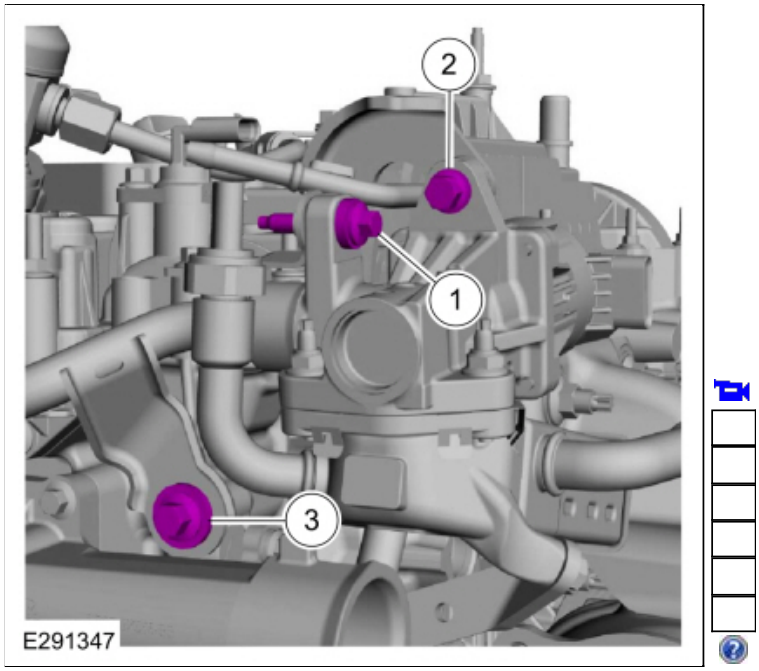
170. Tighten the nuts in sequence shown.
Torque: 97 lb.in (11 Nm)



171. Tighten the nuts and bolt in sequence shown.
Torque: 97 lb.in (11 Nm)

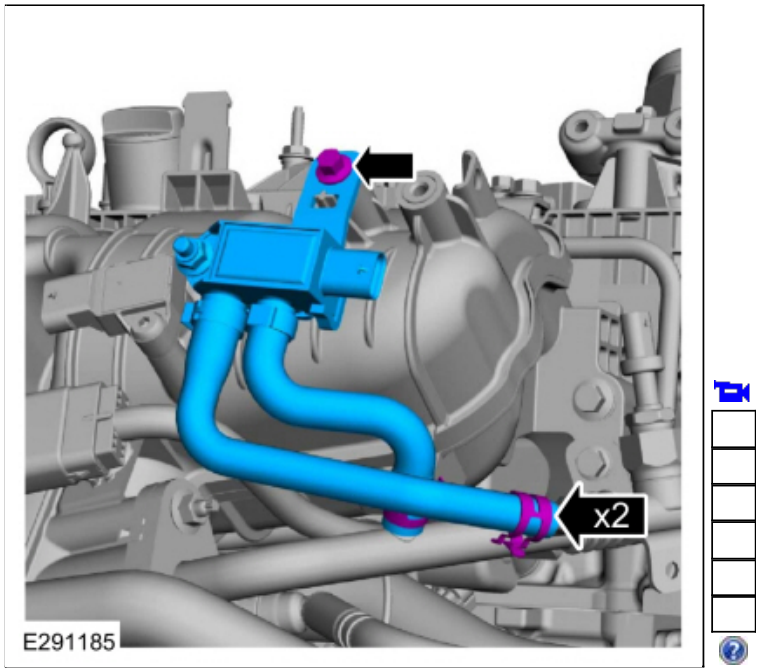


172. Tighten the bolts in sequence shown.
Torque:
Stage 1: Tighten bolts 1 and 2 to: 97 lb.in (11 Nm)
Stage 2: Tighten bolt 3 to: 18 lb.ft (25 Nm)

