

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner

2006 ENGINE**Engine - 2.3L - Escape & Mariner****SPECIFICATIONS****GENERAL SPECIFICATIONS****GENERAL SPECIFICATIONS**

Item	Specification
Displacement	2.3L
No. of cylinders	4
Bore/stroke	87.5/94.0
Firing order	1-3-4-2
Oil pressure (hot @ 2,000 rpm)	29-39 psi 200-268 kPa
Oil capacity	4.1 qts. + 0.4 qt. with filter
Cylinder Block	
Cylinder bore diameter	87.5-87.53 mm (3.444-3.446 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 (3.445-3.446 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 (0.8265-0.8267 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.)
Cylinder Head	
Valve lift @ zero lash (exhaust)	7.4 mm (0.29 in.)
Valve lift @ zero lash (intake)	7.9 mm (0.31 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.)

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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 (0.00010 in.)
Valve stem-to-guide clearance - exhaust	0.0029 mm (0.00011 in.)
Valve face runout	0.05 mm (0.0019 in.)
Valve face angle	45 degrees
Valve Spring - Compression Pressure -	
Intake and exhaust (installed)	38.667 lb
Intake (valve open) 8.9 mm (0.35 in.) of lift	97.032 lb
Exhaust (valve open)	7.4 mm of lift 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	0.019-0.035 mm (0.0007-0.0013 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.)

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

GENERAL SPECIFICATIONS**GENERAL SPECIFICATIONS**

Item	Specification
Motorcraft Metal Surface Cleaner ZC-21	WSE-M5B392-A
Silicone Gasket Remover ZC-30	-
Motorcraft Metal Surface Prep ZC-31	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
High Temperature 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A	ESA-M1C198-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Motorcraft Premium Gold Engine Coolant VC-7-A (in California, Oregon and New Mexico VC-7-B, in Canada CVC-7-A) or equivalent (yellow color)	WSS-M97B51-A1
Multi-Purpose Grease XL-5, XG-4	ESB-M1C93-B
Thread Sealant with PTFE TA-24	WSK-M2G350-A2

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

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Description	N.m	lb-ft	lb-in
Camshaft bearing cap bolts ⁽¹⁾	-	-	-
Coolant outlet bolts	10	-	89
Oil pan bolts ⁽¹⁾	-	-	-
Oil pump-to-engine block bolts ⁽¹⁾	-	-	-
Cylinder head bolts ⁽¹⁾	-	-	-
Accelerator cable snow shield screws	10	-	89
Accelerator cable bracket nuts W520412-S309 (vehicles built through 10/2005)	9	-	89
Accelerator cable bracket nuts W520412-S440 (vehicles built after 10/2005)	5	-	44
Intake manifold bolts	18	13	-
Flexplate bolts ⁽¹⁾	-	-	-
Flywheel bolts ⁽¹⁾	-	-	-
Crankshaft pulley bolt ⁽¹⁾	-	-	-
Crankshaft position (CKP) sensor bolts ⁽¹⁾	-	-	-
Rear crankshaft oil seal retainer bolts ⁽¹⁾	-	-	-
A/C compressor mounting bolts	25	18	-
Oil pump sprocket bolt	25	18	-
Knock sensor (KS) bolt	20	15	-
Engine mount bracket bolt (W710824-S439)	115	85	-
42-pin electrical connector bolt	10	-	89
Engine mount bracket nuts (N807144-S440)	115	85	-
Engine mount bolts	55	41	-
Engine roll-restrictor bolts	90	66	-
Engine-to-bellhousing bolts	48	35	-
Starter motor mounting bolts	25	18	-
Engine support crossmember bolts	90	66	-
Bellhousing-to-engine bolts	48	35	-
Bellhousing-to-oil pan bolts ⁽¹⁾	-	-	-
Engine front cover-to-oil pan bolts ⁽¹⁾	-	-	-
Upper engine bracket-to-power transfer unit (PTU) bolts	45	33	-
Engine support crossmember nut	175	129	-
Torque converter-to-flywheel nuts	35	26	-
Power steering pressure (PSP) tube nut	20	15	-
Powertrain control module (PCM) wiring connector bolt	6	-	53
Coolant pump bolts	10	-	89
Engine front cover bolts ⁽¹⁾	-	-	-
Camshaft sprocket bolt	72	53	-
Valve cover bolts	10	-	89
Exhaust gas recirculation (EGR) valve assembly bolts	20	15	-

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Thermostat housing bolts	10	-	89
Oil pump screen and cover assembly bolts	10	-	89
Catalytic converter studs	17	13	-
Catalytic converter-to-cylinder head nuts	47	35	-
Coolant pump pulley bolts	20	15	-
Generator mounting bolts	47	35	-
Power steering pump mounting bolts	25	18	-
Oil level indicator tube bolt	10	-	89
Oil pressure sensor	15	11	-
A/C manifold tube bolt	20	15	-
Oil drain plug	28	21	-
Oil pump chain tensioner bolts	10	-	89
Oil pump chain guide bolts	10	-	89
Timing chain guide bolts	10	-	89
Timing chain tensioner bolts	10	-	89
Crankcase vent oil separator bolts	10	-	89
Oil filter adapter bolts	25	18	-
Oil cooler bolt	34	25	-
Air cleaner outlet tube clamps	3	-	27
Coil-on-plug retaining stud bolts	10	-	89
Engine plug bolt	20	15	-
Belt tensioner bolt	25	18	-
Oil filter cup	33	24	-
Oil pan-to-bellhousing bolts ⁽¹⁾	-	-	-
Rear main seal mounting plate bolts	10	-	89
Camshaft position (CMP) sensor bolt	20	15	-
Cylinder head temperature (CHT) sensor	12	9	-
Spark plug	12	9	-
Fuel rail bolts	10	-	89
Pressure plate bolts	32	24	-

(1) Refer to the appropriate procedure for specification.

DESCRIPTION AND OPERATION

ENGINE

The 2.3L (140 CID) 4-cylinder engine has the following features:

- Dual overhead camshaft
- Four valves per cylinder
- Sequential multiport fuel injection (SFI)

- Aluminum cylinder head
- Aluminum cylinder block
- Electronic ignition system with coil-on-plug 4 ignition coils

The 2.3L 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.

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 that the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions. The Ford Master Parts Catalog contains a complete listing of the codes and their application.

Code Information

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

- Engine build date
- Engine plant code
- Engine code

Exhaust Emission Control System

Operation and necessary maintenance of the exhaust emission control devices used on this engine are covered in **INTRODUCTION - GASOLINE** article .

Induction System

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

- are mounted in the intake manifold.
- 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.
- are connected in series with the fuel pressure sensor.
- 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.

Positive Crankcase Ventilation System

All engines are equipped with a closed-type positive crankcase ventilation 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 **INTRODUCTION - GASOLINE** article for driveability concerns.

GENERAL PROCEDURES

VALVE CLEARANCE CHECK

1. Remove the valve cover. For additional information, refer to **VALVE COVER**.
2. Remove the 5 bolts, the pin-type retainer (not shown) and the RH splash shield.
 - To install, tighten to 9 Nm (80 lb-in).

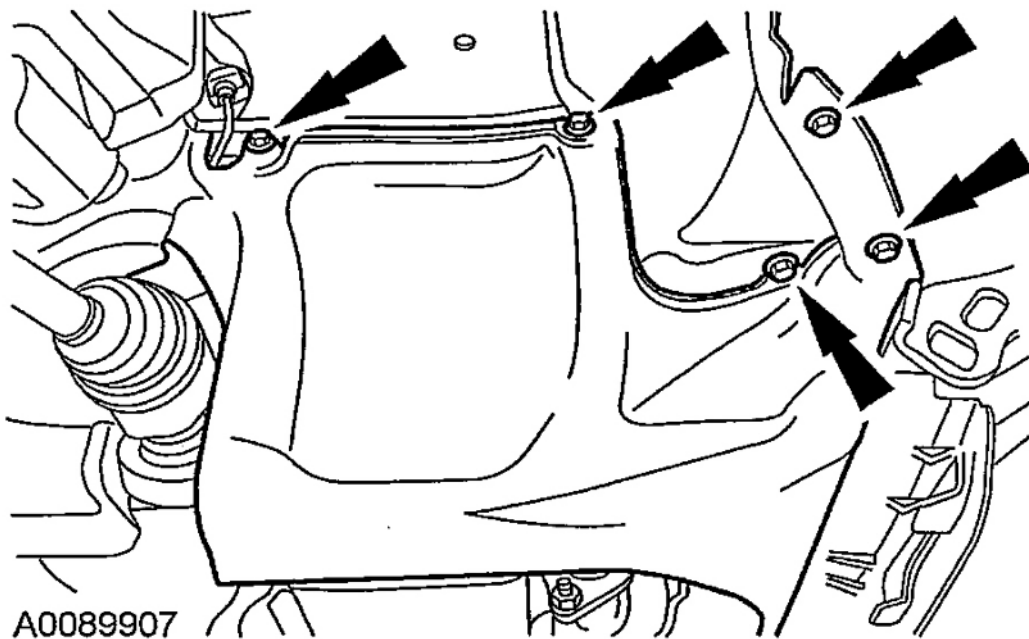


Fig. 1: Removing RH Splash Shield
Courtesy of FORD MOTOR CO.

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

NOTE: Before removing the camshafts, measure the clearance of each valve at base circle, with the lobe pointed away from the tappet. Failure to measure all clearances prior to removing the camshafts will necessitate repeated removal and installation and wasted labor time.

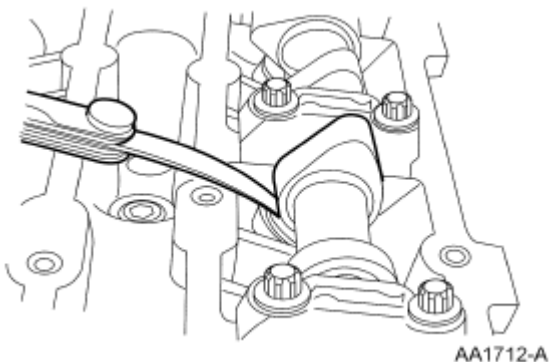


Fig. 2: Checking Valve Clearance
Courtesy of FORD MOTOR CO.

3. Use a feeler gauge to measure the clearance of each valve 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.

A midrange clearance is the most desirable:

- **Intake: 0.22-0.28 mm (0.008-0.011 in)**
- **Exhaust: 0.27-0.33 mm (0.010-0.013 in)**

4. Select tappets using this formula: $\text{tappet thickness} = \text{measured clearance} + \text{the base tappet thickness} - \text{most desirable thickness}$.

Select the tappets and mark the installation location.

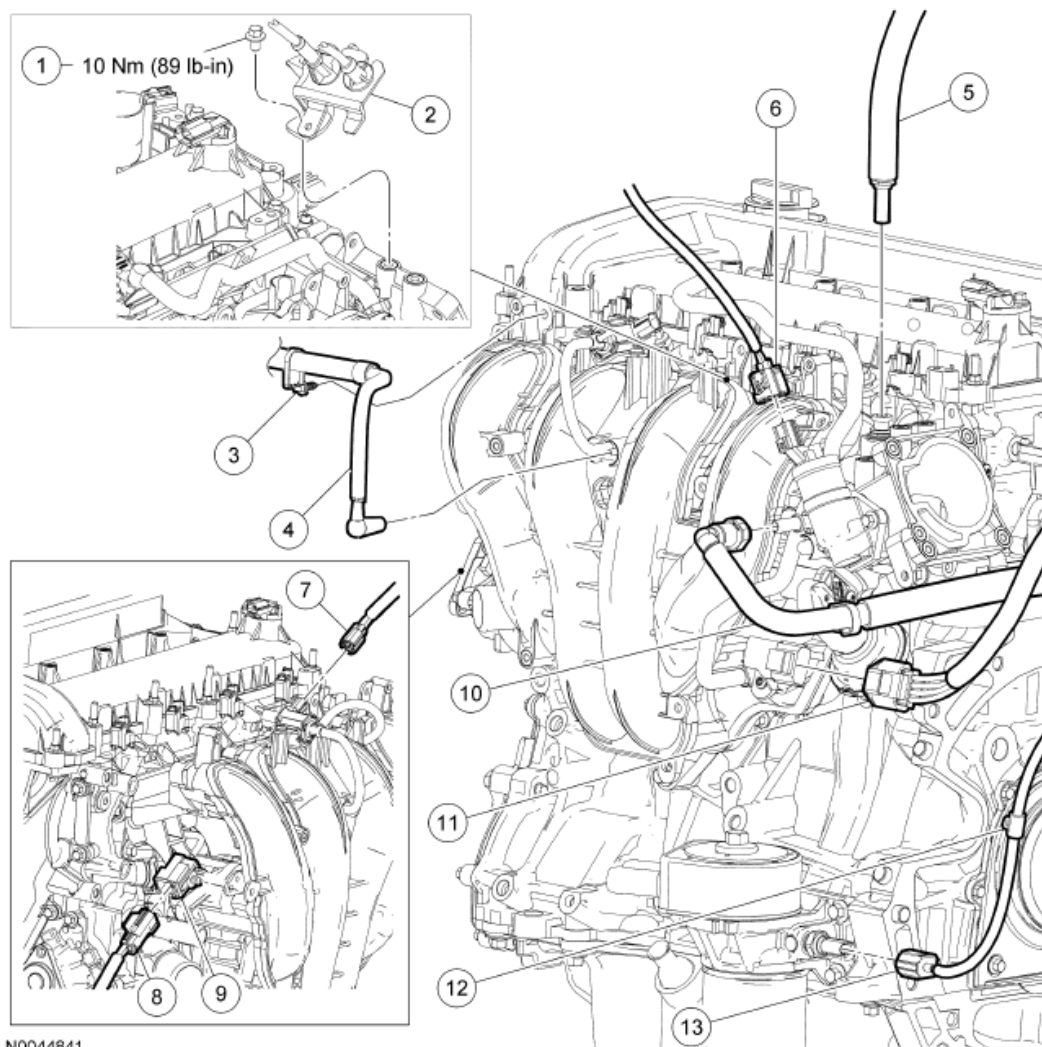
5. If any tappets do not measure within specifications, install new tappets in these locations. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **VALVE TAPPETS**.

IN-VEHICLE REPAIR

INTAKE MANIFOLD

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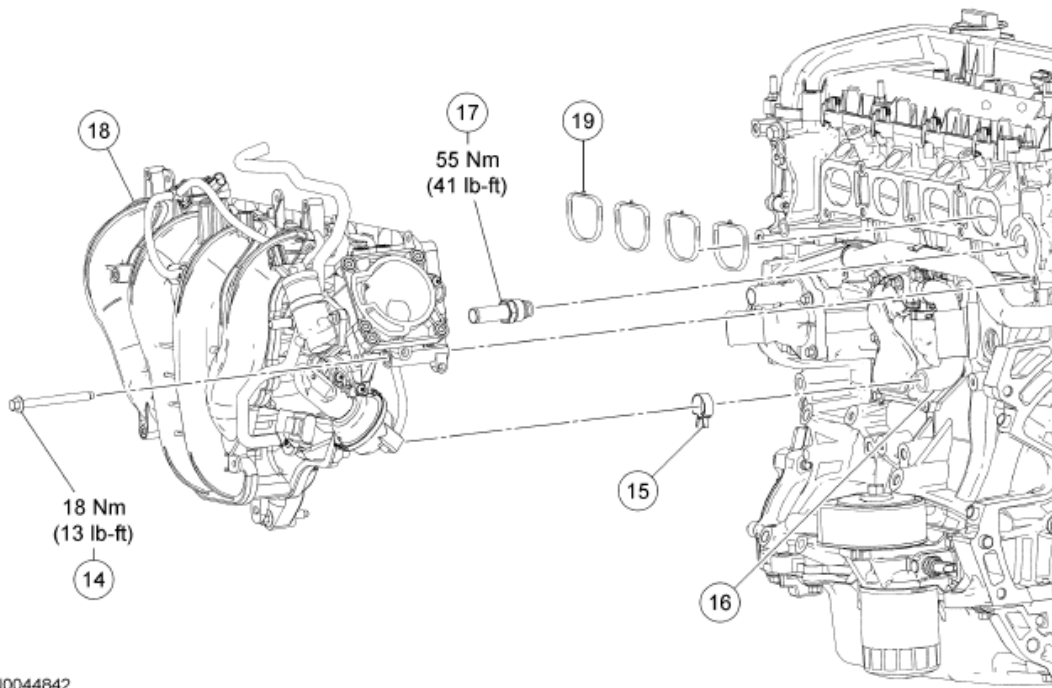


N0044841

Item	Part Number	Description
1	N802358	Accelerator cable bracket bolt (3 required)
2	9278	Accelerator cable bracket
3	—	Vacuum tube retainer (part of 9E498)
4	9E498	Vacuum tube
5	19D848	Vacuum supply hose
6	14A464	Idle air control (IAC) motor electrical connector (part of 12B637)
7	14A464	Swirl control valve electrical connector (part of 12B637)

Item	Part Number	Description
8	14A464	Knock sensor (KS) electrical connector (part of 12B637)
9	14A464	Pin-type retainer (part of 12B637)
10	9D289	Fuel vapor return hose
11	14A464	Temperature manifold absolute pressure (TMAP) sensor electrical connector (part of 12B637)
12	12B637	Engine control wiring harness
13	14A464	Oil pressure sender electrical connector (part of 12B637)

Fig. 3: Identifying Intake Manifold Components (With Torque Specifications) (1 Of 2)
Courtesy of FORD MOTOR CO.



N0044842

Item	Part Number	Description
14	W500311	Intake manifold bolt (8 required)
15	—	Crankcase vent hose clamp (part of 6758)
16	6758	Crankcase vent hose
17	9E470	Exhaust gas recirculation (EGR) tube
18	9424	Intake manifold
19	9461	Intake manifold gasket

Fig. 4: Identifying Intake Manifold Components (With Torque Specifications) (2 Of 2)
Courtesy of FORD MOTOR CO.

Removal and Installation

1. With vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the fuel rail. For additional information, refer to **REMOVAL**.
3. Remove the throttle body. For additional information, refer to **FUEL CHARGING & CONTROLS - 2.3L**.
4. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
5. Disconnect the intake manifold vacuum hose and pin-type retainer.
 - Position the vacuum hose aside.
6. Disconnect the power brake booster vacuum tube.
 - Depress the quick release locking ring.

- Pull the vacuum tube out of the quick release fitting.

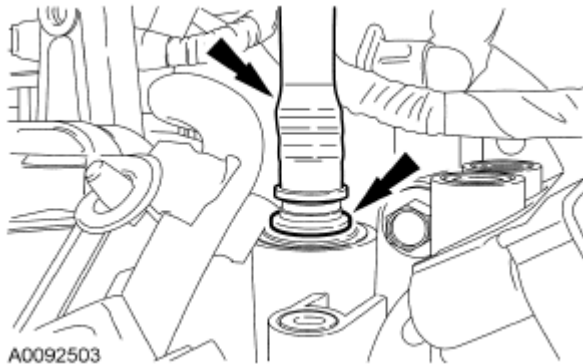


Fig. 5: Locating Quick Release Locking Ring
Courtesy of FORD MOTOR CO.

7. Disconnect the fuel vapor return hose from the intake manifold.
8. Remove the 3 bolts and position the accelerator cable bracket aside.
 - To install, tighten to 10 N.m (89 lb-in).
9. Disconnect the idle air control (IAC) motor electrical connector.
10. Disconnect the swirl control valve electrical connector.
11. Disconnect the knock sensor (KS) electrical connector.
 - Detach the electrical connector pin-type retainer.
12. Disconnect the temperature manifold absolute pressure (TMAP) sensor electrical connector.
13. Disconnect the oil pressure sender electrical connector.
 - Detach the wiring harness pin-type retainer and position the wiring harness aside.

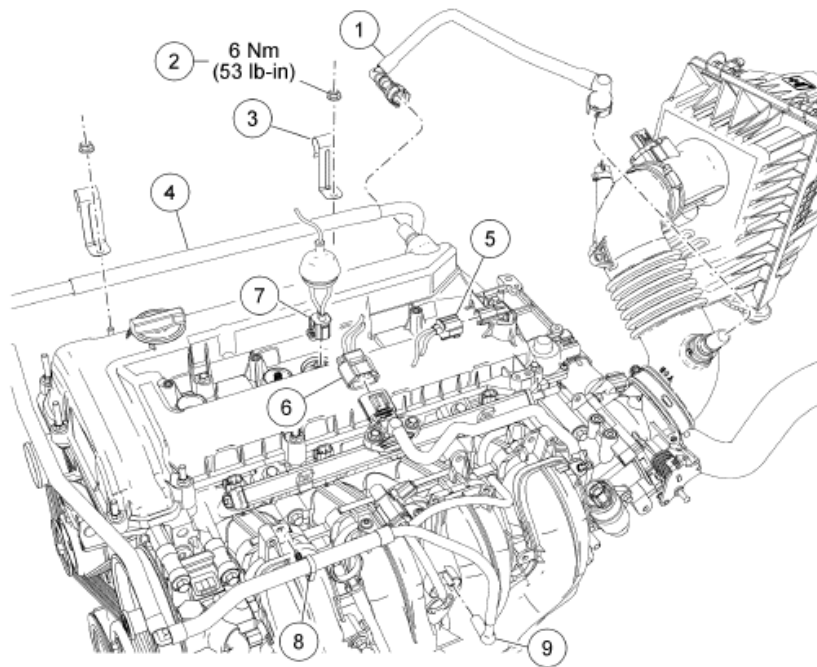
NOTE: There are 3 different size bolts used. Mark the location of the bolts to make sure they are installed in the correct location.

14. Remove the 8 bolts and position the intake manifold aside to access the crankcase vent hose clamp and the EGR tube.
 - To install, tighten to 18 N.m (13 lb-ft).
15. Release the clamp and disconnect the crankcase vent hose.
16. Remove the exhaust gas recirculation (EGR) tube.
 - To install, tighten to 55 N.m (41 lb-ft).
17. Remove the intake manifold and gaskets.
18. To install, reverse the removal procedure.
 - Inspect and install new intake manifold gaskets if necessary.

VALVE COVER

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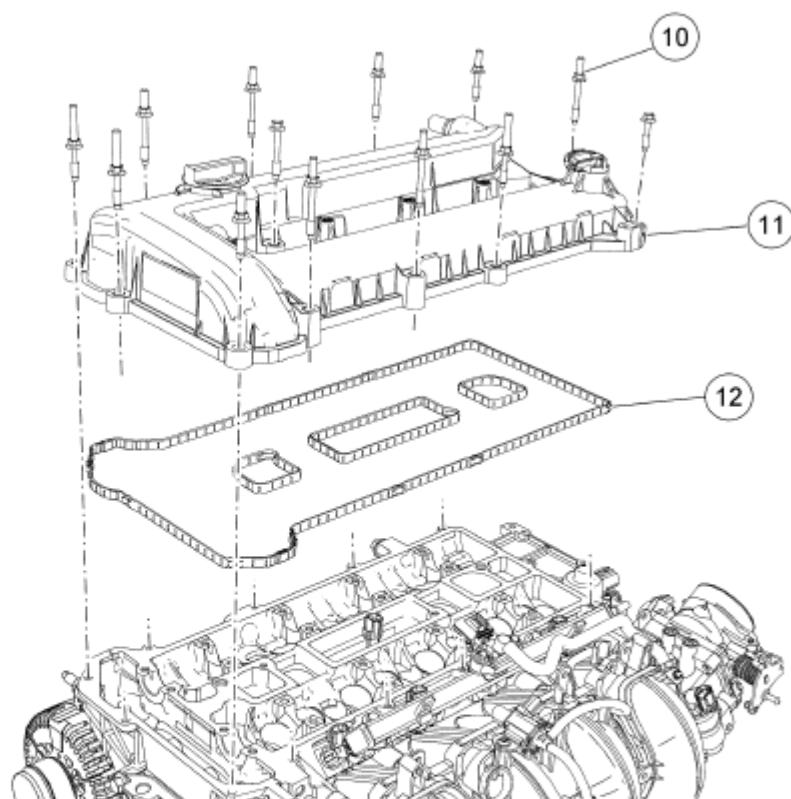
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Item	Part Number	Description
1	6853	Crankcase vent hose
2	W520412	Coolant vent tube bracket nut (2 required)
3	—	Coolant vent tube bracket (2 required) (part of 3A719)
4	3A719	Coolant vent tube
5	14A464	Camshaft position (CMP) sensor electrical connector (part of 12B637)

Item	Part Number	Description
6	14A464	Fuel rail pressure and temperature sensor electrical connector (part of 12B637)
7	14A464	Cylinder head temperature (CHT) sensor electrical connector (part of 12B637)
8	—	Vacuum tube retainer (part of 9E498)
9	9E498	Vacuum tube

Fig. 6: Identifying Valve Cover Components (With Torque Specifications) (1 Of 2)
Courtesy of FORD MOTOR CO.



A0100096

Item	Part Number	Description
10	W500215	Valve cover retainer (14 required)
11	6582	Valve cover
12	6584	Valve cover gasket

Fig. 7: Identifying Valve Cover Components (With Torque Specifications) (2 Of 2)
Courtesy of FORD MOTOR CO.

Removal

CAUTION: 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 ignition coil-on-plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.
3. Disconnect the crankcase vent hose.
4. Remove the 2 coolant vent tube bracket nuts.

- Position the vent tube and brackets aside.
- 5. Disconnect the camshaft position (CMP) sensor electrical connector.
- 6. Disconnect the fuel rail pressure and temperature sensor electrical connector.
- 7. Disconnect the cylinder head temperature (CHT) sensor electrical connector.
- 8. Disconnect the vacuum tube from the intake manifold.
 - Detach the pin-type retainer and position the vacuum tube aside.
- 9. Remove the 2 accelerator cable bracket nuts.
 - Position the accelerator cable and brackets aside.
- 10. Remove the power steering tube bracket nut.
 - Position the power steering tube and bracket aside.
- 11. Detach all of the wiring harness retainers from the valve cover studs and position the harness aside.
- 12. Remove the 14 valve cover retainers, the valve cover and gasket.

Installation

CAUTION: 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.

NOTE: Clean and inspect the gasket. Install a new gasket, if necessary.

2. Install the valve cover, gasket and retainers.
 - Tighten in the sequence shown to 10 N.m (89 lb-in).

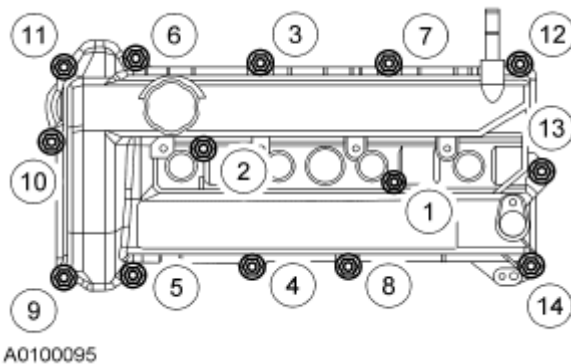
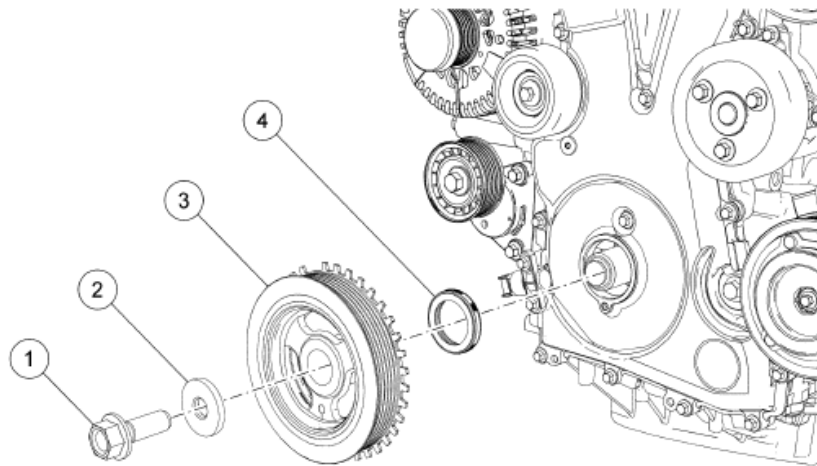


Fig. 8: Identifying Valve Cover Bolts
Courtesy of FORD MOTOR CO.

3. Position the wiring harness and attach all of the wiring harness retainers to the valve cover studs.
4. Position the power steering tube and bracket.
 - Tighten to 6 N.m (53 lb-in).

5. Position the accelerator control cable and brackets.
 - Tighten to 6 N.m (53 lb-in).
6. Attach the vacuum tube and the pin-type retainer to the intake manifold.
7. Connect the CHT sensor electrical connector.
8. Connect the fuel rail pressure and temperature sensor electrical connector.
9. Connect the CMP sensor electrical connector.
10. Install the coolant vent tube, brackets and nuts.
 - Tighten to 6 N.m (53 lb-in).
11. Connect the crankcase vent hose.
12. Install the ignition coil-on-plugs. For additional information, refer to **REMOVAL AND INSTALLATION**.

LOWER END COMPONENTS - EXPLODED VIEW

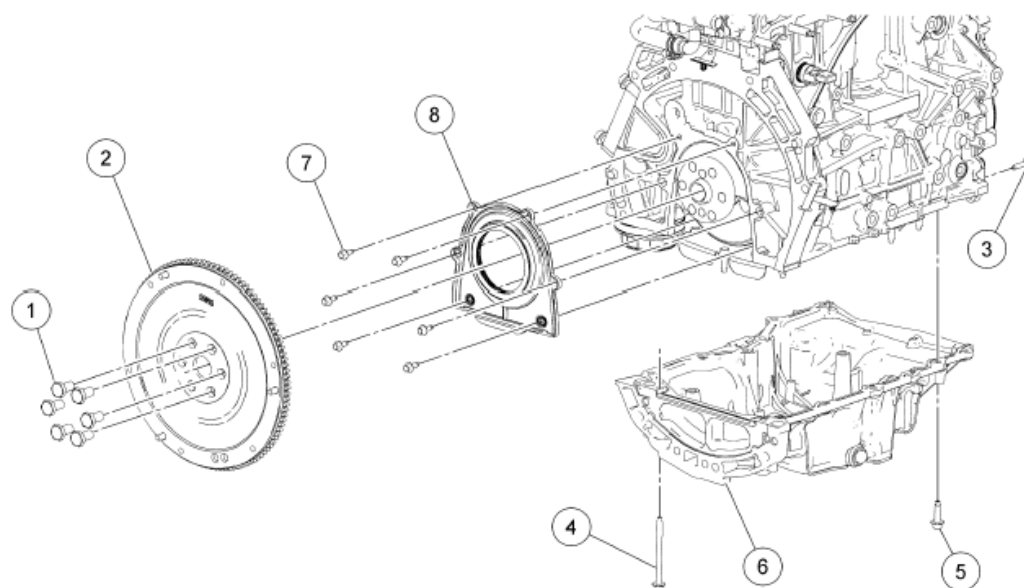


A0002600

Item	Part Number	Description
1	6K340	Crankshaft pulley bolt
2	—	Crankshaft pulley washer (part of 6K340)

Item	Part Number	Description
3	6316	Crankshaft pulley
4	6700	Crankshaft front seal

Fig. 9: Identifying Crankshaft Pulley & Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.



N0004844

Item	Part Number	Description
1	6379	Flexplate or flywheel bolt (6 required)
2	6477	Flexplate or flywheel
3	W500215	Engine front cover bolt (4 required)
4	W706284	Oil pan bolt (2 required)
5	W500224	Oil pan bolt (11 required)

Item	Part Number	Description
6	6675	Oil pan
7	W500212	Crankshaft rear oil seal with retainer plate bolt (6 required)
8	6K318	Crankshaft rear oil seal with retainer plate

Fig. 10: Identifying Flexplate, Flywheel & Crankshaft Rear Oil Seal
 Courtesy of FORD MOTOR CO.

1. For additional information, refer to the appropriate procedure.

CRANKSHAFT PULLEY

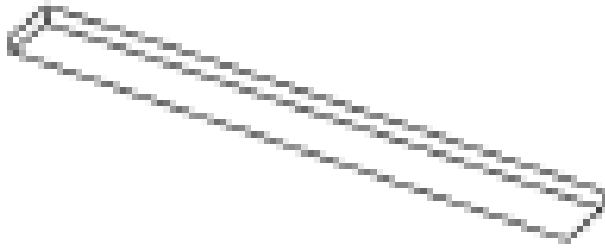
Special Tool(s)

SPECIAL TOOL(S)

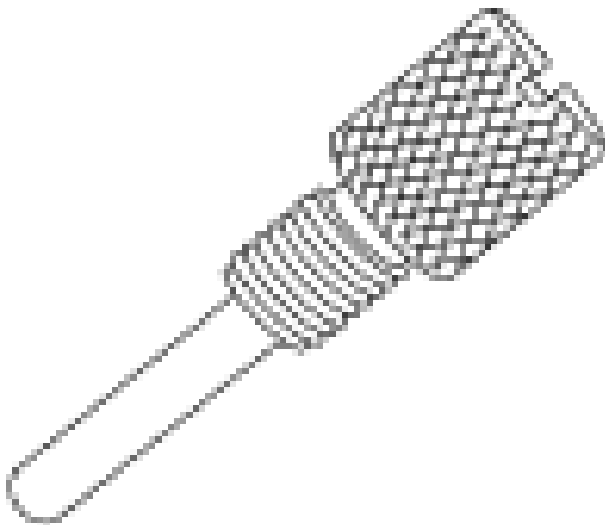
Alignment Plate, Camshaft
 303-465 (T94P-6256-CH)

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST2645-A



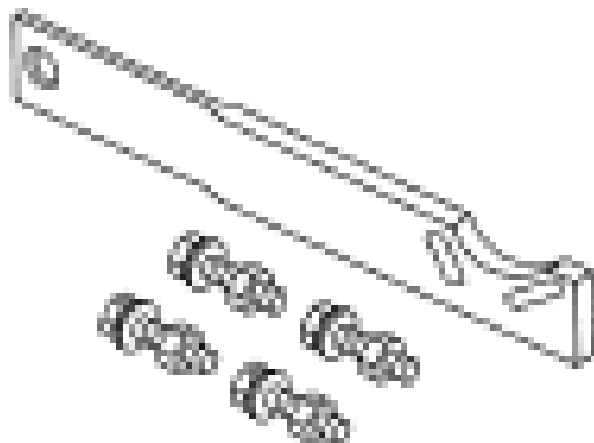
ST2638-A

Timing Peg, Crankshaft
303-507

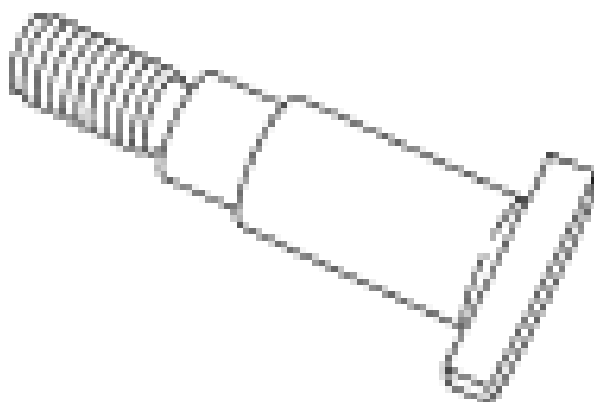
Holding Fixture, Drive Pinion Flange
205-126 (T78P-4851-A)

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST2647-A



ST2639-A

Adapter for 205-126
(205-072-02)

Materials

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

Removal

CAUTION:

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 you loosen the pulley bolt. 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.

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 accessory drive belt. For additional information, refer to **REMOVAL AND INSTALLATION**.
3. Remove the valve cover. For additional information, refer to **VALVE COVER**.

CAUTION: 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.

4. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at TDC.
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

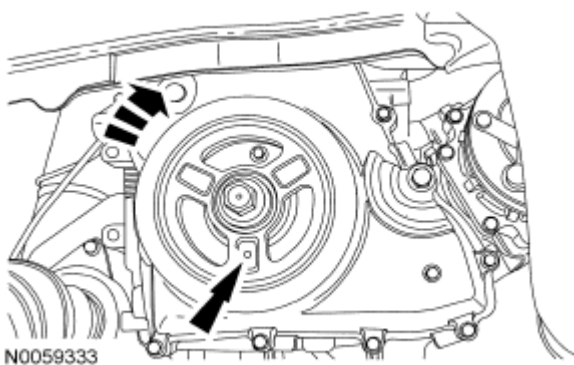


Fig. 11: Locating Crankshaft Pulley
Courtesy of FORD MOTOR CO.

CAUTION: The special tool 303-465 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 special tool cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

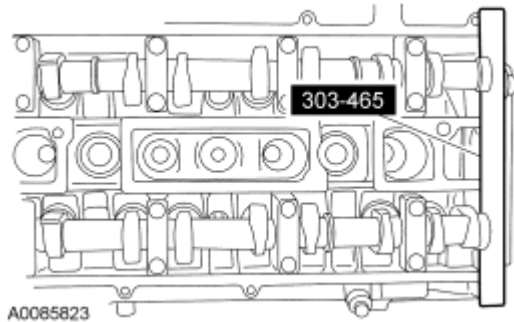


Fig. 12: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

5. Install the special tool in the slots on the rear of both camshafts.
6. Remove the engine plug bolt.

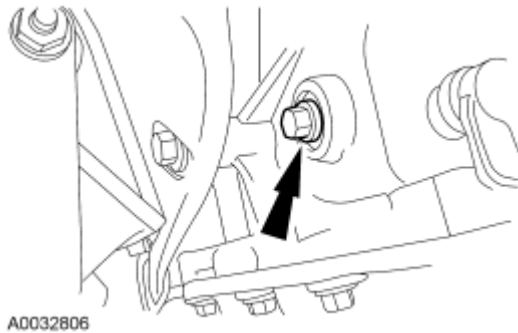
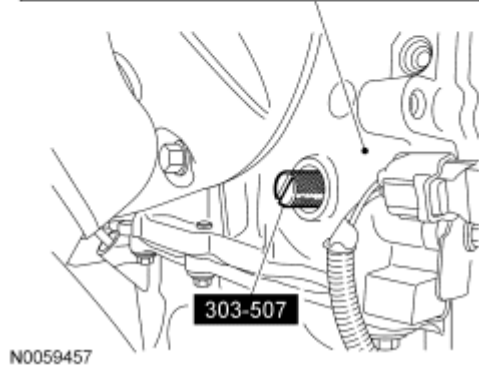
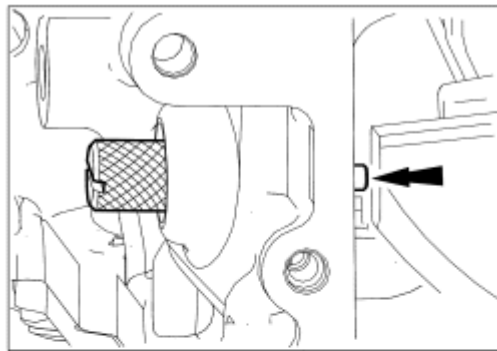


Fig. 13: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

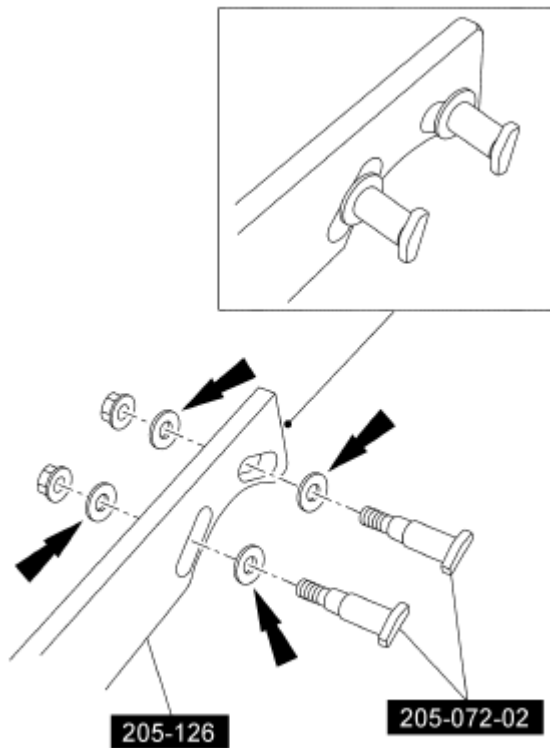
NOTE: The special tool will contact the crankshaft and prevent it from turning past TDC. However, the crankshaft can still be rotated in the counterclockwise direction. The crankshaft must remain at the TDC position during the crankshaft pulley removal and installation.



N0059457

Fig. 14: Identifying Special Tool (303-507)
Courtesy of FORD MOTOR CO.

7. Install the special tool.
8. Assemble the special tools using 4 hardened washers in the locations shown.



N0059334

Fig. 15: Locating Special Tools (205-072-02, 205-126)
Courtesy of FORD MOTOR CO.

CAUTION:

The crankshaft must remain in the 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 special tool and the bolt should be removed using an air impact wrench (1/2-in drive minimum).

If the crankshaft sprocket diamond washer comes off with the crankshaft pulley, it must be installed back onto the crankshaft.

9. Using the special tools and an air impact wrench, remove the crankshaft pulley.
 - Remove and discard the crankshaft pulley bolt and washer.
 - Remove the crankshaft pulley.

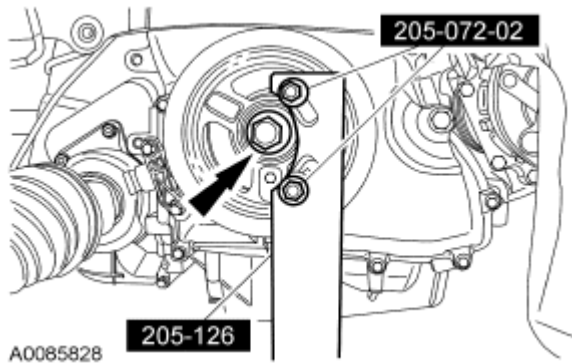


Fig. 16: Identifying Special Tools Assembly (205-072-02, 205-126) And Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

Installation

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

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

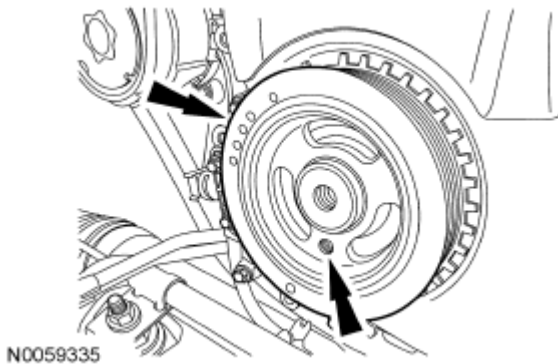


Fig. 17: Locating Crankshaft Pulley Hole
Courtesy of FORD MOTOR CO.

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

CAUTION: Only hand-tighten the 6 mm (0.23 in) bolt or damage to the front cover can occur.

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

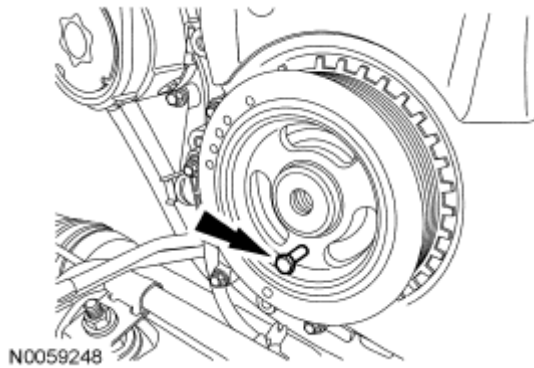


Fig. 18: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

2. Install a standard 6 mm (0.23 in) x 18 mm (0.7 in) bolt through the crankshaft pulley and thread it into the front cover.
3. Assemble the special tools using 4 hardened washers in the locations shown.

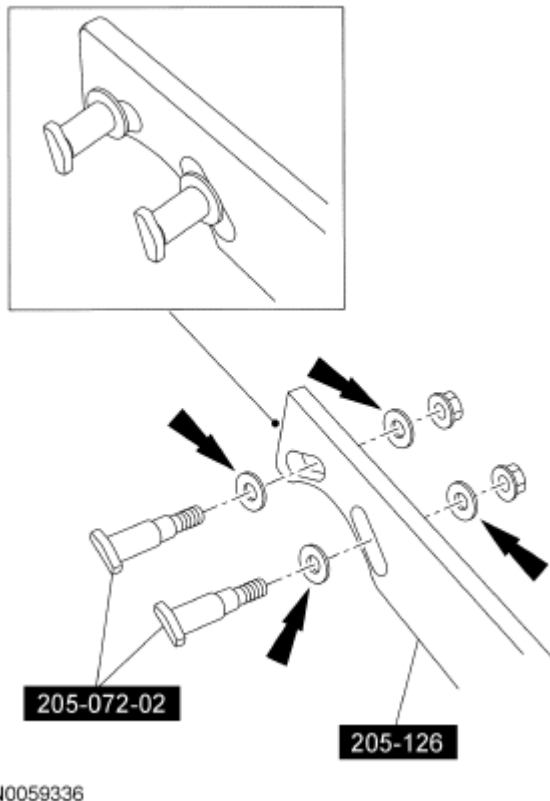


Fig. 19: Assembling Special Tools (205-072-02 And 205-126)
Courtesy of FORD MOTOR CO.

CAUTION: The crankshaft must remain in the TDC position during installation of the pulley bolt or damage to the engine can

occur. Therefore, the crankshaft pulley must be held in place with the special tool and the bolt should be installed using hand tools only.

Do not reuse the crankshaft pulley bolt.

4. Install a new crankshaft pulley bolt. Using the special tools to hold the crankshaft pulley in place, tighten the crankshaft pulley bolt in 2 stages:
 - Stage 1: Tighten to 100 N.m (74 lb-ft).
 - Stage 2: Tighten an additional 90 degrees (1/4 turn).

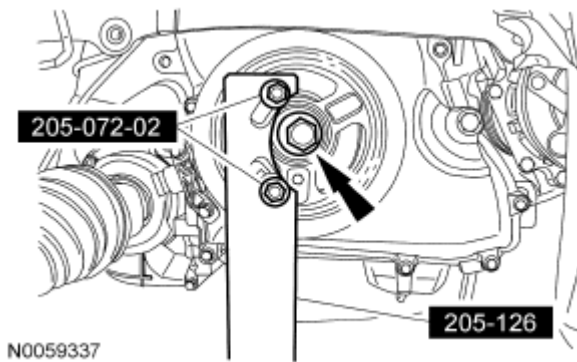


Fig. 20: Identifying Special Tools Assembly (205-072-02, 205-126) And Crankshaft Pulley Bolt

Courtesy of FORD MOTOR CO.

5. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

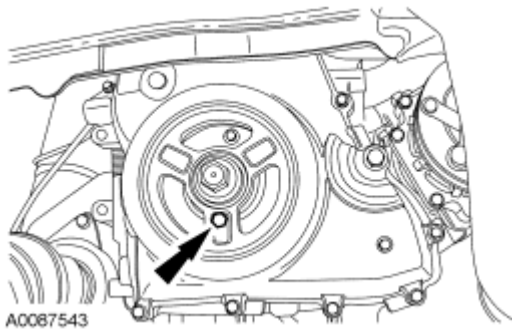


Fig. 21: Aligning Crankshaft Pulley Bolt Holes

Courtesy of FORD MOTOR CO.

6. Remove the special tool.

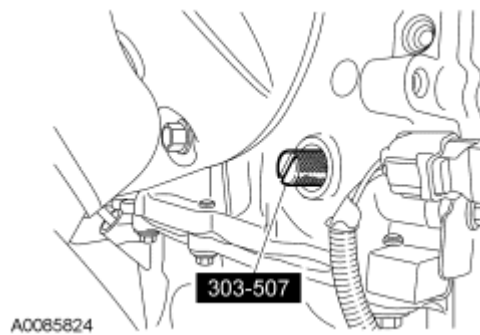


Fig. 22: Identifying Special Tool
Courtesy of FORD MOTOR CO.

7. Remove the special tool.

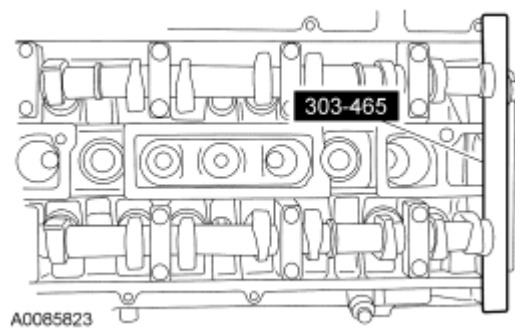


Fig. 23: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

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

8. Turn the crankshaft clockwise 1 and 3/4 turns.
9. Install the special tool.



Fig. 24: Identifying Special Tool
Courtesy of FORD MOTOR CO.

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

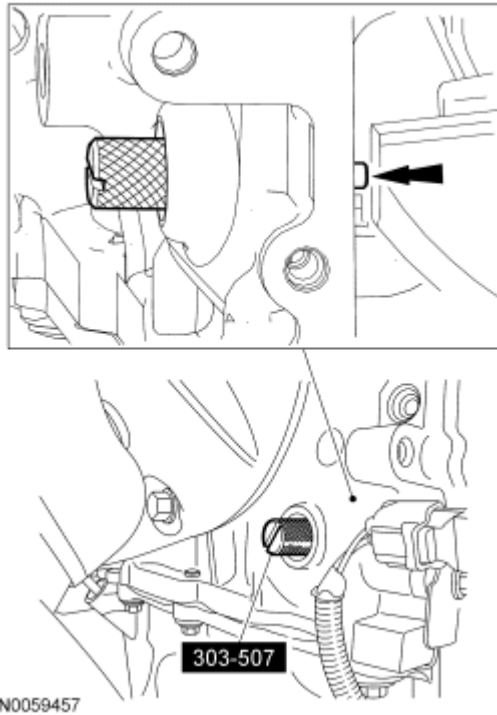


Fig. 25: Identifying Special Tool (303-507)
Courtesy of FORD MOTOR CO.

10. Turn the crankshaft clockwise until the crankshaft contacts the special tool.

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

11. Using the 6 mm (0.23 in) x 18 mm (0.7 in) 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.

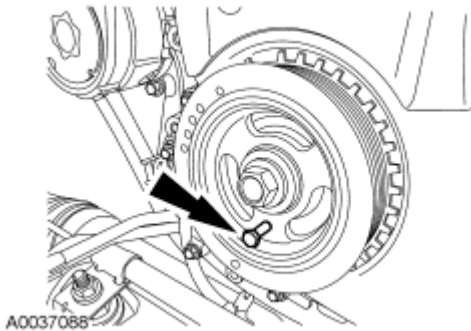


Fig. 26: Installing Bolt Through Crankshaft Pulley And Thread It Into Front Cover
Courtesy of FORD MOTOR CO.

12. Using the special tool, check the position of the camshafts.

- If it is not possible to install the special tool, the engine valve timing must be corrected by repeating this procedure.

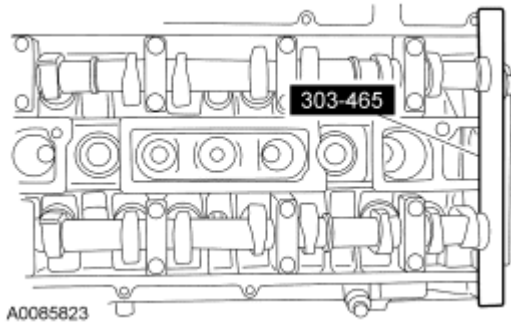


Fig. 27: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

13. Remove the special tool.

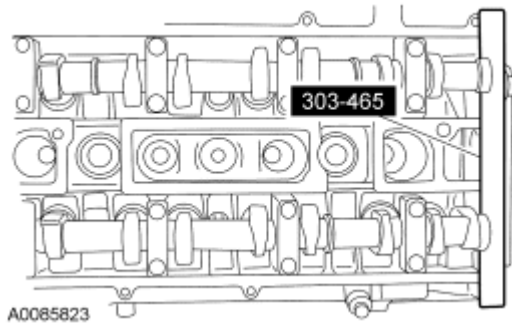


Fig. 28: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

14. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

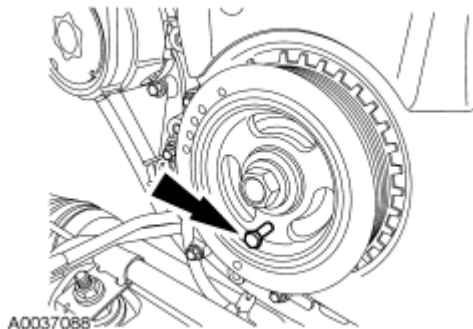


Fig. 29: Installing Bolt Through Crankshaft Pulley And Thread It Into Front Cover
Courtesy of FORD MOTOR CO.

15. Remove the special tool.

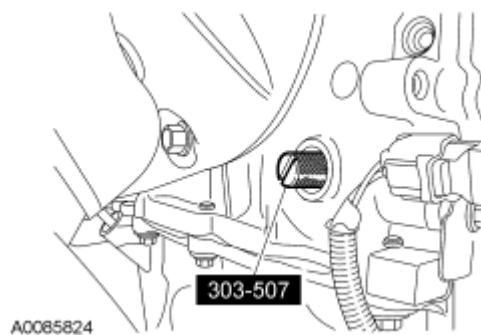


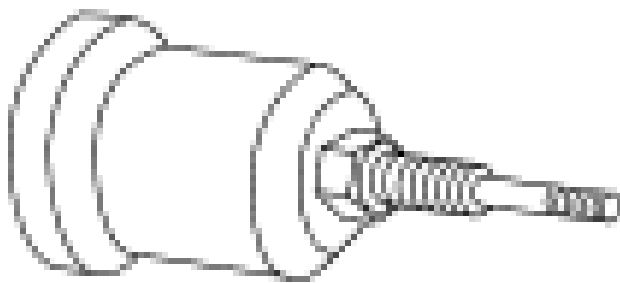
Fig. 30: Identifying Special Tool
Courtesy of FORD MOTOR CO.

16. Install the engine plug bolt.
 - Tighten to 20 N.m (15 lb-ft).
17. Install the accessory drive belt. For additional information, refer to **REMOVAL AND INSTALLATION**.
18. Install the valve cover. For additional information, refer to **VALVE COVER**.

CRANKSHAFT FRONT SEAL

Special Tool(s)

SPECIAL TOOL(S)

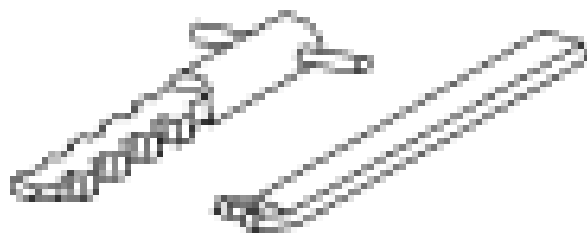


ST1917-A

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

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST1385-A

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

Materials

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

Removal

CAUTION:

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 you loosen the pulley bolt. 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.

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**.

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

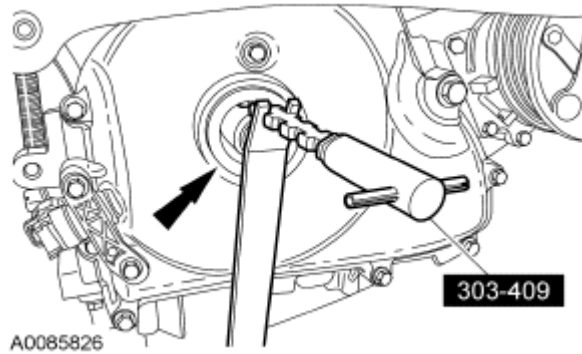


Fig. 31: Removing Crankshaft Front Oil Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

- Using the special tool, remove the crankshaft front oil seal.

Installation

NOTE: Remove the through-bolt from the special tool.
Lubricate the oil seal with clean engine oil.

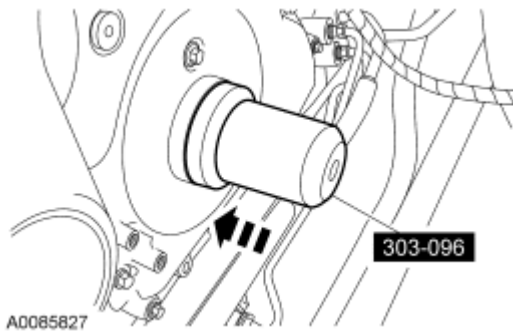


Fig. 32: Installing Crankshaft Front Oil Seal Using Special Tool
Courtesy of FORD MOTOR CO.

- Using the special tool, install the crankshaft front oil seal.
- Install the crankshaft pulley. For additional information, refer to **LOWER END COMPONENTS - EXPLODED VIEW** and **CRANKSHAFT PULLEY**.

FLEXPLATE

Removal

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

LIFTING .

2. Remove the automatic transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE-TRANSMISSION - CD4E** .
3. Remove the 6 bolts and the flexplate.

Installation

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

1. Install the flexplate and tighten the bolts in the sequence shown in 3 stages.
 - Stage 1: Tighten to 50 N.m (37 lb-ft).
 - Stage 2: Tighten to 80 N.m (50 lb-ft).
 - Stage 3: Tighten to 112 N.m (83 lb-ft).

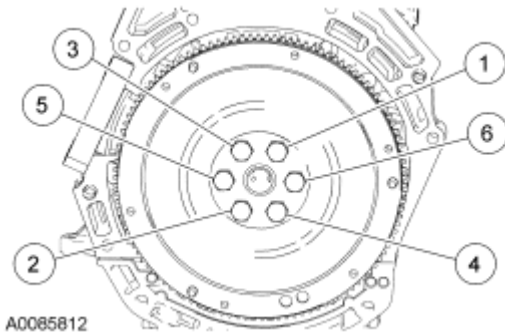


Fig. 33: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2. Install the automatic transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE-TRANSMISSION - CD4E** .

FLYWHEEL**Removal**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the manual transaxle and clutch. For additional information, refer to **CLUTCH** and **MANUAL TRANSAXLE/TRANSMISSION** .
3. Remove the 6 bolts and the flywheel.

Installation

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

1. Install the flywheel and tighten the bolts in the sequence shown in 3 stages.

- Stage 1: Tighten to 50 N.m (37 lb-ft).
- Stage 2: Tighten to 80 N.m (50 lb-ft).
- Stage 3: Tighten to 112 N.m (83 lb-ft).

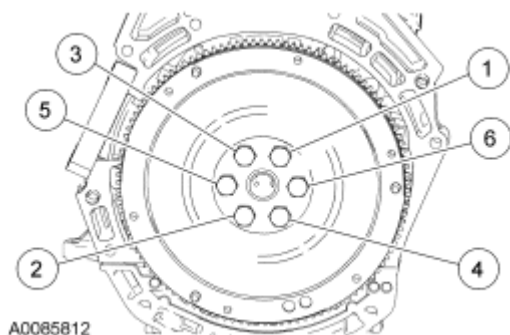


Fig. 34: Identifying Flexplate Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

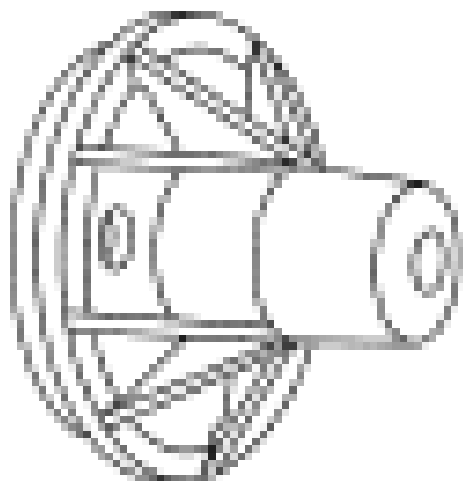
2. Install the clutch and manual transaxle. For additional information, refer to **CLUTCH** and **MANUAL TRANSAXLE/TRANSMISSION**.

CRANKSHAFT REAR SEAL

Special Tool(s)

SPECIAL TOOL(S)

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

**ST1506-A****Materials****MATERIALS**

Item	Specification
Motorcraft Metal Surface Cleaner ZC-21	WSE-M5B392-A
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-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 flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL**.
3. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.

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

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

Installation

1. Using the special tool, position the crankshaft rear oil seal with retainer plate onto the crankshaft.

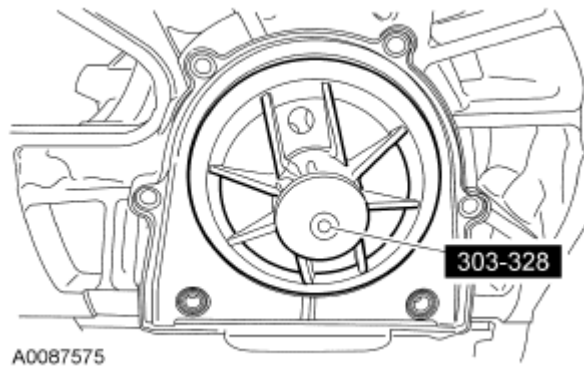


Fig. 35: Identifying Special Tool (303-328)
Courtesy of FORD MOTOR CO.

2. Install the crankshaft rear oil seal with retainer plate and bolts.
 - To install, tighten in the sequence shown to 10 N.m (89 lb-in).

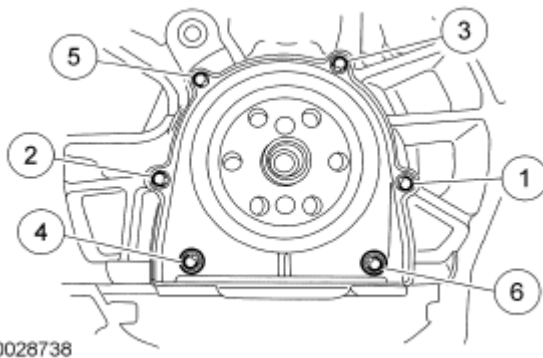


Fig. 36: Identifying Crankshaft Rear Oil Seal With Retainer Plate
Courtesy of FORD MOTOR CO.

CAUTION: 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 and cylinder block 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 cleaner. 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.

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

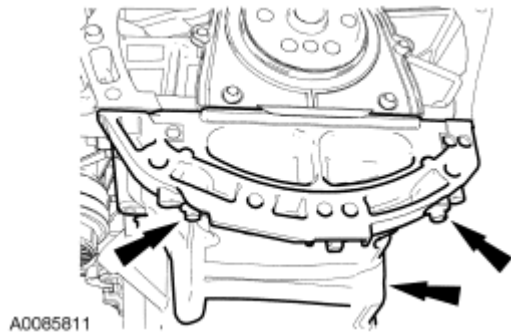


Fig. 37: Identifying Rear Oil Pan Bolts
Courtesy of FORD MOTOR CO.

4. Apply a 2.5 mm (0.09 in) bead of silicone gasket and sealant to the oil pan. Install the oil pan. Install the 2 oil pan bolts finger-tight.
5. Install the 4 bolts.
 - To install, tighten to 10 N.m (89 lb-in).

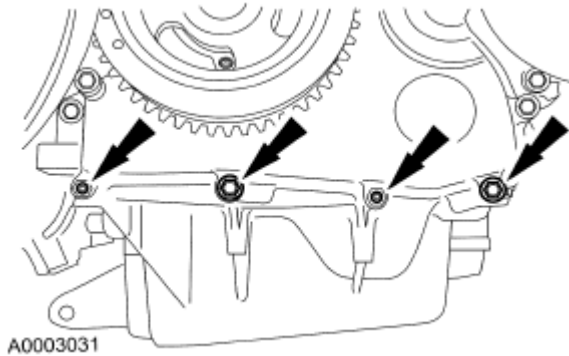


Fig. 38: Locating Oil Pan Bolts (2 Of 2)
Courtesy of FORD MOTOR CO.

6. Install the remaining oil pan bolts and tighten the oil pan bolts in the sequence shown to 25 N.m (18 lb-ft).

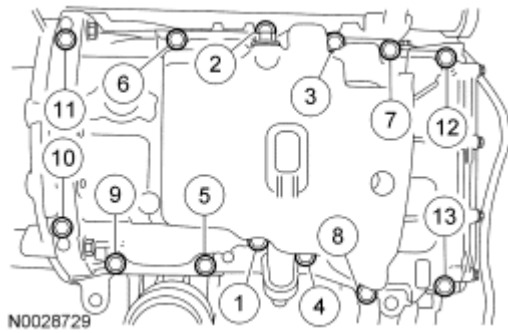
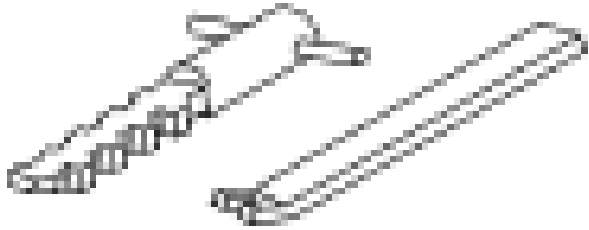


Fig. 39: Identifying Tightening Sequence Of Oil Pan Bolts
Courtesy of FORD MOTOR CO.

7. Install the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
8. Install the flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL**.

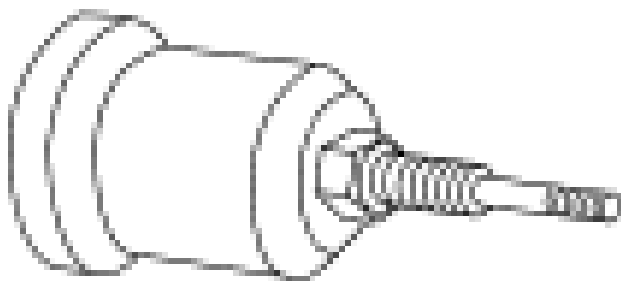
ENGINE FRONT COVER

SPECIAL TOOL TABLE

 ST1385-A	Remover, Oil Seal 303-409 (T92C-6700-CH)
	Installer, Front Oil Seal 303-096 (T74P-6150-A)

2006 Mercury Mariner

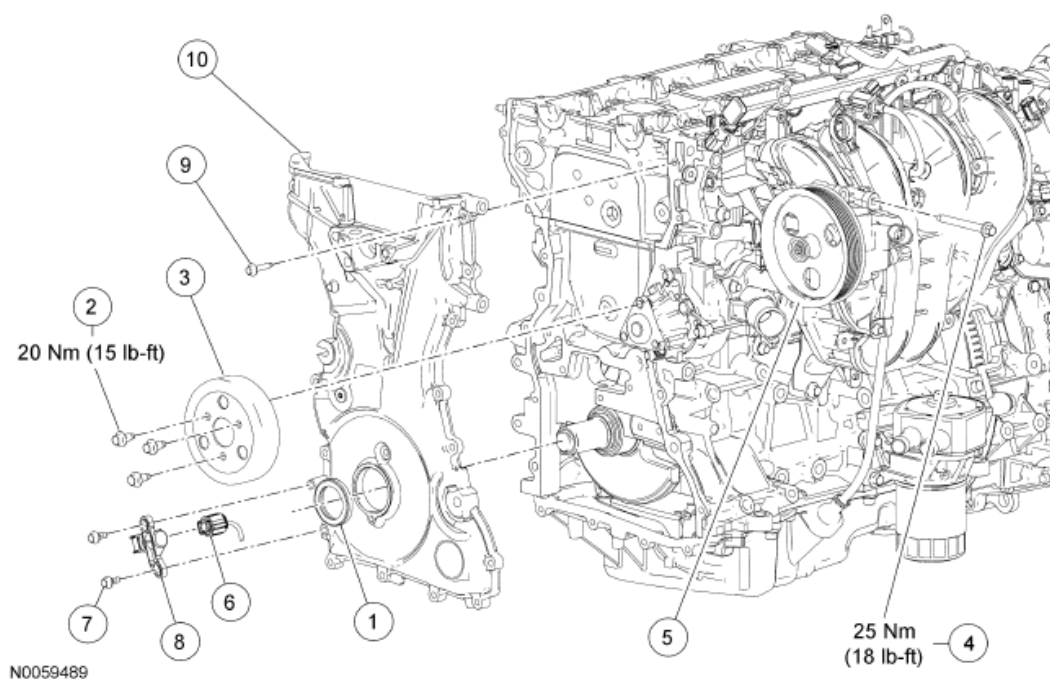
2006 ENGINE Engine - 2.3L - Escape & Mariner



ST1917-A

MATERIAL TABLE

Item	Specification
SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (in Canada Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12) or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4



Item	Part Number	Description
1	6700	Crankshaft front seal
2	W500221	Coolant pump pulley bolt (3 required)
3	8509	Coolant pump pulley
4	W500315	Power steering pump bolt (4 required)
5	3A696	Power steering pump (position aside)

Item	Part Number	Description
6	14A464	Crankshaft position (CKP) sensor electrical connector (part of 12B637)
7	W701219-S	CKP sensor bolt (2 required)
8	6C315	CKP sensor
9	W500215	Engine front cover bolt (22 required)
10	6019	Engine front cover

Fig. 40: Identifying Engine Front Cover Components (With Torque Specifications)
 Courtesy of FORD MOTOR CO.

Removal

CAUTION:

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 you loosen the pulley bolt. 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.

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 accessory drive belt and idler pulleys. For additional information, refer to **REMOVAL AND INSTALLATION - ACCESSORY DRIVE BELT** and **REMOVAL AND INSTALLATION - IDLER PULLEYS**.
3. Remove the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY**.
4. Remove the engine mount. For additional information, refer to **ENGINE MOUNT**.

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

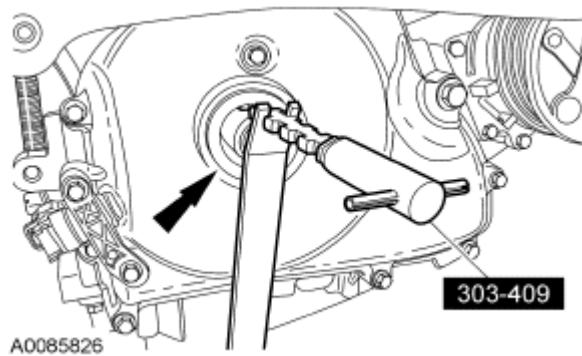


Fig. 41: Removing Crankshaft Front Oil Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

5. Using the special tool, remove the crankshaft front oil seal.
6. Remove the 3 bolts and the coolant pump pulley.
7. Remove the 2 power steering pump bolts.

