

2008 Ford Mustang
2008 ENGINE Engine - 4.0L SOHC - Mustang

2008 ENGINE

Engine - 4.0L SOHC - Mustang

SPECIFICATIONS

Material

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	-

GENERAL SPECIFICATIONS

Item	Specification
Engine	
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)
Cylinder Head and Valve Train	
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 N.m 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

Camshaft

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)

Cylinder Block

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

Crankshaft

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)
Main Bearings	
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)
Piston and Connecting Rod	
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

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	-
Bell housing-to-cylinder block cradle bolts	47	35	-
Camshaft bearing cap bolts ^a	-	-	-

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Camshaft Position (CMP) sensor bolt	6	-	53
Camshaft sprocket bolt	85	63	-
Camshaft tensioners	44	32	-
Catalytic converter-to-exhaust manifold nuts	45	33	-
Connecting rod bolts and nuts ^a	-	-	-
Coolant hose bracket	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 ^a	-	-	-
Crankshaft main bearing cap bolts ^a	-	-	-
Cylinder block cradle bolts	14	-	124
Cylinder block cradle nuts	10	-	89
Cylinder block cradle bolts (inside) ^a	-	-	-
Cylinder block cradle Torx bolts	10	-	89
Cylinder block cradle rear Torx bolts	8	-	71
Cylinder block cradle inserts	3	-	27
Cylinder head bolts (M8) ^a	-	-	-
Cylinder head bolts (M12) ^a	-	-	-
Engine wiring harness-to-cylinder head bolts	40	30	-
Engine front cover 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 ^a	-	-	-
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	-
Hood hinge bolts	12	-	106

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Hydraulic chain tensioner, LH ^a	44	32	-
Hydraulic chain tensioner, RH ^a	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 ^a	-	-	-
Jackshaft chain guide bolts	19	-	168
Jackshaft chain tensioner bolts	9	-	80
Jackshaft rear sprocket bolt ^a	-	-	-
Jackshaft front sprocket bolt ^a	-	-	-
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
LH hydraulic chain tensioner	44	32	-
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 pickup tube bolt	11	-	97
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	10	-	89
Power Distribution Box (PDB) B+ terminal bolt	12	-	106
PDB electrical connector bolt	6	-	53
Power Steering Pressure (PSP) tube-to-crossmember bolt	11	-	97
Power steering supply hose bracket-to-FEAD 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
Throttle Body (TB) bolts	10	-	89

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Valve cover bolts and stud bolts ^a	-	-	-
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^a 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

For quick identification, refer to the vehicle control information decal mounted under the hood.

- Refer to **IDENTIFICATION CODES** article.

An engine identification label is attached to the engine. The label:

- identifies the symbol code for determining parts usage. Refer to **IDENTIFICATION CODES** article.

Exhaust Emission Control System

Operation and required maintenance of the exhaust emission control devices used on this engine is covered in the **Introduction - Gasoline Engines** article.

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:

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- Pulse-Width Modulation (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.

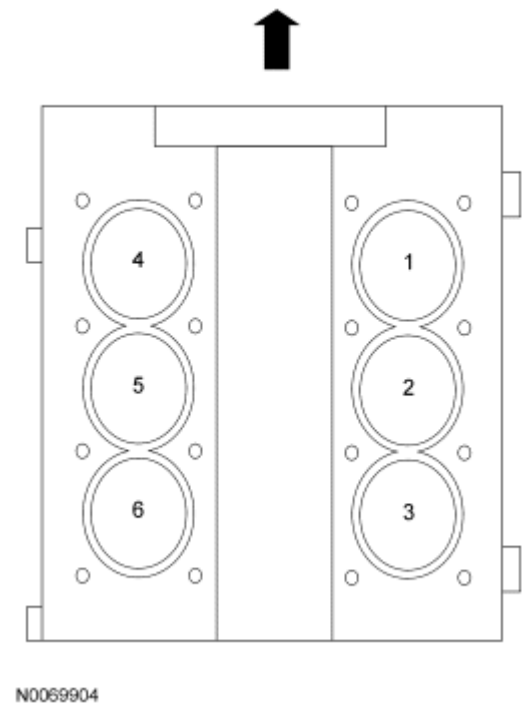
Cooling System

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

Engine Cylinder Identification



N0069904
Fig. 1: Engine Cylinder Identification
Courtesy of FORD MOTOR CO.

DIAGNOSTIC TESTS

ENGINE

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

For driveability concerns, refer to the **Introduction - Gasoline Engines** article.

GENERAL PROCEDURES

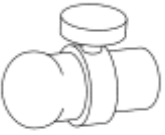
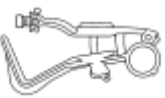
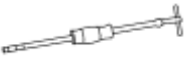
CAMSHAFT TIMING

Special Tools

Illustration	Tool Name	Tool Number
	Adapter for 303-564	303-578 (T97T-6256-C)

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 ST1251-A		
 ST1300-A	Adapter for 303-577	303-576 (T97T-6256-D)
 ST1279-A	Holding Tool, Camshaft	303-577 (T97T-6303-C)
 ST2176-B	Holding Tool, Camshaft Sprocket	303-564 (T97T-6256-B)
 ST1297-A	Socket, Camshaft Sprocket Nut	303-565 (T97T-6256-G)
 ST1185-A	Tensioner, Timing Chain	303-571 (T97T-6K254-A)
 ST1299-A	Timing Tool, Crankshaft TDC	303-573 (T97T-6303-A)
 ST1298-A	Torque Wrench Extension	303-575 (T97T-6256-F)

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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 - GENERAL INFORMATION** article.
3. Remove the Engine Coolant Temperature (ECT) sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS** article.

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 Top Dead Center (TDC).

5. Install the Crankshaft TDC Timing Tool.

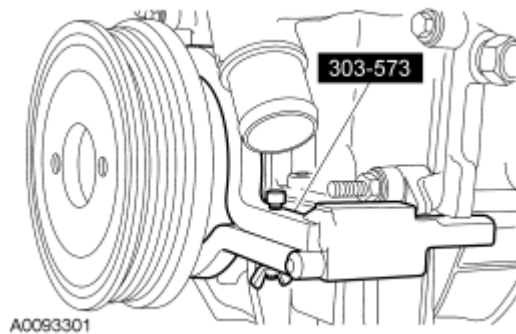


Fig. 2: Identifying Special Tool (303-573)
Courtesy of FORD MOTOR CO.

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).

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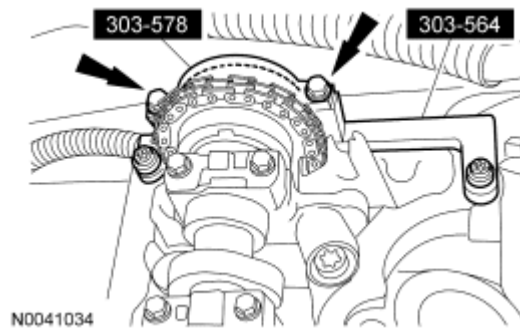


Fig. 3: Locating Clamp Bolts & Special Tools (303-564, 303-578)
Courtesy of FORD MOTOR CO.

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

7. Using the Torque Wrench Extension with the Camshaft Sprocket Nut Socket 303-565, loosen the RH camshaft sprocket bolt.

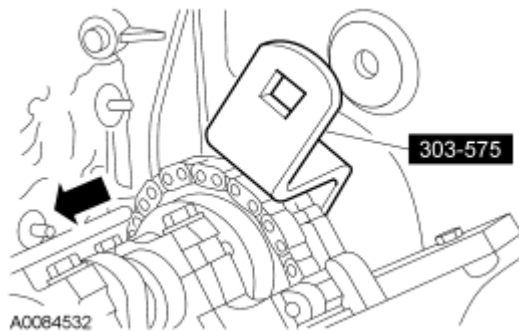


Fig. 4: Identifying Special Tool (303-575)
Courtesy of FORD MOTOR CO.

8. Loosen the top 2 Camshaft Sprocket Holding Tool clamp bolts.

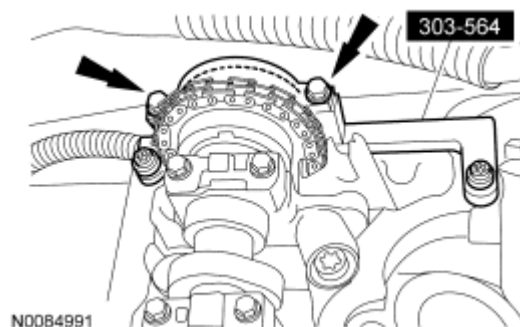


Fig. 5: Locating Top Camshaft Sprocket Holding Tool Clamp Bolts
Courtesy of FORD MOTOR CO.

NOTE: The camshaft timing slots are off-center.

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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.

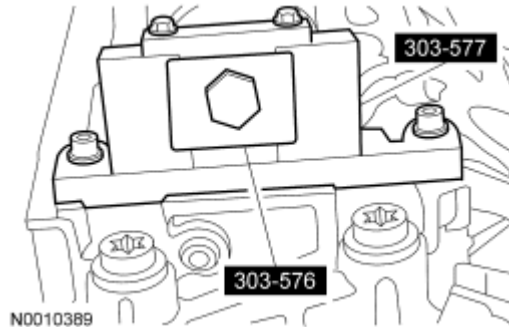


Fig. 6: Identifying Special Tools (303-576, 303-577)

Courtesy of FORD MOTOR CO.

10. Remove the RH camshaft tensioner.
 - Remove and discard the washer.

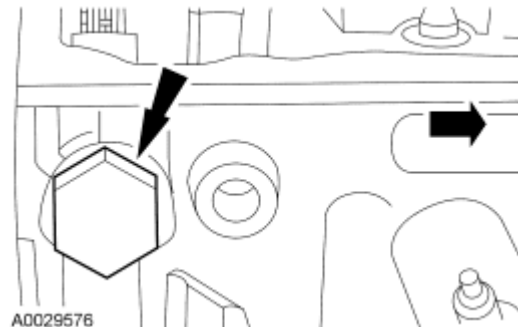


Fig. 7: Locating Hydraulic Camshaft Tensioner Bolt

Courtesy of FORD MOTOR CO.

11. Install the Timing Chain Tensioner.

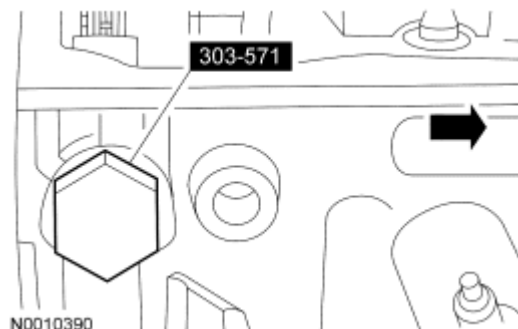


Fig. 8: Identifying Special Tool (303-571)

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.

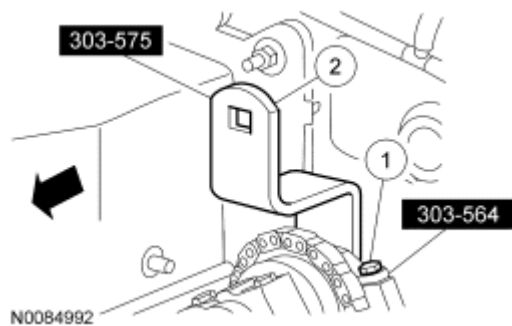


Fig. 9: Tightening Camshaft Sprocket Holding Tool Top Clamp Bolts
Courtesy of FORD MOTOR CO.

13. Remove the Timing Chain Tensioner.

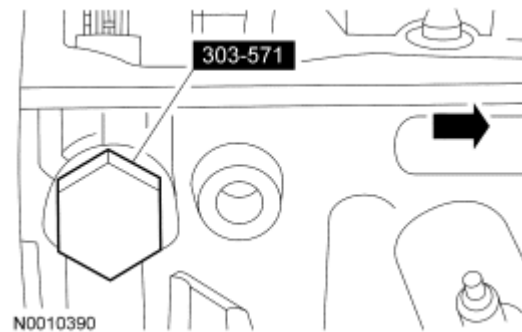


Fig. 10: Identifying Special Tool (303-571)
Courtesy of FORD MOTOR CO.

NOTE: Install a new washer on the tensioner.

14. Install the RH camshaft tensioner.
 - Tighten to 44 Nm (32 lb-ft).

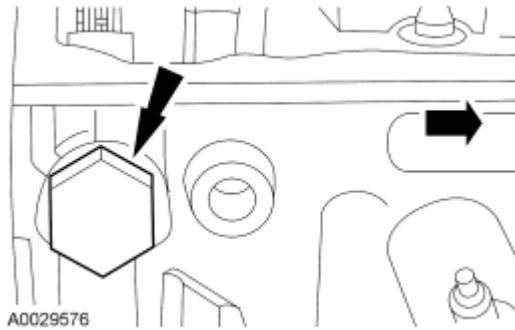


Fig. 11: Locating Hydraulic Camshaft Tensioner Bolt
Courtesy of FORD MOTOR CO.

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).

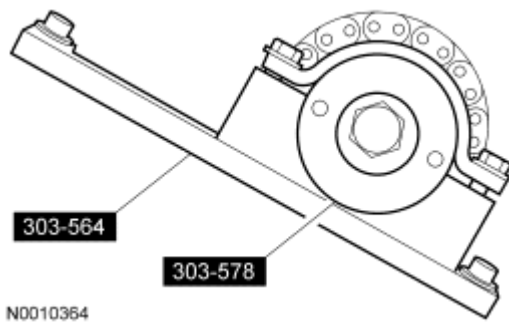


Fig. 12: Identifying Special Holding Tool
Courtesy of FORD MOTOR CO.

16. Loosen the LH camshaft sprocket bolt.

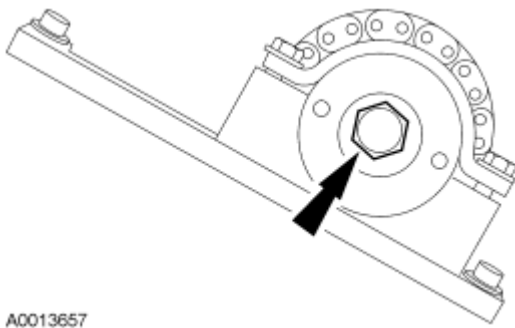


Fig. 13: Locating LH Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

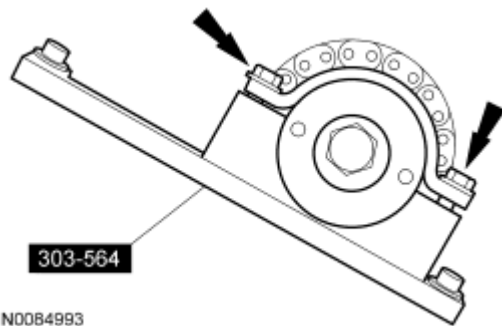


Fig. 14: Loosening Top Clamp Bolts On Camshaft Sprocket Holding Tool
Courtesy of FORD MOTOR CO.

NOTE: The camshaft timing slots are off-center.

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.

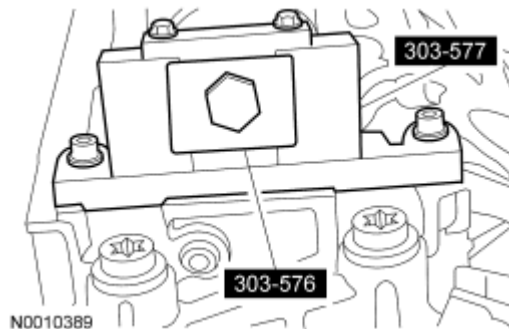


Fig. 15: Identifying Special Tools (303-576, 303-577)
Courtesy of FORD MOTOR CO.

19. Remove the LH camshaft tensioner.
 - Remove and discard the washer.

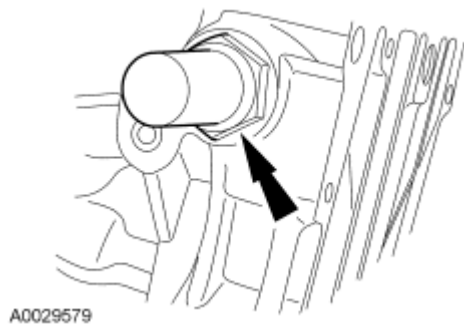


Fig. 16: Locating Camshaft Tensioner
Courtesy of FORD MOTOR CO.

20. Install the Timing Chain Tensioner.



Fig. 17: Identifying Special Tool (303-571)
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).

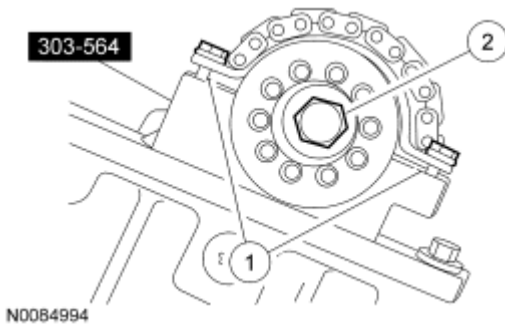


Fig. 18: Tightening Camshaft Sprocket Holding Tool Top Clamp Bolts
Courtesy of FORD MOTOR CO.

22. Remove the Timing Chain Tensioner.



Fig. 19: Identifying Special Tool (303-571)
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).

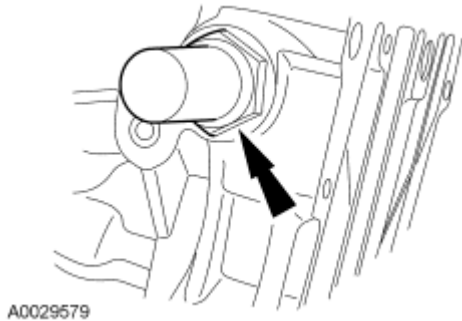


Fig. 20: Locating Camshaft Tensioner
Courtesy of FORD MOTOR CO.

24. Install the ECT sensor. For additional information, refer to **ELECTRONIC ENGINE CONTROLS** article.
25. Install the generator. For additional information, refer to **CHARGING SYSTEM - GENERAL INFORMATION** article.
26. Install the camshaft roller followers. For additional information, refer to **Camshaft Roller Follower**.

IN-VEHICLE SERVICING

INTAKE MANIFOLD

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

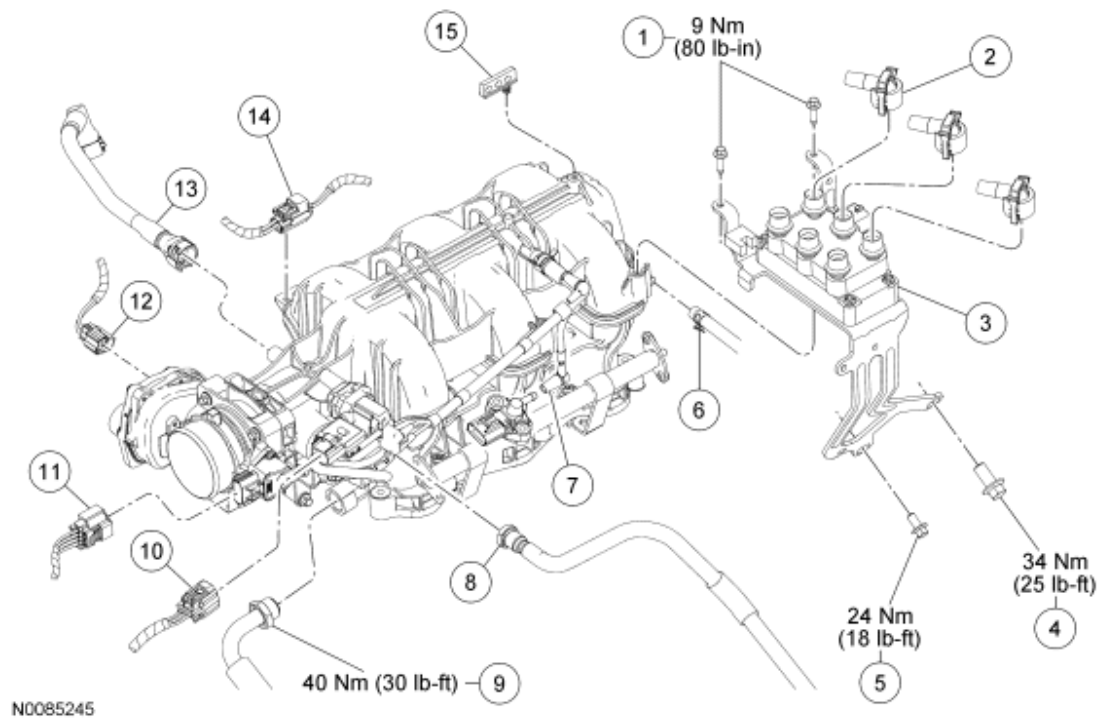


Fig. 21: Exploded View Of Intake Manifold With Torque Specifications (1 Of 2)
Courtesy of FORD MOTOR CO.

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

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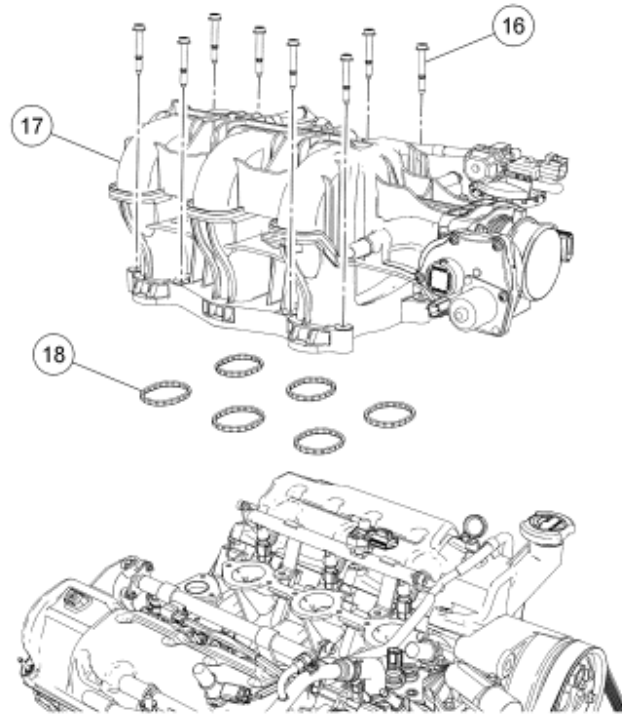


Fig. 22: Exploded View Of Intake Manifold (2 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
16	9Y450	Intake manifold bolt (8 required)
17	9424	Intake manifold
18	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 AND FILTERING** article.
2. Disconnect the RH spark plug wires from the ignition coil.
3. Detach the RH spark plug wire retainer from the intake manifold.
4. Remove the 2 ignition coil bracket upper bolts.
5. Remove the 2 ignition coil lower bolts.
 - Position the ignition coil and bracket assembly aside.
6. Disconnect the EGR system module electrical connector.

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7. Disconnect the EGR system module tube from the EGR system module.
8. Disconnect the brake booster vacuum hose from the intake manifold.
9. Disconnect the vacuum tube from the fuel rail pressure and temperature sensor.
10. Disconnect the vapor tube from the intake manifold.
11. Remove the PCV tube.
12. Detach the Knock Sensor (KS) electrical connector retainer from the intake manifold.
13. Disconnect the Throttle Position (TP) sensor and Throttle Body (TB) electrical connectors.
14. Remove the 8 bolts and the intake manifold.

INSTALLATION

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).

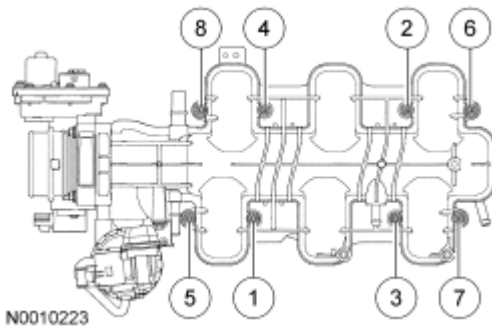


Fig. 23: Identifying Intake Manifold Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

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).

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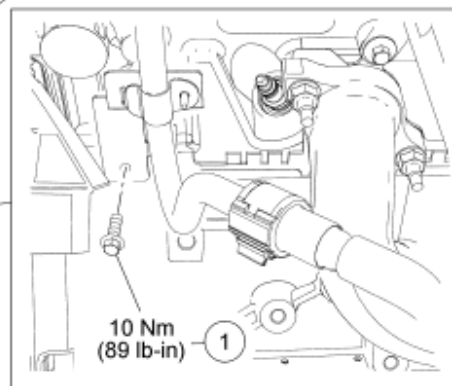
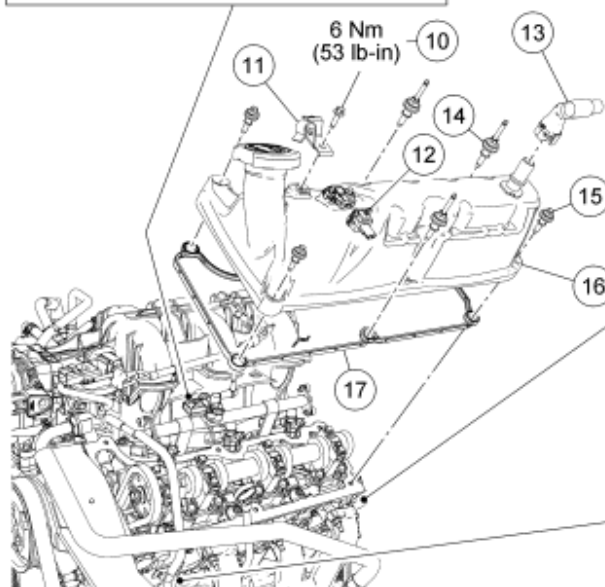
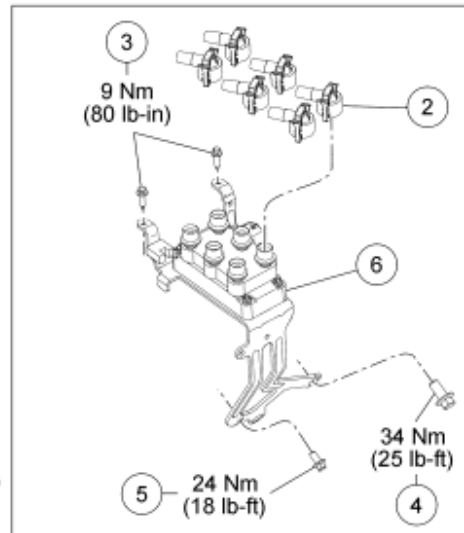
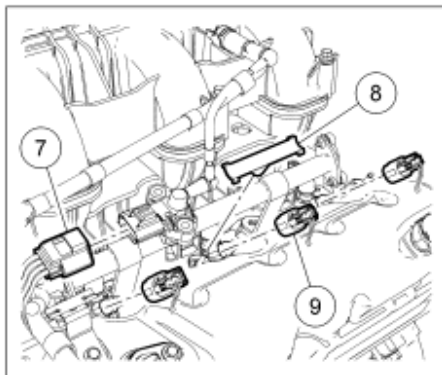
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11. Install the 2 ignition coil bracket upper bolts.
 - Tighten to 9 Nm (80 lb-in).
12. Attach the RH spark plug wire retainer to the intake manifold.
13. Connect the RH spark plug wires to the ignition coil.
14. Install the ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.

VALVE COVER - LH

Material

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



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Fig. 24: Exploded View Of LH Valve Cover With Torque Specifications
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W500213	Fuel rail supply tube bracket-to-cylinder head bolt
2	12280	Spark plug wire-to-ignition coil connector (6 required)
3	W500214	Ignition coil bracket upper bolts
4	W500041	Ignition coil bracket lower bolt (M12)
5	W500023	Ignition coil bracket lower bolt (M8)
6	12A310	Ignition coil and bracket assembly
7	14A464	Fuel rail pressure and temperature sensor electrical connector (part of 12B637)
8	13A506	Wiring harness retainer (part of 12B637)
9	14A464	Fuel injector electrical connector (3 required) (part of 12B637)
10	W500213	Fuel rail supply tube bracket-to-valve cover bolt
11	-	Fuel rail supply tube bracket (part of 9E964)
12	14A464	Camshaft Position (CMP) sensor electrical connector (part of 12B637)
13	6758	Crankcase ventilation tube
14	6C519	LH valve cover stud bolt (3 required)
15	6C519	LH valve cover bolt (3 required)
16	6A505	LH valve cover assembly
17	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 6 spark plug wires from the ignition coil.
2. Remove the 2 upper ignition coil bracket bolts.
3. Remove the 2 lower ignition coil bracket bolts and remove the ignition coil and bracket assembly.
4. Remove the fuel rail supply tube bracket-to-cylinder head bolt.
5. Remove the fuel rail supply tube bracket-to-valve cover bolt.
 - Position the fuel rail supply tube aside.
6. Disconnect the crankcase ventilation tube from the valve cover and position the tube aside.
7. Disconnect the Camshaft Position (CMP) sensor electrical connector.
8. Disconnect the fuel rail pressure and temperature sensor electrical connector.
9. Disconnect the 3 LH fuel injector electrical connectors.

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- Detach the wiring retainer from the valve cover stud bolt and position the wiring harness aside.
10. Detach the spark plug wire retainer from the valve cover stud bolt.
 11. 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).

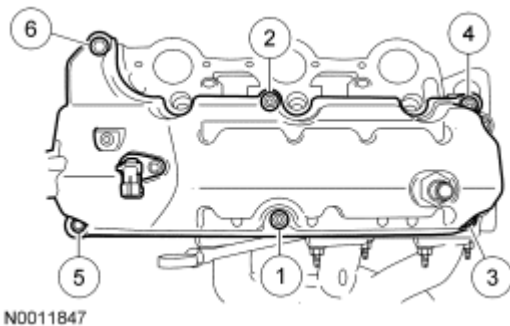


Fig. 25: Identifying Valve Cover Tightening Sequence
Courtesy of FORD MOTOR CO.

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.

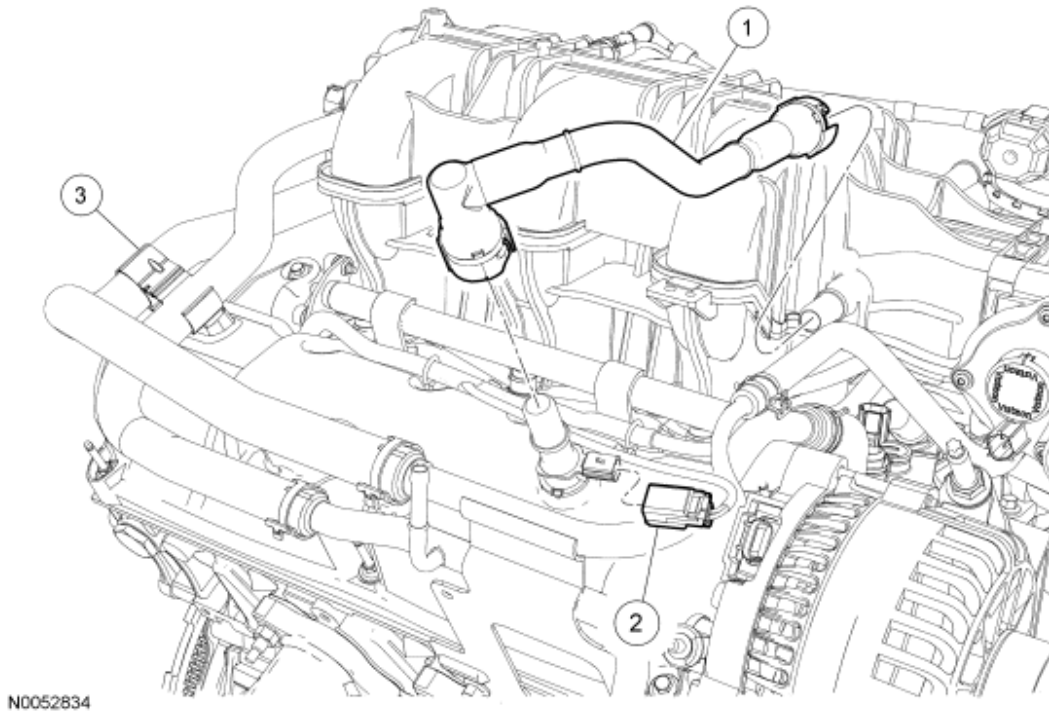
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VALVE COVER - RH

Material

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



N0052834

Fig. 26: Exploded View Of RH Valve Cover (1 Of 2)
Courtesy of FORD MOTOR CO.

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

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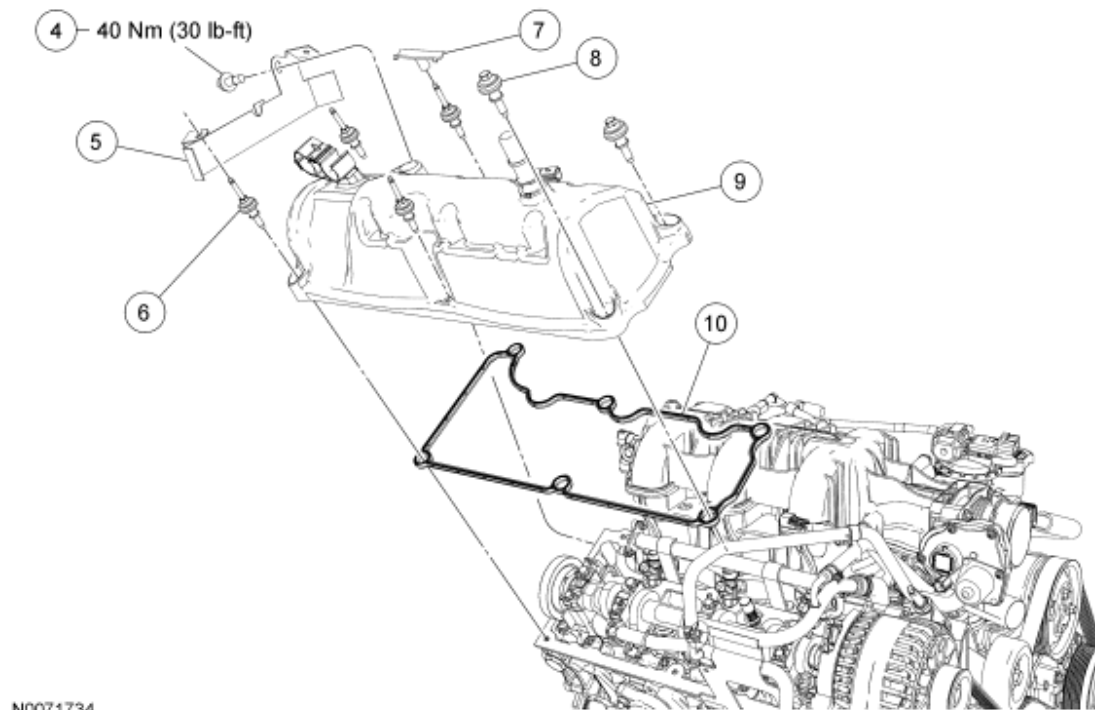


Fig. 27: Exploded View Of RH Valve Cover With Torque Specifications (2 Of 2)
Courtesy of FORD MOTOR CO.

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.

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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).

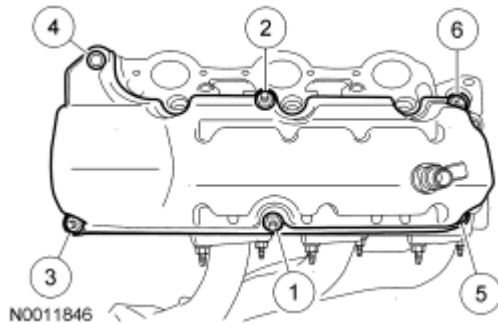


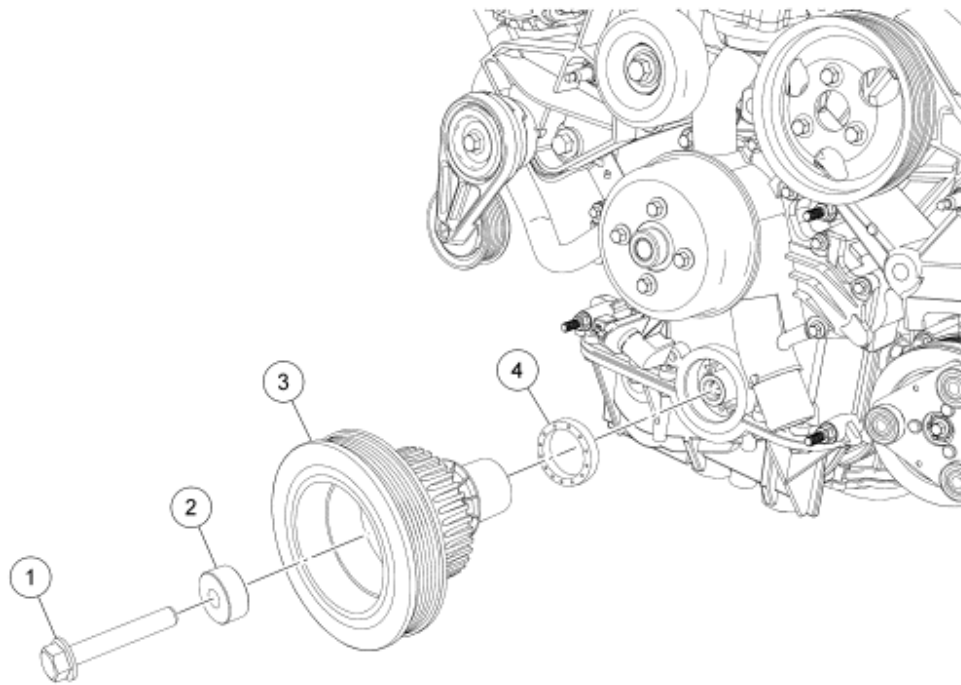
Fig. 28: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

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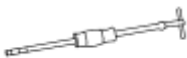
Fig. 29: Exploded View Of Crankshaft Pulley & Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

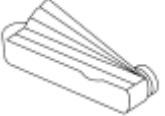
Item	Part Number	Description
1	E800511	Crankshaft pulley bolt
2	-	Washer
3	6B321	Crankshaft pulley
4	6700	Crankshaft front oil seal

1. For additional information, refer to the procedures.

CRANKSHAFT PULLEY

Special Tools

Illustration	Tool Name	Tool Number
 ST1185-A	Installer, Crankshaft Vibration Damper	303-102 (T74P-6316-B)
	Remover, Crankshaft Vibration Damper	303-101 (T74P-3616-A)

 ST1278-A		
 ST1271-A	Remover, Crankshaft Vibration Damper	303-773
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A) or equivalent

General Equipment

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 AND LIFTING** article.
2. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
3. Remove the accessory drive belt. For additional information, refer to **ACCESSORY DRIVE** article.

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

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

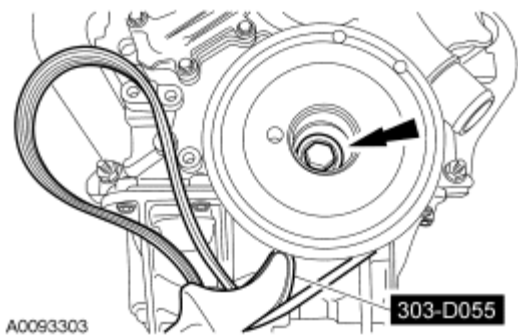


Fig. 30: Holding Crankshaft Pulley Using Special Tool
Courtesy of FORD MOTOR CO.

NOTE: If the pulley bolt is not installed, the tool 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.

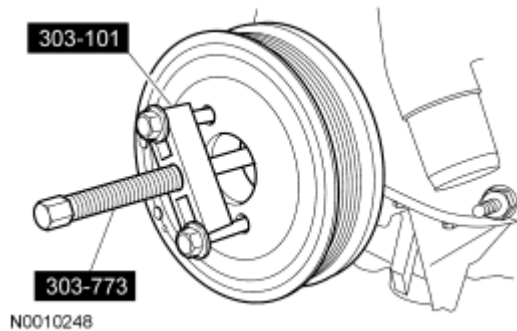


Fig. 31: Identifying Special Tool (303-773, 303-101)
Courtesy of FORD MOTOR CO.

INSTALLATION

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



Fig. 32: Installing Crankshaft Pulley Using Special Tool (303-102)
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 45 Nm (33 lb-ft).
 - Stage 2: Tighten an additional 85 degrees.

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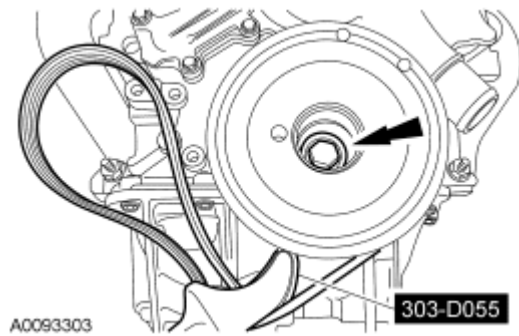
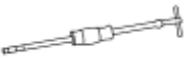


Fig. 33: Holding Crankshaft Pulley Using Special Tool
Courtesy of FORD MOTOR CO.

3. Install the accessory drive belt. For additional information, refer to [**ACCESSORY DRIVE**](#) article.
4. Install the ACL outlet pipe. For additional information, refer to [**INTAKE AIR DISTRIBUTION AND FILTERING**](#) article.

CRANKSHAFT FRONT SEAL

Special Tools

Illustration	Tool Name	Tool Number
 ST2439-A	Aligner, Front Cover	303-093 (T74P-6019-A)
 ST1185-A	Installer, Crankshaft Vibration Damper	303-102 (T74P-6316-B)
 ST1288-A	Remover, Crankshaft Front Oil Seal	303-107 (T74P-6700-A)

Material

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

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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.

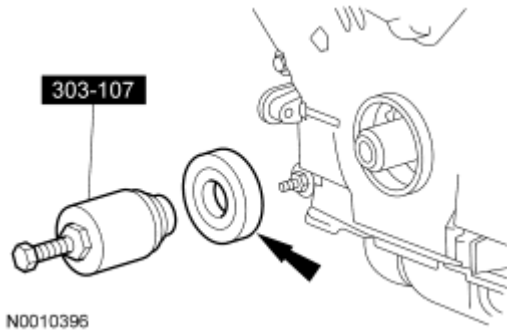


Fig. 34: Identifying Crankshaft Front Oil Seal & Special Tool (303-107)
Courtesy of FORD MOTOR CO.

INSTALLATION

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

1. Using the Front Cover Aligner and Crankshaft Vibration Damper Installer, install a new crankshaft front seal.

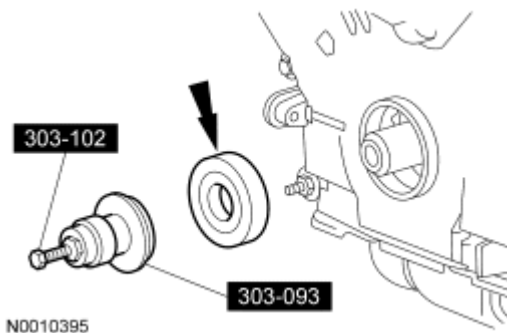


Fig. 35: Identifying Special Tools (303-102, 303-093) & Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.

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, flywheel similar.

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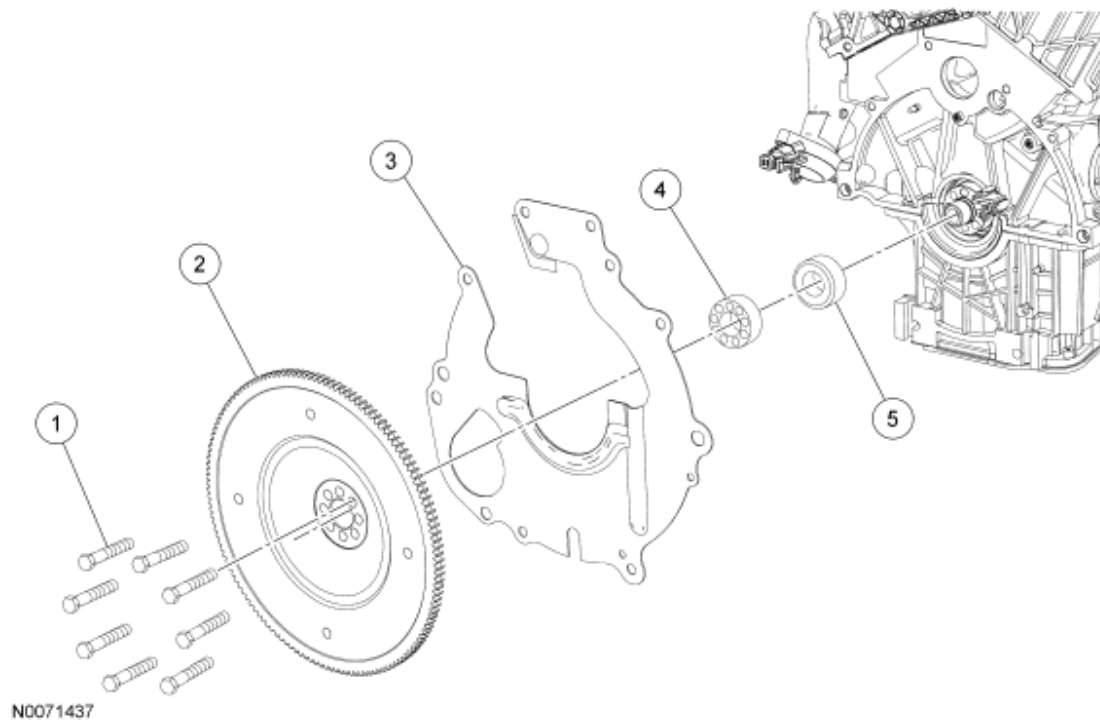


Fig. 36: Exploded View Of Flexplate, Flywheel & Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

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** article.
2. Remove the 8 bolts and the flywheel.

INSTALLATION

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

1. Position the flywheel. Install the 8 bolts and tighten in the sequence shown in 3 stages.

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- 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.

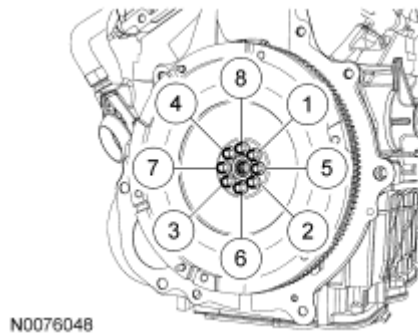


Fig. 37: Identifying Flywheel Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

FLEXPLATE

REMOVAL

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

INSTALLATION

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

1. Position the spacer and the flexplate. Install the 8 bolts and tighten in the sequence shown 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.

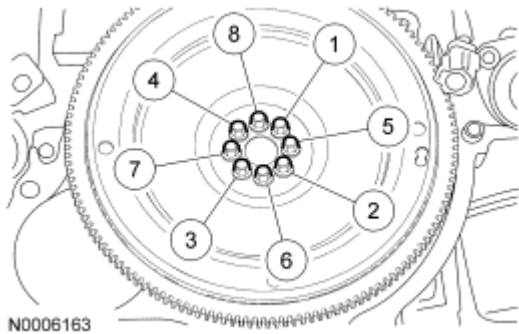
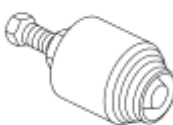
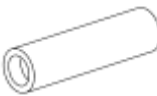
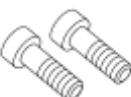


Fig. 38: Identifying Flexplate Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

2. Install the transmission. For additional information, refer to [AUTOMATIC TRANSAXLE/TRANSMISSION - 5R55S](#) article.

CRANKSHAFT REAR SEAL

Special Tools

Illustration	Tool Name	Tool Number
 ST3074-A	Adapter for 303-579 (part of 303-S524)	303-527 (T95P-6701-A3)
 ST1730-A	Installer, Crankshaft Rear Oil Seal	303-579 (T97T-6701-A)
 ST1332-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

Item	Specification

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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.**

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

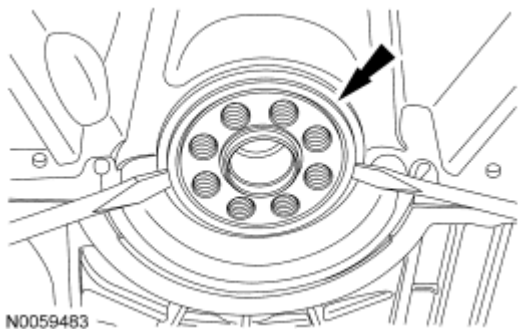


Fig. 39: Removing Speedy Sleeve Using Screwdrivers
Courtesy of FORD MOTOR CO.

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

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

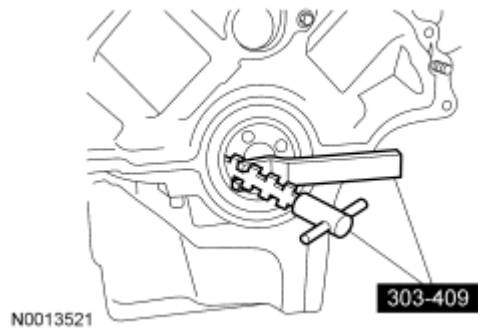


Fig. 40: Removing Crankshaft Rear Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

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.

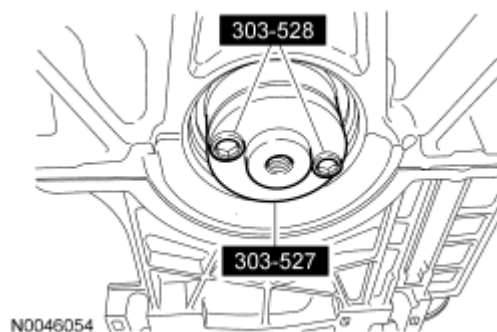


Fig. 41: Identifying Special Tool (303-527, 303-528)
Courtesy of FORD MOTOR CO.

