

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

2013 ENGINE**Engine Mechanical - 2.0L - Transit Connect****SPECIFICATIONS****MATERIAL SPECIFICATIONS****MATERIAL SPECIFICATIONS**

Item	Specification	Fill Capacity
High Temperature 4x4 Front Axle and Wheel Bearing Grease XG-11	WSS-M1C267-A1	-
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D	-
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)	WSS-M2C945-A	4.25L (4.5 qt) includes filter change
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Motorcraft® Silicone Gasket Remover ZC-30	-	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	-

GENERAL SPECIFICATIONS**GENERAL SPECIFICATIONS**

Item	Specification
Engine	
Displacement	2.0L
No. of cylinders	4
Bore/stroke	87.5/83.1
Firing order	1-3-4-2
Oil pressure (hot @ 2,000 RPM)	200-268 kPa (29-39 psi)
Engine weight (without accessory drive components and flexplate)	115.8 kg (255.3 lb)
Engine and transaxle assembly weight	203.8 kg (449.3 lb)

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(without accessory drive components)	
Cylinder Block	
Cylinder bore diameter	87.5-87.53 mm (3.444-3.445 in)
Cylinder bore maximum out-of-round	0.008 mm (0.0003 in)
Main bearing bore diameter	57.020-57.038 mm (2.244-2.245 in)
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	
Diameter (1)	87.5-87.51 mm (3.444-3.445 in)
Diameter (2)	87.51-87.52 mm (3.4452-3.4456 in)
Diameter (3)	87.52-87.53 mm (3.444-3.446 in)
Piston-to-bore clearance	0.025-0.045 mm (0.0009-0.0017 in)
Ring groove width - top	1.203-1.205 mm (0.0473-0.0474 in)
Ring groove width - 2nd	1.17-1.19 mm (0.0460-0.0468 in)
Ring groove width - oil	2.501-2.503 mm (0.0984-0.0985 in)
Piston skirt coating thickness	0.008-0.020 mm (0.0003-0.0007 in)
Piston Pin	
Diameter	20.995-21.0 mm (0.8266-0.8268 in)
Length	59.6-60.4 mm (2.346-2.377 in)
Piston-to-pin clearance	0.008-0.016 mm (0.0003-0.0006 in)
Pin-to-rod clearance	Press fit
Cylinder Head	
Cylinder head flatness	0.08 mm (0.0031 in) maximum overall, a maximum of 0.05 mm (0.0019 in) within 150 mm (5.9 in)
Valve lift @ zero lash (exhaust)	7.7 mm (0.30 in)
Valve lift @ zero lash (intake)	8.8 mm (0.35 in)
Valve guide diameter	5.509-5.539 mm (0.216-0.218 in)
Valve seat width - intake/exhaust	0.99-1.84 mm (0.038-0.072 in)
Valve seat angle	45 degrees
Valve seat runout	0.075 mm (0.0029 in)
Valve lash adjuster bore diameter	31.00-31.03 mm (1.220-1.221 in)
Cam bore diameter	25.015-25.040 mm (0.984-0.985 in)
Valve	
Valve head diameter - intake	34.85-35.15 mm (1.372-1.383 in)
Valve head diameter - exhaust	29.85-30.15 mm (1.175-1.187 in)
Valve stem diameter - intake	5.470-5.485 mm (0.2153-0.2159 in)
Valve stem diameter - exhaust	5.465-5.480 mm (0.2151-0.2157 in)
Valve stem-to-guide clearance - intake	0.0027 mm (0.0001 in)
Valve stem-to-guide clearance - exhaust	0.0029 mm (0.00011 in)
Valve face runout	0.05 mm (0.001 in)
Valve face angle	45 degrees

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Valve Spring - Compression Pressure

Intake and exhaust (installed)	17.5 kg (38.667 lb)
Intake (valve open) 8.9 mm (0.35 in) of lift	44 kg (97.032 lb)
Exhaust (valve open) 7.4 mm (0.29 in) of lift	42 kg (93.338 lb)
Free length	44.92 mm (1.768 in)
Assembled height	37.9 mm (1.492 in)

Crankshaft

Main bearing journal diameter	51.980-52.000 mm (2.046-2.047 in)
Production repair	51.730-51.750 mm (2.036-2.037 in)
Main bearing clearance	0.017-0.047 mm (0.0007-0.0018 in)
Connecting rod journal diameter	49.980-50.000 mm (1.967-1.968 in)
Production repair	49.730-49.750 mm (1.957-1.958 in)
End play	0.22-0.43 mm (0.008-0.016 in)

Rings

Width - top	1.17-1.185 mm (0.0460-0.0466 in)
Width - 2nd	1.197-1.199 mm (0.0471-0.0472 in)
Width - oil	2.38-2.45 mm (0.093-0.096 in)
Ring gap (in bore) - top	0.16-0.31 mm (0.006-0.012 in)
Ring gap (in bore) - 2nd	0.33-0.48 mm (0.012-0.018 in)
Ring gap (in bore) - oil	0.2-0.7 mm (0.007-0.027 in)

Valve Tappet

Diameter	30.97-30.98 mm (1.2192-1.2196 in)
Tappet-to-valve clearance - intake	0.22- 0.28 mm (0.008-0.011 in)
Tappet-to-valve clearance - exhaust	0.27-0.33 mm (0.010-0.013 in)
Tappet-to-bore clearance	0.02-0.06 mm (0.0007-0.0023 in)

Camshaft

Lobe lift - intake	8.24999 mm (0.324 in)
Lobe lift - exhaust	7.80007 mm (0.307 in)
Runout (1) ⁽¹⁾	0.03 mm (0.001 in)
Thrust clearance	0.09-0.24 mm (0.003-0.009 in)
Journal diameter	24.96-24.98 mm (0.982-0.983 in)
Journal-to-bore clearance	0.035-0.080 mm (0.001-0.003 in)

Connecting Rod

Bearing clearance	0.027-0.052 mm (0.001-0.002 in)
Bearing thickness	1.496-1.520 mm (0.058-0.059 in)
Crank bore diameter	53.025-53.045 mm (2.087-2.088 in)
Pin bore diameter	20.965-20.985 mm (0.825-0.826 in)
Length (center to center)	154.8 mm (6.094 in)
Side clearance	1.95-3.05 mm (0.076-0.120 in)
Axial clearance	0.14-0.36 mm (0.005-0.014 in)

No. 3 Journal - Supported by No. 1 and No. 5 journals.

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(1)

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Description	Nm	lb-ft	lb-in
Accessory drive belt idler pulley bolt	25	18	-
Accessory drive belt splash shield bolts	9	-	80
A/C compressor bolts and stud bolt	25	18	-
A/C compressor tube bracket nuts	10	-	89
A/C tube-to-compressor nut	15	-	133
Bellhousing-to-engine bolts	48	35	-
Bellhousing-to-engine stud bolt	48	35	-
Bellhousing-to-oil pan bolts	48	35	-
Camshaft bearing caps ⁽¹⁾	-	-	-
Camshaft drive gear bolts	72	53	-
Connecting rod bearing cap bolts ⁽¹⁾	-	-	-
Coolant degas bottle bolt	8	-	71
Coolant outlet bolts	10	-	89
Coolant pump bolts	10	-	89
Coolant pump pulley bolts	20	-	177
Crankshaft rear seal with retainer plate bolts ⁽¹⁾	-	-	-
Crankshaft Position (CKP) sensor bolts ⁽¹⁾	-	-	-
Crankshaft pulley bolt ⁽¹⁾	-	-	-
Crankcase vent oil separator bolts	10	-	89
Cylinder head bolts ⁽¹⁾	-	-	-
Cylinder Head Temperature (CHT) sensor	12	-	106
EGR tube	55	41	-
EGR valve bolts	20	-	177
Engine front cover bolts ⁽¹⁾	-	-	-
Engine front cover-to-oil pan bolts	10	-	89
Engine ground wire bolt	48	35	-
Engine lifting eye bolts	45	33	-
Engine mount bolts	48	35	-
Engine mount nuts	90	66	-
Engine Oil Pressure (EOP) switch	15	-	133
Engine oil filter ⁽²⁾	-	-	-
Engine plug bolt	20	-	177
Engine-to-bellhousing bolts	48	35	-

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Engine-to-bellhousing stud bolt	48	35	-
Exhaust manifold heat shield bolts	10	-	89
Exhaust manifold nuts ⁽¹⁾	-	-	-
Exhaust manifold studs	17	-	150
Flexplate bolts ⁽¹⁾	-	-	-
Fuel rail bolt	25	18	-
Heated Oxygen Sensor (HO2S) and Catalyst Monitor Sensor (CMS) wire connector bracket nuts	25	18	-
Ignition coil-on-plug bolts	10	-	89
Intake manifold bolts	18	-	159
Intermediate shaft bracket bolts	48	35	-
Knock Sensor (KS)	20	-	177
Lifting eye bolts	45	33	-
Main bearing beam bolts ⁽¹⁾	-	-	-
Negative battery cable ground bolt	10	-	89
Negative battery terminal ground wire nut	10	-	89
Oil cooler bolt	34	25	-
Oil filter adapter bolts	25	18	-
Oil level indicator tube bolt	10	-	89
Oil pan drain plug	28	21	-
Oil pan bolts ⁽¹⁾	-	-	-
Oil pan-to-bellhousing bolts	48	35	-
Oil pump drive chain tensioner shoulder bolt	10	-	89
Oil pump drive chain tensioner bolt	10	-	89
Oil pump bolts ⁽¹⁾	-	-	-
Oil pump screen and pickup tube bolts	10	-	89
Oil pump sprocket bolt	25	18	-
Oil squirters	4	-	35
Positive battery cable nut	10	-	89
Power steering tube bolt	18	-	159
Power steering tube bracket nut	20	-	177
Power steering tube clip bolt	10	-	89
Radio interference capacitor bracket bolt	10	-	89
Radio interference capacitor ground bolt	10	-	89
Spark plugs	12	-	106
Starter motor bolt	35	26	-
Starter motor stud bolt	35	26	-
Starter relay large nut	12	-	106
Starter relay small nut	5	-	44
Thermostat housing bolts	10	-	89

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Timing chain guide bolts	10	-	89
Timing chain tensioner bolts	10	-	89
Torque converter-to-flexplate nuts	35	26	-
Transaxle mounting nut mount plate center nut	150	111	-
Transaxle mounting nut mount plate outer nuts	48	35	-
Transaxle roll-restrictor bolts	70	52	-
Valve cover bolts ⁽¹⁾	-	-	-
Wiring harness bracket bolts	10	-	89

(1) See procedure for specification.

(2) Tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

DESCRIPTION AND OPERATION

ENGINE

The 2.0L 4-cylinder engine has the following features:

- Dual overhead camshaft
- Four valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- Aluminum cylinder head
- Aluminum cylinder block
- Electronic ignition system with coil-on-plug 4 ignition coils

The 2.0L engine is a 4 valve-per-cylinder, dual overhead camshaft engine. The engine uses a coil-on-plug ignition system. The cylinder block is made of aluminum and the bearing caps are integrated into the ladder assembly. An aluminum oil pan bolts to the bottom of the lower cylinder block and to the transmission to provide greater strength. The camshafts are mounted in the cylinder heads and act against valve tappets to open and close the valves. The camshafts are driven off the front of the cylinder head by one timing chain. The chain is driven by a sprocket that is located on the crankshaft. The piston assembly is an aluminum piston with a cast iron connecting rod. The oil pump is driven by the crankshaft via a dedicated chain that is driven by the same sprocket that drives the timing chain.

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 valve cover, contains the following:

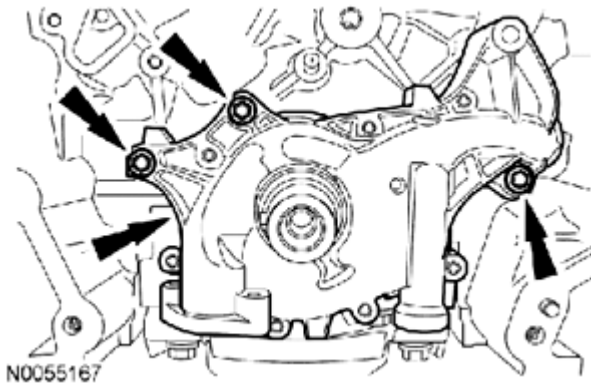


Fig. 1: Identifying Engine Code Information Label
Courtesy of FORD MOTOR CO.

Item	Description
1	Engine part number
2	Bar code
3	Dearborn engine plant
4	Engine displacement
5	Bar code
6	Running number
7	Engine build date (DDMMYY)
8	Plant shift line

Engine Cylinder Identification

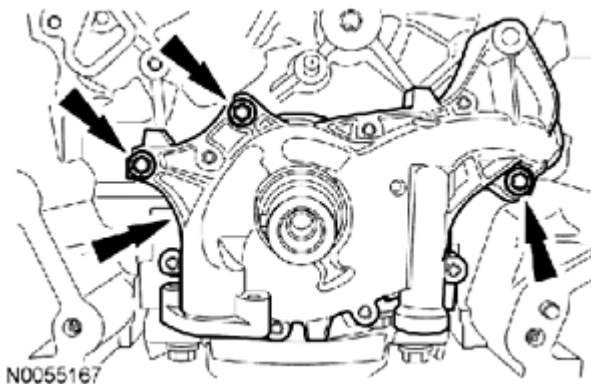


Fig. 2: Engine Cylinder Identification
Courtesy of FORD MOTOR CO.

Exhaust Emission Control System

Operation and necessary maintenance of the exhaust emission control devices used on this engine are covered in the **ENGINE CONTROLS - INTRODUCTION (EXCEPT DIESEL & HYBRID) (SECTION 0)** .

Induction System

The SFI provides the fuel/air mixture needed for combustion in the cylinders. The 4 solenoid-operated fuel injectors:

- are mounted in the cylinder head.
- meter fuel into the air intake stream in accordance with engine demand.
- are positioned so that their tips direct fuel just ahead of the engine intake valves.
- supply fuel from the fuel tank with a fuel pump mounted in the fuel tank.

A constant fuel pressure is maintained across the fuel injectors by the fuel pressure sensor. The fuel pressure sensor is positioned upstream from the fuel injectors on the fuel injection supply manifold.

PCV System

All engines are equipped with a closed-type PCV system recycling the crankcase vapors to the intake manifold.

Lubrication System

The engine lubrication system operates as follows:

- Oil is drawn into the oil pump through the oil pump screen cover and tube in the sump of the oil pan.
- Oil is pumped through the oil filter on the left front side of the cylinder block.
- Oil enters the main gallery where it is distributed to the crankshaft main journals and to the cylinder head.
- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is slung radially outward to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston ring assembly.

DIAGNOSIS AND TESTING

ENGINE

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

GENERAL PROCEDURES

VALVE CLEARANCE CHECK

1. Remove the valve cover. For additional information, refer to **VALVE COVER**.
2. Remove the 2 bolts and accessory drive belt splash shield.
 - To install, tighten to 9 Nm (80 lb-in).

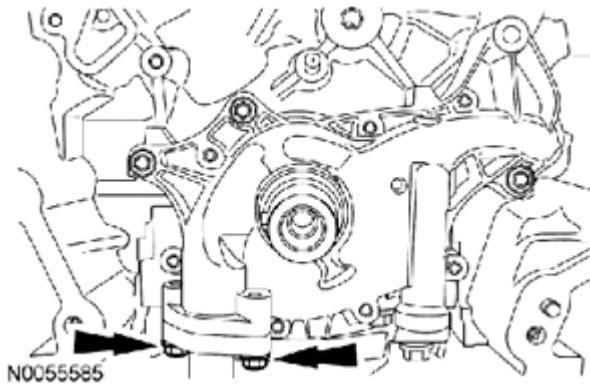


Fig. 3: Locating Accessory Drive Belt Splash Shield And Bolts
Courtesy of FORD MOTOR CO.

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, before removing the camshafts. Failure to measure all clearances prior to removing the camshafts will necessitate repeated removal and installation and wasted labor time.

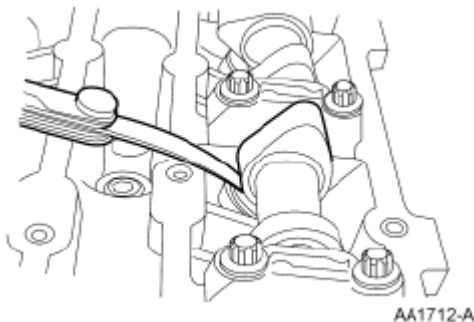


Fig. 4: Measuring Valve Clearance Using Feeler Gauge
Courtesy of FORD MOTOR CO.

3. Use a feeler gauge to measure each valve's clearance and record its location.

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 3.650 mm.

NOTE: The nominal desired mid-range clearance is:

- intake: 0.25 mm (0.0095 in).
- exhaust: 0.30 mm (0.0115 in).

Select tappets using this formula: $\text{tappet thickness} = \text{measured clearance} + \text{the existing tappet thickness} - \text{nominal clearance}$.

NOTE: The acceptable clearances after being fully installed are:

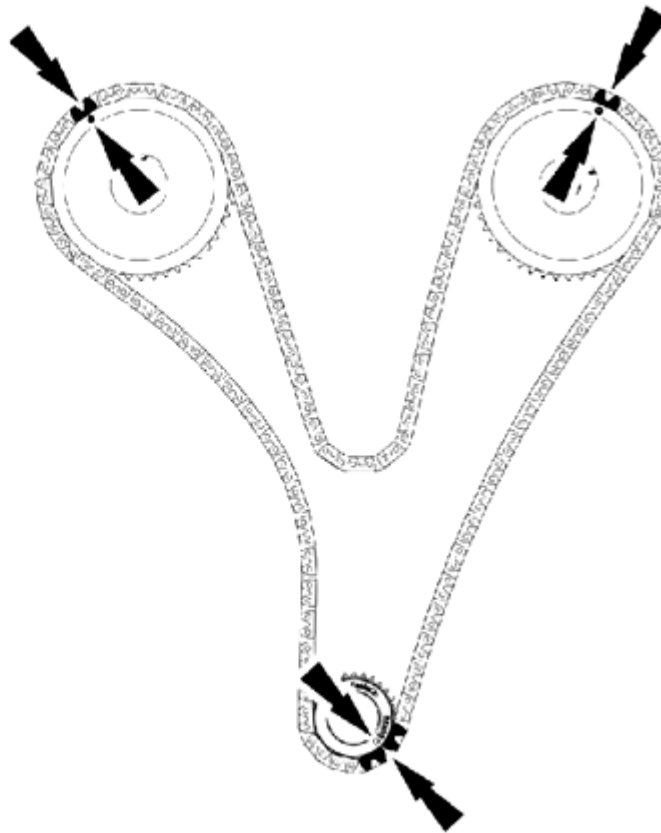
- intake: 0.22-0.28 mm (0.008-0.011 in).
- exhaust: 0.27-0.33 mm (0.010-0.013 in).

4. Select the closest tappet size to the ideal tappet thickness available and mark the installation location.
5. If any tappets do not measure within specifications, install new tappets in these locations. For additional information, refer to VALVE TRAIN COMPONENTS - EXPLODED VIEW and VALVE TAPPETS.

IN-VEHICLE REPAIR

INTAKE MANIFOLD

Intake Manifold (View 1 of 3)



N0117970

Fig. 5: View Of Intake Manifold (1 Of 3)
Courtesy of FORD MOTOR CO.

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Item	Part Number	Description
1	14A464	Engine Oil Pressure (EOP) switch electrical connector (part of 12C508)
2	-	Wire harness retainer (part of 12C508)
3	14A464	Electronic throttle control electrical connector (part of 12C508)
4	9D289	Fuel vapor return hose
5	14A464	Manifold Absolute Pressure (MAP) sensor electrical connector (part of 12C508)
6	14A624	Knock Sensor (KS) electrical connector with retainer (part of 12C508)

Intake Manifold (View 2 of 3)

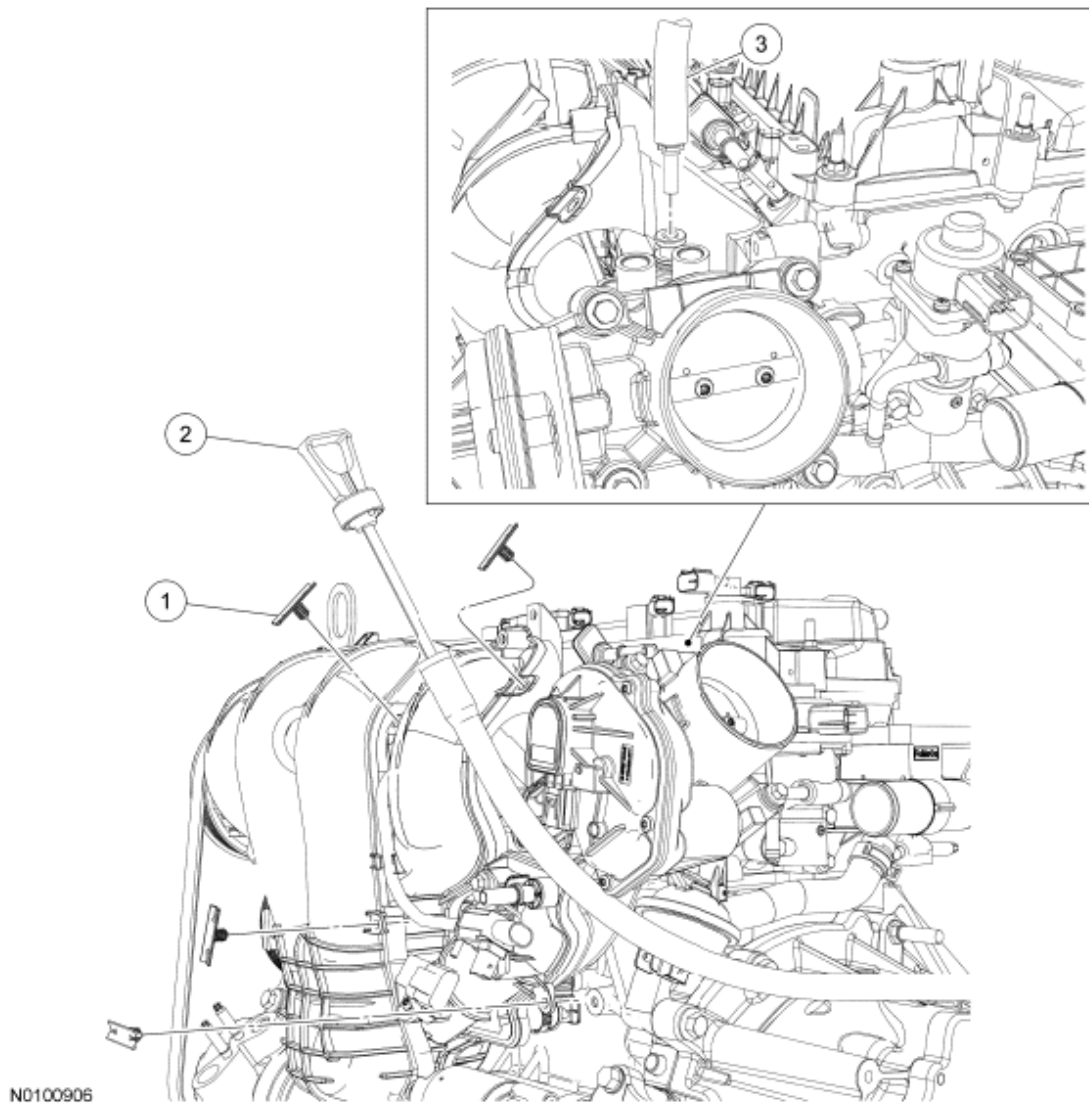


Fig. 6: View Of Intake Manifold (2 Of 3)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description

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1	13A506	Wire harness pin-type retainer (part of 12C508) (4 required)
2	7A020	Transaxle fluid indicator
3	19D848	Power brake booster vacuum tube

Intake Manifold (View 3 of 3)

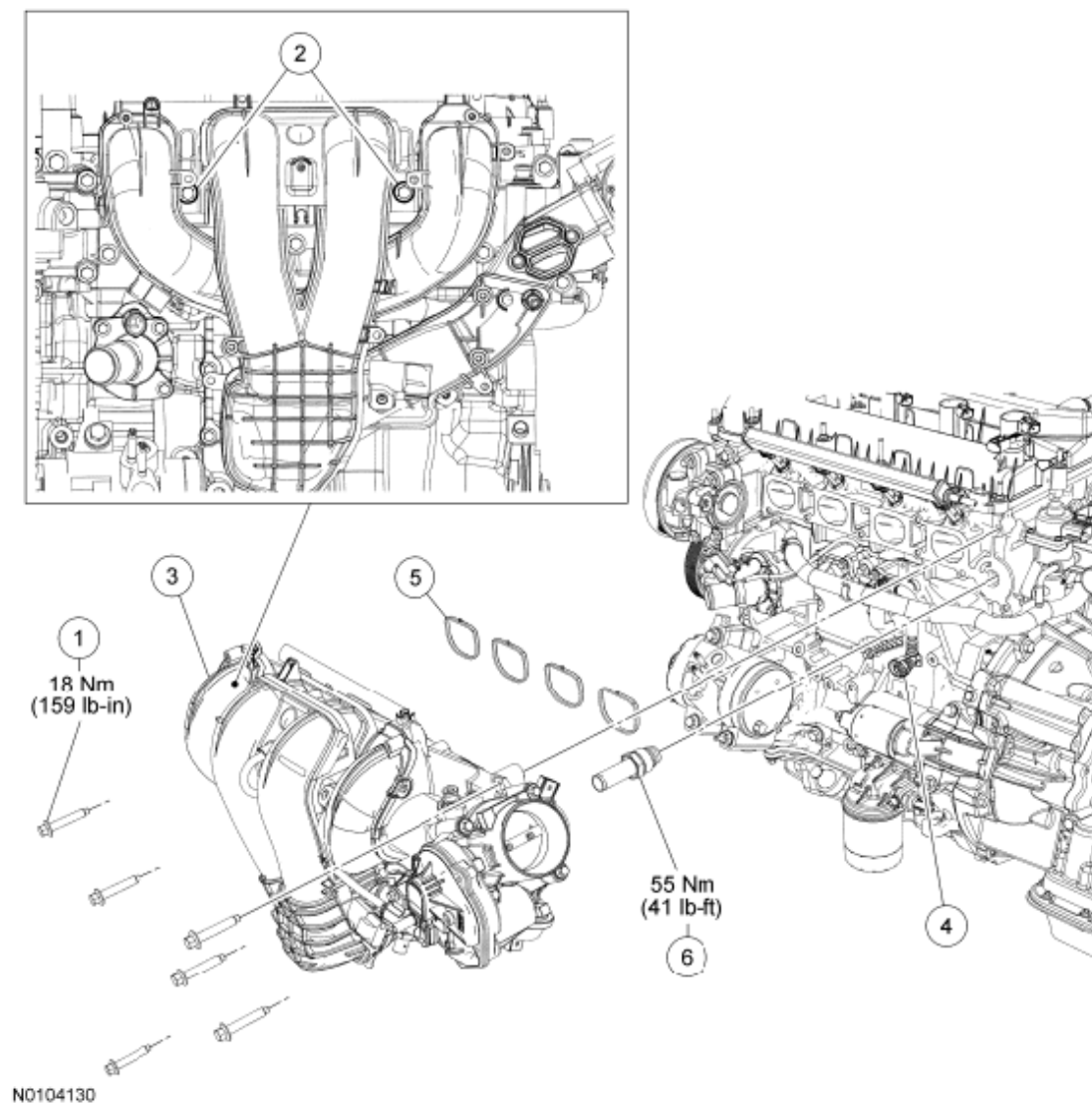


Fig. 7: View Of Intake Manifold (3 Of 3) With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W500311	Intake manifold bolt (6 required)
2	W500312	Intake manifold bolts
3	9424	Intake manifold
4	6758	PCV hose

5	9439	Intake manifold gasket
6	9E470	EGR tube

Removal

1. With vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the Air Cleaner (ACL) and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
3. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE** .
4. Remove the fuel rail. For additional information, refer to **FUEL CHARGING AND CONTROLS - 2.0L** .
5. Remove the transaxle fluid indicator.
6. Remove the intake manifold lower bolt.

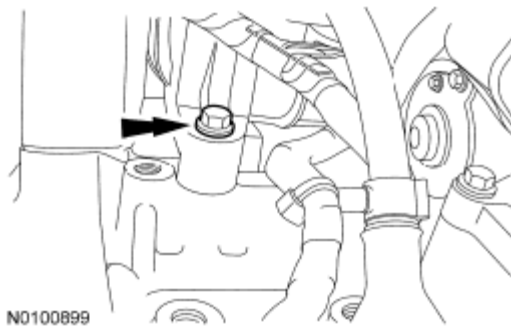


Fig. 8: Locating Intake Manifold Lower Bolt
Courtesy of FORD MOTOR CO.

7. Detach the engine wiring harness pin-type retainer from the intake manifold.



Fig. 9: Locating Engine Wiring Harness Pin-Type Retainer From Intake Manifold
Courtesy of FORD MOTOR CO.

8. Disconnect the Engine Oil Pressure (EOP) switch electrical connector and detach the wire harness retainer from the starter stud bolt.

9. Disconnect the electronic throttle control electrical connector.
10. Disconnect the fuel vapor return hose.
11. Disconnect the power brake booster vacuum tube.
 - Depress the quick release locking ring.
 - Pull the vacuum tube out of the quick release fitting.

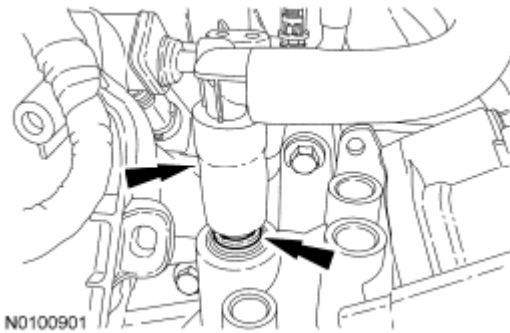


Fig. 10: Locating Vacuum Tube Of Quick Release Fitting
Courtesy of FORD MOTOR CO.

12. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector.
13. Detach the wiring harness retainer from the intake manifold and disconnect the Knock Sensor (KS) electrical connector.
14. Detach the 4 wiring harness pin-type retainers from the intake manifold.

NOTE: The 2 intake manifold bolts differ in length from rest of the bolts and also retain a crash bracket to the intake manifold. The 2 bolts are equipped with an attachment feature that allows them to be loosened but remain attached to the intake manifold. Do not attempt to remove the 2 bolts or the crash bracket from the intake manifold.

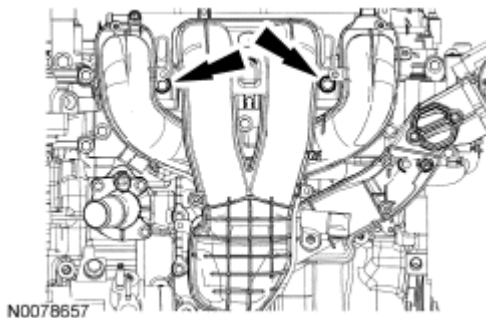


Fig. 11: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

15. Loosen the 2 intake manifold bolts.
16. Remove the 5 intake manifold bolts.

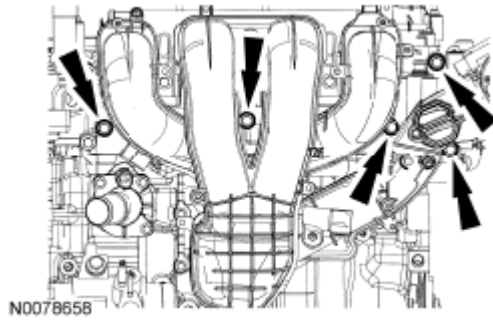


Fig. 12: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

17. Remove the EGR tube from the cylinder head.
18. Disconnect the PCV hose and remove the intake manifold.

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.

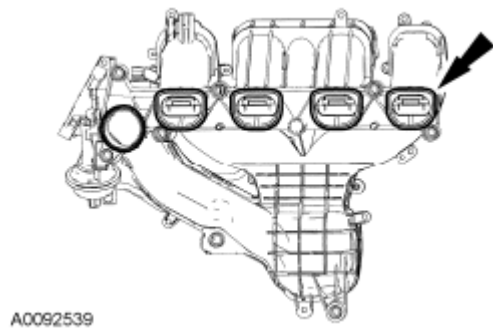


Fig. 13: Locating Intake Manifold Gaskets
Courtesy of FORD MOTOR CO.

1. Inspect and install new intake manifold gaskets if necessary.
2. Position the intake manifold and connect the PCV hose.
3. Install the EGR tube.
 - Tighten to 55 Nm (41 lb-ft).
4. Attach the wiring harness retainer to the intake manifold and connect the KS electrical connector.

NOTE: The 2 intake manifold bolts differ in length from rest of the bolts and also retain a crash bracket to the intake manifold. The 2 bolts are equipped with an attachment feature that allows them to be loosened but remain attached to the intake manifold. Do not attempt to remove the 2 bolts or the crash

bracket from the intake manifold.

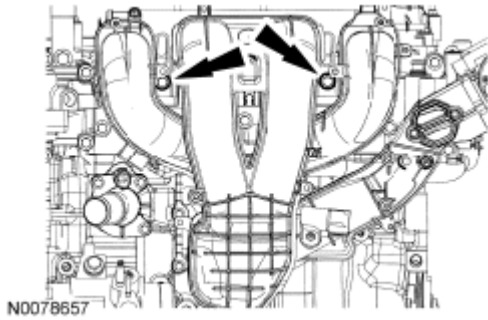


Fig. 14: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

5. Install the intake manifold and hand-tighten the 2 intake manifold bolts.
6. Install the 5 intake manifold mounting bolts.
 - Tighten all 7 bolts to 18 Nm (159 lb-in).

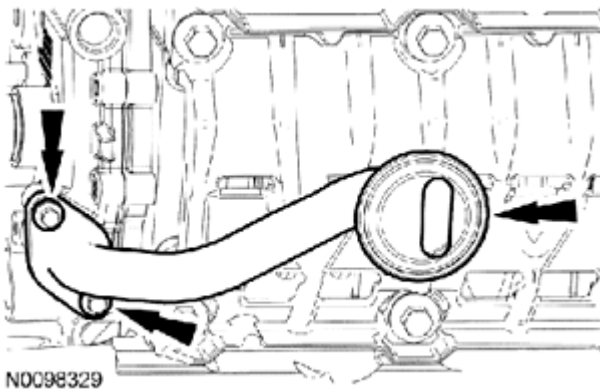


Fig. 15: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

7. Attach the 4 wiring harness pin-type retainers to the intake manifold.
8. Connect the MAP sensor electrical connector.
9. Connect the power brake booster vacuum tube.
 - Push the vacuum tube into the quick release fitting.

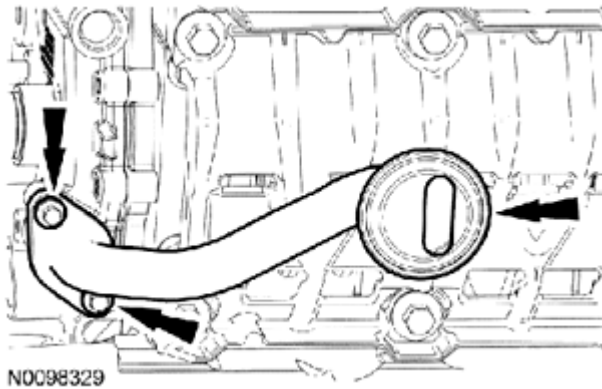


Fig. 16: Locating Vacuum Tube Of Quick Release Fitting
Courtesy of FORD MOTOR CO.

10. Connect the fuel vapor return hose.
11. Connect the electronic throttle control electrical connector.
12. Connect the EOP switch electrical connector and attach the wire harness retainer to the starter stud bolt.
13. Attach the engine wiring harness pin-type retainer to the intake manifold.



Fig. 17: Locating Engine Wiring Harness Pin-Type Retainer From Intake Manifold
Courtesy of FORD MOTOR CO.

14. Install the lower intake manifold bolt.
 - Tighten to 18 Nm (159 lb-in).

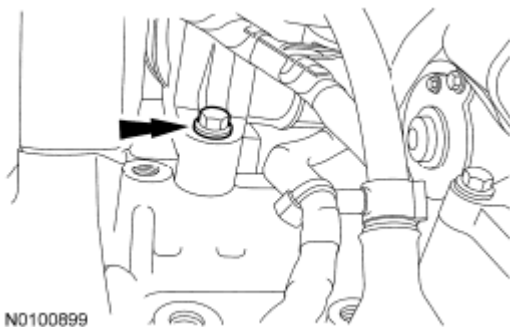


Fig. 18: Locating Intake Manifold Lower Bolt

Courtesy of FORD MOTOR CO.

15. Install the transaxle fluid indicator.
16. Install the fuel rail. For additional information, refer to **FUEL CHARGING AND CONTROLS - 2.0L** .
17. Install the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE** .
18. Install the Air Cleaner (ACL) and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .

VALVE COVER

MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

Valve Cover (View 1 of 2)

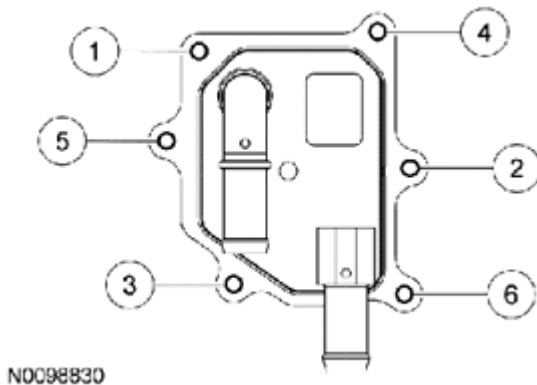


Fig. 19: Exploded View Of Valve Cover (1 Of 2) With Torque Specifications

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Camshaft Position (CMP) sensor electrical connector (part of 12C508)
2	14A464	Ignition coil-on-plug electrical connector (part of 12C508) (4 required)
3	W500215	Ignition coil-to-valve cover bolt (4 required)
4	12A192	Ignition coil (4 required)
5	14A464	Cylinder Head Temperature (CHT) sensor electrical connector (part of 12C508)
6	6853	Crankcase breather tube
7	14A169	Wire harness retainers (part of 12C508) (3 required)
8	-	Generator B+ wire harness retainer (3 required)
9	14A464	Generator electrical connector (part of 12C508)

10	W500031	Radio interference capacitor bracket bolt
11	W705661	Radio interference capacitor ground bolt
12	14K005	Radio interference capacitor bracket

Valve Cover (View 2 of 2)

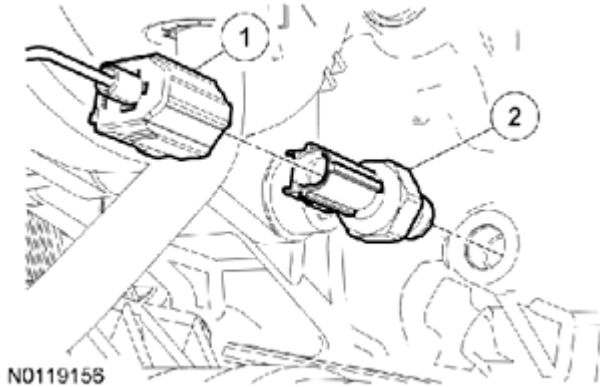


Fig. 20: Exploded View Of Valve Cover (2 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6C295	Valve cover bolt (2 required)
2	6C293	Valve cover stud bolt (12 required)
3	6K272	Valve cover
4	6K260	Valve cover gasket

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. Disconnect the Camshaft Position (CMP) sensor electrical connector.
2. Disconnect the 4 ignition coil-on-plug electrical connectors.
3. Remove the 4 ignition coil-to-valve cover bolts and the ignition coils.
4. Lift up the connector boot and disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.
5. Disconnect the crankcase breather tube from the valve cover.
6. Detach the 6 wiring harness retainers from the valve cover stud bolts.
7. Disconnect the generator electrical connector.
8. Remove the radio interference capacitor bracket bolt.
9. Remove the radio interference capacitor ground bolt and position the bracket aside.

10. Remove the 14 valve cover retainers, the valve cover and gasket.
 - Discard the valve cover gasket.

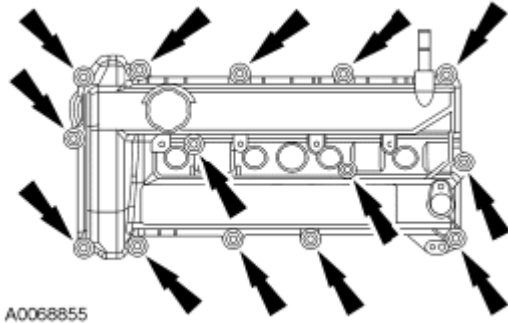


Fig. 21: Locating Valve Cover Retainers
Courtesy of FORD MOTOR CO.

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 which make leak paths.

1. Clean and inspect the sealing surfaces.
2. Apply silicone gasket and sealant to the locations shown in illustration.



N0117936

Fig. 22: Locating Sealant Applying Area On Valve Cover
Courtesy of FORD MOTOR CO.

NOTE: The valve cover must be secured within 4 minutes of silicone gasket application. If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep.

3. Install the valve cover, a new gasket and the 14 retainers.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

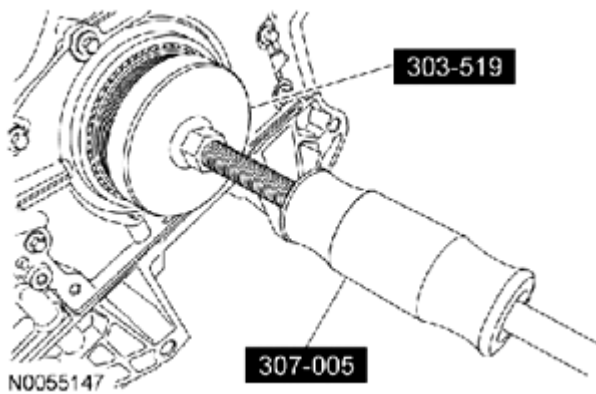


Fig. 23: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Position the radio interference capacitor bracket and install the bolt.
 - Tighten to 10 Nm (89 lb-in).
5. Install the radio interference capacitor ground bolt.
 - Tighten to 10 Nm (89 lb-in).
6. Connect the generator electrical connector.
7. Attach the 6 wiring harness retainers to the valve cover stud bolts.
8. Connect the crankcase breather tube on the valve cover.
9. Connect the CHT sensor electrical connector and install the connector boot.
10. Install the ignition coils and the 4 ignition coil-to-valve cover bolts.
 - Tighten to 10 Nm (89 lb-in).
11. Connect the 4 ignition coil-on-plug electrical connectors.
12. Connect the CMP sensor electrical connector.

LOWER END COMPONENTS - EXPLODED VIEW

Crankshaft Pulley and Crankshaft Front Seal

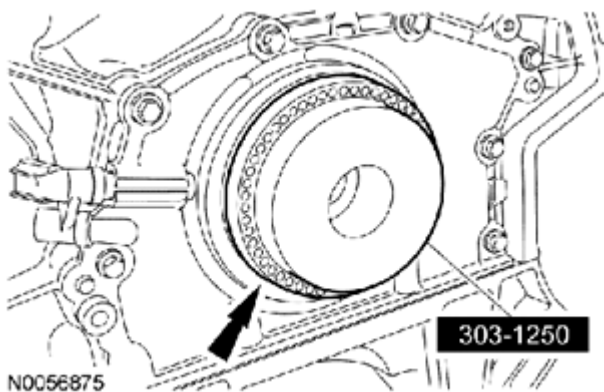


Fig. 24: Exploded View Of Crankshaft Pulley And Crankshaft Front Seal

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6K340	Crankshaft pulley bolt
2	-	Crankshaft pulley washer (part of 6K340)
3	6316	Crankshaft pulley
4	6700	Crankshaft front seal
5	6378	Diamond washer

Flexplate and Crankshaft Rear Seal With Retainer Plate

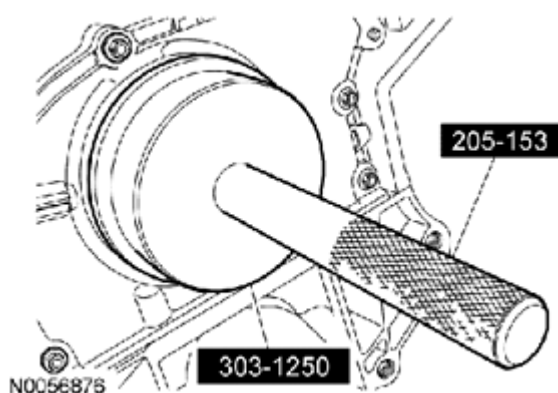


Fig. 25: Exploded View Of Flexplate And Crankshaft Rear Seal With Retainer Plate With Torque Specifications

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6379	Flexplate bolt (6 required)
2	6477	Flexplate
3	6730	Oil pan drain plug
4	W500215	Engine front cover bolt (4 required)
5	W706284	Oil pan bolt (2 required)
6	W500224	Oil pan bolt (11 required)
7	6675	Oil pan
8	W500212	Crankshaft rear oil seal with retainer plate bolt (6 required)
9	6K318	Crankshaft rear oil seal with retainer plate

1. For additional information, refer to the procedures in this information.

CRANKSHAFT PULLEY

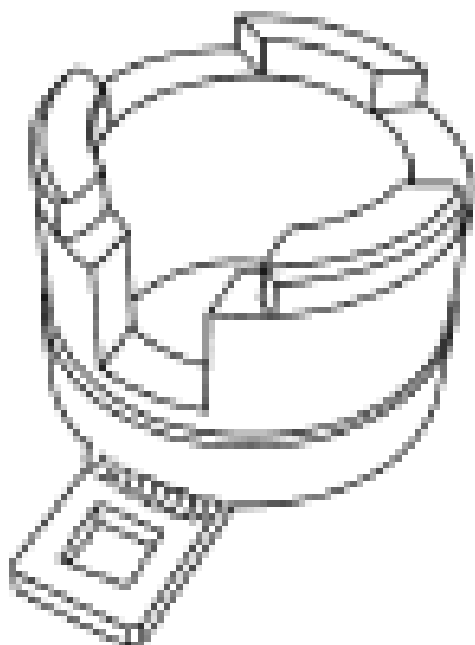
SPECIAL TOOLS

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Alignment Plate, Camshaft
303-465 (T94P-6256-CH)

ST2645-A



Holding Tool, Crankshaft Damper
303-1416

ST3054-A

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



Timing Peg, Crankshaft TDC
303-507

GENERAL EQUIPMENT

6 mm x 18 mm bolt

MATERIAL 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)	WSS-M2C945-A

Removal

NOTE: 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, using diamond washers between the flange faces on each part. 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.

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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the RH wheel and tire. For additional information, refer to **WHEELS AND TIRES**.
3. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE**.
4. Remove the valve cover. For additional information, refer to **VALVE COVER**.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

5. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

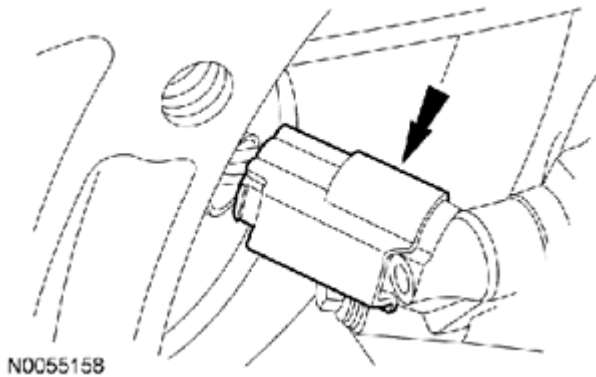


Fig. 26: Turning Crankshaft Clockwise
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE: The camshaft timing slots are offset. If the Camshaft Alignment Plate cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

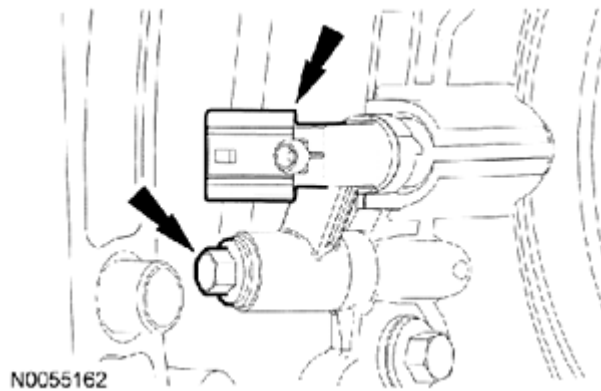


Fig. 27: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

6. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.
7. Remove the engine plug bolt.

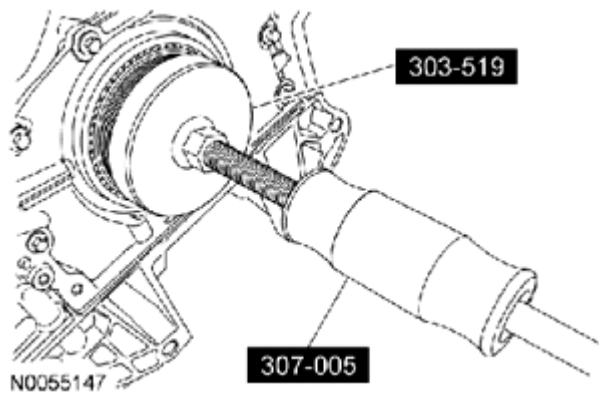


Fig. 28: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft TDC Timing Peg 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.

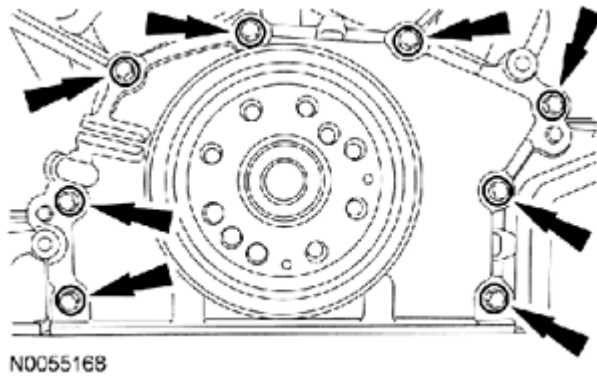


Fig. 29: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

8. Install the Crankshaft TDC Timing Peg.

NOTE: The crankshaft must remain in the Top Dead Center (TDC) position during removal of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the Crankshaft Damper Holding Tool, and the bolt should be removed using an air impact wrench (1/2-in drive minimum).

NOTE: The crankshaft sprocket diamond washer may come off with the crankshaft pulley. The diamond washer must be replaced. Remove and discard the diamond washer. If the diamond washer is not installed, engine damage may occur.

9. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley. Use an air impact wrench to remove the crankshaft pulley bolt.
 - Remove and discard the crankshaft pulley bolt and washer.
 - Remove the crankshaft pulley.
 - Remove the diamond washer and discard.

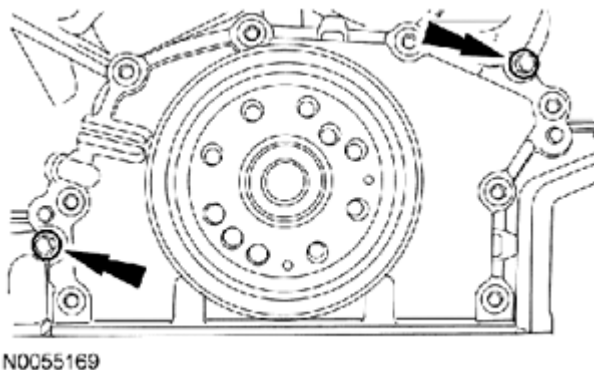


Fig. 30: Holding Crankshaft Pulley

Courtesy of FORD MOTOR CO.

Installation

1. Install a new diamond washer.

NOTE: Do not install the crankshaft pulley bolt at this time.

NOTE: Apply clean engine oil on the seal area before installing.

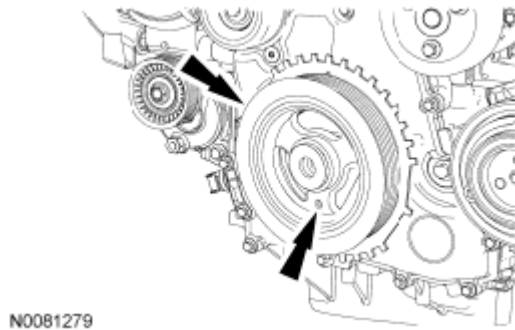


Fig. 31: Locating Crankshaft Pulley Position
Courtesy of FORD MOTOR CO.

2. Position the crankshaft pulley onto the crankshaft with the hole in the pulley at the 6 o'clock position.

NOTE: Only hand-tighten the 6 mm bolt or damage to the front cover can occur.

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

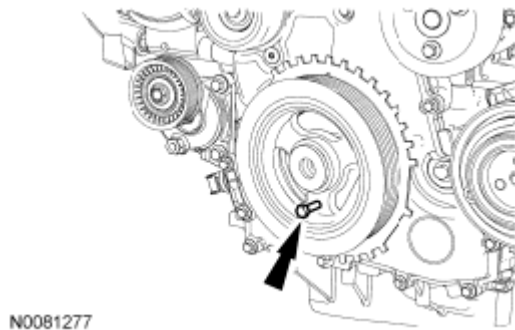


Fig. 32: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

3. Install a standard 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.

NOTE: The crankshaft must remain in the Top Dead Center (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 Crankshaft Damper Holding Tool and the bolt should be installed using hand tools only.

NOTE: Do not reuse the crankshaft pulley bolt.

4. Install a new crankshaft pulley bolt. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley, tighten the crankshaft pulley bolt in 2 stages:
 - Stage 1: Tighten to 100 Nm (74 lb-ft).
 - Stage 2: Tighten an additional 90 degrees (one-fourth turn).

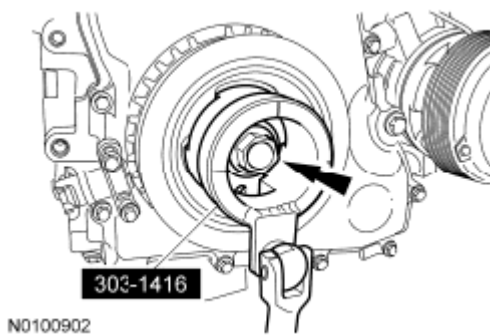


Fig. 33: Holding Crankshaft Pulley
Courtesy of FORD MOTOR CO.

5. Remove the 6 mm x 18 mm bolt.

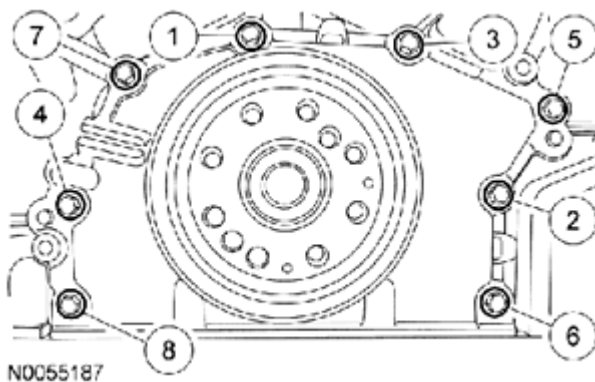


Fig. 34: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

6. Remove the Crankshaft TDC Timing Peg.

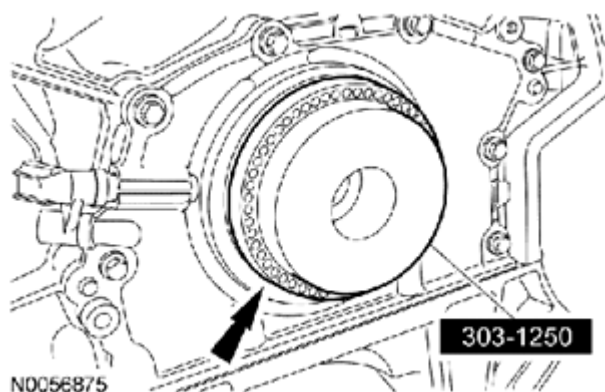


Fig. 35: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

7. Remove the Camshaft Alignment Plate.

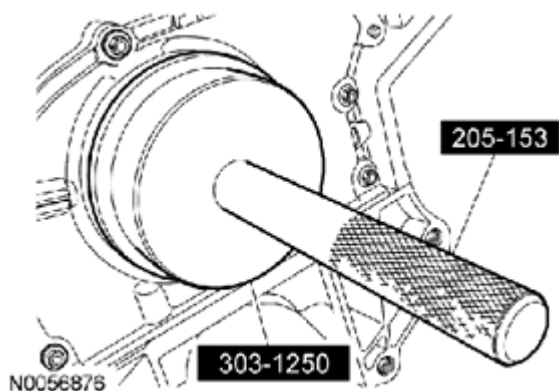


Fig. 36: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.

8. Turn the crankshaft clockwise one and three-fourths turns.
9. Install the Crankshaft TDC Timing Peg.

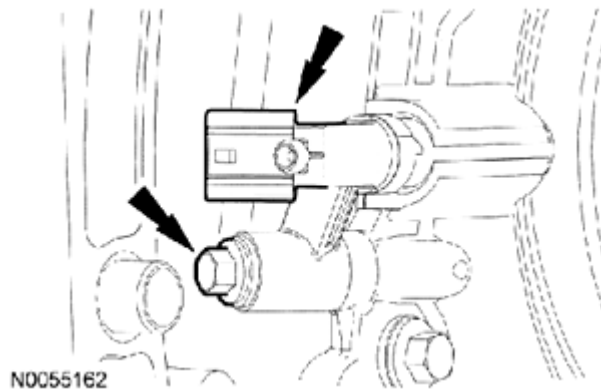


Fig. 37: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.

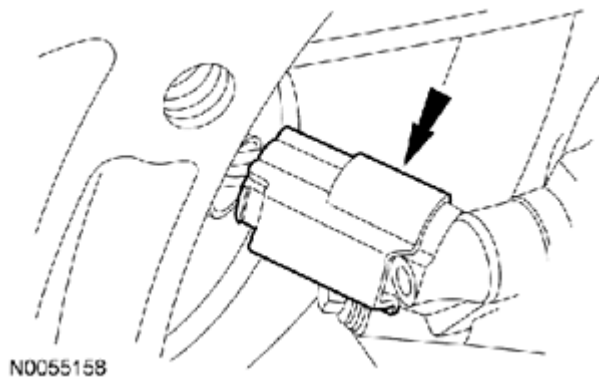


Fig. 38: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

10. Turn the crankshaft clockwise until the crankshaft contacts the Crankshaft TDC Timing Peg.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

11. Using the 6 mm x 18 mm bolt, check the position of the crankshaft pulley.
 - If it is not possible to install the bolt, the engine valve timing must be corrected by repeating this procedure.

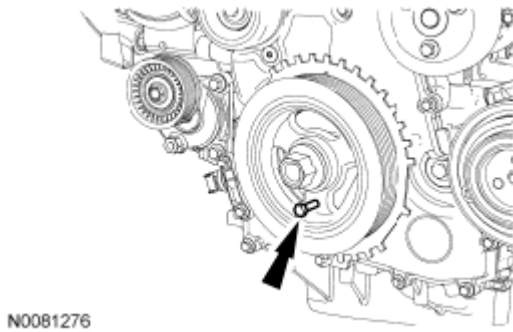


Fig. 39: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

12. Install the Camshaft Alignment Plate to check the position of the camshafts.
 - If it is not possible to install the Camshaft Alignment Plate, the engine valve timing must be corrected by repeating this procedure.

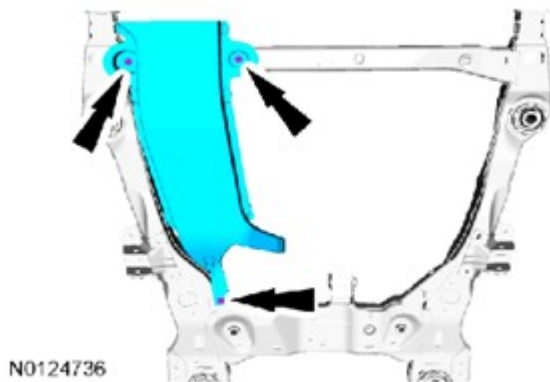


Fig. 40: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

13. Remove the Camshaft Alignment Plate.

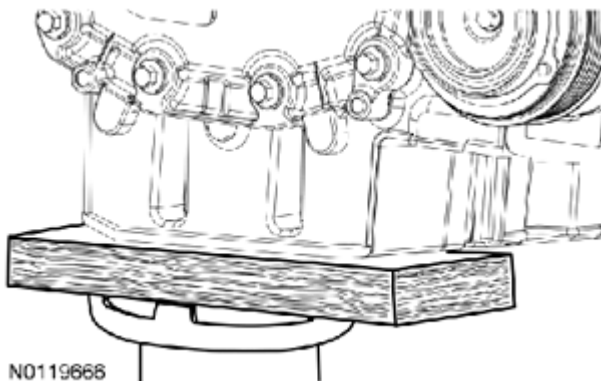


Fig. 41: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

14. Remove the 6 mm x 18 mm bolt.

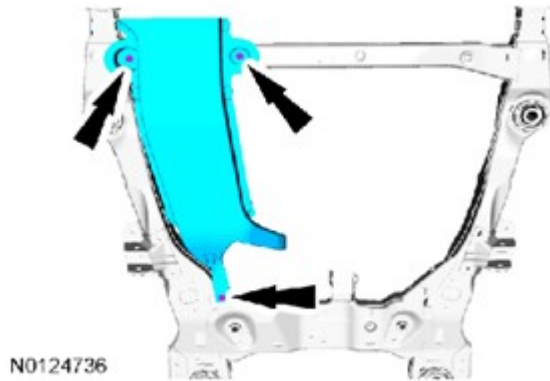


Fig. 42: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

15. Remove the Crankshaft TDC Timing Peg.

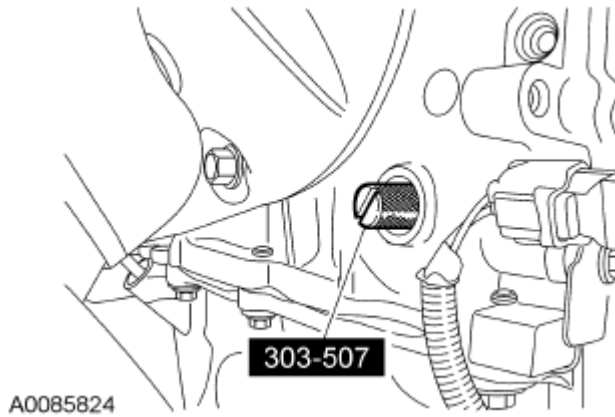


Fig. 43: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

16. Install the engine plug bolt.
 - Tighten to 20 Nm (177 lb-in).
17. Install the valve cover. For additional information, refer to **VALVE COVER**.
18. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE**.
19. Install the RF wheel and tire. For additional information, refer to **WHEELS AND TIRES**.

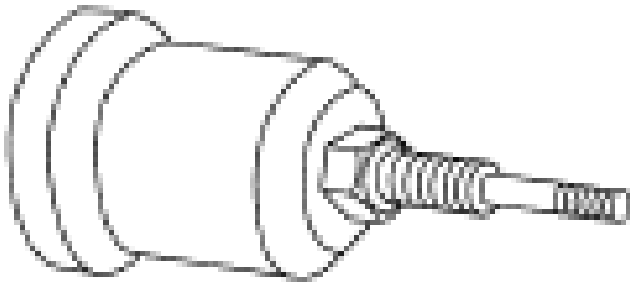
CRANKSHAFT FRONT SEAL

SPECIAL TOOLS

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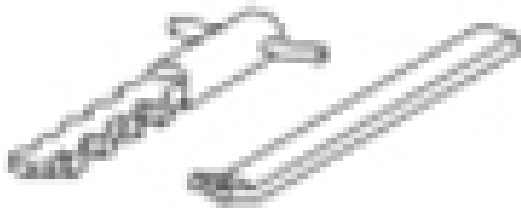
2013 Ford Transit Connect XLT Premium

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Installer, Camshaft Front Oil Seal
303-096 (T74P-6150-A)

ST1917-A



Remover, Oil Seal
303-409 (T92C-6700-CH)

ST1385-A

MATERIAL 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)	WSS-M2C945-A

Removal

NOTE: 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, using diamond washers between the flange faces on each part. 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.

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. Remove the crankshaft pulley. For additional information, refer to **LOWER END COMPONENTS - EXPLODED VIEW** and **CRANKSHAFT PULLEY**.

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

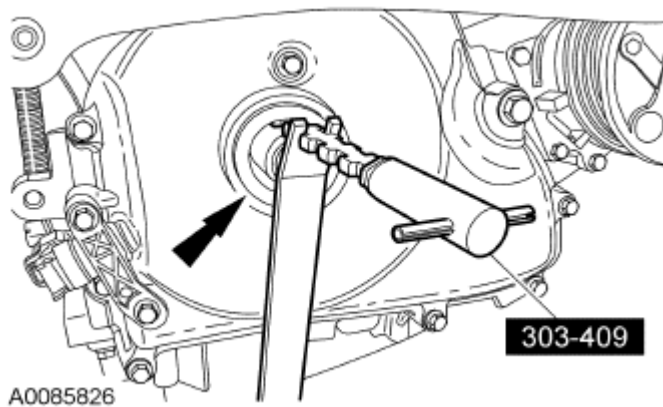


Fig. 44: Removing Crankshaft Front Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

2. Using the Oil Seal Remover, remove the crankshaft front oil seal.

Installation

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

NOTE: Lubricate the oil seal with clean engine oil.