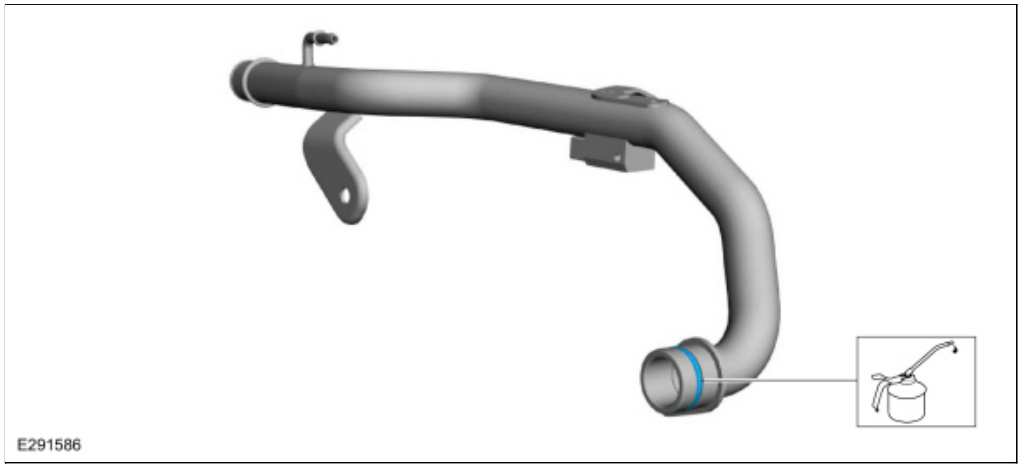


173.

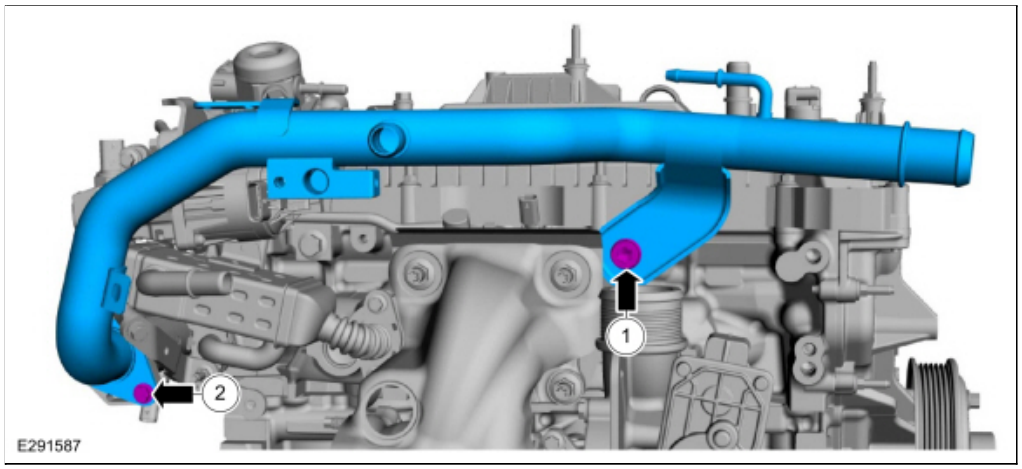
- Install the EGR transducer assembly and the bolt.
  Torque: 97 lb.in (11 Nm)
- Install the EGR transducer hoses.
  Use the General Equipment: Hose Clamp Remover/Installer



174. Install a new coolant tube O-ring seal and lubricate with clean engine coolant.

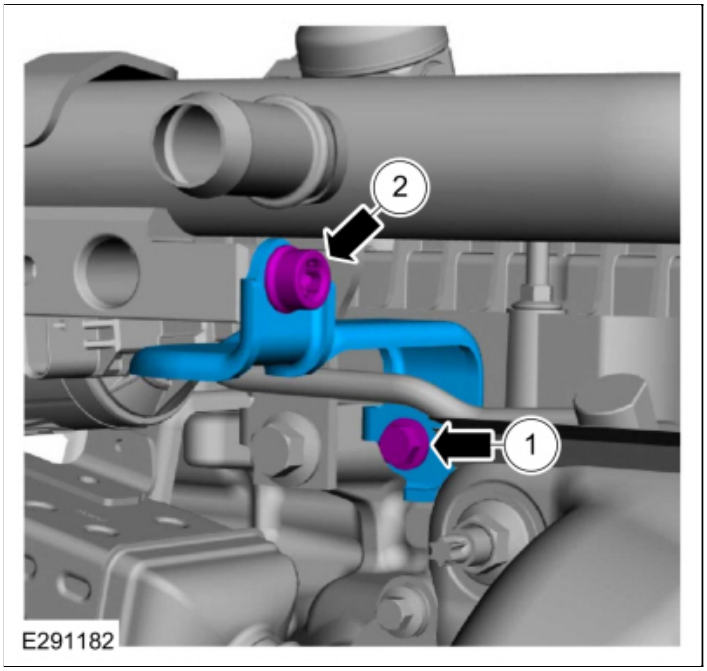


175. Install the coolant tube and the bolts.
Torque:
Stage 1: Tighten bolt 1 to: 35 lb.ft (48 Nm)
Stage 2: Tighten bolt 2 to: 97 lb.in (11 Nm)