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

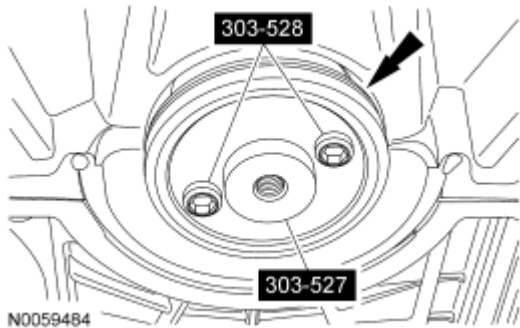


Fig. 42: Identifying Crankshaft Rear Seal, Special Tool (303-527, 303-528)
Courtesy of FORD MOTOR CO.

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

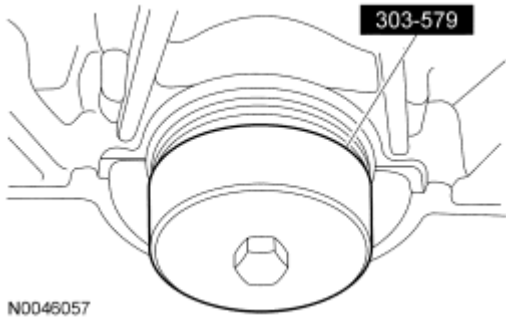


Fig. 43: Identifying Special Tool (303-579)
Courtesy of FORD MOTOR CO.

- 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 Tools

Illustration	Tool Name	Tool Number
	Aligner, Front Cover	303-093 (T74P-6019-A)

Material

Item	Specification
Motorcraft Metal Surface Prep	-

2008 Ford Mustang

2008 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

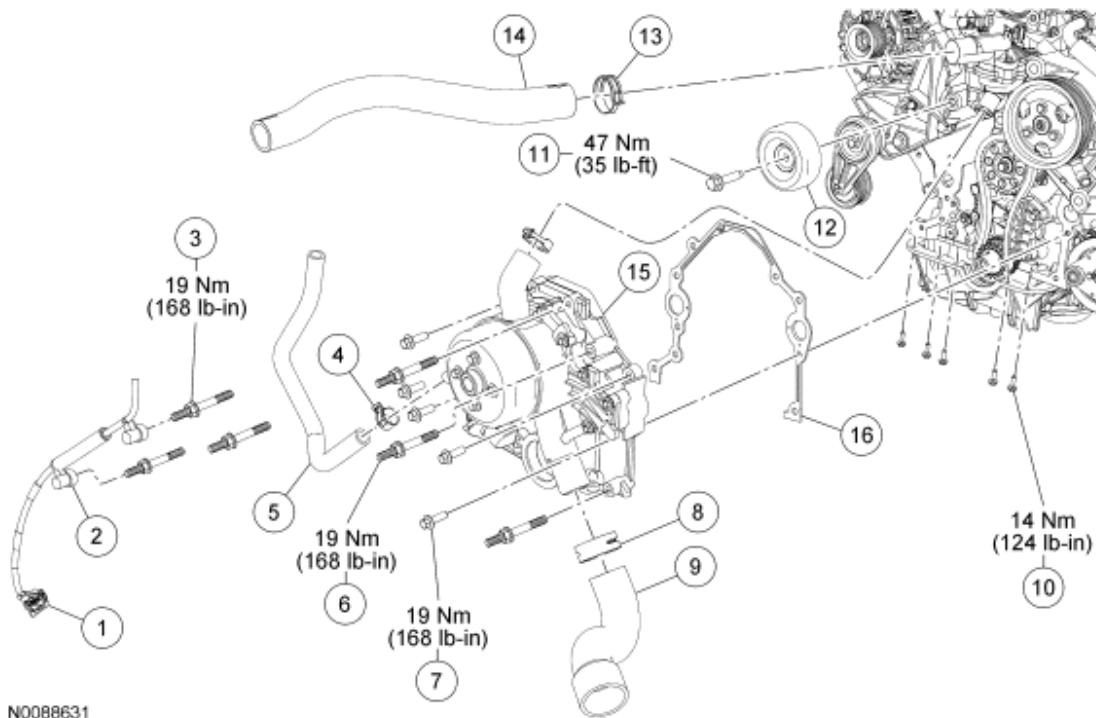


Fig. 44: Exploded View Of Engine Front Cover With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Crankshaft Position (CKP) sensor electrical connector (part of 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

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

7	W500024	Engine front cover bolt (5 required)
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** article.
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.

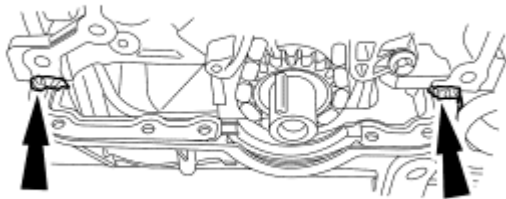
1. Clean and inspect the gasket mating surfaces. Use silicone gasket remover and metal surface prep and a

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.

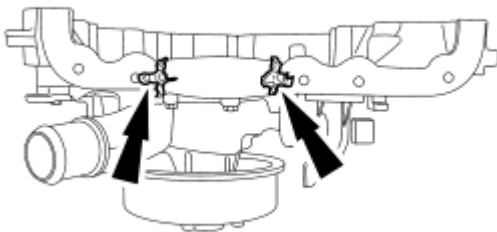
3. Apply silicone gasket and sealant to the oil pan and engine block mating surfaces.



A0029570

Fig. 45: Locating Engine Block Mating Surfaces Sealant Areas
Courtesy of FORD MOTOR CO.

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



A0029571

Fig. 46: Locating Silicone Gasket And Sealant Areas
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).

2008 Ford Mustang

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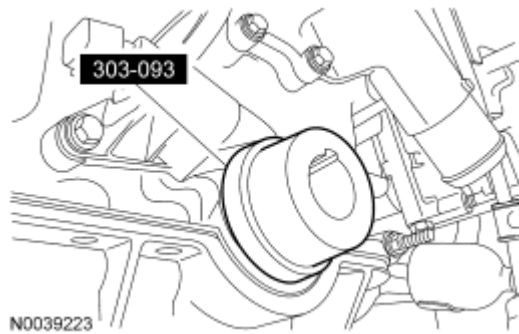
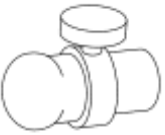


Fig. 47: Identifying Special Tool (303-093)
Courtesy of FORD MOTOR CO.

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** article.

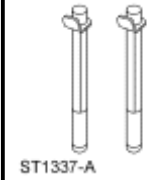
TIMING DRIVE COMPONENTS - CAMSHAFT DRIVE CASSETTE, LH

Special Tools

Illustration	Tool Name	Tool Number
 ST1251-A	Adapter for 303-564	303-578 (T97T-6256-A)
 ST2176-B	Holding Tool, Camshaft Sprocket	303-564 (T97T-6256)

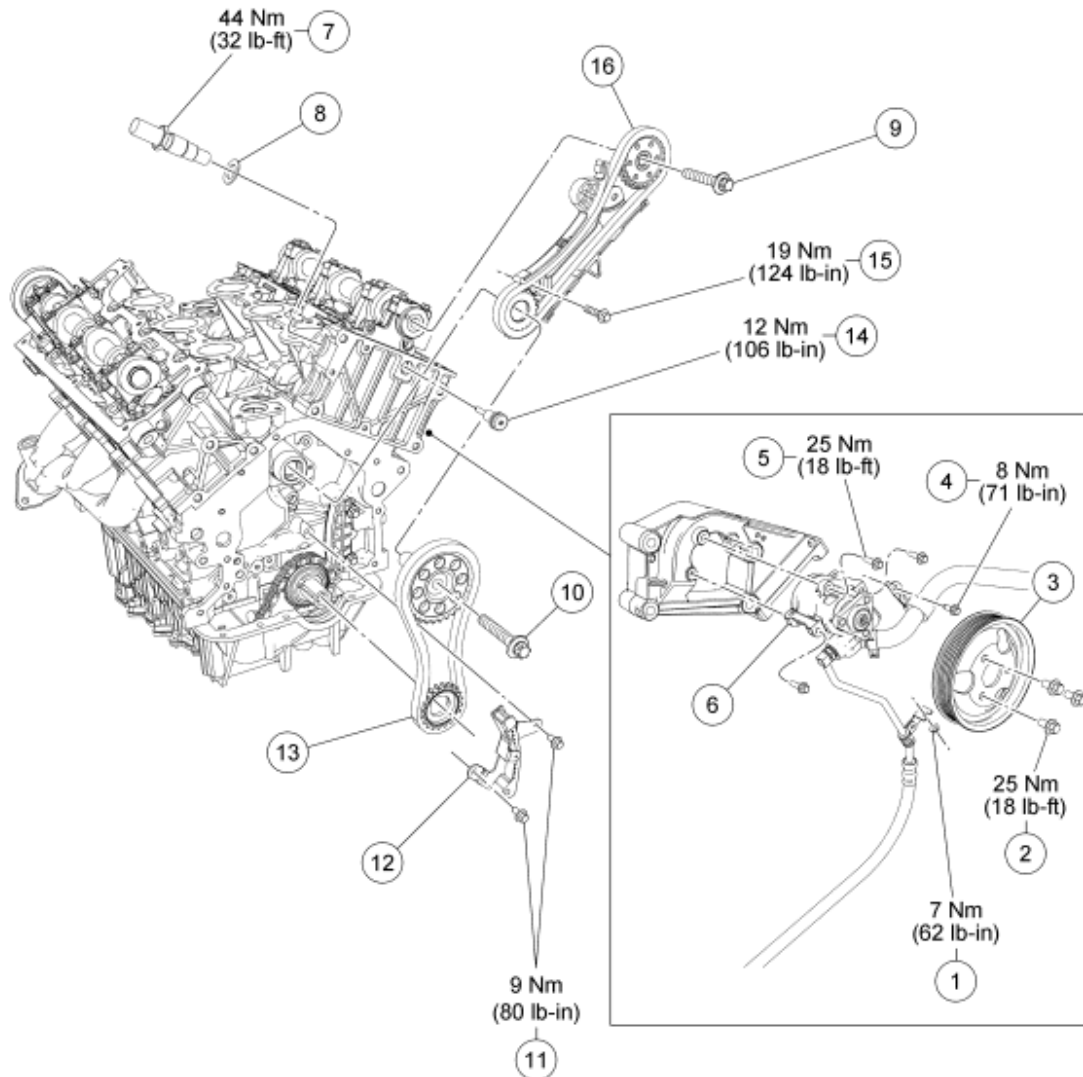
2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang



Holding Tool, Crankshaft

303-674



N0085181

Fig. 48: Exploded View Of LH Timing Drive Components Camshaft Drive Cassette With Torque Specifications

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W520101	Power Steering Pressure (PSP) tube bracket nut
		Power steering pump pulley bolt (3

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

2	N605784	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
9	6M276	Camshaft sprocket bolt
10	6M276	Jackshaft sprocket bolt
11	W500011	Primary chain tensioner bolts
12	6M271	Primary 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

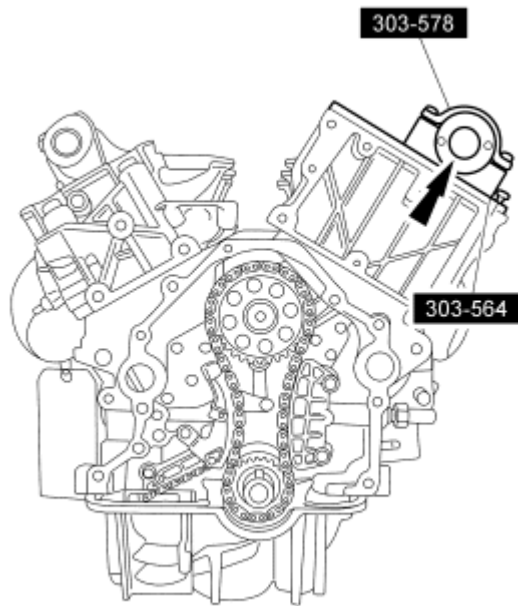
1. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Remove the intake manifold. For additional information, refer 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.

2008 Ford Mustang

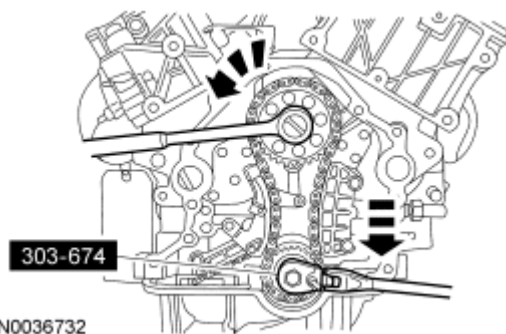
2008 ENGINE Engine - 4.0L SOHC - Mustang



A0083332

Fig. 49: Identifying Special Tool (303-578, 303-564) & Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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



N0036732

Fig. 50: Removing Jackshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

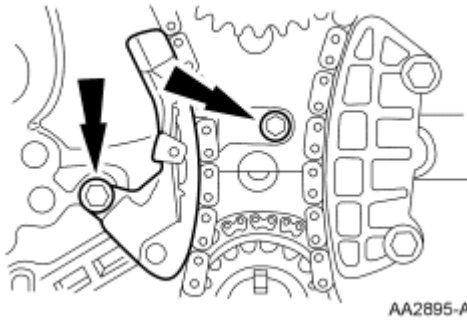


Fig. 51: Locating Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

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

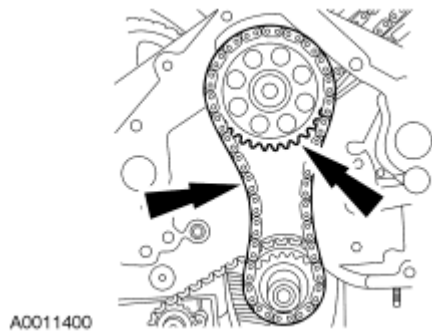


Fig. 52: Locating Jackshaft Chain And Sprockets
Courtesy of FORD MOTOR CO.

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.

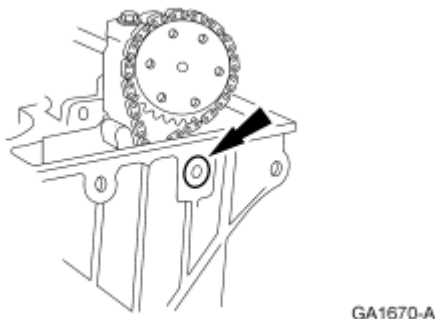


Fig. 53: Locating Chain Guide Bolt
Courtesy of FORD MOTOR CO.

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

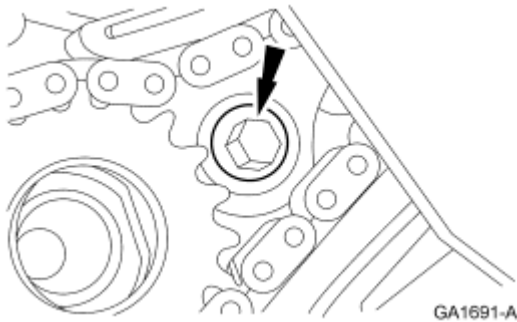
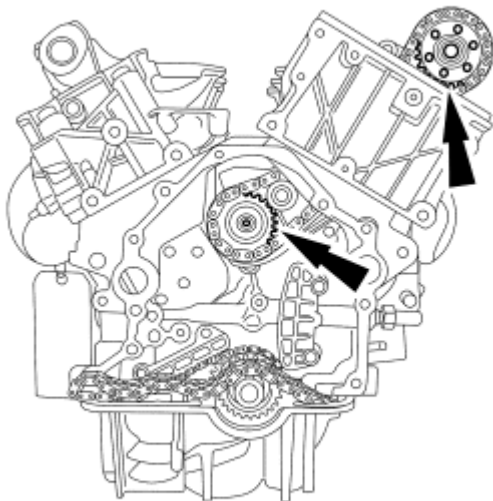


Fig. 54: Locating Front Cassette & Bolt
Courtesy of FORD MOTOR CO.

INSTALLATION

NOTE: The camshaft chain sprockets must be oriented correctly.

1. Position the LH cassette.



A0029678

Fig. 55: Locating Camshaft Chain Sprockets
Courtesy of FORD MOTOR CO.

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

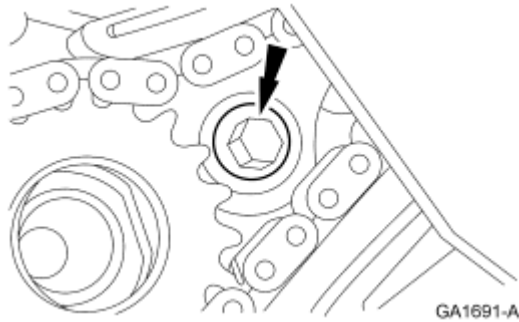


Fig. 56: Locating Front Cassette & Bolt
Courtesy of FORD MOTOR CO.

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

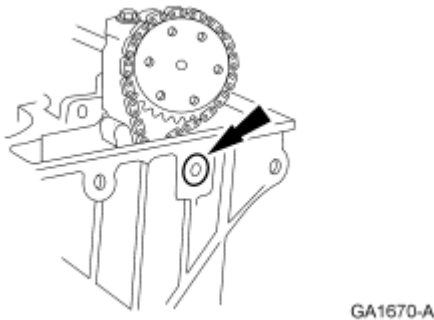


Fig. 57: Locating Chain Guide Bolt
Courtesy of FORD MOTOR CO.

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.

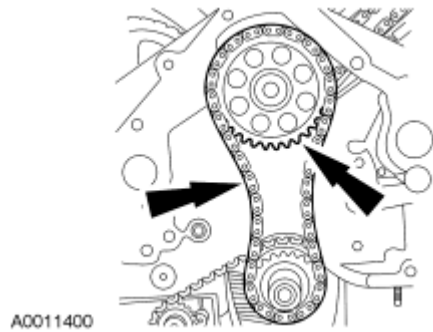


Fig. 58: Locating Jackshaft Chain And Sprockets
Courtesy of FORD MOTOR CO.

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

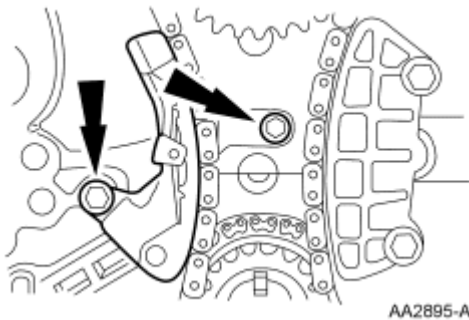


Fig. 59: Locating Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

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

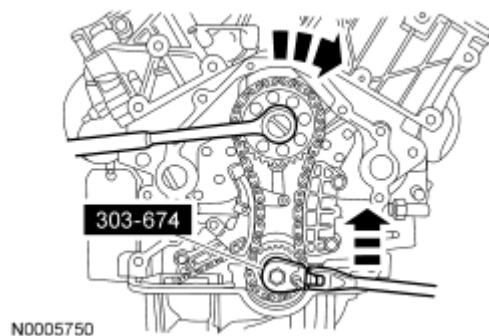


Fig. 60: Using Special Tool (303-674) To Prevent Crankshaft From Turning
Courtesy of FORD MOTOR CO.

- 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 article.
 - 17. Fill and bleed the engine cooling system. For additional information, refer to ENGINE COOLING article.

TIMING DRIVE COMPONENTS - HYDRAULIC CHAIN TENSIONER, LH

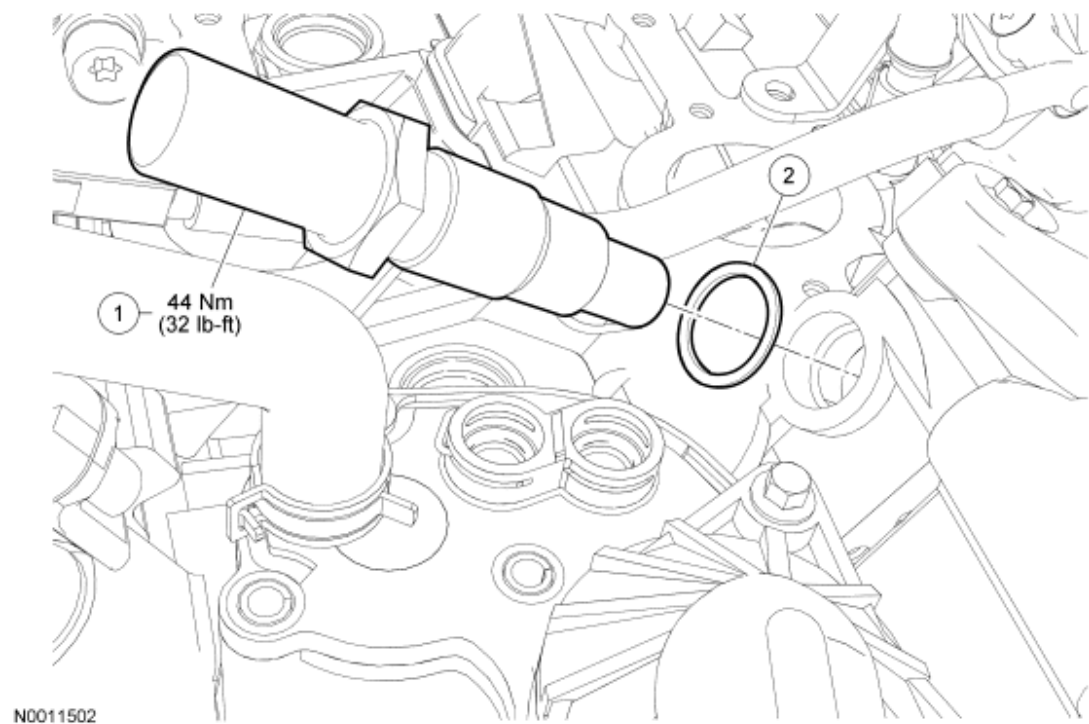


Fig. 61: Exploded View Of LH Timing Drive Components Hydraulic Chain Tensioner With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description

2008 Ford Mustang		
2008 ENGINE Engine - 4.0L SOHC - Mustang		

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** article.
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

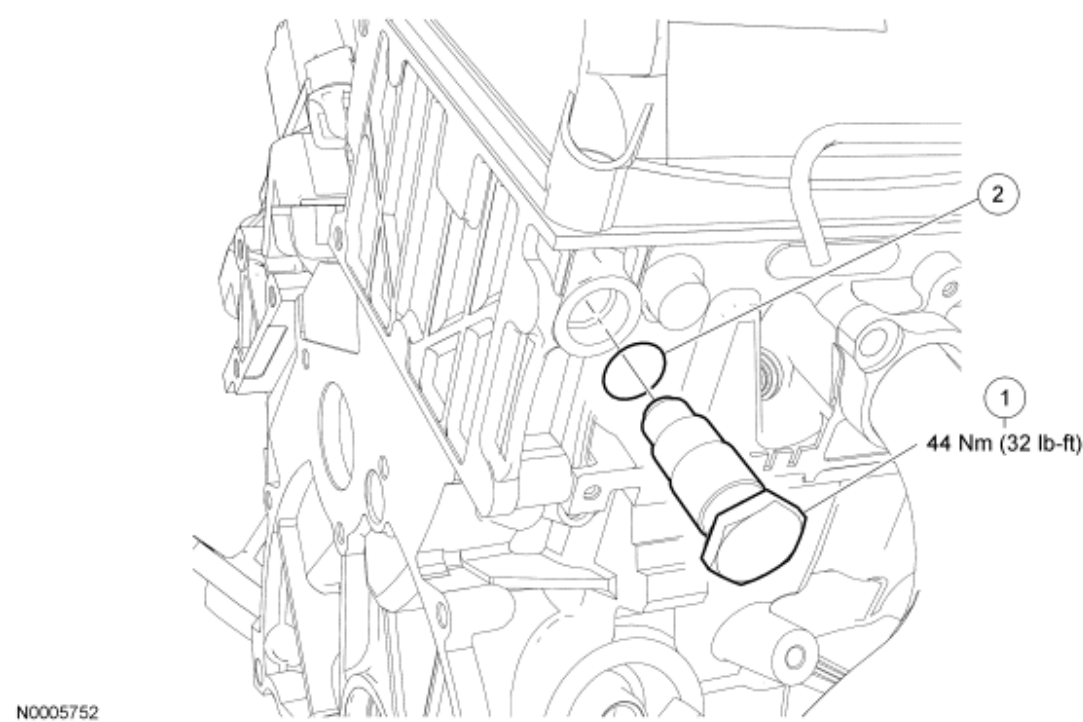


Fig. 62: Exploded View Of RH Hydraulic Timing Chain Tensioner With Torque Specification
 Courtesy of FORD MOTOR CO.

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.

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

- 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

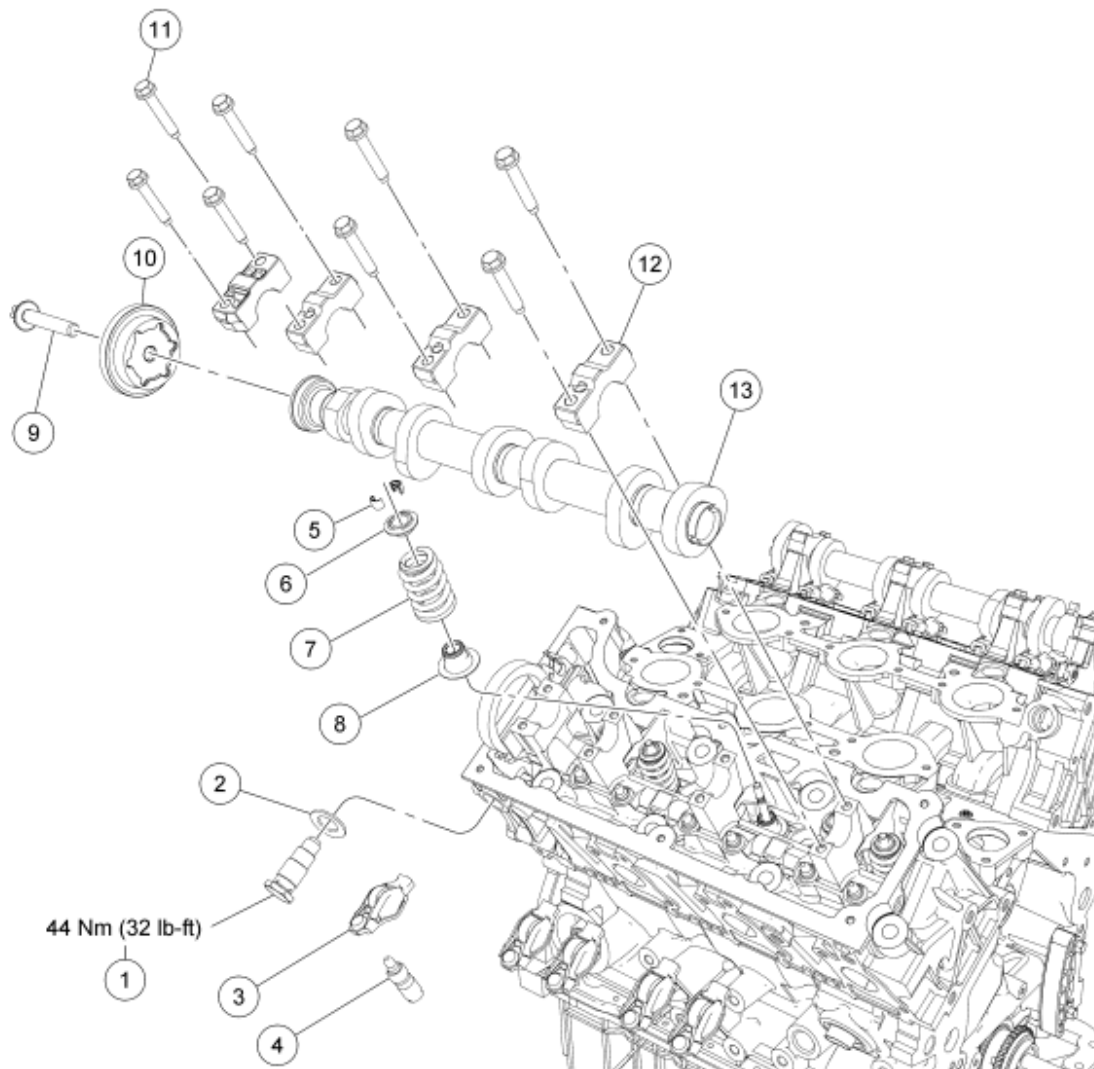


Fig. 63: Exploded View Of Valve Train Components With Torque Specification - RH Side
Courtesy of FORD MOTOR CO.

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)

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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	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

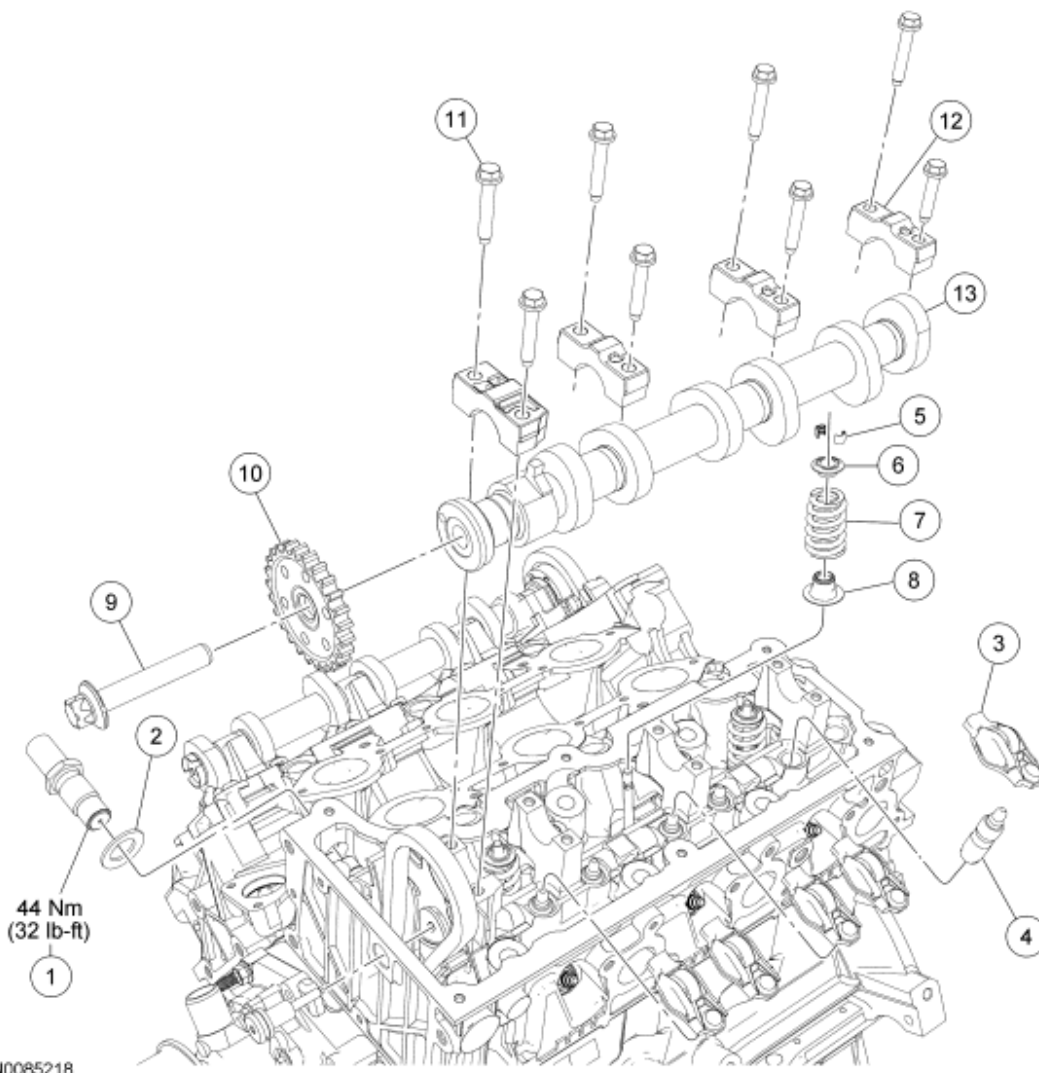


Fig. 64: Exploded View Of Valve Train Components With Torque Specification - LH Side
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
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2008 Ford Mustang

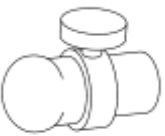
2008 ENGINE Engine - 4.0L SOHC - Mustang

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 Tools

Illustration	Tool Name	Tool Number
 ST1251-A	Adapter for 303-564	303-578 (T97T-6256-A)
 ST2176-B	Holding Tool, Camshaft Sprocket	303-564 (T97T-6256-B)
 ST1297-A	Socket, Camshaft Sprocket Nut	303-565 (T97T-6256-G)
 ST1299-A	Timing Tool, Crankshaft TDC	303-573 (T97T-6303-A)

 ST1298-A	Torque Wrench Extension	303-575 (T97T-6256-F)
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Material

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

- 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.**
- 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.**
- Install the Crankshaft TDC Timing Tool.

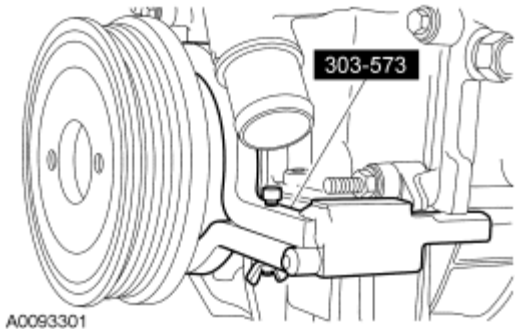


Fig. 65: Identifying Special Tool (303-573)

Courtesy of FORD MOTOR CO.

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).

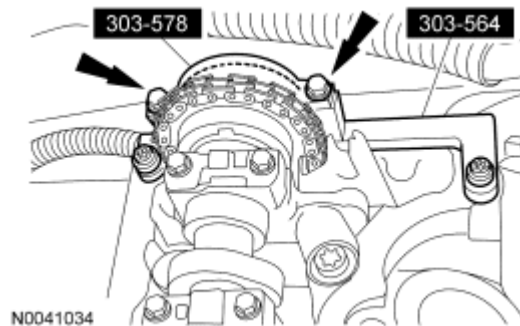


Fig. 66: Locating Clamp Bolts & Special Tools (303-564, 303-578)

Courtesy of FORD MOTOR CO.

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

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

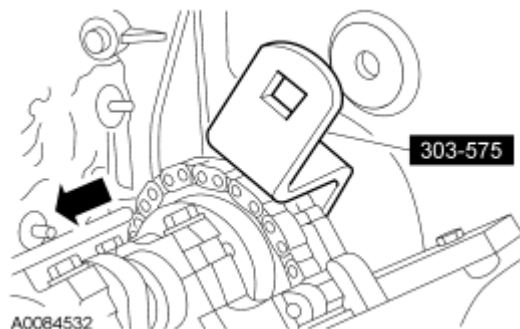


Fig. 67: Identifying Special Tool (303-575)

Courtesy of FORD MOTOR CO.

6. Remove the Camshaft Sprocket bolt and position the RH camshaft sprocket aside.

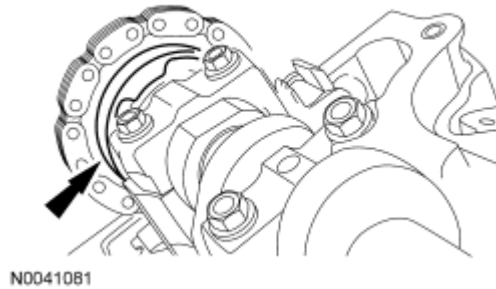


Fig. 68: Locating Camshaft Sprocket & Bolt
Courtesy of FORD MOTOR CO.

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).

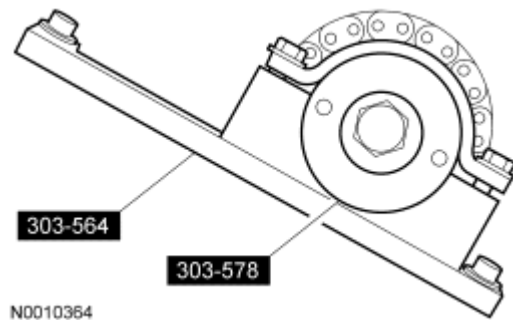


Fig. 69: Identifying Special Holding Tool
Courtesy of FORD MOTOR CO.

8. Loosen the bolt.

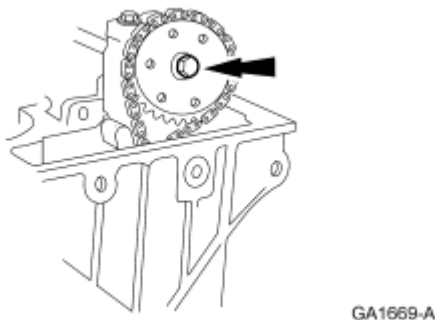


Fig. 70: Locating Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

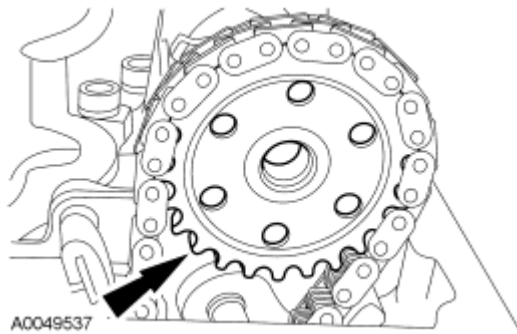


Fig. 71: Locating Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

Both sides

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

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

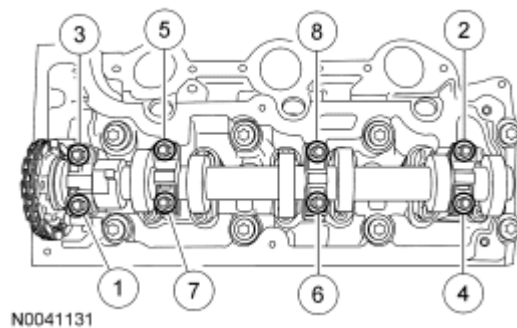


Fig. 72: Identifying Camshaft Bearing Cap Bolts Removal Sequence
Courtesy of FORD MOTOR CO.

11. Remove the camshaft.

INSTALLATION

Both sides

NOTE: Lubricate the camshafts with clean engine oil.

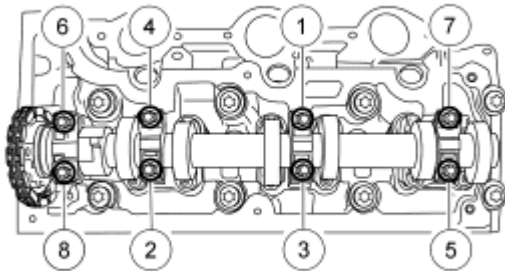
1. Install the camshaft.

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 2 stages.
 - Stage 1: Tighten to 6 Nm (53 lb-in).
 - Stage 2: Tighten to 16 Nm (142 lb-in).



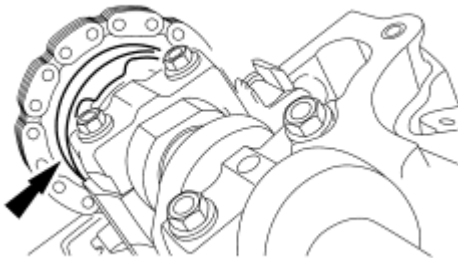
N0041132

Fig. 73: Identifying Camshaft Bearing Cap 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.

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



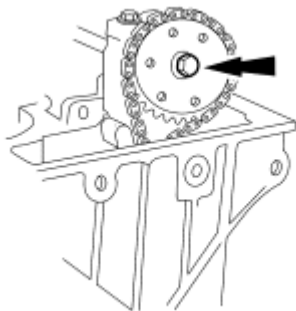
N0041081

Fig. 74: Locating Camshaft Sprocket & Bolt
Courtesy of FORD MOTOR CO.

LH side

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

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



GA1669-A

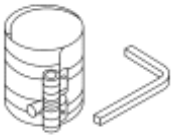
Fig. 75: Locating Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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 Tools

Illustration	Tool Name	Tool Number
 ST1376-A	Compressor, Valve Spring	303-581 (T97T-6565-A)

Material

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 AND CONTROLS - 4.0L SINGLE OVERHEAD CAMSHAFT (SOHC) article.
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.

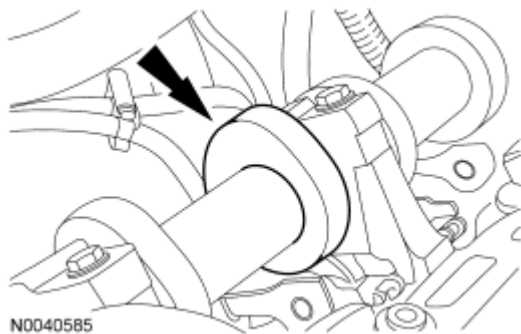


Fig. 76: Locating Crankshaft Lobe
Courtesy of FORD MOTOR CO.

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

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

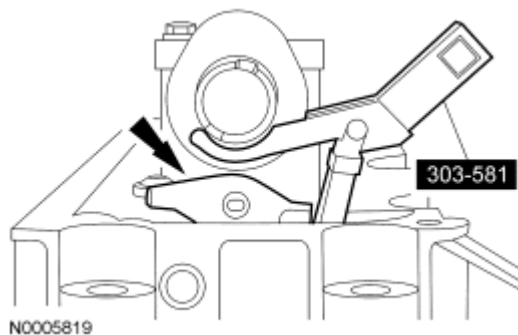


Fig. 77: Removing Camshaft Roller Using Special Tool (303-581)
Courtesy of FORD MOTOR CO.

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

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

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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.

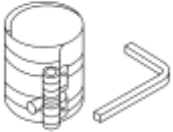
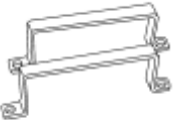
NOTE: The hydraulic lash adjusters must be installed in their original positions.

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

3. To install, reverse the removal procedure.

VALVE SPRING, RETAINER, AND SEAL

Special Tools

Illustration	Tool Name	Tool Number
 ST1376-A	Compressor, Valve Spring	303-581 (T97T-6565-A)
 ST1668-A	Installer, Valve Stem Oil Seal	303-370 (T90T-6571-A)

Material

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](#) article.
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.

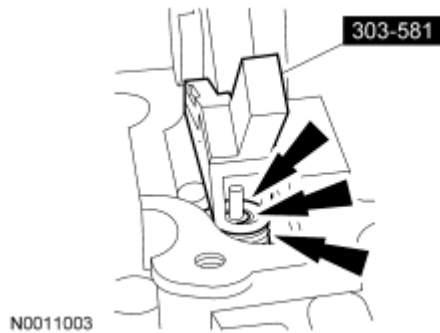


Fig. 78: Removing Valve Spring Retainer Keys, Valve Spring Retainers & Valve Springs Using Special Tool (303-581)
Courtesy of FORD MOTOR CO.

6. Remove the valve seals.

INSTALLATION

NOTE: Lubricate the valve seals with clean engine oil.

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

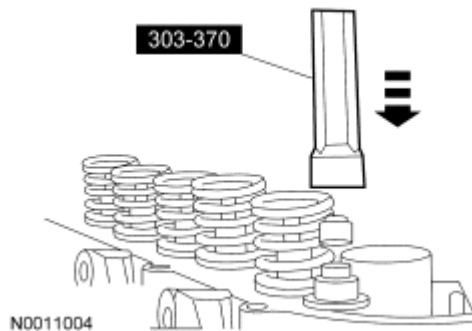


Fig. 79: Installing Valve Seal Using Special Tool (303-370)
Courtesy of FORD MOTOR CO.

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

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- Using the Valve Spring Compressor, install the valve springs the valve spring retainers and the valve spring retainer keys.

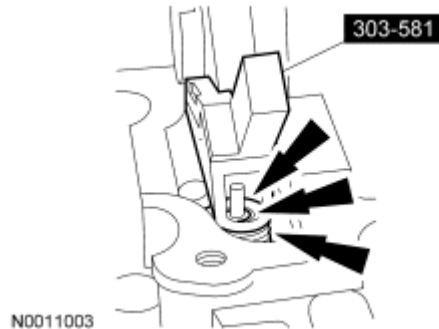
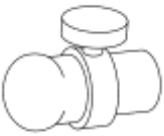


Fig. 80: Removing Valve Spring Retainer Keys, Valve Spring Retainers & Valve Springs Using Special Tool (303-581)
Courtesy of FORD MOTOR CO.

- Install the camshaft roller followers. For additional information, refer to **Camshaft Roller Follower**.
- Install the spark plugs. For additional information, refer to **ENGINE IGNITION - 4.0L SOHC** article.

CYLINDER HEAD

Special Tools

Illustration	Tool Name	Tool Number
 ST1251-A	Adapter for 303-564	303-578 (T97T-6256-A)
 ST1300-A	Adapter for 303-577	303-576 (T97T-6256-D)
 ST1279-A	Holding Tool, Camshaft	303-577 (T97T-6256-C)
	Holding Tool, Camshaft Sprocket	303-564 (T97T-6256-B)

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 ST2176-B		
 ST1337-A	Remover, Spark Plug Wire	303-106 (T74P-6666A)
 ST1297-A	Socket, Camshaft Sprocket Nut	303-565 (T97T-6256-G)
 ST1185-A	Tensioner, Timing Chain	303-571 (T97T-6K254-A)
 ST1299-A	Timing Tool, Crankshaft TDC	303-573 (T97T-6303-A)
 ST1298-A	Torque Wrench Extension	303-575 (T97T-6256-F)

Material

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	ESE-M1C171-A

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XG-3-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 AND LIFTING** article.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
3. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING** article.
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.

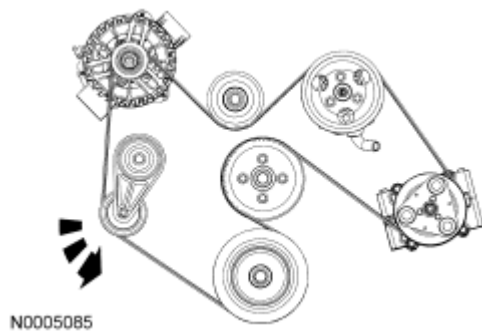


Fig. 81: Rotating Accessory Drive Belt Tensioner
Courtesy of FORD MOTOR CO.

RH side

7. Remove the 2 coolant tube bracket bolts.

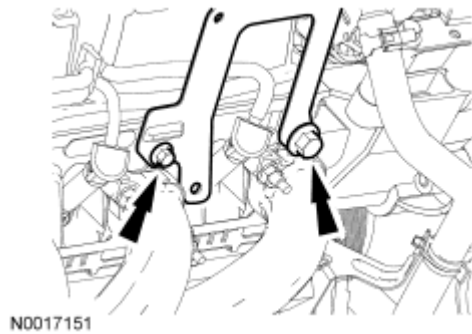


Fig. 82: Locating Coolant Tube Bracket Bolts
Courtesy of FORD MOTOR CO.

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

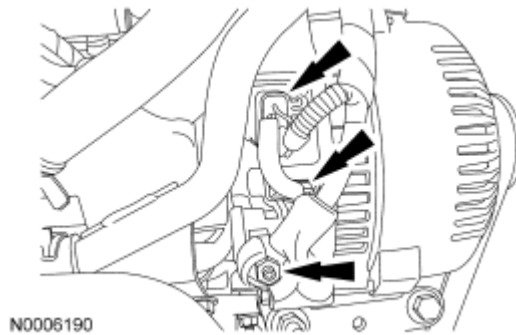


Fig. 83: Locating Generator Electrical Connections Pin-Type Retainer
Courtesy of FORD MOTOR CO.

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

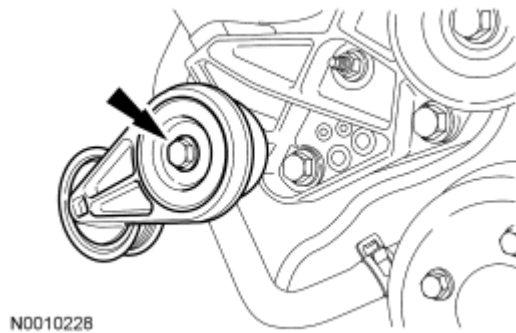


Fig. 84: Locating Belt Tensioner Bolt
Courtesy of FORD MOTOR CO.

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

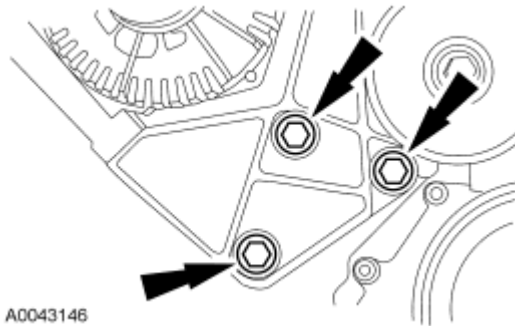


Fig. 85: Locating Generator Mounting Bracket Assembly Bolts
Courtesy of FORD MOTOR CO.

11. Disconnect the heater hose from the thermostat housing.

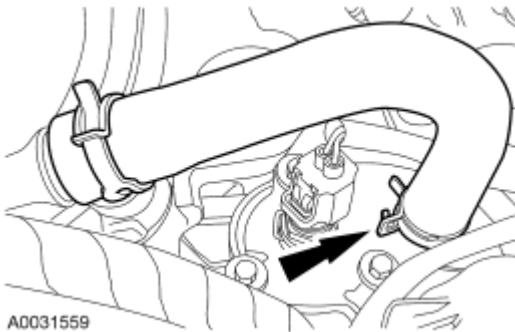


Fig. 86: Locating Heater Hose From Thermostat Housing
Courtesy of FORD MOTOR CO.

12. Disconnect the upper radiator hose.

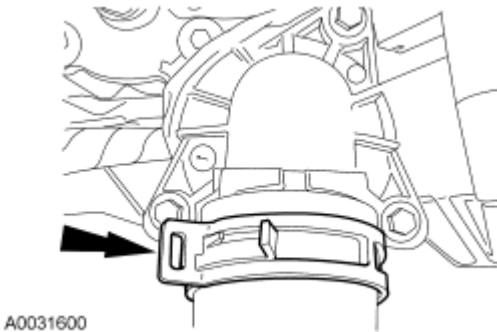


Fig. 87: Locating Upper Radiator Hose Clamp
Courtesy of FORD MOTOR CO.