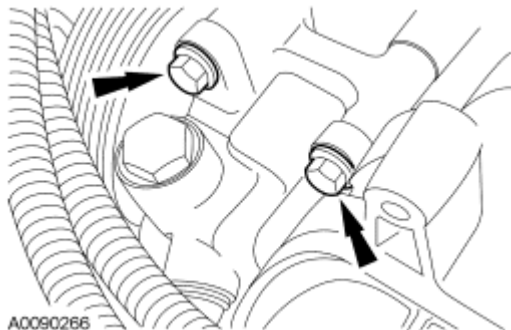


Fig. 42: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

NOTE: The bolt under the power steering pressure tube will remain with the

power steering pump.

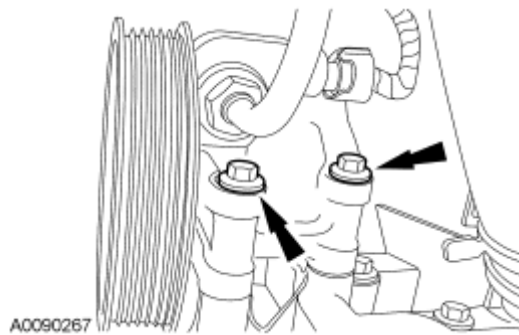


Fig. 43: Identifying Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

8. Remove the remaining bolts and position the power steering pump aside.
9. Disconnect the crankshaft position (CKP) sensor electrical connector.

NOTE: Whenever the CKP sensor is removed, a new one must be installed, using the alignment tool supplied with the new part.

10. Remove and discard the CKP sensor.
11. Remove the bolts and the engine front cover.

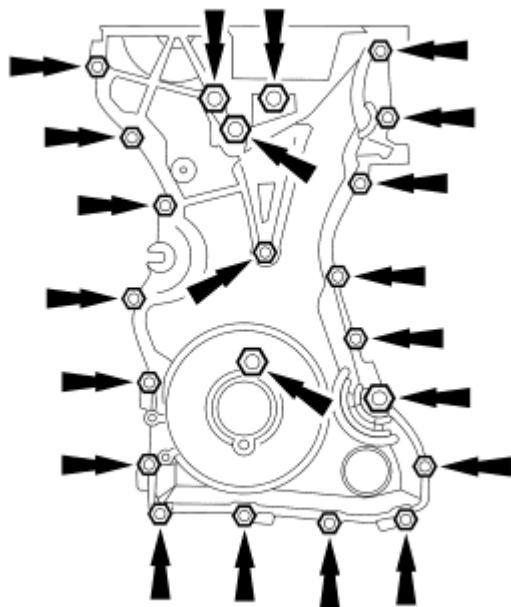


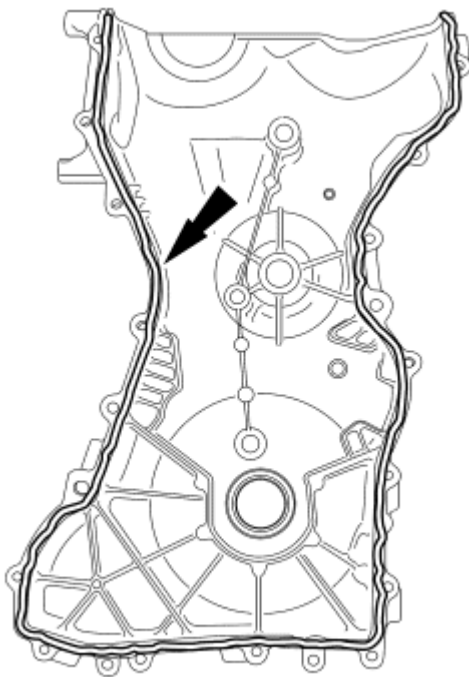
Fig. 44: Locating Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

Installation

CAUTION: 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.



A0032803

Fig. 45: Locating Silicone Gasket
Courtesy of FORD MOTOR CO.

2. Apply a 2.5 mm (0.09 in.) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas. Apply a 2.5 mm (0.09 in.) bead of silicone gasket and sealant to the front cover.
3. Install the engine front cover. Tighten the bolts in the sequence shown, to the following specifications:
 - Tighten the 8 mm bolts to 10 N.m (89 lb-in).
 - Tighten the 13 mm bolts to 48 N.m (35 lb-ft).

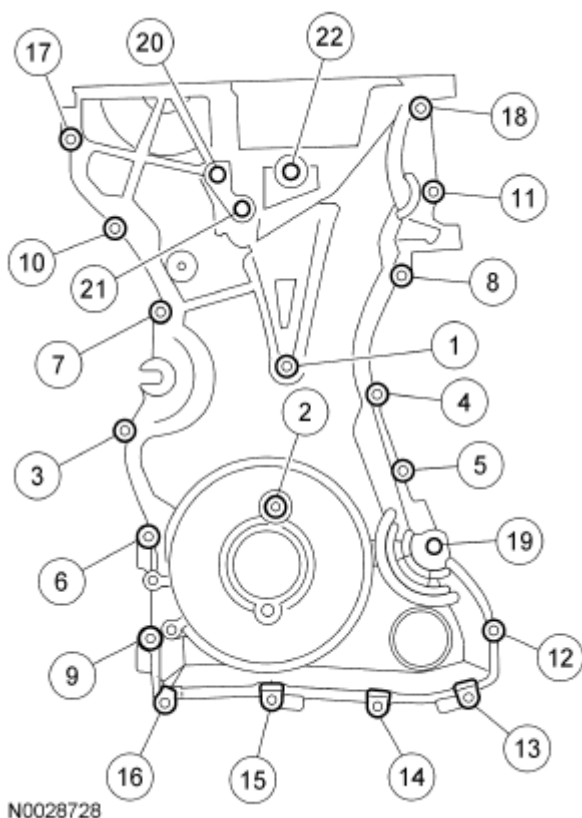


Fig. 46: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

NOTE: The bolt under the power steering pressure tube will remain with the power steering pump.

4. Position the power steering pump and install the bolts.
 - Tighten to 25 N.m (18 lb-ft).

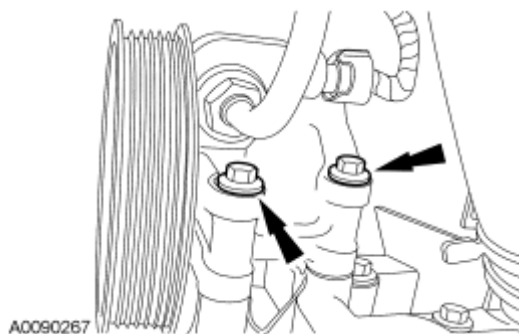


Fig. 47: Identifying Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

5. Install the 2 remaining power steering pump bolts.

- Tighten to 25 N.m (18 lb-ft).

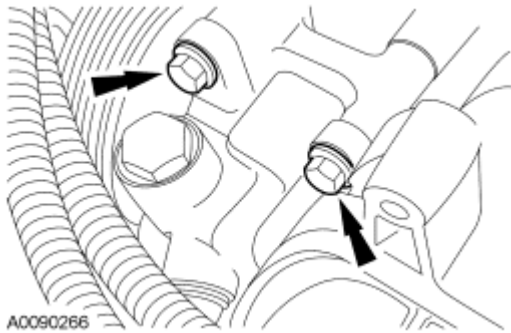


Fig. 48: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

6. Install the coolant pump pulley and bolts.
 - Tighten to 20 N.m (15 lb-ft).

NOTE: Remove the through-bolt from the special tool.
Lubricate the oil seal with clean engine oil.

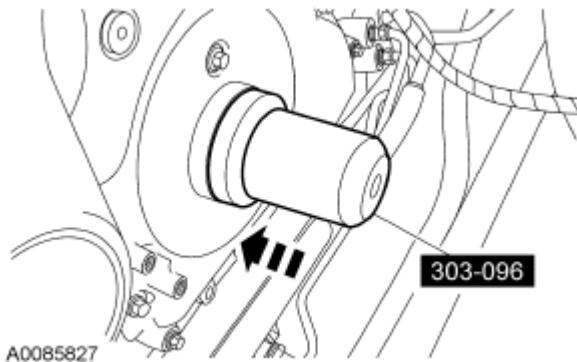


Fig. 49: Installing Crankshaft Front Oil Seal Using Special Tool (303-096)
Courtesy of FORD MOTOR CO.

7. Using the special tool, install the crankshaft front oil seal.
8. Install the engine mount. For additional information, refer to **ENGINE MOUNT**.
9. Install the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY**.

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

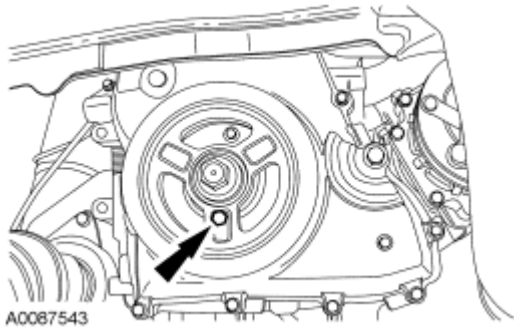


Fig. 50: Aligning Crankshaft Pulley Bolt Holes
Courtesy of FORD MOTOR CO.

10. Install a standard 6 mm (0.23 in.) x 18 mm (0.7 in.) bolt through the crankshaft pulley and thread it into the front cover.

NOTE: Whenever the crankshaft position (CKP) sensor is removed, a new one must be installed using the alignment tool supplied with the new part.

11. Install a new CKP sensor.
 - Do not tighten the bolts at this time.

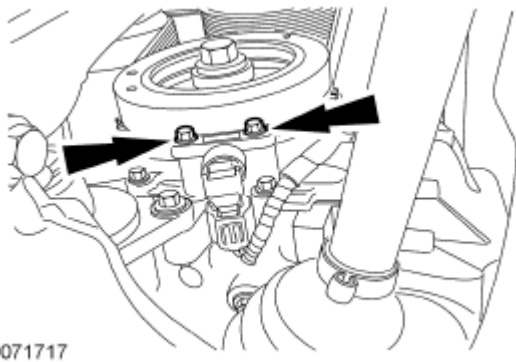


Fig. 51: Locating CKP Sensor Bolts (1 Of 2)
Courtesy of FORD MOTOR CO.

NOTE: The CKP sensor alignment tool is supplied with the new sensor and is not available separately.

12. Adjust the CKP sensor with the alignment tool.
 - Tighten the bolts to 7 N.m (62 lb-in).

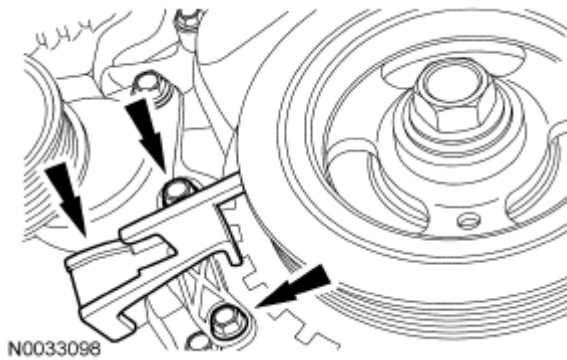


Fig. 52: Locating CKP Sensor Bolts (2 Of 2)
Courtesy of FORD MOTOR CO.

13. Connect the CKP sensor electrical connector.
14. Remove the 6 mm (0.23 in.) x 18 mm (0.7 in.) bolt.

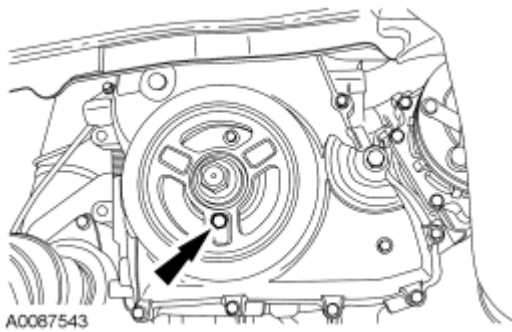


Fig. 53: Aligning Crankshaft Pulley Bolt Holes
Courtesy of FORD MOTOR CO.

15. Install the accessory drive belt and idler pulleys. For additional information, refer to **REMOVAL AND INSTALLATION - ACCESSORY DRIVE BELT** and **REMOVAL AND INSTALLATION - IDLER PULLEYS**.

TIMING DRIVE COMPONENTS

Materials

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4

Removal

CAUTION:

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 you loosen the pulley bolt. 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.

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. Remove the timing chain tensioner.
 1. Compress the timing chain tensioner, and insert a paper clip into the hole to retain the tensioner.
 2. Remove the bolts and timing chain tensioner.

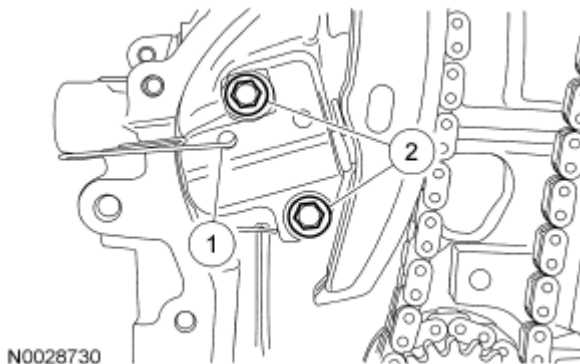


Fig. 54: Identifying Bolts & Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

4. Remove the RH timing chain guide.

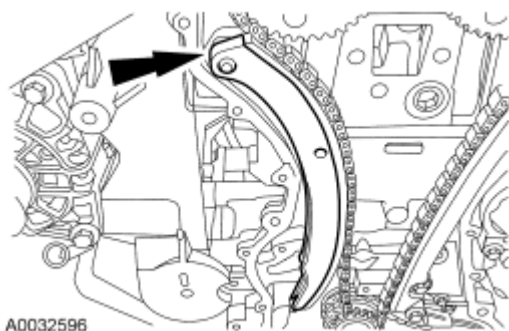


Fig. 55: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

5. Remove the timing chain.

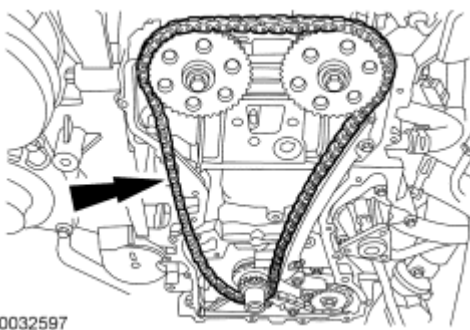


Fig. 56: View Of Timing Chain
Courtesy of FORD MOTOR CO.

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

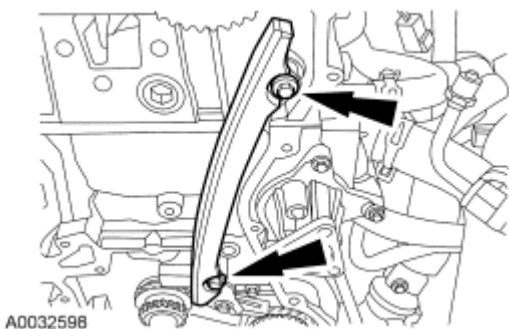


Fig. 57: Identifying Bolts And LH Timing Chain Guide
Courtesy of FORD MOTOR CO.

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

7. Remove the bolts and the camshaft sprockets.

- Use the flats on the camshaft to prevent camshaft rotation.

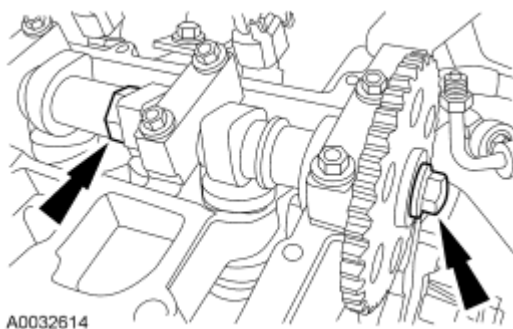


Fig. 58: Locating Cam Holding Area And Sprocket Bolt
Courtesy of FORD MOTOR CO.

Installation

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

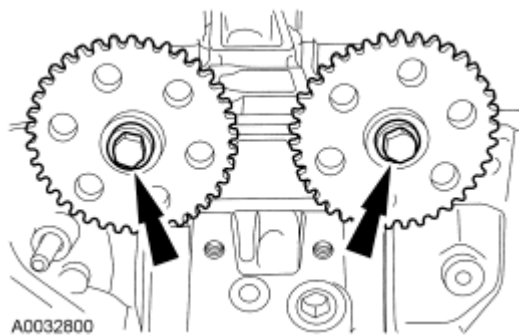


Fig. 59: Locating Camshaft Sprocket Bolts
Courtesy of FORD MOTOR CO.

2. Install the LH timing chain guide and the bolts.
 - To install, tighten to 10 N.m (89 lb-in).

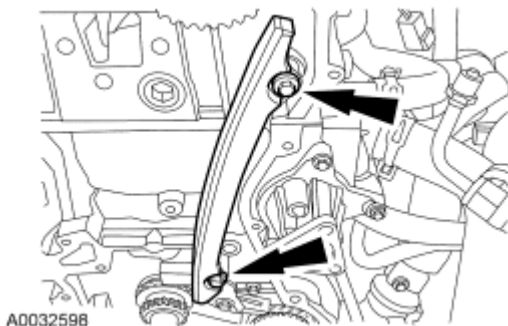


Fig. 60: Identifying Bolts And LH Timing Chain Guide
Courtesy of FORD MOTOR CO.

3. Install the timing chain.

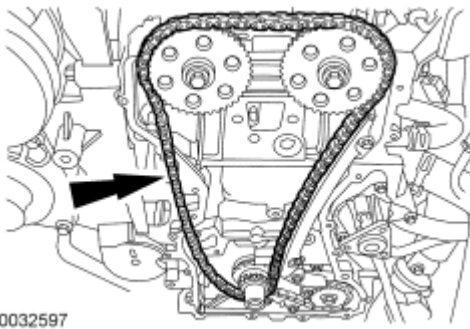


Fig. 61: View Of Timing Chain
Courtesy of FORD MOTOR CO.

4. Install the RH timing chain guide.

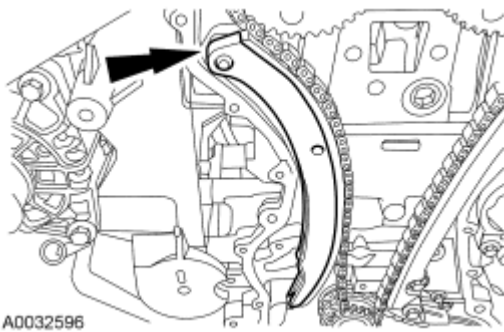


Fig. 62: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

5. Install the timing chain tensioner and the bolts. Remove the paper clip to release the piston.
 - Tighten to 10 N.m (89 lb-in).

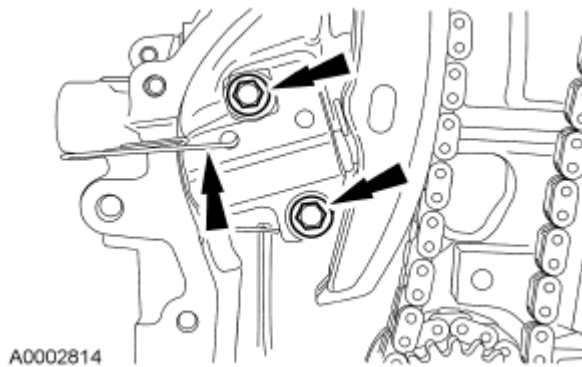


Fig. 63: Locating Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

CAUTION: The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

6. Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.
 - Tighten to 72 N.m (53 lb-ft).

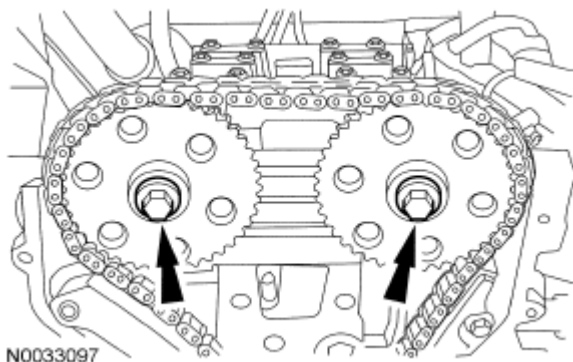


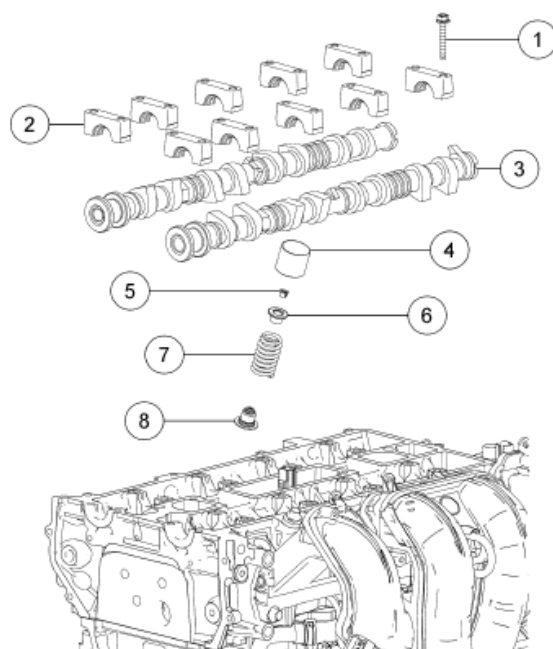
Fig. 64: Locating Camshafts Bolts
Courtesy of FORD MOTOR CO.

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

VALVE TRAIN COMPONENTS - EXPLODED VIEW

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



A0005111

Item	Part Number	Description
1	W706283	Camshaft bearing cap bolt (20 required)
2	6A284	Camshaft bearing cap (10 required)
3	6A267	Camshaft (2 required)
4	6500	Valve tappet (16 required)
5	6518	Valve collet (16 required)

Item	Part Number	Description
6	6514	Valve spring retainer (16 required)
7	6513	Valve spring (16 required)
8	6517	Valve seal (16 required)

Fig. 65: Identifying Valve Train Components
Courtesy of FORD MOTOR CO.

1. For additional information, refer to the appropriate procedure.

CAMSHAFTS

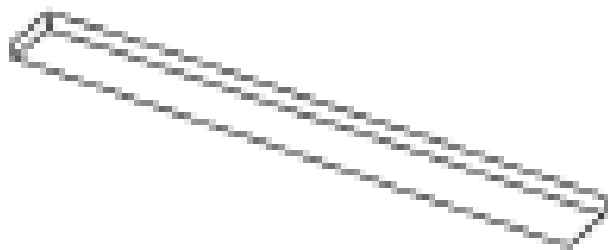
Special Tool(s)

SPECIAL TOOL(S)

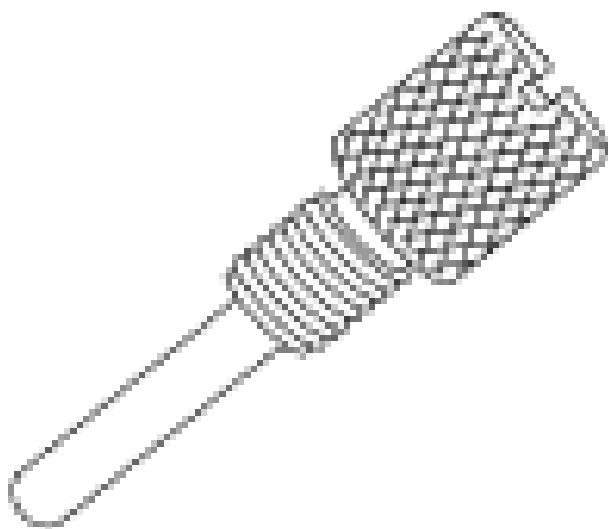
Alignment Plate, Camshaft
303-465 (T94P-6256-CH)

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST2645-A



ST2638-A

Timing Peg, Crankshaft
303-507

Materials

MATERIALS

Item	Specification
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

Removal

CAUTION: 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.

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. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
3. Check the valve clearance. For additional information, refer to **VALVE CLEARANCE CHECK**.
4. Remove the accessory drive belt. For additional information, refer to **REMOVAL AND INSTALLATION**.

CAUTION: 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 TDC.
 - The hole in the crankshaft pulley should be in the 6 o'clock position.

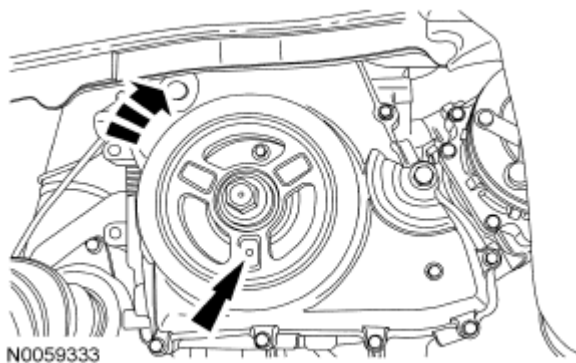


Fig. 66: Removing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

CAUTION: The special tool 303-465 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 special tool cannot be installed,

rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

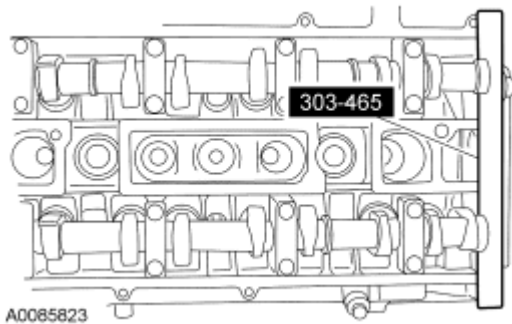


Fig. 67: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

6. Install the special tool in the slots on the rear of both camshafts.
7. Remove the engine plug bolt.

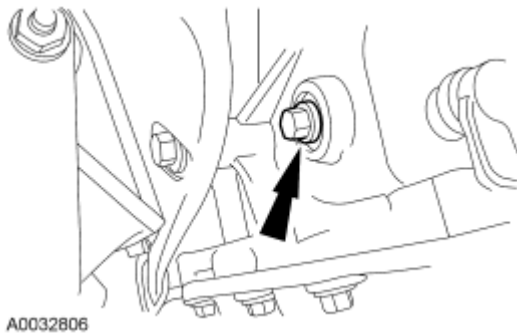


Fig. 68: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The special tool 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 camshaft removal and installation.

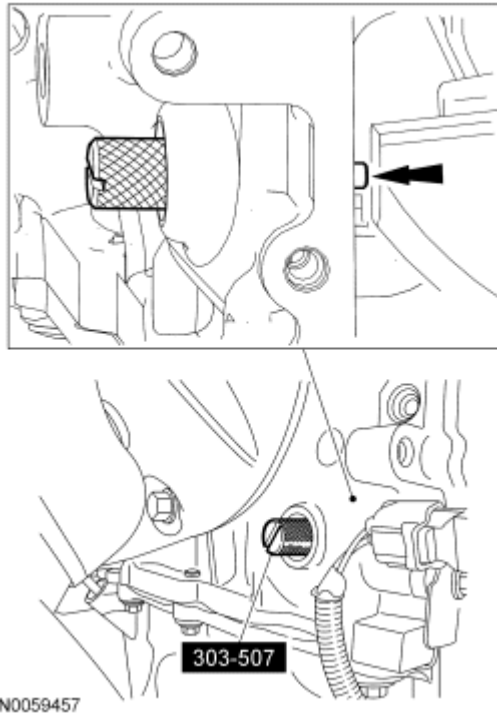


Fig. 69: Identifying Special Tool (303-507)
Courtesy of FORD MOTOR CO.

8. Install the special tool.

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

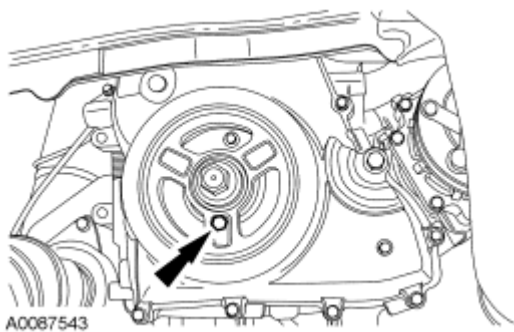


Fig. 70: Aligning Crankshaft Pulley Bolt Holes
Courtesy of FORD MOTOR CO.

9. Install a standard 6 mm (0.23 in) x 18 mm (0.7 in.) bolt through the crankshaft pulley and thread it into the front cover.
10. Remove the lower front cover timing hole plug from the engine front cover.

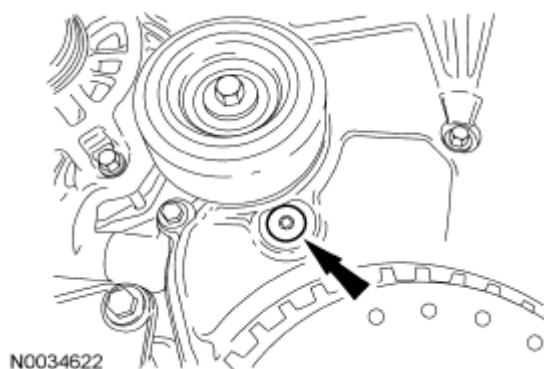


Fig. 71: Locating Lower Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

11. Remove the upper front cover timing hole plug from the engine front cover.

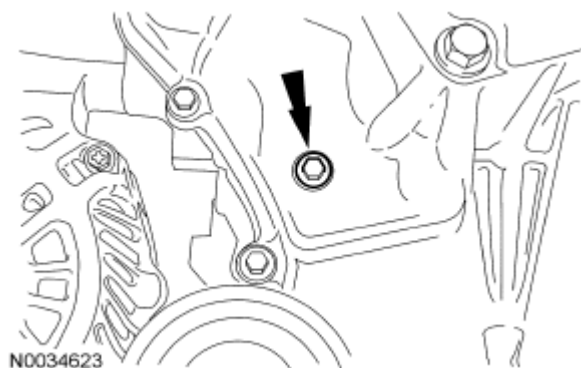


Fig. 72: Locating Upper Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

12. Reposition the special tool to the slot on the rear of the intake camshaft only.

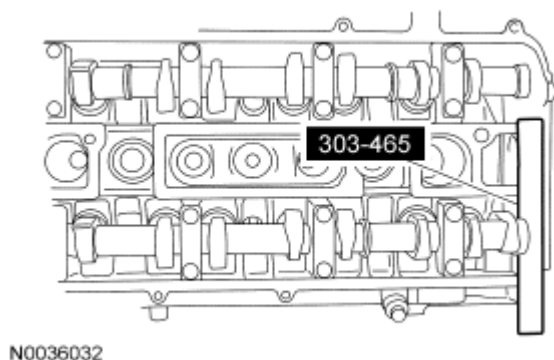


Fig. 73: Identifying Special Tool (303-465) In Slots On Rear Of Camshafts
Courtesy of FORD MOTOR CO.

NOTE: Releasing the ratcheting mechanism in the timing chain tensioner allows

the plunger to collapse and create slack in the timing chain. Installing an M6 x 30 mm (1.18 in) bolt into the upper front cover timing hole will hold the tensioner arm in a retracted position and allow enough slack in the timing chain for removal of the exhaust camshaft gear.

13. Using a small pick tool, unlock the chain tensioner ratchet through the lower front cover timing hole.
 - Using the flats of the camshaft, have an assistant rotate the exhaust camshaft clockwise to collapse the timing chain tensioner plunger.
 - Insert an M6 x 30 mm (1.18 in) bolt into the upper front cover timing hole to hold the tensioner arm in the retracted position.

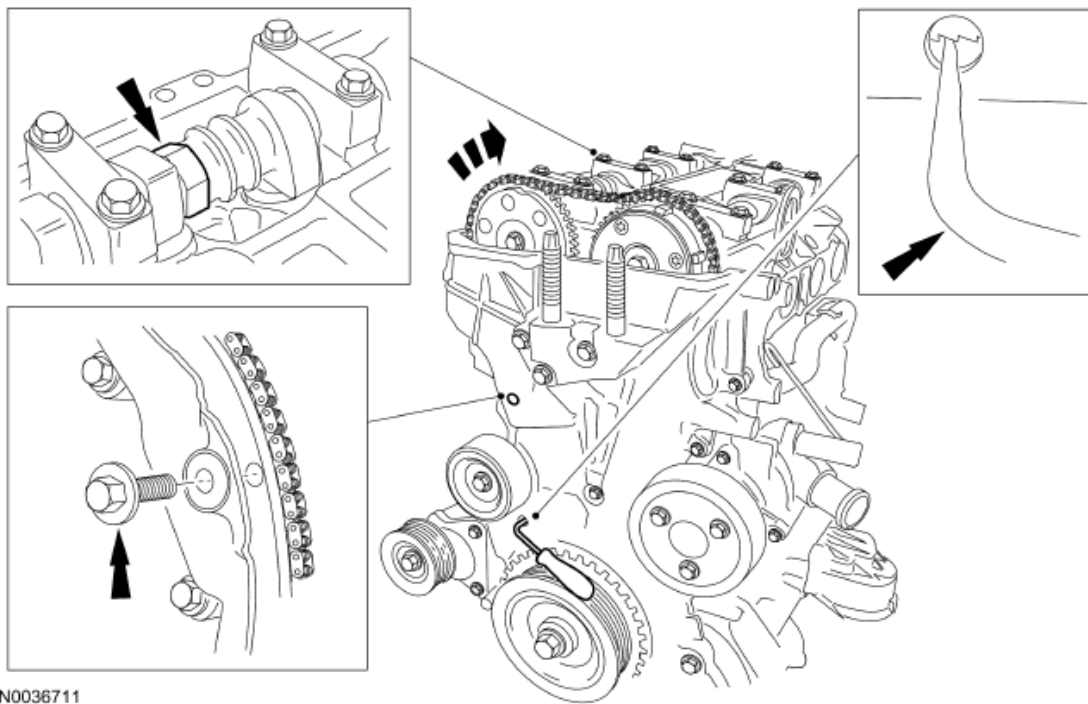
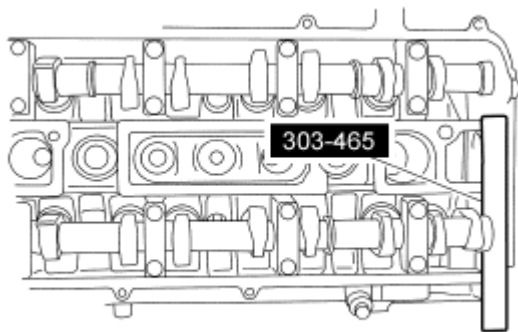


Fig. 74: Unlocking Chain Tensioner Ratchet Through Lower Front Cover Timing Hole
Courtesy of FORD MOTOR CO.

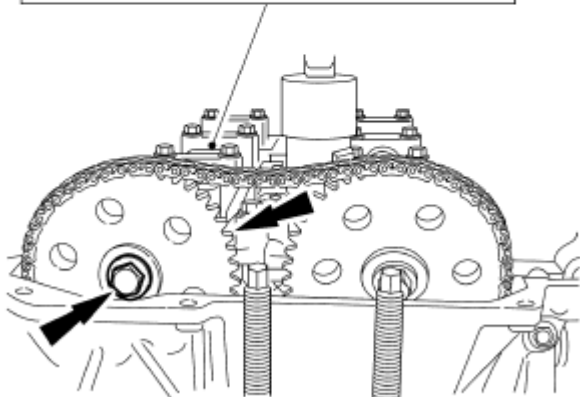
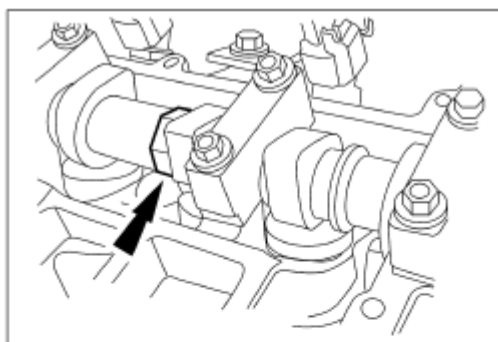
14. Remove the special tool.



N0036032

Fig. 75: Identifying Special Tool (303-465) In Slots On Rear Of Camshafts
Courtesy of FORD MOTOR CO.

15. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and exhaust camshaft drive gear.



N0039584

Fig. 76: Locating Bolt & Exhaust Camshaft Drive Gear
Courtesy of FORD MOTOR CO.

16. Remove the timing chain from the intake camshaft drive gear.

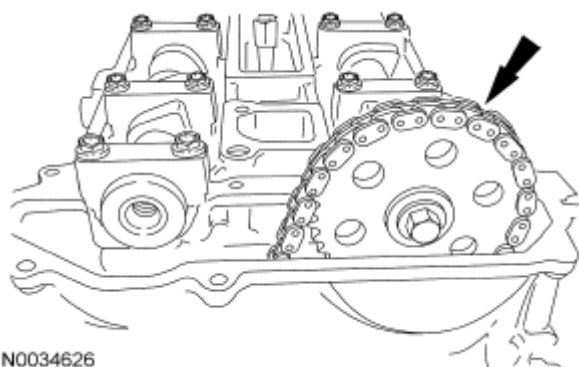


Fig. 77: Locating Timing Chain
Courtesy of FORD MOTOR CO.

17. Using the flats on the camshaft to prevent camshaft rotation, remove the bolt and intake camshaft drive gear.

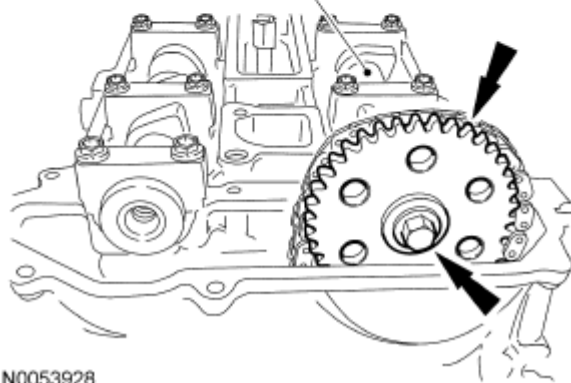
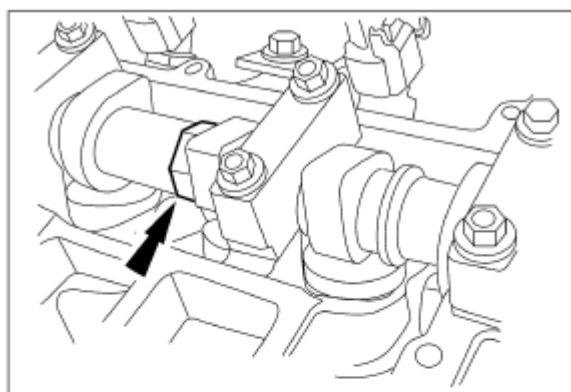


Fig. 78: Locating Bolt & Intake Camshaft Drive Gear
Courtesy of FORD MOTOR CO.

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

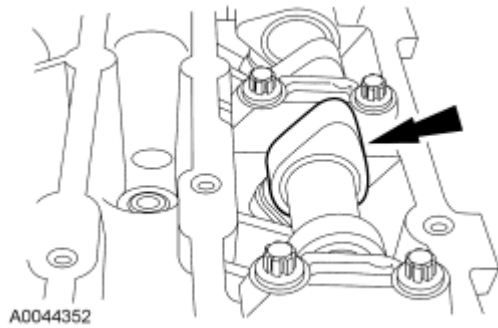


Fig. 79: Locating Camshaft Lobe
Courtesy of FORD MOTOR CO.

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

19. Remove the camshafts from the engine.

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

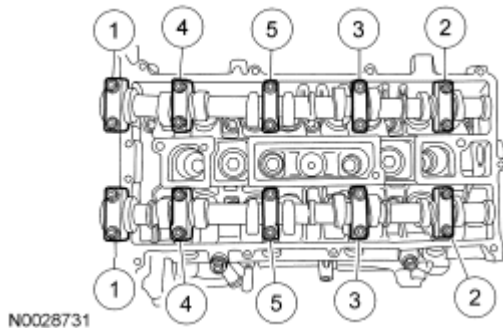


Fig. 80: Identifying Loosening/Tightening Sequence Of Camshaft Bearing Bolts
Courtesy of FORD MOTOR CO.

Installation

CAUTION: 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. 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 N.m (62 lb-in).
- Stage 3: Tighten to 16 N.m (12 lb-ft).

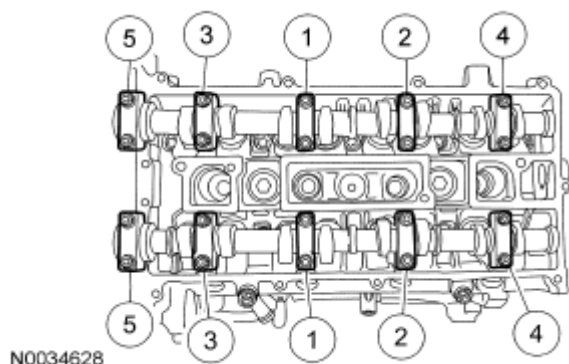


Fig. 81: Identifying Bolts & Camshaft Bearing Caps
Courtesy of FORD MOTOR CO.

2. Install the special tool.

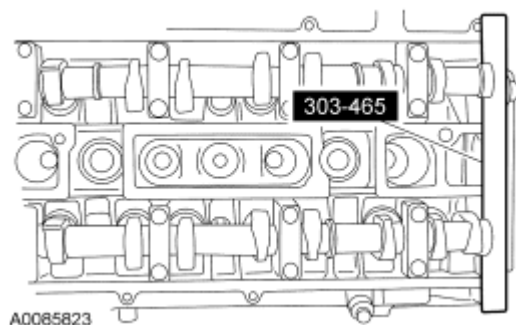


Fig. 82: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

3. Install the intake camshaft drive gear and hand-tighten the bolt.

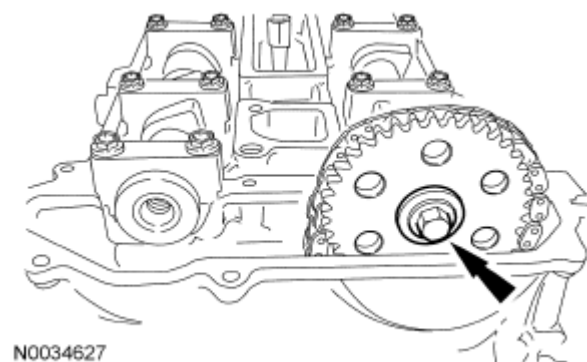


Fig. 83: Identifying Intake Camshaft Drive Gear & Bolt
Courtesy of FORD MOTOR CO.

4. Install the timing chain on the intake camshaft drive gear.

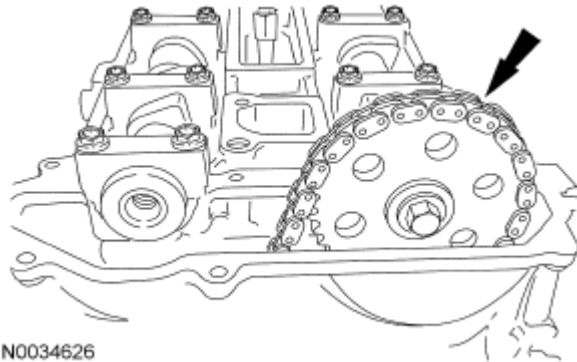


Fig. 84: Locating Timing Chain On Intake Camshaft Drive Gear
Courtesy of FORD MOTOR CO.

NOTE: The timing chain must be correctly engaged on the teeth of the crankshaft timing sprocket and the intake camshaft drive gear in order to install the exhaust camshaft drive gear onto the exhaust camshaft.

5. Position the exhaust camshaft drive gear in the timing chain and install the gear and bolt on the exhaust camshaft.
 - Hand-tighten the bolt.

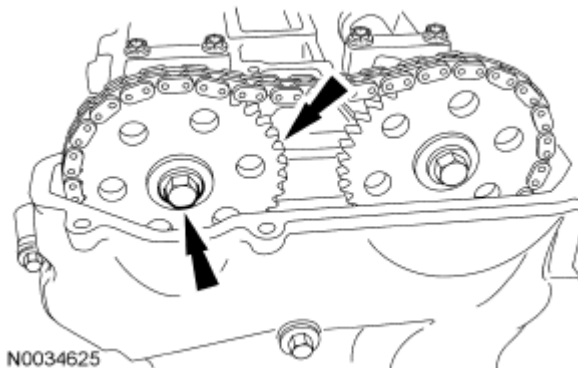


Fig. 85: Locating Timing Chain Gear & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Releasing the tensioner arm will remove the slack from the timing chain release.

6. Remove the M6 x 30 mm bolt from the upper front cover timing hole to release the tensioner arm.

CAUTION: The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

7. Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.
 - Tighten to 72 N.m (53 lb-ft).

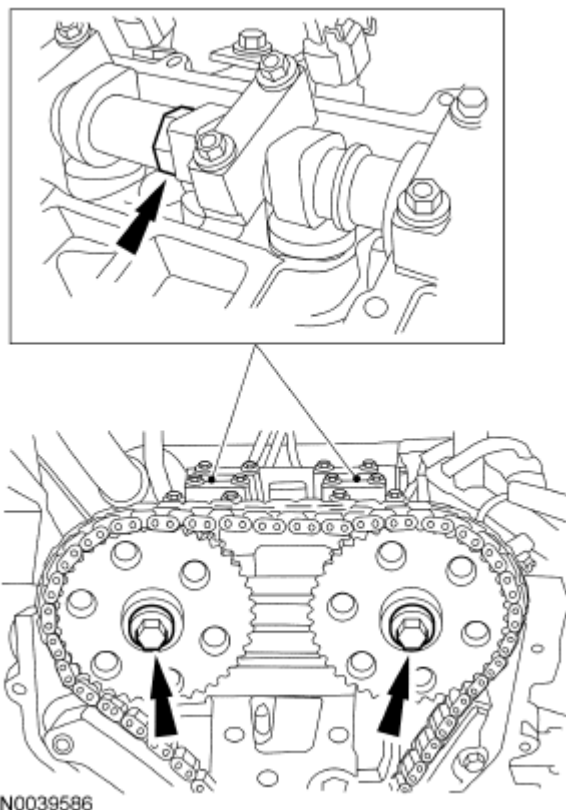


Fig. 86: Locating Camshaft Bolt
Courtesy of FORD MOTOR CO.

8. Remove the special tool.

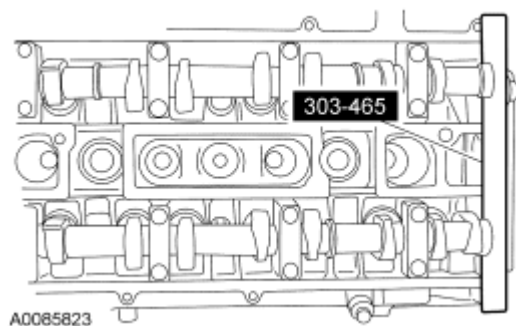


Fig. 87: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

9. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

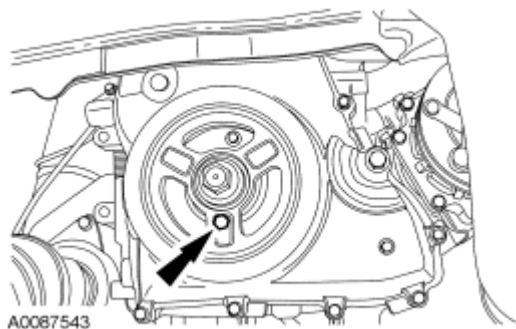


Fig. 88: Aligning Crankshaft Pulley Bolt Holes
Courtesy of FORD MOTOR CO.

10. Remove the special tool.

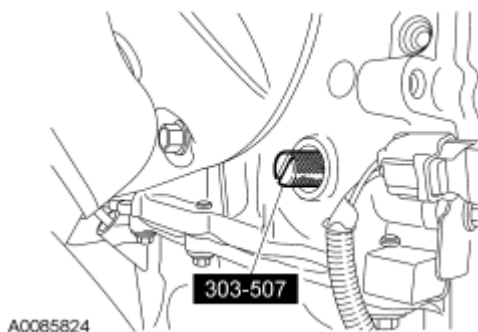


Fig. 89: Identifying Special Tool
Courtesy of FORD MOTOR CO.

11. Install the upper front cover timing hole plug.
- Tighten to 10 N.m (89 lb-in).

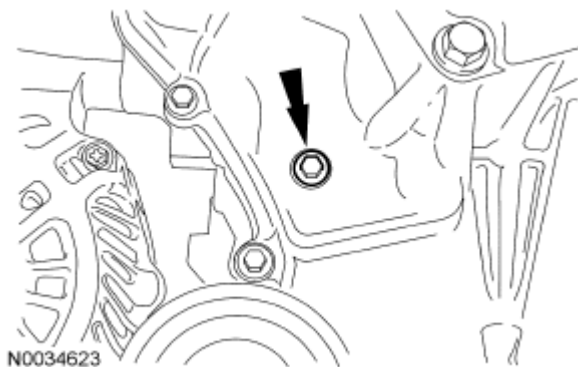


Fig. 90: Locating Upper Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

12. Apply silicone gasket and sealant to the threads of the lower front cover timing hole plug.
 - Install the plug and tighten to 12 N.m (9 lb-ft).

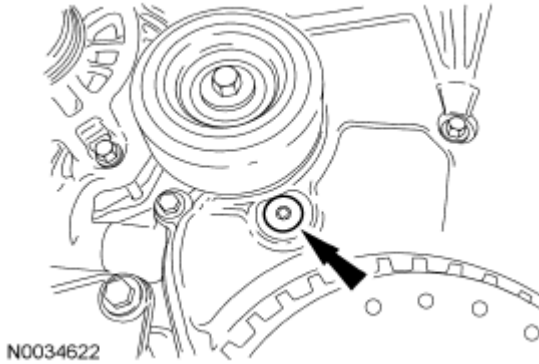


Fig. 91: Locating Lower Front Cover Timing Hole Plug
Courtesy of FORD MOTOR CO.

13. Install the engine plug bolt.
 - Tighten to 20 N.m (15 lb-ft).

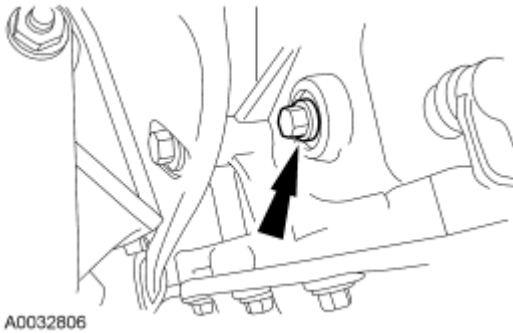


Fig. 92: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

14. Install the accessory drive belt. For additional information, refer to **REMOVAL AND INSTALLATION**.
15. Install the valve cover. For additional information, refer to **VALVE COVER**.
16. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.

VALVE SPRINGS

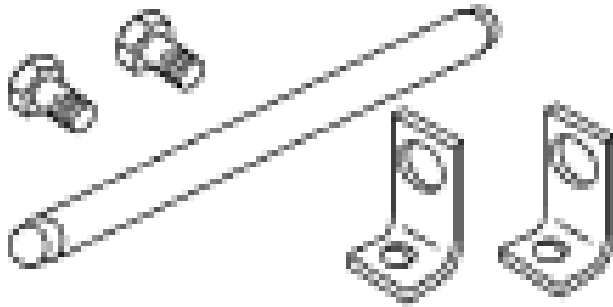
Special Tool(s)

SPECIAL TOOL(S)

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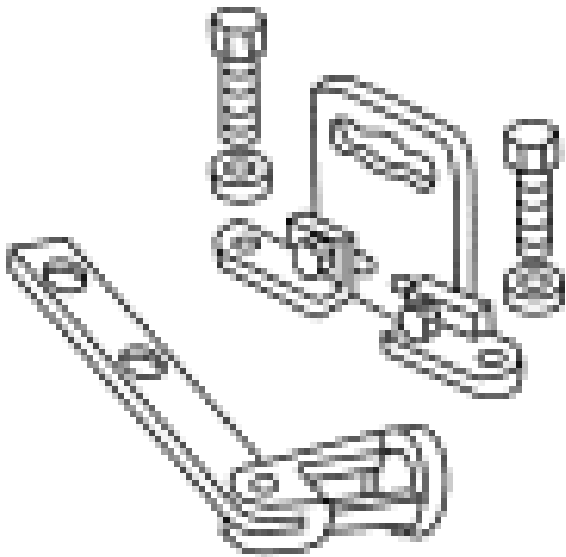
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ST1981-A

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



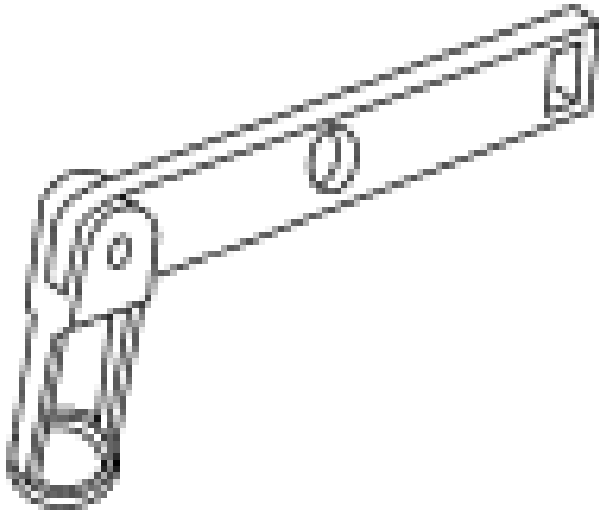
ST1907-A

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

Compressor, Valve Spring

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ST1902-A

303-472 (T94P-6565-AH)

Materials

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

Removal

CAUTION: 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 **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **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.

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 **REMOVAL**.

WARNING: Always wear protective goggles when working with compressed air. This can prevent injury. Failure to follow these instructions can result in personal injury.

CAUTION: 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 special tools, 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.

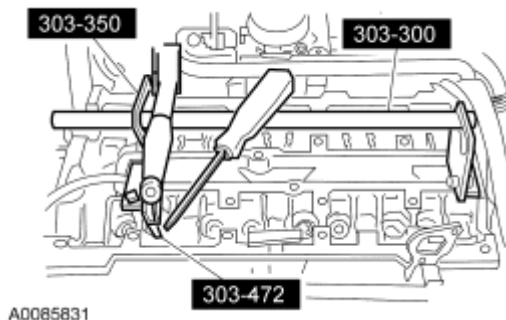


Fig. 93: Identifying Special Tools (303-300, 303-350, 303-472)
Courtesy of FORD MOTOR CO.

Installation

NOTE: Check the seating of the valve collet.

1. Using the special tools, 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.

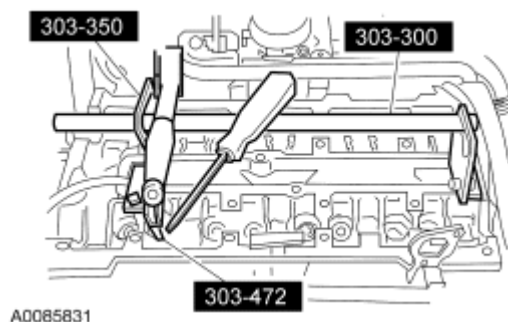


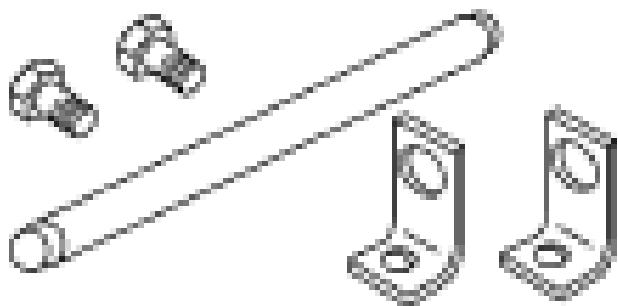
Fig. 94: Identifying Special Tools (303-300, 303-350, 303-472)
Courtesy of FORD MOTOR CO.

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 **INSTALLATION**.
5. Coat the valve tappets with clean engine oil and insert them.
6. Install the camshafts. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **CAMSHAFTS**.

VALVE SEALS

Special Tool(s)

SPECIAL TOOL(S)

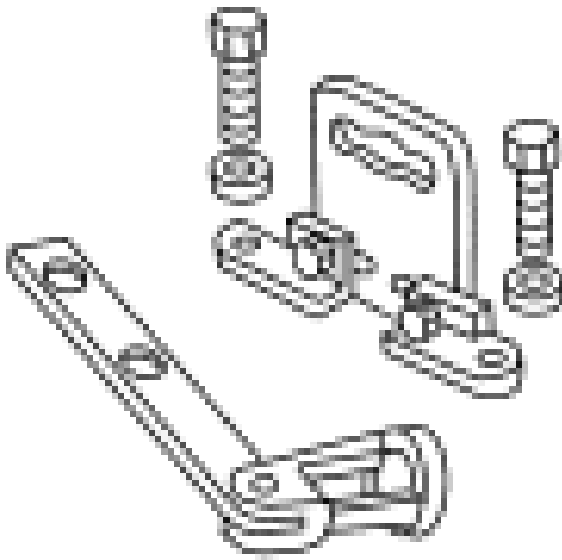


ST1981-A

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

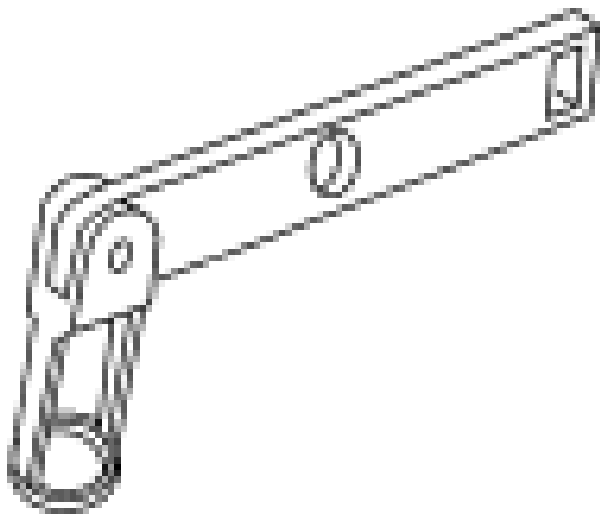
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ST1907-A

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

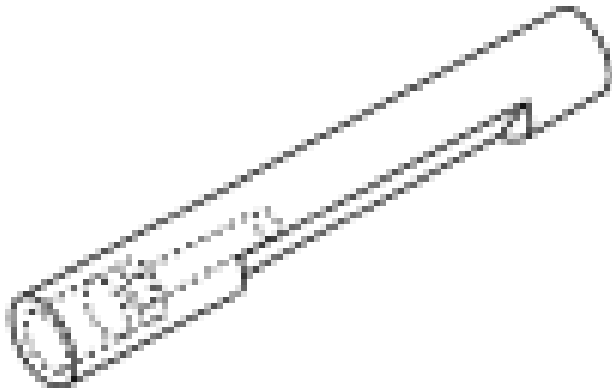


ST1902-A

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

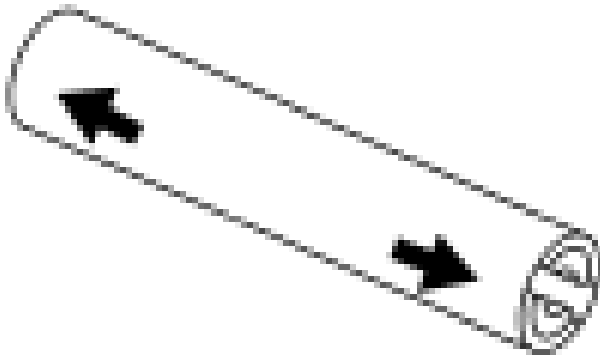
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ST1906-A

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)

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ST1187-A

Materials

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B

Removal

CAUTION: 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 **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **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.

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 **REMOVAL**.

WARNING: Always wear protective goggles when working with compressed air. This can prevent injury. Failure to follow these instructions can result in personal injury.

CAUTION: 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 special tools, 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.

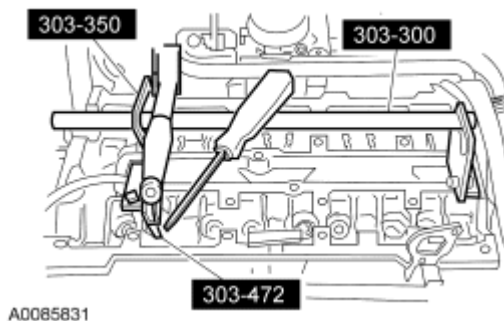


Fig. 95: Identifying Special Tools (303-300, 303-350, 303-472)
Courtesy of FORD MOTOR CO.

7. Using the special tools, remove and discard the valve seal.

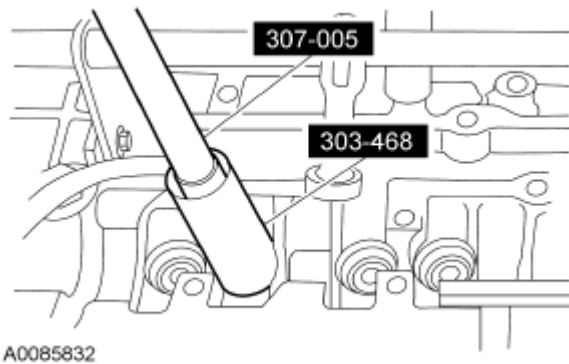


Fig. 96: Identifying Special Tools (307-005, 303-468)
Courtesy of FORD MOTOR CO.

Installation

1. Install the valve stem seal installation sleeve.

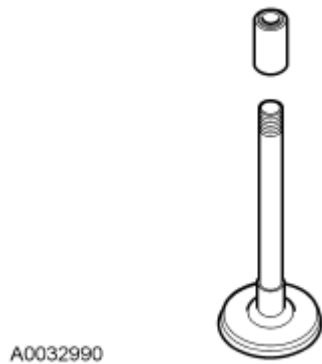


Fig. 97: Identifying Valve Stem Seal
Courtesy of FORD MOTOR CO.

2. Using the special tool, install the valve seal.

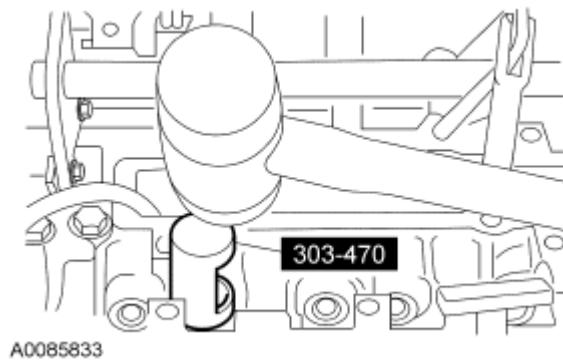


Fig. 98: Installing Valve Seal Using Special Tool (303-470)
Courtesy of FORD MOTOR CO.

NOTE: Check the seating of the valve collet.

3. Using the special tools, 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.

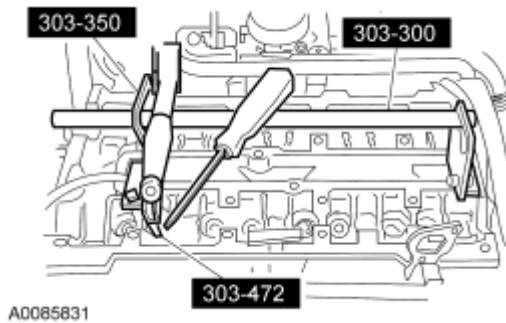


Fig. 99: Identifying Special Tools (303-300, 303-350, 303-472)
Courtesy of FORD MOTOR CO.

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 **INSTALLATION**.
7. Coat the valve tappets with clean engine oil and insert them.
8. Install the camshafts. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **CAMSHAFTS**.

VALVE TAPPETS

Materials

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

Removal and Installation

CAUTION: 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 &**

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LIFTING .

2. Remove the camshafts. For additional information, refer to **VALVE TRAIN COMPONENTS - EXPLODED VIEW** and **CAMSHAFTS**.

NOTE:

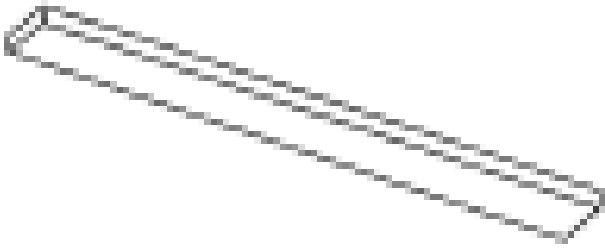
If the camshafts and valve tappets are to be reused, mark the location of the valve tappets to make sure they are assembled in their original positions.

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 TOOL(S)

 ST2645-A	Alignment Plate, Camshaft 303-465 (T94P-6256-CH)
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MATERIALS

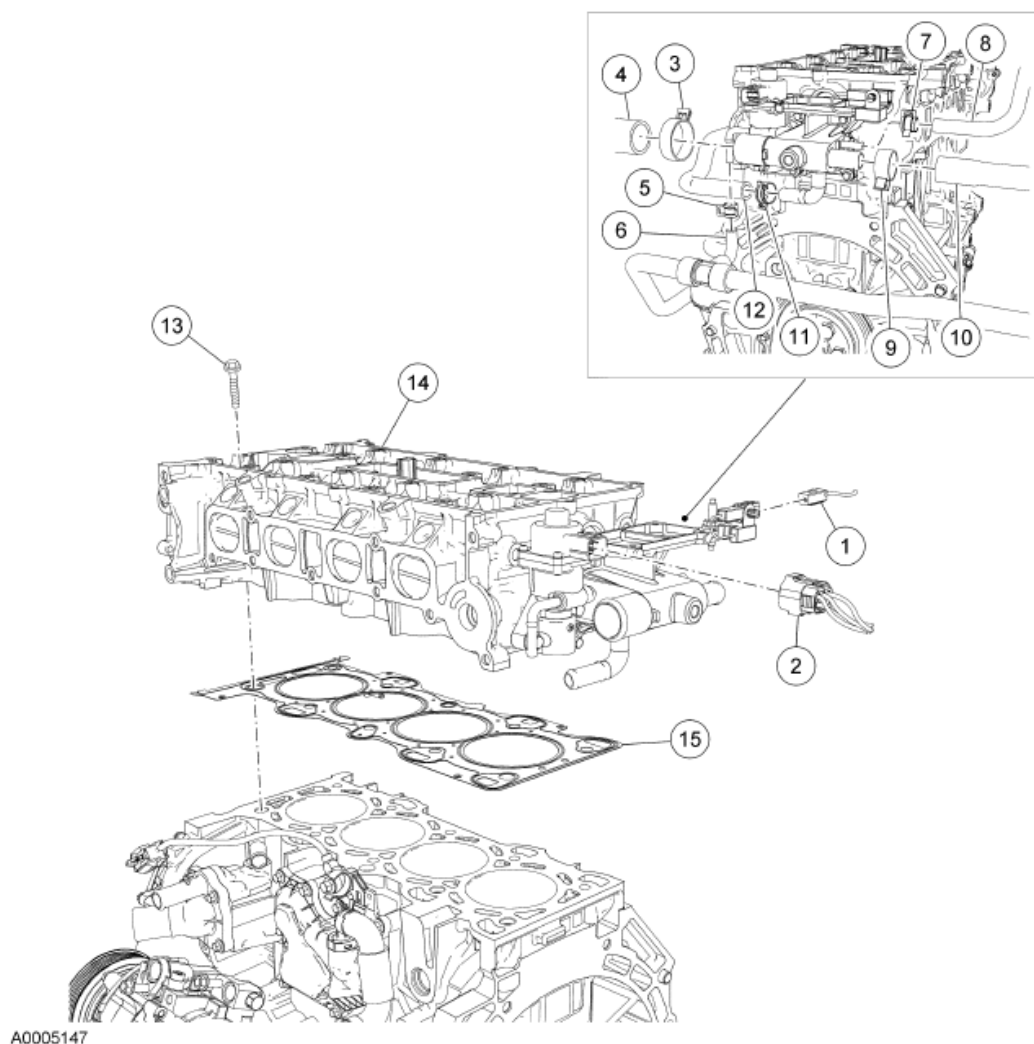
Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket Remover ZC-30	-
Motorcraft Metal Surface Prep ZC-31	-

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Silicone Gasket and Sealant
TA-30

WSE-M4G323-A4



Item	Part Number	Description
1	14489	Radio ignition interference capacitor electrical connector (part of 12B637)
2	14A464	Exhaust gas recirculation (EGR) valve electrical connector (part of 12B637)
3	8287	Upper radiator hose clamp
4	8260	Upper radiator hose
5	W52592	EGR coolant tube clamp
6	18K580	EGR coolant hose (part of heater hose)

Item	Part Number	Description
7	—	Engine coolant vent hose clamp (part of 8W005)
8	8W005	Engine coolant vent hose
9	—	Heater hose clamp (part of 18K580)
10	18K580	Heater hose
11	W525958	Bypass hose clamp
12	8548	Bypass hose
13	6065	Cylinder head bolt (10 required) (F7AZ-19554-EA)
14	6050	Cylinder head
15	6051	Cylinder head gasket

Fig. 100: Identifying Cylinder Head Components
Courtesy of FORD MOTOR CO.

Removal**CAUTION:**

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 you loosen the pulley bolt. 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.

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 PRESSURE RELEASE**.
3. Drain the engine cooling system. For additional information, refer to **DRAINING**.
4. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.
5. Remove the special tool.

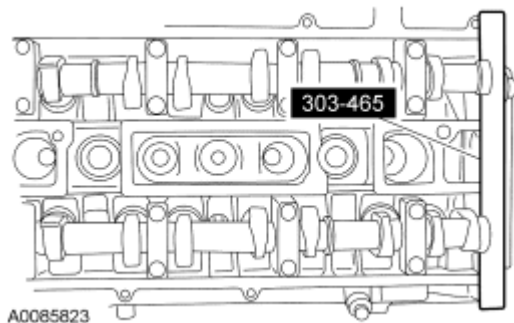


Fig. 101: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

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

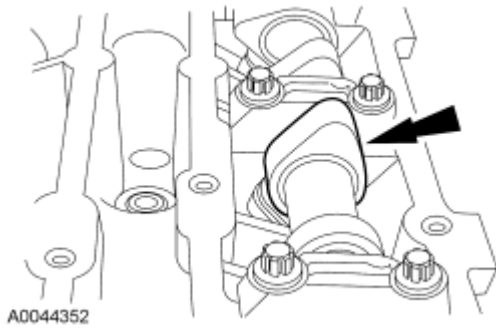


Fig. 102: Locating Camshaft Lobe
Courtesy of FORD MOTOR CO.