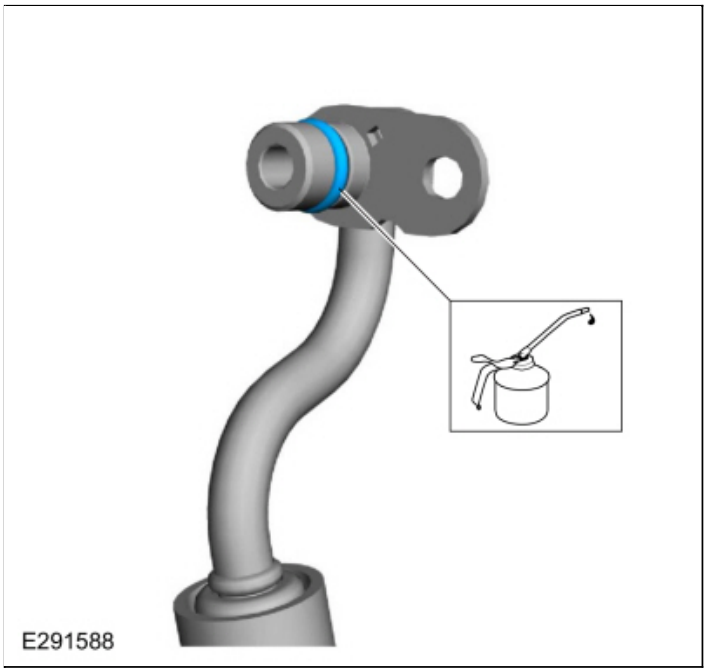


176.

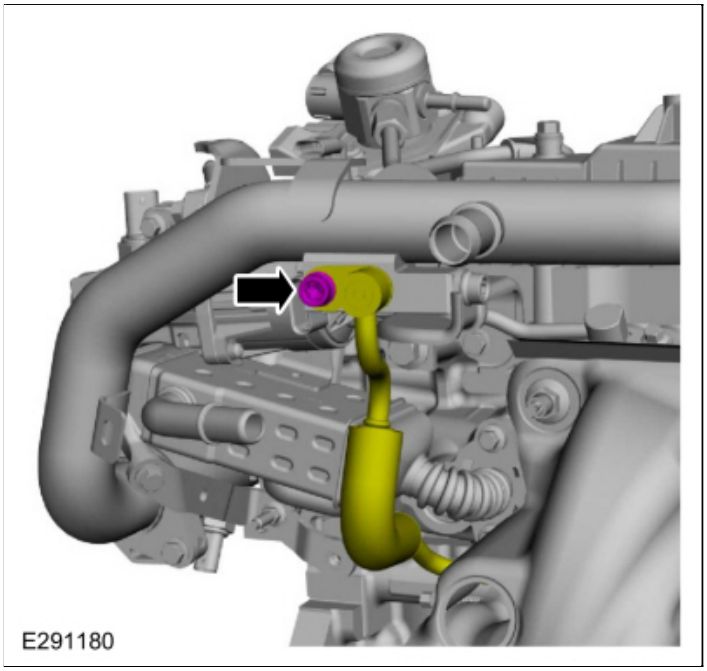
1. Install the coolant tube support bracket and the bolt.
Torque: 97 lb.in (11 Nm)
2. Install the coolant tube support bracket bolt.
Torque: 97 lb.in (11 Nm)



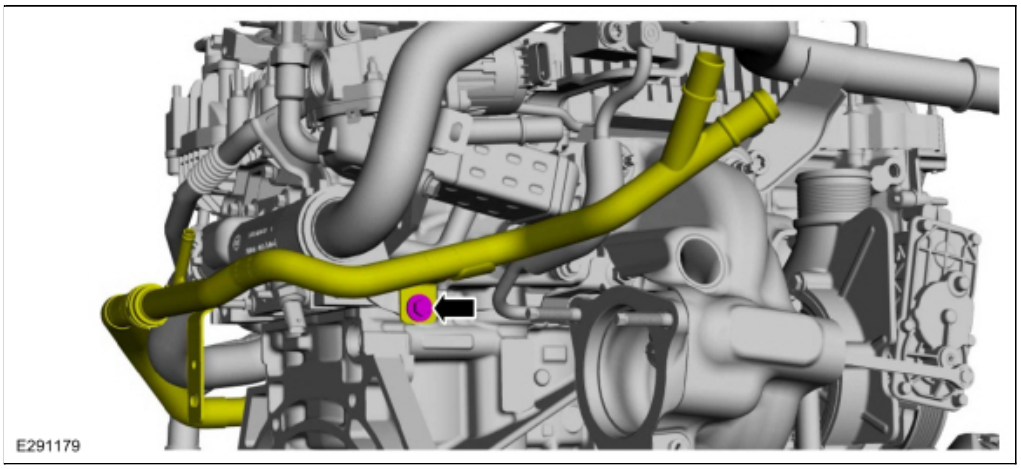
177. Install a new turbocharger coolant tube O-ring seal and lubricate with clean engine coolant.



