

**2010 Ford Mustang Shelby GT500**

2010 ENGINE Engine - 4.0L SOHC - Mustang

**2010 ENGINE****Engine - 4.0L SOHC - Mustang****SPECIFICATIONS****MATERIAL SPECIFICATIONS****MATERIAL SPECIFICATIONS**

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929- A	4.73L (5 qt) with filter
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171- A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323- A4	-
Silicone Gasket Remover ZC-30	-	-
Thread Sealant with PTFE TA-24	WSK-M2G350- A2	-

**ITEM SPECIFICATION****ITEM SPECIFICATION**

Item	Specification
<b>Engine</b>	
Displacement	4.0L (244 CID)
Number of cylinders	6
Bore	100.4 mm (3.953 in)
Stroke	84.4 mm (3.32 in)
Firing order	1-4-2-5-3-6
Oil pressure minimum at 2,000 RPM (engine at normal operating temperature)	103 kPa (15 psi)
Engine weight (without accessory drive components and flexplate or flywheel)	189 kg (416.7 lb)
<b>Cylinder Head and Valve Train</b>	
Cylinder head gasket surface flatness	0.08 mm (0.003 in) total
Combustion chamber volume	65.197 ± 2.068-2.018 cc
Valve arrangement (front to rear) - LH	I-E-I-E-I-E
Valve arrangement (front to rear) - RH	E-I-E-I-E-I
Valve guide bore diameter	7.00-7.018 mm (0.276 in)

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Valve stem diameter - intake	6.965-6.98 mm (0.274-0.275 in)
Valve stem diameter - exhaust	6.95-6.965 mm (0.27-0.274 in)
Valve stem-to-guide clearance - intake	0.020-0.053 mm (0.001-0.002 in)
Valve stem-to-guide clearance - exhaust	0.035-0.068 mm (0.001-0.003 in)
Valve head diameter - intake	45.9-46.1 mm (1.807-1.815 in)
Valve head diameter - exhaust	38.9-39.1 mm (1.531-1.539 in)
Valve face runout	0.03 mm (0.001 in)
Valve face angle	45 degrees
Valve seat width - intake	1.273-2.121 mm (0.05-0.083 in)
Valve seat width - exhaust	1.556-2.404 mm (0.061-0.095 in)
Valve seat runout	0.059 mm (0.002 in)
Valve seat angle	45 degrees
Valve spring free length	43.1 mm (1.7 in)
Valve spring squareness	± 1.5 deg
Valve spring compression pressure at specified height (lbs)	275-305 Nm at 35.9-36.7 mm (202.84-224.968 lb-ft at 1.413-1.445 in)
Valve spring installed height	39.86-40.86 mm (1.569-1.609 in)
Valve spring installed pressure	320 N (72 lb)
Roller follower ratio	1.98:1
<b>Camshaft</b>	
Theoretical valve lift @ 0 lash	11.93 mm (0.472 in)
Lobe lift	6.584 mm (0.259 in)
Allowable lobe lift loss	0.127 mm (0.005 in)
Journal diameter	27.935-27.96 mm (1.099-1.101 in)
Camshaft journal bore inside diameter	28.0-28.03 mm (1.102-1.104 in)
Camshaft journal-to-bearing clearance	0.04-0.095 mm (0.002-0.004 in)
Runout	0.05 mm (0.002 in)
End play	0.075-0.185 mm (0.003-0.007 in)
<b>Cylinder Block</b>	
Cylinder bore diameter	100.4 mm (3.953 in)
Cylinder bore maximum taper	0.025 mm (0.001 in)
Cylinder bore maximum out-of-round	0.025 mm (0.001 in)
Main bearing bore inside diameter	60.620-60.634 mm (2.387-2.387 in)
Head gasket surface flatness	0.1 mm (0.004 in) overall
<b>Crankshaft</b>	
Main bearing journal diameter	56.980-57.0 mm (2.243-2.244 in)
Main bearing journal maximum taper	0.008 mm (0.0003 in)
Main bearing journal maximum out-of-round	0.008 mm (0.0003 in)
Main bearing journal-to-cylinder block clearance	0.008-0.062 mm (0.0003-0.0024 in)
Connecting rod journal diameter	53.98-54.0 mm (2.125-2.126 in)
Connecting rod journal maximum taper	0.008 mm (0.0003 in)

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	0.008 mm (0.0003 in)
Crankshaft maximum end play	0.05-0.32 mm (0.002-0.0126 in)
<b>Main Bearings</b>	
Clearance to crankshaft	0.021-0.039 mm (0.0008-0.0015 in)
Clearance to crankshaft allowable	0.013-0.048 mm (0.0005-0.002 in)
Bearing wall thickness	1.8-1.806 mm (0.0709-0.0711 in)
<b>Piston and Connecting Rod</b>	
Piston diameter - coded standard	100.36-100.400 mm (3.951-3.9528 in)
Piston diameter - coded 0.5	100.880-100.900 mm (3.971-3.972 in)
Piston diameter - coded 1.0	101.390-101.400 mm (3.991-3.992 in)
Piston-to-cylinder bore clearance	0.030-0.050 mm (0.0012-0.002 in)
Piston ring end gap - top	0.250-0.400 mm (0.009-0.015 in)
Piston ring end gap - bottom	0.40-0.65 mm (0.016-0.025 in)
Piston ring groove width - top	1.23-1.25 mm (0.0484-0.0492 in)
Piston ring groove width - bottom	1.52-1.54 mm (0.0598-0.0606 in)
Piston ring groove width - oil ring	3.01-3.03 mm (0.1185-0.1193 in)
Piston ring width - top	1.170-1.190 mm (0.0460-0.0469 in)
Piston ring width - bottom	1.472-1.490 mm (0.0580-0.0587 in)
Piston ring-to-groove clearance - top	0.040-0.080 mm (0.0016-0.0031 in)
Piston ring-to-groove clearance - bottom	0.030-0.068 mm (0.0012-0.0027 in)
Piston pin bore diameter	24.009-24.013 mm (0.9452-0.9453 in)
Piston pin diameter (red)	23.997-24.000 mm (0.9447-0.9448 in)
Piston pin length	71.8-72.3 mm (2.826-2.846 in)
Piston pin-to-piston fit	0.009-0.016 mm (0.0003-0.0006 in)
Connecting rod pin bore diameter	23.958-23.976 mm (0.943-0.944 in)
Connecting rod length (center-to-center)	145.965-146.035 mm (5.747-5.749 in)
Connecting rod maximum allowed bend	0.0125 mm (0.0004 in) per 25.4 mm (1.000 in)
Connecting rod maximum allowed twist	0.038 mm (0.0015 in) per 25.4 mm (1.000 in)
Connecting rod bearing bore diameter	56.82 mm-56.84 mm (2.237 in-2.238 in)
Connecting rod bearing-to-crankshaft clearance	0.022-0.064 mm (0.0008-0.0025 in)
Connecting rod side clearance	0.092-0.318 mm (0.0036-0.0125 in)

### TORQUE SPECIFICATIONS CHART

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Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner bolt	47	35	-
Accessory drive belt idler pulley bolt	47	35	-
Balance shaft bolts	27	20	-
Balance shaft chain guide bolts	10	-	89
Balance shaft chain tensioner bolts	29	21	-

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Bell housing-to-cylinder block cradle bolts	47	35	-
Camshaft bearing cap bolts <sup>(1)</sup>	-	-	-
Camshaft sprocket bolt	85	63	-
Camshaft sprocket holding tool bolts	10	-	89
Camshaft tensioners	44	32	-
Catalytic converter-to-exhaust manifold nuts	45	33	-
Connecting rod bolts and nuts <sup>(1)</sup>	-	-	-
Coolant hose bracket bolt	45	33	-
Coolant pump bolts	10	-	89
Coolant tube bracket bolt (M8)	23	17	-
Coolant tube bracket bolt (M12)	34	25	-
Crankshaft Position (CKP) sensor bolts	10	-	89
Crankshaft pulley bolt <sup>(1)</sup>	-	-	-
Crankshaft main bearing cap bolts <sup>(1)</sup>	-	-	-
Cylinder block cradle bolts	14	-	124
Cylinder block cradle nuts	10	-	89
Cylinder block cradle bolts (inside) <sup>(1)</sup>	-	-	-
Cylinder block cradle Torx bolts	10	-	89
Cylinder block cradle rear Torx bolts	10	-	89
Cylinder block cradle inserts	3	-	27
Cylinder head bolts (M8) <sup>(1)</sup>	-	-	-
Cylinder head bolts (M12) <sup>(1)</sup>	-	-	-
Engine wiring harness-to-cylinder head bolts	40	30	-
Engine front cover bolts and stud bolts	19	-	168
Engine mount bracket bolts	80	59	-
Engine mount nut	63	46	-
Engine mount bolts	70	52	-
Exhaust manifold-to-EGR system module tube fittings	40	30	-
Exhaust manifold nuts	23	17	-
Exhaust manifold studs	12	-	106
Flexplate/flywheel bolts <sup>(1)</sup>	-	-	-
Front End Accessory Drive (FEAD) bracket bolts	48	35	-
Fuel rail bolts	23	17	-
Fuel rail supply tube bracket-to-LH valve cover bolt	6	-	53
Fuel rail supply tube bracket-to-LH cylinder head bolt	10	-	89
Generator bracket bolts and nut	47	35	-
Generator B+ terminal nut	8	-	71
Ground cable-to-RH strut tower bolt	10	-	89
Ground strap-to-cylinder block stud bolt	10	-	89
Ground strap-to-LH cylinder head bolt	40	30	-

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Hood hinge bolts	12	-	106
Hydraulic chain tensioner, LH	44	32	-
Hydraulic chain tensioner, RH	44	32	-
Ignition coil bracket upper bolts	9	-	80
Ignition coil bracket lower bolts (M12)	34	25	-
Ignition coil bracket lower bolt (M8)	24	18	-
Intake manifold bolts <sup>(1)</sup>	-	-	-
Jackshaft chain guide bolts	19	-	168
Jackshaft chain tensioner bolts	9	-	80
Jackshaft rear sprocket bolt <sup>(1)</sup>	-	-	-
Jackshaft front sprocket bolt <sup>(1)</sup>	-	-	-
Jackshaft thrust plate bolts	11	-	97
Knock Sensor (KS) bolt	20	-	177
LH cassette-to-cylinder head bolt	12	-	106
LH cassette-to-cylinder block bolt	19	-	168
Oil filter <sup>(1)</sup>	-	-	-
Oil filter adapter bolt	57	42	-
Oil level indicator tube bracket bolt	11	-	97
Oil pan bolts	11	-	97
Oil pan drain plug	26	19	-
Oil pump intermediate shaft bolts	19	-	168
Oil pump bolts	19	-	168
Oil pump drive bolt	19	-	168
Oil pump screen and pickup tube bolt	11	-	97
Power Distribution Box (PDB) B+ terminal bolt	12	-	106
<b>PDB</b> electrical connector bolt	6	-	53
Power Steering Pressure (PSP) tube-to-crossmember bolt	11	-	97
Power steering supply hose bracket-to- <b>FEAD</b> bracket bolt	11	-	97
Power steering pump bolts	25	18	-
Power steering pump pulley bolts	25	18	-
Pressure tube bracket nut	7	-	62
RH cassette-to-cylinder block bolt	12	-	106
RH cassette-to-cylinder head bolt	10	-	89
Spark plug	17	-	150
Starter motor wiring harness retainer bracket bolt	40	30	-
Steering column intermediate shaft-to-steering gear bolt	25	18	-
Steering gear-to-crossmember bolts	115	85	-
Suction hose bracket bolt	8	-	71
Thermostat housing bolts	11	-	97
Valve cover bolts and stud bolts <sup>(1)</sup>	-	-	-

(1) Refer to the procedure.

## DESCRIPTION AND OPERATION

### ENGINE

The 4.0L SOHC engine consists of the following:

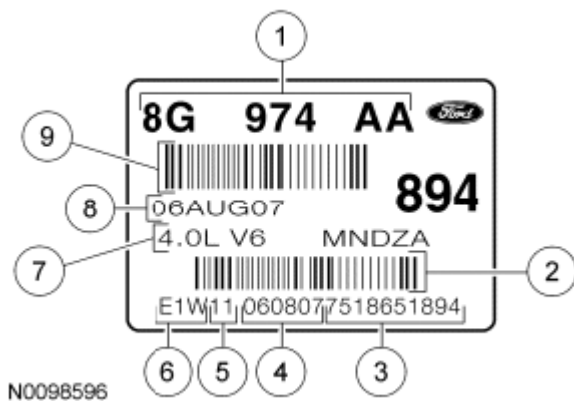
- Single overhead camshafts
- Sequential Multi-Port Fuel Injection (SFI)
- Distributorless ignition system
- Aluminum cylinder heads
- Cast iron, 60-degree V cylinder block
- Balance shaft (manual transmission only)
- Jackshaft
- Unique engine timing configuration

### 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. The Ford Master Parts Catalog contains a complete listing of the codes and their applications.

### Engine Code Information Label

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

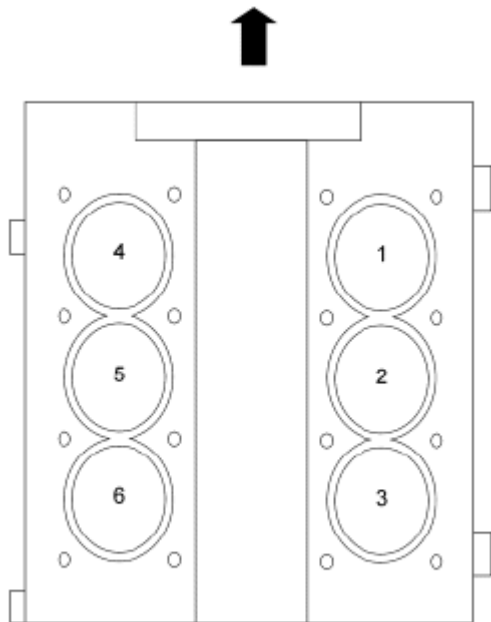


**Fig. 1: Identifying Engine Code Information Label**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

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

**Engine Cylinder Identification**



N0069904

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

**Exhaust Emission Control System**

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

**Induction System**

The **SFI** provides the fuel/air mixture needed for combustion in the cylinders. The fuel charging and controls system consists of the:

- electronic Throttle Body (TB).
- fuel injectors.
- fuel rail.
- fuel rail pressure and temperature sensor.

The fuel charging and controls system is:

- Pulse Width Modulated (PWM).
- Mass Air Flow (MAF)-controlled.

### **PCV System**

The PCV valve:

- controls the amount of ventilating air and blow-by gases going to the intake manifold.

### **EGR System**

The EGR system module transducer:

- monitors the EGR system module flow rate through the EGR-to-exhaust manifold tube.
- sends an EGR system module flow rate signal to the PCM.

### **Lubrication System**

The engine lubrication system is of the force-feed type in which oil is supplied to the crankshaft, connecting rod bearings, camshaft roller followers, hydraulic lash adjusters and camshafts.

### **Oil Pump**

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

Generically this design is known as a gerotor pump, which operates as follows:

- 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 oil pump is mounted on the bottom side of the crankshaft.
- The oil pump is driven by a oil pump intermediate shaft.
- 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.

### **Cooling System**

The engine cooling system includes the following:

- Radiator
- Degas bottle (aids in maintaining the correct volume of engine coolant)
- Coolant thermostat
- Coolant hoses
- Single electric fan

## DIAGNOSIS AND TESTING

### ENGINE

For basic mechanical concerns, refer to ENGINE SYSTEM - GENERAL INFORMATION .

For driveability concerns, refer to the INTRODUCTION - GASOLINE MODELS .

## GENERAL PROCEDURES

### CAMSHAFT TIMING

#### Special Tool(s)

#### SPECIAL TOOLS DESCRIPTION CHART

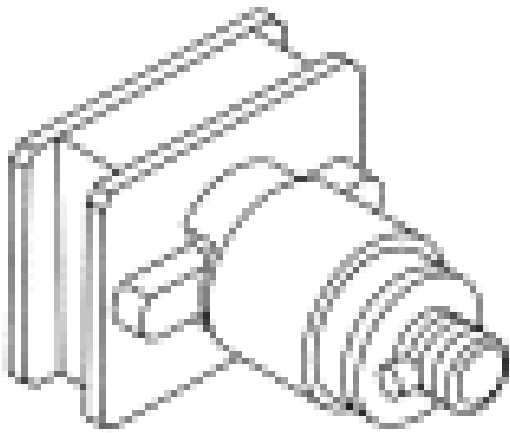


**ST1778-A**

Adapter for 303-564  
303-578 (T97T-6256-C)

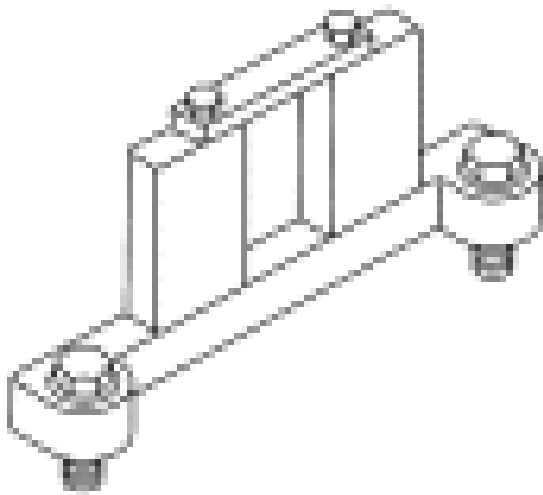
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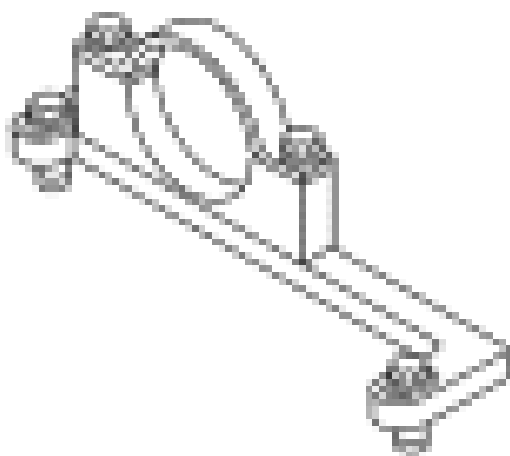
**ST1779-A**

Adapter for 303-577  
303-576 (T97T-6256-D)



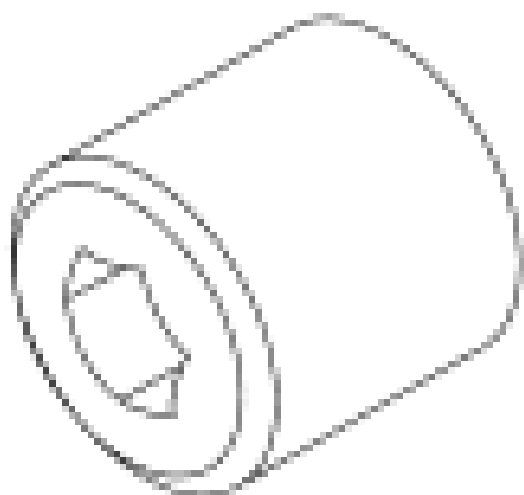
**ST1778-A**

Holding Tool, Camshaft  
303-577 (T97T-6303-C)



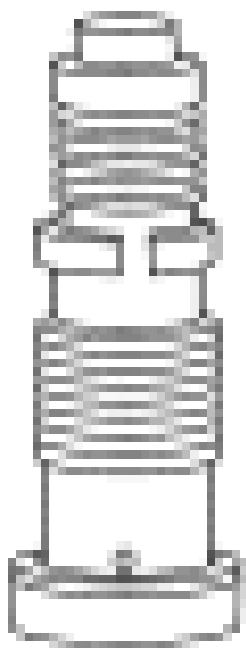
**ST1777-A**

Holding Tool, Camshaft Sprocket  
303-564 (T97T-6256-B)



**ST1781-A**

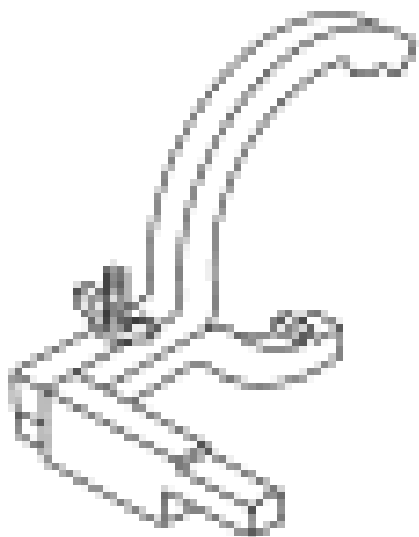
Socket, Camshaft Sprocket Nut  
303-565 (T97T-6256-G)



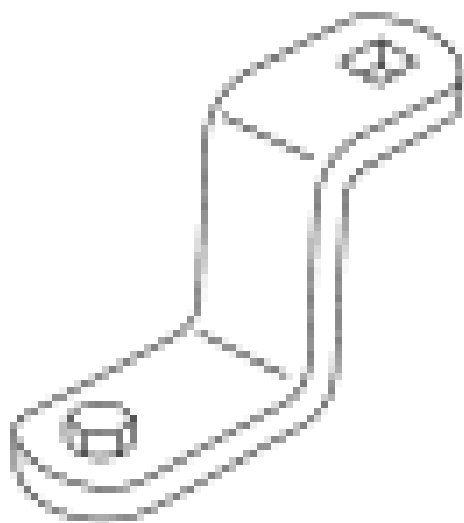
ST1774-A

Tensioner, Timing Chain  
303-571 (T97T-6K254-A)

Timing Tool, Crankshaft TDC  
303-573 (T97T-6303-A)



ST1775-A



ST1780-A

Torque Wrench Extension  
303-575 (T97T-6256-F)

1. Remove the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER**

**FOLLOWER.**

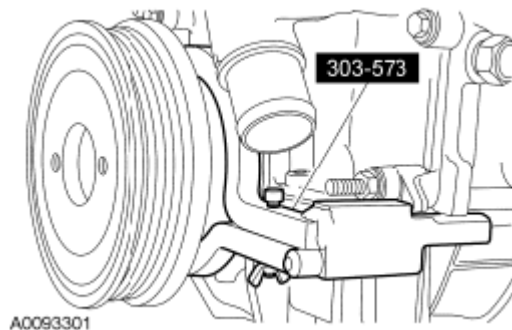
2. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
3. Remove the Engine Coolant Temperature (ECT) sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS** .

**NOTE:** The LH and RH camshafts must be retimed when either camshaft is disturbed.

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

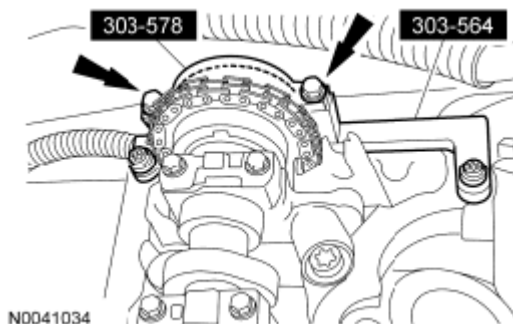
**NOTE:** Do not rotate the engine counterclockwise. Rotating the engine counterclockwise will result in damage to the damper crank sensor speed wheel and incorrect timing of the engine.

**NOTE:** The Crankshaft TDC Timing Tool must be installed on the damper and should contact the engine block, this positions the engine at TDC .



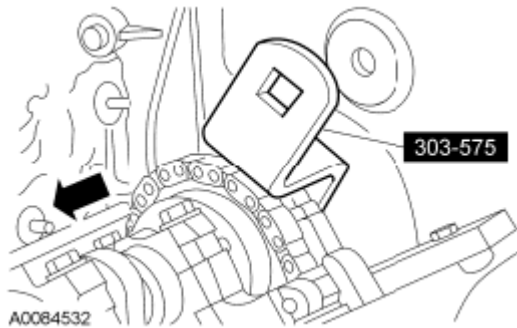
**Fig. 3: Identifying Crankshaft TDC Timing Tool**  
Courtesy of FORD MOTOR CO.

5. Install the Crankshaft TDC Timing Tool.
6. Install the Camshaft Sprocket Holding Tool and Adapter to the RH cylinder head and tighten the 2 top clamp bolts.
  - Tighten to 10 Nm (89 lb-in).



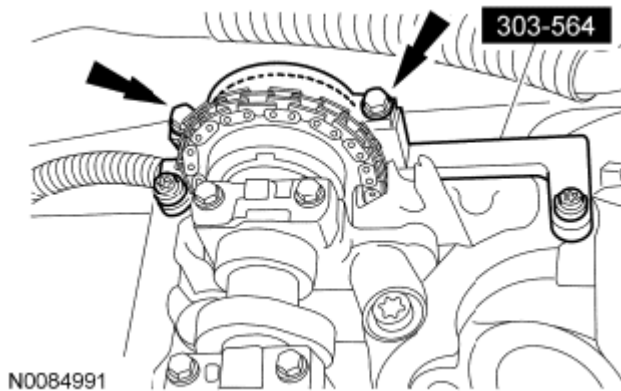
**Fig. 4: Locating Camshaft Sprocket Holding Tool, Adapter With Clamp Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** The RH camshaft sprocket bolt is a LH-threaded bolt.



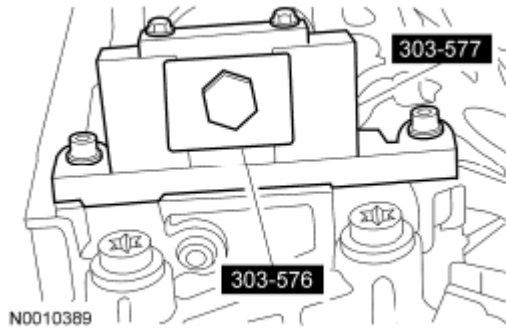
**Fig. 5: Removing/Installing Camshaft Sprocket Bolt Using Torque Wrench Extension**  
Courtesy of FORD MOTOR CO.

7. Using the Torque Wrench Extension with the Camshaft Sprocket Nut Socket 303-565, loosen the RH camshaft sprocket bolt.
8. Loosen the top 2 Camshaft Sprocket Holding Tool clamp bolts.



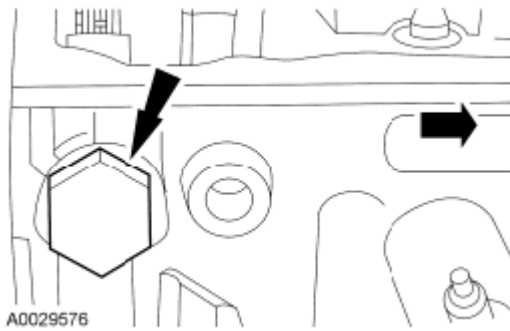
**Fig. 6: Locating Camshaft Sprocket Holding Tool Clamp Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** The camshaft timing slots are off-center.



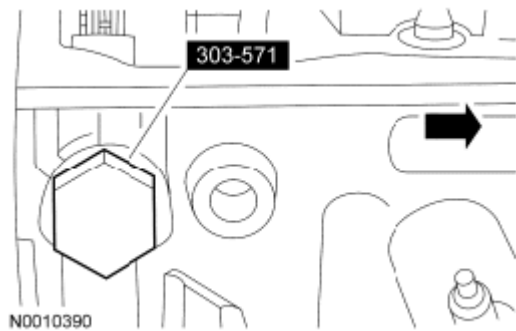
**Fig. 7: Identifying Camshaft Holding Tool And Adapter On Front Of Cylinder Head (RH)**  
Courtesy of FORD MOTOR CO.

9. Position the camshaft timing slots below the centerline of the camshaft to correctly fit the Adapter and install the Camshaft Holding Tool and Adapter on the front of the RH cylinder head.
10. Remove the RH camshaft tensioner.
  - Remove and discard the washer.



**Fig. 8: Locating RH Camshaft Tensioner**  
Courtesy of FORD MOTOR CO.

11. Install the Timing Chain Tensioner.

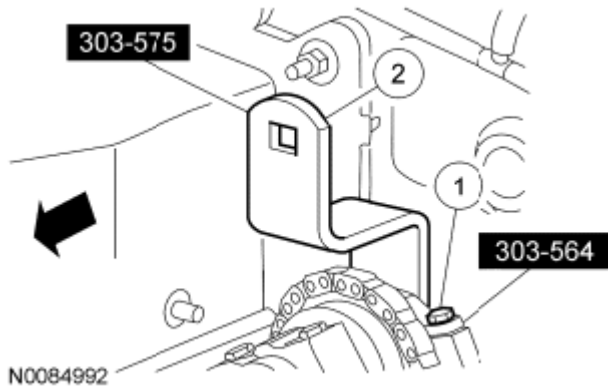


**Fig. 9: Identifying Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

**NOTE:** The RH camshaft sprocket bolt is a LH-threaded bolt.

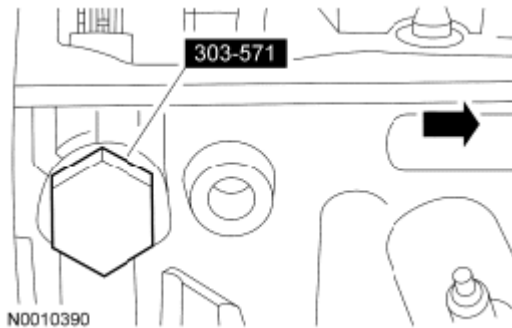
12. Tighten the bolts.

1. Tighten the Camshaft Sprocket Holding Tool top 2 clamp bolts to 10 Nm (89 lb-in).
2. Using the Torque Wrench Extension with the Camshaft Sprocket Nut Socket 303-565, tighten the camshaft bolt.



**Fig. 10: Tightening RH Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

13. Remove the Timing Chain Tensioner.

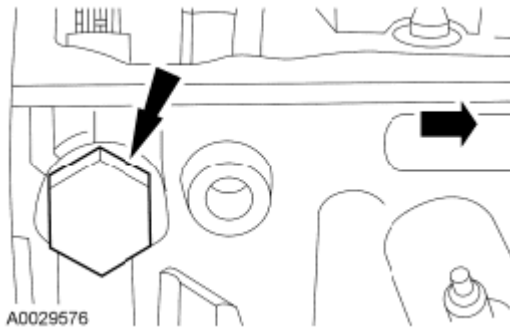


**Fig. 11: Identifying Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

**NOTE:** Install a new washer on the tensioner.

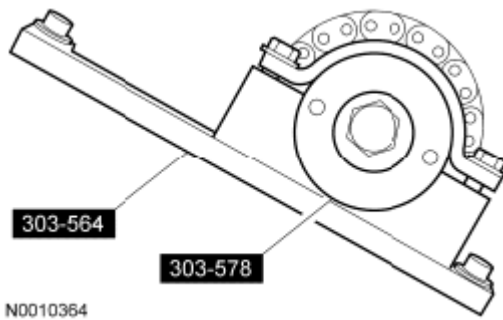
14. Install the RH camshaft tensioner.

- Tighten to 44 Nm (32 lb-ft).



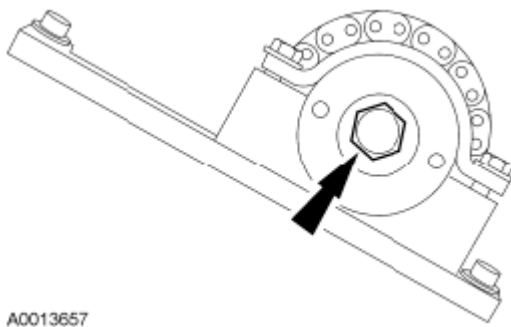
**Fig. 12: Locating RH Camshaft Tensioner**  
Courtesy of FORD MOTOR CO.

15. Install the Camshaft Sprocket Holding Tool and Adapter on the front of the LH cylinder head and tighten the top 2 clamp bolts.
  - Tighten to 10 Nm (89 lb-in).



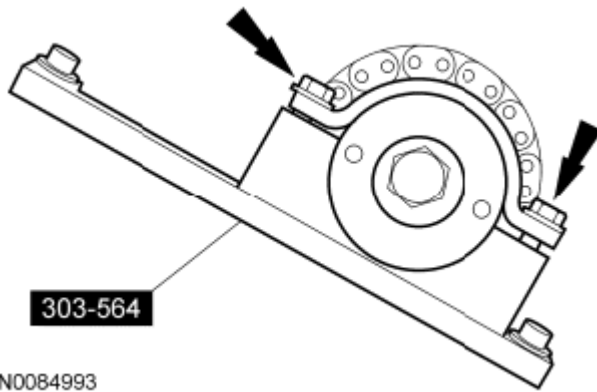
**Fig. 13: Identifying Camshaft Sprocket Holding Tool And Adapter**  
Courtesy of FORD MOTOR CO.

16. Loosen the LH camshaft sprocket bolt.



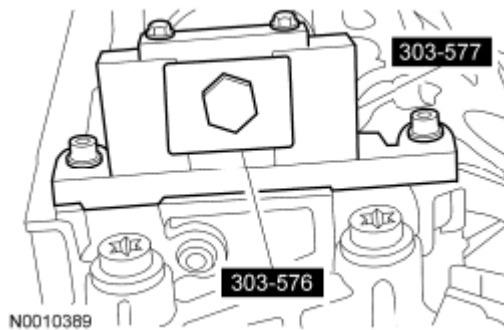
**Fig. 14: Locating LH Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

17. Loosen the top 2 clamp bolts on the Camshaft Sprocket Holding Tool to allow the camshaft sprocket to rotate freely.



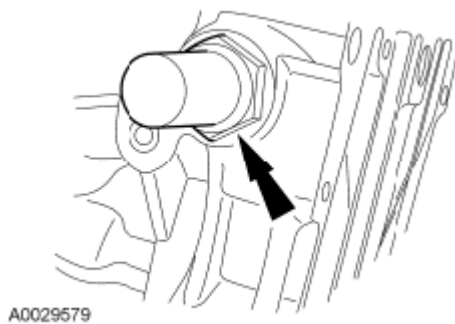
**Fig. 15: Locating Clamp Bolts On Camshaft Sprocket Holding Tool**  
 Courtesy of FORD MOTOR CO.

**NOTE:** The camshaft timing slots are off-center.



**Fig. 16: Identifying Camshaft Holding Tool And Adapter On Rear Of Cylinder Head (LH)**  
 Courtesy of FORD MOTOR CO.

18. Position the camshaft timing slots below the centerline of the camshaft to correctly fit the Adapter, and install the Camshaft Holding Tool and Adapter on the rear of the LH cylinder head.
19. Remove the LH camshaft tensioner.
  - Remove and discard the washer.



**Fig. 17: Locating LH Camshaft Tensioner**

Courtesy of FORD MOTOR CO.

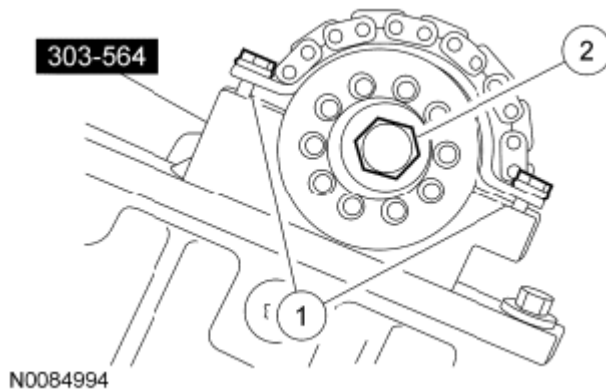
20. Install the Timing Chain Tensioner.



**Fig. 18: Identifying Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

21. Tighten the bolts.

1. Tighten the Camshaft Sprocket Holding Tool top 2 clamp bolts to 10 Nm (89 lb-in).
2. Tighten the LH camshaft bolt to 85 Nm (63 lb-ft).



**Fig. 19: Tightening LH Camshaft Bolt**  
Courtesy of FORD MOTOR CO.

22. Remove the Timing Chain Tensioner.

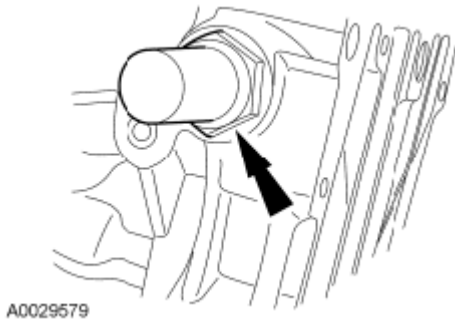


**Fig. 20: Identifying Timing Chain Tensioner**

Courtesy of FORD MOTOR CO.

**NOTE:** Install a new washer on the tensioner.

23. Install the LH camshaft tensioner.
  - Tighten to 44 Nm (32 lb-ft).



**Fig. 21: Locating LH Camshaft Tensioner**

Courtesy of FORD MOTOR CO.

24. Install the ECT sensor. For additional information, refer to ELECTRONIC ENGINE CONTROLS.
25. Install the generator. For additional information, refer to CHARGING SYSTEM.
26. Install the camshaft roller followers. For additional information, refer to CAMSHAFT ROLLER FOLLOWER.

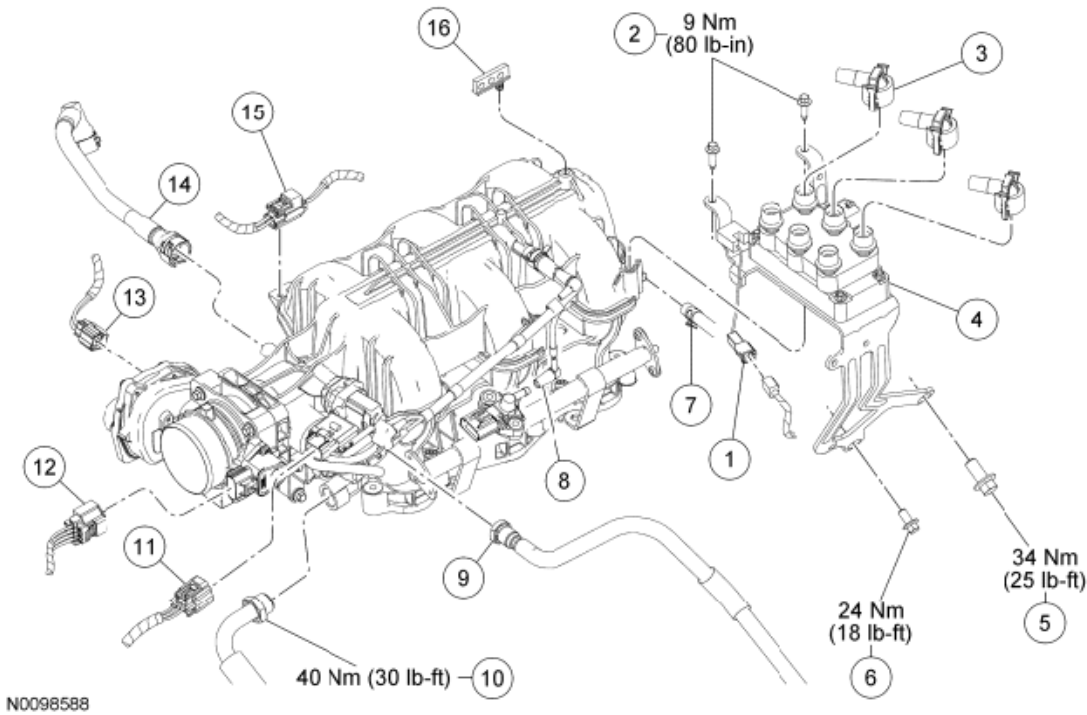
## IN-VEHICLE REPAIR

### INTAKE MANIFOLD

Intake Manifold (View 1 of 2)

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

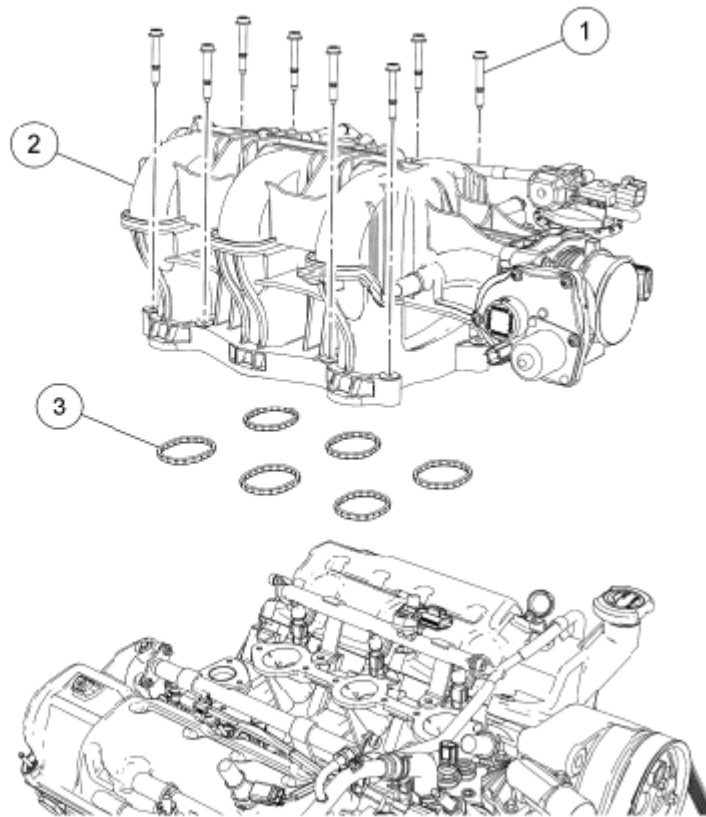


**Fig. 22: Exploded View Of Intake Manifold With Torque Specifications (1 Of 2)**  
 Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

Item	Part Number	Description
1	14A464	Radio capacitor electrical connector
2	W500214	Ignition coil bracket upper bolts
3	12280	RH spark plug wire-to-ignition coil connector (3 required)
4	12A310	Ignition coil and bracket assembly
5	W500041	Ignition coil bracket lower bolt (M12)
6	W500023	Ignition coil bracket lower bolt (M8)
7	2C053	Brake booster vacuum hose
8	-	Vacuum harness fitting (part of 9E498)
9	9G271	Vapor tube
10	-	EGR system module tube fitting (part of 9E469)
11	14A464	EGR system module electrical connector (part of 12B637)
12	14A464	Throttle Position (TP) sensor electrical connector (part of 12B637)
13	14A464	Throttle Body (TB) electrical connector (part of 12B637)
14	6K817	PCV tube
15	14A624	Knock Sensor (KS) electrical connector (part of 12B637)
16	12280	RH spark plug wire retainer

### Intake Manifold (View 2 of 2)



N0098597

**Fig. 23: Exploded View Of Intake Manifold (2 Of 2)**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	9Y450	Intake manifold bolt (8 required)
2	9424	Intake manifold
3	9439	Intake manifold gasket (6 required)

**Removal**

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

1. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
2. Disconnect the radio capacitor electrical connector.
3. Disconnect the RH spark plug wires from the ignition coil.

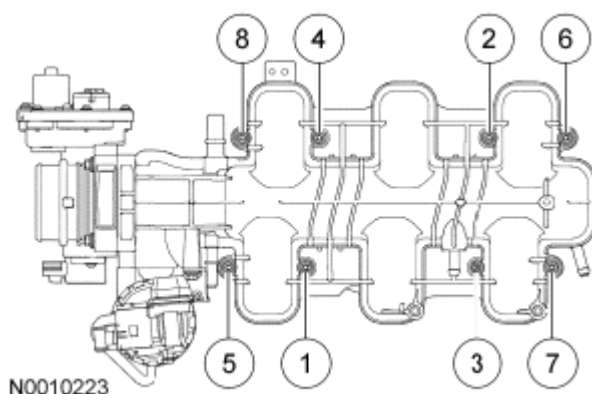
4. Detach the RH spark plug wire retainer from the intake manifold.
5. Remove the 2 ignition coil bracket upper bolts.
6. Remove the 2 ignition coil lower bolts.
  - Position the ignition coil and bracket assembly aside.
7. Disconnect the EGR system module electrical connector.
8. Disconnect the EGR system module tube from the EGR system module.
9. Disconnect the brake booster vacuum hose from the intake manifold.
10. Disconnect the vacuum tube from the fuel rail pressure and temperature sensor.
11. Disconnect the vapor tube from the intake manifold.
12. Remove the PCV tube.
13. Detach the Knock Sensor (KS) electrical connector retainer from the intake manifold.
14. Disconnect the Throttle Position (TP) sensor and Throttle Body (TB) electrical connectors.
15. Remove the 8 bolts and the intake manifold.

### Installation

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

**NOTE:** Clean and inspect all sealing surfaces. Inspect and install new gaskets as necessary.

1. Position the intake manifold and install the 8 bolts.
  - Tighten in the sequence shown to 10 Nm (89 lb-in).



**Fig. 24: Intake Manifold Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

2. Connect the TP sensor and TB electrical connectors.

3. Attach the **KS** electrical connector retainer to the intake manifold.
4. Install the PCV tube.
5. Connect the vapor tube to the intake manifold.
6. Connect the vacuum tube to the fuel rail pressure and temperature sensor.
7. Connect the brake booster vacuum hose to the intake manifold.
8. Connect the EGR system module tube to the EGR system module.
  - Tighten to 40 Nm (30 lb-ft).
9. Connect the EGR system module electrical connector.
10. Position the ignition coil and bracket assembly. Install the 2 lower bolts.
  - Tighten the M8 bolt to 24 Nm (18 lb-ft).
  - Tighten the M12 bolt to 34 Nm (25 lb-ft).
11. Install the 2 ignition coil bracket upper bolts.
  - Tighten to 9 Nm (80 lb-in).
12. Attach the RH spark plug wire retainer to the intake manifold.
13. Connect the RH spark plug wires to the ignition coil.
14. Connect the radio capacitor electrical connector.
15. Install the **ACL** outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .

**VALVE COVER - LH**

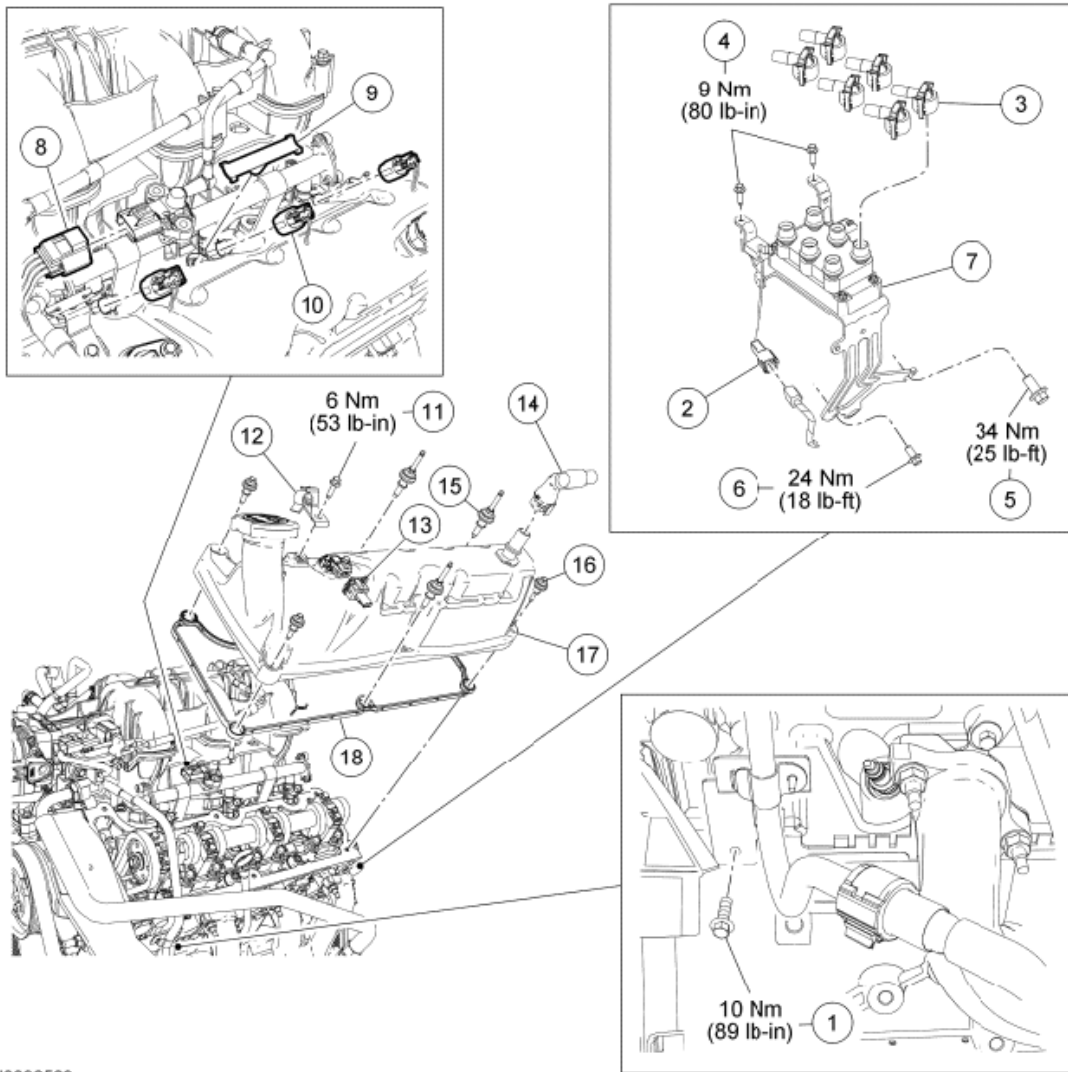
**Material**

**MATERIAL SPECIFICATIONS**

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

# 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang



N0098589

**Fig. 25: Exploded View Of Valve Cover - LH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

## ITEM DESCRIPTION

Item	Part Number	Description
1	W500213	Fuel rail supply tube bracket-to-cylinder head bolt
2	14A464	Radio capacitor electrical connector
3	12280	Spark plug wire-to-ignition coil connector (6 required)
4	W500214	Ignition coil bracket upper bolts
5	W500041	Ignition coil bracket lower bolt (M12)
6	W500023	Ignition coil bracket lower bolt (M8)
7	12A310	Ignition coil and bracket assembly
8	14A464	Fuel rail pressure and temperature sensor electrical connector (part of 12B637)

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

9	13A506	Wiring harness retainer (part of 12B637)
10	14A464	Fuel injector electrical connector (3 required) (part of 12B637)
11	W500213	Fuel rail supply tube bracket-to-valve cover bolt
12	-	Fuel rail supply tube bracket (part of 9E964)
13	14A464	Camshaft Position (CMP) sensor electrical connector (part of 12B637)
14	6758	Crankcase ventilation tube
15	6C519	LH valve cover stud bolt (3 required)
16	6C519	LH valve cover bolt (3 required)
17	6A505	LH valve cover assembly
18	6584	LH valve cover gasket

### Removal

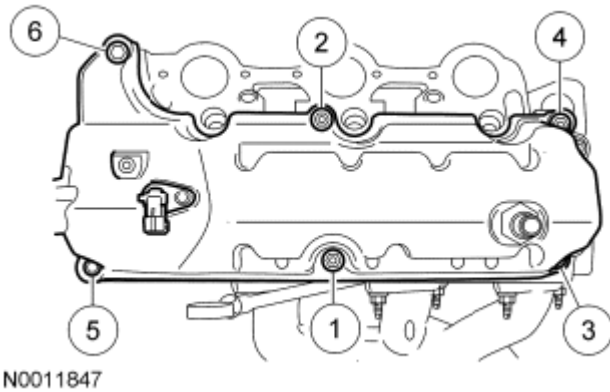
**NOTE:** During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

1. Disconnect the radio capacitor electrical connector.
2. Disconnect the 6 spark plug wires from the ignition coil.
3. Remove the 2 upper ignition coil bracket bolts.
4. Remove the 2 lower ignition coil bracket bolts and remove the ignition coil and bracket assembly.
5. Remove the fuel rail supply tube bracket-to-cylinder head bolt.
6. Remove the fuel rail supply tube bracket-to-valve cover bolt.
  - Position the fuel rail supply tube aside.
7. Disconnect the crankcase ventilation tube from the valve cover and position the tube aside.
8. Disconnect the Camshaft Position (CMP) sensor electrical connector.
9. Disconnect the fuel rail pressure and temperature sensor electrical connector.
10. Disconnect the 3 LH fuel injector electrical connectors.
  - Detach the wiring retainer from the valve cover stud bolt and position the wiring harness aside.
11. Detach the spark plug wire retainer from the valve cover stud bolt.
12. Remove the 3 bolts, the 3 stud bolts and the LH valve cover.

### Installation

**NOTE:** Clean the valve cover and cylinder head sealing surfaces with metal surface prep. Inspect and install a new gasket as necessary.

1. Position the LH valve cover and install the 3 bolts and the 3 stud bolts.
  - Tighten in the sequence shown to 10 Nm (89 lb-in).



**Fig. 26: Identifying Valve Cover Bolts Tightening Sequence (LH)**  
 Courtesy of FORD MOTOR CO.

2. Attach the spark plug wire retainer to the valve cover stud bolt.
3. Position the wiring harness, attach the wiring retainer to the valve cover stud bolt and then connect the 3 LH fuel injector electrical connectors.
4. Connect the fuel rail pressure and temperature sensor electrical connector.
5. Connect the **CMP** sensor electrical connector.
6. Connect the crankcase ventilation tube to the valve cover.
7. Position the fuel rail supply tube and install the fuel rail supply tube bracket-to-valve cover bolt.
  - Tighten to 6 Nm (53 lb-in).
8. Install the fuel rail supply tube bracket-to-cylinder head bolt.
  - Tighten to 10 Nm (89 lb-in).
9. Install the ignition coil and bracket assembly and the lower bolts.
  - Tighten the M8 bolts to 24 Nm (18 lb-ft).
  - Tighten the M12 bolt to 34 Nm (25 lb-ft).
10. Install the upper ignition coil bracket bolts.
  - Tighten to 9 Nm (80 lb-in).
11. Connect the 6 spark plug wire to the ignition coil.
12. Connect the radio capacitor electrical connector.

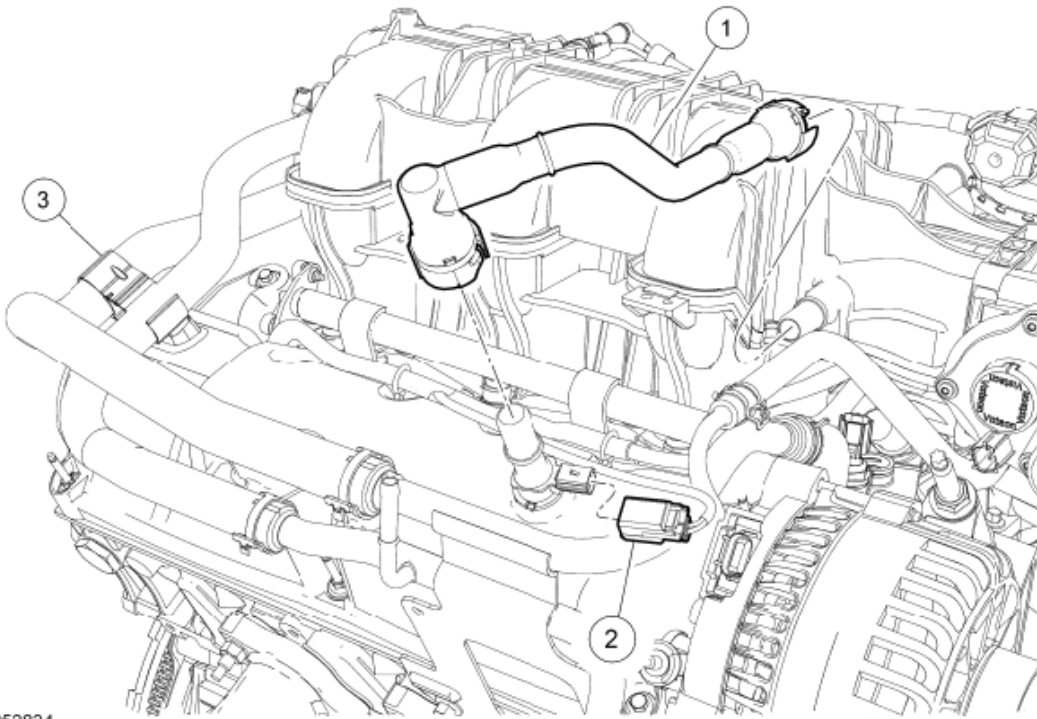
**VALVE COVER - RH**

**Material**

**MATERIAL SPECIFICATIONS**

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

**Valve Cover - RH (View 1 of 2)**



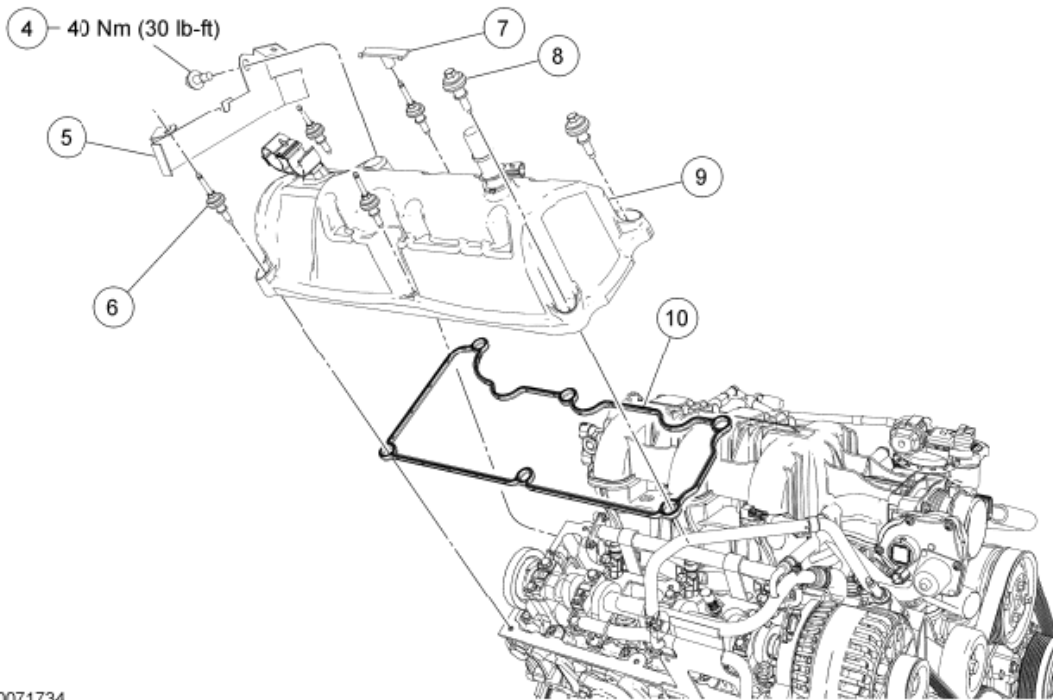
N0052834

**Fig. 27: Exploded View Of Valve Cover - RH (1 Of 2)**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	6K817	PCV tube
2	-	PCV valve electrical connector (part of 12A580)
3	8W287	Heater hose retainer bracket

Valve Cover - RH (View 2 of 2)



N0071734

**Fig. 28: Exploded View Of Valve Cover - RH With Torque Specifications (2 Of 2)**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
4	W506031	Wiring harness bracket bolt
5	14536	Wiring harness bracket (part of 12B637)
6	6C519	RH valve cover stud bolt (4 required)
7	13A506	Wiring retainer (part of 12B637)
8	6C519	RH valve cover bolt (2 required)
9	6582	RH valve cover assembly
10	6584	RH valve cover gasket

**Removal**

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

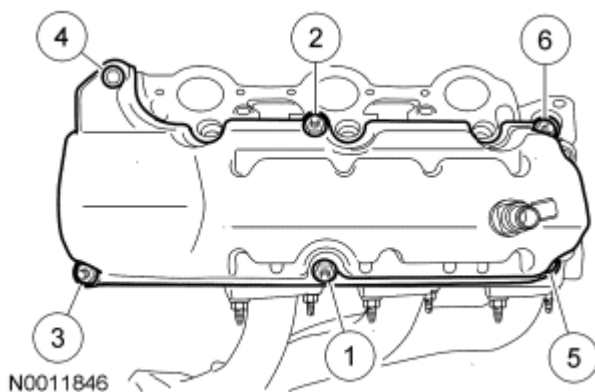
1. Remove the PCV tube.
2. Disconnect the PCV valve electrical connector.
3. Detach the heater hose retainer from the valve cover.

4. Remove the wiring harness bracket bolt from the back of the RH cylinder head and detach the bracket from the valve cover stud bolt.
5. Detach the engine wiring and spark plug wiring retainers from the 2 valve cover stud bolts.
6. Remove the 2 bolts, the 4 stud bolts and the RH valve cover.

### Installation

**NOTE:** Clean the valve cover and cylinder head sealing surfaces with metal surface prep. Inspect and install a new gasket as necessary.

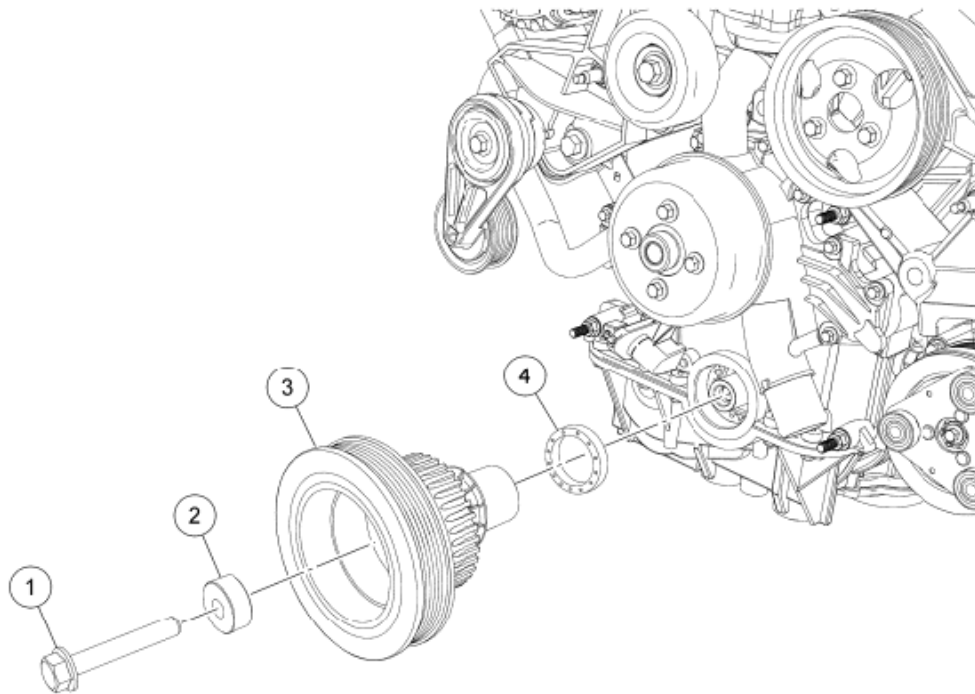
1. Position the RH valve cover and install the 2 bolts and the 4 stud bolts.
  - Tighten in the sequence shown to 10 Nm (89 lb-in).



**Fig. 29: Identifying Valve Cover Bolts Tightening Sequence (RH)**  
Courtesy of FORD MOTOR CO.

2. Attach the engine wiring and spark plug wiring retainers to the 2 valve cover stud bolts.
3. Position the wiring harness bracket on the valve cover stud bolt and install the wiring harness bracket bolt to the back of the RH cylinder head.
  - Tighten to 40 Nm (30 lb-ft).
4. Attach the heater hose retainer to the valve cover.
5. Connect the PCV valve electrical connector.
6. Install the PCV tube.

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



N0010960

**Fig. 30: Exploded View Of Crankshaft Pulley And Crankshaft Front Seal**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	E800511	Crankshaft pulley bolt
2	-	Washer
3	6B321	Crankshaft pulley
4	6700	Crankshaft front oil seal

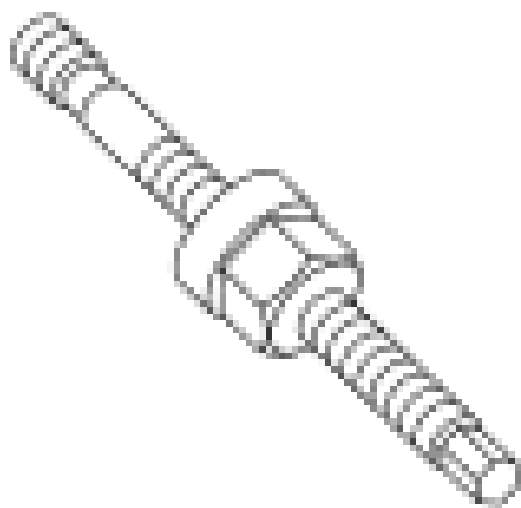
1. For additional information, refer to the procedures.

**CRANKSHAFT PULLEY**

Special Tool(s)

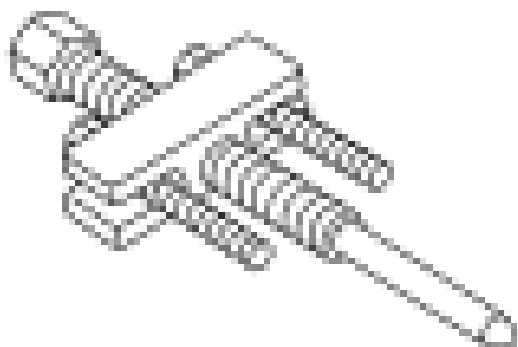
**SPECIAL TOOLS DESCRIPTION CHART**

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**ST2428-A**

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

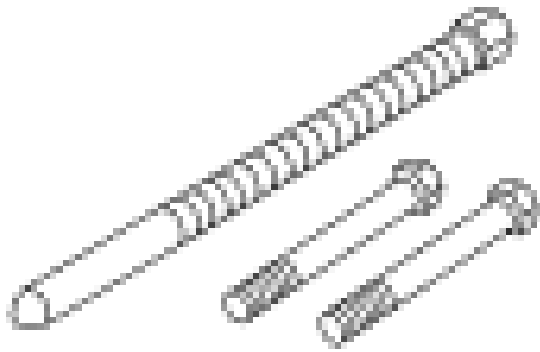


**ST1784-A**

Remover, Crankshaft Vibration Damper  
303-101 (T74P-3616-A)

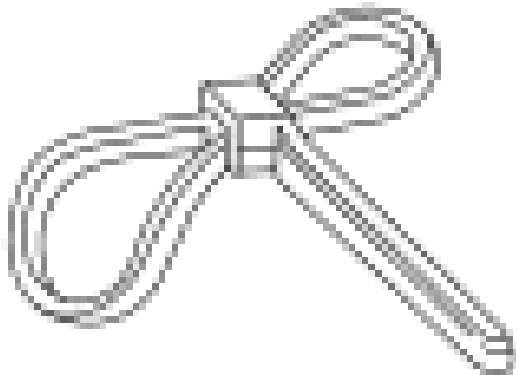
**2010 Ford Mustang Shelby GT500**

2010 ENGINE Engine - 4.0L SOHC - Mustang



**ST2897-A**

Remover, Crankshaft Vibration Damper  
303-773



**ST1438-A**

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

**General Equipment**

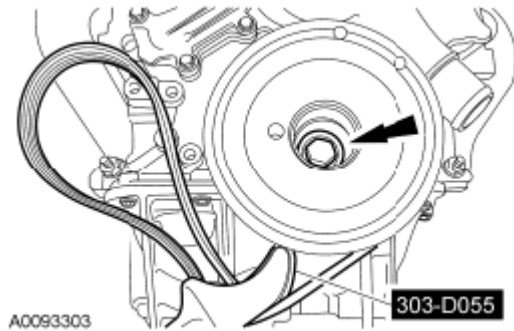
**GENERAL EQUIPMENT CHART**

8-mm x 1.25 x 100-mm bolts (2 required)

**Removal**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
3. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** .

**NOTE:** This bolt is torque-to-yield and cannot be reused.

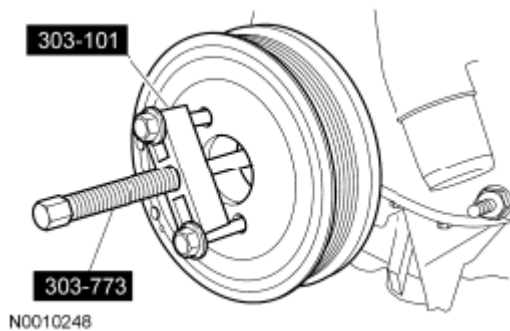


**Fig. 31: Holding Crankshaft Pulley Using Strap Wrench**  
 Courtesy of FORD MOTOR CO.

4. Using the Strap Wrench, hold the crankshaft pulley, remove the bolt and washer.

**NOTE:** If the pulley bolt is not installed, the Crankshaft Vibration Damper Remover will bottom out before the pulley is off.

5. Install the crankshaft pulley bolt 2 to 3 turns. Using the Crankshaft Vibration Damper Removers and the two 8-mm bolts, remove the crankshaft pulley.
  - Discard the crankshaft pulley bolt.



**Fig. 32: Removing Crankshaft Pulley**  
 Courtesy of FORD MOTOR CO.

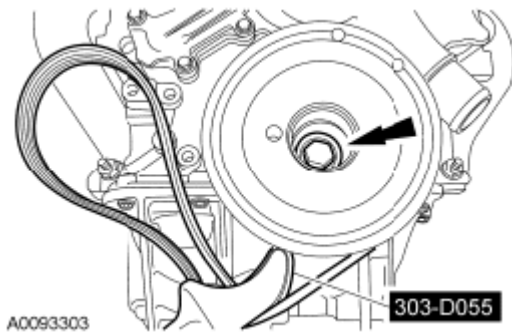
**Installation**

1. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.



**Fig. 33: Installing Crankshaft Pulley Using Crankshaft Vibration Damper Installer**  
Courtesy of FORD MOTOR CO.

2. Using the Strap Wrench, hold the crankshaft pulley, install a new crankshaft pulley bolt. Tighten the bolt in 2 stages.
  - Stage 1: Tighten to 55 Nm (41 lb-ft).
  - Stage 2: Tighten an additional 85 degrees.



**Fig. 34: Holding Crankshaft Pulley Using Strap Wrench**  
Courtesy of FORD MOTOR CO.

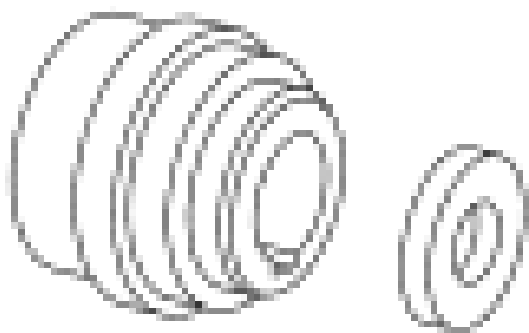
3. Install the accessory drive belt. For additional information, refer to ACCESSORY DRIVE .
4. Install the **ACL** outlet pipe. For additional information, refer to INTAKE AIR DISTRIBUTION & FILTERING .

### CRANKSHAFT FRONT SEAL

#### Special Tool(s)

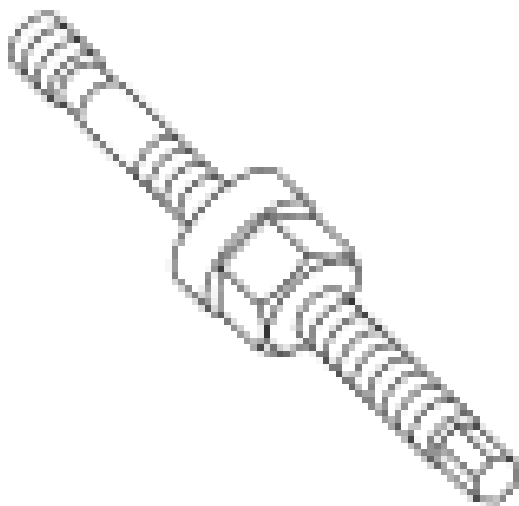
#### SPECIAL TOOLS DESCRIPTION CHART

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Aligner, Front Cover  
303-093 (T74P-6019-A)

ST2439-A



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

ST2428-A



ST1286-A

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

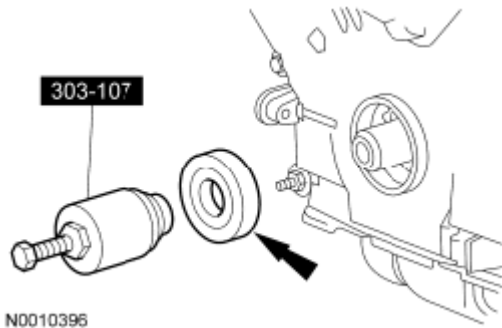
**Material**

**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A

**Removal**

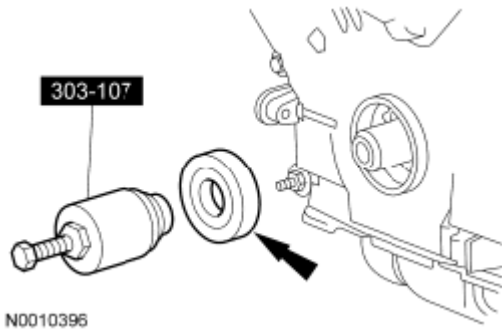
1. Remove the crankshaft pulley. For additional information, refer to **CRANKSHAFT PULLEY**.
2. Using the Crankshaft Front Oil Seal Remover, remove and discard the crankshaft front seal.



**Fig. 35: Locating Crankshaft Front Oil Seal And Crankshaft Front Oil Seal Remover**  
Courtesy of FORD MOTOR CO.

**Installation**

**NOTE:** Lubricate the new front seal with clean engine oil.

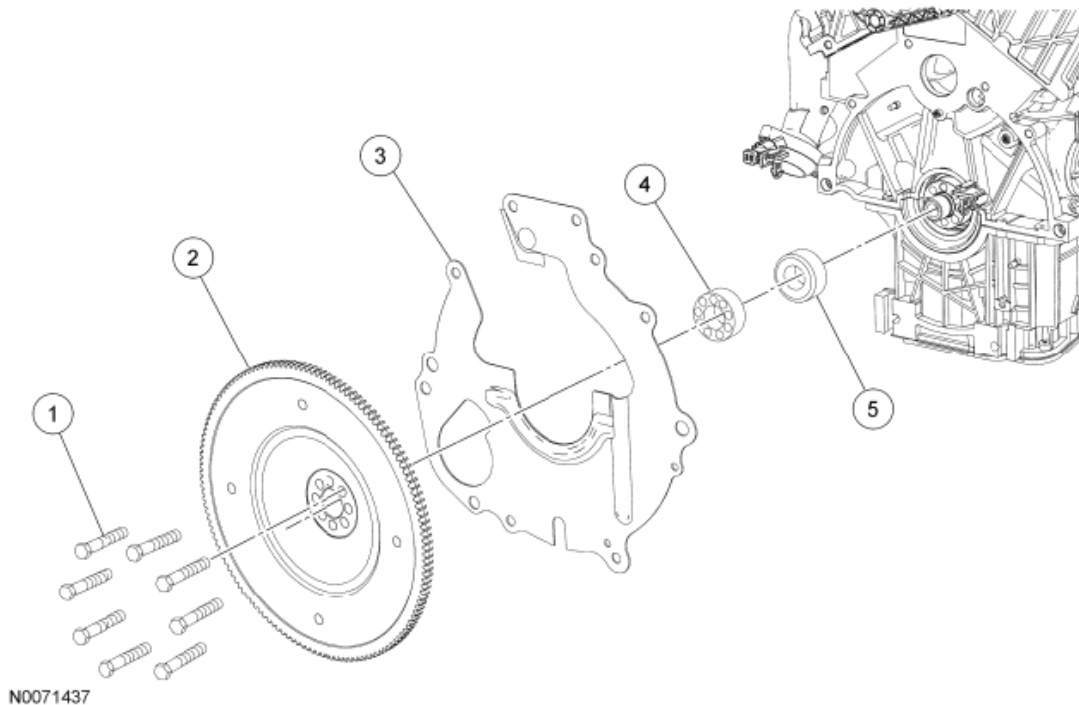


**Fig. 36: Locating Crankshaft Front Oil Seal With Front Cover Aligner And Crankshaft Vibration Damper Installer**  
 Courtesy of FORD MOTOR CO.

1. Using the Front Cover Aligner and Crankshaft Vibration Damper Installer, install a new crankshaft front seal.
2. Install the crankshaft pulley. For additional information, refer to CRANKSHAFT PULLEY.

**LOWER END COMPONENTS - EXPLODED VIEW, FLEXPLATE, FLYWHEEL AND CRANKSHAFT REAR SEAL**

**NOTE:** Flexplate shown in illustration, flywheel similar.



**Fig. 37: Exploded View Of Flexplate, Flywheel And Crankshaft Rear Seal**

Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	6379	Flexplate/flywheel bolt (8 required)
2	6375	Flexplate/flywheel
3	6A373	Spacer plate
4	6434	Flexplate-to-crankshaft spacer (automatic transmission only)
5	6701	Crankshaft rear oil seal

1. For additional information, refer to the procedures.

**FLYWHEEL**

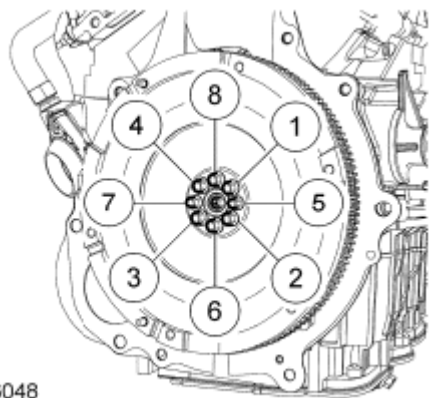
**Removal**

1. Remove the clutch. For additional information, refer to **CLUTCH** .
2. Remove the 8 bolts and the flywheel.
  - Discard the bolts.