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

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

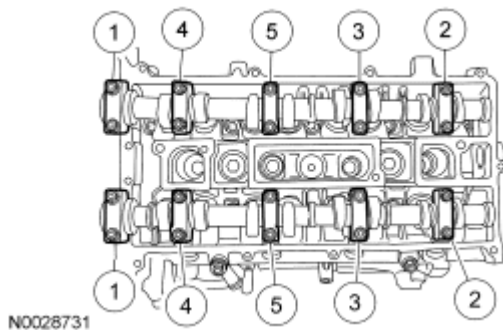


Fig. 103: Identifying Loosening/Tightening Sequence Of Camshaft Bearing Bolts
Courtesy of FORD MOTOR CO.

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

8. 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.

9. Inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM-GENERAL INFORMATION**.
10. Remove the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.
11. Remove the exhaust manifold. For additional information, refer to **EXHAUST SYSTEM**.
12. Disconnect the radio ignition interference capacitor electrical connector.
13. Disconnect the exhaust gas recirculation (EGR) valve electrical connector.
14. Disconnect the EGR coolant hose from the EGR valve.
15. Disconnect the upper radiator hose, coolant bypass hose, heater hose and coolant vent hose from the engine coolant outlet.
16. Remove the bolts and the cylinder head.
 - Discard the bolts and the cylinder head gasket.

Installation**CAUTION:**

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.

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.
 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. Inspect the cylinder head for distortion. For additional information, refer to **ENGINE SYSTEM-GENERAL INFORMATION**.
4. Apply silicone gasket and sealant to the locations shown in **Fig. 104**.

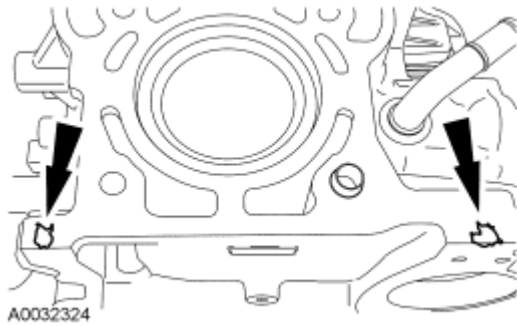


Fig. 104: Identifying Silicone Gasket And Sealant Location
Courtesy of FORD MOTOR CO.

5. Install a new head gasket.

NOTE:

The cylinder head bolts are torque-to-yield and must not be reused. New cylinder head bolts must be installed.
Lubricate the bolts with clean engine oil prior to installation.

6. Install new cylinder head bolts. Tighten the bolts in the sequence shown in 5 stages:
 - Stage 1: Tighten to 5 N.m (44 lb-in).
 - Stage 2: Tighten to 15 N.m (11 lb-ft).
 - Stage 3: Tighten to 45 N.m (33 lb-ft).
 - Stage 4: Turn 90 degrees.
 - Stage 5: Turn an additional 90 degrees.

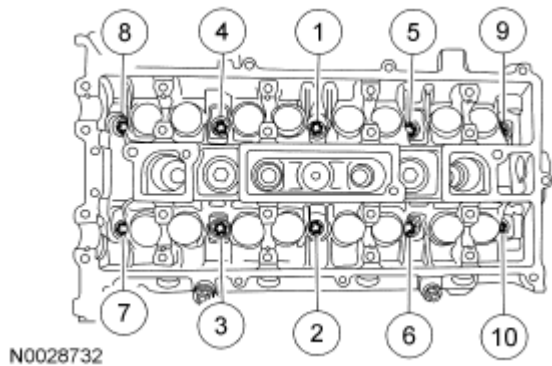


Fig. 105: Identifying Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

7. Connect the upper radiator hose, coolant bypass hose, heater hose and coolant vent hose to the engine coolant outlet.
8. Connect the EGR coolant hose to the EGR valve.
9. Connect the exhaust gas recirculation (EGR) valve electrical connector.

10. Connect the radio ignition interference capacitor electrical connector.
11. Install the exhaust manifold. For additional information, refer to **EXHAUST SYSTEM**.
12. Install the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.

NOTE: Lubricate the valve tappets with clean engine oil.

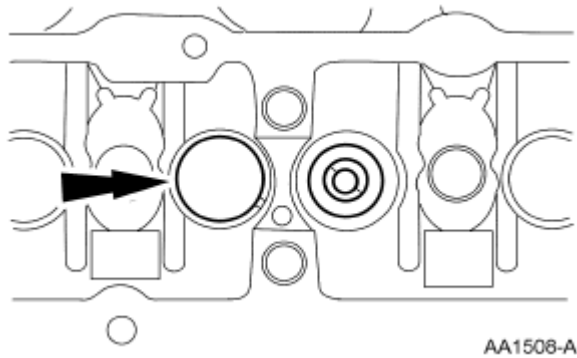


Fig. 106: Locating Intake Manifold
Courtesy of FORD MOTOR CO.

13. Install the valve tappets in their original positions.

CAUTION: 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.

14. Install the camshafts and bearing caps. Tighten the bolts 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 the bolts to 7 N.m (62 lb-in).
 - Stage 3: Tighten the bolts to 16 N.m (12 lb-ft).

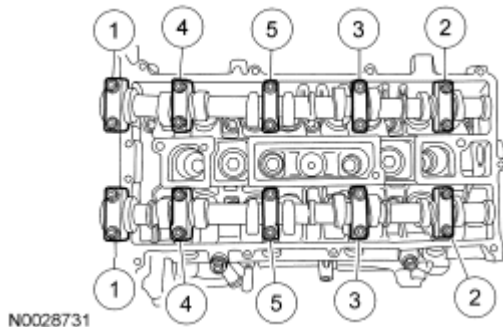


Fig. 107: Identifying Loosening/Tightening Sequence Of Camshaft Bearing Bolts
Courtesy of FORD MOTOR CO.

15. Install the special tool.

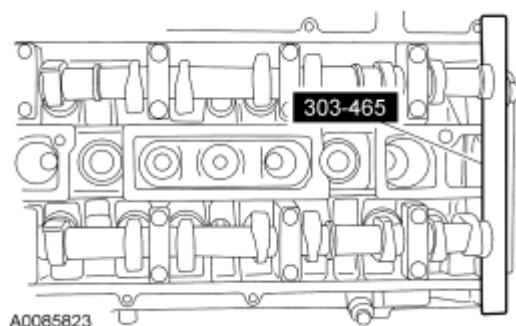
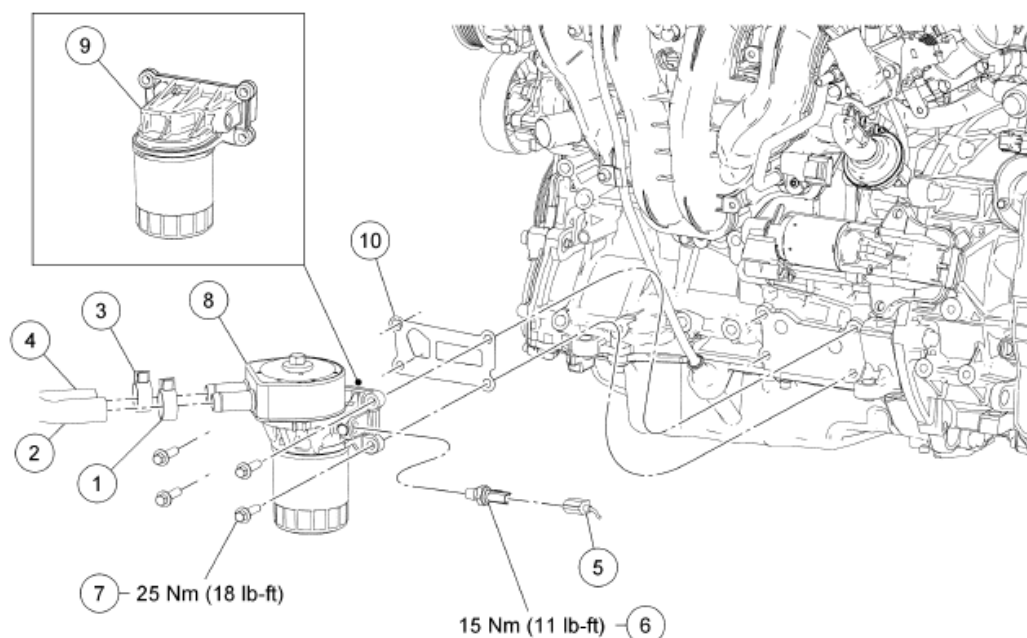


Fig. 108: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

16. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.
17. Fill and bleed the engine cooling system. For additional information, refer to **COOLING SYSTEM DRAINING, FILLING AND BLEEDING**.

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW



N0047206

Item	Part Number	Description
1	—	Heater hose clamp (part of 18K580) (early build)
2	18K850	Heater hose (early build)
3	8287A	Coolant hose clamp (early build)
4	8A593	Coolant hose (early build)
5	14A464	Oil pressure sender electrical connector (part of 12B637)

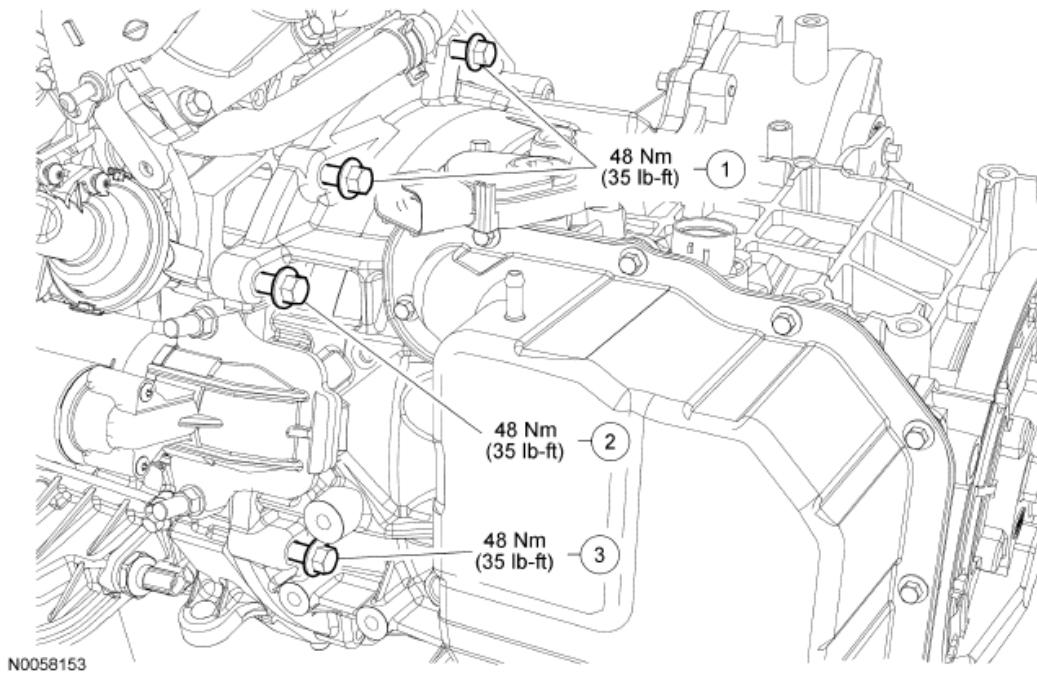
Item	Part Number	Description
6	9278	Oil pressure sender
7	W500225	Oil filter adapter bolt (4 required)
8	6884	Oil filter adapter (early build)
9	6881	Oil filter adapter (late build)
10	6A636	Oil filter adapter gasket

Fig. 109: Identifying Oil Filter Adapter & Oil Pressure Sender Components (With Torque Specifications)
 Courtesy of FORD MOTOR CO.

NOTE: Automatic transmission shown, manual transmission similar.

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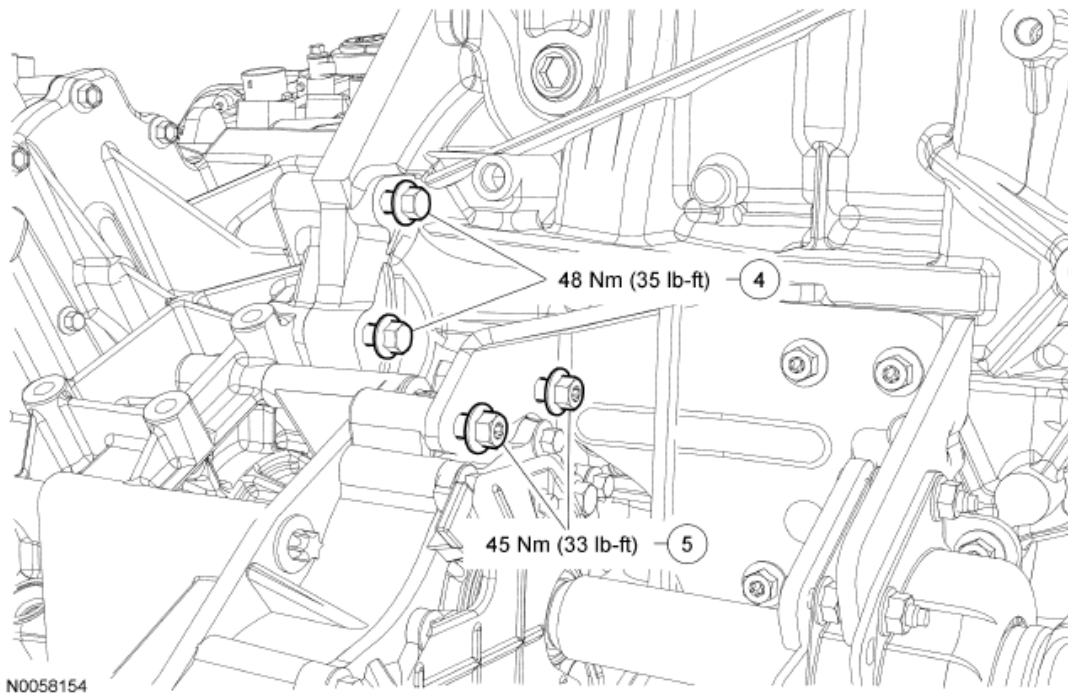


Item	Part Number	Description
1	W500121	Upper bellhousing-to-engine bolts
2	W500121	Front lower bellhousing-to-engine bolt

Item	Part Number	Description
3	W500125	Front lower bellhousing-to-engine bolt

Fig. 110: Identifying Oil Pan, Oil Pump Screen & Pickup Tube (FWD) Components (With Torque Specifications)

Courtesy of FORD MOTOR CO.



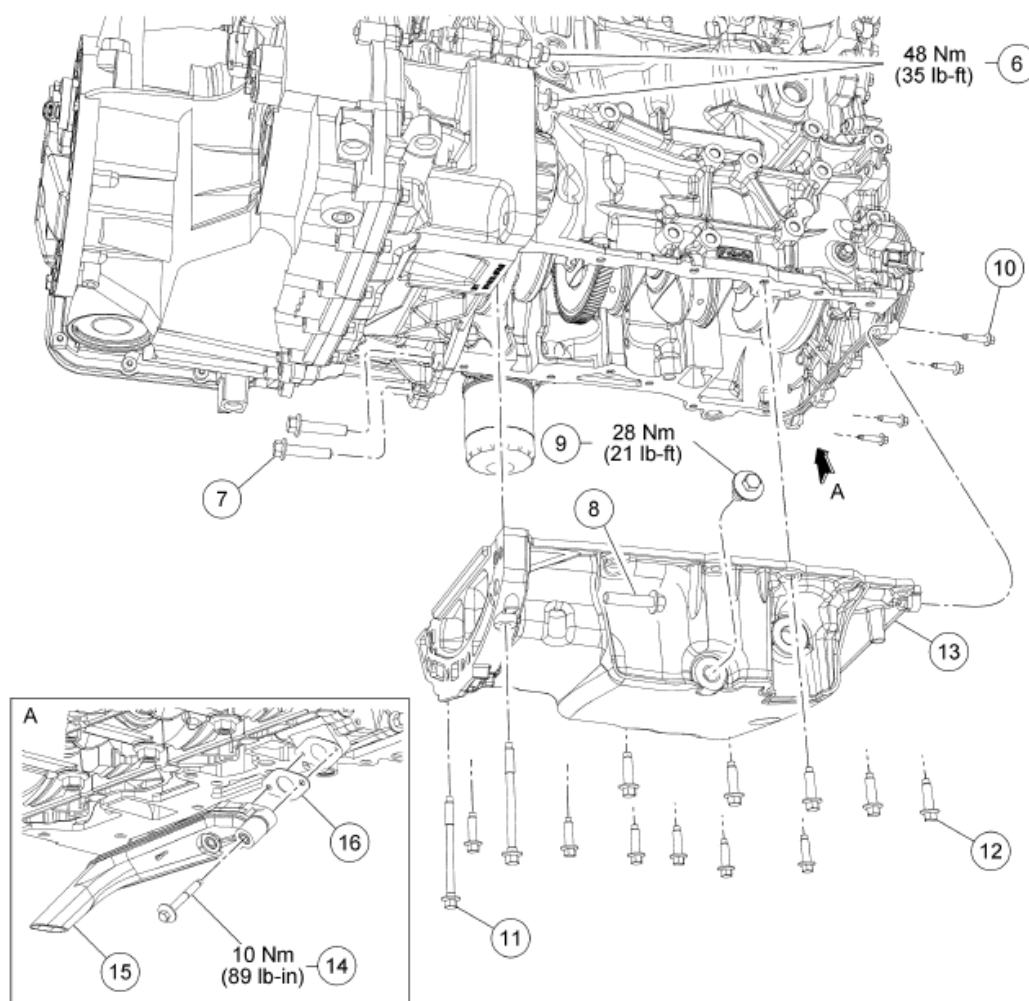
Item	Part Number	Description
4	W500125	Rear lower engine-to-bellhousing bolts
5	W707386	Upper engine bracket-to-power transfer unit (PTU) bolts

Fig. 111: Identifying Oil Pan, Oil Pump Screen & Pickup Tube (AWD) Components (With Torque Specifications)

Courtesy of FORD MOTOR CO.

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N0058155

Item	Part Number	Description
6	W500120	Rear lower engine-to-bellhousing bolts
7	W500121	Bellhousing-to-oil pan bolt (2 required)
8	W500121	Oil pan-to-bellhousing bolt (2 required)
9	6730	Oil pan drain plug
10	W500215	Engine front cover-to-oil pan bolt (4 required)

Item	Part Number	Description
11	W706284	Oil pan bolt (2 required)
12	W500224	Oil pan bolt (11 required)
13	6675	Oil pan
14	W706282	Oil pump screen and pickup tube bolt (2 required)
15	6622	Oil pump screen and pickup tube
16	6625	Oil pump screen and pickup tube gasket

Fig. 112: Identifying Oil Pan, Oil Pump Screen & Pickup Tube (FWD) Components (With Torque Specifications)
Courtesy of FORD MOTOR CO.

1. For additional information, refer to the appropriate procedure.

OIL FILTER ADAPTER

Removal and Installation**All vehicles**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the 5 bolts and the RH splash shield.
 - To install, tighten to 9 N.m (80 lb-in).

Early build vehicles

3. Drain the engine cooling system. For additional information, refer to **DRAINING**.
4. Disconnect the 2 coolant hoses from the oil cooler.

All vehicles

5. Disconnect the oil pressure sender electrical connector.

NOTE: Discard the gasket.

6. Remove the 4 bolts and the oil filter adapter.
 - To install, tighten to 25 N.m (18 lb-ft).
7. To install, reverse the removal procedure.

Early build vehicles

8. Fill and bleed the engine cooling system. For additional information, refer to **COOLING SYSTEM DRAINING, FILLING AND BLEEDING**.

ENGINE OIL PRESSURE (EOP) SWITCH**Materials****MATERIALS**

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. Remove the 5 bolts and the RH splash shield.
 - To install, tighten to 9 N.m (80 lb-in).
3. Disconnect the oil pressure sender electrical connector.

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4. Remove the oil pressure sender.
 - To install, tighten to 15 N.m (11 lb-ft).
5. To install, reverse the removal procedure.
 - Apply thread sealant to the oil pressure sender threads.

OIL PAN

Materials

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft Metal Surface Cleaner ZC-21	WSE-M5B392-A

Removal

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the air cleaner outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION**.

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

3. Loosen the 2 bellhousing-to-engine bolts 5 mm (0.19 in).

All wheel drive (AWD) vehicles

4. Working from the top of the vehicle, loosen the 2 rear lower engine-to-bellhousing bolts 5 mm (0.19 in).
5. Working from under the vehicle, loosen the 2 upper engine bracket-to-power transfer unit (PTU) bolts 5 mm (0.19 in).

All vehicles

6. Remove the 7 retainers and the LH splash shield.

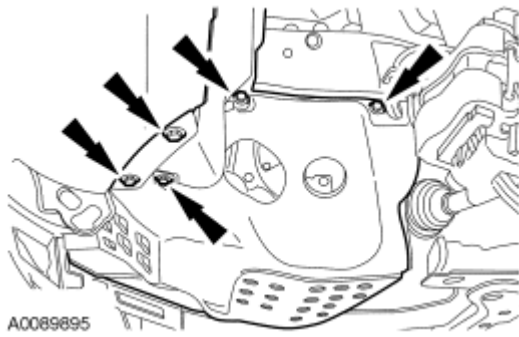


Fig. 113: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

7. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
8. Loosen the 2 front lower bellhousing-to-engine bolts 5 mm (0.19 in).

Front wheel drive (FWD) vehicles

9. Loosen the 1 (manual transmission) and 2 (automatic transmission) rear lower engine-to-bellhousing bolt 5 mm (0.19 in).

All vehicles

10. Remove the 2 oil pan-to-bellhousing bolts.
11. Remove the 2 bellhousing-to-oil pan bolt.
12. Slide the transmission rearward 5 mm (0.19 in).
13. Drain the engine oil.
 - Install the drain plug.
 - To install, tighten to 28 N.m (21 lb-ft).
14. Remove the 4 engine front cover-to-oil pan bolts.
15. Remove the 13 bolts and the oil pan.

Installation

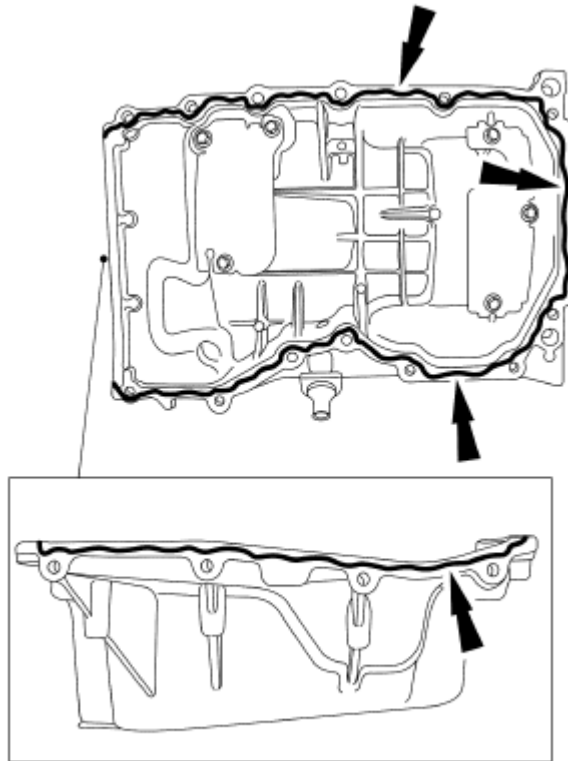
All vehicles

CAUTION: 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 cleaner. 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.



N0059402

Fig. 114: Locating Silicone Gasket
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 oil pan bolts finger-tight.

CAUTION: 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 N.m (89 lb-in).

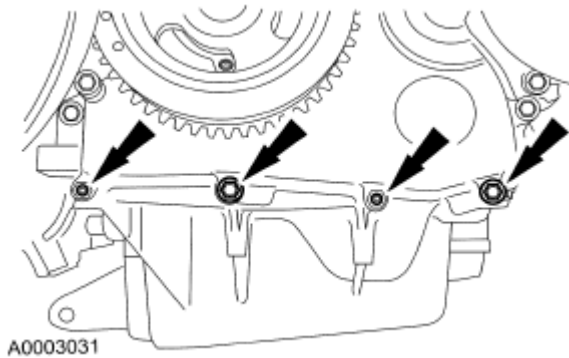


Fig. 115: Locating Engine Front Cover-To-Oil Pan Bolts
Courtesy of FORD MOTOR CO.

5. Tighten the oil pan bolts in the sequence shown in **Fig. 116**.
 - Tighten to 25 N.m (18 lb-ft).

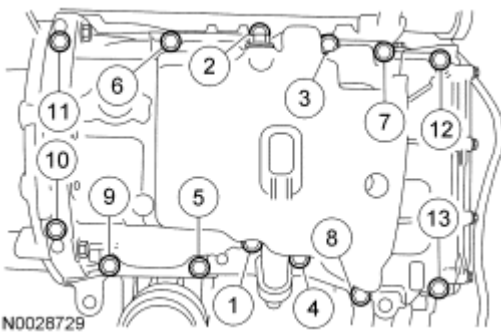


Fig. 116: Identifying Tightening Sequence Of Oil Pan Bolts
Courtesy of FORD MOTOR CO.

FWD vehicles

6. Alternate tightening the 1 front and 1 rear lower bolts to slide the transmission and engine together.
 - Tighten to 48 N.m (35 lb-ft).
7. Tighten the remaining front lower bolt and rear lower bolt (automatic transmission).
 - Tighten to 48 N.m (35 lb-ft).

AWD vehicles

8. Alternate tightening the 1 upper engine-to-PTU bracket bolt and 1 front lower bolt to slide transmission and engine together.
 - Tighten the PTU bracket bolt to 45 N.m (33 lb-ft).
 - Tighten the front lower bolt to 48 N.m (35 lb-ft).
9. Tighten the remaining upper engine-to-PTU bracket bolt.
 - Tighten to 45 N.m (33 lb-ft).

10. Tighten the remaining front lower bolt.
 - Tighten to 48 N.m (35 lb-ft).

All vehicles

11. Install the 2 bellhousing-to-oil pan bolts.
 - Tighten to 48 N.m (35 lb-ft).
12. Install the 2 oil pan-to-bellhousing bolts.
 - Tighten to 48 N.m (35 lb-ft).
13. Install the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
14. Install the LH splash shield and the 7 retainers.
 - Tighten to 9 N.m (80 lb-in).

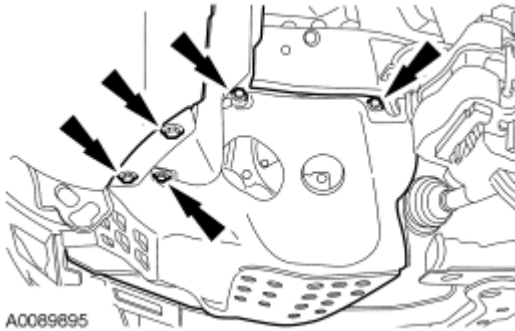


Fig. 117: View Of LH Splash Shield And Retainers
Courtesy of FORD MOTOR CO.

AWD vehicles

15. Working from the top of vehicle, tighten the 2 rear lower engine-to-bellhousing bolts.
 - Tighten to 48 N.m (35 lb-ft).

All vehicles

16. Tighten the 2 top bellhousing-to-engine bolts.
 - Tighten to 48 N.m (35 lb-ft).
17. Install the air cleaner outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION**.
18. Fill the engine with clean engine oil.

OIL PUMP SCREEN AND PICKUP TUBE**Removal and Installation**

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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 **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW** and **OIL PAN**.

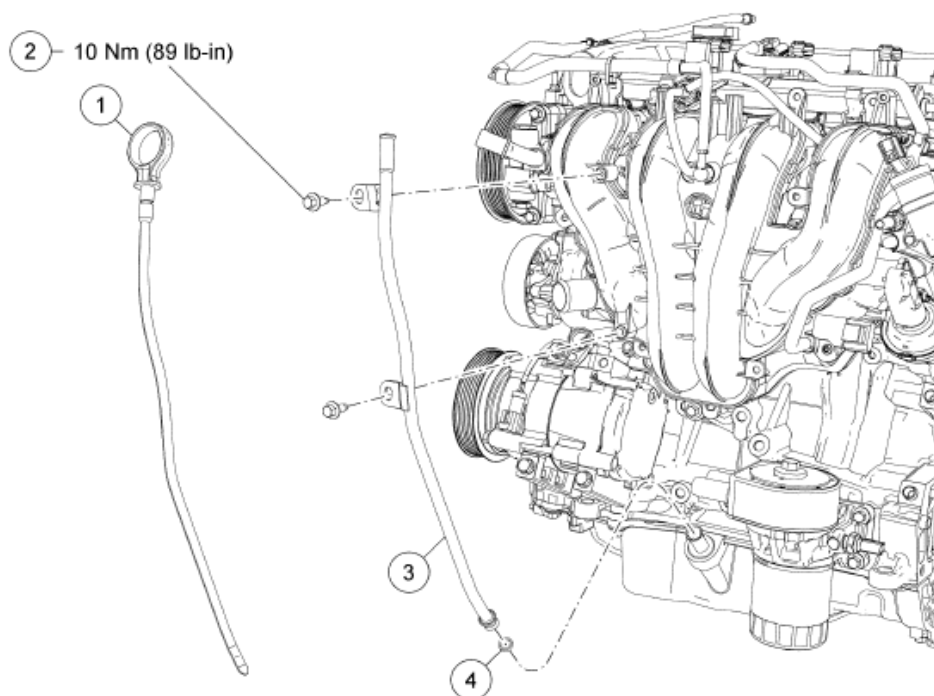
NOTE: Discard the gasket and clean and inspect the gasket mating surfaces.

3. Remove the 2 bolts and the oil pump screen and pickup tube.
 - To install, tighten to 10 N.m (89 lb-in).
4. To install, reverse the removal procedure.

OIL LEVEL INDICATOR AND TUBE

MATERIALS

Item	Specification
SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (in Canada Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12) or equivalent	WSS-M2C930-A



A0005170

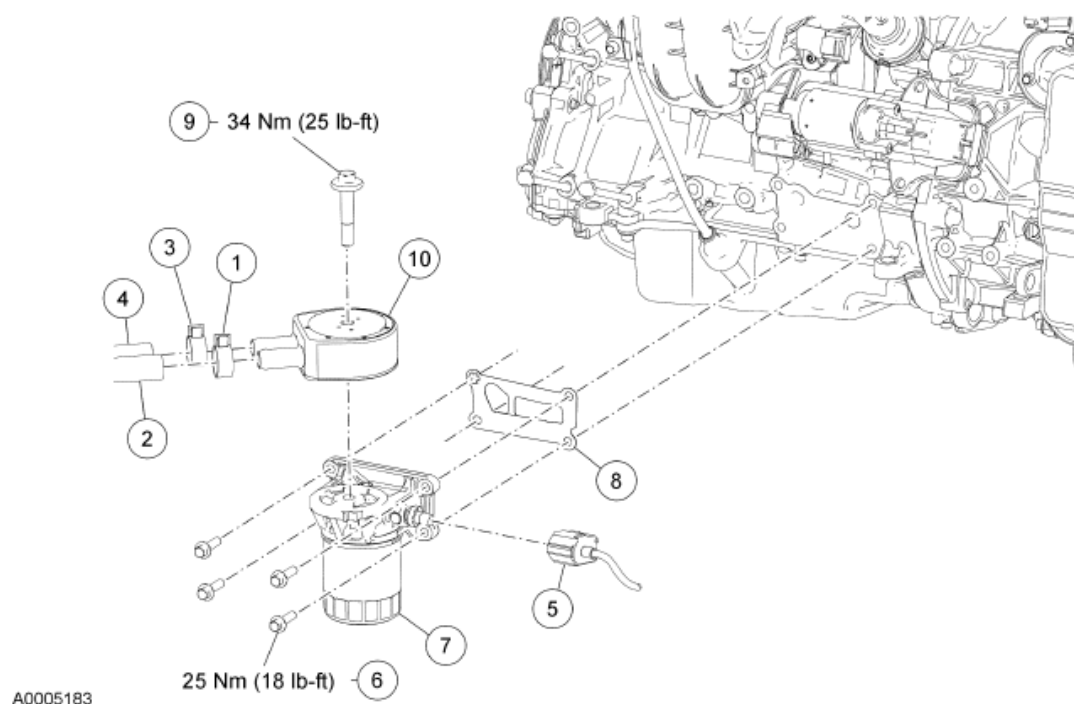
Item	Part Number	Description
1	6750	Oil level indicator
2	W50581	Oil level indicator tube bolt (2 required)
3	6754	Oil level indicator tube
4	6754-B	Oil level indicator tube O-ring seal

Fig. 118: Identifying Oil Level Indicator & Tube Components (With Torque Specifications)
 Courtesy of FORD MOTOR CO.

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the 5 bolts and the RH splash shield.
 - To install, tighten to 9 N.m (80 lb-in).
3. Remove the oil level indicator.
4. Remove the 2 bolts and the oil level indicator tube.
 - To install, tighten to 10 N.m (89 lb-in).
5. Remove and discard the oil level indicator tube O-ring seal.
6. To install, reverse the removal procedure.
 - Lubricate a new O-ring seal with clean engine oil.

OIL COOLER



Item	Part Number	Description
1	—	Heater hose clamp (part of 18K580)
2	18K850	Heater hose
3	8287A	Coolant hose clamp
4	8A593	Coolant hose
5	14A464	Oil pressure sender electrical connector (part of 12B637)
6	W500225	Oil filter adapter bolt (4 required)
7	6884	Oil filter adapter
8	6A636	Oil filter adapter gasket
9	W706487	Oil cooler bolt
10	6A642	Oil cooler

Fig. 119: Identifying Oil Cooler Components (With Torque Specifications)
Courtesy of FORD MOTOR CO.

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the 5 bolts and the RH splash shield.
 - To install, tighten to 9 N.m (80 lb-in).
3. Remove the oil drain plug and drain the engine oil.
 - To install, tighten to 28 N.m (21 lb-ft).
4. Remove and discard the oil filter.

- To install, tighten 3/4 of a turn after the filter gasket makes contact with the oil filter adapter.
- 5. Drain the engine cooling system. For additional information, refer to **COOLING SYSTEM DRAINING, FILLING AND BLEEDING**.
- 6. Disconnect the 2 coolant hoses from the oil cooler.
- 7. Disconnect the oil pressure sender electrical connector.

NOTE: Discard the gasket.

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

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

- 9. 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 N.m (25 lb-ft).
- 10. To install, reverse the removal procedure.
- 11. Fill and bleed the engine cooling system. For additional information, refer to **COOLING SYSTEM DRAINING, FILLING AND BLEEDING**.
- 12. Fill the engine with clean engine oil.

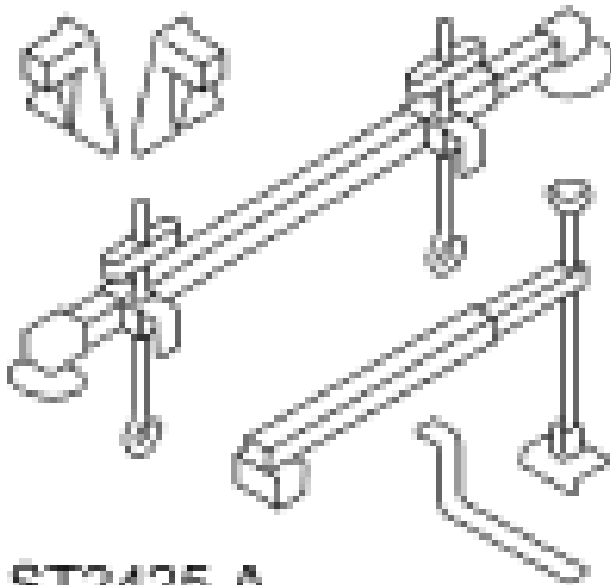
ENGINE MOUNT

SPECIAL TOOL(S)

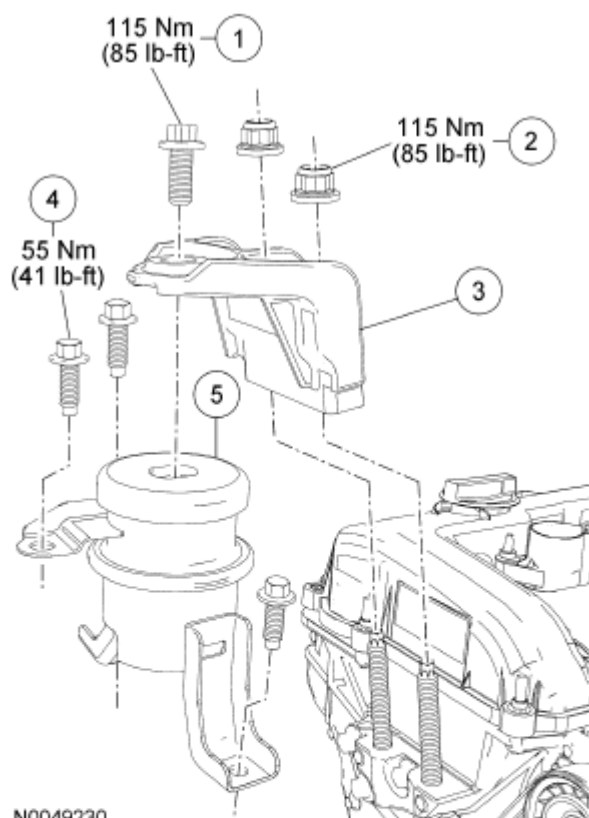
Three-Bar Engine Support Kit
303-F072

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST2425-A



Item	Part Number	Description
1	W710824-S439	Engine mount bracket bolt
2	N807144-S440	Engine mount bracket nut (2 required)
3	6A094	Engine mount bracket
4	W500232	Engine mount bolt (3 required)
5	6068	Engine mount

Fig. 120: Identifying Engine Mount Components (With Torque Specifications)
 Courtesy of FORD MOTOR CO.

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the engine coolant degas bottle. For additional information, refer to **REMOVAL AND INSTALLATION ALL VEHICLES**.
3. Install the special tool.

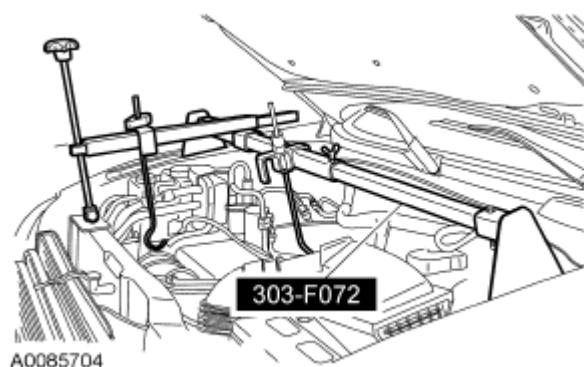


Fig. 121: Using Special Tool (303-F072) To Raise Engine
Courtesy of FORD MOTOR CO.

4. Remove the engine mount bracket bolt.
 - To install, tighten to 115 N.m (85 lb-ft).
5. Use the special tool to raise the engine 25 mm (0.98 in).

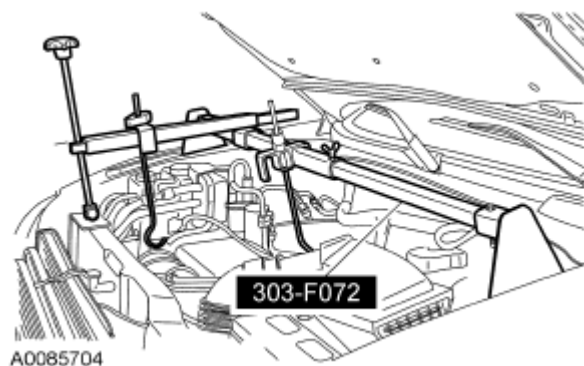


Fig. 122: Using Special Tool (303-F072) To Raise Engine
Courtesy of FORD MOTOR CO.

6. Remove the 2 nuts and the engine mount bracket.
 - To install, tighten to 115 N.m (85 lb-ft).
7. Remove the 3 bolts and the engine mount.
 - To install, tighten to 55 N.m (41 lb-ft).
8. To install, reverse the removal procedure.

REMOVAL

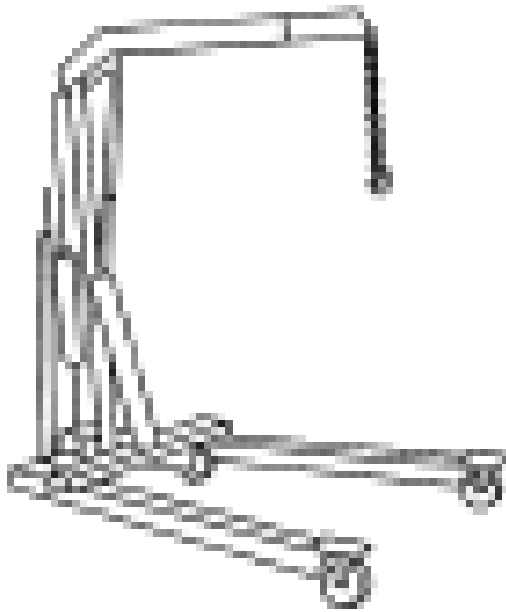
ENGINE - AUTOMATIC TRANSAXLE

SPECIAL TOOL(S)

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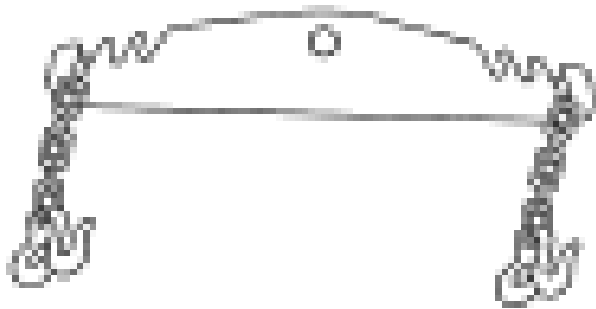
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ST1341-A

Heavy Duty Floor Crane
014-00071 or equivalent



ST1602-A

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

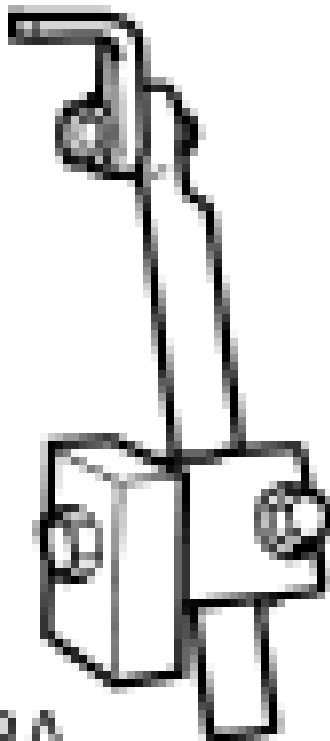
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ST1293-A

Powertrain Lift
014-00765



ST2743A

Universal Adapter Brackets
014-0001
Lifting Bracket Set, Engine 303-D095 (D94L-6001-A) or equivalent

WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

All vehicles

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 PRESSURE RELEASE**.
3. Remove the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION - AIR CLEANER** and **REMOVAL AND INSTALLATION - AIR CLEANER OUTLET PIPE**.
4. Remove the battery tray. For additional information, refer to **REMOVAL AND INSTALLATION**.
5. Drain the engine oil.
6. Drain the cooling system. For additional information, refer to **DRAINING**.
7. Remove the starter. For additional information, refer to **STARTING SYSTEM**.
8. Remove the exhaust flexible pipe. For additional information, refer to **REMOVAL AND INSTALLATION**.
9. Disconnect the heated oxygen sensor (HO2S) and the catalyst monitor sensor electrical connectors.

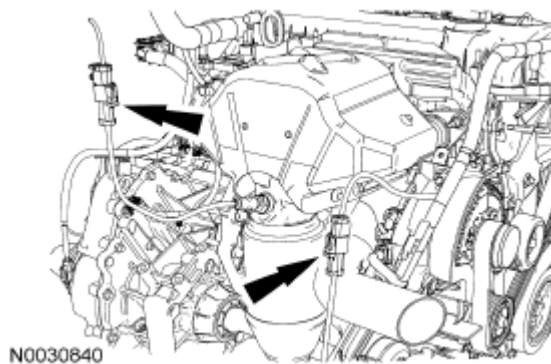


Fig. 123: Locating Heated Oxygen Sensor (HO2S) & Catalyst Monitor Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

10. Remove the accessory drive belt tensioner. For additional information, refer to **REMOVAL AND INSTALLATION**.
11. Remove the bolt and press the locking tab to release the lower air duct from the upper air duct.

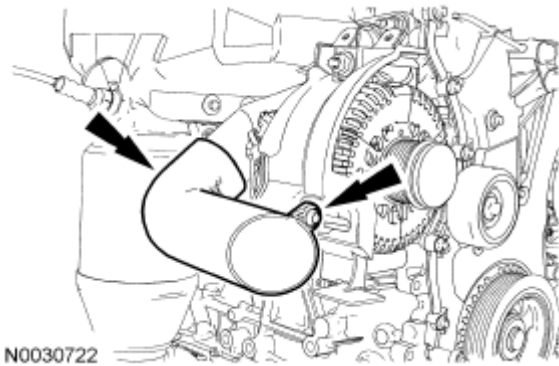


Fig. 124: Locating Bolt & Lower Air Duct
Courtesy of FORD MOTOR CO.

12. Detach the wire retainers from the generator shield and remove the nut and pin-type retainer and remove the generator shield.

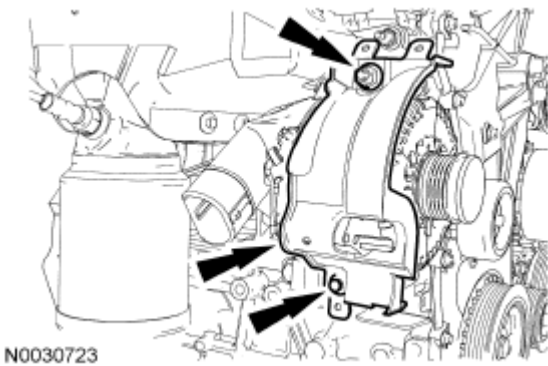


Fig. 125: Locating Nut & Pin-Type Retainer
Courtesy of FORD MOTOR CO.

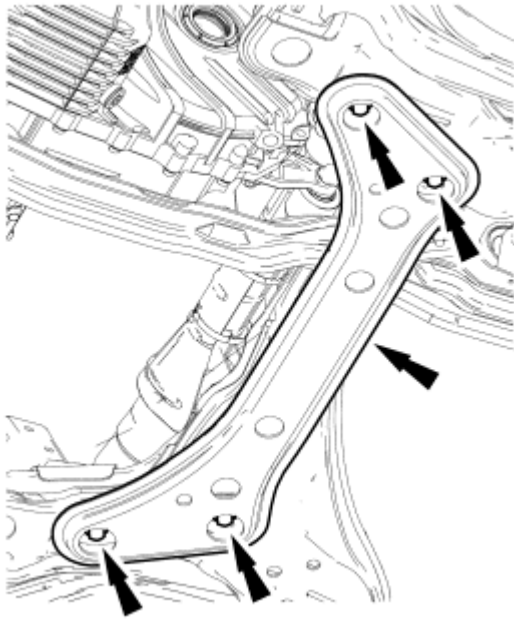
13. Remove the LH front drive halfshafts. For additional information, refer to **REMOVAL** .

All wheel drive (AWD) vehicles

14. Remove the transfer case. For additional information, refer to **TRANSFER CASE-POWER TRANSFER UNIT (PTU)** .

Front wheel drive (FWD) vehicles

15. Remove the bolts and the lateral support crossmember.



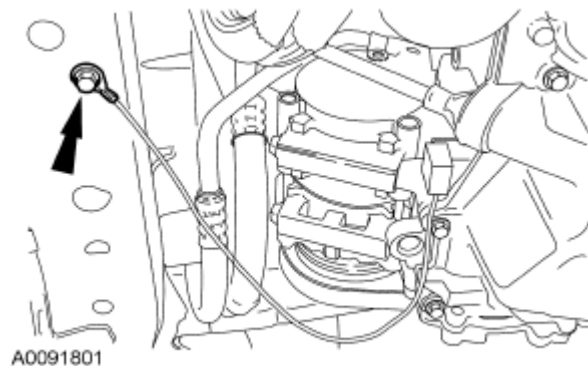
A0087403

Fig. 126: Identifying Lateral Support Crossmember And Bolts
Courtesy of FORD MOTOR CO.

16. Remove the front drive intermediate halfshaft. For additional information, refer to **REMOVAL AND INSTALLATION**.

All vehicles

17. If equipped, remove the bolt and ground eyelet.



A0091801

Fig. 127: Locating Bolt & Ground Eyelet
Courtesy of FORD MOTOR CO.

18. Remove the power distribution box cover.

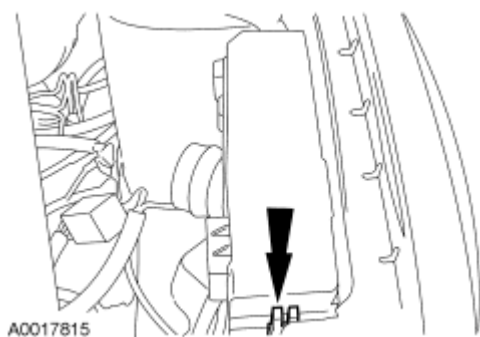


Fig. 128: Locating Power Distribution Box Cover
Courtesy of FORD MOTOR CO.

19. Remove the nuts and disconnect the cables.

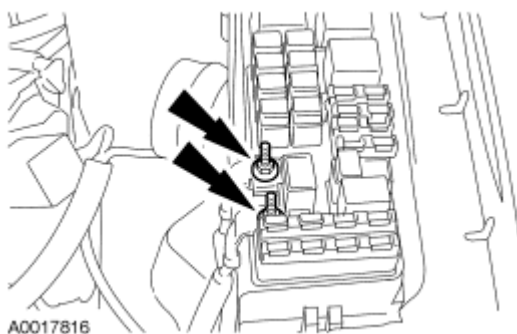


Fig. 129: Locating Cables & Nuts
Courtesy of FORD MOTOR CO.

20. Disconnect the electrical connector from the power distribution box.

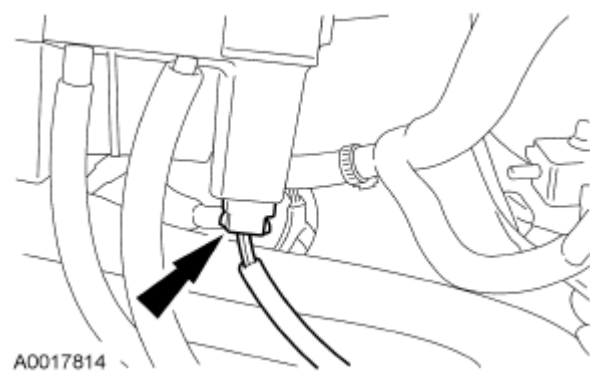


Fig. 130: Locating Electrical Connector
Courtesy of FORD MOTOR CO.

21. Remove the bolt and disconnect the ground strap. Loosen the bolt and disconnect the 42-pin electrical connector.

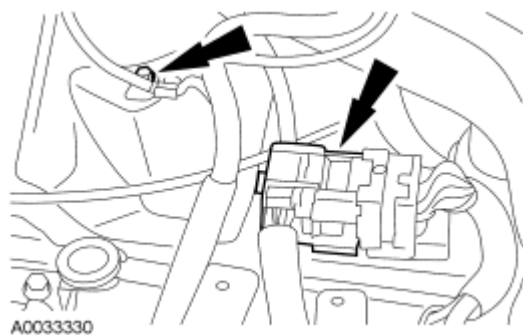


Fig. 131: Locating Ground Strap & Electrical Connector
Courtesy of FORD MOTOR CO.

22. Detach the wiring harness retainers from the battery tray bracket and position the wiring harness aside.

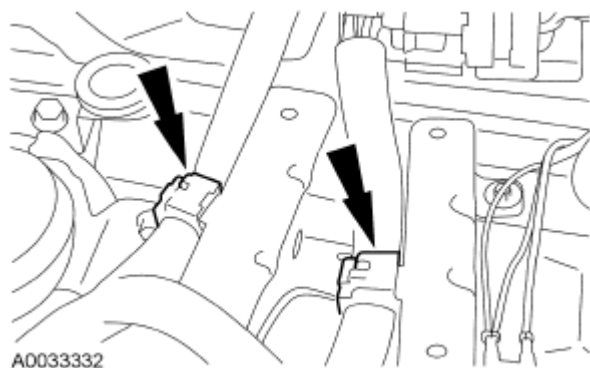


Fig. 132: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

23. Disconnect the transaxle electrical connector.

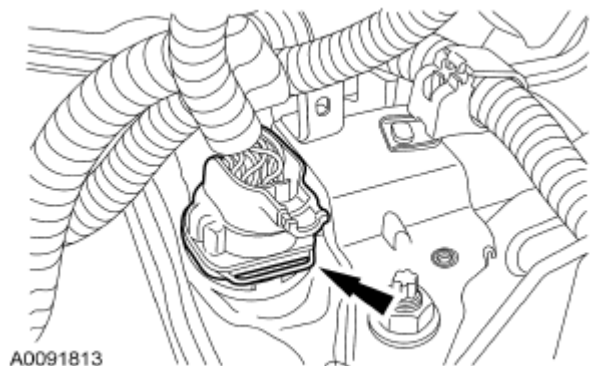


Fig. 133: Locating Transaxle Electrical Connector
Courtesy of FORD MOTOR CO.

24. Disconnect the shift cable from the transaxle manual lever.

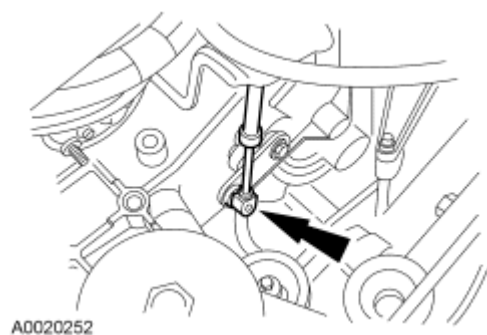


Fig. 134: Locating Shift Cable End At Manual Lever
Courtesy of FORD MOTOR CO.

25. Position the transaxle control cable and bracket aside.
- Detach the wiring harness pin-type retainer.
 - Remove the bolts and position the cable and bracket aside.

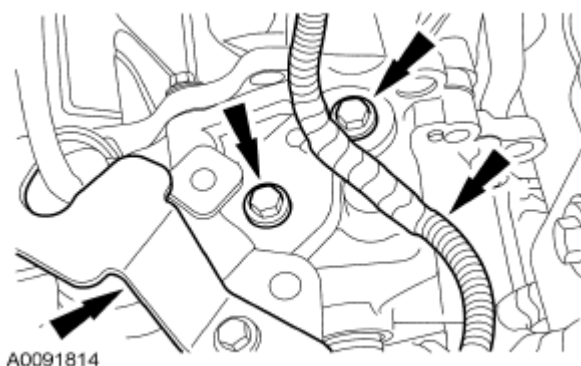


Fig. 135: Locating Transaxle Control Cable & Bolts
Courtesy of FORD MOTOR CO.

26. Disconnect the transmission range (TR) sensor electrical connector.

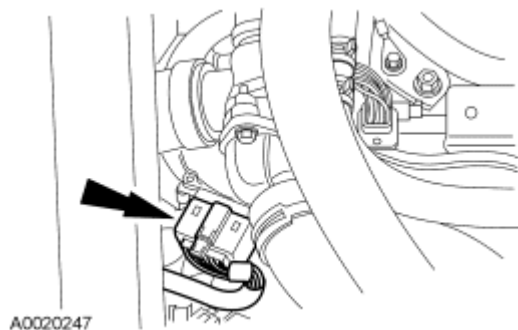


Fig. 136: Locating Transmission Range (TR) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

27. Detach the transaxle control harness from the brackets.

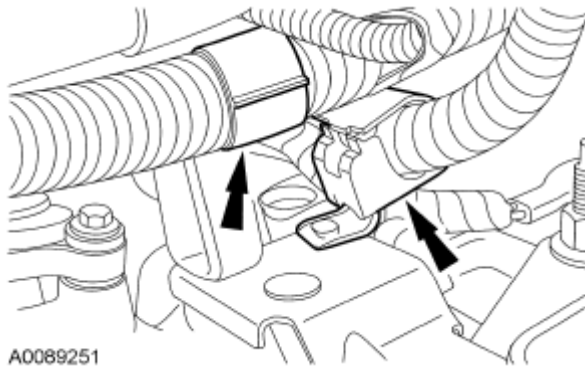


Fig. 137: Locating Transaxle Control Harness
Courtesy of FORD MOTOR CO.

28. Disconnect the front transmission fluid cooler tube.

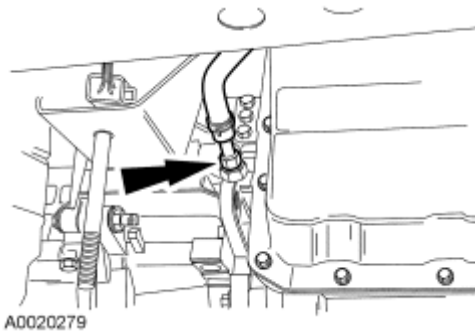


Fig. 138: Locating Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

29. Disconnect the rear transmission fluid cooler tube.

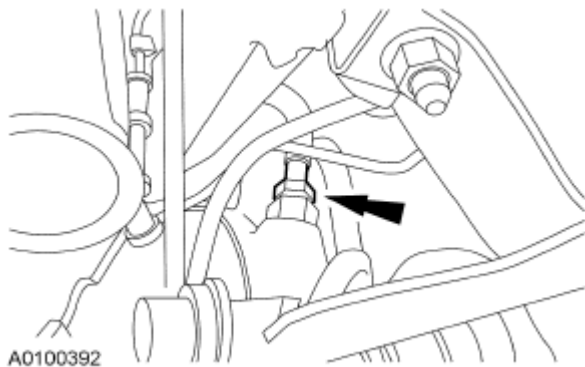


Fig. 139: Locating Rear Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

30. Position the fluid cooler tube aside.
1. Disconnect the output shaft speed (OSS) sensor electrical connector (black).

2. Disconnect the turbine shaft speed (TSS) sensor electrical connector (white connector).
3. Remove the transmission fluid cooler retaining bracket bolt.
4. Position the fluid cooler tube aside.

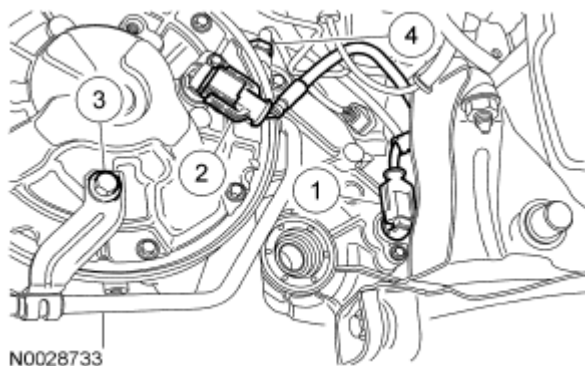


Fig. 140: Identifying Fluid Cooler Tube Aside
Courtesy of FORD MOTOR CO.

31. Remove the bolt and the OSS sensor.

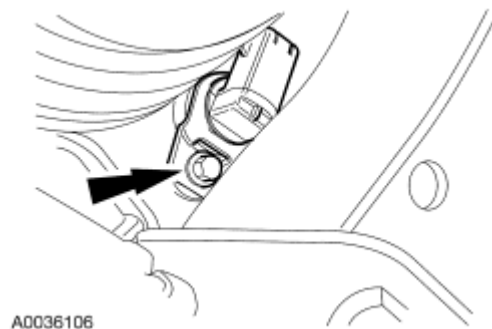


Fig. 141: Locating OSS Sensor Bolt
Courtesy of FORD MOTOR CO.

32. Detach the transaxle control harness from the retaining clip.

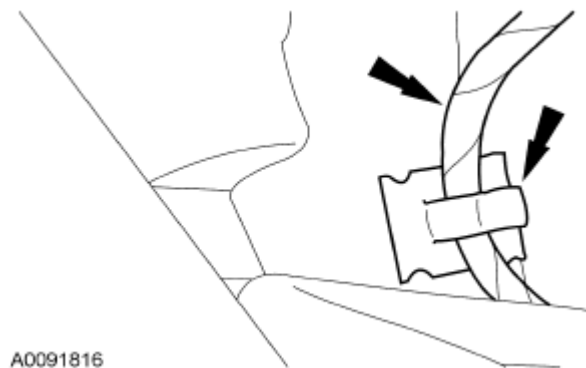


Fig. 142: Locating Transaxle Control Harness From Retaining Clip
Courtesy of FORD MOTOR CO.

33. If equipped, disconnect the block heater electrical connector. Detach all the block heater wiring harness retainers and position the wiring harness aside.

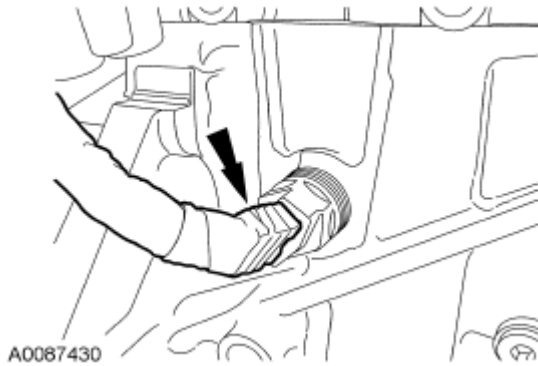


Fig. 143: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

34. Disconnect the upper radiator and coolant vent hoses.

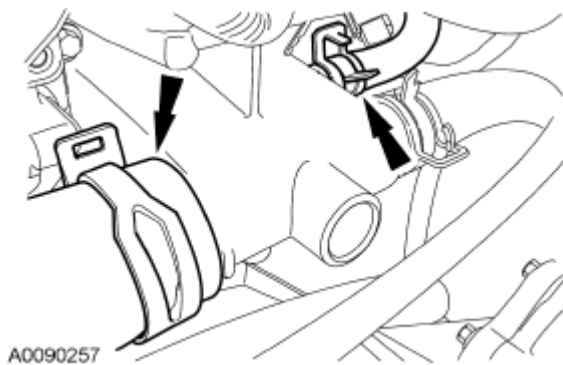
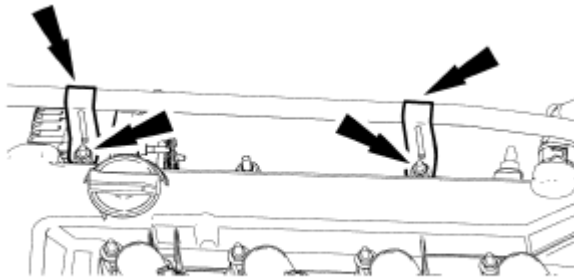


Fig. 144: Locating Upper Radiator & Coolant Vent Hoses
Courtesy of FORD MOTOR CO.

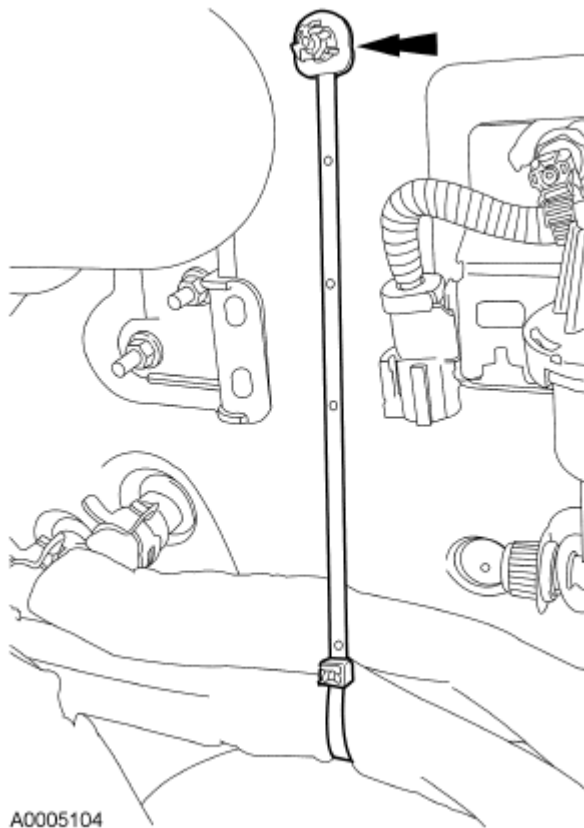
35. Remove the nuts and the coolant vent hose brackets. Position the coolant vent hose aside.



A0090263

Fig. 145: Locating Nuts & Coolant Vent Hose Brackets
Courtesy of FORD MOTOR CO.

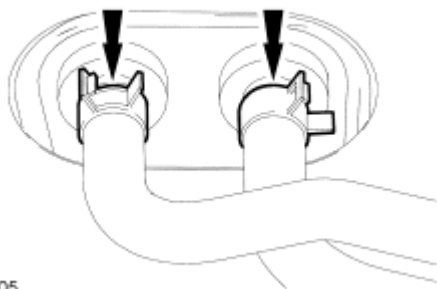
36. Detach the heater hose support strap from the stud.



A0005104

Fig. 146: Locating Heater Hose Support Strap From Stud
Courtesy of FORD MOTOR CO.

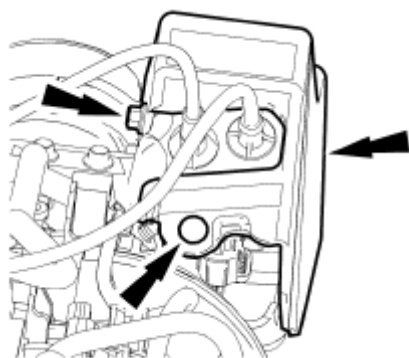
37. Disconnect the heater hoses from the heater core.



A0085705

Fig. 147: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

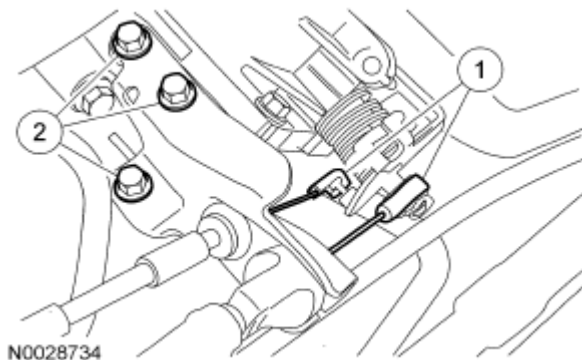
38. Remove the retainers and the accelerator cable snow shield.



A0090258

Fig. 148: Locating Retainers & Accelerator Cable Snow Shield
Courtesy of FORD MOTOR CO.

39. Disconnect the accelerator cable and speed control cable (if equipped).
 1. Disconnect the accelerator and speed control cable (if equipped) from the throttle body.
 2. Remove the bolts from the accelerator cable bracket.



N0028734

Fig. 149: Identifying Accelerator Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

40. Remove the nut from the accelerator control cable bracket.

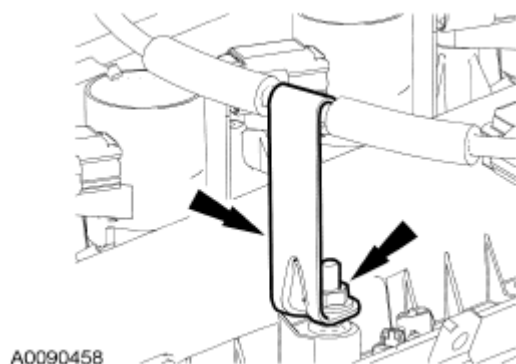


Fig. 150: Locating Accelerator Control Cable Bracket Nut (1 Of 2)
Courtesy of FORD MOTOR CO.

41. Remove the nut from the accelerator control cable bracket and position the accelerator control cable and bracket assembly aside.

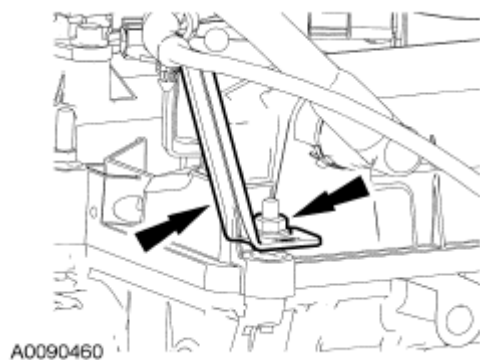


Fig. 151: Locating Accelerator Control Cable Bracket Nut (2 Of 2)
Courtesy of FORD MOTOR CO.

42. Remove the nut and position the power steering tube and bracket aside.

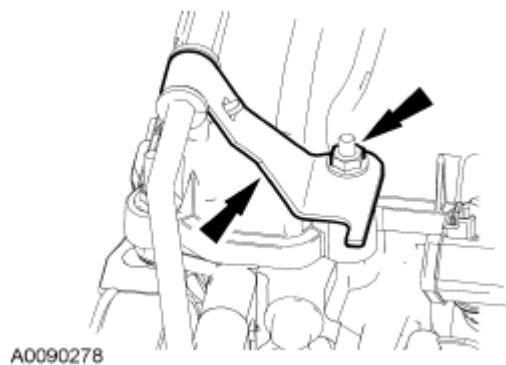


Fig. 152: Locating Power Steering Tube & Bracket Aside

Courtesy of FORD MOTOR CO.

43. Disconnect the vacuum supply tube and position aside.

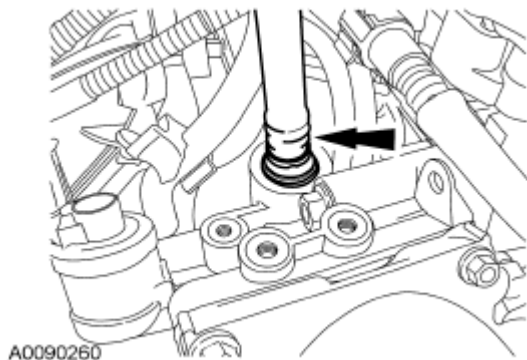


Fig. 153: Locating Vacuum Supply Tube & Position Aside
Courtesy of FORD MOTOR CO.

44. Disconnect the fuel vapor return tube and retainer and position aside.

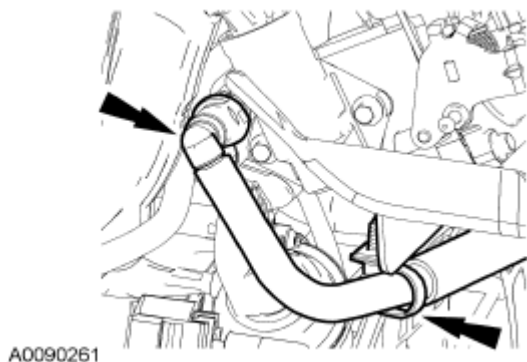


Fig. 154: Locating Fuel Vapor Return Tube & Retainer
Courtesy of FORD MOTOR CO.