178. Position the turbocharger coolant tube and install the bolt.
Torque: 97 lb.in (11 Nm)

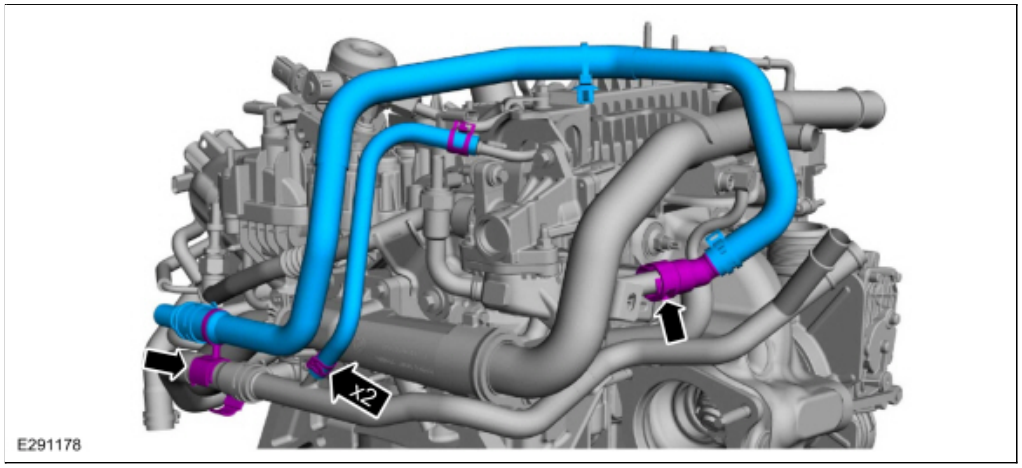


179. Position the coolant tube and install the bolt.
Torque: 97 lb.in (11 Nm)

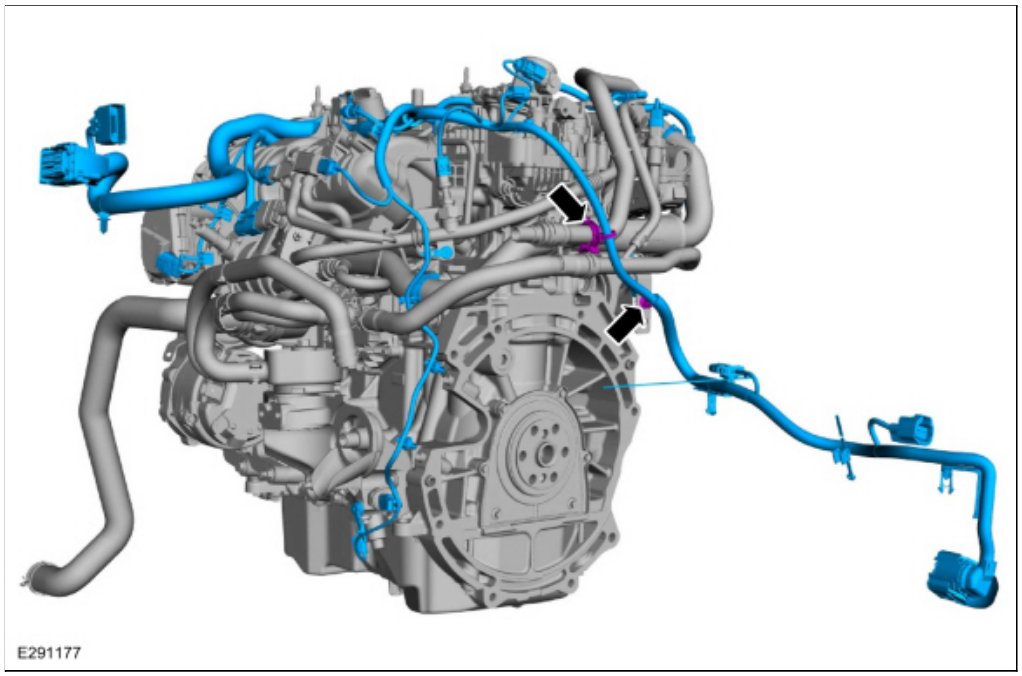


180.