**Installation**

**NOTE:**      **New flywheel bolts must be installed. They are a torque-to-yield design and cannot be reused.**

1. Position the flywheel. Install the 8 new bolts and tighten in the sequence shown in illustration in 3 stages.
  - Stage 1: Tighten to 13 Nm (115 lb-in).
  - Stage 2: Tighten to 50 Nm (37 lb-ft).
  - Stage 3: Tighten an additional 90 degrees.



N0076048

**Fig. 38: Identifying Flywheel Bolts Tightening Sequence**

Courtesy of FORD MOTOR CO.

2. Install the clutch. For additional information, refer to CLUTCH.

## FLEXPLATE

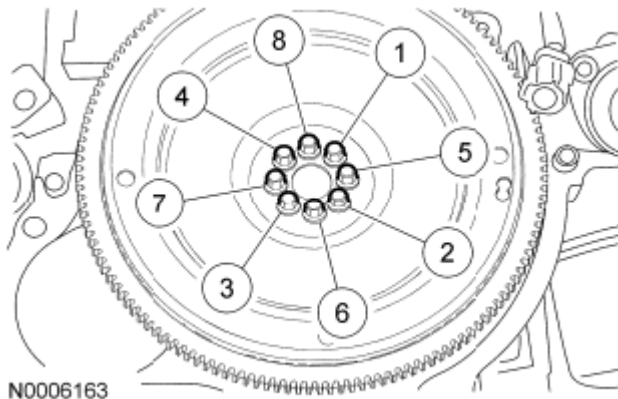
### Removal

1. Remove the transmission. For additional information, refer to AUTOMATIC TRANSAXLE/TRANSMISSION - 5R55S.
2. Remove the 8 bolts, the flexplate and the flexplate-to-crankshaft spacer.
  - Discard the bolts.

### Installation

**NOTE:** New flexplate bolts must be installed. They are a torque-to-yield design and cannot be reused.

1. Position the spacer and the flexplate. Install the 8 new bolts and tighten in the sequence shown in illustration in 3 stages.
  - Stage 1: Tighten to 13 Nm (115 lb-in).
  - Stage 2: Tighten to 50 Nm (37 lb-ft).
  - Stage 3: Tighten an additional 90 degrees.



**Fig. 39: Identifying Flexplate Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

2. Install the transmission. For additional information, refer to AUTOMATIC TRANSAXLE/TRANSMISSION - 5R55S.

## CRANKSHAFT REAR SEAL

### Special Tool(s)

**SPECIAL TOOLS DESCRIPTION CHART**



**ST3074-A**

Adapter for 303-579 (part of 303-S524)  
303-527 (T95P-6701-A3)

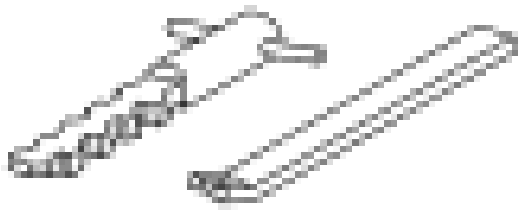


**ST2132-A**

Installer, Crankshaft Rear Oil Seal  
303-579 (T97T-6701-A)

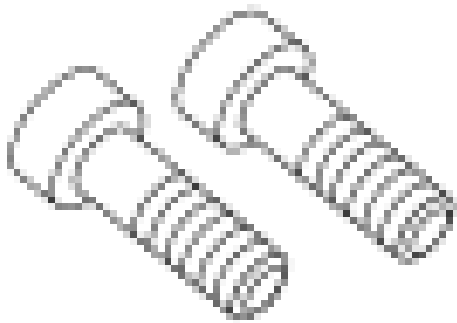
# 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang



**ST1385-A**

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



**ST3075-A**

Screws, Crankshaft Rear Oil Seal (part of 303-S524)  
303-528 (T95T-6701-A4)

## Material

### MATERIAL SPECIFICATIONS

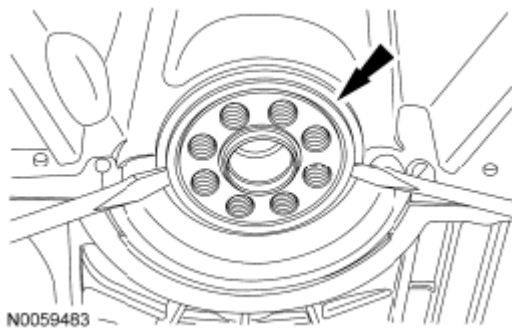
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30- LSP12 (Canada); or equivalent	WSS-M2C929- A

## Removal

1. Remove the flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL**.
2. Remove the spacer plate.

**NOTE:** The original crankshaft rear seal does not have a speedy sleeve. Only a new replacement crankshaft rear seal comes with a speedy sleeve.

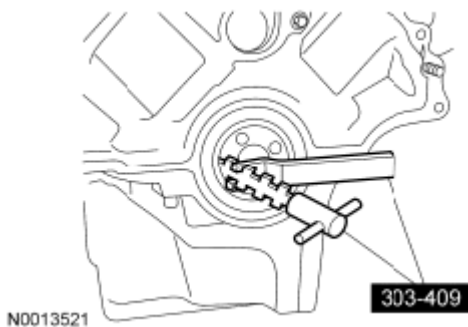
**NOTE:** The crankshaft rear seal may have a metal speedy sleeve. This sleeve must be removed before attempting to remove the seal.



**Fig. 40: Locating Speedy Sleeve**  
Courtesy of FORD MOTOR CO.

3. If necessary, remove the speedy sleeve using 2 screwdrivers or small pry bars.

**NOTE:** Avoid scratching or damaging the crankshaft rear seal running surface during removal of the crankshaft rear seal.



**Fig. 41: Removing Crankshaft Rear Seal Using Oil Seal Remover**  
Courtesy of FORD MOTOR CO.

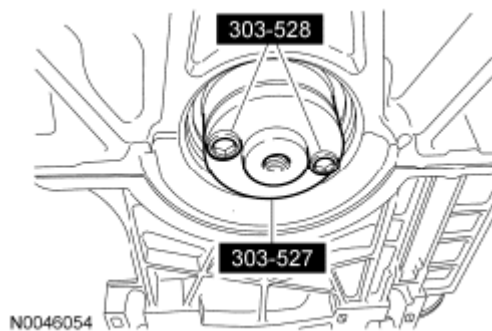
4. Using the Oil Seal Remover, remove the crankshaft rear seal.

## Installation

**NOTE:** The new replacement crankshaft rear seal comes with a speedy sleeve. Do not remove the speedy sleeve, it must be installed with the crankshaft rear seal.

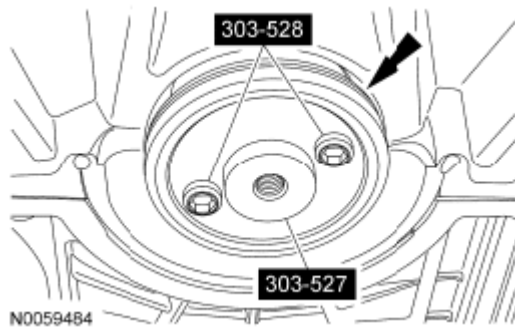
**NOTE:** Be sure the crankshaft rear sealing surface is clean and free from any rust or corrosion. To clean the crankshaft rear seal surface area, use extra-fine emery cloth or extra-fine 0000 steel wool with metal surface prep.

1. Lubricate the crankshaft rear oil seal with clean engine oil.
2. Install the Crankshaft Rear Oil Seal Screws and Adapter.



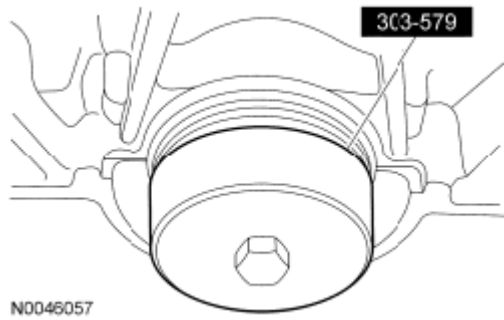
**Fig. 42: Identifying Crankshaft Rear Oil Seal Screws And Adapter**  
Courtesy of FORD MOTOR CO.

3. Position the crankshaft rear seal with speedy sleeve around the Crankshaft Rear Oil Seal Screws and Adapter.



**Fig. 43: Identifying Crankshaft Rear Oil Seal Screws And Adapter**  
Courtesy of FORD MOTOR CO.

4. Using the Crankshaft Rear Oil Seal Installer, install the crankshaft rear seal with speedy sleeve.



**Fig. 44: Installing Crankshaft Rear Oil Seal Using Crankshaft Rear Oil Seal Installer**  
 Courtesy of FORD MOTOR CO.

5. Install the flexplate-to-crankshaft spacer.
6. Install the spacer plate.
7. Install the flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL**.

**ENGINE FRONT COVER**

**Special Tool(s)**

**SPECIAL TOOLS DESCRIPTION CHART**

<p>ST2439-A</p>	<p>Aligner, Front Cover                  303-093 (T74P-6019-A)</p>
-----------------	--

**Material**

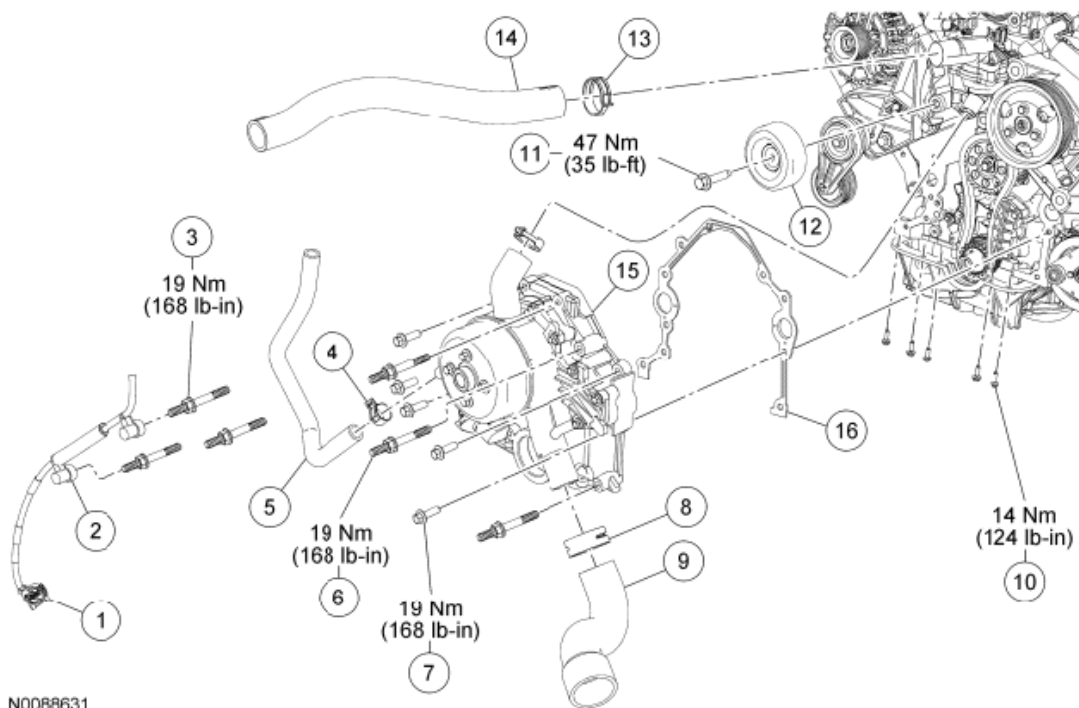
**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® Metal Surface Prep	

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

ZC-31-A	-
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2



**Fig. 45: Exploded View Of Engine Front Cover With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

Item	Part Number	Description
1	14A464	Crankshaft Position (CKP) sensor electrical connector (part of 12B637)
2	-	Wiring retainer (part of 12B637)
3	W702501	Engine front cover stud bolt (4 required)
4	8287	Clamp
5	18C266	Coolant hose
6	W702501	Engine front cover stud bolt
7	W500024	Engine front cover bolt (5 required)

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

8	15161	Clamp
9	8286	Lower radiator hose
10	E802185	Block cradle-to-engine front cover bolt (5 required)
11	-	Accessory drive belt idler pulley bolt (part of 6C348)
12	6C348	Accessory drive belt idler pulley
13	15161	Clamp
14	8620	Upper radiator hose
15	6019	Engine front cover
16	-	Engine front cover gasket

### Removal

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

1. Drain the cooling system. For additional information, refer to ENGINE COOLING .
2. Remove the crankshaft front oil seal. For additional information, refer to CRANKSHAFT FRONT SEAL.
3. Disconnect the upper radiator hose.
4. Disconnect the heater hose from the coolant pump.
5. Disconnect the lower radiator hose from the coolant pump.
6. Remove the bolt and the accessory drive belt idler pulley.
7. Disconnect the Crankshaft Position (CKP) sensor and detach the 2 wiring retainers.
8. Remove the 5 engine block cradle-to-engine front cover bolts.
9. Remove the 5 bolts and the 5 stud bolts from the engine front cover.
10. Disconnect the coolant bypass hose from the coolant pump and remove the engine front cover.

**NOTE:** Make sure that any coolant that drains into the front corners of the engine block cradle is removed.

11. Remove the oil pan drain plug and drain the engine oil.
  - Install the drain plug and tighten to 26 Nm (19 lb-ft).

### Installation

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

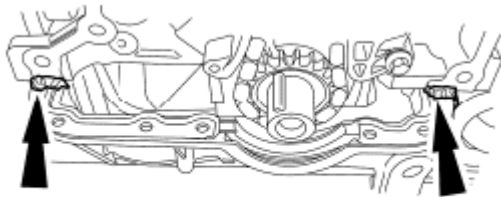
1. Clean and inspect the gasket mating surfaces. Use silicone gasket remover and metal surface prep and a

plastic or wooden scraping tool. Follow the directions on the packaging.

2. Position a new front cover gasket.

**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.

3. Apply silicone gasket and sealant to the oil pan and engine block mating surfaces.

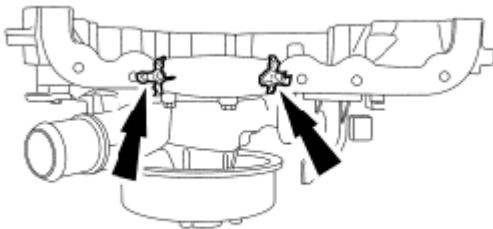


A0029570

**Fig. 46: Silicone Gasket And Sealant Applying Location On Oil Pan And Engine Block Mating Surfaces**

Courtesy of FORD MOTOR CO.

4. Apply silicone gasket and sealant to the front cover in 2 places.



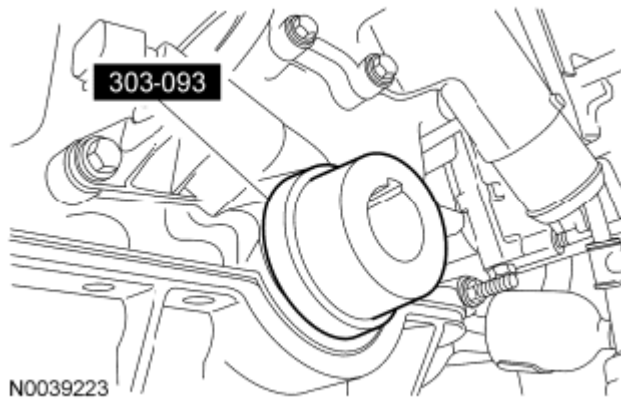
A0029571

**Fig. 47: Silicone Gasket And Sealant Applying Locations On Front Cover**

Courtesy of FORD MOTOR CO.

**NOTE:** Apply thread sealant to the stud bolts and make sure that the stud bolts are installed in their original positions.

5. Position the front cover and connect the coolant bypass hose to the thermostat housing.
  - Loosely install the 5 bolts and the 5 stud bolts.
6. Use the Front Cover Aligner, align the front cover.
  - Tighten the bolts and stud bolts to 19 Nm (168 lb-in).



**Fig. 48: Aligning Front Cover Using Front Cover Aligner**  
Courtesy of FORD MOTOR CO.

7. Install the 5 engine block cradle-to-engine front cover bolts.
  - Tighten to 14 Nm (124 lb-in).
8. Connect the **CKP** sensor and attach the 2 wiring retainers.
9. Install the accessory drive belt idler pulley and the bolt.
  - Tighten to 47 Nm (35 lb-ft).
10. Connect the lower radiator hose to the coolant pump.
11. Connect the heater hose to the coolant pump.
12. Connect the upper radiator hose.
13. Install the crankshaft front oil seal. For additional information, refer to **CRANKSHAFT FRONT SEAL**.
14. Fill the engine with clean engine oil.
15. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING** .

**TIMING DRIVE COMPONENTS - CAMSHAFT DRIVE CASSETTE, LH**

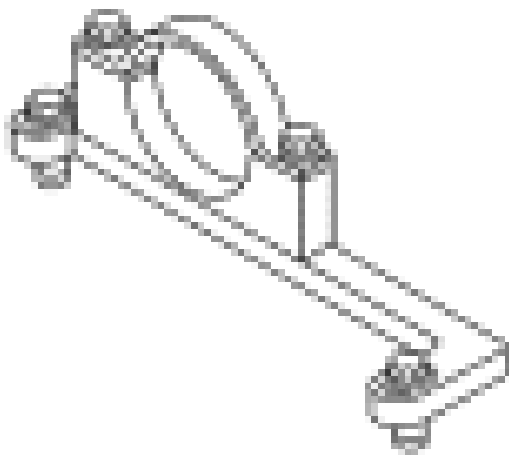
**Special Tool(s)**

**SPECIAL TOOLS DESCRIPTION CHART**

	Adapter for 303-564 303-578 (T97T-6256-A)
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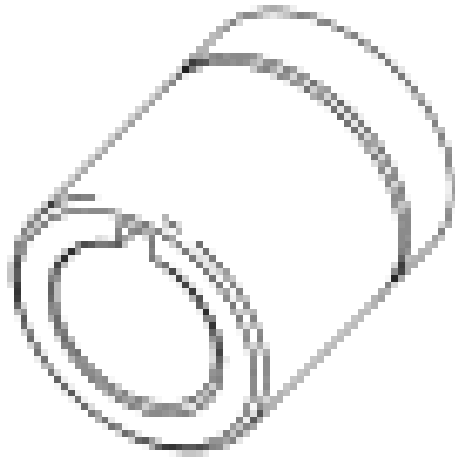


**ST1776-A**



**ST1777-A**

Holding Tool, Camshaft Sprocket  
303-564 (T97T-6256)

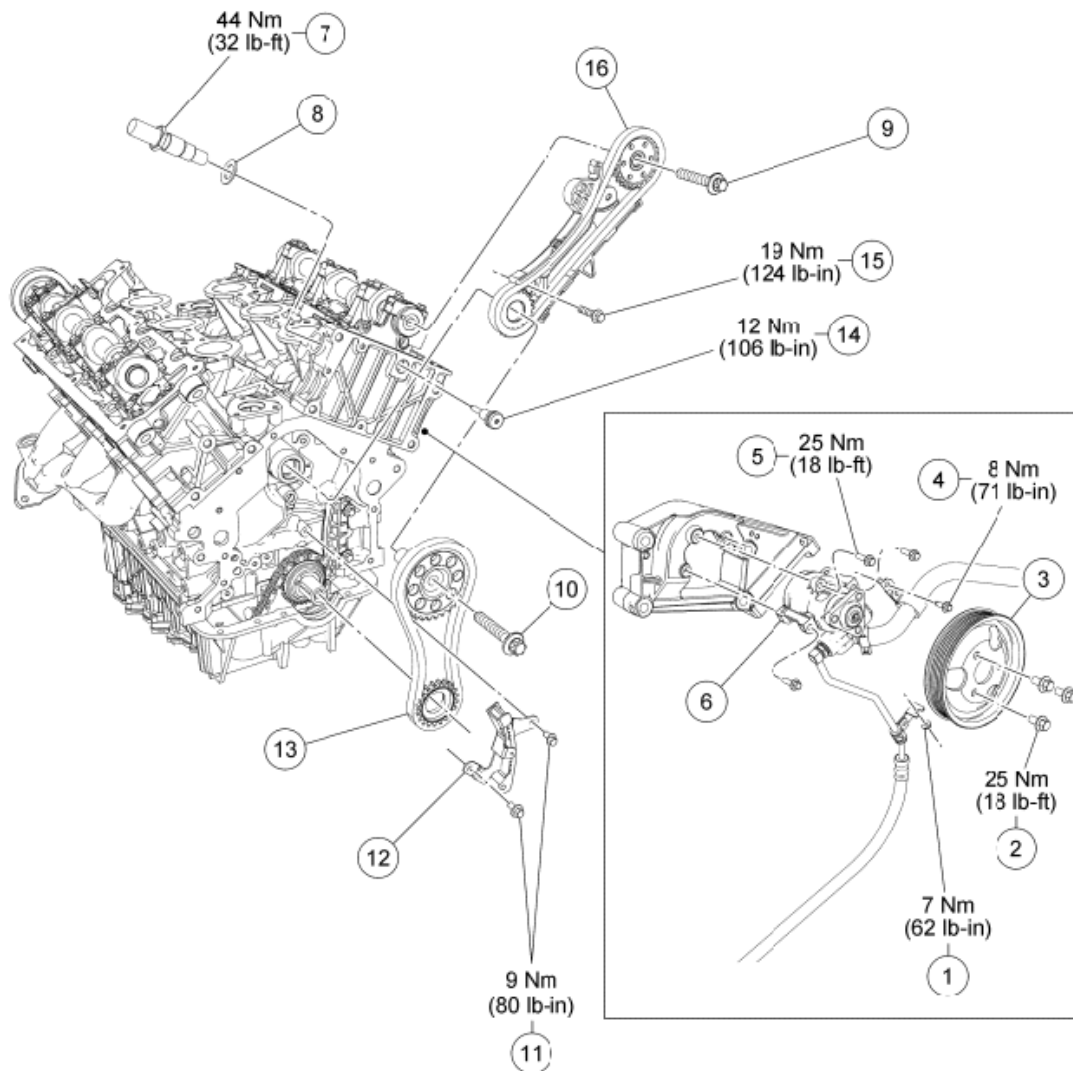


ST2694-A

Holding Tool, Crankshaft  
303-674

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang



N0085181

**Fig. 49: Exploded View Of Camshaft Drive Cassette - LH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

Item	Part Number	Description
1	W520101	Power Steering Pressure (PSP) tube bracket nut
2	N605784	Power steering pump pulley bolt (3 required)
3	3A733	Power steering pump pulley
4	W500213	Suction hose bracket bolt
5	W700839	Power steering pump bolt (3 required)
6	3A674	Power steering pump
7	6K254	Hydraulic chain tensioner
8	6M252	LH hydraulic chain tensioner washer

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

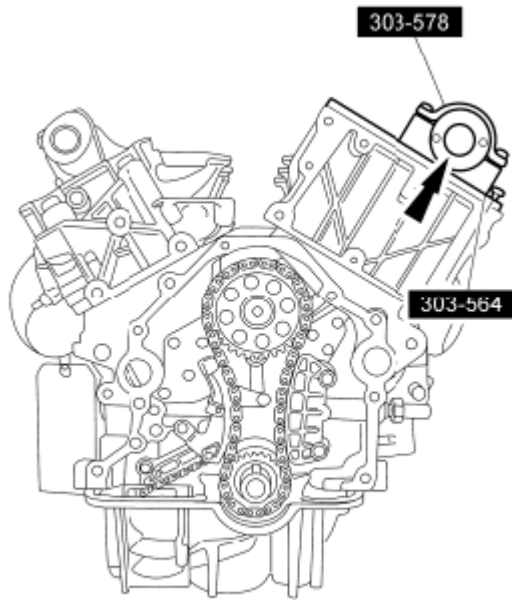
9	6M276	Camshaft sprocket bolt
10	6M276	Jackshaft sprocket bolt
11	W500011	Jackshaft chain tensioner bolts
12	6M271	Jackshaft chain tensioner
13	-	Primary chain and sprocket assembly
14	6U001	LH cassette-to-cylinder head bolt
15	W500110	LH cassette-to-cylinder block bolt
16	6M289	Timing chain and guide assembly

### Removal

1. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
3. Remove the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.
4. Remove the engine front cover. For additional information, refer to **ENGINE FRONT COVER**.
5. Remove all of the roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.

**NOTE:** The LH and RH camshafts must be retimed when either camshaft is disturbed.

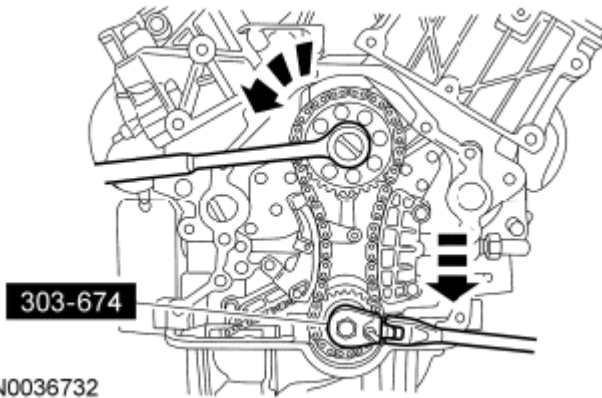
6. Turn the crankshaft clockwise to position the No. 1 cylinder at Top Dead Center (TDC).
7. Remove the LH hydraulic chain tensioner.
  - Remove and discard the washer.
8. Remove the LH camshaft sprocket bolt.
  - Install the Camshaft Sprocket Holding Tool and Adapter and tighten to 10 Nm (89 lb-in).
  - Remove the LH camshaft sprocket bolt.



A0083332

**Fig. 50: Removing LH Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

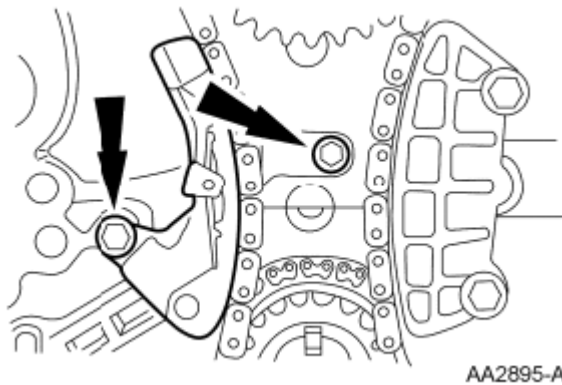
9. Using the Crankshaft Holding Tool, prevent the crankshaft from turning, remove the jack shaft sprocket bolt.



N0036732

**Fig. 51: Removing Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

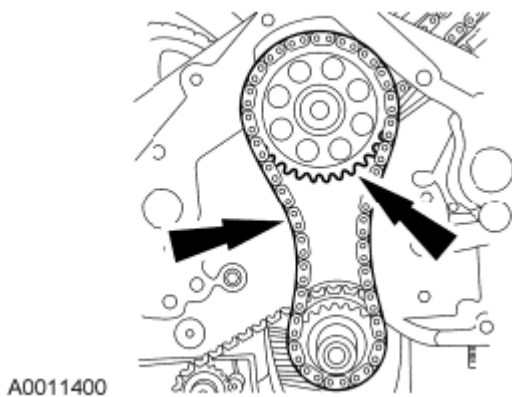
10. Remove the 2 bolts and the primary chain tensioner.



AA2895-A

**Fig. 52: Locating Primary Chain Tensioner Bolts**  
Courtesy of FORD MOTOR CO.

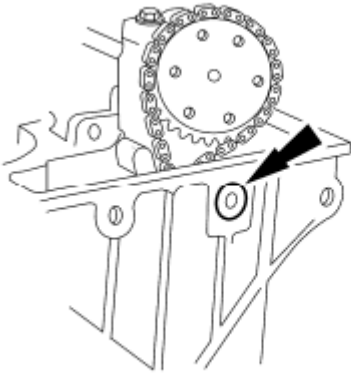
11. Remove the primary chain and sprockets as an assembly.



A0011400

**Fig. 53: Locating Primary Chain And Sprockets**  
Courtesy of FORD MOTOR CO.

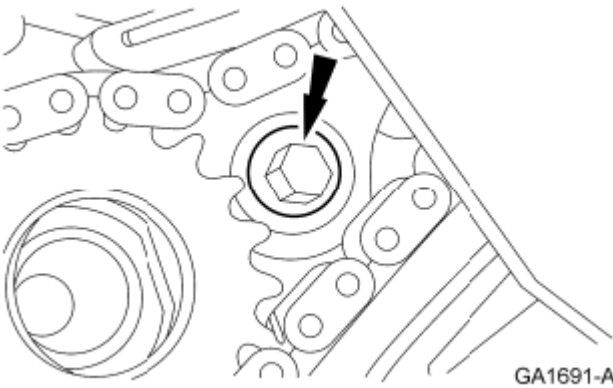
12. Remove the suction hose bracket bolt.
13. Remove the Power Steering Pressure (PSP) tube bracket nut.
14. Remove the 3 bolts and the power steering pump pulley.
15. Remove the 3 bolts and position the power steering pump aside.
16. Remove the LH cassette upper bolt.



GA1670-A

**Fig. 54: Locating LH Cassette Upper Bolt**  
Courtesy of FORD MOTOR CO.

17. Remove the LH cassette lower bolt and the LH cassette.

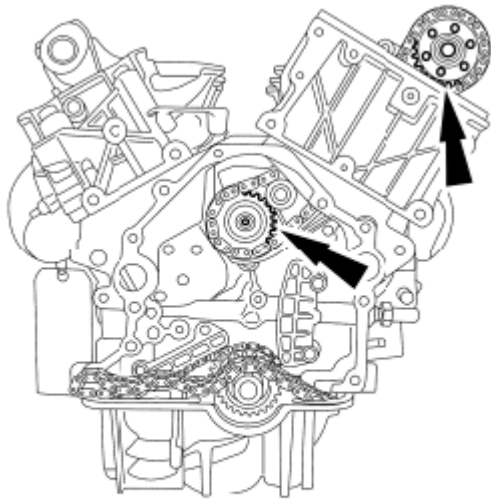


GA1691-A

**Fig. 55: Locating LH Cassette Lower Bolt**  
Courtesy of FORD MOTOR CO.

**Installation**

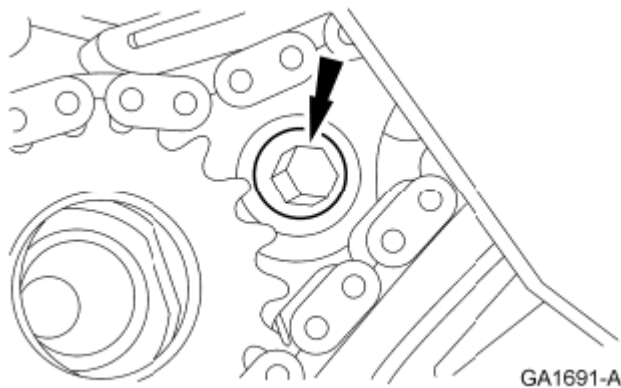
**NOTE:** The camshaft chain sprockets must be oriented correctly.



A0029678

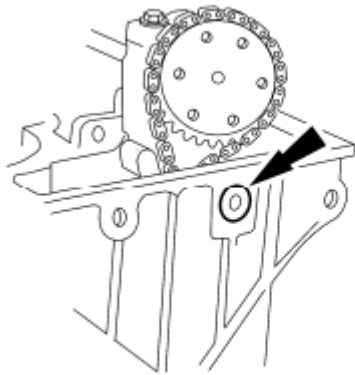
**Fig. 56: Locating Camshaft Chain Sprockets**  
Courtesy of FORD MOTOR CO.

1. Position the LH cassette.
2. Install the LH cassette lower bolt.
  - Tighten to 12 Nm (106 lb-in).



**Fig. 57: Locating LH Cassette Lower Bolt**  
Courtesy of FORD MOTOR CO.

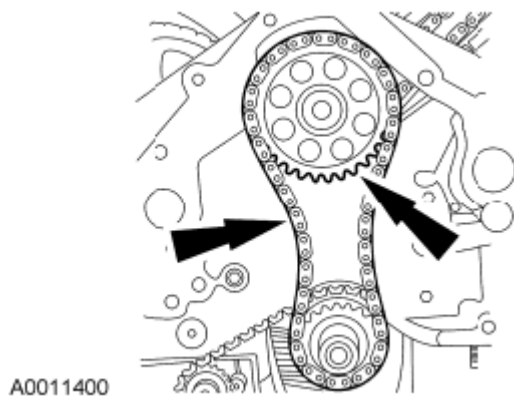
3. Install the LH cassette upper bolt.
  - Tighten to 19 Nm (168 lb-in).



GA1670-A

**Fig. 58: Locating LH Cassette Upper Bolt**  
 Courtesy of FORD MOTOR CO.

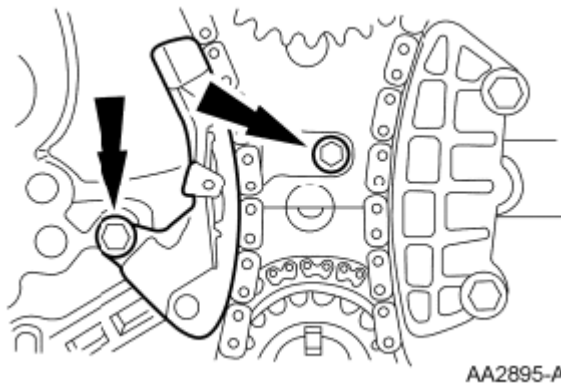
4. Position the power steering pump and install the 3 bolts.
  - Tighten to 25 Nm (18 lb-ft).
5. Install the power steering pump pulley and the 3 bolts.
  - Tighten to 25 Nm (18 lb-ft).
6. Install the **PSP** tube bracket nut.
  - Tighten to 7 Nm (62 lb-in).
7. Install the suction hose bracket bolt.
  - Tighten to 8 Nm (71 lb-in).
8. Install the primary chain and sprockets as an assembly.



A0011400

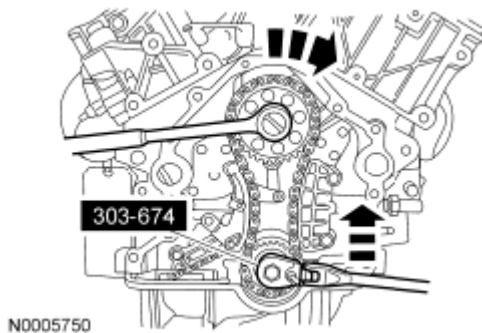
**Fig. 59: Locating Primary Chain And Sprockets**  
 Courtesy of FORD MOTOR CO.

9. Install the jack shaft chain tensioner and the 2 bolts.
  - Tighten to 9 Nm (80 lb-in).



**Fig. 60: Locating Jackshaft Chain Tensioner Bolts**  
Courtesy of FORD MOTOR CO.

10. Using the Crankshaft Holding Tool, prevent the crankshaft from turning, tighten the jack shaft sprocket bolt in 2 stages.
  - Stage 1: Tighten to 45 Nm (33 lb-ft).
  - Stage 2: Tighten an additional 90 degrees.



**Fig. 61: Tightening Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

11. Loosely install the camshaft sprocket bolt.
12. Install the engine front cover. For additional information, refer to **ENGINE FRONT COVER**.

**NOTE:** The LH and RH camshafts must be retimed when either camshaft is disturbed.

**NOTE:** The LH hydraulic chain tensioner will be installed during camshaft timing.

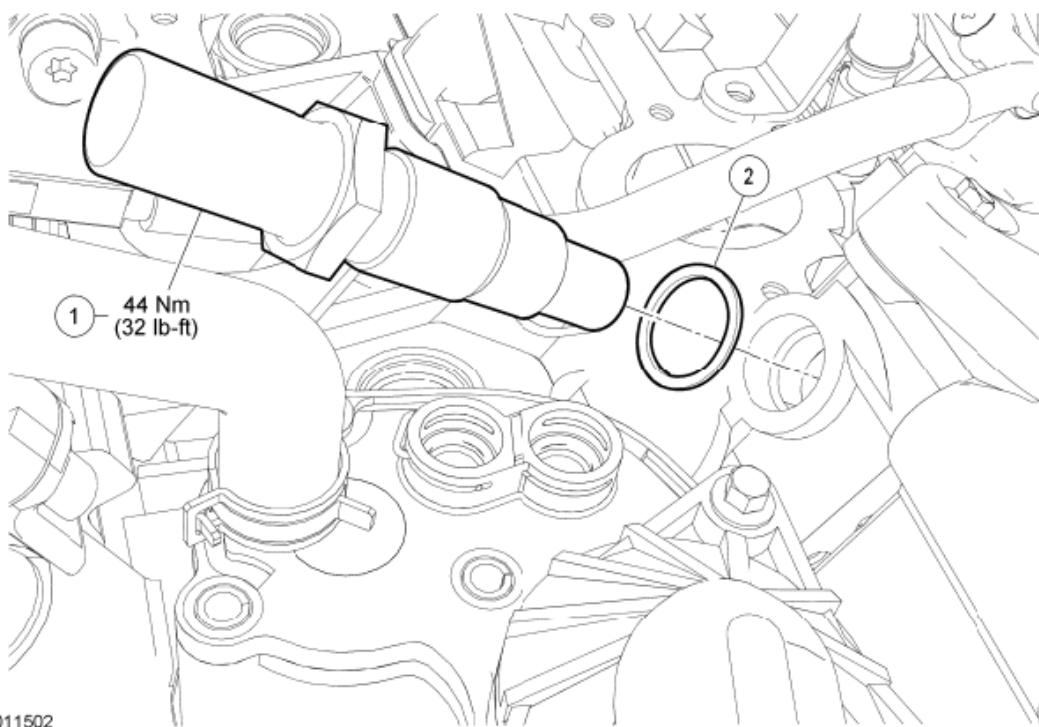
13. Retime the LH and RH camshafts. For additional information, refer to **CAMSHAFT TIMING**.
14. Install the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.
15. Install the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.

16. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
17. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING** .

**TIMING DRIVE COMPONENTS - CAMSHAFT DRIVE CASSETTE, RH**

**NOTE:** For Timing Drive Components - Camshaft Drive Cassette, RH service information, see **Engine** under **DISASSEMBLY**.

**TIMING DRIVE COMPONENTS - HYDRAULIC CHAIN TENSIONER, LH**



**Fig. 62: Identifying Hydraulic Chain Tensioner And Hydraulic Chain Tensioner Washer With Torque Specification - LH**

Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

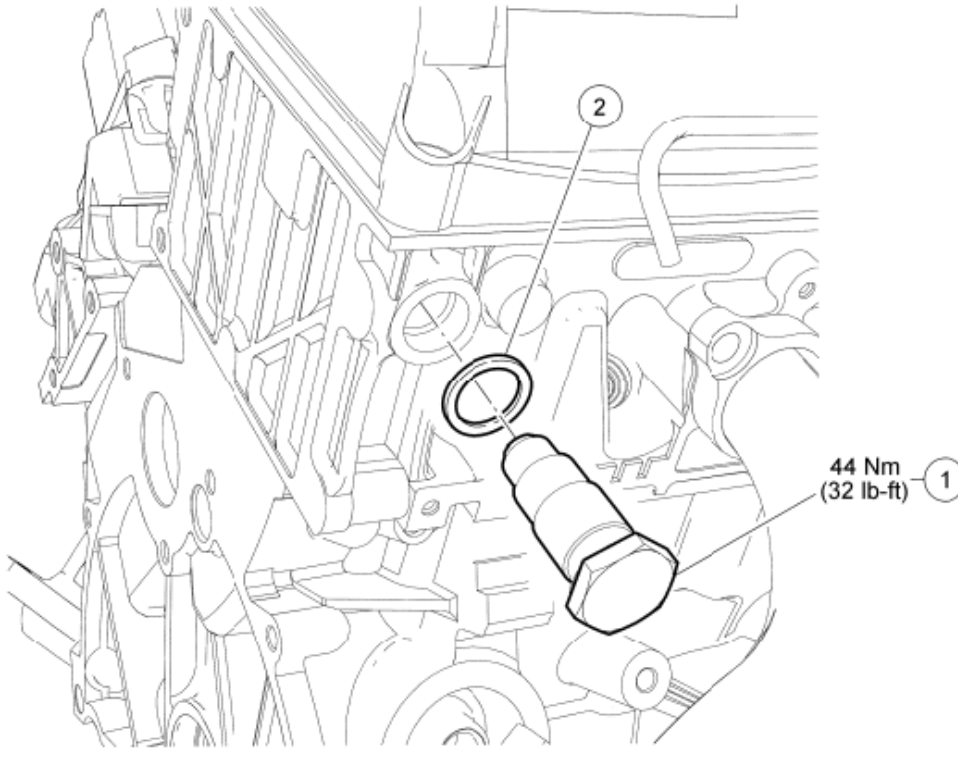
Item	Part Number	Description
1	6K254	LH hydraulic chain tensioner
2	6M252	LH hydraulic chain tensioner washer

**Removal and Installation**

1. Remove the Engine Coolant Temperature (ECT) sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS** .

2. Remove the LH hydraulic chain tensioner.
  - To install, tighten to 44 Nm (32 lb-ft).
3. Remove and discard the washer.
4. To install, reverse the removal procedure.

**TIMING DRIVE COMPONENTS - HYDRAULIC CHAIN TENSIONER, RH**



**Fig. 63: Identifying Hydraulic Chain Tensioner And Hydraulic Chain Tensioner Washer With Torque Specification - RH**

Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

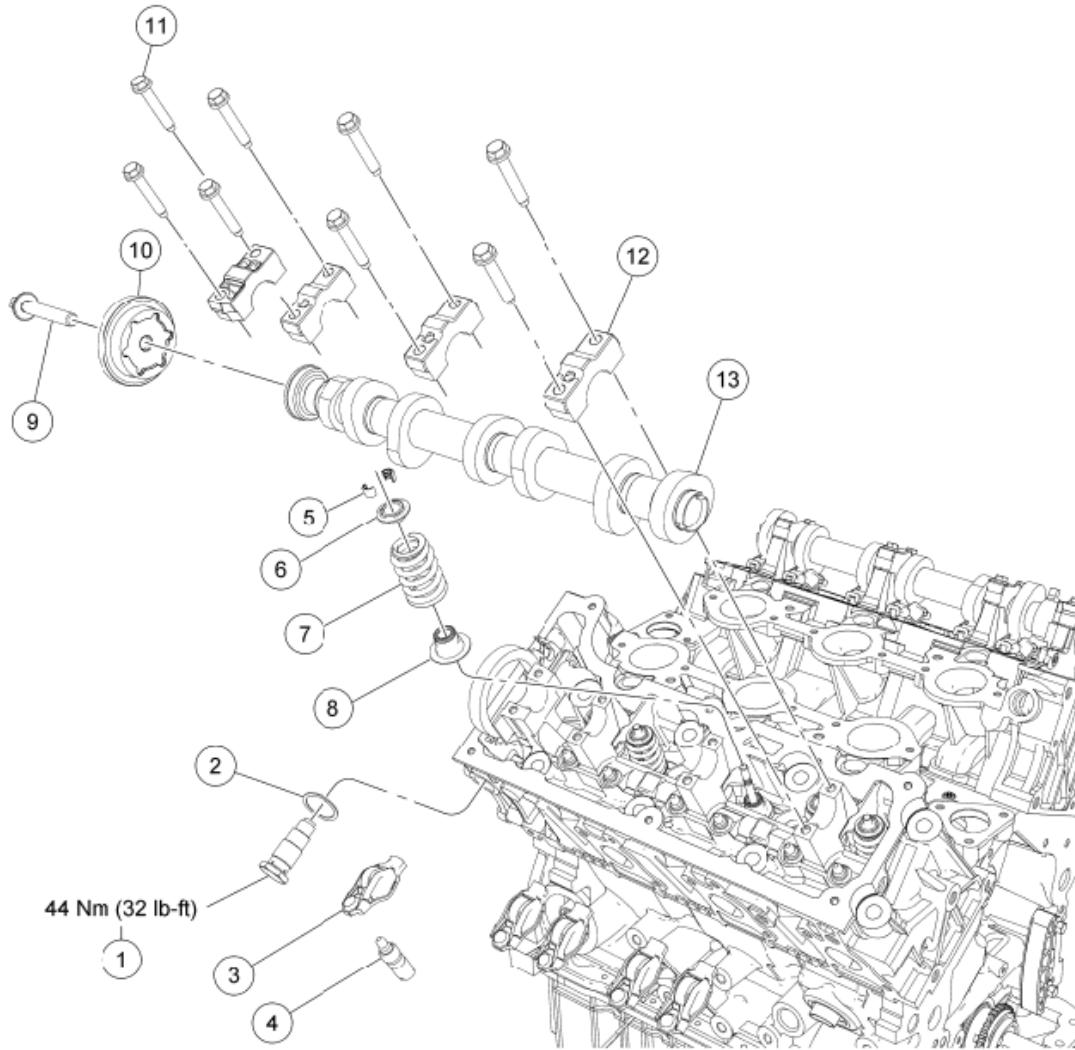
Item	Part Number	Description
1	6K254	RH hydraulic chain tensioner
2	6M252	RH hydraulic chain tensioner washer

**Removal and Installation**

1. Remove the RH hydraulic chain tensioner.
  - To install, tighten to 44 Nm (32 lb-ft).
2. Remove and discard the washer.
3. To install, reverse the removal procedure.

**VALVE TRAIN COMPONENTS - EXPLODED VIEW**

RH Side



**Fig. 64: Exploded View Of Valve Train Components - RH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

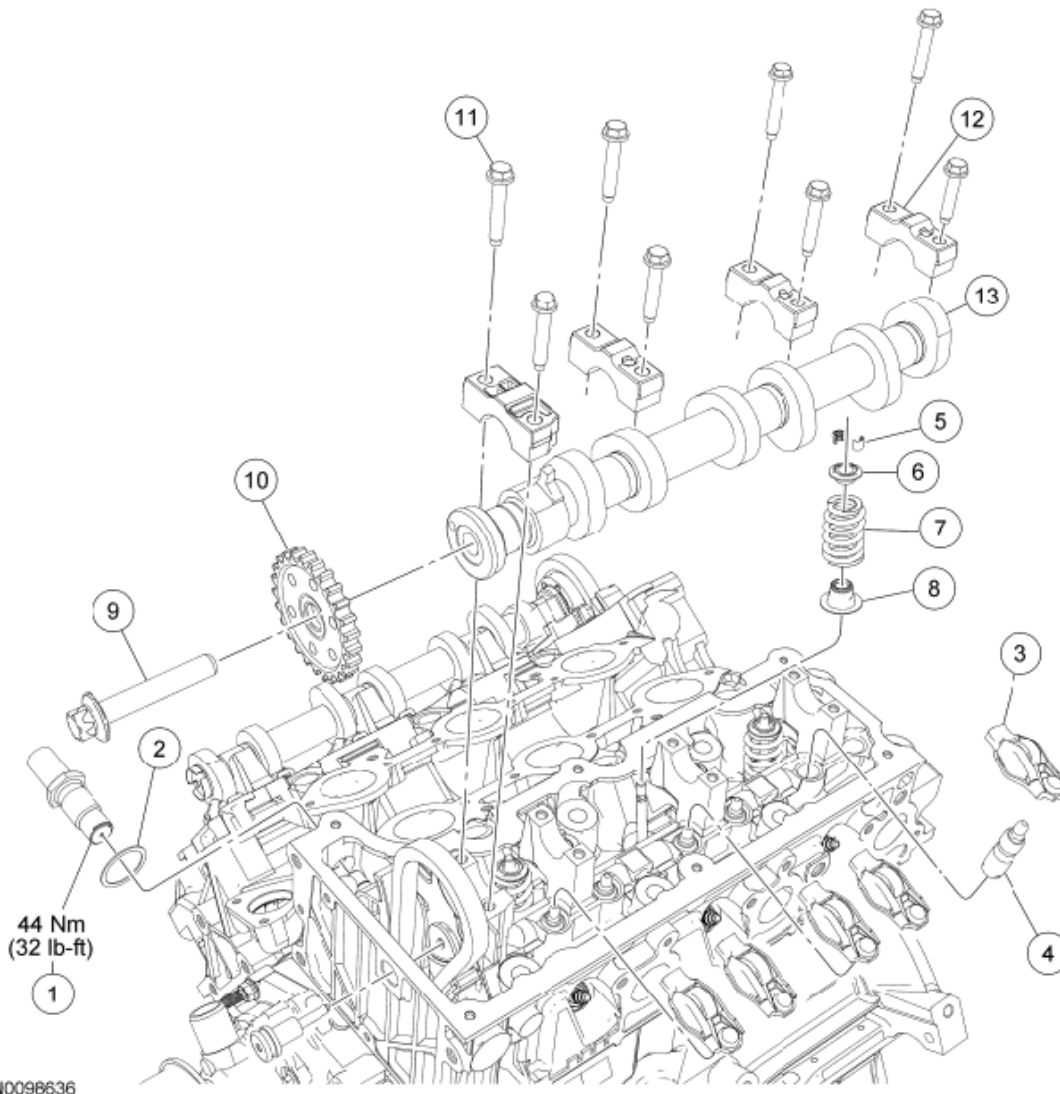
Item	Part Number	Description
1	6K254	RH hydraulic chain tensioner
2	6M252	RH hydraulic chain tensioner washer
3	6529	Camshaft roller follower (6 required)
4	6C501	Hydraulic lash adjuster (6 required)
5	6518	Valve spring retainer key (12 required)

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6	6A536	Valve spring retainer (6 required)
7	6513	Valve spring (6 required)
8	6571	Valve seal (6 required)
9	6M276	RH camshaft sprocket bolt
10	6256	RH camshaft sprocket
11	W702341	Camshaft bearing cap bolt (8 required)
12	6A258	Camshaft bearing cap (4 required)
13	6250	RH camshaft

### LH Side



**Fig. 65: Exploded View Of Valve Train Components - LH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

### ITEM DESCRIPTION


Item	Part Number	Description
1	6K254	LH hydraulic chain tensioner
2	6M252	LH hydraulic chain tensioner washer
3	6529	Camshaft roller follower (6 required)
4	6C501	Hydraulic lash adjuster (6 required)
5	6518	Valve spring retainer key (12 required)
6	6A536	Valve spring retainer (6 required)
7	6513	Valve spring (6 required)
8	6571	Valve seal (6 required)
9	6M276	LH camshaft sprocket bolt
10	6M267	LH camshaft sprocket
11	W702341	Camshaft bearing cap bolt (8 required)
12	6A258	Camshaft bearing cap (4 required)
13	6A274	LH camshaft

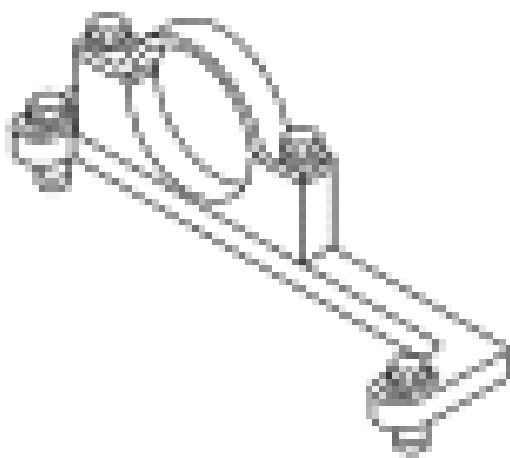
1. For additional information, refer to the procedures.

### CAMSHAFTS

#### Special Tool(s)

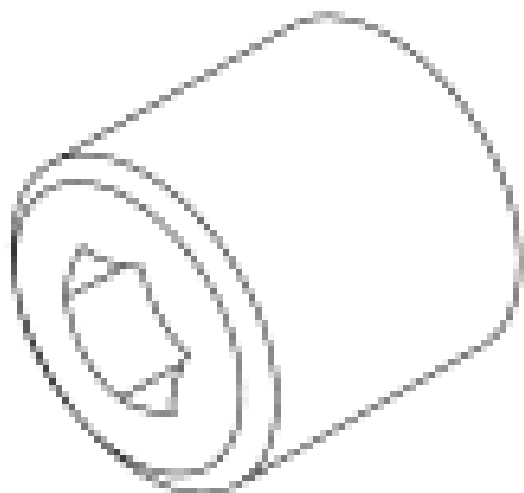
### SPECIAL TOOLS DESCRIPTION CHART

 <b>ST1778-A</b>	Adapter for 303-564 303-578 (T97T-6256-A)
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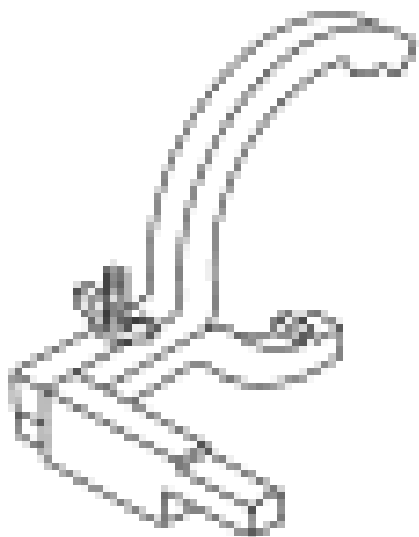
**ST1777-A**

Holding Tool, Camshaft Sprocket  
303-564 (T97T-6256-B)



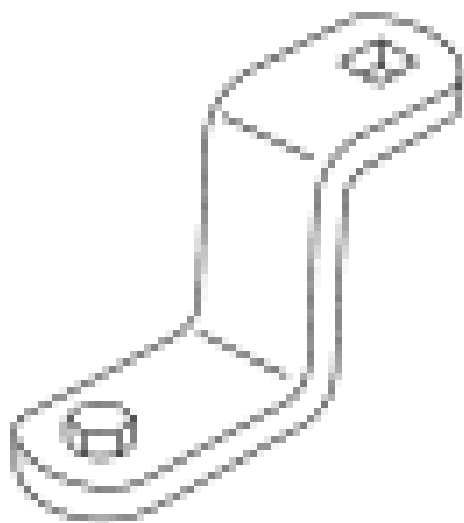
**ST1781-A**

Socket, Camshaft Sprocket Nut  
303-565 (T97T-6256-G)



**ST1775-A**

Timing Tool, Crankshaft TDC  
303-573 (T97T-6303-A)



**ST1780-A**

Torque Wrench Extension  
303-575 (T97T-6256-F)

**Material**

**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A

**Removal**

**Both sides**

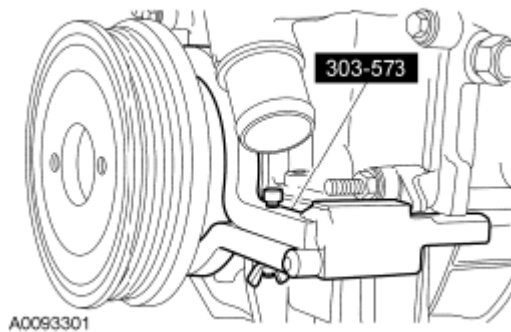
1. Remove the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.

**NOTE:** The RH and LH camshaft timing procedure must be carried out when either camshaft is serviced.

2. Rotate the crankshaft clockwise to position the No. 1 cylinder at Top Dead Center (TDC).

**NOTE:** Do not rotate the engine counterclockwise. Rotating the engine counterclockwise will result in damage to the damper crank sensor speed wheel and incorrect timing of the engine.

**NOTE:** The Crankshaft TDC Timing Tool must be installed on the damper and should contact the engine block. This positions the piston at TDC .

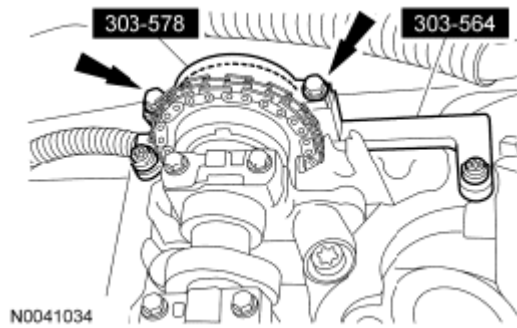


**Fig. 66: Identifying Crankshaft TDC Timing Tool**  
 Courtesy of FORD MOTOR CO.

3. Install the Crankshaft TDC Timing Tool.

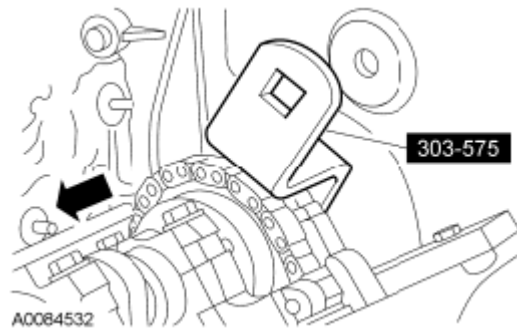
**RH side**

4. Install the Camshaft Sprocket Holding Tool and Adapter on the rear of the RH cylinder head and tighten the top 2 clamp bolts to 10 Nm (89 lb-in).



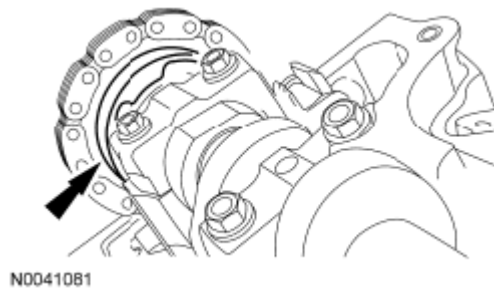
**Fig. 67: Locating Camshaft Sprocket Holding Tool, Adapter With Clamp Bolts**  
 Courtesy of FORD MOTOR CO.

**NOTE:** The RH camshaft sprocket is a LH-threaded bolt.



**Fig. 68: Removing/Installing Camshaft Sprocket Bolt Using Torque Wrench Extension**  
 Courtesy of FORD MOTOR CO.

5. Using the Torque Wrench Extension and the Camshaft Sprocket Nut Socket 303-565, loosen the camshaft sprocket bolt.
6. Remove the camshaft sprocket bolt and position the RH camshaft sprocket aside.

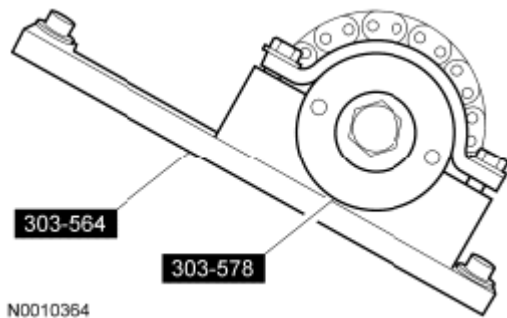


**Fig. 69: Locating RH Camshaft Sprocket**  
 Courtesy of FORD MOTOR CO.

**LH side**

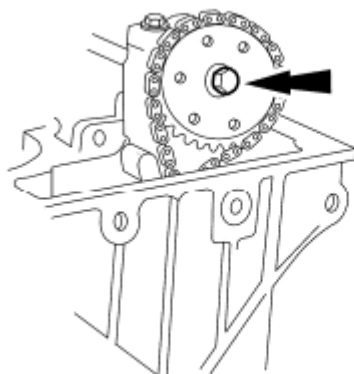
7. Install the Camshaft Sprocket Holding Tool and Adapter on the front of the LH camshaft and tighten the

2 top clamp bolts to 10 Nm (89 lb-in).



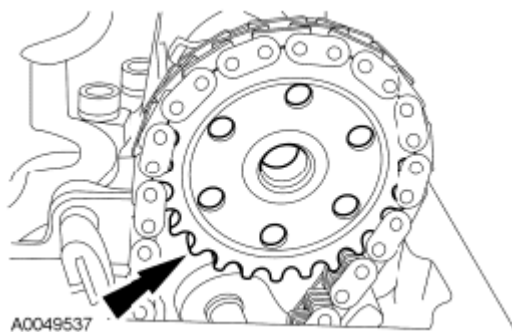
**Fig. 70: Identifying Camshaft Sprocket Holding Tool And Adapter**  
Courtesy of FORD MOTOR CO.

8. Loosen the bolt.



**Fig. 71: Locating Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

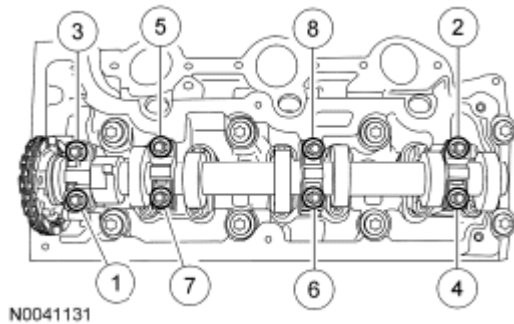
9. Remove the bolt and position the LH camshaft sprocket aside.



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

**Both sides**

**NOTE:** Mark the position of the camshaft bearing caps so they can be installed in their original positions.



**Fig. 73: Identifying Camshaft Bearing Caps Bolts Removal Sequence**  
Courtesy of FORD MOTOR CO.

10. Remove the bolts in the sequence shown in illustration and remove the camshaft bearing caps.
11. Remove the camshaft.

**Installation****Both sides**

**NOTE:** Lubricate the camshafts with clean engine oil.

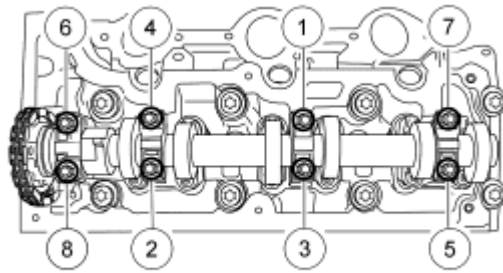
1. Install the camshaft.

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

**NOTE:** The camshaft bearing caps must be installed in their original positions.

**NOTE:** After installing the bolts, check the camshaft for free rotation.

2. Install the camshaft bearing caps and the bolts.
  - Tighten the bolts in the sequence shown in illustration in 2 stages.
    - Stage 1: Tighten to 6 Nm (53 lb-in).
    - Stage 2: Tighten to 16 Nm (142 lb-in).

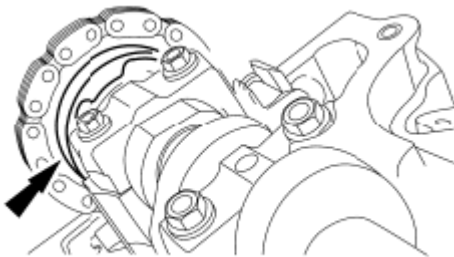


N0041132

**Fig. 74: Identifying Camshaft Bearing Caps Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

**RH side**

**NOTE:** The camshaft gear must turn freely on the camshaft. Do not tighten the bolt at this time.



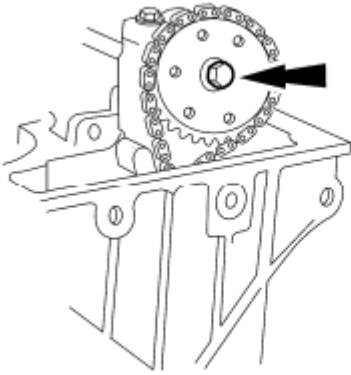
N0041081

**Fig. 75: Locating RH Camshaft Sprocket**  
Courtesy of FORD MOTOR CO.

3. Install the RH camshaft sprocket and loosely install the bolt.

**LH side**

**NOTE:** The camshaft gear must turn freely on the camshaft. Do not tighten the bolt at this time.



GA1669-A

**Fig. 76: Locating Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

4. Install the LH camshaft sprocket and loosely install the bolt.

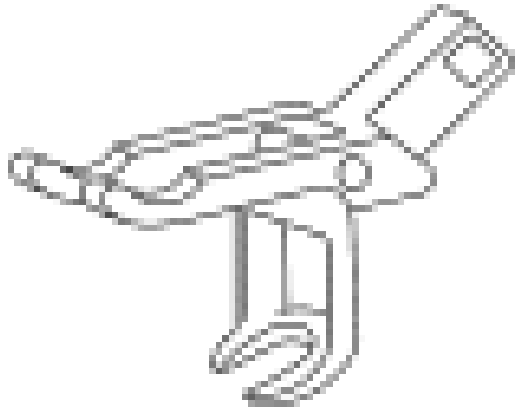
**Both sides**

5. Retime the camshafts. For additional information, refer to CAMSHAFT TIMING.
6. Install the camshaft roller followers. For additional information, refer to CAMSHAFT ROLLER FOLLOWER.

**CAMSHAFT ROLLER FOLLOWER**

**Special Tool(s)**

**SPECIAL TOOLS DESCRIPTION CHART**

 <p>ST1330-A</p>	<p>Compressor, Valve Spring 303-581 (T97T-6565-A)</p>
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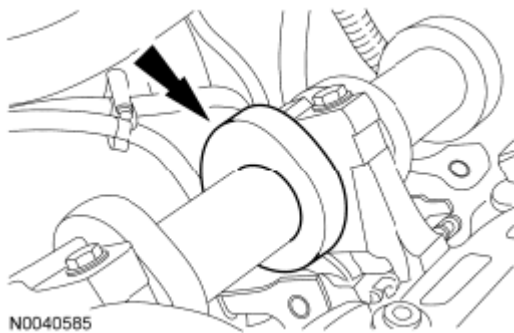
**Material**

**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A

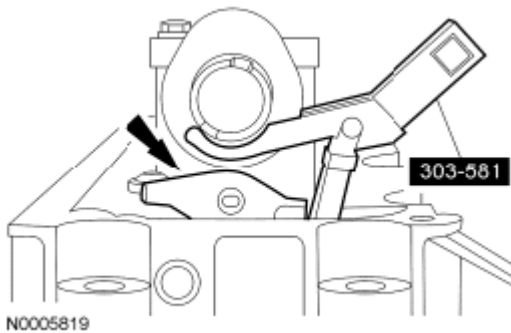
**Removal and Installation**

1. Remove the fuel rail. For additional information, refer to **FUEL CHARGING & CONTROLS - 4.0L SOHC**.
2. Remove the LH and RH valve covers. For additional information, refer to **VALVE COVER - RH** and **VALVE COVER - LH**.
3. Rotate the crankshaft until the camshaft for the cylinder being serviced is at base circle.



**Fig. 77: Locating Cam Lobe**  
 Courtesy of FORD MOTOR CO.

**NOTE:** Mark the position of the camshaft roller followers so they can be installed in their original positions.



**Fig. 78: Removing Camshaft Roller Using Special Tool**  
 Courtesy of FORD MOTOR CO.

4. Using the Valve Spring Compressor, remove the camshaft roller followers.

**NOTE:** The camshaft roller followers must be installed in their original positions.

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

5. To install, reverse the removal procedure.

**HYDRAULIC LASH ADJUSTER**

**Material**

**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A

**Removal and Installation**

1. Remove the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.

**NOTE:** Mark the position of the hydraulic lash adjusters so they can be installed in their original positions.

2. Remove the hydraulic lash adjusters.

**NOTE:** The hydraulic lash adjusters must be installed in their original positions.

**NOTE:** Lubricate the hydraulic lash adjusters with clean engine oil.

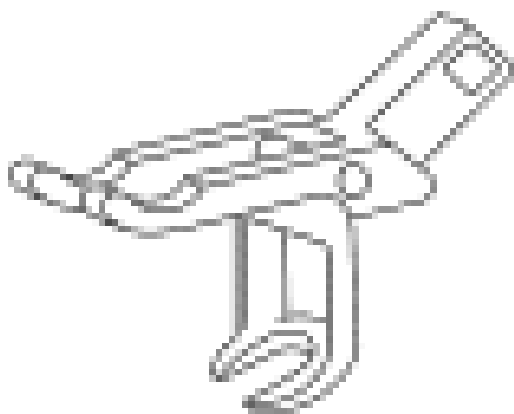
3. To install, reverse the removal procedure.

**VALVE SPRING, RETAINER, AND SEAL**

**Special Tool(s)**

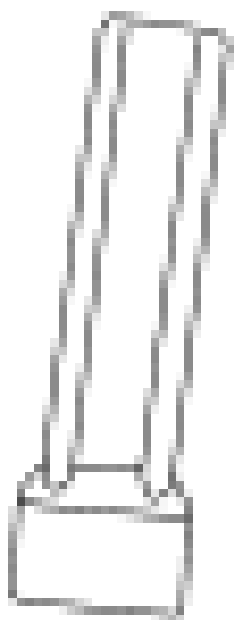
**SPECIAL TOOLS DESCRIPTION CHART**

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ST1330-A

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



ST1824-A

Installer, Valve Stem Oil Seal  
303-370 (T90T-6571-A)

**Material**

**MATERIAL SPECIFICATIONS**

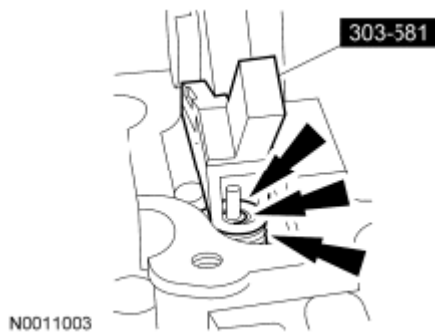
Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A

**Removal**

1. Remove the spark plugs. For additional information, refer to **ENGINE IGNITION - 4.0L SOHC** .
2. Remove the camshaft roller followers. For additional information, refer to **CAMSHAFT ROLLER FOLLOWER**.
3. Position the piston of the cylinder being serviced at Top Dead Center (TDC).

**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.

4. Hold the valves in the cylinder head.
  - Use a suitable tool to apply air pressure to the cylinder.
5. Using the Valve Spring Compressor, remove the valve spring retainer keys, valve spring retainers and the valve springs.

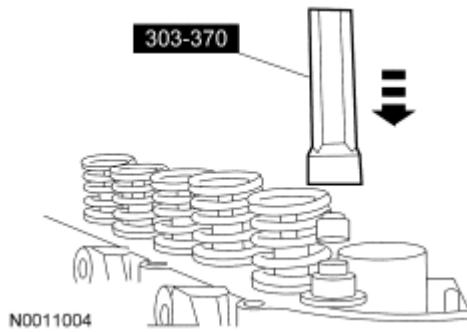


**Fig. 79: Removing/Installing Valve Spring, Valve Spring Retainer And Retainer Keys**  
 Courtesy of FORD MOTOR CO.

6. Remove the valve seals.

**Installation**

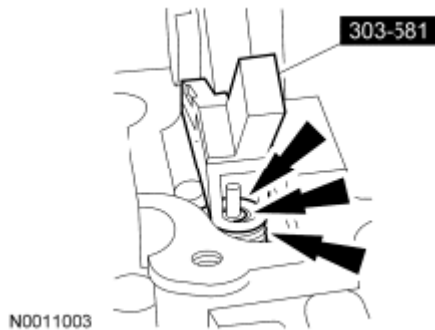
**NOTE:** Lubricate the valve seals with clean engine oil.



**Fig. 80: Installing Valve Stem Seal Using Valve Stem Seal Installer**  
 Courtesy of FORD MOTOR CO.

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

**NOTE:** Lubricate the valve springs, retainers and retainer keys with clean engine oil.



**Fig. 81: Removing/Installing Valve Spring, Valve Spring Retainer And Retainer Keys**  
 Courtesy of FORD MOTOR CO.

2. Using the Valve Spring Compressor, install the valve springs the valve spring retainers and the valve spring retainer keys.
3. Install the camshaft roller followers. For additional information, refer to CAMSHAFT ROLLER FOLLOWER.
4. Install the spark plugs. For additional information, refer to ENGINE IGNITION - 4.0L SOHC .

## CYLINDER HEAD

### Special Tool(s)

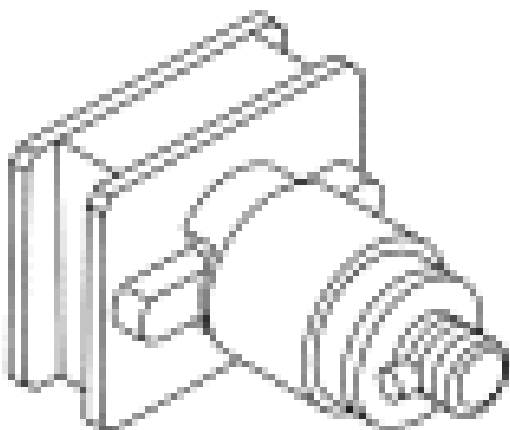
### SPECIAL TOOLS DESCRIPTION CHART

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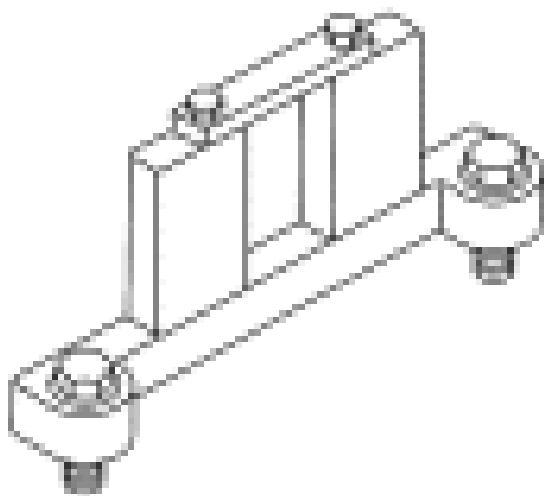
**ST1778-A**

Adapter for 303-564  
303-578 (T97T-6256-A)



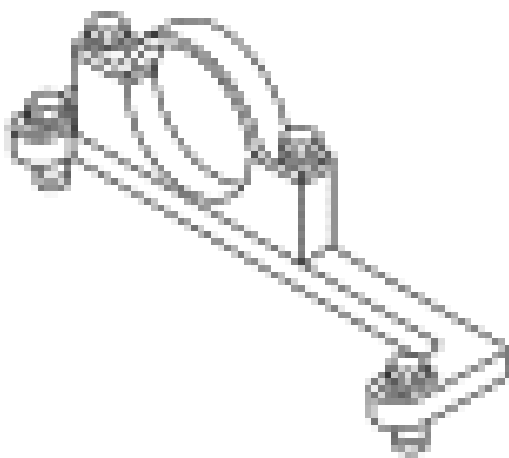
**ST1779-A**

Adapter for 303-577  
303-576 (T97T-6256-D)



**ST1778-A**

Holding Tool, Camshaft  
303-577 (T97T-6256-C)



**ST1777-A**

Holding Tool, Camshaft Sprocket  
303-564 (T97T-6256-B)

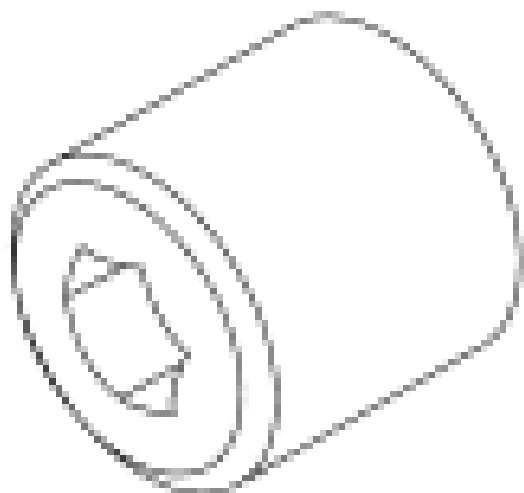
**2010 Ford Mustang Shelby GT500**

2010 ENGINE Engine - 4.0L SOHC - Mustang



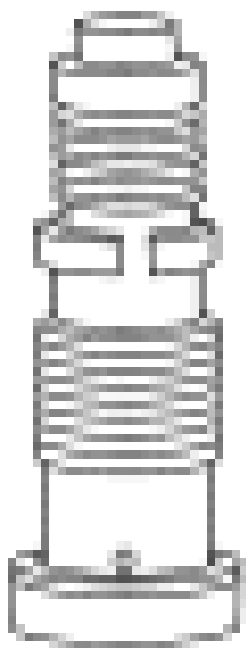
Remover, Spark Plug Wire  
303-106 (T74P-6666A)

**ST1384-A**



Socket, Camshaft Sprocket Nut  
303-565 (T97T-6256-G)

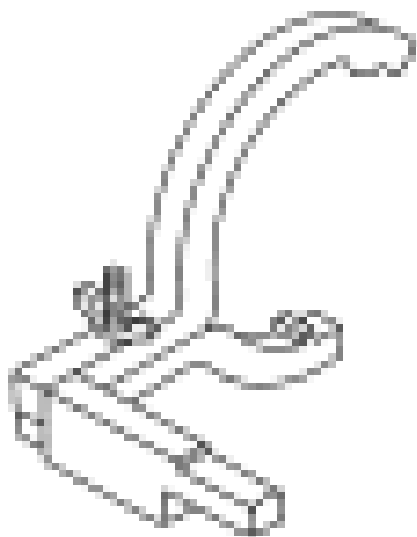
**ST1781-A**



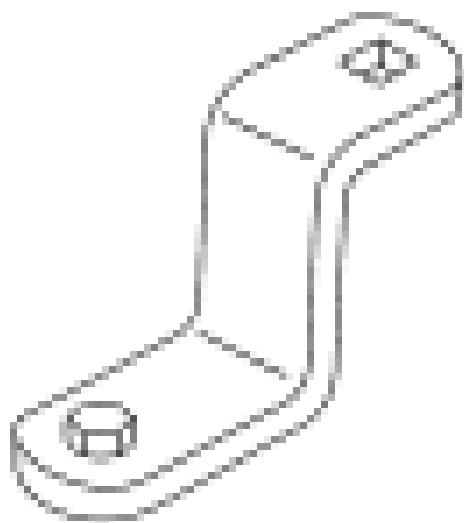
ST1774-A

Tensioner, Timing Chain  
303-571 (T97T-6K254-A)

Timing Tool, Crankshaft TDC  
303-573 (T97T-6303-A)



**ST1775-A**



**ST1780-A**

Torque Wrench Extension  
303-575 (T97T-6256-F)

**Material**

**MATERIAL SPECIFICATIONS**

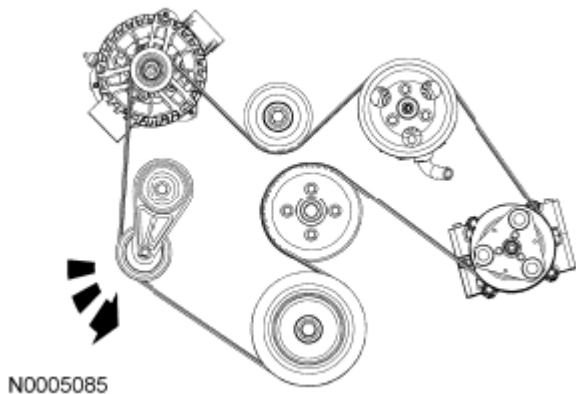
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket Remover ZC-30	-

**Removal**

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

**Both sides**

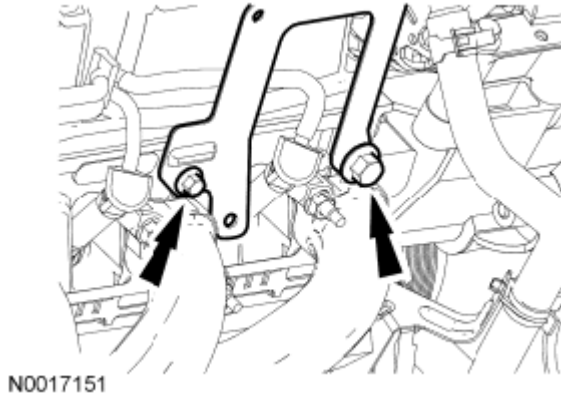
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
3. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING**.
4. Remove the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.
5. Remove the hydraulic lash adjusters. For additional information, refer to **HYDRAULIC LASH ADJUSTER**.
6. Rotate the accessory drive belt tensioner counterclockwise and remove the accessory drive belt.



