

**2010 Mercury Grand Marquis LS**

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

**2010 ENGINE****Engine - 4.6L (2V) - Crown Victoria & Grand Marquis****SPECIFICATIONS****MATERIAL SPECIFICATIONS****MATERIAL SPECIFICATIONS**

| Item                                                                                                                                                                 | Specification | Fill Capacity                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------------------------|
| Gasket Maker<br>TA-16                                                                                                                                                | WSK-M2G348-A5 | -                                       |
| High Temperature Nickel Anti-Seize Lubricant<br>XL-2                                                                                                                 | ESE-M12A4-A   | -                                       |
| Motorcraft® Metal Surface Prep<br>ZC-31-A                                                                                                                            | -             | -                                       |
| Motorcraft® Premium Gold Engine Coolant with Bittering Agent<br>(bittered in US only)<br>VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)                 | WSS-M97B51-A1 | -                                       |
| Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil<br>XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium<br>Motor Oil CXO-5W20-LSP12 (Canada); or equivalent | WSS-M2C930-A  | 5.9L (6.2 qt) includes<br>filter change |
| Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada)<br>XL-1 (US); CXC-51-A (Canada)                                                                      | -             | -                                       |
| Silicone Gasket and Sealant<br>TA-30                                                                                                                                 | WSE-M4G323-A4 | -                                       |
| Silicone Gasket Remover<br>ZC-30                                                                                                                                     | -             | -                                       |

**GENERAL SPECIFICATIONS****GENERAL SPECIFICATIONS**

| Item                                                                | Specification       |
|---------------------------------------------------------------------|---------------------|
| <b>Engine</b>                                                       |                     |
| Displacement                                                        | 4.6L (281 CID) (2V) |
| No. cylinders                                                       | 8                   |
| Bore                                                                | 90.2 mm (3.5512 in) |
| Stroke                                                              | 90 mm (3.5433 in)   |
| Firing order                                                        | 1-3-7-2-6-5-4-8     |
| Oil pressure hot @ 2,500 rpm                                        | 40-70 psi           |
| Compression ratio                                                   | 9.37:1              |
| Engine weight (without accessory drive<br>components and flexplate) | 233.1 kg (514 lb)   |
| <b>Cylinder Head and Valve Train</b>                                |                     |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|                                                         |                                                                                                                                                          |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Combustion chamber volume                               | 43.95 ± 1.5 cc (2.68 ± 0.092 ci)                                                                                                                         |
| Valve arrangement (front to rear) LH                    | EIEIEIEI                                                                                                                                                 |
| Valve arrangement (front to rear) RH                    | IEIEIEIE                                                                                                                                                 |
| Valve guide bore diameter                               | 7.044-7.015 mm (0.2773-0.2762 in)                                                                                                                        |
| Valve stem diameter (intake)                            | 6.995-6.975 mm (0.2753-0.2746 in)                                                                                                                        |
| Valve stem diameter (exhaust)                           | 6.970-6.949 mm (0.2744-0.2735 in)                                                                                                                        |
| Valve stem-to-guide clearance (intake)                  | 0.069-0.020 mm (0.0027-0.0007 in)                                                                                                                        |
| Valve stem-to-guide clearance (exhaust)                 | 0.095-0.046 mm (0.0037-0.0018 in)                                                                                                                        |
| Valve head diameter (intake)                            | 44.6 mm (1.7559 in)                                                                                                                                      |
| Valve head diameter (exhaust)                           | 36.1 mm (1.4212 in)                                                                                                                                      |
| Valve face runout limit                                 | 0.05 mm (0.0019 in)                                                                                                                                      |
| Valve face angle                                        | 45.5°                                                                                                                                                    |
| Valve seat width (intake)                               | 2.1-1.9 mm (0.0827-0.0748 in)                                                                                                                            |
| Valve seat width (exhaust)                              | 2.1-1.9 mm (0.0827-0.0748 in)                                                                                                                            |
| Valve seat runout Total Indicated Runout (TIR)          | 0.025 mm (0.0009 in)                                                                                                                                     |
| Valve seat angle                                        | 45.00°                                                                                                                                                   |
| Valve spring free length (intake)                       | 50.2 mm (1.9763 in)                                                                                                                                      |
| Valve spring free length (exhaust)                      | 50.2 mm (1.9763 in)                                                                                                                                      |
| Valve spring out-of-square limit (intake)               | 2.5°                                                                                                                                                     |
| Valve spring out-of-square limit (exhaust)              | 2.5°                                                                                                                                                     |
| Valve spring compression pressure (intake)              | 633.3-701.3 N @ 28.02 mm (1.1031 in)                                                                                                                     |
| Valve spring compression pressure (exhaust)             | 633.3-701.3 N @ 28.02 mm (1.1031 in)                                                                                                                     |
| Valve spring installed height (intake)                  | 40.6-43.6 mm (1.5984-1.7165 in)                                                                                                                          |
| Valve spring installed height (exhaust)                 | 40.6-43.6 mm (1.5984-1.7165 in)                                                                                                                          |
| Valve spring installed pressure (intake)                | 272.1-306.1 N @ 40.0 mm (1.5748 in)                                                                                                                      |
| Valve spring installed pressure (exhaust)               | 272.1-306.1 N @ 40.0 mm (1.5748 in)                                                                                                                      |
| Valve spring installed pressure service limit (intake)  | 274.6 N @ 40.01 mm (1.5752 in)                                                                                                                           |
| Valve spring installed pressure service limit (exhaust) | 274.6 N @ 40-01 mm (1.5752 in)                                                                                                                           |
| Roller follower ratio                                   | 1.75:1                                                                                                                                                   |
| Head gasket surface flatness                            | 0.025 mm (0.001 in) in any 25 mm (1 in) x 25 mm (1 in) area;<br>0.050 mm (0.002 in) in any 150 mm (6 in) x 150 mm (6 in) area; 0.1 mm (0.004 in) overall |
| <b>Hydraulic Lash Adjuster</b>                          |                                                                                                                                                          |
| Diameter                                                | 15.988-16.00 mm (0.6294-0.6299 in)                                                                                                                       |
| Clearance to bore                                       | 0.018-0.069 mm (0.0007-0.0027 in)                                                                                                                        |
| Service limit                                           | 0.016 mm (0.0006 in)                                                                                                                                     |

**2010 Mercury Grand Marquis LS**

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

|                                                                                             |                                                                                                                                                          |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hydraulic leakdown rate                                                                     | 5-25 seconds                                                                                                                                             |
| Collapsed lash adjuster gap                                                                 | 0.45-0.85 mm (0.0177-0.0334 in)                                                                                                                          |
| <b>Camshaft</b>                                                                             |                                                                                                                                                          |
| Theoretical valve lift @ zero lash (intake)                                                 | 12.0 mm (0.4724 in)                                                                                                                                      |
| Theoretical valve lift @ zero lash (exhaust)                                                | 12.0 mm (0.4724 in)                                                                                                                                      |
| Lobe lift (exhaust) (LH)                                                                    | 7.4974 mm (0.2951 in)                                                                                                                                    |
| Lobe lift (exhaust) (RH)                                                                    | 7.4979 mm (0.2952 in)                                                                                                                                    |
| Lobe lift (intake)                                                                          | 7.1103 mm (0.2799 in)                                                                                                                                    |
| Allowable lobe lift loss                                                                    | 0                                                                                                                                                        |
| Journal diameter                                                                            | 26.96-26.93 mm (1.0615-1.0605 in)                                                                                                                        |
| Journal bore inside diameter (cap assembled)                                                | 27.01-26.99 mm (1.0635-1.0625 in)                                                                                                                        |
| Camshaft journal-to-bearing clearance                                                       | 0.076-0.025 mm (0.0030-0.0010 in)                                                                                                                        |
| Runout: Full indicator measurement on all journals when supported on front and rear journal | 0.09 mm (0.0035 in)<br>(4 places)                                                                                                                        |
| Camshaft end play                                                                           | 0.03-0.19 mm (0.0011-0.0075 in)                                                                                                                          |
| <b>Cylinder Block</b>                                                                       |                                                                                                                                                          |
| Cylinder bore diameter                                                                      | 90.200-90.213 (Grade 1)                                                                                                                                  |
| Cylinder bore diameter                                                                      | 90.213-90.226 (Grade 2)                                                                                                                                  |
| Cylinder bore diameter                                                                      | 90.226-90.239 (Grade 3)                                                                                                                                  |
| Cylinder bore maximum taper                                                                 | 0.013 mm (0.00051 in)                                                                                                                                    |
| Cylinder bore maximum out-of-round                                                          | 0.015 mm (0.00059 in)                                                                                                                                    |
| Main bearing bore inside diameter                                                           | 72.40-72.424 mm (2.8504-2.8513 in)                                                                                                                       |
| Head gasket surface flatness                                                                | 0.03 mm (0.001 in) in any 40 mm (1.5 in) x 40 mm (1.5 in) area; 0.05 mm (0.002 in) in any 150 mm (6 in) x 150 mm (6 in) area; 0.15 mm (0.006 in) overall |
| <b>Crankshaft</b>                                                                           |                                                                                                                                                          |
| Main bearing journal diameter                                                               | 67.483-67.503 mm (2.6568-2.6576 in)                                                                                                                      |
| Main bearing journal maximum taper                                                          | 0.004 mm (0.0002 in)                                                                                                                                     |
| Main bearing journal maximum-out-of-round                                                   | 0.0075 mm (0.0003 in) between cross sections                                                                                                             |
| Main bearing journal-to-cylinder block clearance                                            | 0.066-0.024 mm (0.0259-0.0009 in)                                                                                                                        |
| Connecting rod journal diameter                                                             | 53.003-52.983 mm (2.0867-2.0859 in)                                                                                                                      |
| Connecting rod journal maximum taper (straightness)                                         | 0.004 mm (0.0002 in)                                                                                                                                     |
| Connecting rod journal maximum-out-of-round                                                 | 0.0075 mm (0.0003 in) between cross sections                                                                                                             |
| Crankshaft maximum end play                                                                 | 0.301 mm (0.0118 in)                                                                                                                                     |
| <b>Piston and Connecting Rod</b>                                                            |                                                                                                                                                          |

**2010 Mercury Grand Marquis LS**

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

|                                                   |                                       |
|---------------------------------------------------|---------------------------------------|
| Piston diameter                                   |                                       |
| Grade 1                                           | 90.191-90.206 mm (3.5508-3.5514 in)   |
| Grade 2                                           | 90.203-90.220 mm (3.5513-3.5519 in)   |
| Grade 3                                           | 90.217-90.232 mm (3.5518-3.5524 in)   |
| Piston-to-cylinder bore clearance (at grade size) | 0.017-0.047 mm (0.0007-0.0019 in)     |
| Piston ring end gap (top)                         | 0.15-0.30 mm (0.0059-0.0118 in)       |
| Piston ring end gap (intermediate)                | 0.15-0.30 mm (0.0059-0.0118 in)       |
| Piston ring end gap (oil control)                 | 0.15-0.30 mm (0.0059-0.0118 in)       |
| Ring groove width (top)                           | 1.520-1.540 mm (0.0598-0.0606 in)     |
| Ring groove width (intermediate)                  | 1.520-1.540 mm (0.0598-0.0606 in)     |
| Ring groove width (oil control)                   | 3.03-3.055 mm (0.1193-0.1203 in)      |
| Piston ring width (top)                           | 1.5 mm (0.05 in)                      |
| Piston ring width (intermediate)                  | 1.5 mm (0.05 in)                      |
| Piston ring-to-groove clearance (top)             | 0.020-0.060 mm (0.0008-0.0024 in)     |
| Piston ring-to-groove clearance (intermediate)    | 0.020-0.060 mm (0.0008-0.0023 in)     |
| Piston ring-to-groove clearance (oil control)     | 0.030-0.070 mm (0.0012-0.0028 in)     |
| Piston pin bore diameter                          | 22.0065-22.0110 mm (0.8664-0.8666 in) |
| Piston pin diameter                               | 21.995-21.997 mm (0.8659-0.8660 in)   |
| Piston pin length                                 | 61.870-62.120 mm (2.4358-2.4456 in)   |
| Piston pin-to-piston fit                          | 0.0095-0.016 mm (0.0004-0.0006 in)    |
| Piston-to-connecting rod clearance                | 6.58-7.58 mm (0.259-0.298 in)         |
| Connecting rod-to-pin clearance                   | 0.016-0.038 mm (0.0006-0.0015 in)     |
| Connecting rod pin bore diameter                  | 22.02-22.01 mm (0.8671-0.8666 in)     |
| Connecting rod length (centerline bore-to-bore)   | 150.7 mm (5.9330 in)                  |
| Connecting rod maximum allowable bend             | ±0.038 mm (0.0015 in)                 |
| Connecting rod maximum allowable twist            | ±0.05 mm (0.0019 in)                  |
| Connecting rod bearing bore diameter              | 56.86-56.89 mm (2.2388-2.2396 in)     |
| Connecting rod bearing-to-crankshaft clearance    | 0.06-0.02 mm (0.0026-0.0010 in)       |
| Connecting rod side clearance (standard)          | 0.015-0.45 mm (0.0006-0.0177 in)      |
| Connecting rod side clearance (maximum)           | 0.50 mm (0.0197 in)                   |

**TORQUE SPECIFICATIONS****TORQUE SPECIFICATIONS**

| Description | Nm | lb-ft | lb-in |
|-------------|----|-------|-------|
|-------------|----|-------|-------|

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|                                                          |    |    |     |
|----------------------------------------------------------|----|----|-----|
| A/C compressor stud bolts                                | 25 | 18 | -   |
| Accessory drive idler pulley bolt                        | 25 | 18 | -   |
| Camshaft bearing cap bolts <sup>(1)</sup>                | -  | -  | -   |
| Camshaft sprocket bolt <sup>(1)</sup>                    | -  | -  | -   |
| Catalytic converter-to-exhaust manifold nut              | 48 | 35 | -   |
| Connecting rod bearing cap bolts <sup>(1)</sup>          | -  | -  | -   |
| Coolant bypass tube stud bolt                            | 25 | 18 | -   |
| Coolant outlet adapter bolts                             | 25 | 18 | -   |
| Coolant pump bolts                                       | 25 | 18 | -   |
| Coolant pump pulley bolts                                | 25 | 18 | -   |
| Crankshaft main bearing cap bolts <sup>(1)</sup>         | -  | -  | -   |
| Crankshaft pulley bolt <sup>(1)</sup>                    | -  | -  | -   |
| Crankshaft rear seal retainer plate bolts <sup>(1)</sup> | -  | -  | -   |
| Cylinder head bolt <sup>(1)</sup>                        | -  | -  | -   |
| Engine block coolant drain plug                          | 20 | -  | 177 |
| Engine front cover <sup>(1)</sup>                        | -  | -  | -   |
| Engine mount bolts                                       | 70 | 52 | -   |
| Engine mount nuts                                        | 90 | 66 | -   |
| Engine Oil Pressure (EOP) switch <sup>(1)</sup>          | -  | -  | -   |
| EGR tube                                                 | 43 | 32 | -   |
| Exhaust manifold heat shield bolts                       | 10 | -  | 89  |
| Exhaust manifold nuts <sup>(1)</sup>                     | -  | -  | -   |
| Exhaust manifold studs                                   | 12 | -  | 106 |
| Flexplate bolts <sup>(1)</sup>                           | -  | -  | -   |
| Generator battery cable nut                              | 9  | -  | 80  |
| Generator bolts                                          | 25 | 18 | -   |
| Generator bracket bolts                                  | 10 | -  | 89  |
| Ground strap nut                                         | 10 | -  | 89  |
| Ground strap-to-RH cylinder head stud bolt               | 25 | 18 | -   |
| Ground strap bolt                                        | 10 | -  | 89  |
| Heated Oxygen Sensor (HO2S) <sup>(1)</sup>               | -  | -  | -   |
| Ignition coil bolts                                      | 6  | -  | 53  |
| Intake manifold bolts <sup>(1)</sup>                     | -  | -  | -   |
| Intake manifold crash bracket bolts                      | 25 | 18 | -   |
| Intake manifold shield bolts                             | 10 | -  | 89  |
| Intermediate steering shaft pinch bolt                   | 30 | 22 | -   |
| Jackscrews <sup>(1)</sup>                                | -  | -  | -   |
| Knock Sensor (KS) nut                                    | 20 | -  | 177 |
| Oil cooler mounting bolt                                 | 46 | 34 | -   |

**2010 Mercury Grand Marquis LS**

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

|                                                   |    |    |     |
|---------------------------------------------------|----|----|-----|
| Oil filter adapter bolts <sup>(1)</sup>           | -  | -  | -   |
| Oil level indicator tube bolt                     | 10 | -  | 89  |
| Oil pan bolts <sup>(1)</sup>                      | -  | -  | -   |
| Oil pan drain plug                                | 23 | 17 | -   |
| Oil pump bolts                                    | 10 | -  | 89  |
| Oil pump screen and pickup tube-to-oil pump bolts | 10 | -  | 89  |
| Oil pump screen and pickup tube spacer            | 25 | 18 | -   |
| Oil pump screen and pickup tube-to-spacer bolt    | 25 | 18 | -   |
| Power steering pump bolts                         | 25 | 18 | -   |
| Power steering tube bracket nut                   | 10 | -  | 89  |
| Shield bolts                                      | 25 | 18 | -   |
| Spark plugs                                       | 18 | -  | 159 |
| Support bracket nuts                              | 10 | -  | 89  |
| Timing chain guide bolts                          | 10 | -  | 89  |
| Timing chain tensioner bolts                      | 25 | 18 | -   |
| Torque converter inspection cover bolts           | 19 | -  | 168 |
| Torque converter nuts                             | 36 | 27 | -   |
| Transmission bellhousing bolts                    | 48 | 35 | -   |
| Transmission cooler tube bracket bolt             | 15 | -  | 133 |
| Transmission cooler tube bracket nut              | 9  | -  | 80  |
| Transmission mount insulator bolts                | 90 | 66 | -   |
| Transmission mount insulator nuts                 | 30 | 22 | -   |
| Valve cover studs and bolts <sup>(1)</sup>        | -  | -  | -   |

(1) Refer to the appropriate procedure(s).

## DESCRIPTION AND OPERATION

### ENGINE

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

The 4.6L (281 CID) is a V-8 engine with the following features:

- Single overhead camshafts
- Two valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- Aluminum cylinder heads
- Cast iron, 90-degree V-cylinder block
- Individually chain-driven camshafts with a hydraulic timing chain tensioner on each timing chain
- Electronic ignition system with 8 ignition coils

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

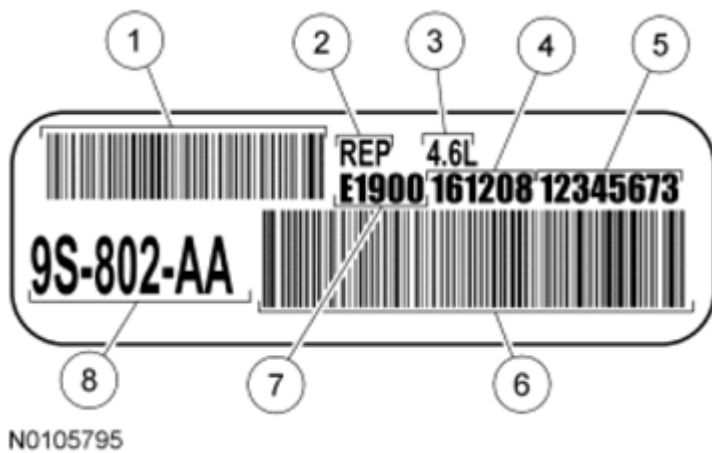
- Electronic returnless fuel system

### Engine Identification

Always refer to these labels when installation of new parts is necessary or when checking engine calibrations. The engine parts often differ within a CID family. Verification of the identification codes will make sure that the correct parts are obtained. These codes contain all the pertinent information relating to the dates, optional equipment and revisions.

### Engine Code Information Label

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

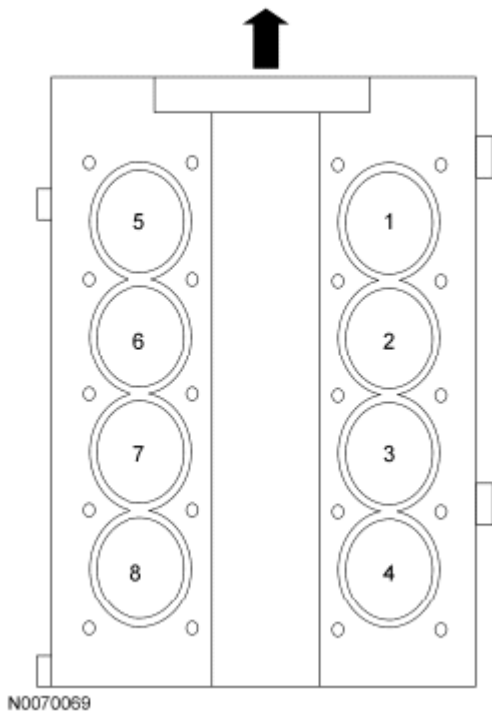


**Fig. 1: Identifying Engine Code Information Label**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

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

### Engine Cylinder Identification



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

### Exhaust Emission Control System

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

### Induction System

The **SFI** provides the fuel/air mixture needed for combustion in the cylinders. The 8 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.

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 rail.

### Valve Train

The valve train operates as follows:

- Ball-tip hydraulic lash adjusters provide automatic lash adjustment.
- Roller followers ride on the camshaft lobe, transferring the up-and-down motion of the camshafts to the valves in the cylinder heads.

### **PCV System**

All engines are equipped with a closed-type PCV system recycling the crankcase vapors to the upper 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 both cylinder heads.
- 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.
- The left cylinder head is fed from a drilling into the supply passage feeding the main gallery at the front of the cylinder block. The right cylinder head is fed from a drilling into the rear of the main gallery. Main gallery pressure is reduced as it enters the cylinder head galleries through fixed serviceable orifices, located at the upper part of the feed passages. It is this reduced pressure in the cylinder head galleries which feeds the camshaft journals, the hydraulic lash adjusters and the primary and secondary timing chain tensioners.
- The camshaft lobe and roller followers are lubricated by splash created through valve train operation.

### **Oil Pump**

The lubrication system of the 4.6L (2V) engine is designed to provide optimum oil flow to critical components of the engine through its entire operating range. The heart of the system is a positive displacement internal gear oil pump using top seal rotors. Generically this design is known as a gerotor pump, which operates as follows:

- The oil pump is mounted on the front face of the cylinder block.
- The inner rotor is piloted on the crankshaft post and is driven through flats on the crankshaft.
- System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil back to the inlet side of the oil pump.
- Oil pump displacement has been selected to provide adequate volume to make sure of correct oil pressure, both at hot idle and maximum speed.
- The relief valve calibration protects the system from excessive pressure during high viscosity conditions.
- The relief valve is designed to provide adequate connecting rod bearing lubrication under high-temperature and high-speed conditions.

## DIAGNOSIS AND TESTING

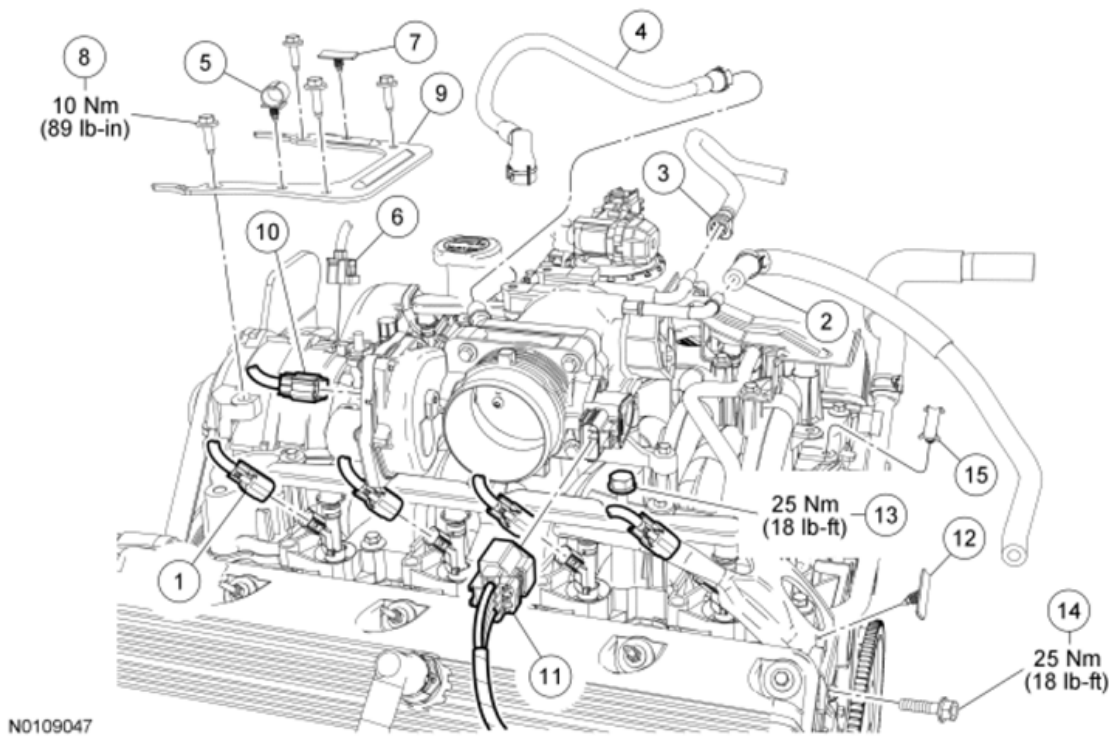
### ENGINE

Refer to **ENGINE SYSTEM - GENERAL INFORMATION** for basic mechanical concerns or refer to the **INTRODUCTION - GASOLINE MODELS**.

## IN-VEHICLE REPAIR

### INTAKE MANIFOLD

Intake Manifold (View 1 of 3)



**Fig. 3: Identifying Intake Manifold Components With Torque Specifications**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

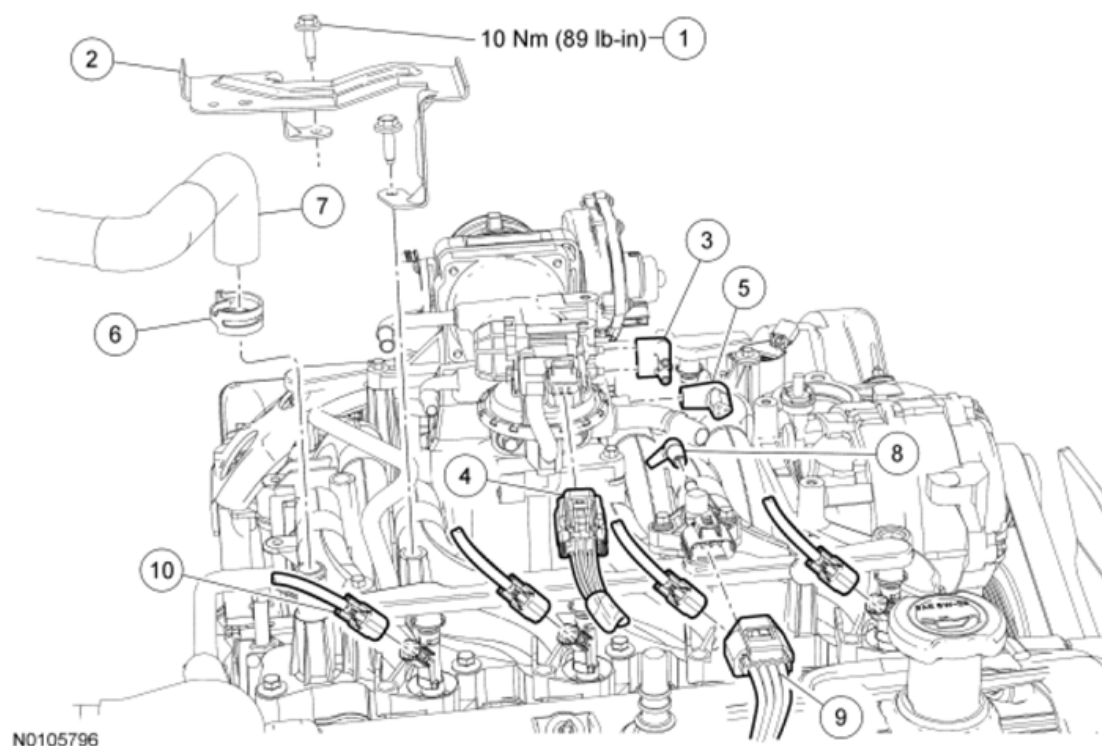
| Item | Part Number | Description                                                      |
|------|-------------|------------------------------------------------------------------|
| 1    | 14A464      | Fuel injector electrical connector (part of 12B637) (4 required) |
| 2    | 9C490       | Brake booster vacuum hose                                        |
| 3    | 9D289       | Evaporative Emission (EVAP) canister purge valve tube            |
| 4    | 6K817       | PCV tube                                                         |
| 5    | -           | Generator wiring harness retainer                                |
| 6    | 14A464      | Generator electrical connector (part of 12B637)                  |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |         |                                                                     |
|----|---------|---------------------------------------------------------------------|
| 7  | -       | Generator B+ wiring harness retainer                                |
| 8  | N807309 | Generator bracket bolt (4 required)                                 |
| 9  | 10153   | Generator bracket                                                   |
| 10 | 14A464  | Throttle control electrical connector (part of 12B637)              |
| 11 | 14A464  | Throttle Position (TP) sensor electrical connector (part of 12B637) |
| 12 | 13A506  | Wire harness retainer                                               |
| 13 | W705793 | Intake manifold crash bracket bolt                                  |
| 14 | W701725 | Intake manifold crash bracket bolt                                  |
| 15 | 13A506  | Wire harness retainer                                               |

### Intake Manifold (View 2 of 3)



**Fig. 4: Identifying Intake Manifold Components With Torque Specifications**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

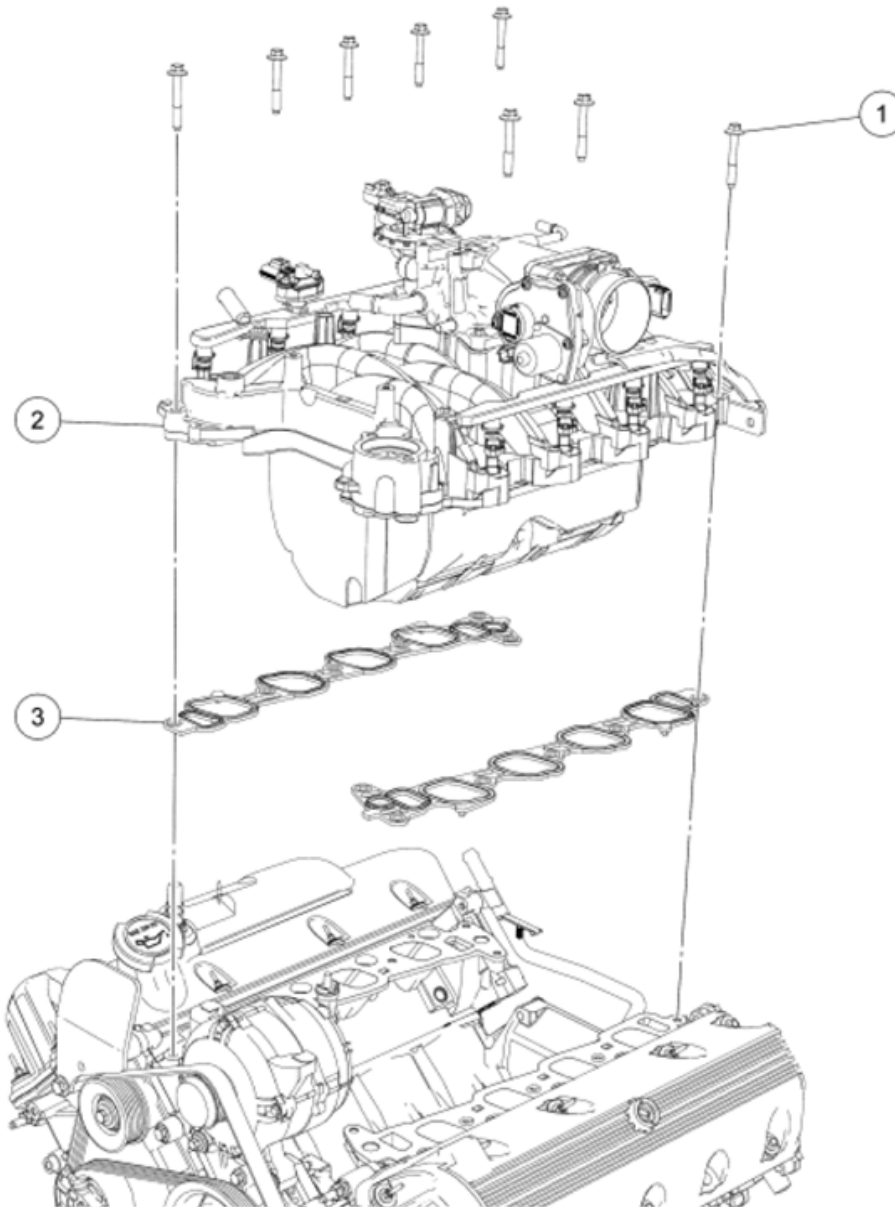
| Item | Part Number | Description                                             |
|------|-------------|---------------------------------------------------------|
| 1    | N807309     | Intake manifold shield bolt (2 required)                |
| 2    | 9F460       | Intake manifold shield                                  |
| 3    | 9E489       | EGR system module vacuum connector                      |
| 4    | 14A464      | EGR system module electrical connector (part of 12B637) |
| 5    | 9E499       | Intake manifold vacuum hose connector                   |
| 6    | 15161       | Heater hose spring clamp                                |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |        |                                                                                 |
|----|--------|---------------------------------------------------------------------------------|
| 7  | 18D334 | Heater hose                                                                     |
| 8  | 9E489  | Fuel rail pressure and temperature sensor vacuum connector                      |
| 9  | 14A464 | Fuel rail pressure and temperature sensor electrical connector (part of 12B637) |
| 10 | 14A464 | Fuel injector electrical connector (part of 12B637) (4 required)                |

### Intake Manifold (View 3 of 3)



**Fig. 5: Identifying Intake Manifold Components**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description |
|------|-------------|-------------|
|------|-------------|-------------|

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

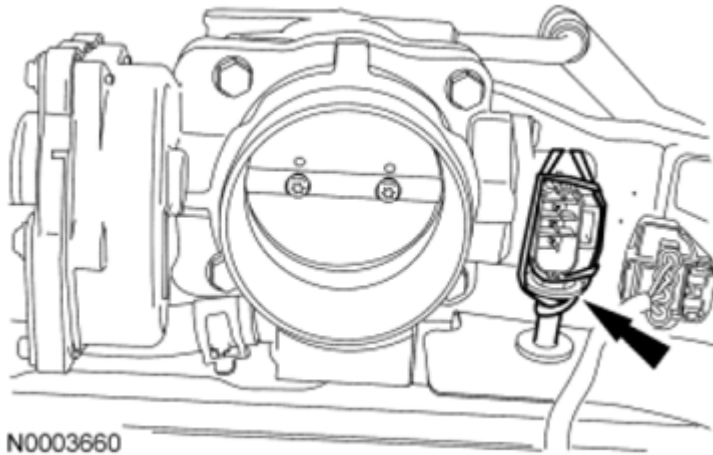
|   |         |                                     |
|---|---------|-------------------------------------|
| 1 | W503301 | Intake manifold bolt (8 required)   |
| 2 | 9424    | Intake manifold                     |
| 3 | 9439    | Intake manifold gasket (2 required) |

### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Disconnect the fuel tube spring lock coupling. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION** .
3. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
4. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING** .
5. Remove the Air Cleaner (ACL) and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
6. Remove the wiper mounting arm and pivot shaft. For additional information, refer to **WIPERS AND WASHERS** .
7. Disconnect the 8 fuel injector electrical connectors.
8. Remove the 8 ignition coil-on-plugs. For additional information, refer to **ENGINE IGNITION - 4.6L (2V)** .
9. Remove the 2 bolts and the intake manifold shield.
10. Disconnect the brake booster vacuum hose from the intake manifold.
11. Disconnect the quick connect coupling Evaporative Emission (EVAP) canister purge valve hoses from the Throttle Body (TB) spacer and from the EVAP canister purge valve. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION** .
12. Disconnect the quick connect coupling PCV tube from the TB spacer. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION** .
13. Disconnect the EGR system module vacuum and electrical connectors.
14. Disconnect the intake manifold-to- TB spacer vacuum hose.
15. Disconnect the generator electrical connector.
16. Detach the 2 generator wiring harness retainers from the generator bracket.
17. Remove the 4 generator bracket bolts and the bracket.
18. Remove the coolant thermostat. For additional information, refer to **ENGINE COOLING** .
19. Disconnect the throttle control and the Throttle Position (TP) sensor electrical connectors.
20. Release the heater hose spring clamp and disconnect the heater hose.
21. Remove the EGR system module tube. For additional information, refer to **ENGINE EMISSION CONTROL** .

22. If equipped, detach the wire harness retainer from the intake manifold crash bracket.
23. Remove the intake manifold crash bracket bolt and prevent the bolt from contacting the cylinder head with a rubber band or tie strap.

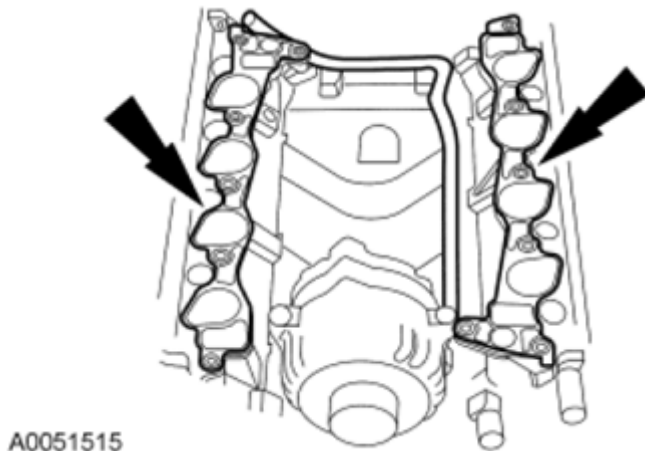


**Fig. 6: Locating Intake Manifold Crash Bracket**  
Courtesy of FORD MOTOR CO.

24. Remove the intake manifold crash bracket bolt.
25. Disconnect the fuel rail pressure and temperature sensor vacuum and electrical connectors.
26. Remove the wire harness retainer from the rear of the intake manifold.
27. Remove the 8 bolts and the intake manifold.
  - Remove and discard the intake manifold gaskets.
28. Clean the sealing surfaces.

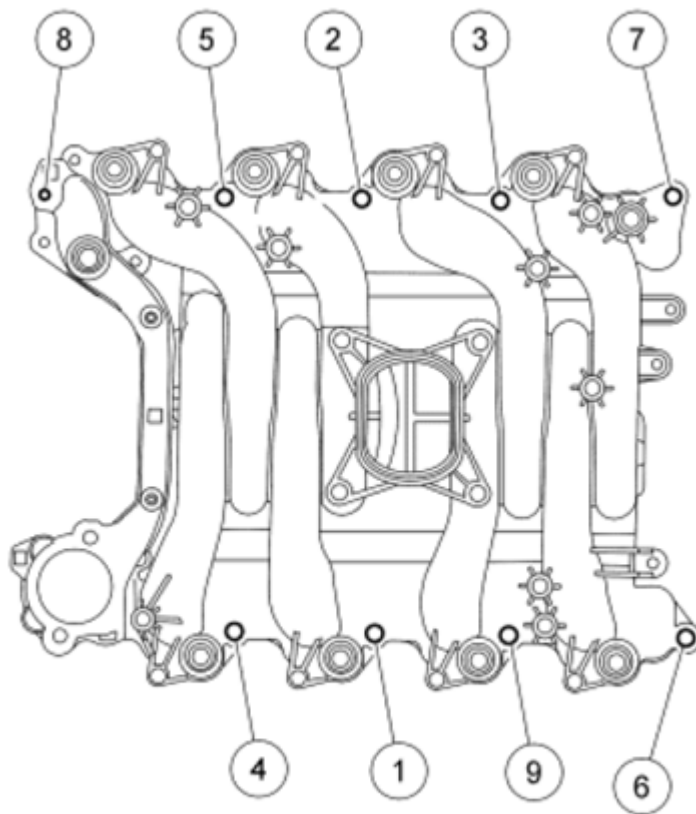
#### Installation

**NOTE:** Align the gasket locator tabs with the slots in the cylinder head.



**Fig. 7: Locating Intake Manifold Gaskets**  
Courtesy of FORD MOTOR CO.

1. Install new intake manifold gaskets.
2. Install the intake manifold and hand-tighten the 8 bolts.
3. Install the 8 ignition coil-on-plugs. For additional information, refer to **ENGINE IGNITION - 4.6L (2V)**.
4. Position the intake manifold crash bracket and loosely install the bolt and stud bolt.
5. Tighten the bolts in the sequence shown in illustration.
  - Tighten to 25 Nm (18 lb-ft).



N0037509

**Fig. 8: Identifying Intake Manifold Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

6. Tighten the intake manifold crash bracket bolt.
  - Tighten to 25 Nm (18 lb-ft).
7. Install the EGR system module tube. For additional information, refer to **ENGINE EMISSION CONTROL**.
8. Install the intake manifold shield and the 2 bolts.

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

- Tighten to 10 Nm (89 lb-in).
- 9. Connect the throttle control and the **TP** sensor electrical connectors.
- 10. Install the coolant thermostat. For additional information, refer to **ENGINE COOLING**.
- 11. Install the generator bracket and the 4 bracket bolts.
  - Tighten to 10 Nm (89 lb-in).
- 12. Connect the generator electrical connector.
- 13. Attach the 2 generator wiring harness retainers to the generator bracket.
- 14. Connect the **EVAP** canister purge valve hoses to the **TB** and the **EVAP** canister purge valve. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
- 15. Connect the intake manifold vacuum hose to the **TB** spacer.
- 16. Connect the EGR system module vacuum and electrical connectors.
- 17. Connect the PCV tube quick connect coupling to the **TB** spacer. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
- 18. Connect the brake booster vacuum hose to the intake manifold.
- 19. Install the heater hose and spring clamp.
- 20. Connect the fuel rail pressure and temperature sensor vacuum and electrical connectors.
- 21. Connect the 8 fuel injector electrical connectors.
- 22. Install the wire harness retainer to the rear of the intake manifold.
- 23. If equipped, attach the wire harness retainer to the intake manifold crash bracket.
- 24. Install the wiper mounting arm and pivot shaft. For additional information, refer to **WIPERS AND WASHERS**.
- 25. Connect the fuel spring lock coupling. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
- 26. Install the **ACL** and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.
- 27. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
- 28. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM**. Failure to follow these instructions may result in serious personal injury.

- 29. If equipped with a fire suppression system, repower the system.

### VALVE COVER - RH

#### Material

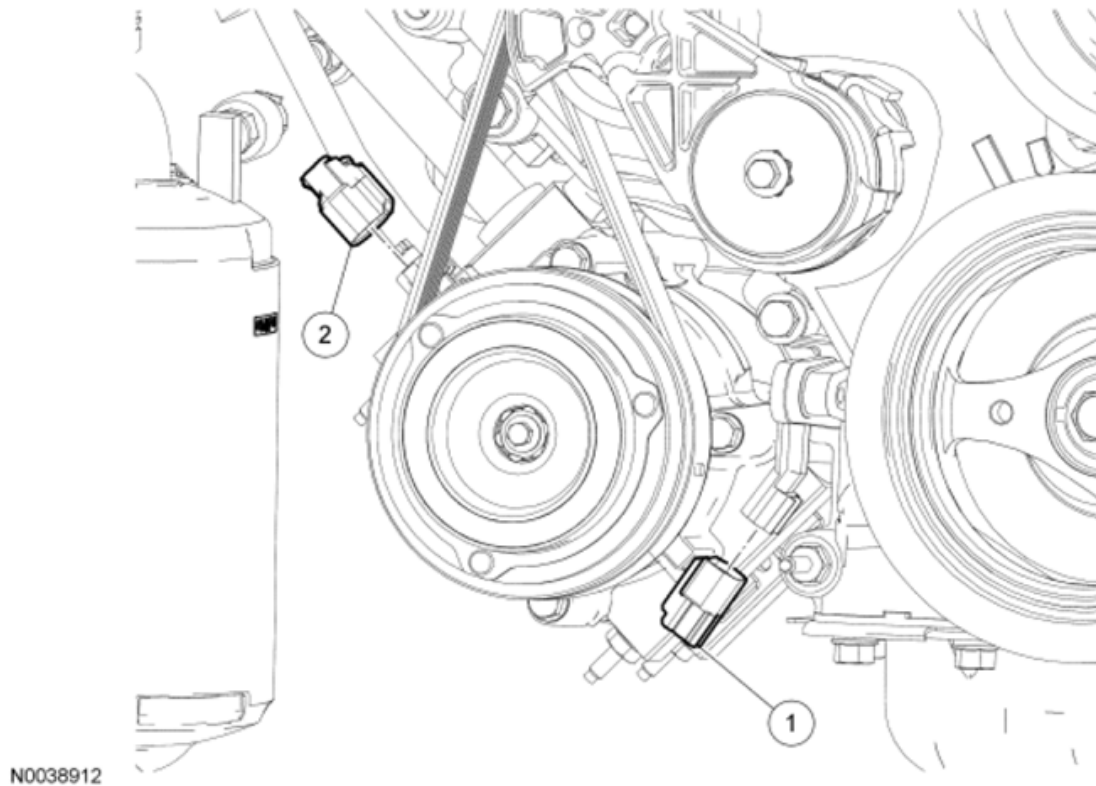
#### MATERIAL SPECIFICATIONS

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

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

### Valve Cover - RH (View 1 of 4)

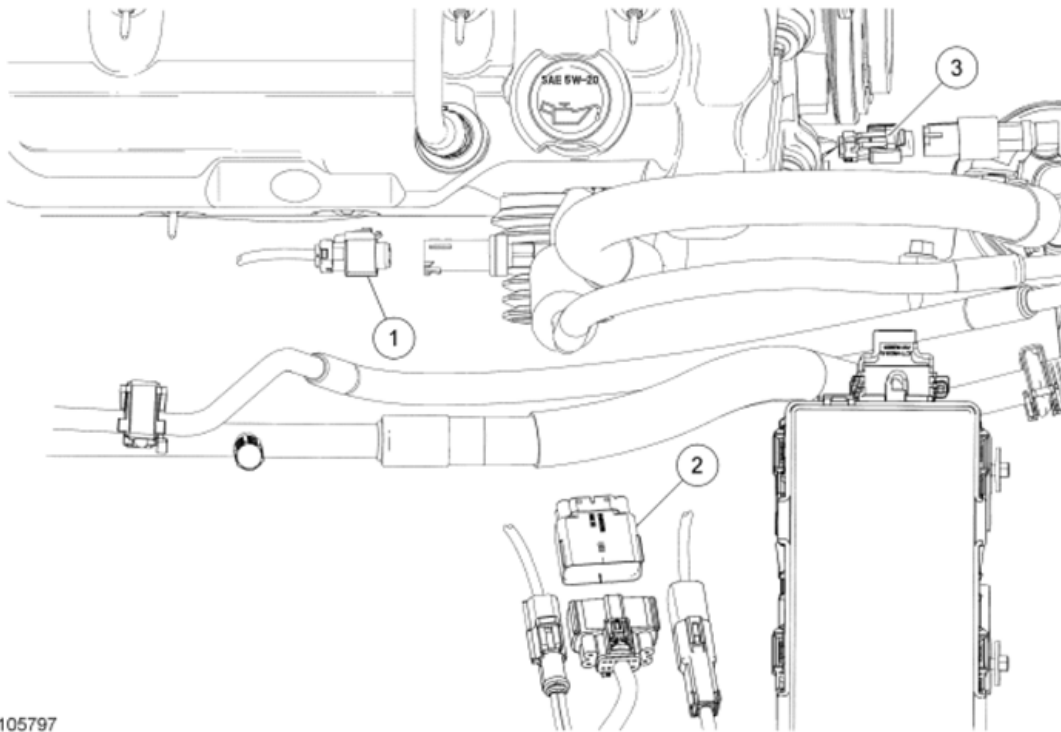


**Fig. 9: Identifying Valve Cover Components - RH**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description                                                            |
|------|-------------|------------------------------------------------------------------------|
| 1    | 14A464      | Crankshaft Position (CKP) sensor electrical connector (part of 12B637) |
| 2    | 14A464      | A/C compressor electrical connector (part of 12B637)                   |

### Valve Cover - RH (View 2 of 4)



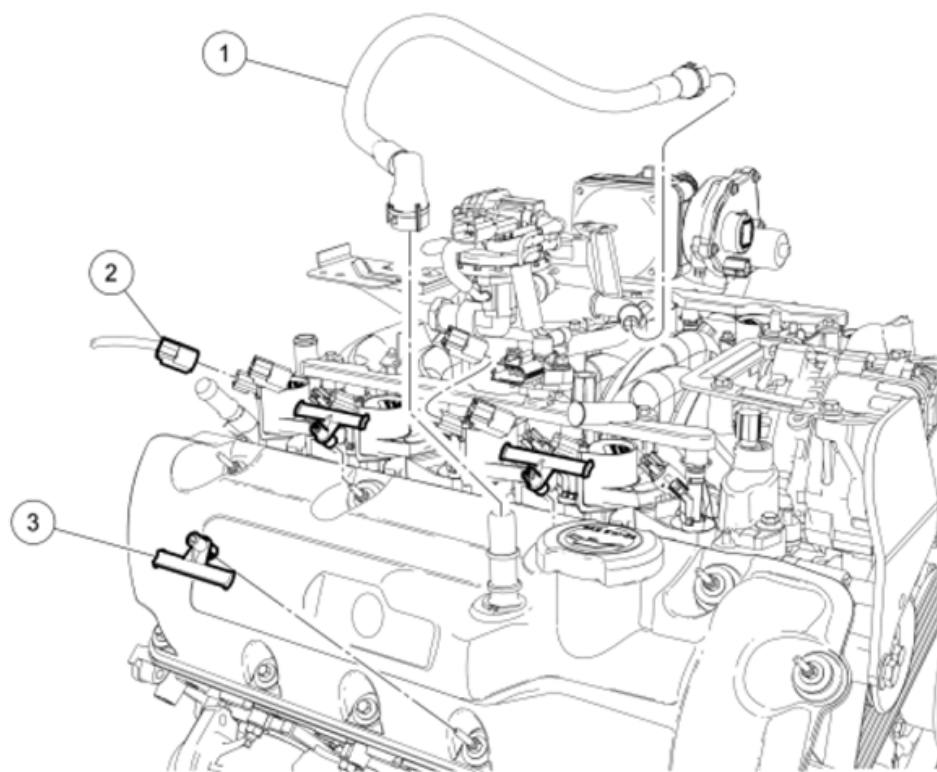
N0105797

**Fig. 10: Identifying Valve Cover Components - RH**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                                                     |
|------|-------------|-----------------------------------------------------------------|
| 1    | 14A464      | A/C pressure sensor electrical connector (part of 12B637)       |
| 2    | 14A464      | Electronic engine control electrical connector (part of 12B637) |
| 3    | 14A464      | A/C accumulator switch electrical connector (part of 12B637)    |

Valve Cover - RH (View 3 of 4)

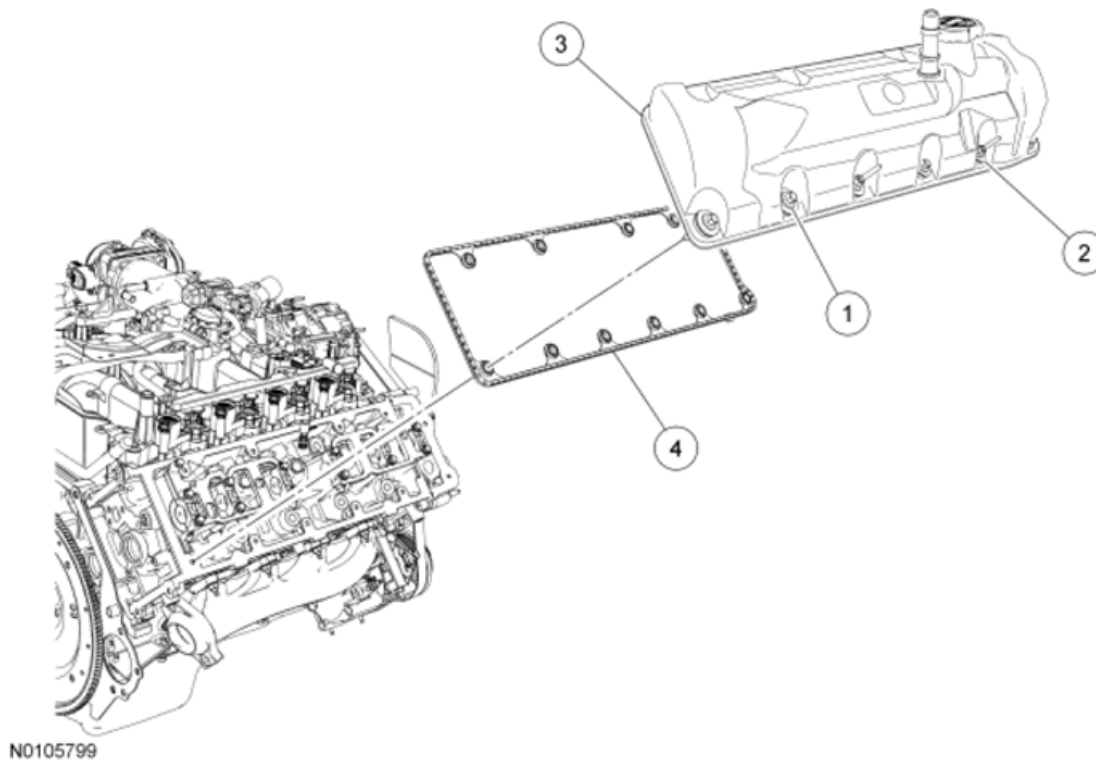


**Fig. 11: Identifying Valve Cover Components - RH**  
Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

| Item | Part Number | Description                                                      |
|------|-------------|------------------------------------------------------------------|
| 1    | 6K817       | PCV tube                                                         |
| 2    | 14A464      | Ignition coil electrical connector (part of 12B637) (4 required) |
| 3    | 14A163      | Engine wire harness retainer (part of 12B637) (3 required)       |

Valve Cover - RH (View 4 of 4)



**Fig. 12: Identifying Valve Cover Components - RH**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                           |
|------|-------------|---------------------------------------|
| 1    | N806183     | RH valve cover bolt (3 required)      |
| 2    | W705644     | RH valve cover stud bolt (8 required) |
| 3    | 6582        | RH valve cover                        |
| 4    | 6584        | RH valve cover gasket                 |

#### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Disconnect the fuel tube spring lock coupling. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION** .
3. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
4. Remove the LH engine mount. For additional information, refer to **ENGINE MOUNT - LH**.

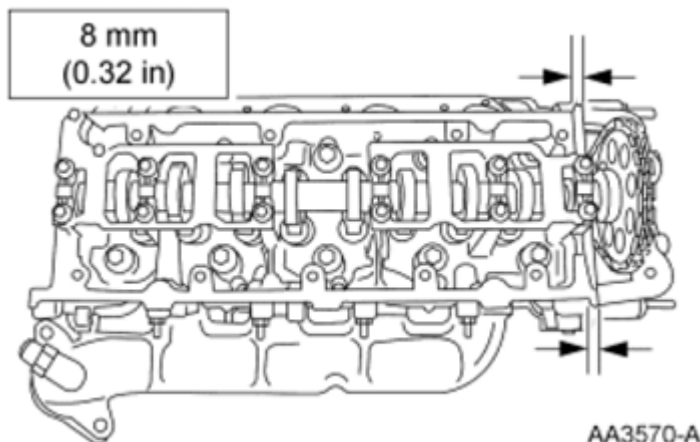
5. Remove the Evaporative Emission (EVAP) canister purge valve. For additional information, refer to **EVAPORATIVE EMISSIONS**.
6. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
7. Disconnect the A/C compressor electrical connector.
8. Disconnect the A/C pressure sensor electrical connector.
9. Disconnect the electronic engine control electrical connector.
10. Disconnect the A/C accumulator switch electrical connector.
11. Disconnect the PCV tube quick connect coupling from the PCV valve. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
12. Disconnect the 4 RH ignition coil electrical connectors.
13. Disconnect the 3 wire harness retainers from the valve cover and position wire harness aside.
14. Lower the engine.

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

15. Loosen the 8 studs, the 3 bolts and remove the valve cover and discard the gasket.
  - Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
  - Discard the valve cover gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

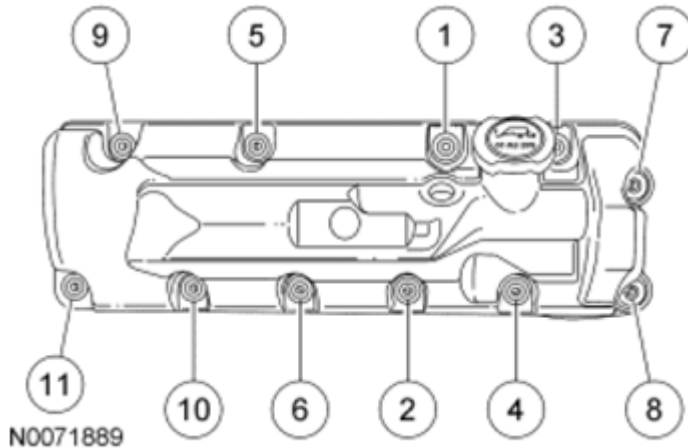
#### Installation

**NOTE:** If the valve cover is not installed and the fasteners tightened within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.



**Fig. 13: Identifying Silicone Gasket And Sealant Clearance**  
Courtesy of FORD MOTOR CO.

1. Apply a bead of silicone gasket and sealant in 2 locations shown in illustration where the engine front cover meets the cylinder head.
2. Install a new valve cover gasket and the valve cover.
  - Tighten the fasteners in the sequence shown in illustration to 10 Nm (89 lb-in).



**Fig. 14: Identifying Valve Cover Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

3. Raise the engine.
4. Position wire harness and connect the 3 wire harness retainers to the valve cover.
5. Connect the 4 RH ignition coil electrical connectors.
6. Connect the PCV tube quick connect coupling to the PCV valve. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
7. Connect the A/C accumulator switch electrical connector.
8. Connect the 3 electronic engine control electrical connectors.
9. Connect the A/C pressure sensor electrical connector.
10. Connect the A/C compressor electrical connector.
11. Connect the **CKP** sensor electrical connector.
12. Install the **EVAP** canister purge valve. For additional information, refer to **EVAPORATIVE EMISSIONS**.
13. Install the LH engine mount. For additional information, refer to **ENGINE MOUNT - LH**.
14. Connect the fuel tube spring lock coupling. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
15. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower

the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

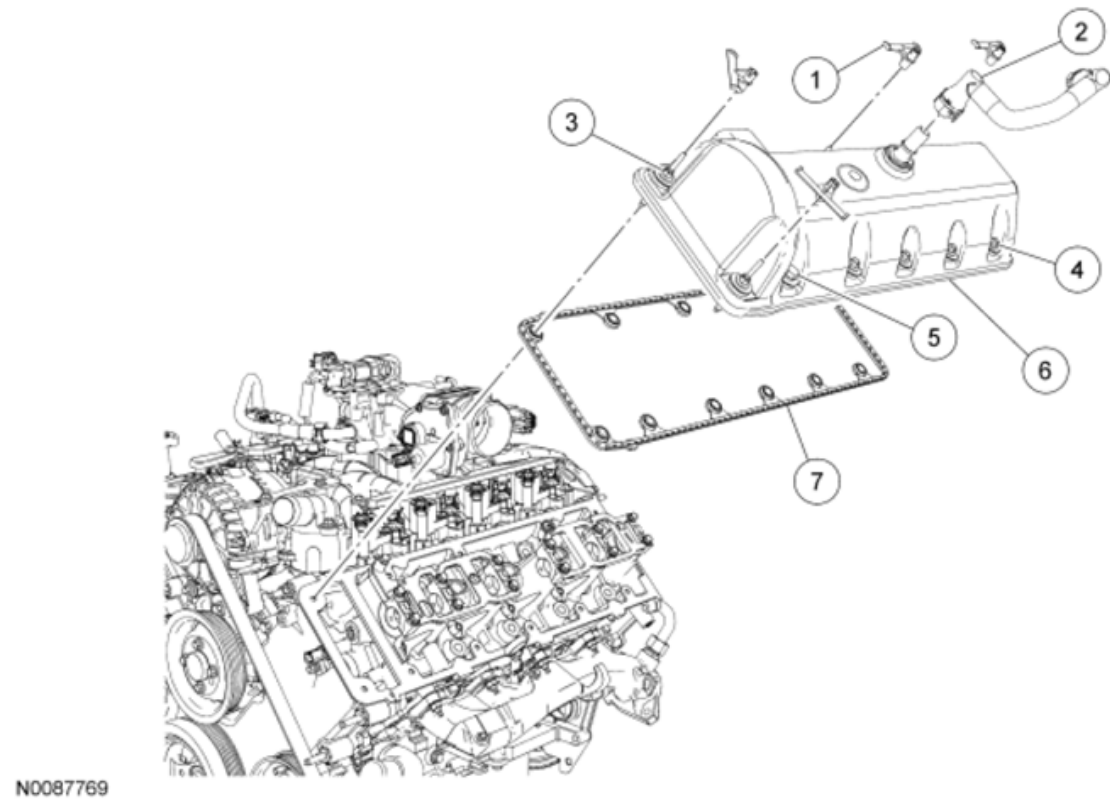
16. If equipped with a fire suppression system, repower the system.

VALVE COVER - LH

Material

MATERIAL SPECIFICATIONS

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



**Fig. 15: Identifying Valve Cover Components - LH**  
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

|  |  |  |
|--|--|--|
|  |  |  |
|--|--|--|

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

| Item | Part Number | Description                                         |
|------|-------------|-----------------------------------------------------|
| 1    | 13A506      | Wire harness retainer (part of 12B637) (4 required) |
| 2    | 6758        | Crankcase ventilation tube                          |
| 3    | W705644     | Valve cover stud bolt (5 required)                  |
| 4    | N806183     | Valve cover bolt (6 required)                       |
| 5    | W705787     | Valve cover bolt                                    |
| 6    | 6A505       | LH valve cover                                      |
| 7    | 6A559       | LH valve cover gasket                               |

### Removal

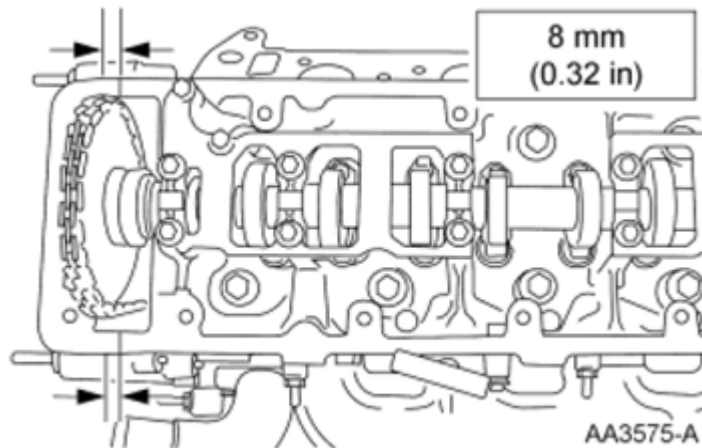
1. Remove the Air Cleaner (ACL) and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.
2. Disconnect the 4 wiring harness retainers from the valve cover and position the wire harness aside.
3. Disconnect the crankcase ventilation tube quick connect coupling from the valve cover. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.

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

4. Loosen the 11 fasteners and remove the LH valve cover and gasket.
  - Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
  - Discard the valve cover gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

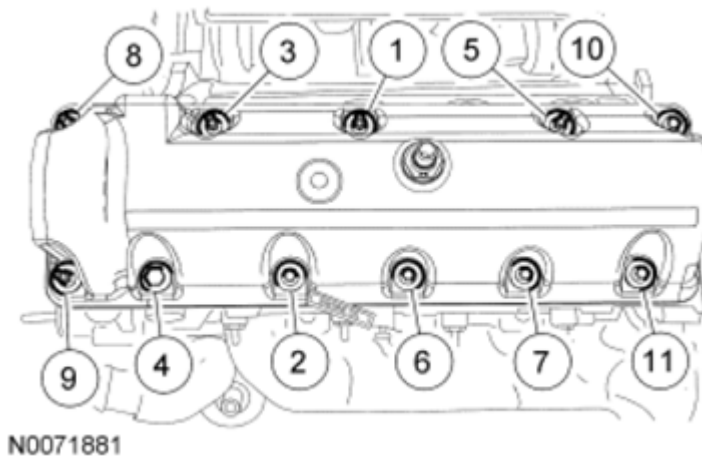
### Installation

**NOTE:** If the valve cover is not installed and the fasteners tightened within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.



**Fig. 16: Identifying Silicone Gasket Clearance**  
Courtesy of FORD MOTOR CO.

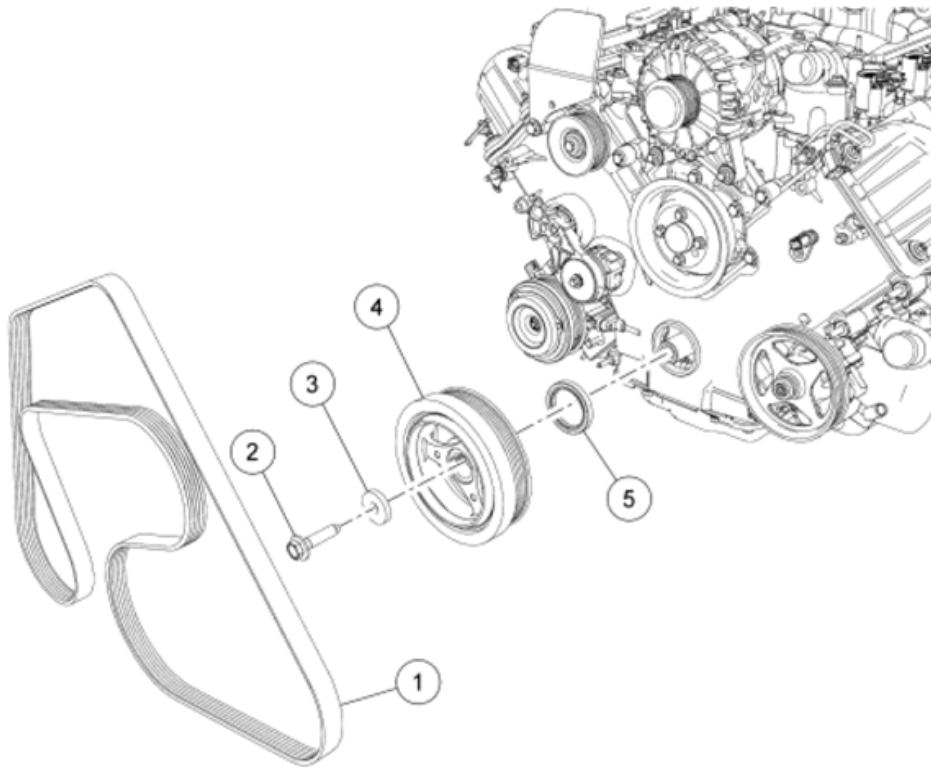
1. Apply a bead of silicone gasket and sealant in 2 locations shown in illustration where the engine front cover meets the cylinder head.
2. Position the LH valve cover and new gasket on the cylinder head.
  - Tighten the fasteners in the sequence shown in illustration to 10 Nm (89 lb-in).



**Fig. 17: Identifying LH Valve Cover Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

3. Connect the crankcase ventilation tube quick connect coupling to the valve cover. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
4. Position the wire harness and connect the 4 wiring harness retainers to the valve cover.
5. Install the ACL and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.

## LOWER END COMPONENTS - EXPLODED VIEW, CRANKSHAFT PULLEY AND CRANKSHAFT FRONT SEAL



**Fig. 18: Exploded View Of Crankshaft Pulley And Crankshaft Front Seal**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                   |
|------|-------------|-------------------------------|
| 1    | 8620        | Accessory drive belt          |
| 2    | W701512     | Crankshaft pulley bolt        |
| 3    | N806165     | Crankshaft pulley bolt washer |
| 4    | 6316        | Crankshaft pulley             |
| 5    | 6700        | Crankshaft front seal         |

1. For additional information, refer to the appropriate procedure(s).

#### CRANKSHAFT PULLEY

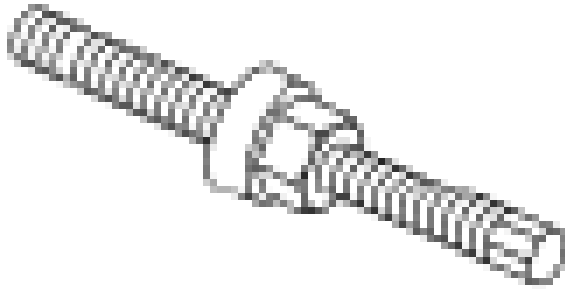
Special Tool(s)

#### SPECIAL TOOL CHART

|  |  |
|--|--|
|  |  |
|--|--|

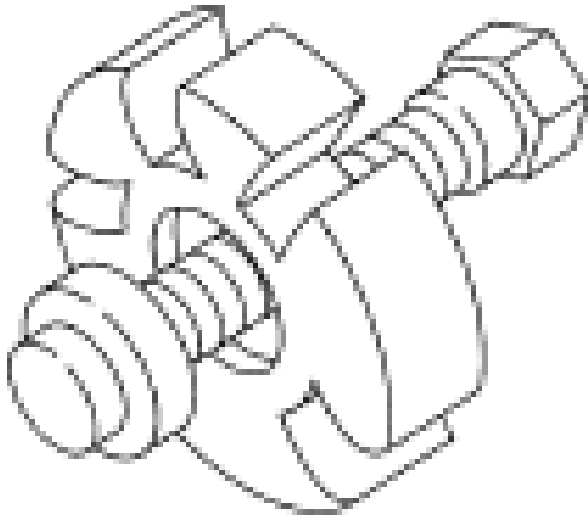
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



Installer, Crankshaft Vibration Damper  
303-102 (T74P-6316-B)

ST1287-A



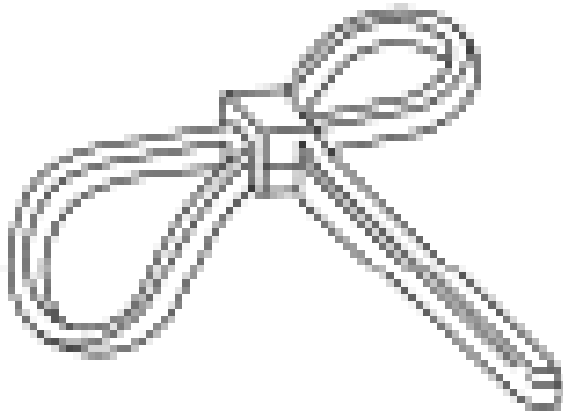
Remover, Crankshaft Vibration Damper  
303-009 (T58P-6316-D)

ST1286-A

Strap Wrench

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1438-A**

303-D055 (D85L-6000-A) or equivalent

### Material

#### MATERIAL SPECIFICATIONS

| Item                                 | Specification |
|--------------------------------------|---------------|
| Silicone Gasket and Sealant<br>TA-30 | WSE-M4G323-A4 |

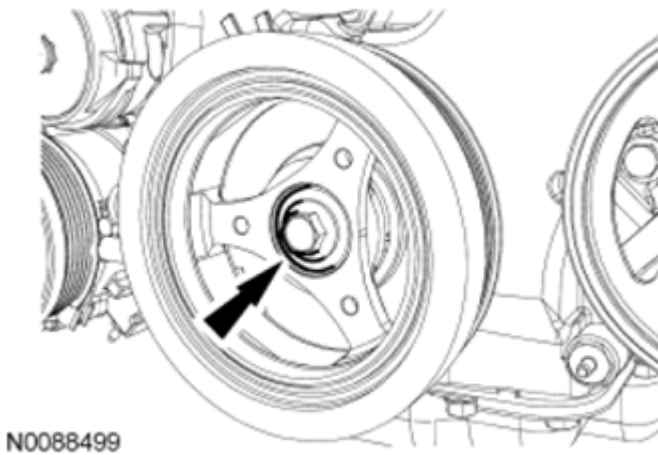
### Removal

1. Remove the engine cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING**.
2. Rotate the tensioner clockwise and remove the accessory drive belt.



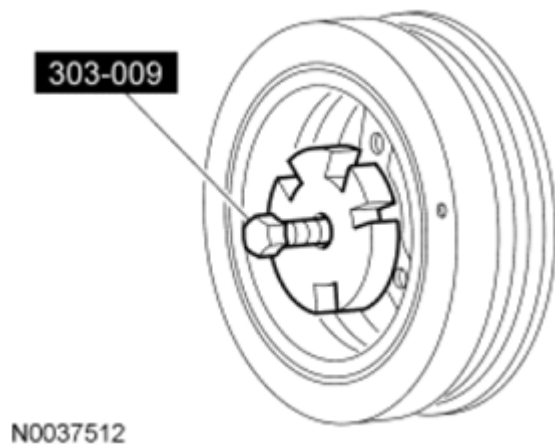
**Fig. 19: Rotating Tensioner Clockwise**  
Courtesy of FORD MOTOR CO.

3. Remove the crankshaft pulley bolt.



**Fig. 20: Locating Crankshaft Pulley Bolt**  
Courtesy of FORD MOTOR CO.

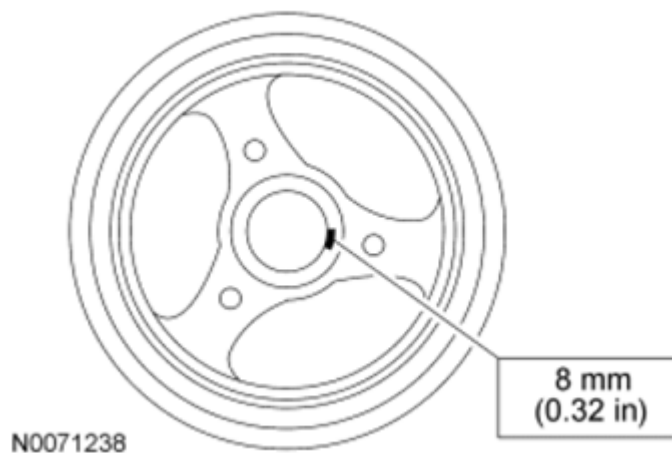
4. Using the Crankshaft Vibration Damper Remover, remove the crankshaft pulley.



**Fig. 21: Removing Crankshaft Pulley Using Crankshaft Vibration Damper Remover**  
Courtesy of FORD MOTOR CO.

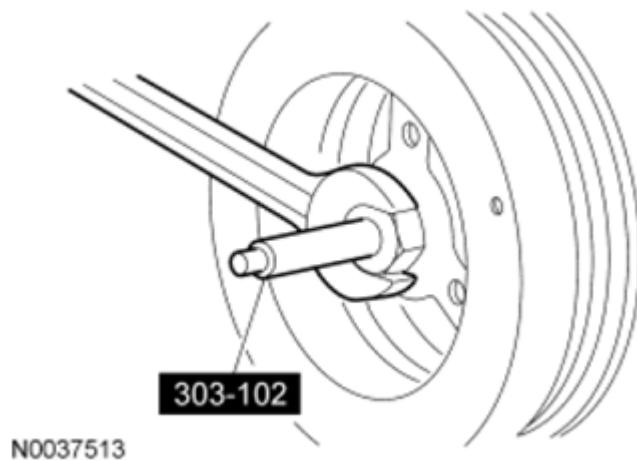
**Installation**

**NOTE:** The crankshaft pulley must be installed within 4 minutes after applying the silicone.



**Fig. 22: Identifying Woodruff Key Slot**  
Courtesy of FORD MOTOR CO.

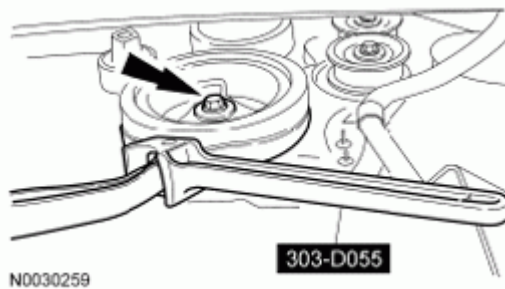
1. Apply sealant to the Woodruff key slot on the crankshaft pulley.
2. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.



**Fig. 23: Installing Crankshaft Pulley Using Crankshaft Vibration Damper Installer**  
Courtesy of FORD MOTOR CO.

**NOTE:** Use the Strap Wrench to hold the crankshaft pulley.

3. Install the bolt and washer. Tighten the bolt in 4 steps.
  - Step 1: Tighten to 120 Nm (89 lb-ft).
  - Step 2: Loosen the bolt one full turn.
  - Step 3: Tighten to 50 Nm (37 lb-ft).
  - Step 4: Tighten an additional 90 degrees.



**Fig. 24: Locating Bolt And Washer**  
Courtesy of FORD MOTOR CO.

4. Rotate the tensioner clockwise and install the accessory drive belt.



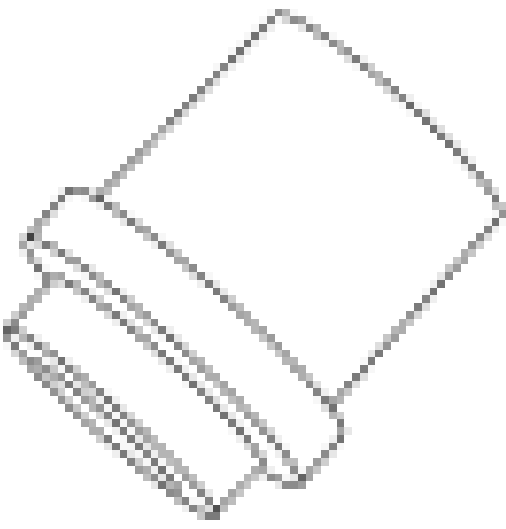
**Fig. 25: Rotating Tensioner Clockwise**  
Courtesy of FORD MOTOR CO.

5. Install the engine cooling fan motor and shroud. For additional information, refer to **ENGINE COOLING**.

## CRANKSHAFT FRONT SEAL

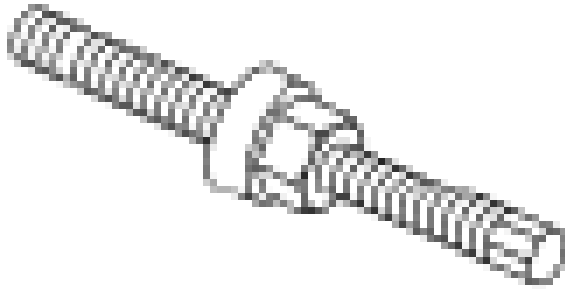
Special Tool(s)

### SPECIAL TOOL CHART

|                                                                                                     |                                                         |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------------------|
|  <p>ST2197-A</p> | <p>Installer, Crankshaft Front Oil Seal<br/>303-635</p> |
|                                                                                                     |                                                         |

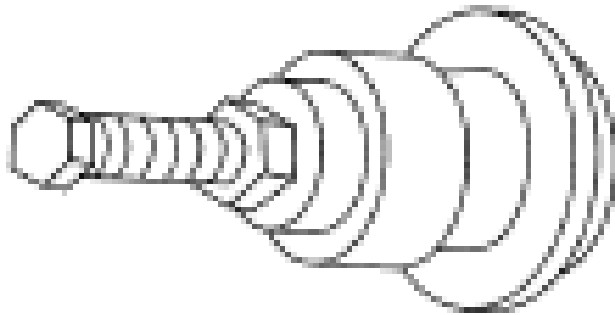
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



Installer, Crankshaft Vibration Damper  
303-102 (T74P-6316-B)

**ST1287-A**



Installer, Front Cover Oil Seal  
303-335 (T88T-6701-A)

**ST1328-A**

Remover, Crankshaft Front Oil Seal  
303-107 (T74P-6700-A)



ST1288-A

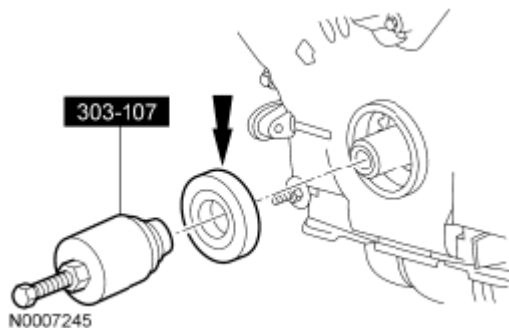
## Material

### MATERIAL SPECIFICATIONS

| 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

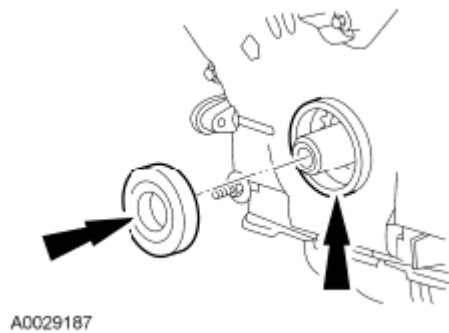
1. Remove the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY**.
2. Using the Crankshaft Front Oil Seal Remover, remove the crankshaft front seal.



**Fig. 26: Locating Crankshaft Front Seal**  
Courtesy of FORD MOTOR CO.

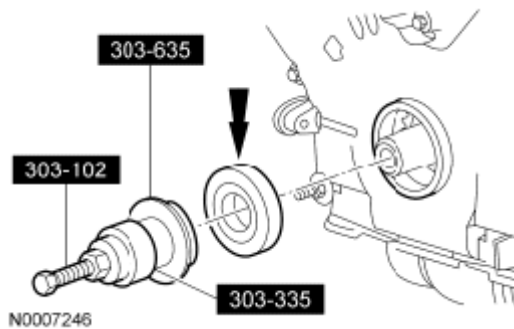
## Installation

1. Lubricate the engine front cover and the crankshaft front seal inner lip with clean engine oil.



**Fig. 27: Locating Crankshaft Front Seal Inner Lip**  
Courtesy of FORD MOTOR CO.

2. Using the Crankshaft Front Oil Seal Installer, Crankshaft Vibration Damper Installer and Front Cover Oil Seal Installer, install the crankshaft front seal into the engine front cover.



**Fig. 28: Installing Crankshaft Front Seal Into Engine Front Cover**  
Courtesy of FORD MOTOR CO.

3. Install the crankshaft pulley. For additional information, refer to [CRANKSHAFT PULLEY](#).

## ENGINE FRONT COVER

### Material

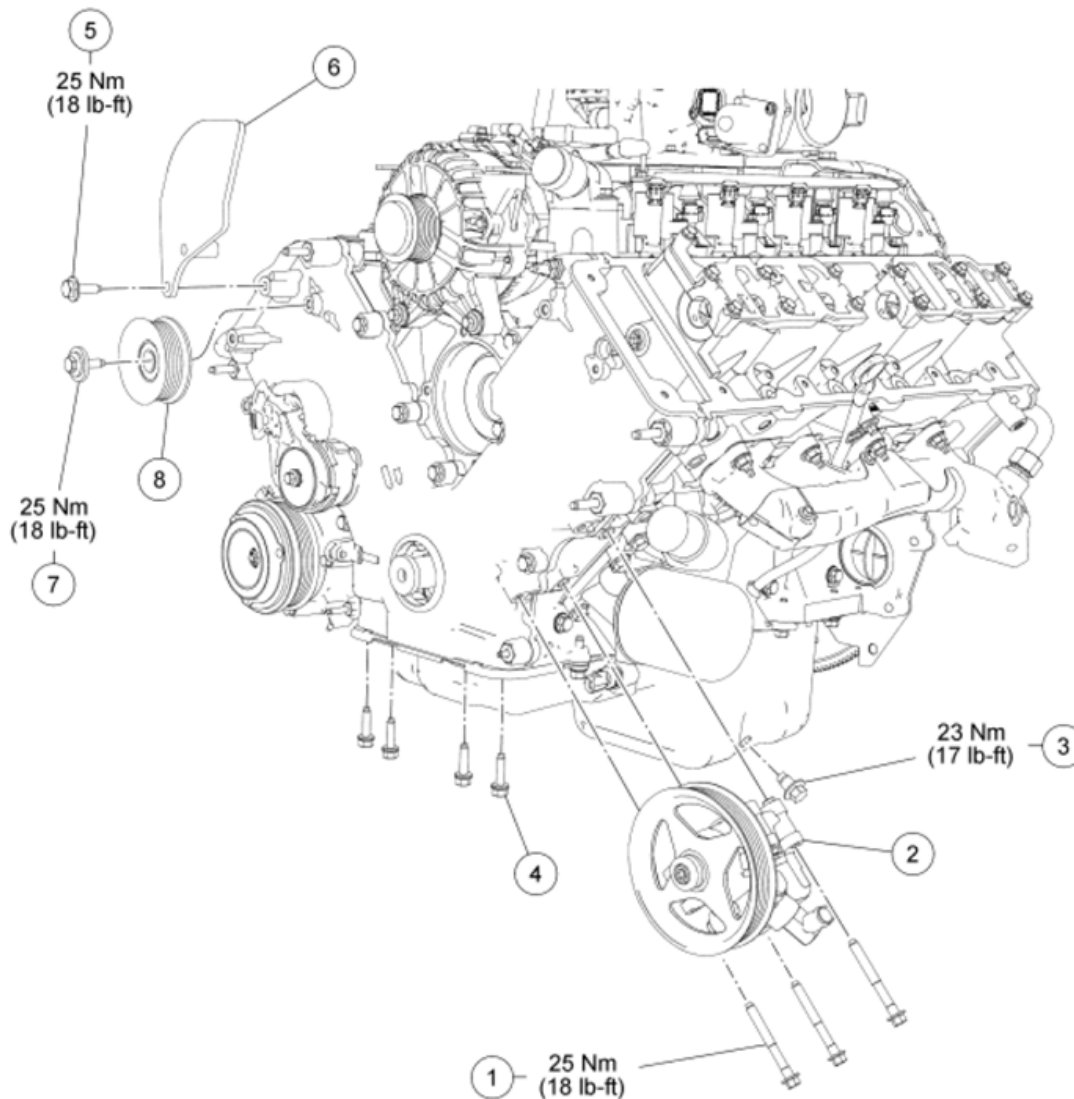
### MATERIAL SPECIFICATIONS

| Item                                                                                                                                                                  | Specification     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Motorcraft® Metal Surface Prep<br>ZC-31-A                                                                                                                             | -                 |
| Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil<br>XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-<br>5W20-LSP12 (Canada); or equivalent | WSS-M2C930-<br>A  |
| Silicone Gasket and Sealant<br>TA-30                                                                                                                                  | WSE-M4G323-<br>A4 |

Silicone Gasket Remover  
ZC-30

-

Engine Front Cover (View 1 of 2)



N0071900

**Fig. 29: Identifying Engine Front Cover Components With Torque Specifications**  
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

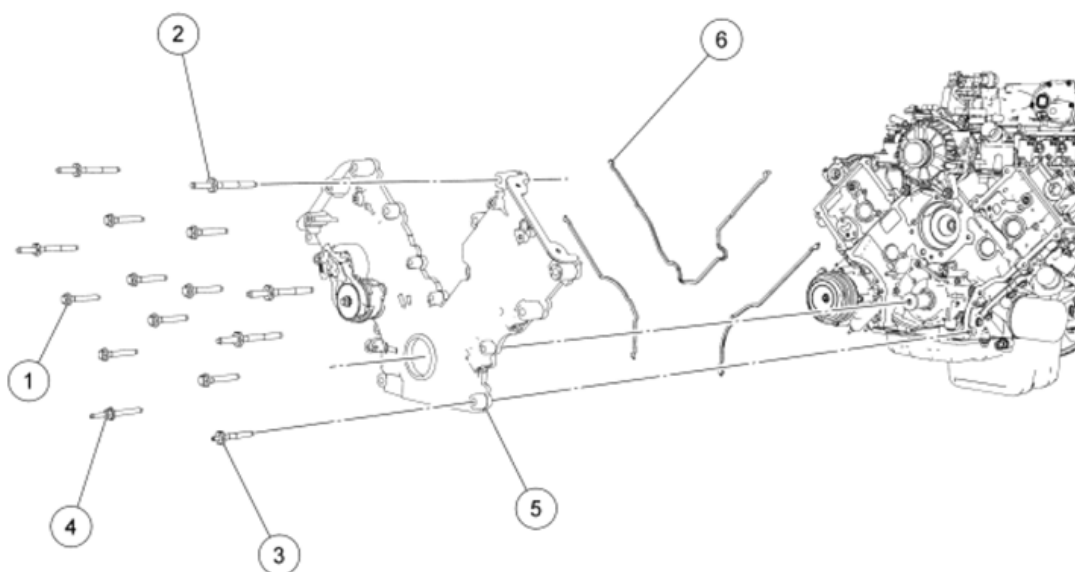
| Item | Part Number | Description                           |
|------|-------------|---------------------------------------|
| 1    | W500315     | Power steering pump bolt (3 required) |
| 2    | 3A674       | Power steering pump assembly          |
| 3    | 6730        | Oil pan drain plug                    |
| 4    | W701605     | Oil pan bolt (4 required)             |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|   |         |                                   |
|---|---------|-----------------------------------|
| 5 | W701725 | Shield bolt                       |
| 6 | 9G609   | Shield                            |
| 7 | N808102 | Accessory drive idler pulley bolt |
| 8 | 19A216  | Accessory drive idler pulley      |

### Engine Front Cover (View 2 of 2)



N0087527

**Fig. 30: Identifying Engine Front Cover Components**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description                               |
|------|-------------|-------------------------------------------|
| 1    | N806177     | Engine front cover bolt (8 required)      |
| 2    | N806300     | Engine front cover stud bolt (5 required) |
| 3    | W706508     | Engine front cover bolt                   |
| 4    | N808586     | Engine front cover bolt                   |
| 5    | 6D080       | Engine front cover                        |
| 6    | 6D081       | Engine front cover gasket (3 required)    |

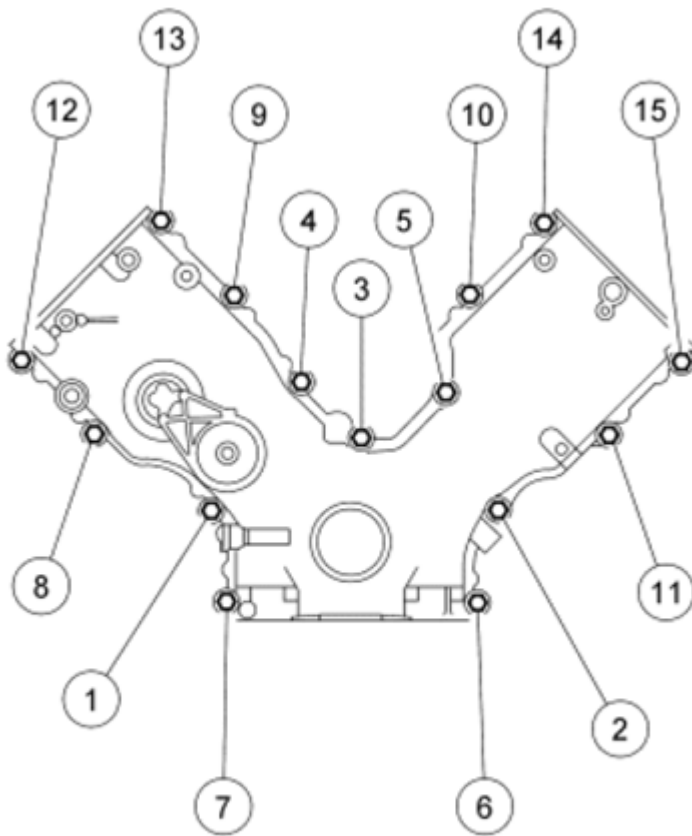
### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

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

**LIFTING .**

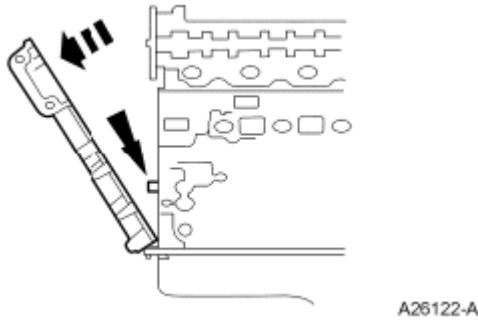
2. Remove both valve covers. For additional information, refer to **VALVE COVER - RH** or **VALVE COVER - LH**.
3. Remove the coolant pump. For additional information, refer to **ENGINE COOLING .**
4. Remove the crankshaft front seal. For additional information, refer to **CRANKSHAFT FRONT SEAL**.
5. Remove the 3 bolts and position the power steering pump aside.
6. Drain the engine oil.
  - Install the drain plug when finished.
  - Tighten to 23 Nm (17 lb-ft).
7. Remove the 4 front oil pan-to-engine front cover bolts.
8. Remove the bolt and the shield.
9. Remove the bolt and the accessory drive idler pulley.
10. Remove the bolts and the stud bolts in the sequence shown in illustration.



N0037514

**Fig. 31: Identifying Bolts And Stud Bolts In Sequence**  
 Courtesy of FORD MOTOR CO.

11. Remove the engine front cover from the front cover-to-cylinder block dowel.



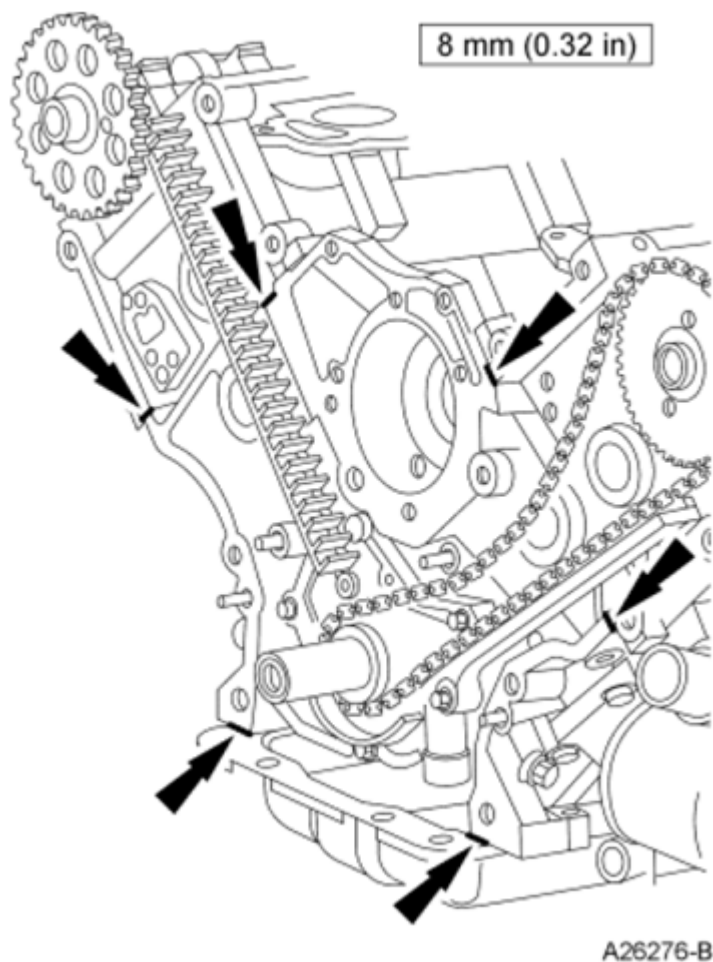
**Fig. 32: Locating Front Cover-To-Cylinder Block Dowel**  
Courtesy of FORD MOTOR CO.

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

12. Clean the gasket surfaces with a plastic scraping tool and metal surface prep.

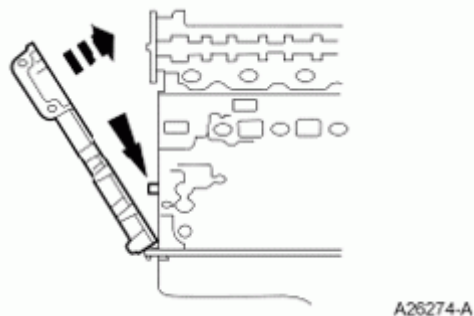
#### Installation

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



**Fig. 33: Locating Silicone Gasket And Sealant Points**  
Courtesy of FORD MOTOR CO.

1. Apply silicone gasket and sealant along the cylinder head-to-block surface and the oil pan-to-cylinder block surface.
2. Position the new engine front cover gaskets.
3. Install the engine front cover on the front cover-to-cylinder block dowel and loosely install the bolts.



**Fig. 34: Locating Front Cover-To-Cylinder Block Dowel**  
Courtesy of FORD MOTOR CO.

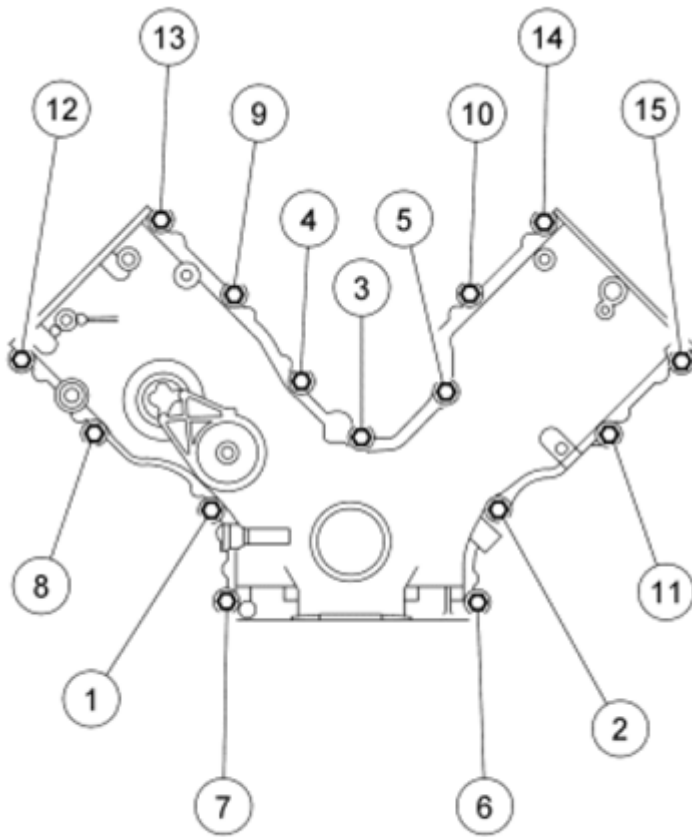
**2010 Mercury Grand Marquis LS**

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

4. Tighten the front cover fasteners in the sequence shown in illustration to 25 Nm (18 lb-ft).

**ITEM DESCRIPTION**

| Item | Part Number | Description                                               |
|------|-------------|-----------------------------------------------------------|
| 1    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 2    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 3    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 4    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 5    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 6    | W706508     | Stud, hex-head pilot, M8 x 1.25 x 5+0 - M6 x 1 x 10       |
| 7    | N808586     | Stud, washer hex-head pilot, M8 x 1.25 - M6 x 1.0 x 86.35 |
| 8    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 9    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 10   | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 11   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 12   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 13   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 14   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 15   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |



N0037514

**Fig. 35: Identifying Bolts And Stud Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

5. Install the accessory drive idler pulley and the bolt.
  - Tighten to 25 Nm (18 lb-ft).
6. Install the shield and the bolts.
  - Tighten to 25 Nm (18 lb-ft).
7. Loosely install the 4 front oil pan bolts.

**NOTE:** Make sure to tighten the bolts in 2 stages.

8. Tighten the 4 front oil pan bolts in 2 stages.
  - Stage 1: Tighten to 20 Nm (177 lb-in).
  - Stage 2: Tighten an additional 60 degrees.

**NOTE:** The front lower hole in the power steering pump is not used.

9. Position the power steering pump and install the 3 bolts.

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

- Tighten to 25 Nm (18 lb-ft).
- 10. Install a new crankshaft front seal. For additional information, refer to **CRANKSHAFT FRONT SEAL**.
- 11. Install the coolant pump. For additional information, refer to **ENGINE COOLING**.
- 12. Install the valve covers. For additional information, refer to **VALVE COVER - RH** or **VALVE COVER - LH**.
- 13. Fill the engine with clean engine oil.

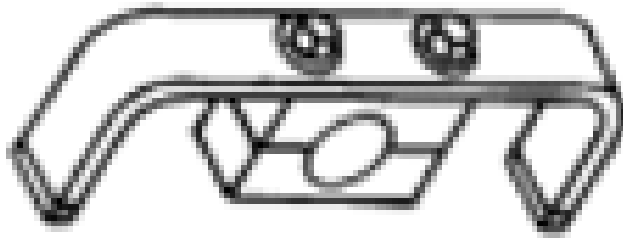
**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM**. Failure to follow these instructions may result in serious personal injury.

- 14. If equipped with a fire suppression system, repower the system.

### TIMING DRIVE COMPONENTS

#### Special Tool(s)

#### SPECIAL TOOL CHART

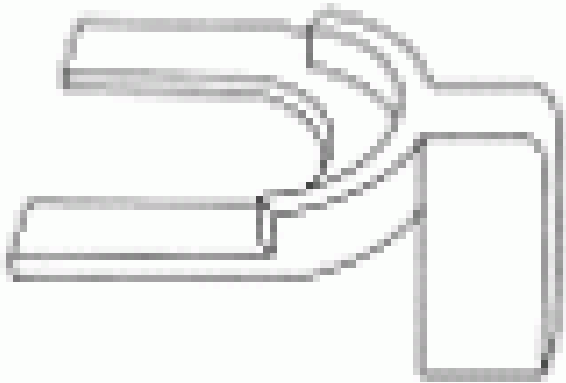


Aligner, Camshaft Position  
303-557 (T96T-6256-B)

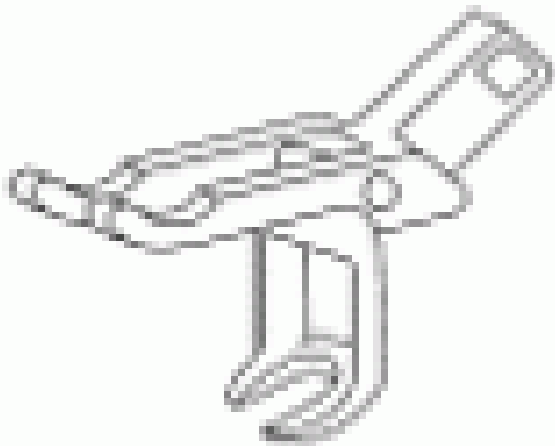
Compressor Spacer, Valve Spring  
303-382 (T91P-6565-AH)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1331-A**



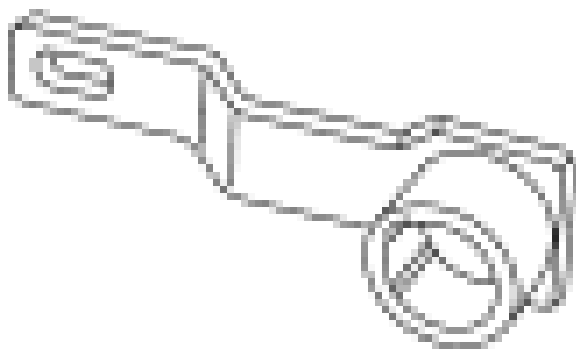
**ST1330-A**

Compressor, Valve Spring  
303-581 (T97T-6565-A)

Holding Tool, Crankshaft  
303-448 (T93P-6303-A)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST1335-A

### General Equipment

#### GENERAL EQUIPMENT

Hydraulic Chain Tensioner Clip - 1L3Z-6P250-AA

### Material

#### MATERIAL SPECIFICATIONS

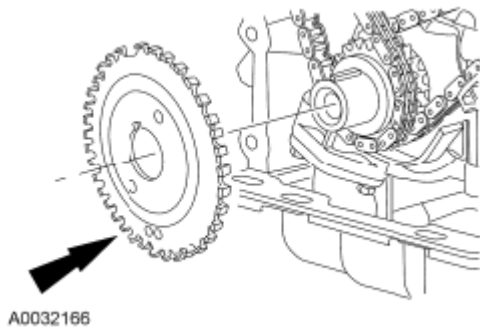
| Item                                                                                                                                                           | Specification |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 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

**NOTE:** Since the engine is not free-wheeling, timing procedures must be followed exactly or piston and valve damage can occur.

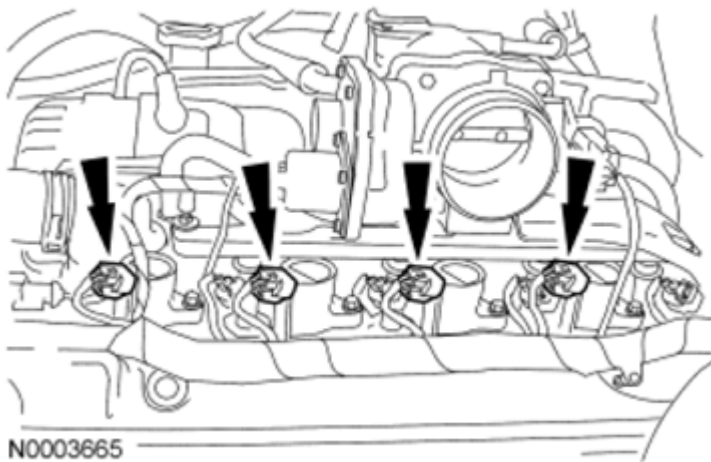
**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

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 crankshaft sensor ring from the crankshaft.



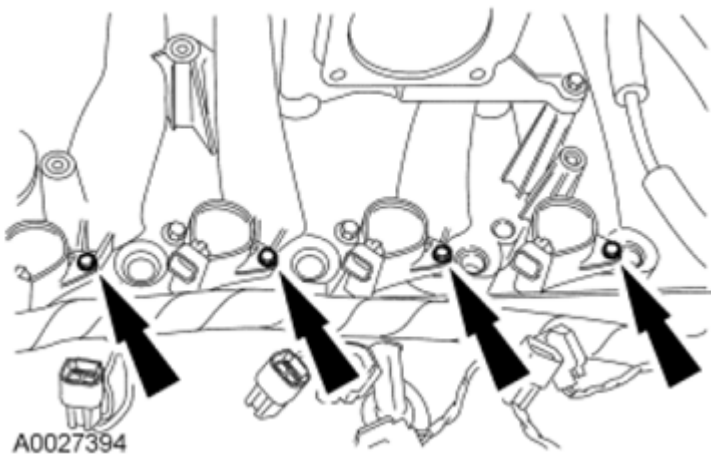
**Fig. 36: Locating Crankshaft Sensor Ring**  
Courtesy of FORD MOTOR CO.

4. Disconnect the 8 ignition coil electrical connectors (4 shown in illustration).



**Fig. 37: Locating Ignition Coil Electrical Connectors**  
Courtesy of FORD MOTOR CO.

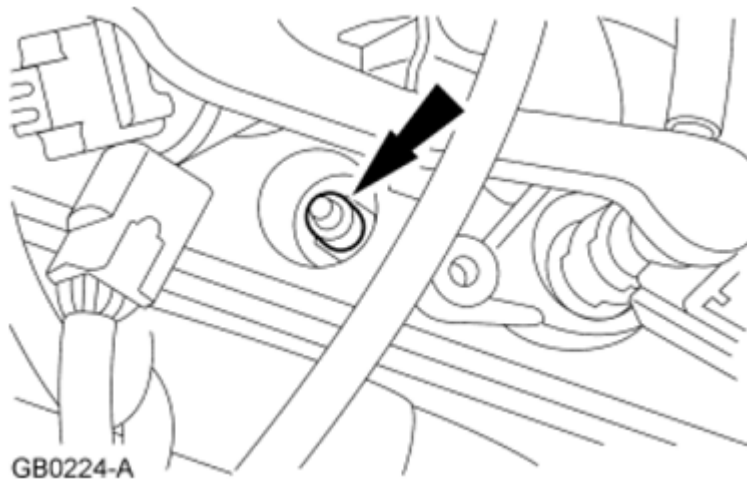
5. Remove the bolts and the 8 ignition coils (4 shown in illustration).