45. Disconnect the vacuum reservoir tube and position aside.

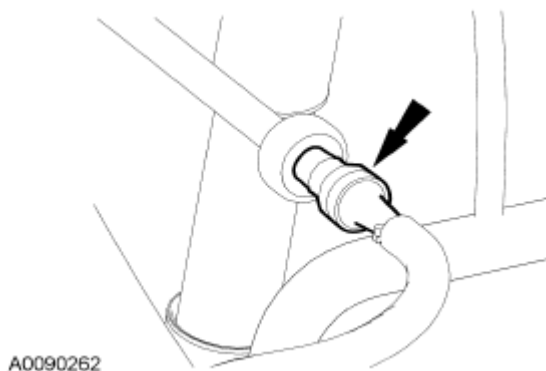


Fig. 155: Locating Vacuum Reservoir Tube & Position Aside
Courtesy of FORD MOTOR CO.

46. Disconnect the fuel supply tube and position aside.

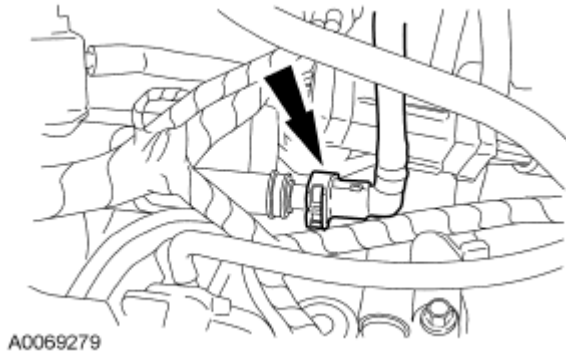


Fig. 156: Locating Fuel Supply Tube & Position Aside
Courtesy of FORD MOTOR CO.

47. Detach the electrical connector retainers.

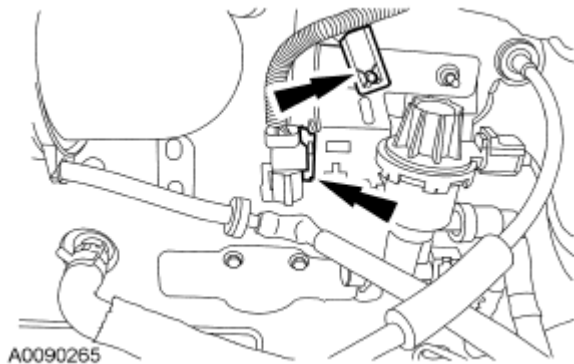


Fig. 157: Locating Electrical Connector Retainers
Courtesy of FORD MOTOR CO.

48. Disconnect the powertrain control module (PCM) electrical connectors. Remove the nut and position the harness aside.

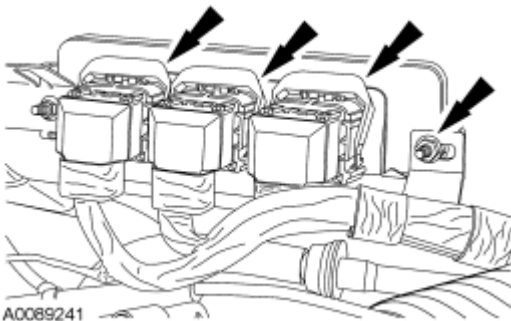


Fig. 158: Locating Powertrain Control Module (PCM) Electrical Connectors
Courtesy of FORD MOTOR CO.

49. Remove the bolt and detach the ground wire.

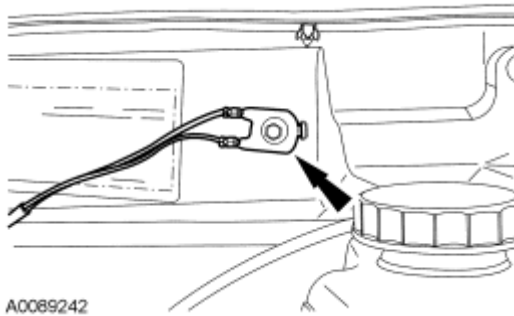


Fig. 159: Locating Ground Wire & Bolt
Courtesy of FORD MOTOR CO.

50. Remove the 2 power steering pump bolts.

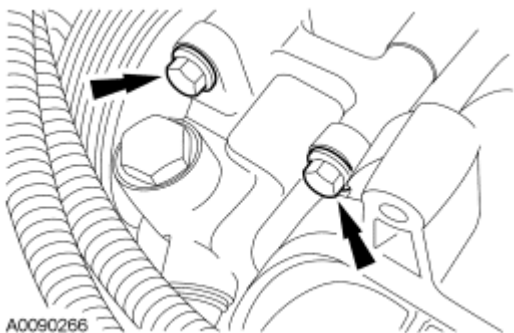


Fig. 160: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

51. Disconnect the lower radiator hose from the radiator.

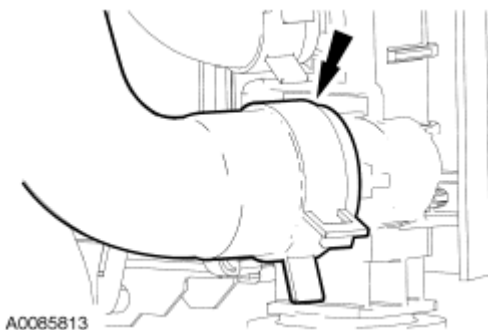


Fig. 161: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

52. Disconnect the A/C compressor electrical connector and remove the 4 bolts. Position the A/C compressor aside and support the compressor with a length of mechanic's wire.

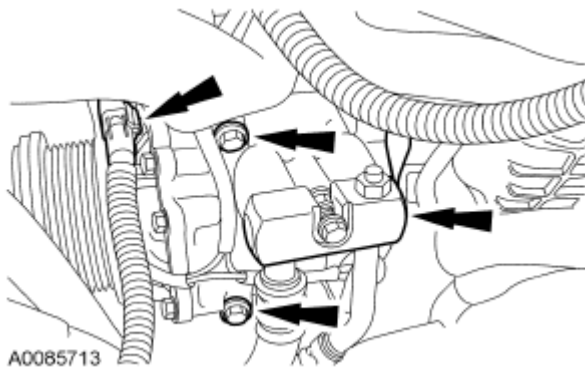


Fig. 162: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

53. Disconnect the power steering pressure (PSP) sensor electrical connector.

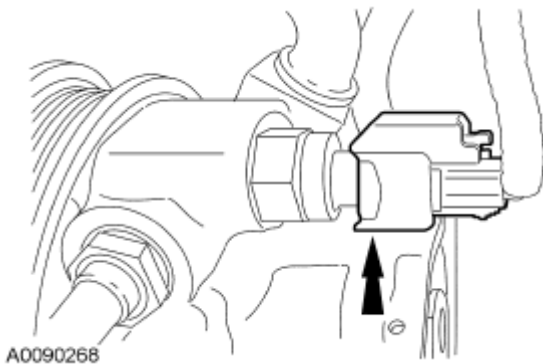


Fig. 163: Locating Power Steering Pressure (PSP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: The bolt under the power steering pressure tube will remain with the power steering pump.

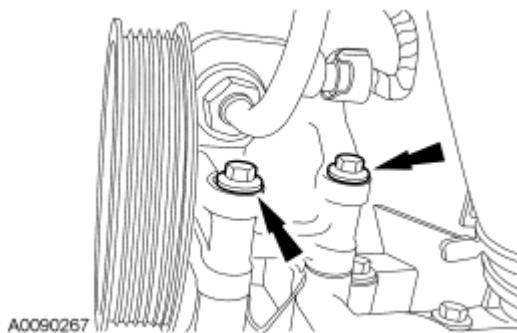


Fig. 164: Identifying Power Steering Pump Bolts

Courtesy of FORD MOTOR CO.

54. Remove the bolts and position the power steering pump aside.
55. Remove the front roll restrictor bolt and the 2 bolts for the engine support crossmember.

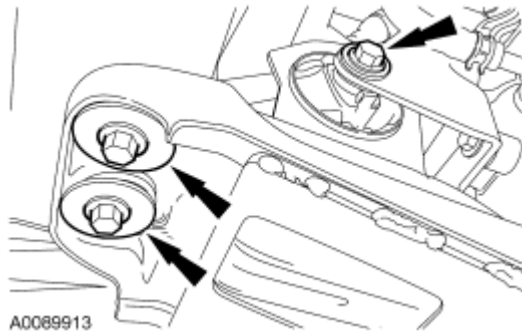


Fig. 165: Identifying Front Roll Restrictor Bolt & Bolts For Engine Support Crossmember
Courtesy of FORD MOTOR CO.

56. Remove the rear nut and the engine support crossmember.
 - Discard the nut.

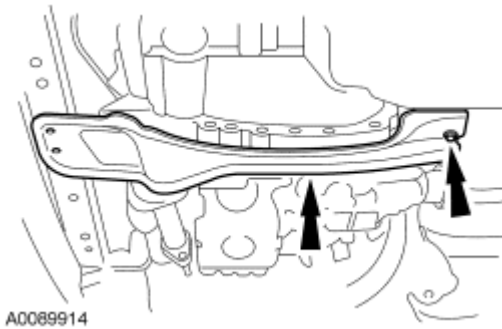


Fig. 166: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

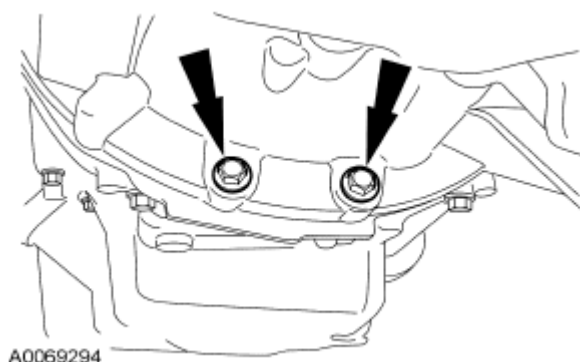


Fig. 167: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

57. Remove the 2 transaxle-to-engine bolts.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

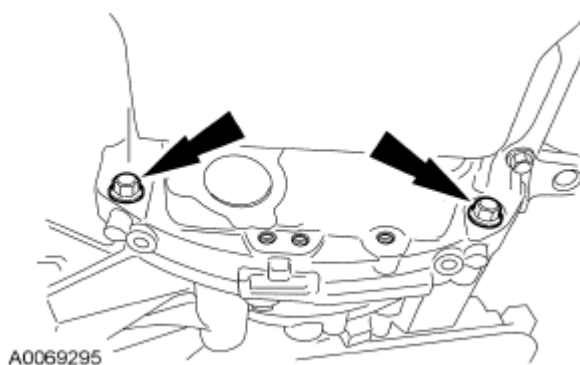


Fig. 168: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

58. Remove the 2 transaxle-to-engine bolts.
59. Using the special tools, secure the engine to the lift table.

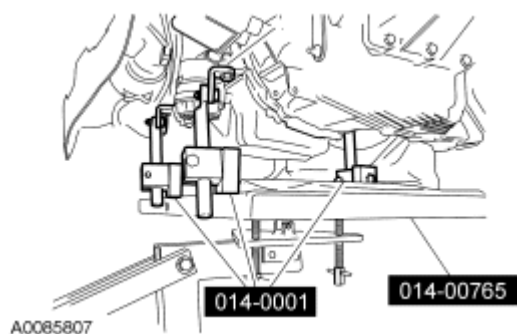


Fig. 169: Securing Engine To Lift Table Using Special Tool (014-0001, 014-00765)

Courtesy of FORD MOTOR CO.

60. Remove the engine mount bracket bolt.

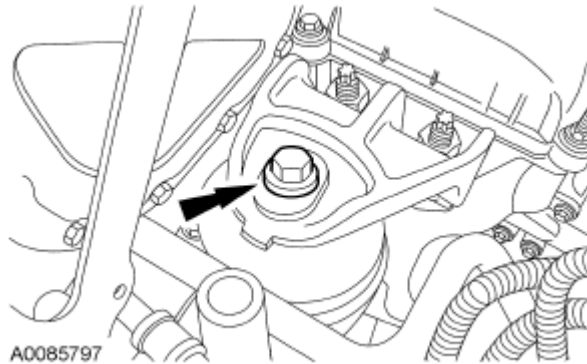


Fig. 170: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

61. Remove the nuts and the engine mount bracket.

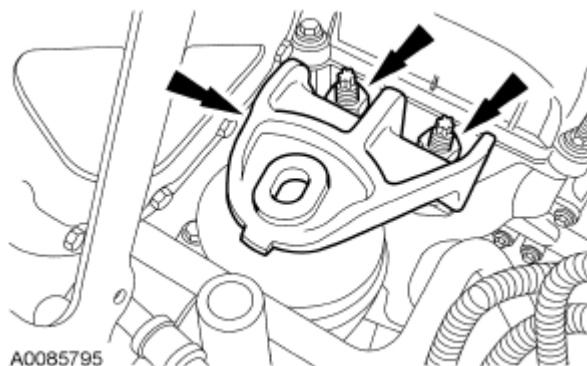


Fig. 171: Locating Nuts & Engine Mount Bracket
Courtesy of FORD MOTOR CO.

62. Remove the bolt from the transaxle rear mount.

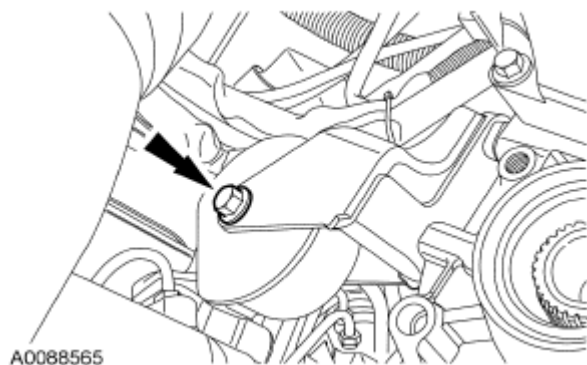


Fig. 172: Locating Bolt From Transaxle Rear Mount
Courtesy of FORD MOTOR CO.

63. Remove the bolt from the LH transaxle mount.

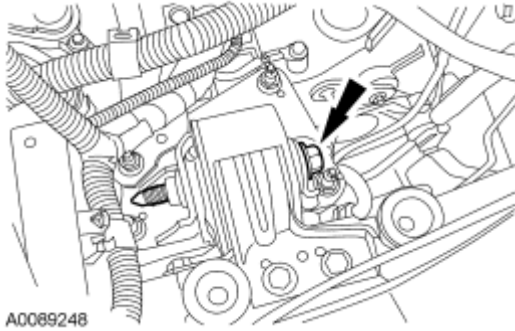


Fig. 173: Locating Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

64. Lower the engine and transaxle from the vehicle.
65. Using the engine crane and spreader bar, remove the engine and transaxle from the lift table.
66. Remove the starter motor isolator.

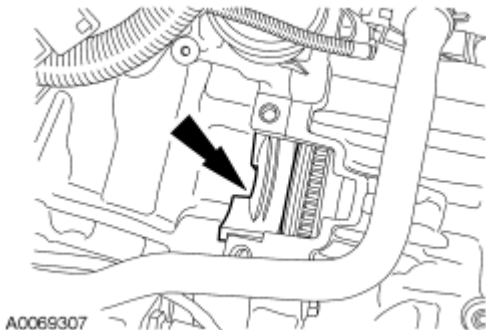


Fig. 174: Identifying Starter Motor Isolator
Courtesy of FORD MOTOR CO.

67. Remove and discard the 4 torque converter nuts.

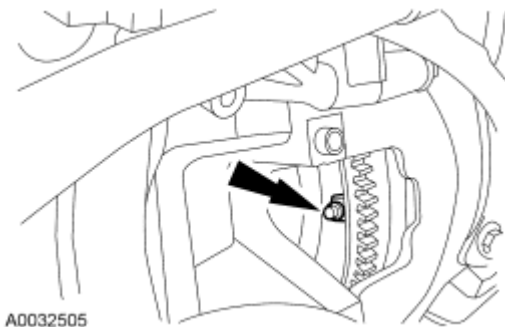


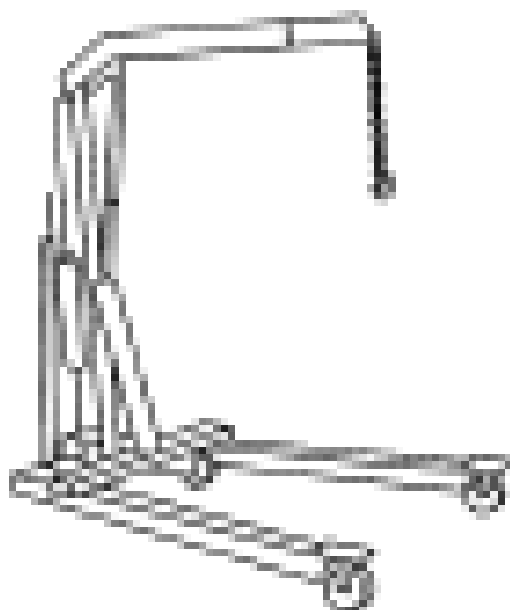
Fig. 175: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

68. Remove the remaining 6 engine-to-transaxle bolts and separate the engine and transaxle.

ENGINE - MANUAL TRANSAXLE

SPECIAL TOOL(S)



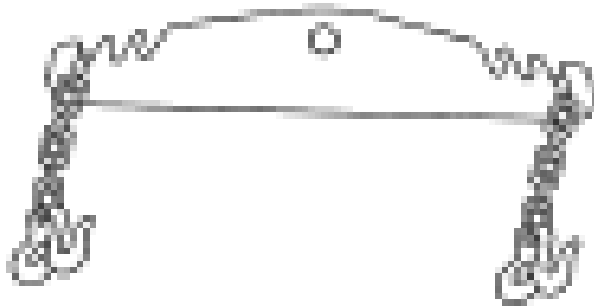
ST1341-A

Heavy Duty Floor Crane
014-00071 or equivalent

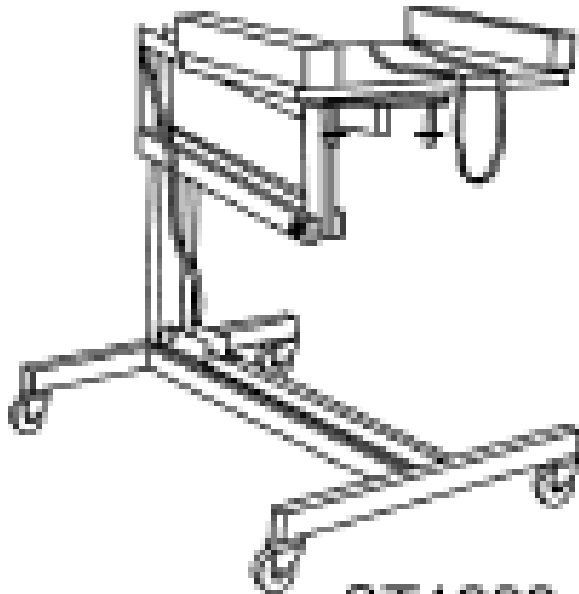
Spreader Bar
303-D089 (D93P-6001-A3) or equivalent

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner

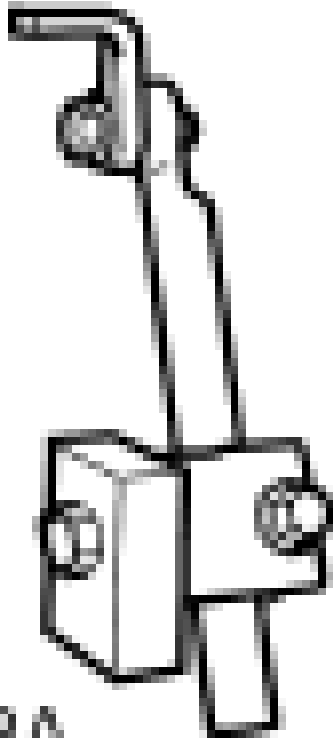


ST1602-A



Powertrain Lift
014-00765

ST1293-A



Universal Adapter Brackets
014-0001
Lifting Bracket Set, Engine
303-D095 (D94L-6001-A) or equivalent

WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

All vehicles

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 PRESSURE RELEASE** .
3. Remove the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION - AIR CLEANER** and **REMOVAL AND INSTALLATION - AIR CLEANER OUTLET PIPE** .
4. Remove the battery tray. For additional information, refer to **REMOVAL AND INSTALLATION** .
5. Drain the engine oil.
6. Drain the cooling system. For additional information, refer to **DRAINING** .
7. Remove the starter. For additional information, refer to **STARTING SYSTEM** .
8. Remove the exhaust flex pipe. For additional information, refer to **REMOVAL AND**

INSTALLATION .

9. Disconnect the heated oxygen sensor (HO2S) and the catalyst monitor sensor electrical connectors.

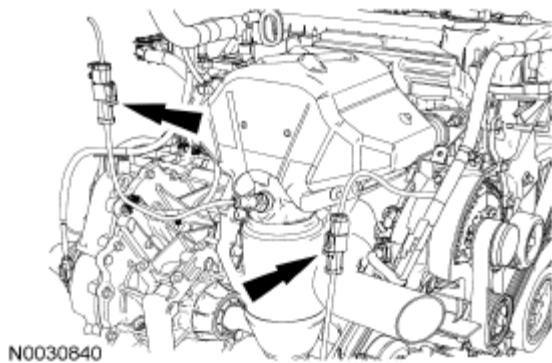


Fig. 176: Locating Heated Oxygen Sensor (HO2S) & Catalyst Monitor Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

10. Remove the accessory drive belt tensioner. For additional information, refer to **REMOVAL AND INSTALLATION .**
11. Remove the bolt and press the locking tab to release the lower air duct from the upper air duct.

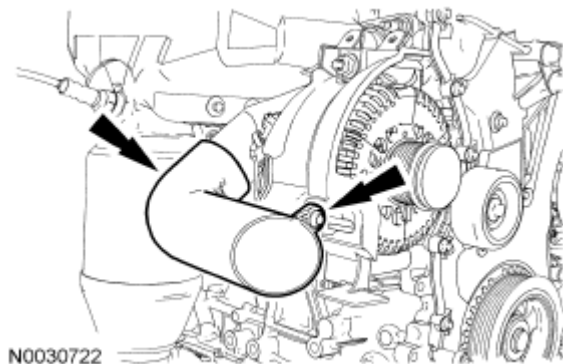


Fig. 177: Locating Bolt & Lower Air Duct

Courtesy of FORD MOTOR CO.

12. Detach the wire retainers from the generator shield and remove the nut and pin-type retainer and remove the generator shield.

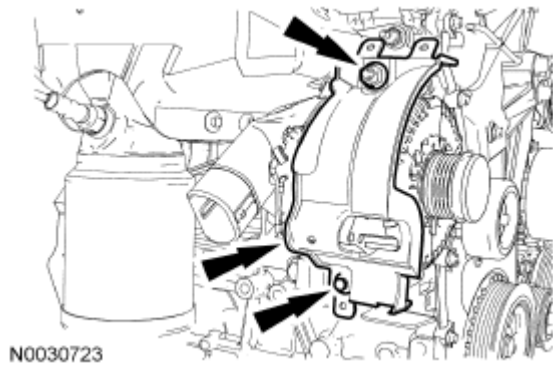


Fig. 178: Locating Nut & Pin-Type Retainer
Courtesy of FORD MOTOR CO.

13. Remove the bolts and the lateral support crossmember.

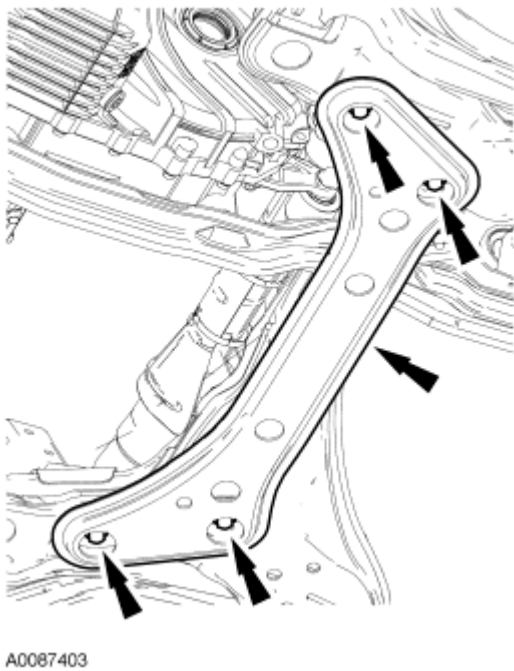


Fig. 179: Identifying Lateral Support Crossmember And Bolts
Courtesy of FORD MOTOR CO.

14. Remove the LH front drive halfshaft. For additional information, refer to **REMOVAL** .
15. Remove the front drive intermediate halfshaft. For additional information, refer to **REMOVAL** .

All wheel drive (AWD) vehicles

16. Remove the 6 bolts holding the driveshaft to the transfer case.

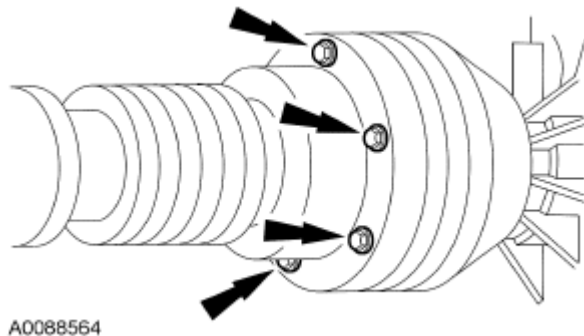


Fig. 180: Locating Driveshaft Bolts
Courtesy of FORD MOTOR CO.

17. Position the driveshaft aside.

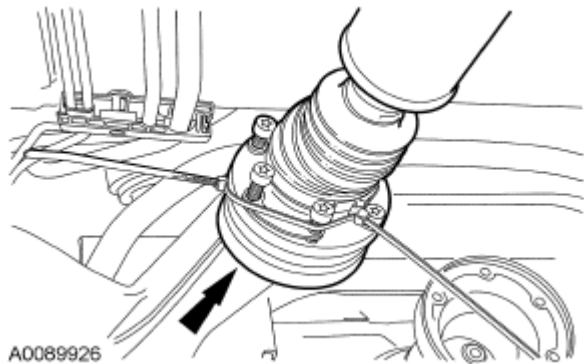


Fig. 181: Locating Driveshaft Aside
Courtesy of FORD MOTOR CO.

All vehicles

18. If equipped, remove the bolt and ground eyelet.

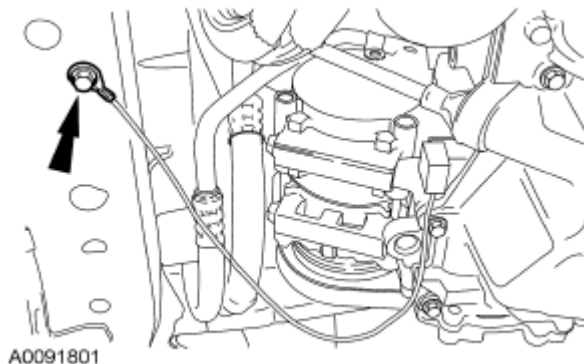


Fig. 182: Locating Bolt & Ground Eyelet
Courtesy of FORD MOTOR CO.

19. Remove the power distribution box cover.

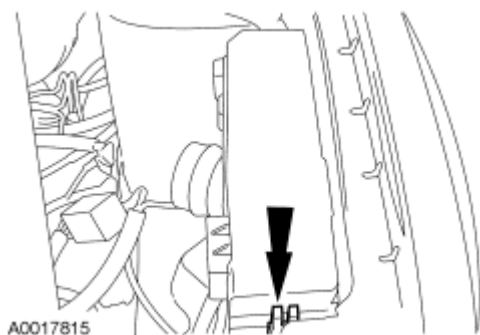


Fig. 183: Locating Power Distribution Box Cover
Courtesy of FORD MOTOR CO.

20. Remove the nuts and disconnect the cables.

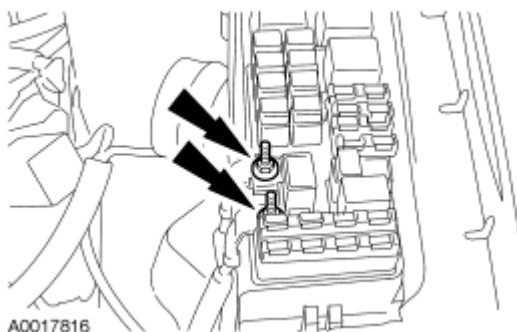


Fig. 184: Locating Cables & Nuts
Courtesy of FORD MOTOR CO.

21. Disconnect the electrical connector from the power distribution box.

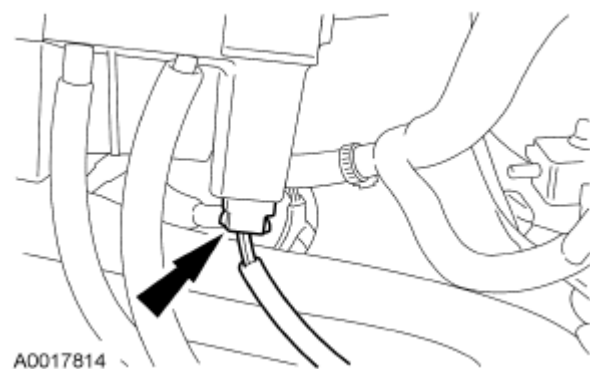


Fig. 185: Locating Electrical Connector
Courtesy of FORD MOTOR CO.

22. Remove the bolt and disconnect the ground strap. Loosen the bolt and disconnect the 42-pin electrical

connector.

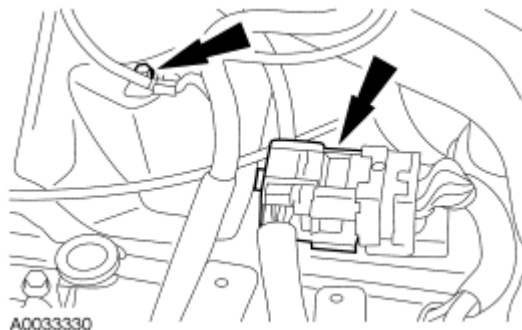


Fig. 186: Locating Ground Strap & Electrical Connector
Courtesy of FORD MOTOR CO.

23. Detach the wiring harness retainers from the battery tray bracket and position the wiring harness aside.

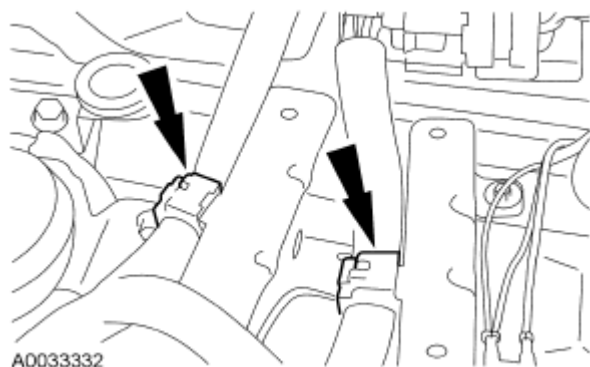


Fig. 187: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

24. Disconnect the clutch hydraulic tube fitting. Remove the clutch hydraulic tube mounting bolt, detach the spring clip and position the tube aside.

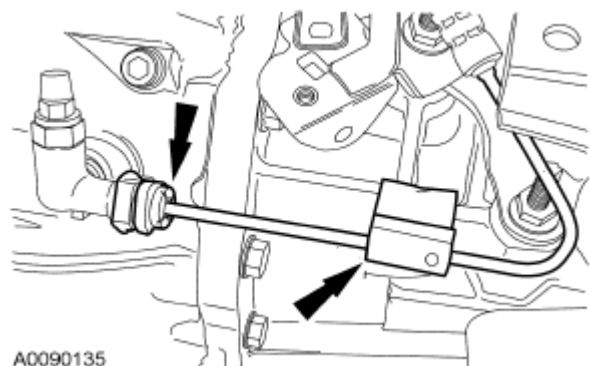


Fig. 188: Locating Clutch Hydraulic Tube Fitting
Courtesy of FORD MOTOR CO.

25. Remove the retaining clips and disconnect the transaxle control cable.

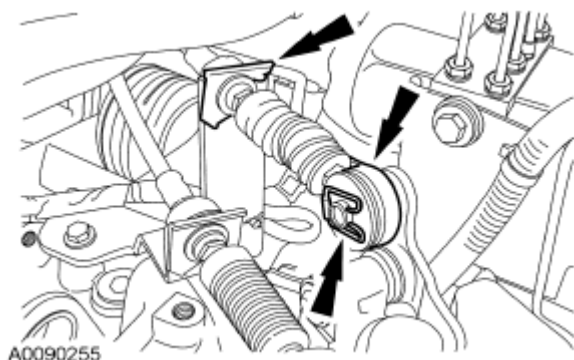


Fig. 189: Locating Transaxle Control Cable (1 Of 2)
Courtesy of FORD MOTOR CO.

26. Remove the retaining clips and disconnect the transaxle control cable.

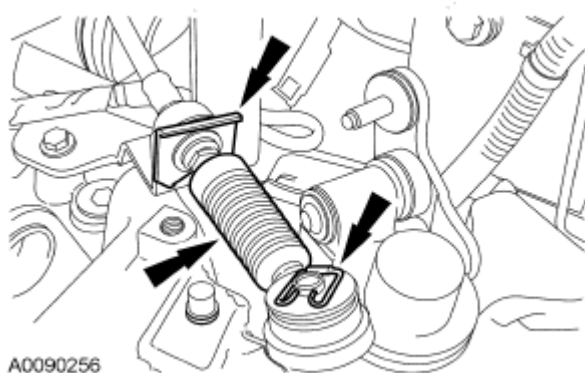


Fig. 190: Locating Transaxle Control Cable (2 Of 2)
Courtesy of FORD MOTOR CO.

27. Disconnect the vehicle speed sensor (VSS) electrical connector and pin-type retainer.

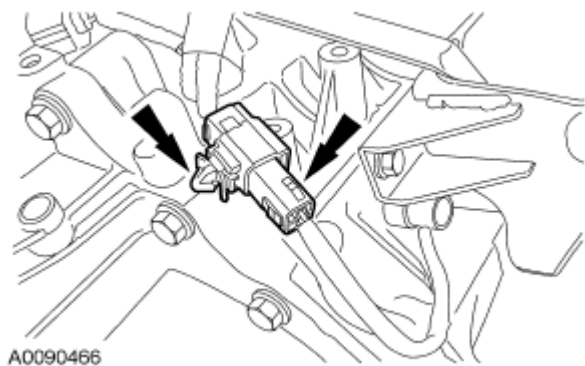


Fig. 191: Locating Vehicle Speed Sensor (VSS) Electrical Connector
Courtesy of FORD MOTOR CO.

28. Disconnect the reversing lamp indicator switch and detach the wiring harness retainers.

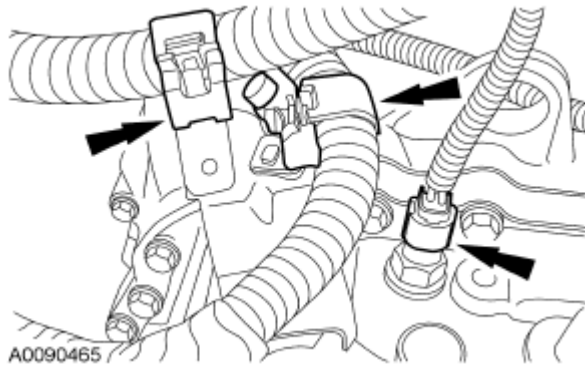


Fig. 192: Locating Reversing Lamp Indicator Switch
Courtesy of FORD MOTOR CO.

29. If equipped, disconnect the block heater electrical connector. Detach all the block heater wiring harness retainers and position the wiring harness aside.

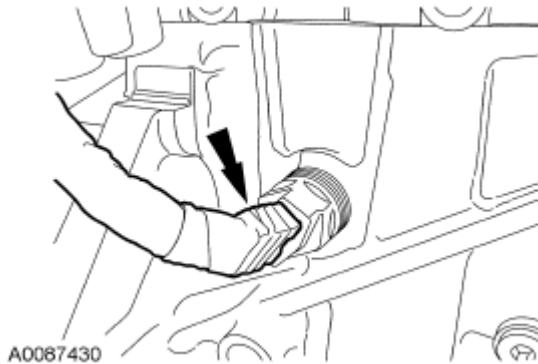


Fig. 193: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

30. Disconnect the upper radiator and coolant vent hoses.

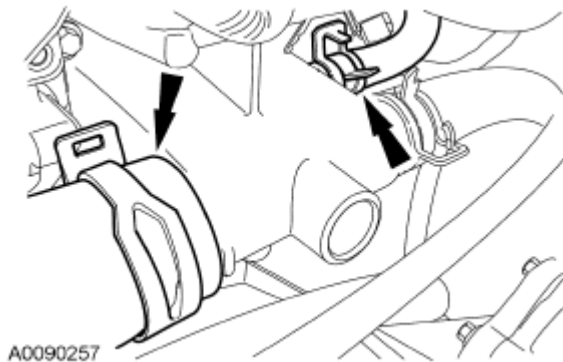
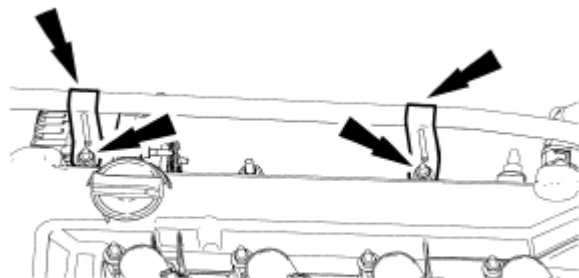


Fig. 194: Locating Upper Radiator & Coolant Vent Hoses

Courtesy of FORD MOTOR CO.

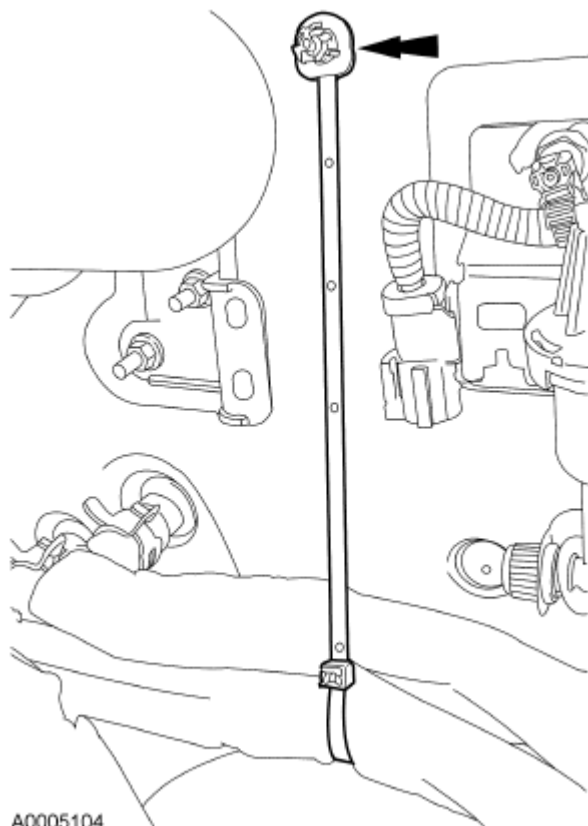
31. Remove the nuts and the coolant vent hose brackets. Position the coolant vent hose aside.



A0090263

Fig. 195: Locating Nuts & Coolant Vent Hose Brackets
Courtesy of FORD MOTOR CO.

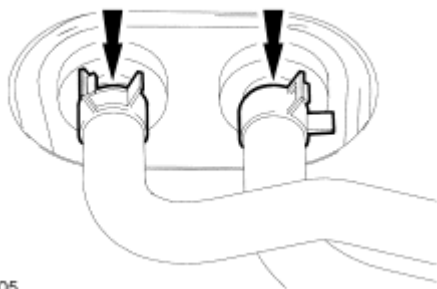
32. Detach the heater hose support strap from the stud.



A0005104

Fig. 196: Locating Heater Hose Support Strap From Stud
Courtesy of FORD MOTOR CO.

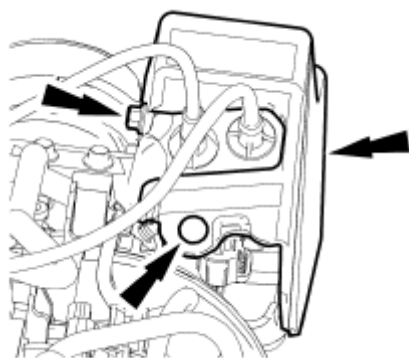
33. Disconnect the heater hoses from the heater core.



A0085705

Fig. 197: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

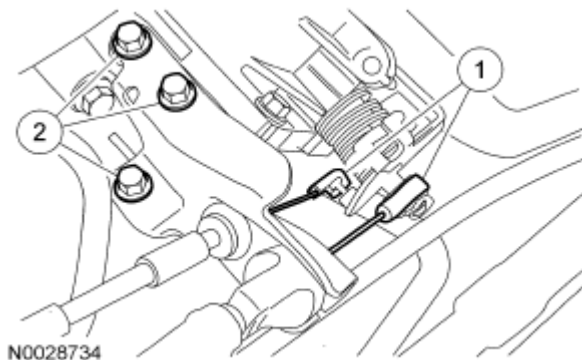
34. Remove the retainers and the accelerator cable snow shield.



A0090258

Fig. 198: Locating Retainers & Accelerator Cable Snow Shield
Courtesy of FORD MOTOR CO.

35. Disconnect the accelerator cable and speed control cable (if equipped).
 1. Disconnect the accelerator and speed control cable (if equipped) from the throttle body.
 2. Remove the bolts from the accelerator cable bracket.



N0028734

Fig. 199: Identifying Accelerator Cable Bracket Bolts
Courtesy of FORD MOTOR CO.

36. Remove the nut from the accelerator control cable bracket.

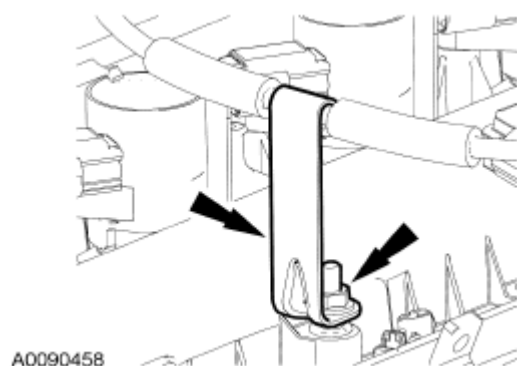


Fig. 200: Locating Accelerator Control Cable Bracket Nut (1 Of 2)
Courtesy of FORD MOTOR CO.

37. Remove the nut from the accelerator control cable bracket and position the accelerator control cable and bracket assembly aside.

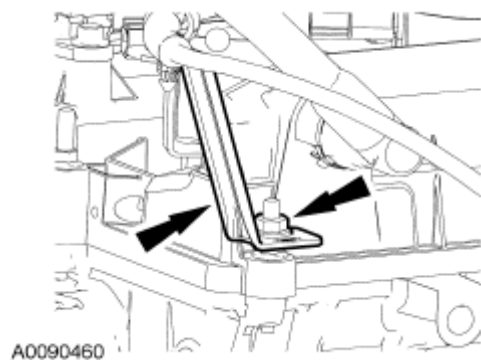


Fig. 201: Locating Accelerator Control Cable Bracket Nut (2 Of 2)
Courtesy of FORD MOTOR CO.

38. Remove the nut and position the power steering tube and bracket aside.

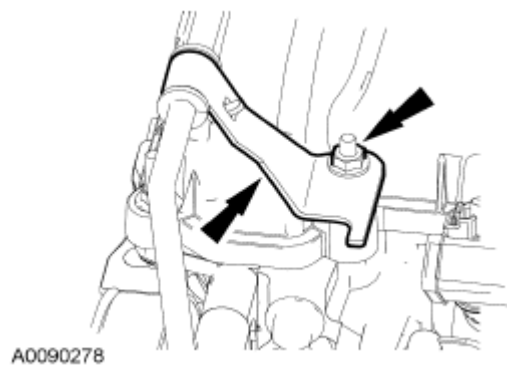


Fig. 202: Locating Power Steering Tube & Bracket Aside

Courtesy of FORD MOTOR CO.

39. Disconnect the vacuum supply tube and position aside.

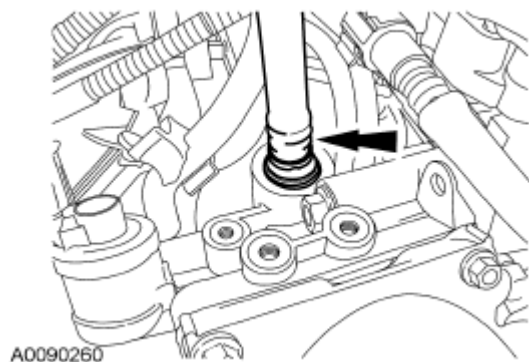


Fig. 203: Locating Vacuum Supply Tube
Courtesy of FORD MOTOR CO.

40. Disconnect the fuel vapor return tube and position aside.

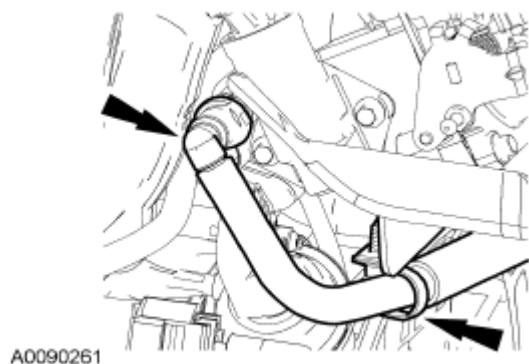


Fig. 204: Locating Fuel Vapor Return Tube
Courtesy of FORD MOTOR CO.

41. Disconnect the vacuum reservoir tube and position aside.

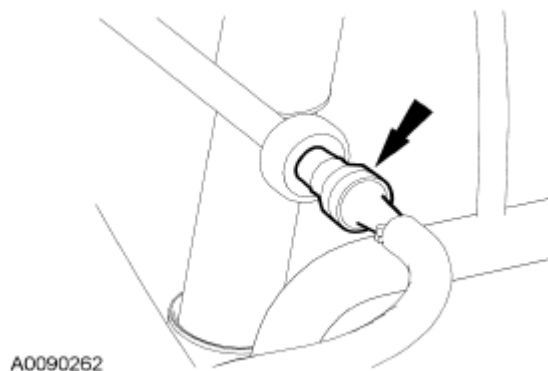


Fig. 205: Locating Vacuum Reservoir Tube
Courtesy of FORD MOTOR CO.

42. Disconnect the fuel supply tube and retainer and position aside.

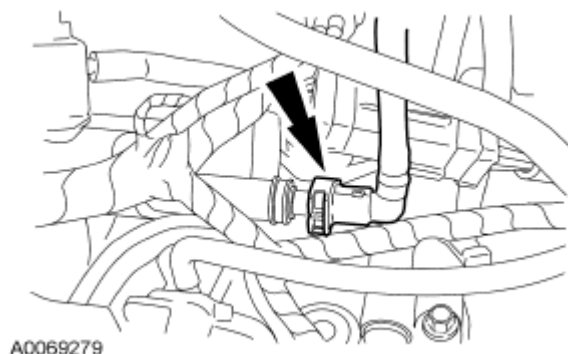


Fig. 206: Locating Fuel Supply Tube & Retainer
Courtesy of FORD MOTOR CO.

43. Detach the electrical connector retainers.

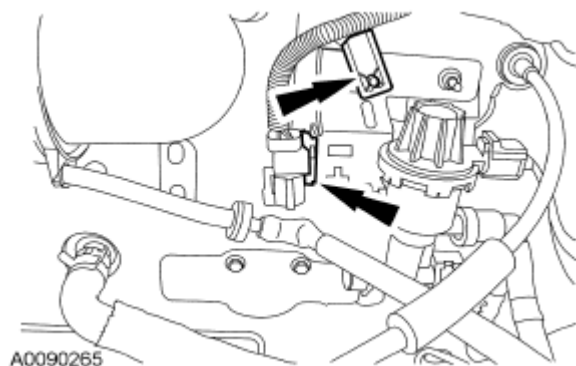


Fig. 207: Locating Electrical Connector Retainers
Courtesy of FORD MOTOR CO.

44. Disconnect the powertrain control module (PCM) electrical connectors. Remove the nut and position the harness aside.

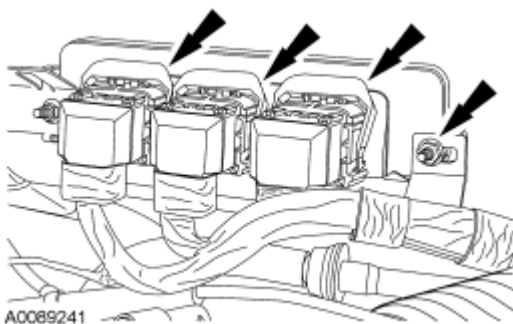


Fig. 208: Locating Powertrain Control Module (PCM) Electrical Connectors
Courtesy of FORD MOTOR CO.

45. Remove the bolt and detach the ground wire.

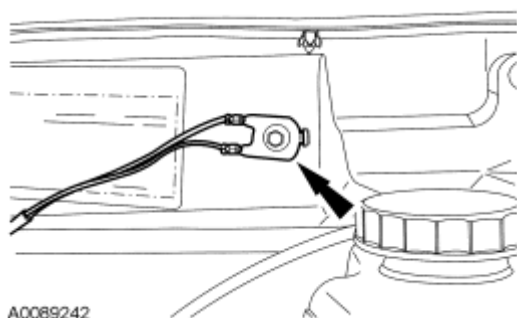


Fig. 209: Locating Ground Wire & Bolt
Courtesy of FORD MOTOR CO.

46. Remove the 2 power steering pump bolts.

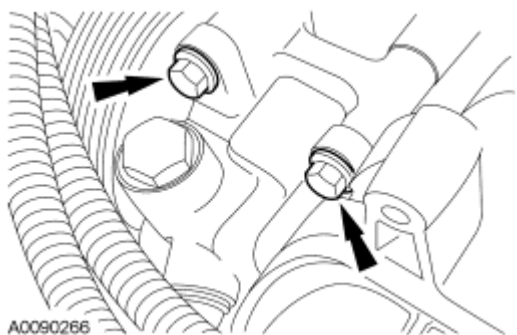


Fig. 210: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

47. Disconnect the lower radiator hose from the radiator.

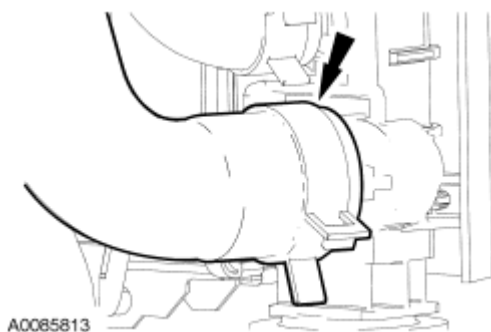


Fig. 211: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

48. Disconnect the A/C compressor electrical connector and remove the 3 bolts. Position the A/C compressor aside and support the compressor with a length of mechanic's wire.

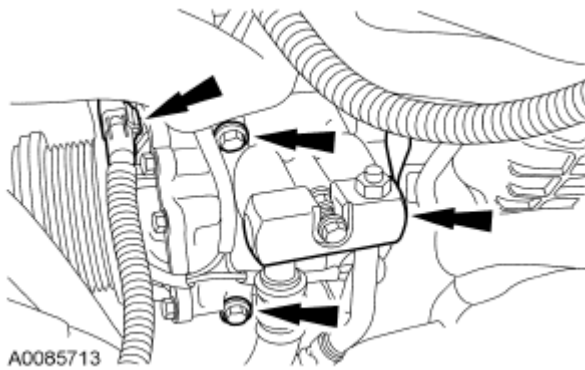


Fig. 212: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

49. Disconnect the power steering pressure (PSP) sensor electrical connector.

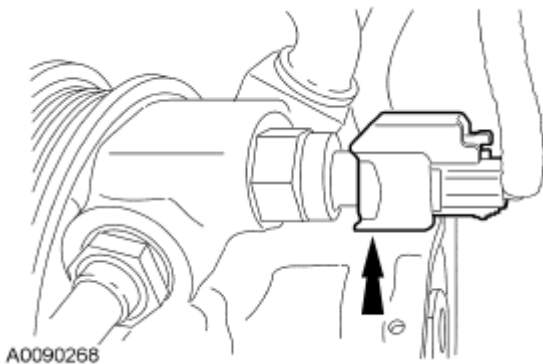


Fig. 213: Locating Power Steering Pressure (PSP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: The bolt under the power steering pressure tube will remain with the power steering pump.

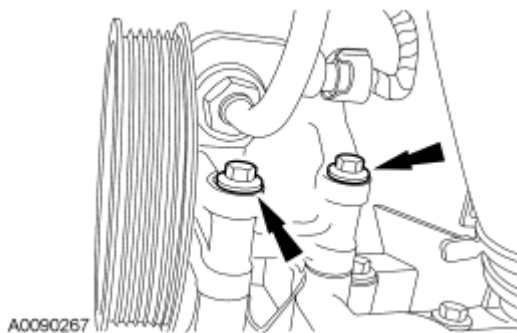


Fig. 214: Identifying Power Steering Pump Bolts

Courtesy of FORD MOTOR CO.

50. Remove the bolts and position the power steering pump aside.
51. Remove the front roll restrictor bolt and the 2 bolts for the engine support crossmember.

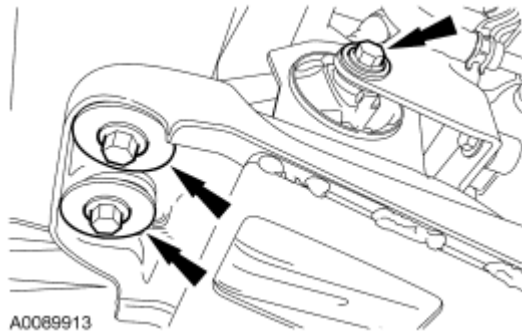


Fig. 215: Identifying Front Roll Restrictor Bolt & Bolts For Engine Support Crossmember
Courtesy of FORD MOTOR CO.

52. Remove the rear nut and the engine support crossmember.
 - Discard the nut.

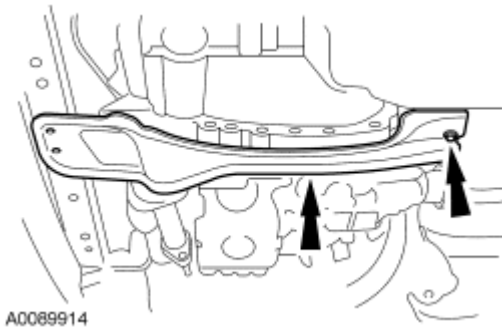


Fig. 216: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

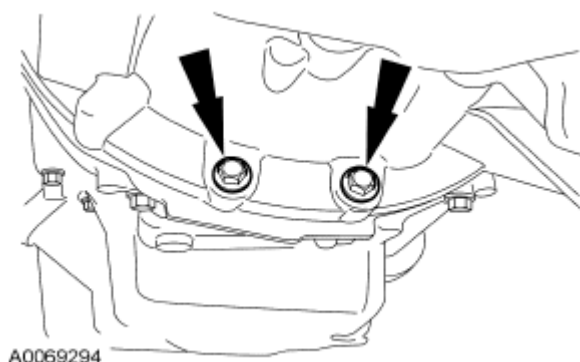


Fig. 217: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

53. Remove the 2 transaxle-to-engine bolts.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

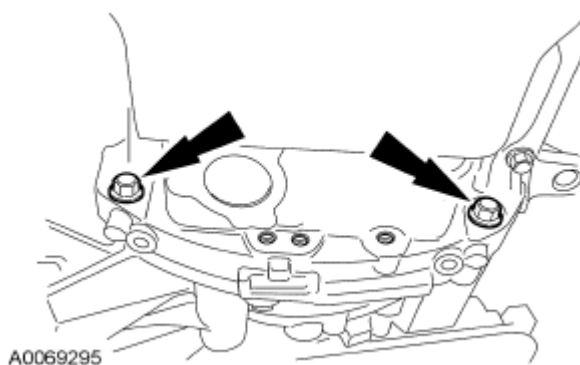


Fig. 218: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

54. Remove the 2 transaxle-to-engine bolts.
55. Using the special tools, secure the engine to the lift table.

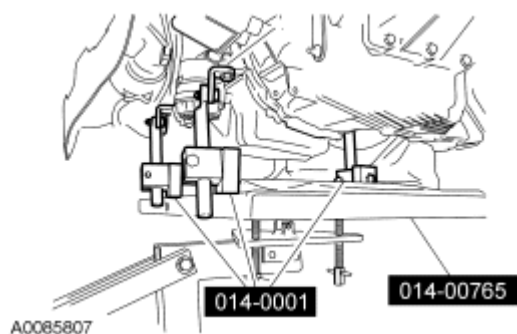


Fig. 219: Securing Engine To Lift Table Using Special Tool (014-0001, 014-00765)

Courtesy of FORD MOTOR CO.

56. Remove the engine mount bracket bolt.

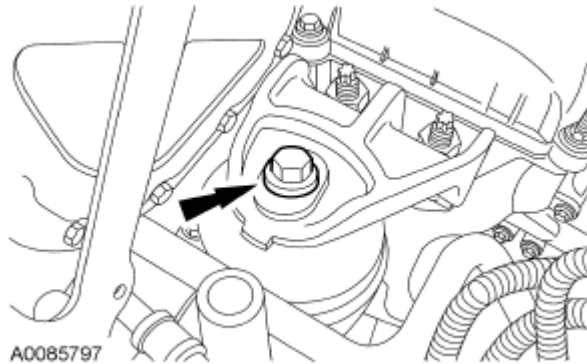


Fig. 220: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

57. Remove the nuts and the engine mount bracket.

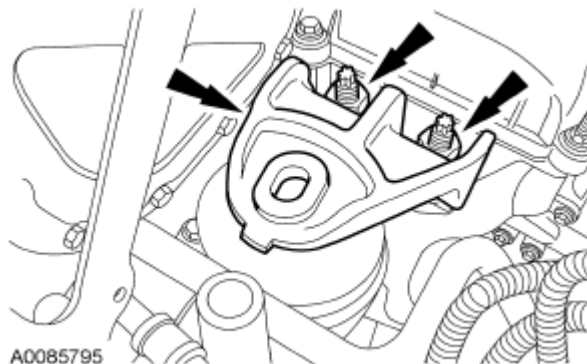


Fig. 221: Locating Nuts & Engine Mount Bracket
Courtesy of FORD MOTOR CO.

58. Remove the bolt from the transaxle rear mount.

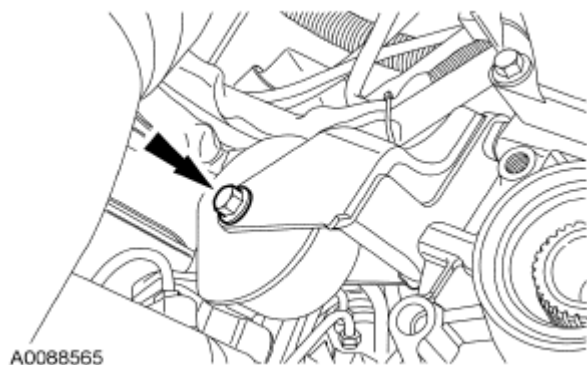


Fig. 222: Locating Transaxle Rear Mount Bolt
Courtesy of FORD MOTOR CO.

59. Remove bolt from the LH transaxle mount.

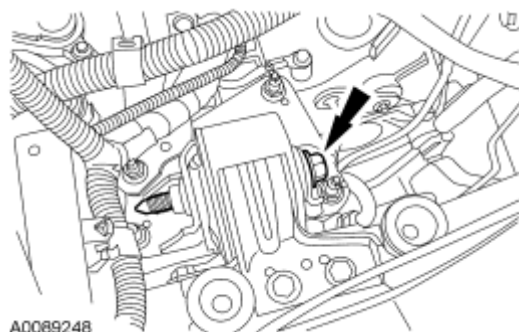


Fig. 223: Locating Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

60. Lower the engine and transaxle from the vehicle.
61. Using the engine crane and spreader bar, remove the engine and transaxle from the lift table.

NOTE: The transaxle-to-engine bolts differ in length. Mark the bolts for correct installation.

62. Remove the remaining 6 engine-to-transaxle bolts and separate the engine and transaxle.

DISASSEMBLY

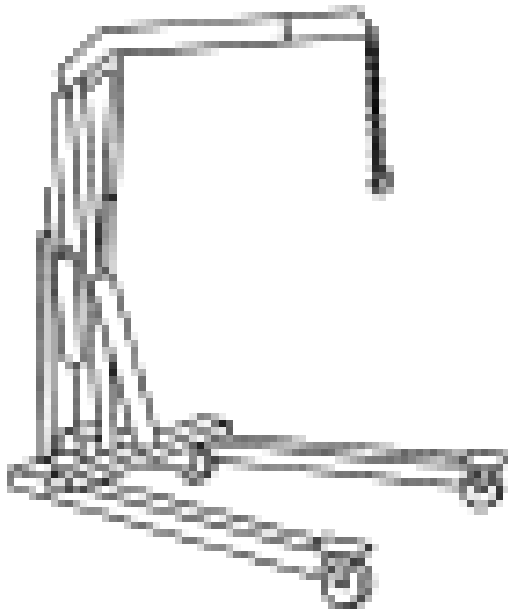
ENGINE

SPECIAL TOOL(S)

Heavy Duty Floor Crane
014-00071 or equivalent

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST1341-A

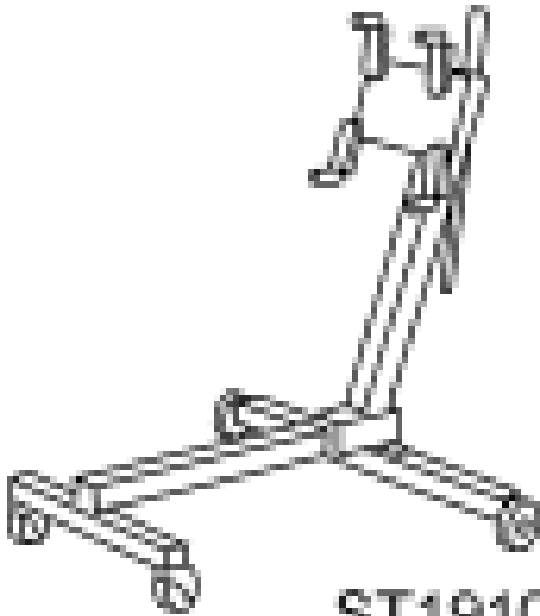


Spreader Bar
303-D089 (D93P-6001-A3) or equivalent

ST1602-A

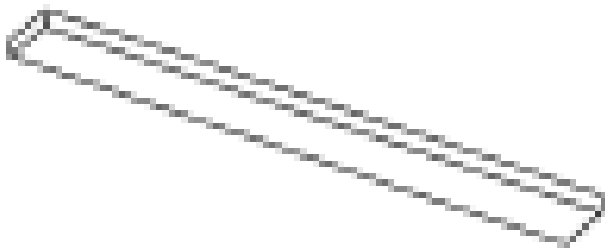
2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST1910-A

Engine Stand
014-00232 or equivalent



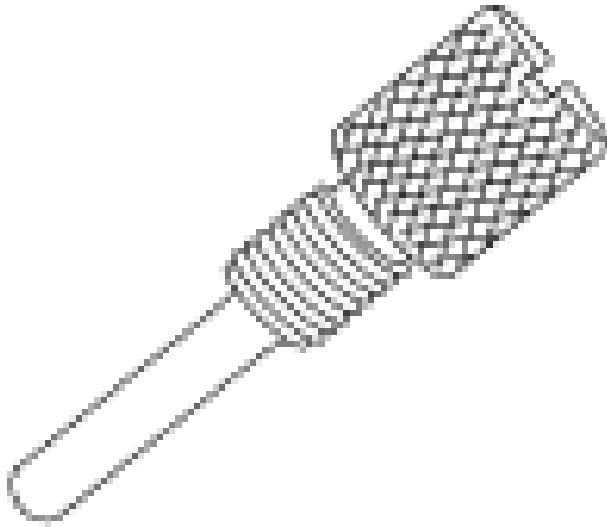
ST2645-A

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

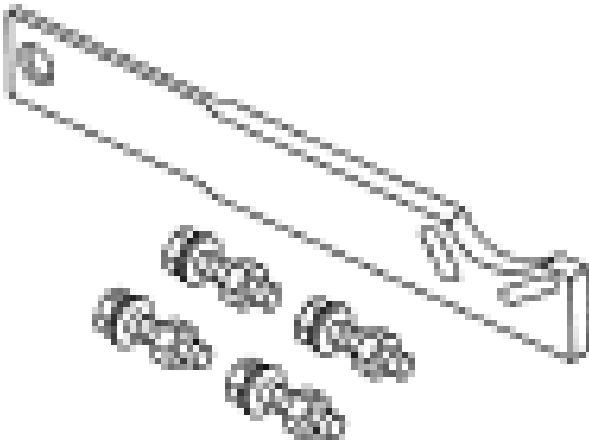
Timing Peg, Crankshaft
303-507

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST2638-A



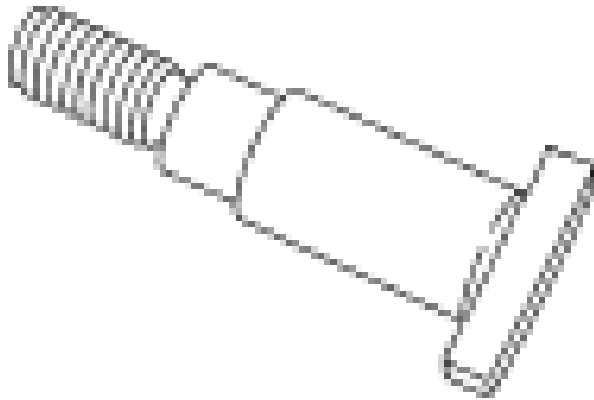
ST2647-A

Holding Fixture, Drive Pinion Flange
205-126 (T78P-4851-A)

Adapter for 205-126

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST2639-A

(205-072-02)



ST1385-A

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

CAUTION:

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 you loosen the pulley bolt. 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.

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.

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 views under the engine assembly procedure .

Vehicles with manual transaxle

WARNING: The clutch disc and clutch pressure plate are heavy and may fall if not held when the bolts are removed. Failure to follow these instructions may result in personal injury.

CAUTION: Loosen the bolts evenly to prevent pressure plate damage.

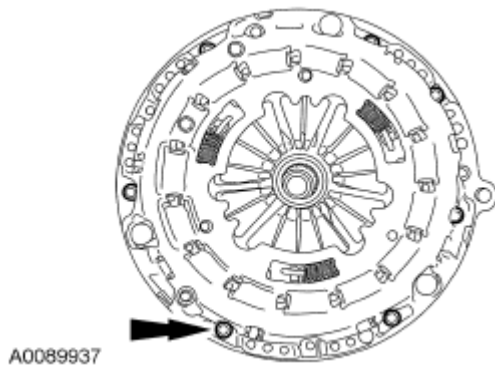


Fig. 224: Locating Bolts, Clutch Pressure Plate & Clutch Disc
Courtesy of FORD MOTOR CO.

1. Remove the bolts, clutch pressure plate and clutch disc.
2. Remove the starter motor isolator.

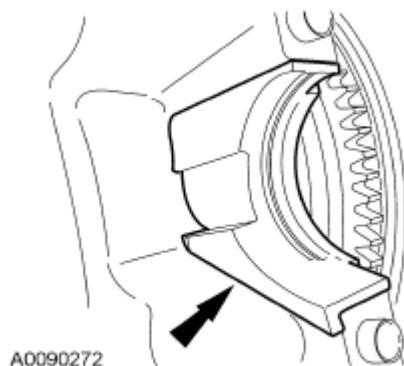


Fig. 225: Locating Starter Motor Isolator
Courtesy of FORD MOTOR CO.

3. Remove the bolts and the flywheel.

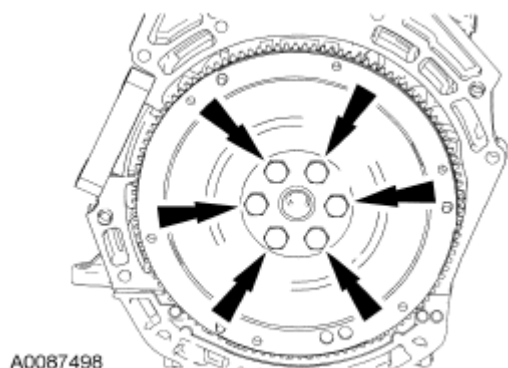


Fig. 226: Locating Bolts & Flywheel
Courtesy of FORD MOTOR CO.

Vehicles with automatic transaxle

4. Remove the bolts and the flexplate.

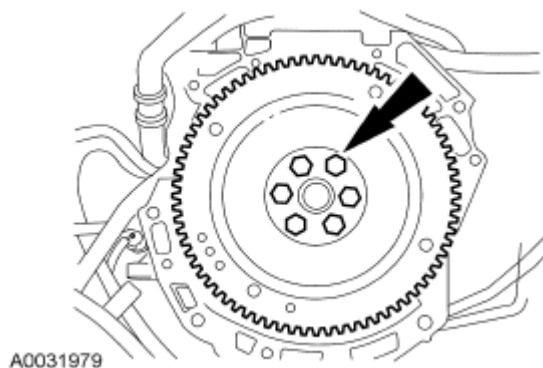


Fig. 227: Locating Bolts & Flexplate
Courtesy of FORD MOTOR CO.