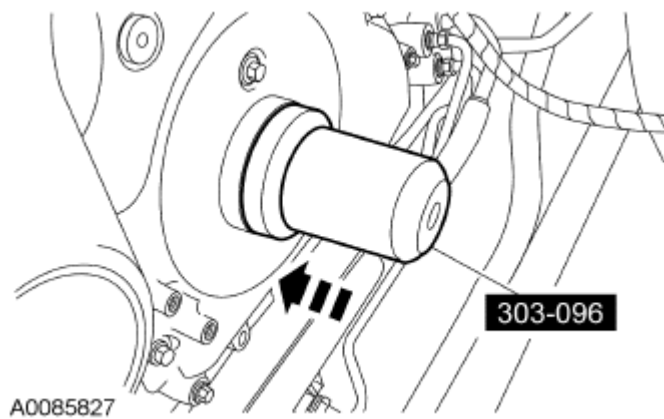


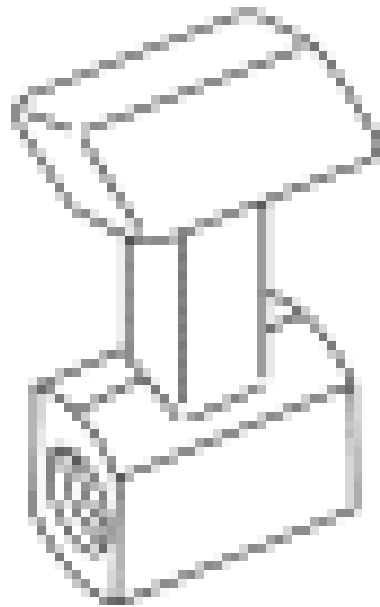
Fig. 45: Installing Crankshaft Front Oil Seal Using Camshaft Front Oil Seal Installer
Courtesy of FORD MOTOR CO.

1. Using the Camshaft Front Oil Seal Installer, install the crankshaft front oil seal.
2. Install the crankshaft pulley. For additional information, refer to **LOWER END COMPONENTS - EXPLODED VIEW** and **CRANKSHAFT PULLEY**.

FLEXPLATE

SPECIAL TOOLS

Holding Tool, Flywheel
303-103 (T74P-8375-A)

**ST2768-A****Removal**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 4F27E**.
3. Install the Flywheel Holding Tool and remove the 6 flexplate bolts and the flexplate. Discard the bolts.

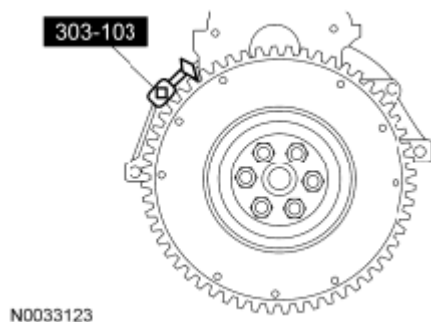


Fig. 46: Identifying Flywheel Holding Tool On Flexplate
Courtesy of FORD MOTOR CO.

Installation

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

1. Install the flexplate.
2. Install the Flywheel Holding Tool.

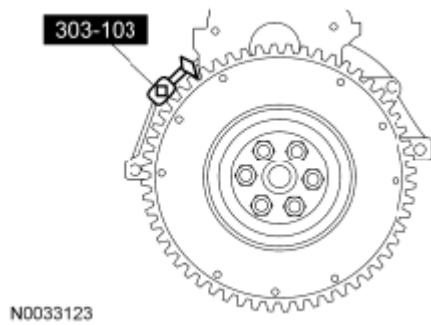


Fig. 47: Identifying Flywheel Holding Tool On Flexplate
Courtesy of FORD MOTOR CO.

3. Tighten the new bolts in the sequence shown in 3 stages:
 - Stage 1: Tighten to 50 Nm (37 lb-ft).
 - Stage 2: Tighten to 80 Nm (50 lb-ft).
 - Stage 3: Tighten to 112 Nm (83 lb-ft).

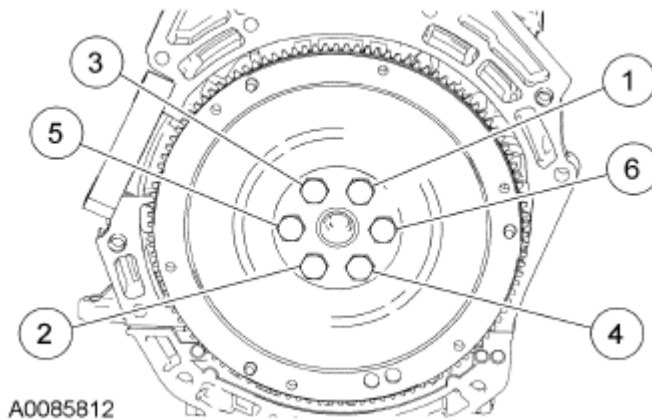
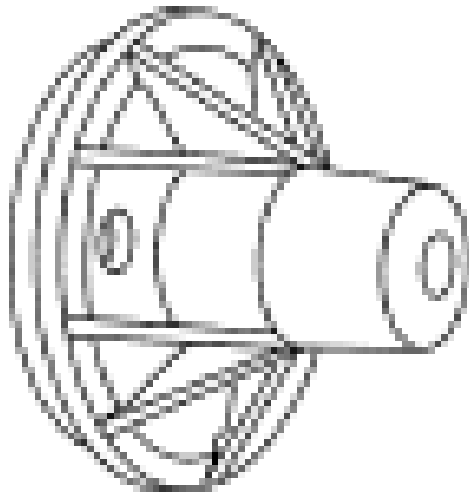


Fig. 48: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 4F27E**.

CRANKSHAFT REAR SEAL WITH RETAINER PLATE**SPECIAL TOOLS**



ST1506-A

Installer, Crankshaft Rear Main Oil Seal
303-328 (T88P-6701-B1)

MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
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)	WSS-M2C945-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Silicone Gasket Remover ZC-30	-

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the flexplate. For additional information, refer to **FLEXPLATE**.
3. Drain the engine oil.
 - Install the drain plug and tighten to 28 Nm (21 lb-ft).
4. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.

NOTE: If the oil pan is not removed damage to the rear oil seal retainer joint can occur.

5. Remove the 17 bolts and the oil pan.
6. Remove the 6 bolts and the crankshaft rear seal with retainer plate.

Installation

1. Using the Crankshaft Rear Main Oil Seal Installer, position the crankshaft rear oil seal with retainer plate onto the crankshaft.

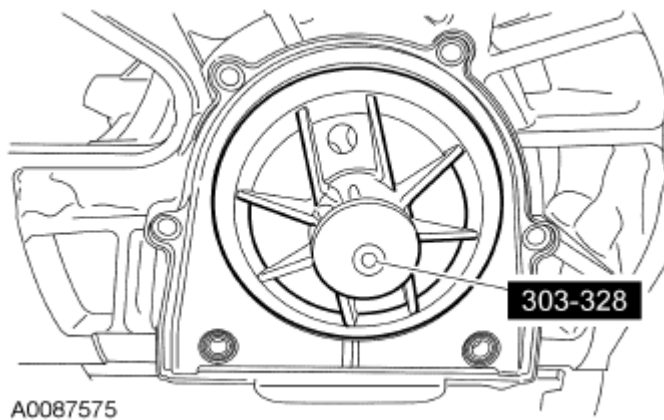


Fig. 49: Identifying Crankshaft Rear Main Oil Seal Installer
Courtesy of FORD MOTOR CO.

2. Install the crankshaft rear seal with retainer plate and 6 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

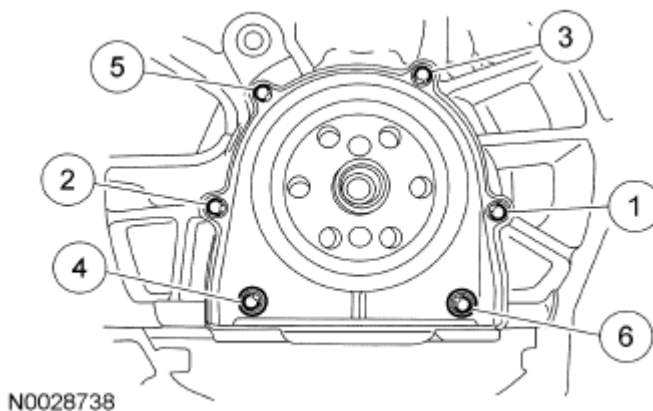


Fig. 50: Crankshaft Rear Oil Seal Retainer Plate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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. Clean and inspect all the oil pan, cylinder block and front cover flange mating surfaces.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

NOTE: The oil pan must be installed and the bolts tightened within 4 minutes of applying the silicone gasket and sealant.

4. Apply a 2.5 mm (0.10 in) bead of silicone gasket and sealant to the oil pan.
 - Install the oil pan and the 2 bolts finger-tight.

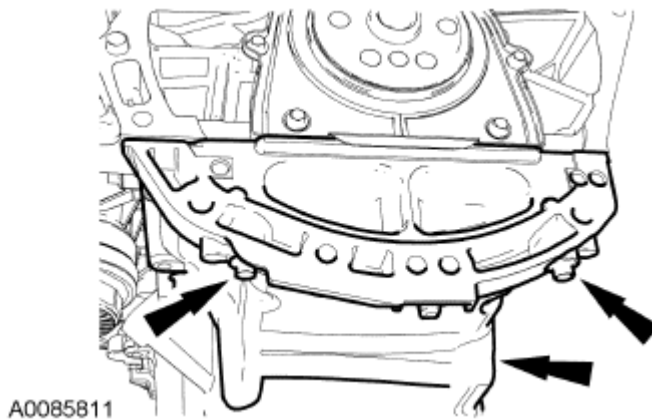


Fig. 51: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

5. Install the 4 engine front cover-to-oil pan bolts.
 - Tighten to 10 Nm (89 lb-in).

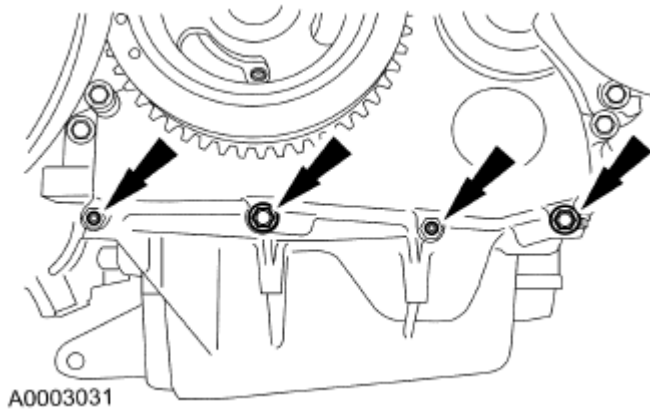


Fig. 52: Locating Engine Front Cover-To-Oil Pan Bolts
Courtesy of FORD MOTOR CO.

6. Install the remaining oil pan bolts.
 - Tighten in the sequence shown in illustration to 25 Nm (18 lb-ft).

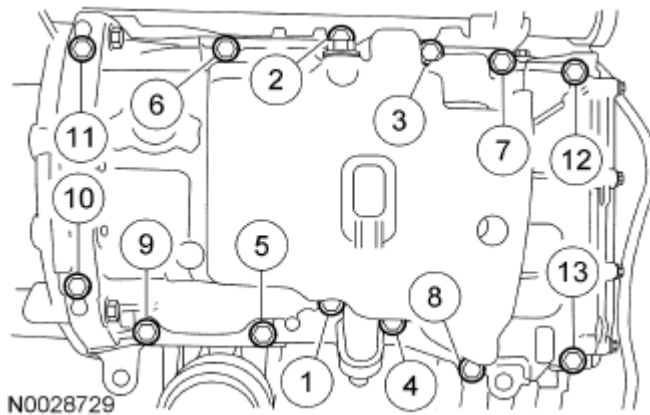


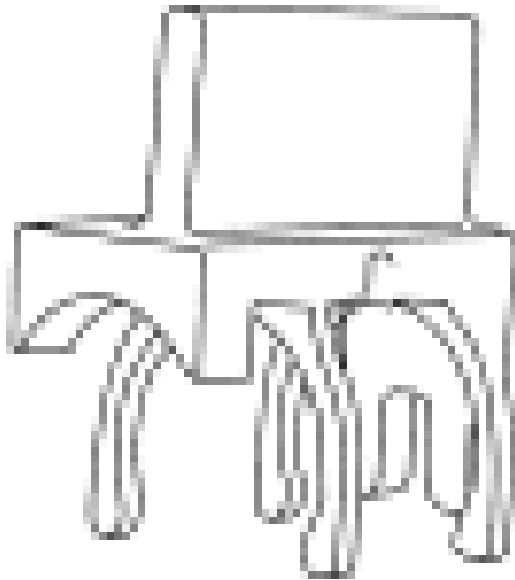
Fig. 53: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

7. Install the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
8. Install the flexplate. For additional information, refer to **FLEXPLATE**.
9. Fill the engine with clean engine oil.

ENGINE FRONT COVER

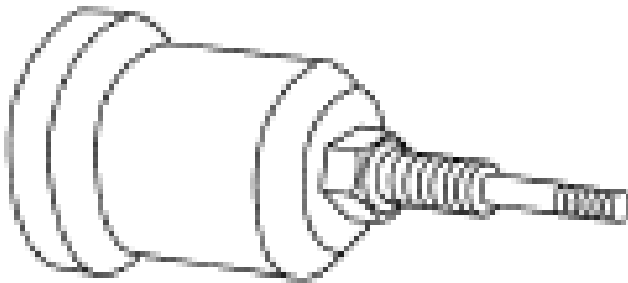
SPECIAL TOOLS

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ST3055A

Aligner, Crankshaft Sensor
303-1417



ST1917-A

Installer, Camshaft Front Oil Seal
303-096 (T74P-6150-A)

Remover, Oil Seal
303-409 (T92C-6700-CH)

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



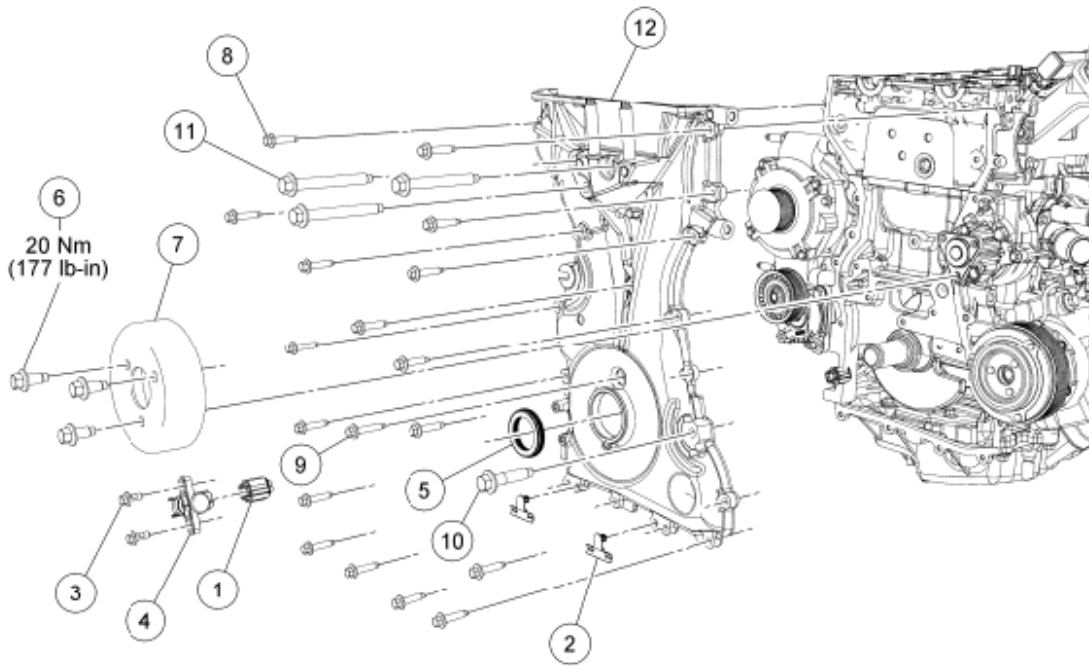
ST1385-A

GENERAL EQUIPMENT

6 mm x 18 mm bolt

MATERIAL 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)	WSS-M2C945-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4



N0090777

Fig. 54: Exploded View Of Engine Front Cover With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Crankshaft Position (CKP) sensor electrical connector (part of 12A690)
2	13A506	Wiring harness retainer (part of 12A690) (2 required)
3	W701219	CKP sensor bolt (2 required)
4	6C315	CKP sensor
5	6700	Crankshaft front seal
6	W500221	Coolant pump pulley bolt (3 required)
7	8509	Coolant pump pulley
8	W500215	Engine front cover bolt (17 required)
9	W500300	Engine front cover bolt
10	W500320	Engine front cover bolt
11	W500328	Engine front cover bolt (3 required)
12	6019	Engine front cover

Removal

NOTE: 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, using diamond washers between the flange faces on each part. 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.

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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Loosen the 3 coolant pump pulley bolts.
3. Remove the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY**.
4. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
 - Detach the 2 wiring harness retainers from the engine front cover.
5. Remove the 2 bolts and the CKP sensor.

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

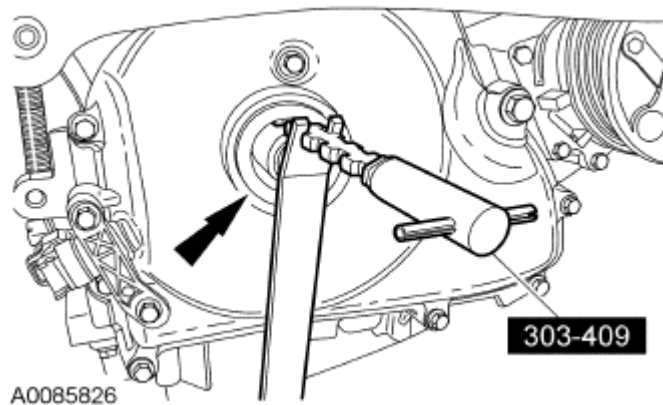
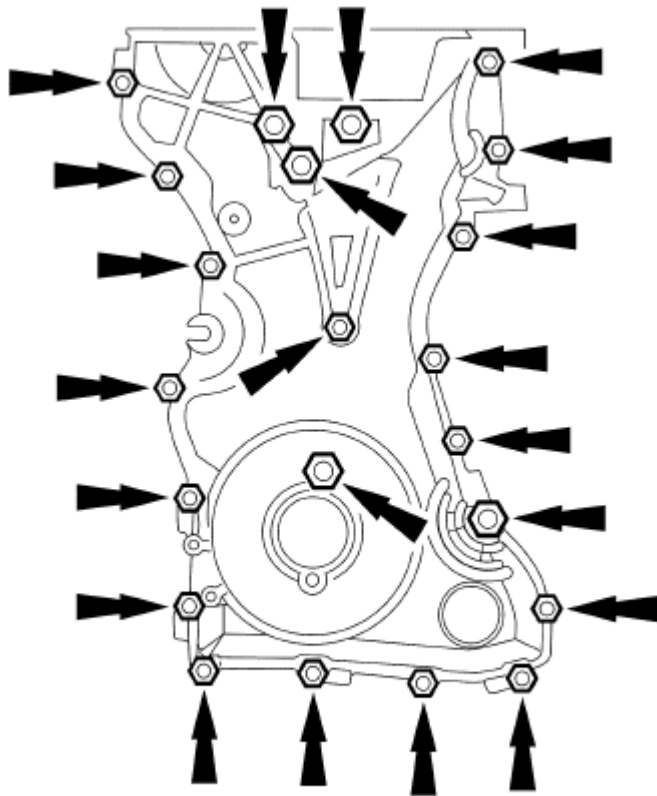


Fig. 55: Removing Crankshaft Front Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

6. Using the Oil Seal Remover, remove the crankshaft front oil seal.
7. Remove the 3 bolts and the coolant pump pulley.
8. Remove the coolant degas bottle. For additional information, refer to **ENGINE COOLING**.
9. Remove the power steering pump. For additional information, refer to **POWER STEERING**.
10. Remove the engine mount. For additional information, refer to **ENGINE MOUNT**.
11. Slightly raise the engine for access to the accessory drive idler pulley.
12. Remove the accessory drive idler pulley. For additional information, refer to **ACCESSORY DRIVE**.
13. Remove the bolts and the engine front cover.



A0087412

Fig. 56: Locating Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

Installation

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

1. Clean and inspect the mounting surfaces of the engine and the front cover.

NOTE: The engine front cover must be installed and the bolts tightened within 4 minutes of applying the silicone gasket and sealant.

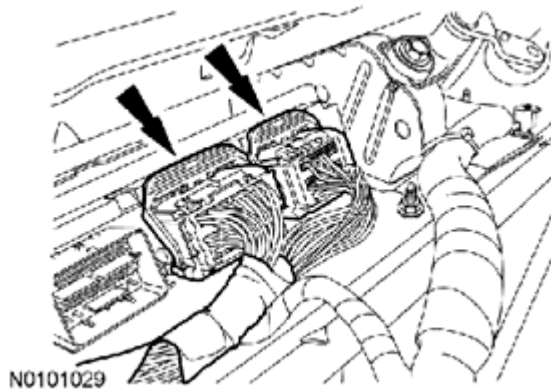


Fig. 57: Locating Bead Of Silicone Gasket And Sealant Applying Area On Front Cover
Courtesy of FORD MOTOR CO.

2. Apply a 2.5 mm (0.10 in) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas. Apply a 2.5 mm (0.10 in) bead of silicone gasket and sealant to the front cover.
3. Install the engine front cover. Tighten the bolts in the sequence shown in illustration, to the following specifications:
 - Tighten the 8-mm bolts to 10 Nm (89 lb-in).
 - Tighten the 13-mm bolts to 48 Nm (35 lb-ft).

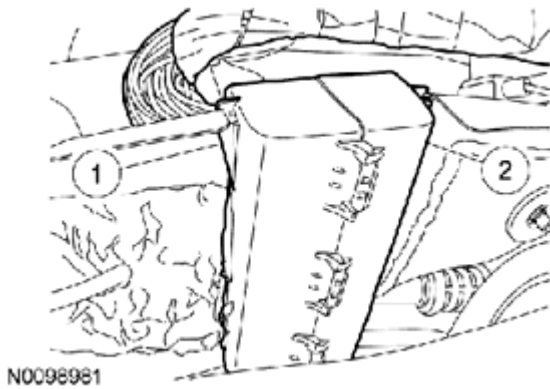


Fig. 58: Identifying Engine Front Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the accessory drive idler pulley. For additional information, refer to **ACCESSORY DRIVE**.
5. Lower the engine to the installed position.
6. Install the engine mount. For additional information, refer to **ENGINE MOUNT**.
7. Install the power steering pump. For additional information, refer to **POWER STEERING**.
8. Install the coolant degas bottle. For additional information, refer to **ENGINE COOLING**.
9. Install the coolant pump pulley and the 3 bolts.
 - Do not tighten at this time.

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

NOTE: Lubricate the oil seal with clean engine oil.

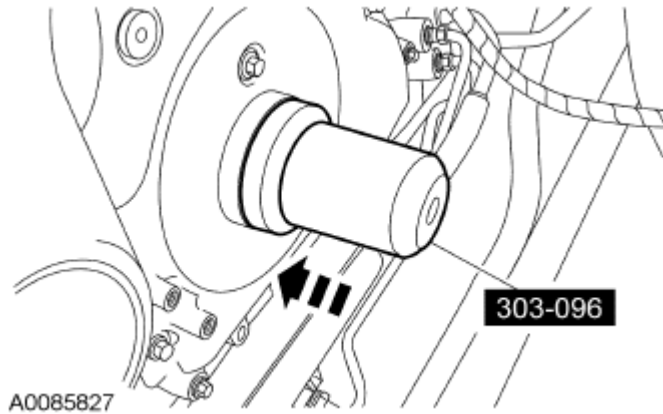


Fig. 59: Installing Crankshaft Front Oil Seal Using Camshaft Front Oil Seal Installer
Courtesy of FORD MOTOR CO.

10. Using the Camshaft Front Oil Seal Installer, install the crankshaft front oil seal.
11. Install the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY**.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

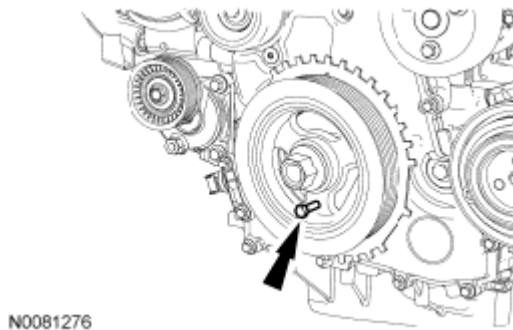


Fig. 60: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

12. Install a standard 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.
13. Install the CKP sensor and the 2 bolts.
 - Do not tighten the bolts at this time.

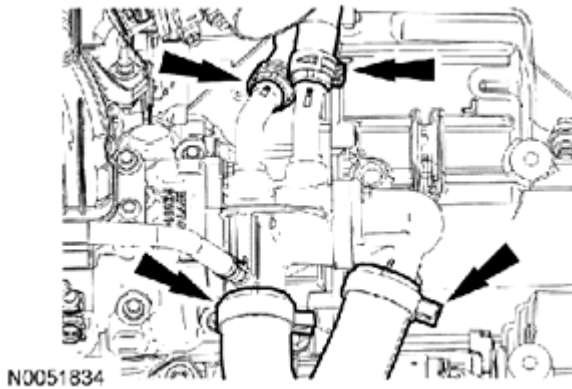


Fig. 61: Locating CKP Sensor Bolts
Courtesy of FORD MOTOR CO.

14. Using the Crankshaft Sensor Aligner, adjust the CKP sensor.
 - Tighten the 2 bolts to 7 Nm (62 lb-in).

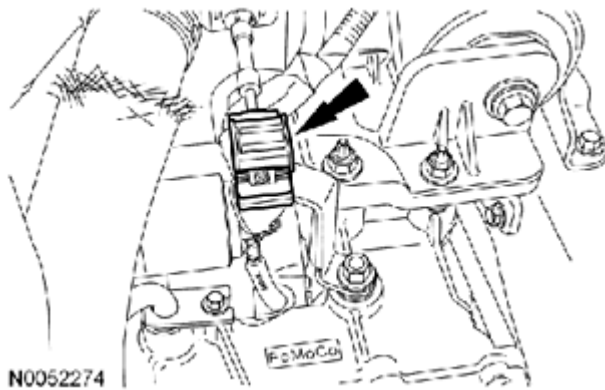


Fig. 62: Adjusting CKP Sensor Using Crankshaft Sensor Aligner
Courtesy of FORD MOTOR CO.

15. Connect the CKP sensor electrical connector.
 - Attach the 2 wiring harness retainers to the engine front cover.

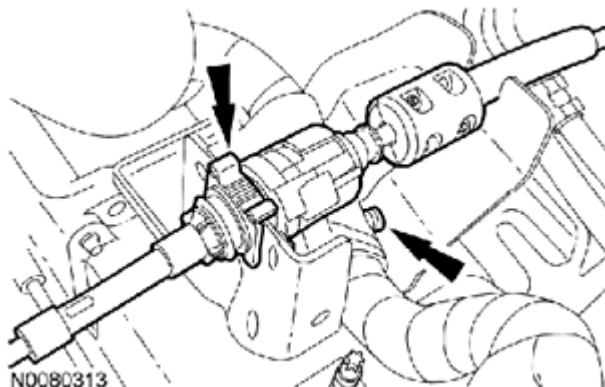


Fig. 63: Locating CKP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

16. Remove the 6 mm x 18 mm bolt.

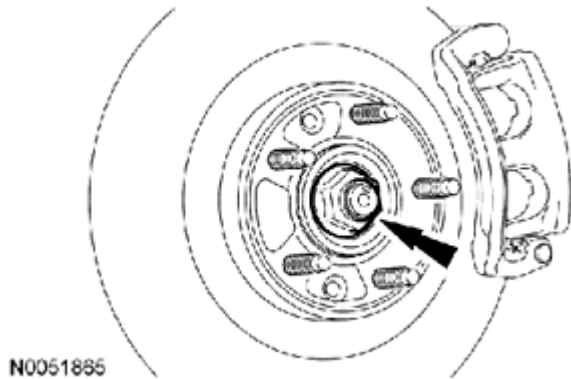


Fig. 64: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

17. Tighten the coolant pump pulley bolts.
 - Tighten to 20 Nm (177 lb-in).
18. Fill the power steering system. For additional information, refer to **STEERING SYSTEM**.

TIMING DRIVE COMPONENTS

Removal

NOTE: 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, using diamond washers between the flange faces on each part. 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.

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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the engine front cover. For additional information, refer to **ENGINE FRONT COVER**.

3. Compress the timing chain tensioner in the following sequence.
 1. Using a small pick, release and hold the ratchet mechanism.
 2. While holding the ratchet mechanism in the released position, compress the tensioner by pushing the timing chain arm toward the tensioner.
 3. Insert a paper clip into the hole to retain the tensioner.

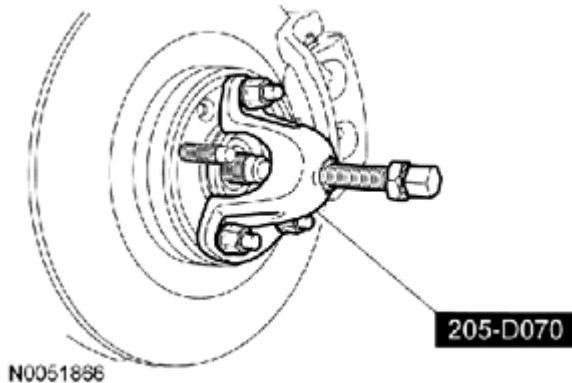


Fig. 65: Compressing Timing Chain Tensioner Using Small Pick
Courtesy of FORD MOTOR CO.

4. Remove the 2 bolts and the timing chain tensioner.

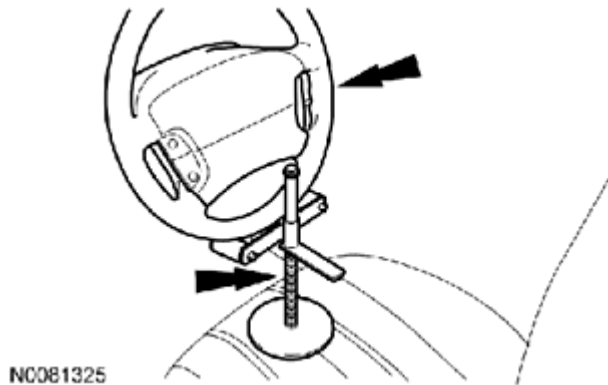


Fig. 66: Locating Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

5. Remove the RH timing chain guide.

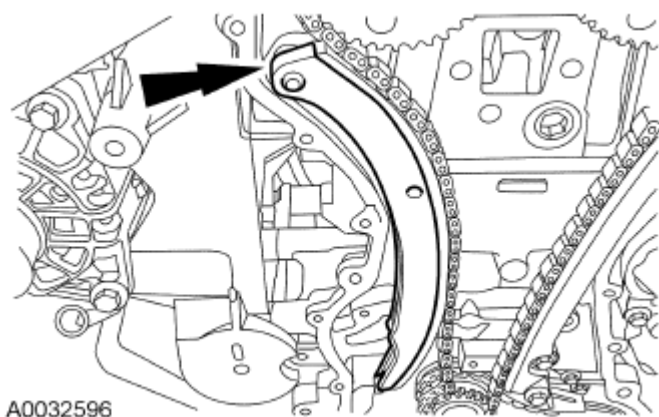


Fig. 67: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

6. Remove the timing chain.

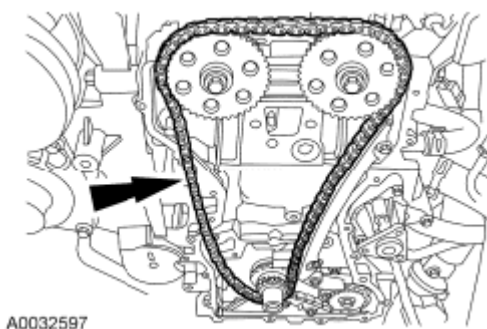


Fig. 68: Locating Timing Chain
Courtesy of FORD MOTOR CO.

7. Remove the bolts and the LH timing chain guide.

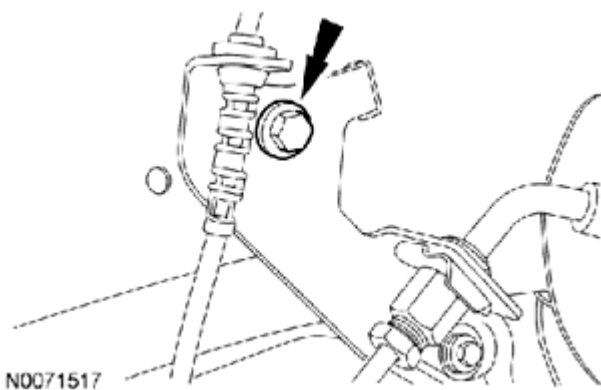


Fig. 69: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

NOTE: Do not rely on the Camshaft Alignment Plate to prevent camshaft rotation. Damage to the tool or the camshaft can occur.

NOTE: Intake camshaft drive gear shown in illustration, exhaust camshaft drive gear similar.

8. Remove the bolts and the camshaft drive gears.
 - Use the flats on the camshaft to prevent camshaft rotation.

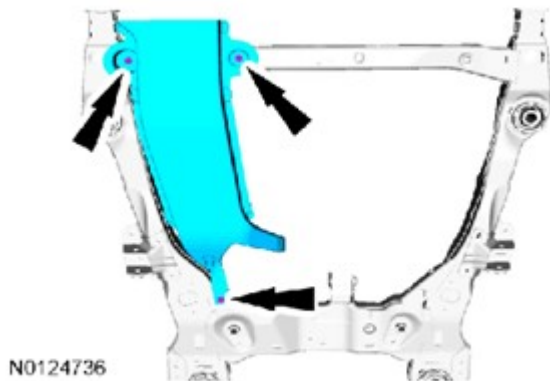


Fig. 70: Locating Camshaft Drive Gear And Bolt
Courtesy of FORD MOTOR CO.

Installation

1. Install the camshaft drive gears and the bolts. Do not tighten the bolts at this time.

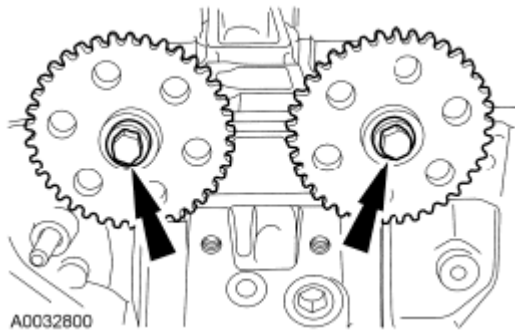


Fig. 71: Locating Camshaft Drive Gear Bolts
Courtesy of FORD MOTOR CO.

2. Install the LH timing chain guide and bolts.
 - Tighten to 10 Nm (89 lb-in).

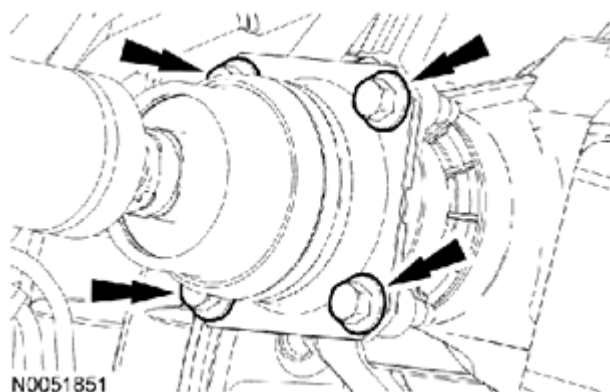


Fig. 72: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

3. Install the timing chain.

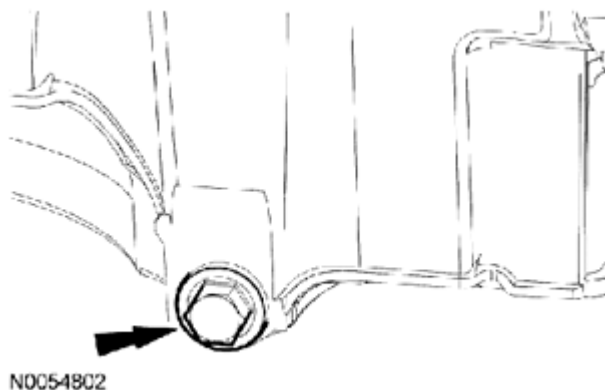


Fig. 73: Locating Timing Chain
Courtesy of FORD MOTOR CO.

4. Install the RH timing chain guide.

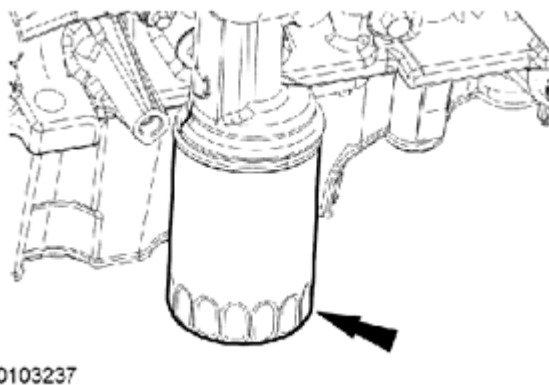


Fig. 74: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

NOTE: If the timing chain tensioner plunger and ratchet assembly are not pinned in the compressed position, follow the next 4 steps.

NOTE: Do not compress the ratchet assembly. This will damage the ratchet assembly.

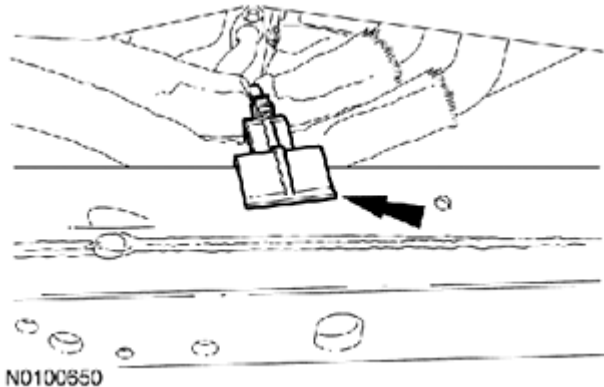


Fig. 75: Compressing Timing Chain Tensioner Plunger
Courtesy of FORD MOTOR CO.

5. Using the edge of a vise, compress the timing chain tensioner plunger.
6. Using a small pick, push back and hold the ratchet mechanism.

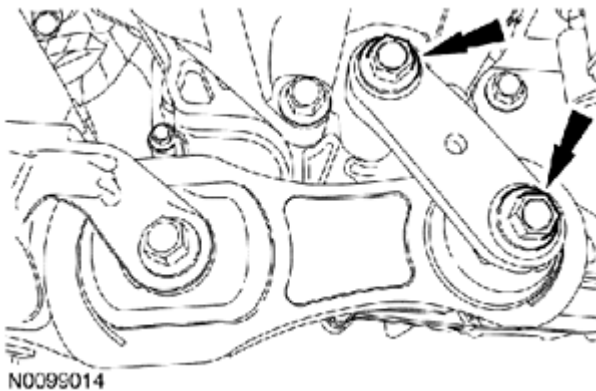


Fig. 76: Holding Ratchet Mechanism Using Small Pick
Courtesy of FORD MOTOR CO.

7. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.

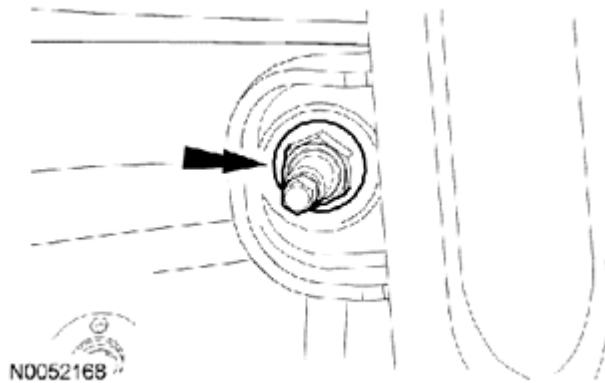


Fig. 77: Pushing Ratchet Arm Back Into Tensioner Housing
Courtesy of FORD MOTOR CO.

8. Install a paper clip into the hole in the tensioner housing to hold the ratchet assembly and the plunger in during installation.

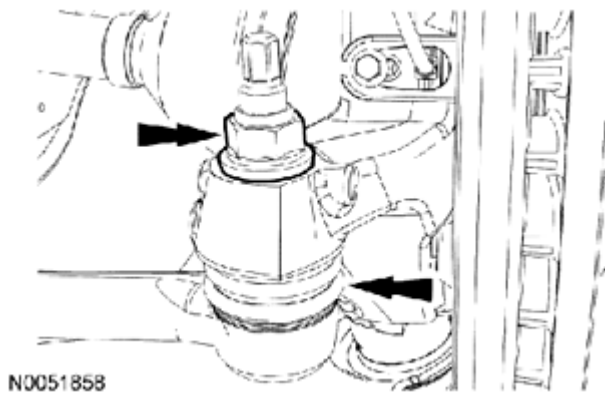


Fig. 78: Holding Ratchet Assembly Using Paper Clip
Courtesy of FORD MOTOR CO.

9. Install the timing chain tensioner and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).
 - Remove the paper clip to release the piston.

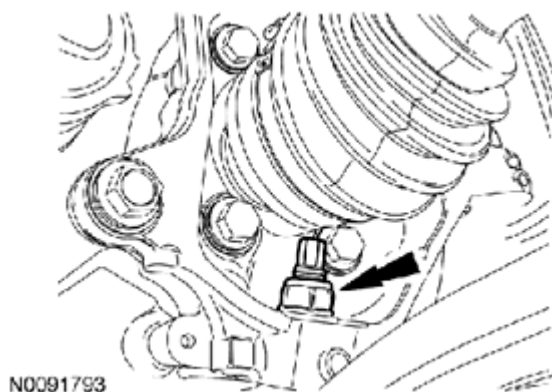


Fig. 79: Locating Timing Chain Tensioner And Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

10. Using the flats on the camshafts to prevent camshaft rotation, tighten the camshaft drive gear bolts.
 - Tighten to 72 Nm (53 lb-ft).

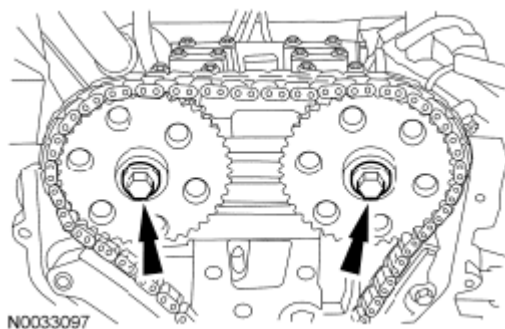


Fig. 80: Locating Camshaft Drive Gear Bolts
Courtesy of FORD MOTOR CO.

11. Install the front cover. For additional information, refer to **ENGINE FRONT COVER**.

CAMSHAFTS

SPECIAL TOOLS

	Alignment Plate, Camshaft
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ST2645-A

303-465 (T94P-6256-CH)

MATERIAL 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)	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:** 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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the coolant expansion tank. For additional information, refer to **ENGINE COOLING**.
3. Remove the RF wheel and tire. For additional information, refer to **WHEELS AND TIRES**.
4. Check the valve clearance. For additional information, refer to **VALVE CLEARANCE CHECK**.
5. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.
6. Mark the position of the camshaft lobes on the No. 1 cylinder for assembly reference.

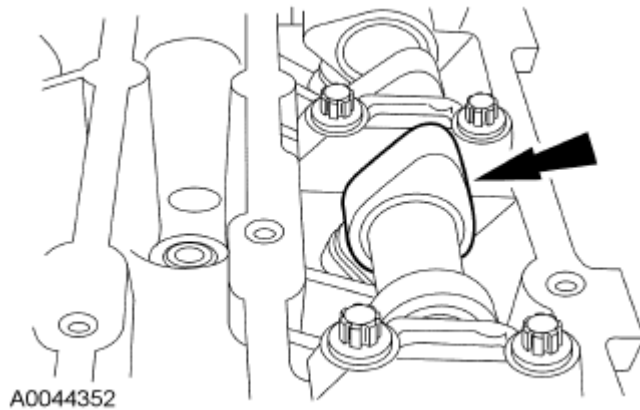


Fig. 81: Locating Camshaft Lobe Position
Courtesy of FORD MOTOR CO.

7. Remove the Camshaft Alignment Plate.

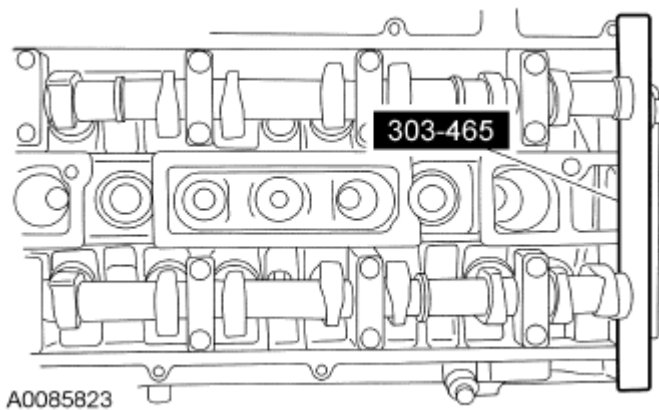


Fig. 82: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

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

NOTE: Mark the location and orientation of each camshaft bearing cap.

8. Remove the camshafts from the engine.
 - Loosen the camshaft bearing cap bolts, in sequence, one turn at a time.
 - Repeat the first step until all tension is released from the camshaft bearing caps.
 - Remove the camshaft bearing caps.
 - Remove the camshafts.

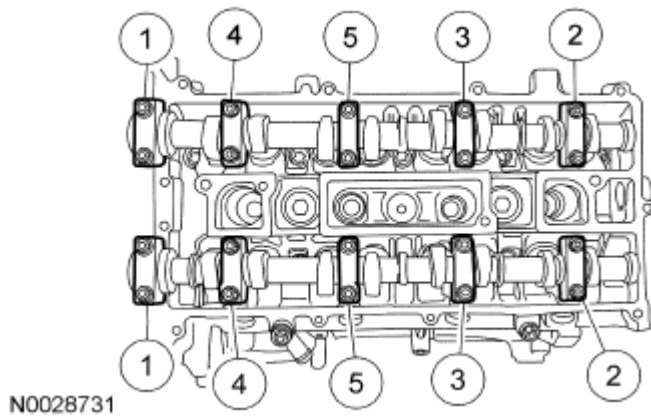


Fig. 83: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

Installation

NOTE: 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.

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

1. Install the camshafts and bearing caps in their original location and orientation. Tighten the bearing caps in the sequence shown in 3 stages:
 - Stage 1: Tighten the camshaft bearing cap bolts one turn at a time until finger-tight.
 - Stage 2: Tighten to 7 Nm (62 lb-in).
 - Stage 3: Tighten to 16 Nm (142 lb-in).

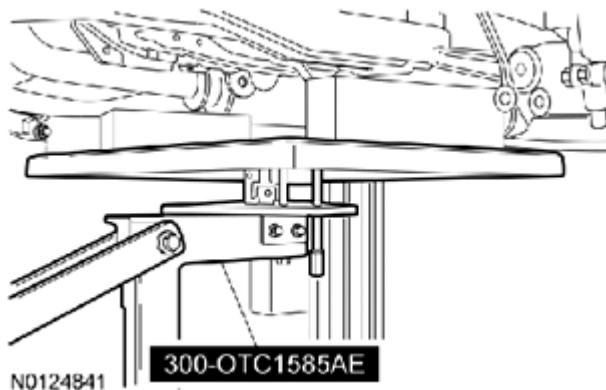


Fig. 84: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2. Install the Camshaft Alignment Plate.

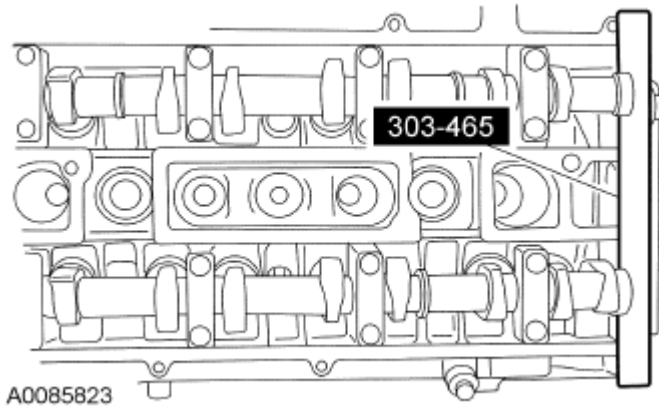


Fig. 85: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

3. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**
4. Install the RF wheel and tire. For additional information, refer to **WHEELS AND TIRES** .
5. Install the coolant expansion tank. For additional information, refer to **ENGINE COOLING** .

VALVE TRAIN COMPONENTS - EXPLODED VIEW

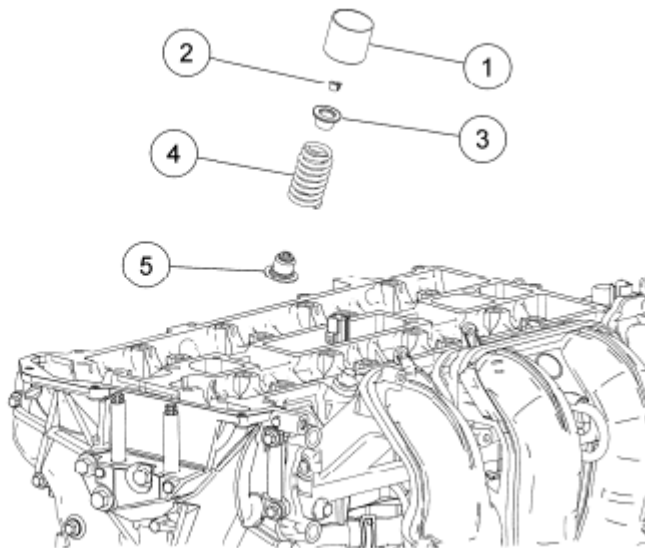


Fig. 86: Exploded View Of Valve Train
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6500	Valve tappet (16 required)

2013 Ford Transit Connect XLT Premium

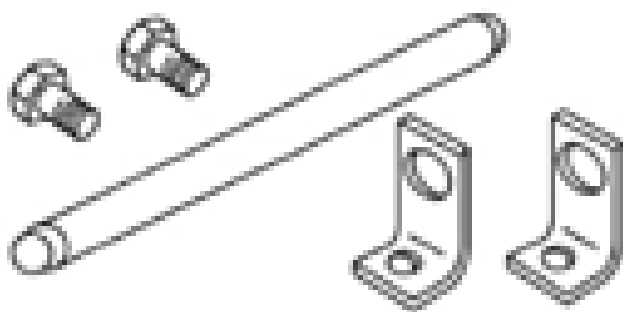
2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

2	6518	Valve collet (16 required)
3	6514	Valve spring retainer (16 required)
4	6513	Valve spring (16 required)
5	6517	Valve seal (16 required)

1. For additional information, refer to the procedures in this information.

VALVE SPRINGS

SPECIAL TOOLS



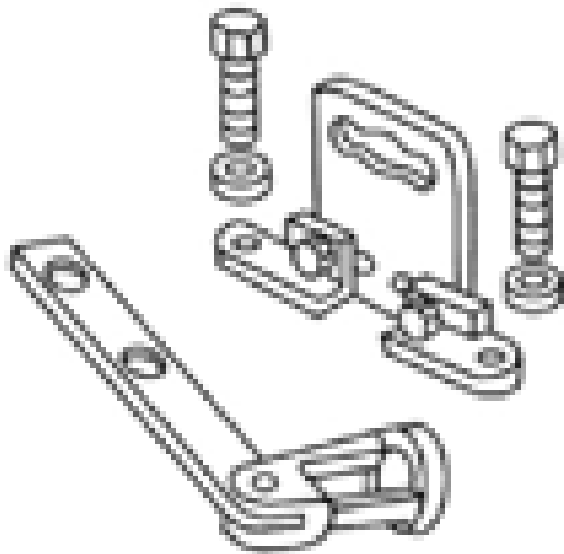
ST1981-A

Compressor, Valve Spring
303-300 (T87C-6565-A)

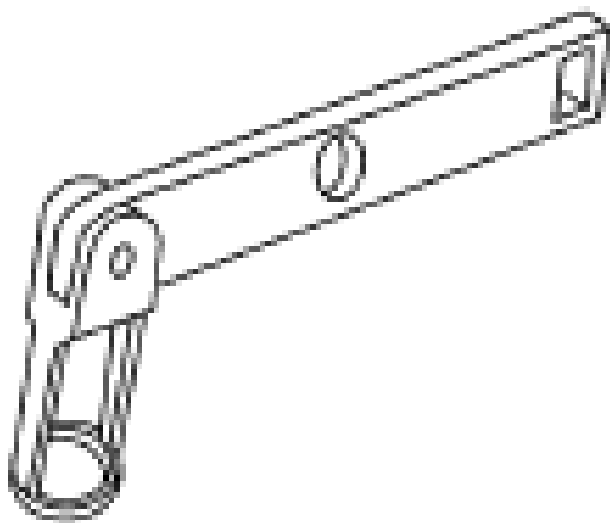
Compressor, Valve Spring
303-350 (T89P-6565-A)

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



ST1907-A



ST1902-A

Compressor, Valve Spring
303-472 (T94P-6565-AH)

MATERIAL 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)	WSS-M2C945-A
Multi-Purpose Grease	

Motorcraft® XL-5 (aerosol) and/or CRC® SL3151

ESB-M1C93-B

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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the camshafts. For additional information, 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.

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.

3. Remove and inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
4. Remove the spark plugs. For additional information, refer to **ENGINE IGNITION - 2.0L**.

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.

5. Connect the compressed air supply to cylinder No. 1.

NOTE: Place all parts in order to one side.

6. Apply compressed air to the cylinder and remove the valve spring.
 - Using the Valve Spring Compressors, compress the valve spring and remove the valve collet, using some multi-purpose grease and a small screwdriver.
 - Remove the valve spring retainer and the valve spring.

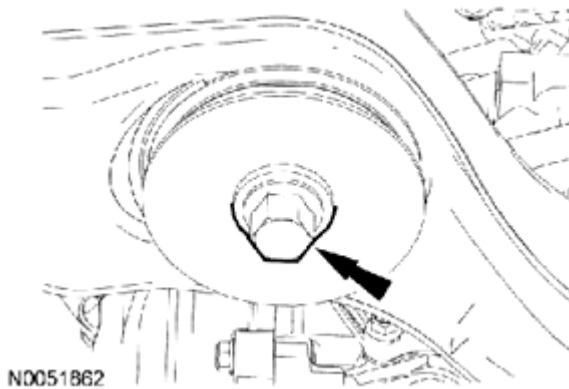


Fig. 87: Compressing Valve Spring Using Valve Spring Compressors
Courtesy of FORD MOTOR CO.

Installation

NOTE: Check the seating of the valve collet.

1. Using the Valve Spring Compressors, install the valve spring.
 - Insert the valve spring and the valve spring retainer.
 - Compress the valve spring and install the valve collet using some grease and a small screwdriver.

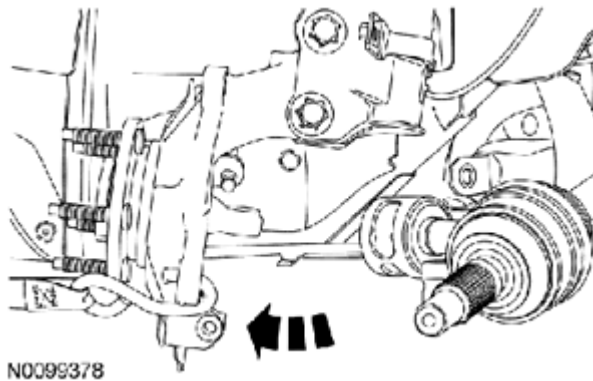
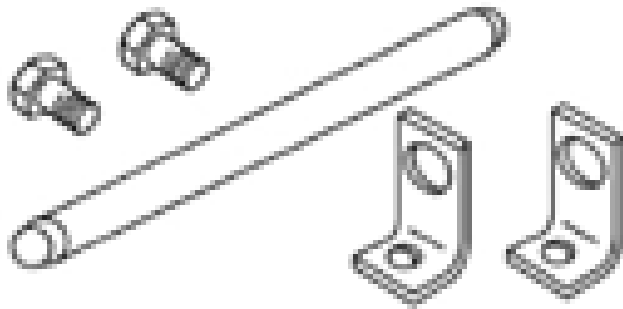


Fig. 88: Compressing Valve Spring Using Valve Spring Compressors
Courtesy of FORD MOTOR CO.

2. Disconnect the compressed air supply.
3. Repeat the appropriate removal and installation steps for all of the other cylinders.
4. Install the spark plugs. For additional information, refer to **ENGINE IGNITION - 2.0L**.
5. Coat the valve tappets with clean engine oil and insert them.
6. Install the camshafts. For additional information, refer to **CAMSHAFTS**.

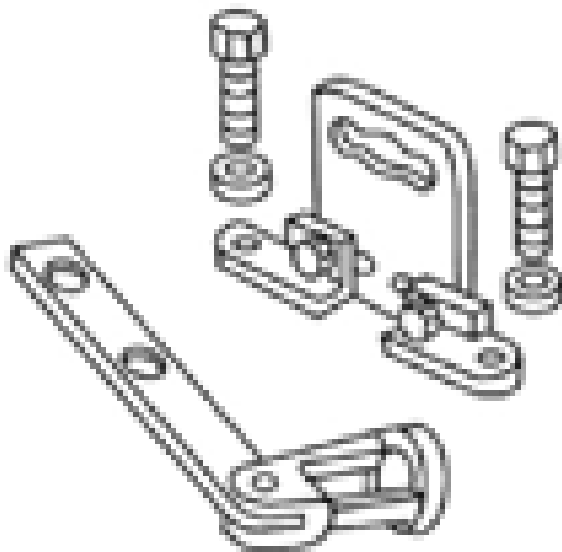
VALVE SEALS

SPECIAL TOOLS



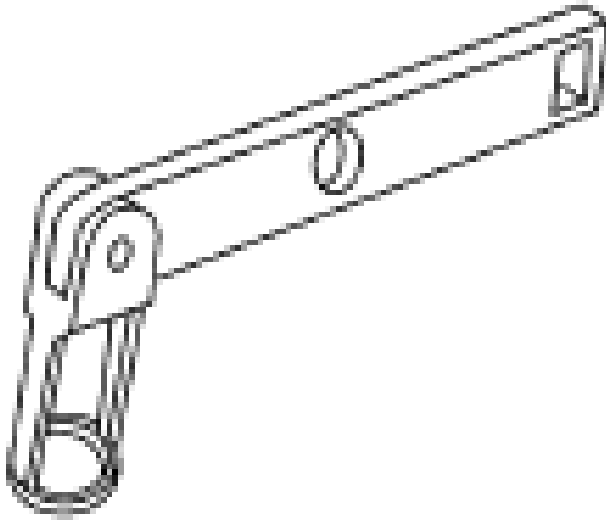
ST1981-A

Compressor, Valve Spring
303-300 (T87C-6565-A)



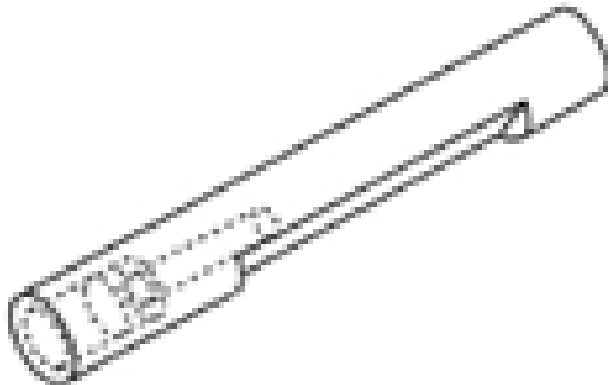
ST1907-A

Compressor, Valve Spring
303-350 (T89P-6565-A)



ST1902-A

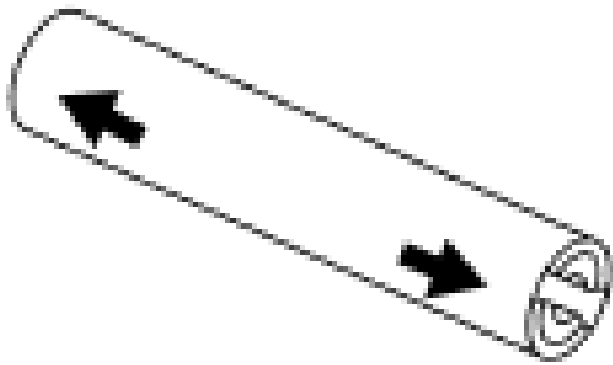
Compressor, Valve Spring
303-472 (T94P-6565-AH)



ST1906-A

Installer, Valve Stem Oil Seal
303-470 (T94P-6510-CH)

Remover, Valve Stem Oil Seal
303-468 (T94P-6510-AH)



ST1904-A



ST1187-A

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

MATERIAL 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)	WSS-M2C945-A
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B

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. With the vehicle in **NEUTRAL**, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the camshafts. For additional information, 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.

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.

3. Remove and inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
4. Remove the spark plugs. For additional information, refer to **ENGINE IGNITION - 2.0L**.

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.

5. Connect the compressed air supply to the No. 1 cylinder.

NOTE: Place all parts in order to one side.

6. Apply compressed air to the cylinder and remove the valve spring.
 - Using the Valve Spring Compressors, compress the valve spring and remove the valve collet, using some multi-purpose grease and a small screwdriver.
 - Remove the valve spring retainer and the valve spring.

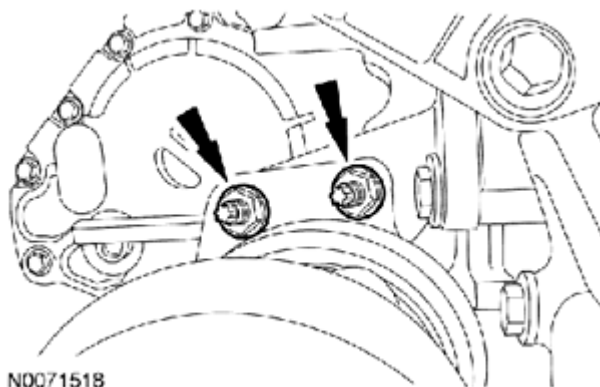


Fig. 89: Compressing Valve Spring Using Valve Spring Compressors

Courtesy of FORD MOTOR CO.

7. Using the Valve Stem Oil Seal Remover and Slide Hammer, remove and discard the valve seal.

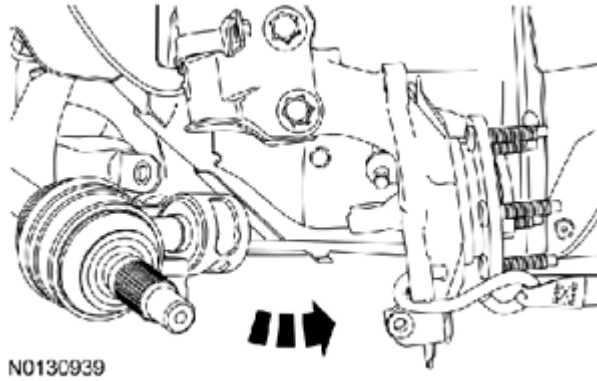


Fig. 90: Removing Valve Seal Using Valve Stem Oil Seal Remover
Courtesy of FORD MOTOR CO.

Installation

1. Install the valve stem seal installation sleeve.

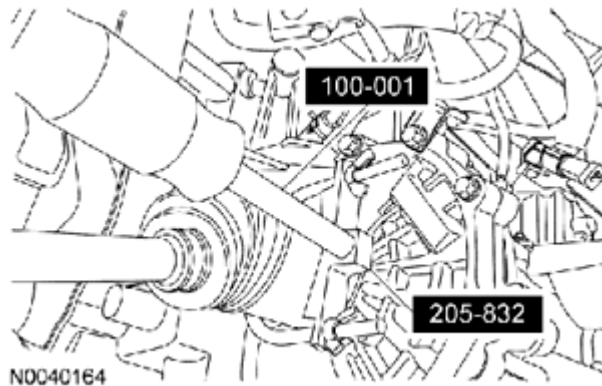


Fig. 91: Identifying Valve Stem Seal Installation Sleeve
Courtesy of FORD MOTOR CO.

2. Using the Valve Stem Oil Seal Installer, install the valve seal.

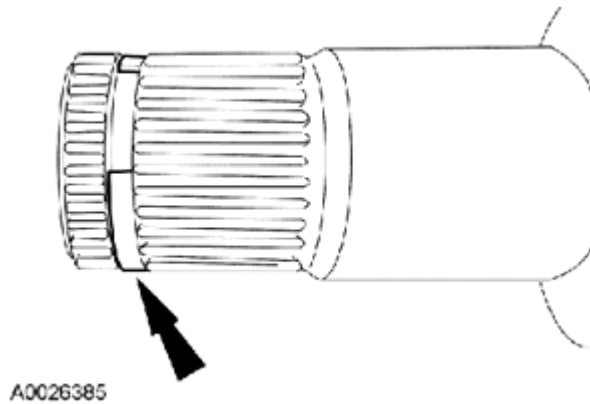


Fig. 92: Installing Valve Seal Using Valve Stem Oil Seal Installer
Courtesy of FORD MOTOR CO.

NOTE: Check the seating of the valve collet.

3. Using the Valve Spring Compressors, install the valve spring.
 - Insert the valve spring and the valve spring retainer.
 - Compress the valve spring and install the valve collet using some multi-purpose grease and a small screwdriver.