**Fig. 38: Locating Bolts And Ignition Coils**

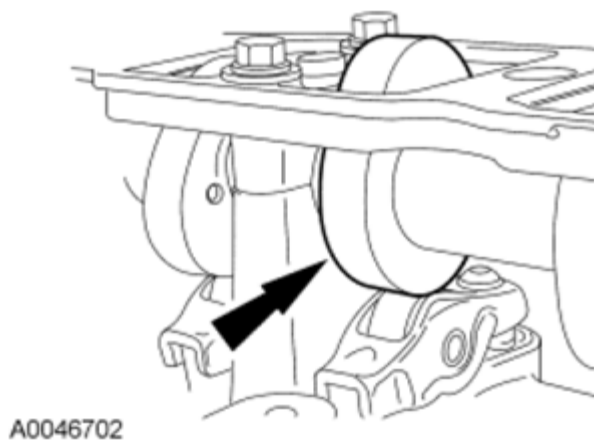
Courtesy of FORD MOTOR CO.

- NOTE:** Only use hand tools when removing or installing the spark plugs, damage may occur to the cylinder head or spark plug.
- NOTE:** Use compressed air to remove any foreign material from the spark plug wells before removing the spark plugs.

**Fig. 39: Locating Spark Plug**

Courtesy of FORD MOTOR CO.

6. Remove the 8 spark plugs.
7. Position the lobe of the camshaft up.

**Fig. 40: Locating Lobe Of Camshaft**

Courtesy of FORD MOTOR CO.

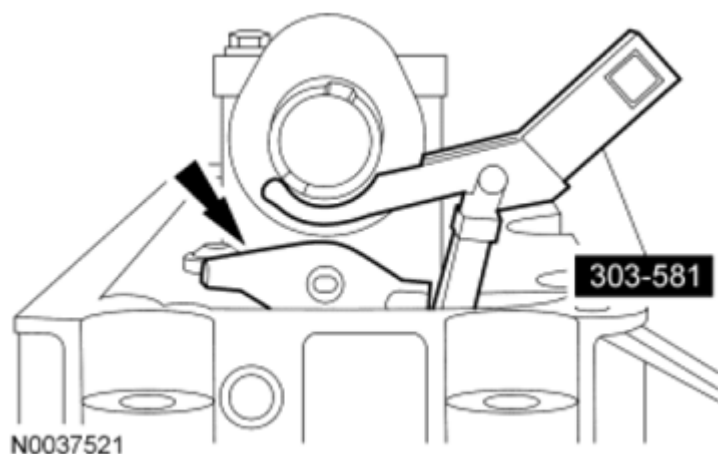
8. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal

damage.



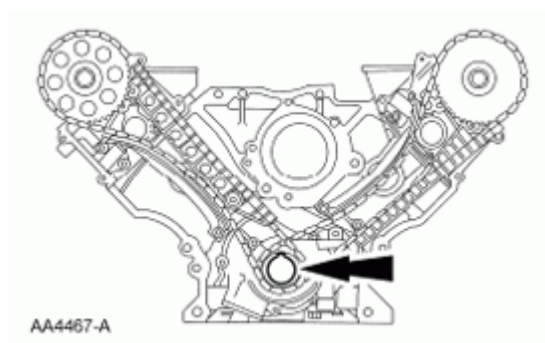
**Fig. 41: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

**NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.



**Fig. 42: Identifying Valve Spring Compressor (303-581)**  
Courtesy of FORD MOTOR CO.

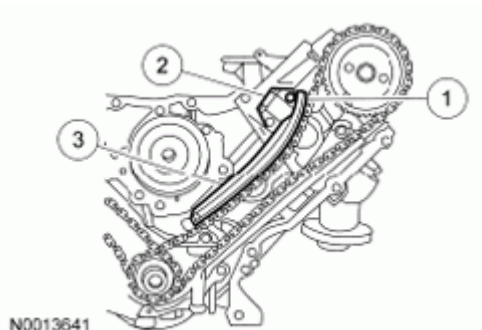
9. Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller followers.
10. Position the crankshaft with the keyway at the 12 o'clock position.



**Fig. 43: Locating Crankshaft**  
Courtesy of FORD MOTOR CO.

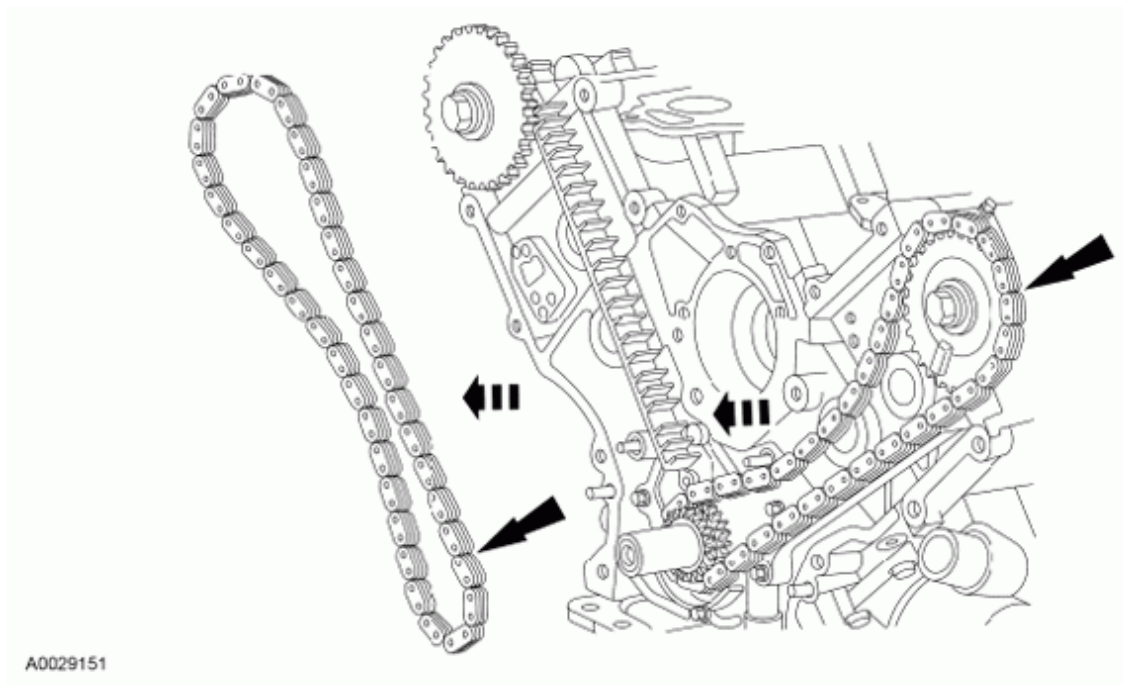
**NOTE:** LH shown in illustration, RH similar.

11. Remove the timing chain tensioning system from both timing chains.
  1. Remove the bolts.
  2. Remove the timing chain tensioners.
  3. Remove the timing chain tensioner arms.



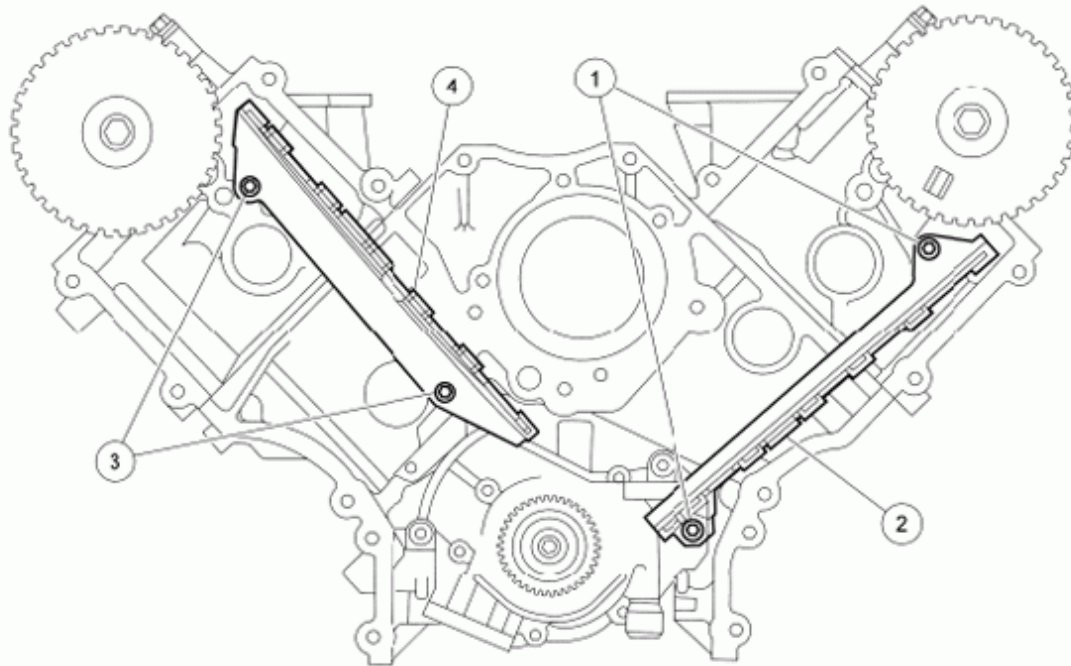
**Fig. 44: Identifying Timing Chain Tensioner Arms And Bolts**  
Courtesy of FORD MOTOR CO.

12. Remove the LH and RH timing chains and the crankshaft sprocket.
  - Remove the RH timing chain from the camshaft sprocket.
  - Remove the RH timing chain from the crankshaft sprocket.
  - Repeat for the LH timing chain and crankshaft sprocket.



**Fig. 45: Removing RH Timing Chain**  
Courtesy of FORD MOTOR CO.

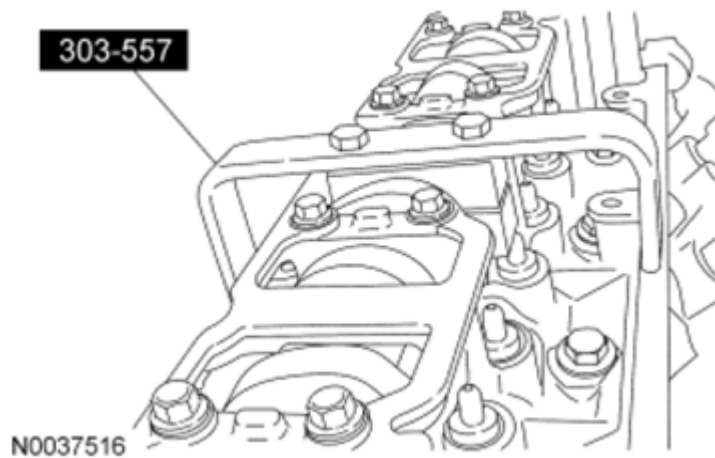
13. Remove the timing chain guides.
  1. Remove the bolts.
  2. Remove the LH timing chain guide.
  3. Remove the bolts.
  4. Remove the RH timing chain guide.



N0013642

**Fig. 46: Identifying Timing Chain Guide And Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** RH shown in illustration, LH similar.

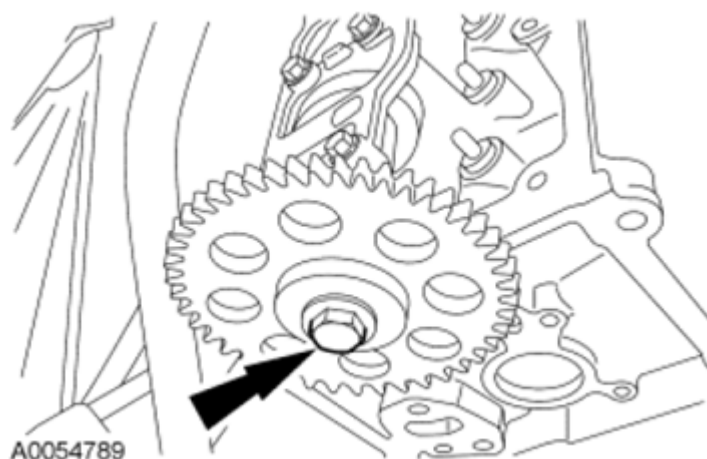


N0037516

**Fig. 47: Identifying Camshaft Position Aligner (303-557)**  
Courtesy of FORD MOTOR CO.

14. Install the Camshaft Position Aligner.

**NOTE:** RH shown in illustration, LH similar.



**Fig. 48: Locating Bolt And Camshaft Gear**  
Courtesy of FORD MOTOR CO.

15. Remove the bolt and the camshaft gear.

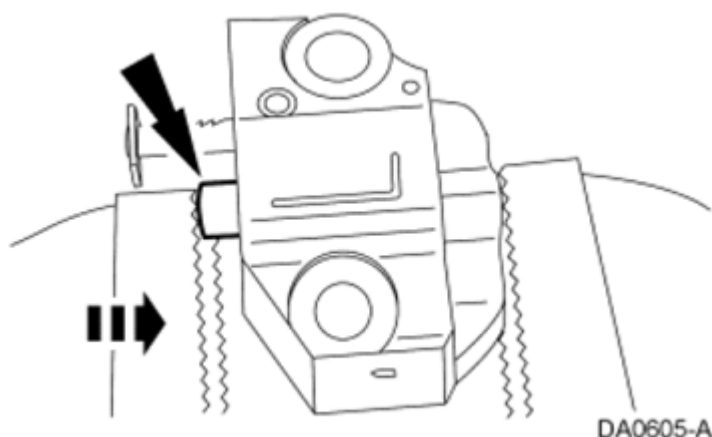
#### Installation

#### Engines with ratcheting timing chain tensioners

**NOTE:** Timing chain procedure must be followed exactly or damage to valves and pistons will result.

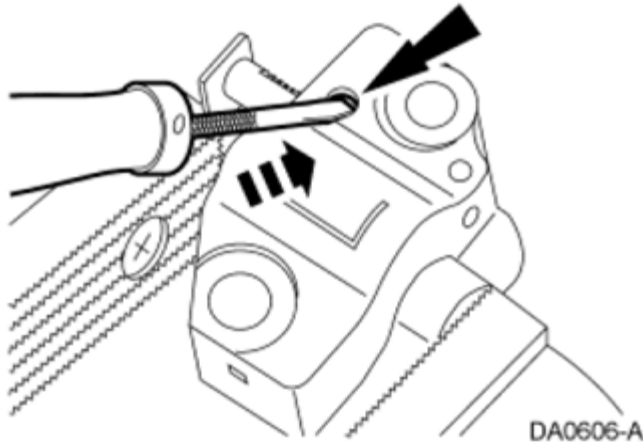
**NOTE:** Do not compress the ratchet assembly. This will damage the ratchet assembly.

**NOTE:** LH shown in illustration, RH similar.



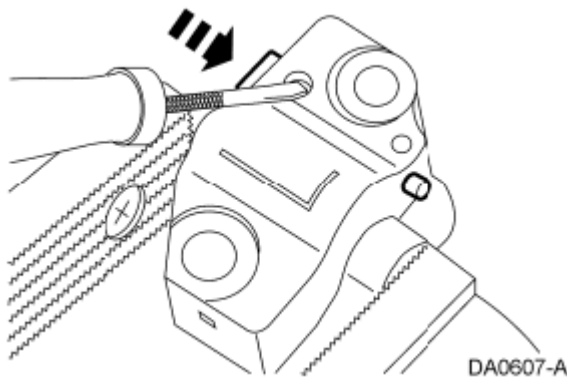
**Fig. 49: Locating Tensioner Plunger**  
Courtesy of FORD MOTOR CO.

1. Compress each tensioner plunger, using an edge of a vise.
2. Using a small screwdriver or pick, push back and hold the ratchet mechanism.



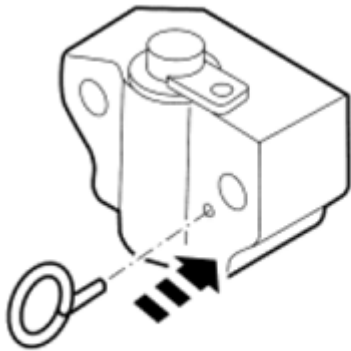
**Fig. 50: Holding Ratchet Mechanism Using Small Screwdriver Or Pick**  
Courtesy of FORD MOTOR CO.

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



**Fig. 51: Pushing Ratchet Arm Back Into Tensioner Housing**  
Courtesy of FORD MOTOR CO.

4. Install a paper clip into the hole of each tensioner housing to hold the ratchet assembly and plunger in during installation.
  - Remove the tensioner from the vise.



A26917-A

**Fig. 52: Identifying Paper Clip Into Hole Of Tensioner Housing**  
Courtesy of FORD MOTOR CO.

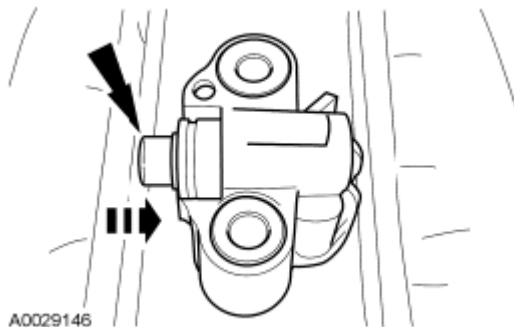
**Engines with non-ratcheting timing chain tensioners**

**NOTE:** If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

5. Inspect the RH and LH timing chain tensioners.
  - Install new tensioners as necessary.

**NOTE:** The timing chain procedure must be followed exactly or damage to valves and pistons will result.

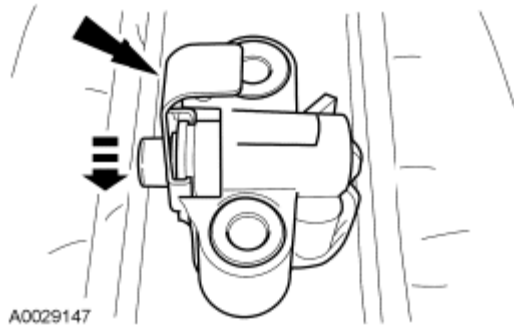
**NOTE:** LH shown in illustration, RH similar.



**Fig. 53: Locating Tensioner Plunger**  
Courtesy of FORD MOTOR CO.

6. Compress each tensioner plunger, using a vise.

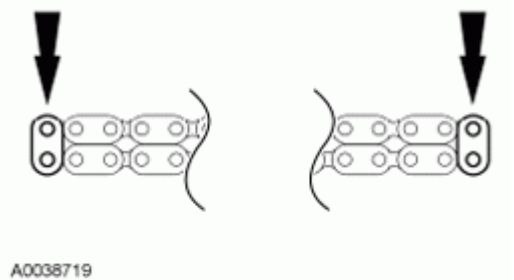
7. Install a Hydraulic Chain Tensioner Retaining Clip on each tensioner to hold the plunger in during installation.



**Fig. 54: Identifying Hydraulic Chain Tensioner Retaining Clip On Tensioner**  
Courtesy of FORD MOTOR CO.

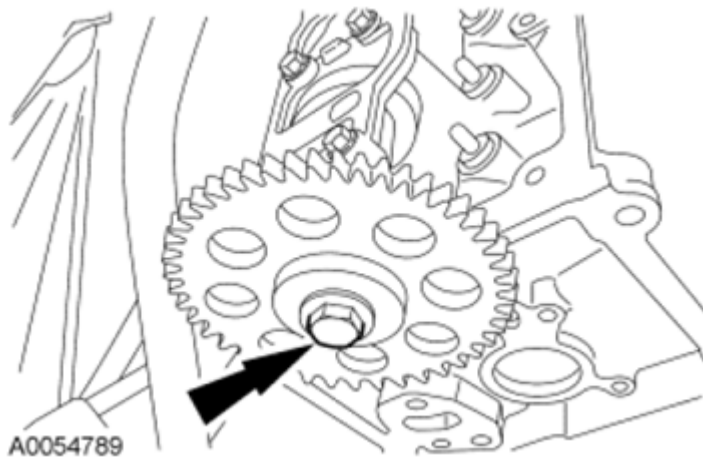
**All engines**

8. If the colored links are not visible, mark one link on one end and one link on the other end, and use as timing marks.



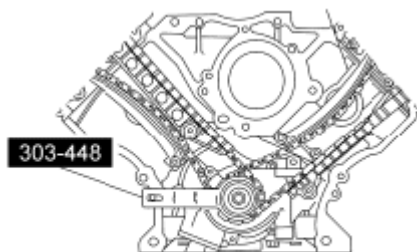
**Fig. 55: Locating Colored Links**  
Courtesy of FORD MOTOR CO.

9. Install the camshaft sprockets and new bolts. Tighten the bolts in 2 stages.
  - Stage 1: Tighten to 40 Nm (30 lb-ft).
  - Stage 2: Tighten an additional 90 degrees (one-fourth turn).



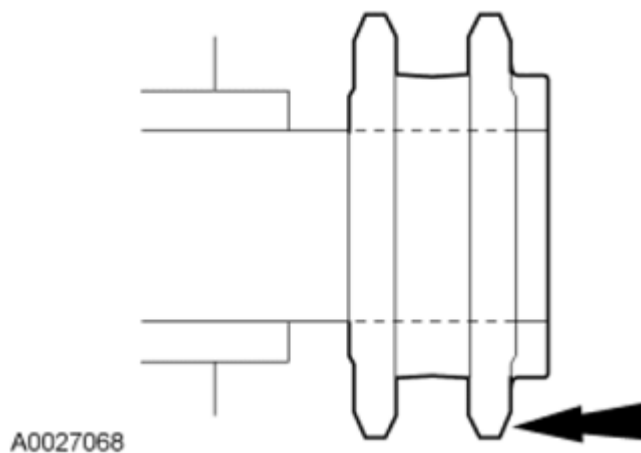
**Fig. 56: Locating Bolt And Camshaft Gear**  
Courtesy of FORD MOTOR CO.

10. Using the Crankshaft Holding Tool, position the crankshaft so the No. 1 cylinder is at Top Dead Center (TDC).



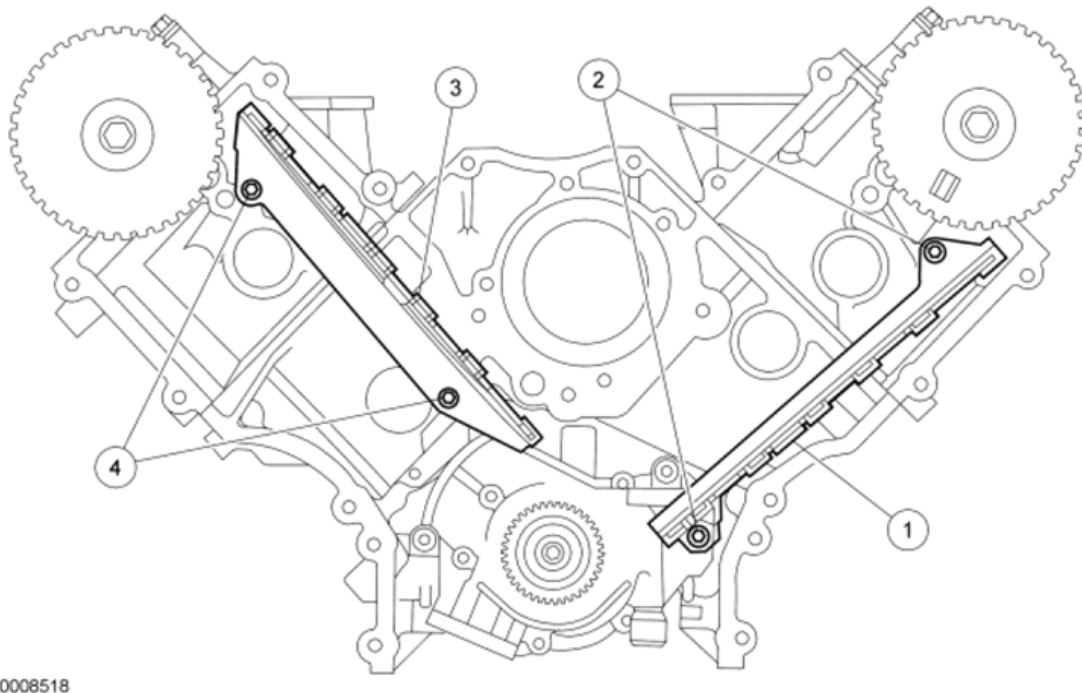
**Fig. 57: Identifying Crankshaft Holding Tool (303-448)**  
Courtesy of FORD MOTOR CO.

11. Install the crankshaft sprocket, making sure the flange faces forward.



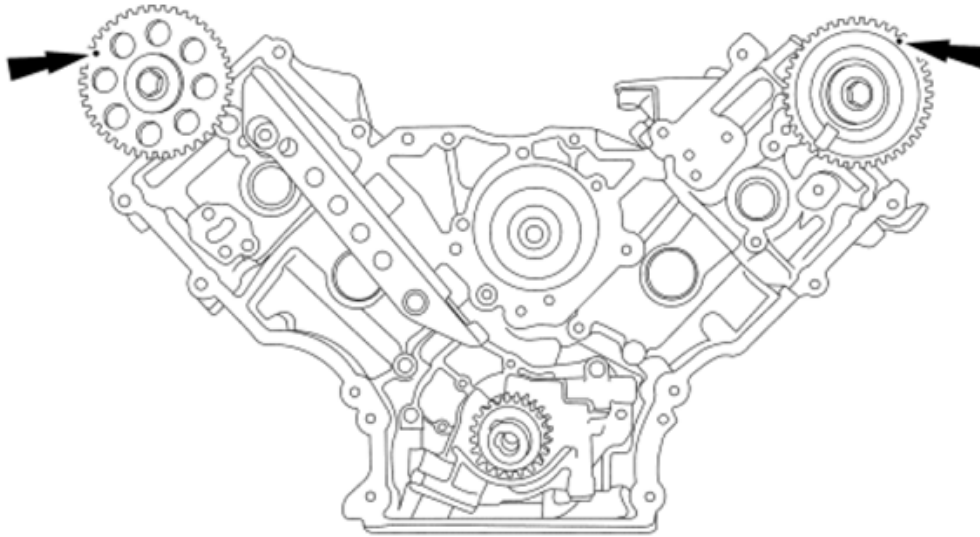
**Fig. 58: Locating Crankshaft Sprocket**  
Courtesy of FORD MOTOR CO.

12. Install the timing chain guide.
  1. Position the LH timing chain guide.
  2. Install and tighten the LH bolts to 10 Nm (89 lb-in).
  3. Position the RH timing chain guide.
  4. Install and tighten the RH bolts to 10 Nm (89 lb-in).



**Fig. 59: Identifying Timing Chain Guide And Bolts**  
Courtesy of FORD MOTOR CO.

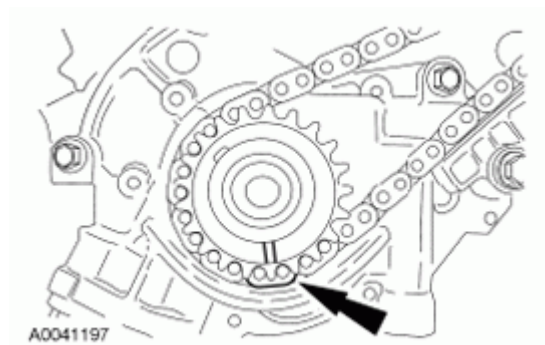
13. Rotate the RH camshaft sprocket until the timing mark is approximately at the 11 o'clock position. Rotate the LH camshaft sprocket until the timing mark is approximately at the 1 o'clock position.



N0071884

**Fig. 60: Locating Timing Marks On Camshaft Sprocket**  
Courtesy of FORD MOTOR CO.

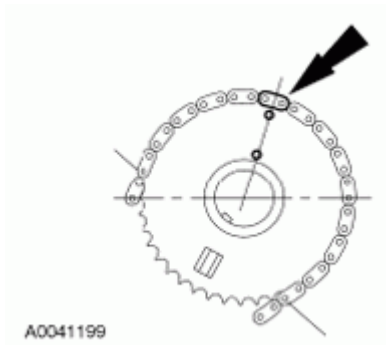
14. Position the LH (inner) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



A0041197

**Fig. 61: Locating Colored (Marked) Link**  
Courtesy of FORD MOTOR CO.

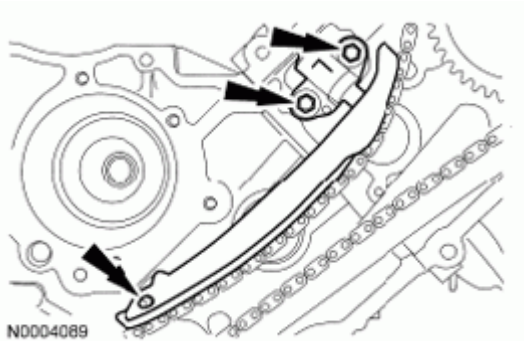
15. Install the LH timing chain on the sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



**Fig. 62: Locating Colored (Marked) Link With Timing Marks On Sprocket**  
Courtesy of FORD MOTOR CO.

**NOTE:** The LH timing chain tensioner arm has a bump near the dowel hole for identification.

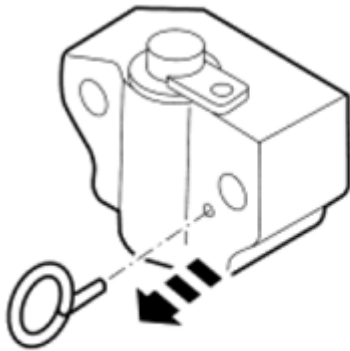
16. Position the LH timing chain tensioner arm on the dowel pin and install the LH timing chain tensioner.
  - Tighten to 25 Nm (18 lb-ft).



**Fig. 63: Locating LH Timing Chain Tensioner Arm**  
Courtesy of FORD MOTOR CO.

#### **Engines with ratcheting timing chain tensioners**

17. Remove the paper clip from the LH timing chain tensioner.

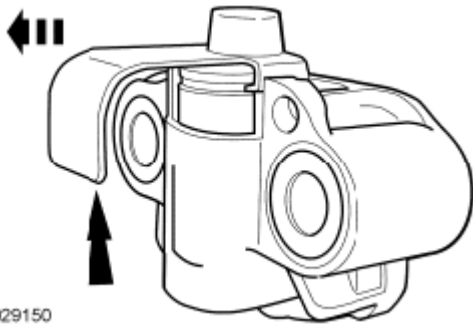


A26273-A

**Fig. 64: Removing Paper Clip From LH Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

**Engines with non-ratcheting timing chain tensioners**

18. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.

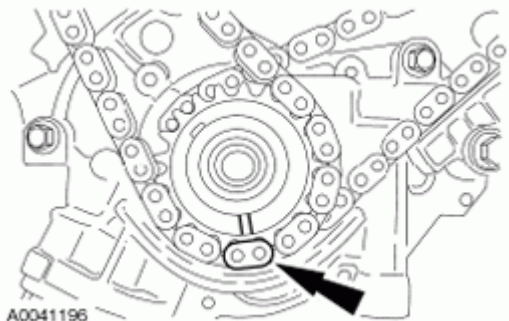


A0029150

**Fig. 65: Locating Hydraulic Chain Tensioner Retaining Clip**  
Courtesy of FORD MOTOR CO.

**All engines**

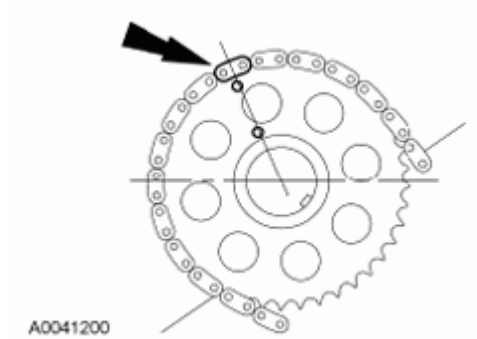
19. Position the RH (outer) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



A0041196

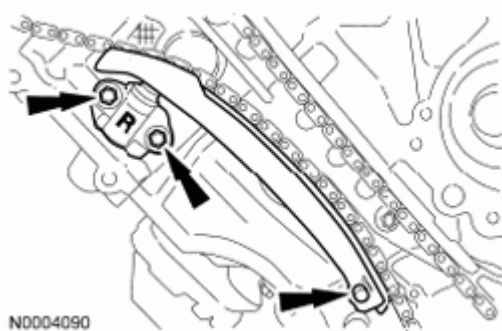
**Fig. 66: Locating Colored (Marked) Link**  
Courtesy of FORD MOTOR CO.

20. Install the RH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



**Fig. 67: Locating Colored (Marked) Link With Timing Marks On Sprocket**  
Courtesy of FORD MOTOR CO.

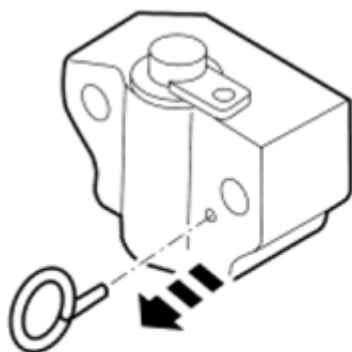
21. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner.
- Tighten to 25 Nm (18 lb-ft).



**Fig. 68: Locating RH Timing Chain Tensioner Arm**  
Courtesy of FORD MOTOR CO.

#### **Engines with ratcheting timing chain tensioners**

22. Remove the paper clip from the RH timing chain tensioner.

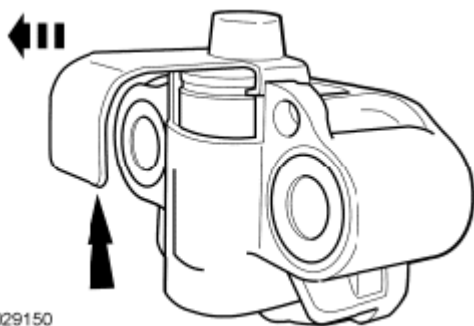


A26273-A

**Fig. 69: Removing Paper Clip From RH Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

**Engines with non-ratcheting timing chain tensioners**

23. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.

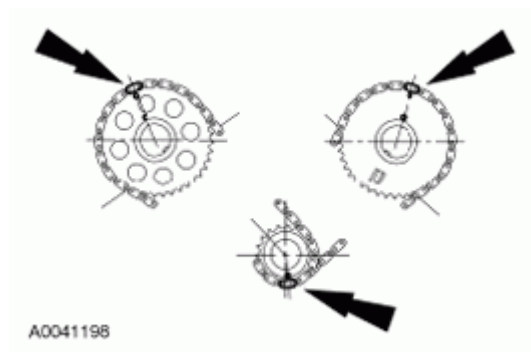


A0029150

**Fig. 70: Locating Hydraulic Chain Tensioner Retaining Clip**  
Courtesy of FORD MOTOR CO.

**All engines**

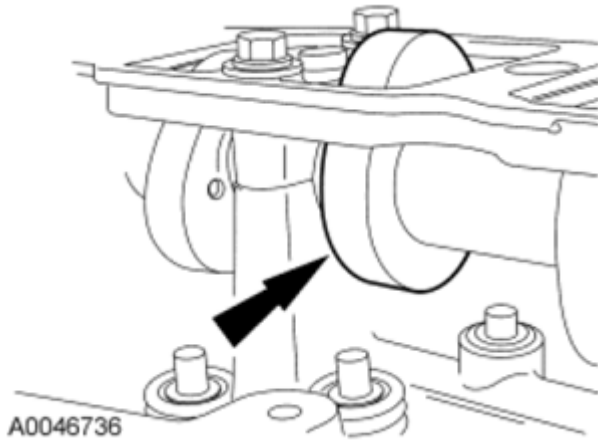
24. Make sure that the colored (marked) chain links are lined up with the dots on the crankshaft sprocket and the camshaft sprockets.



A0041198

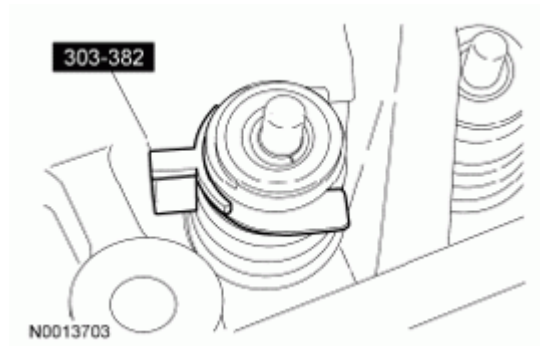
**Fig. 71: Locating Colored (Marked) Chain Links**  
Courtesy of FORD MOTOR CO.

25. Rotate the camshaft until the lobe is in the up position.



**Fig. 72: Locating Camshaft Lobe**  
Courtesy of FORD MOTOR CO.

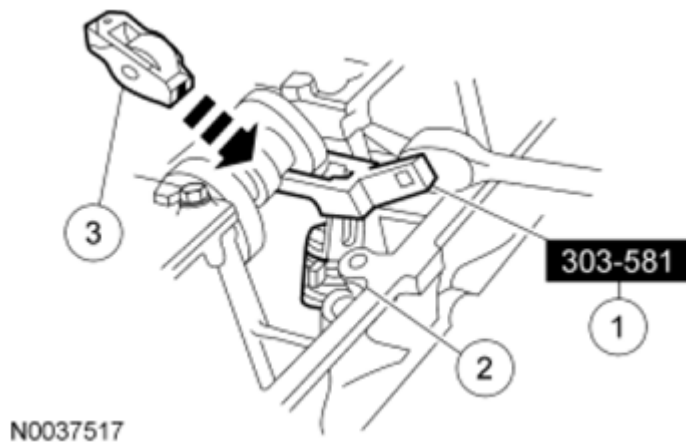
26. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



**Fig. 73: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the camshaft roller followers using clean engine oil.

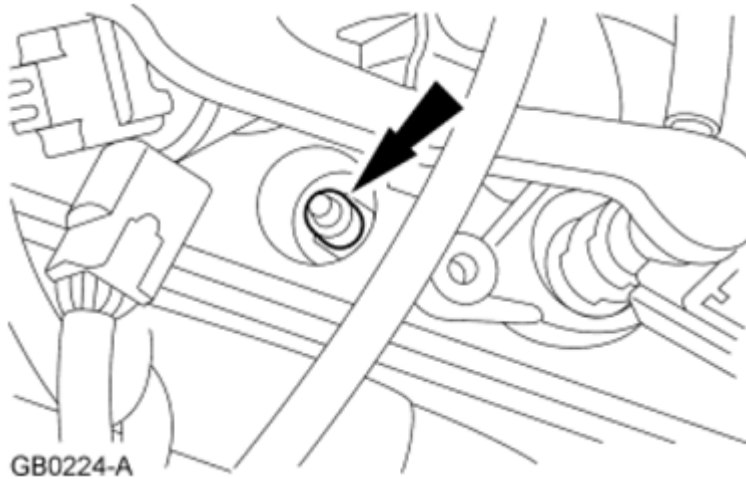
27. Install the camshaft roller followers.
1. Install the Valve Spring Compressor.
  2. Compress the valve spring.
  3. Install the camshaft roller followers in their original locations.



**Fig. 74: Installing Camshaft Roller Followers**  
Courtesy of FORD MOTOR CO.

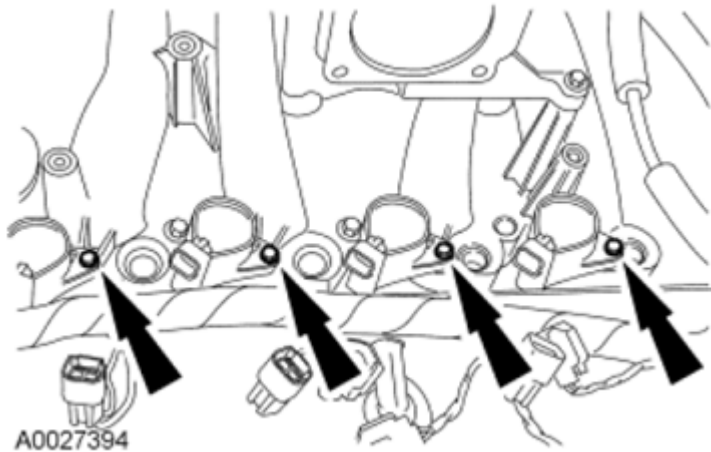
**NOTE:** Only use hand tools when removing or installing the spark plugs, damage may occur to the cylinder head or spark plug.

28. Install the 8 spark plugs.
- Tighten to 18 Nm (159 lb-in).



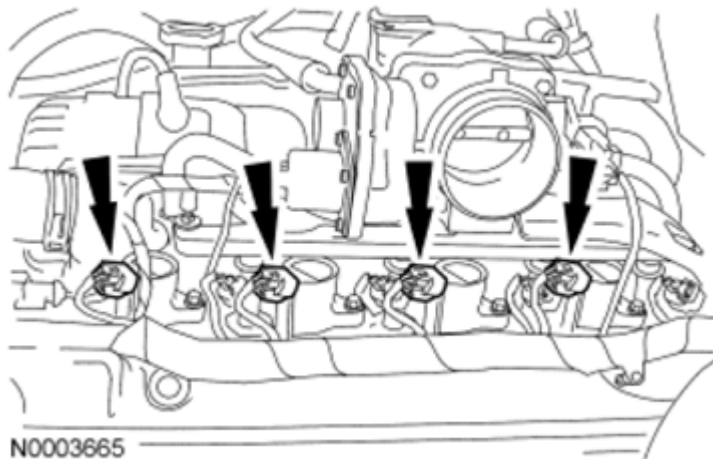
**Fig. 75: Locating Spark Plug**  
Courtesy of FORD MOTOR CO.

29. Install the 8 ignition coils and bolts (4 shown in illustration).
- Tighten to 6 Nm (53 lb-in).



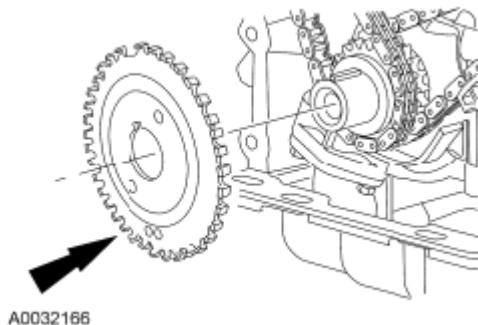
**Fig. 76: Locating Bolts And Ignition Coils**  
Courtesy of FORD MOTOR CO.

30. Connect the 8 ignition coil electrical connectors (4 shown in illustration).



**Fig. 77: Locating Ignition Coil Electrical Connectors**  
Courtesy of FORD MOTOR CO.

31. Install the crankshaft sensor ring on the crankshaft.



**Fig. 78: Locating Crankshaft Sensor Ring**  
Courtesy of FORD MOTOR CO.

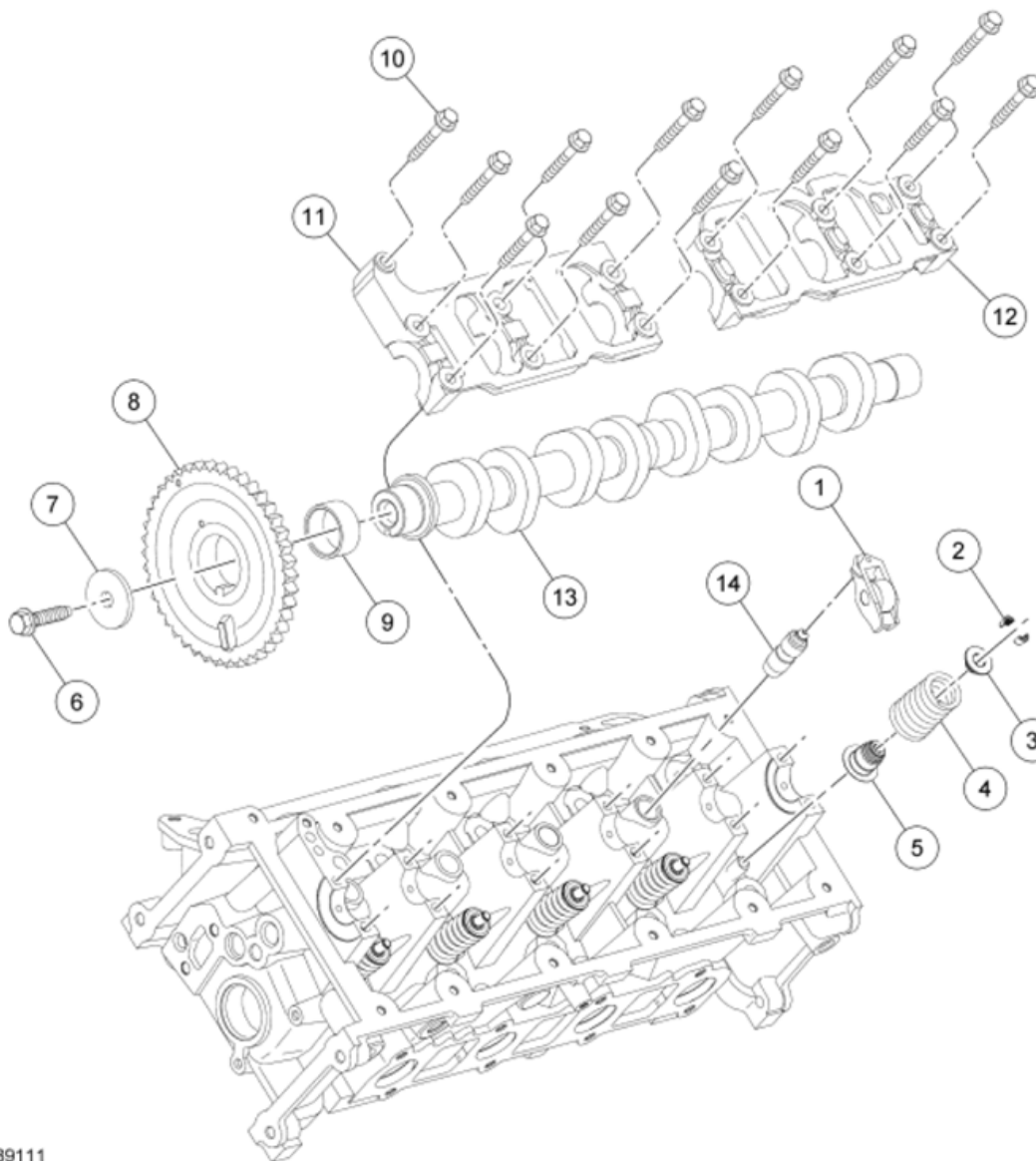
32. Install the engine front cover. For additional information, refer to **ENGINE FRONT COVER**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

33. If equipped with a fire suppression system, repower the system.

**VALVE TRAIN COMPONENTS - EXPLODED VIEW**

**NOTE:** LH shown in illustration, RH similar.



N0089111

**Fig. 79: Exploded View Of Valve Train Components**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                             |
|------|-------------|-----------------------------------------|
| 1    | 6529        | Camshaft roller follower (8 required)   |
| 2    | 6518        | Valve spring retainer key (16 required) |
| 3    | 6514        | Valve spring retainer (8 required)      |
| 4    | 6513        | Valve spring (8 required)               |
| 5    | 6A517       | Valve stem seal (8 required)            |
| 6    | N811085     | Camshaft sprocket bolt                  |
| 7    | N806164     | Camshaft sprocket bolt washer           |
| 8    | 6256        | Camshaft sprocket                       |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

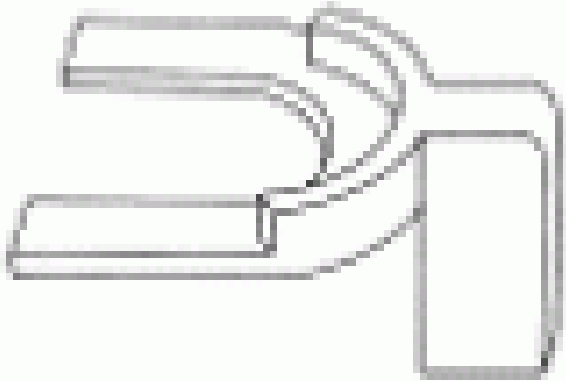
|    |         |                                                  |
|----|---------|--------------------------------------------------|
| 9  | 6265    | Camshaft gear spacer                             |
| 10 | N807352 | Camshaft bearing cap assembly bolt (13 required) |
| 11 | 6B280   | Camshaft bearing cap                             |
| 12 | 6B280   | Camshaft bearing cap                             |
| 13 | 6A274   | Camshaft                                         |
| 14 | 6C501   | Hydraulic lash adjuster (8 required)             |

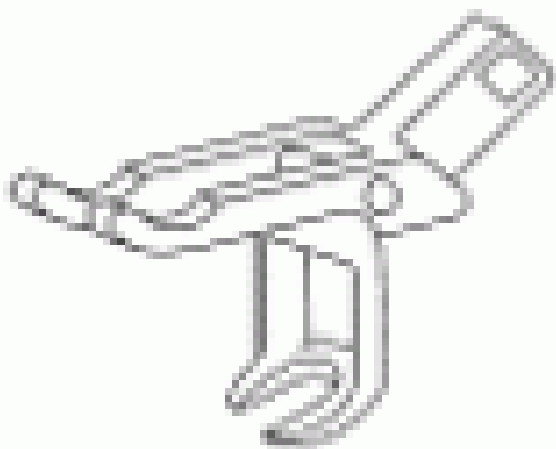
1. For additional information, refer to the appropriate procedure(s).

### VALVE SPRINGS

#### Special Tool(s)

#### SPECIAL TOOL CHART

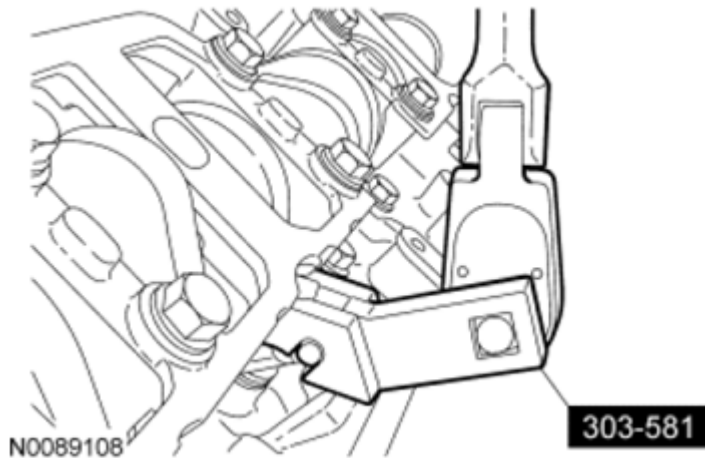
|                                                                                                       |                                                           |
|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <br><b>ST1331-A</b> | Compressor Spacer, Valve Spring<br>303-382 (T91P-6565-AH) |
|                                                                                                       | Compressor, Valve Spring<br>303-581 (T97T-6565-A)         |

**ST1330-A****Removal**

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.
3. Position the piston at the top of the stroke.
4. Remove the spark plugs. For additional information, refer to **ENGINE IGNITION - 4.6L (2V)** .
5. Install compressed air in the cylinder to hold both valves in position.

**NOTE:** If air pressure has forced the piston to the bottom of the cylinder, any loss of air pressure will allow the valve to fall into the cylinder. If air pressure must be removed, support the valve prior to removal or engine damage may occur.

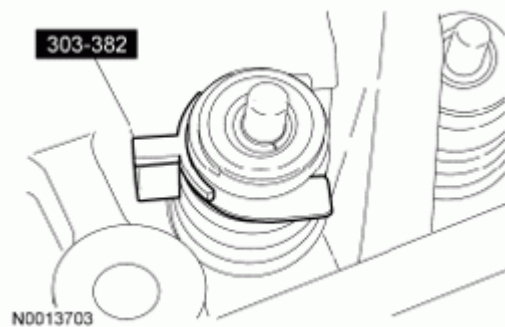


**Fig. 80: Identifying Valve Spring Compressor (303-581)**  
Courtesy of FORD MOTOR CO.

6. Using the Valve Spring Compressor, compress the valve springs.
7. Remove the valve spring retainer keys, the valve spring retainer and the valve spring.

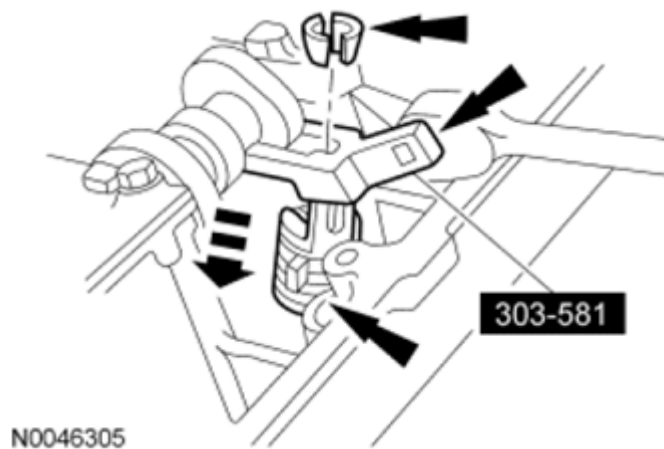
#### **Installation**

1. Position the valve spring and the valve spring retainer.
2. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



**Fig. 81: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

3. Using the Valve Spring Compressor, compress the valve spring. Install the valve spring retainer keys.



**Fig. 82: Compressing Valve Spring**  
Courtesy of FORD MOTOR CO.

4. Remove the Valve Spring Compressor and Valve Spring Compressor Spacer.
5. Install the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.
6. Install the spark plugs. For additional information, refer to **ENGINE IGNITION - 4.6L (2V)**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM**. Failure to follow these instructions may result in serious personal injury.

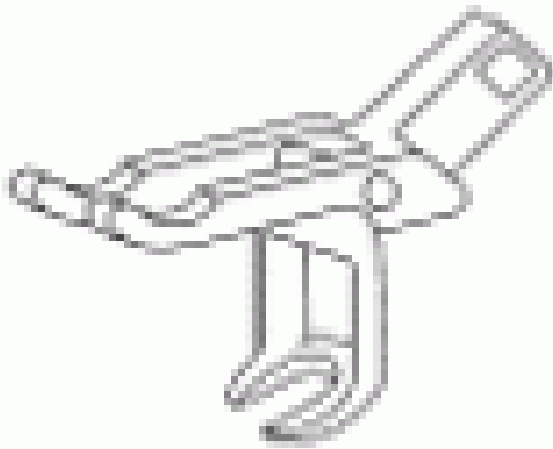
7. If equipped with a fire suppression system, repower the system.

## VALVE SEALS

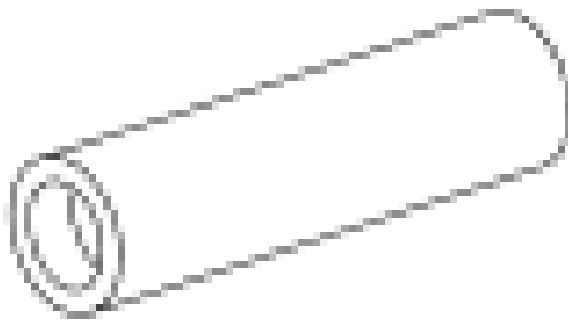
### Special Tool(s)

### SPECIAL TOOL CHART

|  |                                                   |
|--|---------------------------------------------------|
|  | Compressor, Valve Spring<br>303-581 (T97T-6565-A) |
|--|---------------------------------------------------|



ST1330-A



ST1332-A

Installer, Valve Stem Oil Seal  
303-383 (T91P-6571-A)

### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

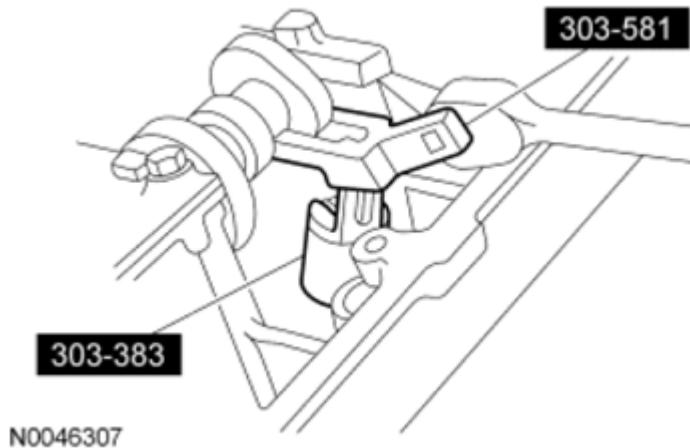
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the valve springs. For additional information, refer to **VALVE SPRINGS**.

3. Remove the valve stem seals.

**Installation**

**NOTE:** The valve stem seal must be bottomed on the valve seat.

**NOTE:** Make sure that the garter spring is present in the valve stem seal.



**Fig. 83: Identifying Valve Spring Compressor And Valve Stem Oil Seal Installer**  
Courtesy of FORD MOTOR CO.

1. Use the Valve Spring Compressor and Valve Stem Oil Seal Installer to install the valve stem seals.
2. Install the valve springs. For additional information, refer to VALVE SPRINGS.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to FIRE SUPPRESSION SYSTEM . Failure to follow these instructions may result in serious personal injury.

3. If equipped with a fire suppression system, repower the system.

**HYDRAULIC LASH ADJUSTER****Removal and Installation**

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in FIRE SUPPRESSION SYSTEM . Failure to follow the instructions may result in serious personal injury.

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

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

2. Remove the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.
3. Remove the hydraulic lash adjusters.

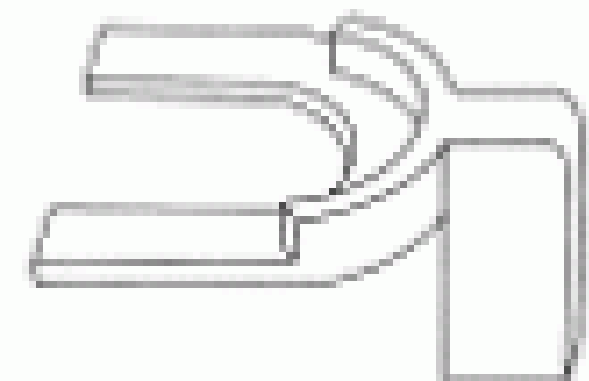
**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

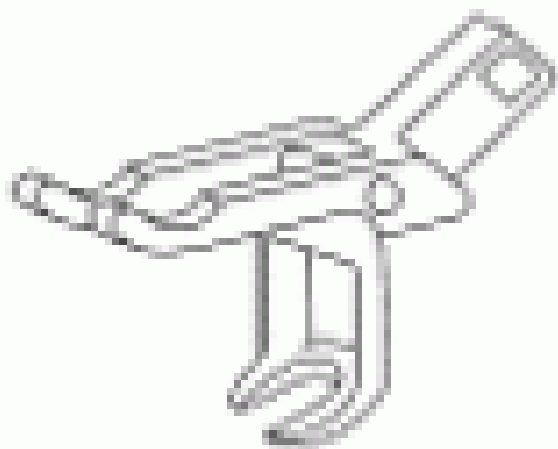
4. To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

### CAMSHAFT ROLLER FOLLOWER

#### Special Tool(s)

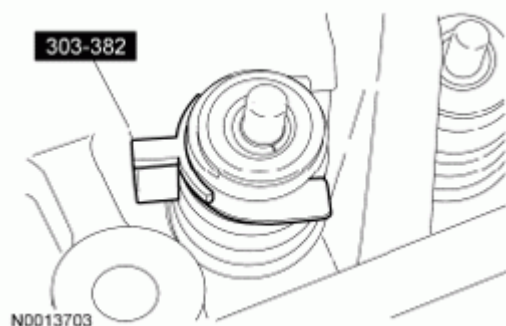
#### SPECIAL TOOL CHART

|                                                                                                |                                                           |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| <br>ST1331-A | Compressor Spacer, Valve Spring<br>303-382 (T91P-6565-AH) |
|                                                                                                | Compressor, Valve Spring<br>303-581 (T97T-6565-A)         |

**ST1330-A****Removal**

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

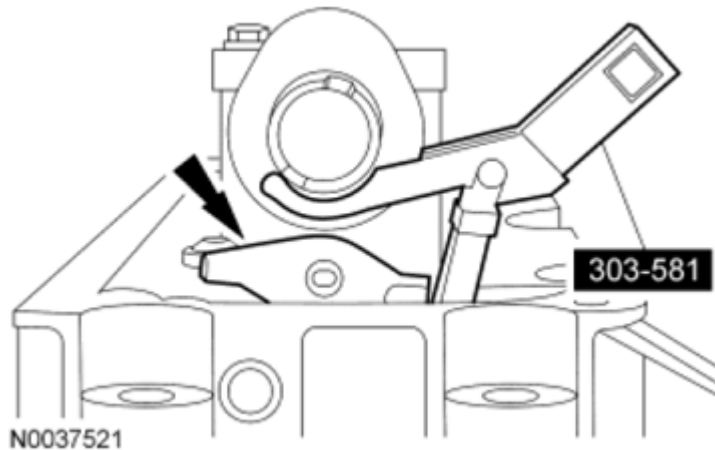
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the valve covers. For additional information, refer to **VALVE COVER - RH** or **VALVE COVER - LH**.
3. Position the piston of the cylinder being repaired at the bottom of the stroke.
4. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



**Fig. 84: Identifying Valve Spring Compressor Spacer (303-382)**

**Courtesy of FORD MOTOR CO.**

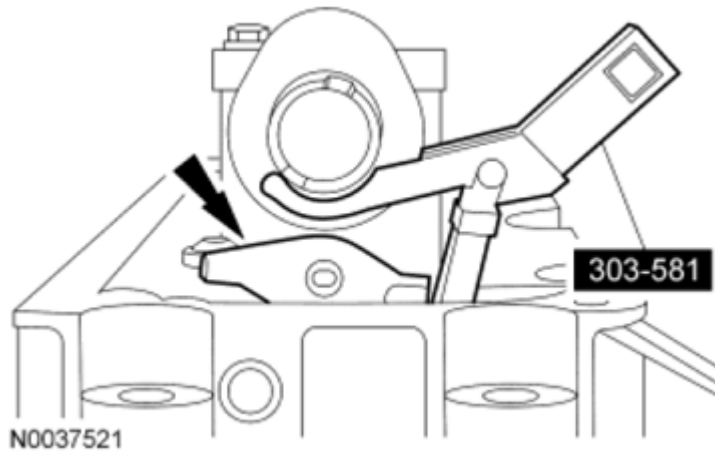
5. Using the Valve Spring Compressor, compress the valve springs and remove the camshaft roller followers.



**Fig. 85: Identifying Valve Spring Compressor (303-581)**  
**Courtesy of FORD MOTOR CO.**

#### **Installation**

1. Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller followers.



**Fig. 86: Identifying Valve Spring Compressor (303-581)**  
**Courtesy of FORD MOTOR CO.**

2. Remove the Valve Spring Compressor from between the valve spring.



**Fig. 87: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

3. Install the valve covers. For additional information, refer to VALVE COVER - RH or VALVE COVER - LH.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to FIRE SUPPRESSION SYSTEM . Failure to follow these instructions may result in serious personal injury.

4. If equipped with a fire suppression system, repower the system.

## CAMSHAFT

### Material

### MATERIAL SPECIFICATIONS

| 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

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in FIRE SUPPRESSION SYSTEM . Failure to follow the instructions may result in serious personal injury.

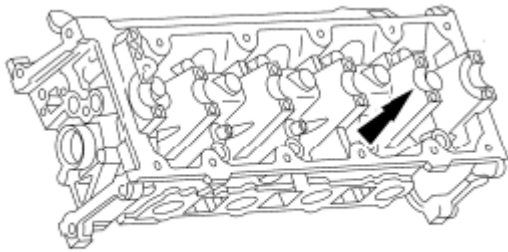
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to JACKING & LIFTING .

**NOTE:** At no time, when the timing chains are removed and the cylinder heads are installed, may the crankshaft or camshaft be rotated. Severe piston and valve damage will occur.

2. Remove the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.
3. Remove the timing chain. For additional information, refer to **TIMING DRIVE COMPONENTS**.
4. Remove the bolt and the camshaft sprocket and spacer.
5. Remove the 13 camshaft bearing cap bolts.
6. Remove the camshaft bearing cap.
7. Remove the camshaft from the cylinder head.

**Installation**

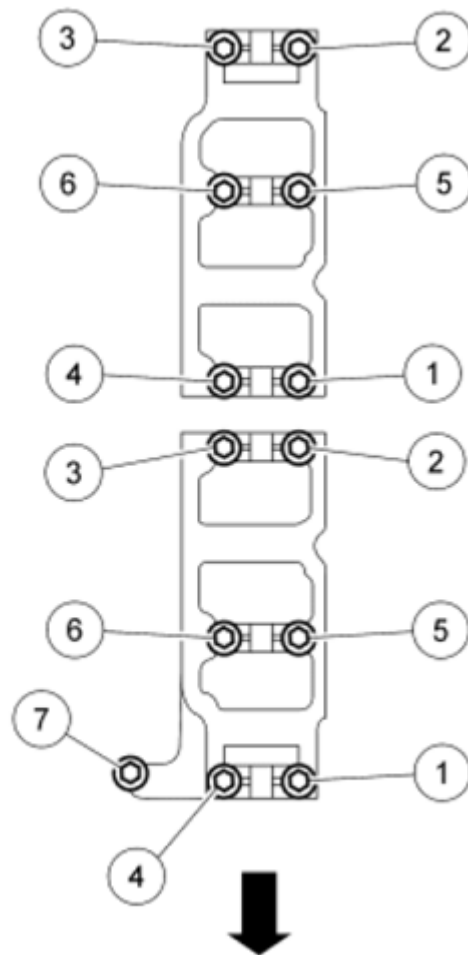
1. Lubricate the camshaft journals with clean engine oil.



GA0983-A

**Fig. 88: Locating Camshaft Journals**  
Courtesy of FORD MOTOR CO.

2. Install the camshaft onto the cylinder head.
3. Lubricate the camshaft bearing cap with clean engine oil.
4. Install the camshaft bearing caps and loosely install the bolts.
5. Tighten the bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



N0089110

**Fig. 89: Identifying Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

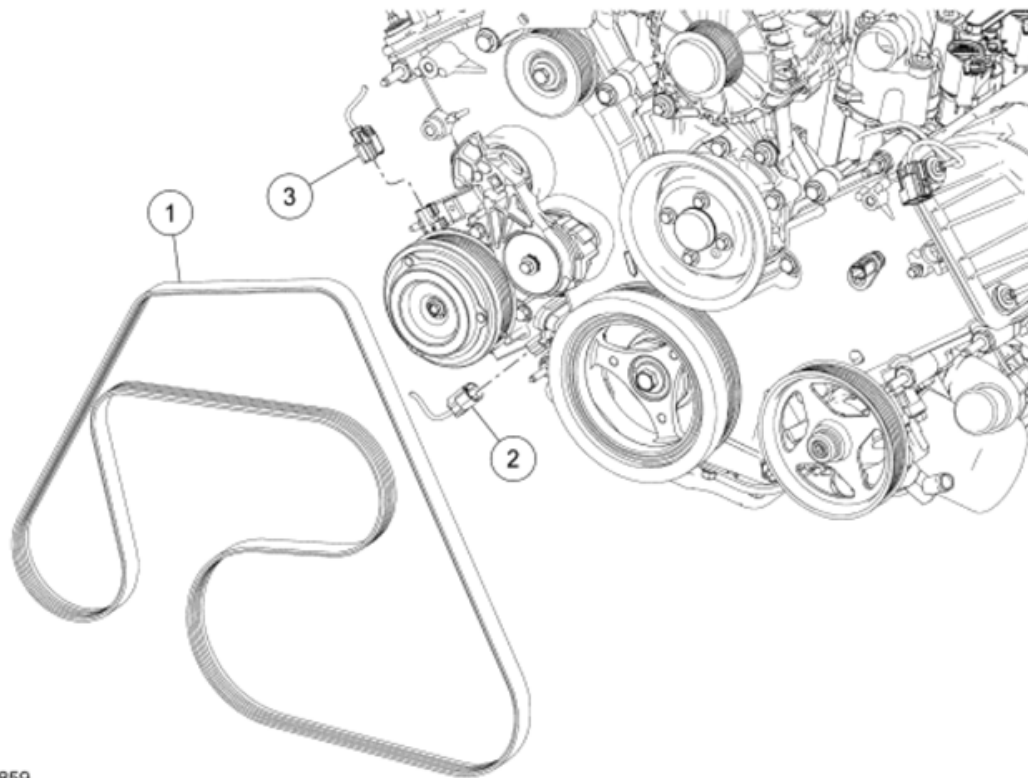
6. Install the camshaft sprocket and bolt. Tighten the bolt in 2 stages.
  - Stage 1: Tighten to 40 Nm (30 lb-ft).
  - Stage 2: Tighten an additional 90 degrees (one-fourth turn).
7. Install the timing chains. For additional information, refer to **TIMING DRIVE COMPONENTS**.
8. Install the roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

9. If equipped with a fire suppression system, repower the system.

## EXHAUST MANIFOLD - RH

Exhaust Manifold - RH (View 1 of 3)



N0037859

**Fig. 90: Identifying Exhaust Manifold Components - RH**  
Courtesy of FORD MOTOR CO.

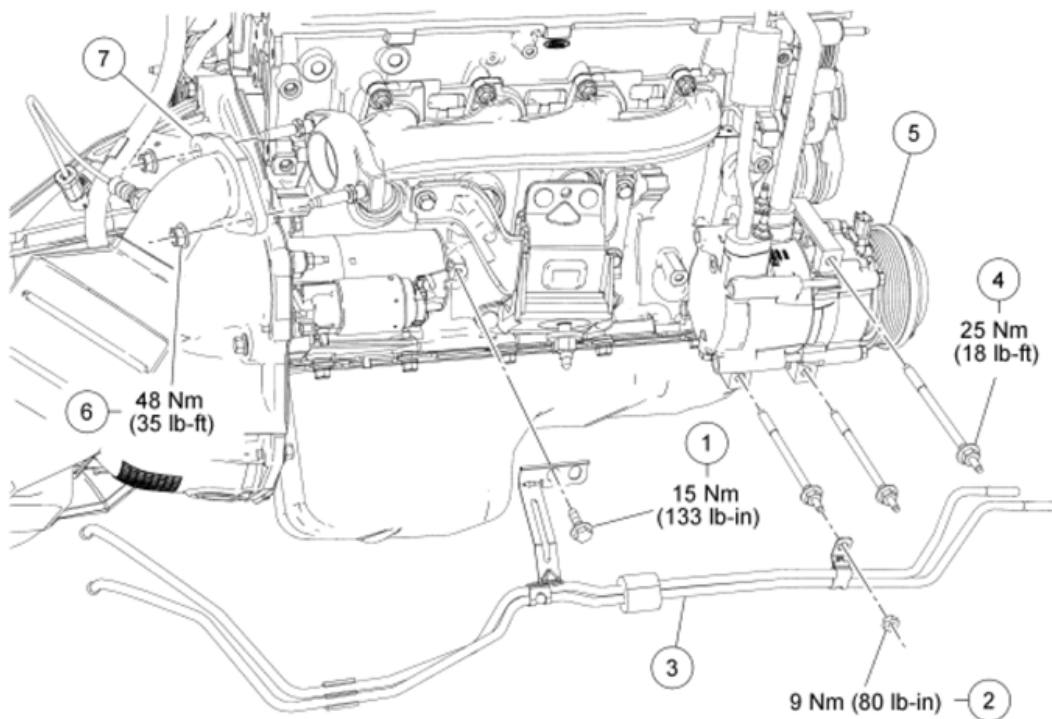
**ITEM DESCRIPTION**

| Item | Part Number | Description                                                            |
|------|-------------|------------------------------------------------------------------------|
| 1    | 8620        | Accessory drive belt                                                   |
| 2    | 14A464      | Crankshaft Position (CKP) sensor electrical connector (part of 12B637) |
| 3    | 14A464      | A/C compressor electrical connector (part of 12B637)                   |

Exhaust Manifold - RH (View 2 of 3)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



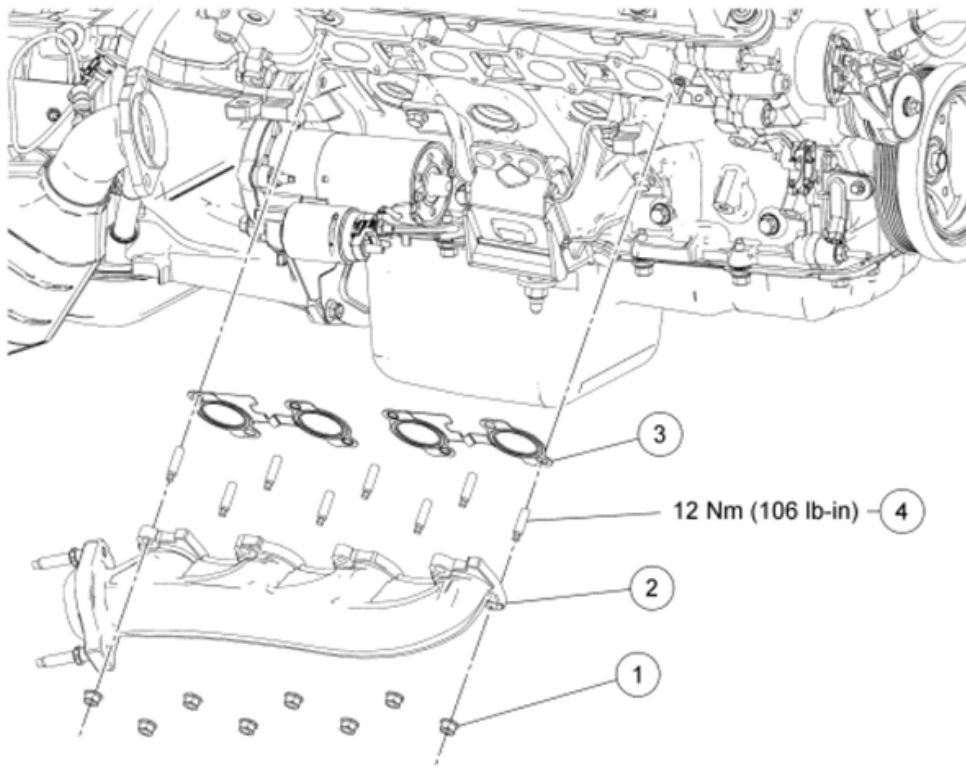
N0087528

**Fig. 91: Identifying Exhaust Manifold Components With Torque Specifications - RH**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description                                              |
|------|-------------|----------------------------------------------------------|
| 1    | N807218     | Transmission cooler tube bracket bolt                    |
| 2    | W705443     | Transmission cooler tube bracket nut                     |
| 3    | 7H420       | Transmission cooler tube assembly                        |
| 4    | W707821     | A/C compressor stud bolt (3 required)                    |
| 5    | 19D629      | A/C compressor                                           |
| 6    | N811485     | Catalytic converter-to-exhaust manifold nut (2 required) |
| 7    | 5F250       | Catalytic converter flange                               |

Exhaust Manifold - RH (View 3 of 3)



N0087529

**Fig. 92: Identifying Exhaust Manifold Components With Torque Specifications - RH**  
 Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                          |
|------|-------------|--------------------------------------|
| 1    | W701706     | Exhaust manifold nut (8 required)    |
| 2    | 9430        | Exhaust manifold                     |
| 3    | 9Y431       | Exhaust manifold gasket (2 required) |
| 4    | W707747     | Exhaust manifold stud (8 required)   |

#### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

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. Rotate the drive belt tensioner clockwise and remove the drive belt.

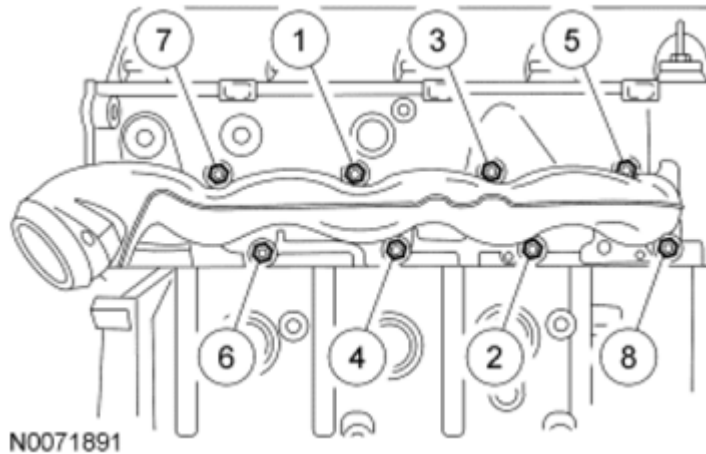


**Fig. 93: Rotating Drive Belt Tensioner Clockwise**  
Courtesy of FORD MOTOR CO.

4. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
5. Disconnect the A/C compressor electrical connector.
6. Remove the bolt from the transmission cooler tube bracket.
7. Remove the nut and position aside the transmission cooler tube assembly.
8. Remove the 3 bolts and position aside the A/C compressor.
9. Remove the catalytic converter-to-exhaust manifold nuts and position aside the catalytic converter flange.
  - Discard the nuts.
10. Remove the 8 nuts, the exhaust manifold and the gasket.
  - Discard the nuts and gasket.
11. Remove and discard the 8 exhaust manifold studs.
12. Clean and inspect the exhaust manifold for flatness. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

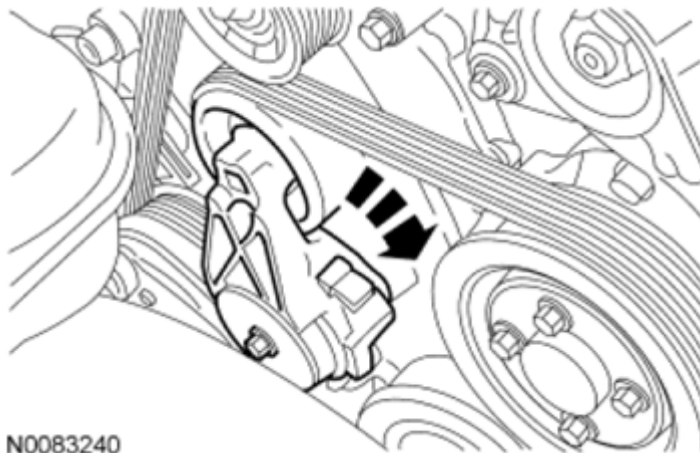
#### **Installation**

1. Install the 8 new exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
2. Install a new exhaust manifold gasket, the exhaust manifold and 8 new nuts.
  - Tighten in sequence shown in illustration to 20 Nm (177 lb-in).



**Fig. 94: Identifying Exhaust Manifold Nuts In Sequence**  
Courtesy of FORD MOTOR CO.

3. Position the catalytic converter flange and install the new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 48 Nm (35 lb-ft).
4. Position the A/C compressor and install the 3 bolts.
  - Tighten to 25 Nm (18 lb-ft).
5. Position the transmission cooler tube assembly and install the nut.
  - To install, tighten to 9 Nm (80 lb-in).
6. Install the transmission cooler tube bracket bolt.
  - To install, tighten to 15 Nm (133 lb-in).
7. Connect the A/C compressor electrical connector.
8. Connect the **CKP** sensor electrical connector.
9. Rotate the drive belt tensioner clockwise and install the drive belt.



**Fig. 95: Rotating Drive Belt Tensioner Clockwise**  
Courtesy of FORD MOTOR CO.

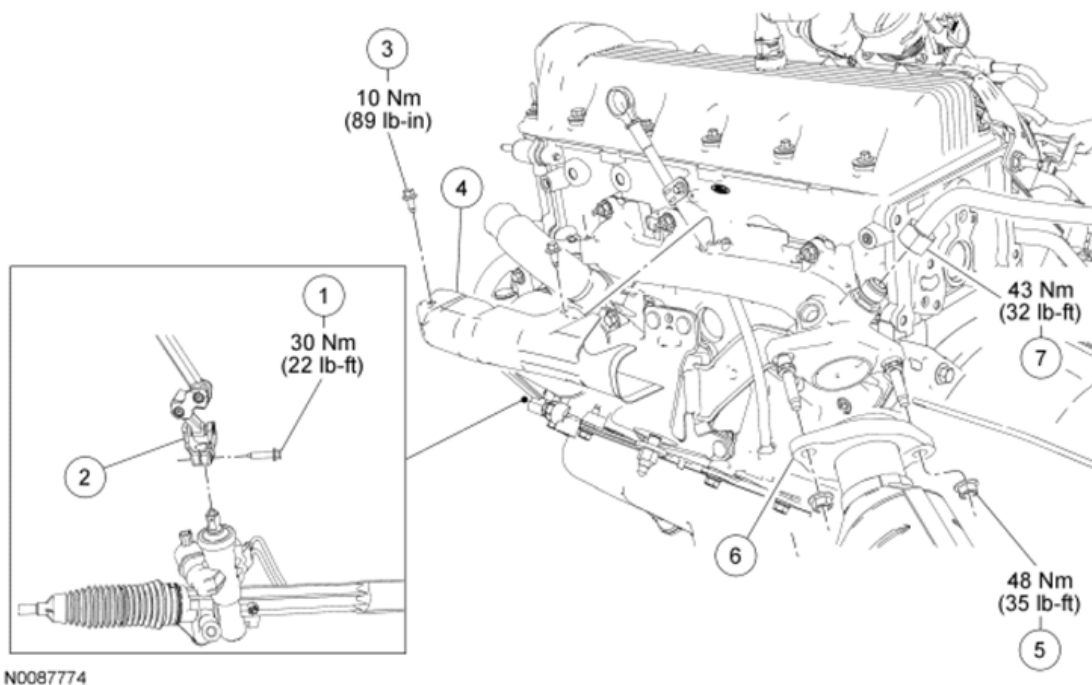
10. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM**. Failure to follow these instructions may result in serious personal injury.

11. If equipped with a fire suppression system, repower the system.

## EXHAUST MANIFOLD - LH

### Exhaust Manifold - LH (View 1 of 2)

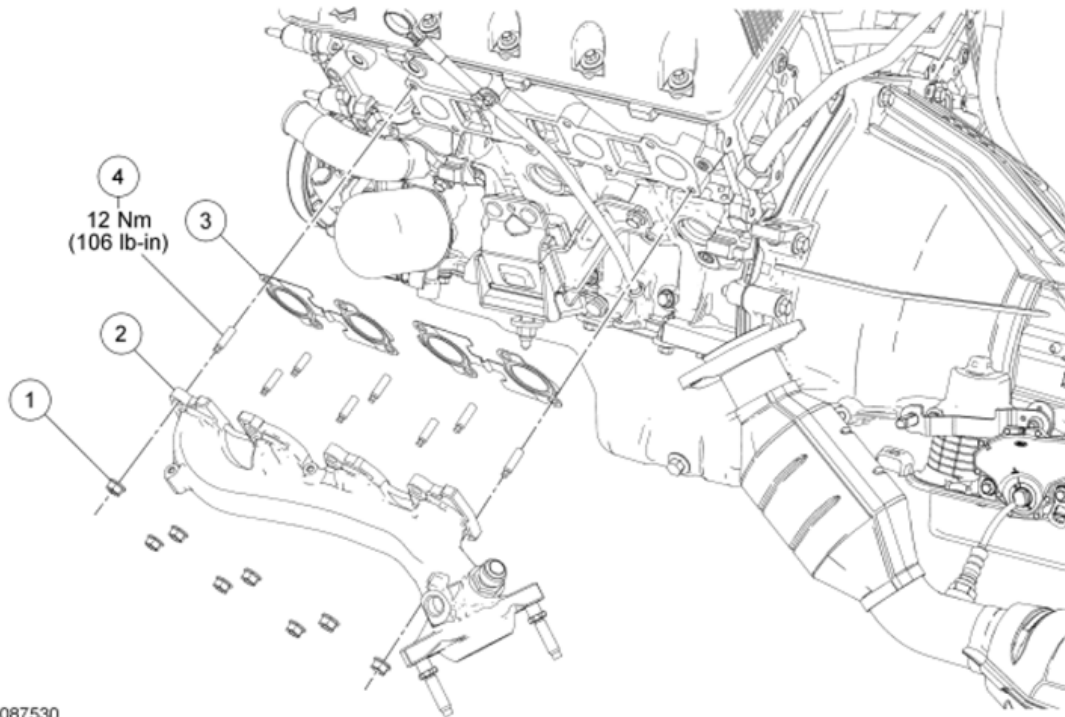


**Fig. 96: Identifying Exhaust Manifold Components With Torque Specifications - LH**  
Courtesy of FORD MOTOR CO.

## ITEM DESCRIPTION

| Item | Part Number | Description                                              |
|------|-------------|----------------------------------------------------------|
| 1    | W710821     | Intermediate steering shaft pinch bolt                   |
| 2    | 3C662       | Intermediate steering shaft                              |
| 3    | W707130     | Exhaust manifold heat shield bolt (2 required)           |
| 4    | 9Y427       | Exhaust manifold heat shield                             |
| 5    | N811485     | Catalytic converter-to-exhaust manifold nut (2 required) |
| 6    | 5F250       | Catalytic converter flange                               |
| 7    | 9D477       | EGR system module tube                                   |

Exhaust Manifold - LH (View 2 of 2)



N0087530

**Fig. 97: Identifying Exhaust Manifold Components With Torque Specifications - LH**  
Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

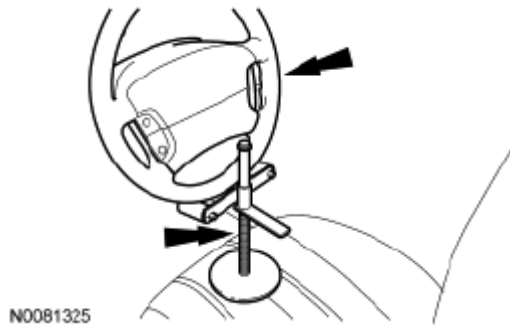
| Item | Part Number | Description                          |
|------|-------------|--------------------------------------|
| 1    | W701706     | Exhaust manifold nut (8 required)    |
| 2    | 9431        | Exhaust manifold                     |
| 3    | 9Y431       | Exhaust manifold gasket (2 required) |
| 4    | W707747     | Exhaust manifold stud (8 required)   |

**Removal**

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

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

**NOTE:** Use a steering wheel holding device (such as Hunter® 28-75-1 or equivalent).



**Fig. 98: Holding Steering Wheel**  
Courtesy of FORD MOTOR CO.

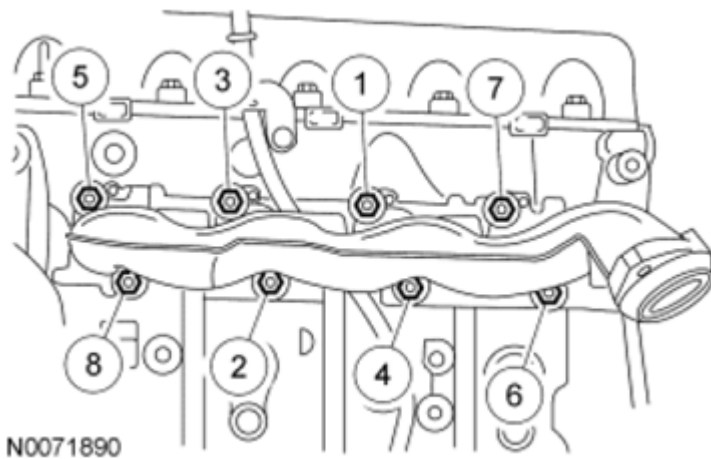
2. Using a suitable holding device, hold the steering wheel in the straight-ahead position.

**NOTE:** Do not allow the intermediate shaft to rotate while it is disconnected from the steering gear or damage to the clockspring may result. If there is evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to **SUPPLEMENTAL RESTRAINT SYSTEM** .

3. Remove the intermediated shaft pinch bolt and detach the intermediate shaft from the steering gear and position aside.
4. Remove the 2 exhaust manifold heat shield bolts and the shield.
5. Remove the 2 catalytic converter-to-exhaust manifold nuts and position aside the catalytic converter flange.
  - Discard the nuts.
6. Disconnect the EGR system module tube from the exhaust manifold.
7. Remove the LH Heated Oxygen Sensor (HO2S). For additional information, refer to **ELECTRONIC ENGINE CONTROLS** .
8. Remove the 8 nuts, the exhaust manifold and the gasket.
  - Discard the nuts and gasket.
9. Remove and discard the 8 exhaust manifold studs.
10. Clean and inspect the exhaust manifold for flatness. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

#### Installation

1. Install the 8 new exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
2. Install a new exhaust manifold gasket, the exhaust manifold and 8 new nuts.
  - Tighten in sequence shown in illustration to 20 Nm (177 lb-in).



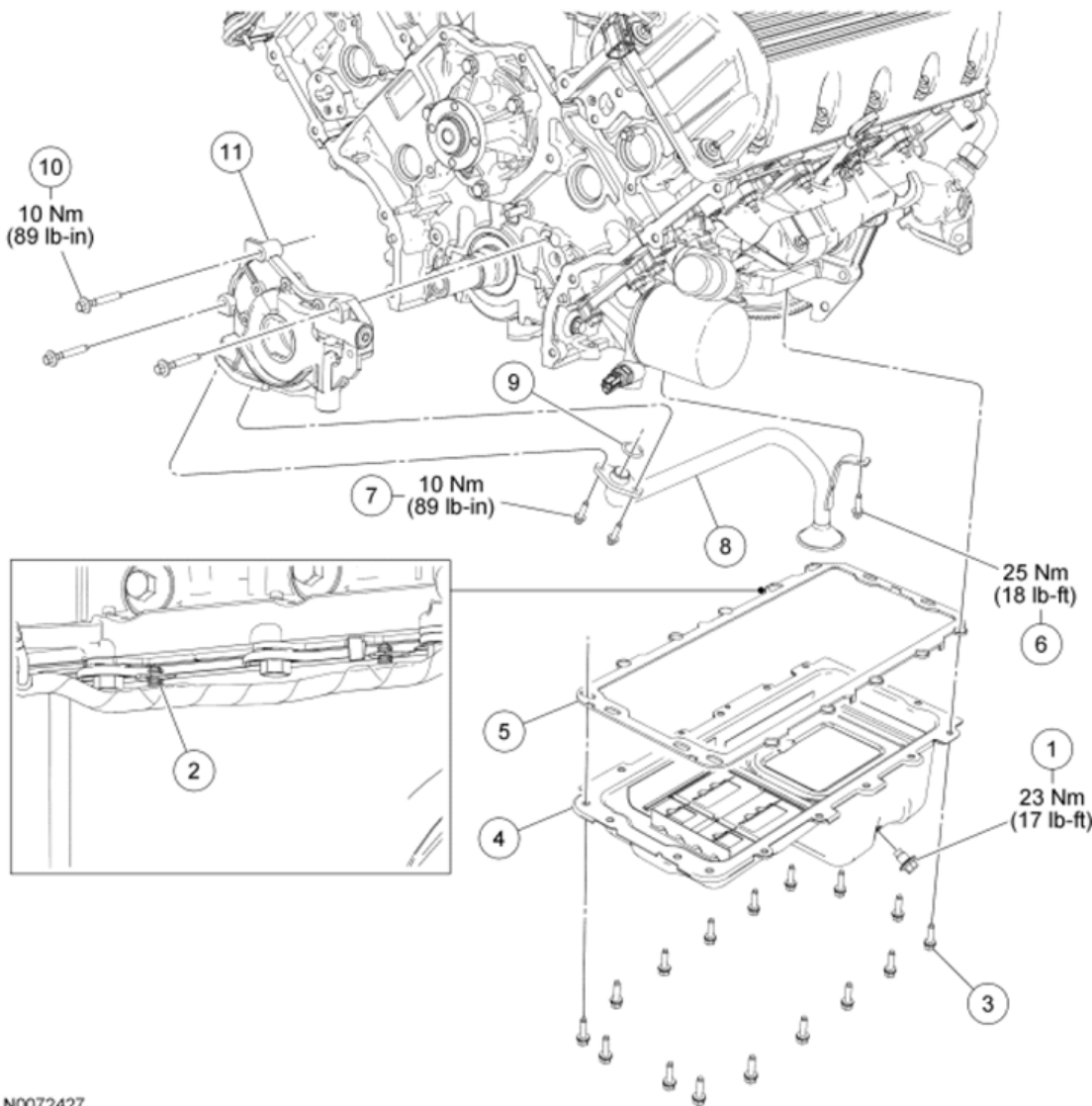
**Fig. 99: Identifying Exhaust Manifold Nuts In Sequence**  
Courtesy of FORD MOTOR CO.

3. Install the LH **HO2S** . For additional information, refer to **ELECTRONIC ENGINE CONTROLS** .
4. Connect the EGR system module tube to the exhaust manifold.
  - Tighten to 43 Nm (32 lb-ft).
5. Position the catalytic converter flange and install the new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 48 Nm (35 lb-ft).
6. Install the exhaust manifold heat shield and the 2 bolts.
  - Tighten to 10 Nm (89 lb-in).
7. Position the intermediate shaft on the steering gear and install the pinch bolt.
  - Tighten to 30 Nm (22 lb-ft).

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

8. If equipped with a fire suppression system, repower the system.

#### ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW, OIL PAN, OIL PUMP, OIL PUMP SCREEN AND PICKUP TUBE



N0072427

**Fig. 100: Identifying Oil Pan, Oil Pump, Oil Pump Screen And Pickup Tube Components With Torque Specifications**

Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                                                   |
|------|-------------|---------------------------------------------------------------|
| 1    | 6730        | Oil pan drain plug                                            |
| 2    | -           | Pin-type wire harness retainer (part of 12B637) (2 required)  |
| 3    | W701605     | Oil pan bolt (16 required)                                    |
| 4    | 6675        | Oil pan                                                       |
| 5    | 6710        | Oil pan gasket                                                |
| 6    | N605904     | Oil pump screen and pickup tube-to-spacer bolt                |
| 7    | N806155     | Oil pump screen and pickup tube-to-oil pump bolt (2 required) |
| 8    | 6622        | Oil pump screen and pickup tube                               |

**2010 Mercury Grand Marquis LS**

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

|    |         |                                      |
|----|---------|--------------------------------------|
| 9  | 6625    | Oil pump screen and tube O-ring seal |
| 10 | N806183 | Oil pump bolt (3 required)           |
| 11 | 6621    | Oil pump                             |

1. For additional information, refer to the appropriate procedure(s).

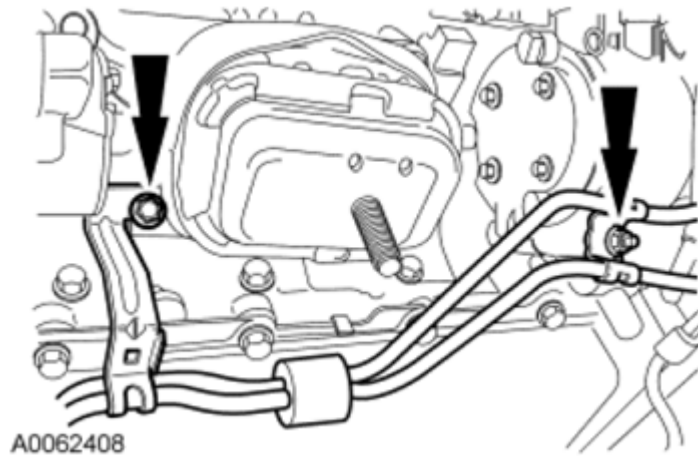
**OIL PAN****Material****MATERIAL SPECIFICATIONS**

| Item                                                                                                                                                                  | Specification     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Motorcraft® Metal Surface Prep<br>ZC-31-A                                                                                                                             | -                 |
| Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil<br>XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-<br>5W20-LSP12 (Canada); or equivalent | WSS-M2C930-<br>A  |
| Silicone Gasket and Sealant<br>TA-30                                                                                                                                  | WSE-M4G323-<br>A4 |
| Silicone Gasket Remover<br>ZC-30                                                                                                                                      | -                 |

**Removal**

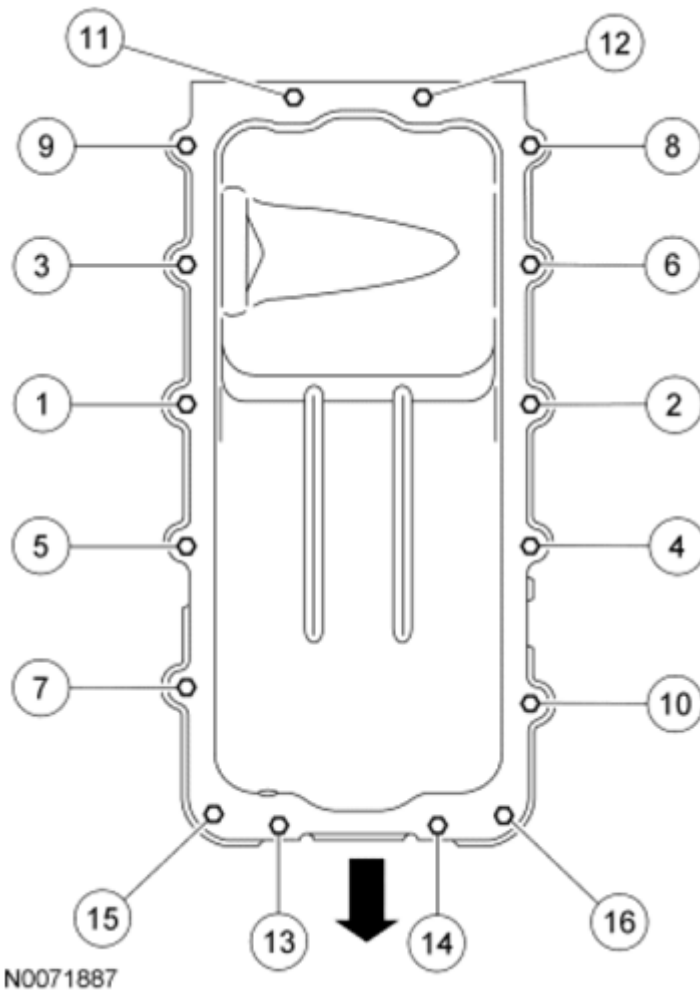
**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the front crossmember. For additional information, refer to **UNI-BODY, SUBFRAME AND MOUNTING SYSTEM** .
3. Remove the bolt and the nut. Position the transmission cooler tubes aside.



**Fig. 101: Locating Bolt And Nut**  
Courtesy of FORD MOTOR CO.

4. Drain the engine oil.
  - Install the drain plug when finished.
  - Tighten to 23 Nm (17 lb-ft).
5. Detach the 2 pin-type wire harness retainers.
6. Remove the oil pan bolts in the sequence shown in illustration.



**Fig. 102: Identifying Oil Pan Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

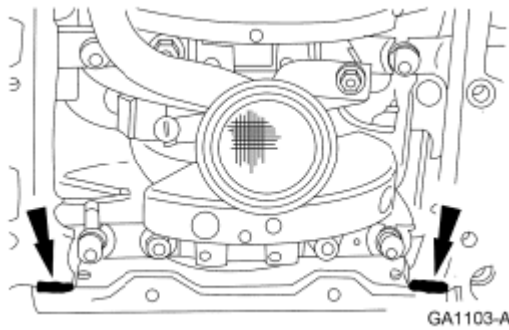
7. Remove the oil pan and the gasket.

#### Installation

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

1. Clean and inspect the mating surfaces.

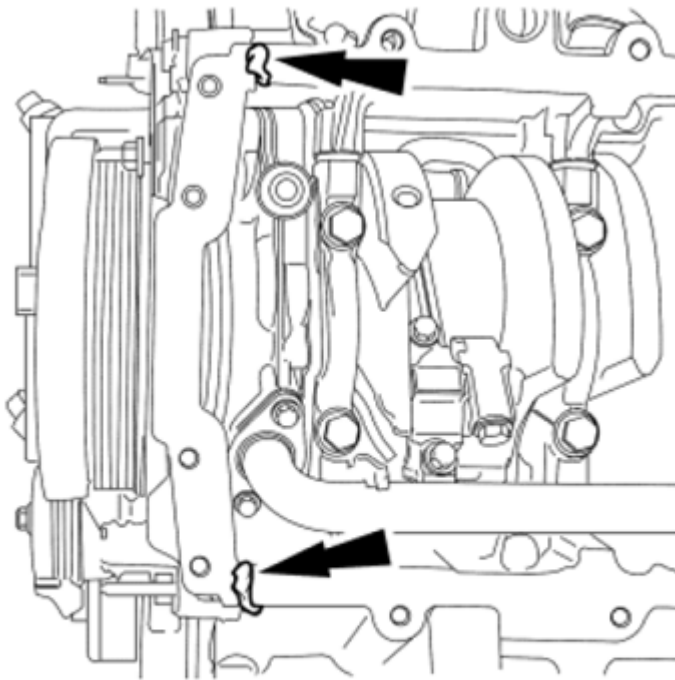
**NOTE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.



**Fig. 103: Locating Silicone Gasket And Sealant**  
Courtesy of FORD MOTOR CO.

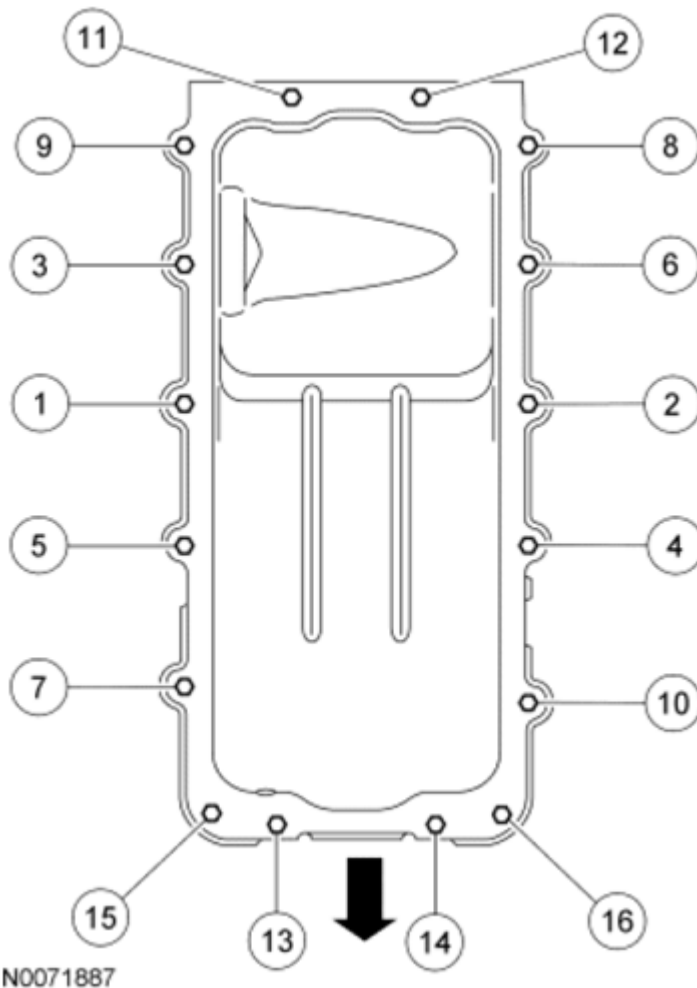
2. Apply silicone gasket and sealant at the rear seal retainer-to-cylinder block sealing surface.

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



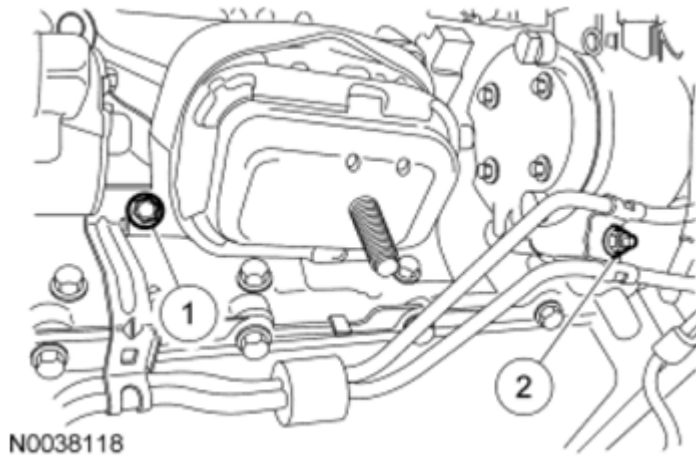
**Fig. 104: Locating Silicone Gasket And Sealant**  
Courtesy of FORD MOTOR CO.

3. Apply silicone gasket and sealant at the engine front cover-to-cylinder block mating surface.
4. Position the oil pan gasket and the oil pan.
5. Tighten the bolts in 2 stages, in the sequence shown in illustration.
  - Stage 1: Tighten to 20 Nm (177 lb-in).
  - Stage 2: Rotate an additional 60 degrees.



**Fig. 105: Identifying Oil Pan Bolts In Sequence**  
 Courtesy of FORD MOTOR CO.

6. Attach the 2 pin-type wire harness retainers.
7. Position the transmission cooler tubes and install the bolt and the nut.
  1. Tighten the bolt to 15 Nm (133 lb-in).
  2. Tighten the nut to 9 Nm (80 lb-in).



**Fig. 106: Identifying Bolt And Nut**  
Courtesy of FORD MOTOR CO.

8. Install the front crossmember. For additional information, refer to **UNI-BODY, SUBFRAME AND MOUNTING SYSTEM**.
9. Fill the engine with clean engine oil.
10. Start the engine and check for leaks.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM**. Failure to follow these instructions may result in serious personal injury.

11. If equipped with a fire suppression system, repower the system.

## OIL PUMP

### Material

### MATERIAL SPECIFICATIONS

| Item                                                                                                                                                           | Specification |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Motorcraft® Metal Surface Prep ZC-31-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  |

### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM**. Failure to follow the instructions may

**result in serious personal injury.**

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, OIL PAN, OIL PUMP, OIL PUMP SCREEN AND PICKUP TUBE** and **OIL PAN**.
3. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.
4. Remove the 3 bolts, the oil pump screen and pickup tube.
  - Discard the O-ring seal.
5. Remove the 3 bolts and the oil pump.

**Installation**

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

1. Clean the sealing surfaces with metal surface prep. Follow the directions on the packaging. Inspect the mating surfaces.
2. Position the oil pump and install the 3 bolts.
  - Tighten to 10 Nm (89 lb-in).

**NOTE:** Make sure the O-ring seal is in place and not damaged. A missing or damaged O-ring seal can cause foam in the lubrication system, low oil pressure and severe engine damage.

**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil prior to installation.

3. Position the oil pump screen and pickup tube and install the bolts.
  - Tighten the oil pump screen and pickup tube-to-oil pump bolts to 10 Nm (89 lb-in).
  - Tighten the oil pump screen and pickup tube-to-spacer bolt to 25 Nm (18 lb-ft).
4. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.
5. Install the oil pan. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW, OIL PAN, OIL PUMP, OIL PUMP SCREEN AND PICKUP TUBE** and **OIL PAN**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to

**FIRE SUPPRESSION SYSTEM . Failure to follow these instructions may result in serious personal injury.**

6. If equipped with a fire suppression system, repower the system.

## **OIL PUMP SCREEN AND PICKUP TUBE**

### **Material**

### **MATERIAL SPECIFICATIONS**

| 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**

**WARNING: Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in FIRE SUPPRESSION SYSTEM . Failure to follow the instructions may result in serious personal injury.**

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, OIL PAN, OIL PUMP, OIL PUMP SCREEN AND PICKUP TUBE** and **OIL PAN**.
3. Remove the 3 bolts, the oil pump screen and pickup tube.
  - Discard the O-ring seal.