13. Position the coolant bypass hose clamp aside.

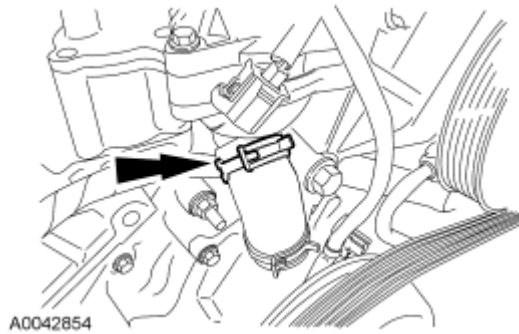


Fig. 88: Locating Coolant Bypass Hose Clamp
Courtesy of FORD MOTOR CO.

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

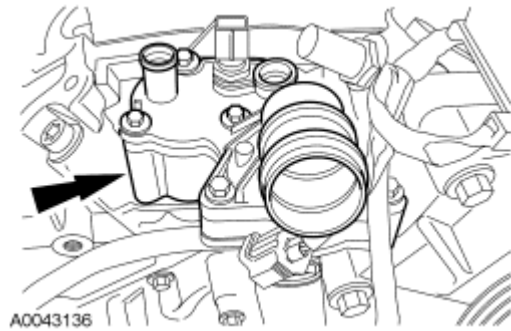


Fig. 89: Locating Thermostat Housing
Courtesy of FORD MOTOR CO.

LH side

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

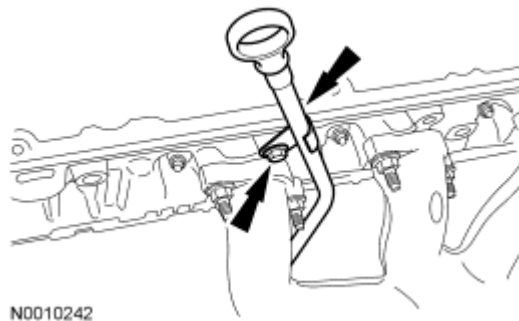


Fig. 90: Locating Oil Level Indicator Tube And Bolt
Courtesy of FORD MOTOR CO.

16. Remove the stud bolt and detach the ground strap.

- Position the ground strap aside.

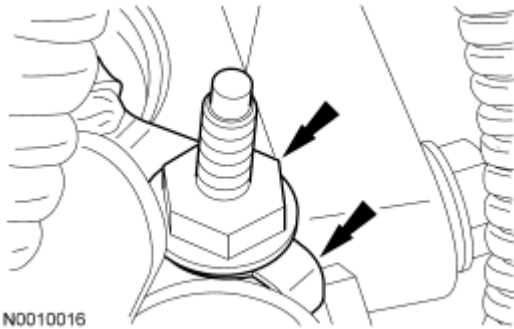


Fig. 91: Locating Ground Strap Stud Bolt
Courtesy of FORD MOTOR CO.

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



Fig. 92: Locating Power Steering Supply Hose Bracket Bolt
Courtesy of FORD MOTOR CO.

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

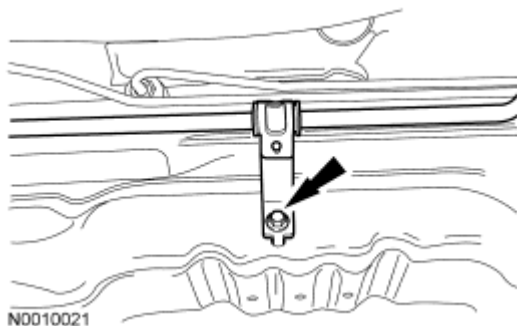


Fig. 93: Locating PSP Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

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

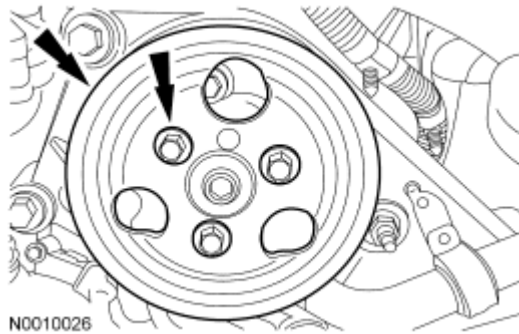


Fig. 94: Locating Power Steering Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

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

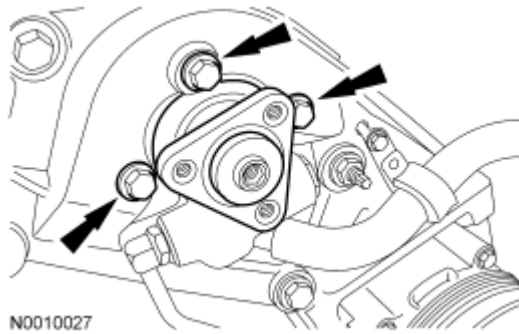


Fig. 95: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

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

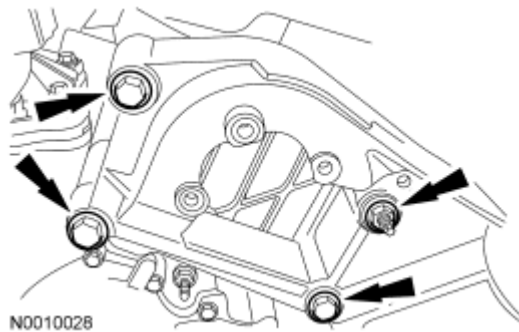


Fig. 96: Locating FEAD Bracket And A/C Compressor Bracket Bolts
Courtesy of FORD MOTOR CO.

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

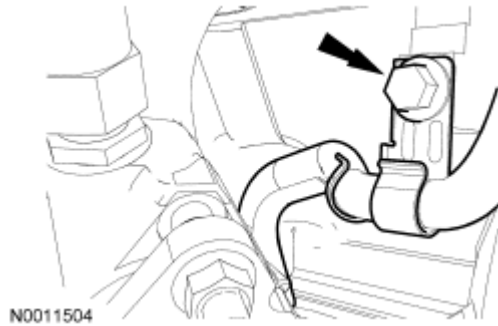


Fig. 97: Locating Starter Motor Wiring Retainer Bracket Bolt
Courtesy of FORD MOTOR CO.

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

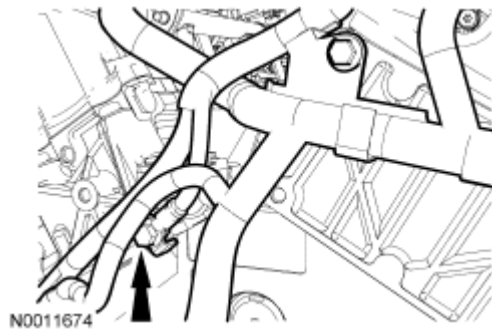


Fig. 98: Locating Ground Strap Bolt
Courtesy of FORD MOTOR CO.

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.

24. Using the Spark Plug Wire Remover, disconnect the 6 spark plug wires from the spark plugs.

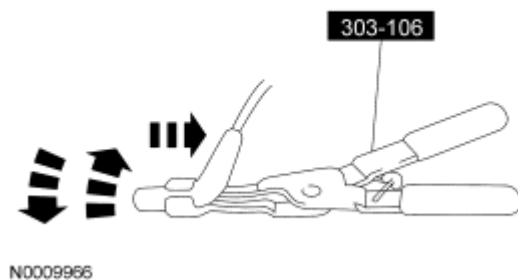


Fig. 99: Pulling Spark Plug Wire Off Spark Plug

Courtesy of FORD MOTOR CO.

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

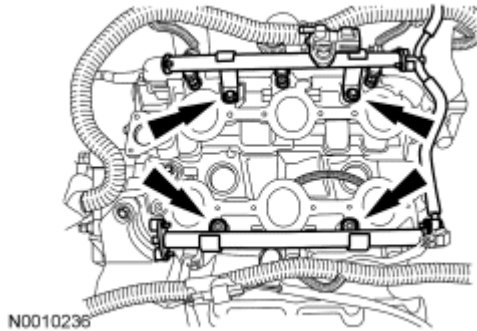


Fig. 100: Locating Fuel Rail And Injectors Bolts
Courtesy of FORD MOTOR CO.

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.

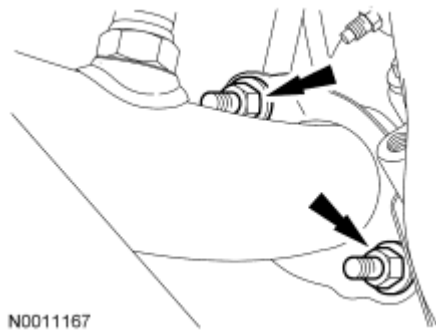


Fig. 101: Locating Catalytic Converter-To-Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

NOTE: LH side shown, RH side similar.

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

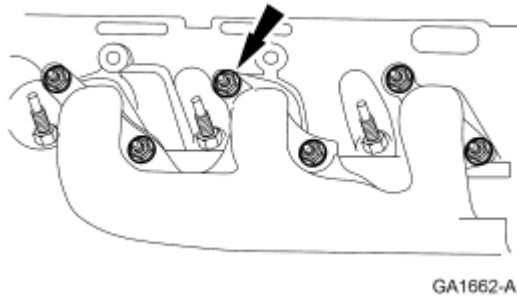


Fig. 102: Locating Exhaust Manifolds, Gaskets & Nuts
Courtesy of FORD MOTOR CO.

NOTE: LH side shown, RH side similar.

29. Remove and discard the 12 exhaust manifold studs.

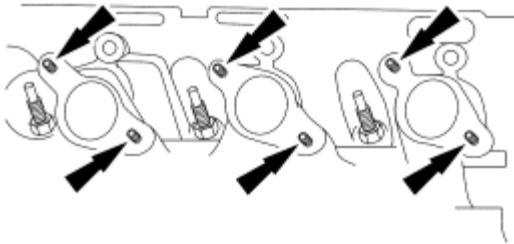


Fig. 103: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

RH side

30. Remove the RH side hydraulic chain tensioner.
- Remove and discard the washer.

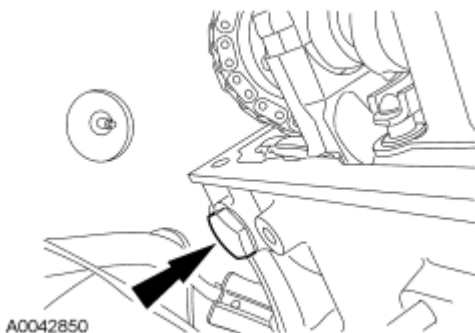


Fig. 104: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

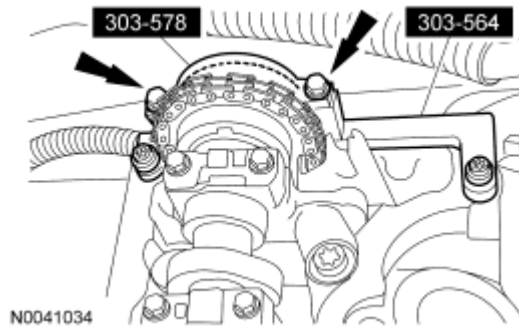


Fig. 105: Locating Clamp Bolts & Special Tools (303-564, 303-578)
Courtesy of FORD MOTOR CO.

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

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

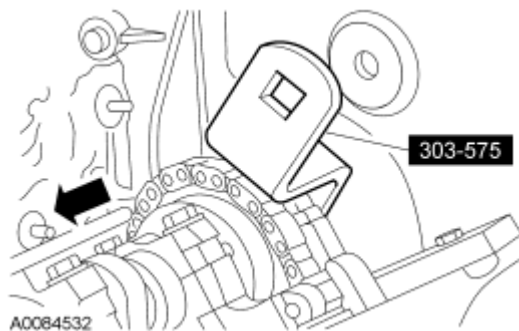


Fig. 106: Identifying Special Tool (303-575)
Courtesy of FORD MOTOR CO.

33. Remove the RH side cassette bolt.

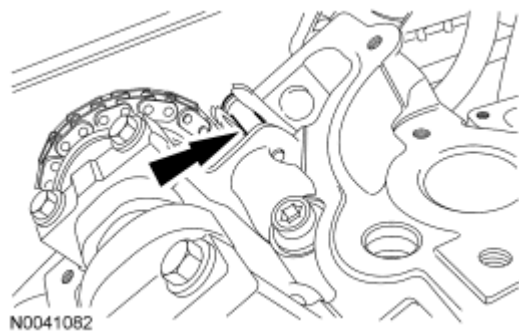


Fig. 107: Locating RH Side Cassette Bolt

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.

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

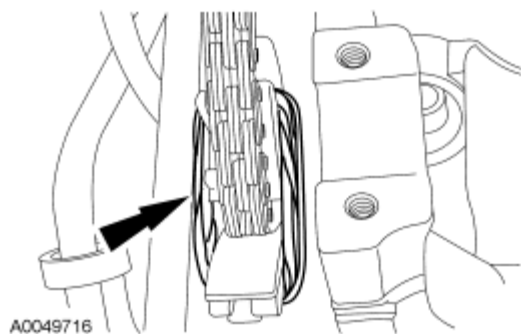


Fig. 108: Locating RH Camshaft Sprocket

Courtesy of FORD MOTOR CO.

LH side

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

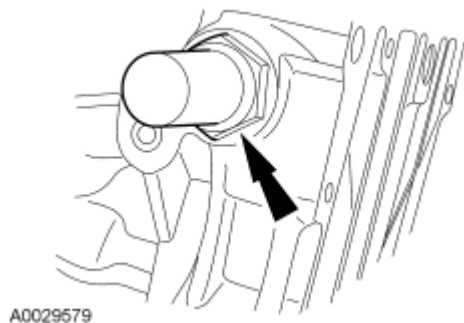


Fig. 109: Locating Camshaft Tensioner

Courtesy of FORD MOTOR CO.

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

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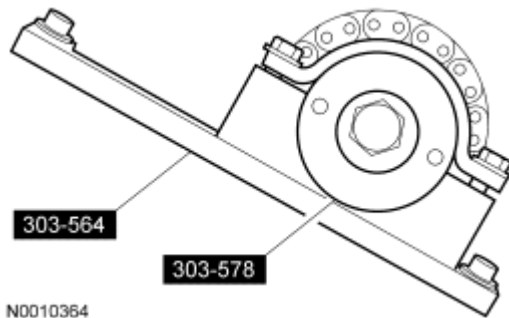


Fig. 110: Identifying Special Holding Tool
Courtesy of FORD MOTOR CO.

37. Remove the LH side camshaft sprocket bolt.

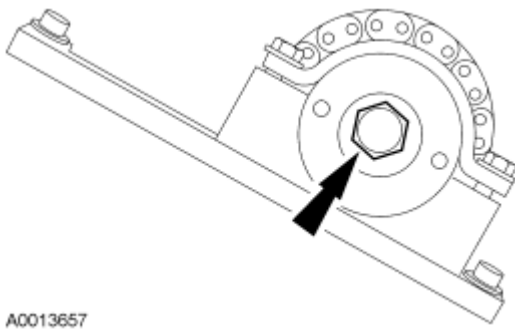


Fig. 111: Locating LH Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

38. Remove the LH side cassette bolt.

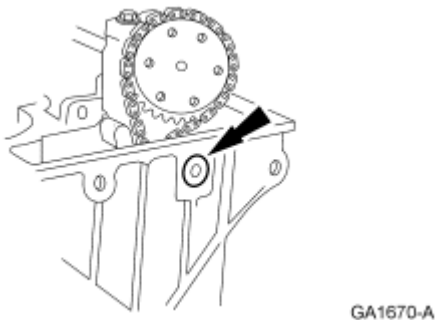


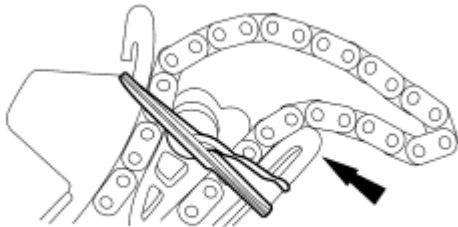
Fig. 112: Locating Chain Guide Bolt
Courtesy of FORD MOTOR CO.

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.

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



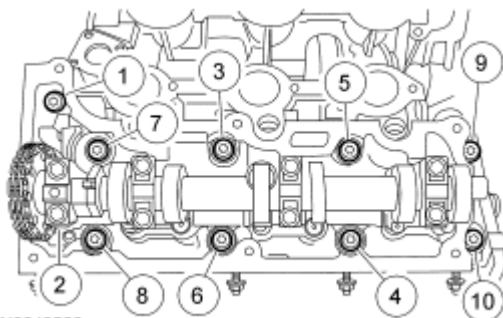
N0014449

Fig. 113: Locating Cassette And Timing Chain
Courtesy of FORD MOTOR CO.

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. Discard all the bolts.
 - Remove and discard the head gaskets.



N0040586

Fig. 114: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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- 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.
 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.
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** article.

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.

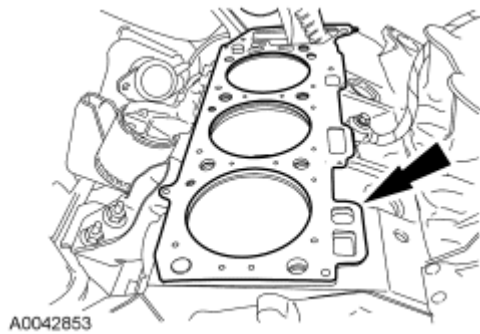


Fig. 115: Locating Cylinder Head Gaskets On Block
Courtesy of FORD MOTOR CO.

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

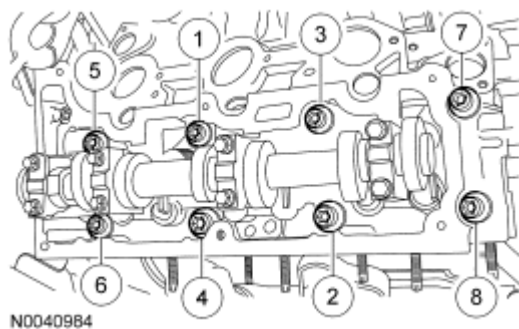


Fig. 116: Identifying Tightening Sequence Of 12-MM Bolts
Courtesy of FORD MOTOR CO.

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

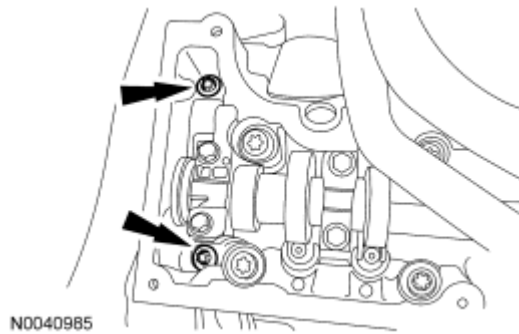


Fig. 117: Locating 8-Mm Bolts
Courtesy of FORD MOTOR CO.

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

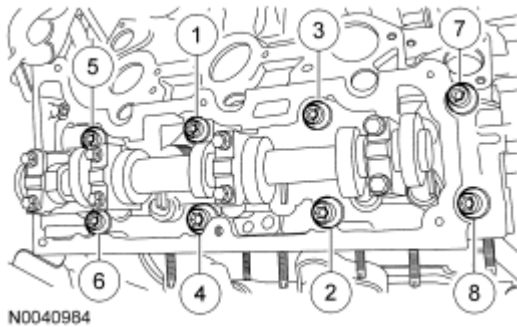


Fig. 118: Identifying Tightening Sequence Of 12-MM Bolts
Courtesy of FORD MOTOR CO.

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.

6. Remove the rubber band, position the camshaft sprocket and chain. Loosely install the bolt.

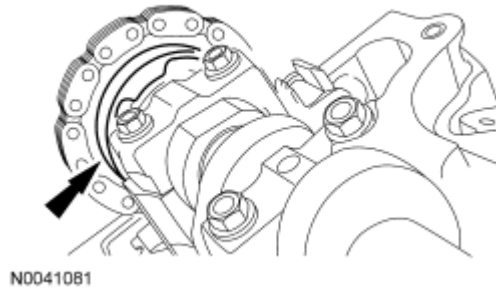


Fig. 119: Locating Camshaft Sprocket & Bolt
Courtesy of FORD MOTOR CO.

7. Install the RH side cassette bolt.
 - Tighten to 12 Nm (106 lb-in).

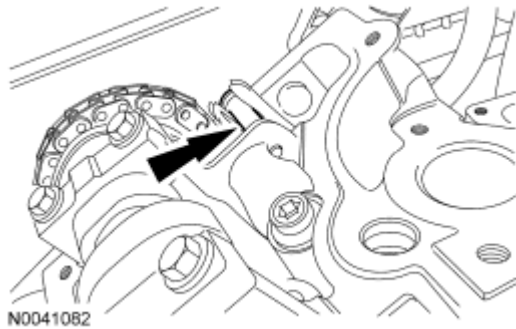


Fig. 120: Locating RH Side Cassette Bolt
Courtesy of FORD MOTOR CO.

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

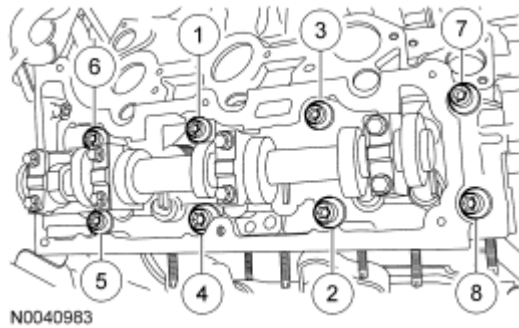


Fig. 121: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

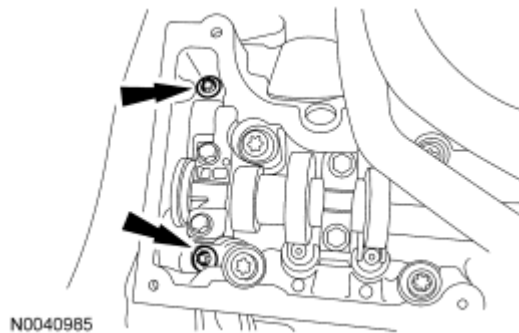


Fig. 122: Locating 8-Mm Bolts
Courtesy of FORD MOTOR CO.

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

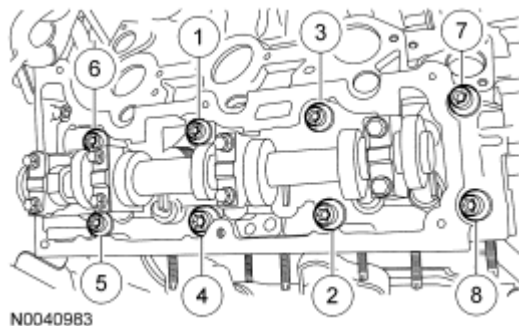
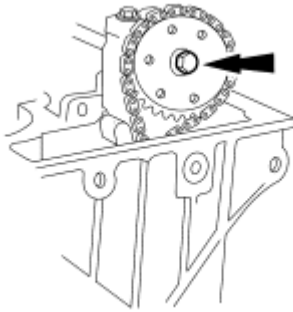


Fig. 123: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

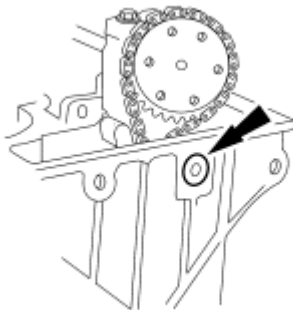
11. Remove the rubber band, position the camshaft sprocket and chain. Loosely install the bolt.



GA1669-A

Fig. 124: Locating Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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



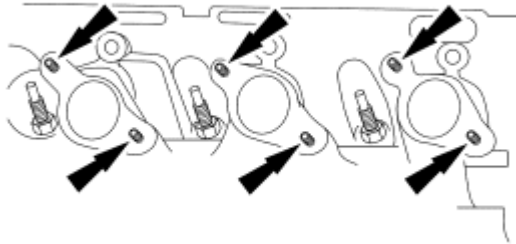
GA1670-A

Fig. 125: Locating Chain Guide 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).

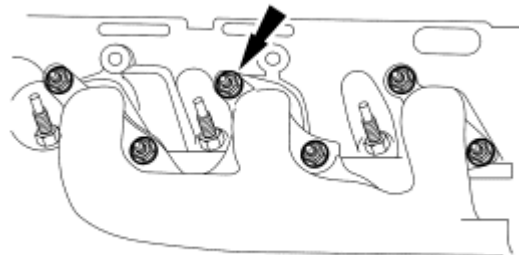


N0072449

Fig. 126: Locating Exhaust Manifold Studs
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).

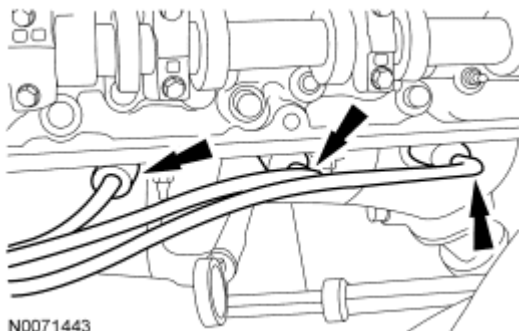


GA1662-A

Fig. 127: Locating Exhaust Manifolds, Gaskets & Nuts
Courtesy of FORD MOTOR CO.

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

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



N0071443

Fig. 128: Locating Spark Plug Wires

Courtesy of FORD MOTOR CO.

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).

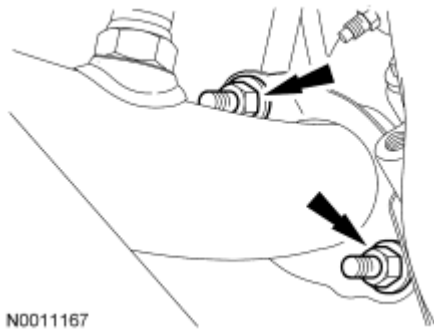


Fig. 129: Locating Catalytic Converter-To-Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

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).

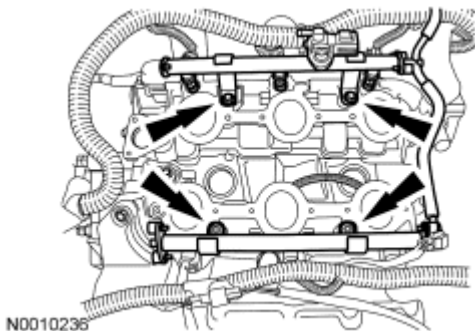


Fig. 130: Locating Fuel Rail And Injectors Bolts
Courtesy of FORD MOTOR CO.

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).

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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.

20. Install the Crankshaft TDC Timing Tool.

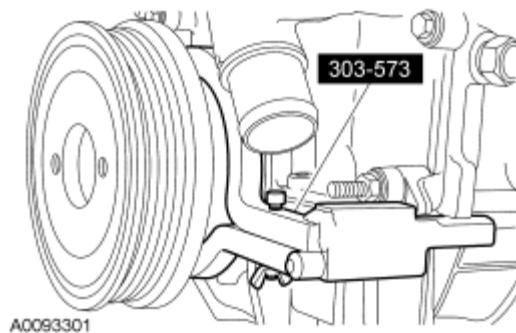


Fig. 131: Identifying Special Tool (303-573)
Courtesy of FORD MOTOR CO.

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

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

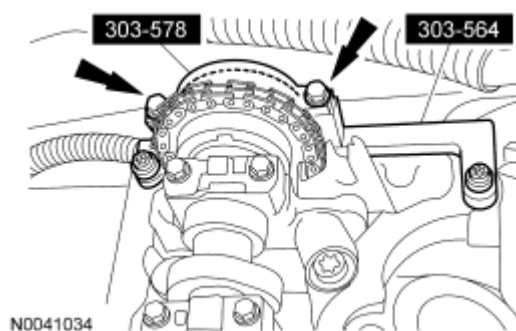


Fig. 132: Locating Clamp Bolts & Special Tools (303-564, 303-578)
Courtesy of FORD MOTOR CO.

NOTE: The camshaft timing slots are off-center.

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.

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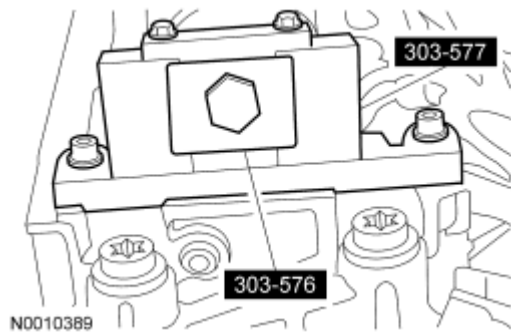


Fig. 133: Identifying Special Tools (303-576, 303-577)
Courtesy of FORD MOTOR CO.

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

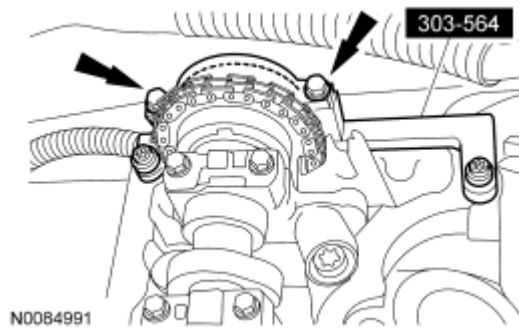


Fig. 134: Locating Top Camshaft Sprocket Holding Tool Clamp Bolts
Courtesy of FORD MOTOR CO.

24. Install the Timing Chain Tensioner.

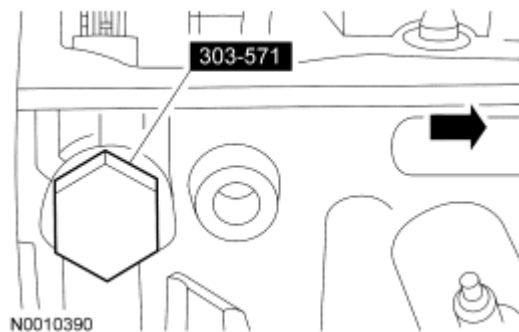


Fig. 135: Identifying Special Tool (303-571)
Courtesy of FORD MOTOR CO.

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

25. Using the Torque Wrench Extension with the Camshaft Sprocket Nut Socket 303-565, tighten the camshaft bolt to 85 Nm (63 lb-ft).

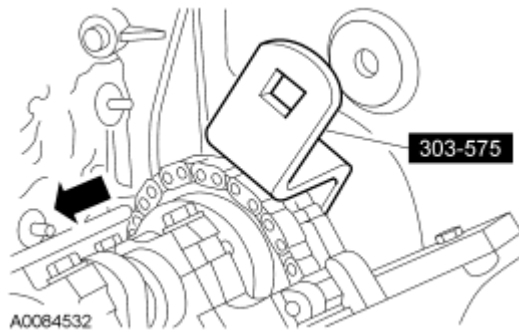


Fig. 136: Identifying Special Tool (303-575)
Courtesy of FORD MOTOR CO.

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

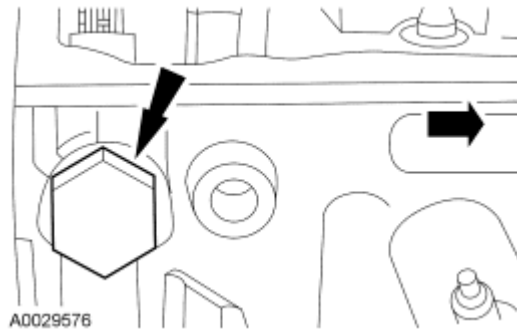


Fig. 137: Locating Hydraulic Camshaft Tensioner Bolt
Courtesy of FORD MOTOR CO.

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

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

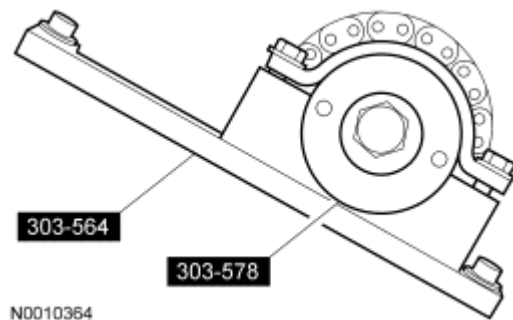


Fig. 138: Identifying Special Holding Tool
Courtesy of FORD MOTOR CO.

NOTE: The camshaft timing slots are off-center.

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.

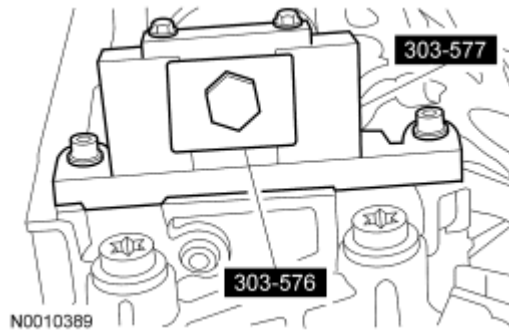


Fig. 139: Identifying Special Tools (303-576, 303-577)
Courtesy of FORD MOTOR CO.

29. Install the Timing Chain Tensioner.



Fig. 140: Identifying Special Tool (303-571)
Courtesy of FORD MOTOR CO.

30. 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).

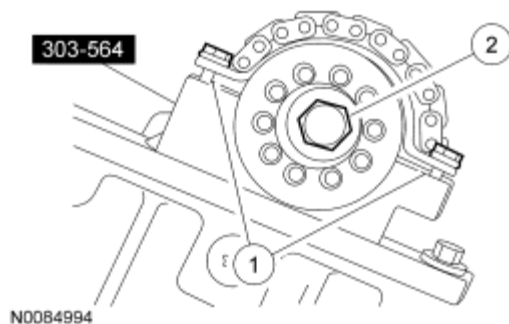


Fig. 141: Tightening Camshaft Sprocket Holding Tool Top Clamp Bolts
Courtesy of FORD MOTOR CO.

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

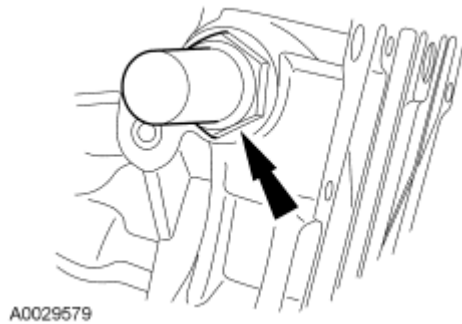


Fig. 142: Locating Camshaft Tensioner
Courtesy of FORD MOTOR CO.

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.

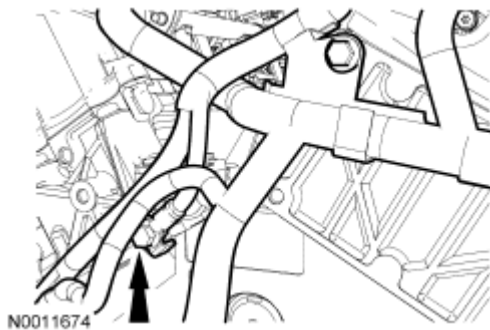


Fig. 143: Locating Ground Strap Bolt
Courtesy of FORD MOTOR CO.

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

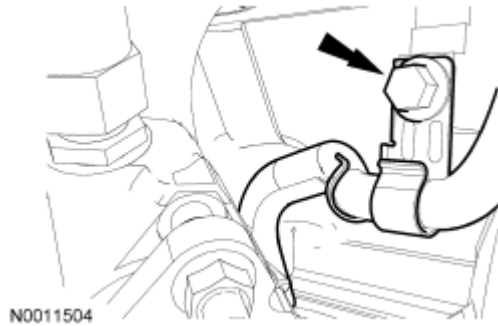


Fig. 144: Locating Starter Motor Wiring Retainer Bracket Bolt
Courtesy of FORD MOTOR CO.

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

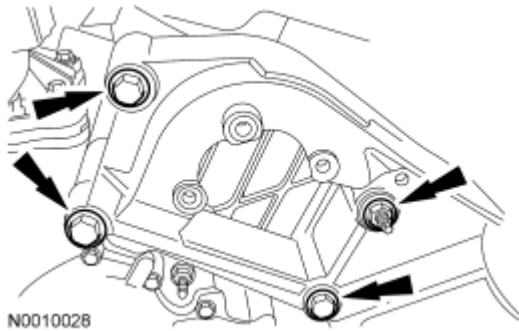


Fig. 145: Locating FEAD Bracket And A/C Compressor Bracket Bolts
Courtesy of FORD MOTOR CO.

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

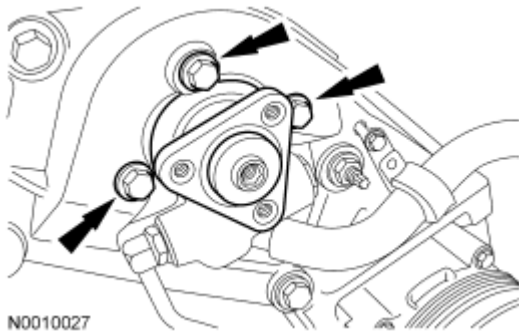


Fig. 146: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

36. Position the power steering pump pulley and install the 3 bolts.

- Tighten to 25 Nm (18 lb-ft).

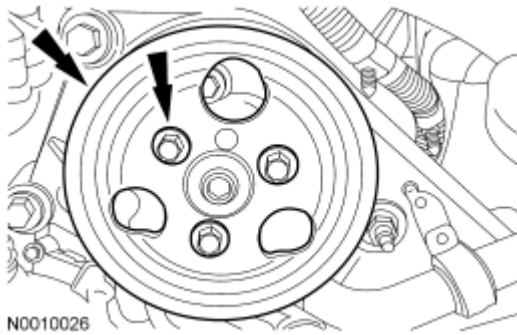


Fig. 147: Locating Power Steering Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

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

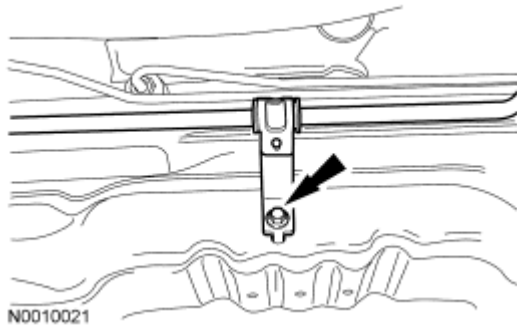


Fig. 148: Locating PSP Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

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

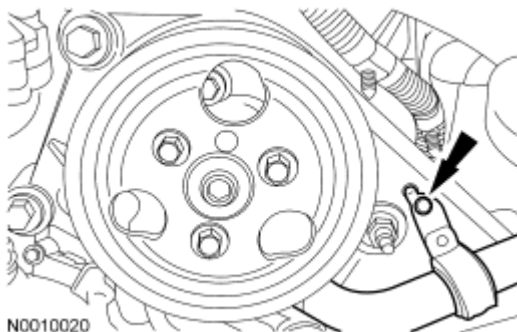


Fig. 149: Locating Power Steering Supply Hose Bracket Bolt
Courtesy of FORD MOTOR CO.

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

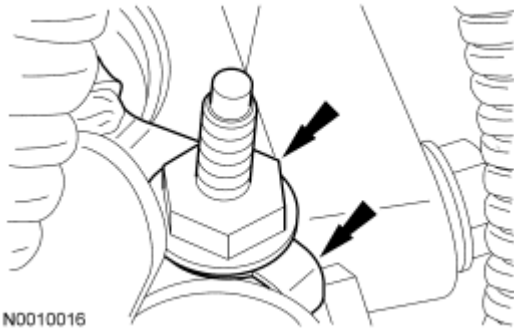


Fig. 150: Locating Ground Strap Stud Bolt
Courtesy of FORD MOTOR CO.

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

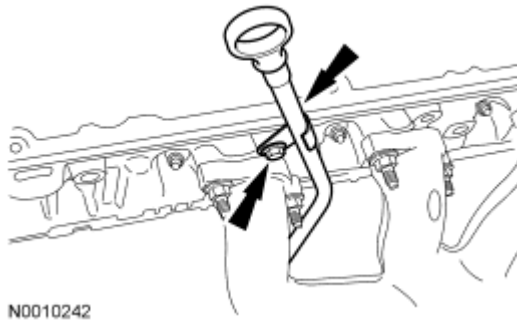


Fig. 151: Locating Oil Level Indicator Tube And Bolt
Courtesy of FORD MOTOR CO.

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).

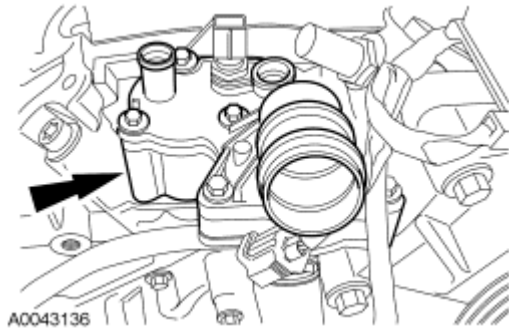


Fig. 152: Locating Thermostat Housing
Courtesy of FORD MOTOR CO.

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

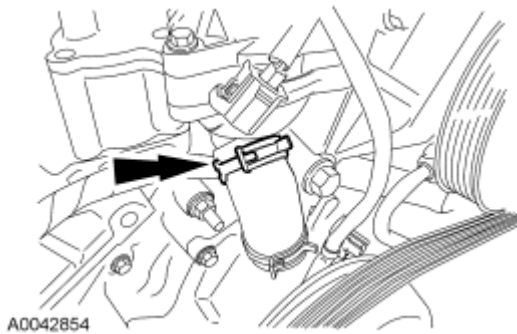


Fig. 153: Locating Coolant Bypass Hose Clamp
Courtesy of FORD MOTOR CO.

43. Install the upper radiator hose.

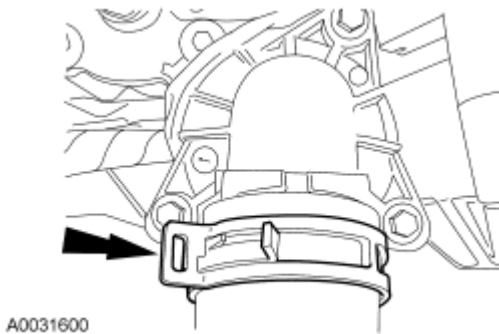


Fig. 154: Locating Upper Radiator Hose Clamp
Courtesy of FORD MOTOR CO.

44. Connect the heater hose to the thermostat housing.

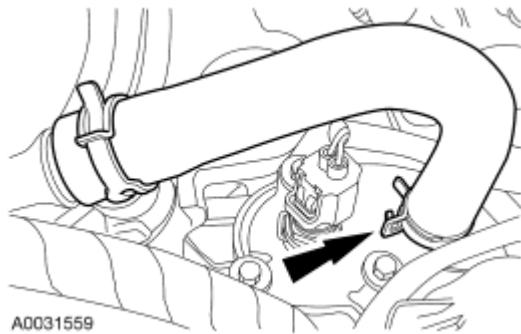


Fig. 155: Locating Heater Hose From Thermostat Housing
Courtesy of FORD MOTOR CO.

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

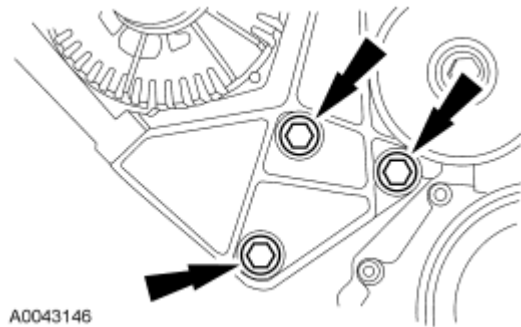


Fig. 156: Locating Generator Mounting Bracket Assembly Bolts
Courtesy of FORD MOTOR CO.

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

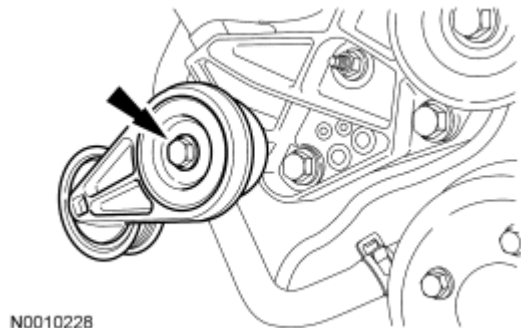


Fig. 157: Locating Belt Tensioner Bolt
Courtesy of FORD MOTOR CO.

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.

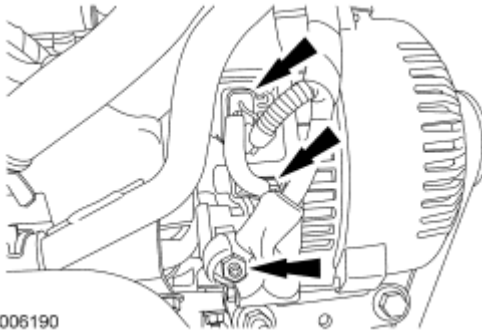


Fig. 158: Locating Generator Electrical Connections Pin-Type Retainer
Courtesy of FORD MOTOR CO.

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).

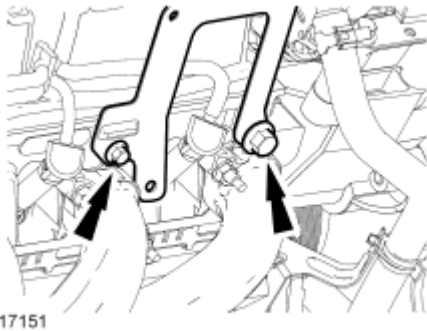


Fig. 159: Locating Coolant Tube Bracket Bolts
Courtesy of FORD MOTOR CO.

Both sides

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

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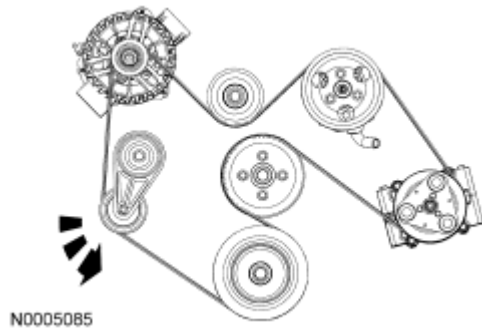


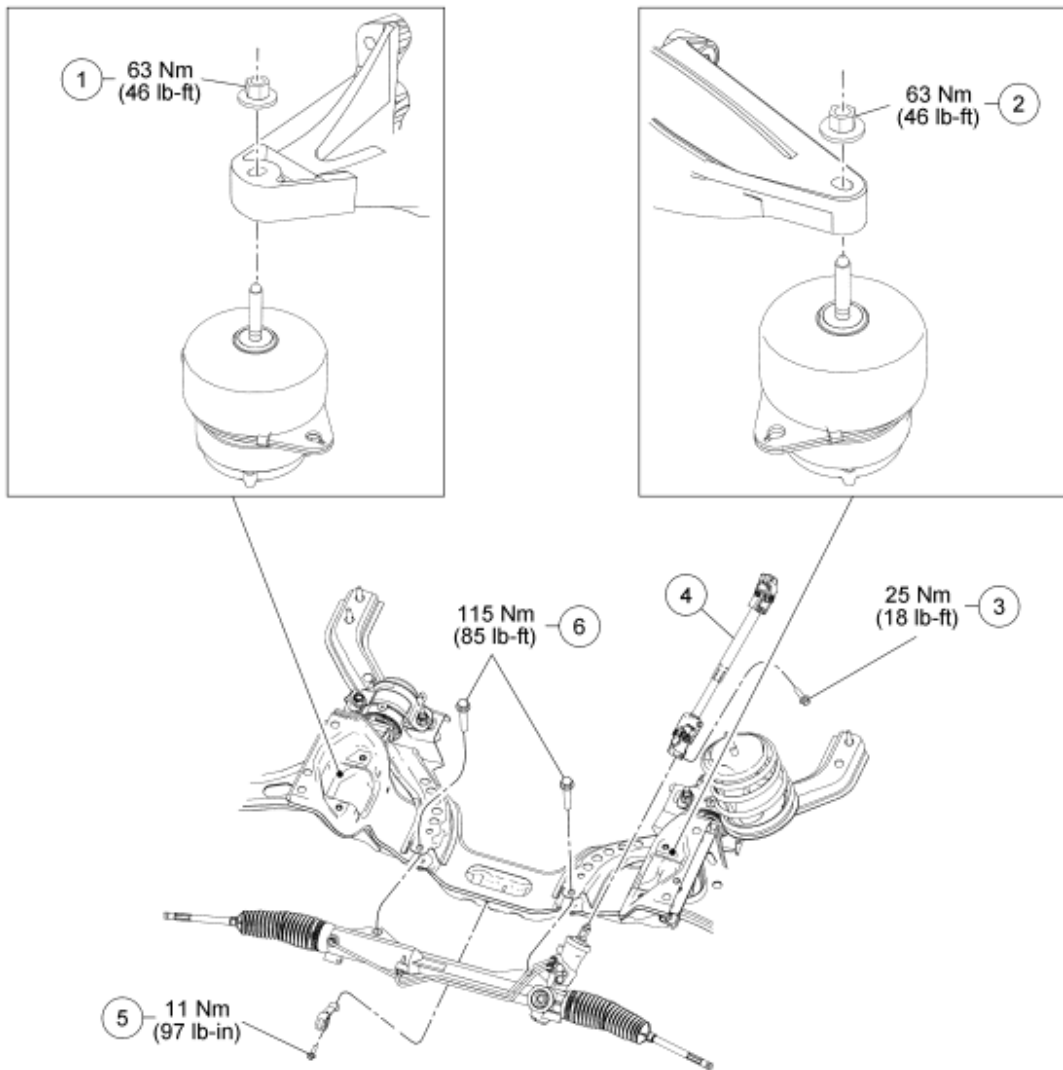
Fig. 160: Rotating Accessory Drive Belt Tensioner
Courtesy of FORD MOTOR CO.

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** article.