**Fig. 82: Rotating Accessory Drive Belt Tensioner Counterclockwise**  
Courtesy of FORD MOTOR CO.

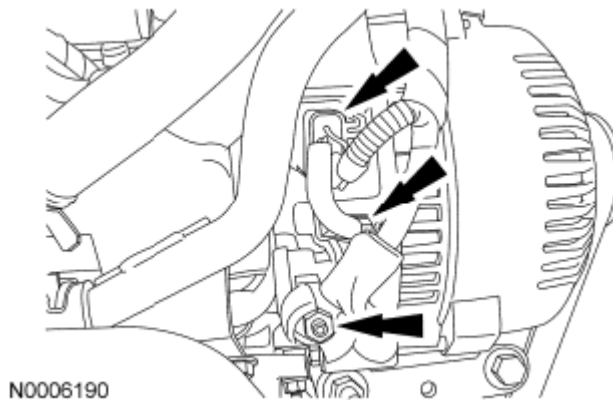
**RH side**

7. Remove the 2 coolant tube bracket bolts.



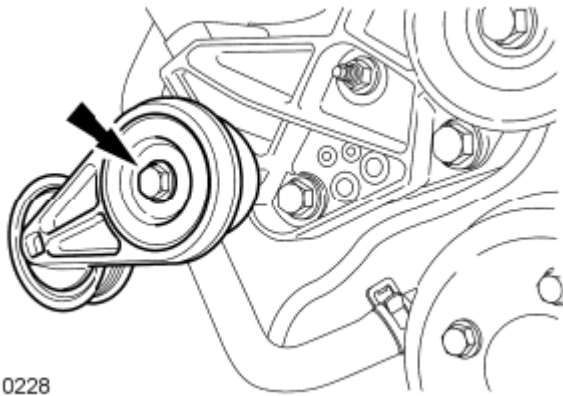
**Fig. 83: Locating Coolant Tube Bracket Bolts**  
Courtesy of FORD MOTOR CO.

8. Disconnect the generator electrical connector, remove the nut and detach the B+ terminal.
  - Detach the pin-type retainer.



**Fig. 84: Locating Generator Electrical Connector And Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

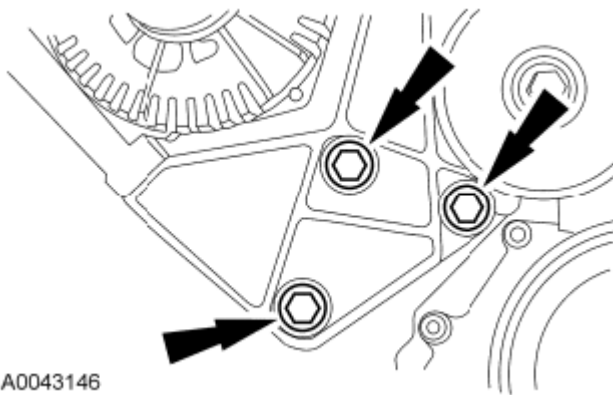
9. Remove the bolt and the accessory drive belt tensioner.



N0010228

**Fig. 85: Locating Accessory Drive Belt Tensioner Bolt**  
Courtesy of FORD MOTOR CO.

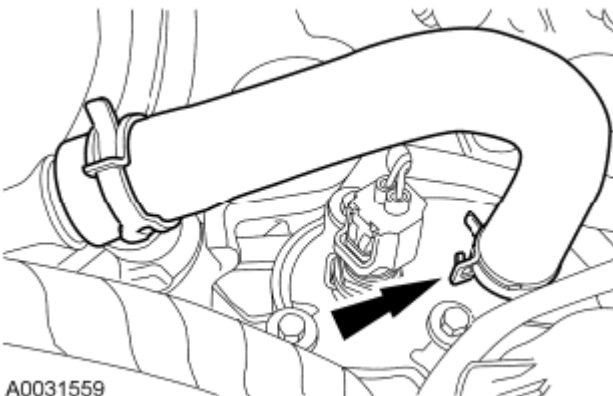
10. Remove the nut, the 2 bolts and the generator mounting bracket assembly.



A0043146

**Fig. 86: Locating Generator Mounting Bracket Assembly Bolts And Nut**  
Courtesy of FORD MOTOR CO.

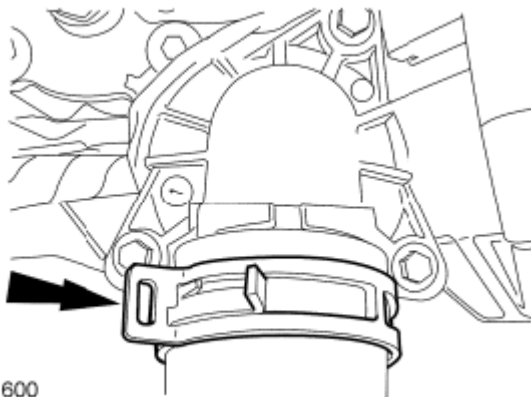
11. Disconnect the heater hose from the thermostat housing.



A0031559

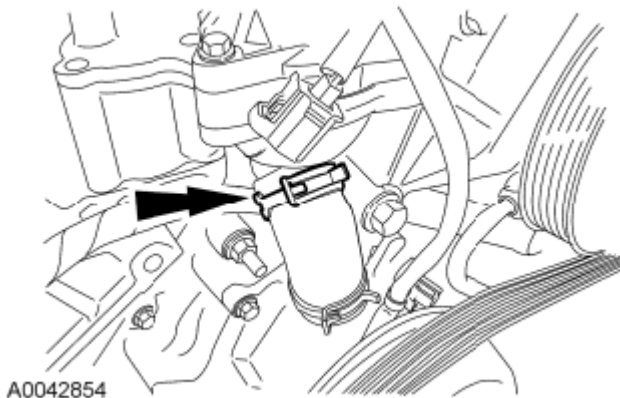
**Fig. 87: Locating Heater Hose On Thermostat Housing**  
Courtesy of FORD MOTOR CO.

12. Disconnect the upper radiator hose.



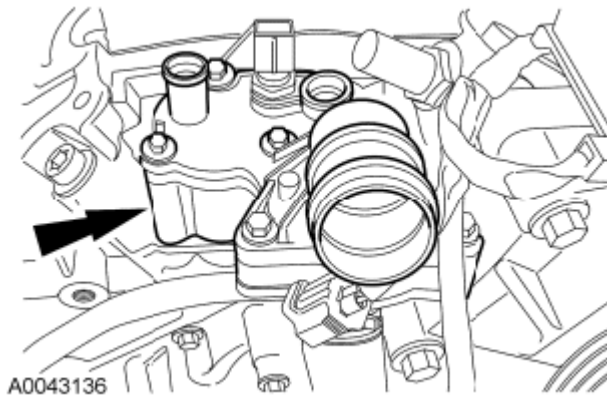
**Fig. 88: Locating Upper Radiator Hose**  
Courtesy of FORD MOTOR CO.

13. Position the coolant bypass hose clamp aside.



**Fig. 89: Locating Coolant Bypass Hose Clamp**  
Courtesy of FORD MOTOR CO.

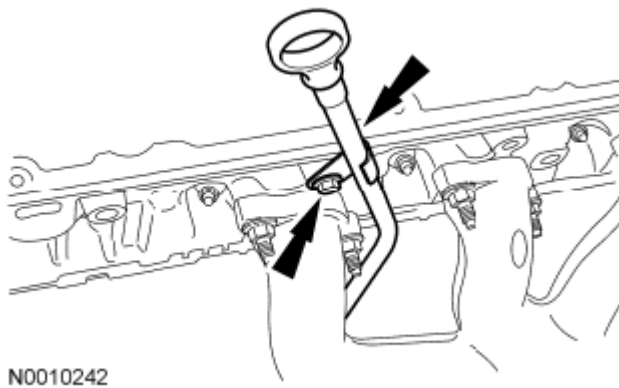
14. Remove the 3 bolts and the thermostat housing.
  - Disconnect the Engine Coolant Temperature (ECT) sensor electrical connector.



**Fig. 90: Locating Thermostat Housing**  
Courtesy of FORD MOTOR CO.

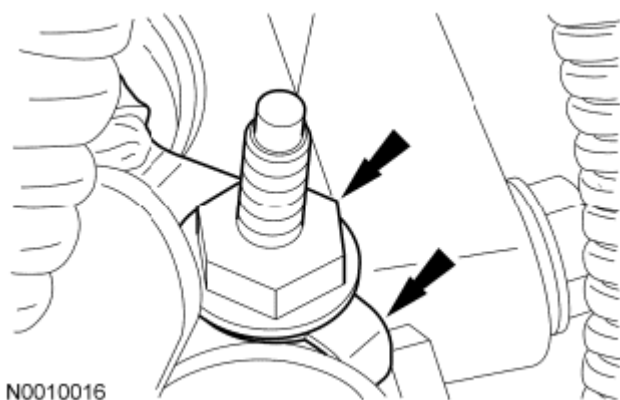
**LH side**

15. Remove the bolt and the oil level indicator tube.



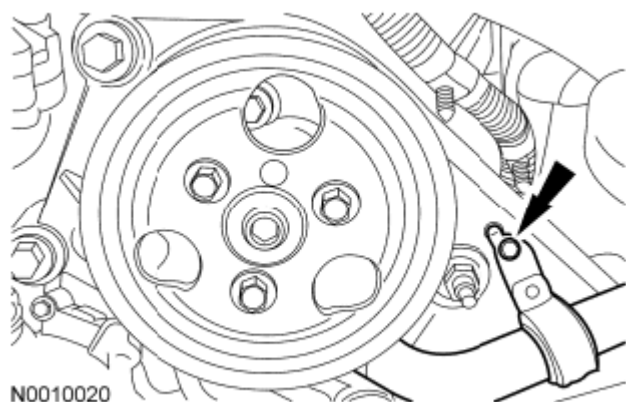
**Fig. 91: Locating Oil Level Indicator Tube And Bolt**  
Courtesy of FORD MOTOR CO.

16. Remove the stud bolt and detach the ground strap.
  - Position the ground strap aside.



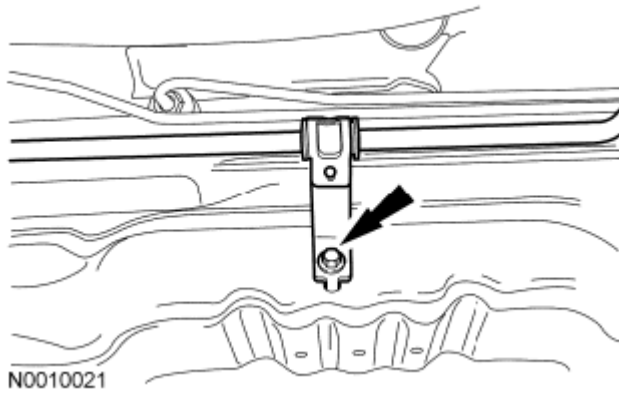
**Fig. 92: Locating Stud Bolt And Ground Strap**  
Courtesy of FORD MOTOR CO.

17. Remove the bolt and detach the power steering supply hose bracket from the Front End Accessory Drive (FEAD) bracket.



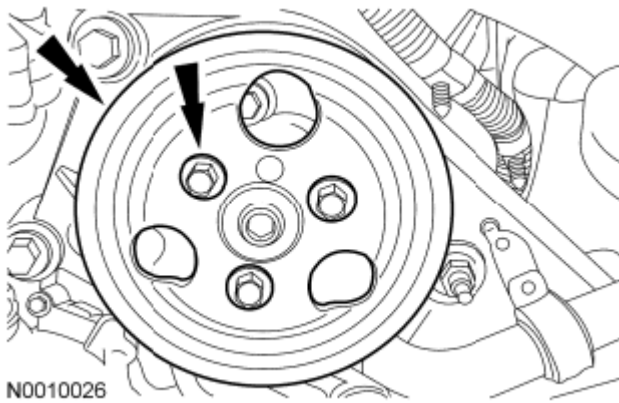
**Fig. 93: Locating Power Steering Supply Hose Bracket**  
Courtesy of FORD MOTOR CO.

18. Remove the bolt and detach the Power Steering Pressure (PSP) tube bracket from the crossmember.



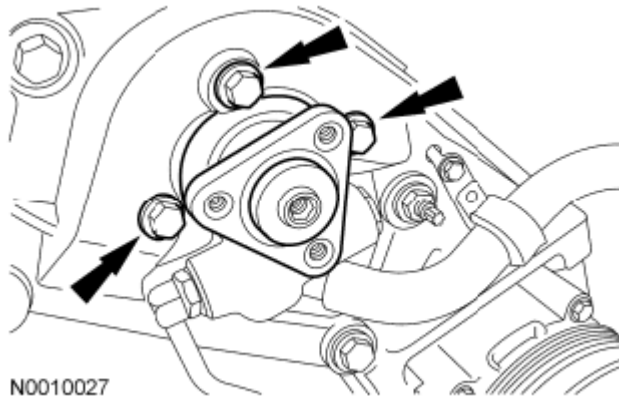
**Fig. 94: Locating Power Steering Pressure (PSP) Tube Bracket On Crossmember**  
Courtesy of FORD MOTOR CO.

19. Remove the 3 bolts and the power steering pump pulley.



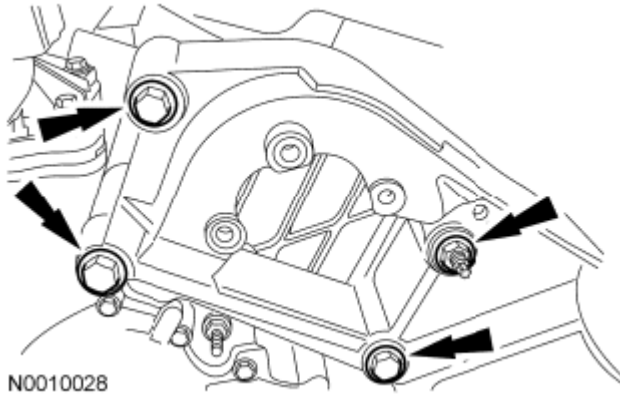
**Fig. 95: Locating Power Steering Pump Pulley With Mounting Bolts**  
Courtesy of FORD MOTOR CO.

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



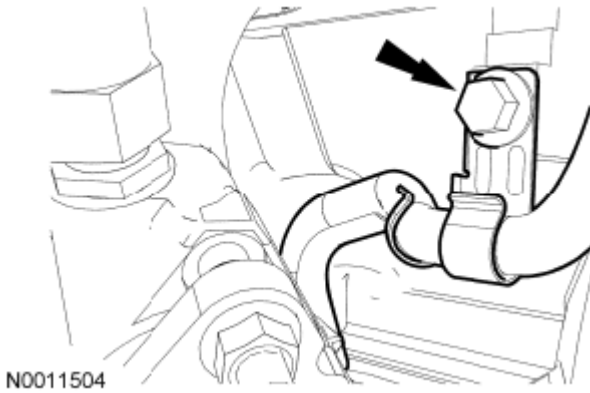
**Fig. 96: Locating Power Steering Pump Bolts**  
Courtesy of FORD MOTOR CO.

21. Remove the 3 bolts, the nut and position the FEAD bracket and A/C compressor aside.



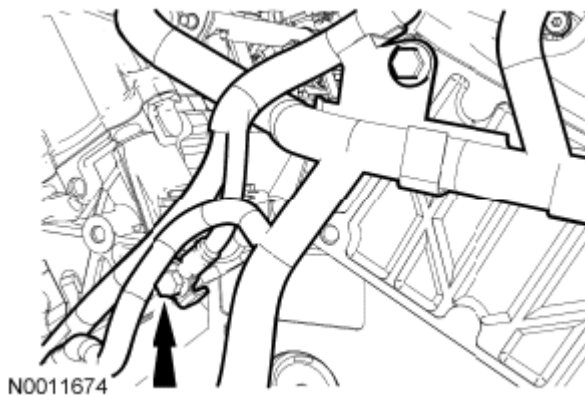
**Fig. 97: Locating Front Engine Accessory Drive (FEAD) Bracket Bolts And Nut**  
Courtesy of FORD MOTOR CO.

22. Remove the bolt and detach the starter motor wiring retainer bracket.



**Fig. 98: Locating Starter Motor Wiring Retainer Bracket**  
Courtesy of FORD MOTOR CO.

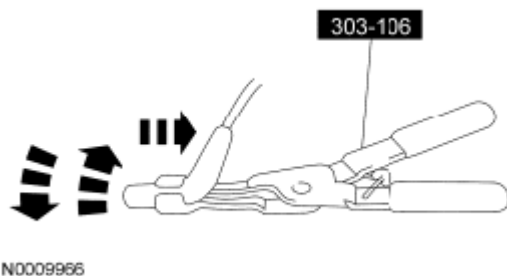
23. Remove the ground strap bolt and detach the wiring harness retainer from the backside of the cylinder head.



**Fig. 99: Locating Wiring Harness Retainer**  
Courtesy of FORD MOTOR CO.

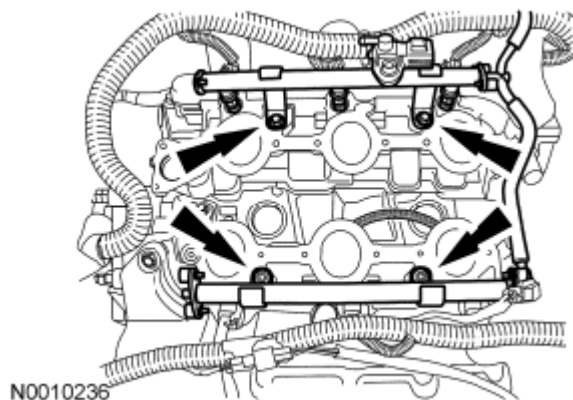
Both sides

**NOTE:** It is important to twist the spark plug wire boots while pulling upward to avoid possible damage to the spark plug wires.



**Fig. 100: Disconnecting Spark Plug Wires From Spark Plugs**  
Courtesy of FORD MOTOR CO.

24. Using the Spark Plug Wire Remover, disconnect the 6 spark plug wires from the spark plugs.
25. Remove the 4 bolts and the fuel rail and injectors.

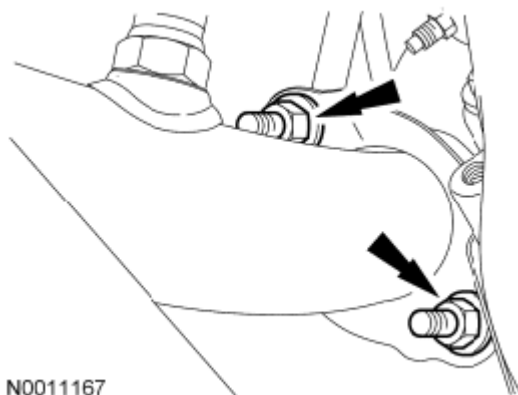


**Fig. 101: Locating Fuel Rail And Injectors With Mounting Bolts**  
Courtesy of FORD MOTOR CO.

26. Separate the 6 fuel injectors from the fuel rail and discard the O-ring seals.

**NOTE:** LH side shown, RH side similar.

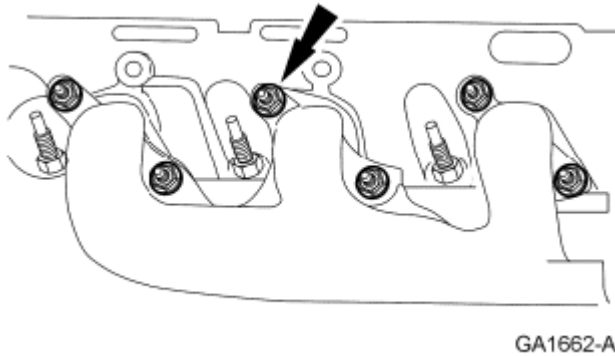
27. Remove the 4 catalytic converter-to-manifold nuts.
- Discard the nuts.



**Fig. 102: Locating Catalytic Converter-To-Exhaust Manifold Nuts**  
Courtesy of FORD MOTOR CO.

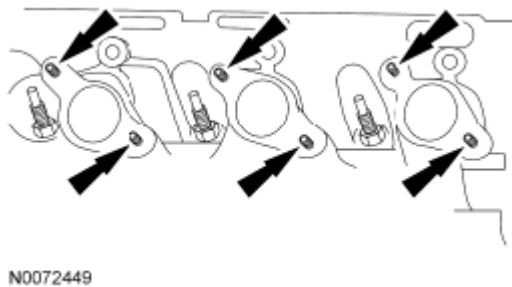
**NOTE:** LH side shown, RH side similar.

28. Remove the 12 nuts and the exhaust manifolds and gaskets.
- Discard the nuts and gaskets.



**Fig. 103: Locating Exhaust Manifold Nut**  
Courtesy of FORD MOTOR CO.

**NOTE:** LH side shown, RH side similar.



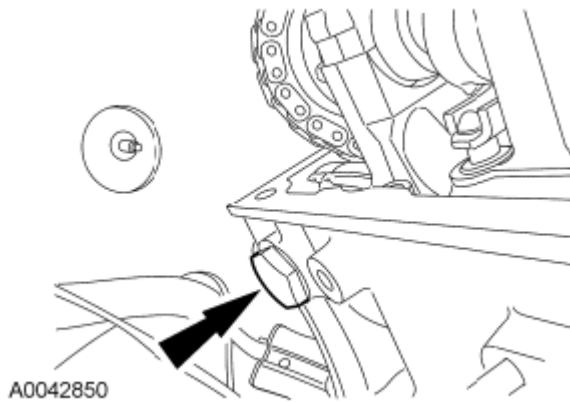
**Fig. 104: Locating Exhaust Manifold Studs (LH)**  
Courtesy of FORD MOTOR CO.

29. Remove and discard the 12 exhaust manifold studs.

**RH side**

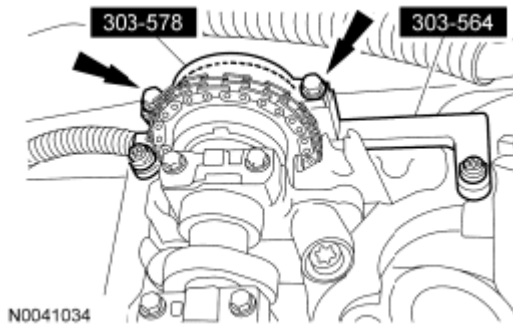
30. Remove the RH side hydraulic chain tensioner.

- Remove and discard the washer.



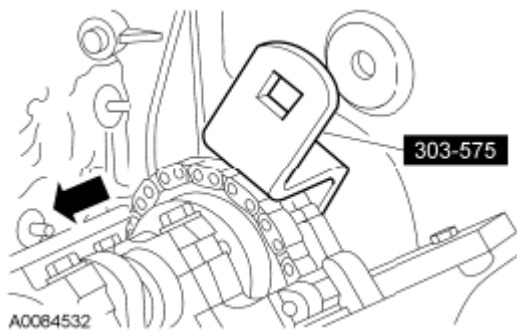
**Fig. 105: Locating Hydraulic Chain Tensioner (RH)**  
Courtesy of FORD MOTOR CO.

31. Install the Camshaft Sprocket Holding Tool and Adapter.
  - Tighten the top clamp bolts to 10 Nm (89 lb-in).



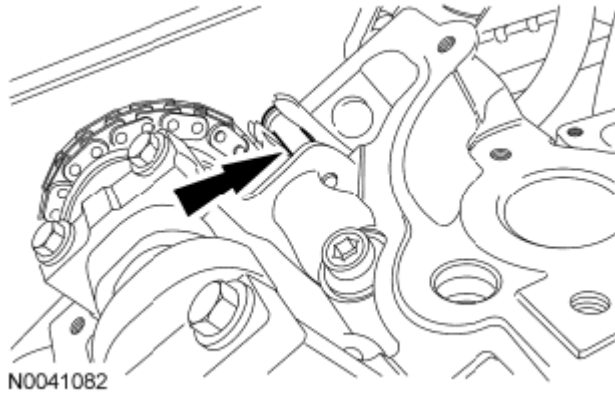
**Fig. 106: Locating Camshaft Sprocket Holding Tool And Adapter**  
Courtesy of FORD MOTOR CO.

**NOTE:** The RH camshaft sprocket bolt is a LH-threaded bolt.



**Fig. 107: Removing/Installing Camshaft Sprocket Bolt Using Torque Wrench Extension**  
Courtesy of FORD MOTOR CO.

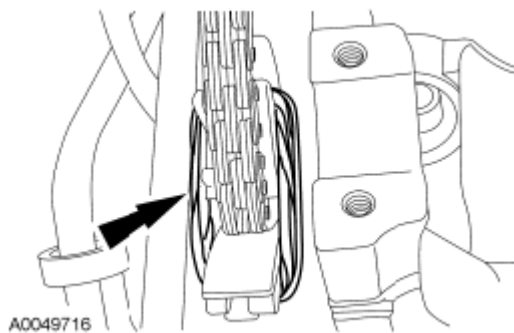
32. Using the Torque Wrench Extension with the Camshaft Sprocket Nut Socket 303-565, remove the RH camshaft bolt.
33. Remove the RH side cassette bolt.



**Fig. 108: Locating RH Side Cassette Bolt**  
Courtesy of FORD MOTOR CO.

**NOTE:** Remove the camshaft sprocket from the timing chain to gain clearance to remove the cylinder head.

**NOTE:** Hold the timing chain and cassette with a rubber band to aid in removal and to prevent the timing chain from falling into the cylinder block.

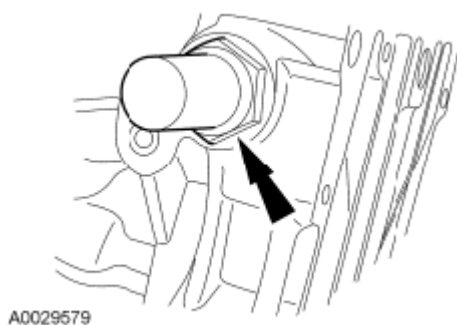


**Fig. 109: Locating Camshaft Sprocket (RH)**  
Courtesy of FORD MOTOR CO.

34. Remove the RH camshaft sprocket from the timing chain. Install a rubber band around the cassette and the timing chain.

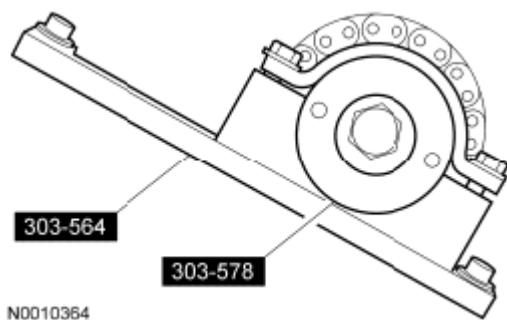
**LH side**

35. Remove the LH side hydraulic chain tensioner.
  - Remove and discard the washer.



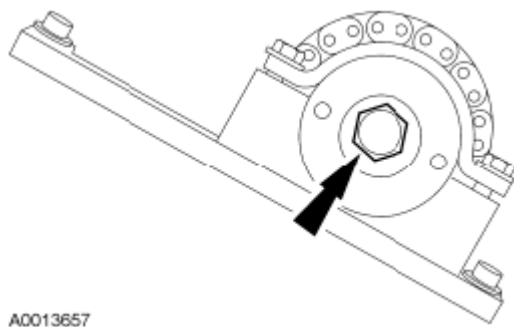
**Fig. 110: Locating LH Hydraulic Chain Tensioner**  
 Courtesy of FORD MOTOR CO.

36. Install the Camshaft Sprocket Holding Tool and Adapter.
  - Tighten to 10 Nm (89 lb-in).



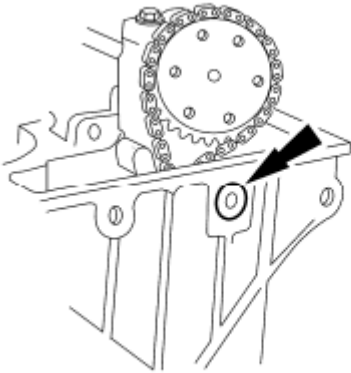
**Fig. 111: Identifying Camshaft Sprocket Holding Tool And Adapter**  
 Courtesy of FORD MOTOR CO.

37. Remove the LH side camshaft sprocket bolt.



**Fig. 112: Locating LH Camshaft Sprocket Bolt**  
 Courtesy of FORD MOTOR CO.

38. Remove the LH side cassette bolt.

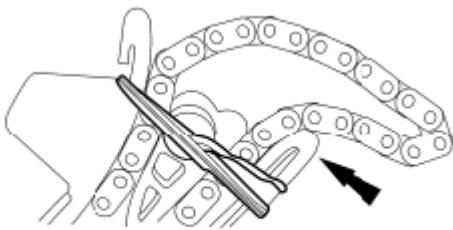


GA1670-A

**Fig. 113: Locating LH Cassette Upper Bolt**  
 Courtesy of FORD MOTOR CO.

**NOTE:** Remove the camshaft sprocket from the timing chain to gain clearance to remove the cylinder head.

**NOTE:** Hold the timing chain and cassette with a rubber band to aid in removal and to prevent the timing chain from falling into the cylinder block.



N0014449

**Fig. 114: Identifying Rubber Band Around Cassette And Timing Chain**  
 Courtesy of FORD MOTOR CO.

39. Remove the LH camshaft sprocket from the timing chain. Install a rubber band around the cassette and the timing chain.

**Both sides**

**NOTE:** To avoid damage to the timing chain cassette, an assistant will be required to help lift the cylinder head from the vehicle.

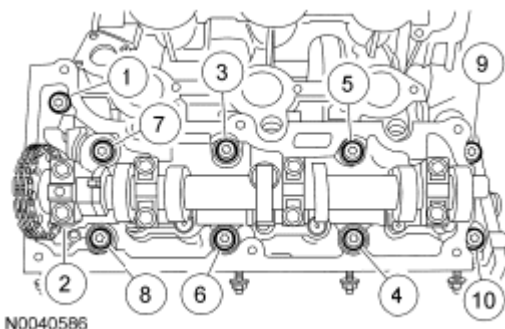
**NOTE:** On the RH side, when lifting the cylinder head, be careful to avoid contacting the A/C tube.

**NOTE:** New cylinder head bolts must be installed. They are a torque-to-yield

**design and cannot be reused.**

40. Remove the cylinder heads.

- Remove the cylinder head bolts in the sequence shown in illustration. Discard all the bolts.
- Remove and discard the head gaskets.



**Fig. 115: Identifying Cylinder Head Bolts Removing Sequence**  
Courtesy of FORD MOTOR CO.

**NOTE:** Make sure all coolant residue and foreign material are cleaned from the block surface and cylinder bore. Failure to follow these instructions may result in engine damage.

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

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

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

41. Clean the cylinder head-to-cylinder block mating surface of both the cylinder head and the cylinder block in the following sequence.

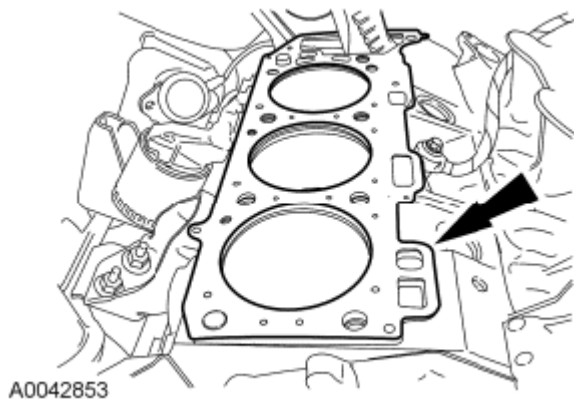
1. Remove any large deposits of silicone or gasket material with a plastic scraper.
2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep, following package directions, to remove any traces of oil or coolant and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.

42. Support the cylinder head on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

### Installation

#### Both sides

1. Clean the cylinder head bolt holes in the cylinder block. Make sure all coolant, oil or other foreign material is removed.
2. Position the cylinder head gaskets on the block.



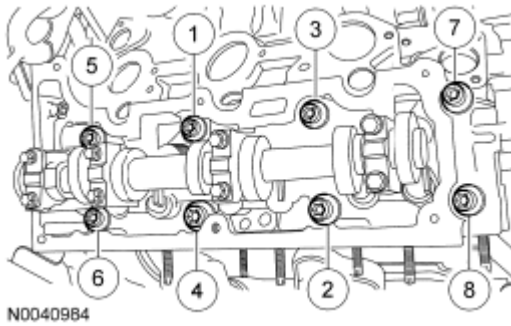
**Fig. 116: Locating Cylinder Head Gasket**  
Courtesy of FORD MOTOR CO.

#### RH side

**NOTE:** To avoid damage to the timing chain cassette, an assistant will be required to help position the cylinder head in the vehicle.

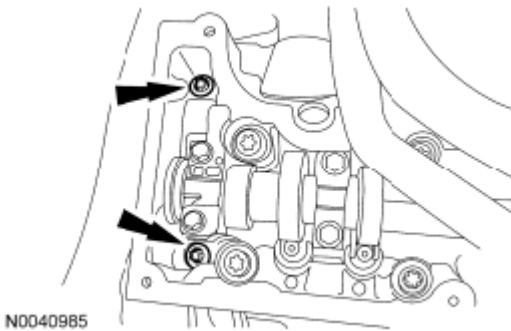
**NOTE:** New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

3. Position the RH cylinder head. Install 8 new M12 bolts and tighten in the sequence shown in illustration in 2 stages.
  - Stage 1: Tighten to 12 Nm (106 lb-in).
  - Stage 2: Tighten to 25 Nm (18 lb-ft).



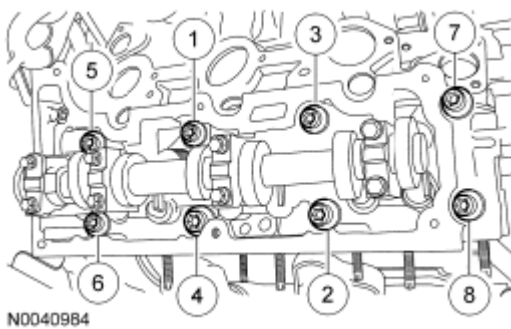
**Fig. 117: Identifying RH Cylinder Head Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

4. Install 2 new M8 bolts.
  - Tighten to 32 Nm (24 lb-ft).



**Fig. 118: Locating M8 Bolts**  
Courtesy of FORD MOTOR CO.

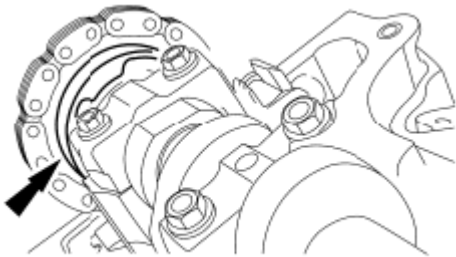
5. Tighten the 8 M12 bolts in the sequence shown in illustration in 2 stages.
  - Stage 1: Tighten 90 degrees.
  - Stage 2: Tighten an additional 90 degrees.



**Fig. 119: Identifying 8 M12 Cylinder Head Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

**NOTE:** The camshaft gear must turn freely on the camshaft. Do not tighten the bolt at this time.

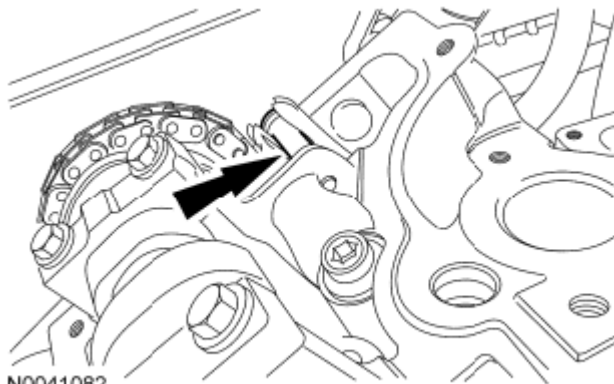
**NOTE:** The right-hand camshaft sprocket bolt is a left-hand threaded bolt.



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**Fig. 120: Locating RH Camshaft Sprocket**  
Courtesy of FORD MOTOR CO.

6. Remove the rubber band, position the camshaft sprocket and chain. Loosely install the bolt.
7. Install the RH side cassette bolt.
  - Tighten to 12 Nm (106 lb-in).



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**Fig. 121: Locating RH Side Cassette Bolt**  
Courtesy of FORD MOTOR CO.

#### LH side

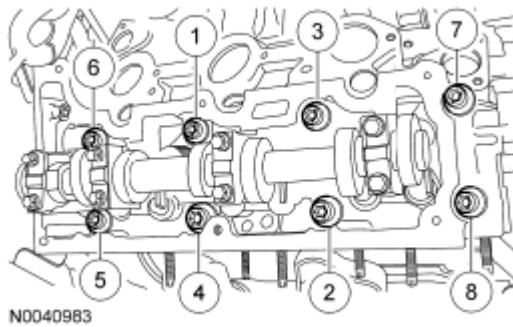
**NOTE:** To avoid damage to the timing chain cassette, an assistant will be required to help position the cylinder head in the vehicle.

**NOTE:** New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

8. Position the LH cylinder head. Install 8 new M12 bolts and tighten in the sequence shown in illustration

in 2 stages.

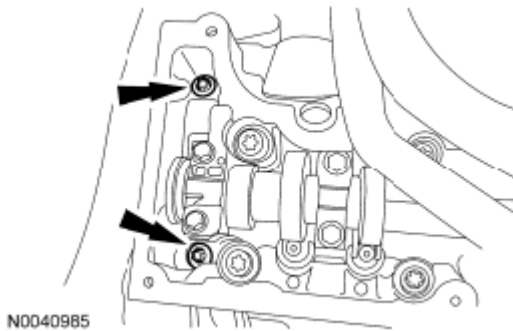
- Stage 1: Tighten to 12 Nm (106 lb-in).
- Stage 2: Tighten to 25 Nm (18 lb-ft).



**Fig. 122: Identifying 8 M12 Cylinder Head Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

9. Install 2 new M8 bolts.

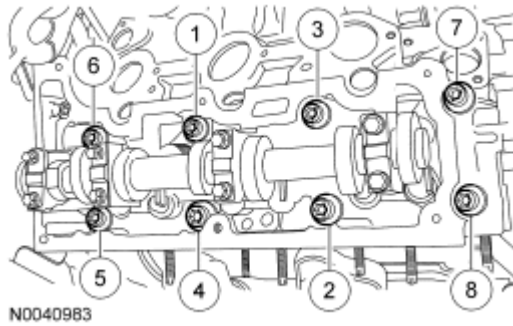
- Tighten to 32 Nm (24 lb-ft).



**Fig. 123: Locating M8 Bolts**  
Courtesy of FORD MOTOR CO.

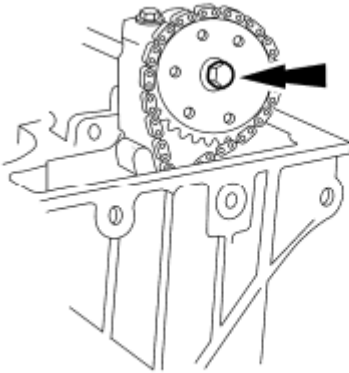
10. Tighten the 8 M12 bolts in the sequence shown in illustration in 2 stages.

- Stage 1: Tighten 90 degrees.
- Stage 2: Tighten an additional 90 degrees.



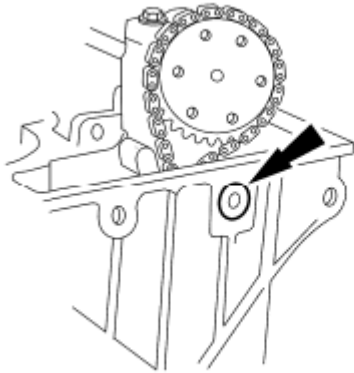
**Fig. 124: Identifying 8 M12 Cylinder Head Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

**NOTE:** The camshaft gear must turn freely on the camshaft. Do not tighten the bolt at this time.



**Fig. 125: Locating Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

11. Remove the rubber band, position the camshaft sprocket and chain. Loosely install the bolt.
12. Install the LH side cassette bolt.
  - Tighten to 19 Nm (168 lb-in).



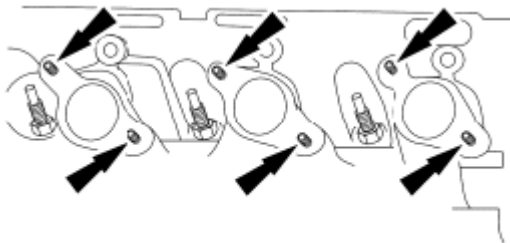
GA1670-A

**Fig. 126: Locating LH Cassette Upper Bolt**  
Courtesy of FORD MOTOR CO.

**Both sides**

**NOTE:** LH side shown, RH side similar.

13. Install the 12 exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).

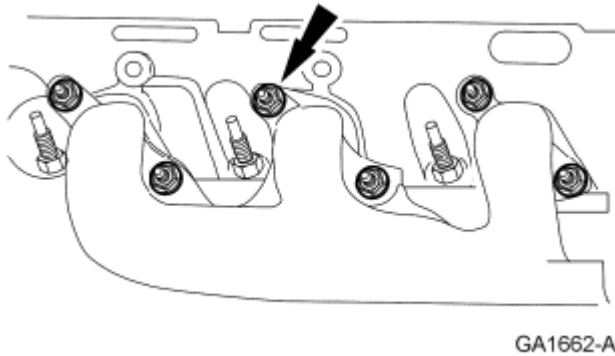


N0072449

**Fig. 127: Locating Exhaust Manifold Studs (LH)**  
Courtesy of FORD MOTOR CO.

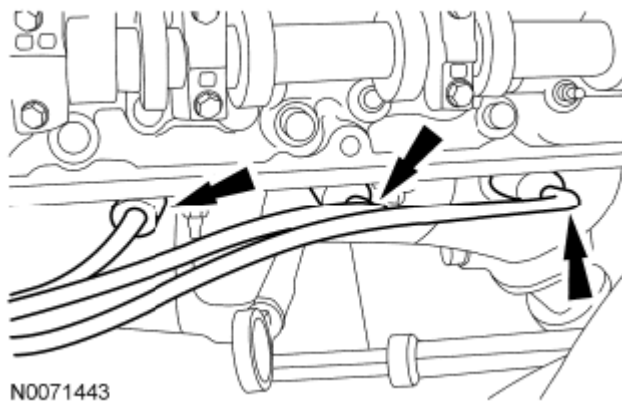
**NOTE:** LH side shown, RH side similar.

14. Position new gaskets and the exhaust manifolds. Install the 12 new nuts.
  - Tighten to 23 Nm (17 lb-ft).



**Fig. 128: Locating Exhaust Manifold Nut**  
Courtesy of FORD MOTOR CO.

**NOTE:** Apply dielectric compound to the inside of the spark plug wire boots.

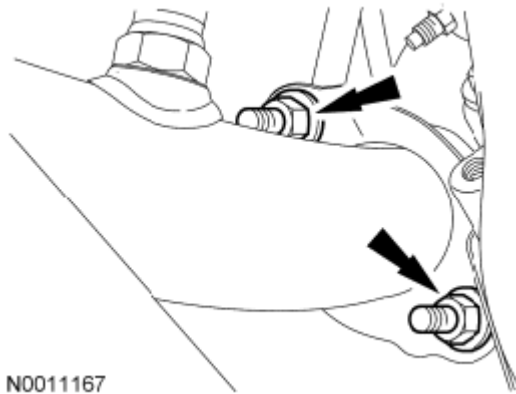


**Fig. 129: Locating Spark Plug Wires**  
Courtesy of FORD MOTOR CO.

15. Connect the 6 spark plug wires to the spark plugs.

**NOTE:** LH side shown, RH side similar.

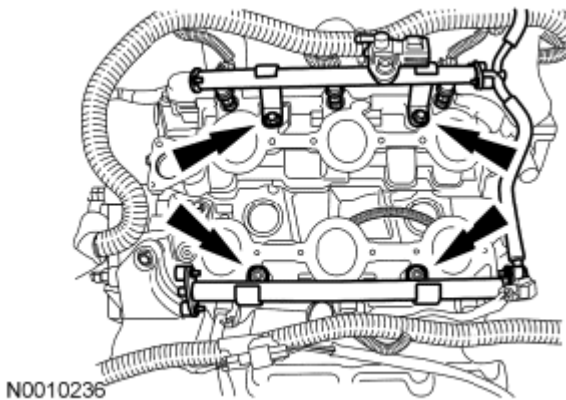
16. Install the 4 new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 45 Nm (33 lb-ft).



**Fig. 130: Locating Catalytic Converter-To-Exhaust Manifold Nuts**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the new O-ring seals with clean engine oil.

17. Install the 6 fuel injectors.
  - Install new O-ring seals on the injectors.
  - Install the injectors.
18. Position the fuel rail and injectors and install the 4 bolts.
  - Tighten to 23 Nm (17 lb-ft).



**Fig. 131: Locating Fuel Rail And Injectors With Mounting Bolts**  
Courtesy of FORD MOTOR CO.

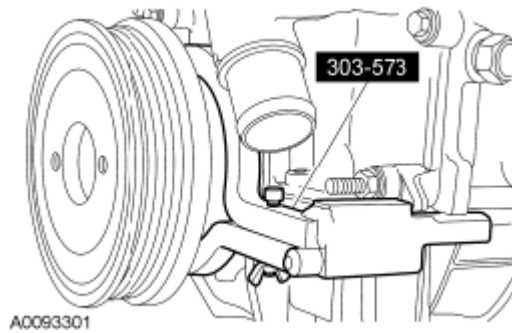
**NOTE:** The LH and RH camshafts must be retimed when either camshaft is disturbed.

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

**NOTE:** Do not rotate the engine counterclockwise. Rotating the engine

counterclockwise will result in damage to the damper crank sensor speed wheel and incorrect timing to the engine.

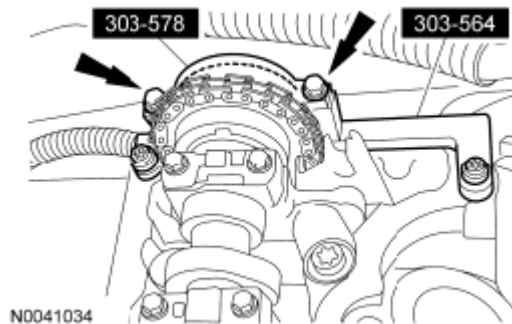
**NOTE:** The Crankshaft TDC Timing Tool must be installed on the damper and should contact the engine block, this positions the engine at TDC .



**Fig. 132: Identifying Crankshaft TDC Timing Tool**  
Courtesy of FORD MOTOR CO.

20. Install the Crankshaft TDC Timing Tool.

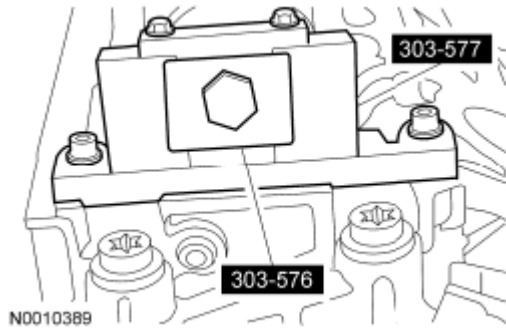
**NOTE:** Leave the top 2 Camshaft Sprocket Holding Tool clamp bolts loose.



**Fig. 133: Locating Camshaft Sprocket Holding Tool And Adapter**  
Courtesy of FORD MOTOR CO.

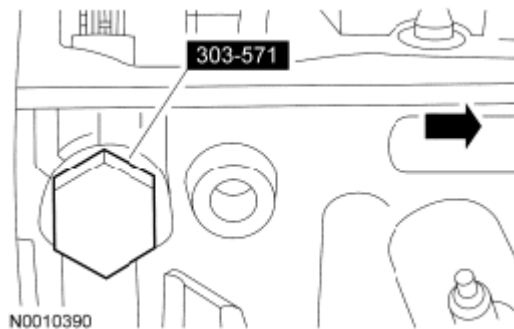
21. Install the Camshaft Sprocket Holding Tool and Adapter on the rear of the RH cylinder head.

**NOTE:** The camshaft timing slots are off-center.



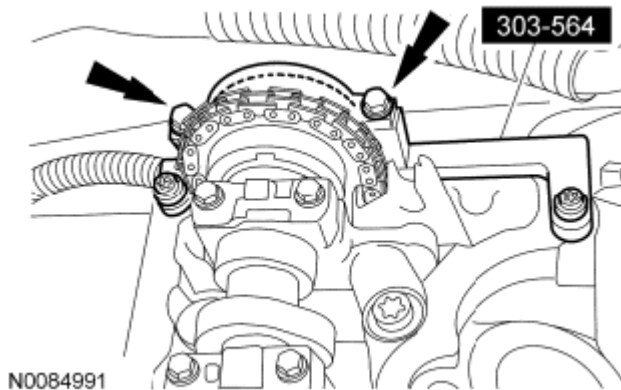
**Fig. 134: Identifying Camshaft Holding Tool And Adapter On Front Of Cylinder Head (RH)**  
 Courtesy of FORD MOTOR CO.

22. Position the camshaft timing slots below the centerline of the camshaft to correctly fit the Camshaft Holding Tool and Adapter, and install the Camshaft Holding Tool and Adapters on the front of the RH cylinder head.
23. Install the Timing Chain Tensioner.



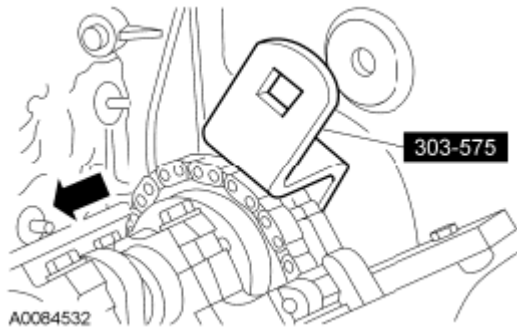
**Fig. 135: Identifying Timing Chain Tensioner**  
 Courtesy of FORD MOTOR CO.

24. Tighten the 2 top Camshaft Sprocket Holding Tool clamp bolts to 10 Nm (89 lb-in).



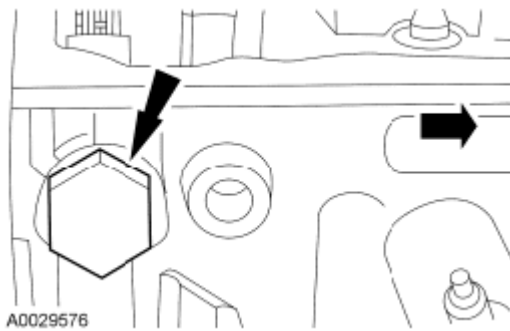
**Fig. 136: Locating Camshaft Sprocket Holding Tool Clamp Bolts**  
 Courtesy of FORD MOTOR CO.

**NOTE:** The RH camshaft sprocket bolt is a LH-threaded bolt.



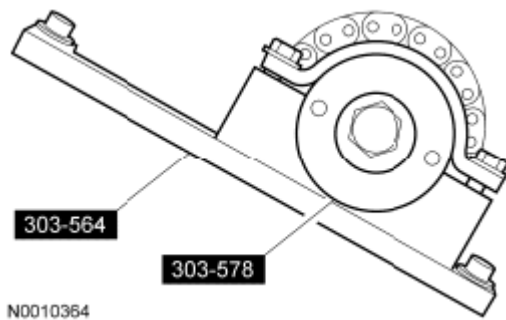
**Fig. 137: Removing/Installing Camshaft Sprocket Bolt Using Torque Wrench Extension**  
Courtesy of FORD MOTOR CO.

25. Using the Torque Wrench Extension with the Camshaft Sprocket Nut Socket 303-565, tighten the camshaft bolt to 85 Nm (63 lb-ft).
26. Install a new washer and the RH camshaft tensioner.
  - Tighten to 44 Nm (32 lb-ft).



**Fig. 138: Locating RH Camshaft Tensioner**  
Courtesy of FORD MOTOR CO.

**NOTE:** Leave the top 2 Camshaft Sprocket Holding Tool clamp bolts loose.

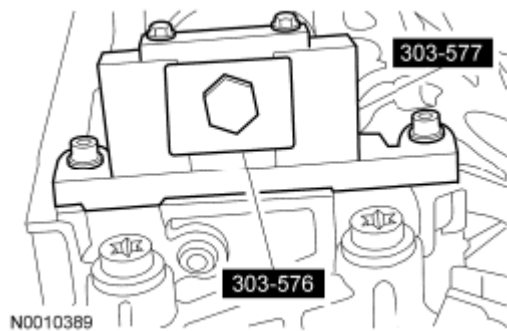


**Fig. 139: Identifying Camshaft Sprocket Holding Tool And Adapter**

Courtesy of FORD MOTOR CO.

27. Install the Camshaft Sprocket Holding Tool and Adapter on the front of the LH cylinder head.

**NOTE:** The camshaft timing slots are off-center.



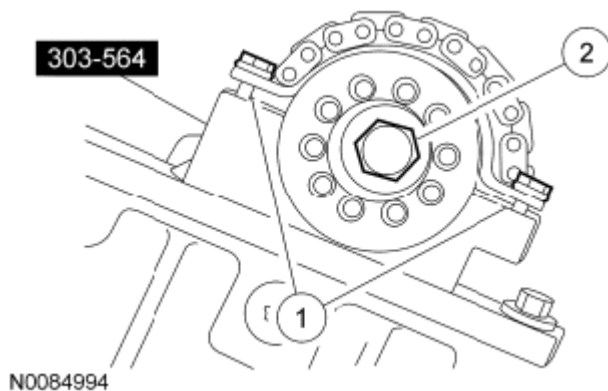
**Fig. 140: Identifying Camshaft Holding Tool And Adapter On Rear Of Cylinder Head (LH)**  
Courtesy of FORD MOTOR CO.

28. Position the camshaft timing slots below the centerline of the camshaft to correctly fit the Adapters, and install the Camshaft Holding Tool and Adapter on the rear of the LH cylinder head.
29. Install the Timing Chain Tensioner.



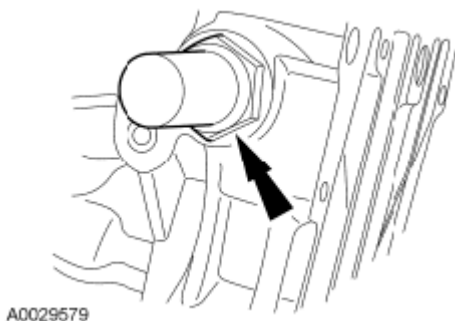
**Fig. 141: Identifying Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

30. Tighten the bolts.
1. Tighten the Camshaft Sprocket Holding Tool top 2 bolts to 10 Nm (89 lb-in).
  2. Tighten the camshaft sprocket bolt to 85 Nm (63 lb-ft).



**Fig. 142: Tightening LH Camshaft Bolt**  
Courtesy of FORD MOTOR CO.

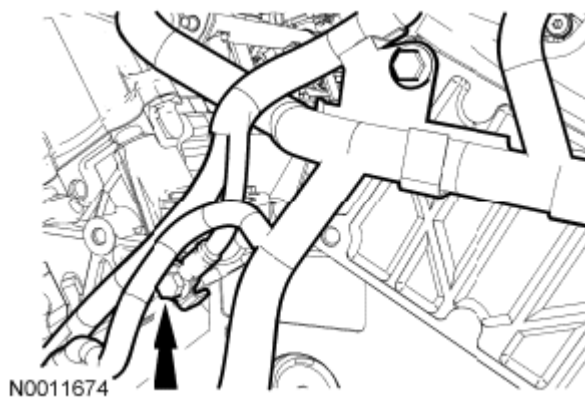
31. Install a new washer and the LH camshaft tensioner.
  - Tighten to 44 Nm (32 lb-ft).



**Fig. 143: Locating LH Camshaft Tensioner**  
Courtesy of FORD MOTOR CO.

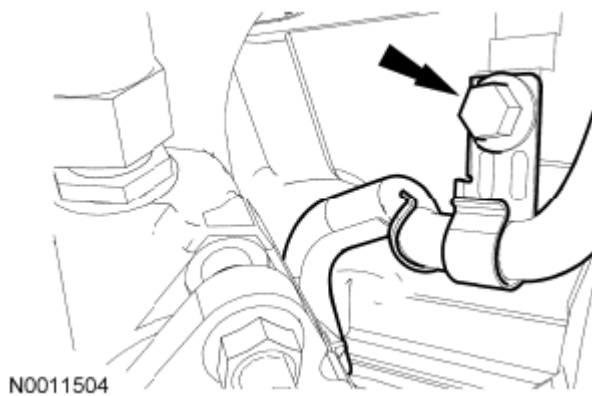
**LH side**

32. Position the ground strap and install the bolt.
  - Tighten to 40 Nm (30 lb-ft).
  - Attach the wiring harness retainer to the backside of the cylinder head.



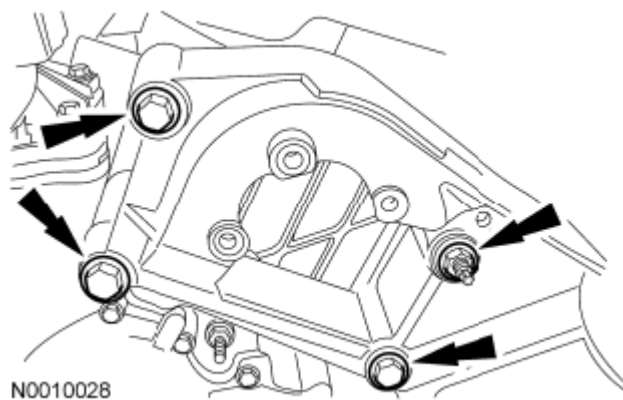
**Fig. 144: Locating Wiring Harness Retainer**  
Courtesy of FORD MOTOR CO.

33. Position the starter motor wiring retainer bracket and install the bolt.
- Tighten to 40 Nm (30 lb-ft).



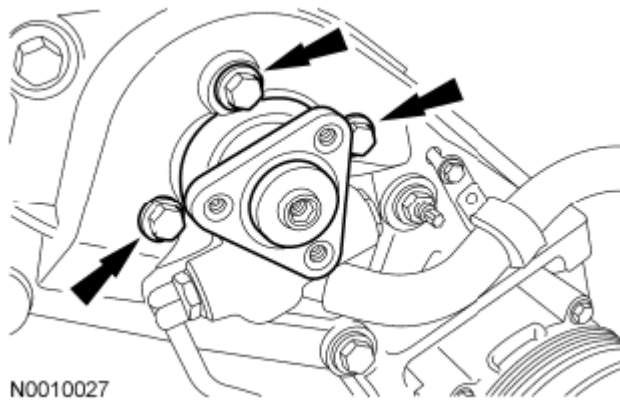
**Fig. 145: Locating Starter Motor Wiring Retainer Bracket**  
Courtesy of FORD MOTOR CO.

34. Position the **FEAD** bracket and A/C compressor. Install the 3 bolts and the nut.
- Tighten to 48 Nm (35 lb-ft).



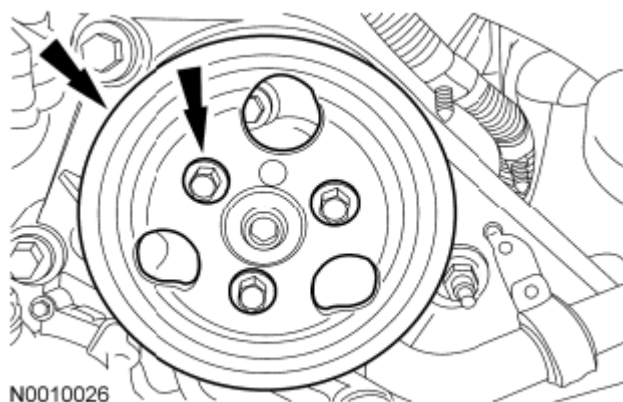
**Fig. 146: Locating Front Engine Accessory Drive (FEAD) Bracket Bolts And Nut**  
Courtesy of FORD MOTOR CO.

35. Position the power steering pump and install the 3 bolts.
  - Tighten to 25 Nm (18 lb-ft).



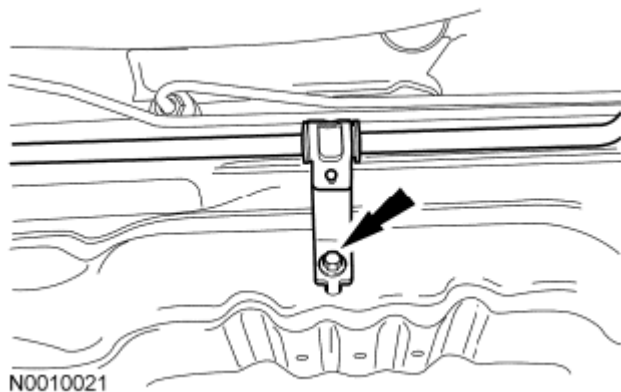
**Fig. 147: Locating Power Steering Pump Bolts**  
Courtesy of FORD MOTOR CO.

36. Position the power steering pump pulley and install the 3 bolts.
  - Tighten to 25 Nm (18 lb-ft).



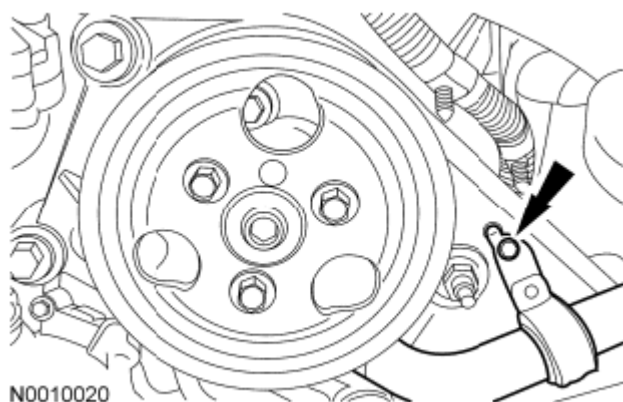
**Fig. 148: Locating Power Steering Pump Pulley With Mounting Bolts**  
Courtesy of FORD MOTOR CO.

37. Attach **PSP** tube bracket to the crossmember and install the bolt.
- Tighten to 11 Nm (97 lb-in).



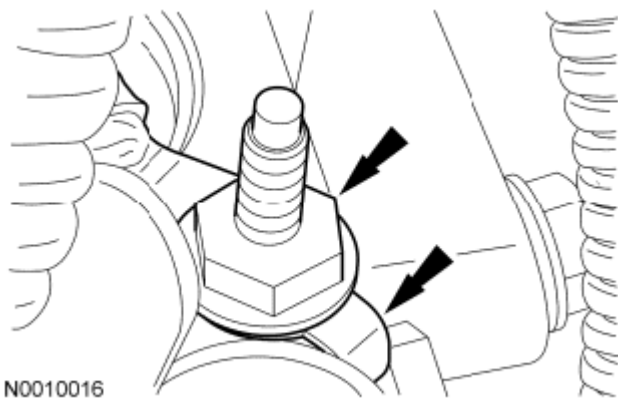
**Fig. 149: Locating Power Steering Pressure (PSP) Tube Bracket On Crossmember**  
Courtesy of FORD MOTOR CO.

38. Attach the power steering supply hose bracket to the **FEAD** bracket and install the bolt.
- Tighten to 11 Nm (97 lb-in).



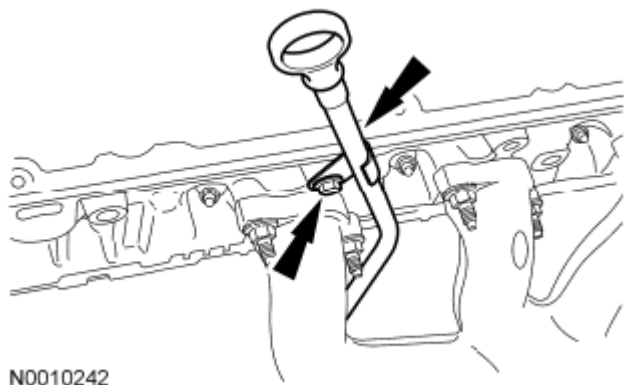
**Fig. 150: Locating Power Steering Supply Hose Bracket**  
Courtesy of FORD MOTOR CO.

39. Position the ground strap and install the stud bolt.
- Tighten to 10 Nm (89 lb-in).



**Fig. 151: Locating Stud Bolt And Ground Strap**  
Courtesy of FORD MOTOR CO.

40. Install the oil level indicator tube and bolt.
- Tighten to 11 Nm (97 lb-in).

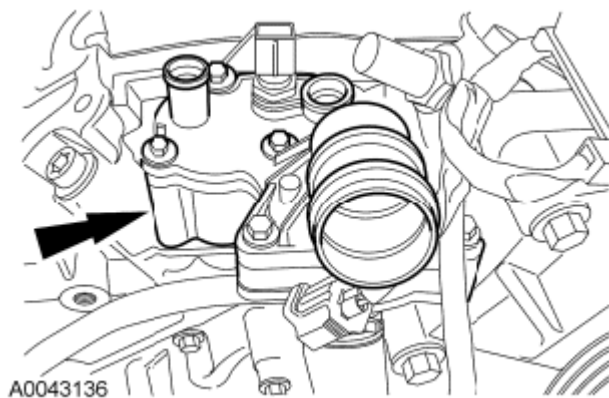


**Fig. 152: Locating Oil Level Indicator Tube And Bolt**  
Courtesy of FORD MOTOR CO.

RH side

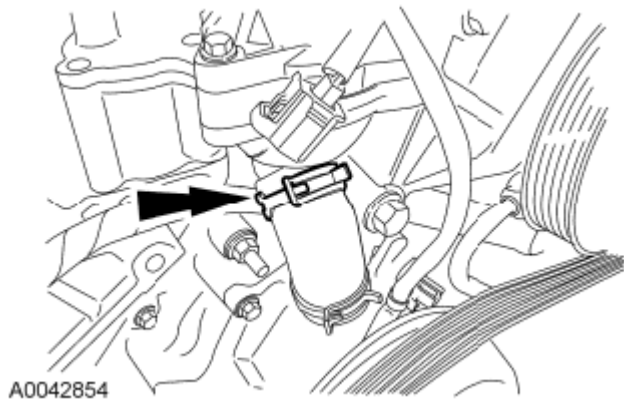
**NOTE:** Inspect the O-ring seal. Install a new O-ring seal if necessary.

41. Position the thermostat housing and install the 3 bolts.
  - Tighten to 11 Nm (97 lb-in).



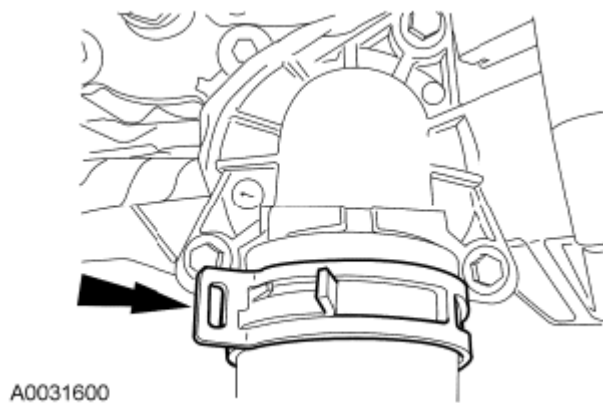
**Fig. 153: Locating Thermostat Housing**  
Courtesy of FORD MOTOR CO.

42. Position the coolant bypass hose clamp and connect the ECT sensor electrical connector.



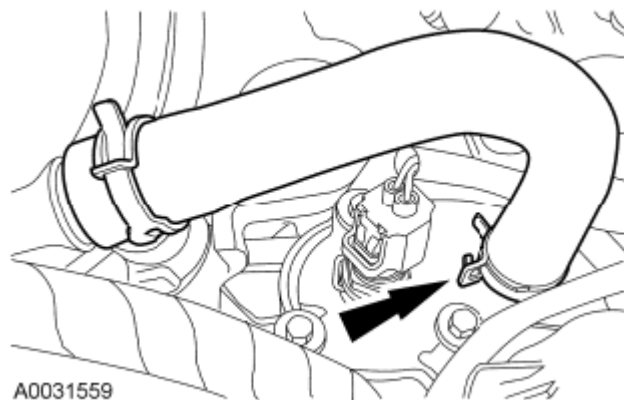
**Fig. 154: Locating Coolant Bypass Hose Clamp**  
Courtesy of FORD MOTOR CO.

43. Install the upper radiator hose.



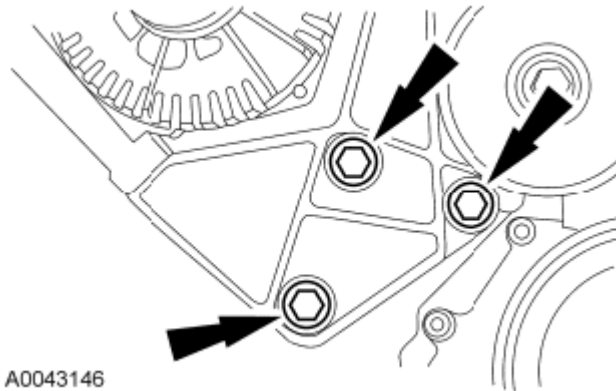
**Fig. 155: Locating Upper Radiator Hose**  
Courtesy of FORD MOTOR CO.

44. Connect the heater hose to the thermostat housing.



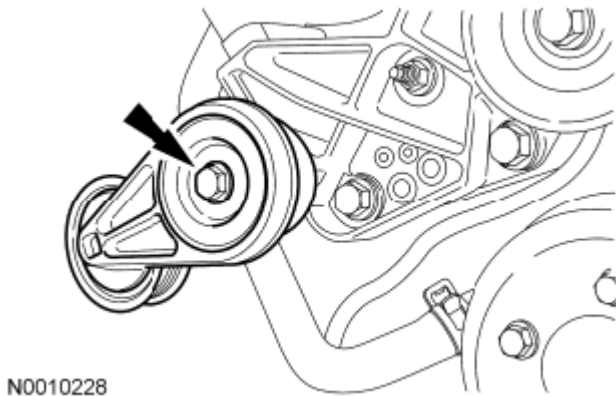
**Fig. 156: Locating Heater Hose On Thermostat Housing**  
Courtesy of FORD MOTOR CO.

45. Position the generator mounting bracket assembly and install the 2 bolts and the nut.
  - Tighten to 47 Nm (35 lb-ft).



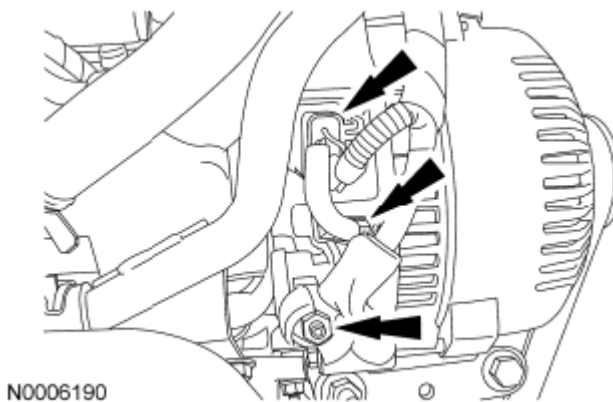
**Fig. 157: Locating Generator Mounting Bracket Assembly Bolts And Nut**  
Courtesy of FORD MOTOR CO.

46. Install the accessory drive belt tensioner and bolt.
  - Tighten to 47 Nm (35 lb-ft).



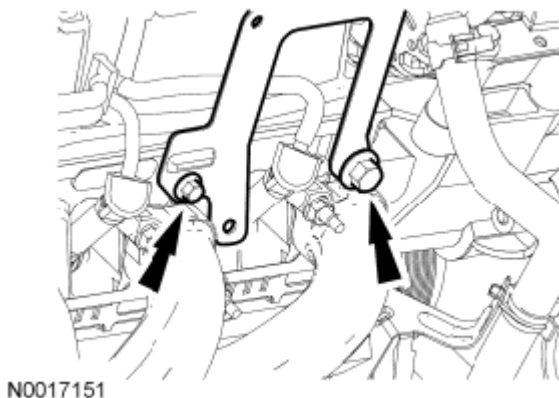
**Fig. 158: Locating Accessory Drive Belt Tensioner Bolt**  
Courtesy of FORD MOTOR CO.

47. Connect the generator electrical connector. Position the B+ terminal and install the nut.
  - Tighten to 8 Nm (71 lb-in).
  - Attach the pin-type retainer.



**Fig. 159: Locating Generator Electrical Connector And Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

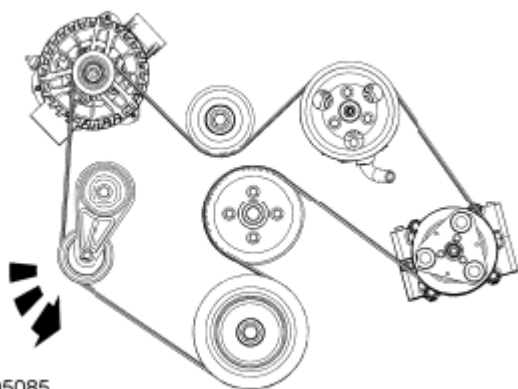
48. Install the 2 coolant tube bracket bolts.
- Tighten the M12 bolt to 34 Nm (25 lb-ft).
  - Tighten the M8 bolt to 23 Nm (17 lb-ft).