### **Installation**

**NOTE:** Make sure the O-ring seal is in place and not damaged. A missing or damaged O-ring seal can cause foam in the lubrication system, low oil pressure and severe engine damage.

**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil prior to installation.

1. Position the oil pump screen and pickup tube and install the bolts.
  - Tighten the oil pump screen and pickup tube-to-oil pump bolts to 10 Nm (89 lb-in).
  - Tighten the oil pump screen and pickup tube-to-spacer bolt to 25 Nm (18 lb-ft).
2. Install the oil pan. For additional information, refer to **ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW, OIL PAN, OIL PUMP, OIL PUMP SCREEN AND PICKUP TUBE** and **OIL**

[PAN.](#)

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to FIRE SUPPRESSION SYSTEM . Failure to follow these instructions may result in serious personal injury.

3. If equipped with a fire suppression system, repower the system.

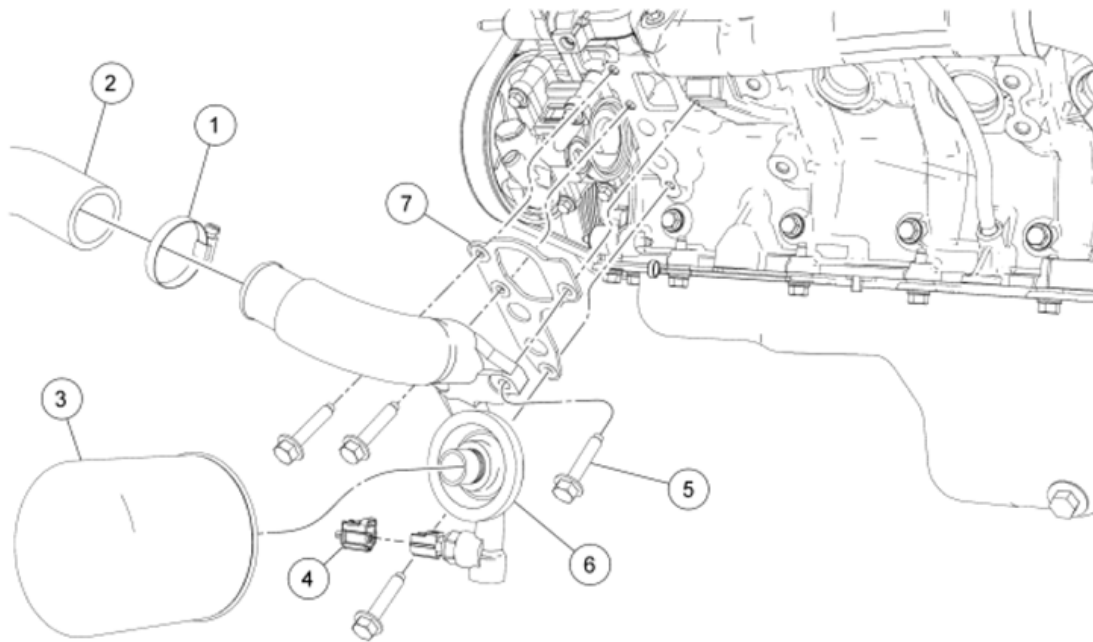
## OIL FILTER ADAPTER

### Material

### MATERIAL SPECIFICATIONS

| 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  |

### Oil Filter Adapter Without Oil Cooler



N0093722

**Fig. 107: Identifying Oil Filter Adapter Without Oil Cooler Components**  
Courtesy of FORD MOTOR CO.

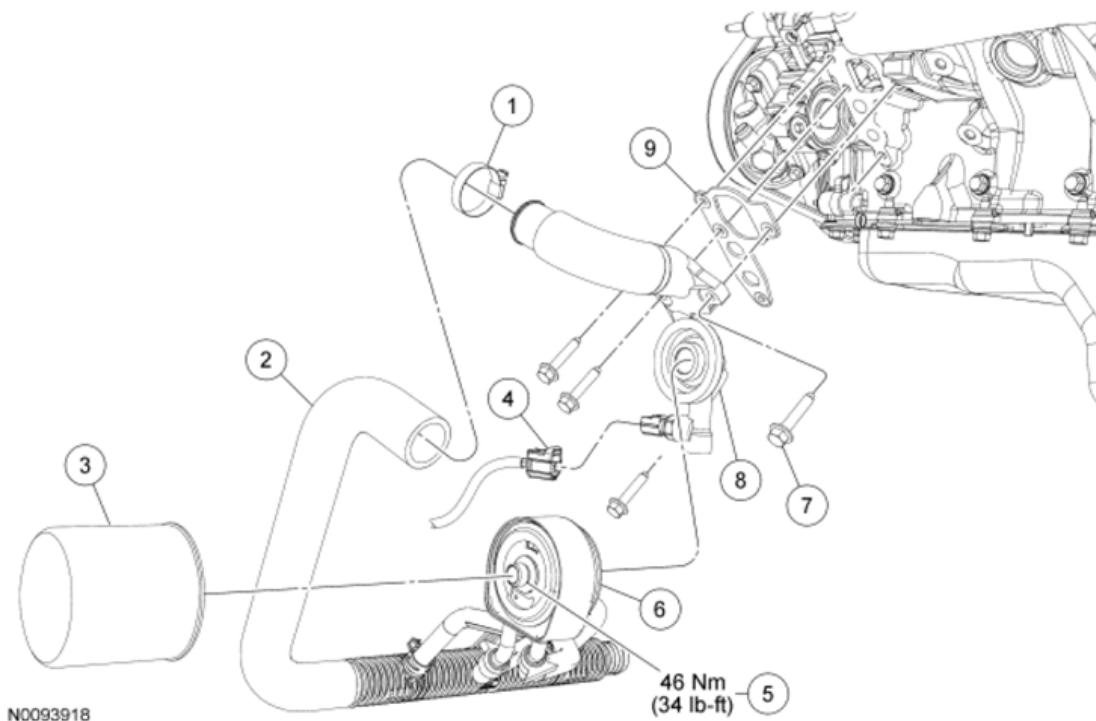
### ITEM DESCRIPTION

| Item | Part Number | Description |
|------|-------------|-------------|
|      |             |             |

## 2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

|   |         |                                                                        |
|---|---------|------------------------------------------------------------------------|
| 1 | W525939 | Lower radiator hose clamp                                              |
| 2 | 8B273   | Lower radiator hose                                                    |
| 3 | 6714    | Oil filter                                                             |
| 4 | 14A464  | Engine Oil Pressure (EOP) switch electrical connector (part of 12B637) |
| 5 | W705128 | Oil filter adapter bolt (4 required)                                   |
| 6 | 6881    | Oil filter adapter                                                     |
| 7 | 6A636   | Oil filter adapter gasket                                              |

## Oil Filter Adapter With Oil Cooler



**Fig. 108: Identifying Oil Filter Adapter With Oil Cooler Components With Torque Specifications**  
**Courtesy of FORD MOTOR CO.**

### ITEM DESCRIPTION

| Item | Part Number | Description                                                            |
|------|-------------|------------------------------------------------------------------------|
| 1    | W525939     | Lower radiator hose clamp                                              |
| 2    | 8B273       | Lower radiator hose                                                    |
| 3    | 6714        | Oil filter                                                             |
| 4    | 14A464      | Engine Oil Pressure (EOP) switch electrical connector (part of 12B637) |
| 5    | 6890        | Oil cooler mounting bolt                                               |
| 6    | 6A642       | Oil cooler                                                             |
| 7    | W705128     | Oil filter adapter bolt (4 required)                                   |
| 8    | 6881        | Oil filter adapter                                                     |
| 9    | 6A636       | Oil filter adapter gasket                                              |

**Removal**

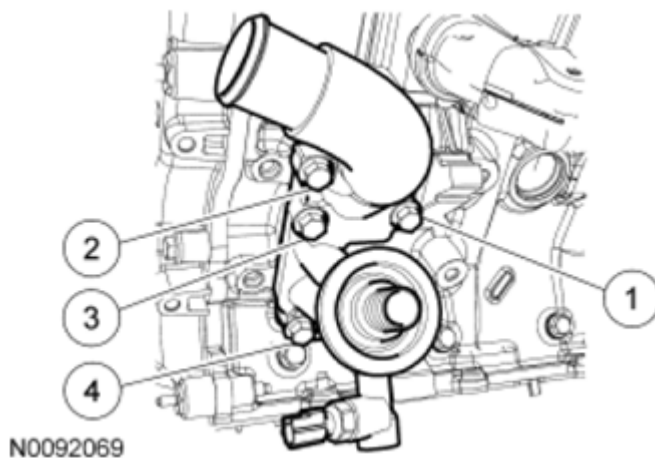
**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

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

**Installation**

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

1. Clean the sealing surfaces.
2. Install a new gasket and the oil filter adapter and tighten the 4 bolts in the sequence shown in illustration.
  - Tighten to 25 Nm (18 lb-ft).



**Fig. 109: Identifying Oil Filter Adapter Bolts**  
Courtesy of FORD MOTOR CO.

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

**NOTE:** Lubricate the oil cooler-to-oil filter adapter seal with clean engine oil.

3. If equipped, position the oil cooler and install the oil cooler mounting bolt.
  - Tighten to 46 Nm (34 lb-ft).
4. Connect the **EOP** switch electrical connector.

**NOTE:** Lubricate the oil filter seal with clean engine oil.

5. Install the oil filter.
6. Connect the lower radiator hose to the oil filter adapter.
7. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** .

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

8. If equipped with a fire suppression system, repower the system.

### OIL COOLER

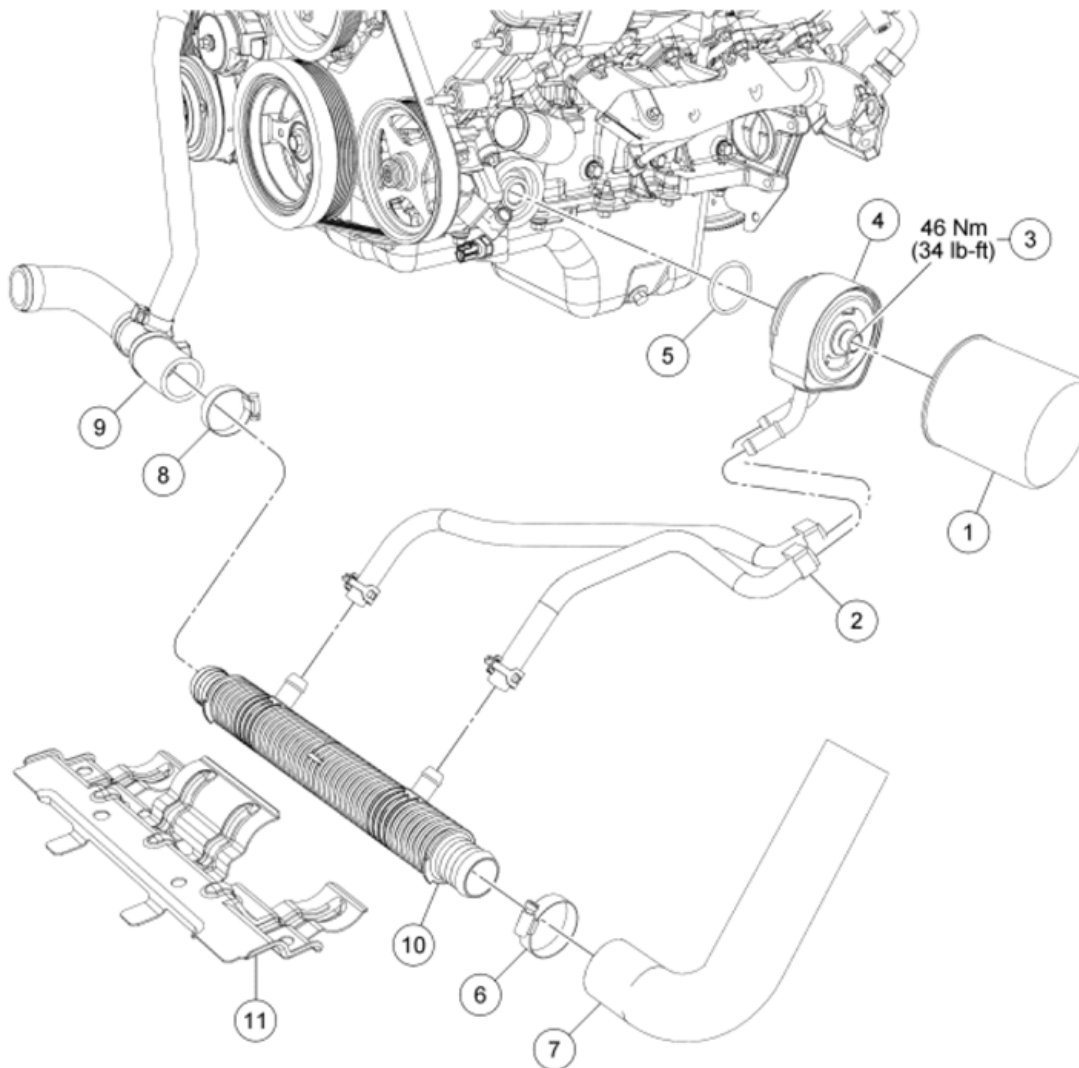
#### Material

#### MATERIAL SPECIFICATIONS

| 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  |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



N0091704

**Fig. 110: Identifying Oil Cooler Components With Torque Specifications**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description                                  |
|------|-------------|----------------------------------------------|
| 1    | 6714        | Oil filter                                   |
| 2    | 8B273       | Oil cooler coolant hose (2 required)         |
| 3    | 6890        | Oil cooler mounting bolt                     |
| 4    | 6A642       | Oil cooler                                   |
| 5    | -           | Oil cooler-to-oil filter adapter O-ring seal |
| 6    | 15161       | Coolant hose clamp                           |
| 7    | 8286        | Coolant hose                                 |
| 8    | 15161       | Coolant hose clamp                           |
| 9    | 8286        | Coolant hose                                 |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |   |                              |
|----|---|------------------------------|
| 10 | - | Coolant tube                 |
| 11 | - | Cooler tube mounting bracket |

### Removal and Installation

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Drain the cooling system. For additional information, refer to **ENGINE COOLING** .
3. Remove and discard the oil filter.
  - To install, lubricate the new oil filter O-ring seal with clean engine oil.

**NOTE:** For correct installation, the white lines on the coolant hoses must be aligned with the black dots on the oil cooler tubes. If the black dots are not visible, mark the oil cooler tube with a permanent marker before disconnecting the hoses. Failure to follow this instruction may result in damage to the coolant hoses.

4. Disconnect the 2 coolant hoses from the oil cooler.
  - To install, align the white lines on the coolant hoses with the black dots on the cooler tubes.

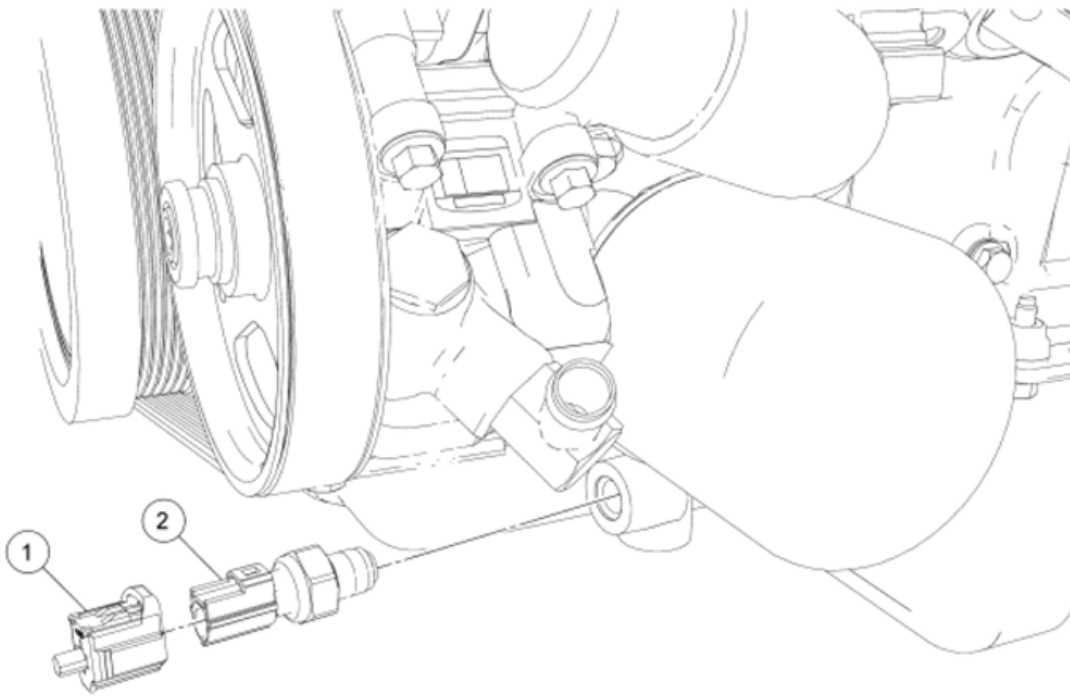
**NOTE:** If metal or aluminum material is present in the oil cooler, mechanical concerns exist. Severe damage to the engine may occur. To diagnose mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION** . Failure to follow this instruction may result in additional engine damage.

5. Remove the oil cooler mounting bolt and the oil cooler and inspect.
  - To install, lubricate the oil cooler-to-oil filter adapter O-ring seal with clean engine oil.
  - To install, tighten to 46 Nm (34 lb-ft).

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

6. To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

### ENGINE OIL PRESSURE (EOP) SWITCH



N0038117

**Fig. 111: Identifying Engine Oil Pressure (EOP) Switch**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                                                            |
|------|-------------|------------------------------------------------------------------------|
| 1    | 14A464      | Engine Oil Pressure (EOP) switch electrical connector (part of 12B637) |
| 2    | 9278        | <b>EOP</b> switch                                                      |

#### Removal and Installation

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Disconnect the Engine Oil Pressure (EOP) switch electrical connector and remove the **EOP** switch.
  - To install, tighten to 14 Nm (124 lb-in), then tighten an additional 180 degrees.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

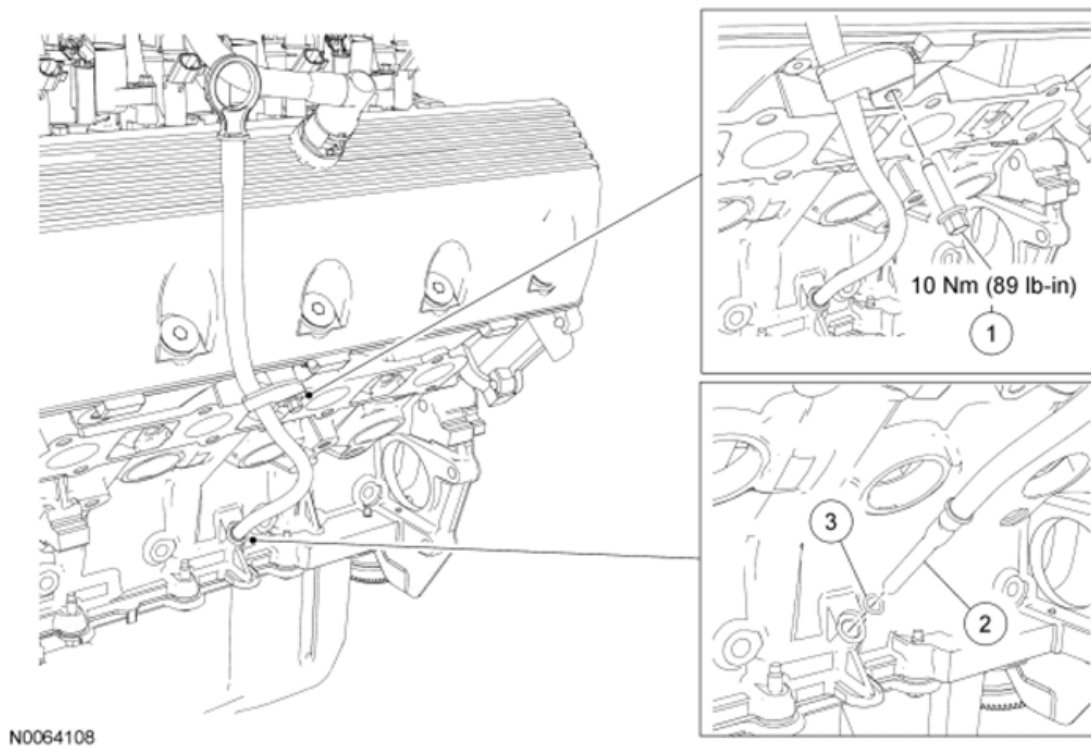
- To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

### OIL LEVEL INDICATOR AND TUBE

#### Material

#### MATERIAL SPECIFICATIONS

| 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  |



**Fig. 112: Identifying Oil Level Indicator And Tube With Torque Specifications**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                          |
|------|-------------|--------------------------------------|
| 1    | N806155     | Oil level indicator tube bolt        |
| 2    | 6754        | Oil level indicator tube             |
| 3    | -           | Oil level indicator tube O-ring seal |

#### Removal and Installation

**WARNING:** Before servicing a vehicle equipped with a fire suppression system,

**depower the system by following the procedure in FIRE SUPPRESSION SYSTEM . Failure to follow the instructions may result in serious personal injury.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the LH exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD - LH**.
3. Remove the oil level indicator.
4. Remove the bolt and the oil level indicator tube.
  - To install, tighten to 10 Nm (89 lb-in).

**NOTE:**        **Failure to lubricate the O-ring seal and the oil level indicator tube-to-engine block mating surface with clean engine oil may result in engine oil leaks.**

**NOTE:**        **Make sure the O-ring seal remains in position and does not roll up the indicator tube during installation or engine oil leaks may occur.**

5. Remove the O-ring seal and discard.

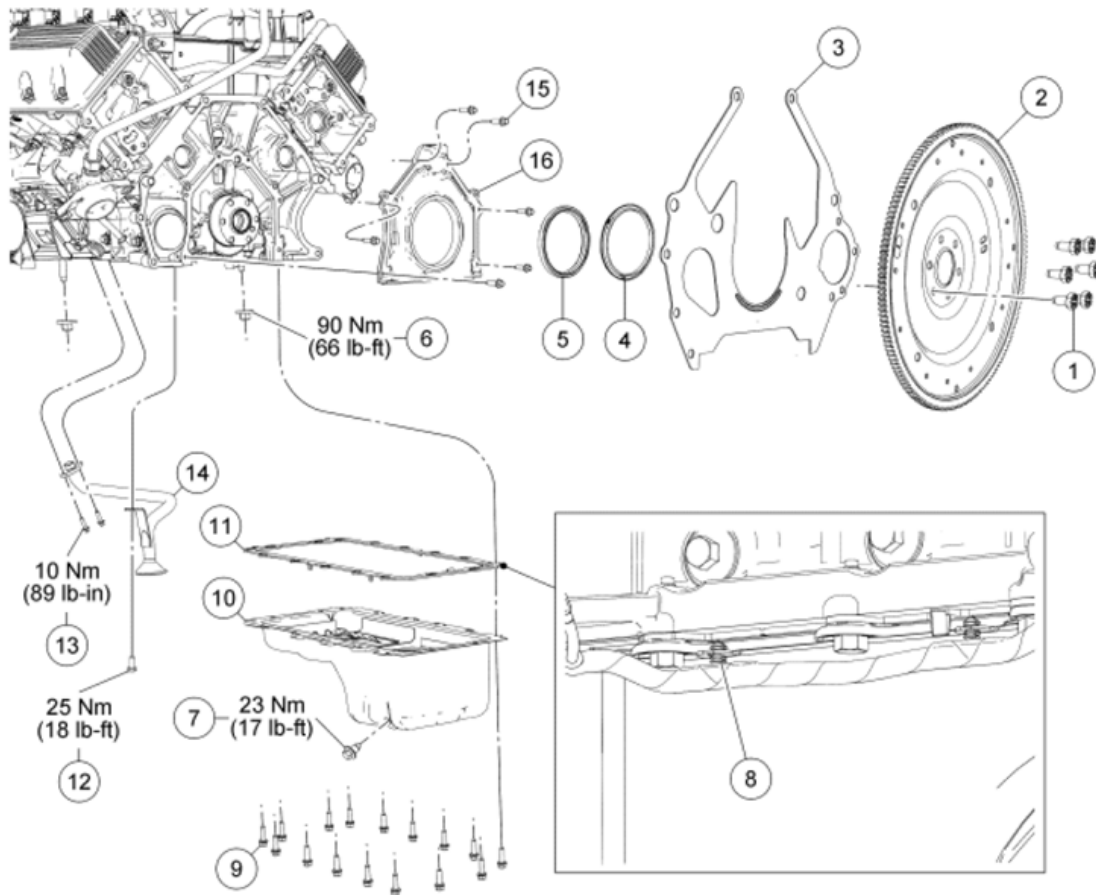
**WARNING:** **If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to FIRE SUPPRESSION SYSTEM . Failure to follow these instructions may result in serious personal injury.**

6. To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.
  - Lubricate the new O-ring seal and engine mating surface with clean engine oil.

#### **LOWER END COMPONENTS - EXPLODED VIEW, FLEXPLATE AND CRANKSHAFT REAR SEAL WITH RETAINER PLATE**

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



N0071895

**Fig. 113: Exploded View Of Flexplate And Crankshaft Rear Seal With Retainer Plate With Torque Specifications**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description                                 |
|------|-------------|---------------------------------------------|
| 1    | N806168     | Flexplate bolt (6 required)                 |
| 2    | 6375        | Flexplate                                   |
| 3    | 6A373       | Engine-to-transmission spacer plate         |
| 4    | 6310        | Crankshaft oil slinger                      |
| 5    | 6701        | Crankshaft rear seal                        |
| 6    | W707492     | Engine mount nut (2 required)               |
| 7    | 6730        | Oil pan drain plug                          |
| 8    | -           | Wire harness pin-type retainer (2 required) |
| 9    | W701605     | Oil pan bolt (16 required)                  |
| 10   | 6675        | Oil pan                                     |
| 11   | 6710        | Oil pan gasket                              |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |         |                                                       |
|----|---------|-------------------------------------------------------|
| 12 | N605904 | Oil pump screen and pickup tube bolt                  |
| 13 | N806155 | Oil pump screen and pickup tube bolt (2 required)     |
| 14 | 6622    | Oil pump screen and pickup tube                       |
| 15 | N806155 | Crankshaft rear seal retainer plate bolt (6 required) |
| 16 | 6K318   | Crankshaft rear seal retainer plate                   |

1. For additional information, refer to the appropriate procedure(s).

### FLEXPLATE

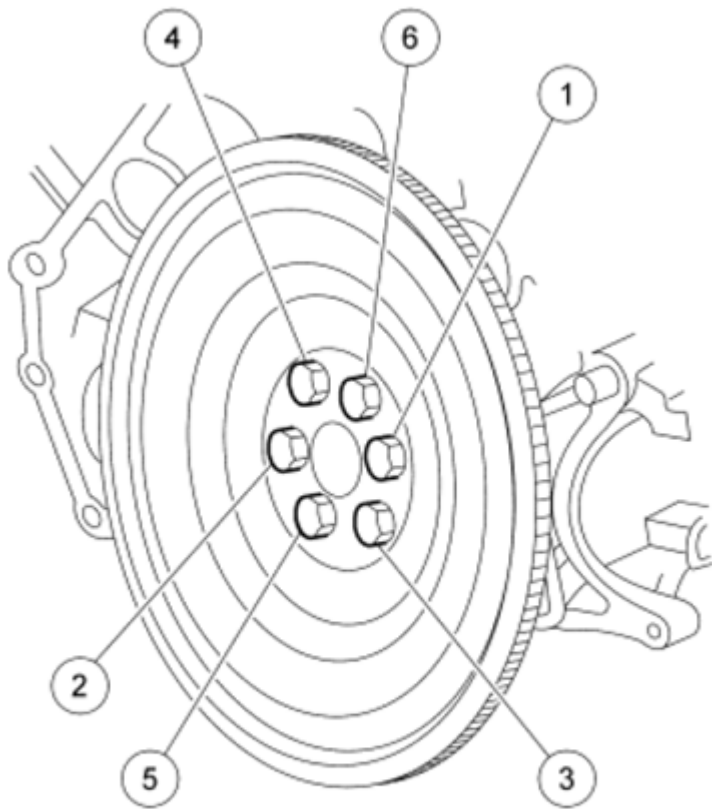
#### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 4R70E/4R75E** .
3. Remove the 6 bolts and the flexplate.

#### Installation

1. Position the flexplate and loosely install the 6 bolts. Tighten the bolts in the sequence shown in illustration to 80 Nm (59 lb-ft).



N0071888

**Fig. 114: Identifying Flexplate Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

- 2. Install the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 4R70E/4R75E** .

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

- 3. If equipped with a fire suppression system, repower the system.

**CRANKSHAFT REAR SEAL**

Special Tool(s)

**SPECIAL TOOL CHART**

|  |  |
|--|--|
|  |  |
|--|--|

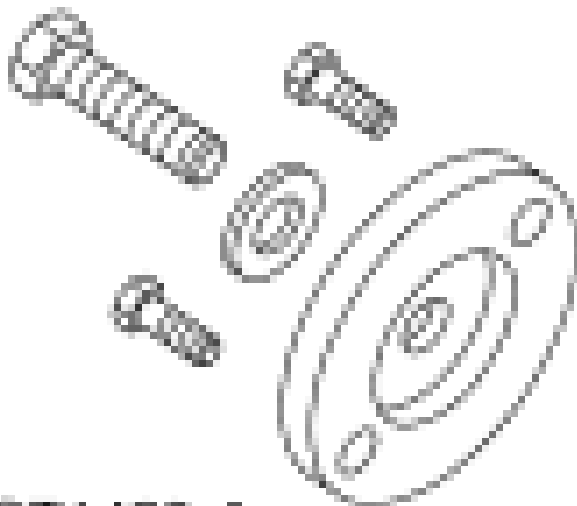
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1479-A**

Installer, Crankshaft Rear Oil Seal  
303-516 (T95P-6701-BH)



**ST1480-A**

Installer, Crankshaft Rear Oil Seal  
303-518 (T95P-6701-DH)

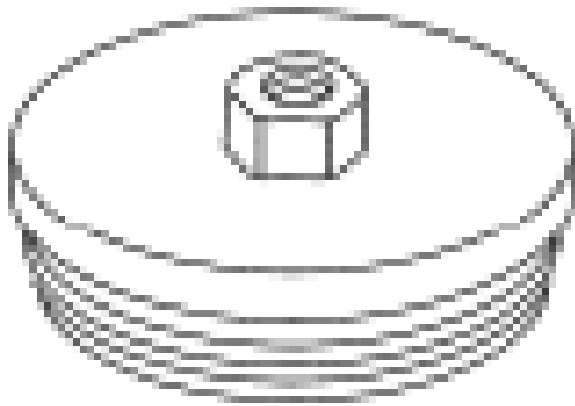
Installer, Crankshaft Rear Oil Slinger  
303-517 (T95P-6701-CH)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST1482-A



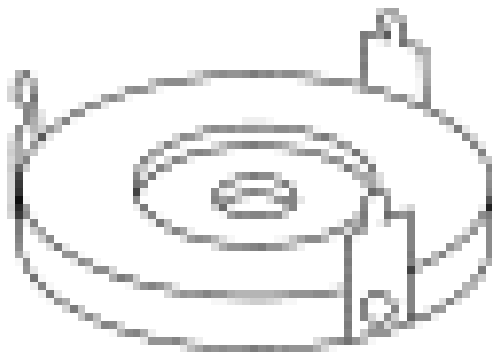
ST1382-A

Remover, Crankshaft Rear Oil Seal  
303-519 (T95P-6701-EH)

Remover, Crankshaft Rear Oil Slinger  
303-514 (T95P-6701-AH)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST1481-A



ST1185-A

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

### Material

#### MATERIAL SPECIFICATIONS

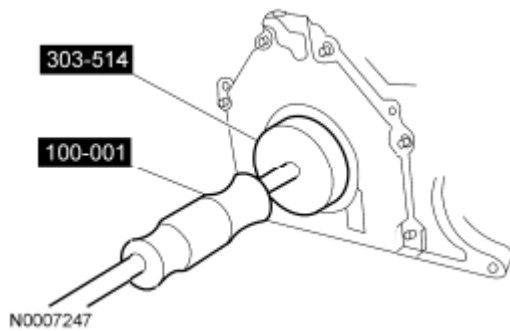
| Item                                                                                                                                                           | Specification |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 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

**WARNING:** Before servicing a vehicle equipped with a fire suppression system,

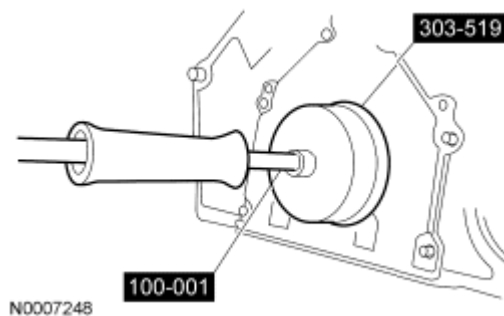
**depower the system by following the procedure in FIRE SUPPRESSION SYSTEM . Failure to follow the instructions may result in serious personal injury.**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the flexplate. For additional information, refer to **FLEXPLATE**.
3. Using the Crankshaft Rear Oil Slinger Remover and Slide Hammer, remove the crankshaft oil slinger.



**Fig. 115: Removing Crankshaft Oil Slinger**  
Courtesy of FORD MOTOR CO.

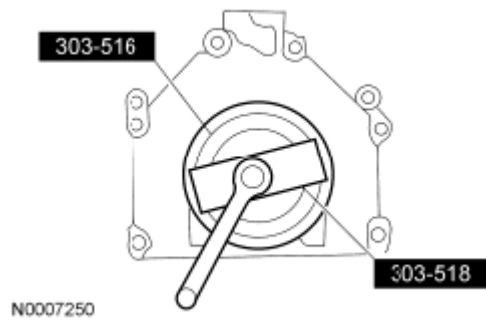
4. Using the Crankshaft Rear Oil Seal Remover and Slide Hammer, remove the crankshaft rear seal.



**Fig. 116: Removing Crankshaft Rear Seal**  
Courtesy of FORD MOTOR CO.

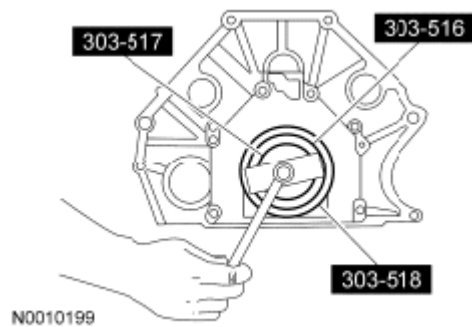
#### Installation

**NOTE:** Lubricate the inner lip of the crankshaft rear seal with engine oil.



**Fig. 117: Installing Crankshaft Rear Seal**  
Courtesy of FORD MOTOR CO.

1. Using the Crankshaft Rear Oil Seal Installers, install the crankshaft rear seal.
2. Using the Crankshaft Rear Oil Slinger Installer and Crankshaft Rear Oil Seal Installers, install the crankshaft oil slinger.



**Fig. 118: Installing Crankshaft Oil Slinger**  
Courtesy of FORD MOTOR CO.

3. Install the flexplate. For additional information, refer to **FLEXPLATE**.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

4. If equipped with a fire suppression system, repower the system.

## CRANKSHAFT REAR SEAL WITH RETAINER PLATE

### Special Tool(s)

### SPECIAL TOOL CHART

|  |  |
|--|--|
|  |  |
|--|--|

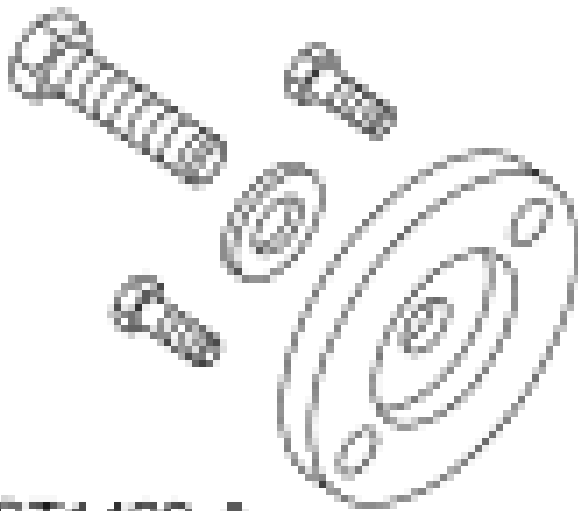
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1479-A**

Installer, Crankshaft Rear Oil Seal  
303-516 (T95P-6701-BH)



**ST1480-A**

Installer, Crankshaft Rear Oil Seal  
303-518 (T95P-6701-DH)

Installer, Crankshaft Rear Oil Slinger  
303-517 (T95P-6701-CH)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1482-A**

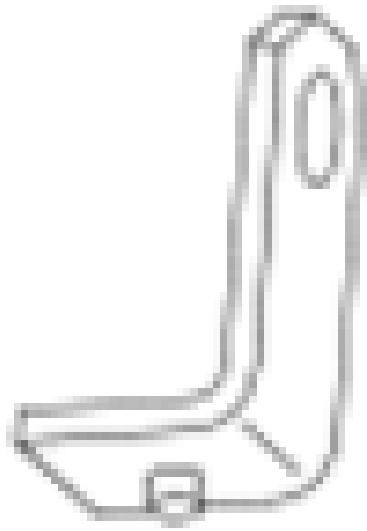


**ST1603-A**

Lifting Bracket, Engine  
303-D087 (D93P-6001-A1) or equivalent

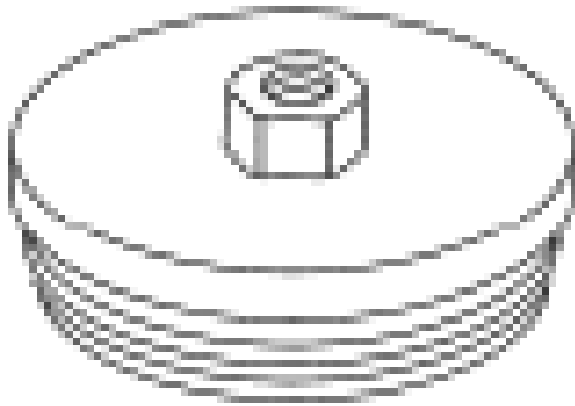
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1604-A**

Lifting Bracket, Engine  
303-D088 (D93P-6001-A2) or equivalent

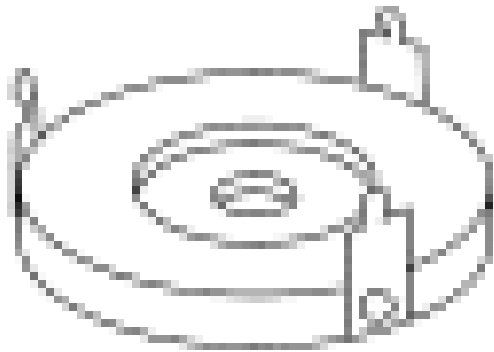


**ST1382-A**

Remover, Crankshaft Rear Oil Seal  
303-519 (T95P-6701-EH)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



Remover, Crankshaft Rear Oil Slinger  
303-514 (T95P-6701-AH)

ST1481-A



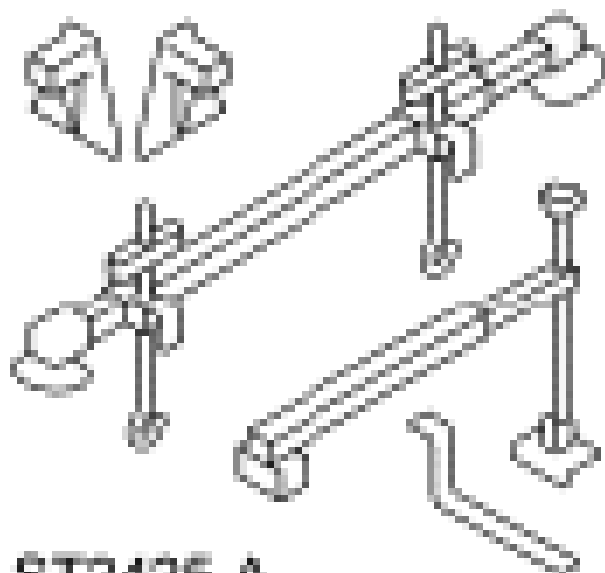
Slide Hammer  
100-001 (T50T-100-A)

ST1185-A

Support Bar, Engine  
303-F072

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



### Material

#### MATERIAL SPECIFICATIONS

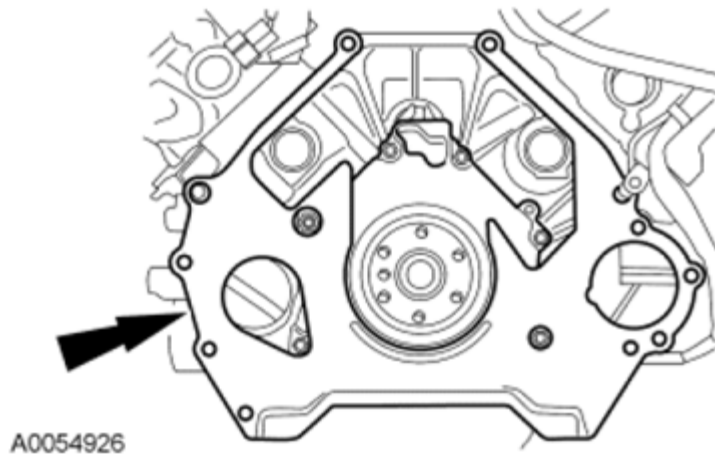
| Item                                                                                                                                                              | Specification |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Gasket Maker<br>TA-16                                                                                                                                             | WSK-M2G348-A5 |
| Motorcraft® Metal Surface Prep<br>ZC-31-A                                                                                                                         | -             |
| Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil<br>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<br>TA-30                                                                                                                              | WSE-M4G323-A4 |
| Silicone Gasket Remover<br>ZC-30                                                                                                                                  | -             |

### Removal

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

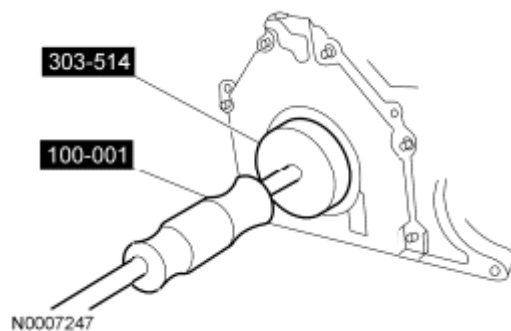
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .

2. Remove the flexplate. For additional information, refer to **FLEXPLATE**.
3. Remove the engine-to-transmission spacer plate.



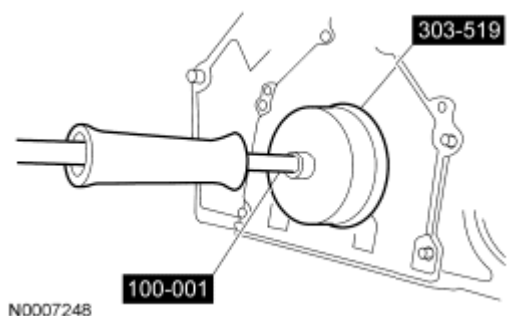
**Fig. 119: Locating Engine-To-Transmission Spacer Plate**  
Courtesy of FORD MOTOR CO.

4. Using the Crankshaft Rear Oil Slinger Remover and Slide Hammer, remove the crankshaft oil slinger.



**Fig. 120: Removing Crankshaft Oil Slinger**  
Courtesy of FORD MOTOR CO.

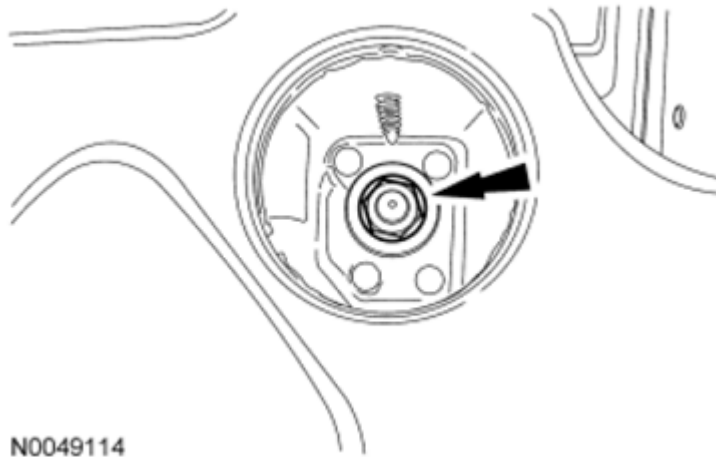
5. Using the Crankshaft Rear Oil Seal Remover and Slide Hammer, remove the crankshaft rear seal.



**Fig. 121: Removing Crankshaft Rear Seal**

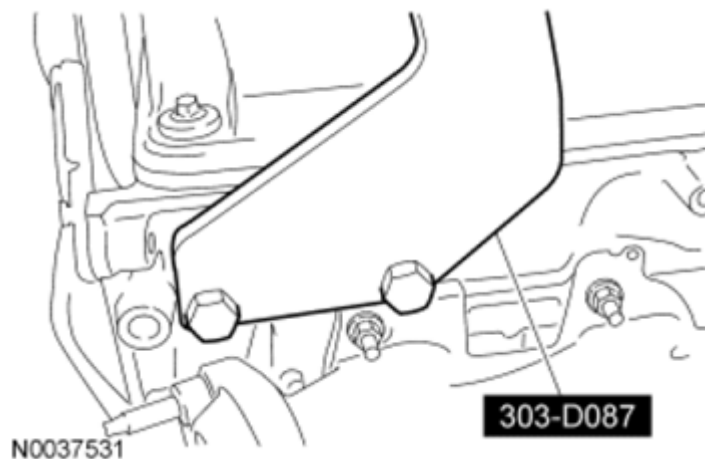
Courtesy of FORD MOTOR CO.

**NOTE:** LH shown in illustration, RH similar.



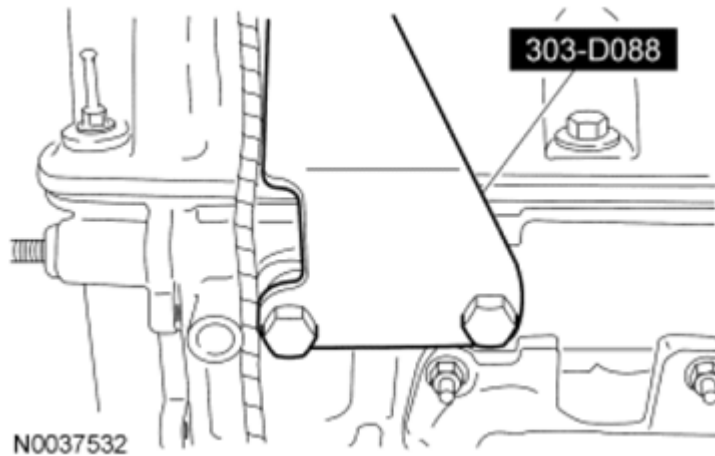
**Fig. 122: Locating Engine Mount Nuts**  
Courtesy of FORD MOTOR CO.

6. Remove the 2 engine mount nuts.
7. Install the Engine Lifting Bracket to the RH cylinder head.



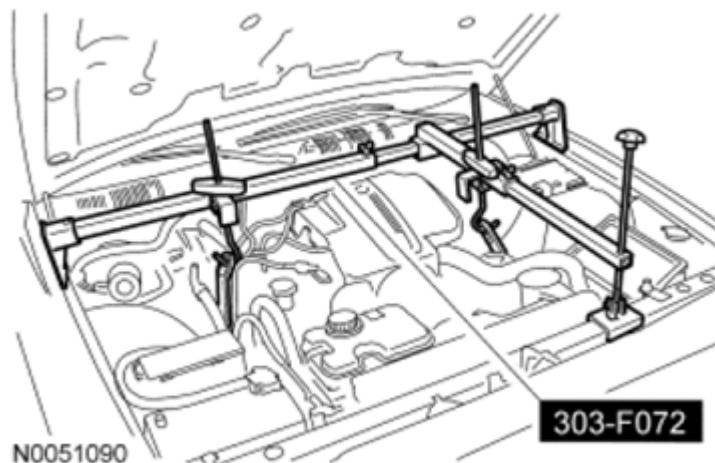
**Fig. 123: Identifying Engine Lifting Bracket (303-D087)**  
Courtesy of FORD MOTOR CO.

8. Install the Engine Lifting Bracket to the LH cylinder head.



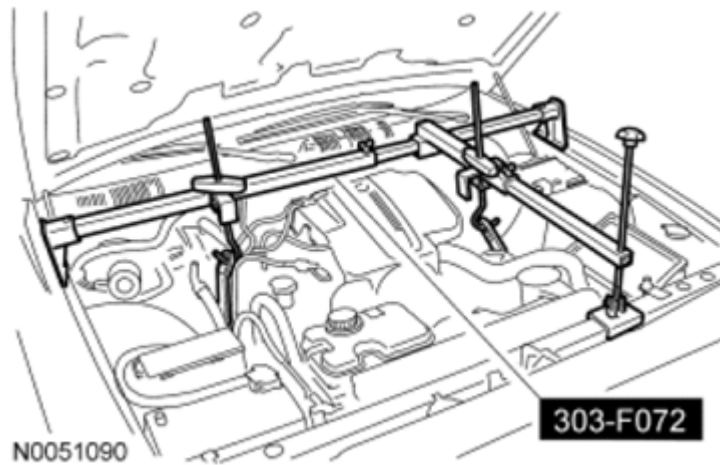
**Fig. 124: Identifying Engine Lifting Bracket (303-D088)**  
Courtesy of FORD MOTOR CO.

9. Install the Engine Support Bar.



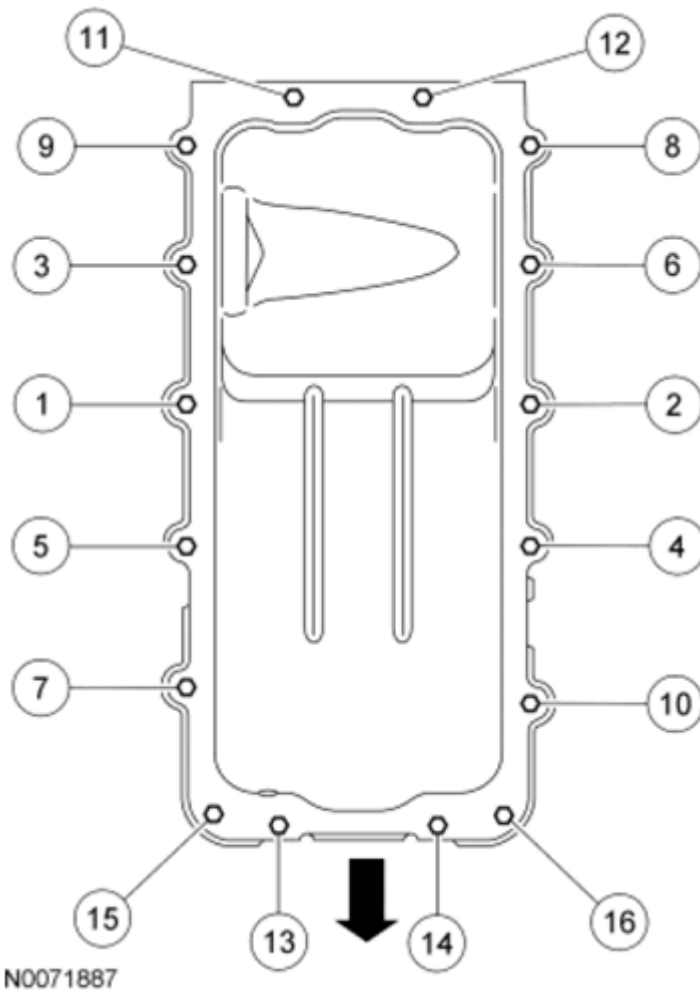
**Fig. 125: Identifying Engine Support Bar (303-F072)**  
Courtesy of FORD MOTOR CO.

10. Using the Engine Support Bar, raise the engine.



**Fig. 126: Identifying Engine Support Bar (303-F072)**  
**Courtesy of FORD MOTOR CO.**

11. Drain the engine oil.
  - Install the drain plug when finished.
  - Tighten to 23 Nm (17 lb-ft).
12. Detach the 2 pin-type wire harness retainers.
13. Remove the oil pan bolts in the sequence shown in illustration and partially lower the oil pan.



**Fig. 127: Identifying Oil Pan Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

14. Remove the 3 bolts and position the oil pump screen and pickup tube into the oil pan and remove the oil pan.
  - Discard the pickup tube O-ring seal.
  - Discard the oil pan gasket.
15. Remove the 6 bolts and the crankcase rear seal retainer plate.

#### Installation

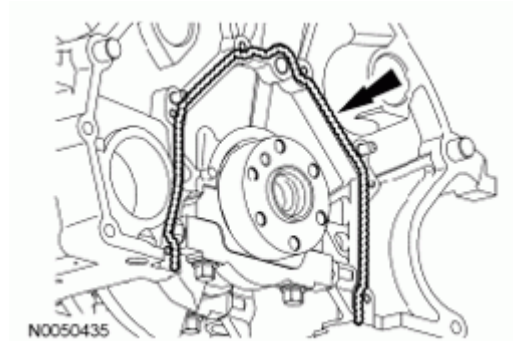
**NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

**NOTE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket

**remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.**

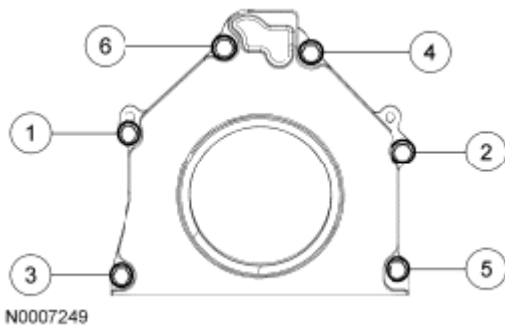
1. Clean and inspect the mating surface.

**NOTE:** The rear crankshaft seal retainer plate does not have a sealant groove. Gasket maker must be applied to the rear crankshaft seal retainer mating surface on the engine block.



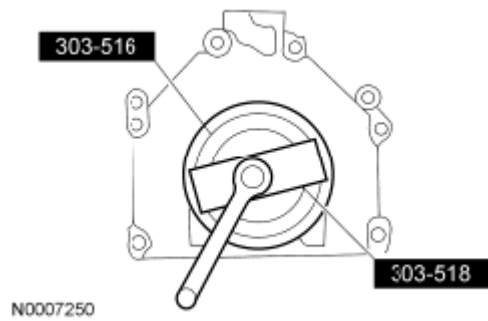
**Fig. 128: Applying Bead Of Gasket Maker To Rear Crankshaft Seal Retainer Mating Surface**  
Courtesy of FORD MOTOR CO.

2. Apply a bead of gasket maker to the rear crankshaft seal retainer mating surface on the engine block.
3. Install the rear oil seal retainer plate and loosely install the 6 crankcase rear seal retainer plate bolts.
4. Tighten the rear seal retainer plate bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



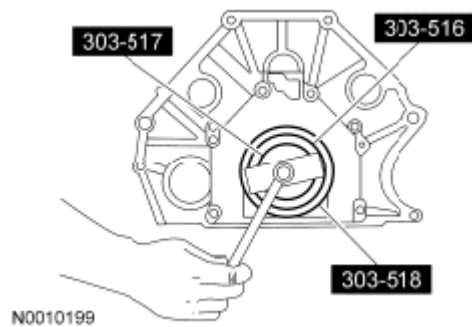
**Fig. 129: Identifying Rear Seal Retainer Plate Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the inner lip of the crankshaft rear seal with engine oil.



**Fig. 130: Installing Crankshaft Rear Seal**  
Courtesy of FORD MOTOR CO.

5. Using the Crankshaft Rear Oil Seal Installers, install the crankshaft rear seal.
6. Using the Crankshaft Rear Oil Slinger Installer and Crankshaft Rear Oil Seal Installers, install the crankshaft oil slinger.



**Fig. 131: Installing Crankshaft Oil Slinger**  
Courtesy of FORD MOTOR CO.

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

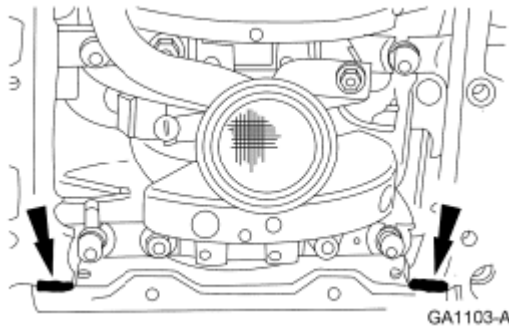
7. Inspect the oil pan. Clean the mating surface for the oil pan with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
8. Position the oil pump screen and pickup tube in the oil pan and position the oil pan and new gasket into the vehicle.

**NOTE:** Make sure to install a new O-ring seal. A missing or damaged O-ring seal may cause foam in the lubrication system, low oil pressure and severe engine damage.

**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil prior to installation.

9. Position the oil pump screen and pickup tube and install the bolts.
  - Tighten the oil pump screen and pickup tube-to-oil pump bolts to 10 Nm (89 lb-in).
  - Tighten the oil pump screen and pickup tube-to-spacer bolt to 25 Nm (18 lb-ft).

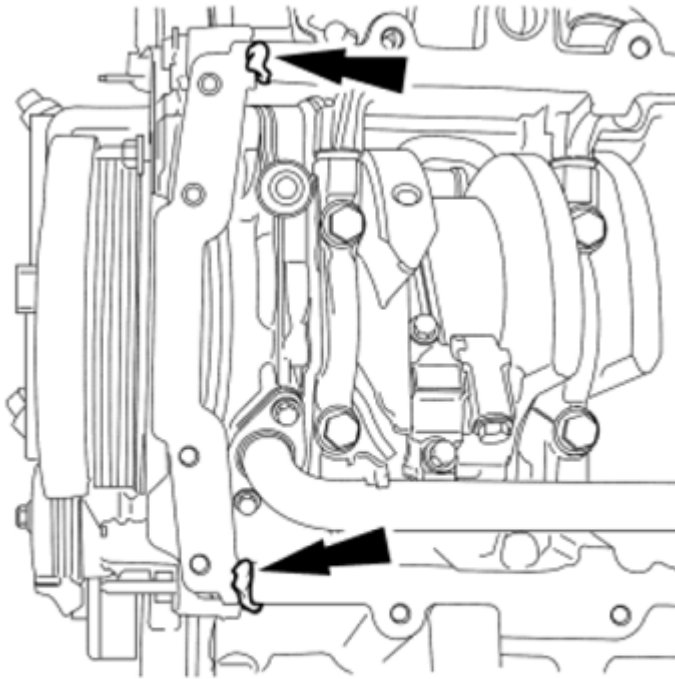
**NOTE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.



**Fig. 132: Locating Silicone Gasket And Sealant**  
Courtesy of FORD MOTOR CO.

10. Apply silicone gasket and sealant at the rear seal retainer-to-cylinder block sealing surface.

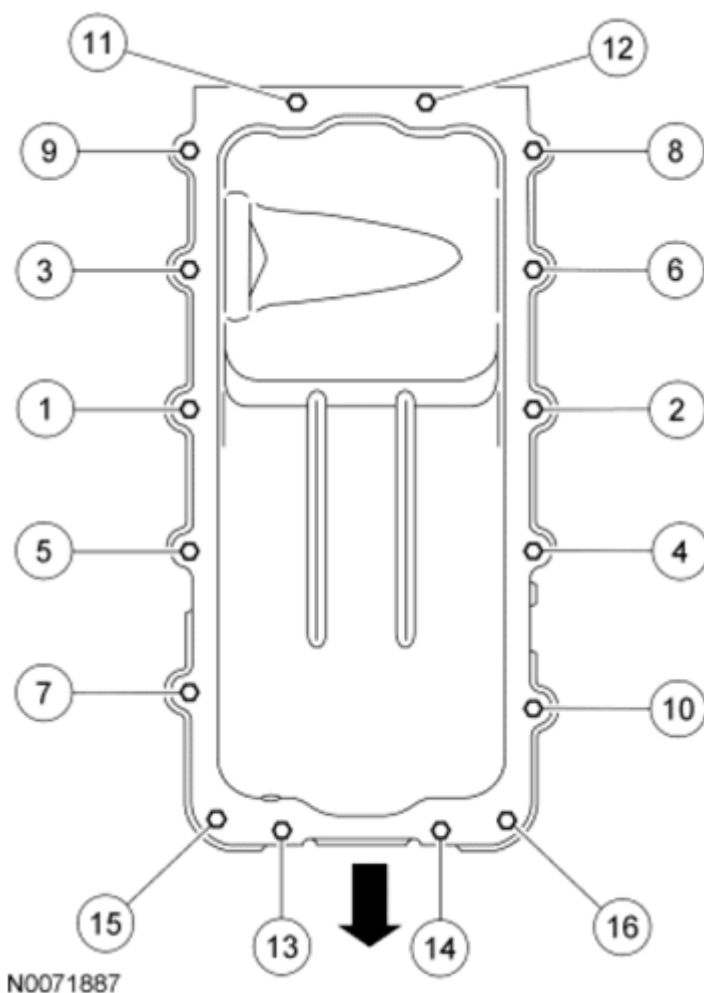
**NOTE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.



A0072750

**Fig. 133: Locating Silicone Gasket And Sealant**  
**Courtesy of FORD MOTOR CO.**

11. Apply silicone gasket and sealant at the engine front cover-to-cylinder block mating surface.
12. Install the oil pan bolts, tighten in the sequence shown in illustration, in 2 stages.
  - Stage 1: Tighten to 20 Nm (177 lb-in).
  - Stage 2: Rotate an additional 60 degrees.

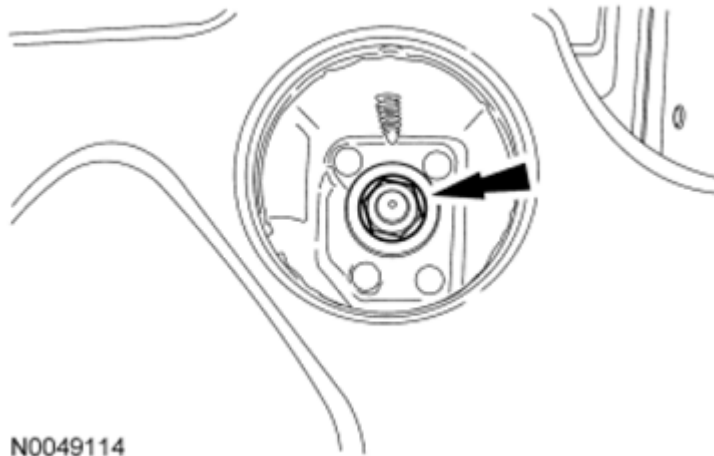


**Fig. 134: Identifying Oil Pan Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

13. Attach the 2 pin-type wire harness retainers.
14. Align the engine mount studs and lower the engine.

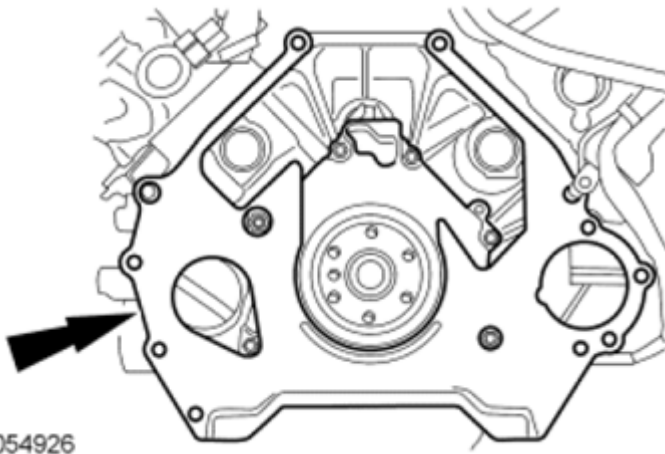
**NOTE:** LH shown in illustration, RH similar.

15. Install the 2 engine mount nuts.
  - Tighten to 90 Nm (66 lb-ft).



**Fig. 135: Locating Engine Mount Nuts**  
Courtesy of FORD MOTOR CO.

16. Install the engine-to-transmission spacer plate.

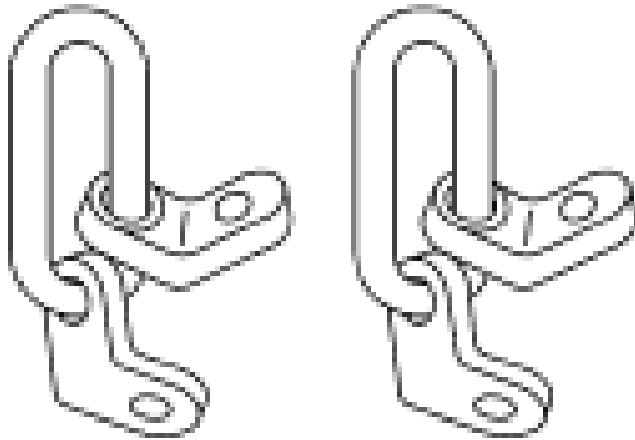
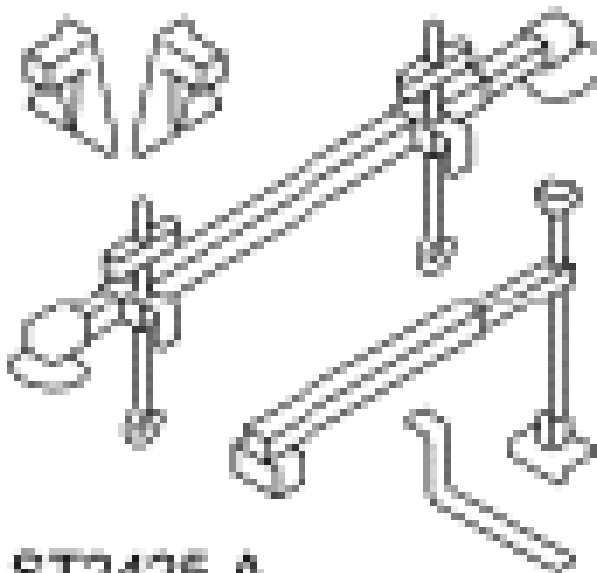


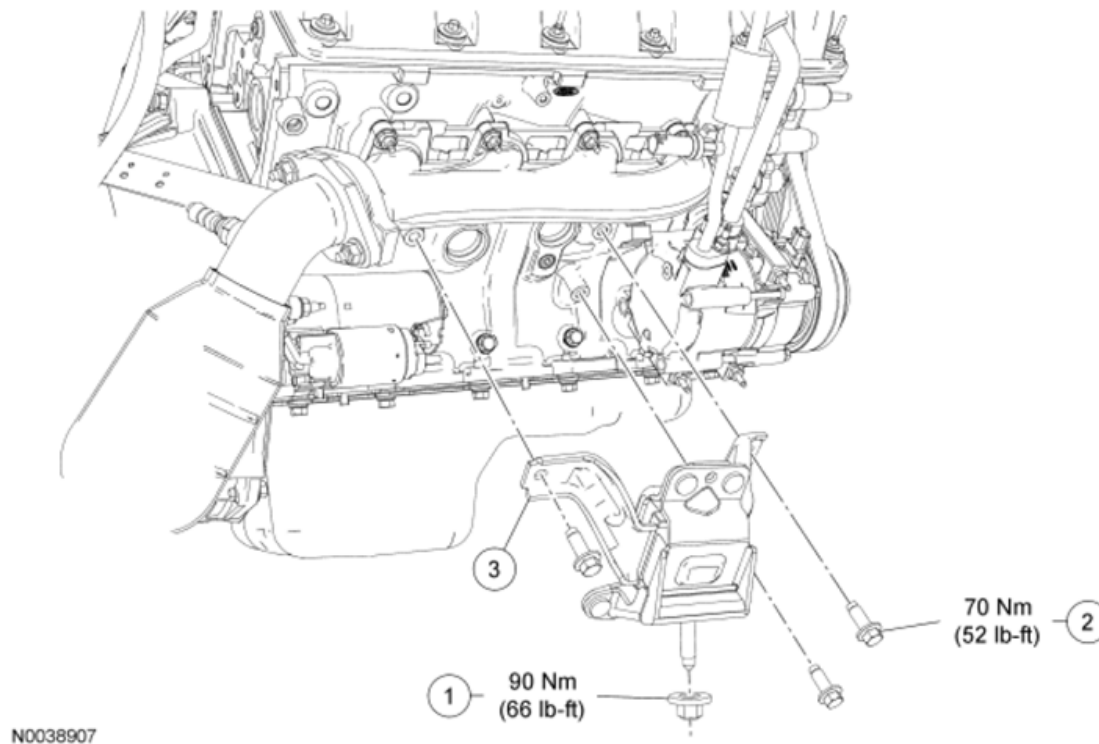
**Fig. 136: Locating Engine-To-Transmission Spacer Plate**  
Courtesy of FORD MOTOR CO.

17. Install the flexplate. For additional information, refer to **FLEXPLATE**.
18. Fill the engine with clean engine oil.
19. Start the engine and check for leaks.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

20. If equipped with a fire suppression system, repower the system.

**ENGINE MOUNT - RH****Special Tool(s)****SPECIAL TOOL CHART****ST1595-A**Lifting Bracket, Engine  
303-050 (T70P-6000)**ST2425-A**Support Bar, Engine  
303-F072



**Fig. 137: Identifying Engine Mount Components With Torque Specifications - RH**  
 Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                       |
|------|-------------|-----------------------------------|
| 1    | W707492     | RH engine mount nut               |
| 2    | W710646     | RH engine mount bolt (3 required) |
| 3    | 6038        | RH engine mount                   |

#### Removal and Installation

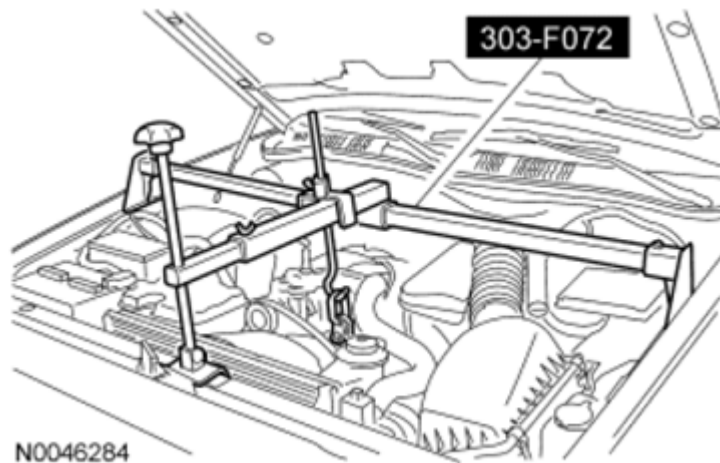
**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
3. Install the Engine Lifting Bracket.



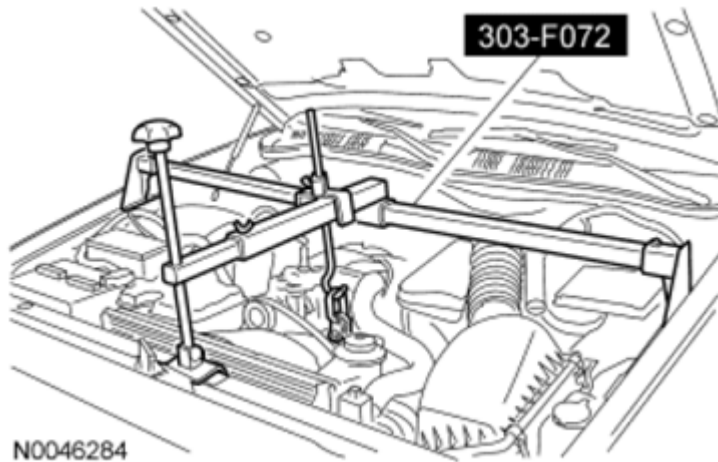
**Fig. 138: Identifying Engine Lifting Bracket (303-050)**  
Courtesy of FORD MOTOR CO.

4. Install the Engine Support Bar.



**Fig. 139: Identifying Engine Support Bar (303-F072)**  
Courtesy of FORD MOTOR CO.

5. Remove the RH and LH lower engine mount nuts.
  - To install, tighten to 90 Nm (66 lb-ft).
6. Using the Engine Support Bar, raise the engine.



**Fig. 140: Identifying Engine Support Bar (303-F072)**  
Courtesy of FORD MOTOR CO.

7. Remove the 3 RH engine mount bolts.
  - To install, tighten to 70 Nm (52 lb-ft).
8. Remove the RH engine mount.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

9. To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

## ENGINE MOUNT - LH

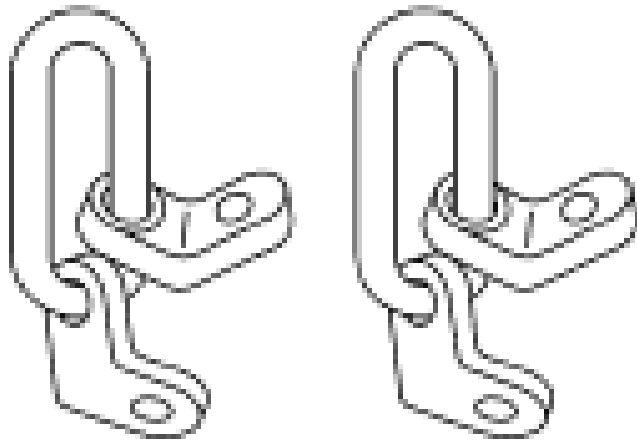
### Special Tool(s)

### SPECIAL TOOL CHART

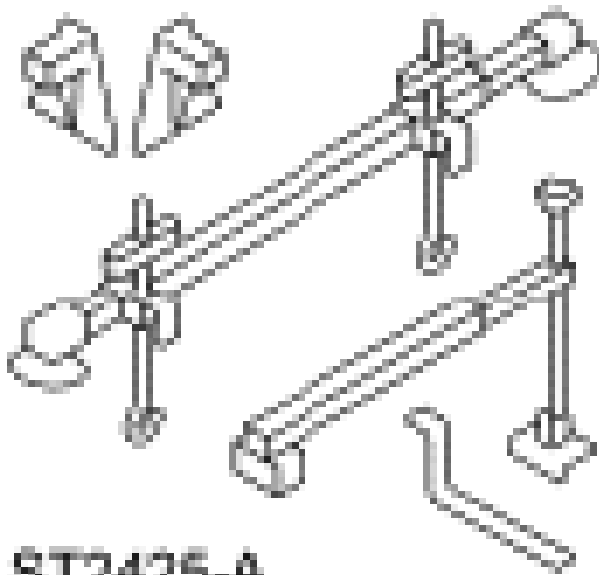
|  |                                                |
|--|------------------------------------------------|
|  | Lifting Bracket, Engine<br>303-050 (T70P-6000) |
|--|------------------------------------------------|

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST1595-A



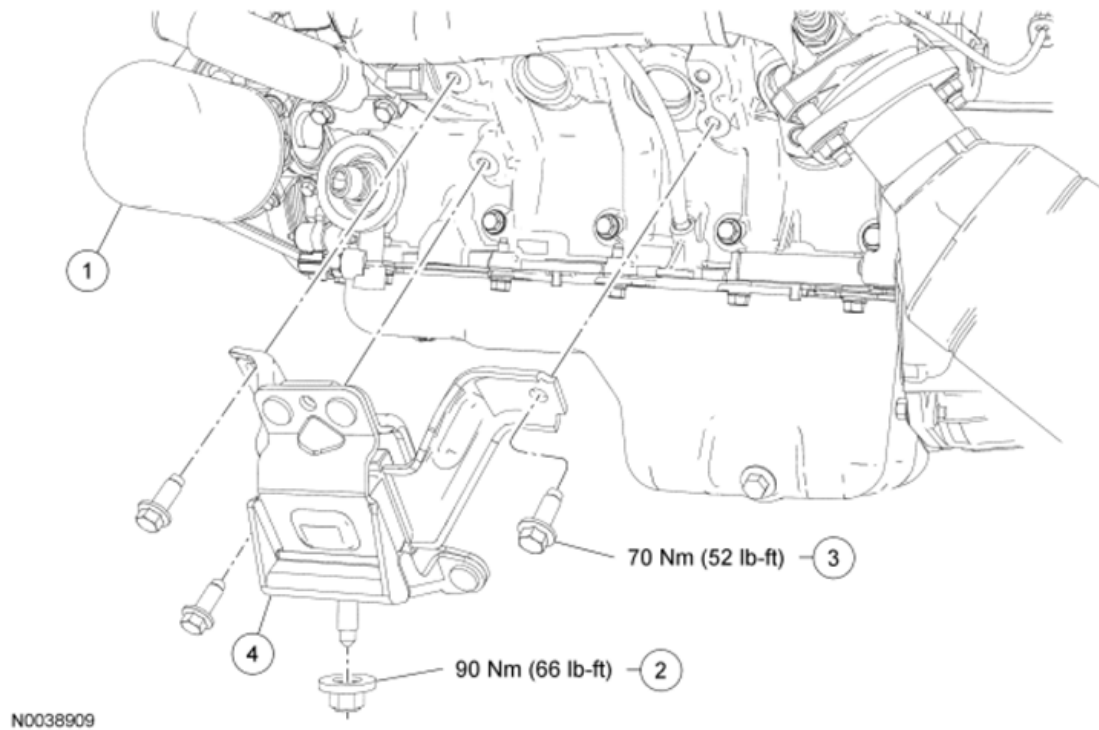
ST2425-A

Support Bar, Engine  
303-F072

### Material

### MATERIAL SPECIFICATIONS

| 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  |



**Fig. 141: Identifying Engine Mount Components With Torque Specifications - LH**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number  | Description                       |
|------|--------------|-----------------------------------|
| 1    | 6714         | Oil filter                        |
| 2    | W707492      | LH engine mount nut               |
| 3    | W710646-S439 | LH engine mount bolt (3 required) |
| 4    | 6B032        | LH engine mount                   |

#### Removal and Installation

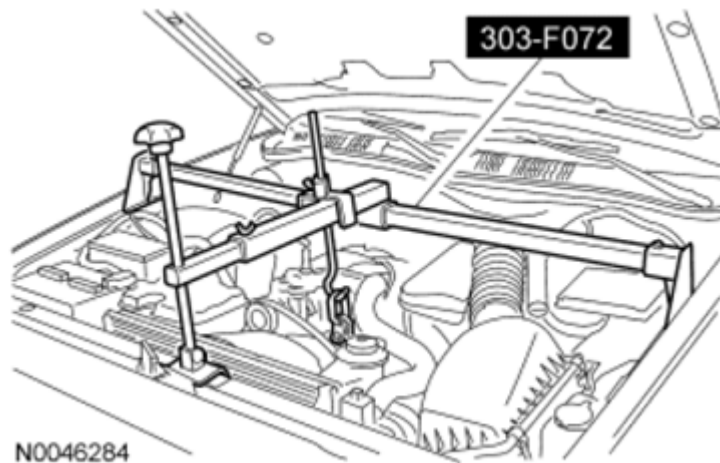
**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
3. Install the Engine Lifting Bracket.



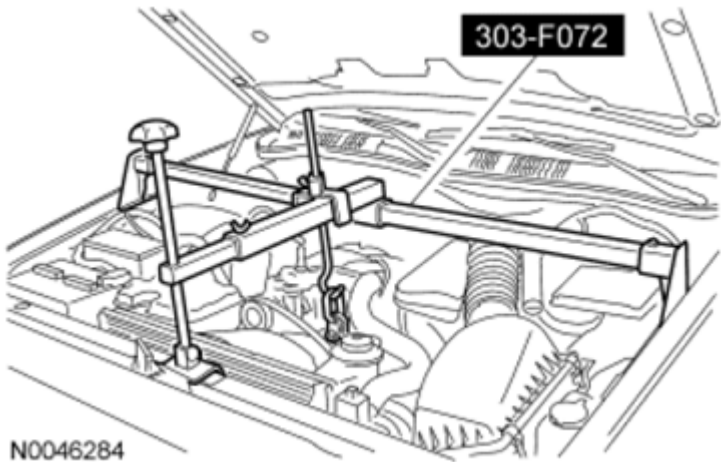
**Fig. 142: Identifying Engine Lifting Bracket (303-050)**  
Courtesy of FORD MOTOR CO.

4. Install the Engine Support Bar.



**Fig. 143: Identifying Engine Support Bar (303-F072)**  
Courtesy of FORD MOTOR CO.

5. Remove the oil filter and discard.
  - Lubricate the new oil filter O-ring seal with clean engine oil prior to installation.
6. Remove the LH and RH lower engine mount nuts.
  - To install, tighten to 90 Nm (66 lb-ft).
7. Using the Engine Support Bar, raise the engine.



**Fig. 144: Identifying Engine Support Bar (303-F072)**  
Courtesy of FORD MOTOR CO.

8. Remove the 3 bolts and the LH engine mount.
- To install, tighten to 70 Nm (52 lb-ft).

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

9. To install, reverse the removal procedure. If equipped with a fire suppression system, repower the system.

**REMOVAL**

**CYLINDER HEAD**

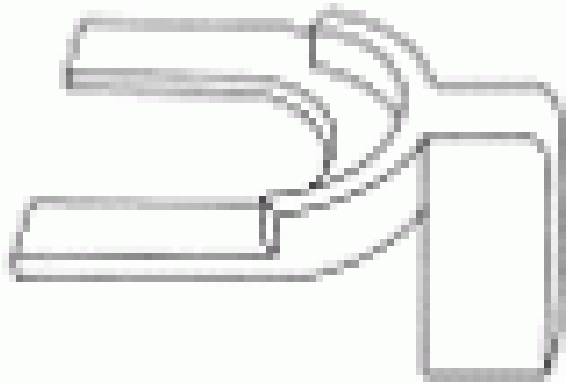
Special Tool(s)

**SPECIAL TOOL CHART**

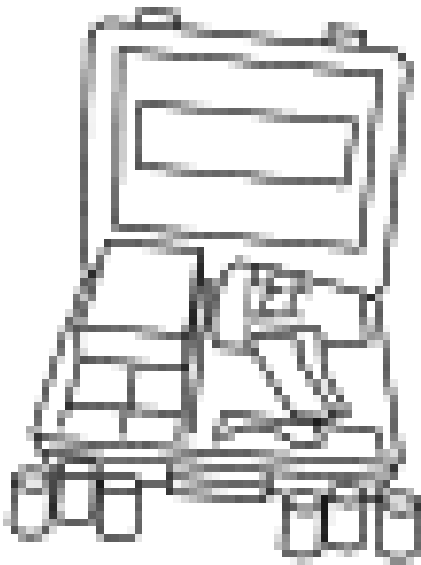
|  |                                                           |
|--|-----------------------------------------------------------|
|  | Compressor Spacer, Valve Spring<br>303-382 (T91P-6565-AH) |
|--|-----------------------------------------------------------|

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1331-A**

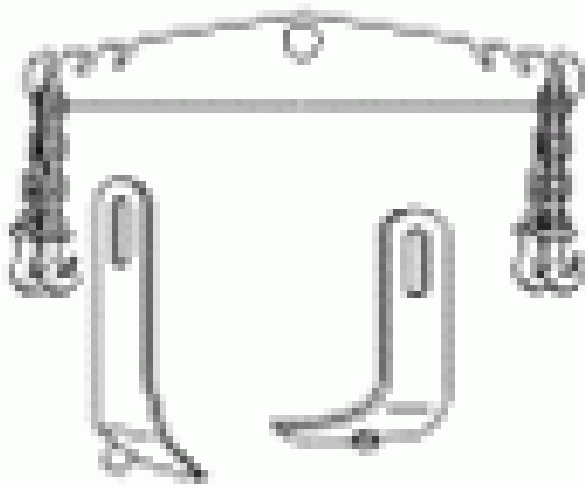


**ST1300-A**

Compressor, Valve Spring  
303-567 (T97P-6565-AH)

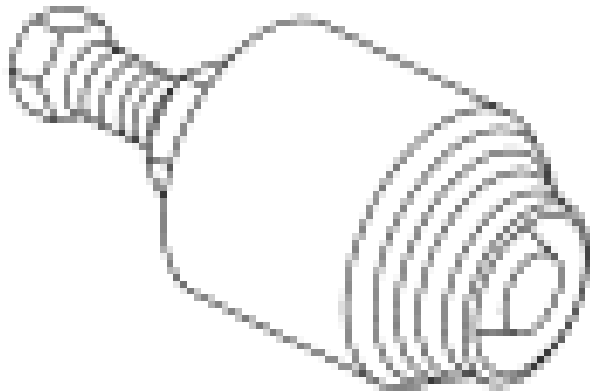
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST2443-A

Lifting Bracket Set, Engine  
303-DS086 (D93P-6001-A) or equivalent



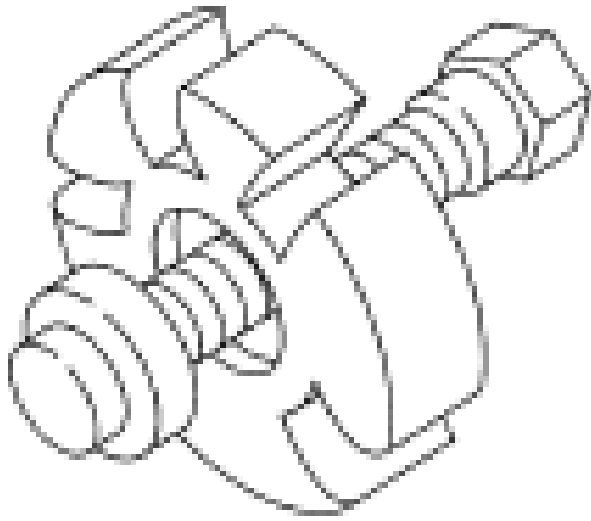
ST1730-A

Remover, Crankshaft Front Oil Seal  
303-107 (T74P-6700-A)

Remover, Crankshaft Vibration Damper

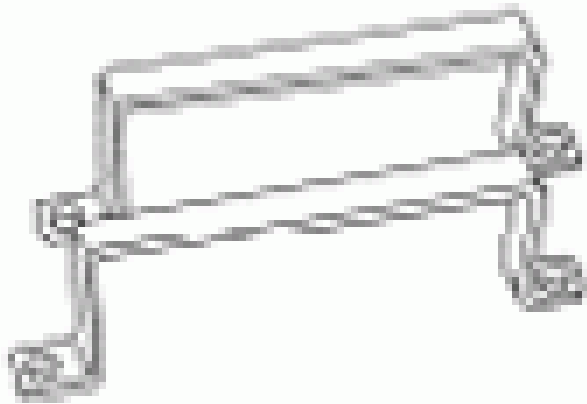
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1286-A**

303-009 (T58P-6316-D)



**ST1658-A**

Remover/Installer, Cylinder Head  
303-572 (T97T-6000-A)

### Material

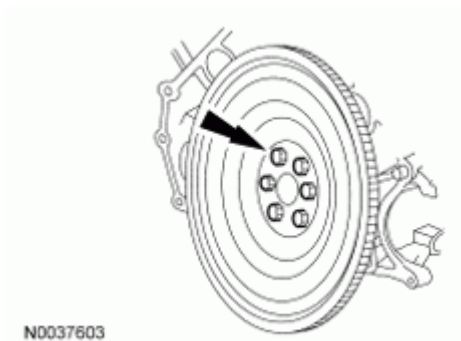
#### MATERIAL SPECIFICATIONS

| Item                                      | Specification |
|-------------------------------------------|---------------|
| Motorcraft® Metal Surface Prep<br>ZC-31-A | -             |
| Silicone Gasket Remover<br>ZC-30          | -             |

**Removal****Cylinder heads**

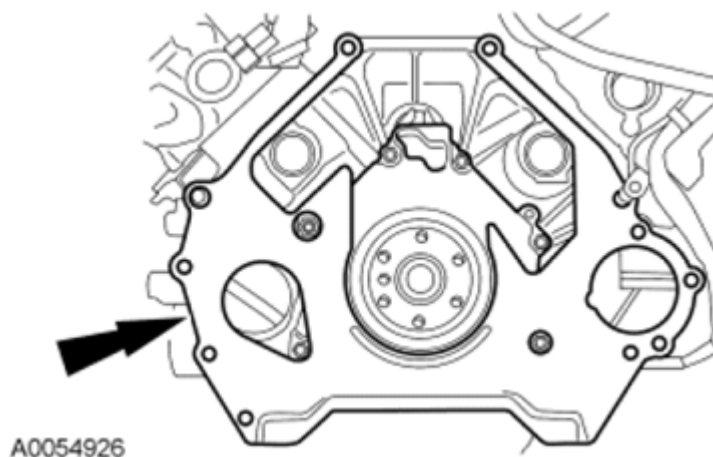
**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the engine. For additional information, refer to **ENGINE**.
3. Remove the bolts and the flexplate.



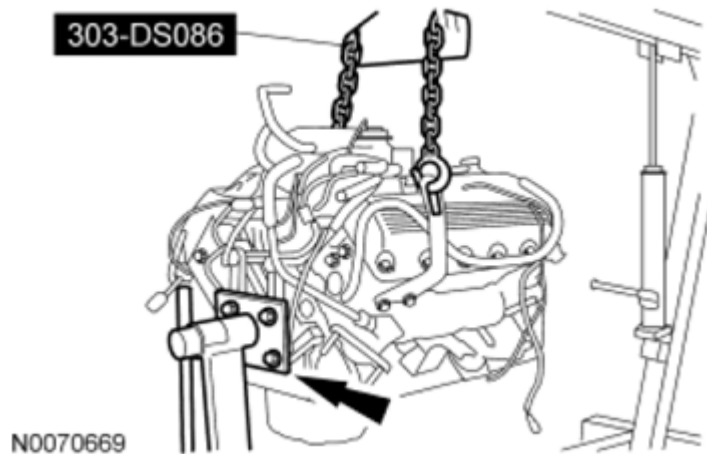
**Fig. 145: Locating Bolts And Flexplate**  
Courtesy of FORD MOTOR CO.

4. Remove the engine/transmission spacer plate.



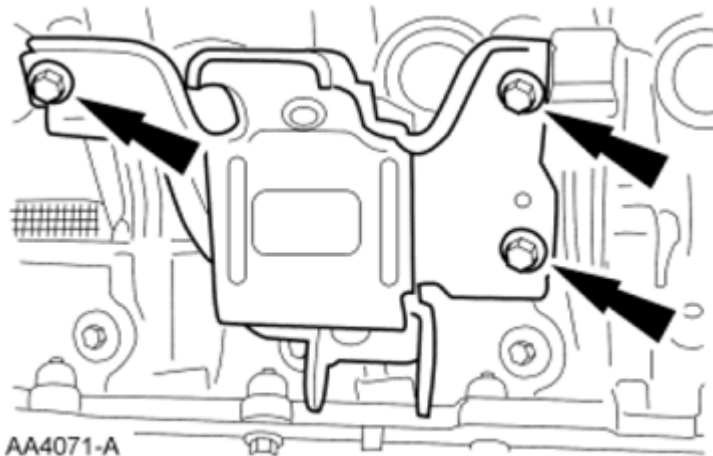
**Fig. 146: Locating Engine/Transmission Spacer Plate**  
Courtesy of FORD MOTOR CO.

5. Using the Engine Lifting Bracket Set, mount the engine on a suitable engine stand.



**Fig. 147: Identifying Engine Lifting Bracket Set (303-DS086)**  
Courtesy of FORD MOTOR CO.

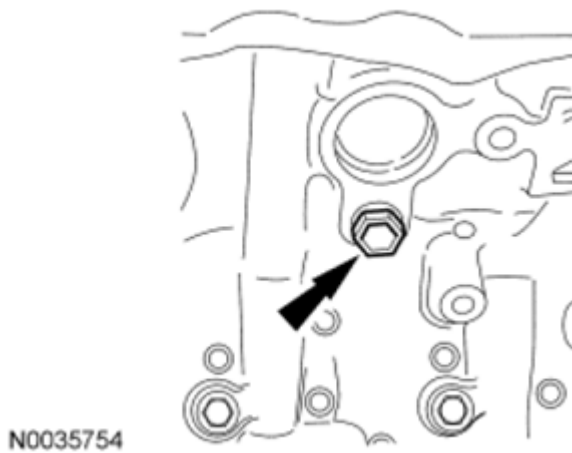
6. If equipped with cylinder block drain plugs, remove the bolts and the RH engine mount.



**Fig. 148: Locating RH Engine Mount Bolts**  
Courtesy of FORD MOTOR CO.

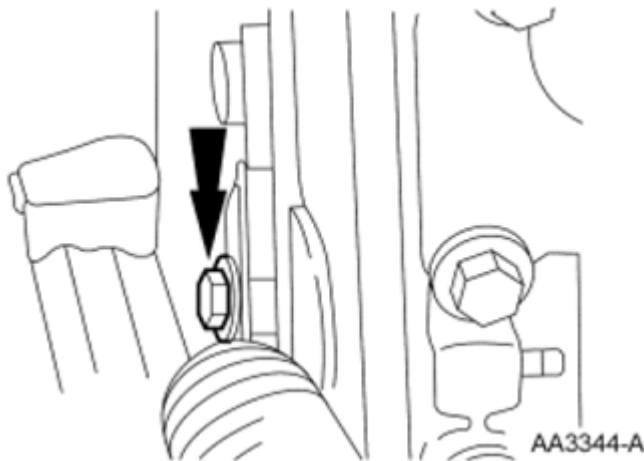
**NOTE:** LH shown in illustration, RH similar.

7. If equipped, remove the drain plugs from the engine block. Allow the coolant to completely drain.
- Install the drain plugs when finished.
  - To install, tighten to 20 Nm (177 lb-in).



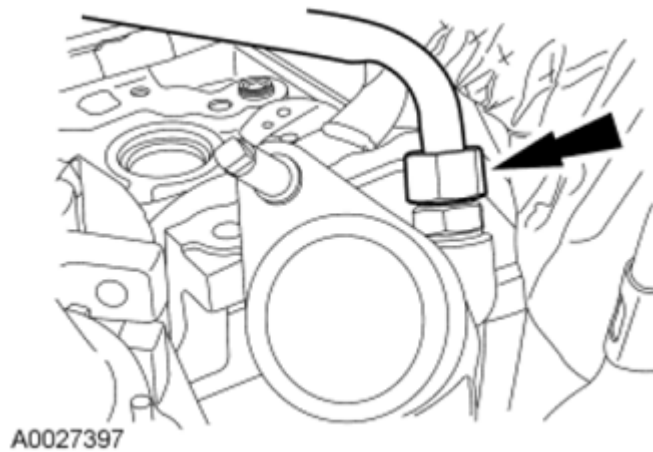
**Fig. 149: Locating Drain Plug**  
Courtesy of FORD MOTOR CO.

8. Remove the bolt and the battery cables from the engine.



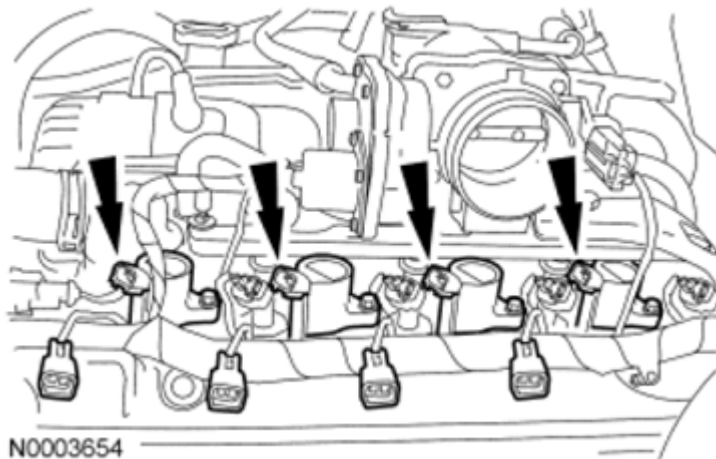
**Fig. 150: Locating Bolt And Battery Cables**  
Courtesy of FORD MOTOR CO.

9. Disconnect the EGR tube from the exhaust manifold.



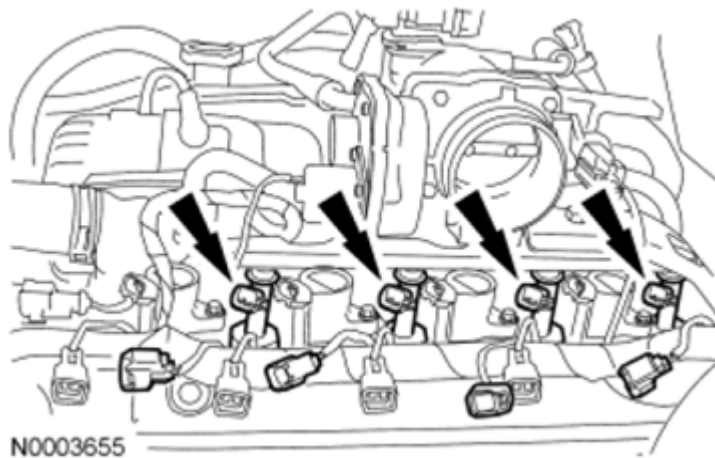
**Fig. 151: Locating EGR Tube**  
Courtesy of FORD MOTOR CO.

10. Disconnect the 8 ignition coil electrical connectors (4 shown in illustration).



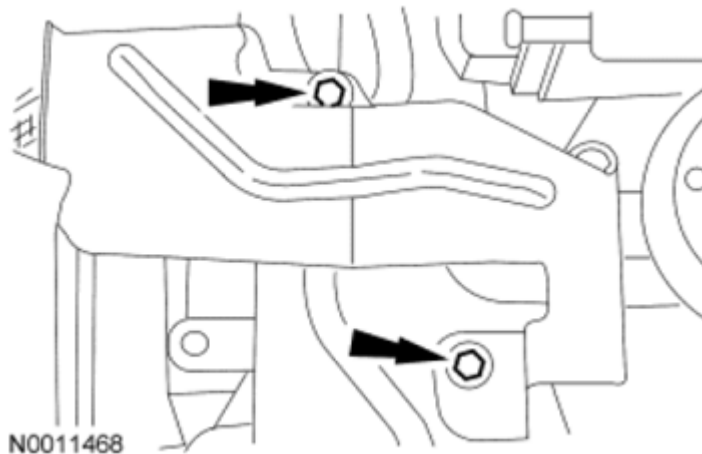
**Fig. 152: Locating Ignition Coil Electrical Connectors**  
Courtesy of FORD MOTOR CO.

11. Disconnect the 8 fuel injector electrical connectors (4 shown in illustration).



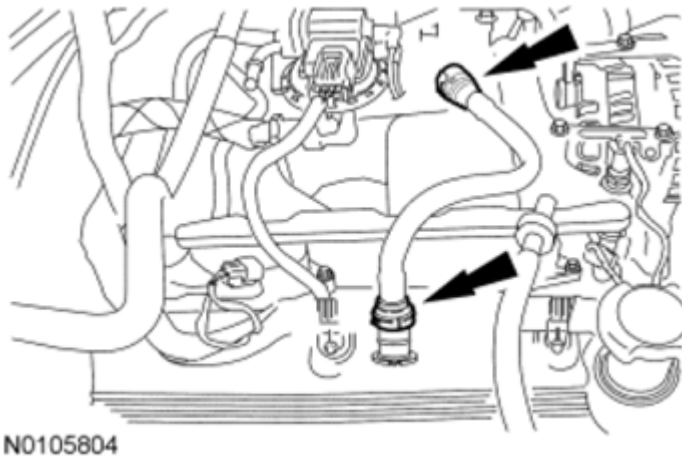
**Fig. 153: Locating Fuel Injector Electrical Connectors**  
Courtesy of FORD MOTOR CO.

12. Remove the 2 bolts and the intake manifold shield.



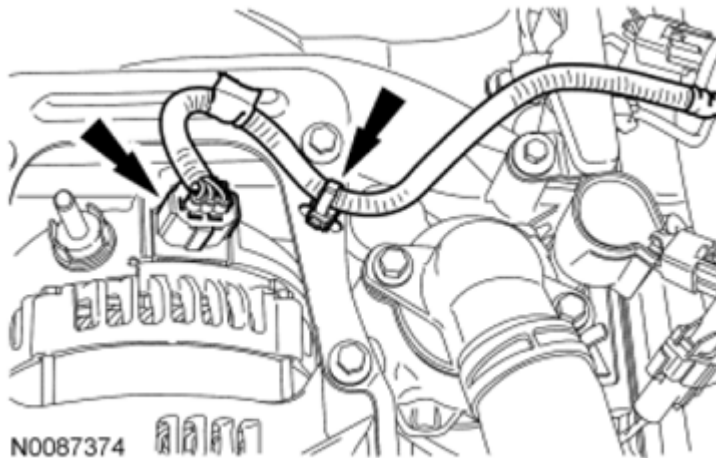
**Fig. 154: Locating Bolts And Intake Manifold Shield**  
Courtesy of FORD MOTOR CO.

13. Remove the crankcase ventilation tube.



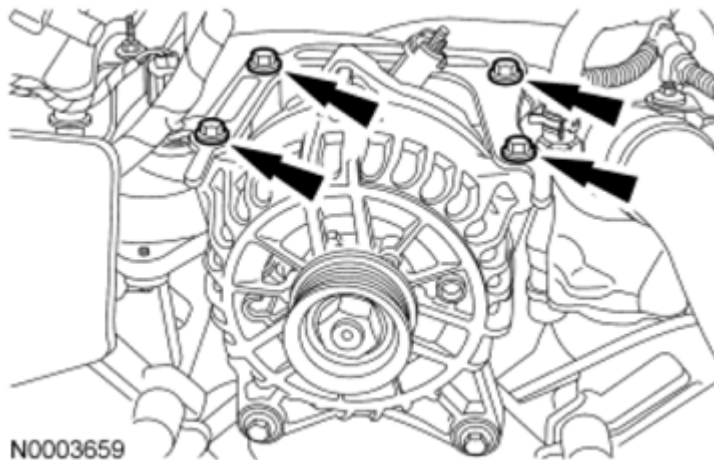
**Fig. 155: Locating Crankcase Ventilation Tube**  
Courtesy of FORD MOTOR CO.

14. Disconnect the generator electrical connector and detach the wire harness retainer.



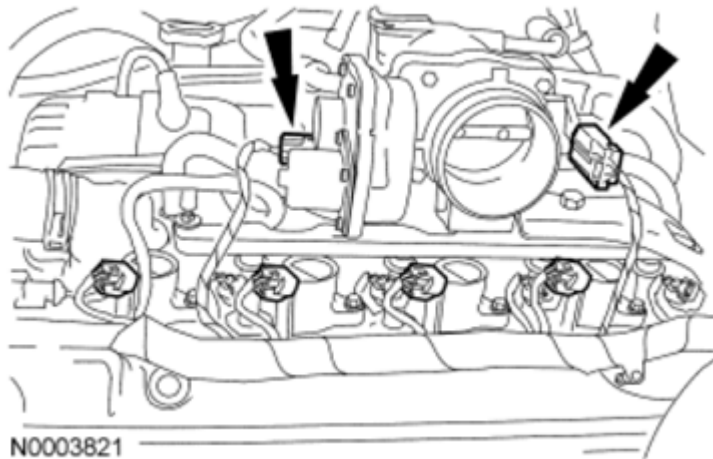
**Fig. 156: Locating Generator Electrical Connector**  
Courtesy of FORD MOTOR CO.

15. Remove the generator mounting bracket.
- Remove the 4 bolts.
  - Remove the bracket.



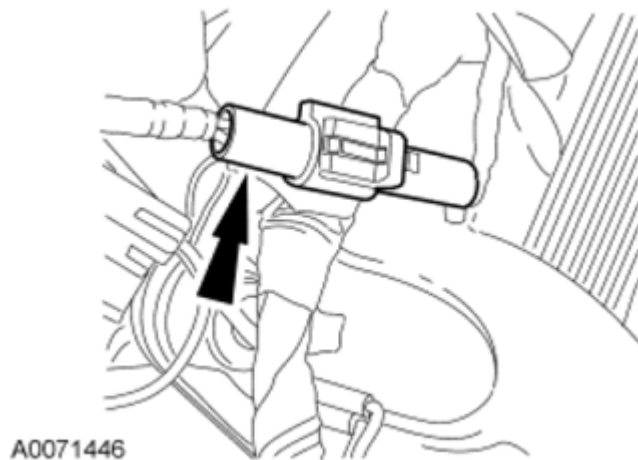
**Fig. 157: Locating Generator Mounting Bracket And Bolts**  
Courtesy of FORD MOTOR CO.

16. Disconnect the throttle control and the Throttle Position (TP) sensor electrical connectors.



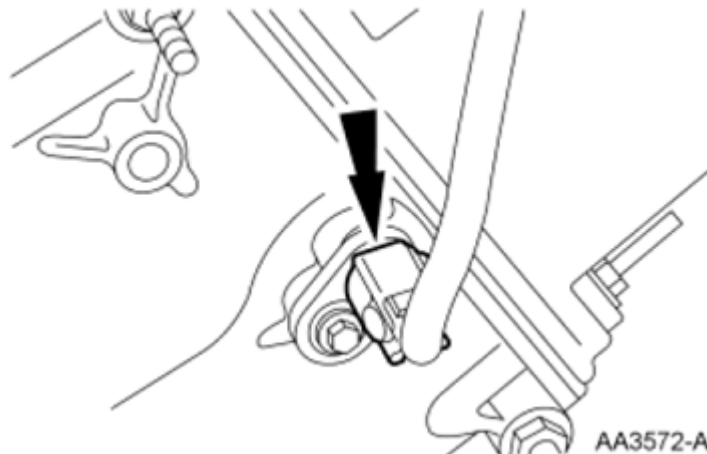
**Fig. 158: Locating Throttle Position (TP) Sensor Electrical Connectors**  
Courtesy of FORD MOTOR CO.

17. Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.