- Connect the coolant hose and the retainers
- Install the coolant hose.
Use the General Equipment: Hose Clamp Remover/Installer

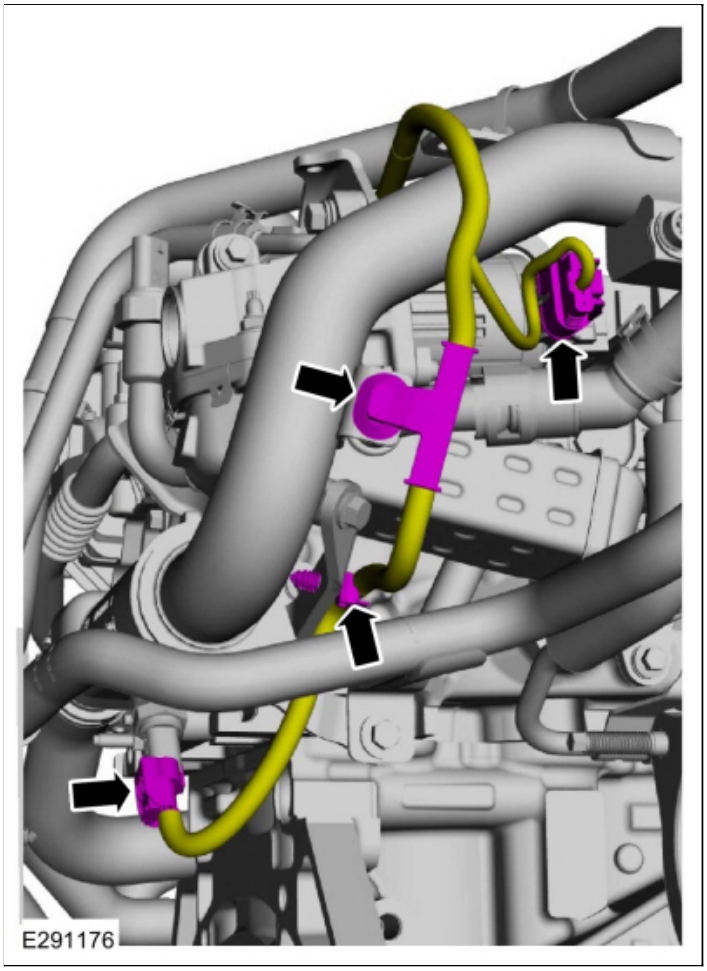


181. Install the engine wiring harness and attach the wiring harness retainers.



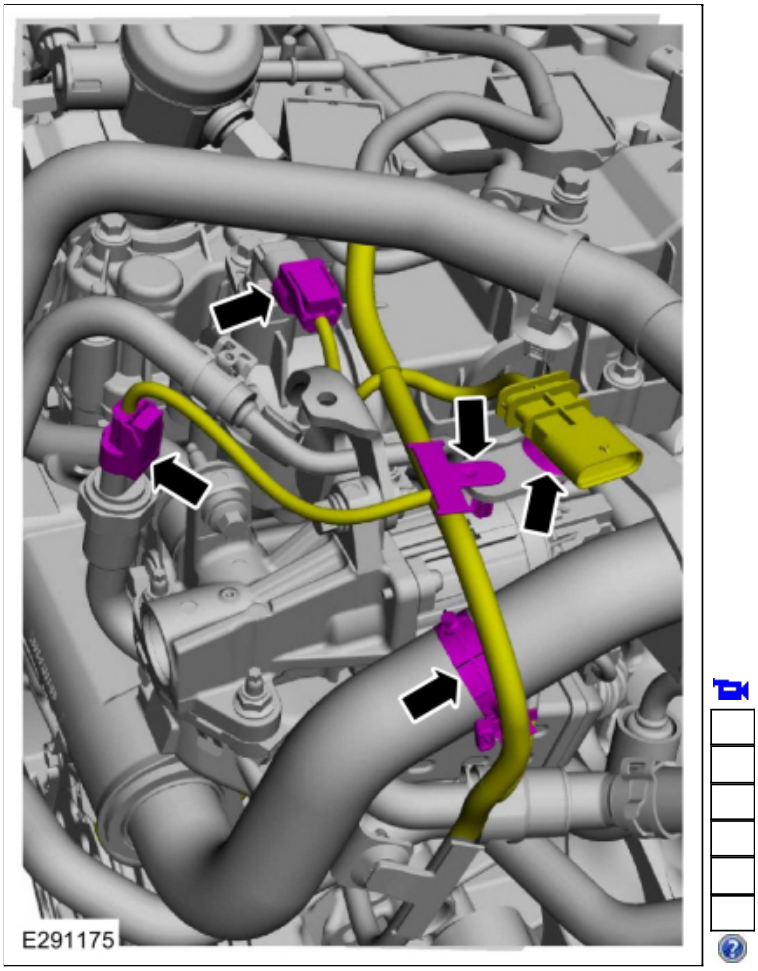
182.