All vehicles

5. Mount the engine on a suitable stand.
6. Disconnect the crankshaft position (CKP) sensor electrical connector.

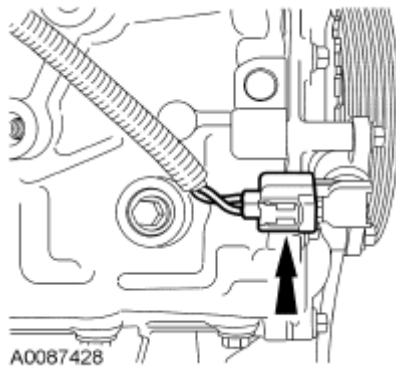


Fig. 228: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

7. Remove the nut and disconnect the generator electrical connections.

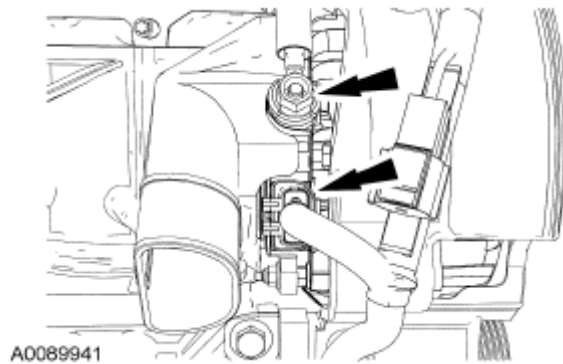


Fig. 229: Locating Nut & Generator Electrical Connections
Courtesy of FORD MOTOR CO.

8. Remove the 2 lower catalytic converter bolts.

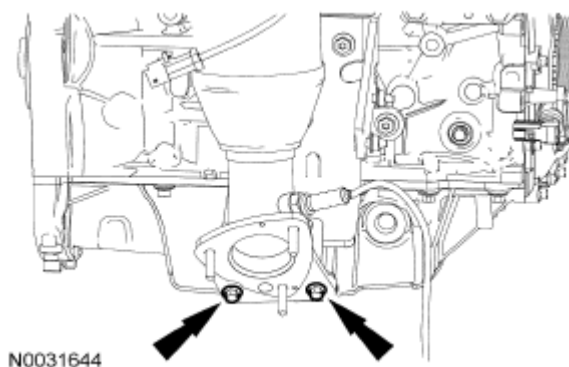


Fig. 230: Locating Lower Catalytic Converter Bolts
Courtesy of FORD MOTOR CO.

9. Remove the 6 heat shield bolts and the heat shield.

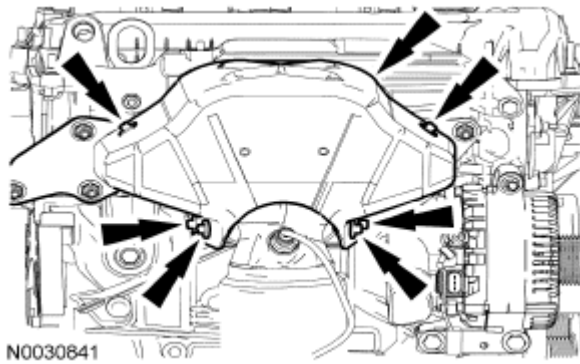


Fig. 231: Locating Heat Shield Bolts & Heat Shield
Courtesy of FORD MOTOR CO.

10. Remove and discard the 7 exhaust manifold nuts.

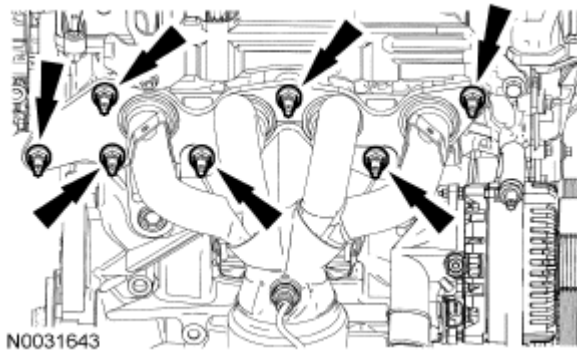
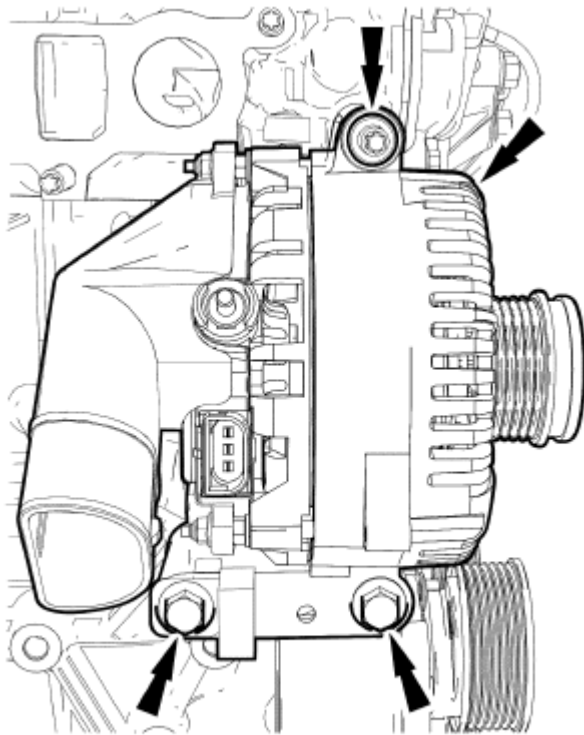


Fig. 232: Locating Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

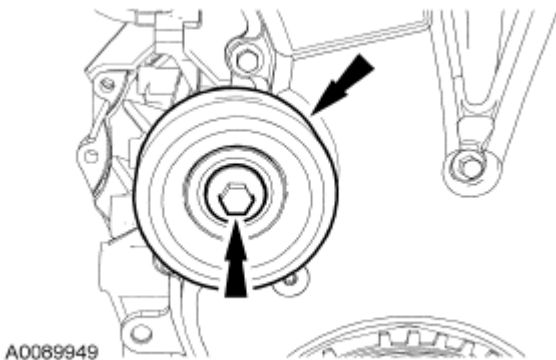
11. Remove the catalytic converter and discard the exhaust manifold gasket.
12. Remove the bolts and the generator.



A0089945

Fig. 233: Locating Bolts & Generator
Courtesy of FORD MOTOR CO.

13. Loosen the bolt and remove the accessory drive belt idler pulley.



A0089949

Fig. 234: Locating Accessory Drive Belt Idler Pulley Bolt
Courtesy of FORD MOTOR CO.

14. If equipped, loosen the bolt and remove the accessory drive belt idler pulley.

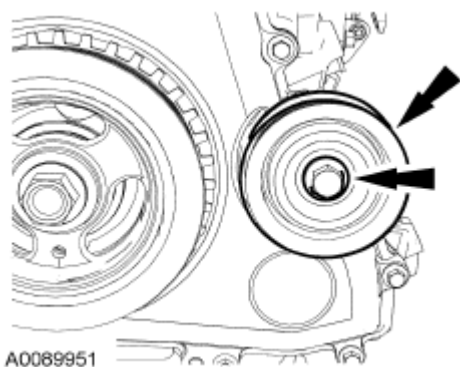


Fig. 235: Locating Bolt & Accessory Drive Belt Idler Pulley
Courtesy of FORD MOTOR CO.

15. Remove the bolts and the coolant pump pulley.

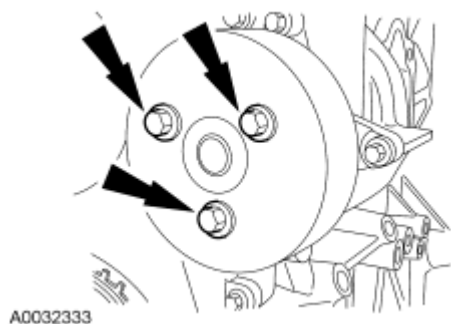


Fig. 236: Locating Coolant Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

16. Remove the bolts and the coolant pump.

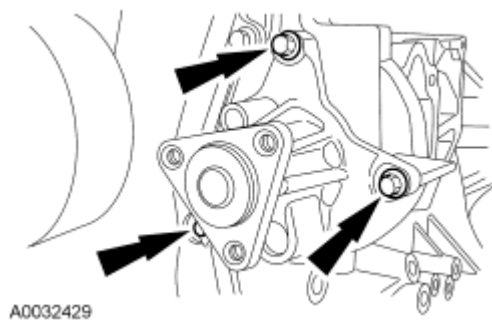


Fig. 237: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

17. Remove the engine vacuum tube.
- Detach the 2 engine vacuum tube retainers.
 - Disconnect and remove the engine vacuum tube.

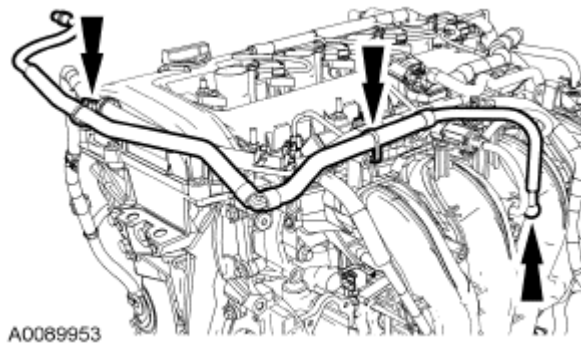


Fig. 238: Locating Engine Vacuum Tube
Courtesy of FORD MOTOR CO.

18. Detach the 2 wiring harness retainers and position the harness aside.

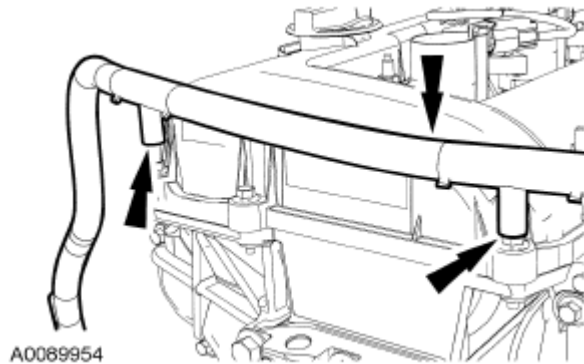


Fig. 239: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

19. If equipped, disconnect the oil cooler hoses.

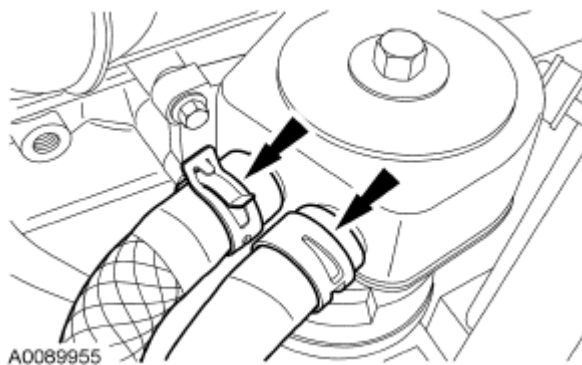


Fig. 240: Locating Oil Cooler Hoses
Courtesy of FORD MOTOR CO.

20. Remove the bolts and the thermostat housing assembly.

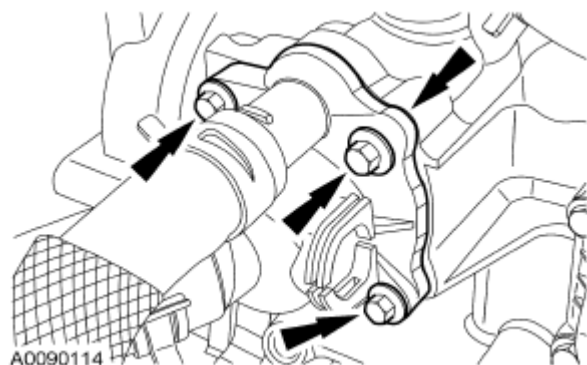


Fig. 241: Locating Bolts & Thermostat Housing Assembly
Courtesy of FORD MOTOR CO.

21. Remove the bolts and the oil level indicator.

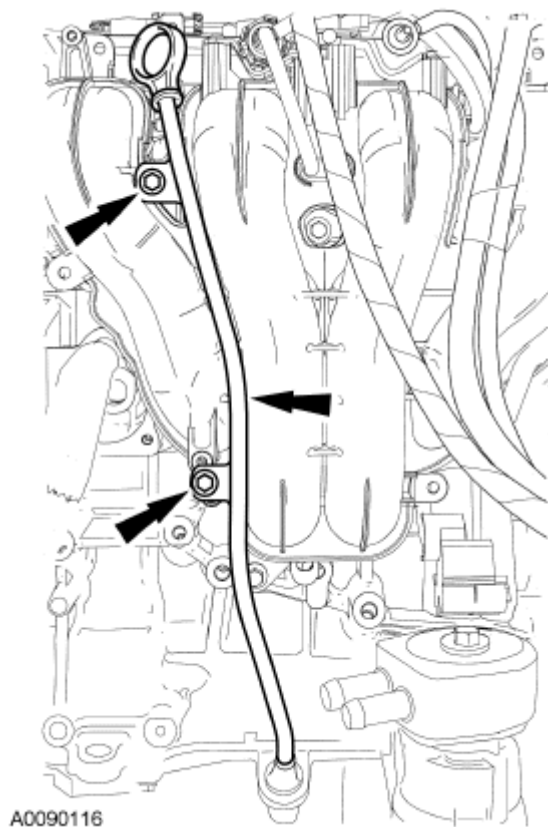


Fig. 242: Locating Bolts & Oil Level Indicator
Courtesy of FORD MOTOR CO.

22. Disconnect the oil pressure sensor electrical connector.

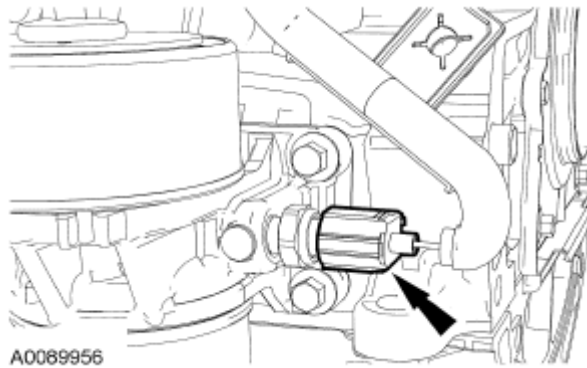


Fig. 243: Locating Oil Pressure Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: Early build with oil cooler shown, late build without oil cooler similar.

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

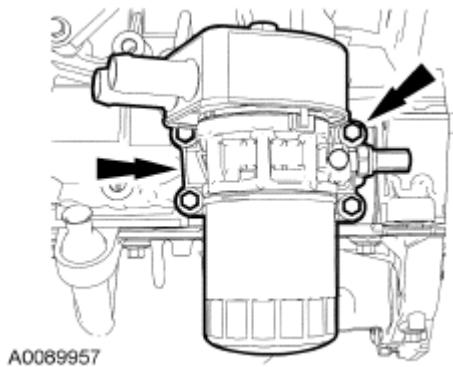


Fig. 244: Locating Oil Filter, Bolts & Oil Filter Adapter
Courtesy of FORD MOTOR CO.

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

24. Position the oil filter adapter in a vise and remove the oil cooler bolt and oil cooler.
 - Discard the oil cooler.
25. If equipped, remove the bolt and capacitor.

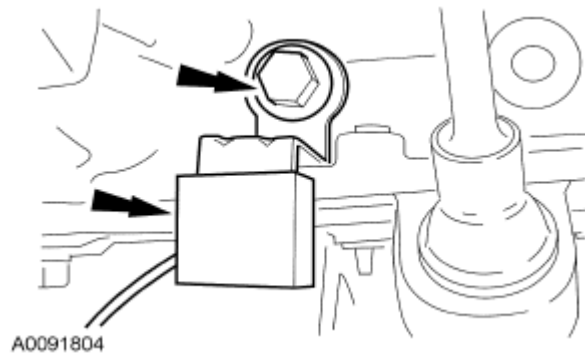


Fig. 245: Locating Bolt & Capacitor
Courtesy of FORD MOTOR CO.

26. Detach the 2 wiring harness retainers.

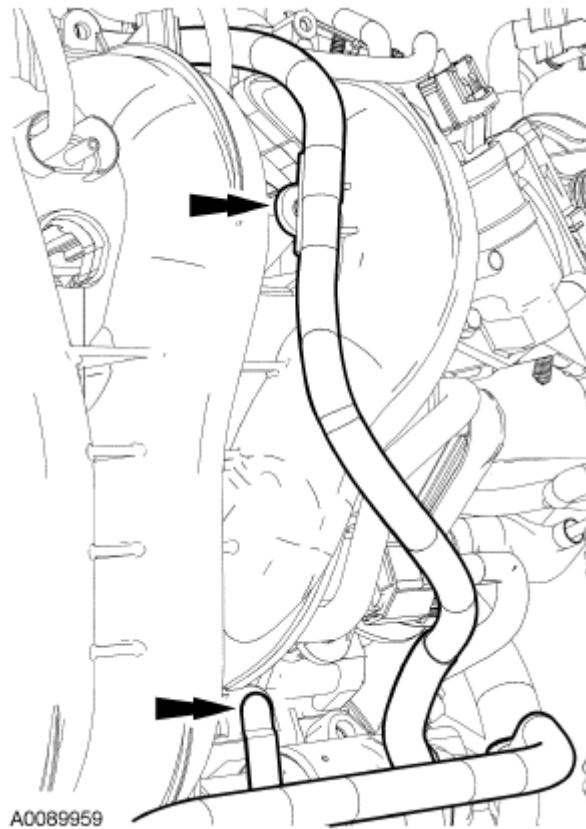


Fig. 246: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

27. Disconnect the knock sensor (KS) and detach the 2 wiring harness retainers.

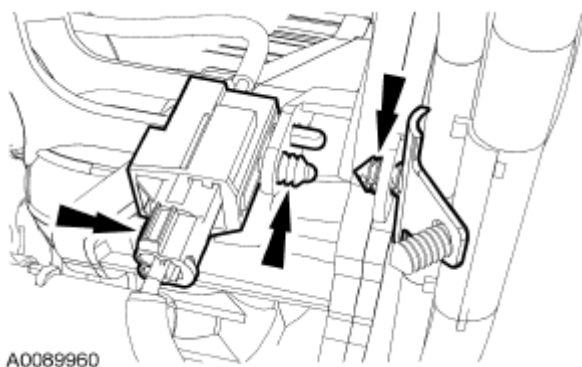


Fig. 247: Locating Knock Sensor (KS) & Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

28. Disconnect the temperature manifold absolute pressure (TMAP) electrical connector.



Fig. 248: Locating Temperature Manifold Absolute Pressure (TMAP) Electrical Connector
Courtesy of FORD MOTOR CO.

29. Disconnect the idle air control (IAC) motor electrical connector.

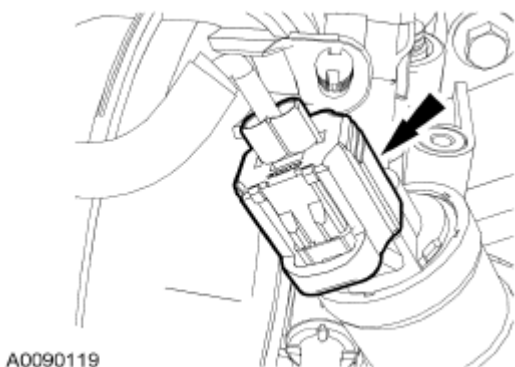


Fig. 249: Locating Idle Air Control (IAC) Motor Electrical Connector
Courtesy of FORD MOTOR CO.

30. Disconnect the swirl control valve electrical connector.

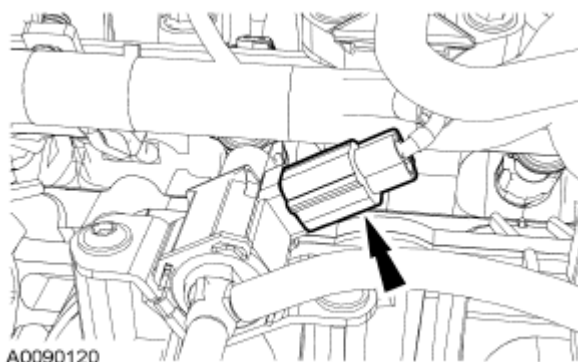


Fig. 250: Locating Swirl Control Valve Electrical Connector
Courtesy of FORD MOTOR CO.

31. Disconnect the fuel rail pressure and temperature sensor electrical connector and vacuum tube.

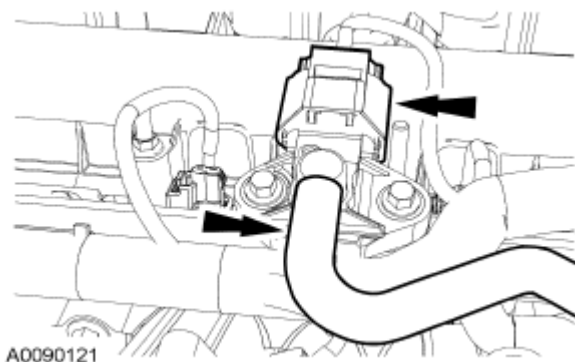


Fig. 251: Locating Fuel Rail Pressure & Temperature Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

32. Disconnect the throttle position (TP) sensor electrical connector.

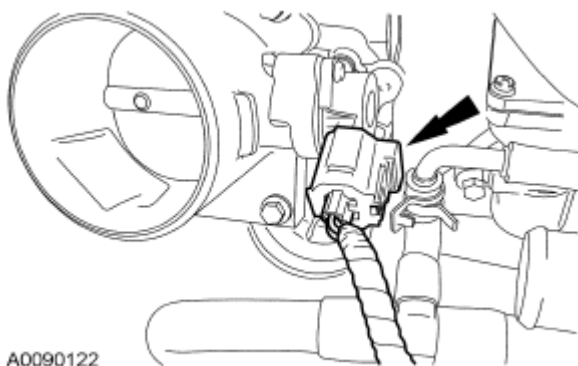


Fig. 252: Locating Throttle Position (TP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: There are 3 different size bolts used. Mark the location of the bolts to

ensure installation in the correct locations.

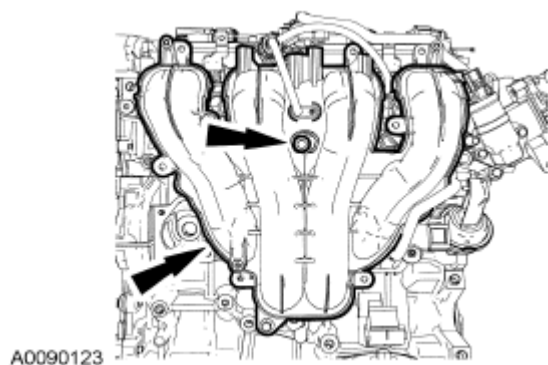


Fig. 253: Locating Intake Manifold Aside & Bolt
Courtesy of FORD MOTOR CO.

33. Remove the bolts and position the intake manifold aside.
34. Disconnect the positive crankcase ventilation (PCV) hose and remove the intake manifold.

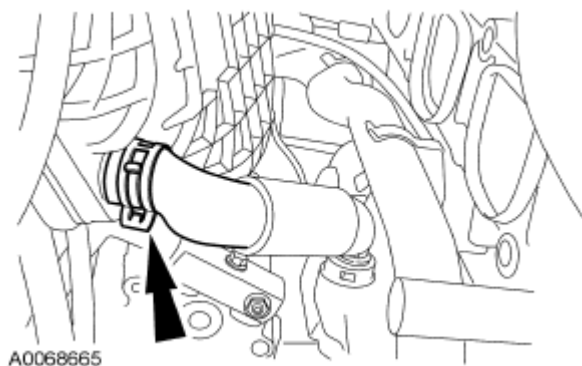


Fig. 254: Locating Positive Crankcase Ventilation (PCV) Hose
Courtesy of FORD MOTOR CO.

35. Remove the exhaust gas recirculation (EGR) tube.

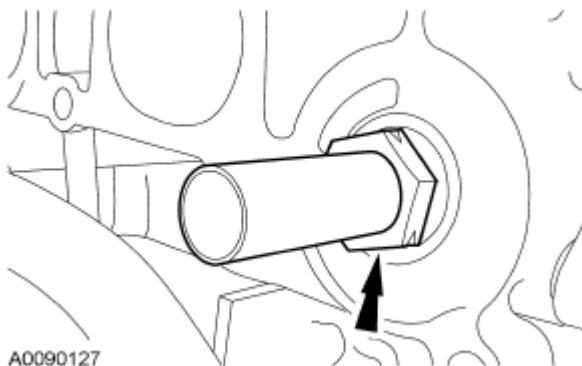


Fig. 255: Locating Exhaust Gas Recirculation (EGR) Tube

Courtesy of FORD MOTOR CO.

36. Disconnect the 4 fuel injector electrical connectors. Detach the 2 wiring harness retainers.

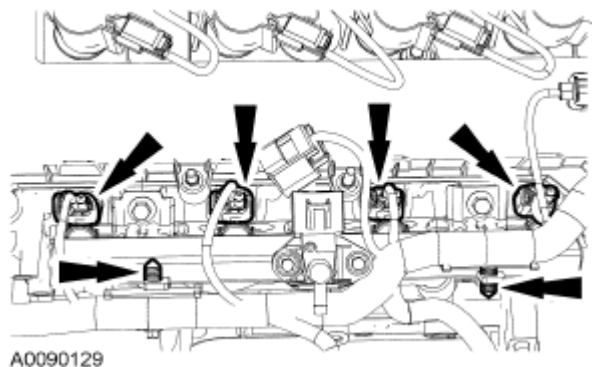


Fig. 256: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

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

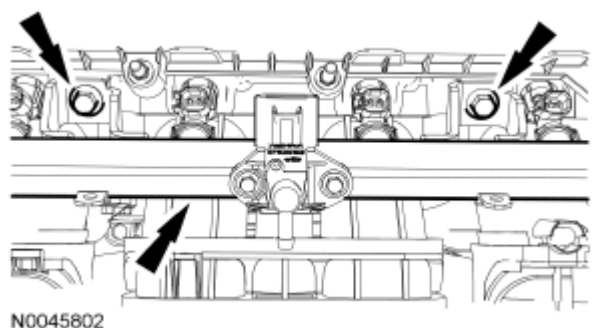


Fig. 257: Locating Bolts & Fuel Rail With Fuel Injectors
Courtesy of FORD MOTOR CO.

38. If equipped, remove the fuel rail spacers.

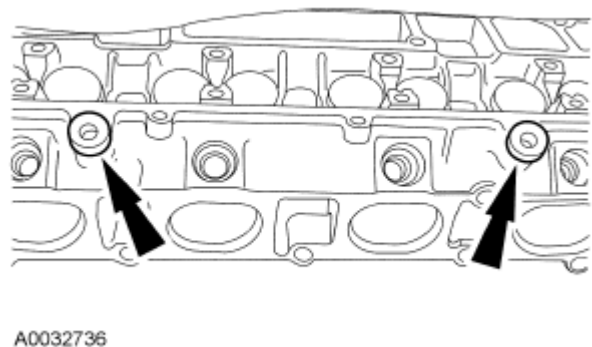


Fig. 258: Locating Fuel Rail Spacers
Courtesy of FORD MOTOR CO.

39. Detach the wiring harness retainer.

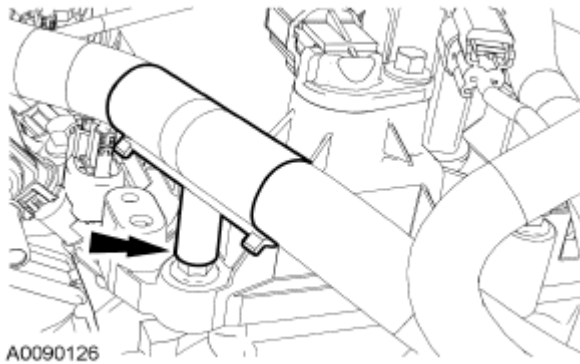


Fig. 259: Locating Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

40. Disconnect the EGR valve and radio interference capacitor electrical connectors. Detach the wiring harness retainer.

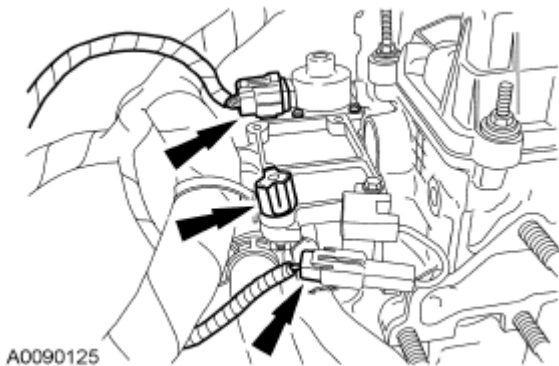


Fig. 260: Locating EGR Valve & Radio Interference Capacitor Electrical Connectors
Courtesy of FORD MOTOR CO.

41. Disconnect the coil-on-plug and camshaft position (CMP) sensor electrical connectors.

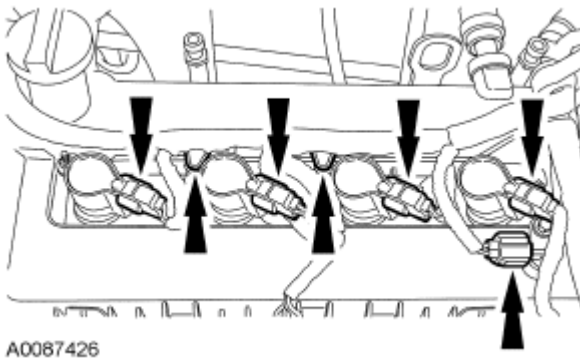


Fig. 261: Locating Coil-On-Plug & Camshaft Position (CMP) Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

42. Detach the wiring harness retainer.

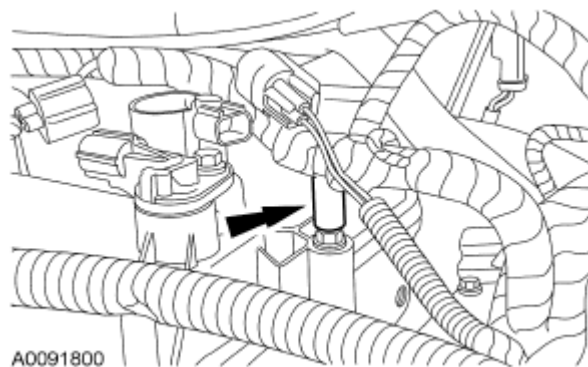


Fig. 262: Locating Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

43. Position the rubber boot aside and disconnect the cylinder head temperature (CHT) sensor electrical connector. Remove the wiring harness from the engine.

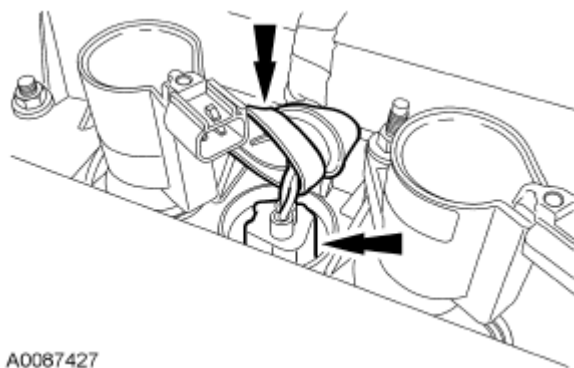


Fig. 263: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

44. Disconnect the coolant hose.

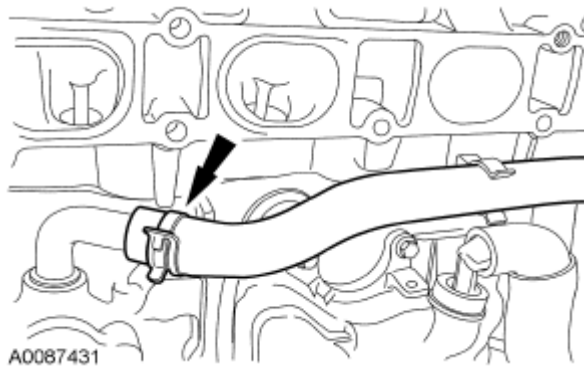


Fig. 264: Locating Coolant Hose (1 Of 3)
Courtesy of FORD MOTOR CO.

45. Disconnect and remove the coolant hose.

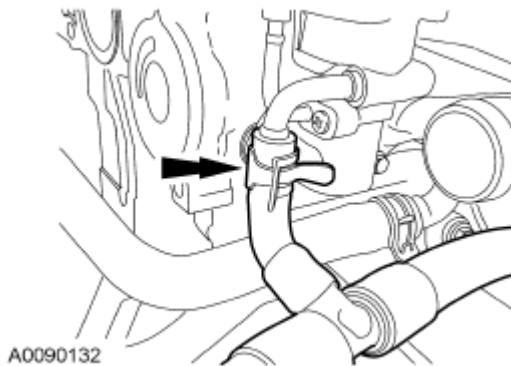


Fig. 265: Locating Coolant Hose (2 Of 3)
Courtesy of FORD MOTOR CO.

46. Disconnect and remove the coolant hoses.

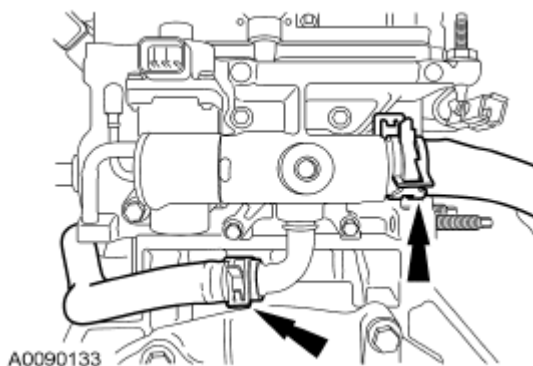


Fig. 266: Locating Coolant Hose (3 Of 3)
Courtesy of FORD MOTOR CO.

47. Remove the bolt and the KS.

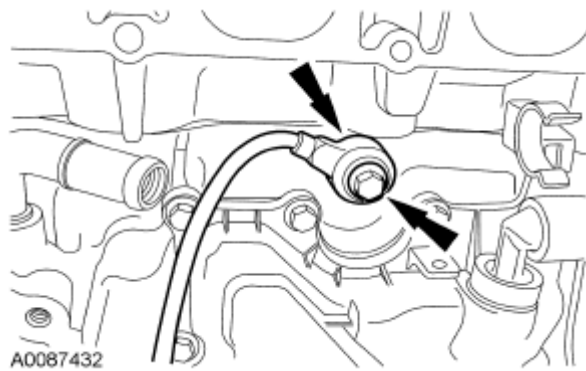


Fig. 267: Locating Bolt & KS
Courtesy of FORD MOTOR CO.

48. Remove the bolts and the crankcase vent oil separator.

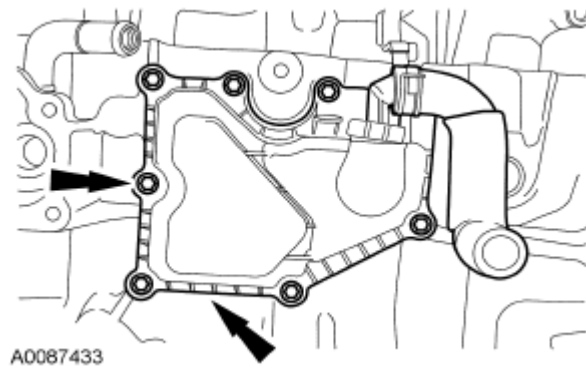


Fig. 268: Locating Bolts & Crankcase Vent Oil Separator
Courtesy of FORD MOTOR CO.

49. If equipped, remove the block heater.

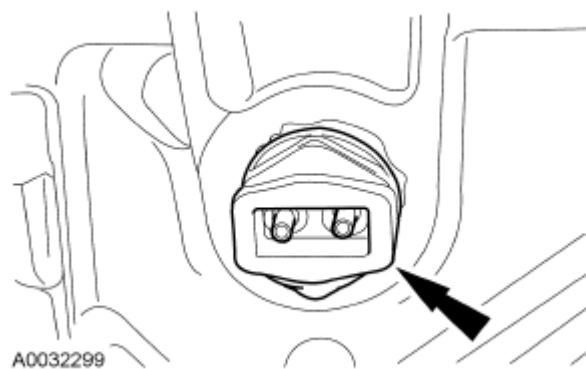


Fig. 269: Locating Block Heater
Courtesy of FORD MOTOR CO.

50. Remove the crankcase vent tube and the coil-on-plugs.

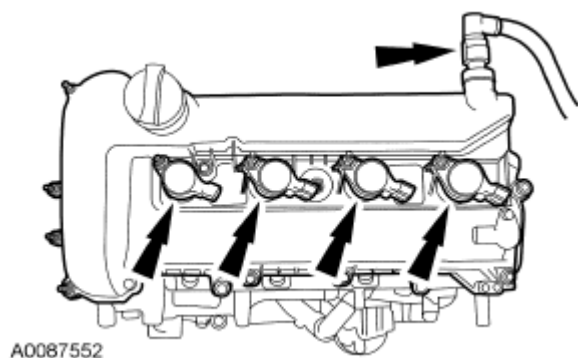


Fig. 270: Locating Crankcase Vent Tube & Coil-On-Plugs
Courtesy of FORD MOTOR CO.

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

51. Remove the spark plugs and the CHT sensor.
 - Discard the CHT.

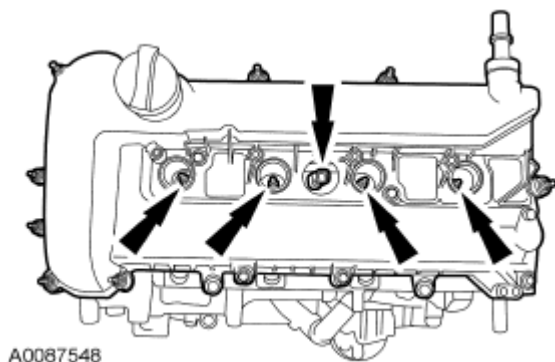


Fig. 271: Locating Spark Plugs & CHT Sensor
Courtesy of FORD MOTOR CO.

52. Remove the bolts and the valve cover.

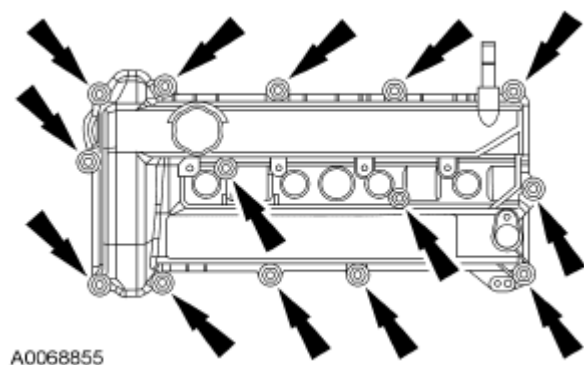


Fig. 272: Locating Bolts & Valve Cover
Courtesy of FORD MOTOR CO.

CAUTION: 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.

53. Using the crankshaft pulley bolt, turn the crankshaft clockwise to position the No. 1 piston at TDC.
- The hole in the crankshaft pulley should be in the 6 o'clock position.

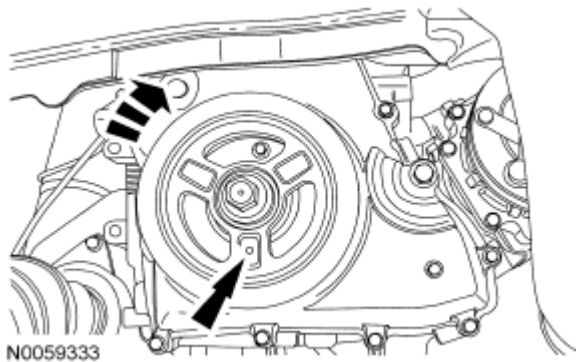


Fig. 273: Locating Crankshaft Pulley
Courtesy of FORD MOTOR CO.

CAUTION: The special tool 303-465 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 special tool cannot be installed, rotate the crankshaft one complete revolution clockwise to correctly position the camshafts.

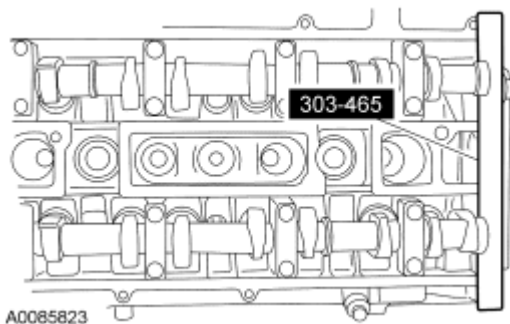


Fig. 274: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

54. Install the special tool in the slots on the rear of both camshafts.
55. Remove the engine plug bolt.

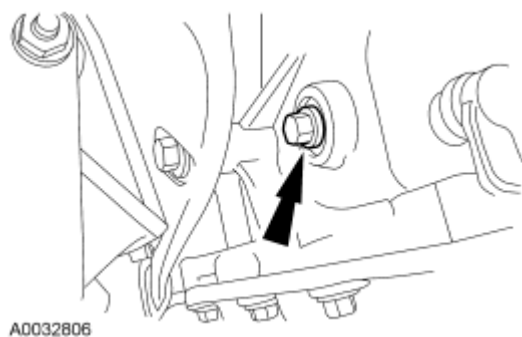


Fig. 275: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The special tool 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 disassembly.

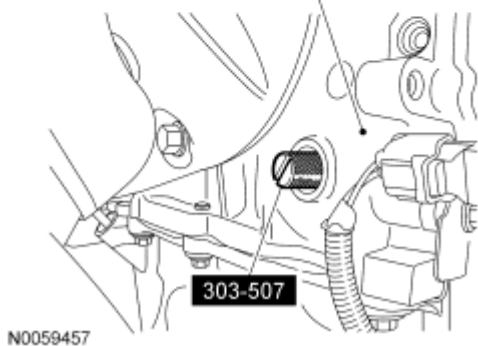
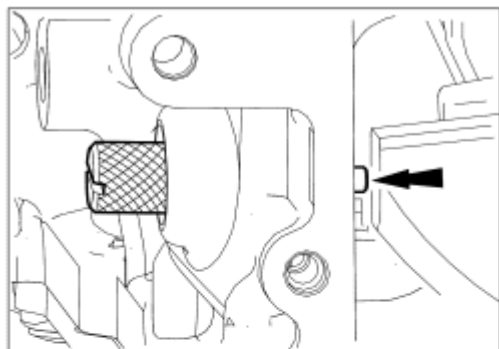
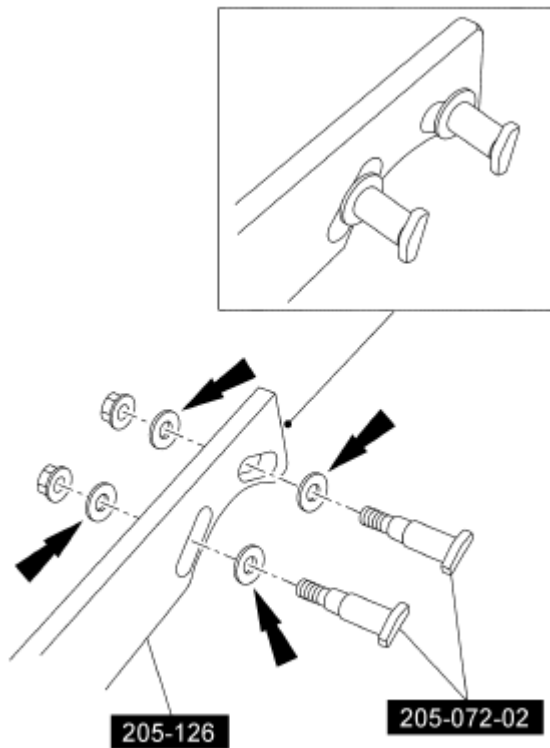


Fig. 276: Identifying Special Tool (303-507)
Courtesy of FORD MOTOR CO.

56. Install the special tool.
57. Assemble the special tools using 4 hardened washers in the locations shown in **Fig. 277**.



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Fig. 277: Assembling Special Tools (205-072-02, 205-126)
Courtesy of FORD MOTOR CO.

CAUTION:

The crankshaft must remain in the 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 special tool and the bolt should be removed using an air impact wrench (1/2-in drive minimum).

If the crankshaft sprocket diamond washer comes off with the crankshaft pulley, it must be installed back onto the crankshaft.

58. Using the special tools and an air impact wrench, remove the crankshaft pulley.
- Remove and discard the crankshaft pulley bolt and washer.
 - Remove the crankshaft pulley.

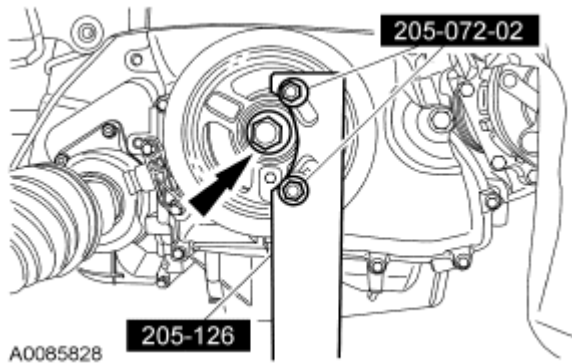


Fig. 278: Identifying Special Tools Assembly (205-072-02/205-126) And Crankshaft Pulley Bolt
 Courtesy of FORD MOTOR CO.

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

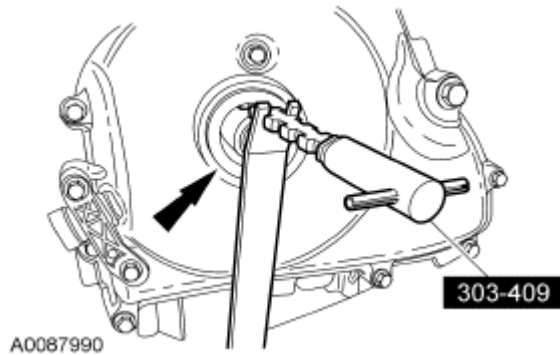


Fig. 279: Removing Crankshaft Front Oil Seal Using Special Tool (303-409)
 Courtesy of FORD MOTOR CO.

59. Using the special tool, remove the crankshaft front oil seal.

NOTE: Whenever the CKP sensor is removed, a new one must be installed using the alignment jig supplied with the new part.

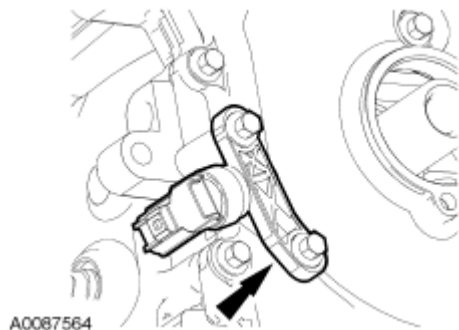
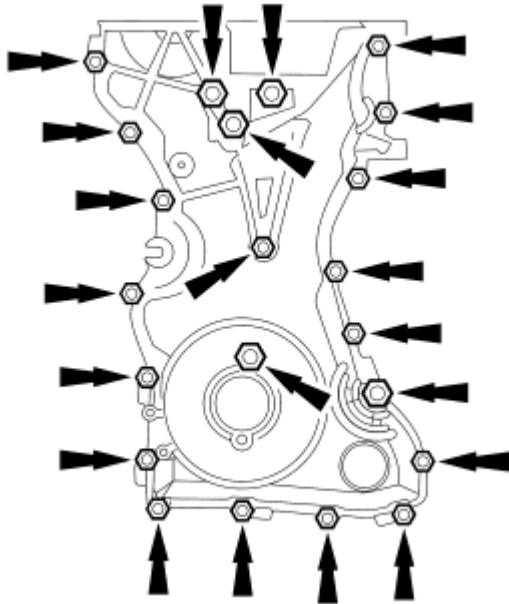


Fig. 280: Locating CKP Sensor
Courtesy of FORD MOTOR CO.

60. Remove and discard the CKP sensor.
61. Remove the bolts and the engine front cover.



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Fig. 281: Locating Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

62. Remove the timing chain tensioner.
 1. Compress the timing chain tensioner, and insert a paper clip into the hole to retain the tensioner.
 2. Remove the bolts and timing chain tensioner.

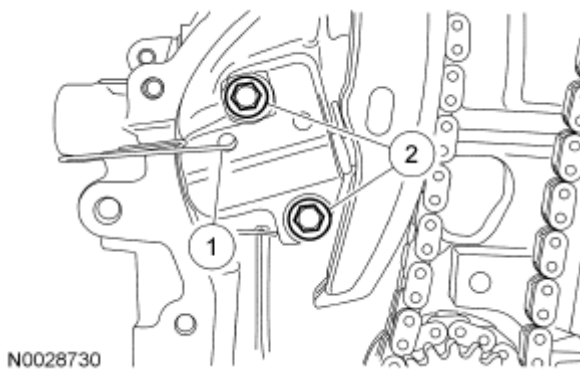


Fig. 282: Locating Timing Chain Tensioner Bolt
Courtesy of FORD MOTOR CO.

63. Remove the RH timing chain guide.

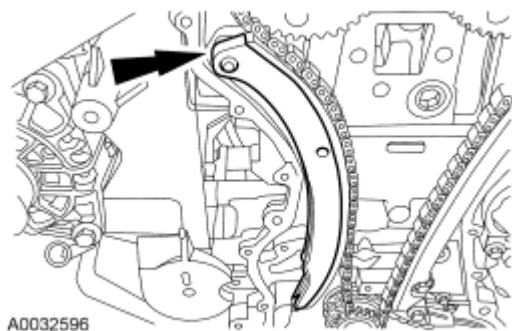


Fig. 283: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

64. Remove the timing chain.

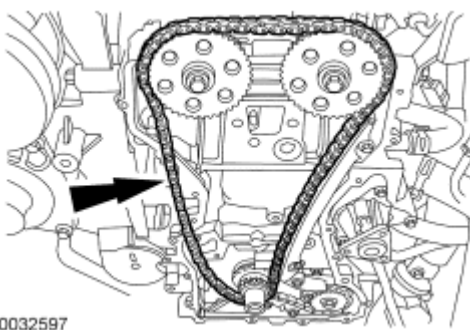


Fig. 284: View Of Timing Chain
Courtesy of FORD MOTOR CO.

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

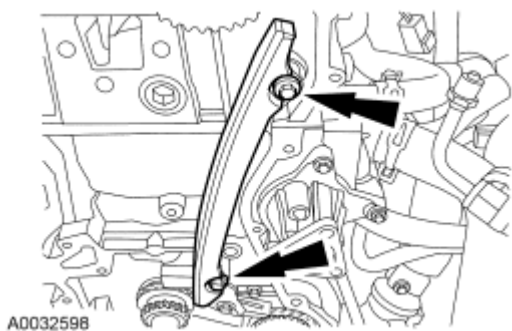


Fig. 285: Identifying Bolts And LH Timing Chain Guide
Courtesy of FORD MOTOR CO.

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

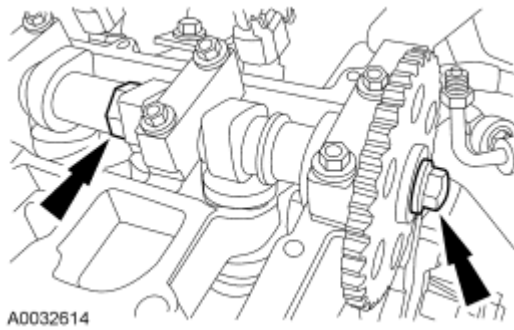


Fig. 286: Locating Cam Holding Area And Sprocket Bolt
Courtesy of FORD MOTOR CO.

66. Using the flats on the camshaft to prevent camshaft rotation, remove the bolts and the camshaft sprockets.
67. Remove the oil pump chain tensioner and guide.
 1. Release the tension on the tensioner spring.
 2. Remove the tensioner and the shoulder bolt.
 3. Remove the guide

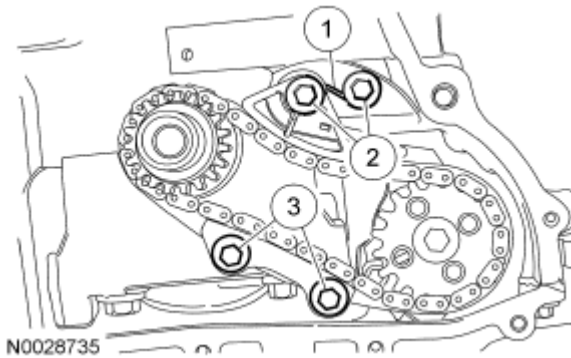


Fig. 287: Identifying Tensioner & Shoulder Bolt
Courtesy of FORD MOTOR CO.

NOTE:

Remove the crankshaft sprocket diamond washers located in front of and behind the crankshaft sprocket.

The oil pump chain sprocket must be held in place.

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

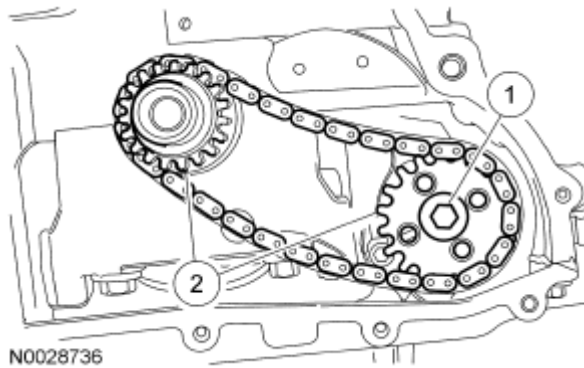


Fig. 288: Identifying Chain & Sprockets
Courtesy of FORD MOTOR CO.

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

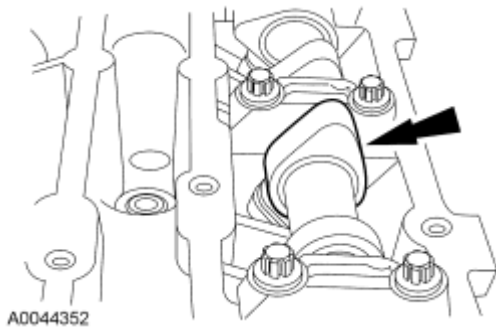


Fig. 289: Locating Camshaft Lobe
Courtesy of FORD MOTOR CO.

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

70. Remove the camshafts from the engine.
- Loosen the camshaft bearing bolts in the sequence shown in **Fig. 290**, one turn at a time. Repeat until all the tension is released.
 - Remove the camshaft bearing caps.
 - Remove the camshafts.

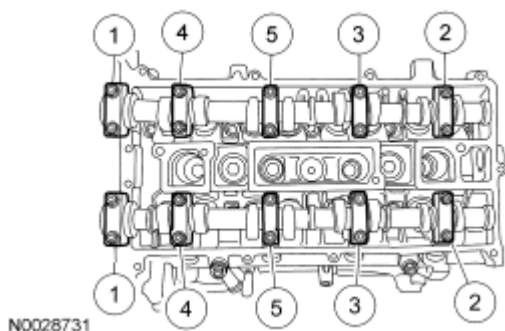


Fig. 290: Identifying Loosening/Tightening Sequence Of Camshaft Bearing Bolts
Courtesy of FORD MOTOR CO.

71. Remove the cylinder head.

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

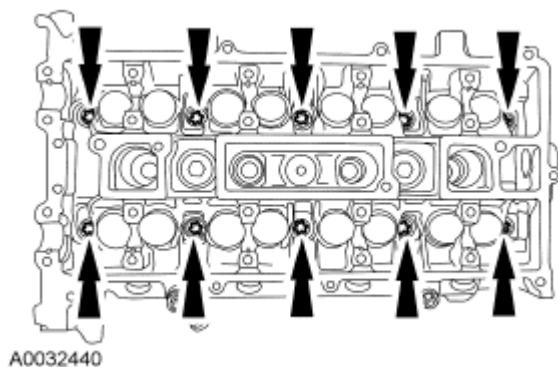


Fig. 291: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

72. Remove the cylinder head alignment dowels.

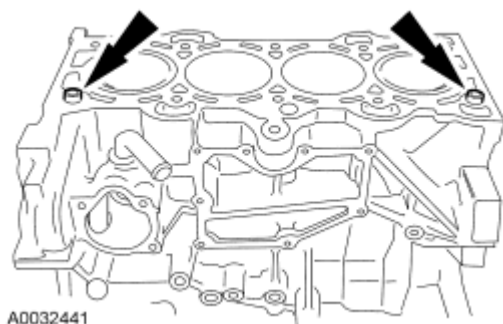


Fig. 292: Identifying Cylinder Head Alignment Dowels
Courtesy of FORD MOTOR CO.

73. Remove the bolts and the oil pan.

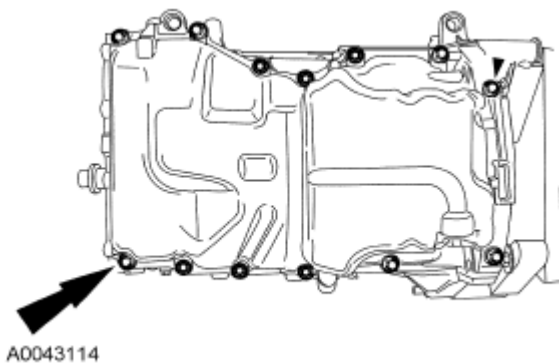


Fig. 293: Locating Bolts & Oil Pan
Courtesy of FORD MOTOR CO.

74. Remove the bolts and the rear crankshaft seal.

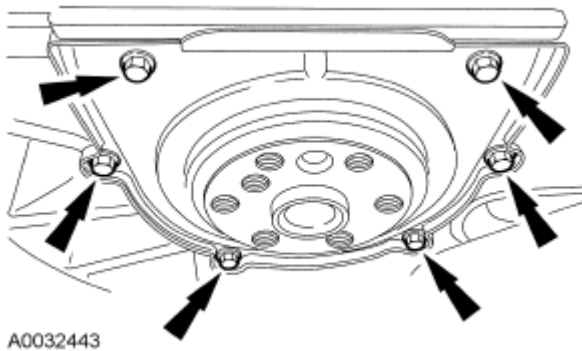


Fig. 294: Locating Bolts & Rear Crankshaft Seal
Courtesy of FORD MOTOR CO.

75. Remove the bolts, oil pump pickup tube and gasket.

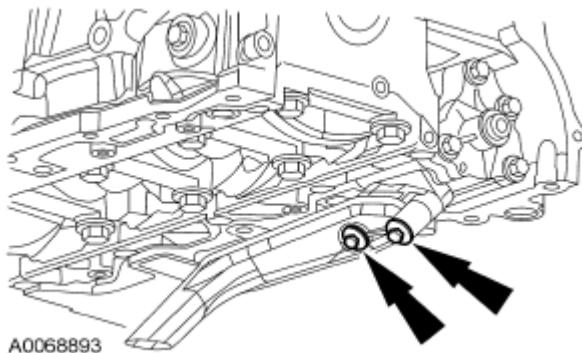


Fig. 295: Locating Bolts, Oil Pump Pickup Tube & Gasket
Courtesy of FORD MOTOR CO.

76. Remove the bolts and the oil pump.

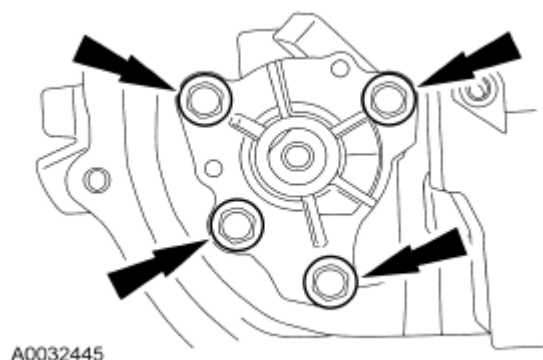


Fig. 296: Locating Bolts & Oil Pump
Courtesy of FORD MOTOR CO.

77. If necessary, remove the bolts and halfshaft support bracket.

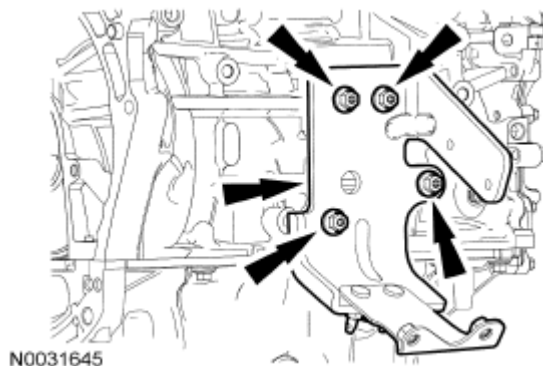


Fig. 297: Locating Bolts & Halfshaft Support Bracket
Courtesy of FORD MOTOR CO.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

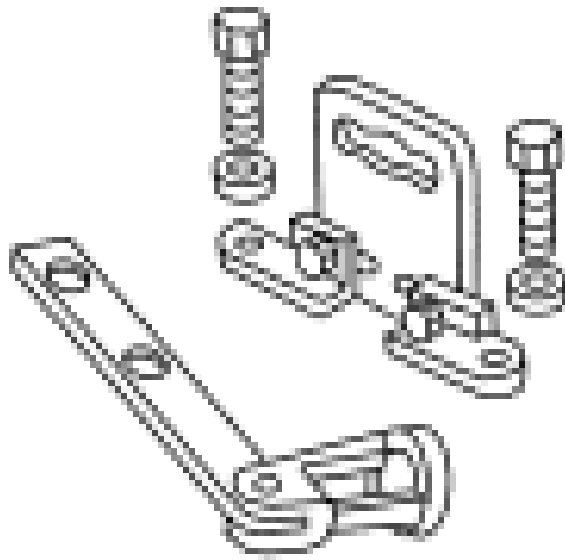
CYLINDER HEAD

SPECIAL TOOL(S)

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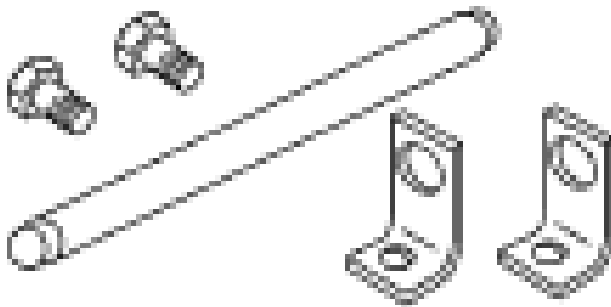
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ST1907-A

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



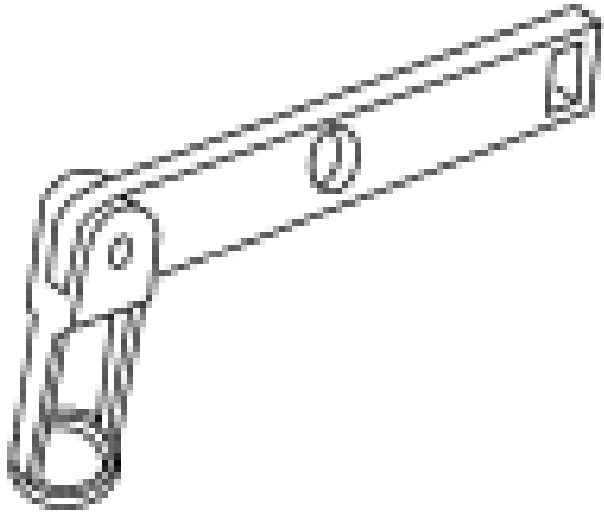
ST1981-A

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

Compressor, Valve Spring

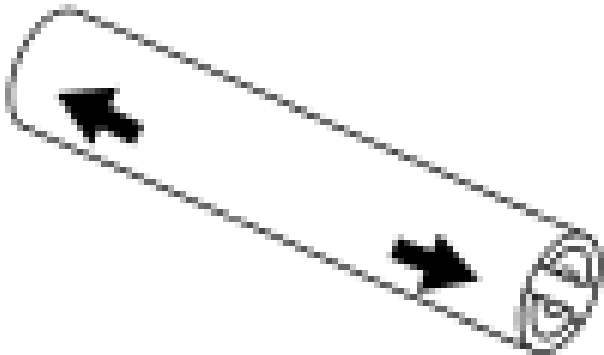
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ST1902-A

303-472 (T94P-6565-AH)



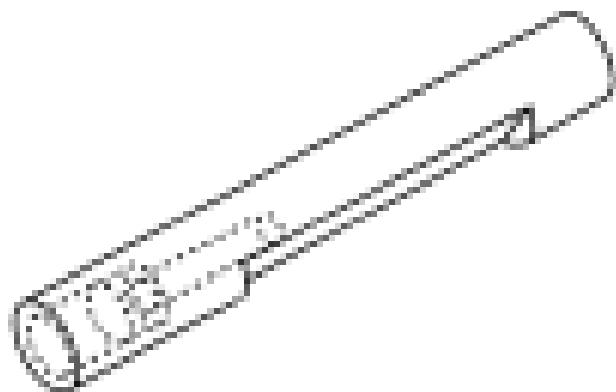
ST1904-A

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

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

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ST1906-A



ST1187-A

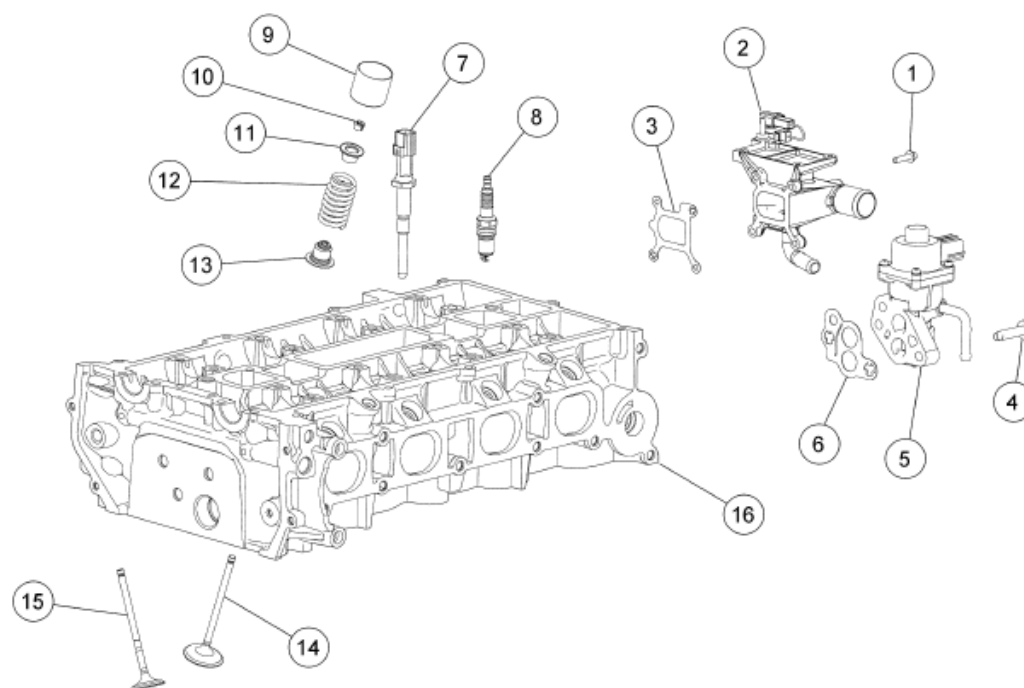
Slide Hammer
307-005 (T59L-100-B)

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS- M2C930-A
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93- B

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Item	Part Number	Description
1	W500015	Coolant outlet bolt (4 required)
2	8K556	Coolant outlet
3	8255	Coolant outlet gasket
4	W500225	Exhaust gas recirculation (EGR) valve bolts (2 required)
5	9D475	EGR valve
6	9D476	EGR valve gasket
7	6G004	Cylinder head temperature (CHT) sensor
8	12405	Spark plug (4 required)
9	6500	Valve tappet (16 required)
10	6518	Valve collet (16 required)
11	6514	Valve spring retainer (16 required)
12	6513	Valve spring (16 required)
13	6517	Valve seal (16 required)
14	6505	Intake valve (8 required)
15	6507	Exhaust valve (8 required)
16	6049	Cylinder head

Fig. 298: Identifying Cylinder Head Components
Courtesy of FORD MOTOR CO.

Disassembly

CAUTION: If the components are to be reinstalled, they must be installed in the same

positions. Mark the components removed for locations.

1. Remove the 4 bolts and the coolant outlet.
 - Discard the gasket.
2. Remove the 2 bolts and the exhaust gas recirculation (EGR) valve.
 - Discard the gasket.
3. Remove and discard the cylinder head temperature (CHT) sensor.
4. Remove the spark plugs.
5. Remove the valve tappets.

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

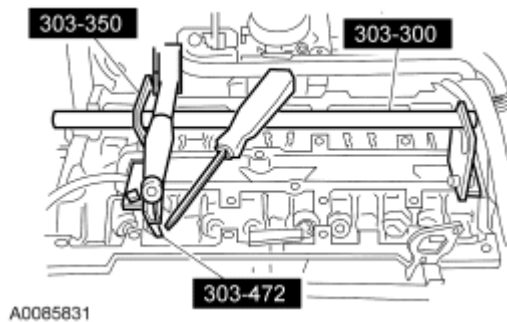


Fig. 299: Identifying Special Tools (303-300, 303-350, 303-472)
Courtesy of FORD MOTOR CO.

6. Using the special tools, compress the valve springs and remove the valve collets, valve spring retainers and the valve springs.
7. Inspect the components, if necessary. For additional information, refer to **ENGINE SYSTEM-GENERAL INFORMATION**.
8. Remove the valves.
9. Using the special tools, remove and discard the valve seals.

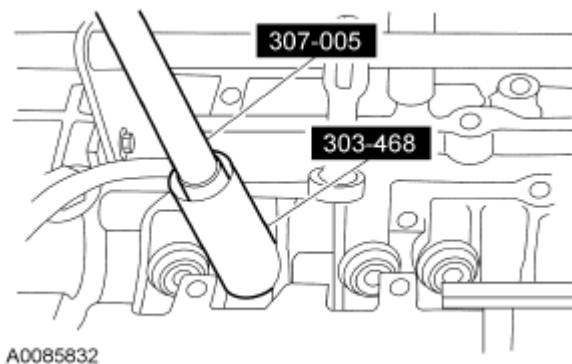


Fig. 300: Removing Valve Seals Using Special Tools (307-005, 303-468)

Courtesy of FORD MOTOR CO.

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

Assembly

NOTE: Coat the valve stems with clean engine oil.

1. Install the valves.

NOTE: Use the protector provided with the replacement kit to prevent damage to the valve seals. Lubricate the valve stems and guides with clean engine oil.

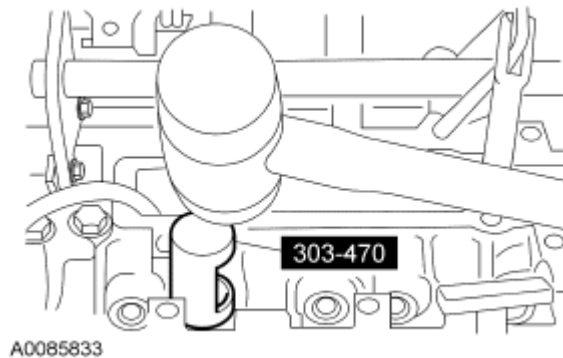


Fig. 301: Installing Valve Seal Using Special Tool (303-470)
Courtesy of FORD MOTOR CO.