**Fig. 160: Locating Coolant Tube Bracket Bolts**  
Courtesy of FORD MOTOR CO.

**Both sides**

49. Rotate the accessory drive belt tensioner counterclockwise and install the accessory drive belt.

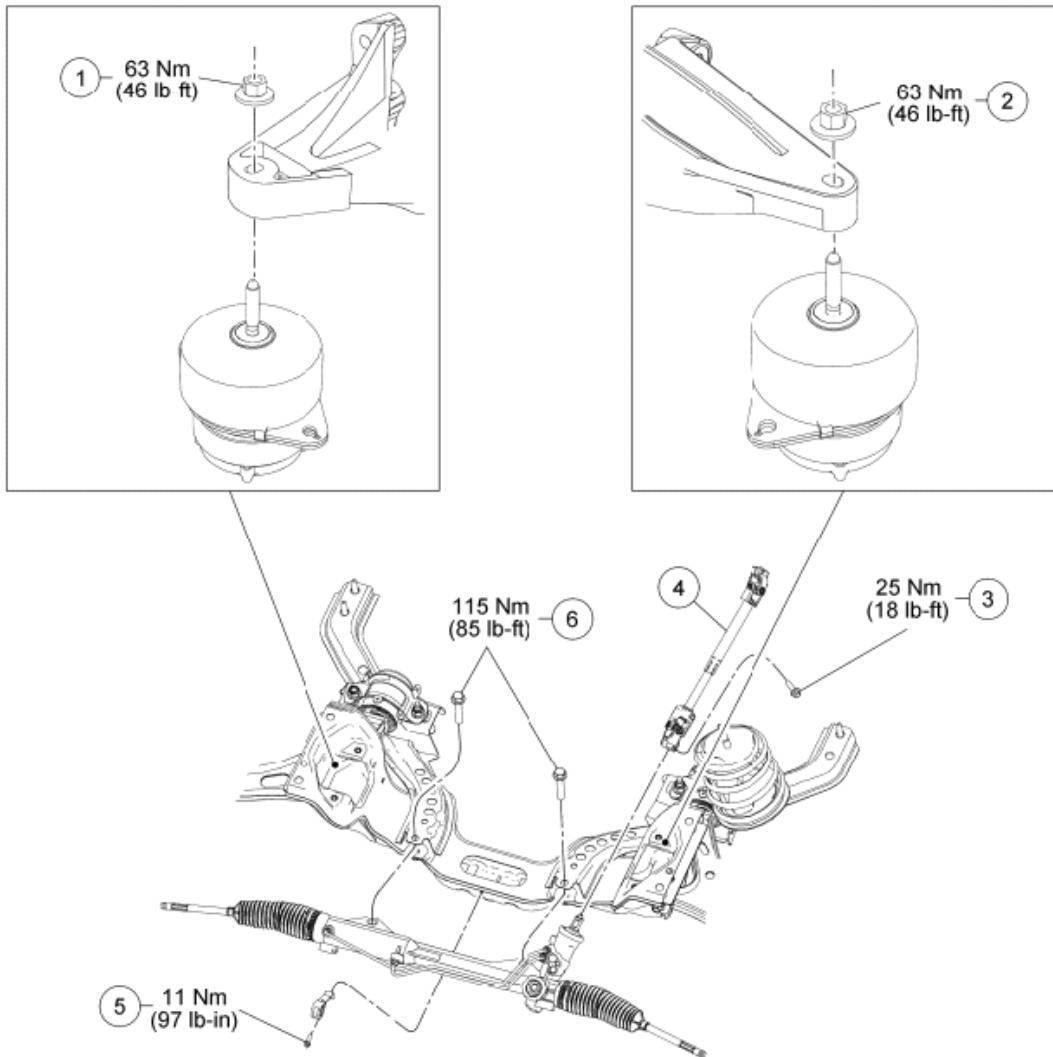


**Fig. 161: Rotating Accessory Drive Belt Tensioner Counterclockwise**  
Courtesy of FORD MOTOR CO.

50. Install the hydraulic lash adjusters. For additional information, refer to **HYDRAULIC LASH ADJUSTER**.
51. Install the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.
52. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING**.

## ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

### Steering Gear and Engine Mounts



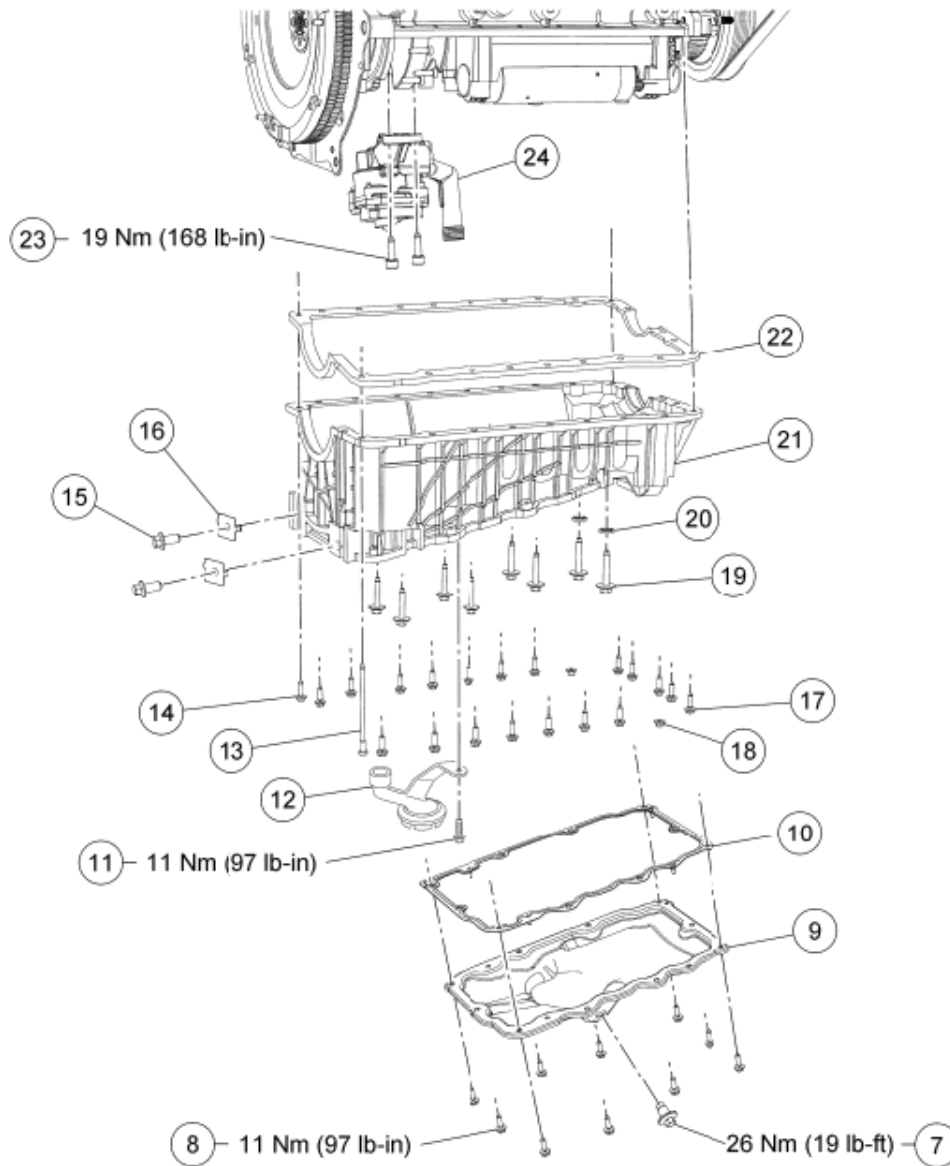
N0089669

**Fig. 162: Exploded View Of Steering Gear And Engine Mounts With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	N621943	RH engine mount bracket-to-engine mount nut
2	N621943	LH engine mount bracket-to-engine mount nut
3	W704980	Steering column coupling-to-steering gear bolt
4	3B676	Steering column lower shaft
5	W505255	Power Steering Pressure (PSP) tube bracket-to-crossmember bolt
6	W10909	Steering gear bolts

**Oil Pan, Oil Pump, Cylinder Block Cradle and Oil Pump Screen and Pickup Tube**



N0085242

**Fig. 163: Exploded View Of Oil Pan, Oil Pump, Cylinder Block Cradle And Oil Pump Screen And Pickup Tube With Torque Specifications**

Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
7	6730	Oil pan drain plug
8	E802185	Oil pan bolt (10 required)
9	6676	Oil pan
10	6710	Oil pan gasket
11	W500214	Oil pump screen and pickup tube bolt
12	6617	Oil pump screen and pickup tube

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

13	E804588	Cylinder block cradle bolt
14	W709198	Cylinder block cradle bolt
15	E802185	Bell housing-to-cylinder block cradle spacer bolt (2 required)
16	6C629	Bell housing-to-cylinder block cradle spacer (2 required)
17	E802185	Cylinder block cradle bolt (20 required)
18	E822125	Cylinder block cradle nut (2 required)
19	W702323	Cylinder block cradle bolt (8 required)
20	6734	Washer (2 required)
21	6F092	Cylinder block cradle
22	6710	Cylinder block cradle gasket
23	W708582	Oil pump bolt (2 required)
24	6600	Oil pump

1. For additional information, refer to the procedures.

### OIL PAN

#### Material

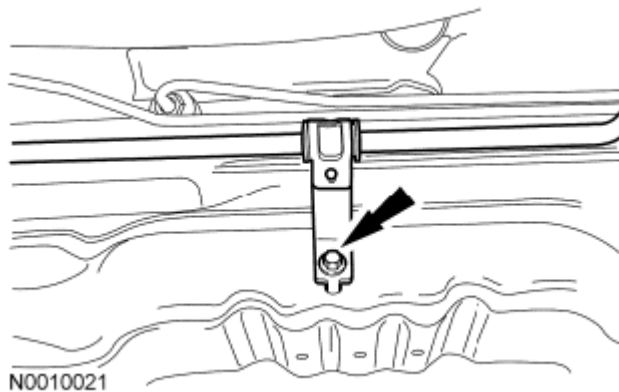
#### MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A

#### Removal and Installation

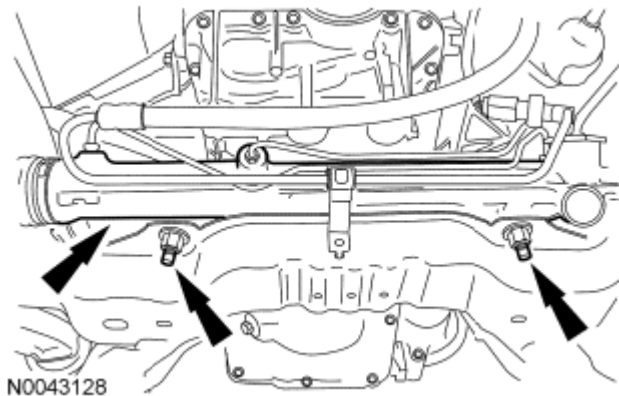
**NOTE:** During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the bolt and detach the Power Steering Pressure (PSP) tube bracket from the crossmember.
  - To install, tighten to 11 Nm (97 lb-in).



**Fig. 164: Locating Power Steering Pressure (PSP) Tube Bracket On Crossmember**  
Courtesy of FORD MOTOR CO.

3. Remove the 2 power steering gear bolts and position aside the steering gear.
  - To install tighten to 115 Nm (85 lb-ft).



**Fig. 165: Locating Power Steering Gear Bolts**  
Courtesy of FORD MOTOR CO.

4. Remove the oil drain plug and drain the engine oil.
  - To install, tighten to 26 Nm (19 lb-ft).
5. Remove the bolts, the oil pan and the gasket. Discard the gasket.
  - To install, tighten to 11 Nm (97 lb-in).

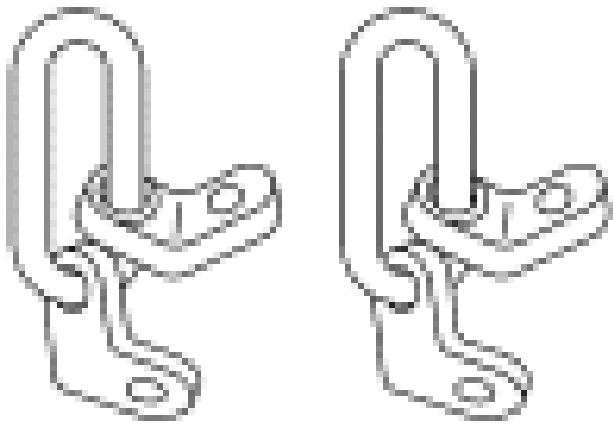
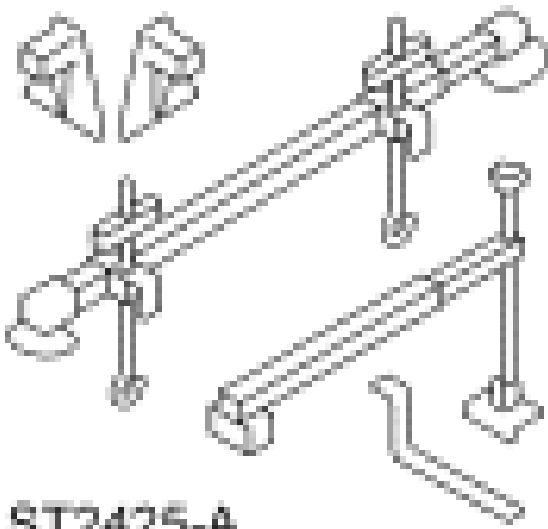
**NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean sealing surfaces. These tools cause scratches and gouges which make leak paths.

6. Clean and inspect the sealing surfaces.
7. To install, reverse the removal procedure.
8. Fill the engine with clean engine oil.

**CYLINDER BLOCK CRADLE**

Special Tool(s)

**SPECIAL TOOLS DESCRIPTION CHART**

 <p><b>ST1595-A</b></p>	<p>Lifting Bracket, Engine 303-050 (T70P-6000)</p>
 <p><b>ST2425-A</b></p>	<p>Support Bar, Engine 303-F072</p>

Material

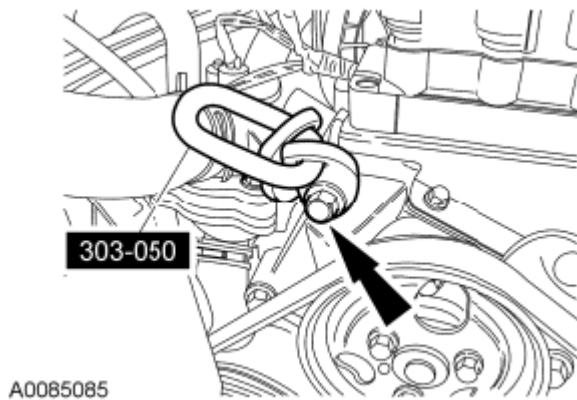
**MATERIAL SPECIFICATIONS**

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

**Removal**

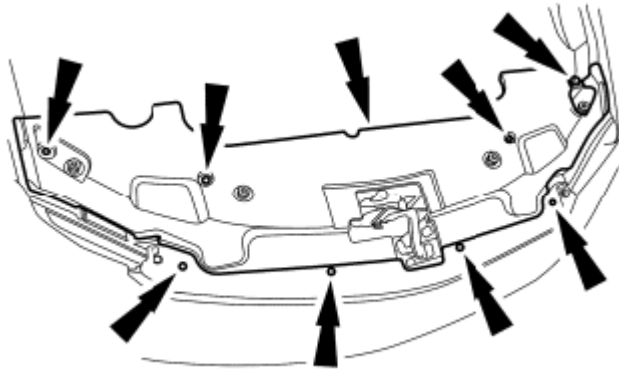
**NOTE:** During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
3. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING & CONTROLS - 4.0L SOHC** .
4. Remove the Front End Accessory Drive (FEAD) bracket bolt and install the Engine Lifting Bracket.



**Fig. 166: Locating Engine Lifting Bracket And Front End Accessory Drive (FEAD) Bracket Bolt**  
 Courtesy of FORD MOTOR CO.

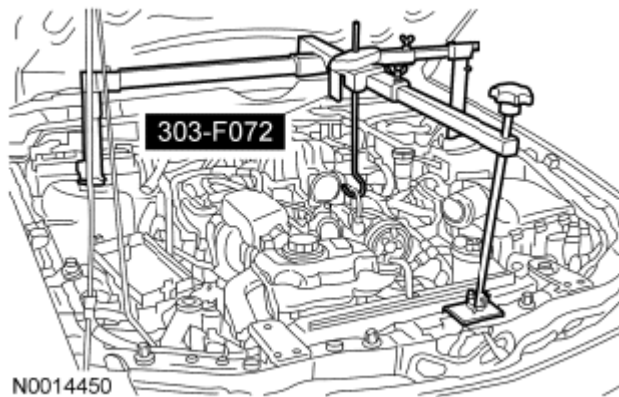
5. Remove the 8 pin-type retainers and the radiator sight shield.



N0095767

**Fig. 167: Locating Pin-Type Retainers**  
Courtesy of FORD MOTOR CO.

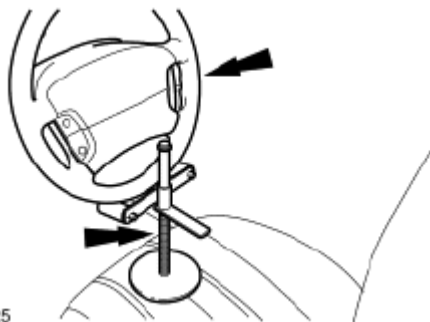
6. Install the Engine Support Bar.



N0014450

**Fig. 168: Identifying Engine Support Bar**  
Courtesy of FORD MOTOR CO.

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



N0081325

**Fig. 169: Holding Steering Wheel Using Steering Wheel Holding Device**

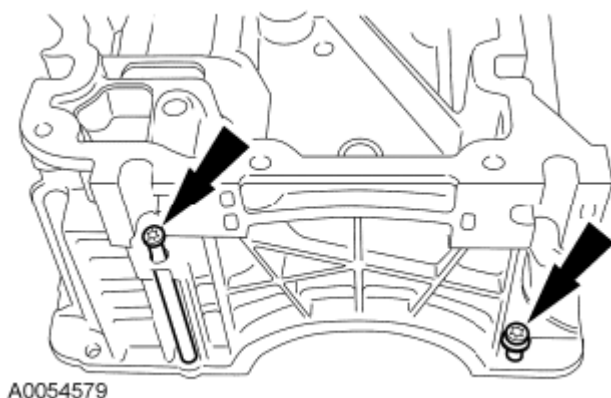
Courtesy of FORD MOTOR CO.

7. Using a suitable holding device, hold the steering wheel in the straight-ahead position.
8. Remove the RH engine mount nut.
9. Remove the LH engine mount nut.
10. Remove the oil pump screen and pickup tube. For additional information, refer to OIL PUMP SCREEN AND PICKUP TUBE.

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

11. Remove the bolt and detach the steering column intermediate shaft from the steering gear.
12. Remove the bolt and detach the Power Steering Pressure (PSP) tube bracket from the crossmember.
13. Remove the 2 steering gear-to-crossmember bolts and detach the gear from the crossmember.
14. Remove the starter. For additional information, refer to STARTING SYSTEM .

**NOTE:** The cylinder block cradle removed for clarity. Note the location of the 2 Torx head bolts at the rear of the cylinder block cradle.



**Fig. 170: Locating Cylinder Block Cradle Rear Torx Bolts**  
Courtesy of FORD MOTOR CO.

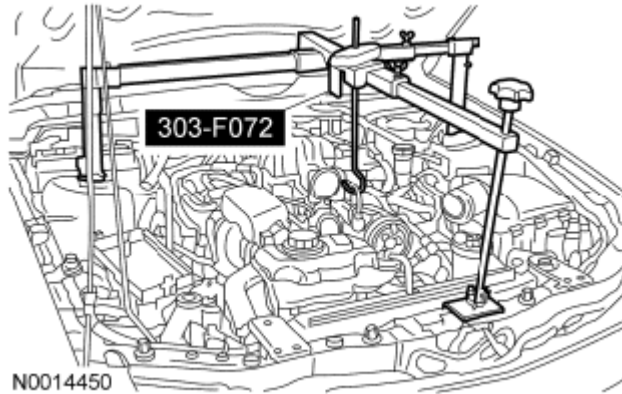
15. Remove the 2 cylinder block cradle rear Torx bolts.
16. Remove the 20 bolts and 2 nuts along the outside of the cylinder block cradle.

**NOTE:** Note the location of the 2 silver-colored bolts that have washer seals. They must be installed in the same position with new washer seals.

17. Remove the 8 cylinder block cradle inner bolts and the 2 washer seals.

- Discard the washer seals.

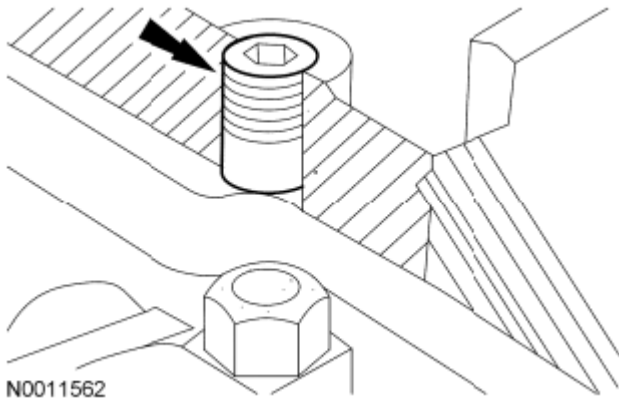
18. Using the Engine Support Bar, raise the engine and then remove the lower block cradle.



**Fig. 171: Identifying Engine Support Bar**  
Courtesy of FORD MOTOR CO.

#### Installation

**NOTE:** Failure to back off the set screws can result in damage to the cylinder block cradle.



**Fig. 172: Locating Cylinder Block Cradle Boss Set Screw**  
Courtesy of FORD MOTOR CO.

1. Back the set screws off until they are below the cylinder block cradle boss.

**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:** Gasket material as well as silicone sealant may be present in the cavities in the main bearing cap. This material must be removed completely prior to assembly.

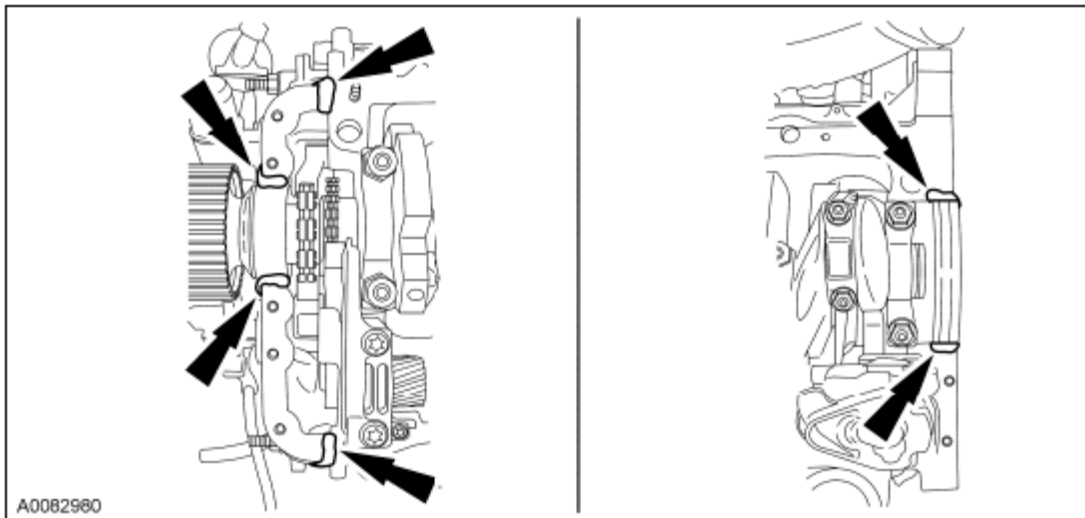


A0082981

**Fig. 173: Locating Gasket Mating Surfaces**  
Courtesy of FORD MOTOR CO.

2. Clean the gasket mating surfaces, making sure all the sealant is removed from the cavities on the rear main bearing cap. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging.

**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.

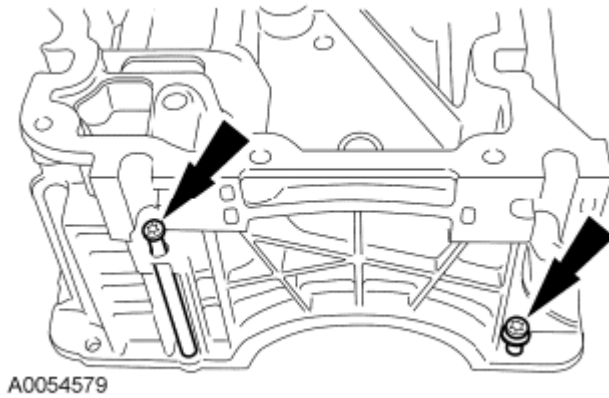


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**Fig. 174: Locating Silicone Gasket And Sealant Applying Areas**  
Courtesy of FORD MOTOR CO.

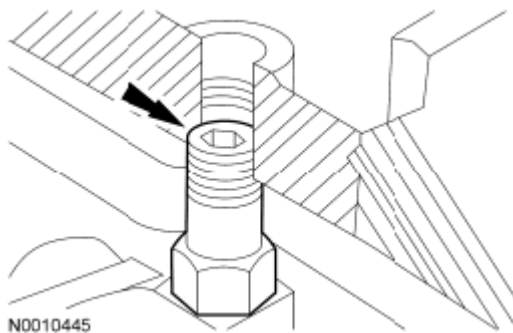
3. Apply silicone in the 6 places shown in illustration.

4. Position a new gasket and the cylinder block cradle.
5. Install the outer 20 bolts and 2 nuts finger-tight.
6. Install the 2 cylinder block cradle rear Torx bolts finger-tight.



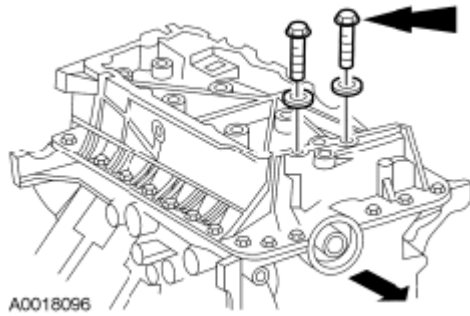
**Fig. 175: Locating Cylinder Block Cradle Rear Torx Bolts**  
 Courtesy of FORD MOTOR CO.

7. Install the 2 bellhousing-to-cylinder block cradle bolts.
  - Tighten to 47 Nm (35 lb-ft).
8. Tighten the outer 20 bolts and 2 nuts.
  - Tighten the nuts to 10 Nm (89 lb-in).
  - Tighten the bolts to 14 Nm (124 lb-in).
9. Tighten the 2 cylinder block cradle rear Torx bolts.
  - Tighten to 10 Nm (89 lb-in).
10. Tighten the 8 inserts.
  - Tighten to 3 Nm (27 lb-in).



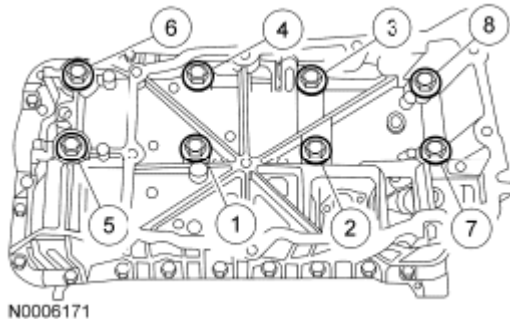
**Fig. 176: Locating Lower Block Cradle Insert**  
 Courtesy of FORD MOTOR CO.

11. Install the 2 silver-colored bolts and new washer seals finger-tight.



**Fig. 177: Locating Silver-Colored Bolts**  
 Courtesy of FORD MOTOR CO.

12. Install the 6 remaining inner bolts finger-tight.
13. Tighten the 8 inner bolts in the sequence shown in illustration in 2 stages.
  - Stage 1: Tighten to 15 Nm (133 lb-in).
  - Stage 2: Tighten to 34 Nm (25 lb-ft).



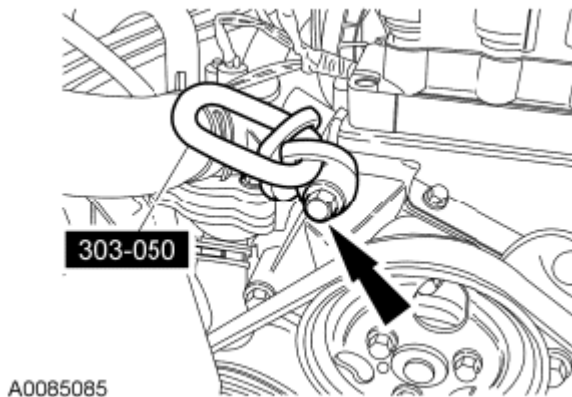
**Fig. 178: Identifying Cylinder Block Cradle Inner Bolts Tightening Sequence**  
 Courtesy of FORD MOTOR CO.

14. Install the starter. For additional information, refer to **STARTING SYSTEM** .
15. Position the steering gear and install the 2 bolts.
  - Tighten to 115 Nm (85 lb-ft).
16. Attach the **PSP** tube bracket to the crossmember and install the bolt.
  - Tighten to 11 Nm (97 lb-in).

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

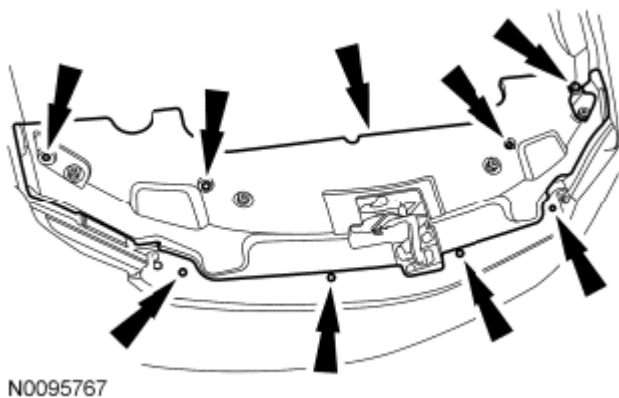
17. Attach the steering column intermediate shaft to the steering gear and install the bolt.
  - Tighten to 25 Nm (18 lb-ft).

18. Install the oil pump screen and pickup tube. For additional information, refer to **OIL PUMP SCREEN AND PICKUP TUBE**.
19. Lower the engine and install the LH engine mount nut.
  - Tighten to 63 Nm (46 lb-ft).
20. Install the RH engine mount nut.
  - Tighten to 63 Nm (46 lb-ft).
21. Remove the Engine Lifting Brackets and install the **FEAD** bracket bolt.
  - Tighten to 48 Nm (35 lb-ft).



**Fig. 179: Locating Engine Lifting Bracket And Front End Accessory Drive (FEAD) Bracket Bolt**  
 Courtesy of FORD MOTOR CO.

22. Position the radiator sight shield and install the 8 pin-type retainers.



**Fig. 180: Locating Pin-Type Retainers**  
 Courtesy of FORD MOTOR CO.

23. Install the **TB** . For additional information, refer to **FUEL CHARGING & CONTROLS - 4.0L SOHC** .
24. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND**

**CABLES .****OIL PUMP****Removal and Installation**

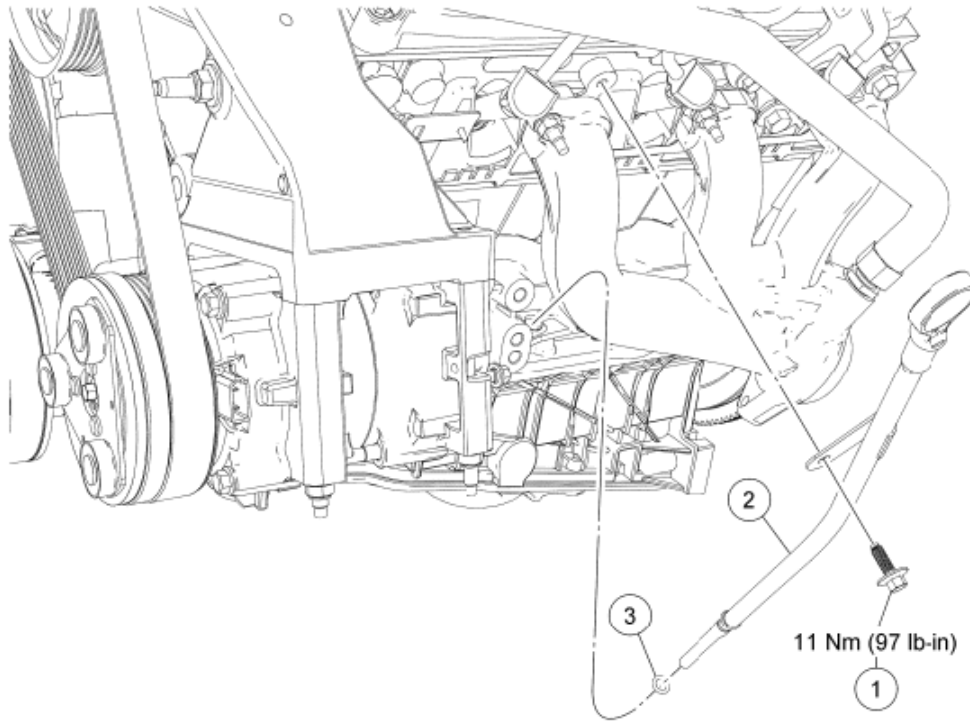
1. Remove the cylinder block cradle. For additional information, refer to **CYLINDER BLOCK CRADLE**.
2. Remove the 2 bolts and the oil pump.
  - To install, tighten to 19 Nm (168 lb-in).
3. To install, reverse the removal procedure.

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

1. Remove the oil pan. For additional information, refer to **OIL PAN**.
2. Remove the bolt and the oil pump screen and pickup tube.
  - To install, tighten to 11 Nm (97 lb-in).
3. To install, reverse the removal procedure.

**OIL LEVEL INDICATOR AND TUBE****Material****MATERIAL SPECIFICATIONS**

<b>Item</b>	<b>Specification</b>
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A



N0085244

**Fig. 181: Exploded View Of Oil Level Indicator And Tube With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	W500213	Oil level indicator tube bolt
2	6754	Oil level indicator tube
3	-	Oil level indicator tube O-ring seal

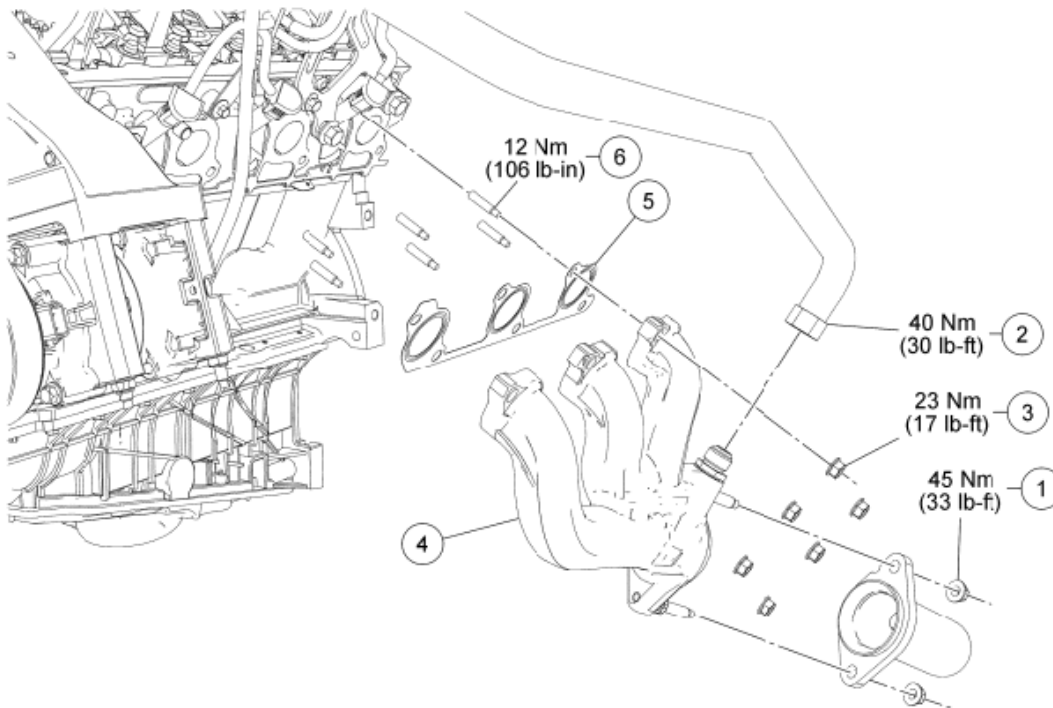
**Removal and Installation**

1. Remove the bolt and the oil level indicator tube.
  - To install, tighten to 11 Nm (97 lb-in).
  - Remove and discard the O-ring seal.

**NOTE:** Lubricate the O-ring seal with clean engine oil.

2. To install, reverse the removal procedure.

**EXHAUST MANIFOLD - LH**



N0085257

**Fig. 182: Exploded View Of Exhaust Manifold - LH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	W701706	LH catalytic converter-to-exhaust manifold nut (2 required)
2	-	EGR system module tube fitting (part of 9E649)
3	W701706	LH exhaust manifold nut (6 required)
4	9431	LH exhaust manifold
5	9448	LH exhaust manifold gasket
6	W705495	LH exhaust manifold stud (6 required)

**Removal**

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the 2 catalytic converter-to-exhaust manifold nuts.
  - Discard the nuts.
3. Disconnect the EGR system module tube from the exhaust manifold.
4. Remove the 6 nuts, the LH exhaust manifold and the gasket.
  - Discard the nuts and gasket.
5. Clean and inspect the LH exhaust manifold. For additional information, refer to **ENGINE SYSTEM -**

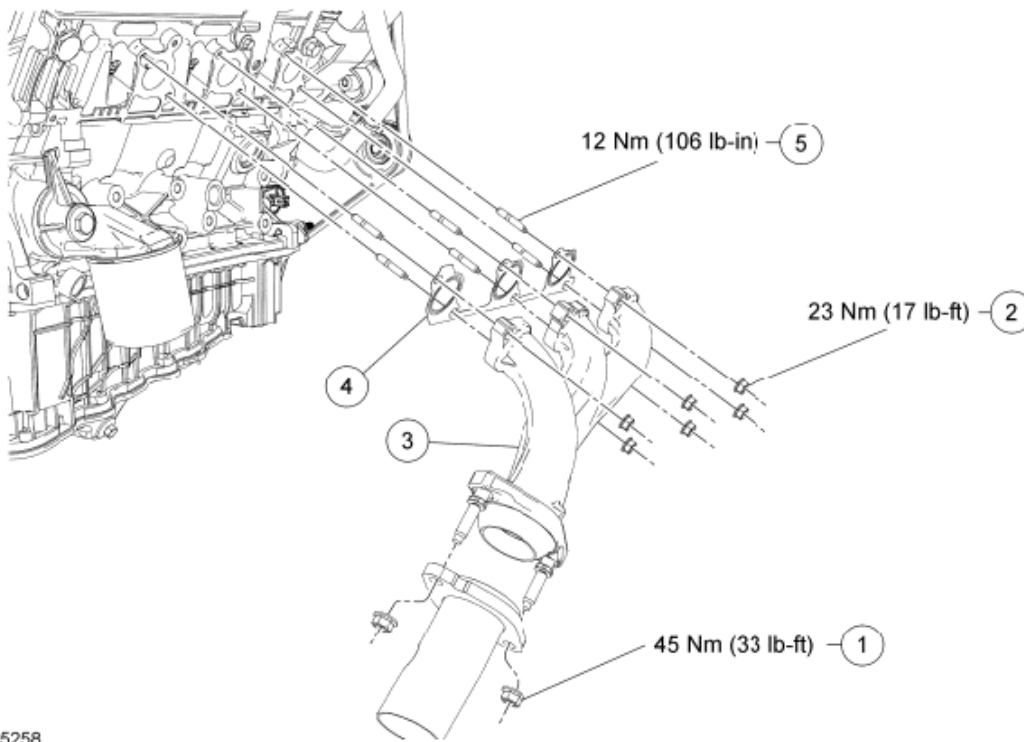
**GENERAL INFORMATION .**

- Remove and discard the 6 LH exhaust manifold studs.

**Installation**

- Install the 6 new LH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
- Install the new LH exhaust manifold gasket, manifold and 6 new nuts.
  - Tighten to 23 Nm (17 lb-ft).
- Connect the EGR system module tube to the exhaust manifold.
  - Tighten to 40 Nm (30 lb-ft).
- Install the 2 new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 45 Nm (33 lb-ft).

**EXHAUST MANIFOLD - RH**



N0085258

**Fig. 183: Exploded View Of Exhaust Manifold - RH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	W701706	RH catalytic converter-to-exhaust manifold nut (2 required)

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

2	W701706	RH exhaust manifold nut (6 required)
3	9430	RH exhaust manifold
4	9448	RH exhaust manifold gasket
5	W705495	RH exhaust manifold stud (6 required)

### Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the 2 catalytic converter-to-exhaust manifold nuts.
  - Discard the nuts.
3. Remove the nuts, the RH exhaust manifold and the gasket.
  - Discard the nuts and gasket.
4. Clean and inspect the RH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
5. Remove and discard the 6 RH exhaust manifold studs.

### Installation

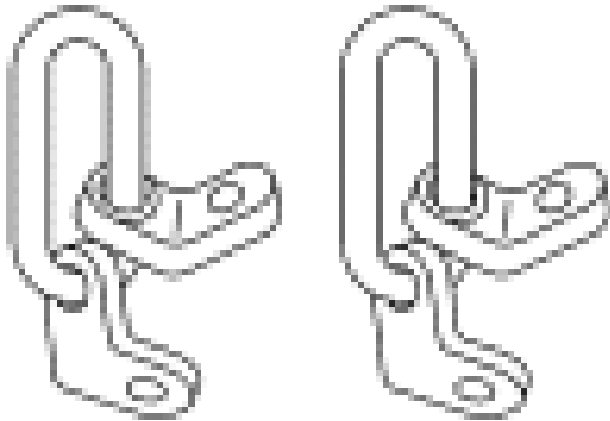
1. Install the 6 new RH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).
2. Install the new RH exhaust manifold gasket, manifold and 6 new nuts.
  - Tighten to 23 Nm (17 lb-ft).
3. Install the 2 new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 45 Nm (33 lb-ft).

## ENGINE MOUNT - LH

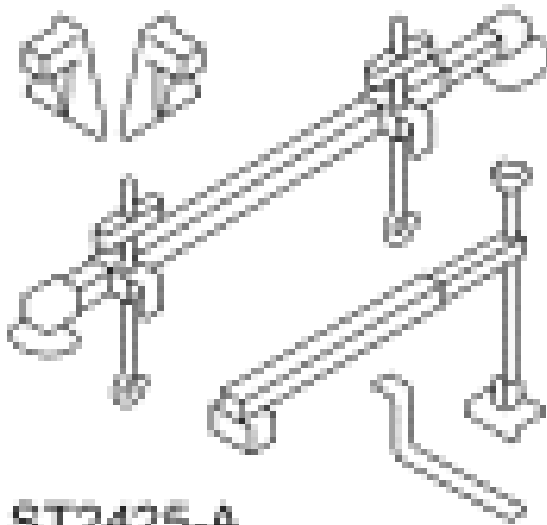
### Special Tool(s)

### SPECIAL TOOLS DESCRIPTION CHART

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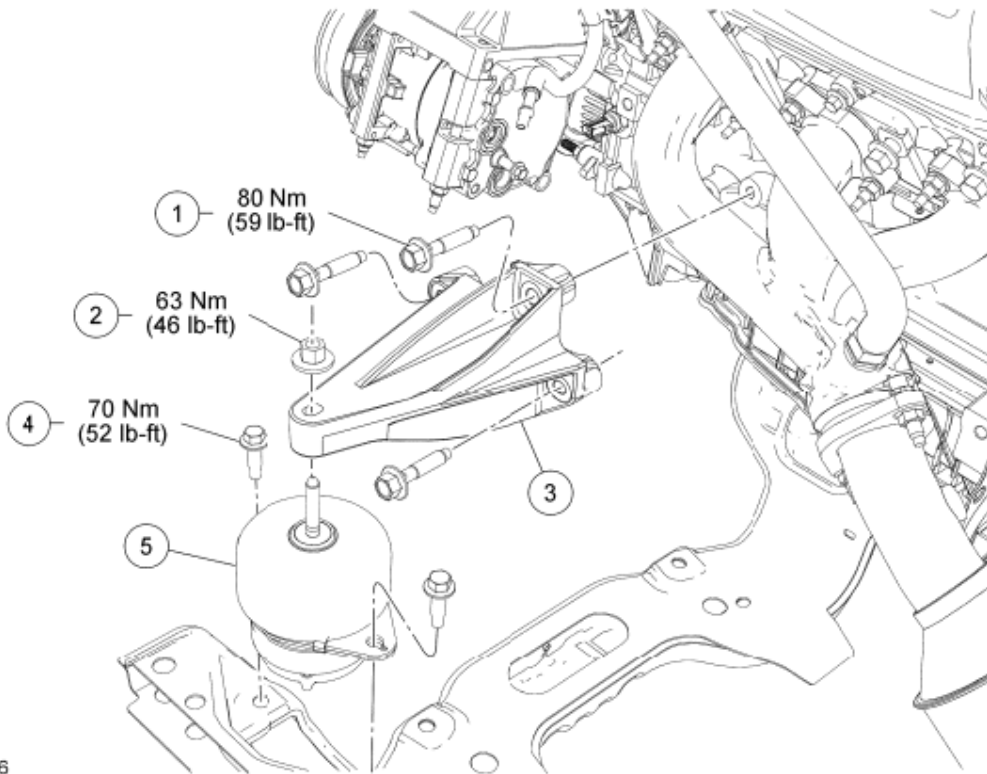


ST1595-A



ST2425-A

Support Bar, Engine  
303-F072



N0071446

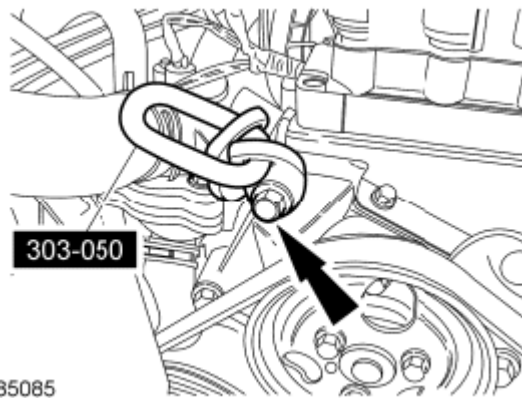
**Fig. 184: Exploded View Of Engine Mount - LH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	W710565	LH engine mount bracket bolt (3 required)
2	N621943	LH engine mount bracket-to-engine mount nut
3	6B033	LH engine mount bracket
4	W707641	LH engine mount bolt (2 required)
5	6038	LH engine mount

**Removal and Installation**

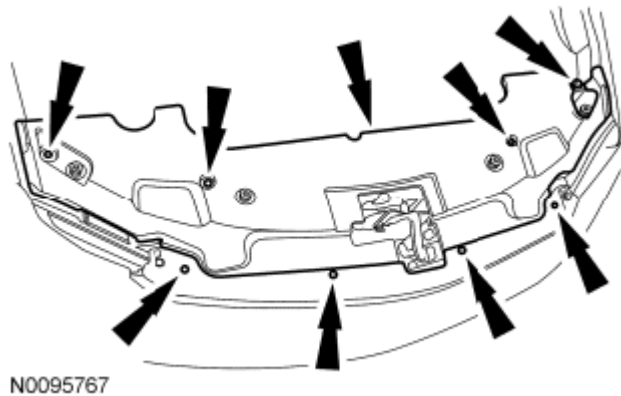
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING & CONTROLS - 4.0L SOHC**.
3. Remove the Front End Accessory Drive (FEAD) bracket bolt and install the Engine Lifting Bracket.
  - To install, tighten to 48 Nm (35 lb-ft).



**Fig. 185: Locating Engine Lifting Bracket And Front End Accessory Drive (FEAD) Bracket Bolt**

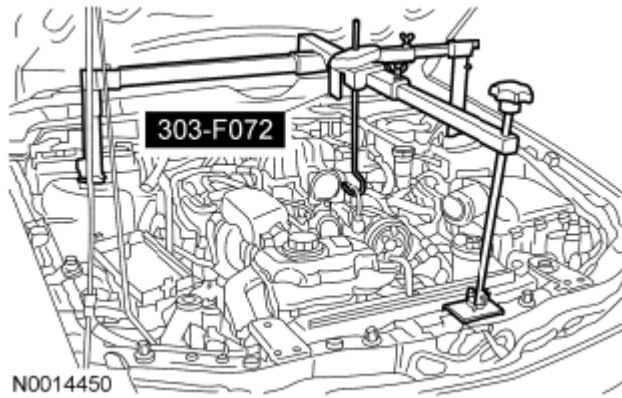
Courtesy of FORD MOTOR CO.

4. Remove the 8 pin-type retainers and the radiator sight shield.



**Fig. 186: Locating Pin-Type Retainers**  
Courtesy of FORD MOTOR CO.

5. Install the Engine Support Bar.



**Fig. 187: Identifying Engine Support Bar**  
Courtesy of FORD MOTOR CO.

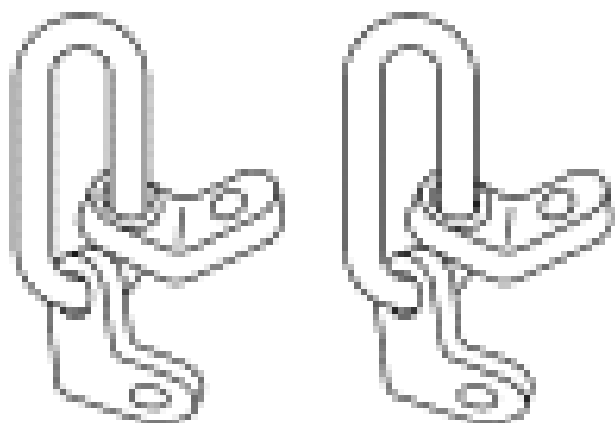
6. Remove the engine mount bracket-to-engine mount nut.
  - To install, tighten to 63 Nm (46 lb-ft).
7. Remove the 3 engine mount bracket bolts and remove the bracket.
  - To install, tighten to 80 Nm (59 lb-ft).
8. Remove the 2 engine mount bolts and the engine mount.
  - To install, tighten to 70 Nm (52 lb-ft).
9. To install, reverse the removal procedure.

## ENGINE MOUNT - RH

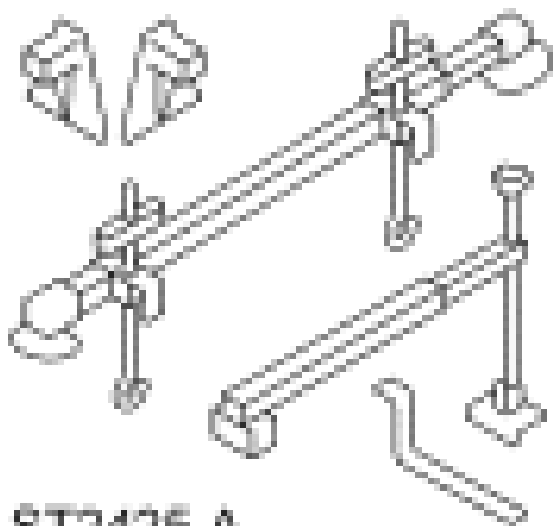
### Special Tool(s)

### SPECIAL TOOLS DESCRIPTION CHART

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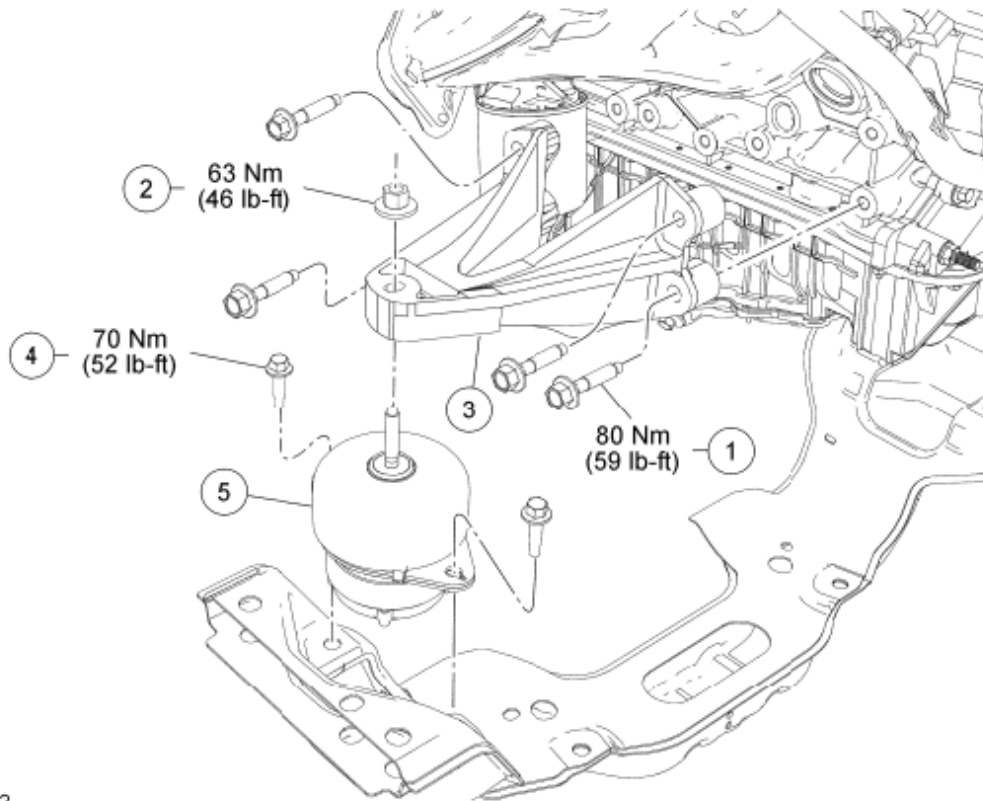


ST1595-A



ST2425-A

Support Bar, Engine  
303-F072



N0072282

**Fig. 188: Exploded View Of Engine Mount - RH With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

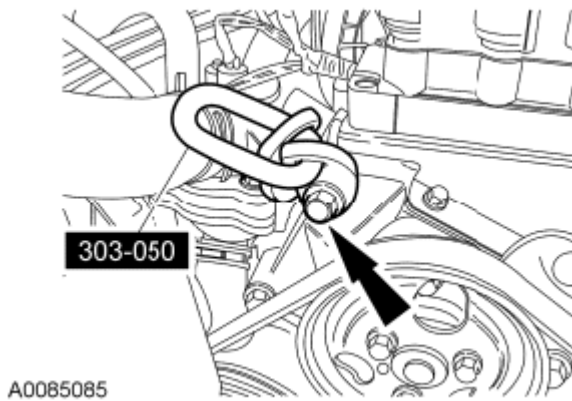
**ITEM DESCRIPTION**

Item	Part Number	Description
1	W710565	RH engine mount bracket bolt (4 required)
2	N621943	RH engine mount bracket-to-engine mount nut
3	6037	RH engine mount bracket
4	W707641	RH engine mount bolt (2 required)
5	6038	RH engine mount

**Removal and Installation**

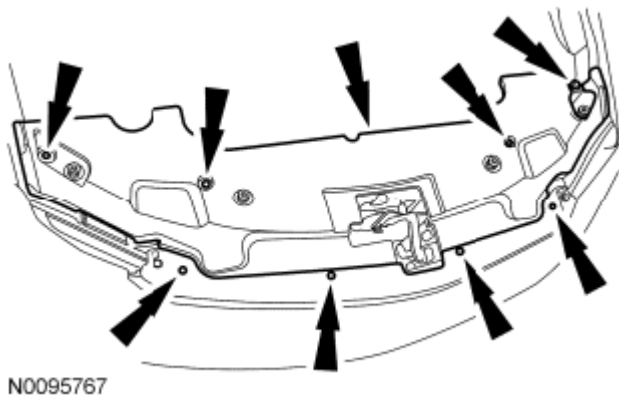
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
3. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING & CONTROLS - 4.0L SOHC**.
4. Remove the Front End Accessory Drive (FEAD) bracket bolt and install the Engine Lifting Bracket.

- To install, tighten to 48 Nm (35 lb-ft).



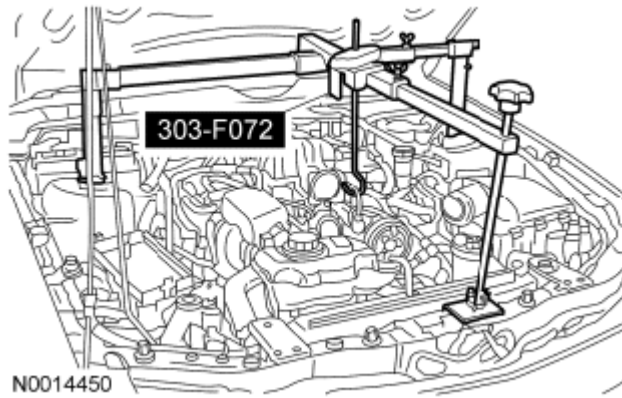
**Fig. 189: Locating Engine Lifting Bracket And Front End Accessory Drive (FEAD) Bracket Bolt**  
Courtesy of FORD MOTOR CO.

5. Remove the 8 pin-type retainers and the radiator sight shield.



**Fig. 190: Locating Pin-Type Retainers**  
Courtesy of FORD MOTOR CO.

6. Install the Engine Support Bar.



**Fig. 191: Identifying Engine Support Bar**  
 Courtesy of FORD MOTOR CO.

7. Remove the engine mount-to-engine bracket mount nut.
  - To install, tighten to 63 Nm (46 lb-ft).
8. Remove the 4 engine mount bracket bolts and remove the bracket.
  - To install, tighten to 80 Nm (59 lb-ft).
9. Remove the 2 engine mount bolts and the engine mount.
  - To install, tighten to 70 Nm (52 lb-ft).
10. To install, reverse the removal procedure.

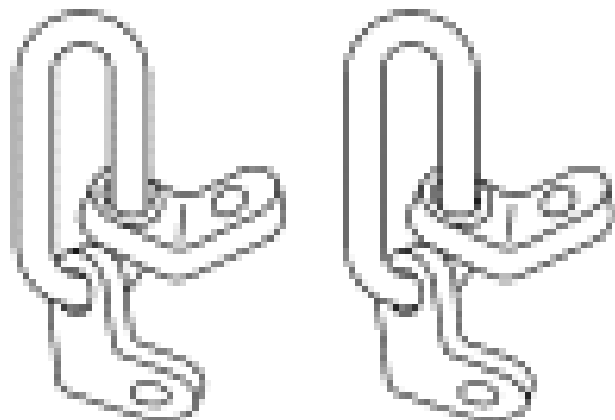
## REMOVAL

### ENGINE

#### Special Tool(s)

#### SPECIAL TOOLS DESCRIPTION CHART

	Lifting Bracket, Engine 303-050 (T70P-6000)
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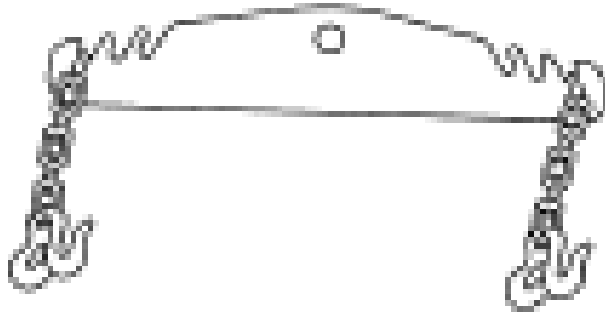
ST1595-A



ST1394-A

Remover, Spark Plug Wire  
303-106 (T74P-6666A)

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



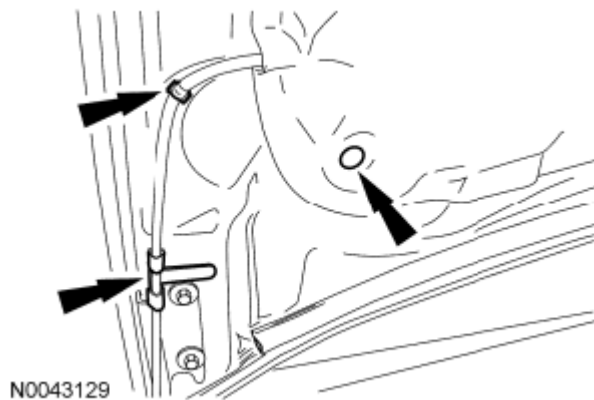
ST1602-A

#### Removal

**NOTE:** Rotating the crankshaft pulley bolt counterclockwise could cause a reduction in clamp load on the crankshaft pulley and timing sprocket, which could cause severe engine damage.

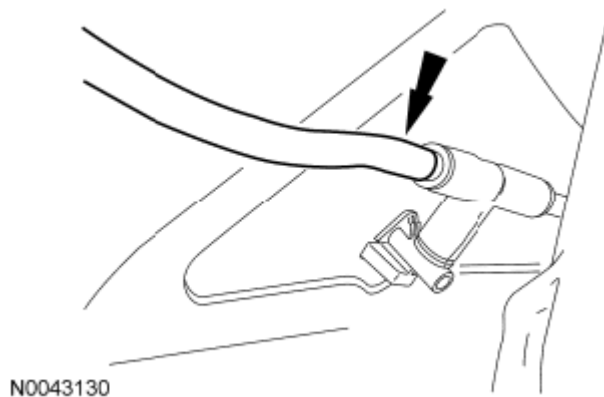
#### All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
3. Disconnect the battery ground and positive cables. For additional information, refer to **BATTERY, MOUNTING AND CABLES**.
4. Remove the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.
5. Release the 2 windshield washer hose retainers and the one hood insulation pin-type retainer.



**Fig. 192: Locating Windshield Washer Hose Retainers And Hood Insulation Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

- Position the hood insulation aside and disconnect the windshield washer hose.



**Fig. 193: Locating Windshield Washer Hose**  
Courtesy of FORD MOTOR CO.

**NOTE:** Index-mark the hood hinge location to aid in hood installation.

- Remove the 4 bolts and the hood.
- Drain the cooling system. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

#### **Vehicles with automatic transmission**

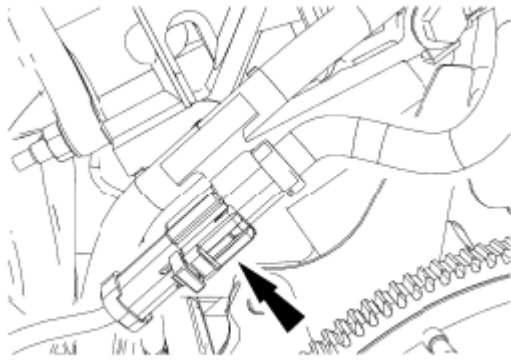
- Remove the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 5R55S**.

#### **Vehicles with manual transmission**

- Remove the clutch. For additional information, refer to **CLUTCH**.

**All vehicles**

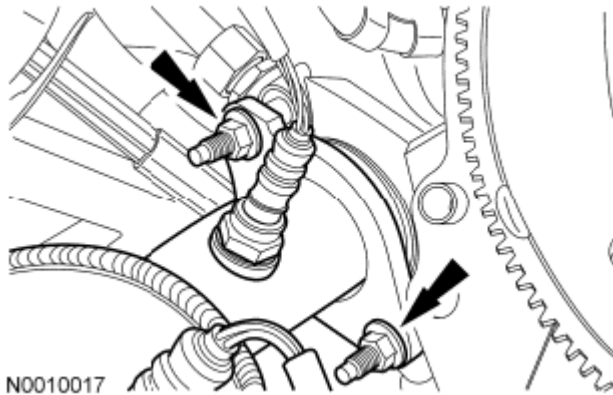
11. Disconnect the 2 Heated Oxygen Sensor (HO2S) and the 2 Catalyst Monitor Sensor (CMS) electrical connectors.



**Fig. 194: Locating Heated Oxygen Sensor (HO2S) Electrical Connector**  
Courtesy of FORD MOTOR CO.

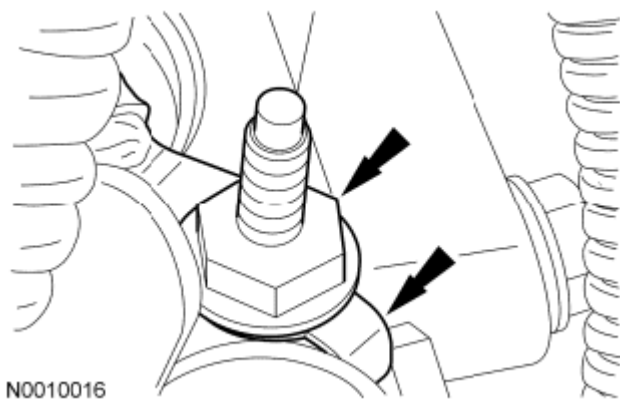
**NOTE:** LH side shown, RH side similar.

12. Remove the 4 catalytic converter-to-exhaust manifold nuts.
  - Discard the nuts.



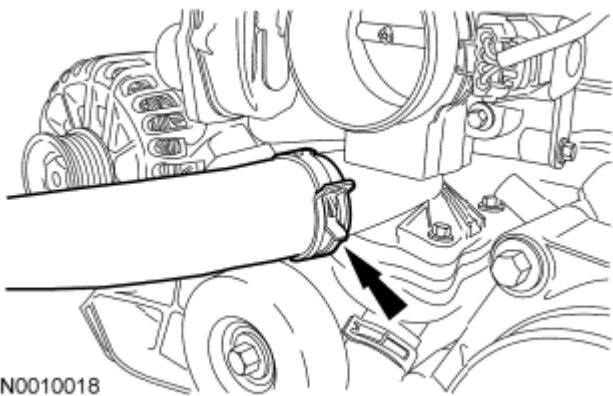
**Fig. 195: Locating Catalytic Converter-To-Exhaust Manifold Nuts**  
Courtesy of FORD MOTOR CO.

13. Remove the stud bolt and detach the ground strap.
  - Position the ground strap aside.



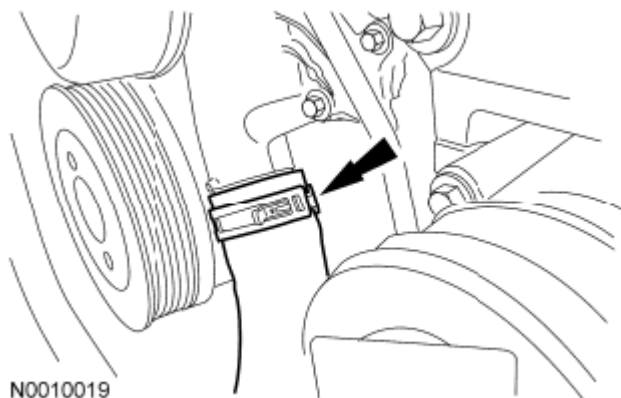
**Fig. 196: Locating Stud Bolt And Ground Strap**  
Courtesy of FORD MOTOR CO.

14. Remove the oil pan drain plug and drain the engine oil.
  - Install the drain plug and tighten to 26 Nm (19 lb-ft).
15. Disconnect the upper radiator hose from the thermostat housing.



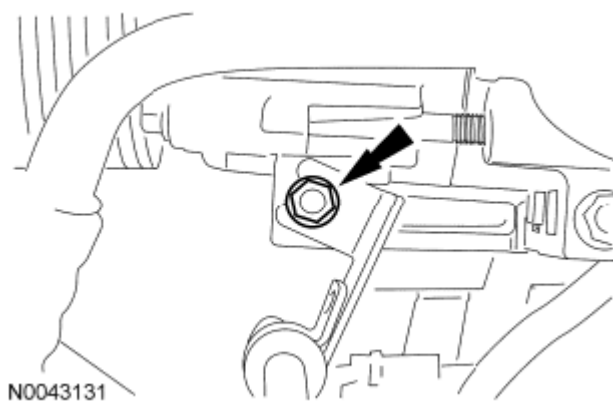
**Fig. 197: Locating Upper Radiator Hose On Thermostat Housing**  
Courtesy of FORD MOTOR CO.

16. Disconnect the lower radiator hose from the coolant pump.



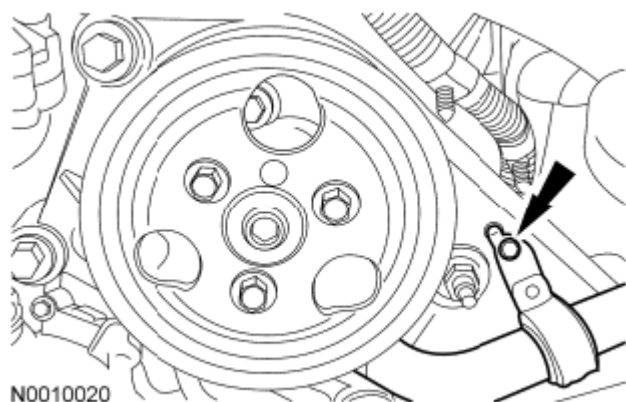
**Fig. 198: Locating Lower Radiator Hose On Coolant Pump**  
Courtesy of FORD MOTOR CO.

17. Remove the nut and Power Steering Pressure (PSP) tube bracket from the A/C compressor.



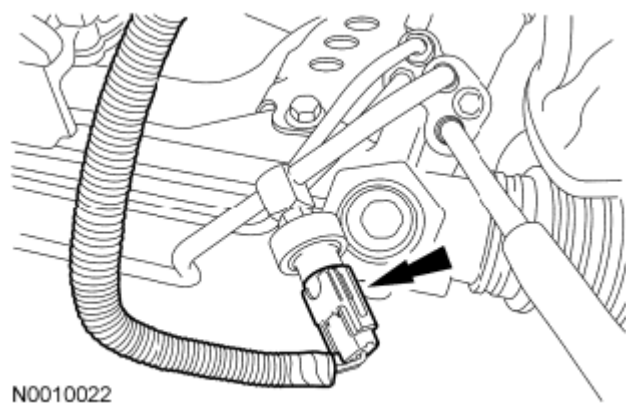
**Fig. 199: Identifying Power Steering Pressure (PSP) Tube Bracket Nut**  
Courtesy of FORD MOTOR CO.

18. Remove the bolt and detach the power steering supply hose bracket from the Front End Accessory Drive (FEAD) bracket.



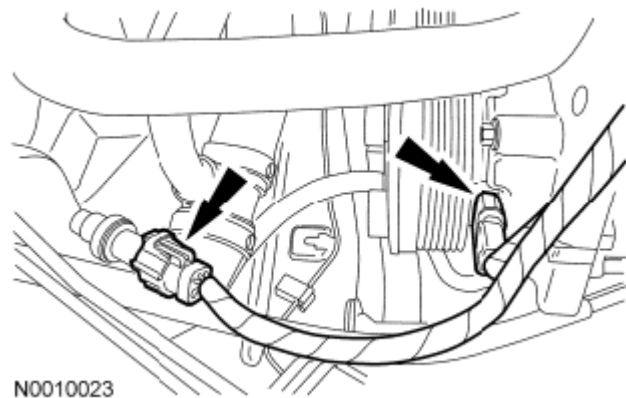
**Fig. 200: Locating Power Steering Supply Hose Bracket**  
Courtesy of FORD MOTOR CO.

19. Disconnect the PSP switch electrical connector.



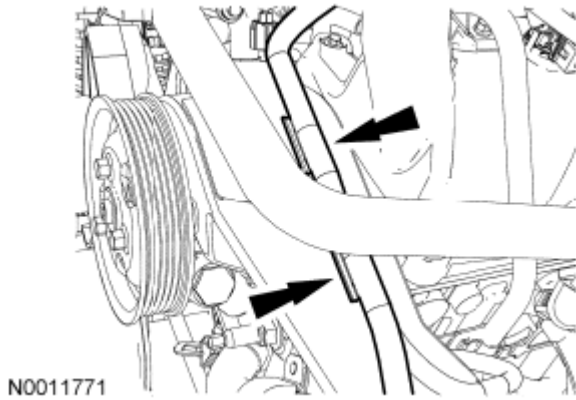
**Fig. 201: Locating Power Steering Pressure (PSP) Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

20. Disconnect the A/C compressor and A/C high pressure switch electrical connectors.



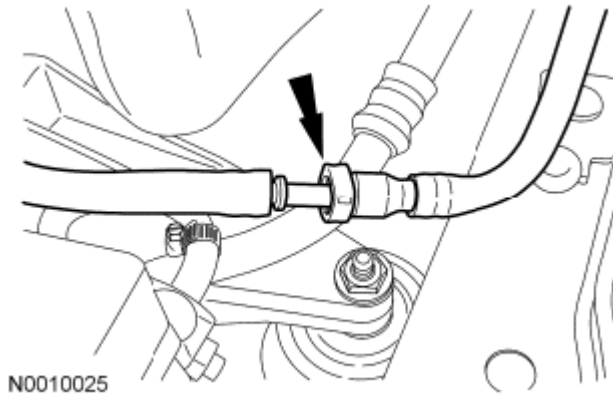
**Fig. 202: Locating A/C Compressor And A/C High Pressure Switch Electrical Connectors**  
Courtesy of FORD MOTOR CO.

21. Detach the 2 wiring retainers from the **FEAD** bracket.



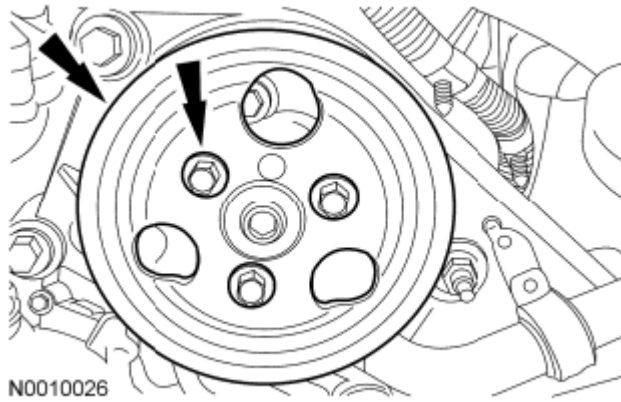
**Fig. 203: Locating Wiring Retainers On FEAD Bracket**  
Courtesy of FORD MOTOR CO.

22. Disconnect the fuel supply tube coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .



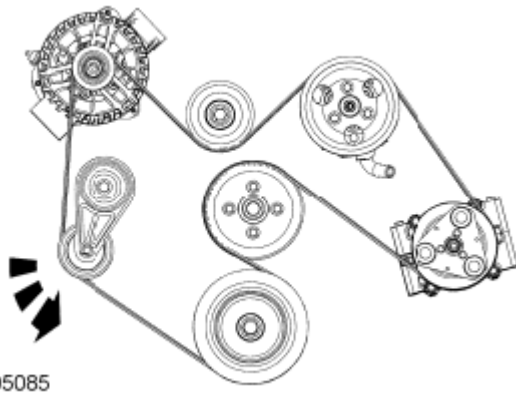
**Fig. 204: Locating Fuel Supply Tube Coupling**  
Courtesy of FORD MOTOR CO.

23. Loosen the 3 bolts on the power steering pump pulley.



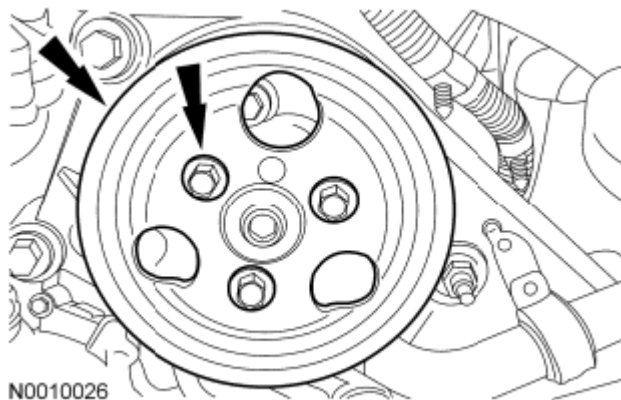
**Fig. 205: Locating Power Steering Pump Pulley With Mounting Bolts**  
Courtesy of FORD MOTOR CO.

24. Rotate the accessory drive belt tensioner counterclockwise and remove the accessory drive belt.



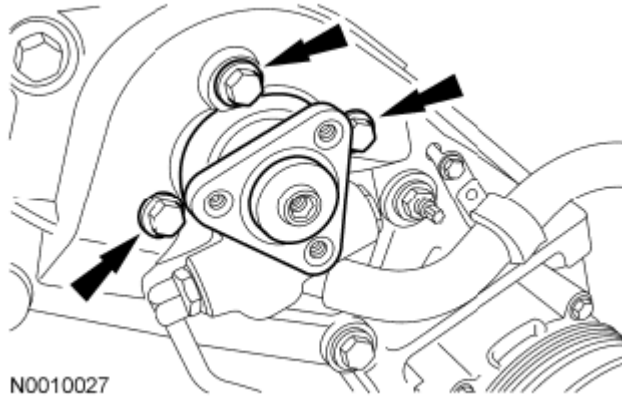
**Fig. 206: Rotating Accessory Drive Belt Tensioner Counterclockwise**  
Courtesy of FORD MOTOR CO.

25. Remove the 3 bolts and the power steering pump pulley.



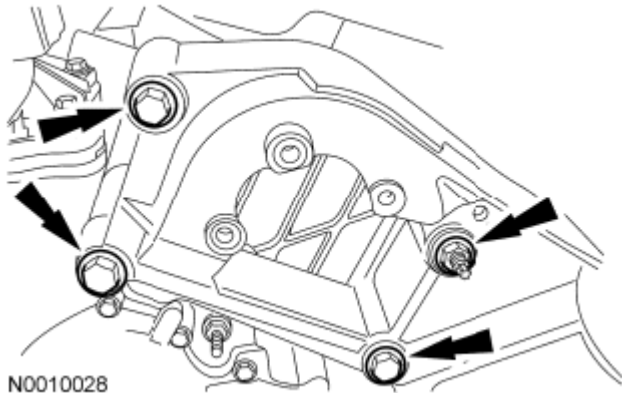
**Fig. 207: Locating Power Steering Pump Pulley With Mounting Bolts**  
Courtesy of FORD MOTOR CO.

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



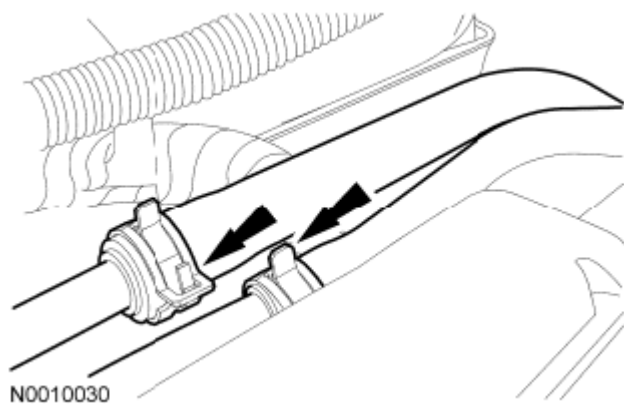
**Fig. 208: Locating Power Steering Pump Bolts**  
Courtesy of FORD MOTOR CO.