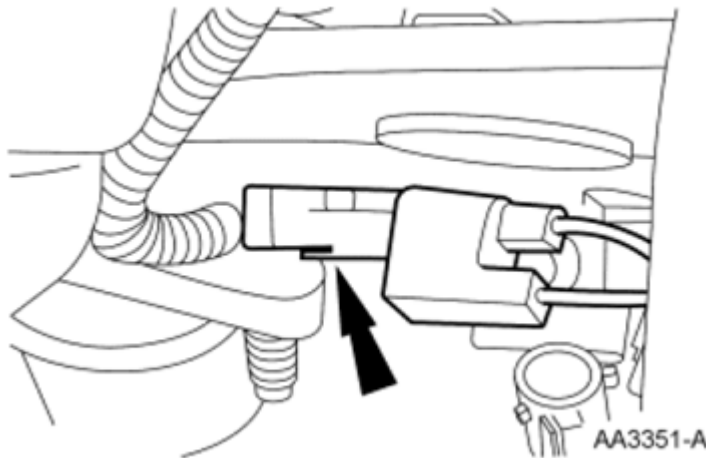
**Fig. 159: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

18. Disconnect the Camshaft Position (CMP) sensor electrical connector.



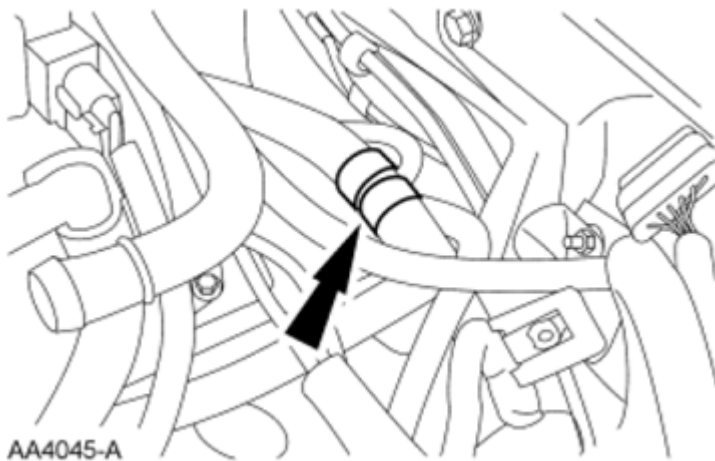
**Fig. 160: Locating Camshaft Position (CMP) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

19. Disconnect the radio ignition interference capacitor and remove the engine control sensor wiring.



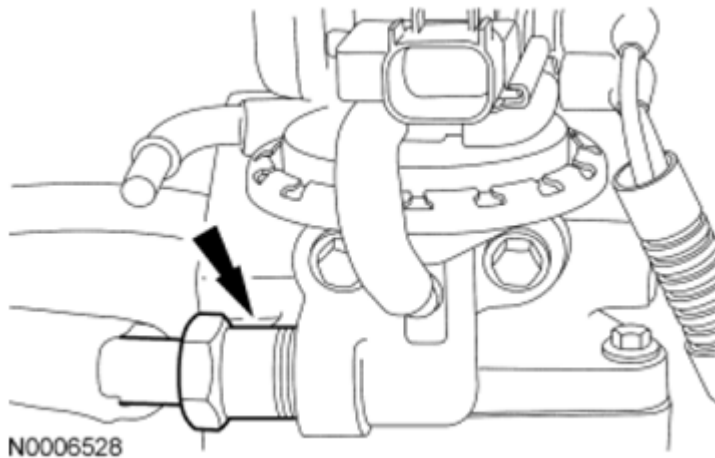
**Fig. 161: Locating Radio Ignition Interference Capacitor**  
Courtesy of FORD MOTOR CO.

20. Disconnect the fuel charging wiring from the crash bracket and the wiring support bracket and remove the harness from the engine.



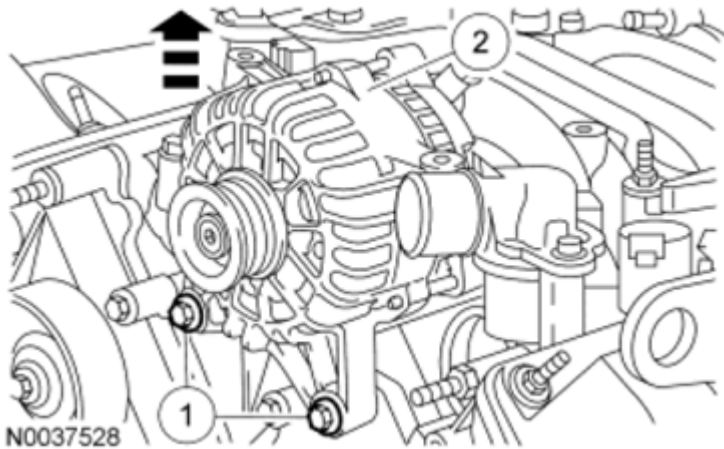
**Fig. 162: Locating Fuel Charging Wiring**  
Courtesy of FORD MOTOR CO.

21. Disconnect the EGR tube nut from the EGR system module.



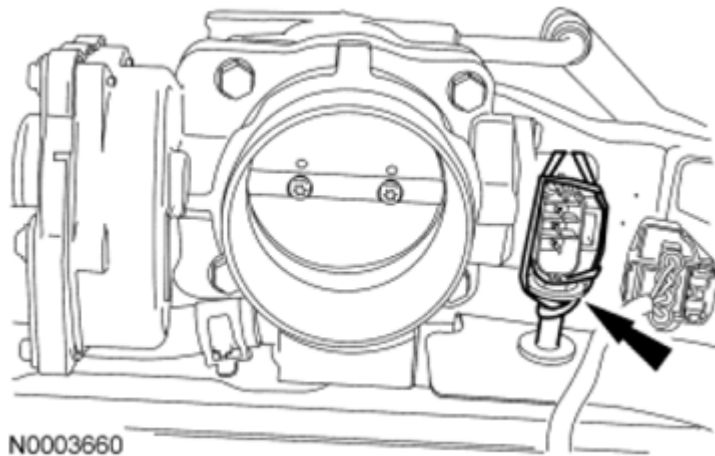
**Fig. 163: Locating EGR Tube Nut**  
Courtesy of FORD MOTOR CO.

22. Remove the generator.
  1. Remove the 2 bolts.
  2. Remove the generator.



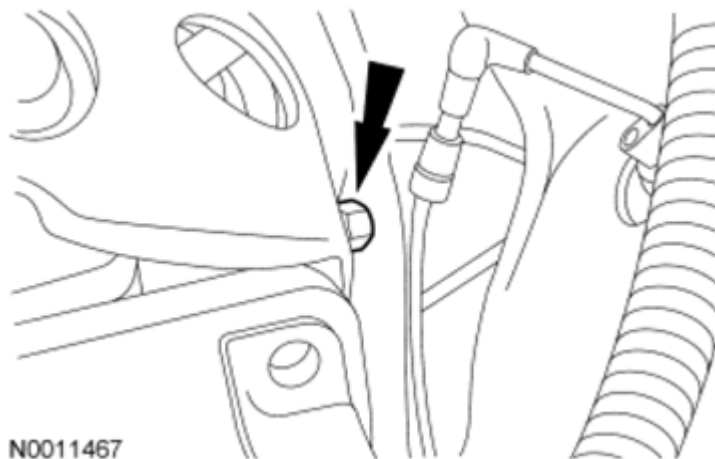
**Fig. 164: Removing Generator**  
Courtesy of FORD MOTOR CO.

23. Remove the intake manifold crash bracket bolt and prevent the bolt from contacting the cylinder head with a rubber band or tie strap.



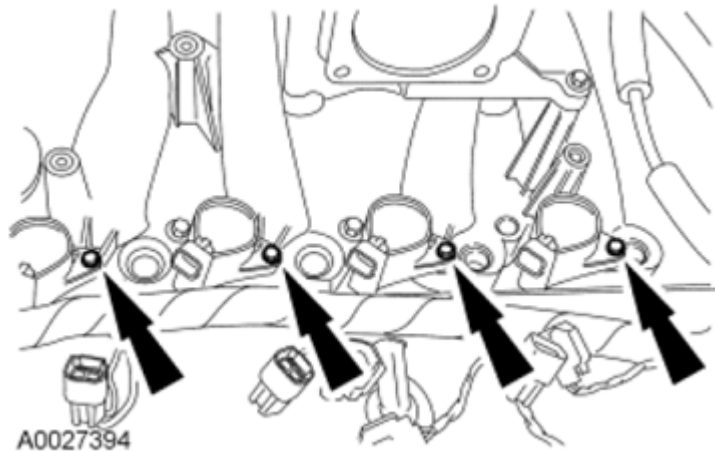
**Fig. 165: Locating Intake Manifold Crash Bracket**  
Courtesy of FORD MOTOR CO.

24. Remove the intake manifold crash bracket stud bolt.



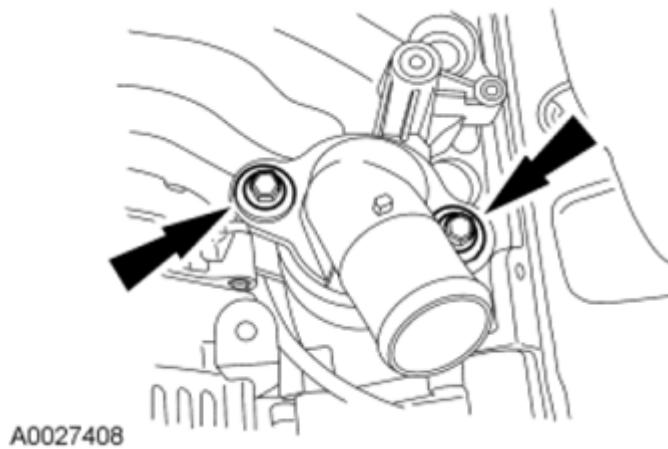
**Fig. 166: Locating Intake Manifold Crash Bracket Stud Bolt**  
Courtesy of FORD MOTOR CO.

25. Remove the 8 bolts and the 8 ignition coils (4 shown in illustration).



**Fig. 167: Locating Bolts And Ignition Coils**  
Courtesy of FORD MOTOR CO.

26. Remove the 2 bolts and the coolant outlet adapter.



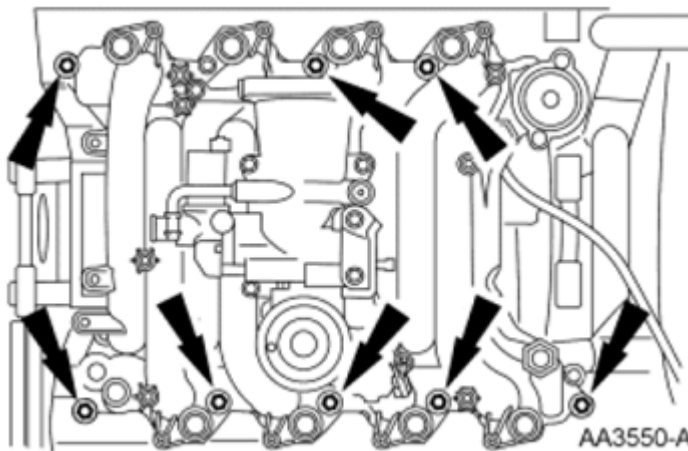
**Fig. 168: Locating Bolts And Coolant Outlet Adapter**  
Courtesy of FORD MOTOR CO.

27. Remove the thermostat.



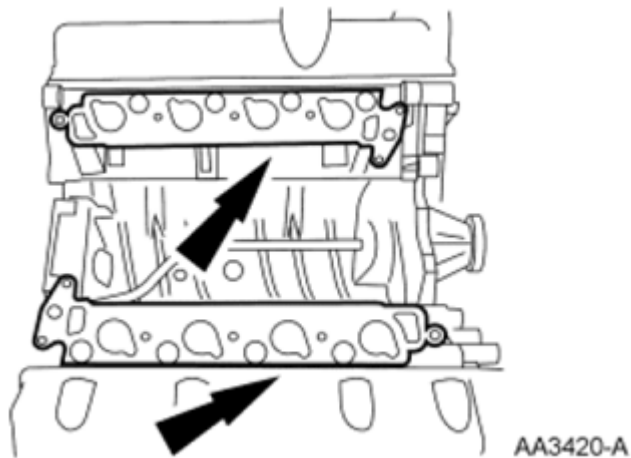
**Fig. 169: Identifying Thermostat**  
Courtesy of FORD MOTOR CO.

28. Remove the 8 bolts and the intake manifold.
- Discard the intake manifold gaskets.



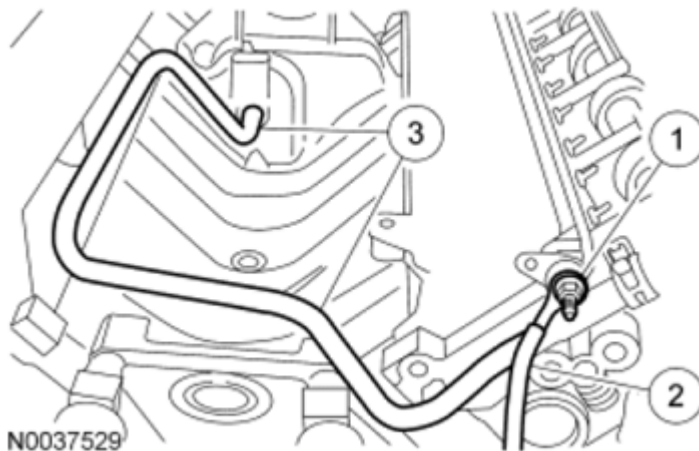
**Fig. 170: Locating Bolts And Intake Manifold**  
Courtesy of FORD MOTOR CO.

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



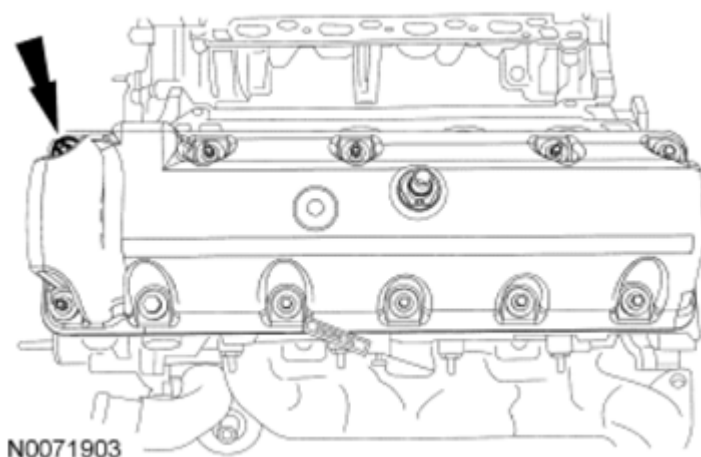
**Fig. 171: Locating Sealing Surfaces**  
Courtesy of FORD MOTOR CO.

29. Clean the sealing surfaces.
30. Remove the coolant bypass tube.
  1. Remove the retaining nut.
  2. Remove the ground strap.
  3. Remove the coolant bypass tube.



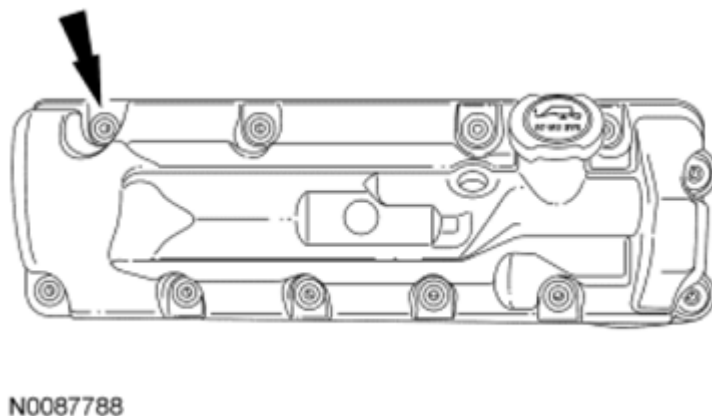
**Fig. 172: Identifying Coolant Bypass Tube**  
Courtesy of FORD MOTOR CO.

31. Loosen the studs and bolts and remove the LH valve cover.
  - Clean the mating surface and discard gasket.



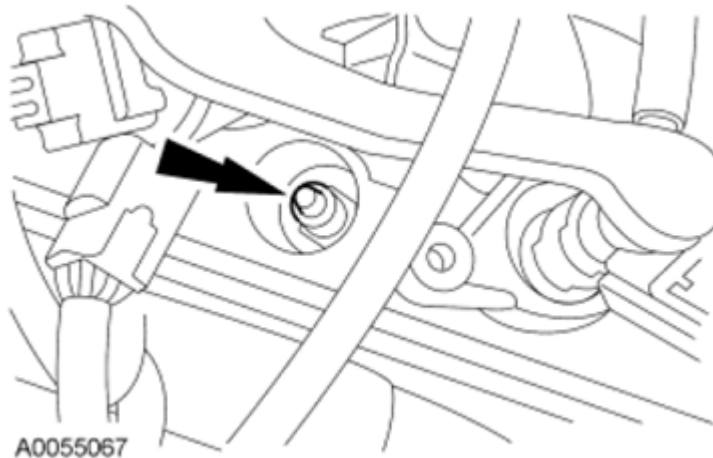
**Fig. 173: Locating Studs, Bolts And LH Valve Cover**  
Courtesy of FORD MOTOR CO.

32. Loosen the studs and bolts and remove the RH valve cover.
- Discard the gasket.



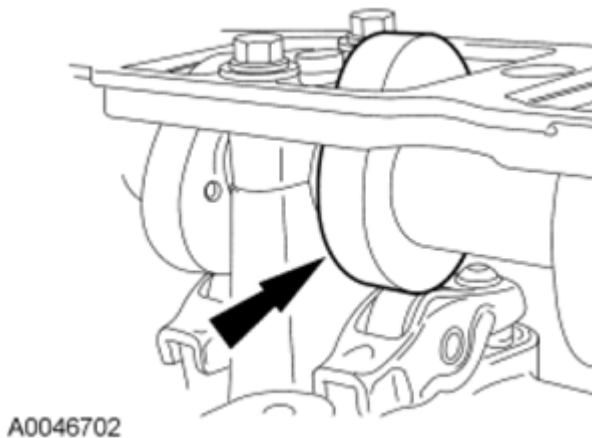
**Fig. 174: Locating Studs, Bolts And RH Valve Cover**  
Courtesy of FORD MOTOR CO.

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



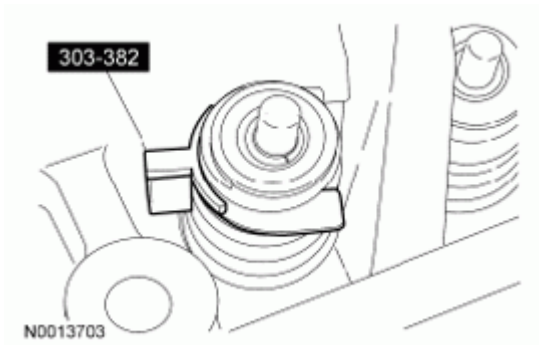
**Fig. 175: Locating Spark Plug**  
Courtesy of FORD MOTOR CO.

33. Remove the spark plugs.
34. Position the lobe of the camshaft upward.



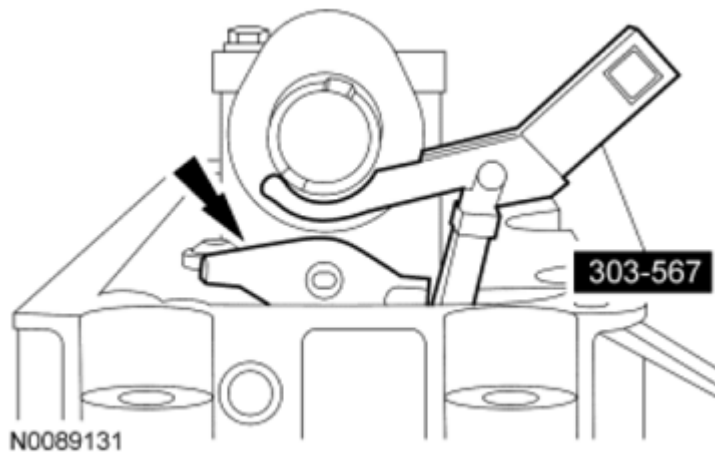
**Fig. 176: Locating Lobe Of Camshaft**  
Courtesy of FORD MOTOR CO.

35. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



**Fig. 177: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

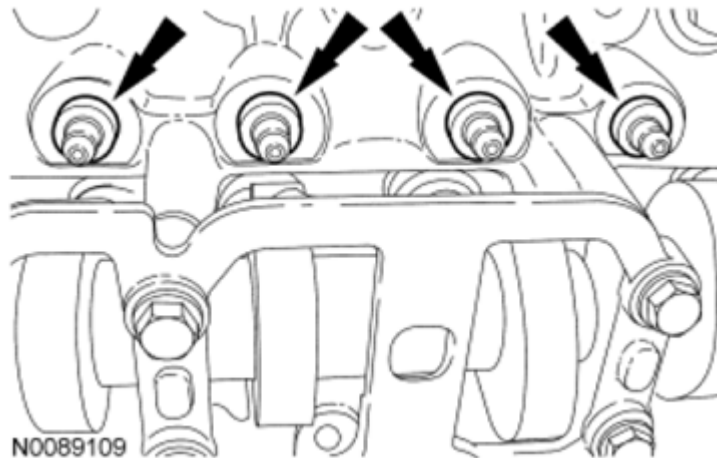
**NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.



**Fig. 178: Identifying Valve Spring Compressor (303-567)**  
Courtesy of FORD MOTOR CO.

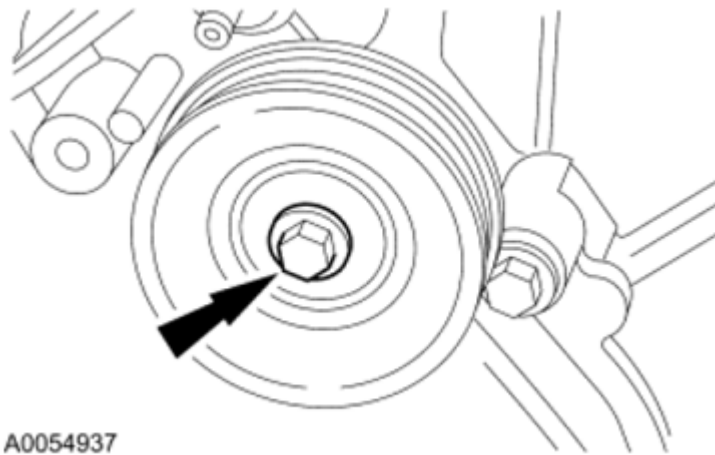
36. Using the Valve Spring Compressor, compress the valve springs and remove the camshaft roller followers.

**NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.



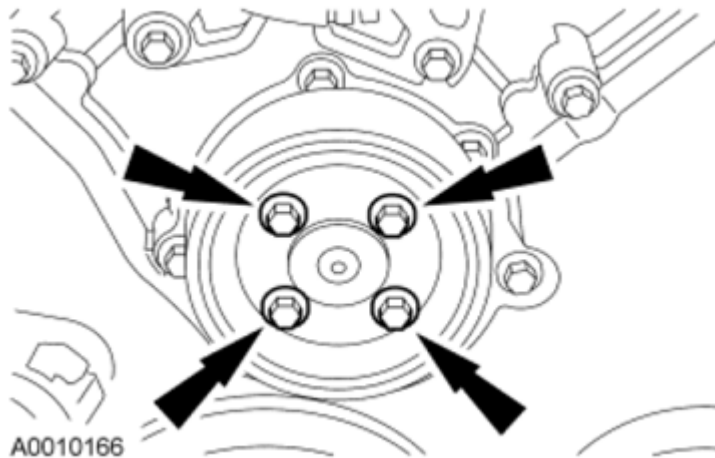
**Fig. 179: Locating Hydraulic Lash Adjusters**  
Courtesy of FORD MOTOR CO.

37. Remove the 16 hydraulic lash adjusters (4 shown in illustration).
38. Remove the bolt and the belt idler pulley.



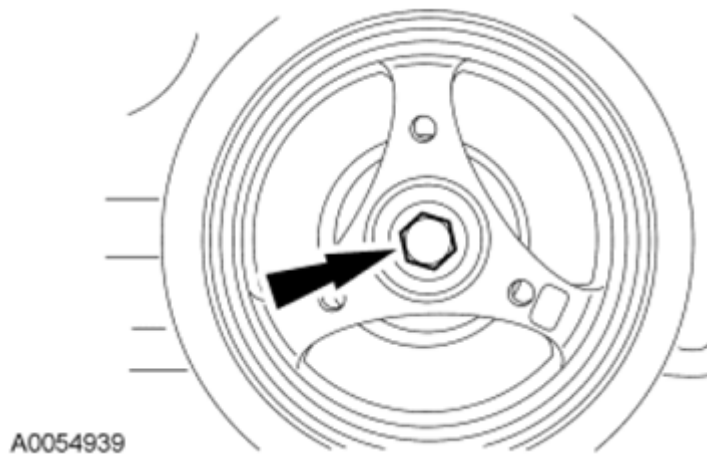
**Fig. 180: Locating Bolt And Belt Idler Pulley**  
Courtesy of FORD MOTOR CO.

39. Remove the coolant pump pulley.



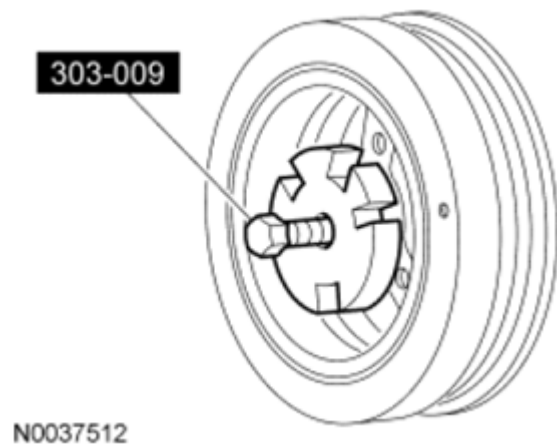
**Fig. 181: Locating Coolant Pump Pulley Bolts**  
Courtesy of FORD MOTOR CO.

40. Remove the crankshaft pulley bolt.



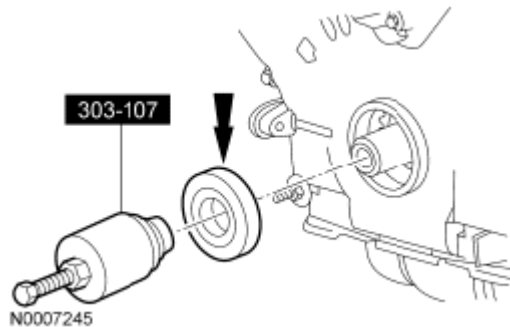
**Fig. 182: Locating Crankshaft Pulley Bolt**  
Courtesy of FORD MOTOR CO.

41. Using the Crankshaft Vibration Damper Remover, remove the crankshaft pulley.



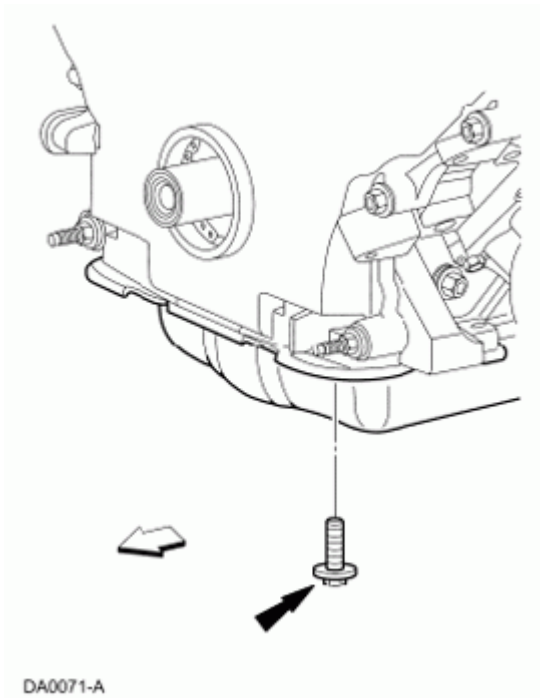
**Fig. 183: Removing Crankshaft Pulley Using Crankshaft Vibration Damper Remover**  
Courtesy of FORD MOTOR CO.

42. Using the Crankshaft Front Oil Seal Remover, remove the crankshaft front oil seal.



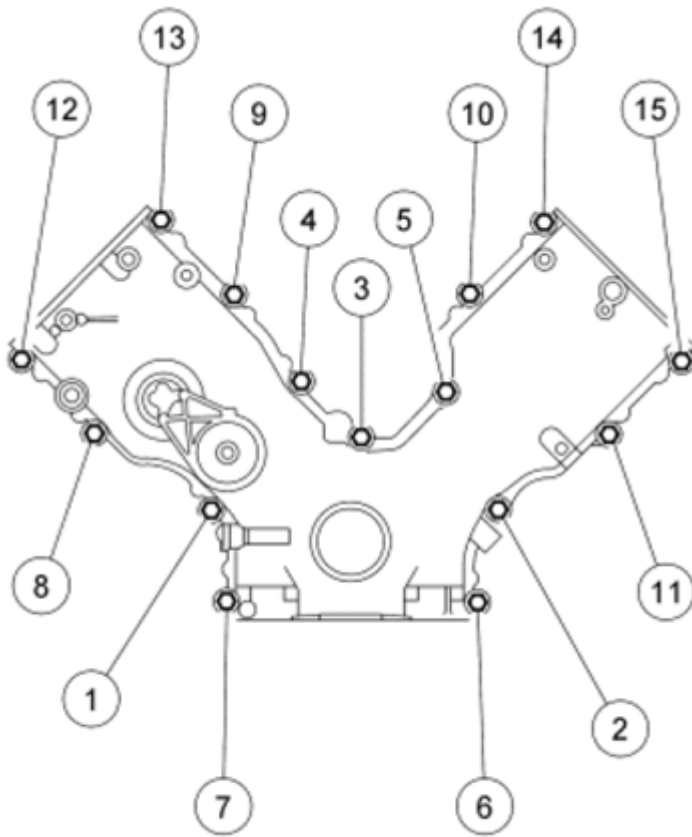
**Fig. 184: Locating Crankshaft Front Seal**  
Courtesy of FORD MOTOR CO.

43. Remove the front 4 oil pan bolts.



**Fig. 185: Locating Front Oil Pan Bolt**  
Courtesy of FORD MOTOR CO.

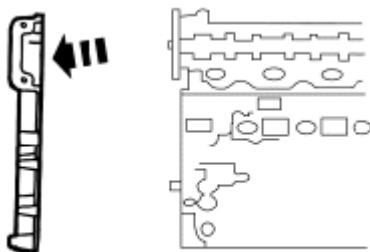
**NOTE:** Correct fastener location is essential for the installation. Record fastener location.



N0037514

**Fig. 186: Identifying Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

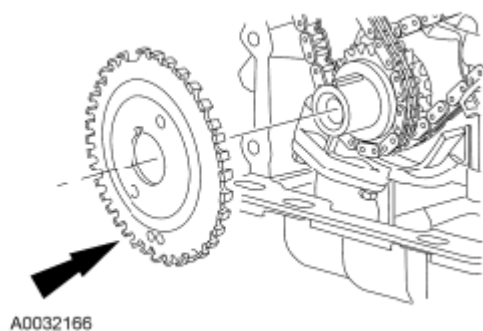
44. Remove the 15 fasteners in the sequence shown in illustration.
45. Remove the engine front cover from the cylinder block.
  - Discard the gaskets.



AA1665-A

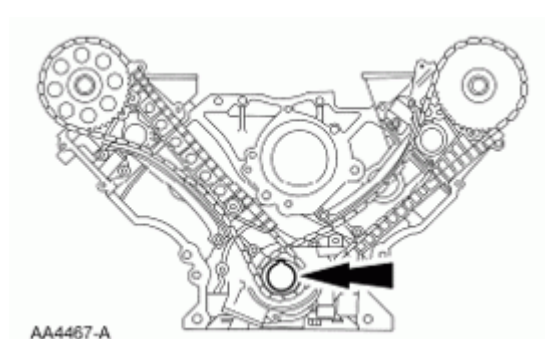
**Fig. 187: Removing Engine Front Cover**  
Courtesy of FORD MOTOR CO.

46. Remove the crankshaft sensor ring.



**Fig. 188: Locating Crankshaft Sensor Ring**  
Courtesy of FORD MOTOR CO.

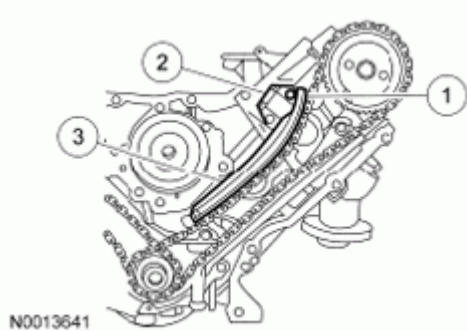
47. Position the crankshaft with the keyway at the 12 o'clock position.



**Fig. 189: Locating Crankshaft**  
Courtesy of FORD MOTOR CO.

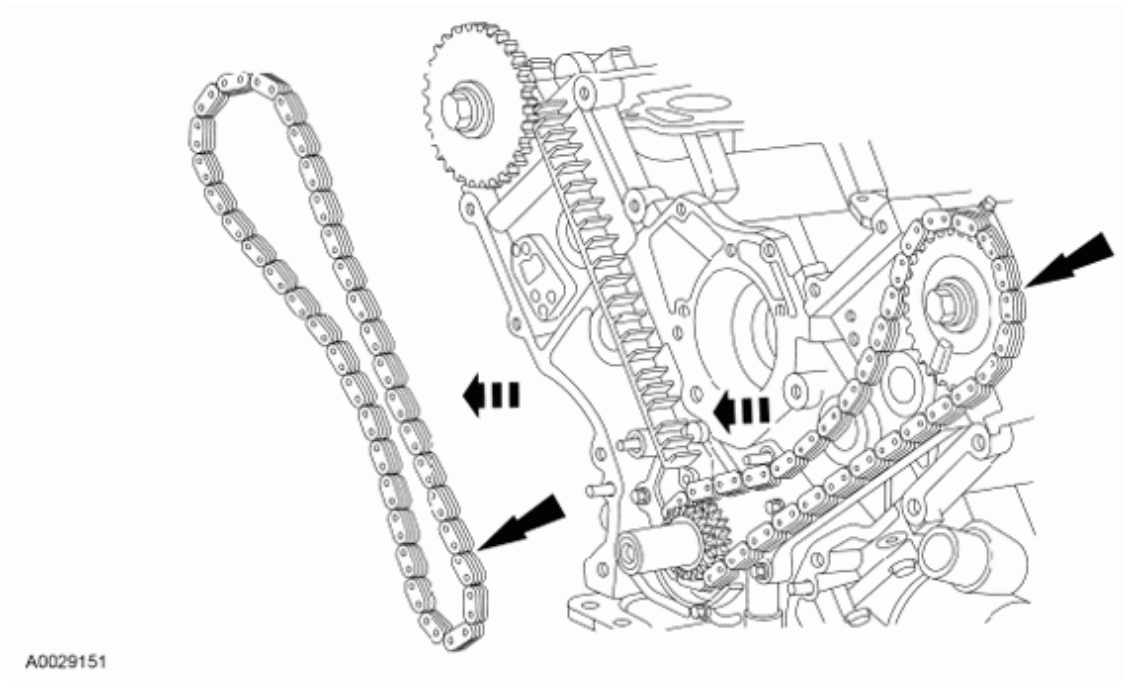
**NOTE:** LH shown in illustration, RH similar.

48. Remove the timing chain tensioning system from both timing chains.
1. Remove the bolts.
  2. Remove the timing chain tensioners.
  3. Remove the timing chain tensioner arms.



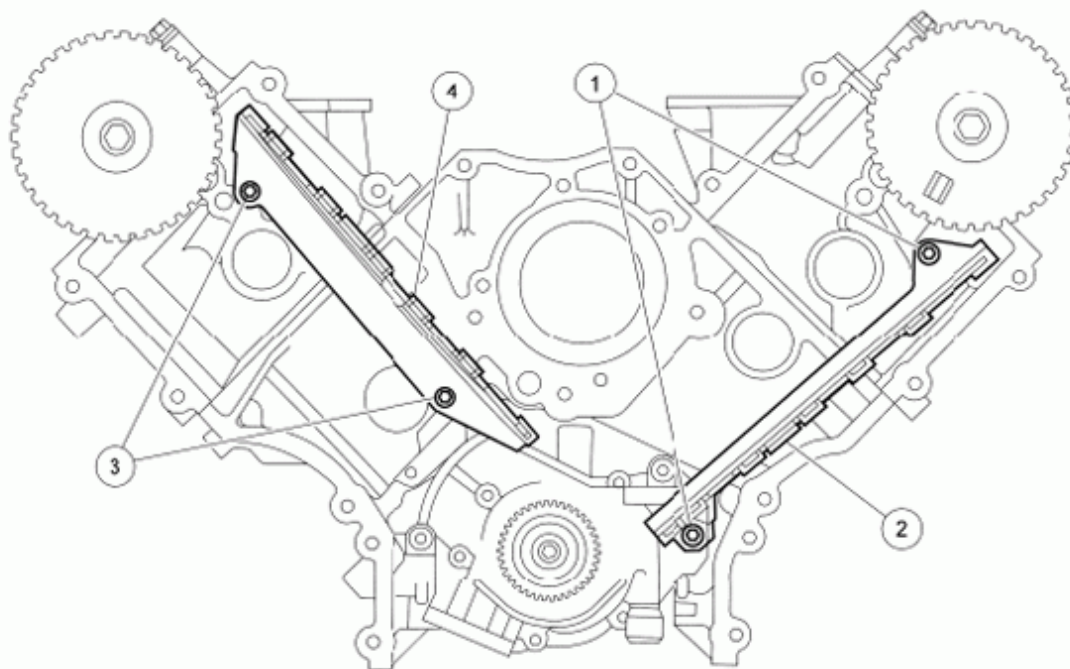
**Fig. 190: Identifying Timing Chain Tensioner Arms And Bolts**  
Courtesy of FORD MOTOR CO.

49. Remove the LH and RH timing chains and the crankshaft sprocket.
- Remove the RH timing chain from the camshaft sprocket.
  - Remove the RH timing chain from the crankshaft sprocket.
  - Repeat for the LH timing chain and crankshaft sprocket.



**Fig. 191: Removing RH Timing Chain**  
Courtesy of FORD MOTOR CO.

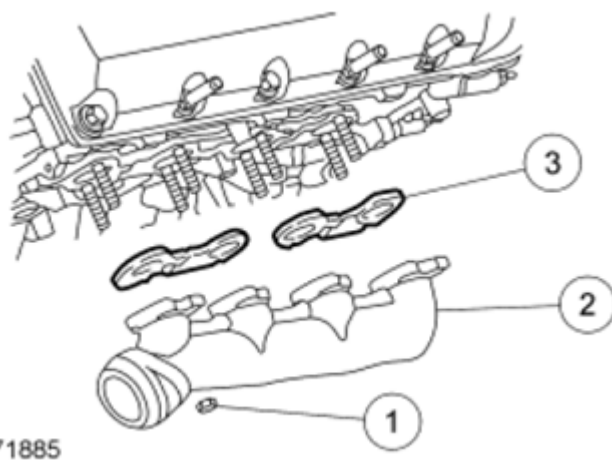
50. Remove both timing chain guides.
1. Remove the bolts.
  2. Remove the LH timing chain guide.
  3. Remove the bolts.
  4. Remove the RH timing chain guide.



**Fig. 192: Identifying Timing Chain Guide And Bolts**  
Courtesy of FORD MOTOR CO.

### **RH cylinder head**

51. Remove the RH exhaust manifold.
  1. Remove the nuts and discard.
  2. Remove the RH exhaust manifold.
  3. Remove and discard the RH exhaust manifold gasket.

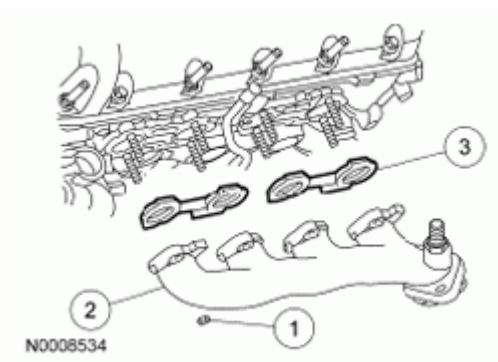


**Fig. 193: Identifying RH Exhaust Manifold, Nut And Gasket**  
Courtesy of FORD MOTOR CO.

52. Remove and discard the 8 RH exhaust manifold studs.

### **LH cylinder head**

53. Remove the LH exhaust manifold.
1. Remove the nuts and discard.
  2. Remove the LH exhaust manifold.
  3. Remove and discard the LH exhaust manifold gaskets.



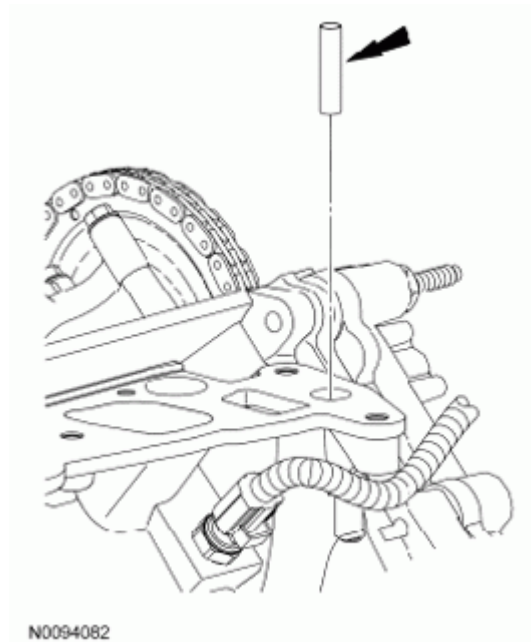
**Fig. 194: Identifying LH Exhaust Manifold, Nut And Gasket**  
Courtesy of FORD MOTOR CO.

54. Remove and discard the 8 LH exhaust manifold studs.
55. Remove the bolt and the oil level indicator tube.



**Fig. 195: Locating Bolt And Oil Level Indicator Tube**  
Courtesy of FORD MOTOR CO.

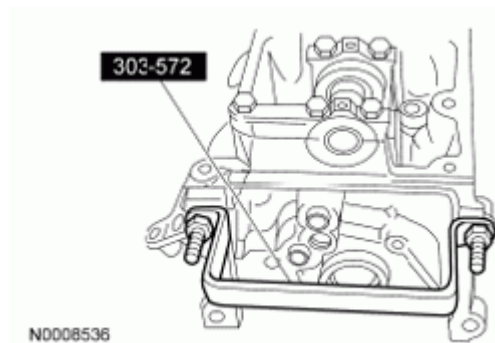
56. Remove the cylinder head insert from the LH cylinder head.



**Fig. 196: Locating Cylinder Head Insert**  
Courtesy of FORD MOTOR CO.

#### **Both cylinder heads**

57. Clean and inspect the exhaust manifolds. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
58. Install the Cylinder Head Remover/Installer on both ends of the cylinder head.



**Fig. 197: Identifying Cylinder Head Remover/Installer (303-572)**  
Courtesy of FORD MOTOR CO.

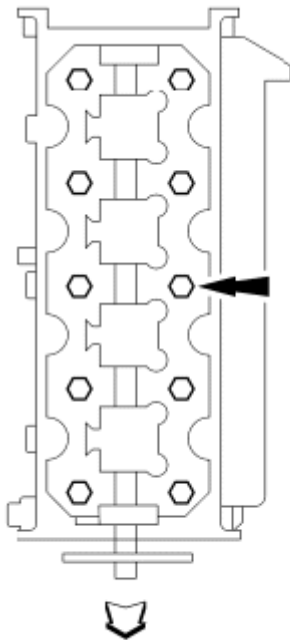
#### **RH cylinder head**

**NOTE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.

- NOTE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.
- NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.
- NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

59. Remove the bolts and the RH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



A26253-A

**Fig. 198: Locating Cylinder Head Bolts**  
Courtesy of FORD MOTOR CO.

#### LH cylinder head

- NOTE:** The cylinder head must be cool before removing it from the engine.

**Cylinder head warpage may result if a warm or hot cylinder head is removed.**

**NOTE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.

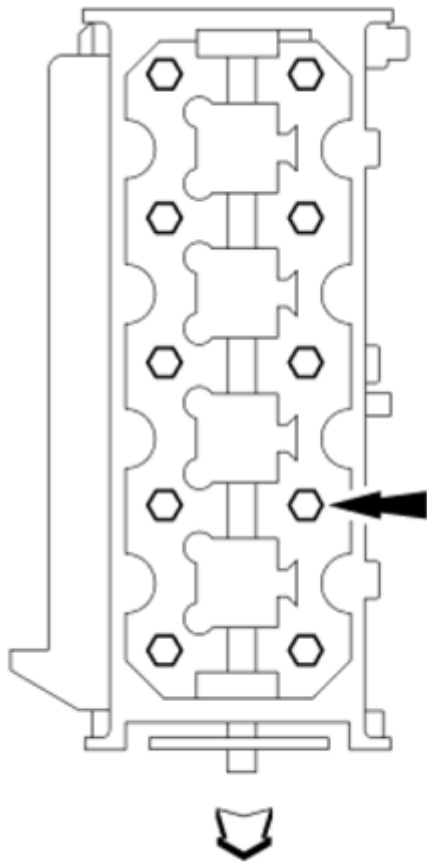
**NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

**NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.

**NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

60. Remove the bolts and the LH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



A26254-A

**Fig. 199: Locating Cylinder Head Bolts**  
Courtesy of FORD MOTOR CO.

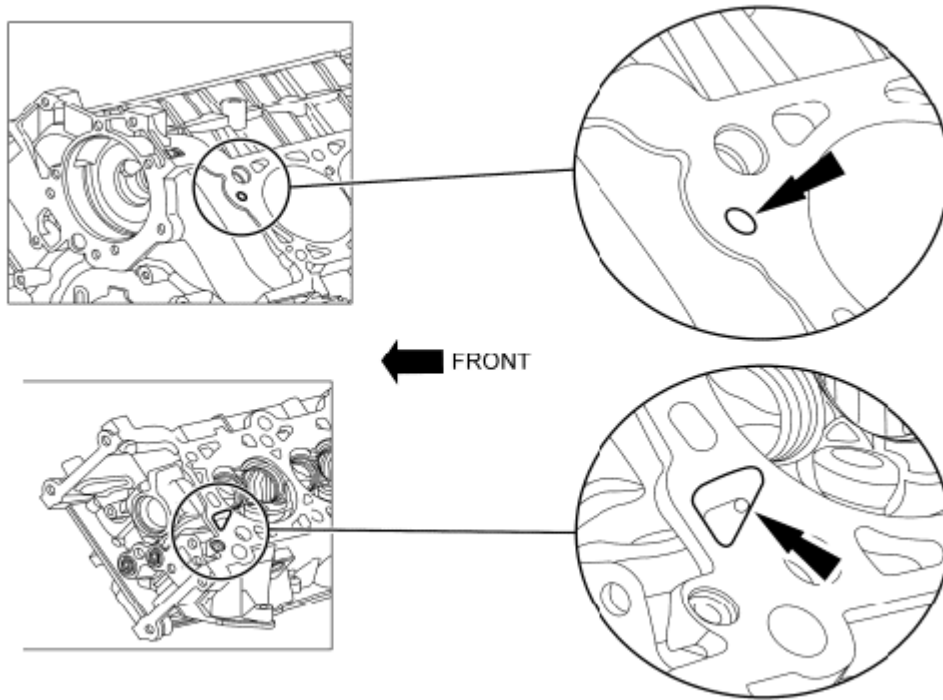
**Both cylinder heads**

- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.
- NOTE:** Observe all warnings or cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.
- NOTE:** If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

61. Clean the cylinder head-to-cylinder block mating surfaces of both the cylinder head and the cylinder block in the following sequence.

1. Remove any large deposits of silicone or gasket material with a plastic scraper.
2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep, following package directions, to remove any remaining 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.

**NOTE:** LH shown in illustration, RH similar.



**Fig. 200: Locating Cylinder Head Marks**  
Courtesy of FORD MOTOR CO.

62. Support the cylinder heads on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion, paying particular attention to the oil pressure feed area. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

## ENGINE

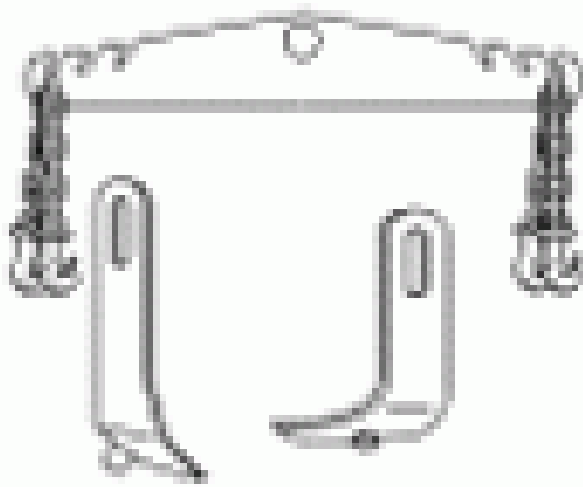
### Special Tool(s)

### SPECIAL TOOL CHART

|  |  |
|--|--|
|  |  |
|--|--|

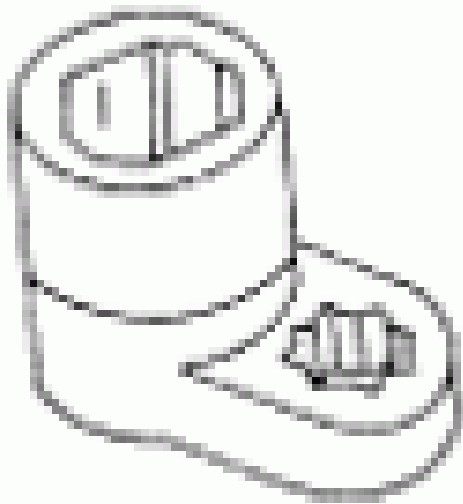
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST2443-A**

Lifting Bracket Set, Engine  
303-DS086 (D93P-6001-A)M  
Includes Lifting Bracket, Engine  
303-D087 and 303-D088 or equivalent



**ST1448-A**

Socket, Exhaust Gas Oxygen Sensor  
303-476 (T94P-9472-A)

### Material

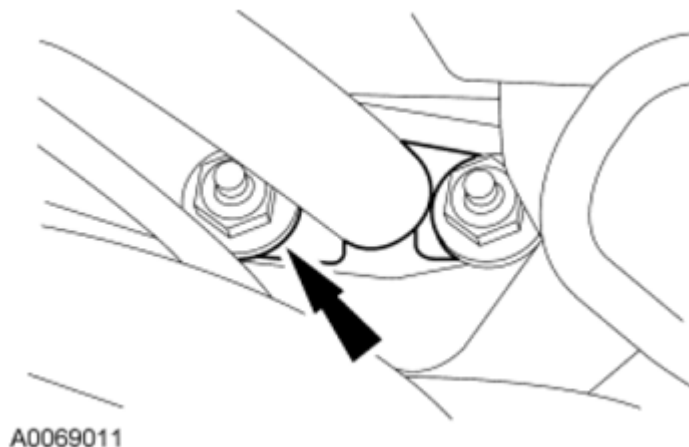
#### MATERIAL SPECIFICATIONS

| Item                                                            | Specification |
|-----------------------------------------------------------------|---------------|
| Penetrating and Lock Lubricant (US); Penetrating Fluid (Canada) | -             |

XL-1 (US); CXC-51-A (Canada)

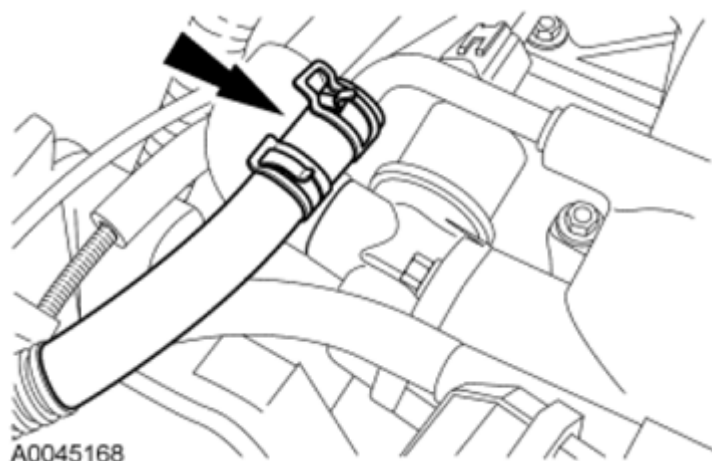
**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information refer to **JACKING & LIFTING** .
2. Release the fuel pressure. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION** .
3. Remove the hood.
4. Disconnect both battery cables. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
5. Remove the Air Cleaner (ACL) and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
6. Remove the wiper mounting arm and pivot shaft. For additional information, refer to **WIPERS AND WASHERS** .
7. Remove the 2 nuts and the support bracket.



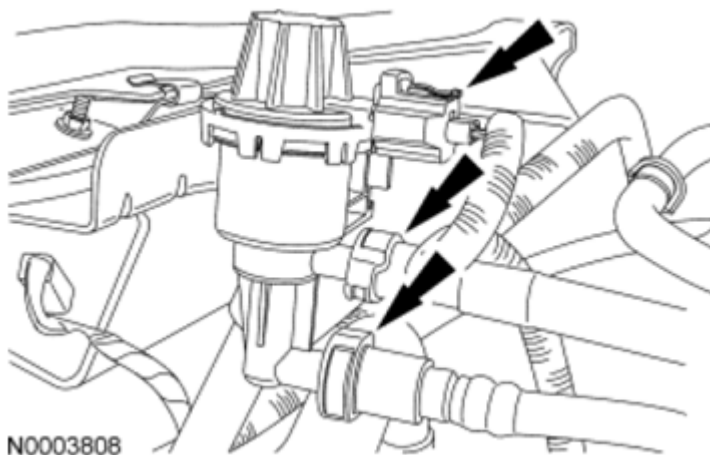
**Fig. 201: Locating Nuts And Support Bracket**  
Courtesy of FORD MOTOR CO.

8. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** .
9. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING** .
10. Disconnect the vacuum hose.



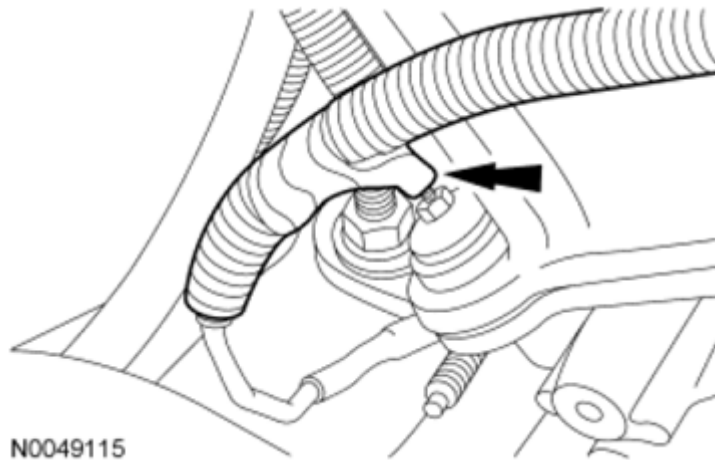
**Fig. 202: Locating Vacuum Hose**  
Courtesy of FORD MOTOR CO.

11. Disconnect the Evaporative Emission (EVAP) canister purge valve.
  - Disconnect the 2 quick release **EVAP** hoses.
  - Disconnect the electrical connector.



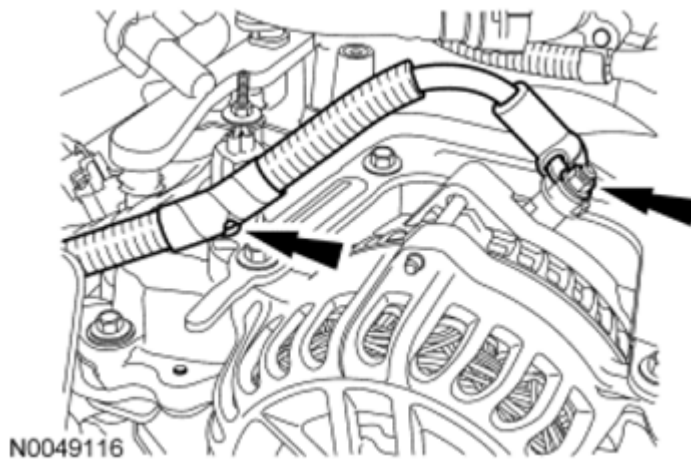
**Fig. 203: Locating Quick Release EVAP Hoses**  
Courtesy of FORD MOTOR CO.

12. Disconnect the fuel tube spring lock coupling. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION**.
13. Detach the generator battery cable retainer from the RH valve cover stud bolt.



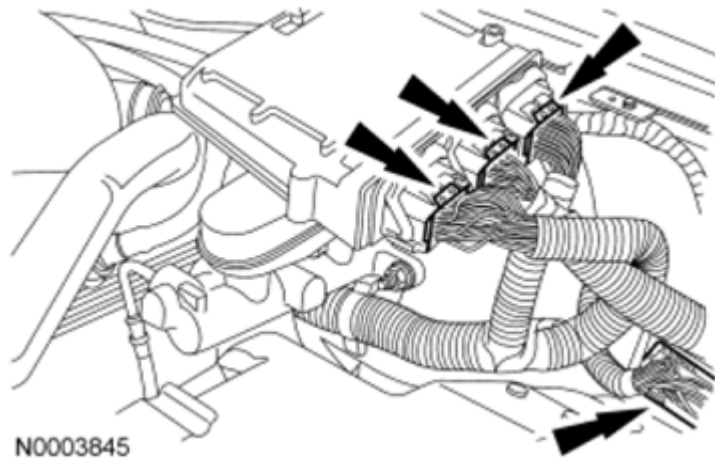
**Fig. 204: Locating Generator Battery Cable Retainer**  
Courtesy of FORD MOTOR CO.

14. Remove the nut and disconnect the generator battery cable.
  - Detach the generator battery cable pin-type retainer.



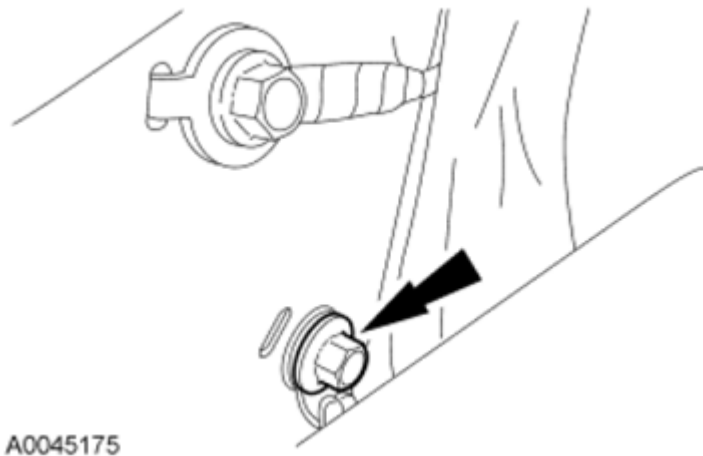
**Fig. 205: Locating Generator Battery Cable Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

15. Disconnect the PCM electrical connectors.



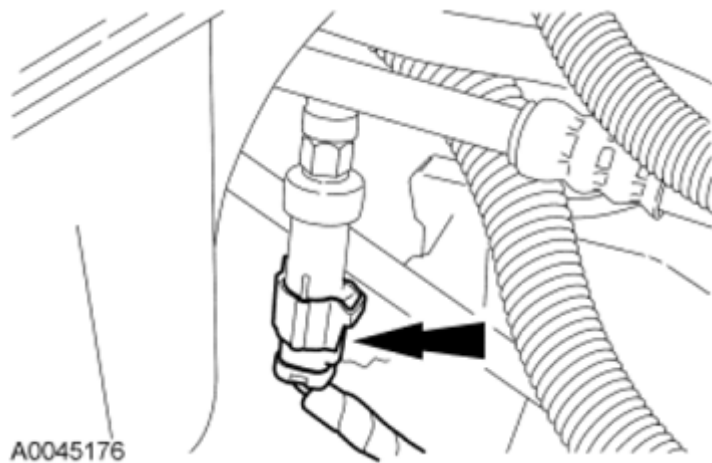
**Fig. 206: Locating PCM Electrical Connectors**  
Courtesy of FORD MOTOR CO.

16. Remove the bolt and ground wire.



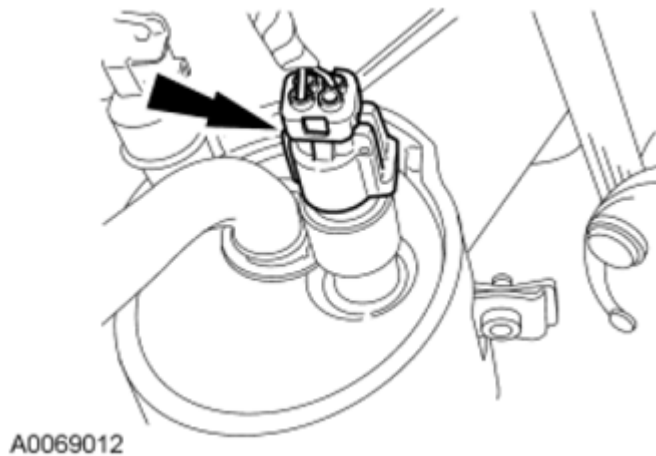
**Fig. 207: Locating Bolt And Ground Wire**  
Courtesy of FORD MOTOR CO.

17. Disconnect the A/C electrical connector.



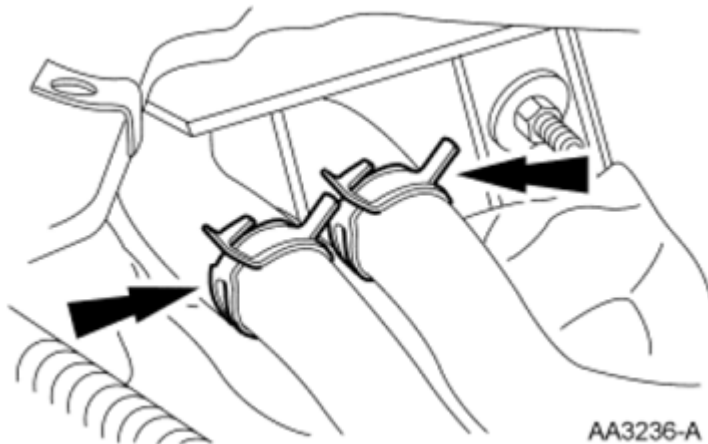
**Fig. 208: Locating A/C Electrical Connector**  
Courtesy of FORD MOTOR CO.

18. Disconnect the A/C low charge protection switch electrical connector.



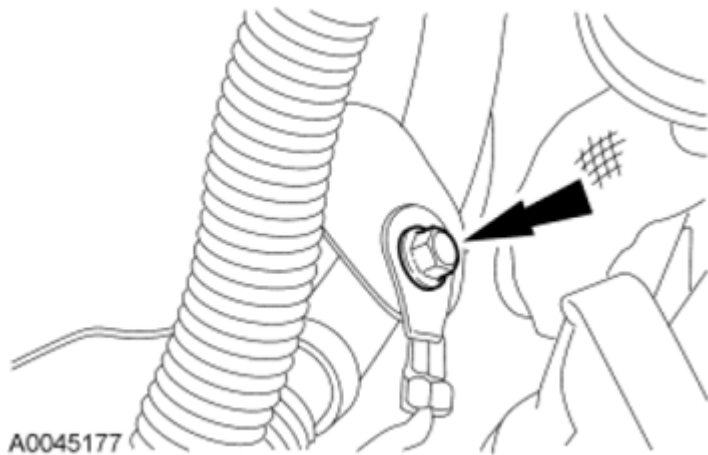
**Fig. 209: Locating A/C Low Charge Protection Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

19. Disconnect the heater hoses.



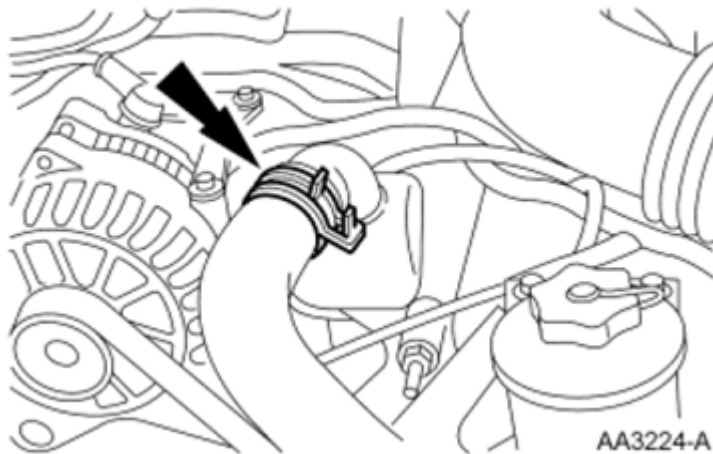
**Fig. 210: Locating Heater Hoses**  
Courtesy of FORD MOTOR CO.

20. Remove the bolt and the ground strap.



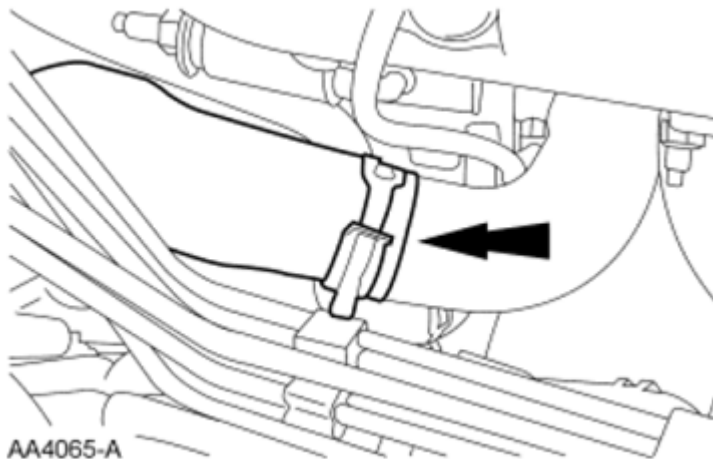
**Fig. 211: Locating Bolt And Ground Strap**  
Courtesy of FORD MOTOR CO.

21. Disconnect the upper radiator hose from the hose connection. Secure the hose to the radiator assembly.



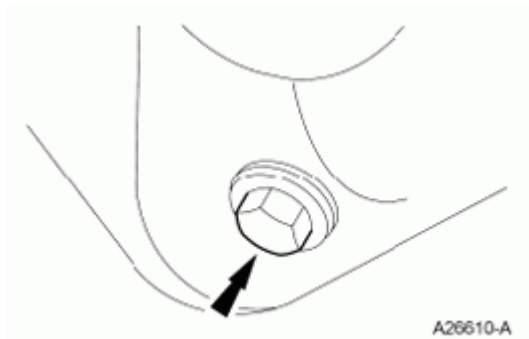
**Fig. 212: Locating Upper Radiator Hose**  
Courtesy of FORD MOTOR CO.

22. Disconnect the lower radiator hose from the oil filter adapter.



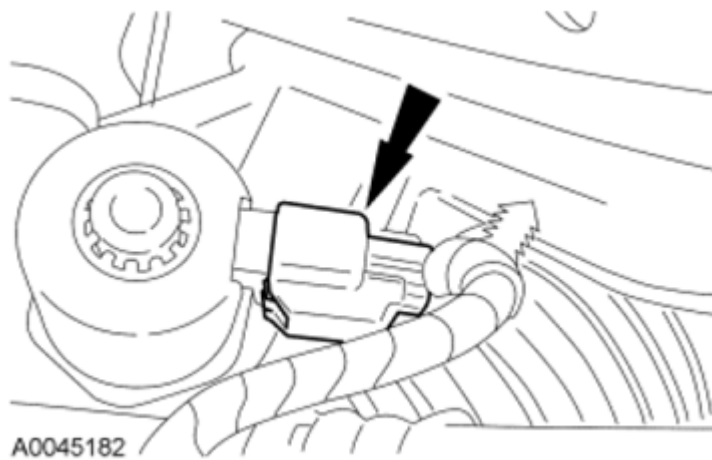
**Fig. 213: Locating Lower Radiator Hose**  
Courtesy of FORD MOTOR CO.

23. Remove the cooling fan. For additional information, refer to **ENGINE COOLING**.
24. Drain the engine oil.
- Install the drain plug when finished.
  - To install, tighten to 23 Nm (17 lb-ft).



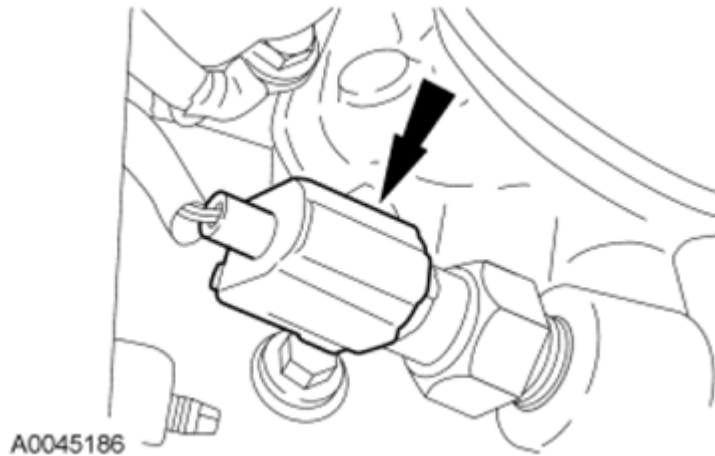
**Fig. 214: Locating Drain Plug**  
Courtesy of FORD MOTOR CO.

25. Remove and discard the oil filter.
26. If equipped, disconnect the block heater electrical connector.
27. Disconnect the power steering electrical connector.



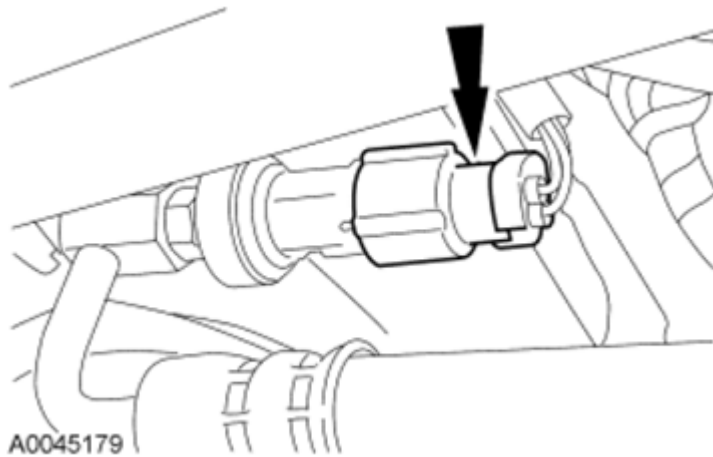
**Fig. 215: Locating Power Steering Electrical Connector**  
Courtesy of FORD MOTOR CO.

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



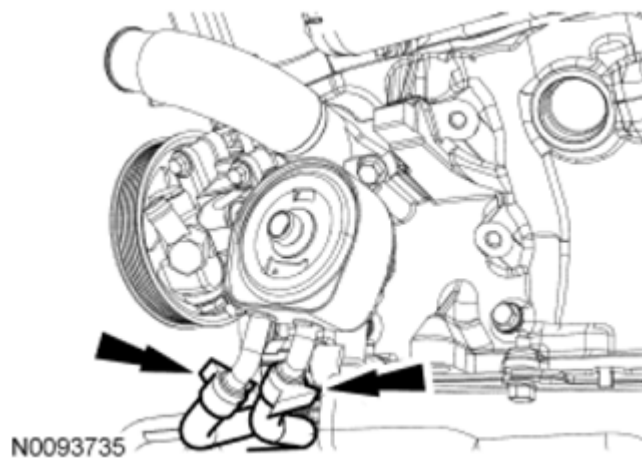
**Fig. 216: Locating Engine Oil Pressure (EOP) Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

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



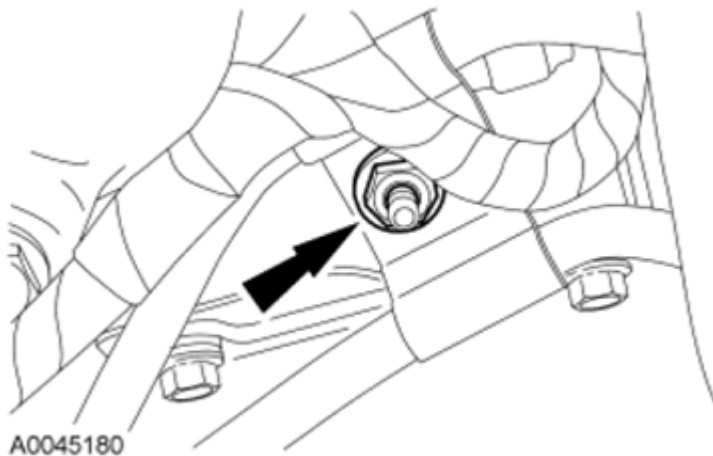
**Fig. 217: Locating Power Steering Pressure (PSP) Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

**NOTE:** For correct installation, the white lines on the coolant hoses must be aligned with the black dots on the oil cooler tubes. If the black dots are not visible, mark the oil cooler tube with a permanent marker before disconnecting the hoses. Failure to follow this instruction may result in damage to the coolant hoses.



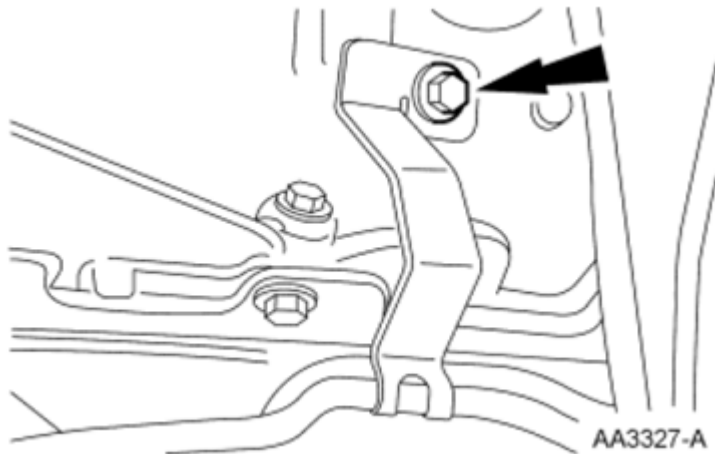
**Fig. 218: Locating Coolant Hoses**  
Courtesy of FORD MOTOR CO.

30. If equipped, disconnect the 2 coolant hoses from the oil cooler.
31. Remove the nut and the transmission cooler tube support bracket.



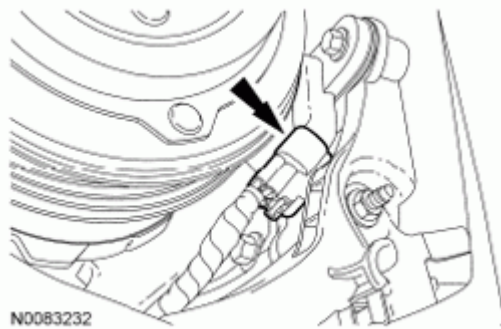
**Fig. 219: Locating Nut And Transmission Cooler Tube Support Bracket**  
Courtesy of FORD MOTOR CO.

32. Remove the transmission oil cooler tube bracket bolt.



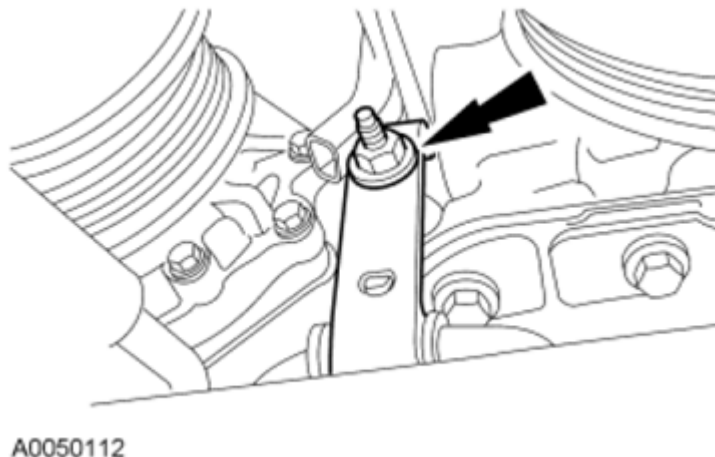
**Fig. 220: Locating Transmission Oil Cooler Tube Bracket Bolt**  
Courtesy of FORD MOTOR CO.

33. Disconnect the Crankshaft Position (CKP) sensor electrical connector.



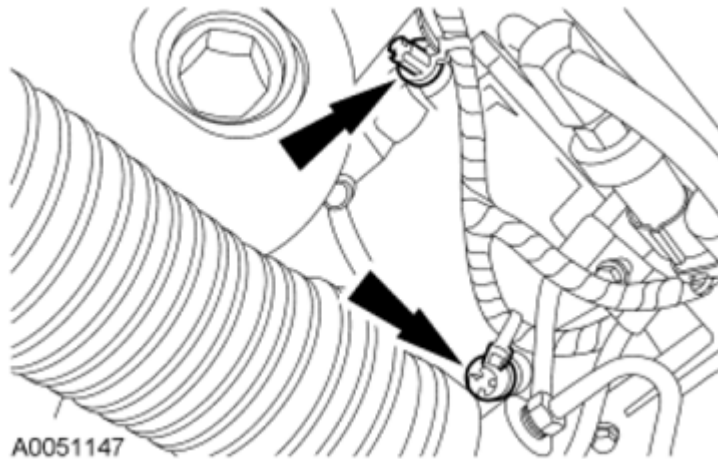
**Fig. 221: Locating Crankshaft Position (CKP) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

34. Position the power steering tube bracket aside.



**Fig. 222: Locating Power Steering Tube Bracket**  
Courtesy of FORD MOTOR CO.

35. Disconnect the engine wiring harness retainers from the A/C compressor.



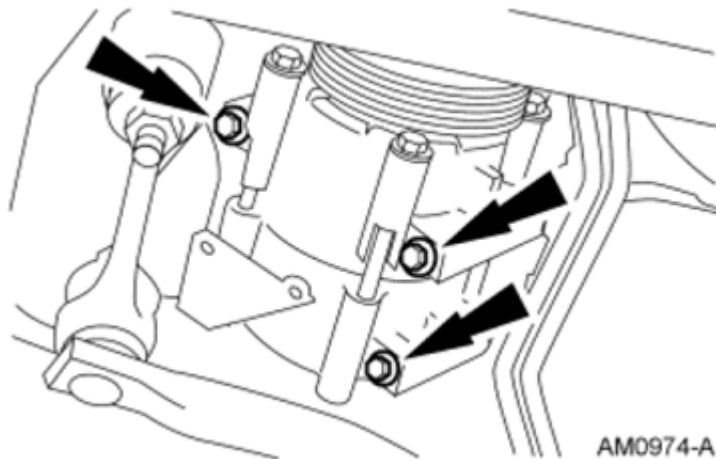
**Fig. 223: Locating Engine Wiring Harness Retainers**  
Courtesy of FORD MOTOR CO.

36. Disconnect the A/C compressor electrical connector.



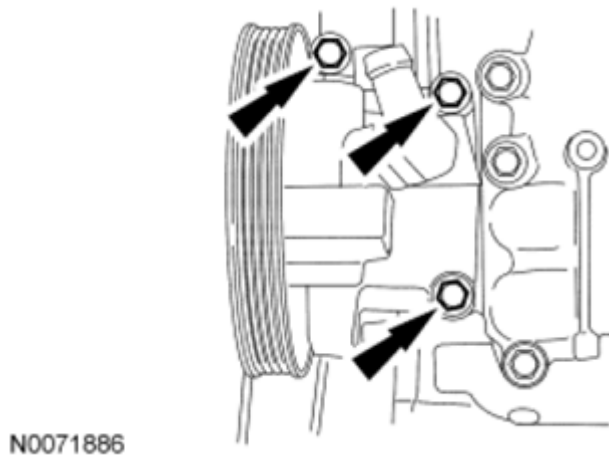
**Fig. 224: Locating A/C Compressor Electrical Connector**  
Courtesy of FORD MOTOR CO.

37. Remove the 3 bolts and position the A/C compressor aside.



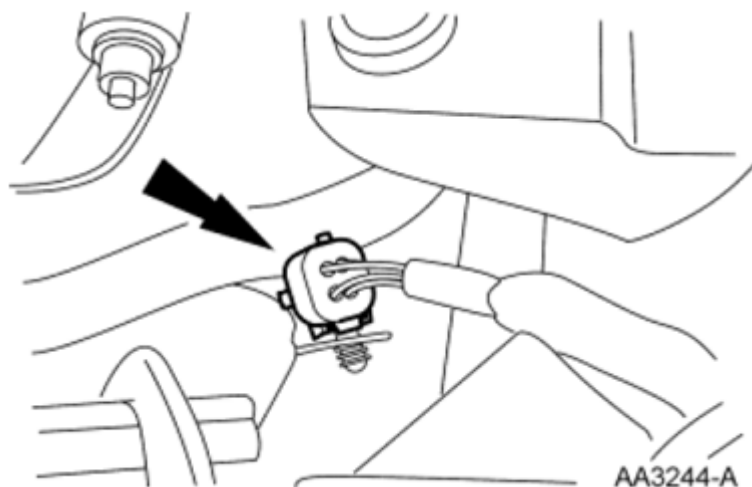
**Fig. 225: Locating Bolts And A/C Compressor**  
Courtesy of FORD MOTOR CO.

38. Remove the 3 bolts and position the power steering pump aside.



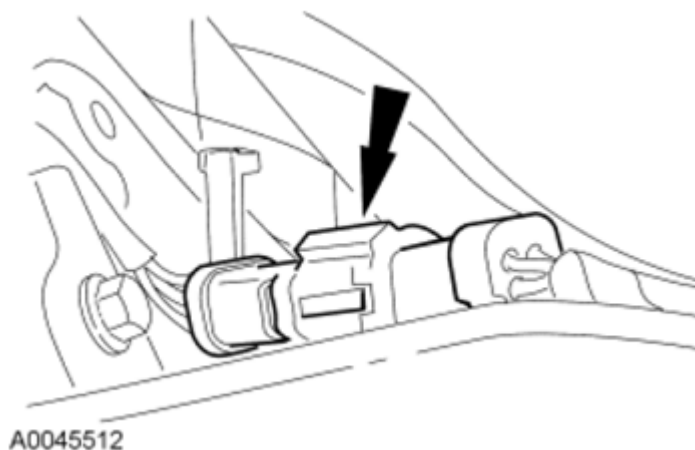
**Fig. 226: Locating Bolts And Power Steering Pump**  
Courtesy of FORD MOTOR CO.

39. Remove the starter motor. For additional information, refer to **STARTING SYSTEM** .
40. Disconnect the RH Heated Oxygen Sensor (HO2S) electrical connectors.



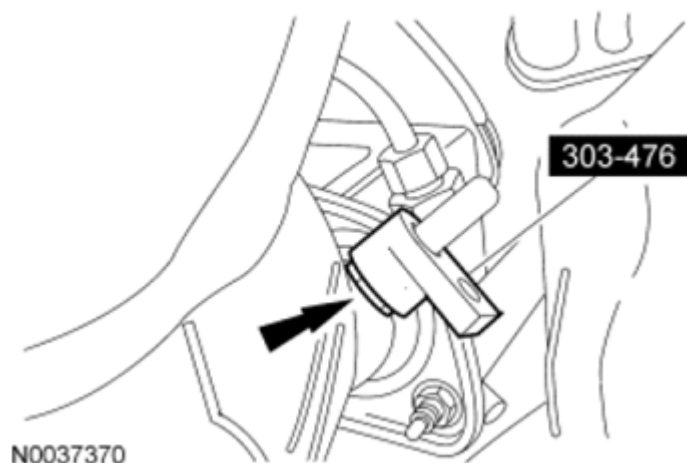
**Fig. 227: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connectors**  
Courtesy of FORD MOTOR CO.

41. Disconnect the LH **HO2S** electrical connector.



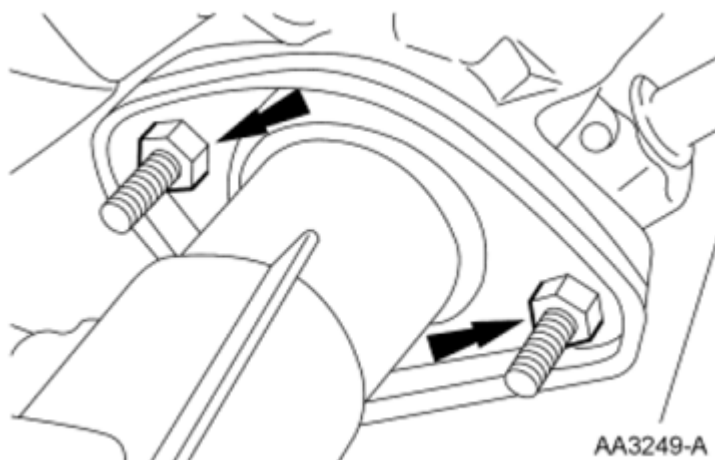
**Fig. 228: Locating LH HO2S Electrical Connector**  
Courtesy of FORD MOTOR CO.

**NOTE:** If necessary, lubricate the sensor threads with penetrating and lock lubricant to assist in removal.



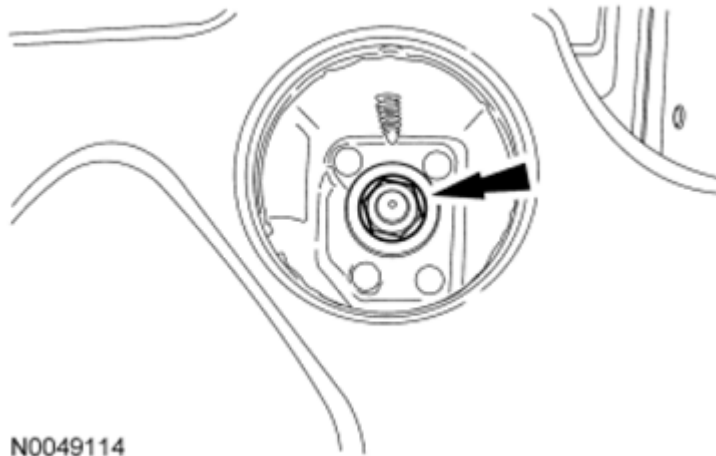
**Fig. 229: Identifying Exhaust Gas Oxygen Sensor Socket (303-476)**  
Courtesy of FORD MOTOR CO.

42. Using the Exhaust Gas Oxygen Sensor Socket, remove the LH **HO2S** .
43. Support the exhaust and remove the 4 nuts.
  - Discard the 4 nuts.



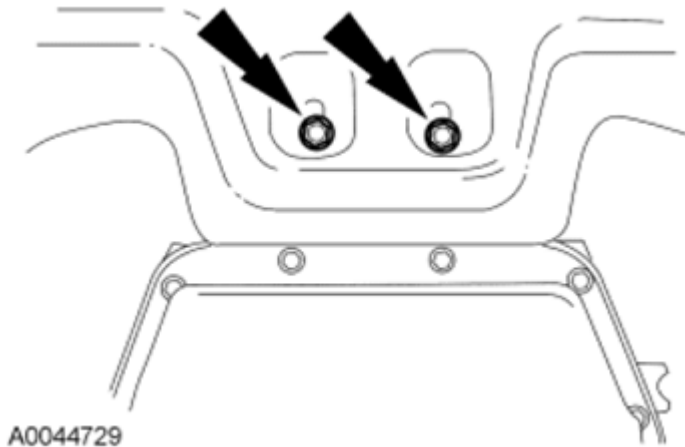
**Fig. 230: Locating Exhaust Nuts**  
Courtesy of FORD MOTOR CO.

**NOTE:** LH shown in illustration, RH similar.



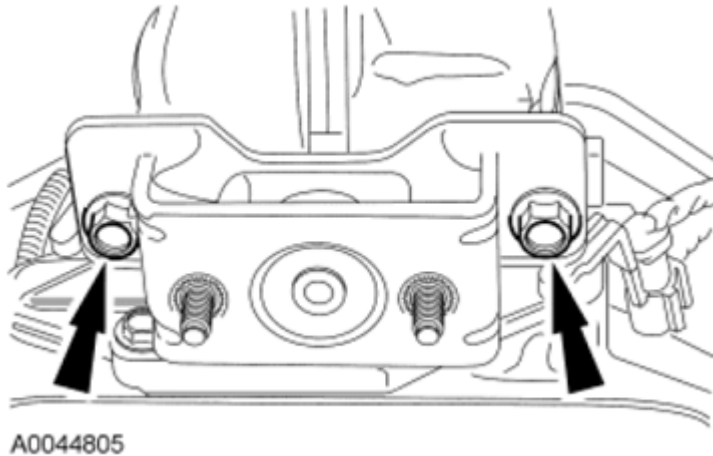
**Fig. 231: Locating Engine Mount Nuts**  
Courtesy of FORD MOTOR CO.

44. Remove the 2 engine mount nuts.
45. Install a suitable lifting device under the transmission and support.
46. Remove the rear transmission insulator nuts.



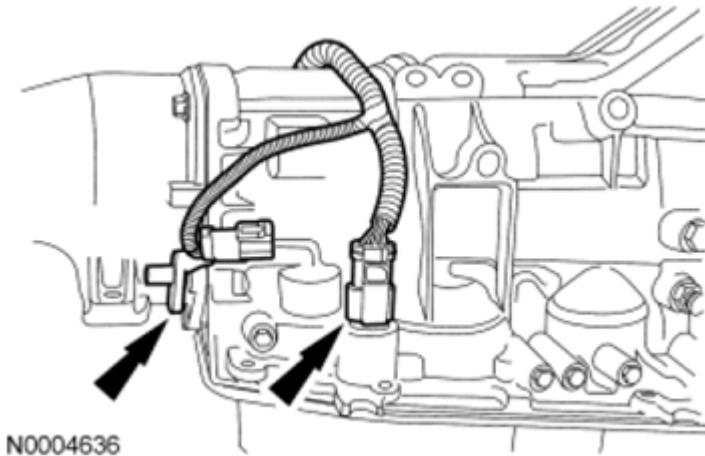
**Fig. 232: Locating Rear Transmission Insulator Nuts**  
Courtesy of FORD MOTOR CO.

47. Raise the transmission and remove the rear transmission insulator bolts.



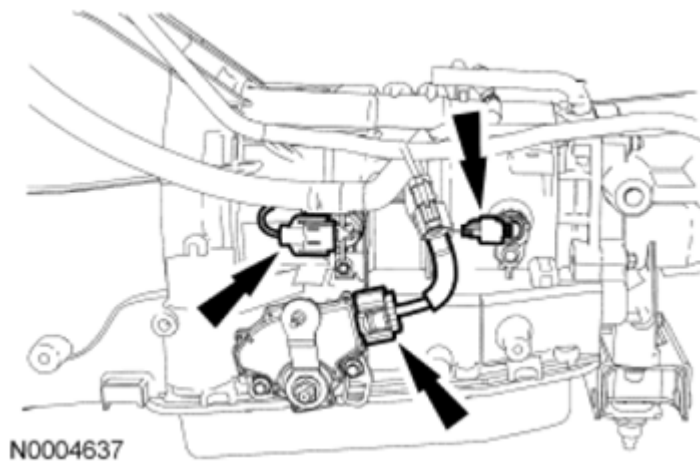
**Fig. 233: Locating Rear Transmission Insulator Bolts**  
Courtesy of FORD MOTOR CO.

48. Remove the transmission rear insulator and lower the transmission down to rest on the rear crossmember.
49. Disconnect the **HO2S** sensor and the solenoid body sensor electrical connectors.



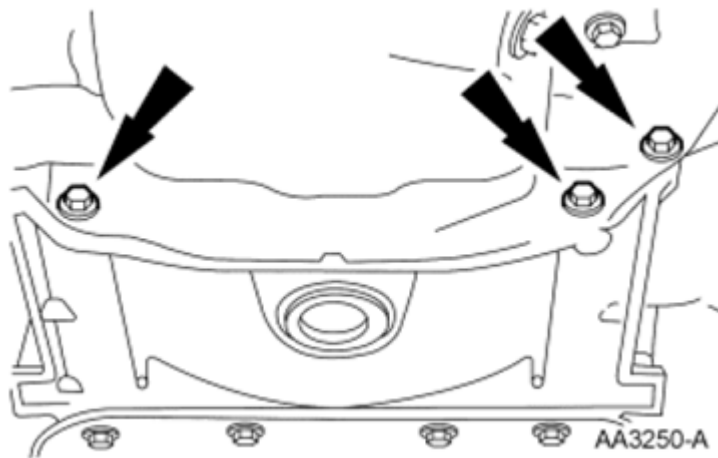
**Fig. 234: Locating Solenoid Body Sensor Electrical Connectors**  
Courtesy of FORD MOTOR CO.

50. Disconnect the Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor and the Turbine Shaft Speed (TSS) sensor electrical connectors.



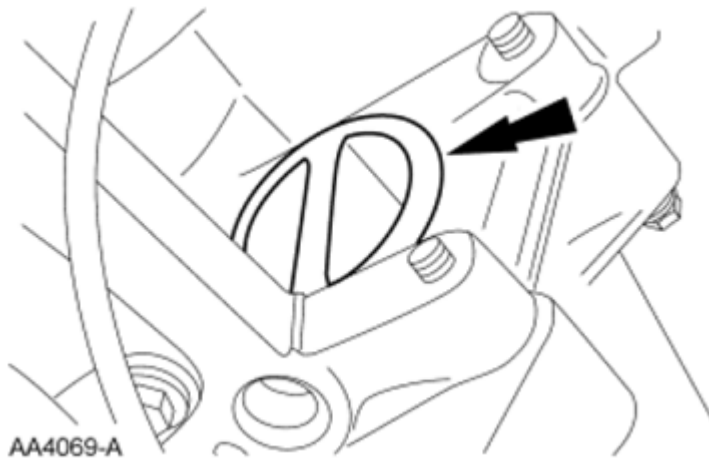
**Fig. 235: Locating Output Shaft Speed (OSS) Sensor, Transmission Range (TR) Sensor And Turbine Shaft Speed (TSS) Sensor Electrical Connectors**  
Courtesy of FORD MOTOR CO.

51. Release the wiring harness from the retainers on the transmission.
52. Remove the 3 bolts and the inspection cover.



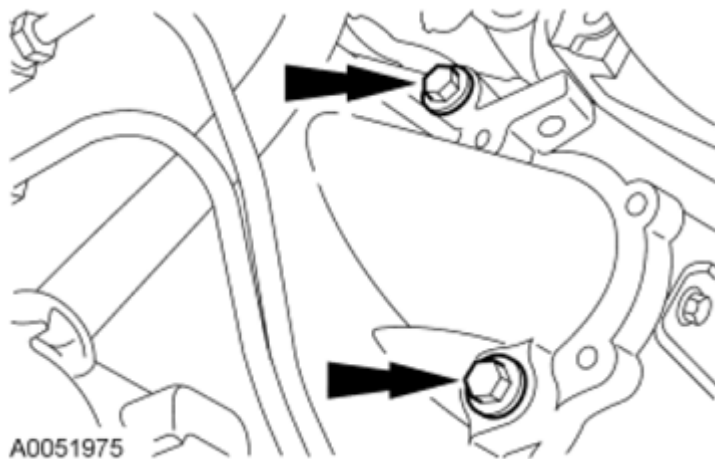
**Fig. 236: Locating Bolts And Inspection Cover**  
Courtesy of FORD MOTOR CO.

53. Remove the torque converter nut access plug.
  - Remove the 4 nuts.



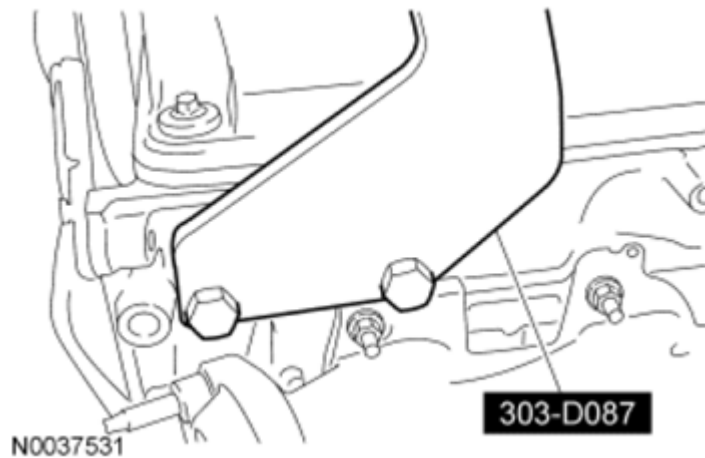
**Fig. 237: Locating Torque Converter Nut Access Plug**  
Courtesy of FORD MOTOR CO.

54. Remove the 4 bolts and 1 stud (2 bolts shown in illustration).



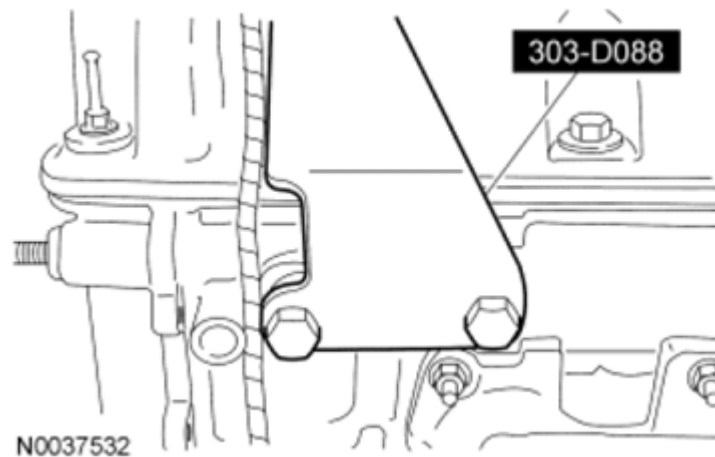
**Fig. 238: Locating Bolts And Stud**  
Courtesy of FORD MOTOR CO.

55. Install the Engine Lifting Bracket to the RH cylinder head.



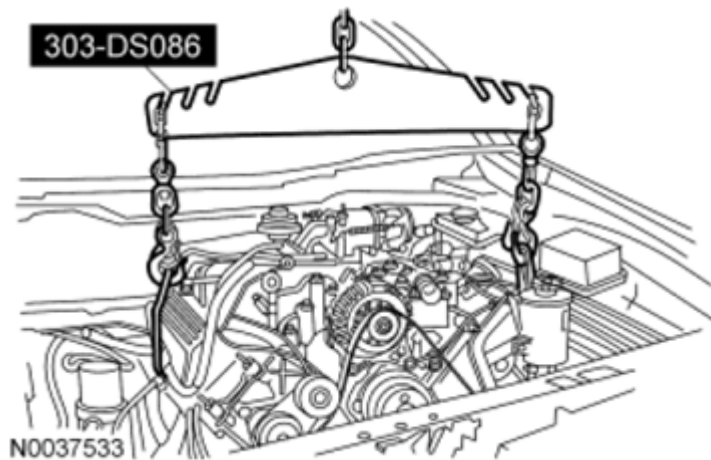
**Fig. 239: Identifying Engine Lifting Bracket (303-D087)**  
Courtesy of FORD MOTOR CO.

56. Install the Engine Lifting Bracket to the LH cylinder head.



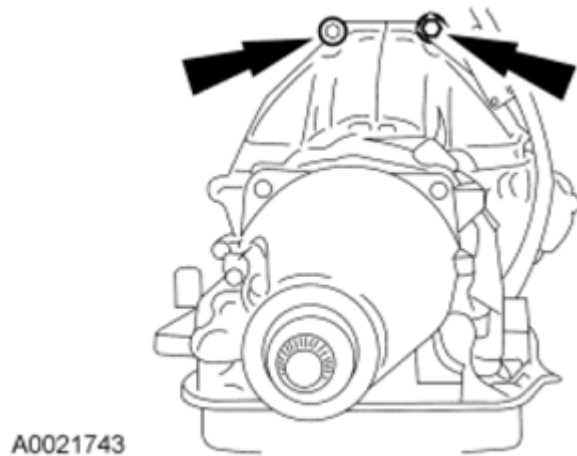
**Fig. 240: Identifying Engine Lifting Bracket (303-D088)**  
Courtesy of FORD MOTOR CO.

57. Install the Engine Lifting Bracket Set.



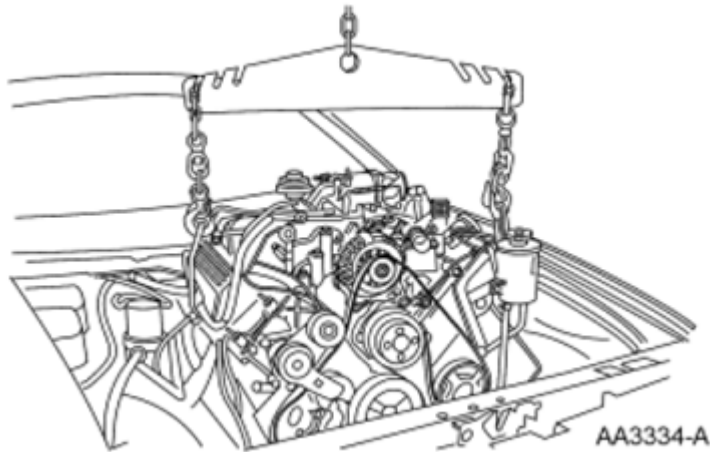
**Fig. 241: Identifying Engine Lifting Bracket Set (303-DS086)**  
Courtesy of FORD MOTOR CO.

58. Remove the 2 bellhousing bolts.



**Fig. 242: Locating Bellhousing Bolts**  
Courtesy of FORD MOTOR CO.

59. Remove the engine assembly from the vehicle.



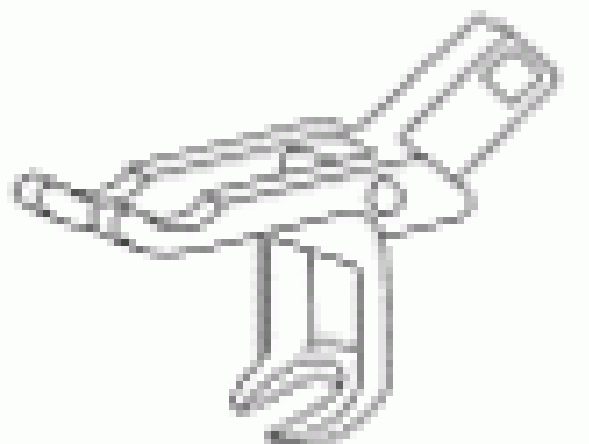
**Fig. 243: Removing Engine Assembly From Vehicle**  
Courtesy of FORD MOTOR CO.

## DISASSEMBLY

### ENGINE

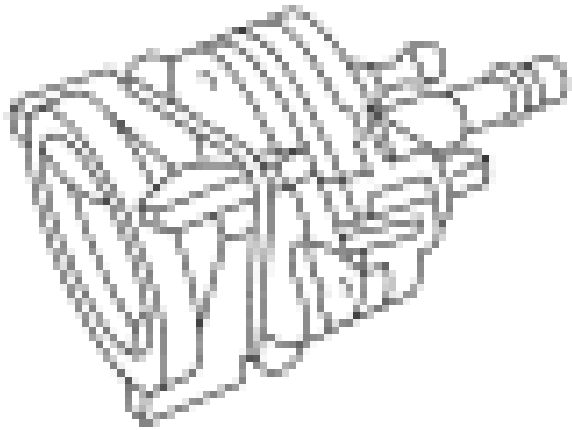
#### Special Tool(s)

#### SPECIAL TOOL CHART

|                                                                                                     |                                                            |
|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|  <p>ST1330-A</p> | <p>Compressor, Valve Spring<br/>303-567 (T97P-6565-AH)</p> |
|                                                                                                     |                                                            |

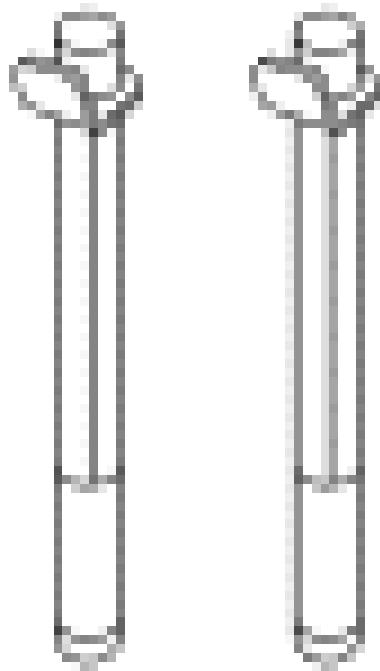
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



Cylinder Ridge Reamer  
303-016 (T64L-6011-EA)

**ST1276-A**

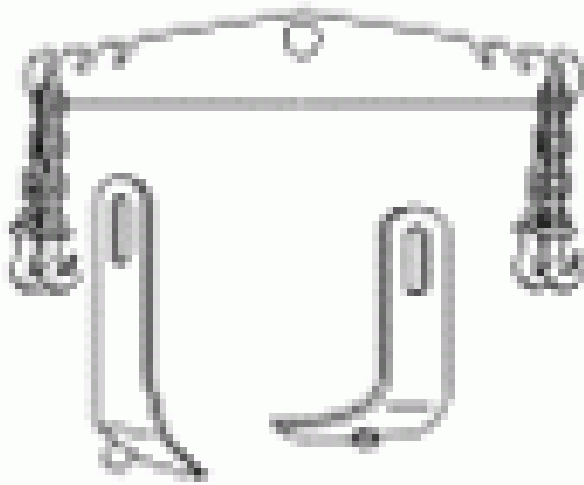


Installer, Connecting Rod  
303-442 (T93P-6136-A)

**ST1337-A**

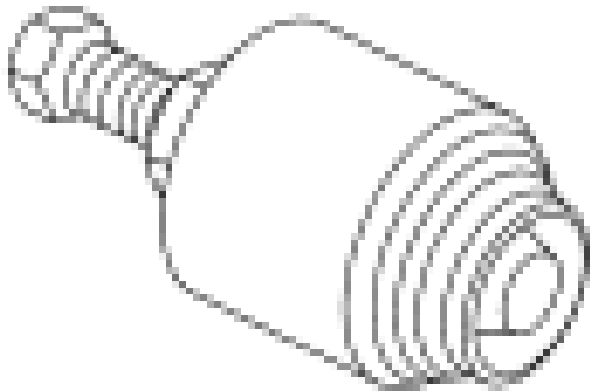
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST2443-A**

Lifting Bracket Set, Engine  
303-DS086 (D93P-6001-A)  
Includes Lifting Bracket, Engine  
303-D087 and 303-D088 or equivalent



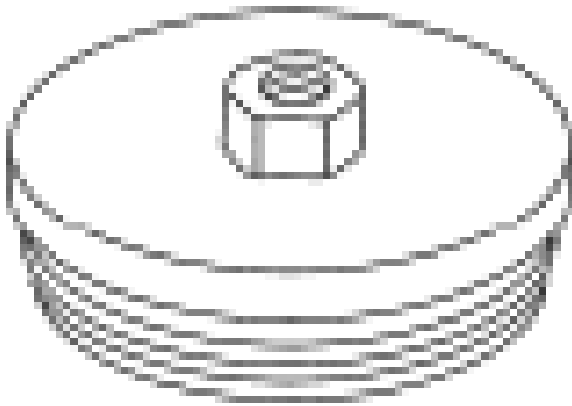
**ST1730-A**

Remover, Crankshaft Front Oil Seal  
303-107 (T74P-6700-A)

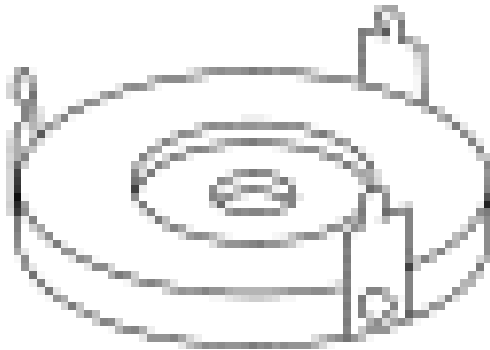
Remover, Crankshaft Rear Oil Seal  
303-519 (T95P-6701-EH)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1382-A**



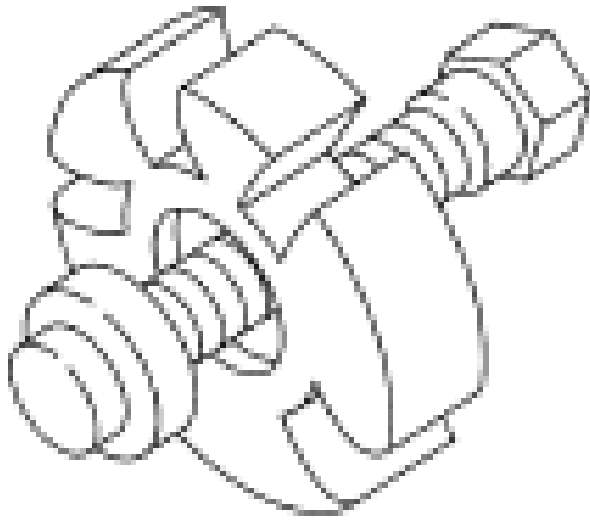
**ST1481-A**

Remover, Crankshaft Rear Oil Slinger  
303-514 (T95P-6701-AH)

Remover, Crankshaft Vibration Damper

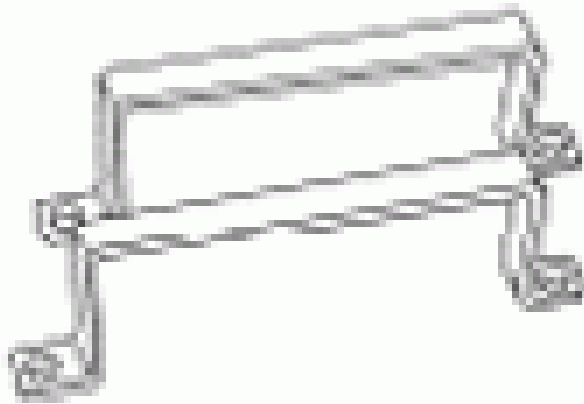
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1286-A**

303-009 (T58P-6316-D)



**ST1668-A**

Remover/Installer, Cylinder Head  
303-572 (T97T-6000-A)

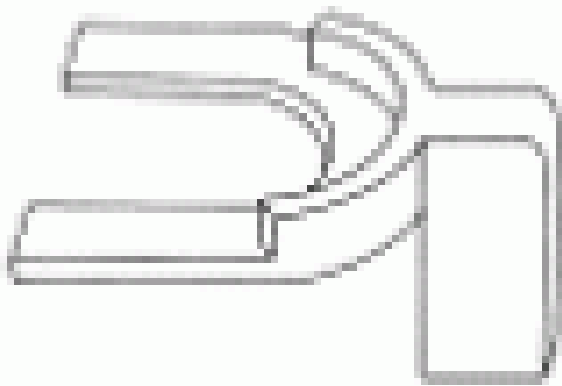
Slide Hammer  
100-001 (T50T-100-A)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1185-A**



**ST1331-A**

Spacer, Valve Spring Compressor  
303-382 (T91P-6565-AH)

### Material

### MATERIAL SPECIFICATIONS

| Item                                      | Specification |
|-------------------------------------------|---------------|
| Motorcraft® Metal Surface Prep<br>ZC-31-A | -             |
| Silicone Gasket Remover<br>ZC-30          | -             |

### Disassembly

**NOTE:** Servicing the bottom end of the engine (crankshaft, bearings) requires that

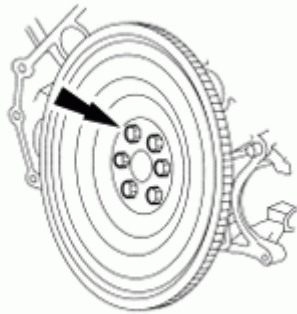
cylinder heads be removed. Failure to do so may result in engine damage.