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

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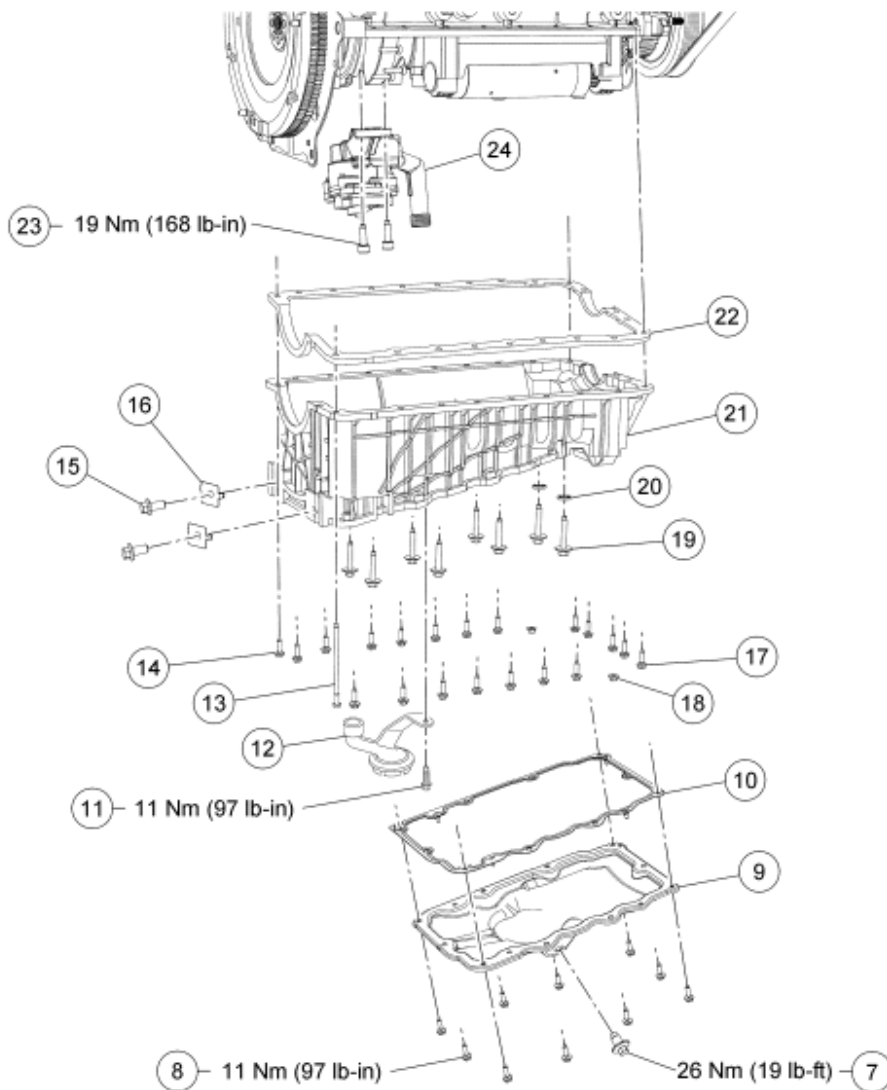
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Fig. 161: Exploded View Of Steering Gear & Engine Mounts With Torque Specifications
Courtesy of FORD MOTOR CO.

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

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N0085242

Fig. 162: Exploded View Of Oil Pan, Oil Pump, Cylinder Block Cradle & Oil Pump Screen & Pickup Tube

Courtesy of FORD MOTOR CO.

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
13	E804588	Cylinder block cradle bolt
14	W709198	Cylinder block cradle bolt
15	E802185	Bell housing-to-cylinder block cradle spacer bolt (2

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		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

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 AND LIFTING** article.
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).

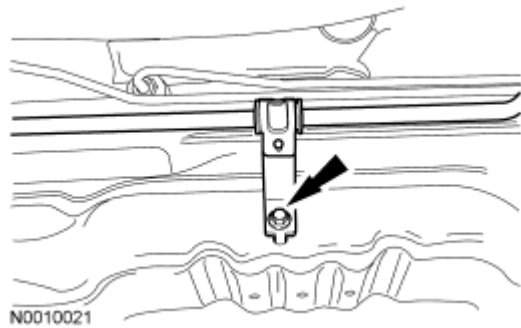


Fig. 163: Locating PSP Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

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

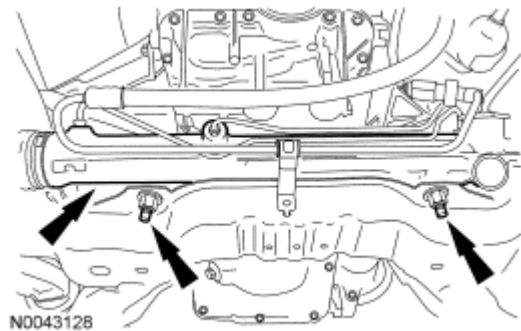


Fig. 164: Locating Power Steering Gear Bolts
Courtesy of FORD MOTOR CO.

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.

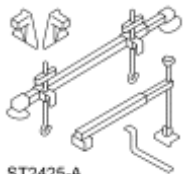
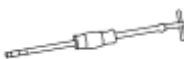
6. Clean and inspect the sealing surfaces.
7. To install, reverse the removal procedure.
8. Fill the engine with clean engine oil.

CYLINDER BLOCK CRADLE

Special Tools

2008 Ford Mustang

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Illustration	Tool Name	Tool Number
 ST2425-A	Lifting Bracket, Engine	303-050 (T70P-6000)
 ST1185-A	Support Bar, Engine	303-F072

Material

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 AND LIFTING** article.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING AND CONTROLS - 4.0L SINGLE OVERHEAD CAMSHAFT (SOHC)** article.
4. Remove the Front End Accessory Drive (FEAD) bracket bolt and install the Engine Lifting Bracket.

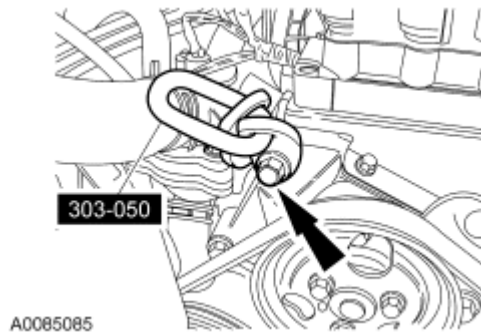


Fig. 165: Locating Front End Accessory Drive (FEAD) Bracket Bolt
Courtesy of FORD MOTOR CO.

5. Remove the 6 pin-type retainers and the radiator sight shield.

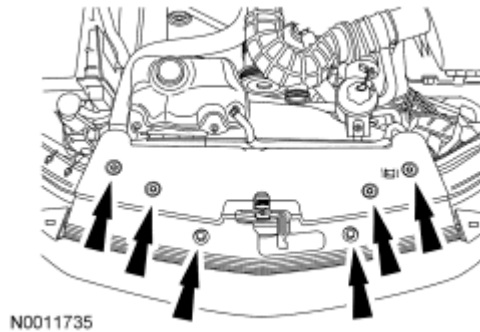


Fig. 166: Locating Pin-Type Retainers And Radiator Sight Shield
Courtesy of FORD MOTOR CO.

6. Install the Engine Support Bar.



Fig. 167: Identifying Special Tool 303-F072
Courtesy of FORD MOTOR CO.

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

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

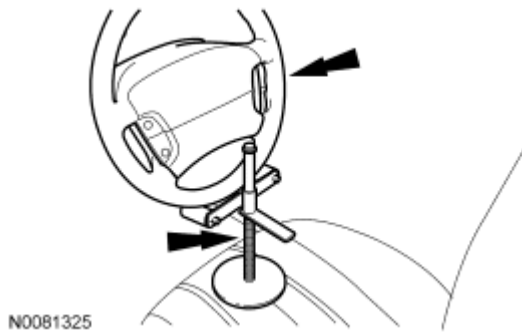


Fig. 168: Holding Steering Wheel In Straight-Ahead Position Using A Suitable Holding Device
Courtesy of FORD MOTOR CO.

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** article.

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** article.

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

15. Remove the 2 cylinder block cradle rear Torx bolts.

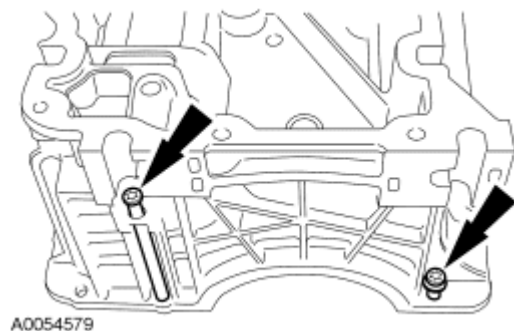


Fig. 169: Locating Rear Cylinder Block Cradle Bolts

Courtesy of FORD MOTOR CO.

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. 170: Identifying Special Tool 303-F072
Courtesy of FORD MOTOR CO.

INSTALLATION

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

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

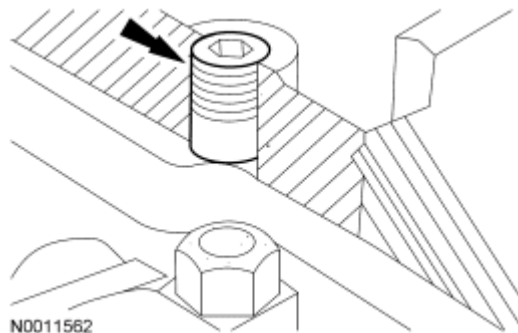


Fig. 171: Locating Cylinder Block Cradle Boss Screw
Courtesy of FORD MOTOR CO.

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches

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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.

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.

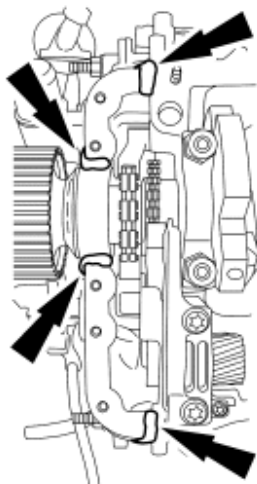


A0082961

Fig. 172: Locating Sealant Position On Rear Main Bearing Cap
Courtesy of FORD MOTOR CO.

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

3. Apply silicone in the 6 places shown.



A0082960



Fig. 173: Locating Silicone Applying Area

Courtesy of FORD MOTOR CO.

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.

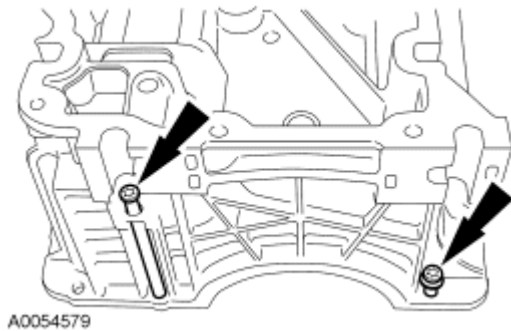


Fig. 174: Locating Rear Cylinder Block Cradle Bolts
Courtesy of FORD MOTOR CO.

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).

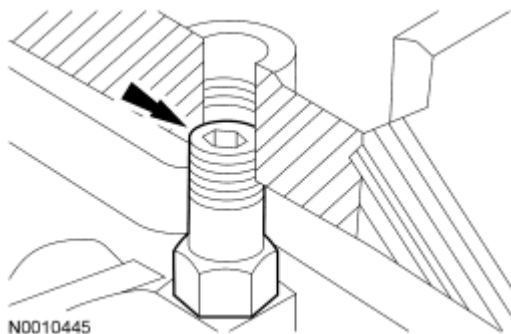


Fig. 175: Locating Cylinder Block Cradle Rear Torx Bolts
Courtesy of FORD MOTOR CO.

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

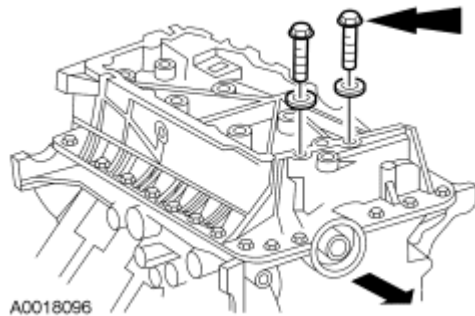


Fig. 176: Locating Silver-Colored Bolts And New Washer Seals
Courtesy of FORD MOTOR CO.

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

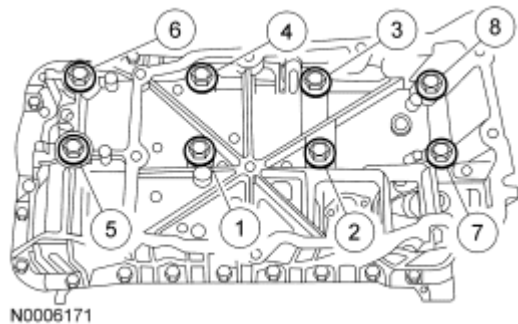


Fig. 177: Identifying Cylinder Block Cradle Inner Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

14. Install the starter. For additional information, refer to **STARTING SYSTEM** article.
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** article.

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).

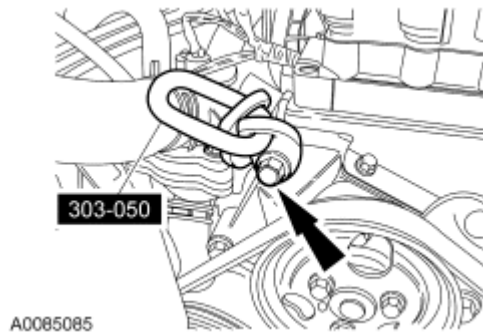


Fig. 178: Locating Front End Accessory Drive (FEAD) Bracket Bolt
Courtesy of FORD MOTOR CO.

22. Position the radiator sight shield and install the 6 pin-type retainers.

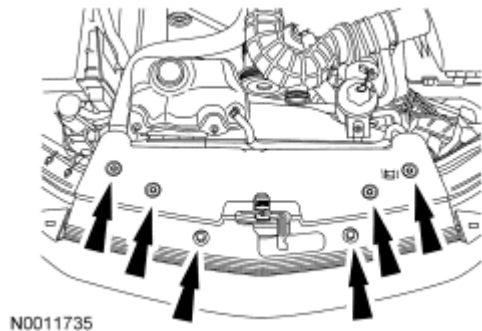


Fig. 179: Locating Pin-Type Retainers And Radiator Sight Shield
Courtesy of FORD MOTOR CO.

23. Install the TB. For additional information, refer to **FUEL CHARGING AND CONTROLS - 4.0L SINGLE OVERHEAD CAMSHAFT (SOHC)** article.
24. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.

OIL PUMP

REMOVAL AND INSTALLATION

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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

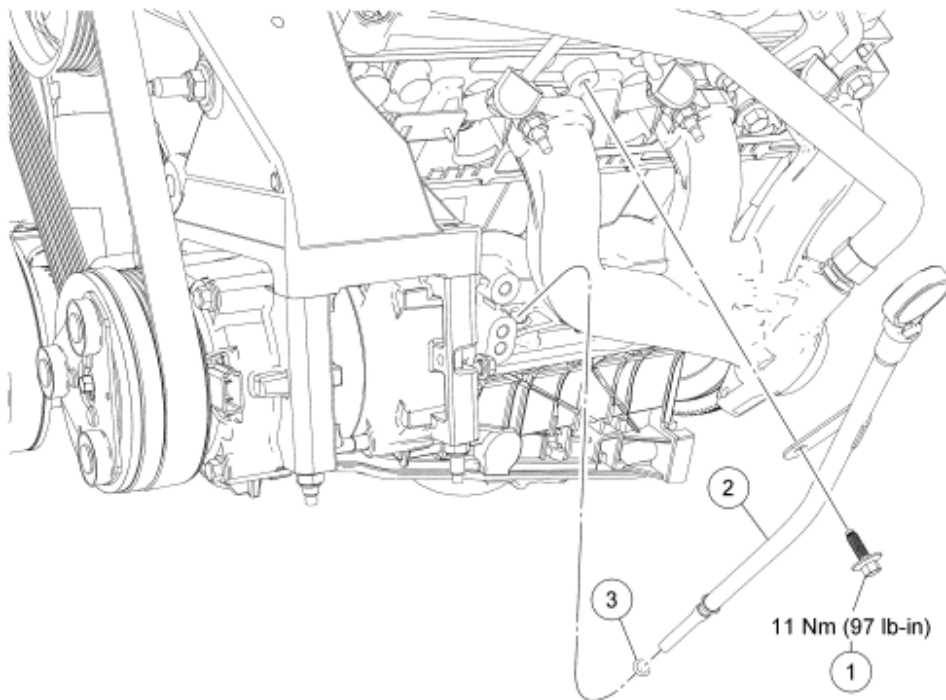
REMOVAL AND INSTALLATION

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

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



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Fig. 180: Exploded View Of Oil Level Indicator & Tube With Torque Specification
Courtesy of FORD MOTOR CO.

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

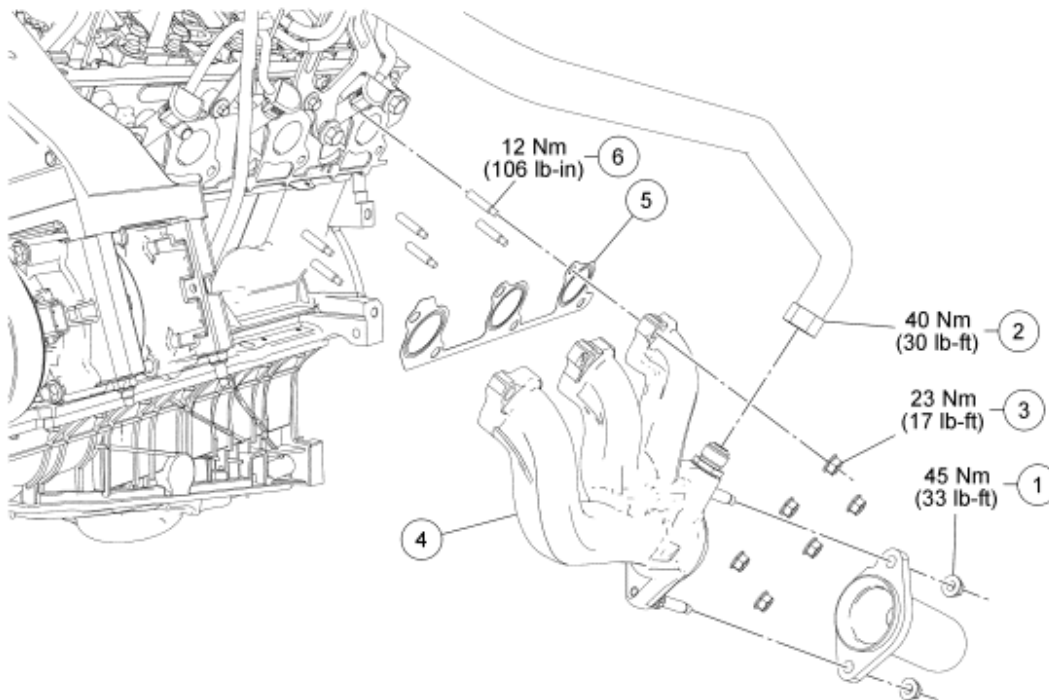
REMOVAL AND INSTALLATION

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. 181: Exploded View Of LH Exhaust Manifold With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description

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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 AND LIFTING** article.
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** article.
6. Remove and discard the 6 LH exhaust manifold studs.

INSTALLATION

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

EXHAUST MANIFOLD - RH

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

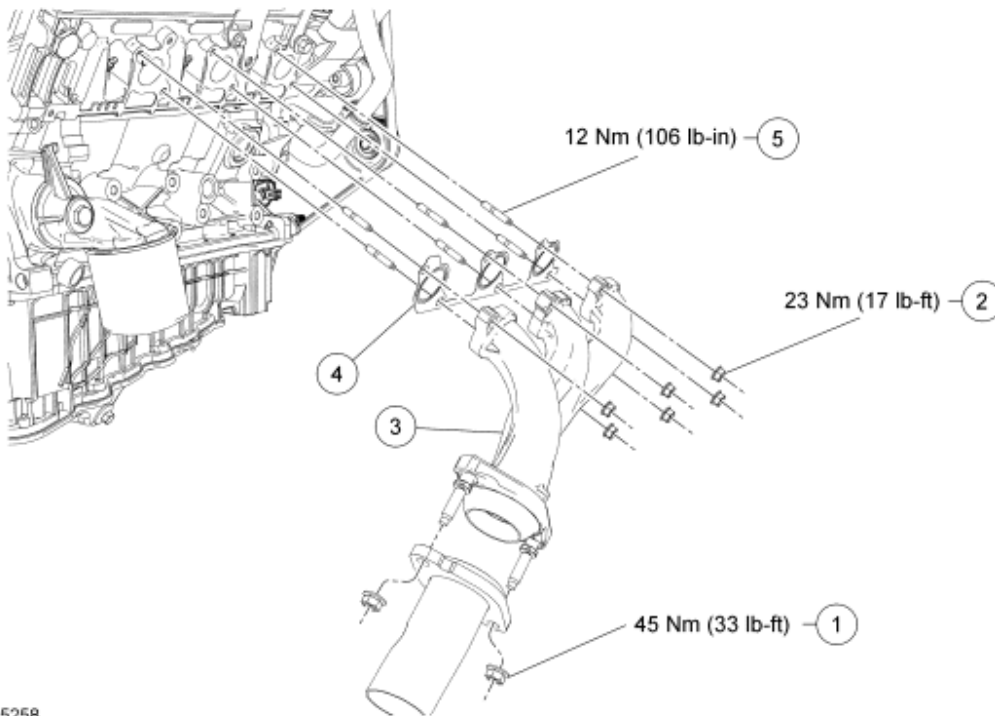


Fig. 182: Exploded View Of RH Exhaust Manifold With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W701706	RH catalytic converter-to-exhaust manifold nut (2 required)
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 AND LIFTING** article.
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** article.
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 Tools

Illustration	Tool Name	Tool Number
ST2425-A	Lifting Bracket, Engine	303-050 (T70P-6000)
ST1185-A	Support Bar, Engine	303-F072

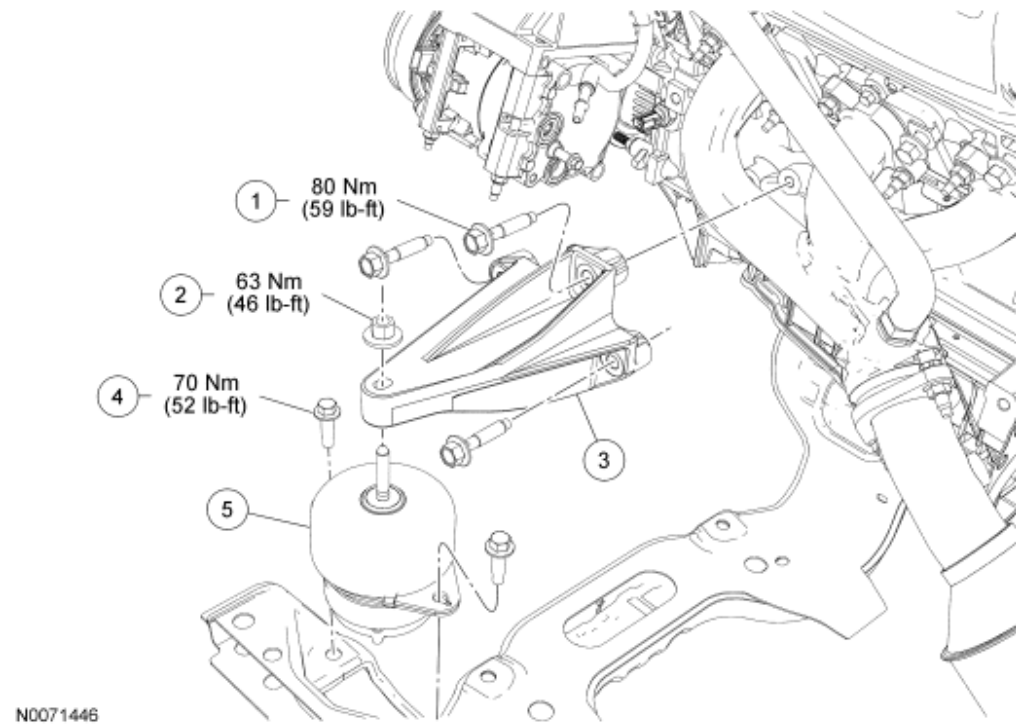


Fig. 183: Exploded View Of LH Engine Mount With Torque Specifications

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Courtesy of FORD MOTOR CO.

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 AND LIFTING** article.
2. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING AND CONTROLS - 4.0L SINGLE OVERHEAD CAMSHAFT (SOHC)** article.
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).

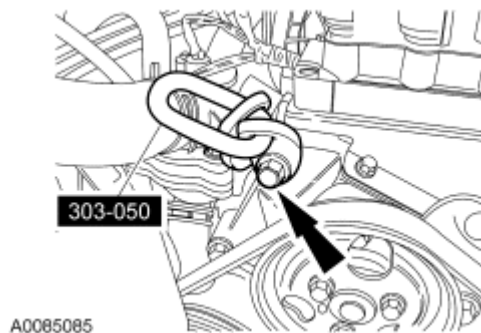


Fig. 184: Locating Front End Accessory Drive (FEAD) Bracket Bolt
Courtesy of FORD MOTOR CO.

4. Remove the 6 pin-type retainers and the radiator sight shield.

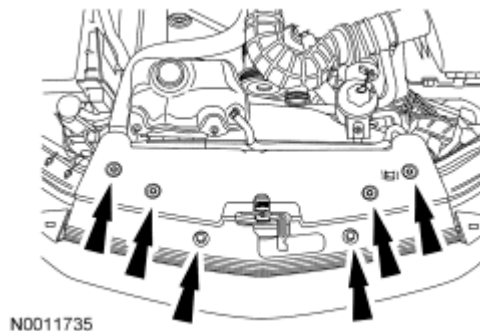


Fig. 185: Locating Pin-Type Retainers And Radiator Sight Shield
Courtesy of FORD MOTOR CO.

5. Install the Engine Support Bar.



Fig. 186: Identifying Special Tool 303-F072
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.

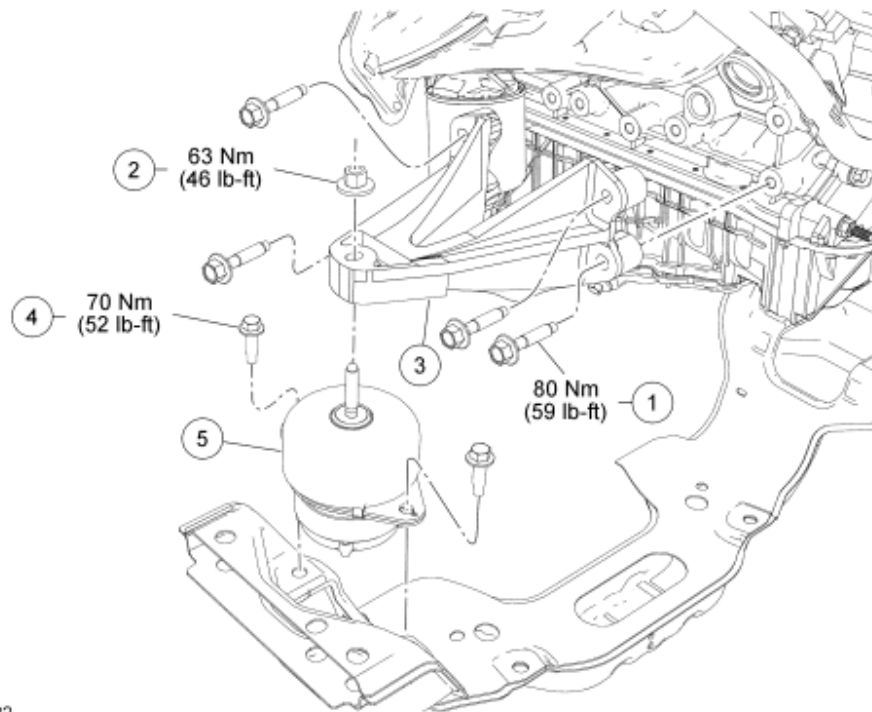
ENGINE MOUNT - RH

Special Tools

Illustration	Tool Name	Tool Number
ST2425-A	Lifting Bracket, Engine	303-050 (T70P-6000)
ST1185-A	Support Bar, Engine	303-F072

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang



N0072282

Fig. 187: Exploded View Of RH Engine Mount With Torque Specifications
Courtesy of FORD MOTOR CO.

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 AND LIFTING** article.
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
3. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING AND CONTROLS - 4.0L SINGLE OVERHEAD CAMSHAFT (SOHC)** article.
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).

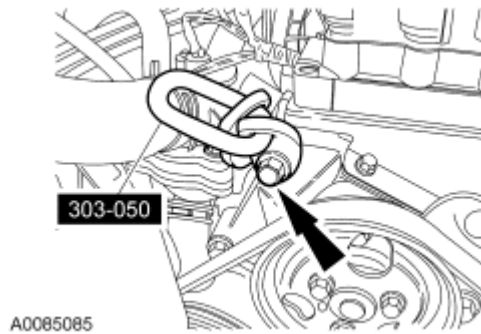


Fig. 188: Locating Front End Accessory Drive (FEAD) Bracket Bolt
Courtesy of FORD MOTOR CO.

5. Remove the 6 pin-type retainers and the radiator sight shield.

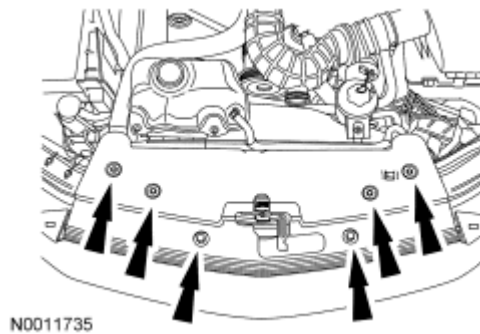


Fig. 189: Locating Pin-Type Retainers And Radiator Sight Shield
Courtesy of FORD MOTOR CO.

6. Install the Engine Support Bar.



Fig. 190: Identifying Special Tool 303-F072
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 Tools

Illustration	Tool Name	Tool Number
An illustration of a metal lifting bracket with two long horizontal arms and several adjustment points. The part number ST2425-A is printed at the bottom left.	Lifting Bracket, Engine	303-050 (T70P-6000)
An illustration of two long, thin metal rods with hexagonal bases and threaded ends. The part number ST1337-A is printed at the bottom left.	Remover, Spark Plug Wire	303-106 (T74P-6666A)
An illustration of a cylindrical metal spreader bar with a threaded rod passing through its center and a hook at one end. The part number ST1376-A is printed at the bottom left.	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent

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 AND LIFTING** article.
2. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
3. Disconnect the battery ground and positive cables. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
4. Remove the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR**

DISTRIBUTION AND FILTERING article.

5. Release the 2 windshield washer hose retainers and the one hood insulation pin-type retainer.

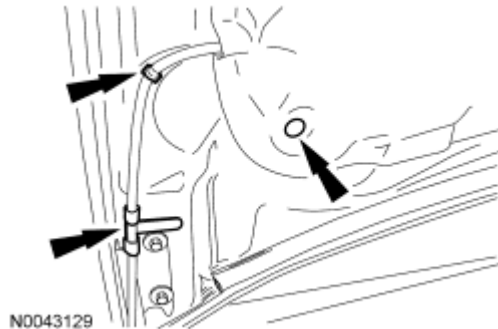


Fig. 191: Locating Windshield Washer Hose Retainers
Courtesy of FORD MOTOR CO.

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

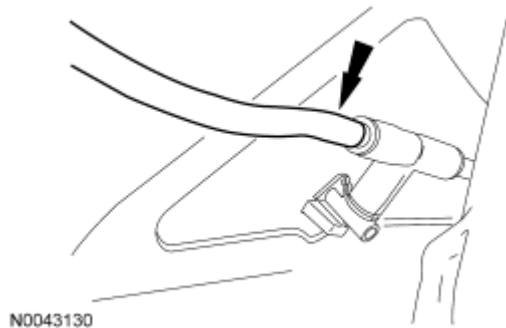


Fig. 192: Locating Windshield Washer Hose
Courtesy of FORD MOTOR CO.

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

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

Vehicles with automatic transmission

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

Vehicles with manual transmission

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

All vehicles

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

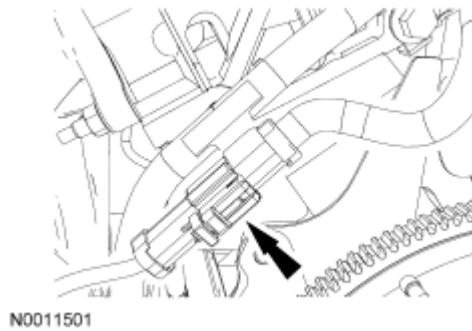


Fig. 193: Locating Heated Oxygen Sensor (HO2S)
Courtesy of FORD MOTOR CO.

NOTE: LH side shown, RH side similar.

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

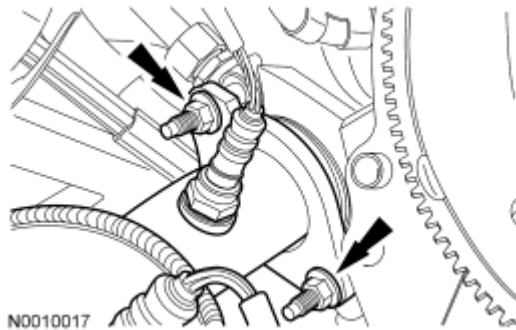


Fig. 194: Locating Catalytic Converter-To-Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

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

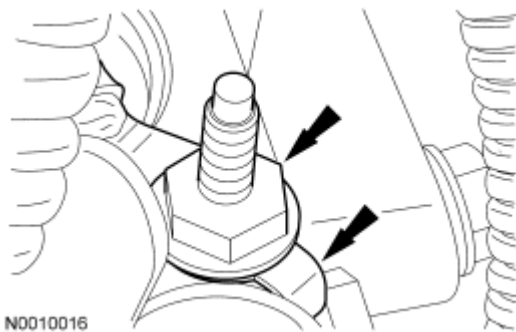


Fig. 195: Locating Ground Strap Stud Bolt
Courtesy of FORD MOTOR CO.

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.

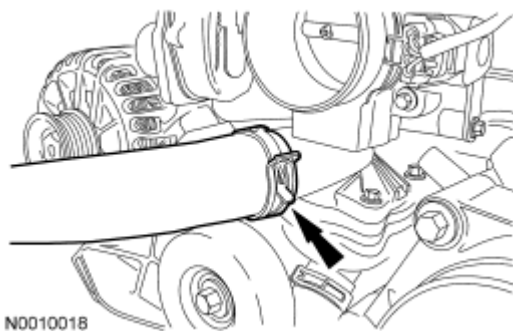


Fig. 196: Locating Upper Radiator Hose On Thermostat Housing
Courtesy of FORD MOTOR CO.

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

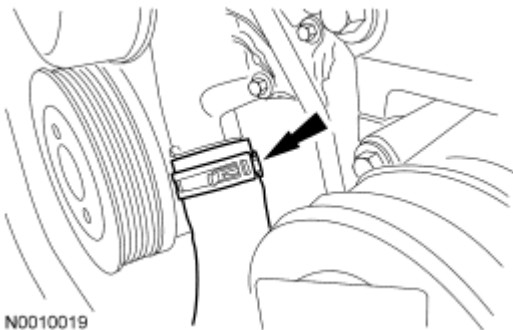


Fig. 197: Locating Lower Radiator Hose On Coolant Pump
Courtesy of FORD MOTOR CO.

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

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2008 ENGINE Engine - 4.0L SOHC - Mustang

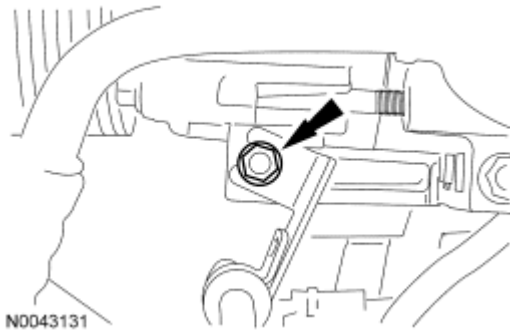


Fig. 198: Identifying Power Steering Pressure Tube Bracket Nut
Courtesy of FORD MOTOR CO.

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

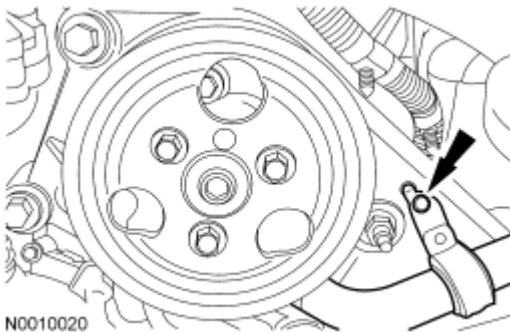


Fig. 199: Locating Power Steering Supply Hose Bracket Bolt
Courtesy of FORD MOTOR CO.

19. Disconnect the PSP switch electrical connector.

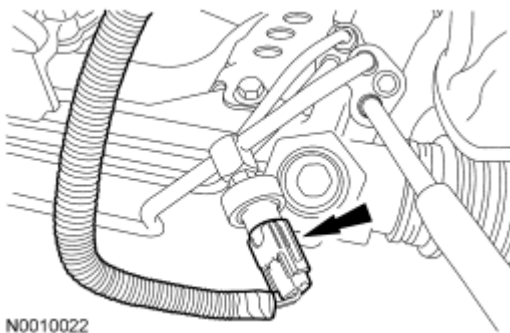


Fig. 200: Locating Power Steering Pressure (PSP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

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

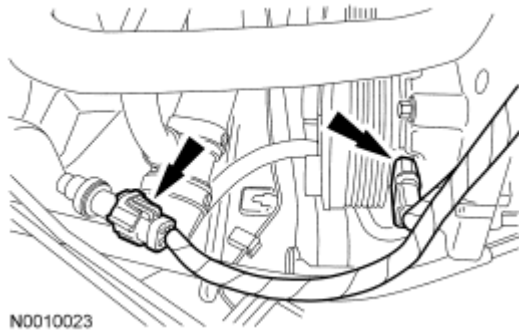


Fig. 201: Locating A/C Compressor And A/C High Pressure Switch Electrical Connectors
Courtesy of FORD MOTOR CO.

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

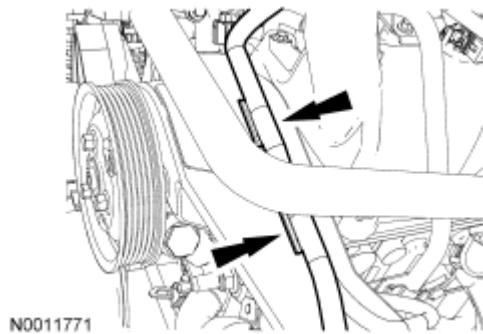


Fig. 202: Locating Wiring Retainers On FEAD Bracket
Courtesy of FORD MOTOR CO.

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

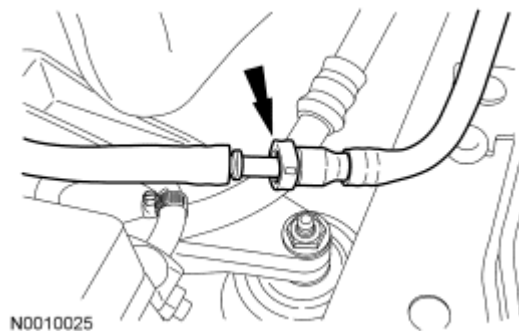


Fig. 203: Locating Fuel Supply Tube Coupling
Courtesy of FORD MOTOR CO.

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

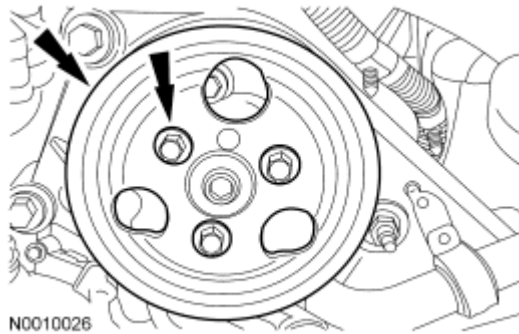


Fig. 204: Locating Power Steering Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

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

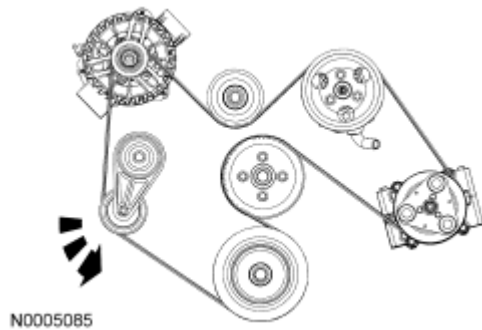


Fig. 205: Rotating Accessory Drive Belt Tensioner
Courtesy of FORD MOTOR CO.

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

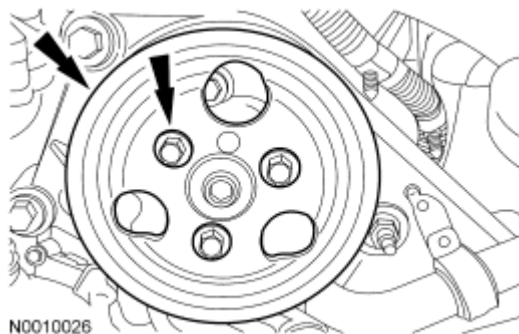


Fig. 206: Locating Power Steering Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

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

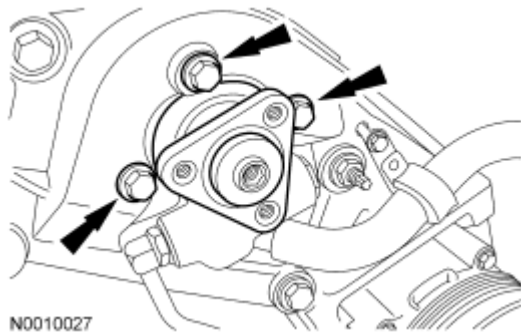


Fig. 207: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

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

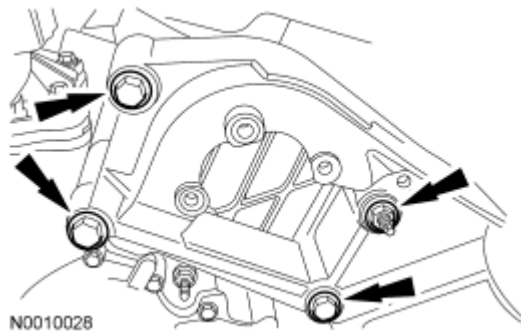


Fig. 208: Locating FEAD Bracket And A/C Compressor Bracket Bolts
Courtesy of FORD MOTOR CO.

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

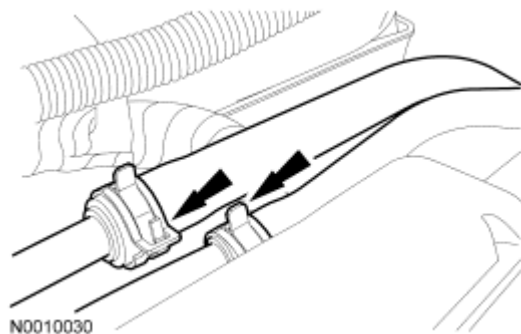


Fig. 209: Locating Heater Hoses On Coolant Tube
Courtesy of FORD MOTOR CO.

29. Remove the 2 coolant tube bracket bolts.

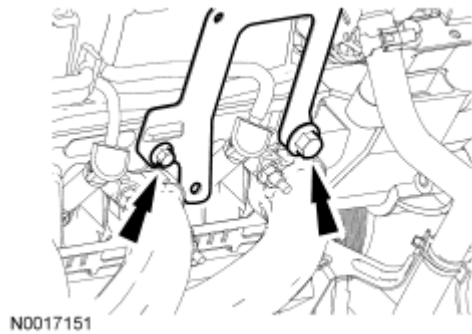


Fig. 210: Locating Coolant Tube Bracket Bolts
Courtesy of FORD MOTOR CO.

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.

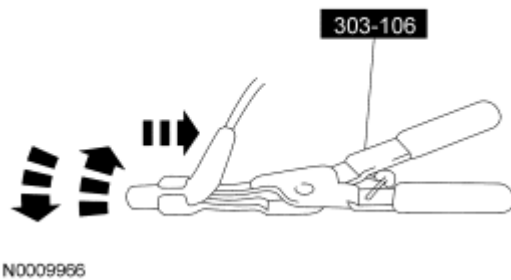


Fig. 211: Pulling Spark Plug Wire Off Spark Plug
Courtesy of FORD MOTOR CO.

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

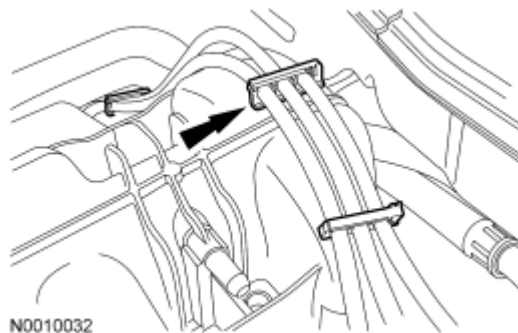


Fig. 212: Locating Spark Plug Wire Retainer On Intake Manifold
Courtesy of FORD MOTOR CO.

32. Disconnect the radio ignition interference capacitor electrical connector.

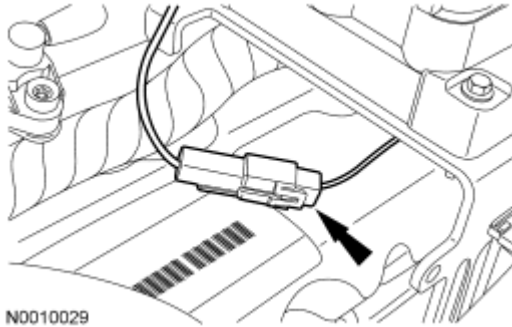


Fig. 213: Locating Radio Ignition Interference Capacitor Electrical Connector
Courtesy of FORD MOTOR CO.

33. Disconnect the ignition coil electrical connector.

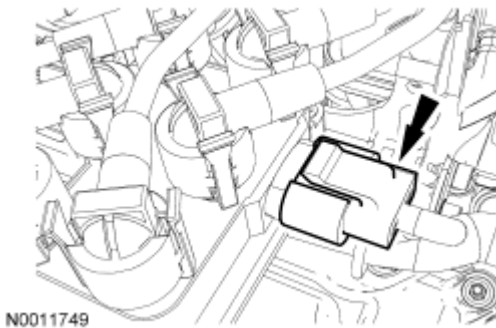


Fig. 214: Locating Ignition Coil Electrical Connector
Courtesy of FORD MOTOR CO.

34. Remove the 2 upper ignition coil bracket bolts.

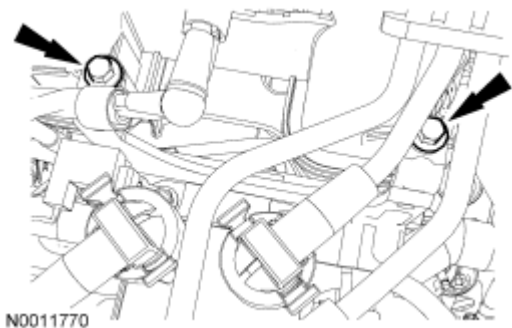


Fig. 215: Locating Upper Ignition Coil Bracket Bolts
Courtesy of FORD MOTOR CO.

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

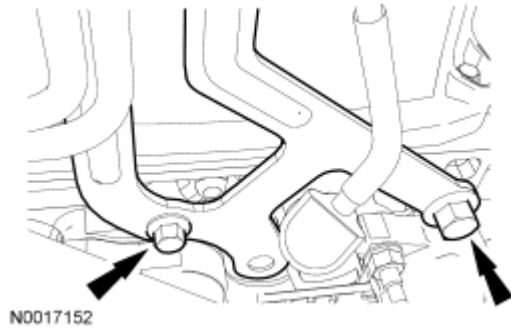


Fig. 216: Locating Ignition Coil Bracket Bolts
Courtesy of FORD MOTOR CO.

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

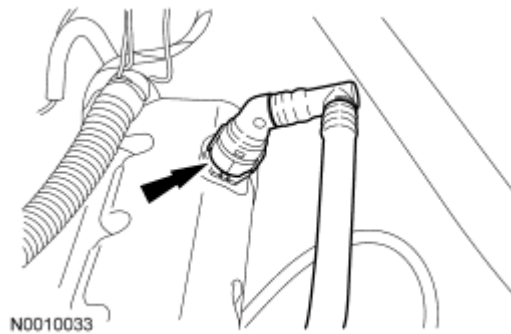


Fig. 217: Locating Crankcase Vent Tube
Courtesy of FORD MOTOR CO.

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

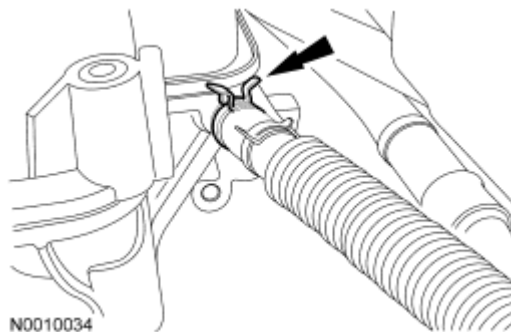


Fig. 218: Locating Brake Booster Vacuum Hose On Upper Intake Manifold
Courtesy of FORD MOTOR CO.

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

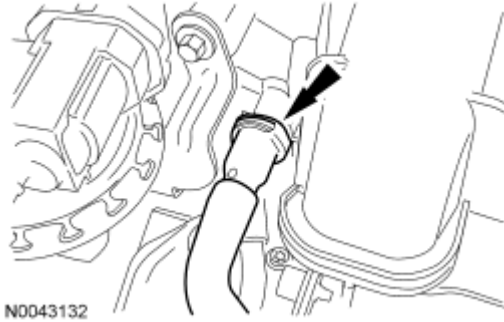


Fig. 219: Locating Fuel Vapor Vent Tube To Intake Manifold
Courtesy of FORD MOTOR CO.

39. Disconnect the upper and lower PCM electrical connectors.

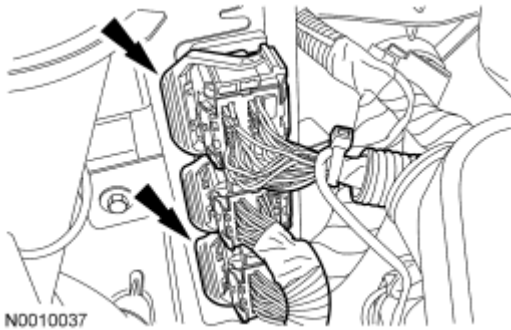


Fig. 220: Identifying Upper & Lower Powertrain Control Module (PCM) Electrical Connectors
Courtesy of FORD MOTOR CO.

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

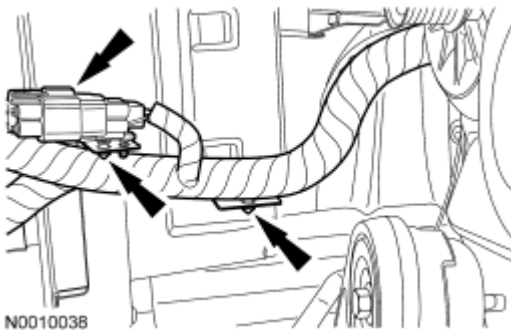


Fig. 221: Locating 16-Pin Electrical Connector
Courtesy of FORD MOTOR CO.

41. Detach the 3 wiring harness retainers.



Fig. 222: 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.

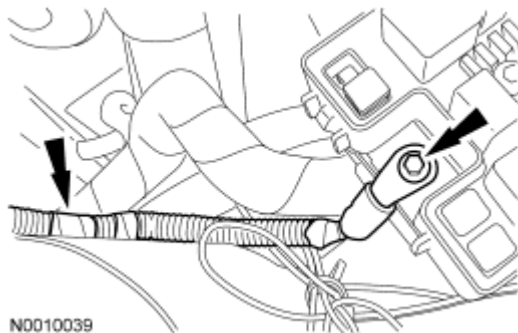


Fig. 223: Locating Pin-Type Retainer From Strut Tower
Courtesy of FORD MOTOR CO.

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

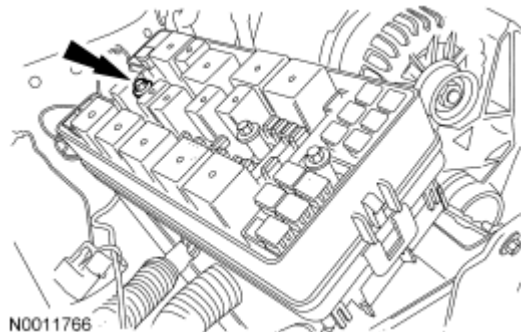


Fig. 224: Locating Power Distribution Box Upper Housing Bolt
Courtesy of FORD MOTOR CO.

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

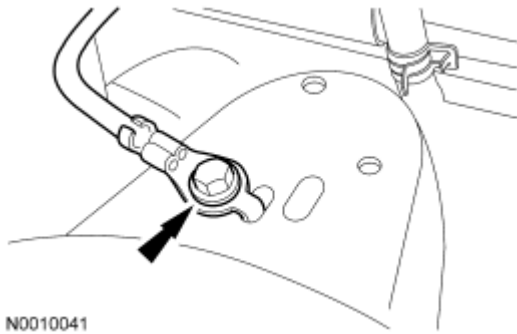


Fig. 225: Locating Ground Cable On Strut Tower
Courtesy of FORD MOTOR CO.

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

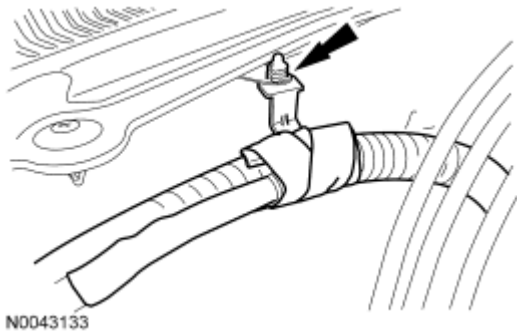


Fig. 226: Locating Battery Cable Harness Pin-Type Retainer To Cowl
Courtesy of FORD MOTOR CO.

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

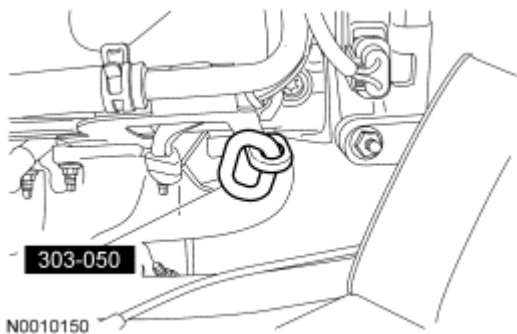


Fig. 227: Installing Special Tool 303-050 To RH Cylinder Head
Courtesy of FORD MOTOR CO.

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

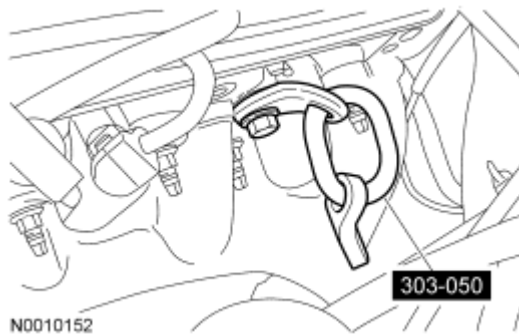


Fig. 228: Installing Special Tool 303-050 To LH Cylinder Head
Courtesy of FORD MOTOR CO.

49. Remove the LH engine mount nut.



Fig. 229: Locating Engine Mount Nut
Courtesy of FORD MOTOR CO.

50. Remove the RH engine mount nut.

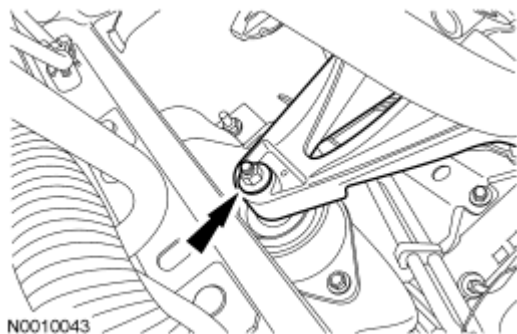


Fig. 230: Locating Engine Mount Nut
Courtesy of FORD MOTOR CO.

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

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

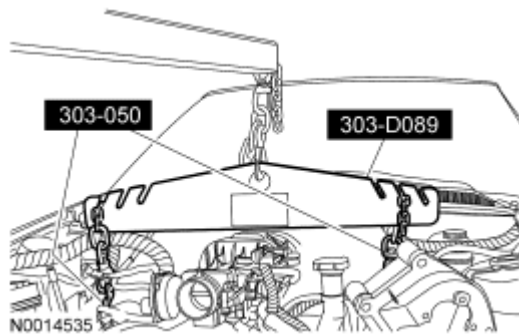
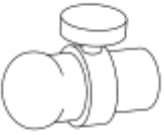
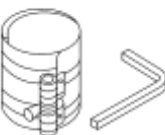


Fig. 231: Removing Engine Using Special Tools (303-050) & (303-D089)
Courtesy of FORD MOTOR CO.

DISASSEMBLY

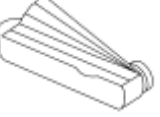
ENGINE

Special Tools

Illustration	Tool Name	Tool Number
 ST1251-A	Adapter for 303-564	303-578 (T97T-6256-A)
 ST1376-A	Compressor, Valve Spring	303-581 (T97T-6565-A)
 ST2176-B	Holding Tool, Camshaft Sprocket	303-564 (T97T-6256-B)
 ST2741A	Holding Tool, Crankshaft	303-674
	Remover, Crankshaft Front Oil Seal	303-107 (T74P-6700-A)

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 ST1288-A		
 ST1278-A	Remover, Crankshaft Vibration Damper	303-101 (T74P-3616-A)
 ST1271-A	Remover, Crankshaft Vibration Damper	303-773
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A) or equivalent

General Equipment

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

Material

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

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.

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

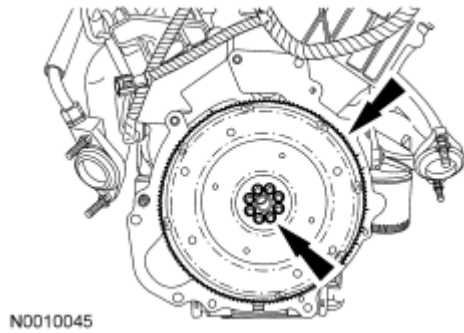


Fig. 232: Locating Flexplate Or Flywheel Bolts
Courtesy of FORD MOTOR CO.

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

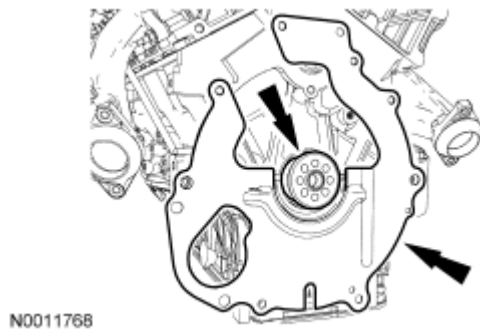


Fig. 233: Locating Spacer Plate Crankshaft Spacer
Courtesy of FORD MOTOR CO.

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.

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

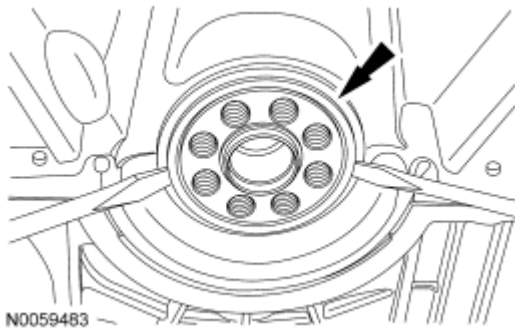


Fig. 234: Removing Speed Sleeve Using Screwdrivers
Courtesy of FORD MOTOR CO.

4. Mount the engine on a suitable engine stand.
5. Disconnect the generator and Throttle Body (TB) electrical connectors.

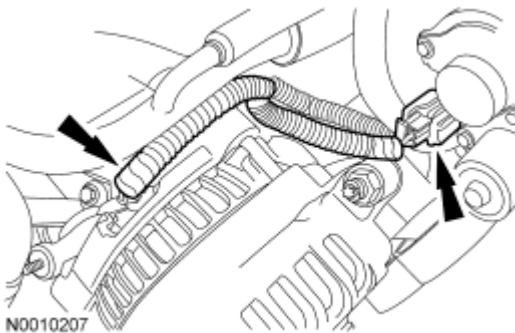


Fig. 235: Locating Generator And Throttle Body Electrical Connectors
Courtesy of FORD MOTOR CO.

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

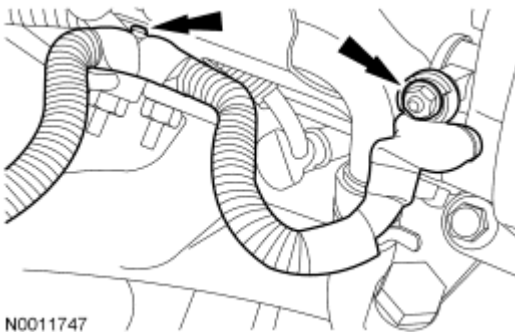


Fig. 236: Locating Wiring Retainer On Generator Nut
Courtesy of FORD MOTOR CO.

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

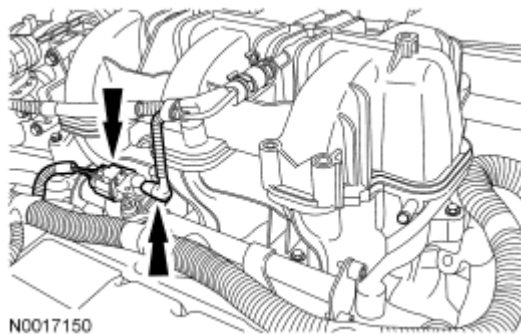


Fig. 237: Locating Fuel Rail Pressure And Temperature Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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

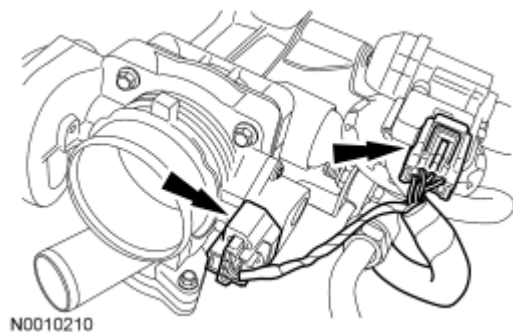


Fig. 238: Locating EGR System Module And Throttle Position (TP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

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

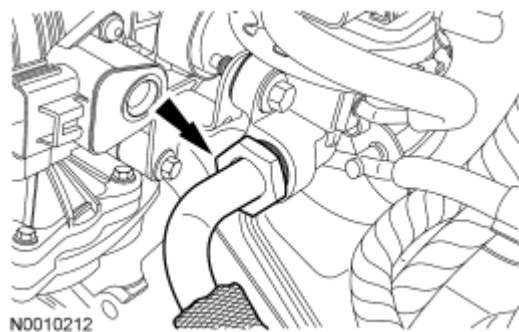


Fig. 239: Locating EGR Tube Fitting On EGR System Module
Courtesy of FORD MOTOR CO.

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

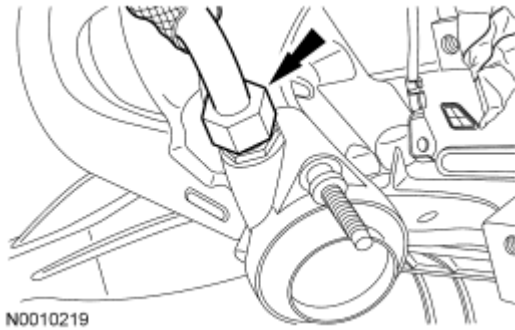


Fig. 240: Locating Exhaust Gas Recirculation (EGR) Tube
Courtesy of FORD MOTOR CO.

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

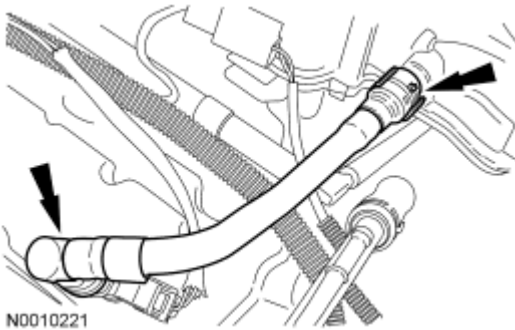


Fig. 241: Locating Positive Crankcase Ventilation (PCV) Tube Fittings
Courtesy of FORD MOTOR CO.

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

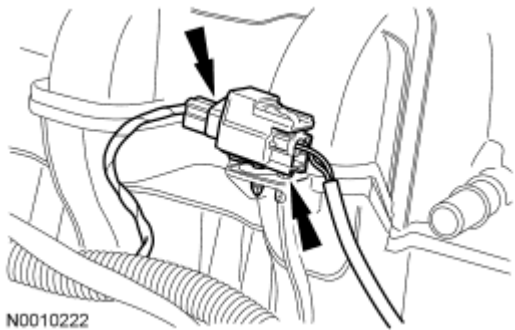
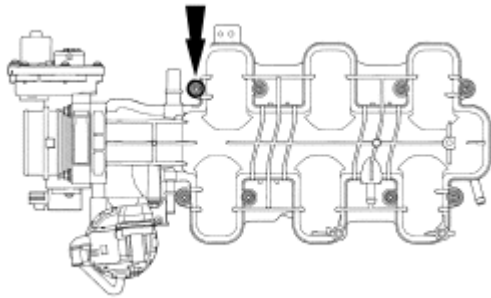


Fig. 242: Locating Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

13. Remove the 8 bolts and the intake manifold.

2008 Ford Mustang

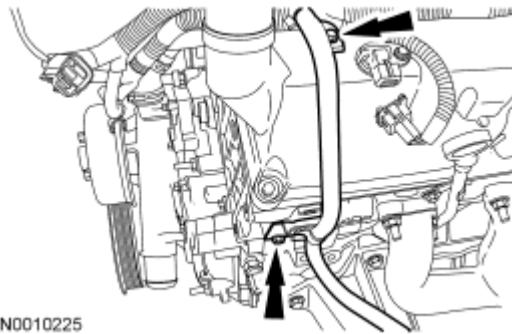
2008 ENGINE Engine - 4.0L SOHC - Mustang



N0010224

Fig. 243: Locating Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

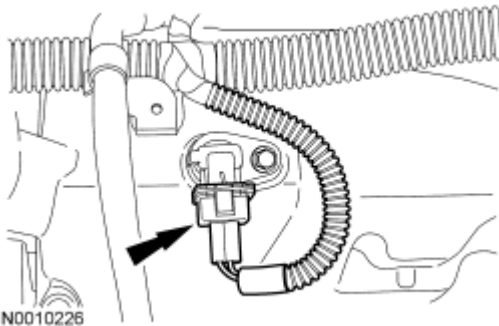
14. Remove the 2 fuel supply tube bracket bolts.



N0010225

Fig. 244: Locating Fuel Supply Tube Bracket Bolts
Courtesy of FORD MOTOR CO.

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



N0010226

Fig. 245: 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.

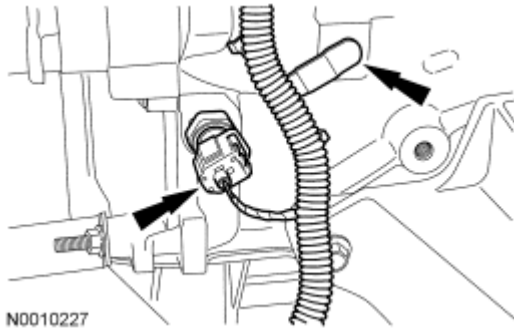


Fig. 246: Locating Oil Pressure Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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

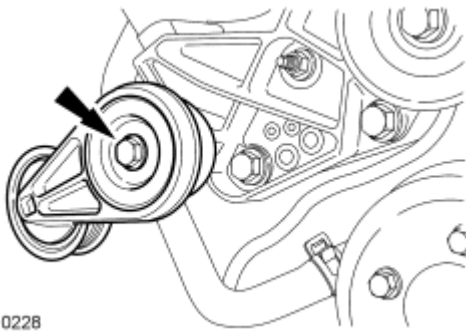


Fig. 247: Locating Belt Tensioner Bolt
Courtesy of FORD MOTOR CO.

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

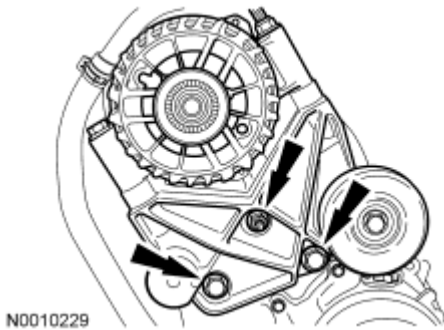


Fig. 248: Locating Generator Bracket Bolt And Nut
Courtesy of FORD MOTOR CO.

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

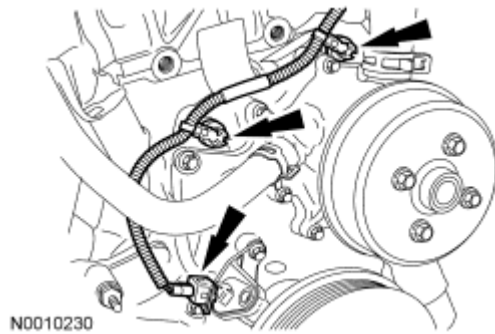


Fig. 249: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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

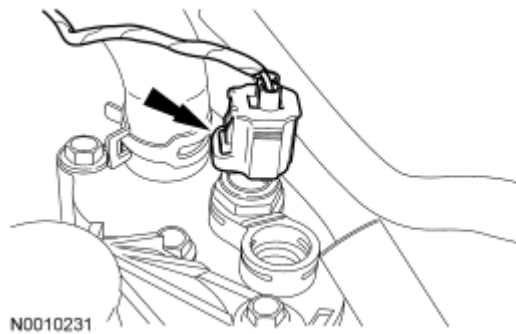


Fig. 250: Locating Engine Coolant Temperature (ECT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

21. Disconnect the PCV valve electrical connector.

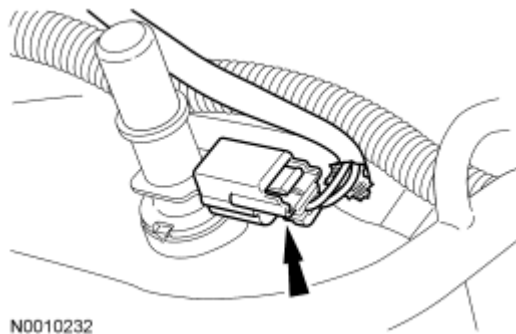


Fig. 251: Locating PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

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

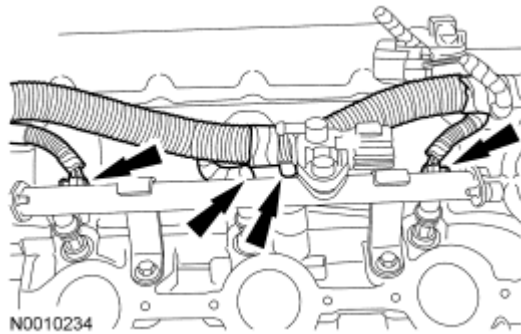


Fig. 252: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

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

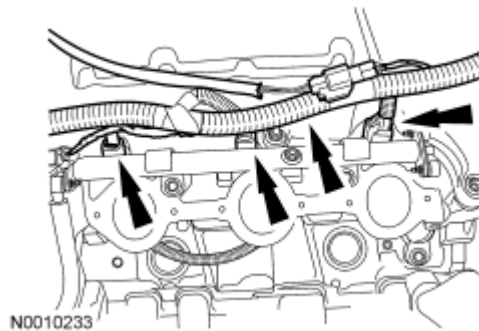


Fig. 253: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

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

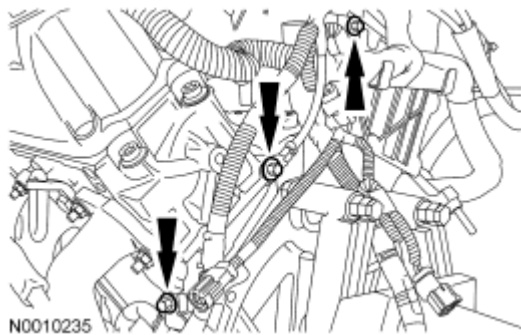


Fig. 254: Locating Main Engine Wiring Harness And Bolts
Courtesy of FORD MOTOR CO.

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

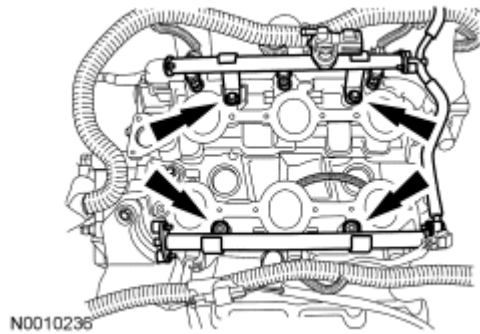


Fig. 255: Locating Fuel Rail And Injectors Bolts
Courtesy of FORD MOTOR CO.

26. Remove the bolt and the KS.

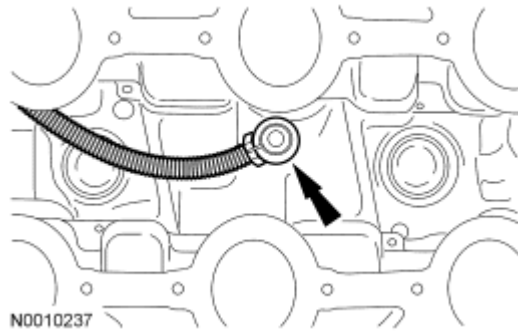


Fig. 256: Locating Knock Sensor Bolt
Courtesy of FORD MOTOR CO.

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

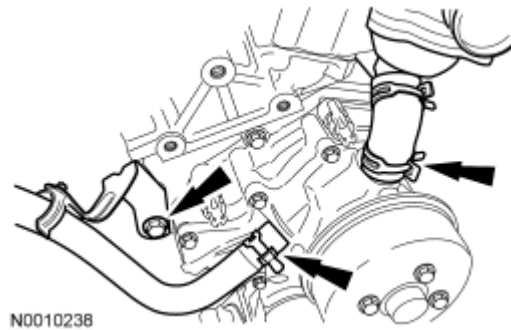


Fig. 257: Locating Coolant Pump Bracket Bolts
Courtesy of FORD MOTOR CO.

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



Fig. 258: Locating Thermostat Housing Hoses Bolts
Courtesy of FORD MOTOR CO.

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

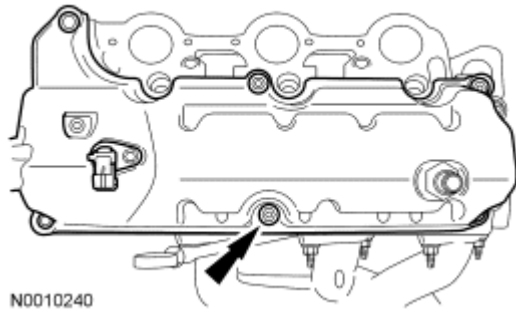


Fig. 259: Locating LH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

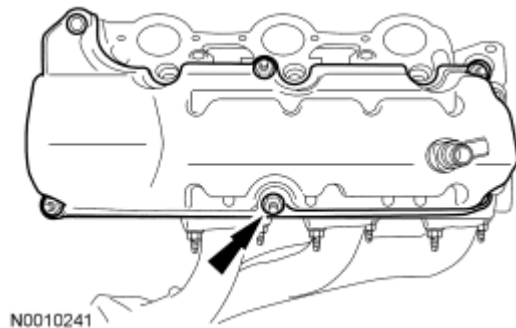
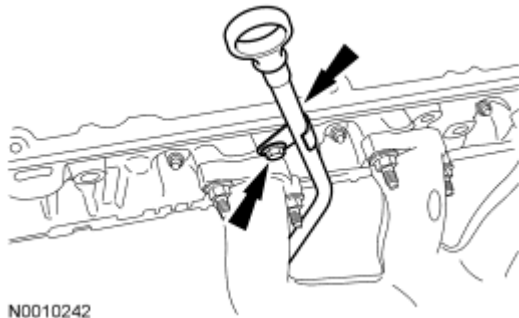


Fig. 260: Locating RH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

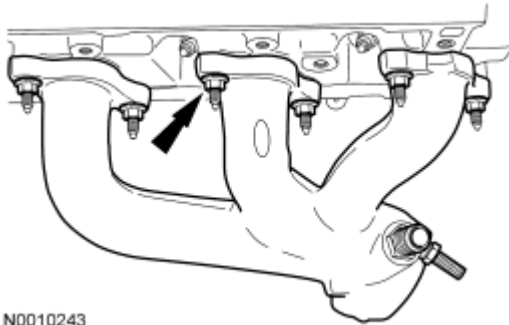
31. Remove the bolt and the oil level indicator tube.
- Discard the oil level indicator tube O-ring seal.



N0010242

Fig. 261: Locating Oil Level Indicator Tube And Bolt
Courtesy of FORD MOTOR CO.

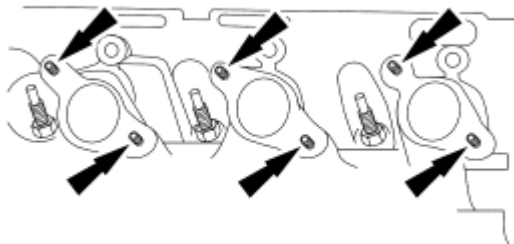
32. Remove the 6 nuts and the LH exhaust manifold and gasket.
- Discard the nuts and the LH exhaust manifold gasket.



N0010243

Fig. 262: Locating Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

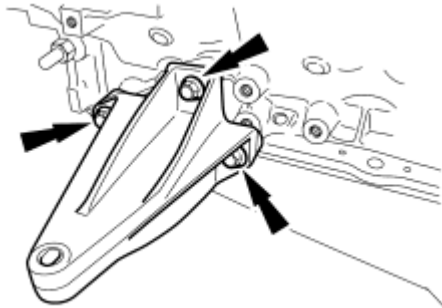
33. Remove and discard the 6 LH exhaust manifold studs.



N0072449

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

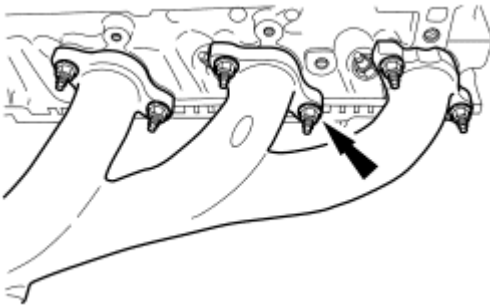
34. Remove the 3 bolts and the LH engine mount bracket.



N0010244

Fig. 264: Locating Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

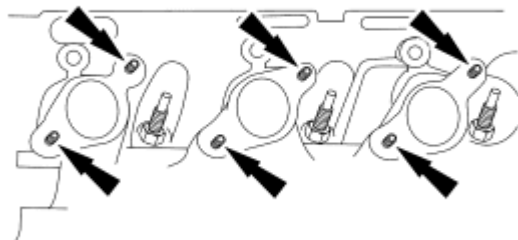
35. Remove the 6 nuts and the RH exhaust manifold and gasket.
- Discard the nuts and the RH exhaust manifold gasket.



N0036739

Fig. 265: Locating Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

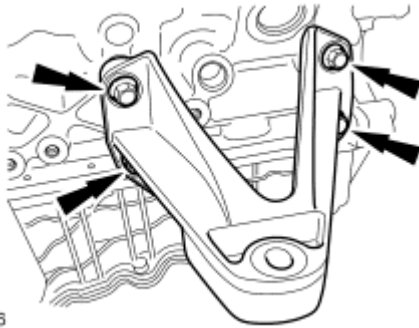
36. Remove and discard the 6 RH exhaust manifold studs.



N0072463

Fig. 266: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

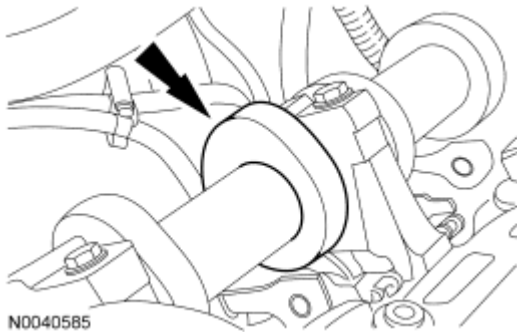
37. Clean and inspect the LH and RH exhaust manifolds. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
38. Remove the 4 bolts and the RH engine mount bracket.



N0010246

Fig. 267: Locating Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

39. Rotate the crankshaft until the cam lobe is in the upward position.

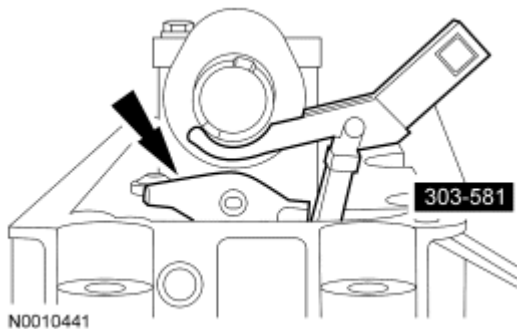


N0040585

Fig. 268: Locating Crankshaft Lobe
Courtesy of FORD MOTOR CO.

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

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



N0010441

Fig. 269: Removing/Installing Camshaft Roller Followers Using Special Tool (303-581)
Courtesy of FORD MOTOR CO.

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

position.

41. Remove the hydraulic lash adjusters.



A26324-A

Fig. 270: Locating Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

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

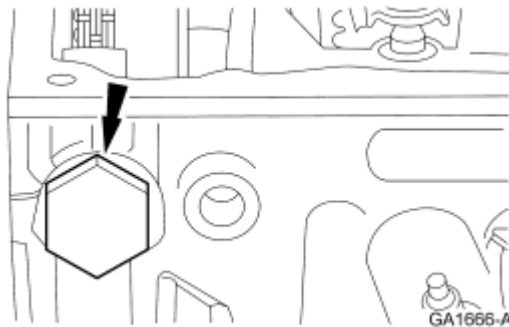
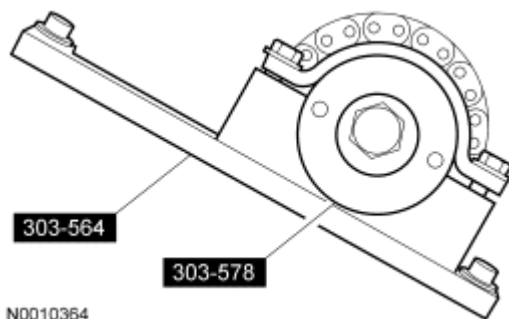


Fig. 271: Locating RH Hydraulic Chain Tensioner
Courtesy of FORD MOTOR CO.

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).



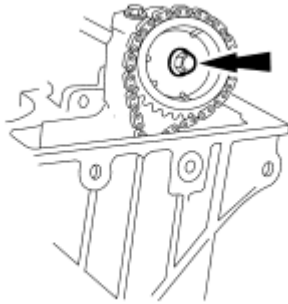
N0010364

Fig. 272: Identifying Special Holding Tool

Courtesy of FORD MOTOR CO.

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

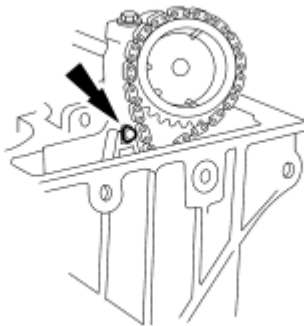
44. Remove the RH camshaft sprocket bolt.



GA1667-A

Fig. 273: Locating RH Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

45. Remove the RH cassette bolt.



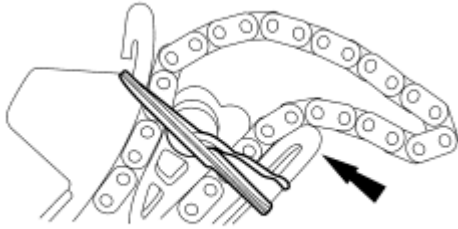
GA3228-A

Fig. 274: Locating RH Chain Guide 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.

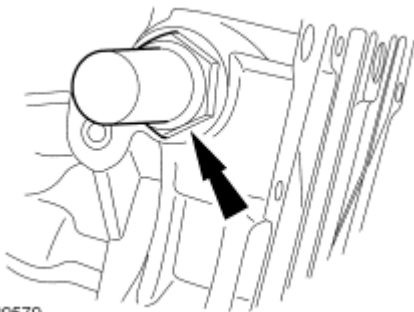
46. Remove the RH camshaft sprocket from the timing chain. Install a rubber band around the cassette and the timing chain.



N0014449

Fig. 275: Locating Cassette And Timing Chain
Courtesy of FORD MOTOR CO.

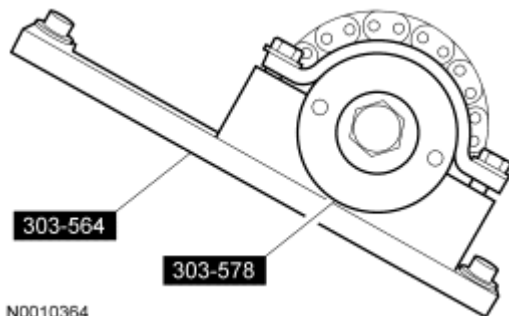
47. Remove the LH hydraulic chain tensioner.
 - Remove and discard the washer.



A0029579

Fig. 276: Locating Camshaft 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).



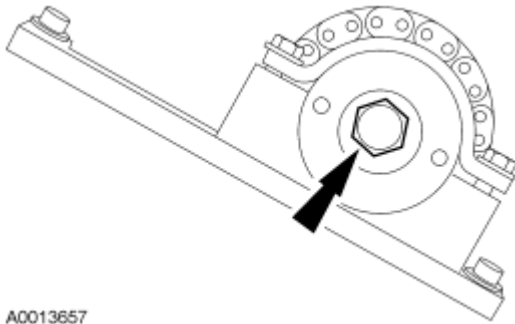
N0010364

Fig. 277: Identifying Special Holding Tool
Courtesy of FORD MOTOR CO.

49. Remove the LH camshaft sprocket bolt.

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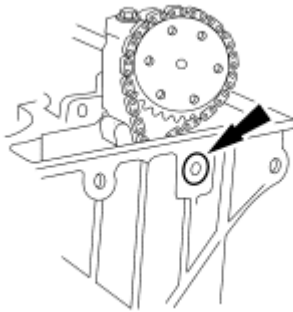
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A0013657

Fig. 278: Locating LH Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

50. Remove the LH cassette bolt.



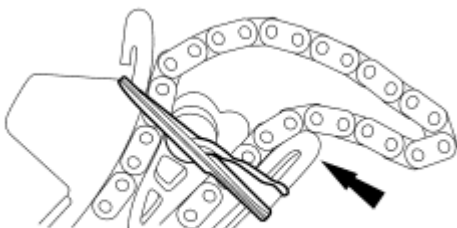
GA1670-A

Fig. 279: Locating Chain Guide 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.

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



N0014449

Fig. 280: Locating Cassette And Timing Chain

Courtesy of FORD MOTOR CO.

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 and remove the cylinder heads.
- Discard the gaskets and the bolts.

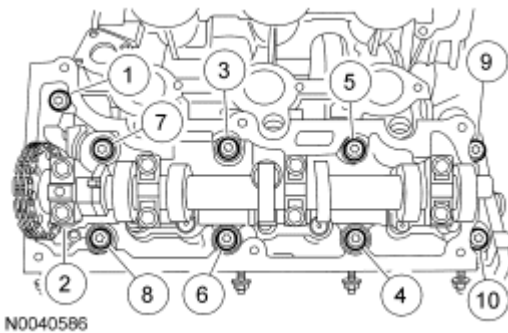


Fig. 281: Identifying Cylinder Head Bolts Tightening Sequence

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.
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** article.
55. Remove the 2 bolts and the CKP.

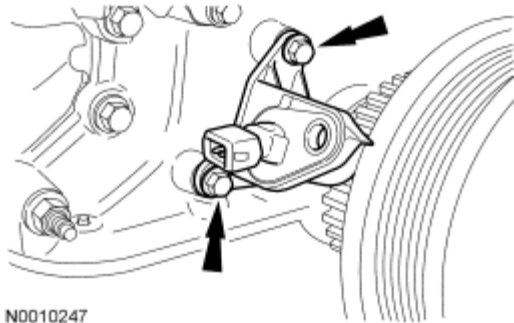


Fig. 282: Locating Crankshaft Position (CKP) Sensor And Bolts
Courtesy of FORD MOTOR CO.

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

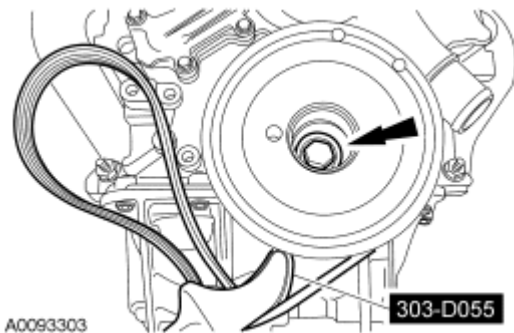


Fig. 283: Holding Crankshaft Pulley Using Special Tool
Courtesy of FORD MOTOR CO.

NOTE: If the pulley bolt is not installed, the tool 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.

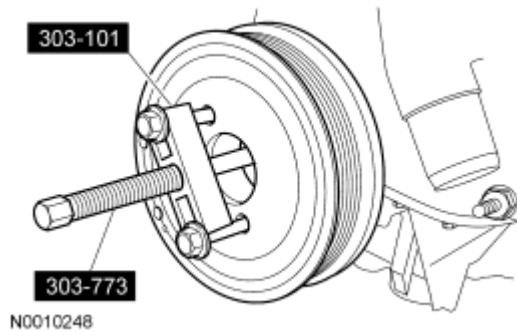


Fig. 284: Identifying Special Tool (303-773, 303-101)
Courtesy of FORD MOTOR CO.

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

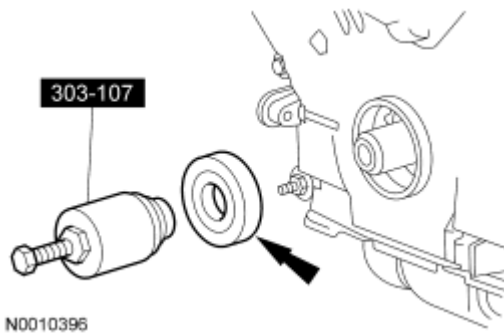


Fig. 285: Identifying Crankshaft Front Oil Seal & Special Tool (303-107)
Courtesy of FORD MOTOR CO.

59. Remove the 5 cylinder block cradle-to-engine front cover bolts.

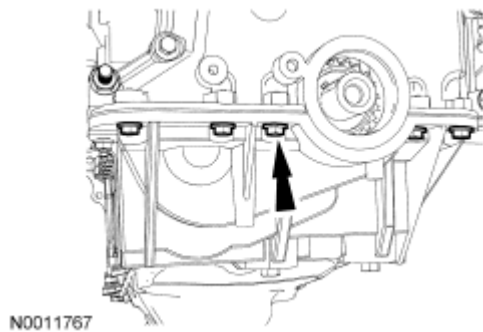


Fig. 286: Locating Cylinder Block Cradle-To-Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

60. Remove the 5 bolts, 5 stud bolts and the engine front cover.

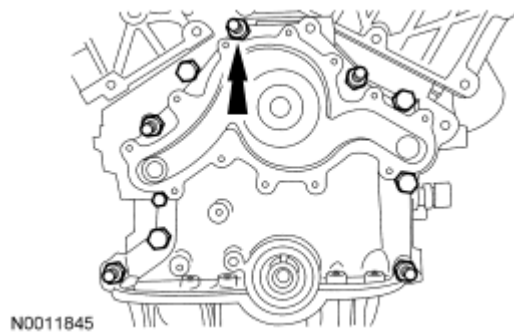


Fig. 287: Locating Engine Front Cover And Stud Bolts
Courtesy of FORD MOTOR CO.

61. Remove and discard the engine oil filter.

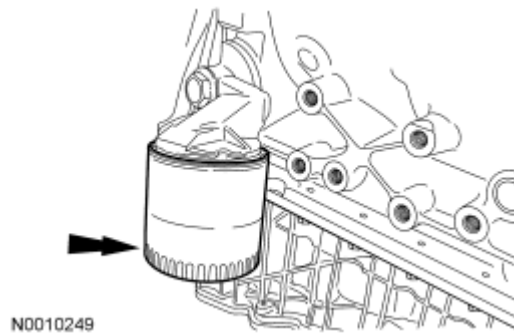


Fig. 288: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

62. Remove the bolts and the oil pan.

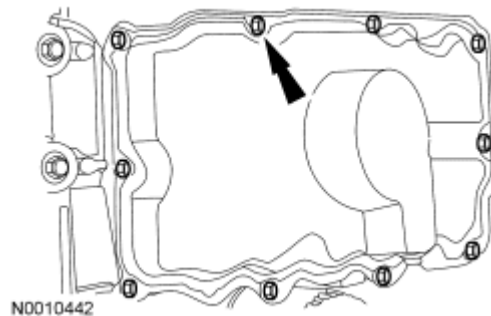


Fig. 289: Locating Gasket, Oil Pan And Bolts
Courtesy of FORD MOTOR CO.

63. Remove the bolt and the oil pump screen cover and tube.

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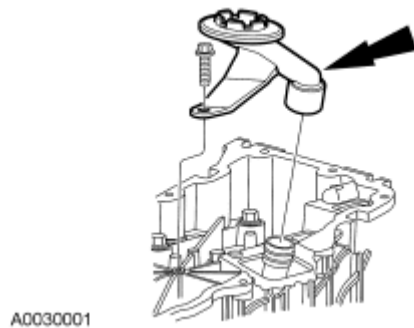


Fig. 290: Locating Oil Pump Screen Cover And Bolt
Courtesy of FORD MOTOR CO.

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.

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

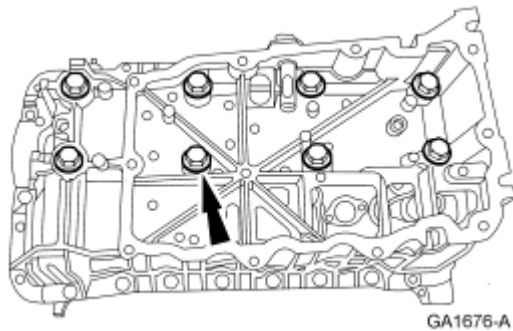


Fig. 291: Locating Inner Cylinder Block Cradle Bolts
Courtesy of FORD MOTOR CO.

65. Remove the 2 cylinder block cradle Torx bolts.

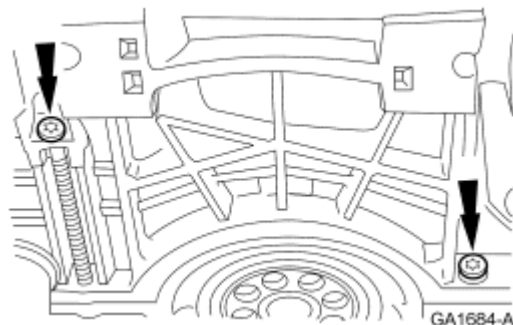


Fig. 292: Locating Rear Cylinder Block Cradle Bolts
Courtesy of FORD MOTOR CO.

66. Remove the 15 bolts and the 2 nuts.
- Remove the cylinder block cradle.

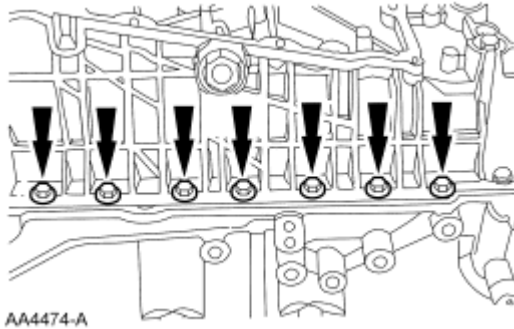


Fig. 293: Locating Cylinder Block Cradle & Gasket
Courtesy of FORD MOTOR CO.

67. Remove the 2 bolts, the oil pump pickup tube and the oil pump intermediate shaft.

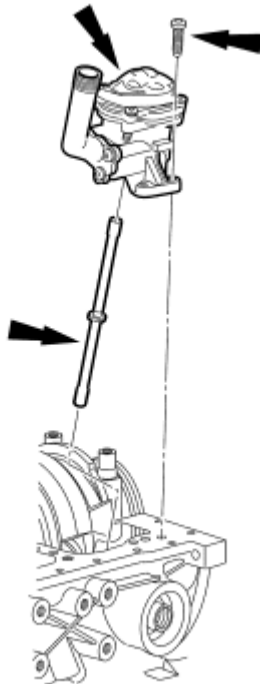


Fig. 294: Locating Oil Pump Intermediate Shaft, Oil Pump And Bolt
Courtesy of FORD MOTOR CO.

68. Remove the oil filter adapter.

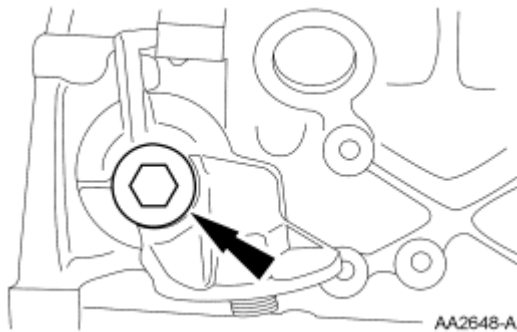


Fig. 295: Locating Oil Filter Adapter
Courtesy of FORD MOTOR CO.

69. Remove the rear jackshaft plug.

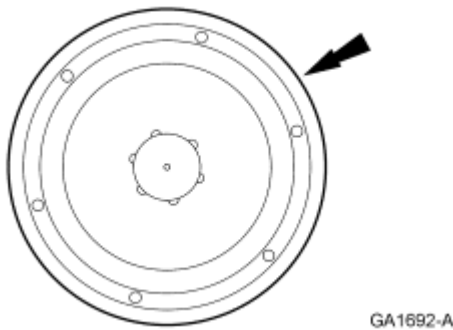


Fig. 296: Locating Rear Jackshaft Plug
Courtesy of FORD MOTOR CO.

70. Using the Crankshaft Holding Tool, hold the crankshaft.

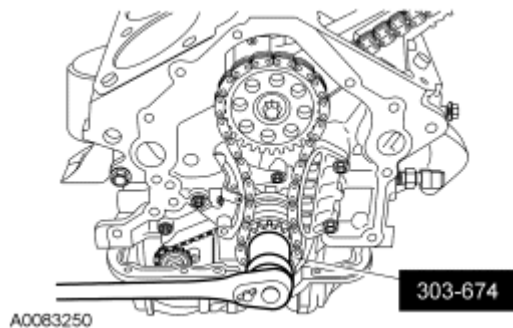


Fig. 297: Holding Crankshaft Using Special Tool (303-674)
Courtesy of FORD MOTOR CO.

71. Remove the rear jackshaft sprocket-retaining bolt and the spacer.

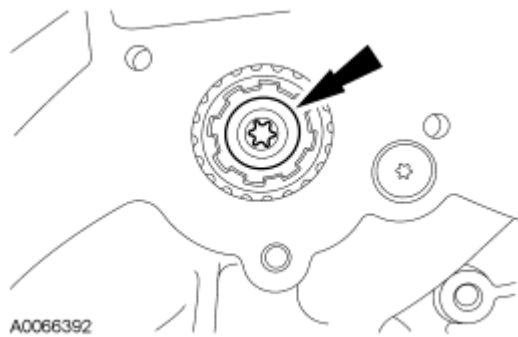


Fig. 298: Locating Rear Jackshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

72. Remove the RH cassette bolt.

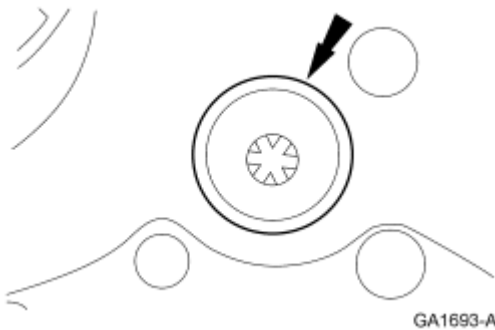


Fig. 299: Locating RH Camshaft Drive Cassette Bolt & Spacer
Courtesy of FORD MOTOR CO.

73. Remove the RH cassette.

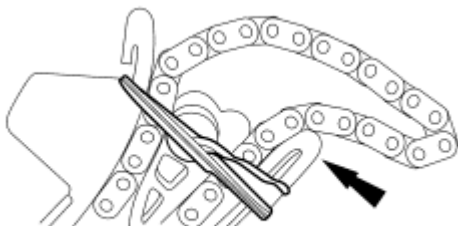


Fig. 300: Locating Cassette And Timing Chain
Courtesy of FORD MOTOR CO.

74. Remove the oil pump bolt and retainer and then remove the oil pump drive.

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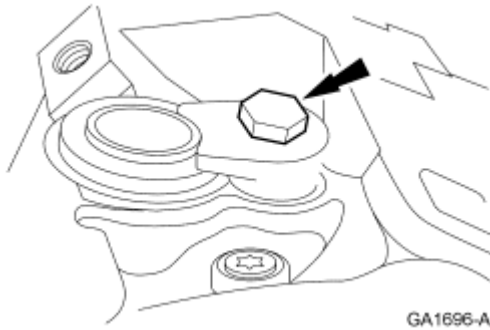


Fig. 301: Locating Oil Pump Drive
Courtesy of FORD MOTOR CO.

75. Using the Crankshaft Holding Tool, loosen the front sprocket retaining bolt.

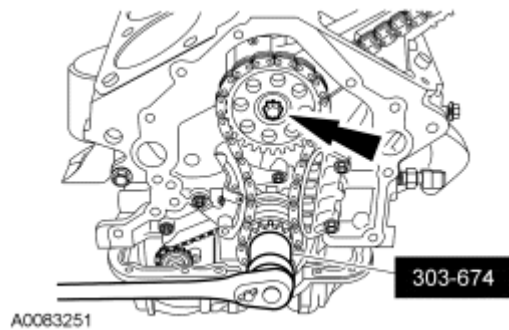


Fig. 302: Identifying Special Tool (303-674) & Jackshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

76. Remove the bolts and the chain tensioner.

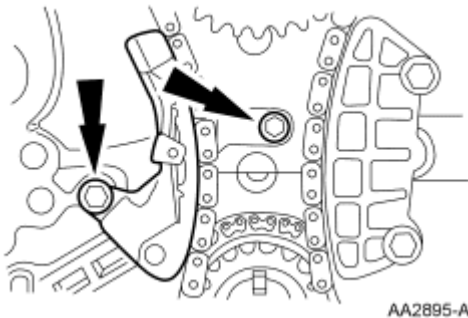


Fig. 303: Locating Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

77. Remove the chain guide.

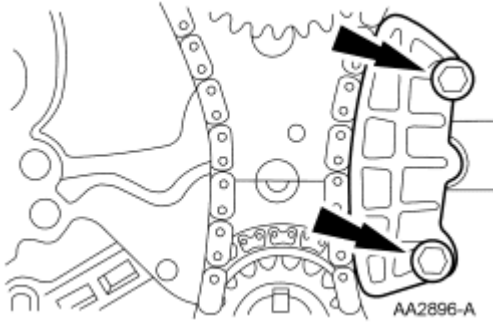


Fig. 304: Locating Chain Guide & Bolts
Courtesy of FORD MOTOR CO.

78. Remove the bolt.

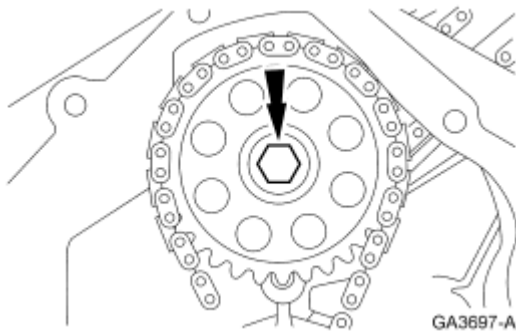


Fig. 305: Locating Jackshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

79. Remove the jackshaft sprocket and chain.

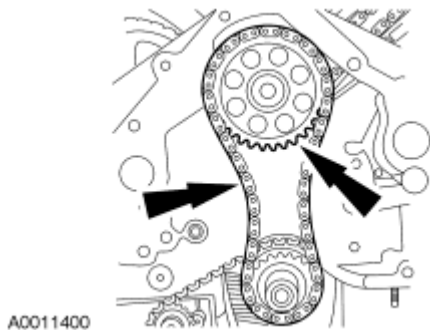


Fig. 306: Locating Jackshaft Chain And Sprockets
Courtesy of FORD MOTOR CO.

80. Remove the LH cassette bolt.

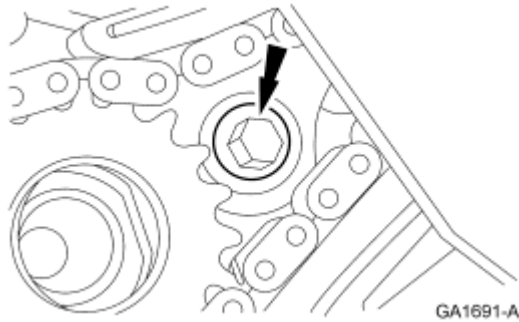


Fig. 307: Locating Front Cassette & Bolt
Courtesy of FORD MOTOR CO.

81. Remove the LH cassette.

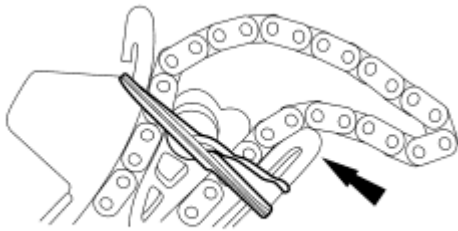


Fig. 308: Locating Cassette And Timing Chain
Courtesy of FORD MOTOR CO.

82. Remove the jackshaft thrust plate.

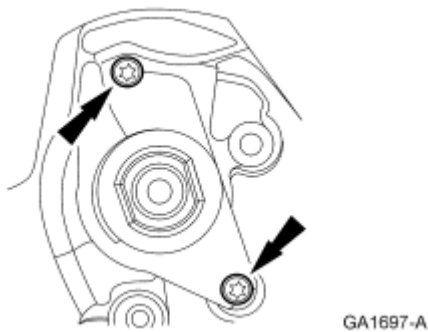
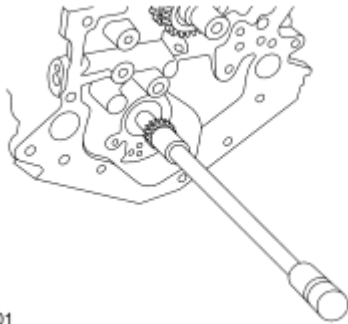


Fig. 309: Locating Jackshaft Thrust Plate & Bolts
Courtesy of FORD MOTOR CO.

83. Remove the jackshaft.



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Fig. 310: Locating Jackshaft
Courtesy of FORD MOTOR CO.

84. If equipped, 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.

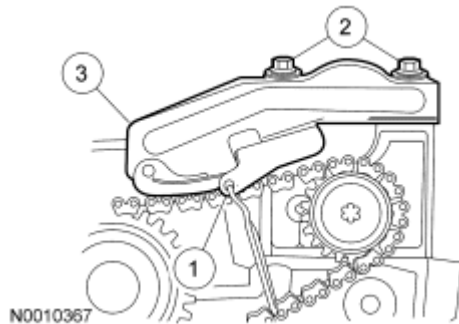


Fig. 311: Identifying Balance Shaft Tensioner, Bolts And Pin
Courtesy of FORD MOTOR CO.

85. If equipped, remove the 2 bolts and the balance shaft chain guide.

NOTE: DO NOT remove the balance shaft sprocket bolt.

86. If equipped, remove the balance shaft chain and crankshaft sprocket.

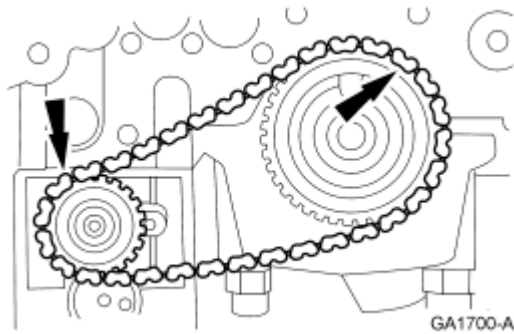


Fig. 312: Identifying Balance Shaft Chain & Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

87. If equipped, remove the balance shaft.
1. Remove the 2 bolts.
 2. Remove the balance shaft.

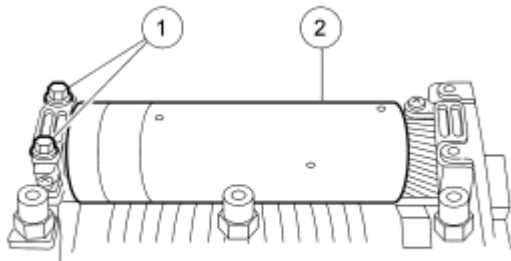


Fig. 313: Identifying Balance Shaft
Courtesy of FORD MOTOR CO.

88. 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.

89. Remove the connecting rod caps.
1. Remove the connecting rod nuts.
 2. Remove the connecting rod caps.

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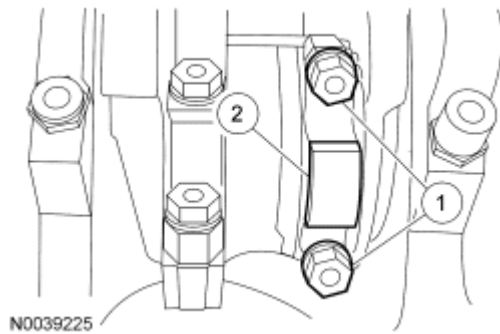


Fig. 314: Identifying Connecting Rod Cap Nuts
Courtesy of FORD MOTOR CO.

90. Install rubber hose pieces on the bolts to protect the crankshaft and remove the pistons.

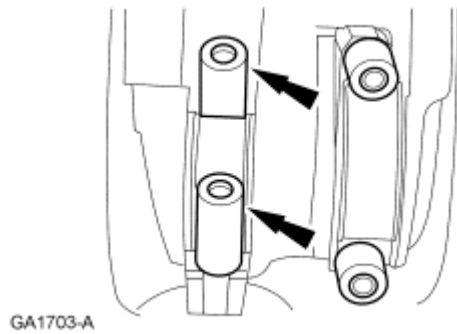


Fig. 315: Locating Rubber Hose Pieces On Connecting Rod Bolts
Courtesy of FORD MOTOR CO.

91. Remove the connecting rod bearings.

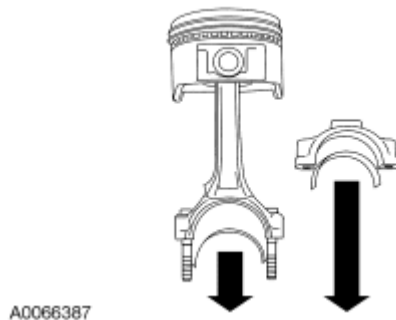


Fig. 316: Locating Connecting Rod Bearings
Courtesy of FORD MOTOR CO.

92. Remove the piston rings.

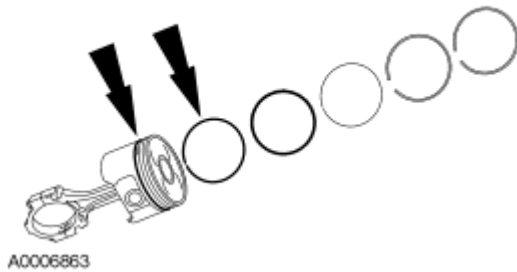


Fig. 317: Locating Piston Rings
Courtesy of FORD MOTOR CO.

93. Clean and inspect the pistons. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.

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.

94. Remove the bolts and the crankshaft main bearing caps.

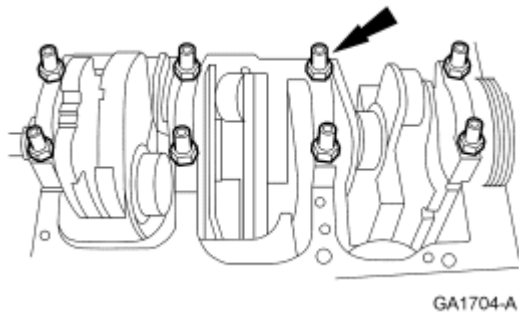


Fig. 318: Locating Crankshaft Main Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

95. Remove the crankshaft rear oil seal from the crankshaft.

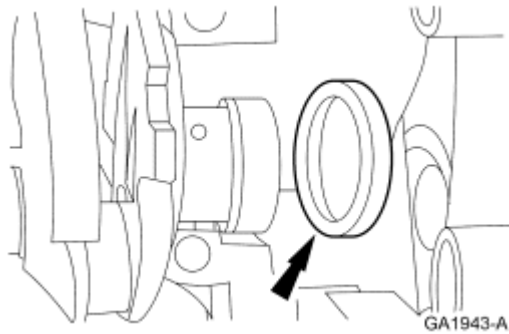


Fig. 319: Identifying Crankshaft Rear Oil Seal
Courtesy of FORD MOTOR CO.

96. Remove the crankshaft.

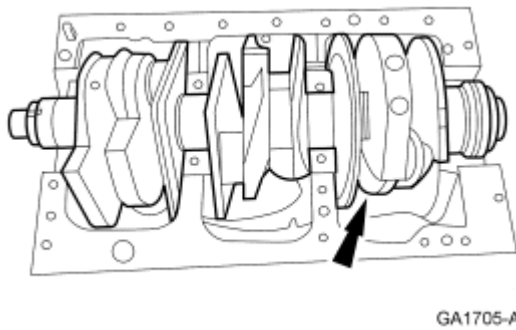


Fig. 320: Locating Crankshaft Main Bearings & Thrust Bearing
Courtesy of FORD MOTOR CO.

97. Remove the crankshaft main bearings and the thrust bearing.

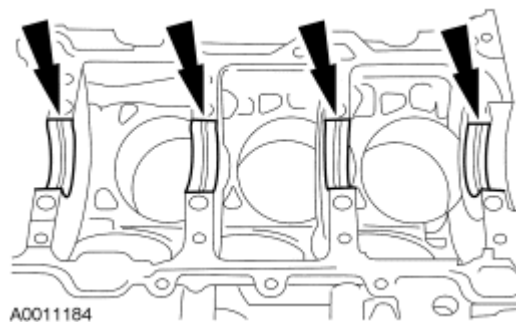
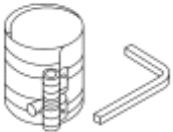
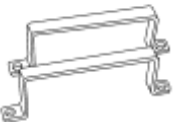


Fig. 321: Locating Crankshaft Main Bearings And Thrust Bearing
Courtesy of FORD MOTOR CO.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

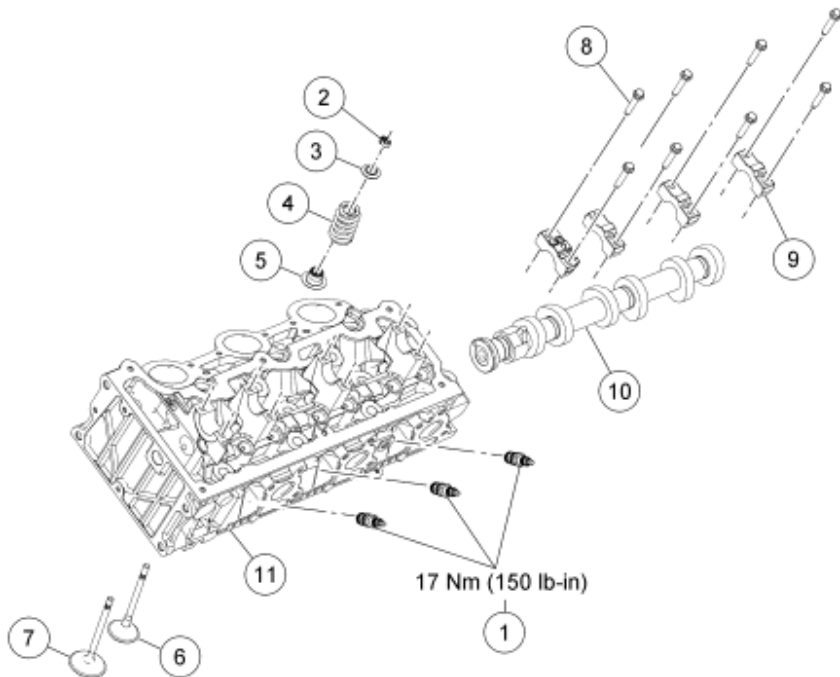
CYLINDER HEAD

Special Tools

Illustration	Tool Name	Tool Number
 ST1376-A	Compressor, Valve Spring	303-581 (T97T-6565-A)
 ST1668-A	Installer, Valve Stem Oil Seal	303-370 (T90T-6571-A)

Material

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. 322: Exploded View Of Cylinder Head With Torque Specification
 Courtesy of FORD MOTOR CO.

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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.

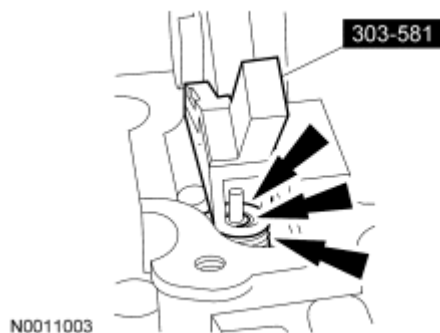


Fig. 323: Removing Valve Spring Retainer Keys, Valve Spring Retainers & Valve Springs Using Special Tool (303-581)
Courtesy of FORD MOTOR CO.

3. Remove and discard the valve seals.

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

4. Remove the bolts in the sequence shown and remove the camshaft bearing caps.

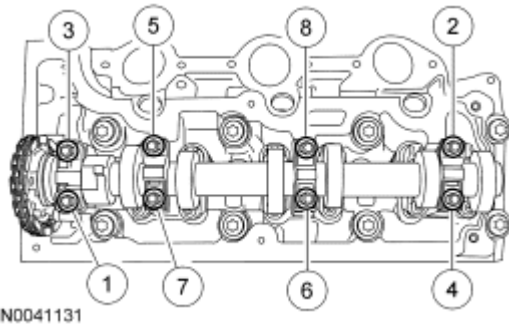


Fig. 324: Identifying Camshaft Bearing Cap Bolts Removal Sequence
Courtesy of FORD MOTOR CO.

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 2 stages.
 - Stage 1: Tighten to 6 Nm (53 lb-in).
 - Stage 2: Tighten to 16 Nm (142 lb-in).

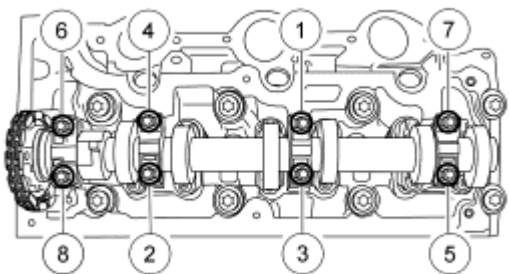


Fig. 325: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Valves must be installed in the position from which they were removed.

3. Install the valve.
4. Using the Valve Stem Oil Seal Installer, install new valve stem seals.

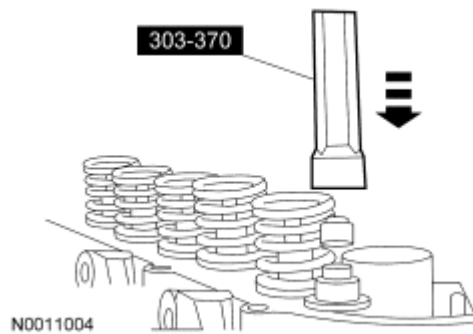


Fig. 326: Installing Valve Seal Using Special Tool (303-370)
Courtesy of FORD MOTOR CO.

NOTE: The valve springs, retainers and retainer keys must be installed in the position from which they were removed.

5. Using the Valve Spring Compressor, install the valve spring, the retainer and the retainer keys.

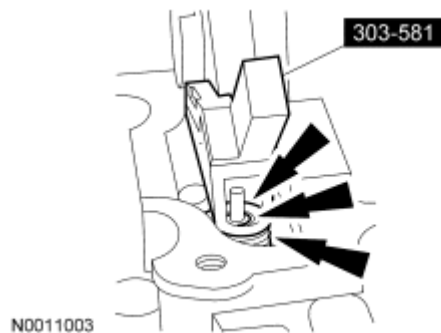


Fig. 327: Removing Valve Spring Retainer Keys, Valve Spring Retainers & Valve Springs Using Special Tool (303-581)
Courtesy of FORD MOTOR CO.

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

6. Install the spark plugs.
 - Tighten to 17 Nm (150 lb-in).

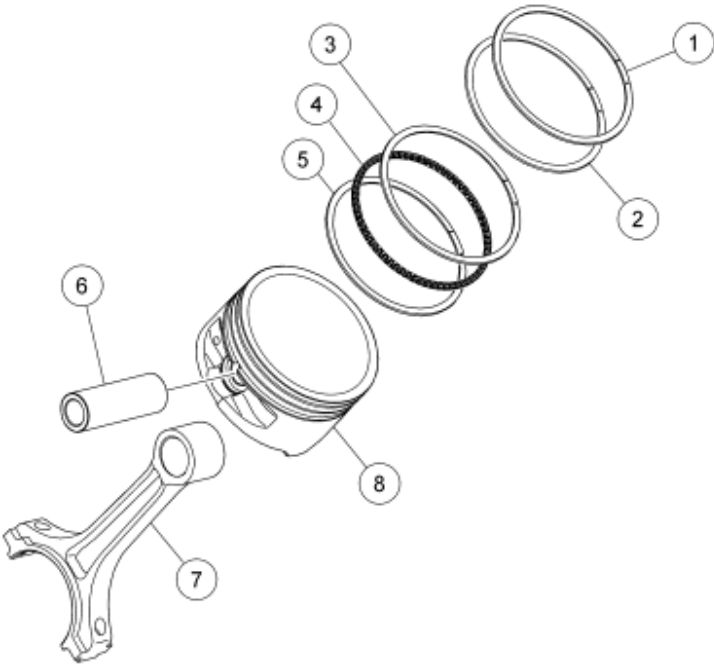
PISTON

Special Tools

Illustration	Tool Name	Tool Number
 ST2806-A	Service Set, Piston Pin	303-S024 (T68P-6135-A)

Material

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. 328: Exploded View Of Piston Components
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6150	Piston compression upper ring
2	6152	Piston compression lower ring

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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.
3. Using the Piston Pin Service Set, press the piston pin out of the connecting rod and piston assembly.

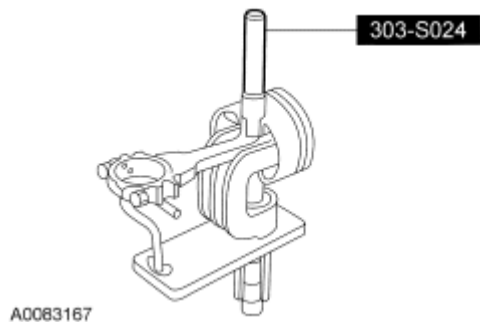


Fig. 329: Pressing Piston Pin Out Of Connecting Rod & Piston Assembly Using Special Tool (303-S024)

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.

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1. 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.
2. Using the Piston Pin Service Set, press the piston pin into the piston and connecting rod assembly.

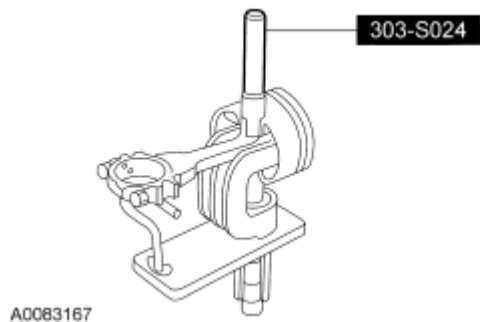


Fig. 330: Pressing Piston Pin Out Of Connecting Rod & Piston Assembly Using Special Tool (303-S024)

Courtesy of FORD MOTOR CO.

3. 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.

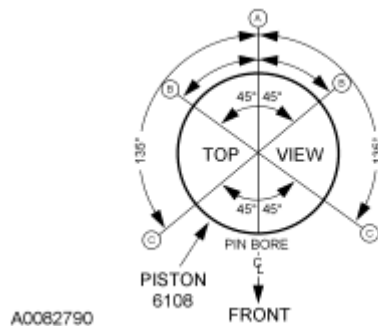


Fig. 331: Identifying Piston Ring Gaps Positioning

Courtesy of FORD MOTOR CO.

5. Install the connecting rod bearings in the connecting rod and cap.

ASSEMBLY

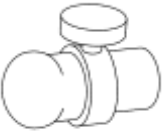
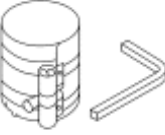
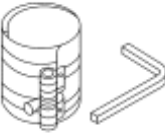
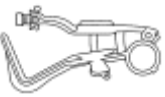
ENGINE

Special Tools

Illustration	Tool Name	Tool Number

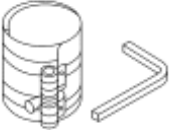
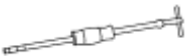
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 ST1251-A	Adapter for 303-564	303-578 (T97T-6256-A)
 ST1300-A	Adapter for 303-577	303-576 (T97T-6256-D)
 ST3074-A	Adapter for 303-579 (part of 303-S524)	303-527 (T95P-6701-A3)
 ST2439-A	Aligner, Front Cover	303-093 (T74P-6019-A)
 ST1380-A	Compressor, Piston Ring	303-D032 (D81L-6002-C)
 ST1376-A	Compressor, Valve Spring	303-581 (T97T-6565-A)
 ST1279-A	Holding Tool, Camshaft	303-577 (T97T-6256-C)
 ST2176-B	Holding Tool, Camshaft Sprocket	303-564 (T97T-6256-B)

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 ST2741A	Holding Tool, Crankshaft	303-674
 ST1730-A	Installer, Crankshaft Rear Oil Seal	303-579 (T97T-6701-A)
 ST1287-A	Installer, Crankshaft Vibration Damper	303-102 (T74P-6316-B)
 ST1831-A	Lifting Bracket, Engine	303-050 (T70P-6000)
 ST3075-A	Screws, Crankshaft Rear Oil Seal (part of 303-S524)	303-528 (T95T-6701-A4)
 ST1376-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent
 ST1438-A	Strap Wrench	303-D055 (85L-6000-A) or equivalent
 ST1185-A	Tensioner, Timing Chain	303-571 (T97T-6K254-A)

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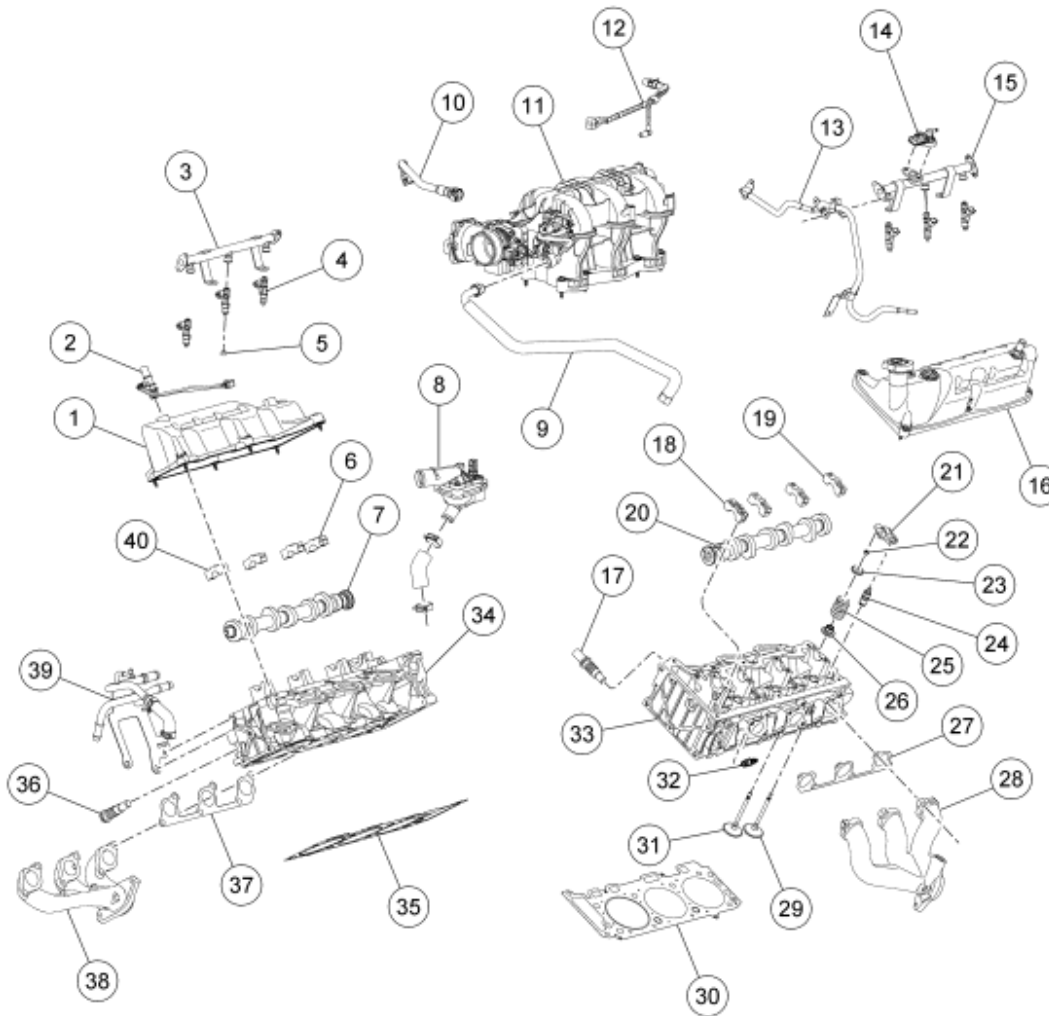
 ST1299-A	Timing Tool, Crankshaft TDC	303-573 (T97T-6303-A)
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Material

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

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N0034712

Fig. 332: Exploded View Of Engine Upper End
Courtesy of FORD MOTOR CO.

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

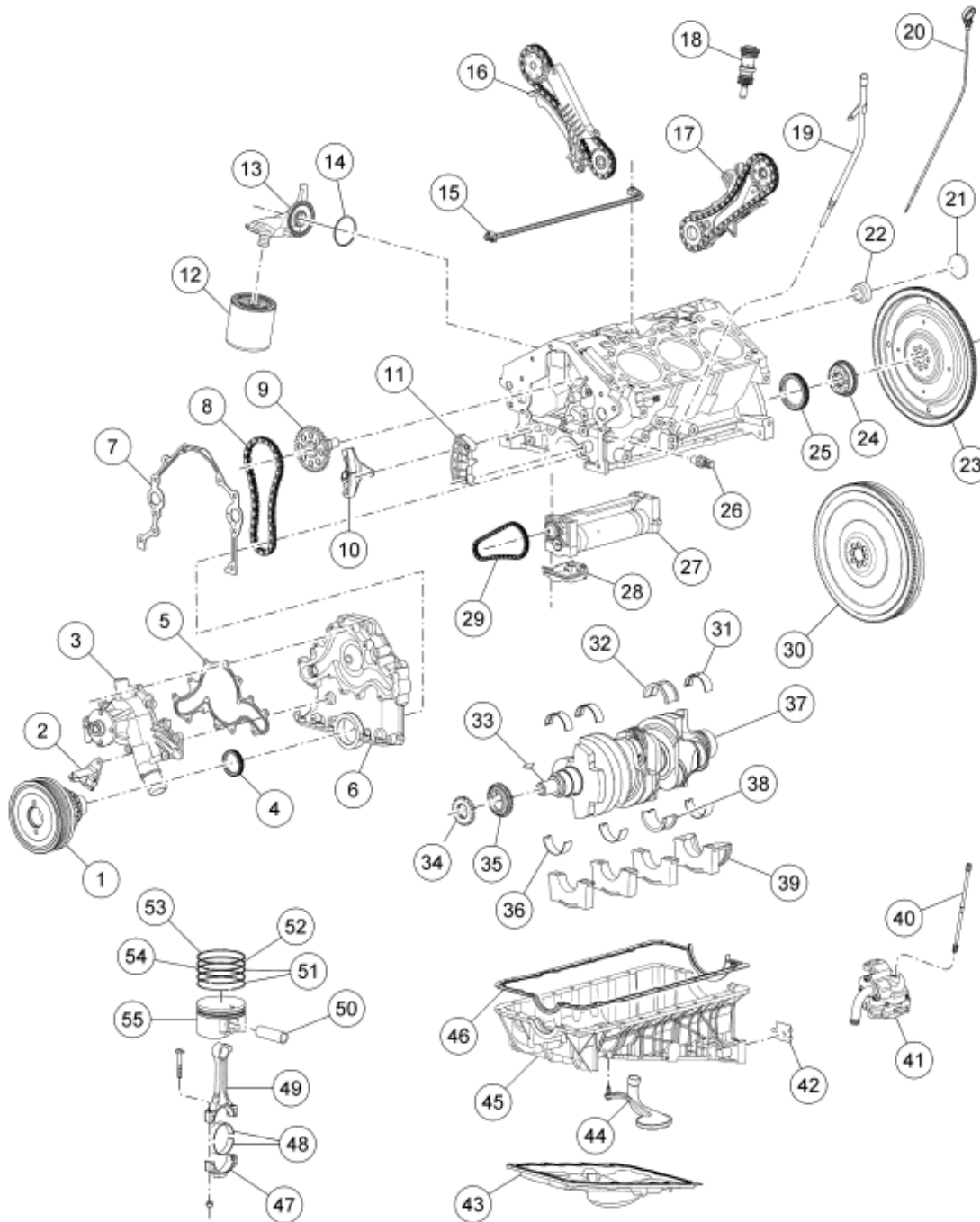
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11	9K479	Intake manifold
12	9E498	Vacuum harness
13	9E964	Fuel supply tube
14	9G756	Fuel rail pressure and temperature sensor
15	9D280	LH fuel rail
16	6A505	LH valve cover
17	6K254	LH hydraulic chain tensioner
18	6A258	LH camshaft thrust bearing cap
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)

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N0017149

Fig. 333: Exploded View Of Engine Lower End
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6B321	Crankshaft pulley
2	6C315	Crankshaft Position (CKP) sensor

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3	8501	Coolant pump
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

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42	6C629	Shim (2 required)
43	6675	Oil pan
44	6617	Oil pump screen and pickup tube
45	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

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.

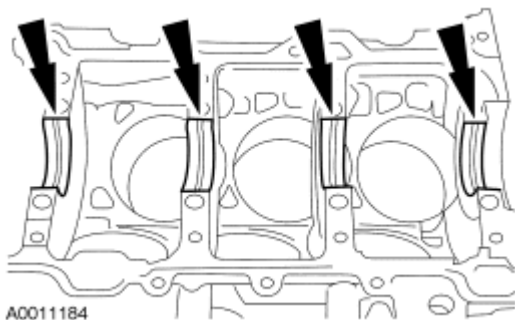
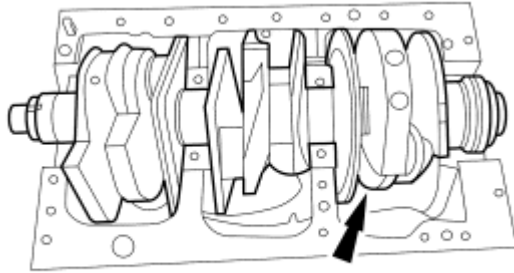


Fig. 334: Locating Crankshaft Main Bearings And Thrust Bearing
Courtesy of FORD MOTOR CO.

NOTE: The crankshaft main bearings are precision selective fit. Inspect the bearing clearance. For additional information, refer to ENGINE SYSTEM - GENERAL INFORMATION article.

3. Install the crankshaft.

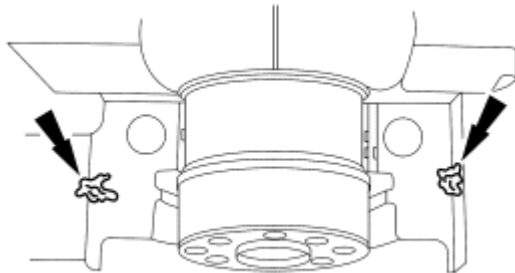


GA1705-A

Fig. 335: Locating Crankshaft Main Bearings & Thrust Bearing
Courtesy of FORD MOTOR CO.

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

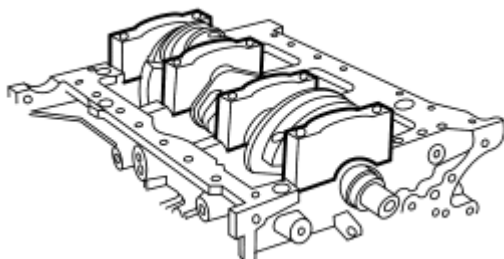
4. Apply silicone gasket and sealant to the rear main bearing cap to cylinder block parting line.



GA1707-A

Fig. 336: Apply Silicone Gasket & Sealant To Rear Main Bearing Cap
Courtesy of FORD MOTOR CO.

5. Install the main bearing caps in the order in which they were removed.



GA1769-A

Fig. 337: Locating Crankshaft Main Bearing Caps
Courtesy of FORD MOTOR CO.

6. Tighten the bolts in the sequence shown to 35 Nm (26 lb-ft) and then rotate an additional 57 degrees.

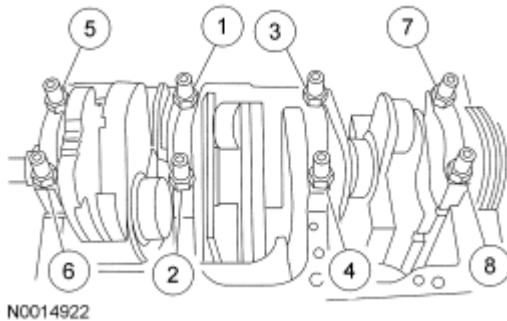


Fig. 338: Identifying Main Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

7. Check the piston to cylinder bore and ring clearance. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.

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.

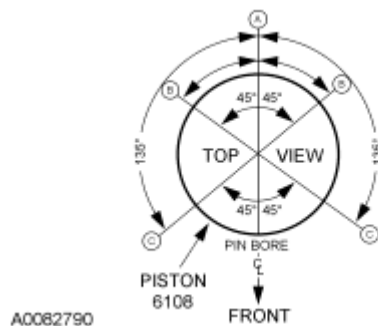
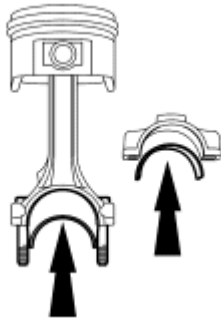


Fig. 339: Identifying Piston Ring Gaps Positioning
Courtesy of FORD MOTOR CO.

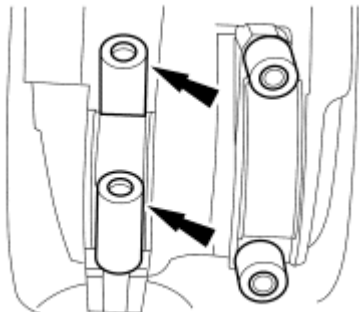
10. Install the connecting rod bearings.



A0067508

Fig. 340: Locating Connecting Rod Bearings
Courtesy of FORD MOTOR CO.

11. Install rubber hose pieces on the connecting rod bolts to protect the crankshaft.

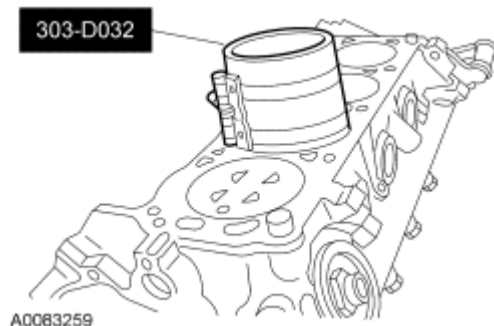


GA1703-A

Fig. 341: Locating Rubber Hose Pieces On Connecting Rod 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.



A0083259

Fig. 342: Installing Piston Using Special Tool (303-D032)
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** article.
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.

15. Loosen the first nut until the face is approximately 2 mm (0.08 in) over the end of the bolt.

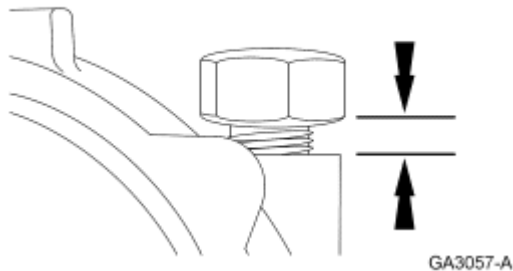


Fig. 343: Locating Connecting Rod Nut
Courtesy of FORD MOTOR CO.

16. Tap on the nut until the bolt can be removed by hand.

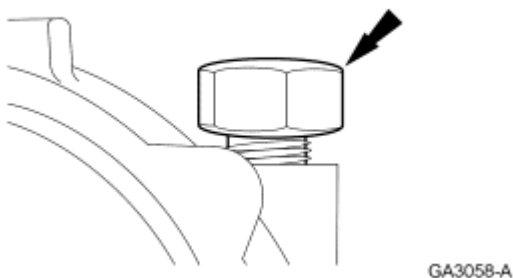


Fig. 344: Locating Opposite Bolt
Courtesy of FORD MOTOR CO.

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.

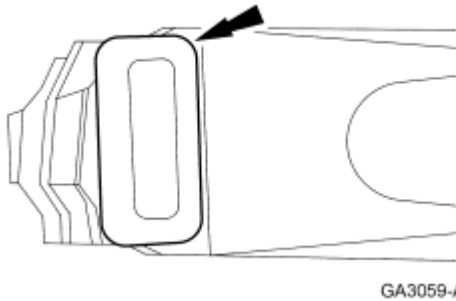


Fig. 345: Locating Connecting Rod Cap
Courtesy of FORD MOTOR CO.

19. Install the connecting rod cap in its original position.
20. Install and tighten the connecting rod nuts finger-tight.

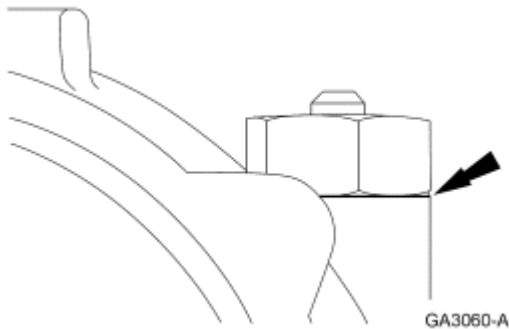
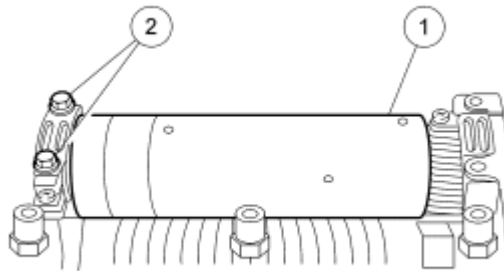


Fig. 346: Tightening Connecting Rod Nuts
Courtesy of FORD MOTOR CO.

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).
24. If equipped, install the balance shaft.
 1. Position the balance shaft assembly.
 2. Install the bolts and tighten to 27 Nm (20 lb-ft).

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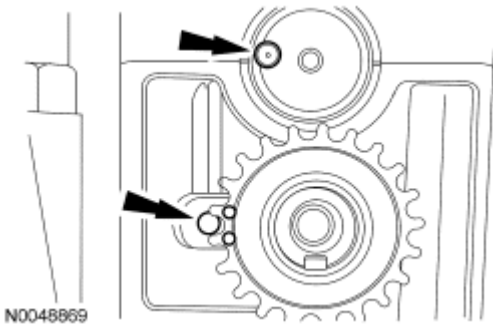


N0010444

Fig. 347: Identifying Balance Shaft Assembly And 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.

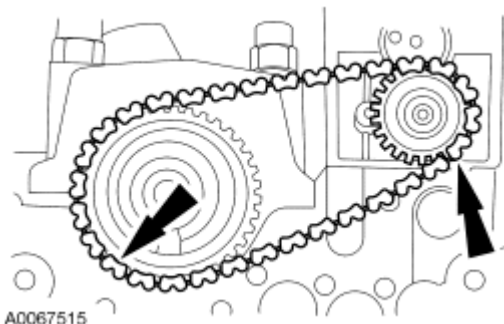
25. Align the timing marks.
 - Install a 4 mm (0.16 in) pin to hold the shaft in place.



N0048869

Fig. 348: Locating Timing Marks
Courtesy of FORD MOTOR CO.

26. If equipped, install the balance shaft chain and crankshaft sprocket.



A0067515

Fig. 349: Locating Balance Shaft Chain And Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

27. If equipped, 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).
 4. Remove the pin from the tensioner.

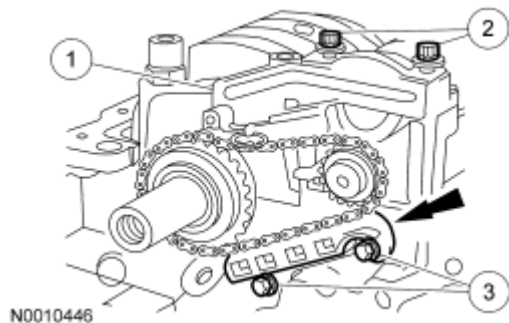


Fig. 350: Locating Balance Shaft Tensioner, Bolts And Balance Shaft Chain Guide
Courtesy of FORD MOTOR CO.

28. Position the oil pump intermediate shaft and the oil pump. Install the 2 bolts.
- Tighten to 19 Nm (168 lb-in).

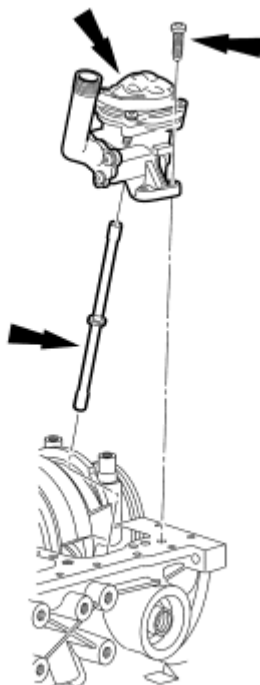
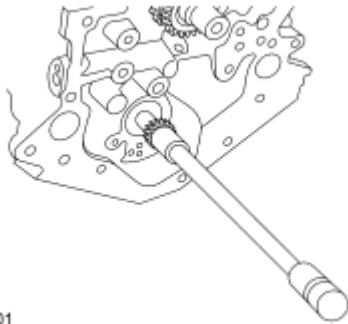


Fig. 351: Locating Oil Pump Intermediate Shaft, Oil Pump And Bolt
Courtesy of FORD MOTOR CO.

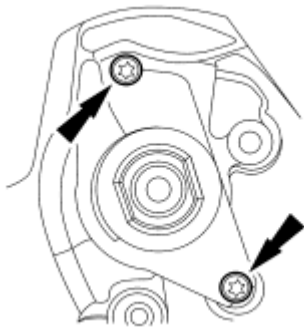
29. Install the jackshaft.



A0011401

Fig. 352: Locating Jackshaft
Courtesy of FORD MOTOR CO.

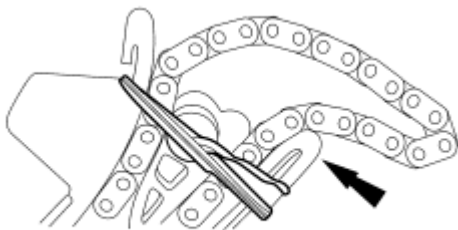
30. Install the jackshaft thrust plate and bolts.
- Tighten to 11 Nm (97 lb-in).



GA1697-A

Fig. 353: Locating Jackshaft Thrust Plate & Bolts
Courtesy of FORD MOTOR CO.

31. Position the LH cassette.



N0014449

Fig. 354: Locating Cassette And Timing Chain
Courtesy of FORD MOTOR CO.

32. Install the front cassette and the bolt.

- Tighten to 19 Nm (168 lb-in).

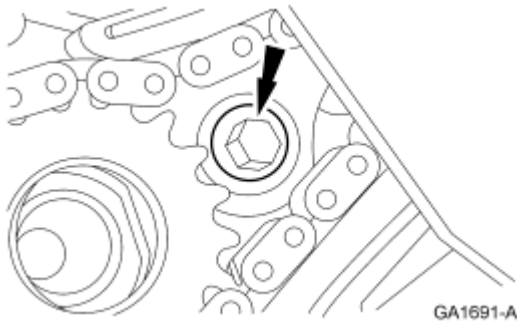


Fig. 355: Locating Front Cassette & Bolt
Courtesy of FORD MOTOR CO.

33. Position the jackshaft sprocket and chain.

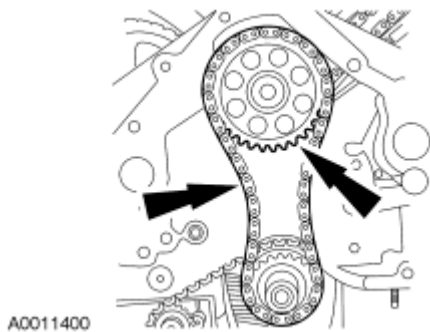


Fig. 356: Locating Jackshaft Chain And Sprockets
Courtesy of FORD MOTOR CO.

34. Install the jackshaft chain guide and the 2 bolts.
- Tighten to 19 Nm (168 lb-in).

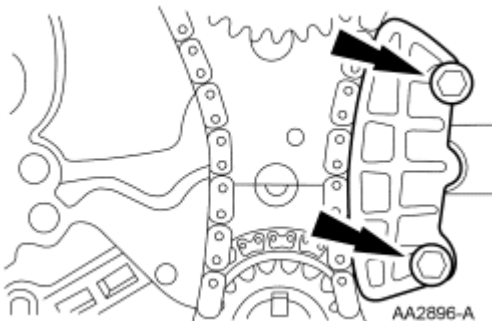


Fig. 357: Locating Chain Guide & Bolts
Courtesy of FORD MOTOR CO.

35. Install the jackshaft chain tensioner and the 2 bolts.

- Tighten to 9 Nm (80 lb-in).

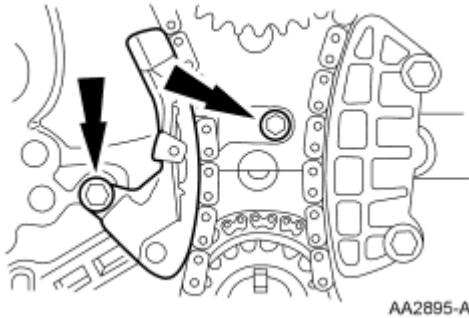


Fig. 358: Locating Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

36. Using the Crankshaft Holding Tool, hold the crankshaft.

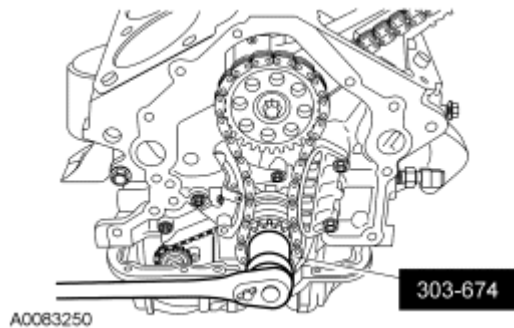


Fig. 359: Holding Crankshaft Using Special Tool (303-674)
Courtesy of FORD MOTOR CO.

37. Install the jackshaft sprocket bolt and tighten in 2 stages.
- Stage 1: Tighten to 45 Nm (33 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

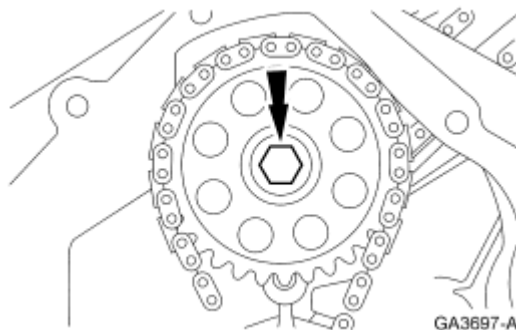


Fig. 360: Locating Jackshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

38. Install the oil pump drive and the bolt.
- Tighten to 19 Nm (168 lb-in).

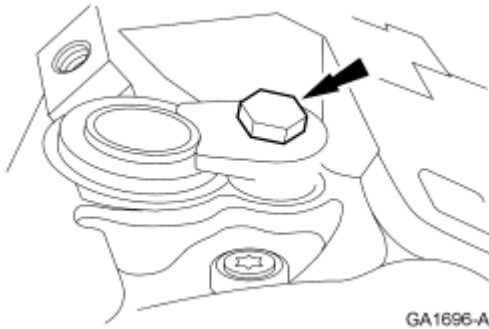


Fig. 361: Locating Oil Pump Drive
Courtesy of FORD MOTOR CO.

39. Position the RH cassette.

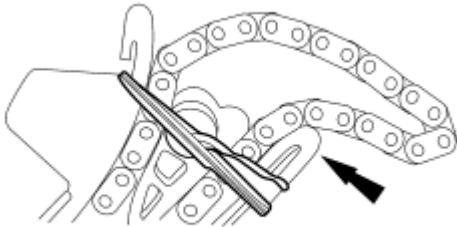


Fig. 362: Locating Cassette And Timing Chain
Courtesy of FORD MOTOR CO.

40. Position the rear jackshaft sprocket and the spacer on the jackshaft.
- Loosely install the bolt.

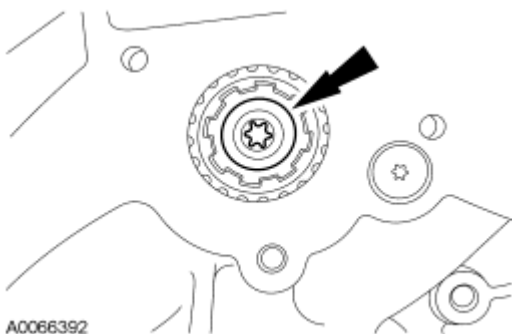


Fig. 363: Locating Rear Jackshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

41. Install the RH cassette bolt.
- Tighten to 12 Nm (106-in).

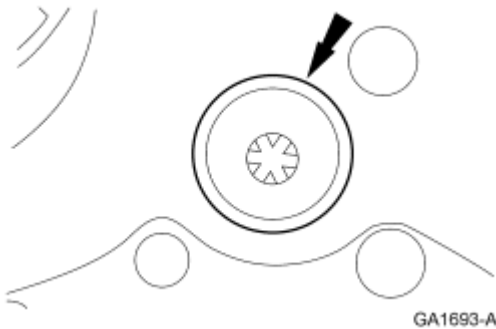


Fig. 364: Locating RH Camshaft Drive Cassette Bolt & Spacer
Courtesy of FORD MOTOR CO.

42. Using the Crankshaft Holding Tool, hold the crankshaft.

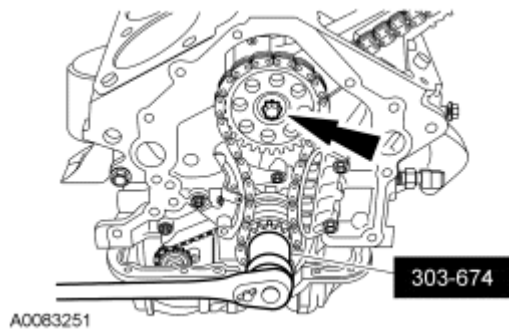


Fig. 365: Identifying Special Tool (303-674) & Jackshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

43. Tighten the rear jackshaft sprocket bolt in 2 stages.
- Stage 1: Tighten to 20 Nm (177 lb-in).
 - Stage 2: Tighten an additional 90 degrees.

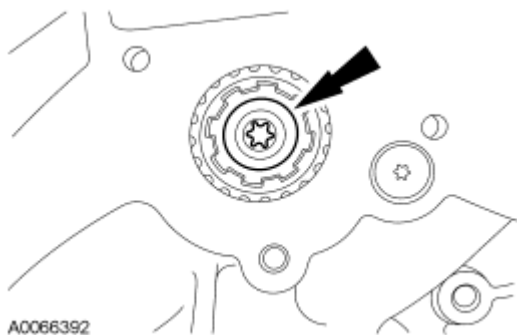


Fig. 366: Locating Rear Jackshaft Sprocket Bolt

Courtesy of FORD MOTOR CO.

44. Install the jackshaft plug.

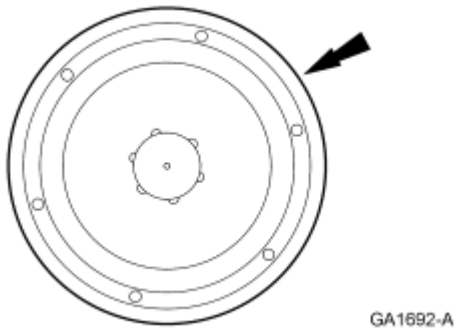


Fig. 367: Locating Rear Jackshaft Plug
Courtesy of FORD MOTOR CO.

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.

46. Position the front cover and loosely install the 5 bolts and the 5 stud bolts.

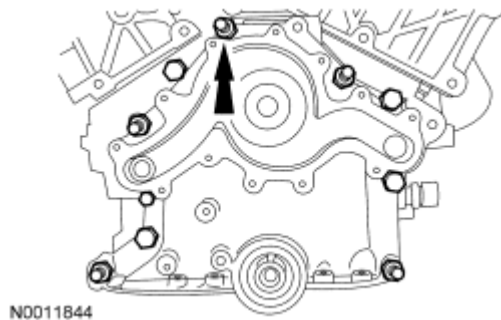


Fig. 368: Locating Front Cover Stud Bolts
Courtesy of FORD MOTOR CO.

47. Use the Front Cover Aligner to align the front cover and tighten the bolts and stud bolts to 19 Nm (168 lb-in).

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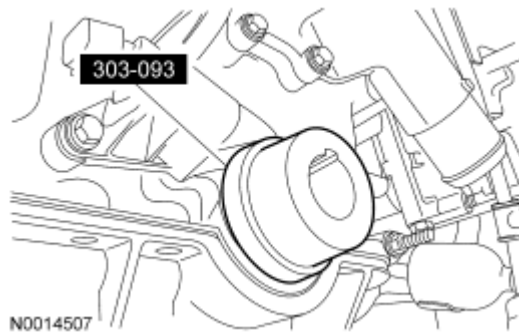


Fig. 369: Identifying Special Tool (303-093)
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the seal lip with clean engine oil.

48. Using the Front Cover Aligner and Crankshaft Vibration Damper Installer, install the crankshaft front oil seal.

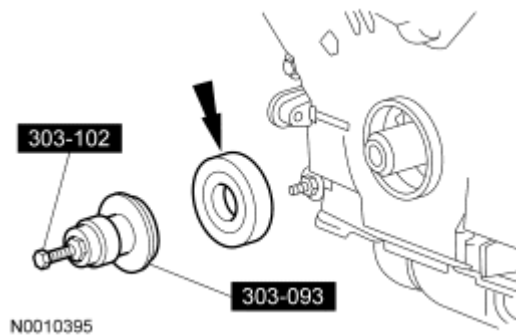


Fig. 370: Identifying Special Tools (303-102, 303-093) & Crankshaft Front Oil Seal
Courtesy of FORD MOTOR CO.

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

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

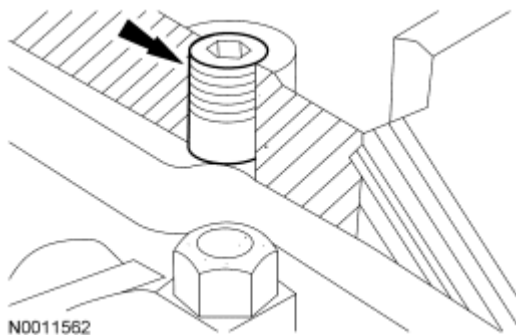


Fig. 371: Locating Cylinder Block Cradle Boss Screw

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Courtesy of FORD MOTOR CO.

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

50. Apply silicone in the 6 places shown.

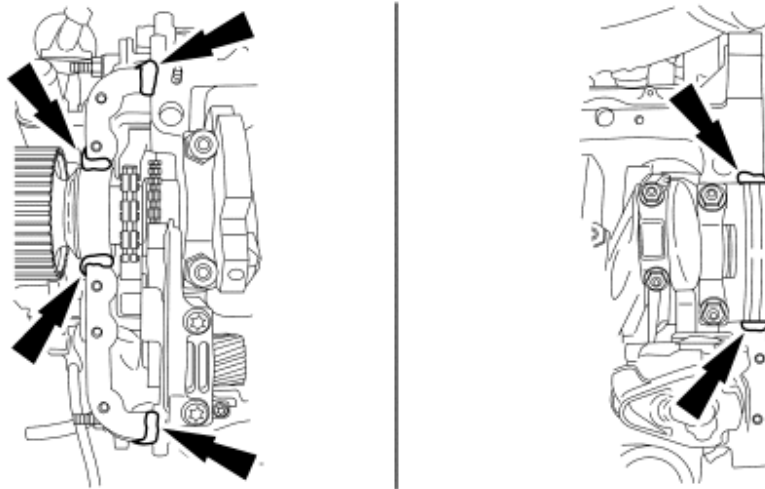


Fig. 372: Locating Silicone Applying Area
Courtesy of FORD MOTOR CO.

51. Position the lower block cradle and a new gasket.

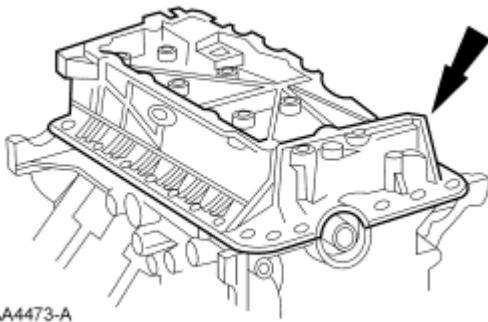


Fig. 373: Locating Cylinder Block Cradle & Gasket Assembly
Courtesy of FORD MOTOR CO.

52. Install and hand-tighten the 20 bolts and 2 nuts.

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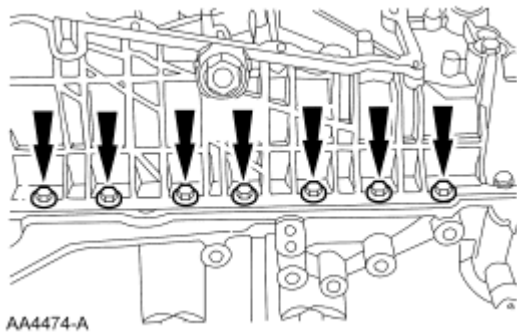


Fig. 374: Locating Cylinder Block Cradle & Gasket
Courtesy of FORD MOTOR CO.

53. Install and hand-tighten the bolts.

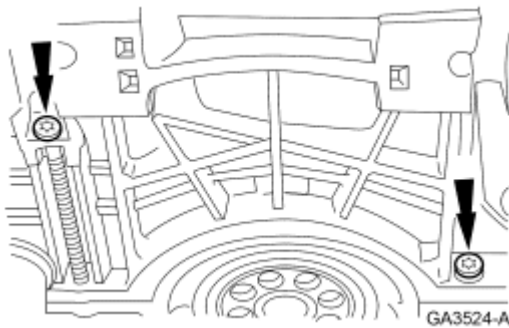


Fig. 375: Locating Rear Cylinder Block Cradle Bolts
Courtesy of FORD MOTOR CO.

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 under flush or 0.05 mm (0.00196 in) lower block cradle protrusion.

54. Using a straightedge, align the transmission face of the lower block cradle with the rear face of the cylinder block.

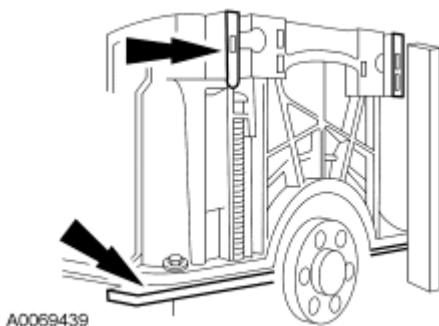


Fig. 376: Locating Transmission Face Of Cylinder Block Cradle With Rear Face Of Cylinder Block
Courtesy of FORD MOTOR CO.

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).

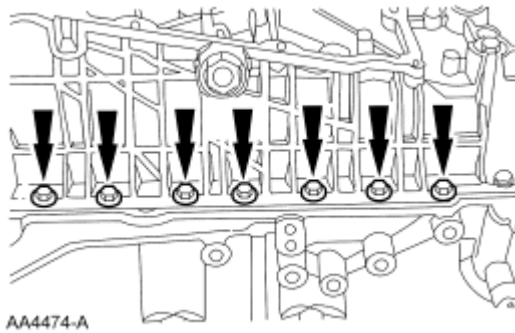


Fig. 377: Locating Cylinder Block Cradle & Gasket
Courtesy of FORD MOTOR CO.

56. Install the 2 block cradle bolts.
- Tighten to 10 Nm (89 lb-in).

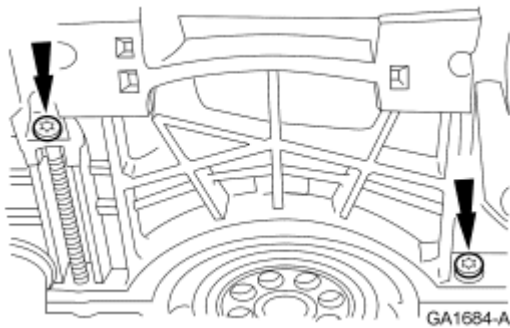


Fig. 378: Locating Rear Cylinder Block Cradle Bolts
Courtesy of FORD MOTOR CO.

57. Tighten the lower block cradle inserts to 3 Nm (27 lb-in).

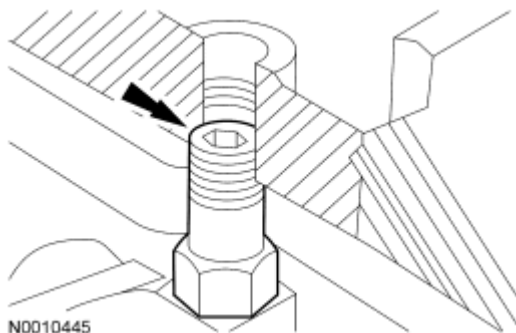


Fig. 379: Locating Cylinder Block Cradle Rear Torx Bolts

Courtesy of FORD MOTOR CO.

58. Install new seals on the 2 silver bolts and loosely install them in the cylinder block cradle.

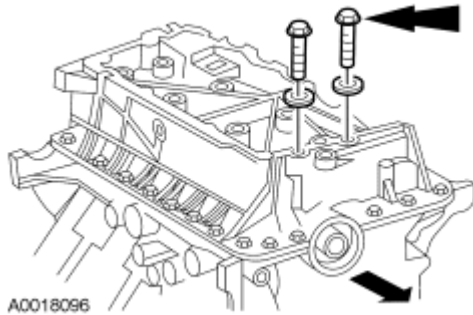


Fig. 380: Locating Silver-Colored Bolts And New Washer Seals
Courtesy of FORD MOTOR CO.

59. Loosely install the 6 remaining lower block cradle bolts.

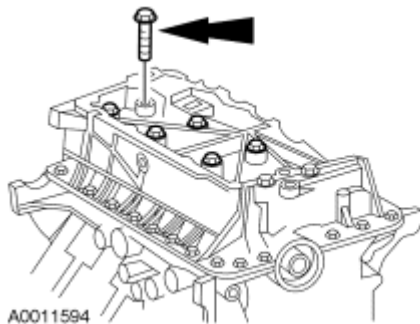


Fig. 381: Locating Lower Block Cradle Bolts
Courtesy of FORD MOTOR CO.

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).

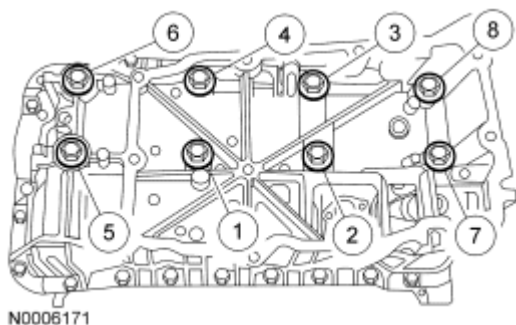


Fig. 382: Identifying Cylinder Block Cradle Inner Bolts Tightening Sequence

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 under flush 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 under flush specification may be repaired by installing shims (next step).

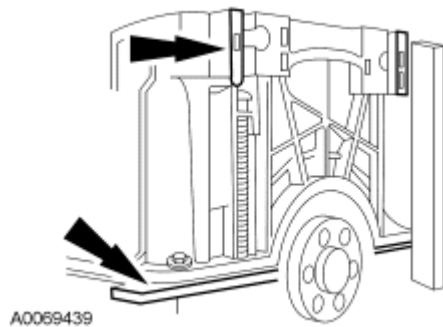


Fig. 383: Locating Transmission Face Of Cylinder Block Cradle With Rear Face Of Cylinder Block
Courtesy of FORD MOTOR CO.

62. Repair all assemblies that exceed under flush specification by installing shims on 1 or both sides of the cylinder block cradle.

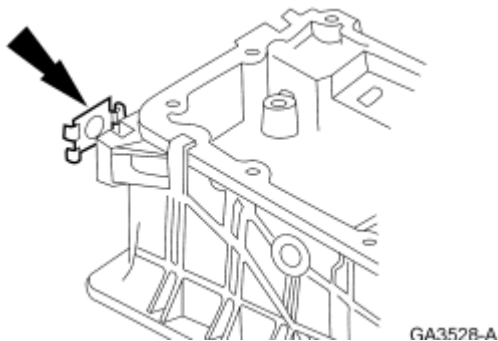


Fig. 384: Locating Shims On Both Sides Of Cylinder Block Cradle
Courtesy of FORD MOTOR CO.

63. Install the oil pump screen and pickup tube and the bolt.
- Tighten to 10 Nm (89 lb-in).

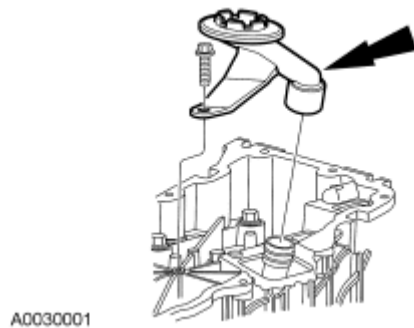


Fig. 385: Locating Oil Pump Screen Cover And Bolt
Courtesy of FORD MOTOR CO.

64. Install the gasket, oil pan and the 10 bolts.
- Tighten to 11 Nm (97 lb-in).

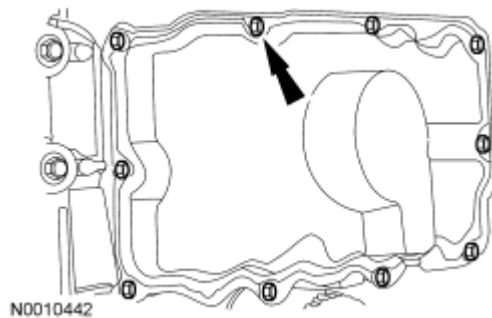


Fig. 386: Locating Gasket, Oil Pan And Bolts
Courtesy of FORD MOTOR CO.

65. Inspect and install new oil filter adapter O-ring seals if necessary.

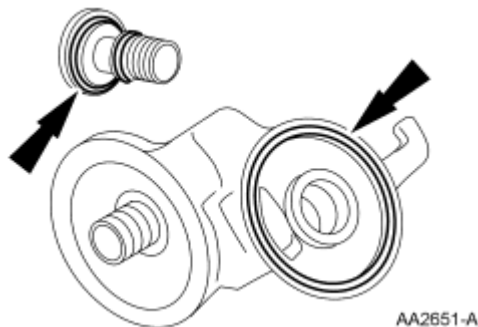


Fig. 387: Locating O-Ring Seals
Courtesy of FORD MOTOR CO.

66. Install the oil filter adapter and the bolt.
- Tighten to 57 Nm (42 lb-ft).

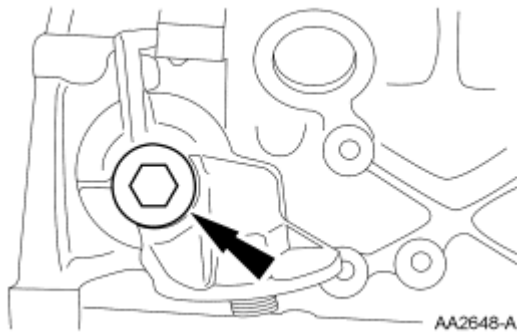


Fig. 388: Locating Oil Filter Adapter
Courtesy of FORD MOTOR CO.

67. Install a new oil filter.
- Tighten until the oil filter seal is flush with the adapter and the tighten an additional 270 degrees.

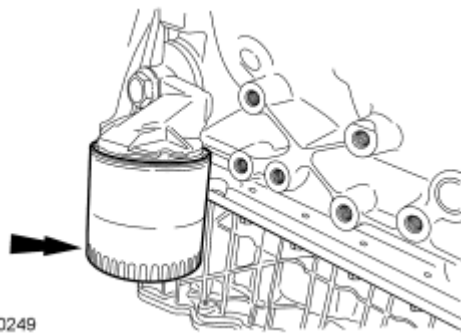


Fig. 389: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

68. Using the Crankshaft Vibration Damper, install the crankshaft pulley.



Fig. 390: Installing Crankshaft Pulley Using Special Tool (303-102)
Courtesy of FORD MOTOR CO.

NOTE: A new bolt must be used each time it is removed.

69. Using the Strap Wrench, tighten the bolt in 2 stages.

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- Stage 1: Tighten to 50 Nm (37 lb-ft).
- Stage 2: Rotate an additional 90 degrees.

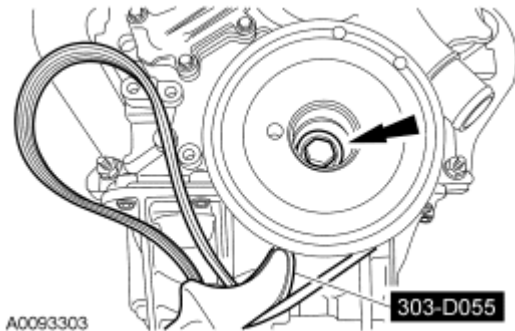


Fig. 391: Holding Crankshaft Pulley Using Special Tool
Courtesy of FORD MOTOR CO.

70. Position the Crankshaft Position (CKP) sensor and install the 2 bolts.
- Tighten to 10 Nm (89 lb-in).

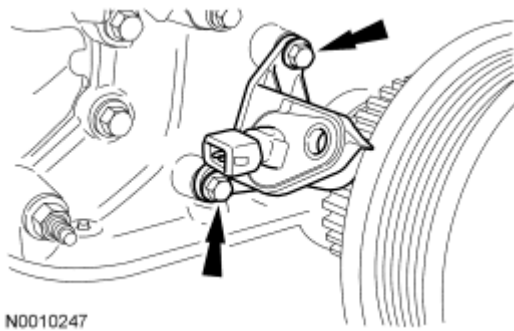


Fig. 392: Locating Crankshaft Position (CKP) Sensor And Bolts
Courtesy of FORD MOTOR CO.

NOTE: LH side shown, RH side similar.

71. Position the cylinder head gaskets.

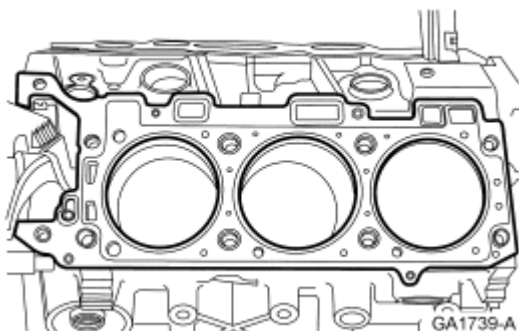


Fig. 393: Identifying Cylinder Head Gaskets

Courtesy of FORD MOTOR CO.

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.

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

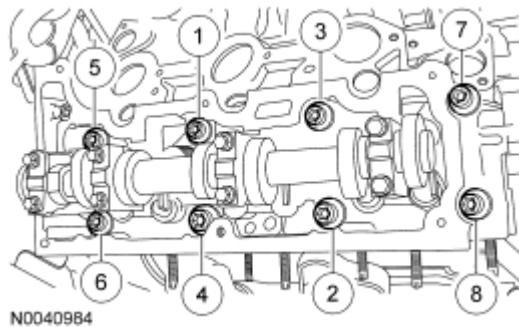


Fig. 394: Identifying Tightening Sequence Of 12-MM Bolts

Courtesy of FORD MOTOR CO.

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

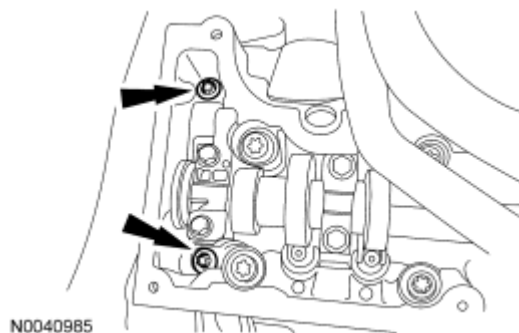


Fig. 395: Locating 8-Mm Bolts

Courtesy of FORD MOTOR CO.

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

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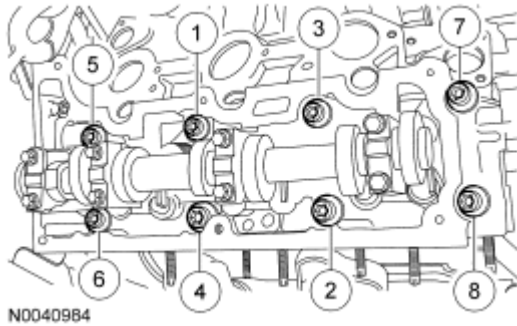


Fig. 396: Identifying Tightening Sequence Of 12-MM Bolts
Courtesy of FORD MOTOR CO.

75. Position the RH cassette and camshaft sprocket.

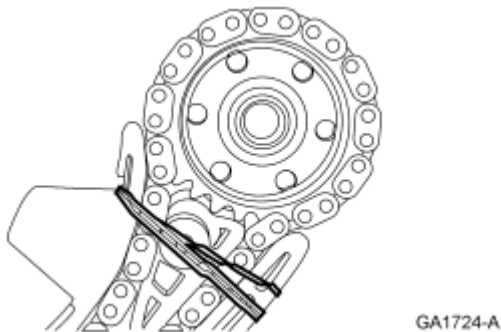


Fig. 397: Identifying Camshaft Sprocket From Camshaft
Courtesy of FORD MOTOR CO.

NOTE: The camshaft sprocket must turn freely on the camshaft. Do not tighten the bolt.

76. Install and hand-tighten the RH rear camshaft sprocket bolt.

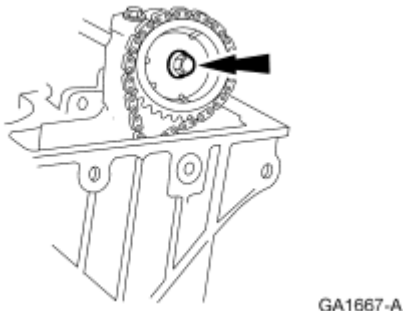


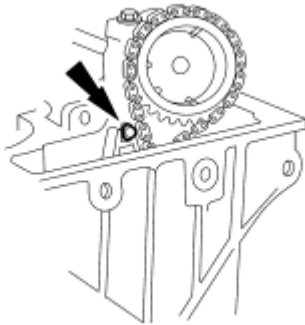
Fig. 398: Locating RH Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

77. Install the RH cassette bolt.

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- Tighten to 10 Nm (89 lb-in).

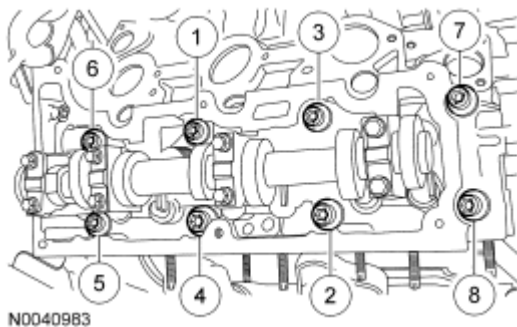


GA3228-A

Fig. 399: Locating RH Chain Guide 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.

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



N0040983

Fig. 400: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

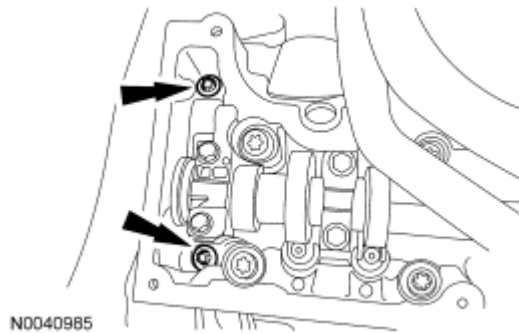


Fig. 401: Locating 8-Mm Bolts
Courtesy of FORD MOTOR CO.

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

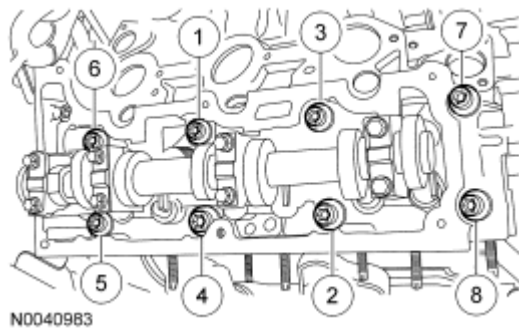


Fig. 402: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

81. Position the LH cassette and camshaft sprocket.

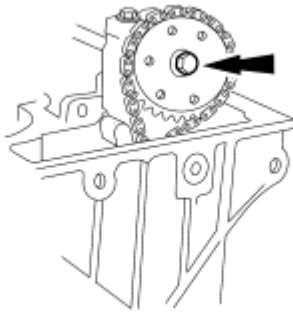


Fig. 403: Identifying Camshaft Sprocket From Camshaft
Courtesy of FORD MOTOR CO.

NOTE: The camshaft sprocket must turn freely on the camshaft. Do not tighten

the bolt.

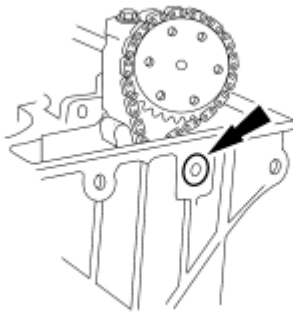
82. Install and hand-tighten the LH camshaft sprocket bolt.



GA1669-A

Fig. 404: Locating Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

83. Install the LH cassette bolt.
- Tighten to 12 Nm (106 lb-in).



GA1670-A

Fig. 405: Locating Chain Guide Bolt
Courtesy of FORD MOTOR CO.

84. 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 Top Dead Center (TDC).

85. Install the Crankshaft TDC Timing Tool.

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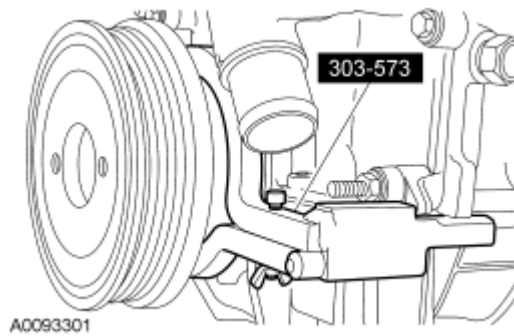


Fig. 406: Identifying Special Tool (303-573)
Courtesy of FORD MOTOR CO.

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.

86. Install the Camshaft Holding Tool and Adapter on the front of the RH cylinder head.

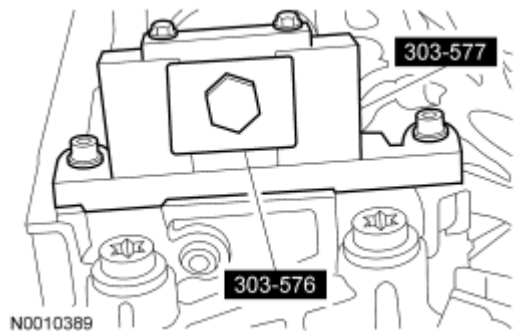


Fig. 407: Identifying Special Tools (303-576, 303-577)
Courtesy of FORD MOTOR CO.

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

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

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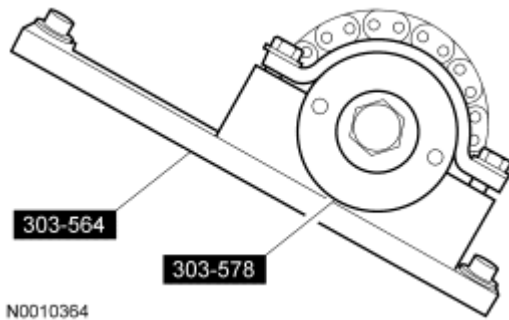


Fig. 408: Identifying Special Holding Tool
Courtesy of FORD MOTOR CO.

88. Install the Timing Chain Tensioner.

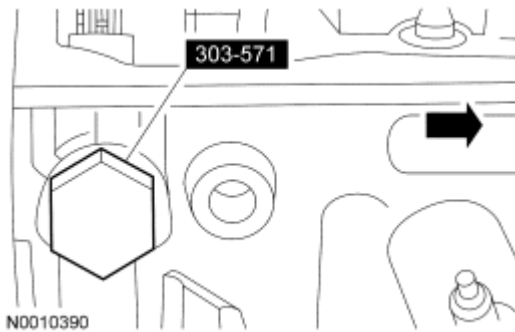


Fig. 409: Identifying Special Tool (303-571)
Courtesy of FORD MOTOR CO.

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

89. 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).

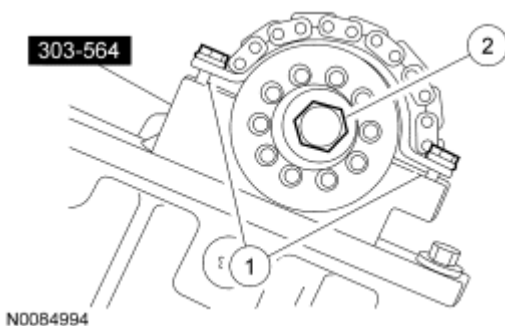


Fig. 410: Tightening Camshaft Sprocket Holding Tool Top Clamp Bolts
Courtesy of FORD MOTOR CO.

90. Remove the Timing Chain Tensioner and install the RH camshaft tensioner.
- Tighten to 44 Nm (32 lb-ft).

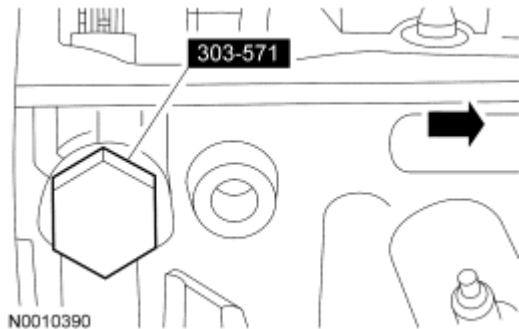


Fig. 411: Identifying Special Tool (303-571)
Courtesy of FORD MOTOR CO.

NOTE: Do not tighten the Camshaft Sprocket Holding Tool top 2 clamp bolts. Camshaft sprocket must rotate freely.

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

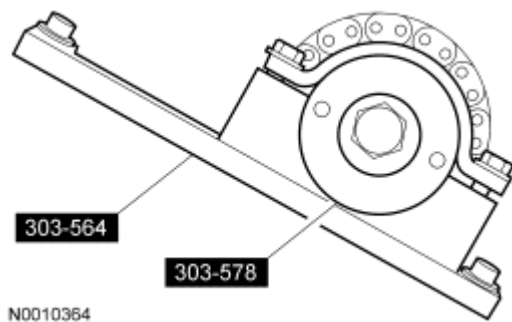


Fig. 412: Identifying Special Holding Tool
Courtesy of FORD MOTOR CO.

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.

92. Install the Camshaft Holding Tool and Adapter on the rear of the LH cylinder head.

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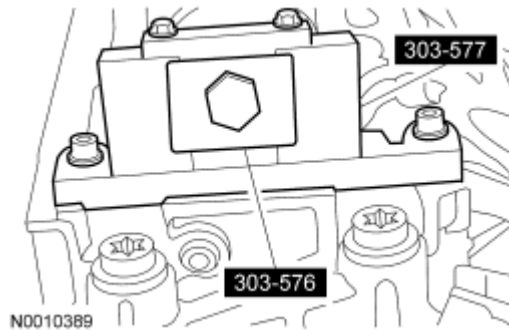


Fig. 413: Identifying Special Tools (303-576, 303-577)
Courtesy of FORD MOTOR CO.

93. Install the Timing Chain Tensioner.



Fig. 414: Identifying Special Tool (303-571)
Courtesy of FORD MOTOR CO.

94. 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).

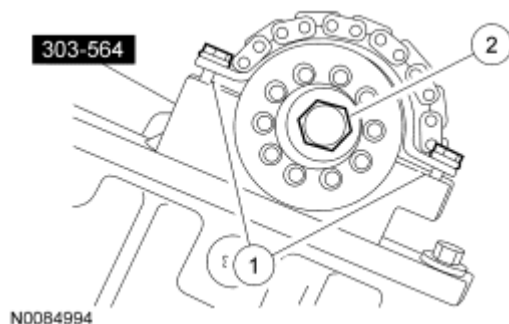
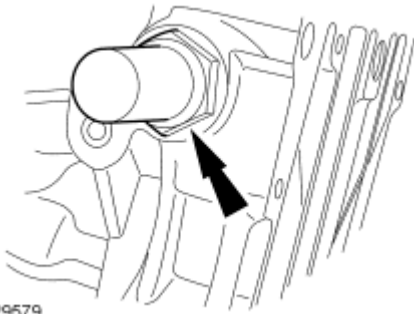


Fig. 415: Tightening Camshaft Sprocket Holding Tool Top Clamp Bolts
Courtesy of FORD MOTOR CO.

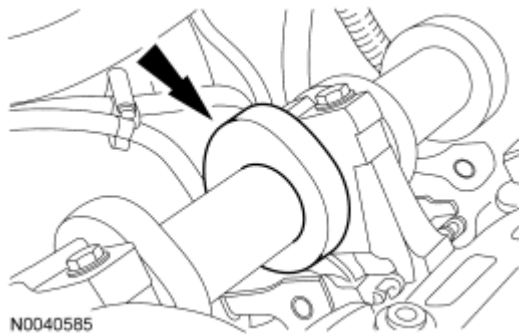
95. Install a new washer and the LH camshaft tensioner.



A0029579

Fig. 416: Locating Camshaft Tensioner
Courtesy of FORD MOTOR CO.

96. Rotate the crankshaft until the cam lobe is in the upward position.

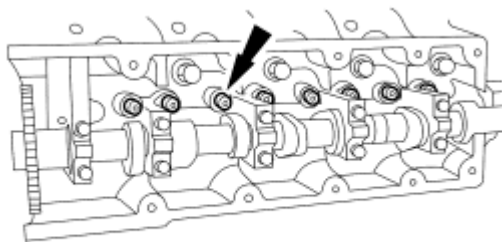


N0040585

Fig. 417: Locating Crankshaft Lobe
Courtesy of FORD MOTOR CO.

NOTE: Install the hydraulic lash adjusters in the same positions from which they were removed.

97. Install the hydraulic lash adjusters.



A26324-A

Fig. 418: Locating Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the roller followers with clean engine oil.

98. Using the Valve Spring Compressor, install the roller followers in their original positions.

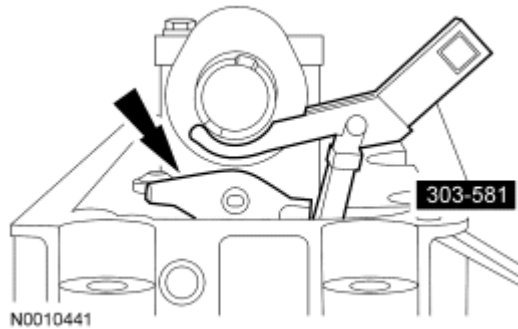


Fig. 419: Removing/Installing Camshaft Roller Followers Using Special Tool (303-581)
Courtesy of FORD MOTOR CO.

99. Position the RH engine mount bracket and install the 4 bolts.
- Tighten to 80 Nm (59 lb-ft).

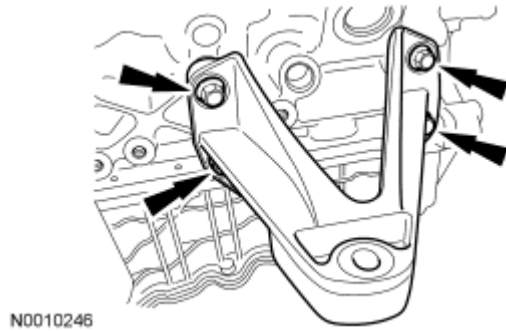


Fig. 420: Locating Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

100. Install the 6 new RH exhaust manifold studs.
- Tighten to 12 Nm (106 lb-in).

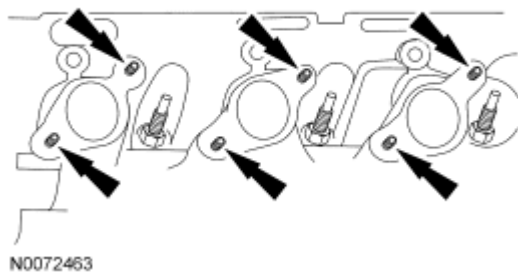


Fig. 421: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

101. Position a new RH exhaust manifold gasket and the RH exhaust manifold. Install the 6 new nuts.
- Tighten to 23 Nm (17 lb-ft).

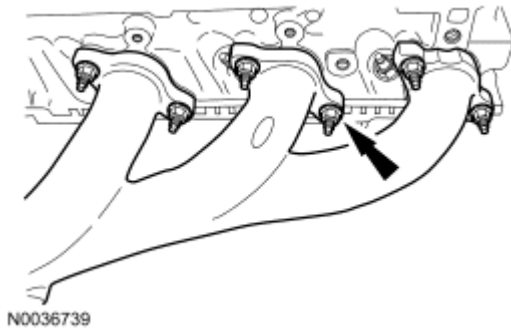


Fig. 422: Locating Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

102. Position the LH engine mount bracket and install the 3 bolts.
- Tighten to 80 Nm (59 lb-ft).

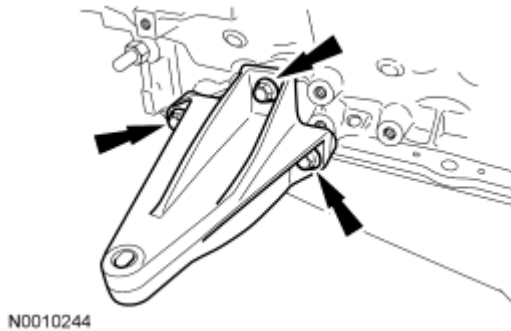


Fig. 423: Locating Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

103. Install the 6 new LH exhaust manifold studs.
- Tighten to 12 Nm (106 lb-in).

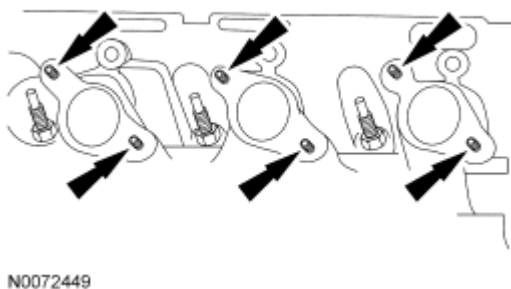


Fig. 424: Locating Exhaust Manifold Studs

Courtesy of FORD MOTOR CO.

104. Position a new LH exhaust manifold gasket and the LH exhaust manifold. Install the 6 new nuts.
- Tighten to 23 Nm (17 lb-ft).

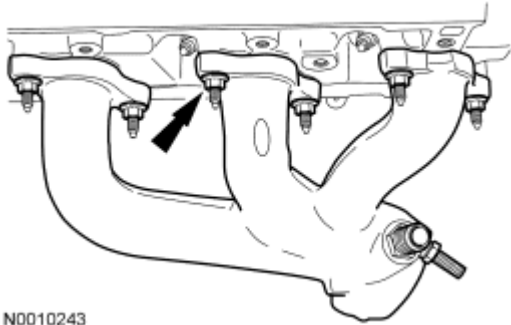


Fig. 425: Locating Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

NOTE: Install a new O-ring seal on the oil level indicator tube and lubricate with clean engine oil.

105. Position the oil level indicator tube and install the bolt.
- Tighten to 11 Nm (97 lb-in).

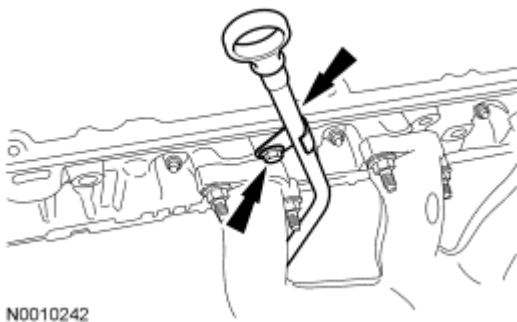


Fig. 426: Locating Oil Level Indicator Tube And Bolt
Courtesy of FORD MOTOR CO.

106. Clean the valve covers and cylinder head sealing surfaces with metal surface prep. Inspect and install new gaskets as necessary.
107. 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).

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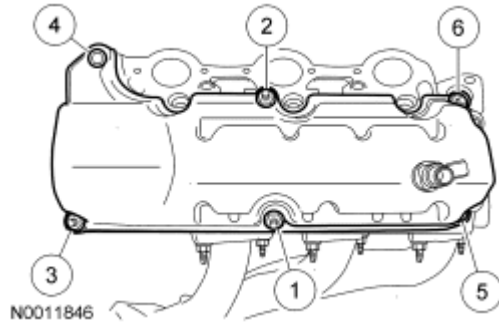


Fig. 427: Identifying Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

108. 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).

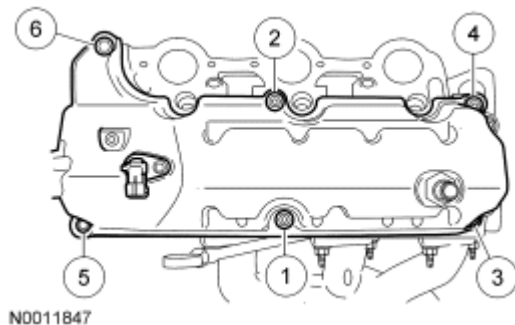


Fig. 428: Identifying Valve Cover Tightening Sequence
Courtesy of FORD MOTOR CO.

109. Position the thermostat housing, hoses and coolant tube. Install the 3 bolts.

- Tighten to 11 Nm (97 lb-in).



Fig. 429: Locating Thermostat Housing Hoses Bolts
Courtesy of FORD MOTOR CO.

110. Connect the coolant hose to the coolant pump, position the bracket and install the bolt.

- Tighten to 45 Nm (33 lb-ft).

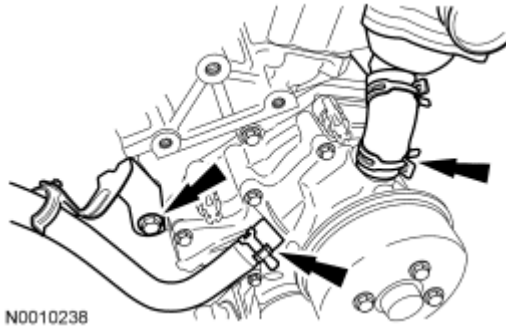


Fig. 430: Locating Coolant Pump Bracket Bolts
Courtesy of FORD MOTOR CO.

111. Position the Knock Sensor (KS) and install the bolt.
- Tighten to 20 Nm (177 lb-in).

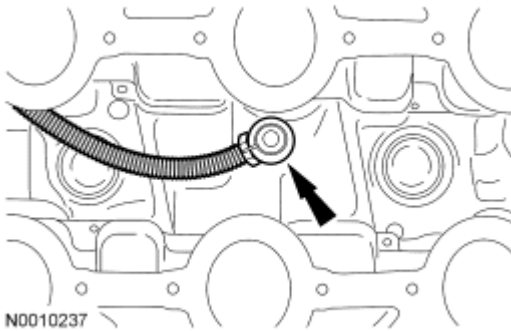
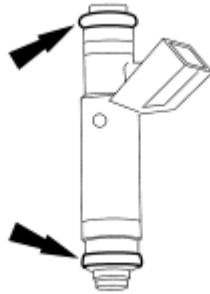


Fig. 431: Locating Knock Sensor Bolt
Courtesy of FORD MOTOR CO.

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.

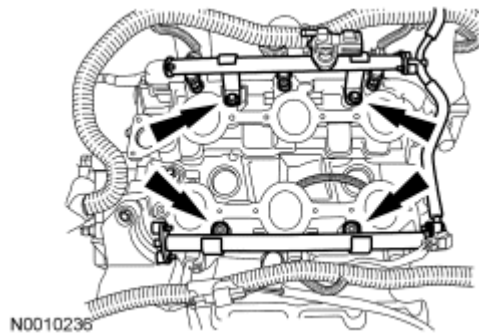
112. Install new O-ring seals on the 6 fuel injectors.



AV1418-A

Fig. 432: Identifying Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

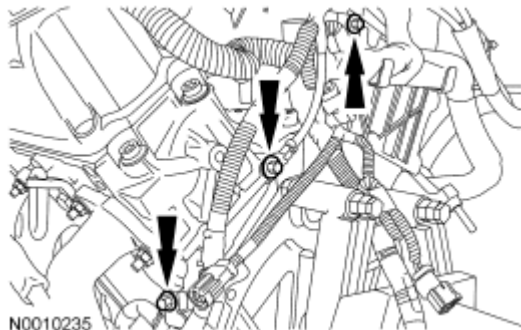
113. Position the fuel rail and injectors and install the 4 bolts.
- Tighten to 23 Nm (17 lb-ft).



N0010236

Fig. 433: Locating Fuel Rail And Injectors Bolts
Courtesy of FORD MOTOR CO.

114. 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.



N0010235

Fig. 434: Locating Main Engine Wiring Harness And Bolts
Courtesy of FORD MOTOR CO.

115. Connect the 3 RH fuel injector electrical connectors and attach the wiring retainer to the valve cover stud bolt.

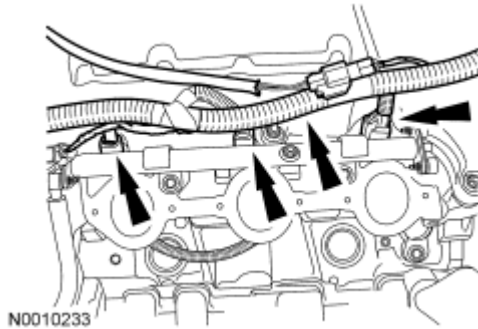


Fig. 435: Locating Fuel Injector Electrical Connectors

Courtesy of FORD MOTOR CO.

116. Connect the 3 LH fuel injector electrical connectors and attach the wiring retainer to the valve cover stud bolt.

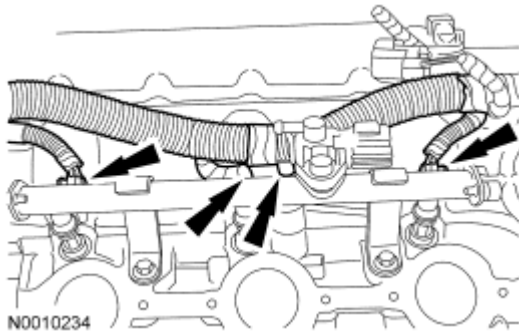


Fig. 436: Locating Fuel Injector Electrical Connectors

Courtesy of FORD MOTOR CO.

117. Connect the PCV valve electrical connector.

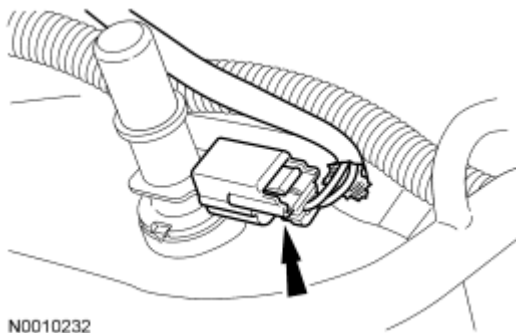


Fig. 437: Locating PCV Valve Electrical Connector

Courtesy of FORD MOTOR CO.

118. Connect the Engine Coolant Temperature (ECT) sensor electrical connector.

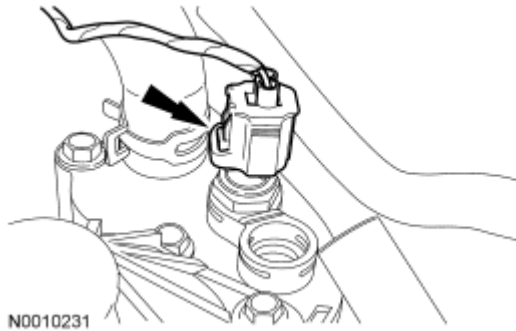


Fig. 438: Locating Engine Coolant Temperature (ECT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

119. Connect the Crankshaft Position (CKP) sensor electrical connector and attach the 2 wiring retainers.

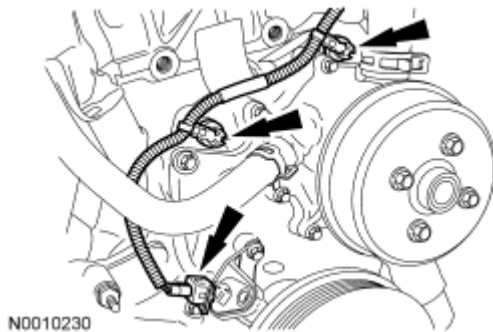


Fig. 439: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

120. Position the generator and bracket. Install the 2 bolts and the nut.
- Tighten to 47 Nm (35 lb-ft).

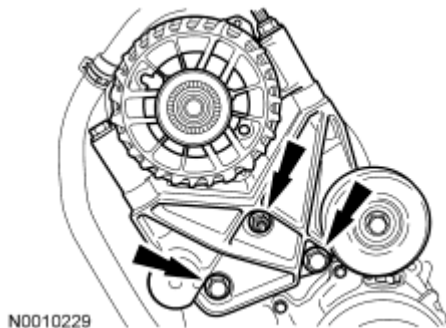


Fig. 440: Locating Generator Bracket Bolt And Nut
Courtesy of FORD MOTOR CO.

121. Install the accessory drive belt tensioner and the bolt.

- Tighten to 47 Nm (35 lb-ft).

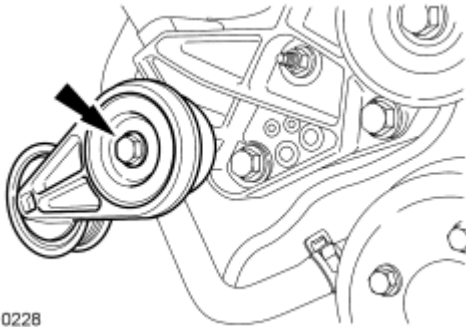


Fig. 441: Locating Belt Tensioner Bolt
Courtesy of FORD MOTOR CO.

122. Connect the Engine Oil Pressure (EOP) switch electrical connector and attach the wiring retainer.

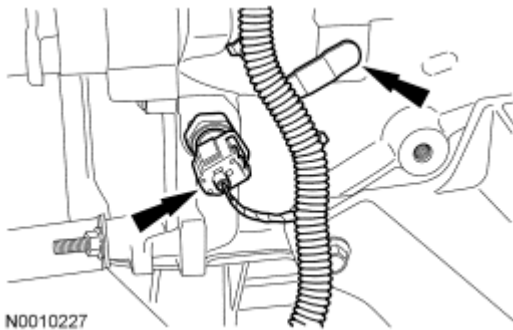


Fig. 442: Locating Oil Pressure Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

123. Connect the Camshaft Position (CMP) electrical connector.

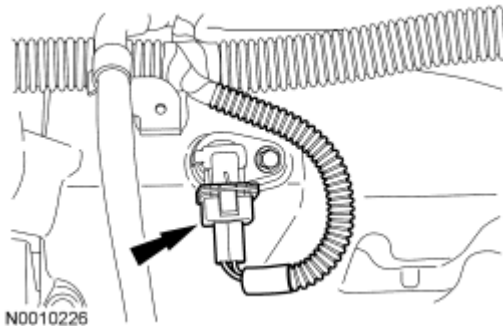


Fig. 443: Locating Camshaft Position (CMP) Electrical Connector
Courtesy of FORD MOTOR CO.

124. 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).

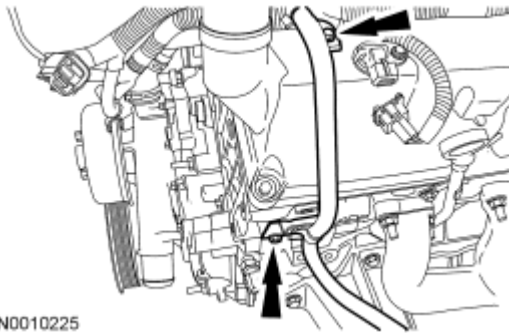


Fig. 444: Locating Fuel Supply Tube Bracket Bolts
Courtesy of FORD MOTOR CO.

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

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

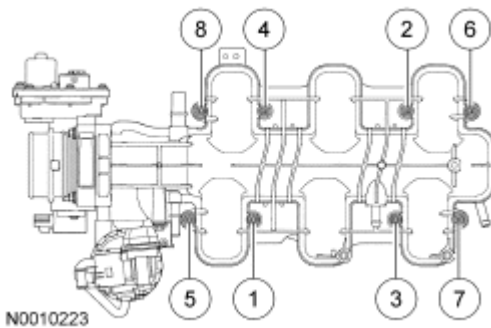


Fig. 445: Identifying Intake Manifold Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

126. Connect the KS electrical connector and attach the wiring retainer.

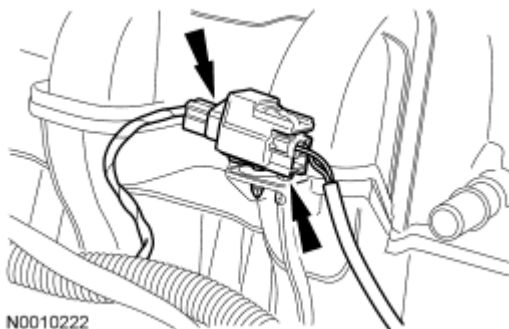


Fig. 446: Locating Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

127. Install the PCV tube.

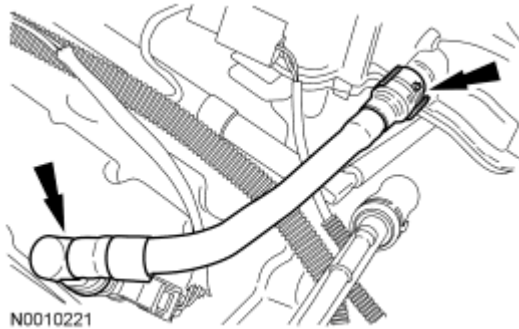


Fig. 447: Locating Positive Crankcase Ventilation (PCV) Tube Fittings
Courtesy of FORD MOTOR CO.

128. Position the EGR tube. Connect the fitting to the LH exhaust manifold.

- Tighten to 40 Nm (30 lb-ft).

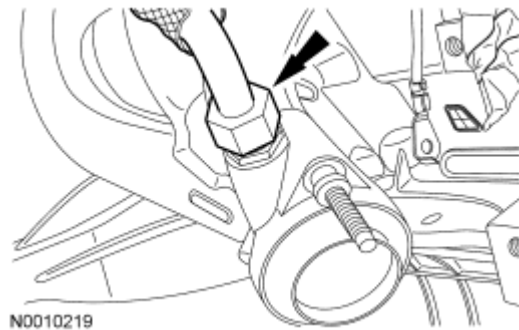


Fig. 448: Locating Exhaust Gas Recirculation (EGR) Tube
Courtesy of FORD MOTOR CO.

129. Connect the EGR tube fitting to the EGR system module.

- Tighten to 40 Nm (30 lb-ft).

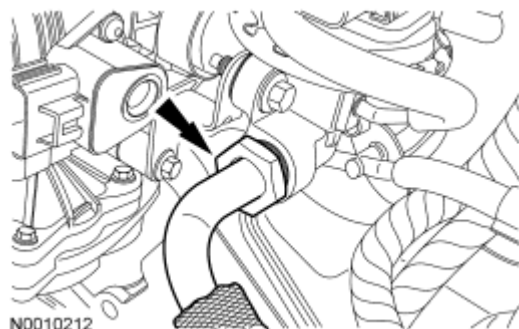


Fig. 449: Locating EGR Tube Fitting On EGR System Module
Courtesy of FORD MOTOR CO.

130. Connect the EGR system module and Throttle Position (TP) sensor electrical connectors.

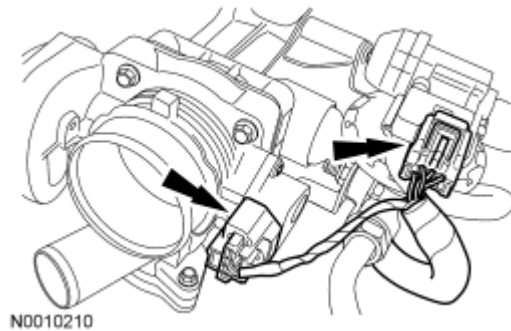


Fig. 450: Locating EGR System Module And Throttle Position (TP) Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

131. Connect the fuel rail pressure and temperature sensor electrical connector and the vacuum tube.

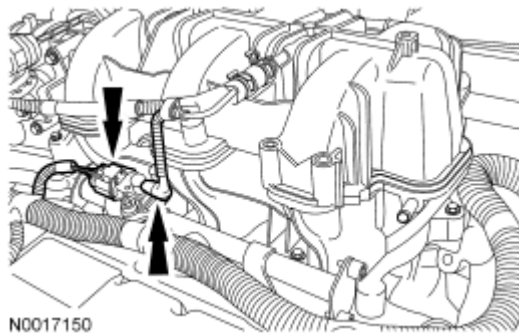


Fig. 451: Locating Fuel Rail Pressure And Temperature Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

132. 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.

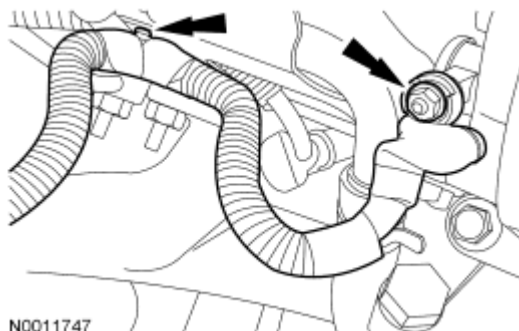


Fig. 452: Locating Wiring Retainer On Generator Nut
Courtesy of FORD MOTOR CO.

133. Connect the generator and Throttle Body (TB) electrical connectors.

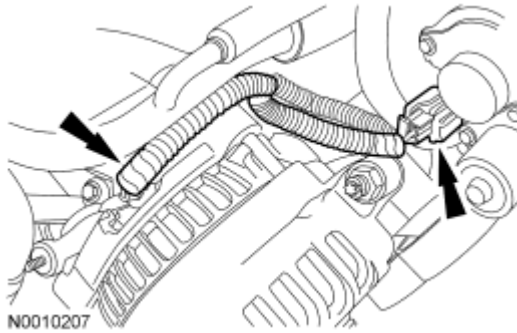


Fig. 453: Locating Generator And Throttle Body Electrical Connectors
Courtesy of FORD MOTOR CO.

134. Install the Engine Lifting Bracket to the RH cylinder head.

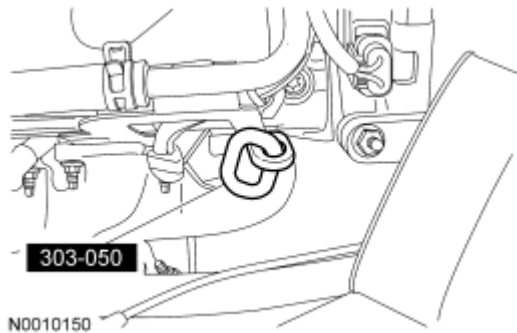


Fig. 454: Installing Special Tool 303-050 To RH Cylinder Head
Courtesy of FORD MOTOR CO.

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

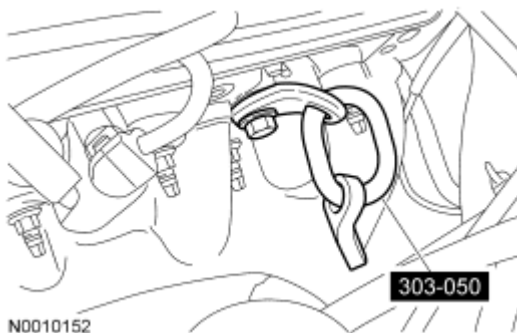


Fig. 455: Installing Special Tool 303-050 To LH Cylinder Head
Courtesy of FORD MOTOR CO.

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

136. Using the Spreader Bar and Engine Lifting Brackets, remove the engine from the engine stand.

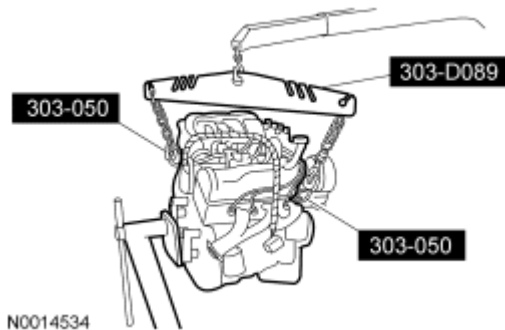


Fig. 456: Removing Engine From Engine Stand Using Special Tools (303-050) & (303-D089)
Courtesy of FORD MOTOR CO.

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.

137. Lubricate the crankshaft rear oil seal with clean engine oil.

138. Install the Crankshaft Rear Oil Seal Screws and Adapter.

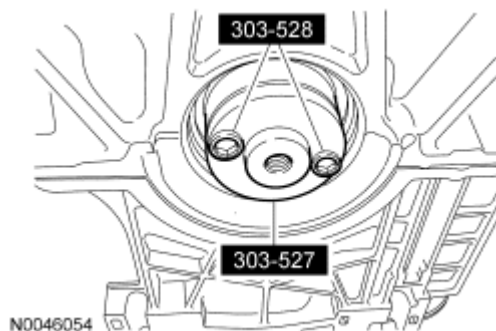


Fig. 457: Identifying Special Tool (303-527, 303-528)
Courtesy of FORD MOTOR CO.

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

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

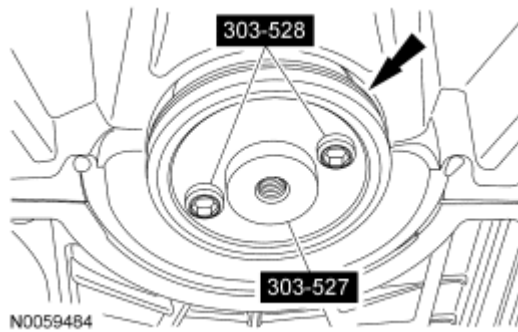


Fig. 458: Identifying Crankshaft Rear Seal, Special Tool (303-527, 303-528)
Courtesy of FORD MOTOR CO.

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

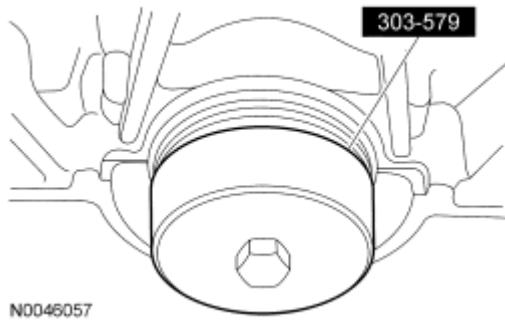


Fig. 459: Identifying Special Tool (303-579)
Courtesy of FORD MOTOR CO.

141. Install the spacer plate and if equipped, the flexplate-to-crankshaft spacer.

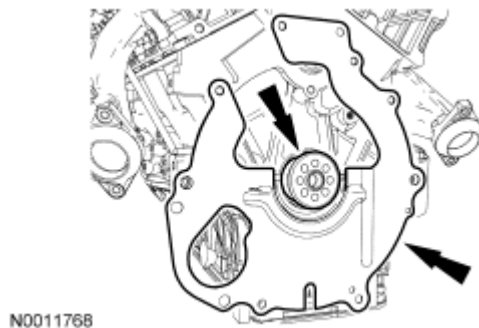


Fig. 460: Locating Spacer Plate Crankshaft Spacer
Courtesy of FORD MOTOR CO.

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

142. Install the flexplate or flywheel.

- Tighten the bolts in the sequence shown 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.

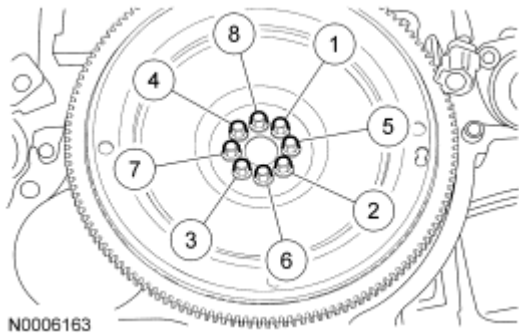


Fig. 461: Identifying Flexplate Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

INSTALLATION

ENGINE

Special Tools

Illustration	Tool Name	Tool Number
	Lifting Bracket, Engine	303-050 (T70P-6000)
	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent

Material

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	

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

Compound
XG-3-A

ESE-M1C171-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.

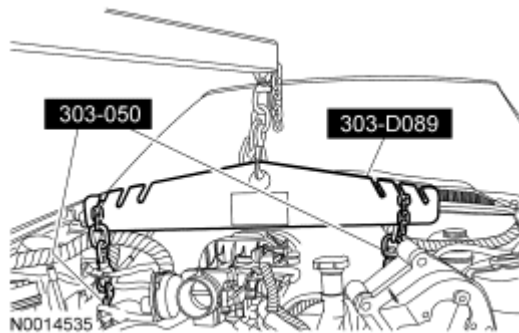


Fig. 462: Removing Engine Using Special Tools (303-050) & (303-D089)
Courtesy of FORD MOTOR CO.

2. Install the RH engine mount nut.
 - Tighten to 63 Nm (46 lb-ft).

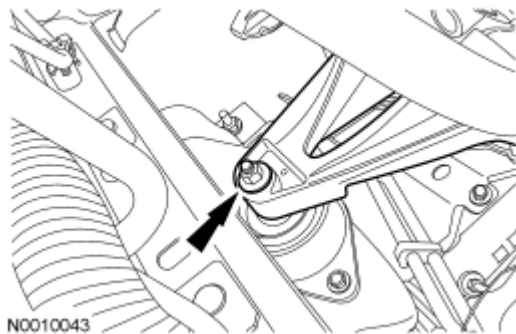


Fig. 463: Locating Engine Mount Nut
Courtesy of FORD MOTOR CO.

3. Install the LH engine mount nut.
 - Tighten to 63 Nm (46 lb-ft).



Fig. 464: 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).

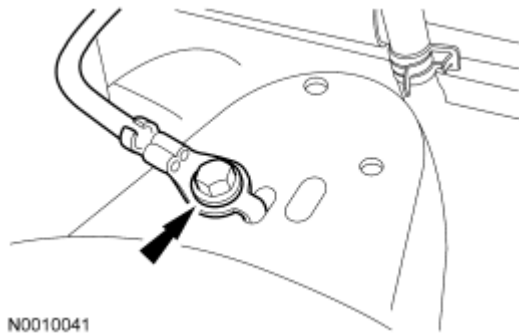


Fig. 465: Locating Ground Cable On Strut Tower
Courtesy of FORD MOTOR CO.

5. Attach the battery cable harness pin-type retainer to the cowl.

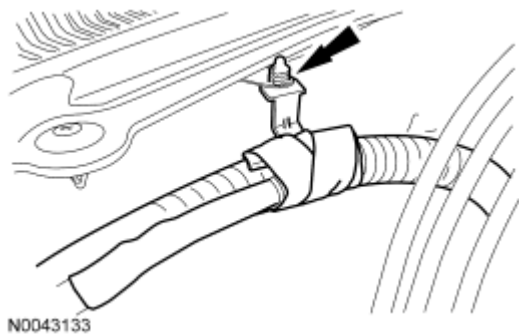


Fig. 466: Locating Battery Cable Harness Pin-Type Retainer To Cowl
Courtesy of FORD MOTOR CO.

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.

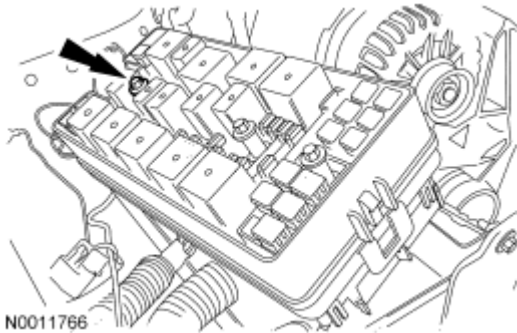


Fig. 467: Locating Power Distribution Box Upper Housing Bolt
Courtesy of FORD MOTOR CO.

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.

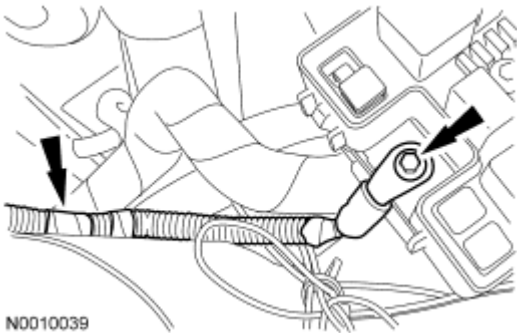


Fig. 468: Locating Pin-Type Retainer From Strut Tower
Courtesy of FORD MOTOR CO.

8. Install the PDB cover.
9. Attach the 3 wiring harness retainers.

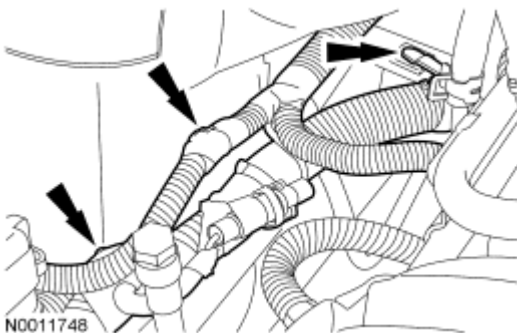


Fig. 469: Locating Wiring Harness Retainers

Courtesy of FORD MOTOR CO.

10. Connect the 16-pin electrical connector and attach the 2 wiring retainers.

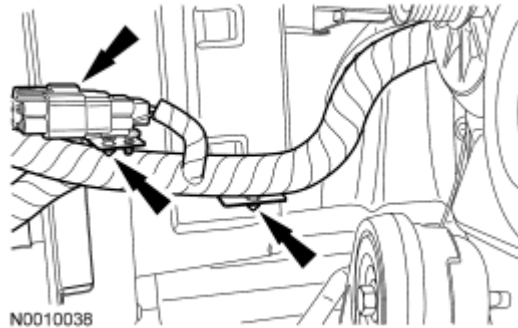


Fig. 470: Locating 16-Pin Electrical Connector
Courtesy of FORD MOTOR CO.

11. Connect the upper and lower PCM electrical connectors.

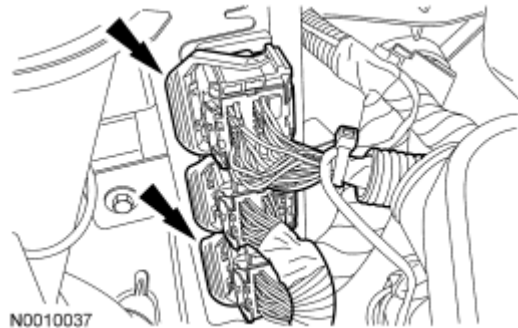


Fig. 471: Identifying Upper & Lower Powertrain Control Module (PCM) Electrical Connectors
Courtesy of FORD MOTOR CO.

12. Connect the fuel vapor vent tube to the intake manifold.

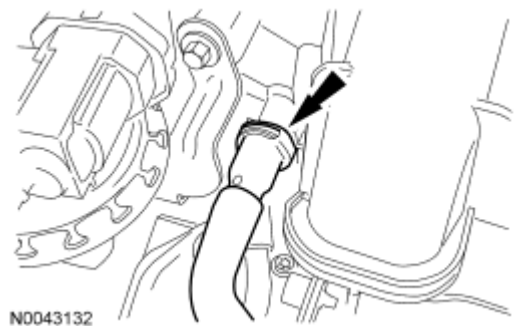


Fig. 472: Locating Fuel Vapor Vent Tube To Intake Manifold
Courtesy of FORD MOTOR CO.

13. Connect the brake booster vacuum hose to the upper intake manifold.

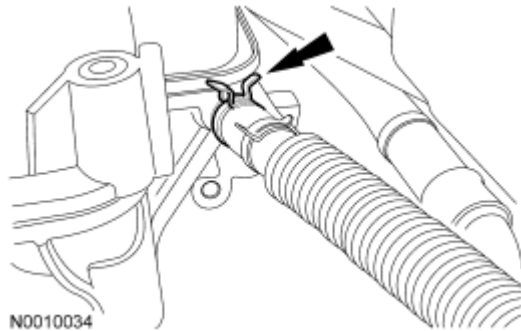


Fig. 473: Locating Brake Booster Vacuum Hose On Upper Intake Manifold
Courtesy of FORD MOTOR CO.

14. Attach the crankcase vent tube to the LH valve cover.

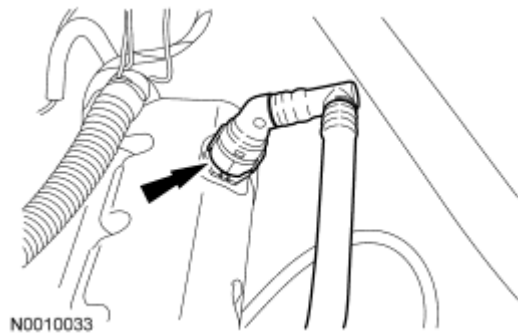


Fig. 474: Locating Crankcase Vent Tube
Courtesy of FORD MOTOR CO.

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).

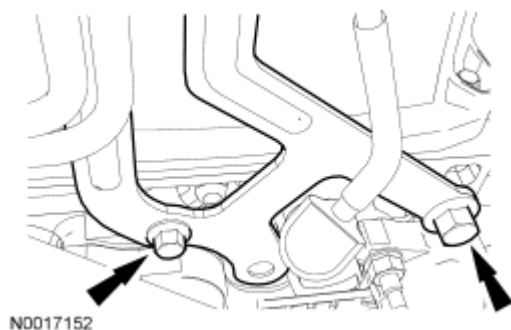


Fig. 475: Locating Ignition Coil Bracket Bolts
Courtesy of FORD MOTOR CO.

16. Install the 2 upper ignition coil bracket bolts.
 - Tighten to 9 Nm (80 lb-in).

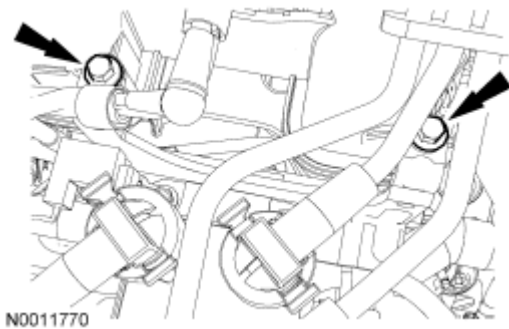


Fig. 476: Locating Upper Ignition Coil Bracket Bolts
Courtesy of FORD MOTOR CO.

17. Connect the ignition coil electrical connector.

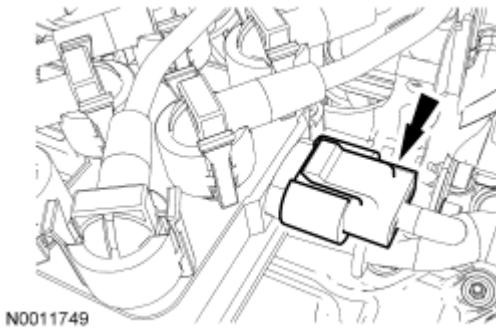


Fig. 477: Locating Ignition Coil Electrical Connector
Courtesy of FORD MOTOR CO.

18. Connect the radio ignition interference capacitor electrical connector.

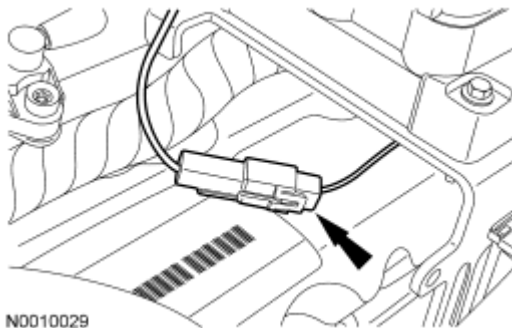


Fig. 478: Locating Radio Ignition Interference Capacitor Electrical Connector
Courtesy of FORD MOTOR CO.

19. Attach the spark plug wire retainer to the intake manifold.

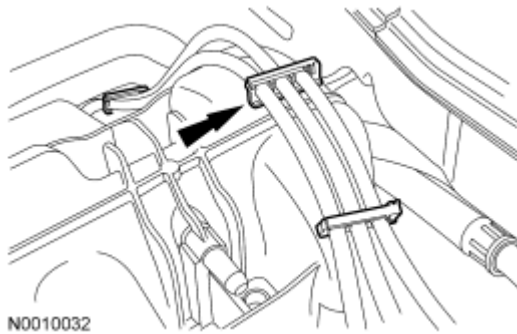


Fig. 479: Locating Spark Plug Wire Retainer On Intake Manifold
Courtesy of FORD MOTOR CO.

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.

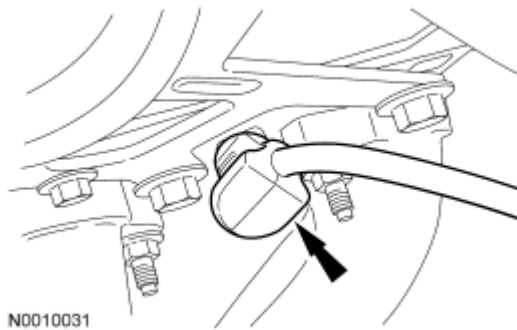


Fig. 480: Locating Spark Plug Wires
Courtesy of FORD MOTOR CO.

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).

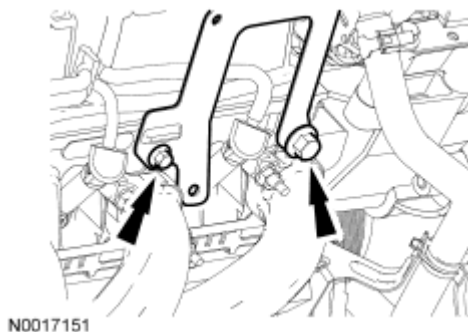


Fig. 481: Locating Coolant Tube Bracket Bolts
Courtesy of FORD MOTOR CO.

22. Connect the 2 heater hoses to the coolant tube.

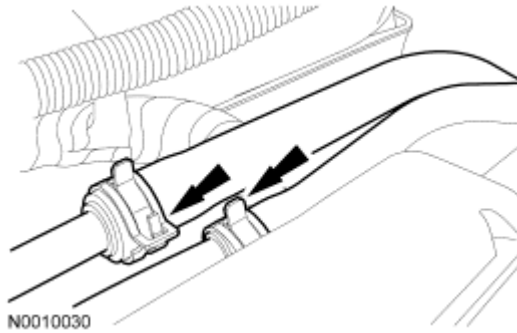


Fig. 482: Locating Heater Hoses On Coolant Tube
Courtesy of FORD MOTOR CO.

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).

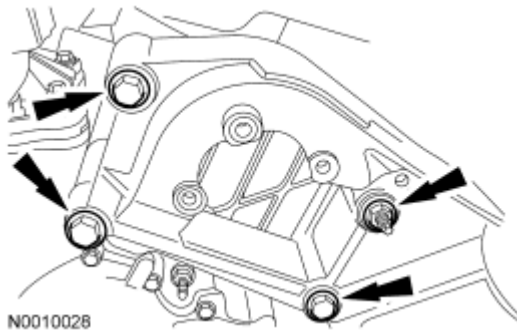


Fig. 483: Locating FEAD Bracket And A/C Compressor Bracket Bolts
Courtesy of FORD MOTOR CO.

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

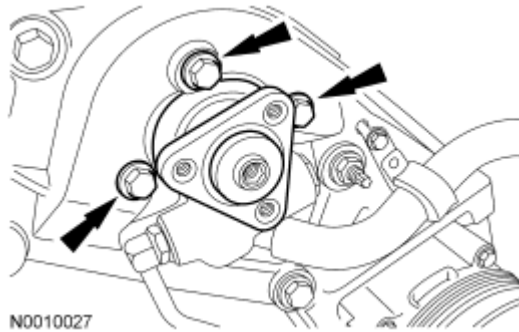


Fig. 484: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

25. Position the power steering pump pulley and install the 3 bolts.
- Do not tighten at this time.

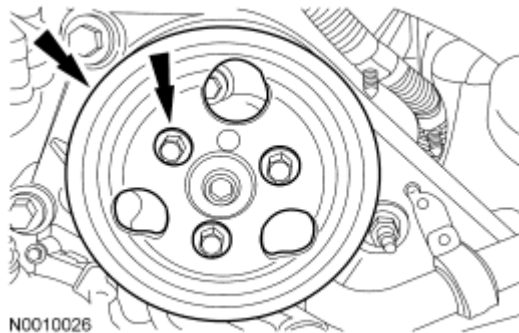


Fig. 485: Locating Power Steering Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

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

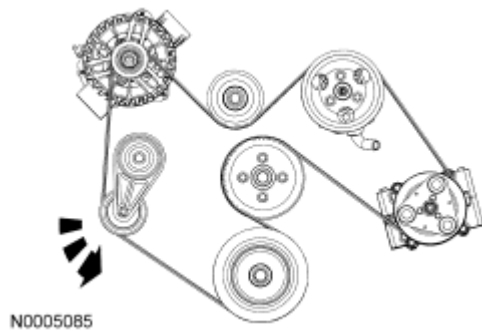


Fig. 486: Rotating Accessory Drive Belt Tensioner
Courtesy of FORD MOTOR CO.

27. Tighten the 3 power steering pulley bolts.
- Tighten to 25 Nm (18 lb-ft).

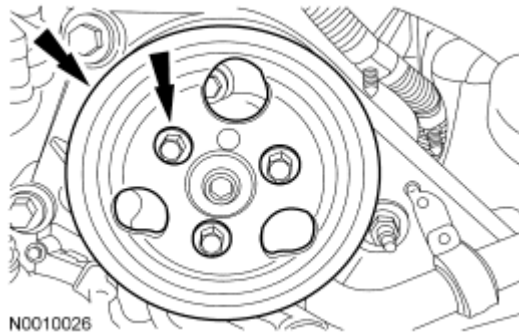


Fig. 487: Locating Power Steering Pump Pulley Bolts
Courtesy of FORD MOTOR CO.

28. Connect the fuel supply tube coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

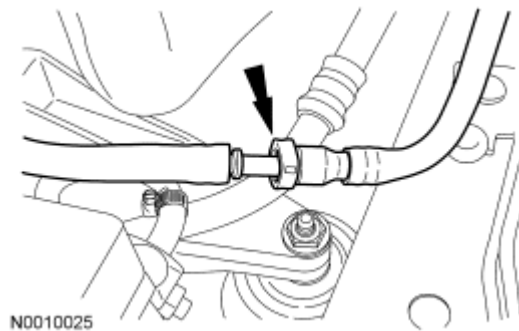


Fig. 488: Locating Fuel Supply Tube Coupling
Courtesy of FORD MOTOR CO.

29. Attach the 2 wiring retainers to the FEAD bracket.

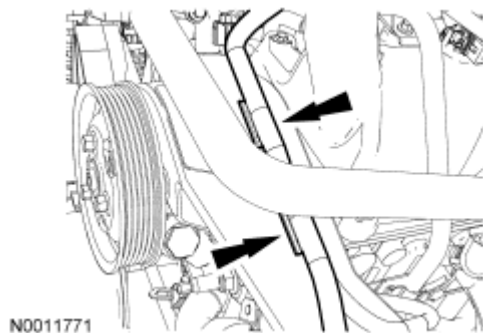


Fig. 489: Locating Wiring Retainers On FEAD Bracket
Courtesy of FORD MOTOR CO.

30. Connect the A/C compressor and A/C high pressure switch electrical connectors.

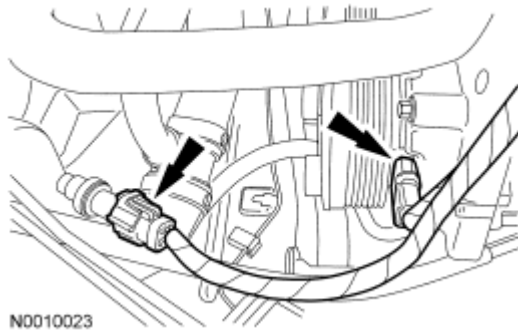


Fig. 490: Locating A/C Compressor And A/C High Pressure Switch Electrical Connectors
Courtesy of FORD MOTOR CO.

31. Connect the Power Steering Pressure (PSP) switch electrical connector.

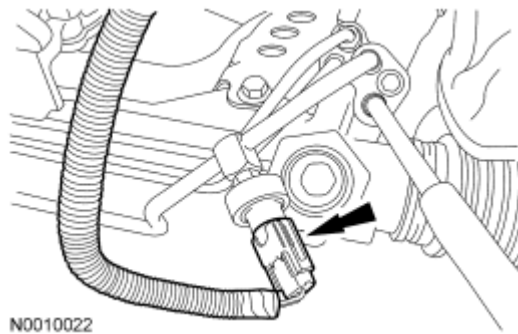


Fig. 491: Locating Power Steering Pressure (PSP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

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



Fig. 492: Locating Power Steering Supply Hose Bracket Bolt
Courtesy of FORD MOTOR CO.

33. Position the power steering pressure tube bracket on the A/C compressor and install the nut.
- Tighten to 7 Nm (62 lb-in).

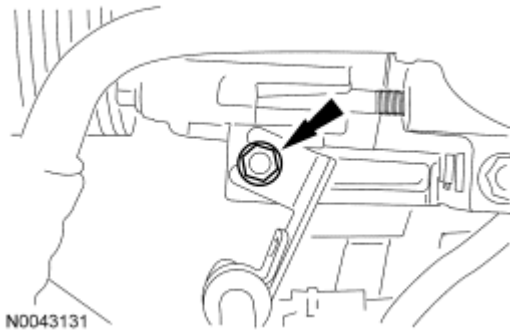


Fig. 493: Identifying Power Steering Pressure Tube Bracket Nut
Courtesy of FORD MOTOR CO.

34. Connect the lower radiator hose to the coolant pump.

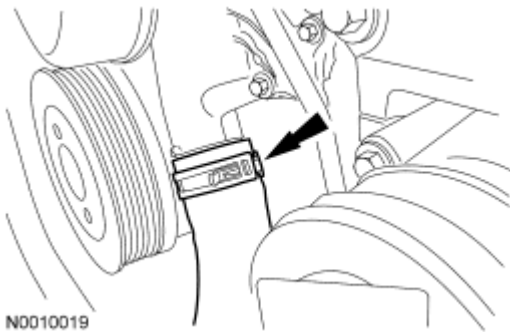


Fig. 494: Locating Lower Radiator Hose On Coolant Pump
Courtesy of FORD MOTOR CO.

35. Connect the upper radiator hose to the thermostat housing.

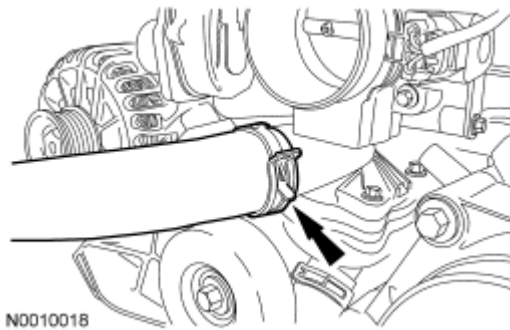


Fig. 495: Locating Upper Radiator Hose On Thermostat Housing
Courtesy of FORD MOTOR CO.

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

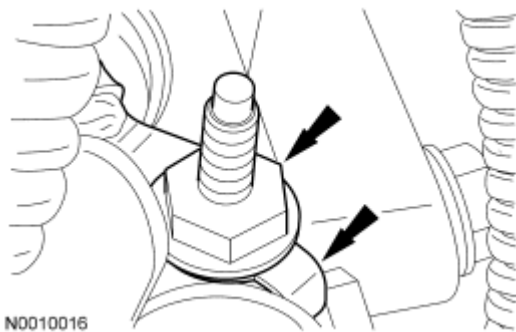


Fig. 496: Locating Ground Strap Stud Bolt
Courtesy of FORD MOTOR CO.

Vehicles with manual transmission

37. Install the clutch. For additional information, refer to **CLUTCH** article.

Vehicles with automatic transmission

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

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).

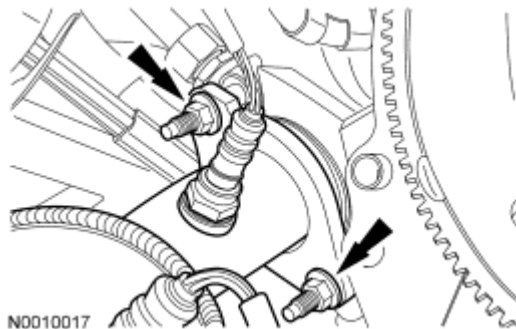


Fig. 497: Locating Catalytic Converter-To-Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

40. Connect the 2 Heated Oxygen Sensor (HO2S) and the 2 Catalyst Monitor Sensor (CMS) electrical connectors (1 shown).

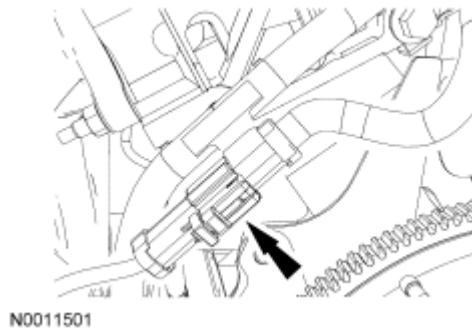


Fig. 498: Locating Heated Oxygen Sensor (HO2S)
Courtesy of FORD MOTOR CO.

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.

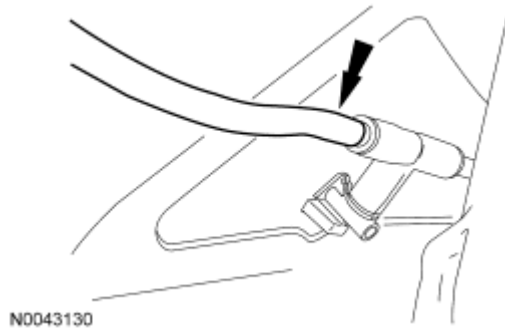


Fig. 499: Locating Windshield Washer Hose
Courtesy of FORD MOTOR CO.

43. Install the 1 hood insulation pin-type retainer and attach the 2 windshield washer hose retainers.

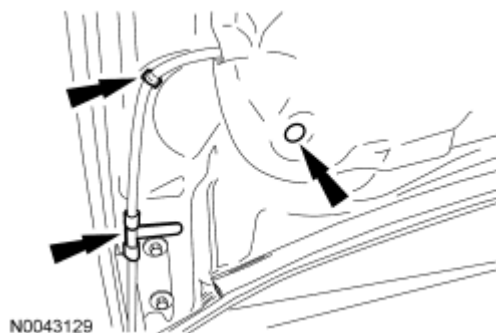


Fig. 500: Locating Windshield Washer Hose Retainers

2008 Ford Mustang

2008 ENGINE Engine - 4.0L SOHC - Mustang

Courtesy of FORD MOTOR CO.

44. Install the Air Cleaner (ACL) and ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
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** article.
47. Fill and bleed the cooling system. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.