27. Remove the 3 bolts, the nut and position the FEAD bracket and A/C compressor aside.



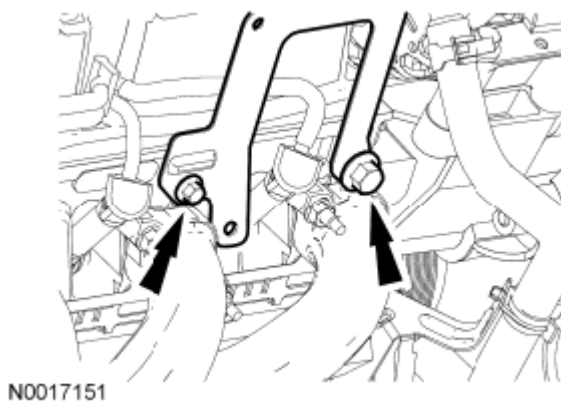
**Fig. 209: Locating Front Engine Accessory Drive (FEAD) Bracket Bolts And Nut**  
Courtesy of FORD MOTOR CO.

28. Disconnect the 2 heater hoses from the coolant tube.



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

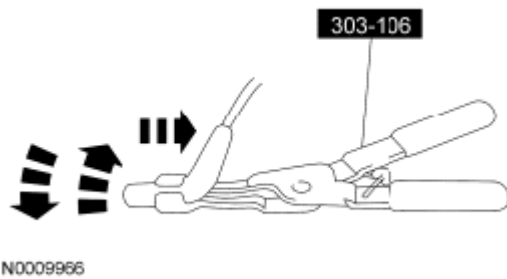
29. Remove the 2 coolant tube bracket bolts.



**Fig. 211: Locating Coolant Tube Bracket Bolts**  
Courtesy of FORD MOTOR CO.

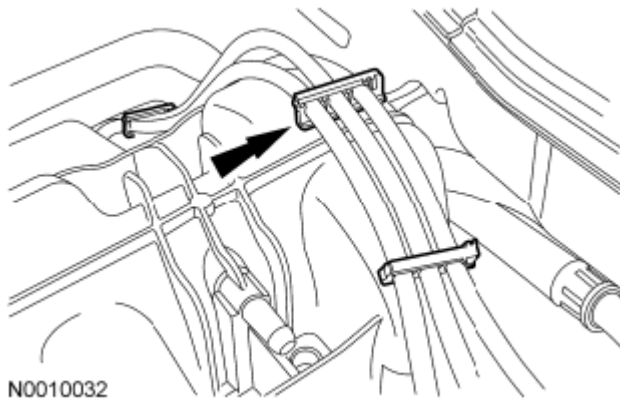
**NOTE:** When removing the ignition wires, a slight twisting motion will break the seal and ease removal.

30. Using the Spark Plug Wire Remover, disconnect the 6 spark plug wires from the spark plugs.
  - Detach the retainers from the valve cover stud bolts and the ignition coil bracket.



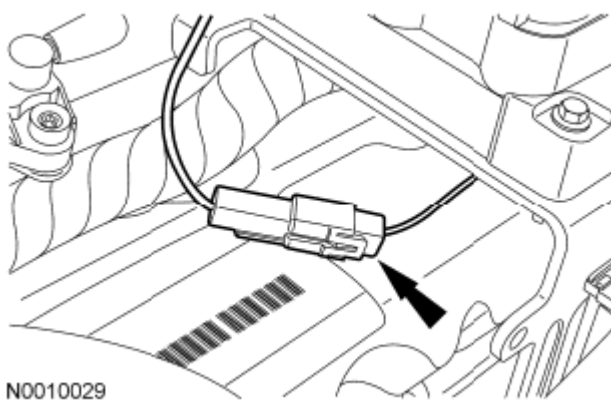
**Fig. 212: Disconnecting Spark Plug Wires From Spark Plugs**  
Courtesy of FORD MOTOR CO.

31. Detach the spark plug wire retainer from the intake manifold.



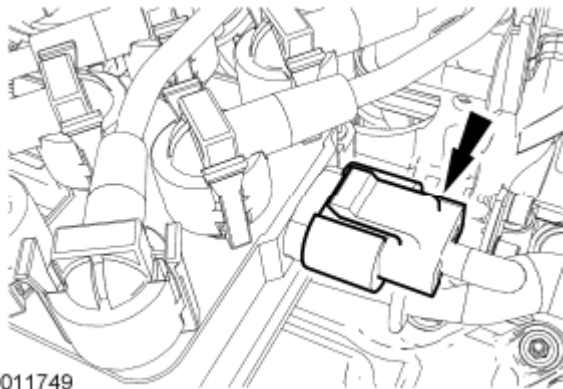
**Fig. 213: Locating Spark Plug Wire Retainer On Intake Manifold**  
Courtesy of FORD MOTOR CO.

32. Disconnect the radio ignition interference capacitor electrical connector.



**Fig. 214: Locating Radio Ignition Interference Capacitor Electrical Connector**  
Courtesy of FORD MOTOR CO.

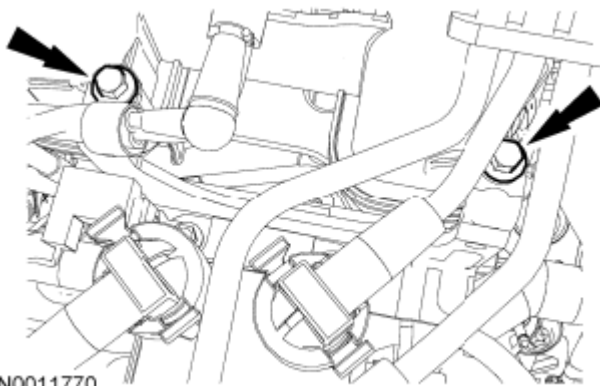
33. Disconnect the ignition coil electrical connector.



N0011749

**Fig. 215: Locating Ignition Coil Electrical Connector**  
Courtesy of FORD MOTOR CO.

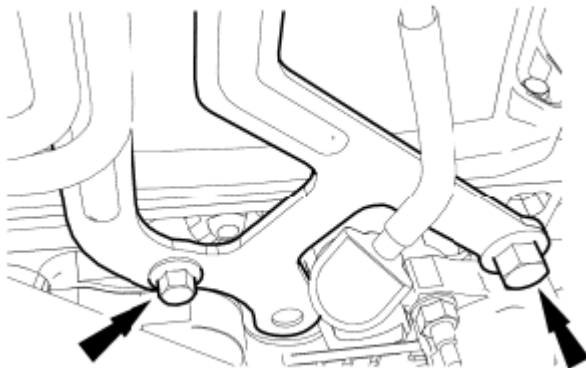
34. Remove the 2 upper ignition coil bracket bolts.



N0011770

**Fig. 216: Locating Upper Ignition Coil Bracket Bolts**  
Courtesy of FORD MOTOR CO.

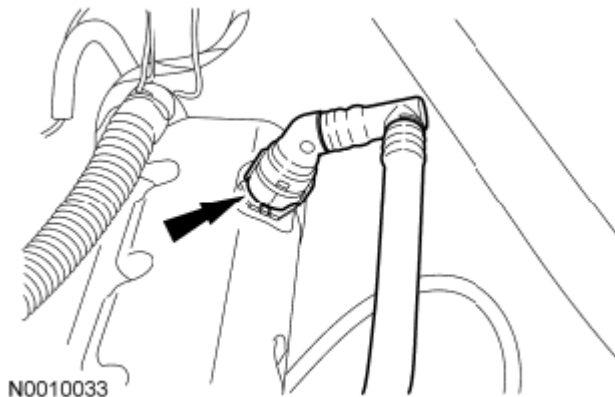
35. Remove the 2 lower ignition coil bracket bolts and then remove the ignition coil and spark plug wires.



N0017152

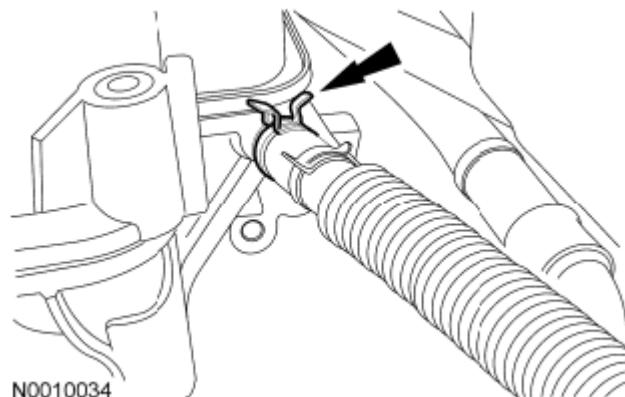
**Fig. 217: Locating Ignition Coil Bracket Bolts**  
Courtesy of FORD MOTOR CO.

36. Detach the crankcase vent tube from the LH valve cover and remove the tube.



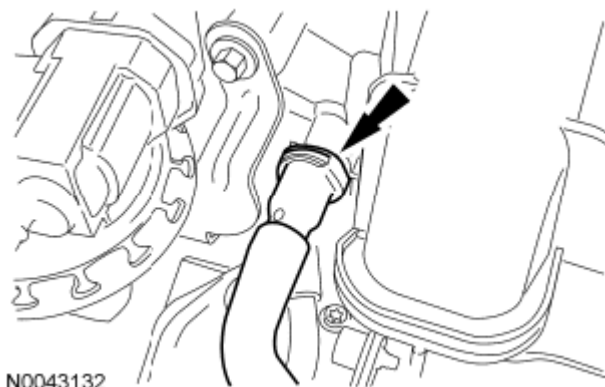
**Fig. 218: Locating Crankcase Vent Tube**  
Courtesy of FORD MOTOR CO.

37. Disconnect the brake booster vacuum hose from the upper intake manifold.



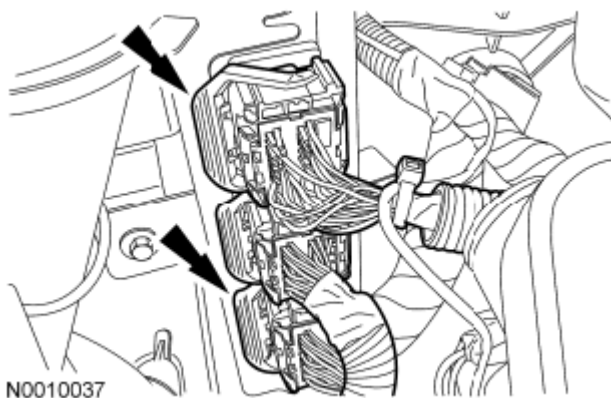
**Fig. 219: Locating Brake Booster Vacuum Hose On Upper Intake Manifold**  
Courtesy of FORD MOTOR CO.

38. Disconnect the fuel vapor vent tube from the intake manifold.



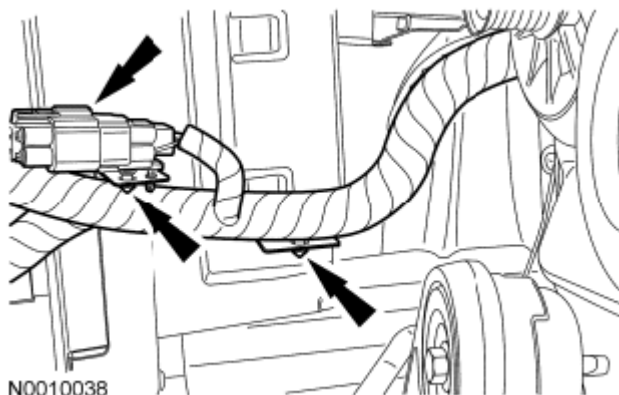
**Fig. 220: Locating Fuel Vapor Vent Tube To Intake Manifold**  
Courtesy of FORD MOTOR CO.

39. Disconnect the upper and lower PCM electrical connectors.



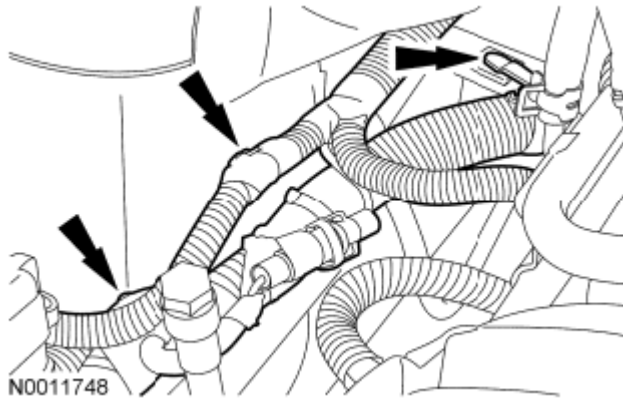
**Fig. 221: Locating Upper And Lower Powertrain Control Module (PCM) Electrical Connectors**  
Courtesy of FORD MOTOR CO.

40. Disconnect the 16-pin electrical connector and detach the 2 wiring retainers.



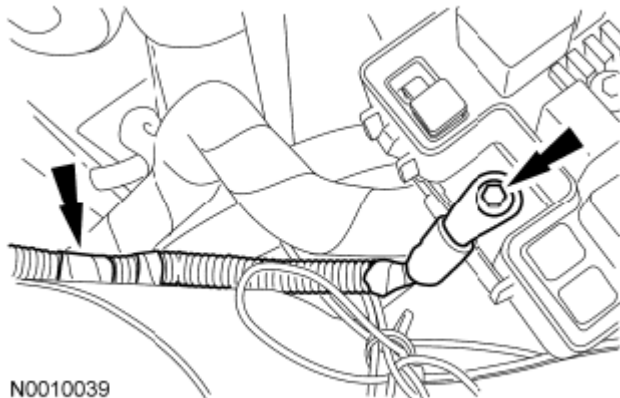
**Fig. 222: Locating 16-Pin Electrical Connector With Wiring Retainers**  
 Courtesy of FORD MOTOR CO.

41. Detach the 3 wiring harness retainers.



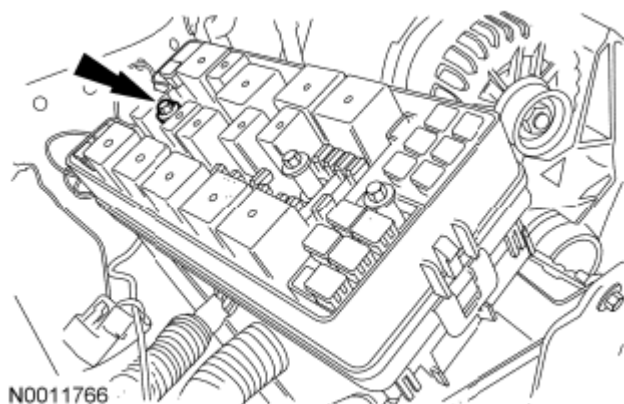
**Fig. 223: Locating Wiring Harness Retainers**  
 Courtesy of FORD MOTOR CO.

42. Remove the Power Distribution Box (PDB) cover.  
 43. Remove the bolt and detach the B+ terminal from the **PDB** .
- Detach the pin-type retainer from the strut tower.



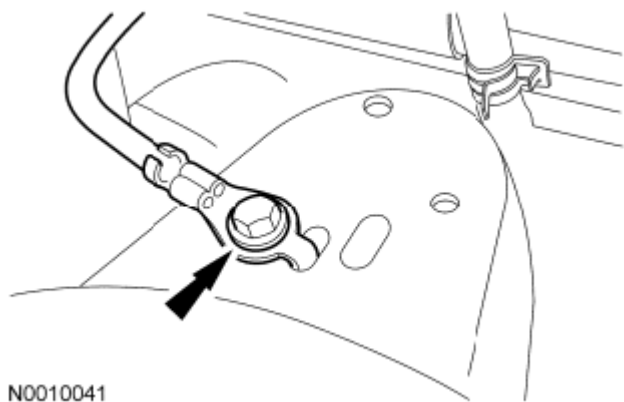
**Fig. 224: Locating Pin-Type Retainer**  
 Courtesy of FORD MOTOR CO.

44. Detach the **PDB** upper housing from the lower housing, loosen the bolt and then disconnect the 68-pin connector from the **PDB** .



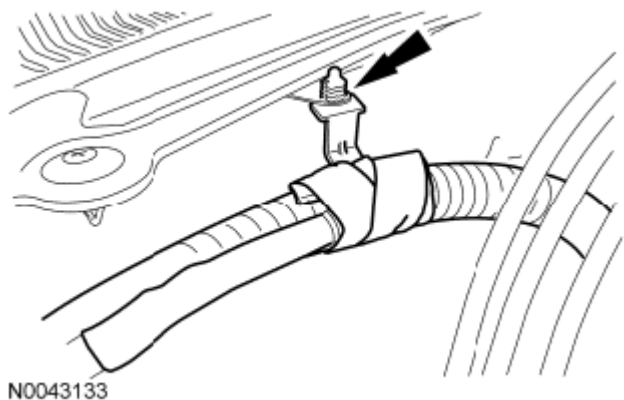
**Fig. 225: Locating Power Distribution Box Upper Housing With Mounting Bolt**  
Courtesy of FORD MOTOR CO.

45. Remove the bolt and detach the ground cable from the RH strut tower.



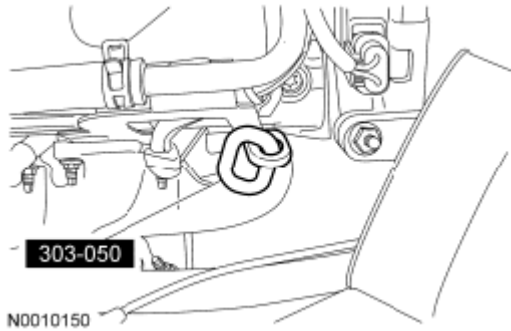
**Fig. 226: Locating Ground Cable With Mounting Bolt**  
Courtesy of FORD MOTOR CO.

46. Detach the battery cable harness pin-type retainer from the cowl.



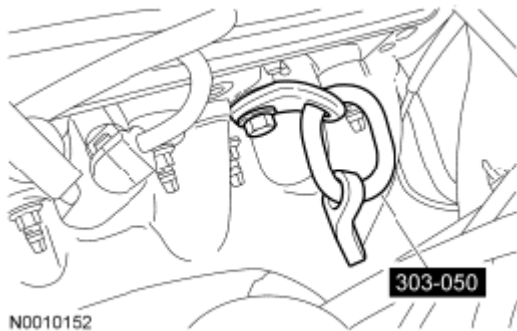
**Fig. 227: Locating Battery Cable Harness Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

- 47. Install the Engine Lifting Bracket to the RH cylinder head.



**Fig. 228: Identifying Engine Lifting Bracket On RH Cylinder Head**  
Courtesy of FORD MOTOR CO.

- 48. Install the Engine Lifting Bracket to the LH cylinder head.



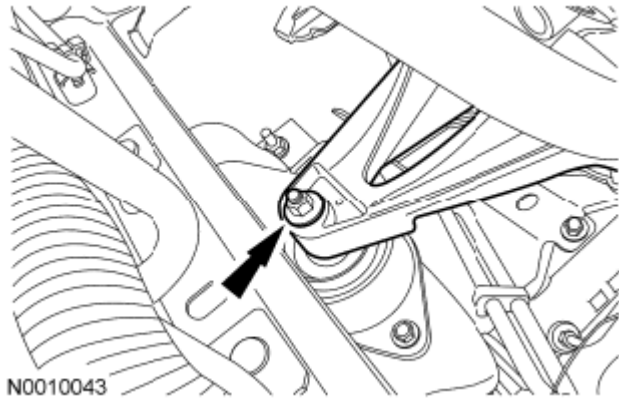
**Fig. 229: Identifying Engine Lifting Bracket On LH Cylinder Head**  
Courtesy of FORD MOTOR CO.

- 49. Remove the LH engine mount nut.



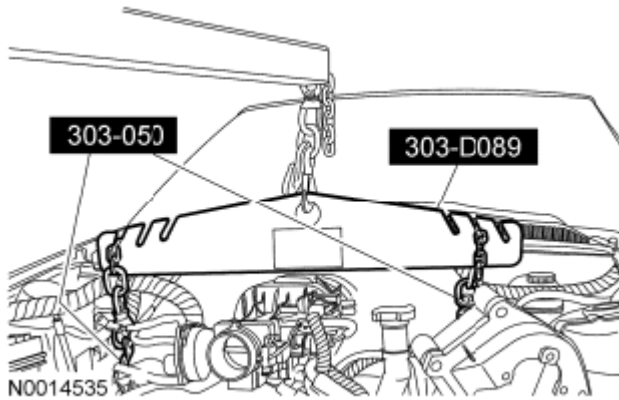
**Fig. 230: Locating Engine Mount Nut (LH)**  
Courtesy of FORD MOTOR CO.

50. Remove the RH engine mount nut.



**Fig. 231: Locating Engine Mount Nut (RH)**  
Courtesy of FORD MOTOR CO.

51. Using the Engine Lifting Bracket and Spreader Bar, remove the engine.



**Fig. 232: Identifying Engine Lifting Bracket And Spreader Bar On Engine**  
Courtesy of FORD MOTOR CO.

## DISASSEMBLY

### ENGINE

Special Tool(s)

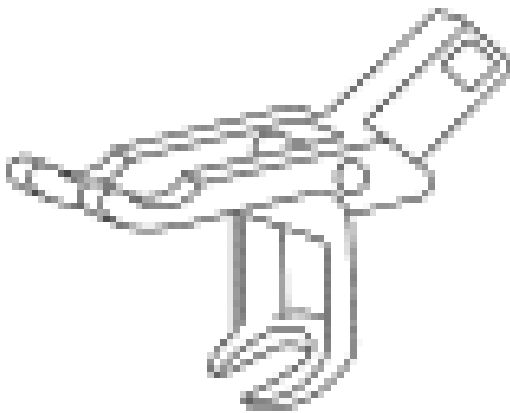
### SPECIAL TOOLS DESCRIPTION CHART

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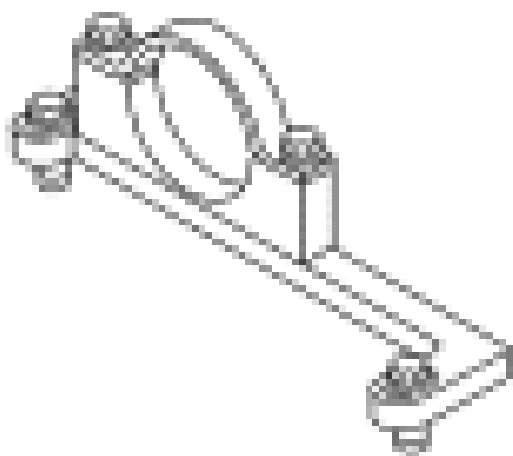
ST1776-A

Adapter for 303-564  
303-578 (T97T-6256-A)



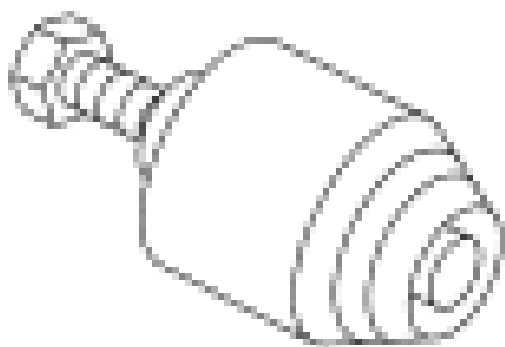
ST1330-A

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



**ST1777-A**

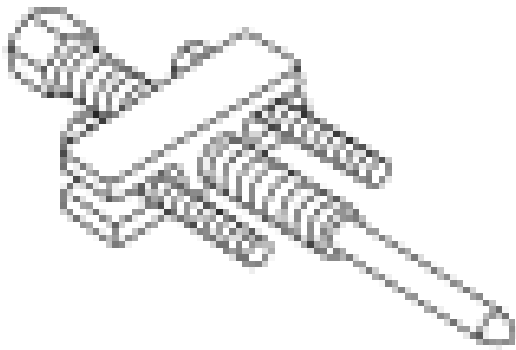
Holding Tool, Camshaft Sprocket  
303-564 (T97T-6256-B)



**ST1288-A**

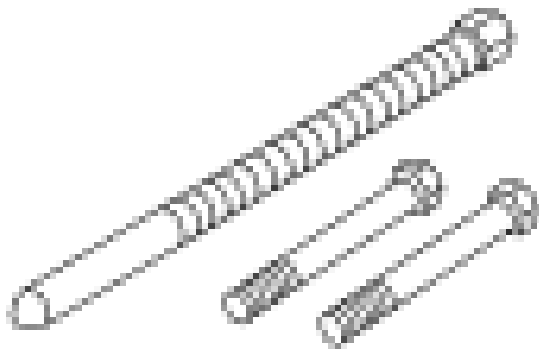
Remover, Crankshaft Front Oil Seal  
303-107 (T74P-6700-A)

Remover, Crankshaft Vibration Damper



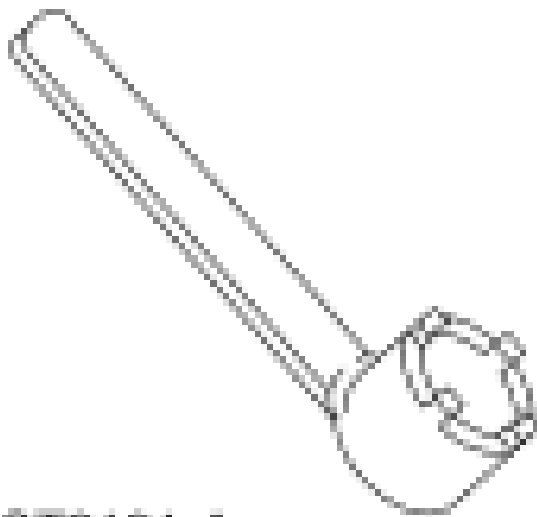
ST1784-A

303-101 (T74P-3616-A)



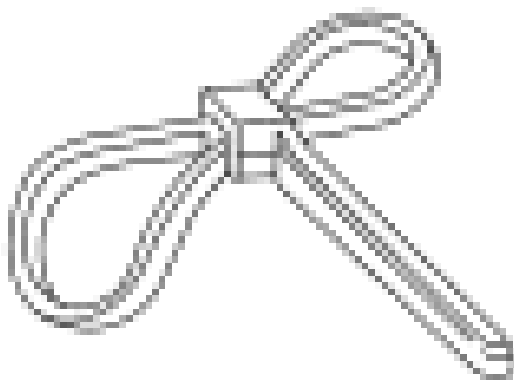
ST2697-A

Remover, Crankshaft Vibration Damper  
303-773



ST2191-A

Socket, Rear Jack Shaft  
303-634



ST1438-A

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

**General Equipment**

**GENERAL EQUIPMENT CHART**

8 mm x 1.25 x 100 mm bolts (2 required)

**Material**

**MATERIAL SPECIFICATIONS**

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

**All vehicles**

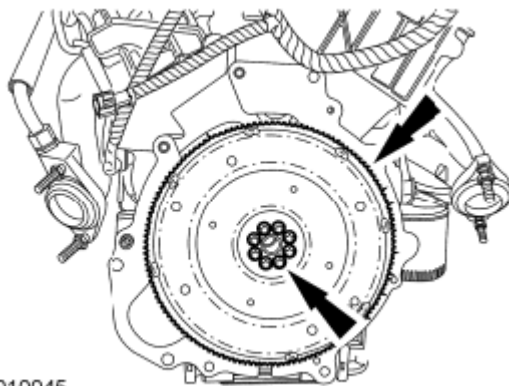
**NOTE:** During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

**NOTE:** Remove the cylinder heads before removing the crankshaft. Failure to do so may result in engine damage.

**NOTE:** If the fuel rail is used as a leverage device, damage may occur to the fuel rail. Care must be taken when working around the fuel rail.

**NOTE:** For additional information, refer to the exploded views under Engine in Assembly.

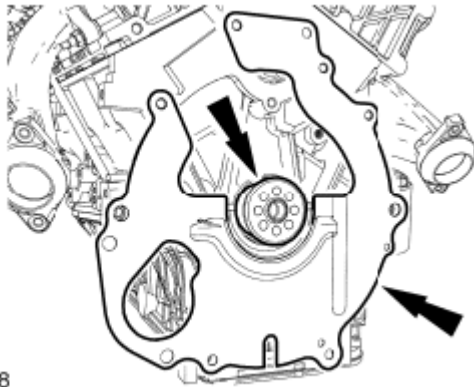
1. Remove the 8 bolts and the flexplate or flywheel.
  - Discard the bolts.



N0010045

**Fig. 233: Locating Flexplate Or Flywheel With Mounting Bolts**  
 Courtesy of FORD MOTOR CO.

2. Remove the spacer plate and if equipped, the flexplate-to-crankshaft spacer.

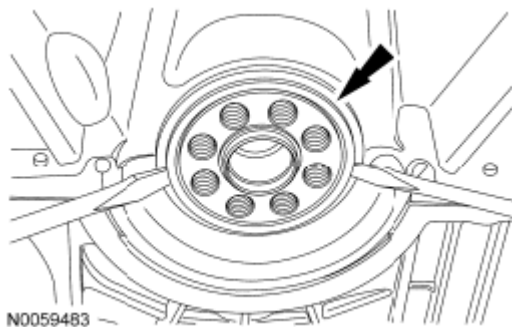


N0011768

**Fig. 234: Locating Flexplate-To-Crankshaft Spacer**  
Courtesy of FORD MOTOR CO.

**NOTE:** The original crankshaft rear seal does not have a speedy sleeve. Only a new replacement crankshaft rear seal comes with a speedy sleeve.

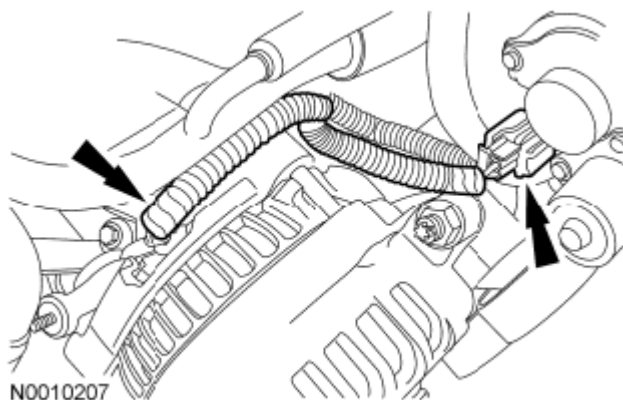
**NOTE:** The crankshaft rear seal may have a metal speedy sleeve. This sleeve must be removed before engine disassembly.



N0059483

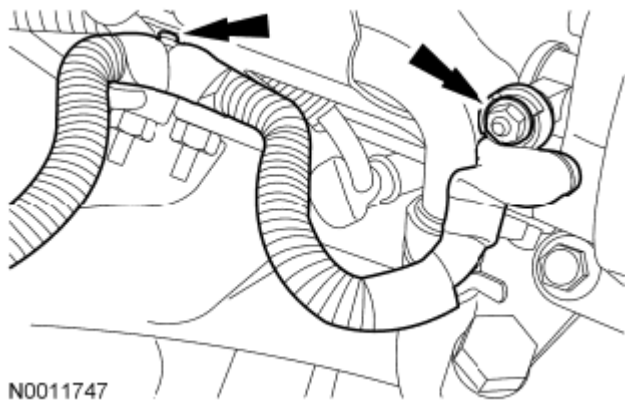
**Fig. 235: Locating Speedy Sleeve**  
Courtesy of FORD MOTOR CO.

3. If necessary, remove the speedy sleeve using 2 screwdrivers or small pry bars.
4. Mount the engine on a suitable engine stand.
5. Disconnect the generator and Throttle Body (TB) electrical connectors.



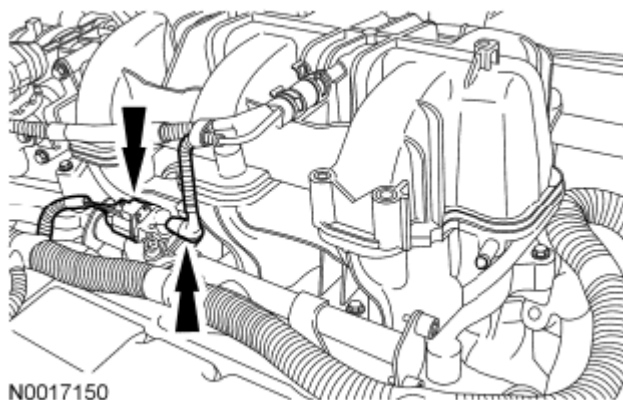
**Fig. 236: Locating Generator And Throttle Body Electrical Connectors**  
Courtesy of FORD MOTOR CO.

6. Remove the nut and detach the B+ terminal from the generator.
  - Detach the wiring retainer from the coolant tube bracket.



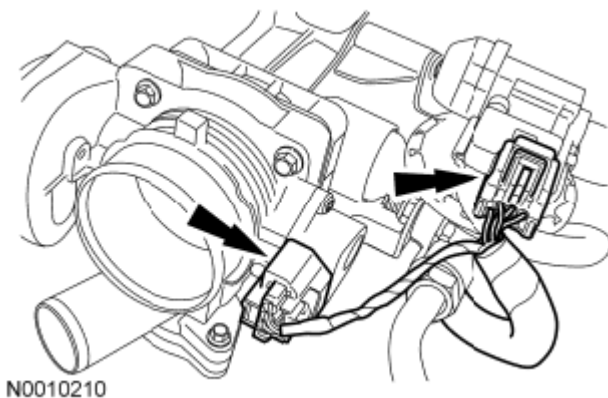
**Fig. 237: Locating B+ Terminal Nut And Wiring Retainer On Coolant Tube Bracket**  
Courtesy of FORD MOTOR CO.

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



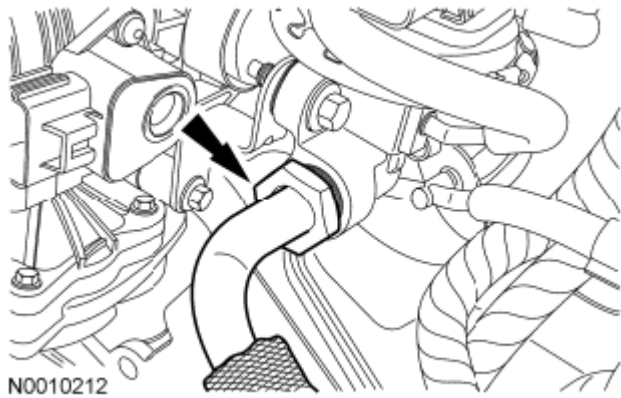
**Fig. 238: Locating Vacuum Tube With Fuel Rail Pressure And Temperature Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

8. Disconnect the EGR system module and Throttle Position (TP) sensor electrical connectors.



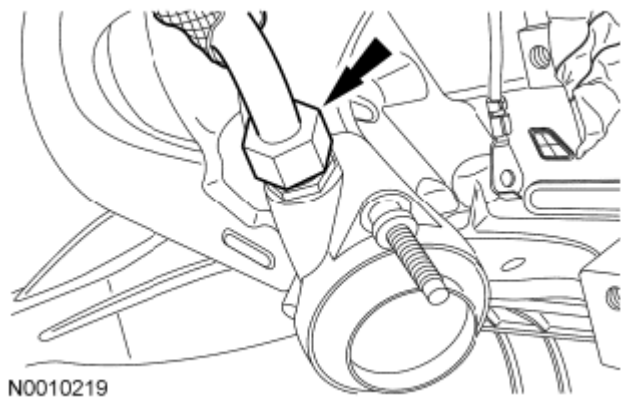
**Fig. 239: Locating EGR System Module And Throttle Position (TP) Sensor Electrical Connectors**  
Courtesy of FORD MOTOR CO.

9. Disconnect the EGR tube fitting from the EGR system module.



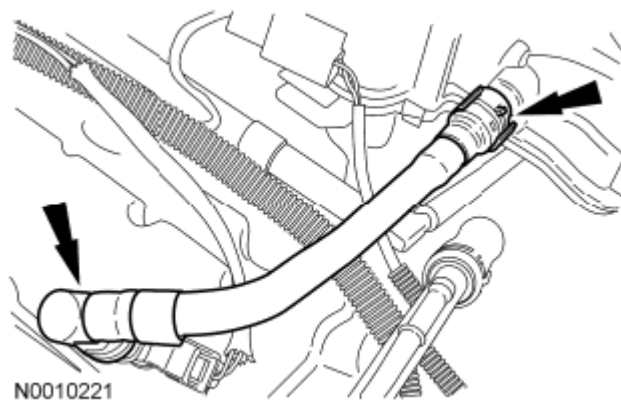
**Fig. 240: Locating EGR Tube Fitting On EGR System Module**  
Courtesy of FORD MOTOR CO.

10. Disconnect the EGR tube fitting from the LH exhaust manifold and remove the tube.



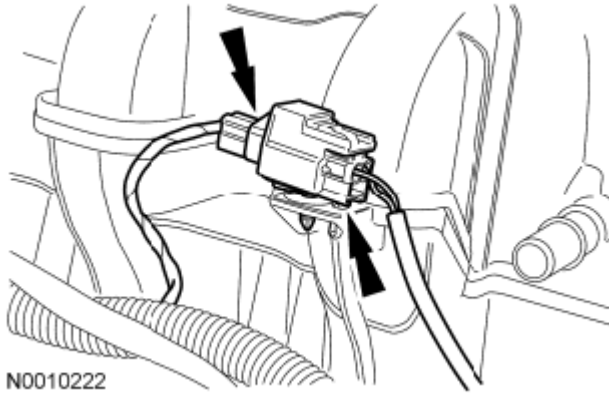
**Fig. 241: Locating Exhaust Gas Recirculation (EGR) Tube Fitting**  
Courtesy of FORD MOTOR CO.

11. Disconnect the PCV tube fittings and remove the tube.



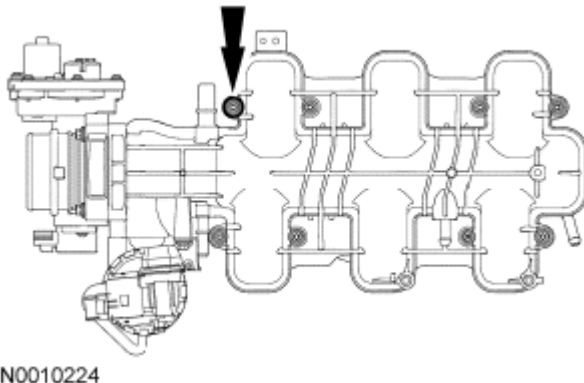
**Fig. 242: Locating Positive Crankcase Ventilation (PCV) Tube Fittings**  
Courtesy of FORD MOTOR CO.

12. Disconnect the Knock Sensor (KS) electrical connector and detach the wiring retainer.



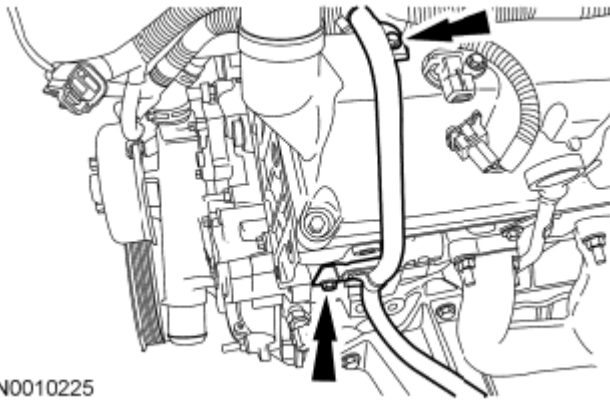
**Fig. 243: Locating Knock Sensor (KS) Electrical Connector**  
Courtesy of FORD MOTOR CO.

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



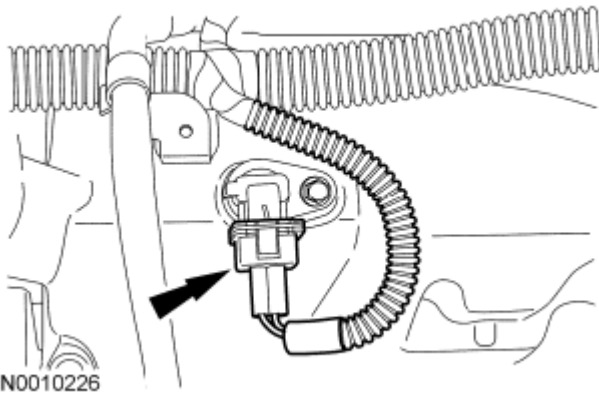
**Fig. 244: Locating Intake Manifold Bolt**  
Courtesy of FORD MOTOR CO.

13. Remove the 8 bolts and the intake manifold.
14. Remove the 2 fuel supply tube bracket bolts.



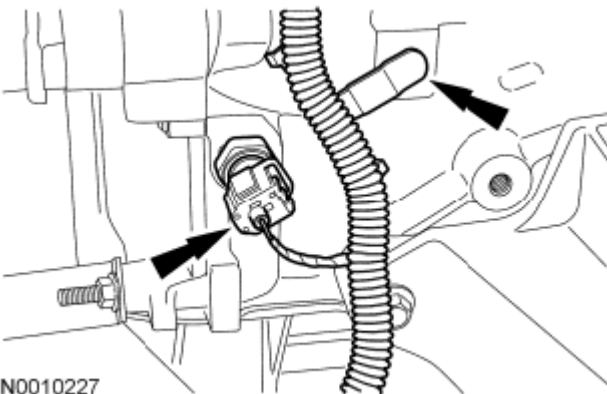
**Fig. 245: Locating Fuel Supply Tube Bracket Bolts**  
Courtesy of FORD MOTOR CO.

15. Disconnect the Camshaft Position (CMP) electrical connector.



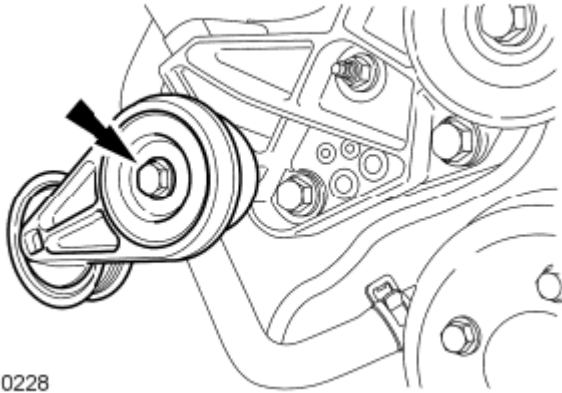
**Fig. 246: Locating Camshaft Position (CMP) Electrical Connector**  
Courtesy of FORD MOTOR CO.

16. Disconnect the Engine Oil Pressure (EOP) switch electrical connector and detach the wiring retainer.



**Fig. 247: Locating Engine Oil Pressure Switch Electrical Connector And Wiring Retainer**  
Courtesy of FORD MOTOR CO.

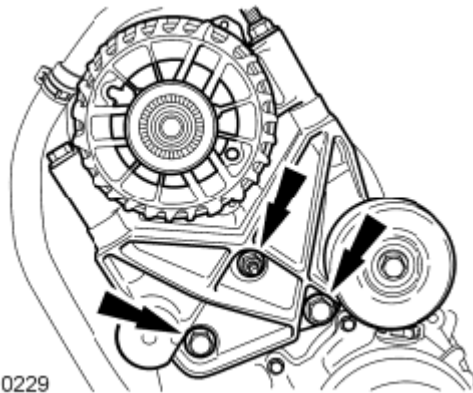
17. Remove the bolt and the accessory drive belt tensioner.



N0010228

**Fig. 248: Locating Accessory Drive Belt Tensioner Bolt**  
Courtesy of FORD MOTOR CO.

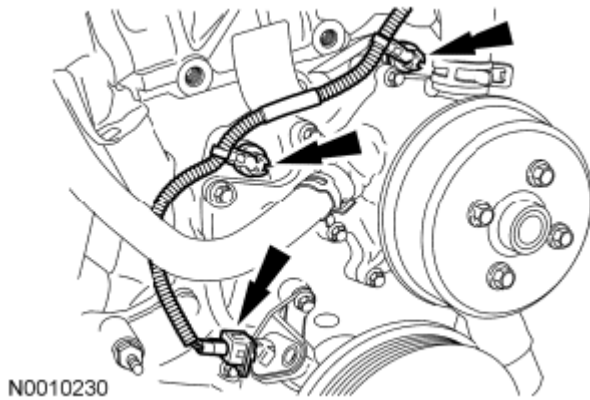
18. Remove the 2 bolts, the nut and the generator and bracket.



N0010229

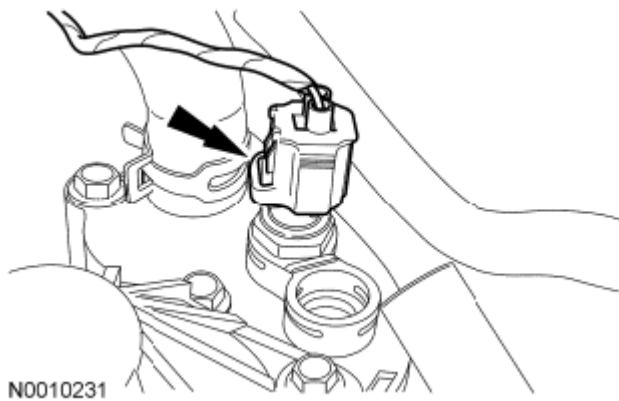
**Fig. 249: Locating Generator Bracket Bolts And Nut**  
Courtesy of FORD MOTOR CO.

19. Disconnect the Crankshaft Position (CKP) sensor electrical connector and detach the 2 wiring retainers.



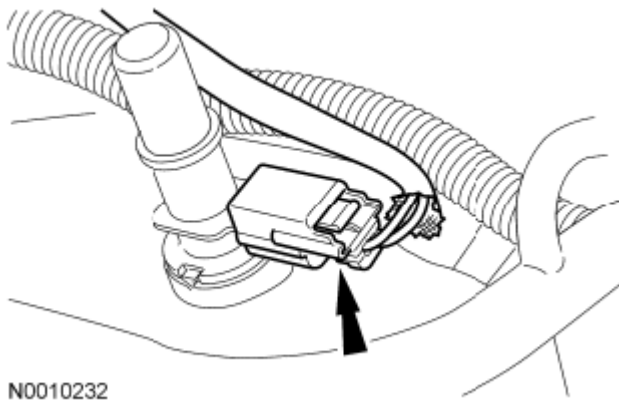
**Fig. 250: Locating Crankshaft Position (CKP) Sensor Electrical Connector And Wiring Retainers**  
Courtesy of FORD MOTOR CO.

20. Disconnect the Engine Coolant Temperature (ECT) sensor electrical connector.



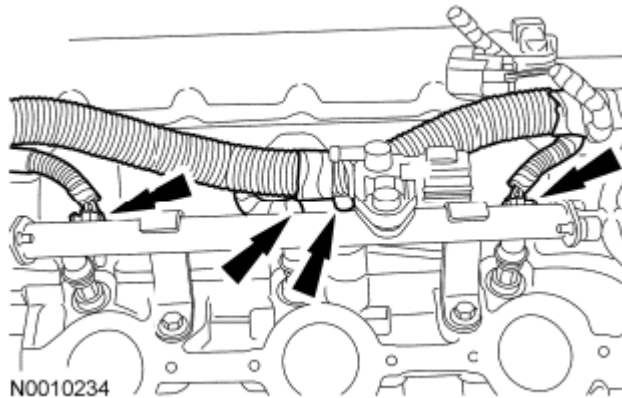
**Fig. 251: Locating Engine Coolant Temperature (ECT) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

21. Disconnect the PCV valve electrical connector.



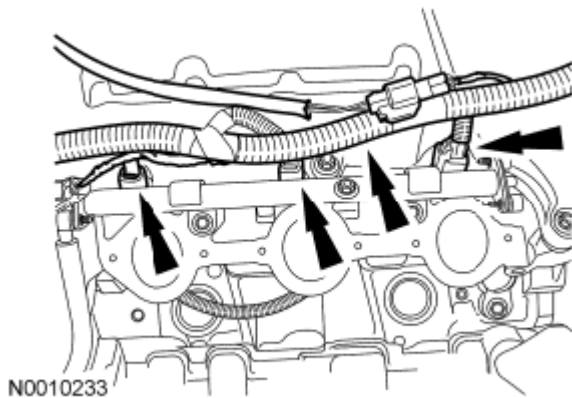
**Fig. 252: Locating PCV Valve Electrical Connector**  
Courtesy of FORD MOTOR CO.

22. Disconnect the 3 LH fuel injector electrical connectors and detach the wiring retainer from the valve cover stud bolt.



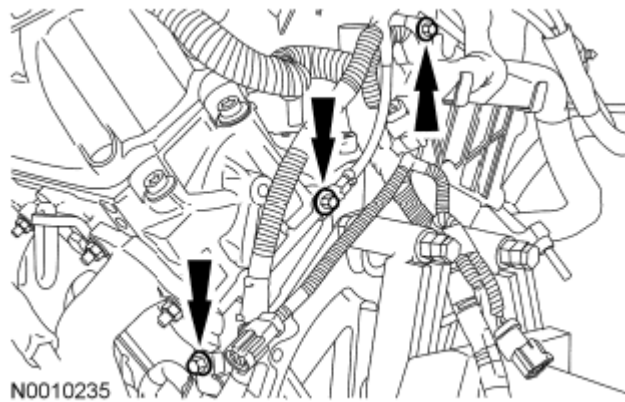
**Fig. 253: Locating Fuel Injector Electrical Connectors And Wiring Retainer (LH)**  
Courtesy of FORD MOTOR CO.

23. Disconnect the 3 RH fuel injector electrical connectors and detach the wiring retainer from the valve cover stud bolt.



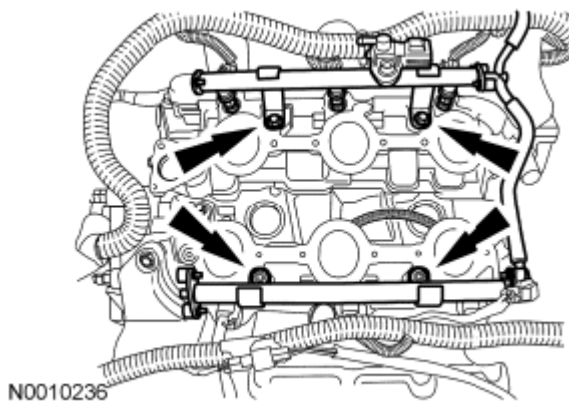
**Fig. 254: Locating Fuel Injector Electrical Connectors And Wiring Retainer (RH)**  
Courtesy of FORD MOTOR CO.

24. Remove the 3 bolts, detach the wiring retainers and remove the main engine wiring harness.



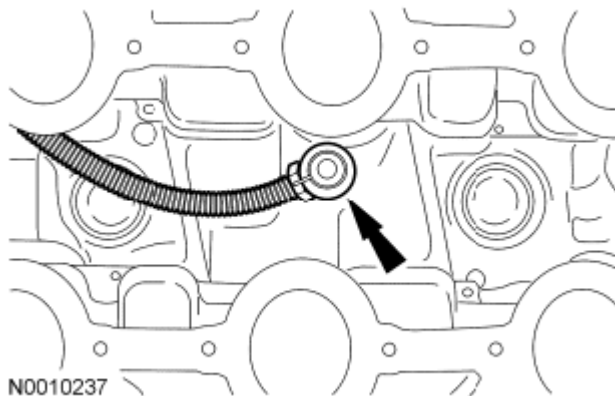
**Fig. 255: Locating Main Engine Wiring Harness Bolts**  
Courtesy of FORD MOTOR CO.

25. Remove the 4 bolts and then remove the fuel rail and injectors.



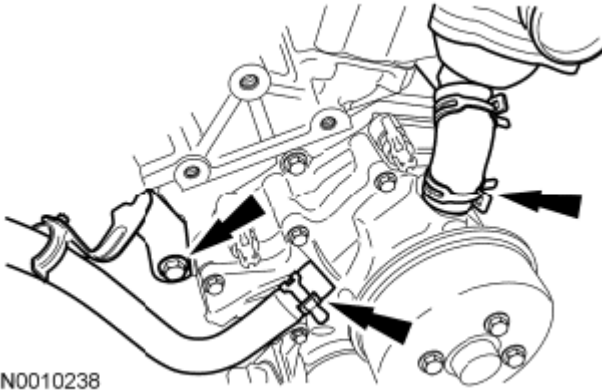
**Fig. 256: Locating Fuel Rail And Injector Bolts**  
Courtesy of FORD MOTOR CO.

26. Remove the bolt and the KS .



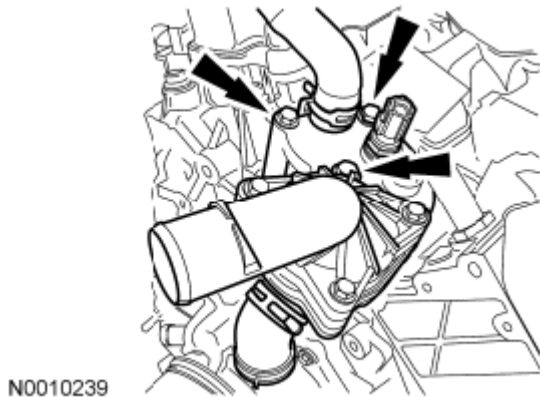
**Fig. 257: Locating Knock Sensor Bolt**  
Courtesy of FORD MOTOR CO.

27. Remove the bolt and then disconnect the coolant bypass hose and the heater hose from the coolant pump.



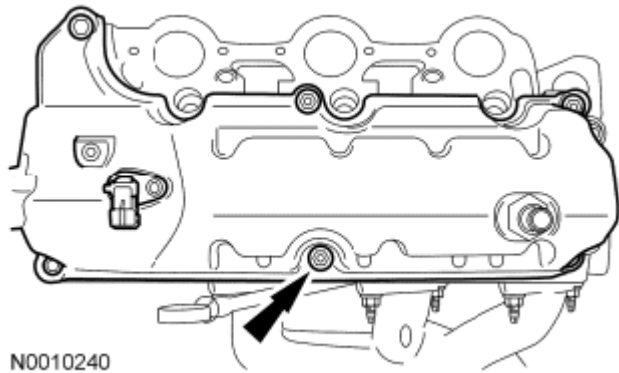
**Fig. 258: Locating Coolant Bypass Hose, Heater Hose With Mounting Bolt**  
Courtesy of FORD MOTOR CO.

28. Remove the 3 bolts and then remove the thermostat housing, hoses and coolant tube.



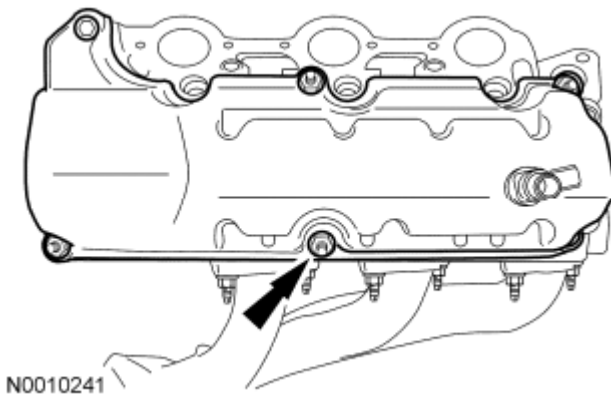
**Fig. 259: Locating Thermostat Housing Bolts**  
Courtesy of FORD MOTOR CO.

29. Remove the 3 bolts, 3 stud bolts and the LH valve cover.



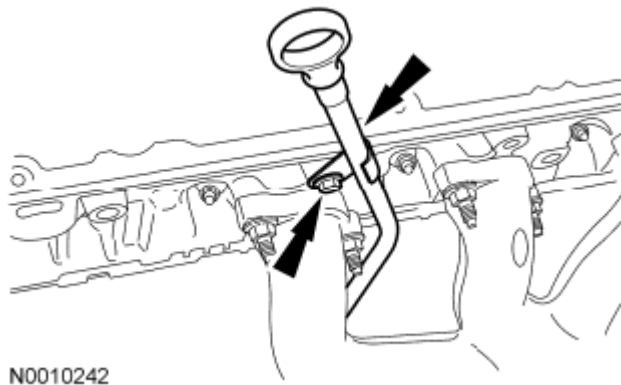
**Fig. 260: Locating Valve Cover Bolt (LH)**  
Courtesy of FORD MOTOR CO.

30. Remove the 2 bolts, 4 stud bolts and the RH valve cover.



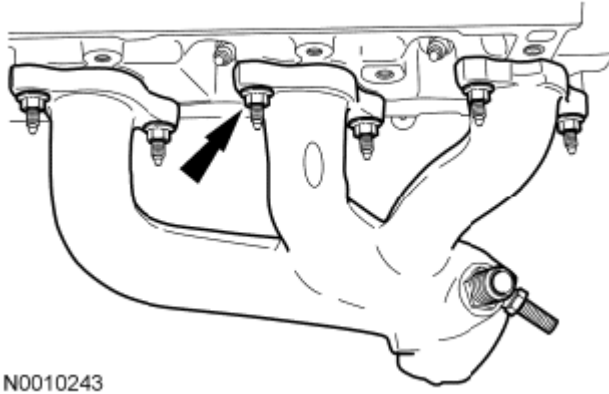
**Fig. 261: Locating Valve Cover Bolt (RH)**  
Courtesy of FORD MOTOR CO.

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



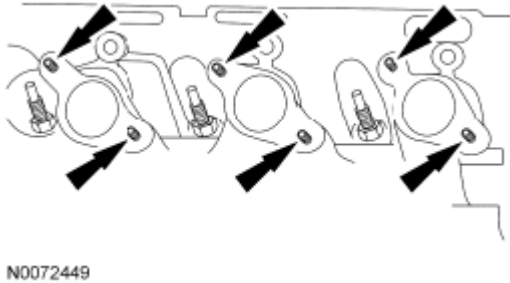
**Fig. 262: Locating Oil Level Indicator Tube And Bolt**  
 Courtesy of FORD MOTOR CO.

32. Remove the 6 nuts and the LH exhaust manifold and gasket.
  - Discard the nuts and the LH exhaust manifold gasket.



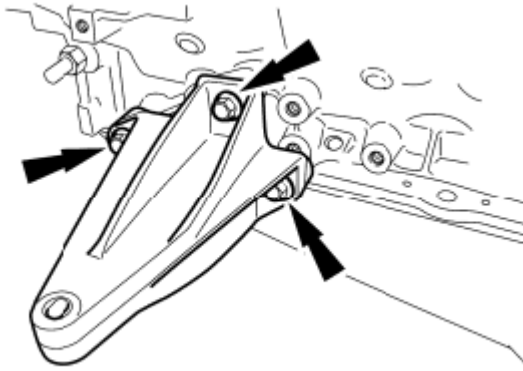
**Fig. 263: Locating Exhaust Manifold Nut**  
 Courtesy of FORD MOTOR CO.

33. Remove and discard the 6 LH exhaust manifold studs.



**Fig. 264: Locating Exhaust Manifold Studs (LH)**  
 Courtesy of FORD MOTOR CO.

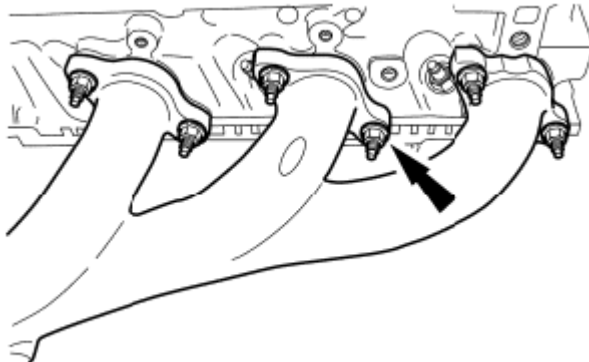
34. Remove the 3 bolts and the LH engine mount bracket.



N0010244

**Fig. 265: Locating Engine Mount Bracket Bolts (LH)**  
 Courtesy of FORD MOTOR CO.

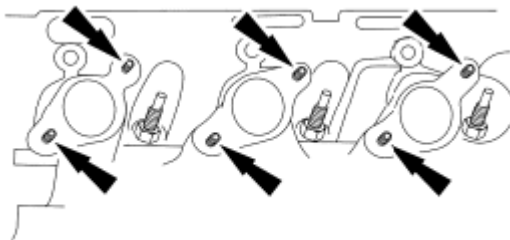
35. Remove the 6 nuts and the RH exhaust manifold and gasket.
  - Discard the nuts and the RH exhaust manifold gasket.



N0036739

**Fig. 266: Locating Exhaust Manifold Nut**  
 Courtesy of FORD MOTOR CO.

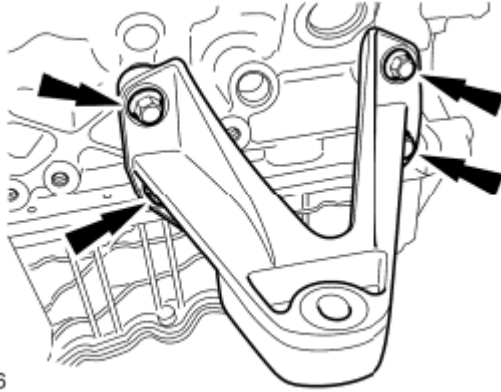
36. Remove and discard the 6 RH exhaust manifold studs.



N0072463

**Fig. 267: Locating RH Exhaust Manifold Studs**  
 Courtesy of FORD MOTOR CO.

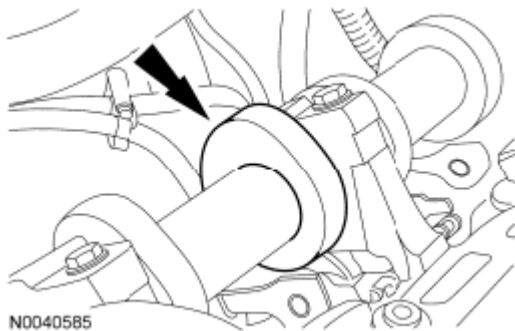
37. Clean and inspect the LH and RH exhaust manifolds. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
38. Remove the 4 bolts and the RH engine mount bracket.



N0010246

**Fig. 268: Locating Engine Mount Bracket Bolts (RH)**  
Courtesy of FORD MOTOR CO.

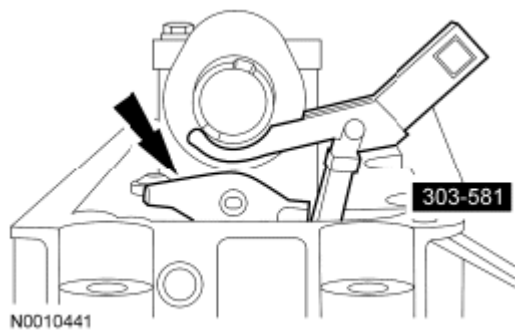
39. Rotate the crankshaft until the cam lobe of the cylinder being serviced is in the upward position.



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**Fig. 269: Locating Cam Lobe**  
Courtesy of FORD MOTOR CO.

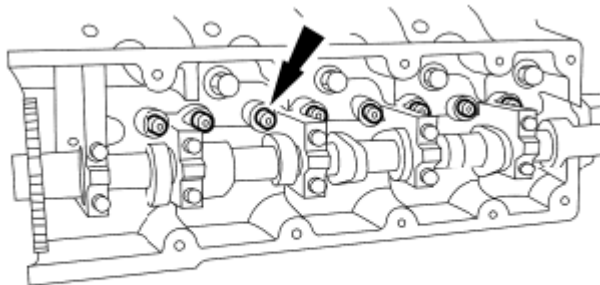
**NOTE:** Mark each camshaft roller follower to make sure it is installed in its original position during reassembly.



**Fig. 270: Removing Camshaft Roller Follower Using Valve Spring Compressor**  
Courtesy of FORD MOTOR CO.

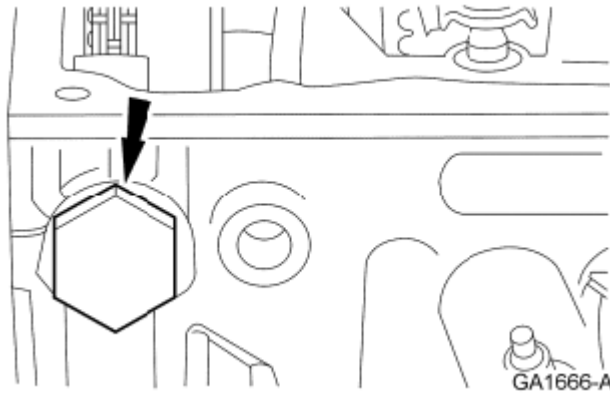
40. Using the Valve Spring Compressor, remove the camshaft roller followers.

**NOTE:** Mark each hydraulic lash adjuster to make sure it is installed in its original position.



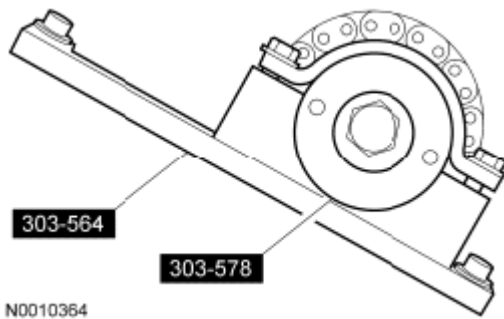
**Fig. 271: Locating Hydraulic Lash Adjuster Nut**  
Courtesy of FORD MOTOR CO.

41. Remove the hydraulic lash adjusters.
42. Remove the RH hydraulic chain tensioner.
  - Remove and discard the washer.



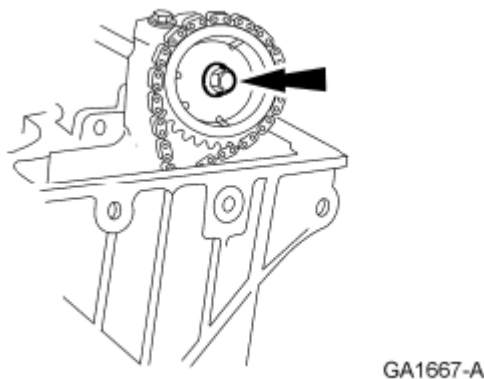
**Fig. 272: Locating RH Hydraulic Chain Tensioner**  
 Courtesy of FORD MOTOR CO.

43. Install the Camshaft Sprocket Holding Tool and Adapter on the RH cylinder head and tighten the top 2 clamp bolts to 10 Nm (89 lb-in).



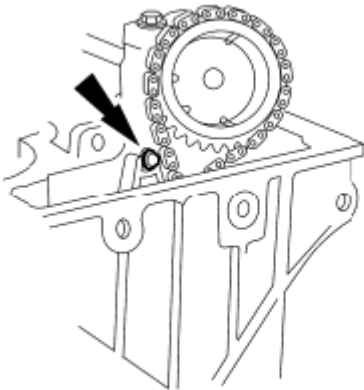
**Fig. 273: Identifying Camshaft Sprocket Holding Tool And Adapter**  
 Courtesy of FORD MOTOR CO.

**NOTE:** The RH camshaft sprocket bolt is a LH-threaded bolt.



**Fig. 274: Locating RH Camshaft Sprocket Bolt**  
 Courtesy of FORD MOTOR CO.

44. Remove the RH camshaft sprocket bolt.
45. Remove the RH cassette bolt.

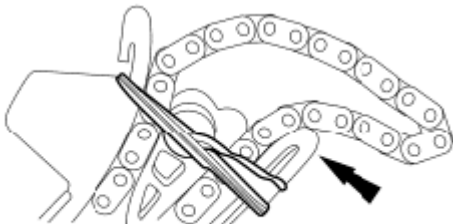


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**Fig. 275: Locating RH Cassette Bolt**  
 Courtesy of FORD MOTOR CO.

**NOTE:** Remove the camshaft sprocket from the timing chain to gain clearance to remove the cylinder head.

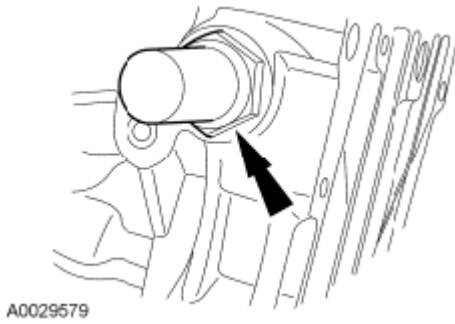
**NOTE:** Hold the timing chain and cassette with a rubber band to aid in removal and to prevent the timing chain from falling into the cylinder block.



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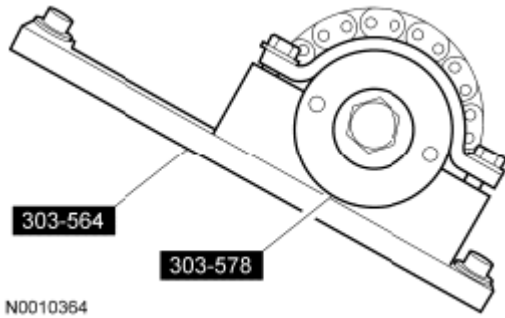
**Fig. 276: Identifying Rubber Band Around Cassette And Timing Chain**  
 Courtesy of FORD MOTOR CO.

46. Remove the RH camshaft sprocket from the timing chain. Install a rubber band around the cassette and the timing chain.
47. Remove the LH hydraulic chain tensioner.
  - Remove and discard the washer.



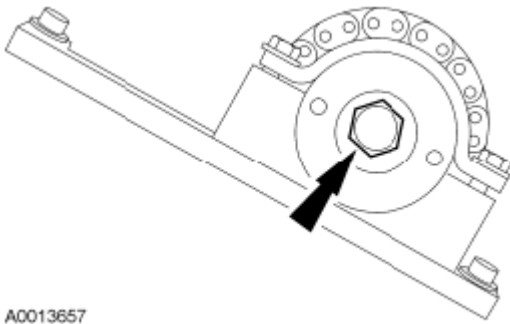
**Fig. 277: Locating LH Hydraulic Chain Tensioner**  
Courtesy of FORD MOTOR CO.

- 48. Install the Camshaft Sprocket Holding Tool and Adapter on the LH cylinder head and tighten the top 2 clamp bolts to 10 Nm (89 lb-in).



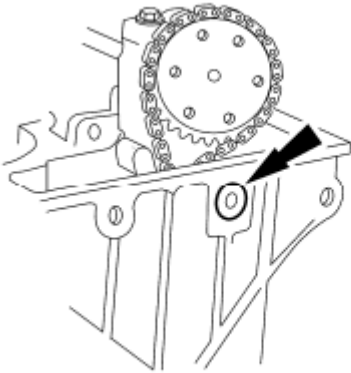
**Fig. 278: Identifying Camshaft Sprocket Holding Tool And Adapter**  
Courtesy of FORD MOTOR CO.

- 49. Remove the LH camshaft sprocket bolt.



**Fig. 279: Locating LH Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

- 50. Remove the LH cassette bolt.

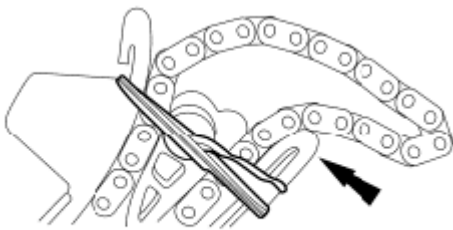


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**Fig. 280: Locating LH Cassette Upper Bolt**  
 Courtesy of FORD MOTOR CO.

**NOTE:** Remove the camshaft sprocket from the timing chain to gain clearance to remove the cylinder head.

**NOTE:** Hold the timing chain and cassette with a rubber band to aid in removal and to prevent the timing chain from falling into the cylinder block.



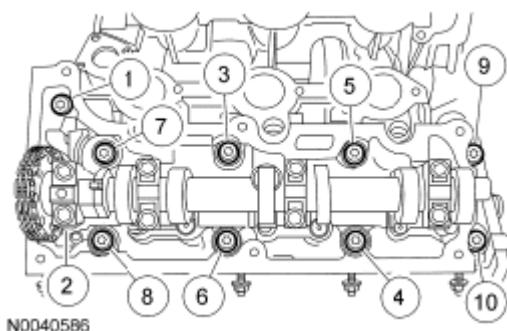
N0014449

**Fig. 281: Identifying Rubber Band Around Cassette And Timing Chain**  
 Courtesy of FORD MOTOR CO.

51. Remove the LH camshaft sprocket from the timing chain. Install a rubber band around the cassette and the timing chain.

**NOTE:** New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

52. Remove the bolts in the sequence shown in illustration and remove the cylinder heads.
  - Discard the gaskets and the bolts.



**Fig. 282: Identifying Cylinder Head Bolts Removing Sequence**  
Courtesy of FORD MOTOR CO.

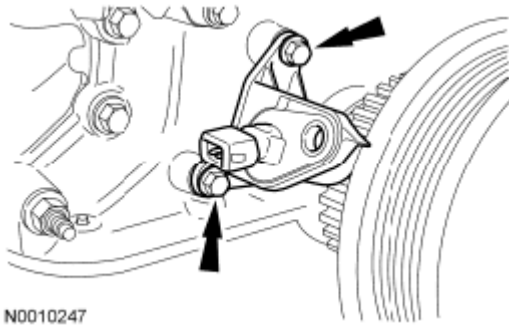
**NOTE:** Make sure all coolant residue and foreign material are cleaned from the block surface and cylinder bore. Failure to follow these instructions may result in engine damage.

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

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

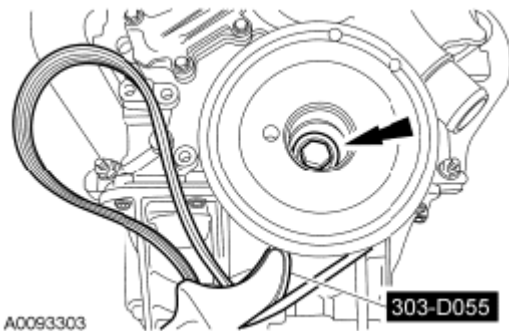
**NOTE:** If there is no residual gasket material present, metal surface prep can be used to clean and prepare the surfaces.

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



**Fig. 283: Locating Crankshaft Position (CKP) Sensor Bolts**  
 Courtesy of FORD MOTOR CO.

56. Using the Strap Wrench, hold the crankshaft pulley, remove the bolt and washer.

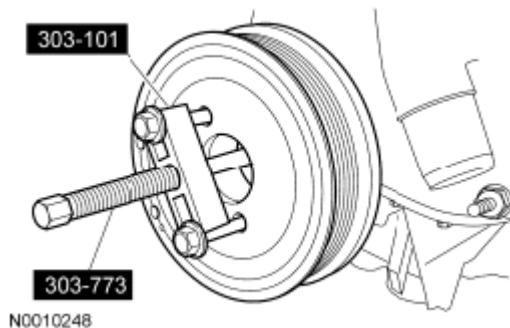


**Fig. 284: Holding Crankshaft Pulley Using Strap Wrench**  
 Courtesy of FORD MOTOR CO.

**NOTE:** If the pulley bolt is not installed, the Crankshaft Vibration Damper Removers will bottom out before the pulley is off.

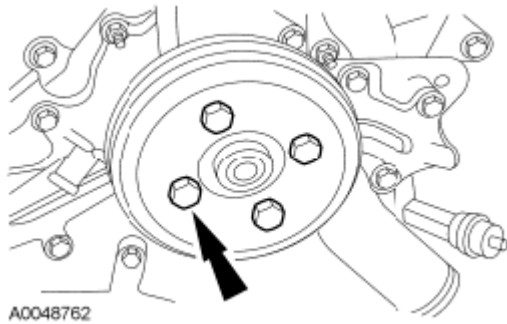
57. Install the crankshaft pulley bolt 2 to 3 turns. Using the Crankshaft Vibration Damper Removers and the two 8-mm bolts, remove the crankshaft pulley.

- Discard the crankshaft pulley bolt.



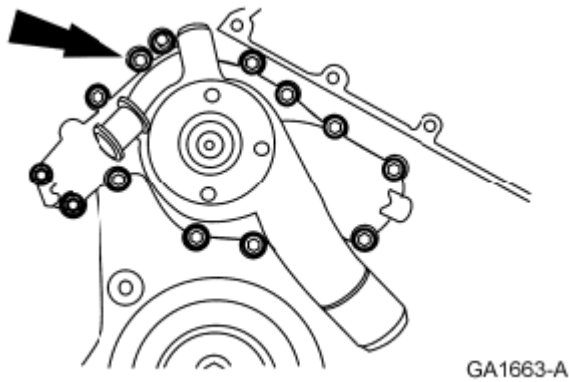
**Fig. 285: Removing Crankshaft Pulley**  
 Courtesy of FORD MOTOR CO.

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



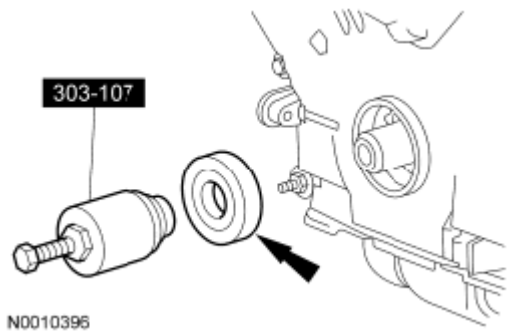
**Fig. 286: Locating Coolant Pump Pulley Bolt**  
Courtesy of FORD MOTOR CO.