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

**NOTE:** The crankshaft rear seal, the rear oil seal slinger and the crankshaft rear seal retainer plate must be removed before mounting the engine on the engine stand.

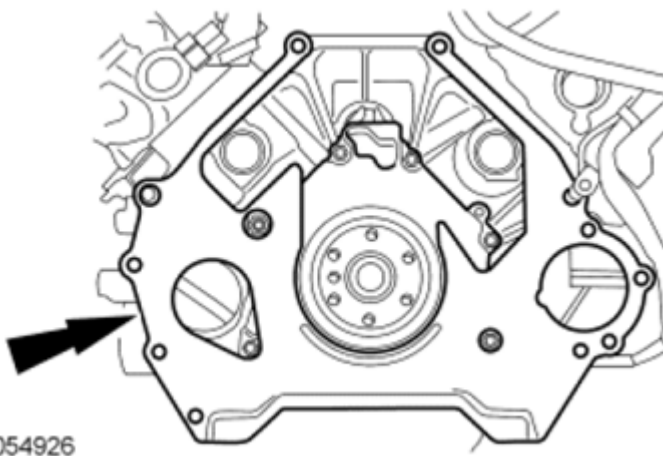
**NOTE:** For additional information, refer to the exploded views under ASSEMBLY.

1. Remove the 6 bolts and the flexplate.



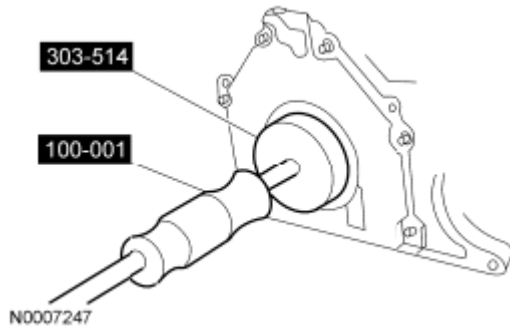
**Fig. 244: Locating Bolts And Flexplate**  
Courtesy of FORD MOTOR CO.

2. Remove the engine/transmission spacer plate.



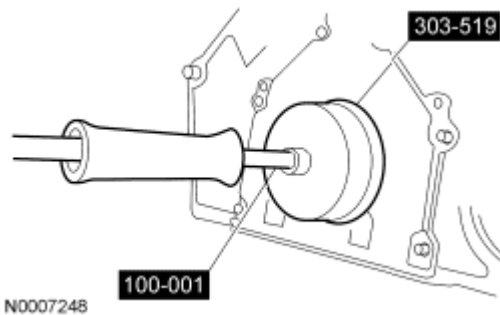
**Fig. 245: Locating Engine/Transmission Spacer Plate**  
Courtesy of FORD MOTOR CO.

3. Using the Crankshaft Rear Oil Slinger Remover and Slide Hammer, remove the crankshaft rear seal slinger.



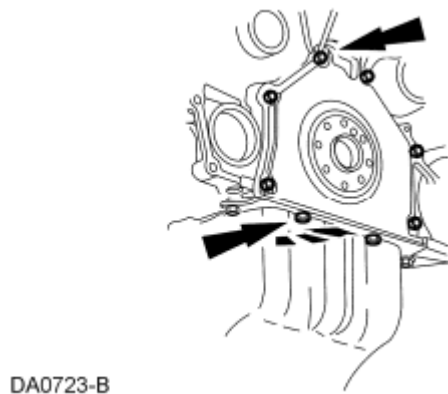
**Fig. 246: Removing Crankshaft Oil Slinger**  
Courtesy of FORD MOTOR CO.

4. Using the Crankshaft Rear Oil Seal Remover and Slide Hammer, remove the crankshaft rear seal.



**Fig. 247: Removing Crankshaft Rear Seal**  
Courtesy of FORD MOTOR CO.

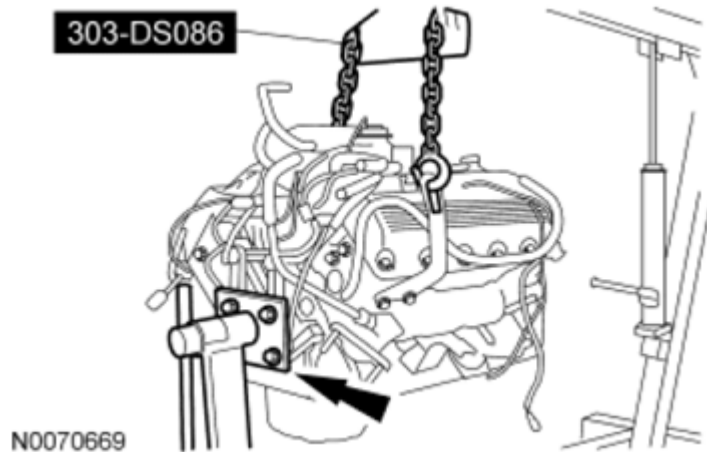
5. Remove the 2 oil pan-to-crankcase rear seal retainer plate bolts and the 6 crankcase rear seal retainer plate bolts.



**Fig. 248: Locating Crankcase Rear Seal Retainer Plate Bolts**

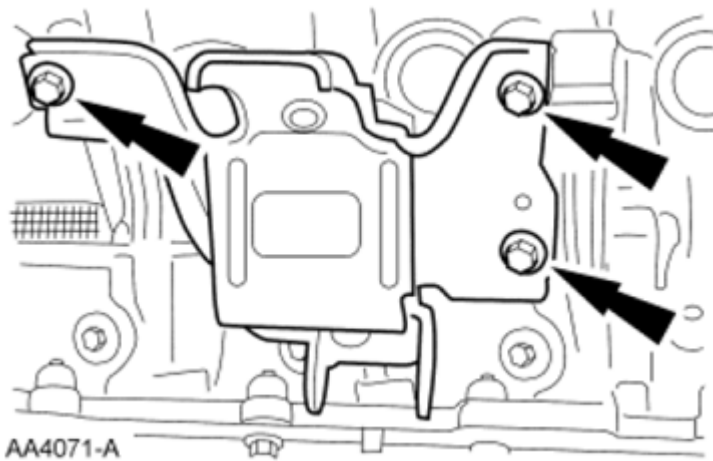
Courtesy of FORD MOTOR CO.

6. Using the Engine Lifting Bracket Set, mount the engine on a suitable engine stand.



**Fig. 249: Identifying Engine Lifting Bracket Set (303-DS086)**  
Courtesy of FORD MOTOR CO.

**NOTE:** RH shown in illustration, LH similar.

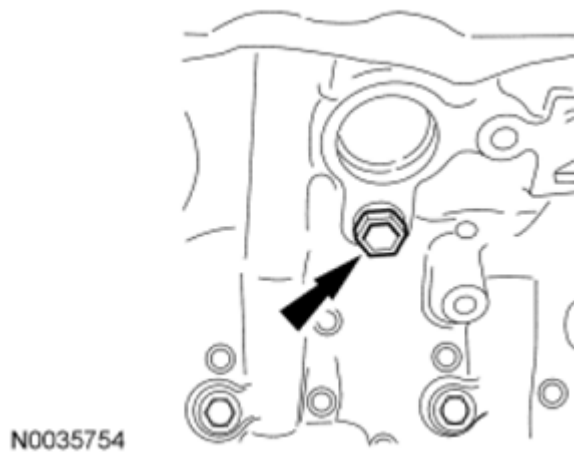


**Fig. 250: Locating RH Engine Mount Bolts**  
Courtesy of FORD MOTOR CO.

7. Remove the bolts and the LH and RH engine mounts.

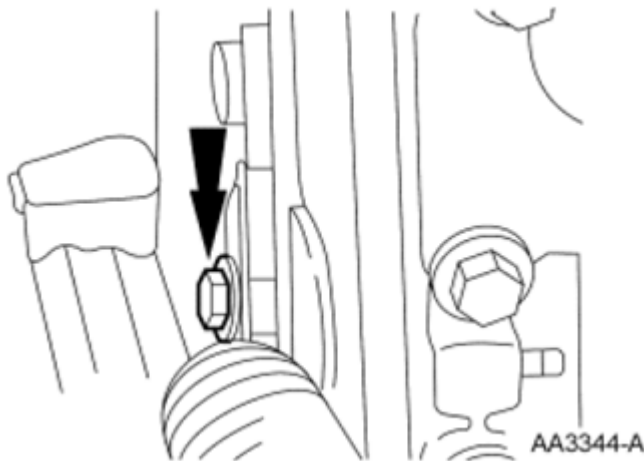
**NOTE:** LH shown in illustration, RH similar.

8. If equipped, remove the drain plugs from the engine block. Allow the coolant to completely drain.
- Install the drain plugs when finished.
  - To install, tighten to 20 Nm (177 lb-in).



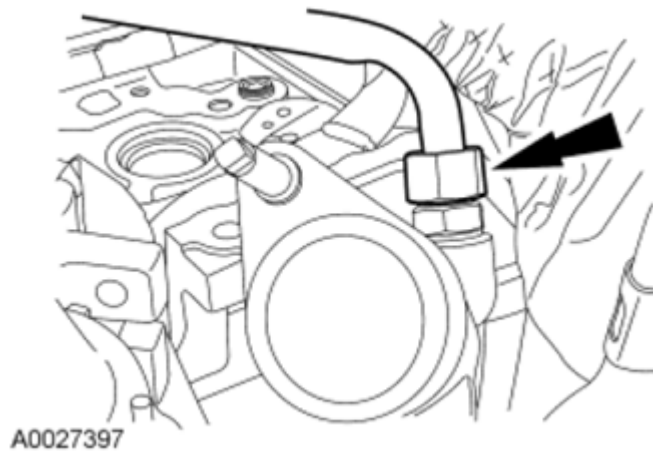
**Fig. 251: Locating Drain Plug**  
Courtesy of FORD MOTOR CO.

9. Remove the bolt and the battery cables from the engine.



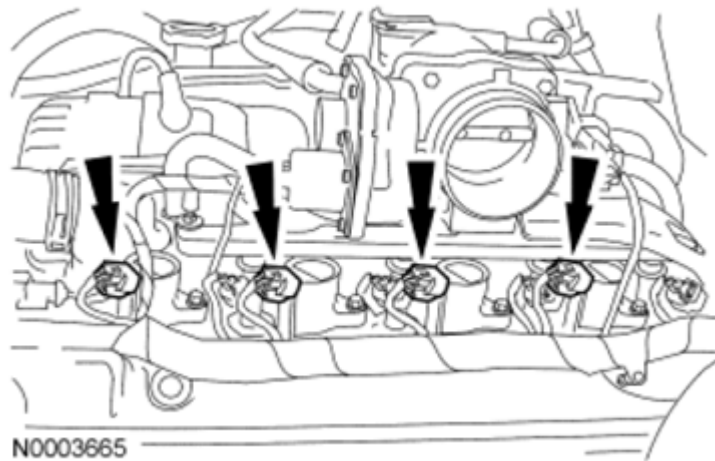
**Fig. 252: Locating Bolt And Battery Cables**  
Courtesy of FORD MOTOR CO.

10. Disconnect the EGR tube from the exhaust manifold.



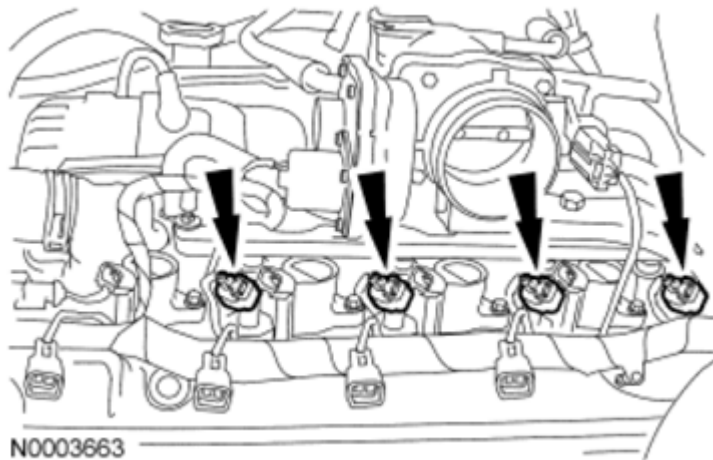
**Fig. 253: Locating EGR Tube**  
Courtesy of FORD MOTOR CO.

11. Disconnect the 8 ignition coil electrical connectors (4 shown in illustration).



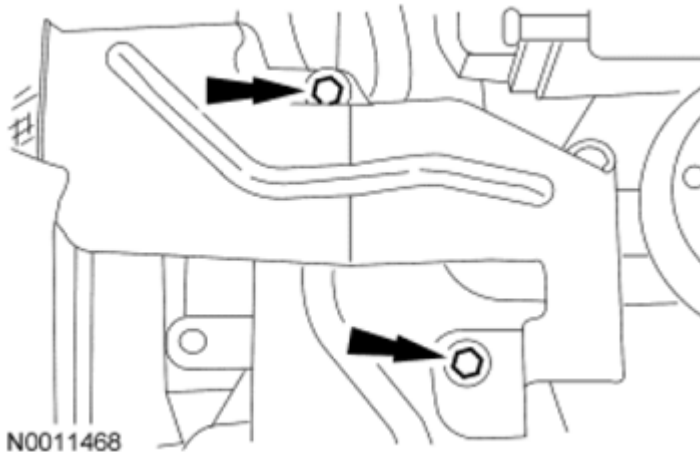
**Fig. 254: Locating Ignition Coil Electrical Connectors**  
Courtesy of FORD MOTOR CO.

12. Disconnect the 8 fuel injector electrical connectors (4 shown in illustration).



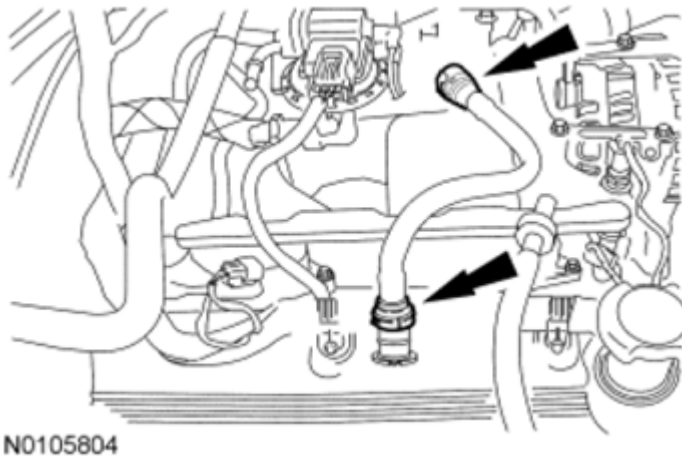
**Fig. 255: Locating Fuel Injector Electrical Connectors**  
Courtesy of FORD MOTOR CO.

13. Remove the 2 bolts and the intake manifold shield.



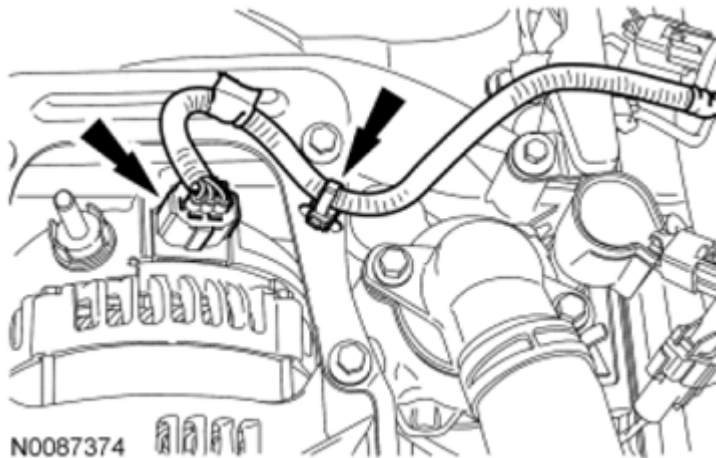
**Fig. 256: Locating Bolts And Intake Manifold Shield**  
Courtesy of FORD MOTOR CO.

14. Disconnect and remove the crankcase ventilation tube.



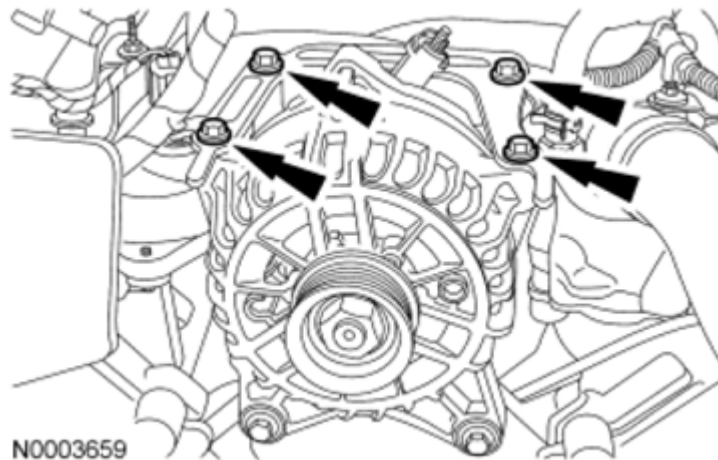
**Fig. 257: Locating Crankcase Ventilation Tube**  
Courtesy of FORD MOTOR CO.

15. Disconnect the generator electrical connector and detach the wiring harness retainer.



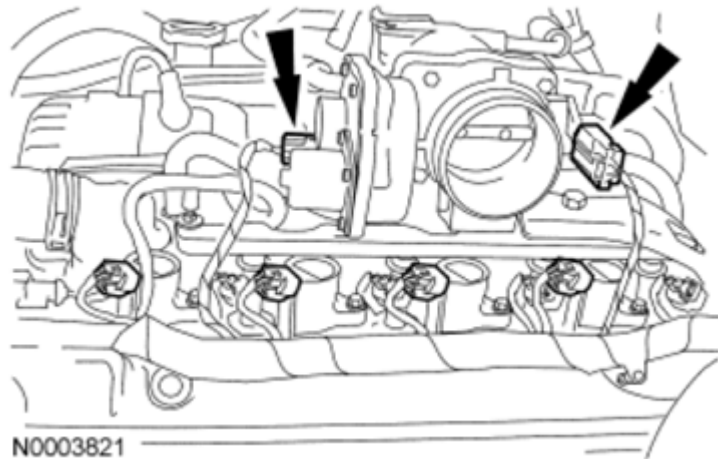
**Fig. 258: Locating Generator Electrical Connector**  
Courtesy of FORD MOTOR CO.

16. Remove the 4 generator mounting bracket bolts and the bracket.



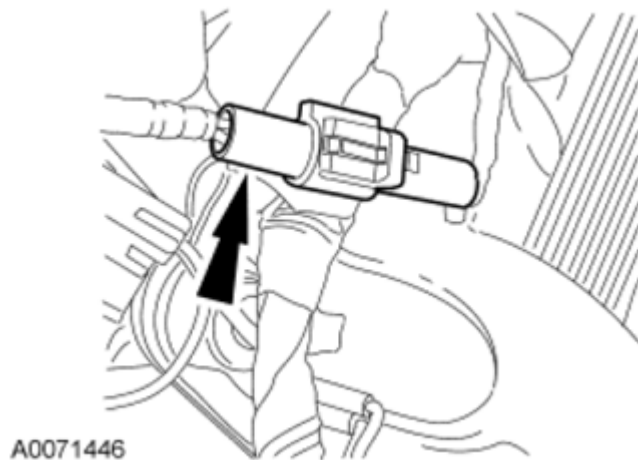
**Fig. 259: Locating Generator Mounting Bracket And Bolts**  
Courtesy of FORD MOTOR CO.

17. Disconnect the throttle control and the Throttle Position (TP) sensor electrical connectors.



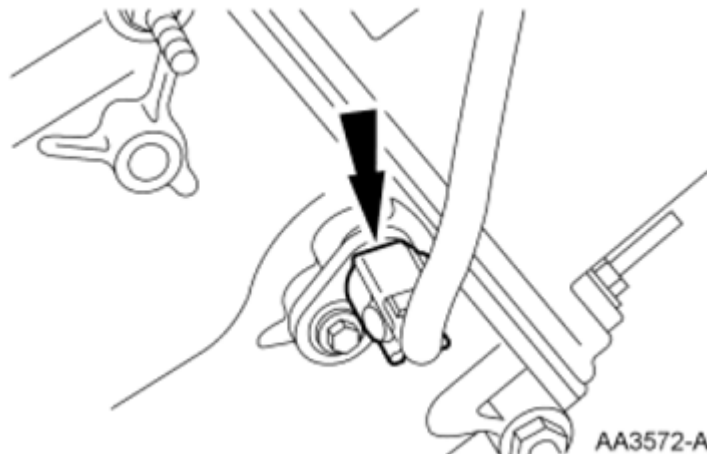
**Fig. 260: Locating Throttle Control And Throttle Position (TP) Sensor Electrical Connectors**  
Courtesy of FORD MOTOR CO.

18. Disconnect the Cylinder Head Temperature (CHT) sensor electrical connector.



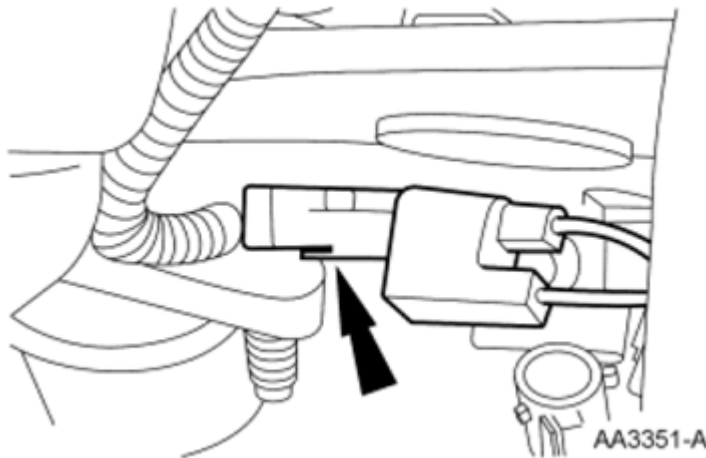
**Fig. 261: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

19. Disconnect the Camshaft Position (CMP) sensor electrical connector.



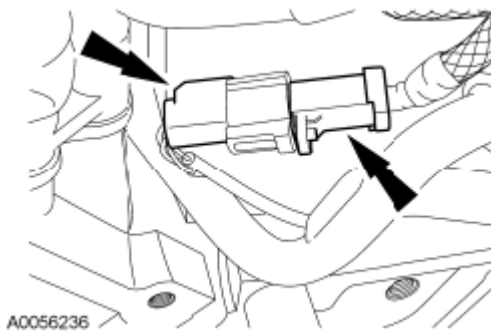
**Fig. 262: Locating Camshaft Position (CMP) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

20. Disconnect the radio ignition interference capacitor and remove the engine control sensor wiring.



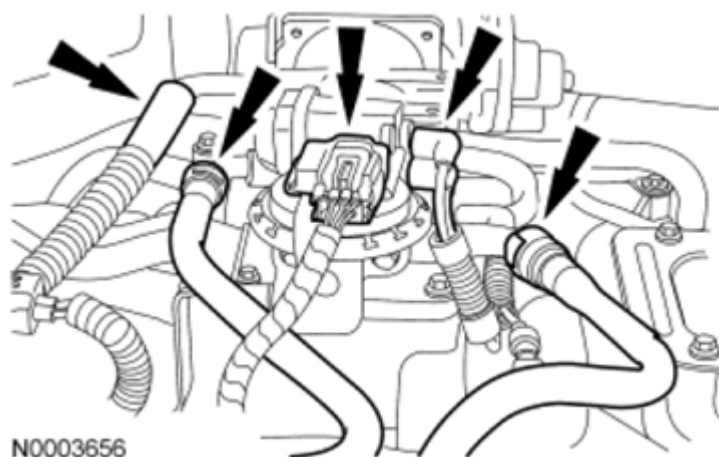
**Fig. 263: Locating Radio Ignition Interference Capacitor**  
Courtesy of FORD MOTOR CO.

21. Disconnect the Knock Sensor (KS) electrical connector and the wiring harness pin-type retainer.



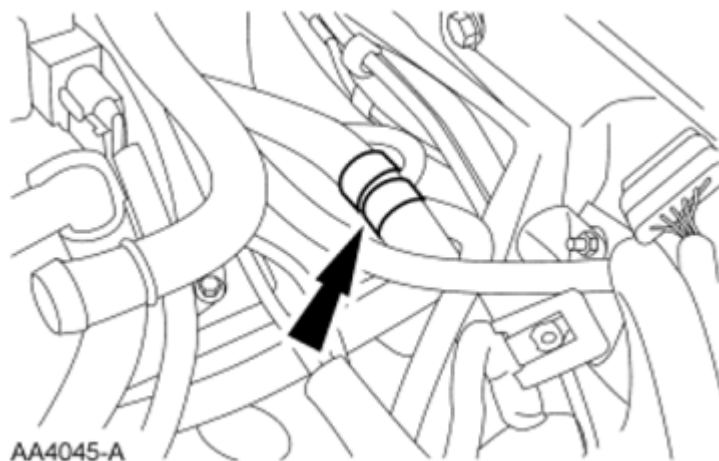
**Fig. 264: Locating Knock Sensor (KS) Electrical Connector And Wiring Harness Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

22. Disconnect the vacuum hoses and the electrical connector.



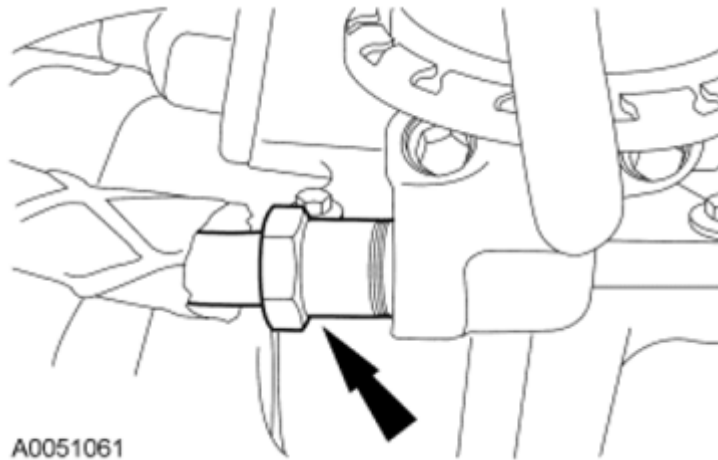
**Fig. 265: Locating Vacuum Hoses And Electrical Connector**  
Courtesy of FORD MOTOR CO.

23. Disconnect the fuel charging wiring from the intake manifold crash bracket and remove the harness from the engine assembly.



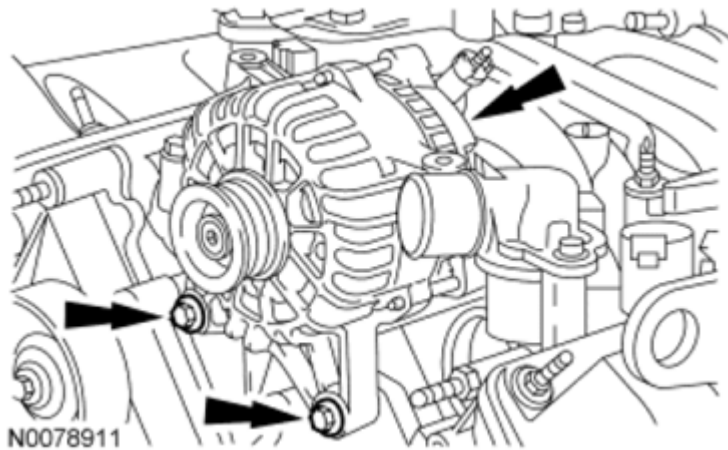
**Fig. 266: Locating Fuel Charging Wiring**  
Courtesy of FORD MOTOR CO.

24. Disconnect the EGR tube nut from the EGR valve.



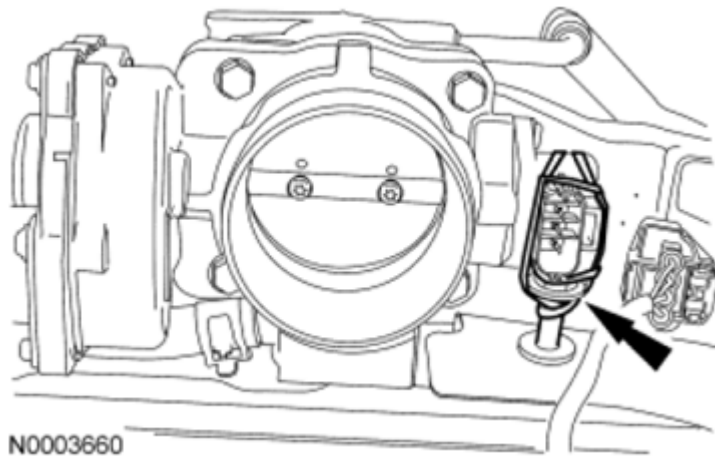
**Fig. 267: Locating EGR Tube Nut**  
Courtesy of FORD MOTOR CO.

25. Remove the 2 generator bolts and the generator.



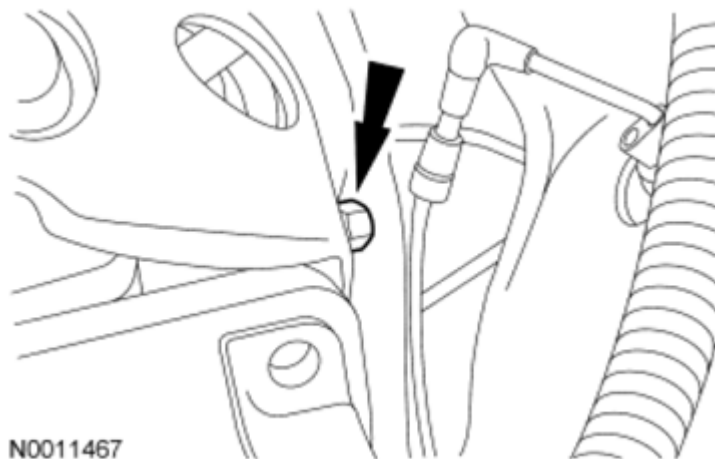
**Fig. 268: Locating Generator Bolts And Generator**  
Courtesy of FORD MOTOR CO.

26. Remove the intake manifold crash bracket bolt and prevent the bolt from contacting the cylinder head with a rubber band or tie strap.



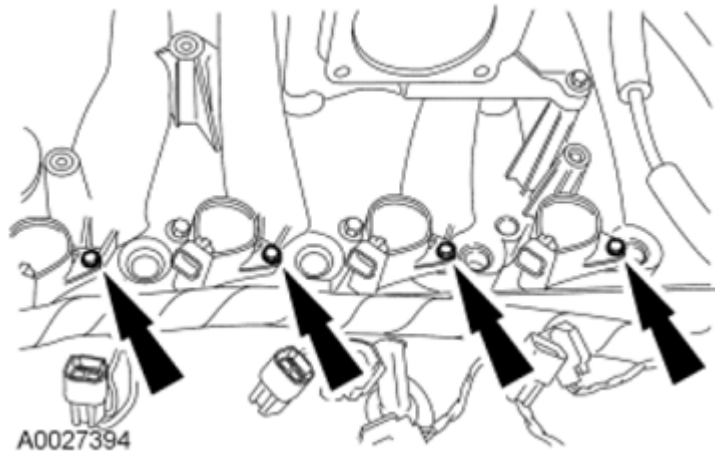
**Fig. 269: Locating Intake Manifold Crash Bracket**  
Courtesy of FORD MOTOR CO.

27. Remove the intake manifold crash bracket stud bolt.



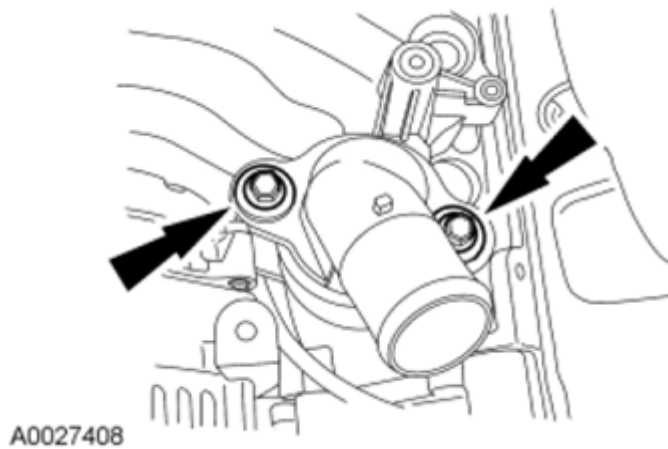
**Fig. 270: Locating Intake Manifold Crash Bracket Stud Bolt**  
Courtesy of FORD MOTOR CO.

28. Remove the 8 bolts and the 8 ignition coils (4 shown in illustration).



**Fig. 271: Locating Bolts And Ignition Coils**  
Courtesy of FORD MOTOR CO.

29. Remove the 2 bolts and the coolant outlet adapter.



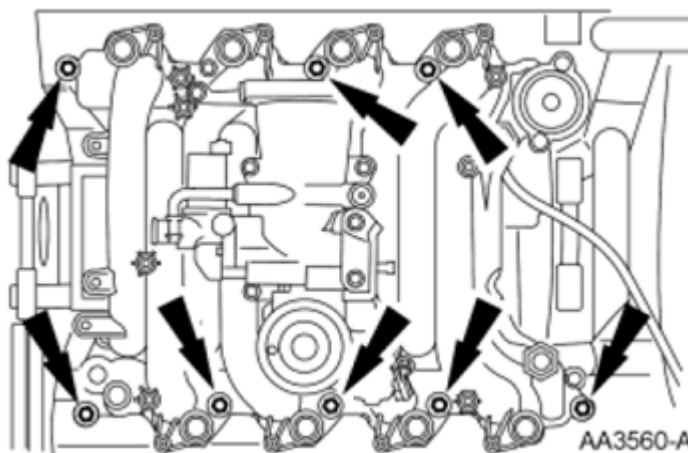
**Fig. 272: Locating Bolts And Coolant Outlet Adapter**  
Courtesy of FORD MOTOR CO.

30. Remove the thermostat.



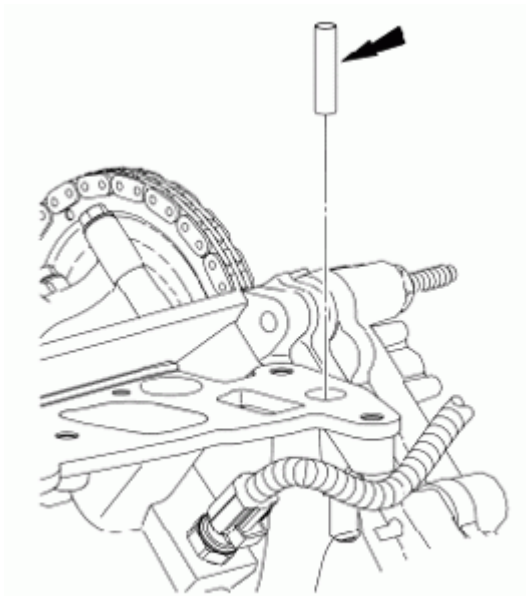
**Fig. 273: Identifying Thermostat**  
Courtesy of FORD MOTOR CO.

31. Remove the 8 bolts and the intake manifold.
- Discard the intake manifold gaskets.



**Fig. 274: Locating Bolts And Intake Manifold**  
Courtesy of FORD MOTOR CO.

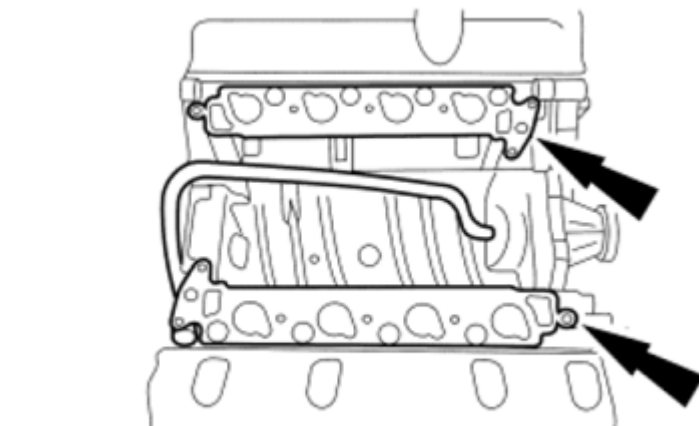
32. Remove the cylinder head insert from the LH cylinder head.



N0094082

**Fig. 275: Locating Cylinder Head Insert**  
Courtesy of FORD MOTOR CO.

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

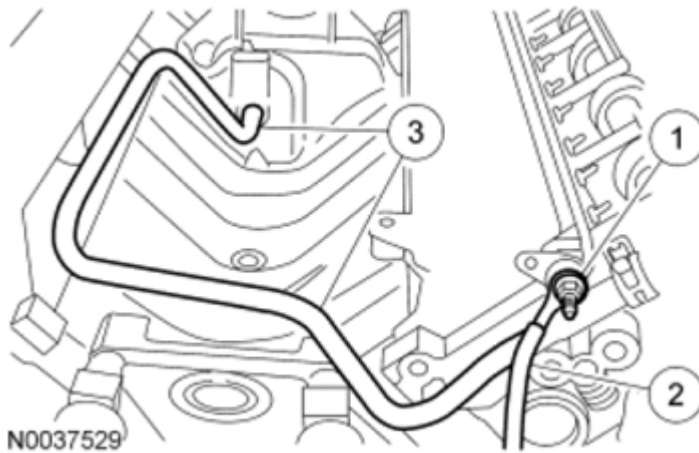


A0051514

**Fig. 276: Locating Sealing Surfaces**  
Courtesy of FORD MOTOR CO.

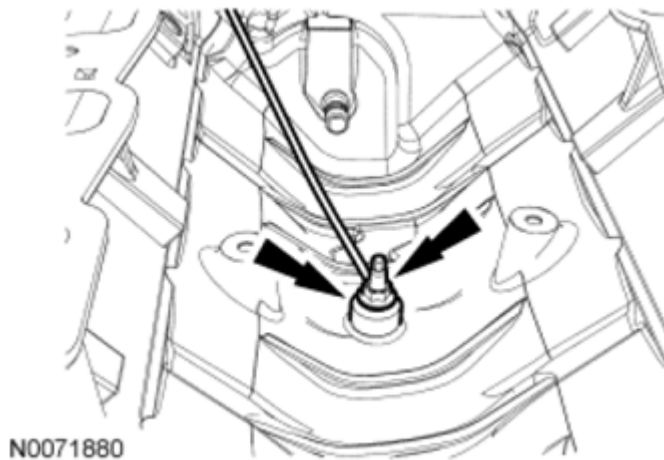
33. Clean the sealing surfaces.
34. Remove the coolant bypass tube.
  1. Remove the retaining nut.
  2. Remove the ground strap.

3. Remove the coolant bypass tube.



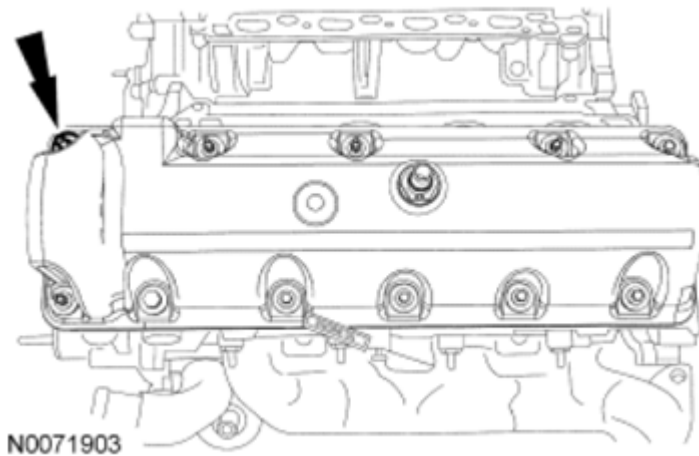
**Fig. 277: Identifying Coolant Bypass Tube**  
Courtesy of FORD MOTOR CO.

35. Remove the nut and the KS .



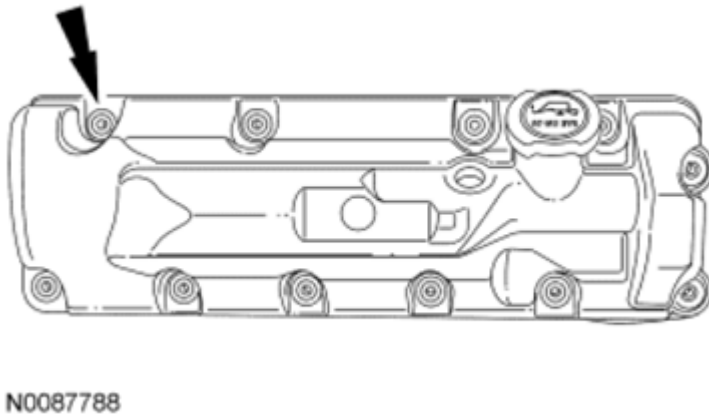
**Fig. 278: Locating Nut And KS**  
Courtesy of FORD MOTOR CO.

36. Loosen the 6 studs and 5 bolts and remove the LH valve cover.
  - Discard the gasket.



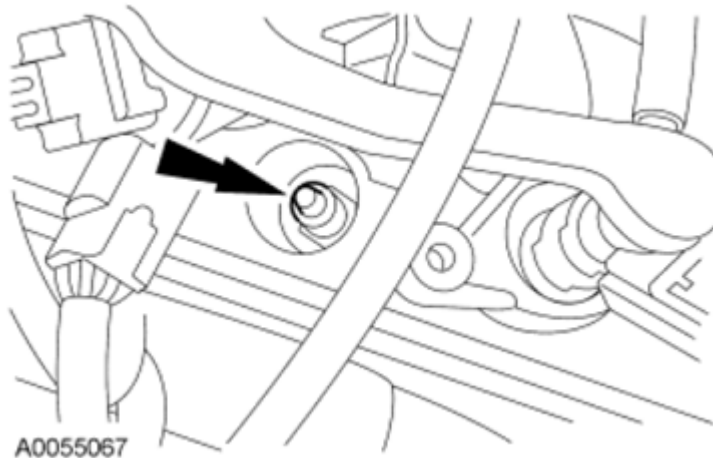
**Fig. 279: Locating Studs, Bolts And LH Valve Cover**  
Courtesy of FORD MOTOR CO.

37. Loosen the 7 studs and 4 bolts and remove the RH valve cover.
- Discard the gasket.



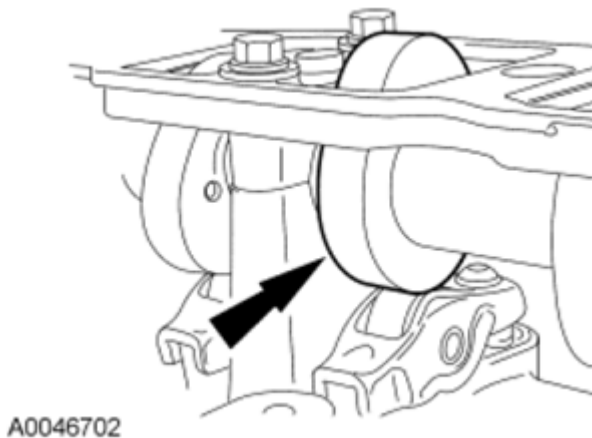
**Fig. 280: Locating Studs, Bolts And RH Valve Cover**  
Courtesy of FORD MOTOR CO.

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



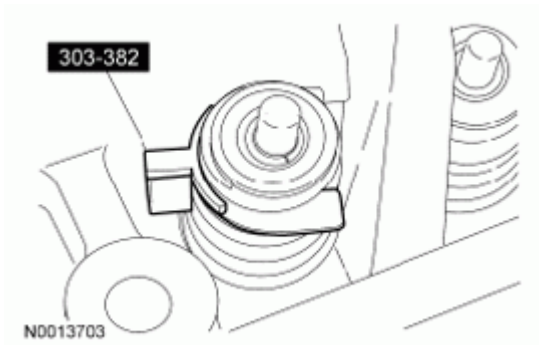
**Fig. 281: Locating Spark Plug**  
Courtesy of FORD MOTOR CO.

38. Remove the 8 spark plugs.
39. Position the lobe of the camshaft upward.



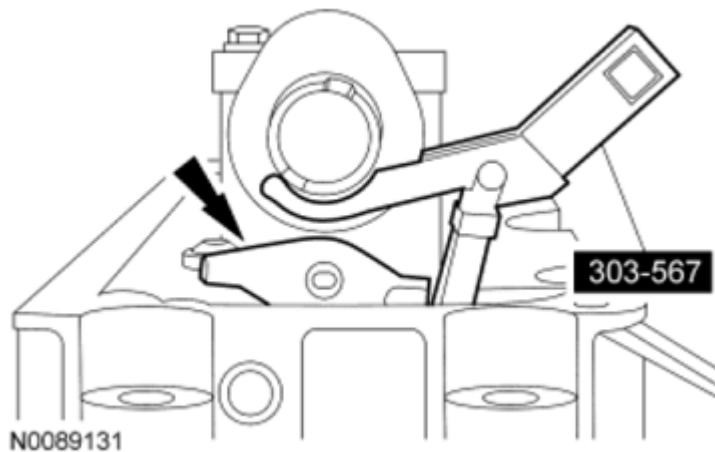
**Fig. 282: Locating Lobe Of Camshaft**  
Courtesy of FORD MOTOR CO.

40. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



**Fig. 283: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

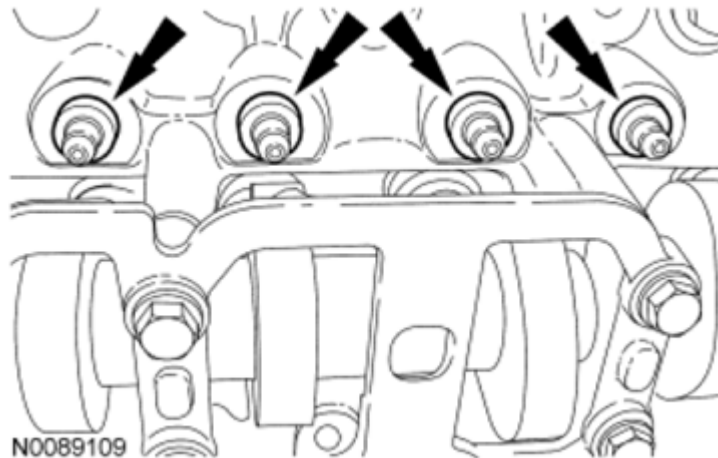
**NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.



**Fig. 284: Identifying Valve Spring Compressor (303-567)**  
Courtesy of FORD MOTOR CO.

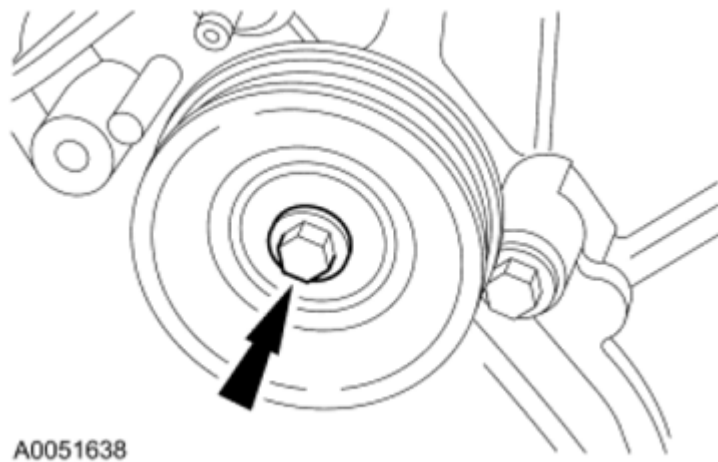
41. Using the Valve Spring Compressor, compress the valve springs and remove the 16 camshaft roller followers.

**NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.



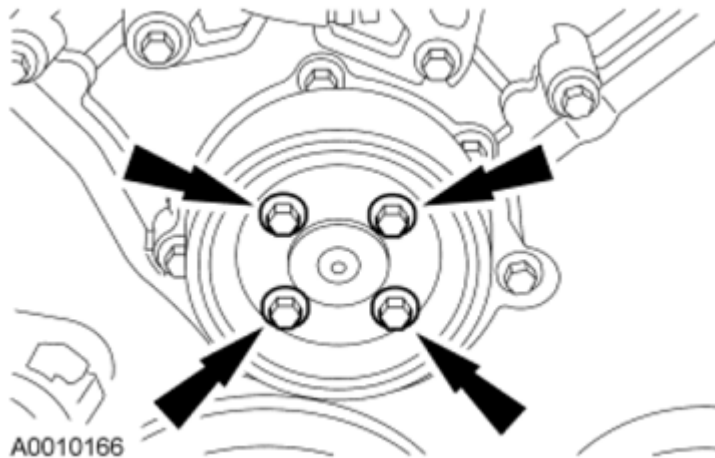
**Fig. 285: Locating Hydraulic Lash Adjusters**  
Courtesy of FORD MOTOR CO.

42. Remove the 16 hydraulic lash adjusters (4 shown in illustration).
43. Remove the bolt and the accessory drive belt idler pulley.



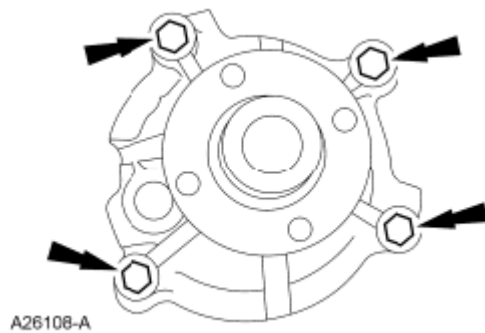
**Fig. 286: Locating Bolt And Accessory Drive Belt Idler Pulley**  
Courtesy of FORD MOTOR CO.

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



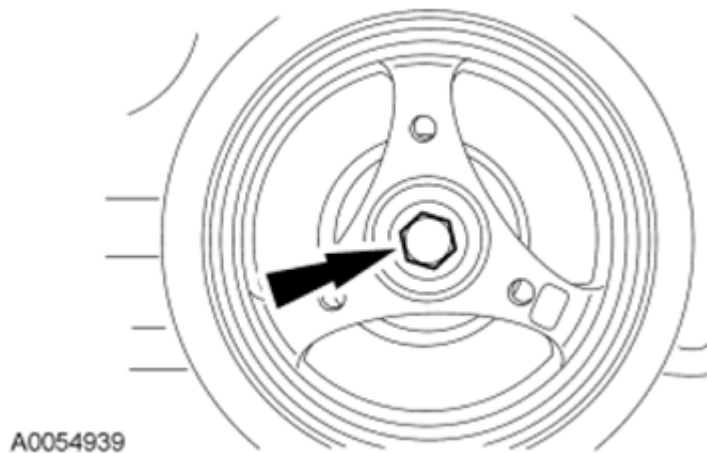
**Fig. 287: Locating Bolts And Coolant Pump Pulley**  
Courtesy of FORD MOTOR CO.

45. Remove the 4 bolts and the coolant pump.



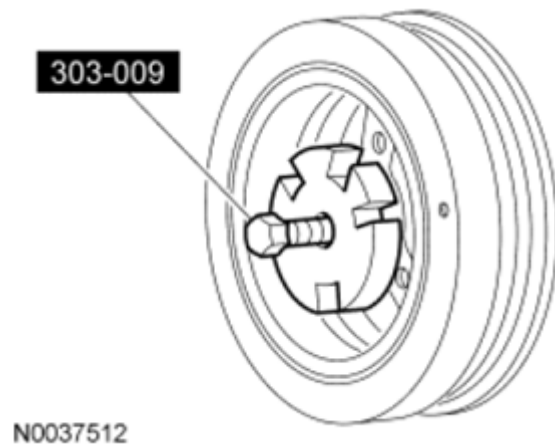
**Fig. 288: Locating Bolts And Coolant Pump**  
Courtesy of FORD MOTOR CO.

46. Remove the crankshaft pulley bolt.



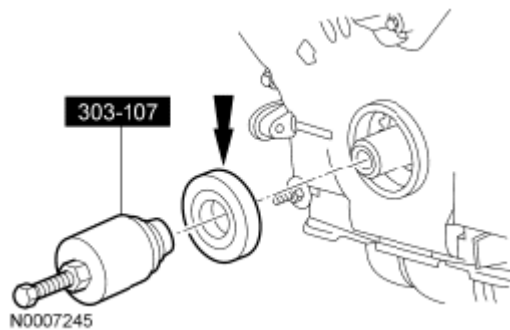
**Fig. 289: Locating Crankshaft Pulley Bolt**  
Courtesy of FORD MOTOR CO.

47. Using the Crankshaft Vibration Damper Remover, remove the crankshaft pulley.



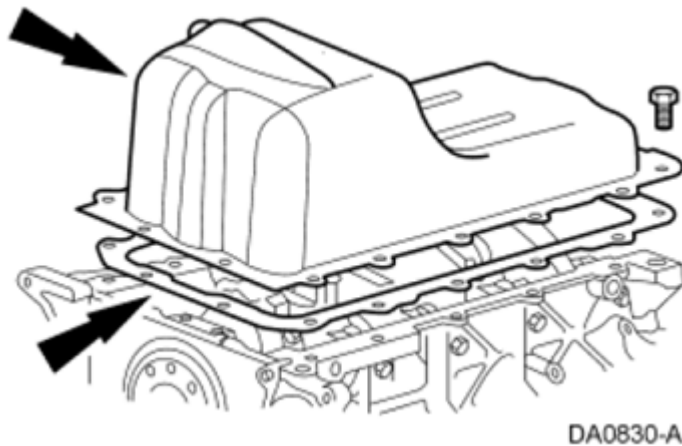
**Fig. 290: Removing Crankshaft Pulley Using Crankshaft Vibration Damper Remover**  
Courtesy of FORD MOTOR CO.

48. Using the Crankshaft Front Oil Seal Remover, remove the crankshaft front seal.



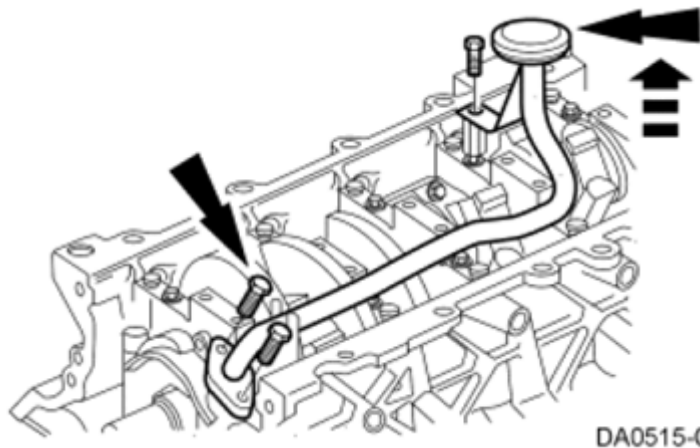
**Fig. 291: Locating Crankshaft Front Seal**  
Courtesy of FORD MOTOR CO.

49. Remove the 16 bolts and the oil pan.
- Discard the gasket.



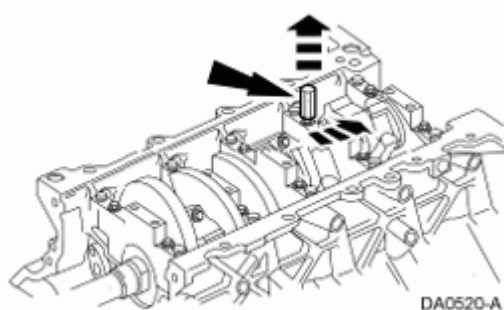
**Fig. 292: Locating Bolts And Oil Pan**  
Courtesy of FORD MOTOR CO.

50. Remove the 3 bolts, the oil pump screen and pickup tube.



**Fig. 293: Locating Bolts, Oil Pump Screen And Pickup Tube**  
Courtesy of FORD MOTOR CO.

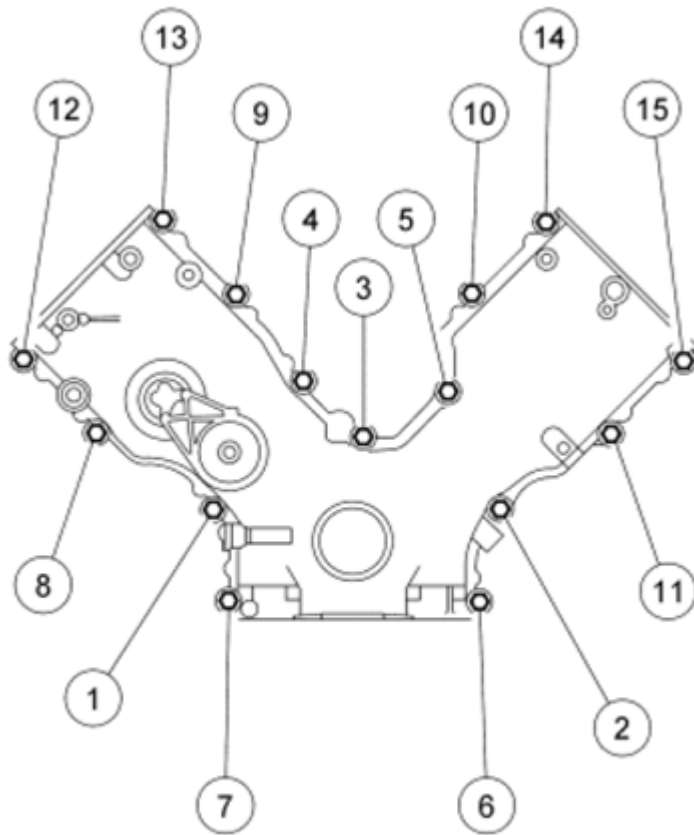
51. Remove the oil pump screen and pickup tube spacer.



**Fig. 294: Removing Oil Pump Screen And Pickup Tube Spacer**

Courtesy of FORD MOTOR CO.

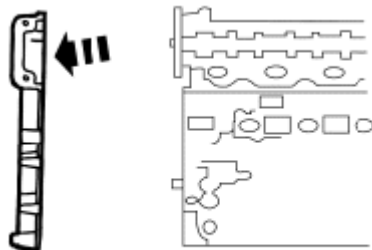
**NOTE:** Correct fastener location is essential for the ASSEMBLY procedure.  
Record fastener location.



N0037514

**Fig. 295: Identifying Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

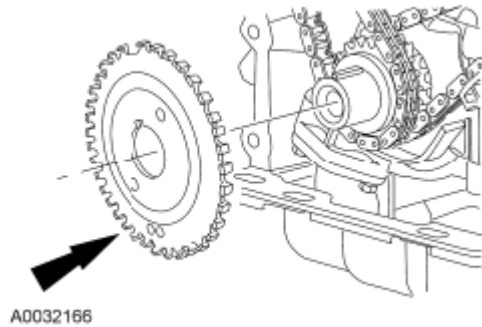
52. Remove the 15 fasteners in the sequence shown in illustration.
53. Remove the engine front cover from the cylinder block.



AA1665-A

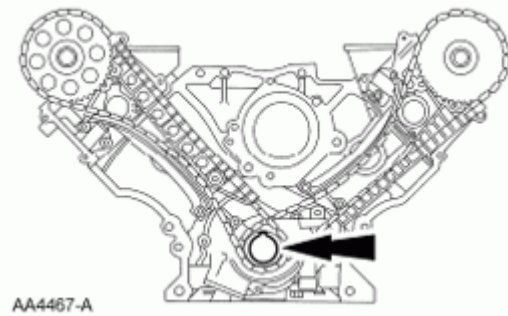
**Fig. 296: Removing Engine Front Cover**  
Courtesy of FORD MOTOR CO.

54. Remove the crankshaft sensor ring from the crankshaft.



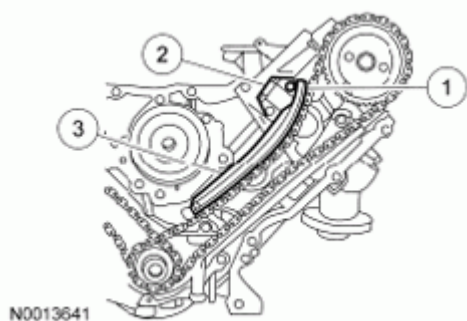
**Fig. 297: Locating Crankshaft Sensor Ring**  
Courtesy of FORD MOTOR CO.

55. Position the crankshaft with the keyway at the 12 o'clock position.



**Fig. 298: Locating Crankshaft**  
Courtesy of FORD MOTOR CO.

56. Remove the timing chain tensioning system from both timing chains.
1. Remove the 4 bolts.
  2. Remove the timing chain tensioners.
  3. Remove the timing chain tensioner arms.

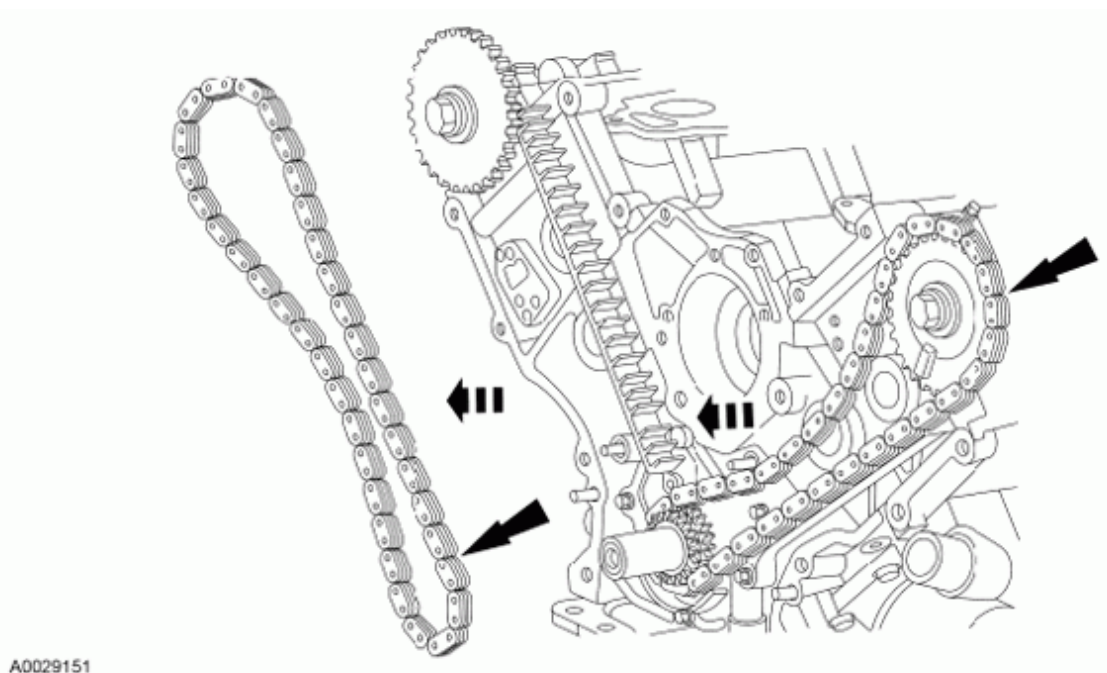


**Fig. 299: Identifying Timing Chain Tensioner Arms And Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** Unless otherwise instructed, at no time when the timing chains are removed and the cylinder heads are installed is the crankshaft or camshaft to be rotated. Severe piston and valve damage will occur.

57. Remove the LH and RH timing chains and the crankshaft sprocket.

- Remove the RH timing chain from the camshaft sprocket.
- Remove the RH timing chain from the crankshaft sprocket.
- Repeat for the LH timing chain and crankshaft sprocket.

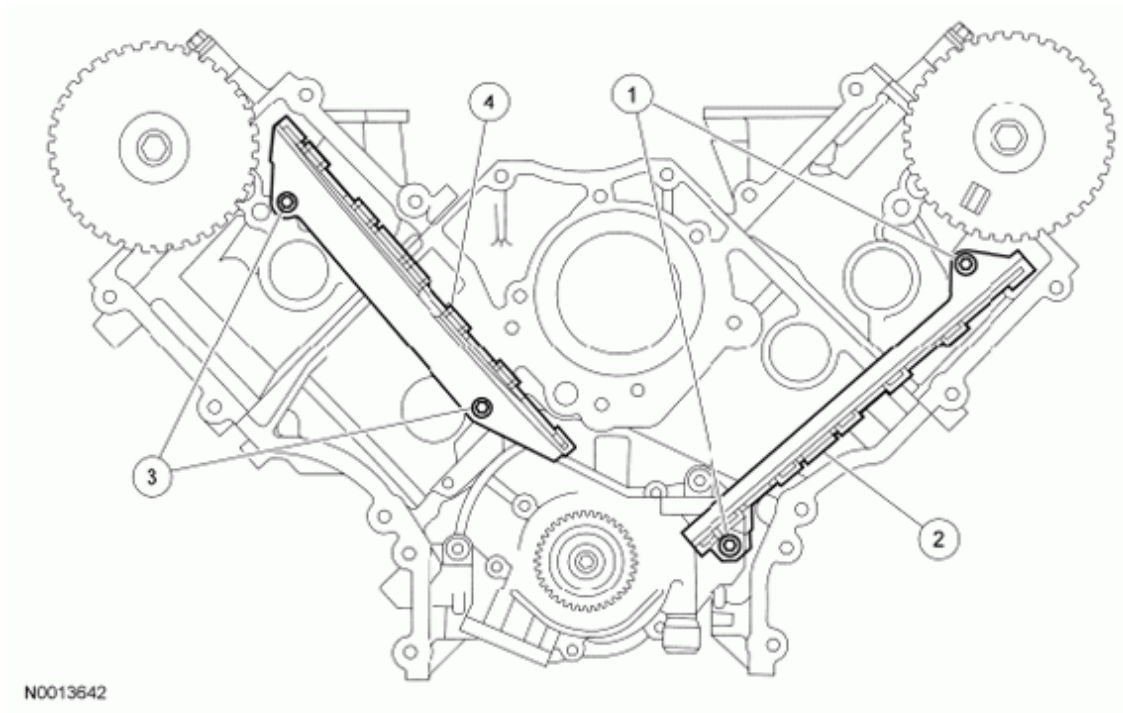


**Fig. 300: Removing RH Timing Chain**  
Courtesy of FORD MOTOR CO.

58. Remove both timing chain guides.

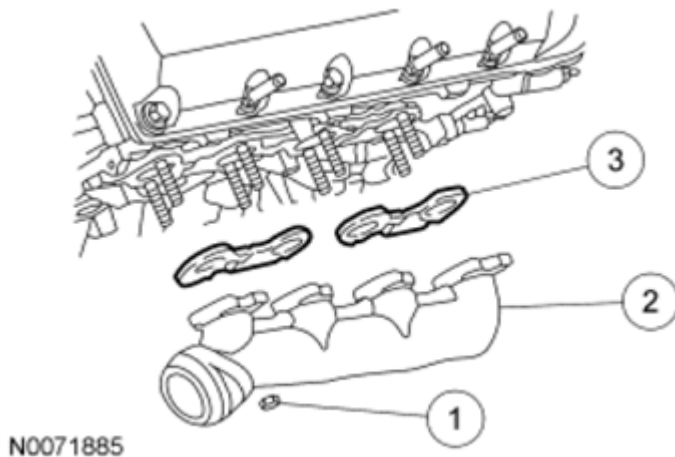
1. Remove the 4 bolts.

2. Remove the LH timing chain guide.
3. Remove the bolts.
4. Remove the RH timing chain guide.



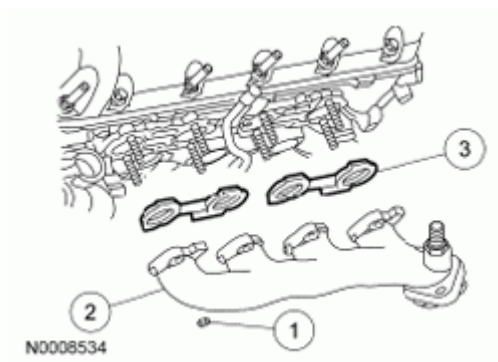
**Fig. 301: Identifying Timing Chain Guide And Bolts**  
Courtesy of FORD MOTOR CO.

59. Remove the RH exhaust manifold.
  1. Remove the 8 nuts and discard.
  2. Remove the RH exhaust manifold.
  3. Remove the RH exhaust manifold gasket and discard.



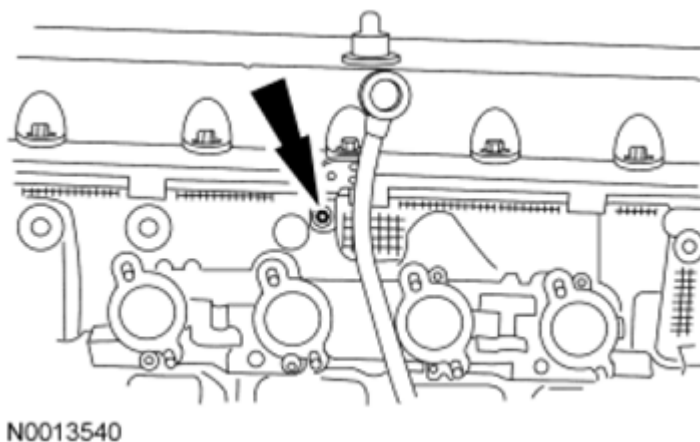
**Fig. 302: Identifying RH Exhaust Manifold, Nut And Gasket**  
Courtesy of FORD MOTOR CO.

60. Remove and discard the 8 RH exhaust manifold studs.
61. Remove the LH exhaust manifold.
  1. Remove the 8 nuts and discard.
  2. Remove the LH exhaust manifold.
  3. Remove the LH exhaust manifold gaskets and discard.



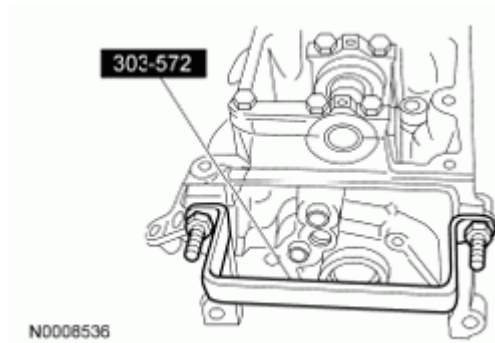
**Fig. 303: Identifying LH Exhaust Manifold, Nut And Gasket**  
Courtesy of FORD MOTOR CO.

62. Remove and discard the 8 LH exhaust manifold studs.
63. Clean and inspect the exhaust manifolds. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
64. Remove the bolt and the oil level indicator tube.



**Fig. 304: Locating Bolt And Oil Level Indicator Tube**  
Courtesy of FORD MOTOR CO.

65. Install the Cylinder Head Remover/Installer on both ends of the cylinder head.



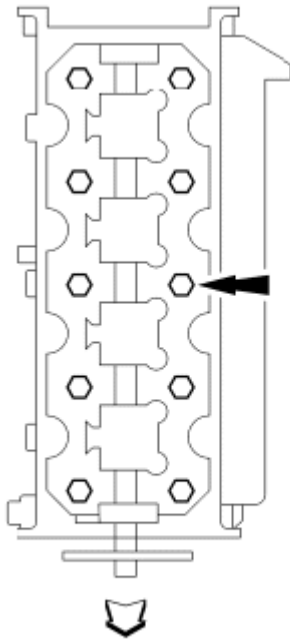
**Fig. 305: Identifying Cylinder Head Remover/Installer (303-572)**

Courtesy of FORD MOTOR CO.

- NOTE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.
- NOTE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.
- NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.
- NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

66. Remove the 10 bolts and the RH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



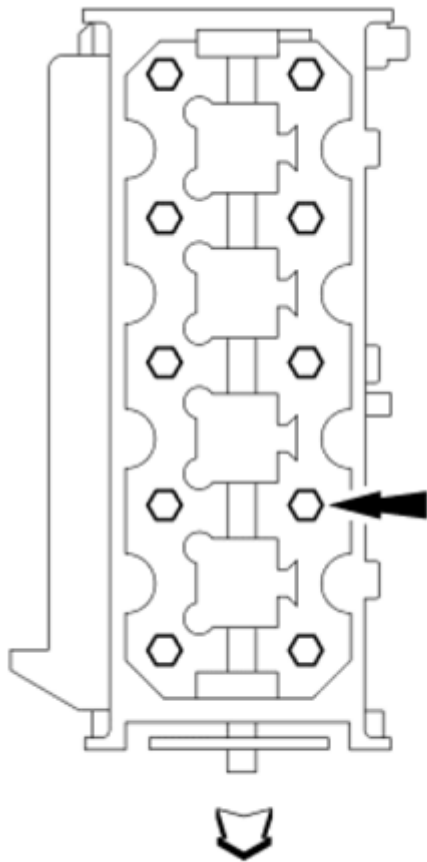
A26253-A

**Fig. 306: Locating Cylinder Head Bolts**  
Courtesy of FORD MOTOR CO.

- NOTE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.
- NOTE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. The scratches may cause leak paths.
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.
- NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.
- NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

67. Remove the 10 bolts and the LH cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.



A26254-A

**Fig. 307: Locating Cylinder Head Bolts**  
Courtesy of FORD MOTOR CO.

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

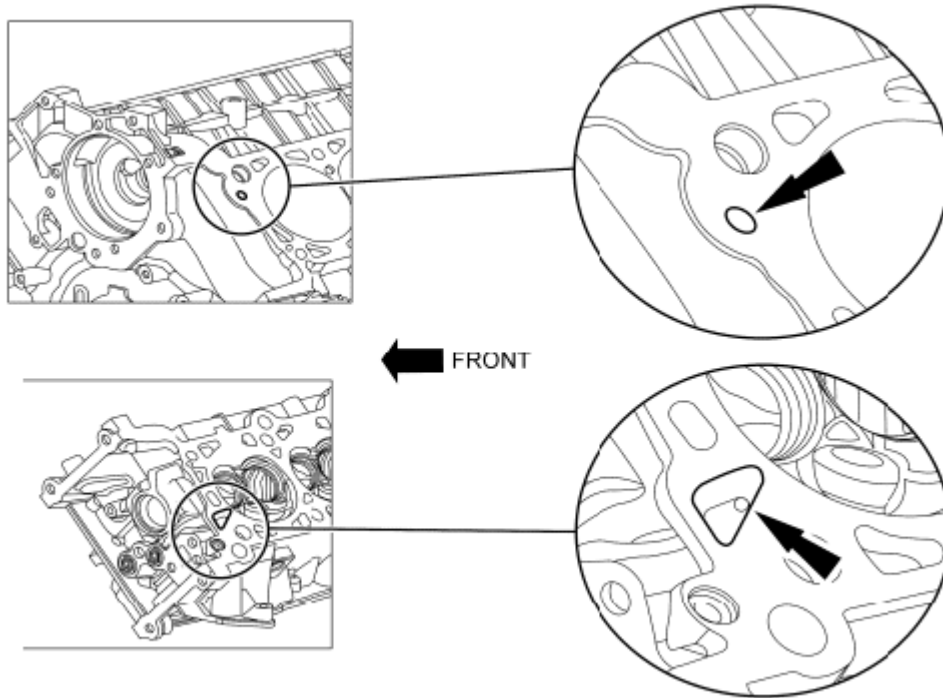
**NOTE:** Observe all warnings or cautions and follow all application directions contained on the packaging of the silicone gasket remover and the metal surface prep.

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

68. Clean the cylinder head-to-cylinder block mating surfaces of both cylinder heads and the cylinder block in the following sequence.
  1. Remove any large deposits of silicone or gasket material with a plastic scraper.
  2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.

3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep, following package directions, to remove any remaining 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.

**NOTE:** LH shown in illustration, RH similar.

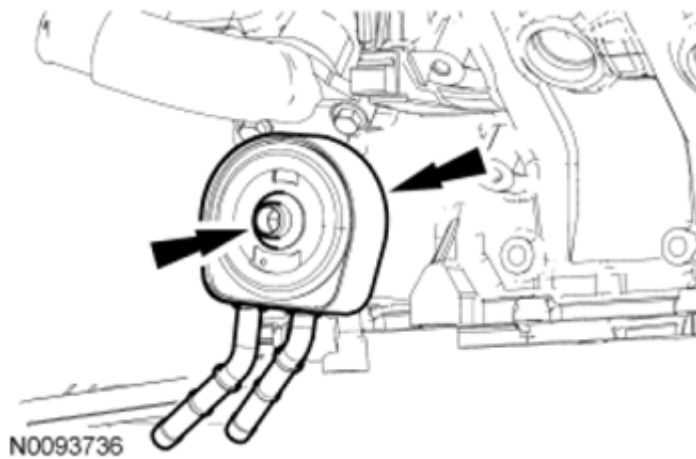


A0079634

**Fig. 308: Locating Cylinder Head Marks**  
Courtesy of FORD MOTOR CO.

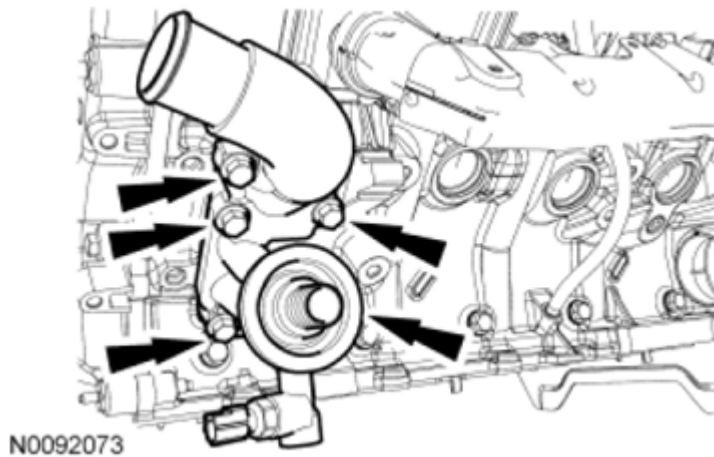
69. Support the cylinder heads on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion paying particular attention to the oil pressure feed area. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

**NOTE:** The oil cooler must be replaced or severe damage to the engine can occur.



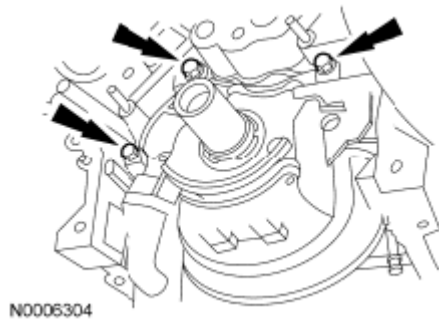
**Fig. 309: Locating Oil Cooler Mounting Bolt And Oil Cooler**  
Courtesy of FORD MOTOR CO.

70. If equipped, remove the oil cooler mounting bolt and remove and discard the oil cooler.
71. Remove the 4 bolts and the oil filter adapter.
  - Discard the gasket.



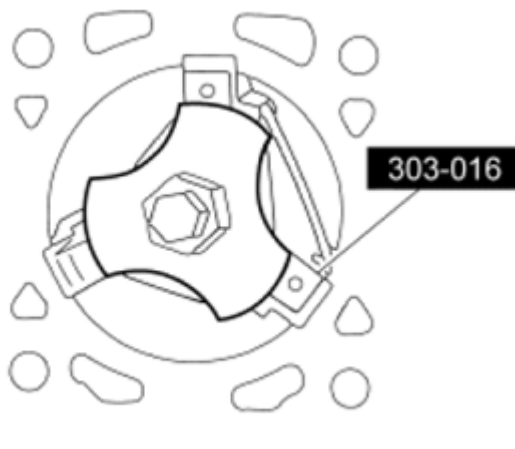
**Fig. 310: Locating Bolts And Oil Filter Adapter**  
Courtesy of FORD MOTOR CO.

72. Remove the 3 oil pump bolts and the oil pump.



**Fig. 311: Locating Oil Pump Bolts And Oil Pump**  
Courtesy of FORD MOTOR CO.

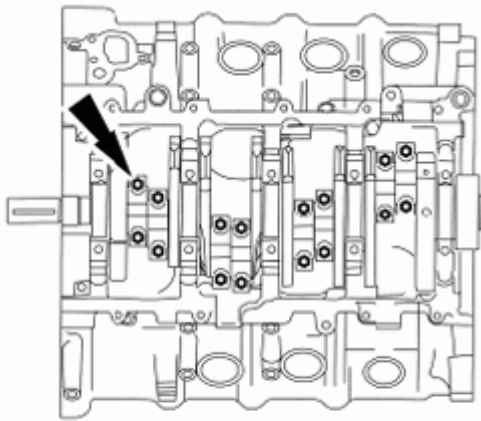
73. Before removing the pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using a Cylinder Ridge Reamer, following the manufacturer instructions.



**Fig. 312: Identifying Cylinder Ridge Reamer (303-016)**  
Courtesy of FORD MOTOR CO.

**NOTE:** Verify that the connecting rods and rod caps have orientation numbers cast into them. If not, number the connecting rods and rod caps for correct orientation.

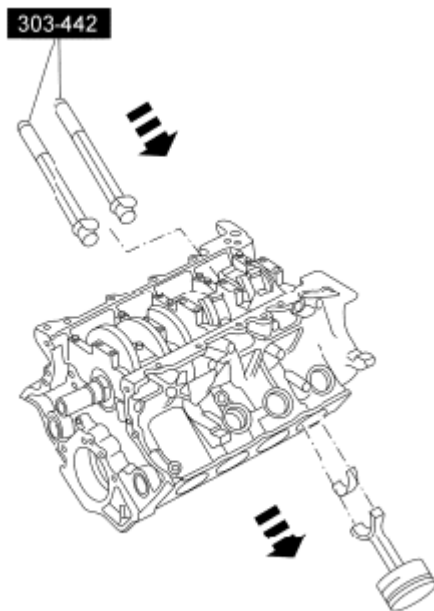
74. Remove the 2 bolts and the connecting rod cap.
- Discard the bolts.



DA0578-A

**Fig. 313: Locating Bolts And Connecting Rod Cap**  
Courtesy of FORD MOTOR CO.

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



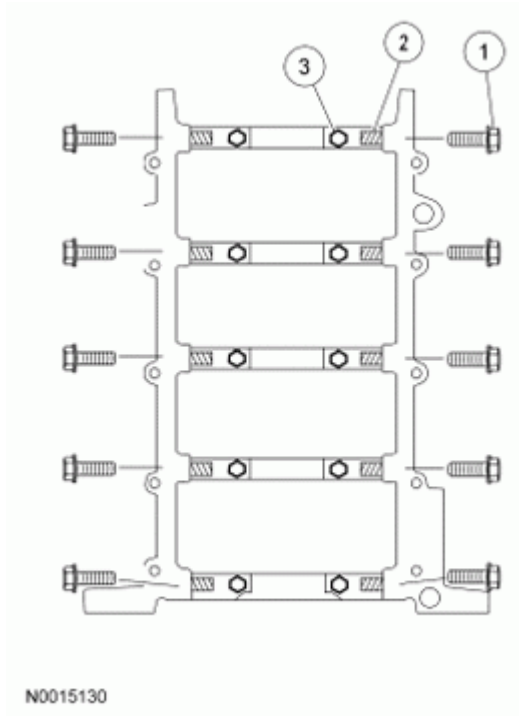
N0010189

**Fig. 314: Pushing Piston Through Top Of Cylinder Block**  
Courtesy of FORD MOTOR CO.

75. Using the Connecting Rod Installer, push the piston through the top of the cylinder block.

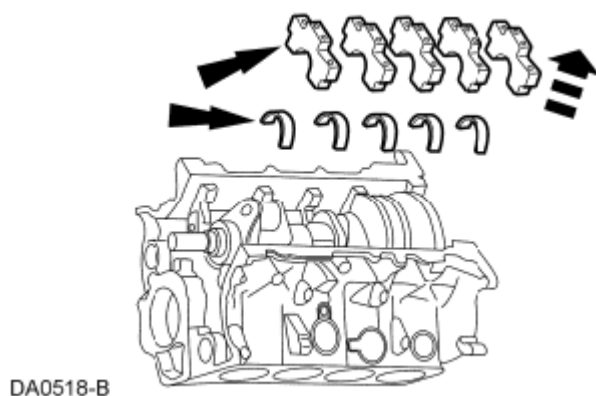
**NOTE:** Servicing the bottom end of the engine (crankshaft, bearings) requires that cylinder heads be removed. Failure to do so may result in engine damage.

76. Remove the crankshaft bearing cap fasteners.
1. Remove and discard the 10 cross-mounted main cap bolts.
  2. Loosen the 10 jack screws.
  3. Remove and discard the 10 main cap bolts.



**Fig. 315: Identifying Crankshaft Bearing Cap Fasteners**  
Courtesy of FORD MOTOR CO.

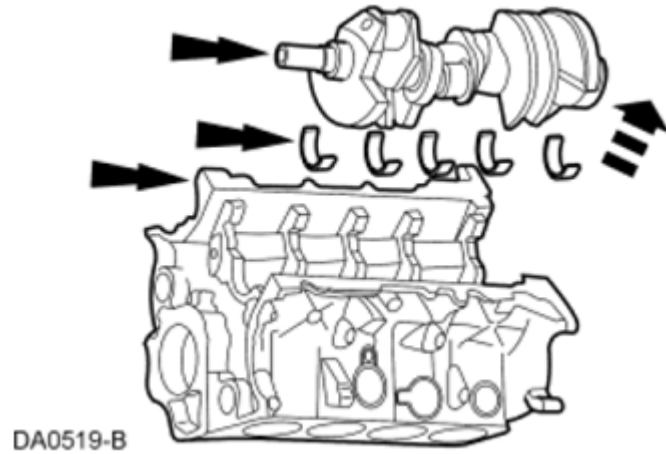
77. Remove the 5 main bearing caps and the lower crankshaft main bearings.



**Fig. 316: Locating Main Bearing Caps And Lower Crankshaft Main Bearings**

Courtesy of FORD MOTOR CO.

78. Remove the crankshaft and the upper crankshaft main bearings from the cylinder block.



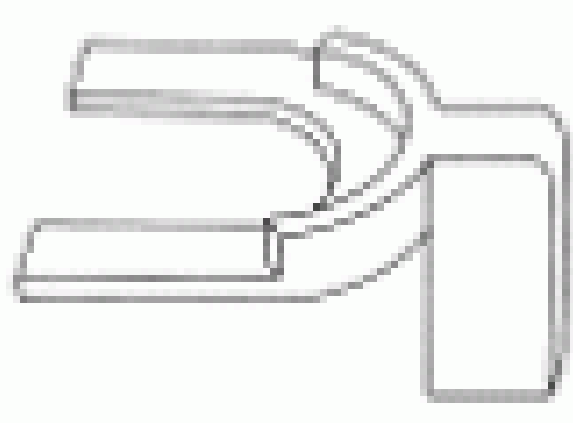
**Fig. 317: Locating Crankshaft And Upper Crankshaft Main Bearings**  
Courtesy of FORD MOTOR CO.

## DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

### CYLINDER HEAD

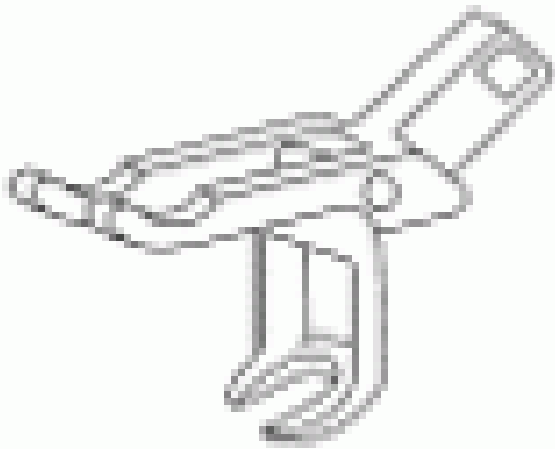
Special Tool(s)

#### SPECIAL TOOL CHART

|                                                                                                     |                                                                   |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
|  <p>ST1331-A</p> | <p>Compressor Spacer, Valve Spring<br/>303-382 (T91P-6565-AH)</p> |
|                                                                                                     |                                                                   |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST1330-A

Compressor, Valve Spring  
303-567 (T97P-6565-AH)



ST1332-A

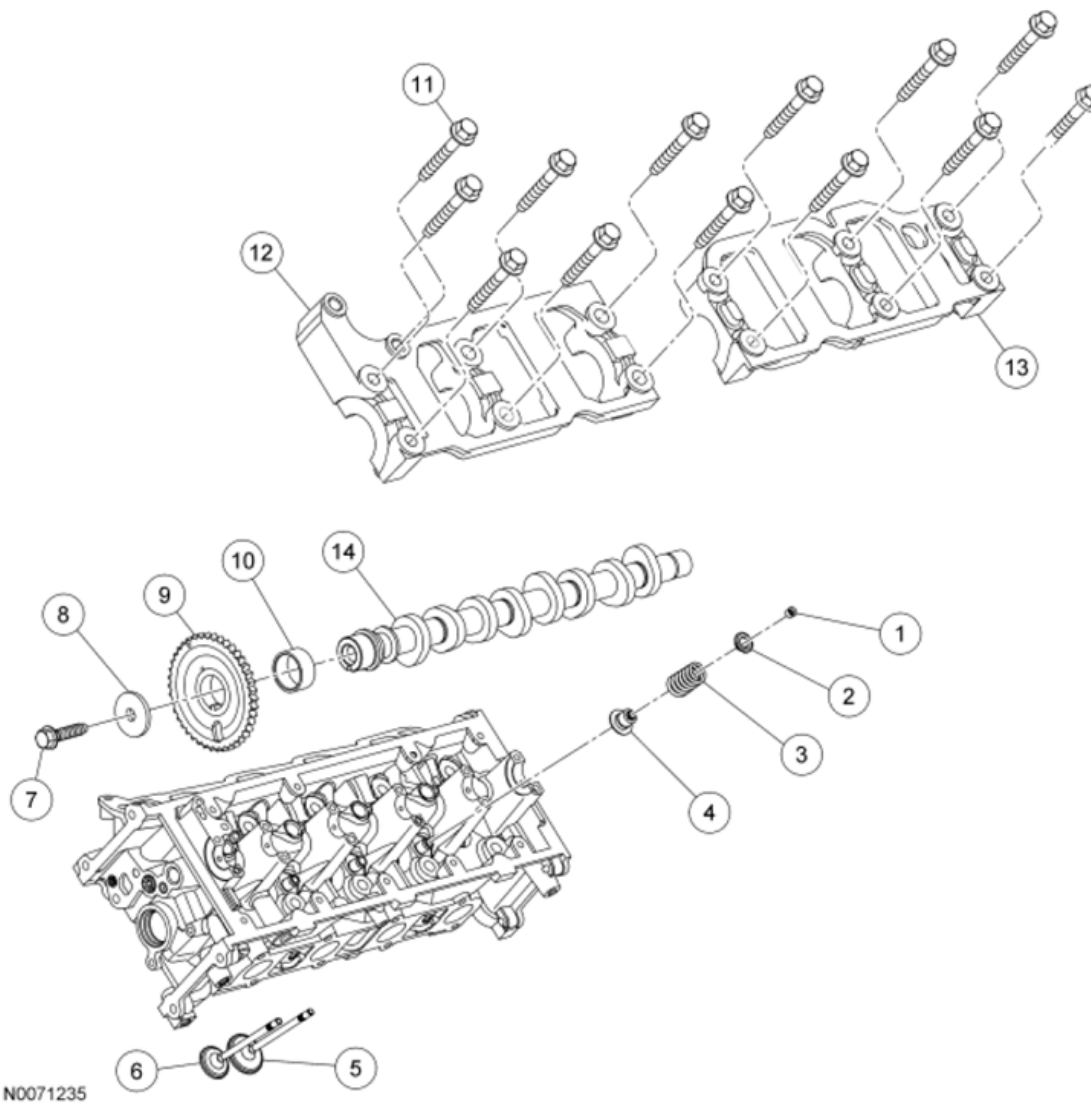
Installer, Valve Stem Oil Seal  
303-383 (T91P-6571-A)

### Material

#### MATERIAL SPECIFICATIONS

| Item                                                                                                                                                           | Specification |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Motorcraft® Metal Surface Prep ZC-31-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  |

**NOTE:** LH shown in illustration, RH similar.



**Fig. 318: Identifying Cylinder Head Components**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

| Item | Part Number | Description                             |
|------|-------------|-----------------------------------------|
| 1    | 6518        | Valve spring retainer key (16 required) |
| 2    | 6514        | Valve spring retainer (8 required)      |
| 3    | 6513        | Valve spring (8 required)               |
| 4    | 6A517       | Valve stem seal (8 required)            |
| 5    | 6505        | Intake valve (4 required)               |
| 6    | 6507        | Exhaust valve (4 required)              |
| 7    | N811085     | Camshaft sprocket bolt                  |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |         |                                         |
|----|---------|-----------------------------------------|
| 8  | N806164 | Camshaft sprocket bolt washer           |
| 9  | 6256    | Camshaft sprocket                       |
| 10 | 6265    | Camshaft sprocket spacer                |
| 11 | N807352 | Camshaft bearing cap bolt (13 required) |
| 12 | 6B280   | Camshaft bearing cap                    |
| 13 | 6B280   | Camshaft bearing cap                    |
| 14 | 6A274   | Camshaft                                |

### Disassembly

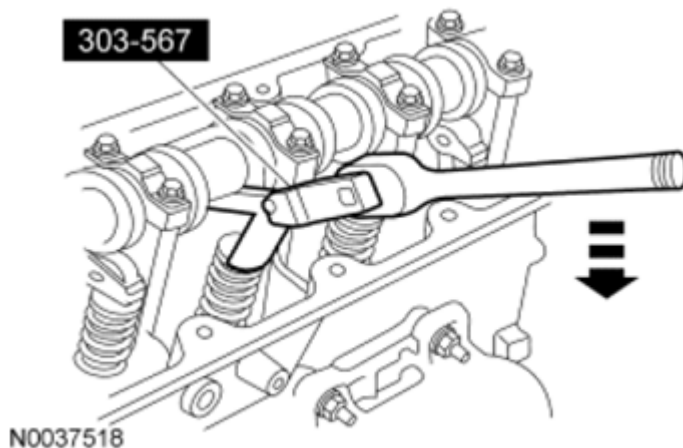
**NOTE:** Place cylinder head on a cardboard or wood surface to prevent damage to the joint face.

**NOTE:** Do not remove the camshaft before removing the roller followers.



**Fig. 319: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

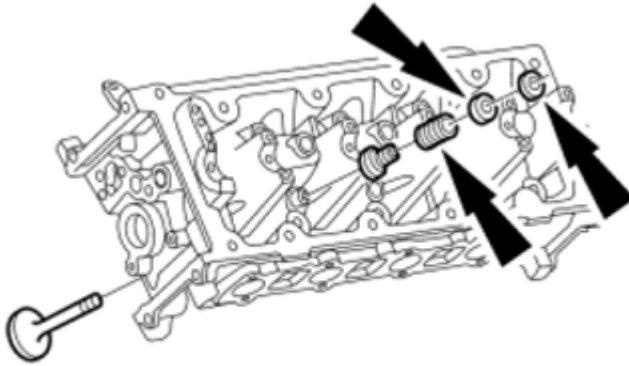
1. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.
2. Using the Valve Spring Compressor, compress the valve springs.



**Fig. 320: Identifying Valve Spring Compressor (303-567)**

Courtesy of FORD MOTOR CO.

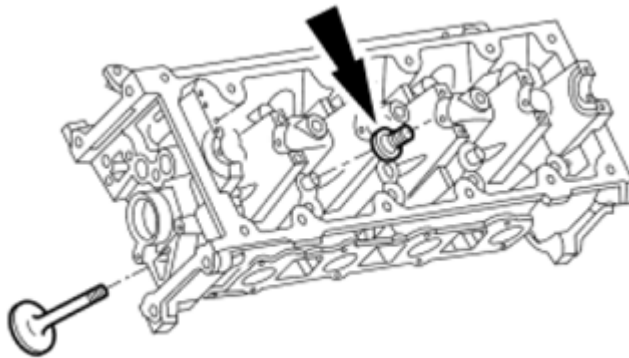
**NOTE:** Keep valves and valve spring retainer keys in order so they can be installed in their original positions.



A0049215

**Fig. 321: Locating Valve Spring Retainer Keys, Valve Spring Retainers, Valve Springs And Valves**  
Courtesy of FORD MOTOR CO.

3. Remove the valve spring retainer keys, the valve spring retainers, the valve springs and the valves.
4. Remove the valve stem seals.

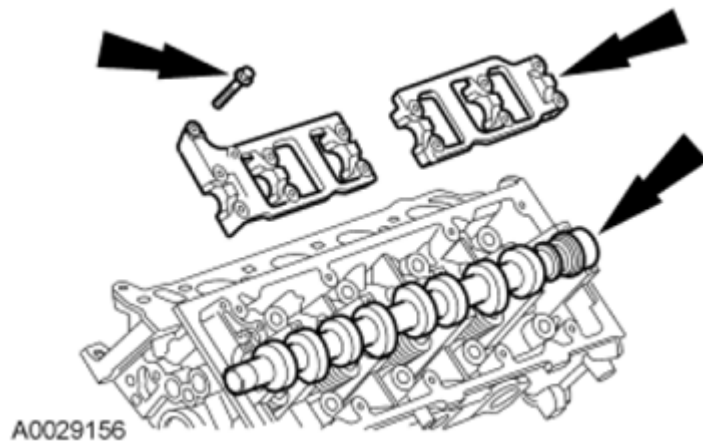


DA0055-B

**Fig. 322: Locating Valve Stem Seals**

Courtesy of FORD MOTOR CO.

**NOTE:** The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations.



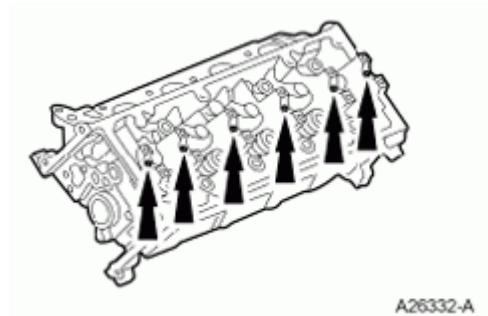
**Fig. 323: Locating Bolts, Bearing Caps And Camshaft**  
Courtesy of FORD MOTOR CO.

5. Remove the bolts, the bearing caps and the camshaft.

#### Assembly

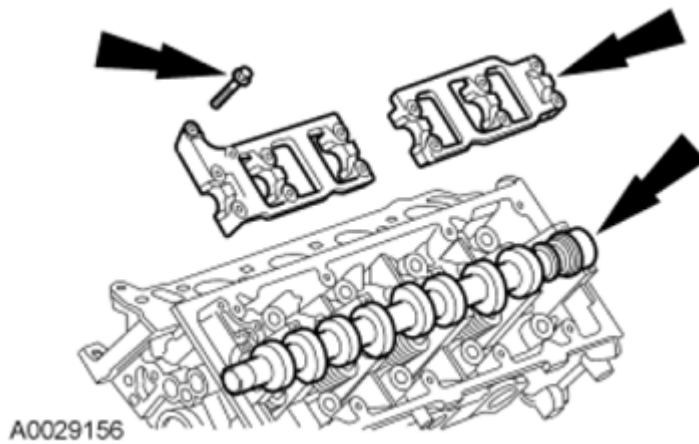
**NOTE:** Do not use metal scrapers or other tools to clean the cylinder head.

1. Use a plastic scraper and metal surface prep to clean the cylinder head.
2. Lubricate the camshaft journals with clean engine oil.



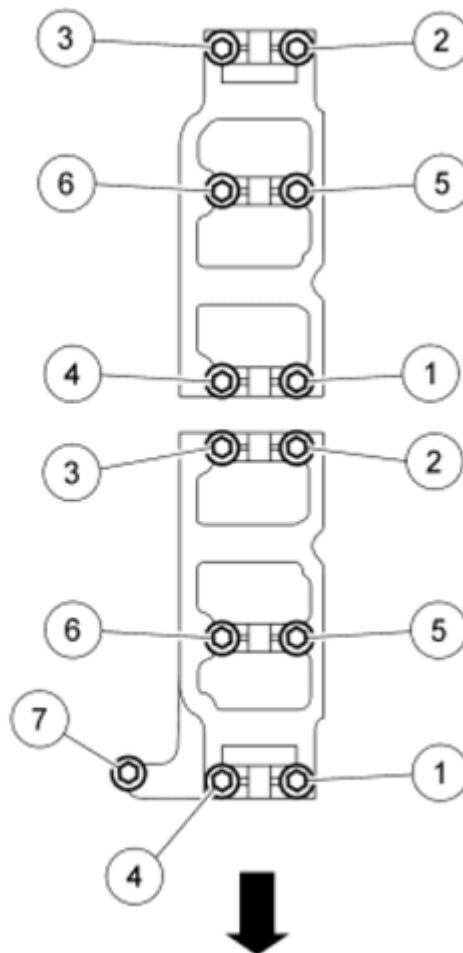
**Fig. 324: Locating Camshaft Journals**  
Courtesy of FORD MOTOR CO.

3. Install the camshaft and the camshaft bearing caps.
  - Lubricate with clean engine oil and position the camshaft bearing caps.
  - Install the bolts loosely.



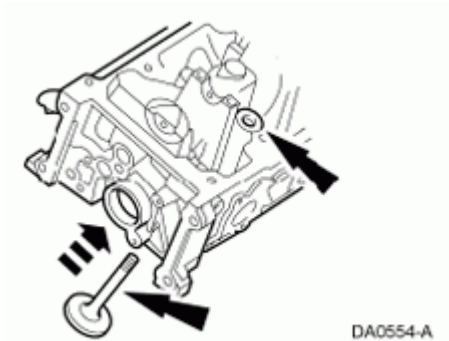
**Fig. 325: Locating Bolts, Bearing Caps And Camshaft**  
 Courtesy of FORD MOTOR CO.

4. Tighten the camshaft bearing caps bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



**Fig. 326: Identifying Camshaft Bearing Caps Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

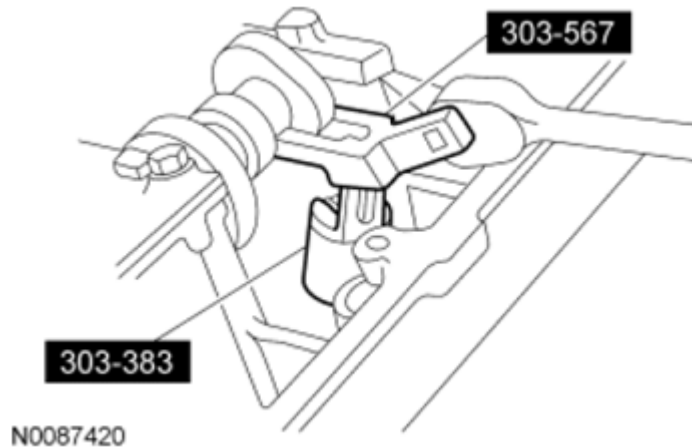
**NOTE:** Lubricate the valve stems with clean engine oil.



**Fig. 327: Installing Valves In Cylinder Head**  
Courtesy of FORD MOTOR CO.

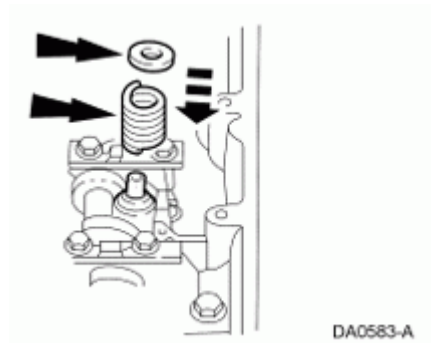
5. Install the valves in the cylinder head.

**NOTE:** Lubricate the valve stems seals with clean engine oil.



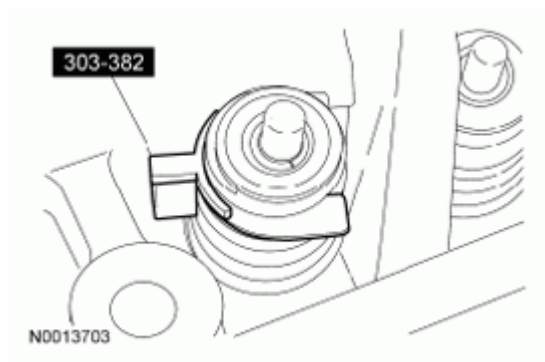
**Fig. 328: Identifying Valve Stem Oil Seal Installer And Valve Spring Compressor**  
Courtesy of FORD MOTOR CO.

6. Using the Valve Stem Oil Seal Installer and Valve Spring Compressor, install the valve stem seals.
7. Install the valve springs and the valve spring retainers onto the valves.