2. Using the special tool, install the valve seals.

NOTE: Check the seating of the valve collets.

3. Using the special tools, install the valve springs.
 - Insert the valve springs and the valve spring retainers.
 - Compress the valve springs and install the valve collets, using grease and a small screwdriver.

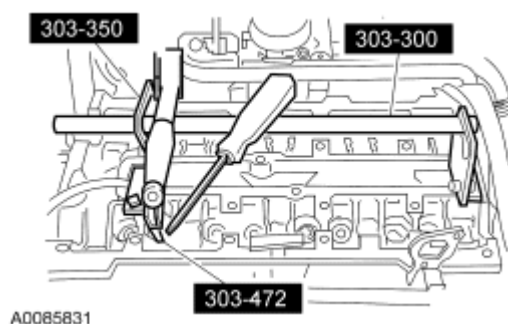


Fig. 302: Identifying Special Tools (303-300, 303-350, 303-472)
 Courtesy of FORD MOTOR CO.

NOTE: Coat the valve tappets with clean engine oil.

4. Install the valve tappets.
5. Install the spark plugs.
 - Tighten to 12 N.m (9 lb-ft).
6. Install a new CHT sensor.
 - Tighten to 12 N.m (9 lb-ft).
7. Install the EGR valve, using a new gasket.
 - Tighten to 20 N.m (15 lb-ft).
8. Using a new gasket, install the coolant outlet and bolts.
 - Tighten to 10 N.m (89 lb-in).

ASSEMBLY

ENGINE BLOCK

For engine block, crankshaft and piston assembly installation procedures, refer to **ENGINE BLOCK - 2.3L** .

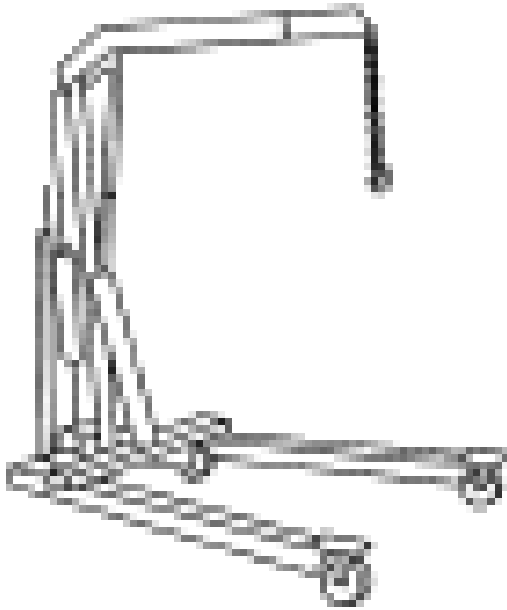
ENGINE (EXCEPT BLOCK)

SPECIAL TOOL(S)

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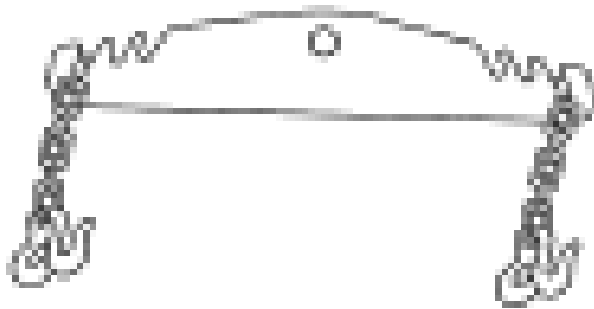
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ST1341-A

Heavy Duty Floor Crane
014-00071 or equivalent

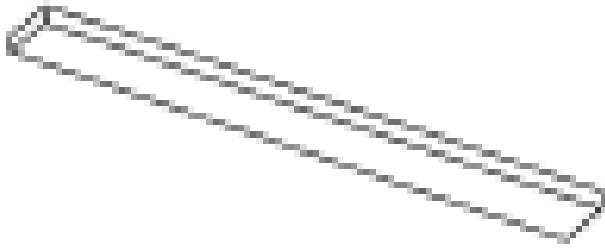


ST1602-A

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

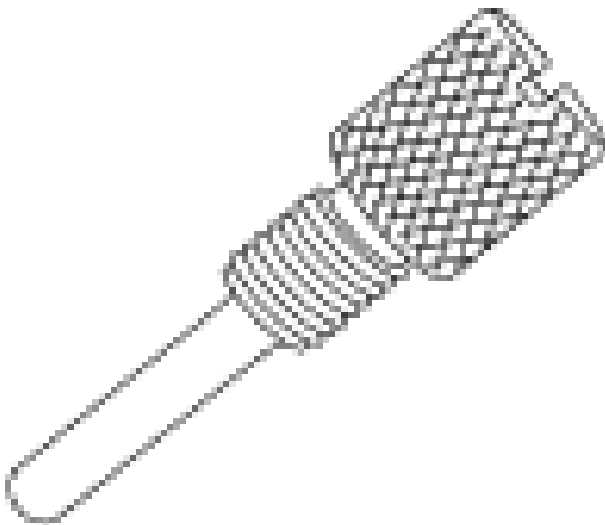
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Alignment Plate, Camshaft
303-465 (T94P-6256-CH)

ST2645-A



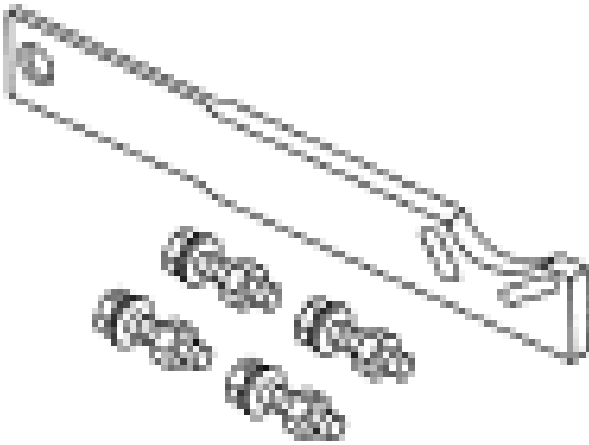
Timing Peg, Crankshaft
303-507

ST2638-A

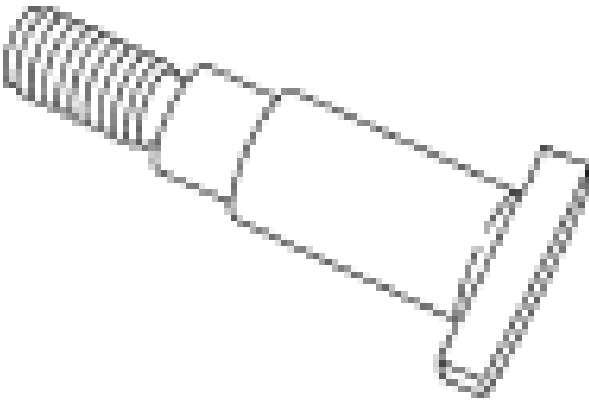
Holding Fixture, Drive Pinion Flange
205-126 (T78P-4851-A)

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ST2647-A



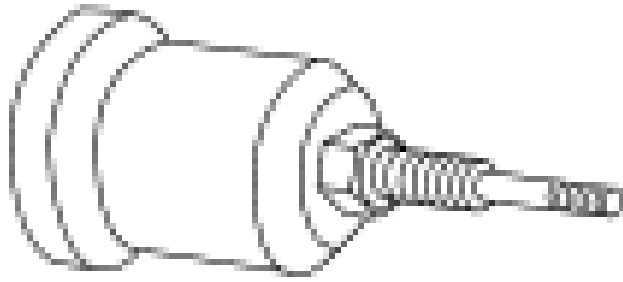
ST2639-A

Adapter for 205-126
(205-072-02)

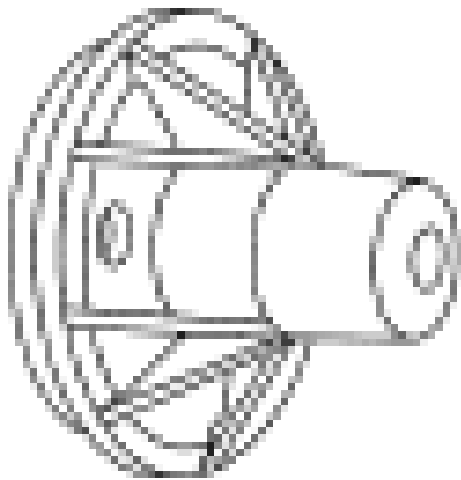
Installer, Front Oil Seal
303-096 (T74P-6150-A)

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ST1917-A

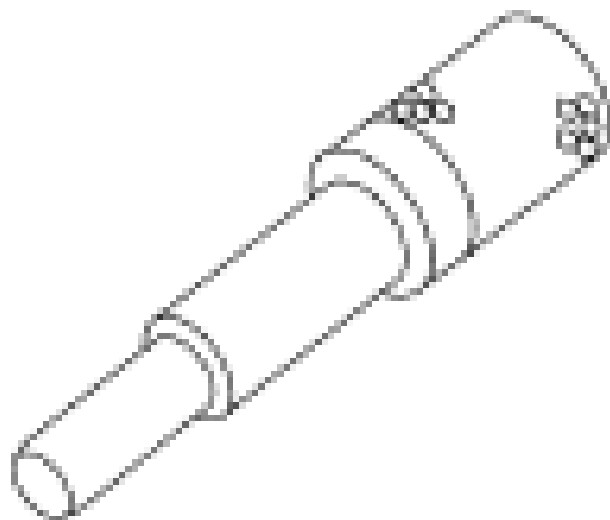


ST1506-A

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

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ST1751-A

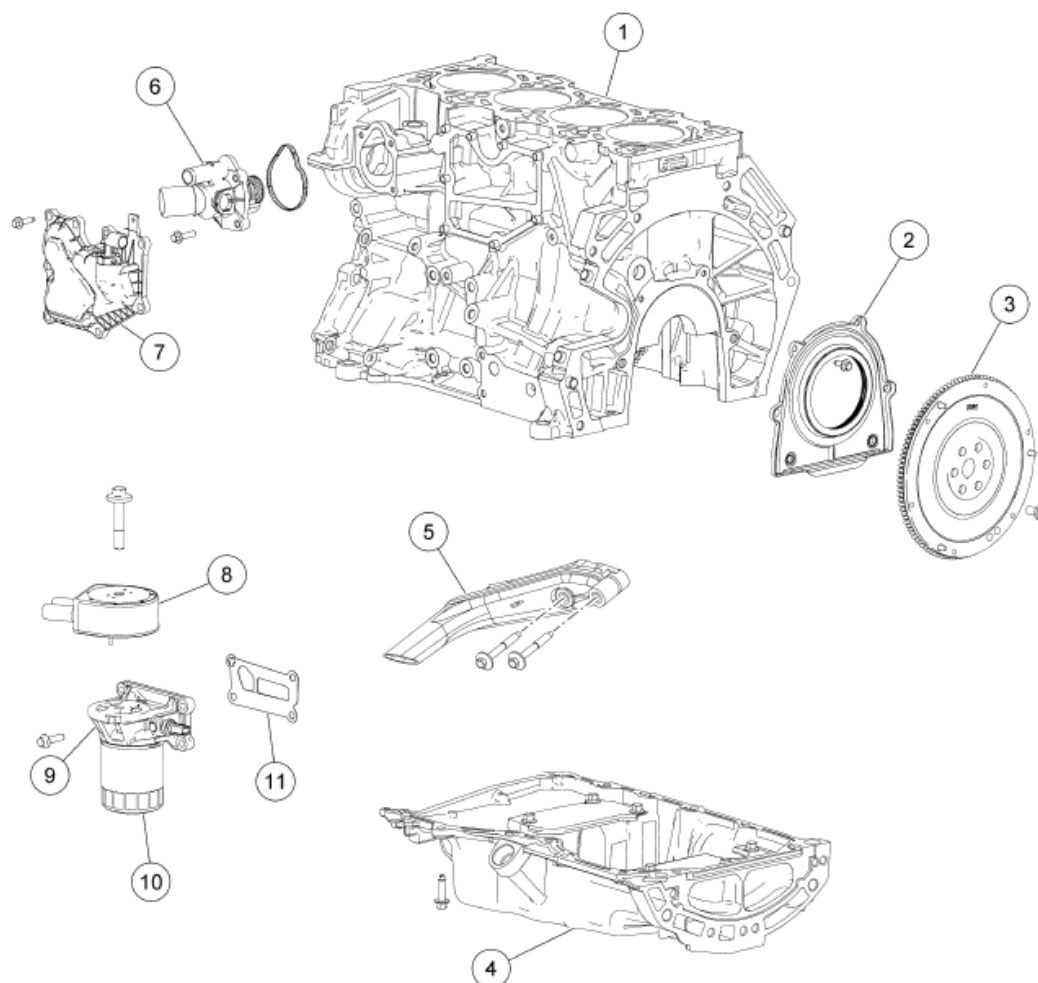
Aligner, Clutch Disc
308-006 (T71P-7137-H)

MATERIALS

Item	Specification
SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Metal Surface Cleaner ZC-21	WSE-M5B392-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft Silicone Gasket Remover ZC-30	-
Motorcraft Metal Surface Prep ZC-31	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Motorcraft Premium Gold Engine Coolant VC-7-A (in California, Oregon and New Mexico VC-7-B, in Canada CVC-7-A) or equivalent (yellow color)	WSS-M97B51-A1
High-Temp 4x4 Front Axle and Wheel Bearing Grease E8TZ-19590-A	ESA-M1C198-A

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A0090479

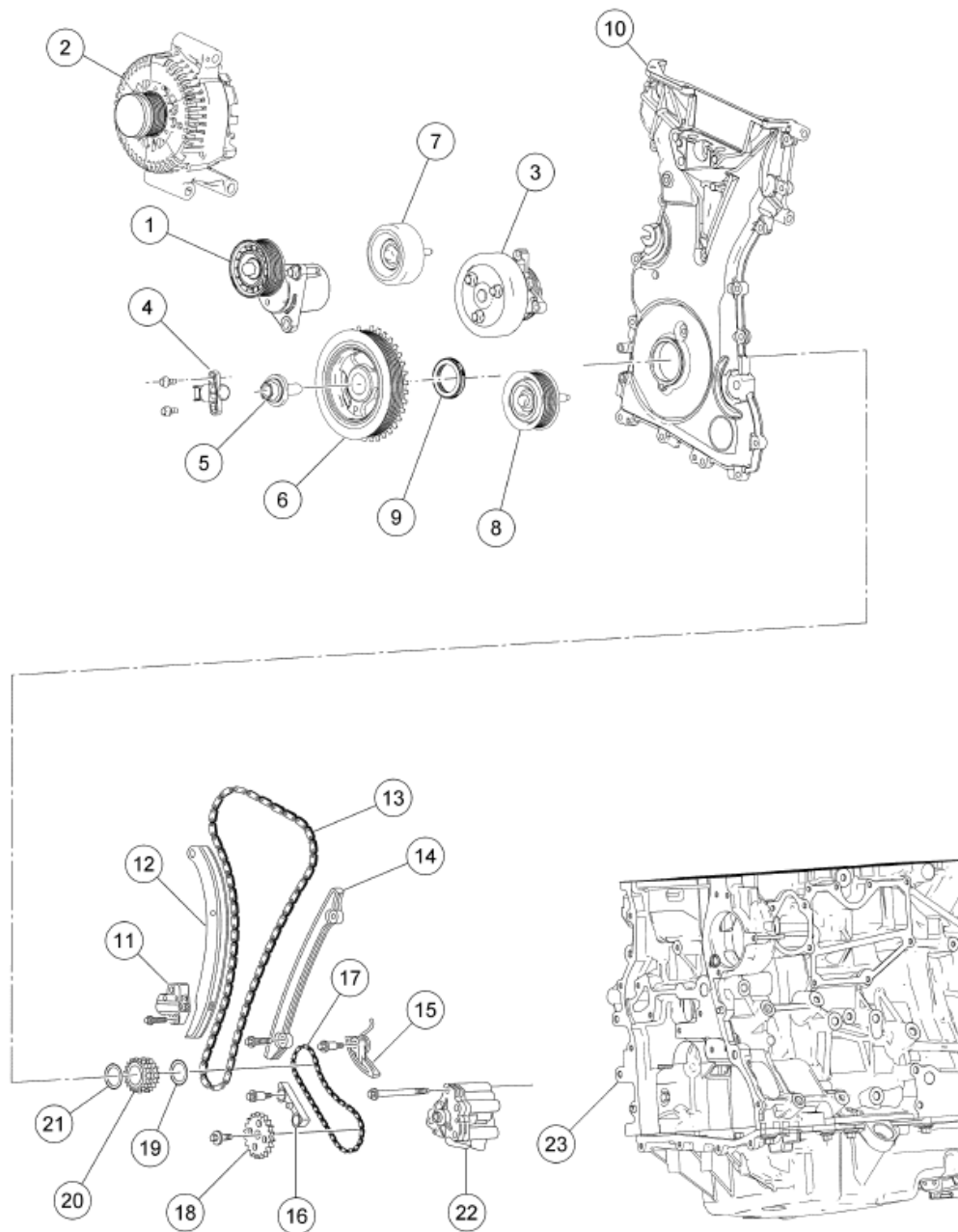
Item	Part Number	Description
1	6010	Cylinder block
2	6K318	Crankshaft rear oil seal and retainer
3	6477	Flywheel
4	6675	Oil pan
5	6622	Oil pump screen and pickup tube

Item	Part Number	Description
6	8575	Thermostat assembly
7	6A785	Crankcase vent oil separator
8	6A642	Oil cooler (if equipped)
9	6884	Oil filter adapter
10	6714	Oil filter
11	6A636	Oil filter adapter gasket

Fig. 303: Identifying Lower Engine Block Components
Courtesy of FORD MOTOR CO.

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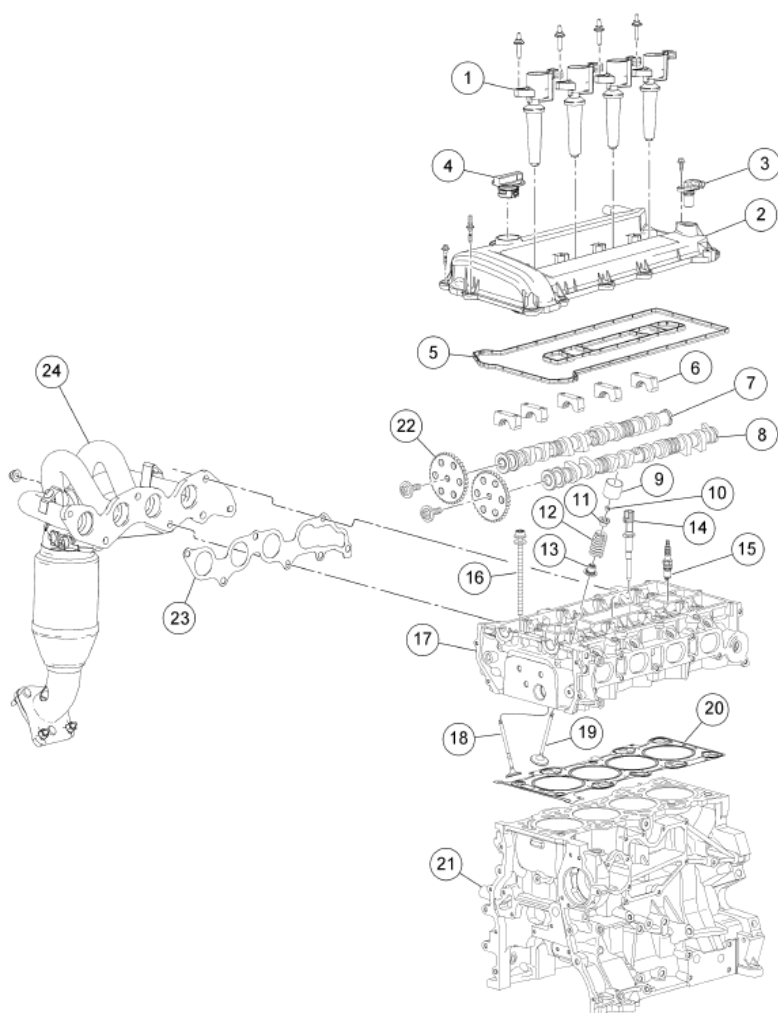


A0092328

Item	Part Number	Description
1	6B209	Accessory drive belt tensioner
2	10300	Generator
3	8501	Coolant pump and pulley
4	6C315	Crankshaft position (CKP) sensor
5	6A340	Crankshaft pulley bolt
6	6316	Crankshaft pulley
7	6C348	Idler pulley
8	6C348	Idler pulley (without A/C only)
9	6700	Crankshaft front seal

Item	Part Number	Description
12	6K255	Timing chain tensioner arm
13	6268	Timing chain
14	6K297	Timing chain guide
15	6C271	Oil pump chain tensioner
16	6M256	Oil pump chain guide
17	6A895	Oil pump chain
18	6652	Oil pump drive gear
19	6378	Diamond washer
20	6306	Crankshaft sprocket
21	6378	Diamond washer

Fig. 304: Identifying Front Engine Block Components
Courtesy of FORD MOTOR CO.



A0087817

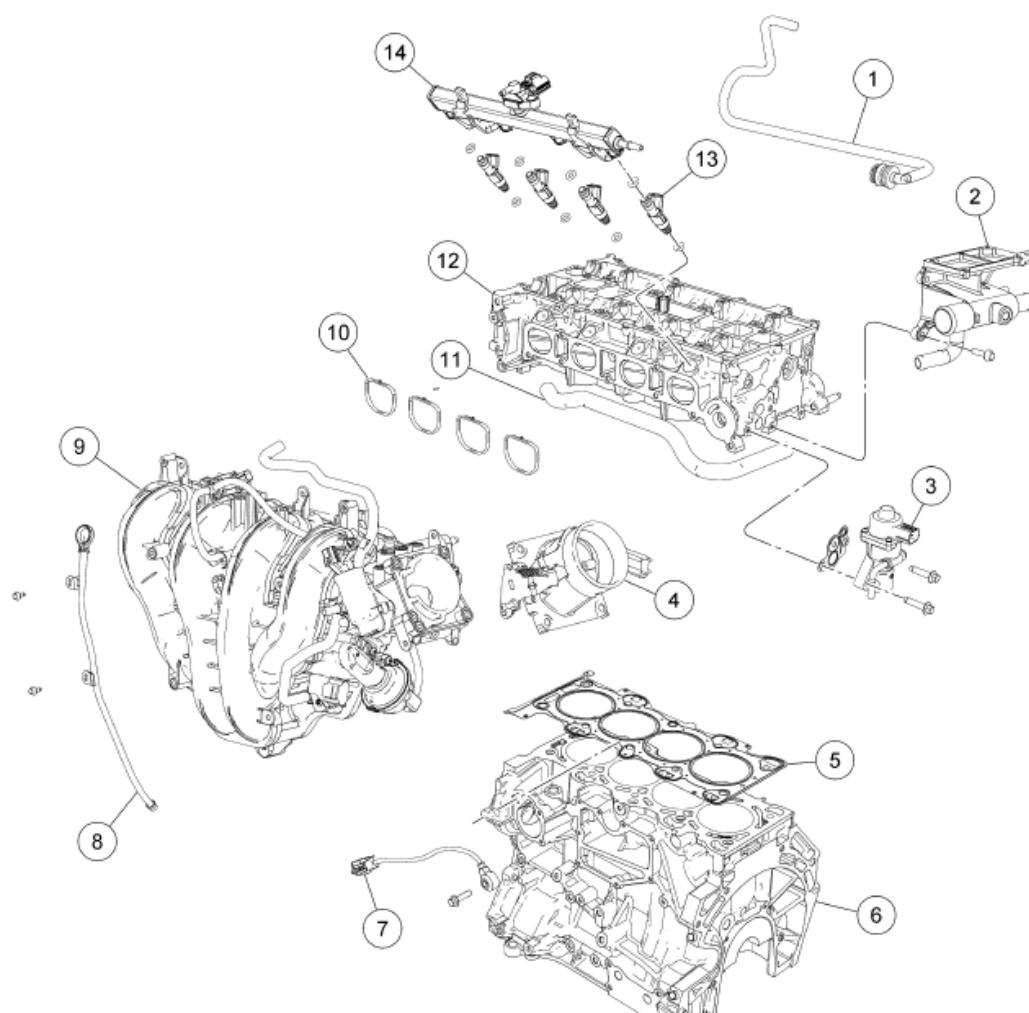
Item	Part Number	Description
1	12A366	Coil-on-plug assembly (4 required)
2	6M293	Valve cover
3	12K073	Camshaft position (CMP) sensor
4	6766	Oil filler cap
5	6M293	Valve cover gasket
6	6A284	Camshaft bearing caps
7	6A272	Camshaft (exhaust)
8	6A271	Camshaft (intake)
9	6500	Valve tappet (16 required)
10	6518	Valve collet (16 required)
11	6514	Valve spring retainer (16 required)
12	6513	Valve spring (16 required)

Item	Part Number	Description
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	Catalytic converter gasket
24	5E211	Catalytic converter

Fig. 305: Identifying Cylinder Head Components
Courtesy of FORD MOTOR CO.

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A0100122

Item	Part Number	Description
1	9288	Fuel supply tube
2	8K556	Coolant outlet
3	9D475	Exhaust gas recirculation (EGR) valve
4	9F991	Throttle body
5	6051	Cylinder head gasket
6	6010	Cylinder block
7	12A699	Knock sensor (KS)

Item	Part Number	Description
8	6754	Oil level indicator and tube assembly
9	9424	Intake manifold
10	9439	Intake manifold gasket
11	8A582	Coolant hose
12	6049	Cylinder head
13	9F593	Fuel injector (4 required)
14	9H487	Fuel rail

Fig. 306: Identifying Intake Manifold Components
Courtesy of FORD MOTOR CO.

CAUTION:

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 you loosen the pulley bolt. 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.

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.

All vehicles

WARNING: 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.

1. Turn the crankshaft clockwise to position the No. 1 piston at TDC.
2. Remove the engine plug bolt.

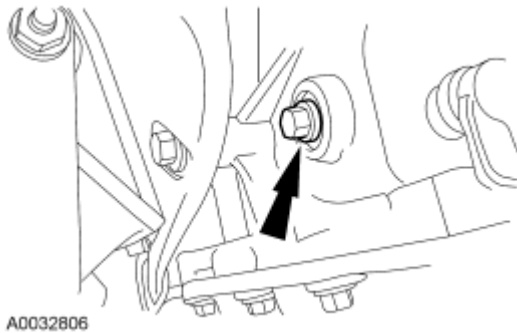


Fig. 307: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

NOTE: The special tool 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.

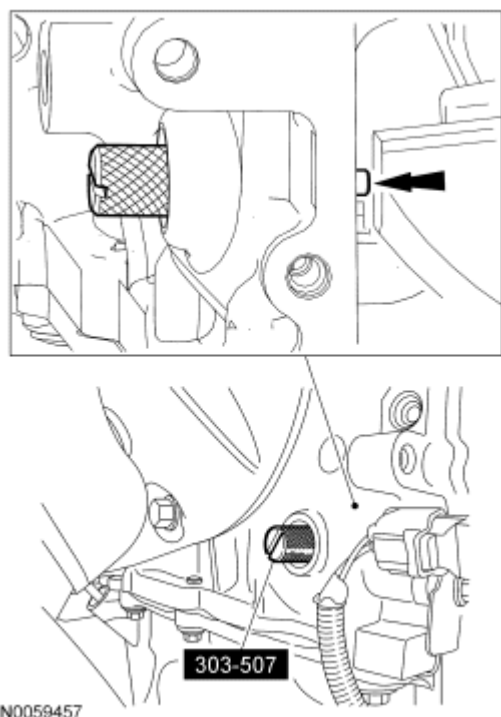


Fig. 308: Identifying Special Tool (303-507)
Courtesy of FORD MOTOR CO.

3. Install the special tool.
4. If removed, install the halfshaft support bracket and bolts.
 - Tighten to 40 N.m (30 lb-ft).

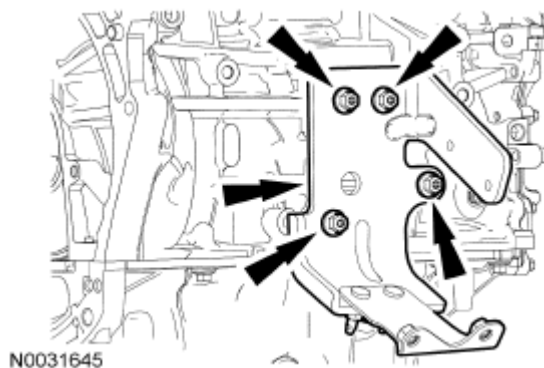


Fig. 309: Locating Halfshaft Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

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

5. Install the oil pump assembly. Tighten the bolts in the sequence shown in 2 stages:

- Stage 1: Tighten to 10 N.m (89 lb-in).
- Stage 2: Tighten to 20 N.m (15 lb-ft).

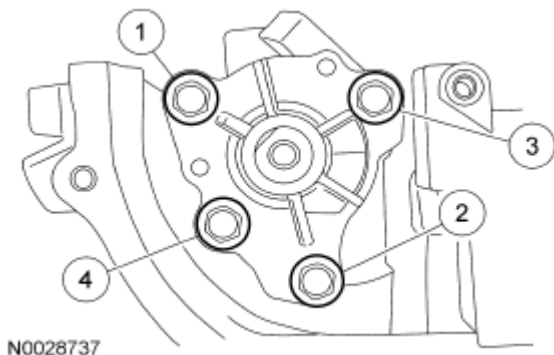


Fig. 310: Identifying Oil Pump Assembly Bolts
Courtesy of FORD MOTOR CO.

6. Install a new oil pump pickup tube gasket and the pickup tube.
 - Tighten to 10 N.m (89 lb-in).

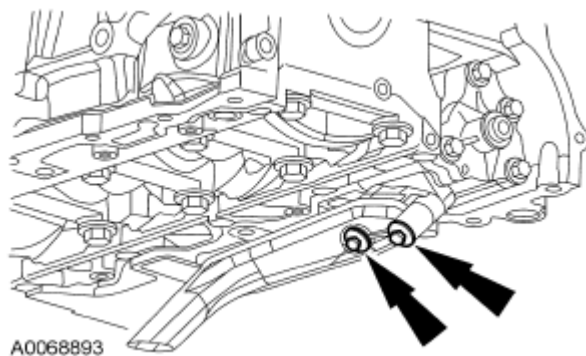


Fig. 311: Locating Pickup Tube & Bolts
Courtesy of FORD MOTOR CO.

7. Using the special tool, install the crankshaft rear main oil seal.

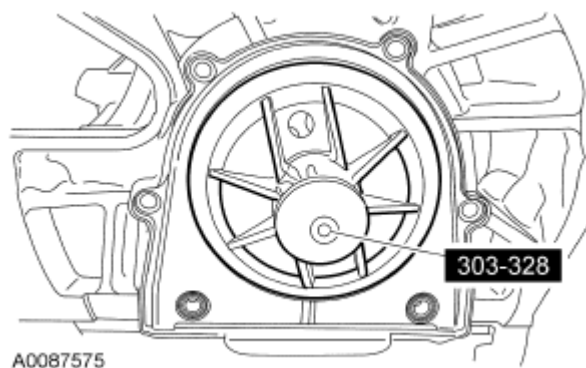
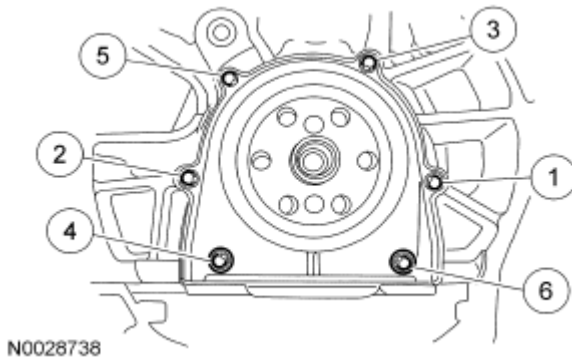


Fig. 312: Identifying Special Tool (303-328)

Courtesy of FORD MOTOR CO.

8. Tighten the crankshaft rear main oil seal bolts in the sequence shown in **Fig. 313**.
 - To install, tighten to 10 N.m (89 lb-in).

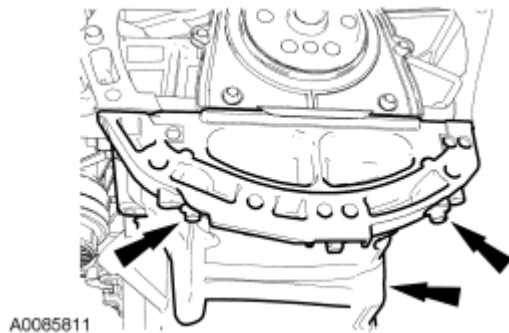
**Fig. 313: Identifying Crankshaft Rear Main Oil Seal Bolts In Sequence**

Courtesy of FORD MOTOR CO.

CAUTION: 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.

9. 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 cleaner. 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.

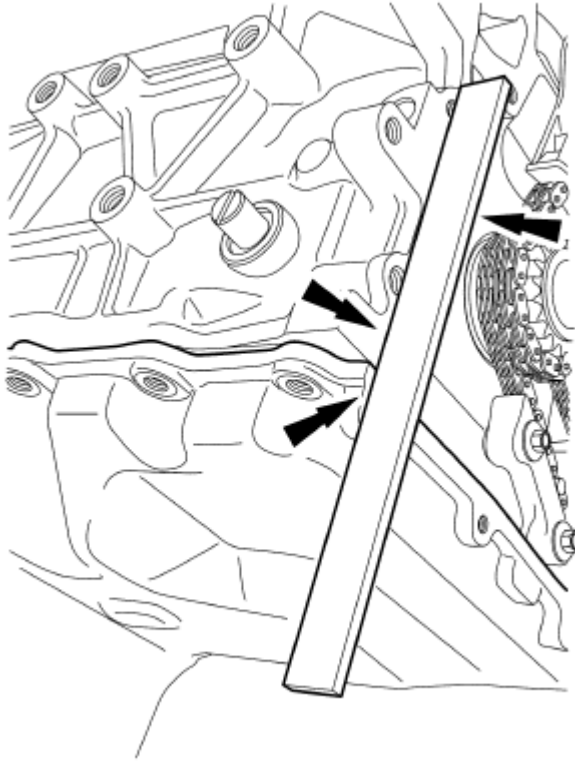
**Fig. 314: Identifying Rear Oil Pan Bolts**

Courtesy of FORD MOTOR CO.

10. Apply a 2.5 mm (0.09 in.) bead of silicone gasket and sealant to the oil pan. Install the oil pan. Install the

2 oil pan bolts finger tight.

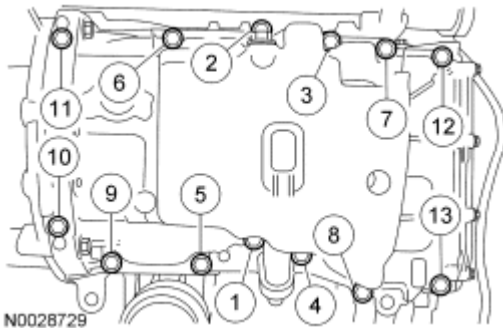
11. Using a suitable straight edge, align the front surface of the oil pan flush with the front surface of the engine block.



N0039349

Fig. 315: Locating Straight Edge
Courtesy of FORD MOTOR CO.

12. Install the remaining oil pan bolts and tighten the oil pan bolts in the sequence shown.
 - Tighten to 25 N.m (18 lb-ft).



N0028729

Fig. 316: Identifying Tightening Sequence Of Oil Pan Bolts
Courtesy of FORD MOTOR CO.

13. Install the cylinder head alignment dowels. Dowels must be fully seated in the cylinder block.

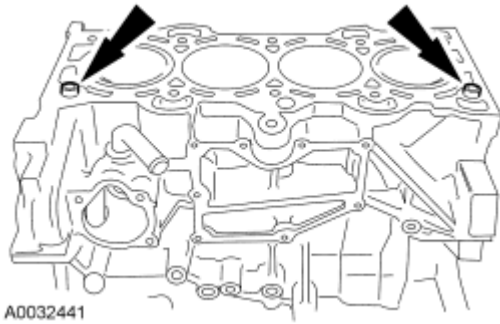


Fig. 317: Identifying Cylinder Head Alignment Dowels
Courtesy of FORD MOTOR CO.

CAUTION:

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. 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.

14. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block.
 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.
15. Apply silicone gasket and sealant to the locations shown in **Fig. 318**.

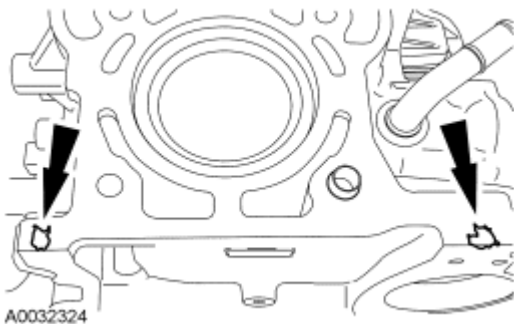
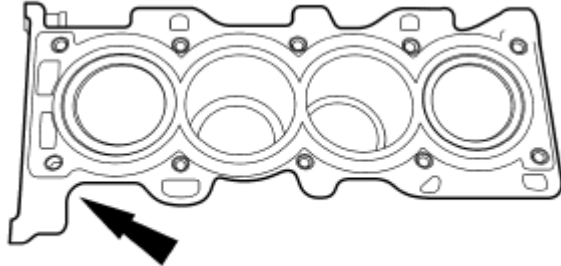


Fig. 318: Identifying Silicone Gasket And Sealant Location

Courtesy of FORD MOTOR CO.

16. Install a new head gasket.



A0087577

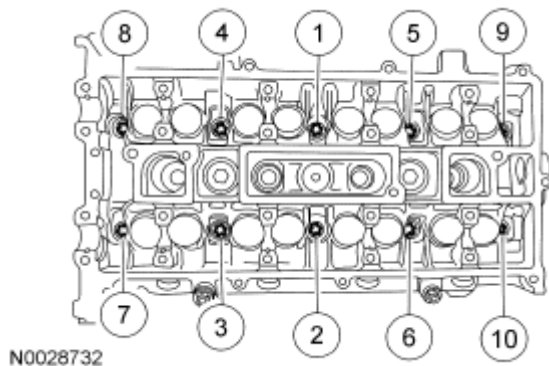
Fig. 319: Locating Head Gasket
Courtesy of FORD MOTOR CO.

NOTE:

The cylinder head bolts are torque-to-yield and must not be reused.
New cylinder head bolts must be installed.
Lubricate the bolts with clean engine oil prior to installation.

17. Install new cylinder head bolts. Tighten the bolts in the sequence shown in 5 stages:

- Stage 1: Tighten to 5 N.m (44 lb-in).
- Stage 2: Tighten to 15 N.m (11 lb-ft).
- Stage 3: Tighten to 45 N.m (33 lb-ft).
- Stage 4: Turn 90 degrees.
- Stage 5: Turn an additional 90 degrees.



N0028732

Fig. 320: Tightening Sequence Of Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

CAUTION: 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.

18. Install the camshafts and bearing caps. Tighten the bolts in the sequence shown in 3 stages:

- Stage 1: Tighten the camshaft bearing cap bolts one at a time until finger tight.
- Stage 2: Tighten to 7 N.m (62 lb-in).
- Stage 3: Tighten to 16 N.m (12 lb-ft).

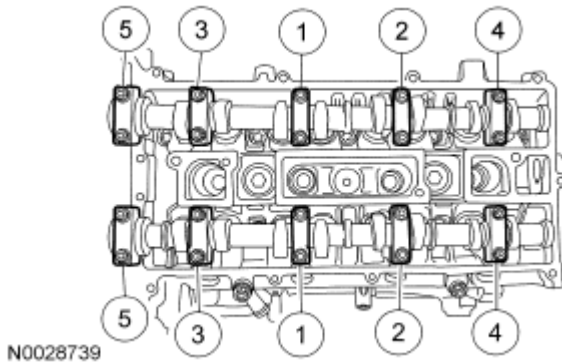


Fig. 321: Tightening Sequence Of Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

NOTE: Install a crankshaft sprocket diamond washer on both sides of the crankshaft sprocket.

19. Install the crankshaft sprocket, crankshaft sprocket diamond washers, oil pump chain and oil pump sprocket.

- The crankshaft sprocket flange must be facing away from the engine block.

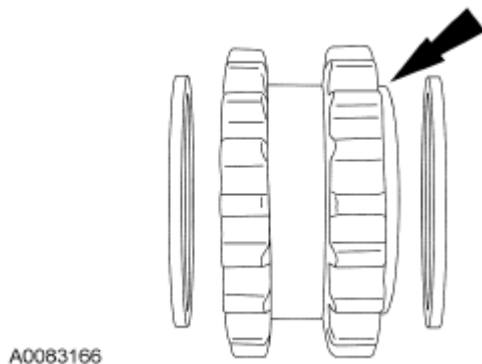


Fig. 322: Locating Crankshaft Sprocket Flange

Courtesy of FORD MOTOR CO.

20. Install the oil pump chain, sprocket and bolt.

- Tighten to 25 N.m (18 lb-ft).

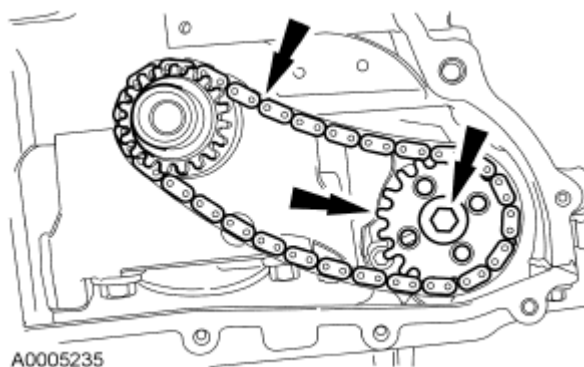


Fig. 323: Locating Oil Pump Chain, Sprocket & Bolt
Courtesy of FORD MOTOR CO.

21. Install the oil pump chain guide and the shoulder bolts.

- Tighten to 10 N.m (89 lb-in).

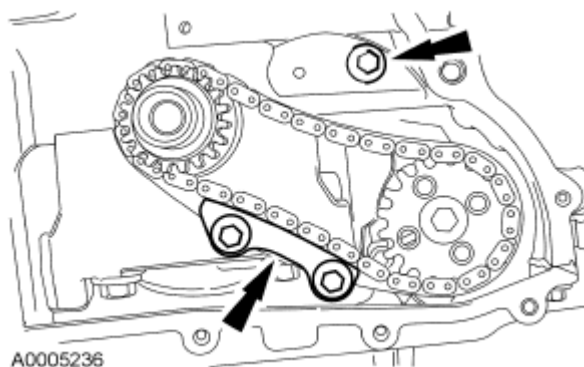


Fig. 324: Locating Oil Pump Chain Guide & Shoulder Bolts
Courtesy of FORD MOTOR CO.

22. Install the oil pump chain tensioner. Hook the tensioner spring around the shoulder bolt.

- Tighten to 10 N.m (89 lb-in).

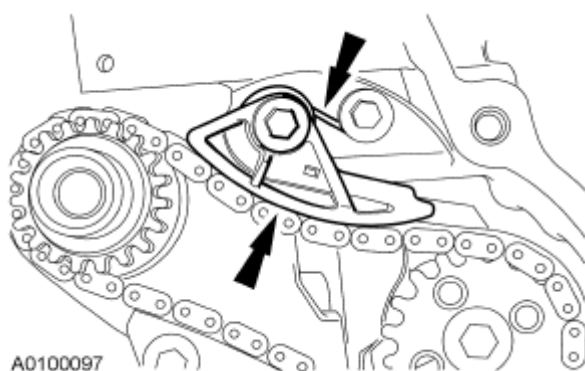


Fig. 325: Locating Oil Pump Chain Tensioner
Courtesy of FORD MOTOR CO.

CAUTION: The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

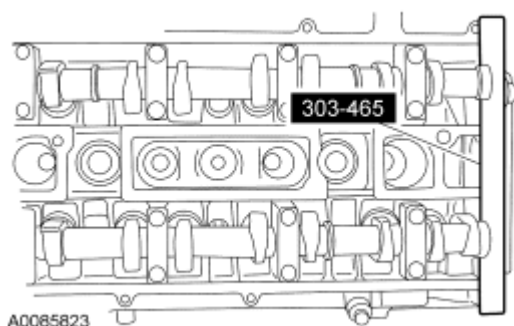


Fig. 326: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

23. Install the special tool in the slots on the rear of both camshafts.
24. Install the camshaft sprockets and the bolts. Do not tighten the bolts at this time.

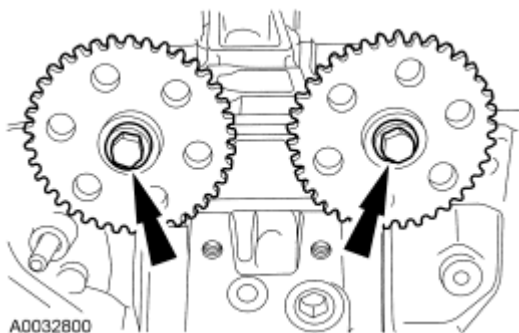


Fig. 327: Locating Camshaft Sprocket Bolts
Courtesy of FORD MOTOR CO.

25. Install the LH timing chain guide and the bolts.

- Tighten to 10 N.m (89 lb-in).

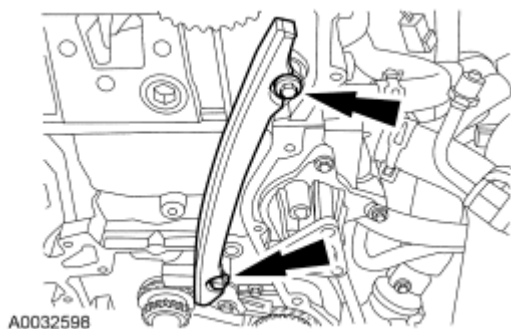


Fig. 328: Identifying Bolts And LH Timing Chain Guide
Courtesy of FORD MOTOR CO.

26. Install the timing chain.

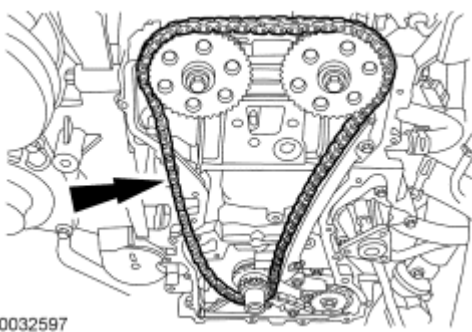


Fig. 329: View Of Timing Chain
Courtesy of FORD MOTOR CO.

27. Install the RH timing chain guide.

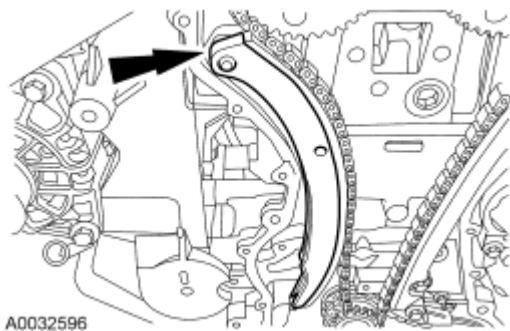
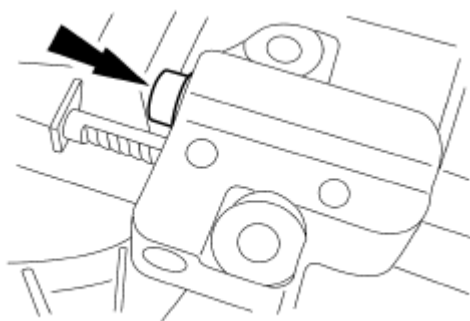


Fig. 330: Locating RH Timing Chain Guide
Courtesy of FORD MOTOR CO.

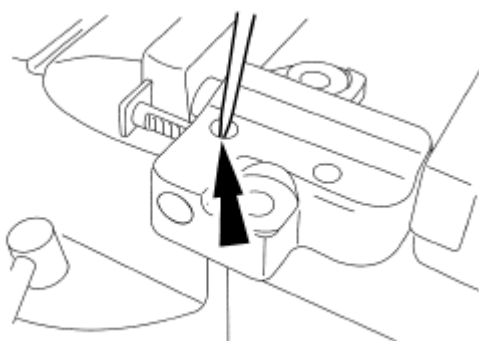
CAUTION: Do not compress the ratchet assembly. This will damage the ratchet assembly.



A0032539

Fig. 331: Locating Timing Chain Tensioner Plunger
Courtesy of FORD MOTOR CO.

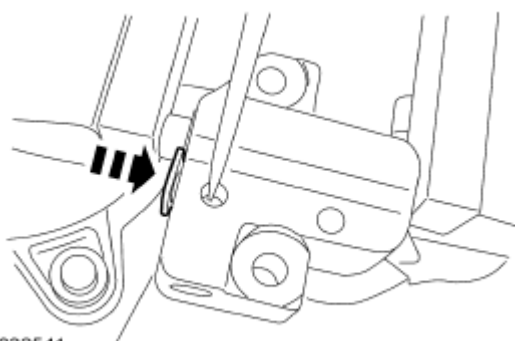
28. Using the edge of a vise, compress the timing chain tensioner plunger.
29. Using a small pick, push back and hold the ratchet mechanism.



A0032540

Fig. 332: Identifying Ratchet Mechanism
Courtesy of FORD MOTOR CO.

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



A0032541

Fig. 333: Pushing Ratchet Arm Back Into Tensioner Housing
Courtesy of FORD MOTOR CO.

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

during installation.

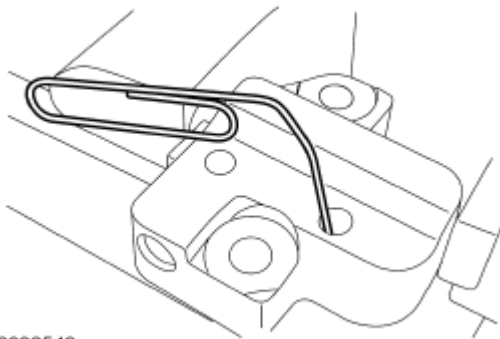


Fig. 334: Identifying Paper Clip Into Hole In Tensioner Housing
 Courtesy of FORD MOTOR CO.

32. Install the timing chain tensioner and the bolts. Remove the paper clip to release the piston.
 - Tighten to 10 N.m (89 lb-in).

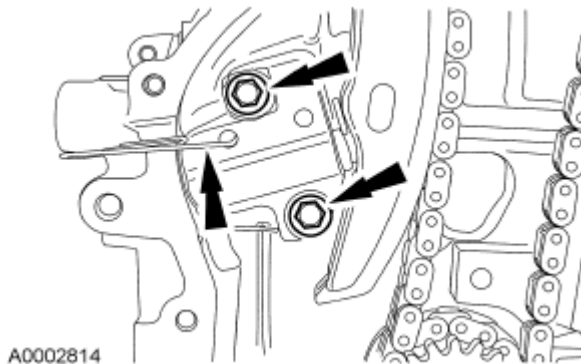


Fig. 335: Locating Timing Chain Tensioner & Bolts
 Courtesy of FORD MOTOR CO.

CAUTION: The special tool 303-465 is for camshaft alignment only. Using this tool to prevent engine rotation can result in engine damage.

33. Using the flats on the camshafts to prevent camshaft rotation, tighten the bolts.
 - To install, tighten to 72 N.m (53 lb-ft).

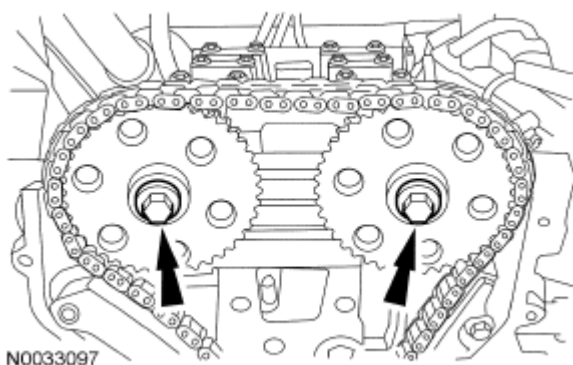


Fig. 336: Locating Camshaft Sprocket Bolts
Courtesy of FORD MOTOR CO.

CAUTION: 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.

34. 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.

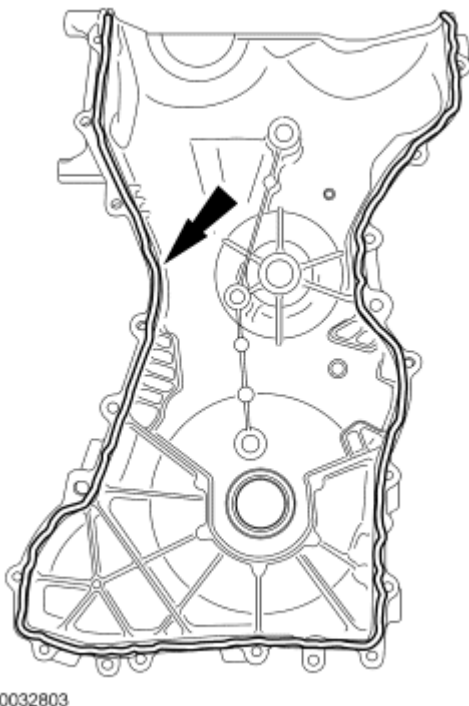


Fig. 337: Locating Silicone Gasket
Courtesy of FORD MOTOR CO.

35. Apply a 2.5 mm (0.09 in.) bead of silicone gasket and sealant to the cylinder head and oil pan joint areas.
Apply a 2.5 mm (0.09 in.) bead of silicone gasket and sealant to the front cover.
36. Install the engine front cover. Tighten the bolts in the sequence shown, to the following specifications:
 - Tighten the 8 mm bolts to 10 N.m (89 lb-in).
 - Tighten the 13 mm bolts to 48 N.m (35 lb-ft).

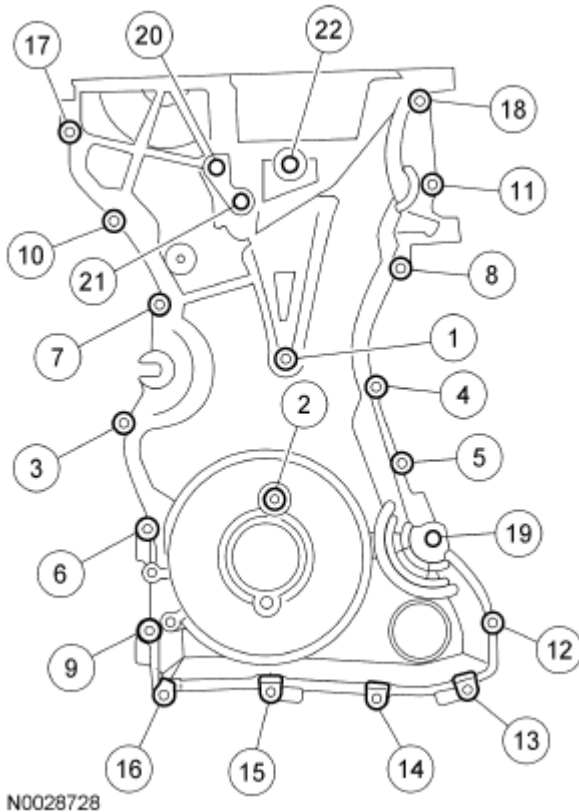


Fig. 338: Tightening Bolts In Sequence
Courtesy of FORD MOTOR CO.

NOTE: Remove the through-bolt from the special tool.
Lubricate the oil seal with clean engine oil.

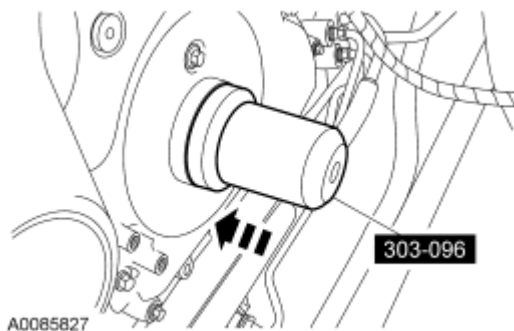


Fig. 339: Installing Crankshaft Front Oil Seal Using Special Tool
Courtesy of FORD MOTOR CO.

37. Using the special tool, install a new crankshaft front oil seal.

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

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

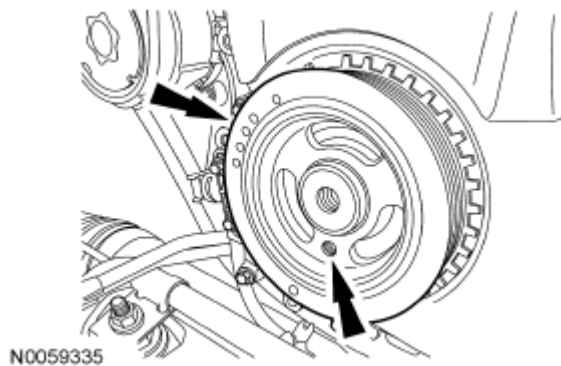


Fig. 340: Locating Crankshaft Pulley & Hole
Courtesy of FORD MOTOR CO.

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

CAUTION: Only hand-tighten the 6 mm (0.23 in) bolt or damage to the front cover can occur.

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

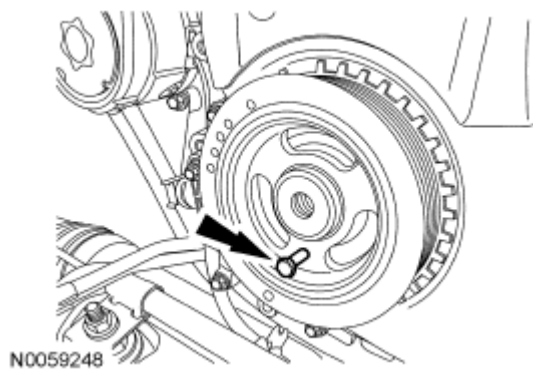
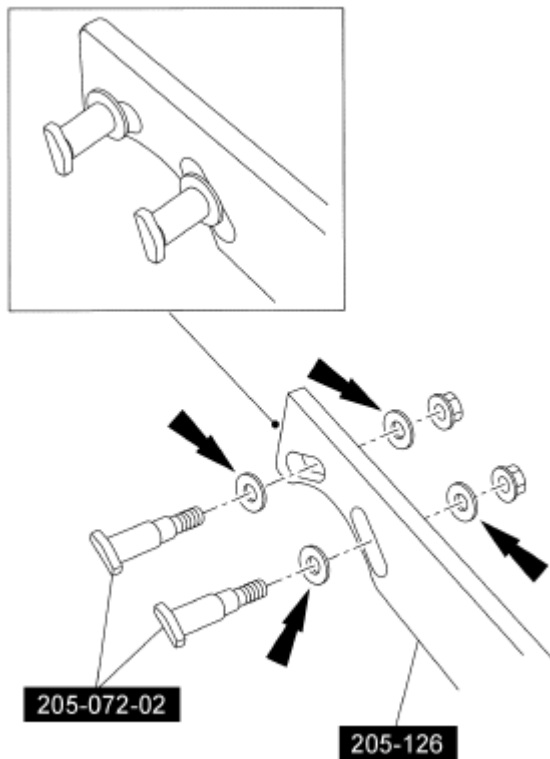


Fig. 341: Locating Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

39. Install a standard 6 mm (0.23 in) x 18 mm (0.7 in) bolt through the crankshaft pulley and thread it into the front cover.
40. Assemble the special tools using 4 hardened washers in the locations shown.



N0059336

Fig. 342: Assembling Special Tools (205-072-02 And 205-126)
Courtesy of FORD MOTOR CO.

CAUTION:

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

Do not reuse the crankshaft pulley bolt.

41. Install a new crankshaft pulley bolt. Using the special tools to hold the crankshaft pulley in place, tighten the crankshaft pulley bolt in 2 stages:
 - Stage 1: Tighten to 100 N.m (74 lb-ft).
 - Stage 2: Tighten an additional 90 degrees (1/4 turn).

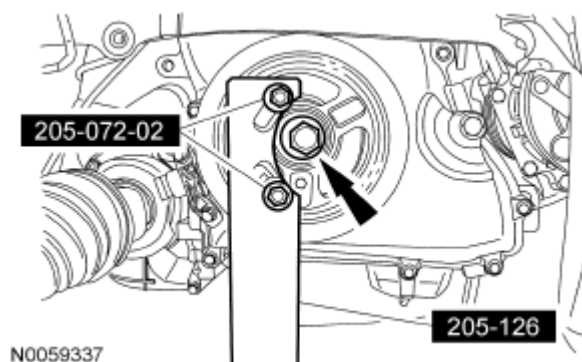


Fig. 343: Identifying Special Tools Assembly (205-072-02, 205-126) And Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

42. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

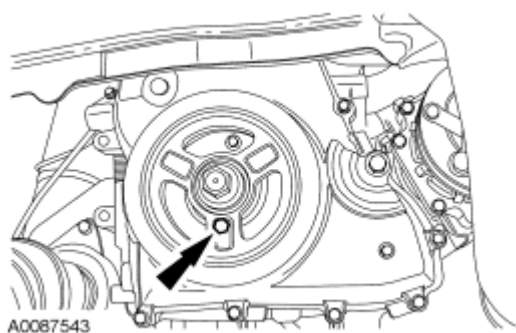


Fig. 344: Aligning Crankshaft Pulley Bolt Holes
Courtesy of FORD MOTOR CO.

43. Remove the special tool.

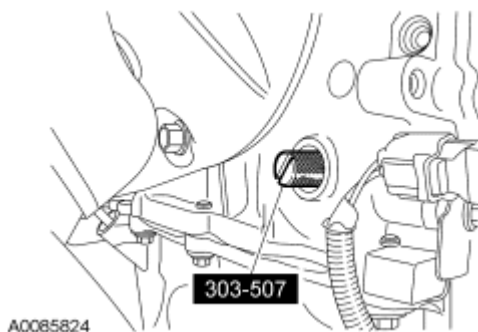


Fig. 345: Identifying Special Tool
Courtesy of FORD MOTOR CO.

44. Remove the special tool.

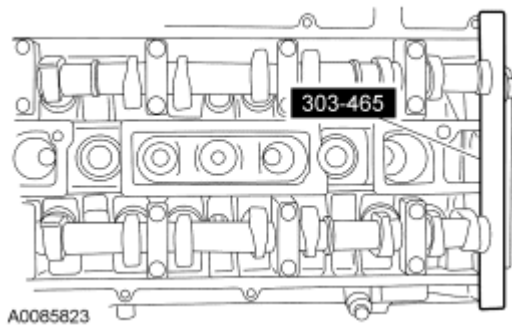


Fig. 346: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

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

45. Turn the crankshaft clockwise 1 and 3/4 turns.
46. Install the special tool.

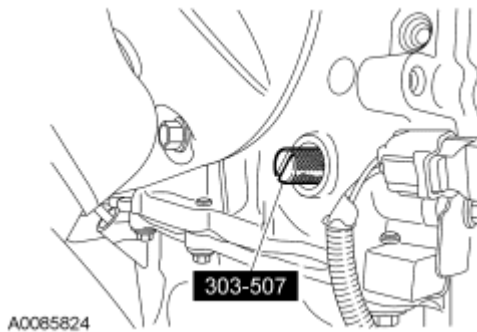


Fig. 347: Identifying Special Tool
Courtesy of FORD MOTOR CO.

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

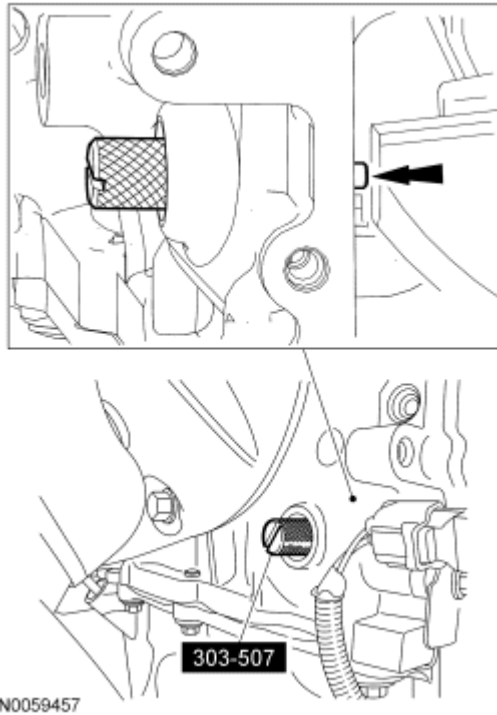


Fig. 348: Identifying Special Tool (303-507)
Courtesy of FORD MOTOR CO.

47. Turn the crankshaft clockwise until the crankshaft contacts the special tool.

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

48. Using the 6 mm (0.23 in) x 18 mm (0.7 in) bolt, check the position of the crankshaft pulley.
- If it is not possible to install the bolt, the engine valve timing must be corrected.

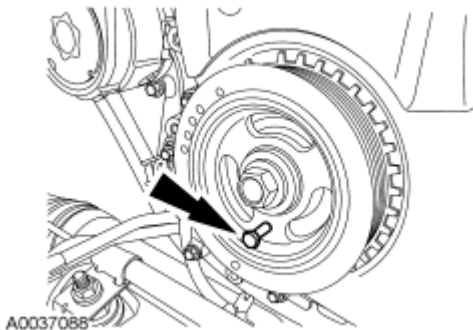


Fig. 349: Installing Bolt Through Crankshaft Pulley And Thread It Into Front Cover
Courtesy of FORD MOTOR CO.

49. Using the special tool, check the position of the camshafts.
- If it is not possible to install the special tool, the engine valve timing must be corrected.

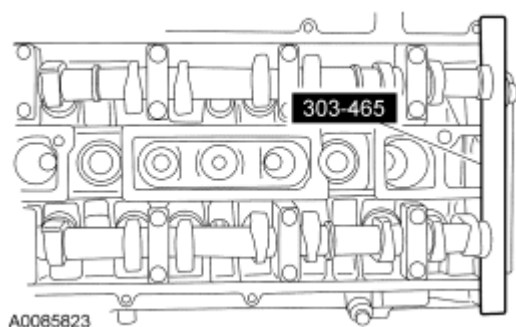


Fig. 350: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

50. Remove the special tool.

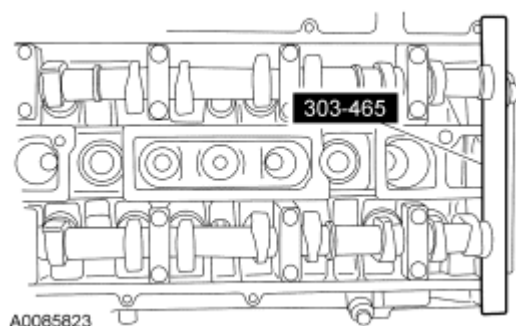


Fig. 351: Identifying Special Camshaft Tool (303-465)
Courtesy of FORD MOTOR CO.

NOTE: Whenever the crankshaft position (CKP) sensor is removed, a new one must be installed using the alignment tool supplied with the new part.

51. Install a new CKP sensor.
- Do not tighten the bolts at this time.

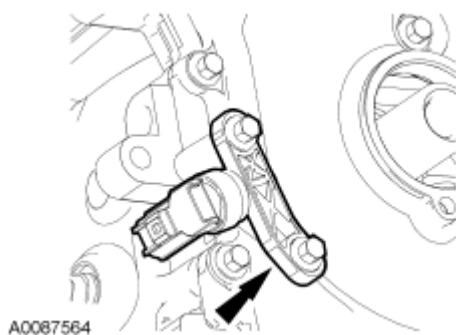


Fig. 352: Locating CKP Sensor
Courtesy of FORD MOTOR CO.

NOTE: The CKP sensor alignment tool is supplied with the new sensor and is not available separately.

52. Adjust the CKP sensor alignment tool and tighten the bolts.

- Tighten to 7 N.m (62 lb-in).

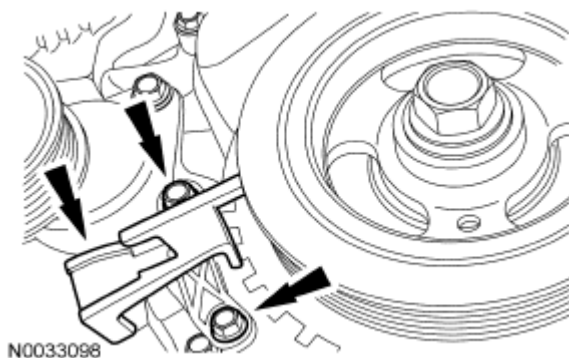


Fig. 353: Locating CKP Sensor Bolts
Courtesy of FORD MOTOR CO.

53. Remove the 6 mm (0.23 in) x 18 mm (0.7 in) bolt.

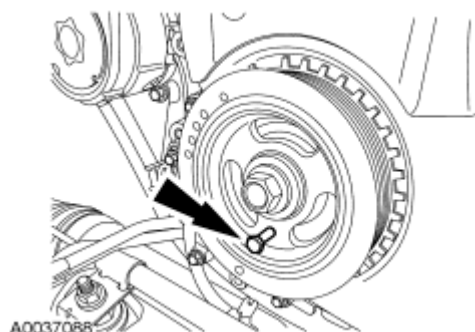


Fig. 354: Installing Bolt Through Crankshaft Pulley And Thread It Into Front Cover
Courtesy of FORD MOTOR CO.

54. Remove the special tool.

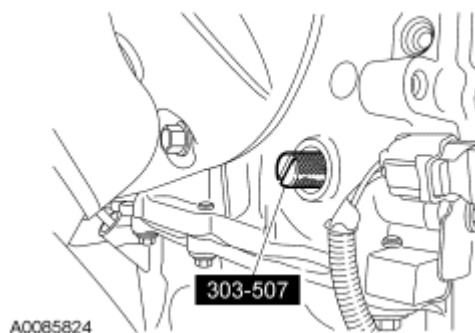


Fig. 355: Identifying Special Tool
Courtesy of FORD MOTOR CO.