59. Remove the 13 bolts and the coolant pump.



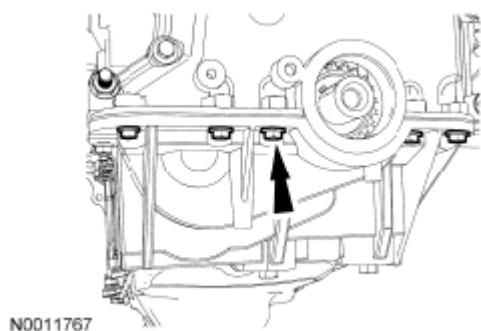
**Fig. 287: Locating Coolant Pump Bolts**  
Courtesy of FORD MOTOR CO.

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



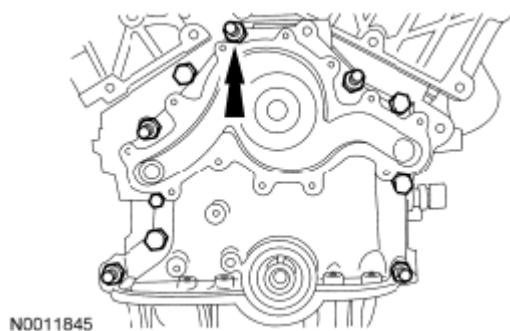
**Fig. 288: Locating Crankshaft Front Oil Seal And Crankshaft Front Oil Seal Remover**  
Courtesy of FORD MOTOR CO.

61. Remove the 5 cylinder block cradle-to-engine front cover bolts.



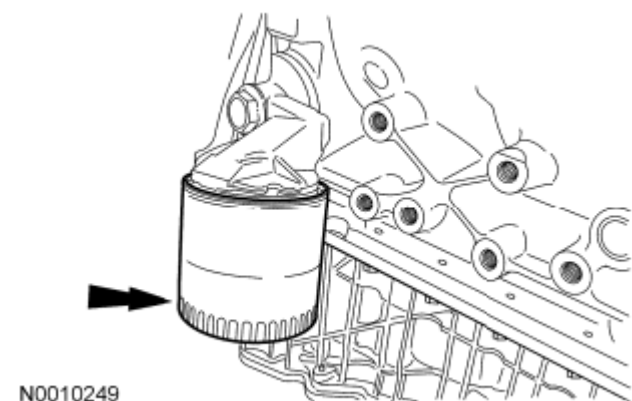
**Fig. 289: Locating Cylinder Block Cradle-To-Engine Front Cover Bolt**  
Courtesy of FORD MOTOR CO.

62. Remove the 5 bolts, 5 stud bolts and the engine front cover.



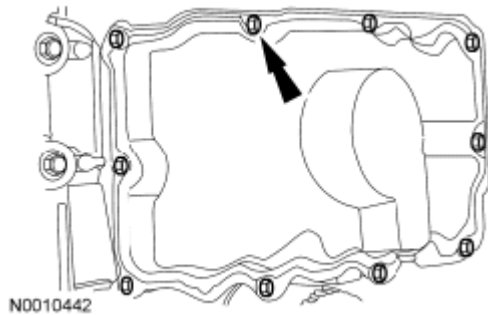
**Fig. 290: Locating Engine Front Cover Bolts**  
Courtesy of FORD MOTOR CO.

63. Remove and discard the engine oil filter.



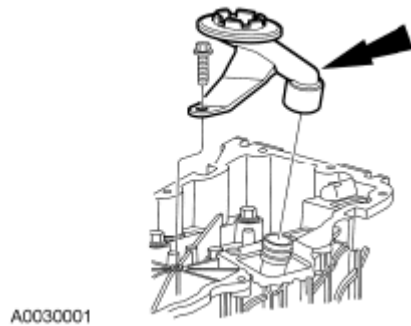
**Fig. 291: Locating Engine Oil Filter**  
Courtesy of FORD MOTOR CO.

64. Remove the bolts and the oil pan.



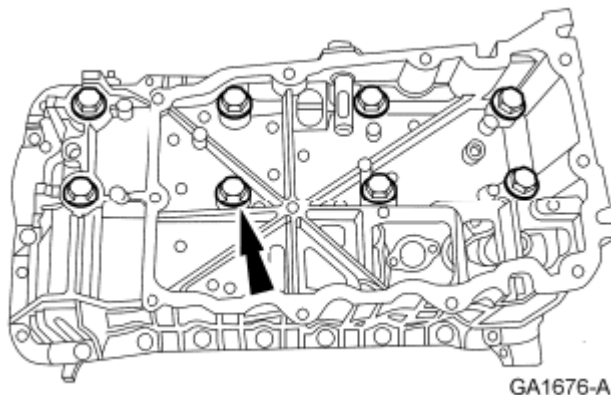
**Fig. 292: Locating Oil Pan Bolt**  
Courtesy of FORD MOTOR CO.

65. Remove the bolt and the oil pump screen cover and tube.



**Fig. 293: Locating Oil Pump Screen Cover And Tube**  
Courtesy of FORD MOTOR CO.

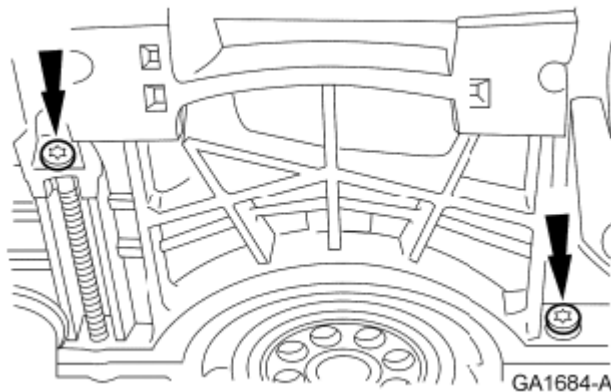
**NOTE:** Note the location of the 2 silver-colored bolts with the washer seals. These bolts must be installed in the same position from which they were removed with new washer seals.



**Fig. 294: Locating Cylinder Block Cradle Inner Bolt**

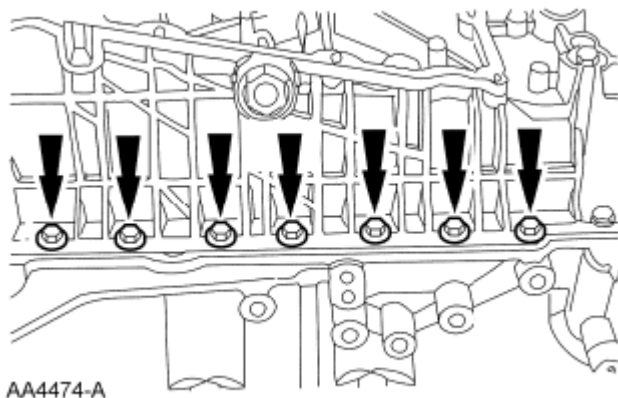
Courtesy of FORD MOTOR CO.

66. Remove the 8 cylinder block cradle inner bolts. Remove and discard the 2 washer seals.
67. Remove the 2 cylinder block cradle Torx bolts.



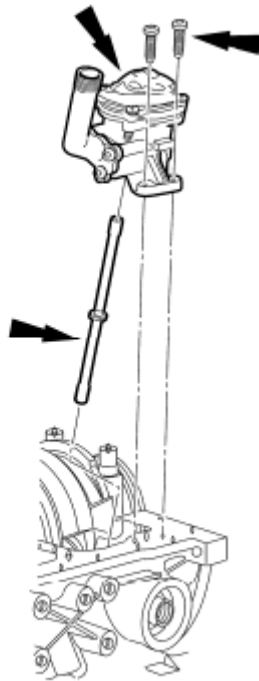
**Fig. 295: Locating Cylinder Block Cradle Torx Bolts**  
Courtesy of FORD MOTOR CO.

68. Remove the 15 bolts and the 2 nuts.
  - Remove the cylinder block cradle.



**Fig. 296: Locating Cylinder Block Cradle Bolts And Nuts**  
Courtesy of FORD MOTOR CO.

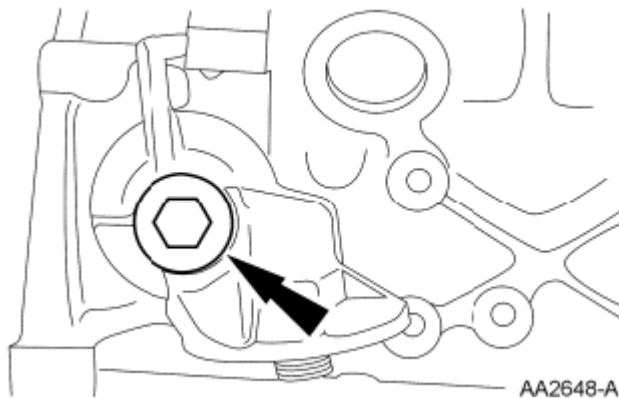
69. Remove the 2 bolts, the oil pump pickup tube and the oil pump intermediate shaft.



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**Fig. 297: Locating Oil Pump Intermediate Shaft, Oil Pump Pickup Tube With Bolts**  
Courtesy of FORD MOTOR CO.

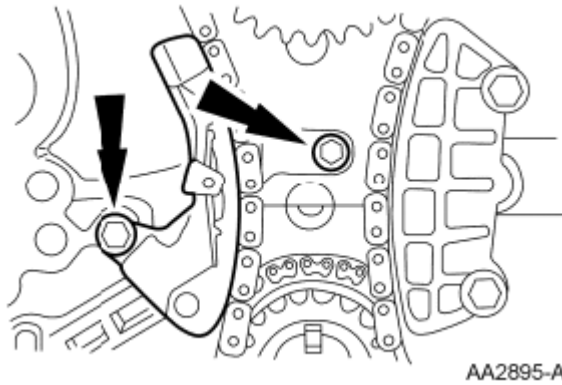
70. Remove the oil filter adapter.



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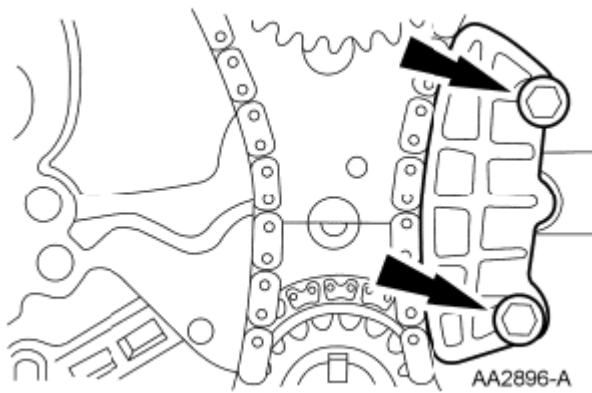
**Fig. 298: Locating Oil Filter Adapter**  
Courtesy of FORD MOTOR CO.

71. Remove the 2 bolts and the jack shaft chain tensioner.



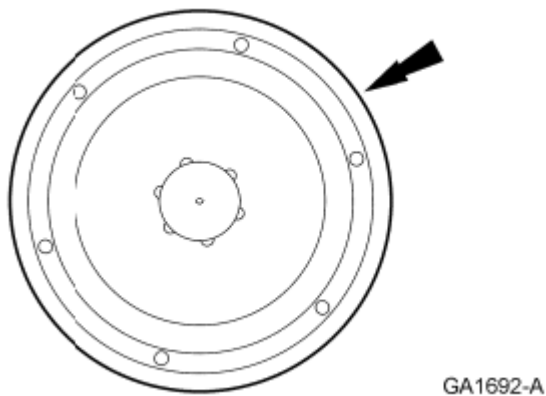
**Fig. 299: Locating Jackshaft Chain Tensioner Bolts**  
Courtesy of FORD MOTOR CO.

72. Remove the 2 bolts and the jack shaft chain guide.



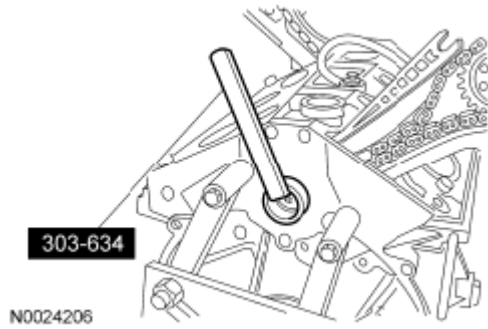
**Fig. 300: Locating Jackshaft Chain Guide Bolts**  
Courtesy of FORD MOTOR CO.

73. Remove the jack shaft rear plug.



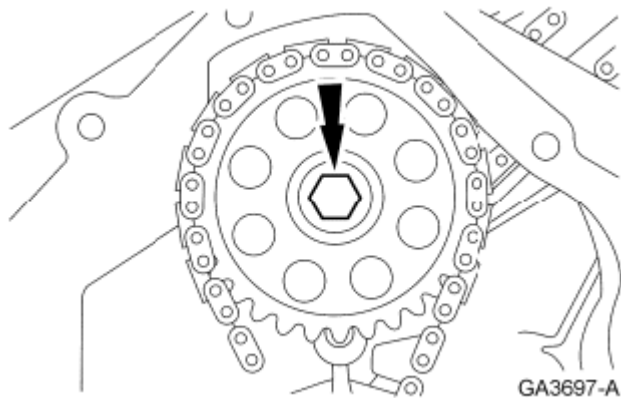
**Fig. 301: Locating Jackshaft Rear Plug**  
Courtesy of FORD MOTOR CO.

74. Install the Rear Jack Shaft Socket on the rear of the jack shaft.



**Fig. 302: Identifying Rear Jack Shaft Socket On Rear Of Jackshaft**  
Courtesy of FORD MOTOR CO.

75. Using the Rear Jack Shaft Socket to hold the jack shaft, loosen the jack shaft sprocket bolt.



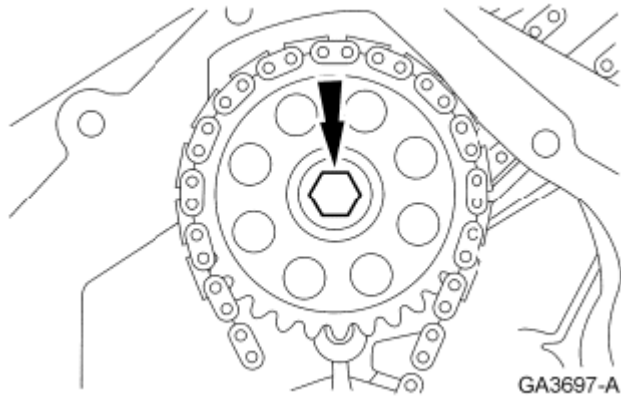
**Fig. 303: Locating Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

76. Using the Rear Jack Shaft Socket to hold the jack shaft, loosen the rear jack shaft sprocket bolt.



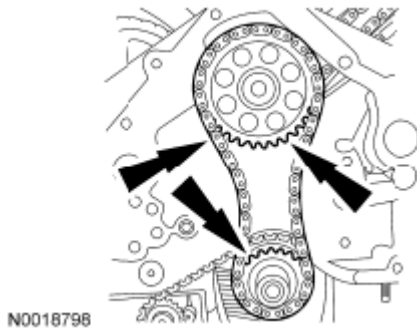
**Fig. 304: Holding Jackshaft Using Rear Jack Shaft Socket**  
 Courtesy of FORD MOTOR CO.

**NOTE:** It may be necessary to hold the oil pump intermediate shaft, using an E-12 external Torx socket, in order to remove the bolt if the bolt does not turn out easily at this time.



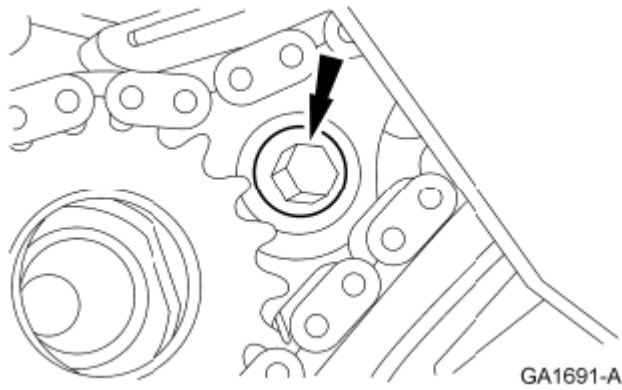
**Fig. 305: Locating Jackshaft Sprocket Bolt**  
 Courtesy of FORD MOTOR CO.

77. Remove the jack shaft sprocket bolt.
78. Remove the jack shaft and crankshaft sprockets and the chain.
  - Remove the crankshaft key.



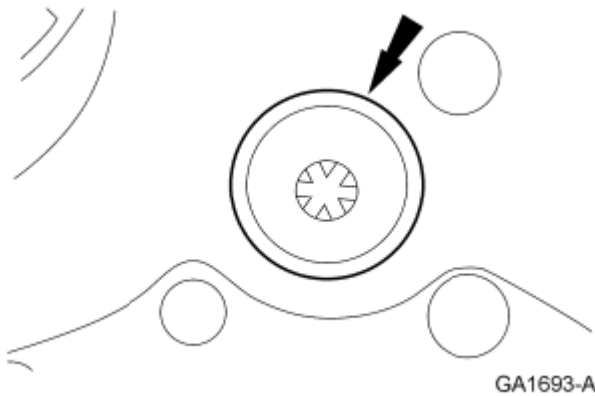
**Fig. 306: Locating Jackshaft, Crankshaft Sprockets And Chain**  
 Courtesy of FORD MOTOR CO.

79. Remove the bolt and the LH camshaft drive cassette.



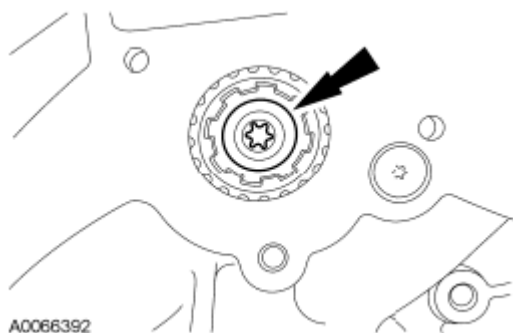
**Fig. 307: Locating LH Cassette Lower Bolt**  
Courtesy of FORD MOTOR CO.

80. Remove the RH camshaft drive cassette bolt and spacer.



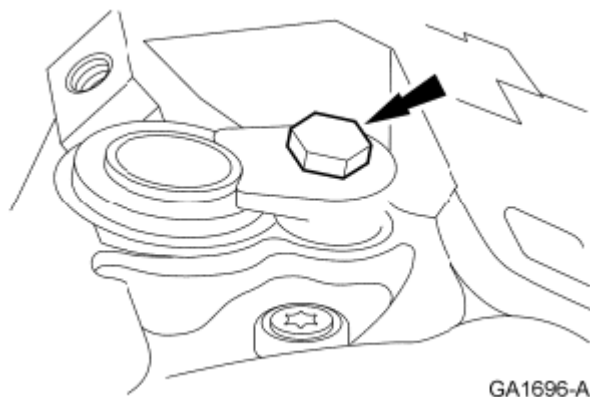
**Fig. 308: Locating RH Camshaft Drive Cassette Bolt**  
Courtesy of FORD MOTOR CO.

**NOTE:** It may be necessary to hold the oil pump intermediate shaft, using an E-12 external Torx socket, in order to remove the bolt if the bolt does not turn out easily at this time.



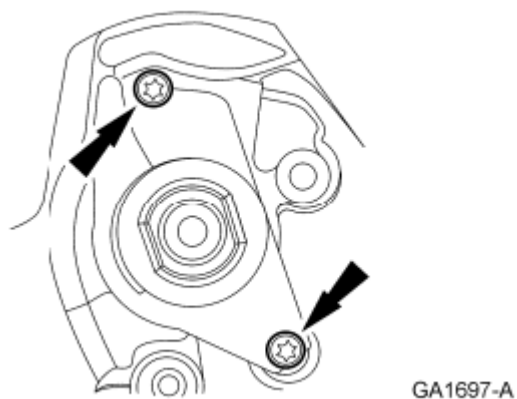
**Fig. 309: Locating Rear Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

81. Remove the rear jack shaft sprocket bolt and remove the RH camshaft drive cassette.
82. Remove the bolt, the hold down and the oil pump drive.



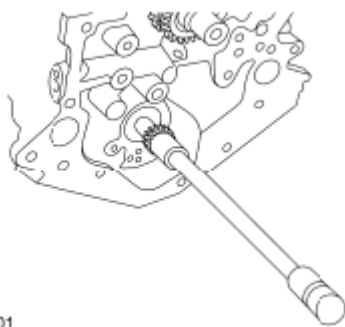
**Fig. 310: Locating Oil Pump Drive Bolt**  
Courtesy of FORD MOTOR CO.

83. Remove the 2 bolts and the jack shaft thrust plate.



**Fig. 311: Locating Jackshaft Thrust Plate Bolts**  
Courtesy of FORD MOTOR CO.

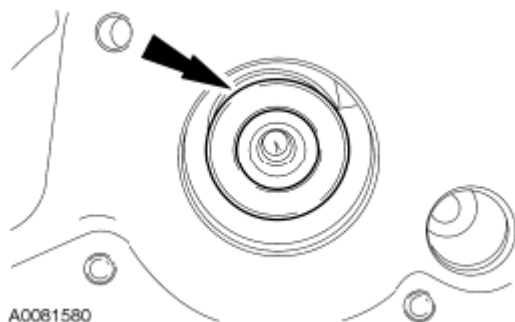
84. Remove the jack shaft.



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**Fig. 312: Removing/Installing Jackshaft**  
Courtesy of FORD MOTOR CO.

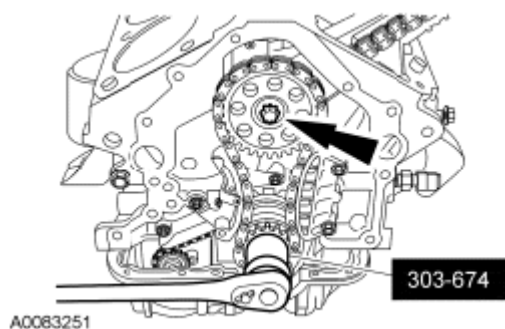
85. Remove the jack shaft spacer.



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**Fig. 313: Locating Jackshaft Spacer**  
Courtesy of FORD MOTOR CO.

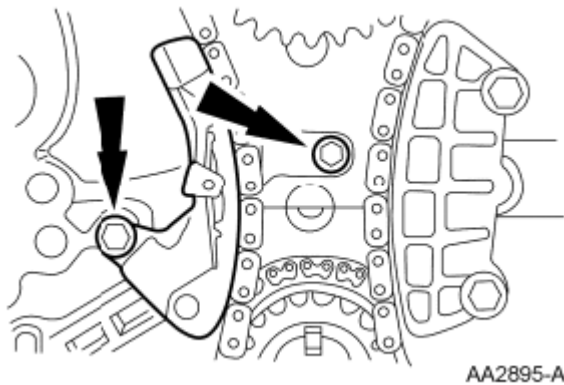
86. Using the Crankshaft Holding Tool, loosen the front sprocket retaining bolt.



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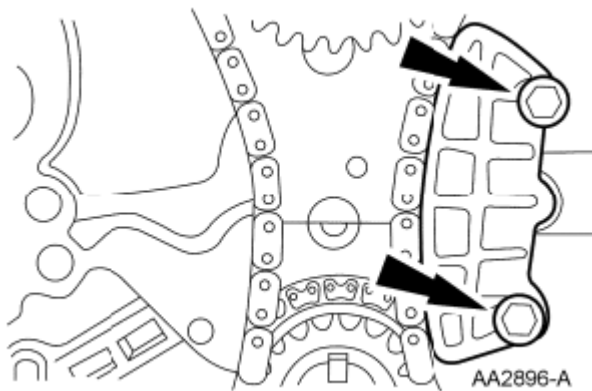
**Fig. 314: Loosening Front Sprocket Retaining Bolt Using Crankshaft Holding Tool**  
Courtesy of FORD MOTOR CO.

87. Remove the bolts and the chain tensioner.



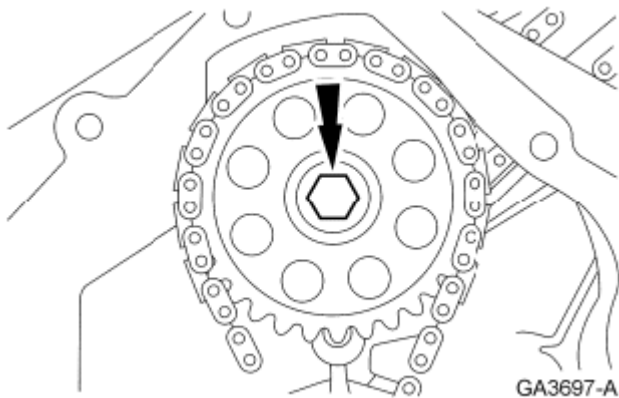
**Fig. 315: Locating Chain Tensioner Bolts**  
Courtesy of FORD MOTOR CO.

88. Remove the chain guide.



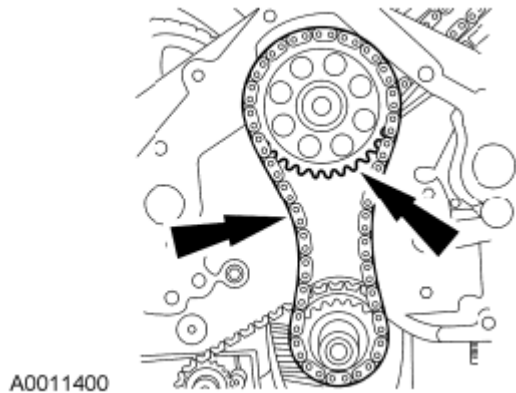
**Fig. 316: Locating Chain Guide Bolts**  
Courtesy of FORD MOTOR CO.

89. Remove the bolt.



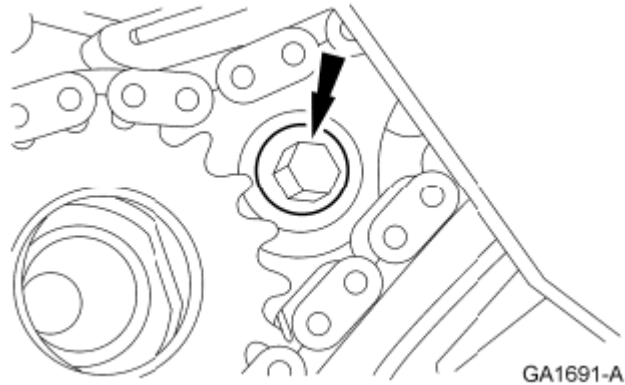
**Fig. 317: Locating Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

90. Remove the jack shaft sprocket and chain.



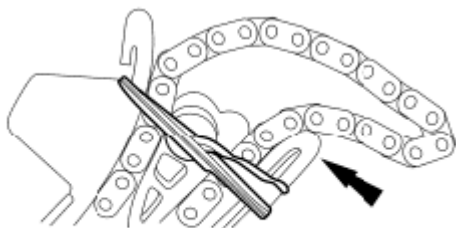
**Fig. 318: Locating Chain And Jackshaft Sprocket**  
Courtesy of FORD MOTOR CO.

91. Remove the LH cassette bolt.



**Fig. 319: Locating LH Cassette Lower Bolt**  
Courtesy of FORD MOTOR CO.

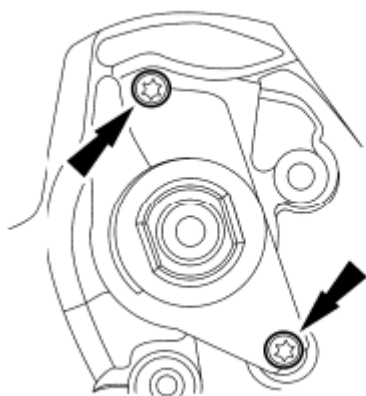
92. Remove the LH cassette.



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**Fig. 320: Identifying Rubber Band Around Cassette And Timing Chain**  
Courtesy of FORD MOTOR CO.

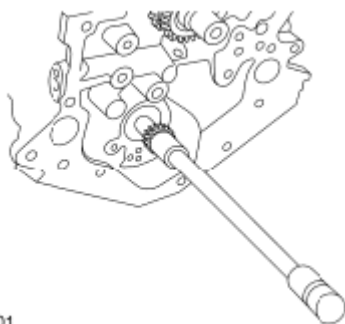
93. Remove the jack shaft thrust plate.



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**Fig. 321: Locating Jackshaft Thrust Plate Bolts**  
Courtesy of FORD MOTOR CO.

94. Remove the jack shaft.



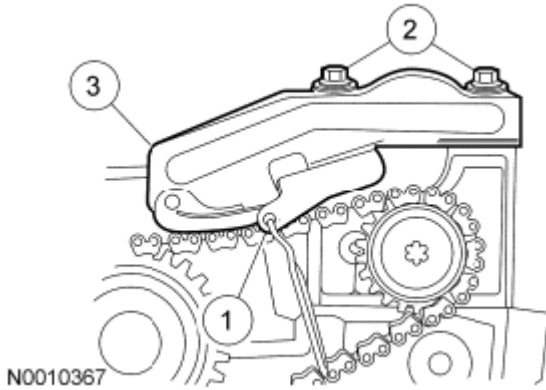
A0011401

**Fig. 322: Removing/Installing Jackshaft**  
Courtesy of FORD MOTOR CO.

**Vehicles equipped with a balance shaft**

95. Remove the balance shaft tensioner.

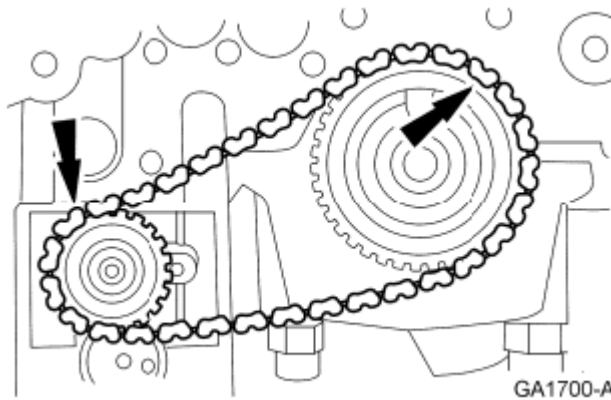
1. Install a pin in the balance shaft tensioner.
2. Remove the 2 bolts.
3. Remove the balance shaft tensioner.



**Fig. 323: Removing Balance Shaft Tensioner**  
 Courtesy of FORD MOTOR CO.

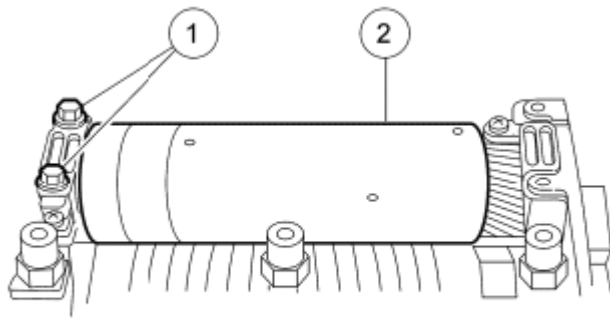
96. Remove the 2 bolts and the balance shaft chain guide.

**NOTE: DO NOT remove the balance shaft sprocket bolt.**



**Fig. 324: Locating Balance Shaft Chain And Crankshaft Sprocket**  
 Courtesy of FORD MOTOR CO.

97. Remove the balance shaft chain and crankshaft sprocket.
98. Remove the balance shaft.
  1. Remove the 2 bolts.
  2. Remove the balance shaft.



N0010365

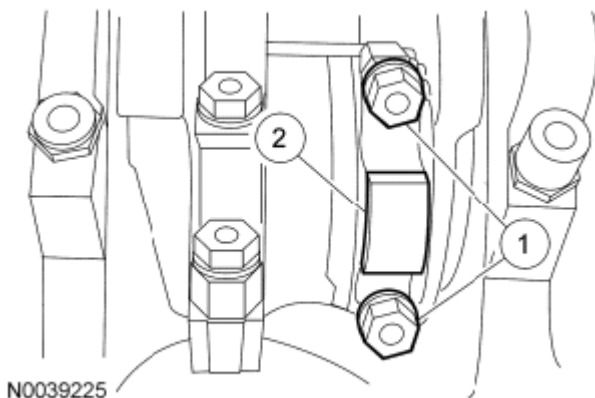
**Fig. 325: Identifying Balance Shaft With Mounting Bolts**  
 Courtesy of FORD MOTOR CO.

### All vehicles

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

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

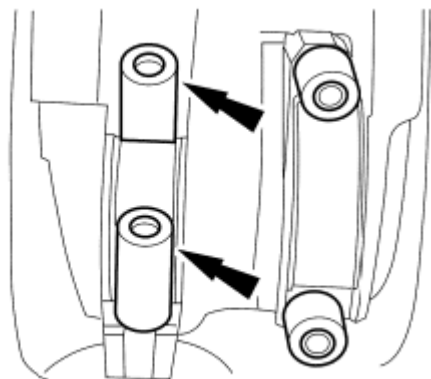
100. Remove the connecting rod caps.
1. Remove the connecting rod nuts.
  2. Remove the connecting rod caps.



N0039225

**Fig. 326: Identifying Connecting Rod Nuts And Caps**  
 Courtesy of FORD MOTOR CO.

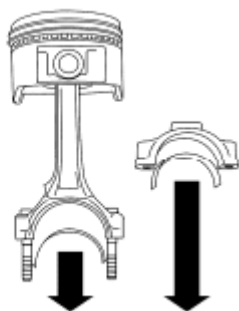
101. Install rubber hose pieces on the bolts to protect the crankshaft and remove the pistons.



GA1703-A

**Fig. 327: Locating Rubber Hose Pieces On Crankshaft Bolts**  
Courtesy of FORD MOTOR CO.

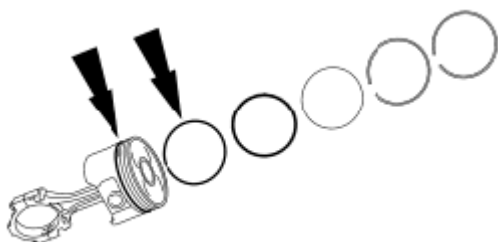
102. Remove the connecting rod bearings.



A0066387

**Fig. 328: Removing Connecting Rod Bearings**  
Courtesy of FORD MOTOR CO.

103. Remove the piston rings.



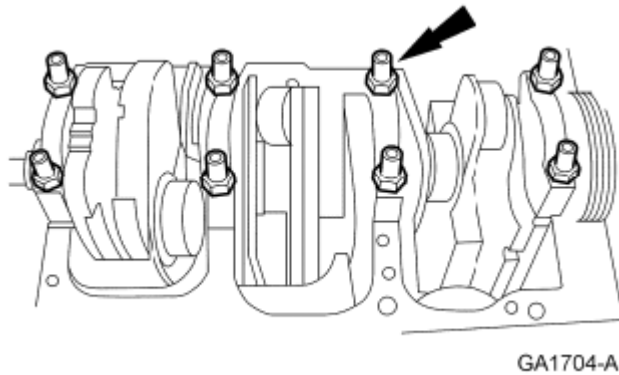
A0066863

**Fig. 329: Locating Piston Rings**  
Courtesy of FORD MOTOR CO.

104. Clean and inspect the pistons. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

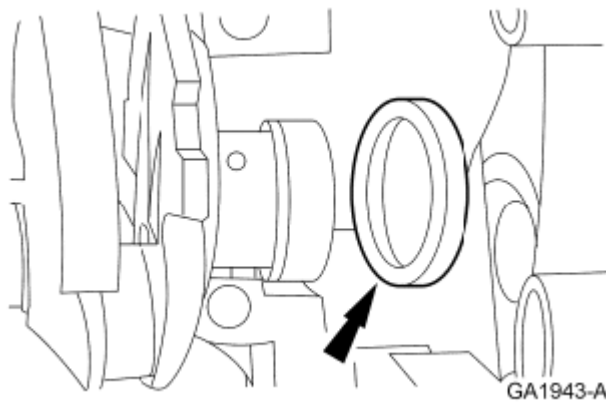
**NOTE:** Remove the cylinder heads before removing the crankshaft. Failure to do so can result in engine damage.

**NOTE:** Number (or mark) the crankshaft bearing caps before removing them.



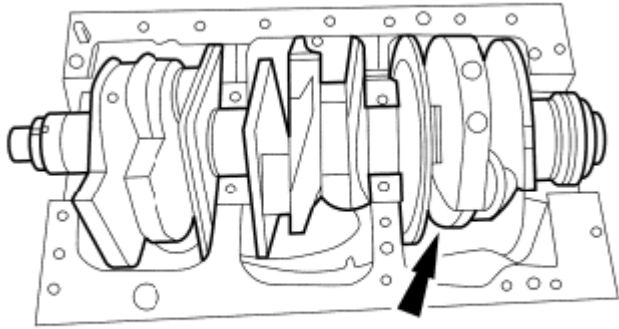
**Fig. 330: Locating Crankshaft Main Bearing Cap Bolts**  
Courtesy of FORD MOTOR CO.

105. Remove the bolts and the crankshaft main bearing caps.
106. Remove the crankshaft rear oil seal from the crankshaft.



**Fig. 331: Locating Crankshaft Rear Oil Seal**  
Courtesy of FORD MOTOR CO.

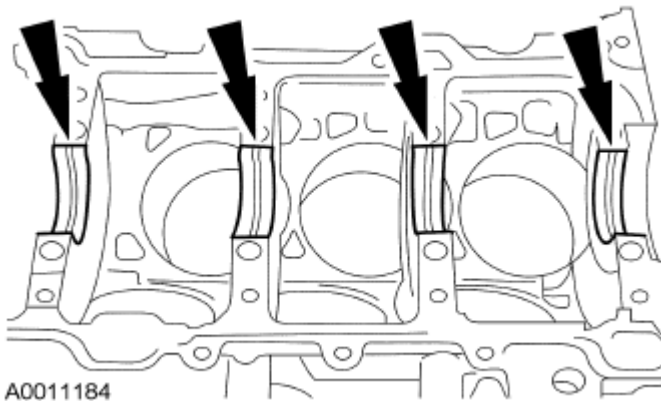
107. Remove the crankshaft.



GA1705-A

**Fig. 332: Locating Crankshaft**  
Courtesy of FORD MOTOR CO.

108. Remove the crankshaft main bearings and the thrust bearing.



A0011184

**Fig. 333: Locating Crankshaft Main Bearings And Thrust Bearing**  
Courtesy of FORD MOTOR CO.

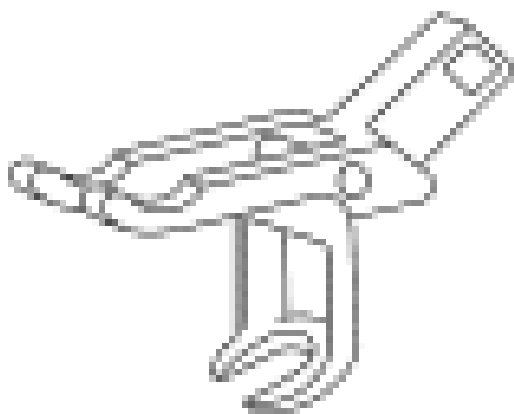
## DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

### CYLINDER HEAD

Special Tool(s)

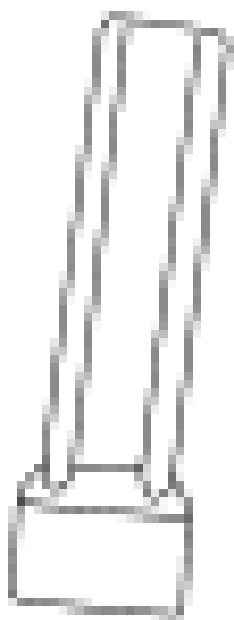
### SPECIAL TOOLS DESCRIPTION CHART

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ST1330-A

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



ST1824-A

Installer, Valve Stem Oil Seal  
303-370 (T90T-6571-A)

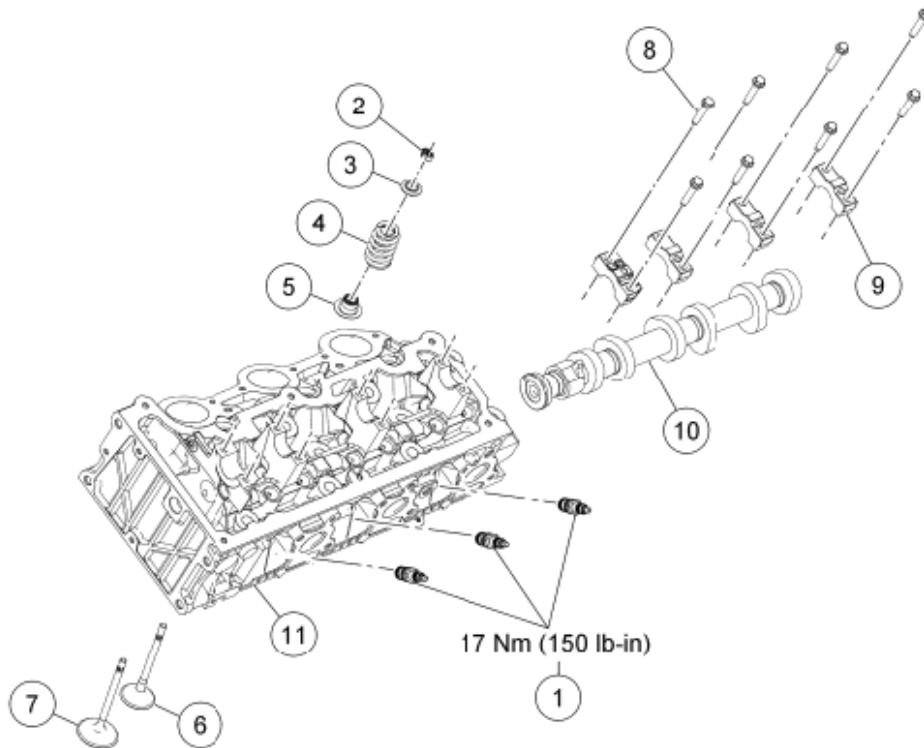
**Material**

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

### MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A



N0088951

**Fig. 334: Exploded View Of Cylinder Head With Torque Specifications**  
 Courtesy of FORD MOTOR CO.

### ITEM DESCRIPTION

Item	Part Number	Description
1	12405	Spark plugs
2	6518	Valve spring retainer key (12 required)
3	6A536	Valve spring retainer (6 required)
4	6513	Valve spring (6 required)
5	6571	Valve seal (6 required)
6	6505	Exhaust valve (3 required)
7	6507	Intake valve (3 required)
8	W702341	Camshaft bearing cap mounting bolt (8 required)
9	6A528	Camshaft bearing cap (4 required)
10	6A258	LH camshaft

11

6050

LH cylinder head

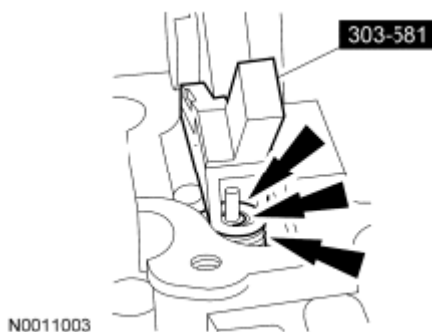
**Disassembly**

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

1. Remove the spark plugs.

**NOTE:** Keep the valves, valve springs, retainers and retainer keys in order so they can be installed in their original positions.

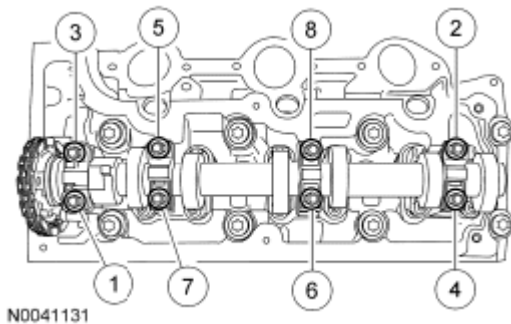
2. Using the Valve Spring Compressor, remove the valve spring retainer keys, the valve spring and the retainer. Remove the valve.
  - Repeat the procedure until all of the valves are removed.



**Fig. 335: Removing/Installing Valve Spring, Valve Spring Retainer And Retainer Keys**  
Courtesy of FORD MOTOR CO.

3. Remove and discard the valve seals.

**NOTE:** Mark the position of the camshaft bearing caps so they can be installed in their original positions.



**Fig. 336: Identifying Camshaft Bearing Caps Bolts Removal Sequence**  
Courtesy of FORD MOTOR CO.

4. Remove the bolts in the sequence shown in illustration and remove the camshaft bearing caps.
5. Remove the camshaft.

**Assembly**

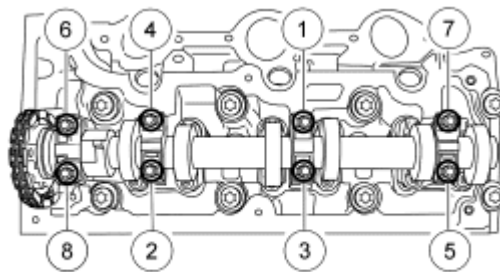
**NOTE:** Lubricate all parts with clean engine oil prior to assembly.

1. Position the camshaft.

**NOTE:** The camshaft bearing caps must be installed in their original positions.

**NOTE:** After installing the bolts, check the camshaft for free rotation.

2. Install the camshaft bearing caps and the bolts.
  - Tighten the bolts in the sequence shown in illustration in 2 stages.
  - Stage 1: Tighten to 6 Nm (53 lb-in).
  - Stage 2: Tighten to 16 Nm (142 lb-in).

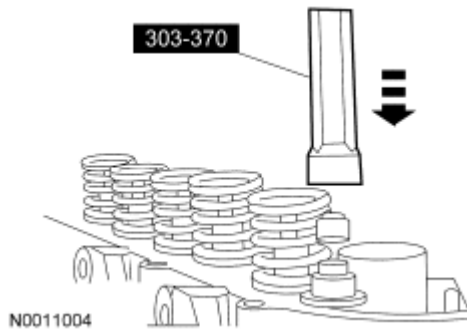


N0041132

**Fig. 337: Identifying Camshaft Bearing Caps Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

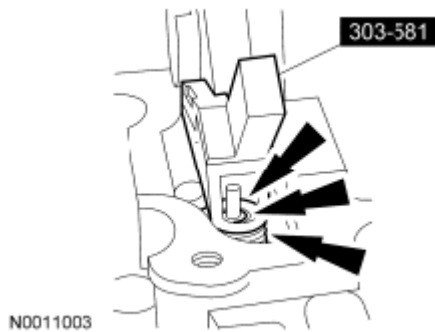
**NOTE:** Valves must be installed in the positions from which they were removed.

3. Install the valve.
4. Using the Valve Stem Oil Seal Installer, install new valve stem seals.



**Fig. 338: Installing Valve Stem Seal Using Valve Stem Seal Installer**  
 Courtesy of FORD MOTOR CO.

**NOTE:** The valve springs, retainers and retainer keys must be installed in the positions from which they were removed.



**Fig. 339: Removing/Installing Valve Spring, Valve Spring Retainer And Retainer Keys**  
 Courtesy of FORD MOTOR CO.

5. Using the Valve Spring Compressor, install the valve spring, the retainer and the retainer keys.

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

6. Install the spark plugs.  
 • Tighten to 17 Nm (150 lb-in).

**PISTON**

Special Tool(s)

**SPECIAL TOOLS DESCRIPTION CHART**

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## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang



**ST1335-A**

Service Set, Piston Pin  
303-S024 (T68P-6135-A)

### Material

#### MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A



N0006375

**Fig. 340: Exploded View Of Piston**  
 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	6135	Piston pin
7	6200	Connecting rod
8	6110	Piston

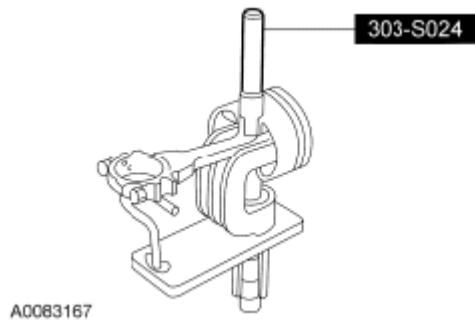
**Disassembly**

**NOTE:** The connecting rod bolts and nuts cannot be reused.

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

1. Remove the connecting rod bearings from the connecting rod and cap.
2. Remove the piston rings from the piston.

- Using the Piston Pin Service Set, press the piston pin out of the connecting rod and piston assembly.



**Fig. 341: Identifying Piston Pin Service Set**  
Courtesy of FORD MOTOR CO.

**Assembly**

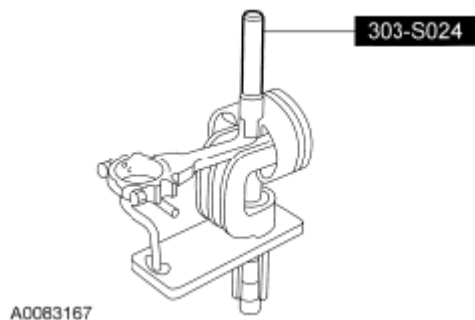
**NOTE:** Lubricate all parts with clean engine oil.

**NOTE:** Install the piston in the connecting rod with the cylinder number side of the rod and the indentation notch in the piston on the same side.

**NOTE:** The oil hole in the connecting rod must face the RH side of the cylinder block and the arrow on the piston must face the front of the engine block.

**NOTE:** If the piston pin is removed from the piston, a new piston and piston pin must be used. Do not reuse the piston or the piston pin.

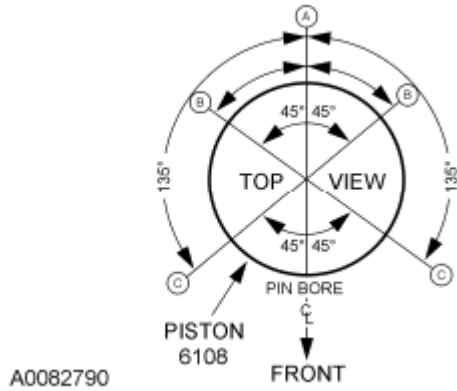
- Gradually heat the pin bore side of the connecting rod to approximately 232°C-316°C (467°F-626°F) and immediately install the piston pin.
- Using the Piston Pin Service Set, press the piston pin into the piston and connecting rod assembly.



**Fig. 342: Identifying Piston Pin Service Set**  
Courtesy of FORD MOTOR CO.

- Install the piston rings.

4. Make sure the ring gaps (oil spacer-A, oil ring-B, compression ring-C) are correctly spaced around the circumference of the piston.



**Fig. 343: Identifying Piston Ring Gap Position**  
 Courtesy of FORD MOTOR CO.

5. Install the connecting rod bearings in the connecting rod and cap.

## ASSEMBLY

### ENGINE

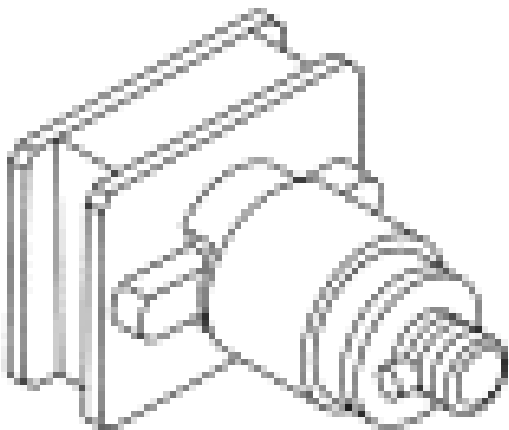
#### Special Tool(s)

#### SPECIAL TOOLS DESCRIPTION CHART

	Adapter for 303-564 303-578 (T97T-6256-A)
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ST1776-A



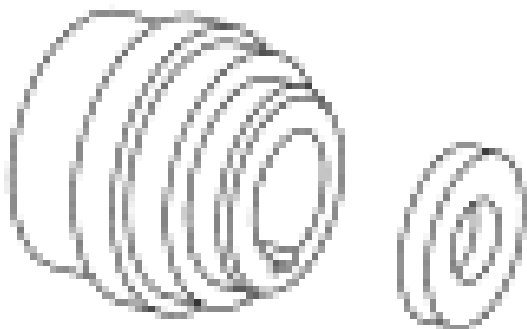
Adapter for 303-577  
303-576 (T97T-6256-D)

ST1779-A



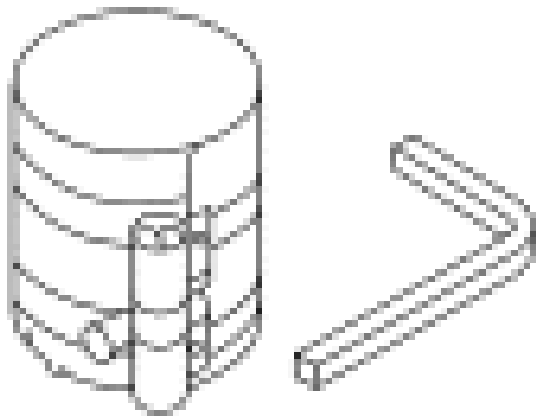
Adapter for 303-579 (part of 303-S524)  
303-527 (T95P-6701-A3)

**ST3074-A**



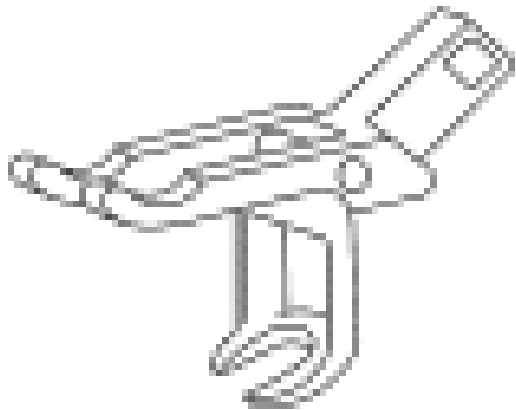
Aligner, Front Cover  
303-093 (T74P-6019-A)

**ST2439-A**



ST1380-A

Compressor, Piston Ring  
303-D032 (D81L-6002-C)



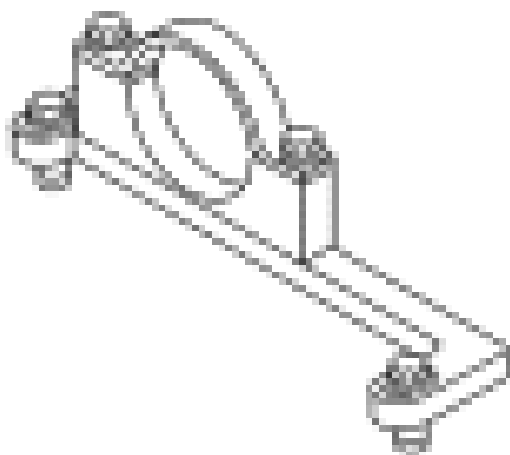
ST1330-A

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



**ST1778-A**

Holding Tool, Camshaft  
 303-577 (T97T-6256-C)



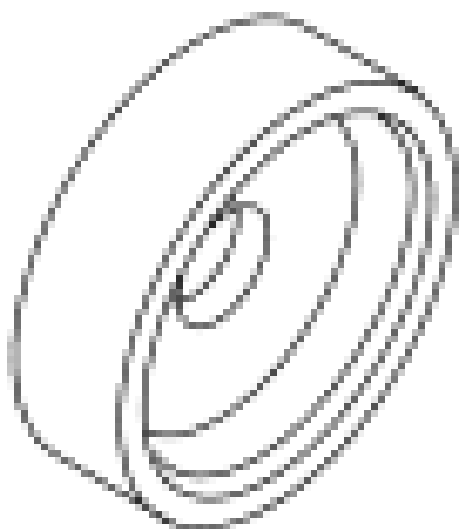
**ST1777-A**

Holding Tool, Camshaft Sprocket  
 303-564 (T97T-6256-B)



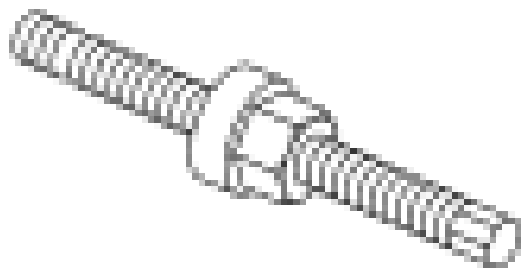
**ST2741A**

Holding Tool, Crankshaft  
303-674



**ST2132-A**

Installer, Crankshaft Rear Oil Seal  
303-579 (T97T-6701-A)



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

ST1287-A



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

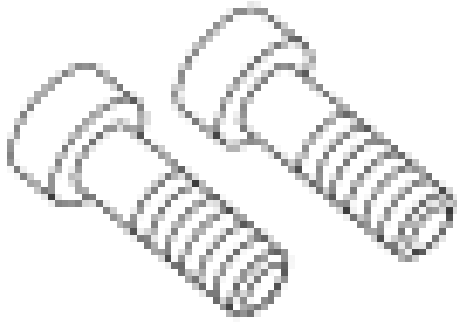
ST1631-A

Screws, Crankshaft Rear Oil Seal (part of 303-S524)

**2010 Ford Mustang Shelby GT500**

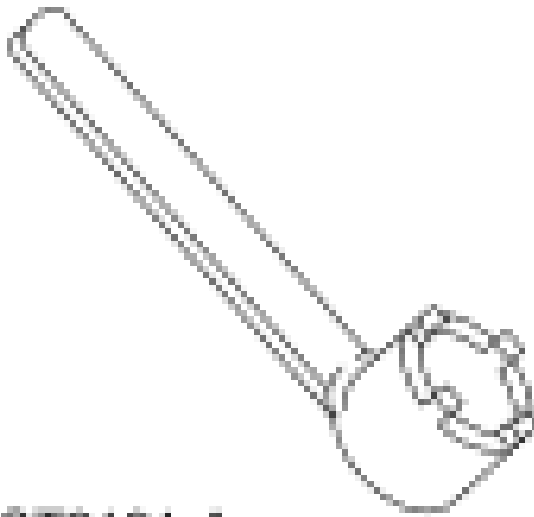
2010 ENGINE Engine - 4.0L SOHC - Mustang

303-528 (T95T-6701-A4)

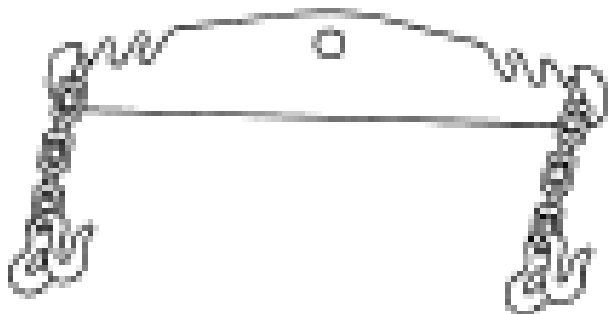


**ST3075-A**

Socket, Rear Jack Shaft  
303-634

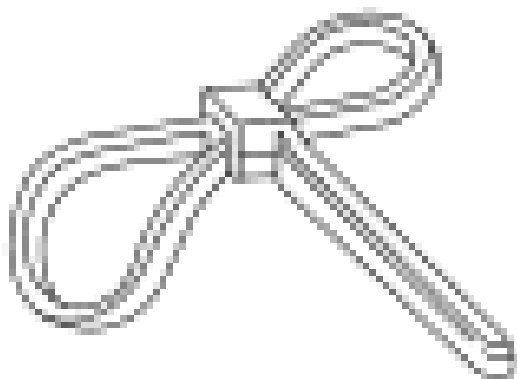


**ST2191-A**



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

ST1602-A

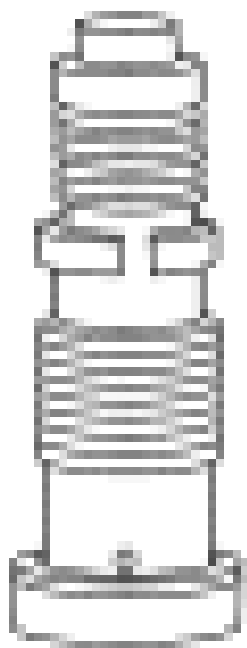


Strap Wrench  
303-D055 (85L-6000-A) or equivalent

ST1438-A

**2010 Ford Mustang Shelby GT500**

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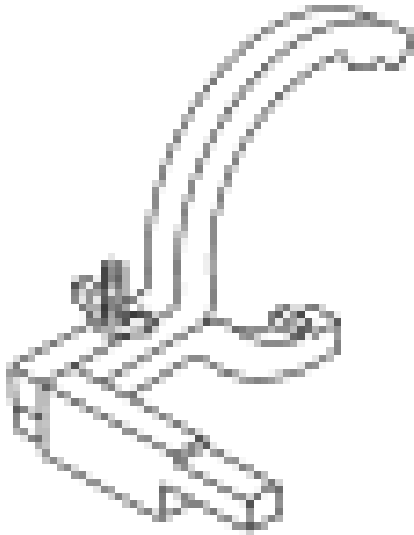
**ST1774-A**

Tensioner, Timing Chain  
303-571 (T97T-6K254-A)

Timing Tool, Crankshaft TDC  
303-573 (T97T-6303-A)

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang



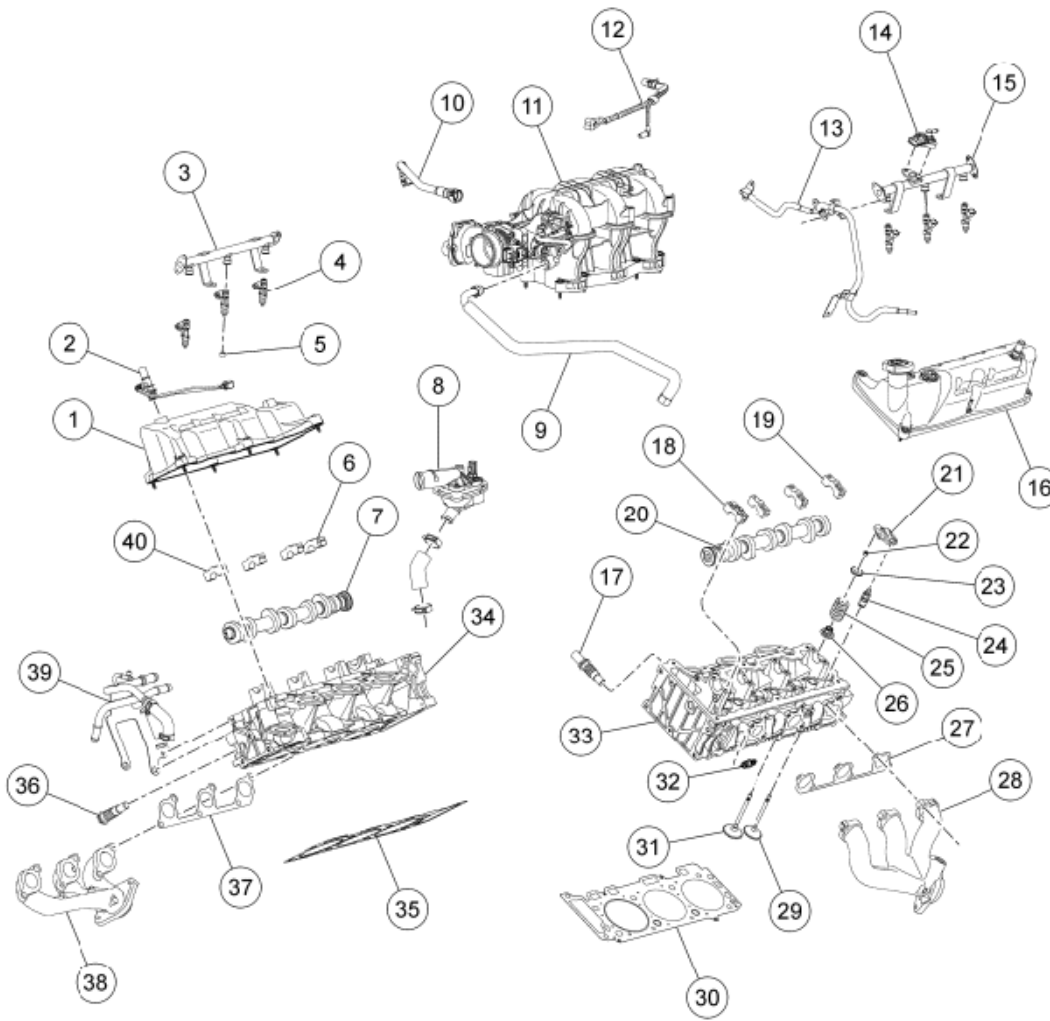
**ST1775-A**

### Material

#### MATERIAL SPECIFICATIONS

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO- 5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323- A4
Silicone Gasket Remover ZC-30	-
Thread Sealant with PTFE TA-24	WSK-M2G350- A2

### Upper End



N0034712

**Fig. 344: Identifying Engine Upper End Components**  
 Courtesy of FORD MOTOR CO.

**ITEM DESCRIPTION**

Item	Part Number	Description
1	6582	RH valve cover
2	6769	Electric PCV valve
3	9D280	RH fuel rail
4	9F593	Fuel injector (6 required)
5	9G512	Fuel injector insert adapter (6 required)
6	6A258	RH camshaft thrust bearing cap
7	6250	RH camshaft
8	8A586	Thermostat housing
9	9E469	EGR system module tube
10	6K817	PCV tube

**2010 Ford Mustang Shelby GT500**

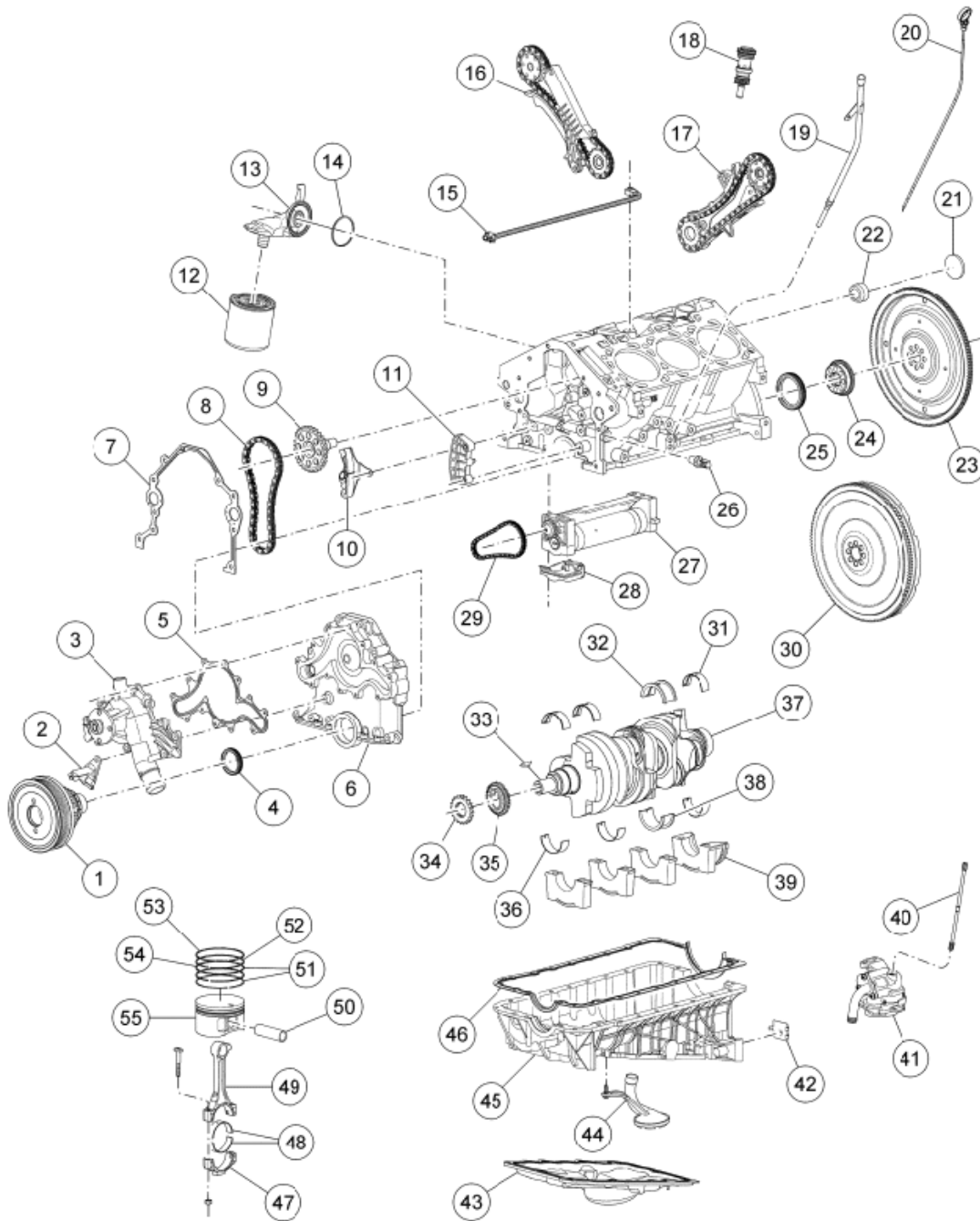
2010 ENGINE Engine - 4.0L SOHC - Mustang

11	9K479	Intake manifold
12	9E498	Vacuum harness
13	9E964	Fuel supply tube
14	9G756	Fuel rail pressure and temperature sensor
15	9D280	LH fuel rail
16	6A505	LH valve cover
17	6K254	LH hydraulic chain tensioner
18	6A258	LH camshaft thrust bearing cap
19	6A258	LH camshaft bearing cap (3 required)
20	6A274	LH camshaft
21	6529	Roller follower (12 required)
22	6518	Valve spring retainer key (12 required)
23	6A536	Valve spring retainer (12 required)
24	6C501	Hydraulic lash adjuster (12 required)
25	6513	Valve spring (12 required)
26	6571	Valve stem seal (12 required)
27	9448	LH exhaust manifold gasket
28	9431	LH exhaust manifold
29	6507	Intake valve (6 required)
30	6083	LH cylinder head gasket
31	6505	Exhaust valve (6 required)
32	12405	Spark plug (6 required)
33	6049	LH cylinder head
34	6049	RH cylinder head
35	6051	RH cylinder head gasket
36	6K254	RH hydraulic chain tensioner
37	9448	RH exhaust manifold gasket
38	9430	RH exhaust manifold
39	18696	Coolant tube
40	6A258	RH camshaft bearing cap (3 required)

**Lower End**

# 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang



N0017149

**Fig. 345: Identifying Engine Lower End Components**  
 Courtesy of FORD MOTOR CO.

## ITEM DESCRIPTION

Item	Part Number	Description
1	6B321	Crankshaft pulley
2	6C315	Crankshaft Position (CKP) sensor
3	8501	Coolant pump

**2010 Ford Mustang Shelby GT500**

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4	6700	Crankshaft front oil seal
5	8507	Coolant pump gasket
6	6019	Engine front cover
7	6020	Engine front cover gasket
8	6M270	Jackshaft chain
9	6M264	Jackshaft chain sprocket
10	6M271	Jackshaft chain tensioner
11	6M272	Jackshaft chain guide
12	6714	Oil filter
13	6884	Oil filter adapter
14	6L621	Oil filter adapter O-ring seal
15	12A699	Knock Sensor (KS)
16	6M290	RH camshaft drive cassette
17	6M289	LH camshaft drive cassette
18	6846	Oil pump drive assembly
19	6754	Oil level indicator tube
20	6750	Oil level indicator
21	6M296	Jackshaft seal
22	6M052	Jackshaft plug
23	6375	Flexplate
24	6434	Flexplate-to-crankshaft spacer
25	6701	Crankshaft rear oil seal
26	9278	Oil pressure sensor
27	6A311	Balance shaft (if equipped)
28	6K355	Balance shaft chain tensioner (if equipped)
29	6A364	Balance shaft chain (if equipped)
30	6375	Flywheel (manual transmission only)
31	6333	Crankshaft main bearing (3 required)
32	6337	Crankshaft main bearing cap
33	W702979	Woodruff key
34	6306	Jackshaft chain sprocket
35	6K350	Balance shaft chain sprocket (if equipped)
36	6A338	Crankshaft main bearing (3 required)
37	6303	Crankshaft
38	6A339	Crankshaft main bearing cap
39	6325	Crankshaft main thrust bearing
40	6A605	Oil pump drive shaft
41	6621	Oil pump
42	6C629	Shim (2 required)
43	6675	Oil pan
44	6617	Oil pump screen and pickup tube
45		

## 2010 Ford Mustang Shelby GT500

2010 ENGINE Engine - 4.0L SOHC - Mustang

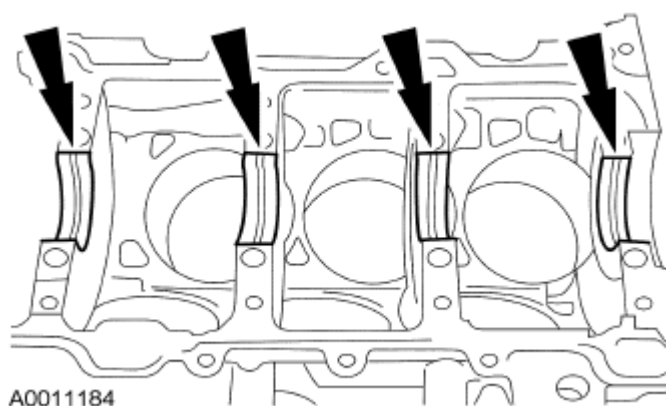
	6F092	Cylinder block cradle
46	6710	Cylinder block cradle gasket
47	6210	Connecting rod cap
48	6211	Connecting rod bearings
49	6200	Connecting rod
50	6135	Piston pin
51	6159	Oil control rings
52	6152	Lower compression ring
53	6150	Upper compression ring
54	6161	Oil control ring spacer
55	6110	Piston

### All vehicles

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

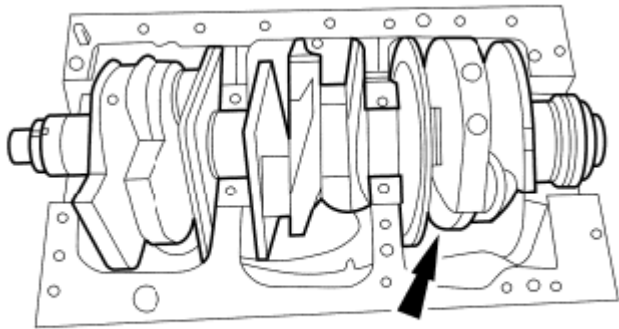
**NOTE:** If the fuel rail is used as a leverage device, damage may occur to the fuel rail. Care must be taken when working around the fuel rail.

1. Install the crankshaft main bearings and the thrust bearing.
  - Lubricate the crankshaft main bearings with clean engine oil.
2. Install the lower main bearings in the bearing caps.



**Fig. 346: Locating Crankshaft Main Bearings And Thrust Bearing**  
Courtesy of FORD MOTOR CO.

**NOTE:** The crankshaft main bearings are precision selective fit. Inspect the bearing clearance. For additional information, refer to ENGINE SYSTEM - GENERAL INFORMATION .

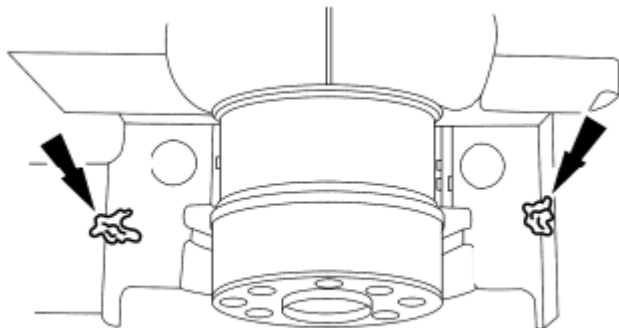


GA1705-A

**Fig. 347: Locating Crankshaft**  
 Courtesy of FORD MOTOR CO.

3. Install the crankshaft.

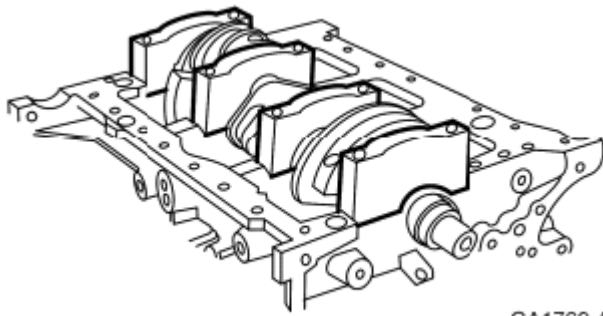
**NOTE:** If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Failure to follow this procedure may cause future oil leakage.



GA1707-A

**Fig. 348: Identifying Silicone Gasket And Sealant Applying Areas On Rear Main Bearing Cap To Cylinder Block Parting Line**  
 Courtesy of FORD MOTOR CO.

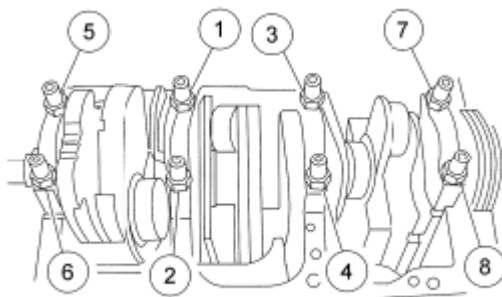
4. Apply silicone gasket and sealant to the rear main bearing cap to cylinder block parting line.
5. Install the main bearing caps in the order in which they were removed.