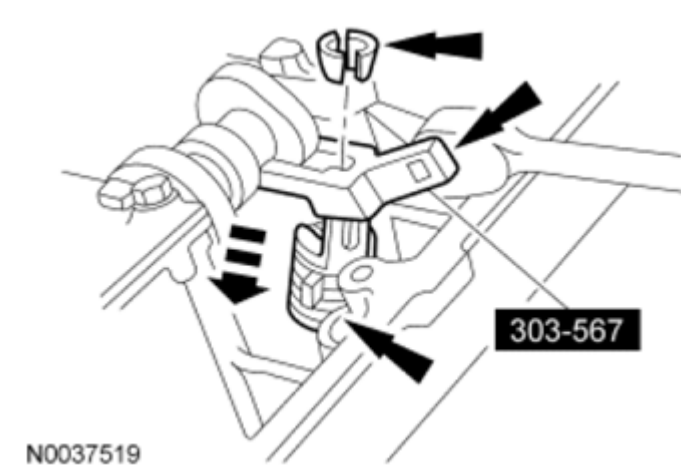
**Fig. 329: Locating Valve Springs And Valve Spring Retainers**  
Courtesy of FORD MOTOR CO.

8. Install the Valve Spring Compressor Spacer (303-382) between the valve spring coils to prevent valve stem seal damage.



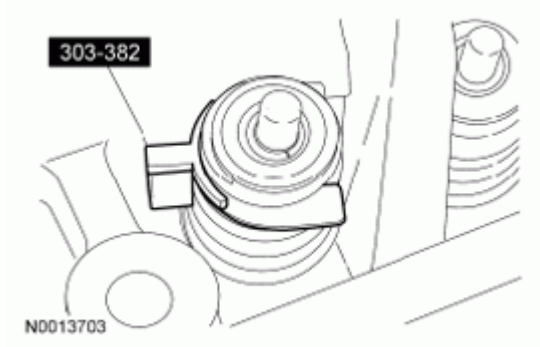
**Fig. 330: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

9. Using the Valve Spring Compressor, compress the valve springs and install the valve spring retainer keys.



**Fig. 331: Compressing Valve Springs**  
Courtesy of FORD MOTOR CO.

10. Remove the Valve Spring Compressor Spacer.



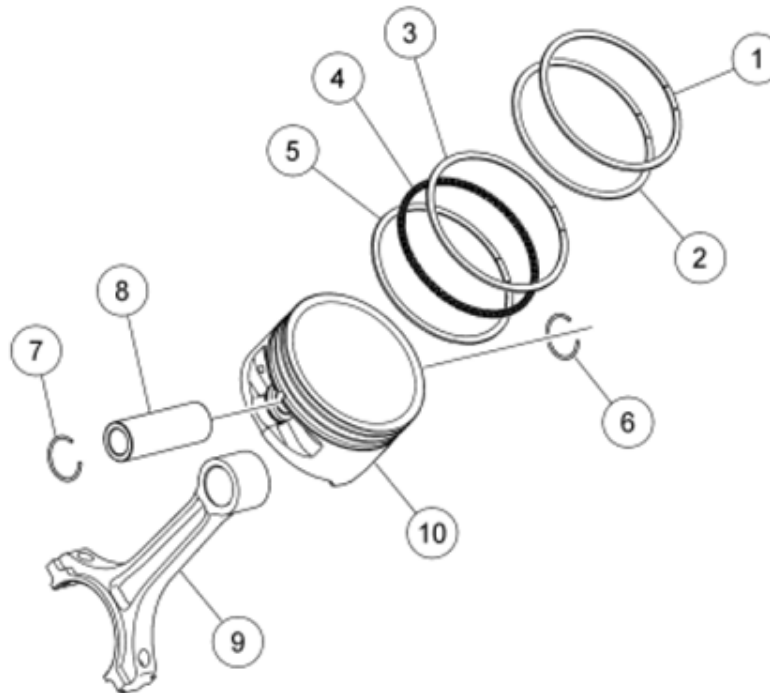
**Fig. 332: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

## PISTON

### Material

### MATERIAL SPECIFICATIONS

| 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  |



N0004114

**Fig. 333: Identifying Piston Components**  
Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

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

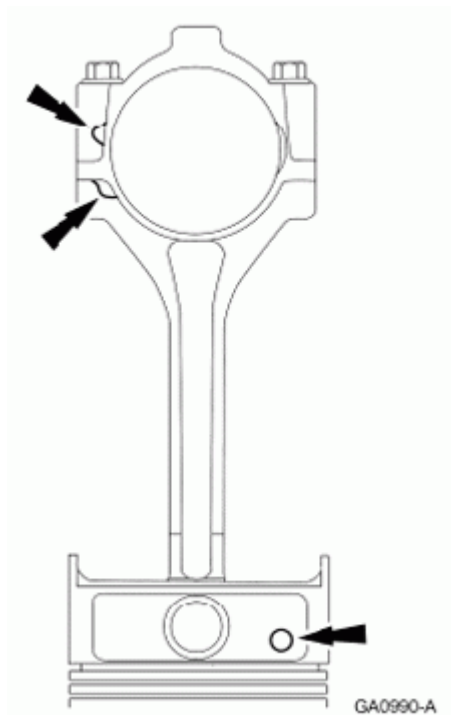
**Disassembly**

1. Remove the upper piston compression ring.
2. Remove the lower piston compression ring.
3. Remove the upper piston oil control segment ring.
4. Remove the piston oil control spacer.

5. Remove the lower piston oil control segment ring.
6. Remove the 2 piston pin retainers.
7. Remove the piston pin and remove the connecting rod from the piston.

**Assembly**

**NOTE:** Connecting rod must be installed into piston with identification markings toward front.



**Fig. 334: Locating Identification Markings**  
Courtesy of FORD MOTOR CO.

1. Position the connecting rod in the piston.

**NOTE:** Lubricate the piston pin and retainers with clean engine oil.

2. Install the piston pin and the 2 piston pin retainers.

**NOTE:** Lubricate all the piston rings and piston oil control spacer with clean engine oil.

3. Install the lower piston oil control segment ring.
4. Install the piston oil control spacer.
5. Install the upper piston oil control segment ring.
6. Install the lower piston compression ring.

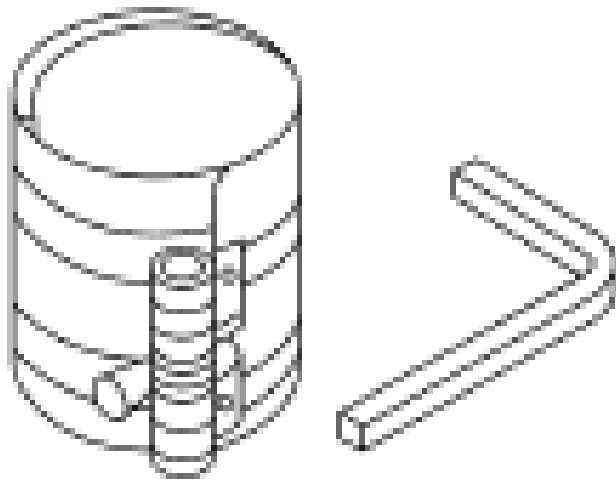
7. Install the upper piston compression ring.

## ASSEMBLY

### ENGINE

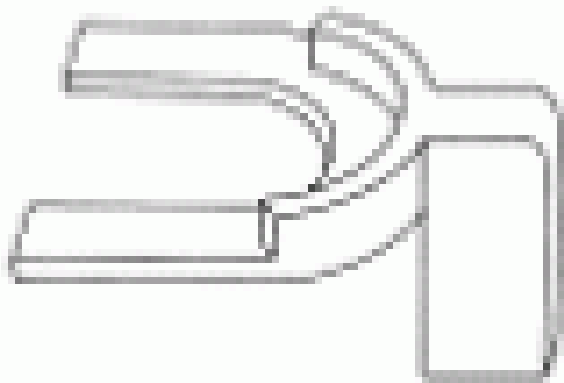
#### Special Tool(s)

#### SPECIAL TOOL CHART



**ST1376-A**

Compressor, Piston Ring  
303-D032 (D81L-6002-C) or equivalent

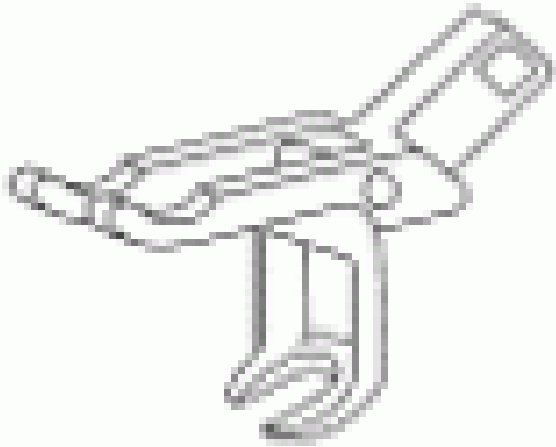


**ST1331-A**

Compressor Spacer, Valve Spring  
303-382 (T91P-6565-AH)

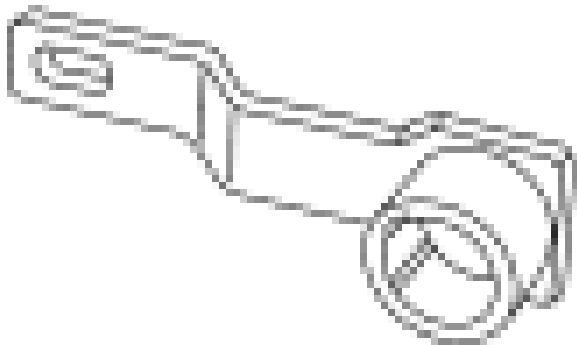
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1330-A**

Compressor, Valve Spring  
303-567 (T97P-6565-AH)

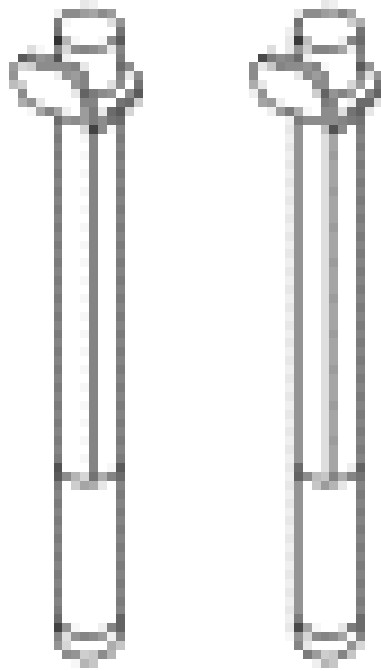


**ST1335-A**

Holding Tool, Crankshaft  
303-448 (T93P-6303-A)

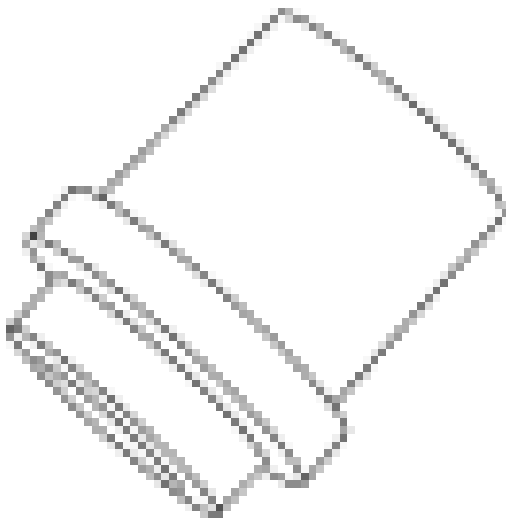
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1337-A**

Installer, Connecting Rod  
303-442 (T93P-6136-A)



**ST2197-A**

Installer, Crankshaft Front Oil Seal  
303-635

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1480-A**

Installer, Crankshaft Rear Oil Seal  
303-518 (T95P-6701-DH)



**ST1479-A**

Installer, Crankshaft Rear Oil Seal  
303-516 (T95P-6701-BH)

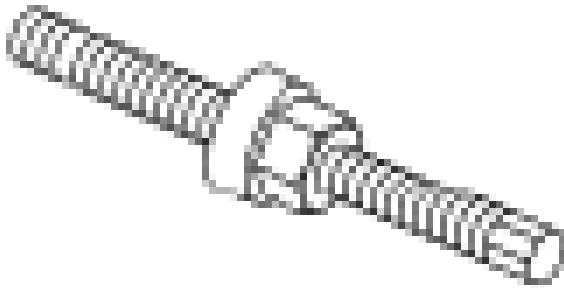
Installer, Crankshaft Rear Oil Slinger  
303-517 (T95P-6701-CH)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1482-A**



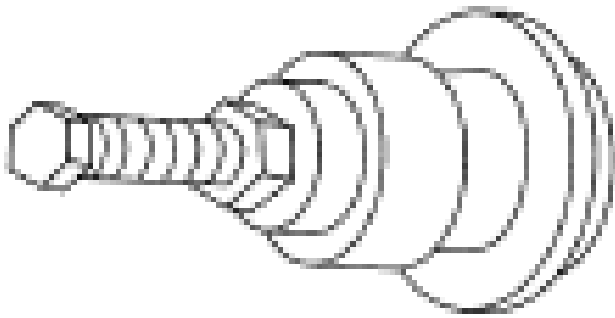
Installer, Crankshaft Vibration Damper  
303-102 (T74P-6316-B)

**ST1287-A**

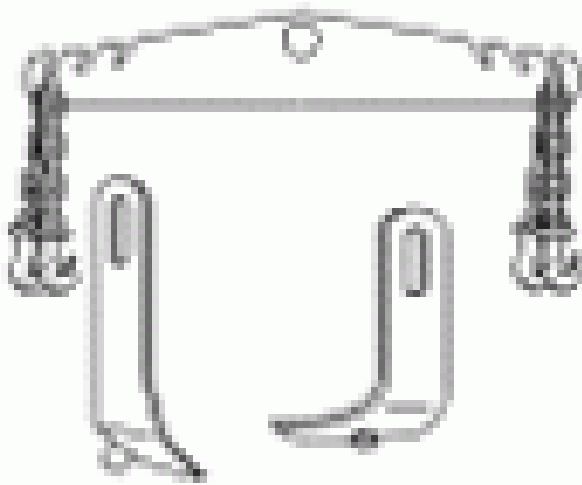
Installer, Front Cover Oil Seal  
303-335 (T88T-6701-A)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1328-A**



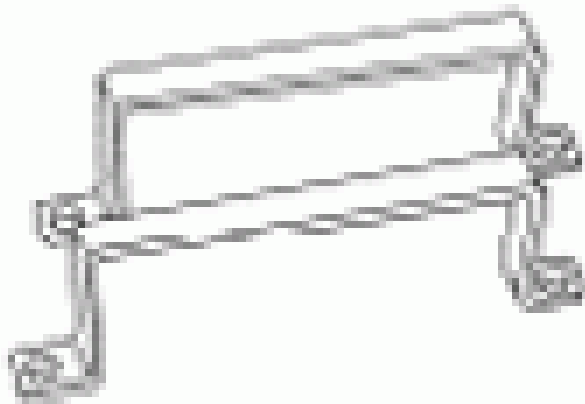
**ST2443-A**

Lifting Bracket Set, Engine  
303-DS086 (D93P-6001-A)  
Includes Lifting Bracket, Engine  
303-D087 and 303-D088 or equivalent

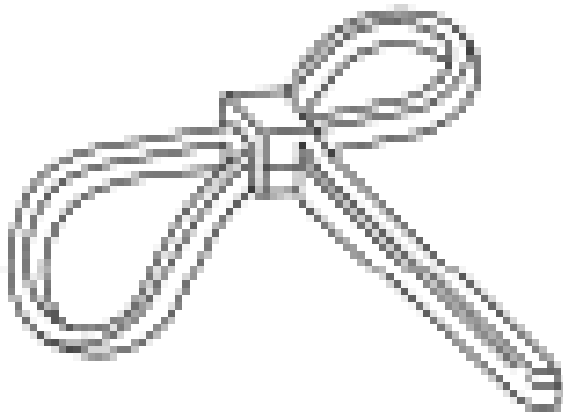
Remover/Installer, Cylinder Head  
303-572 (T97T-6000-A)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST1668-A



ST1436-A

Strap Wrench  
303-D055 (D85L-6000-A) or equivalent

### General Equipment

#### GENERAL EQUIPMENT

Hydraulic Chain Tensioner Retaining Clip - 1L3Z-6P250-AA

### Material

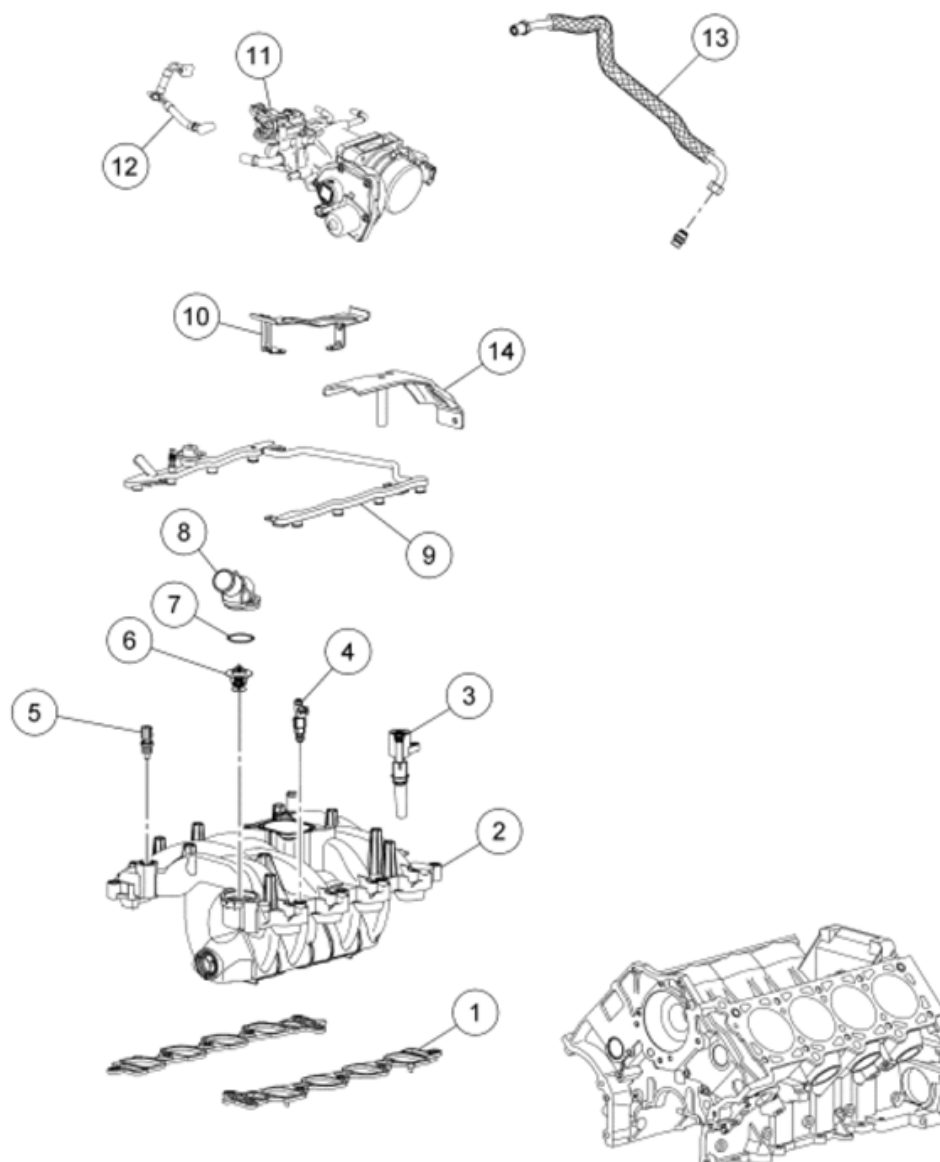
#### MATERIAL SPECIFICATIONS

**2010 Mercury Grand Marquis LS**

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

| Item                                                                                                                                                              | Specification |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Gasket Maker<br>TA-16                                                                                                                                             | WSK-M2G348-A5 |
| Motorcraft® Metal Surface Prep<br>ZC-31-A                                                                                                                         | -             |
| Motorcraft® Premium Gold Engine Coolant with Bittering Agent (bittered in US only)<br>VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)                 | WSS-M97B51-A1 |
| Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil<br>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<br>TA-30                                                                                                                              | WSE-M4G323-A4 |
| Silicone Gasket Remover<br>ZC-30                                                                                                                                  | -             |

**Engine Induction System**



N0066814

**Fig. 335: Identifying Engine Induction System Components**  
Courtesy of FORD MOTOR CO.

#### ITEM DESCRIPTION

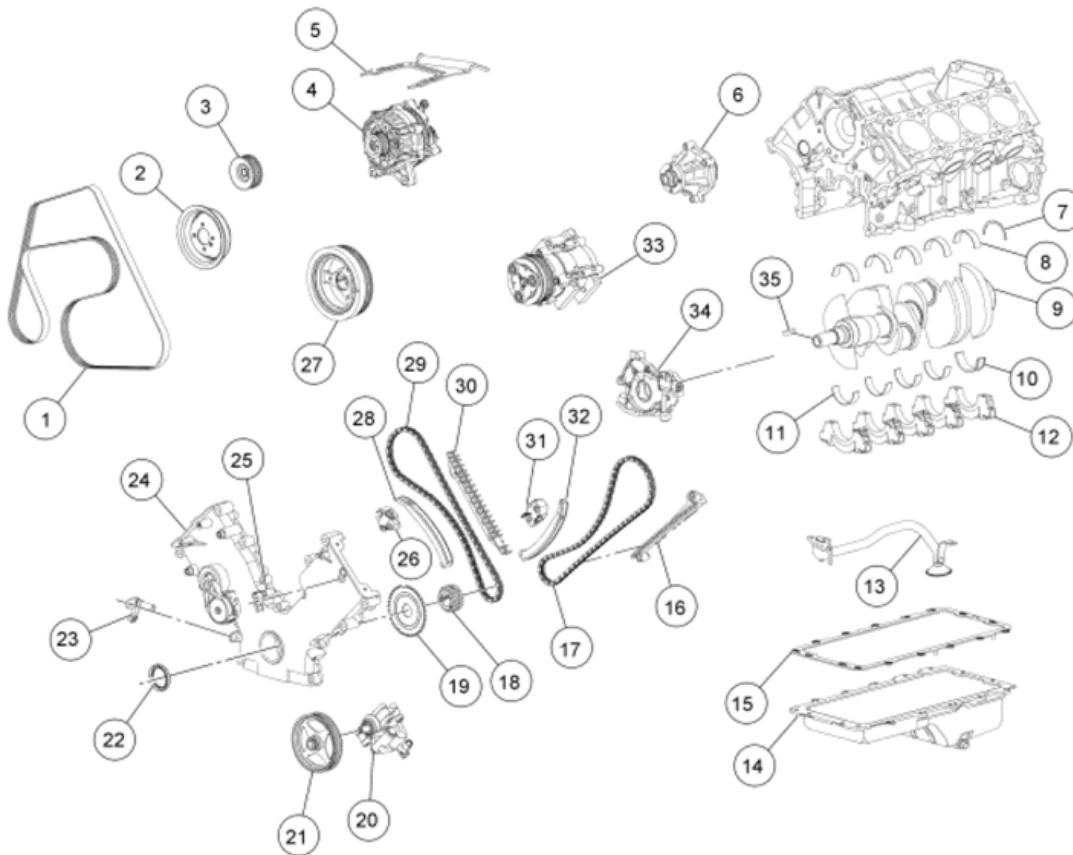
| Item | Part Number | Description                             |
|------|-------------|-----------------------------------------|
| 1    | 9439        | Intake manifold gasket (2 required)     |
| 2    | 9424        | Intake manifold                         |
| 3    | 12A366      | Ignition coil (8 required)              |
| 4    | 9F593       | Fuel injector (8 required)              |
| 5    | 10884       | Engine Coolant Temperature (ECT) sensor |
| 6    | 8575        | Coolant thermostat                      |
| 7    | N806807     | O-ring seal                             |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |       |                              |
|----|-------|------------------------------|
| 8  | 8594  | Coolant outlet adapter       |
| 9  | 9F792 | Fuel rail                    |
| 10 | 9F460 | Intake manifold shield       |
| 11 | 9E822 | Throttle Body (TB)           |
| 12 | 9E498 | Vacuum harness               |
| 13 | 9D477 | EGR-to-exhaust manifold tube |
| 14 | 9G609 | Intake manifold bracket      |

### Engine - Front End and Lower End



N0092151

**Fig. 336: Identifying Engine - Front End And Lower End Components**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description          |
|------|-------------|----------------------|
| 1    | 8620        | Accessory drive belt |
| 2    | 8A528       | Coolant pump pulley  |

**2010 Mercury Grand Marquis LS**

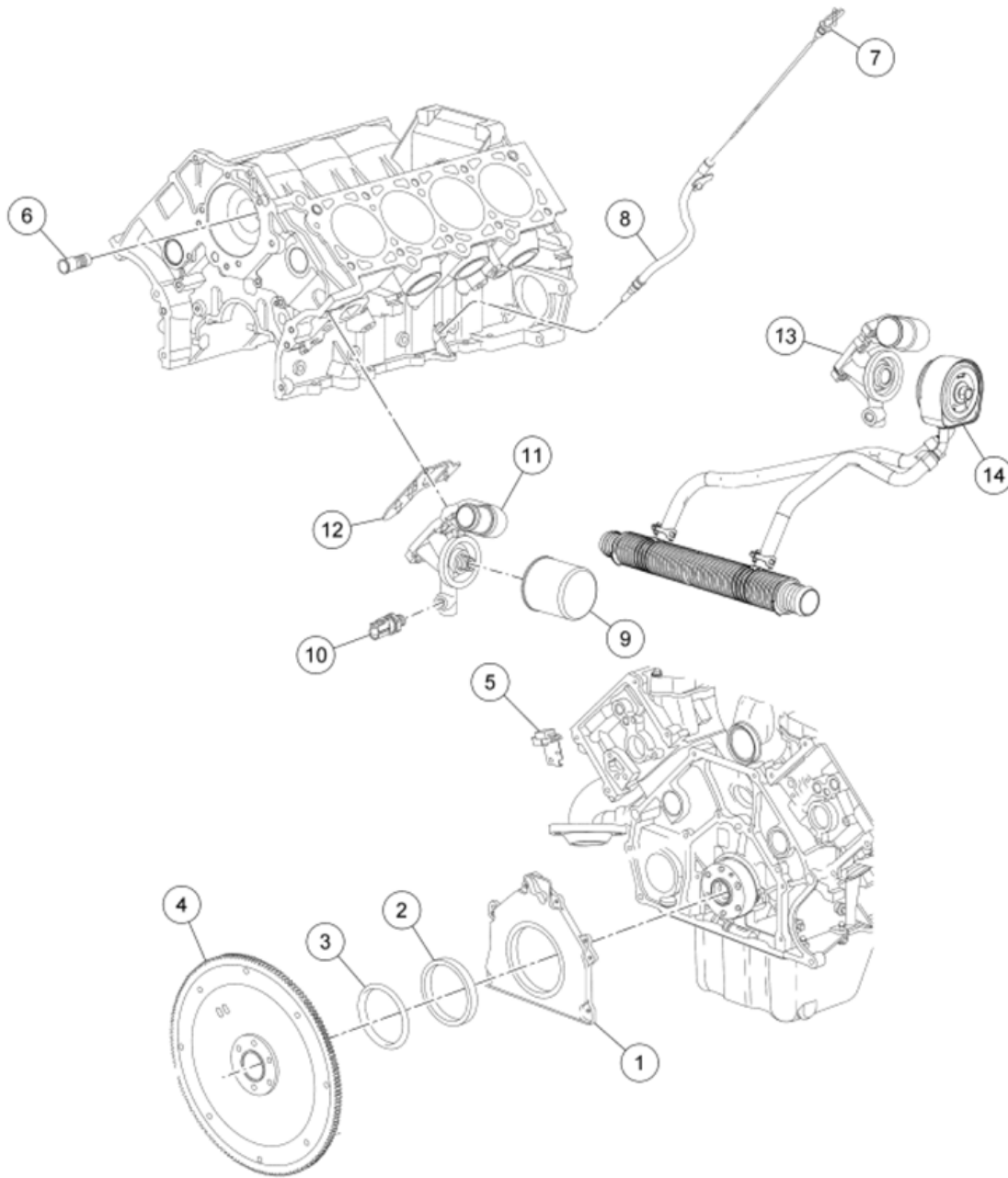
2010 ENGINE Engine - 4.6L (2V) - Crown Victoria &amp; Grand Marquis

|    |         |                                      |
|----|---------|--------------------------------------|
| 3  | 19A216  | Idler pulley                         |
| 4  | 10300   | Generator                            |
| 5  | 10153   | Generator bracket                    |
| 6  | 8501    | Coolant pump                         |
| 7  | 6A341   | Crankshaft thrust washer             |
| 8  | 6333    | Crankshaft main bearing (5 required) |
| 9  | 6303    | Crankshaft                           |
| 10 | 6A339   | Crankshaft thrust main bearing       |
| 11 | 6A338   | Crankshaft main bearing (4 required) |
| 12 | 6325    | Main bearing cap (5 required)        |
| 13 | 6622    | Oil pump screen cover and tube       |
| 14 | 6675    | Oil pan                              |
| 15 | 6710    | Oil pan gasket                       |
| 16 | 6B274   | Timing chain guide                   |
| 17 | 6268    | Timing chain                         |
| 18 | 6306    | Crankshaft sprocket                  |
| 19 | 12A227  | Ignition pulse ring                  |
| 20 | 3A674   | Power steering pump                  |
| 21 | 3D673   | Power steering pump pulley           |
| 22 | 6700    | Crankshaft front seal                |
| 23 | 6C315   | Crankshaft position sensor           |
| 24 | 6C086   | Engine front cover                   |
| 25 | 6B288   | Camshaft position sensor             |
| 26 | 6L266   | Timing chain tensioner               |
| 27 | 6316    | Crankshaft damper                    |
| 28 | 6L253   | Timing chain tensioner arm           |
| 29 | 6268    | Timing chain                         |
| 30 | 6M289   | Timing chain guide                   |
| 31 | 6M256   | Timing chain tensioner               |
| 32 | 6L253   | Timing chain tensioner arm           |
| 33 | 19D629  | A/C compressor                       |
| 34 | 6621    | Oil pump                             |
| 35 | N806201 | Crankshaft keyway                    |

**Engine - Flex Plate and Engine Lubrication**

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



N0092068

**Fig. 337: Identifying Engine - Flex Plate And Engine Lubrication Components**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description                       |
|------|-------------|-----------------------------------|
| 1    | 6K318       | Crankshaft rear oil seal retainer |
| 2    | 6701        | Crankshaft rear oil seal          |
| 3    | 6310        | Crankshaft oil slinger            |

## 2010 Mercury Grand Marquis LS

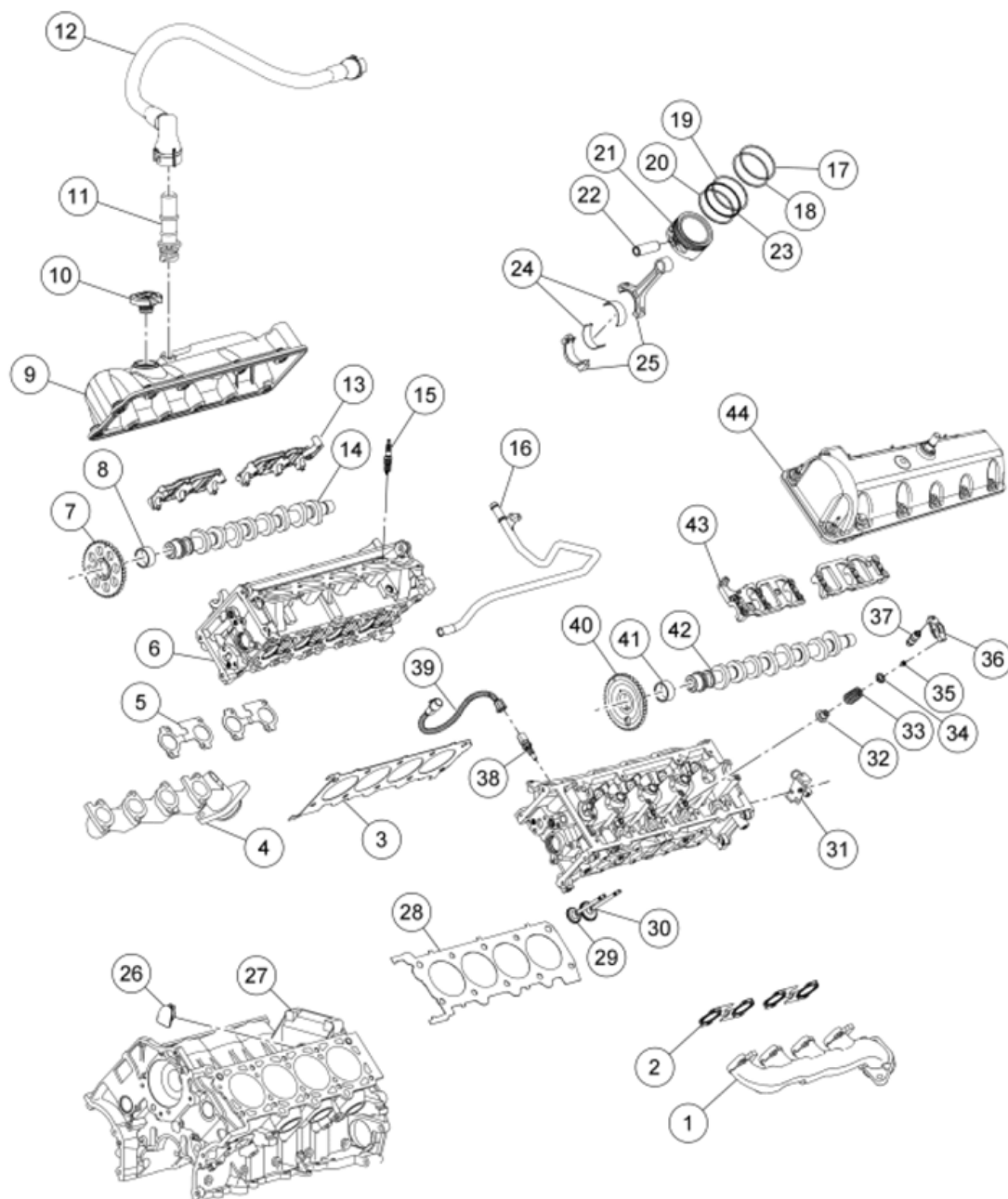
2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |        |                                       |
|----|--------|---------------------------------------|
| 4  | 6375   | Flywheel                              |
| 5  | 18801  | Radio ignition interference capacitor |
| 6  | 18B402 | Coolant bypass tube                   |
| 7  | 6750   | Oil level indicator                   |
| 8  | 6754   | Oil level indicator tube              |
| 9  | 6714   | Oil filter                            |
| 10 | 9278   | Engine Oil Pressure (EOP) switch      |
| 11 | 6881   | Oil filter adapter                    |
| 12 | 6A636  | Oil filter adapter gasket             |
| 13 | 6881   | Oil filter adapter                    |
| 14 | 6A642  | Engine oil cooler                     |

### Engine - Upper End

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



N0109048

**Fig. 338: Identifying Engine - Upper End Components**  
Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

| Item | Part Number | Description                          |
|------|-------------|--------------------------------------|
| 1    | 9431        | Exhaust manifold                     |
| 2    | 9Y431       | Exhaust manifold gasket (2 required) |
| 3    | 6051        | Head gasket                          |

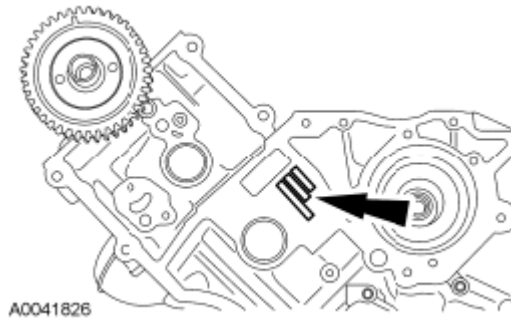
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|    |        |                                         |
|----|--------|-----------------------------------------|
| 4  | 9430   | Exhaust manifold                        |
| 5  | 9Y431  | Exhaust manifold gasket (2 required)    |
| 6  | 6049   | Cylinder head                           |
| 7  | 6256   | Camshaft sprocket                       |
| 8  | 6265   | Camshaft sprocket spacer                |
| 9  | 6582   | Valve cover                             |
| 10 | 6766   | Oil filler cap                          |
| 11 | 6A666  | PCV valve                               |
| 12 | 6K817  | Crankcase vent connector and hose       |
| 13 | 6B280  | Camshaft bearing cap                    |
| 14 | 6250   | Camshaft                                |
| 15 | 12405  | Spark plug (8 required)                 |
| 16 | 18663  | Heater coolant bypass tube              |
| 17 | 6150   | Top compression ring (8 required)       |
| 18 | 6152   | Lower compression ring (8 required)     |
| 19 | 6159   | Top oil control ring (8 required)       |
| 20 | 6159   | Lower oil control ring (8 required)     |
| 21 | 6110   | Piston (8 required)                     |
| 22 | 6135   | Piston pin (8 required)                 |
| 23 | 6161   | Oil ring spacer (8 required)            |
| 24 | 6211   | Connecting rod bearings (16 required)   |
| 25 | 6205   | Connecting rod assembly (8 required)    |
| 26 | 6C070  | Torque converter inspection hold cover  |
| 27 | 6010   | Cylinder block                          |
| 28 | 6083   | Head gasket                             |
| 29 | 6505   | Exhaust valve (8 required)              |
| 30 | 6507   | Intake valve (8 required)               |
| 31 | 18801  | Radio capacitor                         |
| 32 | 6A517  | Valve stem seal (16 required)           |
| 33 | 6513   | Valve spring (16 required)              |
| 34 | 6514   | Valve spring retainer (16 required)     |
| 35 | 6518   | Valve spring retainer key (32 required) |
| 36 | 6529   | Roller follower (16 required)           |
| 37 | 6C501  | Hydraulic lash adjuster (16 required)   |
| 38 | 6G004  | Cylinder Head Temperature (CHT) sensor  |
| 39 | 12A654 | <b>CHT</b> sensor harness               |
| 40 | 6256   | Camshaft sprocket                       |
| 41 | 6265   | Camshaft sprocket spacer                |
| 42 | 6A274  | Camshaft                                |
| 43 | 6B280  | Camshaft bearing cap                    |
| 44 | 6A505  | Valve cover                             |

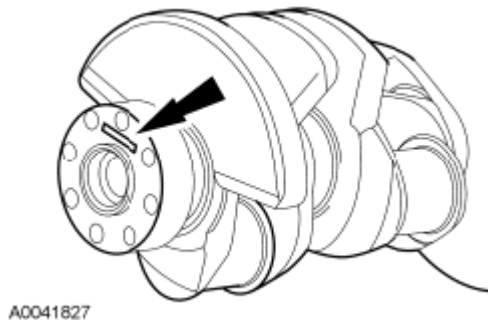
**Assembly****All engines**

1. Record the main bearing code found on the front of the engine block.



**Fig. 339: Locating Main Bearing Code Location**  
Courtesy of FORD MOTOR CO.

2. Record the main bearing code found on the back of the crankshaft.



**Fig. 340: Locating Main Bearing Code Location**  
Courtesy of FORD MOTOR CO.

3. Using the data recorded earlier and the Bearing Select Fit Chart, Standard Bearings Chart determine the required bearing grade for each main bearing.
  - Read the first letter of the engine block main bearing code and the first letter of the crankshaft main bearing code.
  - Read down the column below the engine main bearing code letter, and across the row next to the crankshaft main bearing code letter, until the 2 intersect. This is the required bearing grade for the No. 1 crankshaft main bearing.
  - As an example, if the engine block code letter is "F" and the crankshaft code letter is "D," the correct bearing grade for this main bearing is "2."
  - Repeat this process for the remaining 4 main bearings.

# 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

|                        |   | MINIMUM BLOCK DIA |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |  |
|------------------------|---|-------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
|                        |   | A                 | B    | C    | D    | E    | F    | G    | H    | I    | J    | K    | L    | M    | N    | O    | P    | Q    | R    | S    | T    | U    | V    | W    | X    |      |  |
|                        |   | 72.400            | .401 | .402 | .403 | .404 | .405 | .406 | .407 | .408 | .409 | .410 | .411 | .412 | .413 | .414 | .415 | .416 | .417 | .418 | .419 | .420 | .421 | .422 | .423 | .424 |  |
| MAXIMUM CRANKSHAFT DIA | X | 67.504            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                        | W | 67.503            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                        | V | 67.502            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                        | U | 67.501            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                        | T | 67.500            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                        | S | 67.499            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                        | R | 67.498            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    |  |
|                        | Q | 67.497            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    |  |
|                        | P | 67.496            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    |  |
|                        | O | 67.495            | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    |  |
|                        | N | 67.494            | 1    | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    |  |
|                        | M | 67.493            | 1    | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | L | 67.492            | 1    | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | K | 67.491            | 1    | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | J | 67.490            | 1    | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | I | 67.489            | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | H | 67.488            | 1    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | G | 67.487            | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | F | 67.486            | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | E | 67.485            | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | D | 67.484            | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | C | 67.483            | 2    | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | B | 67.482            | 2    | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
|                        | A | 67.481            | 2    | 2    | 2    | 2    | 2    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |

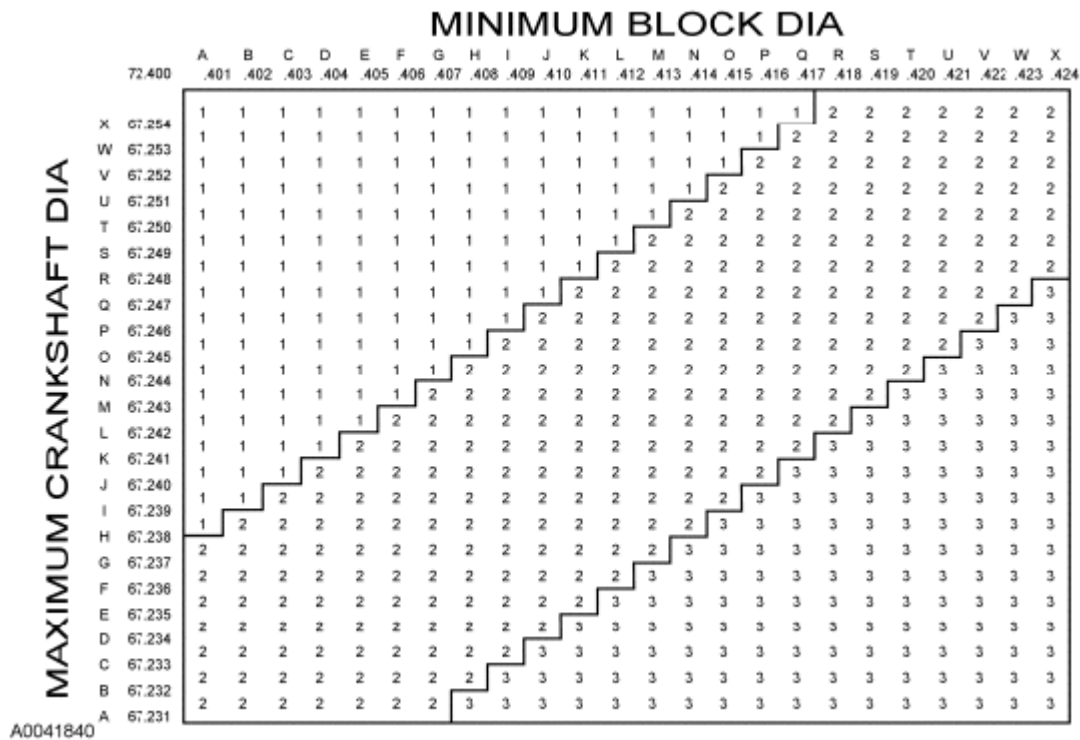
A0031544

**Fig. 341: Bearing Select Fit Chart**  
Courtesy of FORD MOTOR CO.

- If oversize bearings are being used, use the procedure in the previous step and the Bearing Select Fit Chart, Oversize Bearing Chart to determine the required grade for each main bearing.

# 2010 Mercury Grand Marquis LS

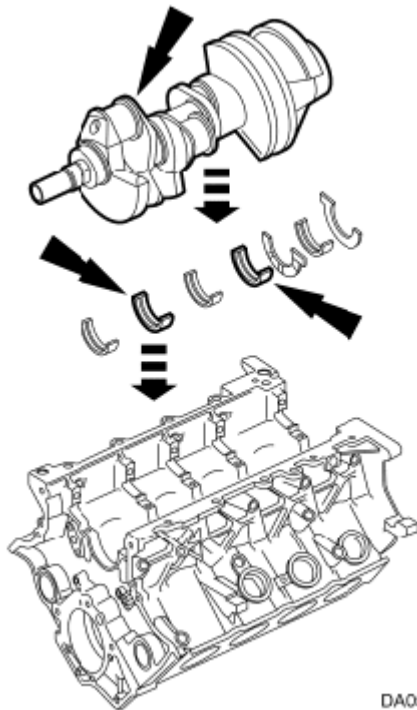
2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**Fig. 342: Bearing Select Fit Chart**  
Courtesy of FORD MOTOR CO.

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

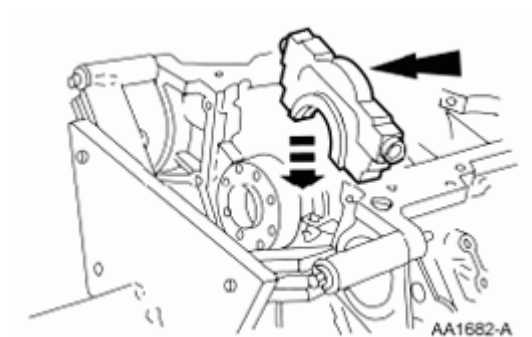
5. Lubricate with clean engine oil and install the crankshaft upper main bearings into the cylinder block.
6. Install the crankshaft onto the upper crankshaft thrust bearing and main bearings.



**Fig. 343: Locating Crankshaft, Upper Crankshaft Thrust Bearing And Main Bearings**  
Courtesy of FORD MOTOR CO.

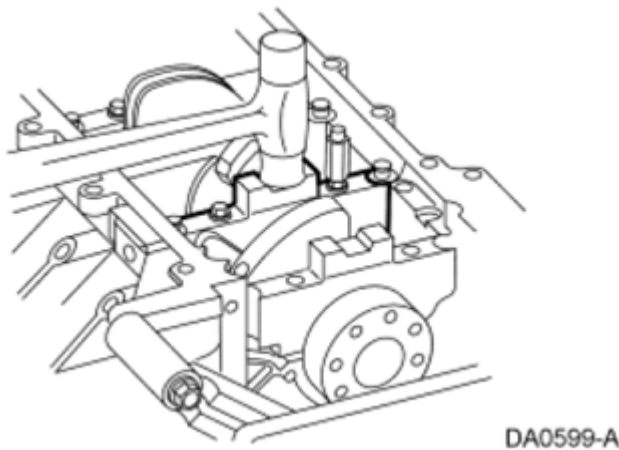
**NOTE:** To aid in assembly, apply petroleum jelly to the back of the crankshaft thrust washer.

**NOTE:** The oil groove on the thrust washer must face toward the rear of the engine (crankshaft surface).



**Fig. 344: Installing Rear Main Bearing Cap**  
Courtesy of FORD MOTOR CO.

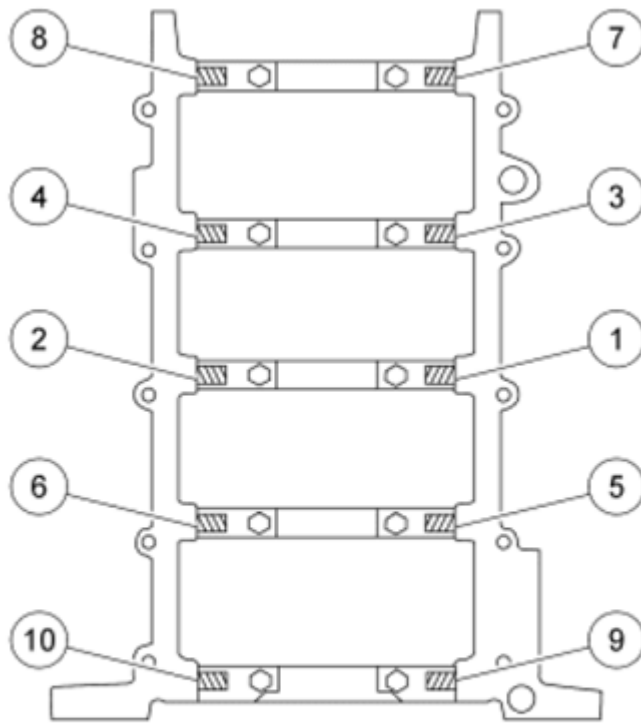
7. Install the rear main bearing cap.
8. Install the crankshaft lower main bearings, thrust bearing and thrust washer into the main bearing caps. Locate the main bearing cap on the cylinder block and tap into place using a plastic or dead-blow hammer.



**Fig. 345: Installing Crankshaft Lower Main Bearings**  
Courtesy of FORD MOTOR CO.

**NOTE:** The jackscrews are a part of the main bearing cap assembly and are screwed into the main caps, not the cylinder block.

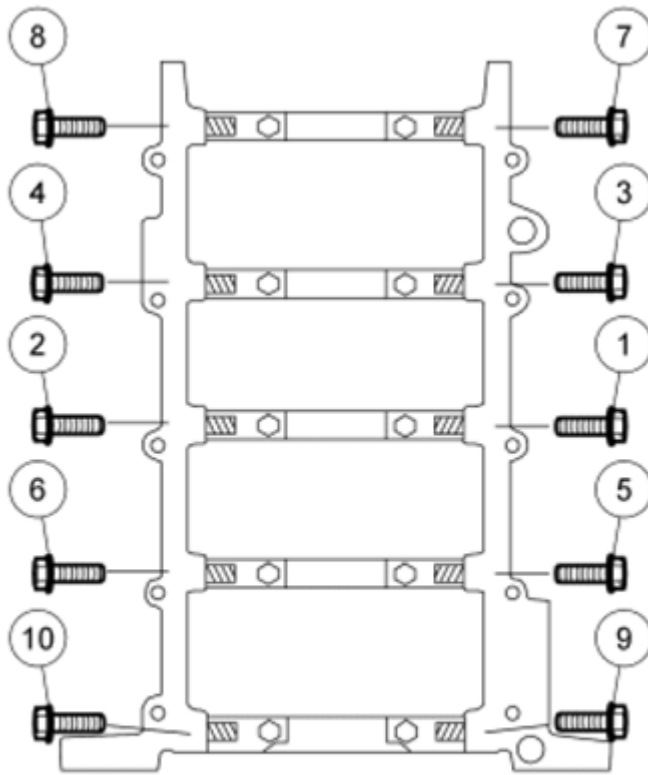
9. Back out the 10 jackscrews against the cylinder block in 2 stages, in the sequence shown in illustration.
  - Stage 1: Tighten to 5 Nm (44 lb-in).
  - Stage 2: Tighten to 10 Nm (89 lb-in).



N0071894

**Fig. 346: Identifying Jackscrews In Sequence**  
Courtesy of FORD MOTOR CO.

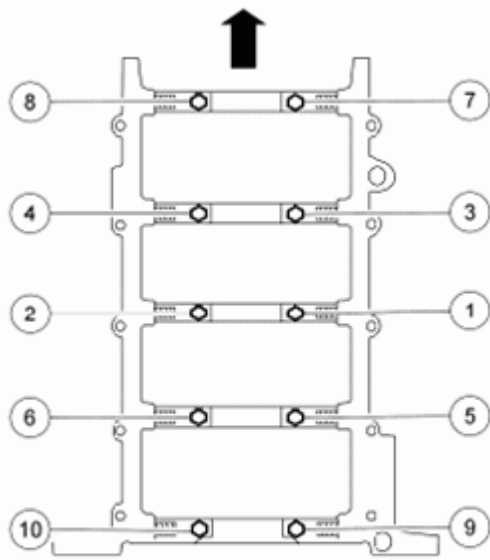
10. Install the 10 main bearing cap bolts and tighten in 2 stages, in the sequence shown in illustration.
  - Stage 1: Tighten to 10 Nm (89 lb-in).
  - Stage 2: Tighten to 21 Nm (15 lb-ft).



N0071893

**Fig. 347: Identifying Main Bearing Cap Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

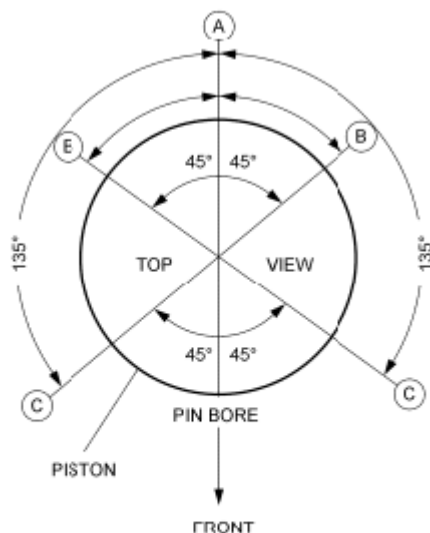
11. Tighten the 10 main bearing cap bolts in 2 stages, in the sequence shown in illustration.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
  - Stage 2: Tighten an additional 90 degrees.



N0013765

**Fig. 348: Identifying Main Bearing Cap Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

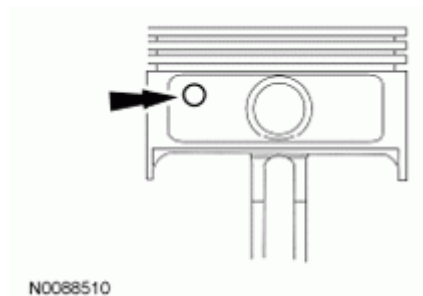
12. Check piston-to-cylinder block and ring clearances. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
13. Assemble the 8 pistons. For additional information, refer to **PISTON**.
14. Make sure the ring gaps (oil spacer-A, oil ring-B, compression ring-C) are correctly spaced around the circumference of the piston.



N0029312

**Fig. 349: Identifying Piston Ring Gaps**  
Courtesy of FORD MOTOR CO.

15. Make sure the dimple in the piston faces the front of the engine.



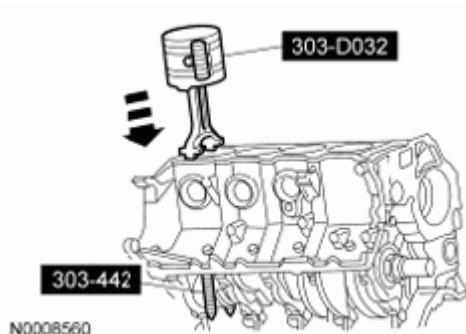
**Fig. 350: Locating Dimple In Piston**  
Courtesy of FORD MOTOR CO.

**NOTE:** Do not scratch the cylinder walls or crankshaft journals with the connecting rod or engine failure may occur.

**NOTE:** Make sure the piston arrow is facing forward.

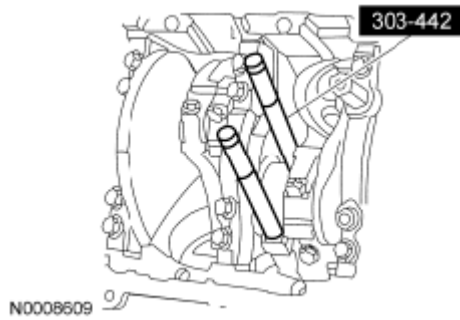
**NOTE:** The next 3 steps are for all 8 connecting rods, rod caps and pistons. Only one connecting rod, rod cap and piston is shown in illustration.

16. Use the Piston Ring Compressor and Connecting Rod Installer to install the piston and connecting rod assemblies.
- Lubricate the piston and ring with clean engine oil.
  - Lubricate the rod bearings with clean engine oil.
  - Rotate the crankshaft as necessary.



**Fig. 351: Installing Piston And Connecting Rod Assemblies**  
Courtesy of FORD MOTOR CO.

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



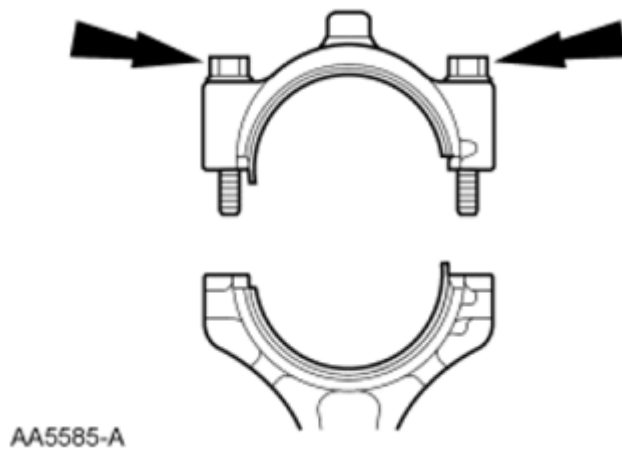
**Fig. 352: Identifying Connecting Rod Installer (303-442)**

Courtesy of FORD MOTOR CO.

17. Once the connecting rod is seated on the crankshaft journal, remove the Connecting Rod Installer.

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

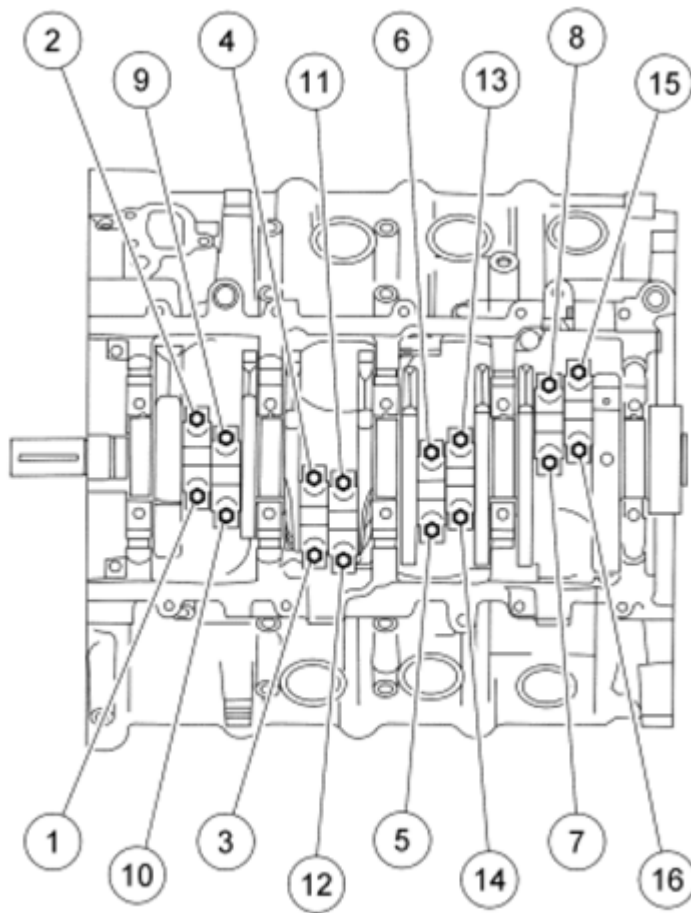
**NOTE:** The connecting rod caps have a cracked design and must make mate with the connecting rod ends. Excessive bearing clearance will result if not mated correctly.



**Fig. 353: Locating Lower Bearing And Connecting Rod Bearing Cap Bolts**

Courtesy of FORD MOTOR CO.

18. Position the lower bearing and connecting rod bearing cap, and install the 2 new bolts loosely.
19. Tighten the 16 connecting rod bearing cap bolts in 3 stages, in the sequence shown in illustration.
  - Stage 1: Tighten to 23 Nm (17 lb-ft).
  - Stage 2: Tighten to 43 Nm (32 lb-ft).
  - Stage 3: Rotate an additional 90-120 degrees.



N0071892

**Fig. 354: Identifying Connecting Rod Bearing Cap Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

20. Position the oil pump and install the 3 bolts.
- Tighten to 10 Nm (89 lb-in).

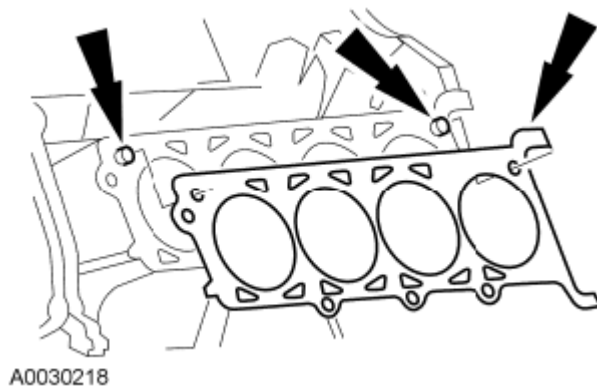


N0006304

**Fig. 355: Locating Oil Pump Bolts And Oil Pump**  
Courtesy of FORD MOTOR CO.

**Both cylinder heads**

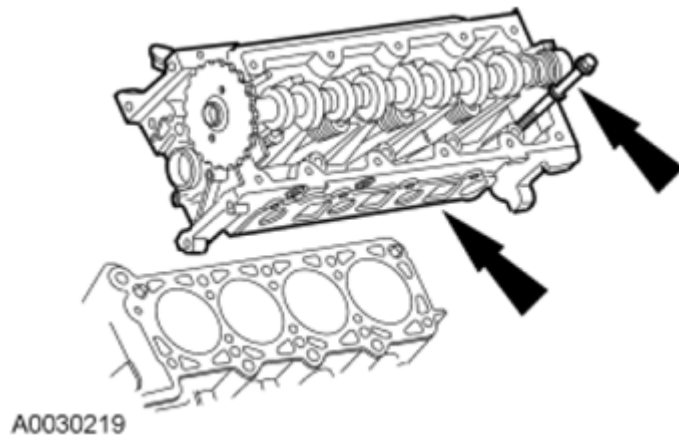
- NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to CYLINDER HEAD.
- NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.
- NOTE:** The new gasket has a film coating which is crucial to the gasket's ability to seat correctly. Do not scratch the gasket.
- NOTE:** RH head gasket shown in illustration, LH head gasket similar.



**Fig. 356: Locating Head Gaskets And Dowel Pins**  
Courtesy of FORD MOTOR CO.

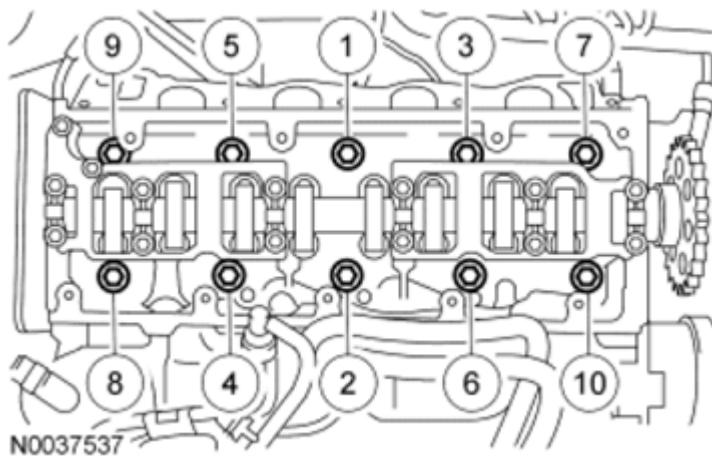
21. Install the head gaskets over the dowel pins.

- NOTE:** Cylinder head machining or milling is not authorized by the Ford Motor Company. Cylinder head flatness must be within 0.0254 mm (0.001 in) across a 38.1 mm (1.5 in) square area.
- NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to CYLINDER HEAD.
- NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.
- NOTE:** Do not allow the dowels to scratch the sealing of the cylinder head during cylinder head installation.
- NOTE:** RH cylinder head shown in illustration, LH cylinder head similar.



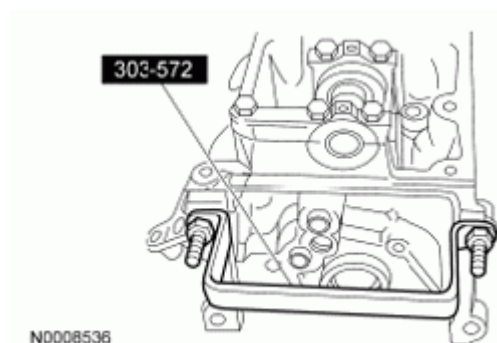
**Fig. 357: Locating Cylinder Head**  
Courtesy of FORD MOTOR CO.

22. Install the cylinder head on the dowels and the head gasket. Loosely install new bolts.
23. Tighten the 10 cylinder head bolts in 6 stages, in the sequence shown in illustration.
  - Stage 1: Tighten to 40 Nm (30 lb-ft).
  - Stage 2: Tighten an additional 90 degrees (one-fourth turn).
  - Stage 3: Loosen a minimum of one full turn (360 degrees).
  - Stage 4: Tighten to 40 Nm (30 lb-ft).
  - Stage 5: Tighten an additional 90 degrees (one-fourth turn).
  - Stage 6: Tighten an additional 90 degrees (one-fourth turn).



**Fig. 358: Identifying Cylinder Head Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

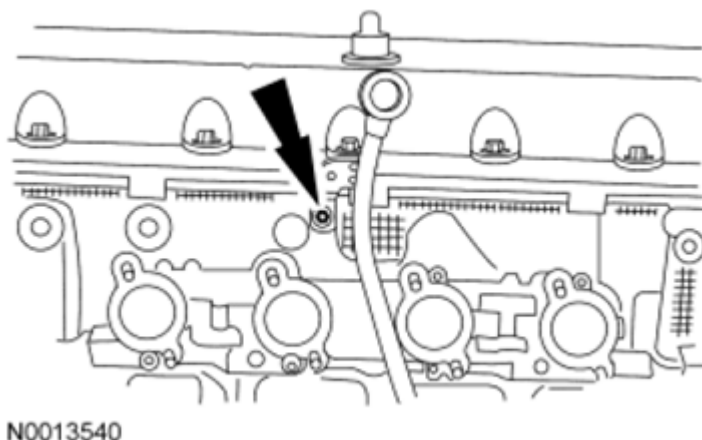
24. Remove the Cylinder Head Remover/Installer from both ends of the cylinder head.



**Fig. 359: Identifying Cylinder Head Remover/Installer (303-572)**  
Courtesy of FORD MOTOR CO.

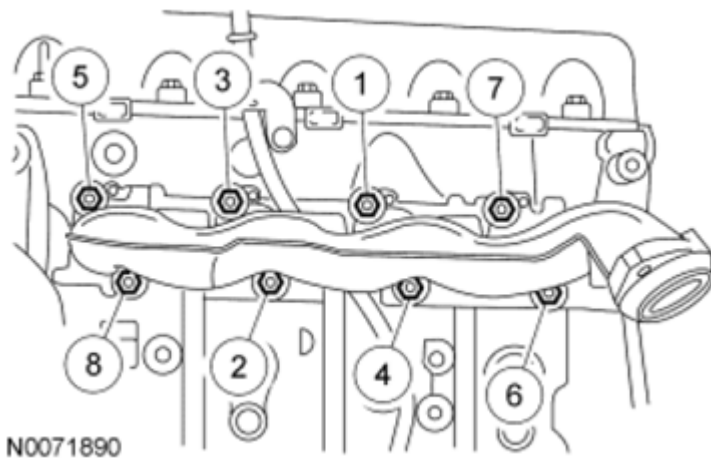
**NOTE:** Lubricate the O-ring seal with clean engine oil.

25. Install a new O-ring seal on the oil level indicator tube and install the oil level indicator tube and bolt.
  - Tighten to 10 Nm (89 lb-in).



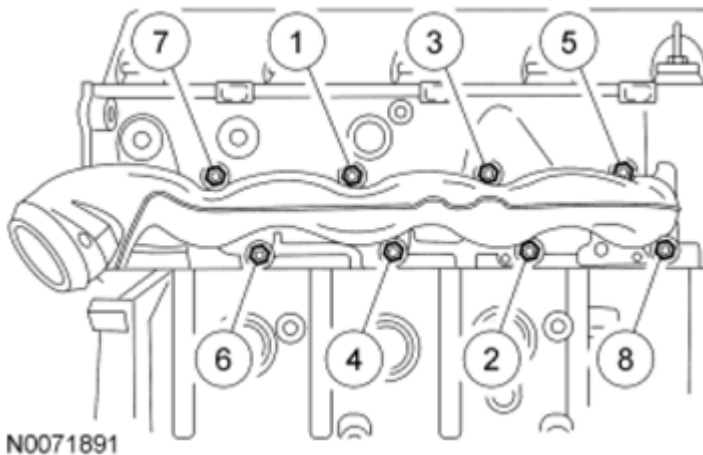
**Fig. 360: Locating Oil Level Indicator Tube And Bolt**  
Courtesy of FORD MOTOR CO.

26. Install the new 8 LH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
27. Install a new LH exhaust manifold gasket the LH exhaust manifold and 8 new nuts.
  - Tighten to 20 Nm (177 lb-in) in the sequence shown in illustration.



**Fig. 361: Identifying LH Exhaust Manifold Nuts In Sequence**  
Courtesy of FORD MOTOR CO.

28. Install the new 8 RH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
29. Install a new RH exhaust manifold gasket the RH exhaust manifold and 8 new nuts.
  - Tighten to 20 Nm (177 lb-in) in the sequence shown in illustration.



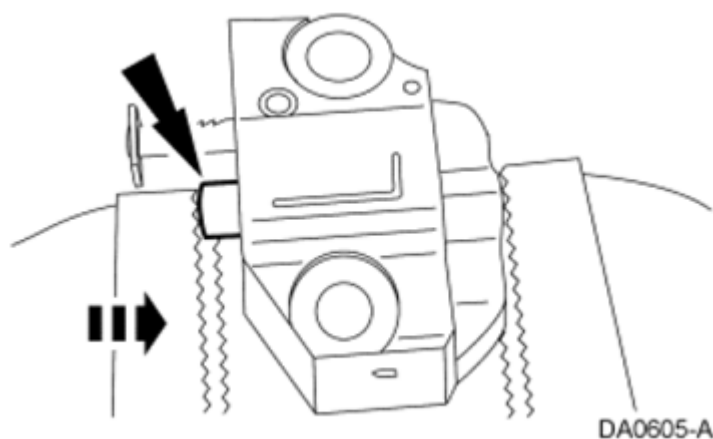
**Fig. 362: Identifying Rh Exhaust Manifold Nuts In Sequence**  
Courtesy of FORD MOTOR CO.

#### Engines with ratcheting timing chain tensioners

**NOTE:** Timing chain procedures must be followed exactly or damage to valves and pistons will result.

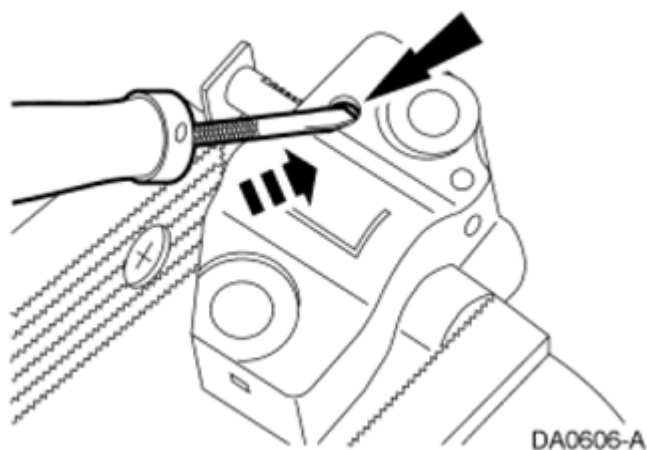
**NOTE:** Do not compress the ratchet assembly. This will damage the ratchet assembly.

**NOTE:** LH shown in illustration, RH similar.



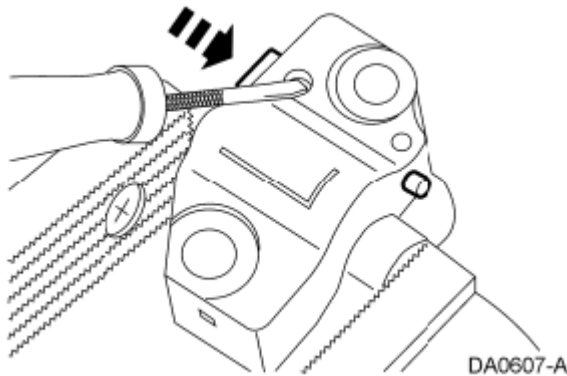
**Fig. 363: Locating Tensioner Plunger**  
Courtesy of FORD MOTOR CO.

30. Compress each tensioner plunger, using an edge or a vise.
31. Using a small screwdriver or pick, push back and hold the ratchet mechanism.



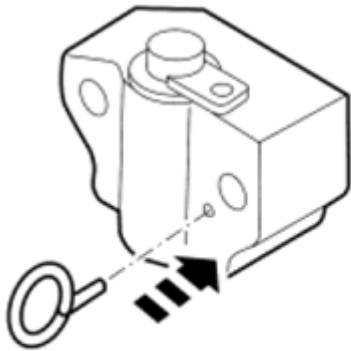
**Fig. 364: Holding Ratchet Mechanism Using Small Screwdriver Or Pick**  
Courtesy of FORD MOTOR CO.

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



**Fig. 365: Pushing Ratchet Arm Back Into Tensioner Housing**  
Courtesy of FORD MOTOR CO.

33. Install a paper clip into the hole of each tensioner housing to hold the ratchet assembly and plunger in during installation.
  - Remove the tensioner from the vise.



**Fig. 366: Identifying Paper Clip Into Hole Of Tensioner Housing**  
Courtesy of FORD MOTOR CO.

#### Engines with non-ratcheting timing chain tensioners

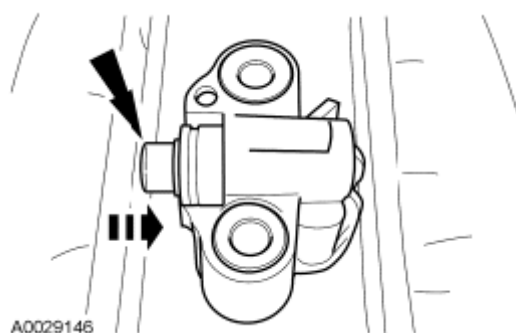
**NOTE:** If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

34. Inspect the RH and LH timing chain tensioners.
  - Install new tensioners as necessary.

**NOTE:** Timing chain procedures must be followed exactly or damage to valves

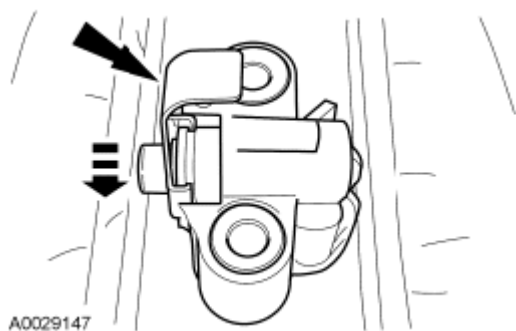
and pistons will result.

**NOTE:** LH shown in illustration, RH similar.



**Fig. 367: Locating Tensioner Plunger**  
Courtesy of FORD MOTOR CO.

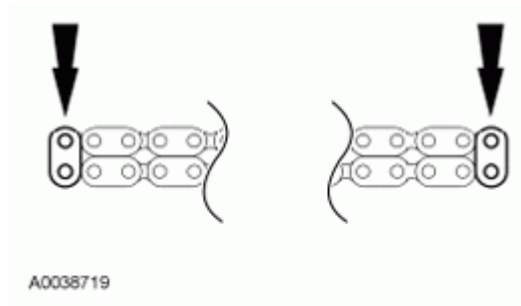
35. Compress each tensioner plunger, using a vise.
36. Install a Hydraulic Chain Tensioner Retaining Clip on the tensioner to hold the plunger in during installation.



**Fig. 368: Identifying Hydraulic Chain Tensioner Retaining Clip On Tensioner**  
Courtesy of FORD MOTOR CO.

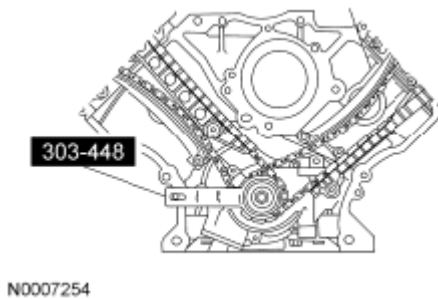
#### All engines

37. If the colored links are not visible, mark one link on one end and one link on the other end, and use as timing marks.



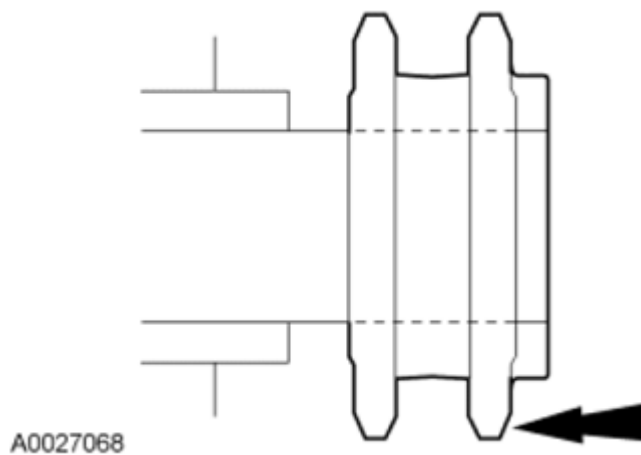
**Fig. 369: Locating Colored Links**  
Courtesy of FORD MOTOR CO.

38. Using the Crankshaft Holding Tool, position the crankshaft.
  - Remove the Crankshaft Holding Tool after crankshaft positioning.



**Fig. 370: Identifying Crankshaft Holding Tool (303-448)**  
Courtesy of FORD MOTOR CO.

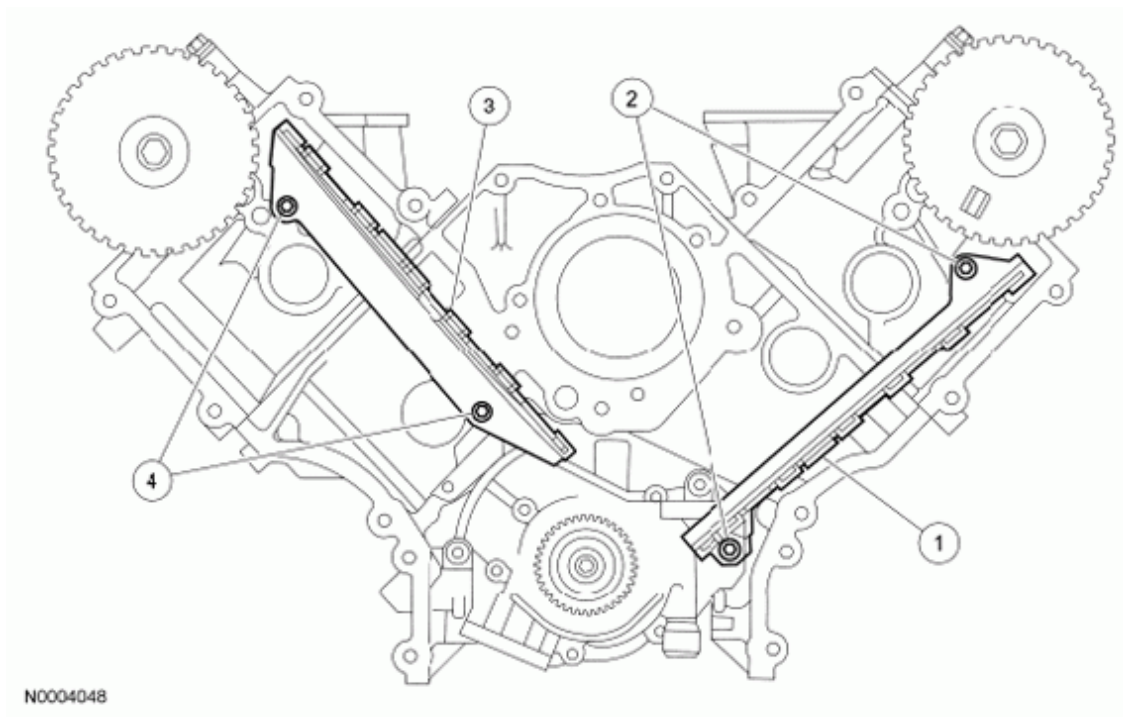
39. Install the crankshaft sprocket, making sure the flange faces forward.



**Fig. 371: Locating Crankshaft Sprocket**  
Courtesy of FORD MOTOR CO.

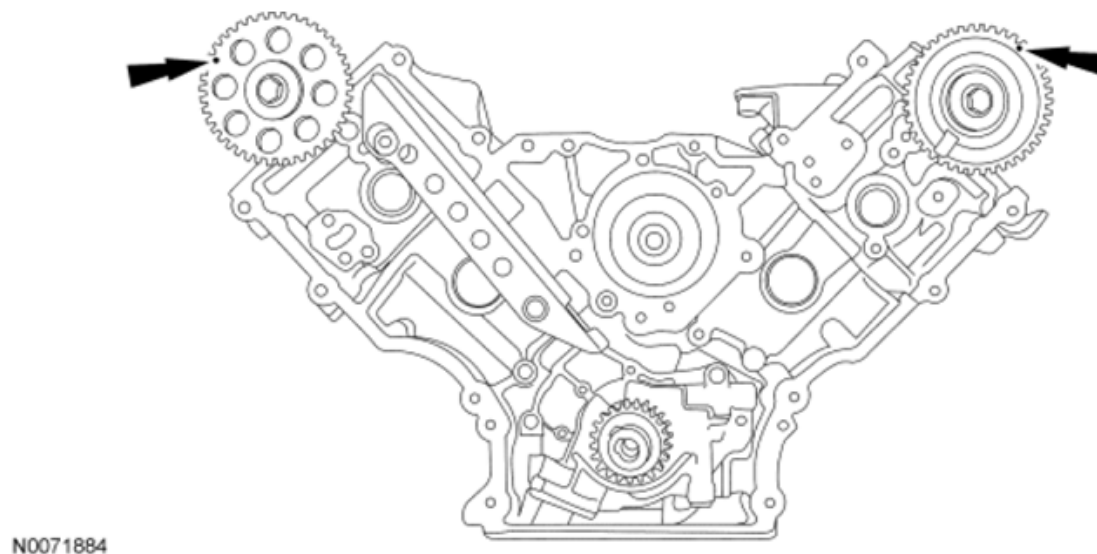
40. Install the timing chain guides.
  1. Position the LH timing chain guide.

2. Install and tighten the 2 LH bolts to 10 Nm (89 lb-in).
3. Position the RH timing chain guide.
4. Install and tighten the 2 RH bolts to 10 Nm (89 lb-in).



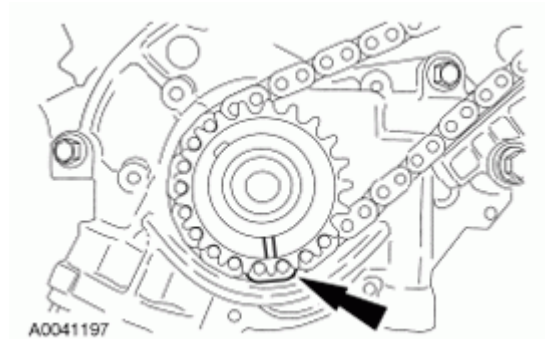
**Fig. 372: Identifying Timing Chain Guide And Bolts**  
Courtesy of FORD MOTOR CO.

41. Rotate the RH camshaft sprocket until the timing mark is approximately at the 11 o'clock position. Rotate the LH camshaft sprocket until the timing mark is approximately at the 1 o'clock position.



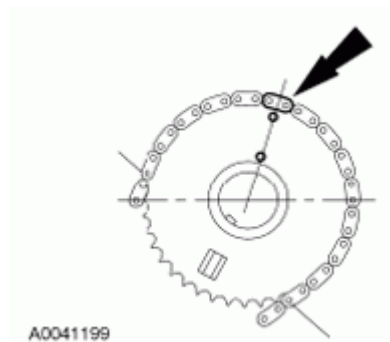
**Fig. 373: Locating Timing Marks On Camshaft Sprocket**  
Courtesy of FORD MOTOR CO.

42. Position the LH (inner) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



**Fig. 374: Locating Colored (Marked) Link**  
Courtesy of FORD MOTOR CO.

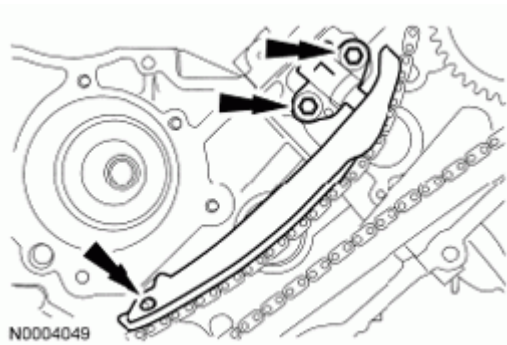
43. Install the LH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



**Fig. 375: Locating Colored (Marked) Link With Timing Marks On Sprocket**  
Courtesy of FORD MOTOR CO.

**NOTE:** The LH timing chain tensioner arm has a bump near the dowel hole for identification.

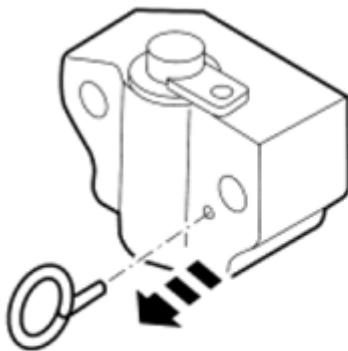
44. Position the LH timing chain tensioner on the dowel pin and install the LH timing chain tensioner and 2 bolts.
- Tighten to 25 Nm (18 lb-ft).



**Fig. 376: Locating LH Timing Chain Tensioner And Bolts**  
Courtesy of FORD MOTOR CO.

**Engines with ratcheting timing chain tensioners**

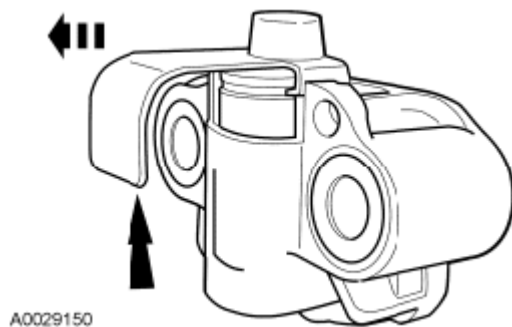
45. Remove the paper clip from the LH timing chain tensioner.



**Fig. 377: Removing Paper Clip From LH Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

**Engines with non-ratcheting timing chain tensioners**

46. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.

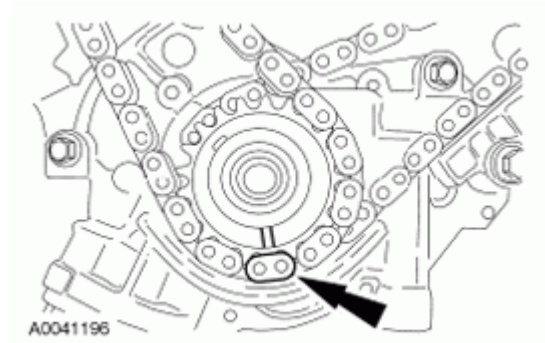


**Fig. 378: Locating Hydraulic Chain Tensioner Retaining Clip**

Courtesy of FORD MOTOR CO.

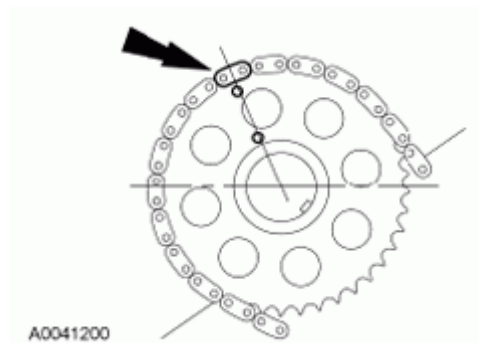
### All engines

47. Position the RH (outer) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



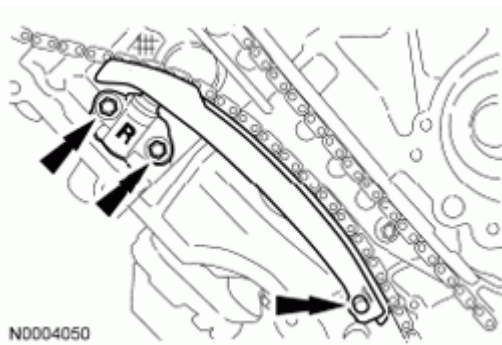
**Fig. 379: Locating Colored (Marked) Link**  
Courtesy of FORD MOTOR CO.

48. Install the RH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



**Fig. 380: Locating Colored (Marked) Link With Timing Marks On Sprocket**  
Courtesy of FORD MOTOR CO.

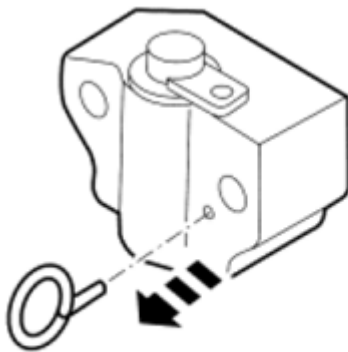
49. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner and 2 bolts.
- Tighten to 25 Nm (18 lb-ft).



**Fig. 381: Locating RH Timing Chain Tensioner And Bolts**  
Courtesy of FORD MOTOR CO.

**Engines with ratcheting timing chain tensioners**

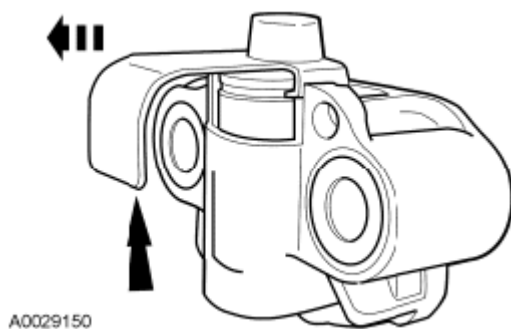
50. Remove the paper clip from the RH timing chain tensioner.



**Fig. 382: Removing Paper Clip From RH Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

**Engines with non-ratcheting timing chain tensioners**

51. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.

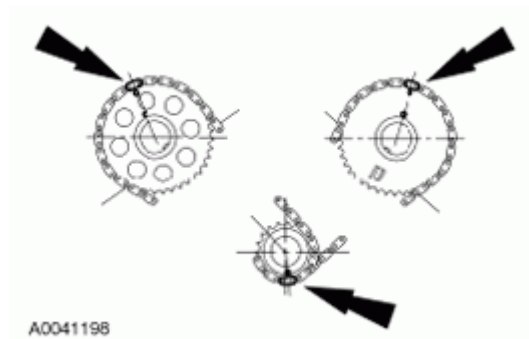


**Fig. 383: Locating Hydraulic Chain Tensioner Retaining Clip**

Courtesy of FORD MOTOR CO.

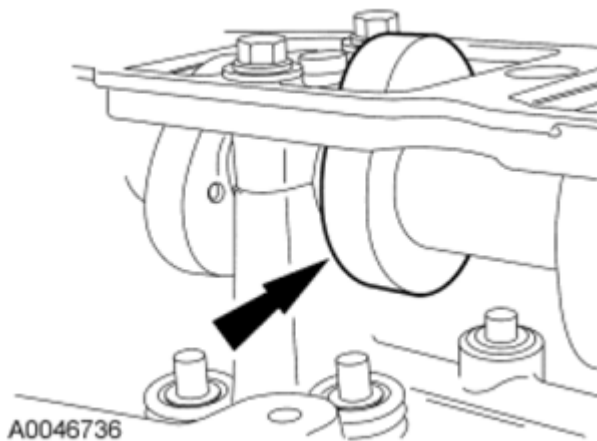
### All engines

52. Make sure that the colored (marked) chain links are lined up with the dots on the crankshaft sprockets and the camshaft sprocket.



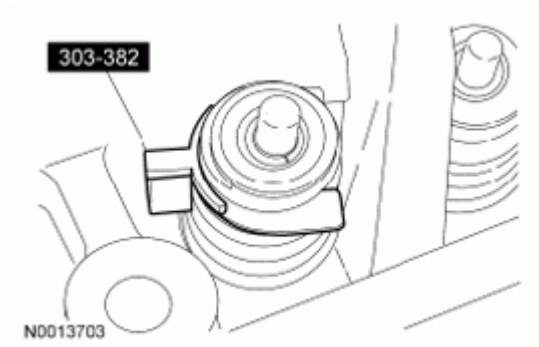
**Fig. 384: Locating Colored (Marked) Chain Links**  
Courtesy of FORD MOTOR CO.

53. Rotate and camshaft until the lobe is in the upward position.



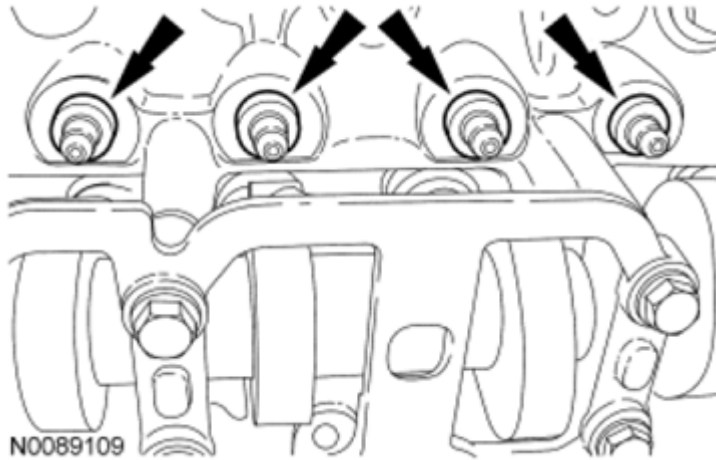
**Fig. 385: Locating Camshaft Lobe**  
Courtesy of FORD MOTOR CO.

54. Install the Valve Spring Compressor Spacer between the valve spring coil to prevent valve stem seal damage.



**Fig. 386: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the hydraulic lash adjusters with clean engine oil.



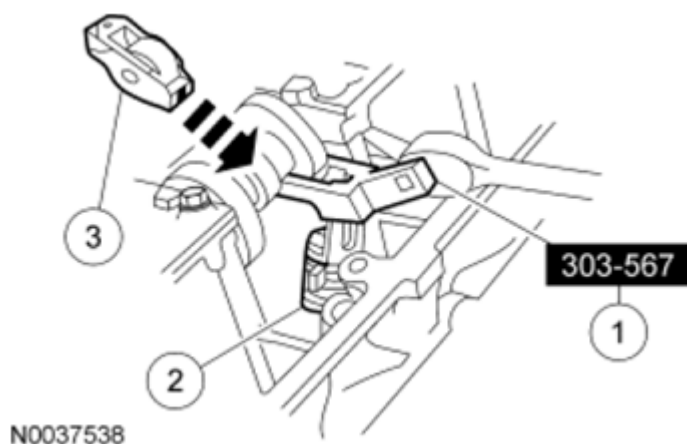
**Fig. 387: Locating Hydraulic Lash Adjusters**  
Courtesy of FORD MOTOR CO.

55. Install the 16 hydraulic lash adjusters in their original locations (4 shown in illustration).

**NOTE:** Lubricate the camshaft roller followers using clean engine oil.

**NOTE:** Position the cam lobe away from the camshaft roller follower location prior to installing each camshaft roller follower.

56. Install the 16 camshaft roller followers.
1. Install the Valve Spring Compressor.
  2. Compress the valve spring.
  3. Install the 16 camshaft roller followers in their original locations.



**Fig. 388: Installing Camshaft Roller Followers**  
Courtesy of FORD MOTOR CO.

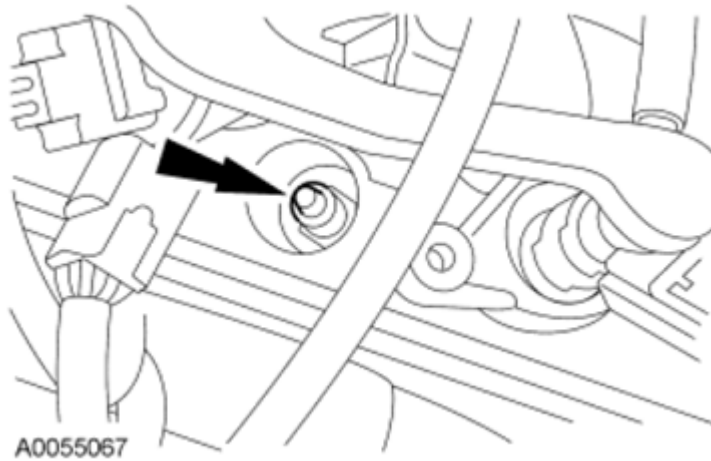
57. Remove the Valve Spring Compressor Spacer.



**Fig. 389: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

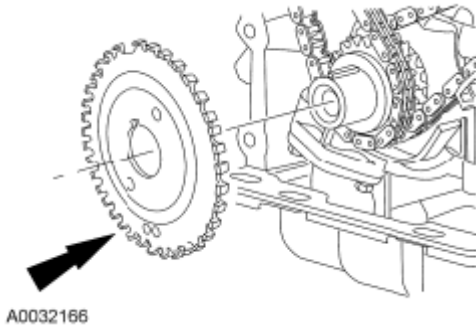
**NOTE:** Only use hand tools when removing or installing the spark plugs or damage may occur to the cylinder head or spark plug.

58. Install all 8 spark plugs.
- Tighten to 18 Nm (159 lb-in).



**Fig. 390: Locating Spark Plug**  
Courtesy of FORD MOTOR CO.

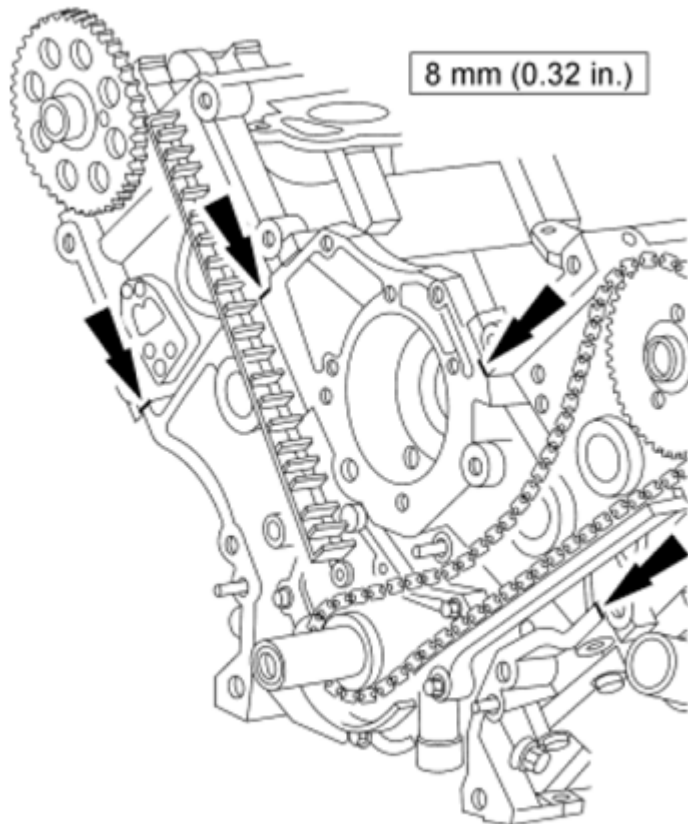
59. Install the crankshaft sensor ring.



**Fig. 391: Locating Crankshaft Sensor Ring**  
Courtesy of FORD MOTOR CO.

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

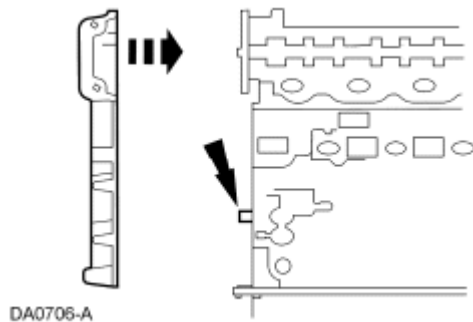
**NOTE:** RH timing chain removed for clarity.



DA0722-A

**Fig. 392: Locating Sealant Area**  
Courtesy of FORD MOTOR CO.

60. Apply a bead of sealant along the head-to-block surface and the oil pan-to-block surface as specified.
61. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.



DA0706-A

**Fig. 393: Installing Engine Front Cover Onto Dowels**  
Courtesy of FORD MOTOR CO.

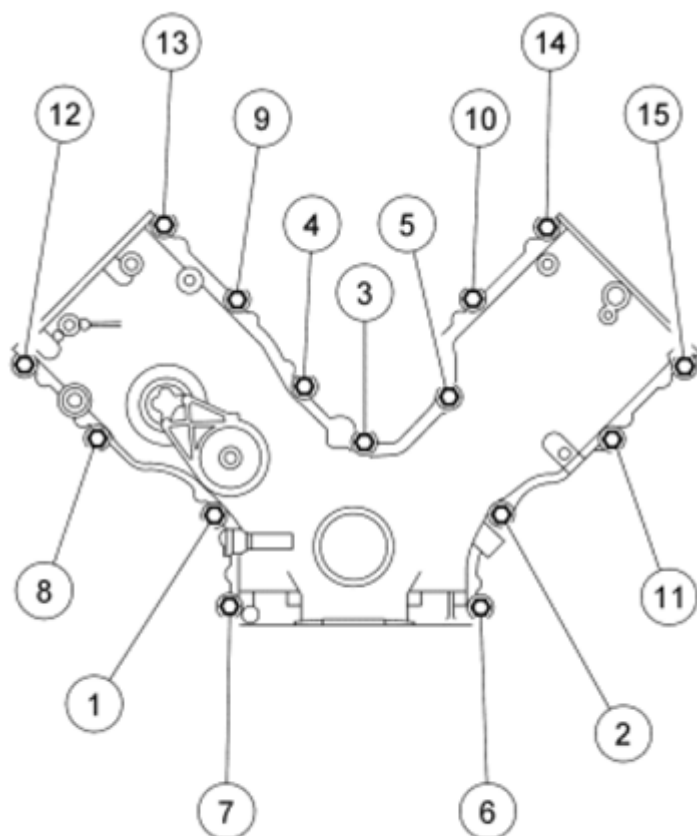
62. Tighten the 15 front cover fasteners in the sequence shown in illustration to 25 Nm (18 lb-ft).

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

### ITEM DESCRIPTION

| Item | Part Number | Description                                               |
|------|-------------|-----------------------------------------------------------|
| 1    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 2    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 3    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 4    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 5    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 6    | W706508     | Stud, hex-head pilot, M8 x 1.25 x 5+0 - M6 x 1 x 10       |
| 7    | N808586     | Stud, washer hex-head pilot, M8 x 1.25 - M6 x 1.0 x 86.35 |
| 8    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 9    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 10   | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 11   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 12   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 13   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 14   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 15   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |

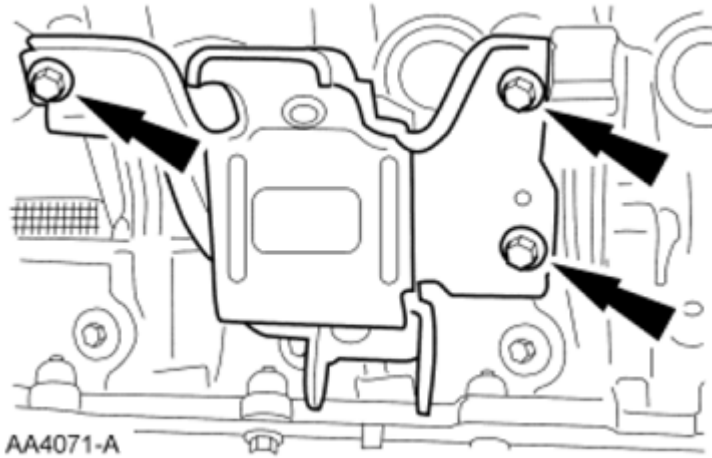


N0037514

**Fig. 394: Identifying Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

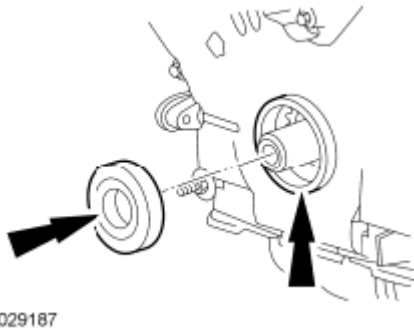
**NOTE:** RH shown in illustration, LH similar.

63. Install the RH and LH engine mounts and the 6 bolts.
- Tighten to 70 Nm (52 lb-ft).



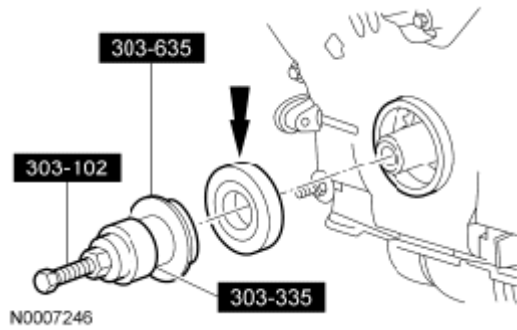
**Fig. 395: Locating RH Engine Mount Bolts**  
Courtesy of FORD MOTOR CO.

64. Lubricate the engine front cover and the front oil seal inner lip with clean engine oil.



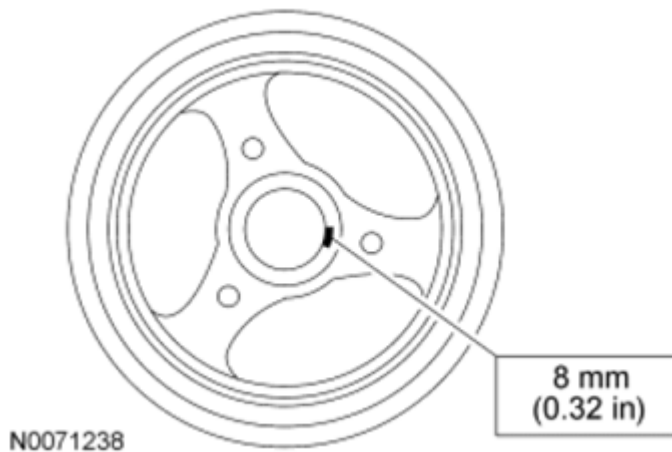
**Fig. 396: Locating Crankshaft Front Seal Inner Lip**  
Courtesy of FORD MOTOR CO.

65. Using the Crankshaft Front Oil Seal Installer, Front Cover Oil Seal Installer and Crankshaft Vibration Damper Installer, install the front oil seal.



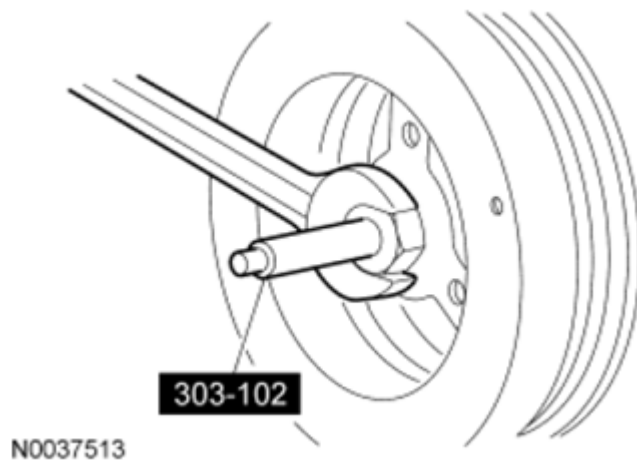
**Fig. 397: Installing Crankshaft Front Seal Into Engine Front Cover**  
Courtesy of FORD MOTOR CO.