55. Install the engine plug bolt.
 - Tighten to 20 N.m (15 lb-ft).

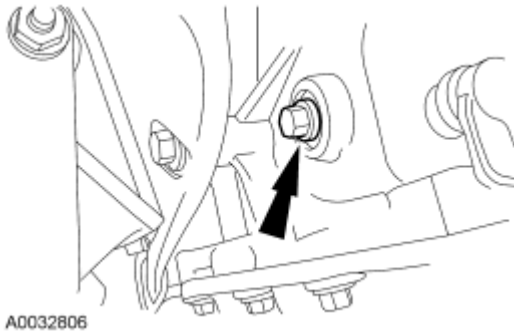


Fig. 356: Locating Engine Plug Bolt
Courtesy of FORD MOTOR CO.

CAUTION: 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.

56. Clean the valve cover gasket surface with metal surface cleaner.
57. Apply silicone gasket and sealant to the locations shown in **Fig. 357**.

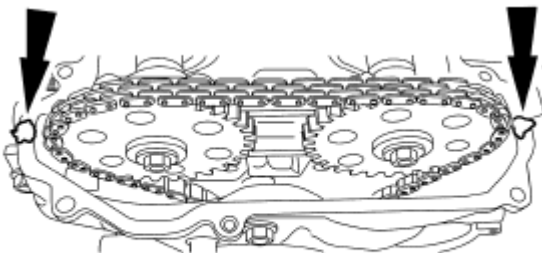


Fig. 357: Locating Silicone Gasket Locations
Courtesy of FORD MOTOR CO.

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 cleaner.

58. Install the valve cover.
 - Tighten the bolts in the sequence shown to 10 N.m (89 lb-in).

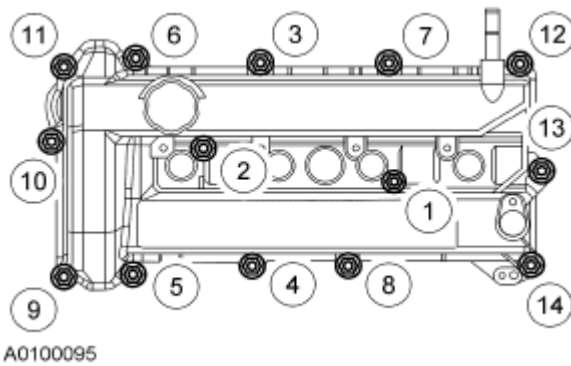


Fig. 358: Tightening Bolts In Sequence
Courtesy of FORD MOTOR CO.

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

59. Install a new cylinder head temperature (CHT) sensor and the spark plugs.
 - Tighten the CHT sensor to 12 N.m (9 lb-ft).
 - Tighten the spark plugs to 12 N.m (9 lb-ft).

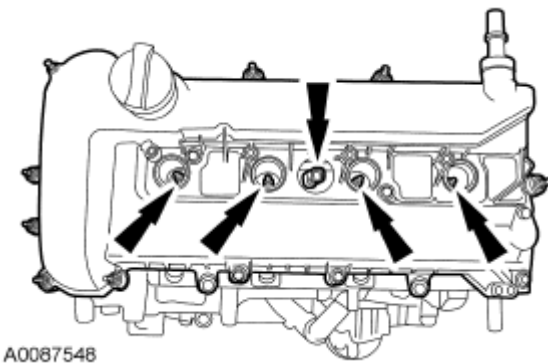


Fig. 359: Locating Cylinder Head Temperature (CHT) Sensor & Spark Plugs
Courtesy of FORD MOTOR CO.

NOTE: Apply dielectric compound to the inside of the coil-on-plug boots.

60. Install the coil-on-plugs, bolts and the crankcase vent tube.
 - Tighten to 10 N.m (89 lb-in).

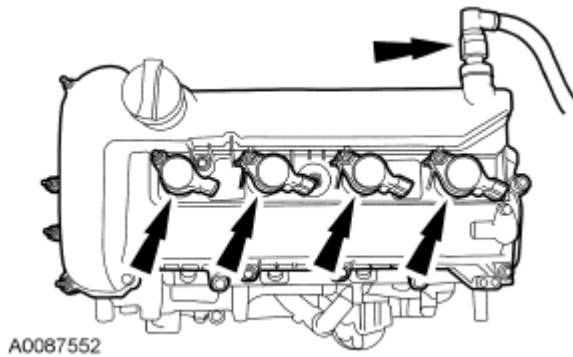


Fig. 360: Locating Coil-On-Plugs, Bolts & Crankcase Vent Tube
Courtesy of FORD MOTOR CO.

61. If equipped, install the block heater.
- Tighten to 21 N.m (15 lb-ft).

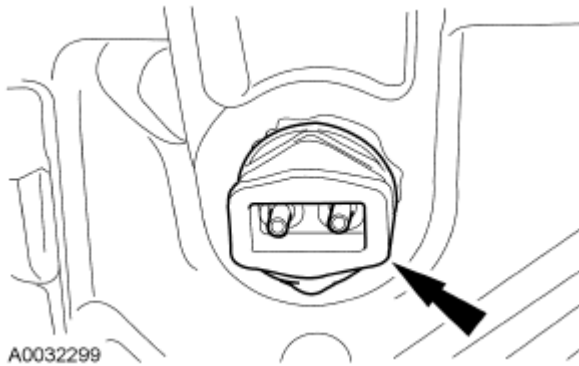
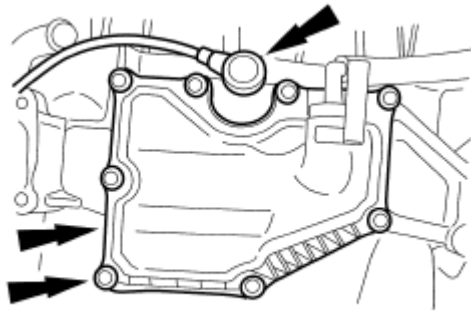


Fig. 361: Locating Block Heater
Courtesy of FORD MOTOR CO.

NOTE: The knock sensor (KS) must not touch the crankcase vent oil separator.

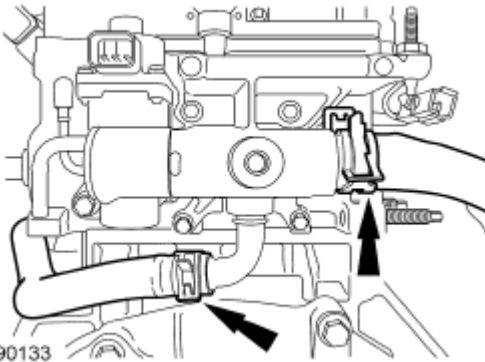
62. Install the crankcase vent oil separator and the KS.
- Tighten the oil separator bolts to 10 N.m (89 lb-in).
 - Tighten the KS to 20 N.m (15 lb-ft).



A0100094

Fig. 362: Locating Crankcase Vent Oil Separator & KS
Courtesy of FORD MOTOR CO.

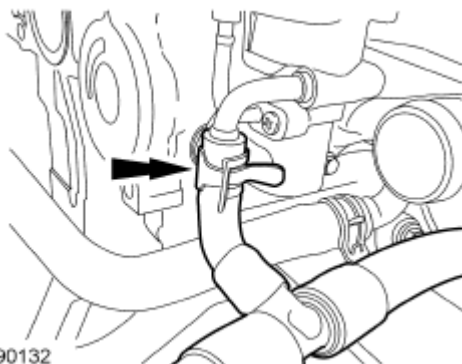
63. Install the coolant hoses.



A0090133

Fig. 363: Locating Coolant Hoses (1 Of 3)
Courtesy of FORD MOTOR CO.

64. Install the coolant hose.



A0090132

Fig. 364: Locating Coolant Hoses (2 Of 3)
Courtesy of FORD MOTOR CO.

65. Install the coolant hose.

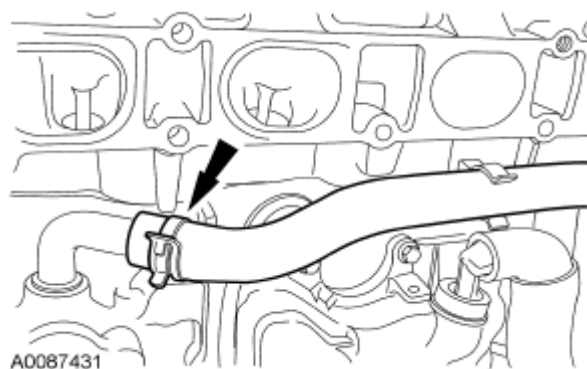


Fig. 365: Locating Coolant Hoses (3 Of 3)
Courtesy of FORD MOTOR CO.

66. Position the engine control wiring harness on the engine and connect the CHT sensor and install the rubber boot.

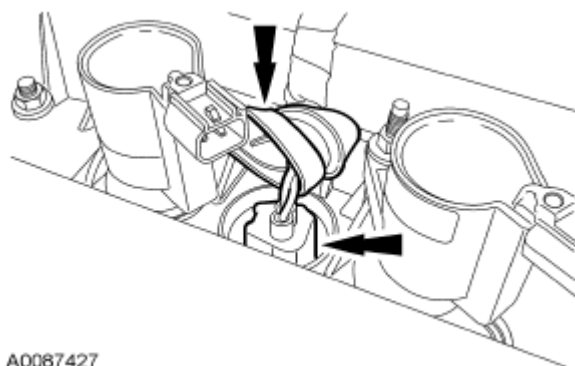


Fig. 366: Locating Rubber Boot
Courtesy of FORD MOTOR CO.

67. Attach the wiring harness retainer.

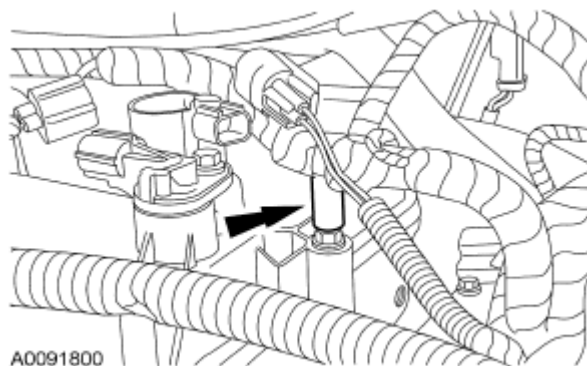


Fig. 367: Locating Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

68. Connect the coil-on-plug and camshaft position (CMP) sensor electrical connectors.

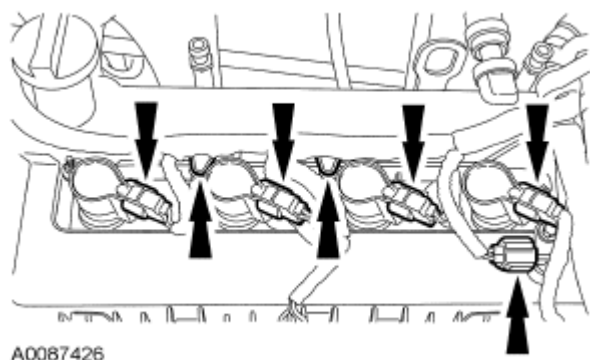


Fig. 368: Locating Coil-On-Plug & Camshaft Position (CMP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

69. Connect the exhaust gas recirculation (EGR) valve and radio interference capacitor electrical connectors. Attach the wiring harness retainer.

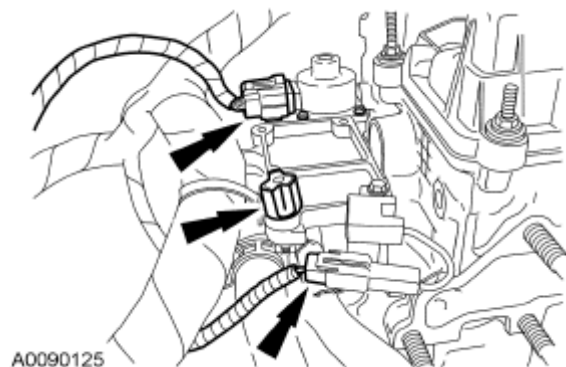


Fig. 369: Locating Exhaust Gas Recirculation (EGR) Valve & Radio Interference Capacitor Electrical Connectors
Courtesy of FORD MOTOR CO.

70. Attach the wiring harness retainer.

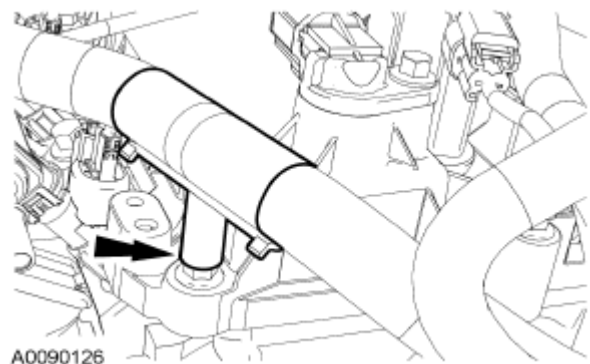
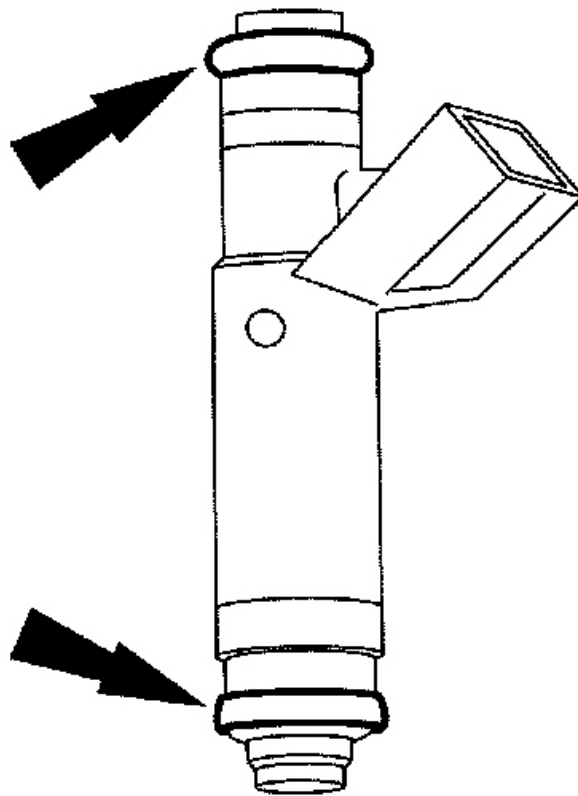


Fig. 370: Locating Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

CAUTION: 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.

71. Install new fuel injector O-rings.

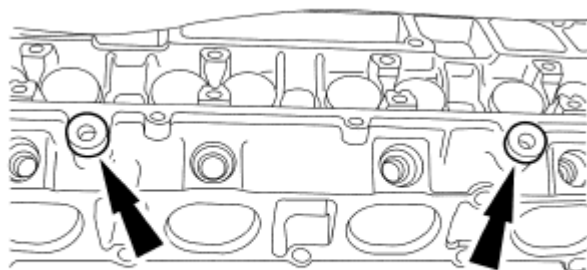
- Separate the fuel injectors from the fuel rail.
- Remove and discard the fuel injector O-rings.
- Install new O-rings and lubricate with clean engine oil.
- Install the fuel injectors onto the fuel rail.



AV1418-A

Fig. 371: Locating Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

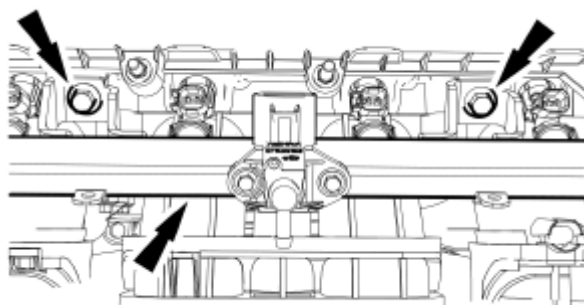
72. If originally equipped, position the fuel rail spacers.



A0032736

Fig. 372: Locating Fuel Rail Spacers
Courtesy of FORD MOTOR CO.

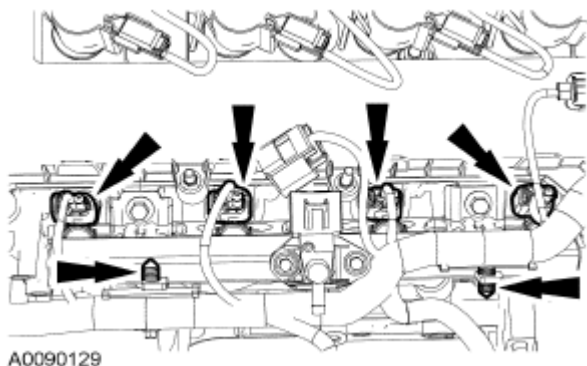
73. Install the fuel rail with the fuel injectors and bolts.
- Tighten to 25 N.m (18 lb-ft).



N0045802

Fig. 373: Locating Fuel Rail With Fuel Injectors & Bolts
Courtesy of FORD MOTOR CO.

74. Connect the 4 fuel injector electrical connectors. Attach the 2 wiring harness retainers.



A0090129

Fig. 374: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

75. Install the EGR tube.

- Tighten to 55 N.m (41 lb-ft).

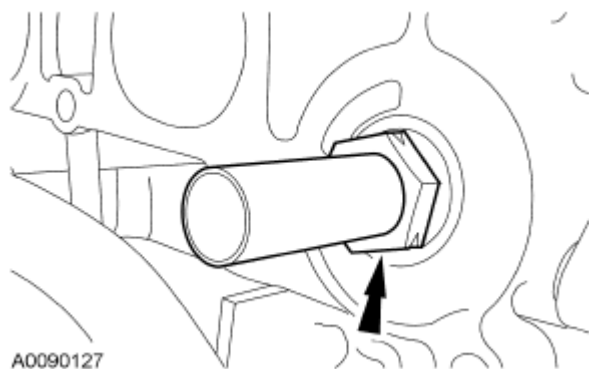


Fig. 375: Locating EGR Tube
 Courtesy of FORD MOTOR CO.

76. Position the intake manifold and connect the positive crankcase ventilation hose.

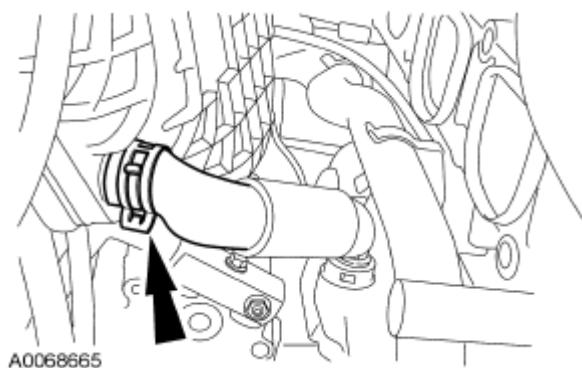


Fig. 376: Locating Positive Crankcase Ventilation Hose
 Courtesy of FORD MOTOR CO.

NOTE: **Inspect and install new intake manifold gaskets, if necessary.**

77. Install the intake manifold gaskets and intake manifold.

- Tighten the bolts to 18 N.m (13 lb-ft).

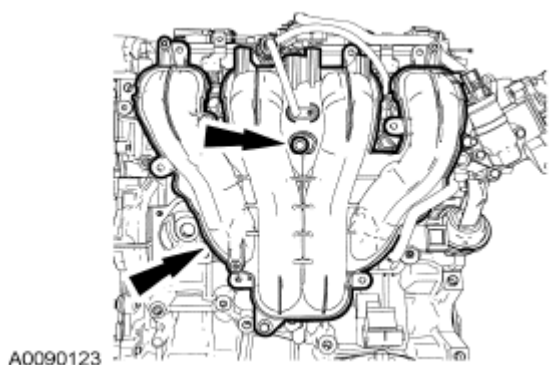


Fig. 377: Locating Intake Manifold Gaskets & Intake Manifold
Courtesy of FORD MOTOR CO.

78. Connect the throttle position (TP) sensor electrical connector.

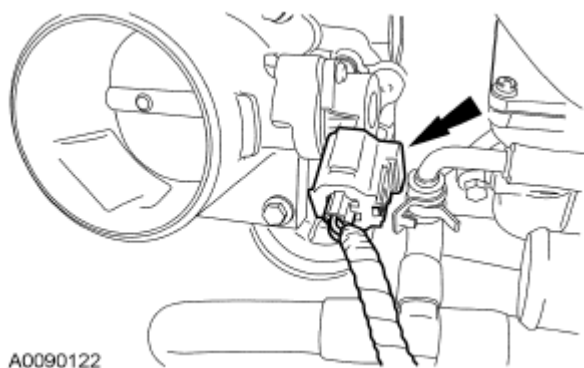


Fig. 378: Locating Throttle Position (TP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

79. Connect the fuel rail pressure and temperature sensor electrical connector and vacuum tube.

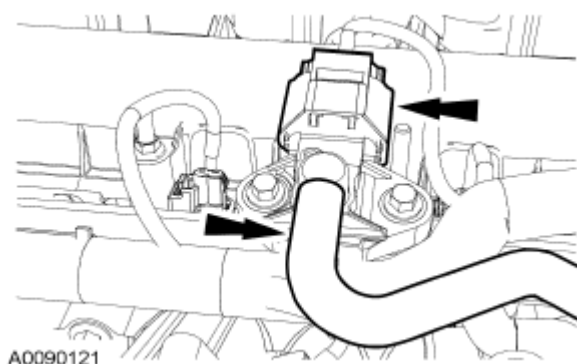


Fig. 379: Locating Fuel Rail Pressure, Temperature Sensor Electrical Connector & Vacuum Tube
Courtesy of FORD MOTOR CO.

80. Connect the swirl control valve electrical connector.

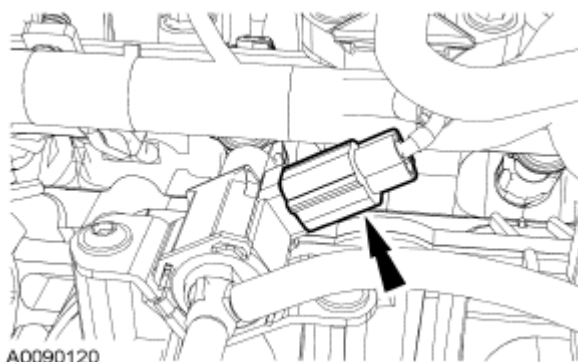


Fig. 380: Locating Swirl Control Valve Electrical Connector
Courtesy of FORD MOTOR CO.

81. Connect the idle air control (IAC) motor electrical connector.

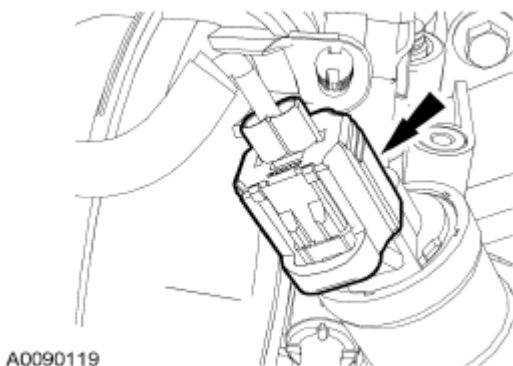


Fig. 381: Locating Idle Air Control (IAC) Motor Electrical Connector
Courtesy of FORD MOTOR CO.

82. Connect the temperature manifold absolute pressure (TMAP) electrical connector.



Fig. 382: Locating Temperature Manifold Absolute Pressure (TMAP) Electrical Connector
Courtesy of FORD MOTOR CO.

83. Connect the KS and attach the 2 wiring harness retainers.

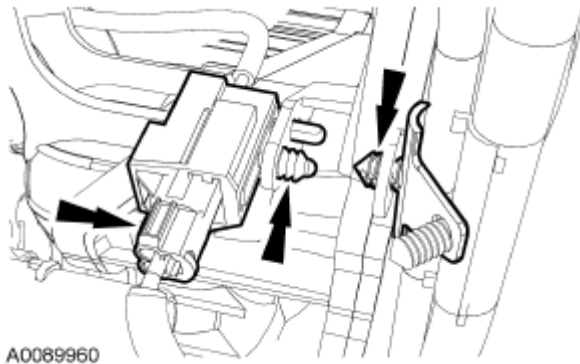


Fig. 383: Locating Wiring Harness Retainers (1 Of 2)
Courtesy of FORD MOTOR CO.

84. Attach the 2 wiring harness retainers.

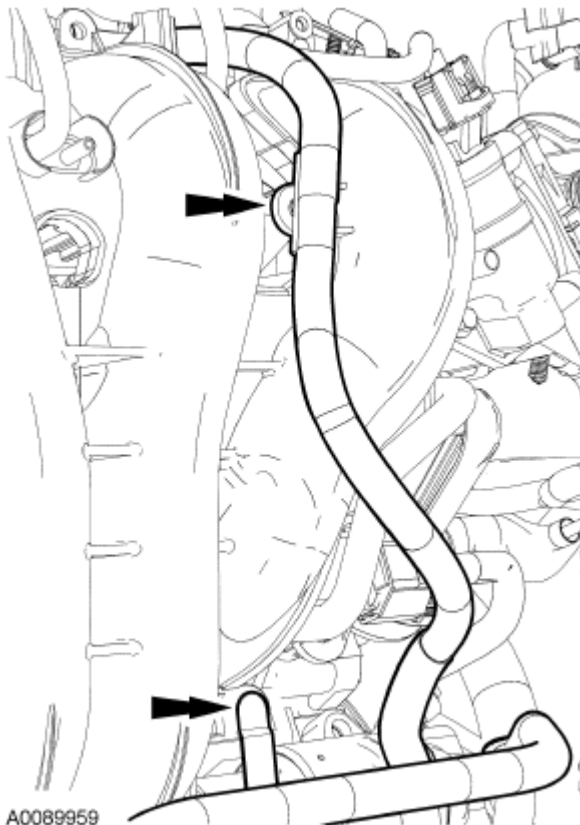


Fig. 384: Locating Wiring Harness Retainers (2 Of 2)
Courtesy of FORD MOTOR CO.

85. If removed, install the capacitor and bolt.
- Tighten to 20 N.m (15 lb-ft).

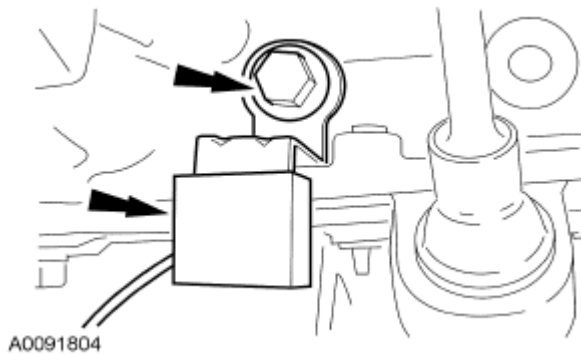


Fig. 385: Locating Capacitor & Bolt
Courtesy of FORD MOTOR CO.

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

86. Position the oil filter adapter in a vise and install the oil filter, new oil cooler and oil cooler bolt.
- Tighten the oil cooler bolt to 34 N.m (25 lb-ft).
 - Tighten the oil filter 3/4 turn after the oil filter gasket makes contact with the oil filter adapter.

NOTE: Early build with oil cooler shown, late build without oil cooler similar.
Clean the gasket mating surfaces with metal surface cleaner.

87. Install the oil filter adapter with a new gasket and bolts.
- Tighten to 25 N.m (18 lb-ft).

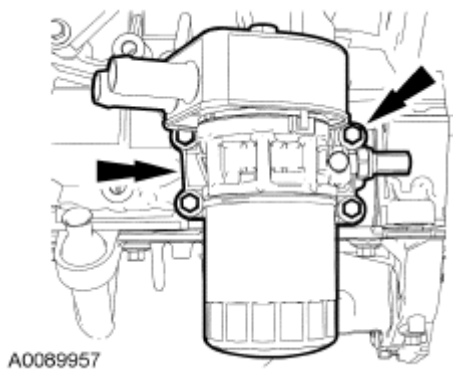


Fig. 386: Locating Oil Filter Adapter
Courtesy of FORD MOTOR CO.

88. Connect the oil pressure sensor electrical connector.

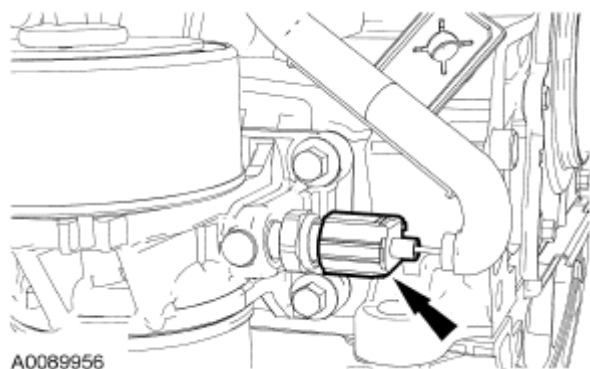


Fig. 387: Locating Oil Pressure Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: Install a new O-ring seal on the oil level indicator tube and lubricate with clean engine oil prior to installing.

89. Install the oil level indicator and bolts.

- Tighten to 10 N.m (89 lb-in).

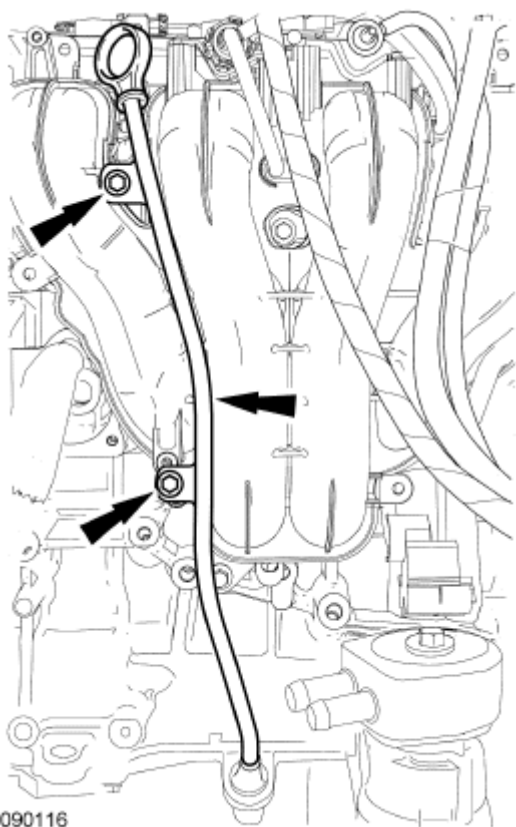


Fig. 388: Locating Oil Level Indicator & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Clean and inspect the thermostat housing gasket. Install a new gasket, if necessary.

90. Install the thermostat housing and bolts.

- Tighten to 10 N.m (89 lb-in).

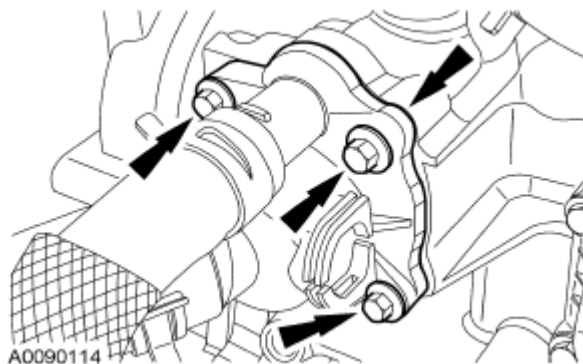


Fig. 389: Locating Thermostat Housing & Bolts
Courtesy of FORD MOTOR CO.

91. If equipped, connect the oil cooler hoses.

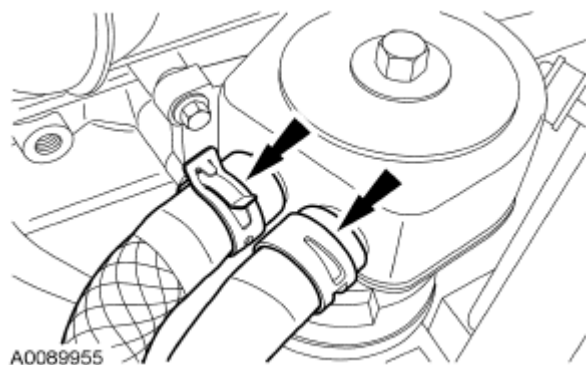


Fig. 390: Locating Oil Cooler Hoses
Courtesy of FORD MOTOR CO.

92. Attach the 2 wiring harness retainers.

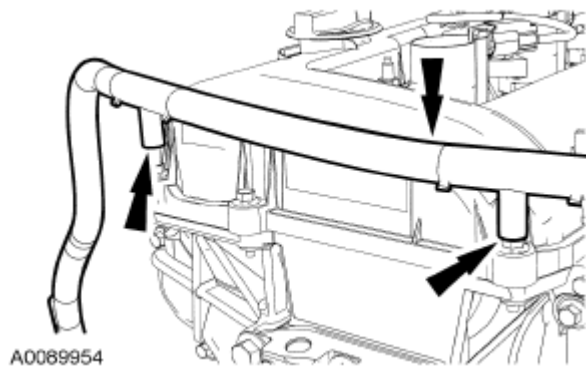


Fig. 391: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

93. Install the engine vacuum tube.
- Connect the engine vacuum tube.
 - Attach the 2 engine vacuum tube retainers.

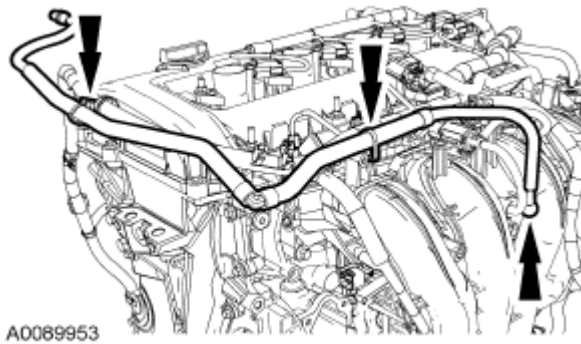


Fig. 392: Locating Engine Vacuum Tube
Courtesy of FORD MOTOR CO.

NOTE: **Clean the coolant pump mating surface with metal surface cleaner.
Lubricate the coolant pump O-ring with clean engine coolant.**

94. Install the coolant pump and bolts.
- Tighten to 10 N.m (89 lb-in).

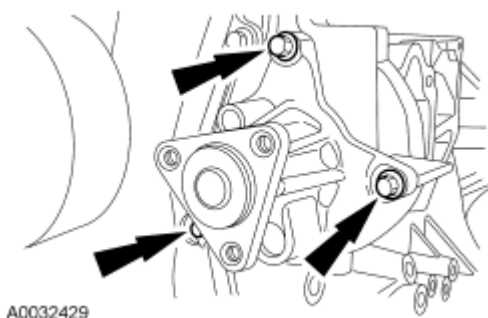


Fig. 393: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

95. Install the coolant pump pulley and bolts.
- Tighten to 20 N.m (15 lb-ft).

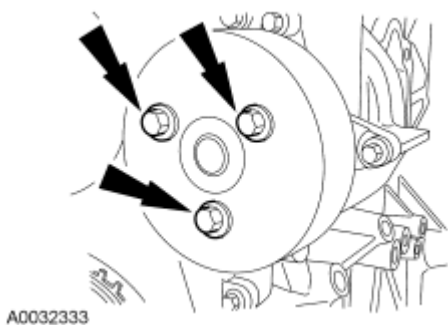


Fig. 394: Locating Coolant Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

96. If equipped, install the accessory drive belt idler pulley.
- Tighten to 25 N.m (18 lb-ft).

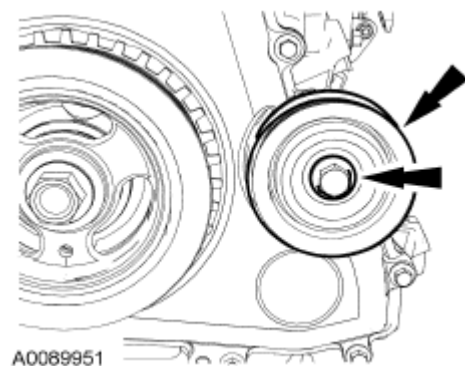


Fig. 395: Locating Accessory Drive Belt Idler Pulley (1 Of 2)
Courtesy of FORD MOTOR CO.

97. Install the accessory drive belt idler pulley.

- Tighten to 25 N.m (18 lb-ft).

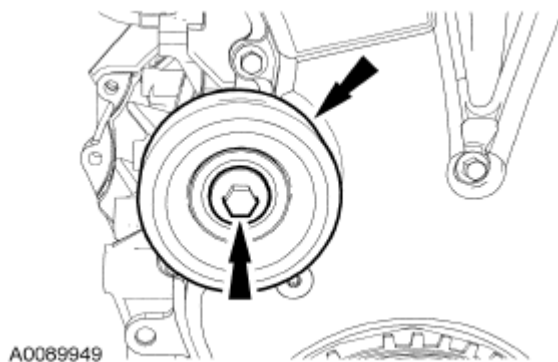


Fig. 396: Locating Accessory Drive Belt Idler Pulley (2 Of 2)
Courtesy of FORD MOTOR CO.

98. Install the generator and bolts.
- Tighten to 47 N.m (35 lb-ft).

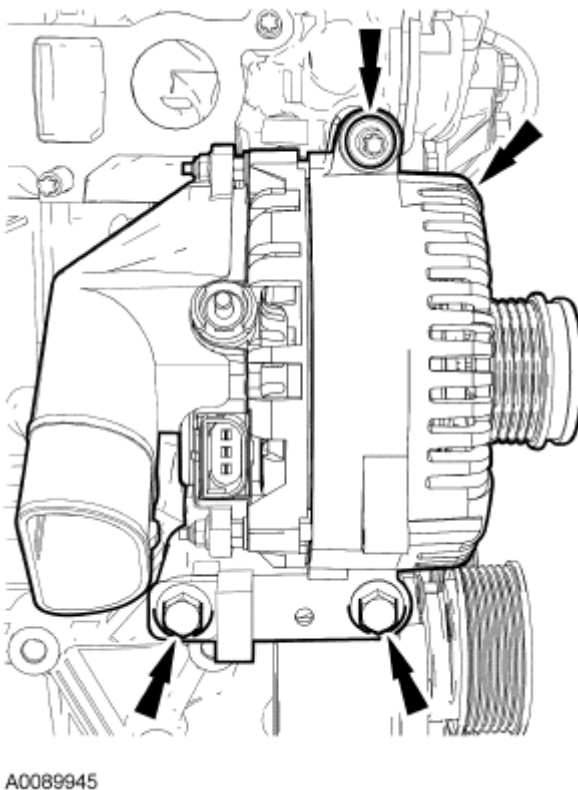


Fig. 397: Locating Generator & Bolts
Courtesy of FORD MOTOR CO.

99. Position a new exhaust manifold gasket on the engine.

CAUTION:

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

Failure to tighten the catalytic converter nuts to specification a second time will cause the converter to develop an exhaust leak.

NOTE:

Make sure to tighten the nuts in the sequence in 2 stages.

100. Position the catalytic converter and tighten the 7 exhaust manifold nuts in the sequence shown.

- Stage 1: Tighten to 47 N.m (35 lb-ft).
- Stage 2: Tighten to 47 N.m (35 lb-ft).

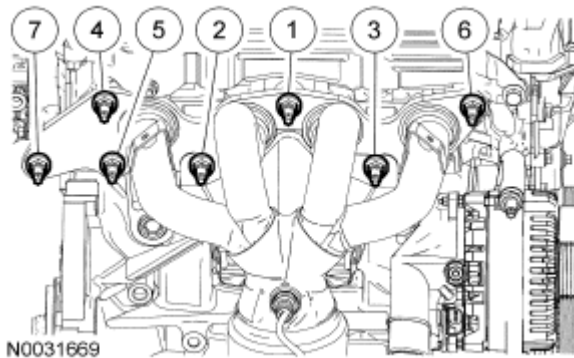


Fig. 398: Tightening Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

101. Install the heat shield and the 6 bolts.

- Tighten to 10 N.m (89 lb-in).

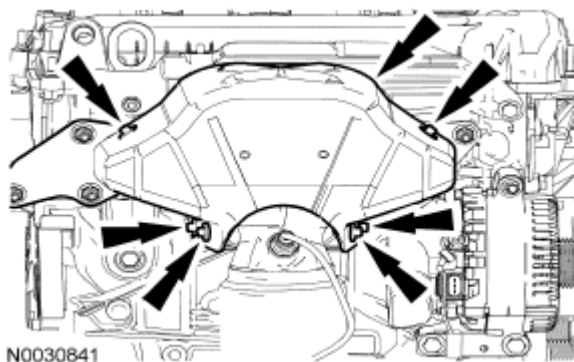


Fig. 399: Locating Heat Shield & Bolts
Courtesy of FORD MOTOR CO.

102. Install the 2 catalytic converter bracket bolts.

- Tighten to 25 N.m (18 lb-ft).

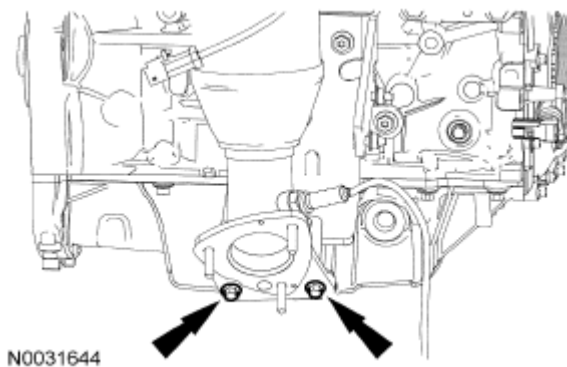


Fig. 400: Locating Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

103. Connect the generator electrical connections and install the nut.
- Tighten to 6 N.m (53 lb-in).

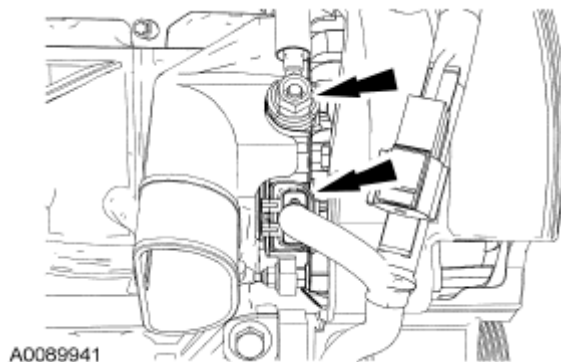


Fig. 401: Locating Generator Electrical Connections
Courtesy of FORD MOTOR CO.

104. Connect the CKP sensor electrical connector.

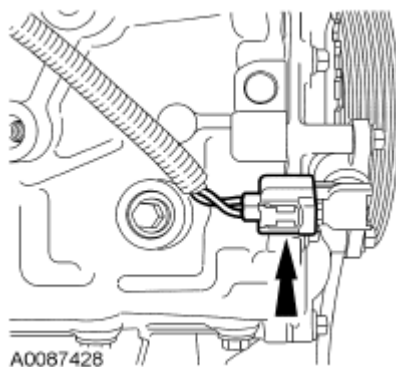


Fig. 402: Locating CKP Sensor Electrical Connector

Courtesy of FORD MOTOR CO.

105. Using the heavy duty floor crane and spreader bar, remove the engine from the engine stand.

Vehicles with automatic transaxle

106. Install the flexplate and the bolts. Tighten the bolts in the sequence shown in 3 stages:

- Stage 1: Tighten to 50 N.m (37 lb-ft).
- Stage 2: Tighten to 80 N.m (50 lb-ft).
- Stage 3: Tighten to 112 N.m (83 lb-ft).

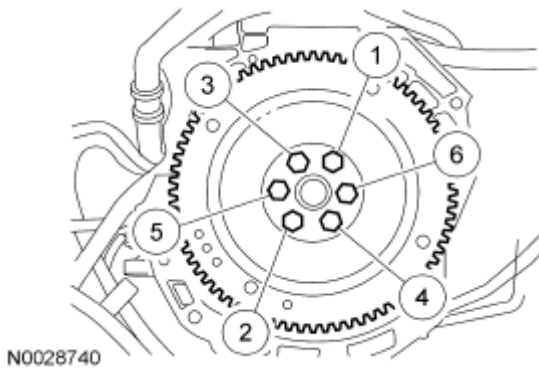


Fig. 403: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

Vehicles with manual transaxle

107. Install the flywheel and the bolts. Tighten the bolts in the sequence shown in 3 stages:

- Stage 1: Tighten to 50 N.m (37 lb-ft).
- Stage 2: Tighten to 80 N.m (50 lb-ft).
- Stage 3: Tighten to 112 N.m (83 lb-ft).

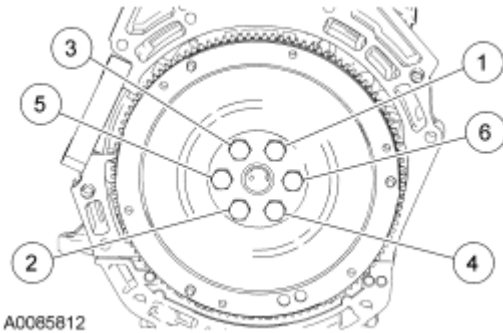


Fig. 404: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

108. Install the starter motor isolator.

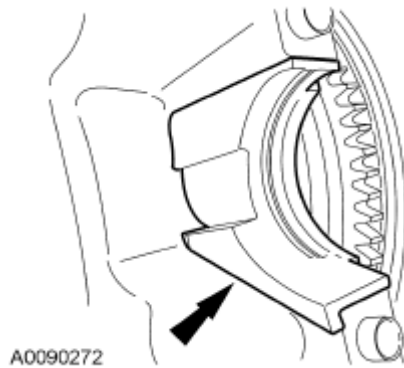


Fig. 405: Locating Starter Motor Isolator
Courtesy of FORD MOTOR CO.

109. Lubricate the transaxle input shaft pilot bearing with front axle grease.

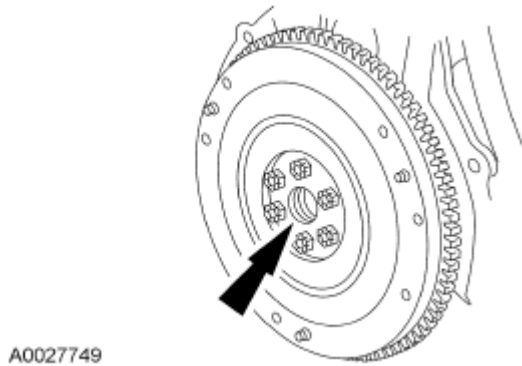


Fig. 406: Locating Transaxle Input Shaft Pilot Bearing
Courtesy of FORD MOTOR CO.

110. Using the special tool, position the clutch disc on the flywheel.

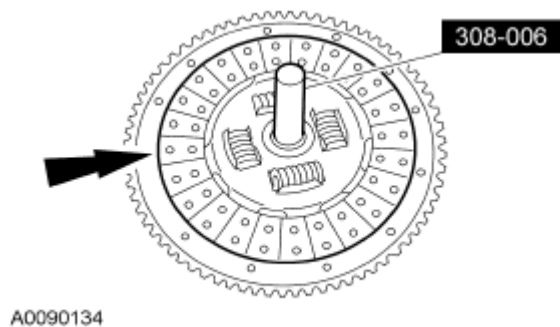


Fig. 407: Positioning Clutch Disc On Flywheel Using Special Tool (308-006)
Courtesy of FORD MOTOR CO.

NOTE: If reusing the clutch pressure plate and flywheel, align the marks made during removal.

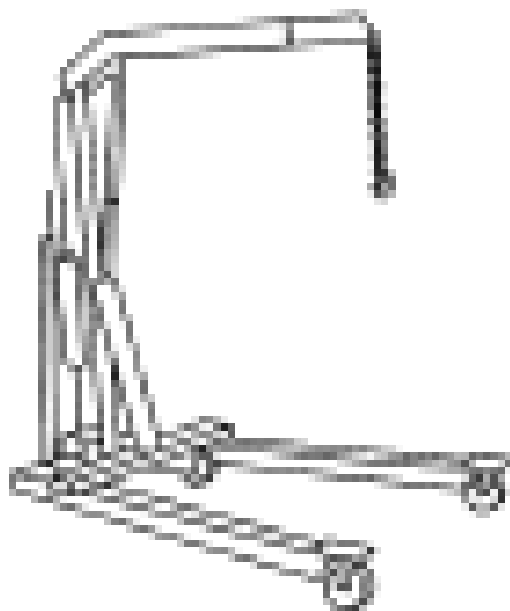
111. Position the clutch pressure plate and install the bolts.

- Tighten to 27 N.m (20 lb-ft) in a star pattern sequence.

INSTALLATION

ENGINE - AUTOMATIC TRANSAXLE

SPECIAL TOOL(S)



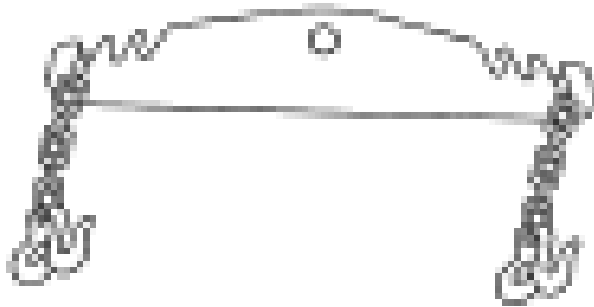
ST1341-A

Heavy Duty Floor Crane
014-00071 or equivalent

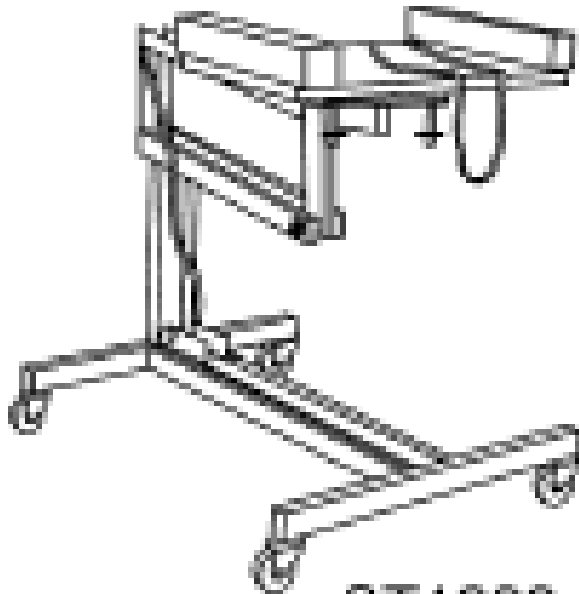
Spreader Bar
303-D089 (D93P-6001-A3) or equivalent

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST1602-A

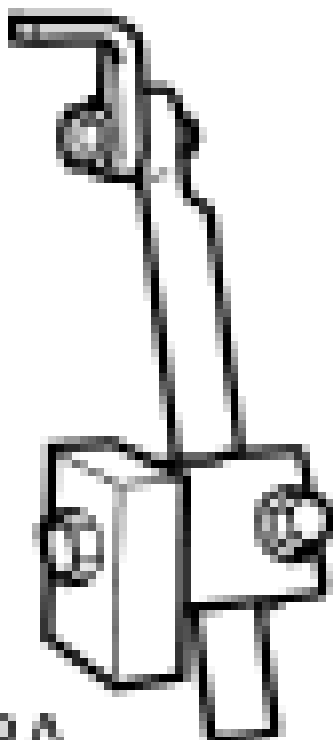


ST1293-A

Powertrain Lift
014-00765

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



Universal Adapter Brackets
014-0001
Lifting Bracket Set, Engine
303-D095 (D94L-6001-A) or equivalent

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (in Canada Motorcraft SAE 5W-20 Super Premium Motor Oil CXO- 5W20-LSP12) or equivalent	WSS-M2C930- A

WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

All vehicles

1. Using the engine crane and spreader bar, position the engine and transaxle together. Install the 6 transaxle-to-engine bolts.
 - Tighten to 48 N.m (35 lb-ft).
2. Install new torque converter nuts.
 - Tighten to 35 N.m (26 lb-ft).

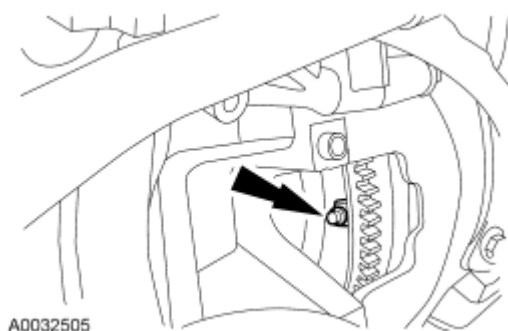


Fig. 408: Locating Torque Converter Nut
Courtesy of FORD MOTOR CO.

3. Install the starter motor isolator.

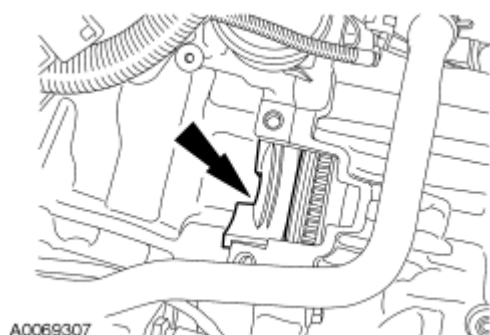


Fig. 409: Identifying Starter Motor Isolator
Courtesy of FORD MOTOR CO.

4. Using the engine crane and spreader bar, position the engine and transaxle onto the lift table.
5. Using the special tools, secure the engine to the lift table.

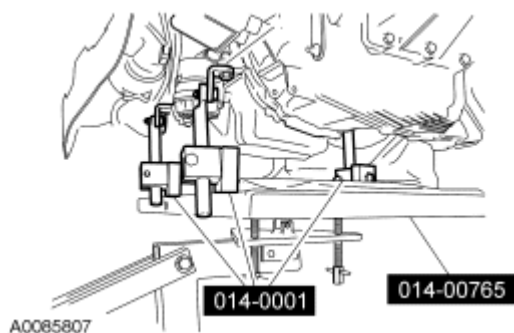


Fig. 410: Securing Engine To Lift Table Using Special Tool (014-0001, 014-00765)
Courtesy of FORD MOTOR CO.

6. Raise the engine and transaxle into the vehicle.
7. Install the bolt in the LH transaxle mount.
 - Tighten to 103 N.m (76 lb-ft).

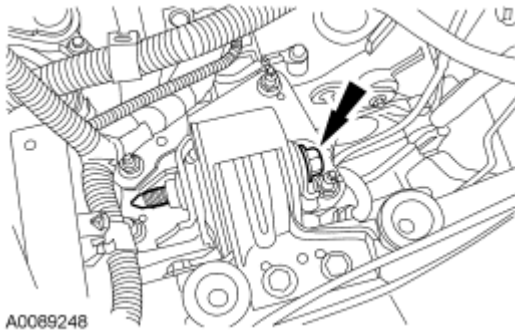


Fig. 411: Locating Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

8. Install the bolt in the rear transaxle mount.
 - Tighten to 115 N.m (85 lb-ft).

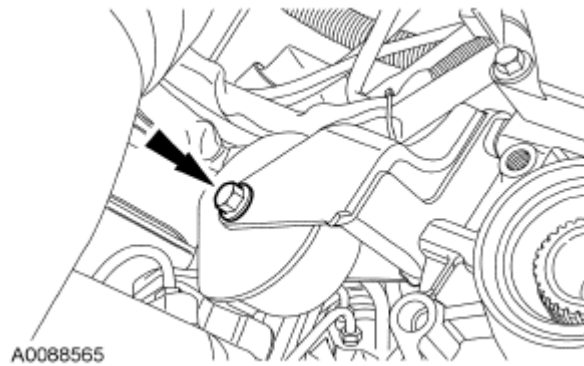


Fig. 412: Locating Rear Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

9. Install the engine mount bracket.
 - Tighten to 115 N.m (85 lb-ft).

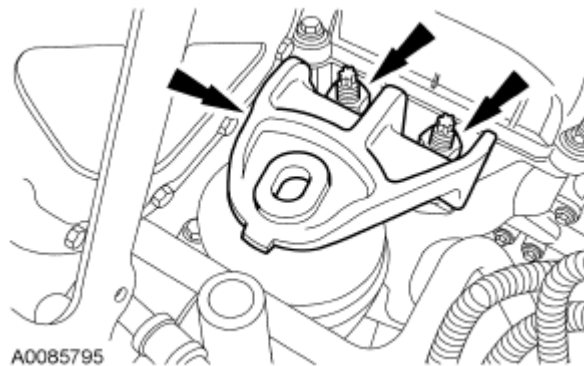


Fig. 413: Locating Engine Mount Bracket
Courtesy of FORD MOTOR CO.

10. Install the engine mount bracket bolt.

- Tighten to 115 N.m (85 lb-ft).

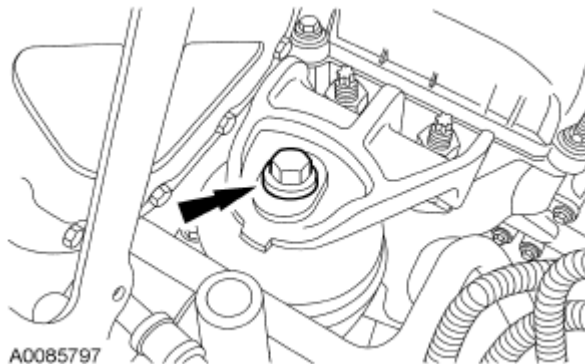


Fig. 414: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

11. Install the 2 transaxle-to-engine bolts.

- Tighten to 48 N.m (35 lb-ft).

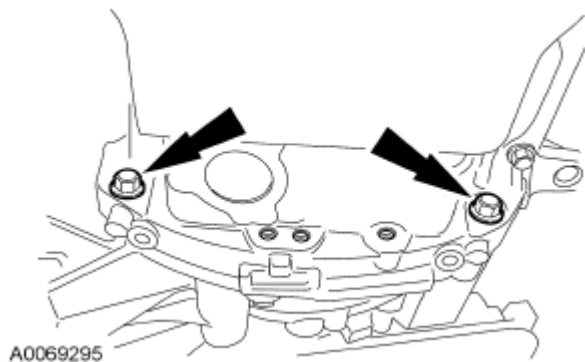


Fig. 415: Locating Transaxle-To-Engine Bolts (1 Of 2)
Courtesy of FORD MOTOR CO.

12. Install the 2 transaxle-to-engine bolts.

- Tighten to 48 N.m (35 lb-ft).

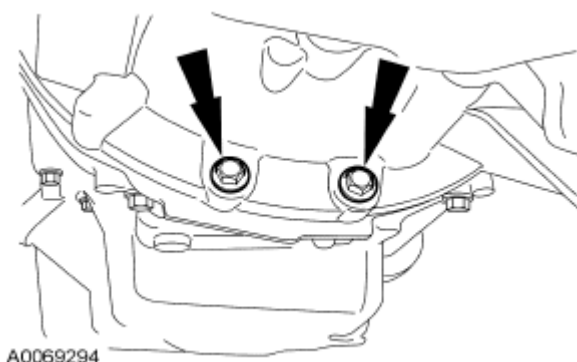


Fig. 416: Locating Transaxle-To-Engine Bolts (2 Of 2)
Courtesy of FORD MOTOR CO.

13. Install the engine support crossmember and new nut.
 - Tighten to 175 N.m (129 lb-ft).

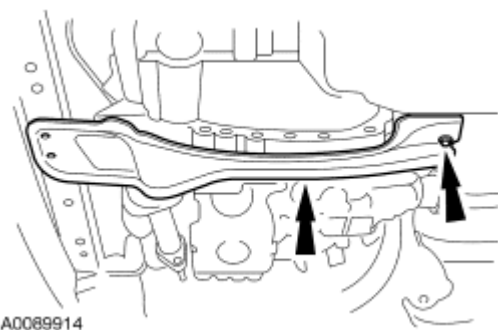


Fig. 417: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

14. Install the 2 bolts for the engine support crossmember and the front roll restrictor bolt.
 - Tighten the engine support crossmember bolts to 90 N.m (66 lb-ft).
 - Tighten the front roll restrictor bolt to 115 N.m (85 lb-ft).

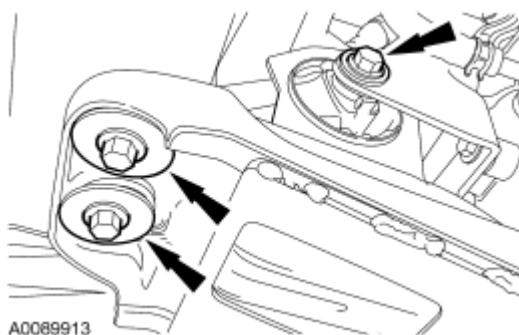


Fig. 418: Identifying Front Roll Restrictor Bolt & Bolts For Engine Support Crossmember
Courtesy of FORD MOTOR CO.

NOTE: The bolt under the power steering pressure tube will remain with the power steering pump.

15. Position the power steering pump and install the bolts.
 - Tighten to 25 N.m (18 lb-ft).

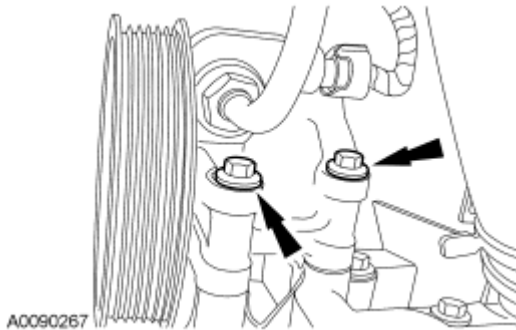


Fig. 419: Identifying Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

16. Connect the power steering pressure (PSP) sensor electrical connector.

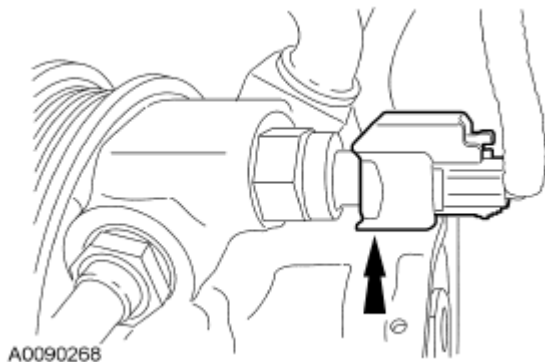


Fig. 420: Locating Power Steering Pressure (PSP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

17. Install the A/C compressor and connect the A/C compressor electrical connector.
 - Tighten the bolts to 25 N.m (18 lb-ft).

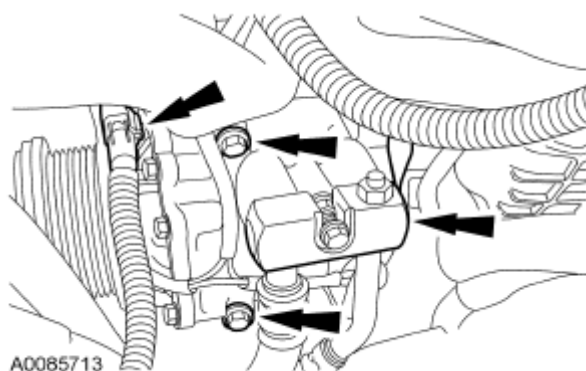


Fig. 421: Locating A/C Compressor & Bolts
Courtesy of FORD MOTOR CO.

18. Connect the lower radiator hose to the radiator.

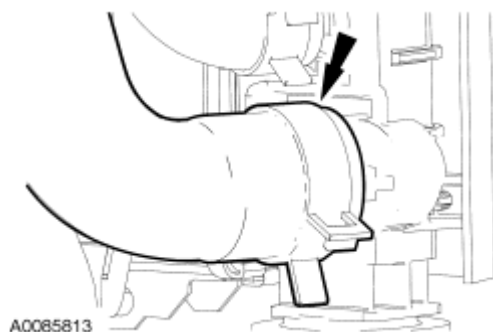


Fig. 422: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

19. Install the 2 power steering pump bolts.
 - Tighten to 25 N.m (18 lb-ft).

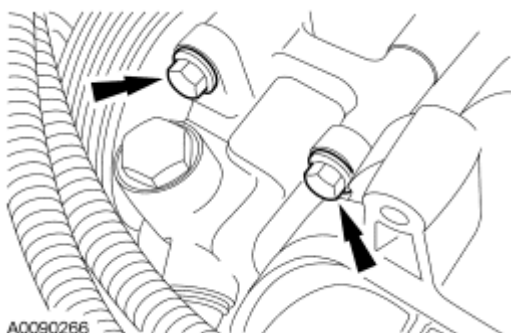


Fig. 423: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

20. Install the ground wire and bolt.
 - Tighten to 10 N.m (89 lb-in).

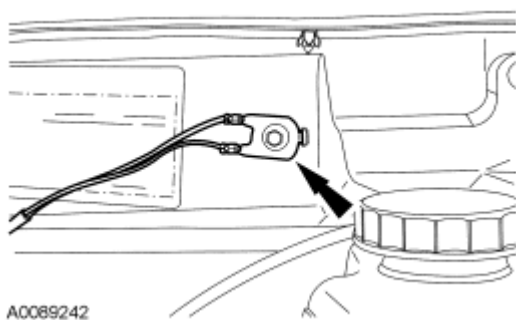


Fig. 424: Locating Ground Wire & Bolt
Courtesy of FORD MOTOR CO.

21. Connect the powertrain control module (PCM) electrical connectors. Position the harness and install the nut.
- Tighten to 8 N.m (71 lb-in).

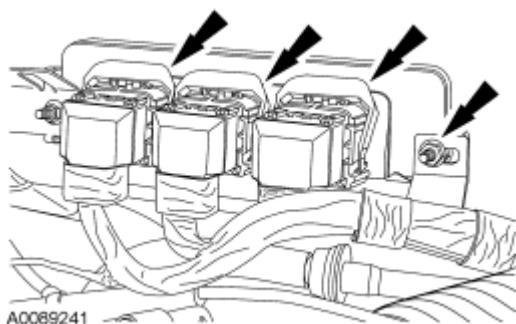


Fig. 425: Locating Powertrain Control Module (PCM) Electrical Connectors
Courtesy of FORD MOTOR CO.

22. Attach the electrical connector retainers.

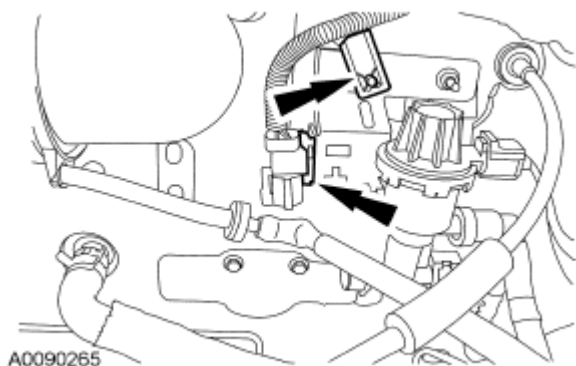


Fig. 426: Locating Electrical Connector Retainers
Courtesy of FORD MOTOR CO.

23. Connect the fuel supply tube.

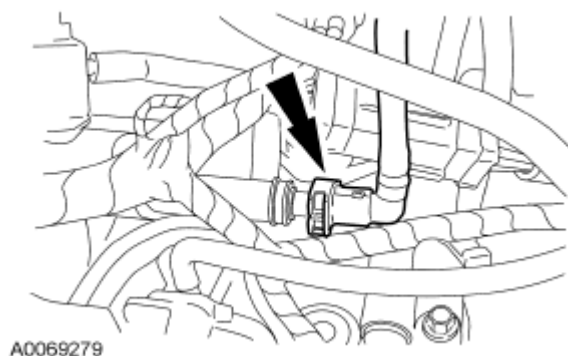


Fig. 427: Locating Fuel Supply Tube
Courtesy of FORD MOTOR CO.

24. Connect the vacuum reservoir tube.

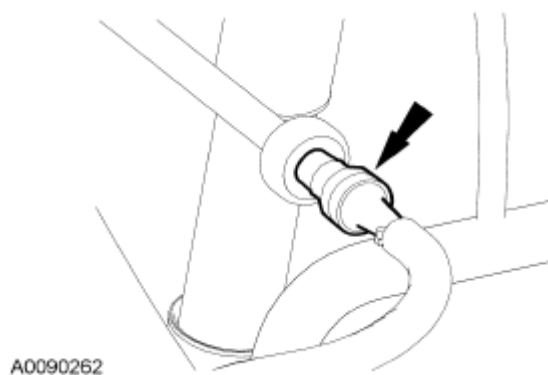


Fig. 428: Locating Vacuum Reservoir Tube
Courtesy of FORD MOTOR CO.

25. Connect the fuel vapor return tube and retainer.

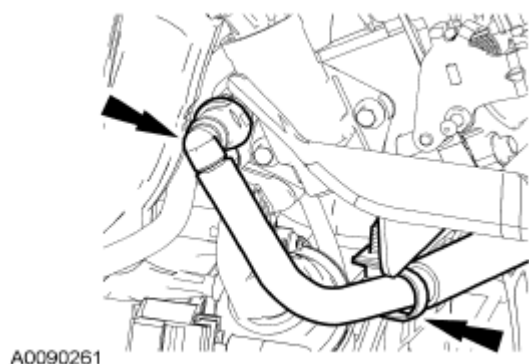


Fig. 429: Locating Fuel Vapor Return Tube & Retainer
Courtesy of FORD MOTOR CO.

26. Connect the vacuum supply tube.

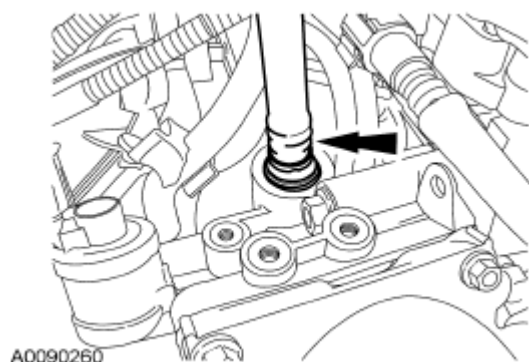


Fig. 430: Locating Vacuum Supply Tube
Courtesy of FORD MOTOR CO.

27. Install the power steering tube, bracket and nut.
- Tighten to 6 N.m (53 lb-in).

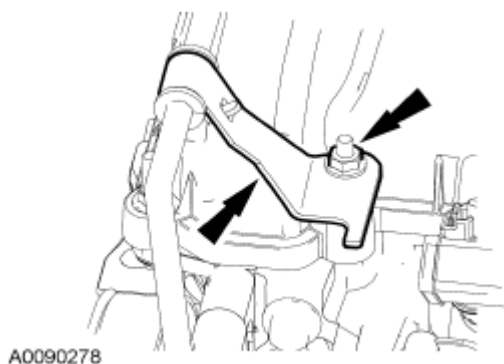


Fig. 431: Locating Power Steering Tube, Bracket & Nut
Courtesy of FORD MOTOR CO.