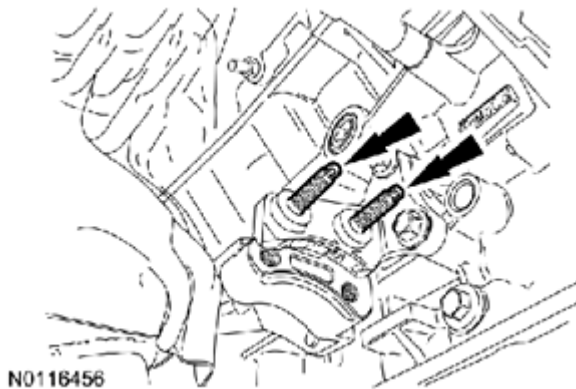


Fig. 93: Compressing Valve Spring Using Valve Spring Compressors
Courtesy of FORD MOTOR CO.

4. Disconnect the compressed air supply.
5. Repeat the appropriate removal and installation steps for all of the other cylinders.
6. Install the spark plugs. For additional information, refer to **ENGINE IGNITION - 2.0L**.
7. Coat the valve tappets with clean engine oil and insert them.
8. Install the camshafts. For additional information, refer to **CAMSHAFTS**.

VALVE TAPPETS

MATERIAL SPECIFICATIONS

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

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)	WSS-M2C945-A

Removal and Installation

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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the camshafts. For additional information, 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.

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.

3. Remove and inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
4. To install, reverse the removal procedure.
 - Coat the valve tappets with clean engine oil prior to installation.

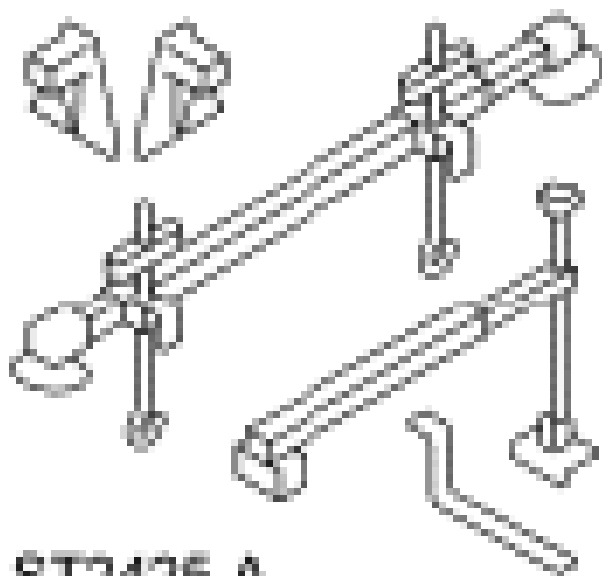
CYLINDER HEAD

SPECIAL TOOLS

Alignment Plate, Camshaft
303-465 (T94P-6256-CH)



ST2645-A



ST2425-A

Engine Support Bar
303-F072

MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
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)	WSS-M2C945-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Silicone Gasket Remover	-

ZC-30

Cylinder Head (View 1 of 2)

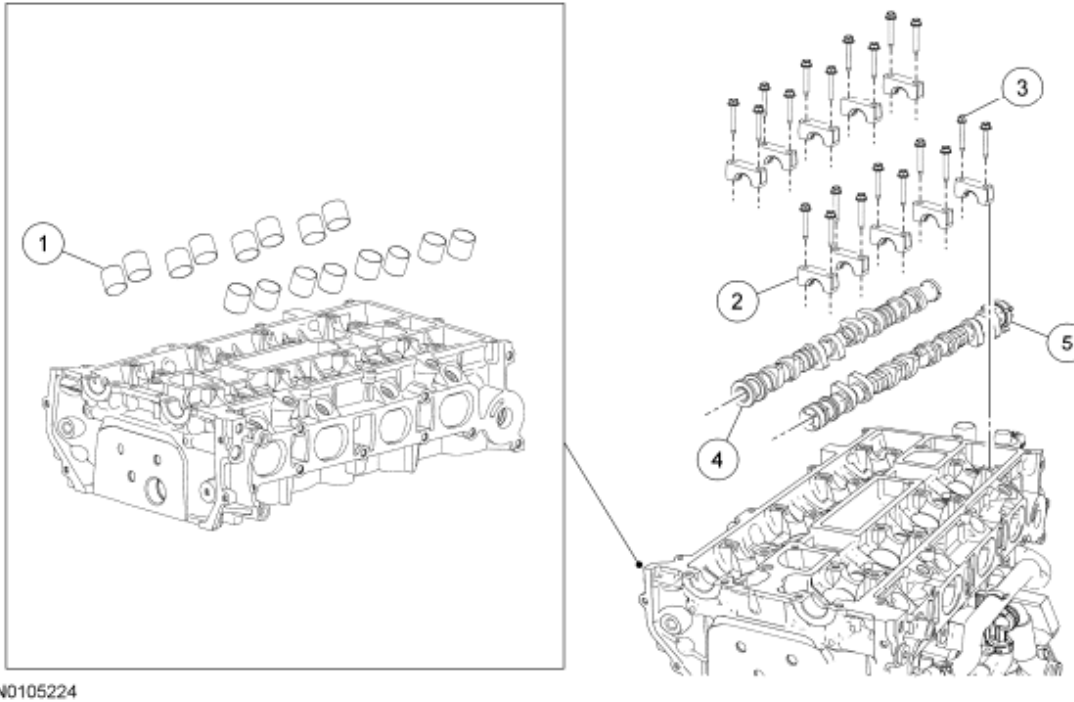


Fig. 94: Exploded View Of Cylinder Head (1 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6500	Valve tappet (16 required)
2	6A284	Camshaft bearing cap (10 required)
3	W703383	Camshaft bearing cap bolt (20 required)
4	6A272	Exhaust camshaft
5	6A267	Intake camshaft

Cylinder Head (View 2 of 2)

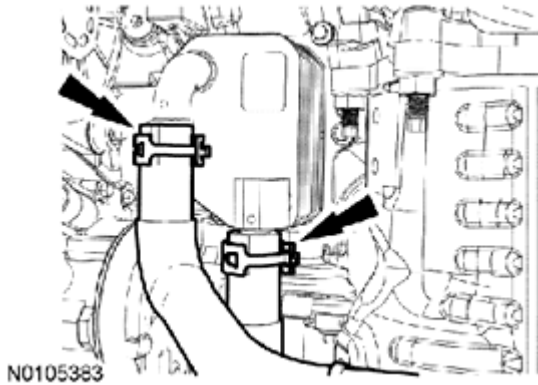


Fig. 95: Exploded View Of Cylinder Head (2 Of 2) With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	EGR valve electrical connector (part of 12B637)
2	8287	Upper radiator hose clamp
3	8260	Upper radiator hose
4	W52592	EGR coolant tube clamp
5	18K580	EGR coolant hose (part of heater hose)
6	-	Engine coolant vent hose clamp (part of 8W005)
7	8W005	Engine coolant vent hose
8	-	Heater hose clamp (part of 18K580)
9	18K580	Heater hose
10	W525958	Bypass hose clamp
11	8548	Bypass hose
12	W500204	Wiring harness bracket bolt (2 required)
13	14A301	Wiring harness bracket
14	6065	Cylinder head bolt (10 required)
15	6050	Cylinder head
16	6051	Cylinder head gasket

Removal

NOTE: 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, using diamond washers between the flange faces on each part. 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.

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. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .
3. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
4. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
5. Remove the exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD** .
6. Clean and inspect the exhaust manifold flange. For additional information, refer to exhaust manifold cleaning and inspection in **ENGINE SYSTEM - GENERAL INFORMATION** .
7. Drain the cooling system. For additional information, refer to **ENGINE COOLING** .
8. Check the valve clearance. For additional information, refer to **VALVE CLEARANCE CHECK** .
9. Remove the engine oil filter and discard.

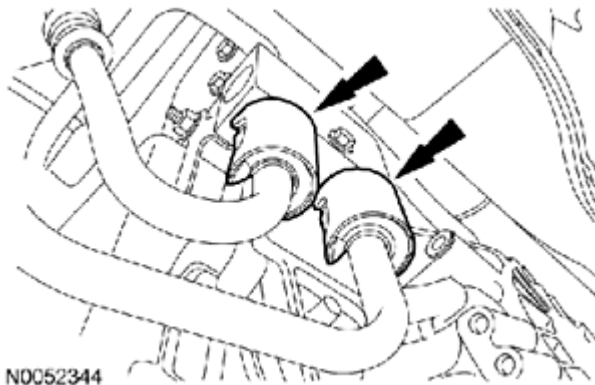


Fig. 96: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

10. Remove the intake manifold. For additional information, refer to **INTAKE MANIFOLD** .
11. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** .
12. Remove the Camshaft Alignment Plate.

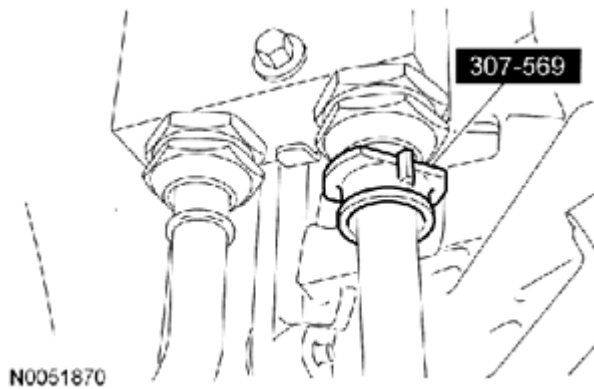


Fig. 97: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

13. Mark the position of the camshaft lobes on the No. 1 cylinder for installation reference.

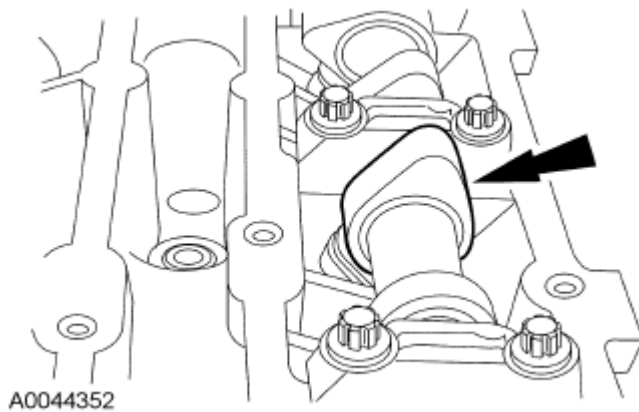


Fig. 98: Locating Camshaft Lobe Position
Courtesy of FORD MOTOR CO.

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

NOTE: Mark the location and orientation of each camshaft bearing cap.

14. Remove the camshafts from the engine.
- Loosen the camshaft bearing cap bolts, in sequence, one turn at a time.
 - Repeat the first step until all tension is released from the camshaft bearing caps.
 - Remove the camshaft bearing caps.
 - Remove the camshafts.

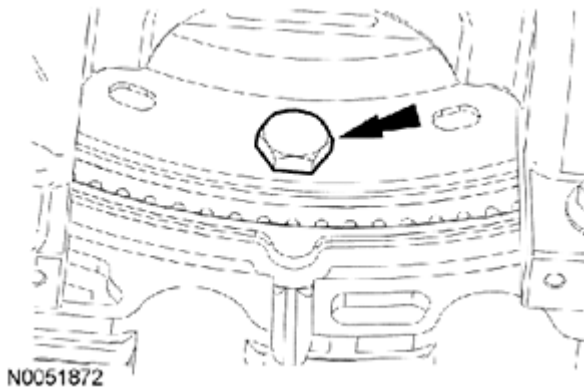


Fig. 99: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

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.

15. Remove the valve tappets.

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.

16. Inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

17. Remove the 3 bolts and position the wiring harness and bracket aside.

18. Disconnect the EGR valve electrical connector.

19. Disconnect the coolant hoses from the coolant bypass.

20. Disconnect the EGR coolant hose.

21. Lower the engine and remove the Engine Support Bar.

22. Remove the 10 bolts and the cylinder head.

- Discard the bolts.

23. Remove and discard the head gasket.

24. Inspect the cylinder head mating surfaces. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

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.

NOTE: Observe all warnings or cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.

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

1. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.
 1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
2. Clean the cylinder head bolt holes in the cylinder block. Make sure all coolant, oil or other foreign material is removed.
3. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
4. Apply silicone gasket and sealant to the locations shown in illustration.

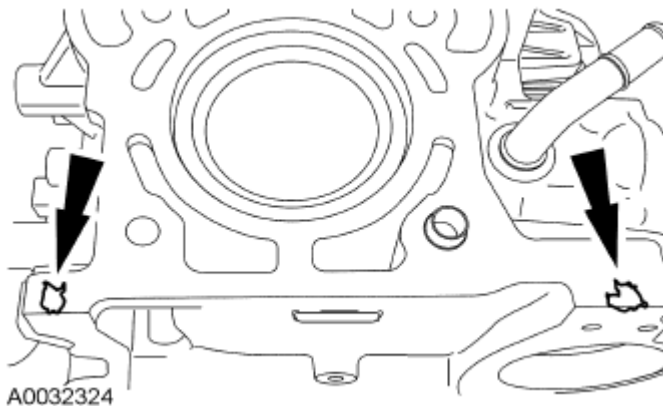


Fig. 100: Locating Sealant Applying Area On Cylinder Block
Courtesy of FORD MOTOR CO.

5. Install a new cylinder head gasket.

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

6. Install the cylinder head and the 10 new bolts. Tighten the bolts in the sequence shown in illustration in 5

stages.

- Stage 1: Tighten to 5 Nm (44 lb-in).
- Stage 2: Tighten to 15 Nm (133 lb-in).
- Stage 3: Tighten to 45 Nm (33 lb-ft).
- Stage 4: Turn 90 degrees.
- Stage 5: Turn an additional 90 degrees.

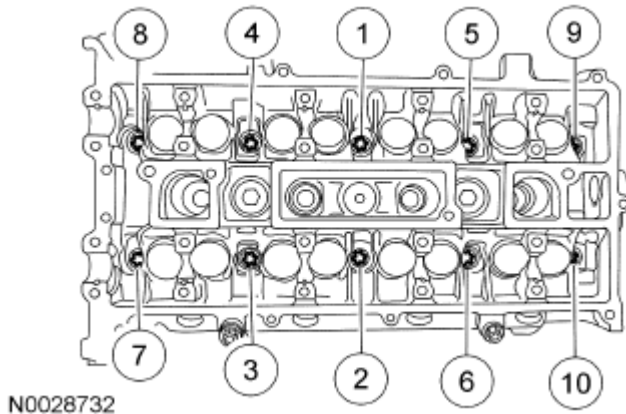


Fig. 101: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

7. Install the Engine Support Bar and raise the engine.

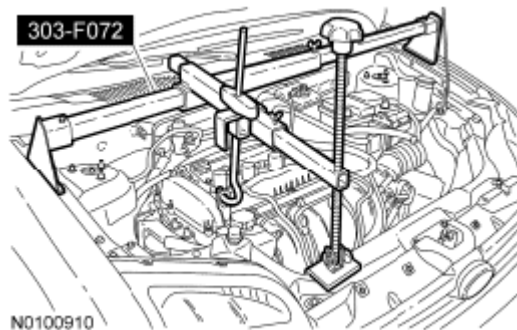


Fig. 102: Installing Engine Support Bar
Courtesy of FORD MOTOR CO.

8. Install the EGR coolant hose.
9. Connect the coolant hoses onto the coolant bypass.
10. Connect the EGR valve electrical connector.
11. Position the wire harness bracket and install the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

NOTE: Lubricate the valve tappets with clean engine oil.

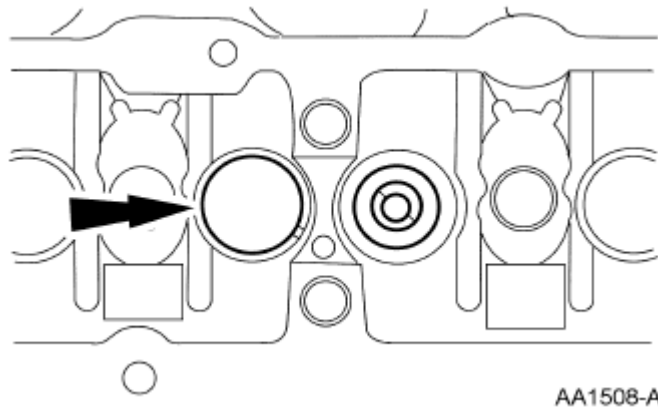


Fig. 103: Locating Valve Tappet
Courtesy of FORD MOTOR CO.

12. Install the valve tappets in their original positions.

NOTE: Install the camshafts with the alignment notches in the camshafts lined up so the camshaft alignment plate can be installed. Make sure the lobes on the No. 1 cylinder are in the same position as noted in the removal procedure. Failure to follow this procedure can cause severe damage to the valves and pistons.

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

13. Install the camshafts and bearing caps in their original location and orientation. Tighten the bearing caps in the sequence shown in 3 stages:
- Stage 1: Tighten the camshaft bearing cap bolts, one turn at a time, until the cam is fully seated.
 - Stage 2: Tighten to 7 Nm (62 lb-in).
 - Stage 3: Tighten to 16 Nm (142 lb-in).

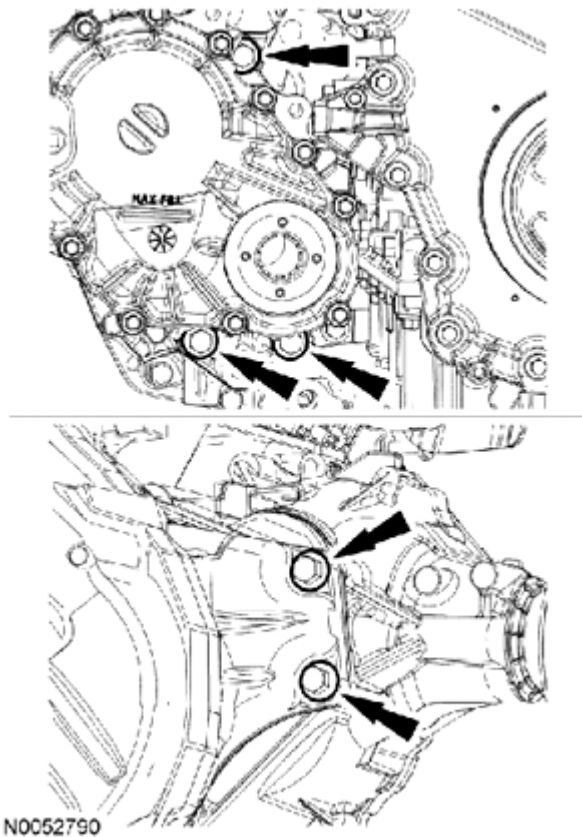
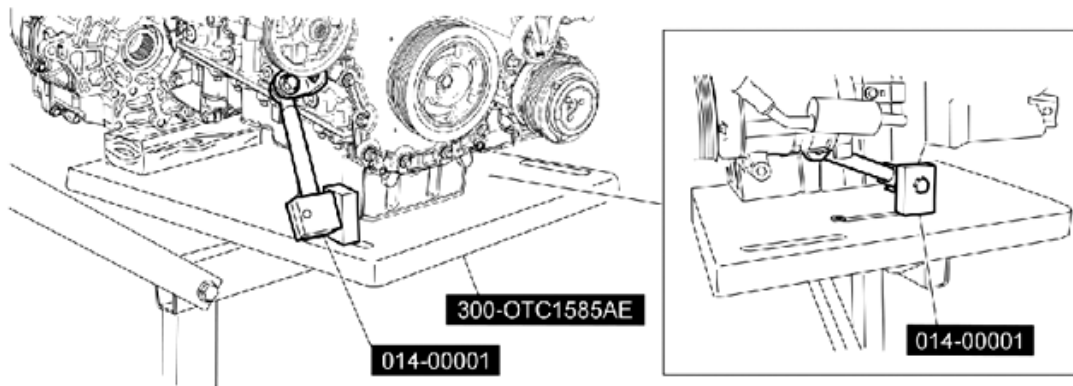


Fig. 104: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

14. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS** .
15. Install the valve cover. For additional information, refer to **VALVE COVER** .
16. Install the intake manifold. For additional information, refer to **INTAKE MANIFOLD** .
17. Install the exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD** .
18. Install the generator. For additional information, refer to **CHARGING SYSTEM** .
19. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
20. Drain the engine oil.
 - Install the drain plug and tighten to 28 Nm (21 lb-ft).



NC127038

Fig. 105: Locating Drain Plug
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

21. Install a new engine oil filter.
 - Tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

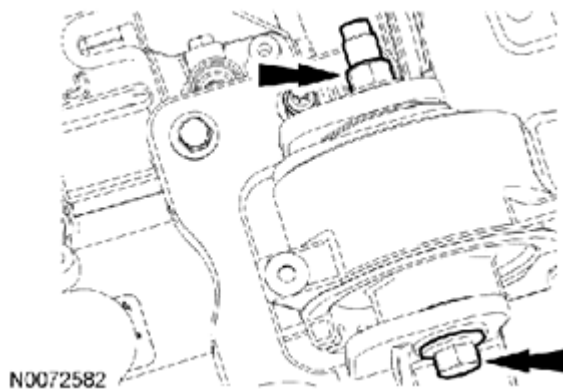


Fig. 106: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

22. Fill the engine with clean engine oil.
23. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING**.

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

Oil Filter, Oil Filter Adapter, Oil Cooler and Engine Oil Pressure (EOP) Switch

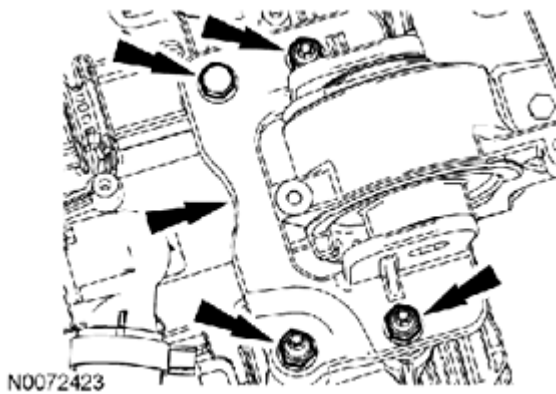


Fig. 107: Identifying Oil Filter, Oil Filter Adapter, Oil Cooler And Engine Oil Pressure (EOP) Switch With Torque Specifications
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Engine Oil Pressure (EOP) switch electrical connector (part of 12C508)
2	9278	EOP switch
3	6714	Oil filter
4	W500025	Oil filter adapter bolt (4 required)
5	6884	Oil filter adapter
6	6A636	Oil filter adapter gasket
7	-	Coolant hose clamp (2 required)
8	-	Coolant hose (2 required)
9	W706487	Oil cooler bolt
10	6A642	Oil cooler

Transaxle Bolts for Oil Pan Removal

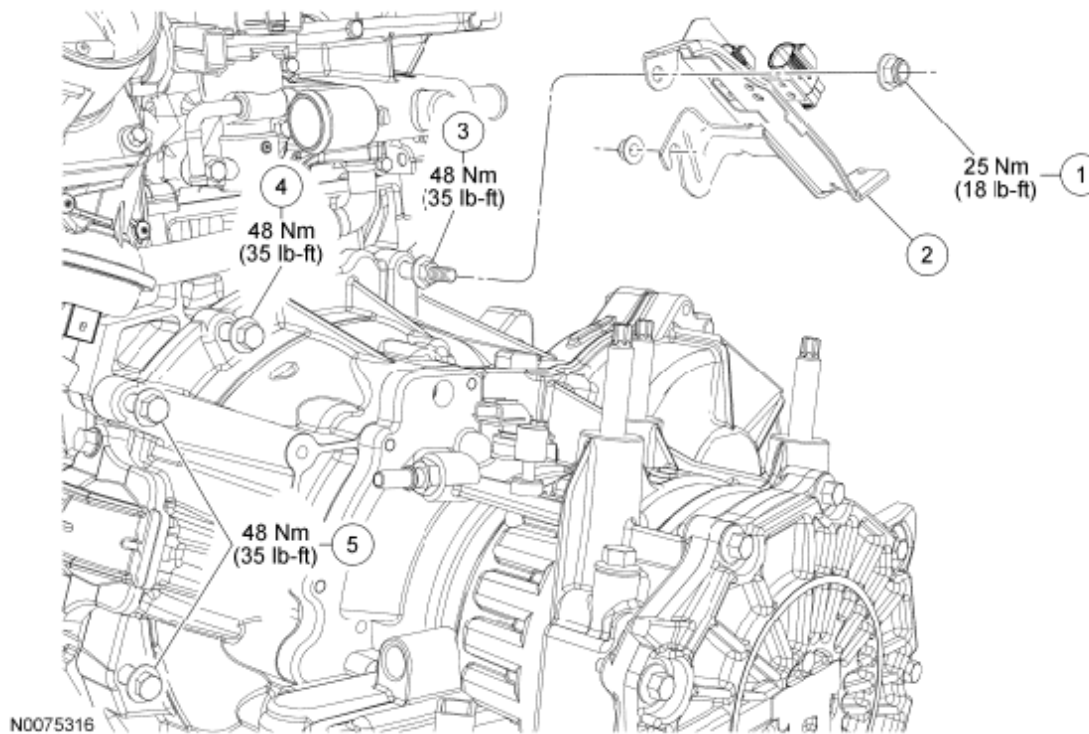


Fig. 108: Identifying Transaxle Bolts For Oil Pan Removal With Torque Specifications
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W520103	Heated Oxygen Sensor (HO2S) and Catalyst Monitor Sensor (CMS) wire connector bracket nut (2 required)
2	14301	HO2S and CMS wire connector bracket
3	W500124	Upper bellhousing-to-engine stud bolt
4	W500121	Upper bellhousing-to-engine bolt
5	W500125	LH bellhousing-to-engine bolts (2 required)

Oil Pan, Oil Pump Screen and Pickup Tube

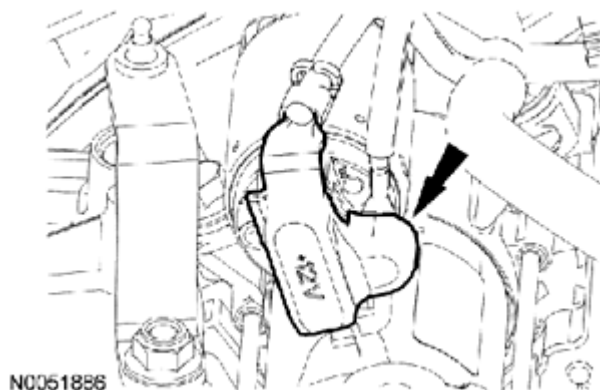


Fig. 109: Identifying Oil Pan, Oil Pump Screen And Pickup Tube And Bolts With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
6	W500124	RH engine-to-bellhousing stud bolt
7	W500120	RH engine-to-bellhousing bolt
8	W500121	Bellhousing-to-oil pan bolt (2 required)
9	W500121	Oil pan-to-bellhousing bolt (2 required)
10	6730	Oil pan drain plug
11	W500215	Engine front cover-to-oil pan bolt (4 required)
12	W706284	Oil pan bolt (2 required)
13	W500224	Oil pan bolt (11 required)
14	6675	Oil pan
15	W706282	Oil pump screen and pickup tube bolt (2 required)
16	6622	Oil pump screen and pickup tube
17	6625	Oil pump screen and pickup tube gasket

Oil Pump

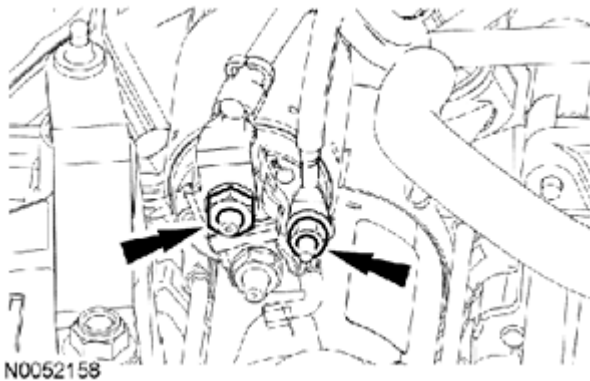


Fig. 110: Exploded View Of Oil Pump With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W703651	Oil pump drive chain tensioner shoulder bolt (2 required)
2	6C271	Oil pump drive chain tensioner
3	6A895	Oil pump drive chain
4	W704397	Oil pump sprocket bolt
5	6652	Oil pump sprocket
6	W703647	Oil pump bolt (4 required)
7	6600	Oil pump

1. For additional information, refer to the procedures in this information.

OIL FILTER ADAPTER**MATERIAL 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)	WSS-M2C945-A
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING**.
3. Disconnect the 2 coolant hoses from the oil cooler.
4. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
5. Remove the EOP switch.
6. Remove and discard the oil filter.
7. Remove the 4 bolts and the oil filter adapter.
 - Discard the gasket.

Installation

1. Using a new gasket, install the oil filter adapter and the 4 bolts.
 - Tighten to 25 Nm (18 lb-ft).

NOTE: Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

2. Install a new oil filter.
 - Tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

NOTE: Apply thread sealant to the EOP switch threads.

3. Install the EOP switch.
 - Tighten to 15 Nm (133 lb-in).
4. Connect the EOP switch electrical connector.
5. Connect the 2 coolant hoses to the oil cooler.
6. Top off the engine with clean engine oil.
7. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING**.

ENGINE OIL PRESSURE (EOP) SWITCH**MATERIAL SPECIFICATIONS**

Item	Specification
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
3. Remove the EOP switch.
 - To install, tighten to 15 Nm (133 lb-in).

NOTE: Apply thread sealant to the EOP switch threads.

4. To install, reverse the removal procedure.

OIL PAN**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
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)	WSS-M2C945-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.

NOTE: To prevent damage to the transmission, do not loosen the transmission-to-engine bolts more than 5 mm (0.19 in).

3. Loosen the upper bellhousing-to-engine bolt and stud bolt 5 mm (0.19 in).
4. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.

5. Loosen the 2 LH bellhousing-to-engine bolts 5 mm (0.19 in).
6. Loosen the RH engine-to-bellhousing bolt and stud bolt 5 mm (0.19 in).
7. Remove the 2 bellhousing-to-oil pan bolts.
8. Remove the 2 oil pan-to-bellhousing bolts.
9. Slide the transaxle rearward 5 mm (0.19 in).
10. Remove the 2 bolts and the accessory drive belt splash shield.

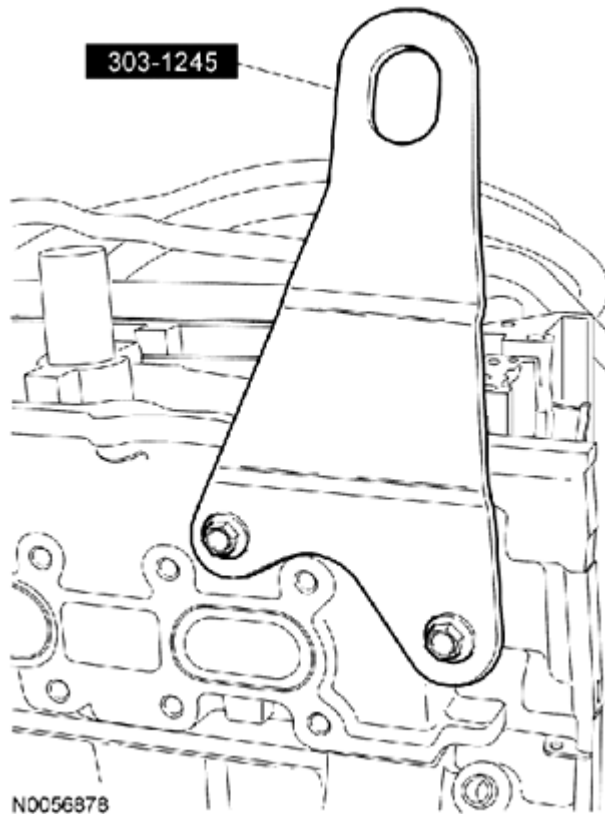


Fig. 111: Locating Accessory Drive Belt Splash Shield And Bolts
Courtesy of FORD MOTOR CO.

11. Drain the engine oil.
 - Install the drain plug.
 - Tighten to 28 Nm (21 lb-ft).
12. Remove the 4 engine front cover-to-oil pan bolts.
13. Remove the 13 bolts and the oil pan.

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, which make leak paths. Use a plastic scraping tool to remove

traces of sealant.

1. Clean and inspect all mating surfaces.

NOTE: If the oil pan is not secured within 10 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. 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.

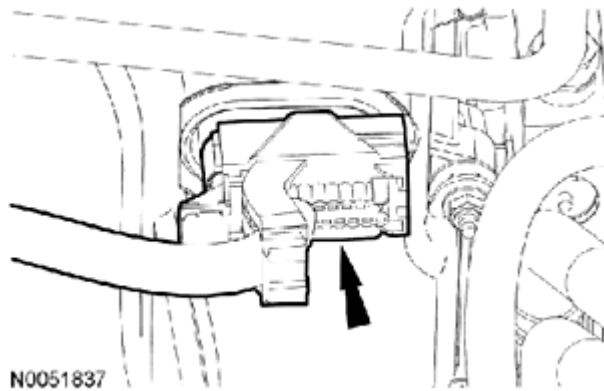


Fig. 112: Locating Oil Pan Silicone Gasket And Sealant Bead Applying Area
Courtesy of FORD MOTOR CO.

2. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the oil pan-to-engine block and to the oil pan-to-engine front cover mating surface.
3. Position the oil pan onto the engine and install the 13 oil pan bolts finger-tight.

NOTE: The engine front cover-to-oil pan bolts must be tightened first to align the front surface of the oil pan flush with the front surface of the engine block.

4. Install the 4 engine front cover-to-oil pan bolts.
 - Tighten to 10 Nm (89 lb-in).

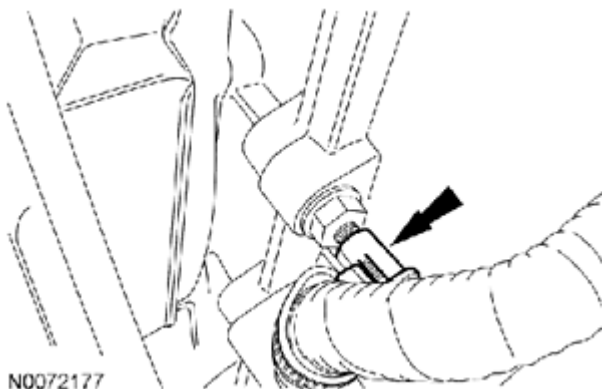


Fig. 113: Locating Engine Front Cover-To-Oil Pan Bolts
Courtesy of FORD MOTOR CO.

5. Tighten the oil pan bolts in the sequence shown in illustration.
 - Tighten to 25 Nm (18 lb-ft).

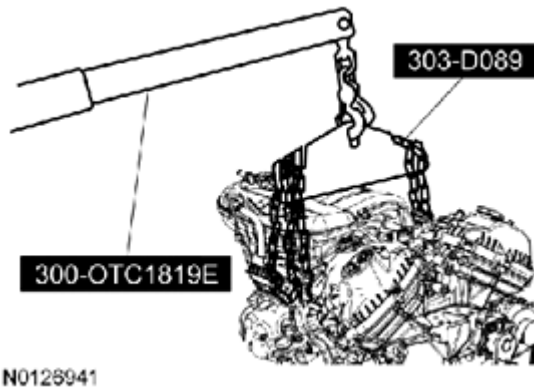


Fig. 114: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

6. Install the accessory drive belt splash shield and the 2 bolts.
 - Tighten to 9 Nm (80 lb-in).

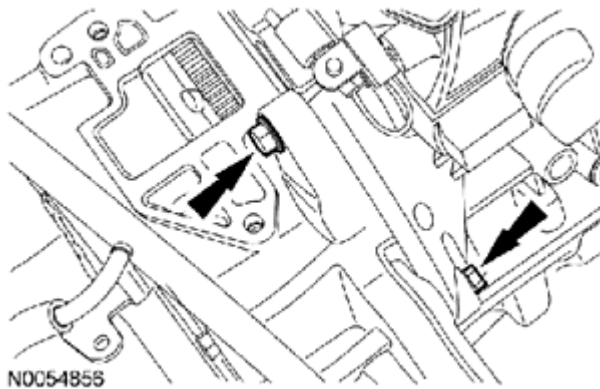


Fig. 115: Locating Accessory Drive Belt Splash Shield And Bolts
Courtesy of FORD MOTOR CO.

7. Alternate tightening the 1 LH bellhousing-to-engine and 1 RH engine-to-bellhousing lower bolts to slide the transaxle and engine together.
 - Tighten to 48 Nm (35 lb-ft).
8. Tighten the remaining LH bellhousing-to-engine bolt and the remaining rear engine-to-bellhousing stud bolt.
 - Tighten to 48 Nm (35 lb-ft).
9. Install the 2 bellhousing-to-oil pan bolts.

- Tighten to 48 Nm (35 lb-ft).
10. Install the 2 oil pan-to-bellhousing bolts.
 - Tighten to 48 Nm (35 lb-ft).
 11. Install the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
 12. Tighten the top bellhousing-to-engine bolt and stud bolt.
 - Tighten to 48 Nm (35 lb-ft).
 13. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
 14. Fill the engine with clean engine oil.

OIL PUMP SCREEN AND PICKUP TUBE

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the oil pan. For additional information, refer to **OIL PAN**.
3. Remove the 2 bolts and the oil pump screen and pickup tube.
 - Discard the gasket.

Installation

1. Clean and inspect all mating surfaces.
2. Using a new gasket, install the oil pump screen and pickup tube and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).
3. Install the oil pan. For additional information, refer to **OIL PAN**.

OIL PUMP

MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
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)	WSS-M2C945- A
Silicone Gasket and Sealant TA-30	WSE-M4G323- A4

Removal

1. With the engine in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.

2. Remove the engine front cover. For additional information, refer to **ENGINE FRONT COVER** .
3. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE** .
4. Drain the engine oil, then install the drain plug.
 - To install, tighten to 28 Nm (21 lb-ft).
5. Remove the 2 oil pan-to-bellhousing bolts.
6. Remove the 2 bellhousing-to-oil pan bolts.
7. Remove the 13 bolts and the oil pan.

NOTE: Discard the gasket and clean and inspect the gasket mating surfaces.

8. Remove the 2 bolts and the oil pump screen and pickup tube.
9. Remove the oil pump drive chain tensioner.
 1. Release the tension on the tensioner spring.
 2. Remove the tensioner and the 2 shoulder bolts.

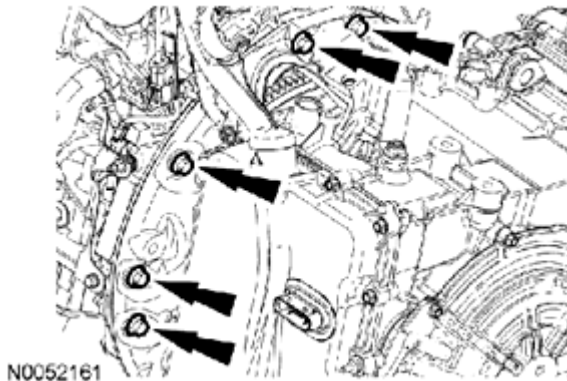


Fig. 116: Identifying Oil Pump Chain Drive Tensioner And Shoulder Bolts
Courtesy of FORD MOTOR CO.

10. Remove the chain from the oil pump sprocket.
11. Remove the bolt and oil pump sprocket.
12. Remove the 4 bolts and the oil pump.

Installation

NOTE: Clean the oil pump and cylinder block mating surfaces with metal surface prep.

1. Install the oil pump assembly. Tighten the 4 bolts in the sequence shown in 2 stages:
 - Stage 1: Tighten to 10 Nm (89 lb-in).
 - Stage 2: Tighten to 20 Nm (177 lb-in).



Fig. 117: Identifying Oil Pump Assembly Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2. Install the oil pump sprocket and bolt.
 - Tighten to 25 Nm (18 lb-ft).
3. Install the chain onto the oil pump sprocket.
4. Install the oil pump drive chain tensioner shoulder bolt.
 - Tighten to 10 Nm (89 lb-in).

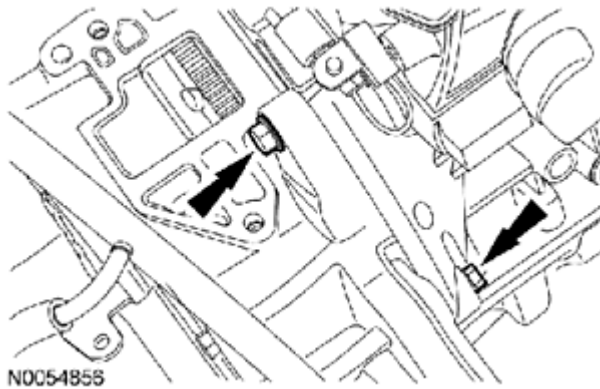


Fig. 118: Locating Oil Pump Chain Drive Tensioner Shoulder Bolt
Courtesy of FORD MOTOR CO.

5. Install the oil pump chain tensioner and bolt. Hook the tensioner spring around the shoulder bolt.
 - Tighten to 10 Nm (89 lb-in).

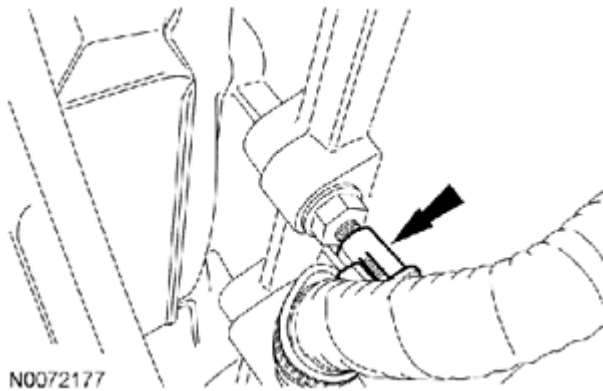


Fig. 119: Locating Oil Pump Drive Chain Tensioner, Bolt And Tensioner Spring
Courtesy of FORD MOTOR CO.

6. Install the oil pump screen and pickup tube and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

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 to sealant.

7. Clean all mating surfaces with metal surface prep.

NOTE: If the oil pan is not secured within 10 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. 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.

8. Apply a 2.5 mm (0.09 in) bead of sealant gasket and sealant to the oil pan.
 - Position the oil pan onto the engine and install the 2 rear oil pan bolts finger-tight.

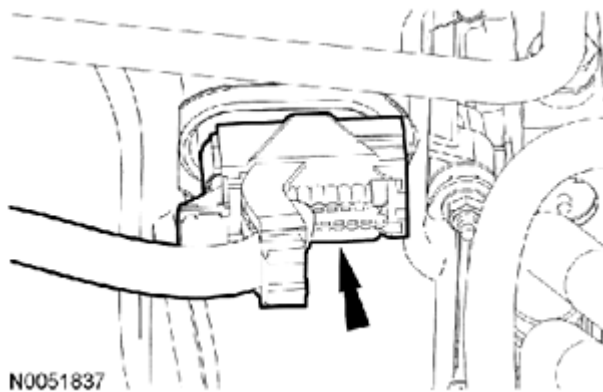


Fig. 120: Locating Oil Pan Bolts

Courtesy of FORD MOTOR CO.

9. Using a suitable straight edge, align the front surface of the oil pan flush with the front surface of the engine block.

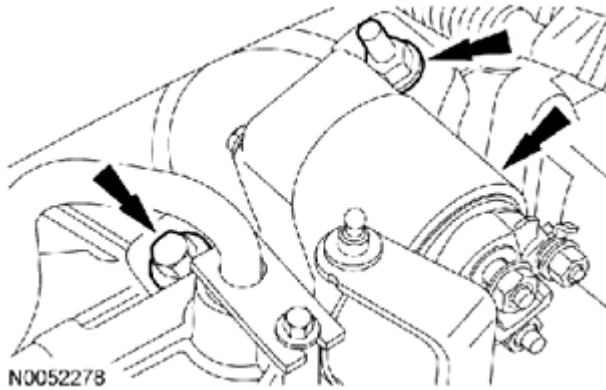


Fig. 121: Aligning Front Surface Of Oil Pan Flush With Front Surface Of Engine Block Using Straightedge
Courtesy of FORD MOTOR CO.

10. Install the remaining oil pan bolts.
 - Tighten in the sequence shown in illustration to 25 Nm (18 lb-ft).

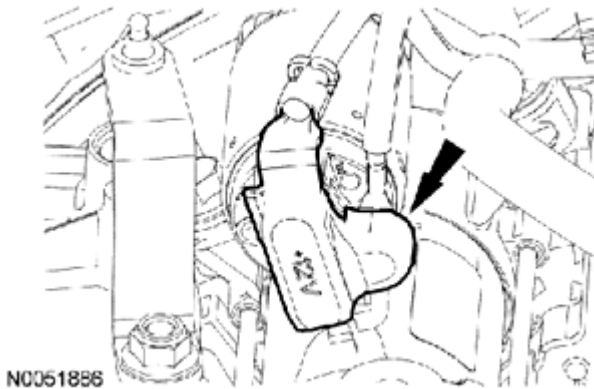


Fig. 122: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

11. Install the 2 bellhousing-to-oil pan bolts.
 - Tighten to 48 Nm (35 lb-ft).
12. Install the 4 oil pan-to-bellhousing bolts.
 - Tighten to 48 Nm (35 lb-ft).
13. Install the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
14. Install the engine front cover. For additional information, refer to **ENGINE FRONT COVER**.

15. Fill the engine with clean engine oil.

OIL LEVEL INDICATOR AND TUBE

MATERIAL 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)	WSS-M2C945-A

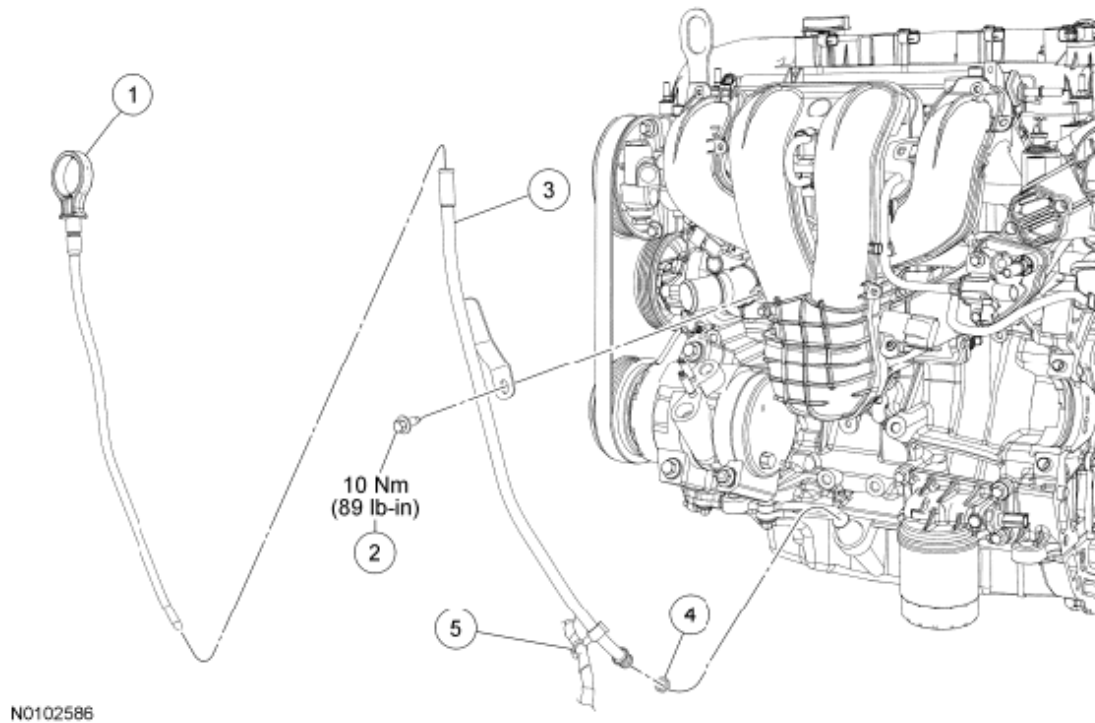


Fig. 123: Identifying Oil Level Indicator And Tube Components With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6750	Oil level indicator
2	W500211	Oil level indicator tube bolt
3	6754	Oil level indicator tube
4	6754-B	O-ring seal
5	-	Wiring harness retainer

Removal and Installation

1. Remove the oil level indicator.
2. Remove the oil level indicator tube bolt.

- To install, tighten to 10 Nm (89 lb-in).
3. Detach the wiring harness retainer from the oil level indicator tube.

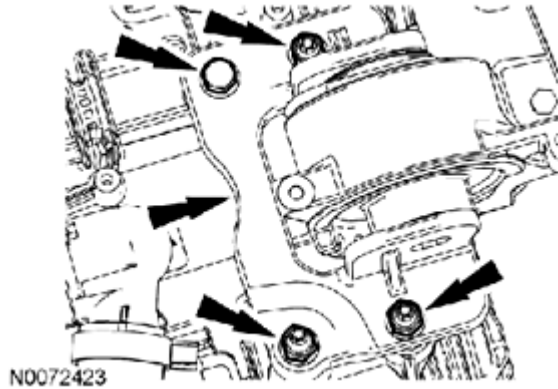


Fig. 124: Locating Wiring Harness Retainer From Oil Level Indicator Tube
Courtesy of FORD MOTOR CO.

4. Remove the oil level indicator tube and discard the O-ring seal.
 - To install, lubricate the new O-ring seal with clean engine oil.
5. To install, reverse the removal procedure.

OIL COOLER

MATERIAL 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)	WSS-M2C945-A

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the oil drain plug and drain the engine oil.
 - To install, tighten to 28 Nm (21 lb-ft).
3. Remove and discard the oil filter.
 - To install, tighten three-fourths of a turn after the filter gasket makes contact with the oil filter adapter.
4. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING**.
5. Disconnect the 2 coolant hoses from the oil cooler.
6. Disconnect the Engine Oil Pressure (EOP) electrical connector.

NOTE: Discard the gasket.

7. Remove the 4 bolts and the oil filter adapter.
 - To install, tighten to 25 Nm (18 lb-ft).

NOTE: If metal or aluminum material is present in the oil cooler, mechanical concerns exist. To diagnose mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

8. Position the oil filter adapter in a vise and remove the oil cooler bolt and oil cooler.
 - Inspect the oil cooler.
 - To install, tighten to 34 Nm (25 lb-ft).
9. To install, reverse the removal procedure.
10. Fill the engine with clean engine oil.
11. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING** .

EXHAUST MANIFOLD

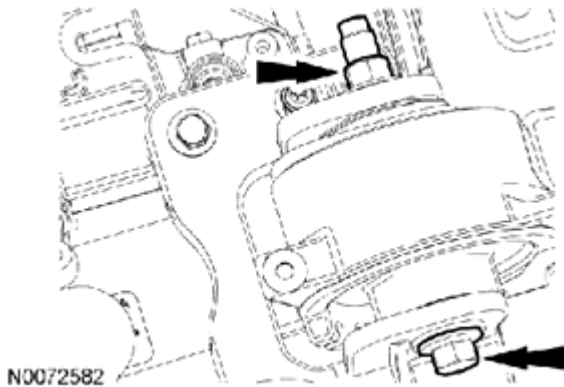


Fig. 125: Identifying Exhaust Manifold Components With Torque Specifications
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Heated Oxygen Sensor (HO2S) electrical connector (part of 12C508)
2	-	HO2S sensor wiring retainer
3	W713299	Exhaust manifold heat shield bolt (4 required)
4	9N454	Exhaust manifold heat shield
5	W713652	Exhaust manifold nut (7 required)
6	9430	Exhaust manifold
7	9448	Exhaust manifold gasket
8	W704474	Exhaust manifold stud (7 required)

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING &**

LIFTING .

2. Remove the catalytic converter. For additional information, refer to **EXHAUST SYSTEM** .
3. Disconnect the Heated Oxygen Sensor (HO2S) electrical connector.
 - Detach the wiring retainer.
4. Remove the 4 exhaust manifold heat shield bolts and the heat shield.
5. Remove and discard the 7 exhaust manifold nuts.
6. Remove the exhaust manifold and discard the exhaust manifold gasket.
7. Remove and discard the 7 exhaust manifold studs.
8. Clean and inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

Installation

1. Install the 7 new exhaust manifold studs.
 - Tighten to 17 Nm (150 lb-in).

NOTE: Failure to tighten the catalytic converter nuts to specification before installing the converter bracket bolts will cause the converter to develop an exhaust leak.

NOTE: Failure to tighten the catalytic converter nuts to specification a second time may cause the converter to develop an exhaust leak. Due to the possibility of the catalytic converter nuts loosening after the first tightening sequence, a second sequence (stage 2) will ensure that the catalytic converter nuts are properly torqued.

2. Install a new exhaust manifold gasket, the exhaust manifold and 7 new nuts in the sequence shown in 2 stages:
 - Stage 1: Tighten to 48 Nm (35 lb-ft).
 - Stage 2: Tighten to 48 Nm (35 lb-ft).

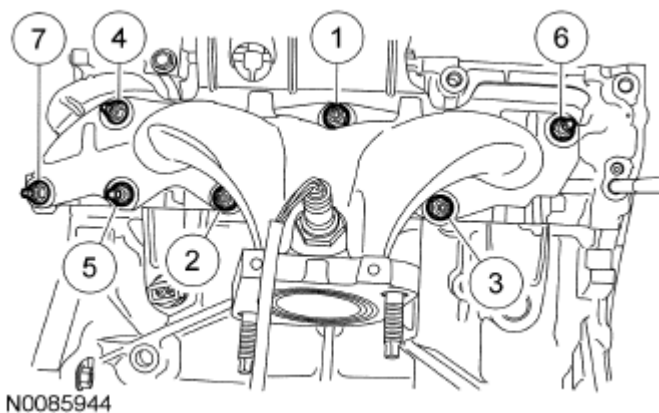


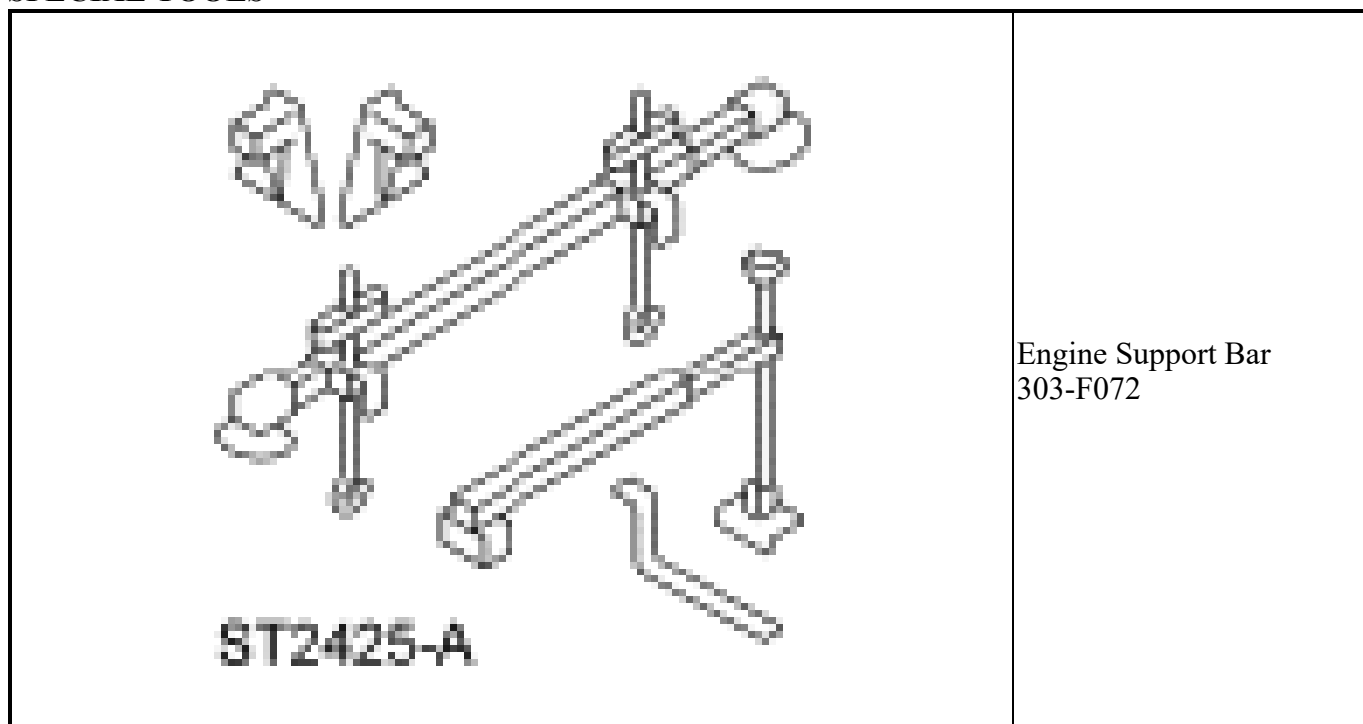
Fig. 126: Identifying Exhaust Manifold Nuts Tightening Sequence

Courtesy of FORD MOTOR CO.

3. Install the exhaust manifold heat shield and the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).
4. Connect the HO2S electrical connector.
 - Attach the wiring retainer.
5. Install the catalytic converter. For additional information, refer to **EXHAUST SYSTEM**.

ENGINE MOUNT

SPECIAL TOOLS



Coolant Degas Bottle

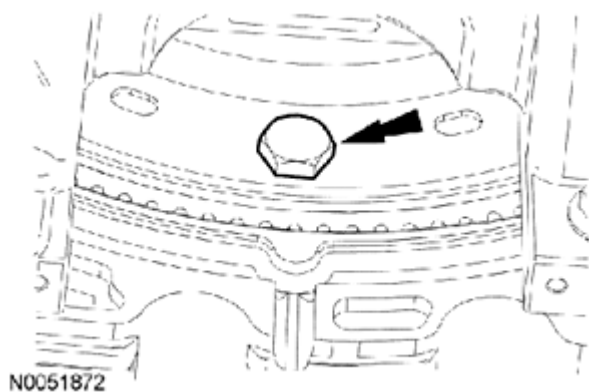


Fig. 127: Identifying Coolant Degas Bottle And Bolt With Torque Specifications

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W701107	Coolant degas bottle bolt
2	8A080	Coolant degas bottle

Engine Mount

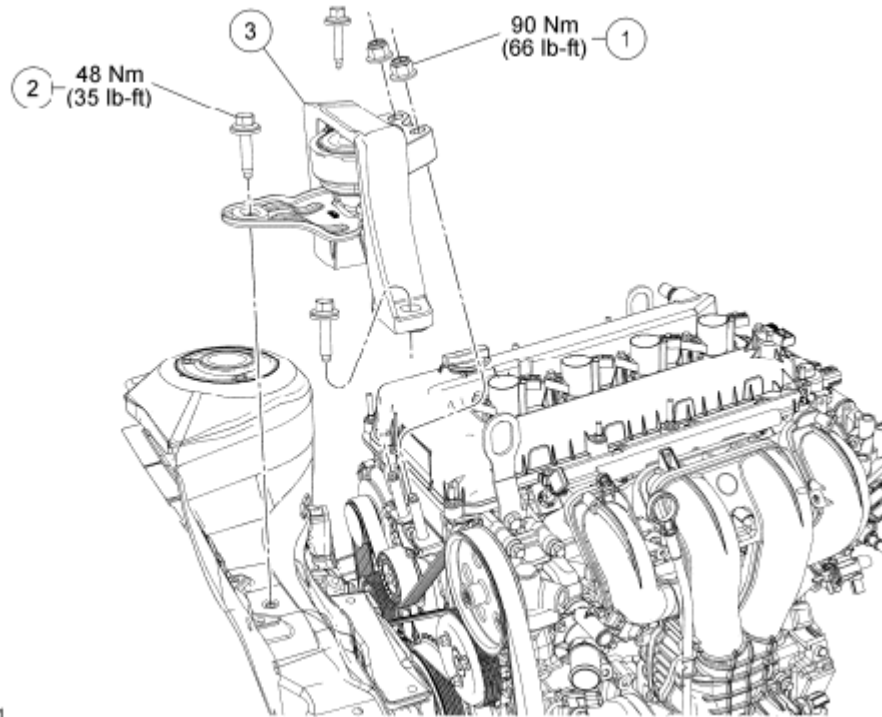


Fig. 128: Identifying Engine Mount Bolt And Nut With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W520214	Engine mount nut (2 required)
2	W710332	Engine mount bolt (3 required)
3	6F012	Engine mount

Removal and Installation

1. Remove the degas bottle bolt.
 - To install, tighten to 8 Nm (71 lb-in).
2. Lift the coolant degas bottle off of the shock tower bracket and position it aside.
3. Install the Engine Support Bar.

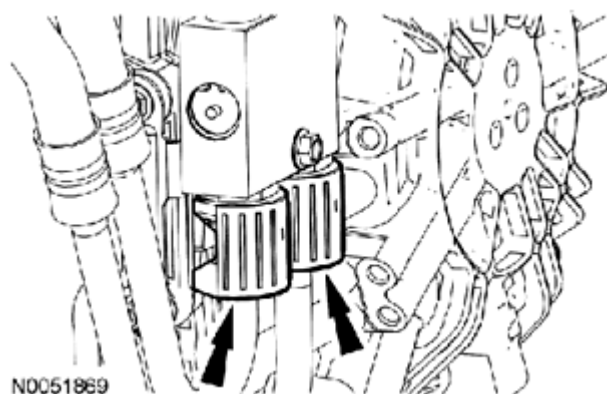


Fig. 129: Installing Engine Support Bar
Courtesy of FORD MOTOR CO.

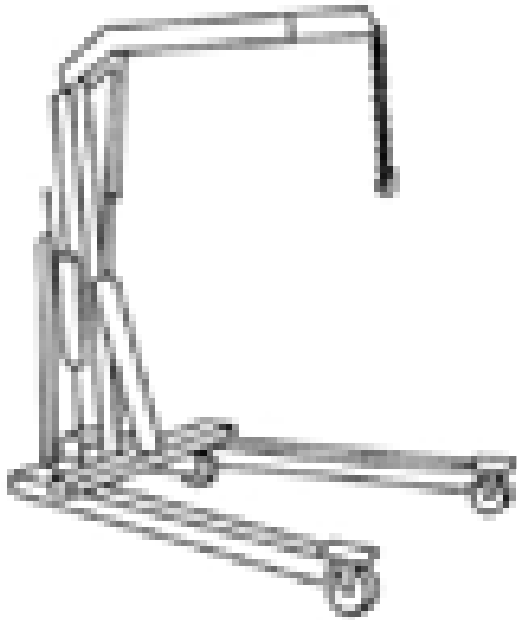
4. Remove the 2 engine mount nuts.
 - To install, tighten to 90 Nm (66 lb-ft).
5. Remove the 3 bolts and the engine mount.
 - To install, tighten to 48 Nm (35 lb-ft).
6. To install, reverse the removal procedure.

REMOVAL

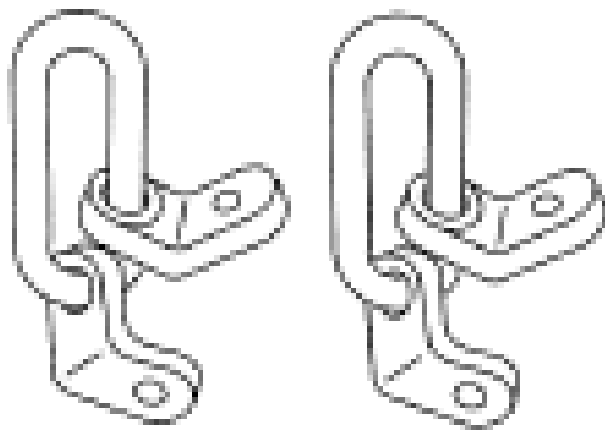
ENGINE

SPECIAL TOOLS

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



ST1341-A

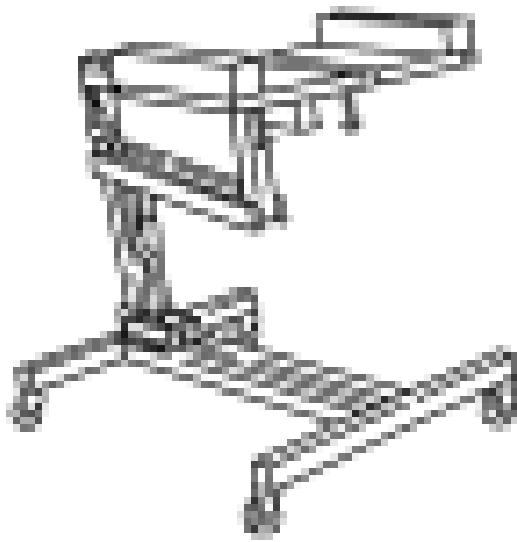


ST2793-A

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

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



ST1652-A

Powertrain Lift
300-OTC1585AE or equivalent



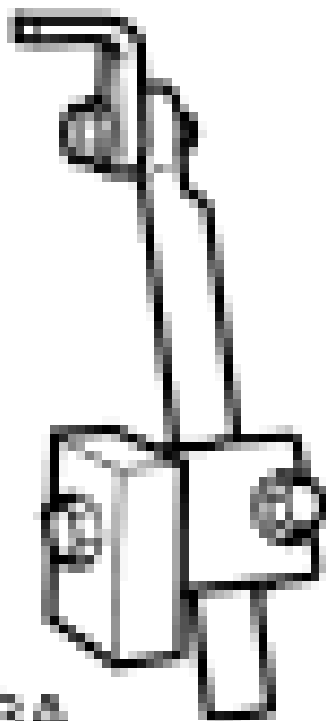
ST1636-A

Retainer, Torque Converter
307-346 (T97T-7902-A)

Spreader Bar
303-D089 (D93P-6001-A3) or equivalent



ST1602-A



ST2743A

Adjustable Grip Arm, 1735A
014-00001 or equivalent

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the 2 bolts, pin-type retainer and the LH front splash shield.