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



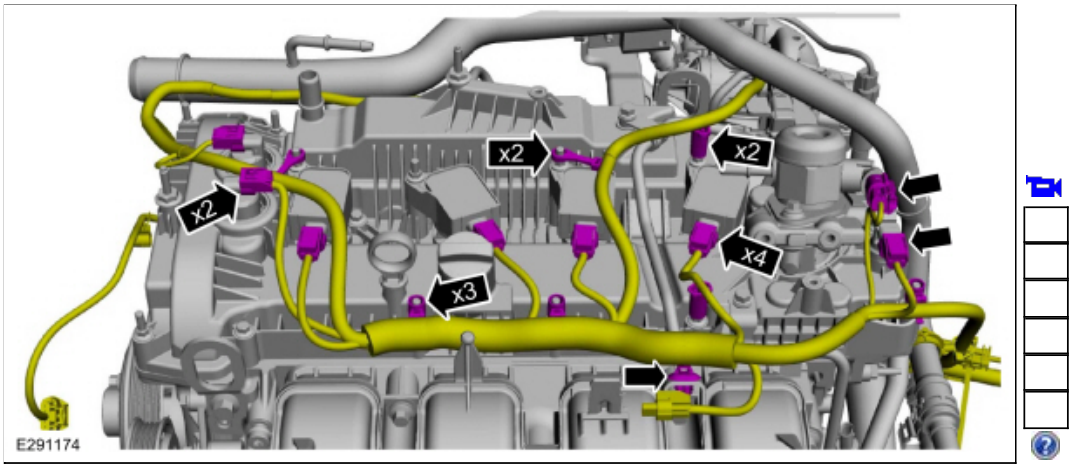
183.

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



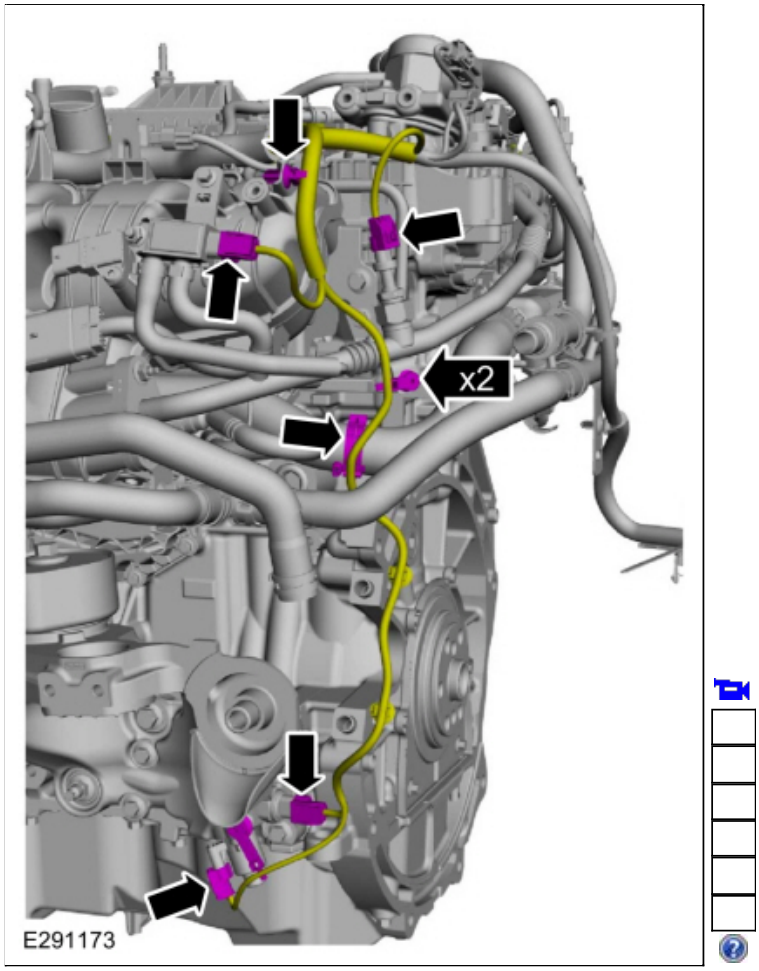
184.

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



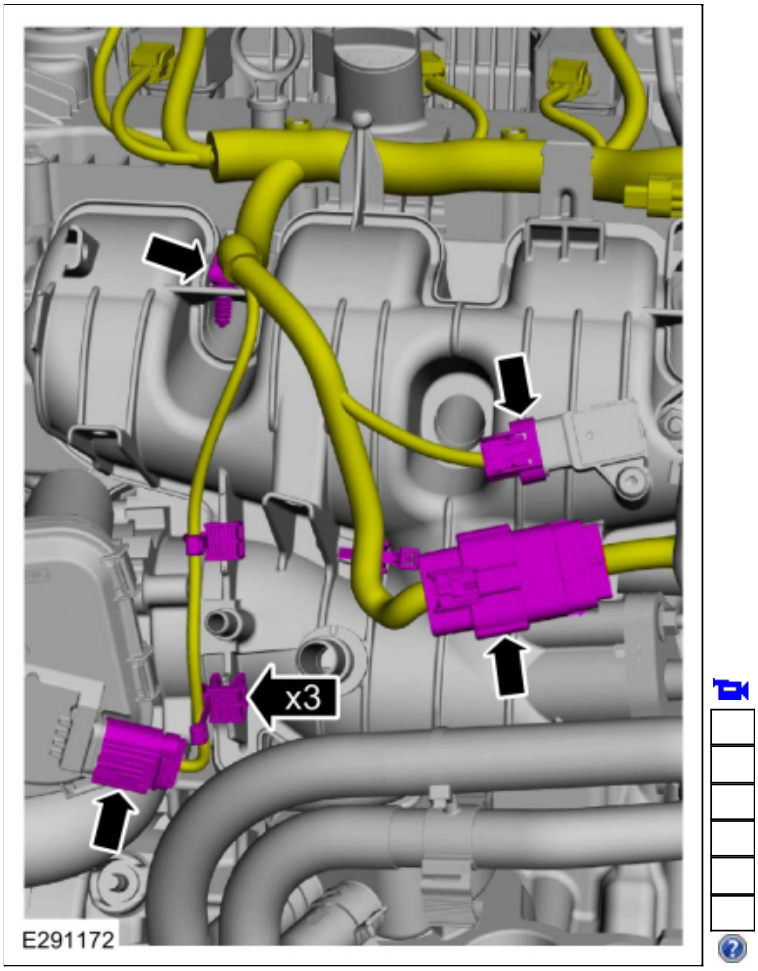
185.

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



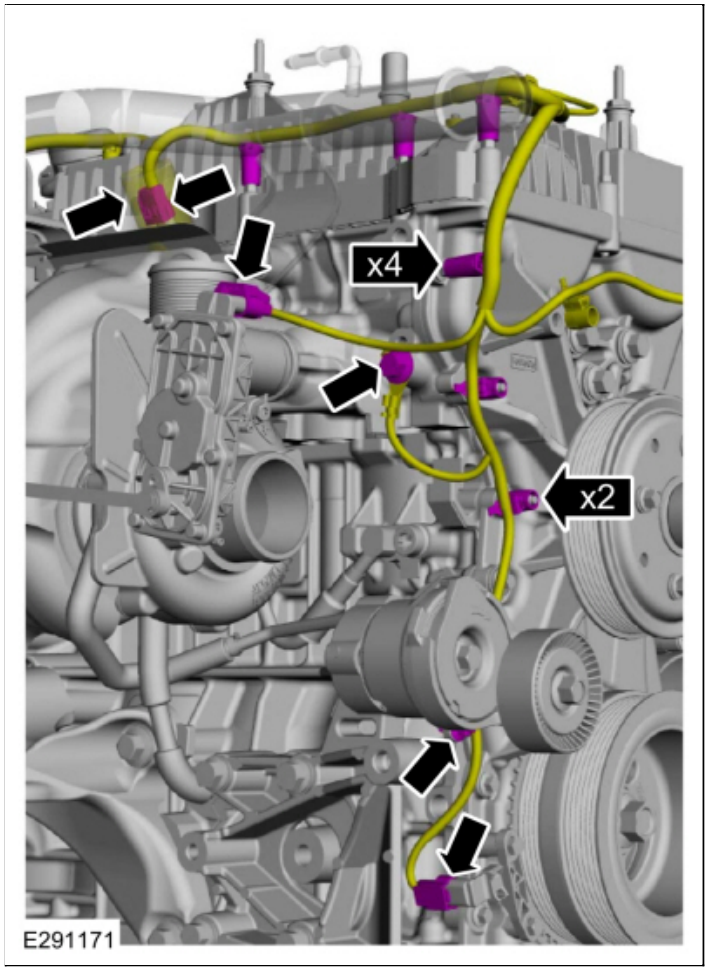
186.

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

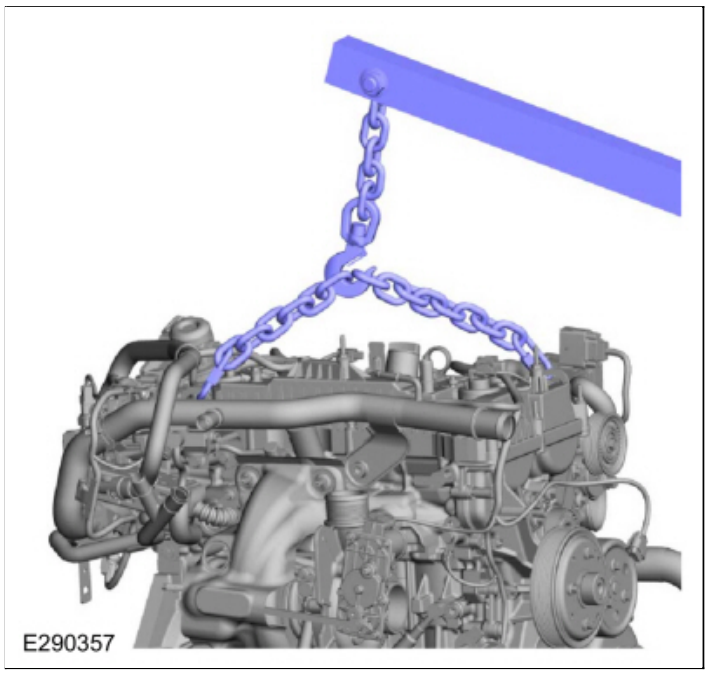


187.

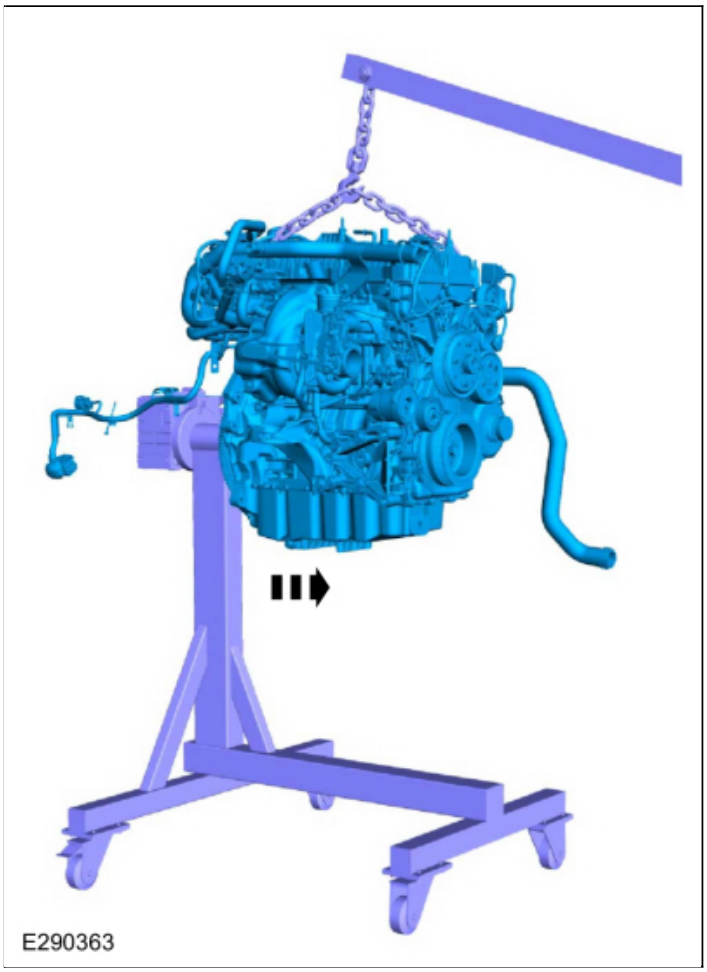
- Attach the wiring harness retainers.
- Connect the wiring harness electrical connectors.
- Install the ground and the bolt.
  Torque: 177 lb.in (20 Nm)



188. Install the engine lift equipment.



189. Using a floor crane, remove the engine from the mounting stand.
Use the General Equipment: Mounting Stand



190.

- **NOTE:** *Special bolts are used for installation. Do not use standard bolts.*

  Install the flexplate and the new bolts finger-tight.
- Install Special Service Tool: 303-103 (T74P-6375-A) Holding Tool, Flywheel.
- Tighten the bolts in sequence shown in 3 stages.
  Torque:
  Stage 1: 37 lb.ft (50 Nm)
  Stage 2: 59 lb.ft (80 Nm)
  Stage 3: 83 lb.ft (112 Nm)