28. Position the accelerator control cable and bracket and install the nut.
- Tighten to 9 N.m (80 lb-in) (vehicles built through 10/2005).
 - Tighten to 5 N.m (44 lb-in) (vehicles built after 10/2005).

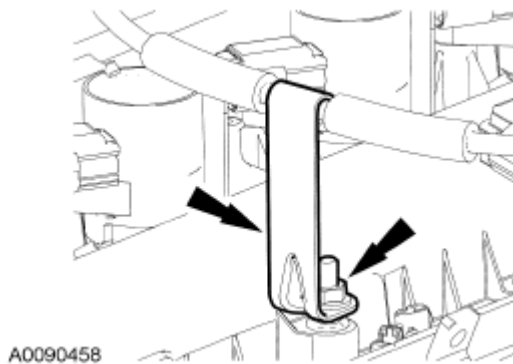


Fig. 432: Locating Accelerator Control Cable & Bracket

Courtesy of FORD MOTOR CO.

29. Install the accelerator control cable and bracket and nut.
- Tighten to 9 N.m (80 lb-in) (vehicles built through 10/2005).
 - Tighten to 5 N.m (44 lb-in) (vehicles built after 10/2005).

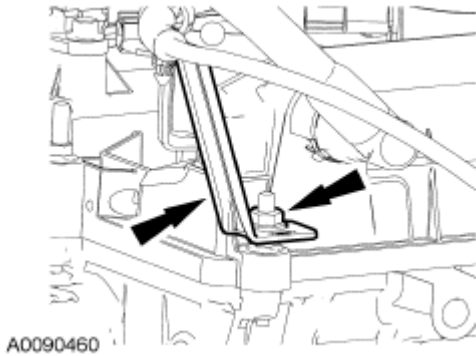


Fig. 433: Locating Accelerator Control Cable, Bracket & Nut
Courtesy of FORD MOTOR CO.

30. Install the accelerator cable and speed control cable (if equipped).
1. Connect the accelerator and speed control cable (if equipped) to the throttle body.
 2. Install the accelerator cable bracket and bolts.
 - Tighten to 10 N.m (89 lb-in).

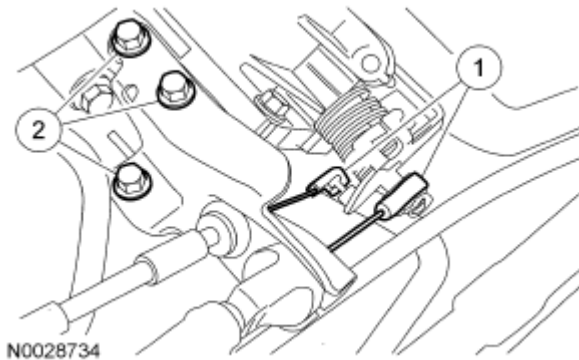


Fig. 434: Identifying Accelerator Cable Bracket & Bolts
Courtesy of FORD MOTOR CO.

31. Install the accelerator cable snow shield and retainers.
- Tighten to 10 N.m (89 lb-in).

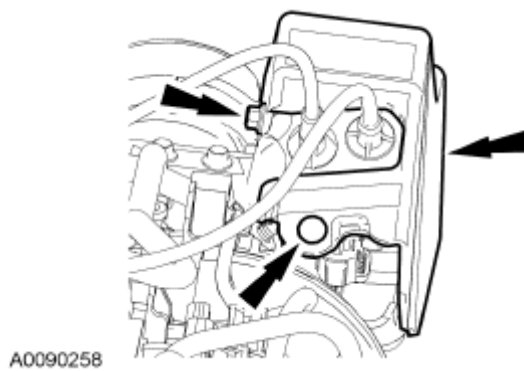


Fig. 435: Locating Accelerator Cable Snow Shield & Retainers
Courtesy of FORD MOTOR CO.

32. Connect the heater hoses to the heater core.

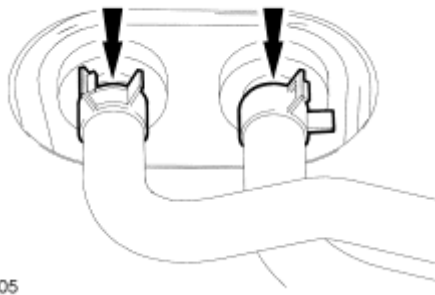


Fig. 436: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

33. Attach the heater hose support strap to the stud.

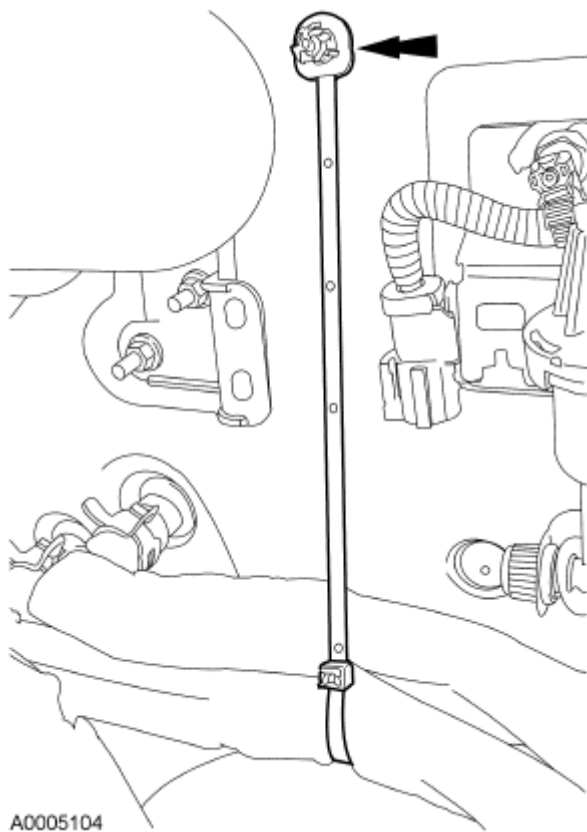


Fig. 437: Locating Heater Hose Support Strap
Courtesy of FORD MOTOR CO.

34. Position the coolant vent hose and install the coolant vent hose brackets and nuts.
- Tighten to 10 N.m (89 lb-in).

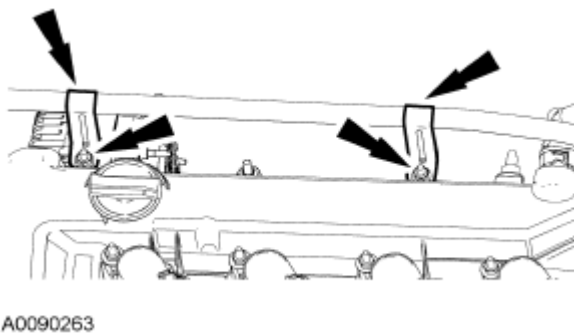


Fig. 438: Locating Coolant Vent Hose
Courtesy of FORD MOTOR CO.

35. Connect the upper radiator and coolant vent hoses.

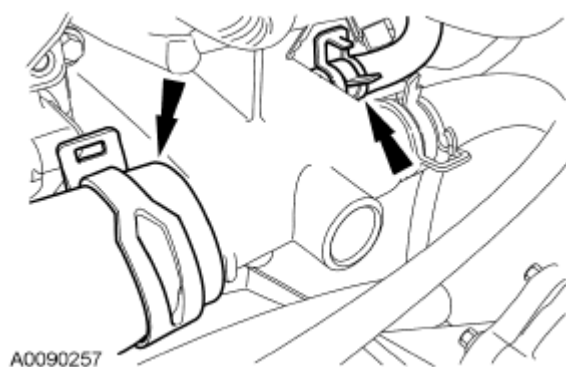


Fig. 439: Locating Upper Radiator & Coolant Vent Hoses
Courtesy of FORD MOTOR CO.

36. If equipped, route the block heater wiring harness and attach all retainers. Connect the block heater electrical connector.

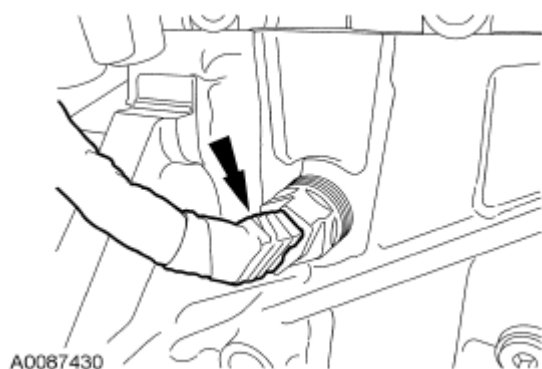


Fig. 440: Locating Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

37. Attach the transaxle control harness to the retaining clip.

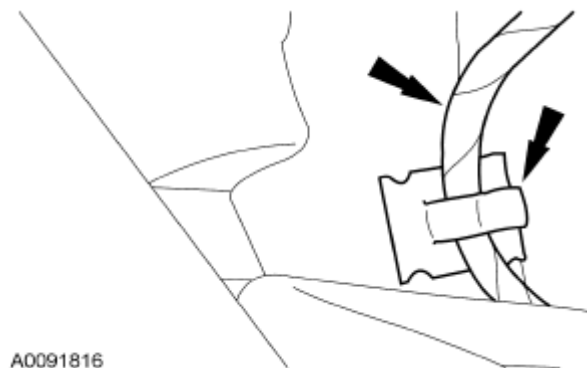


Fig. 441: Locating Transaxle Control Harness
Courtesy of FORD MOTOR CO.

38. Install the output shaft speed (OSS) sensor and bolt.
- Tighten to 13 N.m (10 lb-ft).

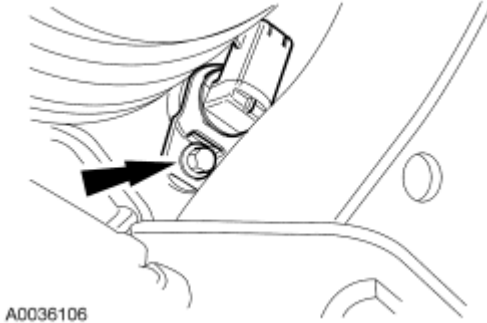


Fig. 442: Locating OSS Sensor Bolt
Courtesy of FORD MOTOR CO.

39. Install the fluid cooler tube.
1. Connect the OSS sensor.
 2. Connect the turbine shaft speed (TSS) sensor (white connector).
 3. Position the bracket and install the bolt.
 - Tighten 13 N.m (10 lb-ft).
 4. Position the fluid cooler tube.
 - Tighten to 23 N.m (17 lb-ft).

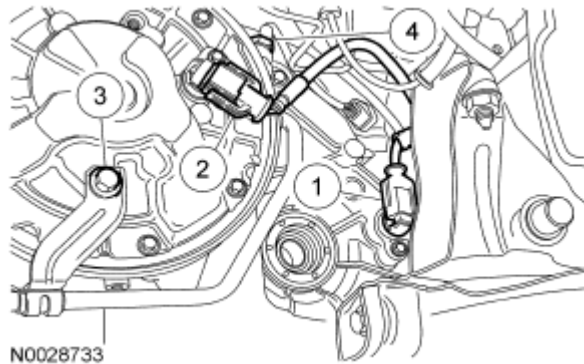


Fig. 443: Locating Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

40. Connect the rear transmission fluid cooler tube.

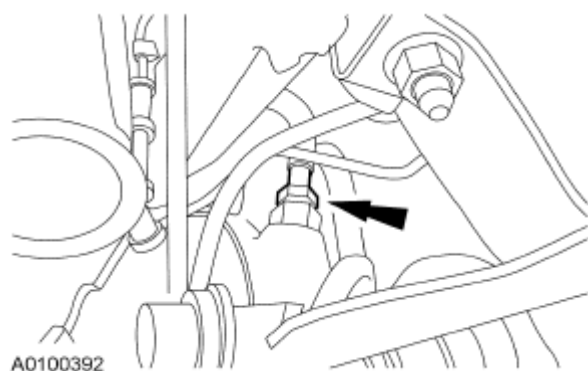


Fig. 444: Locating Rear Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

41. Connect the front transmission fluid cooler tube.
- Tighten to 23 N.m (17 lb-ft).

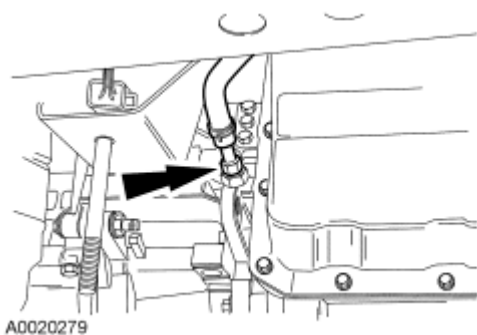


Fig. 445: Locating Transmission Fluid Cooler Tube
Courtesy of FORD MOTOR CO.

42. Attach the transaxle control harness to the brackets.

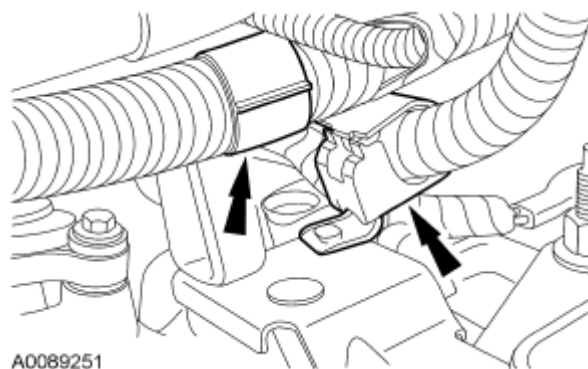


Fig. 446: Locating Transaxle Control Harness
Courtesy of FORD MOTOR CO.

43. Connect the transmission range (TR) sensor electrical connector.

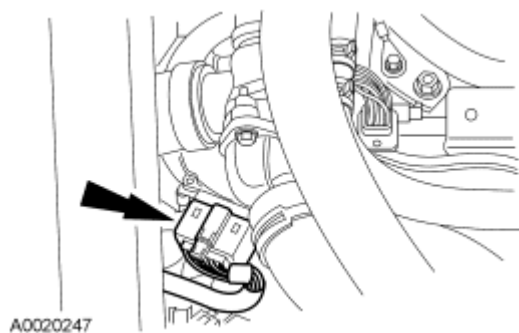


Fig. 447: Locating Transmission Range (TR) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

44. Install the transaxle control cable, bracket and bolts.
- Tighten to 19 N.m (14 lb-ft).
 - Attach the wiring harness pin-type retainers.

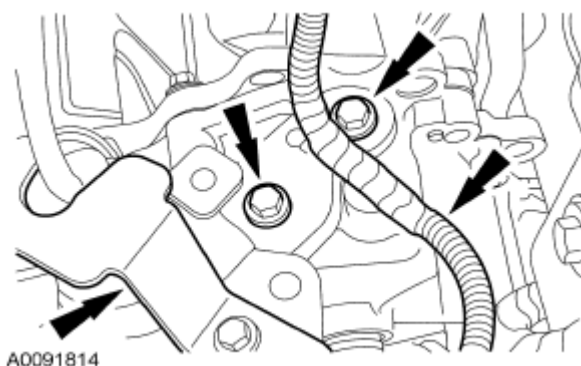


Fig. 448: Locating Transaxle Control Cable, Bracket & Bolts
Courtesy of FORD MOTOR CO.

45. Connect the shift cable to the transaxle manual lever.

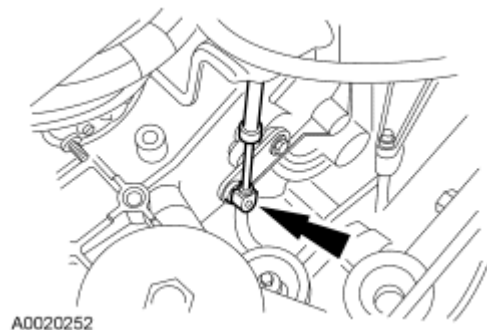


Fig. 449: Locating Shift Cable End At Manual Lever
Courtesy of FORD MOTOR CO.

46. Connect the transaxle electrical connector.

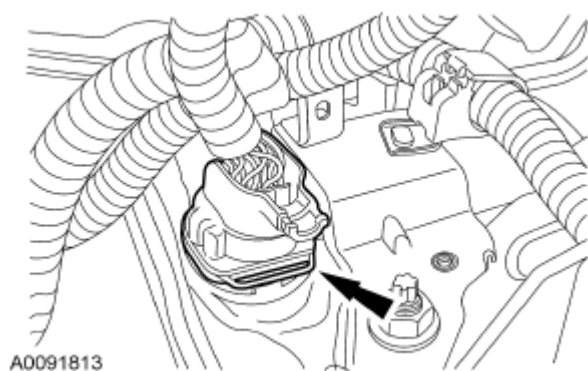


Fig. 450: Locating Transaxle Electrical Connector
Courtesy of FORD MOTOR CO.

47. Attach the wiring harness retainers to the battery tray bracket.

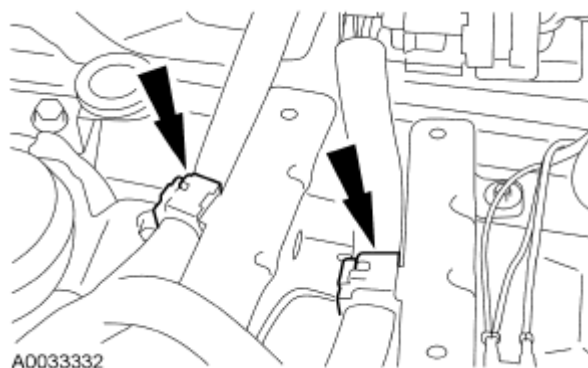


Fig. 451: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

48. Connect the 42-pin electrical connector and tighten the bolt. Install the ground strap and bolt.
- Tighten to 10 N.m (89 lb-in).

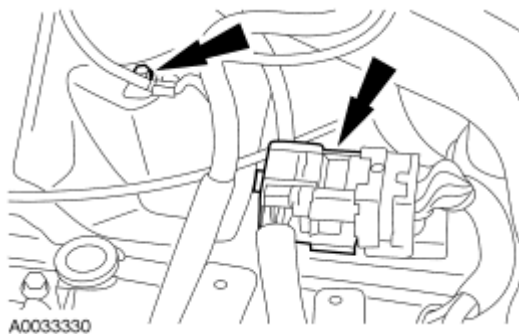


Fig. 452: Locating Ground Strap & Electrical Connector
Courtesy of FORD MOTOR CO.

49. Connect the electrical connector to the power distribution box.

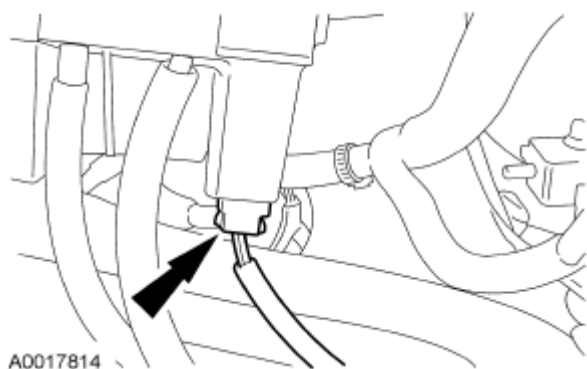


Fig. 453: Locating Electrical Connector
Courtesy of FORD MOTOR CO.

50. Connect the cables and install the nuts.
- Tighten to 12 N.m (9 lb-ft).

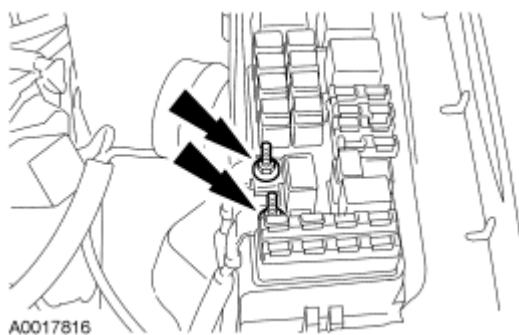


Fig. 454: Locating Cables & Nuts
Courtesy of FORD MOTOR CO.

51. Install the power distribution box cover.

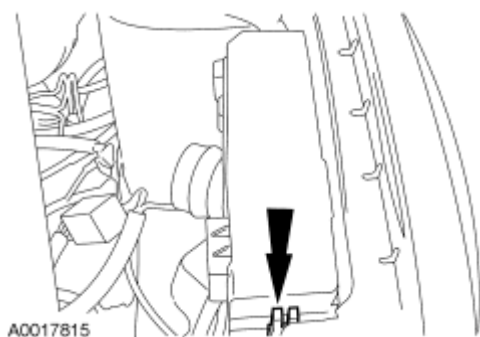


Fig. 455: Locating Power Distribution Box Cover
Courtesy of FORD MOTOR CO.

52. If equipped, install the ground eyelet and bolt.
- Tighten to 10 N.m (89 lb-in).

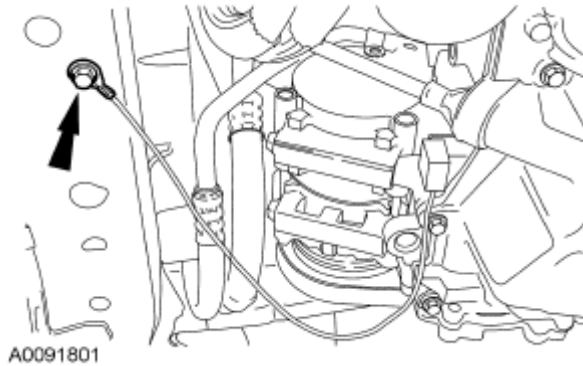


Fig. 456: Locating Ground Eyelet & Bolt
Courtesy of FORD MOTOR CO.

4x2 vehicles

53. Install the front drive intermediate halfshaft. For additional information, refer to **INSTALLATION**.
54. Install the lateral support crossmember and bolts.
 - Tighten to 115 N.m (85 lb-ft).

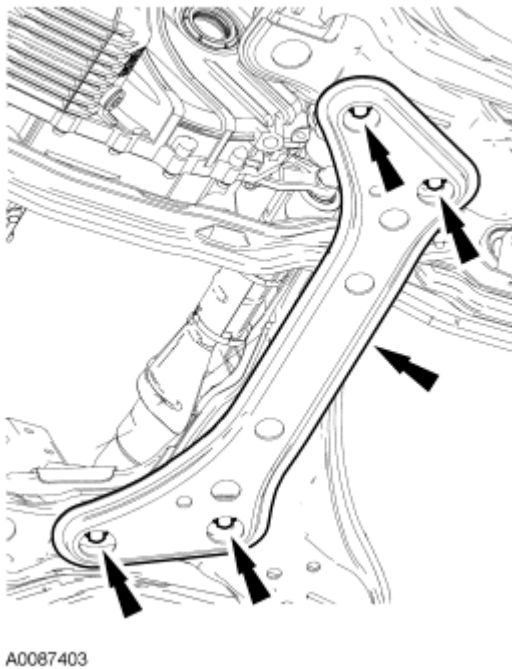


Fig. 457: Identifying Lateral Support Crossmember And Bolts
Courtesy of FORD MOTOR CO.

4x4 vehicles

55. Install the transfer case. For additional information, refer to **TRANSFER CASE-POWER TRANSFER**

UNIT (PTU) .**All vehicles**

56. Install the LH front drive halfshaft. For additional information, refer to **INSTALLATION** .
57. Install the generator shield and the nut and the pin-type retainer and attach the wire retainers.
 - Tighten to 20 N.m (15 lb-ft).

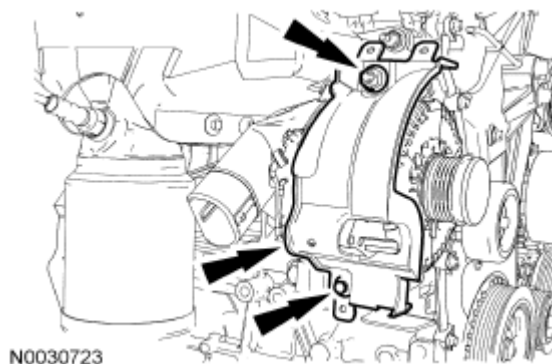


Fig. 458: Locating Generator Shield & Nut
Courtesy of FORD MOTOR CO.

58. Install the lower air duct and install the bolt.
 - Tighten to 4 N.m (35 lb-in).

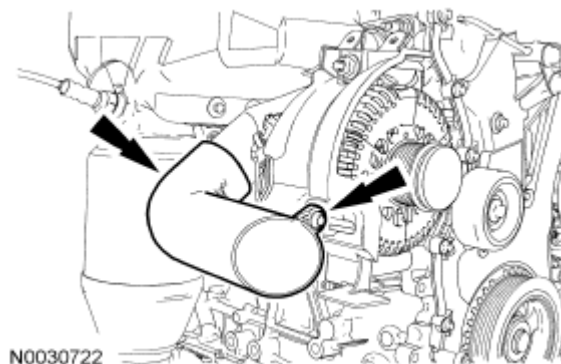


Fig. 459: Locating Lower Air Duct & Bolt
Courtesy of FORD MOTOR CO.

59. Install the accessory drive belt tensioner. For additional information, refer to **REMOVAL AND INSTALLATION** .
60. Connect the heated oxygen sensor (HO2S) and the catalyst monitor sensor electrical connectors.

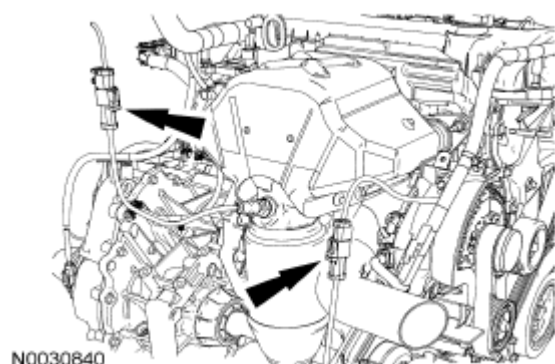


Fig. 460: Locating Heated Oxygen Sensor (HO2S) & Catalyst Monitor Sensor Electrical Connectors

Courtesy of FORD MOTOR CO.

61. Install the exhaust flexible pipe. For additional information, refer to **REMOVAL AND INSTALLATION** .
62. Install the starter. For additional information, refer to **STARTING SYSTEM** .
63. Install the battery tray and battery. For additional information, refer to **REMOVAL AND INSTALLATION - BATTERY TRAY** and **REMOVAL AND INSTALLATION - BATTERY** .
64. Install the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION - AIR CLEANER** and **REMOVAL AND INSTALLATION - AIR CLEANER OUTLET PIPE** .
65. Fill the engine with clean engine oil.
66. Fill and bleed the cooling system. For additional information, refer to **COOLING SYSTEM DRAINING, FILLING AND BLEEDING** .

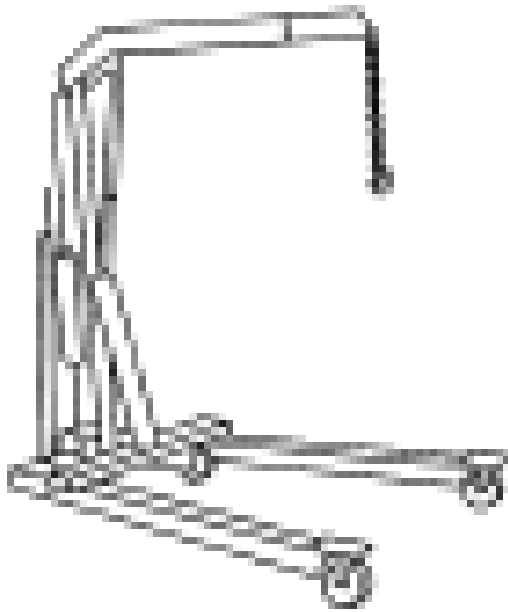
ENGINE - MANUAL TRANSAXLE

SPECIAL TOOL(S)

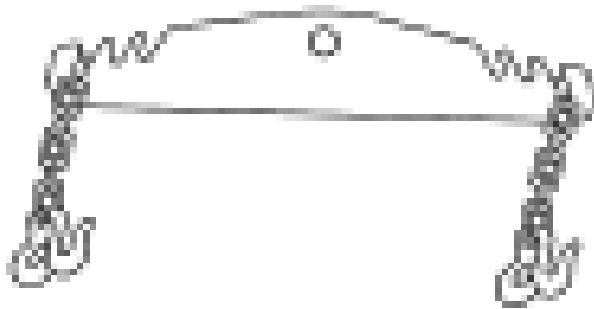
Heavy Duty Floor Crane
014-00071 or equivalent

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



ST1341-A

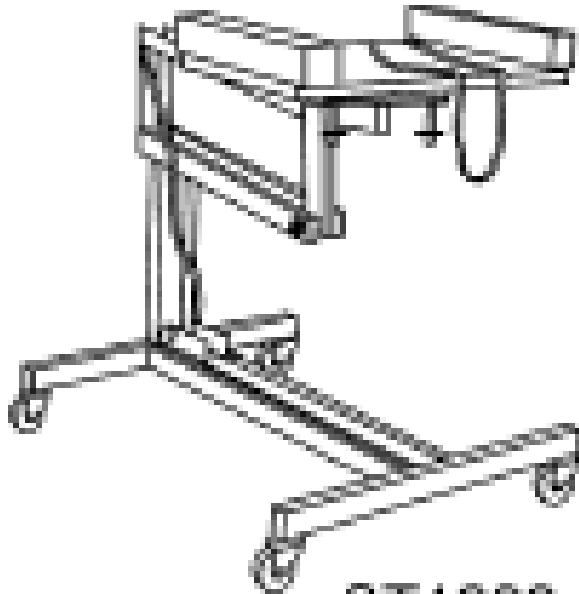


Spreader Bar
303-D089 (D93P-6001-A3) or equivalent

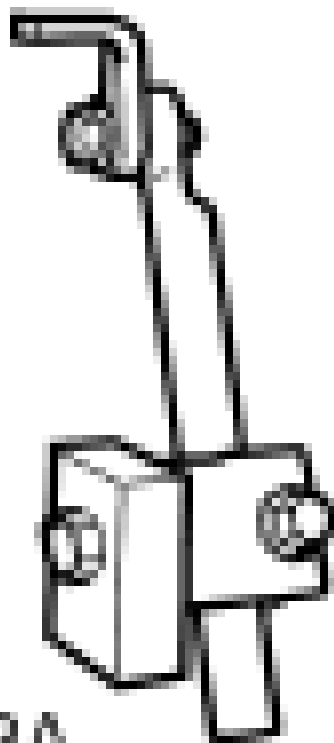
ST1602-A

2006 Mercury Mariner

2006 ENGINE Engine - 2.3L - Escape & Mariner



Powertrain Lift
014-00765



Universal Adapter Brackets
014-0001
Lifting Bracket Set, Engine
303-D095 (D94L-6001-A) or equivalent

ST2743A

MATERIALS

Item	Specification
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (in Canada Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12) or equivalent	WSS-M2C930-A

WARNING: Do not smoke or carry lighted tobacco or open flame of any type when working on or near any fuel-related components. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in personal injury.

All vehicles

1. Using the engine crane and spreader bar, position the engine and transaxle together. Install the 6 transaxle-to-engine bolts.
2. Using the engine crane and spreader bar, position the engine and transaxle onto the lift table.
3. Using the special tools, secure the engine to the lift table.

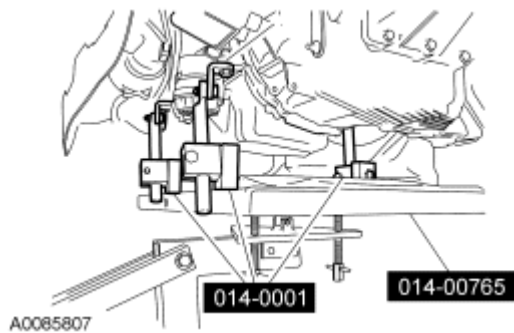


Fig. 461: Securing Engine To Lift Table Using Special Tool (014-0001, 014-00765)
Courtesy of FORD MOTOR CO.

4. Raise the engine and transaxle into the vehicle.
5. Install the bolt in the LH transaxle mount.
 - Tighten to 103 N.m (76 lb-ft).

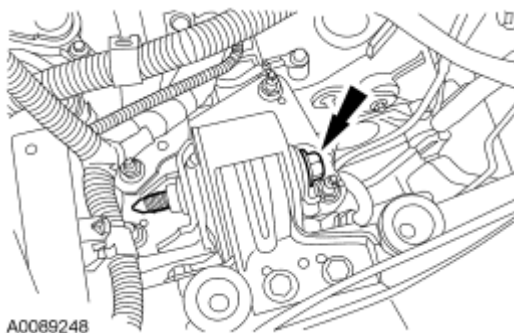


Fig. 462: Locating Transaxle Mount Bolt

Courtesy of FORD MOTOR CO.

6. Install the bolt in the rear transaxle mount.
 - Tighten 115 N.m (85 lb-ft).

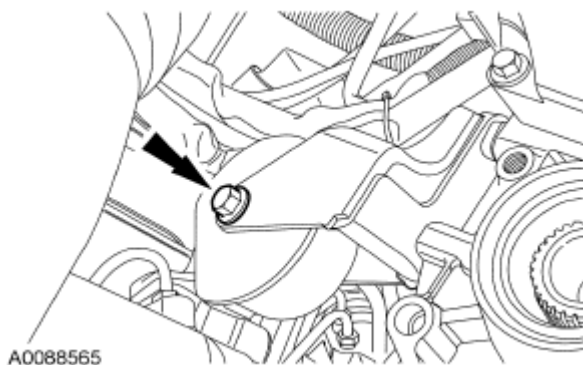


Fig. 463: Locating Rear Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

7. Install the engine mount bracket and nuts.
 - Tighten 115 N.m (85 lb-ft).

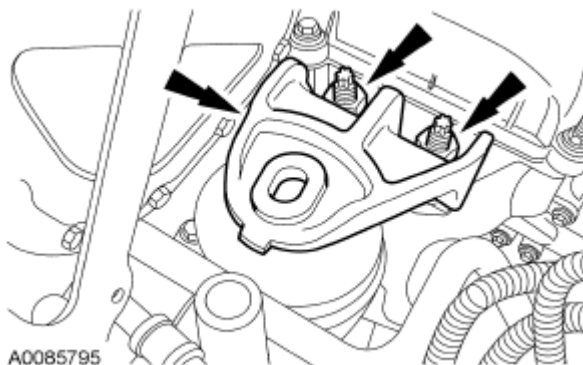


Fig. 464: Locating Engine Mount Bracket & Nuts
Courtesy of FORD MOTOR CO.

8. Install the engine mount bracket bolt.
 - Tighten to 115 N.m (85 lb-ft).

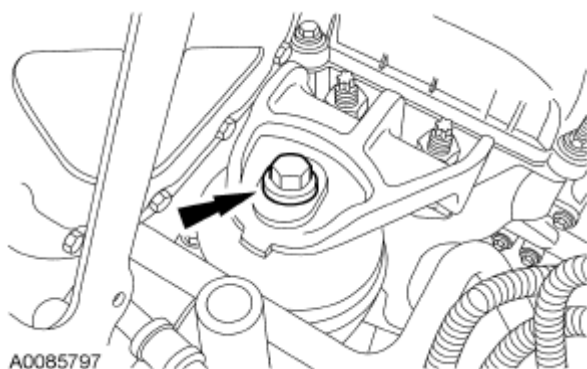


Fig. 465: Locating Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

9. Install the 2 transaxle-to-engine bolts.
 - Tighten to 48 N.m (35 lb-ft).

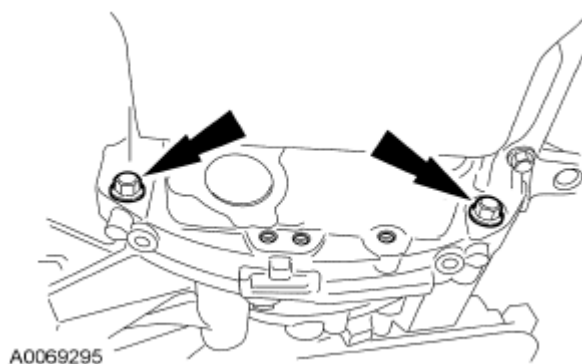


Fig. 466: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

10. Install the 2 transaxle-to-engine bolts.
 - Tighten to 48 N.m (35 lb-ft).

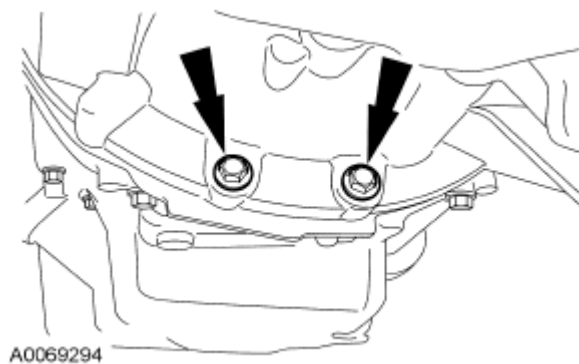


Fig. 467: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

11. Install the engine support crossmember and new nut.
 - Tighten to 175 N.m (129 lb-ft).

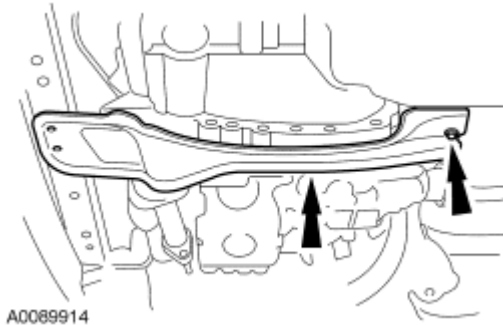


Fig. 468: Identifying Cross Brace And Rear Nut
Courtesy of FORD MOTOR CO.

12. Install the 2 bolts for the engine support crossmember and the front roll restrictor bolt.
 - Tighten the engine support crossmember bolts to 90 N.m (66 lb-ft)
 - Tighten the front roll restrictor bolt to 115 N.m (85 lb-ft).

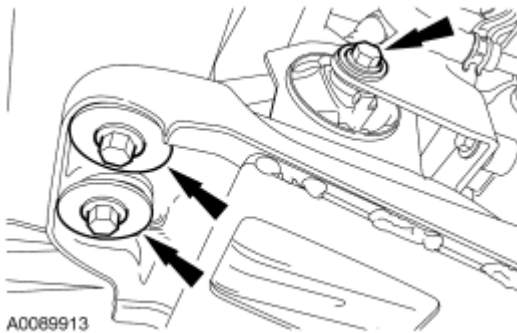


Fig. 469: Identifying Front Roll Restrictor Bolt & Bolts For Engine Support Crossmember
Courtesy of FORD MOTOR CO.

NOTE: The bolt under the power steering pressure tube will remain with the power steering pump.

13. Position the power steering pump and install the bolts.
 - Tighten to 25 N.m (18 lb-ft).

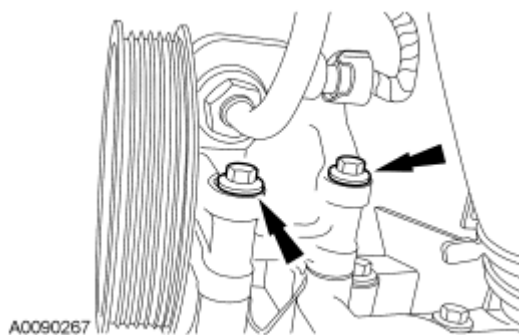


Fig. 470: Identifying Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

14. Connect the power steering pressure (PSP) sensor electrical connector.

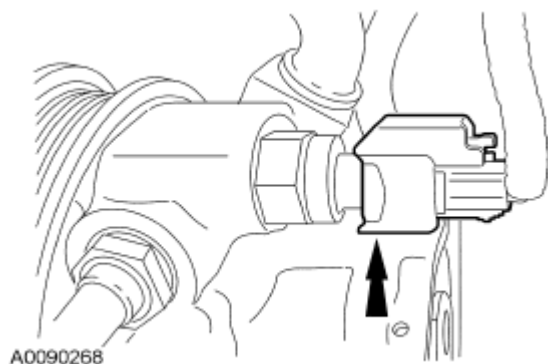


Fig. 471: Locating Power Steering Pressure (PSP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

15. Install the A/C compressor and connect the A/C compressor electrical connector.
- Tighten the bolts to 25 N.m (18 lb-ft).

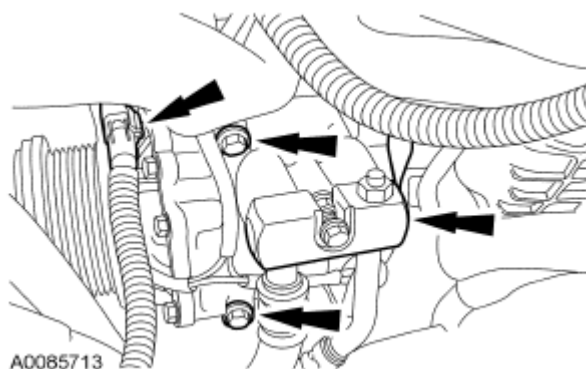


Fig. 472: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

16. Connect the lower radiator hose to the radiator.

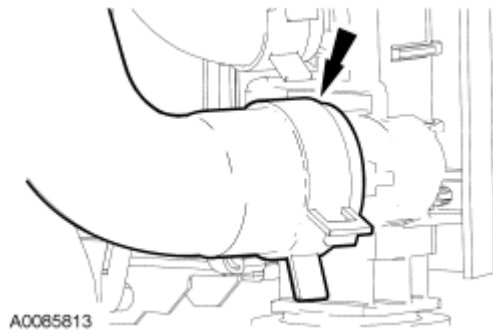


Fig. 473: Locating Lower Radiator Hose
Courtesy of FORD MOTOR CO.

17. Install the 2 power steering pump bolts.
 - Tighten to 25 N.m (18 lb-ft).

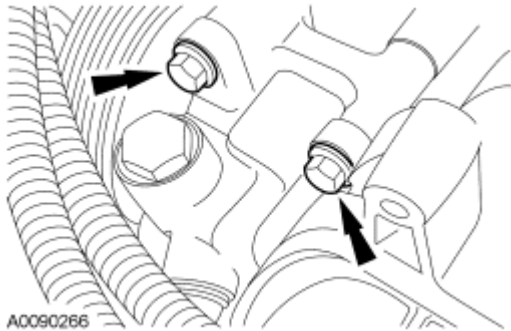


Fig. 474: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

18. Install the ground wire and bolt.
 - Tighten to 10 N.m (89 lb-in).

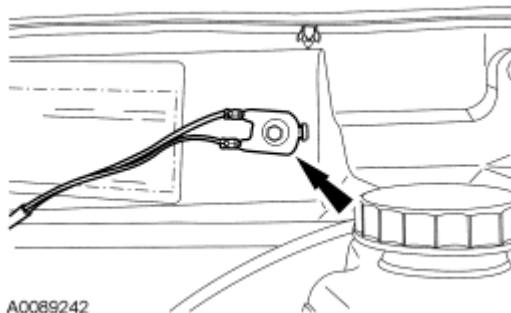


Fig. 475: Locating Ground Wire & Bolt
Courtesy of FORD MOTOR CO.

19. Connect the powertrain control module (PCM) electrical connectors. Position the harness and install the nut.

- Tighten to 8 N.m (71 lb-in).

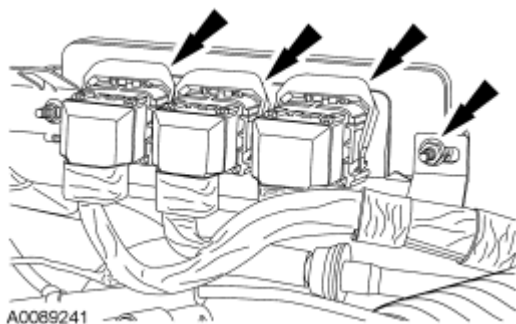


Fig. 476: Locating Powertrain Control Module (PCM) Electrical Connectors
Courtesy of FORD MOTOR CO.

20. Attach the electrical connector retainers.

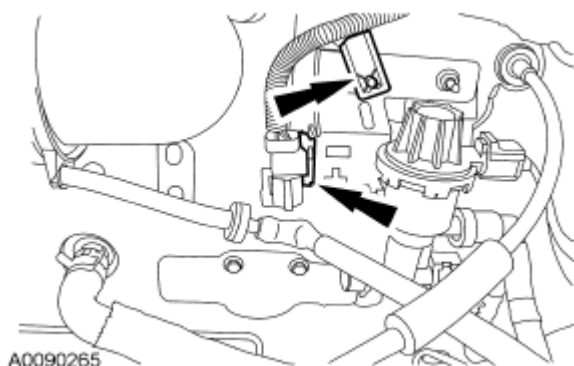


Fig. 477: Locating Electrical Connector Retainers
Courtesy of FORD MOTOR CO.

21. Connect the fuel supply tube.

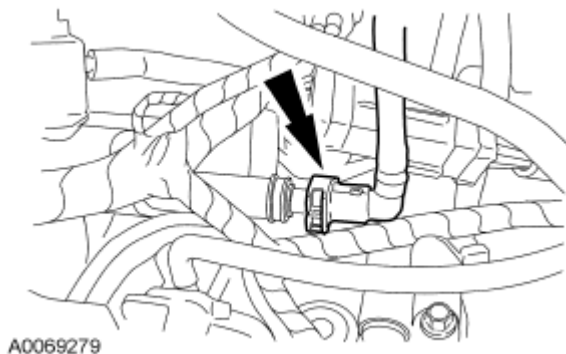


Fig. 478: Locating Fuel Supply Tube
Courtesy of FORD MOTOR CO.

22. Connect the vacuum reservoir tube.

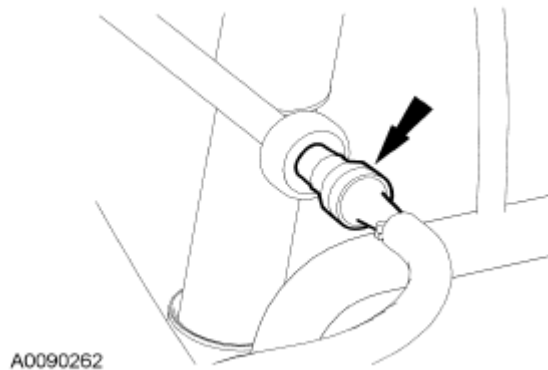


Fig. 479: Locating Vacuum Reservoir Tube
Courtesy of FORD MOTOR CO.

23. Connect the fuel vapor return tube and retainer.

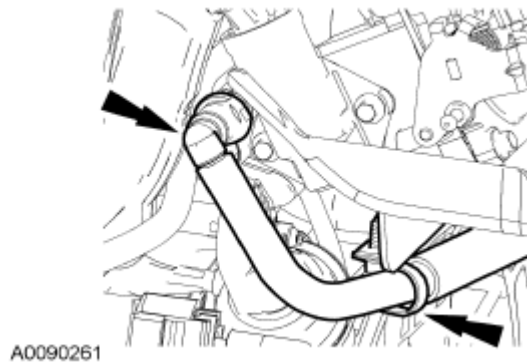


Fig. 480: Locating Fuel Vapor Return Tube & Retainer
Courtesy of FORD MOTOR CO.

24. Connect the vacuum supply tube.

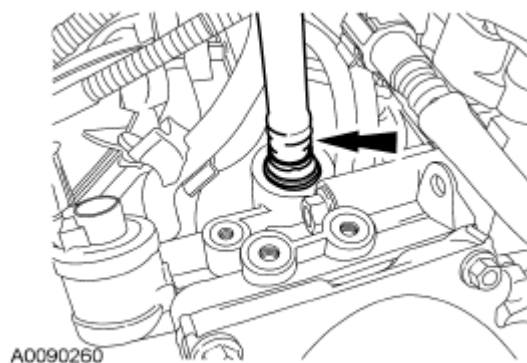


Fig. 481: Locating Vacuum Supply Tube
Courtesy of FORD MOTOR CO.

25. Install the power steering tube, bracket and nut.
- Tighten to 6 N.m (53 lb-in).

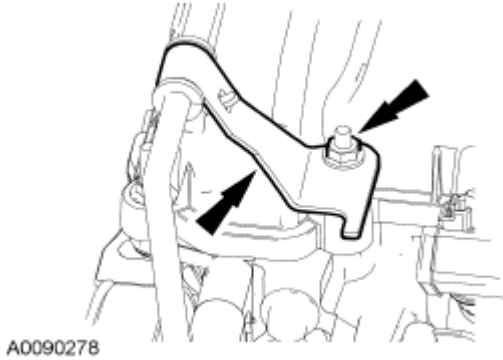


Fig. 482: Locating Power Steering Tube, Bracket & Nut
Courtesy of FORD MOTOR CO.

26. Position the accelerator control cable and bracket and install the nut.
- Tighten to 9 N.m (80 lb-in) (vehicles built through 10/2005).
 - Tighten to 5 N.m (44 lb-in) (vehicles built after 10/2005).

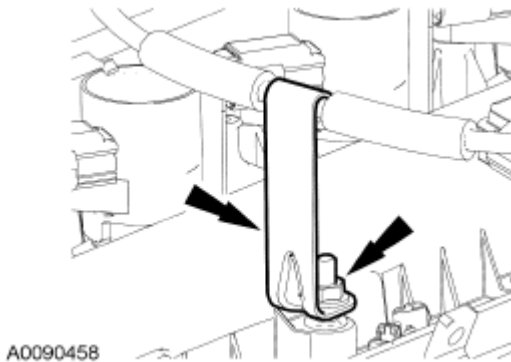


Fig. 483: Locating Accelerator Control Cable & Bracket
Courtesy of FORD MOTOR CO.

27. Install the accelerator control cable and bracket and nut.
- Tighten to 9 N.m (80 lb-in) (vehicles built through 10/2005).
 - Tighten to 5 N.m (44 lb-in) (vehicles built after 10/2005).

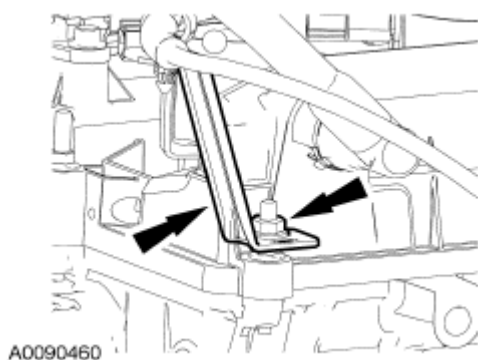


Fig. 484: Locating Accelerator Control Cable, Bracket & Nut
Courtesy of FORD MOTOR CO.

28. Install the accelerator cable and speed control cable (if equipped).
 1. Connect the accelerator and speed control cable (if equipped) to the throttle body.
 2. Install the accelerator cable bracket and bolts.
 - Tighten to 10 N.m (89 lb-in).

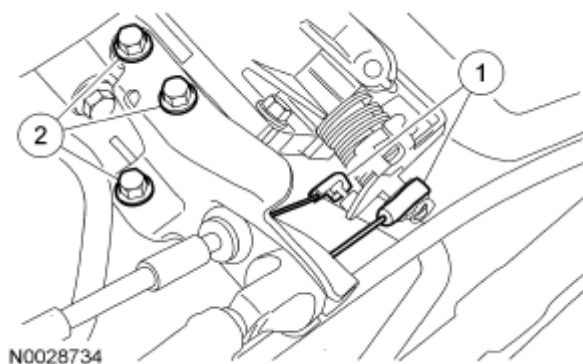


Fig. 485: Locating Accelerator Cable Bracket & Bolts
Courtesy of FORD MOTOR CO.

29. Install the accelerator cable snow shield and retainers.
 - Tighten to 10 N.m (89 lb-in).

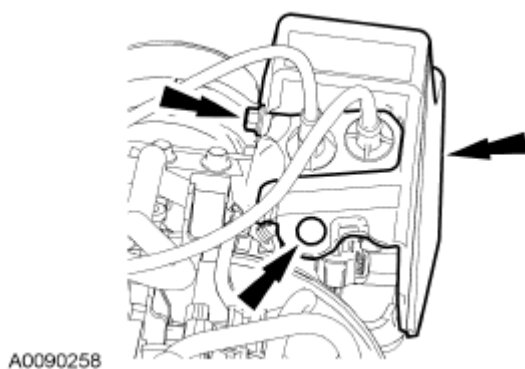
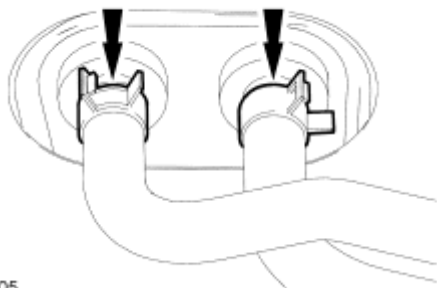


Fig. 486: Locating Accelerator Cable Snow Shield & Retainers
Courtesy of FORD MOTOR CO.

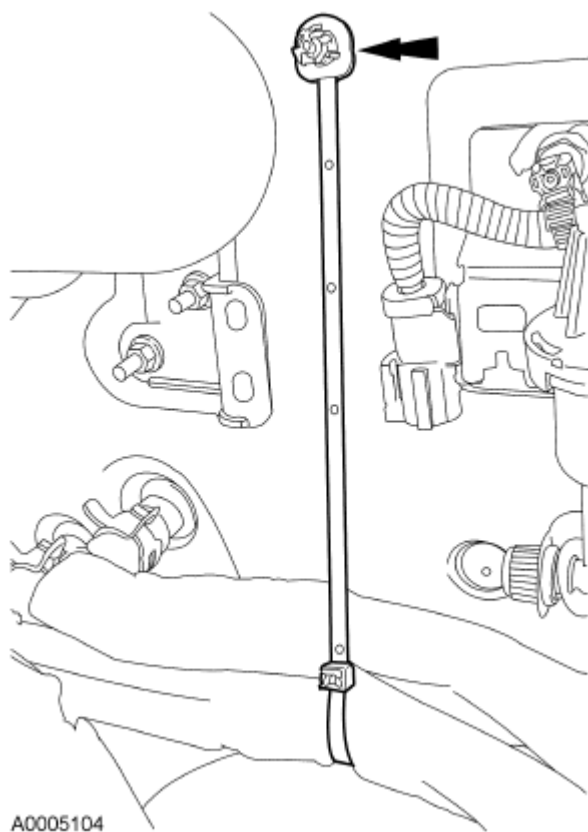
30. Connect the heater hoses to the heater core.



A0085705

Fig. 487: Locating Heater Hoses
Courtesy of FORD MOTOR CO.

31. Attach the heater hose support strap to the stud.

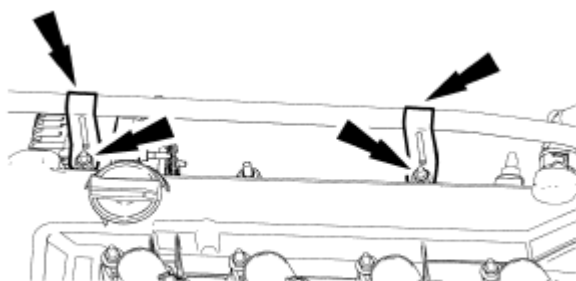


A0005104

Fig. 488: Locating Heater Hose Support Strap
Courtesy of FORD MOTOR CO.

32. Position the coolant vent hose and install the coolant vent hose brackets and nuts.

- Tighten to 10 N.m (89 lb-in).



A0090263

Fig. 489: Locating Coolant Vent Hose
Courtesy of FORD MOTOR CO.

33. Connect the upper radiator and coolant vent hoses.



A0090257

Fig. 490: Locating Upper Radiator & Coolant Vent Hoses
Courtesy of FORD MOTOR CO.

34. If equipped, route the block heater wiring harness and attach all retainers. Connect the block heater electrical connector.



A0087430

Fig. 491: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

35. Connect the reversing lamp indicator switch and attach the wiring harness retainers.

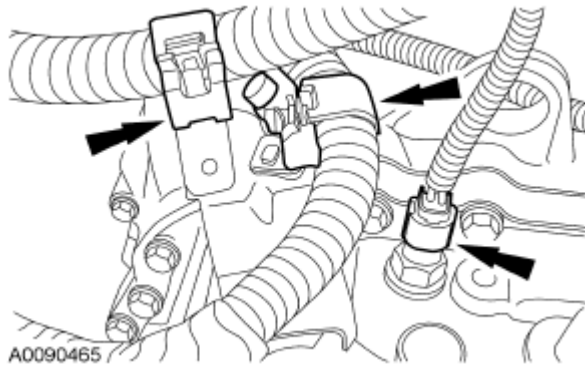


Fig. 492: Locating Reversing Lamp Indicator Switch & Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

36. Connect the vehicle speed sensor (VSS) electrical connector and pin-type retainer.

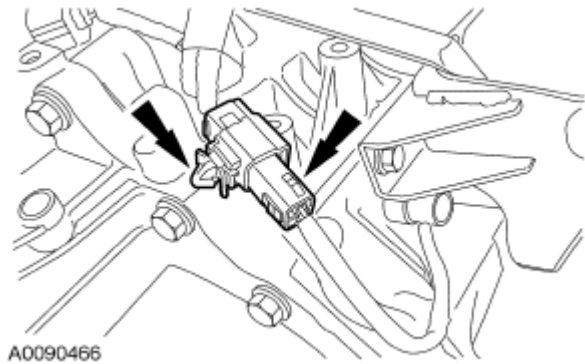


Fig. 493: Locating Vehicle Speed Sensor (VSS) Electrical Connector
Courtesy of FORD MOTOR CO.

37. Connect the transaxle control cable and install the retaining clips.

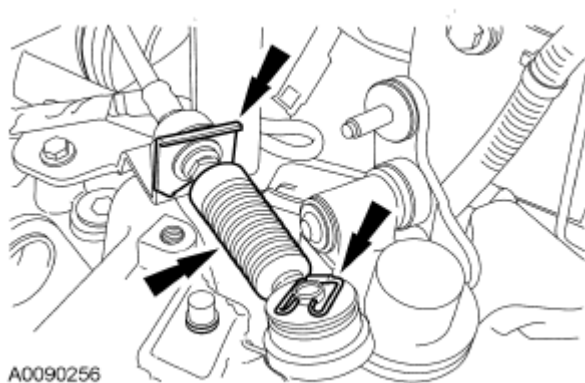


Fig. 494: Locating Transaxle Control Cable (1 Of 2)

Courtesy of FORD MOTOR CO.

38. Connect the transaxle control cable and install the retaining clips.

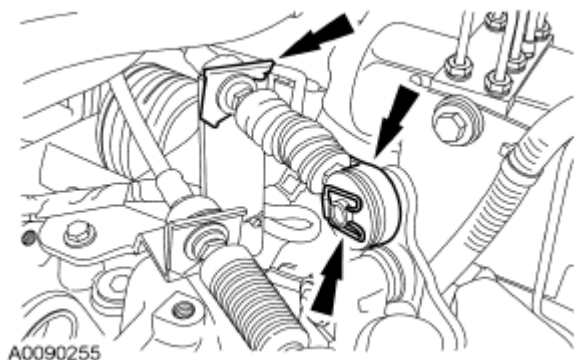


Fig. 495: Locating Transaxle Control Cable (2 Of 2)
Courtesy of FORD MOTOR CO.

39. Connect the clutch hydraulic tube fitting. Position the clutch hydraulic tube, attach the spring clip and tighten the mounting bolt to 3 Nm (27 lb-in).

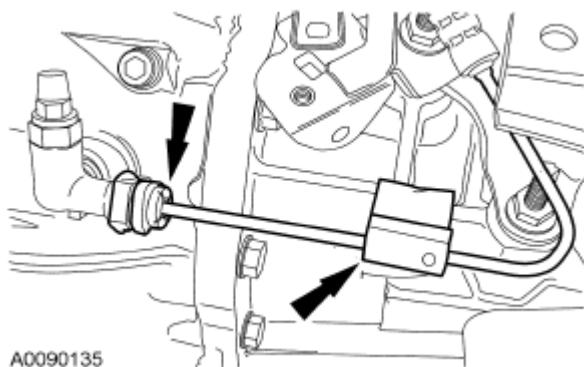


Fig. 496: Locating Clutch Hydraulic Tube Fitting
Courtesy of FORD MOTOR CO.

40. Attach the wiring harness retainers to the battery tray bracket.

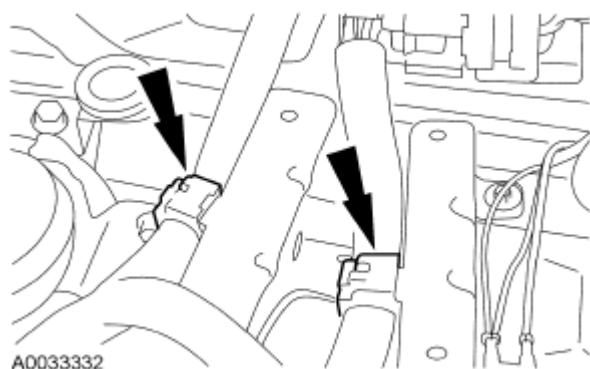


Fig. 497: Locating Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

41. Connect the 42-pin electrical connector and tighten the bolt. Install the ground strap and bolt.
- Tighten to 10 N.m (89 lb-in).

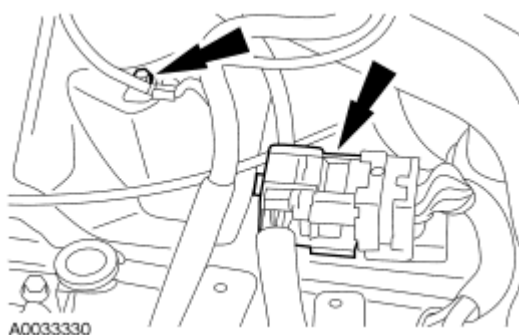


Fig. 498: Locating Ground Strap & Electrical Connector
Courtesy of FORD MOTOR CO.

42. Connect the electrical connector to the power distribution box.

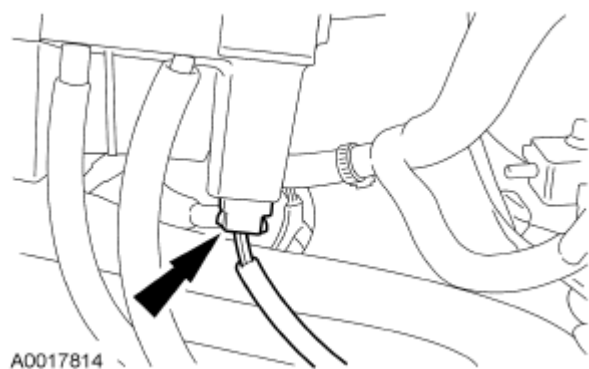


Fig. 499: Locating Electrical Connector
Courtesy of FORD MOTOR CO.

43. Connect the cables and install the nuts.

- Tighten to 12 N.m (9 lb-ft).

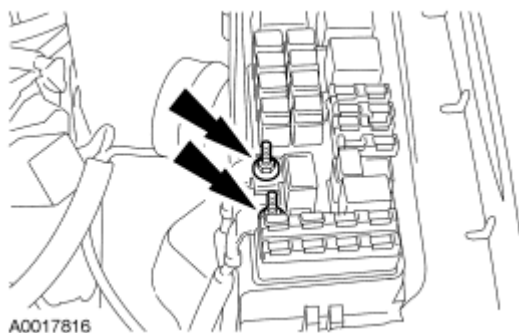


Fig. 500: Locating Cables & Nuts
Courtesy of FORD MOTOR CO.

44. Install the power distribution box cover.

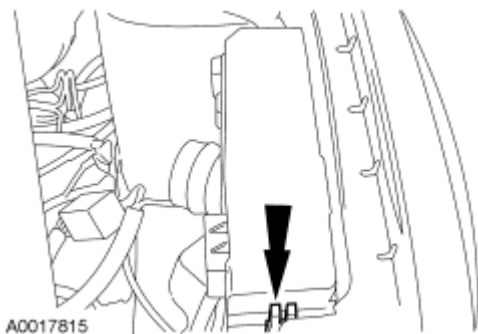


Fig. 501: Locating Power Distribution Box Cover
Courtesy of FORD MOTOR CO.

45. If equipped, install the ground eyelet and bolt.
- Tighten to 10 N.m (89 lb-in).

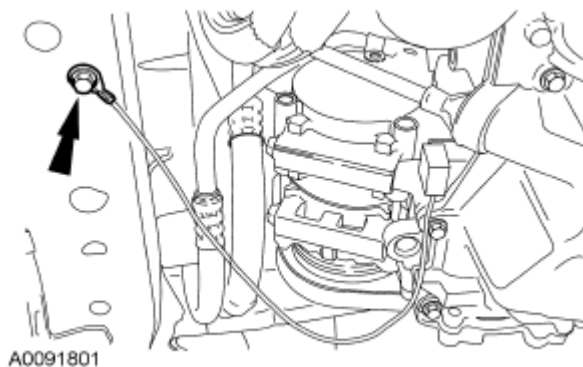


Fig. 502: Locating Ground Eyelet & Bolt
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

46. Install the driveshaft and bolts.
- Tighten to 20 N.m (15 lb-ft).

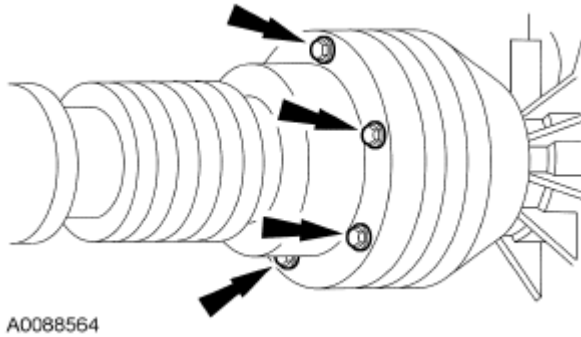


Fig. 503: Locating Driveshaft & Bolts
Courtesy of FORD MOTOR CO.

All vehicles

47. Install the front drive intermediate halfshaft. For additional information, refer to **INSTALLATION** .
48. Install the LH front drive halfshaft. For additional information, refer to **INSTALLATION** .
49. Install the lateral support crossmember and bolts.
- Tighten to 115 N.m (85 lb-ft).

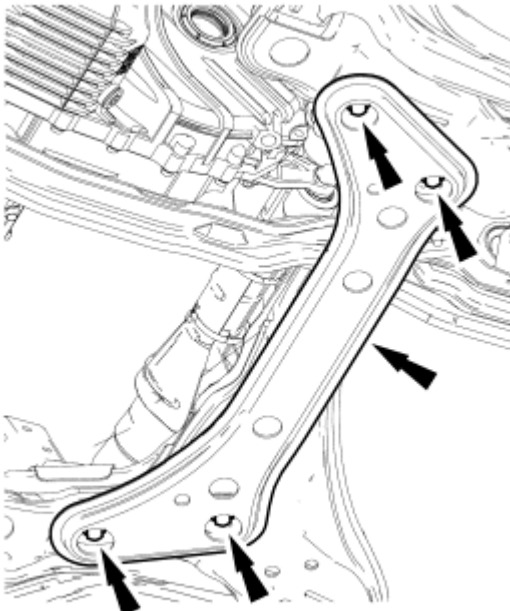


Fig. 504: Identifying Lateral Support Crossmember And Bolts
Courtesy of FORD MOTOR CO.

50. Install the generator shield and the nut and the pin-type retainer and attach the wire retainers.
- Tighten to 20 N.m (15 lb-ft).

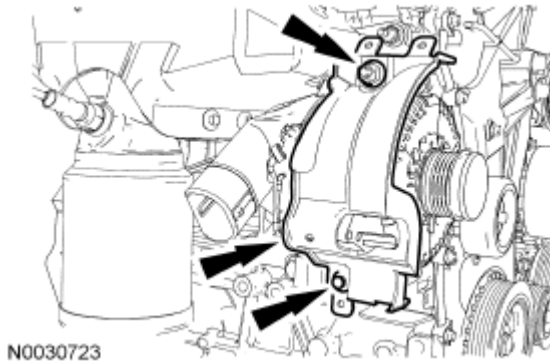


Fig. 505: Locating Generator Shield & Nut
Courtesy of FORD MOTOR CO.

51. Install the lower air duct and install the bolt.
- Tighten to 4 N.m (35 lb-in).

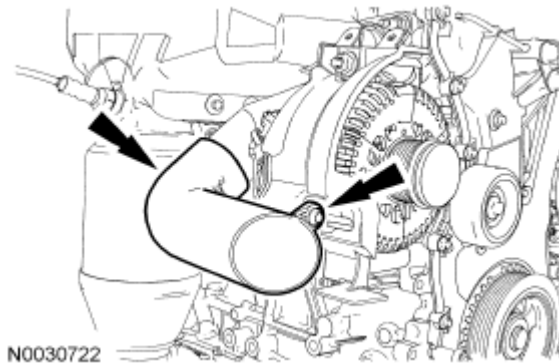


Fig. 506: Locating Lower Air Duct
Courtesy of FORD MOTOR CO.

52. Install the accessory drive belt tensioner. For additional information, refer to **REMOVAL AND INSTALLATION**.
53. Connect the heated oxygen sensor (HO2S) and the catalyst monitor sensor electrical connectors.

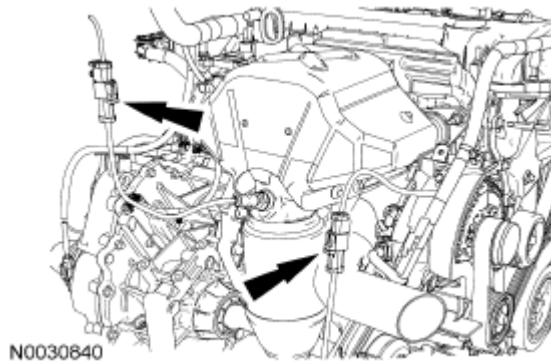


Fig. 507: Locating Heated Oxygen Sensor (HO2S) & Catalyst Monitor Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

54. Install the exhaust flex pipe. For additional information, refer to **REMOVAL AND INSTALLATION** .
55. Install the starter. For additional information, refer to **STARTING SYSTEM** .
56. Install the battery tray and battery. For additional information, refer to **REMOVAL AND INSTALLATION - BATTERY TRAY** and **REMOVAL AND INSTALLATION - BATTERY** .
57. Install the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **REMOVAL AND INSTALLATION - AIR CLEANER** and **REMOVAL AND INSTALLATION - AIR CLEANER OUTLET PIPE** .
58. Fill the engine with clean engine oil.
59. Fill and bleed the cooling system. For additional information, refer to **COOLING SYSTEM DRAINING, FILLING AND BLEEDING** .
60. Bleed the clutch system. For additional information, refer to **CLUTCH SYSTEM BLEEDING** .