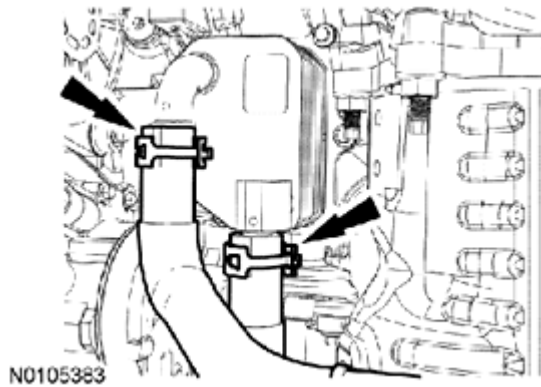


Fig. 130: Locating LH Front Splash Shield, Pin-Type Retainer And Bolts
Courtesy of FORD MOTOR CO.

3. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .
4. Recover the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** .
5. Remove the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
6. Disconnect the crankcase vent tube from the valve cover.

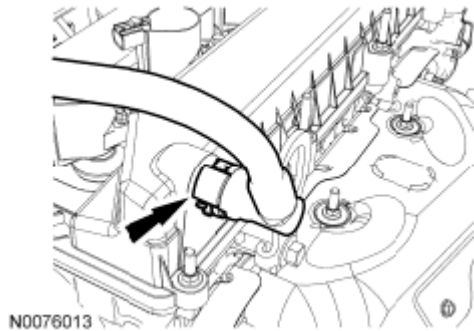


Fig. 131: Locating Crankcase Vent Tube
Courtesy of FORD MOTOR CO.

7. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
8. Remove the nut and disconnect cable from the positive battery cable terminal.

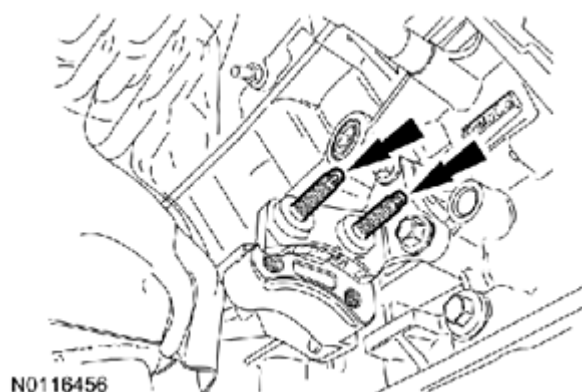


Fig. 132: Locating Positive Battery Cable Terminal And Nut
Courtesy of FORD MOTOR CO.

9. Detach the 3 positive battery cable wire harness retainers.

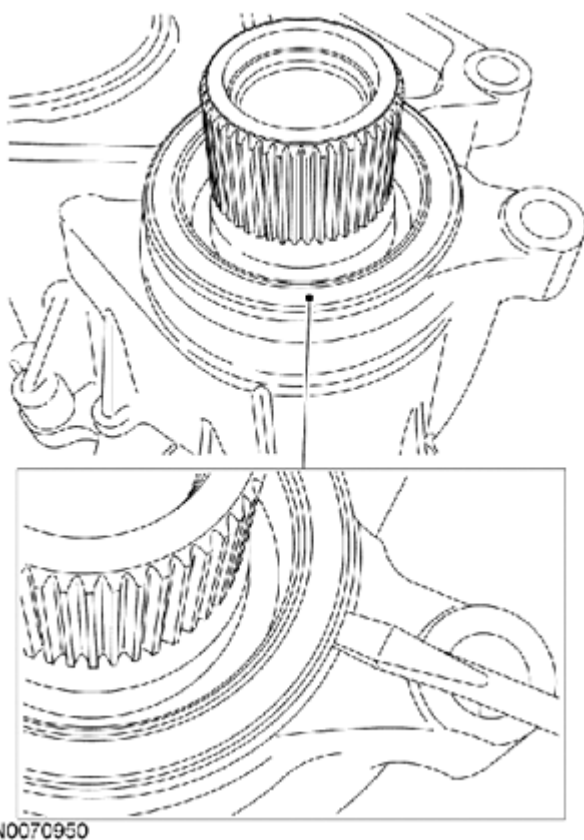


Fig. 133: Locating Positive Battery Cable Wire Harness Retainers
Courtesy of FORD MOTOR CO.

10. Remove the bolt and the negative battery cable ground.

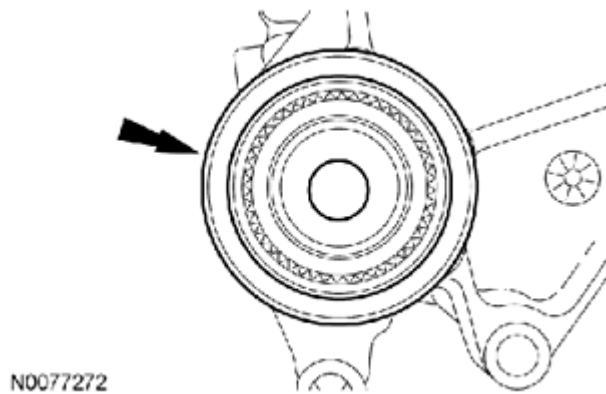


Fig. 134: Locating Negative Battery Cable Ground Bolt
Courtesy of FORD MOTOR CO.

NOTE: The vehicle should be given adequate time to completely cool prior to disconnecting the fuel tube quick connecting coupling. This area is directly above the exhaust manifold and precautions should be taken to avoid any fuel spillage.

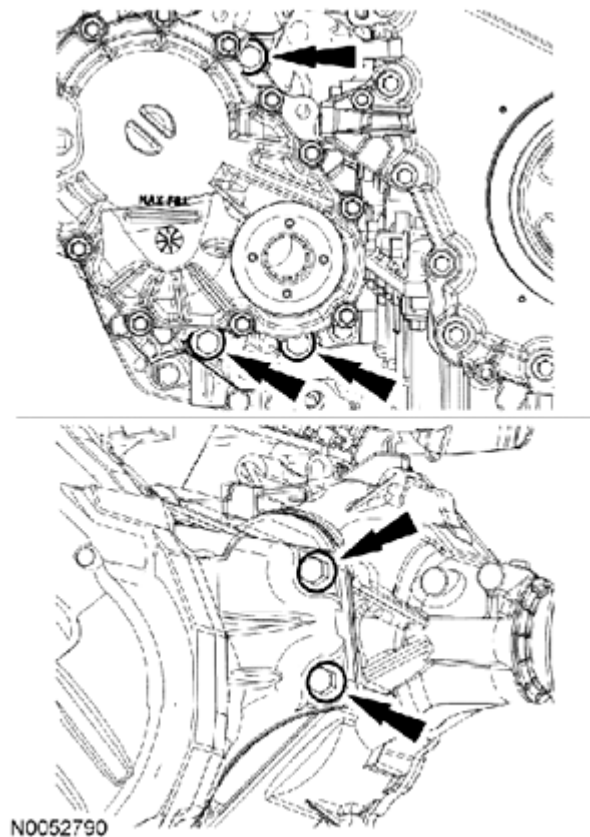


Fig. 135: Locating Fuel Tube Quick Connect Coupling From Fuel Tube Near Bulkhead
Courtesy of FORD MOTOR CO.

11. Disconnect the fuel tube quick connect coupling from the fuel tube near the bulkhead. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
12. Disconnect the Evaporative Emission (EVAP) tube and position aside. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.

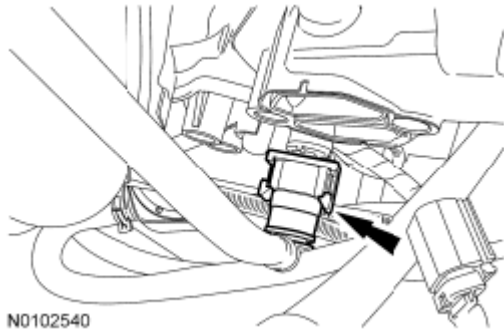


Fig. 136: Locating Evaporative Emission (EVAP) Tube And Position Aside
Courtesy of FORD MOTOR CO.

13. Disconnect the power brake booster vacuum tube.
 - Depress the quick connect locking ring.
 - Pull the vacuum tube out of the quick connect fitting.

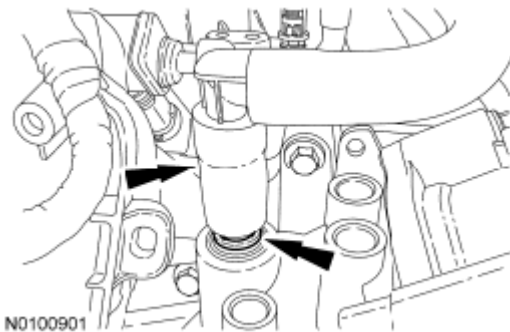


Fig. 137: Locating Vacuum Tube Of Quick Release Fitting
Courtesy of FORD MOTOR CO.

14. Detach and disconnect the 2 engine harness electrical connectors.

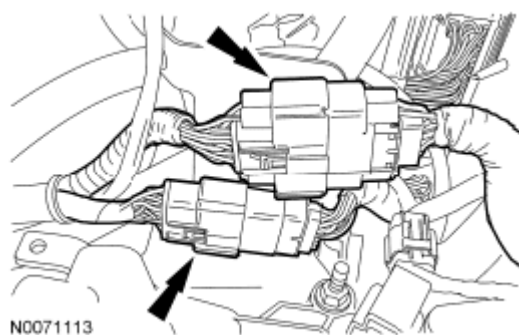


Fig. 138: Locating Engine Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

15. Detach the engine harness from the coolant outlet bracket harness retainer.

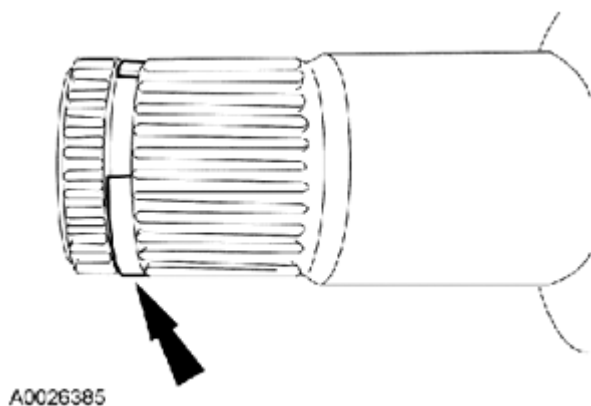


Fig. 139: Locating Engine Harness Of Coolant Outlet Bracket Harness Retainer
Courtesy of FORD MOTOR CO.

16. Remove the nut and the ground wire from the negative battery terminal.

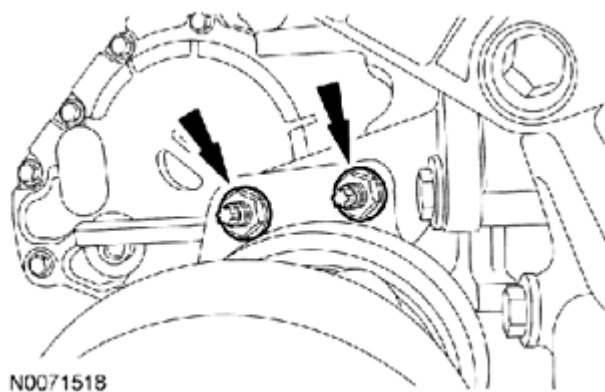


Fig. 140: Locating Nut And Ground Wire From Negative Battery Terminal
Courtesy of FORD MOTOR CO.

17. Disconnect the 3 PCM electrical connectors.

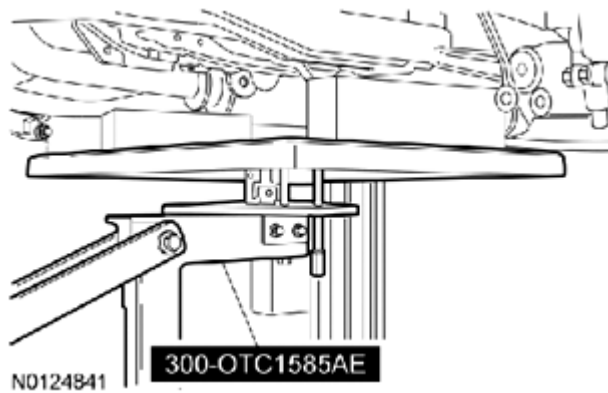


Fig. 141: Locating PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

18. Disconnect the starter wire harness electrical connector.

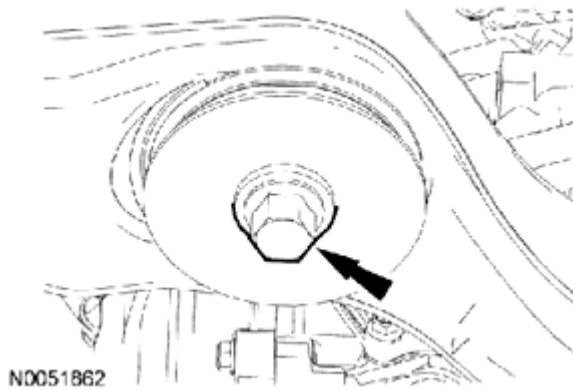


Fig. 142: Locating Starter Wire Harness Electrical Connector
Courtesy of FORD MOTOR CO.

19. Disconnect the Heated Oxygen Sensor (HO2S) and Catalyst Monitor Sensor (CMS) electrical connectors and detach the wire harness retainer.

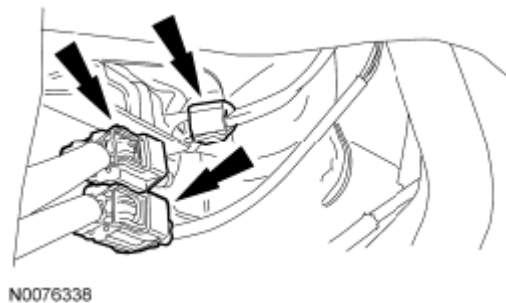


Fig. 143: Locating Heated Oxygen Sensor And Catalyst Monitor Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

20. Disconnect the transaxle shift cable from the lever and bracket.

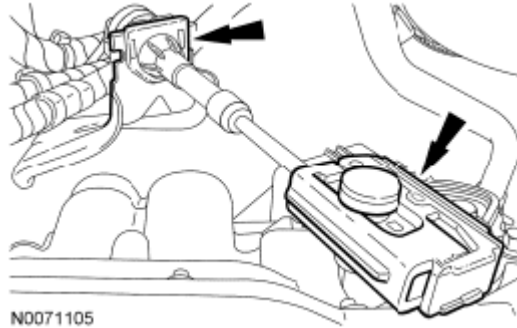


Fig. 144: Locating Transaxle Shift Cable
Courtesy of FORD MOTOR CO.

21. Remove the transmission fluid cooler tube secondary latches.

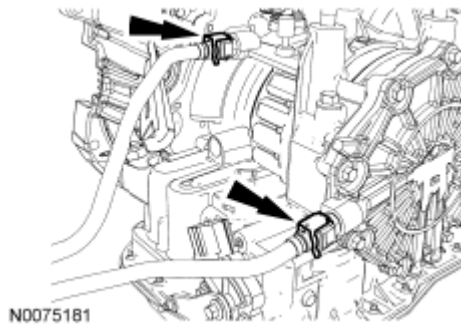


Fig. 145: Locating Transmission Fluid Cooler Tube Secondary Latches
Courtesy of FORD MOTOR CO.

NOTE: Transaxle fluid cooler inlet tube shown in illustration, transaxle fluid cooler outlet tube similar.

22. Disconnect the 2 transaxle fluid cooler tubes from the transaxle.
1. Squeeze the tabs together.
 2. Slide the transaxle fluid cooler tube lock up and remove the transaxle fluid cooler tubes from the transaxle.

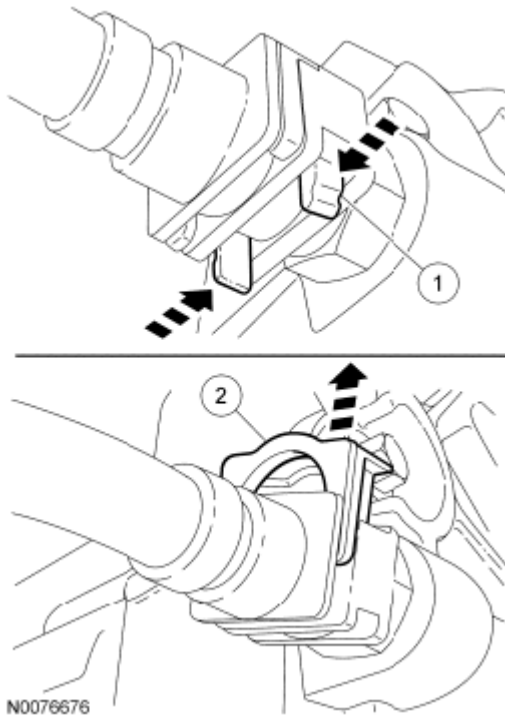


Fig. 146: Sliding Transaxle Fluid Cooler Tube Lock Up
Courtesy of FORD MOTOR CO.

23. Remove the engine oil level indicator.

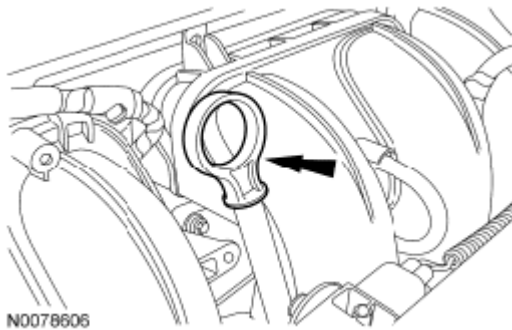
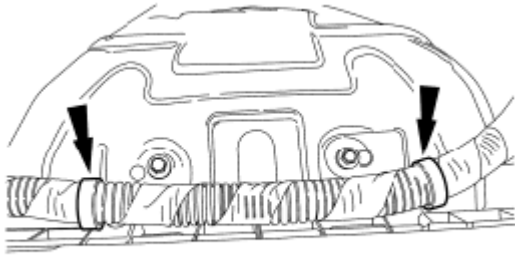


Fig. 147: Locating Engine Oil Level Indicator
Courtesy of FORD MOTOR CO.

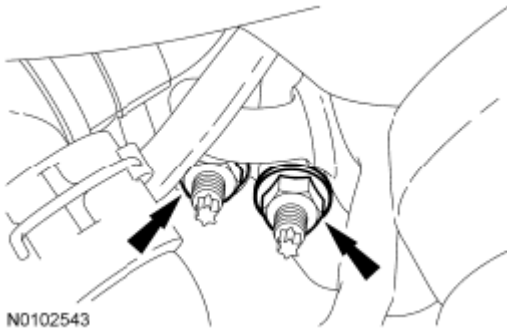
24. Remove the 2 front wheels and tires. For additional information, refer to **WHEELS AND TIRES**.
25. Remove the accessory drive belt and tensioner. For additional information, refer to **ACCESSORY DRIVE**.
26. Remove the generator. For additional information, refer to **CHARGING SYSTEM**.
27. Detach the 2 B+ battery cable wire harness retainers from the valve cover stud bolts and remove the wiring harness.



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Fig. 148: Locating B+ Battery Cable Wire Harness Retainers From Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

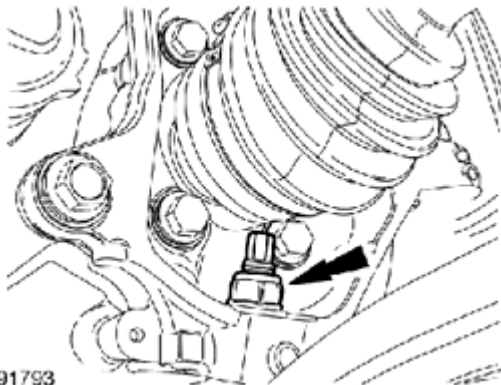
28. Remove the 2 A/C tube nuts from the A/C compressor.



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Fig. 149: Locating A/C Tube-To-Compressor Nuts
Courtesy of FORD MOTOR CO.

29. Disconnect the 2 A/C tubes from the compressor.
- Discard the 2 O-ring seals.



N0091793

Fig. 150: Locating A/C Tube O-Rings
Courtesy of FORD MOTOR CO.

30. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING**.

31. Remove the cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING** .
32. Disconnect the lower radiator hose from the radiator.

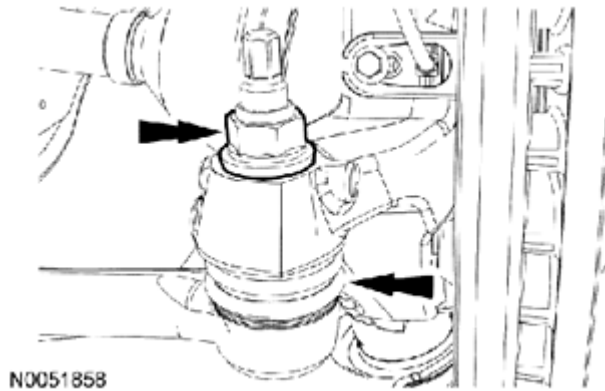


Fig. 151: Locating Lower Radiator Hose From Radiator
Courtesy of FORD MOTOR CO.

33. Drain the engine oil.
 - Install the drain plug and tighten to 28 Nm (21 lb-ft).



Fig. 152: Locating Drain Plug
Courtesy of FORD MOTOR CO.

34. Remove the engine oil filter and discard.

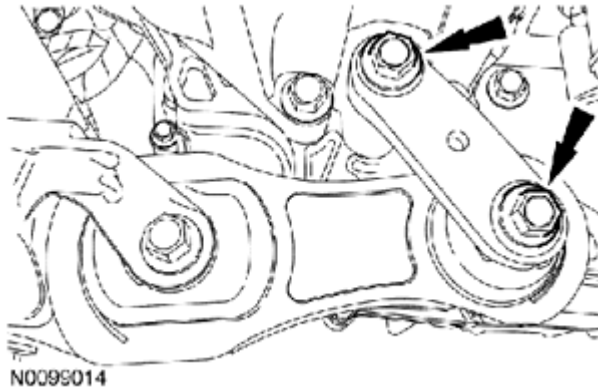


Fig. 153: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

35. Remove the LH and RH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS**.
36. Remove the bolt and the power steering tube clip.

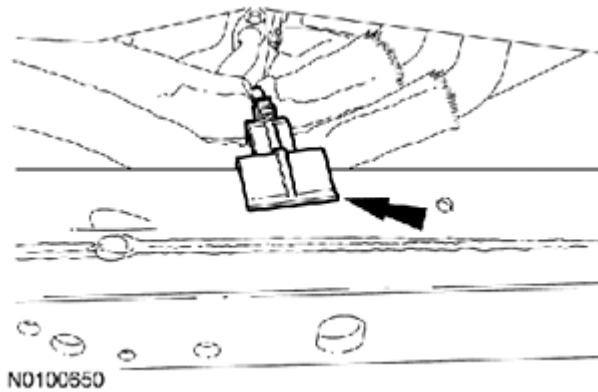


Fig. 154: Locating Power Steering Tube Clip Bolt
Courtesy of FORD MOTOR CO.

37. Remove the bolt and the power steering tubes from the steering gear.
 - Discard the 2 power steering tube O-ring seals.

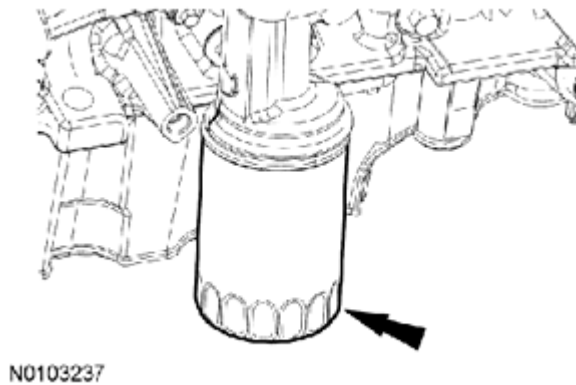


Fig. 155: Locating Power Steering Tubes And Bolt
Courtesy of FORD MOTOR CO.

38. Disconnect the power steering cooler tube.

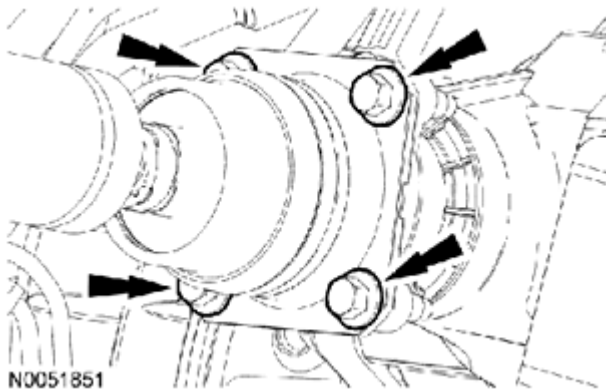


Fig. 156: Locating Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

39. Remove the exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD** .
40. Remove the power steering pump. For additional information, refer to **POWER STEERING** .
41. Release the retaining clip and disconnect the coolant degas bottle hose.

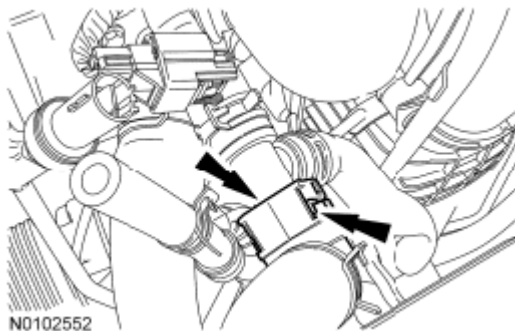


Fig. 157: Locating Coolant Degas Bottle Hose And Retaining Clip

Courtesy of FORD MOTOR CO.

42. Disconnect the coolant degas bottle vent hose from the coolant bypass and position it aside.

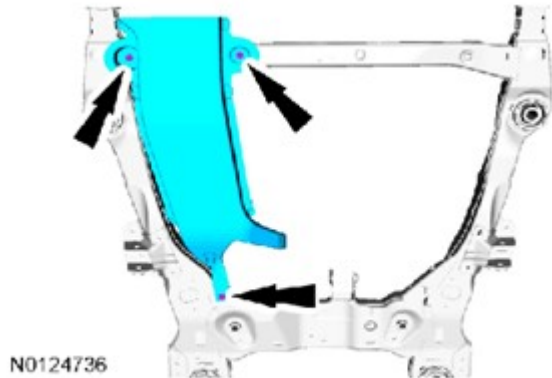


Fig. 158: Locating Coolant Degas Bottle Vent Hose From Coolant Bypass
Courtesy of FORD MOTOR CO.

43. Disconnect the upper radiator hose and the heater hose from the coolant bypass.

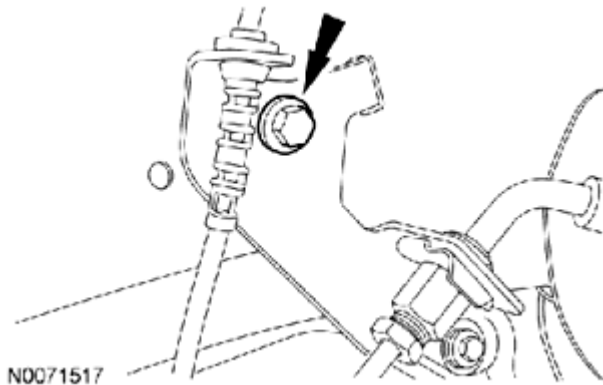


Fig. 159: Locating Upper Radiator Hose And Heater Hose From Coolant Bypass
Courtesy of FORD MOTOR CO.

44. Disconnect the heater hose from the coolant tube.

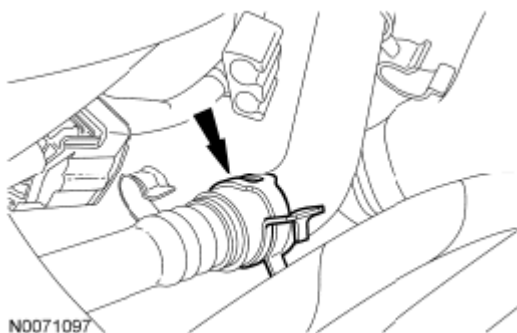


Fig. 160: Locating Heater Hose Of Coolant Tube
Courtesy of FORD MOTOR CO.

45. Remove the transaxle fluid level indicator.

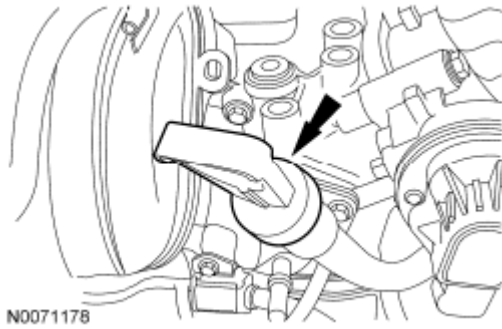


Fig. 161: Locating Transaxle Fluid Level Indicator
Courtesy of FORD MOTOR CO.

NOTE: The bolts are different lengths, mark the bolts for installation.

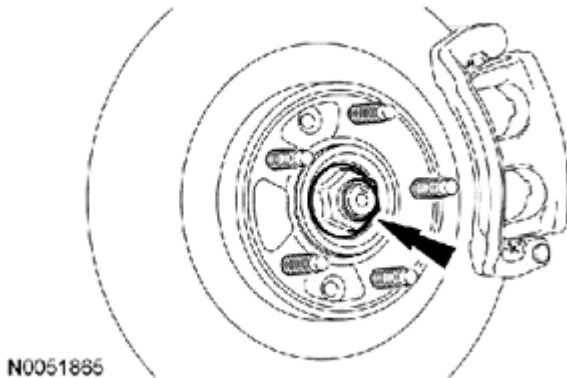


Fig. 162: Locating Transaxle Roll Restrictor And Bolts
Courtesy of FORD MOTOR CO.

46. Remove the 2 bolts and the transaxle roll restrictor.
47. Remove the 2 lower bellhousing-to-oil pan bolts.

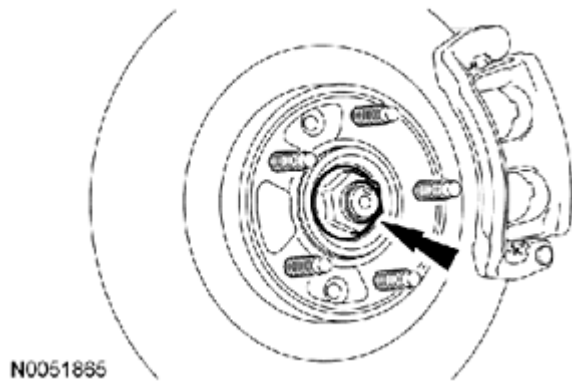


Fig. 163: Locating Lower Bellhousing-To-Oil Pan Bolts
Courtesy of FORD MOTOR CO.

48. Remove the 2 oil pan-to-bellhousing bolts.

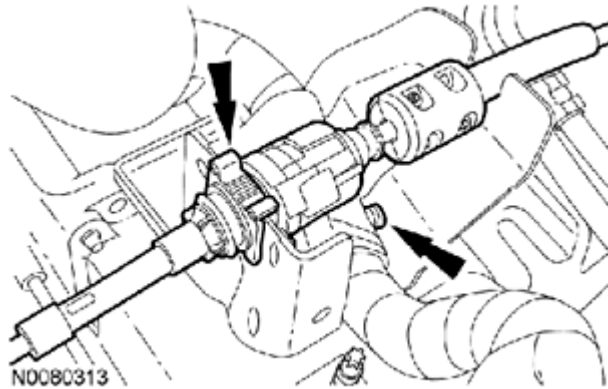


Fig. 164: Locating Oil Pan-To-Bell Housing Bolts
Courtesy of FORD MOTOR CO.

49. Using the Powertrain Lift and Adjustable Grip Arm, secure the engine to the lift table.

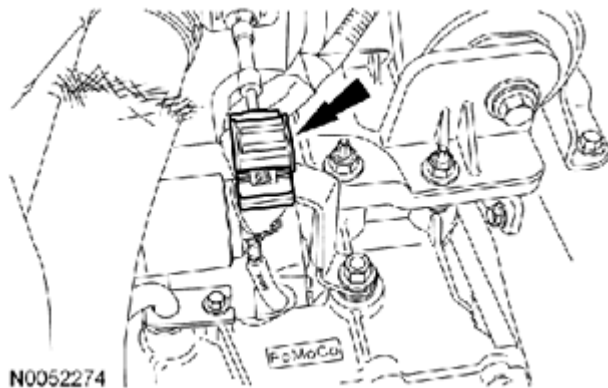


Fig. 165: Securing Engine To Lift Table Using Powertrain Lift And Adjustable Grip Arm
Courtesy of FORD MOTOR CO.

50. Remove the 2 engine mount nuts.

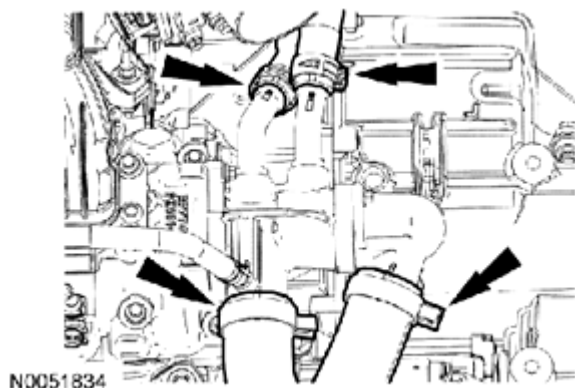


Fig. 166: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

51. Remove the 3 bolts and the engine mount.

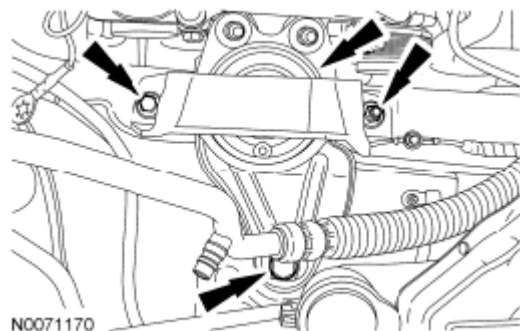


Fig. 167: Locating Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

52. Remove the 5 transaxle mount nuts and the transaxle mount plate.

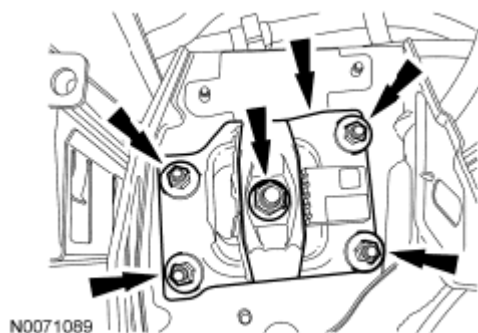


Fig. 168: Locating Transaxle Mount Nuts
Courtesy of FORD MOTOR CO.

53. Lower the engine and transaxle assembly from the vehicle.
54. Remove the nut for the HO2S and CMS wire connector bracket.

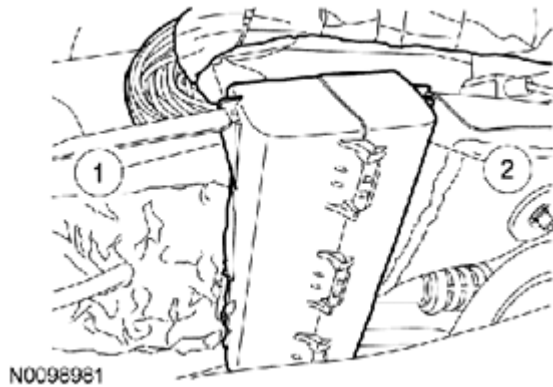


Fig. 169: Locating HO2S And CMS Wire Connector Bracket Nut
Courtesy of FORD MOTOR CO.

55. Remove the nut and position the HO2S and CMS wire connector bracket aside.

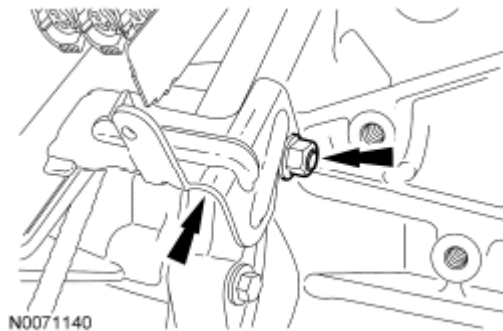


Fig. 170: Locating HO2S And CMS Wire Connector Bracket And Nut
Courtesy of FORD MOTOR CO.

56. Disconnect the Output Shaft Speed (OSS) sensor electrical connector.

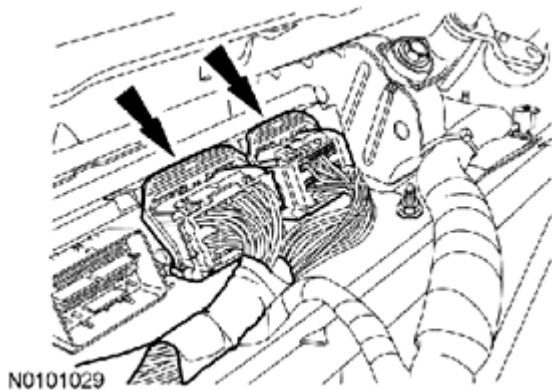


Fig. 171: Locating Output Shaft Speed Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

57. Disconnect the Turbine Shaft Speed (TSS) sensor electrical connector.

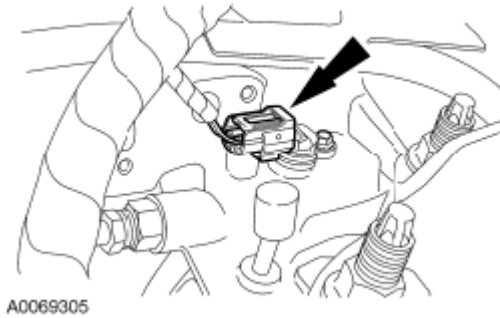


Fig. 172: Locating Turbine Shaft Speed Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

58. Disconnect the 2 transaxle electrical connectors.

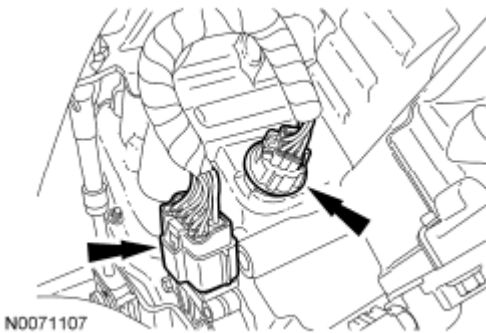


Fig. 173: Locating Transaxle Electrical Connectors
Courtesy of FORD MOTOR CO.

59. Disconnect the A/C compressor electrical connector.

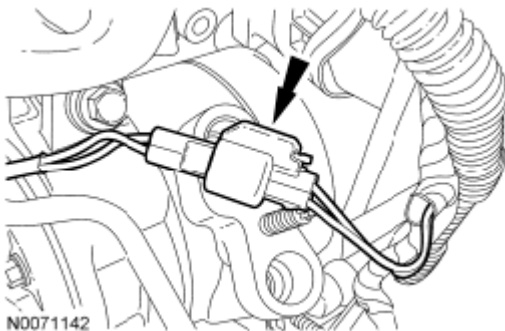


Fig. 174: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

60. Disconnect the Power Steering Pressure (PSP) switch electrical connector.

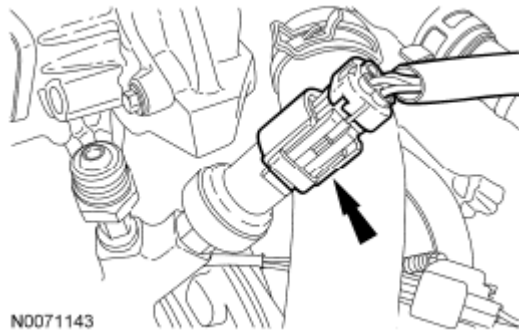


Fig. 175: Locating Power Steering Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

61. Detach the wiring harness pin-type retainer from the intake manifold.

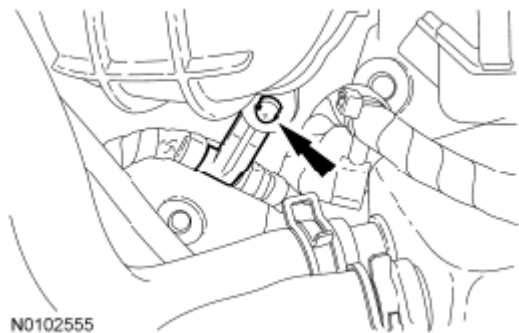


Fig. 176: Locating Wiring Harness Pin-Type Retainer From Intake Manifold
Courtesy of FORD MOTOR CO.

62. Detach the 2 Crankshaft Position (CKP) sensor wire harness retainers.

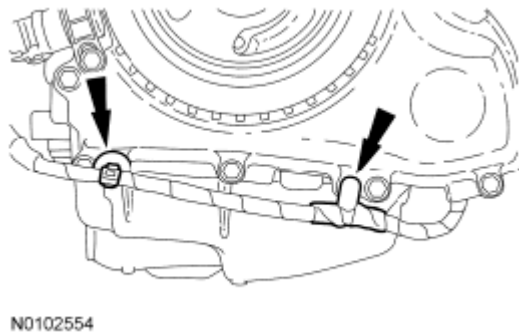


Fig. 177: Locating Crankshaft Position (CKP) Sensor Wire Harness Retainers
Courtesy of FORD MOTOR CO.

63. Disconnect the CKP sensor electrical connector.

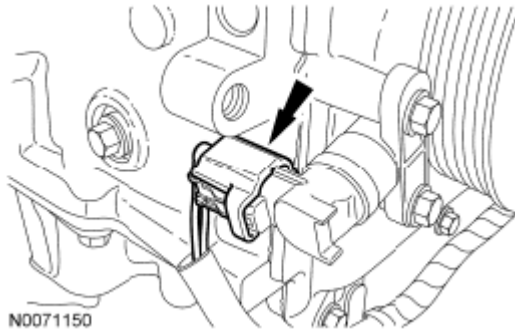


Fig. 178: Locating CKP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

64. Detach the starter wire harness retainer from the starter motor stud bolt.

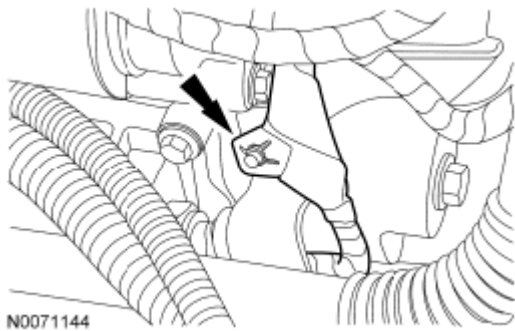


Fig. 179: Locating Starter Wire Harness Retainer Of Starter Motor Stud Bolt
Courtesy of FORD MOTOR CO.

65. Remove the nut from the starter motor stud bolt and remove the power steering tube bracket.

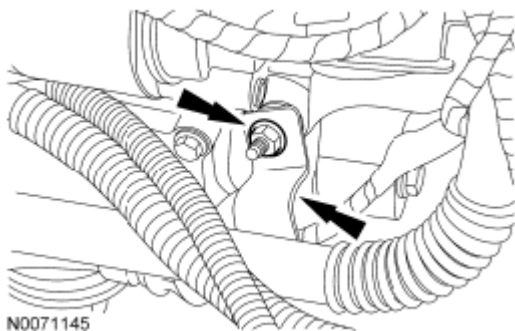


Fig. 180: Locating Starter Motor Stud Bolt And Power Steering Tube Bracket
Courtesy of FORD MOTOR CO.

66. Remove the bolt and the engine ground wire.

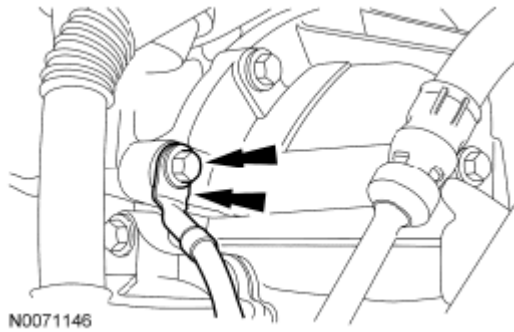


Fig. 181: Locating Engine Ground Wire Bolt
Courtesy of FORD MOTOR CO.

67. Remove the nut from the A/C compressor stud bolt and remove the power steering tube bracket.

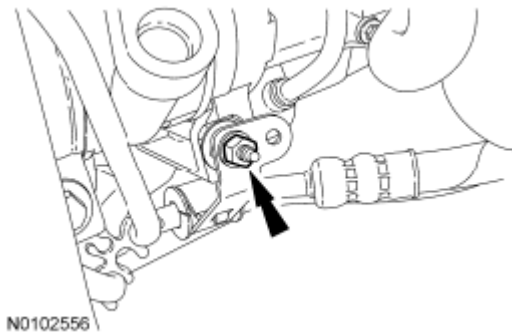


Fig. 182: Locating A/C Compressor Stud Bolt And Nut
Courtesy of FORD MOTOR CO.

68. Remove the 2 power steering tubes and the wiring harness as an assembly.

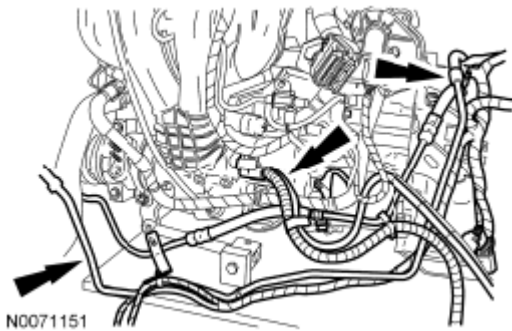


Fig. 183: Locating Power Steering Tubes And Wiring Harness
Courtesy of FORD MOTOR CO.

69. Remove the 2 nuts and disconnect the starter motor electrical terminals.

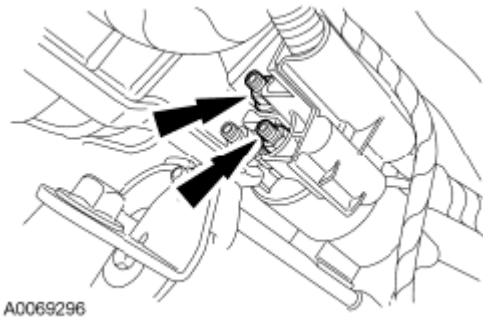


Fig. 184: Locating Starter Motor Electrical Terminals Nuts
Courtesy of FORD MOTOR CO.

70. Remove the bolt, stud bolt and the starter.

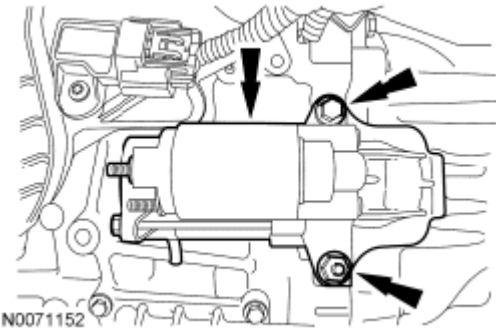


Fig. 185: Locating Starter Stud Bolt And Bolt
Courtesy of FORD MOTOR CO.

71. Remove the starter isolator.

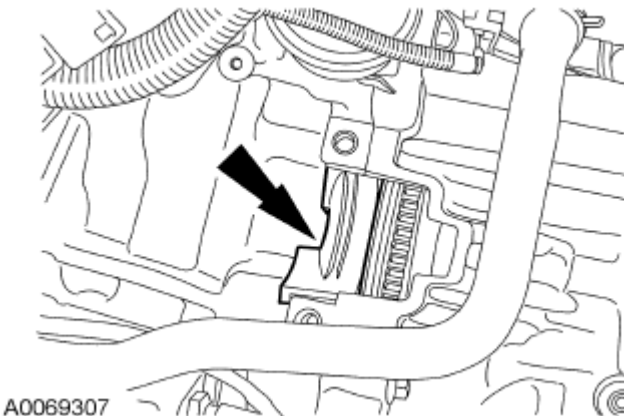


Fig. 186: Locating Starter Isolator
Courtesy of FORD MOTOR CO.

NOTE: Mark one stud and the flexplate for assembly reference.

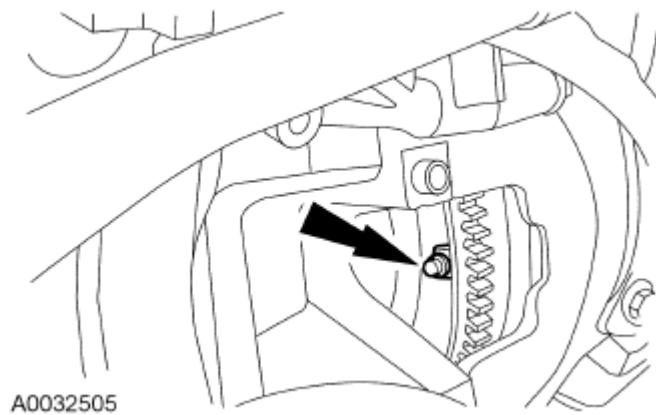


Fig. 187: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

72. Remove the 4 torque converter nuts.

NOTE: Lower the engine to within a few inches of the floor.

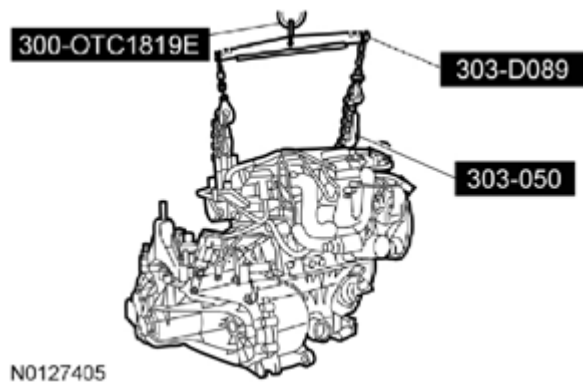


Fig. 188: Raising Engine
Courtesy of FORD MOTOR CO.

73. Using the Floor Crane, Engine Lifting Bracket and Spreader Bar, remove the engine and transaxle assembly from the lift table.
74. Remove the 4 bellhousing-to-engine bolts and the one stud bolt and separate the engine and transmission.
75. Install the Torque Converter Retainer, to prevent damage to the torque converter.

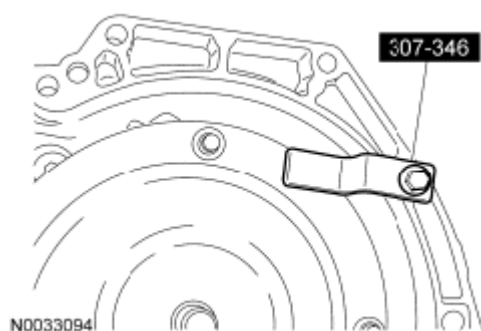


Fig. 189: Identifying Torque Converter Retainer
Courtesy of FORD MOTOR CO.

DISASSEMBLY

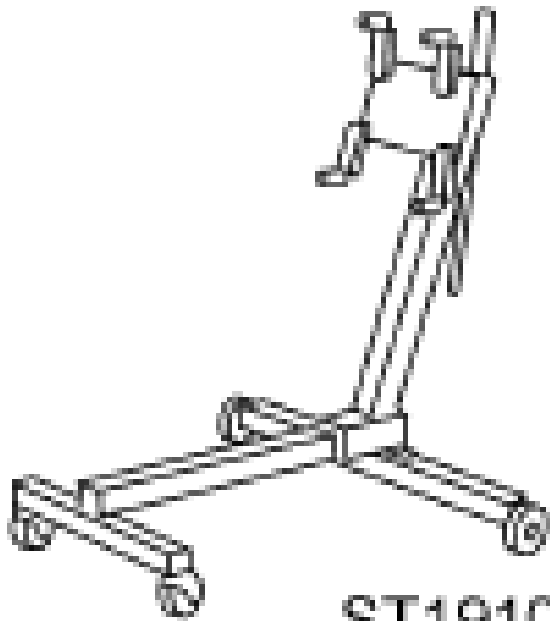
ENGINE

SPECIAL TOOLS

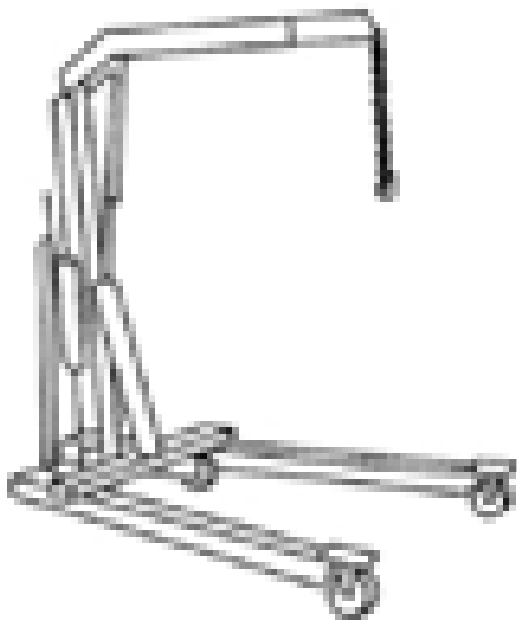
 ST2645-A	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)
	Engine Stand 014-00232 or equivalent

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

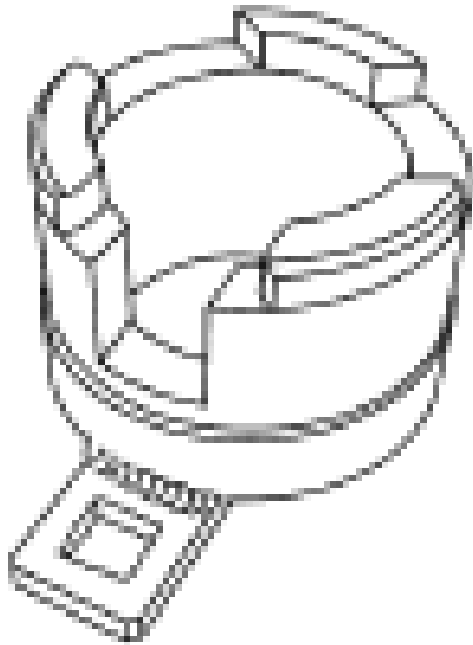


ST1910-A



ST1341-A

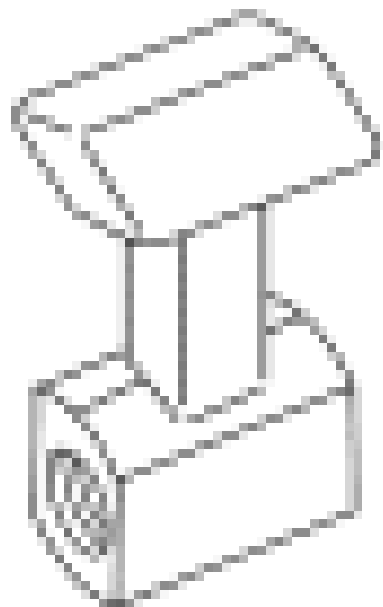
2, 200# Floor Crane, Fold Away
300-OTC1819E



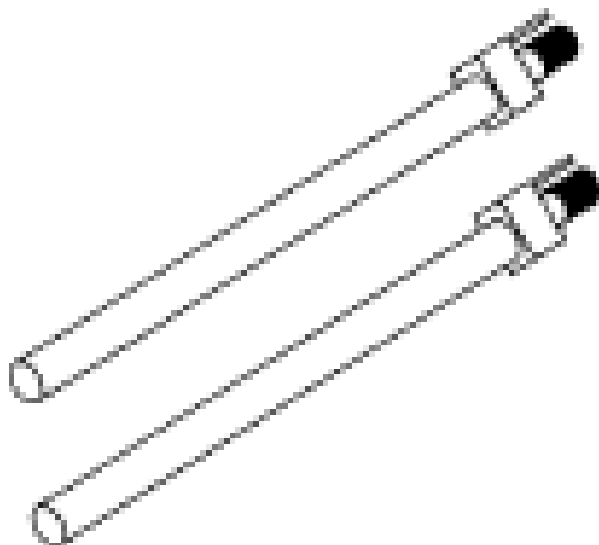
ST3054-A

Holding Tool, Crankshaft Damper
303-1416

Holding Tool, Flywheel
303-103 (T74P-6375-A)



ST2768-A

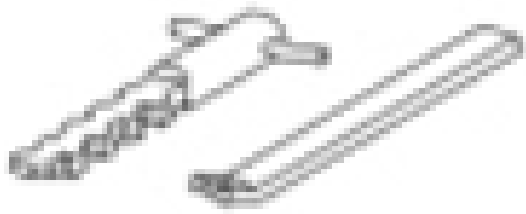


ST1982-A

Installer, Connecting Rod
303-462 (T94P-6136-AH)

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



Remover, Oil Seal
303-409 (T92C-6700-CH)

ST1385-A



Spreader Bar
303-D089 (D93P-6001-A3) or equivalent

ST1602-A

Timing Peg, Crankshaft TDC
303-507

**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Silicone Gasket Remover ZC-30	-

NOTE: 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, using diamond washers between the flange faces on each part. 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.

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: Due to the precision fit and timing of the balancer shaft assembly, it cannot be removed from the engine block.

NOTE: For additional information, refer to the exploded view under the **ASSEMBLY**

procedure .

1. Install the Flywheel Holding Tool and remove the flywheel or flexplate.

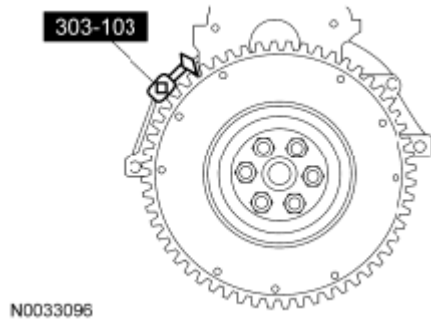


Fig. 190: Identifying Flywheel Holding Tool On Flywheel
Courtesy of FORD MOTOR CO.

2. Mount the engine on a suitable engine stand.
3. Loosen the bolt and remove the accessory drivebelt idler pulley.

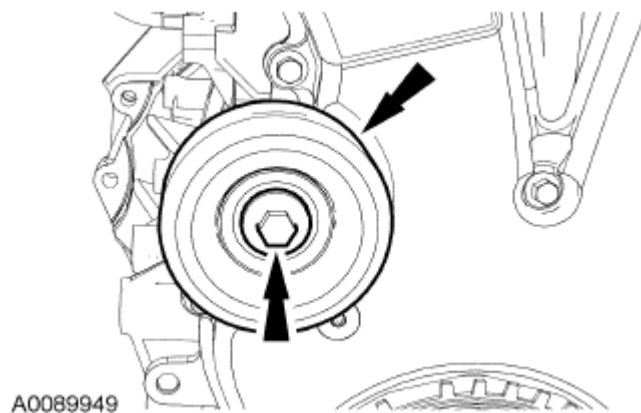


Fig. 191: Locating Accessory Drive Belt Idler Pulley And Bolt
Courtesy of FORD MOTOR CO.

4. Remove the 3 bolts and the coolant pump pulley.

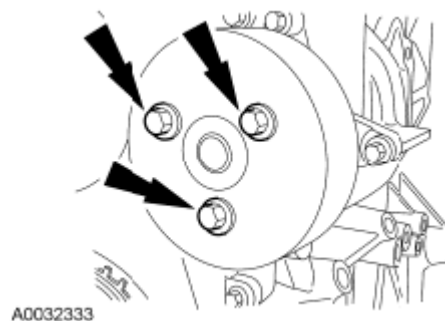


Fig. 192: Locating Coolant Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

5. Remove the 3 bolts and the coolant pump.

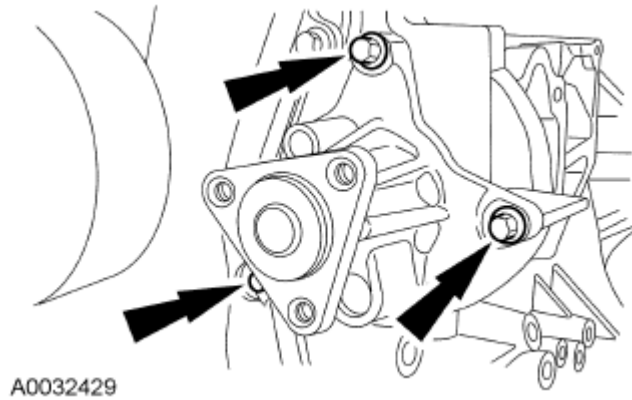


Fig. 193: Locating Coolant Pump And Bolts
Courtesy of FORD MOTOR CO.

6. Disconnect the oil cooler hose and lower radiator hose from the thermostat housing.

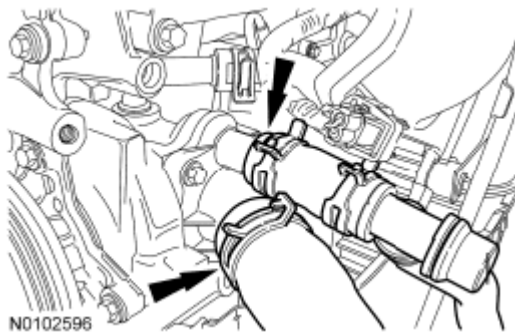


Fig. 194: Locating Oil Cooler Hose And Lower Radiator Hose From Thermostat Housing
Courtesy of FORD MOTOR CO.

7. Disconnect the EGR valve coolant hose.

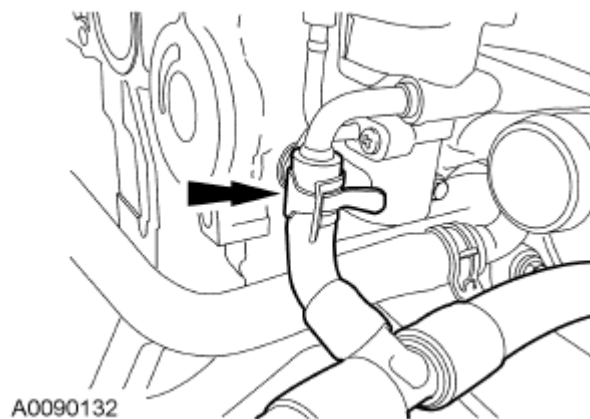


Fig. 195: Locating Coolant Hose Of EGR Valve
Courtesy of FORD MOTOR CO.

8. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.

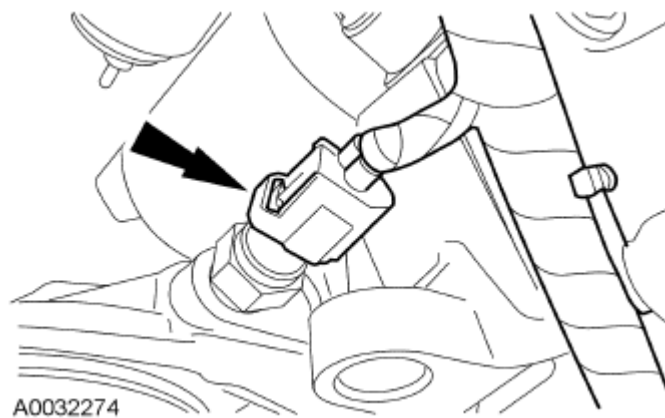


Fig. 196: Locating Engine Oil Pressure Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

9. Disconnect the oil cooler hoses.

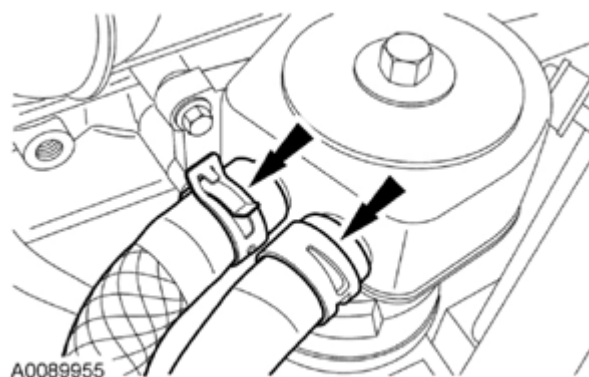


Fig. 197: Locating Oil Cooler Hoses

Courtesy of FORD MOTOR CO.

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

10. Remove the bolt and the oil cooler.
 - Discard the oil cooler.

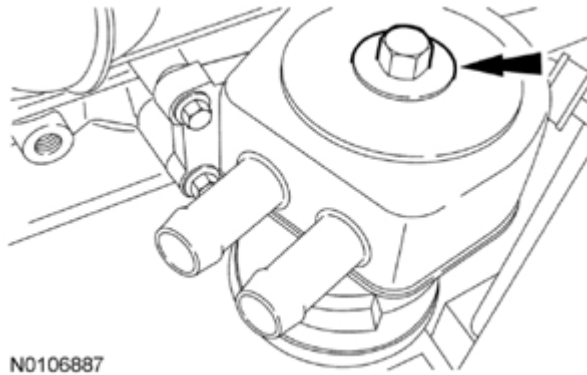


Fig. 198: Locating Oil Cooler And Bolt
Courtesy of FORD MOTOR CO.

11. Remove the oil filter, 4 bolts and the oil filter adapter.
 - Discard the oil filter and gasket.

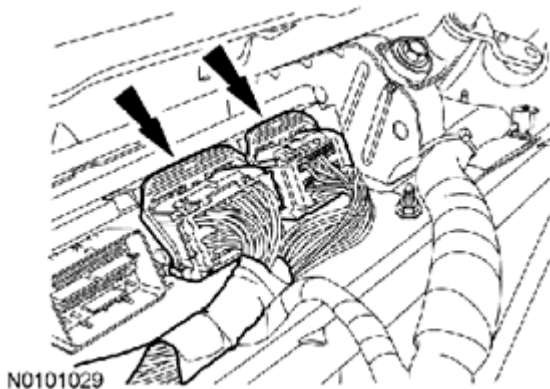


Fig. 199: Locating Oil Filter And Bolts
Courtesy of FORD MOTOR CO.

12. Disconnect the 4 coil-on-plug and Camshaft Position (CMP) sensor electrical connectors.

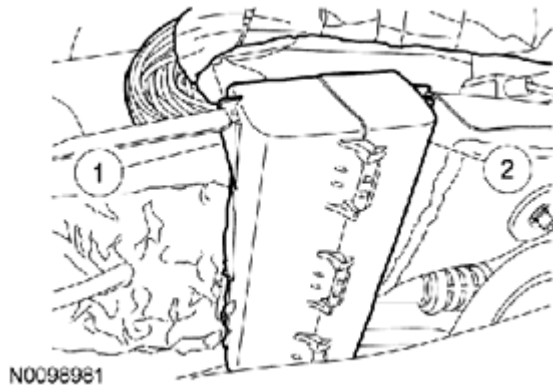


Fig. 200: Locating Coil-On-Plug And Camshaft Position Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

13. Position the rubber boot aside and disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.

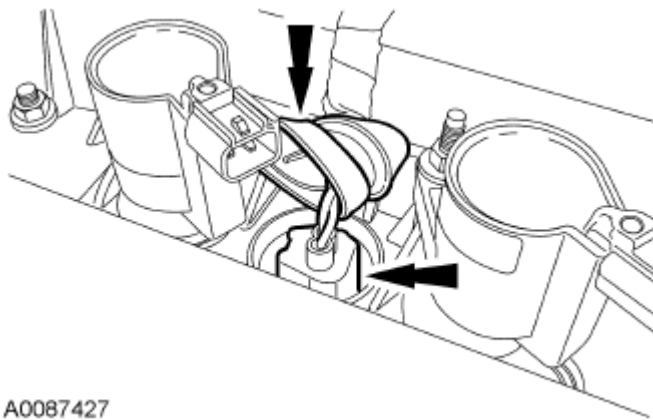


Fig. 201: Locating Cylinder Head Temperature Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

14. Detach the generator wiring harness retainer from the valve cover stud.



Fig. 202: Locating Generator Wiring Harness Retainer From Valve Cover Stud
Courtesy of FORD MOTOR CO.

15. Disconnect the 4 fuel injector electrical connectors and detach the 5 wiring harness retainers from valve cover stud bolts and intake manifold.

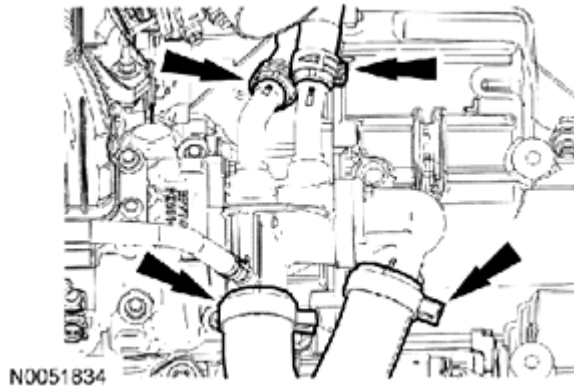


Fig. 203: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

16. Remove the 2 bolts and the fuel rail with the fuel injectors.

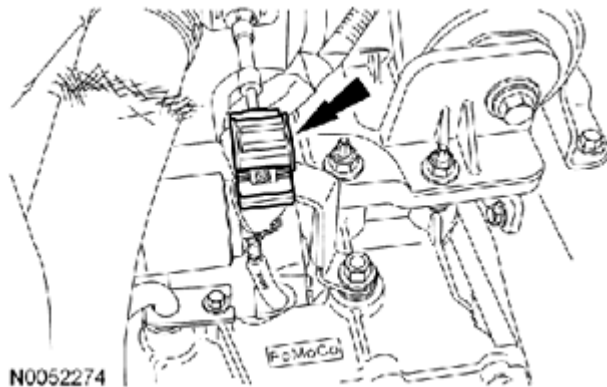


Fig. 204: Locating Fuel Rail Bolts
Courtesy of FORD MOTOR CO.

17. Disconnect the Knock Sensor (KS) electrical connector and pin-type retainer.

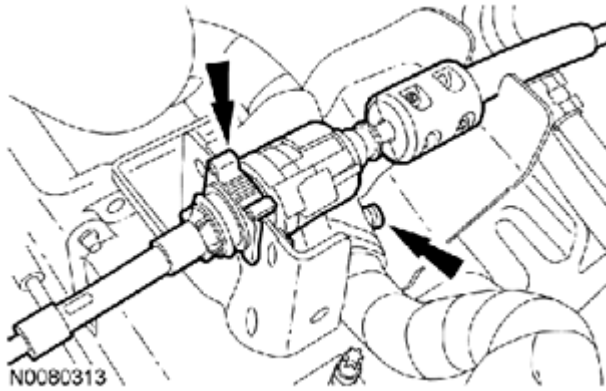


Fig. 205: Locating Knock Sensor Electrical Connector And Pin-Type Retainer
Courtesy of FORD MOTOR CO.

18. Disconnect the throttle control electrical connector.

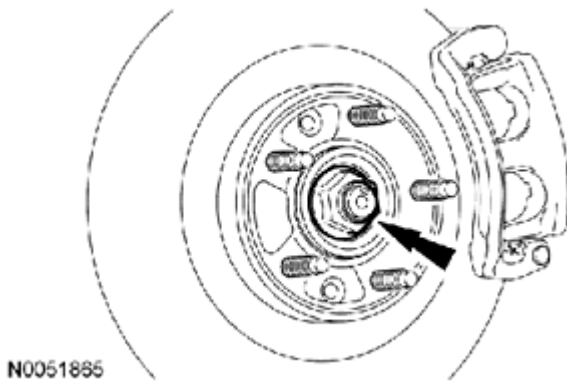


Fig. 206: Locating Throttle Control Electrical Connector
Courtesy of FORD MOTOR CO.

19. Disconnect the Manifold Absolute Pressure (MAP) sensor electrical connector.
- Detach the 3 wiring harness retainers from the intake manifold.

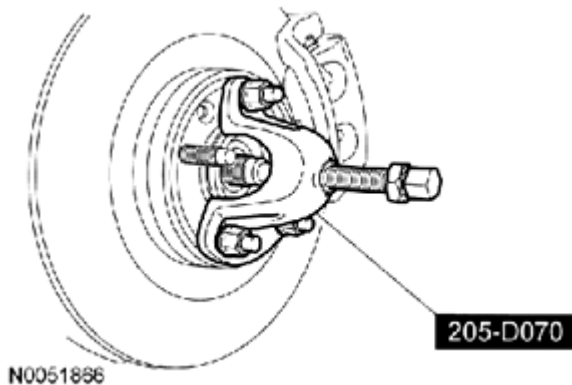


Fig. 207: Locating Wiring Harness Retainers From Intake Manifold

Courtesy of FORD MOTOR CO.

20. Disconnect the EGR valve electrical connector.

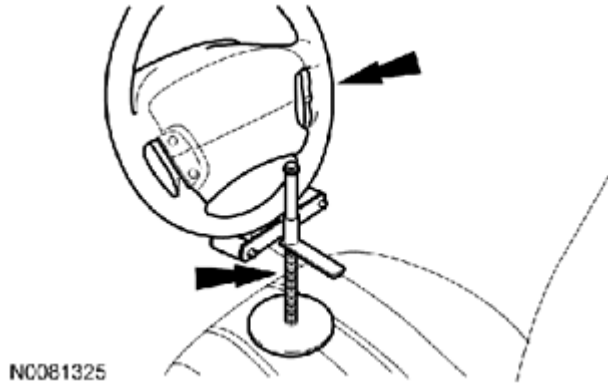


Fig. 208: Locating EGR Valve Electrical Connector
Courtesy of FORD MOTOR CO.

21. Remove the lower intake manifold bolt.



Fig. 209: Identifying Lower Intake Manifold Bolt
Courtesy of FORD MOTOR CO.

22. Remove the bolt and the oil level indicator tube.
- Discard the O-ring seal.

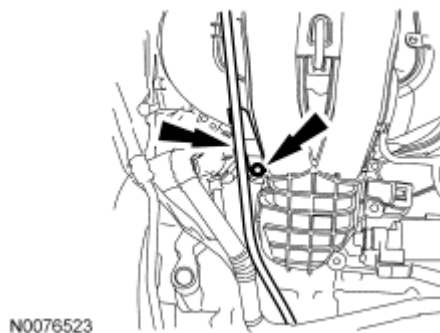


Fig. 210: Locating Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

NOTE: The 2 intake manifold bolts differ in length from rest of the bolts and also retain a crash bracket to the intake manifold. The 2 bolts are equipped with an attachment feature that allows them to be loosened but remain attached to the intake manifold. Do not attempt to remove the 2 bolts or the crash bracket from the intake manifold.

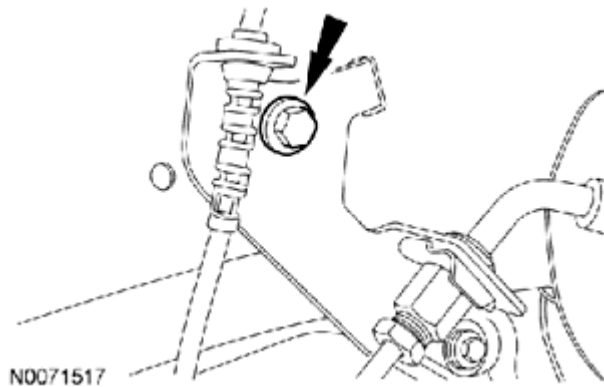


Fig. 211: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

23. Loosen the 2 intake manifold bolts.
24. Remove the 5 intake manifold bolts.

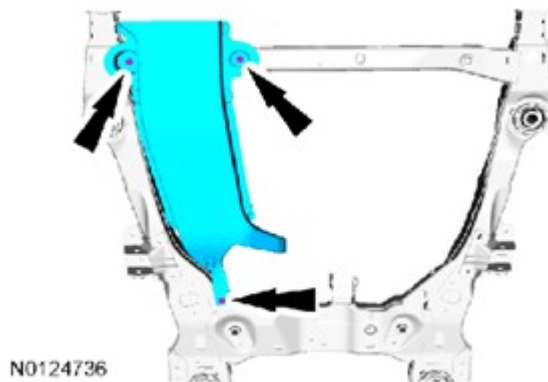


Fig. 212: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

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.

25. Squeeze the 2 PCV hose connector tabs and disconnect the PCV hose from the intake manifold.
- Remove the intake manifold.

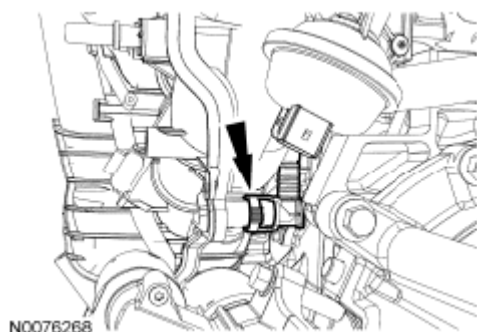


Fig. 213: Locating PCV Hose Connector
Courtesy of FORD MOTOR CO.

26. Remove the EGR tube.

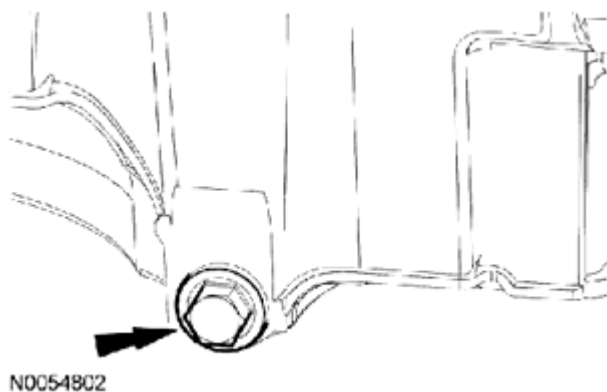


Fig. 214: Identifying Exhaust Gas Recirculation Tube
Courtesy of FORD MOTOR CO.

27. Remove the radio interference capacitor bracket bolt and position the bracket aside.

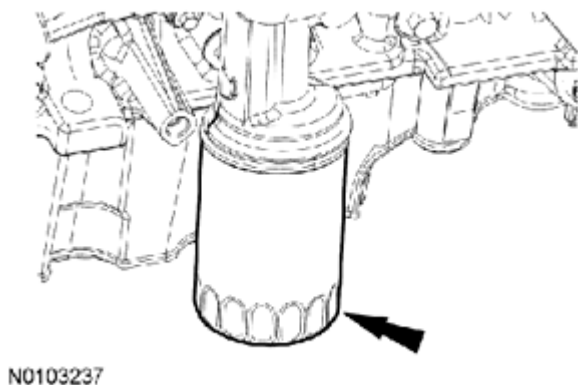


Fig. 215: Locating Radio Interference Capacitor Bracket With Bolt
Courtesy of FORD MOTOR CO.

28. Disconnect the coolant bypass hose.

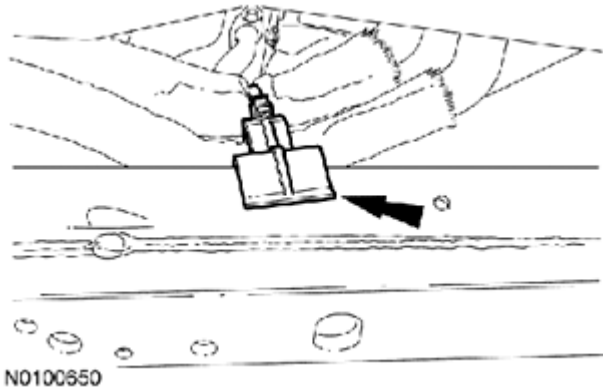


Fig. 216: Locating Coolant Bypass Hose
Courtesy of FORD MOTOR CO.

29. Remove the 4 bolts and the coolant outlet.

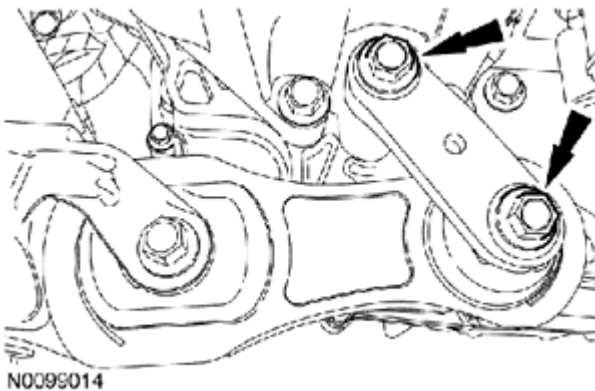


Fig. 217: Locating Coolant Outlet Bolts
Courtesy of FORD MOTOR CO.

30. Disconnect the coolant bypass hose.

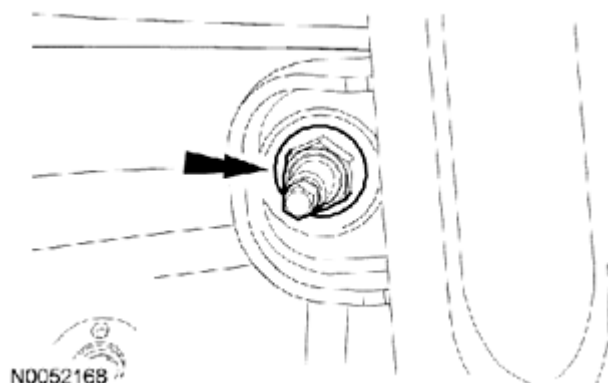


Fig. 218: Locating Coolant Bypass Hose
Courtesy of FORD MOTOR CO.

31. Remove the 3 bolts, thermostat housing and thermostat.

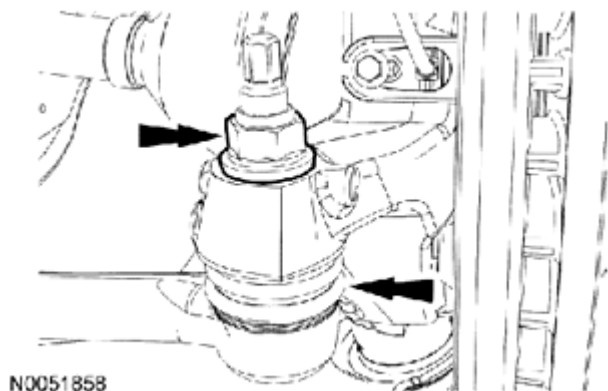


Fig. 219: Locating Thermostat Housing And Bolts
Courtesy of FORD MOTOR CO.

32. Remove the 2 bolts, stud bolt and the A/C compressor.

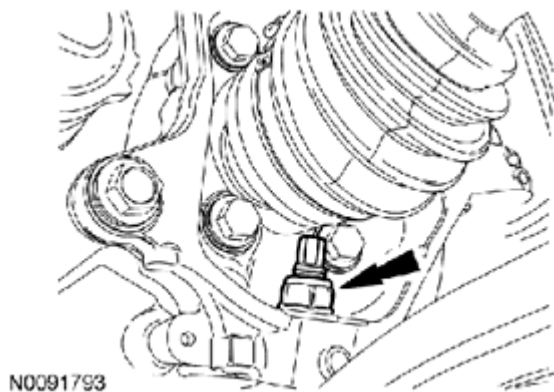


Fig. 220: Locating A/C Compressor, Stud Bolts And Bolts
Courtesy of FORD MOTOR CO.

33. Remove the bolt and the KS.

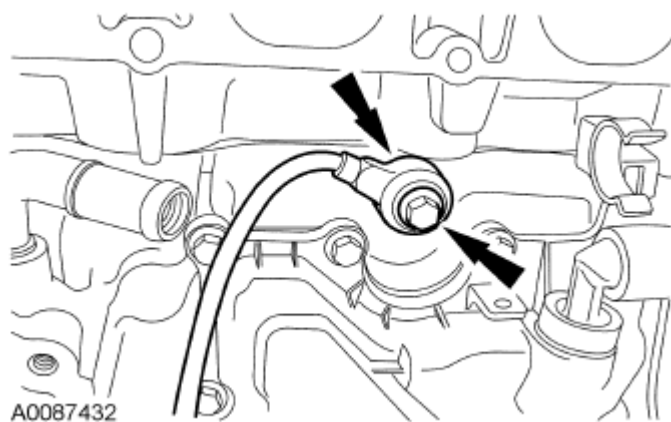


Fig. 221: Locating Bolt And Knock Sensor
Courtesy of FORD MOTOR CO.

34. Remove the 8 bolts and the crankcase vent oil separator.

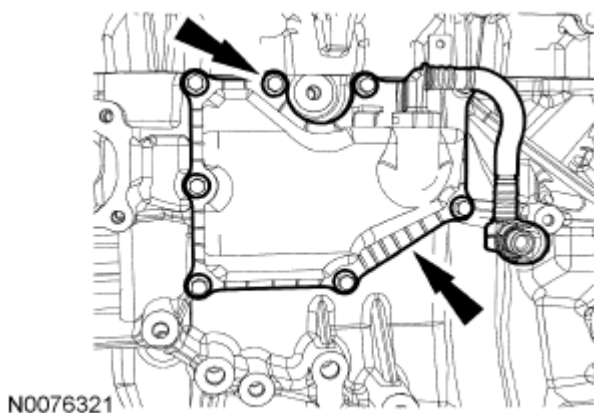


Fig. 222: Locating Crankcase Vent Oil Separator Mounting Bolts
Courtesy of FORD MOTOR CO.

35. Remove the 3 bolts and the intermediate shaft bracket.

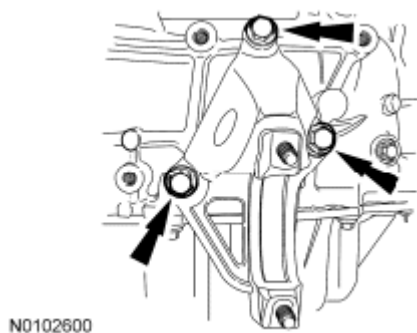


Fig. 223: Locating Intermediate Shaft Bracket And Bolts
Courtesy of FORD MOTOR CO.

36. Remove the 4 bolts and the ignition coil-on-plugs.

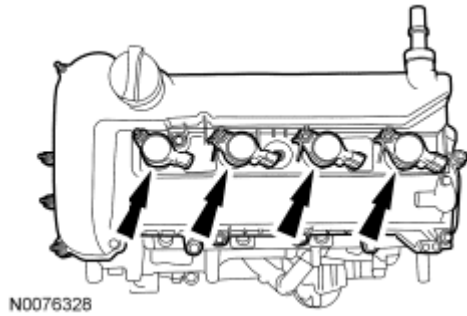


Fig. 224: Locating Ignition Coil-On-Plug Bolts
Courtesy of FORD MOTOR CO.

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

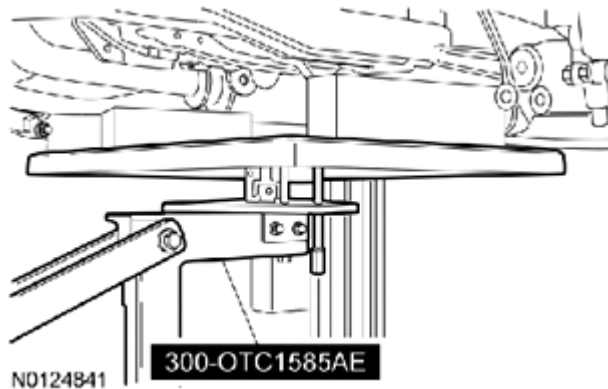


Fig. 225: Locating Cylinder Head Temperature Sensor And Spark Plug
Courtesy of FORD MOTOR CO.

37. Remove the spark plugs and the CHT sensor.
38. Remove the bolts and the valve cover.

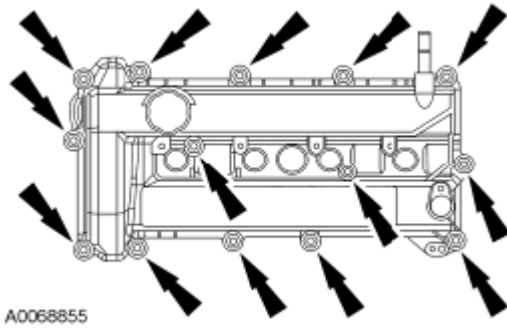


Fig. 226: Locating Valve Cover Bolts
Courtesy of FORD MOTOR CO.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

39. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).
- The hole in the crankshaft pulley should be in the 6 o'clock position.

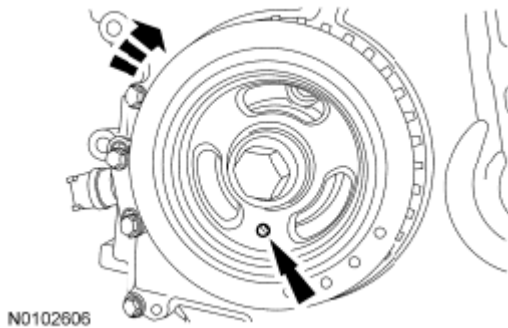


Fig. 227: Turning Crankshaft Clockwise To Position No. 1 Piston At Top Dead Center
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

NOTE: The camshaft timing slots are offset. If the Camshaft Alignment Plate cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

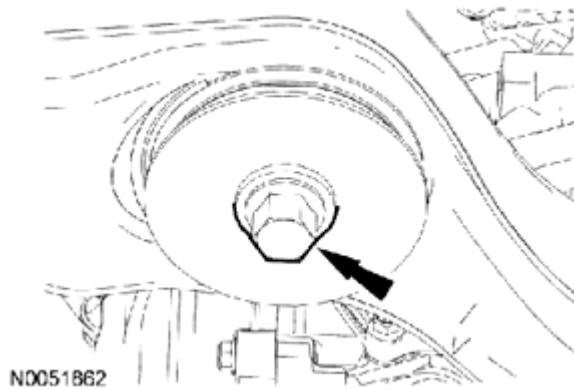


Fig. 228: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

40. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.
41. Remove the engine plug bolt.

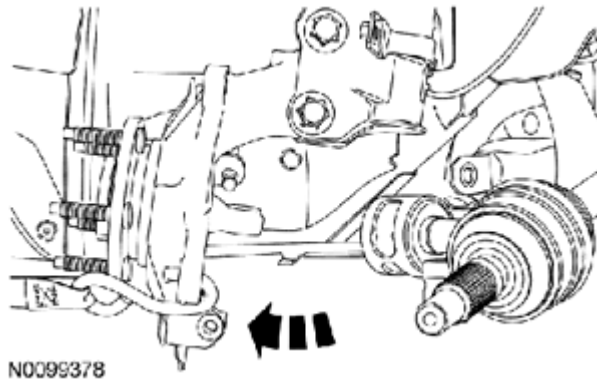


Fig. 229: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The Crankshaft TDC Timing Peg 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 disassembly.

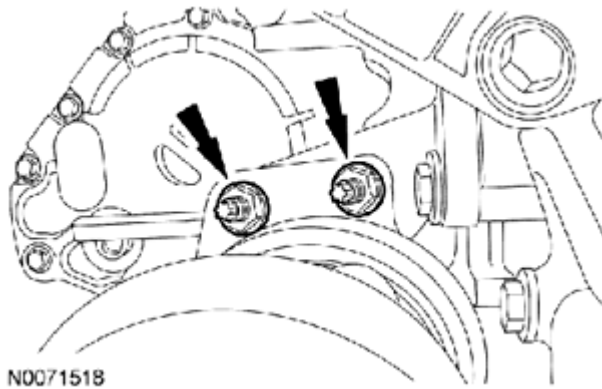


Fig. 230: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

42. Install the Crankshaft TDC Timing Peg.

NOTE: The crankshaft must remain in the Top Dead Center (TDC) position during removal of the pulley bolt or damage to the engine can occur. Therefore, the crankshaft pulley must be held in place with the Crankshaft Damper Holding Tool, and the bolt should be removed using an air impact wrench (1/2-in drive minimum).

NOTE: The crankshaft sprocket diamond washer may come off with the crankshaft pulley. The diamond washer must be replaced. Remove and discard the diamond washer. If the diamond washer is not installed, engine damage may occur.

43. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley. Use an air impact wrench to remove the crankshaft pulley bolt.
- Remove and discard the crankshaft pulley bolt and washer.
 - Remove the crankshaft pulley.
 - Remove the diamond washer and discard.

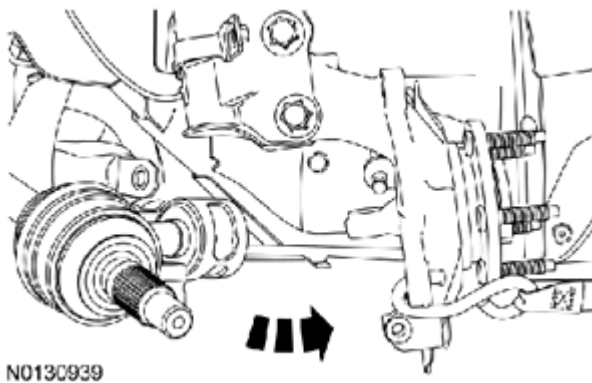


Fig. 231: Locating Crankshaft Pulley Bolt And Washer

Courtesy of FORD MOTOR CO.

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

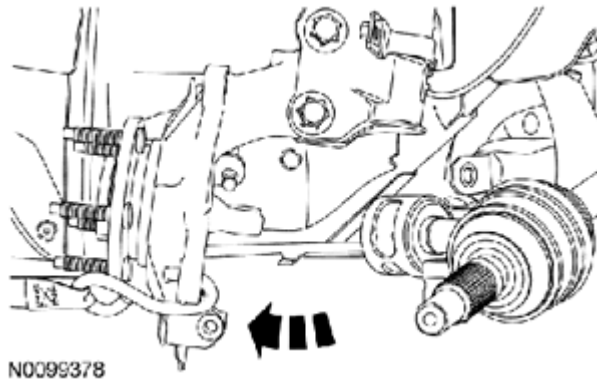


Fig. 232: Removing Crankshaft Front Oil Seal Using Oil Seal Remover
Courtesy of FORD MOTOR CO.

44. Using the Oil Seal Remover, remove the crankshaft front seal.
45. Remove the 2 bolts and the CKP sensor.

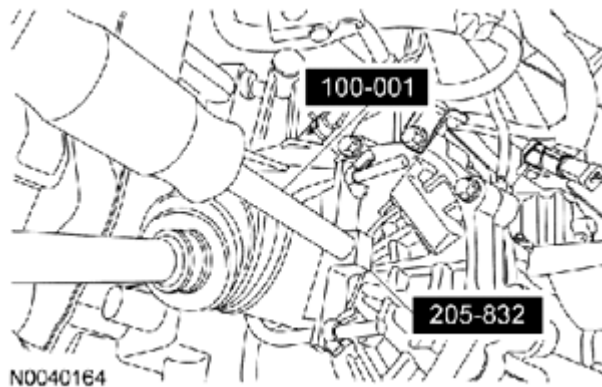


Fig. 233: Locating CKP Sensor
Courtesy of FORD MOTOR CO.

46. Remove the 22 bolts and the engine front cover.

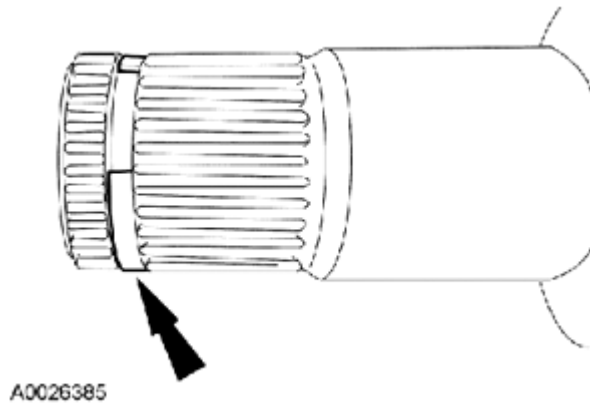


Fig. 234: Locating Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

47. Compress the timing chain tensioner in the following sequence.
1. Using a small pick, release and hold the ratchet mechanism.
 2. While holding the ratchet mechanism in the released position, compress the tensioner by pushing the timing chain arm toward the tensioner.
 3. Insert a paper clip into the hole to retain the tensioner.

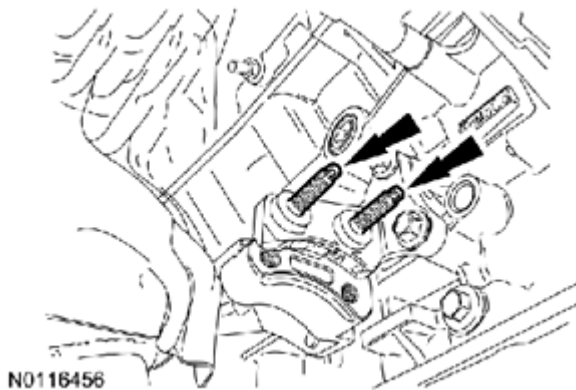


Fig. 235: Compressing Timing Chain Tensioner Using Small Pick
Courtesy of FORD MOTOR CO.

48. Remove the 2 bolts and the timing chain tensioner.

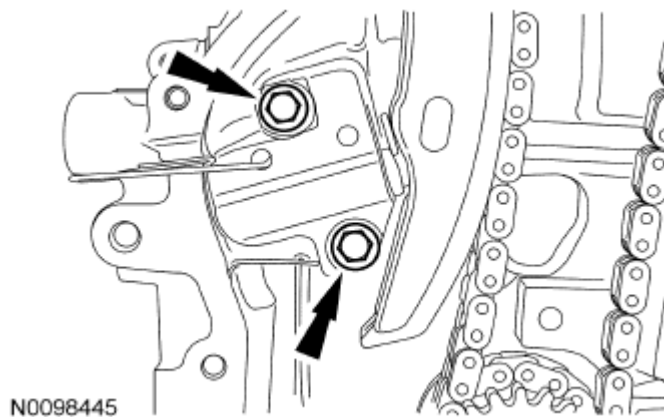


Fig. 236: Locating Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

49. Remove the RH timing chain guide.

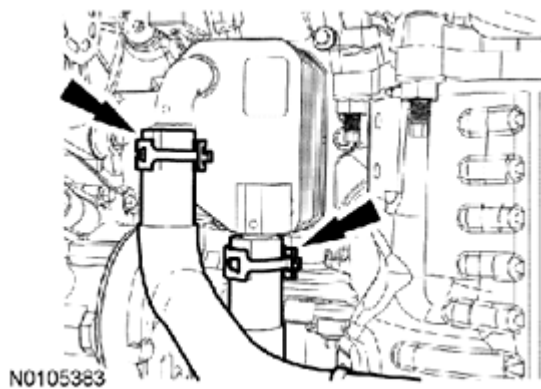


Fig. 237: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

50. Remove the timing chain.

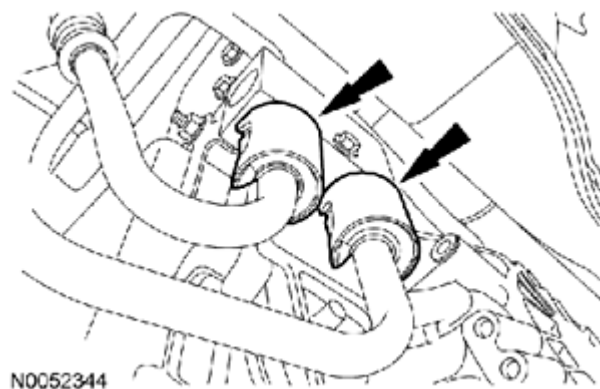


Fig. 238: Locating Timing Chain
Courtesy of FORD MOTOR CO.

51. Remove the 2 bolts and the LH timing chain guide.

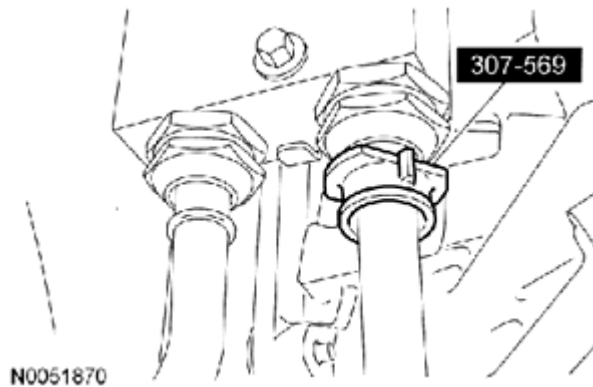


Fig. 239: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

NOTE: Do not rely on the Camshaft Alignment Plate to prevent camshaft rotation. Damage to the tool or the camshaft can occur.

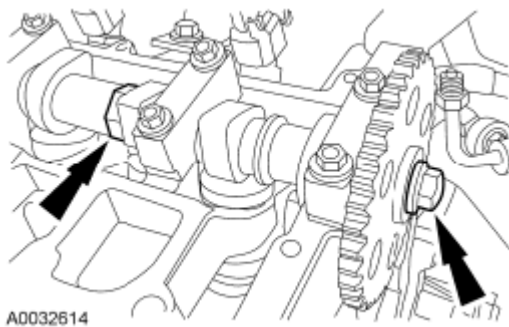


Fig. 240: Locating Camshaft Drive Gear And Bolt
Courtesy of FORD MOTOR CO.

52. Using the flats on the camshaft to prevent camshaft rotation, remove the bolts and the camshaft sprockets.
53. Remove the oil pump drive chain tensioner.
1. Release the tension on the tensioner spring.
 2. Remove the tensioner and the 2 shoulder bolts.

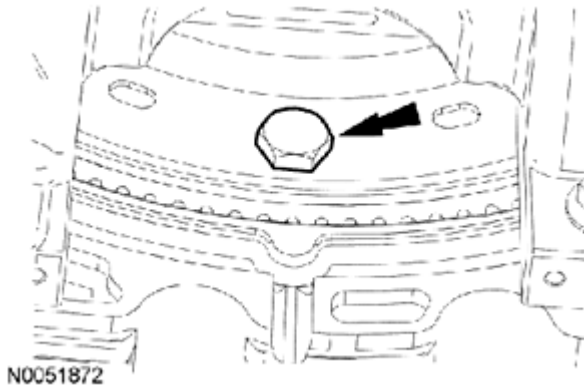


Fig. 241: Identifying Oil Pump Chain Drive Tensioner And Shoulder Bolts
Courtesy of FORD MOTOR CO.

NOTE: Remove and discard the crankshaft sprocket diamond washer located behind the crankshaft sprocket.

NOTE: The oil pump chain sprocket must be held in place.

54. Remove the oil pump chain and sprockets.
1. Remove the bolt.
 2. Remove the chain and sprockets.

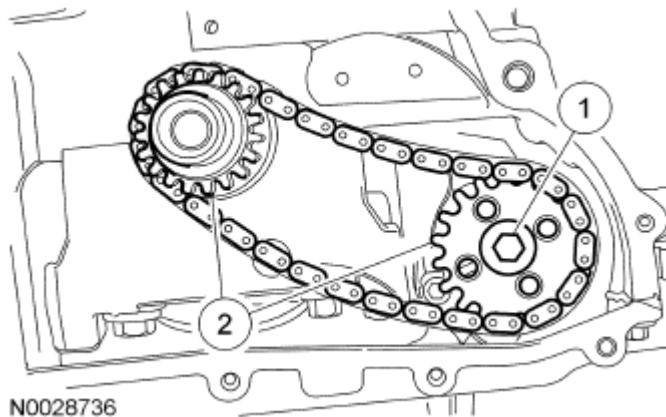


Fig. 242: Identifying Oil Pump Chain And Sprockets
Courtesy of FORD MOTOR CO.

55. Mark the position of the camshaft lobes on the No. 1 cylinder for assembly reference.

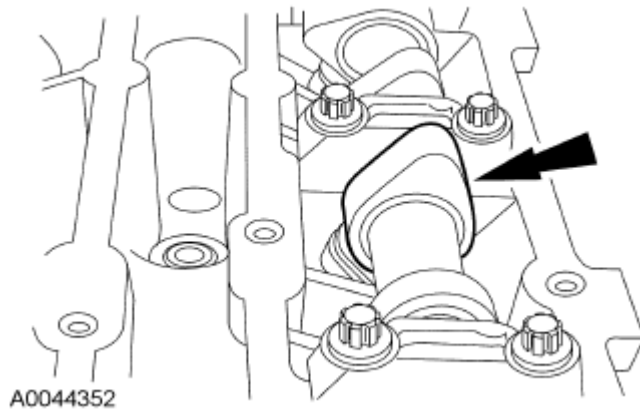


Fig. 243: Locating Camshaft Lobe Position
Courtesy of FORD MOTOR CO.

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

NOTE: Mark the location and orientation of each camshaft bearing cap.

56. Remove the camshafts from the engine.

- Loosen the camshaft bearing bolts in the sequence shown in illustration, one turn at a time. Repeat until all the tension is released.
- Remove the camshaft bearing caps.
- Remove the camshafts.

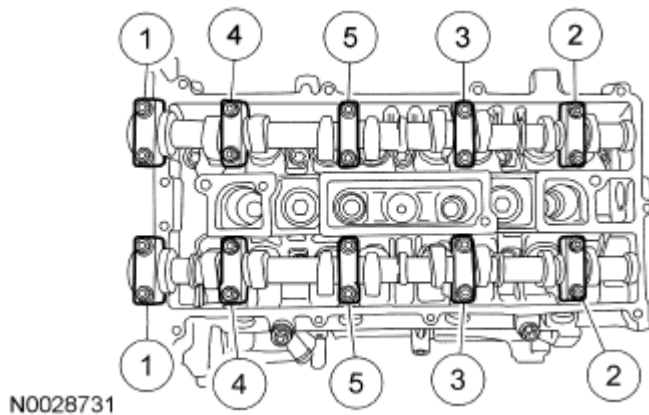


Fig. 244: Identifying Camshaft Bearing Cap Bolts Loosening Sequence
Courtesy of FORD MOTOR CO.

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.

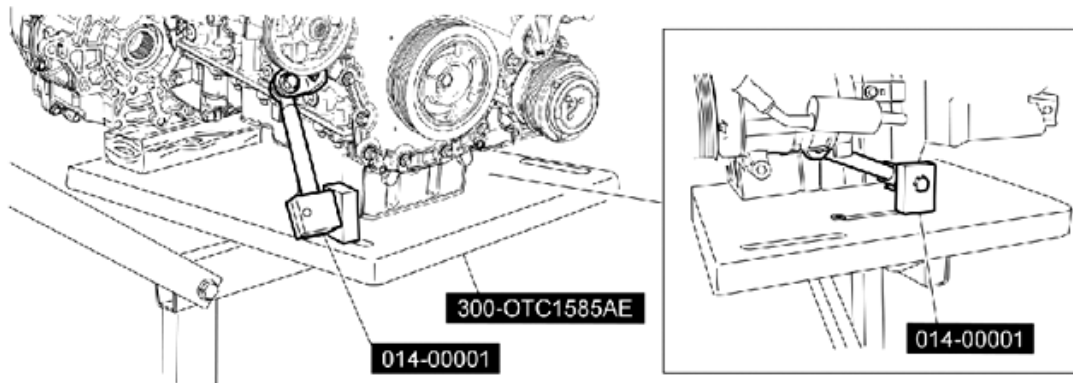
57. Remove the valve tappets.

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.

58. Inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

59. Remove the cylinder head.

- Remove and discard the 10 cylinder head bolts.
- Remove the cylinder head.
- Remove and discard the cylinder head gasket.



N0127038

Fig. 245: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

60. Remove the cylinder head alignment dowels.

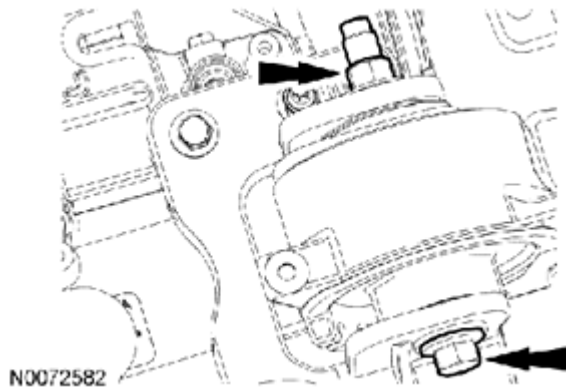


Fig. 246: Locating Cylinder Head Alignment Dowels
Courtesy of FORD MOTOR CO.

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.

NOTE: Observe all warnings and cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.

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

61. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.
 1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any traces of oil or coolant, and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
62. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
63. Remove the 13 bolts and the oil pan.

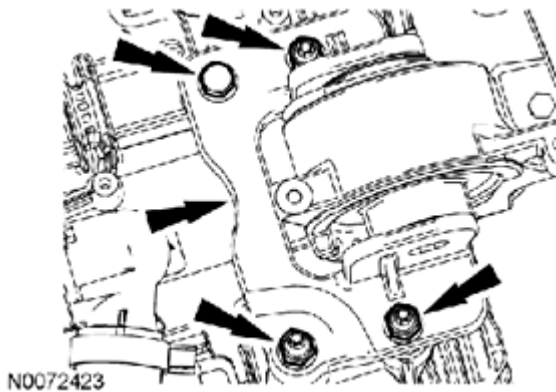


Fig. 247: Locating Oil Pan Bolt
Courtesy of FORD MOTOR CO.

64. Remove the 6 bolts and the crankshaft rear seal with retainer plate.

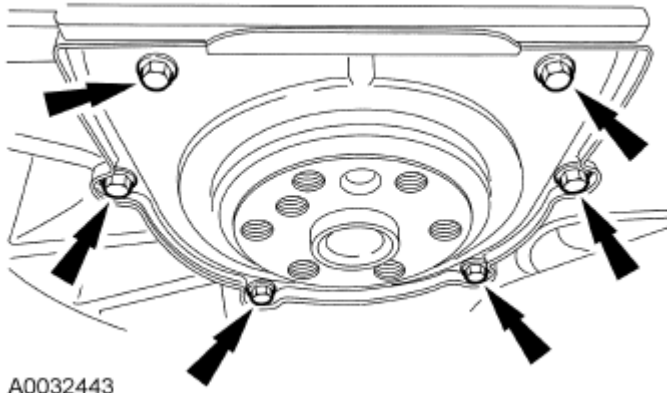


Fig. 248: Locating Crankshaft Rear Seal Bolts
Courtesy of FORD MOTOR CO.

65. Remove the 2 bolts, oil pump pickup tube and gasket.
- Discard the gasket.

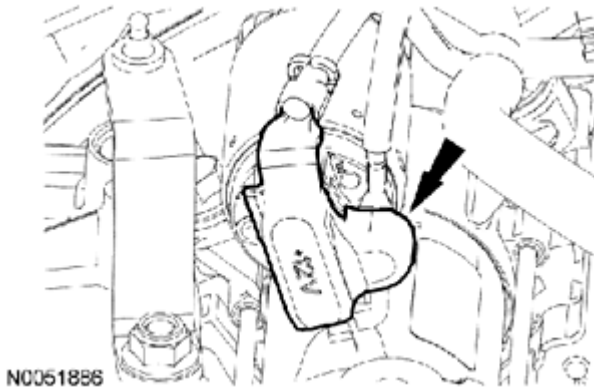


Fig. 249: Locating Bolts, Oil Pump Pickup Tube And Gasket
Courtesy of FORD MOTOR CO.

66. Remove the 4 bolts and the oil pump.

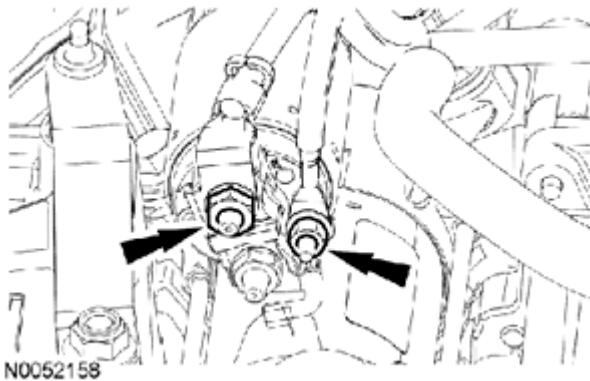


Fig. 250: Locating Oil Pump Assembly Bolts

Courtesy of FORD MOTOR CO.

67. Remove the Crankshaft TDC Timing Peg.

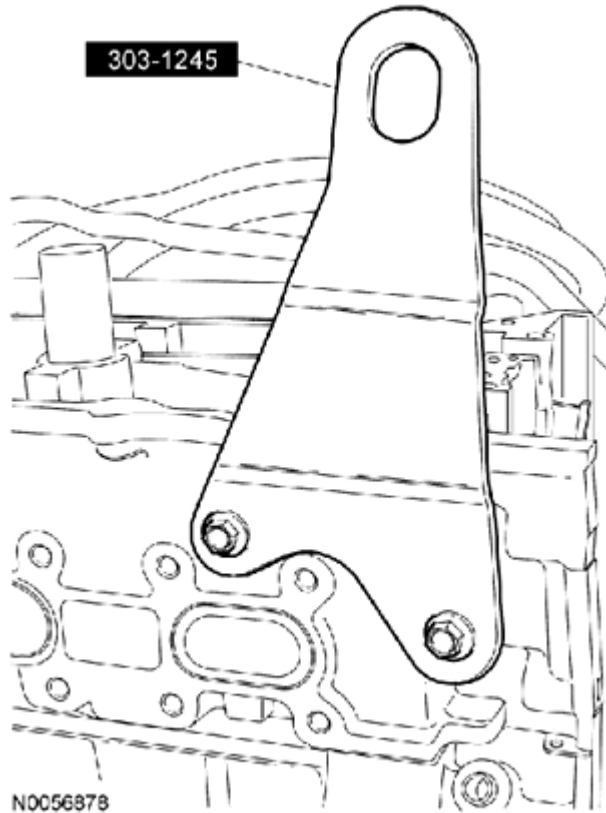


Fig. 251: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

68. Before removing the pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using an abrasive pad or equivalent, following manufacturer's instructions.

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

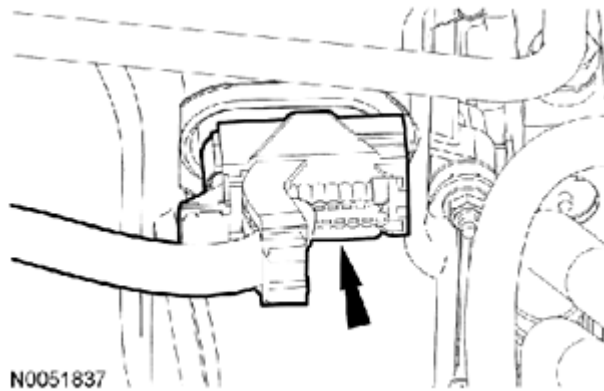


Fig. 252: Locating Connecting Rod Cap Bolts And Cap
Courtesy of FORD MOTOR CO.

69. Remove the connecting rod cap bolts and cap.

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

70. Using the Connecting Rod Installer, remove the piston/rod assembly from the engine block.
- Repeat the previous 2 steps until all the piston/rod assemblies are removed from the engine block.

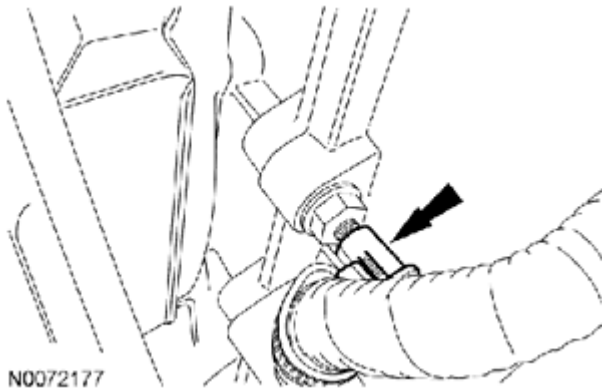


Fig. 253: Removing Piston/Rod Assembly From Engine Block Using Connecting Rod Installer
Courtesy of FORD MOTOR CO.

71. Remove the bolts in the sequence shown in illustration.
- Remove the main bearing beam.
 - Discard the bolts.

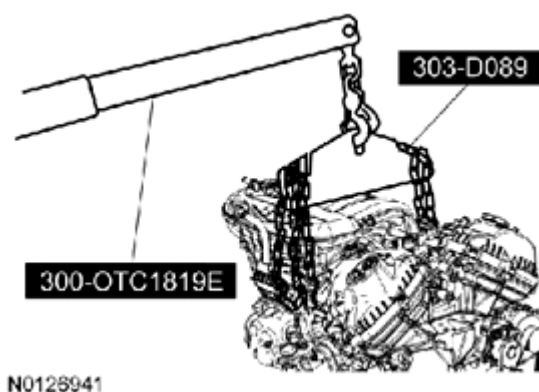


Fig. 254: Identifying Crankshaft Cap Bolts Sequence
Courtesy of FORD MOTOR CO.

72. Remove the crankshaft from the engine block.

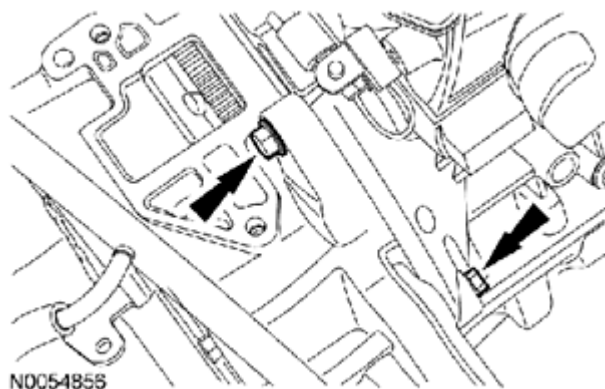


Fig. 255: Locating Crankshaft Of Engine Block
Courtesy of FORD MOTOR CO.

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

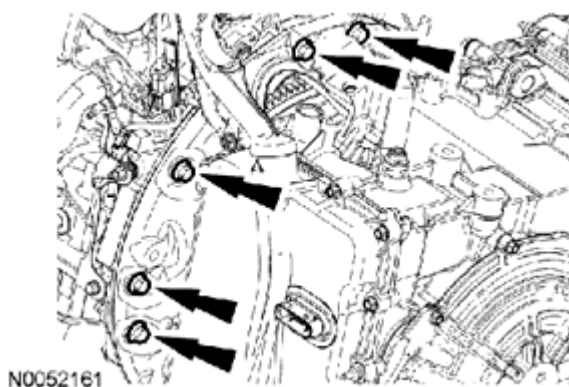


Fig. 256: Locating Crankshaft Main Bearings

Courtesy of FORD MOTOR CO.

73. Remove the main bearings from the main bearing beam.

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

NOTE: The center bulkhead has the thrust bearing.

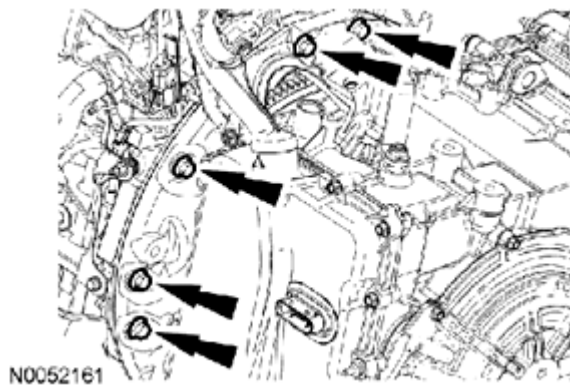


Fig. 257: Locating Crankshaft Main Bearings
Courtesy of FORD MOTOR CO.

74. Remove the main bearings from the cylinder block.

NOTE: If the oil squirters are being reused, mark them in order for correct location during reassembly.

NOTE: The front bulkhead does not have an oil squirter.

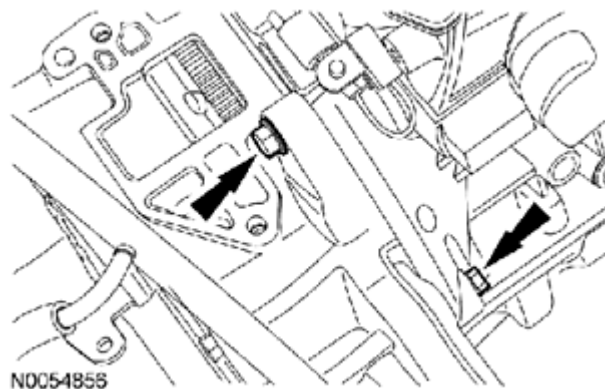


Fig. 258: Locating Oil Squirters
Courtesy of FORD MOTOR CO.

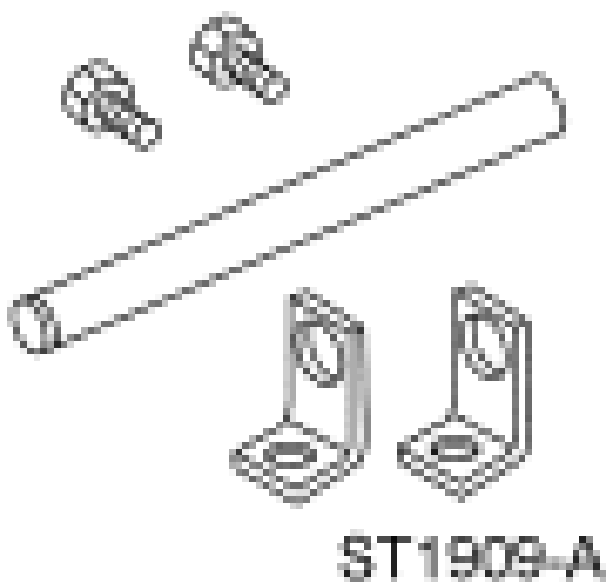
75. Remove the 4 oil squirters.

76. Inspect the cylinder block, main bearing beam, pistons and connecting rods. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

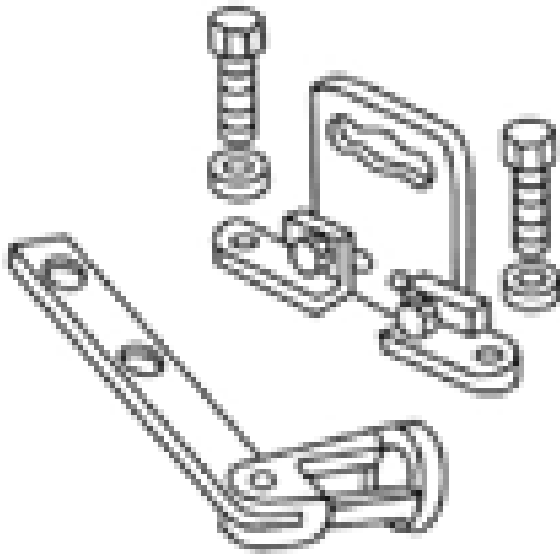
CYLINDER HEAD

SPECIAL TOOLS

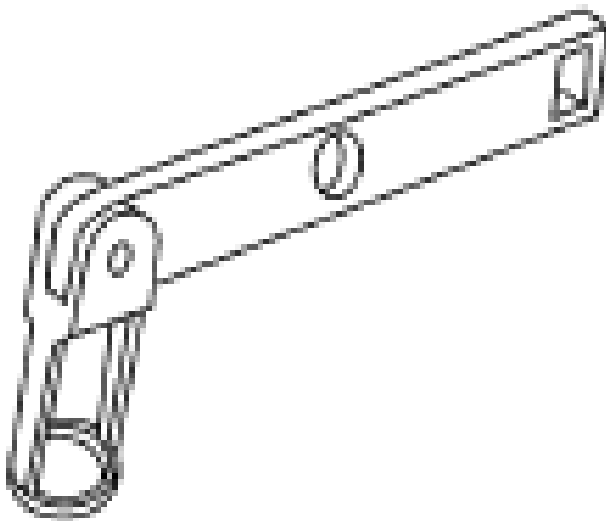


Compressor, Valve Spring
303-300 (T87C-6565-A)

Compressor, Valve Spring
303-350 (T89P-6565-A)

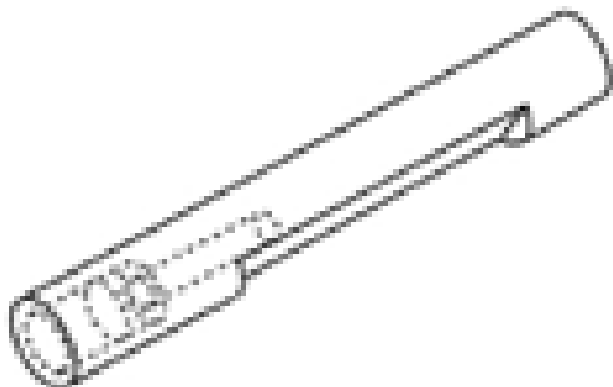


ST1907-A



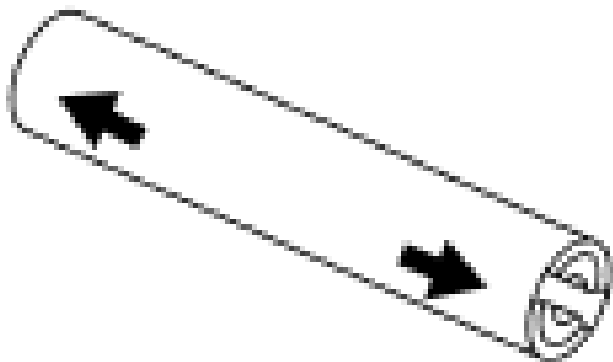
ST1902-A

Compressor, Valve Spring
303-472 (T94P-6565-AH)



ST1906-A

Installer, Valve Stem Oil Seal
303-470 (T94P-6510-CH)



ST1904-A

Remover, Valve Stem Oil Seal
303-468 (T94P-6510-AH)

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

2013 Ford Transit Connect XLT Premium

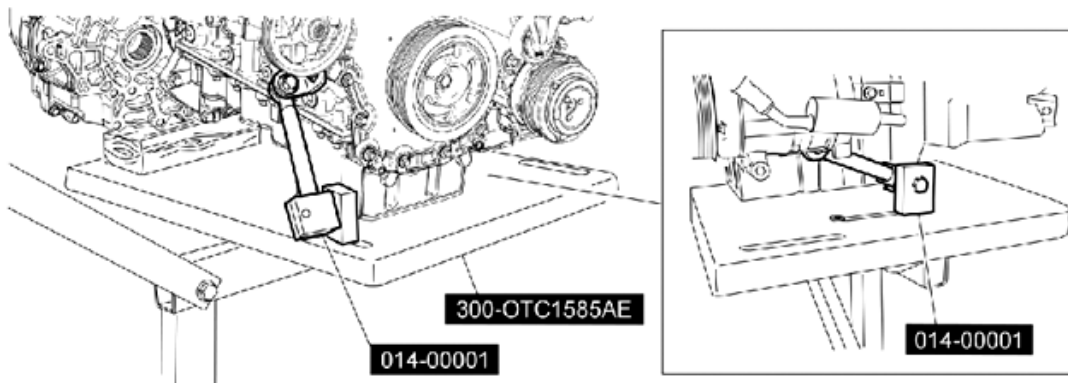
2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



ST1187-A

MATERIAL 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)	WSS-M2C945-A
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B



NC127038

Fig. 259: Exploded View Of Cylinder Head
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W500015	Coolant outlet bolt (4 required)
2	8K556	Coolant outlet
3	8255	Coolant outlet gasket
4	W500225	EGR valve bolt (2 required)

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

5	9D475	EGR valve
6	9D476	EGR valve gasket
7	6G004	Cylinder Head Temperature (CHT) sensor
8	6518	Valve collet (16 required)
9	6514	Valve spring retainer (16 required)
10	6513	Valve spring (16 required)
11	6A517	Valve seal (16 required)
12	6505	Intake valve (8 required)
13	6507	Exhaust valve (8 required)
14	9E470	EGR tube
15	6049	Cylinder head

Disassembly

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

NOTE: One lifting eye shown in illustration, other lifting eye similar.

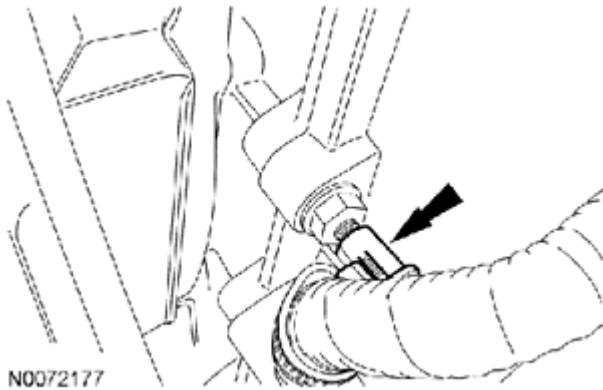


Fig. 260: Locating Lifting Eyes And Bolts
Courtesy of FORD MOTOR CO.

1. Remove the bolts and the 2 lifting eyes.
2. Remove the 4 bolts and the coolant outlet.
 - Discard the gasket.
3. Remove the 2 bolts and the EGR valve.
 - Discard the gasket.
4. Remove the Cylinder Head Temperature (CHT) sensor.
5. Remove the EGR tube.

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. Remove the spark plugs.

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

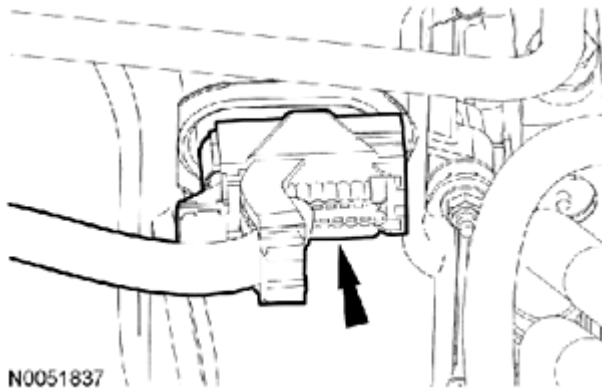


Fig. 261: Compressing Valve Spring
Courtesy of FORD MOTOR CO.

7. Using the Valve Spring Compressors, compress the valve spring and remove the valve spring collets, the valve spring retainers and the valve springs.
8. Inspect the valve spring, valve spring retainer and valve spring retainer key. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

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

NOTE: Mark each valve if the original valves are to be used.

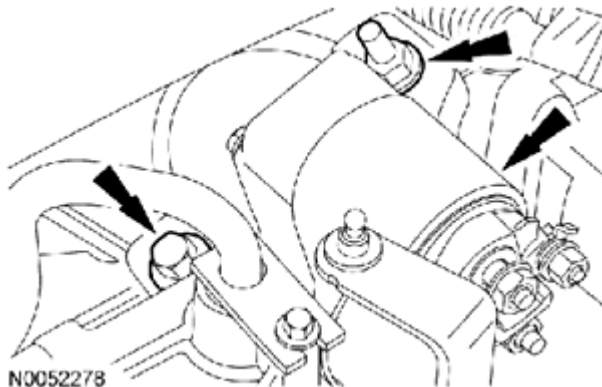
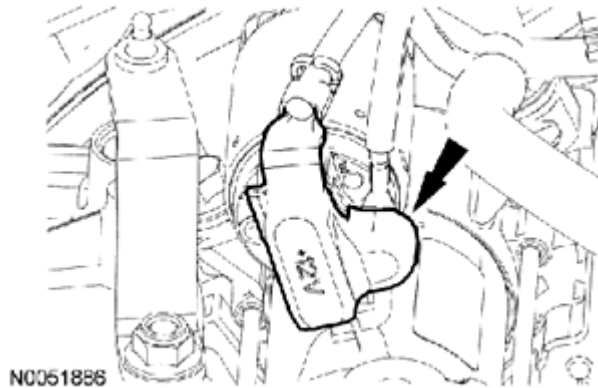


Fig. 262: Removing Valves

Courtesy of FORD MOTOR CO.

9. Remove the valves.
10. Using the Valve Stem Oil Seal Remover and Slide Hammer, remove and discard the valve seals.

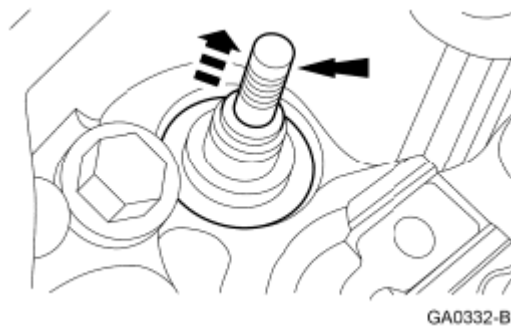
**Fig. 263: Installing Valve Seal Using Valve Stem Oil Seal Installer**

Courtesy of FORD MOTOR CO.

11. Inspect the valves. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** . Install new parts, as necessary.

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.

**Fig. 264: Installing Valves**

Courtesy of FORD MOTOR CO.

1. Install the valves.

NOTE: Use the protector provided with the replacement kit to prevent damage to the valve seals.

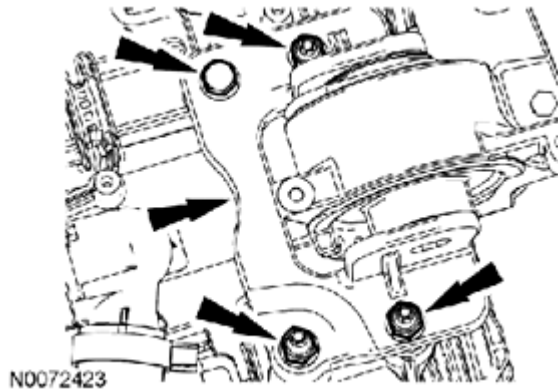


Fig. 265: Installing Valve Seal Using Valve Stem Oil Seal Installer
Courtesy of FORD MOTOR CO.

2. Lubricate the valve stems and guides with clean engine oil and, using the Valve Stem Oil Seal Installer, install the valve seals onto the cylinder head valve guides.
3. Place the valve spring in position over the valve and install the valve spring retainer.

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

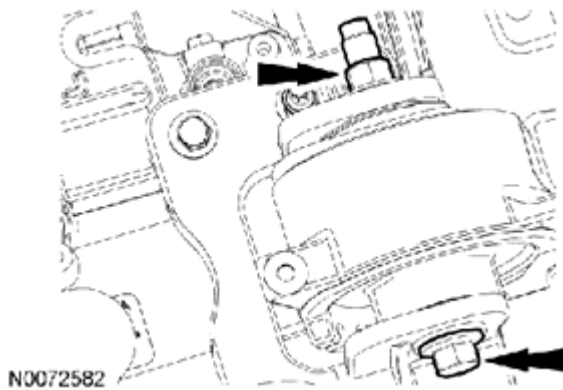


Fig. 266: Compressing Valve Spring
Courtesy of FORD MOTOR CO.

4. Using the Valve Spring Compressors, compress the valve spring and install the valve collets.

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

5. Install the spark plugs.
 - Tighten to 12 Nm (106 lb-in).
6. Install the EGR tube.
 - Tighten to 55 Nm (41 lb-ft).

7. Install the CHT sensor.
 - Tighten to 12 Nm (106 lb-in).
8. Using a new gasket, install the EGR valve, and the 2 bolts.
 - Tighten to 20 Nm (177 lb-in).
9. Using a new gasket, install the coolant outlet and the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).

NOTE: One lifting eye shown in illustration, other lifting eye similar.

10. Install the 2 lifting eyes and the bolts.
 - Tighten to 45 Nm (33 lb-ft).

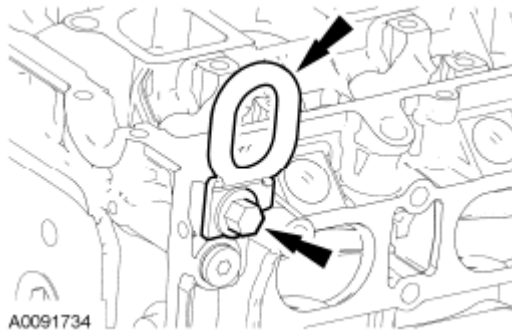


Fig. 267: Locating Lifting Eyes And Bolts
Courtesy of FORD MOTOR CO.

PISTON

MATERIAL 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)	WSS-M2C945-A

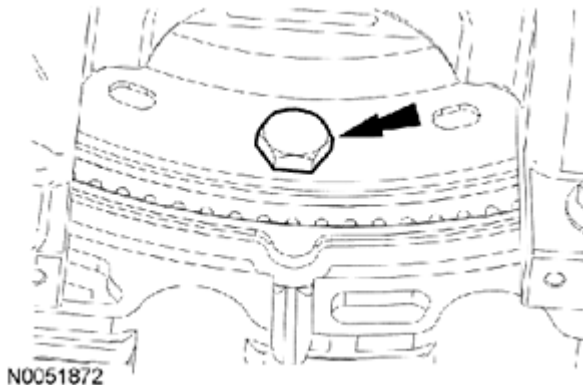


Fig. 268: Exploded View Of Piston
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6150	Piston compression upper ring
2	6152	Piston compression lower ring
3	6159	Piston oil control upper segment ring
4	6161	Piston oil control spacer
5	6159	Piston oil control lower segment ring
6	6140	Piston pin retainer
7	6140	Piston pin retainer
8	6135	Piston pin
9	6200	Connecting rod
10	6110	Piston

Disassembly

1. Remove the piston rings from the piston.
 - Discard the piston rings.
2. Remove the 2 piston pin retainers and the piston pin.

NOTE: If the piston and connecting rod are to be reinstalled, they must be assembled in the same orientation. Mark the piston orientation to the connecting rod for reassembly.

3. Separate the piston from the connecting rod.
4. Clean and inspect the piston and connecting rod. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Assembly

NOTE: The arrow on the top of the piston points towards the front of the engine.

1. Align the piston-to-connecting rod orientation marks, and position the connecting rod in the piston.
2. Lubricate the piston pin and pin bore with clean engine oil.
3. Install the piston pin in the piston and connecting rod assembly.
4. Install the piston pin retaining clips in the piston.
5. Lubricate the piston and the new piston rings with clean engine oil.

NOTE: The piston compression upper and lower ring should be installed with the paint mark on the outside diameter circumference of the ring to be positioned on the right side of the ring gap. The lower compression ring needs to be installed with the undercut side downward.

NOTE: The upper and lower compression ring gaps are not controlled for installation.

6. Install the piston rings onto the piston as shown in illustration.

1. Piston pin
2. Upper oil control ring gap location
3. Lower oil control ring gap location
4. Center line of the piston pin bore and the expander gap

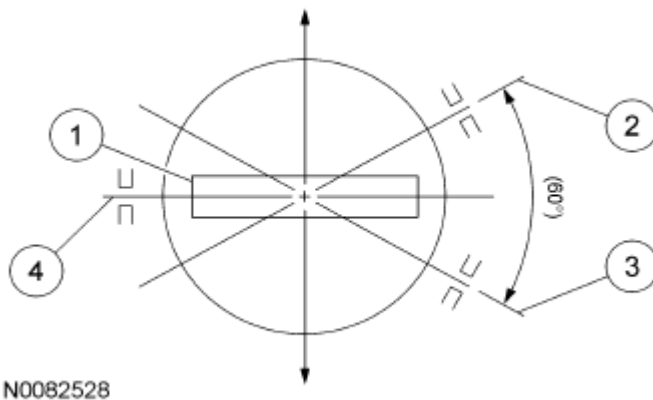


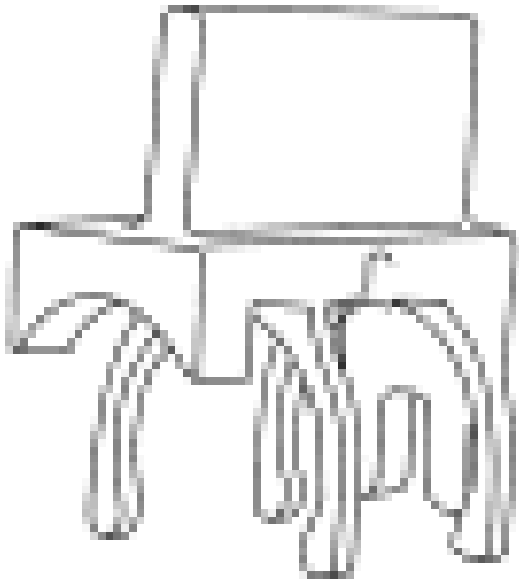
Fig. 269: Identifying Piston Rings Installation Dimensions
Courtesy of FORD MOTOR CO.

ASSEMBLY

ENGINE

SPECIAL TOOLS

Aligner, Crankshaft Sensor
303-1417



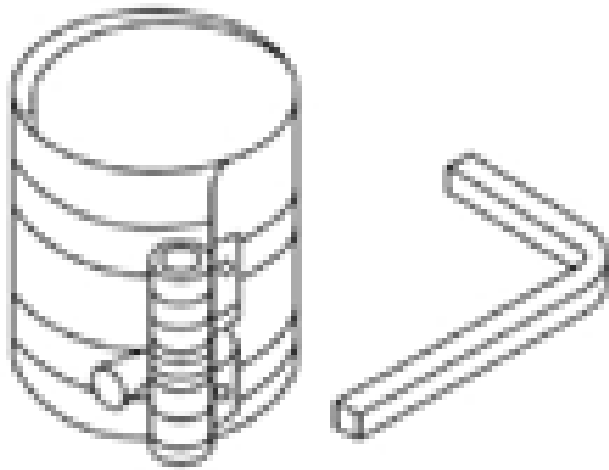
ST3055A



ST2645-A

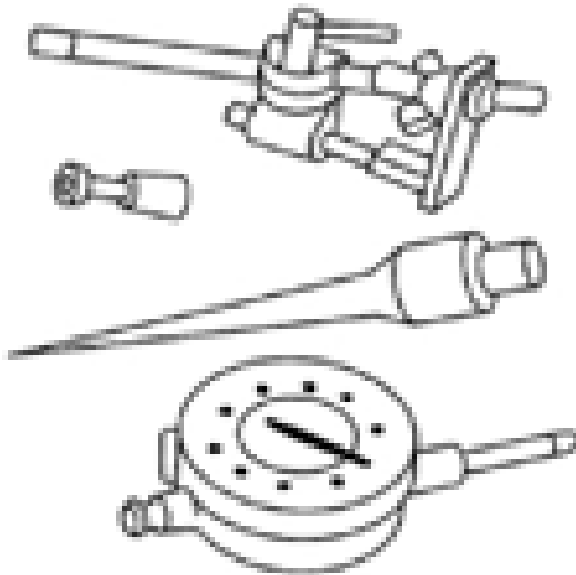
Alignment Plate, Camshaft
303-465 (T94P-6256-CH)

Compressor, Piston Ring



ST1376-A

303-D032 (D81L-6002-C)

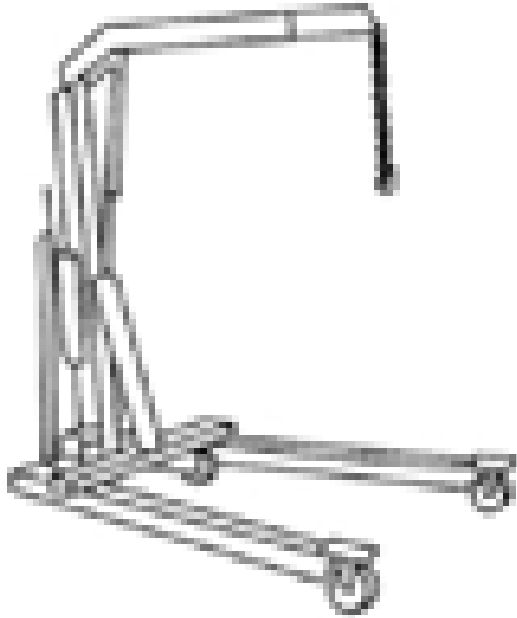


ST1214-A

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

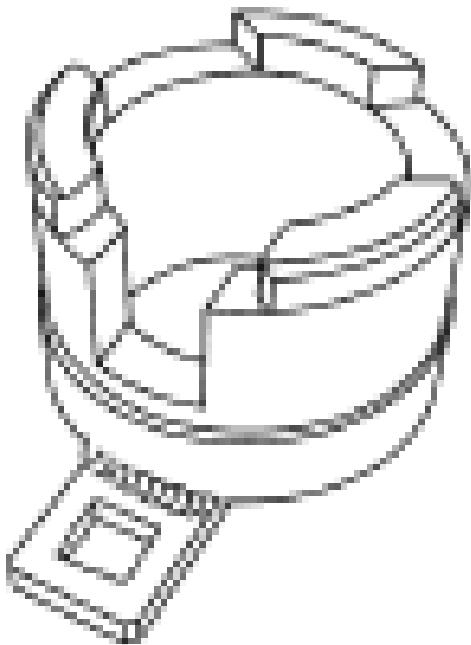
2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



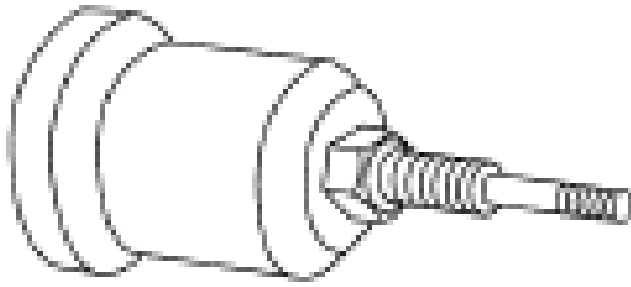
ST1341-A

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



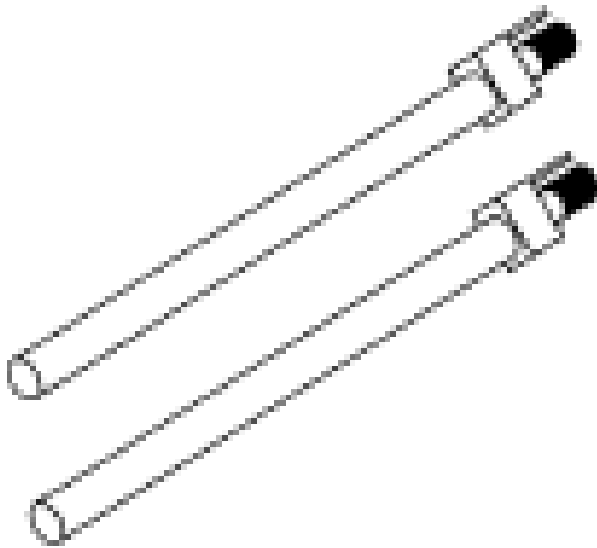
ST3054-A

Holding Tool, Crankshaft Damper
303-1416



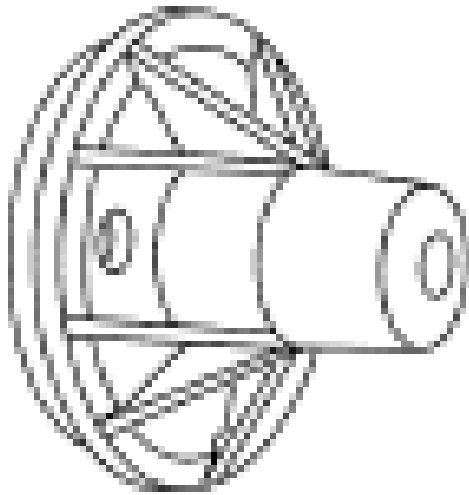
Installer, Camshaft Front Oil Seal
303-096 (T74P-6150-A)

ST1917-A



Installer, Connecting Rod
303-462 (TOOL-6136-AH)

ST1982-A



Installer, Crankshaft Rear Main Oil Seal
303-328 (T88P-6701-B1)

ST1506-A



Spreader Bar
303-D089 (D93P-6001-A3) or equivalent

ST1602-A

2013 Ford Transit Connect XLT Premium

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Timing Peg, Crankshaft TDC
303-507

GENERAL EQUIPMENT

6 mm x 18 mm bolt

MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Orange Antifreeze/Coolant Concentrated VC-3-B (US); CVC-3-B2 (Canada)	WSS-M97B44-D
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)	WSS-M2C945-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

Lower Engine Block (View 1)

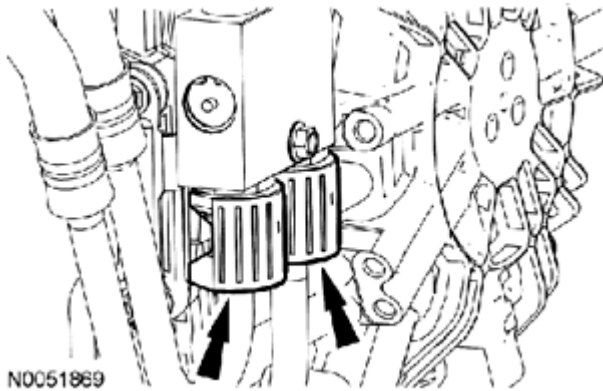


Fig. 270: Exploded View Of Lower Engine Block (1)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6010	Cylinder block
2	6K318	Crankshaft rear oil seal and retainer
3	6477	Flywheel/flexplate
4	6675	Oil pan
5	6714	Oil filter
6	6884	Oil filter adapter
7	9278	Engine Oil Pressure (EOP) sensor
8	6A642	Oil cooler
9	6A636	Oil filter adapter gasket
10	6A785	Crankcase vent oil separator
11	8575	Thermostat assembly
12	6622	Oil pump screen and pickup tube

Lower Engine Block (View 2)

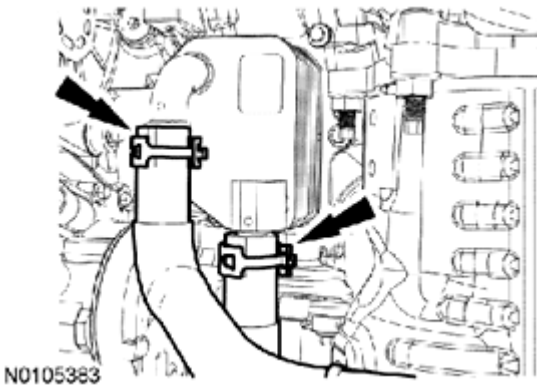


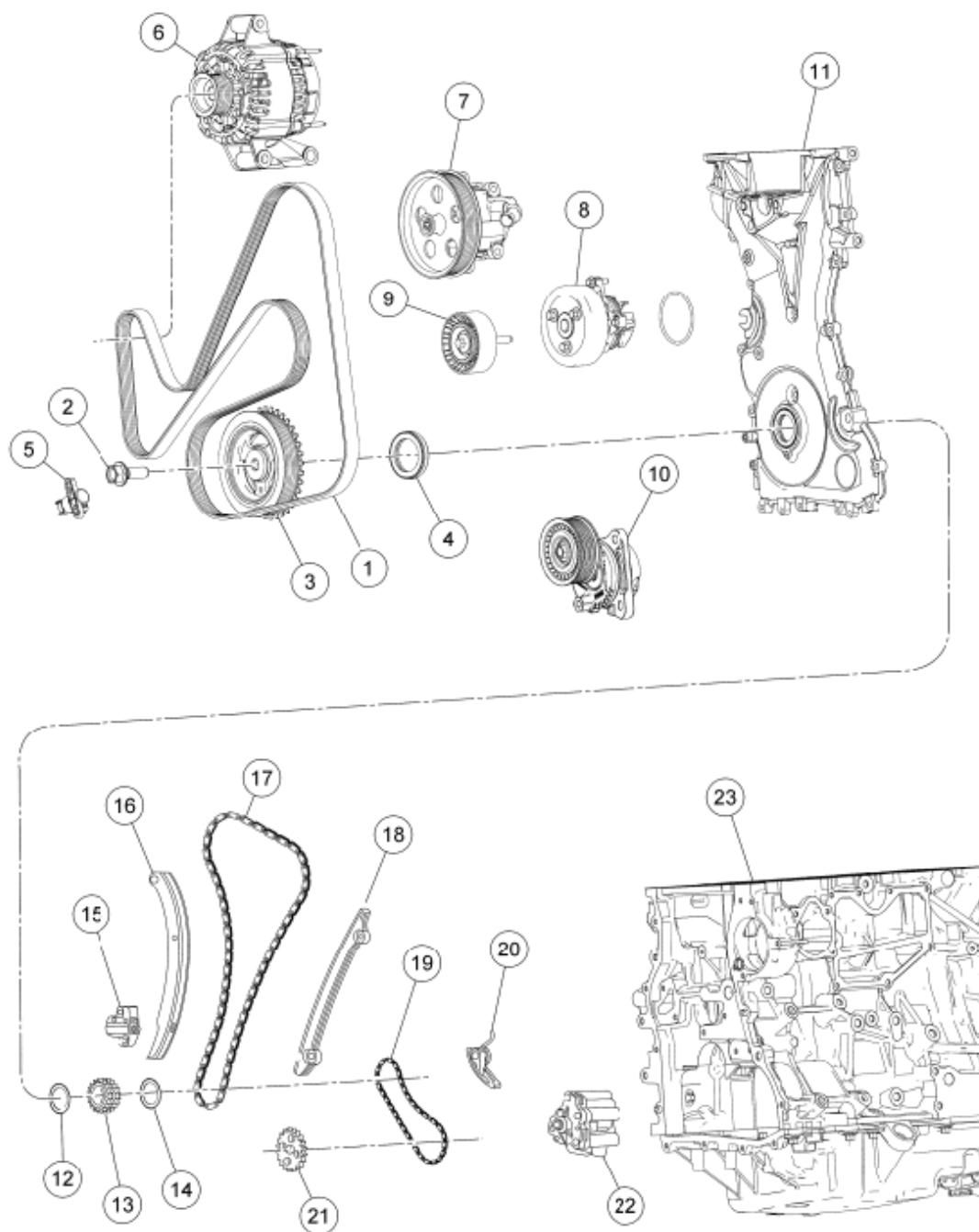
Fig. 271: Exploded View Of Lower Engine Block (2)
Courtesy of FORD MOTOR CO.

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

Item	Part Number	Description
1	6161	Piston oil control spacer (4 required)
2	6150	Piston compression upper ring (4 required)
3	6152	Piston compression lower ring (4 required)
4	6159	Piston oil control upper segment ring (4 required)
5	6159	Piston oil control lower segment ring (4 required)
6	6140	Piston pin retainer (8 required)
7	6135	Piston pin (4 required)
8	6200	Connecting rod (4 required)
9	6211	Connecting rod upper bearing (4 required)
10	6110	Piston (4 required)
11	6211	Connecting rod lower bearing (4 required)
12	6210	Connecting rod cap (4 required)
13	6010	Cylinder block
14	6333	Cylinder block crankshaft main bearing (5 required)
15	6303	Crankshaft
16	6333	Crankshaft main bearing beam bearing (5 required)
17	6F098	Main bearing beam

Front Engine Block



N0088386

Fig. 272: Exploded View Of Front Engine Block
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6C301	Accessory drive belt
2	6A340	Crankshaft pulley bolt
3	6316	Crankshaft damper

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

4	6700	Crankshaft front seal
5	6C315	Crankshaft Position (CKP) sensor
6	10300	Generator
7	3A696	Power steering pump
8	8501	Coolant pump and pulley
9	19A216	Drive belt pulley idler
10	6A228	Drive belt tensioner
11	6019	Engine front cover
12	6378	Diamond washer
13	6306	Crankshaft sprocket
14	6378	Diamond washer
15	6K254	Timing chain tensioner
16	6K255	Timing chain tensioner arm
17	6268	Timing chain
18	6K297	Timing chain guide
19	6A895	Oil pump chain
20	6C271	Oil pump chain tensioner
21	6652	Oil pump drive gear
22	6600	Oil pump
23	6010	Cylinder block

Cylinder Head

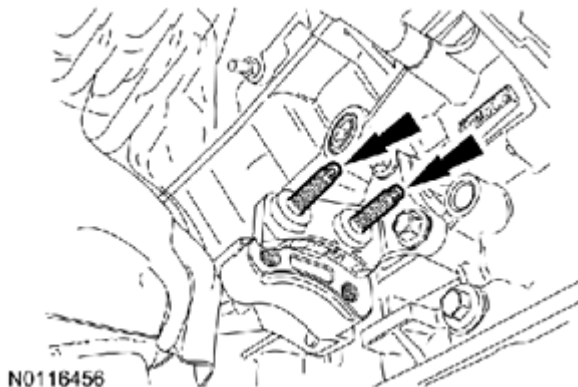


Fig. 273: Exploded View Of Cylinder Head
Courtesy of FORD MOTOR CO.

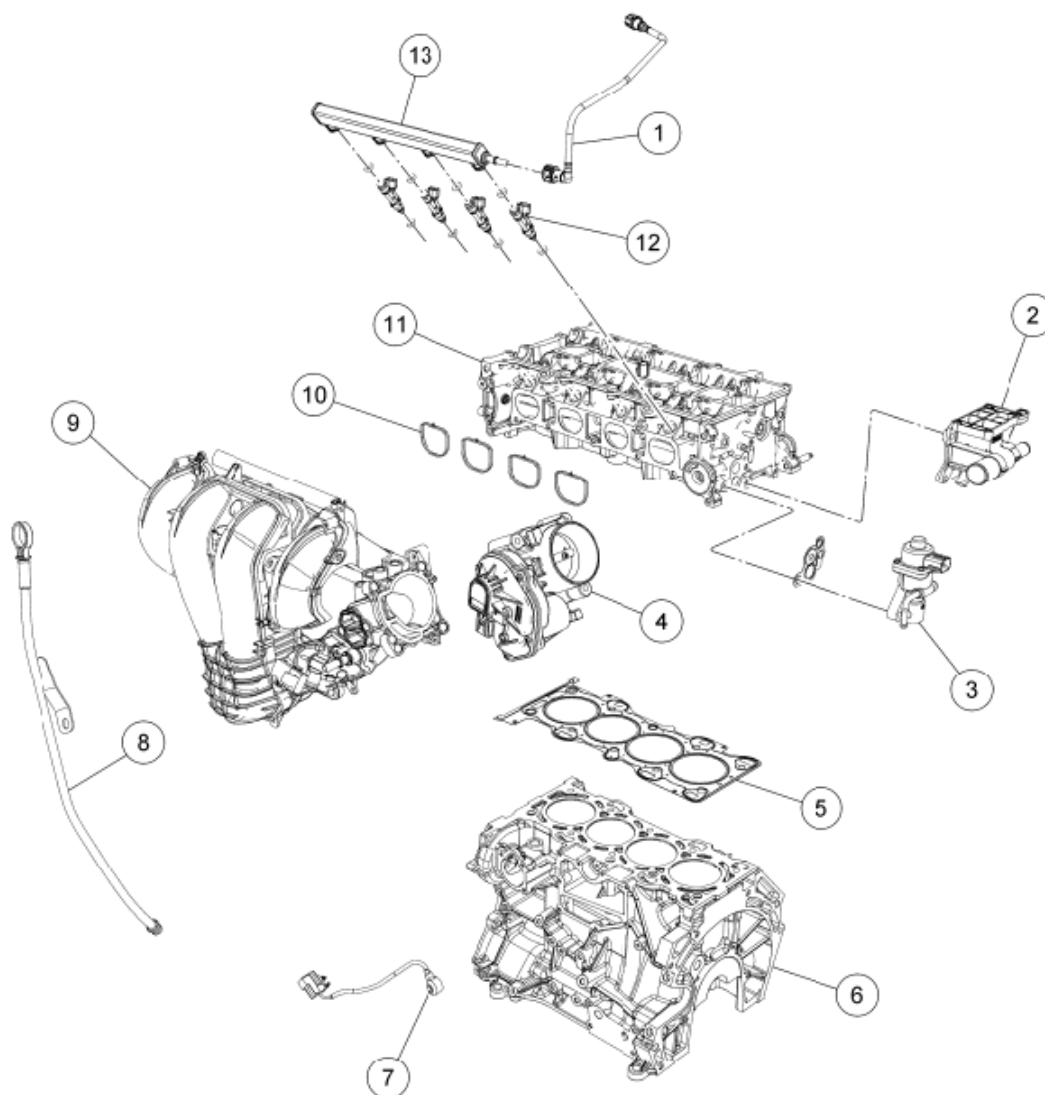
Item	Part Number	Description
1	12A366	Coil-on-plug (4 required)
2	6M293	Valve cover
3	12K073	Camshaft Position (CMP) sensor
4	6766	Oil filler cap

2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect

5	6M293	Valve cover gasket
6	6A284	Camshaft bearing cap
7	6A272	Camshaft (exhaust)
8	6A271	Camshaft (intake)
9	6500	Valve tappet (16 required)
10	6518	Valve spring retainer key (16 required)
11	6514	Valve spring retainer (16 required)
12	6513	Valve spring (16 required)
13	6A517	Valve stem seal (16 required)
14	6G004	Cylinder Head Temperature (CHT) sensor
15	12405	Spark plug (4 required)
16	6065	Cylinder head bolt (10 required)
17	6049	Cylinder head
18	6505	Exhaust valve (8 required)
19	6507	Intake valve (8 required)
20	6051	Head gasket
21	6010	Cylinder block
22	6C251	Camshaft sprocket (2 required)
23	9448	Exhaust manifold gasket
24	9430	Exhaust manifold
25	9N454	Exhaust manifold heat shield

Intake Manifold



N0078666

Fig. 274: Exploded View Of Intake Manifold
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	9288	Fuel supply tube
2	8K556	Coolant outlet
3	9D475	EGR valve
4	9E926	Throttle Body (TB)
5	6051	Cylinder head gasket
6	6010	Cylinder block
7	12A699	Knock Sensor (KS)
8	6754	Oil level indicator and tube
9	9424	Intake manifold

2013 Ford Transit Connect XLT Premium

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10	9439	Intake manifold gasket
11	6049	Cylinder head
12	9F593	Fuel injector (4 required)
13	9H487	Fuel rail

NOTE: 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, using diamond washers between the flange faces on each part. 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.

NOTE: 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.

NOTE: Assembly of the engine requires various inspections/measurements of the engine components (engine block, crankshaft, connecting rods, pistons and piston rings). These inspections/measurements will aid in determining if the engine components will require replacement. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

NOTE: If the oil squirters are being reused, they must be installed in the same location as marked during disassembly.

NOTE: The front bulkhead does not have an oil squirter.

1. Install the 4 oil squirters.
 - Tighten to 4 Nm (35 lb-in).

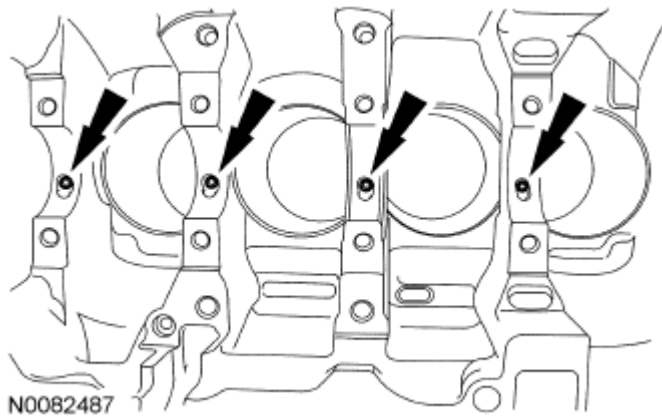


Fig. 275: Locating Oil Squirters
Courtesy of FORD MOTOR CO.

2. Measure each of the crankshaft main bearing journal diameters in at least 2 directions and record the smallest diameter for each journal.

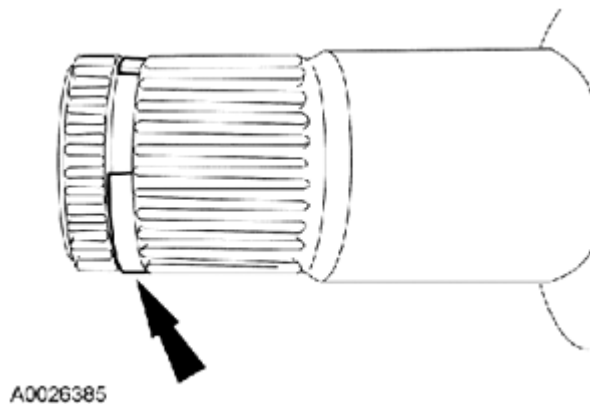


Fig. 276: Identifying Crankshaft Main Bearing Journal Diameter Measuring Directions
Courtesy of FORD MOTOR CO.

3. Position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block.

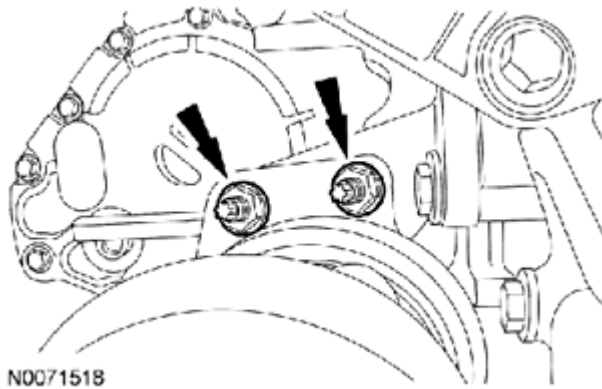


Fig. 277: Locating Main Bearing Beam In Engine Block
Courtesy of FORD MOTOR CO.

4. Using the original main bearing beam bolts, install and tighten the 10 main bearing beam bolts.
 - Tighten the bolts in the sequence shown in illustration in 3 stages.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 25 Nm (18 lb-ft).
 - Stage 3: Tighten an additional 90 degrees.

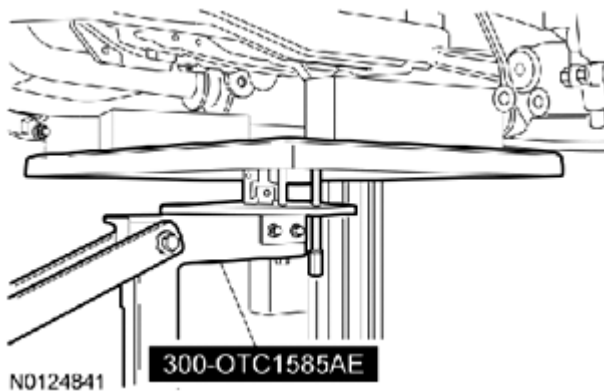


Fig. 278: Identifying Main Bearing Beam Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

5. Measure each crankshaft block housing main bearing bore diameter.
 - Remove the bolts and the main bearing beam.
 - Discard the main bearing beam bolts.

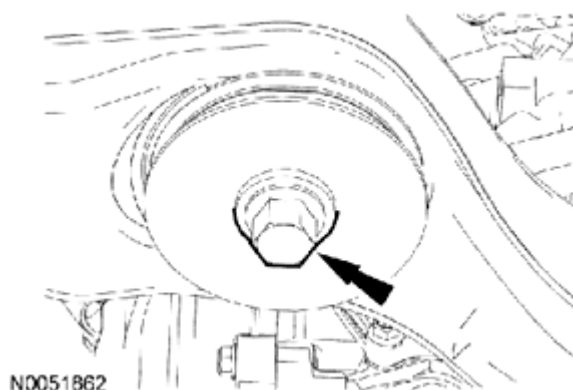


Fig. 279: Identifying Crankshaft Block Housing Main Bearing Bore Diameter
Courtesy of FORD MOTOR CO.

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

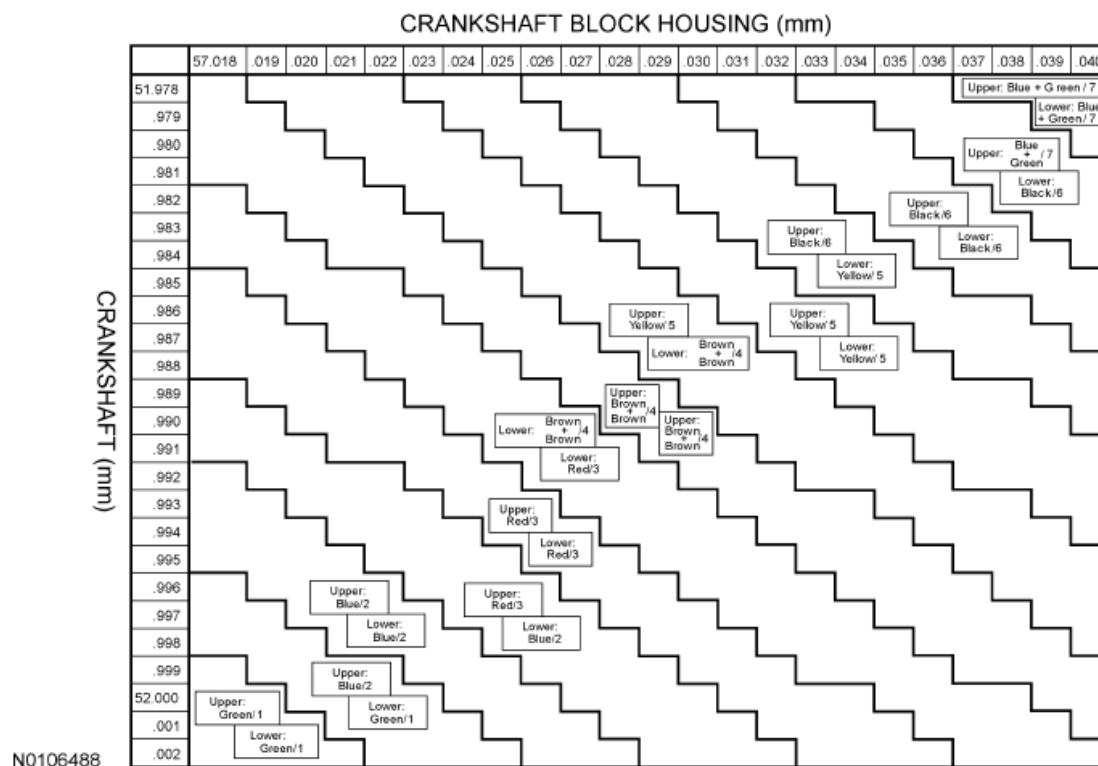


Fig. 280: Crankshaft Main Bearings Chart
Courtesy of FORD MOTOR CO.

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

7. Using the original connecting rod cap bolts, install the connecting caps and bolts.
- Tighten the bolts in 2 stages.

- Stage 1: Tighten to 29 Nm (21 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
8. Measure the connecting rod large end bore in 2 directions. Record the smallest measurement for each connecting rod.
- Remove the bolts and the connecting rod cap.
 - Discard the connecting rod cap bolts.

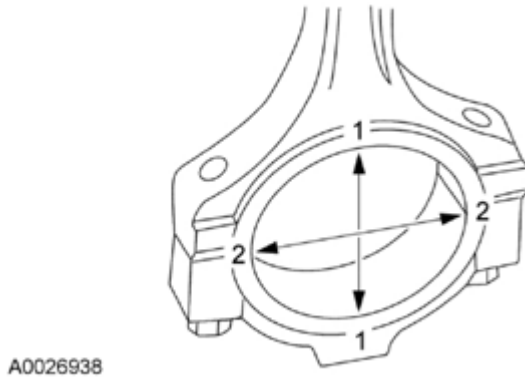


Fig. 281: Identifying Connecting Rod Large End Bore Measuring Directions
Courtesy of FORD MOTOR CO.

9. Measure each of the crankshaft connecting rod bearing journal diameters in at least 2 directions. Record the smallest measurement for each connecting rod journal.

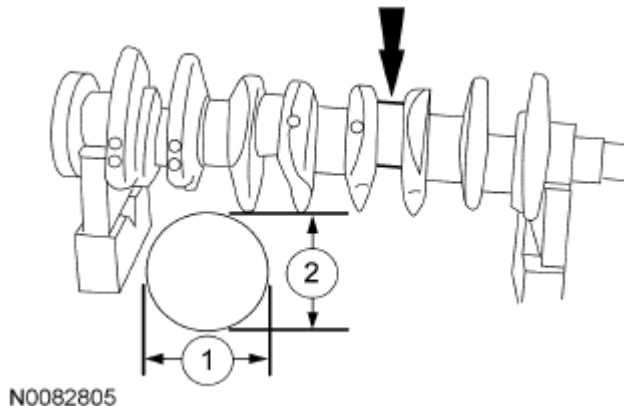


Fig. 282: Locating Crankshaft Connecting Rod Bearing Journal Diameters In Measuring Directions
Courtesy of FORD MOTOR CO.

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

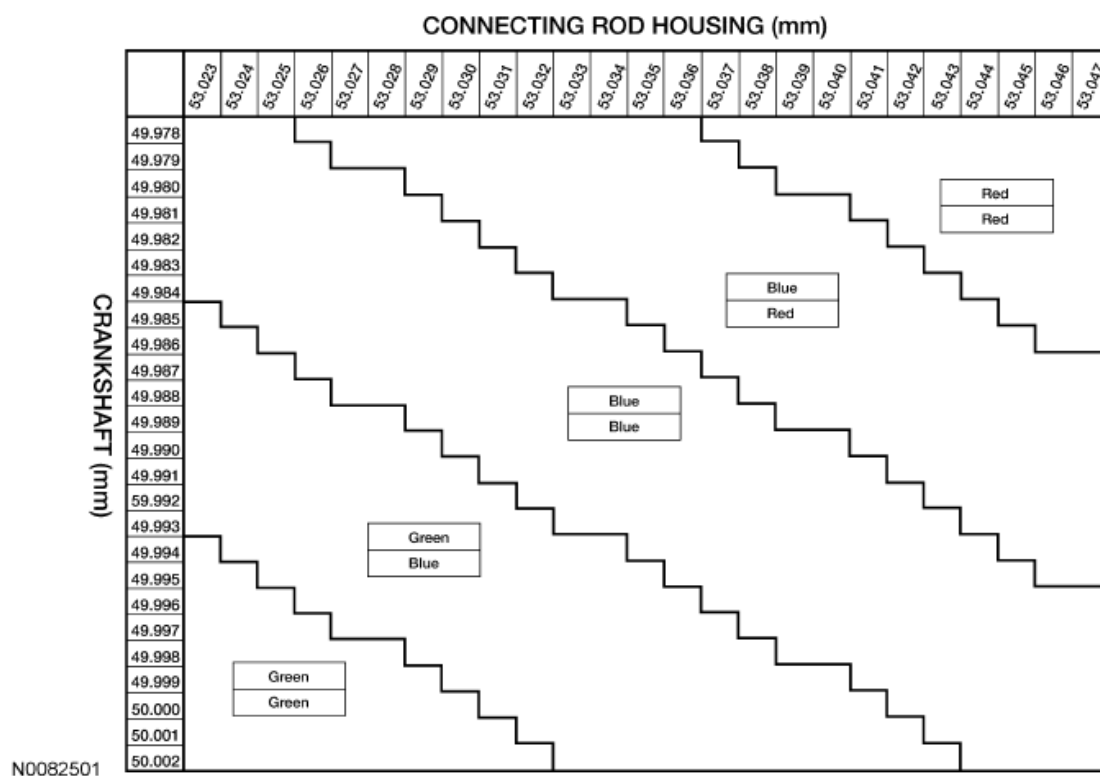


Fig. 283: Connecting Rod Bearings Chart
 Courtesy of FORD MOTOR CO.

- 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.
- NOTE:** The center bulkhead is the thrust bearing.

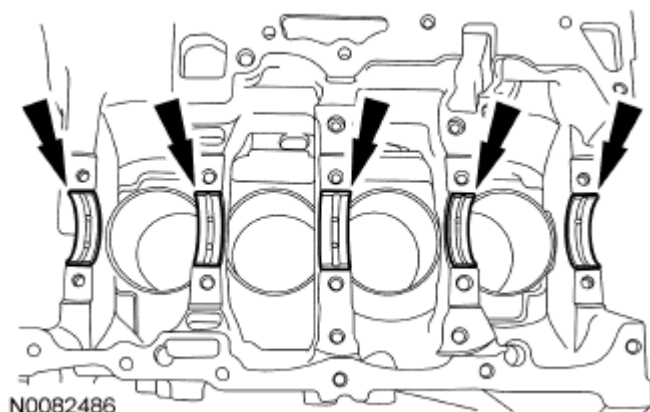
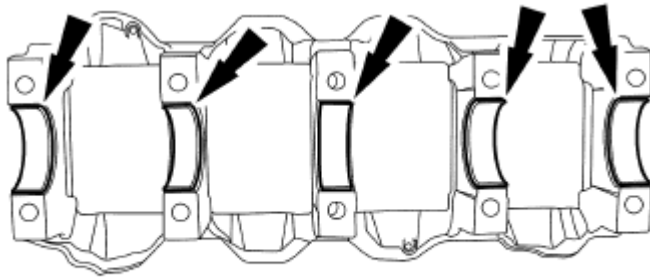


Fig. 284: Locating Crankshaft Main Bearings

Courtesy of FORD MOTOR CO.

11. Lubricate the upper crankshaft main bearings with clean engine oil and install the 5 crankshaft main bearings in the cylinder block.

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

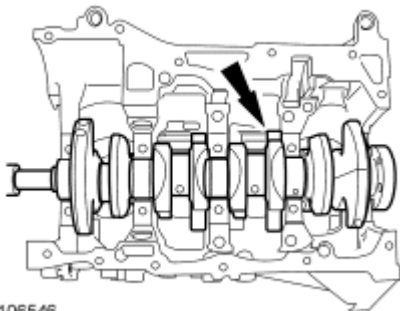


N0082485

Fig. 285: Locating Crankshaft Main Bearings

Courtesy of FORD MOTOR CO.

12. Lubricate the crankshaft main bearings with clean engine oil and install the 5 crankshaft main bearings in the main bearing beam.
13. Lubricate journals on the crankshaft with clean engine oil.
14. Position the crankshaft in the cylinder block.



N0106546

Fig. 286: Locating Crankshaft Of Engine Block

Courtesy of FORD MOTOR CO.

15. Lubricate the 10 main bearing beam side fit surfaces (front 2 shown in illustration) with clean engine oil.

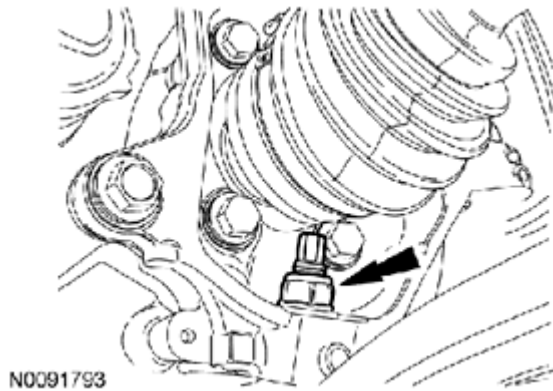


Fig. 287: Locating Main Bearing Beam Lubrication Area
Courtesy of FORD MOTOR CO.

16. Lubricate the crankshaft bearing journals on the main bearing beam with clean engine oil. Then position the main bearing beam in the engine block with the main bearing beam mounted flush with the rear face of the engine block.

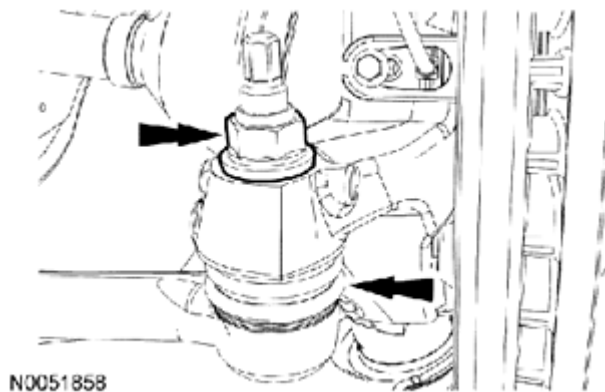


Fig. 288: Locating Main Bearing Beam In Engine Block
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the 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.

17. Install and tighten the 10 main bearing beam bolts.
 - Tighten the bolts in the sequence shown in 3 stages.
 - Stage 1: Tighten to 5 Nm (44 lb-in).
 - Stage 2: Tighten to 25 Nm (18 lb-ft).
 - Stage 3: Tighten an additional 90 degrees.

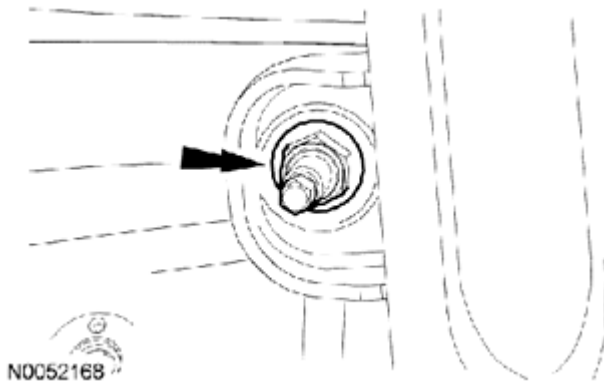


Fig. 289: Identifying Main Bearing Beam Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

18. Using the Dial Indicator Gauge with Holding Fixture, measure crankshaft end play.
 - Position the crankshaft to the rear of the cylinder block.
 - Zero the Dial Indicator Gauge with Holding Fixture.
 - Move the crankshaft to the front of the cylinder block. Note and record the crankshaft end play.
 - Acceptable crankshaft end play is 0.22-0.43 mm (0.008-0.016 in). If the crankshaft end play exceeds the specified range, install new parts as necessary.

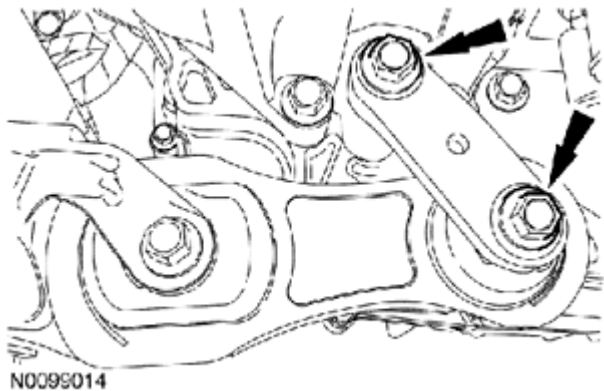


Fig. 290: Measuring Crankshaft End Play Using Dial Indicator Gauge With Holding Fixture
 Courtesy of FORD MOTOR CO.

- NOTE:** 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:** Lubricate the pistons, piston rings, connecting rod bearings and the entire cylinder bores with clean engine oil.
- NOTE:** Make sure the piston arrow on top is facing toward the front of the engine.

19. Using the Piston Ring Compressor and the Connecting Rod Installer, install the piston and connecting rod assemblies.

- When installing the pistons and connecting rod assemblies, the oil ring gaps must be positioned 60 degrees apart from each other and a minimum of 90 degrees from the expander gap.
- The position of the upper and lower compression ring gaps are not controlled for installation.

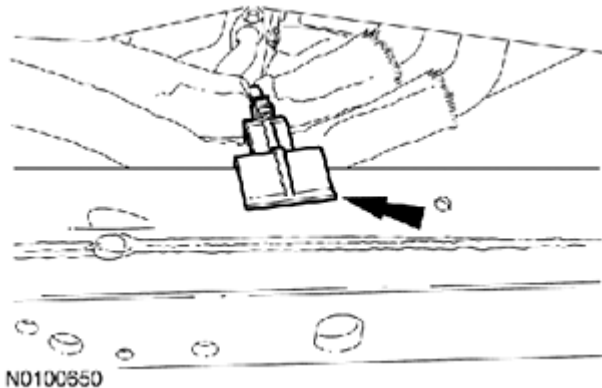


Fig. 291: Identifying Piston Ring Compressor And Connecting Rod Installer
Courtesy of FORD MOTOR CO.

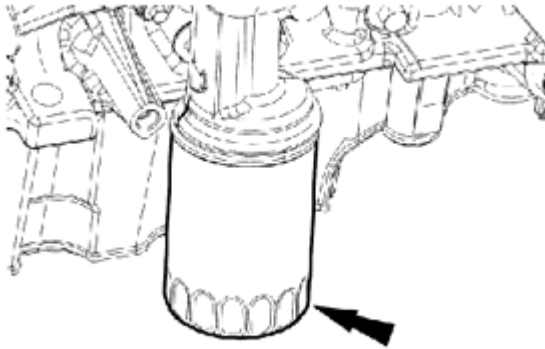
NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

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.

20. Install the connecting rod caps and bolts.

- Tighten the bolts in 2 stages.
- Stage 1: Tighten to 29 Nm (21 lb-ft).
- Stage 2: Tighten an additional 90 degrees.



N0103237

Fig. 292: Locating Connecting Rod Caps And Bolts
Courtesy of FORD MOTOR CO.

NOTE: Failure to position the No. 1 piston at Top Dead Center (TDC) can result in damage to the engine. Turn the engine in the normal direction of rotation only.

21. Turn the crankshaft clockwise to position the No. 1 piston at Top Dead Center (TDC).

NOTE: The Crankshaft TDC Timing Peg 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 until the timing drive components and crankshaft pulley are installed.

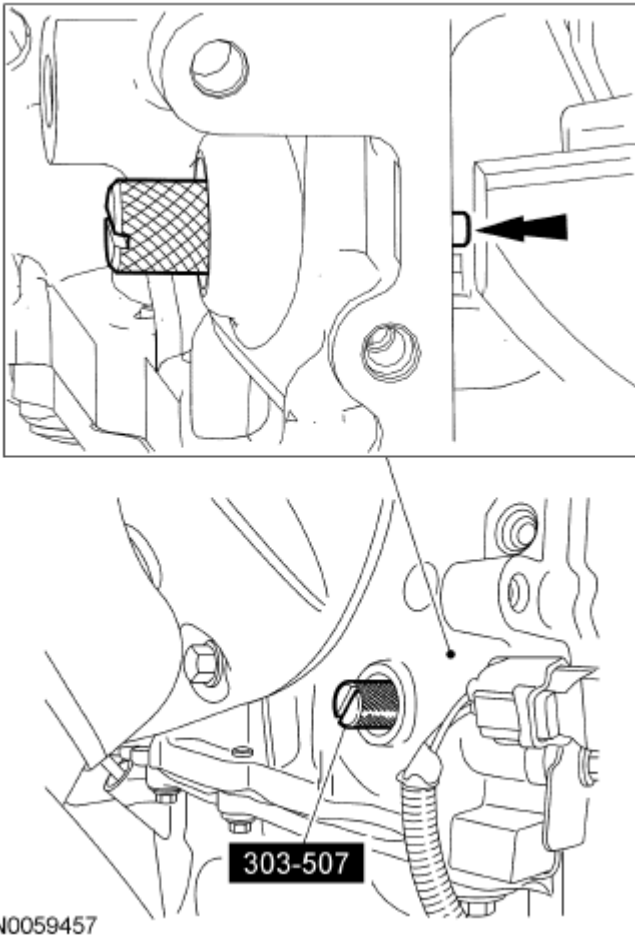


Fig. 293: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

22. Install the Crankshaft TDC Timing Peg.

NOTE: Clean the oil pump and cylinder block mating surfaces with metal surface prep.

23. Install the oil pump assembly. Tighten the 4 bolts in the sequence shown in 2 stages.

- Stage 1: Tighten to 10 Nm (89 lb-in).
- Stage 2: Tighten to 20 Nm (177 lb-in).

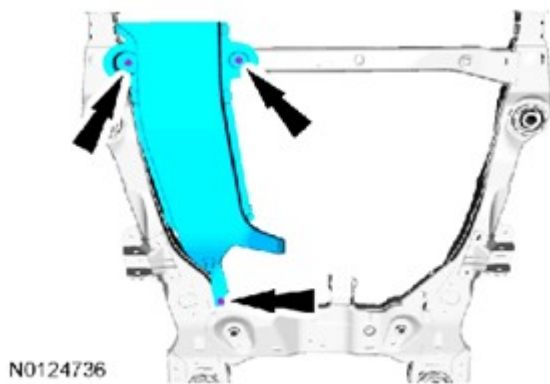


Fig. 294: Identifying Oil Pump Assembly Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

24. Using a new oil pump pickup tube gasket, install the pickup tube and bolts.
- Tighten to 10 Nm (89 lb-in).

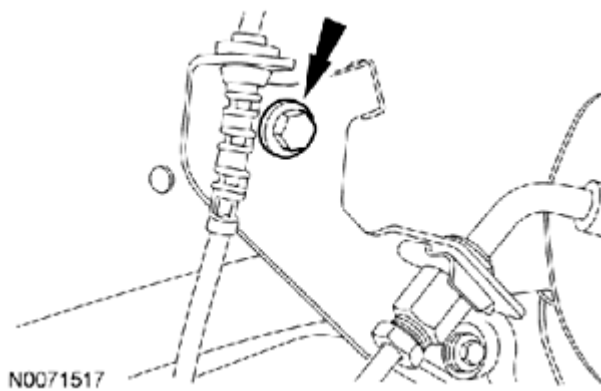


Fig. 295: Locating Bolts, Oil Pump Pickup Tube And Gasket
Courtesy of FORD MOTOR CO.

25. Using the Crankshaft Rear Main Oil Seal Installer, install the crankshaft rear seal.

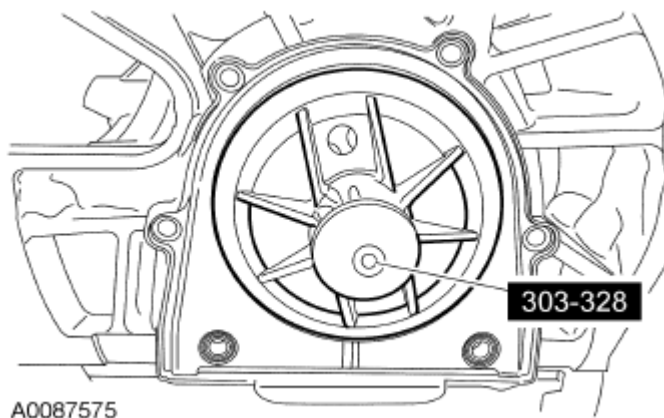


Fig. 296: Identifying Crankshaft Rear Main Oil Seal Installer
Courtesy of FORD MOTOR CO.

26. Tighten the 6 crankshaft rear seal with retainer plate bolts in the sequence shown in illustration.
- Tighten to 10 Nm (89 lb-in).

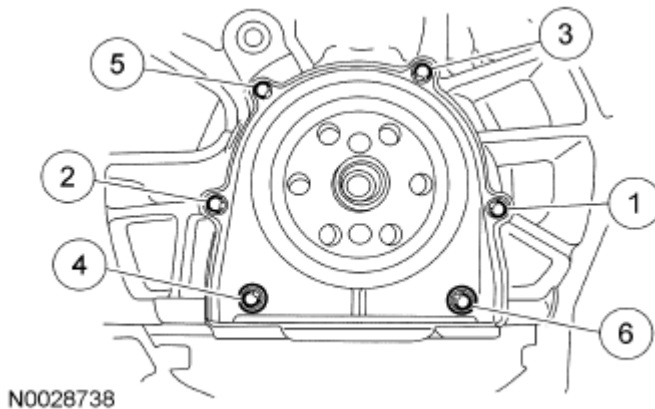


Fig. 297: Identifying Crankshaft Rear Oil Seal Retainer Plate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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.

27. Clean and inspect all mating surfaces.

NOTE: If the oil pan is not secured within 4 minutes of sealant application, the sealant must be removed and the sealing area cleaned with metal surface prep. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

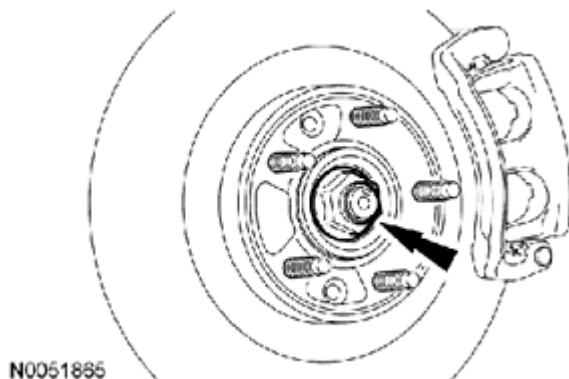


Fig. 298: Locating Oil Pan Silicone Gasket And Sealant Bead Applying Area

Courtesy of FORD MOTOR CO.

28. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the oil pan-to-engine block and to the oil pan-to-engine front cover mating surface.
29. Install the oil pan. Install the 2 oil pan bolts finger-tight.

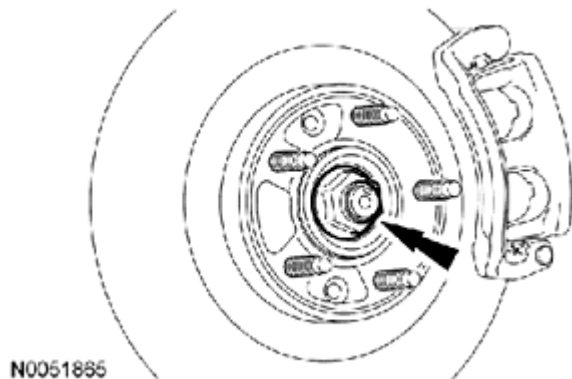


Fig. 299: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

30. Using a suitable straight edge, align the front surface of the oil pan flush with the front surface of the engine block.

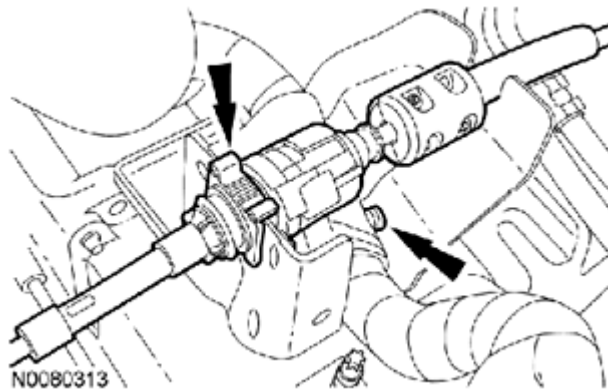


Fig. 300: Aligning Front Surface Of Oil Pan Flush With Front Surface Of Engine Block Using Straightedge
Courtesy of FORD MOTOR CO.

31. Install the remaining 13 oil pan bolts and tighten the oil pan bolts in the sequence shown in illustration to 25 Nm (18 lb-ft).

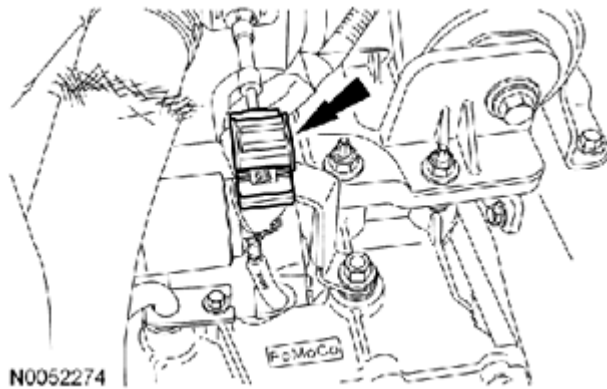


Fig. 301: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

32. Install the cylinder head alignment dowels. Dowels must be fully seated in the cylinder block.

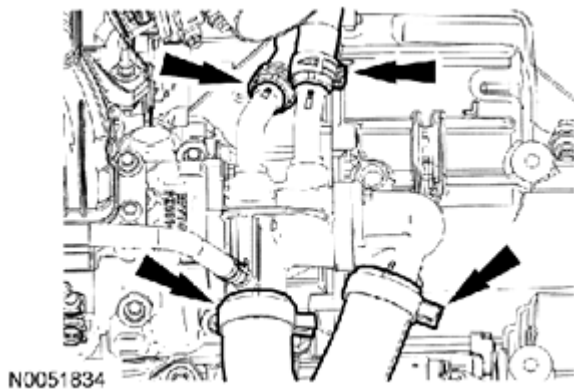


Fig. 302: Locating Cylinder Head Alignment Dowels
Courtesy of FORD MOTOR CO.

33. Apply silicone gasket and sealant to the locations shown in illustration.

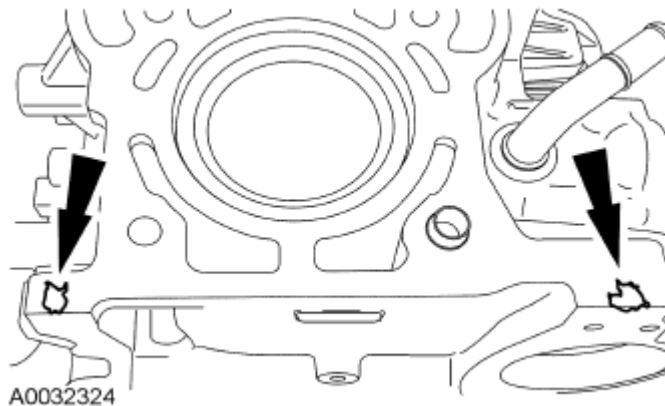
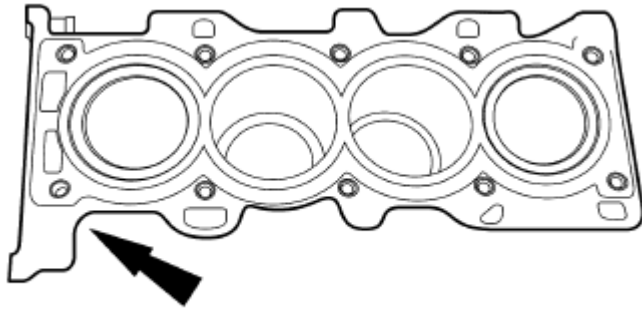


Fig. 303: Locating Sealant Applying Area On Cylinder Block
Courtesy of FORD MOTOR CO.

34. Install a new cylinder head gasket.



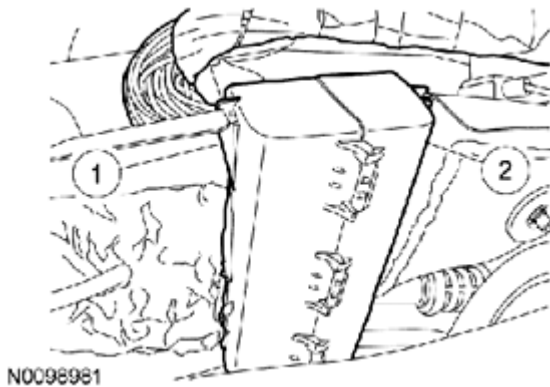
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Fig. 304: Locating Cylinder Head Gasket
Courtesy of FORD MOTOR CO.

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

35. Install the cylinder head and 10 new bolts. Tighten the bolts in the sequence shown in 5 stages.

- Stage 1: Tighten to 5 Nm (44 lb-in).
- Stage 2: Tighten to 15 Nm (133 lb-in).
- Stage 3: Tighten to 45 Nm (33 lb-ft).
- Stage 4: Turn 90 degrees.
- Stage 5: Turn an additional 90 degrees.



N0098981

Fig. 305: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

NOTE: Coat the valve tappets with clean engine oil.

36. Install the valve tappets.

NOTE: 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 disassembly 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.

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

37. Install the camshafts and bearing caps in their original location and orientation. Tighten the bearing caps in the sequence shown in 3 stages:

- Stage 1: Tighten one turn at a time until tight.
- Stage 2: Tighten to 7 Nm (62 lb-in).
- Stage 3: Tighten to 16 Nm (142 lb-in).

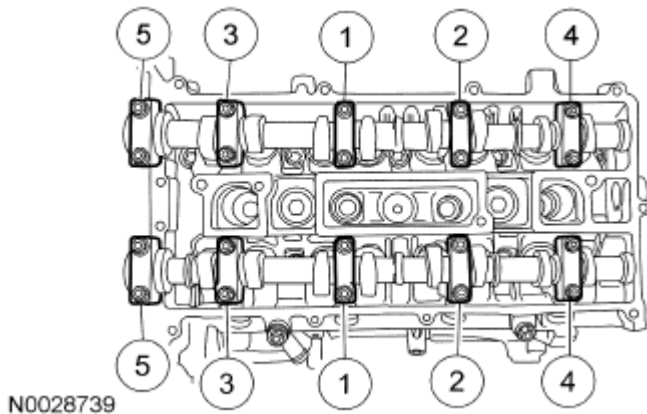


Fig. 306: Identifying Camshafts And Bearing Caps Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Install a new crankshaft sprocket diamond washer on both sides of the crankshaft sprocket.

38. Install the crankshaft sprocket, new crankshaft sprocket diamond washers, oil pump chain and oil pump sprocket.

- The crankshaft sprocket flange must be facing away from the engine block.

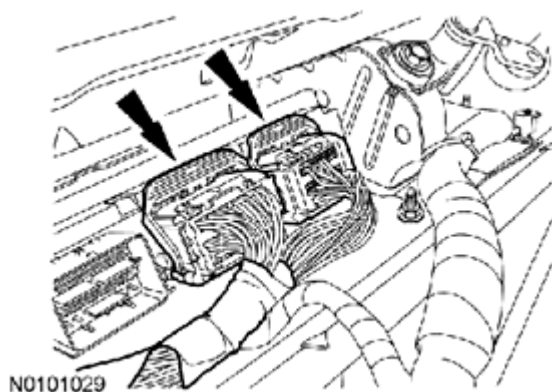


Fig. 307: Locating Crankshaft Sprocket Flange
Courtesy of FORD MOTOR CO.

39. Install the oil pump chain, sprocket and bolt.
- Tighten to 25 Nm (18 lb-ft).

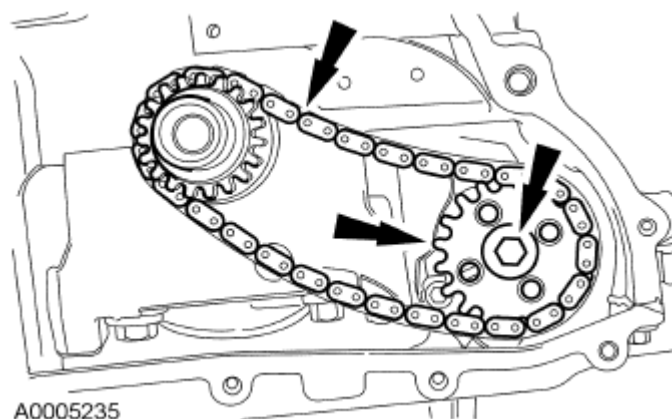


Fig. 308: Locating Oil Pump Chain, Sprocket And Bolt
Courtesy of FORD MOTOR CO.

40. Install the oil pump chain tensioner shoulder bolt.
- Tighten to 10 Nm (89 lb-in).

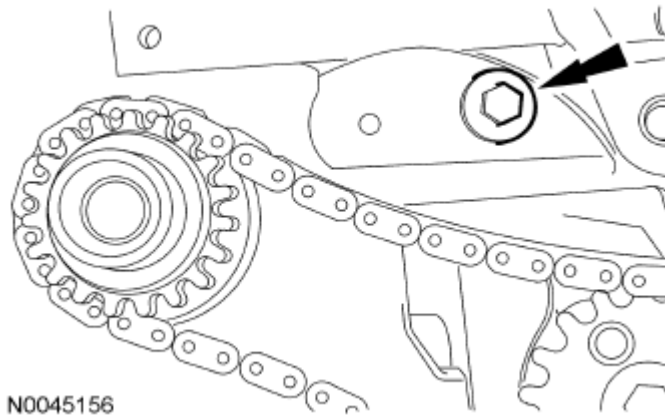


Fig. 309: Locating Oil Pump Chain Drive Tensioner Shoulder Bolt
Courtesy of FORD MOTOR CO.

41. Install the oil pump chain tensioner. Hook the tensioner spring around the shoulder bolt.
- Tighten to 10 Nm (89 lb-in).

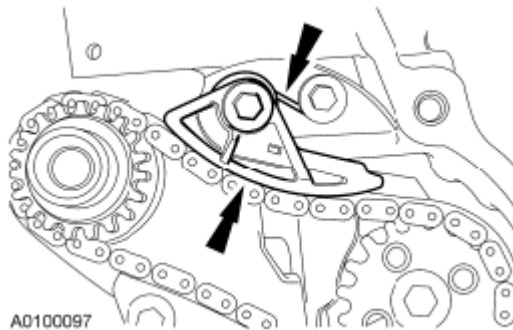


Fig. 310: Locating Oil Pump Chain Tensioner
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

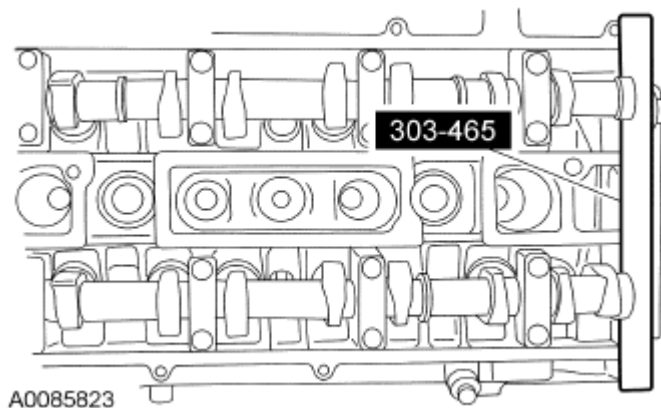


Fig. 311: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

42. Install the Camshaft Alignment Plate in the slots on the rear of both camshafts.
43. Install the camshaft sprockets and the bolts. Do not tighten the bolts at this time.

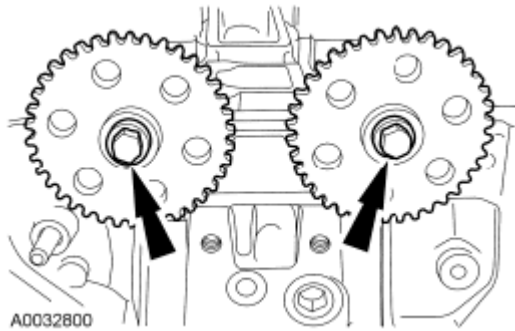


Fig. 312: Locating Camshaft Sprockets And Bolts
Courtesy of FORD MOTOR CO.

44. Install the LH timing chain guide and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

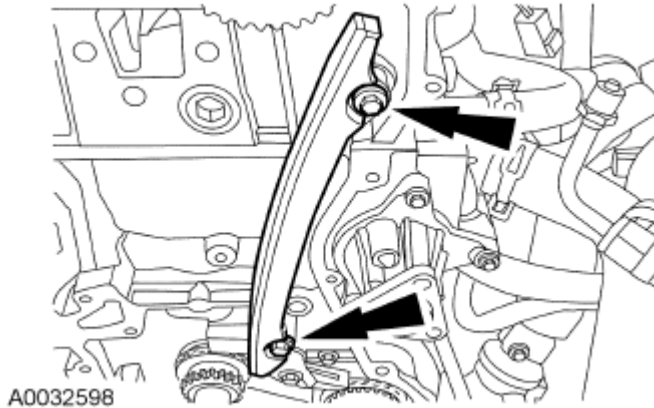


Fig. 313: Locating LH Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

45. Install the timing chain.

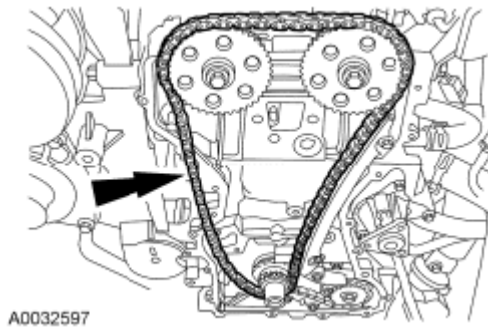


Fig. 314: Locating Timing Chain
Courtesy of FORD MOTOR CO.

46. Install the RH timing chain guide.

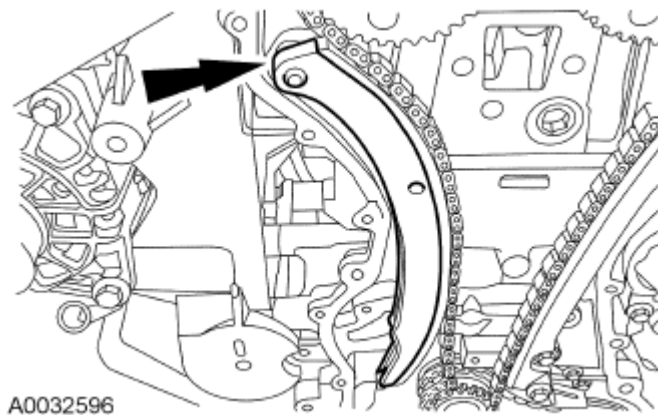
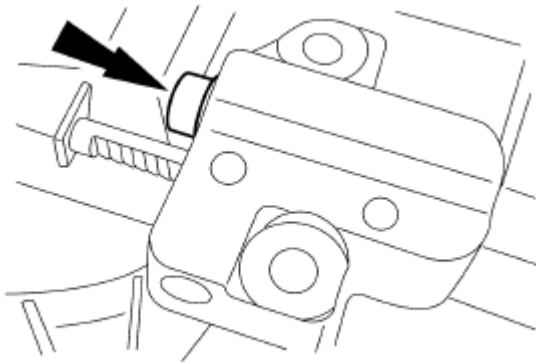


Fig. 315: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

NOTE: If the timing chain tensioner plunger and ratchet assembly are not pinned in the compressed position, follow the next 4 steps.

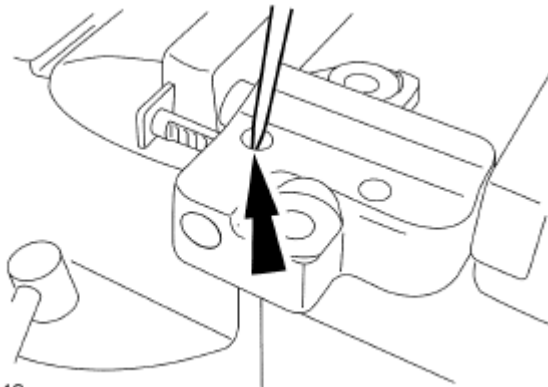
NOTE: Do not compress the ratchet assembly. This will damage the ratchet assembly.



A0032539

Fig. 316: Compressing Timing Chain Tensioner Plunger
Courtesy of FORD MOTOR CO.

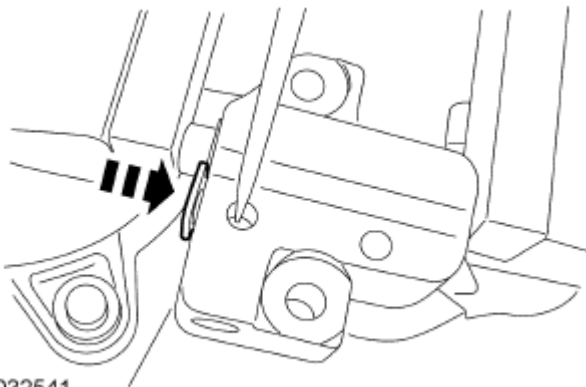
47. Using the edge of a vise, compress the timing chain tensioner plunger.
48. Using a small pick, push back and hold the ratchet mechanism.



A0032540

Fig. 317: Holding Ratchet Mechanism Using Small Pick
Courtesy of FORD MOTOR CO.

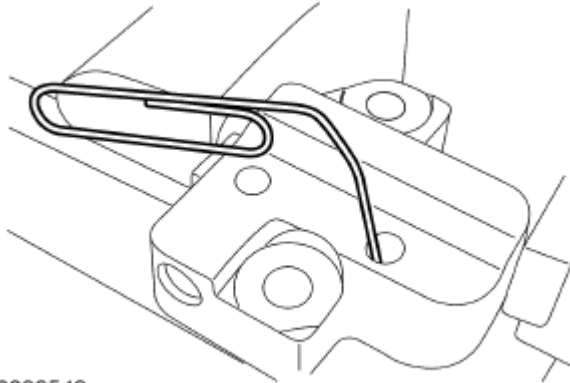
49. While holding the ratchet mechanism, push the ratchet arm back into the tensioner housing.



A0032541

Fig. 318: Pushing Ratchet Arm Back Into Tensioner Housing
Courtesy of FORD MOTOR CO.

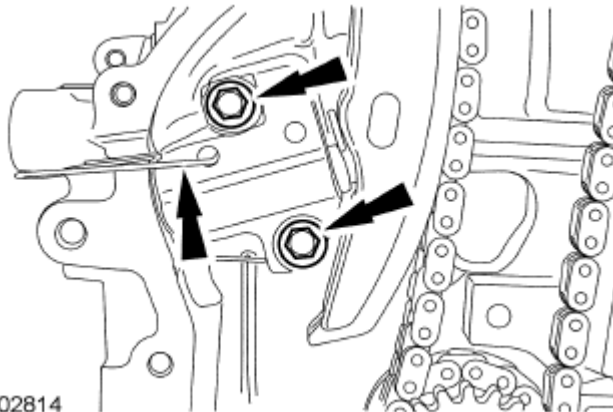
50. Install a paper clip into the hole in the tensioner housing to hold the ratchet assembly and the plunger in during installation.



A0032542

Fig. 319: Holding Ratchet Assembly Using Paper Clip
Courtesy of FORD MOTOR CO.

51. Install the timing chain tensioner and the 2 bolts.
- Tighten to 10 Nm (89 lb-in).
 - Remove the paper clip to release the piston.



A0002814

Fig. 320: Locating Timing Chain Tensioner And Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Camshaft Alignment Plate is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

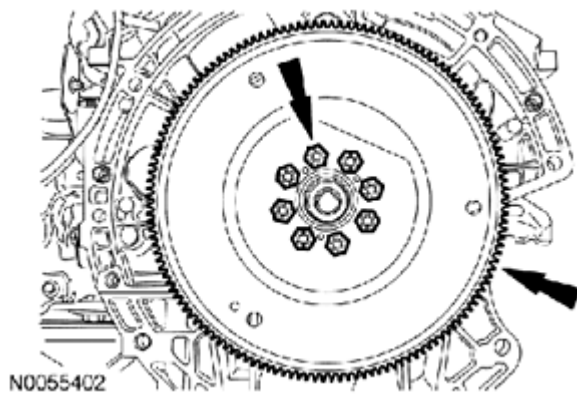


Fig. 321: Locating Camshaft Drive Gear Bolts
Courtesy of FORD MOTOR CO.

52. Using the flats on the camshafts to prevent camshaft rotation, tighten the camshaft drive gear bolts to 72 Nm (53 lb-ft).

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

53. Clean and inspect the mounting surfaces of the engine and the front cover.

NOTE: The engine front cover must be installed and the bolts tightened within 4 minutes of applying the silicone gasket and sealant.

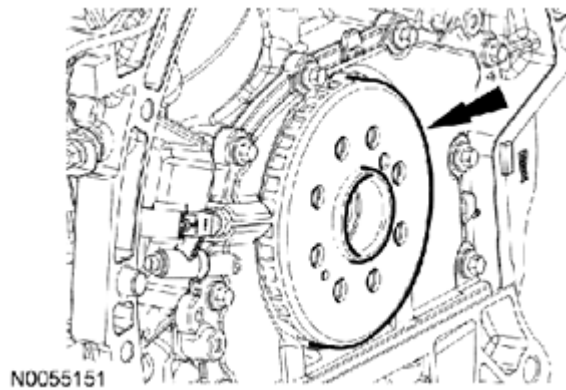


Fig. 322: Locating Bead Of Silicone Gasket And Sealant Applying Area On Front Cover
Courtesy of FORD MOTOR CO.

54. Apply a 2.5 mm (0.10 in) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas. Apply a 2.5 mm (0.10 in) bead of silicone gasket and sealant to the front cover.
55. Install the engine front cover. Tighten the 22 bolts in the sequence shown to the following specifications:
 - Tighten the 8-mm bolts to 10 Nm (89 lb-in).

- Tighten the 13-mm bolts to 48 Nm (35 lb-ft).

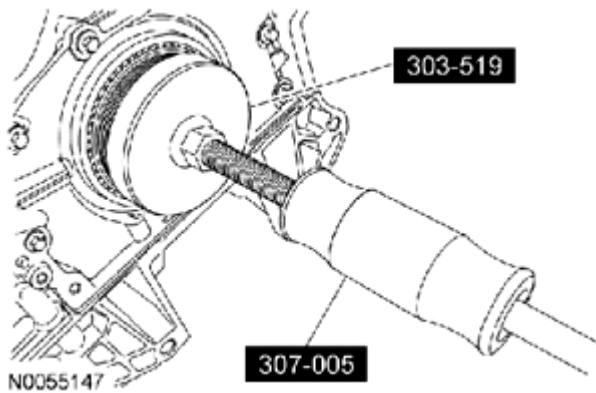


Fig. 323: Identifying Engine Front Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

NOTE: Lubricate the oil seal with clean engine oil.

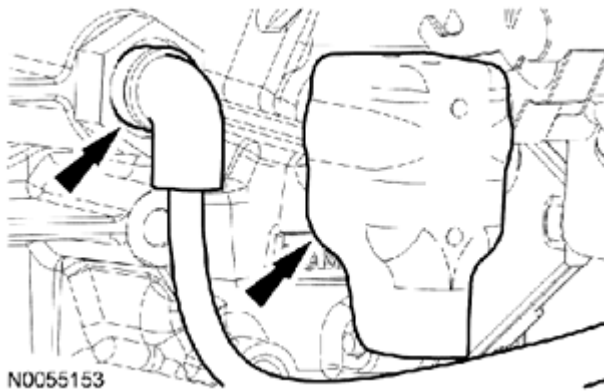


Fig. 324: Installing Crankshaft Front Oil Seal Using Camshaft Front Oil Seal Installer
Courtesy of FORD MOTOR CO.

56. Using the Camshaft Front Oil Seal Installer, install a new crankshaft front seal.

NOTE: Do not install the crankshaft pulley bolt at this time.

NOTE: Apply clean engine oil on the seal area before installing.

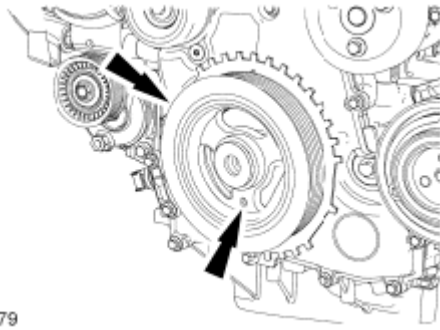


Fig. 325: Locating Crankshaft Pulley Position
Courtesy of FORD MOTOR CO.

57. Position the crankshaft pulley onto the crankshaft with the hole in the pulley at the 6 o'clock position.

NOTE: Only hand-tighten the 6 mm bolt or damage to the front cover can occur.

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

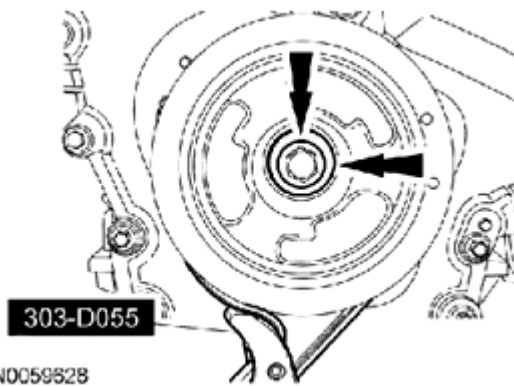


Fig. 326: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

58. Install a standard 6 mm x 18 mm bolt through the crankshaft pulley and thread it into the front cover.

NOTE: The crankshaft must remain in the Top Dead Center (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 Crankshaft Damper Holding Tool and the bolt should be installed using hand tools only.

NOTE: Do not reuse the crankshaft pulley bolt.

59. Install a new crankshaft pulley bolt. Use the Crankshaft Damper Holding Tool and a suitable 1/2-in drive hand tool to hold the crankshaft pulley, tighten the crankshaft pulley bolt in 2 stages:

- Stage 1: Tighten to 100 Nm (74 lb-ft).
- Stage 2: Tighten an additional 90 degrees (one-fourth turn).

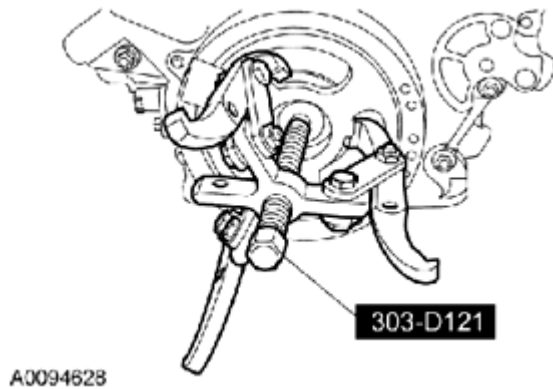


Fig. 327: Locating Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

60. Remove the 6 mm x 18 mm bolt.

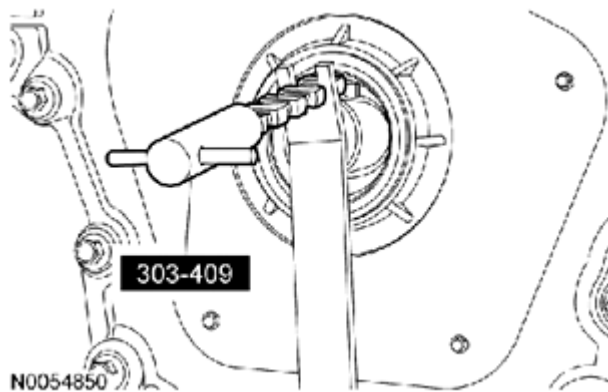


Fig. 328: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

61. Remove the Crankshaft TDC Timing Peg.

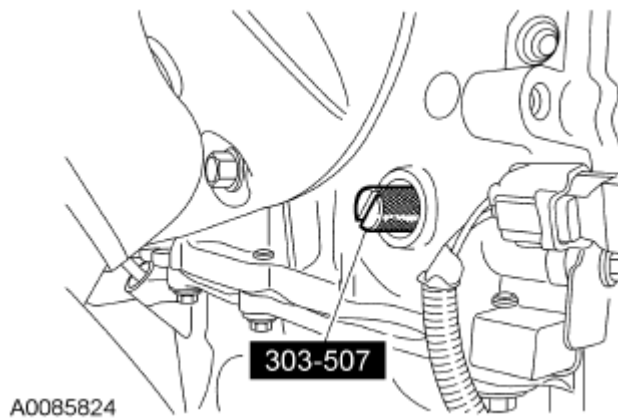


Fig. 329: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

62. Remove the Camshaft Alignment Plate.

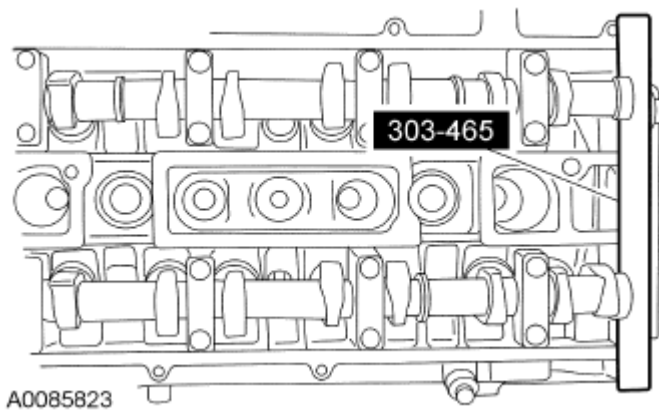


Fig. 330: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.

63. Turn the crankshaft clockwise one and three-fourths turn.
64. Install the Crankshaft TDC Timing Peg.

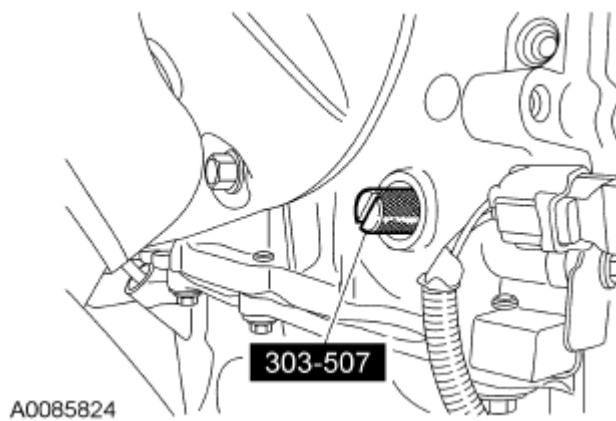


Fig. 331: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

NOTE: Only turn the engine in the normal direction of rotation.

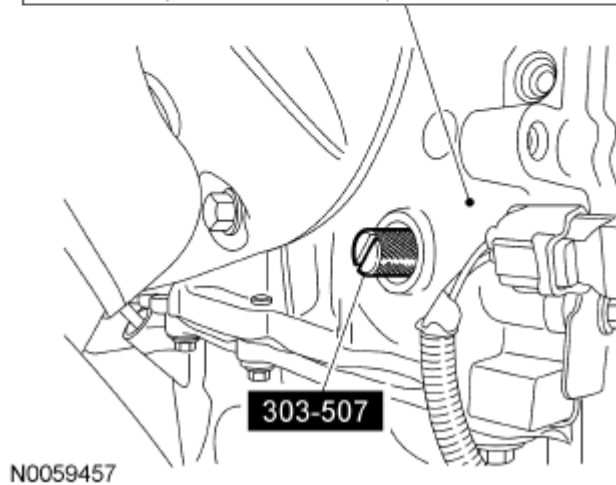
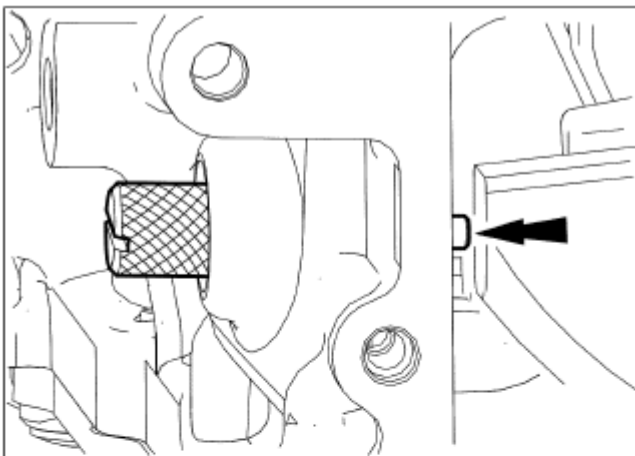


Fig. 332: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

65. Turn the crankshaft clockwise until the crankshaft contacts the Crankshaft TDC Timing Peg.

NOTE: Only hand-tighten the bolt or damage to the front cover can occur.

66. Using the 6 mm x 18 mm bolt, check the position of the crankshaft pulley.
- If it is not possible to install the bolt, the engine valve timing must be corrected.

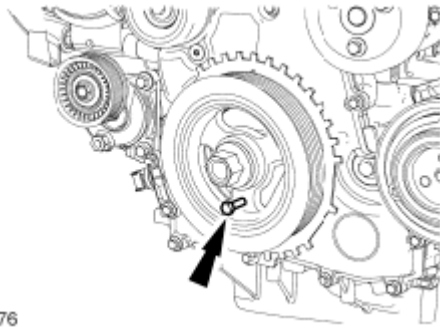


Fig. 333: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

67. Install the Camshaft Alignment Plate to check the position of the camshafts.
- If it is not possible to install the Camshaft Alignment Plate, the engine valve timing must be corrected.

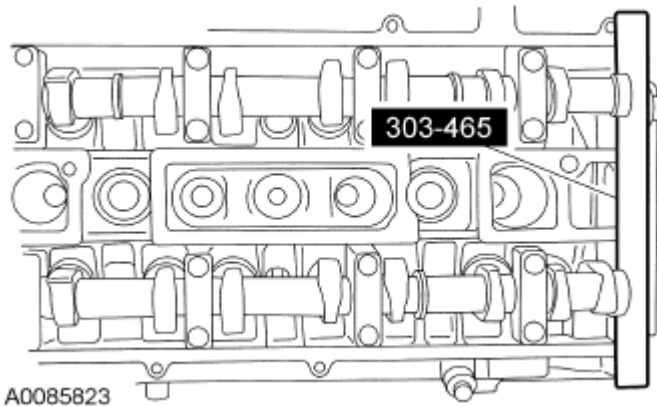


Fig. 334: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

68. Remove the Camshaft Alignment Plate.

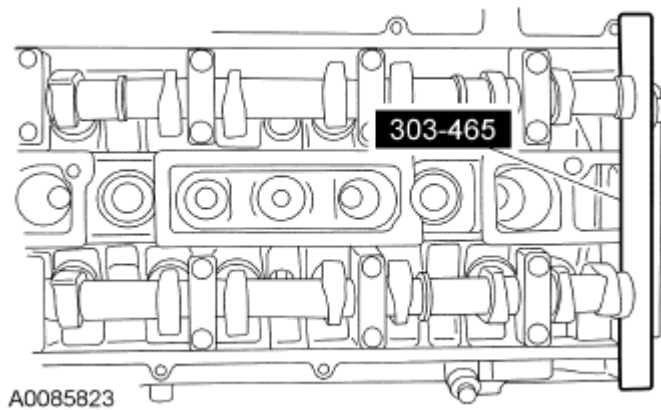


Fig. 335: Checking Position Of Camshafts Using Camshaft Alignment Plate
Courtesy of FORD MOTOR CO.

69. Install the Crankshaft Position (CKP) sensor and the 2 bolts.
- Do not tighten the bolts at this time.

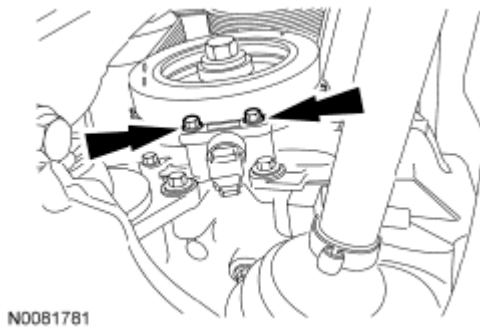


Fig. 336: Locating CKP Sensor Bolts
Courtesy of FORD MOTOR CO.

70. Using the Crankshaft Sensor Aligner, adjust the CKP sensor.
- Tighten the 2 CKP bolts to 7 Nm (62 lb-in).

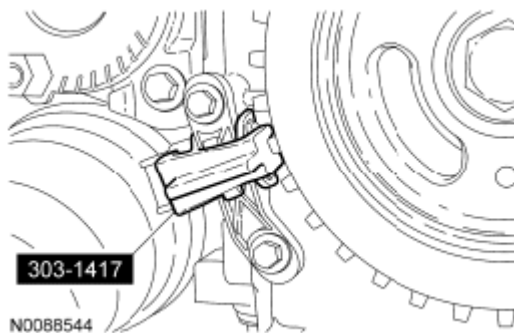


Fig. 337: Adjusting CKP Sensor Using Crankshaft Sensor Aligner
Courtesy of FORD MOTOR CO.

71. Remove the 6 mm x 18 mm bolt.

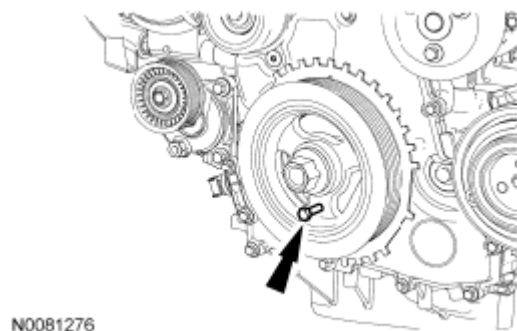


Fig. 338: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

72. Remove the Crankshaft TDC Timing Peg.

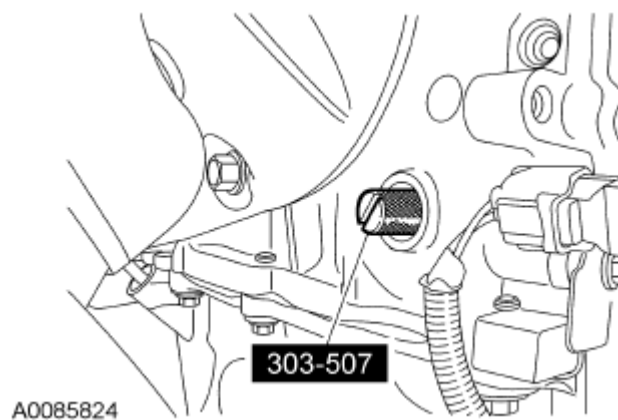


Fig. 339: Identifying Crankshaft TDC Timing Peg
Courtesy of FORD MOTOR CO.

73. Install the engine plug bolt.
- Tighten to 20 Nm (177 lb-in).

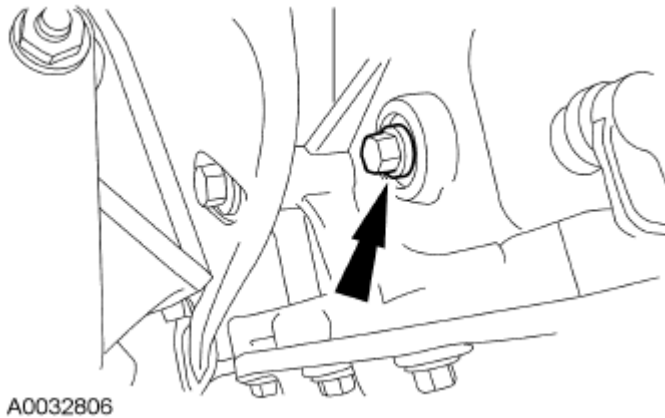


Fig. 340: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

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.

74. Clean the valve cover gasket surface with metal surface prep.
75. Apply silicone gasket and sealant to the locations shown in illustration.



Fig. 341: Locating Sealant Applying Area On Valve Cover
Courtesy of FORD MOTOR CO.

NOTE: The valve cover must be secured within 4 minutes of silicone gasket application. If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep.

76. Install the valve cover.
 - Tighten the 14 bolts in the sequence shown to 10 Nm (89 lb-in).

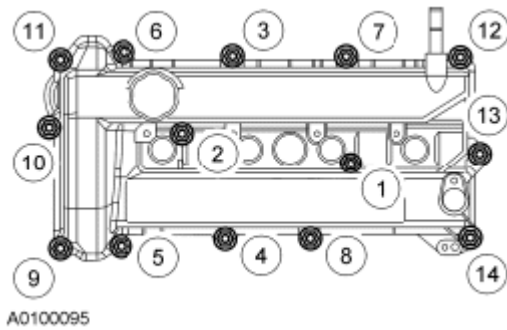


Fig. 342: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

77. Install the Cylinder Head Temperature (CHT) sensor and the spark plugs.
 - Tighten the CHT sensor to 12 Nm (106 lb-in).
 - Tighten the spark plugs to 12 Nm (106 lb-in).

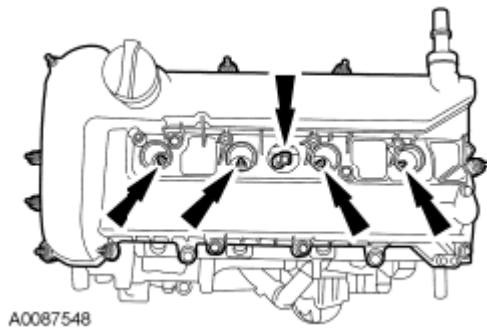


Fig. 343: Locating Cylinder Head Temperature Sensor And Spark Plug
Courtesy of FORD MOTOR CO.

NOTE: Apply dielectric compound to the inside of the coil-on-plug boots.

78. Install the 4 ignition coil-on-plugs and the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).

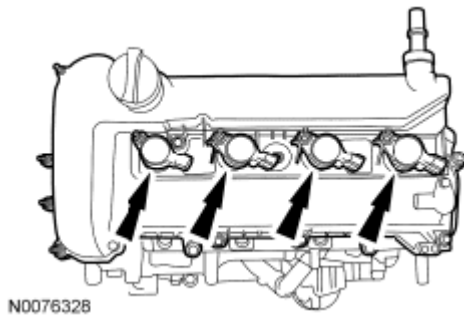


Fig. 344: Locating Ignition Coil-On-Plug Bolts
Courtesy of FORD MOTOR CO.

79. Install the intermediate shaft bracket and the 3 bolts.
- Tighten to 48 Nm (35 lb-ft).

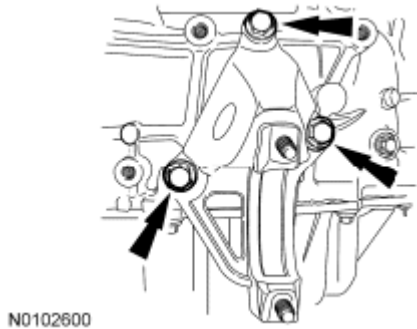


Fig. 345: Locating Intermediate Shaft Bracket And Bolts
Courtesy of FORD MOTOR CO.

80. Install the crankcase vent oil separator and the 8 bolts.
- Tighten to 10 Nm (89 lb-in).

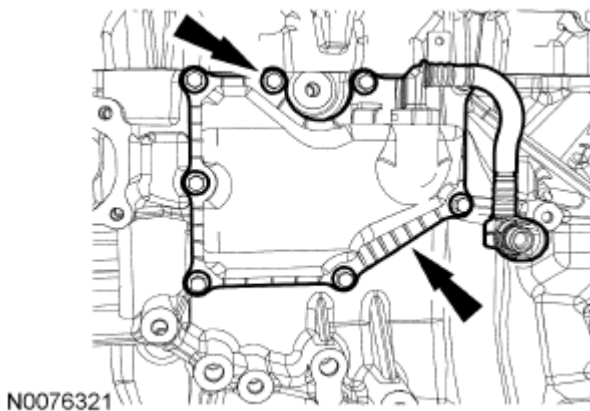


Fig. 346: Locating Crankcase Vent Oil Separator Mounting Bolts
Courtesy of FORD MOTOR CO.

NOTE: The Knock Sensor (KS) must not touch the crankcase vent oil separator.

81. Install the KS and the bolt.
- Tighten to 20 Nm (177 lb-in).

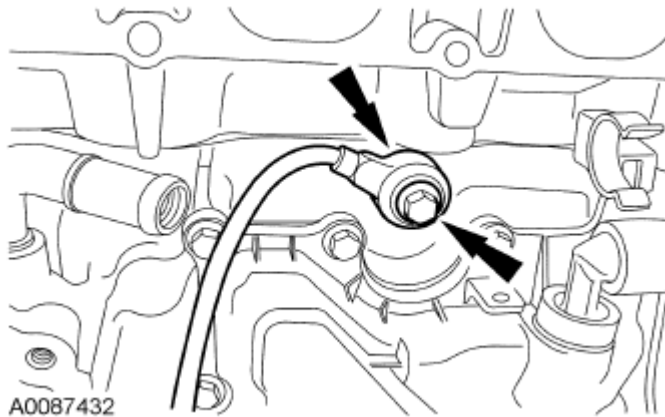


Fig. 347: Locating Bolt And Knock Sensor
Courtesy of FORD MOTOR CO.

82. Install the A/C compressor, 2 bolts and the stud bolt.
- Tighten to 25 Nm (18 lb-ft).

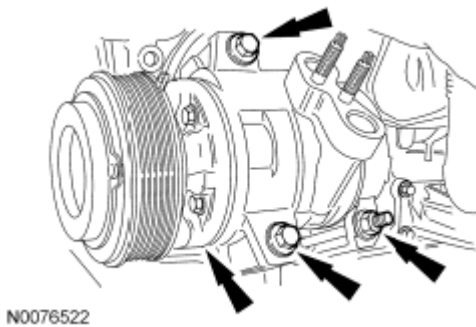


Fig. 348: Locating A/C Compressor, Stud Bolts And Bolts
Courtesy of FORD MOTOR CO.

NOTE: Clean and inspect the thermostat housing gasket. Install a new gasket if necessary.

83. Install the thermostat housing and 3 bolts.
- Tighten to 10 Nm (89 lb-in).

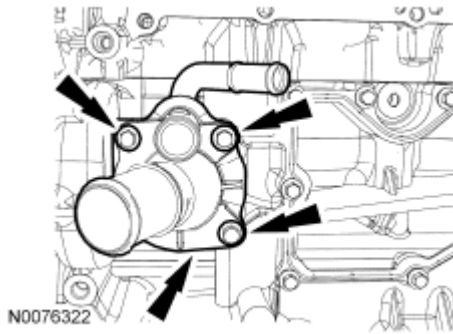


Fig. 349: Locating Thermostat Housing And Bolts
Courtesy of FORD MOTOR CO.

84. Connect the coolant bypass hose.

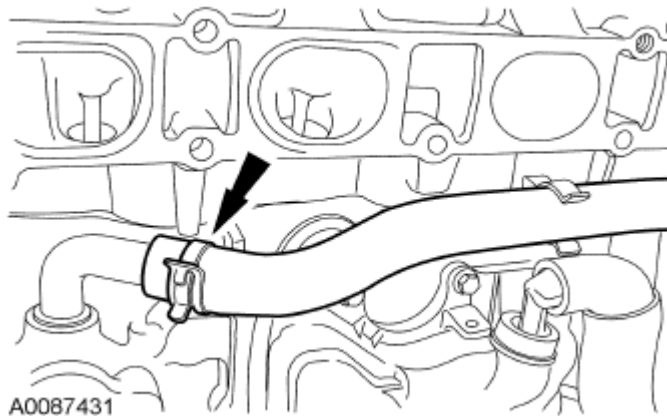


Fig. 350: Locating Coolant Bypass Hose
Courtesy of FORD MOTOR CO.

85. Using a new gasket, install the coolant outlet and the 4 bolts.
- Tighten to 10 Nm (89 lb-in).

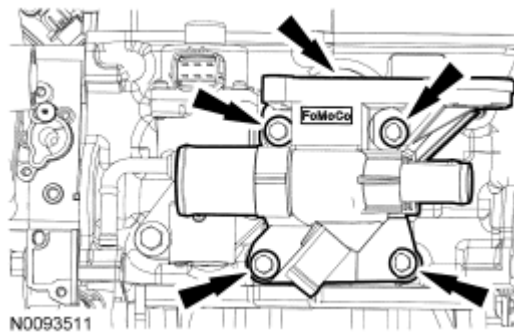


Fig. 351: Locating Coolant Outlet Bolts
Courtesy of FORD MOTOR CO.

86. Connect the coolant bypass hose.

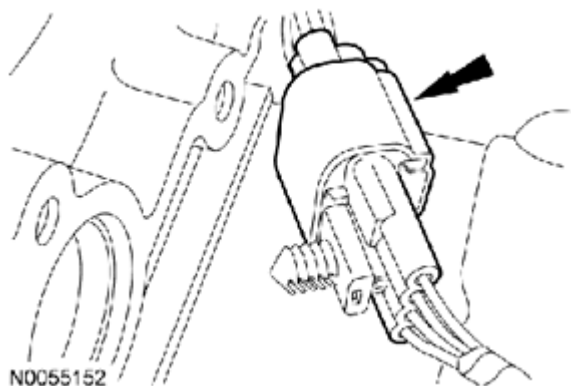


Fig. 352: Locating Coolant Bypass Hose
Courtesy of FORD MOTOR CO.

87. Install the radio interference capacitor bracket and bolt.
- Tighten to 10 Nm (89 lb-in).

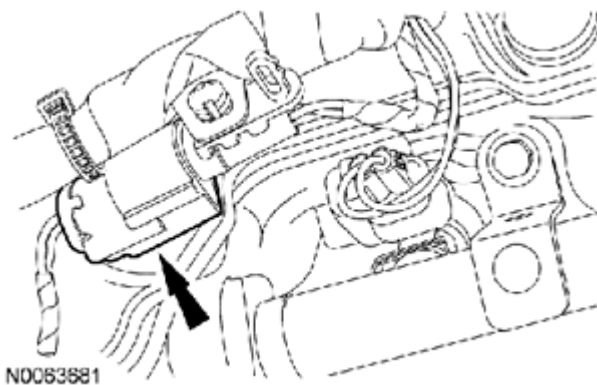


Fig. 353: Locating Radio Interference Capacitor Bracket With Bolt
Courtesy of FORD MOTOR CO.

88. Install the EGR tube.
- Tighten to 55 Nm (41 lb-ft).

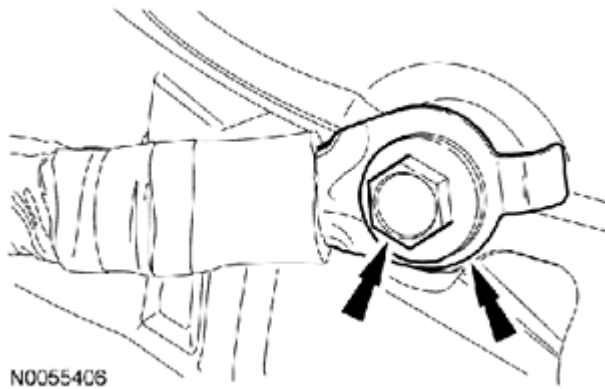


Fig. 354: Identifying Exhaust Gas Recirculation Tube
Courtesy of FORD MOTOR CO.

89. Inspect and install new intake manifold gaskets if necessary.

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.

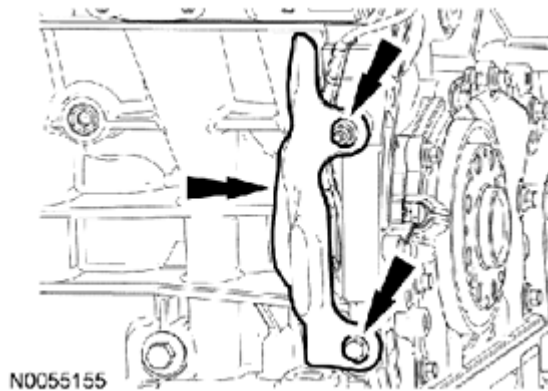


Fig. 355: Locating PCV Hose Connector
Courtesy of FORD MOTOR CO.

90. Position the intake manifold and connect the PCV hose.

NOTE: The 2 intake manifold bolts differ in length from rest of the bolts and also retain a crash bracket to the intake manifold. The 2 bolts are equipped with an attachment feature that allows them to be loosened but remain attached to the intake manifold. Do not attempt to remove the 2 bolts or the crash bracket from the intake manifold.

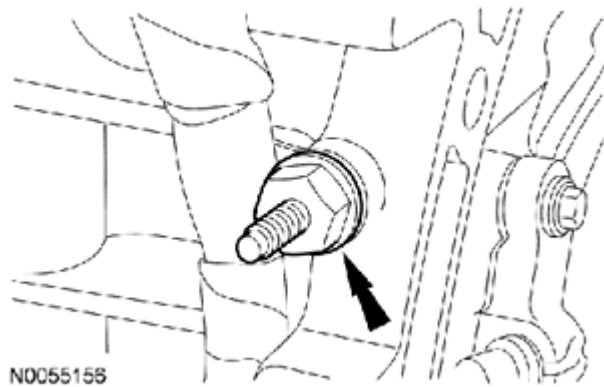


Fig. 356: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

91. Install the intake manifold and hand-tighten the 2 intake manifold bolts.
92. Install the 5 intake manifold mounting bolts.
 - Tighten all 7 bolts to 18 Nm (159 lb-in).

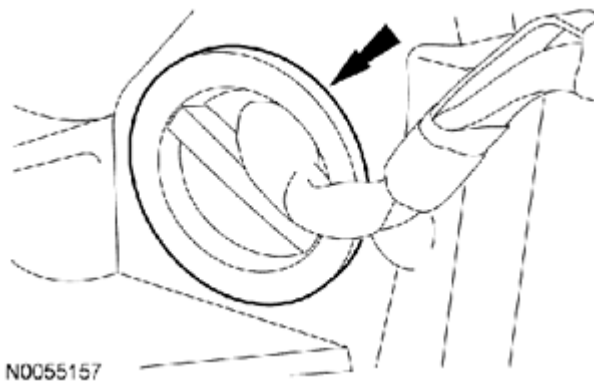


Fig. 357: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the new O-ring with clean engine oil.

93. Using a new O-ring seal, install the oil level indicator tube assembly and the bolt.
 - Tighten to 10 Nm (89 lb-in).

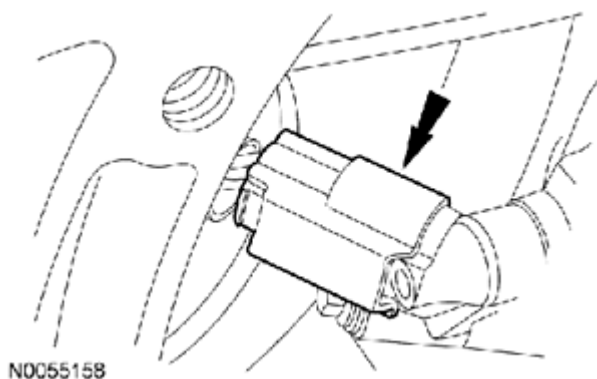


Fig. 358: Locating Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

94. Install the lower intake manifold bolt.
- Tighten to 18 Nm (159 lb-in).

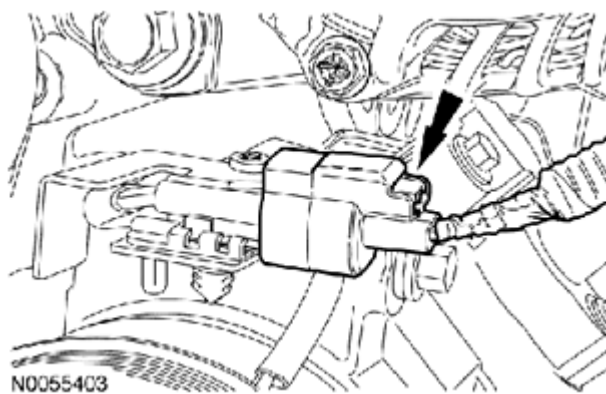


Fig. 359: Identifying Lower Intake Manifold Bolt
Courtesy of FORD MOTOR CO.

95. Connect the EGR valve electrical connector.

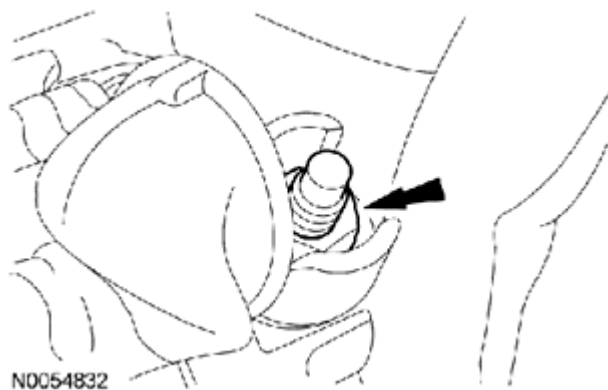


Fig. 360: Locating EGR Valve Electrical Connector

Courtesy of FORD MOTOR CO.

96. Connect the Manifold Absolute Pressure (MAP) sensor electrical connector.
- Attach the 3 wiring harness retainers to the intake manifold.

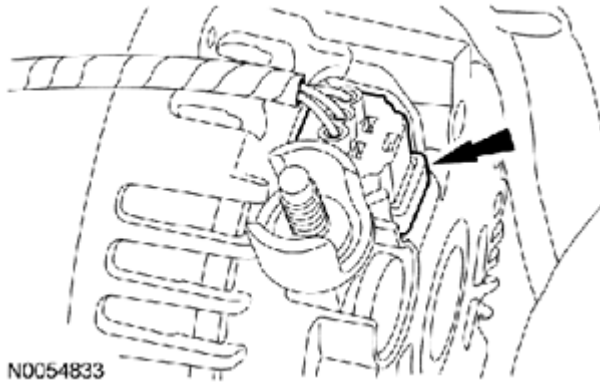


Fig. 361: Locating Wiring Harness Retainers To Intake Manifold
Courtesy of FORD MOTOR CO.

97. Connect the throttle control electrical connector.

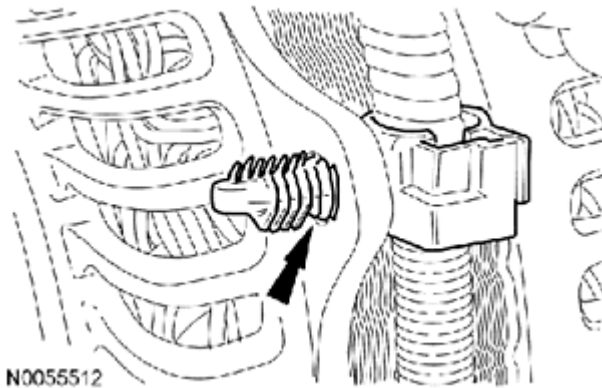


Fig. 362: Locating Throttle Control Electrical Connector
Courtesy of FORD MOTOR CO.

98. Connect the KS electrical connector and pin-type retainer.

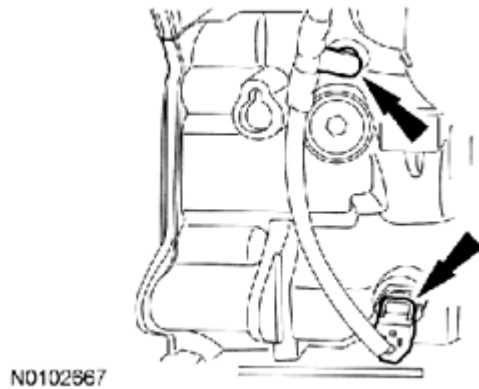


Fig. 363: Locating Knock Sensor Electrical Connector And Pin-Type Retainer
Courtesy of FORD MOTOR CO.

NOTE: Use O-ring seals that are made of special fuel-resistant material. Use of ordinary O-rings can cause the fuel system to leak. Do not reuse the O-ring seals.

99. Install new fuel injector O-rings.
- Separate the fuel injectors from the fuel rail.
 - Remove and discard the fuel injector O-rings.
 - Install new O-rings and lubricate with clean engine oil.
 - Install the fuel injectors onto the fuel rail.

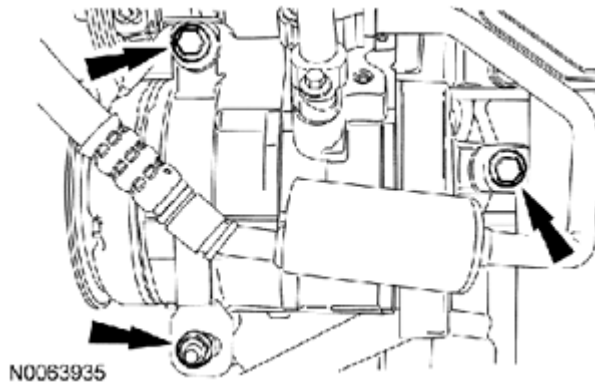


Fig. 364: Locating Fuel Injector O-Rings
Courtesy of FORD MOTOR CO.

100. Install the fuel rail with the fuel injectors and the 2 bolts.
- Tighten to 25 Nm (18 lb-ft).

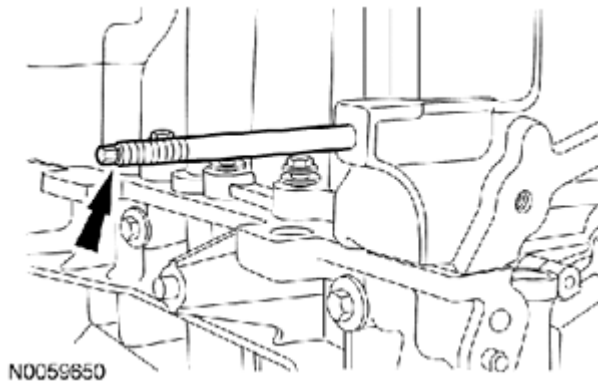


Fig. 365: Locating Fuel Rail Bolts
Courtesy of FORD MOTOR CO.

101. Connect the 4 fuel injector electrical connectors and attach the 4 wiring harness retainers to valve cover stud bolts and intake manifold.

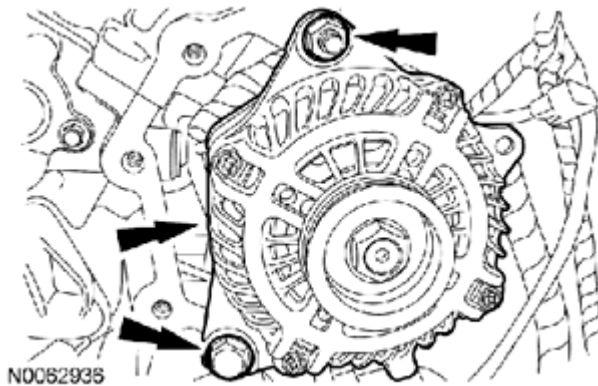


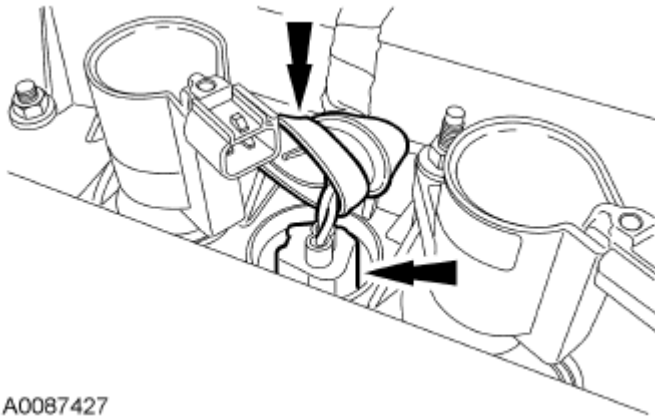
Fig. 366: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

102. Attach the wiring harness retainer on the valve cover stud.



Fig. 367: Locating Wiring Harness Retainer On Valve Cover Stud
Courtesy of FORD MOTOR CO.

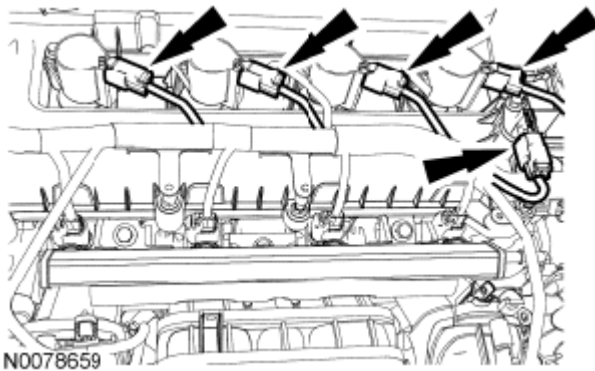
103. Position the engine control wiring harness on the engine and connect the CHT sensor and install the rubber boot.



A0087427

Fig. 368: Locating Cylinder Head Temperature Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

104. Connect the 4 coil-on-plug and Camshaft Position (CMP) sensor electrical connectors.



N0078659

Fig. 369: Locating Coil-On-Plug And Camshaft Position Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

NOTE: Clean the gasket mating surfaces with metal surface prep.

105. Using a new gasket, install the oil filter adapter and the 4 bolts.
- Tighten to 25 Nm (18 lb-ft).

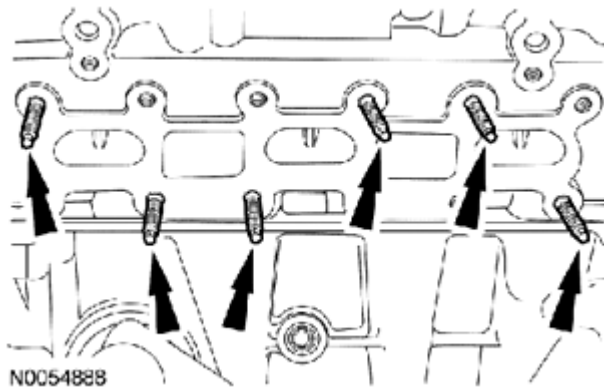


Fig. 370: Locating Oil Filter Adapter And 4 Bolts
Courtesy of FORD MOTOR CO.

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

106. Install a new oil cooler and bolt.
- Tighten to 34 Nm (25 lb-ft).

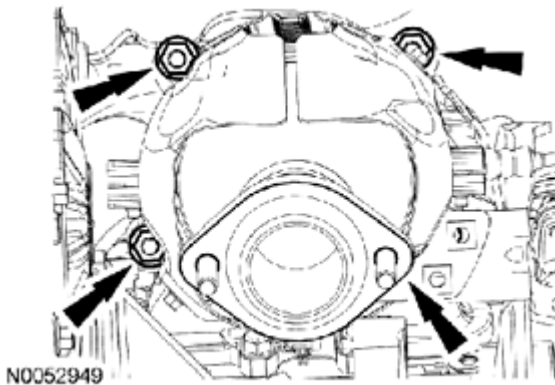


Fig. 371: Locating Oil Cooler And Bolt
Courtesy of FORD MOTOR CO.

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

107. Install the oil filter.
- Tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

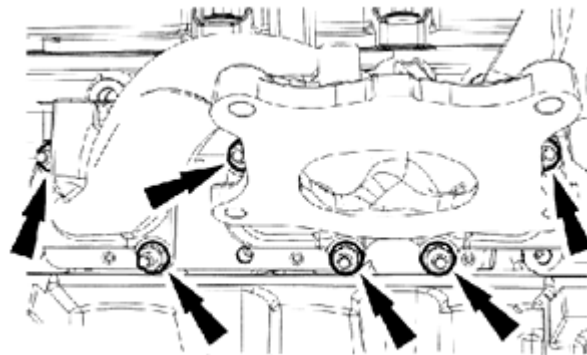


Fig. 372: Locating Oil Filter
Courtesy of FORD MOTOR CO.

108. Connect the oil cooler hoses.

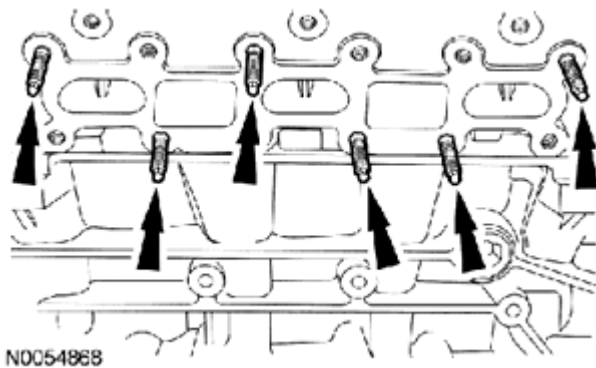


Fig. 373: Locating Oil Cooler Hoses
Courtesy of FORD MOTOR CO.

109. Connect the Engine Oil Pressure (EOP) switch electrical connector.

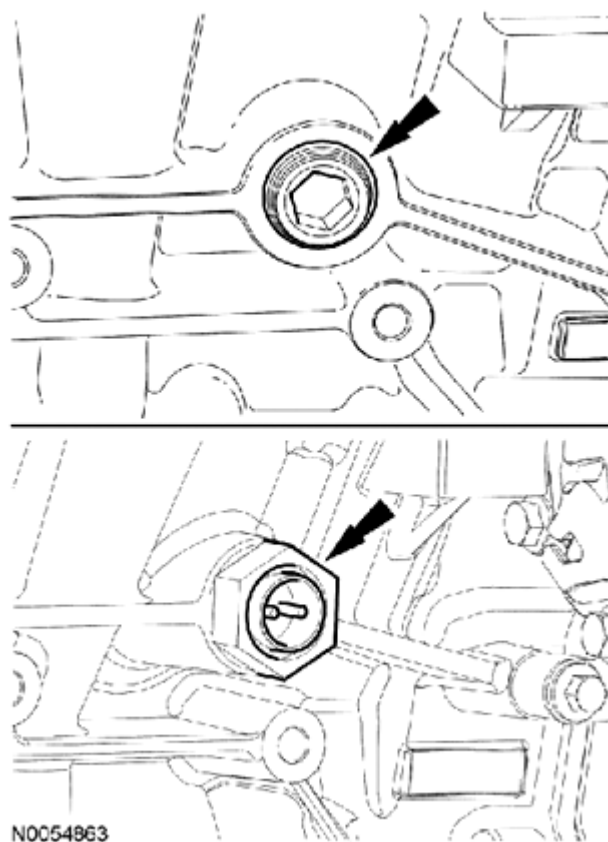


Fig. 374: Locating Engine Oil Pressure Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

110. Connect the EGR valve coolant hose.

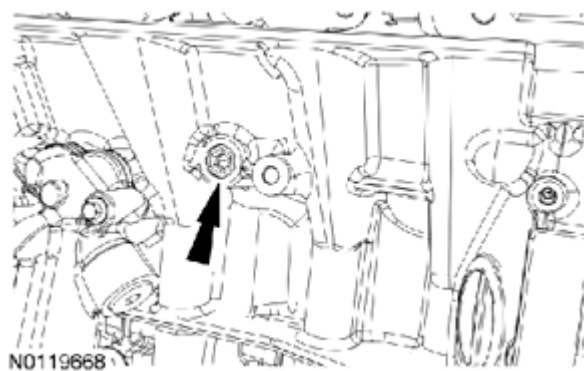


Fig. 375: Locating Coolant Hose Of EGR Valve
Courtesy of FORD MOTOR CO.

111. Connect the oil cooler hose and lower radiator hose to the thermostat housing.

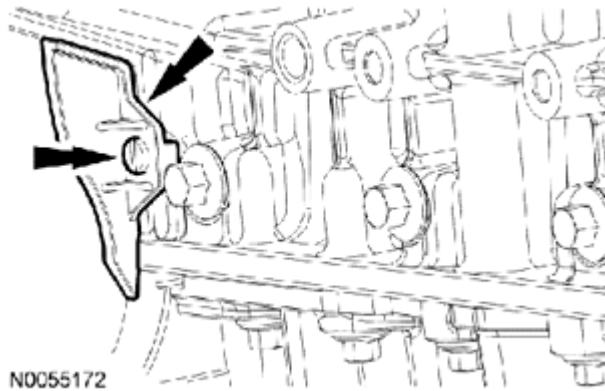


Fig. 376: Locating Oil Cooler Hose And Lower Radiator Hose From Thermostat Housing
Courtesy of FORD MOTOR CO.

NOTE: Clean the coolant pump mating surface with metal surface prep.

NOTE: Lubricate the coolant pump O-ring with clean engine coolant.

112. Position the coolant pump and install the 3 bolts.

- Tighten to 10 Nm (89 lb-in).

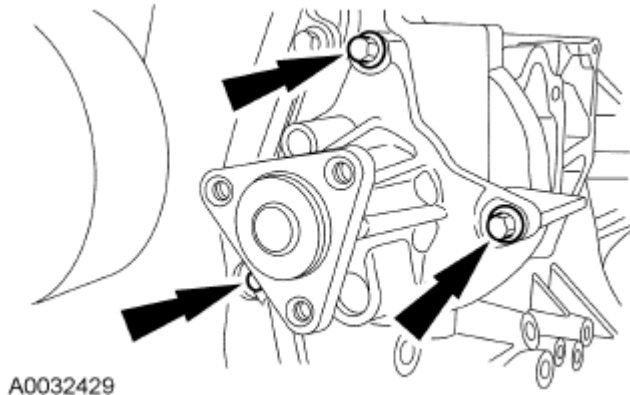


Fig. 377: Locating Coolant Pump And Bolts
Courtesy of FORD MOTOR CO.

113. Install the coolant pump pulley and 3 bolts.

- Tighten to 20 Nm (177 lb-in).

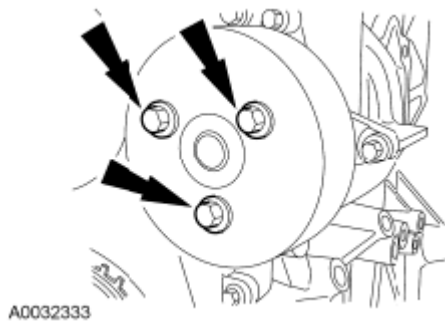


Fig. 378: Locating Coolant Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

114. Install the accessory drive belt idler pulley.
- Tighten to 25 Nm (18 lb-ft).

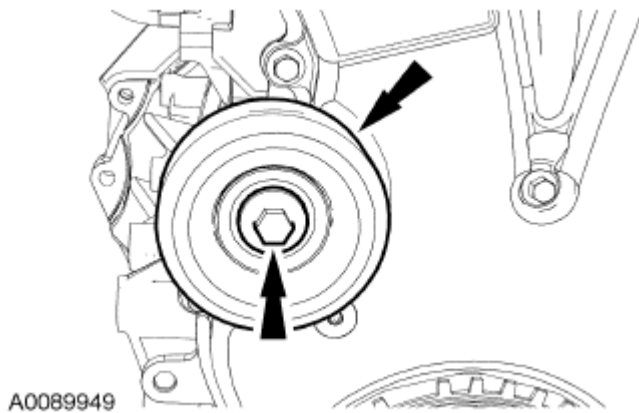


Fig. 379: Locating Accessory Drive Belt Idler Pulley And Bolt
Courtesy of FORD MOTOR CO.

115. Using the Floor Crane and Spreader Bar, remove the engine from the engine stand.
116. Install the flexplate or flywheel and the 6 bolts. Tighten the bolts in the sequence shown in 3 stages:
- Stage 1: Tighten to 50 Nm (37 lb-ft).
 - Stage 2: Tighten to 80 Nm (50 lb-ft).
 - Stage 3: Tighten to 112 Nm (83 lb-ft).

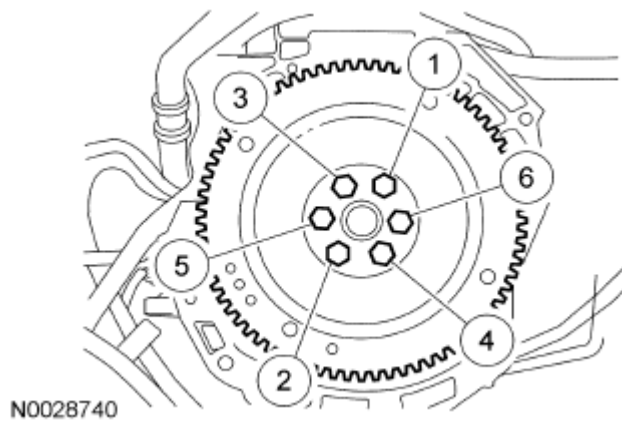
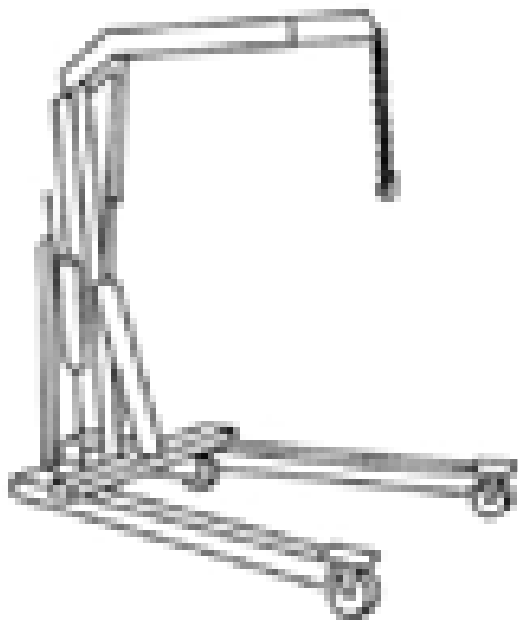


Fig. 380: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

INSTALLATION

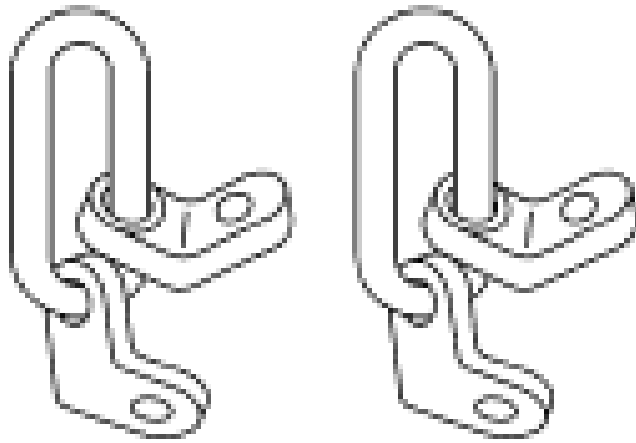
ENGINE

SPECIAL TOOLS



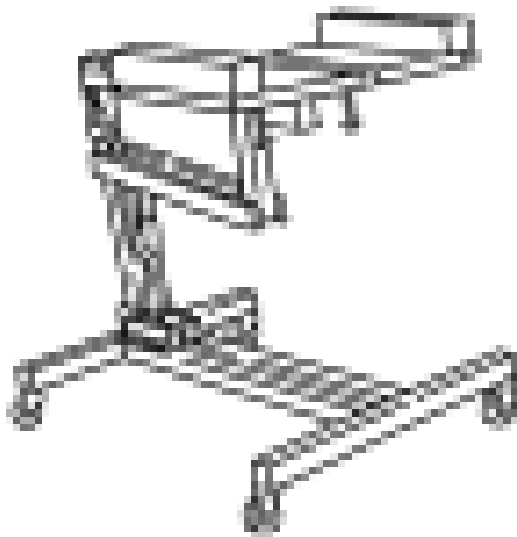
ST1341-A

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



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

ST1595-A



Powertrain Lift
300-OTC1585AE or equivalent

ST1682-A

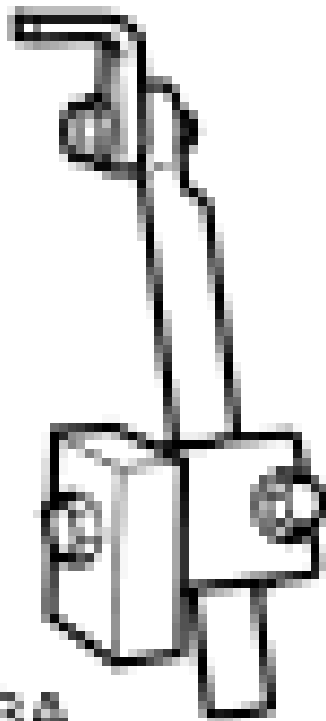
2013 Ford Transit Connect XLT Premium

2013 ENGINE Engine Mechanical - 2.0L - Transit Connect



ST1602-A

Spreader Bar
303-D089 (D93P-6001-A3) or equivalent



ST2743A

Adjustable Grip Arm, 1735A
014-00001 or equivalent

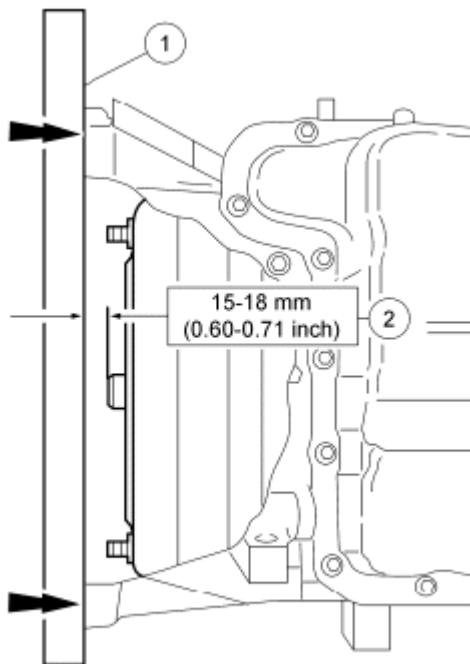
MATERIAL SPECIFICATIONS

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)	WSS-M2C945-A
Multi-Purpose Grease Motorcraft® XL-5 (aerosol) and/or CRC® SL3151	ESB-M1C93-B

NOTE: Lubricate the torque converter pilot hub with multi-purpose grease.

1. Check the installation depth of the torque converter.
 1. Lay a straightedge on the automatic transaxle flange.
 2. Check the installation depth between the transaxle flange and the torque converter centering spigot for the correct clearance.



N0033318

Fig. 381: Identifying Depth Between Transaxle Flange And Torque Converter Centering Spigot

Courtesy of FORD MOTOR CO.

2. Using the Floor Crane and Spreader Bar, position the engine and transaxle together. Install the 6 bellhousing-to-engine fasteners.
 - Tighten to 48 Nm (35 lb-ft).
3. Using the Floor Crane, Engine Lifting Bracket and Spreader Bar, raise the engine and transaxle assembly onto the lift table.

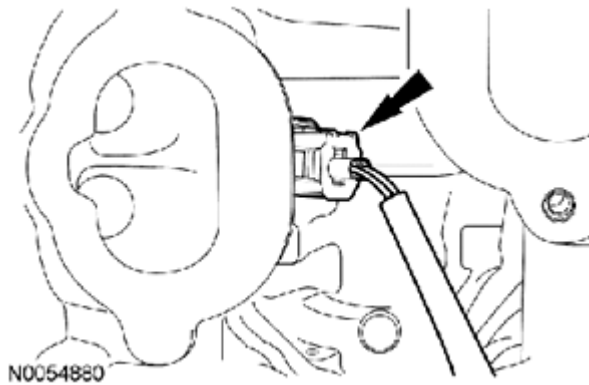


Fig. 382: Raising Engine
Courtesy of FORD MOTOR CO.

4. Using the Powertrain Lift and Adjustable Grip Arm, secure the engine and transaxle assembly to the lift table.

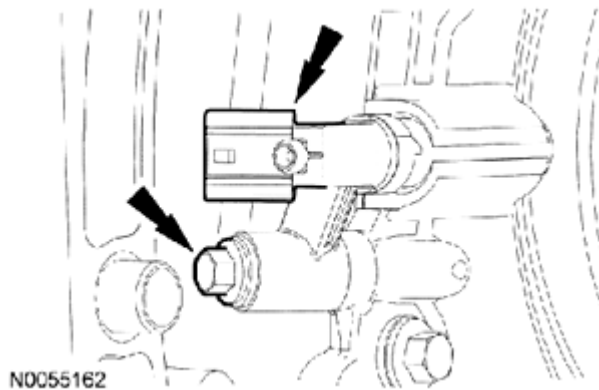


Fig. 383: Securing Engine To Lift Table Using Powertrain Lift And Adjustable Grip Arm
Courtesy of FORD MOTOR CO.

NOTE: If new parts are not being used, be sure to align the marks on the flexplate and the stud made during engine removal.

5. Install the 4 torque converter nuts.
 - Tighten to 35 Nm (26 lb-ft).

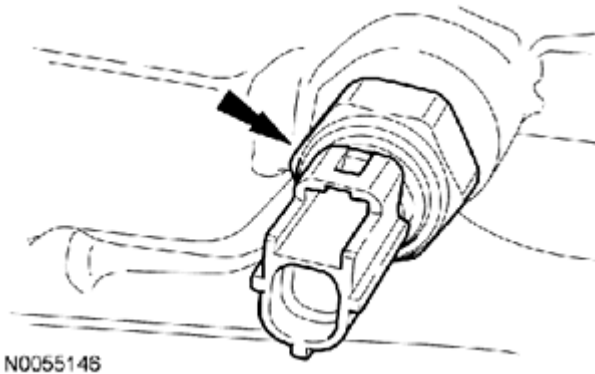


Fig. 384: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

6. Install the starter motor isolator.

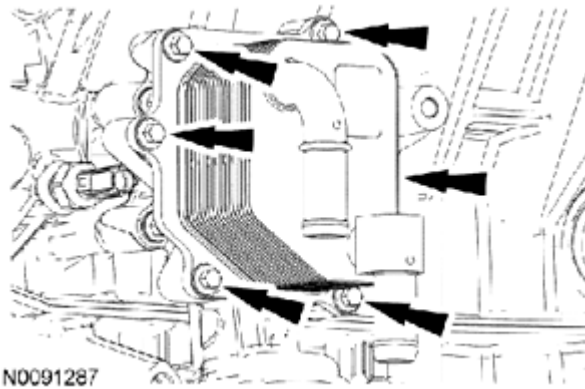
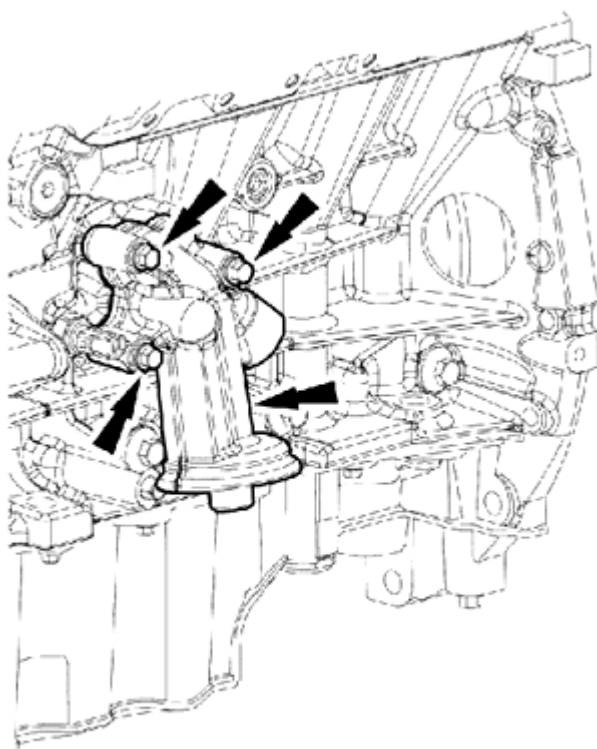


Fig. 385: Locating Starter Motor Isolator
Courtesy of FORD MOTOR CO.

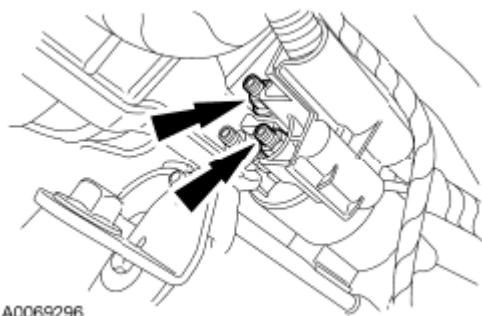
7. Install the starter motor, stud bolt and the bolt.
- Install the upper bolt and lower stud bolt finger-tight.
 - Tighten the upper bolt to 35 Nm (26 lb-ft).
 - Tighten the lower stud bolt to 35 Nm (26 lb-ft).



N0C97838

Fig. 386: Locating Starter Stud Bolt And Bolt
Courtesy of FORD MOTOR CO.

8. Connect the starter motor electrical terminals and install the 2 nuts.
 - Tighten the small nut to 5 Nm (44 lb-in).
 - Tighten the large nut to 12 Nm (106 lb-in).



A0069296

Fig. 387: Locating Starter Motor Electrical Terminals Nuts
Courtesy of FORD MOTOR CO.

9. Position the 2 power steering tubes and the wiring harness as an assembly on the engine.

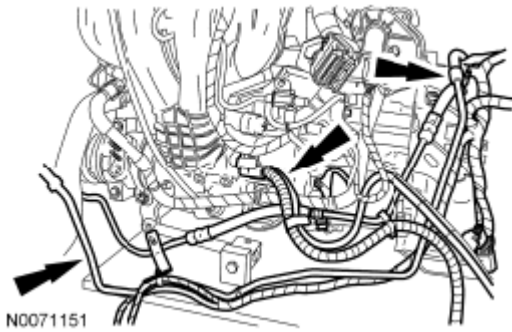


Fig. 388: Locating Power Steering Tubes And Wiring Harness
Courtesy of FORD MOTOR CO.

10. Install the power steering tube bracket on the A/C compressor stud bolt and install the nut.
 - Tighten to 20 Nm (177 lb-in).

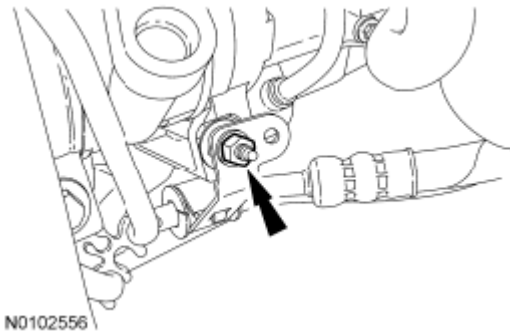


Fig. 389: Locating A/C Compressor Stud Bolt And Nut
Courtesy of FORD MOTOR CO.

11. Install the engine ground wire and the bolt.
 - Tighten to 48 Nm (35 lb-ft).

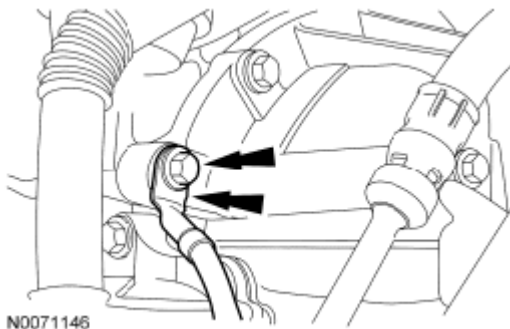


Fig. 390: Locating Engine Ground Wire Bolt
Courtesy of FORD MOTOR CO.

12. Install the power steering tube bracket on the starter motor stud bolt and install the nut.

- Tighten to 20 Nm (177 lb-in).

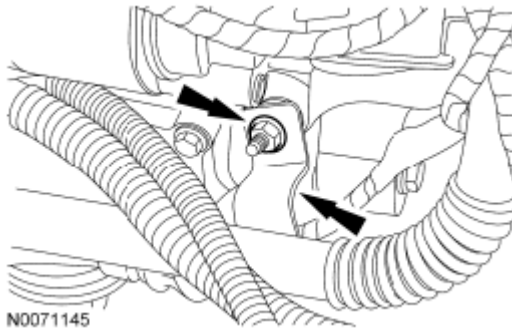


Fig. 391: Locating Starter Motor Stud Bolt And Power Steering Tube Bracket
Courtesy of FORD MOTOR CO.

13. Attach the starter wire harness retainer to the starter motor stud bolt.

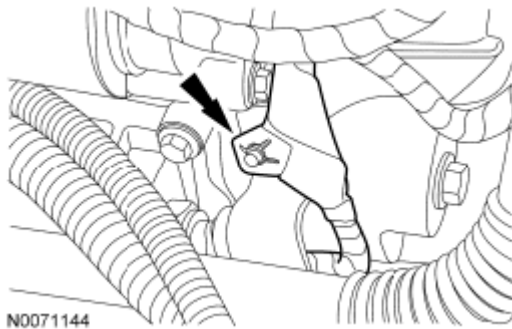


Fig. 392: Locating Starter Wire Harness Retainer Of Starter Motor Stud Bolt
Courtesy of FORD MOTOR CO.

14. Connect the Crankshaft Position (CKP) sensor electrical connector.

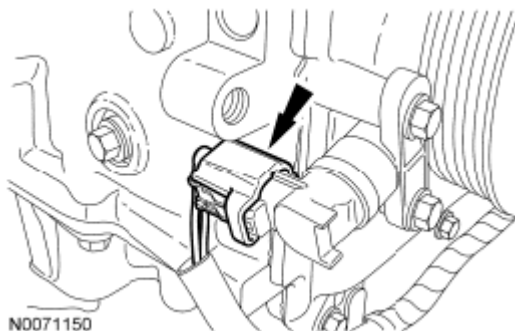
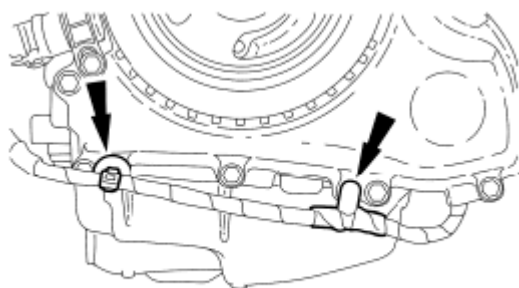


Fig. 393: Locating CKP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

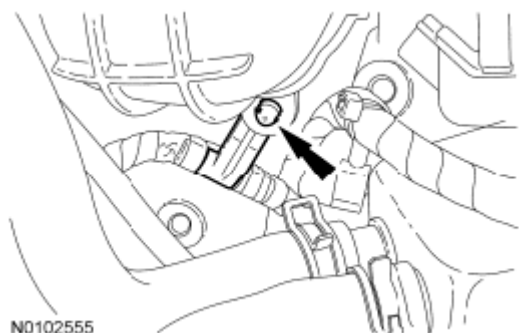
15. Attach the 2 CKP sensor wire harness retainers.



N0102554

Fig. 394: Locating Crankshaft Position (CKP) Sensor Wire Harness Retainers
Courtesy of FORD MOTOR CO.

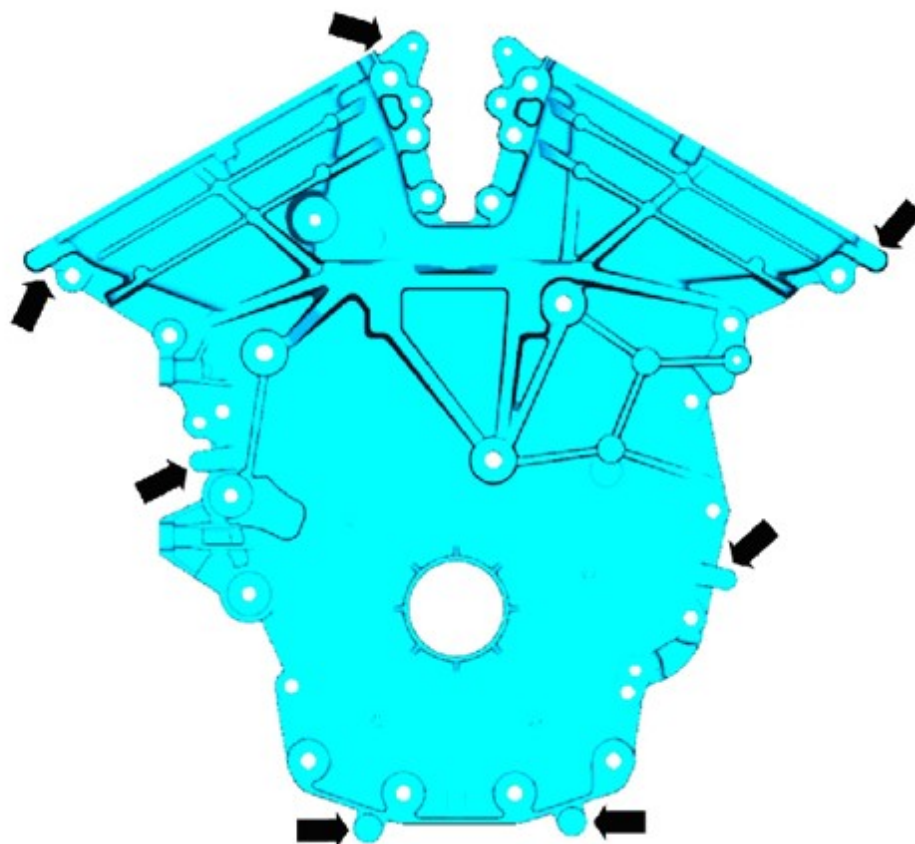
16. Attach the wire harness pin-type retainer to the intake manifold.



N0102555

Fig. 395: Locating Wiring Harness Pin-Type Retainer To Intake Manifold
Courtesy of FORD MOTOR CO.

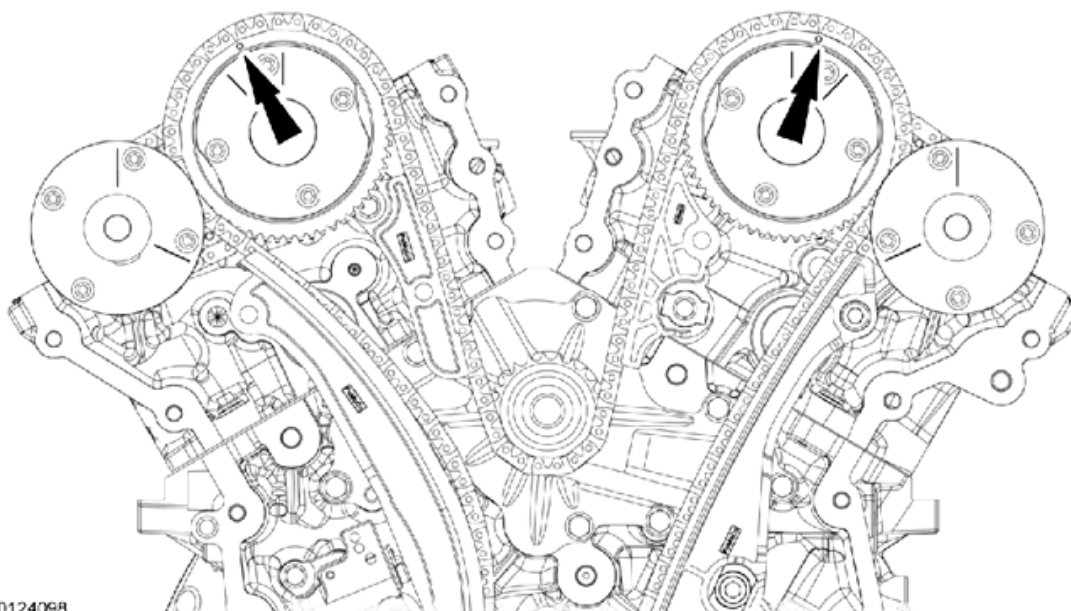
17. Connect the Power Steering Pressure (PSP) switch electrical connector.



N0126960

Fig. 396: Locating Power Steering Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

18. Connect the A/C compressor electrical connector.



N0124098

Fig. 397: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

19. Connect the 2 transaxle electrical connectors.

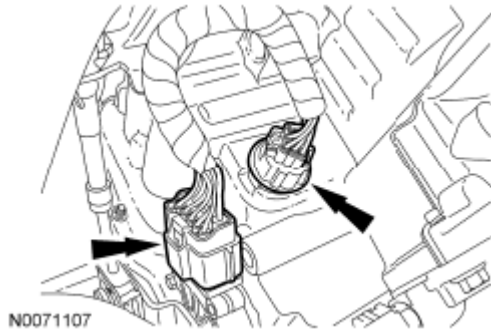


Fig. 398: Locating Transaxle Electrical Connectors
Courtesy of FORD MOTOR CO.

20. Connect the Turbine Shaft Speed (TSS) sensor electrical connector.

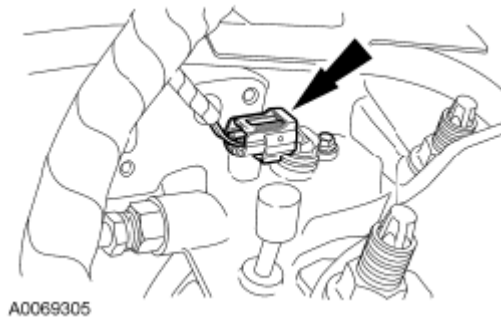


Fig. 399: Locating Turbine Shaft Speed Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

21. Connect the Output Shaft Speed (OSS) sensor electrical connector.

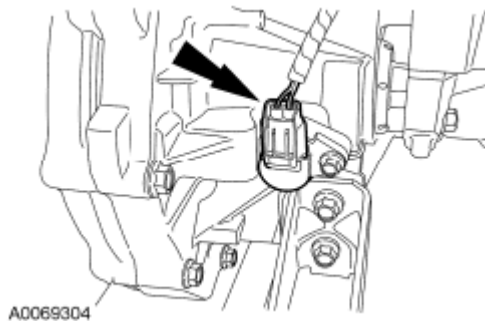


Fig. 400: Locating Output Shaft Speed Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

22. Position the Heated Oxygen Sensor (HO2S) and Catalyst Monitor Sensor (CMS) wire connector bracket and install the nut.
- Tighten to 25 Nm (18 lb-ft).

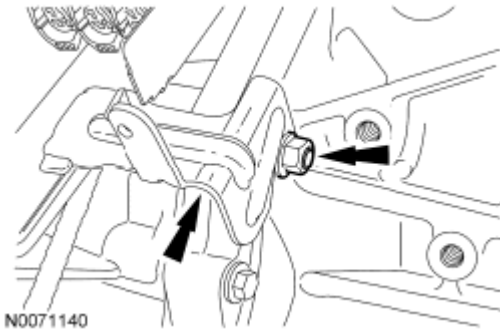


Fig. 401: Locating HO2S And CMS Wire Connector Bracket And Nut
Courtesy of FORD MOTOR CO.

23. Install the nut for the HO2S and CMS wire connector bracket.
- Tighten to 25 Nm (18 lb-ft).

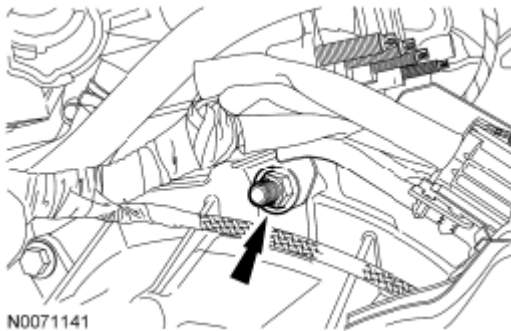


Fig. 402: Locating HO2S And CMS Wire Connector Bracket Nut
Courtesy of FORD MOTOR CO.

24. Using the lift table, position the engine and transaxle assembly in the vehicle.
25. Install the transaxle mount plate and the 5 nuts.
- Tighten the center nut to 150 Nm (111 lb-ft).
 - Tighten the 4 outer nuts to 48 Nm (35 lb-ft).

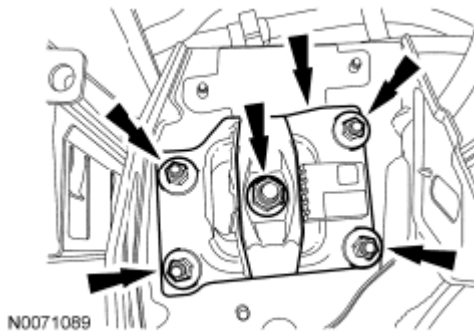


Fig. 403: Locating Transaxle Mount Nuts
Courtesy of FORD MOTOR CO.

26. Install the engine mount and the 3 bolts.
- Tighten to 48 Nm (35 lb-ft).

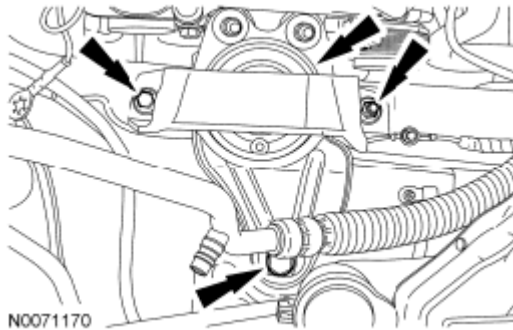


Fig. 404: Locating Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

27. Install the 2 motor mount nuts.
- Tighten to 90 Nm (66 lb-ft).

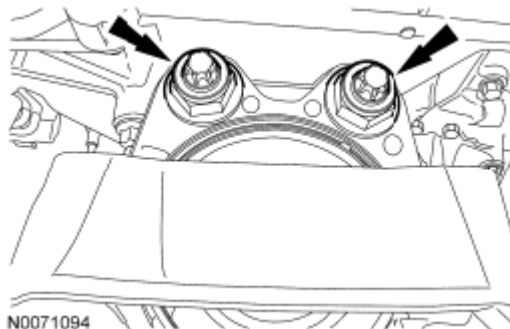


Fig. 405: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

28. Install the 2 oil pan-to-bellhousing bolts.

- Tighten to 48 Nm (35 lb-ft).

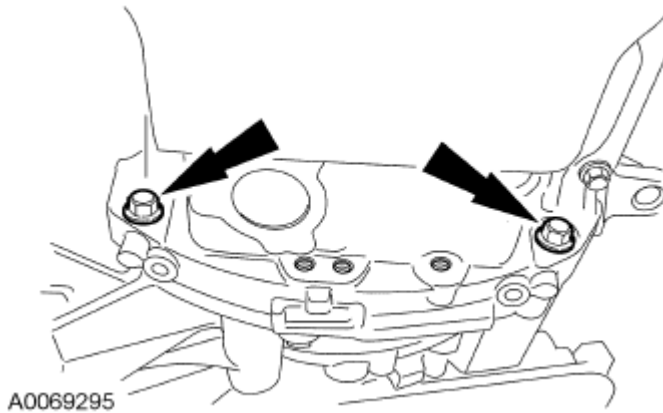


Fig. 406: Locating Oil Pan-To-Bell Housing Bolts
Courtesy of FORD MOTOR CO.

29. Install the 2 lower bellhousing-to-oil pan bolts.
- Tighten to 48 Nm (35 lb-ft).



Fig. 407: Locating Lower Bellhousing-To-Oil Pan Bolts
Courtesy of FORD MOTOR CO.

NOTE: The bolts are different lengths, make sure the bolts are in the correct location.

30. Install the transaxle roll restrictor and the 2 bolts.
1. Install the transaxle roll restrictor.
 2. Install the short bolt.
 3. Install the long bolt.
 - Tighten to 70 Nm (52 lb-ft).

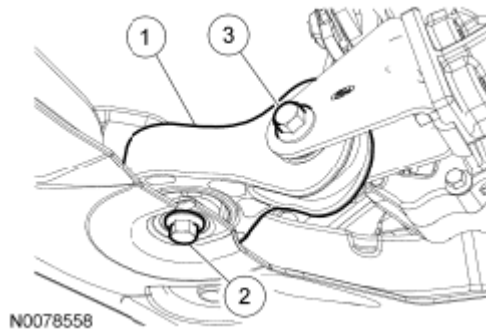


Fig. 408: Identifying Transaxle Roll Restrictor With Short And Long Bolt
Courtesy of FORD MOTOR CO.

31. Install the transaxle fluid indicator.

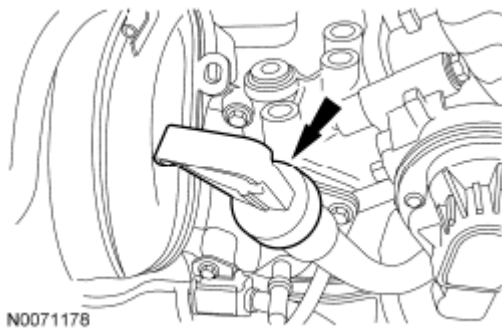


Fig. 409: Locating Transaxle Fluid Level Indicator
Courtesy of FORD MOTOR CO.

32. Connect the heater hose to the coolant tube.

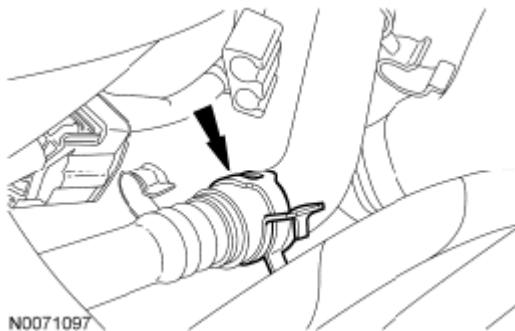


Fig. 410: Locating Heater Hose Of Coolant Tube
Courtesy of FORD MOTOR CO.

33. Connect the upper radiator hose and the heater hose to the coolant bypass.

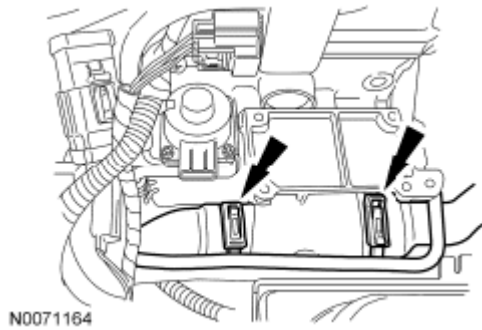


Fig. 411: Locating Upper Radiator Hose And Heater Hose From Coolant Bypass
Courtesy of FORD MOTOR CO.

34. Connect the coolant degas bottle vent hose to the coolant bypass.

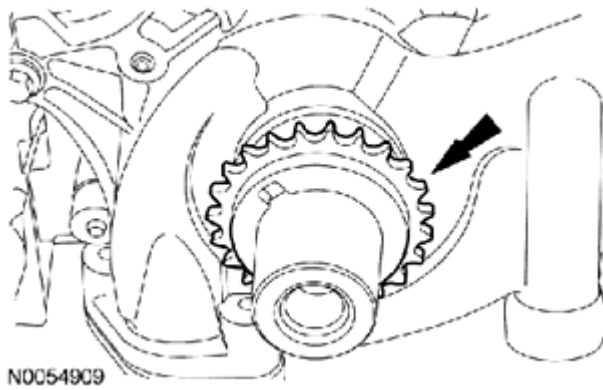


Fig. 412: Locating Coolant Degas Bottle Vent Hose To Coolant Bypass
Courtesy of FORD MOTOR CO.

35. Connect the coolant degas bottle hose and install the retaining clip.

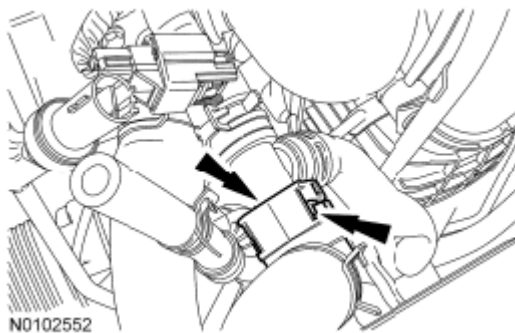


Fig. 413: Locating Coolant Degas Bottle Hose And Retaining Clip
Courtesy of FORD MOTOR CO.

36. Install the power steering pump. For additional information, refer to **POWER STEERING** .
37. Clean and inspect the exhaust manifold flange. For additional information, refer to Exhaust Manifold

Cleaning and Inspection in **ENGINE SYSTEM - GENERAL INFORMATION** .

38. Install the exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD** .
39. Connect the power steering cooler tube.

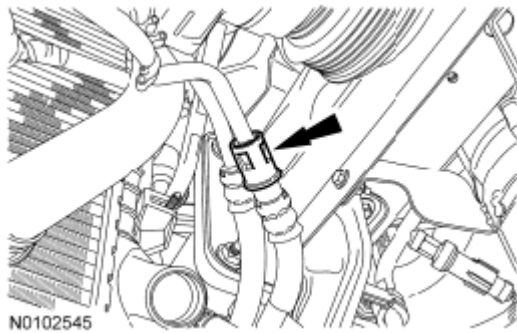


Fig. 414: Locating Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

40. Using 2 new O-ring seals, install the power steering tubes to the steering gear and install the bolt.
 - Tighten to 18 Nm (159 lb-in).

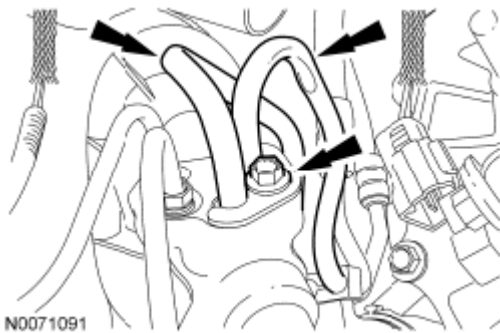


Fig. 415: Locating Power Steering Tubes And Bolt
Courtesy of FORD MOTOR CO.

41. Install the power steering tube clip and the bolt.
 - Tighten to 10 Nm (89 lb-in).

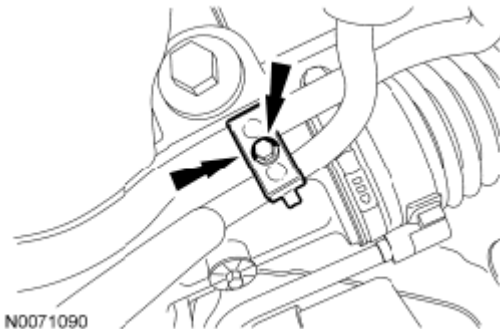


Fig. 416: Locating Power Steering Tube Clip Bolt
Courtesy of FORD MOTOR CO.

42. Install the LH and RH halfshafts. For additional information, refer to **FRONT DRIVE HALFSHAFTS** .

NOTE: Lubricate the engine oil filter gasket with clean engine oil prior to installing the oil filter.

43. Install a new engine oil filter.
- Tighten the oil filter three-fourths turn after the oil filter gasket makes contact with the oil filter adapter.

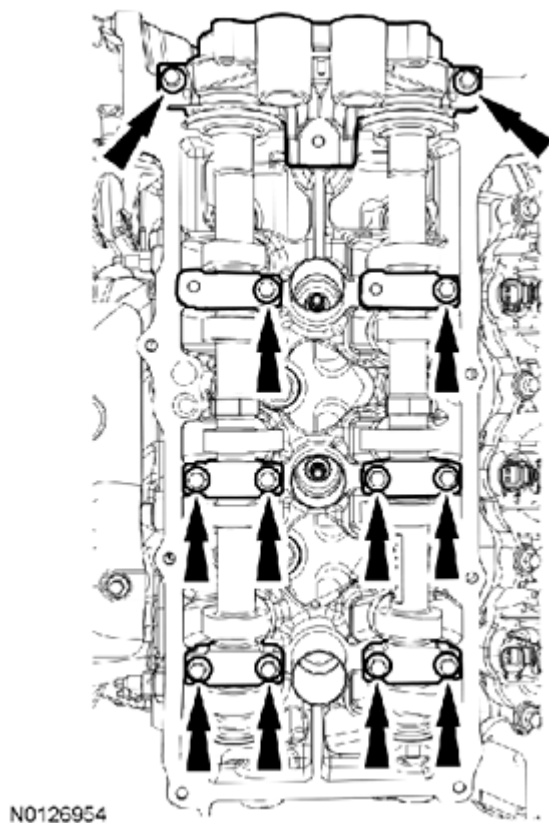


Fig. 417: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

44. Connect the lower radiator hose to the radiator.

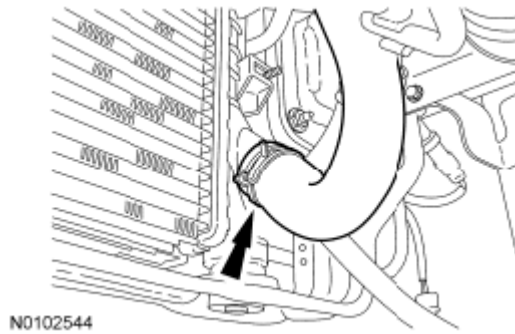


Fig. 418: Locating Lower Radiator Hose To Radiator
Courtesy of FORD MOTOR CO.

45. Install the cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING**.
46. Using 2 new O-ring seals, connect the A/C tubes to the compressor.

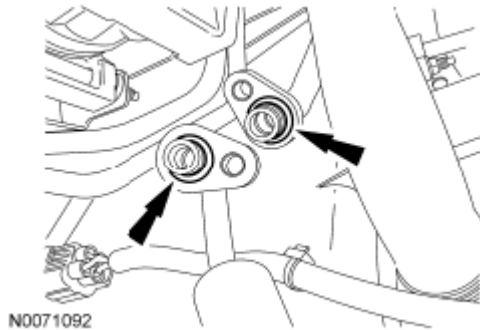


Fig. 419: Locating A/C Tube O-Rings
Courtesy of FORD MOTOR CO.

47. Install the 2 A/C tube-to-compressor nuts.
 - Tighten to 15 Nm (133 lb-in).

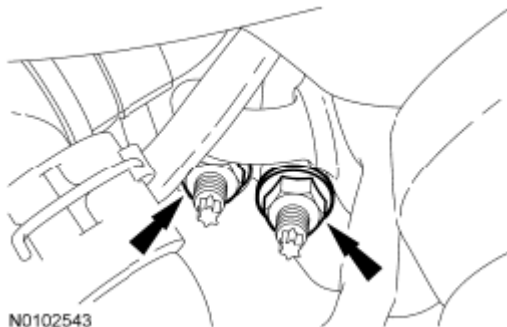
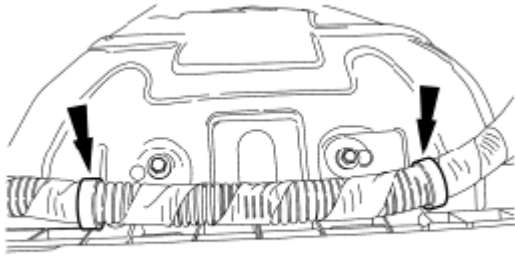


Fig. 420: Locating A/C Tube-To-Compressor Nuts
Courtesy of FORD MOTOR CO.

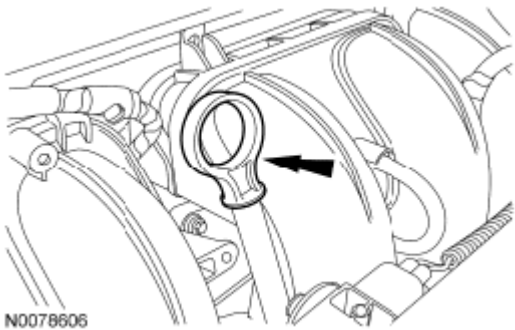
48. Position and attach the 2 B+ battery cable wire harness retainers.



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Fig. 421: Locating B+ Battery Cable Wire Harness Retainers From Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

49. Install the generator. For additional information, refer to **CHARGING SYSTEM** .
50. Install the accessory drive belt and tensioner. For additional information, refer to **ACCESSORY DRIVE** .
51. Install the 2 front wheels and tires. For additional information, refer to **WHEELS AND TIRES** .
52. Install the engine oil level indicator.



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Fig. 422: Locating Engine Oil Level Indicator
Courtesy of FORD MOTOR CO.

53. Install the transmission fluid cooler tubes on the transaxle and slide the latches to the locked position.

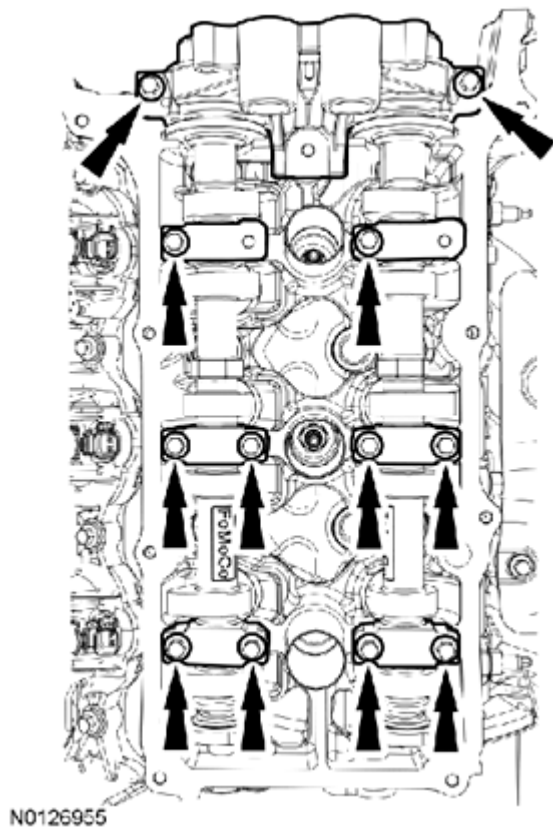


Fig. 423: Installing Transmission Fluid Cooler Tubes On Transaxle
Courtesy of FORD MOTOR CO.

54. Install the secondary latches.

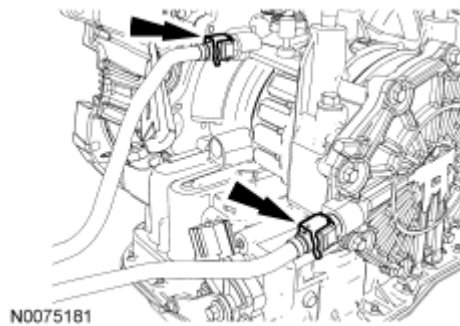


Fig. 424: Locating Transmission Fluid Cooler Tube Secondary Latches
Courtesy of FORD MOTOR CO.

55. Connect the transaxle shift cable to the lever and bracket.

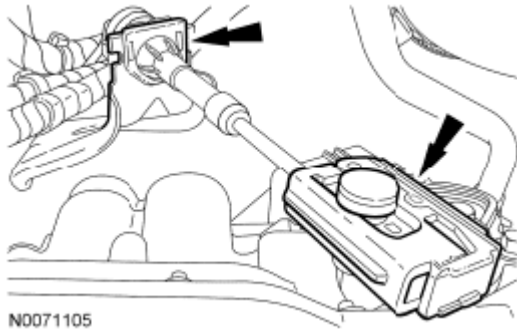


Fig. 425: Locating Transaxle Shift Cable
Courtesy of FORD MOTOR CO.

56. Connect the Heated Oxygen Sensor (HO2S) and Catalyst Monitor Sensor (CMS) electrical connectors and attach the wire harness retainer.

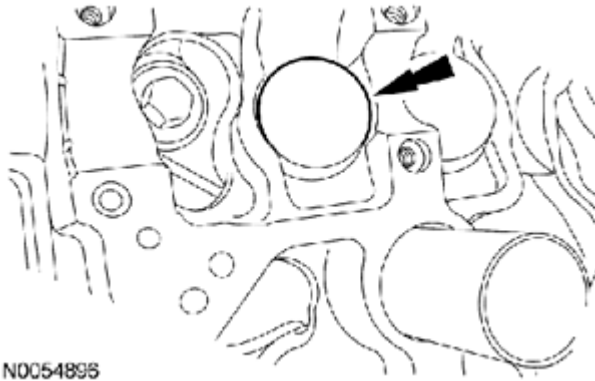


Fig. 426: Locating Heated Oxygen Sensor And Catalyst Monitor Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

57. Connect the starter wire harness electrical connector.

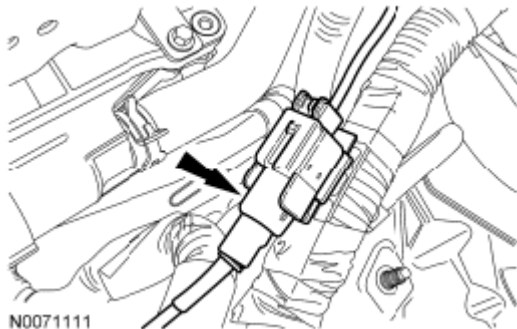


Fig. 427: Locating Starter Wire Harness Electrical Connector
Courtesy of FORD MOTOR CO.

58. Connect the 3 PCM electrical connectors.

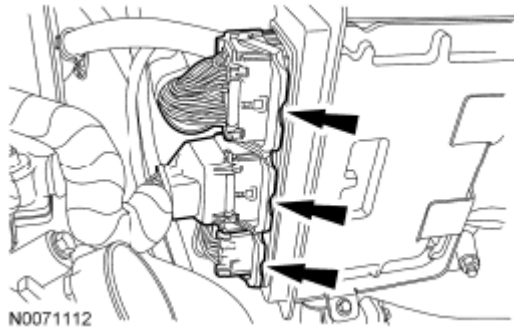


Fig. 428: Locating PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

59. Install the ground wire and nut on the negative battery terminal.
- Tighten to 10 Nm (89 lb-in).

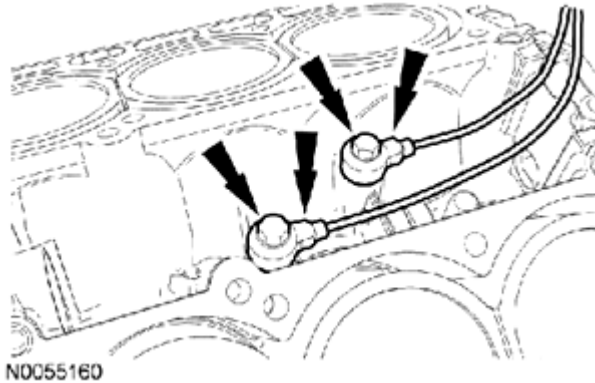


Fig. 429: Locating Ground Wire And Nut On Negative Battery Terminal
Courtesy of FORD MOTOR CO.

60. Attach the engine harness to the coolant outlet bracket harness retainer.

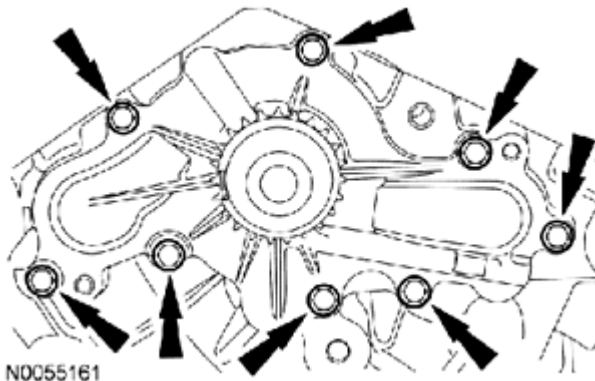
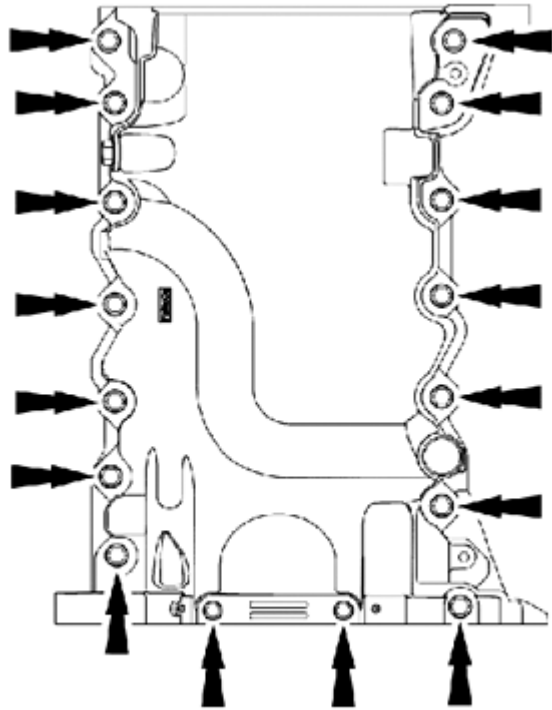


Fig. 430: Locating Engine Harness Of Coolant Outlet Bracket Harness Retainer
Courtesy of FORD MOTOR CO.

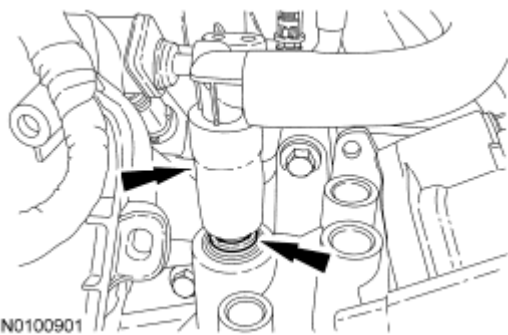
61. Connect and attach the 2 engine harness electrical connectors.



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Fig. 431: Locating Engine Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

62. Install the power brake booster vacuum tube into the quick connect fitting.



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Fig. 432: Locating Vacuum Tube Of Quick Release Fitting
Courtesy of FORD MOTOR CO.

63. Position and connect the Evaporative Emission (EVAP) tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.

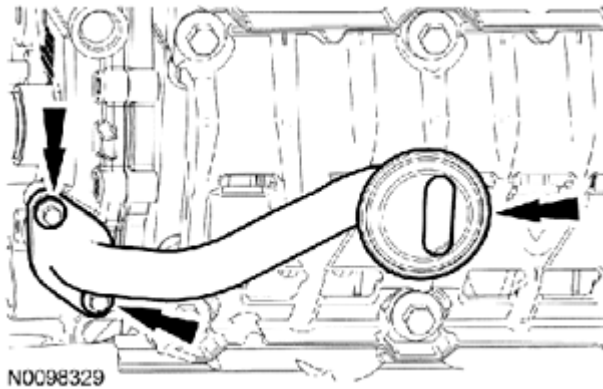


Fig. 433: Locating Evaporative Emission (EVAP) Tube And Position Aside
Courtesy of FORD MOTOR CO.

64. Connect the fuel tube quick connect coupling to the fuel tube near the bulkhead. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.

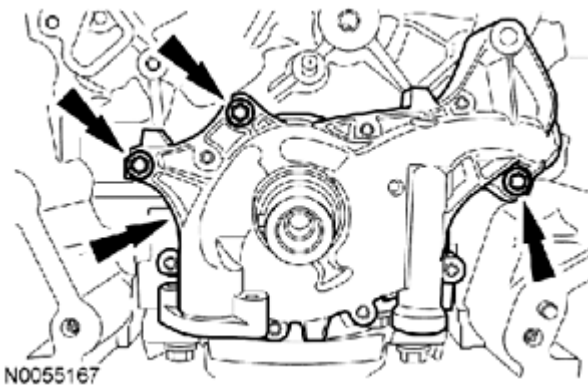


Fig. 434: Locating Fuel Tube Quick Connect Coupling From Fuel Tube Near Bulkhead
Courtesy of FORD MOTOR CO.

65. Install the negative battery cable ground and the bolt.
 - Tighten to 10 Nm (89 lb-in).

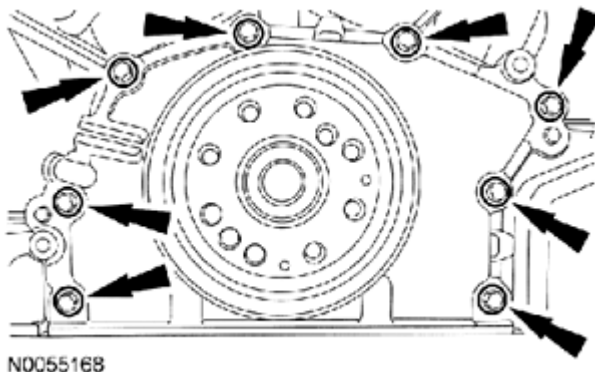
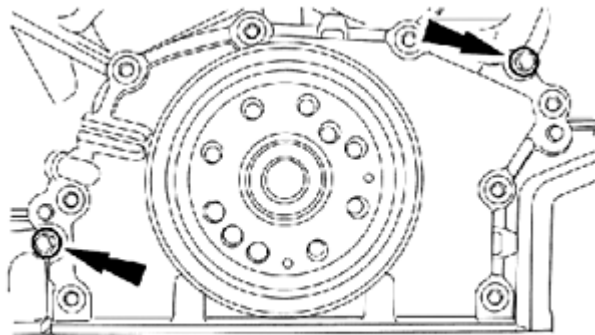


Fig. 435: Locating Negative Battery Cable Ground Bolt
Courtesy of FORD MOTOR CO.

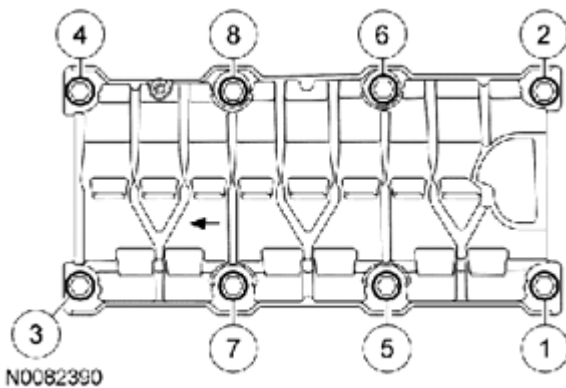
66. Attach the 3 positive battery cable wire harness retainer.



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Fig. 436: Locating Positive Battery Cable Wire Harness Retainers
Courtesy of FORD MOTOR CO.

67. Connect the positive battery cable nut.
- Tighten to 10 Nm (89 lb-in).



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Fig. 437: Locating Positive Battery Cable Terminal Nut
Courtesy of FORD MOTOR CO.

68. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
69. Connect the crankcase vent tube to the valve cover.

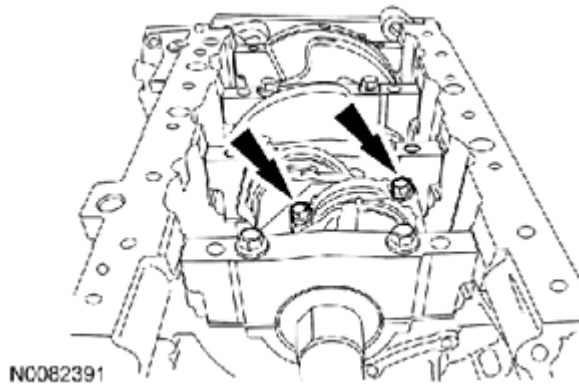


Fig. 438: Locating Crankcase Vent Tube
Courtesy of FORD MOTOR CO.

70. Install the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
71. Fill the engine with clean engine oil.
72. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** .
73. Evacuate and charge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** .
74. Install the splash shield, pin-type retainer and the 2 bolts.

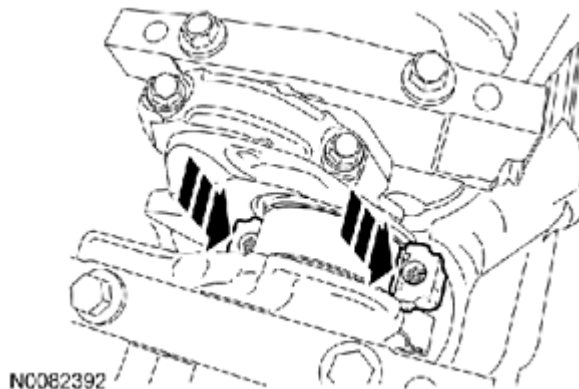


Fig. 439: Locating Splash Shield, Pin-Type Retainer And Bolts
Courtesy of FORD MOTOR CO.