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



**Fig. 398: Identifying Woodruff Key Slot**  
Courtesy of FORD MOTOR CO.

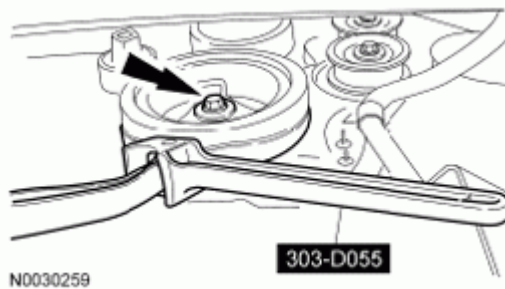
66. Apply sealant to the Woodruff key slot on the crankshaft pulley.
67. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.



**Fig. 399: Installing Crankshaft Pulley Using Crankshaft Vibration Damper Installer**  
Courtesy of FORD MOTOR CO.

**NOTE:** Use the Strap Wrench to hold the crankshaft pulley.

68. Install the bolt and washer and tighten the crankshaft pulley bolt in 4 stages.
  - Stage 1: Tighten to 120 Nm (89 lb-ft).
  - Stage 2: Loosen 360 degrees.
  - Stage 3: Tighten to 50 Nm (37 lb-ft).
  - Stage 4: Rotate an additional 90 degrees (one-fourth turn).



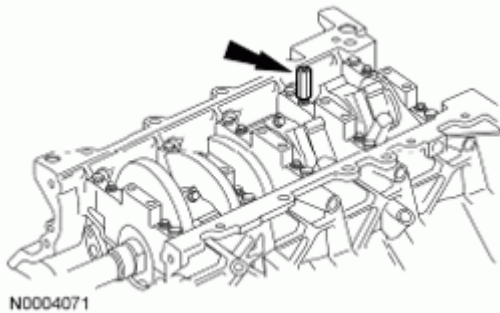
**Fig. 400: Locating Bolt And Washer**  
Courtesy of FORD MOTOR CO.

**NOTE:** Make sure the O-ring seal is in place and not damaged. A missing or damaged O-ring seal may cause foam in the lubrication system, low oil pressure and severe engine damage.

**NOTE:** Clean and inspect the mating surfaces and install a new O-ring seal. Lubricate the O-ring seal with clean engine oil.

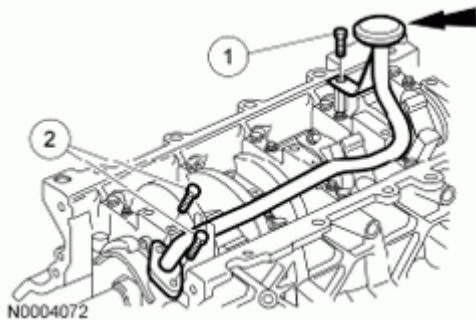
69. Install the oil pump screen and pickup tube spacer.

- Tighten to 25 Nm (18 lb-ft).



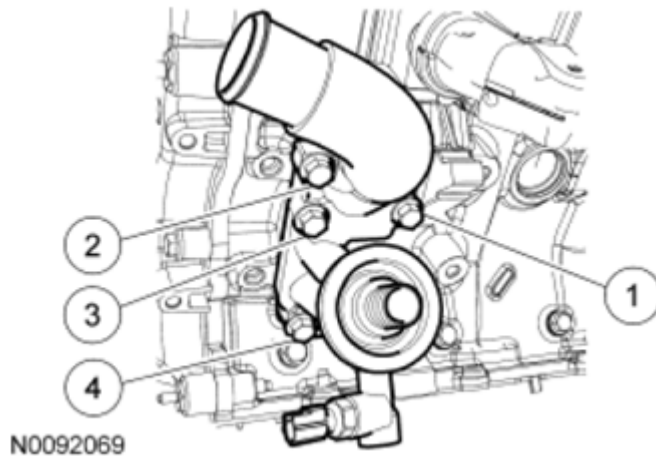
**Fig. 401: Locating Oil Pump Screen And Pickup Tube Spacer**  
Courtesy of FORD MOTOR CO.

70. Position the oil pump screen and pickup tube, and install the 3 bolts.
1. Tighten to 25 Nm (18 lb-ft).
  2. Tighten to 10 Nm (89 lb-in).



**Fig. 402: Locating Oil Pump Screen And Pickup Tube**  
Courtesy of FORD MOTOR CO.

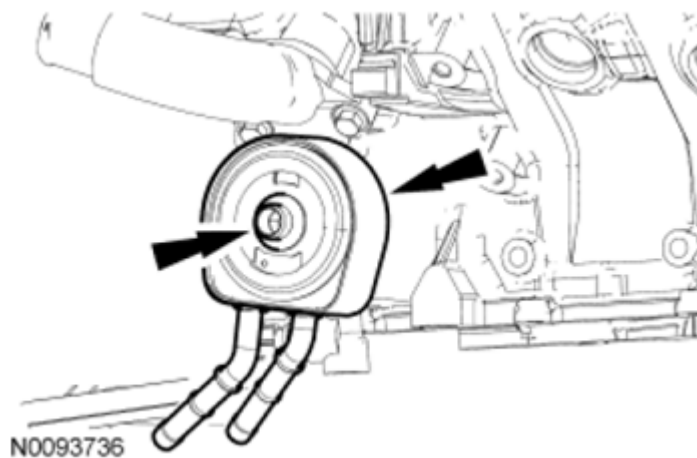
71. Install the new oil filter adapter gasket, oil filter adapter and the 4 bolts.
- Tighten to 25 Nm (18 lb-ft) in the sequence shown in illustration.



**Fig. 403: Identifying Oil Filter Adapter Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** The oil cooler must be replaced or severe damage to the engine can occur.

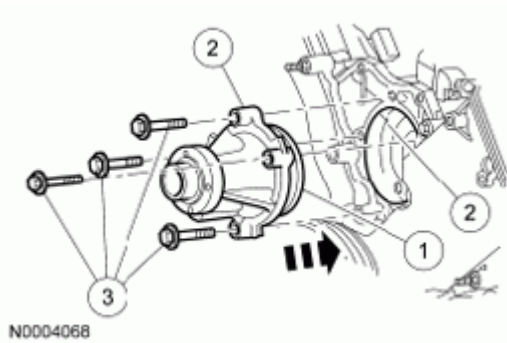
72. If equipped, install the new oil cooler and install the oil cooler mounting bolt.
  - Tighten to 46 Nm (34 lb-ft).



**Fig. 404: Locating Oil Cooler Mounting Bolt And Oil Cooler**  
Courtesy of FORD MOTOR CO.

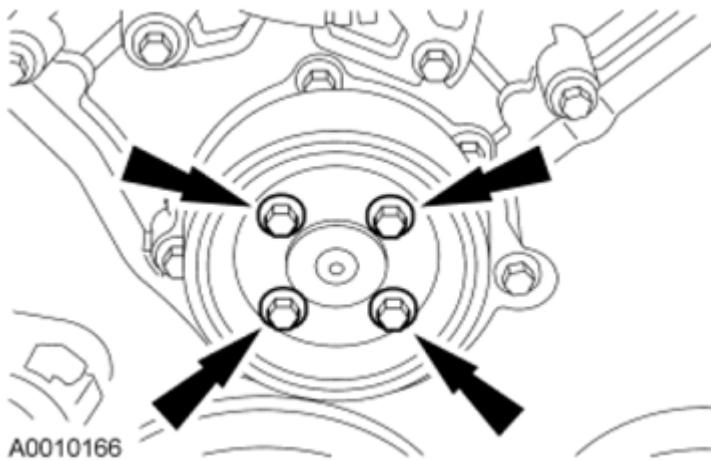
**NOTE:** Do not rotate the coolant pump housing once the coolant pump has been positioned in the cylinder block. Damage to the O-ring seal will occur.

73. Install the coolant pump.
  1. Lubricate the new O-ring seal using clean engine coolant.
  2. Position the coolant pump into the engine block.
  3. Install the 4 bolts and tighten to 25 Nm (18 lb-ft).



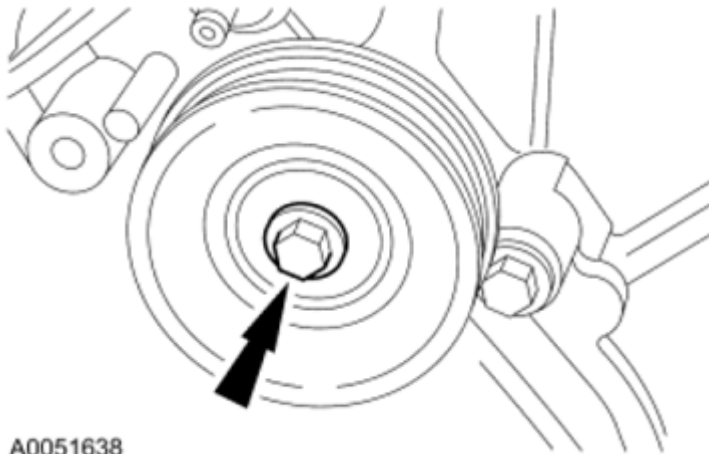
**Fig. 405: Identifying Coolant Pump And Bolts**  
Courtesy of FORD MOTOR CO.

74. Position the coolant pump pulley on the coolant pump and install the 4 bolts.
- Tighten to 25 Nm (18 lb-ft).



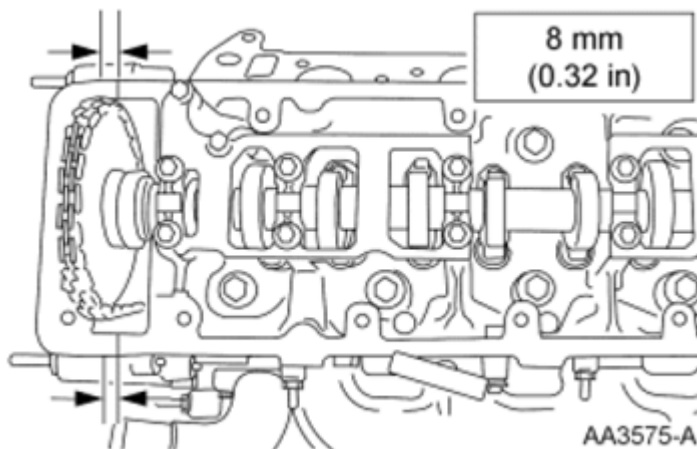
**Fig. 406: Locating Coolant Pump Pulley Bolts**  
Courtesy of FORD MOTOR CO.

75. Position the accessory drive belt idler pulley and install the bolt.
- Tighten to 25 Nm (18 lb-ft).



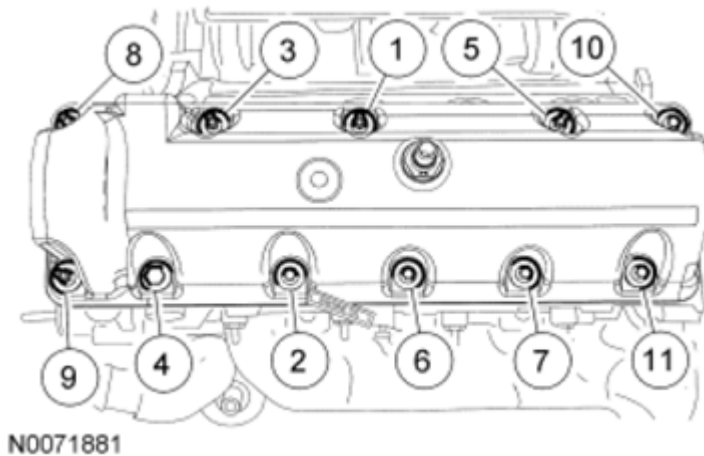
**Fig. 407: Locating Bolt And Accessory Drive Belt Idler Pulley**  
Courtesy of FORD MOTOR CO.

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



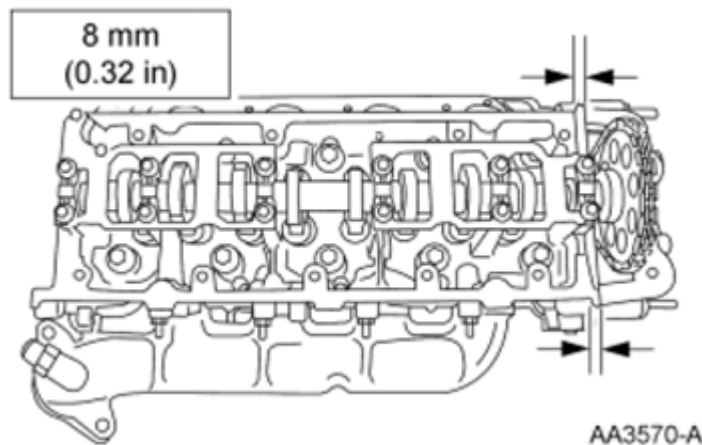
**Fig. 408: Identifying Sealant Clearance**  
Courtesy of FORD MOTOR CO.

76. Apply sealant in 2 places where the engine front cover meets the cylinder head.
77. Install the new LH gasket into the valve cover and position on the cylinder head. Tighten the bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



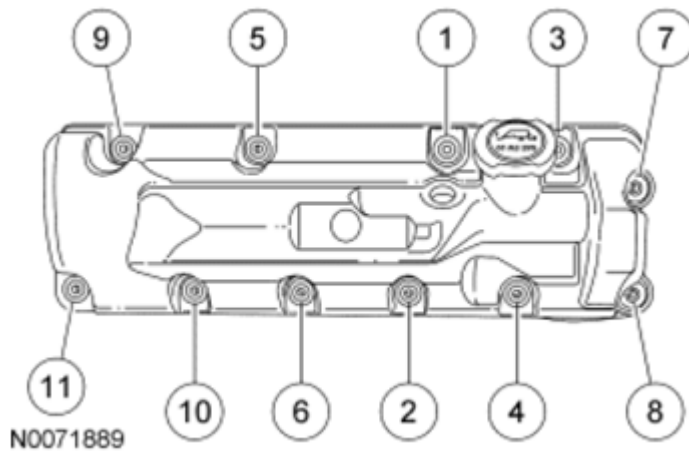
**Fig. 409: Identifying LH Valve Cover Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

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



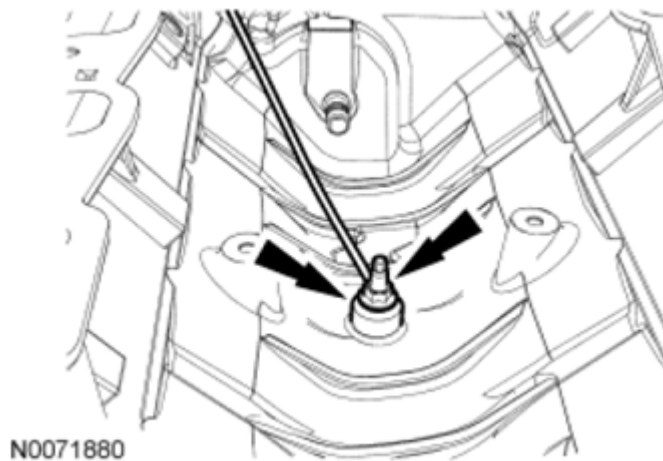
**Fig. 410: Identifying Silicone Gasket And Sealant Clearance**  
Courtesy of FORD MOTOR CO.

78. Apply sealant in 2 places where the engine front cover meets the cylinder head.
79. Install the new RH gasket into the valve cover and position on the cylinder head. Tighten the 11 bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



**Fig. 411: Identifying Valve Cover Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

80. Install the Knock Sensor (KS) and the nut.
- Tighten to 20 Nm (177 lb-in).



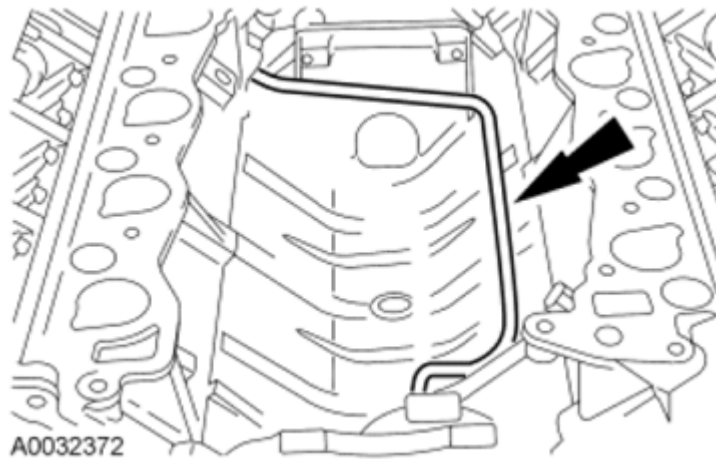
**Fig. 412: Locating Knock Sensor (KS) And Nut**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the O-ring seal with clean engine coolant.



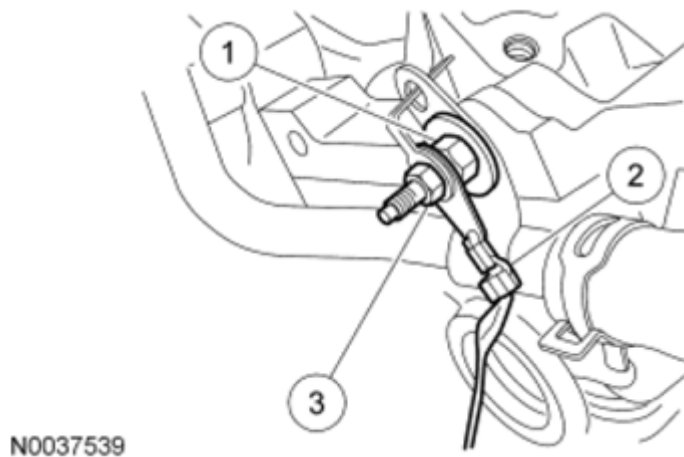
**Fig. 413: Locating O-Rings Seals**  
Courtesy of FORD MOTOR CO.

81. Inspect the O-rings seals. Install new seals, if necessary.
82. Install the coolant bypass tube.



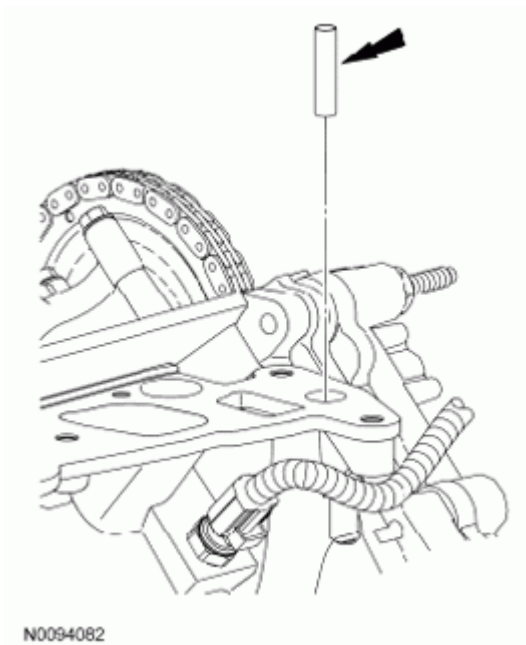
**Fig. 414: Locating Coolant Bypass Tube**  
Courtesy of FORD MOTOR CO.

83. Install the ground strap on the rear of the RH cylinder head.
  1. Install the stud bolt and tighten to 25 Nm (18 lb-ft).
  2. Install the ground strap.
  3. Install the retaining nut and tighten to 10 Nm (89 lb-in).



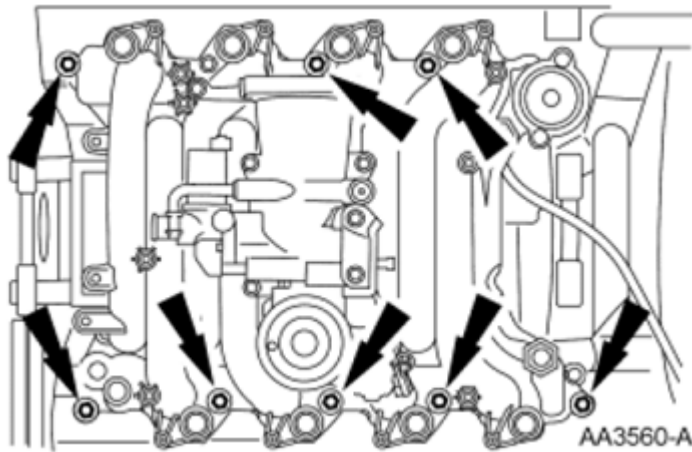
**Fig. 415: Identifying Ground Strap**  
Courtesy of FORD MOTOR CO.

84. Install the insert into the LH cylinder head.



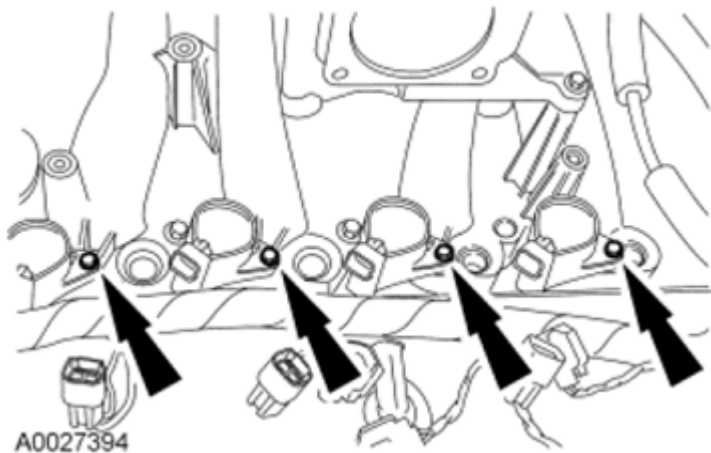
**Fig. 416: Locating Cylinder Head Insert**  
Courtesy of FORD MOTOR CO.

**NOTE:**        **Align the gasket locator tabs to slots in cylinder head.**



**Fig. 417: Locating Bolts And Intake Manifold**  
Courtesy of FORD MOTOR CO.

85. Install the new intake manifold gaskets, intake manifold and hand-tighten the 8 bolts at the locations shown in illustration.
86. Install the 8 ignition coils and tighten the 8 bolts (4 shown in illustration).
  - Tighten to 6 Nm (53 lb-in).



**Fig. 418: Locating Bolts And Ignition Coils**  
Courtesy of FORD MOTOR CO.

87. Install the intake manifold crash bracket bolt and loosely install the bolt and the stud bolt.



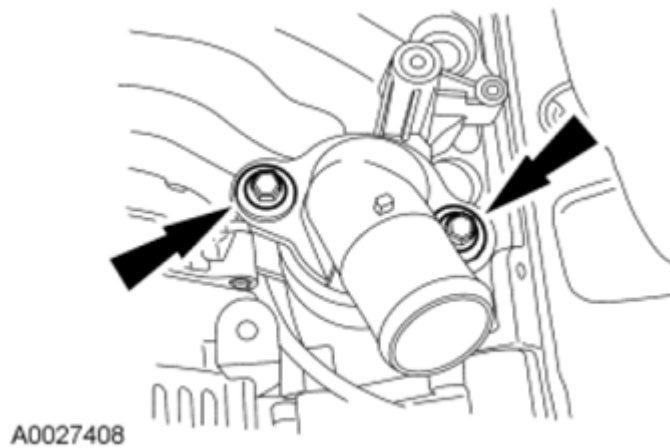
**Fig. 419: Locating Intake Manifold Crash Bracket Bolt**  
Courtesy of FORD MOTOR CO.

88. Install the thermostat.



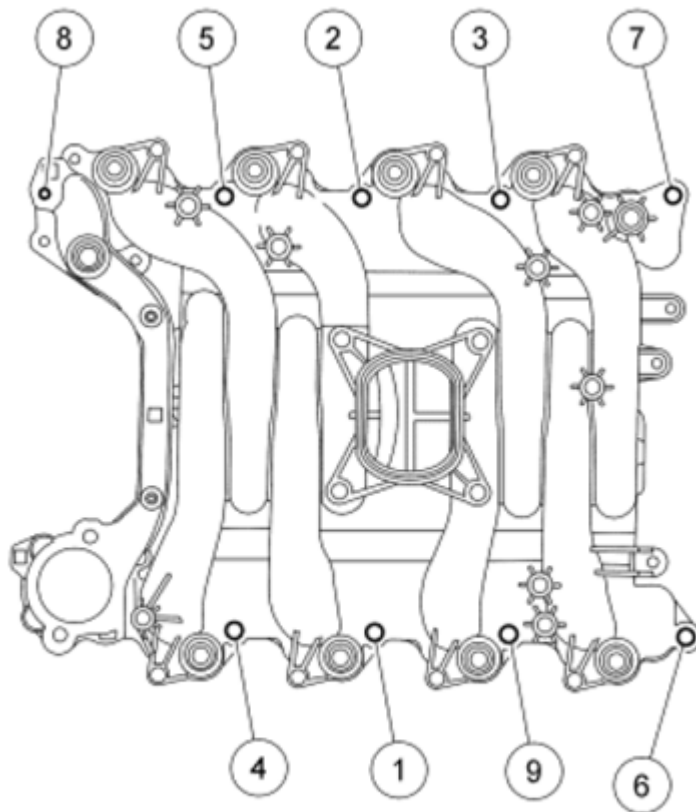
**Fig. 420: Identifying Thermostat**  
Courtesy of FORD MOTOR CO.

89. Install the coolant outlet adapter and loosely install the 2 bolts.



**Fig. 421: Locating Coolant Outlet Adapter And Bolts**  
Courtesy of FORD MOTOR CO.

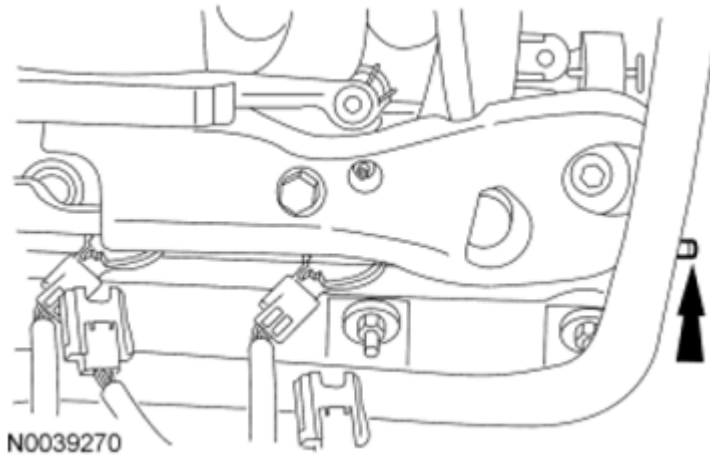
90. Tighten the 9 bolts in the sequence shown in illustration.
- Tighten to 25 Nm (18 lb-ft).



**Fig. 422: Identifying Intake Manifold Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

91. Tighten the stud bolt.

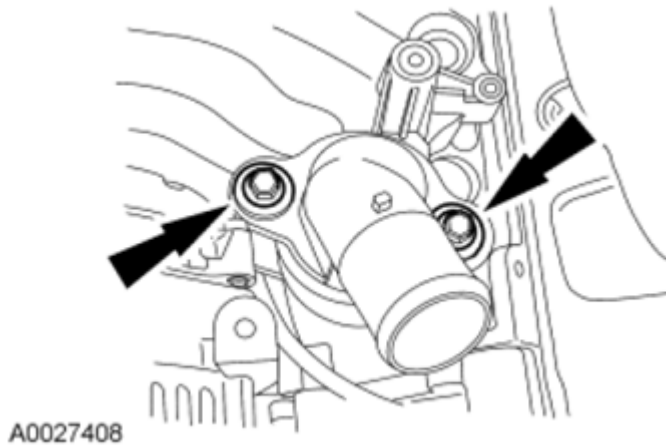
- Tighten to 25 Nm (18 lb-ft).



**Fig. 423: Locating Stud Bolt**  
Courtesy of FORD MOTOR CO.

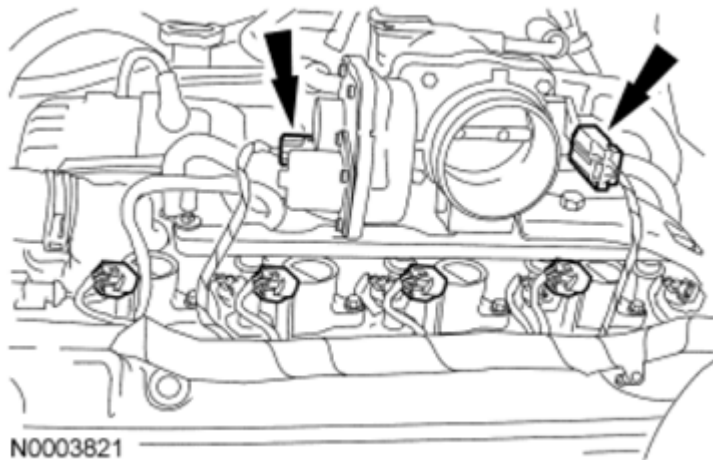
92. Tighten the 2 coolant outlet adapter bolts.

- Tighten to 25 Nm (18 lb-ft).



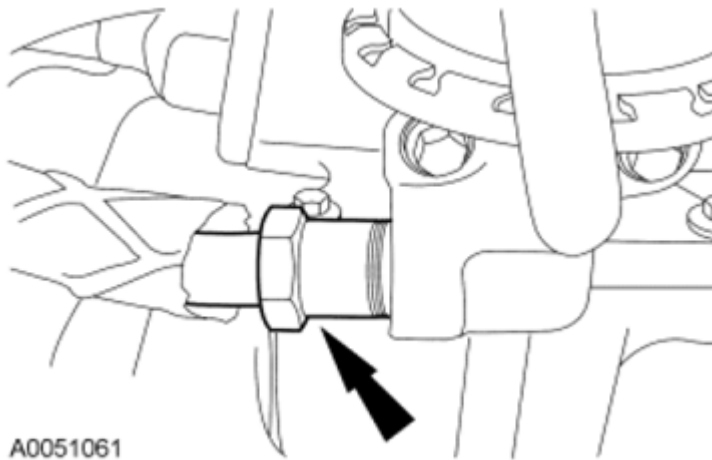
**Fig. 424: Locating Coolant Outlet Adapter Bolts**  
Courtesy of FORD MOTOR CO.

93. Connect the throttle control and throttle positioning sensor electrical connector.



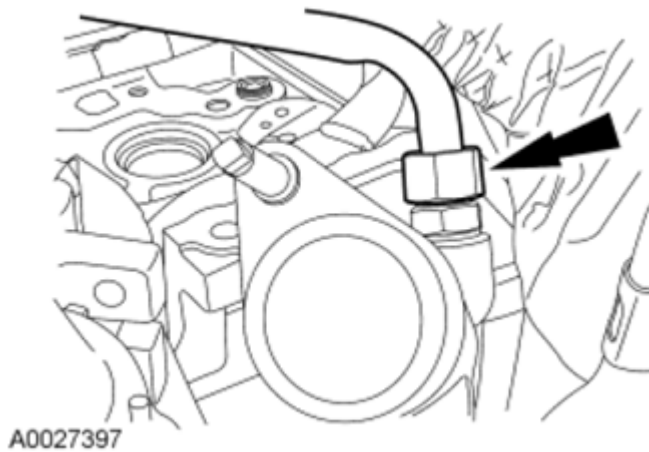
**Fig. 425: Locating Throttle Control And Throttle Positioning Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

94. Connect the EGR tube to the EGR valve.
- Tighten to 43 Nm (32 lb-ft).



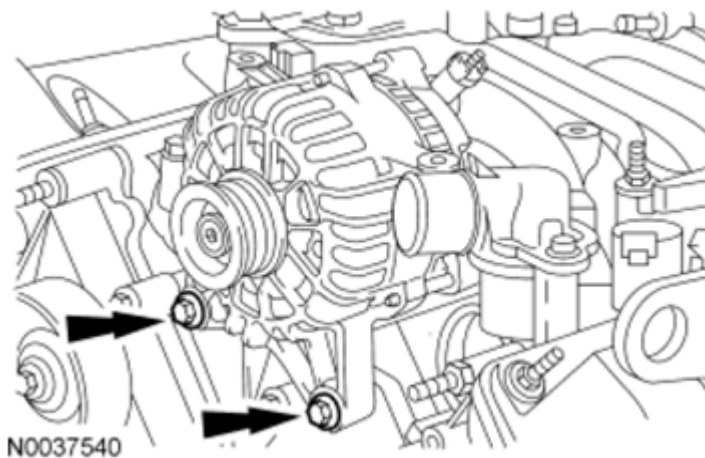
**Fig. 426: Locating EGR Tube Nut**  
Courtesy of FORD MOTOR CO.

95. Connect the EGR tube to the exhaust manifold.
- Tighten to 43 Nm (32 lb-ft).



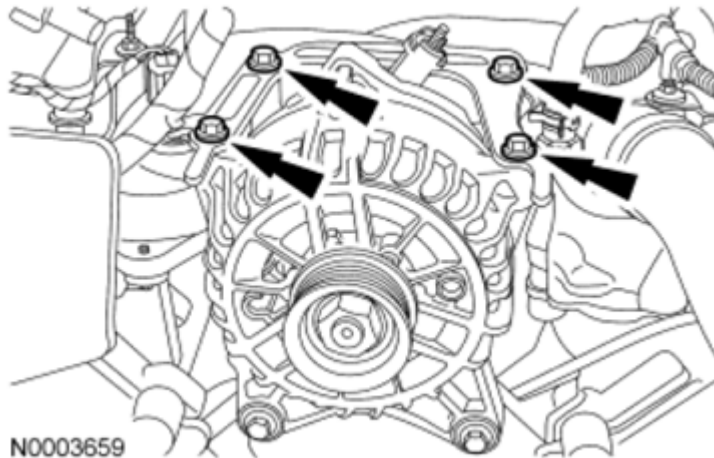
**Fig. 427: Locating EGR Tube**  
Courtesy of FORD MOTOR CO.

96. Position the fuel charging wiring at 2 locations at the back of the intake manifold.
97. Install the generator and the 2 bolts.
  - Tighten to 25 Nm (18 lb-ft).



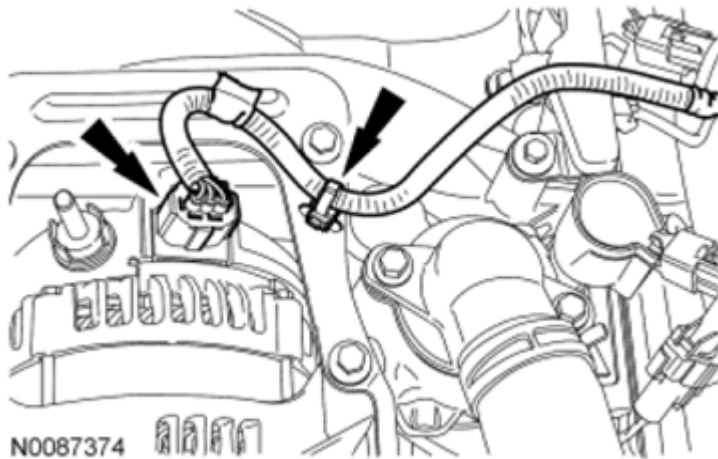
**Fig. 428: Locating Generator And Bolts**  
Courtesy of FORD MOTOR CO.

98. Install the generator mounting bracket and the 4 bolts.
  - Tighten to 10 Nm (89 lb-in).



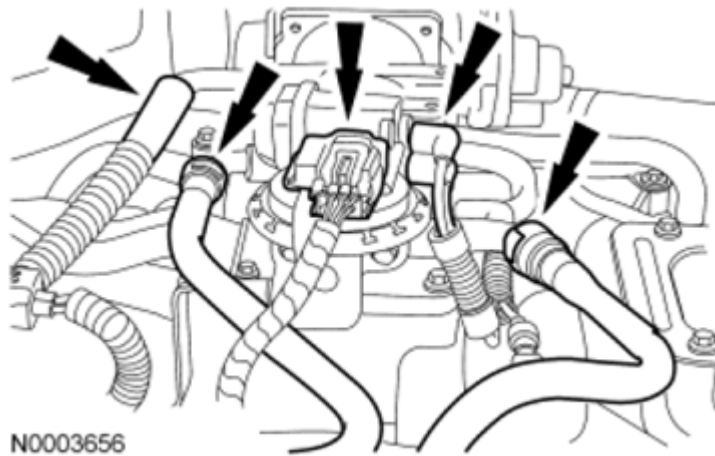
**Fig. 429: Locating Generator Mounting Bracket And Bolts**  
Courtesy of FORD MOTOR CO.

99. Attach the wire harness retainer and connect the generator electrical connector.



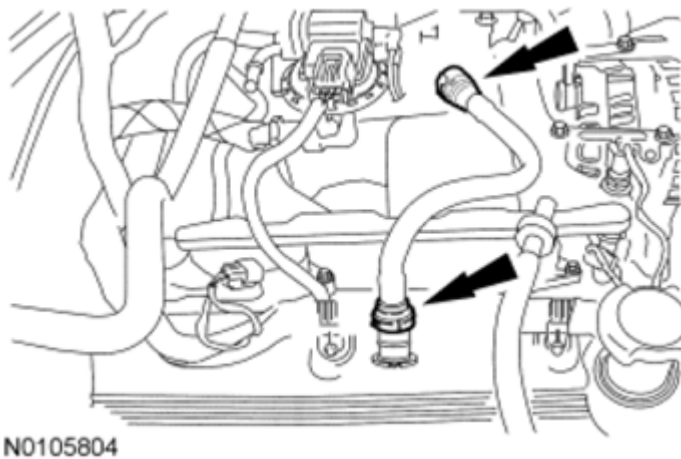
**Fig. 430: Locating Wire Harness Retainer And Generator Electrical Connector**  
Courtesy of FORD MOTOR CO.

100. Position the vacuum harness and connect the vacuum hoses for the Evaporative Emission (EVAP) canister purge valve, the main chassis hose and the EGR valve.



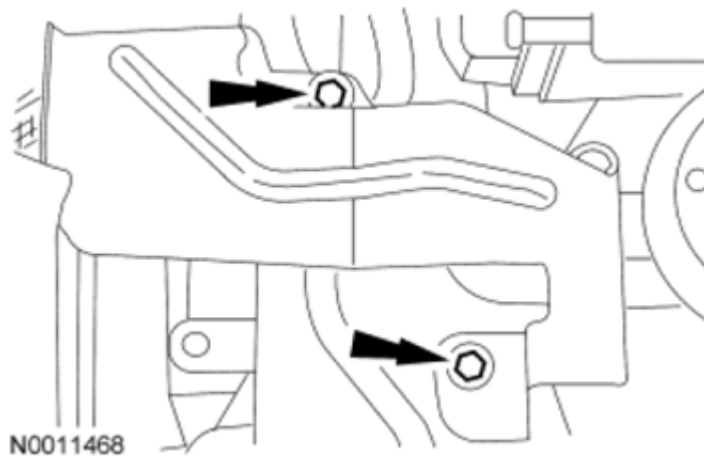
**Fig. 431: Locating Vacuum Hoses And Electrical Connector**  
Courtesy of FORD MOTOR CO.

101. Connect the crankcase ventilation tube.



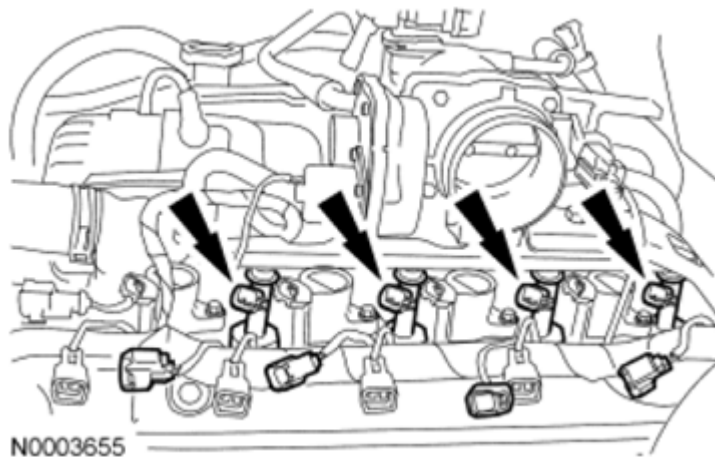
**Fig. 432: Locating Crankcase Ventilation Tube**  
Courtesy of FORD MOTOR CO.

102. Install the intake manifold shield and 2 bolts.
- Tighten to 10 Nm (89 lb-in).



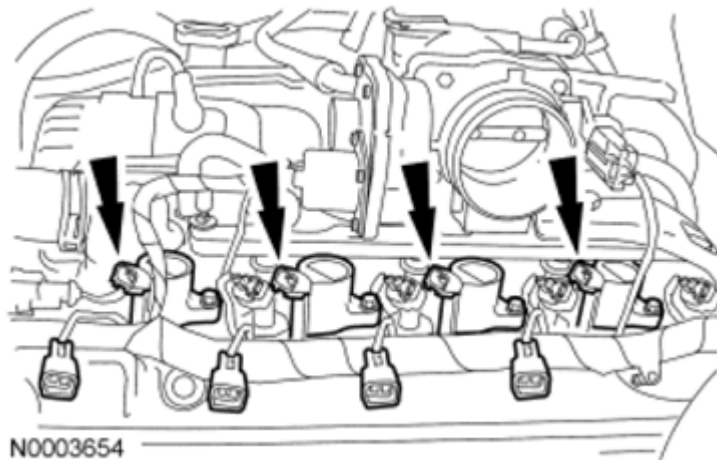
**Fig. 433: Locating Bolts And Intake Manifold Shield**  
Courtesy of FORD MOTOR CO.

103. Connect the 8 fuel injector electrical connectors (4 shown in illustration).



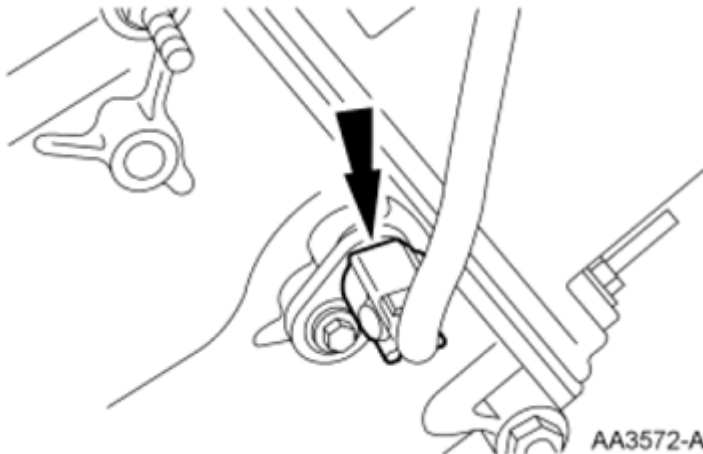
**Fig. 434: Locating Fuel Injector Electrical Connectors**  
Courtesy of FORD MOTOR CO.

104. Connect the 8 ignition coil electrical connectors (4 shown in illustration).



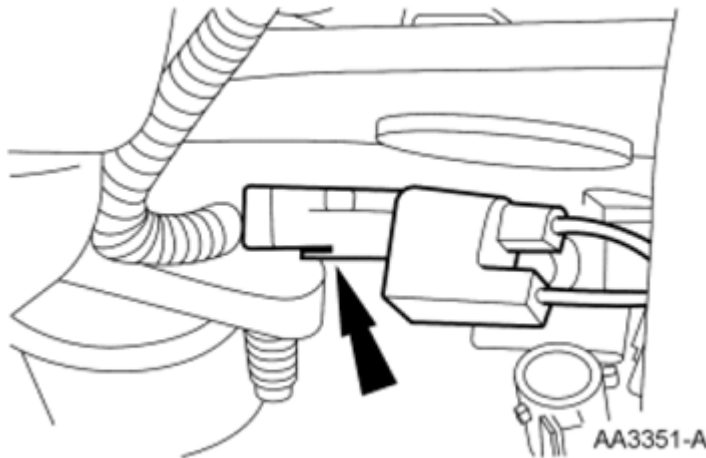
**Fig. 435: Locating Ignition Coil Electrical Connectors**  
Courtesy of FORD MOTOR CO.

105. Connect the Camshaft Position (CMP) sensor electrical connector.



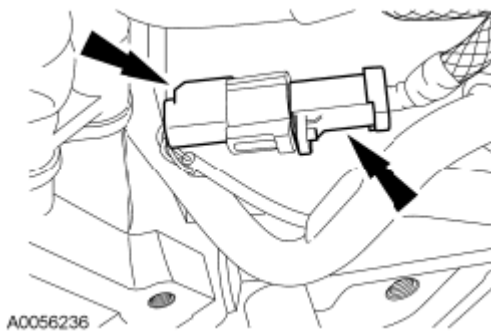
**Fig. 436: Locating Camshaft Position (CMP) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

106. Connect the radio interference capacitor electrical connector.



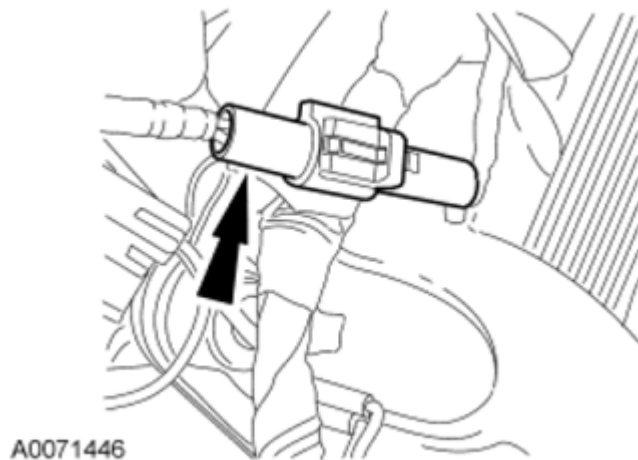
**Fig. 437: Locating Radio Interference Capacitor Electrical Connector**  
Courtesy of FORD MOTOR CO.

107. Connect the **KS** electrical connector and install the harness retainer to the intake manifold.



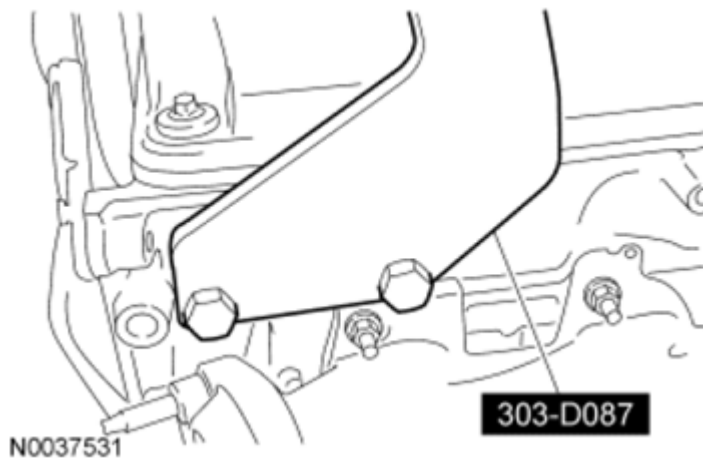
**Fig. 438: Locating Knock Sensor (KS) Electrical Connector And Wiring Harness Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

108. Connect the Cylinder Head Temperature (CHT) sensor electrical connector.



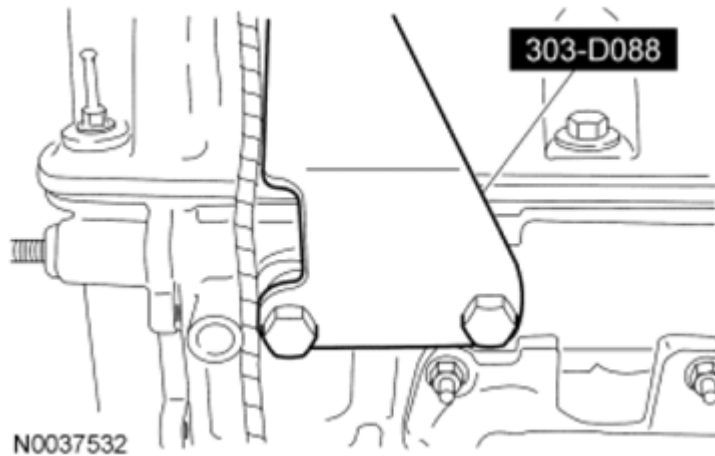
**Fig. 439: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

109. Install the battery cables and the bolt.
110. Install the Engine Lifting Bracket to the RH cylinder head.



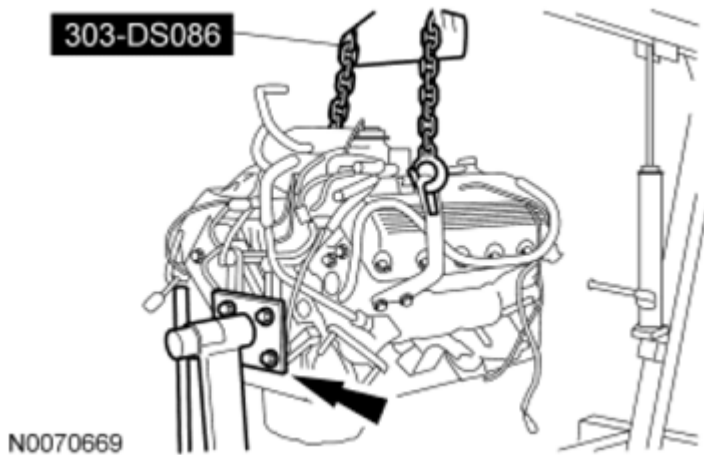
**Fig. 440: Identifying Engine Lifting Bracket (303-D087)**  
Courtesy of FORD MOTOR CO.

111. Install the Engine Lifting Bracket to the LH cylinder head.



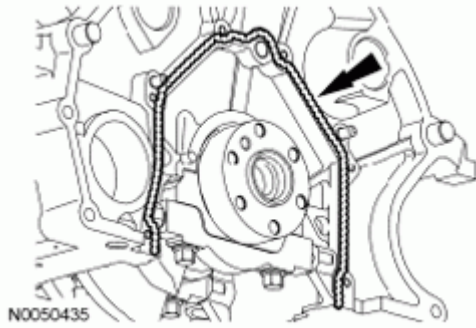
**Fig. 441: Identifying Engine Lifting Bracket (303-D088)**  
Courtesy of FORD MOTOR CO.

112. Using the Engine Lifting Bracket Set, remove the engine from the engine stand.



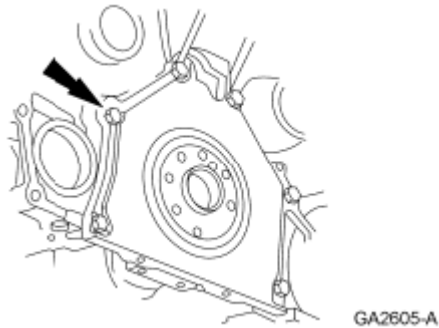
**Fig. 442: Identifying Engine Lifting Bracket Set (303-DS086)**  
Courtesy of FORD MOTOR CO.

**NOTE:** The rear crankshaft seal retainer plate does not have a sealant groove. Gasket maker must be applied to the rear crankshaft seal retainer mating surface on the engine block.



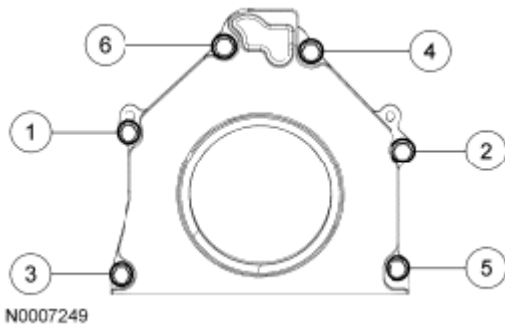
**Fig. 443: Applying Bead Of Gasket Maker To Rear Crankshaft Seal Retainer Mating Surface**  
Courtesy of FORD MOTOR CO.

113. Apply a bead of gasket maker to the crankshaft rear seal retainer plate mating surface on the engine block.
114. Install the crankshaft rear seal retainer plate and loosely install the 6 bolts.



**Fig. 444: Locating Crankshaft Rear Seal Retainer Plate Bolts**  
Courtesy of FORD MOTOR CO.

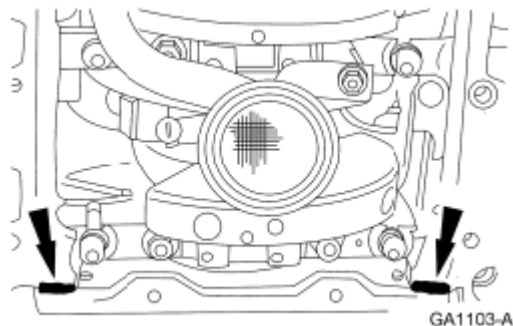
115. Tighten the 6 crankshaft rear seal retainer plate bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



**Fig. 445: Identifying Rear Seal Retainer Plate Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

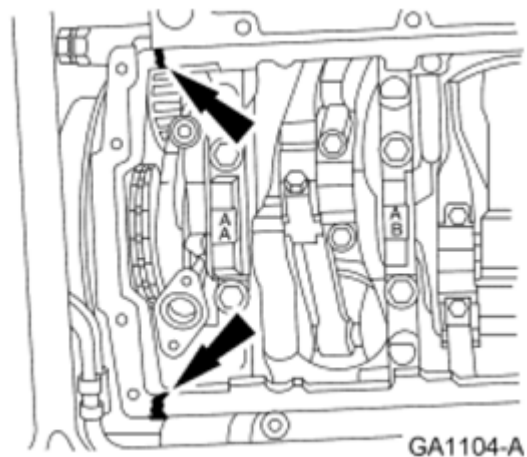
**NOTE:** If not secured within 4 minutes, the sealant must be removed and the

sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.



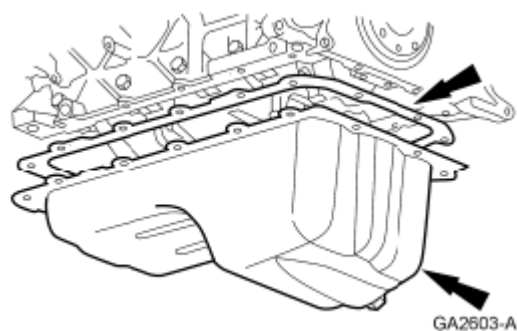
**Fig. 446: Locating Silicone Gasket And Sealant**  
Courtesy of FORD MOTOR CO.

- 116. Apply the sealant at the rear oil seal retainer to cylinder block sealing surface.
- 117. Apply sealant at the front cover-to-cylinder block sealing surface.



**Fig. 447: Locating Silicone Gasket And Sealant**  
Courtesy of FORD MOTOR CO.

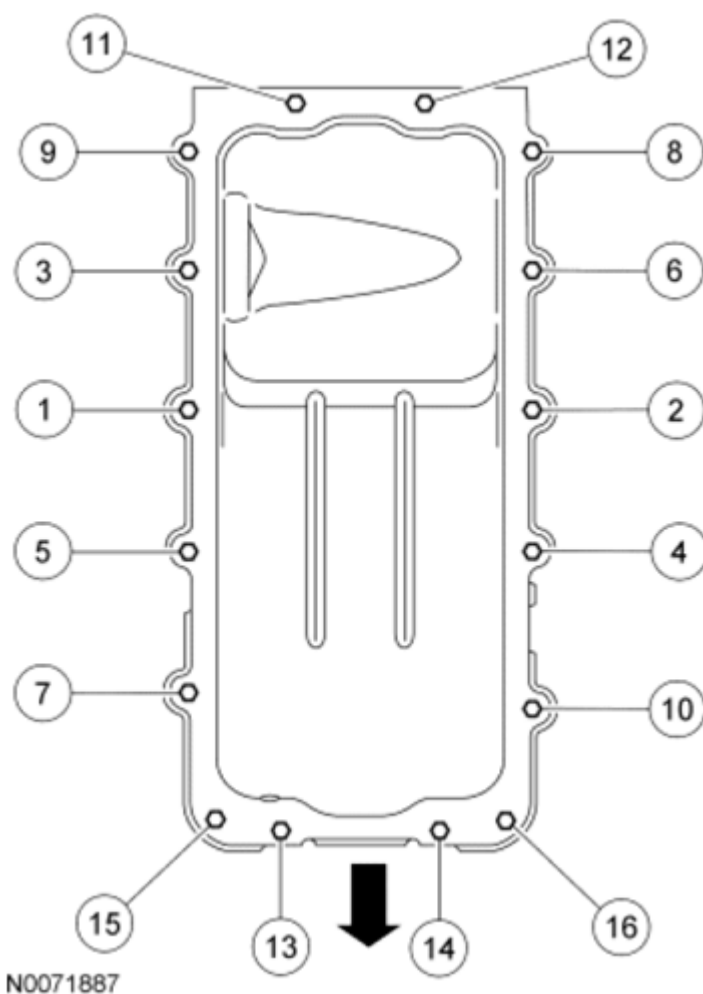
- 118. Position the new oil pan gasket, the oil pan and the loosely install the 16 bolts.



**Fig. 448: Locating Oil Pan And Gasket**  
Courtesy of FORD MOTOR CO.

119. Tighten the 16 bolts in 2 stages, in the sequence shown in illustration.

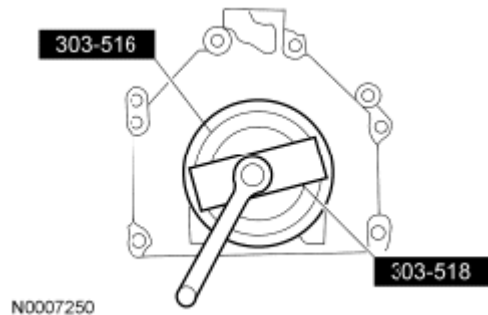
- Stage 1: Tighten to 20 Nm (177 lb-in).
- Stage 2: Rotate an additional 60 degrees.



**Fig. 449: Identifying Oil Pan Bolts In Sequence**

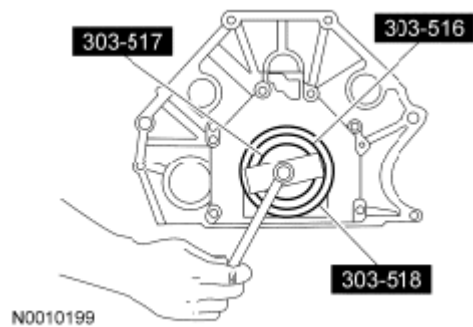
**Courtesy of FORD MOTOR CO.**

120. Using the Crankshaft Rear Oil Seal Installers, install the crankshaft rear oil seal.



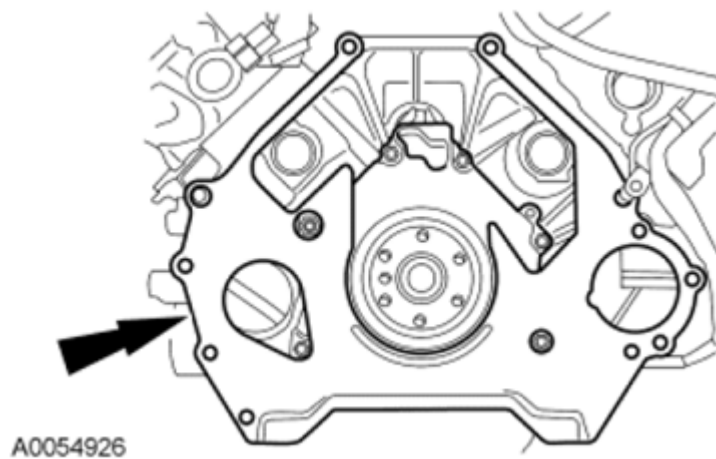
**Fig. 450: Installing Crankshaft Rear Seal**  
**Courtesy of FORD MOTOR CO.**

121. Using the Crankshaft Rear Oil Seal Installer and Crankshaft Rear Oil Slinger Installer, install the crankshaft oil slinger.



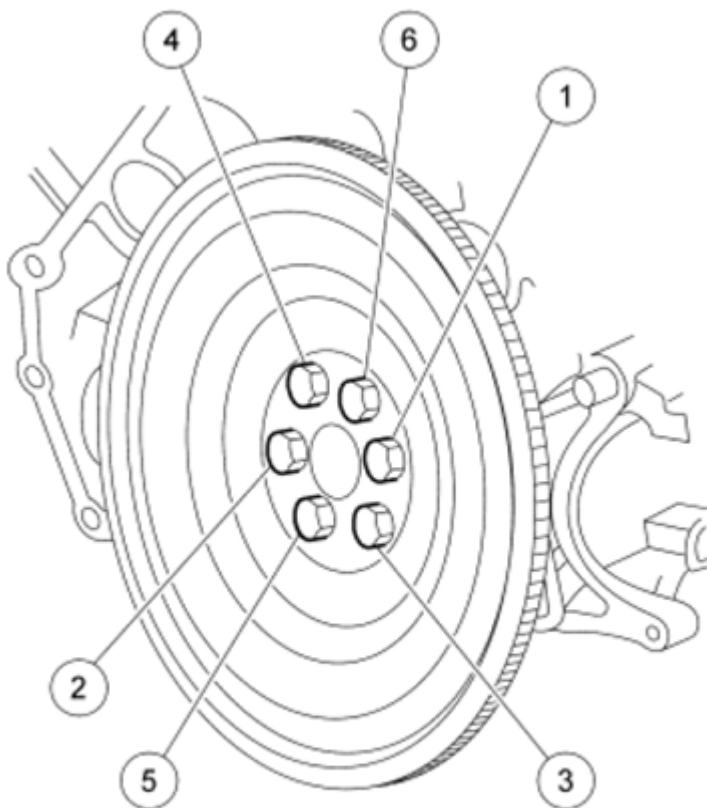
**Fig. 451: Installing Crankshaft Oil Slinger**  
**Courtesy of FORD MOTOR CO.**

122. Install the engine/transmission spacer plate.



**Fig. 452: Locating Engine/Transmission Spacer Plate**  
Courtesy of FORD MOTOR CO.

123. Position the flexplate and install the 6 bolts in the sequence shown in illustration.
- Tighten to 80 Nm (59 lb-ft).

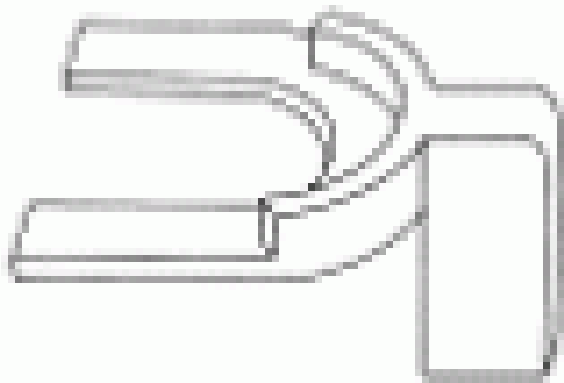
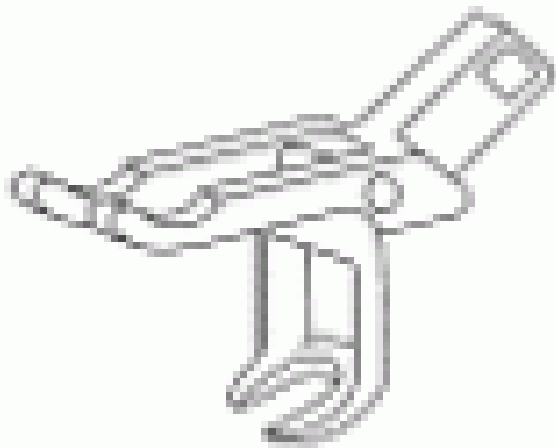


**Fig. 453: Identifying Flexplate Bolts In Sequence**

Courtesy of FORD MOTOR CO.

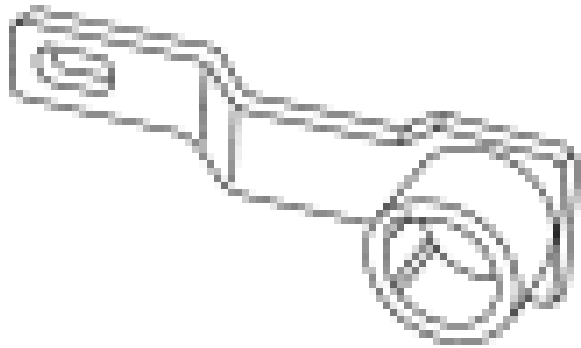
**INSTALLATION****CYLINDER HEAD**

Special Tool(s)

**SPECIAL TOOL CHART****ST1331-A**Compressor Spacer, Valve Spring  
303-382 (T91P-6565-AH)**ST1330-A**Compressor, Valve Spring  
303-567 (T97P-6565-AH)

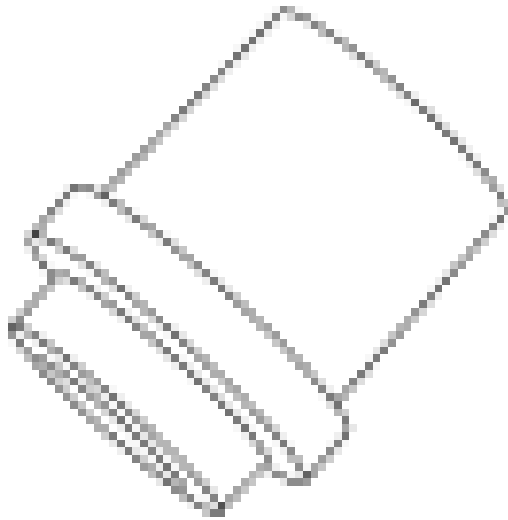
## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1335-A**

Holding Tool, Crankshaft  
303-448 (T93P-6303-A)



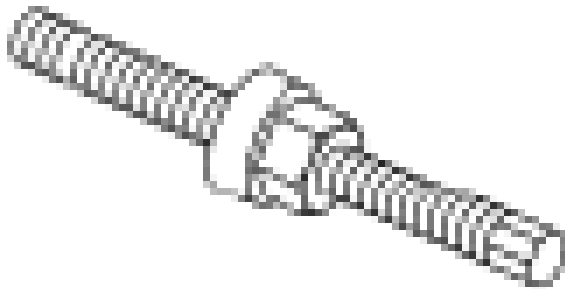
**ST2197-A**

Installer, Crankshaft Front Oil Seal  
303-635

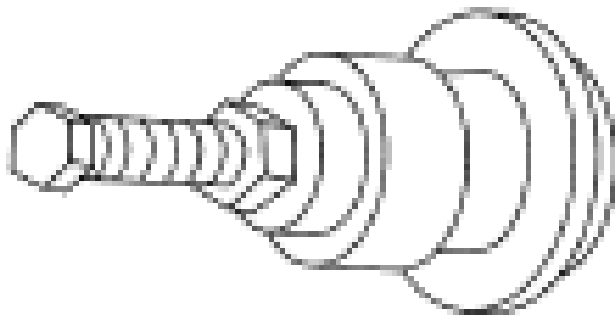
Installer, Crankshaft Vibration Damper  
303-102 (T74P-6316-B)

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST1287-A



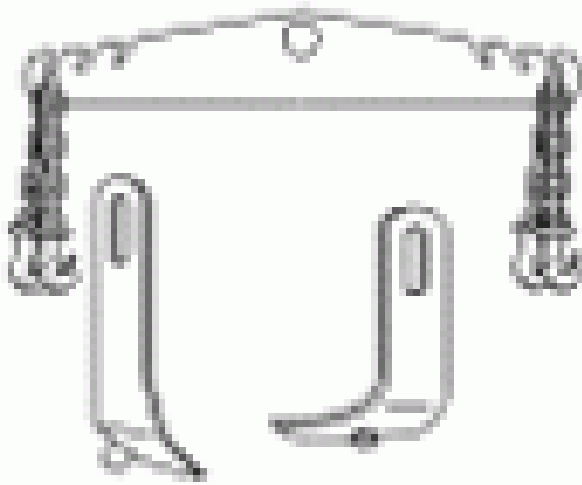
ST1328-A

Installer, Front Cover Oil Seal  
303-335 (T88T-6701-A)

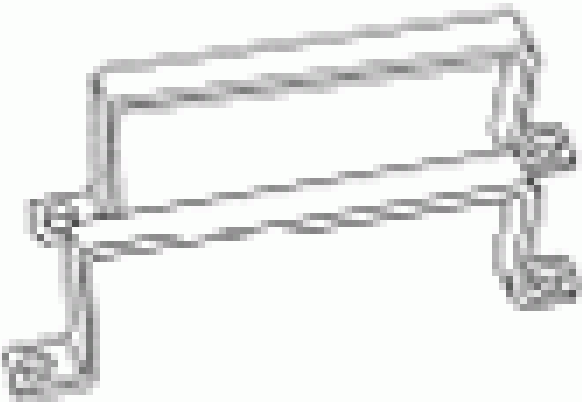
Lifting Bracket Set, Engine  
303-DS086 (D93P-6001-A)  
Includes Lifting Bracket, Engine  
303-D087 and 303-D088 or equivalent

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



ST2443-A



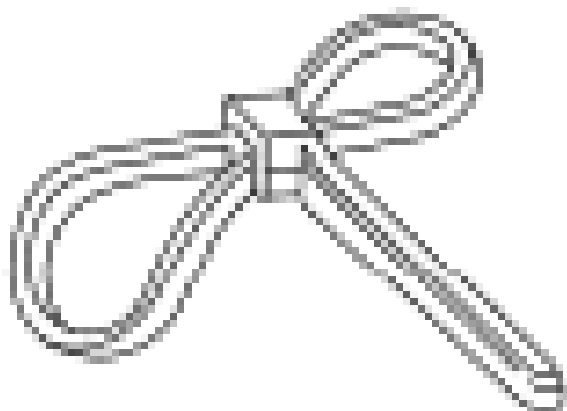
ST1668-A

Remover/Installer, Cylinder Head  
303-572 (T97T-6000-A)

Strap Wrench

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1438-A**

303-D055 (D85L-6000-A) or equivalent

### General Equipment

#### GENERAL EQUIPMENT

Hydraulic Chain Tensioner Retaining Clip - 1L3Z-6P250-AA

### Material

#### MATERIAL SPECIFICATIONS

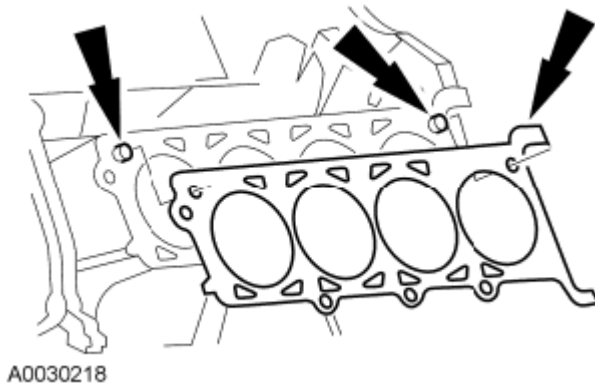
| Item                                                                                                                                                                  | Specification     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Motorcraft® Metal Surface Prep<br>ZC-31-A                                                                                                                             | -                 |
| Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil<br>XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-<br>5W20-LSP12 (Canada); or equivalent | WSS-M2C930-<br>A  |
| Silicone Gasket and Sealant<br>TA-30                                                                                                                                  | WSE-M4G323-<br>A4 |
| Silicone Gasket Remover<br>ZC-30                                                                                                                                      | -                 |

### Installation

#### Both cylinder heads

**NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to CYLINDER HEAD.

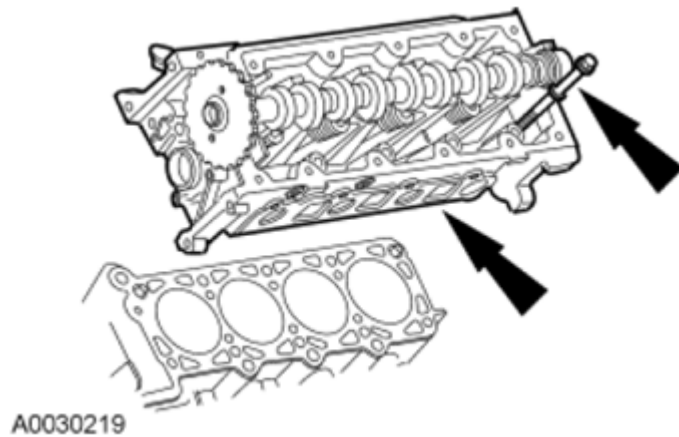
- NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.
- NOTE:** The new gasket has a film coating which is crucial to the gasket's ability to seal correctly. Do not scratch the gasket.
- NOTE:** RH head gasket shown in illustration, LH head gasket similar.



**Fig. 454: Locating Head Gaskets And Dowel Pins**  
Courtesy of FORD MOTOR CO.

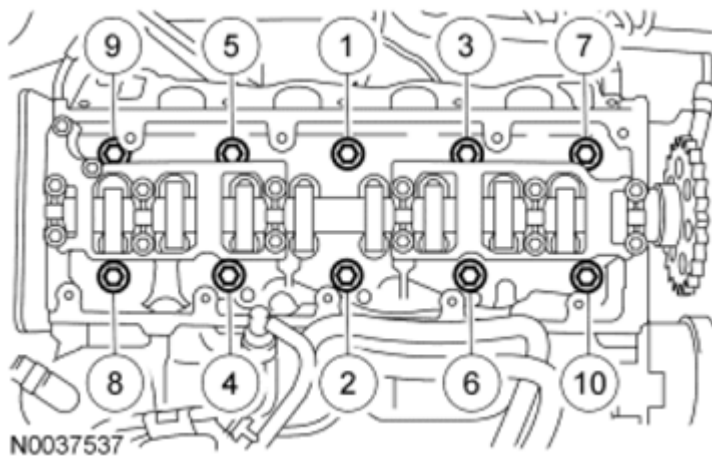
1. Install the new head gasket over the dowel pins.

- NOTE:** Cylinder head machining or milling is not authorized by the Ford Motor Company. Cylinder head flatness must be within 0.0254 mm (0.001 in) across a 38.1 mm (1.5 in) square area.
- NOTE:** The gasket sealing surfaces on the cylinder head and cylinder block must be clean. For additional information, refer to CYLINDER HEAD.
- NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.
- NOTE:** Do not allow the dowels to scratch the sealing surface of the cylinder head during cylinder head installation.
- NOTE:** RH cylinder head shown in illustration, LH cylinder head similar.



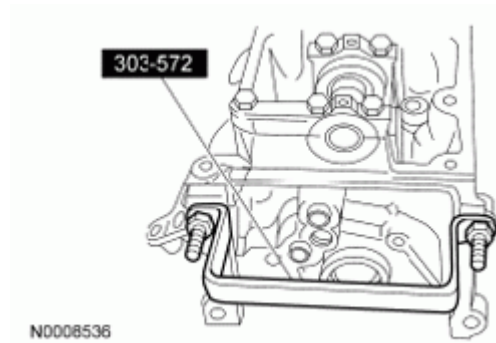
**Fig. 455: Locating Cylinder Head**  
Courtesy of FORD MOTOR CO.

2. Install the cylinder head on the dowels and the head gasket. Loosely install new bolts.
3. Tighten the cylinder head bolts in 6 stages, in the sequence shown in illustration.
  - Stage 1: Tighten to 40 Nm (30 lb-ft).
  - Stage 2: Tighten an additional 90 degrees (one-fourth turn).
  - Stage 3: Loosen a minimum of one full turn (360 degrees).
  - Stage 4: Tighten to 40 Nm (30 lb-ft).
  - Stage 5: Tighten an additional 90 degrees (one-fourth turn).
  - Stage 6: Tighten an additional 90 degrees (one-fourth turn).



**Fig. 456: Identifying Cylinder Head Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

4. Remove the Cylinder Head Remover/Installer from both ends of the cylinder head.

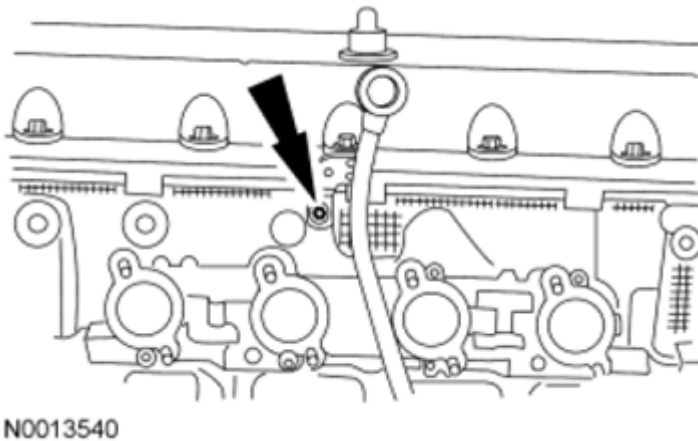


**Fig. 457: Identifying Cylinder Head Remover/Installer (303-572)**  
Courtesy of FORD MOTOR CO.

### LH cylinder head

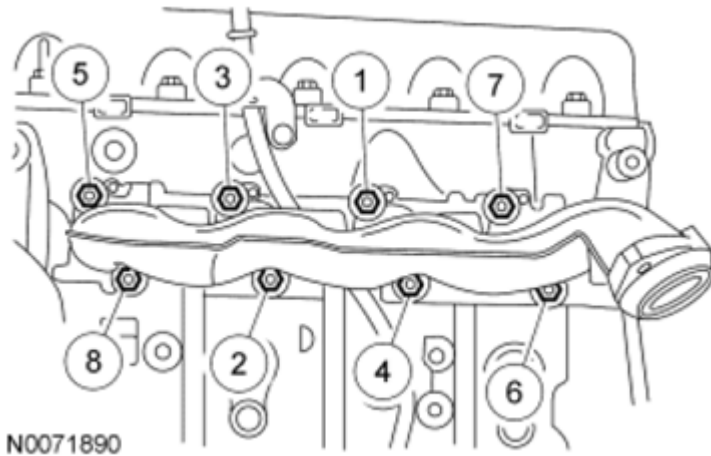
**NOTE:** Lubricate the O-ring seal with clean engine oil.

5. Install a new O-ring seal on the oil level indicator tube and install the oil level indicator tube and bolt.
  - Tighten to 10 Nm (89 lb-in).



**Fig. 458: Locating Oil Level Indicator Tube And Bolt**  
Courtesy of FORD MOTOR CO.

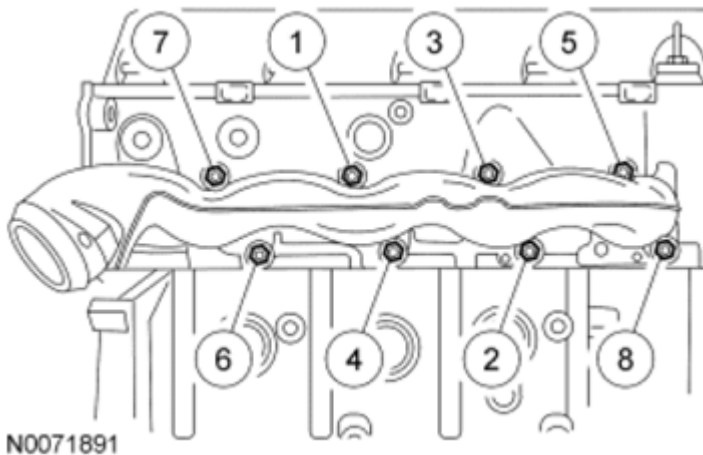
6. Install the 8 new LH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
7. Install a new LH exhaust manifold gasket the LH exhaust manifold and 8 new nuts.
  - Tighten to 20 Nm (177 lb-in) in the sequence shown in illustration.



**Fig. 459: Identifying LH Exhaust Manifold Nuts In Sequence**  
Courtesy of FORD MOTOR CO.

### RH cylinder head

8. Install the 8 new RH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
9. Install a new RH exhaust manifold gasket the RH exhaust manifold and 8 new nuts.
  - Tighten to 20 Nm (177 lb-in) in the sequence shown in illustration.



**Fig. 460: Identifying RH Exhaust Manifold Nuts In Sequence**  
Courtesy of FORD MOTOR CO.

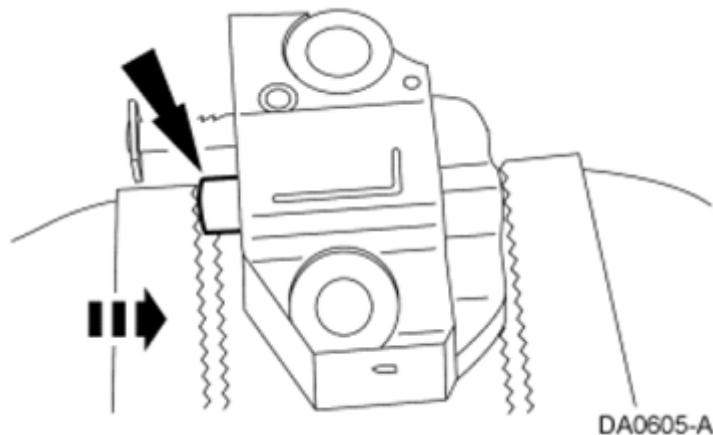
### Engines with ratcheting timing chain tensioners

**NOTE:** Timing chain procedures must be followed exactly or damage to valves and pistons will result.

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

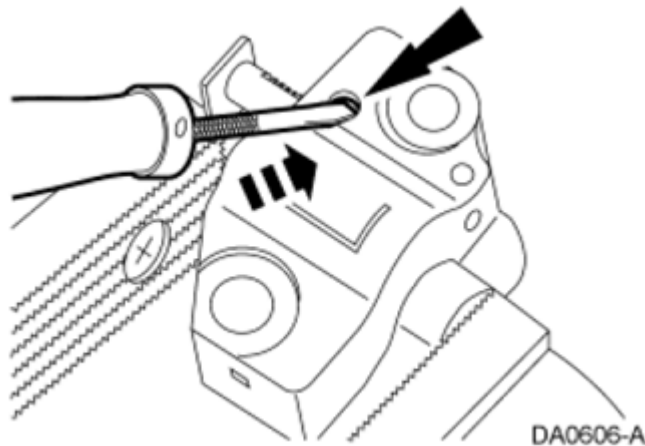
assembly.

**NOTE:** LH shown in illustration, RH similar.



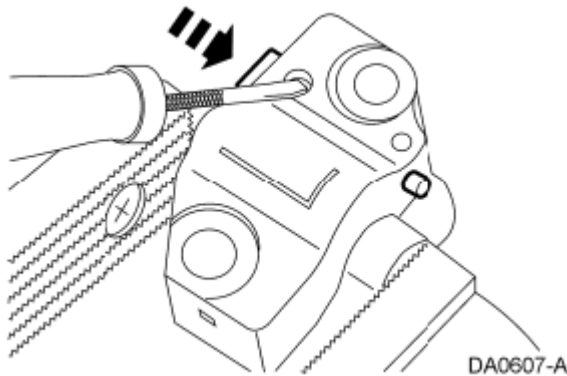
**Fig. 461: Locating Tensioner Plunger**  
Courtesy of FORD MOTOR CO.

10. Compress each tensioner plunger, using an edge of a vise.
11. Using a small screwdriver or pick, push back and hold the ratchet mechanism.



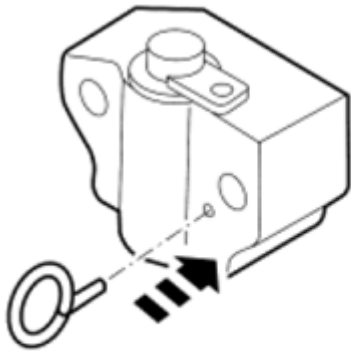
**Fig. 462: Holding Ratchet Mechanism Using Small Screwdriver Or Pick**  
Courtesy of FORD MOTOR CO.

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



**Fig. 463: Pushing Ratchet Arm Back Into Tensioner Housing**  
Courtesy of FORD MOTOR CO.

13. Install a paper clip into the hole of each tensioner housing to hold the ratchet assembly and plunger in during installation.
  - Remove the tensioner from the vise.



A26917-A

**Fig. 464: Identifying Paper Clip Into Hole Of Tensioner Housing**  
Courtesy of FORD MOTOR CO.

#### Engines with non-ratcheting timing chain tensioners

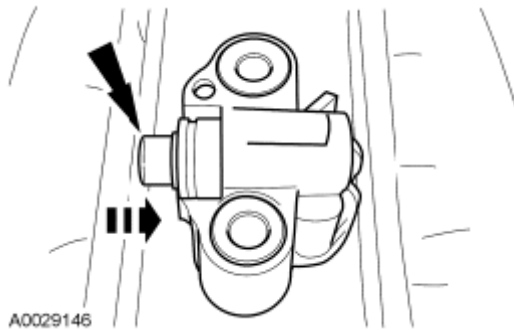
**NOTE:** If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

14. Inspect the RH and LH timing chain tensioners.
  - Install new tensioners as necessary.

**NOTE:** Timing chain procedures must be followed exactly or damage to valves

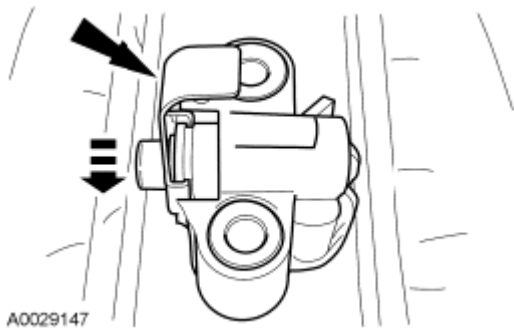
and pistons will result.

**NOTE:** LH shown in illustration, RH similar.



**Fig. 465: Locating Tensioner Plunger**  
Courtesy of FORD MOTOR CO.

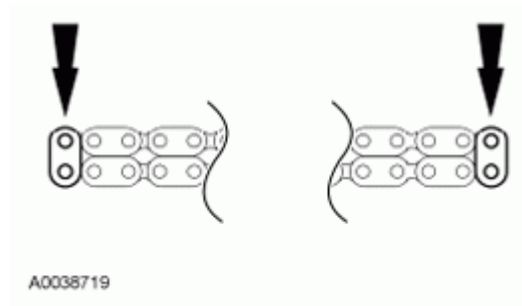
15. Compress each tensioner plunger, using an edge of a vise.
16. Install a Hydraulic Chain Tensioner Retaining Clip on the tensioner to hold the plunger in during installation.



**Fig. 466: Identifying Hydraulic Chain Tensioner Retaining Clip On Tensioner**  
Courtesy of FORD MOTOR CO.

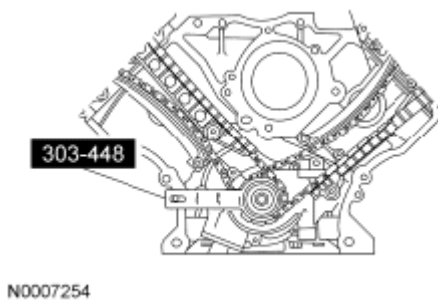
#### **Both cylinder heads**

17. If the colored links are not visible, mark one link on one end and one link on the other end, and use as timing marks.



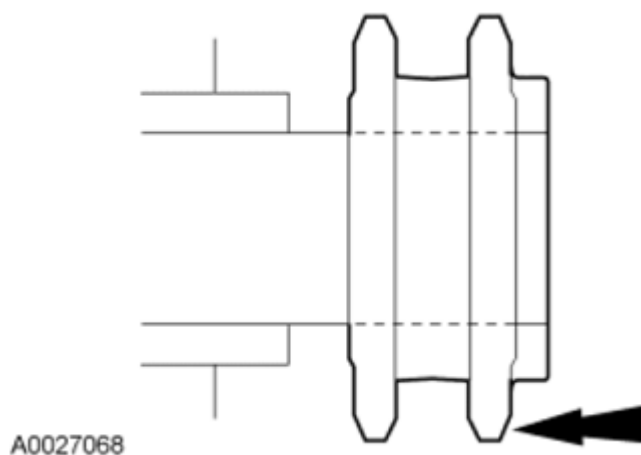
**Fig. 467: Locating Colored Links**  
Courtesy of FORD MOTOR CO.

18. Using the Crankshaft Holding Tool, position the crankshaft.
  - Remove the Crankshaft Holding Tool after crankshaft positioning.



**Fig. 468: Identifying Crankshaft Holding Tool (303-448)**  
Courtesy of FORD MOTOR CO.

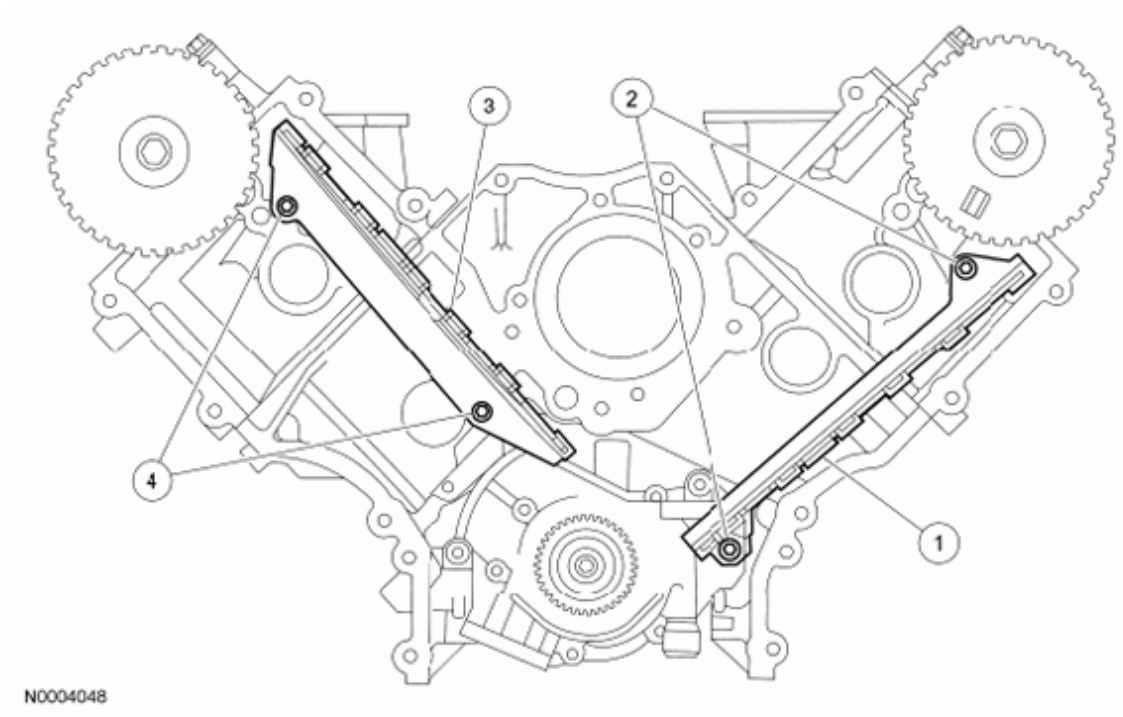
19. Install the crankshaft sprocket, making sure the flange faces forward.



**Fig. 469: Locating Crankshaft Sprocket**  
Courtesy of FORD MOTOR CO.

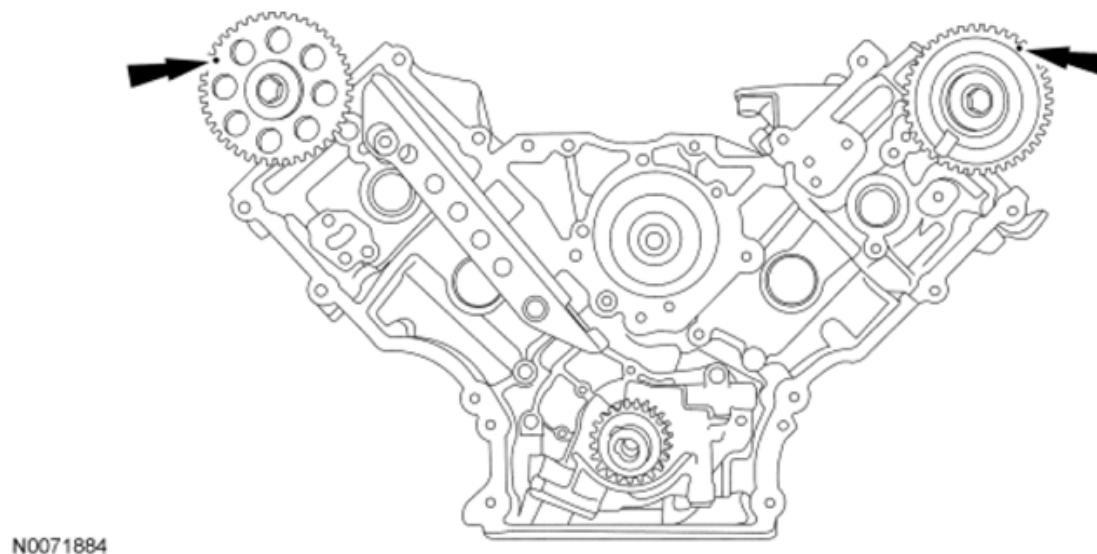
20. Install the timing chain guides.
  1. Position the LH timing chain guide.

2. Install and tighten the LH bolts to 10 Nm (89 lb-in).
3. Position the RH timing chain guide.
4. Install and tighten the RH bolts to 10 Nm (89 lb-in).



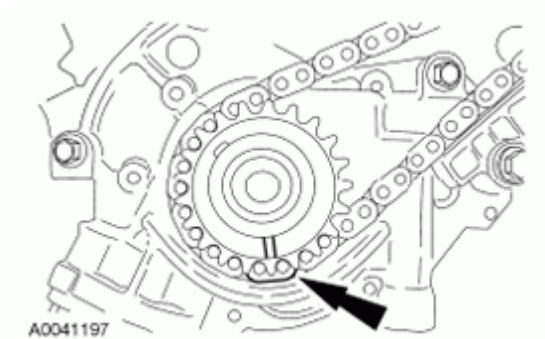
**Fig. 470: Identifying Timing Chain Guide And Bolts**  
Courtesy of FORD MOTOR CO.

21. Rotate the RH camshaft sprocket until the timing mark is approximately at the 11 o'clock position. Rotate the LH camshaft sprocket until the timing mark is approximately at the 1 o'clock position.



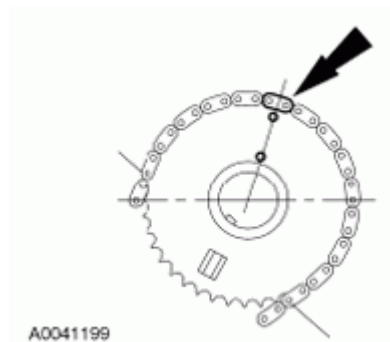
**Fig. 471: Locating Timing Marks On Camshaft Sprocket**  
Courtesy of FORD MOTOR CO.

22. Position the LH (inner) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



**Fig. 472: Locating Colored (Marked) Link**  
Courtesy of FORD MOTOR CO.

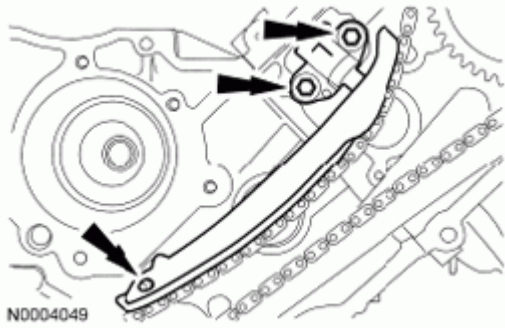
23. Install the LH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



**Fig. 473: Locating Colored (Marked) Link With Timing Marks On Sprocket**  
Courtesy of FORD MOTOR CO.

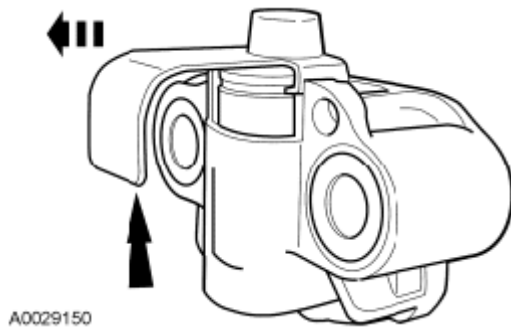
**NOTE:** The LH timing chain tensioner arm has a bump near the dowel hole for identification.

24. Position the LH timing chain tensioner on the dowel pin and install the LH timing chain tensioner.
- Tighten to 25 Nm (18 lb-ft).



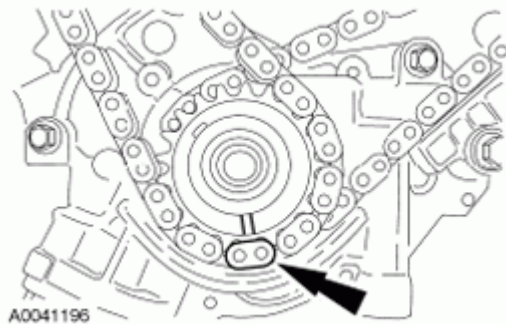
**Fig. 474: Locating LH Timing Chain Tensioner And Bolts**  
Courtesy of FORD MOTOR CO.

25. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.



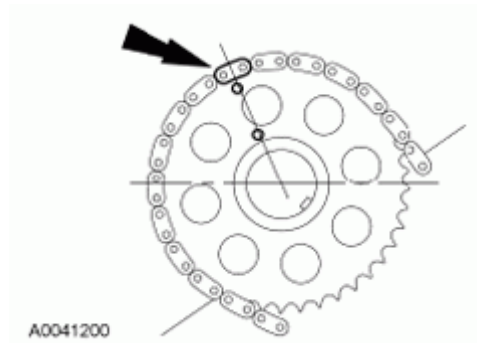
**Fig. 475: Locating Hydraulic Chain Tensioner Retaining Clip**  
Courtesy of FORD MOTOR CO.

26. Position the RH (outer) timing chain on the crankshaft sprocket, aligning the colored (marked) link with the timing mark on the sprocket.



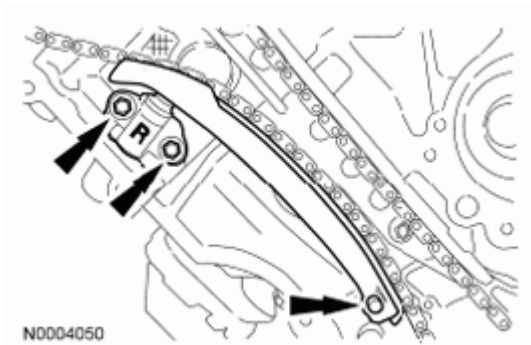
**Fig. 476: Locating Colored (Marked) Link**  
Courtesy of FORD MOTOR CO.

27. Install the RH timing chain on the camshaft sprocket, aligning the colored (marked) link with the timing marks on the sprocket.



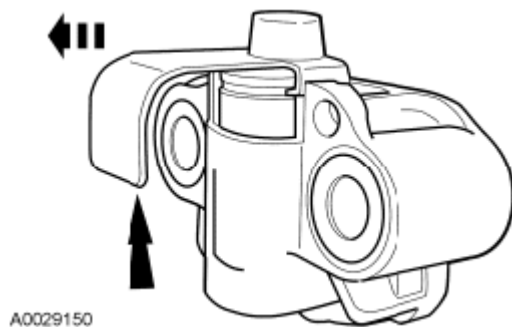
**Fig. 477: Locating Colored (Marked) Link With Timing Marks On Sprocket**  
Courtesy of FORD MOTOR CO.

28. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner.
  - Tighten to 25 Nm (18 lb-ft).



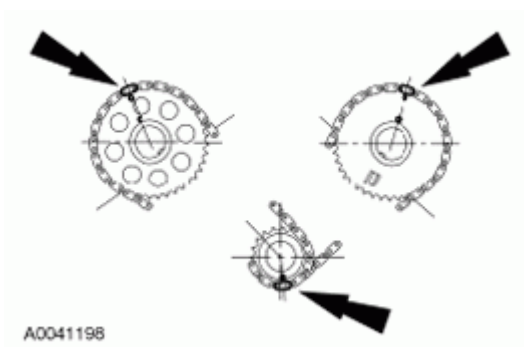
**Fig. 478: Locating RH Timing Chain Tensioner And Bolts**  
Courtesy of FORD MOTOR CO.

29. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.



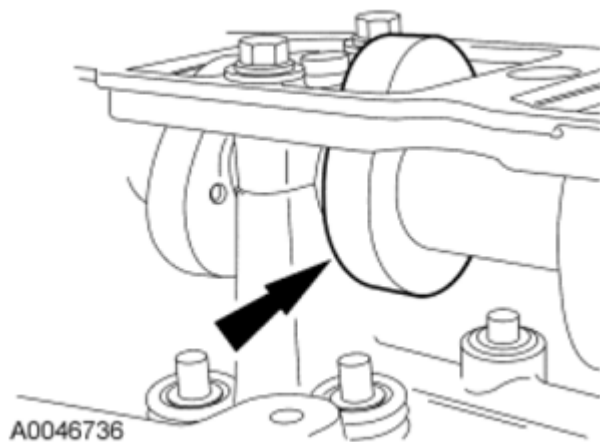
**Fig. 479: Locating Hydraulic Chain Tensioner Retaining Clip**  
Courtesy of FORD MOTOR CO.

30. Make sure that the colored (marked) chain links are lined up with the dots on the crankshaft sprockets and the camshaft sprocket.



**Fig. 480: Locating Colored (Marked) Chain Links**  
Courtesy of FORD MOTOR CO.

31. Rotate the camshaft until the lobe is in the upward position.



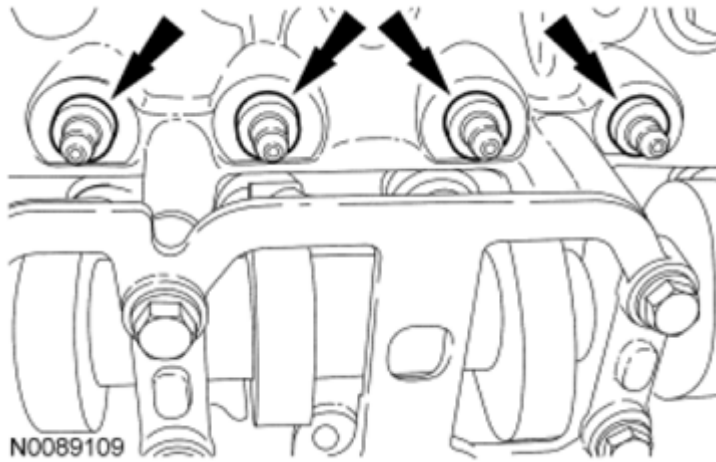
**Fig. 481: Locating Camshaft Lobe**  
Courtesy of FORD MOTOR CO.

32. Install the Valve Spring Compressor Spacer between the valve spring coils to prevent valve stem seal damage.



**Fig. 482: Identifying Valve Spring Compressor Spacer (303-382)**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the hydraulic lash adjusters with clean engine oil.



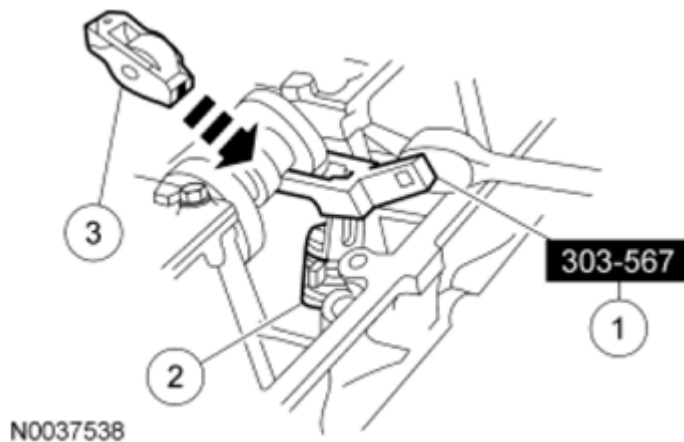
**Fig. 483: Locating Hydraulic Lash Adjusters**  
Courtesy of FORD MOTOR CO.

33. Install the 16 hydraulic lash adjusters in their original locations (4 shown in illustration).

**NOTE:** Lubricate the camshaft roller followers using clean engine oil.

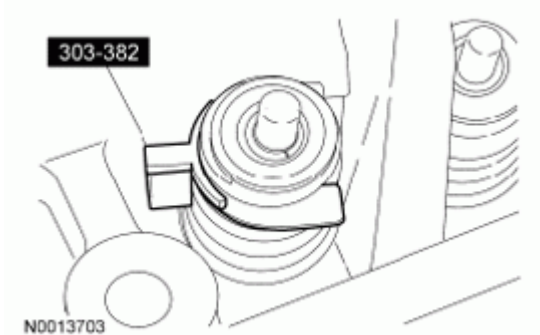
**NOTE:** Position the cam lobe away from the camshaft roller follower location prior to installing each camshaft roller follower.

34. Install the camshaft roller follower.
1. Install the Valve Spring Compressor.
  2. Compress the valve spring.
  3. Install the camshaft roller followers in their original locations.



**Fig. 484: Installing Camshaft Roller Followers**  
Courtesy of FORD MOTOR CO.

35. Remove the Valve Spring Compressor Spacer.

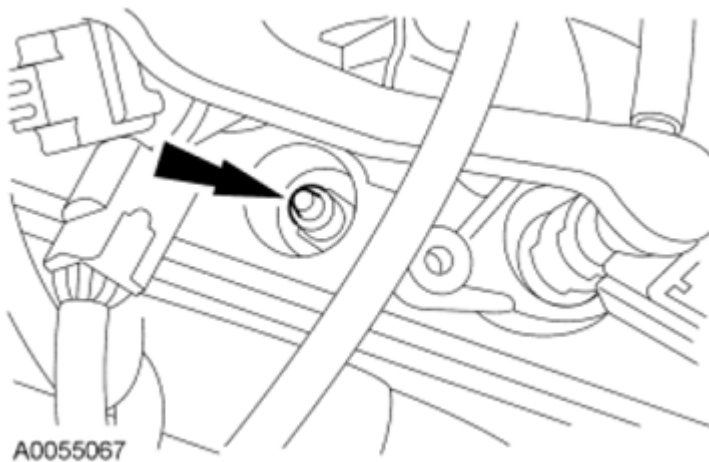


**Fig. 485: Identifying Valve Spring Compressor Spacer (303-382)**

Courtesy of FORD MOTOR CO.

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

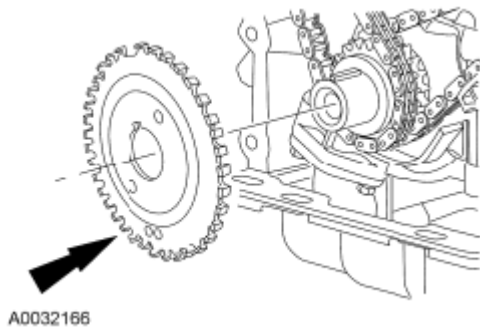
36. Install all 8 spark plugs.
- Tighten to 18 Nm (159 lb-in).



**Fig. 486: Locating Spark Plug**

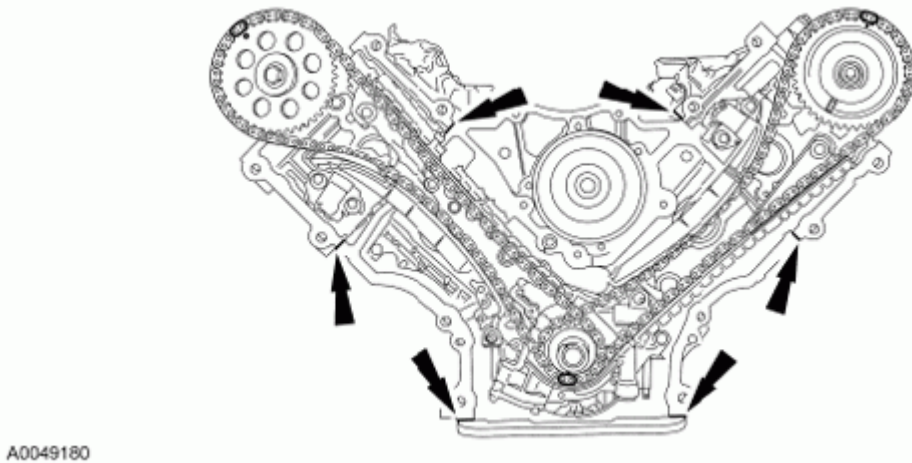
Courtesy of FORD MOTOR CO.

37. Install the crankshaft sensor ring.



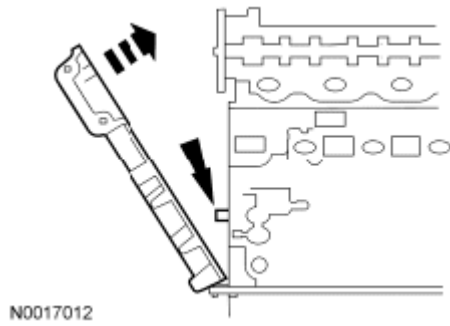
**Fig. 487: Locating Crankshaft Sensor Ring**  
Courtesy of FORD MOTOR CO.

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



**Fig. 488: Locating Sealant Area**  
Courtesy of FORD MOTOR CO.

38. Apply a bead of sealant along the head-to-block surface and the oil pan-to-block surface as specified.
39. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.

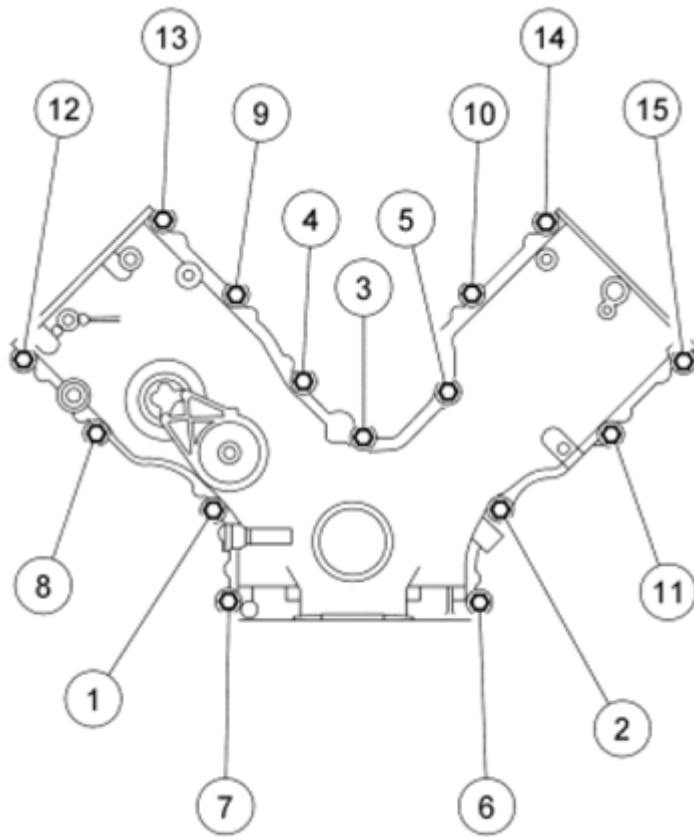


**Fig. 489: Installing Engine Front Cover Onto Dowels**  
Courtesy of FORD MOTOR CO.

40. Tighten the front cover fasteners in the sequence shown in illustration to 25 Nm (18 lb-ft).

**ITEM DESCRIPTION**

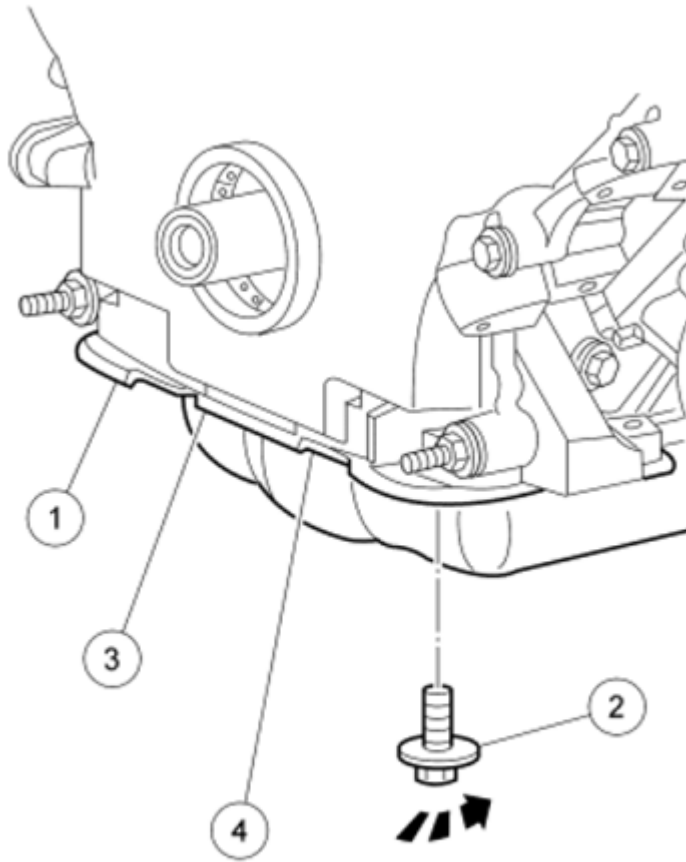
| Item | Part Number | Description                                               |
|------|-------------|-----------------------------------------------------------|
| 1    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 2    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 3    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 4    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 5    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 6    | W706508     | Stud, hex-head pilot, M8 x 1.25 x 50 - M6 x 1 x 10        |
| 7    | N808586     | Stud, washer hex-head pilot, M8 x 1.25 - M6 x 1.0 x 86.35 |
| 8    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 9    | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 10   | N806177     | Bolt, hex flange head pilot, M8 x 1.25 x 53               |
| 11   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 12   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 13   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 14   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |
| 15   | N806300     | Stud, hex-shoulder pilot, M8 x 1.25 x 1.25 x 91.1         |



N0037514

**Fig. 490: Identifying Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

41. Loosely install the 4 bolts, then tighten in 2 stages in the sequence shown in illustration.
- Stage 1: Tighten to 20 Nm (177 lb-in).
  - Stage 2: Tighten an additional 60 degrees.

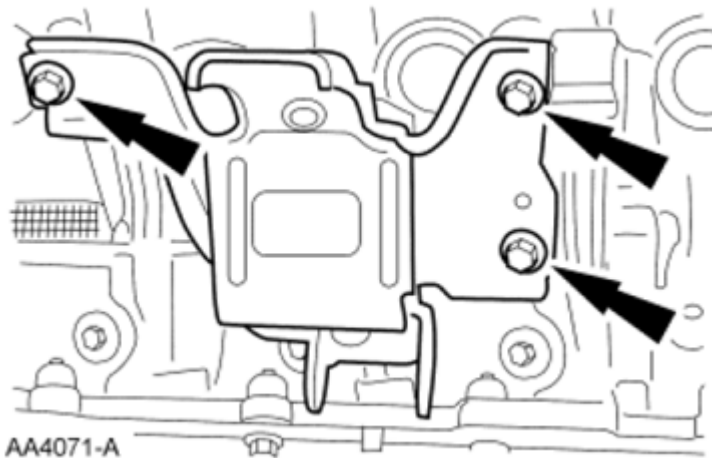


N0037542

**Fig. 491: Identifying Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

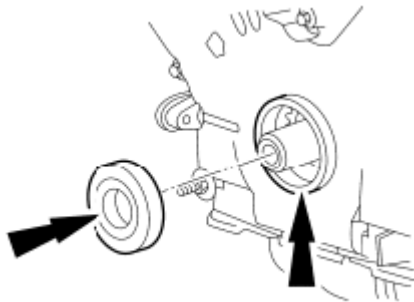
**NOTE:** RH shown in illustration, LH similar.

42. Install the RH and LH engine mounts and the bolts.
- Tighten to 70 Nm (52 lb-ft).



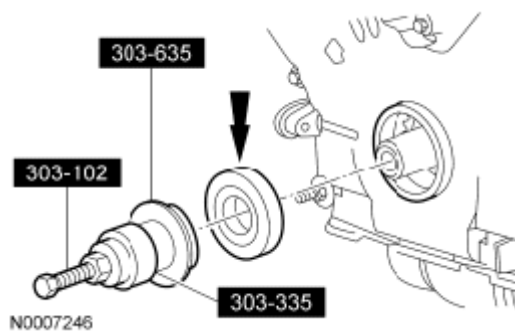
**Fig. 492: Locating RH Engine Mount Bolts**  
Courtesy of FORD MOTOR CO.

43. Lubricate the engine front cover and the front oil seal inner lip with clean engine oil.



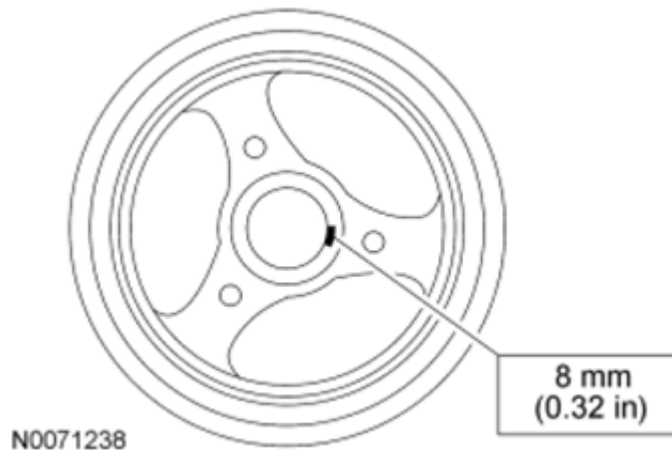
**Fig. 493: Locating Crankshaft Front Seal Inner Lip**  
Courtesy of FORD MOTOR CO.

44. Using the Crankshaft Front Oil Seal Installer, Front Cover Oil Seal Installer and Crankshaft Vibration Damper Installer, install the front oil seal.



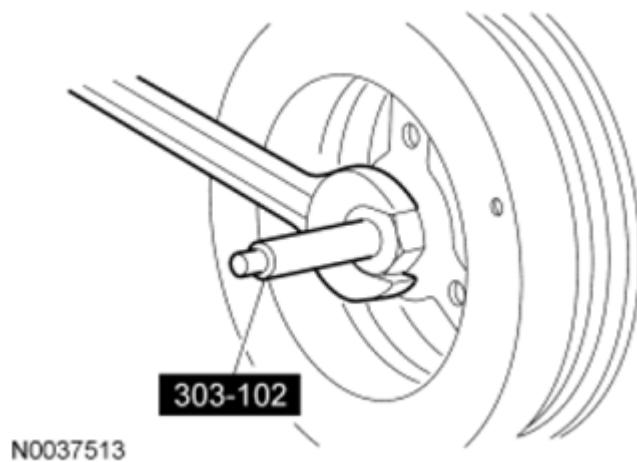
**Fig. 494: Installing Crankshaft Front Seal Into Engine Front Cover**  
Courtesy of FORD MOTOR CO.

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



**Fig. 495: Identifying Woodruff Key Slot**  
Courtesy of FORD MOTOR CO.

45. Apply sealant to the Woodruff key slot on the crankshaft pulley.
46. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.

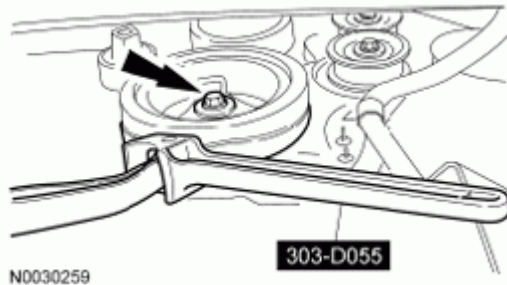


**Fig. 496: Installing Crankshaft Pulley Using Crankshaft Vibration Damper Installer**  
Courtesy of FORD MOTOR CO.

**NOTE:** Use a Strap Wrench to hold the pulley.

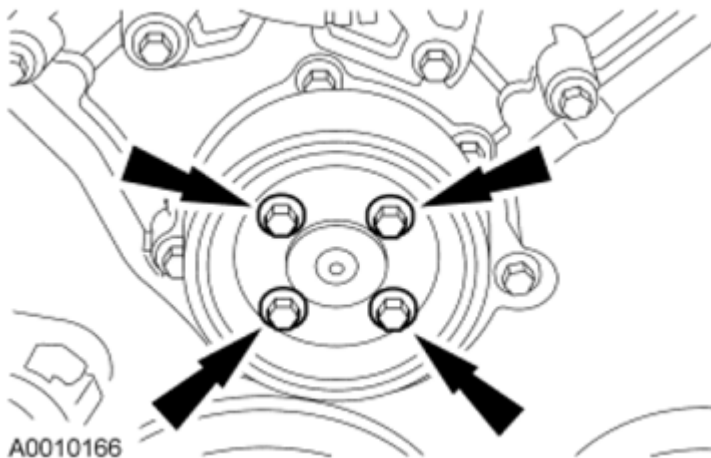
47. Tighten the crankshaft pulley bolt in 4 stages.
  - Stage 1: Tighten to 120 Nm (89 lb-ft).
  - Stage 2: Loosen 360 degrees.

- Stage 3: Tighten to 50 Nm (37 lb-ft).
- Stage 4: Rotate an additional 90 degrees (one-fourth turn).



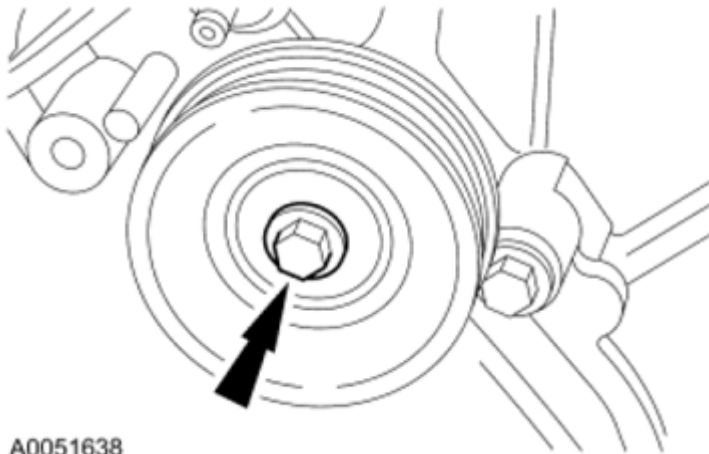
**Fig. 497: Locating Bolt And Washer**  
Courtesy of FORD MOTOR CO.

48. Position the coolant pump pulley on the coolant pump and install the bolts.
- Tighten to 25 Nm (18 lb-ft).



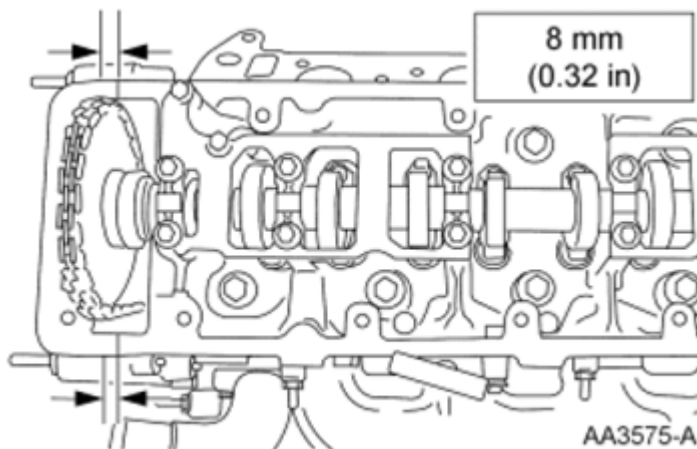
**Fig. 498: Locating Coolant Pump Pulley Bolts**  
Courtesy of FORD MOTOR CO.

49. Install the accessory drive belt idler pulley and bolt.
- Tighten to 25 Nm (18 lb-ft).



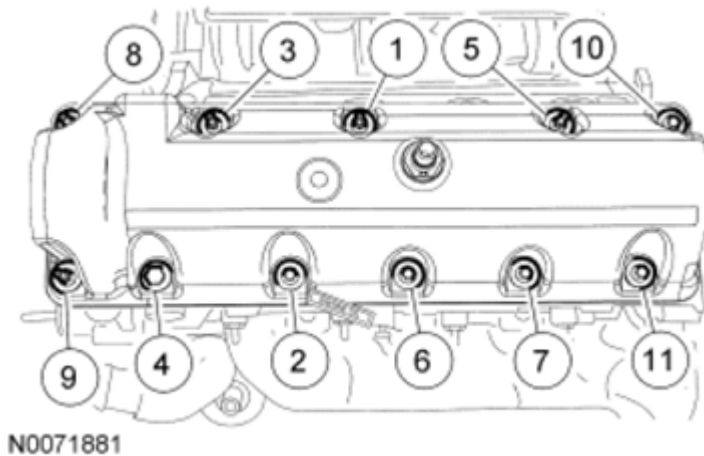
**Fig. 499: Locating Bolt And Accessory Drive Belt Idler Pulley**  
Courtesy of FORD MOTOR CO.

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



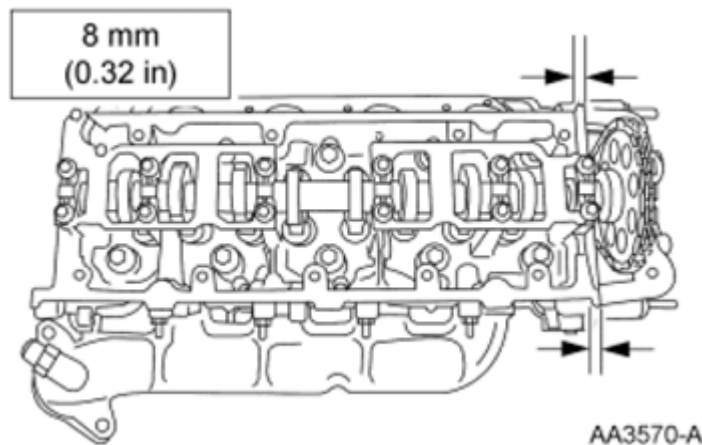
**Fig. 500: Identifying Sealant Clearance**  
Courtesy of FORD MOTOR CO.

50. Apply sealant in 2 places where the engine front cover meets the cylinder head.
51. Install the new valve cover gasket into the valve cover and position on the cylinder head. Tighten the bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



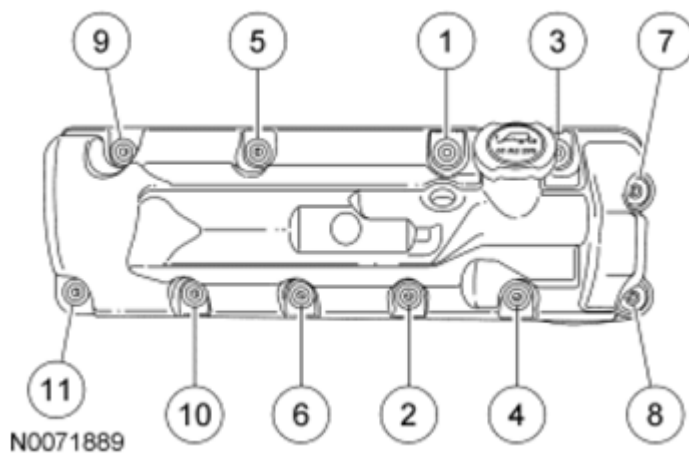
**Fig. 501: Identifying LH Valve Cover Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

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



**Fig. 502: Identifying Silicone Gasket And Sealant Clearance**  
Courtesy of FORD MOTOR CO.

52. Apply sealant in 2 places where the engine front cover meets the cylinder head.
53. Install the gasket into the valve cover and position on the cylinder head. Tighten the bolts in the sequence shown in illustration.
  - Tighten to 10 Nm (89 lb-in).



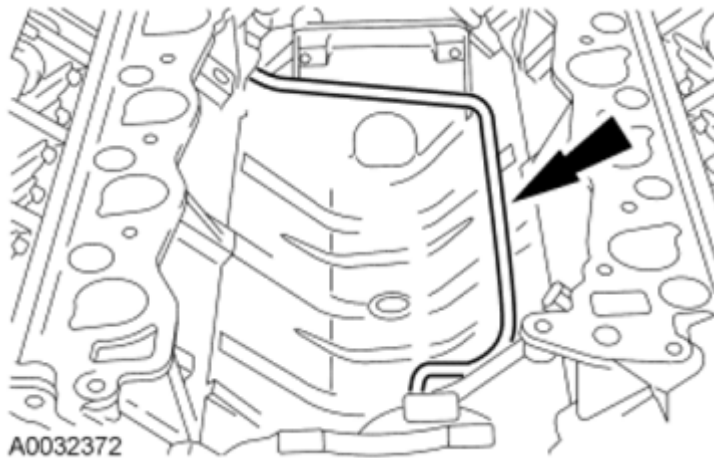
**Fig. 503: Identifying Valve Cover Fasteners In Sequence**  
Courtesy of FORD MOTOR CO.

54. Inspect the O-ring seals. Install new seals if necessary.



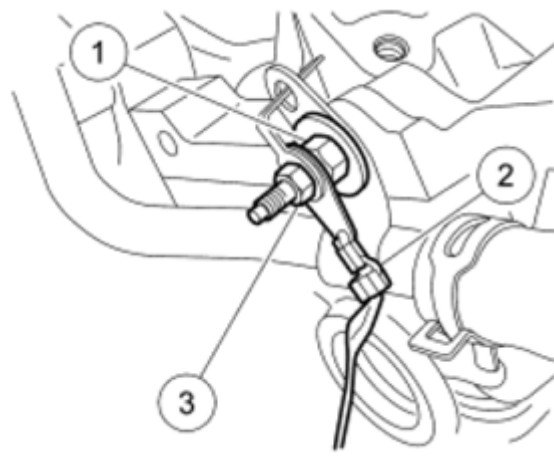
**Fig. 504: Locating O-Ring Seals**  
Courtesy of FORD MOTOR CO.

55. Install the coolant bypass tube.



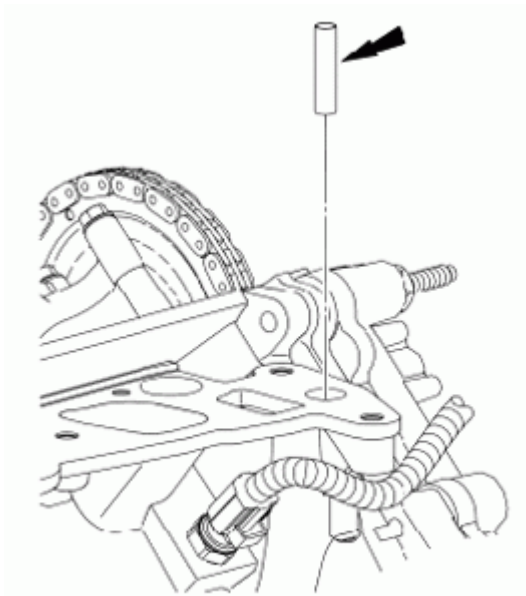
**Fig. 505: Locating Coolant Bypass Tube**  
Courtesy of FORD MOTOR CO.

56. Install the ground strap on the rear of the RH cylinder head.
  1. Install the stud bolt and tighten to 25 Nm (18 lb-ft).
  2. Install the ground strap.
  3. Install the retaining nut and tighten to 10 Nm (89 lb-in).



**Fig. 506: Identifying Ground Strap**  
Courtesy of FORD MOTOR CO.

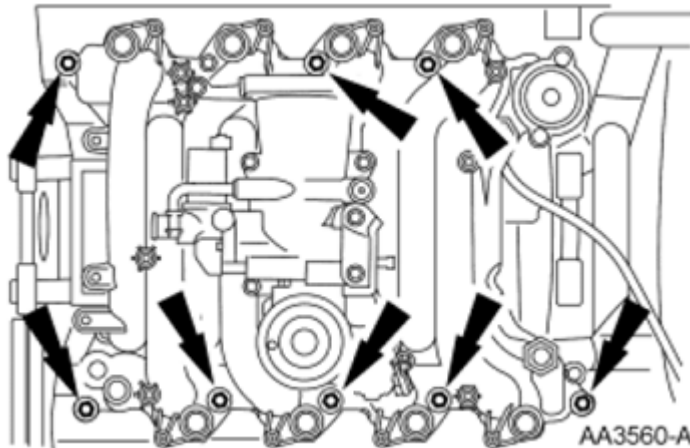
57. Install the insert into the LH cylinder head.



N0094082

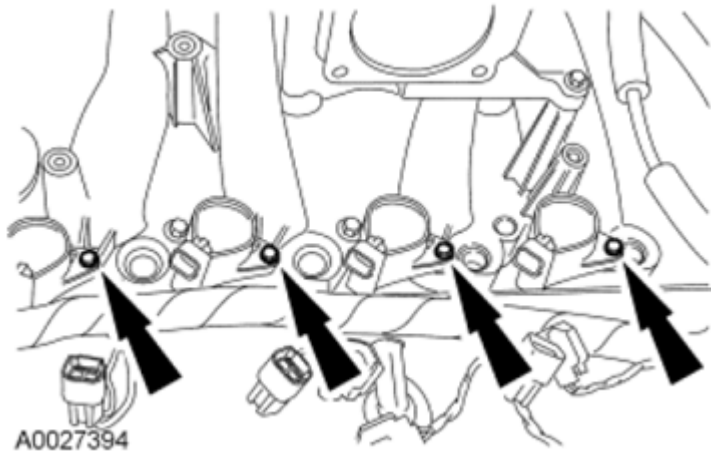
**Fig. 507: Locating Cylinder Head Insert**  
Courtesy of FORD MOTOR CO.

**NOTE:** Align the gasket locator tabs to slots in cylinder head.



**Fig. 508: Locating Bolts And Intake Manifold**  
Courtesy of FORD MOTOR CO.

58. Install the new intake manifold gaskets, intake manifold and hand-tighten the bolts at the locations shown in illustration.
59. Install the 8 ignition coils and tighten the 8 bolts (4 shown in illustration).
  - Tighten to 6 Nm (53 lb-in).



**Fig. 509: Locating Bolts And Ignition Coils**  
Courtesy of FORD MOTOR CO.

60. Install the intake manifold bracket and loosely install the bolt and the stud bolt.



**Fig. 510: Locating Intake Manifold Crash Bracket Bolt**  
Courtesy of FORD MOTOR CO.

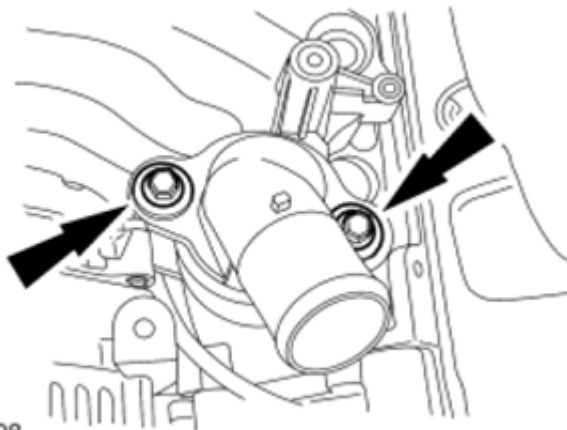
61. Install the thermostat.



A0027409

**Fig. 511: Identifying Thermostat**  
Courtesy of FORD MOTOR CO.

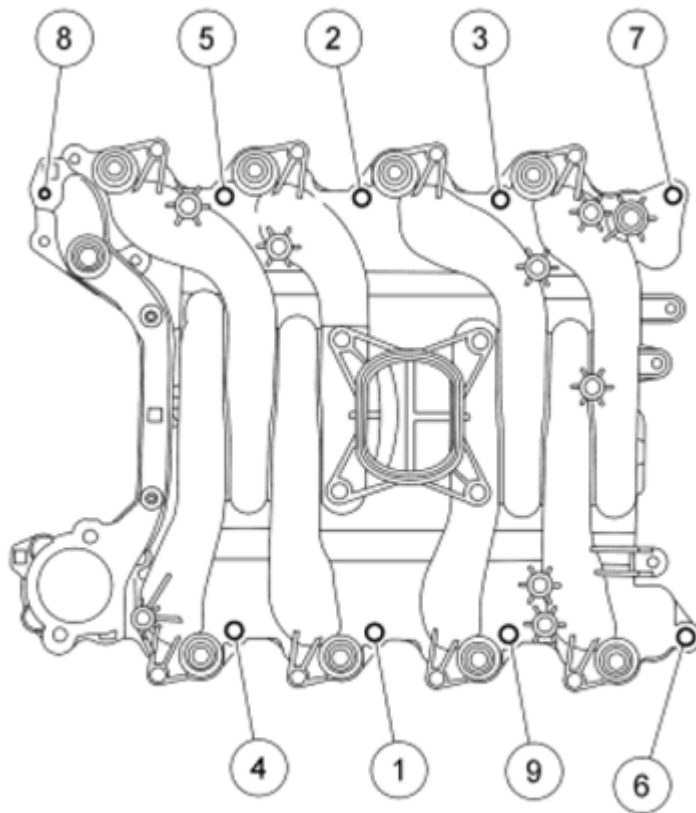
62. Install the coolant outlet adapter and loosely install the 2 bolts.



A0027408

**Fig. 512: Locating Coolant Outlet Adapter Bolts**  
Courtesy of FORD MOTOR CO.

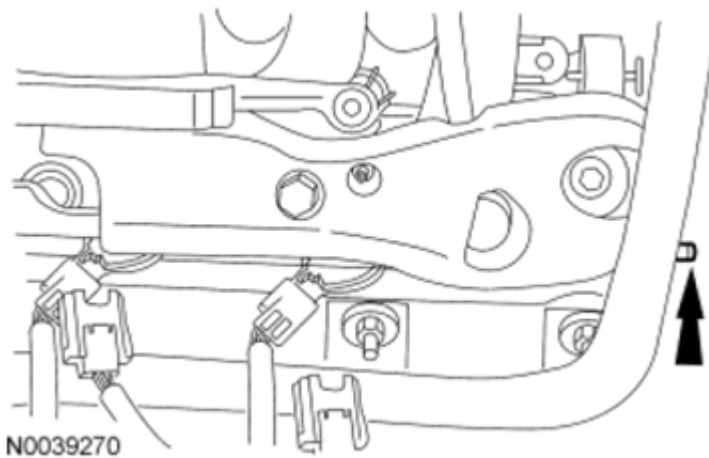
63. Tighten the bolts in the sequence shown in illustration.
- Tighten to 25 Nm (18 lb-ft).



N0037509

**Fig. 513: Identifying Intake Manifold Bolts In Sequence**  
Courtesy of FORD MOTOR CO.

64. Tighten the stud bolt.
  - Tighten to 25 Nm (18 lb-ft).

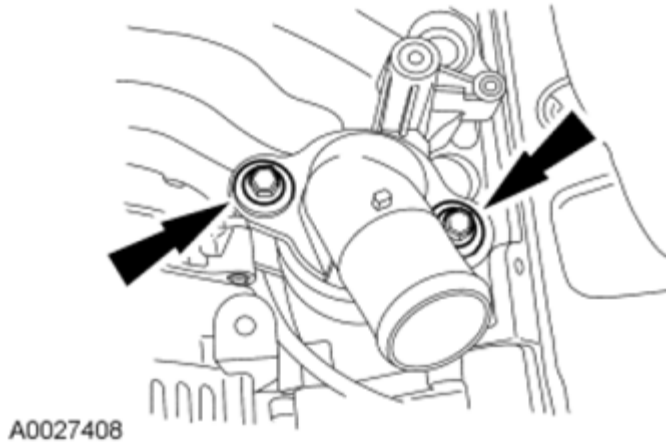


N0039270

**Fig. 514: Locating Stud Bolt**  
Courtesy of FORD MOTOR CO.

65. Tighten the bolts.

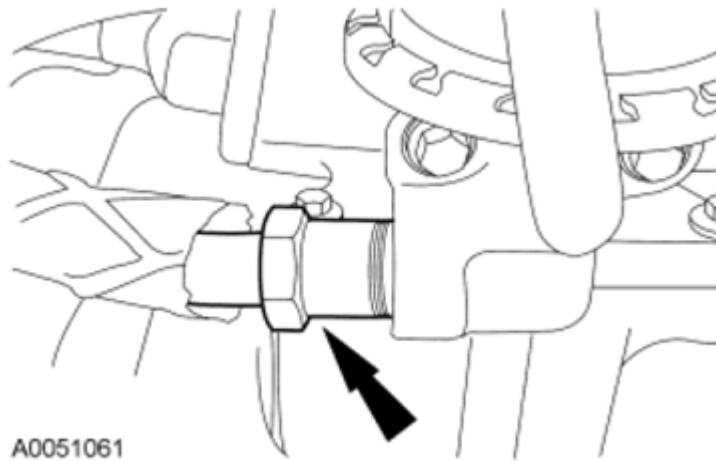
- Tighten to 25 Nm (18 lb-ft).



**Fig. 515: Locating Coolant Outlet Adapter Bolts**  
Courtesy of FORD MOTOR CO.

66. Connect the EGR tube to the EGR valve.

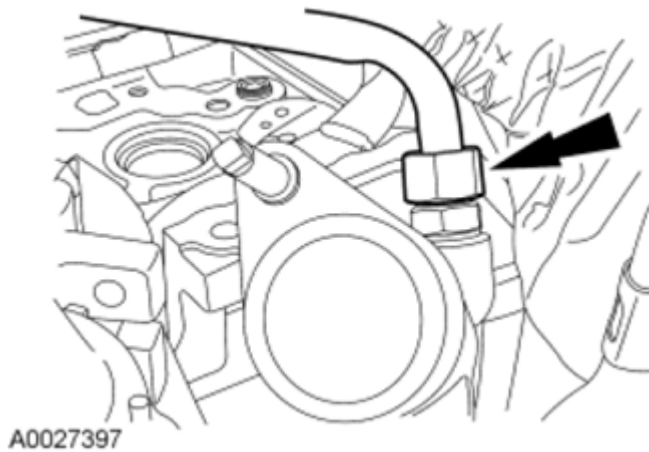
- Tighten to 43 Nm (32 lb-ft).



**Fig. 516: Locating EGR Tube Nut**  
Courtesy of FORD MOTOR CO.

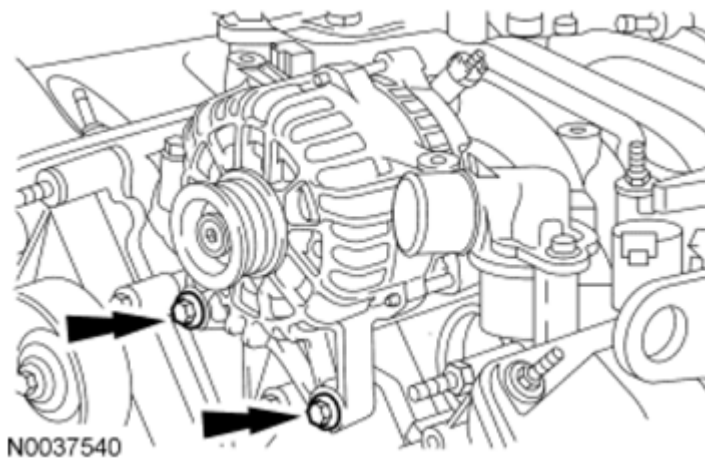
67. Connect the EGR tube-to-exhaust manifold connector.

- Tighten to 43 Nm (32 lb-ft).



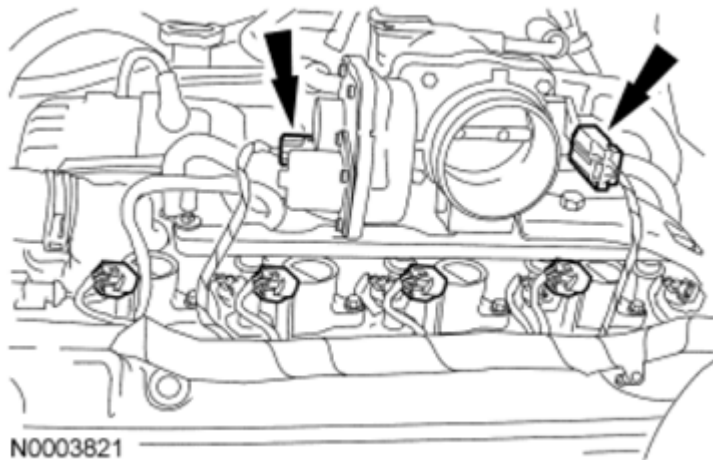
**Fig. 517: Locating EGR Tube-To-Exhaust Manifold Connector**  
Courtesy of FORD MOTOR CO.

68. Position the fuel charging wiring at 2 locations at the back of the intake manifold.
69. Install the generator and the 2 bolts.
  - Tighten to 25 Nm (18 lb-ft).



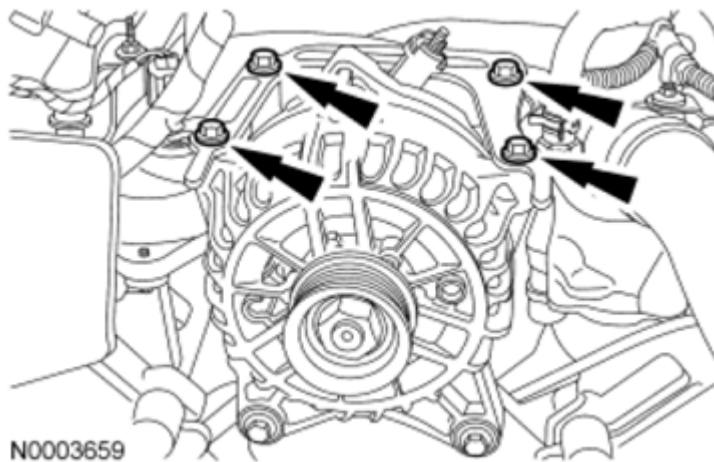
**Fig. 518: Locating Generator And Bolts**  
Courtesy of FORD MOTOR CO.

70. Connect the throttle control and the Throttle Position (TP) sensor electrical connector.



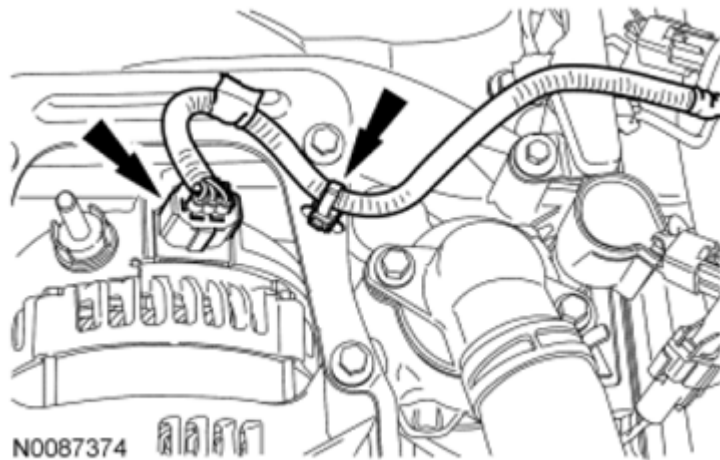
**Fig. 519: Locating Throttle Control And Throttle Positioning Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

71. Install the generator mounting bracket and the 4 bolts.
- Tighten to 10 Nm (89 lb-in).



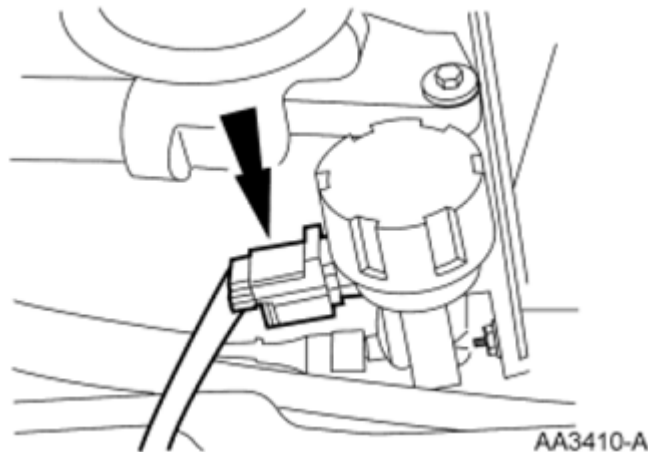
**Fig. 520: Locating Generator Mounting Bracket And Bolts**  
Courtesy of FORD MOTOR CO.

72. Attach the wire harness retainer and connect the generator electrical connector.



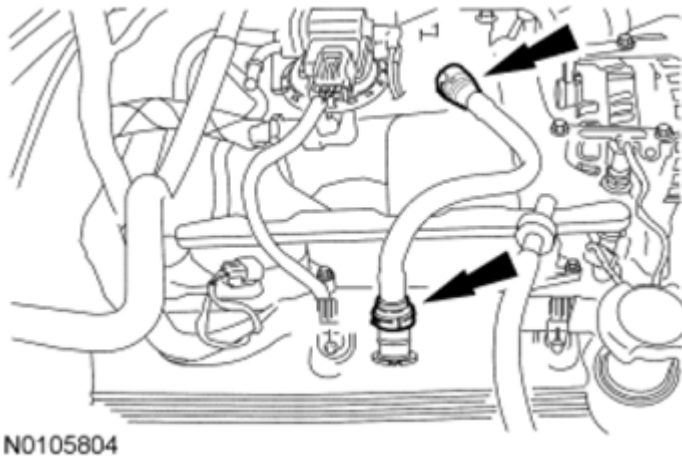
**Fig. 521: Locating Wire Harness Retainer And Generator Electrical Connector**  
Courtesy of FORD MOTOR CO.

73. Connect the electrical connector to the EGR vacuum regulator solenoid.



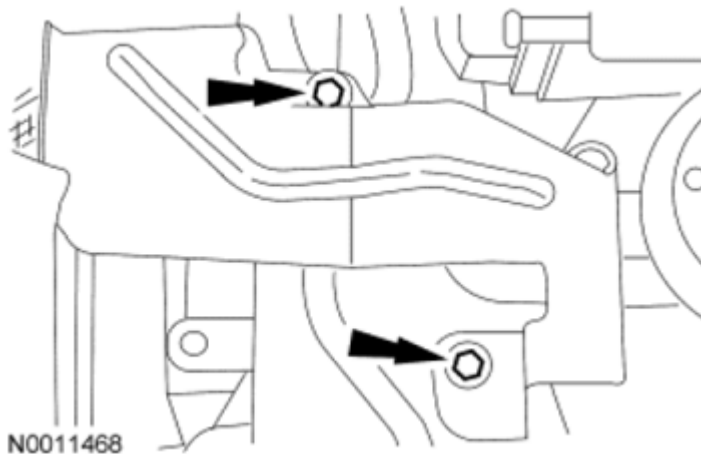
**Fig. 522: Locating Electrical Connector**  
Courtesy of FORD MOTOR CO.

74. Connect the crankcase ventilation tube.



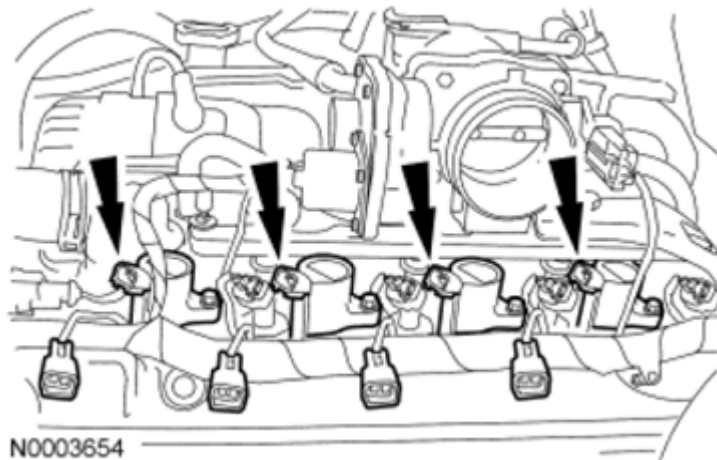
**Fig. 523: Locating Crankcase Ventilation Tube**  
Courtesy of FORD MOTOR CO.

75. Install the intake manifold shield and the 2 bolts.
- Tighten to 10 Nm (89 lb-in).



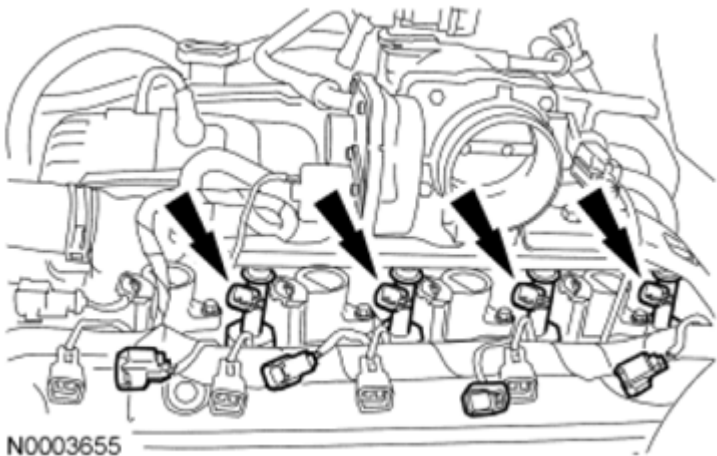
**Fig. 524: Locating Bolts And Intake Manifold Shield**  
Courtesy of FORD MOTOR CO.

76. Connect the 8 fuel injector electrical connectors (4 shown in illustration).



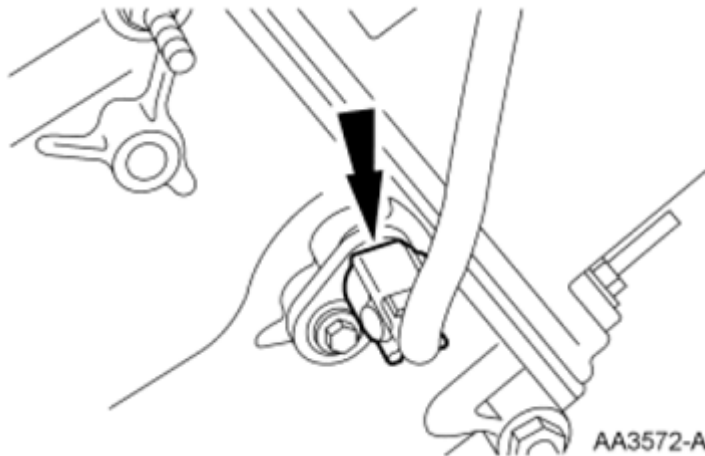
**Fig. 525: Locating Ignition Coil Electrical Connectors**  
Courtesy of FORD MOTOR CO.

77. Connect the 8 ignition coil electrical connectors.



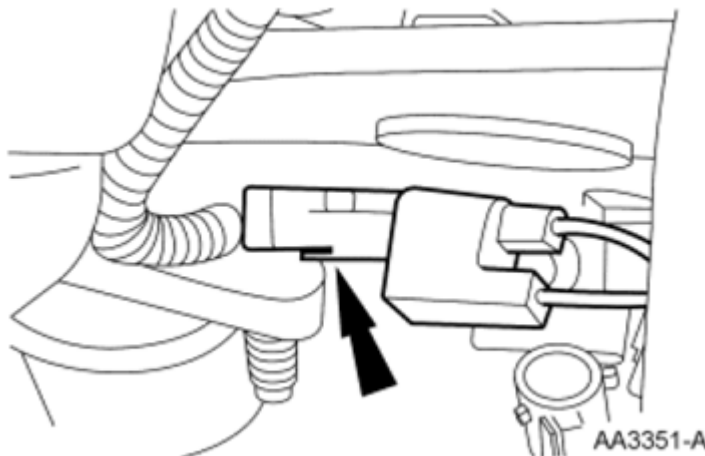
**Fig. 526: Locating Fuel Injector Electrical Connectors**  
Courtesy of FORD MOTOR CO.

78. Connect the Camshaft Position (CMP) sensor electrical connector.



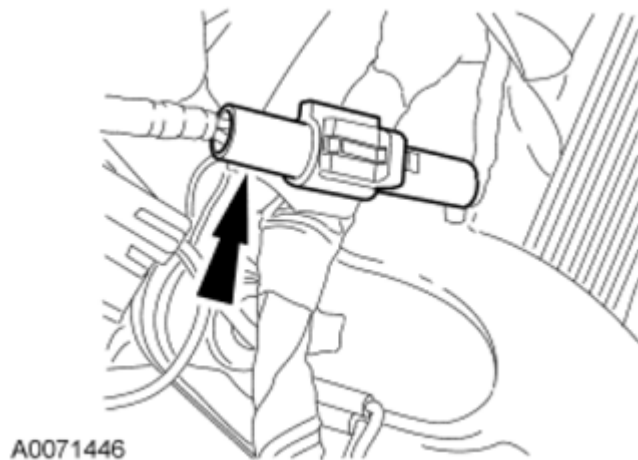
**Fig. 527: Locating Camshaft Position (CMP) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

79. Connect the radio interference capacitor electrical connector.



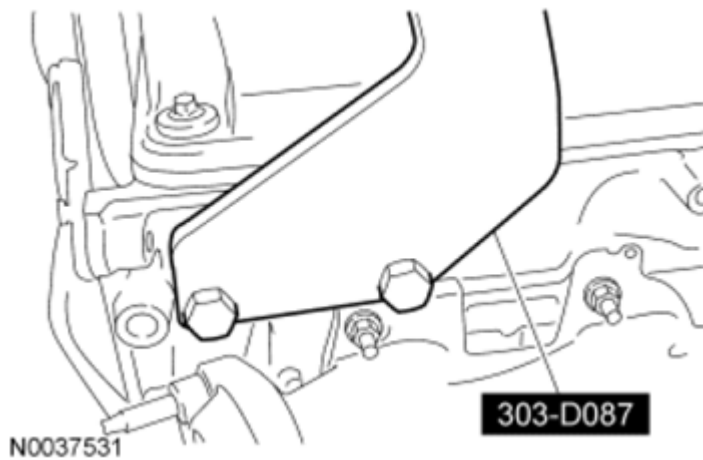
**Fig. 528: Locating Radio Interference Capacitor Electrical Connector**  
Courtesy of FORD MOTOR CO.

80. Connect the Cylinder Head Temperature (CHT) sensor electrical connector.



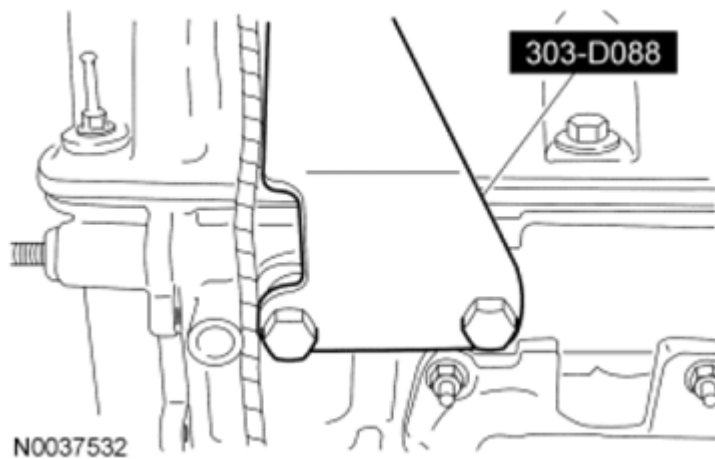
**Fig. 529: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

81. Install the battery cables and the bolt.
82. Install the Engine Lifting Bracket to the RH cylinder head.



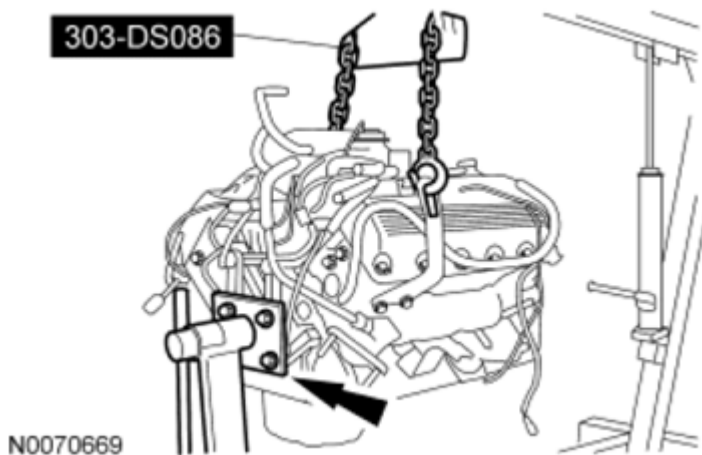
**Fig. 530: Identifying Engine Lifting Bracket (303-D087)**  
Courtesy of FORD MOTOR CO.

83. Install the Engine Lifting Bracket to the LH cylinder head.



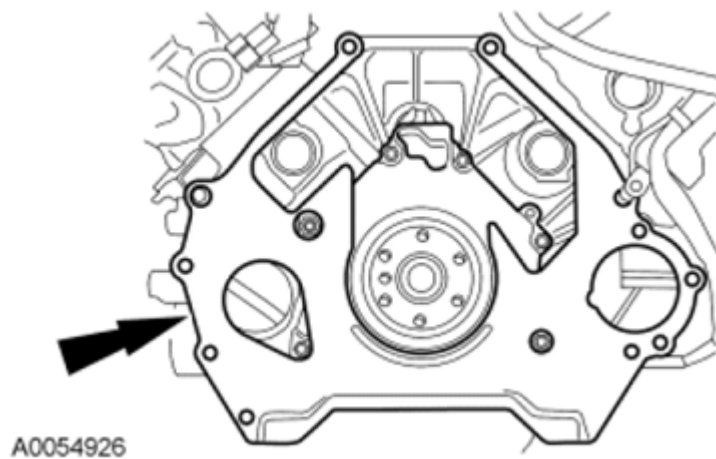
**Fig. 531: Identifying Engine Lifting Bracket (303-D088)**  
Courtesy of FORD MOTOR CO.

84. Using the Engine Lifting Bracket Set, remove the engine from the engine stand.



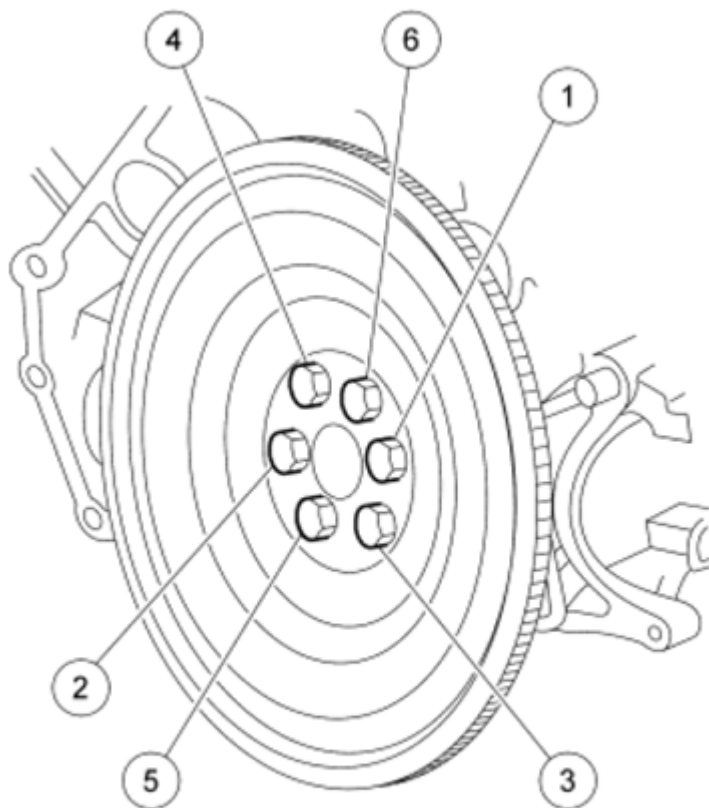
**Fig. 532: Identifying Engine Lifting Bracket Set (303-DS086)**  
Courtesy of FORD MOTOR CO.

85. Install the engine/transmission spacer plate.



**Fig. 533: Locating Engine/Transmission Spacer Plate**  
Courtesy of FORD MOTOR CO.

86. Position the flexplate and install the bolts in the sequence shown in illustration.
- Tighten to 80 Nm (59 lb-ft).



N0071888

**Fig. 534: Identifying Flexplate Bolts In Sequence**

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis

Courtesy of FORD MOTOR CO.

87. Install the engine. For additional information, refer to **ENGINE**.

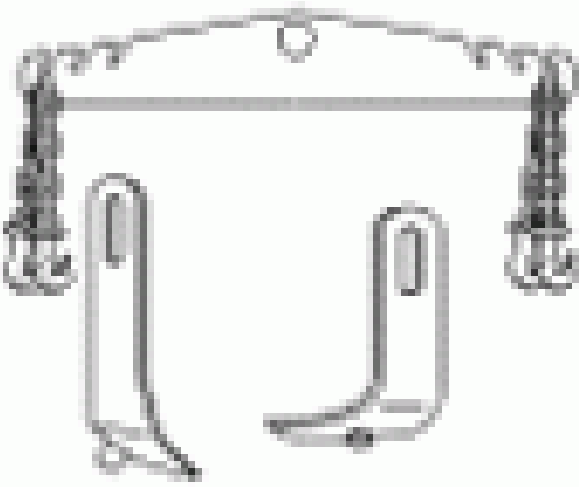
**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

88. If equipped with a fire suppression system, repower the system

### ENGINE

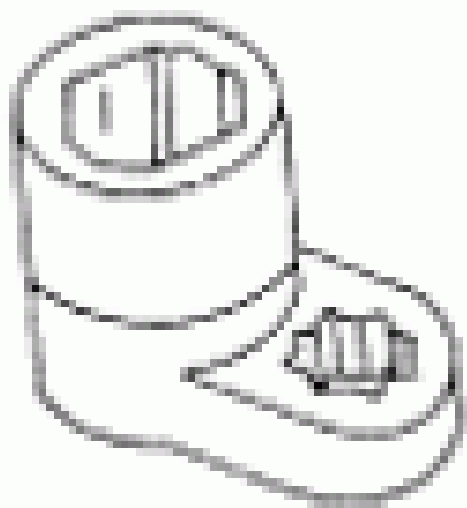
#### Special Tool(s)

#### SPECIAL TOOL CHART

|                                                                                                    |                                                                              |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|  <p>ST2443-A</p> | <p>Lifting Bracket Set, Engine<br/>303-DS086 (D93P-6001-A) or equivalent</p> |
|                                                                                                    | <p>Socket, Exhaust Gas Oxygen Sensor<br/>303-476 (T94P-9472-A)</p>           |

## 2010 Mercury Grand Marquis LS

2010 ENGINE Engine - 4.6L (2V) - Crown Victoria & Grand Marquis



**ST1448-A**

### Material

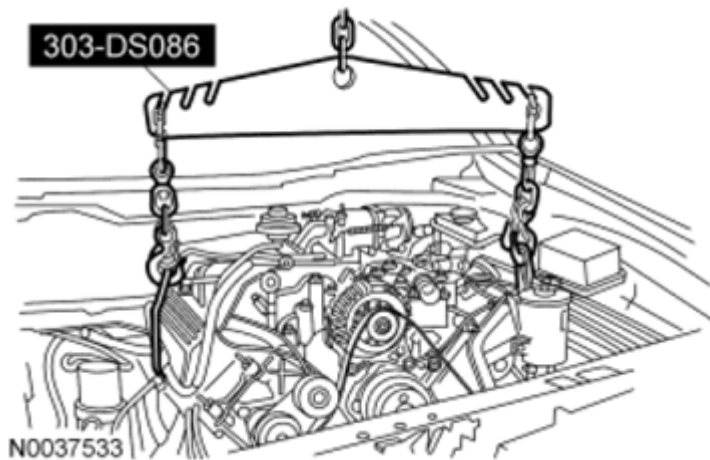
#### MATERIAL SPECIFICATIONS

| Item                                                                                                                                                           | Specification |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| High Temperature Nickel Anti-Seize Lubricant XL-2                                                                                                              | ESE-M12A4-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  |

### Installation

**WARNING:** Before servicing a vehicle equipped with a fire suppression system, depower the system by following the procedure in **FIRE SUPPRESSION SYSTEM** . Failure to follow the instructions may result in serious personal injury.

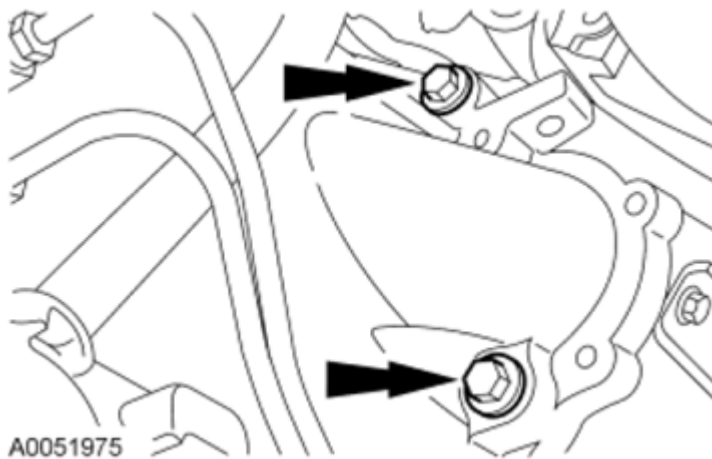
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Using the Engine Lifting Bracket Set, install the engine assembly in the vehicle.



**Fig. 535: Identifying Engine Lifting Bracket Set (303-DS086)**  
Courtesy of FORD MOTOR CO.

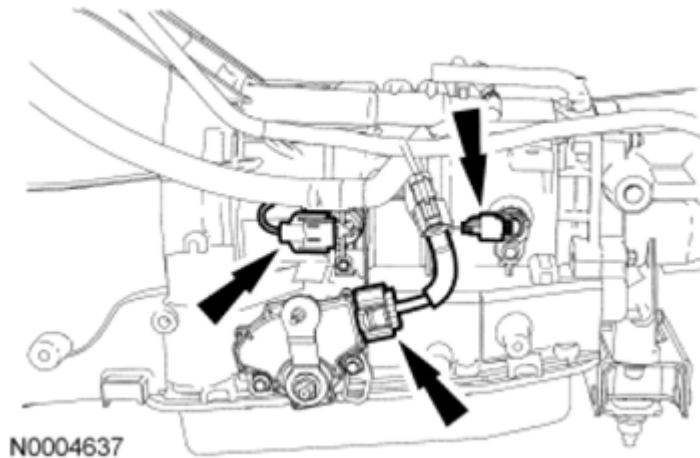
**NOTE:** When vehicle is raised, verify that the torque converter is correctly seated.

3. Install the 4 transmission bellhousing bolts (2 shown in illustration) and 1 stud.
  - Tighten to 48 Nm (35 lb-ft).



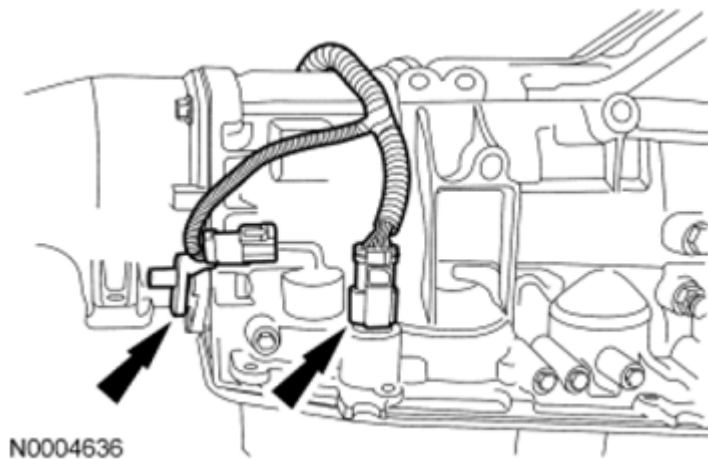
**Fig. 536: Locating Transmission Bellhousing Bolts**  
Courtesy of FORD MOTOR CO.

4. Attach the wiring harness to the retainers on the transmission.
5. Connect the Output Shaft Speed (OSS) sensor, Transmission Range (TR) sensor and the Turbine Shaft Speed (TSS) sensor electrical connectors.



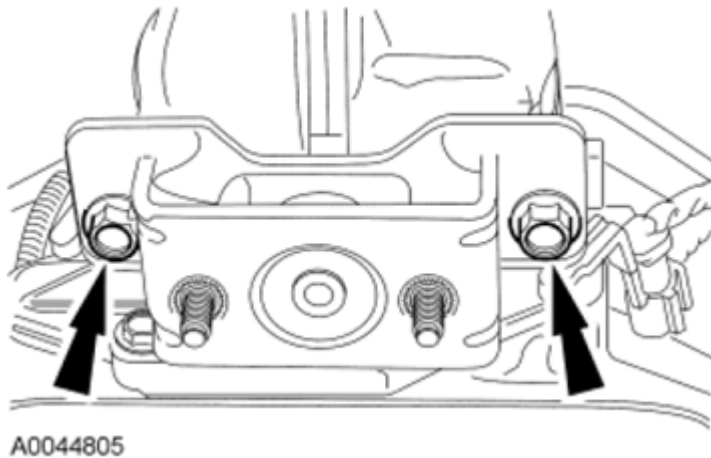
**Fig. 537: Locating Output Shaft Speed (OSS) Sensor, Transmission Range (TR) Sensor And Turbine Shaft Speed (TSS) Sensor Electrical Connectors**  
Courtesy of FORD MOTOR CO.

6. Connect the Heated Oxygen Sensor (HO2S) and the solenoid body sensor electrical sensors.



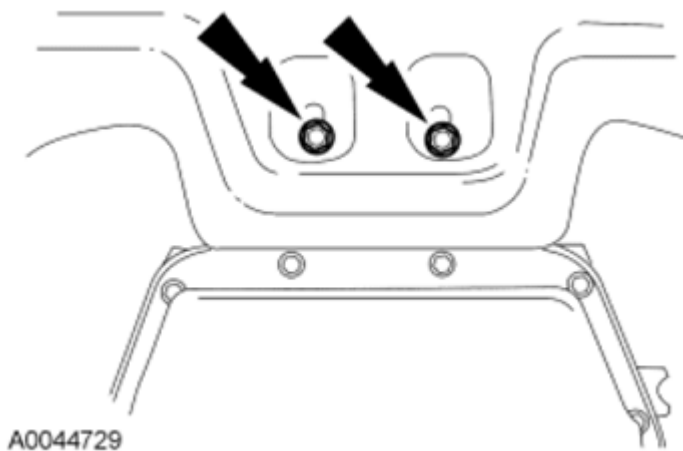
**Fig. 538: Locating Heated Oxygen Sensor (HO2S) And Solenoid Body Sensor Electrical Sensors**  
Courtesy of FORD MOTOR CO.

7. Raise the transmission and install the transmission insulator.
8. Install the 2 insulator bolts.
  - Tighten to 90 Nm (66 lb-ft).



**Fig. 539: Locating Insulator Bolts**  
Courtesy of FORD MOTOR CO.

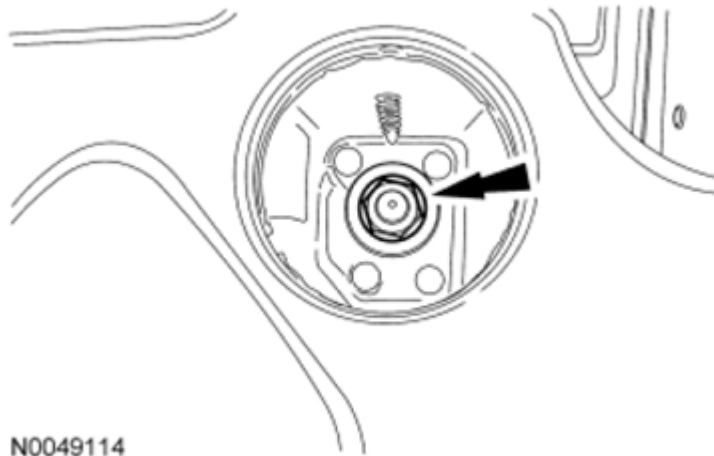
9. Lower the transmission and install the 2 transmission insulator nuts.
  - Tighten to 30 Nm (22 lb-ft).



**Fig. 540: Locating Transmission Insulator Nuts**  
Courtesy of FORD MOTOR CO.

**NOTE:** LH shown in illustration, RH similar.

10. Install the 2 engine mount nuts.
  - Tighten to 90 Nm (66 lb-ft).

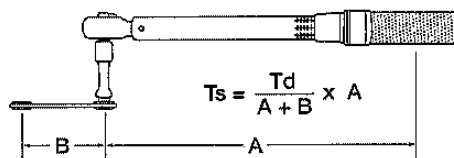
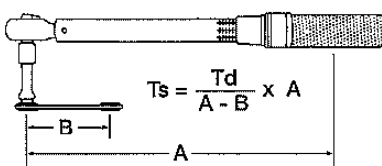
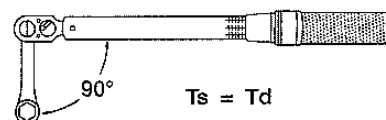
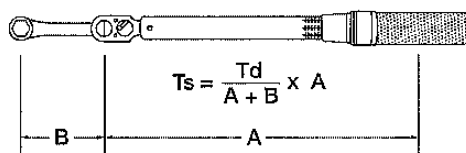
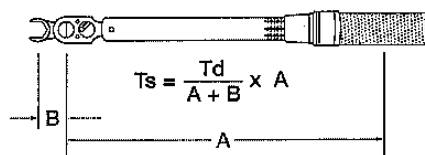
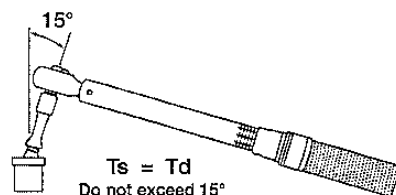
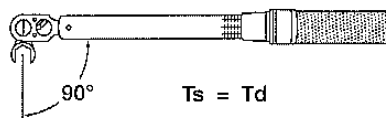
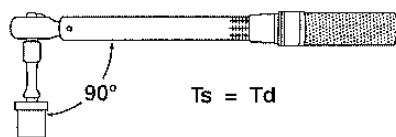


**Fig. 541: Locating Engine Mount Nuts**  
Courtesy of FORD MOTOR CO.

**NOTE:**        **Apply a light coat of anti-seize lubricant to the threads of the HO2S .**

11. Using the Exhaust Gas Oxygen Sensor Socket, install the **HO2S** .
  - Calculate the correct torque wrench setting for the following torque. For additional information, refer to the illustration.

## Torque Wrench Adapter Formulas



### TORQUE FORMULA LEGEND

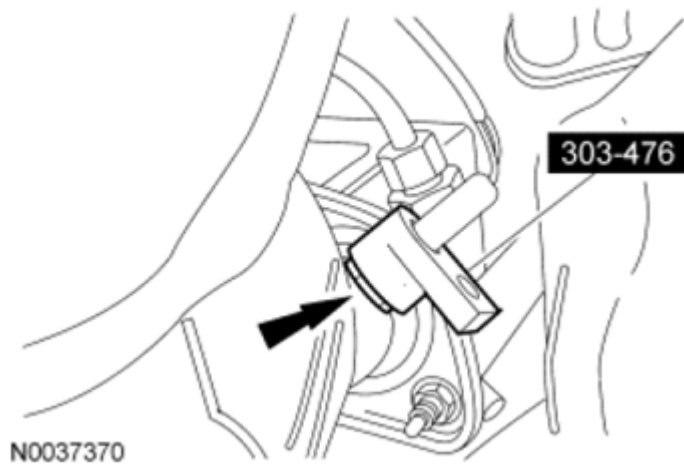
$T_s$  = Torque wrench setting  
 $T_d$  = Fastener torque desired

A = Torque wrench length  
B = Torque adapter length

G00468730

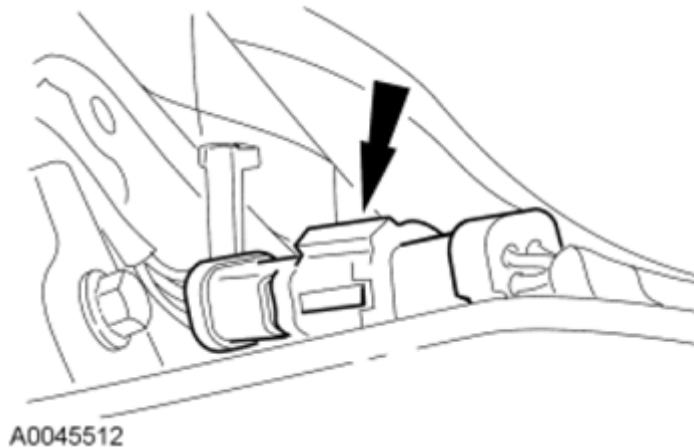
**Fig. 542: Identifying Torque Wrench Adapter Formulas**  
Courtesy of FORD MOTOR CO.

- Tighten to 40 Nm (30 lb-ft).



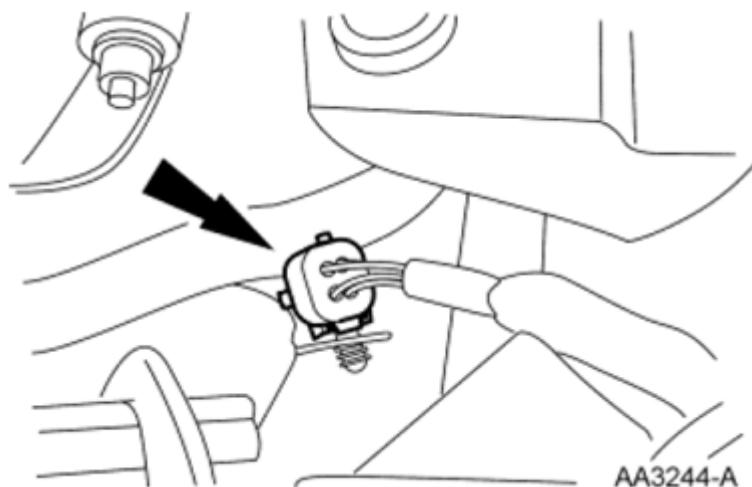
**Fig. 543: Identifying Exhaust Gas Oxygen Sensor Socket (303-476)**  
Courtesy of FORD MOTOR CO.

12. Connect the LH **HO2S** electrical connector.



**Fig. 544: Locating LH HO2S Electrical Connector**  
Courtesy of FORD MOTOR CO.

13. Connect the RH **HO2S** electrical connector.



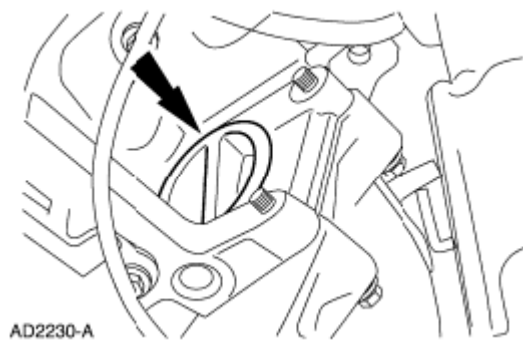
**Fig. 545: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connectors**  
Courtesy of FORD MOTOR CO.

14. Install the 4 torque converter nuts.
  - Rotate the crankshaft to access the nuts.
  - Tighten to 36 Nm (27 lb-ft).



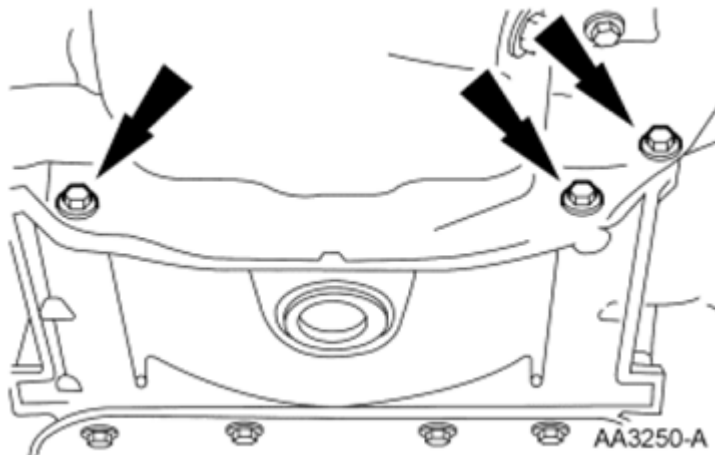
**Fig. 546: Locating Torque Converter Nuts**  
Courtesy of FORD MOTOR CO.

15. Install the rubber access plug.



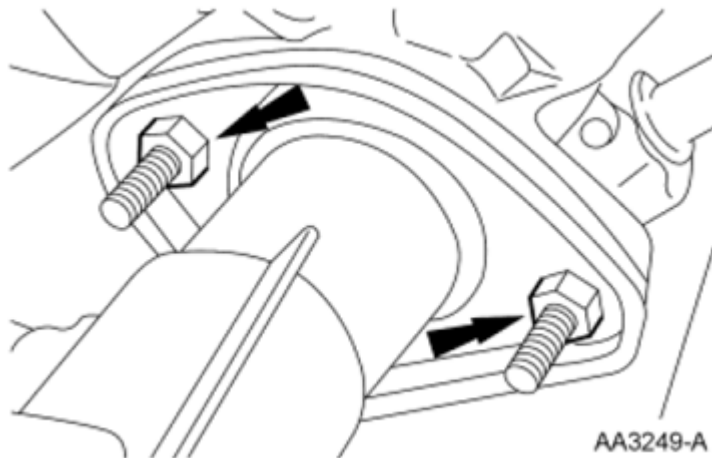
**Fig. 547: Locating Rubber Access Plug**  
Courtesy of FORD MOTOR CO.

16. Install the inspection cover and the 3 bolts.
  - Tighten to 19 Nm (168 lb-in).



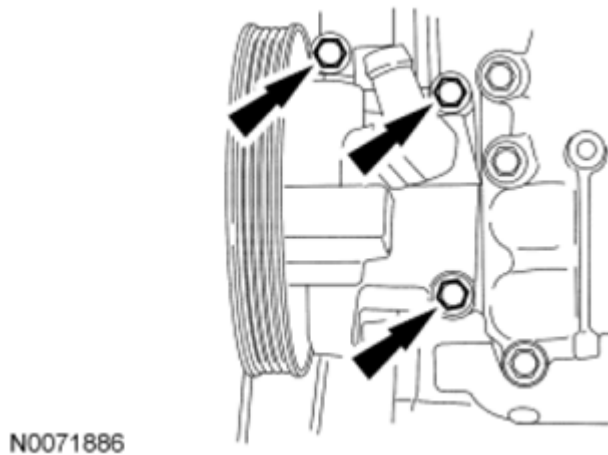
**Fig. 548: Locating Inspection Cover And Bolts**  
Courtesy of FORD MOTOR CO.

17. Install the starter motor. For additional information, refer to **STARTING SYSTEM**.
18. Position the exhaust, install the 4 new nuts and remove the support.
  - Tighten to 48 Nm (35 lb-ft).



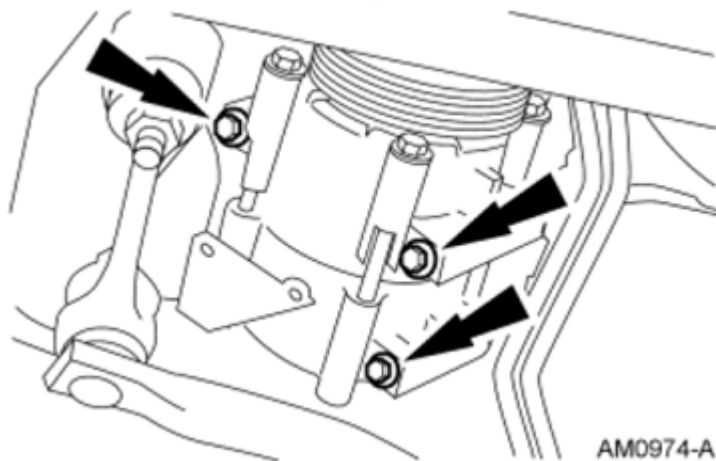
**Fig. 549: Locating Exhaust Nuts**  
Courtesy of FORD MOTOR CO.

19. Install the power steering pump and the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).



**Fig. 550: Locating Power Steering Pump And Bolts**  
Courtesy of FORD MOTOR CO.

20. Install the A/C compressor and the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).



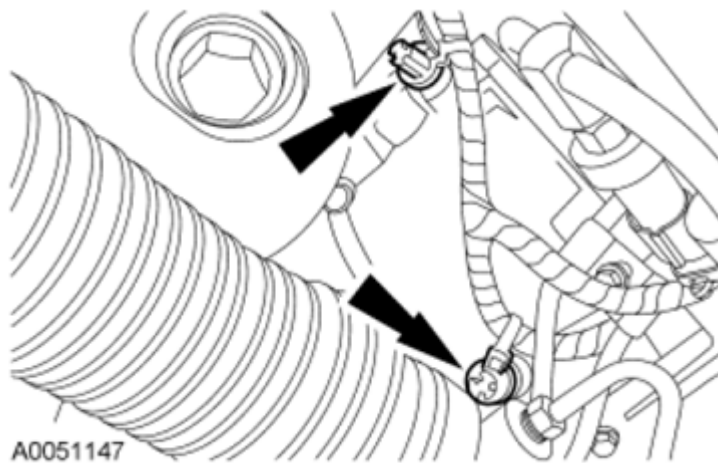
**Fig. 551: Locating A/C Compressor And Bolts**  
Courtesy of FORD MOTOR CO.

21. Connect the A/C compressor electrical connector.



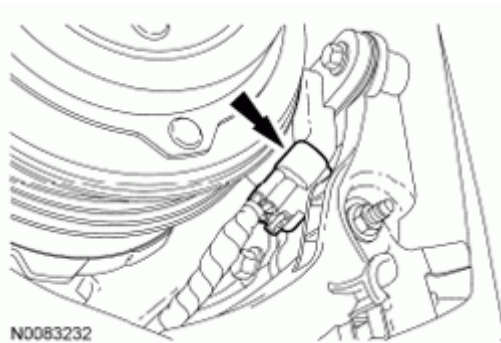
**Fig. 552: Locating A/C Compressor Electrical Connector**  
Courtesy of FORD MOTOR CO.

22. Connect the engine wiring harness retainers to the A/C compressor.



**Fig. 553: Locating Engine Wiring Harness Retainers**  
Courtesy of FORD MOTOR CO.

23. Connect the Crankshaft Position (CKP) sensor electrical connector.



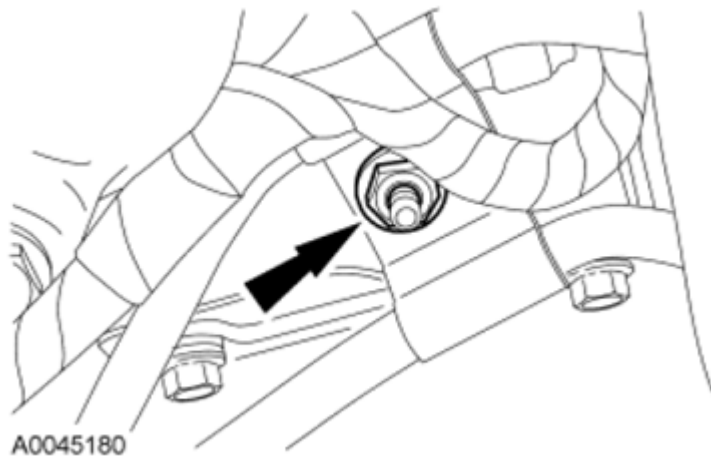
**Fig. 554: Locating Crankshaft Position (CKP) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

24. Position the transmission oil cooler tube bracket and install the bolt.
- Tighten to 15 Nm (133 lb-in).



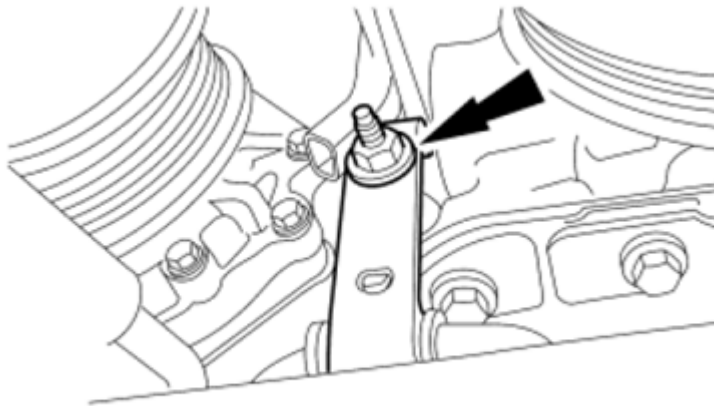
**Fig. 555: Locating Transmission Oil Cooler Tube Bracket Bolt**  
Courtesy of FORD MOTOR CO.

25. Install the transmission cooler tube support bracket.
- Tighten to 9 Nm (80 lb-in).



**Fig. 556: Locating Nut And Transmission Cooler Tube Support Bracket**  
Courtesy of FORD MOTOR CO.

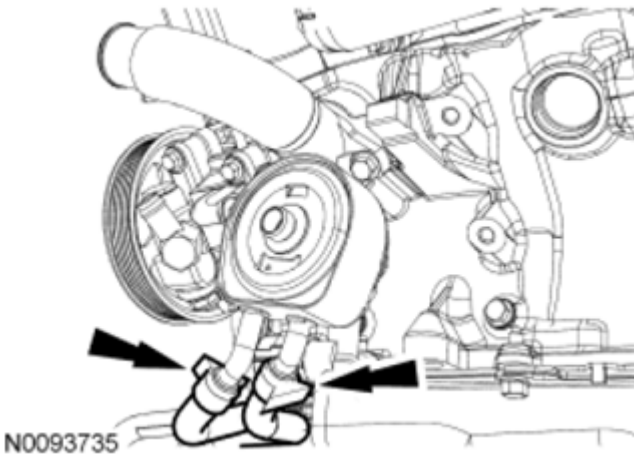
26. Install the power steering tube bracket.
- Tighten to 10 Nm (89 lb-in).



A0050112

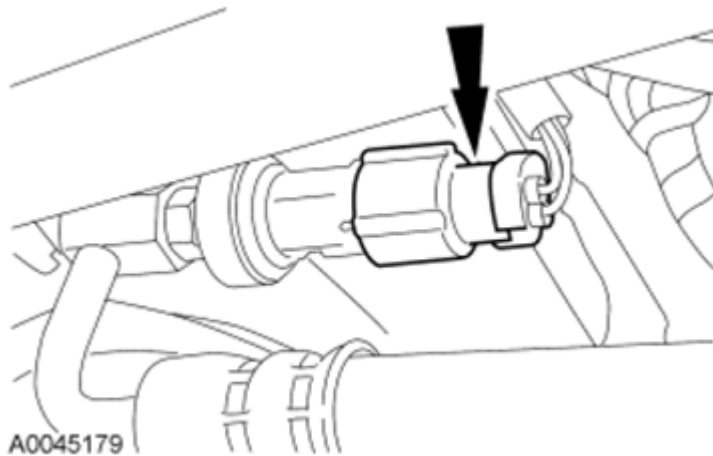
**Fig. 557: Locating Power Steering Tube Bracket**  
Courtesy of FORD MOTOR CO.

27. If equipped, connect the 2 coolant hoses to the oil cooler.
- Align the white lines on the coolant hoses with the black dots on the cooler tubes.



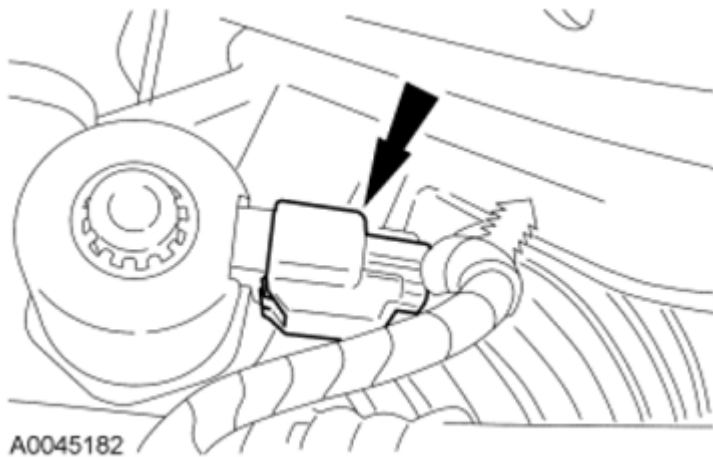
**Fig. 558: Locating Coolant Hoses**  
Courtesy of FORD MOTOR CO.

28. Connect the Power Steering Pressure (PSP) switch electrical connector.



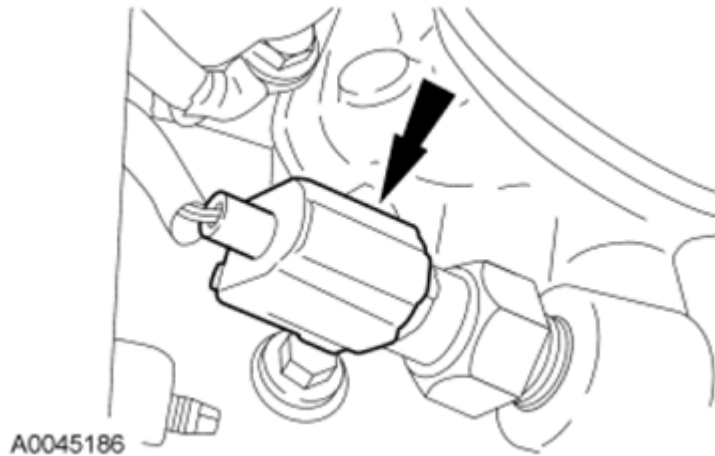
**Fig. 559: Locating Power Steering Pressure (PSP) Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

29. Connect the power steering electrical connector.



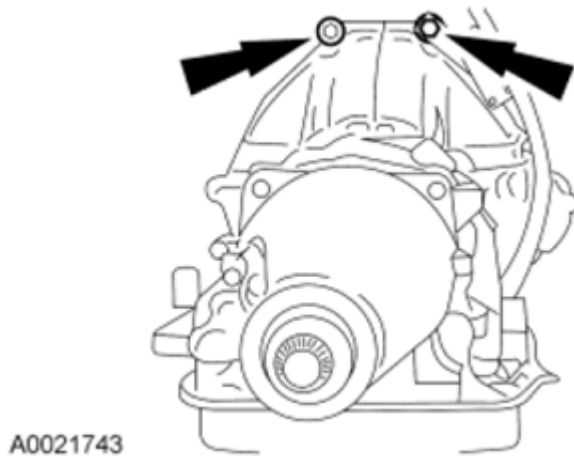
**Fig. 560: Locating Power Steering Electrical Connector**  
Courtesy of FORD MOTOR CO.

30. If equipped, connect the block heater electrical connector.  
31. Connect the **EOP** switch electrical connector.



**Fig. 561: Locating Engine Oil Pressure (EOP) Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

32. Install the 2 top transmission bellhousing bolts.
- Tighten to 48 Nm (35 lb-ft).

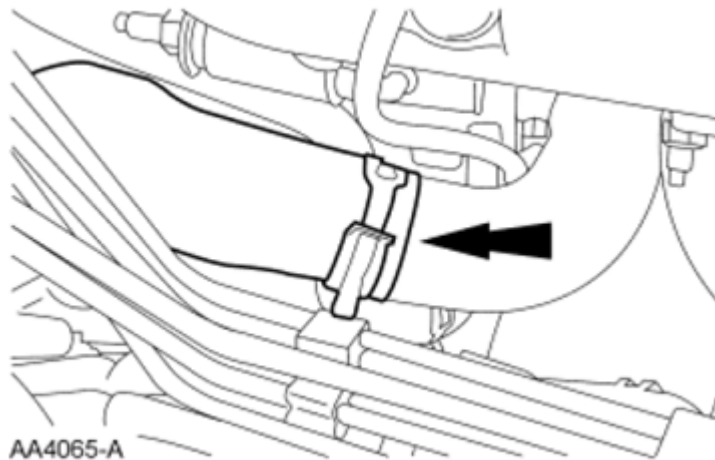


**Fig. 562: Locating Top Transmission Bellhousing Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the oil filter seal with clean engine oil.

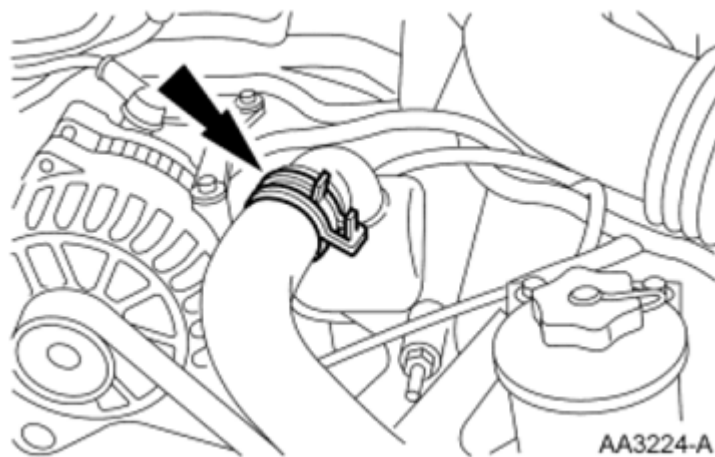
33. Install the oil filter.
34. Install the cooling fan. For additional information, refer to **ENGINE COOLING** .

**NOTE:** Do not reuse hose clamps. Use appropriately sized worm-style clamps in place of the constant tension clamps.



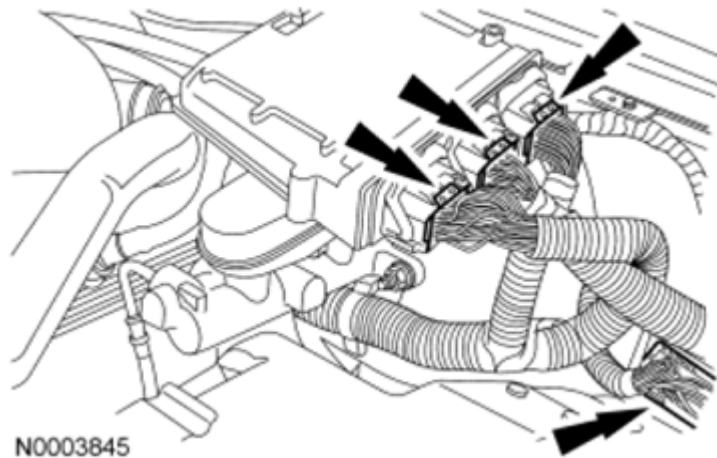
**Fig. 563: Locating Lower Radiator Hose**  
Courtesy of FORD MOTOR CO.

35. Connect the lower radiator hose.
36. Connect the upper radiator hose to the hose connection.



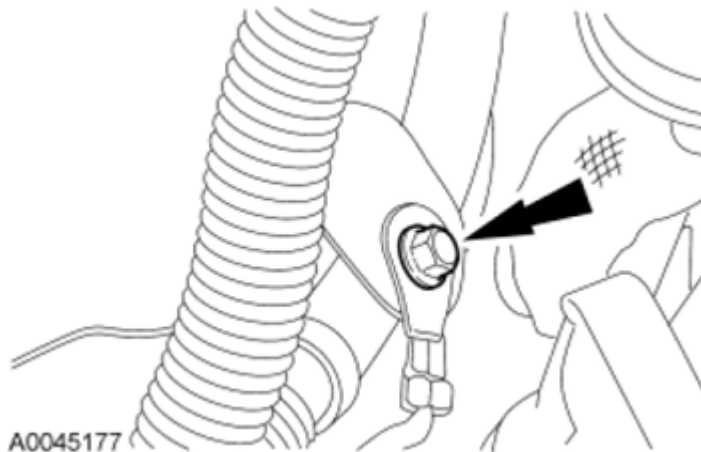
**Fig. 564: Locating Upper Radiator Hose**  
Courtesy of FORD MOTOR CO.

37. Connect the PCM electrical connectors.



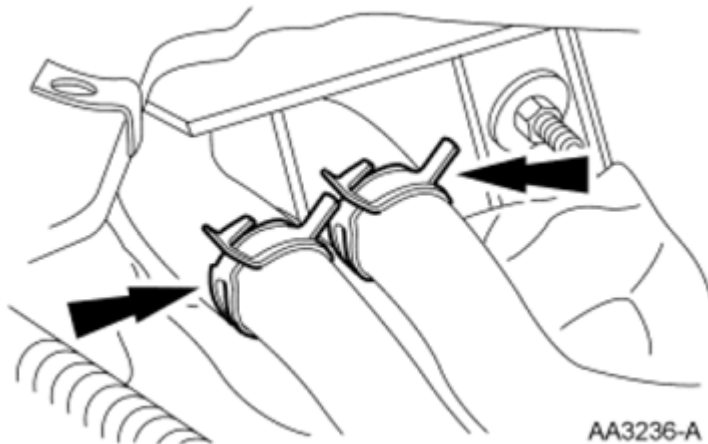
**Fig. 565: Locating PCM Electrical Connectors**  
Courtesy of FORD MOTOR CO.

38. Position the ground strap and install the bolt.
- Tighten to 10 Nm (89 lb-in).



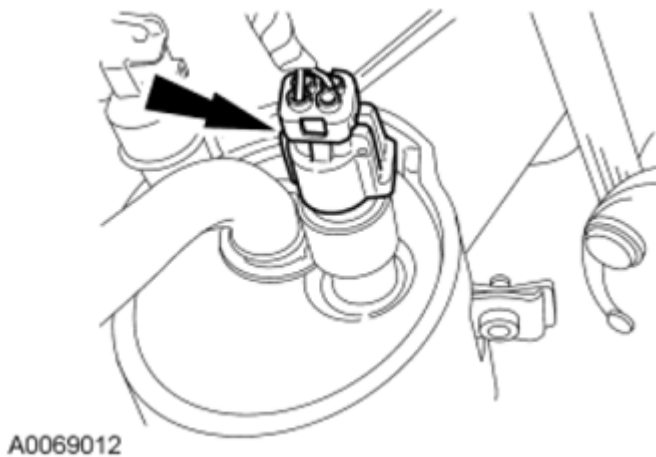
**Fig. 566: Locating Ground Strap And Bolt**  
Courtesy of FORD MOTOR CO.

**NOTE:** Do not reuse hose clamps. Use appropriately sized worm-style clamps in place of the constant tension clamps.



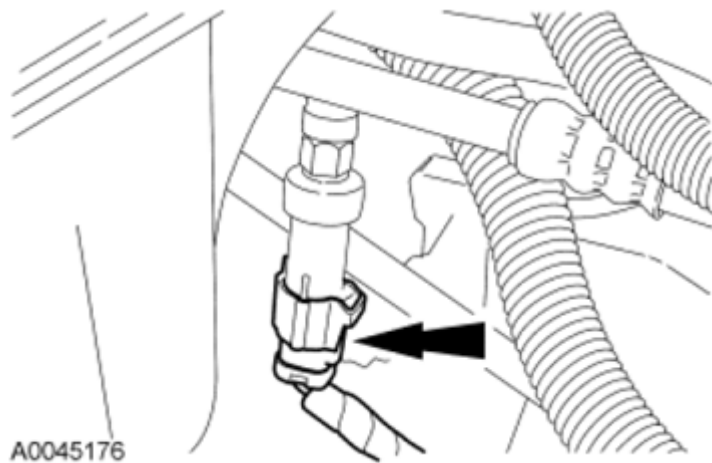
**Fig. 567: Locating Heater Hoses**  
Courtesy of FORD MOTOR CO.

39. Connect the heater hoses.
40. Connect the A/C low charge protection switch electrical connector.



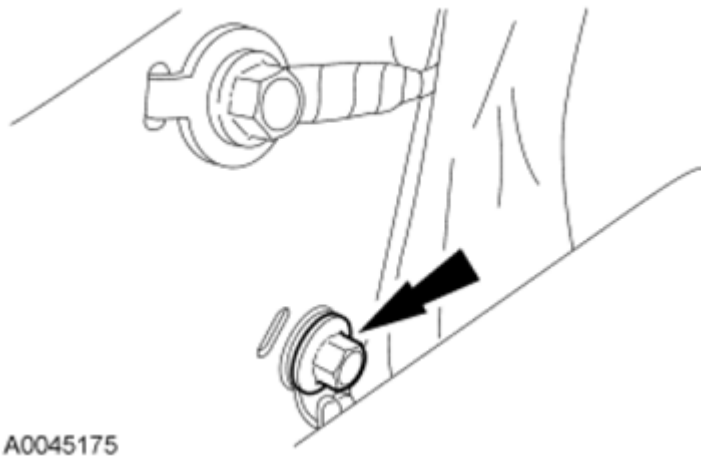
**Fig. 568: Locating A/C Low Charge Protection Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

41. Connect the A/C electrical connector.



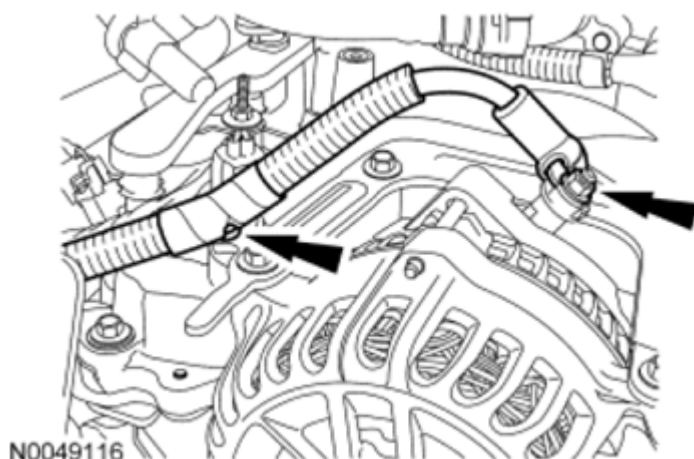
**Fig. 569: Locating A/C Electrical Connector**  
Courtesy of FORD MOTOR CO.

42. Install the ground strap and the bolt.
- Tighten to 10 Nm (89 lb-in).



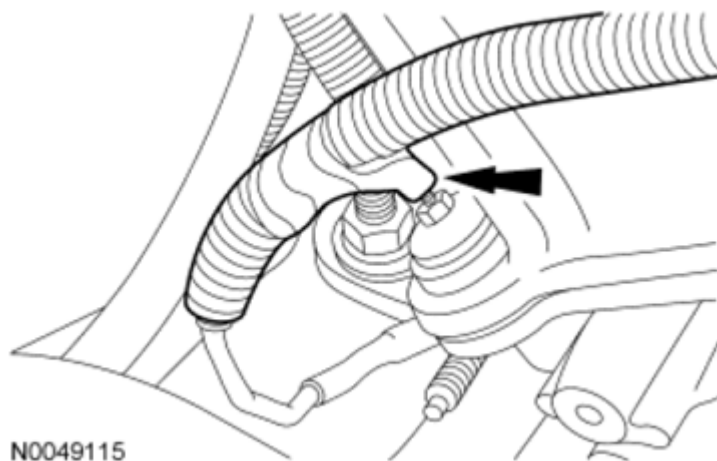
**Fig. 570: Locating Ground Strap And Bolt**  
Courtesy of FORD MOTOR CO.

43. Attach the pin-type retainer and install the generator battery cable and nut.
- Tighten to 9 Nm (80 lb-in).



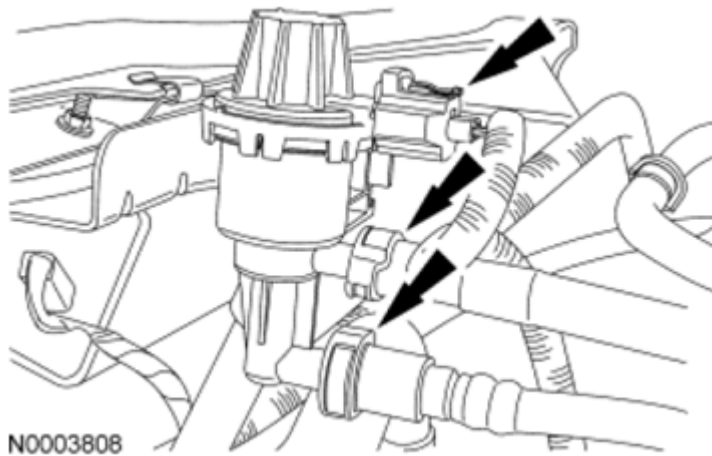
**Fig. 571: Locating Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

44. Attach the generator battery cable retainer to the RH valve cover stud bolt.



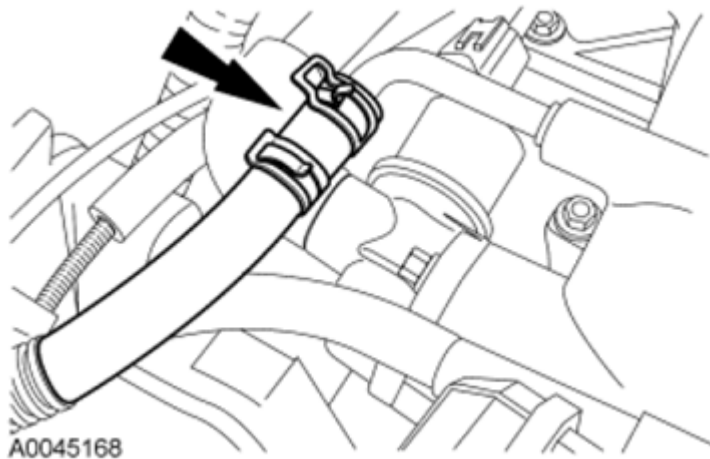
**Fig. 572: Locating Generator Battery Cable Retainer**  
Courtesy of FORD MOTOR CO.

45. Connect the fuel tube spring lock coupling. For additional information, refer to **FUEL SYSTEM-GENERAL INFORMATION** .
46. Connect the 2 hoses and the Evaporative Emission (EVAP) canister purge valve electrical connection.



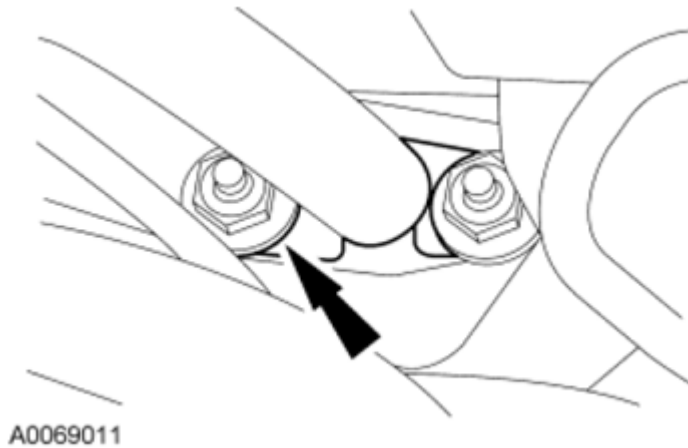
**Fig. 573: Locating Quick Release EVAP Hoses**  
Courtesy of FORD MOTOR CO.

47. Connect the vacuum hose.



**Fig. 574: Locating Vacuum Hose**  
Courtesy of FORD MOTOR CO.

48. Install the Air Cleaner (ACL) and outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
49. Install the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** .
50. Install the support bracket and the 2 nuts.
- Tighten to 10 Nm (89 lb-in).



**Fig. 575: Locating Support Bracket And Nuts**  
Courtesy of FORD MOTOR CO.

51. Install the wiper mounting arm and pivot shaft. For additional information, refer to **WIPERS AND WASHERS** .
52. Fill the crankcase with clean engine oil.
53. Connect both battery cables. For additional information, refer to **CHARGING SYSTEM** .
54. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** .
55. Install the hood.

**WARNING:** If the vehicle is equipped with a fire suppression system, repower the system. For important safety warnings and procedures, refer to **FIRE SUPPRESSION SYSTEM** . Failure to follow these instructions may result in serious personal injury.

56. If equipped with a fire suppression system, repower the system.