GA1769-A

**Fig. 349: Identifying Main Bearing Caps**  
Courtesy of FORD MOTOR CO.

6. Tighten the bolts in the sequence shown in illustration to 35 Nm (26 lb-ft) and then rotate an additional 57 degrees.



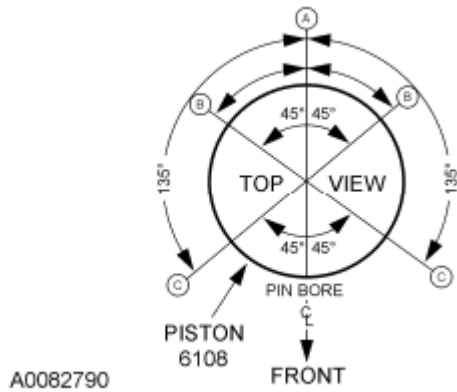
N0014922

**Fig. 350: Identifying Main Bearing Cap Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

7. Check the piston to cylinder bore and ring clearance. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

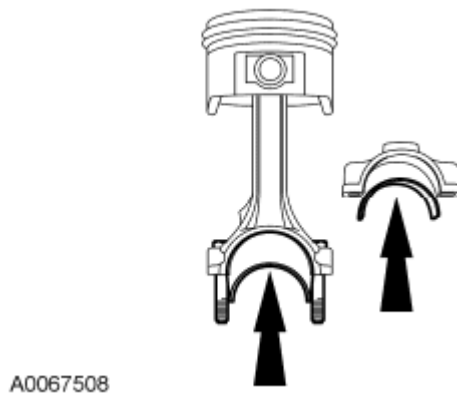
**NOTE:** Lubricate the piston rings with clean engine oil.

8. Install the piston rings.
9. Make sure the ring gaps (oil spacer-A, oil ring-B, compression ring-C) are correctly spaced around the circumference of the piston.



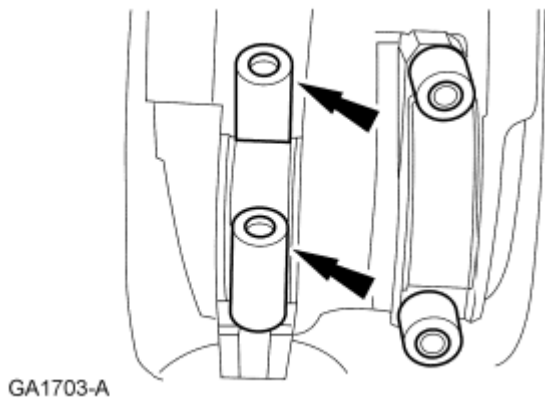
**Fig. 351: Identifying Piston Ring Gap Position**  
Courtesy of FORD MOTOR CO.

10. Install the connecting rod bearings.



**Fig. 352: Installing Connecting Rod Bearings**  
Courtesy of FORD MOTOR CO.

11. Install rubber hose pieces on the connecting rod bolts to protect the crankshaft.



**Fig. 353: Locating Rubber Hose Pieces On Crankshaft Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** Position the piston with the indentation arrow toward the front of the cylinder block.

12. Using the Piston Ring Compressor, install the pistons.
  - Rotate the crankshaft as necessary.

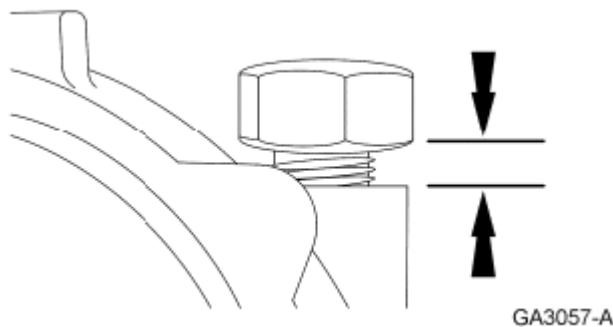


**Fig. 354: Installing Piston Using Piston Ring Compressor**  
Courtesy of FORD MOTOR CO.

**NOTE:** The old nuts and bolts are used for checking clearances. New nuts and bolts must be used for reassembly.

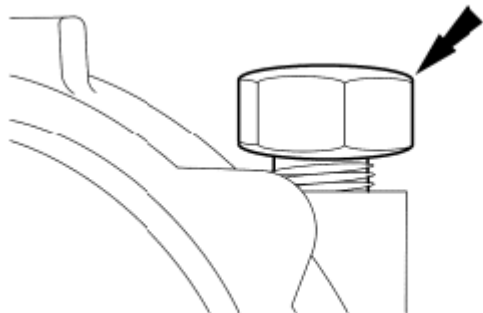
13. Check the clearance of each connecting rod bearing. For additional information, refer to ENGINE SYSTEM - GENERAL INFORMATION.
14. Rotate the crankshaft until the piston is at the bottom of its stroke.

**NOTE:** For cylinders 1, 2 and 3, remove the connecting rod nut at the oil split hole side first. For cylinders 4, 5 and 6, remove the opposite nut first.



**Fig. 355: Locating Face Distance Over End Of Bolt**  
Courtesy of FORD MOTOR CO.

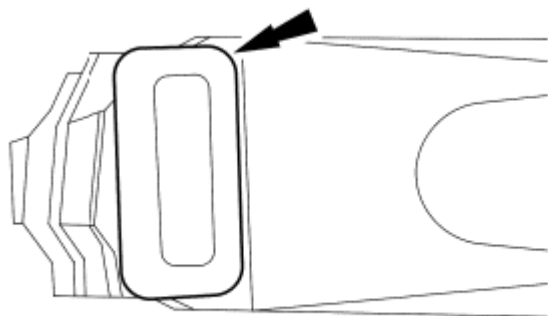
15. Loosen the first nut until the face is approximately 2 mm (0.08 in) over the end of the bolt.
16. Tap on the nut until the bolt can be removed by hand.



GA3058-A

**Fig. 356: Locating Connecting Rod Bolt**  
Courtesy of FORD MOTOR CO.

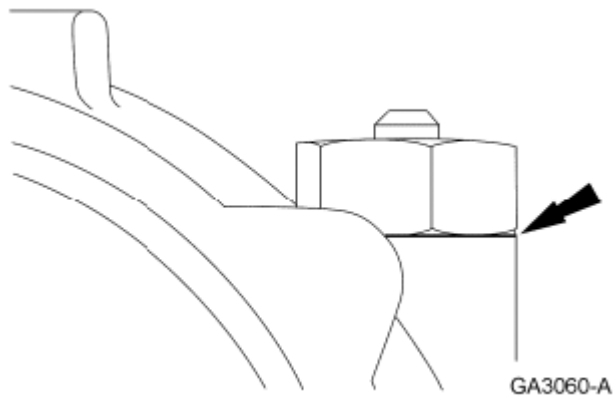
17. Repeat the previous 2 steps for the opposite bolt.
18. Install the new bolts making certain that the bolt head is parallel to the sideward face of the connecting rod.



GA3059-A

**Fig. 357: Locating Bolt Head Position**  
Courtesy of FORD MOTOR CO.

19. Install the connecting rod cap in its original position.
20. Install and tighten the connecting rod nuts finger-tight.

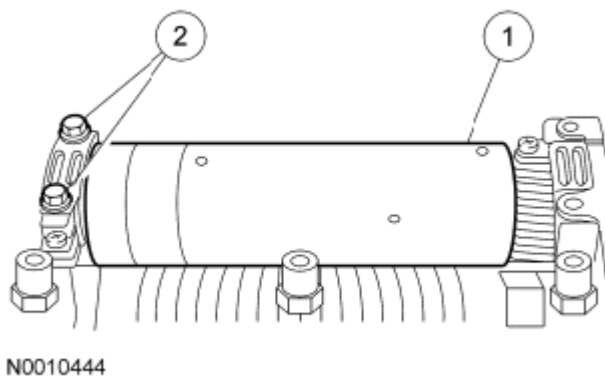


**Fig. 358: Locating Connecting Rod Nut Tightening Position**  
 Courtesy of FORD MOTOR CO.

21. Tighten the connecting rod nuts simultaneously in 2 stages:
  - Stage 1: Tighten to 20 Nm (177 lb-in).
  - Stage 2: Tighten an additional 90 degrees.
22. Repeat the previous 4 steps for the remaining connecting rods.
23. Rotate crankshaft until the No. 1 piston is at Top Dead Center (TDC).

#### **Vehicles equipped with a balance shaft**

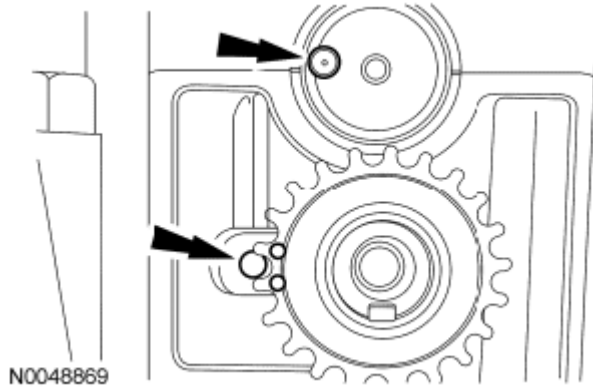
24. Install the balance shaft.
  1. Position the balance shaft assembly.
  2. Install the bolts and tighten to 27 Nm (20 lb-ft).



**Fig. 359: Identifying Balance Shaft Assembly With Mounting Bolts**  
 Courtesy of FORD MOTOR CO.

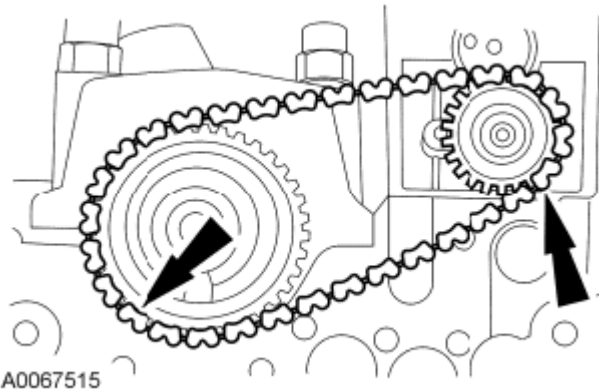
**NOTE:** Due to the gear ratio between the reversal shaft and the balance shaft, up to 7 complete turns of the balance shaft may be required to find the correct position.

25. Align the timing marks.
- Install a 4 mm (0.16 in) pin to hold the shaft in place.



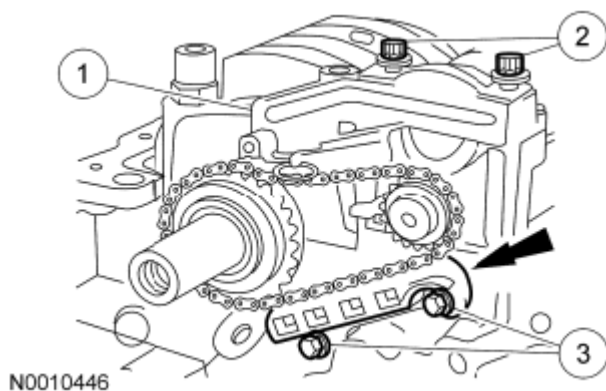
**Fig. 360: Locating Timing Marks**  
Courtesy of FORD MOTOR CO.

26. Install the balance shaft chain and crankshaft sprocket.



**Fig. 361: Locating Balance Shaft Chain And Crankshaft Sprocket**  
Courtesy of FORD MOTOR CO.

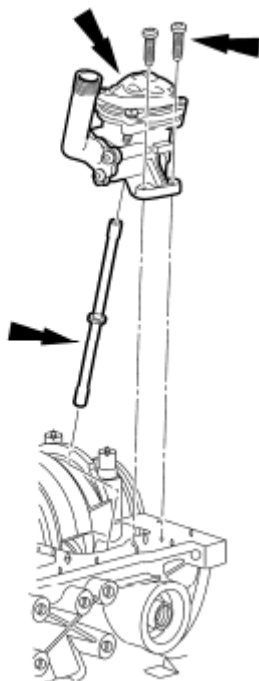
27. Install the balance shaft tensioner.
1. Position the balance shaft tensioner.
  2. Install the 2 bolts and tighten to 29 Nm (21 lb-ft).
  3. Position the balance shaft chain guide, install the 2 bolts and tighten to 10 Nm (89 lb-in).
    - Remove the pin from the tensioner.



**Fig. 362: Locating Balance Shaft Chain Guide With Mounting Bolts**  
Courtesy of FORD MOTOR CO.

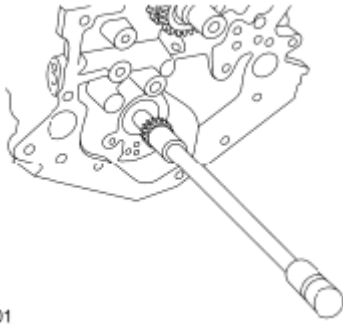
**All vehicles**

28. Position the oil pump intermediate shaft and the oil pump. Install the 2 bolts.
  - Tighten to 19 Nm (168 lb-in).



**Fig. 363: Locating Oil Pump Intermediate Shaft, Oil Pump Pickup Tube With Bolts**  
Courtesy of FORD MOTOR CO.

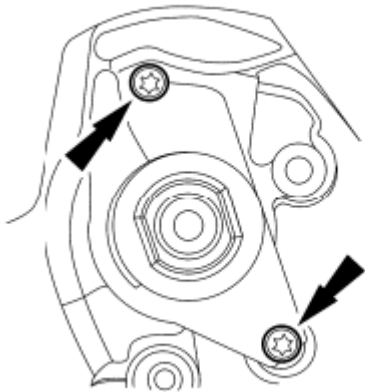
29. Install the jack shaft.



A0011401

**Fig. 364: Removing/Installing Jackshaft**  
 Courtesy of FORD MOTOR CO.

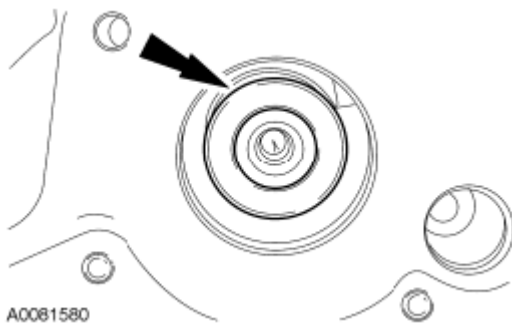
30. Install the jack shaft thrust plate and bolts.
  - Tighten to 11 Nm (97 lb-in).



GA1697-A

**Fig. 365: Locating Jackshaft Thrust Plate Bolts**  
 Courtesy of FORD MOTOR CO.

31. Install the jack shaft spacer.

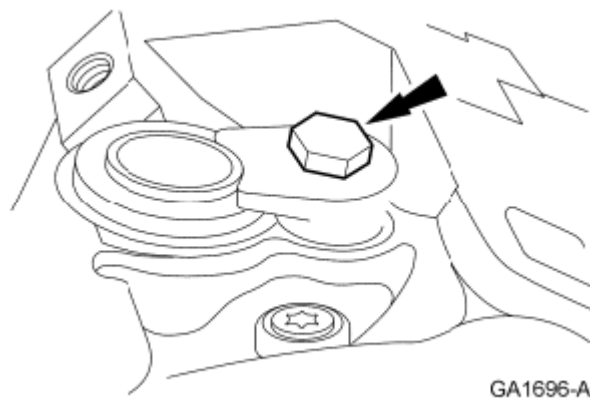


A0081580

**Fig. 366: Locating Jackshaft Spacer**  
 Courtesy of FORD MOTOR CO.

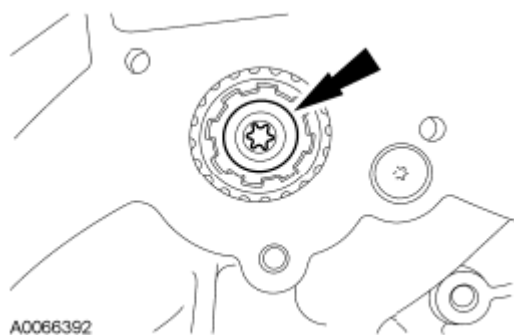
32. Install the oil pump drive and the hold down.

- Tighten to 19 Nm (168 lb-in).



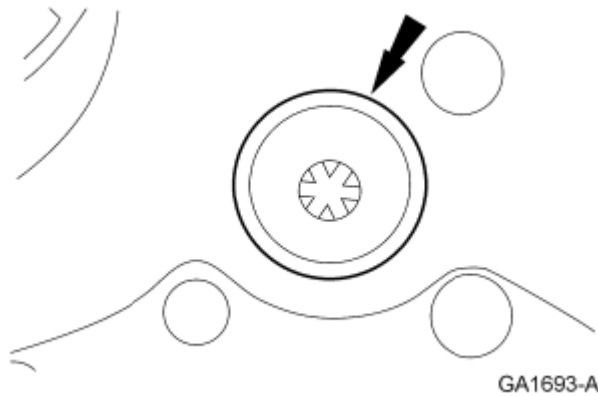
**Fig. 367: Locating Oil Pump Drive Bolt**  
Courtesy of FORD MOTOR CO.

33. Position the RH camshaft drive cassette and install the sprocket bolt. Do not tighten the bolt at this time.



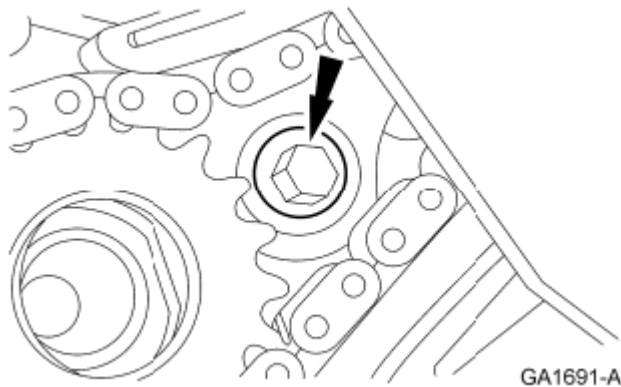
**Fig. 368: Locating Rear Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

34. Install the RH drive cassette bolt and spacer.
- Tighten to 18 Nm (159 lb-in).



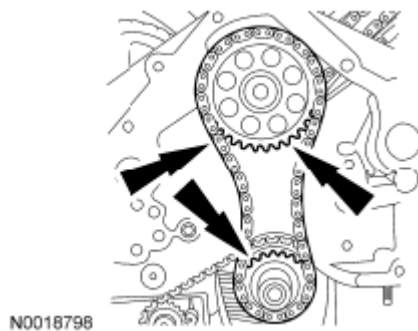
**Fig. 369: Locating RH Camshaft Drive Cassette Bolt**  
Courtesy of FORD MOTOR CO.

35. Install the LH cassette and the bolt.
- Tighten to 19 Nm (168 lb-in).



**Fig. 370: Locating LH Cassette Lower Bolt**  
Courtesy of FORD MOTOR CO.

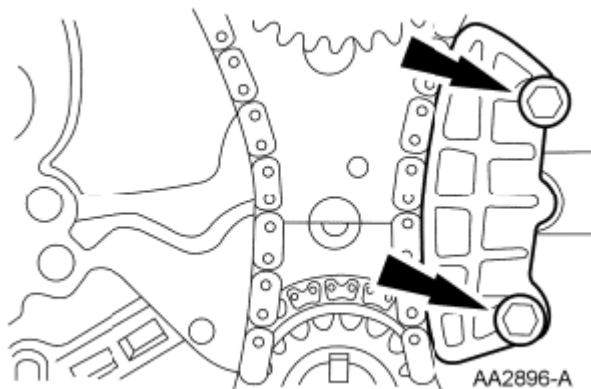
36. Install the crankshaft key. Position the jack shaft and crankshaft sprockets and the chain.



**Fig. 371: Locating Jackshaft, Crankshaft Sprockets And Chain**

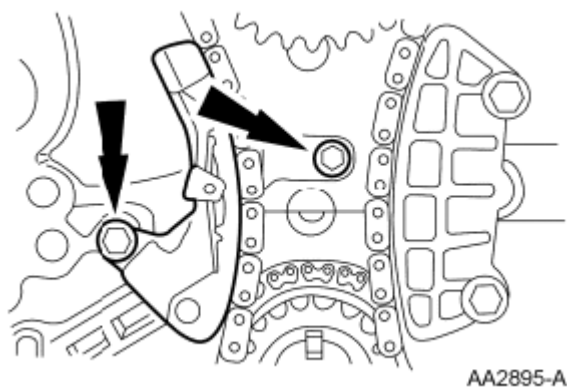
Courtesy of FORD MOTOR CO.

37. Install the chain guide and the 2 bolts.
  - Tighten to 19 Nm (168 lb-in).



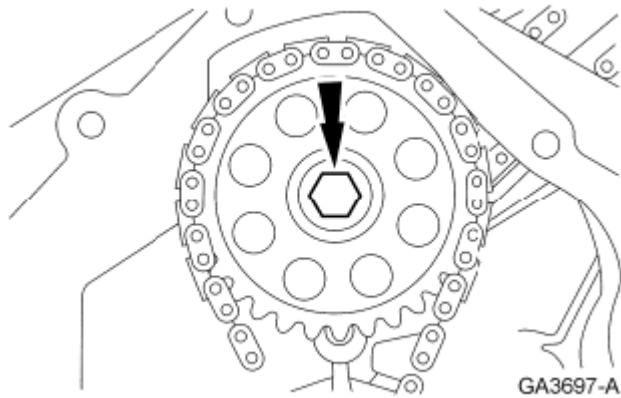
**Fig. 372: Locating Chain Guide Bolts**  
Courtesy of FORD MOTOR CO.

38. Install the chain tensioner and the 2 bolts.
  - Tighten to 9 Nm (80 lb-in).



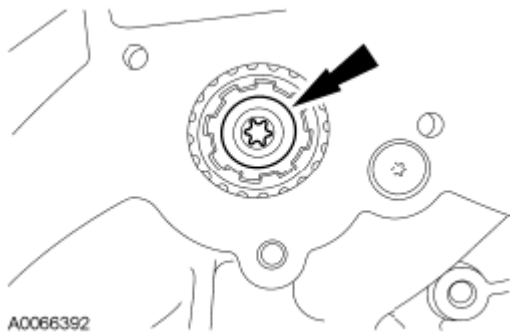
**Fig. 373: Locating Chain Tensioner Bolts**  
Courtesy of FORD MOTOR CO.

39. Install the jack shaft sprocket bolt. Do not tighten the bolt at this time.



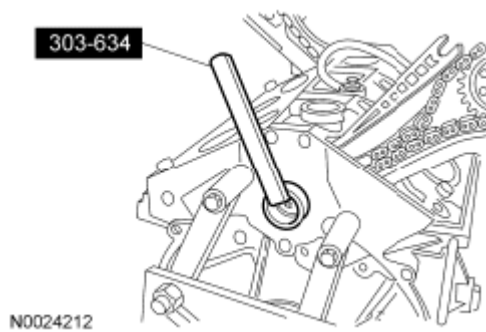
**Fig. 374: Locating Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

40. While holding the front jack shaft sprocket bolt secure, tighten the rear bolt.
  - Tighten to 20 Nm (177 lb-in).



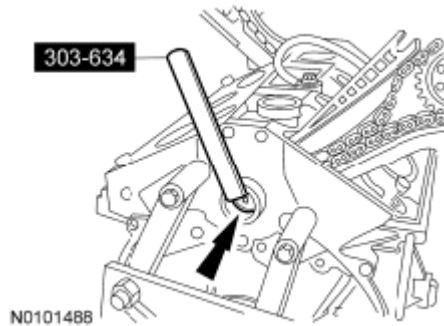
**Fig. 375: Locating Rear Jackshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

41. Install the Rear Jack Shaft Socket on the rear of the jack shaft.



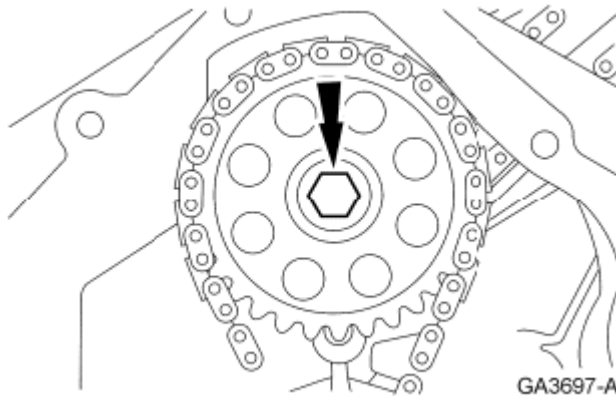
**Fig. 376: Identifying Rear Jack Shaft Socket**  
Courtesy of FORD MOTOR CO.

42. Using the Rear Jack Shaft Socket to hold the jack shaft, tighten the rear jack shaft bolt an additional 90 degrees.



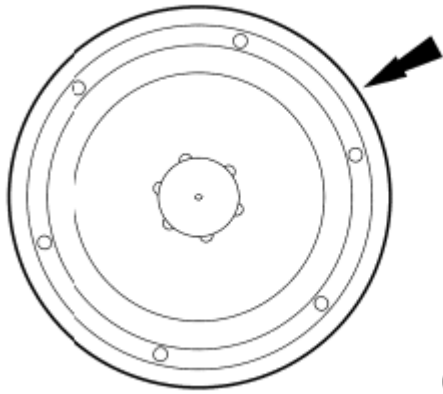
**Fig. 377: Holding Jackshaft Using Rear Jack Shaft Socket**  
 Courtesy of FORD MOTOR CO.

43. Using the Rear Jack Shaft Socket to hold the jack shaft, tighten the front sprocket bolt in 2 stages.
- Tighten to 45 Nm (33 lb-ft).
  - Tighten an additional 90 degrees.



**Fig. 378: Locating Jackshaft Sprocket Bolt**  
 Courtesy of FORD MOTOR CO.

44. Remove the Rear Jack Shaft Sprocket and install the rear jack shaft plug.

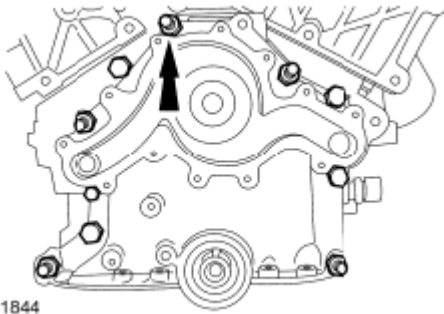


GA1692-A

**Fig. 379: Locating Jackshaft Rear Plug**  
 Courtesy of FORD MOTOR CO.

45. Position a new engine front cover gasket on the cylinder block.

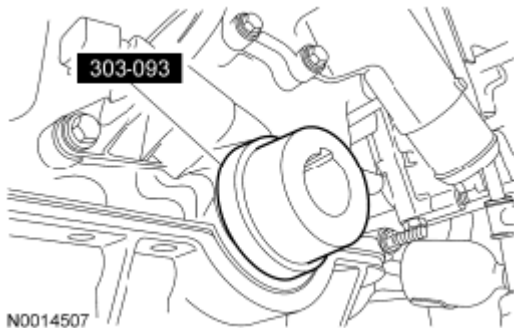
**NOTE:** Apply thread sealant to the stud bolts and make sure that the stud bolts are installed in their original positions.



N0011844

**Fig. 380: Locating Stud Bolt**  
 Courtesy of FORD MOTOR CO.

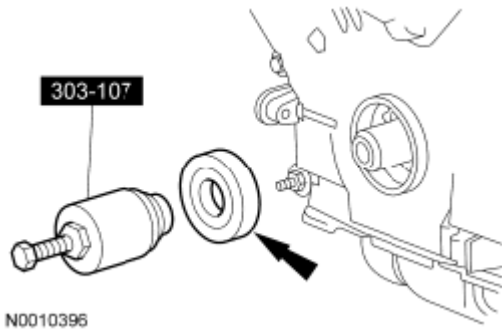
46. Position the front cover and loosely install the 5 bolts and the 5 stud bolts.
47. Use the Front Cover Aligner to align the front cover and tighten the bolts and stud bolts to 19 Nm (168 lb-in).



N0014507

**Fig. 381: Identifying Front Cover Aligner**  
Courtesy of FORD MOTOR CO.

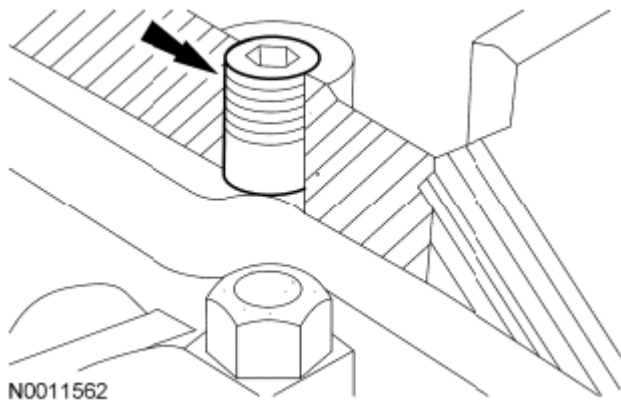
**NOTE:** Lubricate the seal lip with clean engine oil.



**Fig. 382: Locating Crankshaft Front Oil Seal With Front Cover Aligner And Crankshaft Vibration Damper Installer**  
Courtesy of FORD MOTOR CO.

48. Using the Front Cover Aligner and Crankshaft Vibration Damper Installer, install the crankshaft front oil seal.

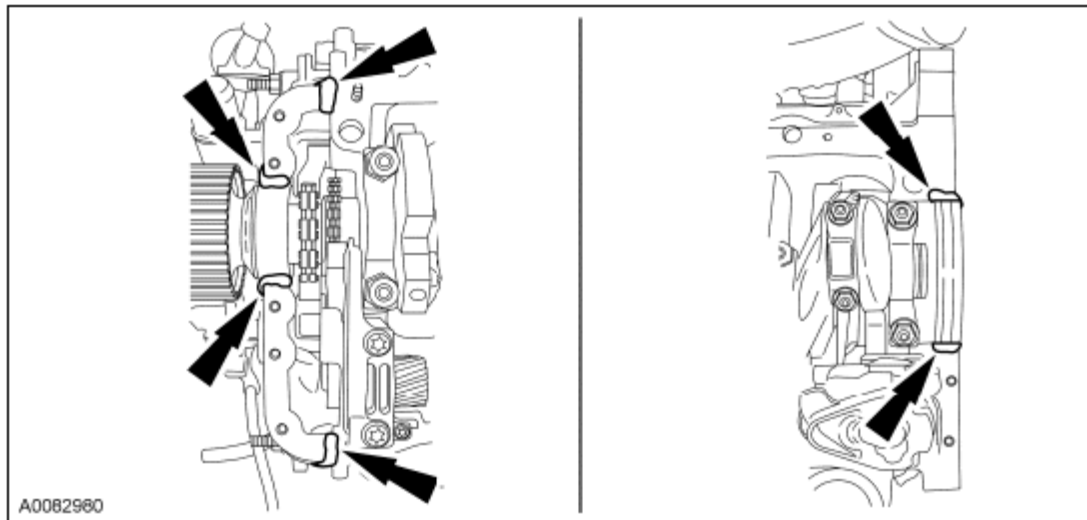
**NOTE:** Failure to back off the set screws may result in damage to the cylinder block cradle.



**Fig. 383: Locating Cylinder Block Cradle Boss Set Screw**  
Courtesy of FORD MOTOR CO.

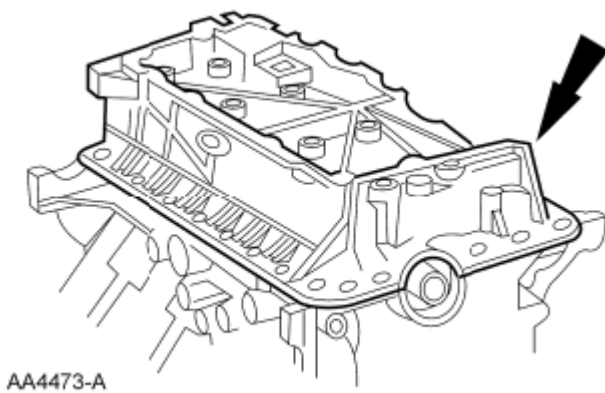
49. Back the set screws off until they are below the cylinder block cradle boss.

**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.



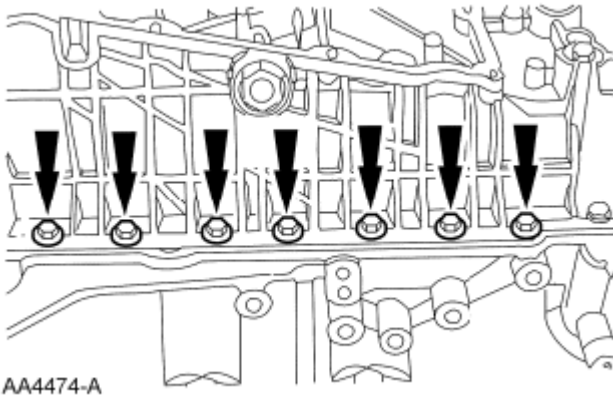
**Fig. 384: Locating Silicone Gasket And Sealant Applying Areas**  
Courtesy of FORD MOTOR CO.

50. Apply silicone gasket and sealant in the 6 places shown in illustration.
51. Position the lower block cradle and a new gasket.



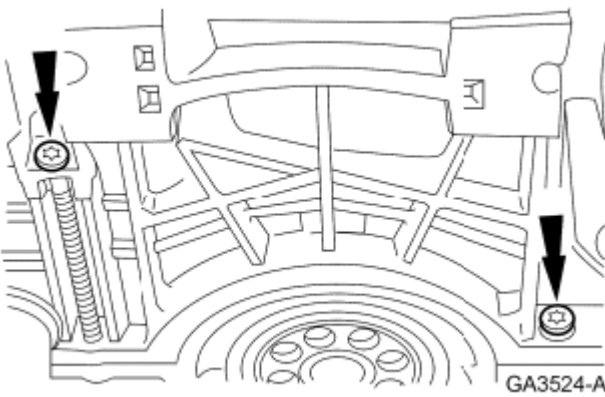
**Fig. 385: Locating Lower Block Cradle**  
Courtesy of FORD MOTOR CO.

52. Install and hand-tighten the 20 bolts and 2 nuts.



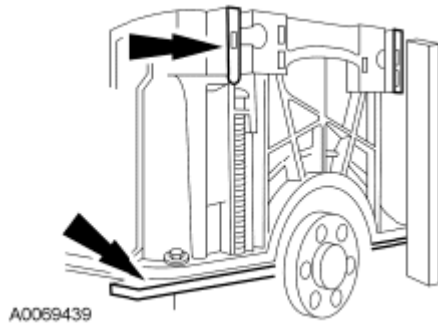
**Fig. 386: Locating Cylinder Block Cradle Bolts And Nuts**  
Courtesy of FORD MOTOR CO.

53. Install and hand-tighten the bolts.



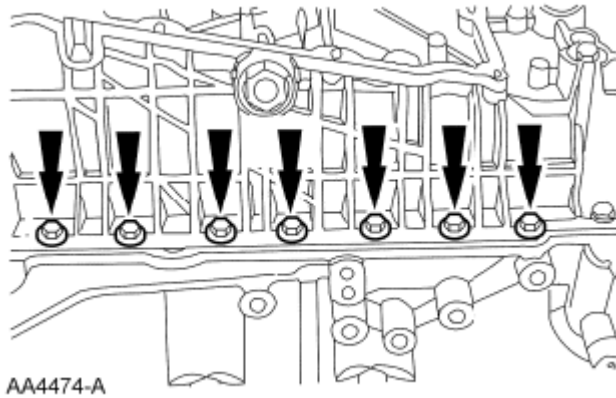
**Fig. 387: Locating Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** The lower block cradle to the cylinder block alignment must be within a maximum mismatch of 0.25 mm (0.01 in) lower block cradle underflush or 0.05 mm (0.00196 in) lower block cradle protrusion.



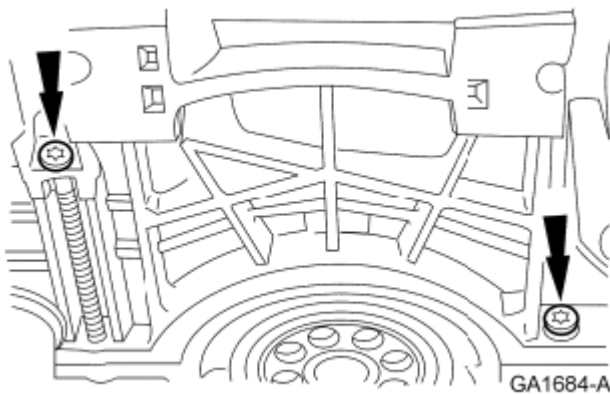
**Fig. 388: [Locating Lower Block Cradle]**  
 Courtesy of FORD MOTOR CO.

54. Using a straightedge, align the transmission face of the lower block cradle with the rear face of the cylinder block.
55. Tighten the 20 bolts and the 2 nuts.
  - Tighten the nuts to 10 Nm (89 lb-in).
  - Tighten the bolts to 14 Nm (124 lb-in).



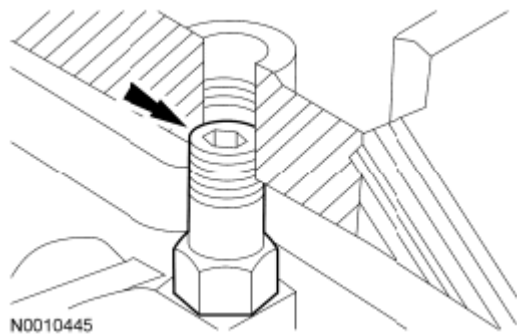
**Fig. 389: Locating Cylinder Block Cradle Bolts And Nuts**  
 Courtesy of FORD MOTOR CO.

56. Install the 2 block cradle bolts.
  - Tighten to 10 Nm (89 lb-in).



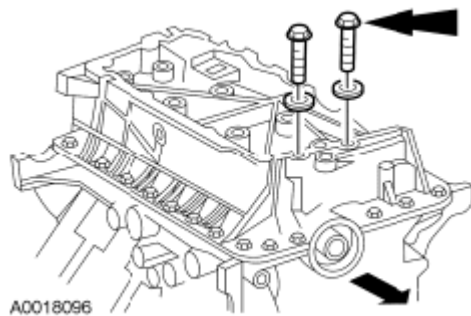
**Fig. 390: Locating Cylinder Block Cradle Torx Bolts**  
 Courtesy of FORD MOTOR CO.

57. Tighten the lower block cradle inserts to 3 Nm (27 lb-in).



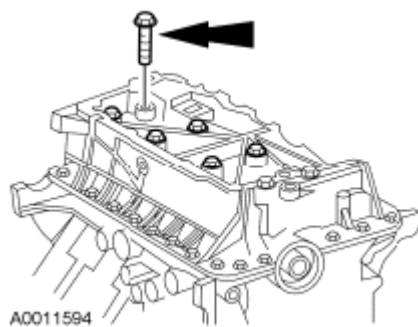
**Fig. 391: Locating Lower Block Cradle Insert**  
 Courtesy of FORD MOTOR CO.

58. Install new seals on the 2 silver bolts and loosely install them in the cylinder block cradle.



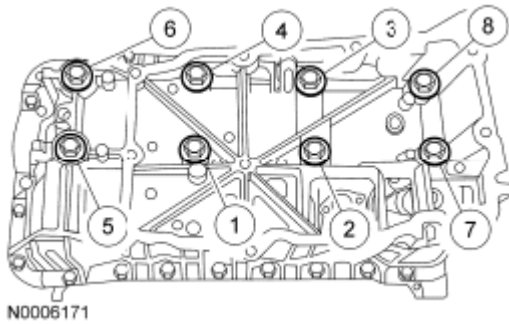
**Fig. 392: Locating Silver-Colored Bolts**  
 Courtesy of FORD MOTOR CO.

59. Loosely install the 6 remaining lower block cradle bolts.



**Fig. 393: Locating Lower Block Cradle Bolts**  
 Courtesy of FORD MOTOR CO.

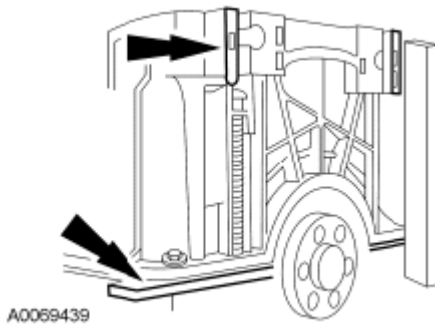
60. Tighten the cylinder block cradle bolts in 2 stages.
- Stage 1: Tighten to 15 Nm (133 lb-in).
  - Stage 2: Tighten to 34 Nm (25 lb-ft).



**Fig. 394: Identifying Cylinder Block Cradle Bolts Tightening Sequence**  
 Courtesy of FORD MOTOR CO.

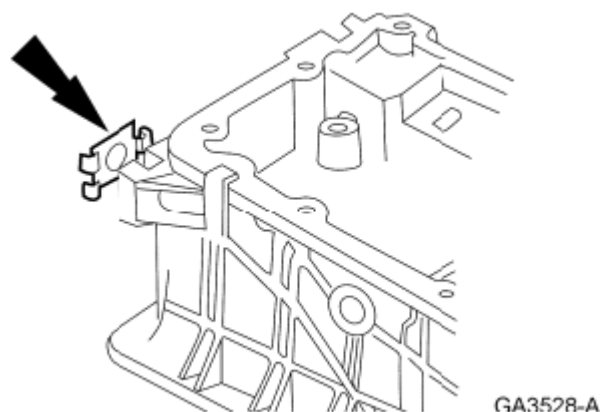
**NOTE:** The cylinder block cradle to the cylinder block alignment must be within a maximum mismatch of 0.25 mm (0.01 in) cylinder block cradle underflush or 0.05 mm (0.00196 in) cylinder block cradle protrusion.

61. Using a straightedge, measure the mismatch between the transmission face of the cylinder block cradle with the rear face of the cylinder block.
  - Cradles that exceed protrusion specification must be removed and the appropriate assembly steps repeated.
  - Cradles that exceed the underflush specification may be repaired by installing shims (next step).



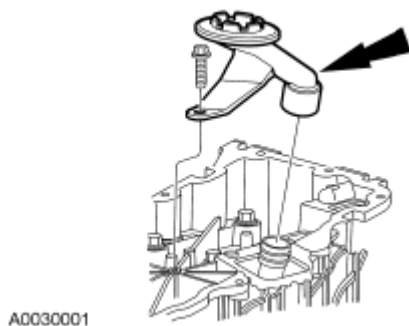
**Fig. 395: [Locating Lower Block Cradle]**  
 Courtesy of FORD MOTOR CO.

62. Repair all assemblies that exceed underflush specification by installing shims on 1 or both sides of the cylinder block cradle.



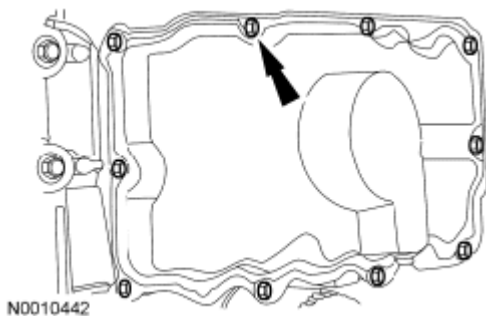
**Fig. 396: Locating Cylinder Block Cradle**  
 Courtesy of FORD MOTOR CO.

63. Install the oil pump screen and pickup tube and the bolt.
- Tighten to 11 Nm (97 lb-in).



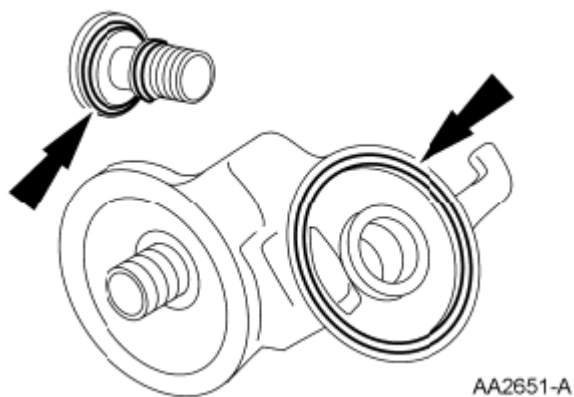
**Fig. 397: Locating Oil Pump Screen Cover And Tube**  
 Courtesy of FORD MOTOR CO.

64. Install the gasket, oil pan and the 10 bolts.
- Tighten to 11 Nm (97 lb-in).



**Fig. 398: Locating Oil Pan Bolts**  
 Courtesy of FORD MOTOR CO.

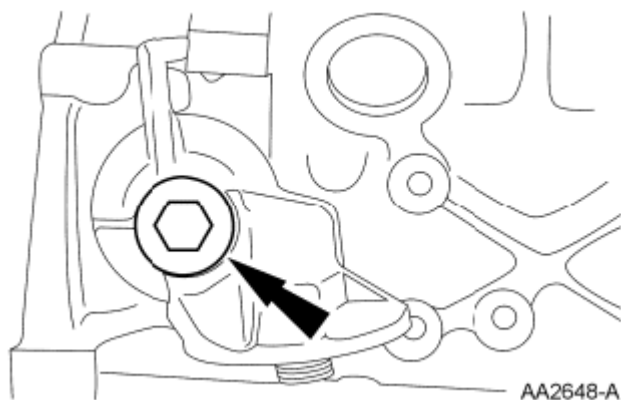
65. Inspect and install new oil filter adapter O-ring seals if necessary.



**Fig. 399: Locating Oil Filter Adapter O-ring Seals**  
Courtesy of FORD MOTOR CO.

66. Install the oil filter adapter and the bolt.

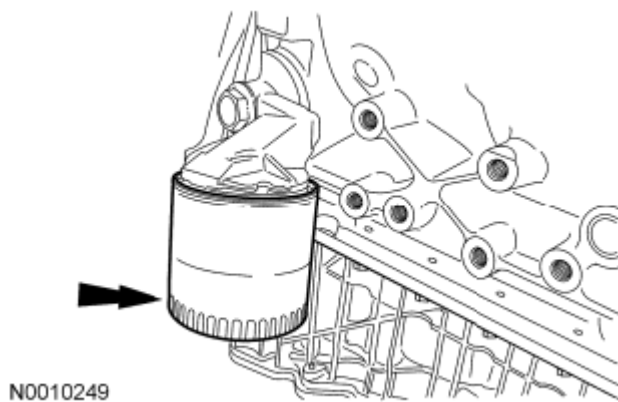
- Tighten to 57 Nm (42 lb-ft).



**Fig. 400: Locating Oil Filter Adapter**  
Courtesy of FORD MOTOR CO.

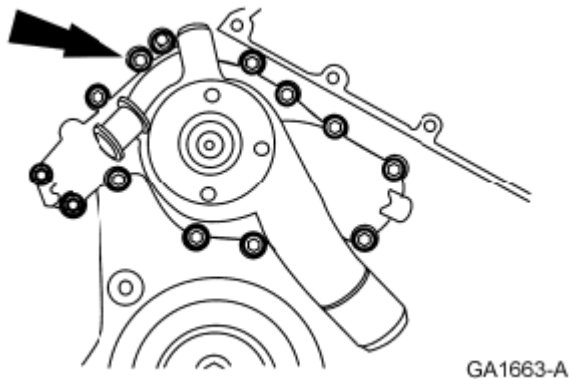
67. Install a new oil filter.

- Tighten until the oil filter seal is flush with the adapter and the tighten an additional 270 degrees.



**Fig. 401: Identifying Engine Oil Filter**  
Courtesy of FORD MOTOR CO.

68. Install a new gasket, the coolant pump and the 13 bolts.
- Tighten to 10 Nm (89 lb-in).



**Fig. 402: Locating Coolant Pump Bolts**  
Courtesy of FORD MOTOR CO.

69. Using the Crankshaft Vibration Damper, install the crankshaft pulley.

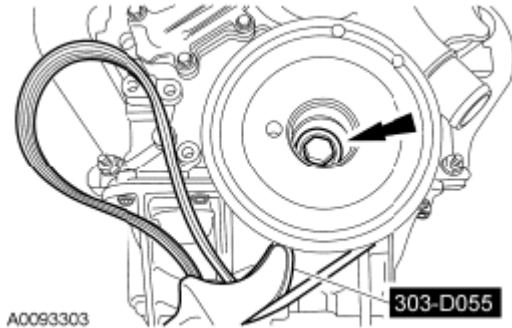


**Fig. 403: Installing Crankshaft Pulley**

Courtesy of FORD MOTOR CO.

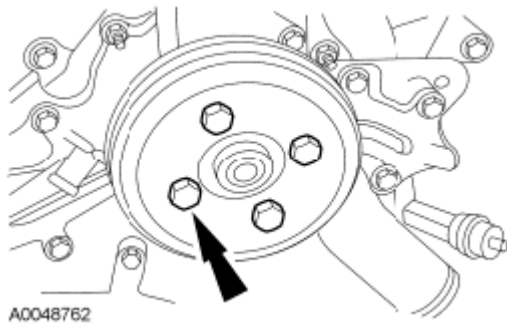
**NOTE:** A new bolt must be used each time it is removed.

70. Using the Strap Wrench, tighten the bolt in 2 stages.
- Stage 1: Tighten to 55 Nm (41 lb-ft).
  - Stage 2: Rotate an additional 85 degrees.



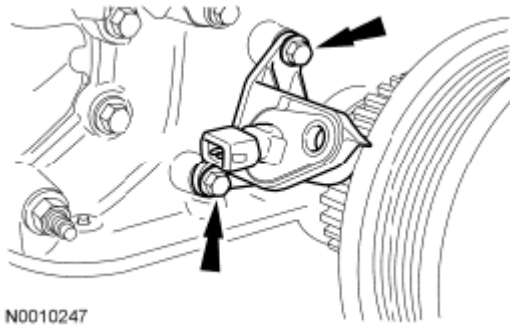
**Fig. 404: Locating Crankshaft Pulley Bolt**  
Courtesy of FORD MOTOR CO.

71. Install the coolant pump pulley and the 4 bolts.
- Tighten to 25 Nm (18 lb-ft).



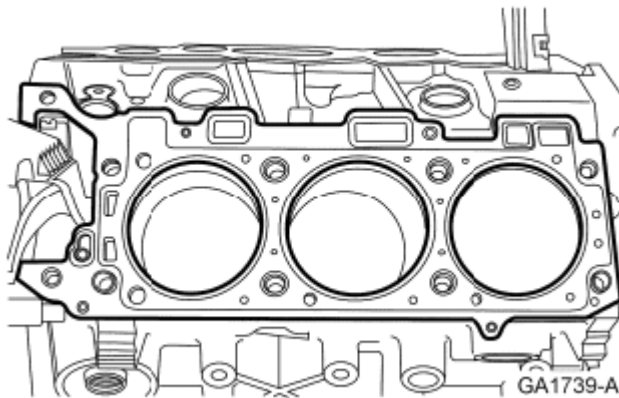
**Fig. 405: Locating Coolant Pump Pulley Bolt**  
Courtesy of FORD MOTOR CO.

72. Position the Crankshaft Position (CKP) sensor and install the 2 bolts.
- Tighten to 10 Nm (89 lb-in).



**Fig. 406: Locating Crankshaft Position (CKP) Sensor Bolts**  
Courtesy of FORD MOTOR CO.

**NOTE:** LH side shown, RH side similar.



**Fig. 407: Identifying Cylinder Head Gaskets**  
Courtesy of FORD MOTOR CO.

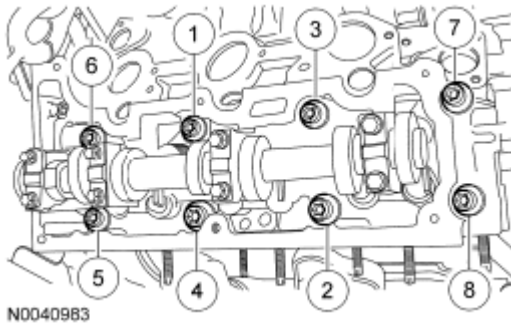
73. Position the cylinder head gaskets.

**NOTE:** To avoid damage to the timing chain cassette, an assistant will be required to help lift the cylinder head from the vehicle.

**NOTE:** New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

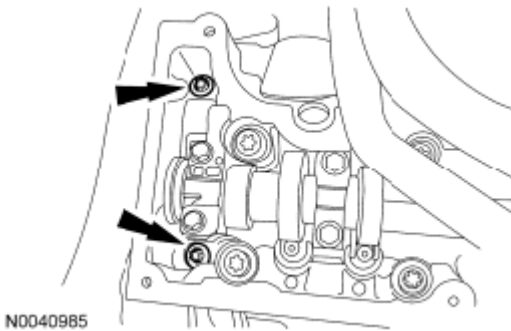
74. Position the RH cylinder head. Install 8 new M12 bolts and tighten in the sequence shown in illustration in 2 stages.

- Stage 1: Tighten to 12 Nm (106 lb-in).
- Stage 2: Tighten to 25 Nm (18 lb-ft).



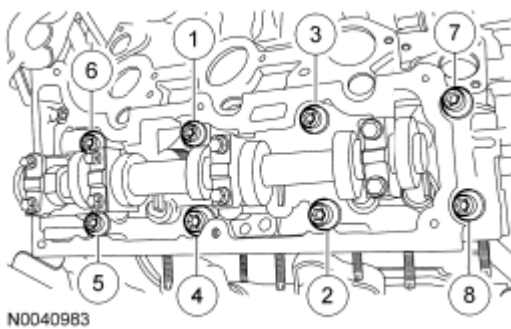
**Fig. 408: Identifying Cylinder Head Bolts Tightening Sequence**  
 Courtesy of FORD MOTOR CO.

75. Install 2 new M8 bolts.
- Tighten to 32 Nm (24 lb-ft).



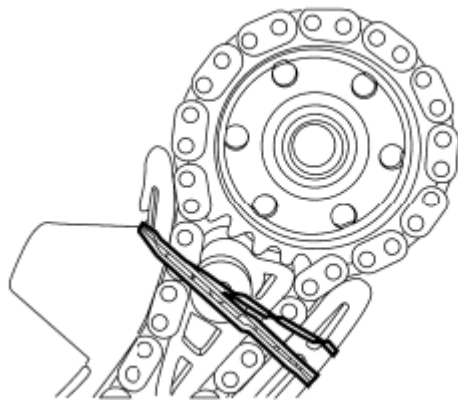
**Fig. 409: Locating 8-mm Bolts**  
 Courtesy of FORD MOTOR CO.

76. Tighten the 8 M12 bolts in the sequence shown in illustration in 2 stages.
- Stage 1: Tighten 90 degrees.
  - Stage 2: Tighten an additional 90 degrees.



**Fig. 410: Identifying Cylinder Head Bolts Tightening Sequence**  
 Courtesy of FORD MOTOR CO.

77. Position the RH camshaft sprocket.

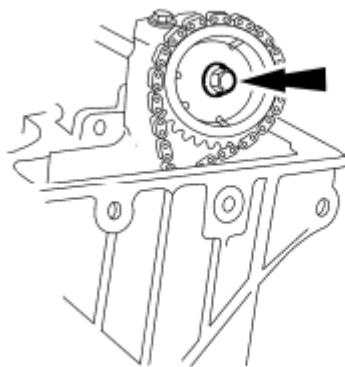


GA1724-A

**Fig. 411: Identifying RH Camshaft Sprocket**  
Courtesy of FORD MOTOR CO.

**NOTE:** The RH camshaft sprocket bolt is a LH-threaded bolt. Turning the bolt in the wrong direction can damage the bolt.

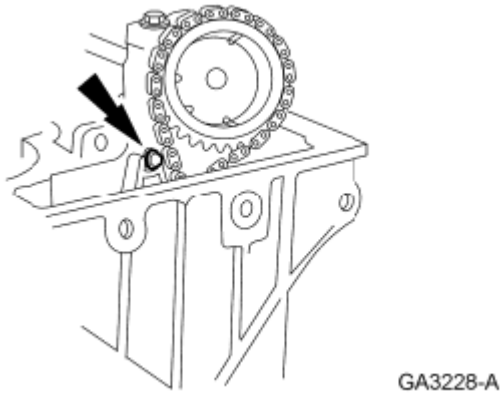
**NOTE:** The camshaft sprocket must turn freely on the camshaft. Do not tighten the bolt.



GA1667-A

**Fig. 412: Locating RH Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

78. Install and hand-tighten the RH rear camshaft sprocket bolt.
79. Install the RH cassette bolt.
  - Tighten to 10 Nm (89 lb-in).

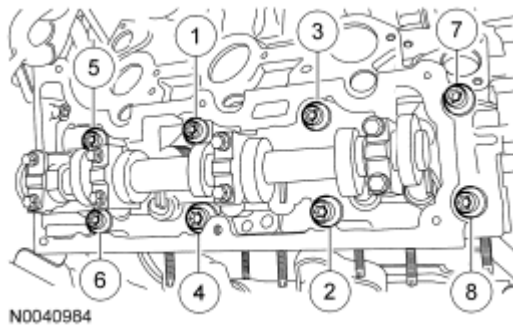


**Fig. 413: Locating RH Cassette Bolt**  
 Courtesy of FORD MOTOR CO.

**NOTE:** To avoid damage to the timing chain cassette, an assistant will be required to help position the cylinder head in the vehicle.

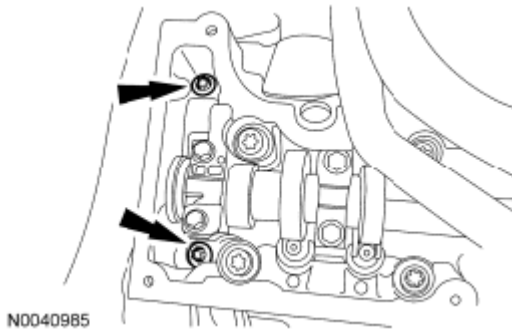
**NOTE:** New cylinder head bolts must be installed. They are a torque-to-yield design and cannot be reused.

80. Position the LH cylinder head. Install 8 new M12 bolts and tighten in the sequence shown in illustration in 2 stages.
- Stage 1: Tighten to 12 Nm (106 lb-in).
  - Stage 2: Tighten to 25 Nm (18 lb-ft).



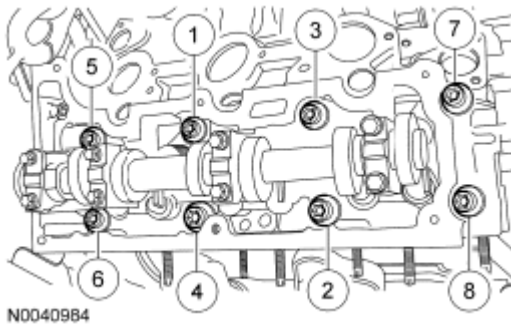
**Fig. 414: Identifying Cylinder Head Bolts Tightening Sequence**  
 Courtesy of FORD MOTOR CO.

81. Install 2 new M8 bolts.
- Tighten to 32 Nm (24 lb-ft).



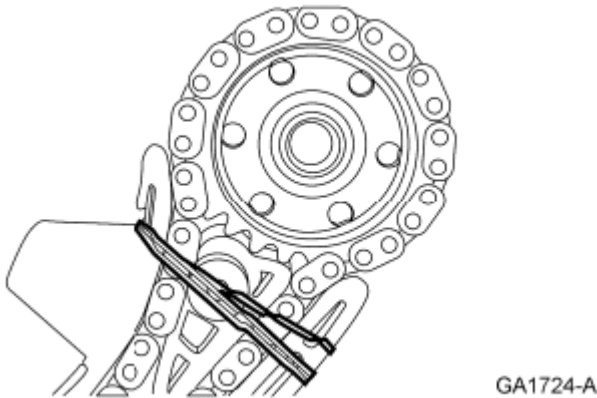
**Fig. 415: Locating 8-mm Bolts**  
Courtesy of FORD MOTOR CO.

82. Tighten the 8 M12 bolts in the sequence shown in illustration in 2 stages.
- Stage 1: Tighten 90 degrees.
  - Stage 2: Tighten an additional 90 degrees.



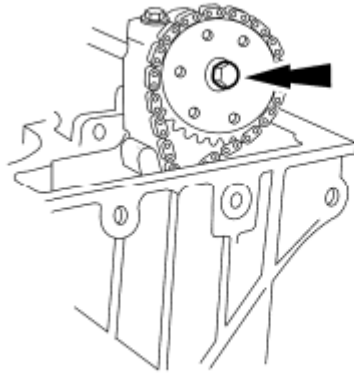
**Fig. 416: Identifying Cylinder Head Bolts Tightening Sequence**  
Courtesy of FORD MOTOR CO.

83. Position the LH camshaft sprocket.



**Fig. 417: Identifying LH Camshaft Sprocket**  
Courtesy of FORD MOTOR CO.

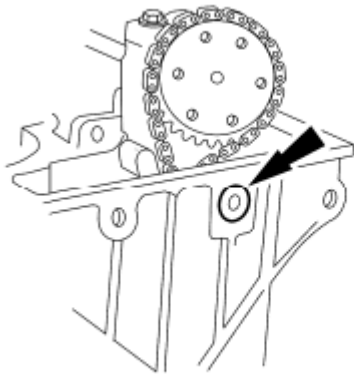
**NOTE:** The camshaft sprocket must turn freely on the camshaft. Do not tighten the bolt.



GA1669-A

**Fig. 418: Locating Camshaft Sprocket Bolt**  
Courtesy of FORD MOTOR CO.

84. Install and hand-tighten the LH camshaft sprocket bolt.
85. Install the LH cassette bolt.
  - Tighten to 12 Nm (106 lb-in).



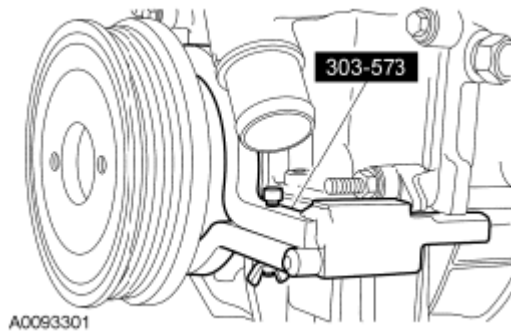
GA1670-A

**Fig. 419: Locating LH Cassette Upper Bolt**  
Courtesy of FORD MOTOR CO.

86. Turn the crankshaft one revolution clockwise.

**NOTE:** Do not rotate the engine counterclockwise. Rotating the engine counterclockwise will result in damage to the damper crank sensor speed wheel and incorrect timing of the engine.

**NOTE:** The Crankshaft TDC Timing Tool must be installed on the damper and should contact the engine block, this positions the engine at TDC .

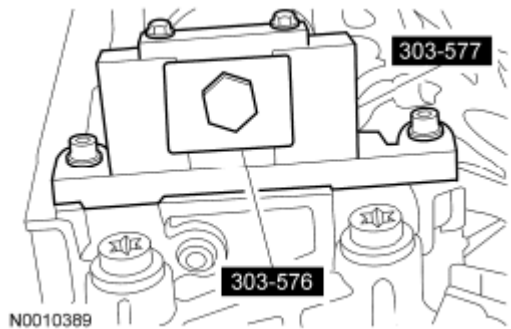


**Fig. 420: Installing Special Tool**  
Courtesy of FORD MOTOR CO.

87. Install the Crankshaft TDC Timing Tool.

**NOTE:** Camshaft timing slots are off-center.

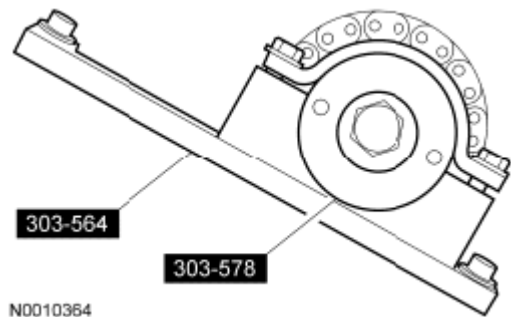
**NOTE:** Position the camshaft timing slots below centerline of camshaft to correctly fit the Camshaft Holding Tool and Adapter.



**Fig. 421: Installing Special Tools On Front Of Cylinder Head**  
Courtesy of FORD MOTOR CO.

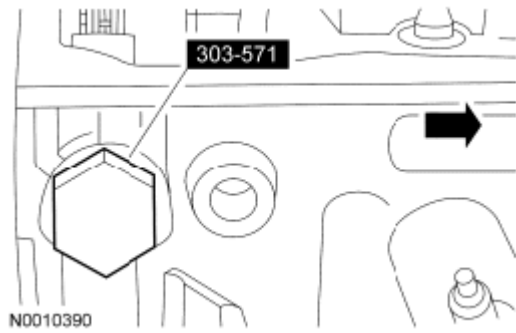
88. Install the Camshaft Holding Tool and Adapter on the front of the RH cylinder head.

**NOTE:** Leave the top 2 Camshaft Sprocket Holding Tool clamp bolts loose.



**Fig. 422: Identifying Special Holding Tool**  
Courtesy of FORD MOTOR CO.

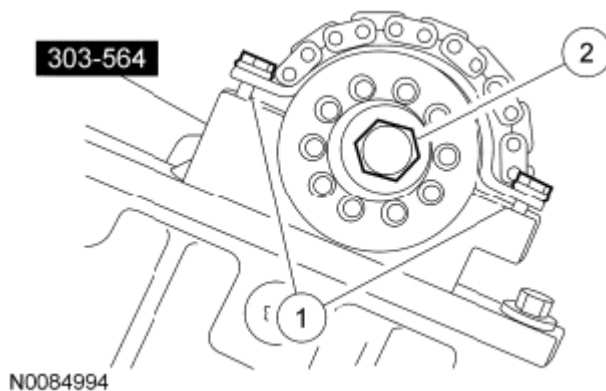
89. Install the Camshaft Sprocket Holding Tool and Adapter on the rear of the RH cylinder head.
90. Install the Timing Chain Tensioner.



**Fig. 423: Locating Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

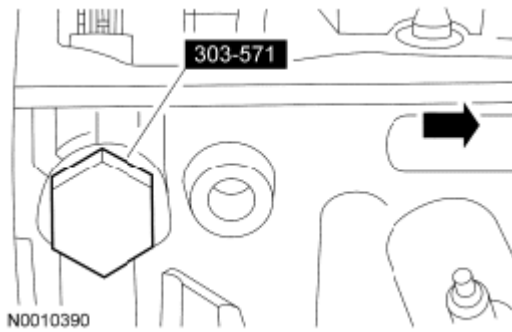
**NOTE:** The RH camshaft sprocket bolt is a LH threaded bolt.

91. Tighten the bolts.
  1. Tighten the Camshaft Sprocket Holding Tool top 2 clamp bolts to 10 Nm (89 lb-in).
  2. Tighten the camshaft bolt to 85 Nm (63 lb-ft).



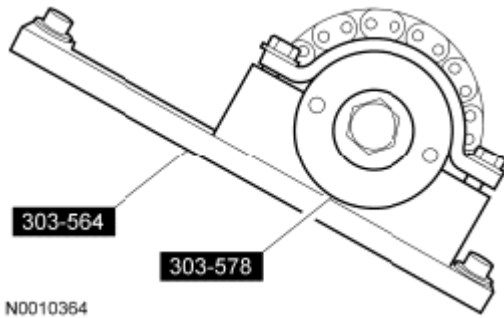
**Fig. 424: Tightening LH Camshaft Bolt**  
Courtesy of FORD MOTOR CO.

92. Remove the Timing Chain Tensioner and install the RH camshaft tensioner.
  - Tighten to 44 Nm (32 lb-ft).



**Fig. 425: Locating Timing Chain Tensioner**  
Courtesy of FORD MOTOR CO.

**NOTE:** Do not tighten the Camshaft Sprocket Holding Tool top 2 clamp bolts. Camshaft sprocket must rotate freely.

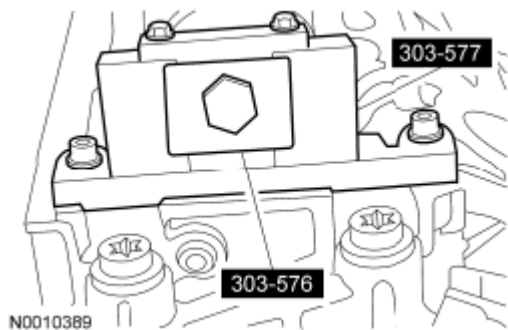


**Fig. 426: Identifying Special Holding Tool**  
Courtesy of FORD MOTOR CO.

93. Install the Camshaft Sprocket Holding Tool and Adapter on the front of the LH cylinder head.

**NOTE:** Camshaft timing slots are off-center.

**NOTE:** Position the camshaft timing slots below centerline of camshaft to correctly fit the Camshaft Holding Tool and Adapter.



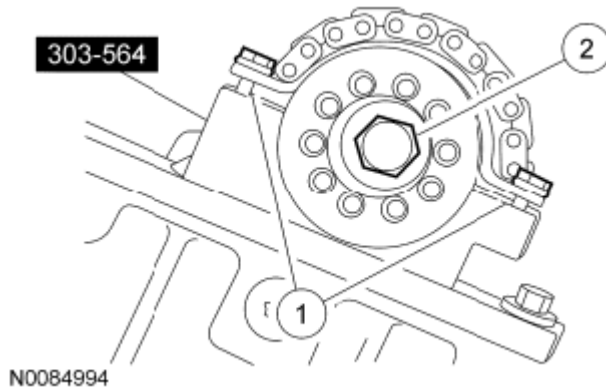
**Fig. 427: Installing Special Tools On Front Of Cylinder Head**  
 Courtesy of FORD MOTOR CO.

94. Install the Camshaft Holding Tool and Adapter on the rear of the LH cylinder head.
95. Install the Timing Chain Tensioner.



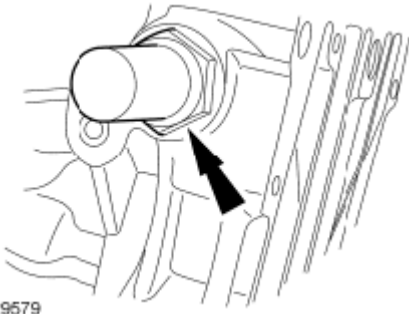
**Fig. 428: Identifying Timing Chain Tensioner**  
 Courtesy of FORD MOTOR CO.

96. Tighten the bolts.
  1. Tighten the Camshaft Sprocket Holding Tool top 2 clamp bolts to 10 Nm (89 lb-in).
  2. Tighten the camshaft bolt to 85 Nm (63 lb-ft).



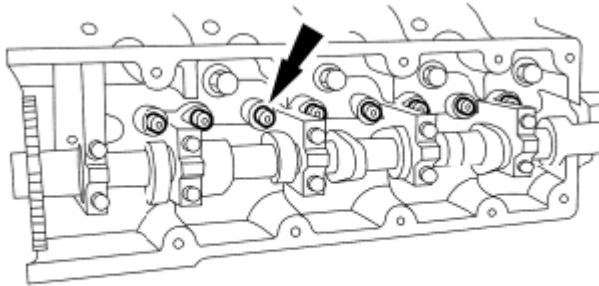
**Fig. 429: Tightening LH Camshaft Bolt**  
 Courtesy of FORD MOTOR CO.

97. Install a new washer and the LH camshaft tensioner.



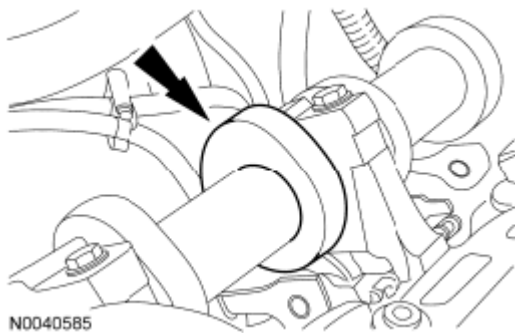
**Fig. 430: Identifying LH Camshaft Tensioner**  
Courtesy of FORD MOTOR CO.

**NOTE:** Install the hydraulic lash adjusters in the same positions from which they were removed.



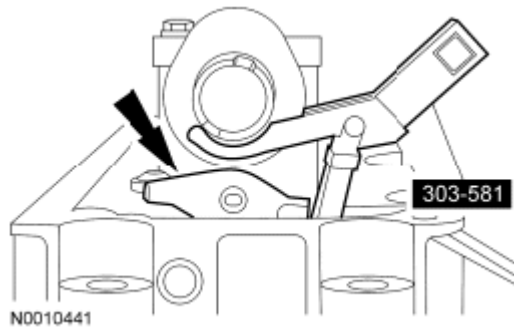
**Fig. 431: Locating Hydraulic Lash Adjuster Nut**  
Courtesy of FORD MOTOR CO.

98. Install the hydraulic lash adjusters.
99. Rotate the crankshaft until the cam lobe is in the upward position.



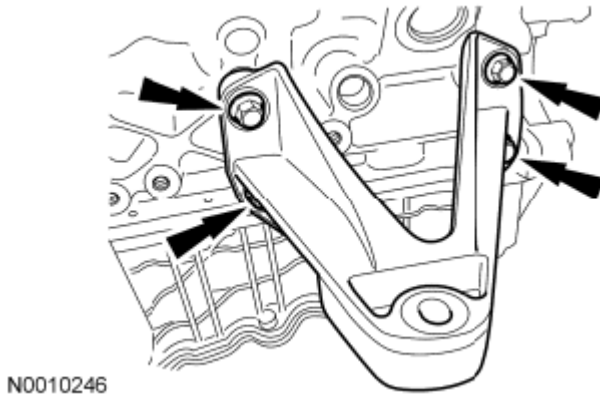
**Fig. 432: Locating Cam Lobe**  
Courtesy of FORD MOTOR CO.

**NOTE:** Lubricate the roller followers with clean engine oil.



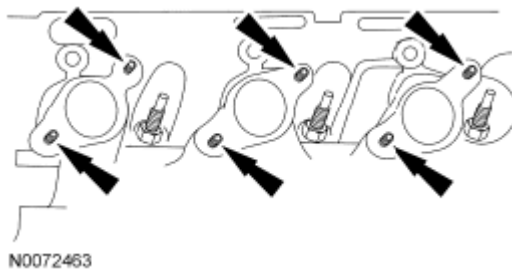
**Fig. 433: Locating Roller Followers**  
Courtesy of FORD MOTOR CO.

100. Using the Valve Spring Compressor, install the roller followers in their original positions.
101. Position the RH engine mount bracket and install the 4 bolts.
  - Tighten to 80 Nm (59 lb-ft).



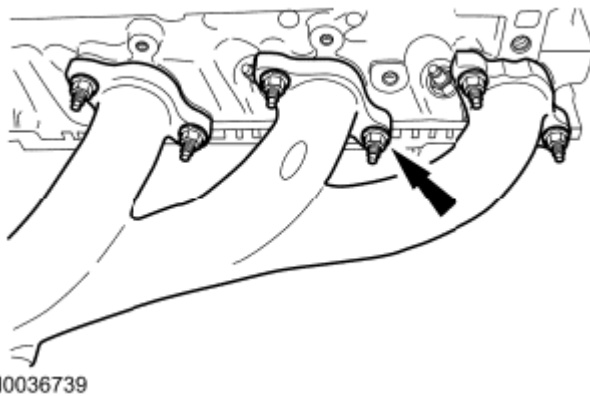
**Fig. 434: Locating Engine Mount Bracket**  
Courtesy of FORD MOTOR CO.

102. Inspect the RH and LH exhaust manifold gasket mating surfaces for flatness. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
103. Install the 6 new RH exhaust manifold studs.
  - Tighten to 12 Nm (106 lb-in).



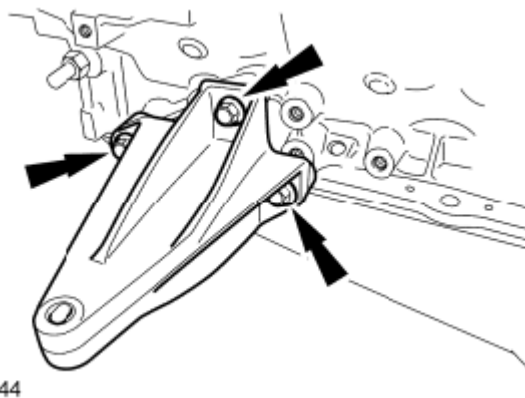
**Fig. 435: Locating RH Exhaust Manifold Studs**  
Courtesy of FORD MOTOR CO.

104. Position a new RH exhaust manifold gasket and the RH exhaust manifold. Install the 6 new nuts.
- Tighten to 23 Nm (17 lb-ft).



**Fig. 436: Identifying Exhaust Manifold**  
Courtesy of FORD MOTOR CO.

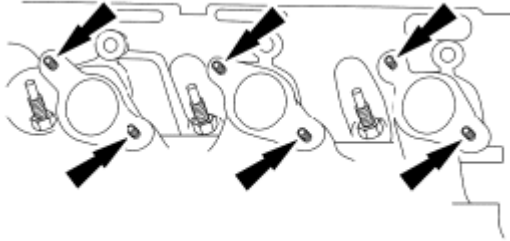
105. Position the LH engine mount bracket and install the 3 bolts.
- Tighten to 80 Nm (59 lb-ft).



**Fig. 437: Locating Engine Mount Bracket**  
Courtesy of FORD MOTOR CO.

106. Install the 6 new LH exhaust manifold studs.

- Tighten to 12 Nm (106 lb-in).

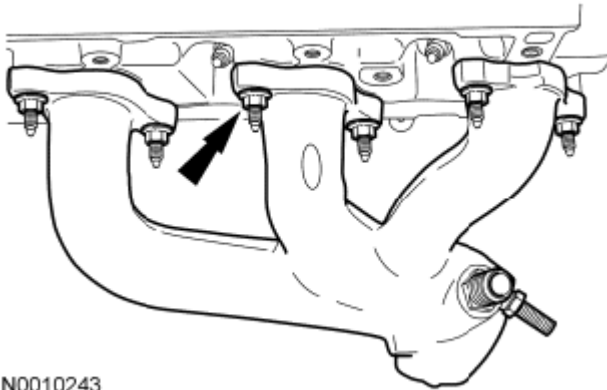


N0072449

**Fig. 438: Locating LH Exhaust Manifold Studs**  
Courtesy of FORD MOTOR CO.

107. Position a new LH exhaust manifold gasket and the LH exhaust manifold. Install the 6 new nuts.

- Tighten to 23 Nm (17 lb-ft).



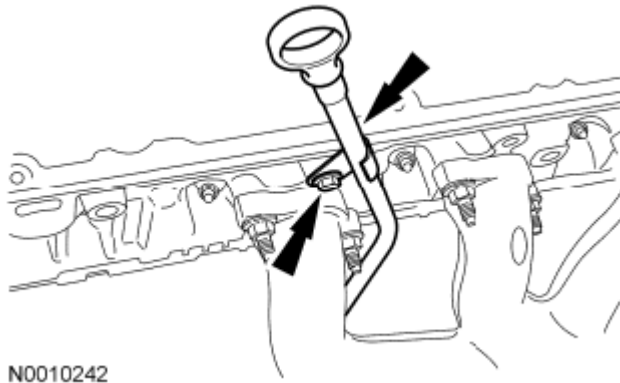
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**Fig. 439: Locating Exhaust Manifold**  
Courtesy of FORD MOTOR CO.

**NOTE:** Install a new O-ring seal on the oil level indicator tube and lubricate with clean engine oil.

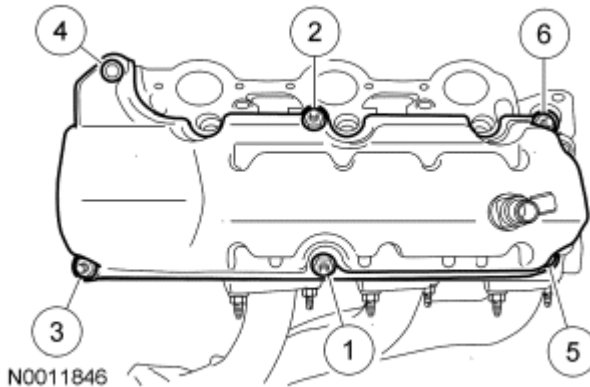
108. Position the oil level indicator tube and install the bolt.

- Tighten to 11 Nm (97 lb-in).



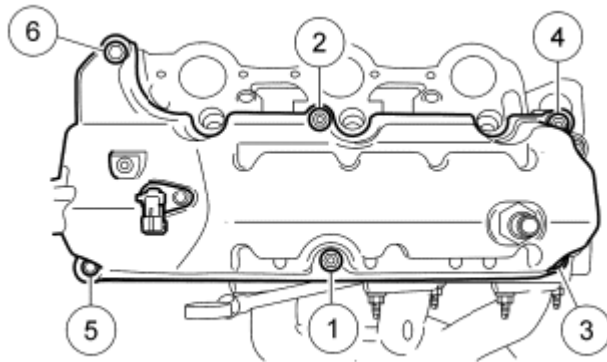
**Fig. 440: Locating Oil Level Indicator Tube And Bolt**  
 Courtesy of FORD MOTOR CO.

109. Clean the valve covers and cylinder head sealing surfaces with metal surface prep. Inspect and install new gaskets as necessary.
110. Position the RH valve cover and install the 2 bolts and the 4 stud bolts.
  - Tighten in the sequence shown to 10 Nm (89 lb-in).



**Fig. 441: Identifying Valve Cover Torque Sequence**  
 Courtesy of FORD MOTOR CO.

111. Position the LH valve cover and install the 3 bolts and the 3 stud bolts.
  - Tighten in the sequence shown to 10 Nm (89 lb-in).



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**Fig. 442: Identifying Valve Cover Torque Sequence**  
Courtesy of FORD MOTOR CO.

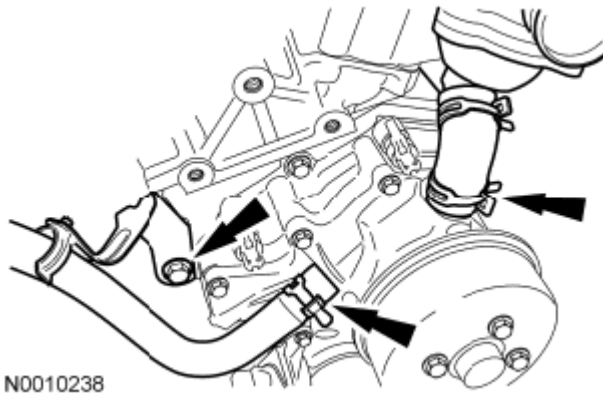
112. Position the thermostat housing, hoses and coolant tube. Install the 3 bolts.
- Tighten to 11 Nm (97 lb-in).



N0010239

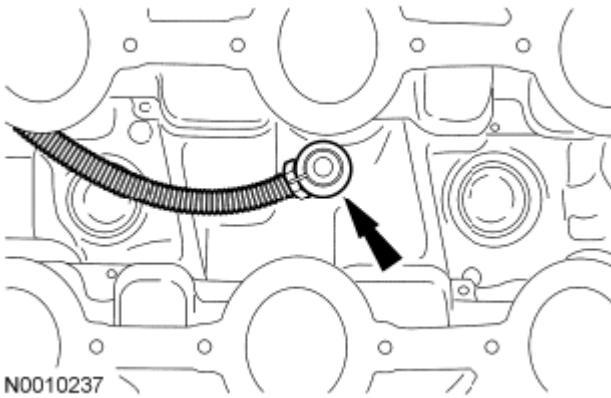
**Fig. 443: Locating Thermostat Housing Hoses And Coolant Tube**  
Courtesy of FORD MOTOR CO.

113. Connect the coolant hose to the coolant pump, position the bracket and install the bolt.
- Tighten to 45 Nm (33 lb-ft).



**Fig. 444: Identifying Coolant Hose On Coolant Pump**  
Courtesy of FORD MOTOR CO.

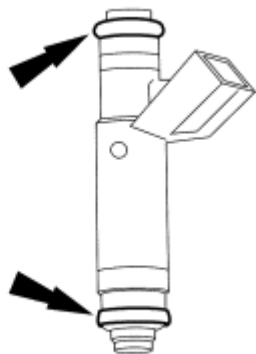
114. Position the Knock Sensor (KS) and install the bolt.
- Tighten to 20 Nm (177 lb-in).



**Fig. 445: Locating Bolt And Knock Sensor**  
Courtesy of FORD MOTOR CO.

**NOTE:** Use O-ring seals that are made of special fuel-resistant material. Use of ordinary O-rings seals can cause the fuel system to leak. Do not reuse the O-ring seals.

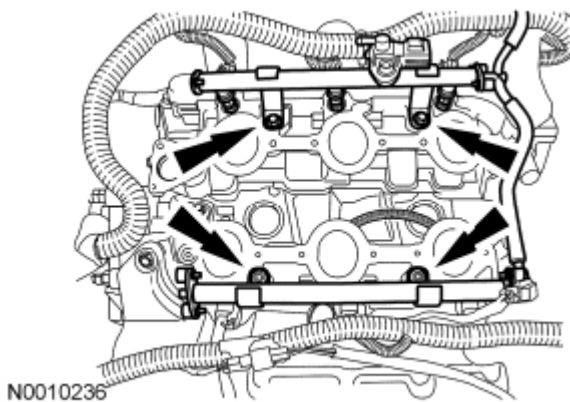
**NOTE:** Lubricate the O-ring seals with clean engine oil.



AV1418-A

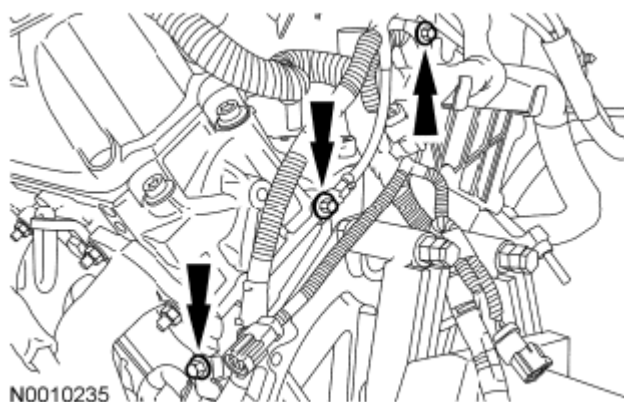
**Fig. 446: Locating O-ring Seals**  
Courtesy of FORD MOTOR CO.

115. Install new O-ring seals on the 6 fuel injectors.
116. Position the fuel rail and injectors and install the 4 bolts.
  - Tighten to 23 Nm (17 lb-ft).



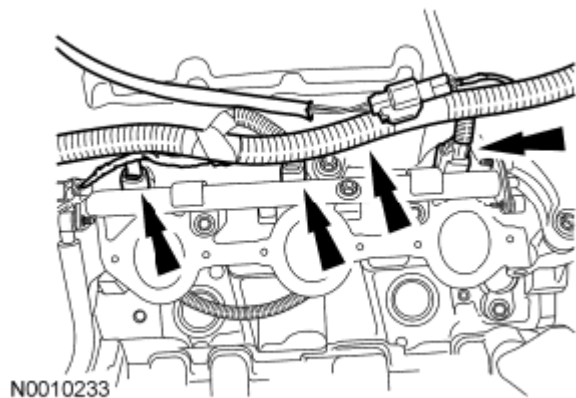
**Fig. 447: Locating Fuel Rail And Injectors**  
Courtesy of FORD MOTOR CO.

117. Position the main engine wiring harness on the engine and install the 3 bolts.
  - Tighten to 40 Nm (30 lb-ft).
  - Attach the wiring retainers.



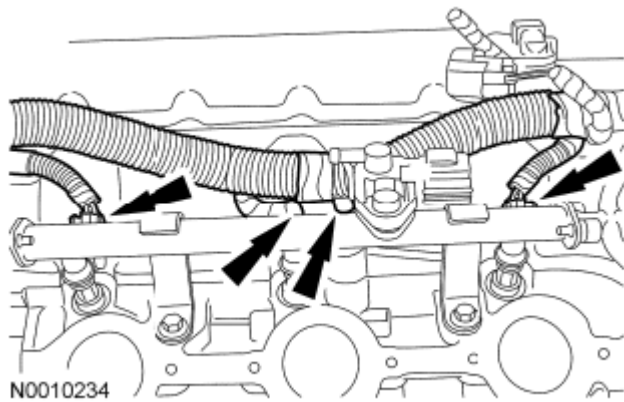
**Fig. 448: Locating Main Engine Wiring Harness**  
Courtesy of FORD MOTOR CO.

118. Connect the 3 RH fuel injector electrical connectors and attach the wiring retainer to the valve cover stud bolt.



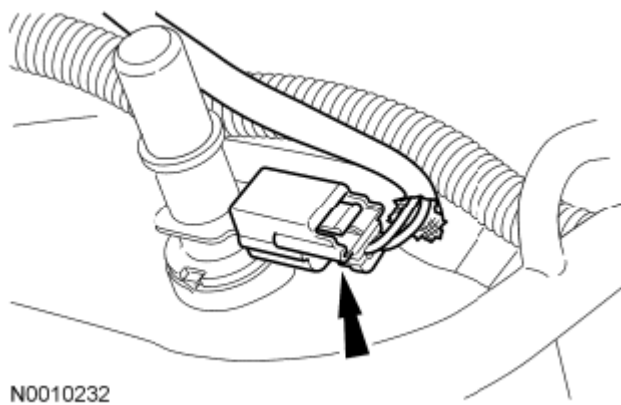
**Fig. 449: Locating Fuel Injector Electrical Connectors**  
Courtesy of FORD MOTOR CO.

119. Connect the 3 LH fuel injector electrical connectors and attach the wiring retainer to the valve cover stud bolt.



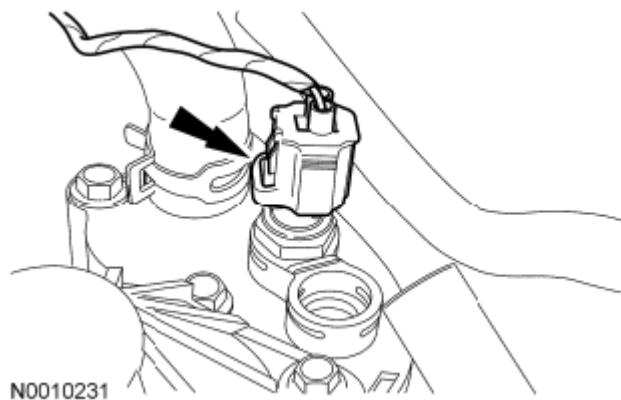
**Fig. 450: Locating Fuel Injector Electrical Connectors**  
Courtesy of FORD MOTOR CO.

120. Connect the PCV valve electrical connector.



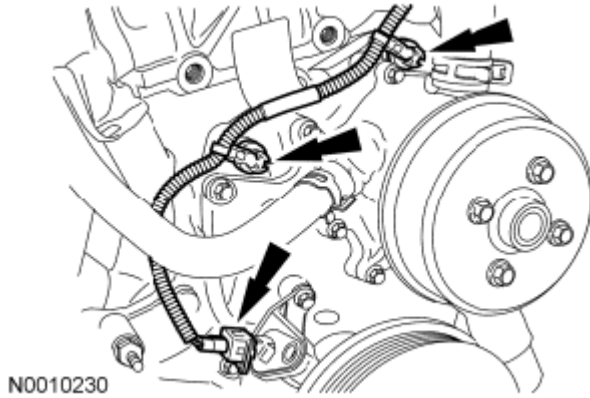
**Fig. 451: Locating PCV Valve Electrical Connector**  
Courtesy of FORD MOTOR CO.

121. Connect the Engine Coolant Temperature (ECT) sensor electrical connector.



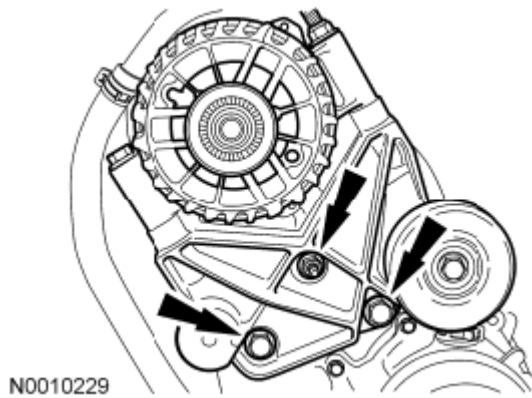
**Fig. 452: Locating Engine Coolant Temperature (ECT) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

122. Connect the Crankshaft Position (CKP) sensor electrical connector and attach the 2 wiring retainers.



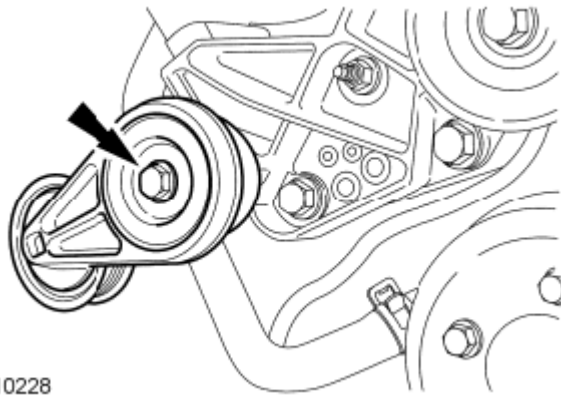
**Fig. 453: Locating Crankshaft Position (CKP) Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

123. Position the generator and bracket. Install the 2 bolts and the nut.
- Tighten to 47 Nm (35 lb-ft).



**Fig. 454: Locating Generator And Bracket**  
Courtesy of FORD MOTOR CO.

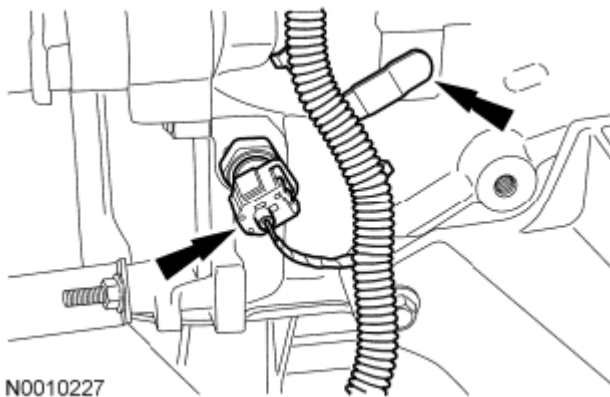
124. Install the accessory drive belt tensioner and the bolt.
- Tighten to 47 Nm (35 lb-ft).



N0010228

**Fig. 455: Locating Accessory Drive Belt Tensioner And Bolt**  
Courtesy of FORD MOTOR CO.

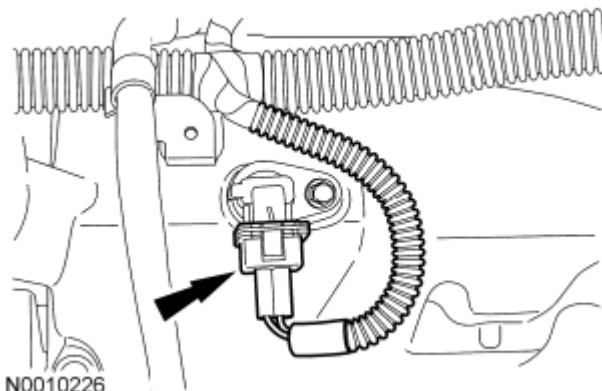
125. Connect the Engine Oil Pressure (EOP) switch electrical connector and attach the wiring retainer.



N0010227

**Fig. 456: Locating Oil Pressure Sensor Electrical Connector**  
Courtesy of FORD MOTOR CO.

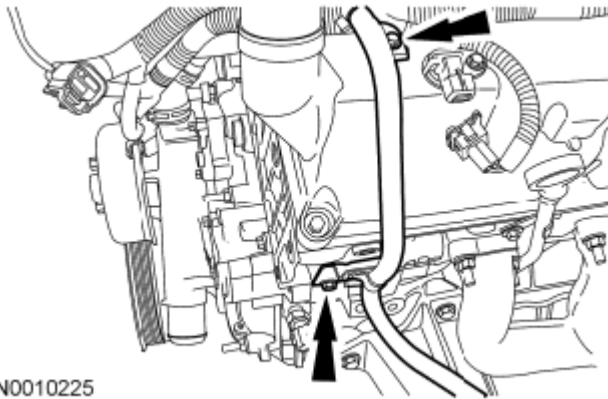
126. Connect the Camshaft Position (CMP) electrical connector.



N0010226

**Fig. 457: Locating Camshaft Position (CMP) Electrical Connector**  
Courtesy of FORD MOTOR CO.

127. Position the fuel rail supply tube brackets and install the 2 bolts.
- Tighten the bolt for the upper bracket to 6 Nm (53 lb-in).
  - Tighten the bolt for the lower bracket to 10 Nm (89 lb-in).

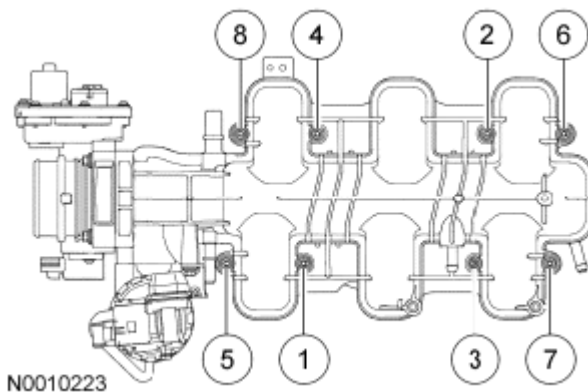


**Fig. 458: Locating Fuel Supply Tube Bracket Bolts**  
Courtesy of FORD MOTOR CO.

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

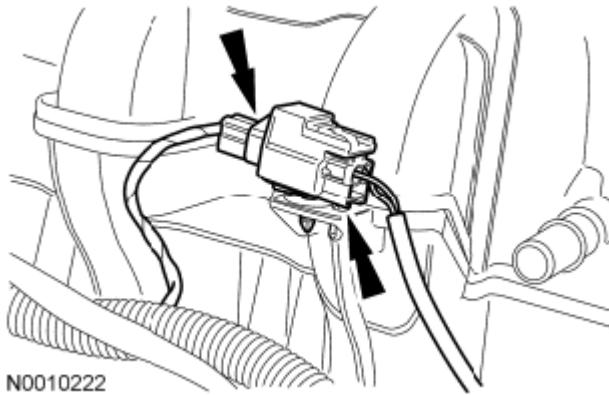
**NOTE:** Clean and inspect all sealing surfaces. Inspect and install new intake manifold gaskets as necessary.

128. Position the intake manifold and install the 8 bolts.
- Tighten in the sequence shown to 10 Nm (89 lb-in).



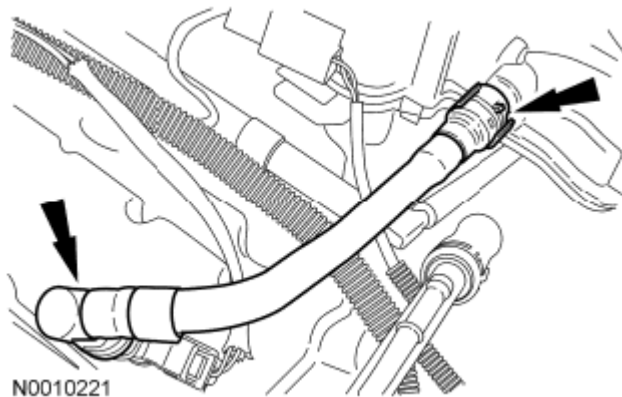
**Fig. 459: Identifying Intake Manifold Bolt Torque Sequence**  
 Courtesy of FORD MOTOR CO.

129. Connect the KS electrical connector and attach the wiring retainer.



**Fig. 460: Locating Knock Sensor (KS) Electrical Connector**  
 Courtesy of FORD MOTOR CO.

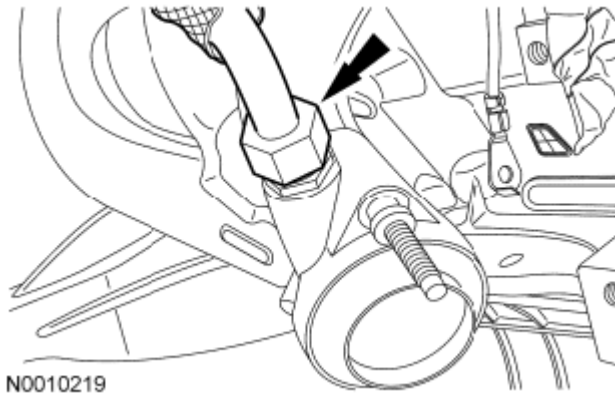
130. Install the PCV tube.



**Fig. 461: Locating Positive Crankcase Ventilation (PCV) Tube Fittings**  
 Courtesy of FORD MOTOR CO.

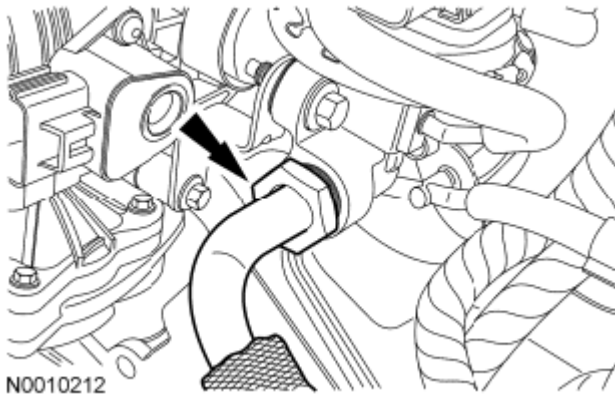
131. Position the EGR tube. Connect the fitting to the LH exhaust manifold.

- Tighten to 40 Nm (30 lb-ft).



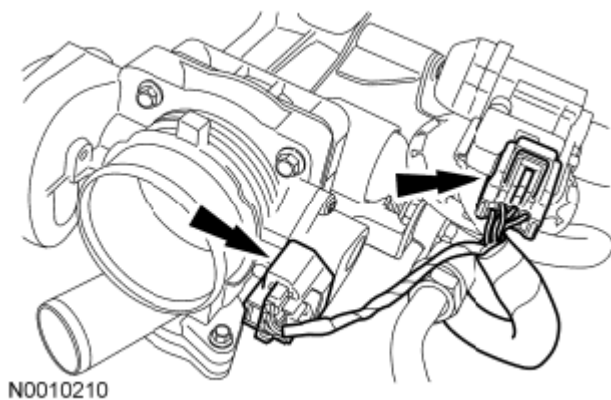
**Fig. 462: Locating Exhaust Gas Recirculation (EGR) Tube**  
Courtesy of FORD MOTOR CO.

132. Connect the EGR tube fitting to the EGR system module.
  - Tighten to 40 Nm (30 lb-ft).



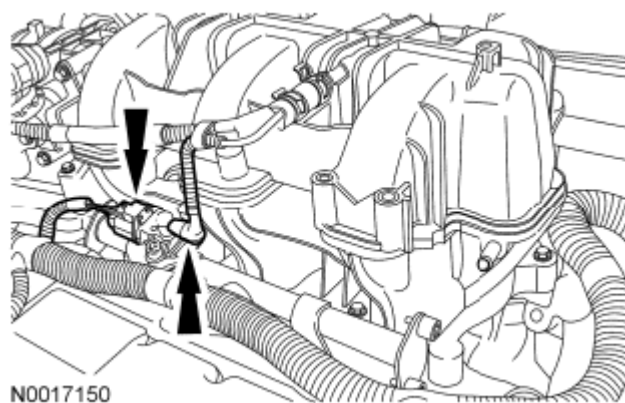
**Fig. 463: Locating EGR Tube Fitting On EGR System Module**  
Courtesy of FORD MOTOR CO.

133. Connect the EGR system module and Throttle Position (TP) sensor electrical connectors.



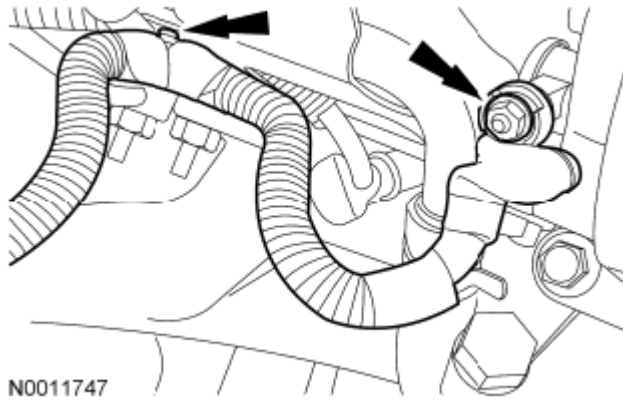
**Fig. 464: Locating EGR System Module And Throttle Position (TP) Sensor Electrical Connectors**  
Courtesy of FORD MOTOR CO.

134. Connect the fuel rail pressure and temperature sensor electrical connector and the vacuum tube.



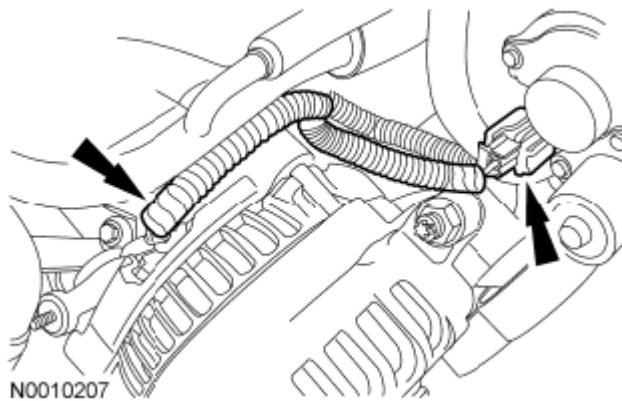
**Fig. 465: Locating Fuel Rail Pressure And Temperature Sensor Electrical Connector And Vacuum Tube**  
Courtesy of FORD MOTOR CO.

135. Attach the B+ terminal to the generator and install the nut.
- Tighten to 8 Nm (71 lb-in).
  - Attach the wiring retainer to the generator.



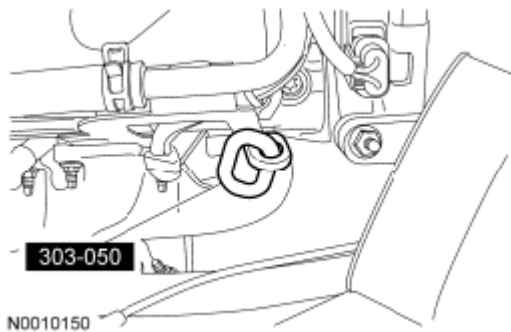
**Fig. 466: Locating Wiring Retainer On Generator**  
Courtesy of FORD MOTOR CO.

136. Connect the generator and Throttle Body (TB) electrical connectors.



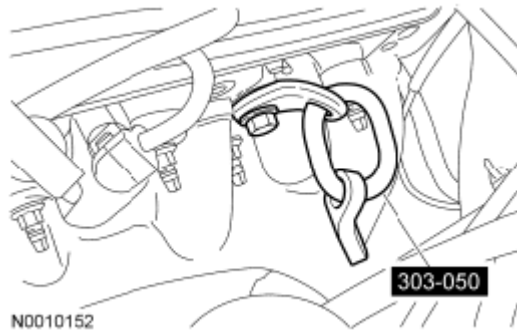
**Fig. 467: Locating Generator And Throttle Body Electrical Connectors**  
Courtesy of FORD MOTOR CO.

137. Install the Engine Lifting Bracket to the RH cylinder head.



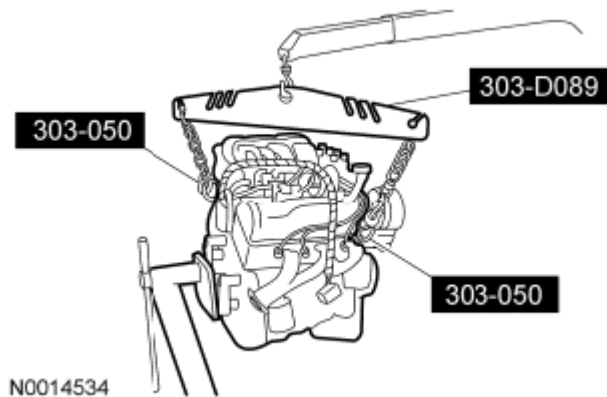
**Fig. 468: Installing Special Tool To RH Cylinder Head**  
Courtesy of FORD MOTOR CO.

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



**Fig. 469: Identifying Special Tool On Engine**  
Courtesy of FORD MOTOR CO.

139. Using the Spreader Bar and Engine Lifting Brackets, remove the engine from the engine stand.

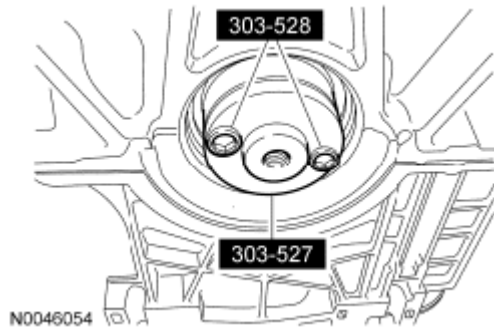


**Fig. 470: Removing Engine From Engine Stand**  
Courtesy of FORD MOTOR CO.

**NOTE:** The new replacement crankshaft rear seal comes with a speedy sleeve. Do not remove the speedy sleeve, it must be installed with the crankshaft rear seal.

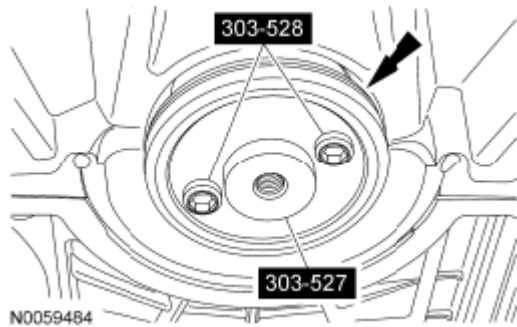
**NOTE:** Be sure the crankshaft rear sealing surface is clean and free from any rust or corrosion. To clean the crankshaft rear seal surface area, use extra-fine emery cloth or extra-fine 0000 steel wool with metal surface prep.

140. Lubricate the crankshaft rear oil seal with clean engine oil.  
141. Install the Crankshaft Rear Oil Seal Screws and Adapter.



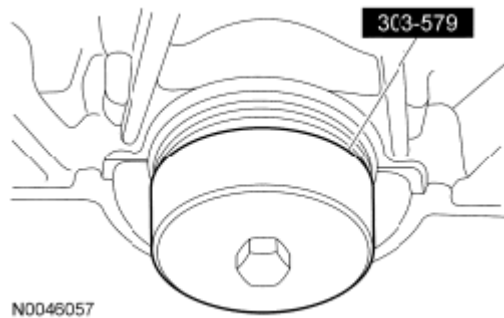
**Fig. 471: Installing Special Tools**  
 Courtesy of FORD MOTOR CO.

142. Position the crankshaft rear oil seal with speedy sleeve around the Crankshaft Rear Oil Seal Screws and Adapter.



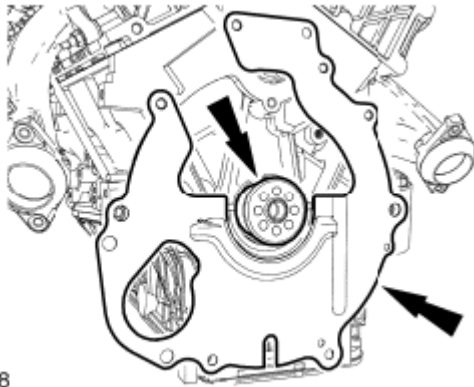
**Fig. 472: Identifying Crankshaft Rear Oil Seal Screws**  
 Courtesy of FORD MOTOR CO.

143. Using the Crankshaft Rear Oil Seal Installer, install the crankshaft rear oil seal with speedy sleeve.



**Fig. 473: Installing Crankshaft Rear Seal With Speedy Sleeve**  
 Courtesy of FORD MOTOR CO.

144. Install the spacer plate and if equipped, the flexplate-to-crankshaft spacer.



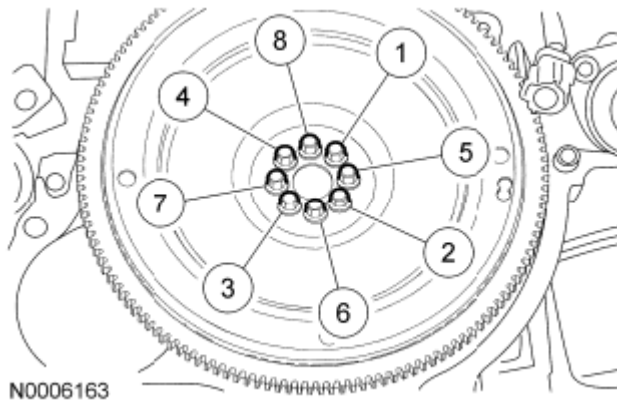
N0011768

**Fig. 474: Locating Spacer Plate**  
 Courtesy of FORD MOTOR CO.

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

145. Install the flexplate or flywheel.

- Tighten the bolts in the sequence shown in illustration in 3 stages.
  - Stage 1: Tighten to 13 Nm (115 lb-in).
  - Stage 2: Tighten to 50 Nm (37 lb-ft).
  - Stage 3: Tighten an additional 90 degrees.



N0006163

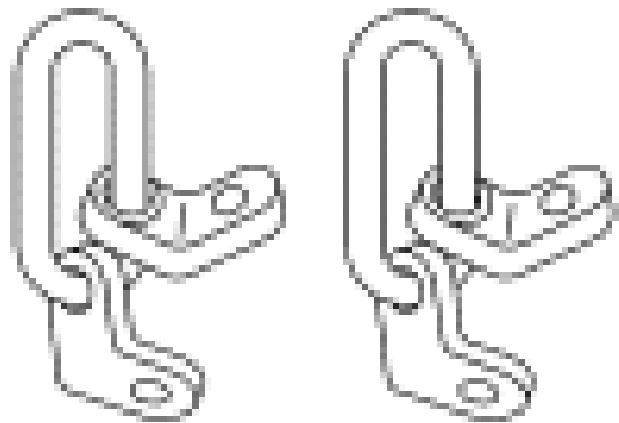
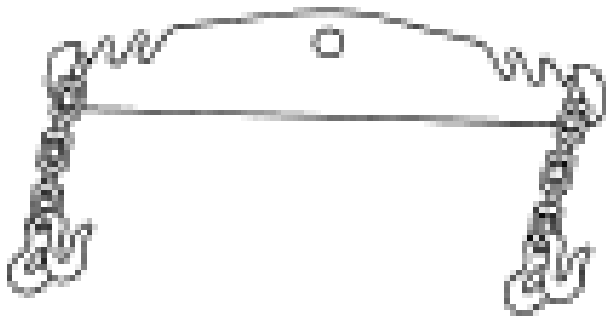
**Fig. 475: Identifying Flexplate Torque Sequence**  
 Courtesy of FORD MOTOR CO.

## INSTALLATION

### ENGINE

#### Special Tool(s)

**SPECIAL TOOLS DESCRIPTION CHART**

 <p><b>ST1595-A</b></p>	<p>Lifting Bracket, Engine 303-050 (T70P-6000)</p>
 <p><b>ST1602-A</b></p>	<p>Spreader Bar 303-D089 (D93P-6001-A3) or equivalent</p>

**Material**

**MATERIAL SPECIFICATIONS**

Item	Specification
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A
Silicone Brake Caliper Grease and Dielectric Compound	ESE-M1C171-

XG-3-A

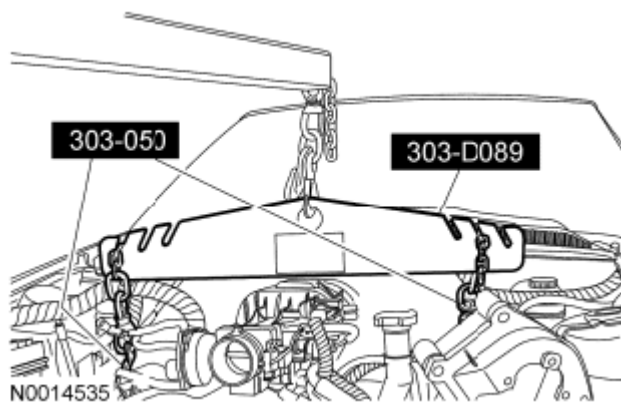
A

**Installation**

**NOTE:** Rotating the crankshaft pulley bolt counterclockwise could cause a reduction in clamp load on the crankshaft pulley and timing sprocket, which could cause severe engine damage.

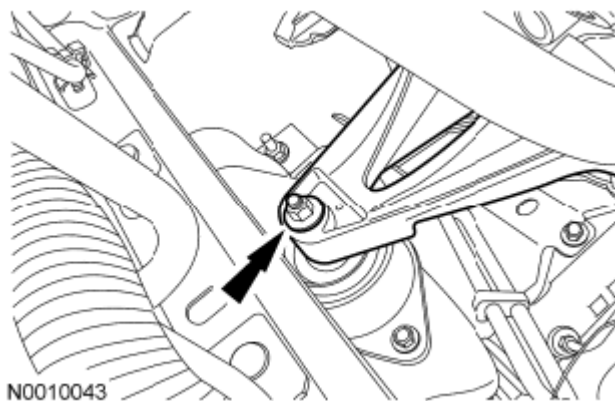
**All vehicles**

1. Using the Spreader Bar and Engine Lifting Bracket, position the engine in the vehicle.



**Fig. 476: Positioning Engine In Vehicle**  
Courtesy of FORD MOTOR CO.

2. Install the RH engine mount nut.
  - Tighten to 63 Nm (46 lb-ft).



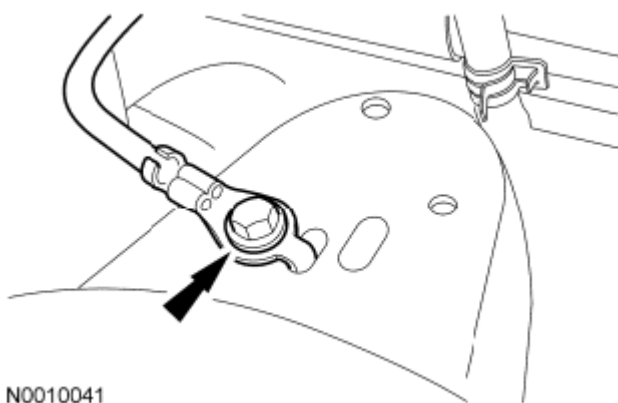
**Fig. 477: Locating Engine Mount Nut**  
Courtesy of FORD MOTOR CO.

3. Install the LH engine mount nut.
  - Tighten to 63 Nm (46 lb-ft).



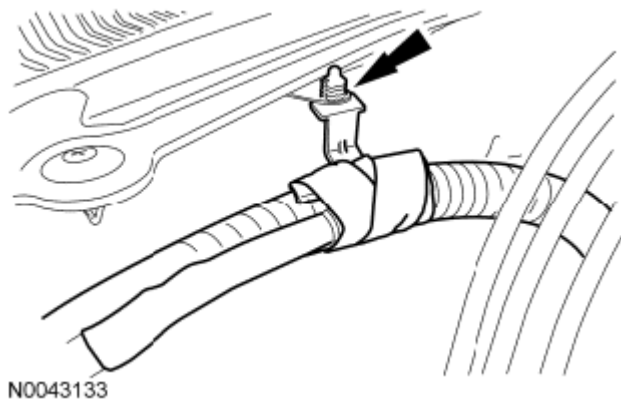
**Fig. 478: Locating Engine Mount Nut**  
Courtesy of FORD MOTOR CO.

4. Attach the ground cable to the RH strut tower and install the bolt.
  - Tighten to 10 Nm (89 lb-in).



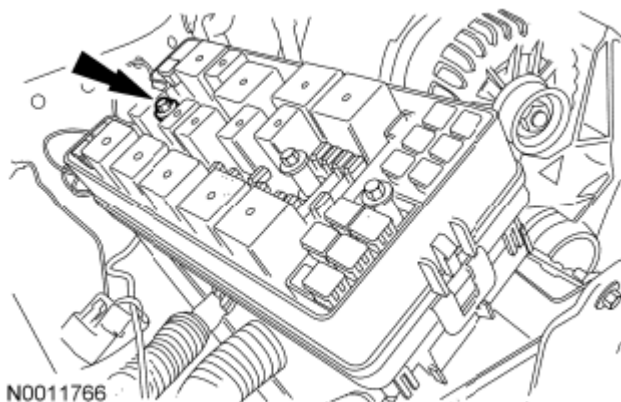
**Fig. 479: Locating Ground Cable On Strut Tower**  
Courtesy of FORD MOTOR CO.

5. Attach the battery cable harness pin-type retainer to the cowl.



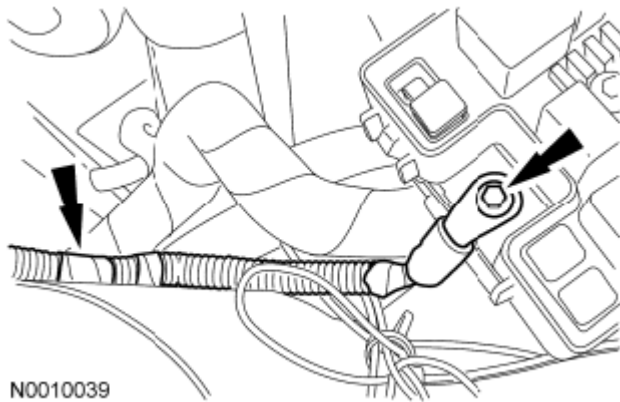
**Fig. 480: Locating Battery Cable Harness Pin-Type Retainer To Cowl**  
Courtesy of FORD MOTOR CO.

6. Connect the 68-pin connector to the Power Distribution Box (PDB) and tighten the bolt.
  - Tighten to 6 Nm (53 lb-in).
  - Attach the **PDB** upper housing to the lower housing.



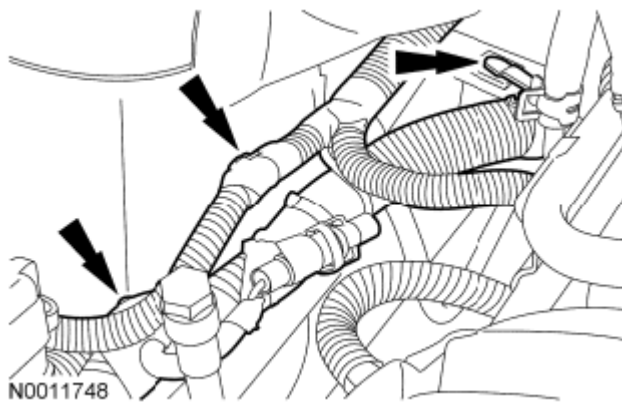
**Fig. 481: Locating Power Distribution Box Upper Housing**  
Courtesy of FORD MOTOR CO.

7. Attach the B+ terminal to the **PDB** and install the bolt.
  - Tighten to 12 Nm (106 lb-in).
  - Attach the pin-type retainer from the strut tower.



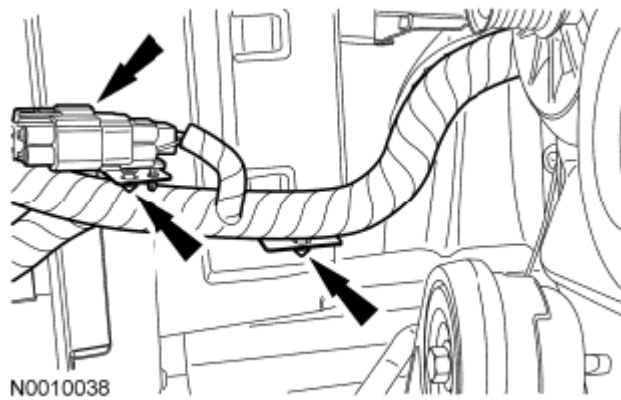
**Fig. 482: Locating Pin-Type Retainer**  
Courtesy of FORD MOTOR CO.

8. Install the **PDB** cover.
9. Attach the 3 wiring harness retainers.



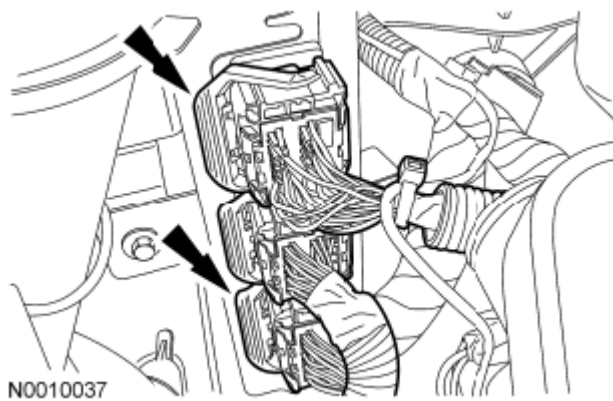
**Fig. 483: Locating Wiring Harness Retainers**  
Courtesy of FORD MOTOR CO.

10. Connect the 16-pin electrical connector and attach the 2 wiring retainers.



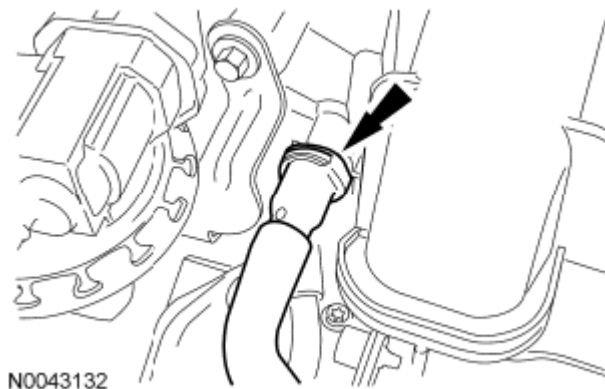
**Fig. 484: Locating 16-Pin Electrical Connector**  
Courtesy of FORD MOTOR CO.

11. Connect the upper and lower PCM electrical connectors.



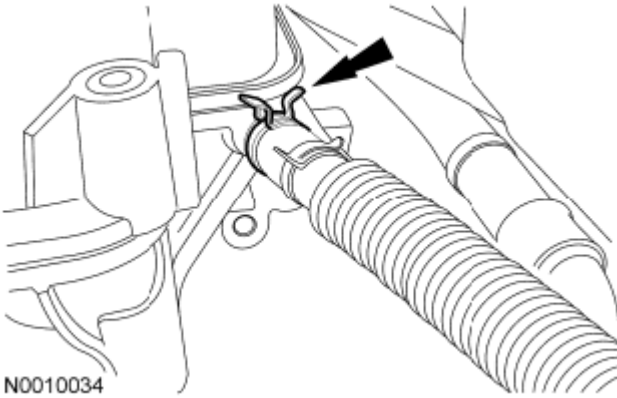
**Fig. 485: Locating Upper And Lower Powertrain Control Module (PCM) Electrical Connectors**  
Courtesy of FORD MOTOR CO.

12. Connect the fuel vapor vent tube to the intake manifold.



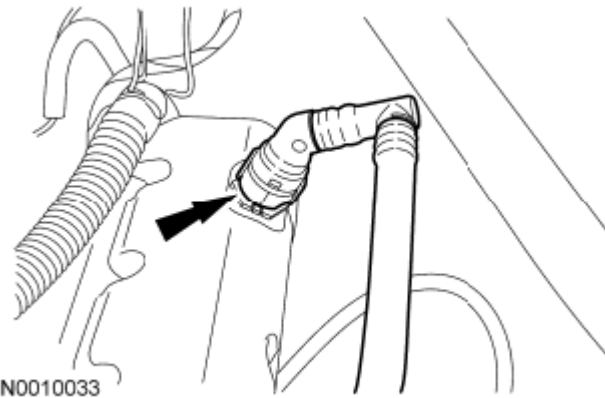
**Fig. 486: Locating Fuel Vapor Vent Tube To Intake Manifold**  
 Courtesy of FORD MOTOR CO.

13. Connect the brake booster vacuum hose to the upper intake manifold.



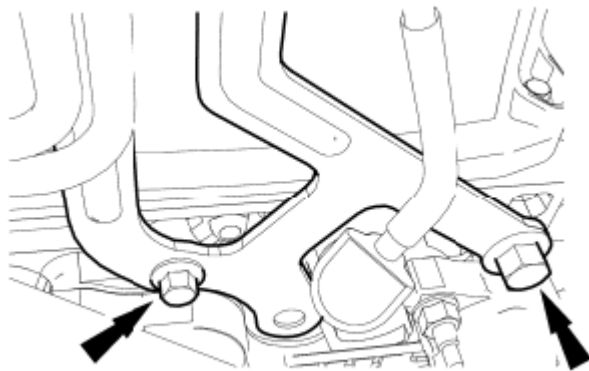
**Fig. 487: Locating Brake Booster Vacuum Hose On Upper Intake Manifold**  
 Courtesy of FORD MOTOR CO.

14. Attach the crankcase vent tube to the LH valve cover.



**Fig. 488: Locating Crankcase Vent Tube**  
 Courtesy of FORD MOTOR CO.

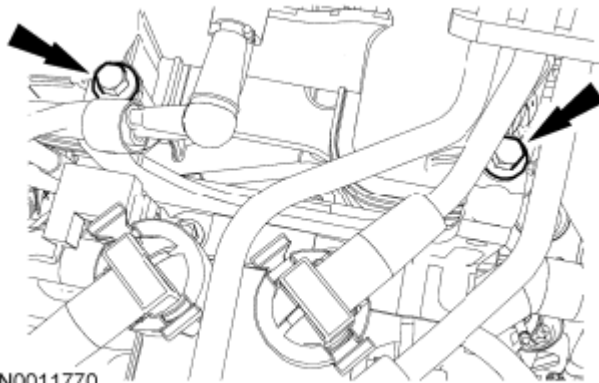
15. Position the ignition coil and spark plug wires and install the 2 bolts.
- Tighten the M8 bolt to 24 Nm (18 lb-ft).
  - Tighten the M12 bolt to 34 Nm (25 lb-ft).



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**Fig. 489: Locating Ignition Coil Bracket Bolts**  
Courtesy of FORD MOTOR CO.

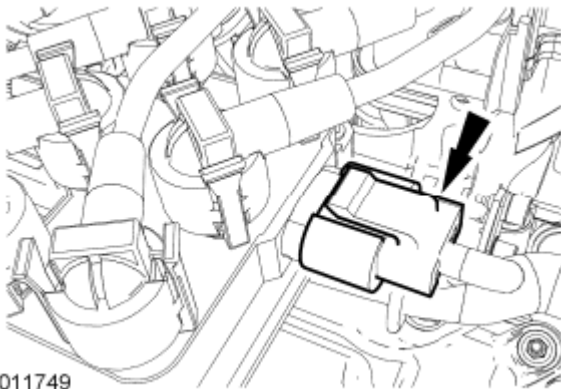
16. Install the 2 upper ignition coil bracket bolts.
  - Tighten to 9 Nm (80 lb-in).



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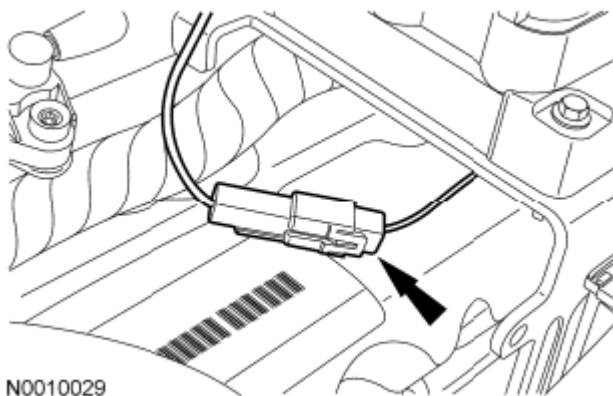
**Fig. 490: Locating Upper Ignition Coil Bracket Bolts**  
Courtesy of FORD MOTOR CO.

17. Connect the ignition coil electrical connector.



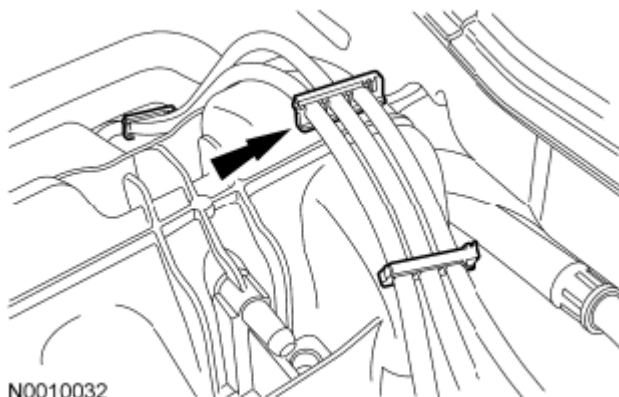
**Fig. 491: Locating Ignition Coil Electrical Connector**  
Courtesy of FORD MOTOR CO.

18. Connect the radio ignition interference capacitor electrical connector.



**Fig. 492: Locating Radio Ignition Interference Capacitor Electrical Connector**  
Courtesy of FORD MOTOR CO.

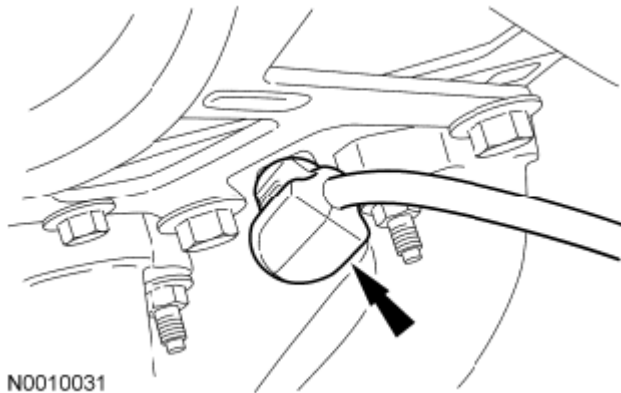
19. Attach the spark plug wire retainer to the intake manifold.



**Fig. 493: Locating Spark Plug Wire Retainer On Intake Manifold**  
Courtesy of FORD MOTOR CO.

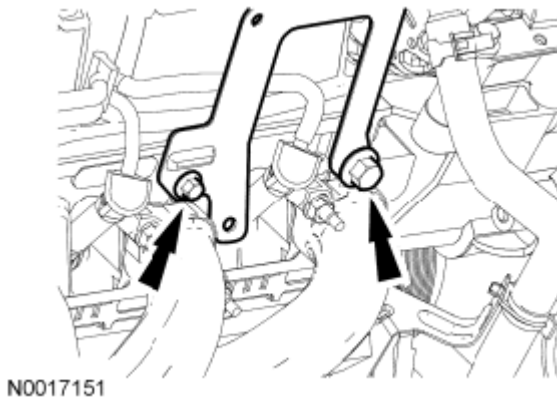
**NOTE:** Apply a light film of silicone brake caliper grease and dielectric compound to the inside of the spark plug wire boots before installation.

20. Connect the 6 spark plug wires to the spark plugs.
  - Attach the retainers to the valve cover stud bolts and the ignition coil bracket.



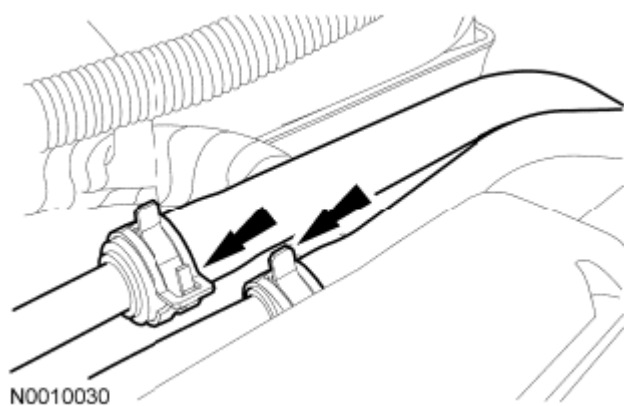
**Fig. 494: Connecting Spark Plug Wires**  
Courtesy of FORD MOTOR CO.

21. Install the 2 coolant tube bracket bolts.
  - Tighten the M12 bolt to 34 Nm (25 lb-ft).
  - Tighten the M8 bolt to 23 Nm (17 lb-ft).



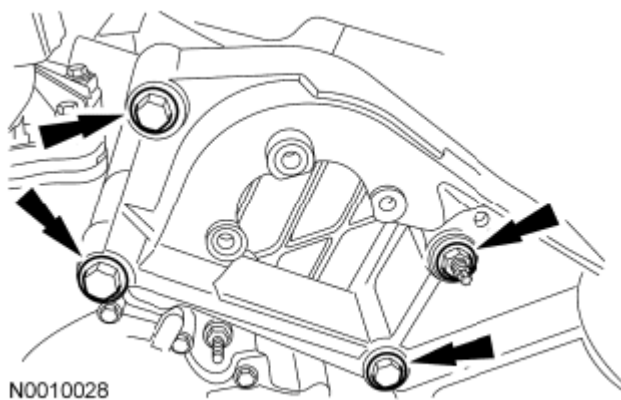
**Fig. 495: Locating Coolant Tube Bracket Bolts**  
Courtesy of FORD MOTOR CO.

22. Connect the 2 heater hoses to the coolant tube.



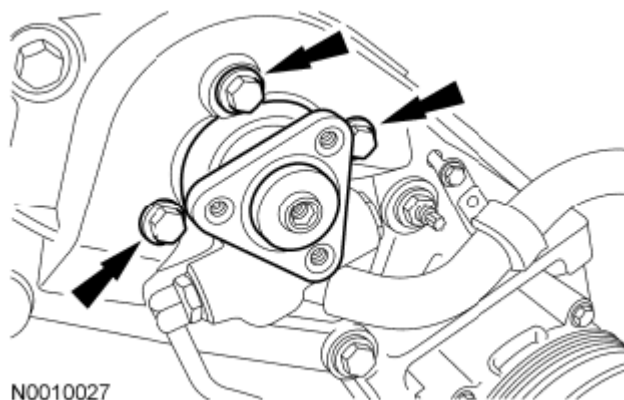
**Fig. 496: Locating Heater Hoses On Coolant Tube**  
Courtesy of FORD MOTOR CO.

23. Position the Front End Accessory Drive (FEAD) bracket and A/C compressor. Install the 3 bolts and the nut.
- Tighten to 48 Nm (35 lb-ft).



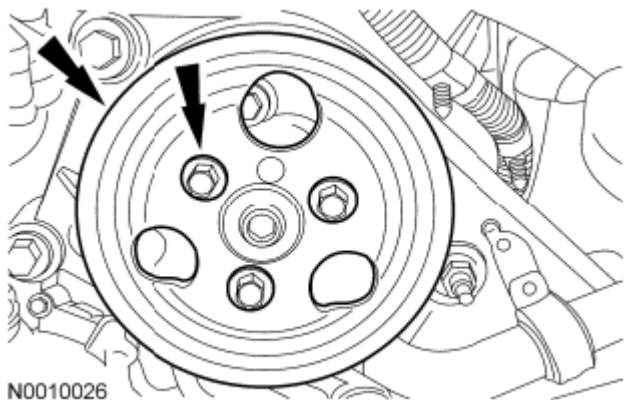
**Fig. 497: Positioning Front Engine Accessory Drive (FEAD) Bracket**  
Courtesy of FORD MOTOR CO.

24. Position the power steering pump and install the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).



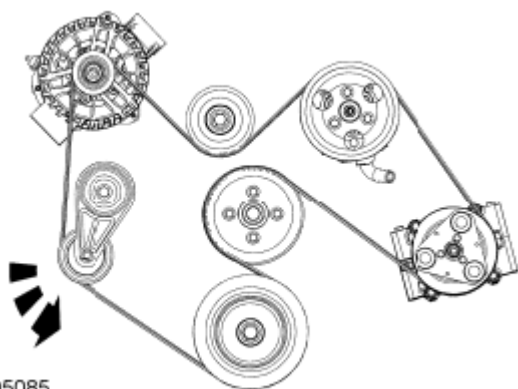
**Fig. 498: Locating Power Steering Pump**  
Courtesy of FORD MOTOR CO.

25. Position the power steering pump pulley and install the 3 bolts.
  - Do not tighten at this time.



**Fig. 499: Locating Power Steering Pump Pulley**  
Courtesy of FORD MOTOR CO.

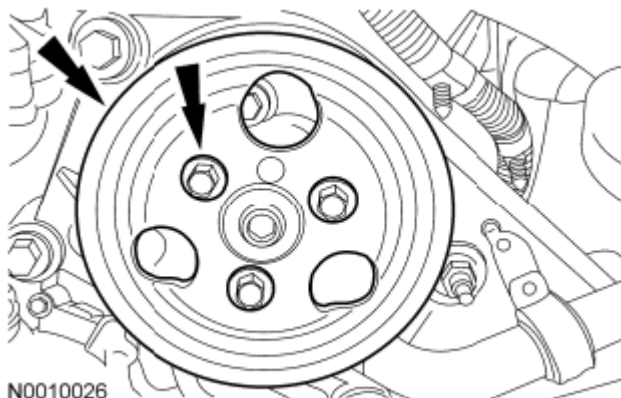
26. Rotate the accessory drive belt tensioner counterclockwise and install the accessory drive belt.



N0005085

**Fig. 500: Identifying Accessory Drive Belt Routing - 4.0L SOHC**  
Courtesy of FORD MOTOR CO.

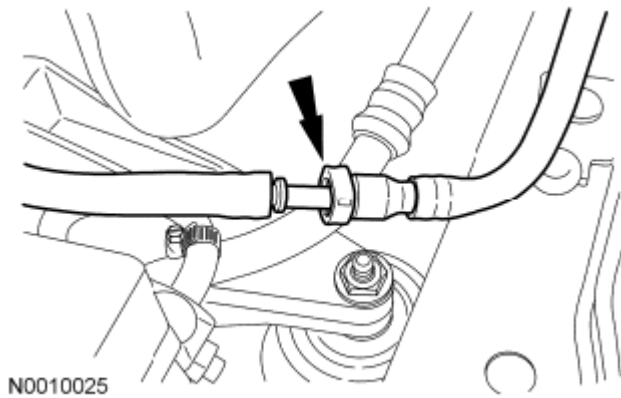
27. Tighten the 3 power steering pulley bolts.
  - Tighten to 25 Nm (18 lb-ft).



N0010026

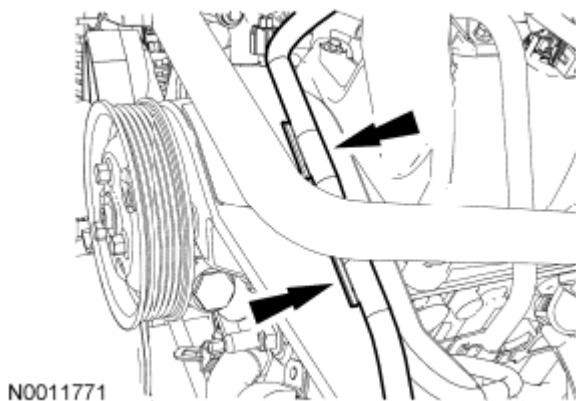
**Fig. 501: Locating Power Steering Pump Pulley**  
Courtesy of FORD MOTOR CO.

28. Connect the fuel supply tube coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .



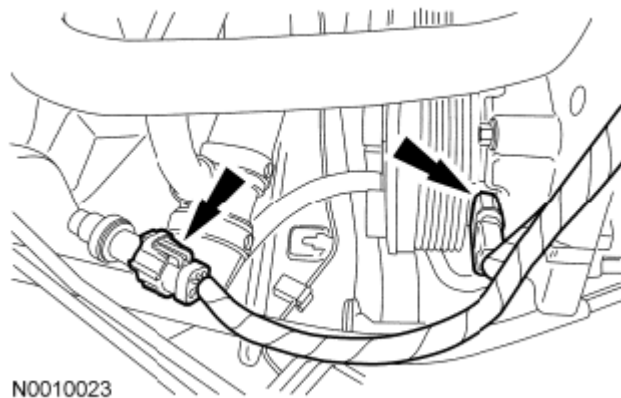
**Fig. 502: Locating Fuel Supply Tube Coupling**  
Courtesy of FORD MOTOR CO.

29. Attach the 2 wiring retainers to the **FEAD** bracket.



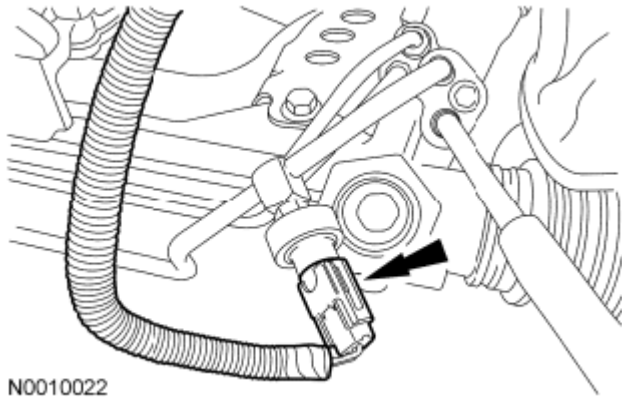
**Fig. 503: Locating Wiring Retainers On Feed Bracket**  
Courtesy of FORD MOTOR CO.

30. Connect the A/C compressor and A/C high pressure switch electrical connectors.



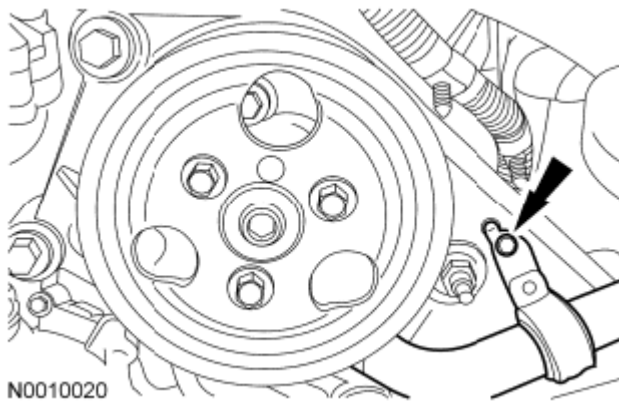
**Fig. 504: Locating A/C Compressor And A/C High Pressure Switch Electrical Connectors**  
Courtesy of FORD MOTOR CO.

31. Connect the Power Steering Pressure (PSP) switch electrical connector.



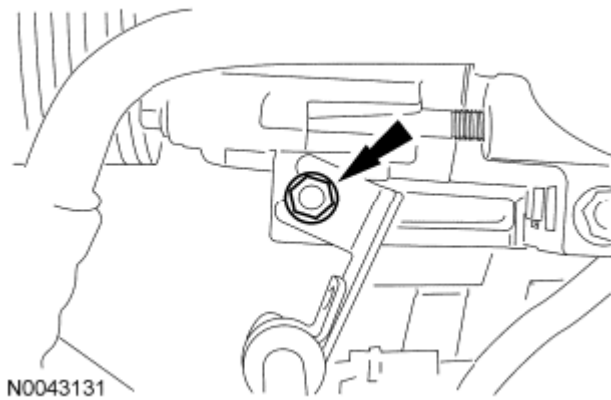
**Fig. 505: Locating Power Steering Pressure (PSP) Switch Electrical Connector**  
Courtesy of FORD MOTOR CO.

32. Attach the power steering supply hose bracket to the FEAD bracket and install the bolt.
  - Tighten to 11 Nm (97 lb-in).



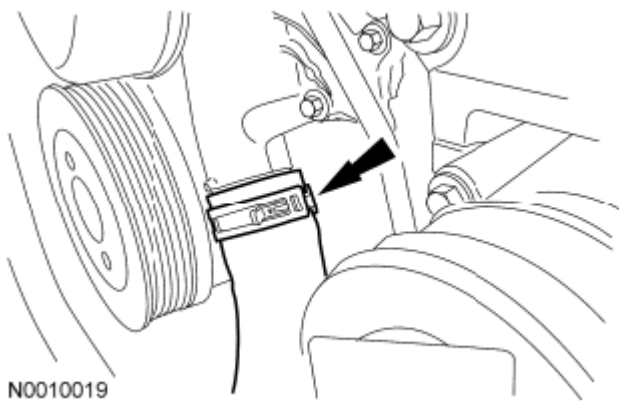
**Fig. 506: Identifying Power Steering Supply Hose Bracket**  
Courtesy of FORD MOTOR CO.

33. Position the Power Steering Pressure (PSP) tube bracket on the A/C compressor and install the nut.
  - Tighten to 7 Nm (62 lb-in).



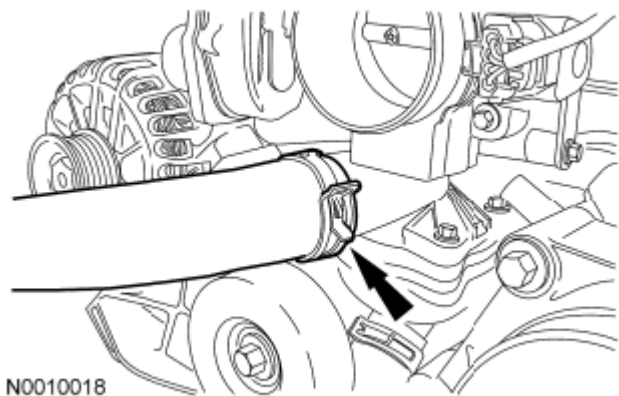
**Fig. 507: Identifying Power Steering Pressure Tube Bracket On A/C Compressor**  
Courtesy of FORD MOTOR CO.

34. Connect the lower radiator hose to the coolant pump.



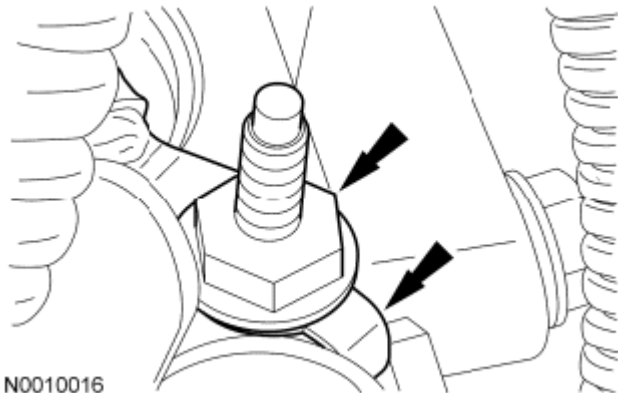
**Fig. 508: Locating Lower Radiator Hose On Coolant Pump**  
Courtesy of FORD MOTOR CO.

35. Connect the upper radiator hose to the thermostat housing.



**Fig. 509: Locating Upper Radiator Hose On Thermostat Housing**  
Courtesy of FORD MOTOR CO.

36. Position the ground strap and install the stud bolt.
  - Tighten to 10 Nm (89 lb-in).



**Fig. 510: Positioning Ground Strap**  
Courtesy of FORD MOTOR CO.

**Vehicles with manual transmission**

37. Install the clutch. For additional information, refer to **CLUTCH** .

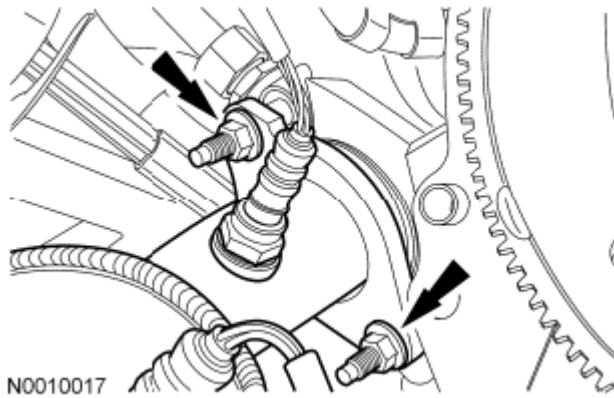
**Vehicles with automatic transmission**

38. Install the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 5R55S** .

**All vehicles**

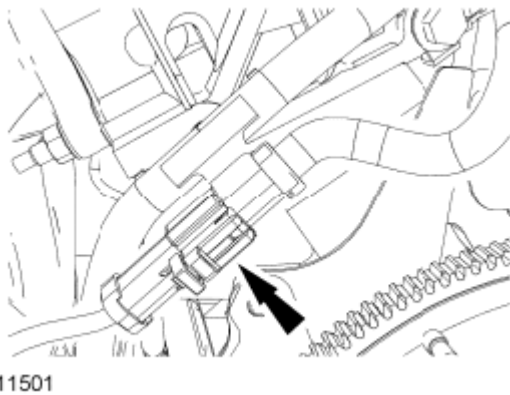
**NOTE:** LH side shown, RH side similar.

39. Install the 4 new catalytic converter-to-exhaust manifold nuts.
  - Tighten to 45 Nm (33 lb-ft).



**Fig. 511: Locating Catalytic Converter-To-Exhaust Manifold Nuts**  
 Courtesy of FORD MOTOR CO.

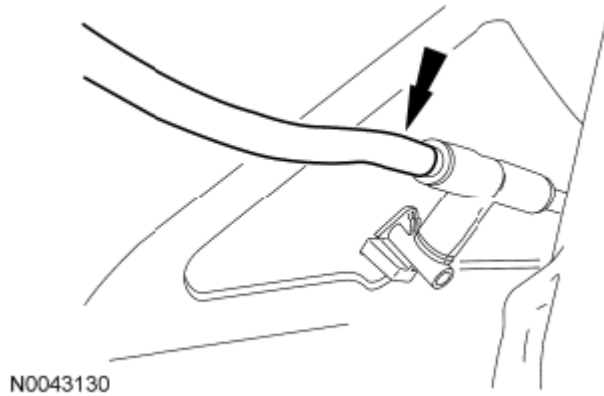
40. Connect the 2 Heated Oxygen Sensor (HO2S) and the 2 Catalyst Monitor Sensor (CMS) electrical connectors (1 shown).



**Fig. 512: Locating Heated Oxygen Sensor (HO2S)**  
 Courtesy of FORD MOTOR CO.

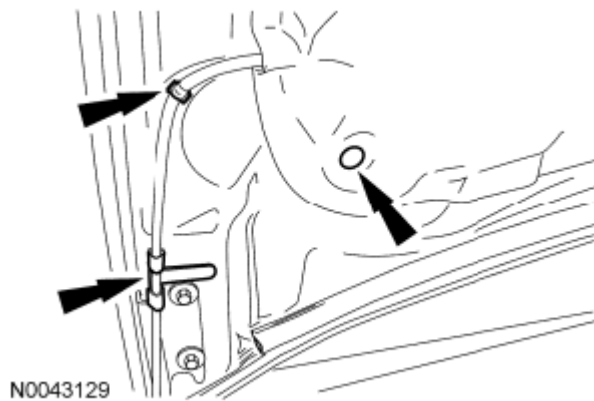
**NOTE:** Use the index marks made during the removal procedure for correct hood alignment.

41. Position the hood and install the 4 bolts.
  - Tighten to 12 Nm (106 lb-in).
42. Connect the windshield washer hose and position the hood insulation.



**Fig. 513: Locating Windshield Washer Hose**  
Courtesy of FORD MOTOR CO.

43. Install the 1 hood insulation pin-type retainer and attach the 2 windshield washer hose retainers.



**Fig. 514: Locating Windshield Washer Hose Retainers**  
Courtesy of FORD MOTOR CO.

44. Install the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
45. Fill the engine with clean engine oil.
46. Connect the battery ground and positive cables. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
47. Fill and bleed the cooling system. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .