

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

2009 ENGINE**Engine - 3.5L - Sable, Taurus & Taurus X****SPECIFICATIONS****MATERIAL****MATERIAL**

Item	Specification	Fill Capacity
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6	-
Motorcraft Metal Surface Prep ZC-31-A	-	-
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1	-
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A	5.2L (5.5 qt) includes filter change
Silicone Gasket Remover ZC-30	-	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	-

GENERAL SPECIFICATIONS**GENERAL SPECIFICATIONS**

Item	Specification
Engine	
Displacement	3.5L (4V) (214 CID)
No. cylinders	6
Bore/stroke	92.5/86.7 mm (3.641/3.413 in)
Fire order	1-4-2-5-3-6
Oil pressure	Minimum 30 psi @ 1,500 RPM with engine at normal operating temperature
Compression ratio	10.3:1
Spark plug	AYSF-22FM Gap = 1.29-1.45 mm (0.051-0.057 in)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

Engine weight (without accessory drive components)	161 kg (355 lb)
Engine and transaxle assembly weight (without accessory drive components)	260.8 kg (575 lb)
Cylinder Head and Valve Train	
Cylinder head gasket surface flatness ^a	-
Combustion chamber volume	55.84 cc (3.41 CI)
Valve tappet clearance - intake	0.15-0.25 mm (0.006-0.01 in)
Valve tappet clearance - exhaust	0.300-0.400 mm (0.0118-0.0157 in)
Valve guide bore inner diameter	5.519-5.549 mm (0.217-0.218 in)
Valve stem diameter - intake	5.479-5.497 mm (0.2157-0.2164 in)
Valve stem diameter - exhaust	5.466-5.484 mm (0.2151-0.2159 in)
Valve stem-to-guide clearance - intake	0.022-0.070 mm (0.0008-0.0027 in)
Valve stem-to-guide clearance - exhaust	0.035-0.083 mm (0.0013-0.032 in)
Valve head diameter - intake	36.82-37.18 mm (1.44-1.46 in)
Valve head diameter - exhaust	30.82-31.18 mm (1.21-1.22 in)
Valve face runout	0.05 mm (0.0001 in)
Valve face angle	90.50-91.50 degrees
Valve seat width - intake	1.3-1.5 mm (0.051-0.059 in)
Valve seat width - exhaust	1.4-1.6 mm (0.055-0.062 in)
Valve seat runout	0.04 mm (0.0001 in) MAX
Valve seat angle	89.0-91.0 degrees
Valve spring free length (approx.)	48.4 mm (1.90 in)
Valve spring compression pressure (N @ spec. length)	510 N @ 27.32 mm (115 lbs @ 1.08 in)
Valve spring installed height	37.0 mm (1.45 in)
Valve spring installed height pressure (N @ spec. length)	235 N @ 37.0 mm (53 lbs @ 1.45 in)
Valve spring installed pressure - service limit	10% force loss @ specified height
Camshaft	
Theoretical valve lift @ 0 lash	9.6798 mm (0.38 in)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

Lobe lift - intake	9.6798 mm (0.38 in)
Lobe lift - exhaust	9.6798 mm (0.38 in)
Allowable lobe lift loss	0.062 mm (0.0024 in)
Camshaft journal bore inside diameter - 1st journal	31.0375-31.0625 mm (1.221-1.222 in)
Camshaft journal bore inside diameter - intermediate journals	25.9875-26.0125 mm (1.023-1.024 in)
Camshaft bearing outside diameter - 1st journal	30.993-31.013 mm (1.2202-1.2209 in)
Camshaft bearing outside diameter - intermediate journals	25.937-25.963 mm (1.021-1.022 in)
Camshaft journal-to-bearing clearance, 1st journal - service limit	0.070 mm (0.0027 in) MAX
Camshaft journal-to-bearing clearance, intermediate journals - service limit	0.0755 mm (0.0029 in) MAX
Runout	0.040 mm (0.0015 in) MAX
End play - standard	0.032-0.170 mm (0.0012-0.0066 in)
End play - service limit	0.190 mm (0.00748 in) MAX
Cylinder Block	
Cylinder bore diameter - grade 1	-
Cylinder bore diameter - grade 2	-
Cylinder bore diameter - grade 3	-
Cylinder bore maximum taper	-
Cylinder bore maximum out-of-round - limit	-
Cylinder bore maximum out-of-round - service limit	-
Main bearing bore inside diameter	72.400-72.424 mm (2.8503-2.8513 in)
Head gasket surface flatness	-
Head gasket surface finish	-
Crankshaft	
Main bearing journal diameter	67.5 mm (2.657 in)
Main bearing journal maximum taper	0.004 mm (0.00015 in)
Main bearing journal maximum out-of-round	0.006 mm (0.00023 in)
Main bearing journal-to-cylinder block clearance	-
Connecting rod journal diameter	55.983-56.003 mm (2.204-2.205 in)
Connecting rod journal maximum taper	0.004 mm (0.00015 in)
Connecting rod journal maximum out-of-round	0.006 mm (0.00023 in)
Crankshaft maximum end play	0.101-0.291 mm (0.0039-0.0114 in)
Piston and Connecting Rod	
Piston diameter - single grade	92.476-92.490 mm (3.6407-3.6413 in)
Piston-to-cylinder bore clearance	0.010 to 0.044 mm

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

	(0.0003-0.0017 in)
Piston ring end gap - compression (top, gauge diameter)	0.15-0.25 mm (0.0059-0.0098 in)
Piston ring end gap - compression (bottom, gauge diameter)	0.30-0.55 mm (0.0118-0.0216 in)
Piston ring end gap - oil ring (steel rail, gauge diameter)	0.15-0.45 mm (0.0059-0.0177 in)
Piston ring groove width - compression (top)	1.230-1.25 mm (0.0484-0.0492 in)
Piston ring groove width - compression (bottom)	1.530-1.55 mm (0.0602-0.0610 in)
Piston ring groove width - oil ring	2.53-2.55 mm (0.0996-0.1003 in)
Piston ring width - upper comp ring	1.17-1.19 mm (0.0460-0.0468 in)
Piston ring width - lower comp ring	1.47-1.49 mm (0.0578-0.0586 in)
Piston ring-to-groove clearance (upper and lower compression rings)	0.040-0.080 mm (0.0015-0.0031 in)
Piston pin bore diameter	23.002-23.006 mm (0.9055-0.9057 in)
Piston pin diameter	22.998-23.000 mm (0.9054-0.9055 in)
Piston pin length	55.975 mm (2.203 in)
Piston pin-to-piston fit	0.002 to 0.008 mm (0.00007-0.0003 in)
Piston-to-connecting rod clearance	2.7 mm (0.1 in)
Connecting rod-to-pin clearance - standard	0.007-0.021 mm (0.0002-0.0008 in)
Connecting rod-to-pin clearance - service limit	-
Connecting rod pin bore diameter	23.007-23.019 mm (0.905-0.906 in)
Connecting rod length (center-to-center)	152.68 mm (6.01 in)
Connecting rod maximum allowed bend	0.038 mm (0.0014 in)
Connecting rod maximum allowed twist	0.050 mm (0.0019 in)
Connecting rod bearing bore diameter - grade 1	59.866-59.872 mm (2.3569-2.3571 in)
Connecting rod bearing bore diameter - grade 2	59.873-59.879 mm (2.3572-2.3574 in)
Connecting rod bearing bore diameter - grade 3	59.880-59.886 mm (2.3574-2.3577 in)
Connecting rod bearing-to-crankshaft clearance	-
Connecting rod side clearance (assembled to crank) - standard	0.175-0.425 mm (0.0068-0.0167 in)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

Connecting rod side clearance (assembled to crank) - service limit	-
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^a Refer to the appropriate procedure.**TORQUE SPECIFICATIONS TABLE****TORQUE SPECIFICATIONS TABLE**

Description	Nm	lb-ft	lb-in
A/C compressor bolts and nut	25	18	-
A/C compressor stud	9	-	80
A/C tube bracket bolt	10	-	89
A/C tube nut	15	11	-
A/C tube retaining clamp bolt	10	-	89
A/C tube-to-condenser nut	15	11	-
A/C tube-to-evaporator bolt	15	11	-
A/C tube-to-receiver/drier nut	15	11	-
Accessory drive belt tensioner bolts	10	-	89
Battery cable power feed cable nut	6	-	53
Battery tray bolts	9	-	80
Block drain plug (large)	40	30	-
Block drain plug (small) ^a	-	-	-
Block heater	40	30	-
Camshaft bearing cap bolts ^b	-	-	-
Camshaft position (CMP) sensor bolts	10	-	89
Carrier bearing nuts	40	30	-
Catalytic convertert-to-halfshaft bracket bolts	20	15	-
Catalytic converter nuts	40	30	-
Catalytic converter-to-exhaust manifold studs	25	18	-
Coolant pump bolts ^b	-	-	-
Crankcase rear seal retainer plate bolts ^b	-	-	-
Crankshaft position (CKP) sensor bolt	10	-	89
Crankshaft pulley bolt ^b	-	-	-
Cylinder head bolts ^b	-	-	-
Cylinder head M6 bolt	10	-	89
Cylinder head temperature (CHT) sensor	10	-	89
Driveshaft-to-power transfer unit (PTU) bolts	70	52	-
Engine front cover bolts ^b	-	-	-
Engine lifting eye bolts	24	18	-
Engine mount brace bolt and nut	20	15	-

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

Engine mount bracket bolts ^b	-	-	-
Engine mount bracket-to-engine front cover bolts	24	18	-
Engine mount studs	18	13	-
Engine mount-to-engine nuts	63	46	-
Engine mount-to-frame bolts	90	66	-
Engine oil filter ^c	-	-	-
Engine oil pressure (EOP) switch	18	13	-
Engine roll restrictor-to-subframe through bolt	103	76	-
Engine roll restrictor-to-transaxle bolts	103	76	-
Exhaust manifold heat shield bolts	14	10	-
Exhaust manifold nuts ^b	-	-	-
Exhaust manifold studs	12	9	-
Exhaust Y-pipe nuts	40	30	-
Flexplate bolts	80	59	-
Front halfshaft nut	350	258	-
Fuel rail bolts	10	-	89
Fuel tube bracket-to-upper intake manifold bolt	6	-	53
Generator bolt and nut	48	35	-
Generator B+ terminal nut	6	-	53
Generator stud	12	9	-
Ground cable-to-negative battery cable nut	6	-	53
Ground cable bolt	12	9	-
Ground wire-to-engine bolt	10	-	89
Halfshaft nut	350	258	-
Halfshaft support bracket bolts	40	30	-
Halfshaft support bracket studs	10	-	89
Heat shield nut and bolt	10	-	89
Ignition coil-on-plug bolts	7	-	62
Intermediate steering shaft bolt	23	17	-
Knock sensor (KS) bolts	20	15	-
Lower ball joint nuts	115	85	-
Lower intake manifold bolts ^b	-	-	-
Oil filter adapter large bolt	57	42	-
Oil filter adapter small bolt	10	-	89
Oil pan bolts ^b	-	-	-
Oil pan drain plug	27	20	-
Oil pan-to-transaxle bolts	48	35	-
Oil pump bolts	10	-	89
Oil pump screen and pickup tube bolts	10	-	89
Power steering pressure (PSP) tube bracket-to-cylinder head bolt	10	-	89

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

Power steering pump bolts	25	18	-
PSP tube bracket-to-power steering pump bolt	10	-	89
PSP tube bracket-to-steering gear bolt	10	-	89
PSP tube bracket-to-valve cover stud bolt nut	7	-	62
PSP tubes-to-power steering gear plate bolt	25	18	-
PTU support bracket bolts	70	52	-
RH cylinder head ground wire bolt	10	-	89
Secondary timing exhaust camshaft bolt ^b	-	-	-
Secondary timing variable camshaft timing (VCT) bolt ^b	-	-	-
Secondary timing chain tensioner bolts ^b	-	-	-
Spark plugs	15	11	-
Stabilizer bar link nuts	55	41	-
Starter bolt and stud bolt	27	20	-
Starter B+ terminal nut	12	9	-
Starter S-terminal nut	5	-	44
Subframe bolts	150	111	-
Subframe bracket bolts	103	76	-
Thermostat housing bolts	10	-	89
Tie-rod end nuts	115	85	-
Timing chain guide bolts	10	-	89
Timing chain tensioner bolts	10	-	89
Torque converter-to-flexplate bolts	55	41	-
Transaxle mount bracket bolt and nuts	80	59	-
Transaxle mount through bolt and nut	175	129	-
Transaxle-to-engine bolts	48	35	-
Upper intake manifold bolts ^b	-	-	-
Upper intake manifold bracket-to-engine bolt - long bracket (early build engines)	24	18	-
Upper intake manifold bracket-to-engine bolt - short bracket	10	-	89
Upper intake manifold-to-bracket bolt - long bracket (early build engines)	10	-	89
Upper intake manifold-to-bracket bolt - short bracket	10	-	89
Upper stabilizer bar link nuts	55	41	-
Valve cover bolts and stud bolts ^b	-	-	-
VCT housing bolts ^b	-	-	-
VCT solenoid bolts	10	-	89
Wiring harness retainer bolt and stud bolt	10	-	89

^a Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

^b Refer to the appropriate procedure.

^c Tighten to 5 Nm (44 lb-in) plus an additional 180 degrees.

DESCRIPTION AND OPERATION

ENGINE

The 3.5L (4V) is a V-6 engine with the following features:

- Dual overhead camshafts
- Four valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- An aluminum lower intake manifold and a composite upper intake manifold
- Aluminum cylinder heads
- An aluminum, 60-degree V-cylinder block
- Timing chain driven coolant pump
- Variable Camshaft Timing (VCT) system
- The electronic ignition system with 6 ignition coils

Identification

For quick identification, refer to the safety certification decal.

- The decal is located on the LH front door lock face panel.
- An engine identification label is also attached to the engine.
- The symbol code on the identification tag identifies each engine for determining parts usage; for instance, engine displacement in liters or cubic inch displacement and model year.

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 6 solenoid-operated fuel injectors:

- are mounted between the fuel rail and the intake manifold.
- meter fuel into the air intake stream in accordance with engine demand.
- are positioned so that their tips direct fuel just ahead of the engine intake valves.

Valve Train

The valve train uses Direct Acting Mechanical Buckets (DAMB). The camshaft lobes are positioned directly

above mechanical buckets which are positioned on top of the valves.

Variable Camshaft Timing (VCT) System

The VCT system changes intake camshaft timing dependent on engine speed, load and oil temperature. Oil pressure advances and retards camshaft timing to improve low-speed and high-speed engine performance, engine idle quality and exhaust emissions.

PCV System

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

Lubrication System

The engine lubrication system is of the force-feed type in which oil is supplied under full pressure to the crankshaft, connecting rod bearings, timing chain tensioners and VCT solenoids. The flow of oil to the valve tappets and valve train is controlled by a restricting orifice located in the cylinder head, front camshaft cup.

Oil Pump

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

The heart of the system is a positive displacement internal gear oil pump.

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

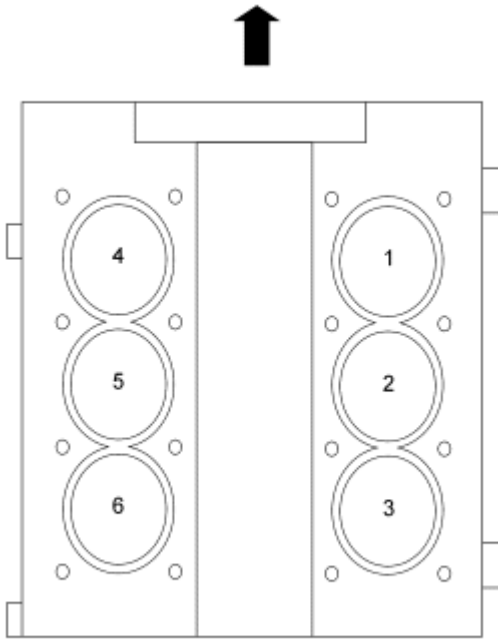
- The oil pump is mounted on the front face of the cylinder block.
- The inner rotor is piloted on the crankshaft post and is driven through flats on the crankshaft.
- System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil back to the inlet side of the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

Cooling System

The engine cooling system includes the following:

- Radiator
- Timing chain driven coolant pump
- Electric fan assembly(ies)
- Degas bottle (aids in maintaining the correct volume of engine coolant)

- Coolant thermostat
- Coolant hoses

Engine Cylinder Identification

N0069904

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

DIAGNOSTIC TESTS**ENGINE**

For basic engine mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
For driveability concerns, refer to the **Introduction - Gasoline Engines** article.

GENERAL PROCEDURES**VALVE CLEARANCE CHECK**

1. Remove the valve covers. For additional information, refer to **Valve Cover - LH** and **Valve Cover - RH**.

NOTE: The valve clearance must be measured with the camshaft at base circle. The engine will have to be rotated with the crankshaft pulley bolt to bring each valve to base circle.

2. Use a feeler gauge to measure the clearance of each valve and record its location. A midrange clearance is the most desirable:
 - Intake: 0.15-0.25 mm (0.006-0.01 in)
 - Exhaust: 0.300-0.400 mm (0.0118-0.0157 in)

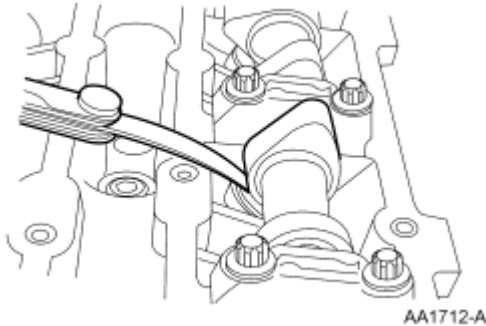


Fig. 2: Measuring Each Valve's Clearance Using A Feeler Gauge
Courtesy of FORD MOTOR CO.

NOTE: The number on the valve tappet reflects the thickness of the valve tappet. For example, a tappet with the number 3.310 has the thickness of 3.31 mm (0.13 in).

3. If any of the valve clearances are out of specification, select new tappets using this formula: tappet thickness = measured clearance + the base tappet thickness - most desirable thickness.

Select the tappets and mark the installation location.

4. If required, install the new selected valve tappets in the marked locations. For additional information, refer to **Valve Tappets**.

IN-VEHICLE SERVICING

UPPER INTAKE MANIFOLD

NOTE: Early build shown in illustration, late build similar.

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

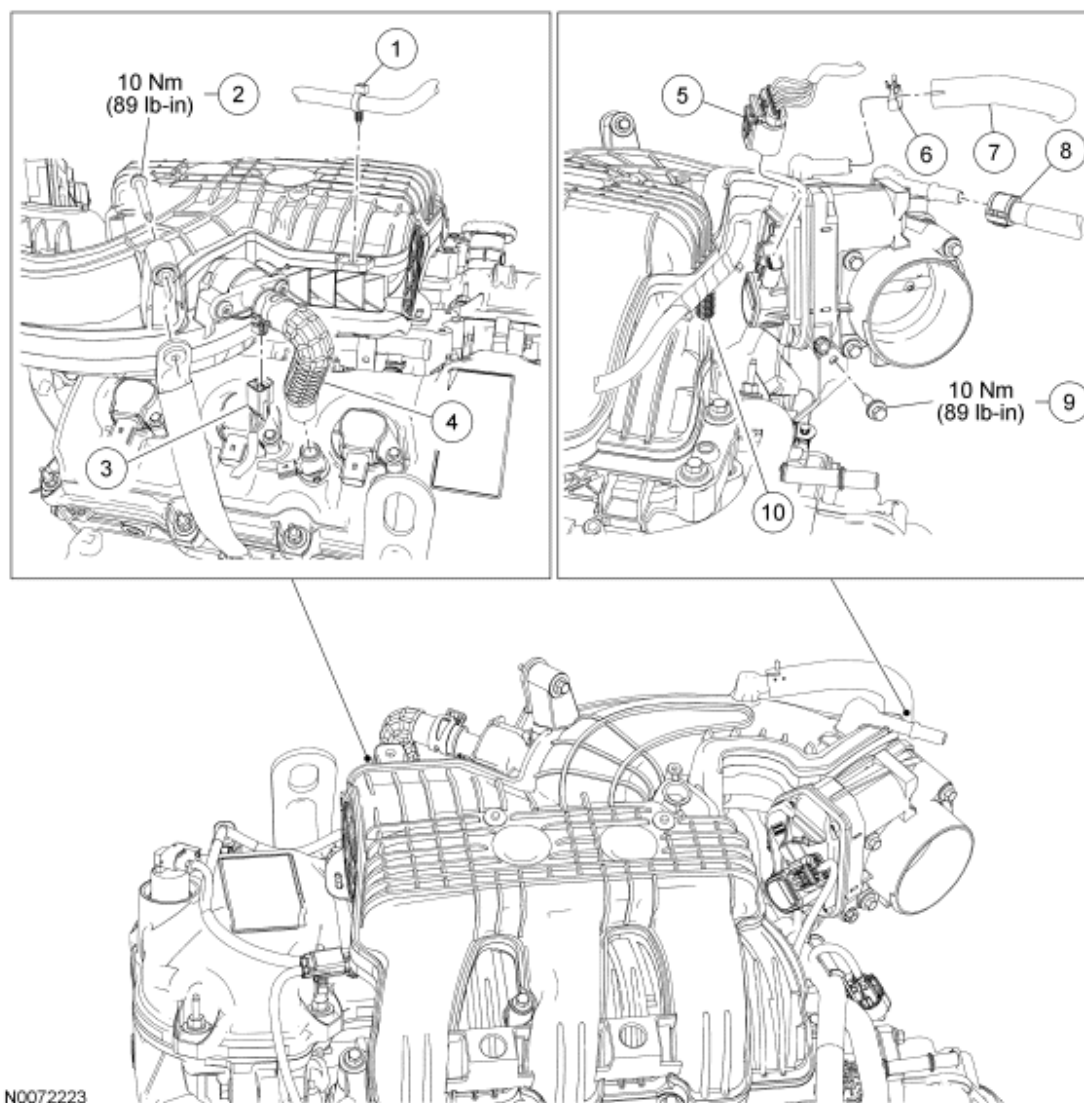


Fig. 3: Upper Intake Manifold Components With Torque Specifications (1 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	-	Evaporative emissions (EVAP) tube-to-upper intake manifold pin-type retainer
2	W503274	Upper intake manifold long support bracket bolt (early build engines)
3	14A464	Heated PCV electrical connector (part of 12C508) (early build engines)
4	6K817	PCV hose
5	14A464	Throttle body (TB) electrical connector (part of 12C508)
6	CS16140	Brake booster-to-intake manifold vacuum hose clamp

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

7	6K817	Brake booster-to-intake manifold vacuum hose
8	9D661	EVAP-to-intake manifold tube
9	W503274	Upper intake manifold short support bracket bolt
10	-	Engine control wiring harness retainer (part of 12C508)

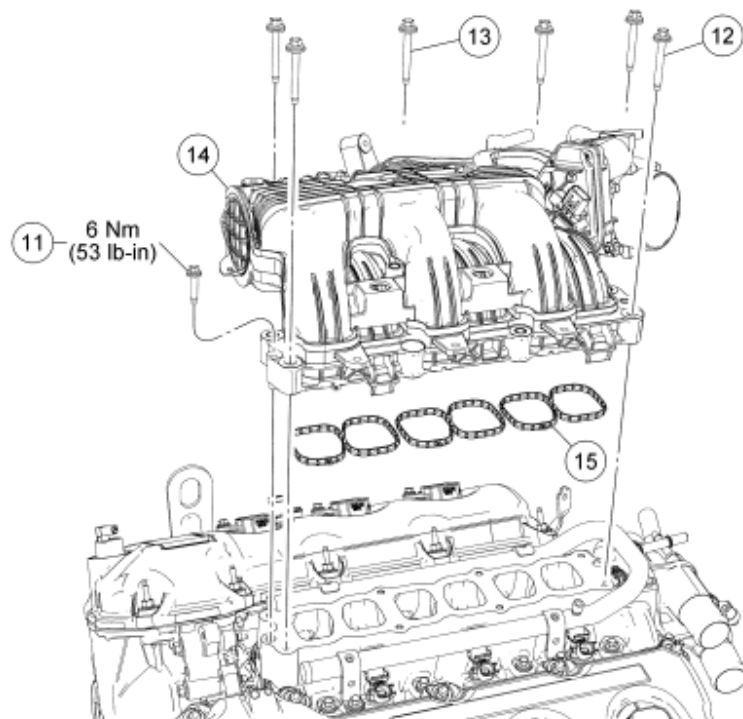


Fig. 4: Upper Intake Manifold Components With Torque Specification (2 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
11	-	Fuel tube bracket bolt
12	W503282	Upper intake manifold bolt (5 required)
13	W707083	Upper intake manifold bolt
14	9S455	Upper intake manifold
15	9H486	Upper intake manifold gasket (3 required)

REMOVAL

All engines

1. Remove the air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.

2. Disconnect the throttle body (TB) electrical connector.
3. Disconnect the evaporative emissions (EVAP) tube from the intake manifold.
4. Detach the EVAP tube pin-type retainer from the upper intake manifold.
5. Disconnect the brake booster vacuum hose from the intake manifold.
6. Disconnect the PCV tube from the PCV valve.

Early build engines

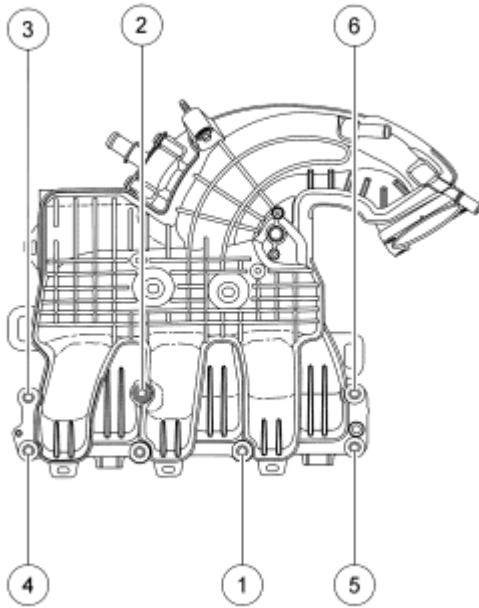
7. Disconnect the heated PCV electrical connector.
8. Remove the upper intake manifold long support bracket bolt.

All engines

9. Detach the wiring harness retainers from the upper intake manifold.
10. Remove the upper intake manifold short support bracket bolt.
11. Remove the fuel tube bracket bolt.
12. Remove the 6 bolts and the upper intake manifold.
 - Remove and discard the gaskets.
 - Clean and inspect all of the sealing surfaces of the upper and lower intake manifold.

INSTALLATION**All engines**

1. Using new gaskets, install the upper intake manifold and the 6 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).



N0052211

Fig. 5: Installing Upper Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

2. Install the fuel tube bracket bolt.
 - Tighten to 6 Nm (53 lb-in).
3. Install the upper intake manifold short support bracket bolt.
 - Tighten to 10 Nm (89 lb-in).
4. Attach the wiring harness retainers to the upper intake manifold.

Early build engines

5. Install the upper intake manifold long support bracket bolt.
 - Tighten to 10 Nm (89 lb-in).
6. Connect the heated PCV electrical connector.

All engines

7. Connect the PCV tube to the PCV valve.
8. Connect the brake booster vacuum hose to the intake manifold.
9. Connect the EVAP tube to the intake manifold.
10. Attach the EVAP tube pin-type retainer to the upper intake manifold.
11. Connect the TB electrical connector.
12. Install the air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.

LOWER INTAKE MANIFOLD

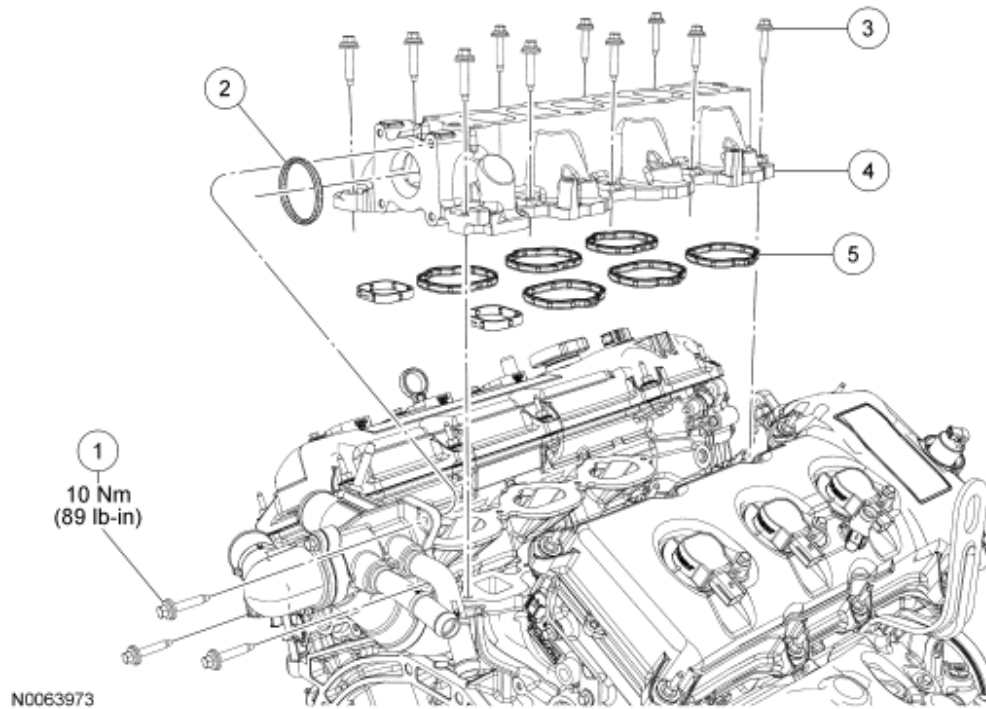


Fig. 6: Lower Intake Manifold Components With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W503279	Thermostat housing-to-lower intake manifold bolt (3 required)
2	8A571	Thermostat housing gasket
3	W503279	Lower intake manifold bolt (10 required)
4	9K461	Lower intake manifold
5	9439	Lower intake manifold gasket (8 required)

REMOVAL

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

1. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
2. Remove the fuel rail. For additional information, refer to **FUEL CHARGING AND CONTROLS - 3.5L** article.
3. Remove the 3 thermostat housing-to-lower intake manifold bolts.

4. Remove the 10 bolts and the lower intake manifold.
 - Remove and discard the intake manifold and thermostat housing gaskets.
 - Clean and inspect all sealing surfaces.

INSTALLATION

1. Using new intake manifold and thermostat housing gaskets, install the lower intake manifold and the 10 bolts.
 - Tighten in the sequence shown in illustration in sequence to 10 Nm (89 lb-in).

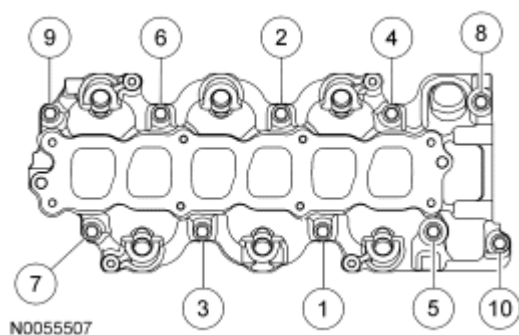


Fig. 7: Installing Lower Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

2. Install the 3 thermostat housing-to-lower intake manifold bolts.
 - Tighten to 10 Nm (89 lb-in).
3. Install the fuel rail. For additional information, refer to **FUEL CHARGING AND CONTROLS - 3.5L** article.
4. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.

VALVE COVER - LH

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST2983-A	Installer, Seal	303-1247/2

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



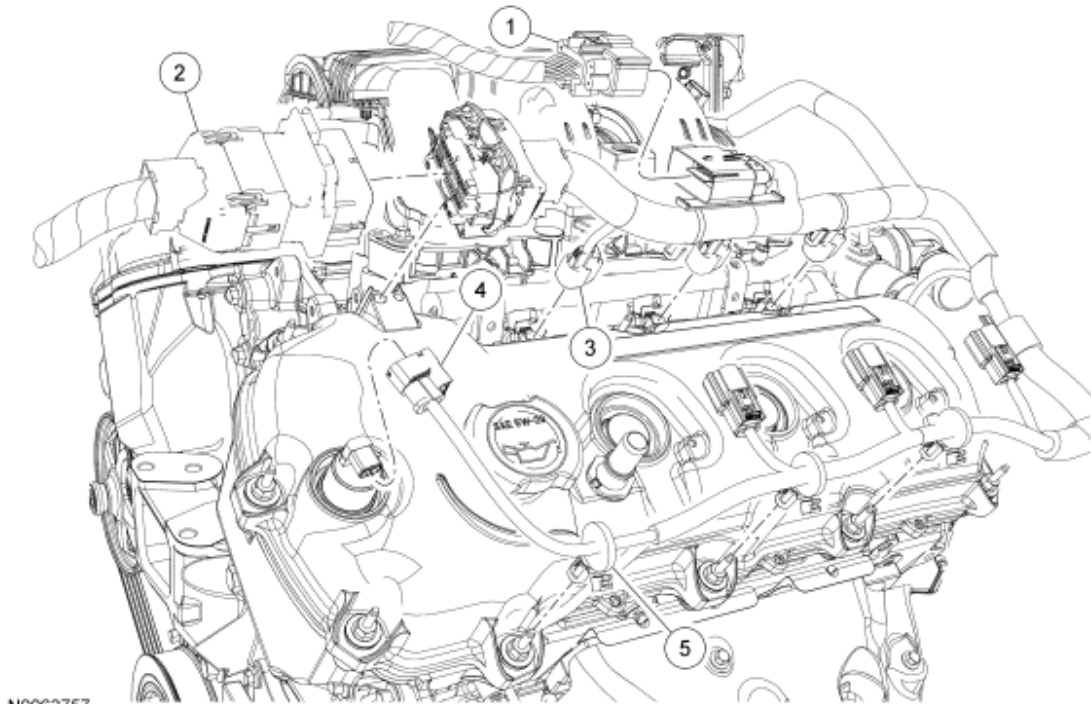
ST2982-A

Remover, Seal

303-1247/1

MATERIAL

Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft Metal Surface Cleaner ZC-21	WSE-M5B392-A
Motorcraft Metal Surface Prep ZC-31	-
Silicone Gasket Remover ZC-30	-



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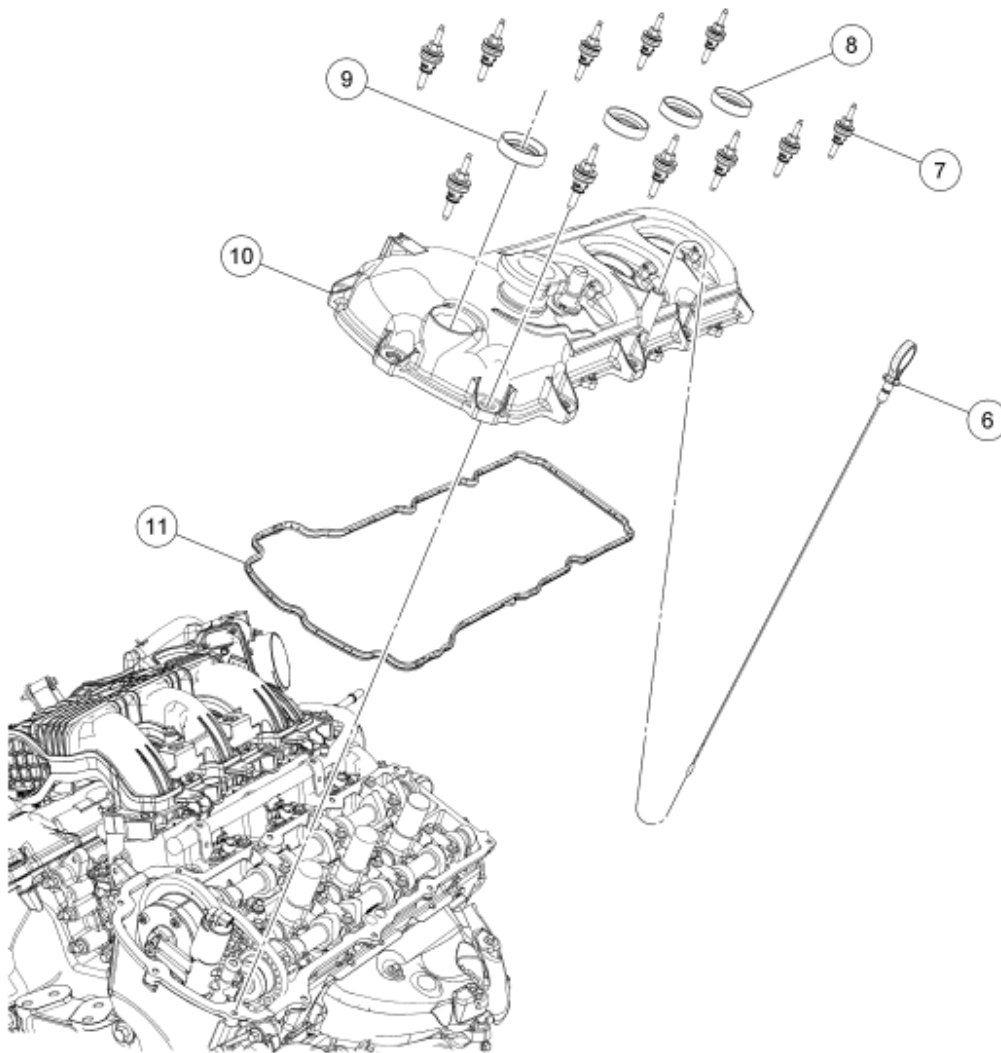
Fig. 8: Valve Cover Components - LH (1 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Engine control wiring harness electrical connector (part of 12C508)
2	14A464	Engine control wiring harness electrical

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

		connector (part of 12C508)
3	14A464	LH fuel injector electrical connector (3 required) (part of 12C508)
4	14A464	LH variable camshaft timing (VCT) electrical connector (part of 12C508)
5	W700497	Engine control wiring harness retainer (part of 12C508)



N0063914

Fig. 9: Valve Cover Components - LH (2 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
6	6750	Oil level indicator
7	6C519	Valve cover stud bolt (11 required)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

8	6C535	Spark plug tube seal (3 required)
9	6C535	VCT seal
10	6A505	LH valve cover
11	6A559	LH valve cover gasket

REMOVAL

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

1. Remove the LH ignition coils. For additional information, refer to **ENGINE IGNITION - 3.5L** article.
2. Remove the oil level indicator.
3. Disconnect the LH variable camshaft timing (VCT) solenoid electrical connector.
4. Detach and disconnect the 2 engine control wiring harness electrical connectors.
5. Detach all of the wiring harness retainers from the LH valve cover stud bolts.
6. Disconnect the 3 LH fuel injector electrical connectors.
7. Loosen the 11 stud bolts and remove the LH valve cover.
 - Discard the gasket.

NOTE: VCT solenoid seal removal shown in illustration, spark plug tube seal removal similar.

8. Inspect the VCT solenoid seals and the spark plug tube seals. Remove any damaged seals.
 - Using the special tools, remove the seal(s).

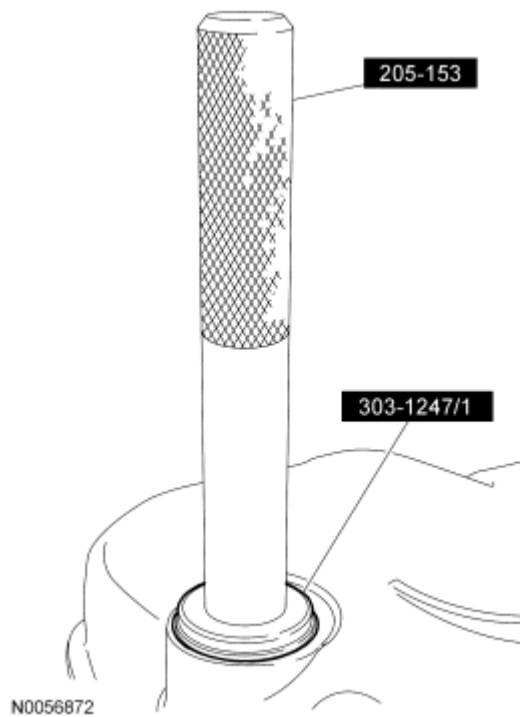


Fig. 10: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

9. Clean the valve cover, cylinder head and engine front cover sealing surfaces with metal surface cleaner.

INSTALLATION

NOTE: Installation of new seals is only required if damaged seals were removed during disassembly of the engine.

NOTE: Spark plug tube seal installation shown in illustration, VCT seal installation similar.

1. Using the special tools, install new VCT solenoid and/or spark plug tube seals.

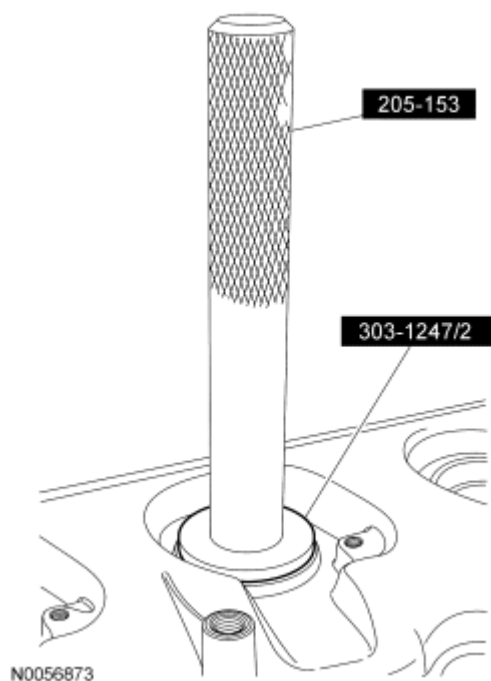


Fig. 11: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

Courtesy of FORD MOTOR CO.

CAUTION: Failure to use the correct Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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

2. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-LH cylinder head joints.

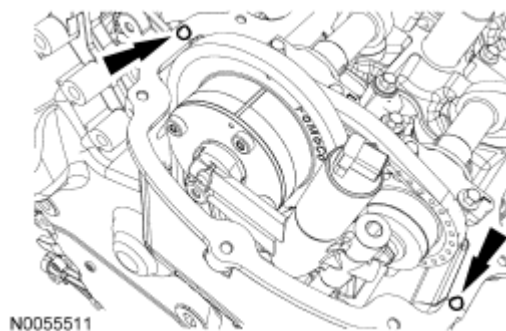


Fig. 12: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

3. Using a new gasket, install the LH valve cover and 11 stud bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

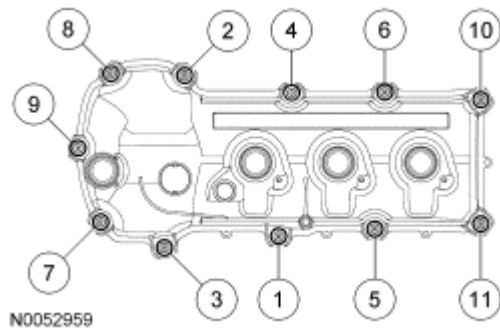


Fig. 13: Installing LH Valve Cover Stud Bolts In Sequence
 Courtesy of FORD MOTOR CO.

4. Connect the 3 LH fuel injector electrical connectors.
5. Attach all of the wiring harness retainers to the LH valve cover stud bolts.
6. Connect and attach the 2 engine control wiring harness electrical connectors.
7. Connect the LH VCT solenoid electrical connector.
8. Install the oil level indicator.
9. Install the LH ignition coils. For additional information, refer to [ENGINE IGNITION - 3.5L](#) article.

VALVE COVER - RH

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
	Handle	205-153 (T80T-4000-W)
	Installer, Seal	303-1247/2
	Remover, Seal	303-1247/1

2009 Mercury Sable

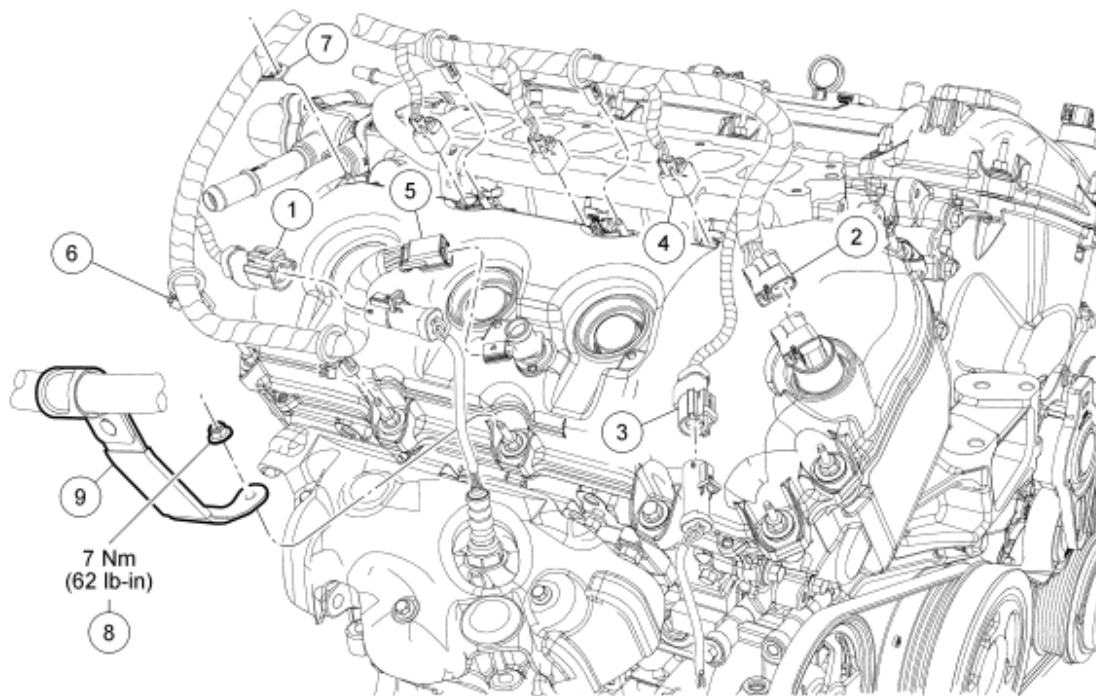
2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



ST2982-A

MATERIAL

Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft Metal Surface Cleaner ZC-21	WSE-M5B392-A
Motorcraft Metal Surface Prep ZC-31	-
Silicone Gasket Remover ZC-30	-



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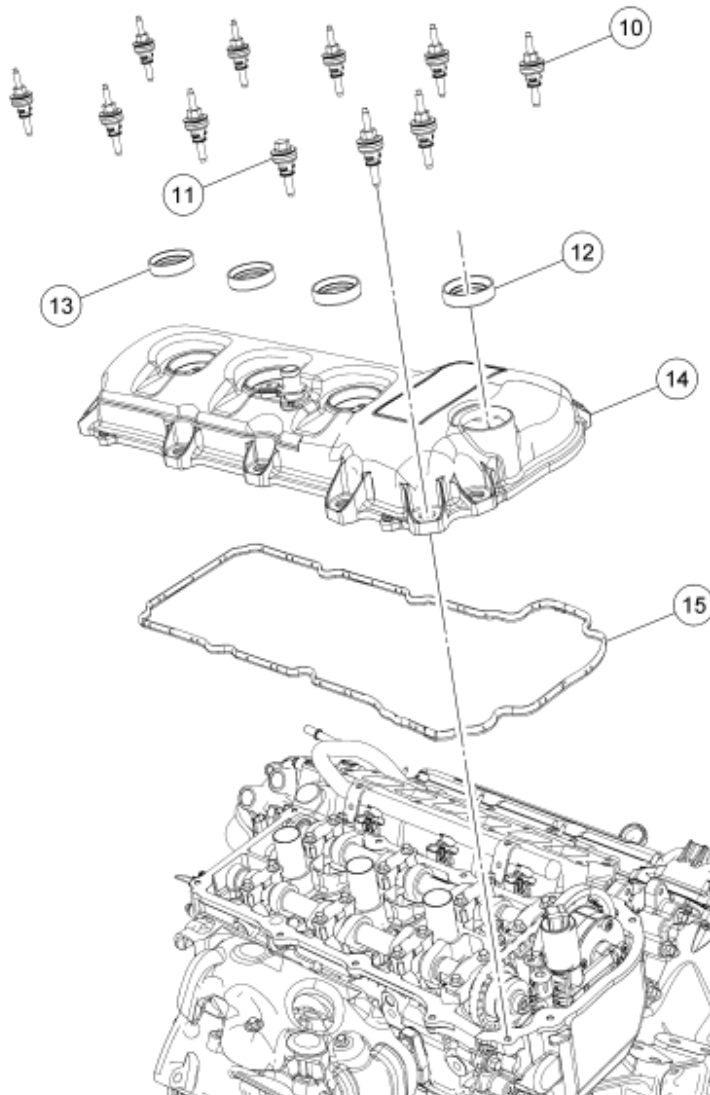
Fig. 14: Valve Cover Components - RH With Torque Specification (1 Of 2)
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	RH heated oxygen sensor (HO2S) electrical connector (part of 12C508)
2	14A464	RH variable camshaft timing (VCT)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

		electrical connector (part of 12C508)
3	14A464	RH catalyst monitor sensor electrical connector (part of 12C508)
4	14A464	RH fuel injector electrical connector (3 required) (part of 12C508)
5	14A464	Heated PCV electrical connector (part of 12C508) (early build engines)
6	W700497	Engine control wiring harness retainer (part of 12C508)
7	13A506	Engine control wiring harness retainer (part of 12C508)
8	W520100	Power steering pressure (PSP) tube bracket-to valve cover stud bolt nut
9	-	PSP tube bracket (part of 3A719)



N0072227

Fig. 15: Valve Cover Components - RH (2 Of 2)

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
10	6C519	Valve cover stud bolt (10 required)
11	6C520	Valve cover bolt
12	6C535	VCT seal
13	6C535	Spark plug tube seal (3 required)
14	6582	RH valve cover
15	6584	RH valve cover gasket

REMOVAL

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

All engines

1. Remove the RH ignition coils. For additional information, refer to **ENGINE IGNITION - 3.5L** article.
2. Detach and disconnect the RH catalyst monitor sensor electrical connector.
3. Detach and disconnect the RH heated oxygen sensor (HO2S) electrical connector.
4. Disconnect the RH variable camshaft timing (VCT) solenoid electrical connector.
5. Disconnect the 3 RH fuel injector electrical connectors.

Early build engines

6. Disconnect the heated PCV valve electrical connector.

All engines

7. Detach all of the wiring harness retainers from the RH valve cover stud bolts.
8. Remove the nut and the power steering pressure (PSP) tube bracket from the valve cover stud bolt.

NOTE: It is necessary to reposition the A/C tubes to remove the valve cover.

9. Loosen the bolt, the 10 stud bolts and remove the RH valve cover.
 - Discard the gasket.

NOTE: VCT solenoid seal removal shown in illustration, spark plug tube seal removal similar.

10. Inspect the VCT solenoid seals and the spark plug tube seals. Remove any damaged seals.

- Using the special tools, remove the seal(s).

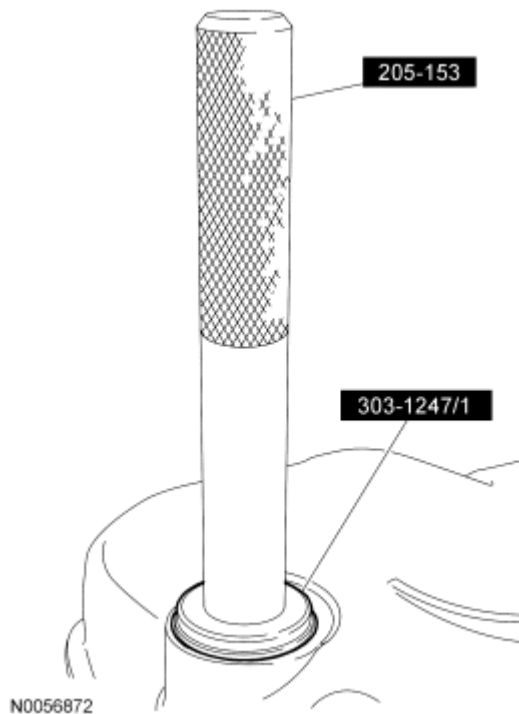


Fig. 16: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

11. Clean the valve cover, cylinder head and engine front cover sealing surfaces with metal surface cleaner.

INSTALLATION

All engines

NOTE: Installation of new seals is only required if damaged seals were removed during disassembly of the engine.

NOTE: Spark plug tube seal installation shown in illustration, VCT seal installation similar.

1. Using the special tools, install new VCT solenoid and/or spark plug tube seals.

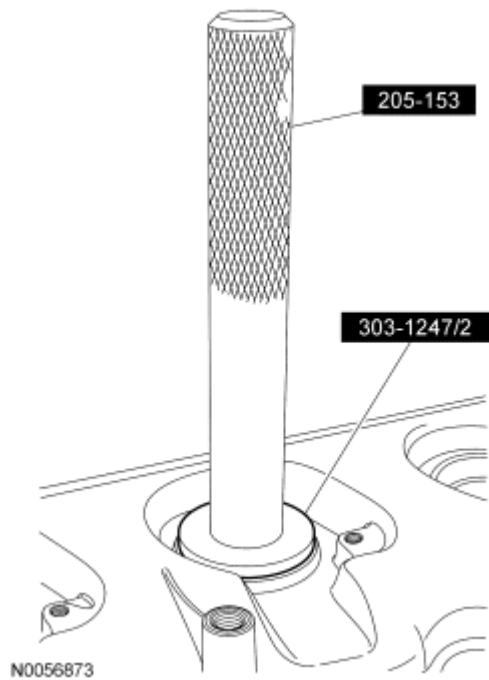


Fig. 17: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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

2. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-RH cylinder head joints.

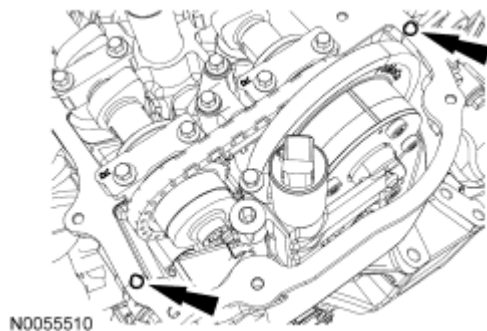


Fig. 18: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

3. Using a new gasket, install the RH valve cover, bolt and the 10 stud bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

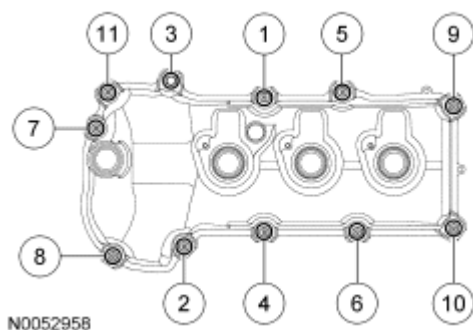


Fig. 19: Installing RH Valve Cover Stud Bolts In Sequence
 Courtesy of FORD MOTOR CO.

4. Install the PSP tube bracket on the valve cover stud bolt and install the nut.
 - Tighten to 7 Nm (62 lb-in).
5. Attach all of the wiring harness retainers to the RH valve cover stud bolts.

Early build engines

6. Connect the heated PCV valve electrical connector.

All engines

7. Connect the 3 RH fuel injector electrical connectors.
8. Connect the RH VCT electrical connector.
9. Connect the RH HO2S sensor electrical connector.
10. Connect the RH catalyst monitor sensor electrical connector.
11. Install the RH ignition coils. For additional information, refer to **ENGINE IGNITION - 3.5L** article.

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

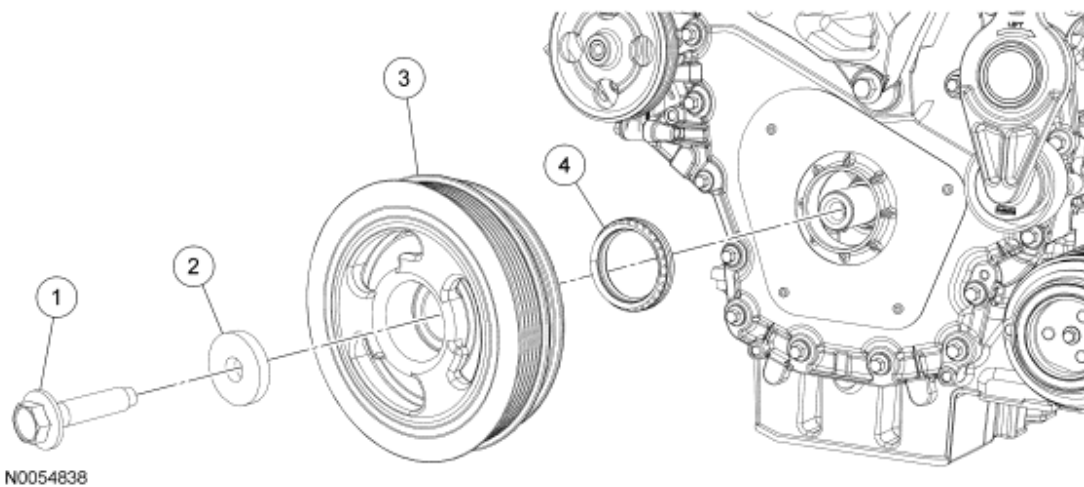


Fig. 20: Exploded View Of Crankshaft Pulley & Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W701512	Crankshaft pulley bolt
2	N806165	Washer
3	6316	Crankshaft pulley
4	6700	Crankshaft front seal

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

CRANKSHAFT PULLEY

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
ST1184-A	3-Jaw Puller	303-D121
ST2296-A	Installer, Front Cover Oil Seal	303-335
ST1287-A	Replacer, Crankshaft Damper	303-102 (T74P-6316-B)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



ST1438-A

Strap Wrench

303-D055 (D85L-6000-A)

MATERIAL

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

REMOVAL

1. With the vehicle in **NEUTRAL**, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
3. Using the special tool, remove the crankshaft bolt and washer.
 - Discard the bolt.

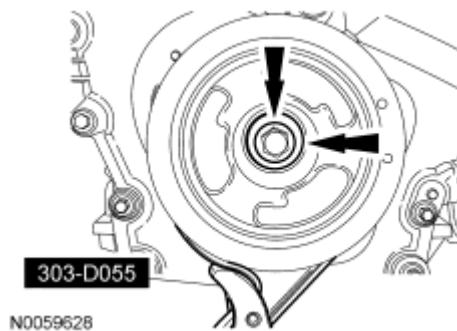


Fig. 21: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

4. Using the special tool, remove the crankshaft pulley.

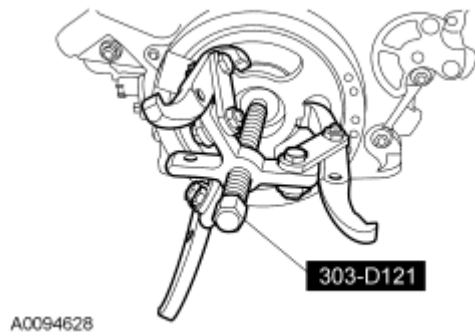


Fig. 22: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

INSTALLATION

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

NOTE: Lubricate the outside diameter sealing surfaces with clean engine oil.

2. Using the special tools, install the crankshaft pulley.

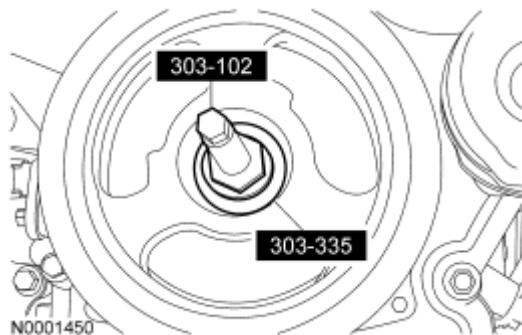


Fig. 23: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

3. Using the special tool, install the crankshaft pulley washer and new bolt and tighten in 4 stages.
 - Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

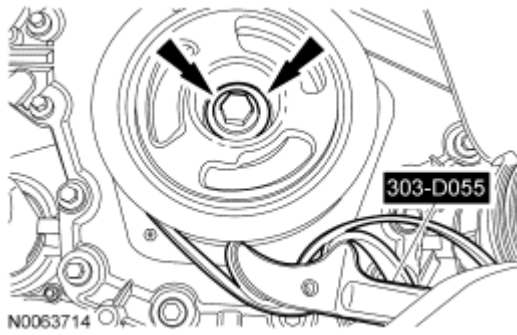
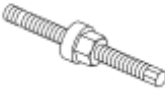


Fig. 24: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

4. Install the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.

CRANKSHAFT FRONT SEAL

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1287-A	Installer, Crankshaft Vibration Damper	303-102 (T74P-6316-B)
 ST2981-A	Installer, Front Crankshaft Seal	303-1251
 ST1385-A	Remover, Oil Seal	303-409 (T92C-6700CH)

MATERIAL

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

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the crankshaft pulley. For additional information, refer to **Crankshaft Pulley**.
3. Using the Oil Seal Remover, remove and discard the crankshaft front seal.
 - Clean all sealing surfaces with metal surface prep.

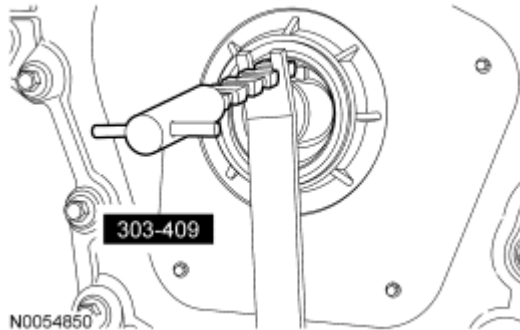


Fig. 25: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

INSTALLATION

NOTE: Apply clean engine oil to the crankshaft front seal bore in the engine front cover.

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

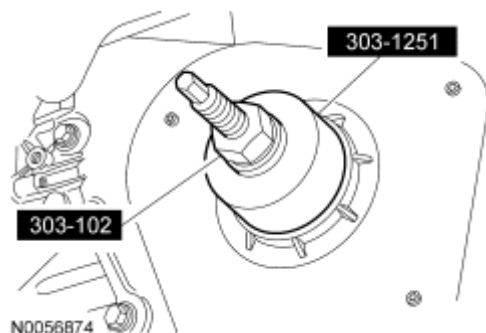
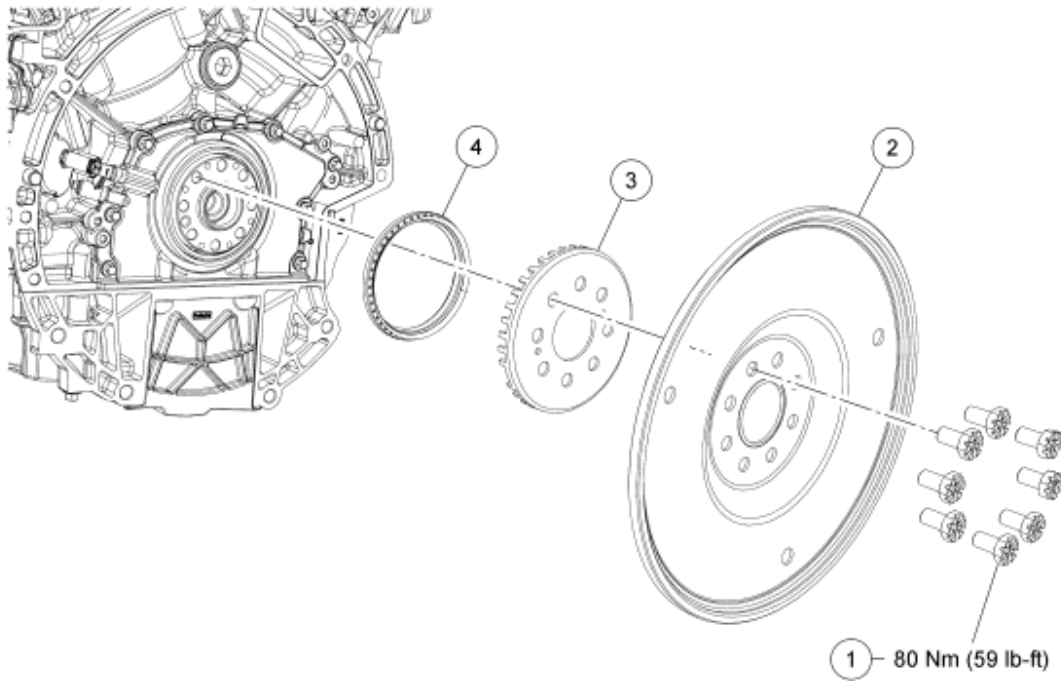


Fig. 26: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

2. Install the crankshaft pulley. For additional information, refer to **Crankshaft Pulley**.

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



N0058151

Fig. 27: Exploded View Of Flexplate & Crankshaft Rear Seal - Lower End Components With Torque Specification

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W701559	Flexplate bolt (8 required)
2	6375	Flexplate
3	12A227	Crankshaft sensor ring
4	6701	Crankshaft rear seal

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

FLEXPLATE

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 transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6F50** article.

NOTE: One of the 8 flexplate holes are offset so the flexplate can only be installed in one position.

3. Remove the bolts and the flexplate.

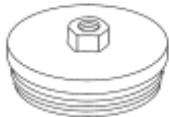
2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

- To install, tighten to 80 Nm (59 lb-ft).
4. To install, reverse the removal procedure.

CRANKSHAFT REAR SEAL

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST2980-A	Installer, Rear Main Seal	303-1250
 ST1382-A	Remover, Crankshaft Rear Oil Seal	303-519 (T95P-6701-EH)
 ST1187-A	Slide Hammer	307-005 (T59L-100-B)

MATERIAL

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

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove the flexplate. For additional information, refer to **Flexplate**.

3. Remove the crankshaft sensor ring.
4. Using the Crankshaft Rear Oil Seal Remover and Slide Hammer, remove and discard the crankshaft rear seal.
 - Clean all sealing surfaces with metal surface prep.

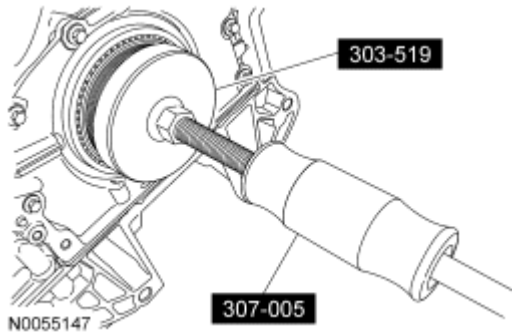


Fig. 28: Removing Crankshaft Rear Seal Using Special Tools (303-519) & (307-005)
Courtesy of FORD MOTOR CO.

INSTALLATION

NOTE: Lubricate the seal lips and bore with clean engine oil prior to installation.

1. Position the Rear Main Seal Installer onto the end of the crankshaft and slide a new crankshaft rear seal onto the tool.

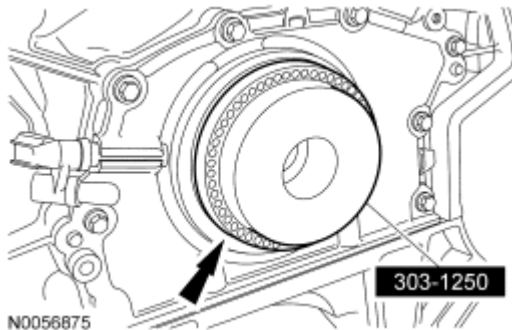


Fig. 29: Positioning Special Tool (303-1250) Onto End Of Crankshaft
Courtesy of FORD MOTOR CO.

2. Using the Rear Main Seal Installer and Handle, install the new crankshaft rear seal.

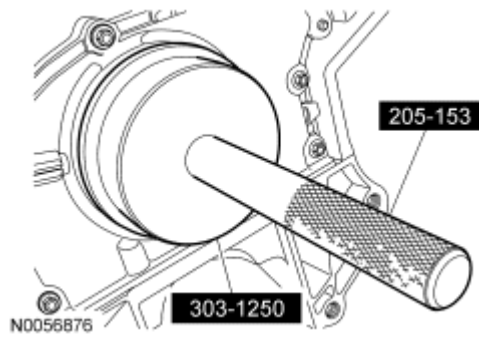
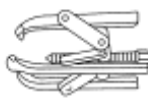
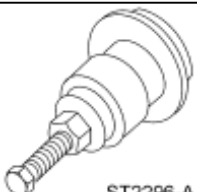


Fig. 30: Installing New Crankshaft Rear Seal Using Special Tools (303-1250) & (205-153)
Courtesy of FORD MOTOR CO.

3. Install the crankshaft sensor ring.
4. Install the flexplate. For additional information, refer to **Flexplate**.

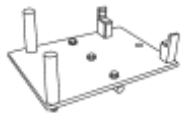
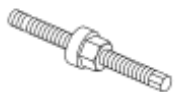
ENGINE FRONT COVER

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1184-A	3-Jaw Puller	303-D121
 ST2433-A	Alignment Pins	307-399
 ST2981-A	Installer, Crankshaft Front Seal	303-1251
 ST2296-A	Installer, Front Cover Seal	303-335 (T88T-6701-A)
	Engine Support	303-1295

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST3034-A		
 ST1385-A	Remover, Oil Seal	303-409 (T92C-6700CH)
 ST1287-A	Replacer, Crankshaft Damper	303-102 (T74P-6312-B)
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A)

MATERIAL

Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft Metal Surface Prep ZC-31	-
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket Remover ZC-30	-

REMOVAL

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

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

AND LIFTING article.

2. Recover the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article.
3. Remove the air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
4. Remove the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
5. Remove the accessory drive belt, tensioner and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
6. Remove the degas bottle. For additional information, refer to **ENGINE COOLING** article.
7. Remove the 2 nuts and disconnect the A/C tubes.
 - Discard the O-ring seals.



Fig. 31: Identifying Nuts
Courtesy of FORD MOTOR CO.

8. Remove the nut and the A/C tube-to-receiver/drier.
 - Discard the O-ring seal.

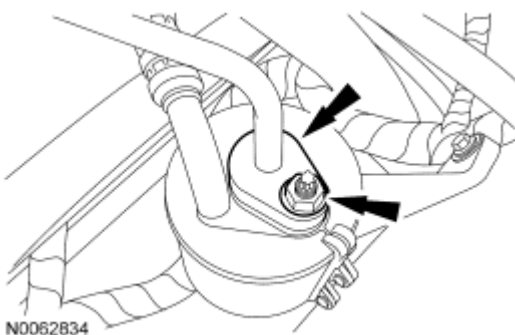


Fig. 32: Identifying Nut
Courtesy of FORD MOTOR CO.

9. Disconnect the power steering cooler tube and drain the power steering fluid into a suitable container.

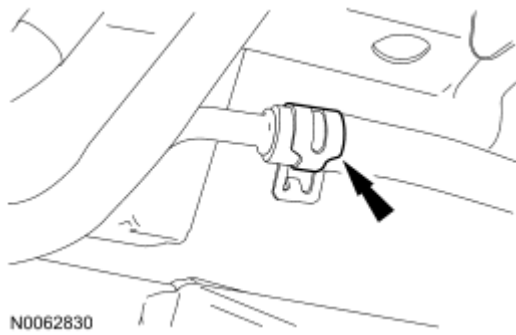


Fig. 33: Identifying Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

10. Remove the RH inner fender splash shield. For additional information, refer to **FRONT END BODY PANELS** article.
11. Using the special tool, remove the crankshaft bolt and washer.
 - Discard the bolt.

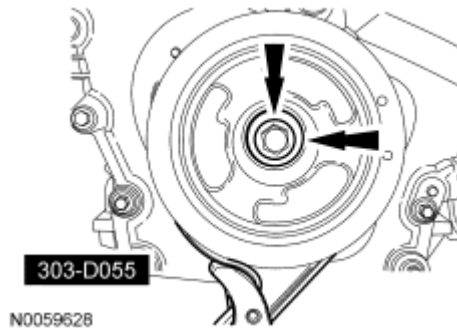


Fig. 34: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

12. Using the special tool, remove the crankshaft pulley.

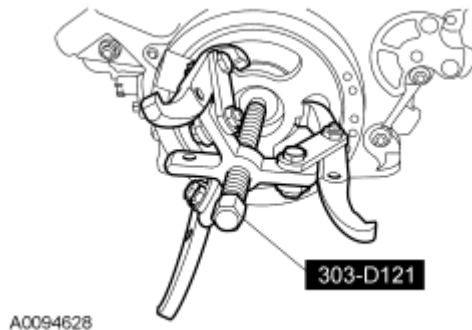


Fig. 35: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

13. Using the special tool, remove and discard the crankshaft front seal.

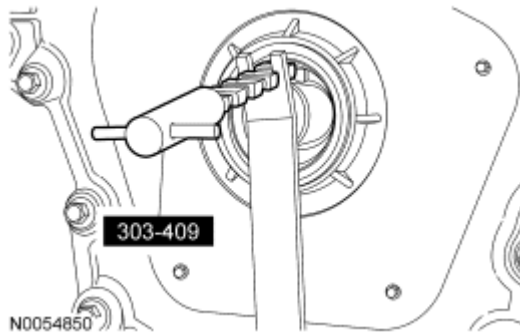


Fig. 36: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

14. Remove the 4 nuts and the Y-pipe-to-catalytic converter nuts.
 - Discard the nuts.

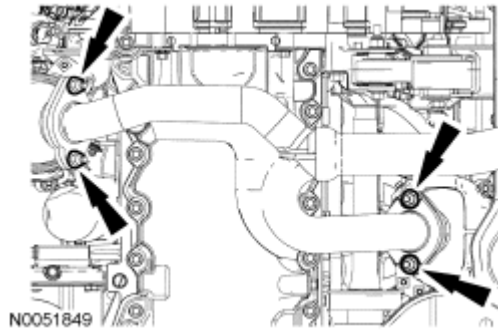


Fig. 37: Identifying Nuts
Courtesy of FORD MOTOR CO.

15. Remove the 2 Y-pipe flange nuts.
 - Detach the exhaust hanger and remove the Y-pipe.
 - Discard the gaskets and nuts.

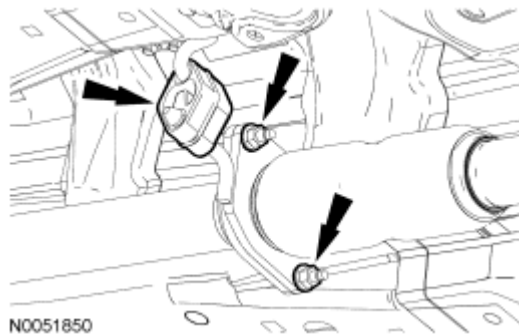


Fig. 38: Identifying Nuts And Exhaust Hanger
Courtesy of FORD MOTOR CO.

16. Remove the drain plug and drain the engine oil.

- Install the drain plug and tighten to 27 Nm (20 lb-ft).

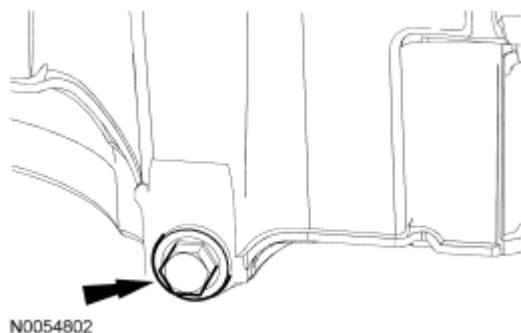


Fig. 39: Locating Drain Plug
Courtesy of FORD MOTOR CO.

17. Disconnect the hose from the power steering reservoir.

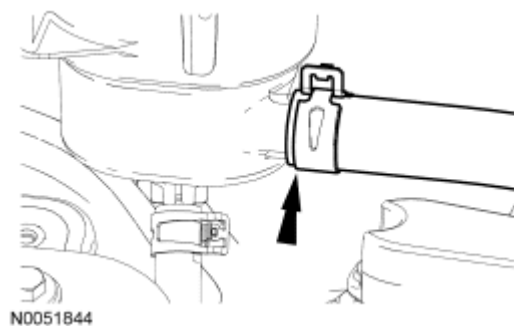


Fig. 40: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

18. Remove the RH and LH valve covers. For additional information, refer to **Valve Cover - LH** and **Valve Cover - RH**.
19. Remove the bolt and the ground cable.

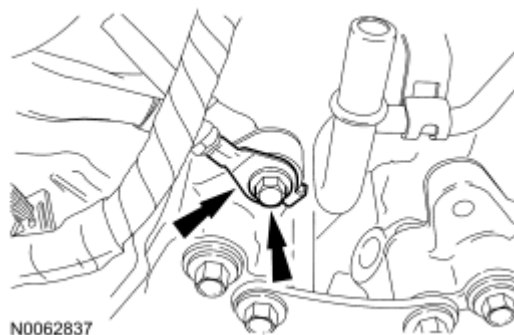


Fig. 41: Identifying Bolt And Ground Cable
Courtesy of FORD MOTOR CO.

20. Disconnect the fuel efficient power steering system solenoid electrical connector.

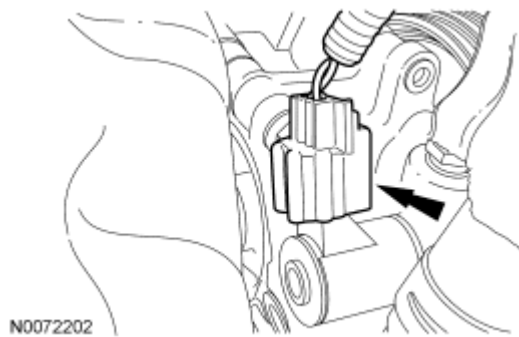


Fig. 42: Identifying Connector
Courtesy of FORD MOTOR CO.

21. Disconnect the power steering pressure (PSP) switch electrical connector.

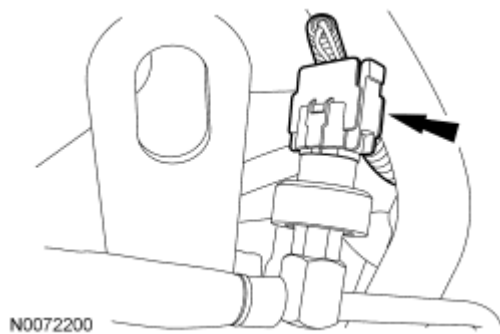


Fig. 43: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

22. Remove the PSP tube bracket-to-power steering pump bolt.

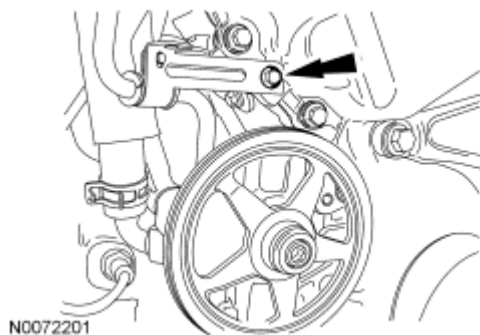


Fig. 44: Identifying Bracket-To-Power Steering Pump Bolt
Courtesy of FORD MOTOR CO.

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

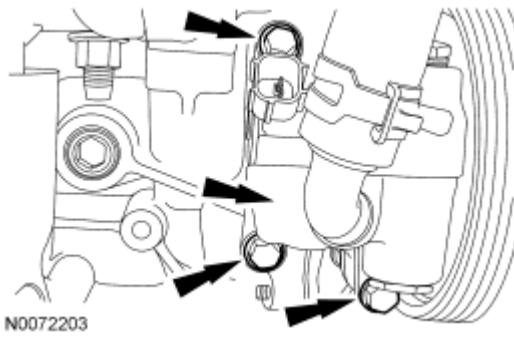


Fig. 45: Identifying Bolts
Courtesy of FORD MOTOR CO.

CAUTION: The special tool must be carefully aligned to the mounting bosses on the oil pan. Failure to follow these instructions may result in damage to the oil pan.

24. Position a floor jack and the special tool under the oil pan.

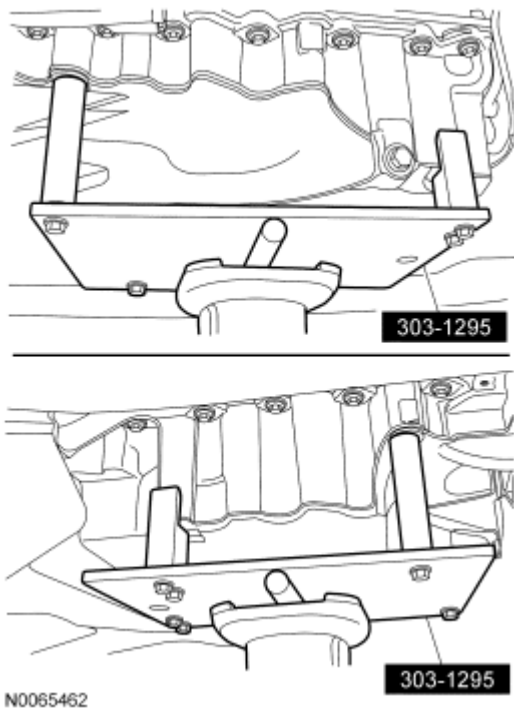
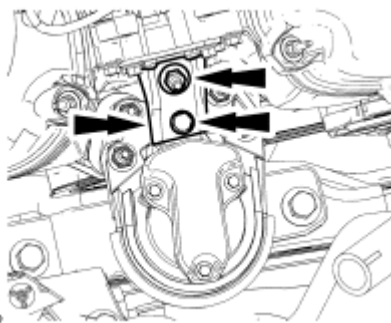


Fig. 46: Positioning Floor Jack & Special Tool (303-1295) Under Oil Pan
Courtesy of FORD MOTOR CO.

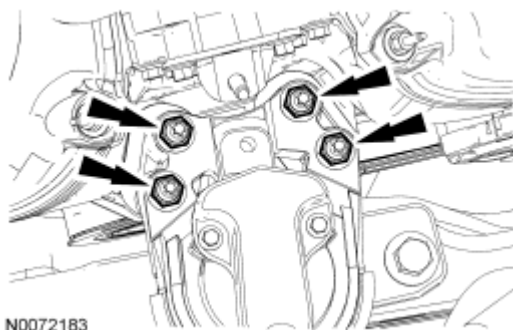
25. Remove the nut, bolt and engine mount brace.



N0072182

Fig. 47: Identifying Nut, Bolt And Brace
Courtesy of FORD MOTOR CO.

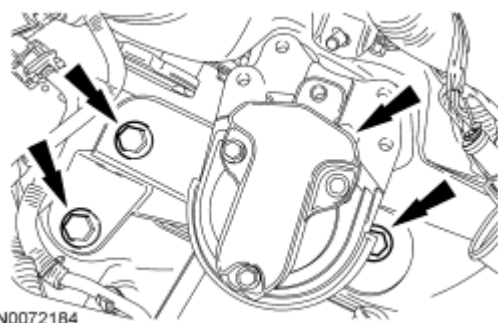
26. Remove the 4 engine mount nuts.



N0072183

Fig. 48: Identifying Mounting Nuts
Courtesy of FORD MOTOR CO.

27. Remove the 3 bolts and the engine mount.



N0072184

Fig. 49: Identifying Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

28. Remove the 2 bolts and the engine mount bracket.

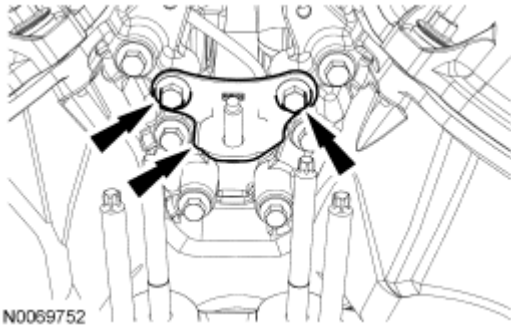


Fig. 50: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

29. Remove the 2 engine mount studs.

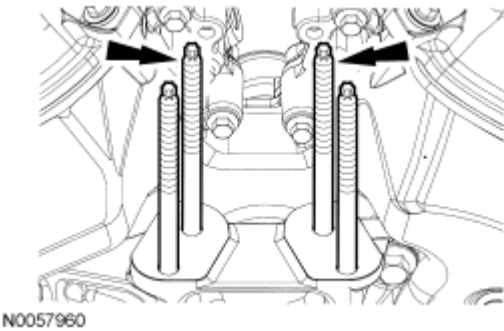


Fig. 51: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

30. Remove the 2 upper engine mount bracket bolts.

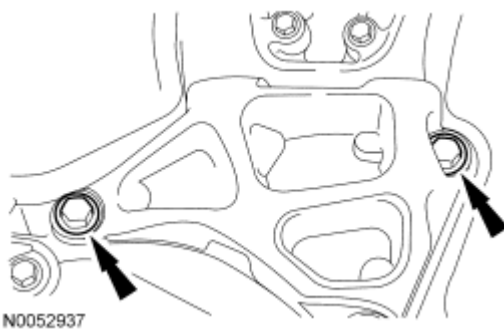


Fig. 52: Locating Upper Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

31. Loosen the lower engine mount bracket bolt and remove the engine mount bracket and bolt as an assembly.

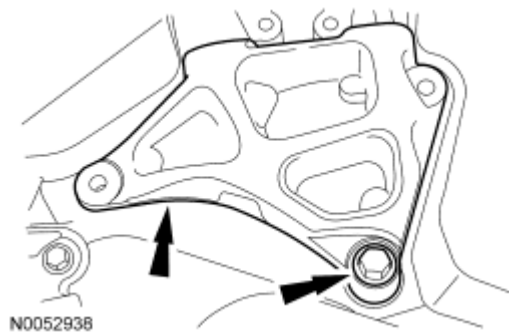


Fig. 53: Locating Lower Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

32. Remove the A/C tube bracket bolt.

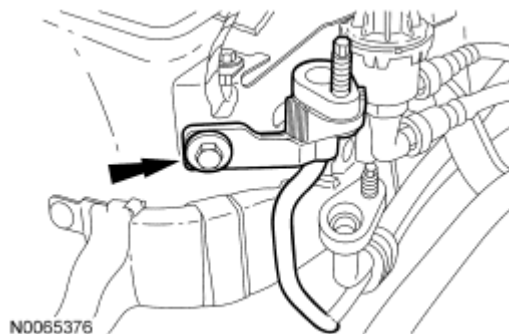


Fig. 54: Identifying A/C Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

33. Remove the A/C tube retaining clamp bolt.

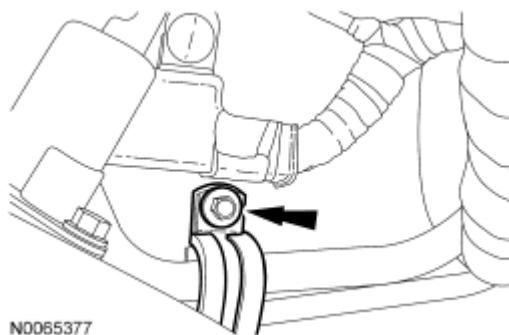


Fig. 55: Identifying Retaining Clamp Bolt
Courtesy of FORD MOTOR CO.

34. Remove the A/C tube-to-evaporator bolt and the 2 A/C tubes.
- Discard the O-ring seals.

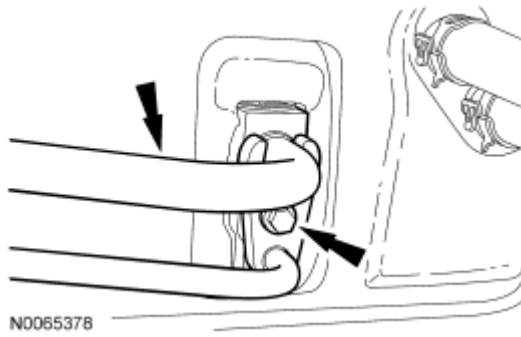


Fig. 56: Identifying Bolt And A/C Tubes
Courtesy of FORD MOTOR CO.

35. Using the floor jack, raise the engine slightly.
36. Remove the 22 engine front cover bolts.

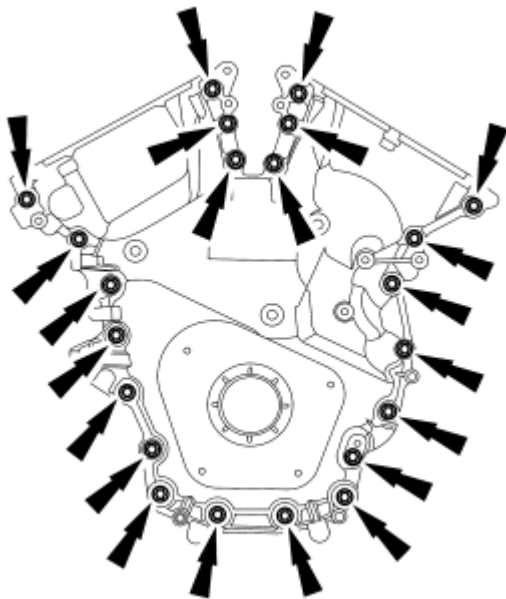
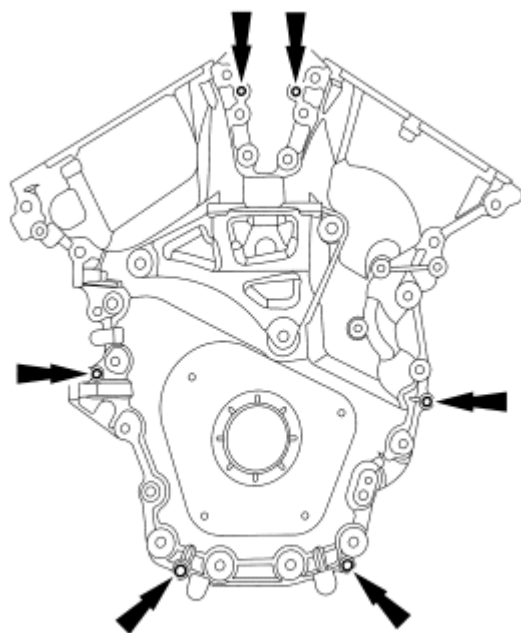


Fig. 57: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

37. Install 6 of the engine front cover bolts (finger tight) into the 6 threaded holes in the engine front cover.
 - Tighten the bolts one turn at a time in a criss-cross pattern until the engine front cover-to-cylinder block seal is released.
 - Remove the engine front cover.



N0069753

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

INSTALLATION

CAUTION: Only use a 3M Roloc® Bristle Disk (2-in white, part number 07528), to clean the engine front cover. Do not use metal scrapers, wire brushes or any other power abrasive disk to clean the engine front cover. These tools cause scratches and gouges that make leak paths.

1. Clean the engine front cover using a 3M Roloc® Bristle Disk (2-in white, part number 07528) in a suitable tool turning at the recommended speed of 15,000 RPM.
 - Thoroughly wash the engine front cover to remove any foreign material, including any abrasive particles created during the cleaning process.

CAUTION: Place clean, lint-free shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan may cause engine failure.

CAUTION: Do not use wire brushes, power abrasive discs or 3M Roloc® Bristle Disk (2-in white, part number 07528) to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. They also cause contamination that will cause premature engine failure. Remove all traces of sealant, including any sealant from the inner

surface of the cylinder block and cylinder head.

2. Clean the sealing surfaces of the cylinder heads, the cylinder block and the oil pan in the following sequence.
 1. Remove any large deposits of silicone or gasket material.
 2. Apply silicone gasket remover and allow to set for several minutes.
 3. Remove the silicone gasket remover. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep to remove any remaining traces of oil or coolant and to prepare the surfaces to bond. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
 5. Make sure the 2 locating dowel pins are seated correctly in the cylinder block.
3. Install the special tools.

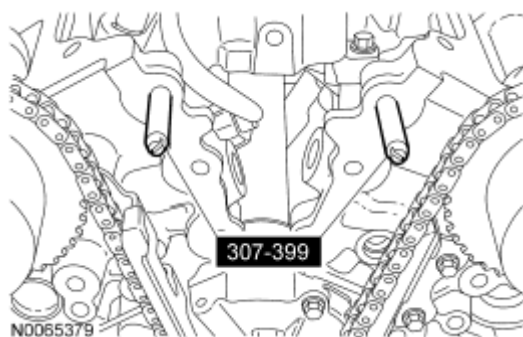


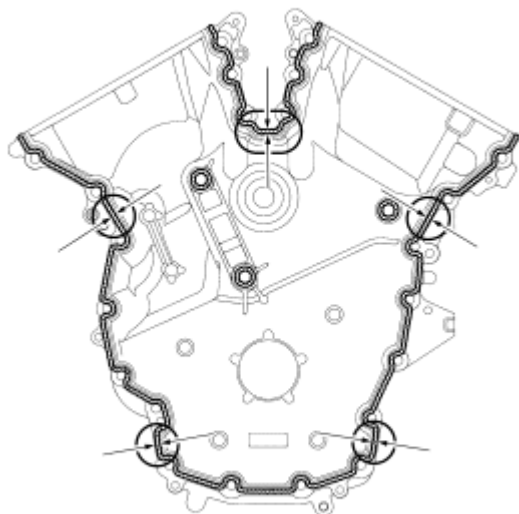
Fig. 59: Identifying Special Tool (307-399)
Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The engine front cover and bolts 17, 18, 19 and 20 must be installed within 4 minutes of the initial sealant application. The remainder of the engine front cover bolts and the engine mount bracket bolts must be installed and tighten within 35 minutes of the initial sealant application. If the time limits are exceeded, the sealant must be removed, the sealing area cleaned and sealant reapplied. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.

4. Apply a 3.0 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover sealing surfaces including the 3 engine mount bracket bosses.
 - Apply a 5.5 mm (0.21 in) bead of Motorcraft High Performance Engine RTV Silicone to the oil pan-to-cylinder block joint and the cylinder head-to-cylinder block joint areas of the engine front cover in 5 places as indicated.

5.5 mm
(0.21 in)



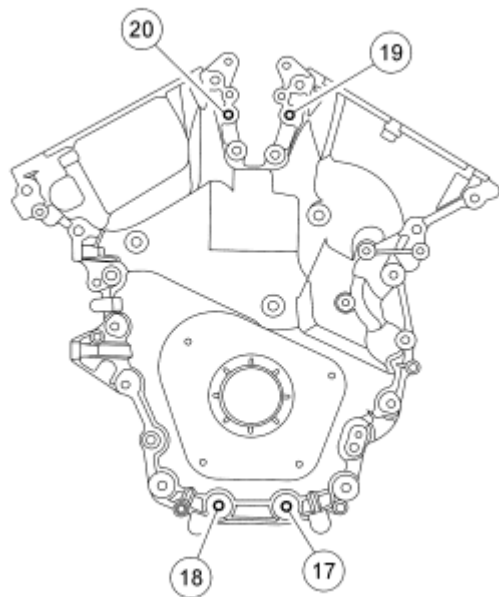
N0068283

Fig. 60: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover Sealing Surfaces

Courtesy of FORD MOTOR CO.

NOTE: **Make sure the 2 locating dowel pins are seated correctly in the cylinder block.**

5. Install the engine front cover and bolts 17, 18, 19 and 20.
 - Tighten in sequence to 3 Nm (27 lb-in).



N0068108

Fig. 61: Installing Engine Front Cover & Bolts In Sequence
Courtesy of FORD MOTOR CO.

6. Remove the special tools (alignment pins).
7. Install the engine mount bracket and lower bolt.
 - Do not tighten at this time.

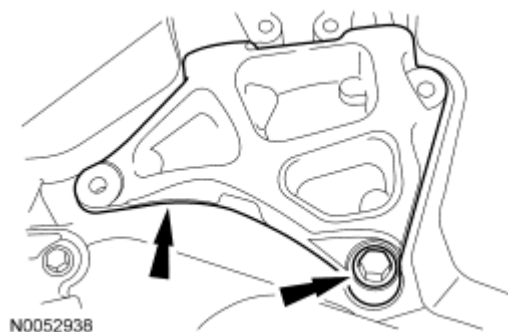


Fig. 62: Locating Lower Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

8. Install the 2 upper engine mount bracket bolts.
 - Do not tighten at this time.

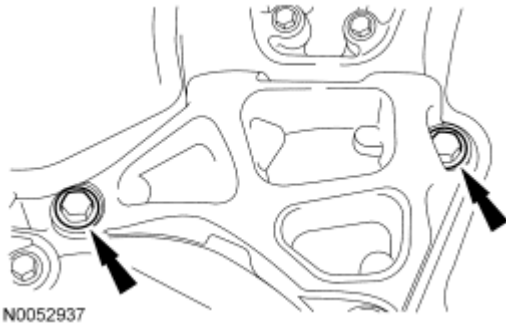


Fig. 63: Locating Upper Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Do not expose the Motorcraft High Performance Engine RTV Silicone to engine oil for at least 90 minutes after installing the engine front cover. Failure to follow this instruction may cause oil leakage.

9. Install the remaining engine front cover bolts. Tighten all of the engine front cover bolts and engine mount bracket bolts in the sequence shown in illustration in 2 stages:
 - Stage 1: Tighten bolts 1 thru 22 to 10 Nm (89 lb-in) and bolts 23, 24 and 25 to 15 Nm (11 lb-ft).
 - Stage 2: Tighten bolts 1 thru 22 to 24 Nm (18 lb-ft) and bolts 23, 24 and 25 to 75 Nm (55 lb-ft).

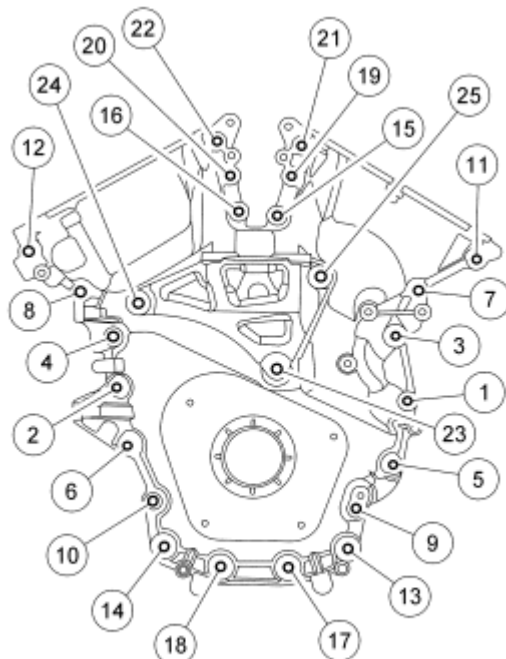


Fig. 64: Identifying Tightening Of Engine Front Cover Bolts & Engine Mount Bracket Bolts In Sequence
Courtesy of FORD MOTOR CO.

10. Using the floor jack, lower the engine to the installed position.
11. Install the new O-ring seals and the A/C tubes-to-evaporator and the bolt.
 - Tighten to 15 Nm (11 lb-ft).

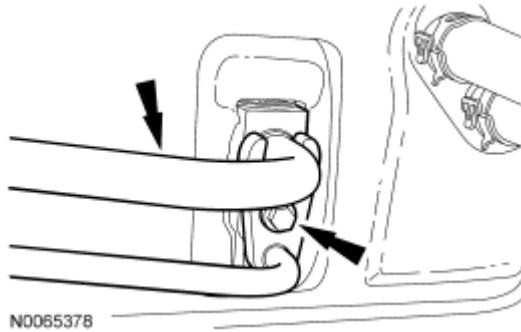


Fig. 65: Identifying Bolt And A/C Tubes
Courtesy of FORD MOTOR CO.

12. Install the A/C tube retaining clamp bolt.
 - Tighten to 10 Nm (89 lb-in).

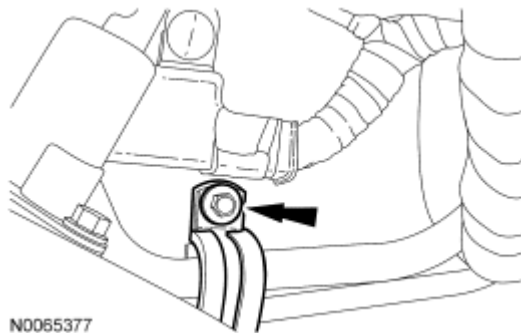


Fig. 66: Identifying A/C Tube Retaining Clamp Bolt
Courtesy of FORD MOTOR CO.

13. Install the A/C tube bracket bolt.
 - Tighten to 10 Nm (89 lb-in).

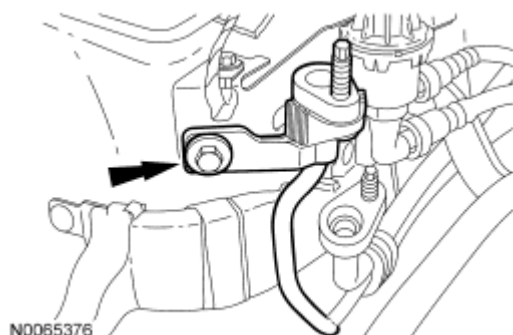


Fig. 67: Identifying A/C Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

14. Install the 2 engine mount studs.
 - Tighten to 18 Nm (13 lb-ft).

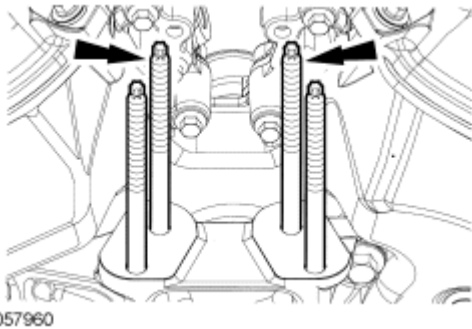


Fig. 68: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

15. Install the engine mount bracket and the 2 bolts.
 - Tighten to 24 Nm (18 lb-ft).

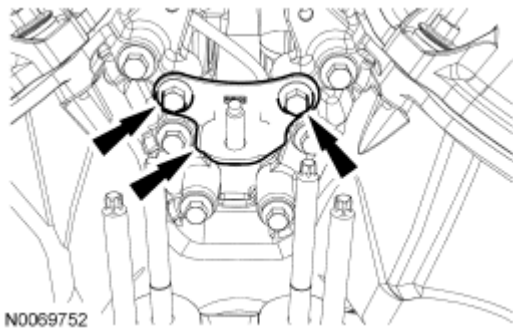


Fig. 69: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

16. Install the engine mount and the 3 bolts.
 - Tighten to 90 Nm (66 lb-ft).

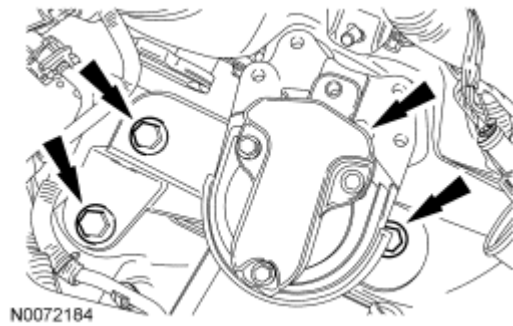


Fig. 70: Identifying Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

17. Install the 4 engine mount nuts.
 - Tighten to 63 Nm (46 lb-ft).

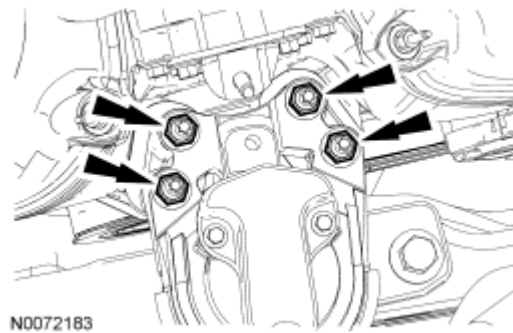


Fig. 71: Identifying Mounting Nuts
Courtesy of FORD MOTOR CO.

18. Install the engine mount brace, nut and bolt.
 - Tighten to 20 Nm (15 lb-ft).

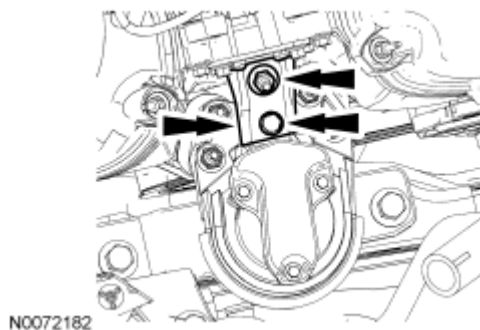


Fig. 72: Identifying Nut, Bolt And Brace
Courtesy of FORD MOTOR CO.

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

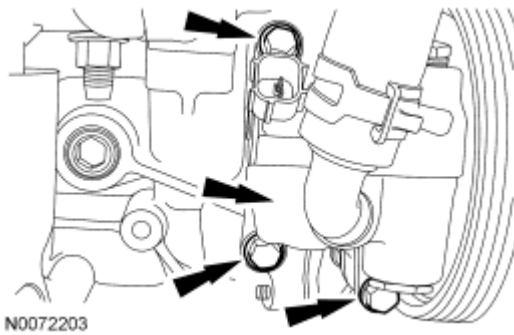


Fig. 73: Identifying Bolts
Courtesy of FORD MOTOR CO.

20. Install the power steering pressure (PSP) tube bracket-to-power steering pump bolt.
- Tighten to 10 Nm (89 lb-in).

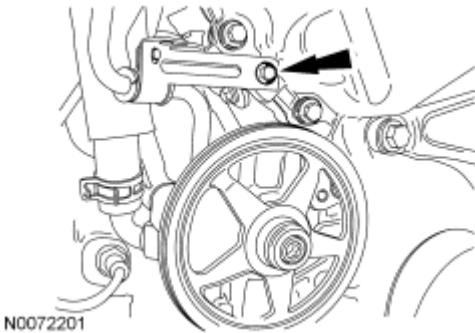


Fig. 74: Identifying Bracket-To-Power Steering Pump Bolt
Courtesy of FORD MOTOR CO.

21. Connect the PSP switch electrical connector.

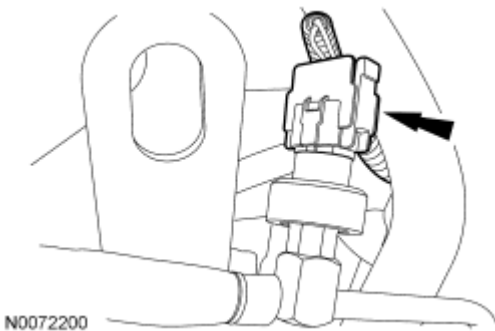


Fig. 75: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

22. Connect the fuel efficient power steering system solenoid electrical connector.



Fig. 76: Identifying Connector
Courtesy of FORD MOTOR CO.

23. Install the ground cable bolt.
 - Tighten to 12 Nm (9 lb-ft).

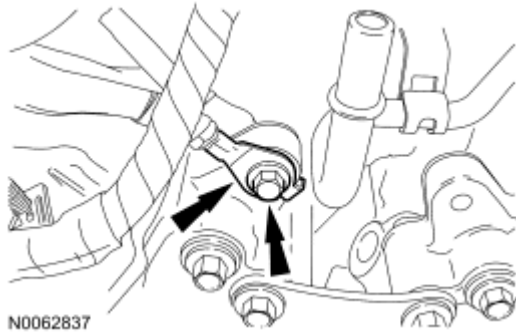


Fig. 77: Identifying Bolt And Ground Cable
Courtesy of FORD MOTOR CO.

24. Install the RH and LH valve covers. For additional information, refer to **Valve Cover - LH** and **Valve Cover - RH**.
25. Connect the hose to the power steering reservoir.

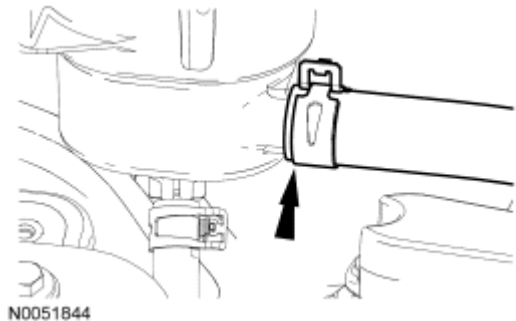


Fig. 78: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

26. Using a new gasket, install the exhaust Y-pipe and install the 2 new nuts.

- Tighten to 40 Nm (30 lb-ft).
- Attach the exhaust hanger.

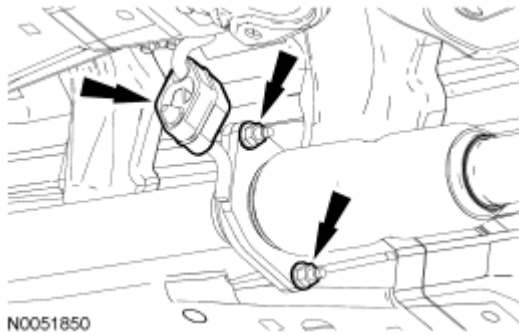


Fig. 79: Identifying Nuts And Exhaust Hanger
Courtesy of FORD MOTOR CO.

27. Install the exhaust Y-pipe assembly and 4 new nuts.
 - Tighten to 40 Nm (30 lb-ft).

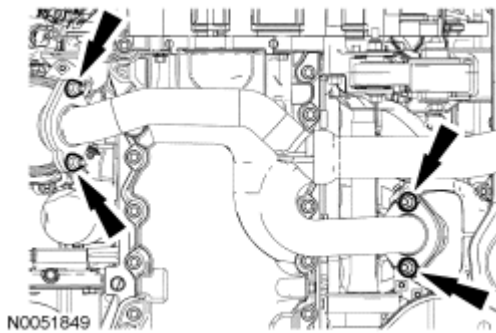


Fig. 80: Identifying Nuts
Courtesy of FORD MOTOR CO.

NOTE: Apply clean engine oil to the crankshaft front seal bore in the engine front cover.

28. Using the special tools, install a new crankshaft front seal.

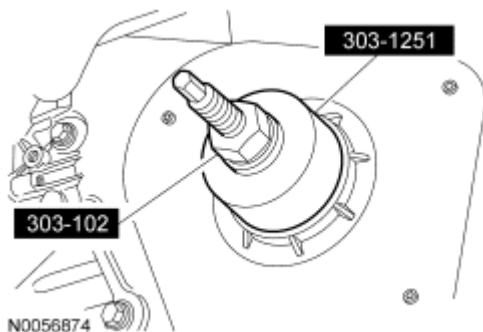


Fig. 81: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the outside diameter sealing surfaces with clean engine oil.

29. Using the special tools, install the crankshaft pulley.

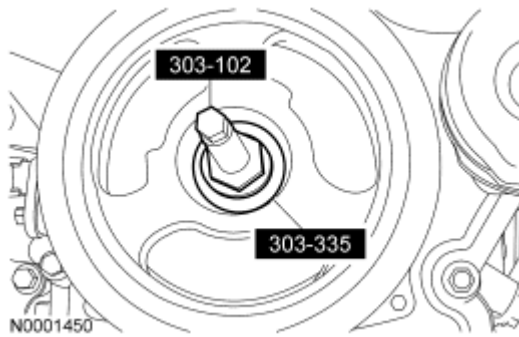


Fig. 82: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

30. Using the special tool, install the crankshaft pulley washer and new bolt and tighten in 4 stages.
- Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

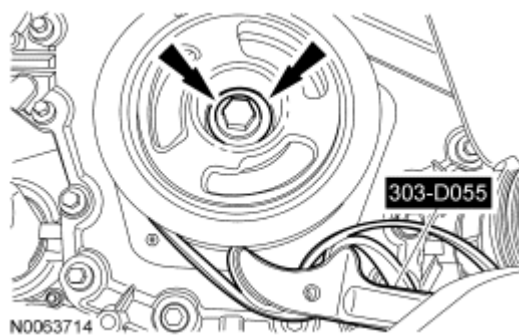


Fig. 83: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

31. Install the RH inner fender splash shield. For additional information, refer to **FRONT END BODY PANELS** article.
32. Connect the power steering cooler tube.

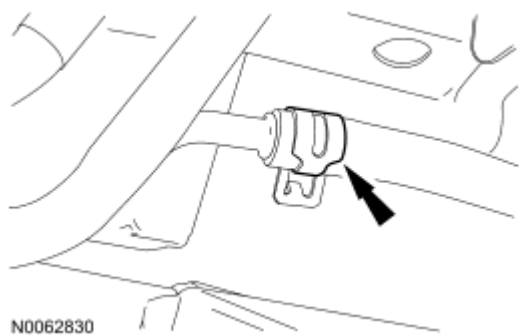


Fig. 84: Identifying Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

33. Install a new O-ring seal and the A/C tube-to-receiver/drier and the nut.
- Tighten to 15 Nm (11 lb-ft).

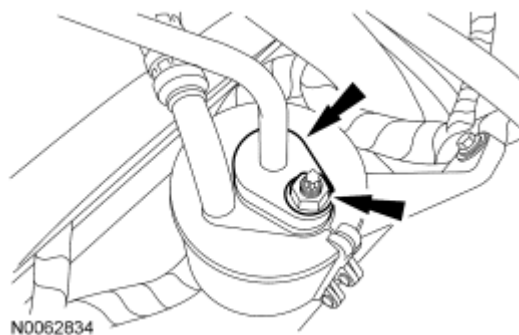


Fig. 85: Identifying Nut
Courtesy of FORD MOTOR CO.

34. Using new O-ring seals, connect the A/C tubes and install the 2 nuts.
- Tighten to 15 Nm (11 lb-ft).

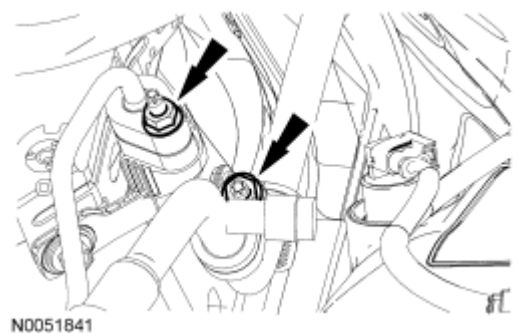


Fig. 86: Identifying Nuts
Courtesy of FORD MOTOR CO.

35. Install the degas bottle. For additional information, refer to **ENGINE COOLING** article.
36. Install the accessory drive belt, tensioner and the power steering belt. For additional information, refer to

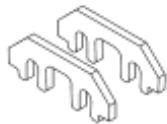
ACCESSORY DRIVE article.

37. Install the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
38. Install the engine air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.

CAUTION: Do not expose the Motorcraft High Performance Engine RTV Silicone to engine oil for at least 90 minutes after installing the engine front cover. Failure to follow this instruction may cause oil leakage.

39. Fill the engine with clean engine oil.
40. Fill the power steering system. For additional information, refer to **STEERING SYSTEM - GENERAL INFORMATION** article.
41. Recharge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article.

TIMING DRIVE COMPONENTS**SPECIAL TOOLS**

Illustration	Tool Name	Tool Number
 ST2979-A	Camshaft Alignment Tool	303-1248

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 may cause engine failure.

1. Remove the engine front cover. For additional information, refer to **Engine Front Cover**.
2. Rotate the crankshaft clockwise and align the timing marks on the variable camshaft timing (VCT) assemblies as shown in illustration.

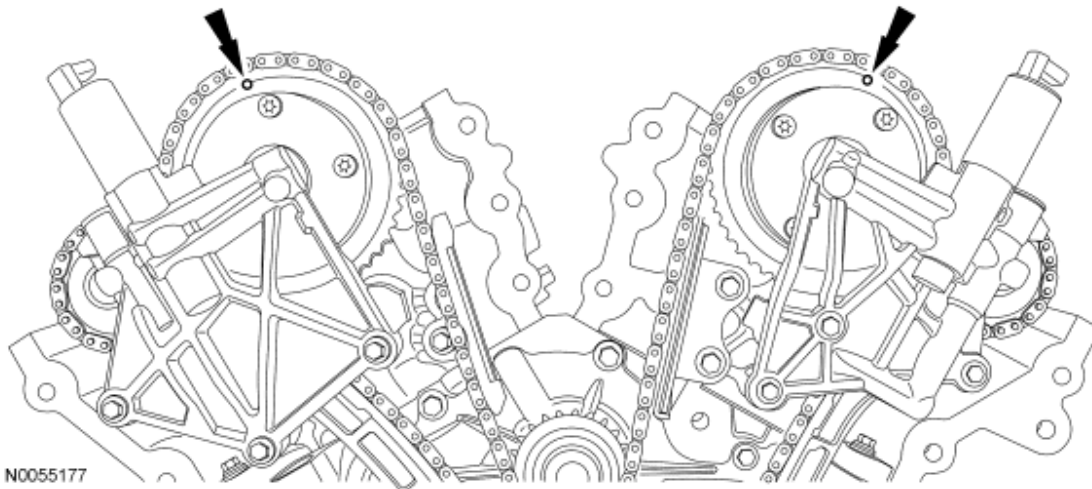


Fig. 87: Aligning Timing Marks On Variable Camshaft Timing (VCT) Assemblies
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the top dead center (TDC) position.

3. Install the special tool onto the flats of the LH camshafts.

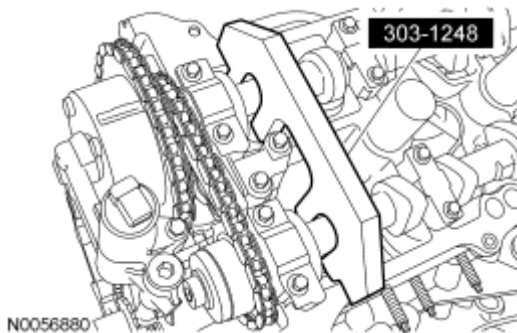


Fig. 88: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the TDC position.

4. Install the special tool onto the flats of the RH camshafts.

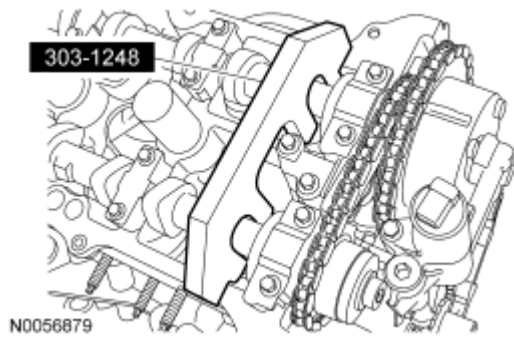


Fig. 89: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

5. Remove the 3 bolts and the RH VCT housing.

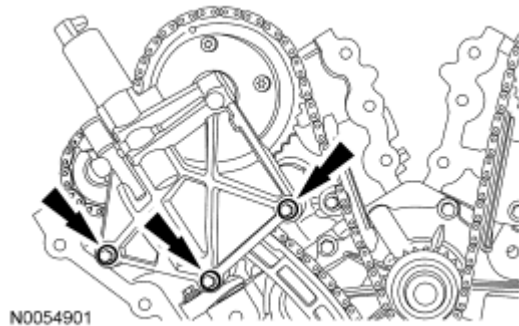


Fig. 90: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

6. Remove the 3 bolts and the LH VCT housing.

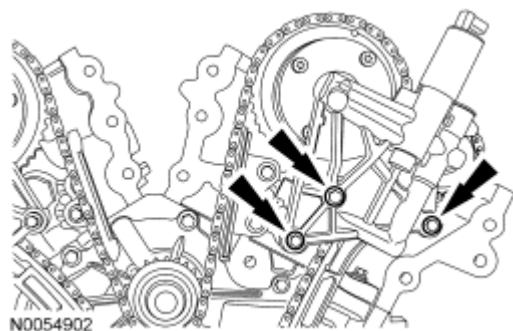


Fig. 91: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

7. Remove and discard the VCT housing seals.

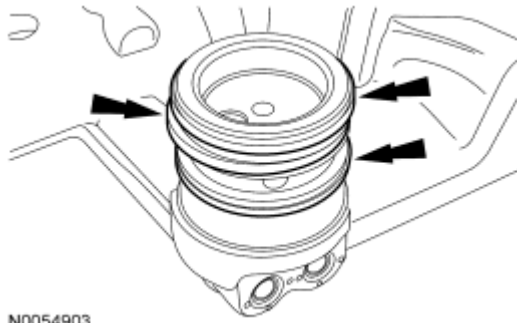


Fig. 92: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

8. Remove the 2 bolts and the primary timing chain tensioner.

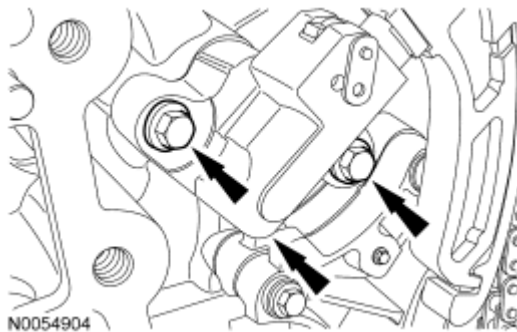


Fig. 93: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

9. Remove the primary timing chain tensioner arm.

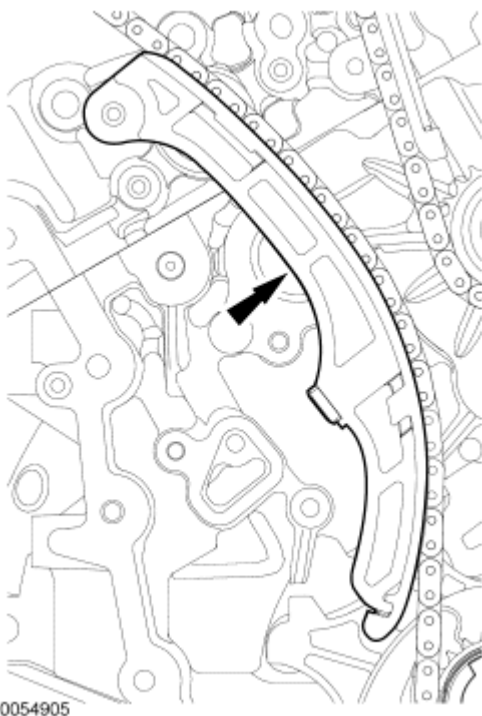


Fig. 94: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

10. Remove the 2 bolts and the lower LH primary timing chain guide.

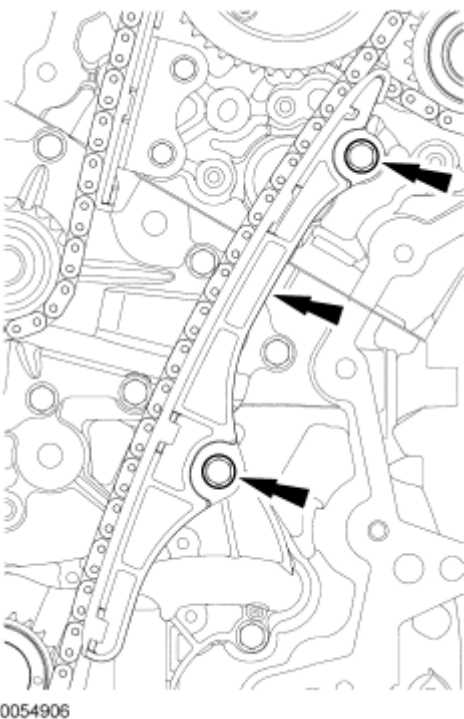
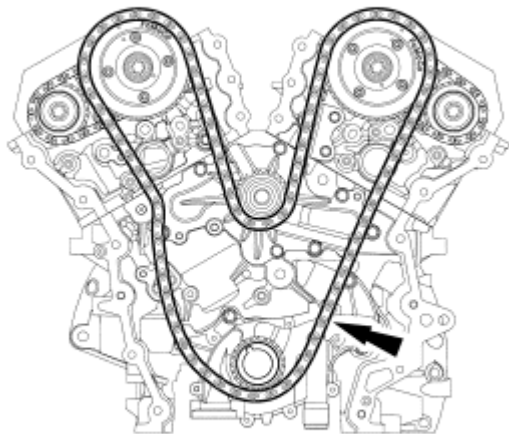


Fig. 95: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

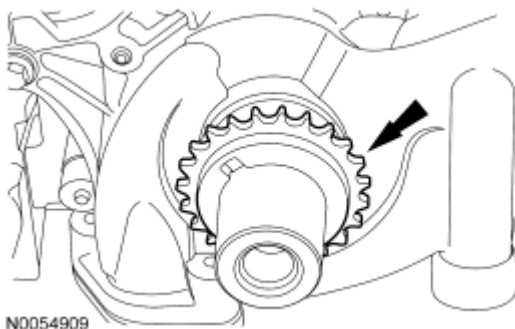
11. Remove the primary timing chain.



N0054908

Fig. 96: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

12. Remove the crankshaft timing chain sprocket.



N0054909

Fig. 97: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

13. Remove the 2 bolts and the upper LH primary timing chain guide.

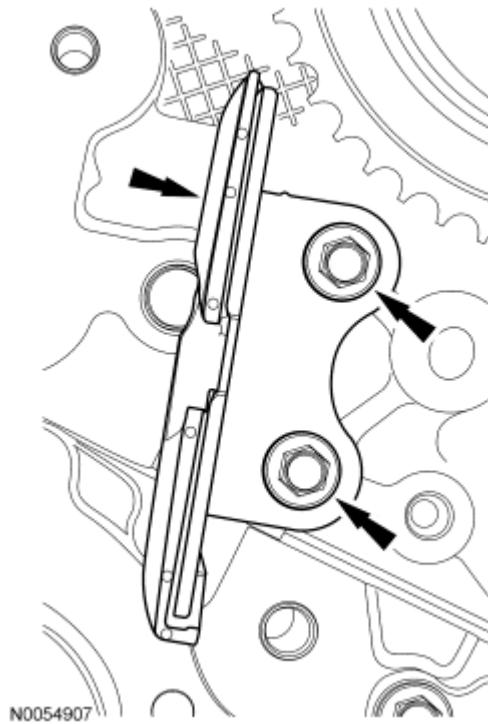


Fig. 98: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

14. Compress the LH secondary timing chain tensioner and install a suitable lockpin to retain the tensioner in the collapsed position.

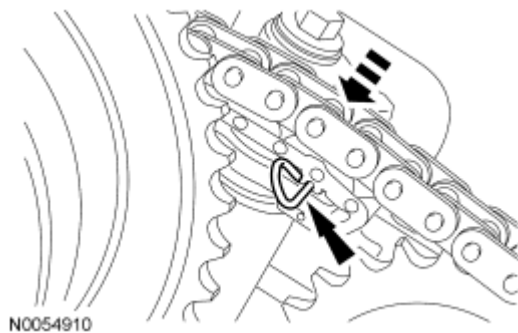


Fig. 99: Compressing LH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

NOTE: The VCT bolt and the exhaust camshaft bolt must be discarded and new ones installed. However, the exhaust camshaft washer is reusable.

15. Remove and discard the LH VCT assembly bolt and the LH exhaust camshaft sprocket bolt.
 - Remove the LH VCT assembly, secondary timing chain and the LH exhaust camshaft sprocket as an assembly.

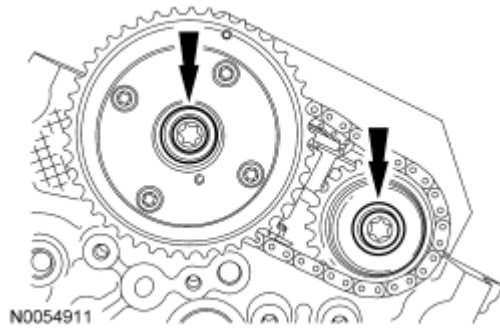


Fig. 100: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

NOTE: It is necessary to tilt the special tool toward the rear of the engine to access the rearmost secondary timing chain tensioner bolt.

16. Remove the 2 bolts and the LH secondary timing chain tensioner.

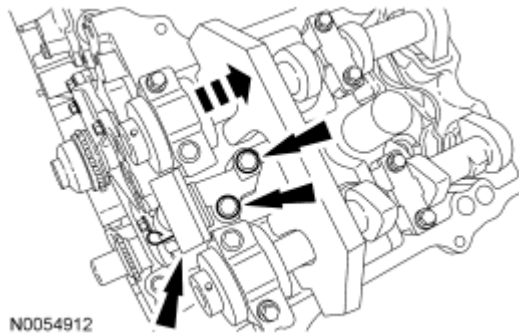


Fig. 101: Locating LH Secondary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

17. Compress the RH secondary timing chain tensioner and install a suitable lockpin to retain the tensioner in the collapsed position.

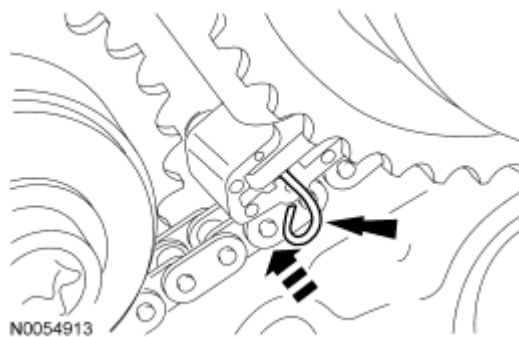


Fig. 102: Compressing RH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

NOTE: The VCT bolt and the exhaust camshaft bolt must be discarded and new ones installed. However, the exhaust camshaft washer is reusable.

18. Remove and discard the RH VCT assembly bolt and the RH exhaust camshaft sprocket bolt.
- Remove the RH VCT assembly, secondary timing chain and the RH exhaust camshaft sprocket as an assembly.

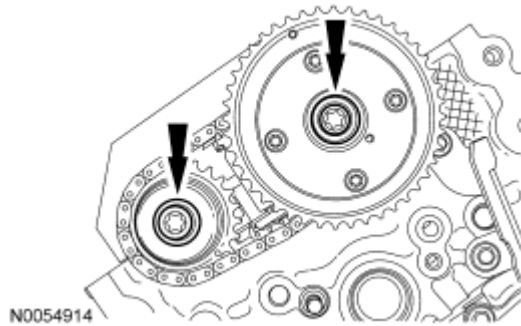


Fig. 103: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

NOTE: It is necessary to tilt the special tool toward the rear of the engine to access the rearmost secondary timing chain tensioner bolt.

19. Remove the 2 bolts and the RH secondary timing chain tensioner.

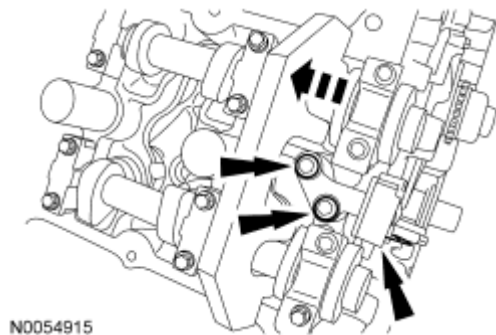


Fig. 104: Locating RH Secondary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

20. Remove the 2 bolts and the RH primary timing chain guide.

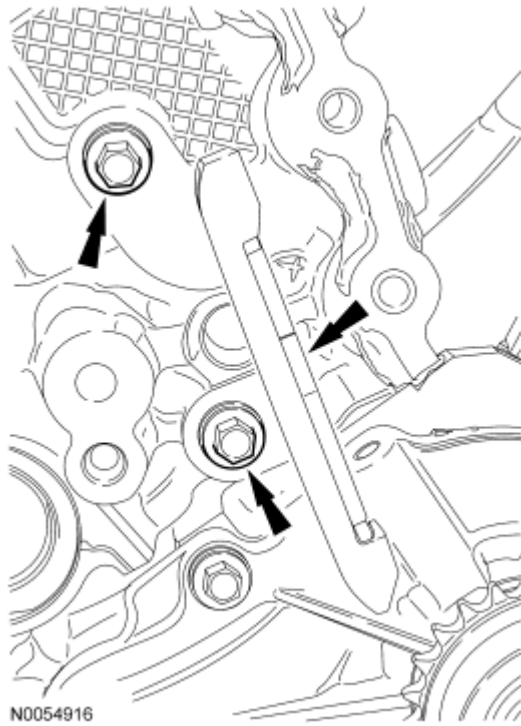


Fig. 105: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

INSTALLATION

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

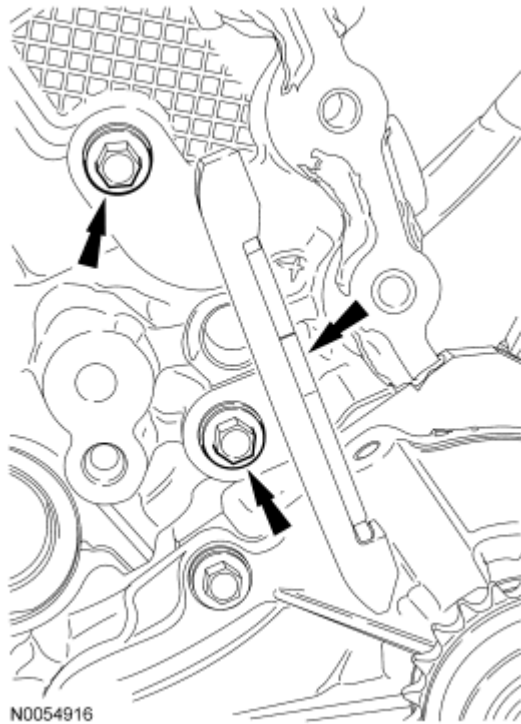


Fig. 106: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

NOTE: It is necessary to tilt the special tool toward the rear of the engine to access the rearmost secondary timing chain tensioner bolt.

2. Install the RH secondary timing chain tensioner and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

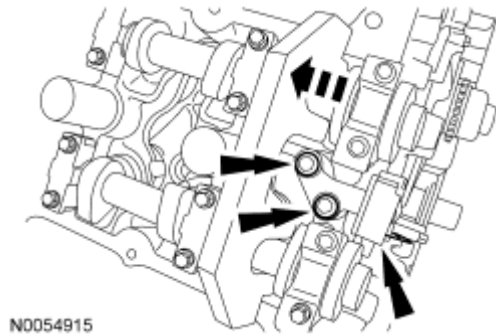


Fig. 107: Locating RH Secondary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

3. Assemble the RH VCT assembly, the RH exhaust camshaft sprocket and the RH secondary timing chain.
 - Align the colored links with the timing marks.

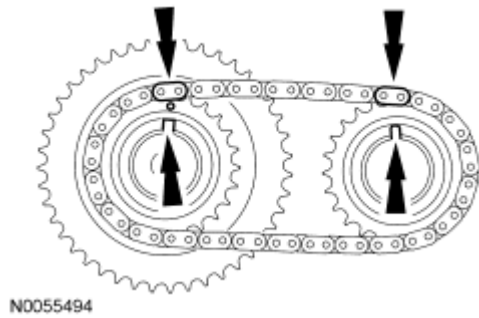


Fig. 108: Aligning RH Exhaust Camshaft Sprocket & RH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

4. Position the RH secondary timing assembly onto the camshafts.

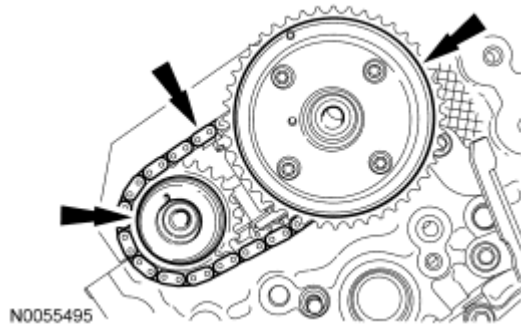


Fig. 109: Positioning RH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

5. Install the new VCT bolt and new exhaust camshaft bolt and the original washers. Tighten in 4 stages.
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 10 Nm (89 lb-in).
 - Stage 4: Tighten 90 degrees.

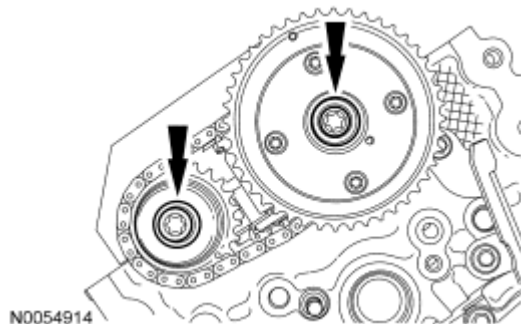


Fig. 110: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

6. Remove the lockpin from the RH secondary timing chain tensioner.

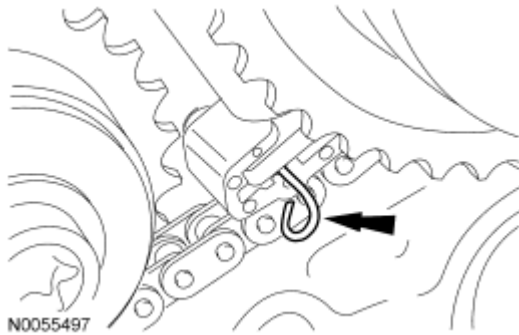


Fig. 111: Identifying Lock Pin On RH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

NOTE: It is necessary to tilt the special tool toward the rear of the engine to access the rearmost secondary timing chain tensioner bolt.

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

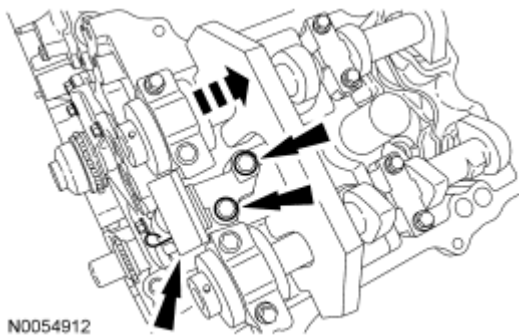


Fig. 112: Locating LH Secondary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

8. Assemble the LH VCT assembly, the LH exhaust camshaft sprocket and the LH secondary timing chain.
 - Align the colored links with the timing marks.

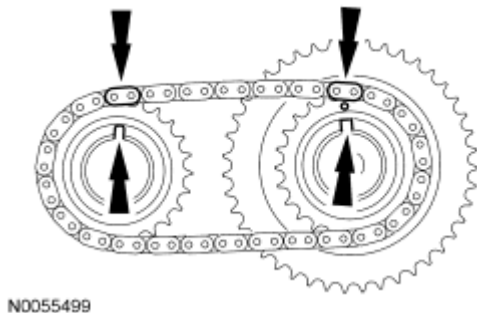


Fig. 113: Aligning LH Exhaust Camshaft Sprocket & LH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

9. Position the LH secondary timing assembly onto the camshafts.

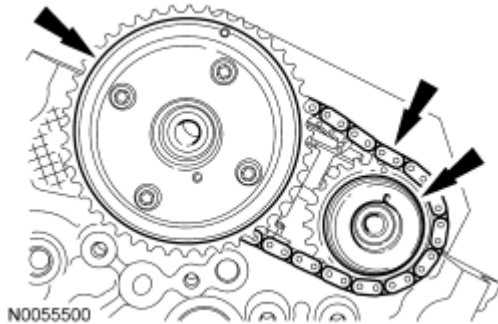


Fig. 114: Positioning LH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

10. Install the new VCT bolt and new exhaust camshaft bolt and the original washers. Tighten in 4 stages.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 10 Nm (89 lb-in).
 - Stage 4: Tighten 90 degrees.

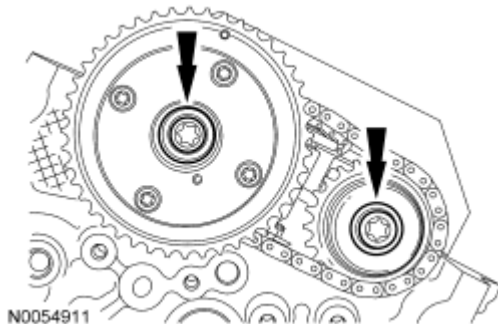


Fig. 115: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

11. Remove the lockpin from the LH secondary timing chain tensioner.

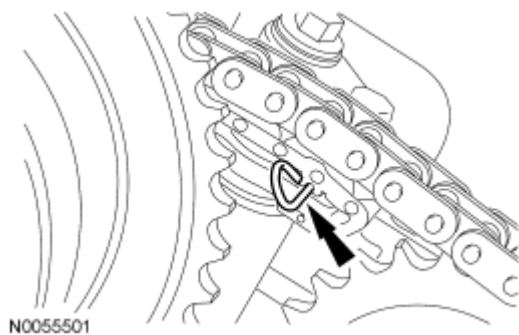


Fig. 116: Locating Lock Pin On LH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

12. Install the crankshaft timing chain sprocket.

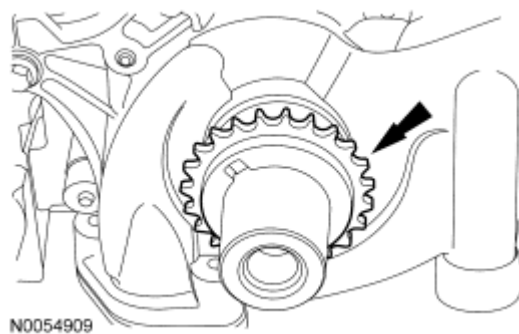
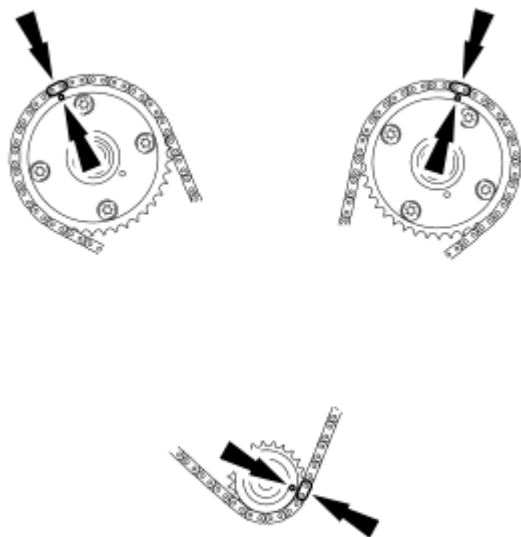


Fig. 117: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

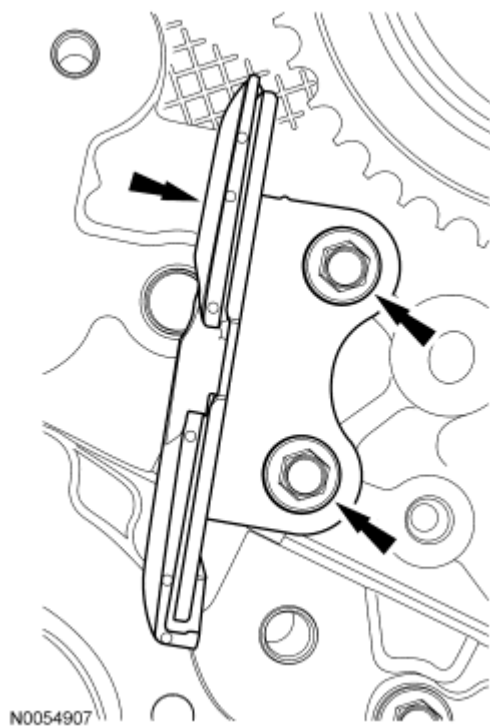
13. Install the primary timing chain with the colored links aligned with the timing marks on the VCT assemblies and the crankshaft sprocket.



N0055503

Fig. 118: Aligning Timing Marks On VCT Assemblies & Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

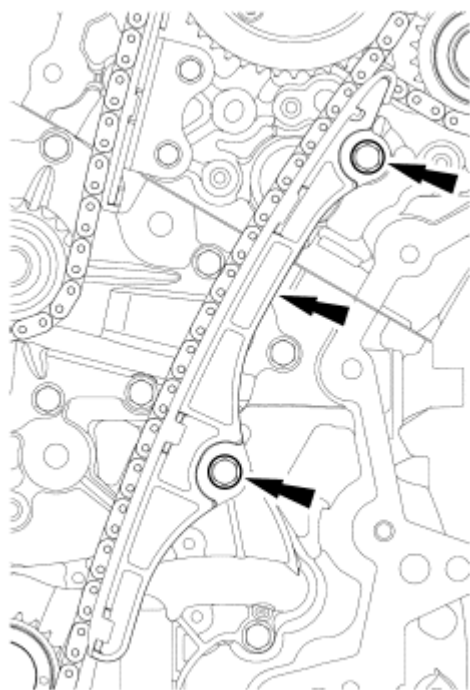
14. Install the upper LH primary timing chain guide and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0054907

Fig. 119: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

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



N0054906

Fig. 120: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

16. Install the primary timing chain tensioner arm.

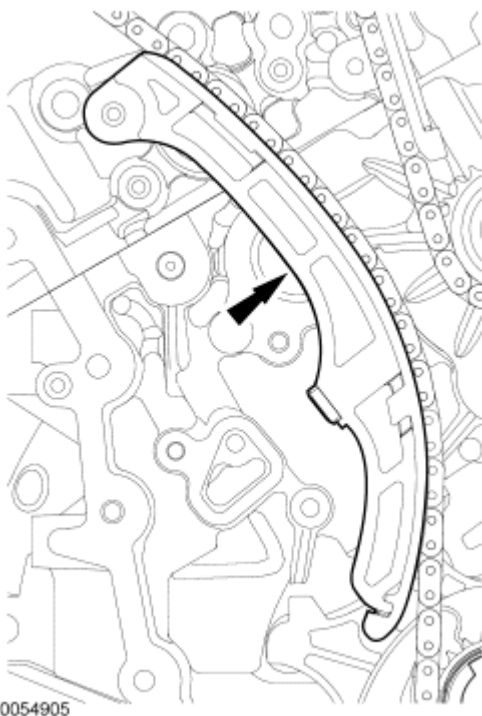
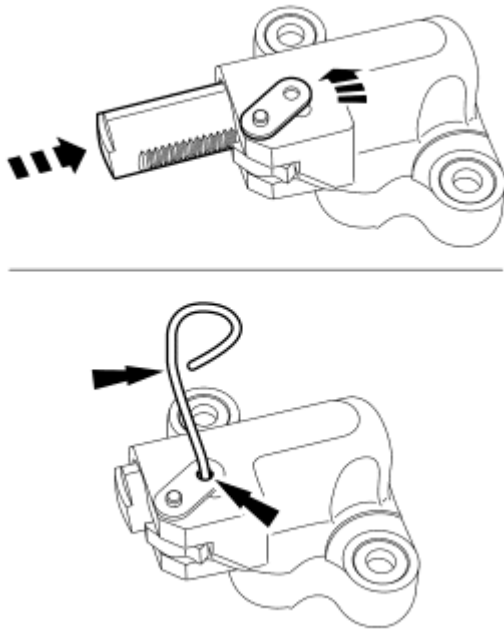


Fig. 121: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

17. Reset the primary timing chain tensioner.
 - Rotate the lever counterclockwise.
 - Using a soft-jawed vise, compress the plunger.
 - Align the hole in the lever with the hole in the tensioner housing.
 - Install a suitable lockpin.

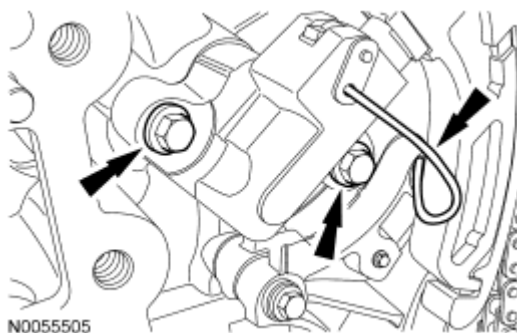


N0055504

Fig. 122: Compressing Plunger Using A Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

NOTE: It may be necessary to rotate the crankshaft slightly to remove slack from the timing chain and install the tensioner.

18. Install the primary tensioner and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).
 - Remove the lockpin.



N0055505

Fig. 123: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

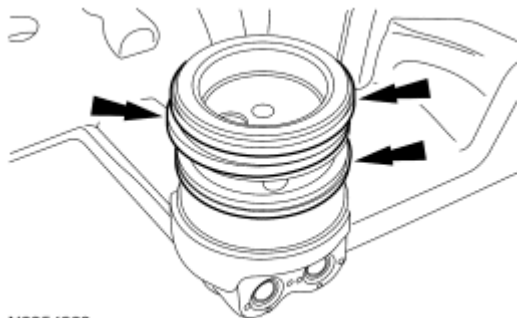
19. As a post-check, verify correct alignment of all timing marks.



N0055496

Fig. 124: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

20. Install new VCT housing seals.



N0054903

Fig. 125: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

NOTE: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

21. Install the LH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

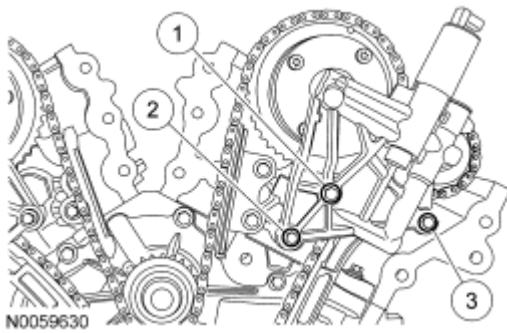


Fig. 126: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

22. Install the RH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

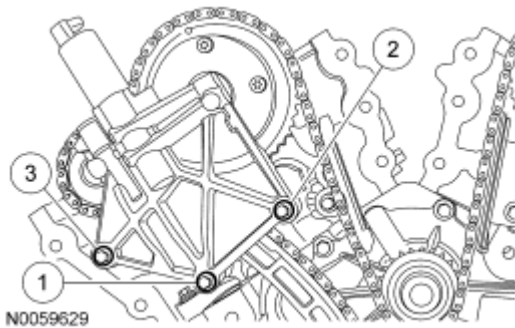


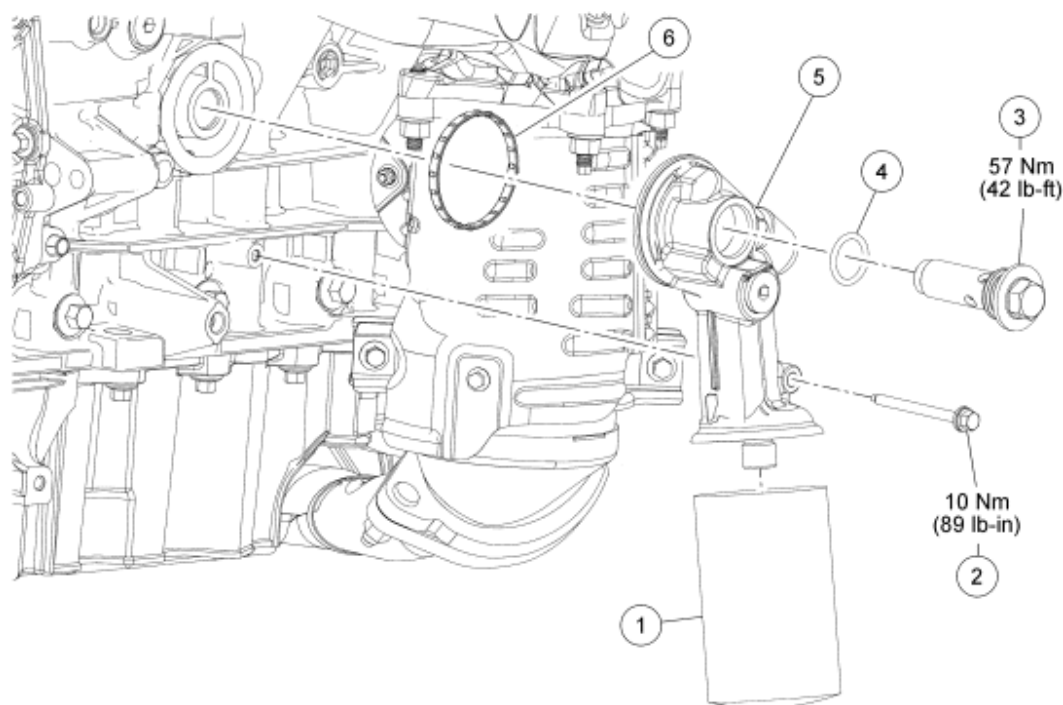
Fig. 127: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

23. Install the engine front cover. For additional information, refer to **Engine Front Cover**.

OIL FILTER ADAPTER

MATERIAL

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



N0055591

Fig. 128: Exploded View Of Oil Filter Adapter With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6714	Engine oil filter
2	W708607	Oil filter adapter bolt
3	6895	Oil filter adapter bolt
4	6K649	O-ring seal
5	6881	Oil filter adapter
6	6A636	Oil filter adapter gasket

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING AND LIFTING** article.
2. Remove and discard the engine oil filter.
3. Remove the 2 bolts and the oil filter adapter.
 - Discard the gasket and O-ring seal.
 - Clean and inspect all sealing surfaces.

INSTALLATION

1. Using a new gasket and O-ring seal, install the oil filter adapter.
 - Tighten the large bolt to 57 Nm (42 lb-ft).

- Tighten the small bolt to 10 Nm (89 lb-in).

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

2. Install a new engine oil filter.

- Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

ENGINE OIL PRESSURE (EOP) SWITCH

MATERIAL

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

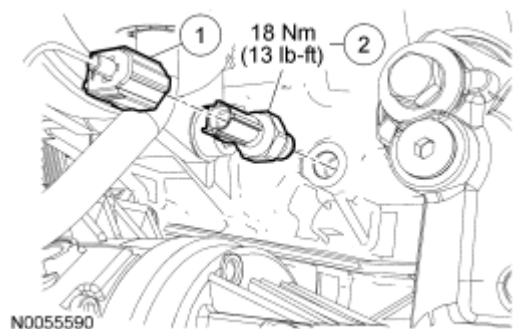


Fig. 129: Exploded View Of Engine Oil Pressure (EOP) Switch With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Engine oil pressure (EOP) switch electrical connector (part of 12C508)
2	9278	EOP switch

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 engine oil pressure (EOP) switch electrical connector.
3. Remove the EOP switch.
 - To install, tighten to 18 Nm (13 lb-ft).
4. To install, reverse the removal procedure.
 - Apply thread sealant with PTFE to the EOP switch threads prior to installation.

EXHAUST MANIFOLD - LH

MATERIAL

Item	Specification
Motorcraft Metal Surface Prep ZC-31	-

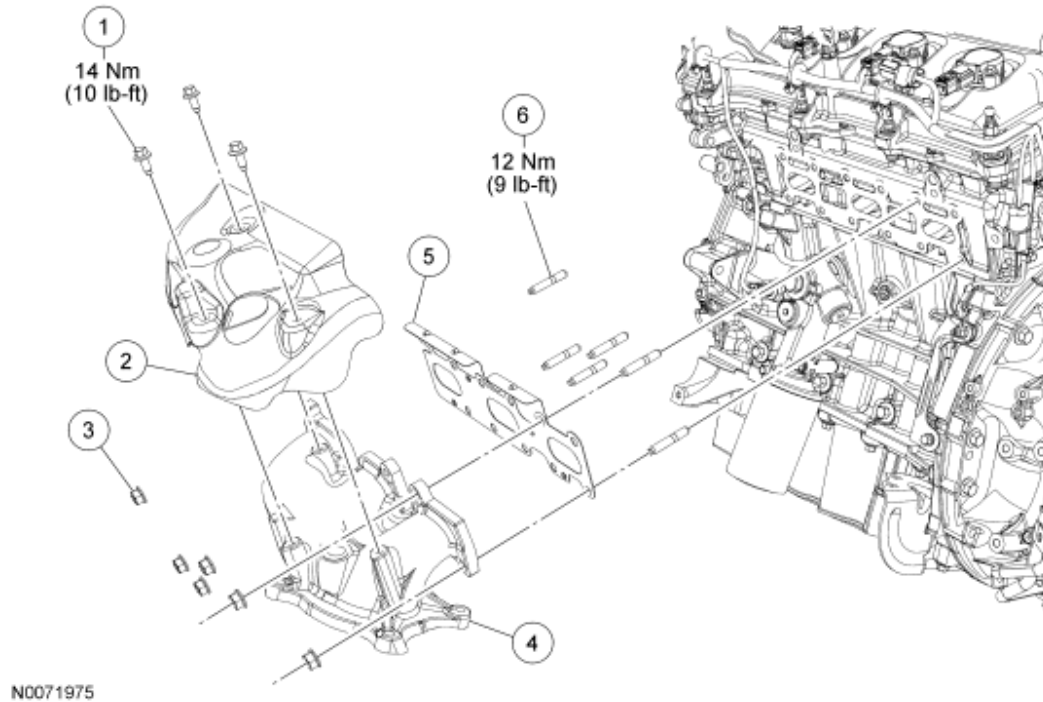


Fig. 130: Exploded View Of Exhaust Manifold With Torque Specifications - LH
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W713299	LH exhaust manifold heat shield bolt (3 required)
2	9Y427	LH exhaust manifold heat shield
3	W701706	LH exhaust manifold nut (6 required)
4	9431	LH exhaust manifold
5	9448	LH exhaust manifold gasket
6	W701732	LH exhaust manifold stud (6 required)

REMOVAL

1. Remove the LH catalytic converter. For additional information, refer to **EXHAUST SYSTEM** article.
2. Remove the LH heated oxygen sensor (HO2S). For additional information, refer to **ELECTRONIC ENGINE CONTROLS** article.
3. Remove the 3 bolts and the LH exhaust manifold heat shield.
4. Remove the 6 nuts and the LH exhaust manifold.

- 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.

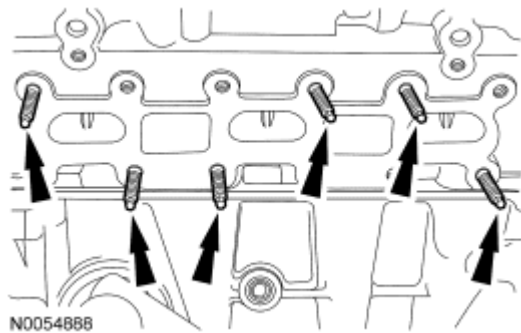


Fig. 131: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These may cause scratches and gouges resulting in leak paths. Use a plastic scraper to clean the sealing surfaces.

- 7. Clean the exhaust manifold mating surface of the cylinder head with metal surface prep. Follow the directions on the packaging.

INSTALLATION

- 1. Install 6 new LH exhaust manifold studs.
 - Tighten to 12 Nm (9 lb-ft).

NOTE: Failure to tighten the exhaust manifold nuts to specification a second time will cause the exhaust manifold to develop an exhaust leak.

- 2. Using a new gasket, install the LH exhaust manifold and 6 new nuts. Tighten in 2 stages in the sequence shown in illustration:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 20 Nm (15 lb-ft).

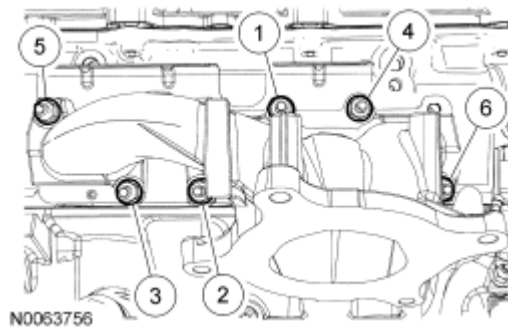


Fig. 132: Installing LH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

3. Install the LH exhaust manifold heat shield and the 3 bolts.
 - Tighten to 14 Nm (10 lb-ft).
4. Install the LH HO2S. For additional information, refer to [ELECTRONIC ENGINE CONTROLS](#) article.
5. Install the LH catalytic converter. For additional information, refer to [EXHAUST SYSTEM](#) article.

EXHAUST MANIFOLD - RH

MATERIAL

Item	Specification
Motorcraft Metal Surface Prep ZC-31	-

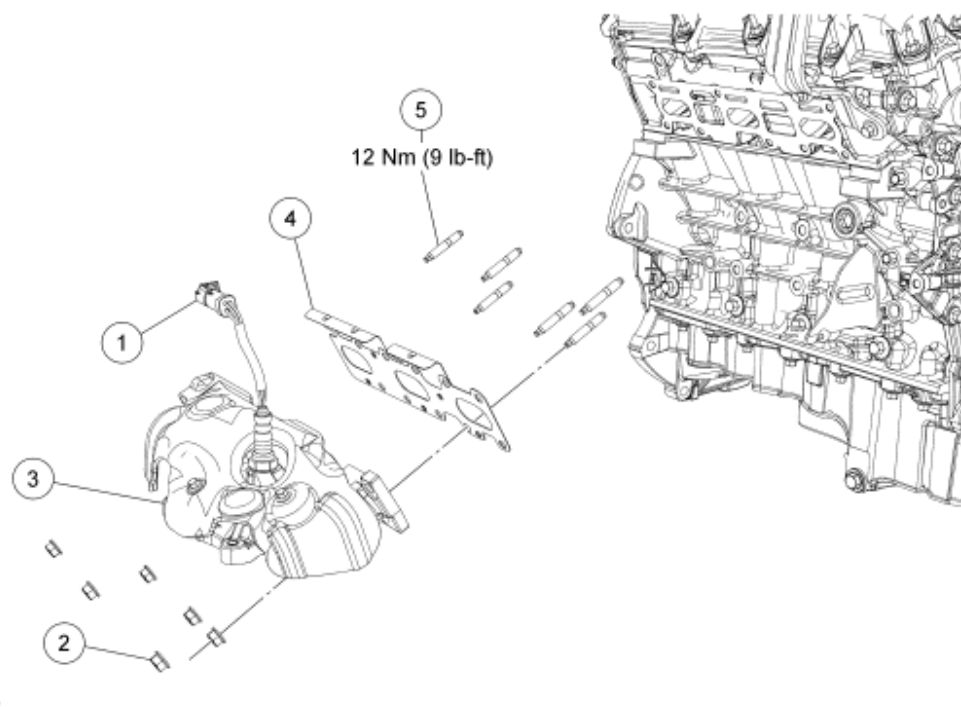


Fig. 133: Exploded View Of Exhaust Manifold - RH With Torque Specification
 Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	RH heated oxygen sensor (HO2S) electrical connector
2	W701706	RH exhaust manifold nut (6 required)
3	9430	RH exhaust manifold
4	9448	RH exhaust manifold gasket
5	W701732	RH exhaust manifold stud (6 required)

REMOVAL

1. Remove the RH catalytic converter. For additional information, refer to **EXHAUST SYSTEM** article.
2. Disconnect the RH heated oxygen sensor (HO2S) electrical connector.
3. Remove the 6 nuts and the RH exhaust manifold.
 - 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.

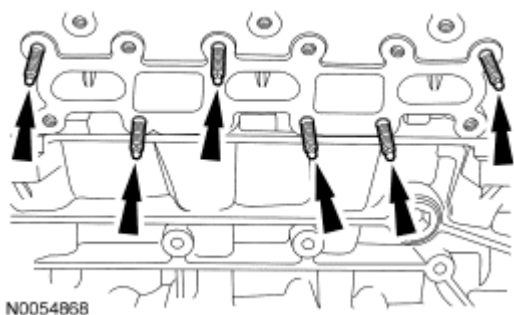


Fig. 134: Locating RH Exhaust Manifold Studs
 Courtesy of FORD MOTOR CO.

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These may cause scratches and gouges resulting in leak paths. Use a plastic scraper to clean the sealing surfaces.

6. Clean the exhaust manifold mating surface of the cylinder head with metal surface prep. Follow the directions on the packaging.

INSTALLATION

1. Install 6 new RH exhaust manifold studs.

- Tighten to 12 Nm (9 lb-ft).

NOTE: Failure to tighten the exhaust manifold nuts to specification a second time will cause the exhaust manifold to develop an exhaust leak.

- Using a new gasket, install the RH exhaust manifold and 6 new nuts. Tighten in 2 stages in the sequence shown in illustration:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 20 Nm (15 lb-ft).

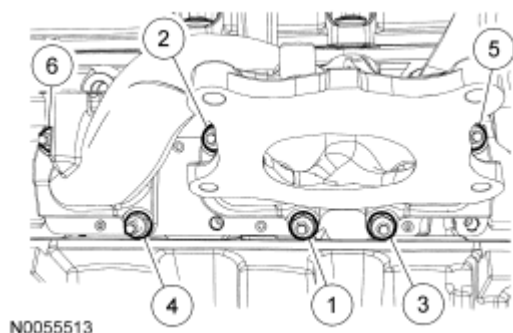


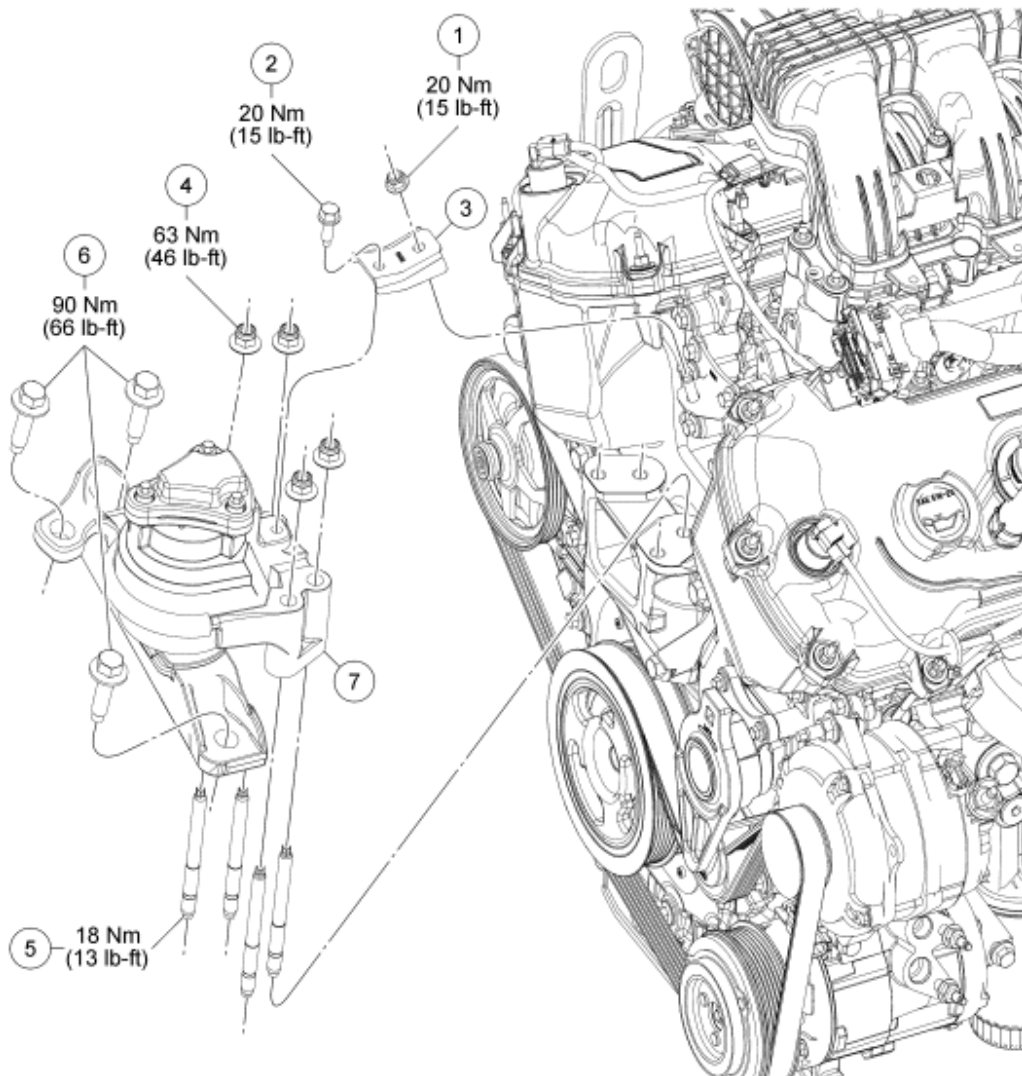
Fig. 135: Installing RH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

- Connect the RH HO2S electrical connector.
- Install the RH catalytic converter. For additional information, refer to **EXHAUST SYSTEM** article.

ENGINE MOUNT

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
	Oil Pan Holding Fixture	303-1295



N0072204

Fig. 136: Engine Mount Components With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W520102	Engine mount brace nut
2	W712511	Engine mount brace bolt
3	6K075	Engine mount brace
4	W712334	Engine mount-to-engine nut (4 required)
5	W711914	Engine mount stud (4 required)
6	W712507	Engine mount-to-frame bolt (3 required)
7	6F012	Engine mount

REMOVAL AND INSTALLATION

1. Remove the exhaust flexible pipe. For additional information, refer to **EXHAUST SYSTEM** article.

NOTE: The special tool must be carefully aligned to the mounting bosses on the oil pan. Failure to follow these instructions may result in damage to the oil pan.

2. Position a floor jack and the special tool under the oil pan.

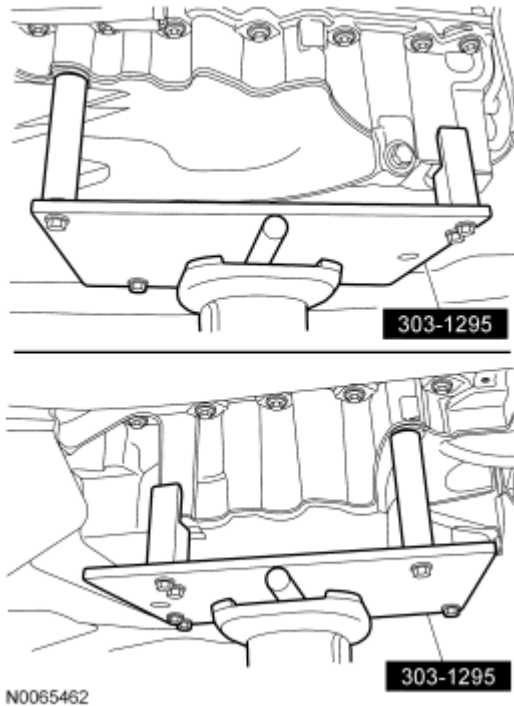
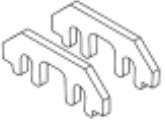


Fig. 137: Positioning Floor Jack & Special Tool (303-1295) Under Oil Pan
Courtesy of FORD MOTOR CO.

3. Remove the engine coolant degas bottle. For additional information, refer to **ENGINE COOLING** article.
4. Remove the nut, bolt and engine mount brace.
 - To install, tighten to 20 Nm (15 lb-ft).
5. Remove the 4 engine mount nuts.
 - To install, tighten to 63 Nm (46 lb-ft).
6. Remove the 4 engine mount studs.
 - To install, tighten to 18 Nm (13 lb-ft).
7. Remove the 3 bolts and the engine mount.
 - To install, tighten to 90 Nm (66 lb-ft).
8. To install, reverse the removal procedure.

OIL PUMP

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST2979-A	Camshaft Alignment Tool	303-1248

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 may cause engine failure.

1. Remove the engine front cover. For additional information, refer to Engine Front Cover.
2. Rotate the crankshaft clockwise and align the timing marks on the variable camshaft timing (VCT) assemblies as shown in illustration.

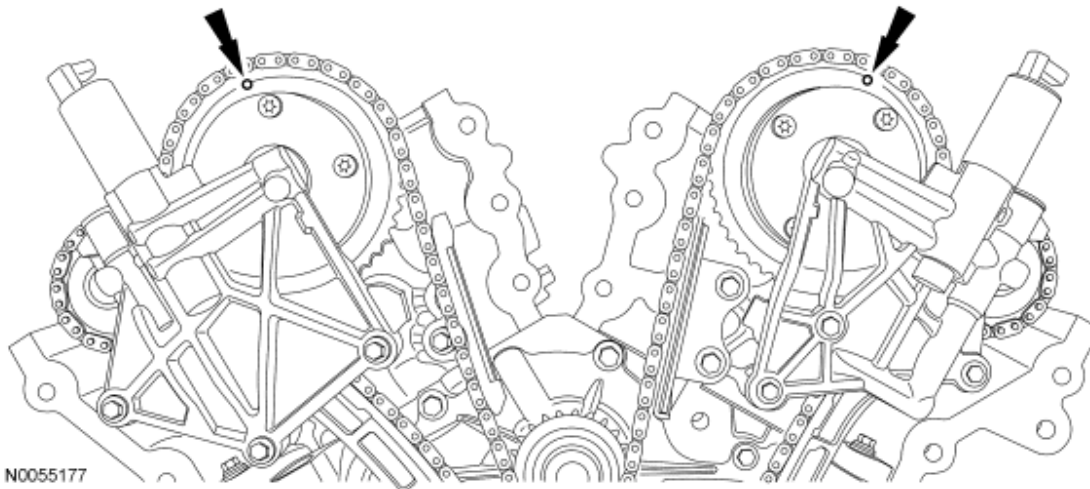


Fig. 138: Aligning Timing Marks On Variable Camshaft Timing (VCT) Assemblies
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the top dead center (TDC) position.

3. Install the special tool onto the flats of the LH camshafts.

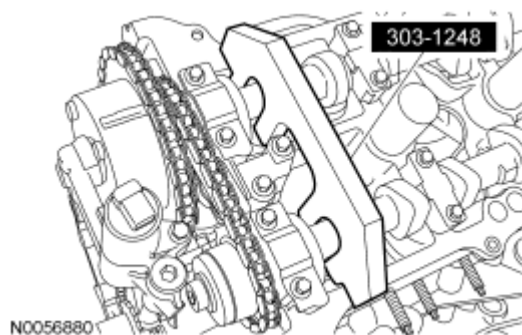


Fig. 139: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the TDC position.

4. Install the special tool onto the flats of the RH camshafts.

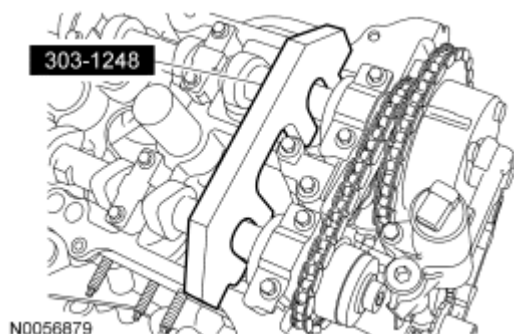


Fig. 140: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

5. Remove the 3 bolts and the RH VCT housing.

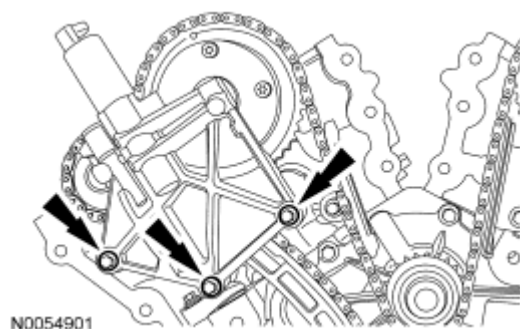


Fig. 141: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

6. Remove the 3 bolts and the LH VCT housing.

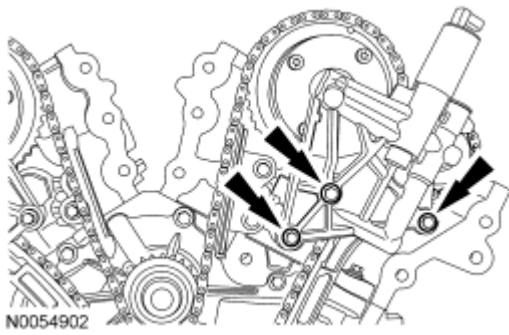


Fig. 142: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

7. Remove and discard the VCT housing seals.

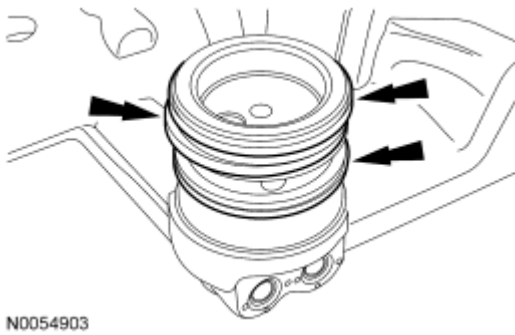


Fig. 143: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

8. Remove the 2 bolts and the primary timing chain tensioner.

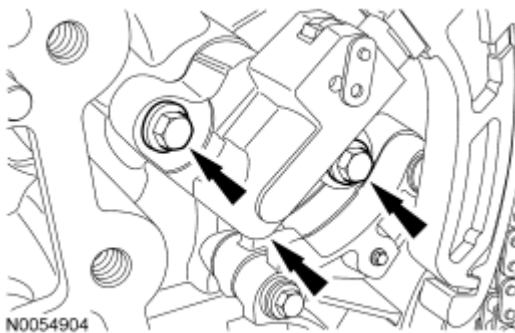


Fig. 144: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

9. Remove the primary timing chain tensioner arm.



Fig. 145: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

10. Remove the 2 bolts and the lower LH primary timing chain guide.

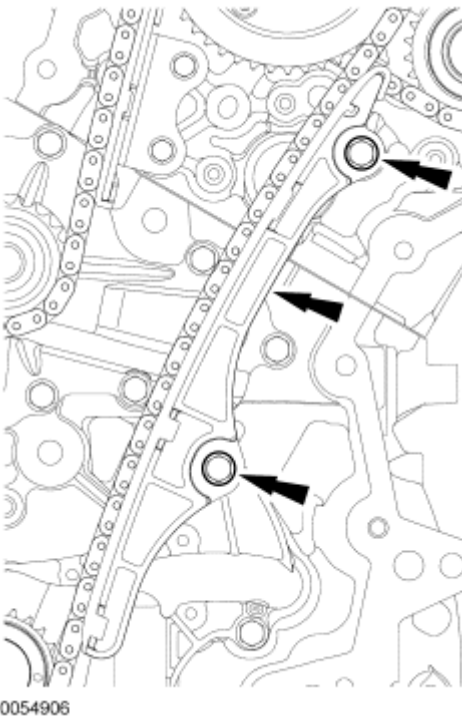
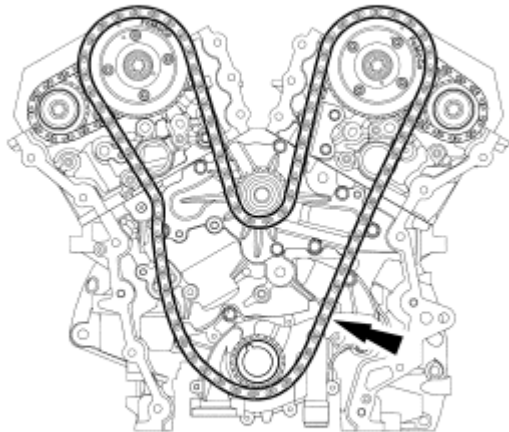


Fig. 146: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

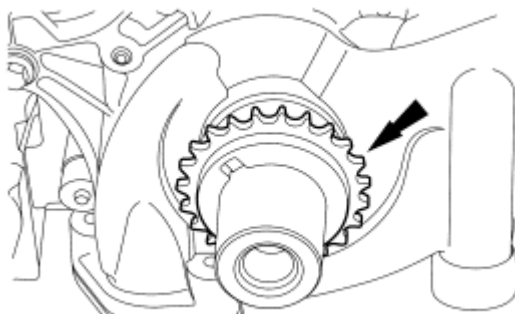
11. Remove the primary timing chain.



N0054908

Fig. 147: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

12. Remove the crankshaft timing chain sprocket.



N0054909

Fig. 148: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

13. Remove the 2 oil pump screen and pickup tube bolts.

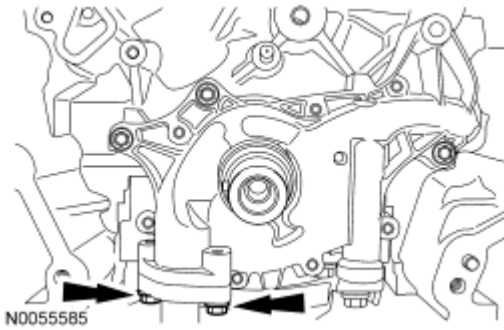


Fig. 149: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

14. Remove the 3 oil pump bolts.
 - Rotate the oil pump clockwise and separate the oil pump from the oil pump screen and pickup tube.
 - Remove the oil pump.
 - Discard the oil pump screen and pickup tube O-ring seal.

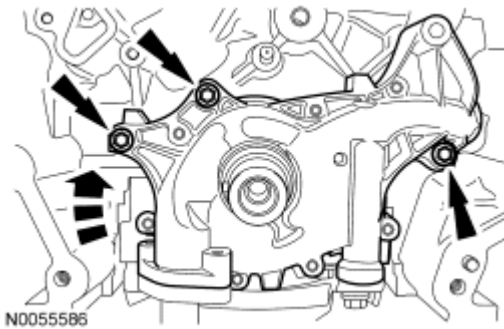


Fig. 150: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

INSTALLATION

NOTE: Install a new oil pump screen and pickup tube O-ring seal prior to installing the oil pump.

1. Position the oil pump onto the crankshaft and rotate counterclockwise to position the pump onto the oil pump screen and pickup tube.
 - Install the 3 bolts and tighten to 10 Nm (89 lb-in).

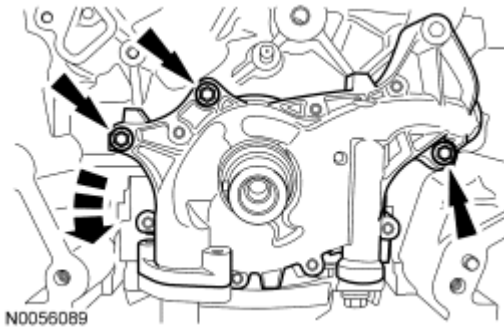


Fig. 151: Locating Oil Pump Screen & Pickup Tube Bolts & Rotating Oil Pump Counterclockwise
Courtesy of FORD MOTOR CO.

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

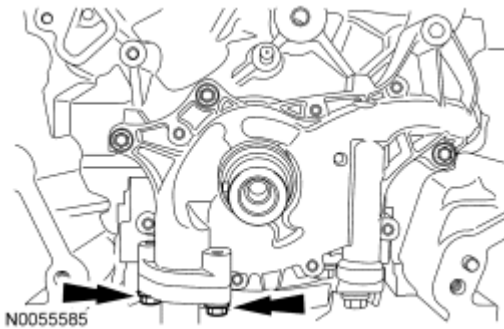


Fig. 152: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

3. Install the crankshaft timing chain sprocket.

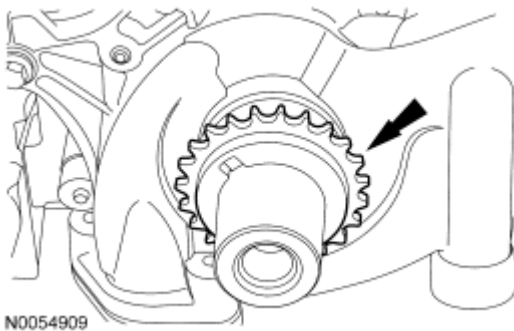
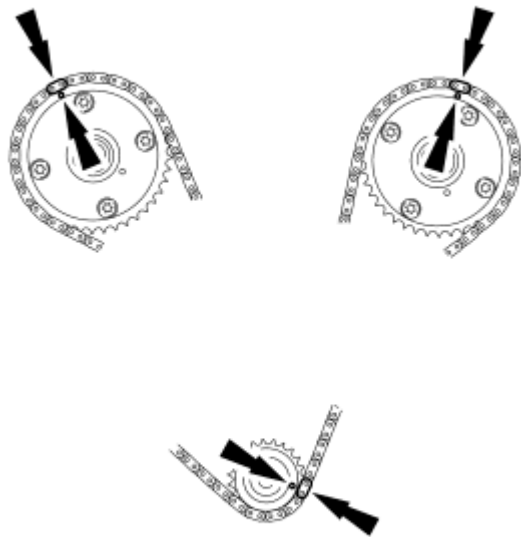


Fig. 153: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

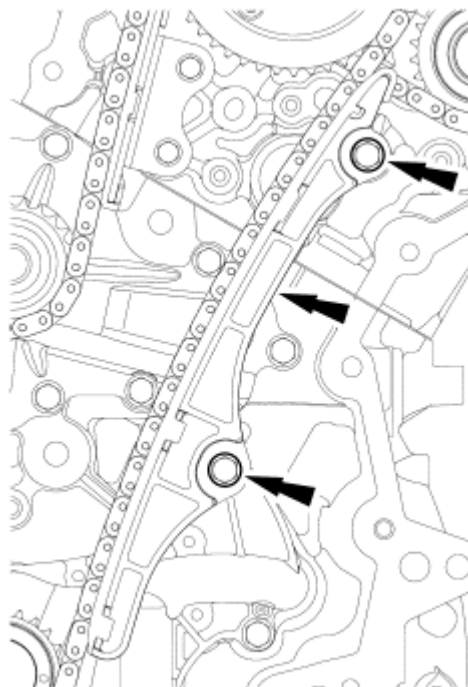
4. Install the primary timing chain with the colored links aligned with the timing marks on the VCT assemblies and the crankshaft sprocket.



N0055503

Fig. 154: Aligning Timing Marks On VCT Assemblies & Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

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



N0054906

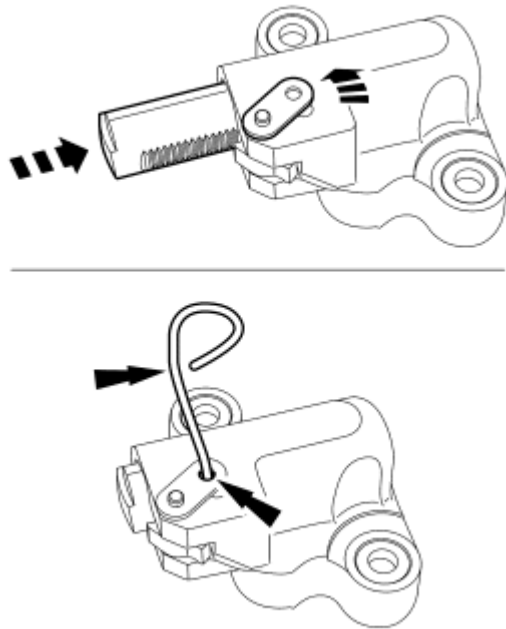
Fig. 155: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

6. Install the primary timing chain tensioner arm.



Fig. 156: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

7. Reset the primary timing chain tensioner.
 - Rotate the lever counterclockwise.
 - Using a soft-jawed vise, compress the plunger.
 - Align the hole in the lever with the hole in the tensioner housing.
 - Install a suitable lockpin.

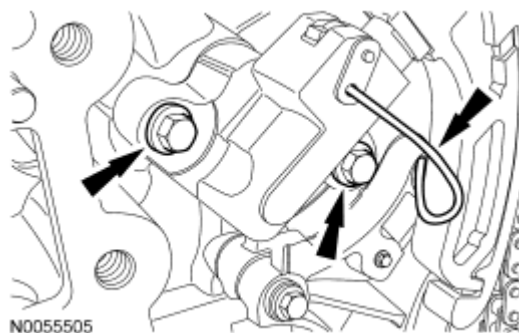


N0055504

Fig. 157: Compressing Plunger Using A Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

NOTE: It may be necessary to rotate the crankshaft slightly to remove slack from the timing chain and install the tensioner.

8. Install the primary tensioner and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).
 - Remove the lockpin.



N0055505

Fig. 158: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

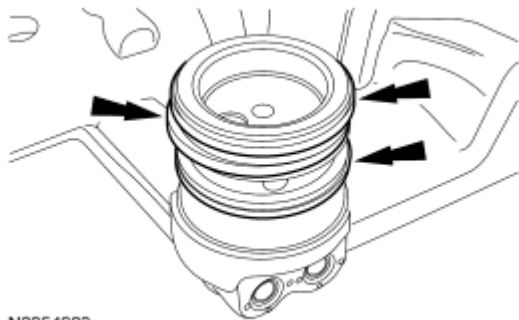
9. As a post-check, verify correct alignment of all timing marks.



N0055496

Fig. 159: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

10. Install new VCT housing seals.



N0054903

Fig. 160: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

NOTE: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

11. Install the LH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

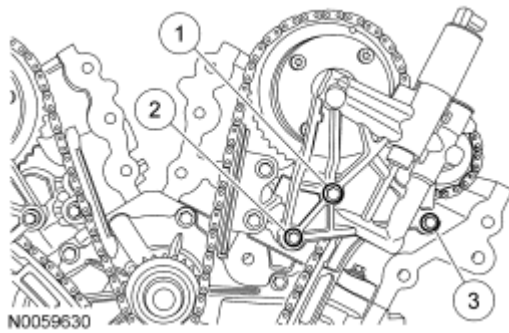


Fig. 161: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

12. Install the RH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

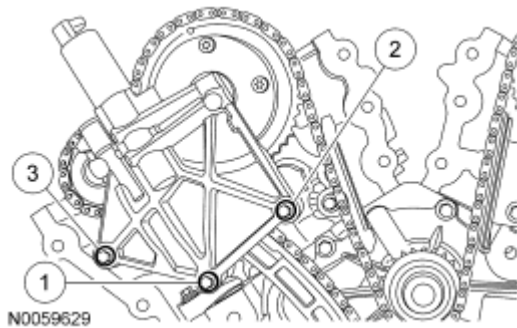


Fig. 162: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

13. Install the engine front cover. For additional information, refer to Engine Front Cover.

REMOVAL

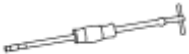
ENGINE

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
	Disconnect Tool, Transmission Cooler Line	307-569

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST2976A	Engine Lifting Bracket	303-1245
 ST1341-A	Heavy Duty Floor Crane	014-00071 or equivalent
 ST1293-A	Powertrain Lift	014-00765
 ST2272-A	Remover, Front Wheel Hub	205-D070 (D93P-1175-B) or equivalent
 ST2939-A	Remover, Halfshaft (Extension)	205-243 (T89P-3415-A)
 ST2038-A	Remover, Halfshaft (Plate)	205-290 (T89P-3415-B)
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)
 ST1602-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent

 ST2743A	Universal Adapter Brackets	014-0001
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WARNING: Do not smoke, carry lighted tobacco or have an open flame of any type when working on or near any fuel-related component. Highly flammable mixtures are always present and may be ignited. Failure to follow these instructions may result in serious personal injury.

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. Recover the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article.
4. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
5. Remove the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
6. Remove the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
7. Disconnect the power steering cooler tube and drain the power steering fluid into a suitable container.

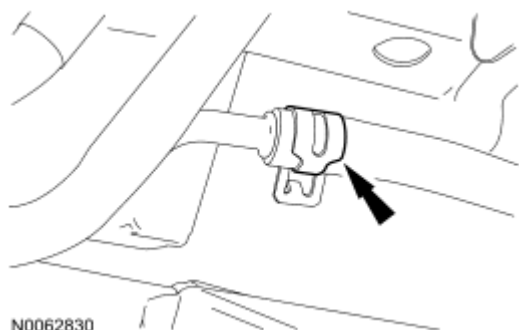


Fig. 163: Identifying Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

8. Remove the degas bottle. For additional information, refer to **ENGINE COOLING** article.
9. Remove the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
10. Remove the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
11. Detach the 4 pin-type wiring harness fasteners from the side of the battery tray.

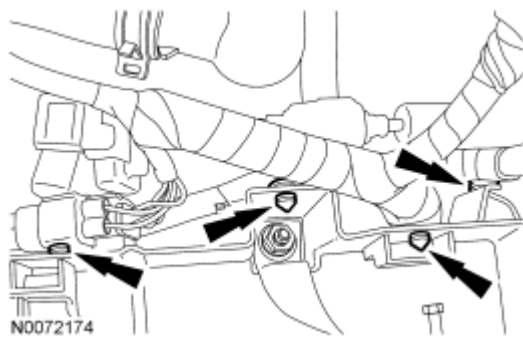


Fig. 164: Identifying Fasteners
Courtesy of FORD MOTOR CO.

12. Detach the 2 pin-type wiring harness fasteners from the front of the battery tray.

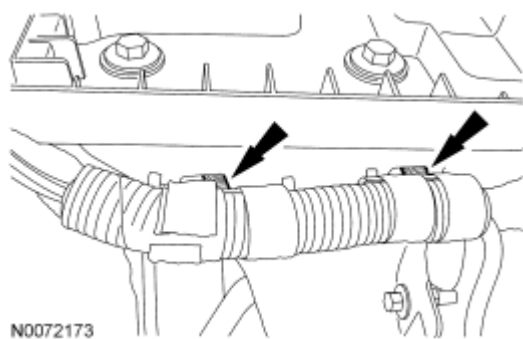


Fig. 165: Identifying Fasteners
Courtesy of FORD MOTOR CO.

13. Remove the 2 lower battery tray bracket bolts.

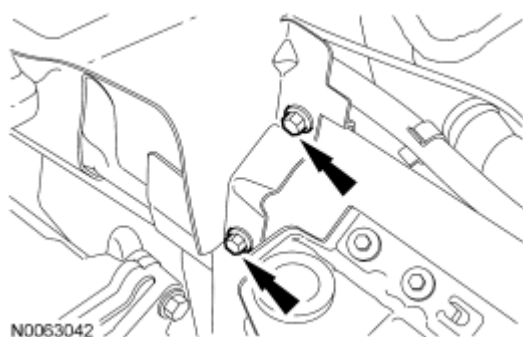


Fig. 166: Identifying Bolts
Courtesy of FORD MOTOR CO.

14. Remove the nut, bolt and the battery tray and bracket.

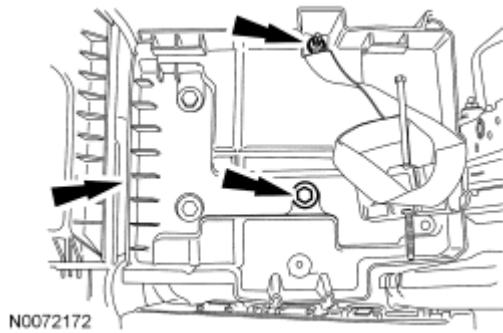


Fig. 167: Identifying Bolt, Nut And Bracket
Courtesy of FORD MOTOR CO.

15. Disconnect the engine wiring harness electrical connector.

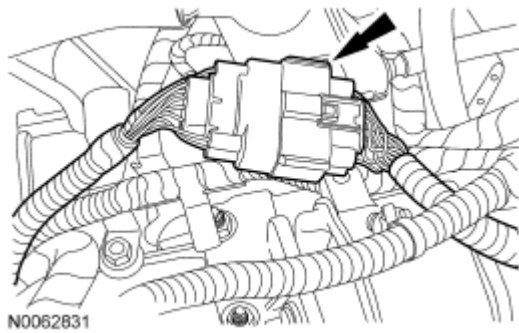


Fig. 168: Identifying Connector
Courtesy of FORD MOTOR CO.

16. Remove the nut and disconnect the power feed wire from the positive battery terminal.

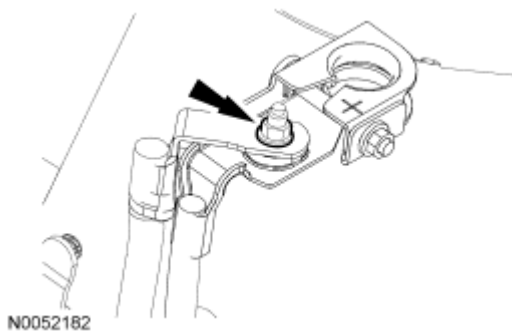


Fig. 169: Identifying Nut
Courtesy of FORD MOTOR CO.

17. Remove the nut and disconnect the ground cable from the negative battery terminal.

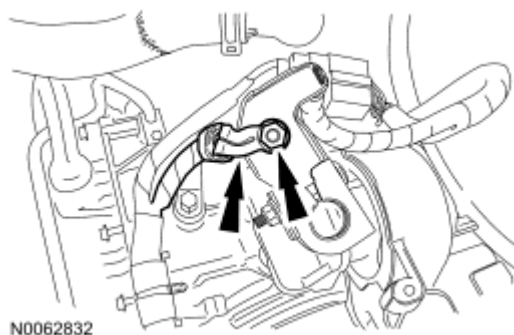


Fig. 170: Identifying Nut And Ground Cable
Courtesy of FORD MOTOR CO.

18. Disconnect the vacuum hose and the evaporative emissions (EVAP) tube from the upper intake manifold.

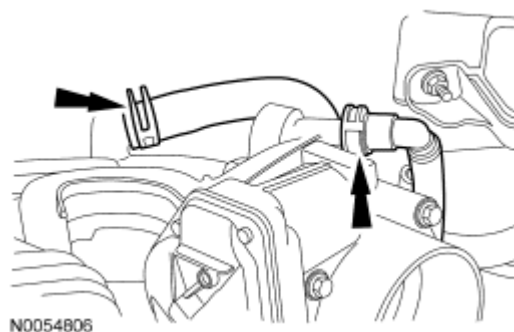


Fig. 171: Locating Vacuum Hose & Evaporative Emissions (EVAP) Tube From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

19. Detach the EVAP tube pin-type retainer from the upper intake manifold.

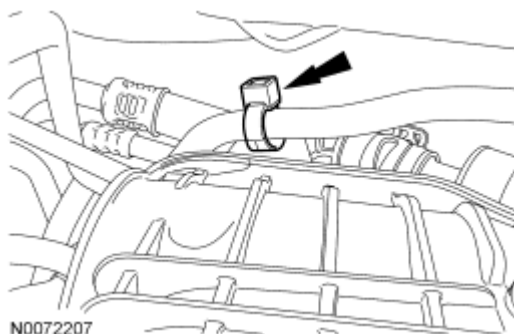


Fig. 172: Identifying pin-Type Retainer
Courtesy of FORD MOTOR CO.

20. Disconnect the upper radiator hose, lower radiator hose and 2 heater hoses from the thermostat housing.

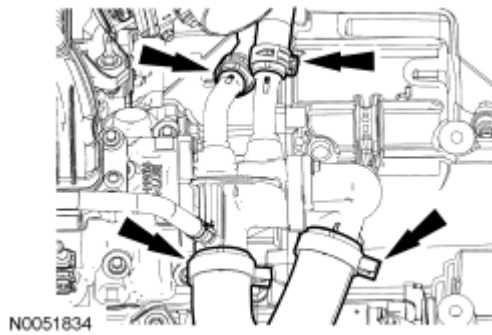


Fig. 173: Locating Upper Radiator Hose, Lower Radiator Hose & Heater Hoses
Courtesy of FORD MOTOR CO.

21. Disconnect the transaxle control cable from the control lever.

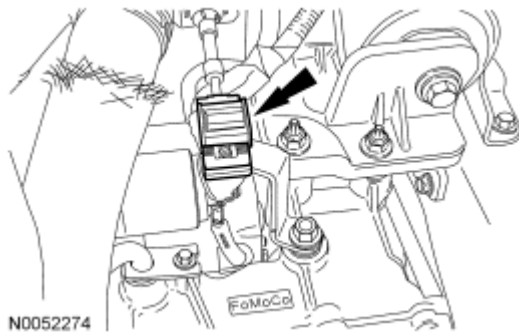


Fig. 174: Locating Selector Lever Cable End From Manual Lever
Courtesy of FORD MOTOR CO.

22. Disconnect the transaxle control cable from the shift cable bracket and detach the 2 wiring harness pin-type retainers.

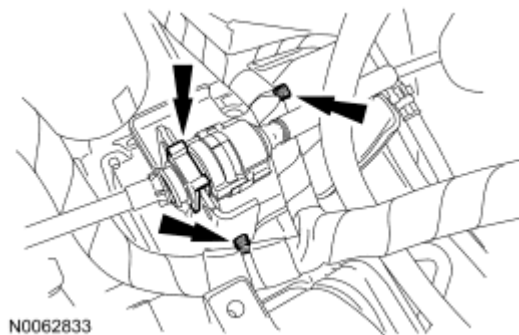


Fig. 175: Identifying Control Cable And Pin-Type Retainers
Courtesy of FORD MOTOR CO.

23. If equipped, detach the engine block heater harness from the radiator support and the power steering tube.
24. Disconnect the A/C pressure switch and remove the nut and disconnect the upper A/C tube from the condenser.

- Discard the O-ring seal.

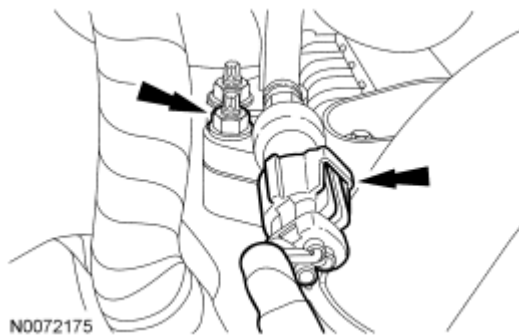


Fig. 176: Identifying A/C Pressure Switch And Nut
Courtesy of FORD MOTOR CO.

25. Remove the 2 nuts and disconnect the A/C tubes.

- Discard the O-ring seals.

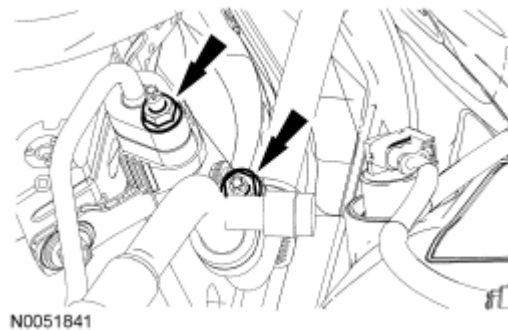


Fig. 177: Identifying Nuts
Courtesy of FORD MOTOR CO.

26. Remove the nut and the A/C tube.

- Discard the O-ring seal.

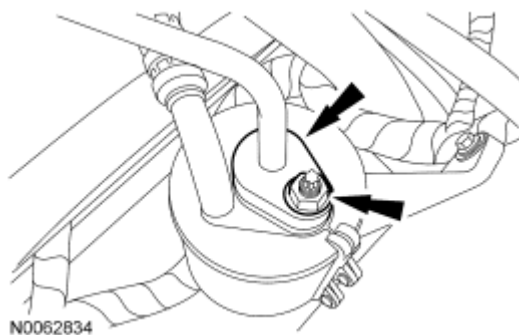


Fig. 178: Identifying Nut
Courtesy of FORD MOTOR CO.

27. Disconnect the fuel supply tube from the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

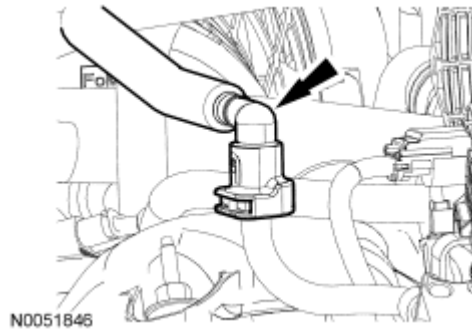


Fig. 179: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

28. Disconnect the 2 engine wiring harness electrical connectors.
- Detach the electrical connector from the LH valve cover.

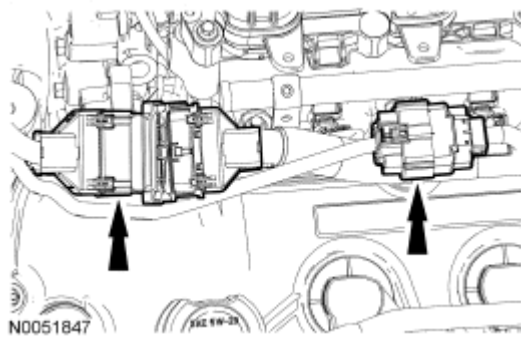


Fig. 180: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

29. Detach the wire harness retainer from the RH valve cover stud bolt.



Fig. 181: Identifying Wire Harness Retainer
Courtesy of FORD MOTOR CO.

30. Remove the bolt and the ground cable from the engine.

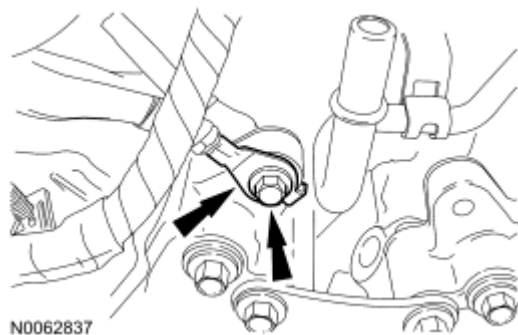


Fig. 182: Identifying Bolt And Ground Cable
Courtesy of FORD MOTOR CO.

31. Remove the oil level indicator.

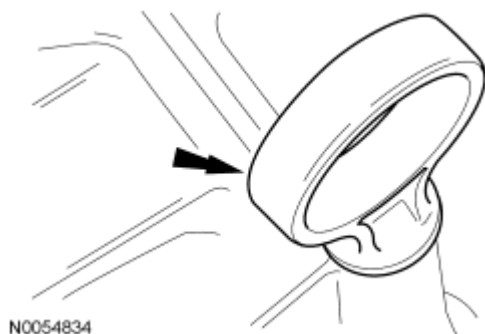


Fig. 183: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

32. Disconnect the hose from the power steering reservoir.

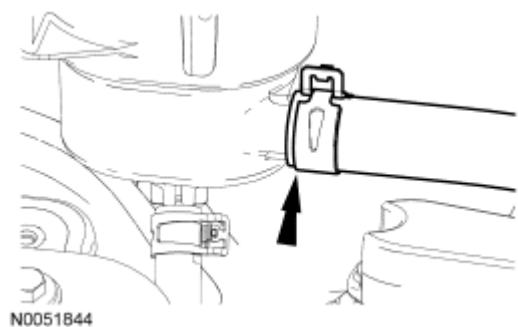


Fig. 184: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

33. Disconnect the transaxle control electrical connector.

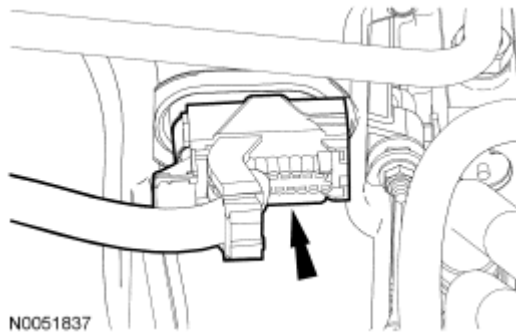


Fig. 185: Identifying Connector
Courtesy of FORD MOTOR CO.

34. Detach the transaxle control wire harness retainer from the transaxle stud bolt.

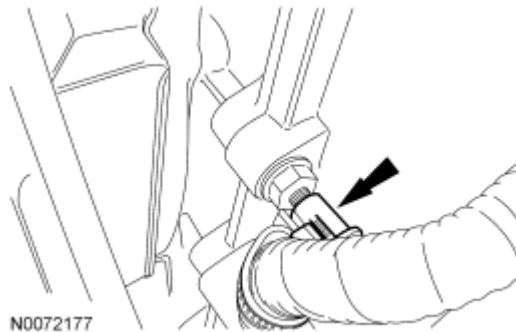


Fig. 186: Identifying Transaxle Control Wire Harness Retainer
Courtesy of FORD MOTOR CO.

35. Place the steering wheel in the straight-ahead position and the ignition key in the OFF position.

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

NOTE: Index-mark the steering column shaft position to the steering gear for reference during installation.

36. Remove the bolt and disconnect the steering column shaft from the steering gear.
 - Discard the bolt.

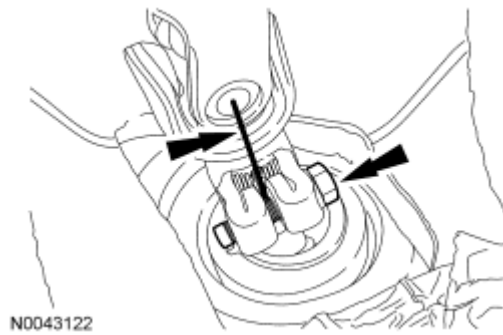


Fig. 187: Locating Steering Column Shaft Index Mark And Bolt
Courtesy of FORD MOTOR CO.

37. Remove the 4 Y-pipe-to-catalytic converter nuts.
 - Discard the nuts.

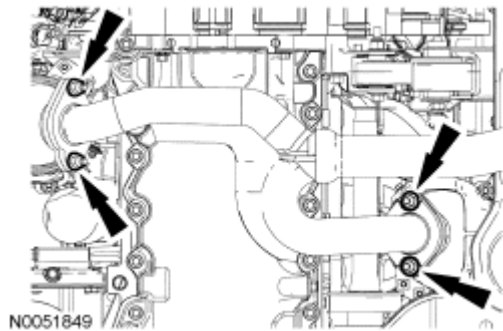


Fig. 188: Identifying Nuts
Courtesy of FORD MOTOR CO.

38. Remove the 2 Y-pipe flange nuts.
 - Detach the exhaust hanger and remove the Y-pipe.
 - Discard the gaskets and nuts.

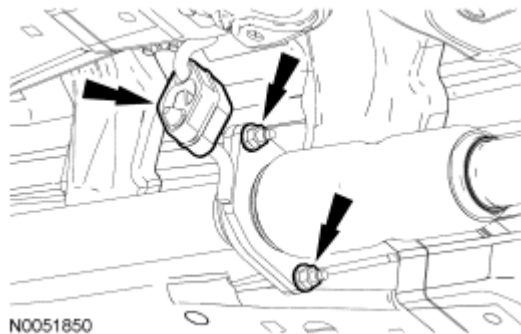


Fig. 189: Identifying Nuts And Exhaust Hanger
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

NOTE: Index-mark the driveshaft for installation.

39. Remove the 4 bolts (3 shown in illustration) and support the driveshaft with a length of mechanic's wire.

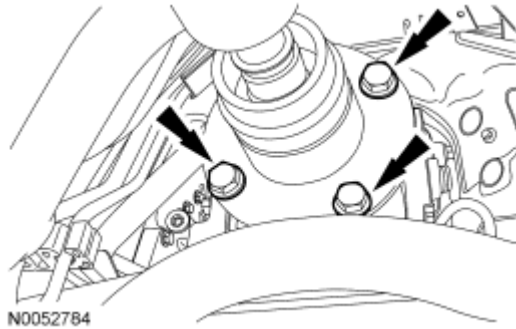


Fig. 190: Identifying Drive Shaft Bolts
Courtesy of FORD MOTOR CO.

All vehicles

40. Remove the drain plug and drain the engine oil.
- Install the drain plug and tighten to 27 Nm (20 lb-ft).

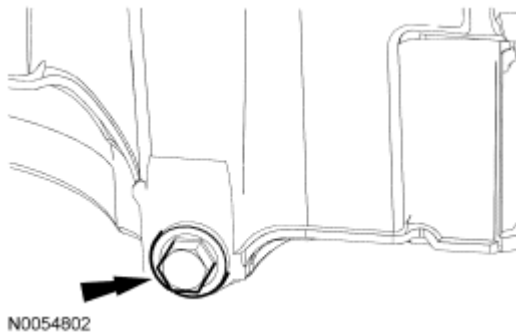


Fig. 191: Locating Drain Plug
Courtesy of FORD MOTOR CO.

41. Remove and discard the engine oil filter.

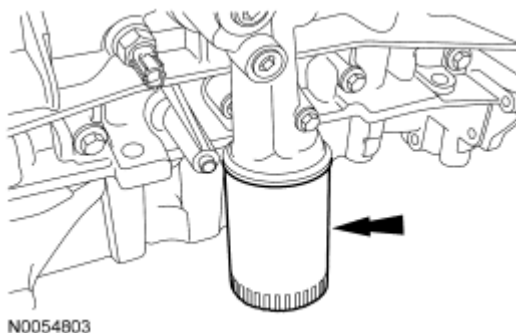


Fig. 192: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

42. Remove the power steering pressure (PSP) tube bracket-to-steering gear bolt.

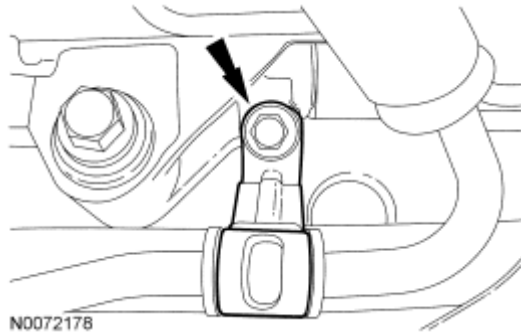


Fig. 193: Identifying PSP Bracket-To-Steering Gear Bolt
Courtesy of FORD MOTOR CO.

43. Remove the bolt, rotate the clamp plate clockwise and disconnect the PSP tube from the steering gear.
- Discard the O-ring seal.

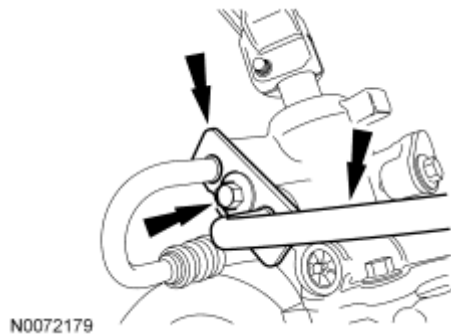


Fig. 194: Identifying Bolt, Clamp Plate And PSP Tube
Courtesy of FORD MOTOR CO.

44. Remove the 2 engine roll restrictor-to-transaxle bolts.

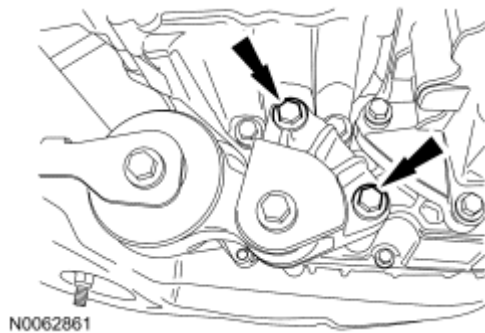


Fig. 195: Identifying Bolts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

45. Remove and discard the upper stabilizer link nuts.

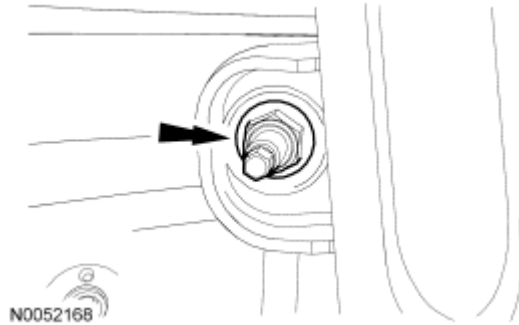


Fig. 196: Identifying Nut
Courtesy of FORD MOTOR CO.

NOTE: The hex holding feature can be used to prevent turning of the stud while removing the nuts.

NOTE: RH shown in illustration, LH similar.

46. Remove and discard the tie-rod end nuts.
- Separate the tie-rod ends from the wheel knuckles.

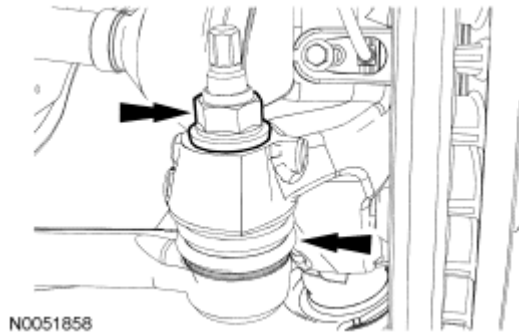


Fig. 197: Identifying Tie-Rod End Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

47. Remove and discard the lower ball joint-to-wheel knuckle nuts.
- Separate the ball joints from the wheel knuckles.

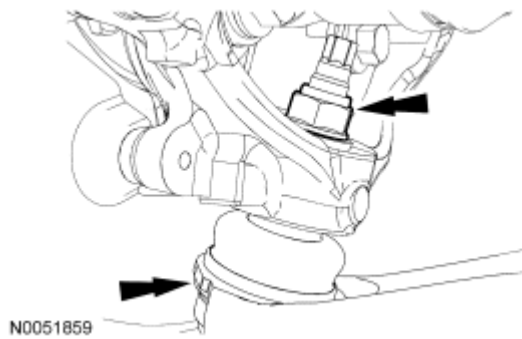


Fig. 198: Identifying Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

48. Position the special tool under the subframe assembly.

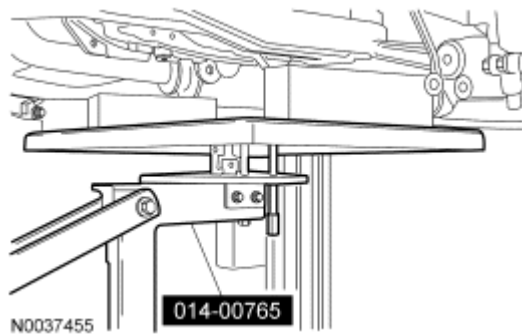


Fig. 199: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

49. Remove the subframe bracket-to-body bolts.

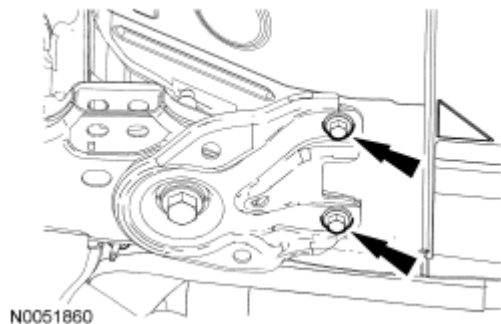


Fig. 200: Identifying Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

50. Remove the rear subframe bolts and the subframe brackets.

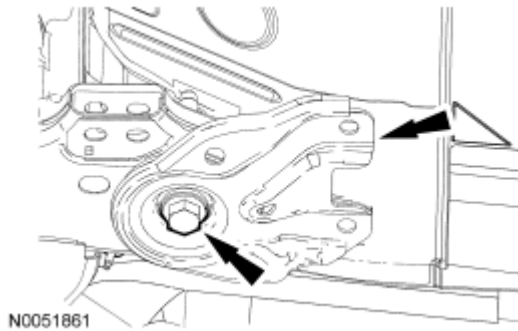


Fig. 201: Identifying Bolt And Bracket
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

51. Remove the front subframe bolts.

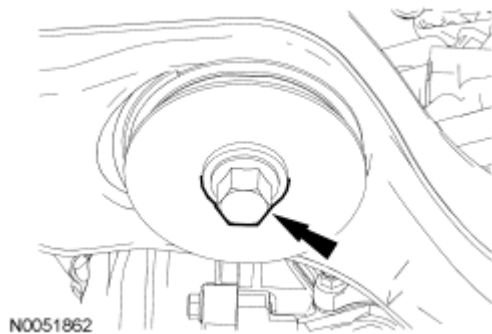


Fig. 202: Identifying Bolt
Courtesy of FORD MOTOR CO.

52. Lower the subframe assembly from the vehicle.
53. Using the special tools, separate the LH halfshaft from the transaxle and support halfshaft with a length of mechanic's wire.

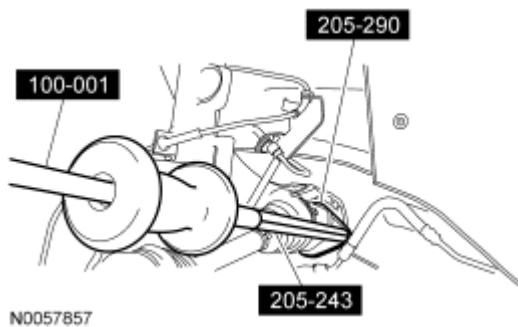


Fig. 203: Separating LH Halfshaft From Transaxle Using Special Tools (100-001), (205-243) &

(205-290)**Courtesy of FORD MOTOR CO.**

54. Remove and discard the RH halfshaft nut.

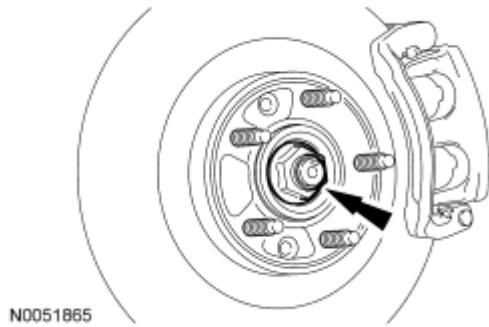


Fig. 204: Identifying RH Halfshaft Nut
Courtesy of FORD MOTOR CO.

55. Using the special tool, separate the RH halfshaft from the hub.

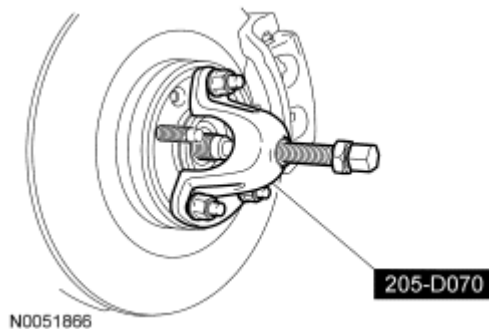


Fig. 205: Separating RH Halfshaft From Hub Using Special Tool (205-D070)
Courtesy of FORD MOTOR CO.

56. Remove the 2 RH halfshaft carrier bearing nuts.
- Remove the RH halfshaft.

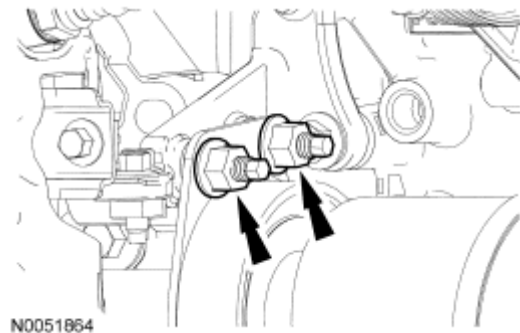


Fig. 206: Identifying Nuts
Courtesy of FORD MOTOR CO.

57. Remove the 2 RH halfshaft support bracket studs.

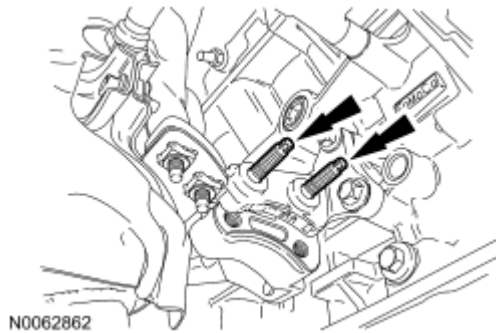


Fig. 207: Identifying Studs
Courtesy of FORD MOTOR CO.

58. Remove the 4 bolts and the RH halfshaft support bracket.

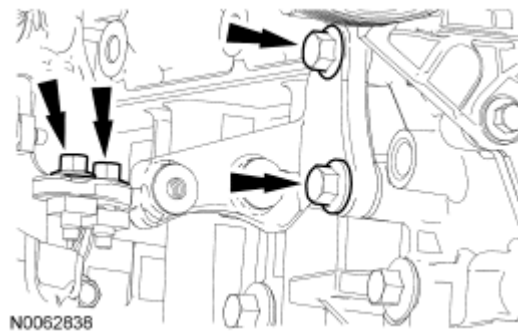


Fig. 208: Separating LH Halfshaft From Transaxle
Courtesy of FORD MOTOR CO.

59. Remove the 2 secondary latches from the transmission fluid cooler tubes at the transmission fluid cooler thermal bypass valve.

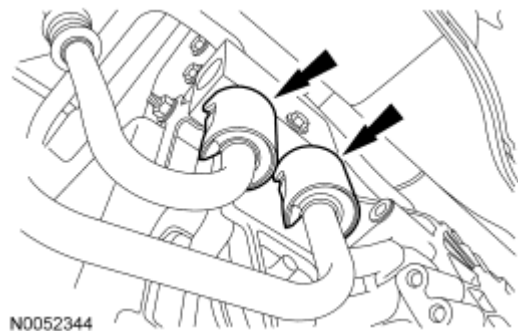


Fig. 209: Locating Secondary Latches On Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

60. Using the special tool, disconnect the transmission fluid cooler tubes from the transmission fluid cooler thermal bypass valve.

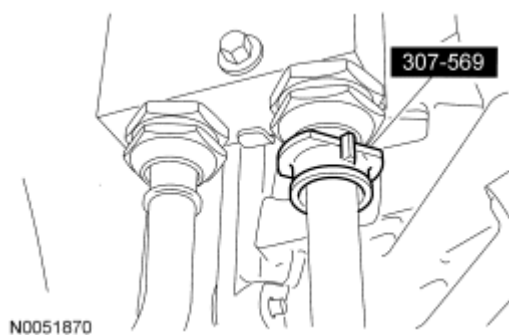


Fig. 210: Disconnecting Transmission Cooling Tubes Using Special Tool (307-569)
Courtesy of FORD MOTOR CO.

61. Remove the 2 fasteners and the inspection cover.



Fig. 211: Identifying Inspection Cover & Fasteners
Courtesy of FORD MOTOR CO.

62. Remove and discard the 3 torque converter bolts.

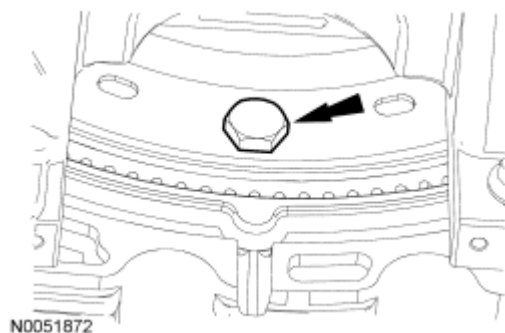


Fig. 212: Identifying Bolt
Courtesy of FORD MOTOR CO.

63. Remove the 4 oil pan-to-transaxle bolts.

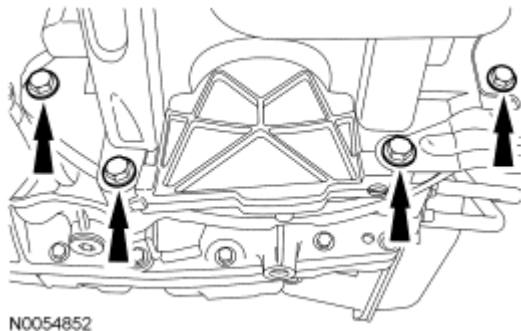


Fig. 213: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

AWD vehicles

64. Disconnect the RH catalyst monitor electrical connector.

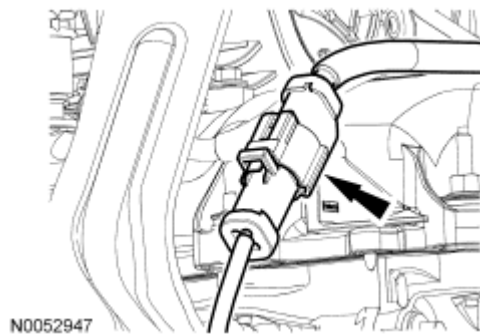


Fig. 214: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

65. Remove the 4 nuts and the RH catalytic converter.
 - Discard the nuts and gasket.

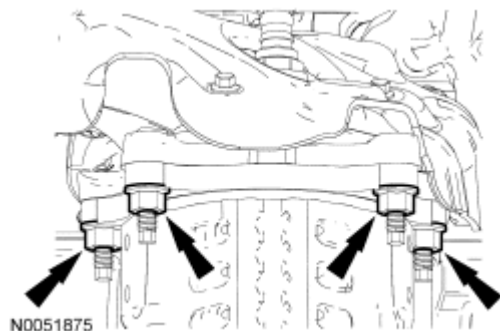


Fig. 215: Identifying Nuts
Courtesy of FORD MOTOR CO.

66. Remove the 5 bolts and the power transfer unit (PTU) support bracket.

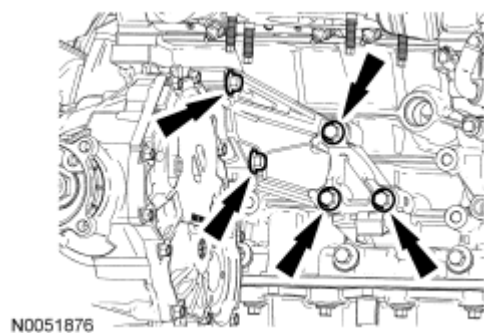


Fig. 216: Identifying Bolts
Courtesy of FORD MOTOR CO.

67. Remove the 5 bolts and the PTU.

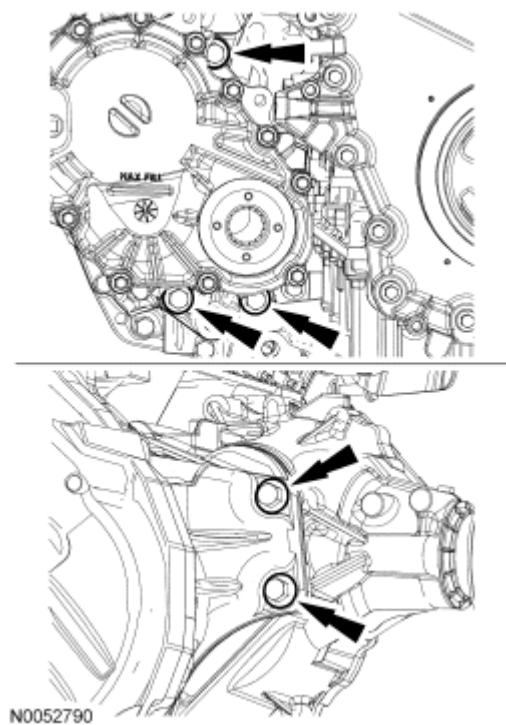


Fig. 217: Locating PTU Bolts
Courtesy of FORD MOTOR CO.

All vehicles

NOTE: Position a block of wood under the transaxle.

68. Install the special tools.

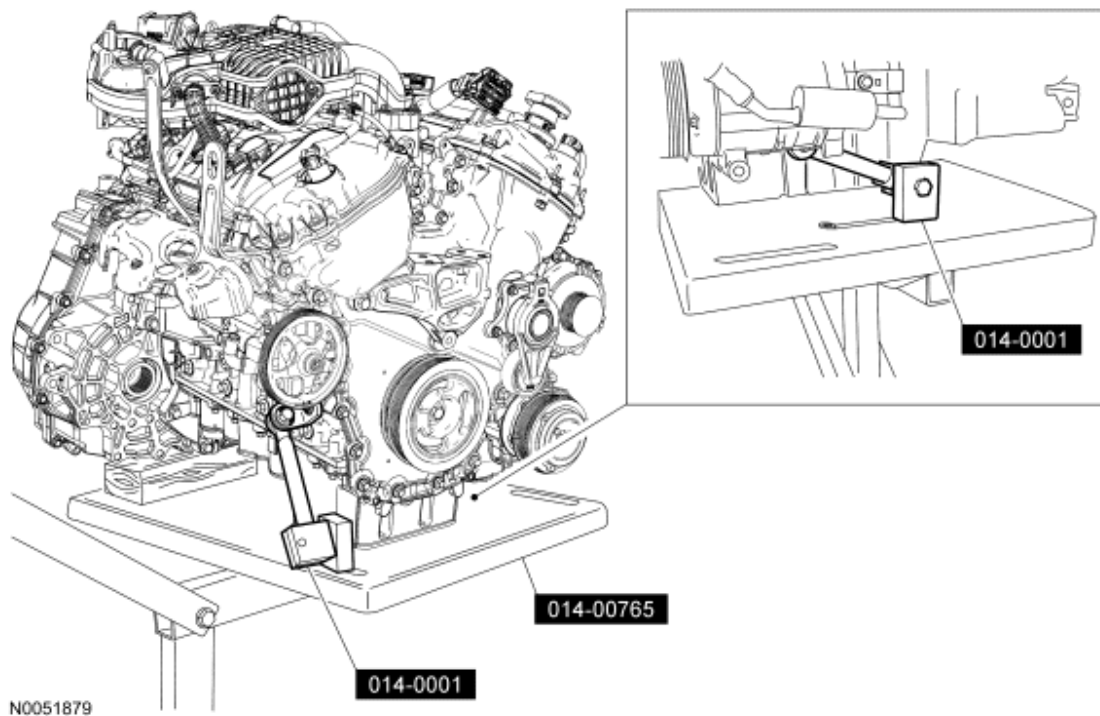


Fig. 218: Positioning Block Of Wood Under Transaxle Using Special Tools (014-0001) & (014-00765)

Courtesy of FORD MOTOR CO.

69. Remove the transaxle mount through bolt and nut.

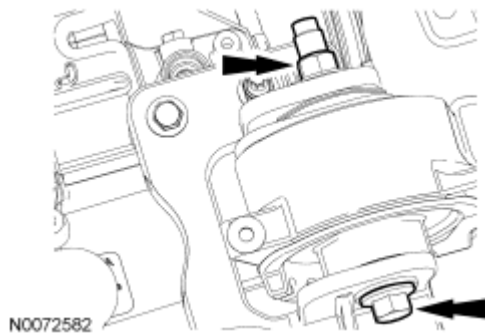


Fig. 219: Identifying Bolt And Nut
Courtesy of FORD MOTOR CO.

70. Remove the bolt, 3 nuts and the transaxle mount bracket.

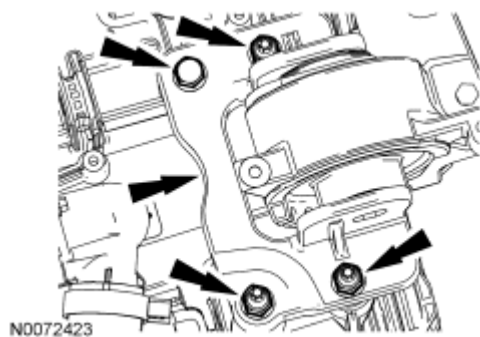


Fig. 220: Identifying Bolt, Nuts And Mount Bracket
Courtesy of FORD MOTOR CO.

71. Remove the nut, bolt and engine mount brace.

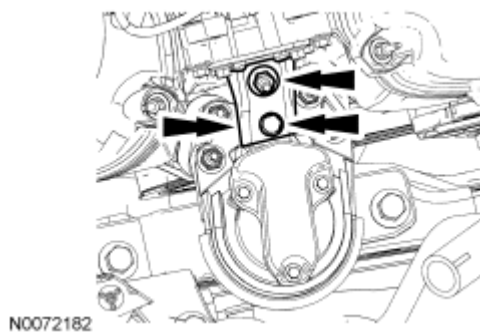


Fig. 221: Identifying Nut, Bolt And Brace
Courtesy of FORD MOTOR CO.

72. Remove the 4 engine mount nuts.

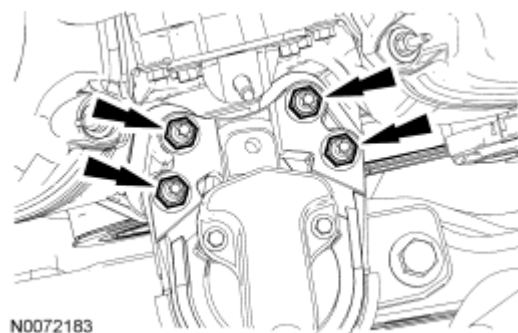


Fig. 222: Identifying Mounting Nuts
Courtesy of FORD MOTOR CO.

73. Remove the 3 bolts and the engine mount.

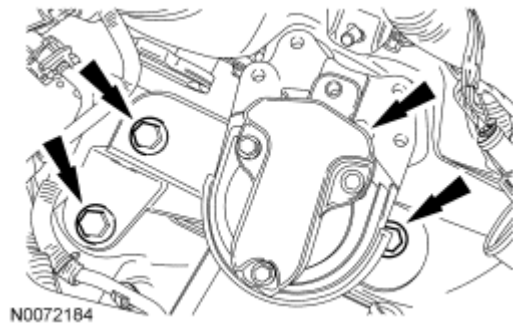


Fig. 223: Identifying Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

- 74. Lower the engine and transaxle assembly from the vehicle.
- 75. If equipped, remove the starter motor solenoid cover.

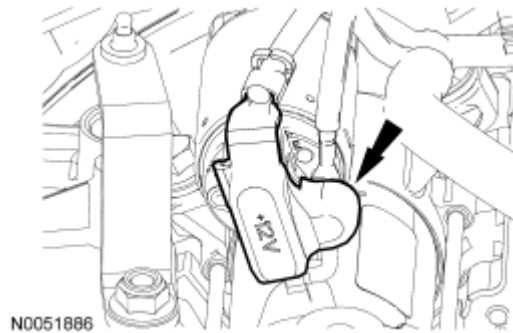


Fig. 224: Identifying Starter Motor Solenoid Cover
Courtesy of FORD MOTOR CO.

- 76. Remove the 2 nuts and the starter motor wiring terminals.



Fig. 225: Identifying Nuts
Courtesy of FORD MOTOR CO.

- 77. Disconnect the wiring harness retainer from the starter motor stud bolt.

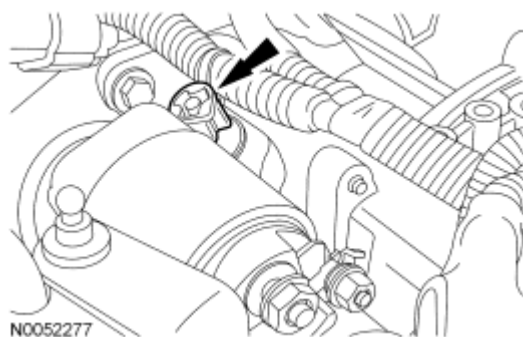


Fig. 226: Identifying Wiring Harness Retainer From Starter Motor Stud Bolt
Courtesy of FORD MOTOR CO.

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

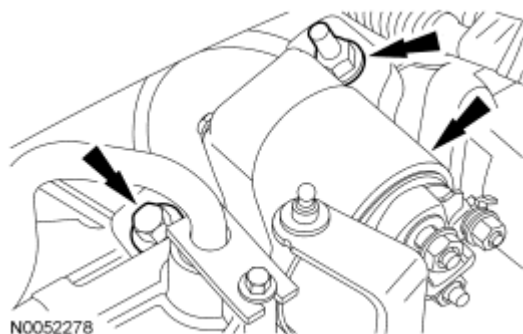


Fig. 227: Identifying Bolt, Stud Bolt & Starter
Courtesy of FORD MOTOR CO.

79. Install the special tool on the LH cylinder head.

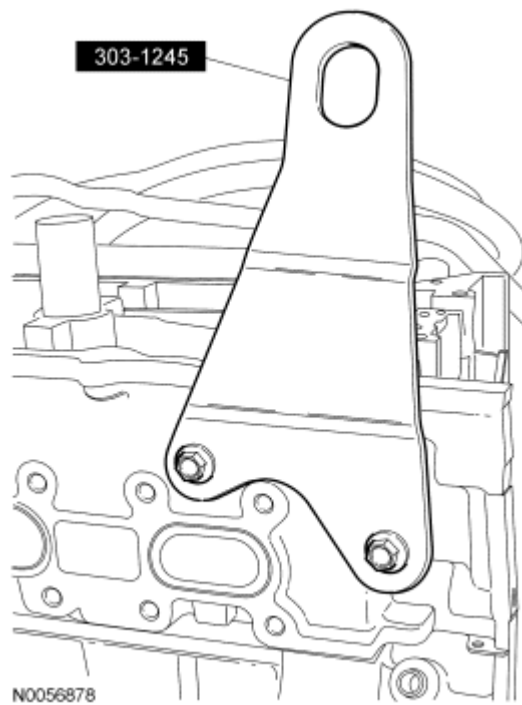


Fig. 228: Installing Special Tool (303-1245) On LH Cylinder Head
Courtesy of FORD MOTOR CO.

80. Using the special tools and a suitable engine crane, remove the engine and transaxle from the lift table.

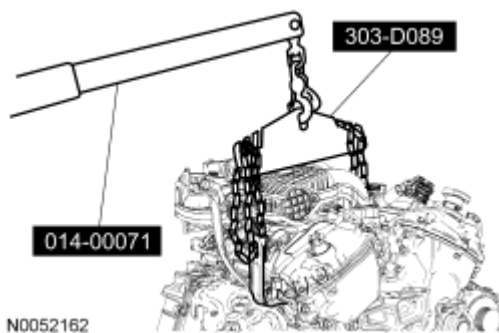


Fig. 229: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

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

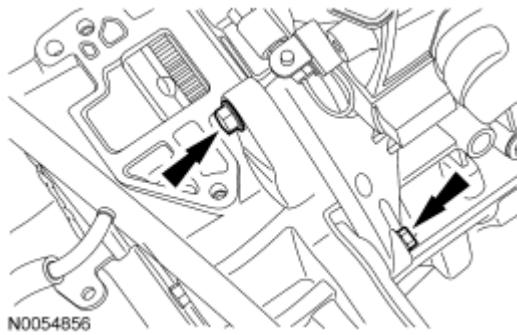


Fig. 230: Locating Engine-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

82. Remove the 5 transaxle-to-engine bolts.
- Separate the transaxle from the engine.

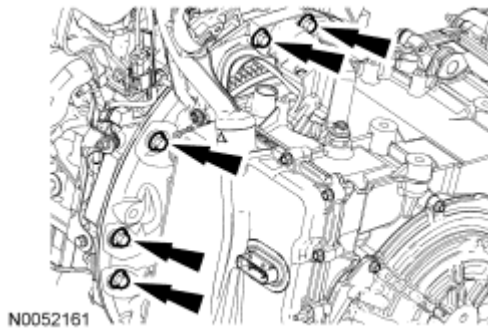
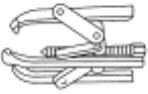


Fig. 231: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

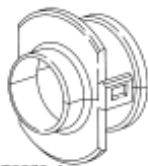
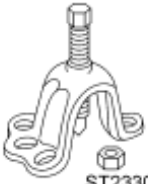
CAMSHAFT

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1184-A	3-Jaw Puller	303-D121
 ST2979-A	Camshaft Alignment Tool	303-1248
	Disconnect Tool, Transmission	

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST2870-A	Cooler Tube	307-569
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST1293-A	Powertrain Lift	014-00765
 ST2330-A	Remover, Front Hub	205-D070 (D93P-1175-B) or equivalent
 ST2939-A	Remover, Halfshaft (Extension)	205-243 (T89P-3415-A)
 ST2038-A	Remover, Halfshaft (Plate)	205-290 (T89P-3415-B)
 ST1385-A	Remover, Oil Seal	303-409 (T92C-6700CH)
 ST2982-A	Seal Remover	303-1247/1

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST1185-A	Slide Hammer	100-001 (T50T-100-A)
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A)
 ST2743A	Universal Adapter Brackets	014-0001

MATERIAL

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

REMOVAL

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

All camshafts

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. Recover the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article.
4. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
5. Remove the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
6. Remove the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
7. Disconnect the power steering cooler hose and drain the power steering fluid into a suitable container.

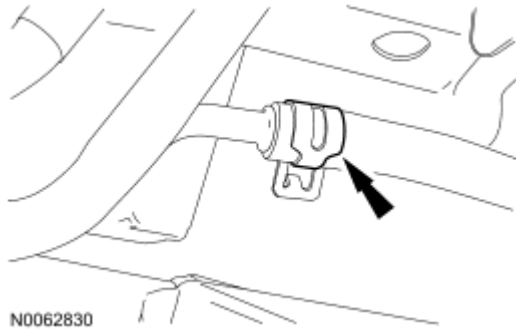


Fig. 232: Identifying Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

8. Remove the degas bottle. For additional information, refer to **ENGINE COOLING** article.
9. Remove the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
10. Remove the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
11. Detach the 4 pin-type wiring harness fasteners from the side of the battery tray.

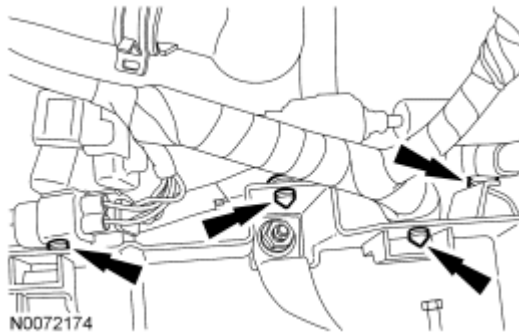


Fig. 233: Identifying Fasteners
Courtesy of FORD MOTOR CO.

12. Detach the 2 pin-type wiring harness fasteners from the front of the battery tray.

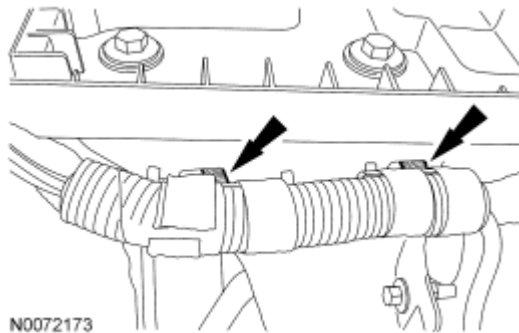


Fig. 234: Identifying Fasteners
Courtesy of FORD MOTOR CO.

13. Remove the 2 lower battery tray bracket bolts.

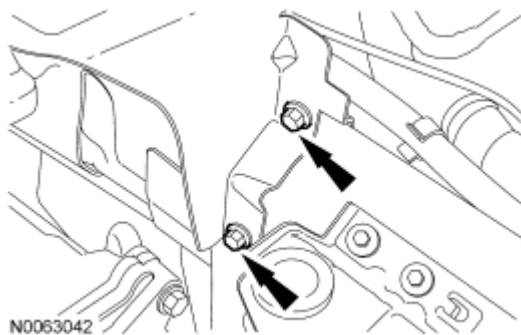


Fig. 235: Identifying Bolts
Courtesy of FORD MOTOR CO.

14. Remove the nut, bolt and the battery tray and bracket.

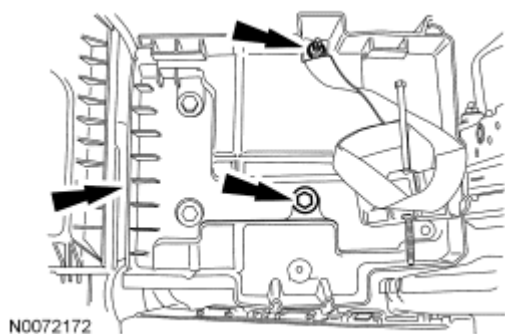


Fig. 236: Identifying Bolt, Nut And Bracket
Courtesy of FORD MOTOR CO.

15. Disconnect the engine wiring harness electrical connector.

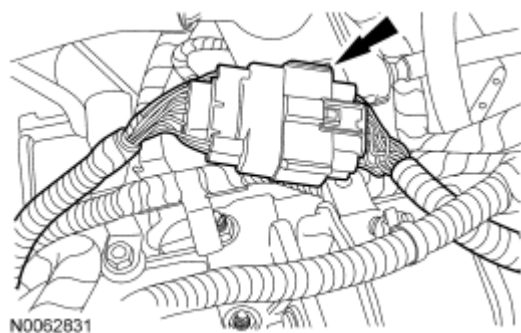


Fig. 237: Identifying Connector
Courtesy of FORD MOTOR CO.

16. Remove the nut and disconnect the power feed wire from the positive battery terminal.

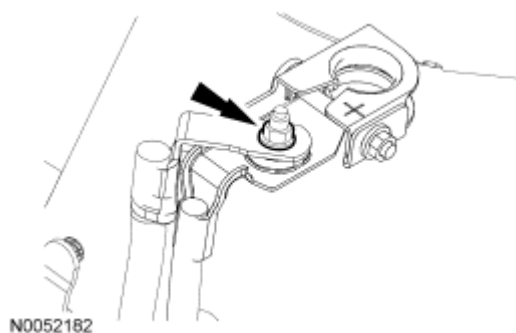


Fig. 238: Identifying Nut
Courtesy of FORD MOTOR CO.

17. Remove the nut and disconnect the ground cable from the negative battery terminal.

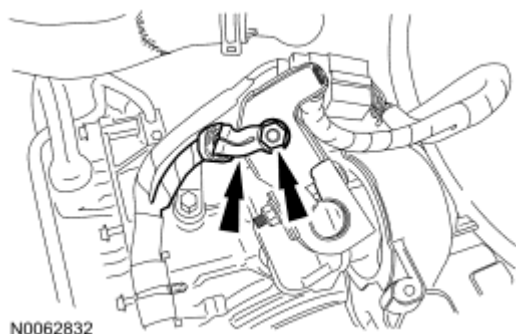


Fig. 239: Identifying Nut And Ground Cable
Courtesy of FORD MOTOR CO.

18. Disconnect the vacuum hose and the evaporative emissions (EVAP) tube from the upper intake manifold.

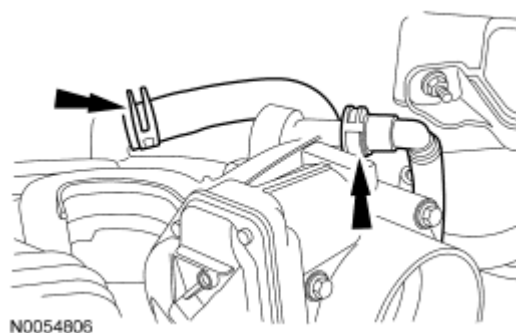


Fig. 240: Locating Vacuum Hose & Evaporative Emissions (EVAP) Tube From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

19. Detach the EVAP tube pin-type retainer from the upper intake manifold.

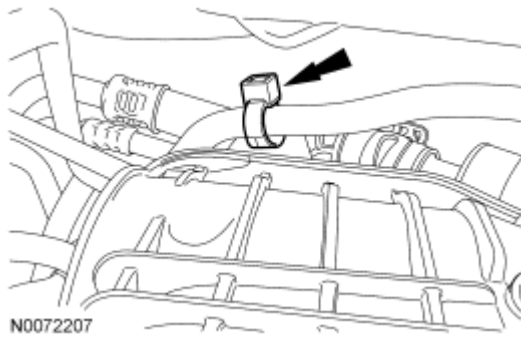


Fig. 241: Identifying pin-Type Retainer
Courtesy of FORD MOTOR CO.

20. Disconnect the upper radiator hose, lower radiator hose and one heater hose from the thermostat housing.

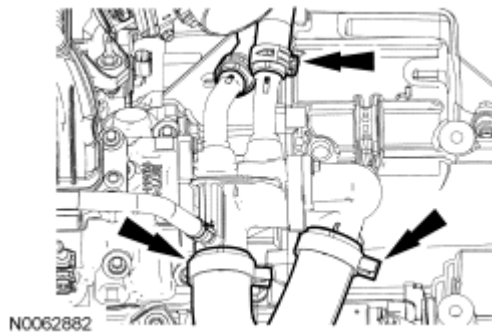


Fig. 242: Identifying Upper Radiator Hose, Lower Radiator Hose And Heater Hose
Courtesy of FORD MOTOR CO.

21. Disconnect the transaxle control cable from the control lever.



Fig. 243: Locating Selector Lever Cable End From Manual Lever
Courtesy of FORD MOTOR CO.

22. Disconnect the transaxle control cable from the shift cable bracket.

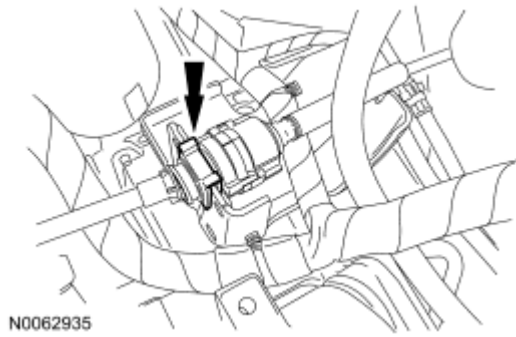


Fig. 244: Identifying Shift Cable Bracket
Courtesy of FORD MOTOR CO.

23. If equipped, detach the engine block heater wiring harness from the radiator support and the power steering tube.
24. Disconnect the A/C pressure switch and remove the nut and disconnect the upper A/C tube from the condenser.
 - Discard the O-ring seal.

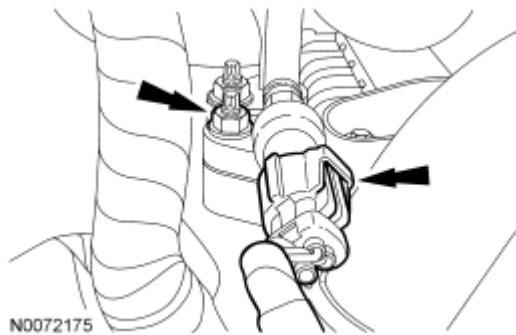


Fig. 245: Identifying A/C Pressure Switch And Nut
Courtesy of FORD MOTOR CO.

25. Remove the 2 nuts and disconnect the A/C tubes.
 - Discard the O-ring seals.

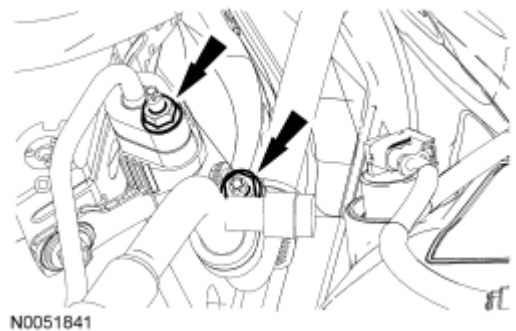


Fig. 246: Identifying Nuts
Courtesy of FORD MOTOR CO.

26. Remove the nut and the A/C tube.
- Discard the O-ring seal.

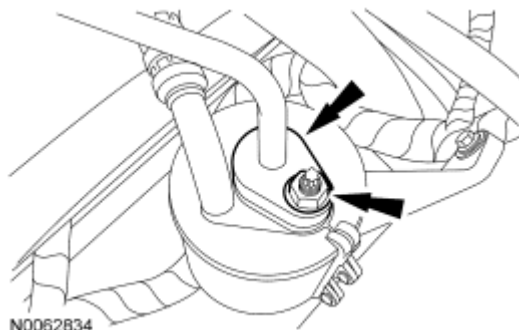


Fig. 247: Identifying Nut
Courtesy of FORD MOTOR CO.

27. Disconnect the fuel supply tube from the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

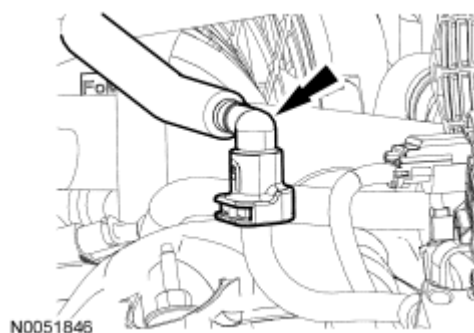


Fig. 248: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

28. Disconnect the 2 engine wiring harness electrical connectors.
- Detach the electrical connector from the LH valve cover.

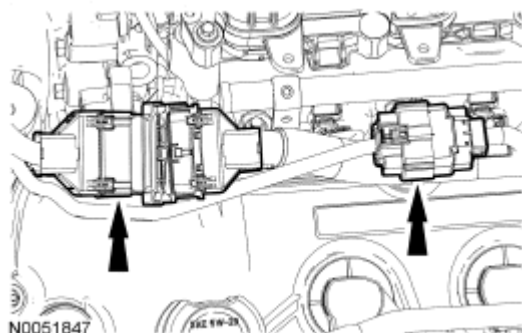


Fig. 249: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

29. Detach the wire harness retainer from the RH valve cover stud bolt.

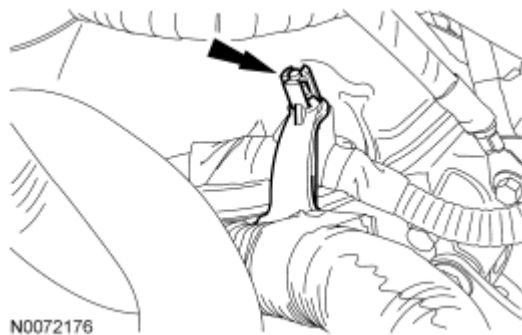


Fig. 250: Identifying Wire Harness Retainer
Courtesy of FORD MOTOR CO.

30. Remove the bolt and the ground cable.

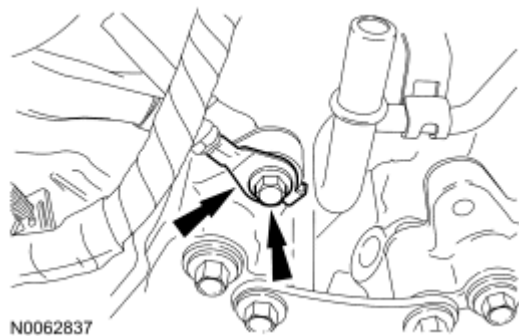


Fig. 251: Identifying Bolt And Ground Cable
Courtesy of FORD MOTOR CO.

31. Remove the oil level indicator.

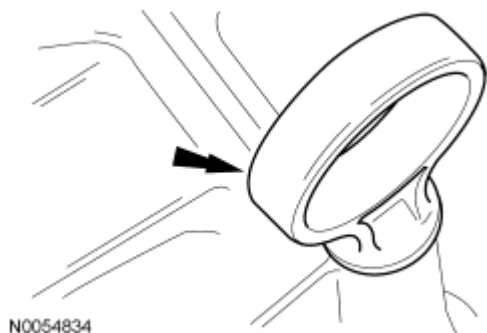


Fig. 252: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

32. Disconnect the hose from the power steering reservoir.

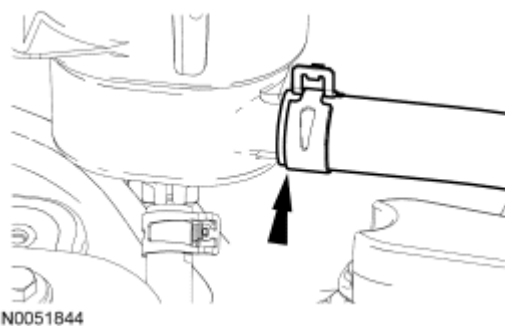


Fig. 253: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

33. Disconnect the transaxle control electrical connector.

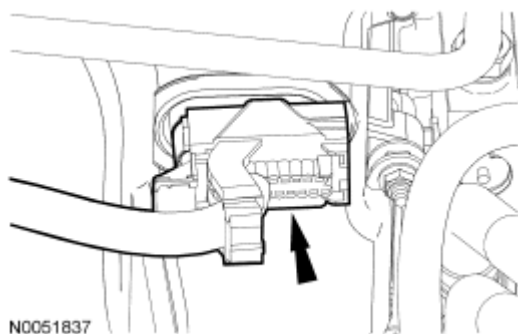


Fig. 254: Identifying Connector
Courtesy of FORD MOTOR CO.

34. Detach the transaxle control wire harness retainer from the transaxle stud bolt.

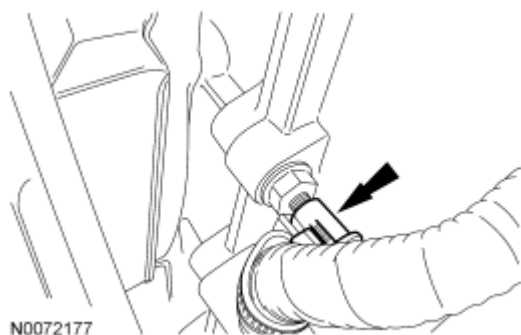


Fig. 255: Identifying Transaxle Control Wire Harness Retainer
Courtesy of FORD MOTOR CO.

35. Place the steering wheel in the straight-ahead position and the ignition key in the OFF position.

CAUTION: Do not allow the intermediate shaft to rotate while it is disconnected from the gear or damage to the clockspring may occur. If there is

evidence that the intermediate shaft has rotated, the clockspring must be removed and recentered. For additional information, refer to **SUPPLEMENTAL RESTRAINT SYSTEM** article.

NOTE: Index-mark the steering column shaft position to the steering gear for reference during installation.

36. Remove the bolt and disconnect the steering column shaft from the steering gear.
- Discard the bolt.

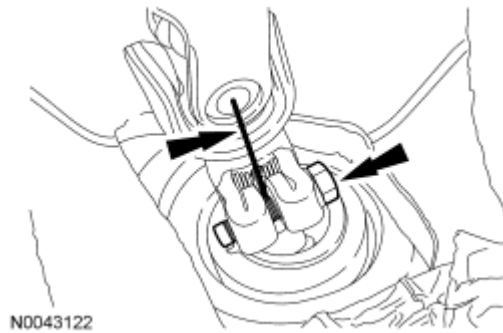


Fig. 256: Locating Steering Column Shaft Index Mark And Bolt
Courtesy of FORD MOTOR CO.

37. Remove the 4 Y-pipe-to-catalytic converter nuts.
- Discard the nuts.

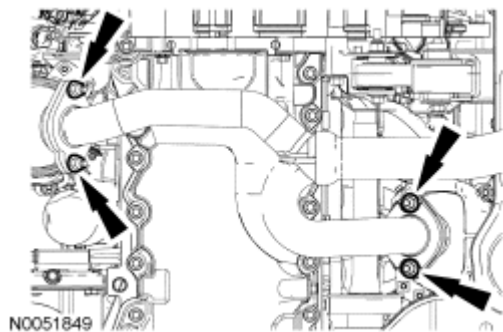


Fig. 257: Identifying Nuts
Courtesy of FORD MOTOR CO.

38. Remove the 2 Y-pipe flange nuts.
- Detach the exhaust hanger and remove the Y-pipe.
 - Discard the gaskets and nuts.

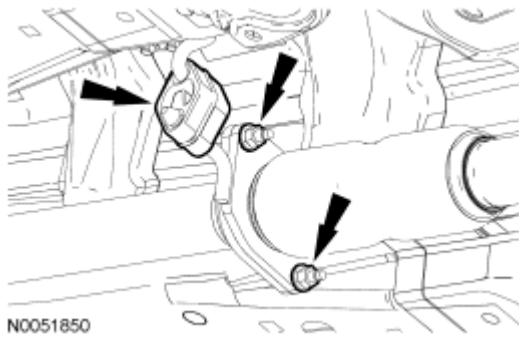


Fig. 258: Identifying Nuts And Exhaust Hanger
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

NOTE: Index-mark the driveshaft for installation.

39. Remove the 4 bolts (3 shown in illustration) and support the driveshaft with a length of mechanic's wire.

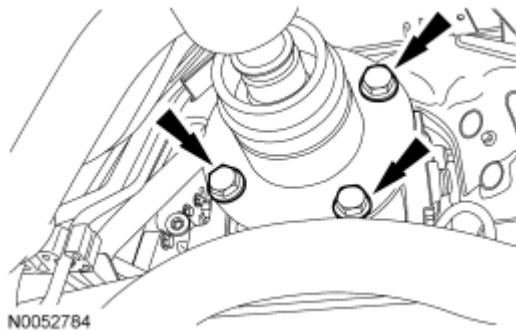


Fig. 259: Identifying Drive Shaft Bolts
Courtesy of FORD MOTOR CO.

All camshafts

40. Remove the drain plug and drain the engine oil.
- Install the drain plug and tighten to 27 Nm (20 lb-ft).

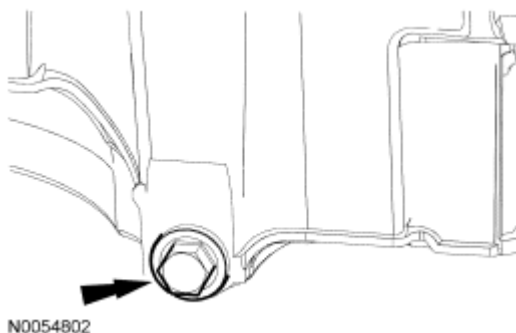


Fig. 260: Locating Drain Plug
Courtesy of FORD MOTOR CO.

41. Remove and discard the engine oil filter.

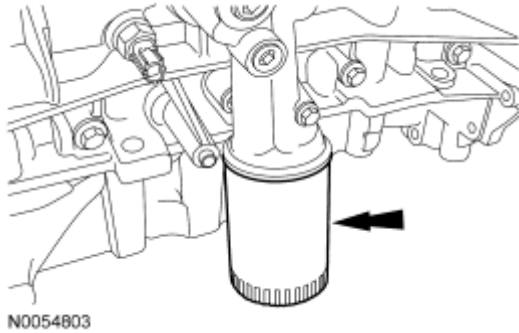


Fig. 261: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

42. Remove the power steering pressure (PSP) tube bracket-to-steering gear bolt.

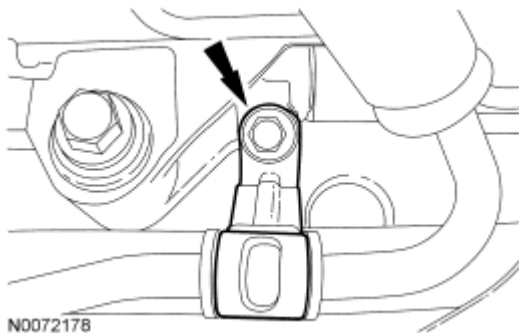


Fig. 262: Identifying PSP Bracket-To-Steering Gear Bolt
Courtesy of FORD MOTOR CO.

43. Remove the bolt, rotate the clamp plate clockwise and disconnect the PSP tube from the steering gear.
- Discard the O-ring seal.

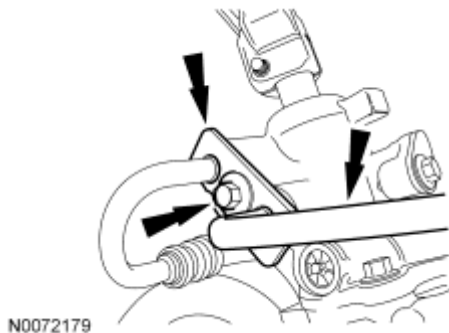


Fig. 263: Identifying Bolt, Clamp Plate And PSP Tube
Courtesy of FORD MOTOR CO.

44. Remove the 2 engine roll restrictor-to-transaxle bolts.

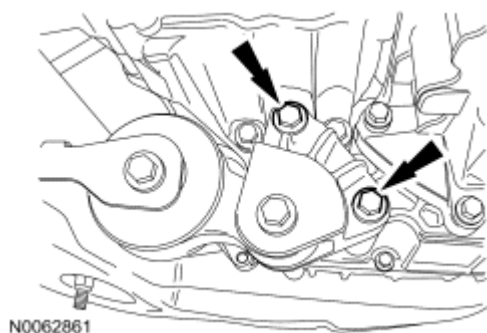


Fig. 264: Identifying Bolts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

45. Remove and discard the upper stabilizer link nuts.

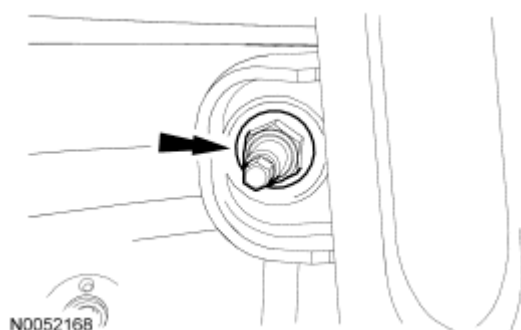


Fig. 265: Identifying Nut
Courtesy of FORD MOTOR CO.

NOTE: The hex holding feature can be used to prevent turning of the stud while removing the nuts.

NOTE: RH shown in illustration, LH similar.

46. Remove and discard the tie-rod end nuts.
- Separate the tie-rod ends from the wheel knuckles.

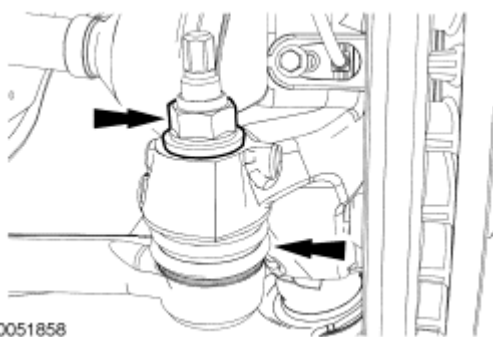


Fig. 266: Identifying Tie-Rod End Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

47. Remove and discard the lower ball joint-to-wheel knuckle nuts.
 - Separate the ball joints from the wheel knuckles.

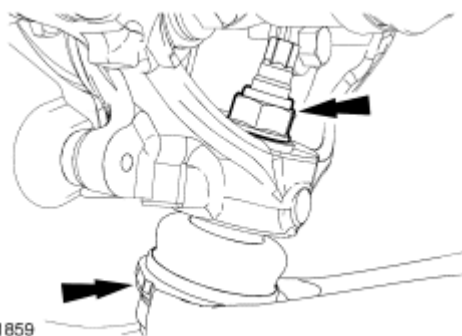


Fig. 267: Identifying Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

48. Position the special tool under the subframe assembly.

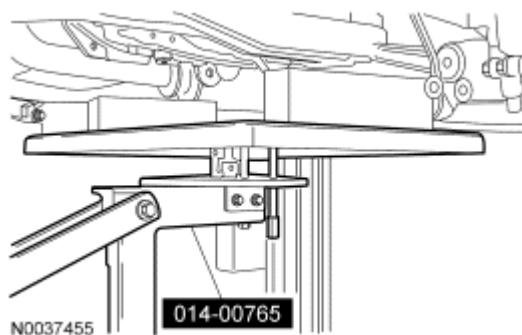


Fig. 268: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

49. Remove the subframe bracket-to-body bolts.

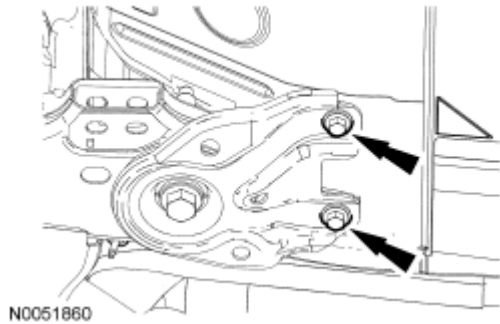


Fig. 269: Identifying Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

50. Remove the rear subframe bolts and the subframe brackets.

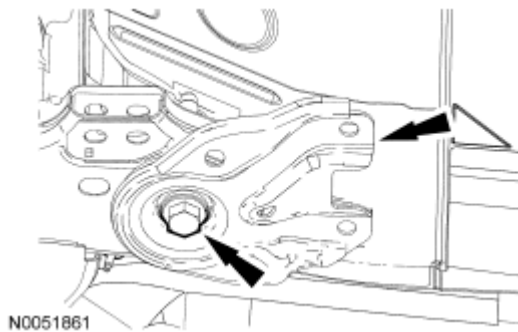


Fig. 270: Identifying Bolt And Bracket
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

51. Remove the front subframe bolts.

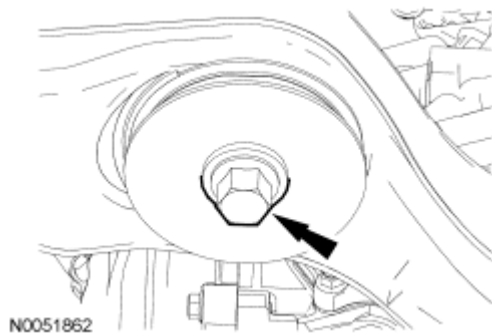


Fig. 271: Identifying Bolt

Courtesy of FORD MOTOR CO.

52. Lower the subframe assembly from the vehicle.
53. Using the special tools, separate the LH halfshaft from the transaxle and support halfshaft with a length of mechanic's wire.

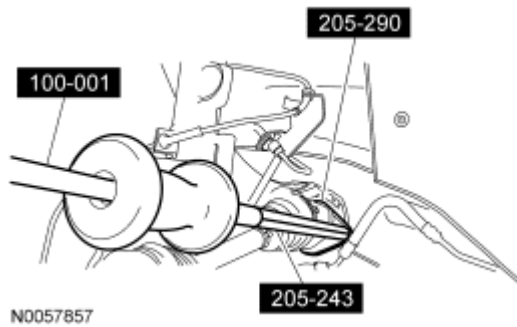


Fig. 272: Separating LH Halfshaft From Transaxle Using Special Tools (100-001), (205-243) & (205-290)
Courtesy of FORD MOTOR CO.

54. Remove and discard the RH halfshaft nut.

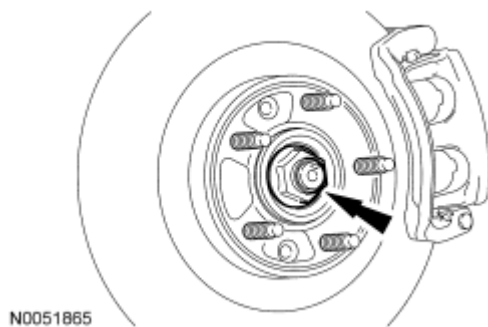


Fig. 273: Identifying RH Halfshaft Nut
Courtesy of FORD MOTOR CO.

55. Using the special tool, separate the RH halfshaft from the hub.

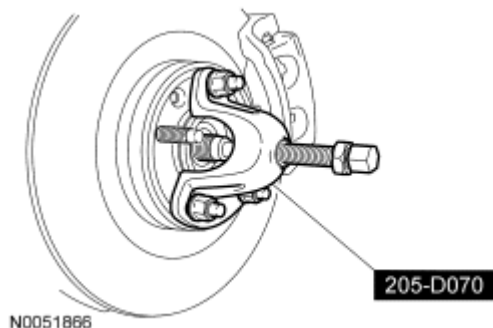


Fig. 274: Separating RH Halfshaft From Hub Using Special Tool (205-D070)

Courtesy of FORD MOTOR CO.

56. Remove the 2 RH halfshaft carrier bearing nuts.
- Remove the RH halfshaft.

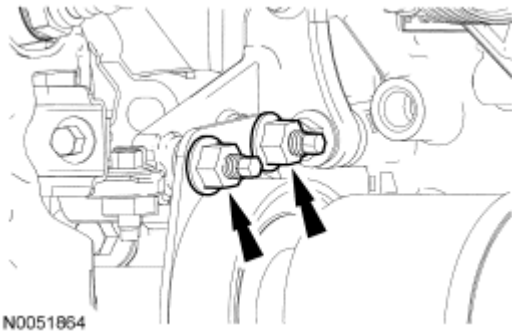


Fig. 275: Identifying Nuts
Courtesy of FORD MOTOR CO.

57. Remove the 2 RH halfshaft support bracket studs.

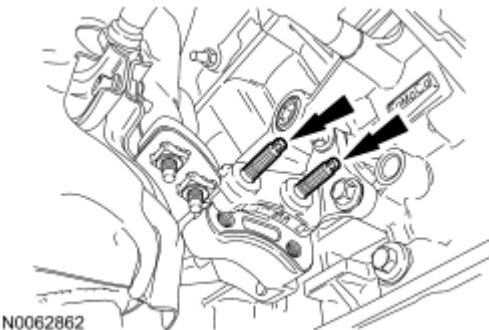


Fig. 276: Identifying Studs
Courtesy of FORD MOTOR CO.

58. Remove the 4 bolts and the RH halfshaft support bracket.

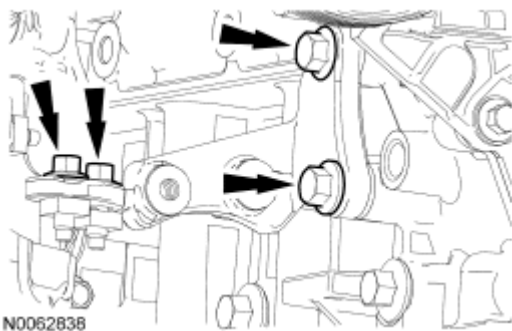


Fig. 277: Separating LH Halfshaft From Transaxle
Courtesy of FORD MOTOR CO.

59. Remove the 2 secondary latches from the transmission fluid cooler tubes at the transmission fluid cooler thermal bypass valve.

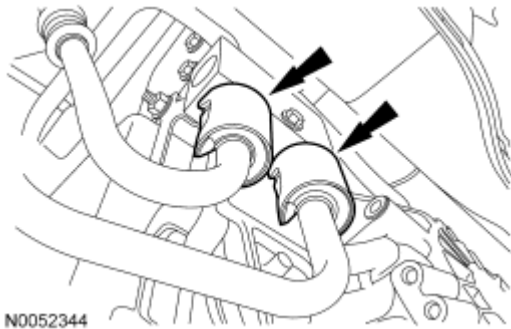


Fig. 278: Locating Secondary Latches On Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

60. Using the special tool, disconnect the transmission fluid cooler tubes from the transmission fluid cooler thermal bypass valve.

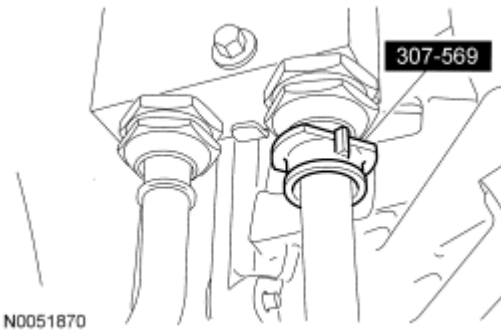


Fig. 279: Disconnecting Transmission Cooling Tubes Using Special Tool (307-569)
Courtesy of FORD MOTOR CO.

NOTE: Position a block of wood under the transaxle.

61. Install the special tools.

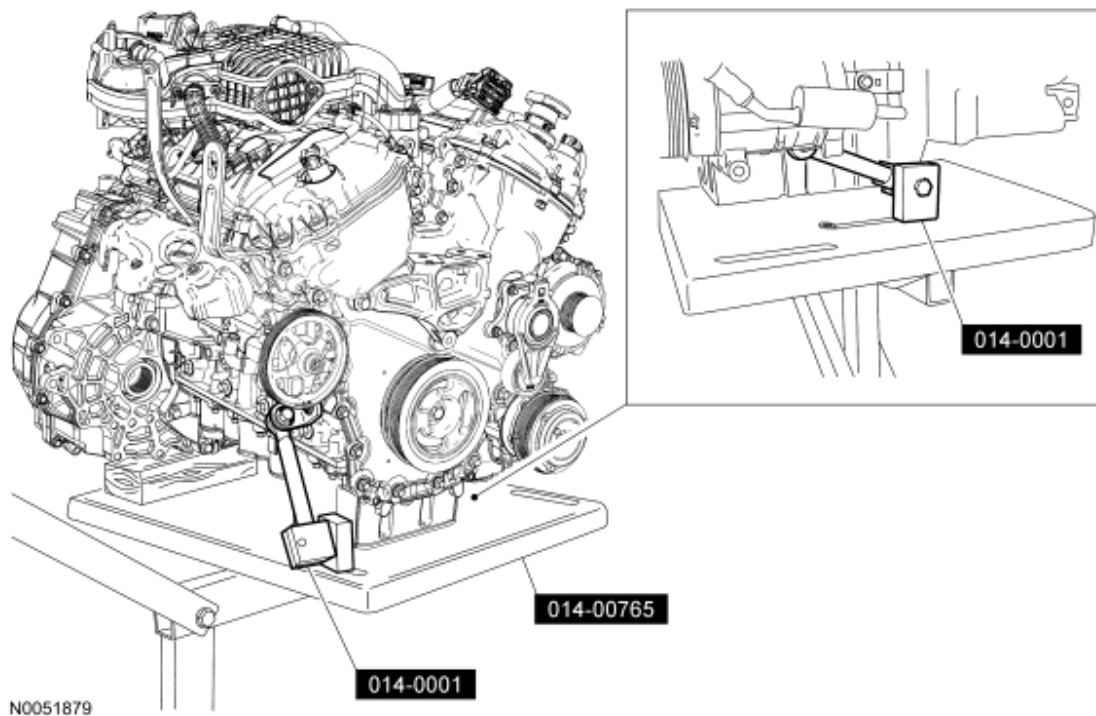


Fig. 280: Positioning Block Of Wood Under Transaxle Using Special Tools (014-0001) & (014-00765)

Courtesy of FORD MOTOR CO.

62. Remove the transaxle mount through bolt and nut.

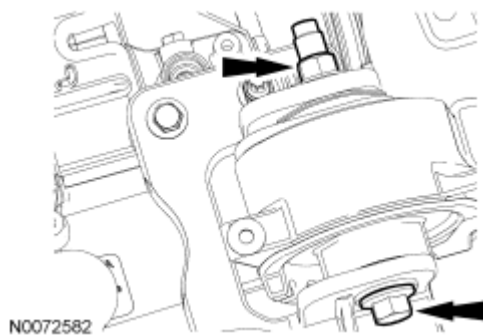


Fig. 281: Identifying Bolt And Nut
Courtesy of FORD MOTOR CO.

63. Remove the bolt, 3 nuts and the transaxle mount bracket.

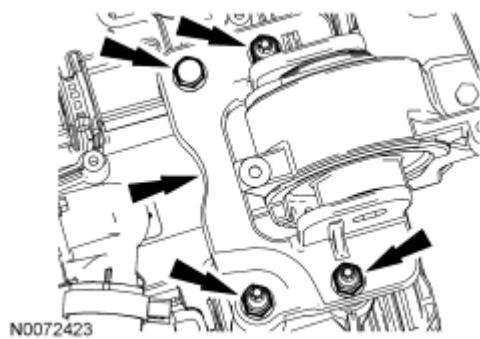


Fig. 282: Identifying Bolt, Nuts And Mount Bracket
Courtesy of FORD MOTOR CO.

64. Remove the nut, bolt and engine mount brace.

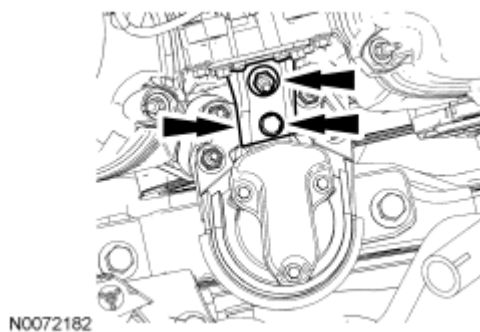


Fig. 283: Identifying Nut, Bolt And Brace
Courtesy of FORD MOTOR CO.

65. Remove the 4 engine mount nuts.

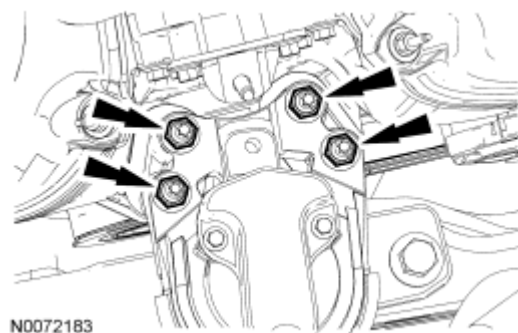


Fig. 284: Identifying Mounting Nuts
Courtesy of FORD MOTOR CO.

66. Remove the 3 bolts and the engine mount.

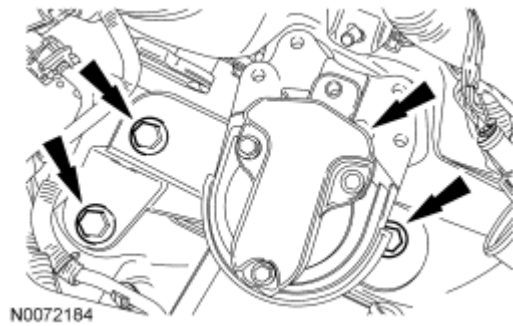


Fig. 285: Identifying Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

67. Lower the engine and transaxle assembly from the vehicle.
68. If equipped, disconnect the heated PCV electrical connector.

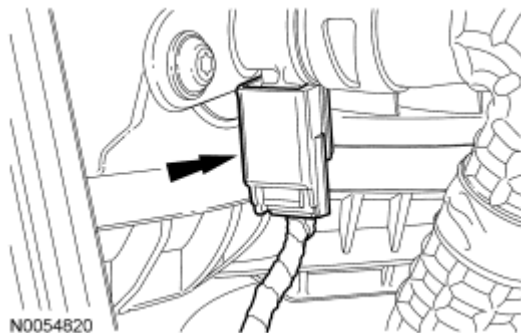


Fig. 286: Identifying Positive Crankcase Ventilation (PCV) Fitting Electrical Connector
Courtesy of FORD MOTOR CO.

69. Disconnect the PCV hose from the PCV valve.

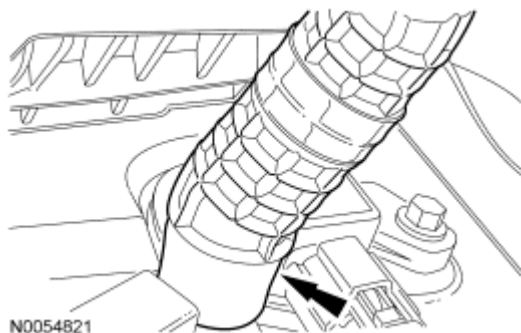


Fig. 287: Identifying PCV Hose From PCV Valve
Courtesy of FORD MOTOR CO.

70. Disconnect the throttle body (TB) electrical connector.

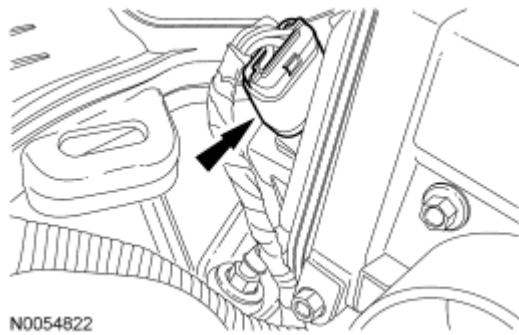


Fig. 288: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

71. Detach the wiring harness retainers from the upper intake manifold.

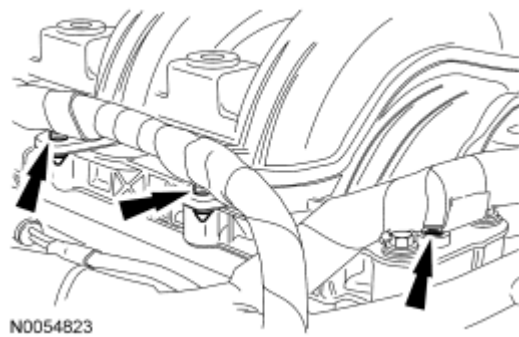


Fig. 289: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

72. If equipped, remove the upper intake manifold long support bracket bolt.

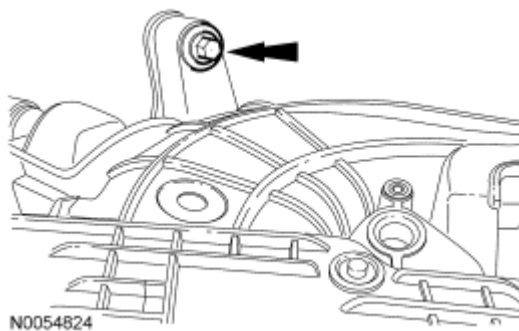


Fig. 290: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

73. Remove the upper intake manifold short support bracket bolt.

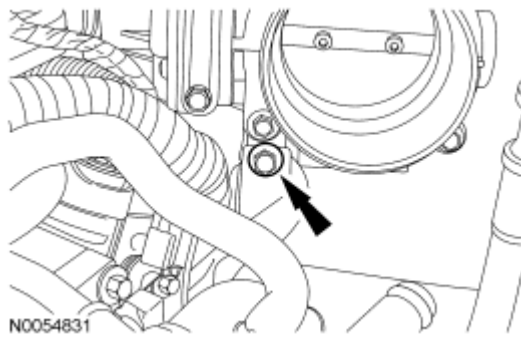


Fig. 291: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

74. Remove the wire harness pin-type retainer and the fuel tube bracket bolt from the upper intake manifold.

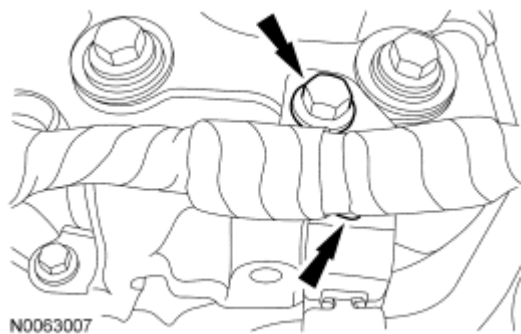
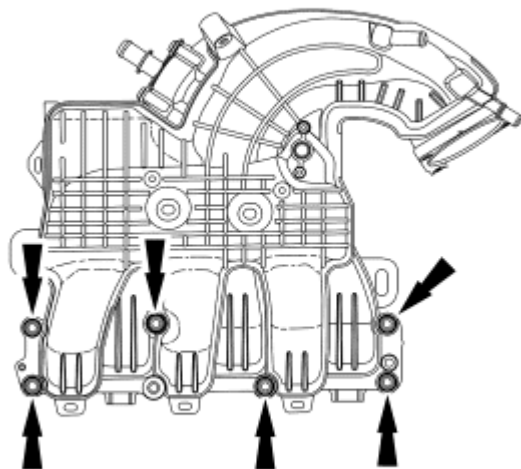


Fig. 292: Identifying Pin-Type Retainer And Fuel Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

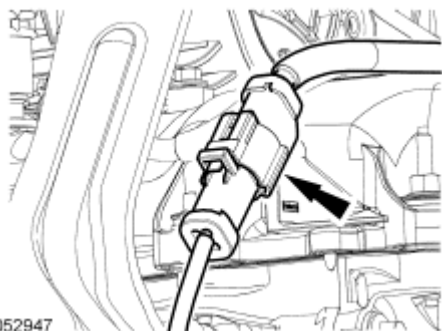
75. Remove the 6 bolts and the upper intake manifold.
- Discard the gaskets.



N0054825

Fig. 293: Identifying Upper Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

76. Disconnect the RH catalyst monitor electrical connector.



N0052947

Fig. 294: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

77. Disconnect the fuel efficient power steering system solenoid electrical connector.



Fig. 295: Identifying Connector
Courtesy of FORD MOTOR CO.

78. Disconnect the RH variable camshaft timing (VCT) solenoid electrical connector.

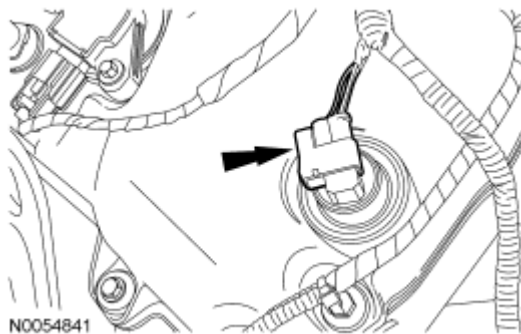


Fig. 296: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

79. Disconnect the 3 RH coil-on-plug electrical connectors.

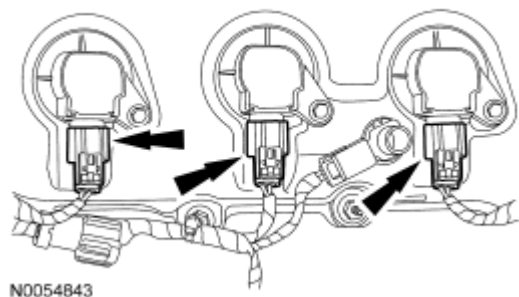


Fig. 297: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

80. If equipped, disconnect the heated PCV valve electrical connector.

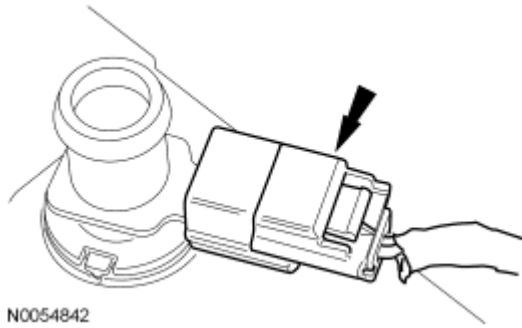


Fig. 298: Locating Heated PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

81. Detach all of the wiring harness retainers from the RH valve cover and stud bolts.
82. Disconnect the LH VCT solenoid electrical connector.

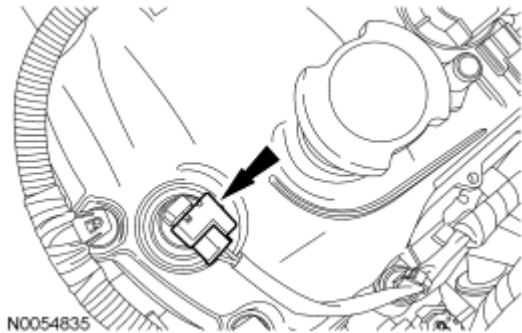


Fig. 299: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

83. Disconnect the 3 LH coil-on-plug electrical connectors.

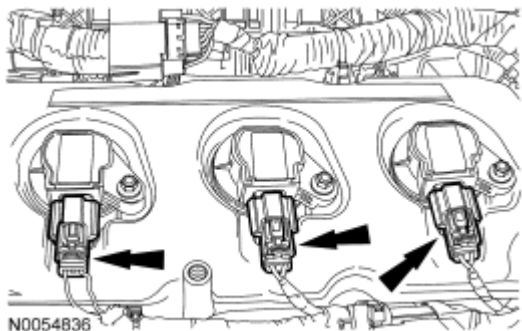


Fig. 300: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

84. Detach all of the wiring harness retainers from the LH valve cover and stud bolts.

NOTE: LH shown in illustration, RH similar.

85. Remove the 6 bolts and the 6 coil-on-plug assemblies.

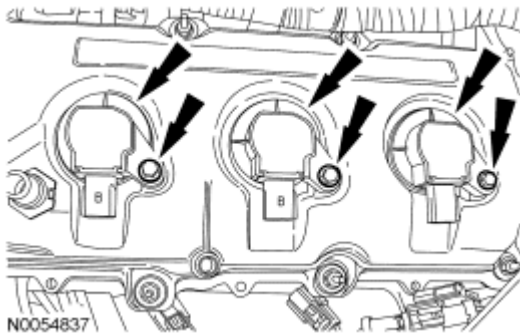


Fig. 301: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

86. Disconnect the PSP switch electrical connector.

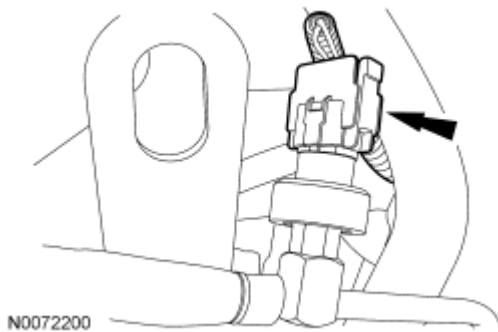


Fig. 302: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

87. Remove the PSP tube bracket-to-power steering pump bolt.

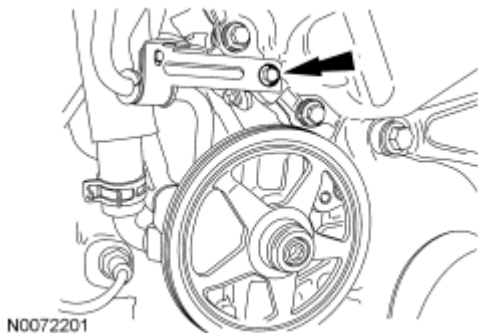


Fig. 303: Identifying Bracket-To-Power Steering Pump Bolt
Courtesy of FORD MOTOR CO.

88. Remove the nut and the PSP tube bracket from the RH valve cover stud bolt.

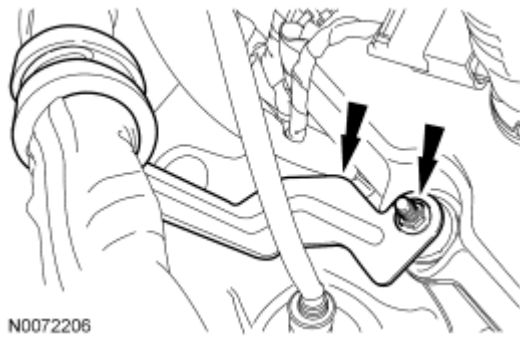


Fig. 304: Identifying Nut And PSP Tube Bracket
Courtesy of FORD MOTOR CO.

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

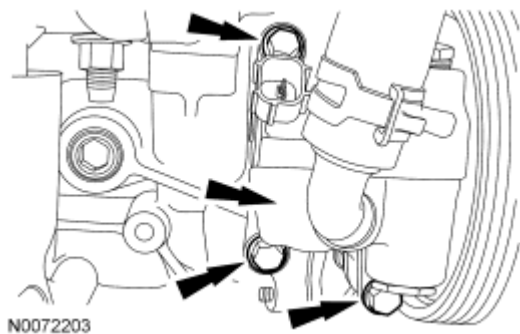


Fig. 305: Identifying Bolts
Courtesy of FORD MOTOR CO.

90. Remove the 3 bolts and the accessory drive belt tensioner.

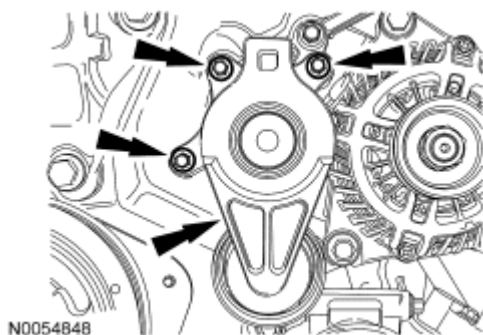
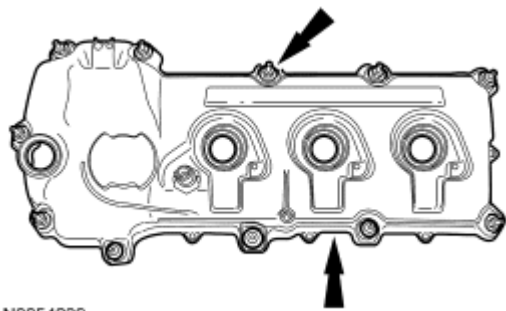


Fig. 306: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

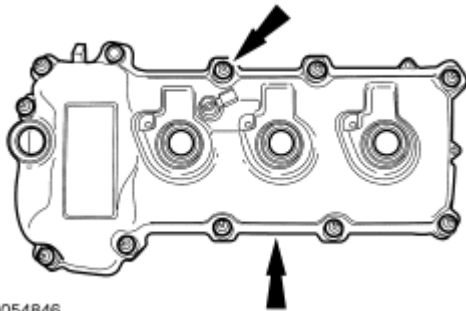
91. Remove the 11 stud bolts and the LH valve cover.
- Discard the gasket.



N0054839

Fig. 307: Locating LH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

92. Remove the bolt, the 10 stud bolts and the RH valve cover.
- Discard the gasket.



N0054846

Fig. 308: Locating RH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

NOTE: VCT solenoid seal removal shown in illustration, spark plug tube seal removal similar.

93. Inspect the VCT solenoid seals and the spark plug tube seals. Install new seals if damaged.
- Using the special tools, remove the seal(s).

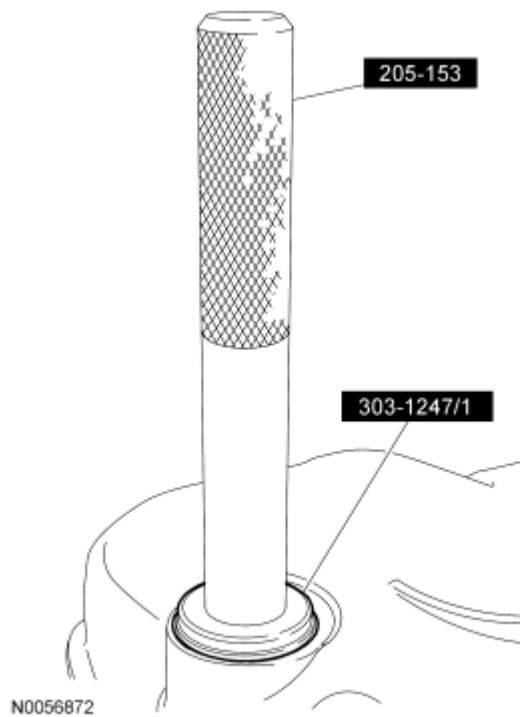


Fig. 309: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

94. Using the special tool, remove the crankshaft bolt and washer.
- Discard the bolt.

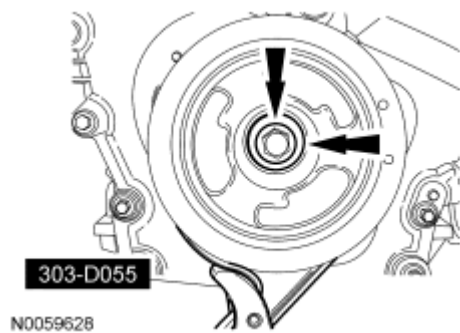


Fig. 310: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

95. Using the special tool, remove the crankshaft pulley.

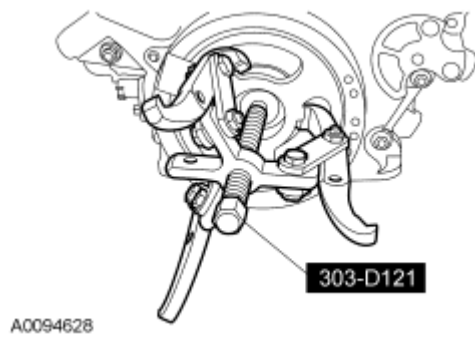


Fig. 311: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

96. Using the special tool, remove and discard the crankshaft front seal.

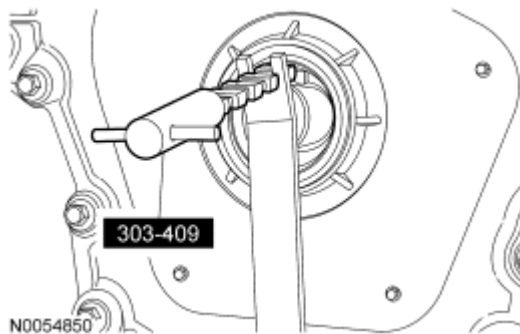


Fig. 312: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

97. Remove the 2 bolts and the engine mount bracket.

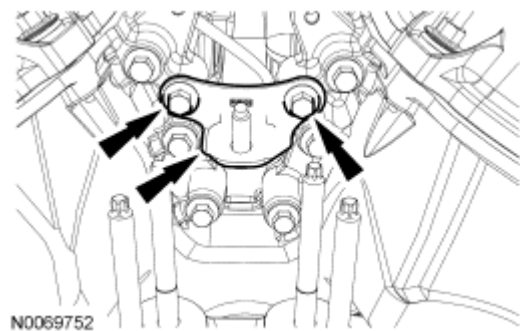


Fig. 313: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

98. Remove the 2 engine mount studs.

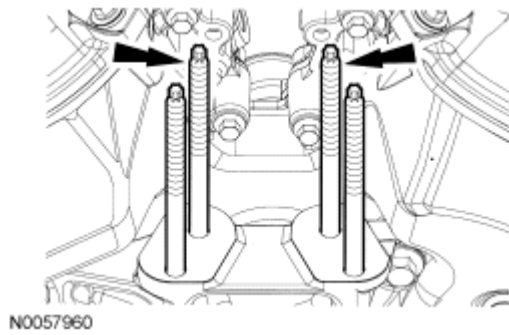


Fig. 314: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

99. Remove the 3 bolts and the engine mount bracket.

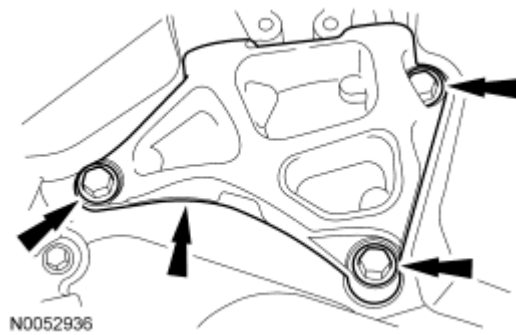
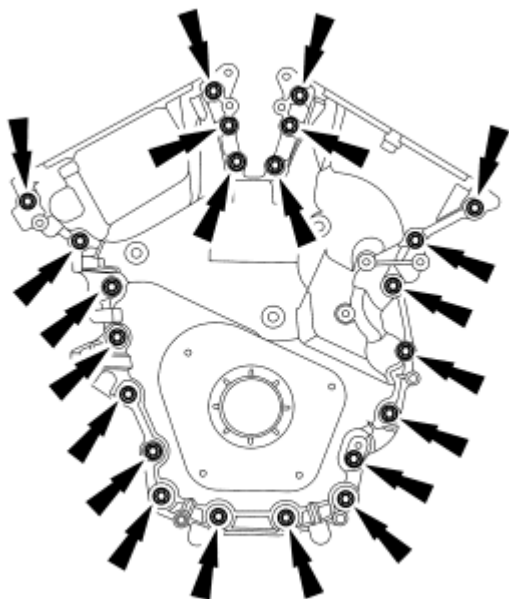


Fig. 315: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

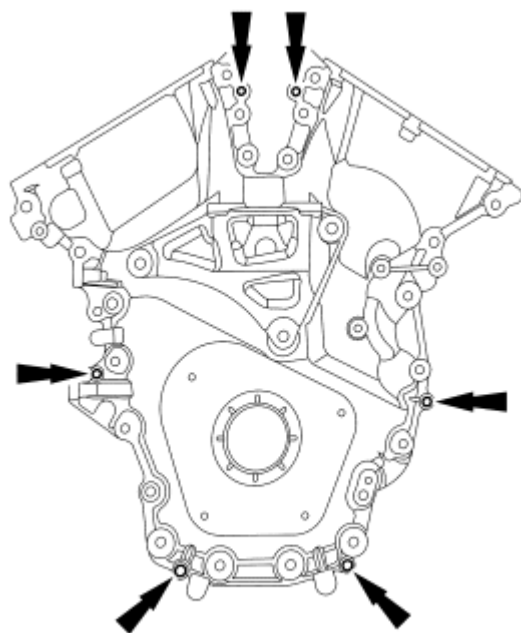
100. Remove the 22 engine front cover bolts.



N0054851

Fig. 316: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

101. Install 6 of the engine front cover bolts (finger tight) into the 6 threaded holes in the engine front cover.
 - Tighten the bolts one turn at a time in a criss-cross pattern until the engine front cover-to-cylinder block seal is released.
 - Remove the engine front cover.



N0069753

Fig. 317: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Only use a 3M Roloc® Bristle Disk (2-in white, part number 07528) to clean the engine front cover. Do not use metal scrapers, wire brushes or any other power abrasive disk to clean the engine front cover. These tools cause scratches and gouges that make leak paths.

102. Clean the engine front cover using a 3M Roloc® Bristle Disk (2-in white, part number 07528) in a suitable tool turning at the recommended speed of 15,000 RPM.

- Thoroughly wash the engine front cover to remove any foreign material, including any abrasive particles created during the cleaning process.

CAUTION: Place clean, lint-free shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

CAUTION: Do not use wire brushes, power abrasive discs or 3M Roloc® Bristle Disk (2-in white, part number 07528) to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. They also cause contamination that will cause premature engine failure. Remove all traces of sealant, including any sealant from the inner surface of the cylinder block and cylinder head.

103. Clean the sealing surfaces of the cylinder heads, the cylinder block and the oil pan in the following sequence.
1. Remove any large deposits of silicone or gasket material.
 2. Apply silicone gasket remover and allow to set for several minutes.
 3. Remove the silicone gasket remover. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, to remove any remaining traces of oil or coolant and to prepare the surfaces to bond. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
 5. Make sure the 2 locating dowel pins are seated correctly in the cylinder block.
104. Rotate the crankshaft clockwise and align the timing marks on the VCT assemblies as shown in illustration.

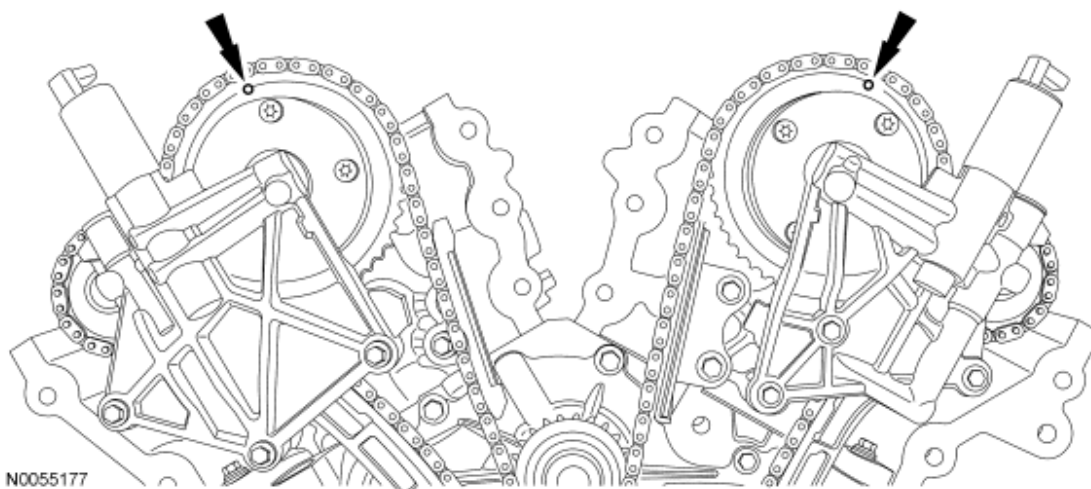


Fig. 318: Aligning Timing Marks On Variable Camshaft Timing (VCT) Assemblies
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the top dead center (TDC) position.

105. Install the special tool onto the flats of the LH camshafts.

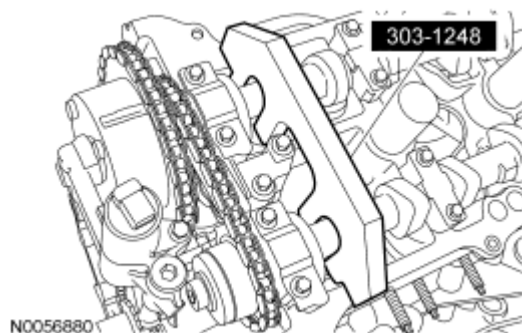


Fig. 319: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the TDC position.

106. Install the special tool onto the flats of the RH camshafts.

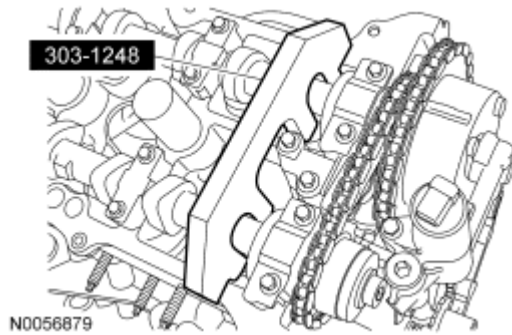


Fig. 320: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

107. Remove the 3 bolts and the RH VCT housing.

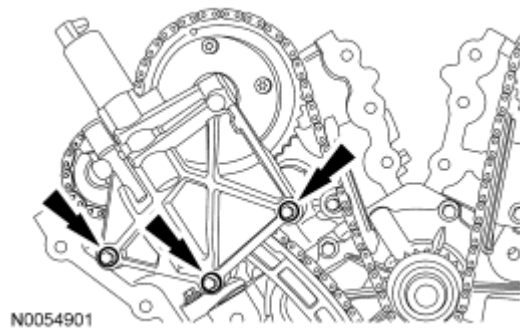


Fig. 321: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

108. Remove the 3 bolts and the LH VCT housing.

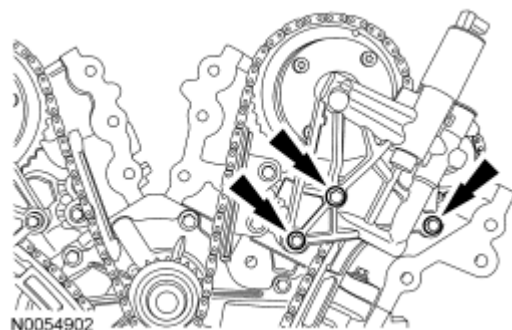


Fig. 322: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

109. Remove and discard the VCT housing seals.

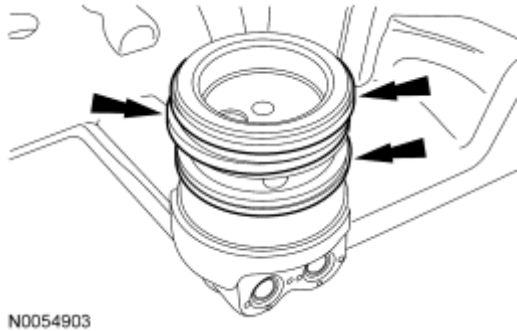


Fig. 323: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

110. Remove the 2 bolts and the primary timing chain tensioner.

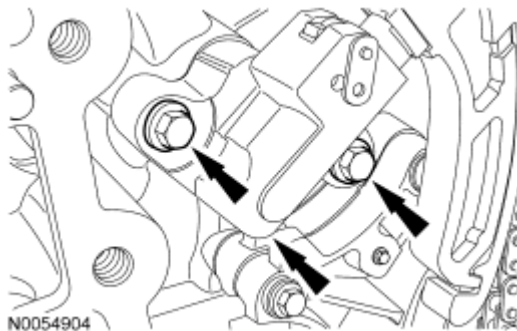


Fig. 324: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

111. Remove the primary timing chain tensioner arm.

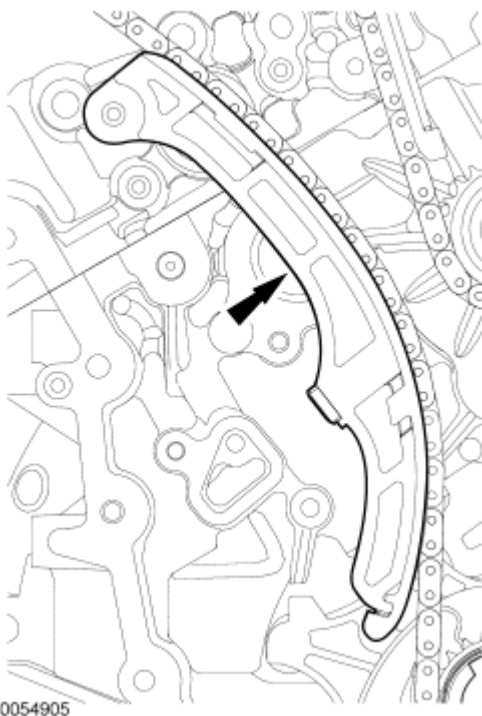


Fig. 325: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

112. Remove the 2 bolts and the lower LH primary timing chain guide.

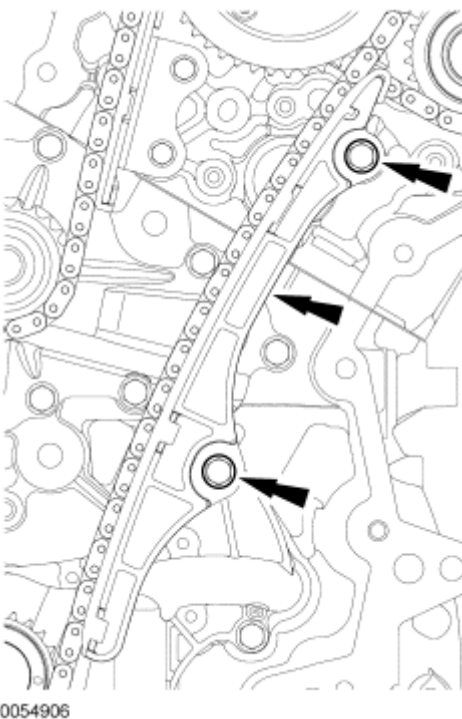
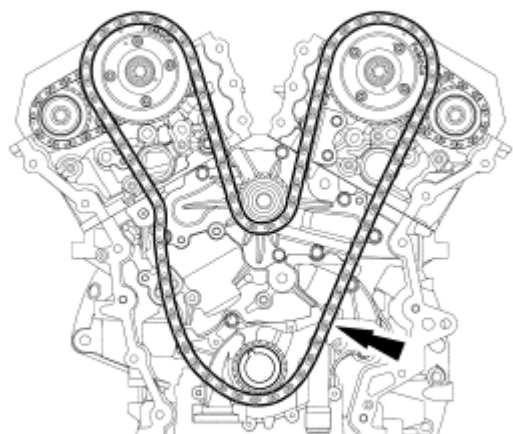


Fig. 326: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

113. Remove the primary timing chain.

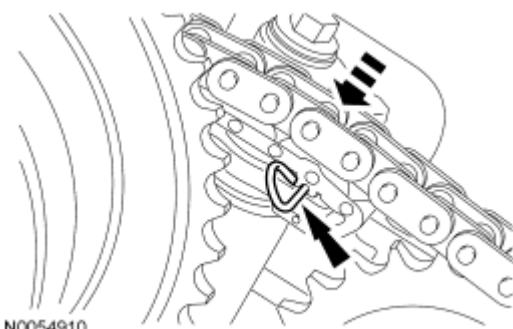


N0054908

Fig. 327: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

LH camshafts

114. Compress the LH secondary timing chain tensioner and install a suitable lockpin to retain the tensioner in the collapsed position.



N0054910

Fig. 328: Compressing LH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

NOTE: The VCT bolt and the exhaust camshaft bolt must be discarded and new

ones installed. However, the exhaust camshaft washer is reusable.

115. Remove and discard the LH VCT assembly bolt and the LH exhaust camshaft sprocket bolt.
- Remove the LH VCT assembly, secondary timing chain and the LH exhaust camshaft sprocket as an assembly.

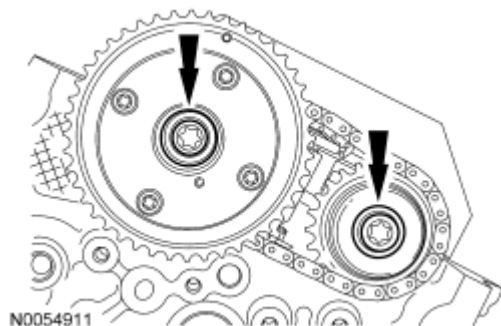


Fig. 329: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

NOTE: When the special tool is removed, valve spring pressure will rotate the LH camshafts approximately 3 degrees to a neutral position.

116. Remove the special tool from the LH camshafts.

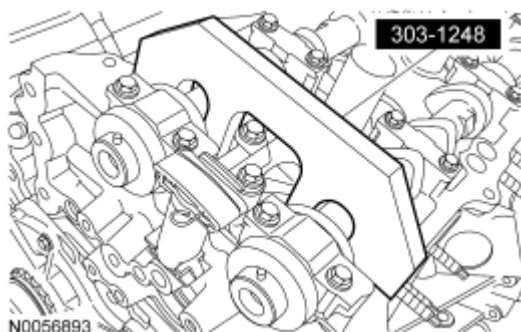


Fig. 330: Removing Special Tool (303-1248) From LH Camshafts
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

117. Verify the LH camshafts are in the neutral position.

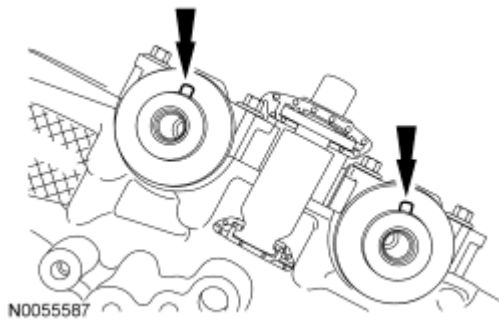


Fig. 331: Verifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

118. Remove the bolts and the LH camshaft bearing caps.
 - Remove the LH camshafts.

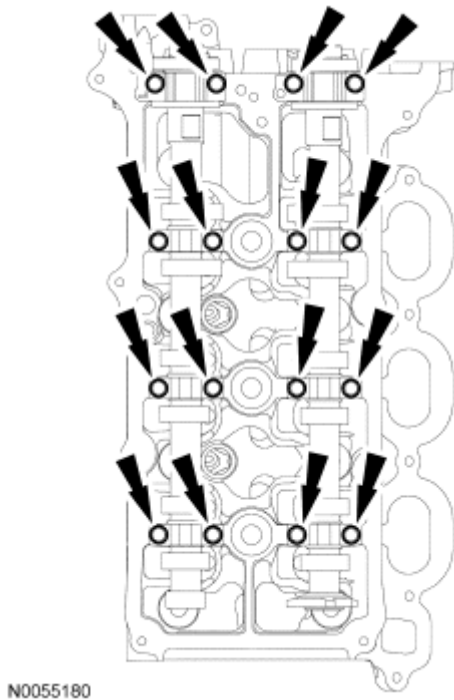


Fig. 332: Identifying LH Camshafts Bolts
Courtesy of FORD MOTOR CO.

RH camshafts

119. Compress the RH secondary timing chain tensioner and install a suitable lockpin to retain the tensioner in the collapsed position.

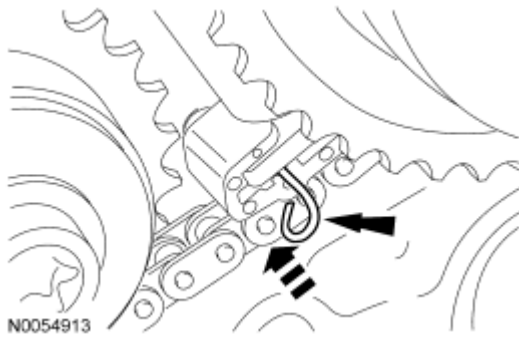


Fig. 333: Compressing RH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
 Courtesy of FORD MOTOR CO.

NOTE: The VCT bolt and the exhaust camshaft bolt must be discarded and new ones installed. However, the exhaust camshaft washer is reusable.

120. Remove and discard the RH VCT assembly bolt and the RH exhaust camshaft sprocket bolt.
 - Remove the RH VCT assembly, secondary timing chain and the RH exhaust camshaft sprocket as an assembly.

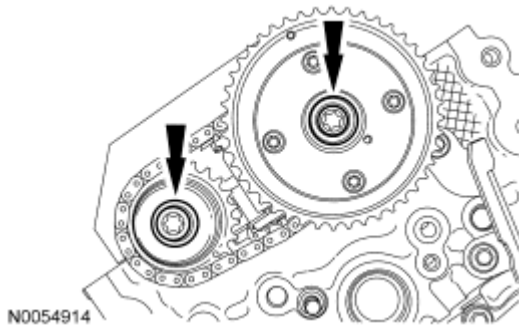


Fig. 334: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
 Courtesy of FORD MOTOR CO.

121. Remove the special tool from the RH camshafts.

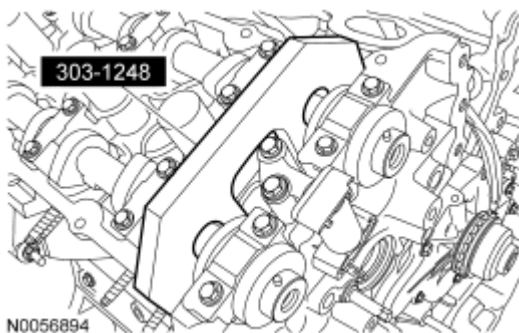


Fig. 335: Removing Special Tool (303-1248) From RH Camshafts

Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

122. Rotate the RH camshafts counterclockwise to the neutral position.

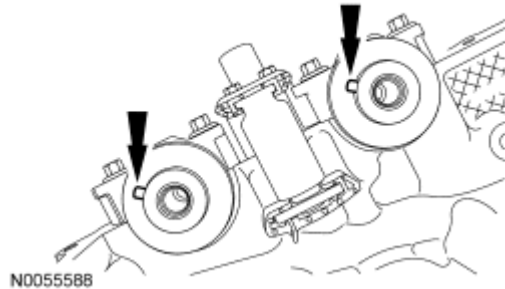


Fig. 336: Rotating RH Camshafts Counterclockwise To Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

123. Remove the bolts and the RH camshaft bearing caps.

- Remove the RH camshafts.

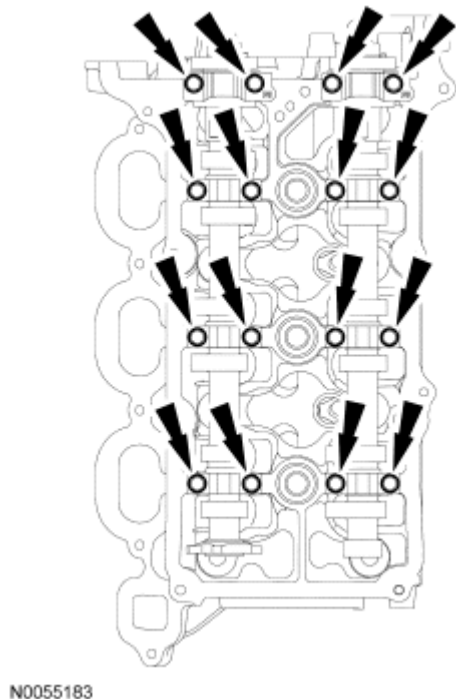


Fig. 337: Identifying RH Camshafts Bolts
 Courtesy of FORD MOTOR CO.

VALVE TAPPETS

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

- Depending on the valve tappets being serviced, remove the LH and/or the RH camshafts. For additional information, refer to Camshaft.

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations.

- Remove the valve tappets from the cylinder head.

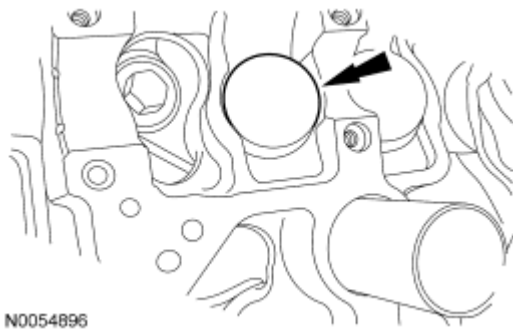
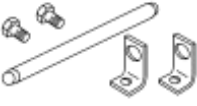


Fig. 338: Identifying Valve Tappets From Cylinder Head
 Courtesy of FORD MOTOR CO.

VALVE SPRING, RETAINER AND SEAL

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1981-F	Compressor, Valve Spring	303-300 (T87C-6565-A)
	Compressor, Valve Spring	303-350 (T89P-6565-A)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST1907-A		
 ST3028-A	Compressor, Valve Spring	303-1249

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

1. Remove the valve tappets from the cylinder being serviced. For additional information, refer to Valve Tappets.
2. Rotate the crankshaft until the piston for the valve being serviced is at the top of its stroke.

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

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations.

NOTE: If a valve drops into the cylinder, remove the cylinder head. For additional information, refer to Cylinder Head - RH or Cylinder Head - LH.

3. Pressurize the cylinder using compressed air.
4. Using the Valve Spring Compressors, remove the keys, retainer and spring.

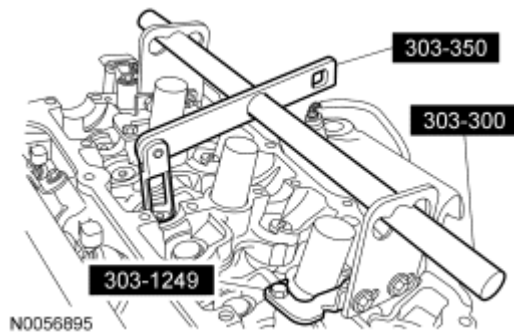


Fig. 339: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

5. Remove and discard the valve stem seal.

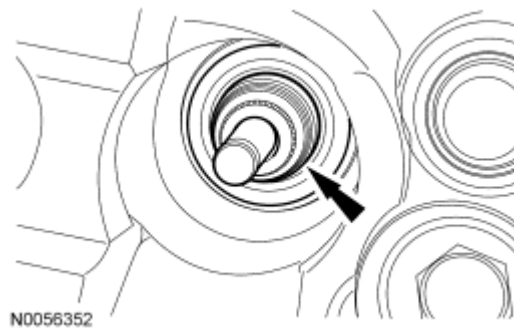


Fig. 340: Identifying Valve Stem Seal
Courtesy of FORD MOTOR CO.

CYLINDER HEAD - RH

MATERIAL

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

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

1. Remove the RH camshafts. For additional information, refer to Camshaft.
2. Disconnect the RH heated oxygen sensor (HO2S) electrical connector.

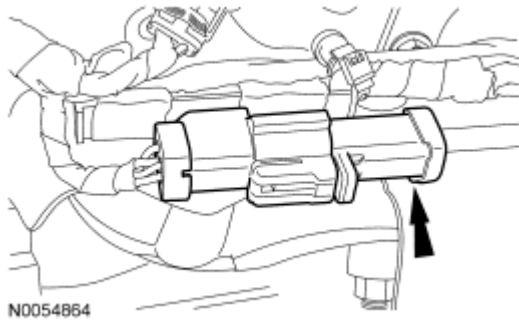


Fig. 341: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

3. Disconnect the RH camshaft position (CMP) sensor electrical connector.

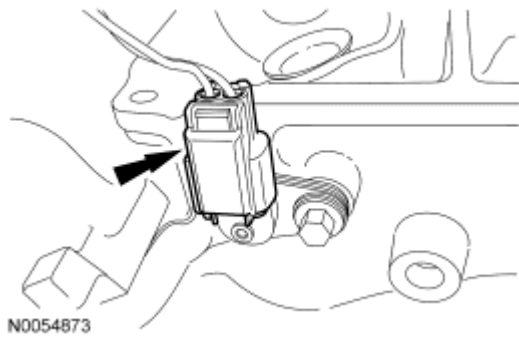


Fig. 342: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

4. Remove the bolt and the RH CMP sensor.

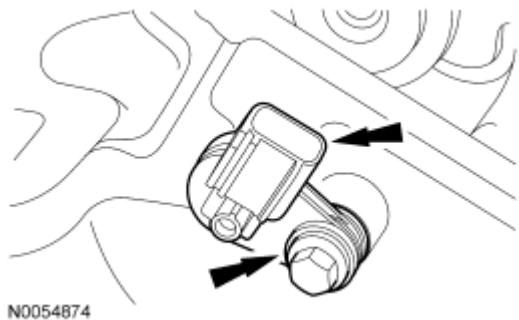


Fig. 343: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the power steering pressure (PSP) tube bracket from the RH cylinder head.

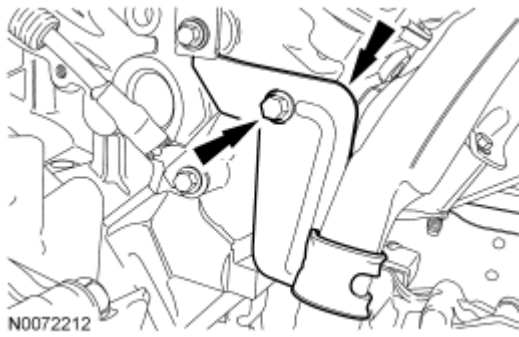


Fig. 344: Identifying Bolt
Courtesy of FORD MOTOR CO.

6. Remove the bolt and the ground wire.

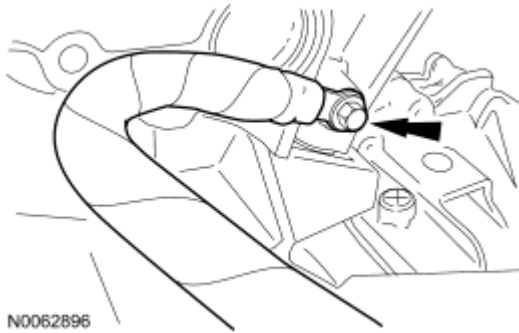


Fig. 345: Identifying Bolt
Courtesy of FORD MOTOR CO.

7. Disconnect the 6 fuel injector electrical connectors (3 shown in illustration).

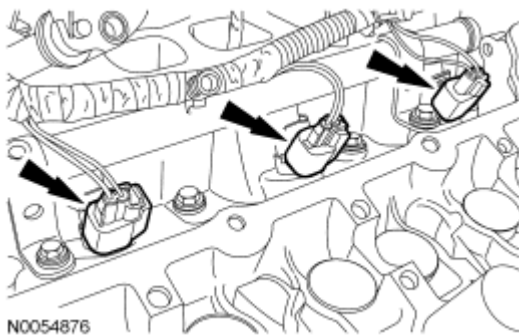


Fig. 346: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

8. Disconnect the cylinder head temperature (CHT) sensor electrical connector.

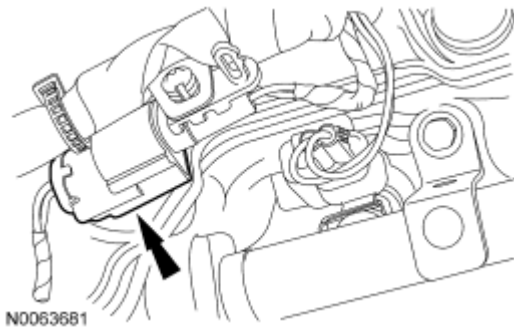


Fig. 347: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

9. Disconnect the LH catalyst monitor sensor electrical connector.

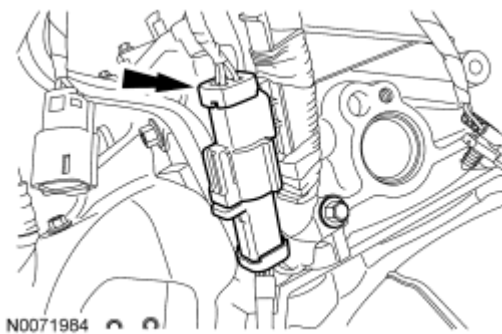


Fig. 348: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

10. Remove the 2 LH catalytic converter bracket bolts.

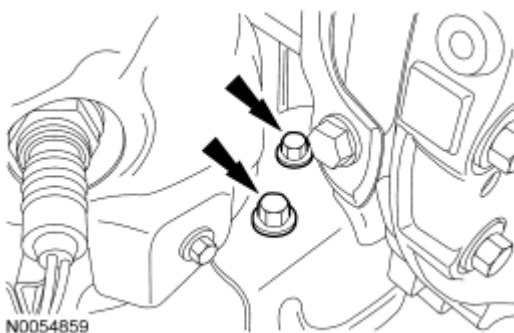


Fig. 349: Locating LH Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

11. Remove the 4 nuts (3 shown in illustration) and the LH catalytic converter.
- Discard the nuts and the gasket.

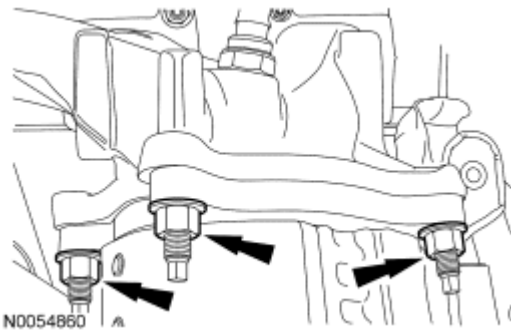


Fig. 350: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

12. Remove the LH cylinder block drain plug.
 - Allow coolant to drain from the cylinder block.

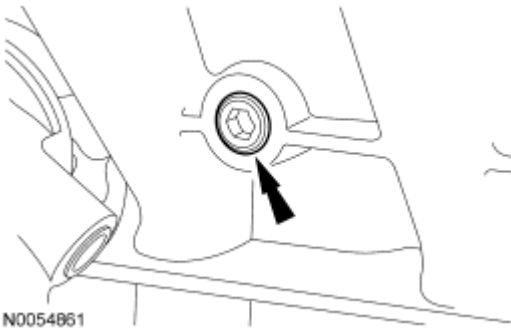


Fig. 351: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

13. Remove the 4 nuts and the RH catalytic converter.
 - Discard the nuts and gasket.

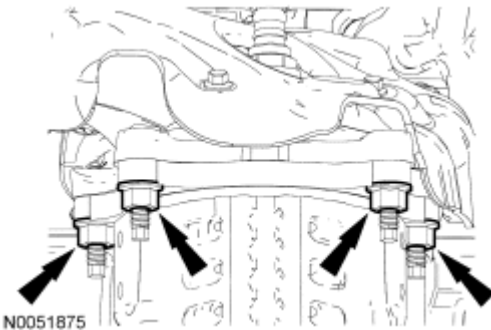


Fig. 352: Identifying Nuts
Courtesy of FORD MOTOR CO.

14. If equipped, remove the heat shield and disconnect the block heater electrical connector.
 - Remove the block heater wiring harness from the engine.

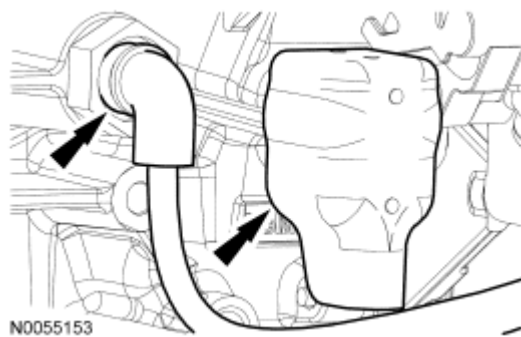


Fig. 353: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

15. Remove the RH cylinder block drain plug or, if equipped, the block heater.
 - Allow coolant to drain from the cylinder block.

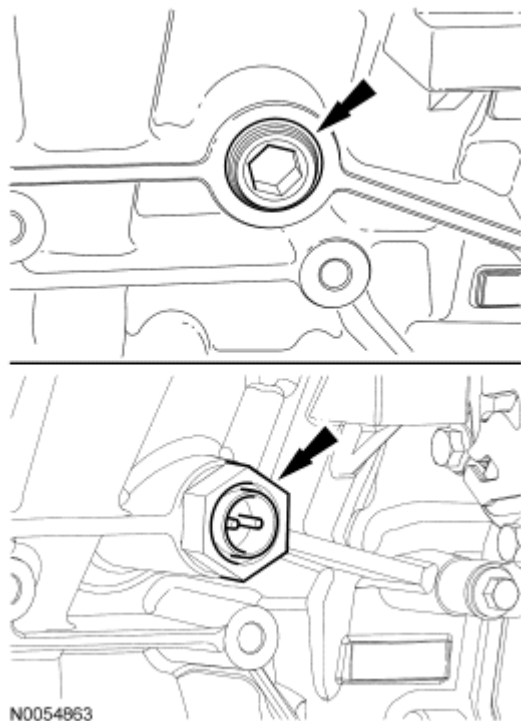


Fig. 354: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

16. Remove the 3 bolts and the RH exhaust manifold heat shield.

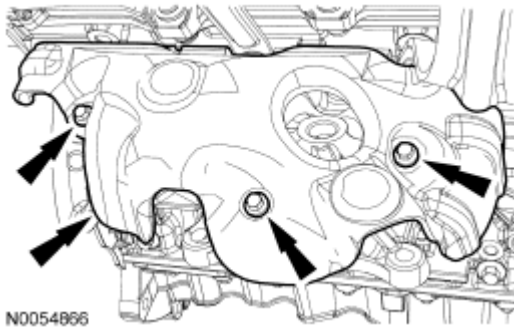


Fig. 355: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

17. Remove the 6 nuts and the RH exhaust manifold.
 - Discard the nuts and exhaust manifold gaskets.

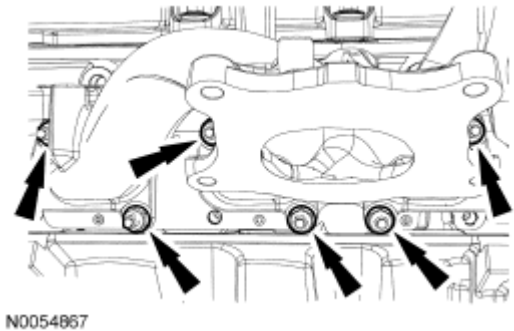


Fig. 356: Locating RH Exhaust Manifold & Nuts
Courtesy of FORD MOTOR CO.

18. Clean and inspect the RH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
19. Remove and discard the 6 RH exhaust manifold studs.

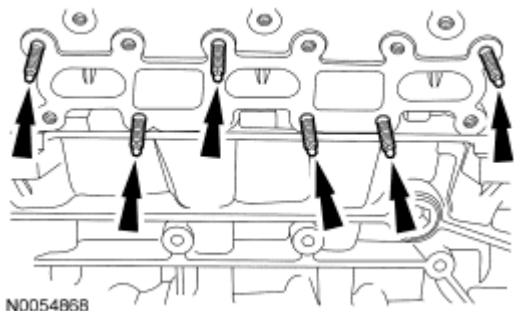


Fig. 357: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

20. Remove the 2 bolts and the RH primary timing chain guide.

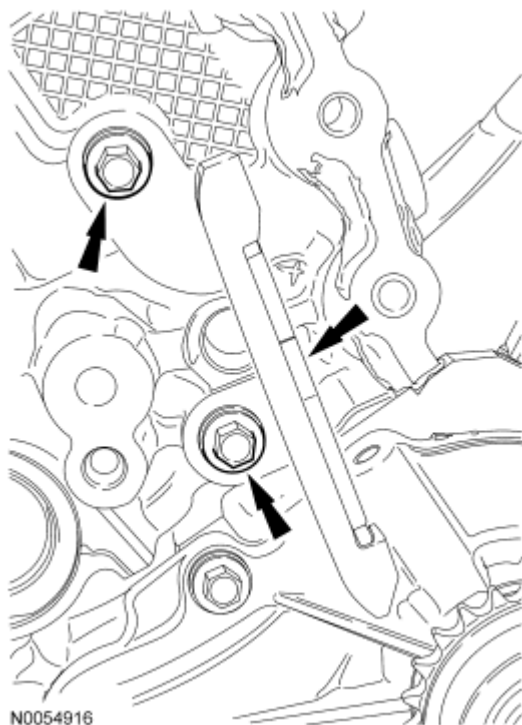


Fig. 358: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

21. Remove the bolts and the RH secondary timing chain tensioner.

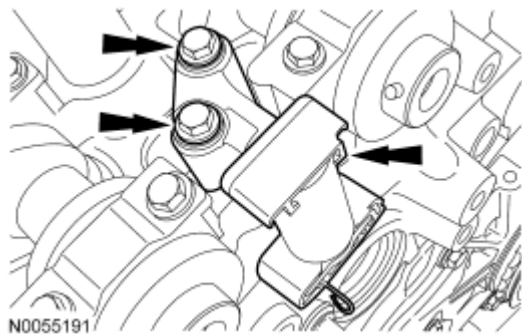


Fig. 359: Locating RH Secondary Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

22. Remove the 2 bolts and the engine lifting eye.

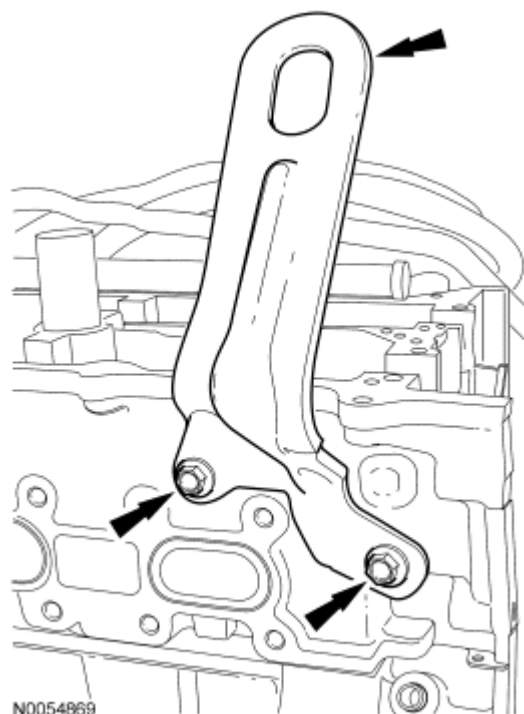


Fig. 360: Locating Engine Lifting Eye & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Index-mark the location of the bracket on the cylinder head for installation.

23. If equipped, remove the bolt and the upper intake manifold long support bracket.

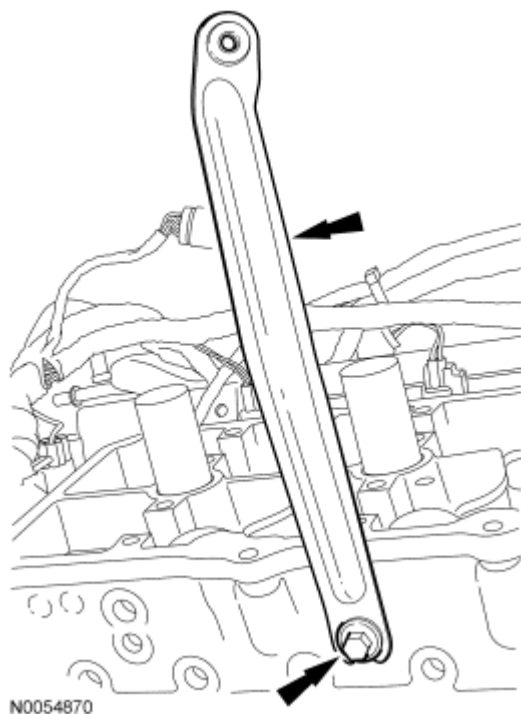


Fig. 361: Locating Upper Intake Manifold Bracket & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Index-mark the location of the bracket on the cylinder head for installation.

24. Remove the bolt and the upper intake manifold short support bracket.

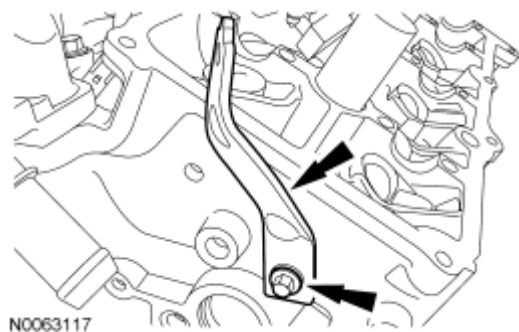


Fig. 362: Identifying Bolt And Support Bracket
Courtesy of FORD MOTOR CO.

25. Remove the coolant by-pass hose from the thermostat housing.

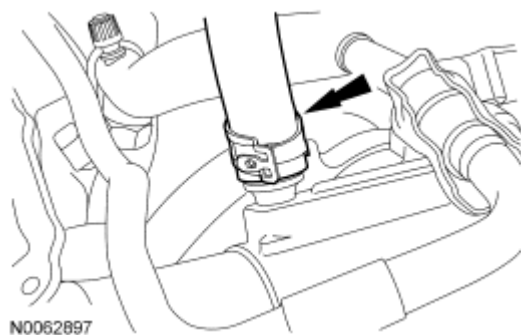


Fig. 363: Identifying Coolant By-Pass Hose
Courtesy of FORD MOTOR CO.

26. Remove the 4 bolts and the fuel rail and injectors as an assembly.

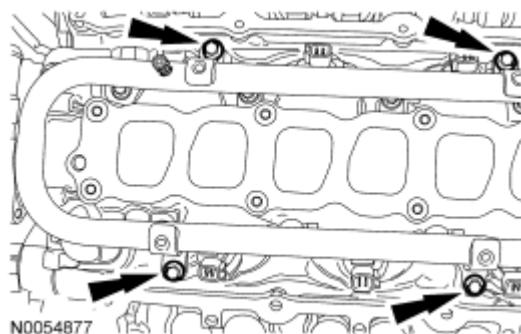


Fig. 364: Locating Fuel Rail And Injectors & Bolts
Courtesy of FORD MOTOR CO.

27. Remove the 3 thermostat housing-to-lower intake manifold bolts.
 - Remove the thermostat housing and discard the gasket and O-ring seal.

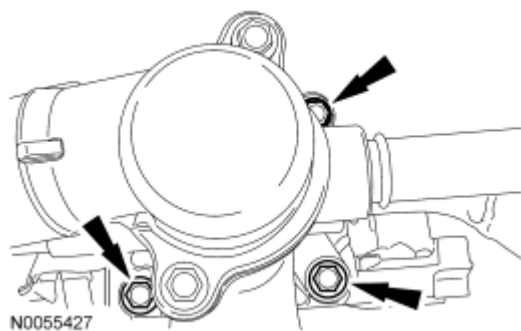


Fig. 365: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

28. Remove the 10 bolts and the lower intake manifold.
 - Discard the gaskets.

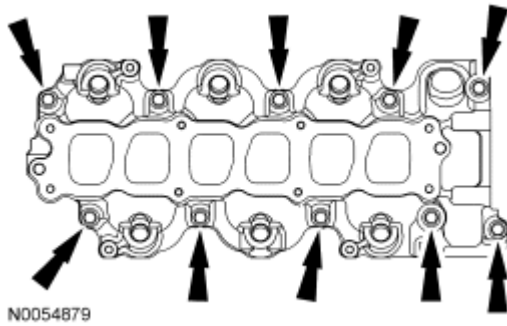


Fig. 366: Locating Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

29. Disconnect and remove the CHT sensor jumper harness.

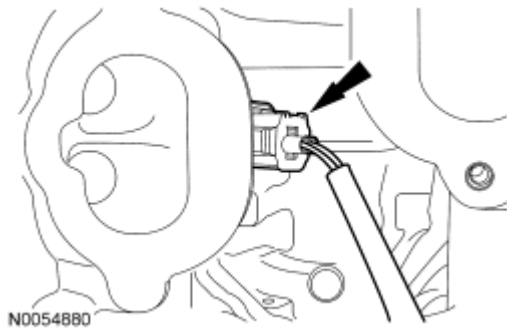


Fig. 367: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations.

30. Remove the valve tappets from the cylinder head.

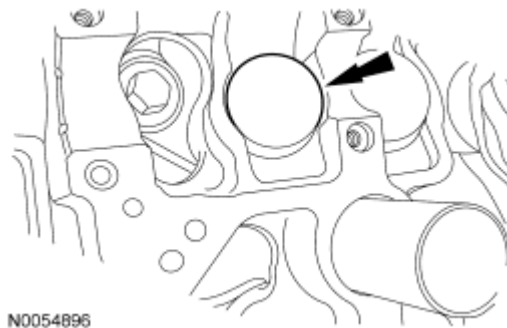


Fig. 368: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

31. Inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
32. Remove and discard the M6 bolt.

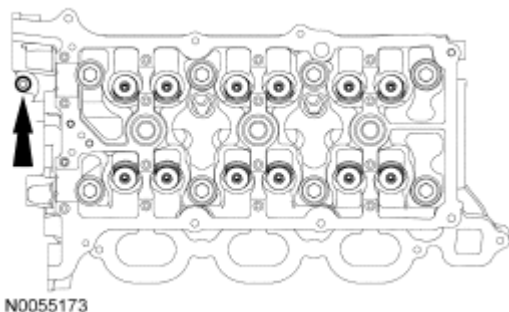


Fig. 369: Identifying M6 Bolt
Courtesy of FORD MOTOR CO.

CAUTION: Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

CAUTION: Aluminum surfaces are soft and may be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface.

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

33. Remove and discard the 8 bolts from the cylinder head.
 - Remove the cylinder head.
 - Discard the cylinder head gasket.

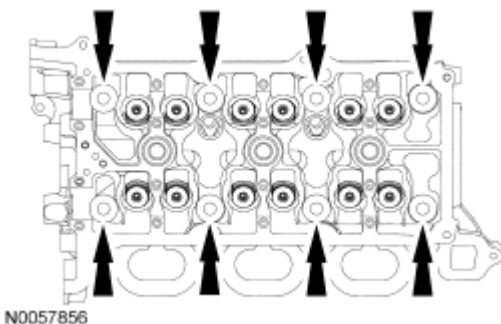


Fig. 370: Identifying Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

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

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

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

34. Clean the cylinder head-to-cylinder block mating surfaces of both the cylinder heads and the cylinder block in the following sequence.
1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any remaining traces of oil or coolant and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
35. Support the cylinder head on a bench with the head gasket side up.

NOTE: The straightedge used must be flat within 0.0051 mm (0.0002 in) per foot of tool length.

36. Inspect all areas of the deck face with a straightedge and feeler gauge. The cylinder head must not have depressions deeper than 0.0254 mm (0.001 in) across a 38.1 mm (1.5 in) square area, or scratches more than 0.0254 mm (0.001 in).

CYLINDER HEAD - LH

MATERIAL

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

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

1. Remove the LH camshafts. For additional information, refer to **Camshaft**.
2. Disconnect the 6 fuel injector electrical connectors (3 shown in illustration).

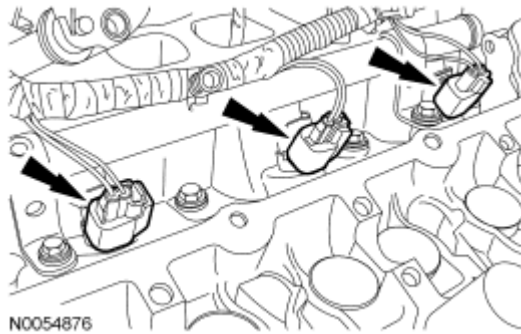


Fig. 371: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

3. Disconnect the cylinder head temperature (CHT) sensor electrical connector.

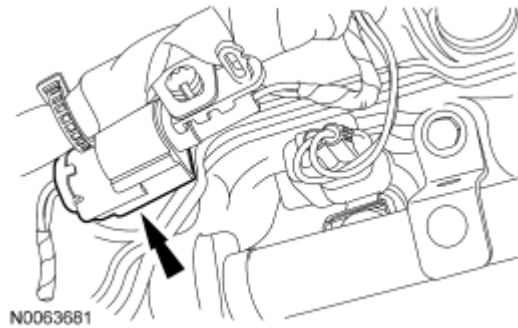


Fig. 372: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

4. Disconnect the LH camshaft position (CMP) sensor electrical connector.

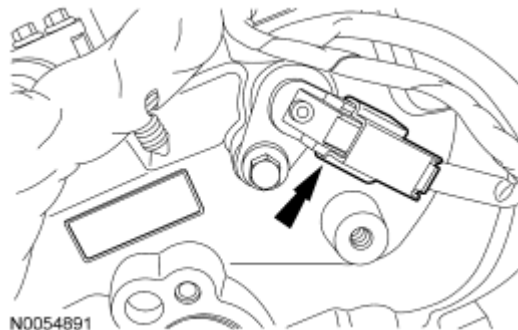


Fig. 373: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the LH CMP sensor.

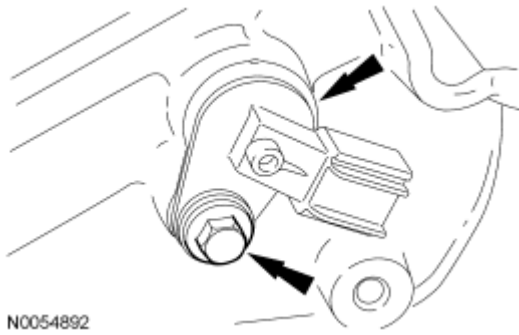


Fig. 374: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

6. Disconnect the LH heated oxygen sensor (HO2S) electrical connector.

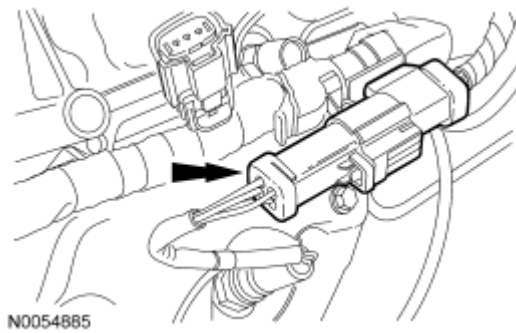


Fig. 375: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the LH catalyst monitor sensor electrical connector.

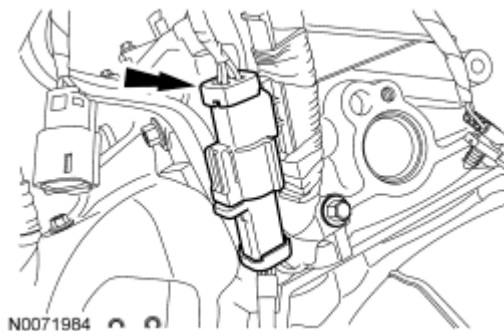


Fig. 376: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

8. Detach the wiring harness retainer from the rear of the LH cylinder head.

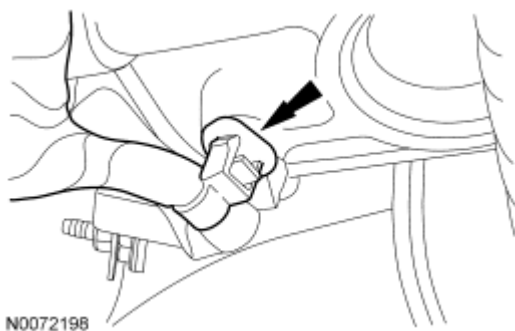


Fig. 377: Identifying Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

9. Remove the nut and disconnect the generator B+ cable.

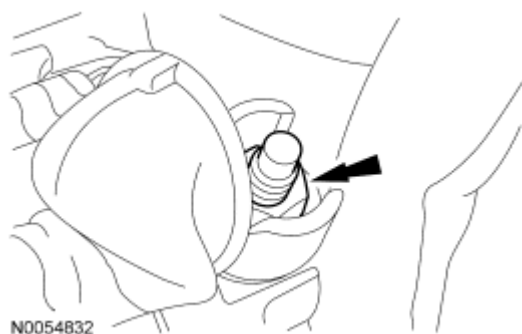


Fig. 378: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

10. Disconnect the generator electrical connector.

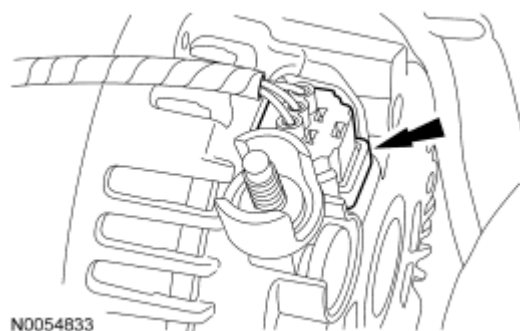


Fig. 379: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

11. Remove the nut, bolt and the generator.
 - Remove the generator stud.

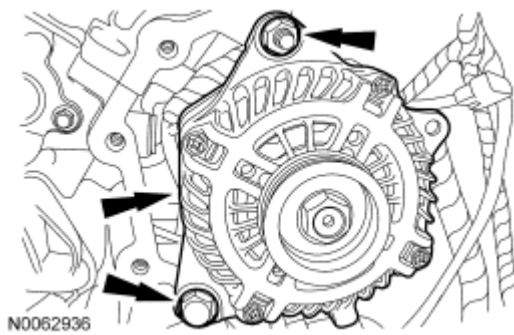


Fig. 380: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

12. Detach the engine oil pressure (EOP) switch wiring harness pin-type retainer.

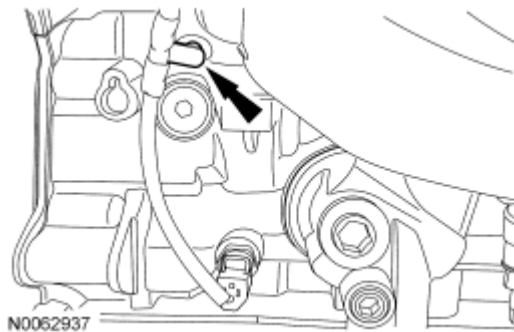


Fig. 381: Identifying Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

13. Remove the 2 LH catalytic converter bracket bolts.

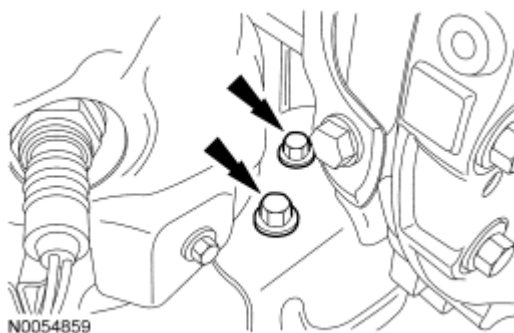


Fig. 382: Locating LH Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

14. Remove the 4 nuts (3 shown in illustration) and the LH catalytic converter.
- Discard the nuts and the gasket.

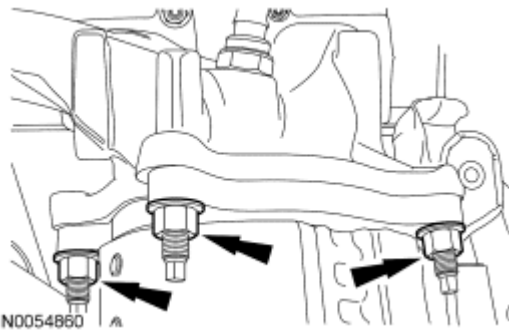


Fig. 383: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

15. Remove the 3 bolts and the LH exhaust manifold heat shield.

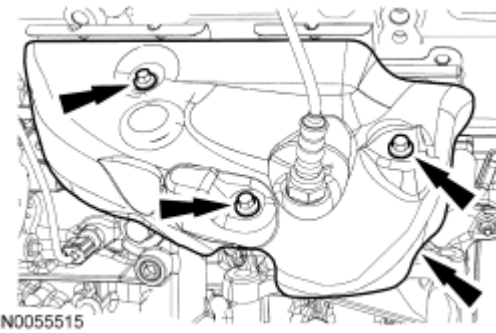


Fig. 384: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

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

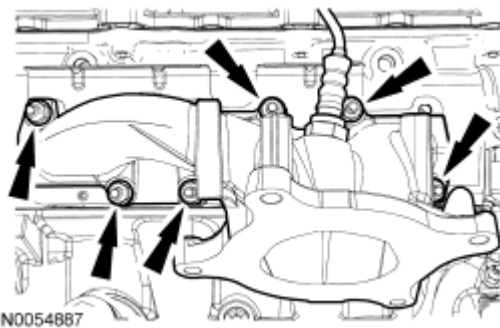


Fig. 385: Locating LH Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

17. Clean and inspect the LH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
18. Remove and discard the 6 LH exhaust manifold studs.

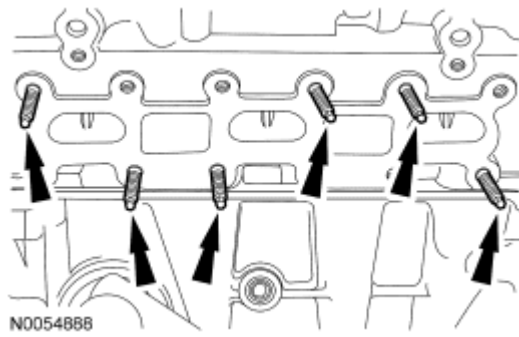


Fig. 386: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

19. Remove the LH cylinder block drain plug.
 - Allow coolant to drain from the cylinder block.

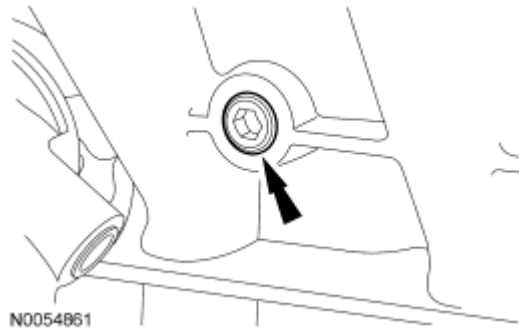


Fig. 387: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

20. Remove the 4 nuts and the RH catalytic converter.
 - Discard the nuts and gasket.

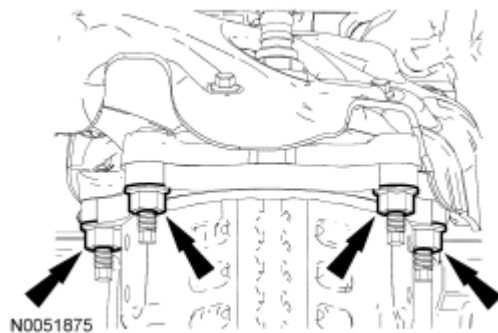


Fig. 388: Identifying Nuts
Courtesy of FORD MOTOR CO.

21. If equipped, remove the heat shield and disconnect the block heater electrical connector.
 - Remove the block heater wiring harness from the engine.

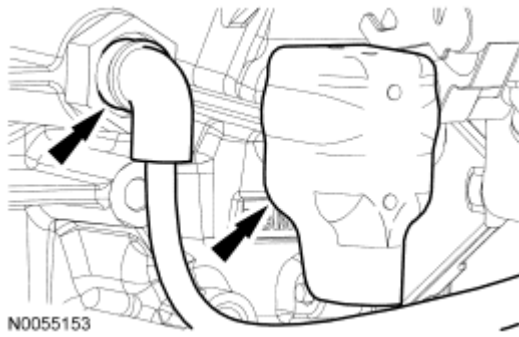


Fig. 389: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

22. Remove the RH cylinder block drain plug or, if equipped, the block heater.
- Allow coolant to drain from the cylinder block.

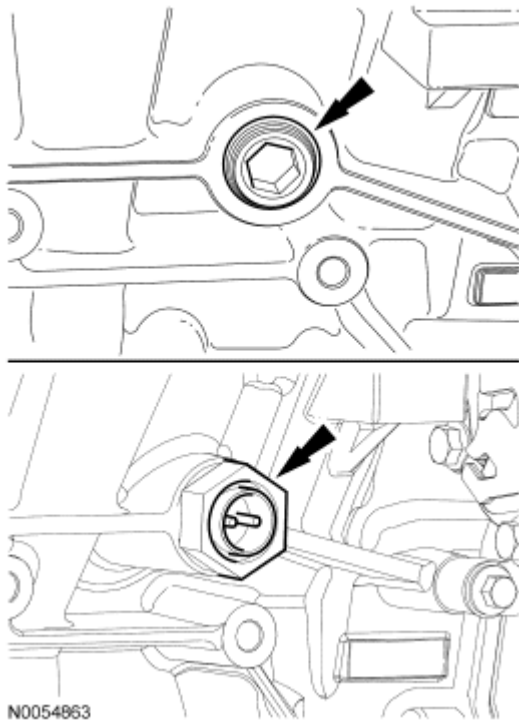


Fig. 390: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

23. Remove the coolant bypass hose from the thermostat housing.

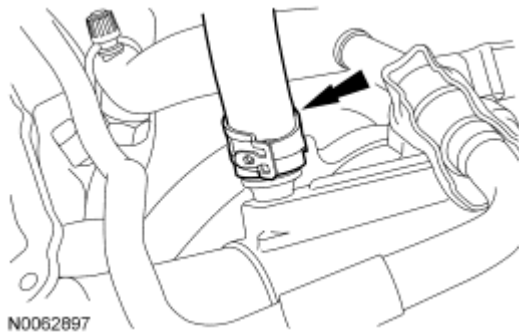


Fig. 391: Identifying Coolant By-Pass Hose
Courtesy of FORD MOTOR CO.

24. Remove the 4 bolts and the fuel rail and injectors as an assembly.

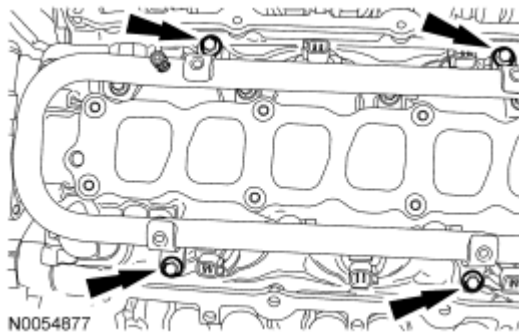


Fig. 392: Locating Fuel Rail And Injectors & Bolts
Courtesy of FORD MOTOR CO.

25. Remove the 3 thermostat housing-to-lower intake manifold bolts.
 - Remove the thermostat housing and discard the gasket and O-ring seal.

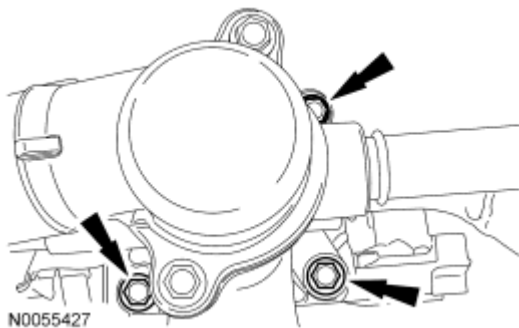


Fig. 393: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

26. Remove the 10 bolts and the lower intake manifold.
 - Discard the gaskets.

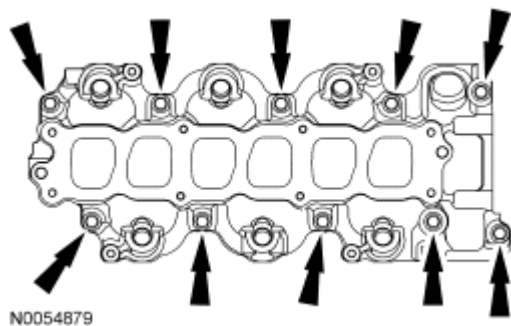


Fig. 394: Locating Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

27. Remove the 2 bolts and the upper LH primary timing chain guide.

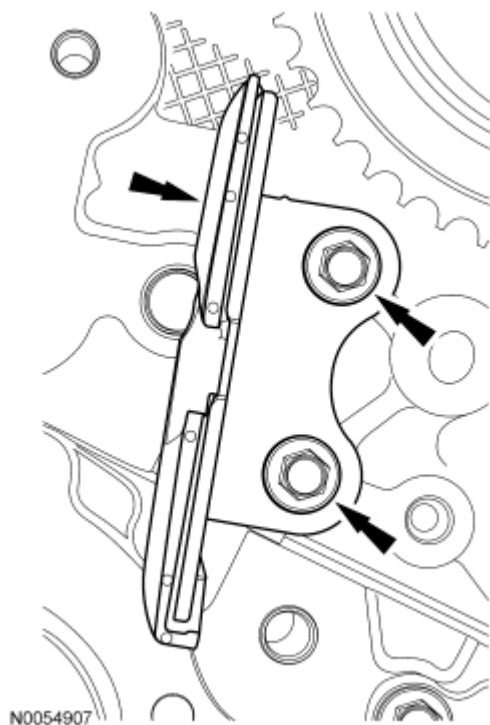


Fig. 395: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

28. Remove the 2 bolts and the LH secondary timing chain tensioner.

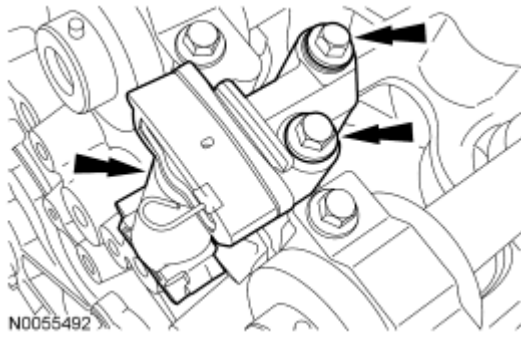


Fig. 396: Locating LH Secondary Timing Chain Tensioner & Bolt
Courtesy of FORD MOTOR CO.

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations.

29. Remove the valve tappets from the cylinder head.

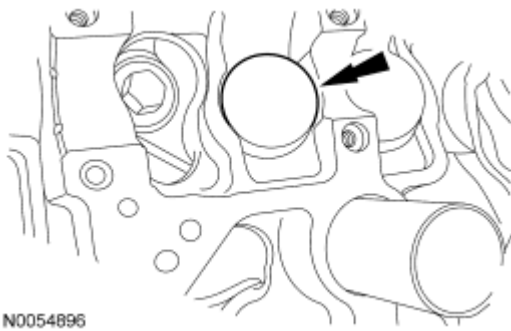


Fig. 397: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

30. Inspect the valve tappets. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
31. Remove and discard the M6 bolt.

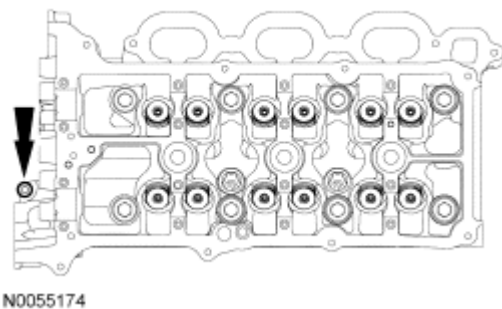


Fig. 398: Identifying M6 Bolt

Courtesy of FORD MOTOR CO.

CAUTION: Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

CAUTION: Aluminum surfaces are soft and may be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface.

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

32. Remove and discard the 8 bolts from the cylinder head.

- Remove the cylinder head.
- Discard the cylinder head gasket.

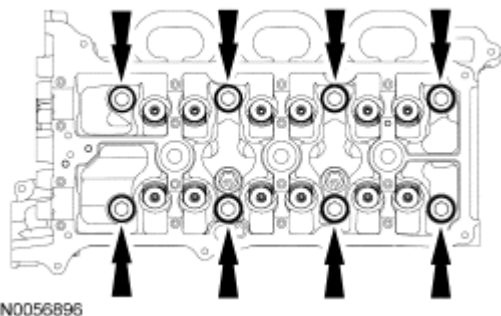


Fig. 399: Identifying Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

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

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

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

33. Clean the cylinder head-to-cylinder block mating surfaces of both the cylinder heads and the cylinder

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

block in the following sequence.

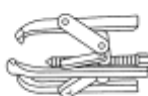
1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may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

NOTE: The straightedge used must be flat within 0.0051 mm (0.0002 in) per foot of tool length.

35. Inspect all areas of the deck face with a straightedge and feeler gauge. The cylinder head must not have depressions deeper than 0.0254 mm (0.001 in) across a 38.1 mm (1.5 in) square area, or scratches more than 0.0254 mm (0.001 in).

OIL PAN

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1184-A	3-Jaw Puller	303-D121
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST2982-A	Seal Remover	303-1247/1
 ST1385-A	Remover, Oil Seal	303-409 (T92C-6700CH)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



ST1438-A

Strap Wrench

303-D055 (D85L-6000-A)

MATERIAL

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

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

All vehicles

1. Remove the engine from the vehicle. For additional information, refer to **Engine**.
2. Remove the 8 bolts and the flywheel.

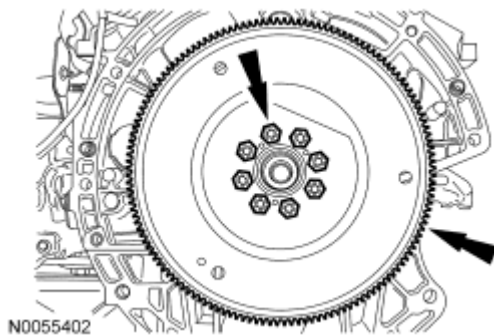


Fig. 400: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

3. Remove the crankshaft sensor ring.

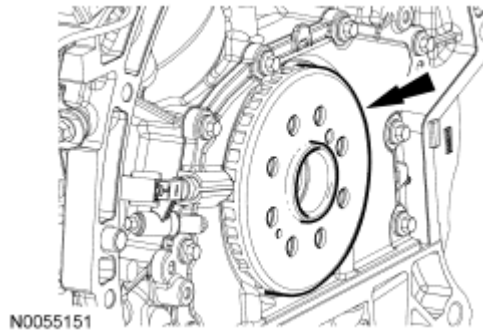


Fig. 401: Identifying Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

NOTE: Install the engine stand bolts into the cylinder block only. Do not install the bolts into the oil pan.

4. Mount the engine on a suitable engine stand.
5. If equipped, remove the heat shield and disconnect the block heater electrical connector.
 - Detach all of the engine block heater harness retainers and remove the harness.

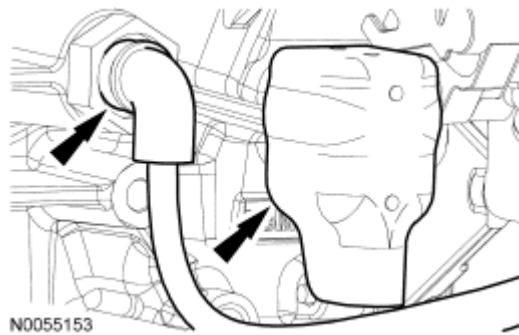


Fig. 402: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

6. If equipped, disconnect the heated PCV electrical connector.

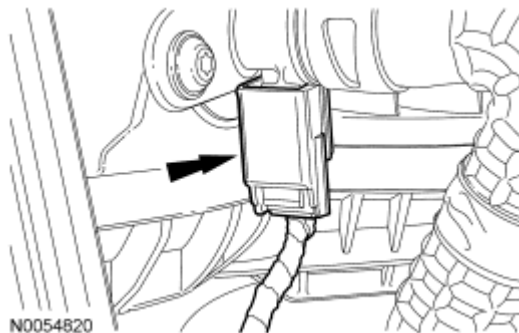


Fig. 403: Identifying Positive Crankcase Ventilation (PCV) Fitting Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the PCV hose from the PCV valve.

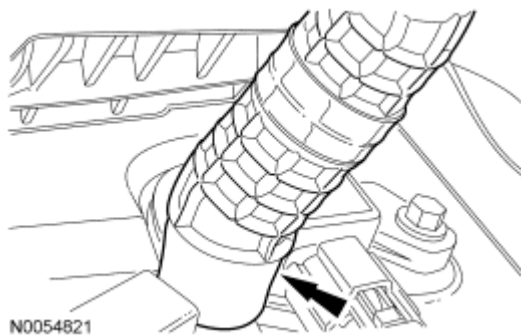


Fig. 404: Identifying PCV Hose From PCV Valve
Courtesy of FORD MOTOR CO.

8. Disconnect the throttle body (TB) electrical connector.

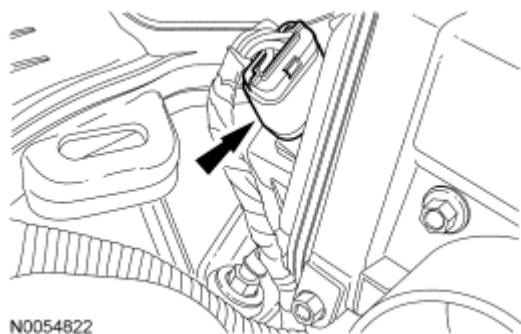


Fig. 405: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

9. Detach the wiring harness retainers from the upper intake manifold.

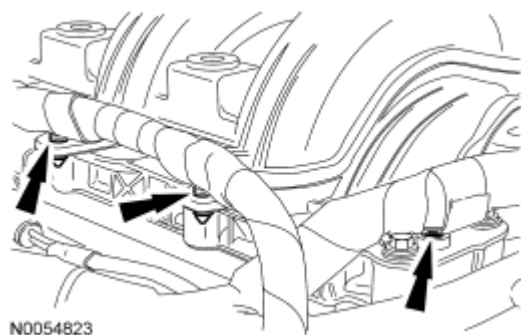


Fig. 406: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

10. If equipped, remove the upper intake manifold long support bracket bolt.

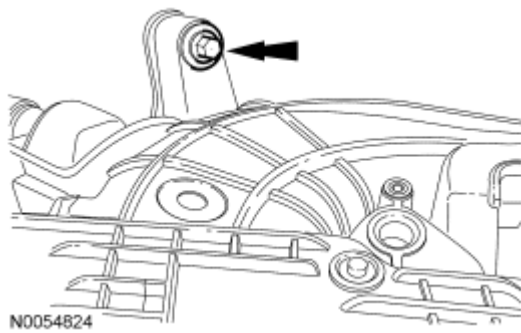


Fig. 407: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

11. Remove the upper intake manifold short support bracket bolt.

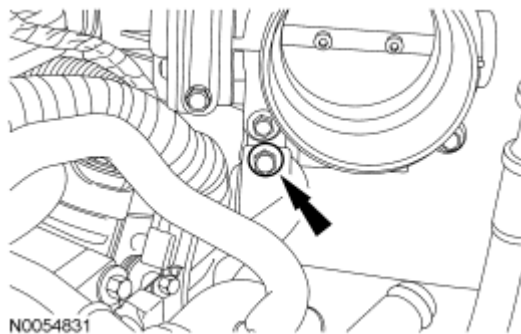


Fig. 408: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

12. Remove the fuel tube bracket bolt from the upper intake manifold.

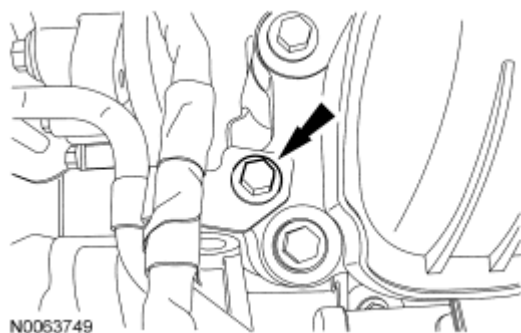
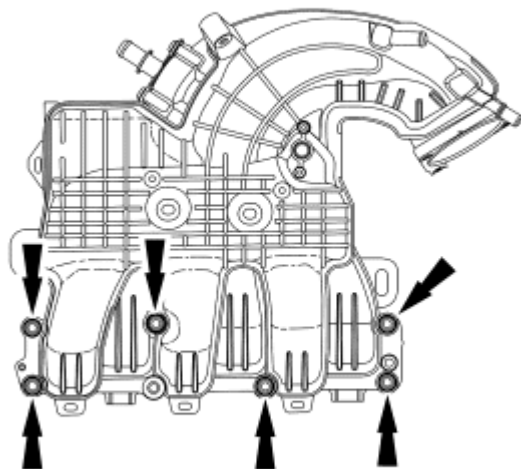


Fig. 409: Identifying Bolt
Courtesy of FORD MOTOR CO.

13. Remove the 6 bolts and the upper intake manifold.
- Discard the gaskets.



N0054825

Fig. 410: Identifying Upper Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

14. Disconnect the fuel efficient power steering system solenoid electrical connector.



N0072202

Fig. 411: Identifying Connector
Courtesy of FORD MOTOR CO.

15. Disconnect the power steering pressure (PSP) switch electrical connector.

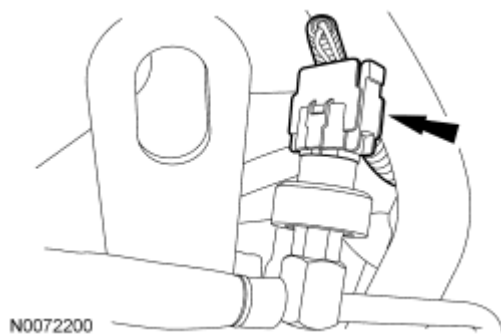


Fig. 412: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

16. Disconnect the RH catalyst monitor sensor electrical connector.

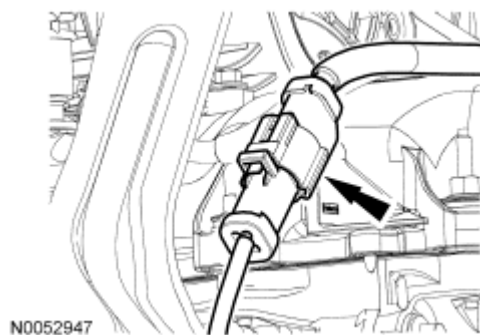


Fig. 413: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

17. Disconnect the RH variable camshaft timing (VCT) solenoid electrical connector.

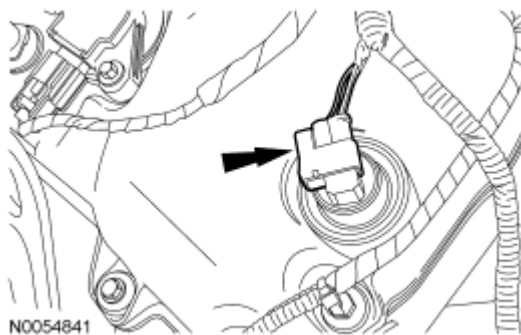


Fig. 414: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

18. Disconnect the 3 RH coil-on-plug electrical connectors.

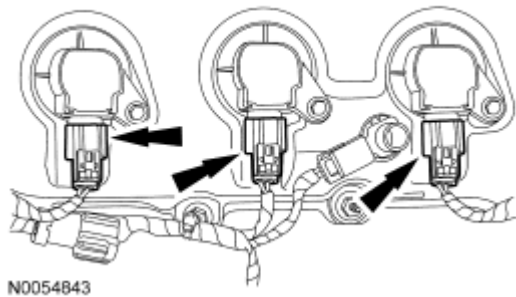


Fig. 415: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

19. If equipped, disconnect the heated PCV valve electrical connector.

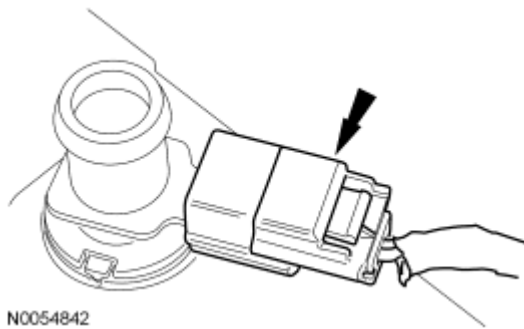


Fig. 416: Locating Heated PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

20. Disconnect the RH heated oxygen sensor (HO2S) electrical connector.

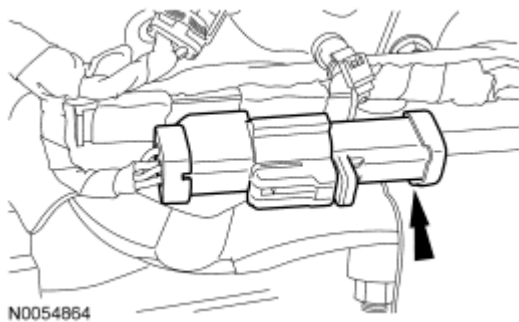


Fig. 417: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

21. Detach all of the wiring harness retainers from the RH valve cover and stud bolts.
22. Disconnect the LH catalyst monitor sensor electrical connector.

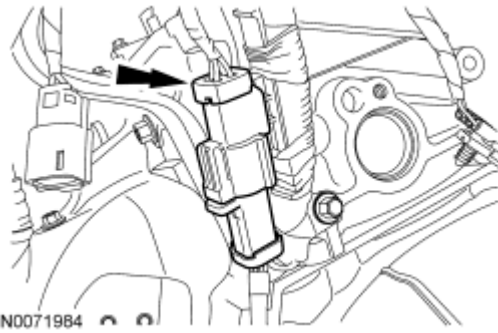


Fig. 418: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

23. Disconnect the LH VCT solenoid electrical connector.

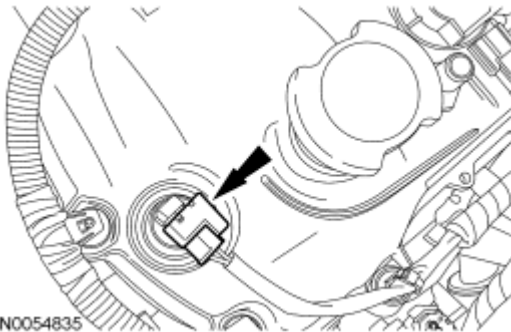


Fig. 419: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

24. Disconnect the 3 LH coil-on-plug electrical connectors.

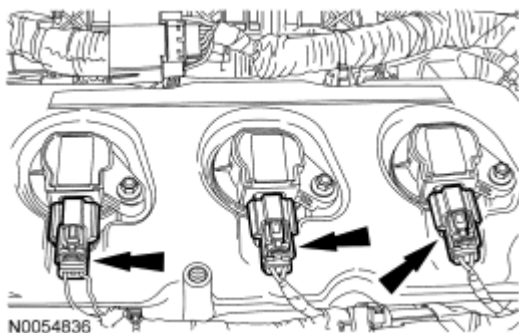


Fig. 420: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

25. Detach all of the wiring harness retainers from the LH valve cover and stud bolts.

NOTE: LH shown in illustration, RH similar.

26. Remove the 6 bolts and the 6 coil-on-plugs.

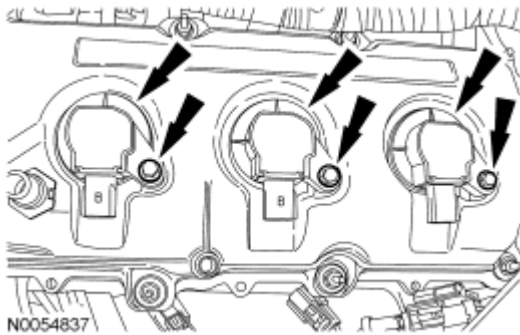


Fig. 421: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

NOTE: The A/C compressor must remain bolted to the cylinder block prior to installing the oil pan.

27. Remove the A/C compressor nut and stud.

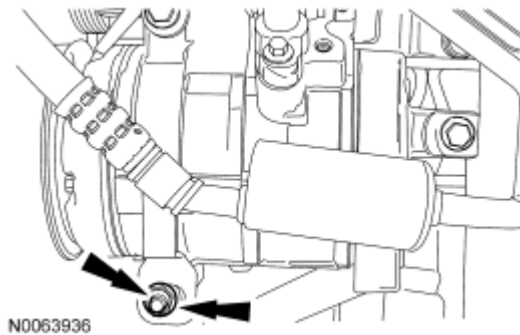


Fig. 422: Locating A/C Compressor Nut & Stud
Courtesy of FORD MOTOR CO.

28. Remove the PSP tube bracket-to-power steering pump bolt.

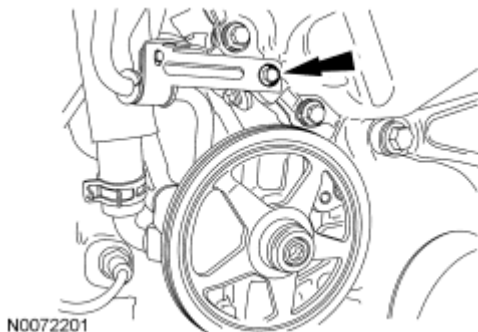


Fig. 423: Identifying Bracket-To-Power Steering Pump Bolt
Courtesy of FORD MOTOR CO.

29. Remove the nut and the PSP tube bracket from the RH valve cover stud bolt.

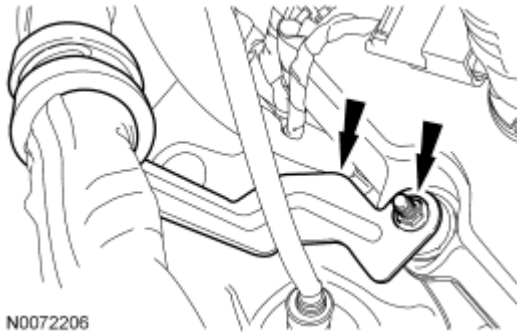


Fig. 424: Identifying Nut And PSP Tube Bracket
Courtesy of FORD MOTOR CO.

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

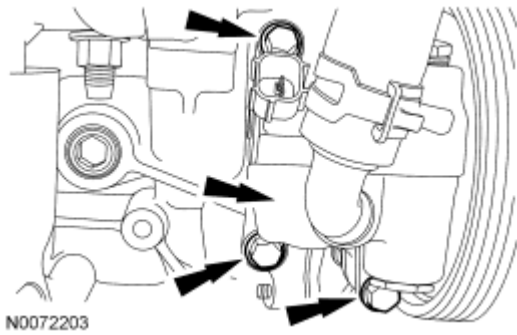


Fig. 425: Identifying Bolts
Courtesy of FORD MOTOR CO.

31. Remove the 3 bolts and the accessory drive belt tensioner.

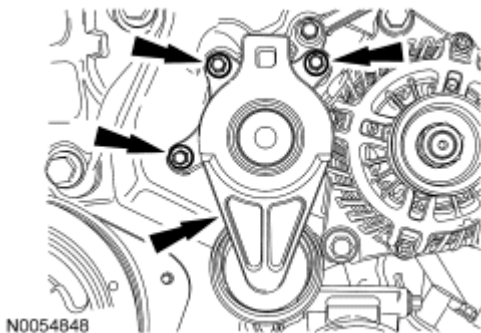


Fig. 426: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

32. Remove the 4 nuts (3 shown in illustration) and the LH catalytic converter.
- Discard the nuts and the gasket.

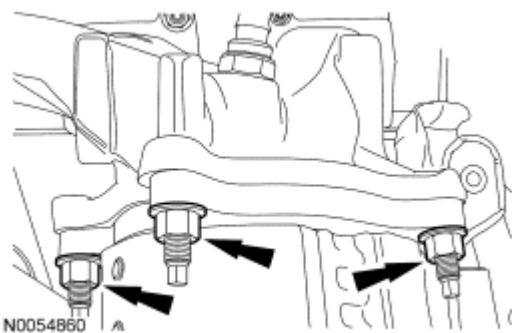


Fig. 427: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

FWD vehicles

33. Remove the 4 nuts and the RH catalytic converter.
 - Discard the nuts and the gasket.

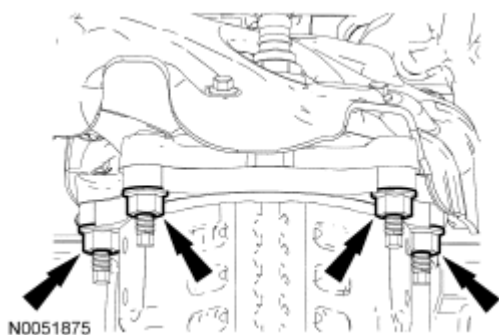


Fig. 428: Identifying Nuts
Courtesy of FORD MOTOR CO.

All vehicles

34. Remove the RH cylinder block drain plug or, if equipped, the block heater.
 - Allow coolant to drain from the cylinder block.

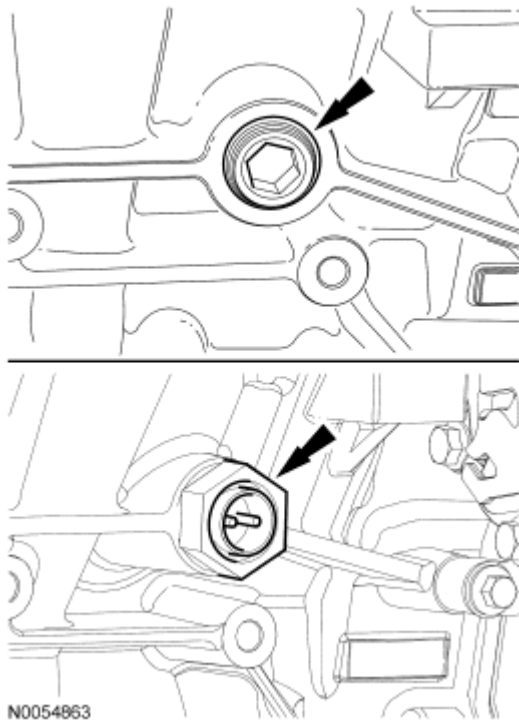


Fig. 429: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

35. Remove the LH cylinder block drain plug.
- Allow coolant to drain from the cylinder block.

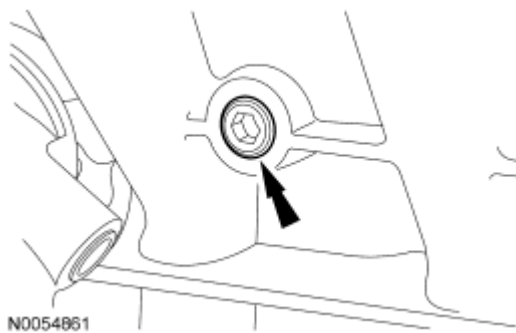
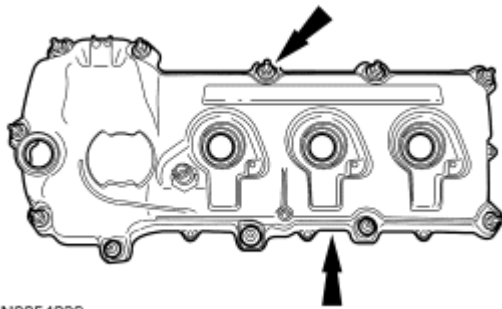


Fig. 430: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

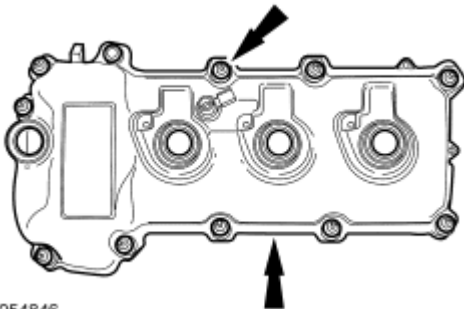
36. Remove the 11 stud bolts and the LH valve cover.
- Discard the gasket.



N0054839

Fig. 431: Locating LH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

37. Remove the bolt, the 10 stud bolts and the RH valve cover.
- Discard the gasket.



N0054846

Fig. 432: Locating RH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

NOTE: VCT solenoid seal removal shown in illustration, spark plug tube seal removal similar.

38. Inspect the VCT solenoid seals and the spark plug tube seals. Remove any damaged seals.
- Using the special tools, remove the seal(s).

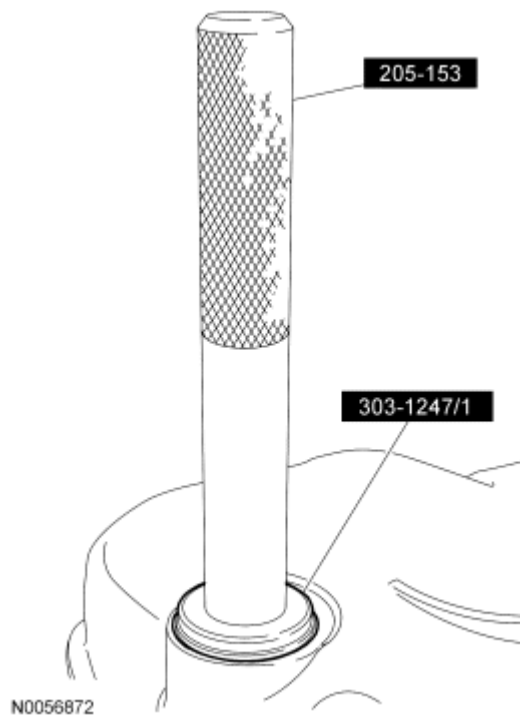


Fig. 433: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

39. Using the special tool, remove the crankshaft bolt and washer.
- Discard the bolt.

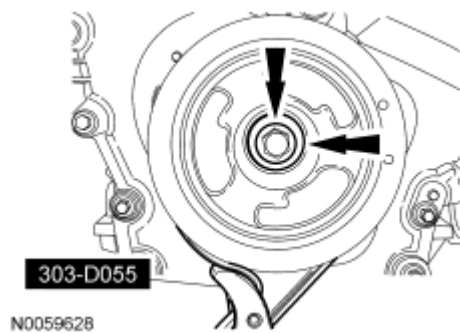


Fig. 434: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

40. Using the special tool, remove the crankshaft pulley.

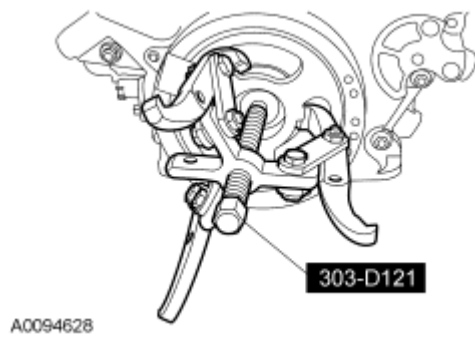


Fig. 435: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

41. Using the special tool, remove and discard the crankshaft front seal.

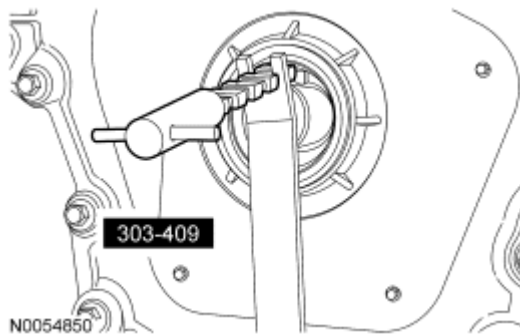


Fig. 436: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

42. Remove the 2 bolts and the engine mount bracket.

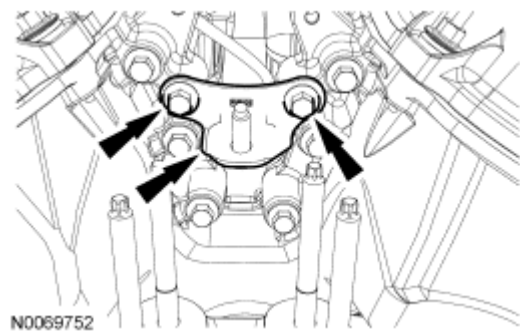


Fig. 437: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

43. Remove the 2 engine mount studs.

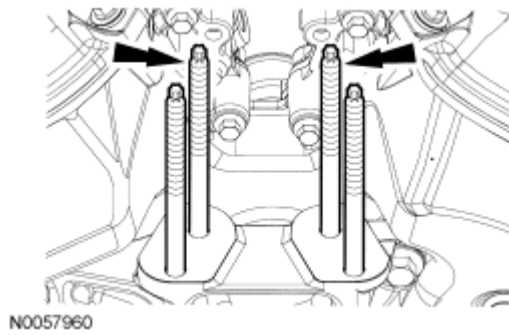


Fig. 438: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

44. Remove the 3 bolts and the engine mount bracket.

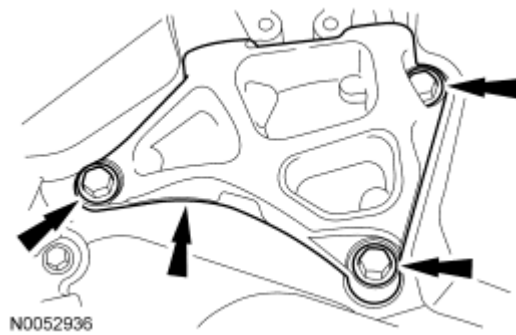
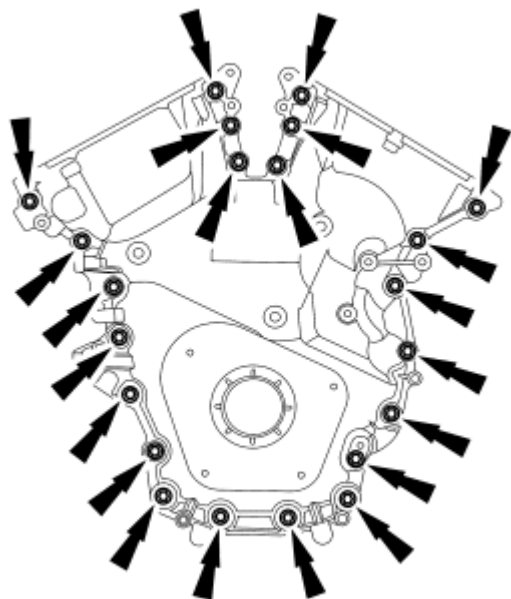


Fig. 439: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

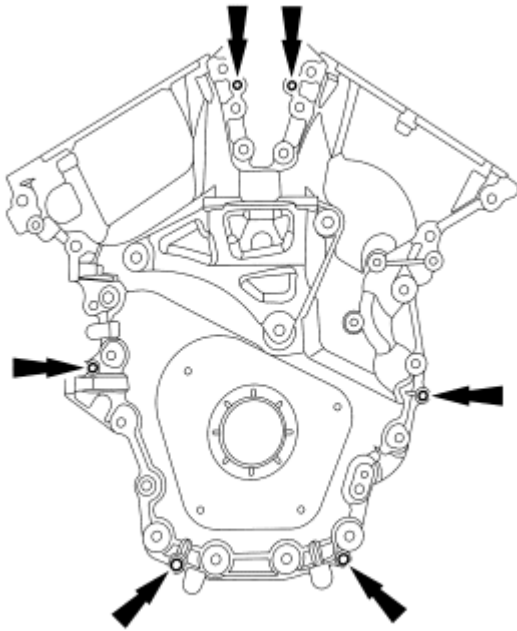
45. Remove the 22 engine front cover bolts.



N0054851

Fig. 440: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

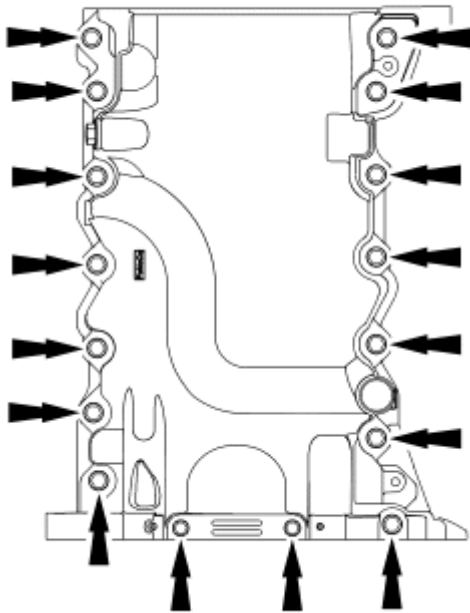
46. Install 6 of the engine front cover bolts (finger tight) into the 6 threaded holes in the engine front cover.
 - Tighten the bolts one turn at a time in a criss-cross pattern until the engine front cover-to-cylinder block seal is released.
 - Remove the engine front cover.



N0069753

Fig. 441: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

47. Remove the 16 oil pan bolts.

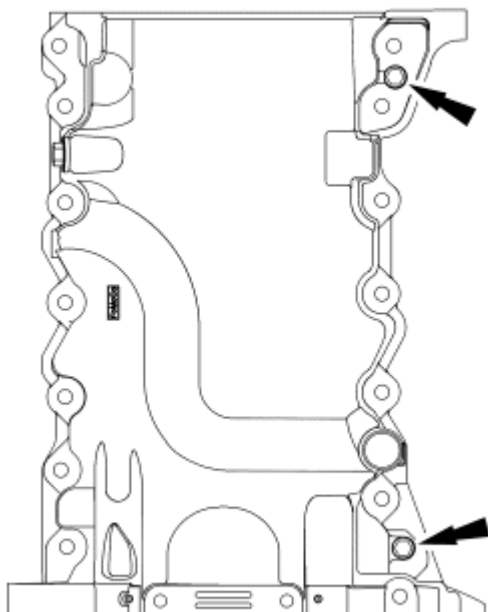


N0055163

Fig. 442: Identifying Oil Pan Bolts

Courtesy of FORD MOTOR CO.

48. Install 2 of the oil pan bolts (finger tight) into the 2 threaded holes in the oil pan.
- Alternately tighten the 2 bolts one turn at a time until the oil pan-to-cylinder block seal is released.
 - Remove the oil pan.



N0055164

Fig. 443: Installing 2 Of Oil Pan Bolts (Finger Tight) Into 2 Threaded Holes In Oil Pan
Courtesy of FORD MOTOR CO.

CAUTION: Only use a 3M Roloc® Bristle Disk (2-in white, part number 07528) to clean the engine front cover and oil pan. Do not use metal scrapers, wire brushes or any other power abrasive disk to clean the engine front cover. These tools cause scratches and gouges that make leak paths.

49. Clean the engine front cover and oil pan using a 3M Roloc® Bristle Disk (2-in white, part number 07528) in a suitable tool turning at the recommended speed of 15,000 RPM.
- Thoroughly wash the engine front cover and oil pan to remove any foreign material, including any abrasive particles created during the cleaning process.

CAUTION: Place clean, lint-free shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

CAUTION: Do not use wire brushes, power abrasive discs or 3M Roloc® Bristle Disk (2-in white, part number 07528) to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. They also cause contamination that will cause premature engine failure. Remove all traces of the gasket.

50. Clean the sealing surfaces of the cylinder block in the following sequence.
 1. Remove any large deposits of silicone or gasket material.
 2. Apply silicone gasket remover and allow to set for several minutes.
 3. Remove the silicone gasket remover. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep to remove any remaining traces of oil or coolant and to prepare the surfaces to bond. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
 5. Make sure the 2 locating dowel pins are seated correctly in the cylinder block.

OIL PUMP SCREEN AND PICKUP TUBE

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

1. Remove the oil pan. For additional information, refer to Oil Pan.
2. Remove the 3 bolts and the oil pump screen and pickup tube.
 - Discard the O-ring seal.

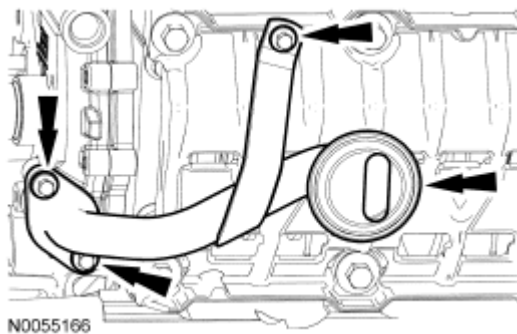


Fig. 444: Identifying Oil Pump Screen, Pickup Tube & Bolts
Courtesy of FORD MOTOR CO.

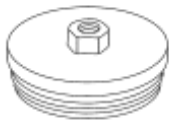
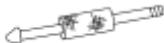
CRANKSHAFT REAR SEAL WITH RETAINER PLATE

SPECIAL TOOLS

Illustration	Tool Name	Tool Number

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST1341-A	Heavy Duty Floor Crane	014-00071 or equivalent
 ST1382-A	Remover, Crankshaft Rear Oil Seal	303-519 (T95P-6701-EH)
 ST1187-A	Slide Hammer	307-005 (T59L-100-B)
 ST1602-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent

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, may cause engine failure.

NOTE: This procedure is for removal of the crankshaft rear seal and retainer plate and requires removal of the oil pan. If only removing the crankshaft rear seal, refer to Crankshaft Rear Seal.

1. Remove the oil pan. For additional information, refer to Oil Pan.
2. Using the Heavy Duty Floor Crane and Spreader Bar, remove the engine from the stand.

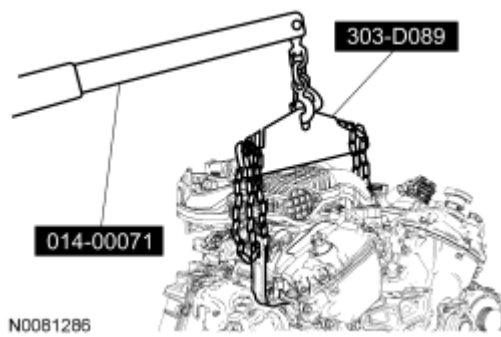


Fig. 445: Identifying Heavy Duty Floor Crane and Spreader Bar
Courtesy of FORD MOTOR CO.

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

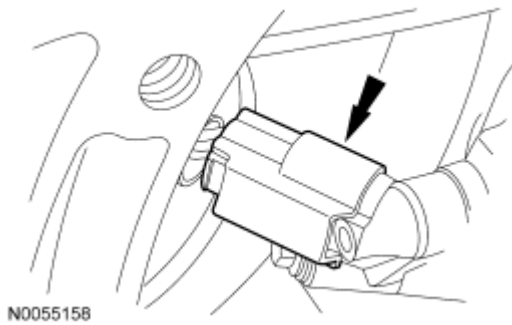


Fig. 446: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

4. Remove the bolt and the CKP sensor.

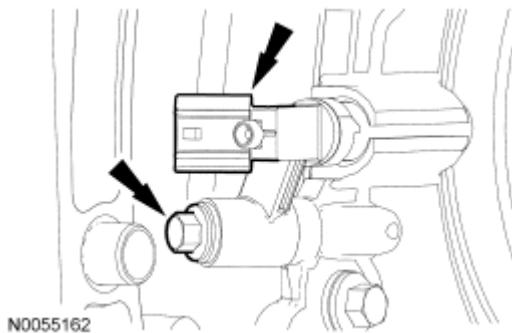


Fig. 447: Identifying CKP Sensor & Bolt
Courtesy of FORD MOTOR CO.

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

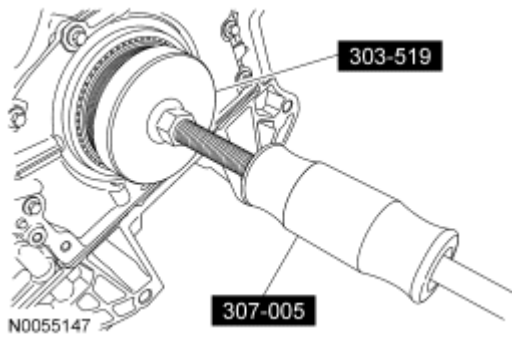


Fig. 448: Removing Crankshaft Rear Seal Using Special Tools (303-519) & (307-005)
Courtesy of FORD MOTOR CO.

6. Remove the 8 crankshaft rear seal retainer bolts.

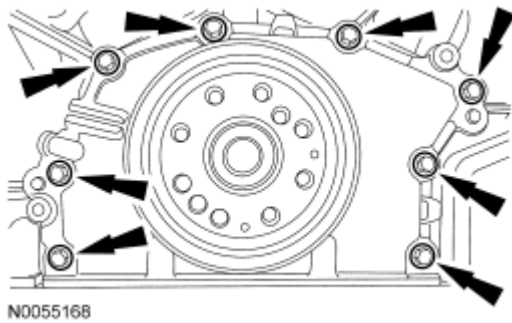


Fig. 449: Locating Crankshaft Rear Seal Retainer Bolts
Courtesy of FORD MOTOR CO.

7. Install the 2 M6 oil pan bolts (finger tight) into the 2 threaded holes in the crankshaft rear seal retainer.
 - Alternately tighten the 2 bolts one turn at a time until the crankshaft rear seal retainer-to-cylinder block seal is released.
 - Remove the crankshaft rear seal retainer.

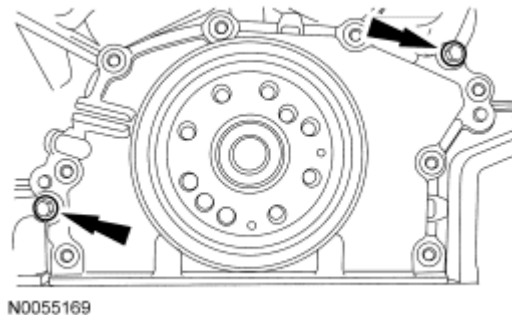


Fig. 450: Identifying M6 Oil Pan Bolts
Courtesy of FORD MOTOR CO.

NOTE: Only use a 3M Roloc® Bristle Disk, (2-in white, part number 07528) to clean

the crankshaft rear seal retainer plate. Do not use metal scrapers, wire brushes or any other power abrasive disk to clean the crankshaft rear seal retainer plate. These tools cause scratches and gouges that make leak paths.

8. Clean the crankshaft rear seal retainer plate using a 3M Roloc® Bristle Disk, (2-in white, part number 07528) in a suitable tool turning at the recommended speed of 15,000 RPM.
 - Thoroughly wash the crankshaft rear seal retainer plate to remove any foreign material, including any abrasive particles created during the cleaning process.

NOTE: Place clean, lint-free shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

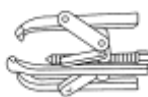
NOTE: Do not use wire brushes, power abrasive discs or 3M Roloc® Bristle Disk (2-in white, part number 07528) to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. They also cause contamination that will cause premature engine failure. Remove all traces of the gasket.

9. Clean the sealing surfaces of the cylinder block in the following sequence.
 1. Remove any large deposits of silicone or gasket material.
 2. Apply silicone gasket remover and allow to set for several minutes.
 3. Remove the silicone gasket remover. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep to remove any remaining traces of oil or coolant and to prepare the surfaces to bond. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.

DISASSEMBLY

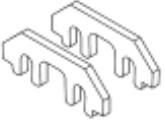
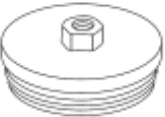
ENGINE

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1184-A	3-Jaw Puller	303-D121

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST2979-A	Camshaft Alignment Tool	303-1248
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST1382-A	Remover, Crankshaft Rear Oil Seal	303-519 (T95P-6701-EH)
 ST1385-A	Remover, Oil Seal	303-409 (T92C-6700CH)
 ST2982-A	Remover, Seal	303-1247/1
 ST1187-A	Slide Hammer	307-005 (T59L-100-B)
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A)

MATERIAL

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

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

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

All vehicles

1. Remove the 8 bolts and the flexplate.

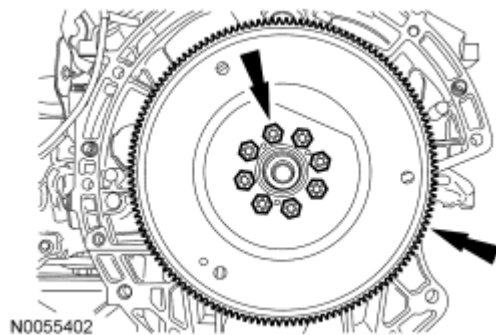


Fig. 451: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

2. Remove the crankshaft sensor ring.

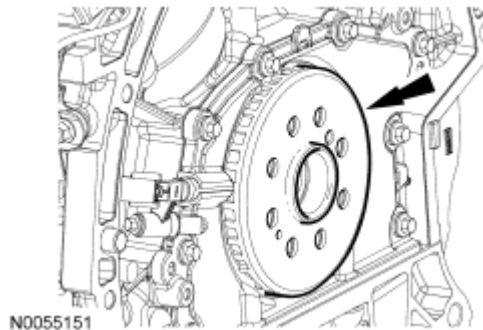


Fig. 452: Identifying Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

3. Using the special tools, remove and discard the rear crankshaft seal.

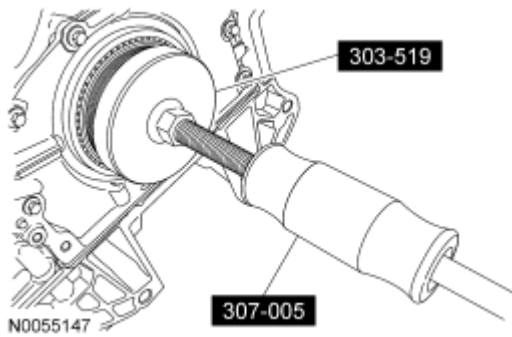


Fig. 453: Removing Crankshaft Rear Seal Using Special Tools (303-519) & (307-005)
Courtesy of FORD MOTOR CO.

NOTE: Install the engine stand bolts into the cylinder block only. Do not install the bolts into the oil pan.

4. Mount the engine on a suitable engine stand.
5. If equipped, remove the heat shield and disconnect the block heater electrical connector.
 - Detach all of the engine block heater harness retainers and remove the harness.

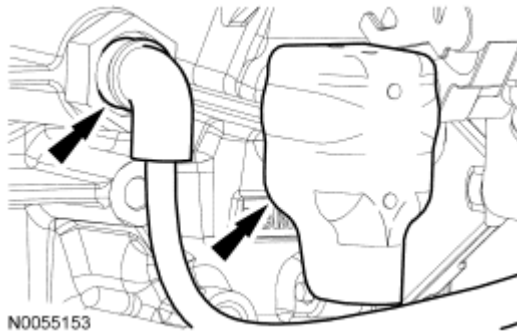


Fig. 454: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

6. If equipped, disconnect the heated PCV electrical connector.

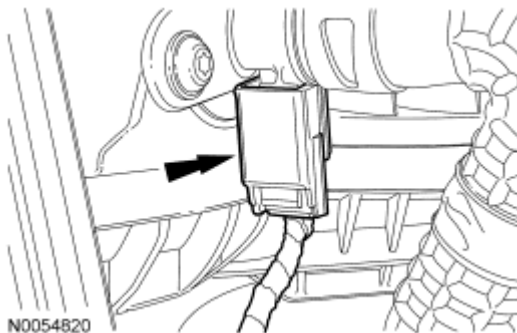


Fig. 455: Identifying Positive Crankcase Ventilation (PCV) Fitting Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the PCV hose from the PCV valve.

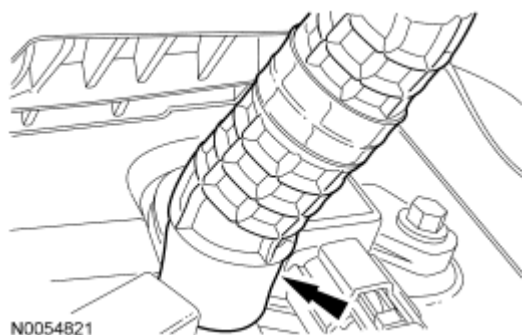


Fig. 456: Identifying PCV Hose From PCV Valve
Courtesy of FORD MOTOR CO.

8. Disconnect the throttle body (TB) electrical connector.

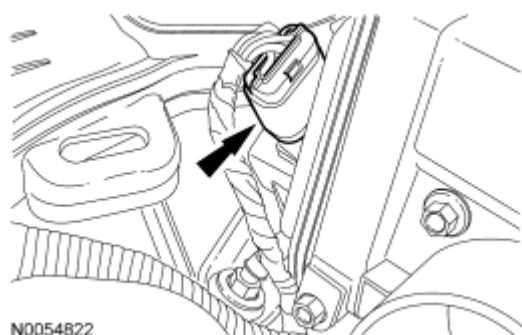


Fig. 457: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

9. Detach the wiring harness retainers from the upper intake manifold.

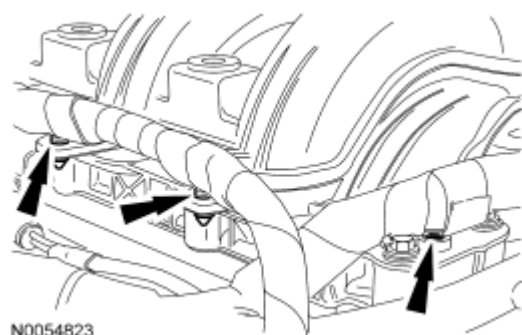


Fig. 458: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

10. If equipped, remove the upper intake manifold long support bracket bolt.

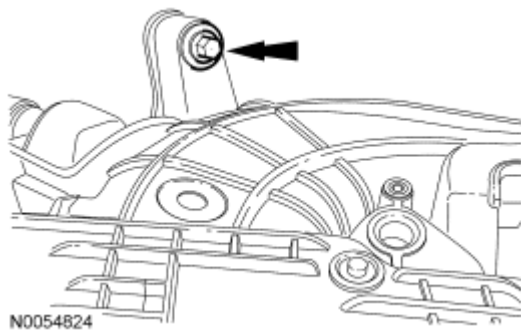


Fig. 459: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

11. Remove the upper intake manifold short support bracket bolt.

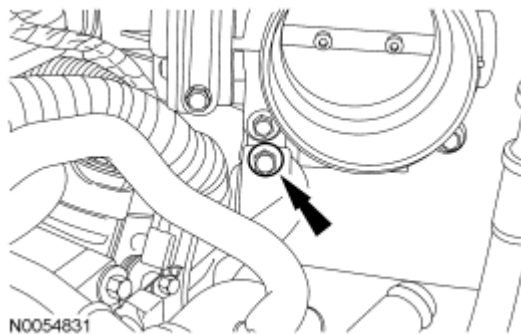


Fig. 460: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

12. Remove the wire harness pin-type retainer and the fuel tube bracket bolt from the upper intake manifold.

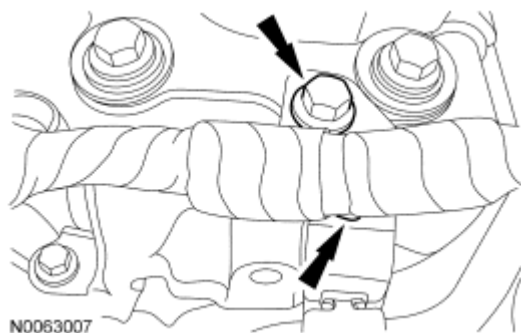
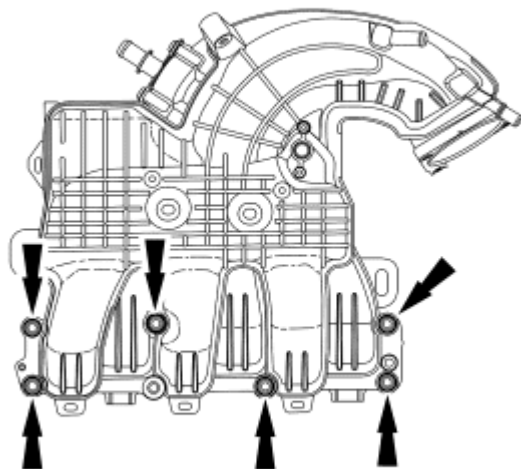


Fig. 461: Identifying Pin-Type Retainer And Fuel Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

13. Remove the 6 bolts and the upper intake manifold.
 - Discard the gaskets.



N0054825

Fig. 462: Identifying Upper Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

14. Disconnect the fuel efficient power steering system solenoid electrical connector.



N0072202

Fig. 463: Identifying Connector
Courtesy of FORD MOTOR CO.

15. Disconnect the power steering pressure (PSP) switch electrical connector.

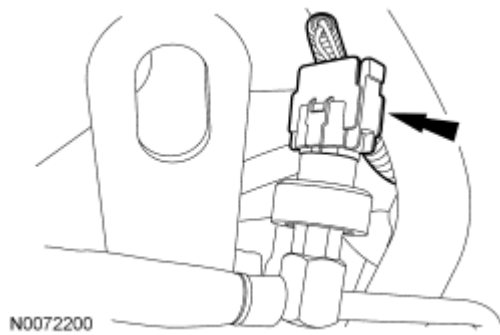


Fig. 464: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

16. Disconnect the RH catalyst monitor sensor electrical connector.

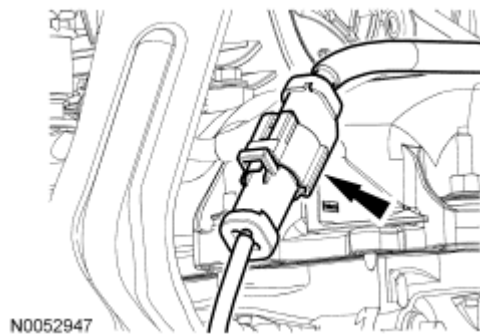


Fig. 465: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

17. Disconnect the RH heated oxygen sensor (HO2S) electrical connector.

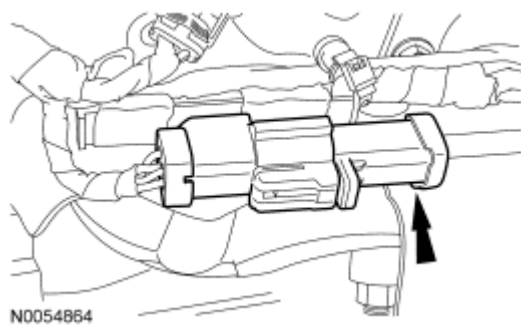


Fig. 466: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

18. Disconnect the RH variable camshaft timing (VCT) solenoid electrical connector.

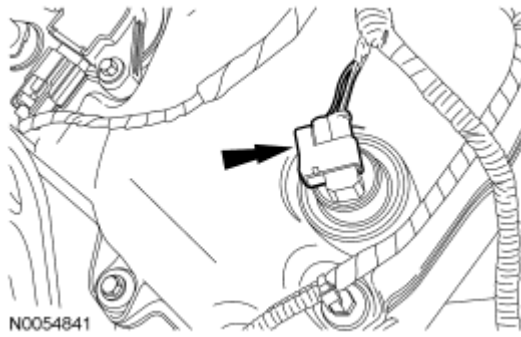


Fig. 467: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

19. Disconnect the 3 RH coil-on-plug electrical connectors.

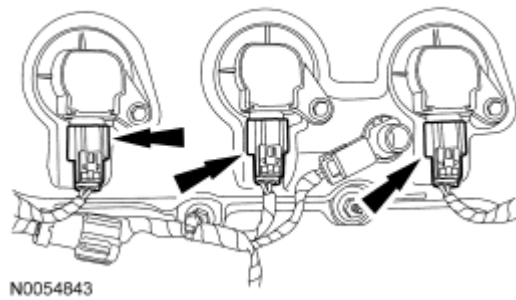


Fig. 468: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

20. If equipped, disconnect the heated PCV valve electrical connector.

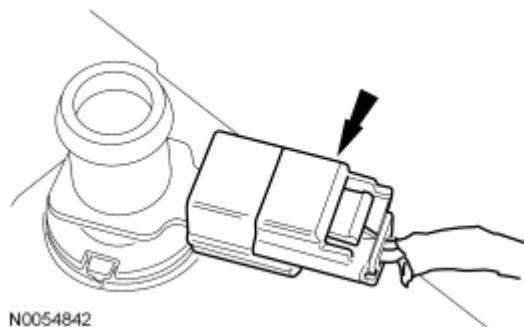


Fig. 469: Locating Heated PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

21. Detach all of the wiring harness retainers from the RH valve cover and stud bolts.
22. Disconnect the RH camshaft position (CMP) sensor electrical connector.

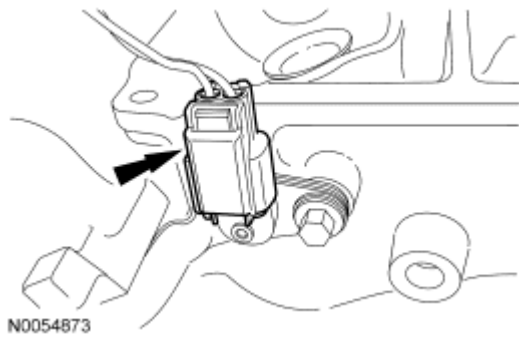


Fig. 470: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

23. Disconnect the knock sensor (KS) electrical connector.

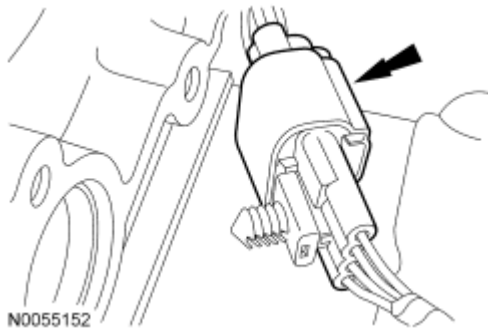


Fig. 471: Locating Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

24. Remove the bolt and the ground cable from the RH cylinder.



Fig. 472: Identifying Bolt
Courtesy of FORD MOTOR CO.

25. Disconnect the 6 fuel injector electrical connectors (3 shown in illustration).

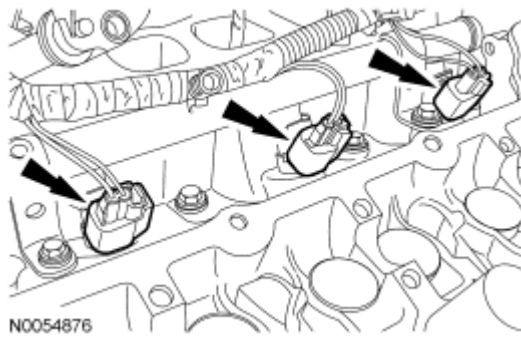


Fig. 473: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

26. Disconnect the cylinder head temperature (CHT) sensor electrical connector.

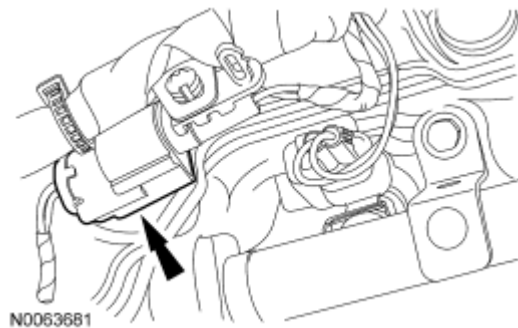


Fig. 474: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

27. Disconnect the LH CMP sensor electrical connector.

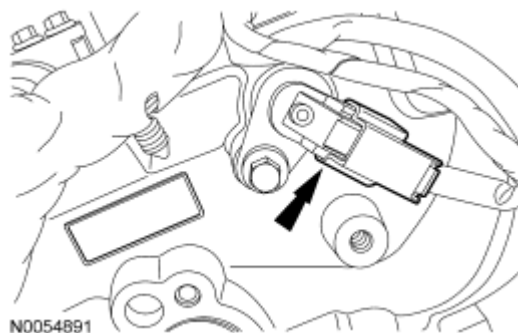


Fig. 475: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

28. Disconnect the LH catalyst monitor sensor electrical connector.

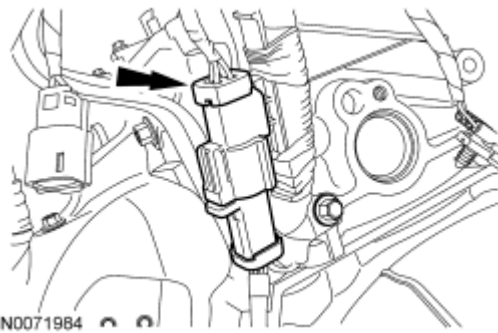


Fig. 476: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

29. Disconnect the LH HO2S electrical connector.

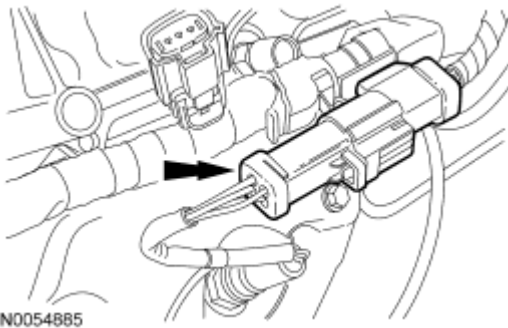


Fig. 477: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

30. Disconnect the 3 LH coil-on-plug electrical connectors.

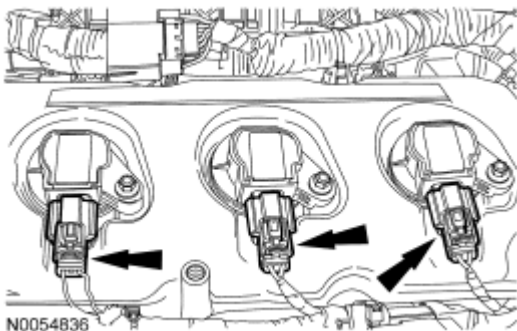


Fig. 478: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

31. Disconnect the LH VCT solenoid electrical connector.

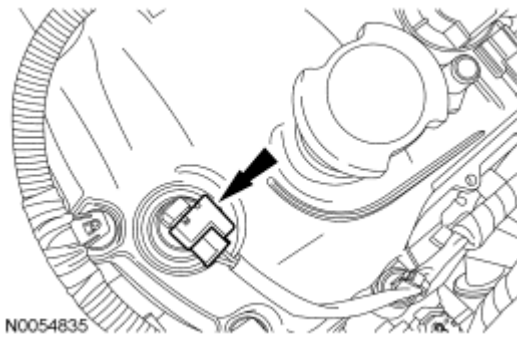


Fig. 479: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

32. Detach all of the wiring harness retainers from the LH valve cover and stud bolts.
33. Remove the nut, the bolt and the heat shield.

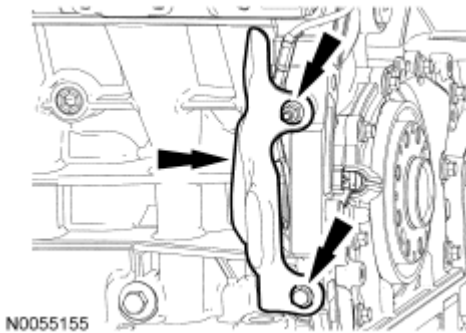


Fig. 480: Identifying Heat Shield, Nut & Bolt
Courtesy of FORD MOTOR CO.

34. Remove the wiring harness retainer stud bolt.

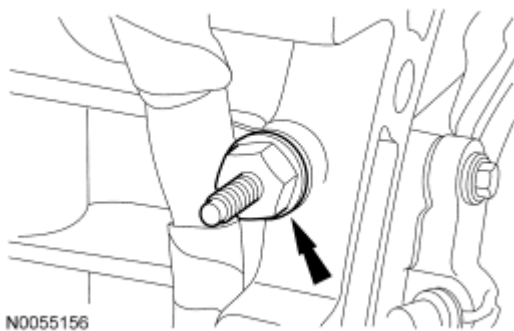


Fig. 481: Identifying Wiring Harness Retainer Stud Bolt
Courtesy of FORD MOTOR CO.

35. Remove the wiring harness grommet.

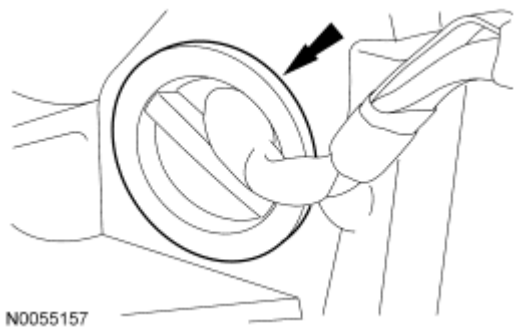


Fig. 482: Identifying Wiring Harness Grommet
Courtesy of FORD MOTOR CO.

36. Disconnect the crankshaft position (CKP) sensor electrical connector.

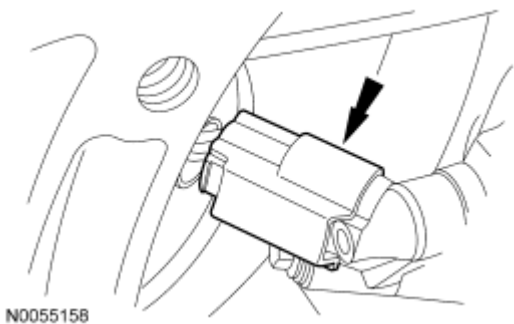


Fig. 483: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

37. Disconnect the A/C compressor electrical connector.
 - Detach the A/C compressor wiring harness retainer.

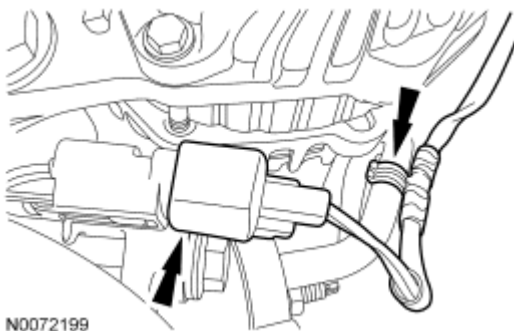


Fig. 484: Identifying Connector And Retainer
Courtesy of FORD MOTOR CO.

38. Remove the nut and disconnect the generator B+ cable.

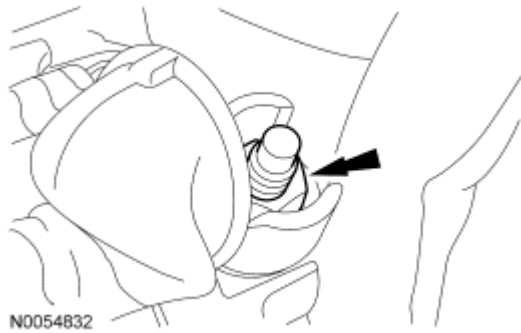


Fig. 485: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

39. Disconnect the generator electrical connector.

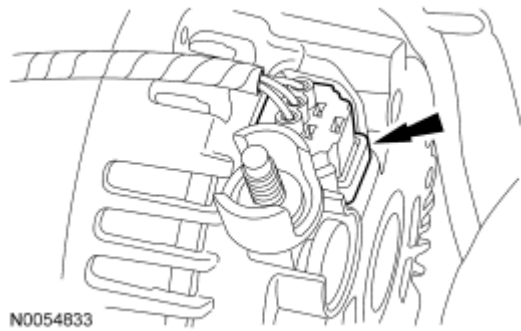


Fig. 486: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

40. Disconnect the engine oil pressure (EOP) switch electrical connector and the wiring harness pin-type retainer.
- Remove the wiring harness from the engine.

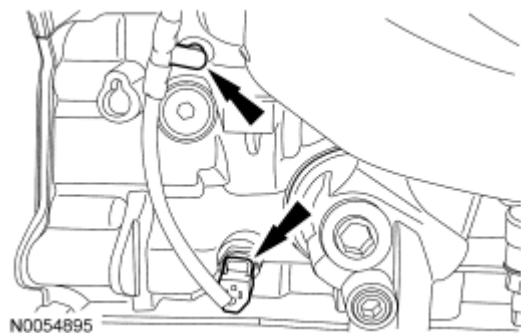


Fig. 487: Locating Engine Oil Pressure (EOP) Switch Electrical Connector & Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

41. Remove the nut, 2 bolts and the A/C compressor.

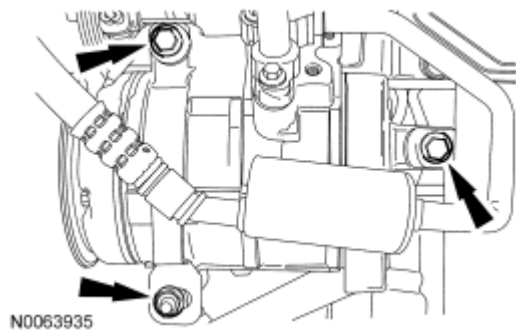


Fig. 488: Locating A/C Compressor, Bolts & Nuts
Courtesy of FORD MOTOR CO.

42. Remove the A/C compressor mounting stud from the oil pan.

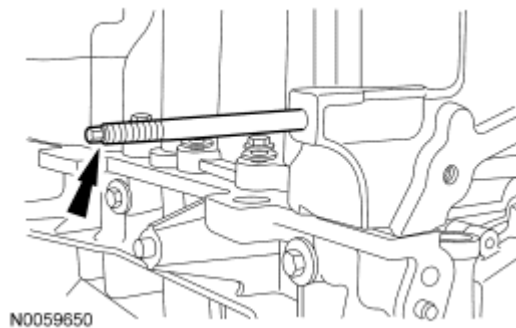


Fig. 489: Locating A/C Compressor Mounting Stud
Courtesy of FORD MOTOR CO.

43. Remove the nut, bolt and the generator.

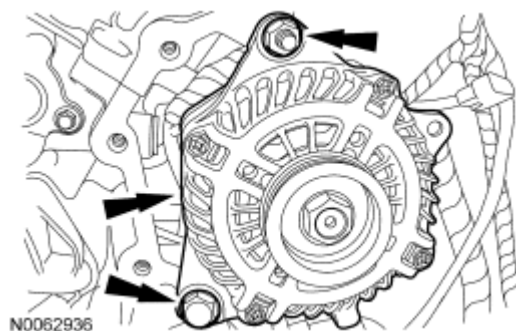


Fig. 490: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

44. Remove the PSP tube bracket-to-power steering pump bolt.

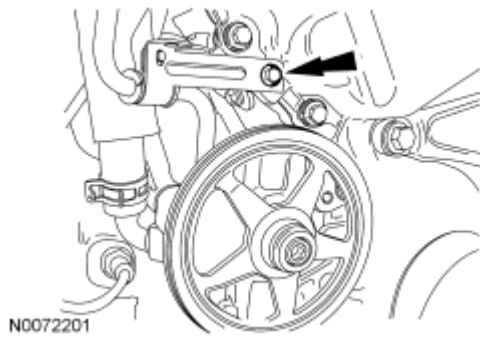


Fig. 491: Identifying Bracket-To-Power Steering Pump Bolt
Courtesy of FORD MOTOR CO.

45. Remove the nut and the PSP tube bracket from the RH valve cover stud bolt.

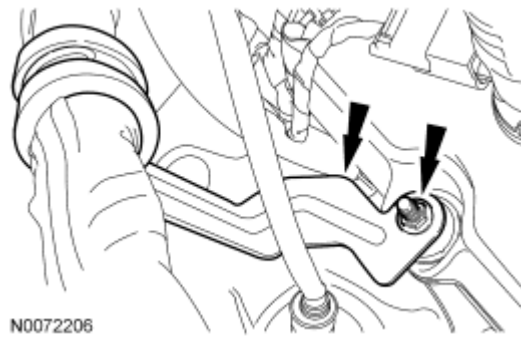


Fig. 492: Identifying Nut And PSP Tube Bracket
Courtesy of FORD MOTOR CO.

46. Remove the bolt and the PSP tube bracket from the RH cylinder head.

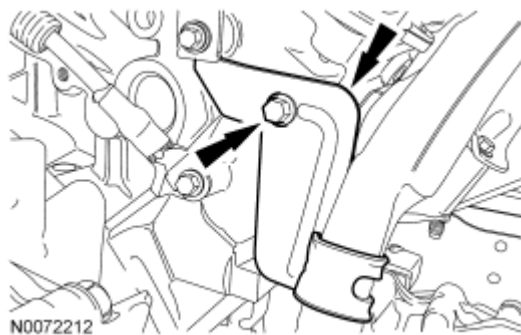


Fig. 493: Identifying Bolt
Courtesy of FORD MOTOR CO.

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

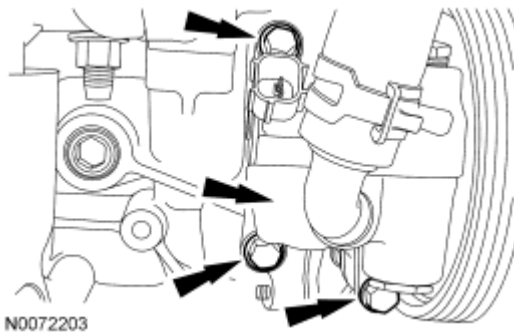


Fig. 494: Identifying Bolts
Courtesy of FORD MOTOR CO.

48. Remove the 3 bolts and the accessory drive belt tensioner.

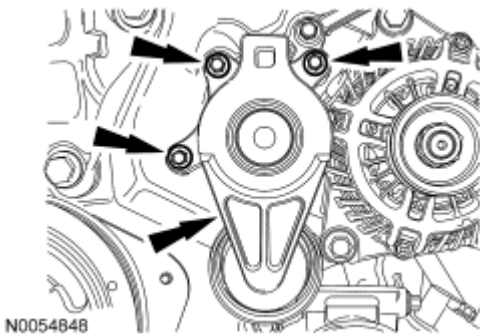


Fig. 495: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

49. Remove the 4 nuts (3 shown in illustration) and the LH catalytic converter.
- Discard the nuts and the gasket.

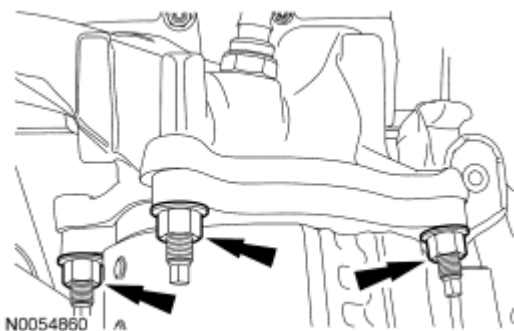


Fig. 496: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

50. Remove the 3 bolts and the LH exhaust manifold heat shield.

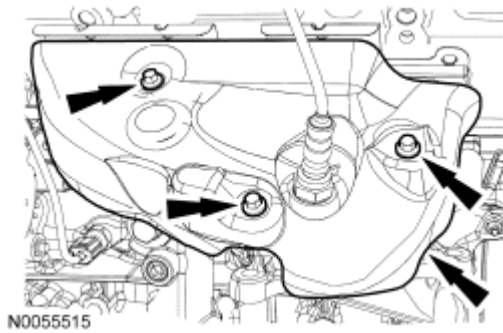


Fig. 497: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

51. Remove the 6 nuts and the LH exhaust manifold.
 - Discard the nuts and exhaust manifold gaskets.

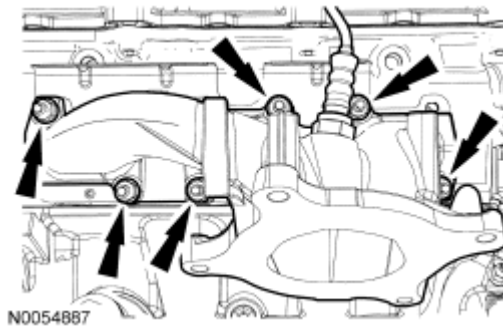


Fig. 498: Locating LH Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

52. Clean and inspect the LH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
53. Remove and discard the 6 LH exhaust manifold studs.

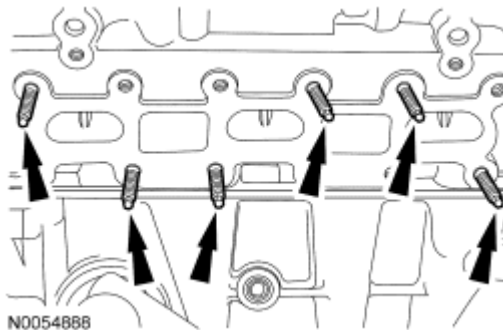


Fig. 499: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

FWD vehicles

54. Remove the 4 nuts and the RH catalytic converter.
- Discard the nuts and the gasket.

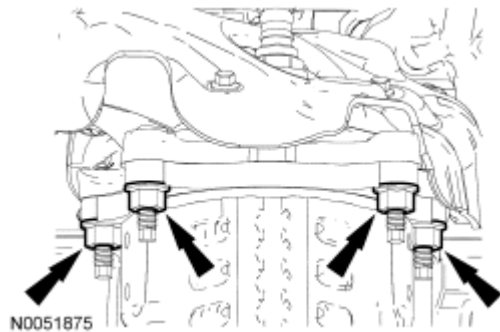


Fig. 500: Identifying Nuts
Courtesy of FORD MOTOR CO.

All vehicles

55. Remove the 3 bolts and the RH exhaust manifold heat shield.

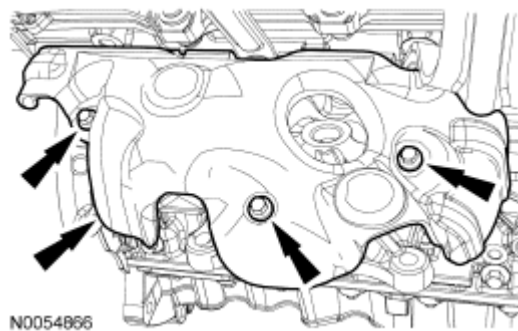


Fig. 501: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

56. Remove the 6 nuts and the RH exhaust manifold.
- Discard the nuts and exhaust manifold gaskets.

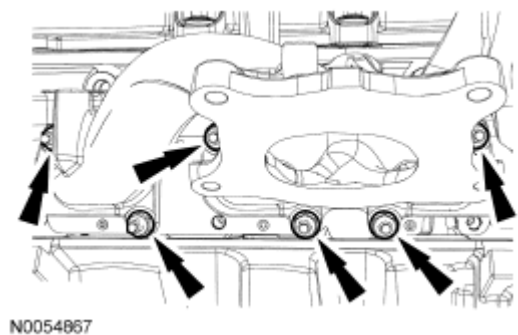


Fig. 502: Locating RH Exhaust Manifold & Nuts

Courtesy of FORD MOTOR CO.

57. Clean and inspect the RH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
58. Remove and discard the 6 RH exhaust manifold studs.

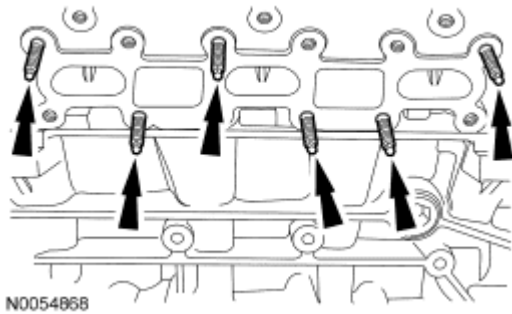


Fig. 503: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

59. Remove the RH cylinder block drain plug or, if equipped, the block heater.
 - Allow coolant to drain from the cylinder block.

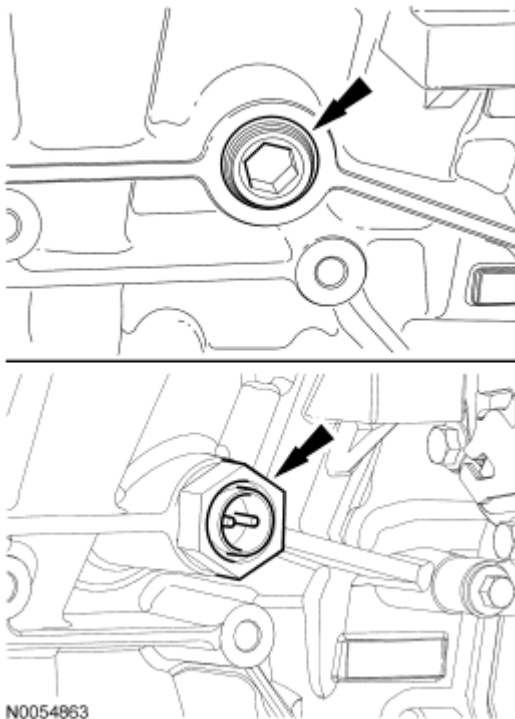


Fig. 504: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

60. Remove the LH cylinder block drain plug.

- Allow coolant to drain from the cylinder block.

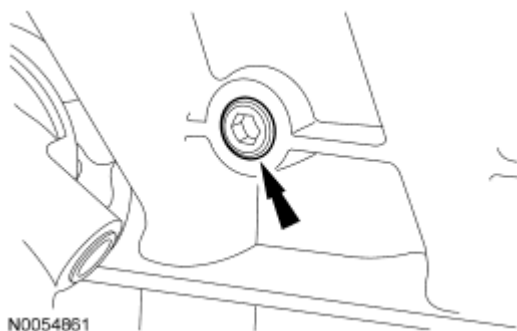


Fig. 505: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

61. Remove the pin-type retainer and the cover.

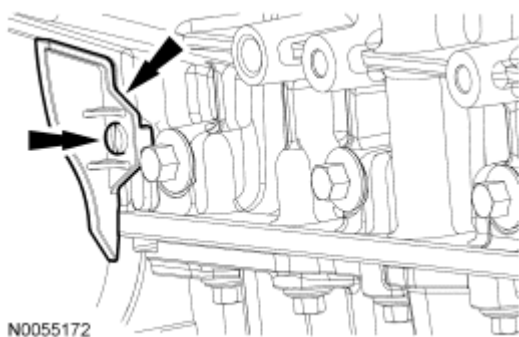


Fig. 506: Locating Pin-Type Retainer & Cover
Courtesy of FORD MOTOR CO.

62. Remove the 2 bolts and the engine lifting eye.

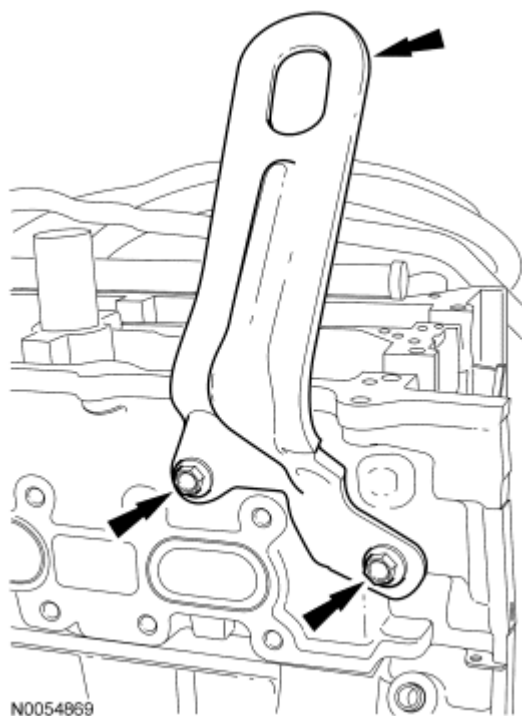


Fig. 507: Locating Engine Lifting Eye & Bolts
Courtesy of FORD MOTOR CO.

63. If equipped, remove the bolt and the upper intake manifold long support bracket.

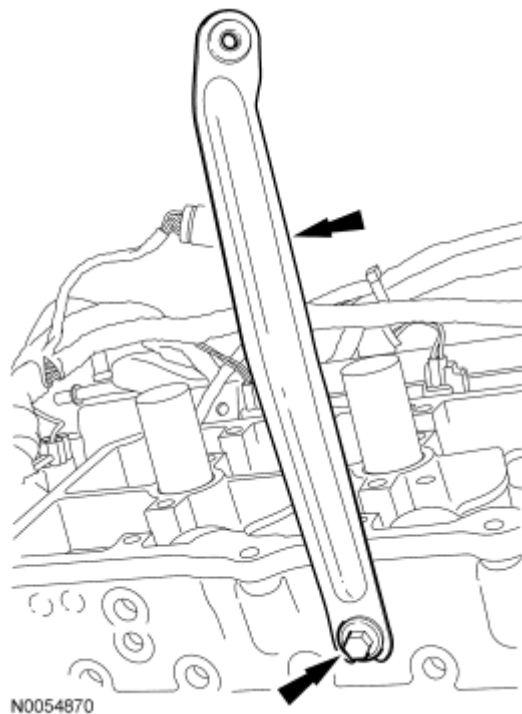


Fig. 508: Locating Upper Intake Manifold Bracket & Bolt

Courtesy of FORD MOTOR CO.

64. Remove the bolt and the upper intake manifold short support bracket.

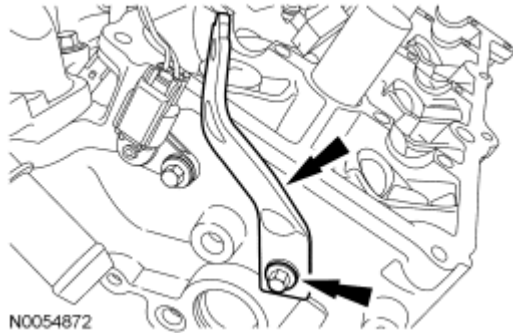


Fig. 509: Locating Upper Intake Manifold Bracket & Bolt
Courtesy of FORD MOTOR CO.

65. Remove the bolt and the RH CMP sensor.

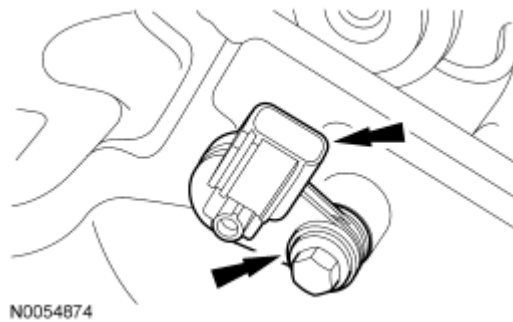


Fig. 510: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

66. Remove the coolant by-pass hose from the thermostat housing.

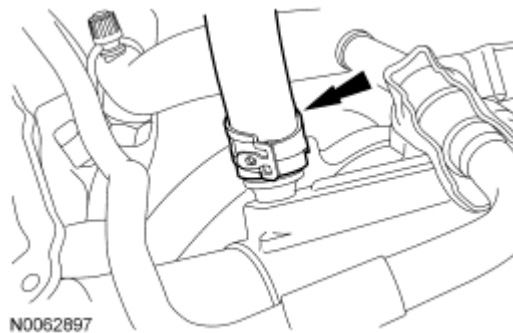


Fig. 511: Identifying Coolant By-Pass Hose
Courtesy of FORD MOTOR CO.

67. Remove the 4 bolts and the fuel rail and injectors as an assembly.

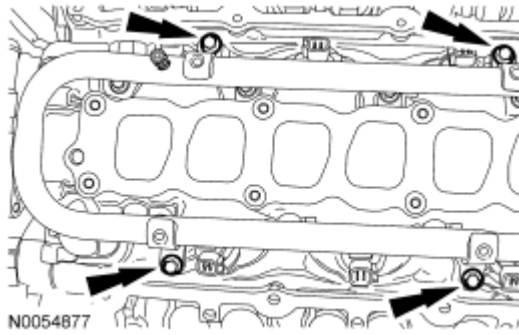


Fig. 512: Locating Fuel Rail And Injectors & Bolts
 Courtesy of FORD MOTOR CO.

68. Remove the 3 thermostat housing-to-lower intake manifold bolts.
 - Remove the thermostat housing and discard the gasket.

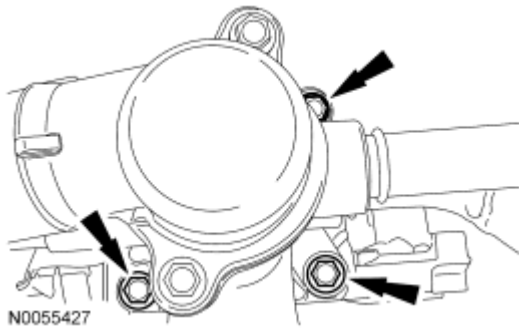


Fig. 513: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
 Courtesy of FORD MOTOR CO.

69. Remove the 10 bolts and the lower intake manifold.
 - Discard the gaskets.

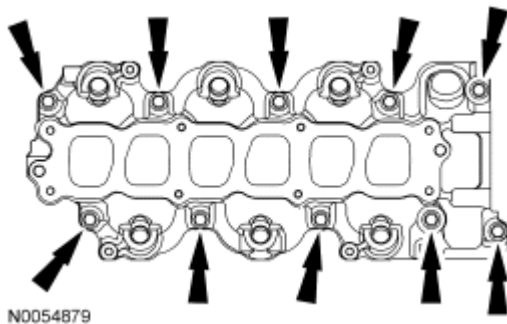


Fig. 514: Locating Lower Intake Manifold Bolts
 Courtesy of FORD MOTOR CO.

70. Disconnect and remove the CHT sensor jumper harness.

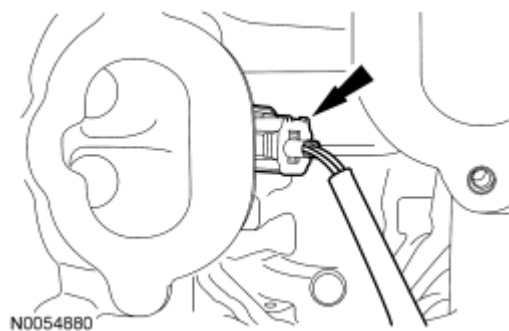


Fig. 515: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

71. Remove the bolt and the LH CMP sensor.

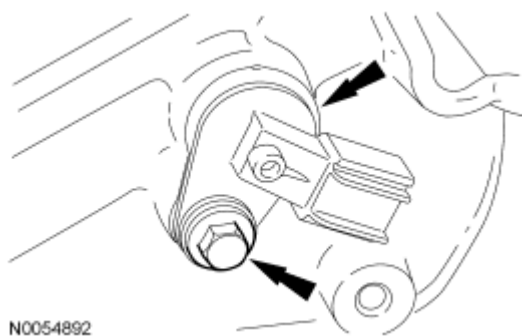


Fig. 516: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

72. Remove the bolt and the CKP sensor.

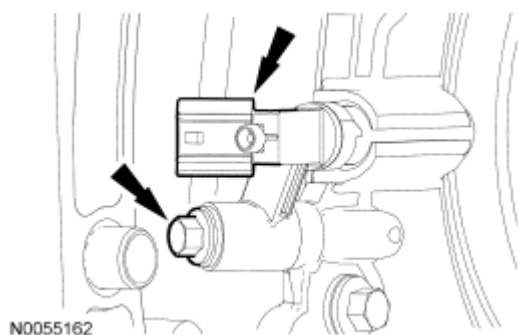


Fig. 517: Identifying CKP Sensor & Bolt
Courtesy of FORD MOTOR CO.

73. Remove the EOP switch.

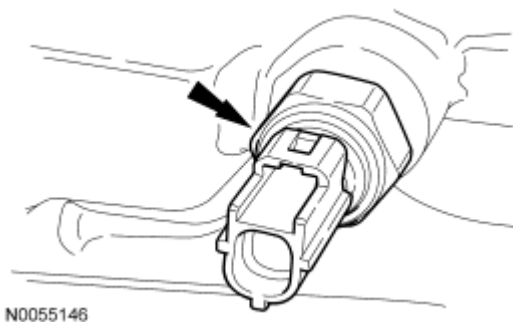


Fig. 518: Identifying EOP Switch
Courtesy of FORD MOTOR CO.

74. Remove the 2 bolts and the oil filter adapter.
- Discard the gasket and O-ring seal (on banjo bolt).

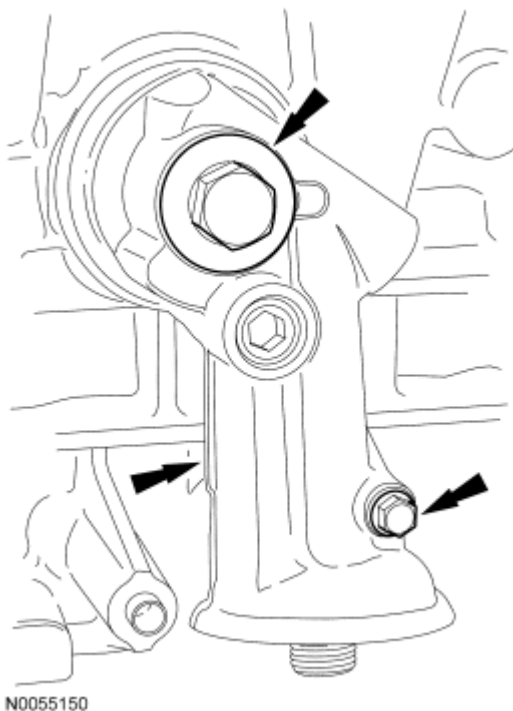


Fig. 519: Locating Oil Filter Adapter & Bolts
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

75. Remove the 6 bolts and the 6 coil-on-plugs.

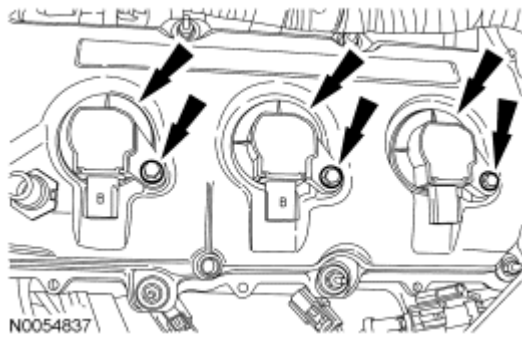


Fig. 520: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

76. Remove the 11 stud bolts and the LH valve cover.
 - Discard the gasket.

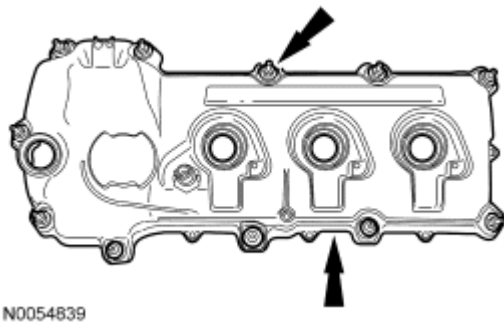


Fig. 521: Locating LH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

77. Remove the bolt, the 10 stud bolts and the RH valve cover.
 - Discard the gasket.

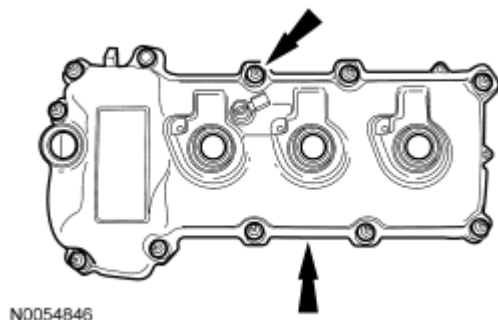


Fig. 522: Locating RH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

NOTE: VCT solenoid seal removal shown in illustration, spark plug tube seal similar.

78. Inspect the VCT solenoid seals and the spark plug tube seals. Remove any damaged seals.
- Using the special tools, remove the seal(s).

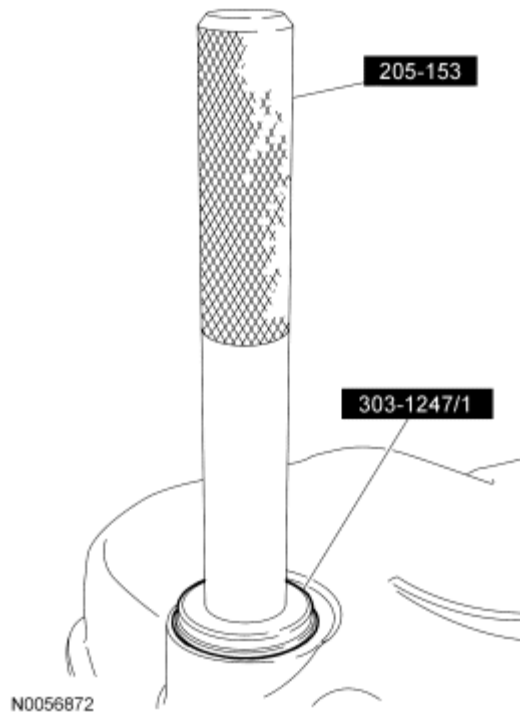


Fig. 523: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

79. Remove the crankshaft bolt and washer.
- Discard the bolt.

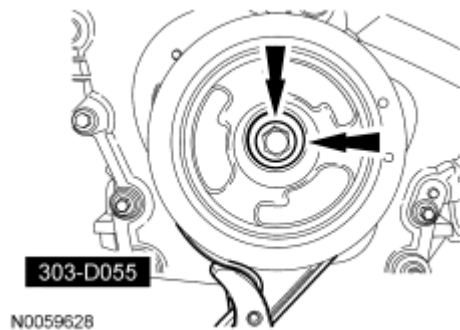


Fig. 524: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

80. Using the special tool, remove the crankshaft pulley.

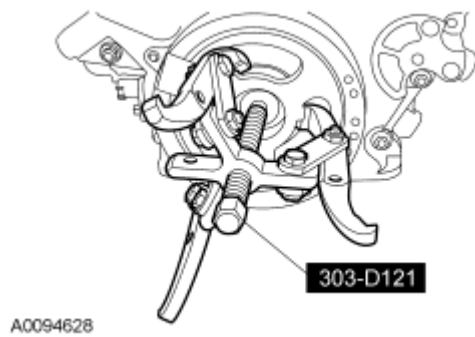


Fig. 525: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

81. Using the special tool, remove and discard the crankshaft front seal.

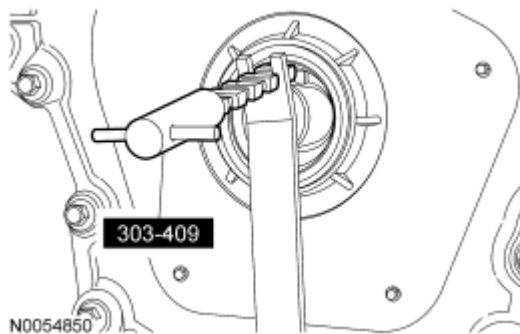


Fig. 526: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

82. Remove the 2 bolts and the engine mount bracket.

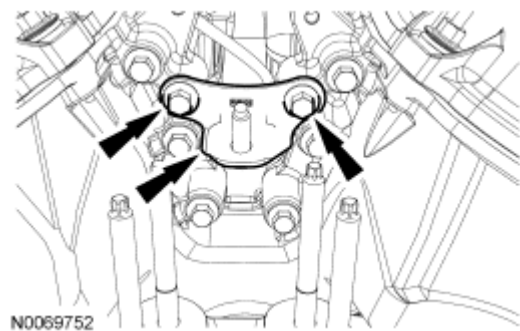


Fig. 527: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

83. Remove the 2 engine mount studs.

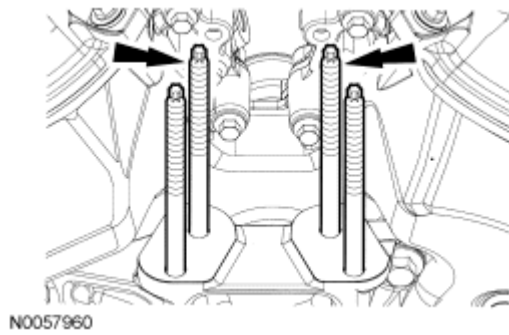


Fig. 528: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

84. Remove the 3 bolts and the engine mount bracket.

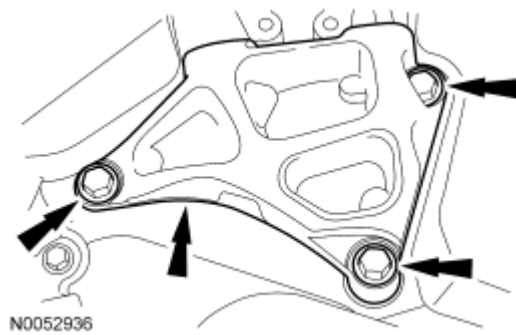
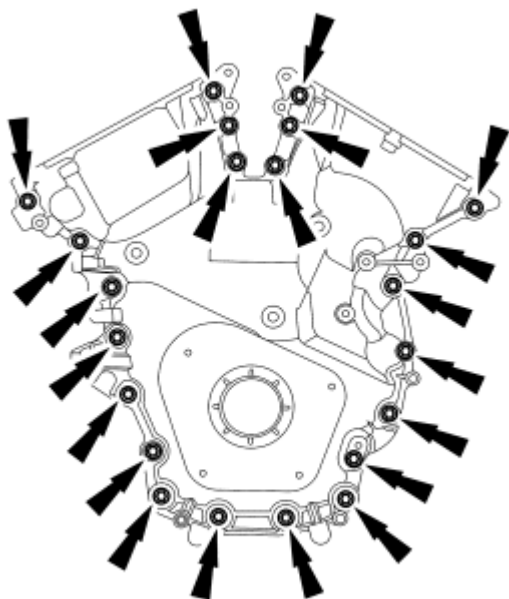


Fig. 529: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

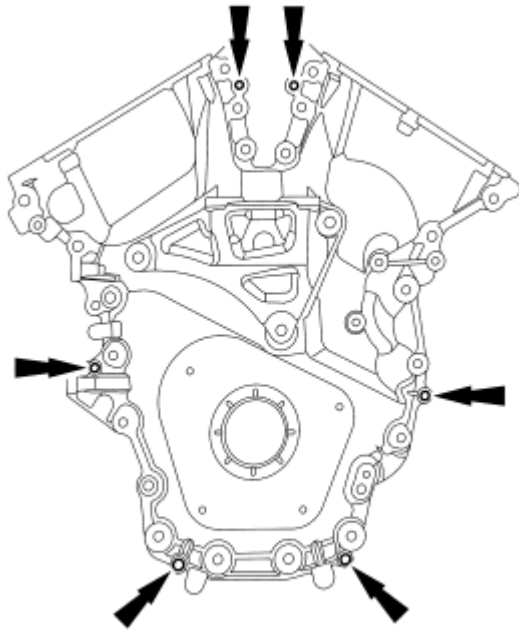
85. Remove the 22 engine front cover bolts.



N0054851

Fig. 530: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

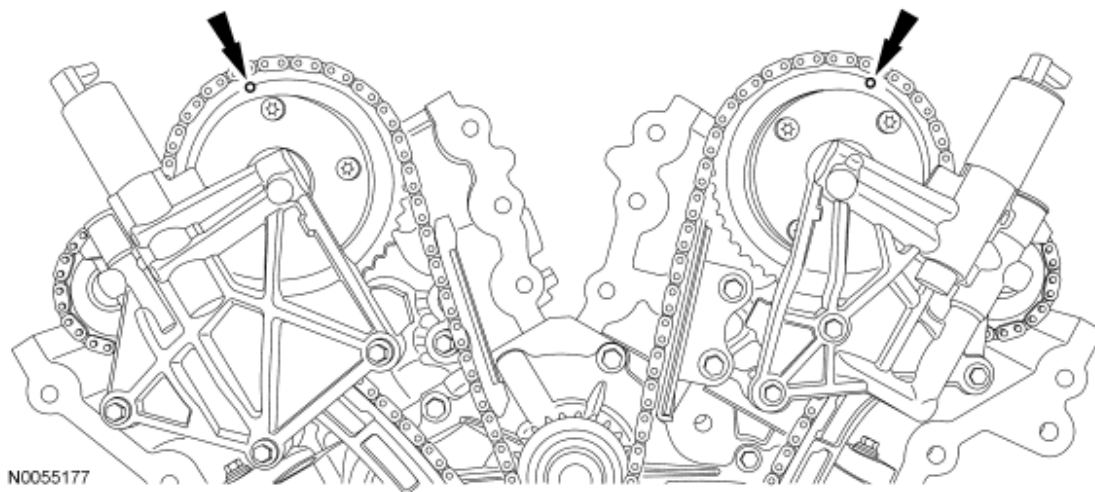
86. Install 6 of the engine front cover bolts (finger tight) into the 6 threaded holes in the engine front cover.
- Tighten the bolts one turn at a time in a criss-cross pattern until the engine front cover-to-cylinder block seal is released.
 - Remove the engine front cover.



N0069753

Fig. 531: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

87. Rotate the crankshaft clockwise and align the timing marks on the VCT assemblies as shown in illustration.



N0055177

Fig. 532: Aligning Timing Marks On Variable Camshaft Timing (VCT) Assemblies
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the top dead center (TDC) position.

88. Install the special tool onto the flats of the LH camshafts.

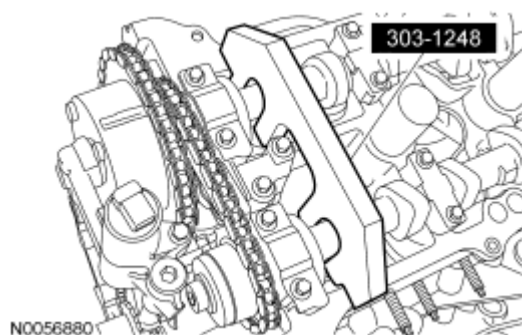


Fig. 533: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

NOTE: The special tool will hold the camshafts in the TDC position.

89. Install the special tool onto the flats of the RH camshafts.

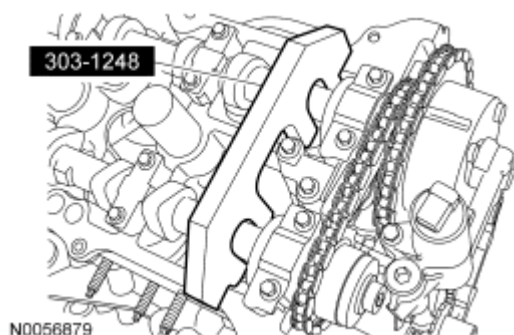


Fig. 534: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

90. Remove the 3 bolts and the RH VCT housing.

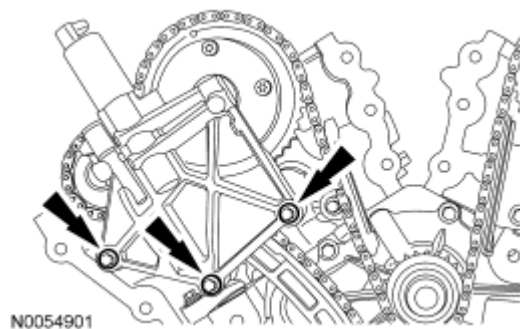


Fig. 535: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

91. Remove the 3 bolts and the LH VCT housing.

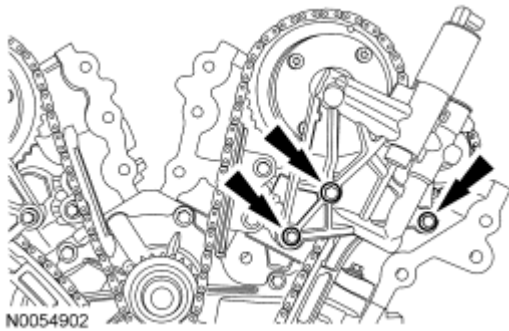


Fig. 536: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

92. Remove and discard the VCT housing seals.

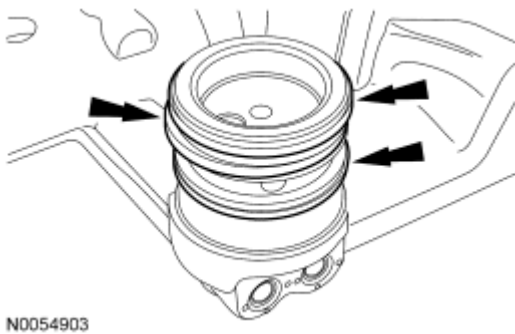


Fig. 537: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

93. Remove the 2 bolts and the primary timing chain tensioner.

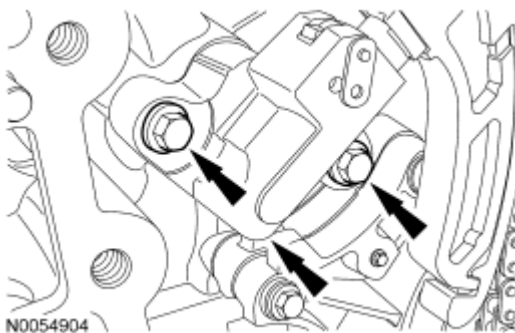


Fig. 538: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

94. Remove the primary timing chain tensioner arm.

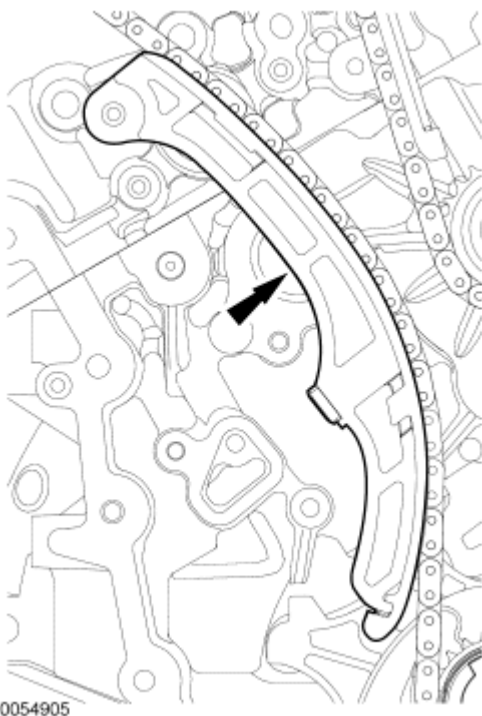


Fig. 539: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

95. Remove the 2 bolts and the lower LH primary timing chain guide.

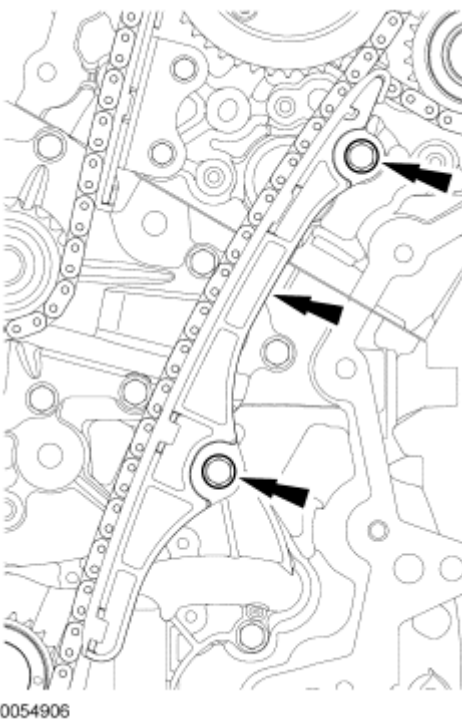
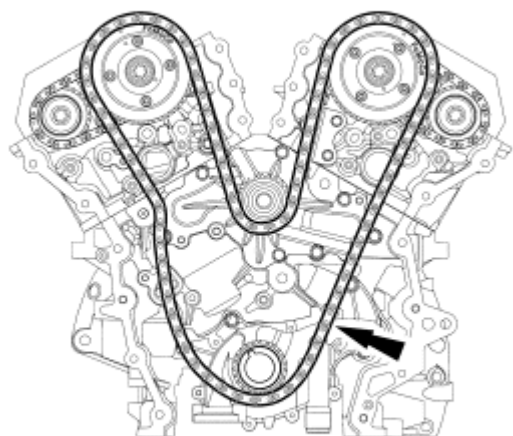


Fig. 540: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

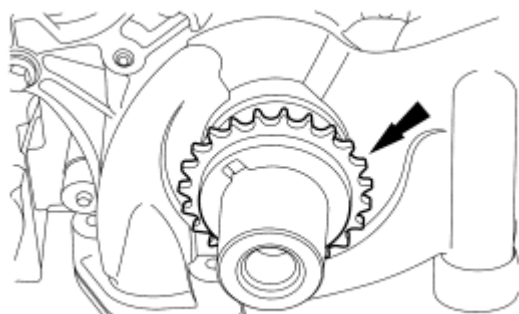
96. Remove the primary timing chain.



N0054908

Fig. 541: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

97. Remove the crankshaft timing chain sprocket.



N0054909

Fig. 542: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

98. Remove the 2 bolts and the upper LH primary timing chain guide.

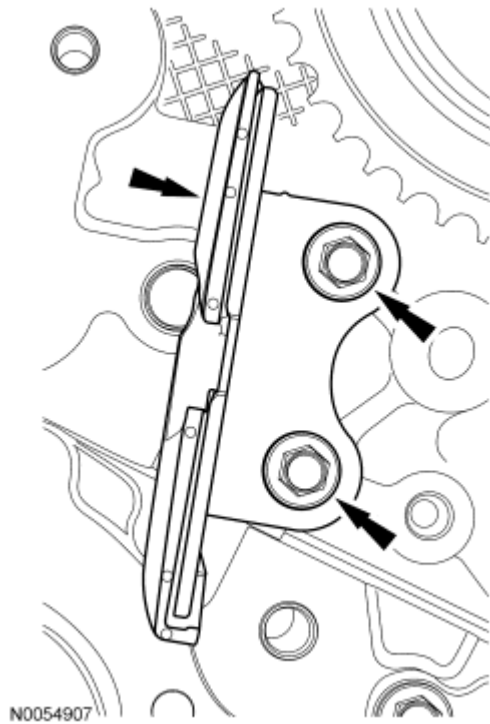


Fig. 543: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

99. Compress the LH secondary timing chain tensioner and install a suitable lockpin to retain the tensioner in the collapsed position.

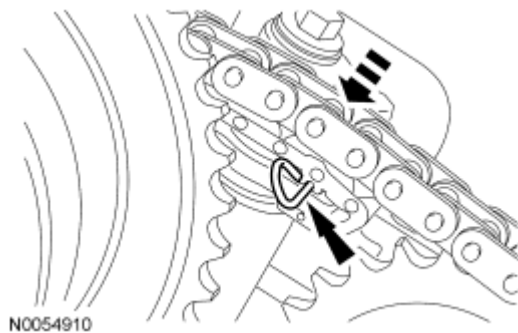


Fig. 544: Compressing LH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

NOTE: The VCT bolt and the exhaust camshaft bolt must be discarded and new ones installed. However, the exhaust camshaft washer is reusable.

100. Remove and discard the LH VCT assembly bolt and the LH exhaust camshaft sprocket bolt.
 - Remove the LH VCT assembly, secondary timing chain and the LH exhaust camshaft sprocket as an assembly.

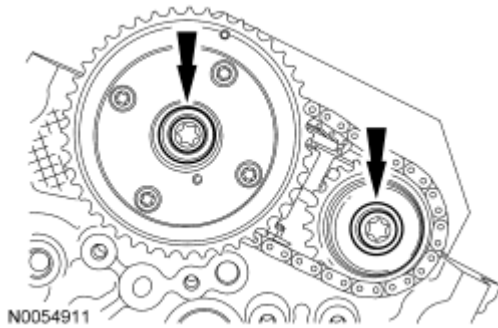


Fig. 545: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

NOTE: When the special tool is removed, valve spring pressure will rotate the LH camshafts approximately 3 degrees to a neutral position.

101. Remove the special tool from the LH camshafts.

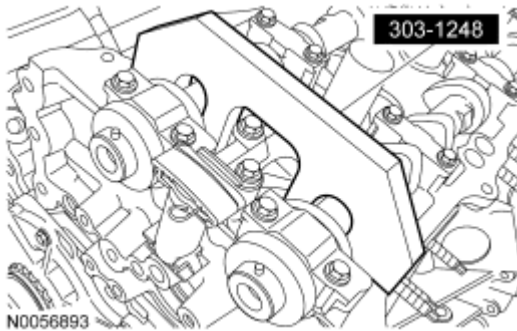


Fig. 546: Removing Special Tool (303-1248) From LH Camshafts
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

102. Verify the LH camshafts are in the neutral position.

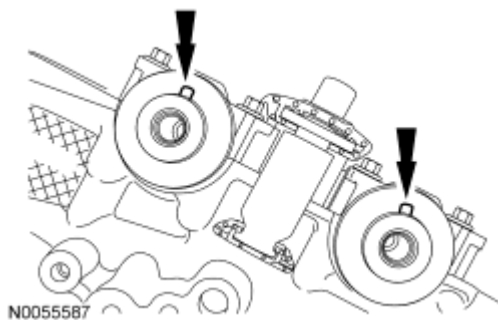


Fig. 547: Verifying LH Camshafts Are In Neutral Position

Courtesy of FORD MOTOR CO.

103. Remove the 2 bolts and the LH secondary timing chain tensioner.

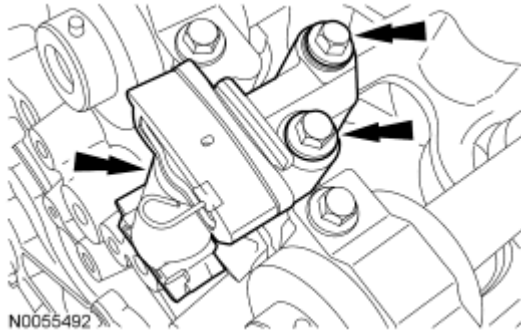


Fig. 548: Locating LH Secondary Timing Chain Tensioner & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

104. Remove the bolts and the LH camshaft bearing caps.
- Remove the LH camshafts.

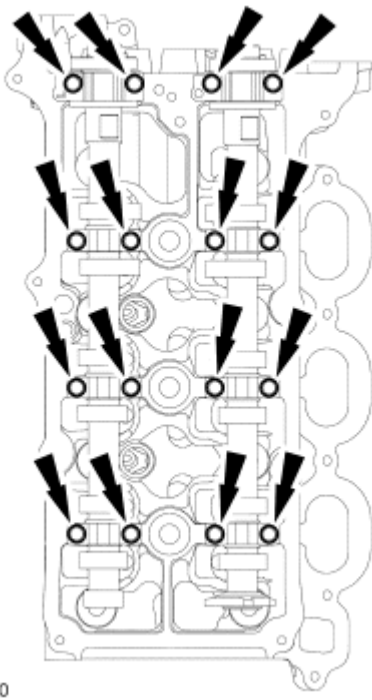


Fig. 549: Identifying LH Camshafts Bolts
Courtesy of FORD MOTOR CO.

105. Compress the RH secondary timing chain tensioner and install a suitable lockpin to retain the tensioner in the collapsed position.

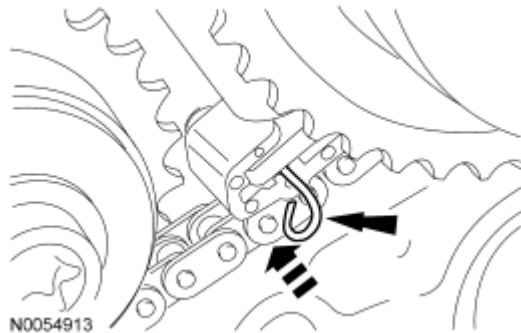


Fig. 550: Compressing RH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

NOTE: The VCT bolt and the exhaust camshaft bolt must be discarded and new ones installed. However, the exhaust camshaft washer is reusable.

106. Remove and discard the RH VCT assembly bolt and the RH exhaust camshaft sprocket bolt.
- Remove the RH VCT assembly, secondary timing chain and the RH exhaust camshaft sprocket as an assembly.

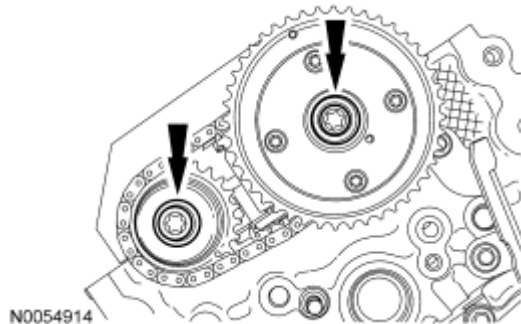


Fig. 551: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

107. Remove the special tool from the RH camshafts.

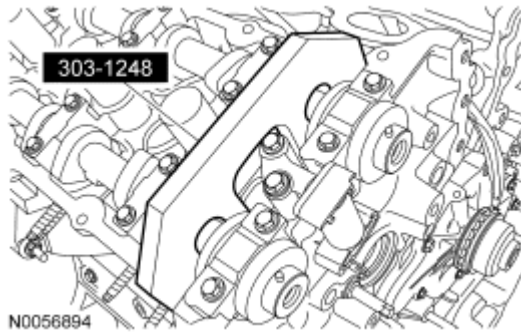


Fig. 552: Removing Special Tool (303-1248) From RH Camshafts
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

108. Rotate the RH camshafts counterclockwise to the neutral position.

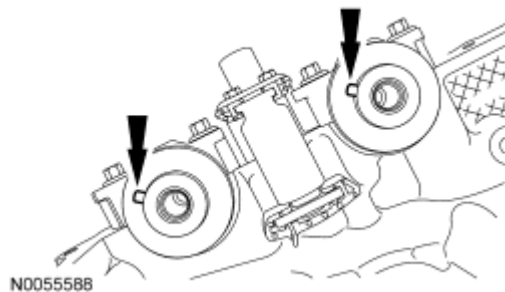


Fig. 553: Rotating RH Camshafts Counterclockwise To Neutral Position
Courtesy of FORD MOTOR CO.

109. Remove the 2 bolts and the RH secondary timing chain tensioner.

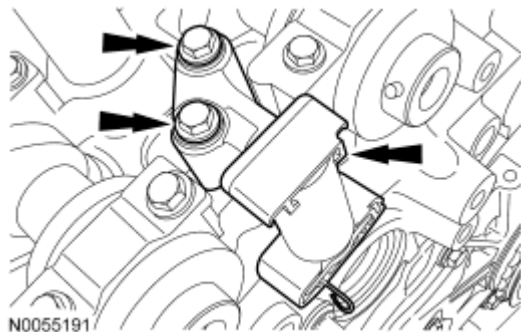


Fig. 554: Locating RH Secondary Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

110. Remove the 2 bolts and the RH primary timing chain guide.

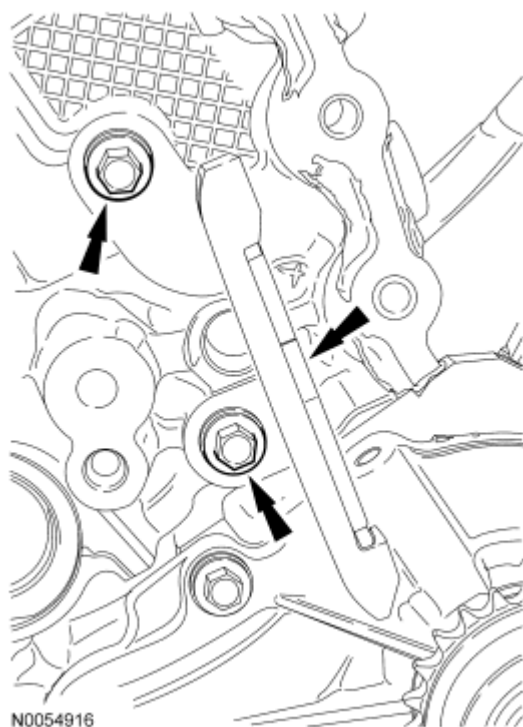
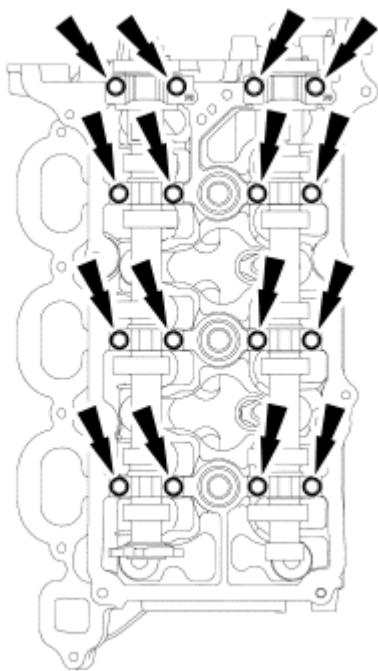


Fig. 555: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

NOTE: **Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.**

111. Remove the bolts and the RH camshaft bearing caps.
 - Remove the RH camshafts.



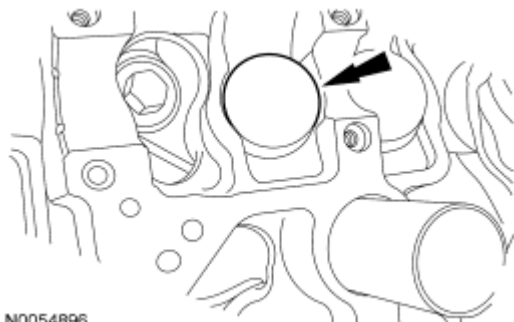
N0055183

Fig. 556: Identifying RH Camshafts Bolts
Courtesy of FORD MOTOR CO.

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations.

NOTE: LH shown in illustration, RH similar.

112. Remove the valve tappets from the cylinder heads.

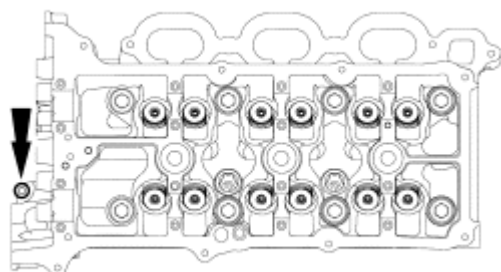


N0054896

Fig. 557: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

113. Remove and discard the M6 bolt from each cylinder head.



N0055174

Fig. 558: Identifying M6 Bolt
Courtesy of FORD MOTOR CO.

CAUTION: Place clean, lint-free shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

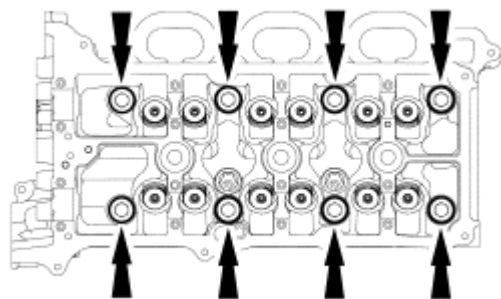
CAUTION: Aluminum surfaces are soft and may be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface.

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

NOTE: LH shown in illustration, RH similar.

114. Remove and discard the 8 bolts from each cylinder head.

- Remove the cylinder heads.
- Discard the cylinder head gaskets.



N0056896

Fig. 559: Identifying Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

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

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

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

115. Clean the cylinder head-to-cylinder block mating surfaces of both the cylinder heads and the cylinder block in the following sequence.
1. Remove any large deposits of silicone or gasket material with a plastic scraper.
 2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal surface prep, following package directions, to remove any remaining traces of oil or coolant and to prepare the surfaces to bond with the new gasket. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
116. Support the cylinder heads on a bench with the head gasket side up.

NOTE: The straightedge used must be flat within 0.0051 mm (0.0002 in) per foot of tool length.

117. Inspect all areas of the deck face with a straightedge and feeler gauge. The cylinder heads must not have depressions deeper than 0.0254 mm (0.001 in) across a 38.1 mm (1.5 in) square area, or scratches more than 0.0254 mm (0.001 in).
118. Remove the coolant tube.
- Remove and discard the O-ring seals.

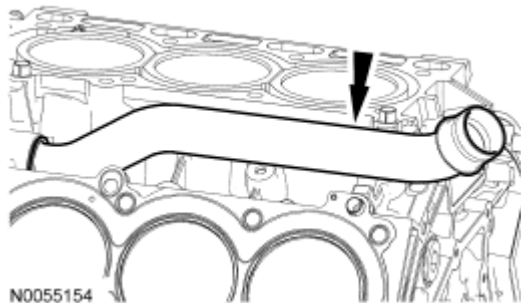


Fig. 560: Identifying Coolant Tube
Courtesy of FORD MOTOR CO.

119. Remove the 2 bolts and the KS.

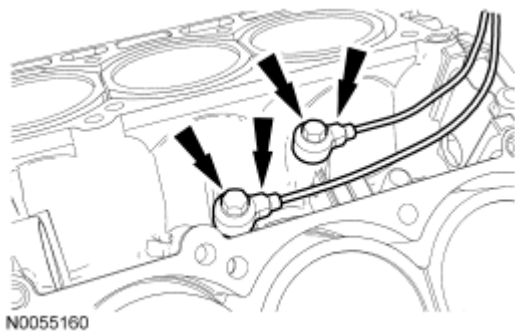


Fig. 561: Locating Knock Sensor (KS) Bolts
Courtesy of FORD MOTOR CO.

120. Remove the 8 bolts and the coolant pump.

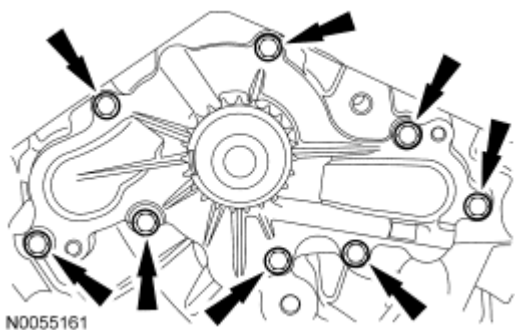
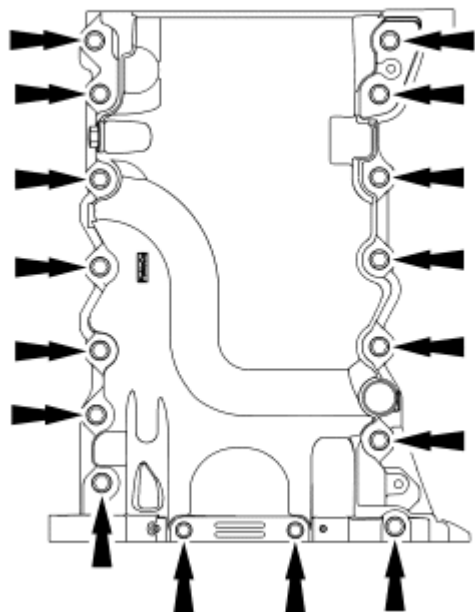


Fig. 562: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

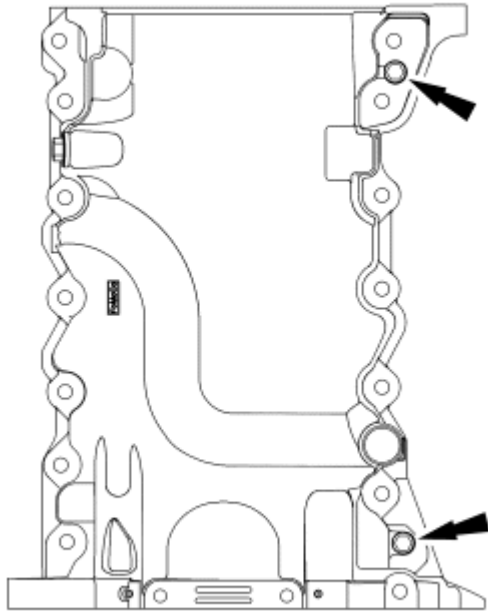
121. Remove the 16 oil pan bolts.



N0055163

Fig. 563: Identifying Oil Pan Bolts
Courtesy of FORD MOTOR CO.

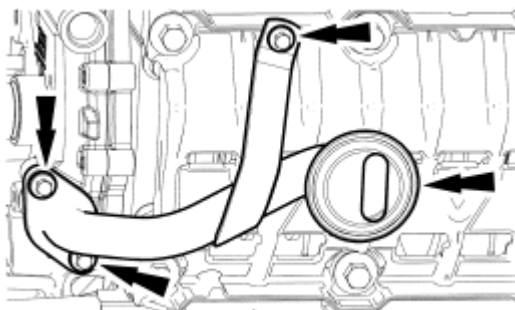
122. Install 2 of the oil pan bolts (finger tight) into the 2 threaded holes in the oil pan.
- Alternately tighten the 2 bolts one turn at a time until the oil pan-to-cylinder block seal is released.
 - Remove the oil pan.



N0055164

Fig. 564: Installing 2 Of Oil Pan Bolts (Finger Tight) Into 2 Threaded Holes In Oil Pan
 Courtesy of FORD MOTOR CO.

123. Remove the 3 bolts and the oil pump screen and pickup tube.
 - Discard the O-ring seal.



N0055166

Fig. 565: Identifying Oil Pump Screen, Pickup Tube & Bolts
 Courtesy of FORD MOTOR CO.

124. Remove the 3 bolts and the oil pump.

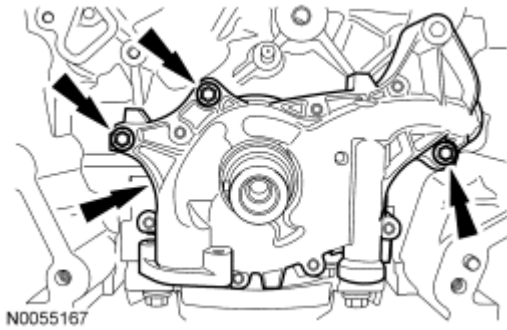


Fig. 566: Identifying Oil Pump & Bolts
Courtesy of FORD MOTOR CO.

125. Remove the 8 crankshaft rear seal retainer bolts.

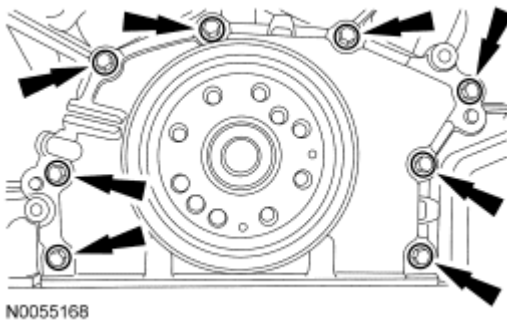


Fig. 567: Locating Crankshaft Rear Seal Retainer Bolts
Courtesy of FORD MOTOR CO.

126. Install the 2 M6 oil pan bolts (finger tight) into the 2 threaded holes in the crankshaft rear seal retainer.
- Alternately tighten the 2 bolts one turn at a time until the crankshaft rear seal retainer-to-cylinder block seal is released.
 - Remove the crankshaft rear seal retainer.

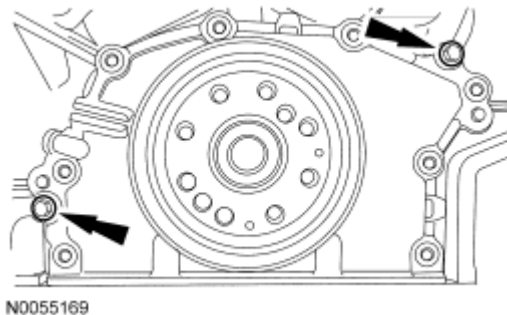


Fig. 568: Identifying M6 Oil Pan Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Only use a 3M Roloc® Bristle Disk (2-in white, part number 07528) to

clean the engine front cover, oil pan and crankshaft rear seal retainer plate. Do not use metal scrapers, wire brushes or any other power abrasive disk to clean the engine front cover, oil pan and crankshaft rear seal retainer plate. These tools cause scratches and gouges that make leak paths.

127. Clean the engine front cover, oil pan and crankshaft rear seal retainer plate using a 3M Roloc® Bristle Disk (2-in white, part number 07528) in a suitable tool turning at the recommended speed of 15,000 RPM.

- Thoroughly wash the engine front cover, oil pan and crankshaft rear seal retainer plate to remove any foreign material, including any abrasive particles created during the cleaning process.

CAUTION: Place clean, lint-free shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Any foreign material (including any material created while cleaning gasket surfaces) that enters the oil passages or the oil pan, may cause engine failure.

CAUTION: Do not use wire brushes, power abrasive discs or 3M Roloc® Bristle Disk (2-in white, part number 07528) to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. They also cause contamination that will cause premature engine failure. Remove all traces of sealant.

128. Clean the sealing surfaces of the cylinder block in the following sequence.

1. Remove any large deposits of silicone or gasket material.
2. Apply silicone gasket remover and allow to set for several minutes.
3. Remove the silicone gasket remover. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep to remove any remaining traces of oil or coolant and to prepare the surfaces to bond. Do not attempt to make the metal shiny. Some staining of the metal surfaces is normal.
5. Make sure the 2 engine front cover locating dowel pins are seated correctly in the cylinder block.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

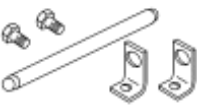
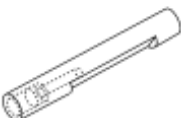
CYLINDER HEAD

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
	Compressor, Valve Spring	303-300 (T87C-6565-A)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

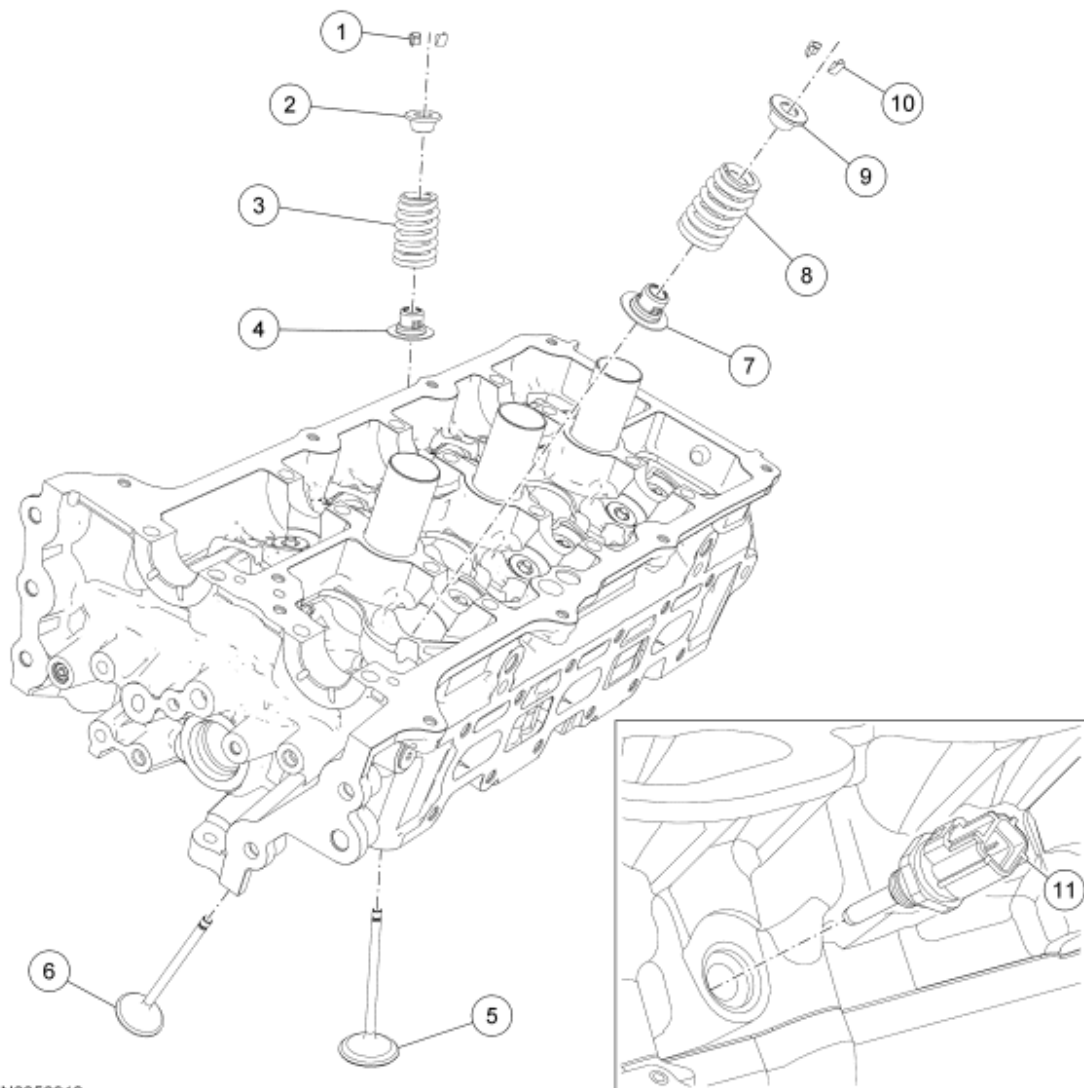
 ST1981-F		
 ST1907-A	Compressor, Valve Spring	303-350 (T89P-6565-A)
 ST3028-A	Compressor, Valve Spring	303-1249
 ST1906-A	Installer, Valve Stem Oil Seal	303-470 (T94P-6510-CH)

MATERIAL

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

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



N0056912

Fig. 569: Cylinder Head
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6518	Intake valve spring retainer key (12 required)
2	6514	Intake valve spring retainer (6 required)
3	6513	Intake valve spring (6 required)
4	6A517	Intake valve stem seal (6 required)
5	6505	Intake valve (6 required)
6	6507	Exhaust valve (6 required)
7	6A517	Exhaust valve stem seal (6 required)
8	6513	Exhaust valve spring (6 required)
9	6514	Exhaust valve spring retainer (6 required)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

10	6518	Exhaust valve spring retainer key (12 required)
11	6G004	Cylinder Head Temperature (CHT) sensor

DISASSEMBLY

All cylinder heads

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations.

1. Using the Valve Spring Compressors, remove the keys, retainer and spring.

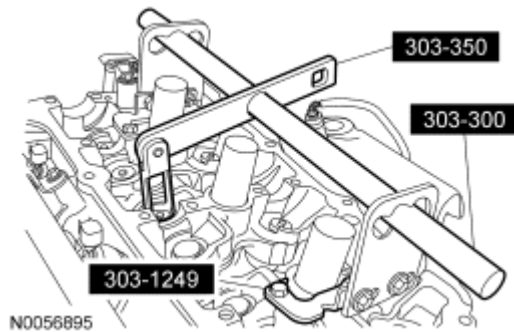


Fig. 570: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

2. Remove the valve from the cylinder head.
3. Remove and discard the valve stem seal.
4. Repeat the above steps for each valve.

RH cylinder head

5. Remove and discard the Cylinder Head Temperature (CHT) sensor.

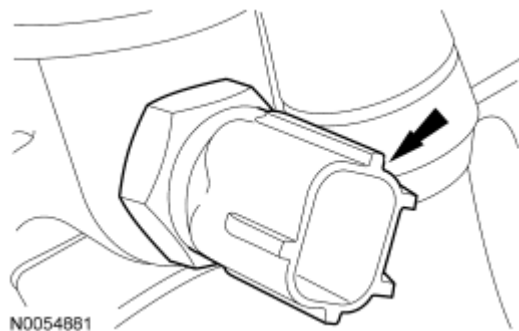


Fig. 571: Identifying Cylinder Head Temperature (CHT) Sensor

Courtesy of FORD MOTOR CO.

ASSEMBLY

All cylinder heads

NOTE: Lubricate the valve stem seal with clean engine oil prior to installation.

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

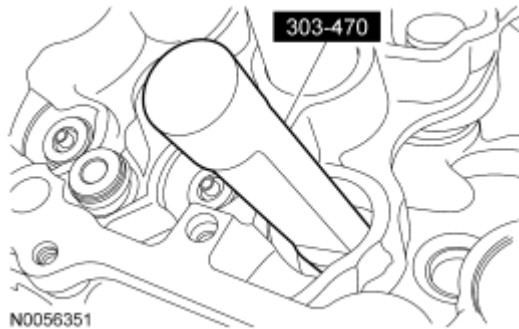


Fig. 572: Installing New Valve Stem Seal Using Special Tool (303-470)
Courtesy of FORD MOTOR CO.

2. Install the valve.
3. Using the Valve Spring Compressors, install the valve spring, retainer and key.

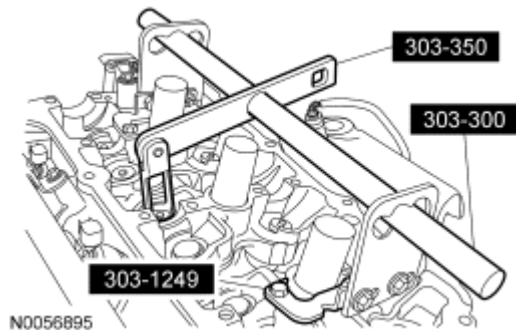


Fig. 573: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

4. Repeat the above steps for each valve.

RH cylinder head

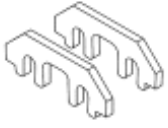
5. Install a new CHT sensor.
 - Tighten to 10 Nm (89 lb-in).

ASSEMBLY

2009 Mercury Sable

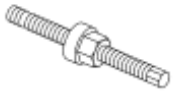
2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

ENGINE**SPECIAL TOOLS**

Illustration	Tool Name	Tool Number
 ST2433-A	Alignment Pins	307-399
 ST2979-A	Camshaft Alignment Tool	303-1248
 ST2976A	Engine Lifting Bracket	303-1245
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST1341-A	Heavy Duty Floor Crane	014-00071 or equivalent
 ST2981-A	Installer, Crankshaft Front Seal	303-1251
 ST2980-A	Installer, Crankshaft Rear Seal	303-1250
	Installer, Crankshaft Vibration	303-102 (T74P-6316-B)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST1287-A	Damper	
 ST2296-A	Installer, Front Cover Oil Seal	303-335
 ST2983-A	Installer, Seal	303-1247/2
 ST1602-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A)

MATERIAL

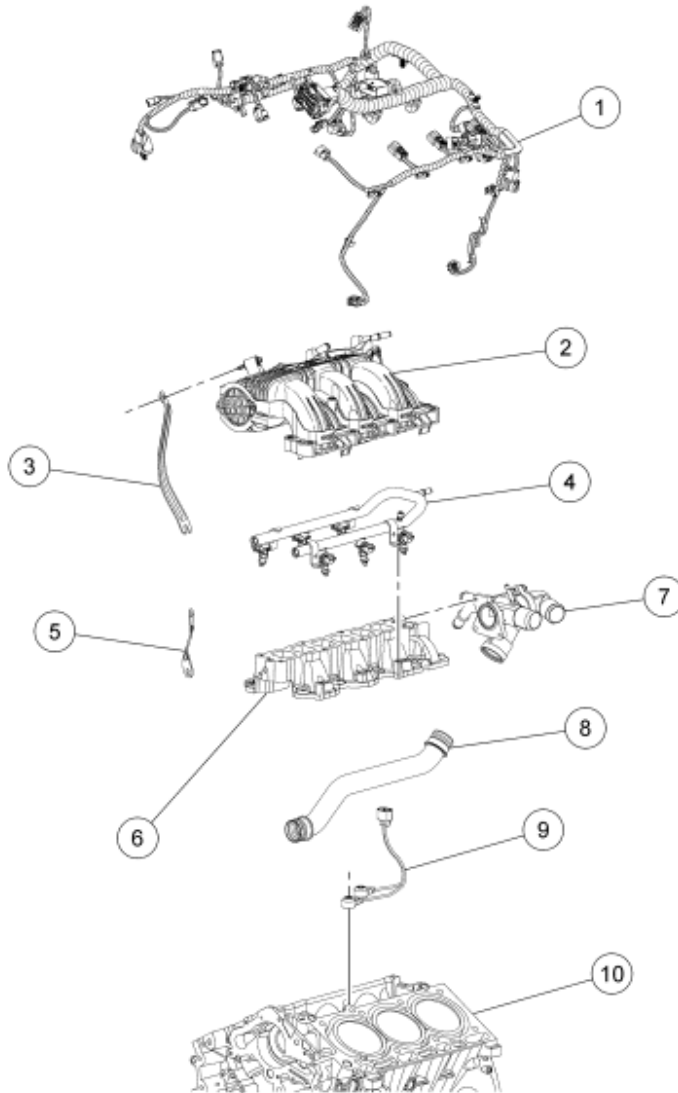
Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft Metal Surface Prep ZC-31-A	-
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket Remover ZC-30	-

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

Thread Sealant with PTFE
TA-24

WSK-M2G350-A2



N0055425

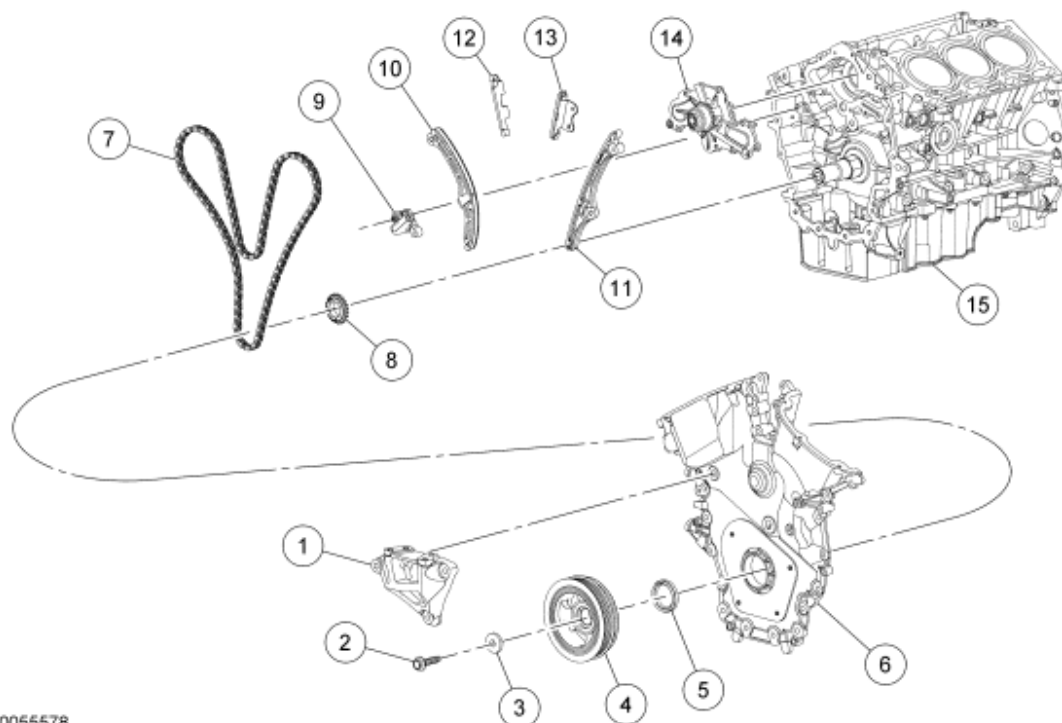
Fig. 574: Engine Upper
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	12C508	Engine control harness
2	9S455	Upper intake manifold
3	9J444	Upper intake manifold long support bracket (early build engines)
4	9F797	Fuel rail
5	9J444	Upper intake manifold short support bracket

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

6	9K461	Lower intake manifold
7	8A856	Thermostat housing
8	9N271	Coolant tube
9	9N271	Knock sensor (KS)
10	6010	Cylinder block



N0055578

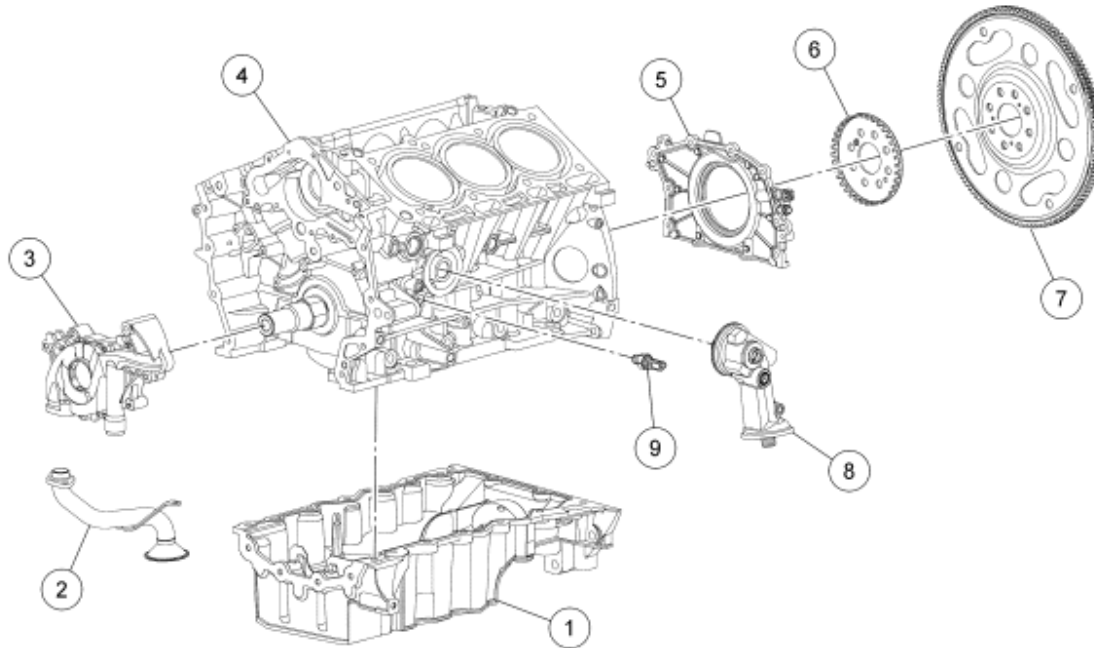
Fig. 575: Engine Front
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6A0003	Engine mount bracket
2	W701512	Crankshaft pulley bolt
3	N806165	Crankshaft pulley washer
4	6316	Crankshaft pulley
5	6700	Crankshaft front seal
6	6C086	Engine front cover
7	6268	Timing chain
8	6306	Crankshaft timing sprocket
9	6K254	Primary timing chain tensioner
10	6K255	Primary timing chain tensioner arm
11	6B274	LH lower primary timing chain guide
12	6M256	RH primary timing chain guide
13	6K297	LH upper primary timing chain guide

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

14	8501	Coolant pump
15	6010	Cylinder block



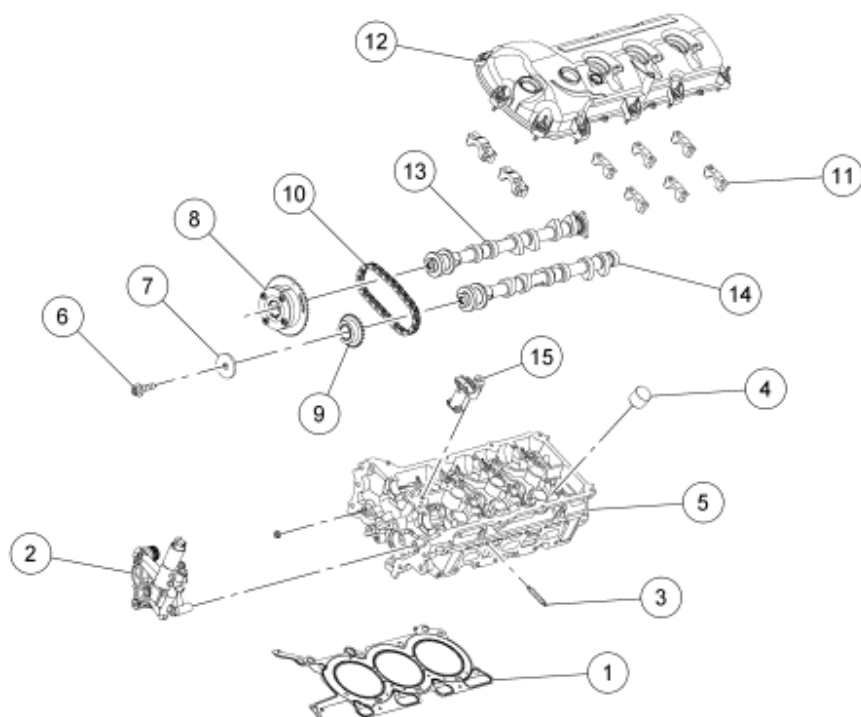
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Fig. 576: Engine Lower
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6675	Oil pan
2	6622	Oil pump screen and pickup tube
3	6621	Oil pump
4	6010	Cylinder block
5	6D327	Crankshaft rear seal retainer
6	12A227	Crankshaft sensor ring
7	6375	Flexplate
8	6881	Oil filter adapter
9	9278	Engine oil pressure (EOP) switch

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



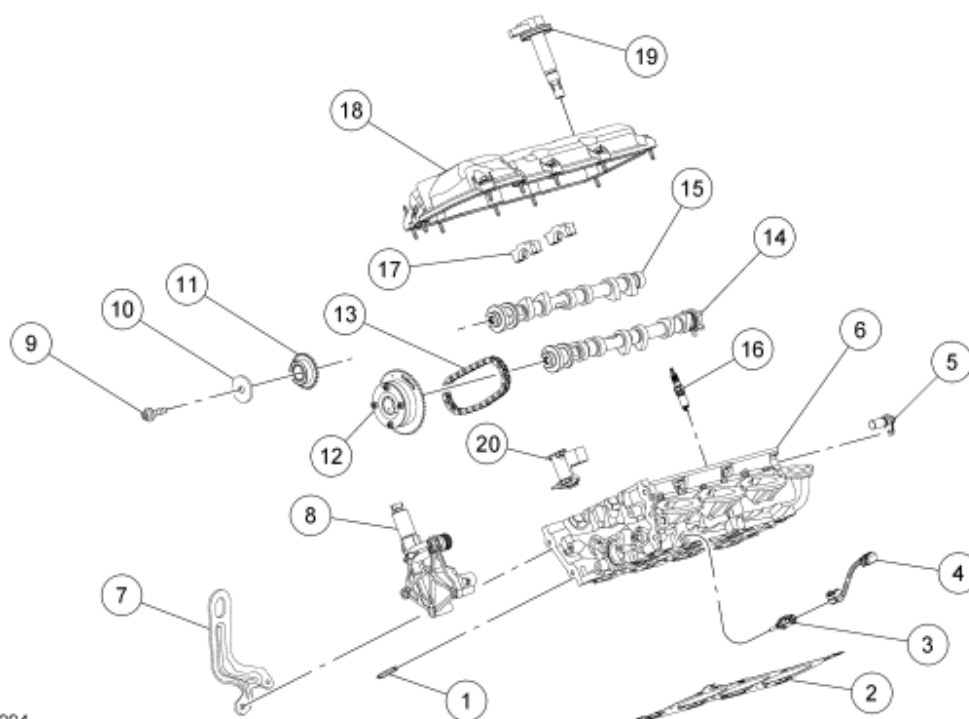
N0055580

Fig. 577: LH Cylinder Head
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6083	LH cylinder head gasket
2	6C261	LH variable camshaft timing (VCT) housing
3	W12244	LH exhaust manifold stud (6 required)
4	6500	Valve tappet (32 required)
5	6050	LH cylinder head
6	6279	LH camshaft bolt (2 required)
7	W710738	LH exhaust camshaft sprocket washer
8	6C524	LH VCT assembly
9	6256	LH exhaust camshaft sprocket
10	6C256	LH secondary timing chain
11	6A258	LH camshaft cap (8 required)
12	6A505	LH valve cover
13	6A267	LH intake camshaft
14	6A269	LH exhaust camshaft
15	6C271	LH secondary timing chain tensioner

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



N0071994

Fig. 578: RH Cylinder Head
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W712244	RH exhaust manifold stud (6 required)
2	6051	RH cylinder head gasket
3	6G004	Cylinder head temperature (CHT) sensor
4	14B485	CHT sensor jumper harness
5	6B288	Camshaft position sensor (2 required)
6	6049	RH cylinder head
7	17A084	Engine lift eye
8	6C260	RH variable camshaft timing (VCT) housing
9	6279	RH camshaft bolt (2 required)
10	W710738	RH exhaust camshaft sprocket washer
11	6256	RH exhaust camshaft sprocket
12	6C524	RH VCT assembly
13	6C256	RH secondary timing chain
14	6A266	RH intake camshaft
15	6A268	RH exhaust camshaft
16	12405	Spark plug (6 required)
17	6A258	RH camshaft cap (8 required)
18	6582	RH valve cover
19	12A375	Coil-on-plug (6 required)

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

All vehicles

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The crankshaft rear seal retainer must be installed and the bolts tightened within 4 minutes of sealant application.

1. Apply a 3 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the sealing surface of the crankshaft rear seal retainer.

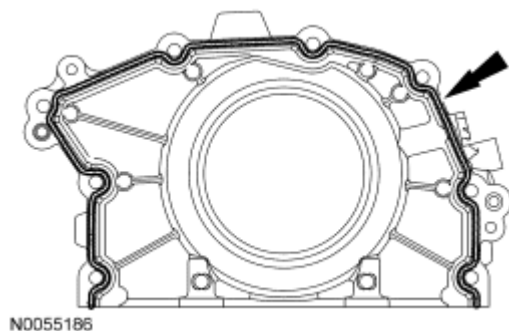


Fig. 579: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Sealing Surface Of Crankshaft Rear Seal Retainer
Courtesy of FORD MOTOR CO.

2. Install the crankshaft rear seal retainer and the 8 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

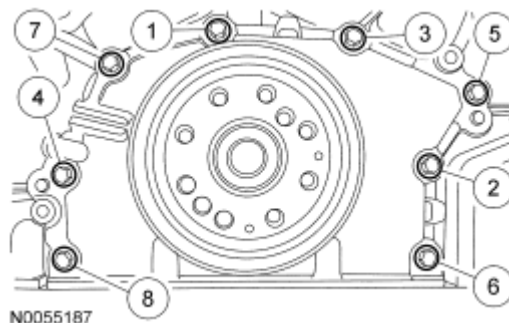


Fig. 580: Installing Crankshaft Rear Seal Retainer Bolts In Sequence
Courtesy of FORD MOTOR CO.

3. Install the oil pump and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

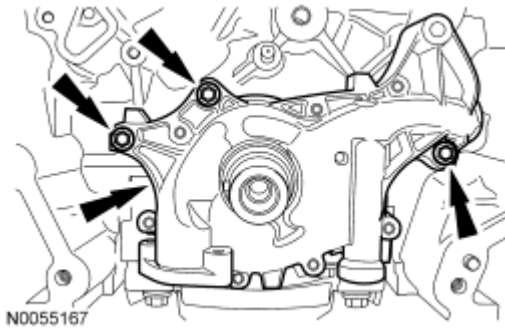


Fig. 581: Identifying Oil Pump & Bolts
Courtesy of FORD MOTOR CO.

4. Using a new O-ring seal, install the oil pump screen and pickup tube and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

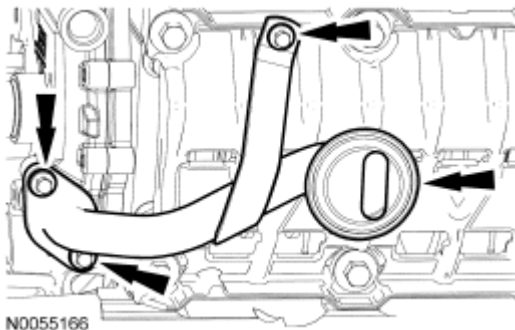


Fig. 582: Identifying Oil Pump Screen, Pickup Tube & Bolts
Courtesy of FORD MOTOR CO.

NOTE: The A/C compressor must be installed on the cylinder block and the 2 bolts tightened prior to installing the oil pan.

5. Install the A/C compressor and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

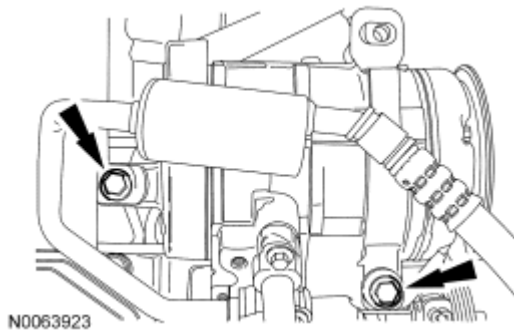
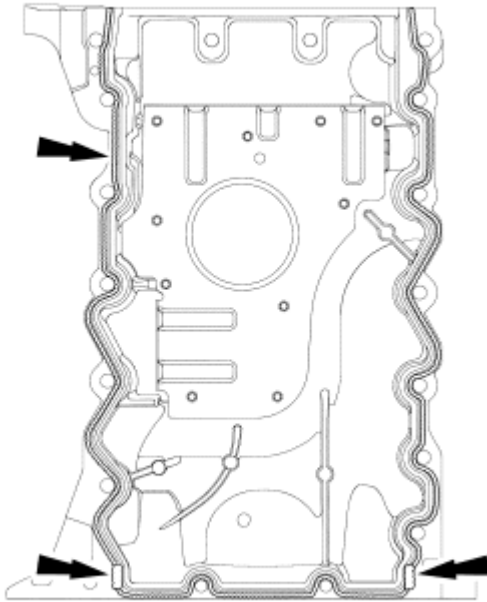


Fig. 583: Identifying A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The oil pan and the 4 specified bolts must be installed and the oil pan aligned to the cylinder block and A/C compressor within 4 minutes of sealant application. Final tightening of the oil pan bolts must be carried out within 60 minutes of sealant application.

6. Apply a 3 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the sealing surface of the oil pan.
 - Apply a 5.5 mm (0.21 in) bead of Motorcraft High Performance Engine RTV Silicone to the 2 crankshaft seal retainer plate-to-cylinder block joint areas on the sealing surface of the oil pan.

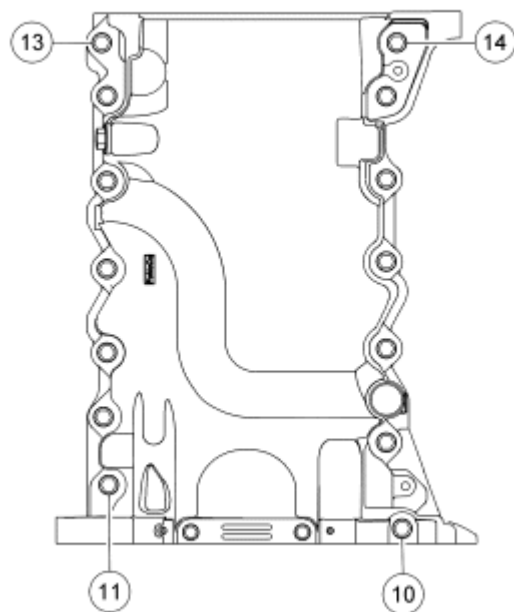


N0055188

Fig. 584: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Crankshaft Seal Retainer Plate-To-Cylinder Block
Courtesy of FORD MOTOR CO.

NOTE: The oil pan and the 4 specified bolts must be installed within 4 minutes of the start of sealant application.

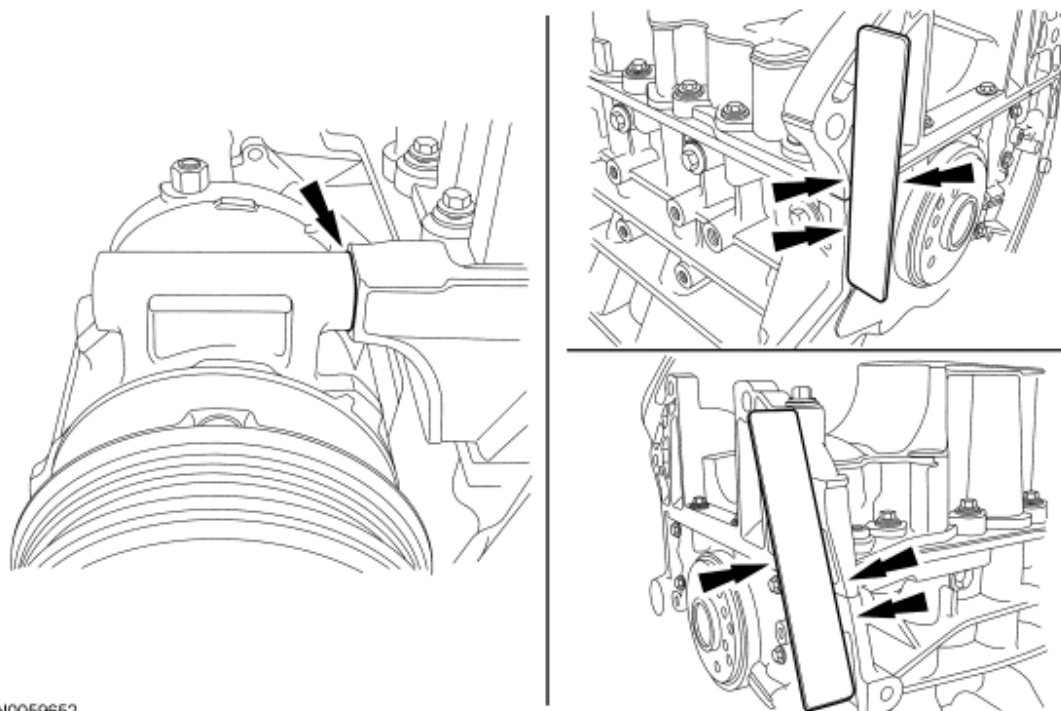
7. Install the oil pan and bolts 10, 11, 13 and 14.
 - Tighten the bolts in the sequence in illustration to 3 Nm (27 lb-in).
 - Loosen the bolts 180 degrees.



N0069773

Fig. 585: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence
Courtesy of FORD MOTOR CO.

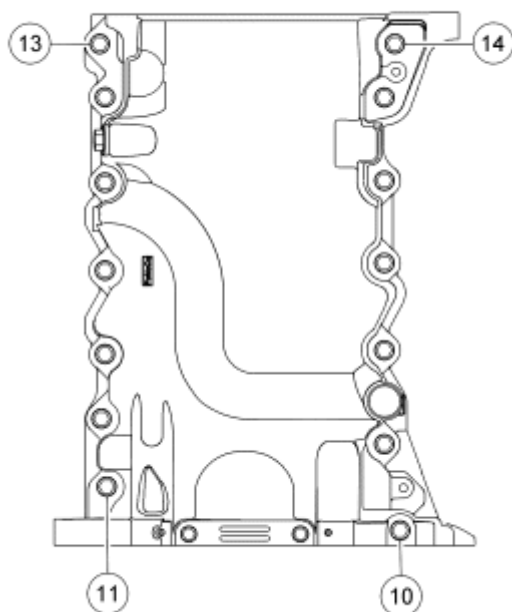
8. Align the oil pan to the cylinder block and A/C compressor.
 - Position the oil pan so the mounting boss is against the A/C compressor and using a straightedge, align the oil pan flush with the rear of the cylinder block at the 2 areas shown in illustration.



N0059652

Fig. 586: Aligning Oil Pan Flush With Rear Of Cylinder Block
Courtesy of FORD MOTOR CO.

9. Tighten bolts 10, 11, 13 and 14 in the sequence shown in illustration to 3 Nm (27 lb-in).

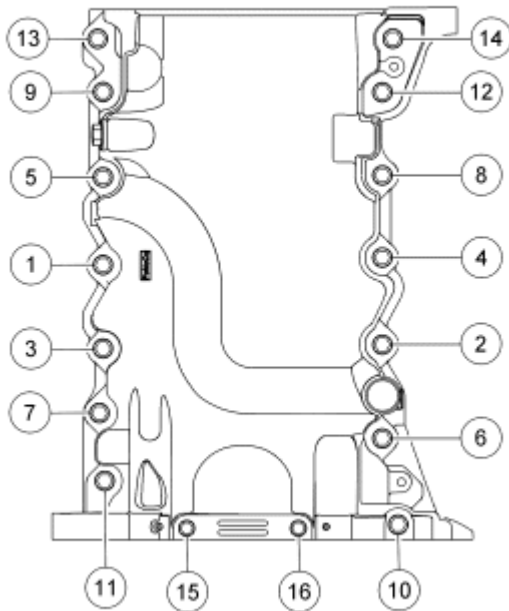


N0069773

Fig. 587: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence

Courtesy of FORD MOTOR CO.

10. Install the remaining oil pan bolts. Tighten all the oil pan bolts in the sequence shown in illustration.
- Tighten the large bolts (1-14) to 20 Nm (15 lb-ft).
 - Tighten the small bolts (15 and 16) to 10 Nm (89 lb-in).



N0055165

Fig. 588: Installing Remaining Oil Pan Bolts In Sequence
Courtesy of FORD MOTOR CO.

11. Install the A/C compressor mounting stud and nut.
- Tighten the stud to 9 Nm (80 lb-in) and the nut to 25 Nm (18 lb-ft).

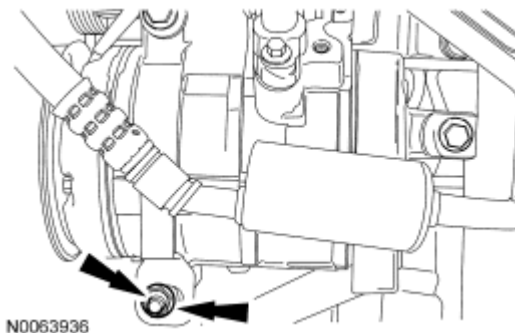


Fig. 589: Locating A/C Compressor Nut & Stud
Courtesy of FORD MOTOR CO.

12. Install the coolant pump and the 8 bolts.

- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

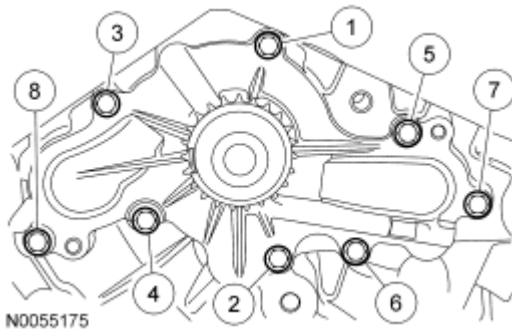


Fig. 590: Identifying Coolant Pump Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

13. Install the knock sensor (KS) and the 2 bolts.
 - Tighten to 20 Nm (15 lb-ft).

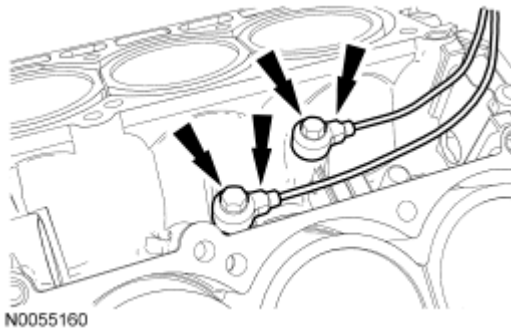


Fig. 591: Locating Knock Sensor (KS) Bolts
Courtesy of FORD MOTOR CO.

NOTE: Apply clean engine coolant to the O-ring seals prior to installation.

14. Using new O-ring seals, install the coolant tube.

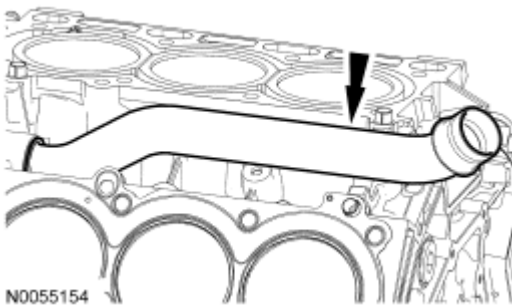
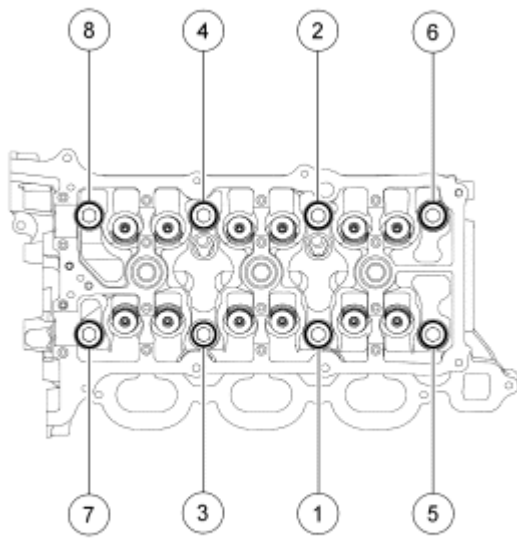


Fig. 592: Identifying Coolant Tube
Courtesy of FORD MOTOR CO.

15. Install a new gasket, the RH cylinder head and 8 new bolts. Tighten in the sequence shown in illustration in 5 stages:

- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten to 35 Nm (26 lb-ft).
- Stage 3: Tighten 90 degrees.
- Stage 4: Tighten 90 degrees.
- Stage 5: Tighten 90 degrees.

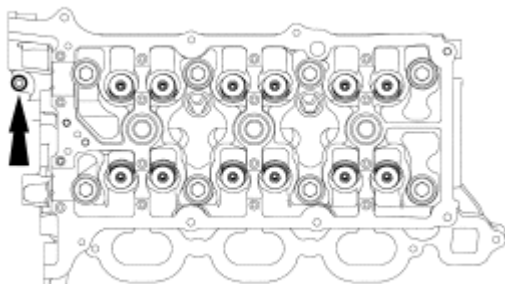


N0054884

Fig. 593: Installing RH Cylinder Head Bolts In Sequence
 Courtesy of FORD MOTOR CO.

16. Install the bolt.

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

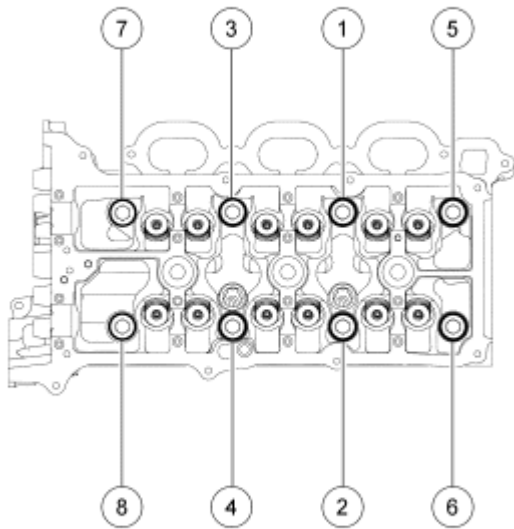


N0055173

Fig. 594: Identifying M6 Bolt

Courtesy of FORD MOTOR CO.

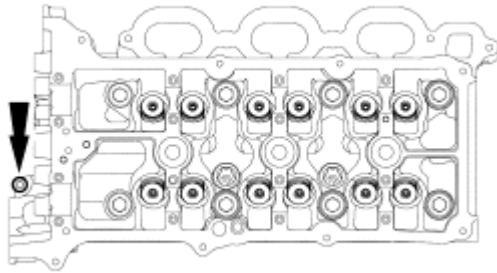
17. Install a new gasket, the LH cylinder head and 8 new bolts. Tighten in the sequence shown in illustration in 5 stages:
- Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 35 Nm (26 lb-ft).
 - Stage 3: Tighten 90 degrees.
 - Stage 4: Tighten 90 degrees.
 - Stage 5: Tighten 90 degrees.



N0054898

Fig. 595: Installing LH Cylinder Head Bolts In Sequence
Courtesy of FORD MOTOR CO.

18. Install the bolt.
- Tighten to 10 Nm (89 lb-in).

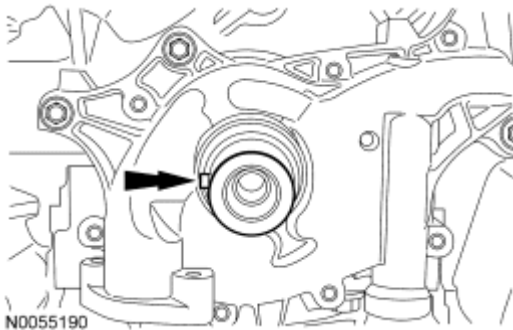


N0055174

Fig. 596: Identifying M6 Bolt
Courtesy of FORD MOTOR CO.

CAUTION: The crankshaft must remain in the freewheeling position (crankshaft dowel pin at 9 o'clock) until after the camshafts are installed and the valve clearance is checked/adjusted. Do not turn the crankshaft until instructed to do so. Failure to follow this process will result in severe engine damage.

19. Position the crankshaft dowel pin in the 9 o'clock position.



N0055190

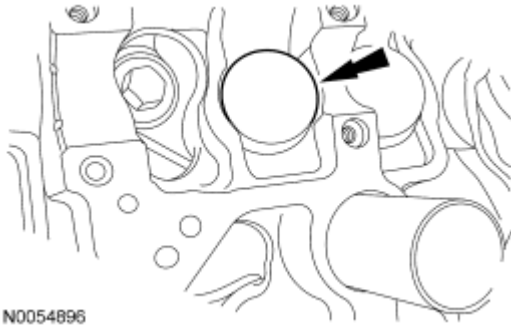
Fig. 597: Positioning Crankshaft Dowel Pin In 9 O'clock Position
Courtesy of FORD MOTOR CO.

NOTE: The valve tappets must be installed in their original positions.

NOTE: Coat the valve tappets with clean engine oil prior to installation.

NOTE: LH shown in illustration, RH similar.

20. Install the valve tappets.



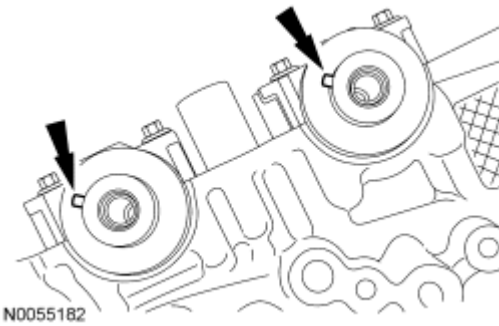
N0054896

Fig. 598: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during installation or engine damage may occur.

NOTE: Coat the camshafts with clean engine oil prior to installation.

21. Position the camshafts onto the RH cylinder head in the neutral position as shown in illustration.

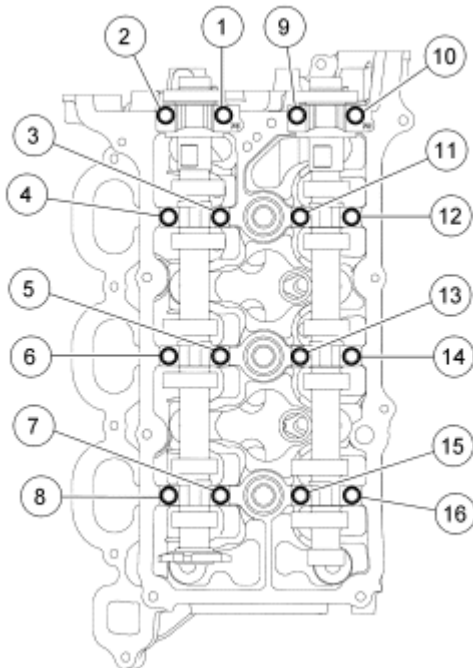


N0055182

Fig. 599: Positioning Camshafts Onto RH Cylinder Head In Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

22. Install the 8 camshaft caps and the 16 bolts.
- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).



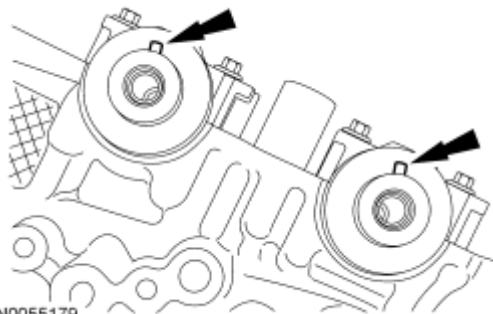
N0055184

Fig. 600: Installing Camshaft Caps & Bolts In Sequence
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during installation or engine damage may occur.

NOTE: Coat the camshafts with clean engine oil prior to installation.

23. Position the camshafts onto the LH cylinder head in the neutral position as shown in illustration.

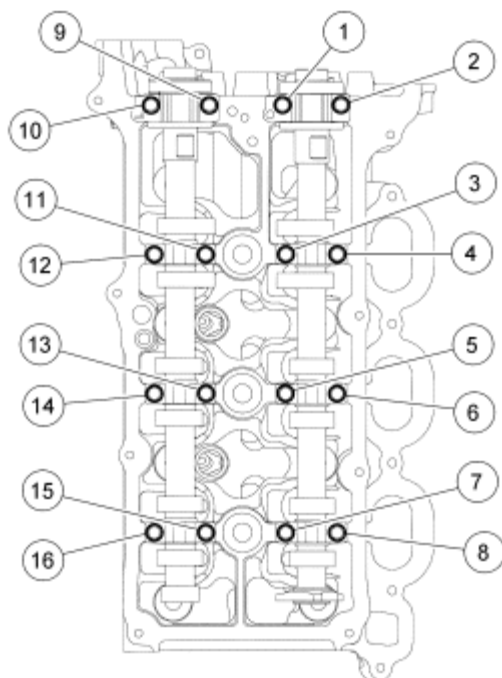


N0055179

Fig. 601: Positioning Camshafts Onto LH Cylinder Head In Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

24. Install the 8 camshaft caps and the 16 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).



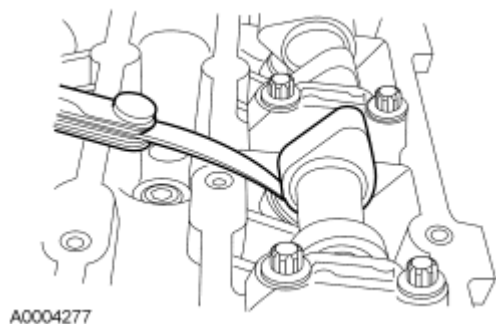
N0055185

Fig. 602: Installing Camshaft Caps & Bolts In Sequence
Courtesy of FORD MOTOR CO.

CAUTION: If any components are installed new, the engine valve clearance must be checked/adjusted or engine damage may occur.

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

25. Using a feeler gauge, confirm that the valve tappet clearances are within specification. For additional information, refer to Valve Clearance Check.



A0004277

Fig. 603: Measuring Valve Clearance

Courtesy of FORD MOTOR CO.

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

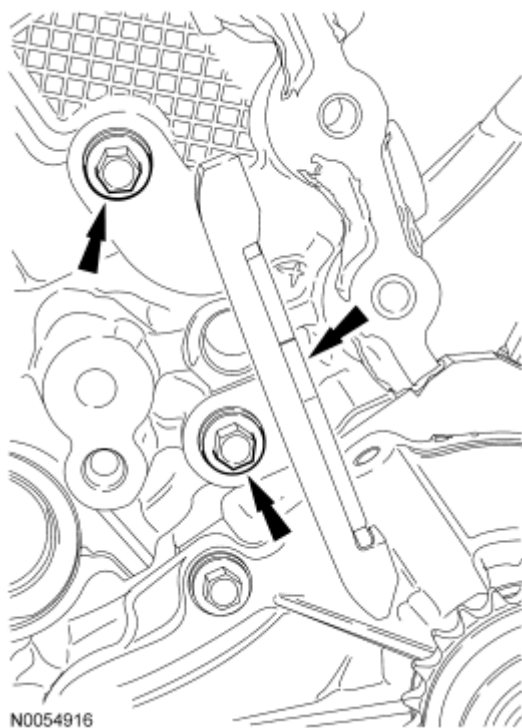


Fig. 604: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

27. Install the RH secondary timing chain tensioner and the 2 bolts.
- Tighten to 10 Nm (89 lb-in).

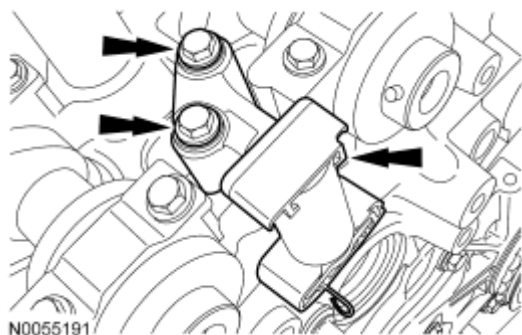


Fig. 605: Locating RH Secondary Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

28. Rotate the RH camshafts to the top dead center (TDC) position and install the special tool on the flats of the camshafts.

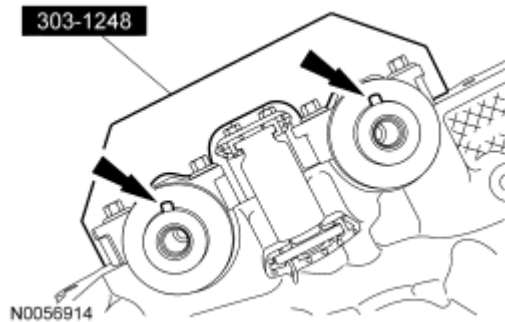


Fig. 606: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

29. Assemble the RH variable camshaft timing (VCT) assembly, the RH exhaust camshaft sprocket and the RH secondary timing chain.
- Align the colored links with the timing marks.

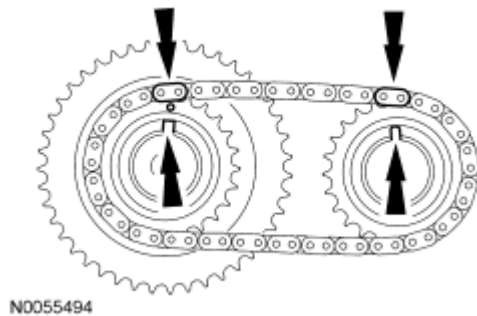


Fig. 607: Aligning RH Exhaust Camshaft Sprocket & RH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

30. Position the RH secondary timing assembly onto the camshafts.

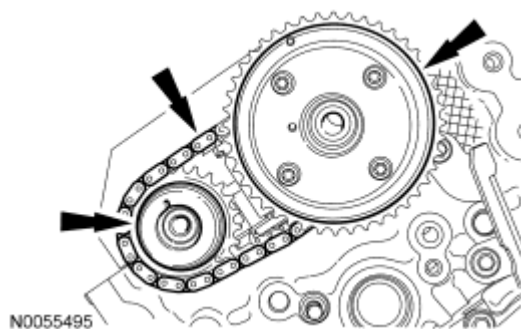


Fig. 608: Positioning RH Secondary Timing Assembly Onto Camshafts

Courtesy of FORD MOTOR CO.

31. Install the new VCT bolt and the exhaust camshaft bolt and the original washers. Tighten in 4 stages.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 10 Nm (89 lb-in).
 - Stage 4: Tighten 90 degrees.

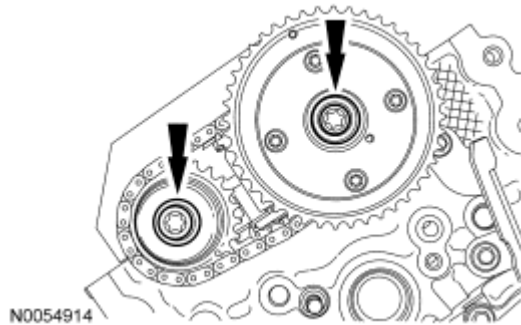


Fig. 609: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

32. Remove the lockpin from the RH secondary timing chain tensioner.

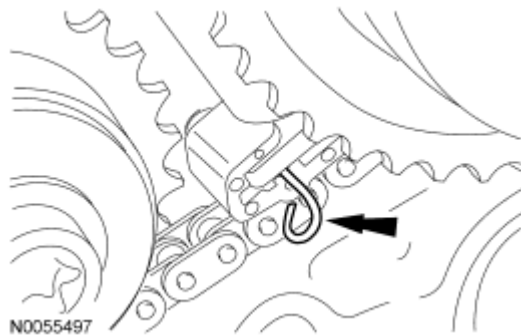


Fig. 610: Identifying Lock Pin On RH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

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

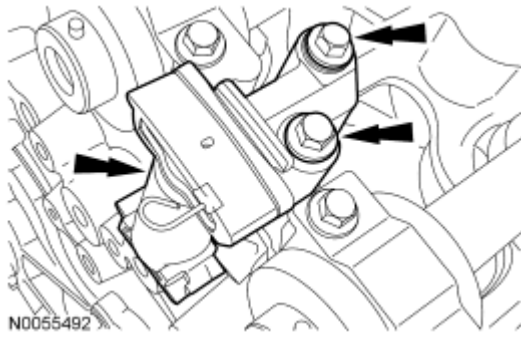


Fig. 611: Locating LH Secondary Timing Chain Tensioner & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

34. Rotate the LH camshafts to the TDC position and install the special tool on the flats of the camshafts.

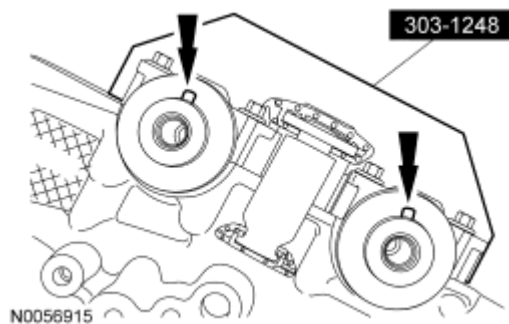


Fig. 612: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

35. Assemble the LH VCT assembly, the LH exhaust camshaft sprocket and the LH secondary timing chain.
- Align the colored links with the timing marks.

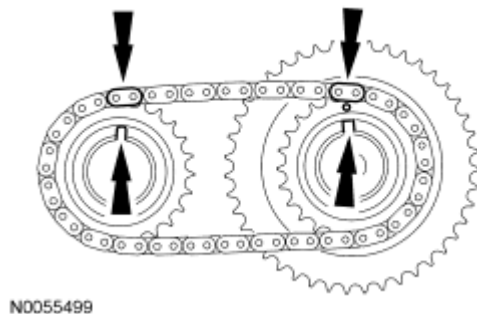


Fig. 613: Aligning LH Exhaust Camshaft Sprocket & LH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

36. Position the LH secondary timing assembly onto the camshafts.

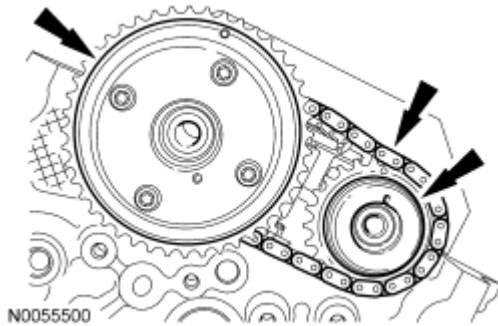


Fig. 614: Positioning LH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

37. Install the new VCT bolt and the exhaust camshaft bolt and the original washers. Tighten in 4 stages.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 10 Nm (89 lb-in).
 - Stage 4: Tighten 90 degrees.

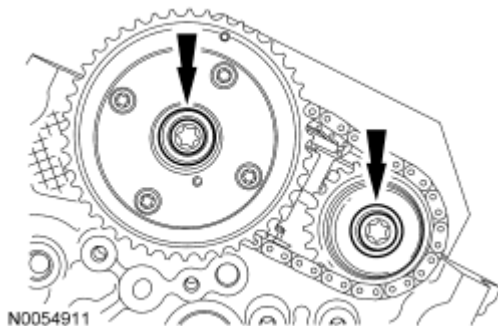


Fig. 615: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

38. Remove the lockpin from the LH secondary timing chain tensioner.

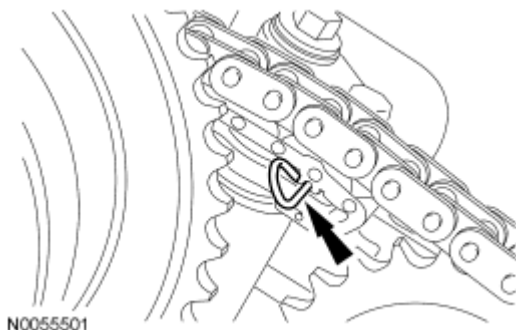


Fig. 616: Locating Lock Pin On LH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

39. Rotate the crankshaft clockwise 60 degrees to the TDC position (crankshaft dowel pin at 11 o'clock).

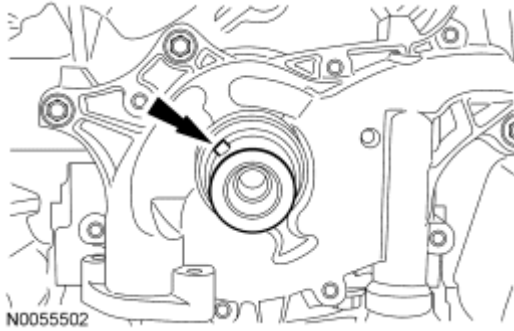


Fig. 617: Identifying Crankshaft Dowel Pin
Courtesy of FORD MOTOR CO.

40. Install the crankshaft timing chain sprocket.

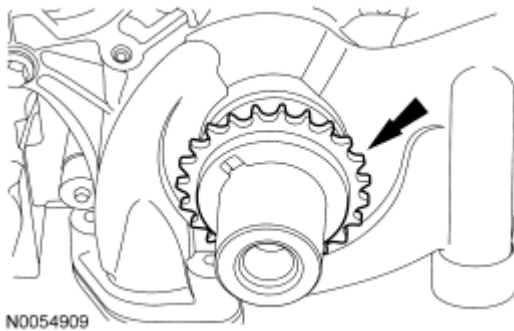
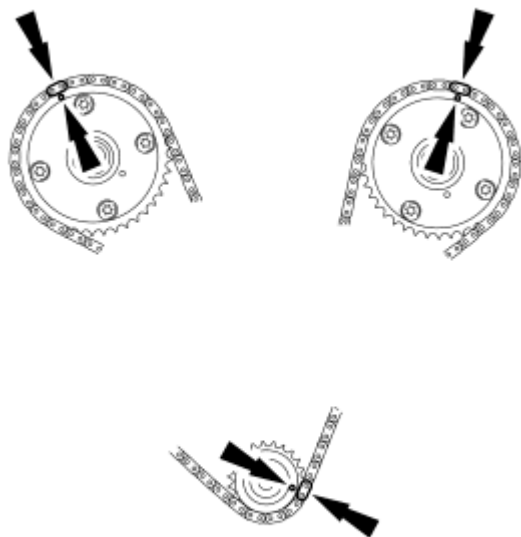


Fig. 618: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

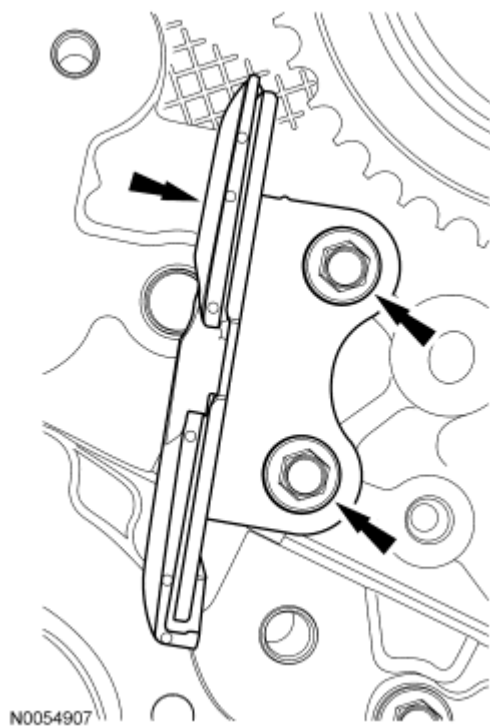
41. Install the primary timing chain with the colored links aligned with the timing marks on the VCT assemblies and the crankshaft sprocket.



N0055503

Fig. 619: Aligning Timing Marks On VCT Assemblies & Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

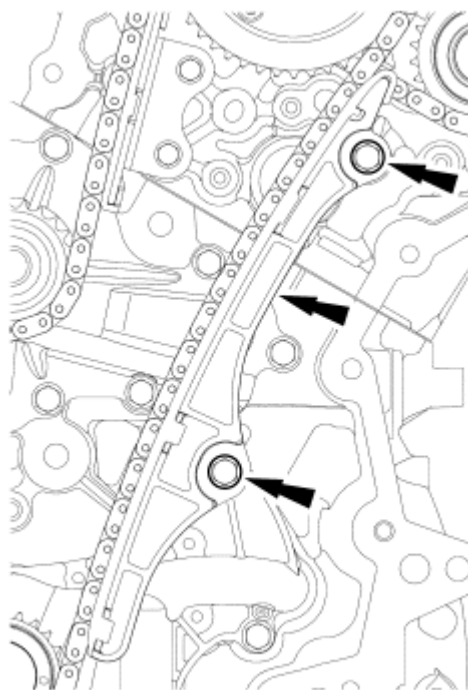
42. Install the upper LH primary timing chain guide and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0054907

Fig. 620: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

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



N0054906

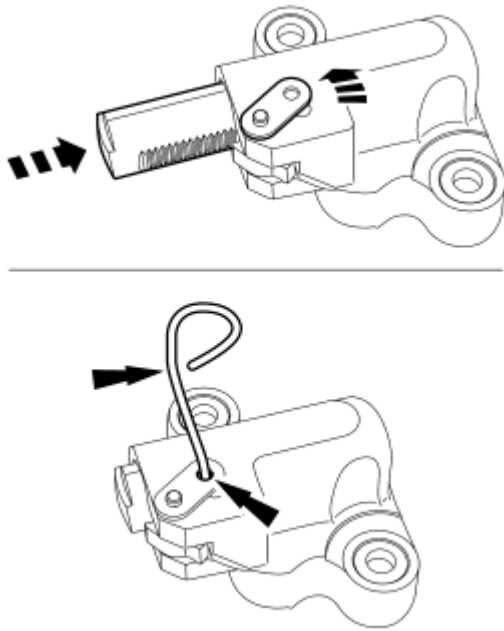
Fig. 621: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

44. Install the primary timing chain tensioner arm.



Fig. 622: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

45. Reset the primary timing chain tensioner.
- Rotate the lever counterclockwise.
 - Using a soft-jawed vise, compress the plunger.
 - Align the hole in the lever with the hole in the tensioner housing.
 - Install a suitable lockpin.

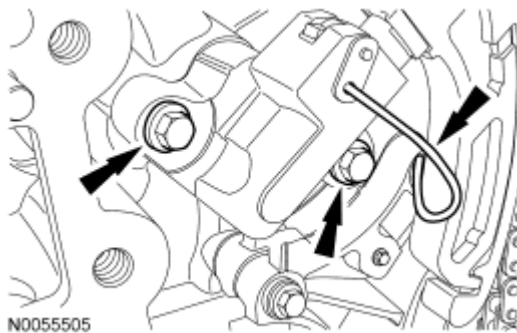


N0055504

Fig. 623: Compressing Plunger Using A Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

NOTE: It may be necessary to rotate the crankshaft slightly to remove slack from the timing chain and install the tensioner.

46. Install the primary tensioner and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).
 - Remove the lockpin.



N0055505

Fig. 624: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

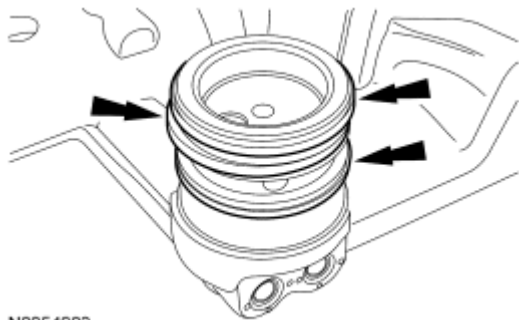
47. As a post-check, verify correct alignment of all timing marks.



N0055496

Fig. 625: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

48. Install new VCT housing seals.



N0054903

Fig. 626: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

CAUTION: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

49. Install the LH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

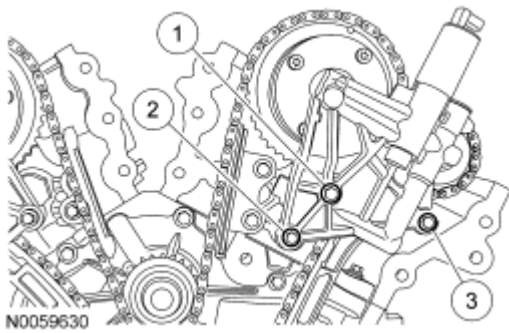


Fig. 627: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

CAUTION: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

50. Install the RH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

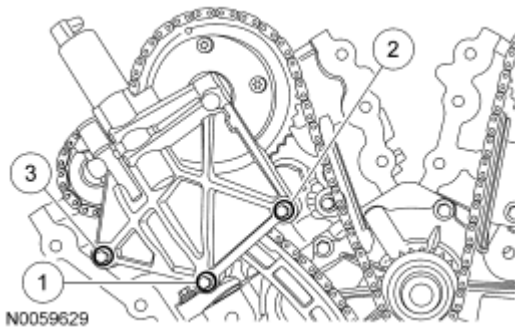


Fig. 628: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

51. Install the special tools.

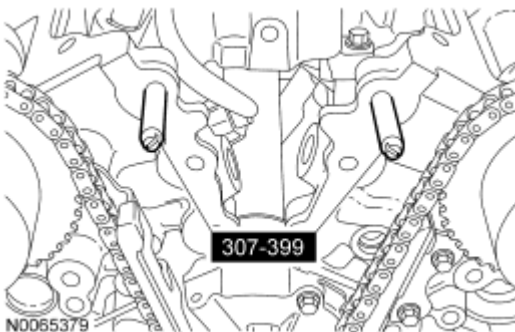


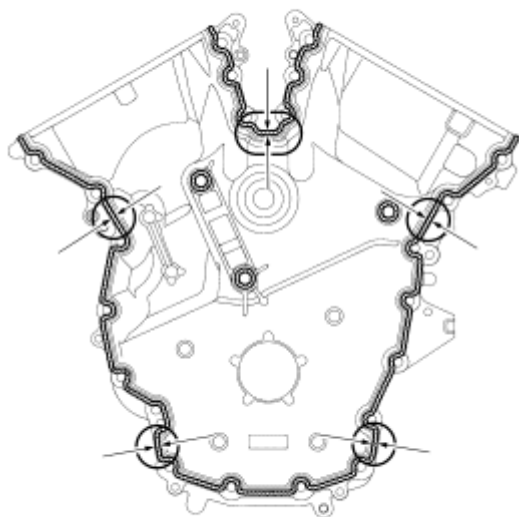
Fig. 629: Identifying Special Tool (307-399)
Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The engine front cover and bolts 17, 18, 19 and 20 must be installed within 4 minutes of the initial sealant application. The remainder of the engine front cover bolts and the engine mount bracket bolts must be installed and tightened within 35 minutes of the initial sealant application. If the time limits are exceeded, the sealant must be removed, the sealing area cleaned and sealant reapplied. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.

52. Apply a 3.0 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover sealing surfaces including the 3 engine mount bracket bosses.
- Apply a 5.5 mm (0.21 in) bead of Motorcraft High Performance Engine RTV Silicone to the oil pan-to-cylinder block joint and the cylinder head-to-cylinder block joint areas of the engine front cover in 5 places as indicated.

5.5 mm
(0.21 in)

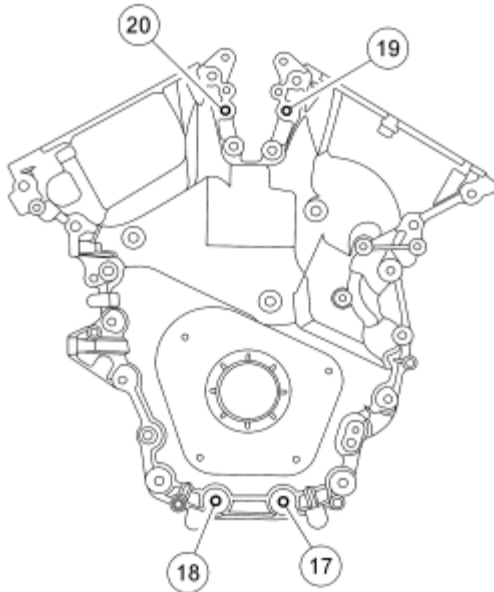


N0068283

Fig. 630: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover Sealing Surfaces
Courtesy of FORD MOTOR CO.

NOTE: Make sure the 2 locating dowel pins are seated correctly in the cylinder block.

53. Install the engine front cover and bolts 17, 18, 19 and 20.
- Tighten in sequence to 3 Nm (27 lb-in).



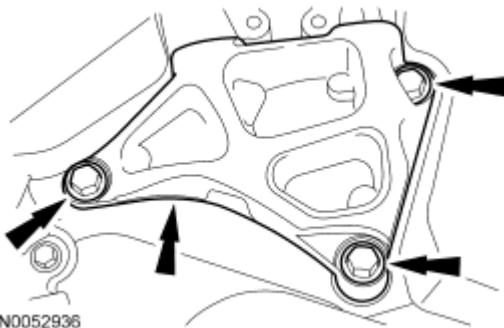
N0068108

Fig. 631: Installing Engine Front Cover & Bolts In Sequence
Courtesy of FORD MOTOR CO.

54. Remove the special tools (alignment pins).

NOTE: Do not tighten the bolts at this time.

55. Install the engine mount bracket and the 3 bolts.



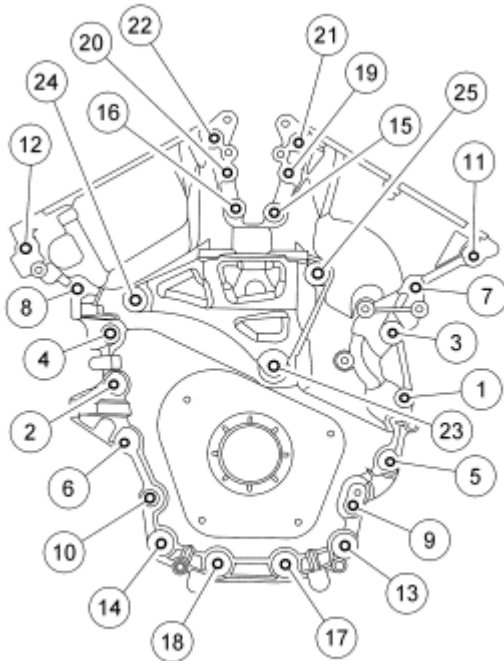
N0052936

Fig. 632: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Do not expose the Motorcraft High Performance Engine RTV Silicone

to engine oil for at least 90 minutes after installing the engine front cover. Failure to follow this instruction may cause oil leakage.

56. Install the remaining engine front cover bolts. Tighten all of the engine front cover bolts and engine mount bracket bolts in the sequence shown in illustration in 2 stages:
- Stage 1: Tighten bolts 1 thru 22 to 10 Nm (89 lb-in) and bolts 23, 24 and 25 to 15 Nm (11 lb-ft).
 - Stage 2: Tighten bolts 1 thru 22 to 24 Nm (18 lb-ft) and bolts 23, 24 and 25 to 75 Nm (55 lb-ft).

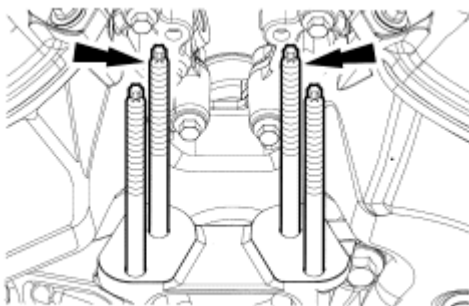


N0068109

Fig. 633: Identifying Tightening Of Engine Front Cover Bolts & Engine Mount Bracket Bolts In Sequence

Courtesy of FORD MOTOR CO.

57. Install the 2 engine mount studs.
- Tighten to 18 Nm (13 lb-ft).



N0057960

Fig. 634: Locating Engine Mount Studs

Courtesy of FORD MOTOR CO.

58. Install the engine mount bracket and the 2 bolts.
- Tighten to 24 Nm (18 lb-ft).

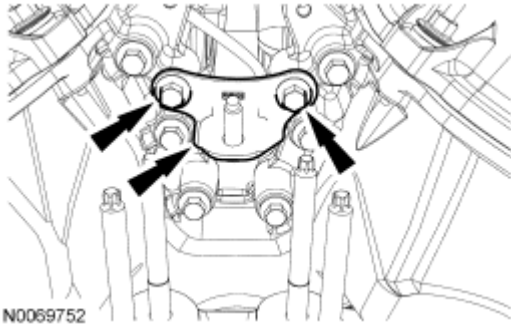


Fig. 635: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Apply clean engine oil to the crankshaft front seal bore in the engine front cover.

59. Using the special tools, install a new crankshaft front seal.

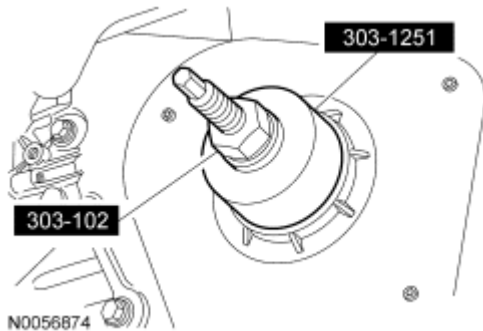


Fig. 636: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the outside diameter sealing surfaces with clean engine oil.

60. Using the special tools, install the crankshaft pulley.

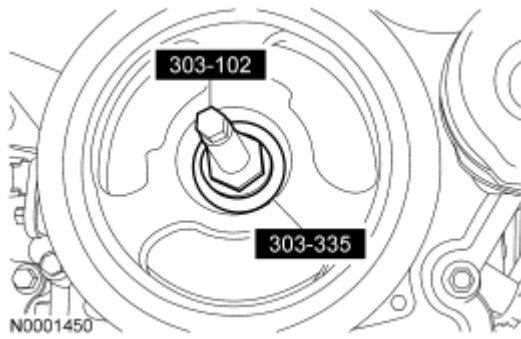


Fig. 637: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

61. Using the special tool, install the crankshaft pulley washer and new bolt and tighten in 4 stages.
 - Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

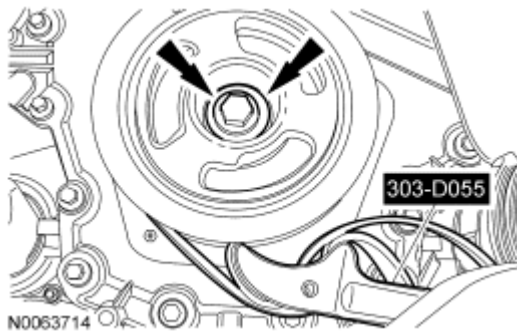


Fig. 638: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

NOTE: Installation of new seals is only required if damaged seals were removed during disassembly of the engine.

NOTE: Spark plug tube seal installation shown in illustration, VCT seal installation similar.

62. Using the special tools, install new VCT solenoid and/or spark plug tube seals.

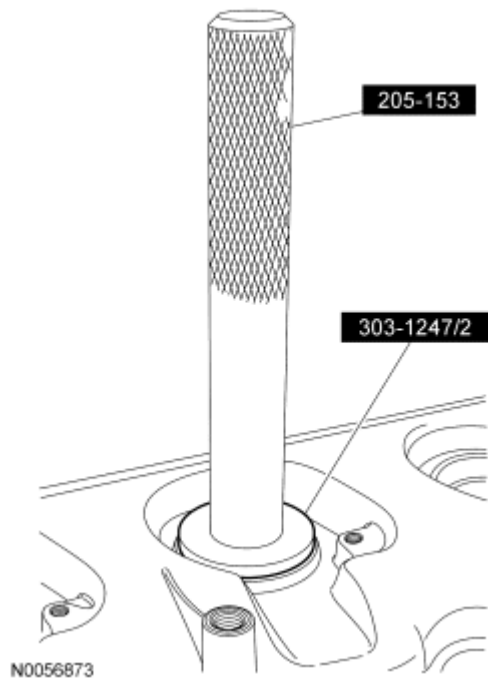


Fig. 639: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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

63. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-RH cylinder head joints.

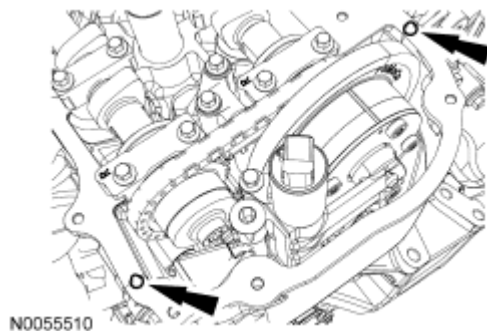


Fig. 640: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

64. Using a new gasket, install the RH valve cover, bolt and the 10 stud bolts.
- Tighten in the sequence shown to 10 Nm (89 lb-in).

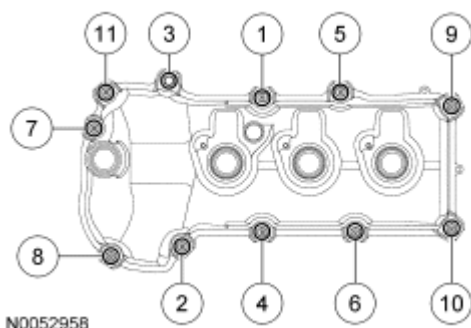


Fig. 641: Installing RH Valve Cover Stud Bolts In Sequence
 Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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

65. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-LH cylinder head joints.

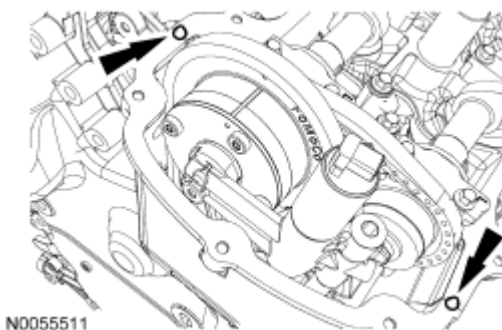


Fig. 642: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

66. Using a new gasket, install the LH valve cover and 11 stud bolts.

- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

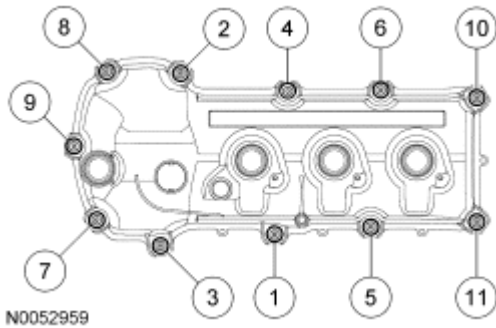


Fig. 643: Installing LH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

67. Install the 6 coil-on-plug assemblies and the 6 bolts.
- Tighten to 7 Nm (62 lb-in).

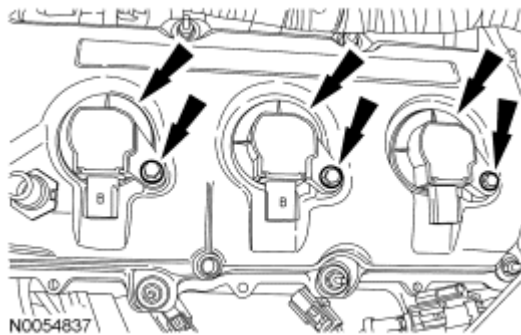


Fig. 644: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

68. Using a new gasket and O-ring seal, install the oil filter adapter and the 2 bolts.
- Tighten the large bolt to 57 Nm (42 lb-ft).
 - Tighten the small bolt to 10 Nm (89 lb-in).

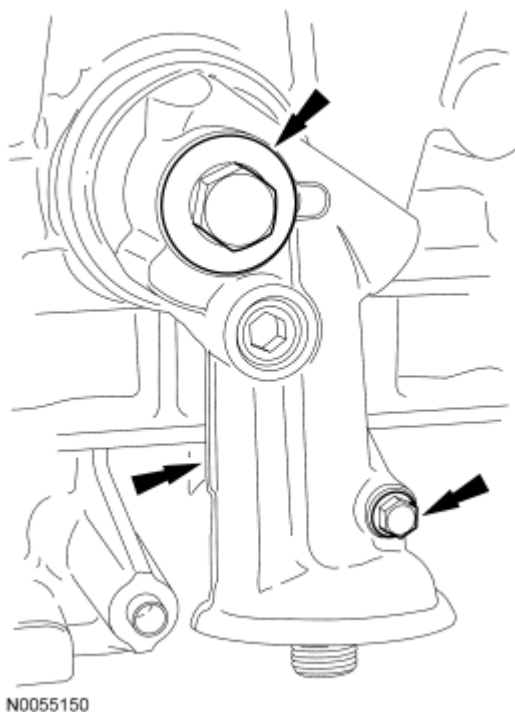


Fig. 645: Locating Oil Filter Adapter & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Apply thread sealant with PTFE to the engine oil pressure (EOP) switch threads.

69. Install the EOP switch.
- Tighten to 18 Nm (13 lb-ft).

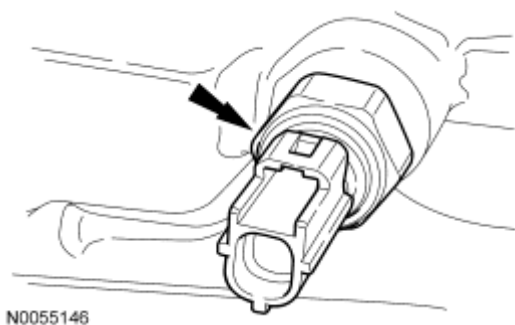


Fig. 646: Identifying EOP Switch
Courtesy of FORD MOTOR CO.

70. Install the crankshaft position (CKP) sensor and install the bolt.
- Tighten to 10 Nm (89 lb-in).

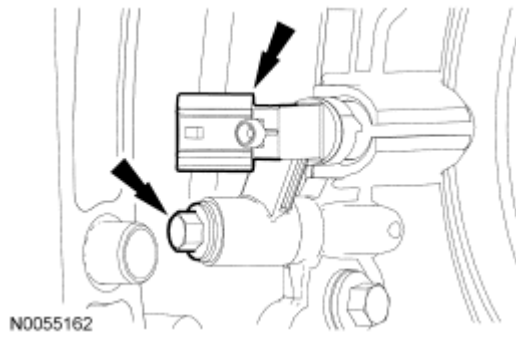


Fig. 647: Identifying CKP Sensor & Bolt
Courtesy of FORD MOTOR CO.

71. Install LH camshaft position (CMP) sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

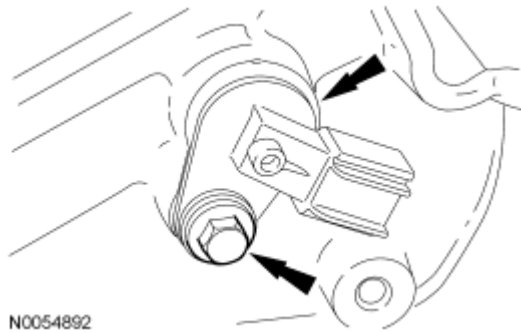


Fig. 648: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

72. Install and connect the CHT sensor jumper harness.

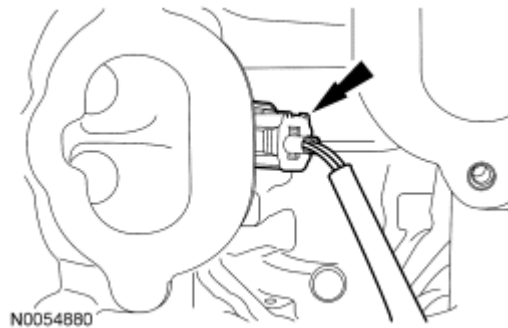


Fig. 649: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

73. Using new gaskets, install the lower intake manifold and the 10 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

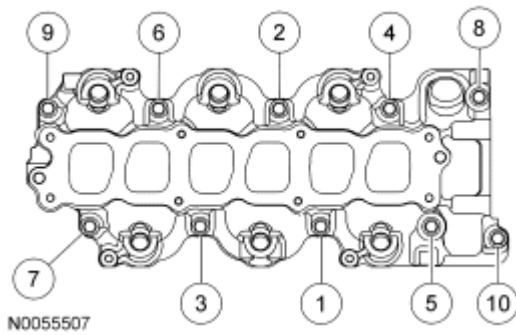


Fig. 650: Installing Lower Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

74. Using a new gasket, install the thermostat housing and the 3 bolts.
- Tighten to 10 Nm (89 lb-in).

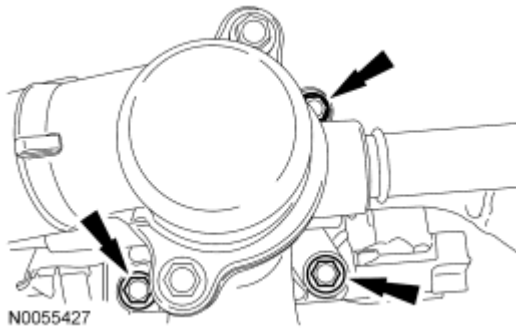
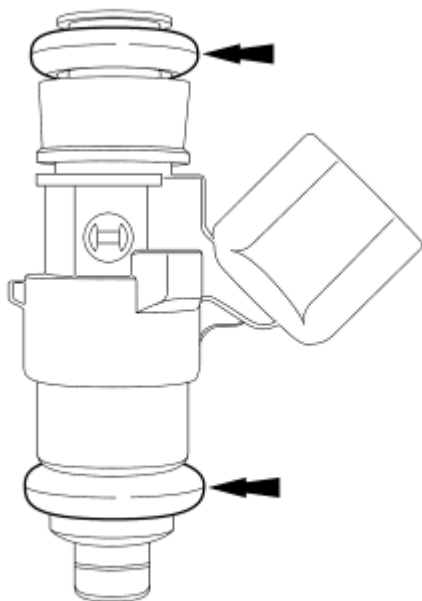


Fig. 651: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings may cause the fuel system to leak. Do not reuse the O-ring seals.

NOTE: The upper and lower O-ring seals are not interchangeable.

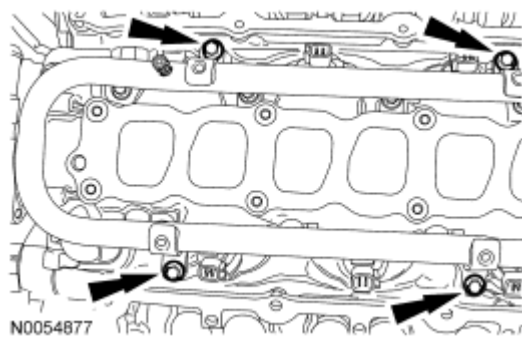
75. Install new fuel injector O-ring seals.
- Remove the retaining clips and separate the fuel injectors from the fuel rail.
 - Remove and discard the O-ring seals.
 - Install new O-ring seals and lubricate with clean engine oil.
 - Install the fuel injectors and the retaining clips onto the fuel rail.



N0055508

Fig. 652: Identifying Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

76. Install the fuel rail and injectors as an assembly and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0054877

Fig. 653: Locating Fuel Rail And Injectors & Bolts
Courtesy of FORD MOTOR CO.

77. Install the coolant bypass hose to the thermostat housing.

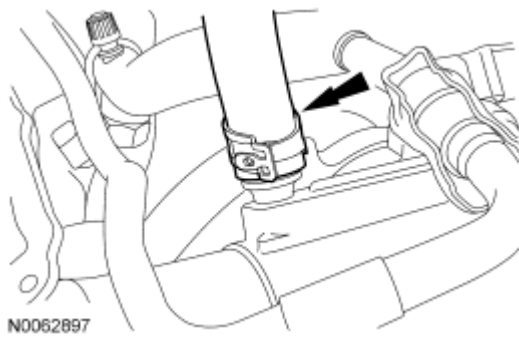


Fig. 654: Identifying Coolant By-Pass Hose
Courtesy of FORD MOTOR CO.

78. Install the RH CMP sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

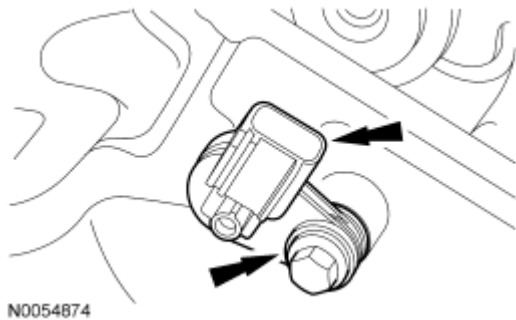


Fig. 655: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Align the bracket with the index mark made during removal.

79. Install the upper intake manifold short support bracket and the bolt.
 - Tighten to 10 Nm (89 lb-in).

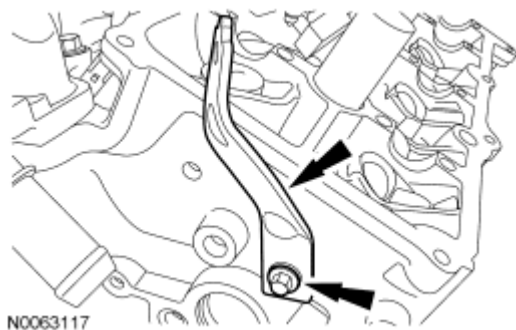


Fig. 656: Identifying Bolt And Support Bracket
Courtesy of FORD MOTOR CO.

NOTE: **Align the bracket with the index mark made during removal.**

80. If equipped, install the upper intake long support manifold bracket and the bolt.
- Tighten to 10 Nm (89 lb-in).

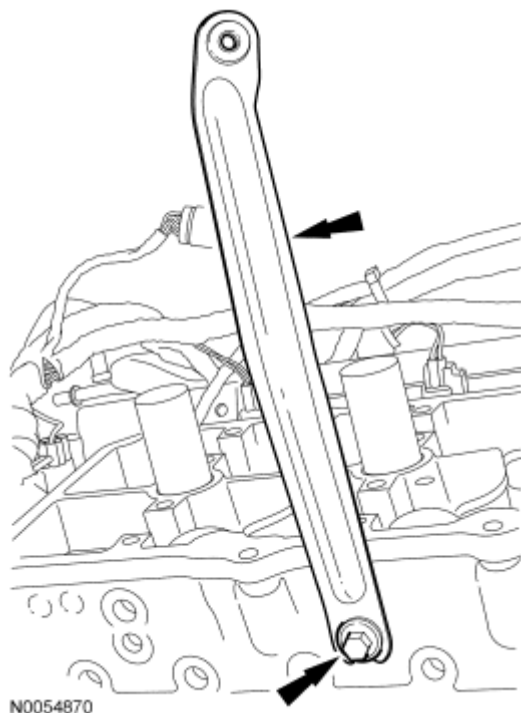


Fig. 657: Locating Upper Intake Manifold Bracket & Bolt
Courtesy of FORD MOTOR CO.

81. Install the engine lifting eye and the 2 bolts.
- Tighten to 24 Nm (18 lb-ft).

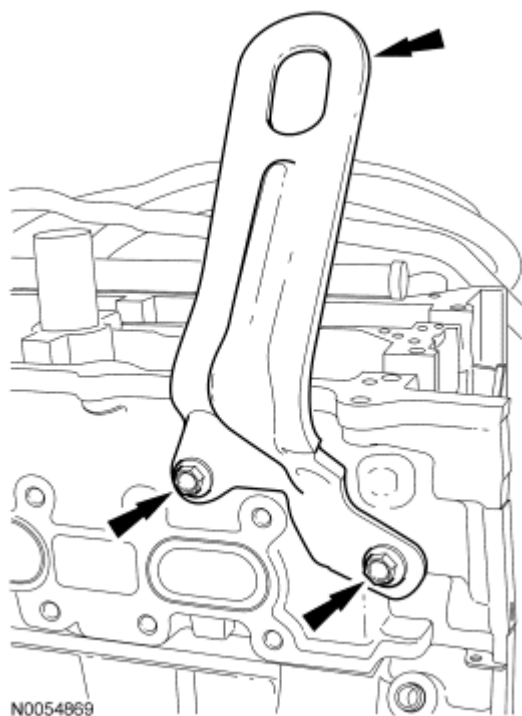


Fig. 658: Locating Engine Lifting Eye & Bolts
Courtesy of FORD MOTOR CO.

82. Install the cover and the pin-type retainer.

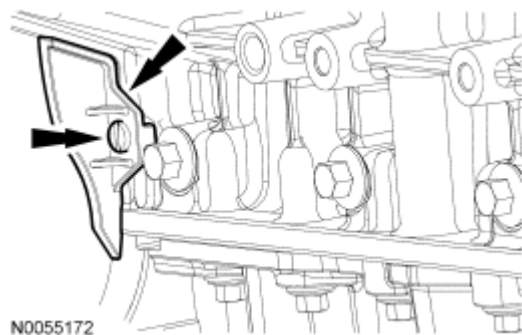


Fig. 659: Locating Pin-Type Retainer & Cover
Courtesy of FORD MOTOR CO.

83. Install the LH cylinder block drain plug.
- Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

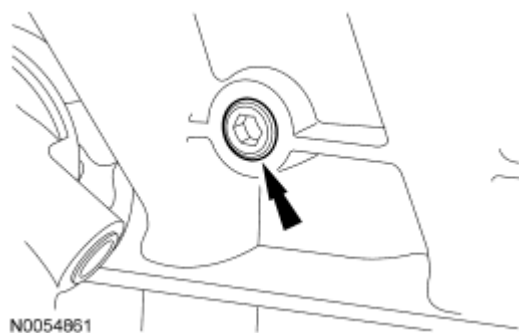


Fig. 660: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

84. Install the RH cylinder block drain plug or, if equipped, the block heater.
- Tighten to 40 Nm (30 lb-ft).

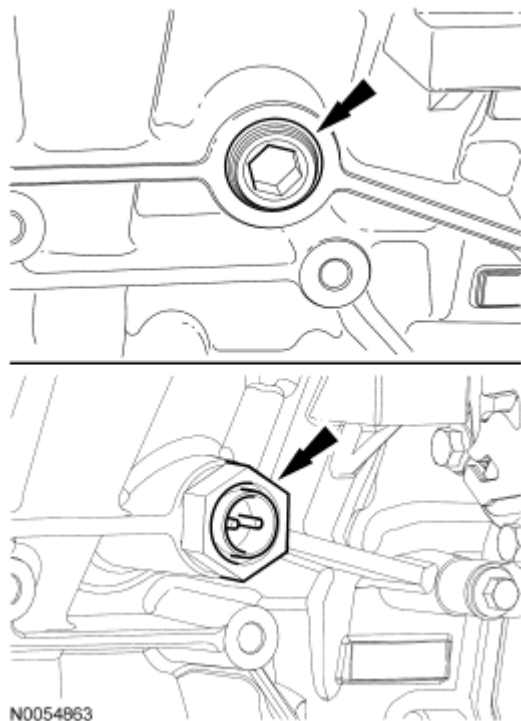


Fig. 661: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

85. Install 6 new RH exhaust manifold studs.
- Tighten to 12 Nm (9 lb-ft).

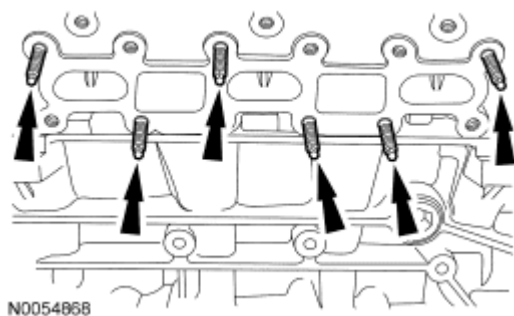


Fig. 662: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

CAUTION: Failure to tighten the exhaust manifold nuts to specification a second time will cause the exhaust manifold to develop an exhaust leak.

86. Using a new gasket, install the RH exhaust manifold and 6 new nuts. Tighten in 2 stages in the sequence shown in illustration:
- Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 20 Nm (15 lb-ft).

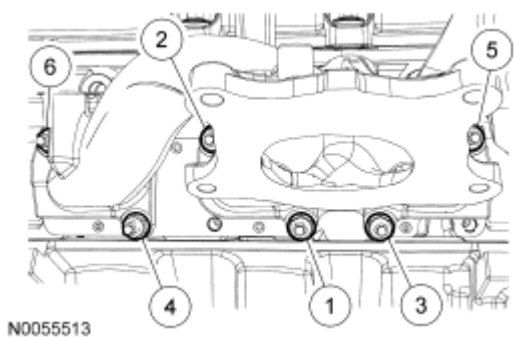


Fig. 663: Installing RH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

87. Install the RH exhaust manifold heat shield and the 3 bolts.
- Tighten to 14 Nm (10 lb-ft).

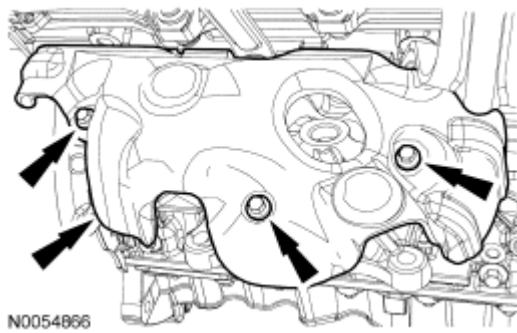


Fig. 664: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

88. Using a new gasket, install the RH catalytic converter and the 4 new nuts.
 - Tighten to 40 Nm (30 lb-ft).

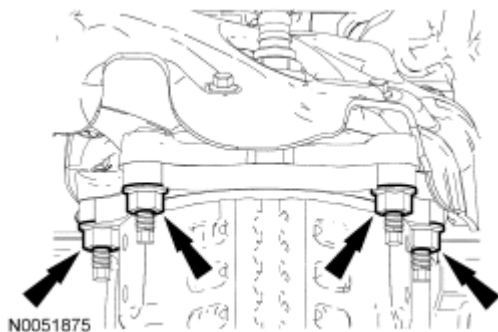


Fig. 665: Identifying Nuts
Courtesy of FORD MOTOR CO.

All vehicles

89. Install 6 new LH exhaust manifold studs.
 - Tighten to 12 Nm (9 lb-ft).

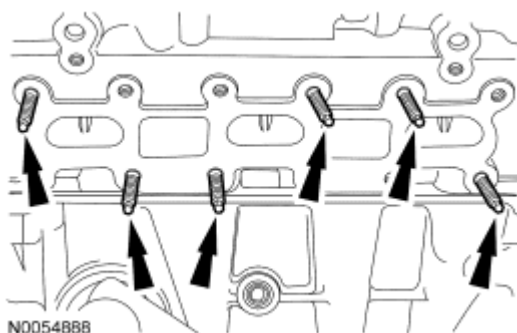


Fig. 666: Locating LH Exhaust Manifold Studs

Courtesy of FORD MOTOR CO.

CAUTION: Failure to tighten the exhaust manifold nuts to specification a second time will cause the exhaust manifold to develop an exhaust leak.

90. Using a new gasket, install the LH exhaust manifold and 6 new nuts. Tighten in 2 stages in the sequence shown in illustration:

- Stage 1: Tighten to 20 Nm (15 lb-ft).
- Stage 2: Tighten to 20 Nm (15 lb-ft).

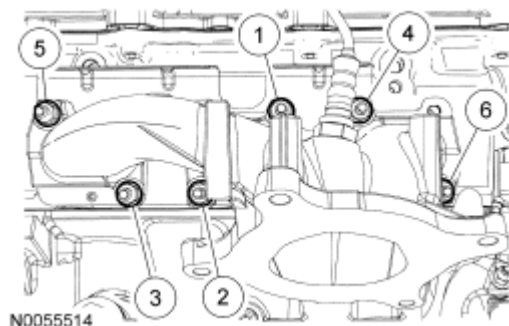


Fig. 667: Installing LH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

91. Install the LH exhaust manifold heat shield and the 3 bolts.
- Tighten to 14 Nm (10 lb-ft).

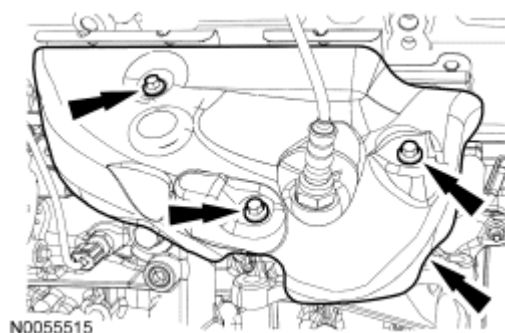


Fig. 668: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

92. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown in illustration).
- Tighten to 40 Nm (30 lb-ft).

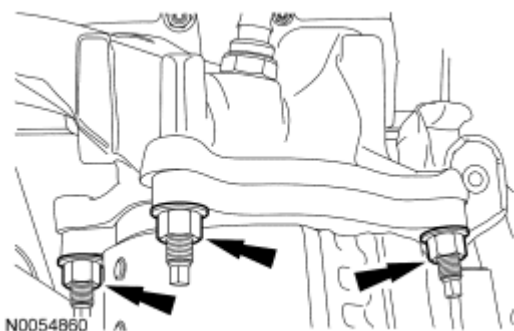


Fig. 669: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

93. Install the accessory drive belt tensioner and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

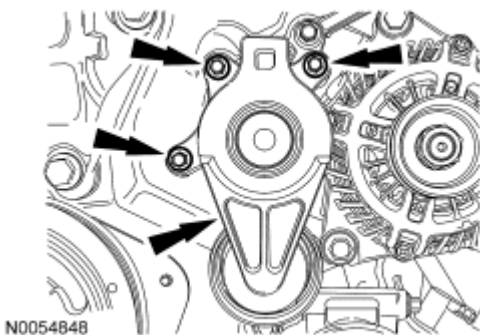


Fig. 670: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

94. Install the power steering pump and the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).

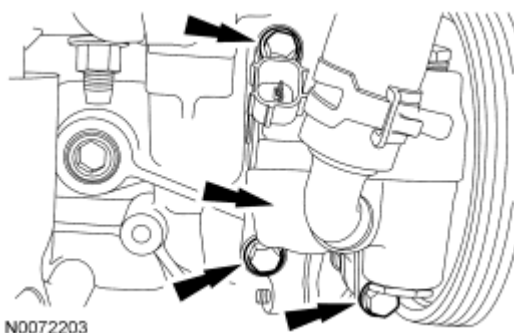


Fig. 671: Identifying Bolts
Courtesy of FORD MOTOR CO.

95. Install the power steering pressure (PSP) tube bracket and the bolt to the RH cylinder head.
 - Tighten to 10 Nm (89 lb-in).

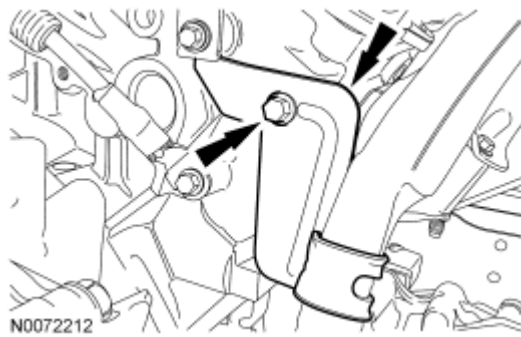


Fig. 672: Identifying Bolt
Courtesy of FORD MOTOR CO.

96. Install the PSP tube bracket and nut to the RH valve cover stud bolt.
 - Tighten to 7 Nm (62 lb-in).

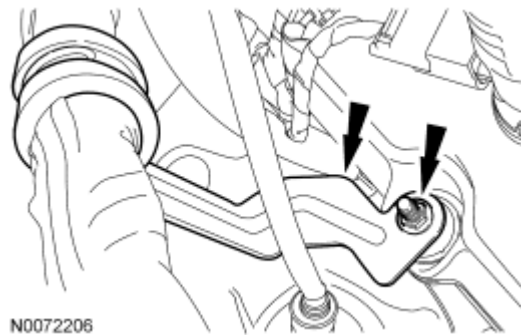


Fig. 673: Identifying Nut And PSP Tube Bracket
Courtesy of FORD MOTOR CO.

97. Install the PSP tube bracket bolt.
 - Tighten to 10 Nm (89 lb-in).

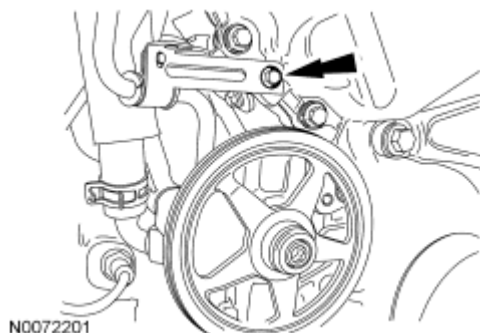


Fig. 674: Identifying Bracket-To-Power Steering Pump Bolt
Courtesy of FORD MOTOR CO.

98. Install the generator, the bolt and the nut.
 - Tighten to 48 Nm (35 lb-ft).

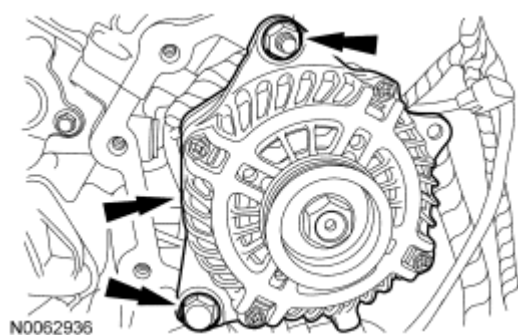


Fig. 675: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

99. Position the wiring harness onto the engine.
100. Connect the EOP switch electrical connector and the wiring harness pin-type retainer.

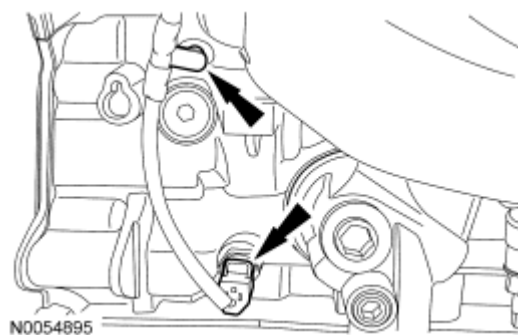


Fig. 676: Locating Engine Oil Pressure (EOP) Switch Electrical Connector & Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

101. Connect the generator electrical connector.

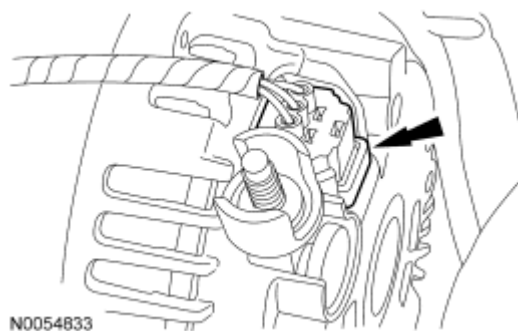


Fig. 677: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

102. Connect the generator B+ cable and install the nut.
 - Tighten to 6 Nm (53 lb-in).

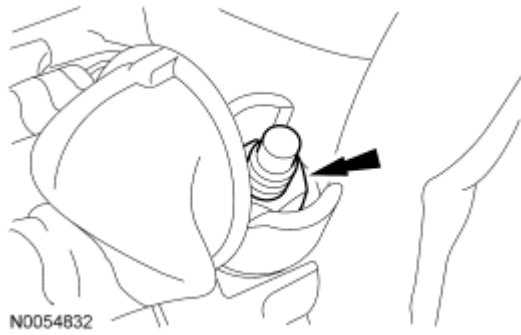


Fig. 678: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

103. Connect the A/C compressor electrical connector.
- Attach the A/C compressor wiring harness retainer.

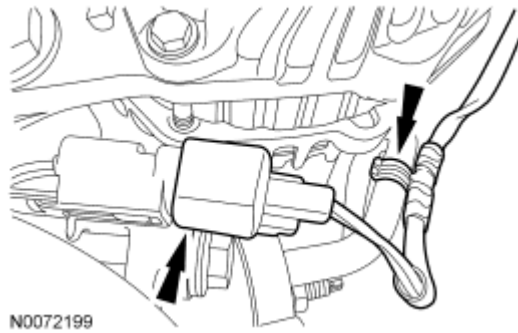


Fig. 679: Identifying Connector And Retainer
Courtesy of FORD MOTOR CO.

104. Connect the CKP sensor electrical connector.

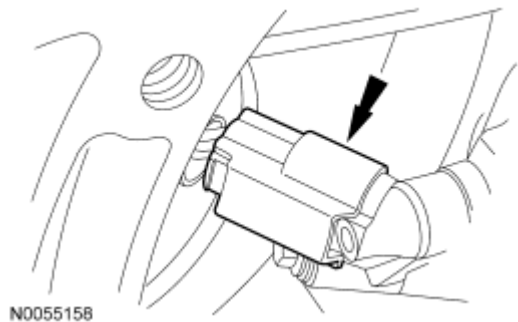


Fig. 680: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

105. Install the wiring harness grommet.

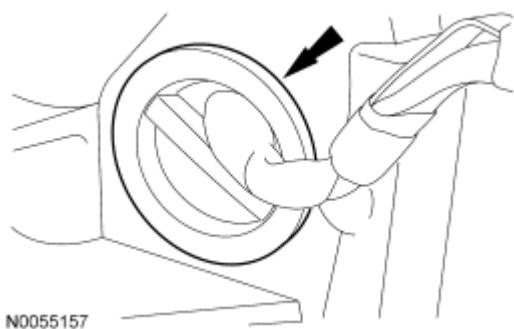


Fig. 681: Identifying Wiring Harness Grommet
Courtesy of FORD MOTOR CO.

106. Install the wiring harness retainer stud bolt.
 - Tighten to 10 Nm (89 lb-in).

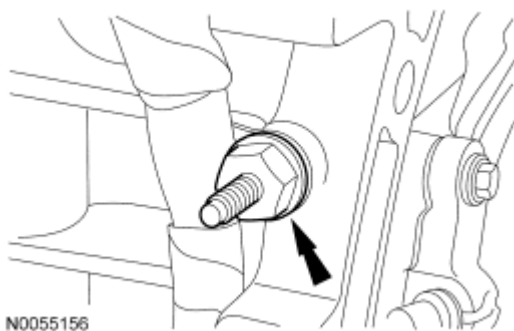


Fig. 682: Identifying Wiring Harness Retainer Stud Bolt
Courtesy of FORD MOTOR CO.

107. Install the heat shield, the nut and the bolt.
 - Tighten to 10 Nm (89 lb-in).

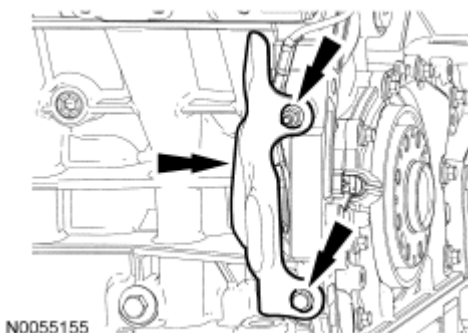


Fig. 683: Identifying Heat Shield, Nut & Bolt
Courtesy of FORD MOTOR CO.

108. Attach all of the wiring harness retainers to the LH valve cover and stud bolts.
109. Connect the LH camshaft VCT solenoid electrical connector.

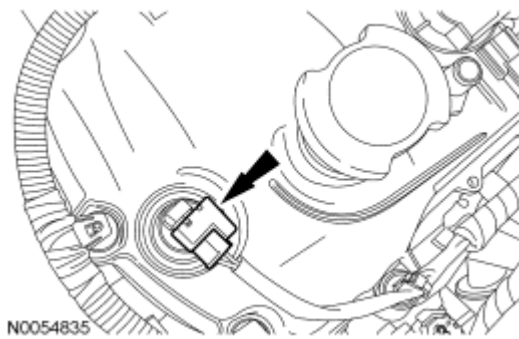


Fig. 684: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

110. Connect the 3 LH coil-on-plug electrical connectors.

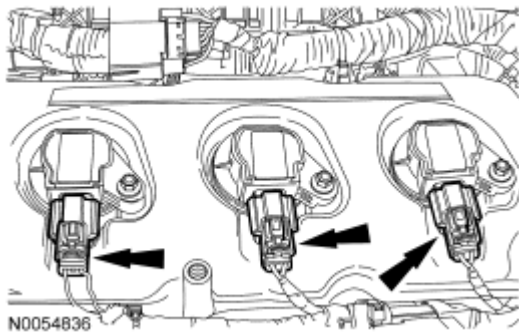


Fig. 685: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

111. Connect the LH HO2S electrical connector.

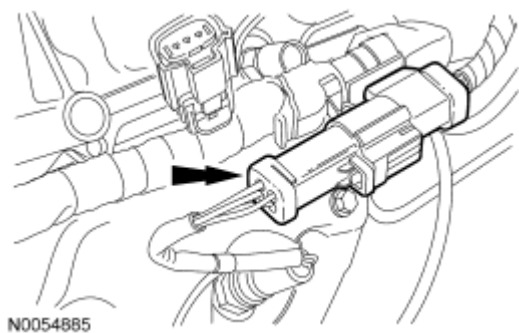


Fig. 686: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

112. Connect the LH catalyst monitor sensor electrical connector.

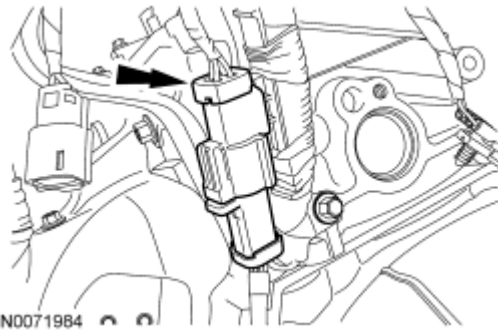


Fig. 687: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

113. Connect the LH CMP sensor electrical connector.

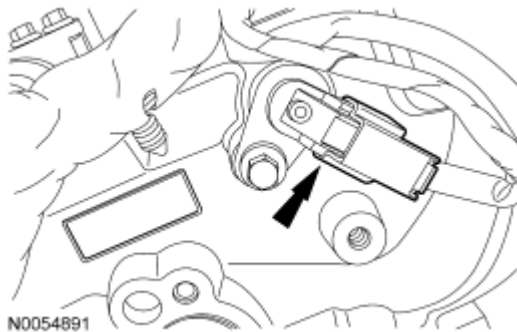


Fig. 688: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

114. Connect the CHT sensor electrical connector.

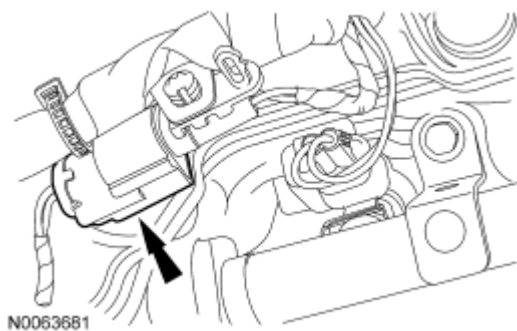


Fig. 689: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

115. Connect the 6 fuel injector electrical connectors (3 shown in illustration).

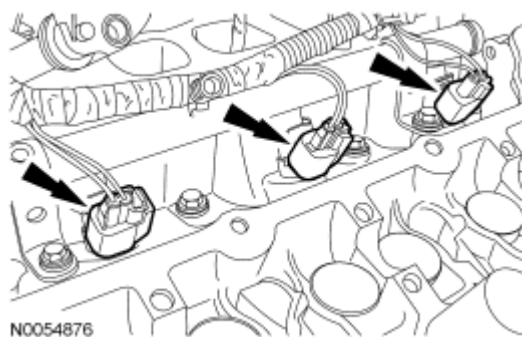


Fig. 690: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

116. Install the ground cable and the bolt.
- Tighten to 10 Nm (89 lb-in).

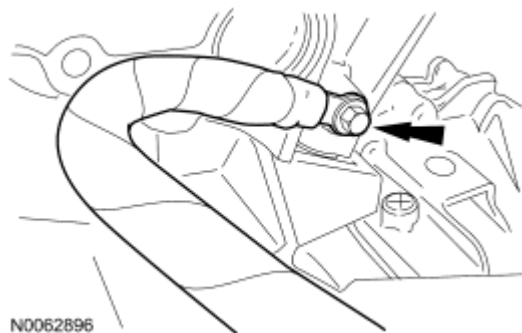


Fig. 691: Identifying Bolt
Courtesy of FORD MOTOR CO.

117. Connect the KS electrical connector.

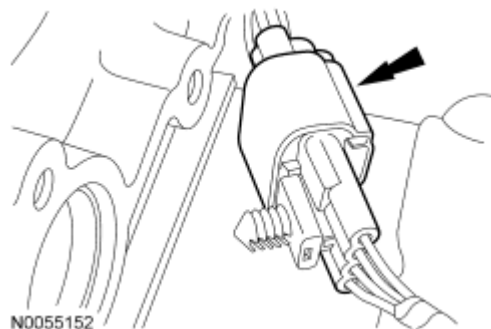


Fig. 692: Locating Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

118. Connect the RH CMP sensor electrical connector.

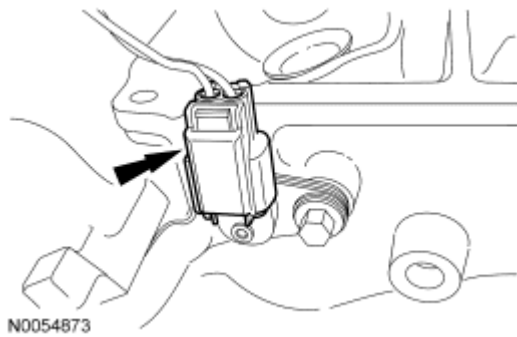


Fig. 693: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

119. Attach all of the wiring harness retainers to the RH valve cover and stud bolts.
120. If equipped, connect the heated PCV valve electrical connector.

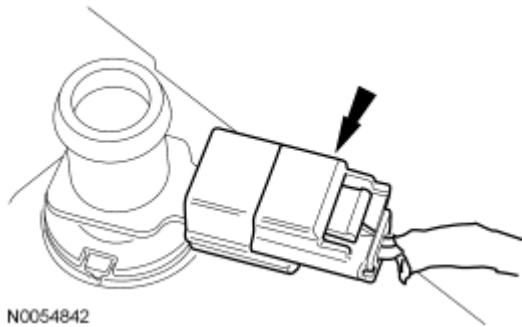


Fig. 694: Locating Heated PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

121. Connect the 3 RH coil-on-plug electrical connectors.

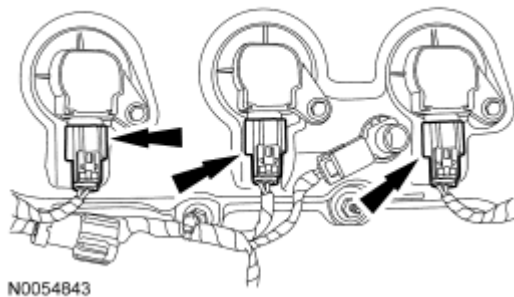


Fig. 695: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

122. Connect the RH VCT solenoid electrical connector.

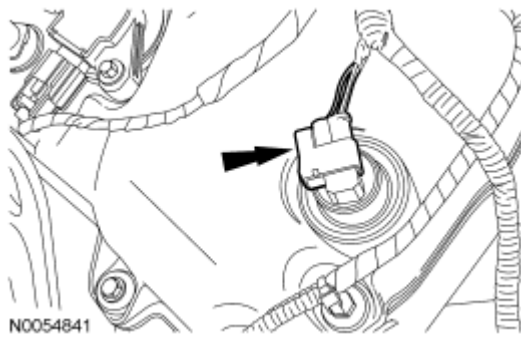


Fig. 696: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

123. Connect the RH HO2S electrical connector.

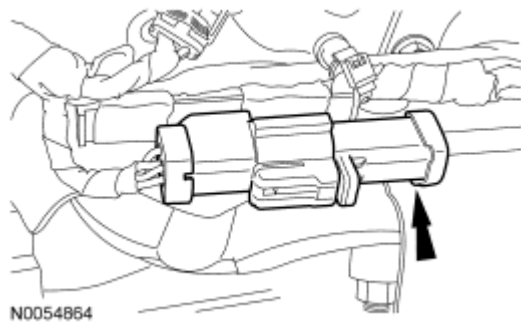


Fig. 697: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

FWD vehicles

124. Connect the RH catalyst monitor sensor electrical connector.

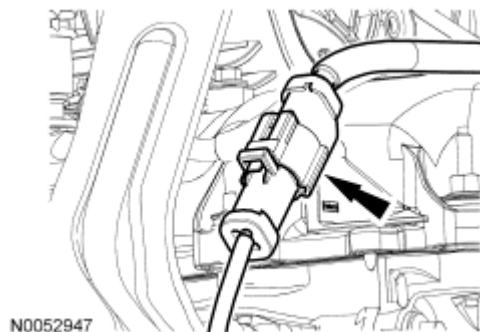


Fig. 698: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

125. Connect the PSP switch electrical connector.

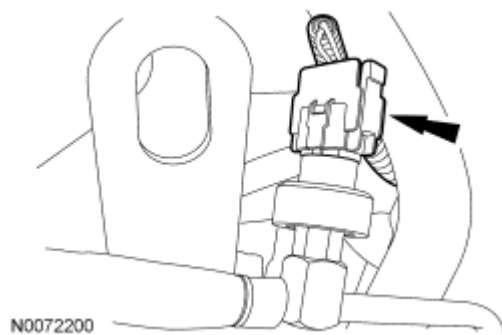


Fig. 699: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

126. Connect the fuel efficient power steering system solenoid electrical connector.

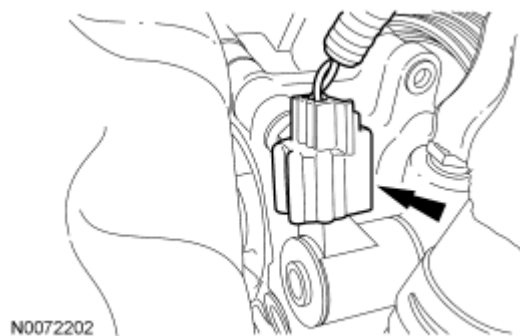
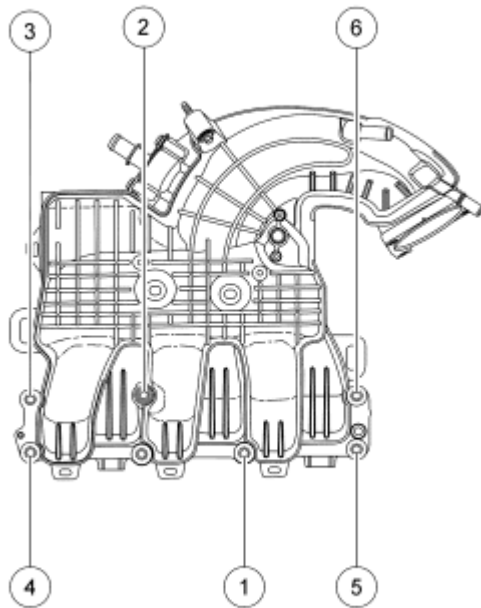


Fig. 700: Identifying Connector
Courtesy of FORD MOTOR CO.

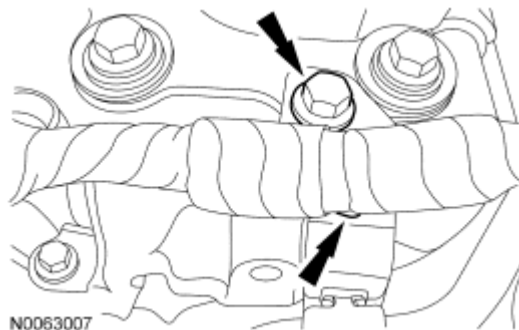
127. Using a new gasket, install the upper intake manifold and the 6 bolts.
- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).



N0052211

Fig. 701: Installing Upper Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

128. Install the fuel tube bracket bolt to the upper intake manifold and install the wiring harness pin-type retainer.
 - Tighten to 6 Nm (53 lb-in).



N0063007

Fig. 702: Identifying Pin-Type Retainer And Fuel Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

129. Install the upper intake manifold short support bracket and the 2 bolts (1 shown in illustration).
 - Tighten to 10 Nm (89 lb-in).

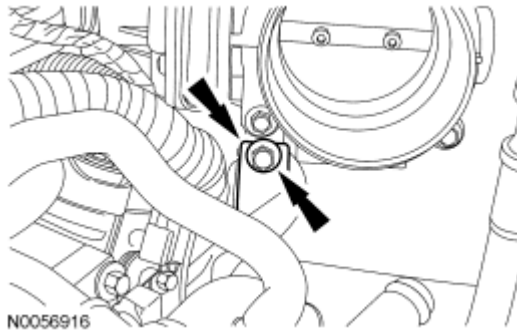


Fig. 703: Identifying Upper Intake Manifold Support Bracket & Bolt
Courtesy of FORD MOTOR CO.

130. If equipped, install the upper intake manifold long support bracket and the 2 bolts (1 shown in illustration).
- Tighten the upper bolt 10 Nm (89 lb-in).
 - Tighten the lower bolt 24 Nm (18 lb-ft).

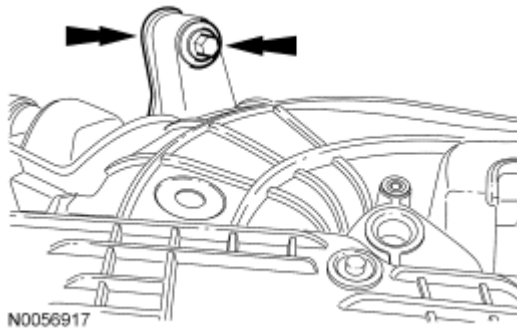


Fig. 704: Identifying Upper Intake Manifold Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

131. Attach the wiring harness retainers to the upper intake manifold.

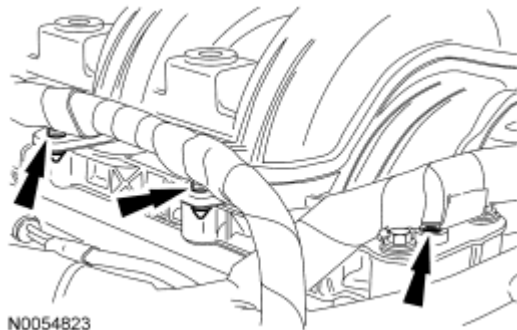


Fig. 705: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

132. Connect the throttle body (TB) electrical connector.

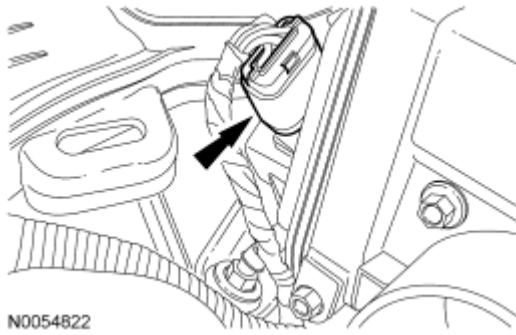


Fig. 706: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

133. Connect the PCV hose to the PCV valve.

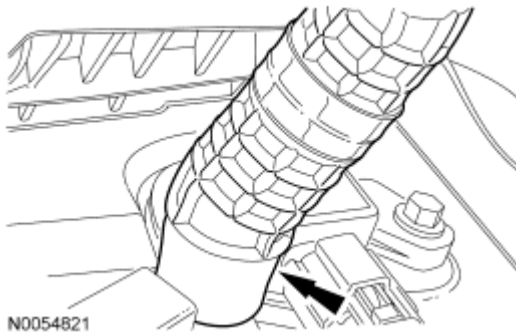


Fig. 707: Identifying PCV Hose From PCV Valve
Courtesy of FORD MOTOR CO.

134. If equipped, connect the heated PCV electrical connector.

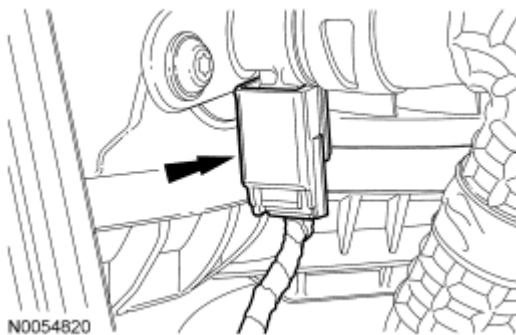


Fig. 708: Identifying Positive Crankcase Ventilation (PCV) Fitting Electrical Connector
Courtesy of FORD MOTOR CO.

135. If equipped, position the block heater wiring harness onto the engine and attach all of the harness retainers.
136. If equipped, connect the block heater electrical connector and install the heat shield.

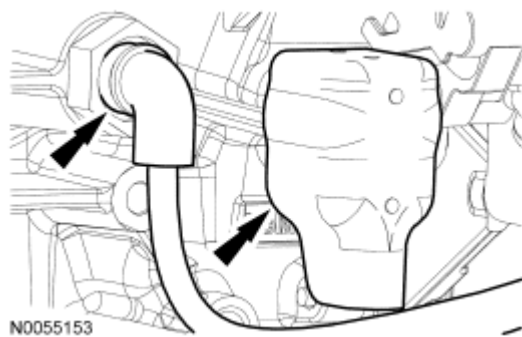


Fig. 709: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

137. Install the special tool on the LH cylinder head.

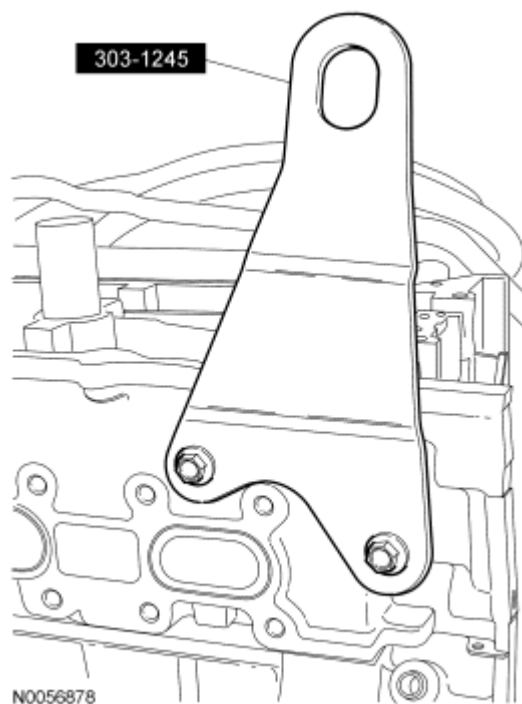


Fig. 710: Installing Special Tool (303-1245) On LH Cylinder Head
Courtesy of FORD MOTOR CO.

138. Using the special tools, remove the engine from the stand.

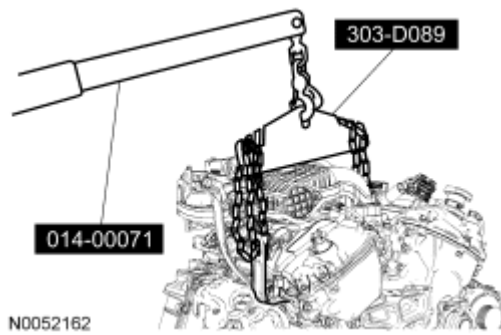


Fig. 711: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the seal lips and bore with clean engine oil prior to installation.

139. Position the special tool onto the end of the crankshaft and slide a new crankshaft rear seal onto the tool.

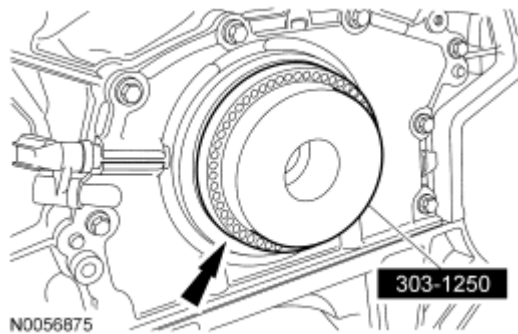


Fig. 712: Positioning Special Tool (303-1250) Onto End Of Crankshaft
Courtesy of FORD MOTOR CO.

140. Using the special tools, install the new crankshaft rear seal.

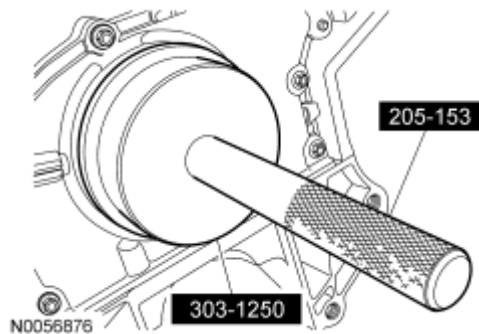


Fig. 713: Installing New Crankshaft Rear Seal Using Special Tools (303-1250) & (205-153)
Courtesy of FORD MOTOR CO.

141. Install the crankshaft sensor ring.

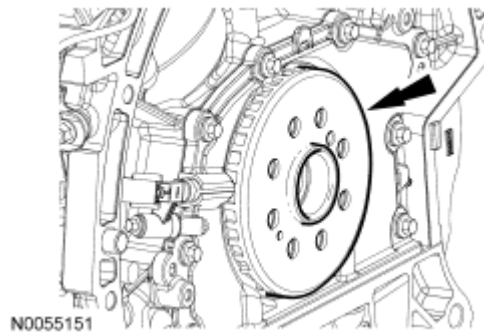


Fig. 714: Identifying Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

142. Install the flexplate and the 8 bolts.
- Tighten to 80 Nm (59 lb-ft).

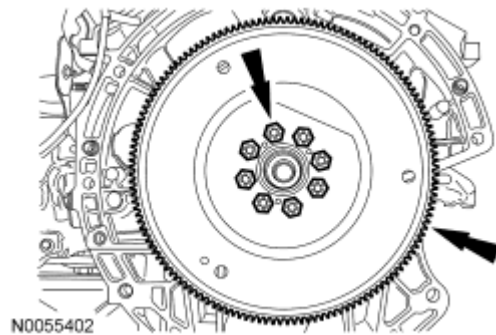


Fig. 715: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

INSTALLATION

ENGINE

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
 ST1341-A	Heavy Duty Floor Crane	014-00071 or equivalent
 ST1293-A	Powertrain Lift	014-00765

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST1602-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent
 ST2743A	Universal Adapter Brackets	014-0001

MATERIAL

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

All vehicles

1. Using the special tools, align the transaxle to the engine.

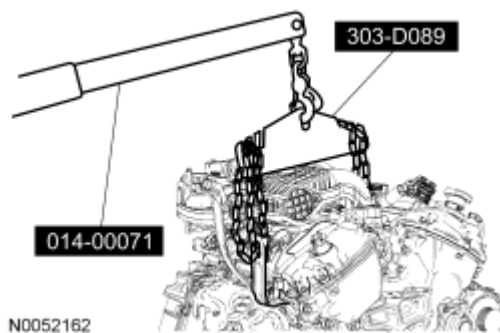


Fig. 716: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

2. Install the 5 transaxle-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).

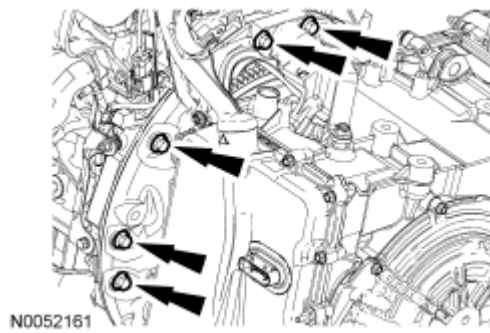


Fig. 717: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

3. Install the 2 engine-to-transaxle bolts.
 - Tighten to 48 Nm (35 lb-ft).

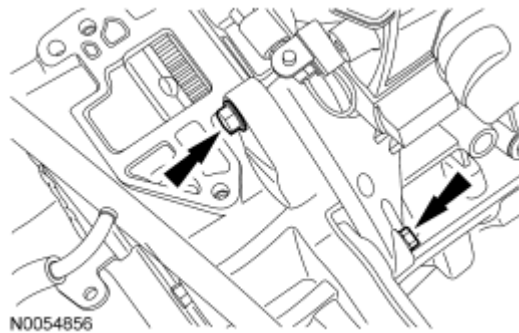


Fig. 718: Locating Engine-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

4. Using the special tools, position the engine and transaxle onto the lift table.

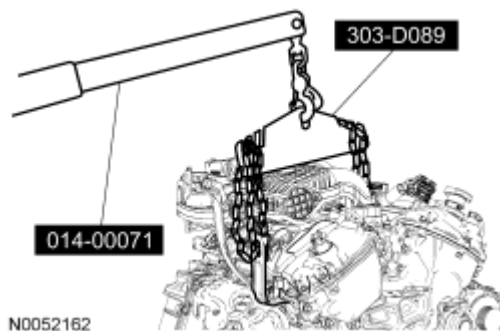


Fig. 719: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

NOTE: Position a block of wood under the transaxle.

5. Install the special tools.

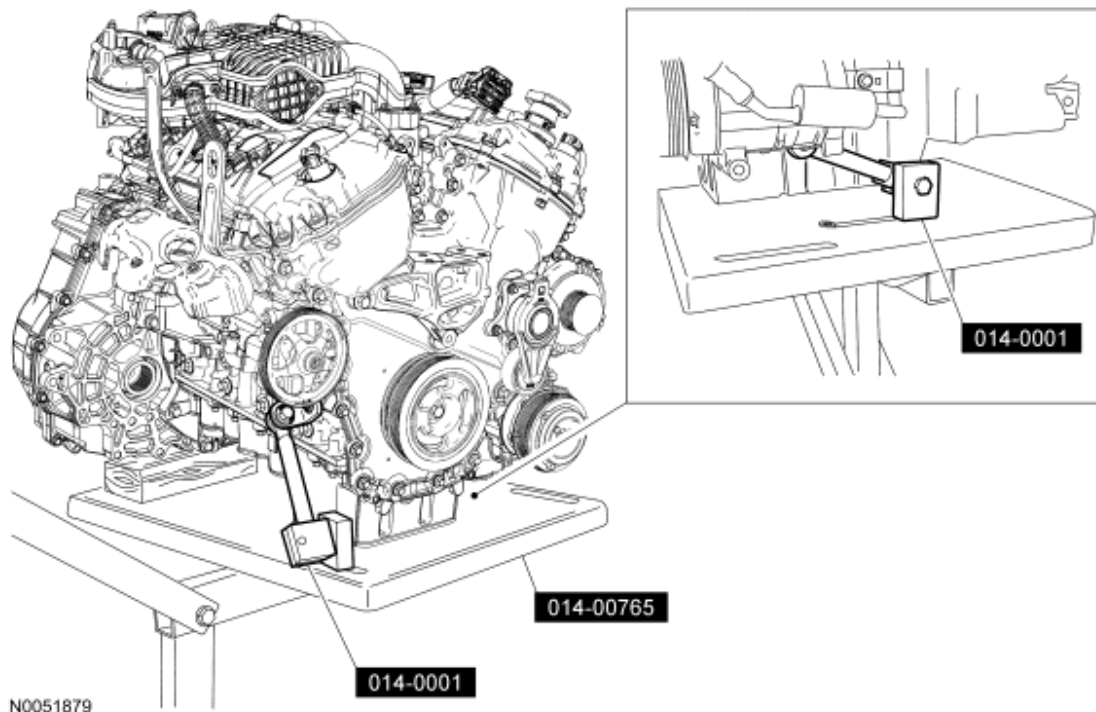


Fig. 720: Positioning Block Of Wood Under Transaxle Using Special Tools (014-0001) & (014-00765)

Courtesy of FORD MOTOR CO.

6. Install the starter, the stud bolt and bolt.
 - Tighten to 27 Nm (20 lb-ft).

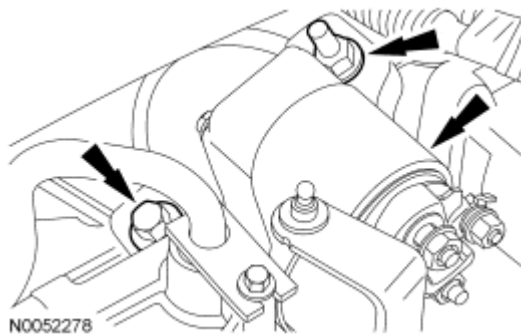


Fig. 721: Identifying Bolt, Stud Bolt & Starter

Courtesy of FORD MOTOR CO.

7. Connect the wiring harness retainer to the starter motor stud bolt.

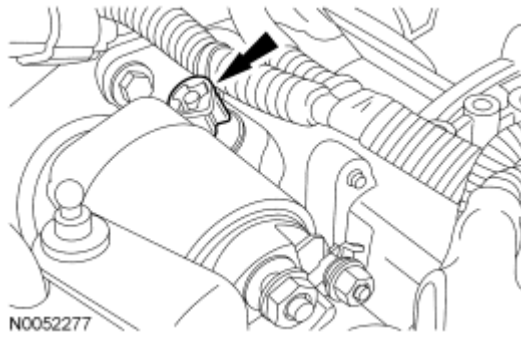


Fig. 722: Identifying Wiring Harness Retainer From Starter Motor Stud Bolt
Courtesy of FORD MOTOR CO.

8. Attach the starter wire terminals and install the 2 nuts.
 1. Tighten to 12 Nm (9 lb-ft).
 2. Tighten to 5 Nm (44 lb-in).

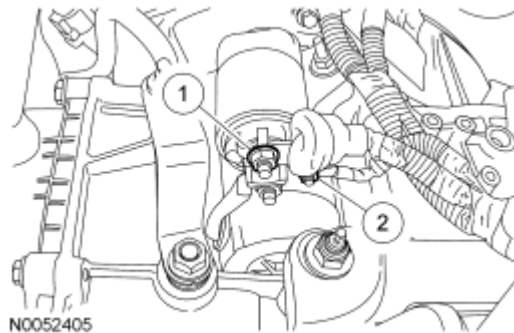


Fig. 723: Identifying Starter Motor Wire Terminals & Nuts
Courtesy of FORD MOTOR CO.

9. If equipped, install the starter motor solenoid cover.

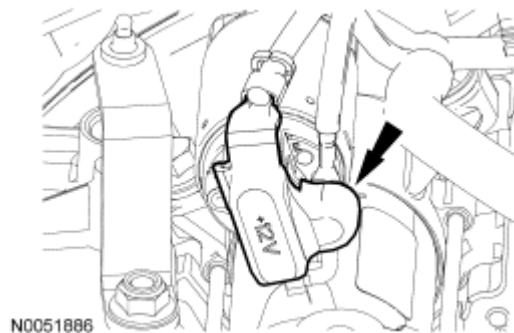


Fig. 724: Identifying Starter Motor Solenoid Cover
Courtesy of FORD MOTOR CO.

10. Raise the engine and transaxle assembly into the vehicle.
11. Install the engine mount and the 3 bolts.

- Tighten to 90 Nm (66 lb-ft).

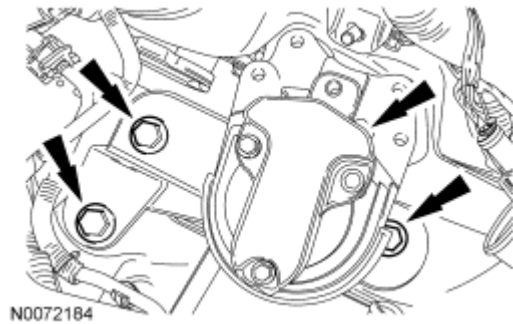


Fig. 725: Identifying Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

12. Install the 4 engine mount nuts.
 - Tighten to 63 Nm (46 lb-ft).

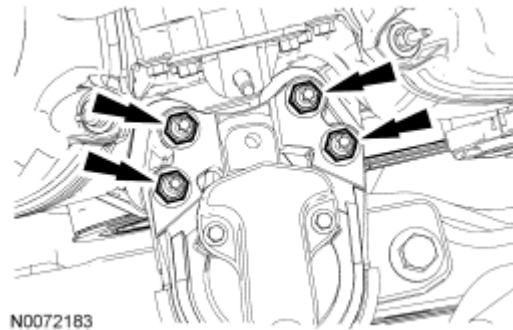


Fig. 726: Identifying Mounting Nuts
Courtesy of FORD MOTOR CO.

13. Install the engine mount brace, nut and bolt.
 - Tighten to 20 Nm (15 lb-ft).

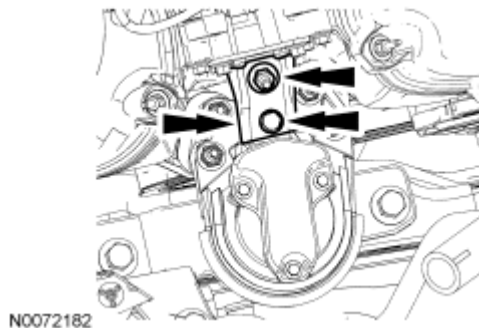


Fig. 727: Identifying Nut, Bolt And Brace
Courtesy of FORD MOTOR CO.

14. Install the transaxle mount bracket and the 4 nuts.

- Tighten to 80 Nm (59 lb-ft).

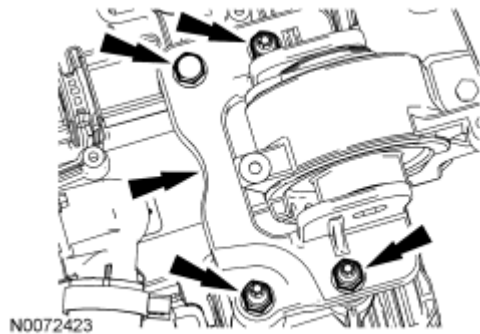


Fig. 728: Identifying Bolt, Nuts And Mount Bracket
Courtesy of FORD MOTOR CO.

15. Install the transaxle mount through bolt and nut.

- Tighten to 175 Nm (129 lb-ft).

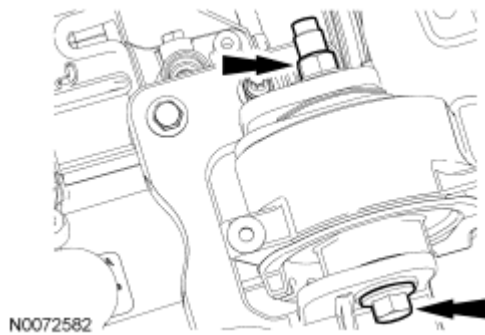


Fig. 729: Identifying Bolt And Nut
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

16. Position the power transfer unit (PTU) in place and install the 5 bolts.

- Tighten to 90 Nm (66 lb-ft).

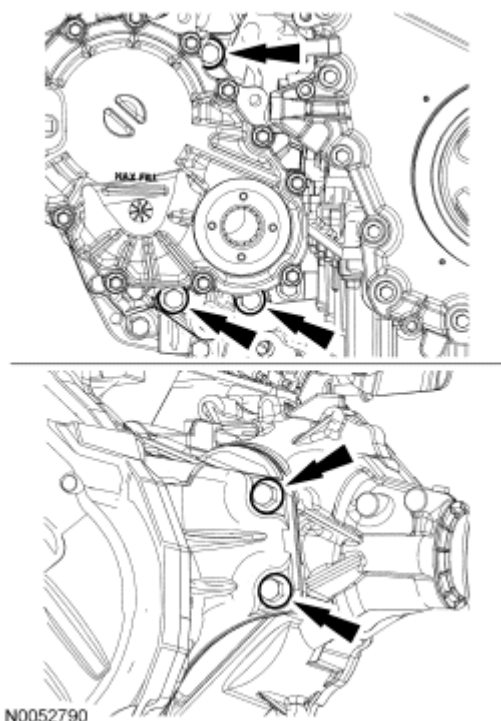


Fig. 730: Locating PTU Bolts
Courtesy of FORD MOTOR CO.

17. Position the PTU support bracket in place and install the 5 bolts.
 - Tighten to 70 Nm (52 lb-ft).

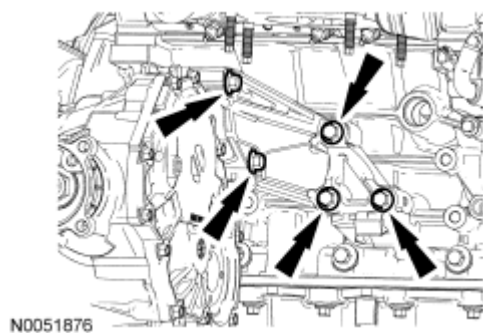


Fig. 731: Identifying Bolts
Courtesy of FORD MOTOR CO.

NOTE: A new PTU seal must be installed whenever the intermediate shaft is removed.

18. Install a new PTU seal. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.
19. Using a new gasket, install the RH catalytic converter and 4 new nuts.
 - Tighten to 40 Nm (30 lb-ft).

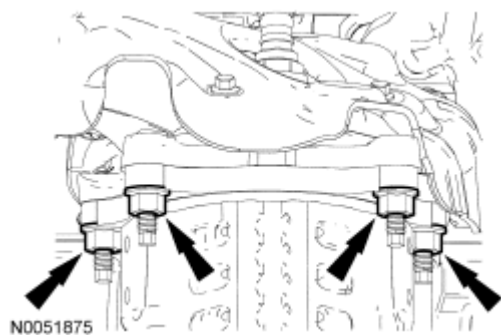


Fig. 732: Identifying Nuts
Courtesy of FORD MOTOR CO.

20. Connect the RH catalyst monitor electrical connector.

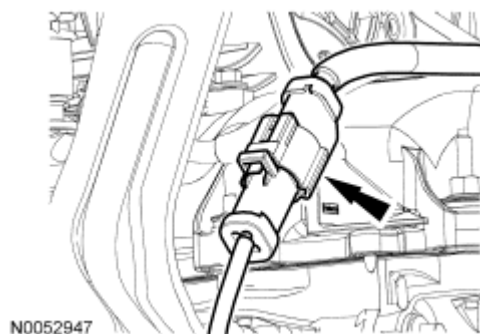


Fig. 733: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

21. Install the RH halfshaft support bracket and the 4 bolts.
 - Tighten the halfshaft support-to-cylinder block bolts to 40 Nm (30 lb-ft).
 - Tighten the catalytic converter-to-halfshaft support bolts to 20 Nm (15 lb-ft).

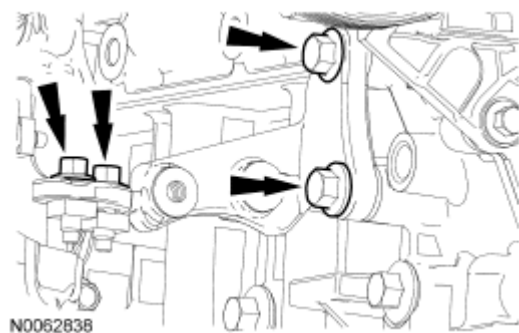


Fig. 734: Separating LH Halfshaft From Transaxle
Courtesy of FORD MOTOR CO.

22. Install the 2 halfshaft support bracket studs.
- Tighten to 10 Nm (89 lb-in).

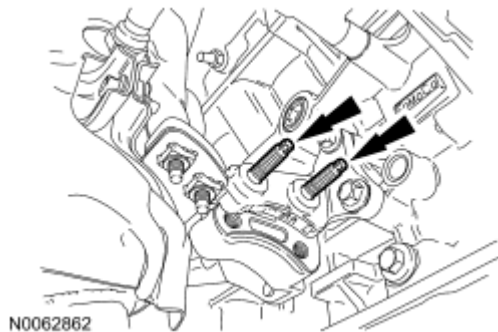


Fig. 735: Identifying Studs
Courtesy of FORD MOTOR CO.

23. Install the RH halfshaft into the transaxle and the wheel hub and install the 2 carrier bearing nuts.
- Tighten to 40 Nm (30 lb-ft).

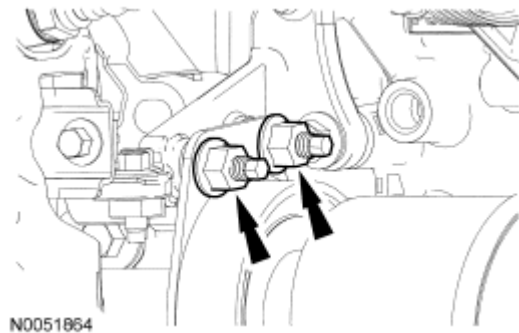


Fig. 736: Identifying Nuts
Courtesy of FORD MOTOR CO.

24. Install the 4 oil pan-to-transaxle bolts.
- Tighten to 48 Nm (35 lb-ft).

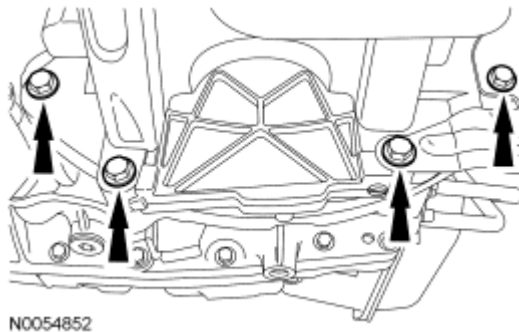


Fig. 737: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

25. Install 3 new torque converter bolts.
- Tighten to 55 Nm (41 lb-ft).

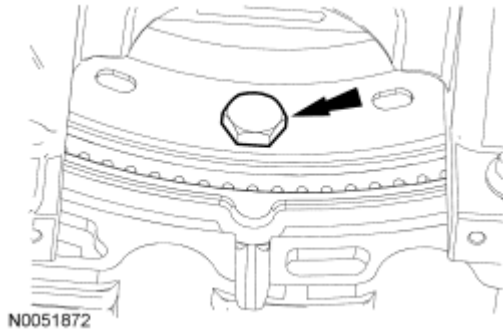


Fig. 738: Identifying Bolt
Courtesy of FORD MOTOR CO.

26. Install the inspection cover and the 2 fasteners.

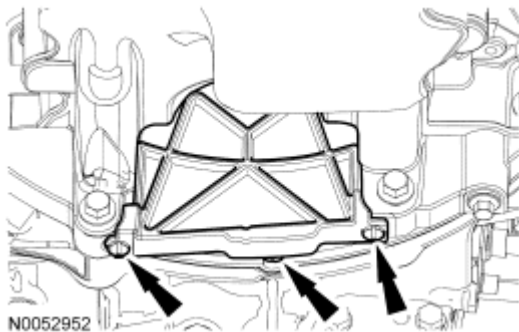


Fig. 739: Identifying Inspection Cover & Fasteners
Courtesy of FORD MOTOR CO.

27. Connect the transaxle cooling tubes and install the safety clips.

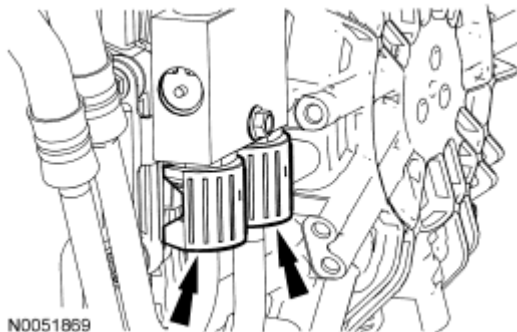


Fig. 740: Identifying Cooling Tubes
Courtesy of FORD MOTOR CO.

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface

for wear or damage and install new, if necessary.

28. Install the LH halfshaft into the transaxle.

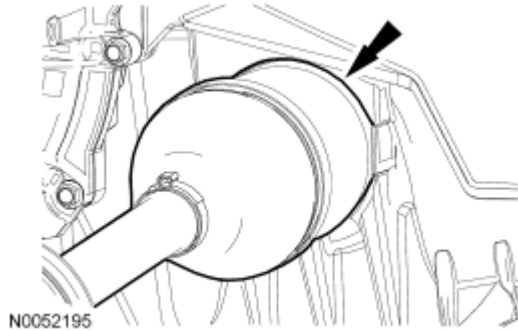


Fig. 741: Identifying LH Halfshaft
Courtesy of FORD MOTOR CO.

29. Using the special tool, raise the subframe into the installed position.

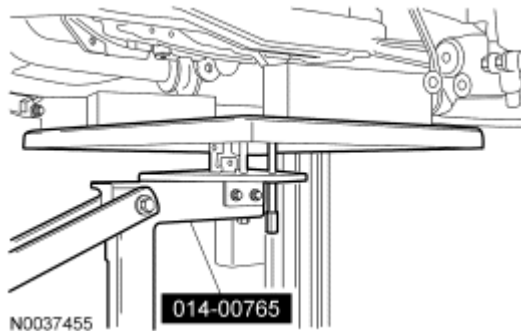


Fig. 742: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

30. Install the 2 front subframe bolts.
- Tighten to 150 Nm (111 lb-ft).

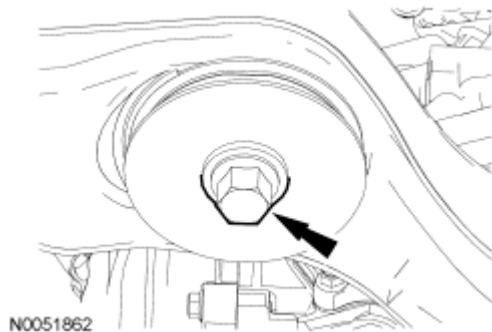


Fig. 743: Identifying Bolt

Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

31. Position the subframe brackets and install the 4 bolts finger-tight.

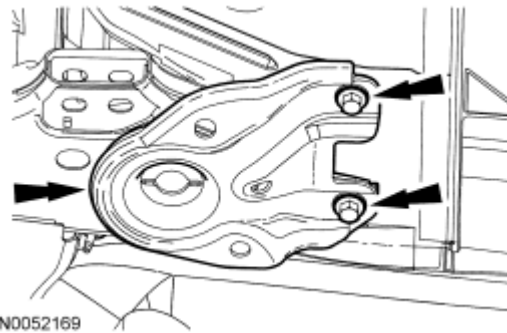


Fig. 744: Identifying Bracket And Bolts

Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

32. Install the 2 rear subframe bolts.
 - Tighten to 150 Nm (111 lb-ft).

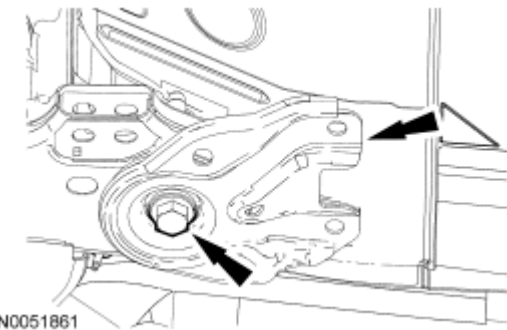


Fig. 745: Identifying Bolt And Bracket

Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

33. Tighten the 4 subframe bracket-to-body bolts to 103 Nm (76 lb-ft).

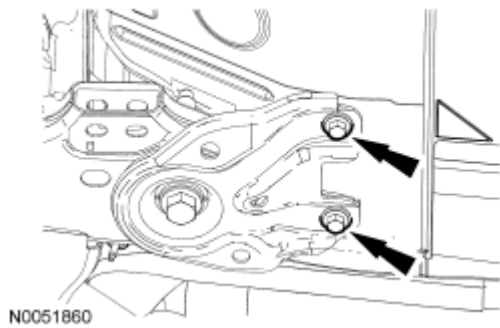


Fig. 746: Identifying Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

34. Install new lower ball joint-to-wheel knuckle nuts.
- Tighten to 115 Nm (85 lb-ft).

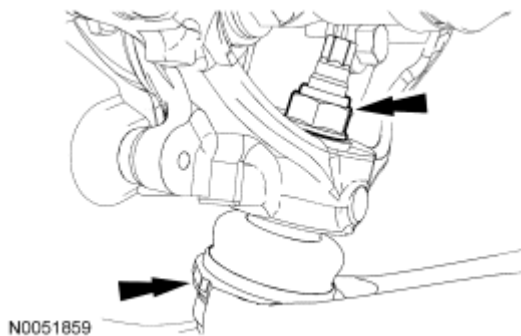


Fig. 747: Identifying Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

NOTE: The hex holding feature can be used to prevent turning of the stud while removing the nuts.

NOTE: RH shown in illustration, LH similar.

35. Install new tie-rod end nuts.
- Tighten to 115 Nm (85 lb-ft).

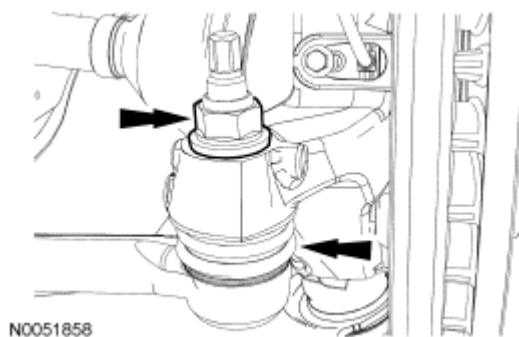


Fig. 748: Identifying Tie-Rod End Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

36. Install new upper stabilizer bar link nuts.
- Tighten to 55 Nm (41 lb-ft).

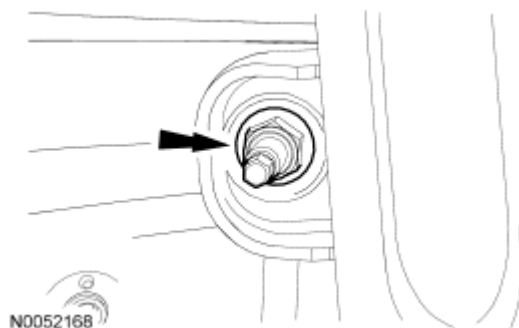


Fig. 749: Identifying Nut
Courtesy of FORD MOTOR CO.

CAUTION: Install and tighten the new front axle wheel end nut to specification in a continuous rotation. Stopping the rotation during installation will cause the nylon lock to seat incorrectly. This will cause incorrect torque readings while tightening the front axle wheel end nut and lead to bearing failure. Always install a new front axle wheel end nut after loosening or when not tightened to specifications in a continuous rotation.

NOTE: Never use power tools to tighten the front axle wheel end nut.

NOTE: Apply the brake to keep the halfshaft from rotating.

37. Install the new halfshaft nut.
- Tighten to 350 Nm (258 lb-ft).

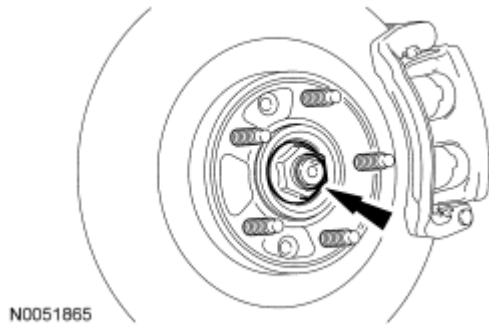


Fig. 750: Identifying RH Halfshaft Nut
Courtesy of FORD MOTOR CO.

38. Install the 2 engine roll restrictor-to-transaxle bolts.
 - Tighten to 103 Nm (76 lb-ft).

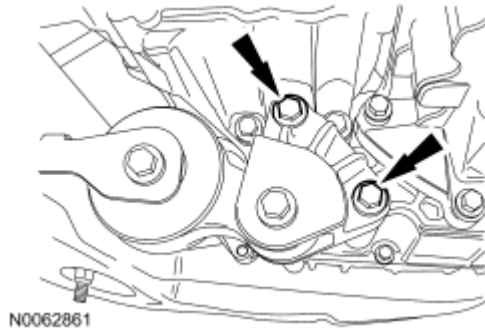


Fig. 751: Identifying Bolts
Courtesy of FORD MOTOR CO.

39. Using a new O-ring seal, install the PSP tube onto the steering gear, rotate the clamp plate and install the bolt.
 - Tighten to 25 Nm (18 lb-ft).

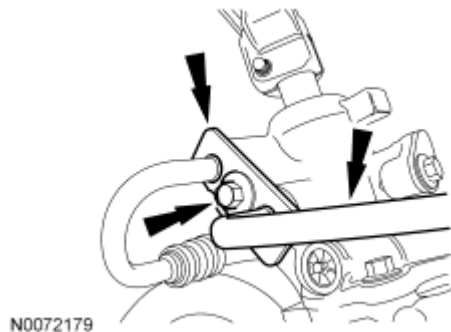


Fig. 752: Identifying Bolt, Clamp Plate And PSP Tube
Courtesy of FORD MOTOR CO.

40. Install the PSP tube bracket-to-steering gear bolt.

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

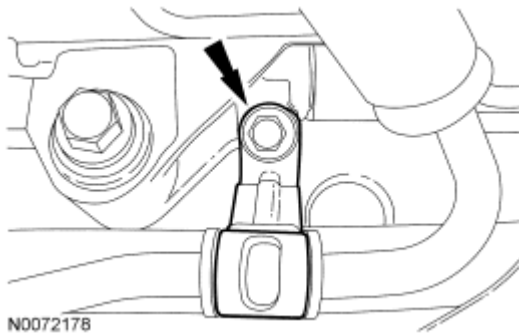


Fig. 753: Identifying PSP Bracket-To-Steering Gear Bolt
Courtesy of FORD MOTOR CO.

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

41. Install a new engine oil filter.
 - Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

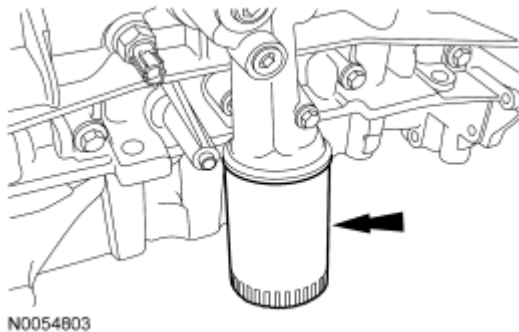


Fig. 754: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

AWD vehicles

42. Line up the index marks on the rear driveshaft to the index marks on the PTU flange made during removal and install the 4 bolts (3 shown in illustration).
 - Tighten to 70 Nm (52 lb-ft).

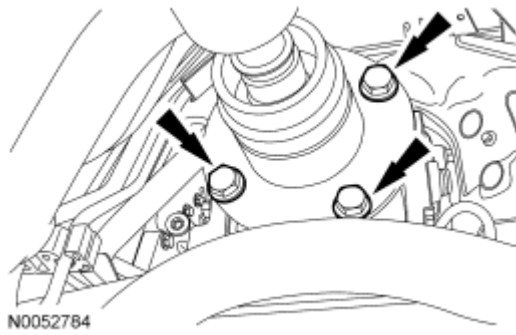


Fig. 755: Identifying Drive Shaft Bolts
Courtesy of FORD MOTOR CO.

All vehicles

43. Using a new gasket, install the Y-pipe and install the 2 new nuts.
 - Tighten to 40 Nm (30 lb-ft).
 - Attach the exhaust hanger.

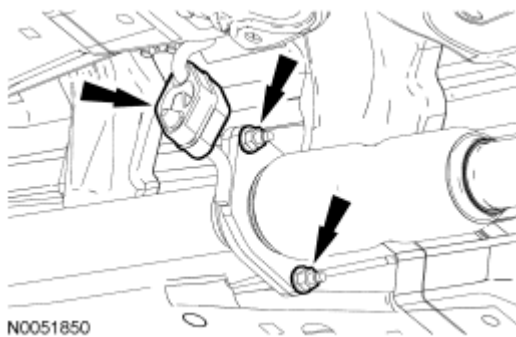


Fig. 756: Identifying Nuts And Exhaust Hanger
Courtesy of FORD MOTOR CO.

44. Install the Y-pipe assembly and 4 new nuts.
 - Tighten to 40 Nm (30 lb-ft).

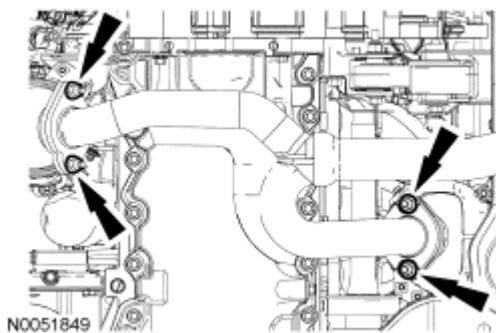


Fig. 757: Identifying Nuts
Courtesy of FORD MOTOR CO.

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

NOTE: Align the index marks made during removal.

45. Install the steering intermediate shaft onto the steering gear and install a new bolt.
- Tighten to 23 Nm (17 lb-ft).

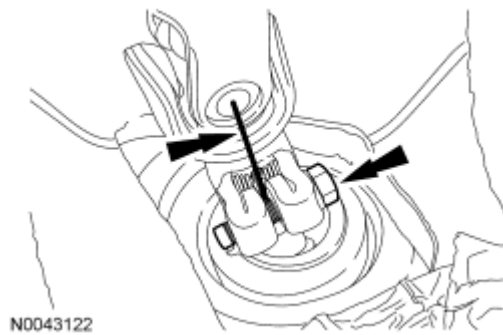


Fig. 758: Locating Steering Column Shaft Index Mark And Bolt
Courtesy of FORD MOTOR CO.

46. Connect the transaxle control electrical connector.

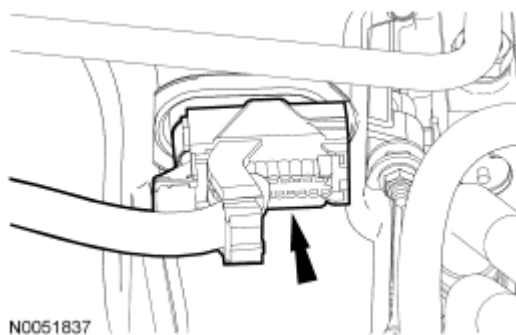


Fig. 759: Identifying Connector
Courtesy of FORD MOTOR CO.

47. Attach the transaxle control wire harness retainer to the transaxle stud bolt.

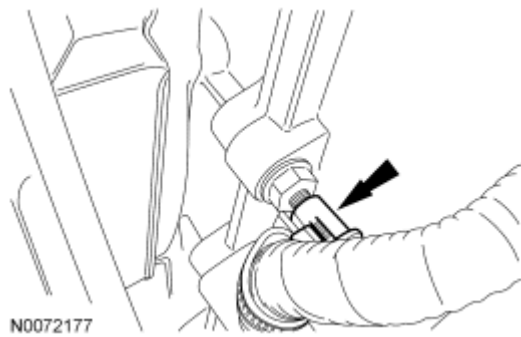


Fig. 760: Identifying Transaxle Control Wire Harness Retainer
Courtesy of FORD MOTOR CO.

48. Connect the hose to the power steering reservoir.

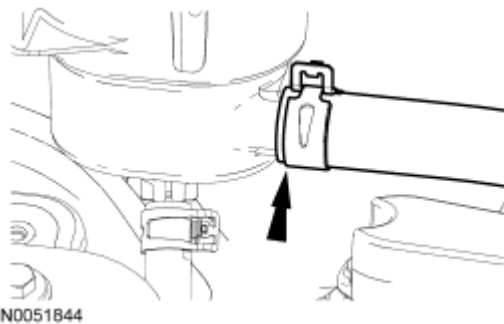


Fig. 761: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

49. Install the oil level indicator.

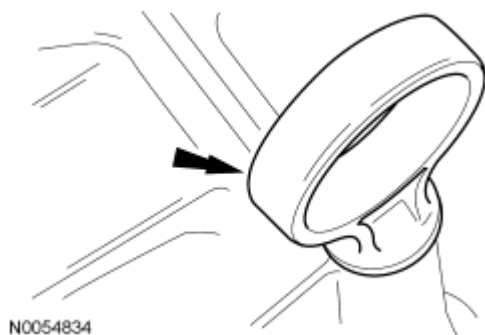


Fig. 762: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

50. Install the ground cable and bolt.
- Tighten to 12 Nm (9 lb-ft).

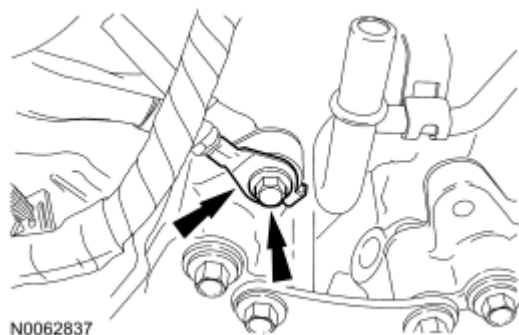


Fig. 763: Identifying Bolt And Ground Cable
Courtesy of FORD MOTOR CO.

51. Attach the wire to the RH valve cover stud bolt.



Fig. 764: Identifying Wire Harness Retainer
Courtesy of FORD MOTOR CO.

52. Connect the 2 engine wiring harness electrical connectors.
- Attach the electrical connector to the LH valve cover.

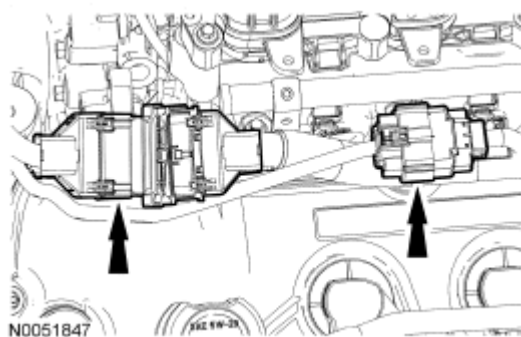


Fig. 765: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

53. Connect the fuel supply tube to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

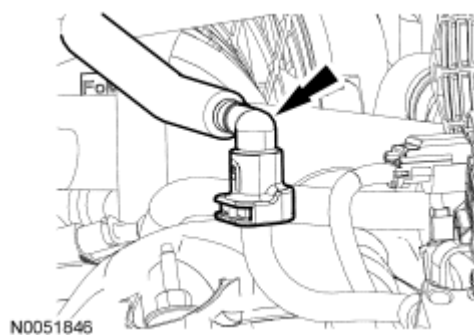


Fig. 766: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

54. Using a new O-ring seal, install the A/C tube and the nut.
 - Tighten to 15 Nm (11 lb-ft).

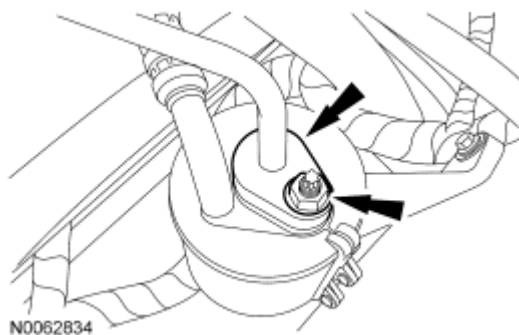


Fig. 767: Identifying Nut
Courtesy of FORD MOTOR CO.

55. Using new O-ring seals, connect the A/C tubes and install the 2 nuts.
 - Tighten to 15 Nm (11 lb-ft).

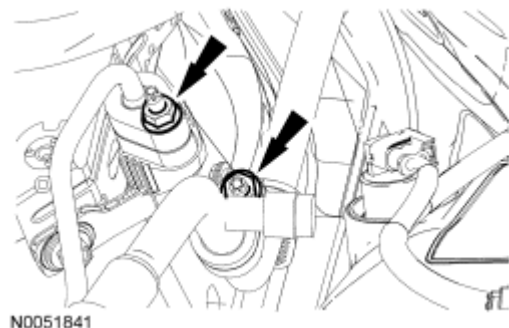


Fig. 768: Identifying Nuts
Courtesy of FORD MOTOR CO.

56. Using a new O-ring seal, connect the upper A/C tube to the condenser and install the nut and connect the A/C pressure switch electrical connector.

- Tighten to 15 Nm (11 lb-ft).

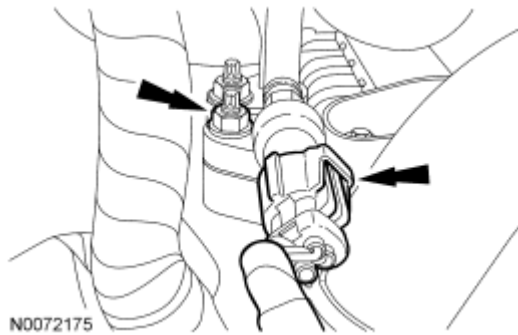


Fig. 769: Identifying A/C Pressure Switch And Nut
Courtesy of FORD MOTOR CO.

57. If equipped, attach the engine block heater harness to the radiator support and the power steering tube.
58. Connect the transaxle control cable to the shift cable bracket and attach the 2 wiring harness pin-type retainers.

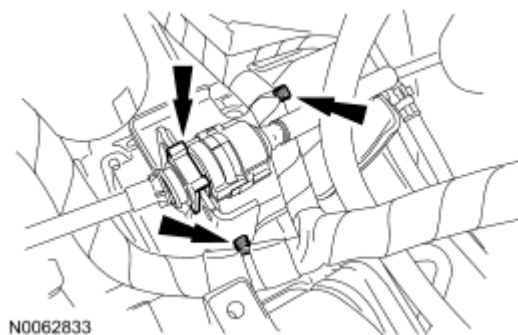


Fig. 770: Identifying Control Cable And Pin-Type Retainers
Courtesy of FORD MOTOR CO.

59. Connect the transaxle control cable to the control lever.



Fig. 771: Locating Selector Lever Cable End From Manual Lever
Courtesy of FORD MOTOR CO.

60. Connect the upper radiator hose, lower radiator hose and 2 heater hoses to the thermostat housing.

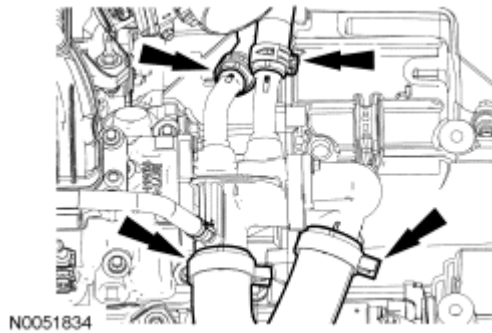


Fig. 772: Locating Upper Radiator Hose, Lower Radiator Hose & Heater Hoses
Courtesy of FORD MOTOR CO.

61. Disconnect the vacuum hose and the evaporative emissions (EVAP) tube from the upper intake manifold.

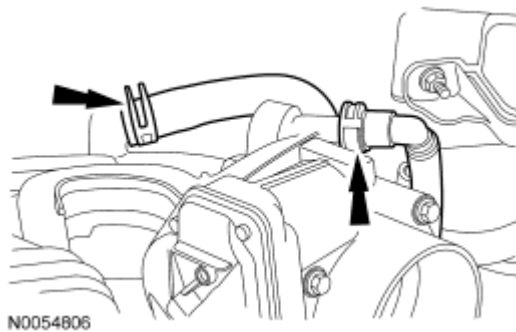


Fig. 773: Locating Vacuum Hose & Evaporative Emissions (EVAP) Tube From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

62. Attach the EVAP tube pin-type retainer to the upper intake manifold.

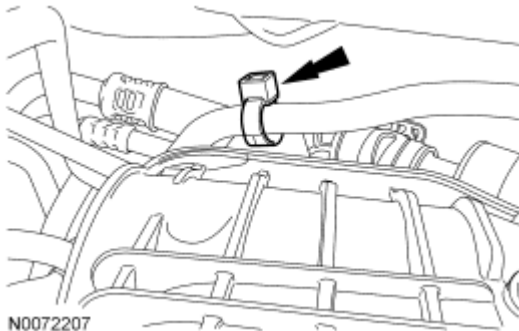


Fig. 774: Identifying pin-Type Retainer
Courtesy of FORD MOTOR CO.

63. Connect the ground cable to the negative battery terminal and install the nut.

- Tighten to 6 Nm (53 lb-in).

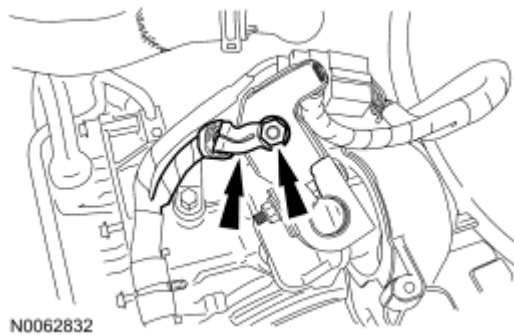


Fig. 775: Identifying Nut And Ground Cable
Courtesy of FORD MOTOR CO.

64. Connect the power feed wire to the positive battery terminal and install the nut.
- Tighten to 6 Nm (53 lb-in).

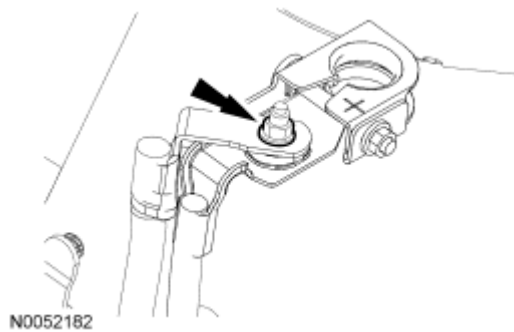


Fig. 776: Identifying Nut
Courtesy of FORD MOTOR CO.

65. Connect the engine wiring harness electrical connector.

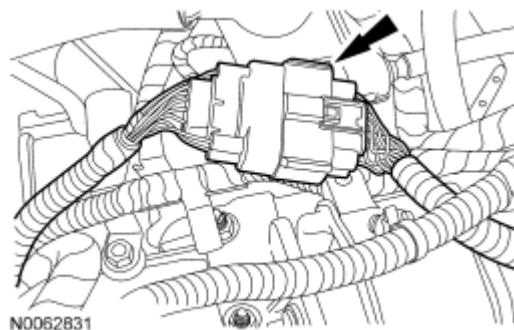


Fig. 777: Identifying Connector
Courtesy of FORD MOTOR CO.

66. Install the battery tray and bracket and the nut and bolt.

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

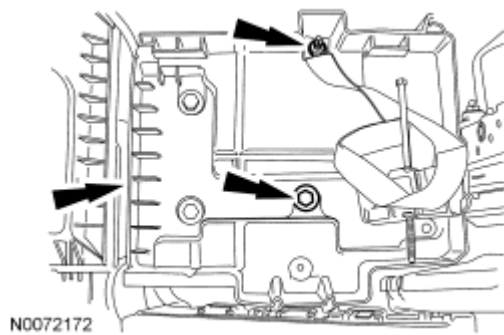


Fig. 778: Identifying Bolt, Nut And Bracket
Courtesy of FORD MOTOR CO.

67. Install the 2 lower battery tray bracket bolts.
 - Tighten to 9 Nm (80 lb-in).

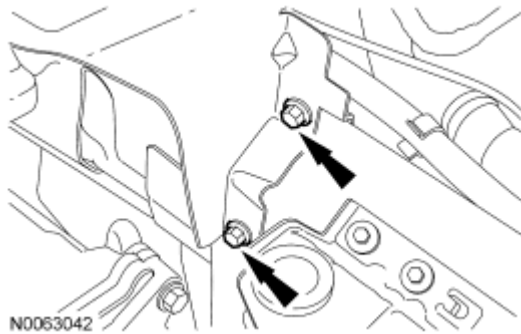


Fig. 779: Identifying Bolts
Courtesy of FORD MOTOR CO.

68. Attach the 2 pin-type wiring harness fasteners to the front of the battery tray.

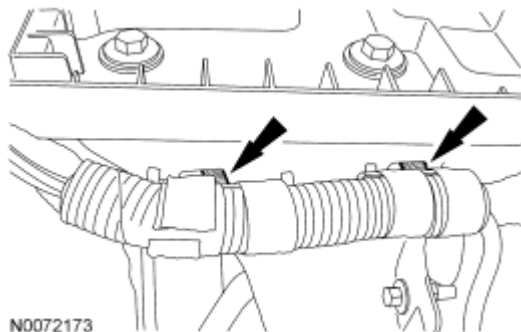


Fig. 780: Identifying Fasteners
Courtesy of FORD MOTOR CO.

69. Attach the 4 pin-type wiring harness fasteners to the side of the battery tray.

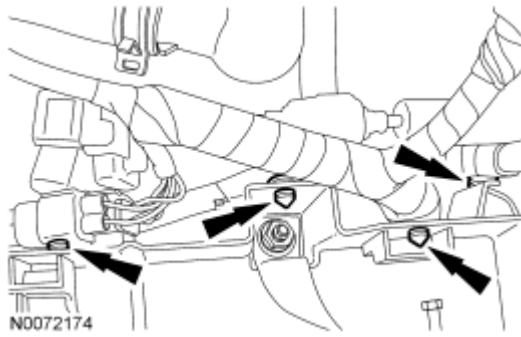


Fig. 781: Identifying Fasteners
Courtesy of FORD MOTOR CO.

70. Install the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
71. Install the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
72. Install the degas bottle. For additional information, refer to **ENGINE COOLING** article.
73. Connect the power steering cooler tube.

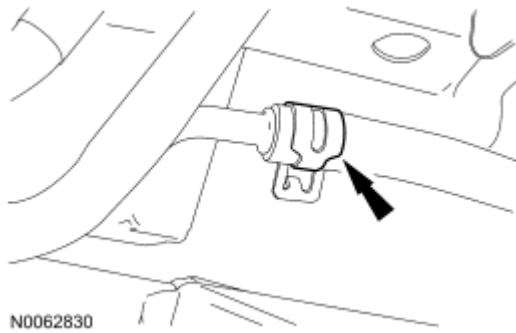


Fig. 782: Identifying Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

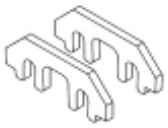
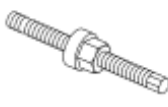
74. Install the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
75. Install the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.
76. Fill the engine with clean engine oil.
77. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.
78. Fill the power steering system. For additional information, refer to **STEERING SYSTEM - GENERAL INFORMATION** article.
79. Recharge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article.

CAMSHAFT

SPECIAL TOOLS

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

Illustration	Tool Name	Tool Number
 ST2433-A	Alignment Pins	307-399
 ST2979-A	Camshaft Alignment Tool	303-1248
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST2981-A	Installer, Crankshaft Front Seal	303-1251
 ST1287-A	Installer, Crankshaft Vibration Damper	303-102 (T74P-6316-B)
 ST2296-A	Installer, Front Cover Oil Seal	303-335
 ST2983-A	Installer, Seal	303-1247/2
 ST1293-A	Powertrain Lift	014-00765

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



ST1438-A

Strap Wrench

303-D055 (D85L-6000-A)

MATERIAL

Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft Metal Surface Prep ZC-31-A	-
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket Remover ZC-30	-

INSTALLATION

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

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

All camshafts

CAUTION: The crankshaft must remain in the freewheeling position (crankshaft dowel pin at 9 o'clock) until after the camshafts are installed and the valve clearance is checked/adjusted. Do not turn the crankshaft until instructed to do so. Failure to follow this process will result in severe engine damage.

1. Rotate the crankshaft counterclockwise until the crankshaft dowel pin is in the 9 o'clock position.

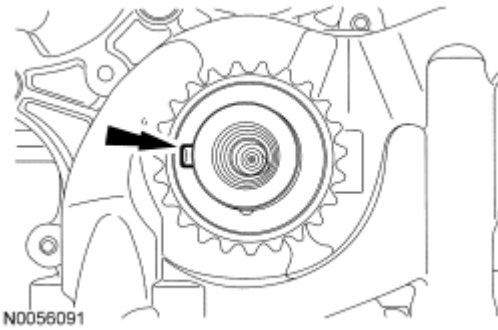


Fig. 783: Rotating Crankshaft Counterclockwise Until Crankshaft Dowel Pin Is In 9 O'clock Position

Courtesy of FORD MOTOR CO.

LH camshafts

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

NOTE: Coat the camshafts with clean engine oil prior to installation.

2. Position the camshafts onto the LH cylinder head in the neutral position as shown in illustration.

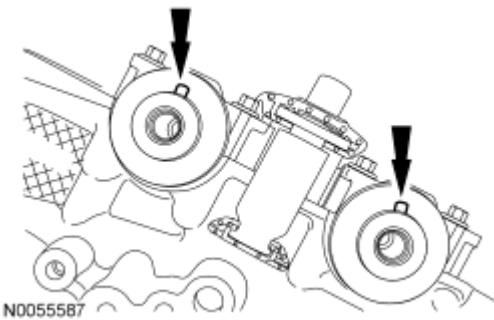
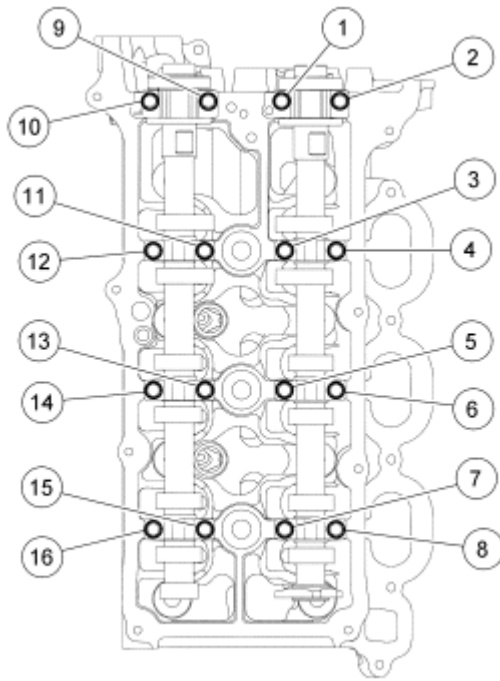


Fig. 784: Verifying LH Camshafts Are In Neutral Position

Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

3. Install the 8 camshaft caps and the 16 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).



N0055185

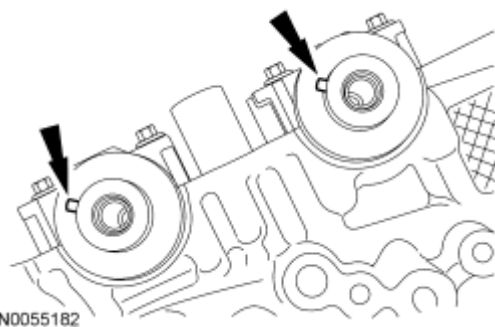
Fig. 785: Installing Camshaft Caps & Bolts In Sequence
Courtesy of FORD MOTOR CO.

RH camshafts

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

NOTE: Coat the camshafts with clean engine oil prior to installation.

4. Position the camshafts onto the RH cylinder head in the neutral position as shown in illustration.

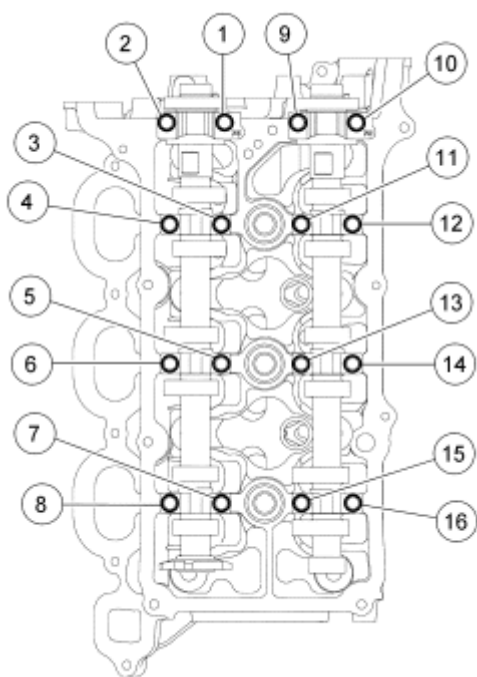


N0055182

Fig. 786: Positioning Camshafts Onto RH Cylinder Head In Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

5. Install the 8 camshaft caps and the 16 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).



N0055184

Fig. 787: Installing Camshaft Caps & Bolts In Sequence
Courtesy of FORD MOTOR CO.

All camshafts

CAUTION: If any components are installed new, the engine valve clearance must be checked/adjusted or engine damage may occur.

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

6. Using a feeler gauge, confirm that the valve tappet clearances are within specification. If valve tappet clearances are not within specification, the clearance must be adjusted by installing new valve tappet(s) of the correct size. For additional information, refer to Valve Clearance Check.

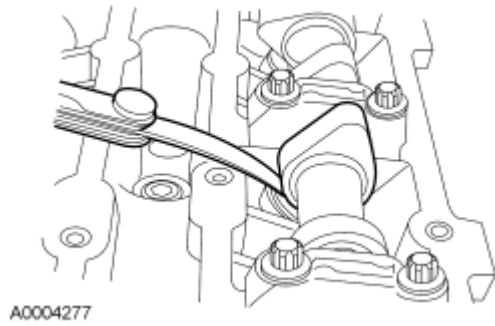


Fig. 788: Measuring Valve Clearance
Courtesy of FORD MOTOR CO.

LH camshafts

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

7. Rotate the LH camshafts to the top dead center (TDC) position and install the special tool on the flats of the camshafts.

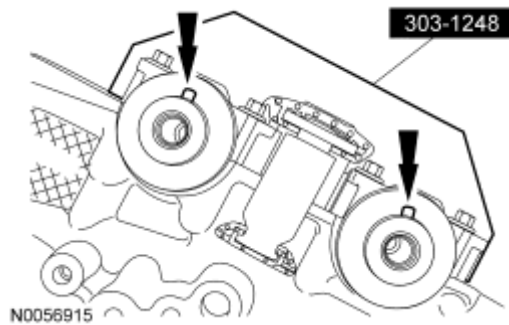


Fig. 789: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

8. Assemble the LH variable camshaft timing (VCT) assembly, the LH exhaust camshaft sprocket and the LH secondary timing chain.
 - Align the colored links with the timing marks.

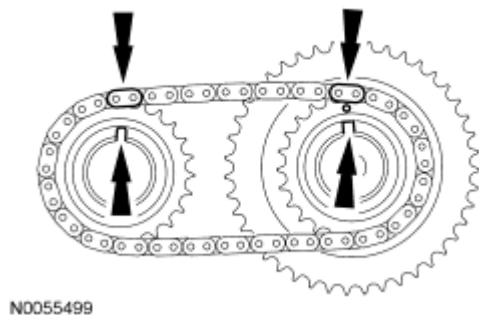


Fig. 790: Aligning LH Exhaust Camshaft Sprocket & LH Secondary Timing Chain Colored Links With Timing Marks
 Courtesy of FORD MOTOR CO.

9. Position the LH secondary timing assembly onto the camshafts.

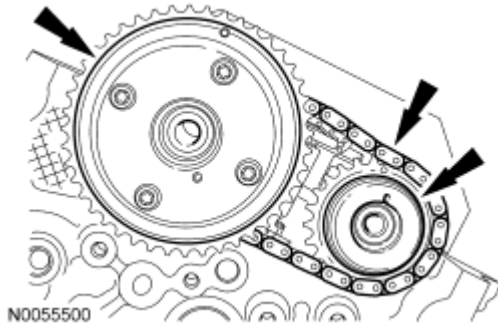


Fig. 791: Positioning LH Secondary Timing Assembly Onto Camshafts
 Courtesy of FORD MOTOR CO.

10. Install 2 new bolts and the original washer. Tighten in 4 stages.
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 10 Nm (89 lb-in).
 - Stage 4: Tighten 90 degrees.

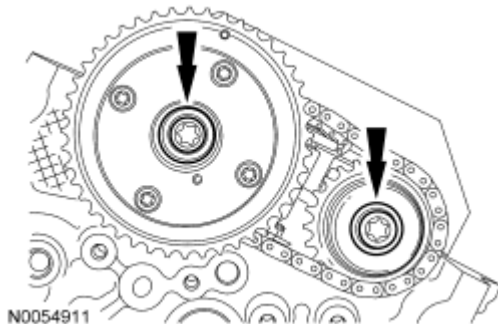


Fig. 792: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
 Courtesy of FORD MOTOR CO.

11. Remove the lockpin from the LH secondary timing chain tensioner.

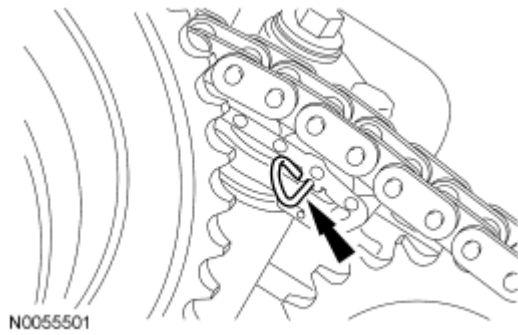


Fig. 793: Locating Lock Pin On LH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

RH camshafts

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

12. Rotate the RH camshafts to the TDC position and install the special tool on the flats of the camshafts.

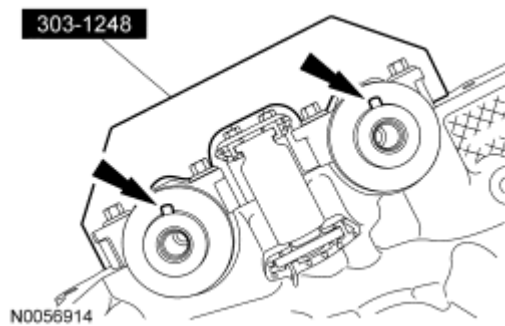


Fig. 794: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

13. Assemble the RH VCT assembly, the RH exhaust camshaft sprocket and the RH secondary timing chain.
 - Align the colored links with the timing marks.

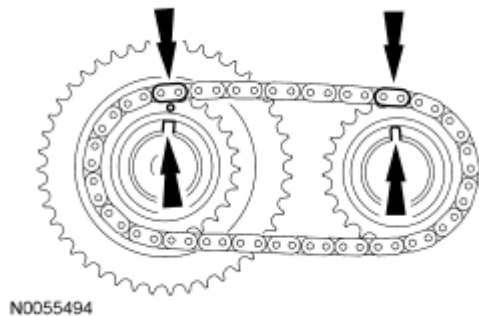


Fig. 795: Aligning RH Exhaust Camshaft Sprocket & RH Secondary Timing Chain Colored Links With Timing Marks

Courtesy of FORD MOTOR CO.

14. Position the RH secondary timing assembly onto the camshafts.

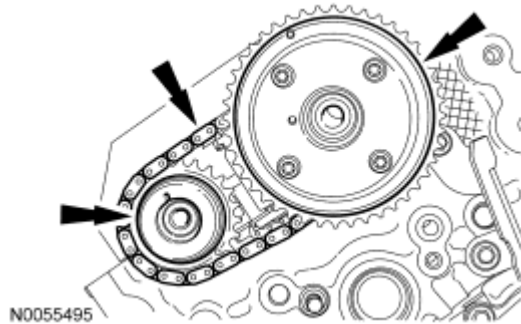


Fig. 796: Positioning RH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

15. Install 2 new bolts and the original washer. Tighten in 4 stages.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 10 Nm (89 lb-in).
 - Stage 4: Tighten 90 degrees.

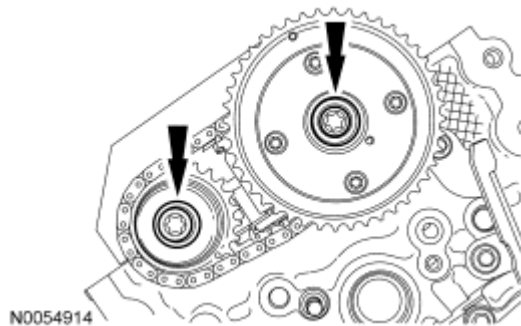


Fig. 797: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

16. Remove the lockpin from the RH secondary timing chain tensioner.

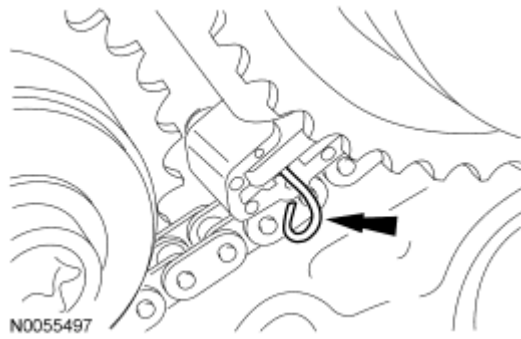


Fig. 798: Identifying Lock Pin On RH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

All camshafts

17. Rotate the crankshaft clockwise 60 degrees to the TDC position (crankshaft dowel pin at 11 o'clock).

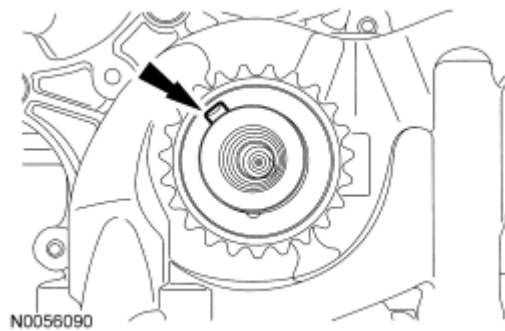
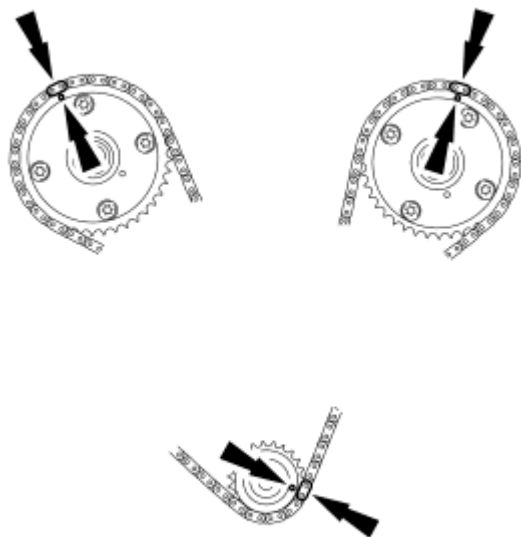


Fig. 799: Identifying Crankshaft Dowel Pin At 11 O'clock
Courtesy of FORD MOTOR CO.

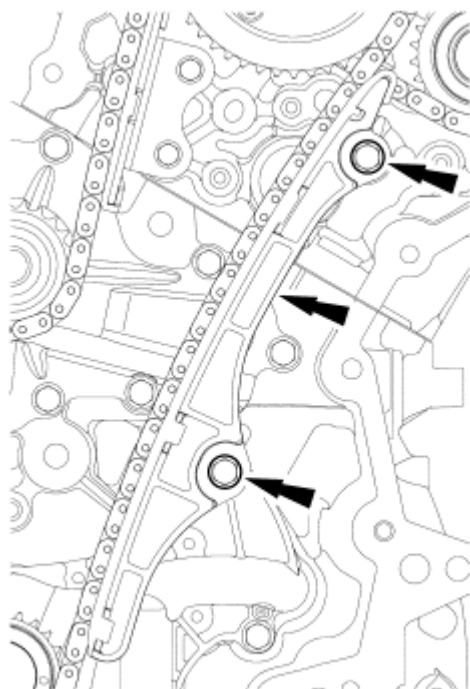
18. Install the primary timing chain with the colored links aligned with the timing marks on the VCT assemblies and the crankshaft sprocket.



N0055503

Fig. 800: Aligning Timing Marks On VCT Assemblies & Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

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



N0054906

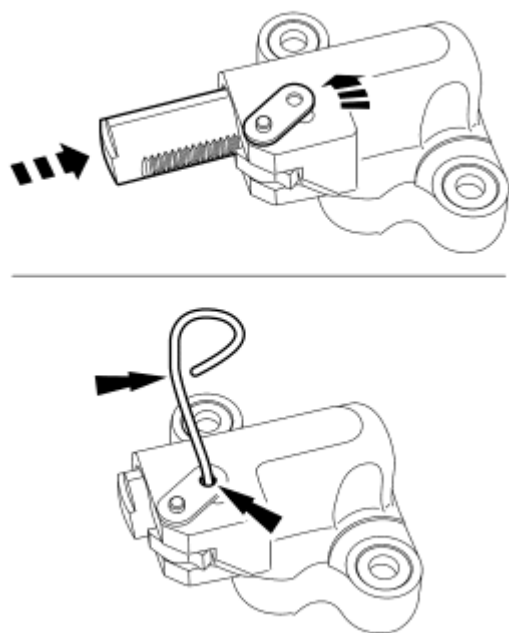
Fig. 801: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

20. Install the primary timing chain tensioner arm.



Fig. 802: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

21. Reset the primary timing chain tensioner.
- Rotate the lever counterclockwise.
 - Using a soft-jawed vise, compress the plunger.
 - Align the hole in the lever with the hole in the tensioner housing.
 - Install a suitable lockpin.

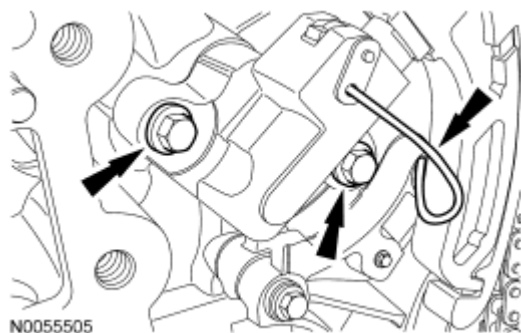


N0055504

Fig. 803: Compressing Plunger Using A Soft-Jawed Vise
Courtesy of FORD MOTOR CO.

NOTE: It may be necessary to rotate the crankshaft slightly to remove slack from the timing chain and install the tensioner.

22. Install the primary tensioner and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).
 - Remove the lockpin.



N0055505

Fig. 804: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

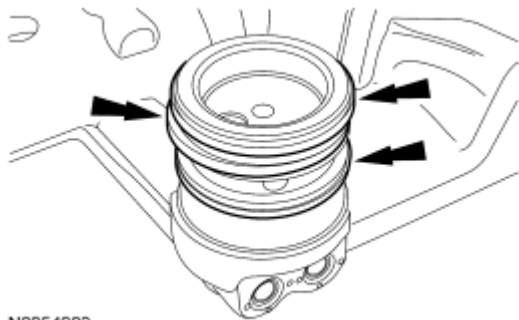
23. As a post-check, verify correct alignment of all timing marks.



N0055496

Fig. 805: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

24. Install new VCT housing seals.



N0054903

Fig. 806: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

CAUTION: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

25. Install the LH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

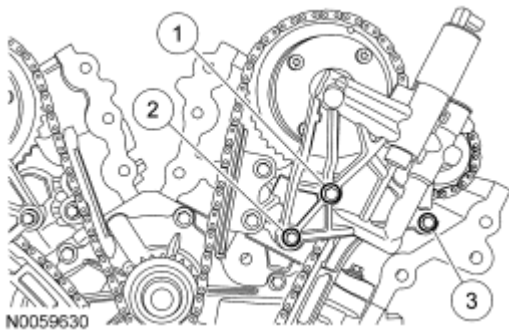


Fig. 807: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

CAUTION: Make sure the dowels on the variable camshaft timing (VCT) housing are fully engaged in the cylinder head prior to tightening the bolts. Failure to follow this process will result in severe engine damage.

26. Install the RH VCT housing and the 3 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

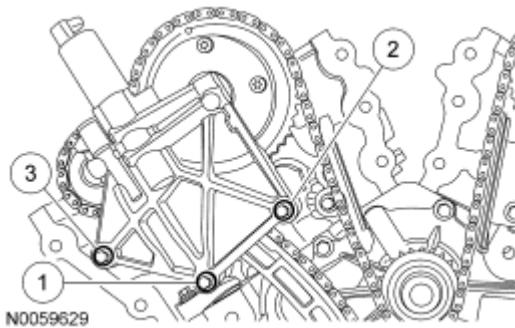


Fig. 808: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

27. Install the special tools.

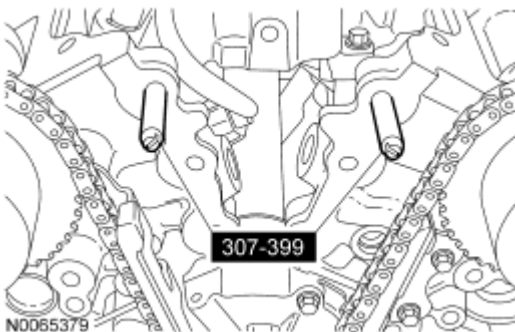


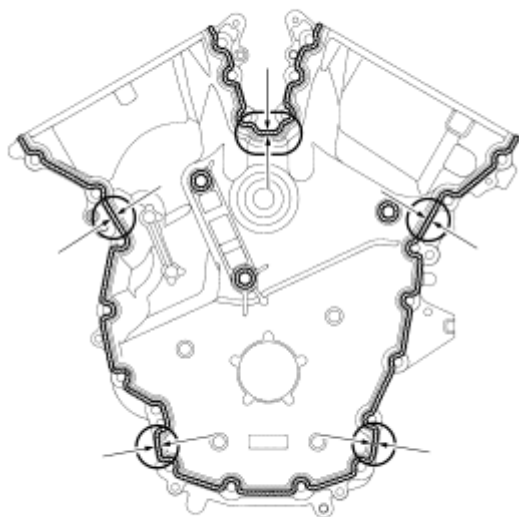
Fig. 809: Identifying Special Tool (307-399)
Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The engine front cover and bolts 17, 18, 19 and 20 must be installed within 4 minutes of the initial sealant application. The remainder of the engine front cover bolts and the engine mount bracket bolts must be installed and tighten within 35 minutes of the initial sealant application. If the time limits are exceeded, the sealant must be removed, the sealing area cleaned and sealant reapplied. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.

28. Apply a 3.0 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover sealing surfaces including the 3 engine mount bracket bosses.
- Apply a 5.5 mm (0.21 in) bead of Motorcraft High Performance Engine RTV Silicone to the oil pan-to-cylinder block joint and the cylinder head-to-cylinder block joint areas of the engine front cover in 5 places as indicated.

5.5 mm
(0.21 in)

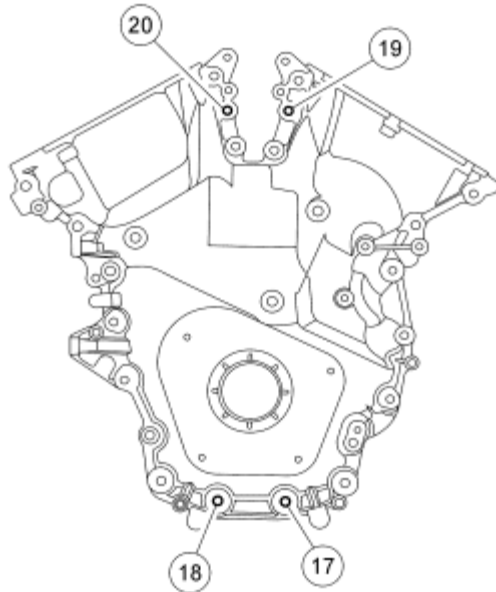


N0068283

Fig. 810: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover Sealing Surfaces
Courtesy of FORD MOTOR CO.

NOTE: Make sure the 2 locating dowel pins are seated correctly in the cylinder block.

29. Install the engine front cover and bolts 17, 18, 19 and 20.
- Tighten in sequence shown in illustration to 3 Nm (27 lb-in).



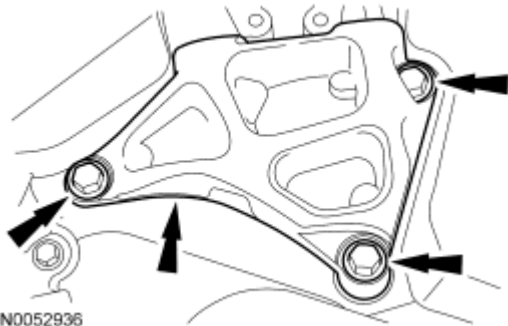
N0068108

Fig. 811: Installing Engine Front Cover & Bolts In Sequence
Courtesy of FORD MOTOR CO.

30. Remove the special tools (alignment pins).

NOTE: Do not tighten the bolts at this time.

31. Install the engine mount bracket and the 3 bolts.



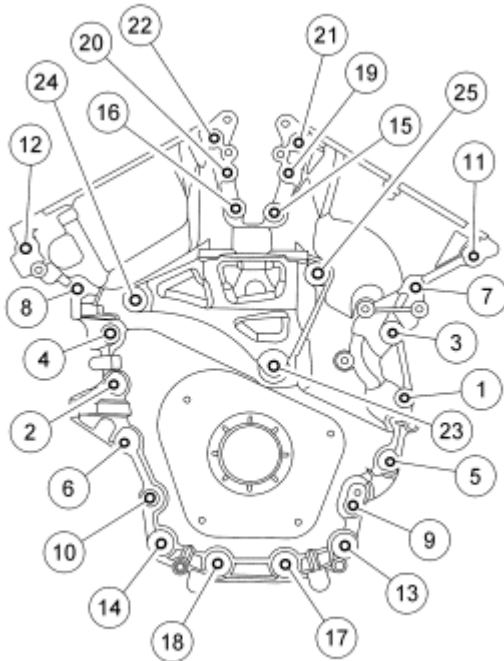
N0052936

Fig. 812: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Do not expose the Motorcraft High Performance Engine RTV Silicone

to engine oil for at least 90 minutes after installing the engine front cover. Failure to follow this instruction may cause oil leakage.

32. Install the remaining engine front cover bolts. Tighten all of the engine front cover bolts and engine mount bracket bolts in the sequence shown in illustration in 2 stages:
- Stage 1: Tighten bolts 1 thru 22 to 10 Nm (89 lb-in) and bolts 23, 24 and 25 to 15 Nm (11 lb-ft).
 - Stage 2: Tighten bolts 1 thru 22 to 24 Nm (18 lb-ft) and bolts 23, 24 and 25 to 75 Nm (55 lb-ft).

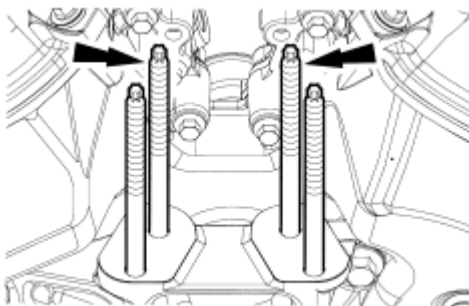


N0068109

Fig. 813: Identifying Tightening Of Engine Front Cover Bolts & Engine Mount Bracket Bolts In Sequence

Courtesy of FORD MOTOR CO.

33. Install the 2 engine mount studs.
- Tighten to 18 Nm (13 lb-ft).



N0057960

Fig. 814: Locating Engine Mount Studs

Courtesy of FORD MOTOR CO.

34. Install the engine mount bracket and the 2 bolts.
- Tighten to 24 Nm (18 lb-ft).

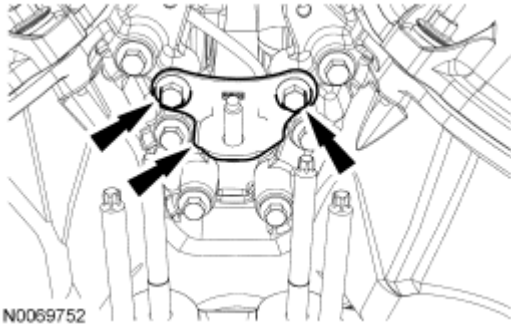


Fig. 815: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Apply clean engine oil to the crankshaft front seal bore in the engine front cover.

35. Using the special tools, install a new crankshaft front seal.

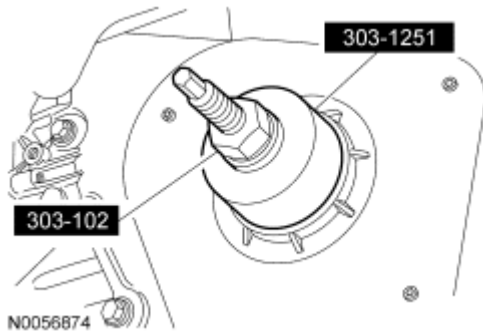


Fig. 816: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the outside diameter sealing surfaces with clean engine oil.

36. Using the special tools, install the crankshaft pulley.

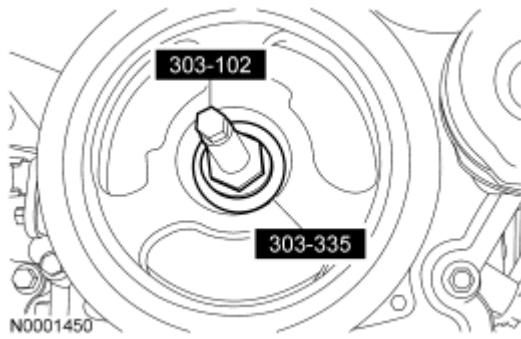


Fig. 817: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

37. Using the special tool, install the crankshaft pulley washer and new bolt and tighten in 4 stages.
- Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

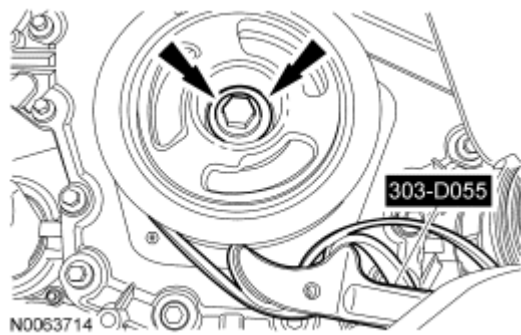


Fig. 818: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

38. Install the accessory drive belt tensioner and the 3 bolts.
- Tighten to 10 Nm (89 lb-in).

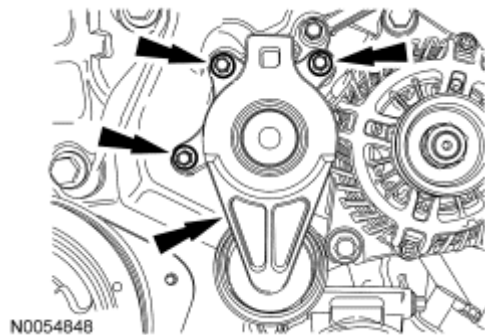


Fig. 819: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

39. Install the power steering pump and the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).

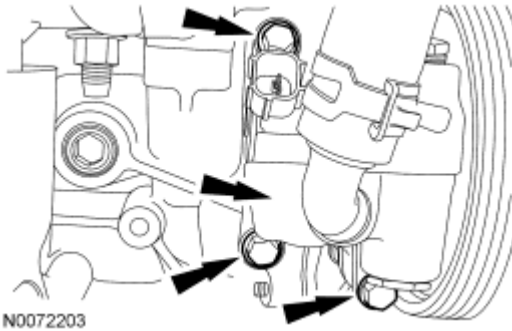


Fig. 820: Identifying Bolts
Courtesy of FORD MOTOR CO.

NOTE: Installation of new seals is only required if damaged seals were removed during disassembly of the engine.

NOTE: Spark plug tube seal installation shown in illustration, VCT seal installation similar.

40. Using the special tools, install new VCT solenoid and/or spark plug tube seals.

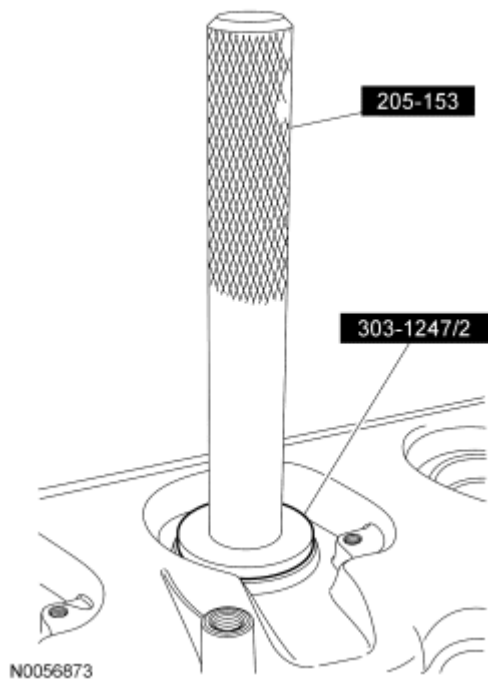


Fig. 821: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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

41. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-RH cylinder head joints.

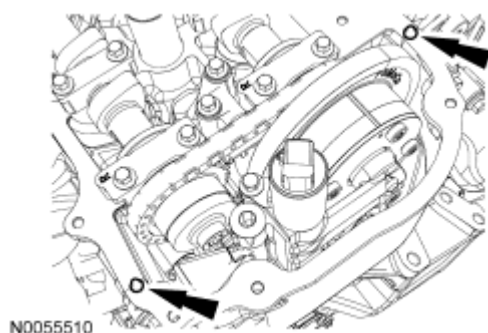


Fig. 822: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
Courtesy of FORD MOTOR CO.

42. Using a new gasket, install the RH valve cover, bolt and the 10 stud bolts.
 - Tighten in the sequence in illustration to 10 Nm (89 lb-in).

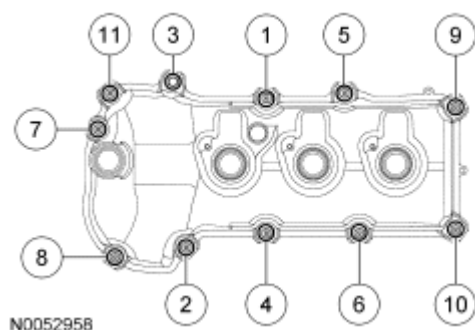


Fig. 823: Installing RH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine

damage.

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

43. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-LH cylinder head joints.

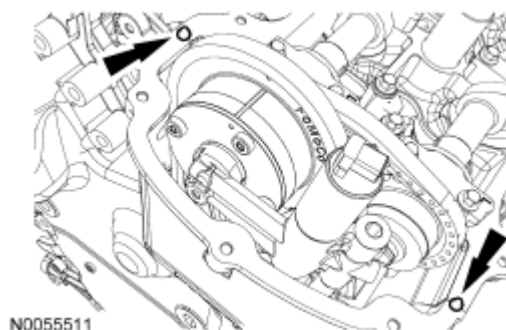


Fig. 824: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
Courtesy of FORD MOTOR CO.

44. Using a new gasket, install the LH valve cover and 11 stud bolts.
- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

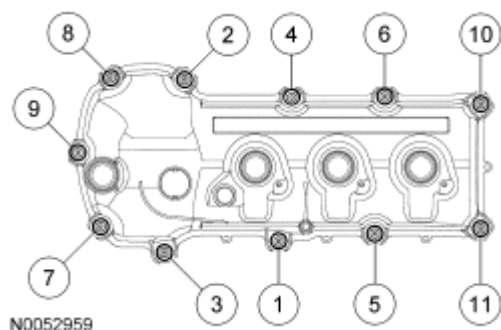


Fig. 825: Installing LH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

45. Install the power steering pressure (PSP) tube bracket and nut to the RH valve cover stud bolt.
- Tighten to 7 Nm (62 lb-in).

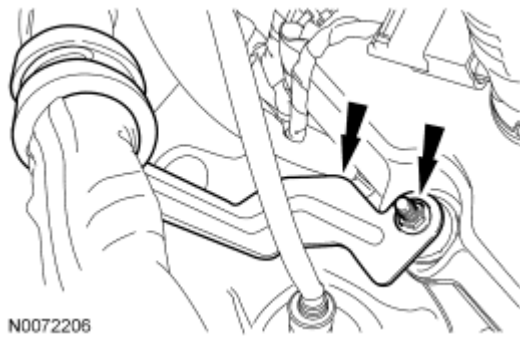


Fig. 826: Identifying Nut And PSP Tube Bracket
Courtesy of FORD MOTOR CO.

46. Install the PSP tube bracket bolt.
- Tighten to 10 Nm (89 lb-in).

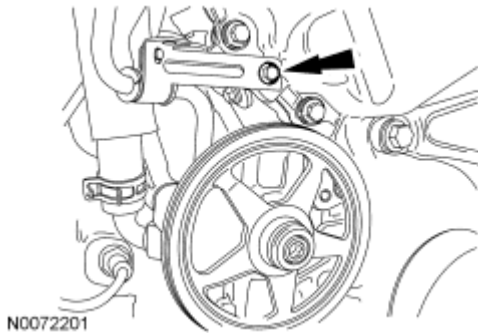


Fig. 827: Identifying Bracket-To-Power Steering Pump Bolt
Courtesy of FORD MOTOR CO.

47. Connect the PSP switch electrical connector.

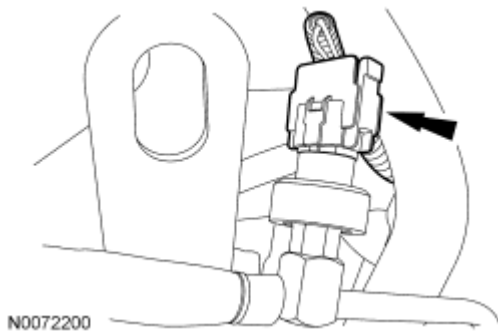


Fig. 828: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

48. Install the 6 coil-on-plug assemblies and the 6 bolts.

- Tighten to 7 Nm (62 lb-in).

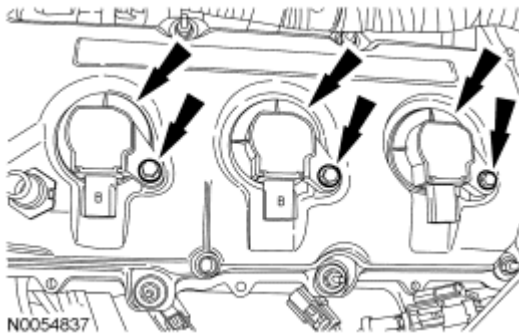


Fig. 829: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

49. Attach all of the wiring harness retainers to the LH valve cover and stud bolts.
50. Connect the 3 LH coil-on-plug electrical connectors.

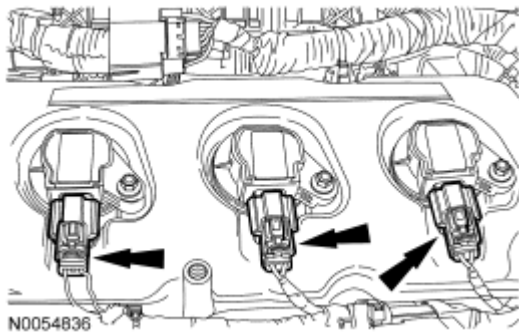


Fig. 830: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

51. Connect the LH VCT solenoid electrical connector.

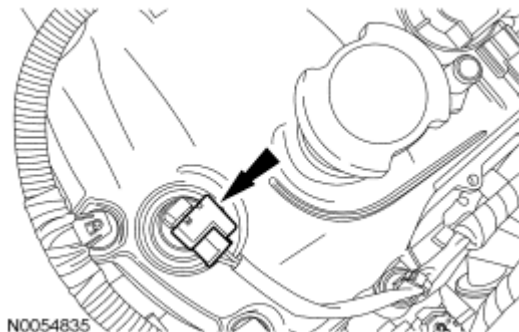


Fig. 831: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

52. Attach all of the wiring harness retainers to the RH valve cover and stud bolts.

53. If equipped, connect the heated PCV valve electrical connector.

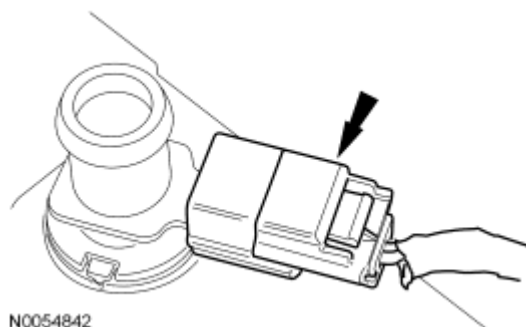


Fig. 832: Locating Heated PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

54. Connect the 3 RH coil-on-plug electrical connectors.

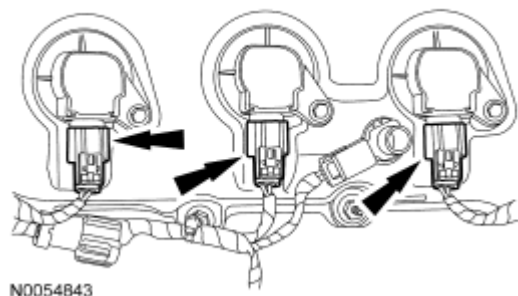


Fig. 833: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

55. Connect the RH VCT solenoid electrical connector.

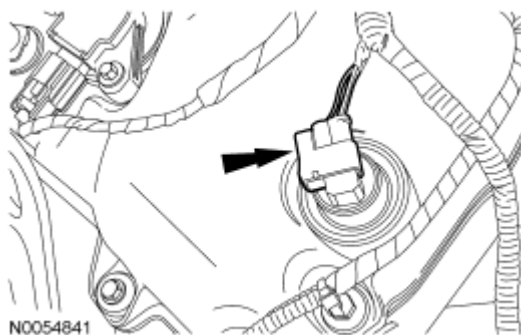


Fig. 834: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

56. Connect the fuel efficient power steering system solenoid electrical connector.



Fig. 835: Identifying Connector
Courtesy of FORD MOTOR CO.

57. Connect the RH catalyst monitor sensor electrical connector.

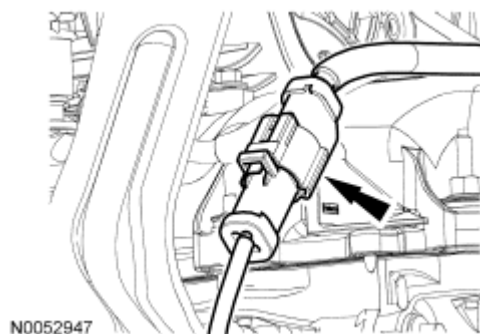
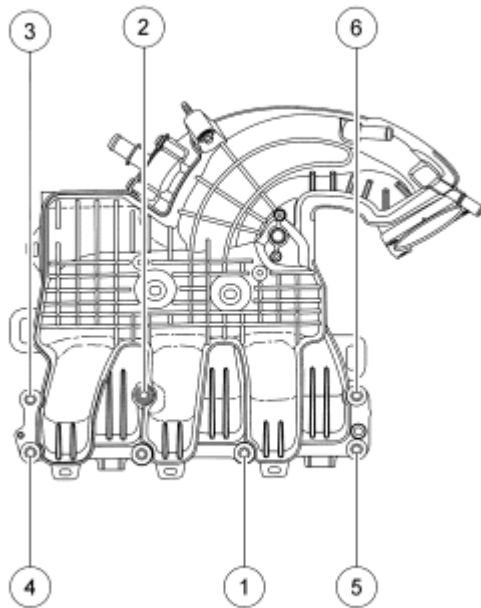


Fig. 836: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

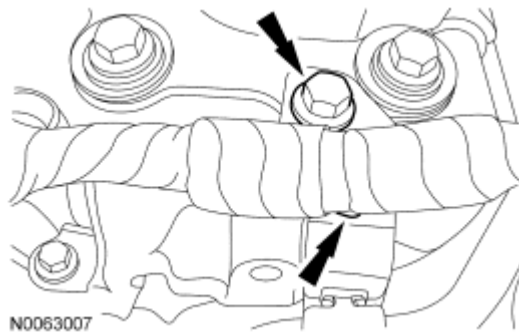
58. Using a new gasket, install the upper intake manifold and the 6 bolts.
- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).



N0052211

Fig. 837: Installing Upper Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

59. Install the fuel tube bracket bolt to the upper intake manifold and install the wiring harness pin-type retainer.
 - Tighten to 6 Nm (53 lb-in).



N0063007

Fig. 838: Identifying Pin-Type Retainer And Fuel Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

60. Install the upper intake manifold short support bracket and the bolt.
 - Tighten to 10 Nm (89 lb-in).

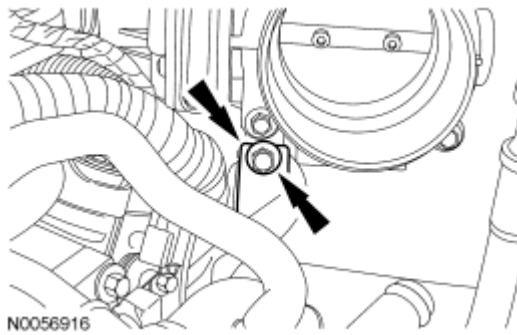


Fig. 839: Identifying Upper Intake Manifold Support Bracket & Bolt
Courtesy of FORD MOTOR CO.

61. If equipped, install the upper intake manifold long support bracket and the bolt.
- Tighten to 10 Nm (89 lb-in).

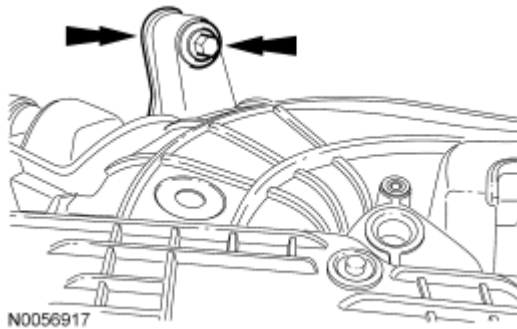


Fig. 840: Identifying Upper Intake Manifold Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

62. Attach the wiring harness retainers to the upper intake manifold.

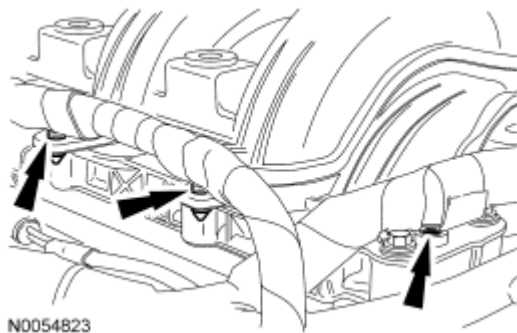


Fig. 841: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

63. Connect the throttle body electrical connector.

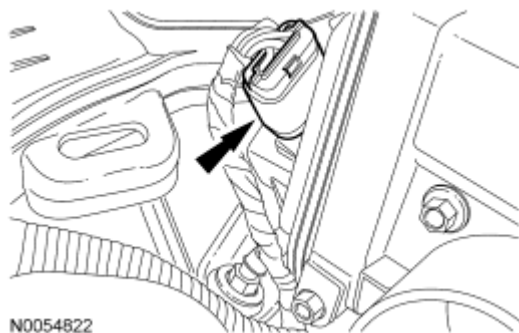


Fig. 842: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

64. Connect the PCV hose to the PCV valve.

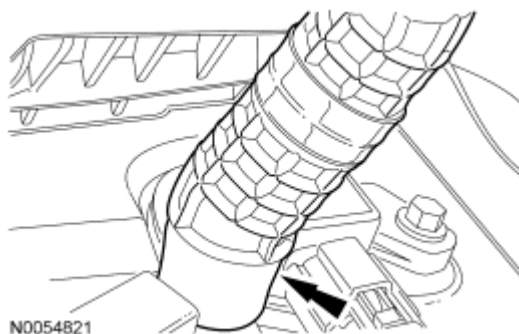


Fig. 843: Identifying PCV Hose From PCV Valve
Courtesy of FORD MOTOR CO.

65. If equipped, connect the heated PCV electrical connector.

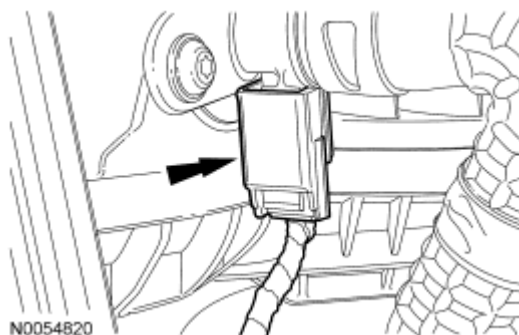


Fig. 844: Identifying Positive Crankcase Ventilation (PCV) Fitting Electrical Connector
Courtesy of FORD MOTOR CO.

66. Raise the engine and transaxle assembly into the vehicle.
67. Install the engine mount and the 3 bolts.
 - Tighten to 90 Nm (66 lb-ft).

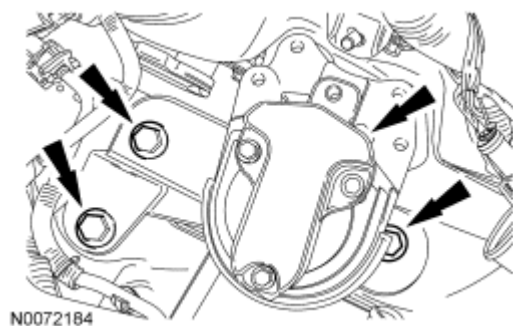


Fig. 845: Identifying Engine Mount And Bolts
Courtesy of FORD MOTOR CO.

68. Install the 4 engine mount nuts.
- Tighten to 63 Nm (46 lb-ft).

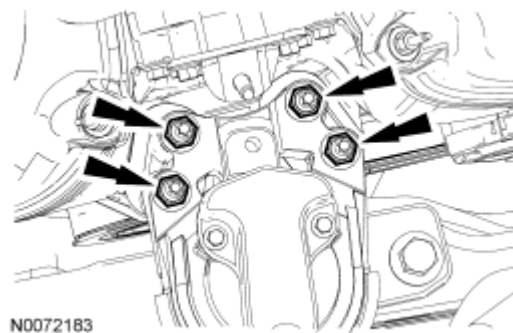


Fig. 846: Identifying Mounting Nuts
Courtesy of FORD MOTOR CO.

69. Install the engine mount brace, the nut and the bolt.
- Tighten to 20 Nm (15 lb-ft).

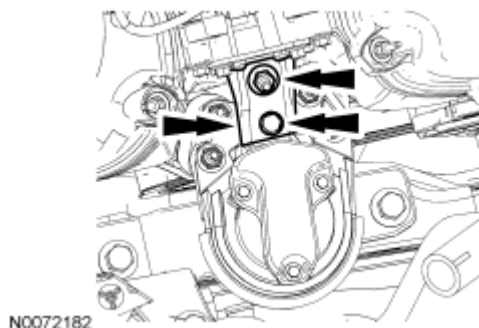


Fig. 847: Identifying Nut, Bolt And Brace
Courtesy of FORD MOTOR CO.

70. Install the transaxle support insulator bracket and the 4 nuts.
- Tighten the nuts to 80 Nm (59 lb-ft).

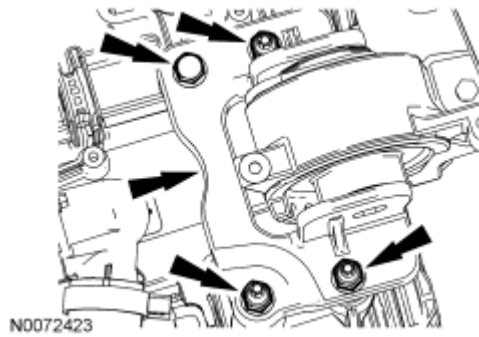


Fig. 848: Identifying Bolt, Nuts And Mount Bracket
Courtesy of FORD MOTOR CO.

71. Install the transaxle support insulator through bolt and nut.
- Tighten to 175 Nm (129 lb-ft).

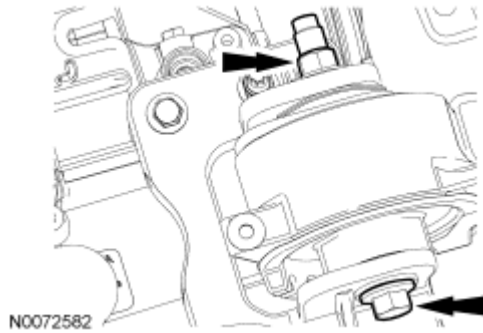


Fig. 849: Identifying Bolt And Nut
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

NOTE: A new powertrain transfer unit (PTU) seal must be installed whenever the intermediate shaft is removed.

72. Install a new PTU seal. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.

All camshafts

73. Install the RH halfshaft support bracket and the 4 bolts.
- Tighten the halfshaft support-to-cylinder block bolts to 40 Nm (30 lb-ft).
 - Tighten the catalytic converter-to-halfshaft support bolts to 20 Nm (15 lb-ft).

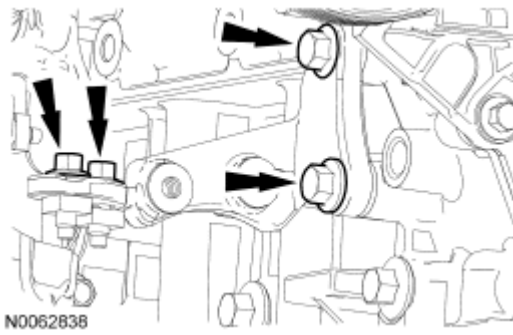


Fig. 850: Separating LH Halfshaft From Transaxle
Courtesy of FORD MOTOR CO.

74. Install the 2 halfshaft support bracket studs.
- Tighten to 10 Nm (89 lb-in).

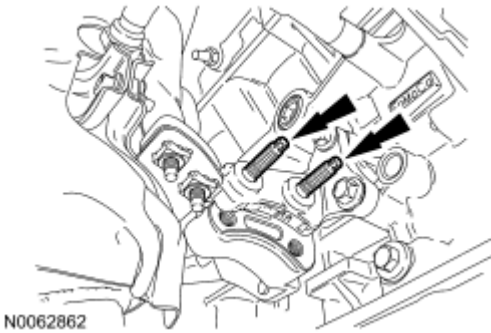


Fig. 851: Identifying Studs
Courtesy of FORD MOTOR CO.

75. Install the RH halfshaft into the transaxle and the wheel hub and install the 2 carrier bearing nuts.
- Tighten to 40 Nm (30 lb-ft).

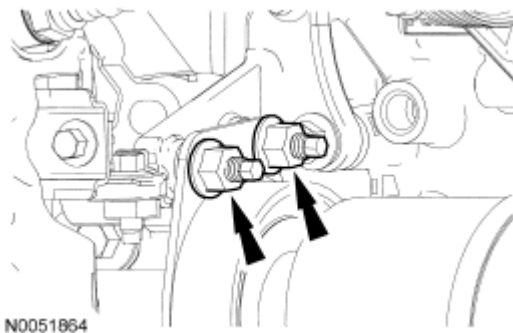


Fig. 852: Identifying Nuts
Courtesy of FORD MOTOR CO.

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface for wear or damage and install new, if necessary.

76. Install the LH halfshaft into the transaxle.

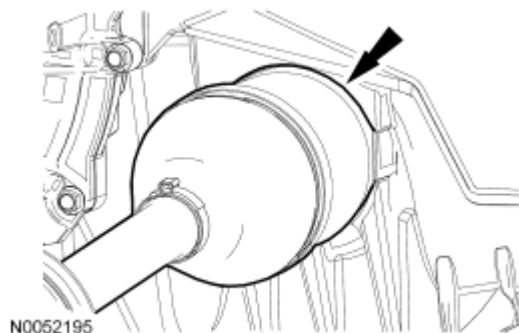


Fig. 853: Identifying LH Halfshaft
Courtesy of FORD MOTOR CO.

77. Connect the transaxle cooling tubes and install the safety clips.

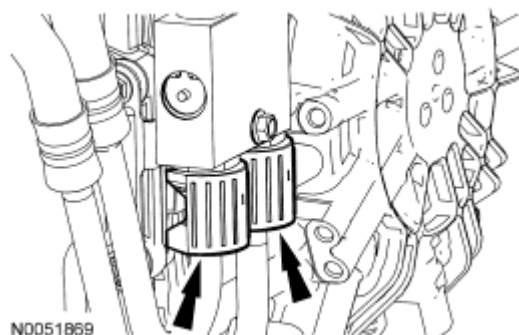


Fig. 854: Identifying Cooling Tubes
Courtesy of FORD MOTOR CO.

78. Using the special tool, raise the subframe into the installed position.

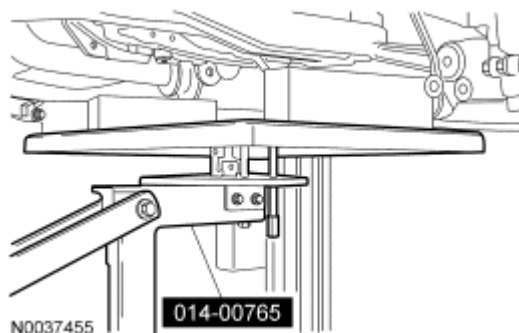


Fig. 855: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

79. Install the 2 front subframe bolts.

- Tighten to 150 Nm (111 lb-ft).

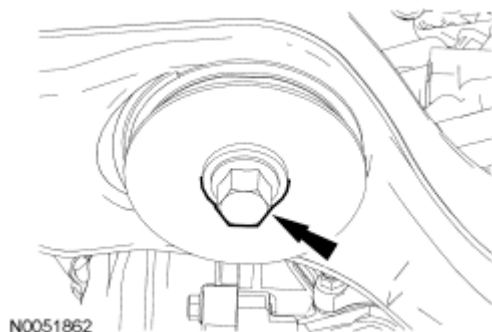


Fig. 856: Identifying Bolt
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

80. Position the subframe brackets and install the 4 bolts finger-tight.

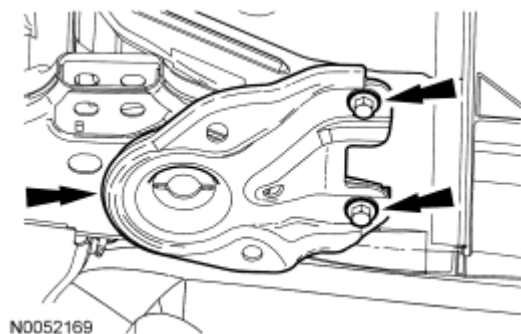


Fig. 857: Identifying Bracket And Bolts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

81. Install the 2 rear subframe bolts.

- Tighten to 150 Nm (111 lb-ft).

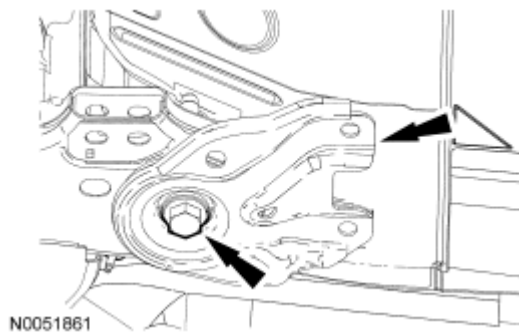


Fig. 858: Identifying Bolt And Bracket
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

82. Tighten the 4 subframe bracket-to-body bolts to 103 Nm (76 lb-ft).

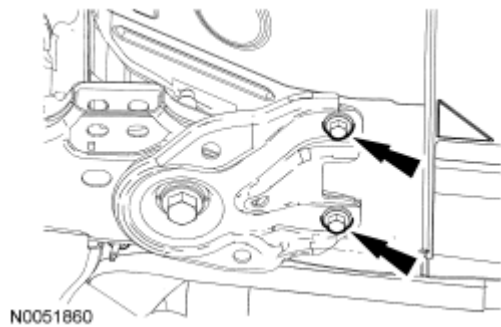


Fig. 859: Identifying Bracket-To-Body Bolts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

83. Install new lower ball joint-to-wheel knuckle nuts.
- Tighten to 115 Nm (85 lb-ft).

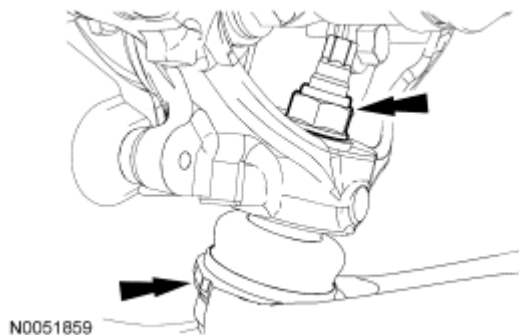


Fig. 860: Identifying Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

NOTE: The hex holding feature can be used to prevent turning of the stud while removing the nuts.

NOTE: RH shown in illustration, LH similar.

84. Install new tie-rod end nuts.
- Tighten to 115 Nm (85 lb-ft).

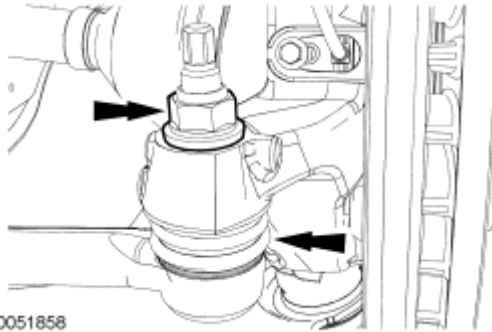


Fig. 861: Identifying Tie-Rod End Nut And Wheel Knuckles
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

85. Install new upper stabilizer bar link nuts.
- Tighten to 55 Nm (41 lb-ft).

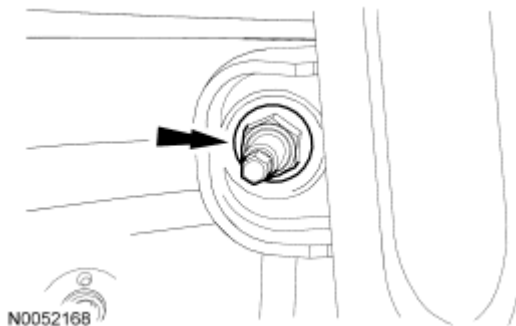


Fig. 862: Identifying Nut
Courtesy of FORD MOTOR CO.

CAUTION: Install and tighten the new front axle wheel end nut to specification in a continuous rotation. Stopping the rotation during installation will cause the nylon lock to seat incorrectly. This will cause incorrect torque readings while tightening the front axle wheel end nut and lead to bearing failure. Always install a new front axle wheel end nut after loosening or when not tightened to specifications in a continuous rotation.

NOTE: Never use power tools to tighten the front axle wheel end nut.

NOTE: Apply the brake to keep the halfshaft from rotating.

86. Install the new halfshaft nut.

- Tighten to 350 Nm (258 lb-ft).

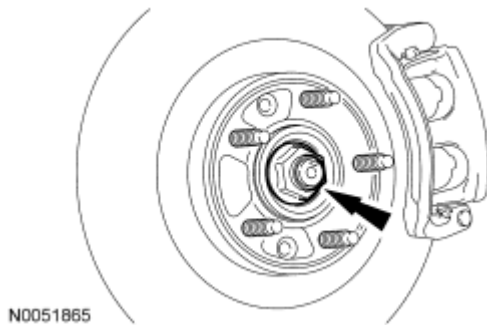


Fig. 863: Identifying RH Halfshaft Nut
Courtesy of FORD MOTOR CO.

87. Install the 2 engine roll restrictor-to-transaxle bolts.

- Tighten to 103 Nm (76 lb-ft).

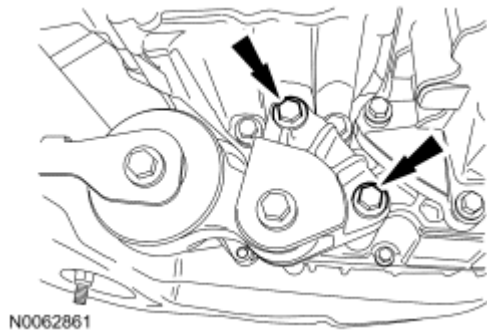


Fig. 864: Identifying Bolts
Courtesy of FORD MOTOR CO.

88. Using a new O-ring seal, install the PSP tube onto the steering gear, rotate the clamp plate and install the bolt.

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

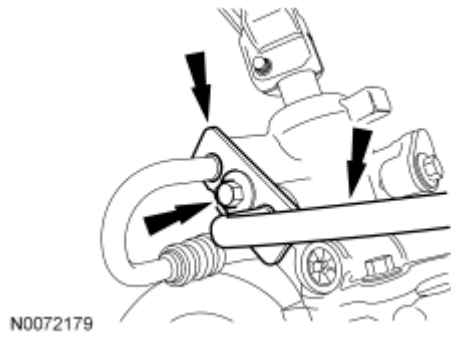


Fig. 865: Identifying Bolt, Clamp Plate And PSP Tube
Courtesy of FORD MOTOR CO.

89. Install the PSP tube bracket-to-steering gear bolt.
- Tighten to 10 Nm (89 lb-in).

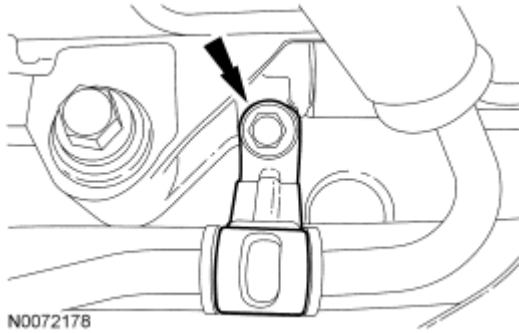


Fig. 866: Identifying PSP Bracket-To-Steering Gear Bolt
Courtesy of FORD MOTOR CO.

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

90. Install a new engine oil filter.
- Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

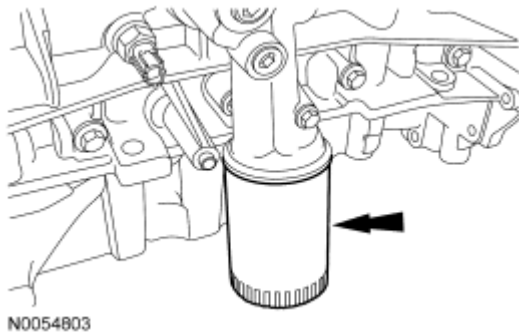


Fig. 867: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

AWD vehicles

91. Line up the index marks on the rear driveshaft to the index marks on the PTU flange made during removal and install the 4 bolts (3 shown in illustration).
- Tighten to 70 Nm (52 lb-ft).

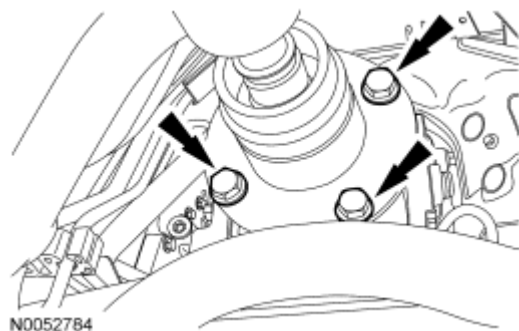


Fig. 868: Identifying Drive Shaft Bolts
Courtesy of FORD MOTOR CO.

All camshafts

92. Using a new gasket, install the Y-pipe and install the 2 new nuts.
- Tighten to 40 Nm (30 lb-ft).
 - Attach the exhaust hanger.

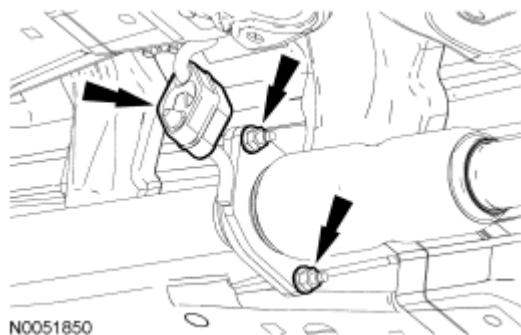


Fig. 869: Identifying Nuts And Exhaust Hanger
Courtesy of FORD MOTOR CO.

93. Install the Y-pipe assembly and 4 new nuts.
- Tighten to 40 Nm (30 lb-ft).

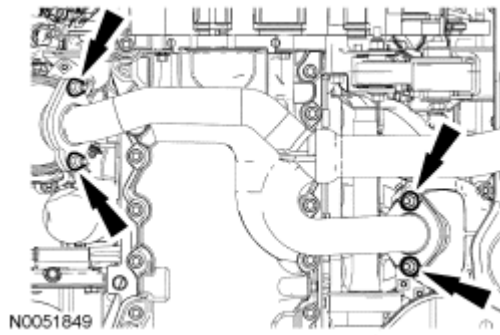


Fig. 870: Identifying Nuts
Courtesy of FORD MOTOR CO.

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

NOTE: Align the index marks made during removal.

94. Install the steering intermediate shaft onto the steering gear and install a new bolt.
 - Tighten to 23 Nm (17 lb-ft).

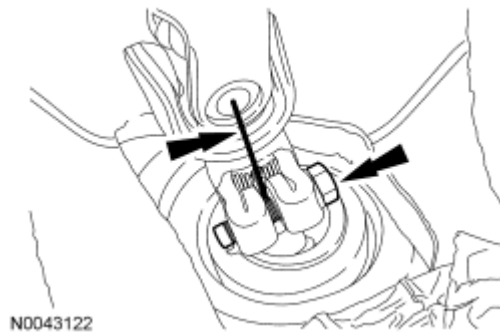


Fig. 871: Locating Steering Column Shaft Index Mark And Bolt
Courtesy of FORD MOTOR CO.

95. Connect the transaxle control electrical connector.

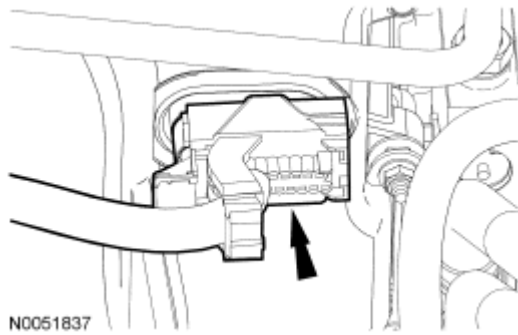


Fig. 872: Identifying Connector
Courtesy of FORD MOTOR CO.

96. Attach the transaxle control wire harness to the transaxle stud bolt.

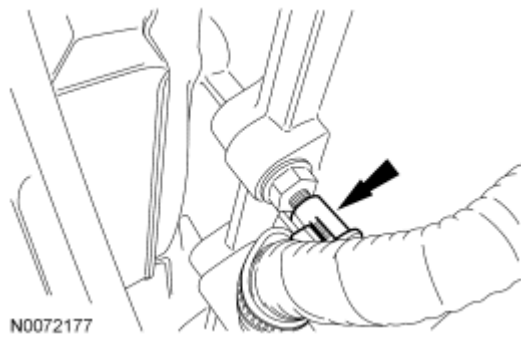


Fig. 873: Identifying Transaxle Control Wire Harness Retainer
Courtesy of FORD MOTOR CO.

97. Connect the hose to the power steering reservoir.

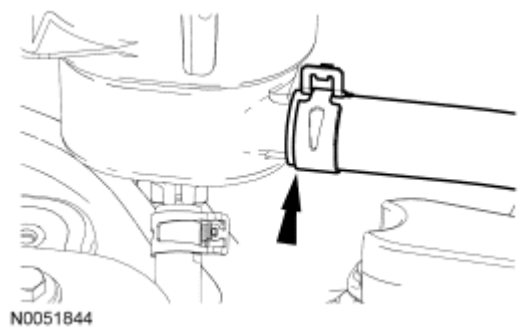


Fig. 874: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

98. Install the oil level indicator.

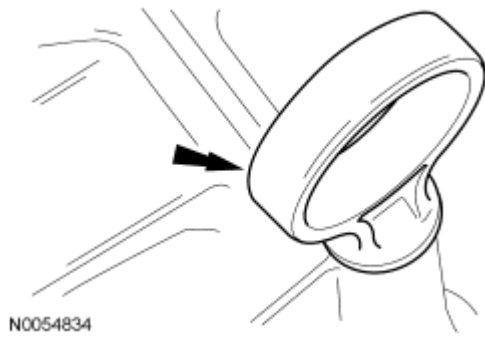


Fig. 875: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

99. Install the ground cable and bolt.
- Tighten to 12 Nm (9 lb-ft).

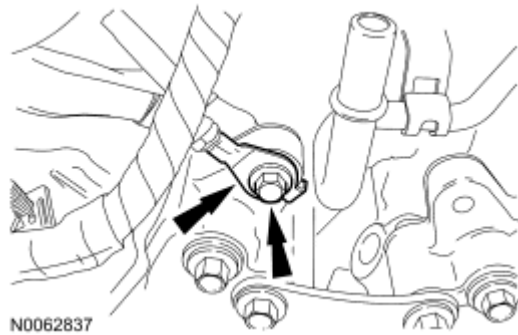


Fig. 876: Identifying Bolt And Ground Cable
Courtesy of FORD MOTOR CO.

100. Attach the wire harness retainer to the RH valve cover stud bolt.

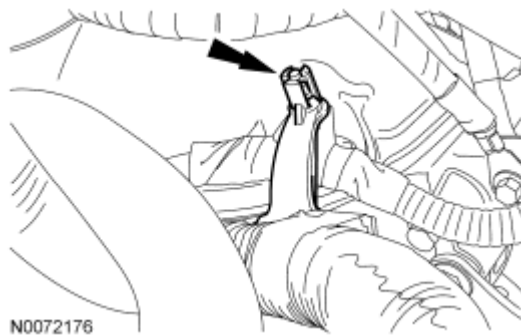


Fig. 877: Identifying Wire Harness Retainer
Courtesy of FORD MOTOR CO.

101. Connect the 2 engine wiring harness electrical connectors.
- Attach the electrical connector to the LH valve cover.

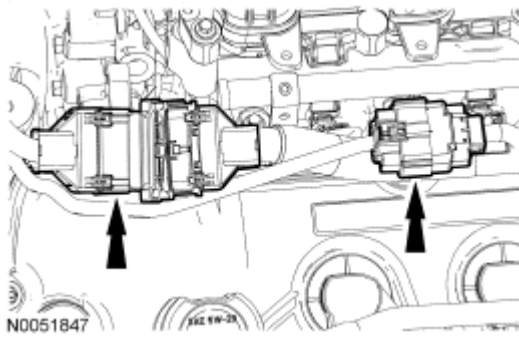


Fig. 878: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

102. Connect the fuel supply tube to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

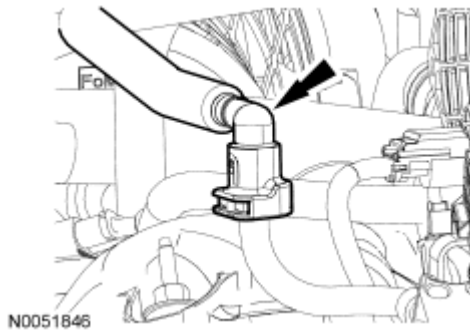


Fig. 879: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

103. Using a new O-ring seal, install the A/C tube and the nut.
- Tighten to 15 Nm (11 lb-ft).

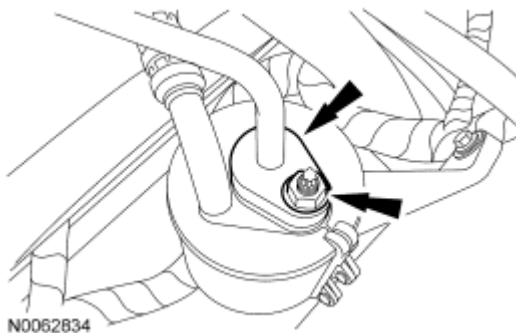


Fig. 880: Identifying Nut
Courtesy of FORD MOTOR CO.

104. Using new O-ring seals, connect the A/C tubes and install the 2 nuts.
- Tighten to 15 Nm (11 lb-ft).

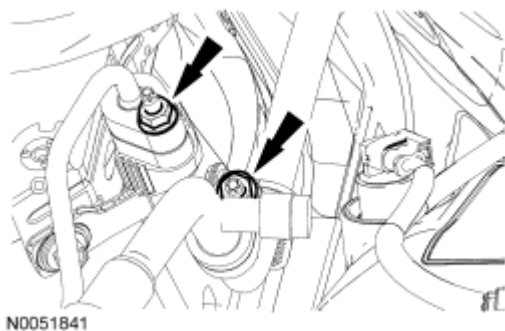


Fig. 881: Identifying Nuts
Courtesy of FORD MOTOR CO.

105. Using a new O-ring seal, connect the upper A/C tube to the condenser and install the nut and connect the A/C pressure switch electrical connector.
 - Tighten to 15 Nm (11 lb-ft).

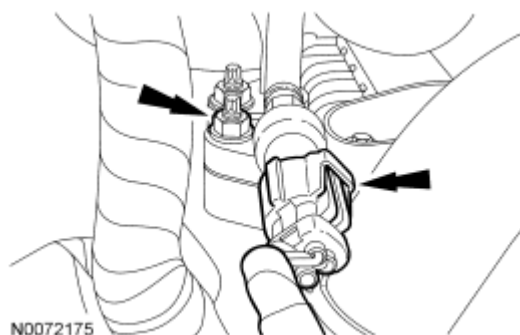


Fig. 882: Identifying A/C Pressure Switch And Nut
Courtesy of FORD MOTOR CO.

106. If equipped, attach the block heater wiring harness retainer to the radiator and power steering tube.
107. Connect the transaxle control cable to the shift cable bracket.

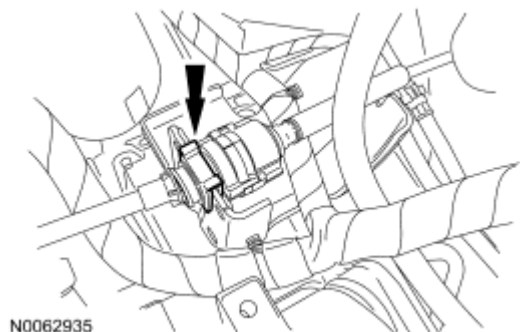


Fig. 883: Identifying Shift Cable Bracket
Courtesy of FORD MOTOR CO.

108. Connect the transaxle control cable to the control lever.

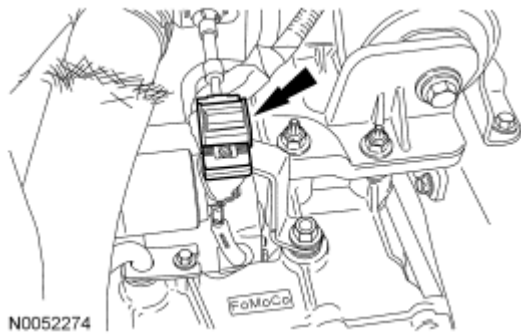


Fig. 884: Locating Selector Lever Cable End From Manual Lever
Courtesy of FORD MOTOR CO.

109. If equipped, connect the heater hose to the auxiliary coolant pump.

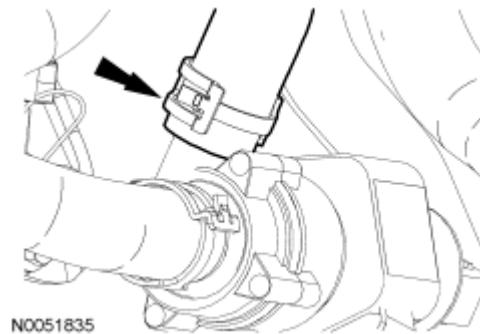


Fig. 885: Identifying Heater Hose
Courtesy of FORD MOTOR CO.

110. Connect the upper radiator hose, lower radiator hose and heater hose to the thermostat housing.

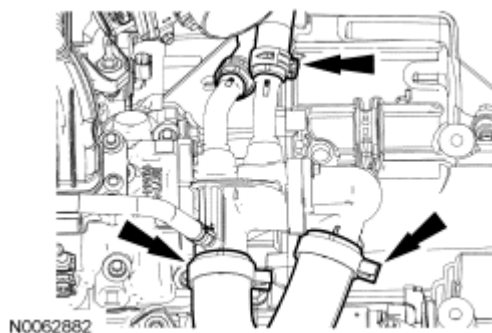


Fig. 886: Identifying Upper Radiator Hose, Lower Radiator Hose And Heater Hose
Courtesy of FORD MOTOR CO.

111. Connect the vacuum hose and the evaporative emissions (EVAP) tube to the upper intake manifold.

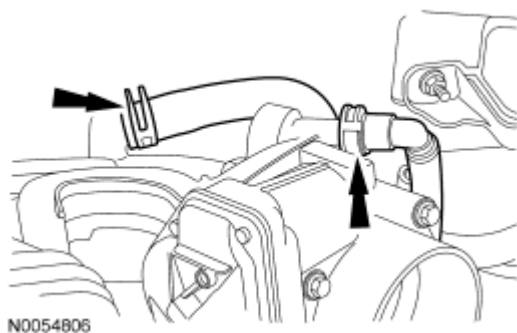


Fig. 887: Locating Vacuum Hose & Evaporative Emissions (EVAP) Tube From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

112. Attach the EVAP tube pin-type retainer to the upper intake manifold.

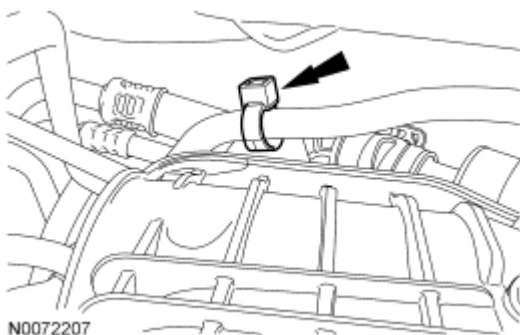


Fig. 888: Identifying pin-Type Retainer
Courtesy of FORD MOTOR CO.

113. Connect the ground cable to the negative battery terminal and install the nut.
- Tighten to 6 Nm (53 lb-in).

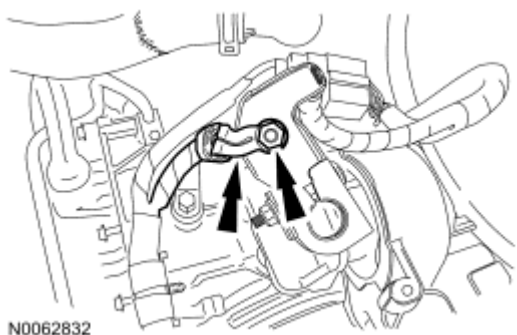


Fig. 889: Identifying Nut And Ground Cable
Courtesy of FORD MOTOR CO.

114. Connect the power feed wire to the positive battery terminal and install the nut.
- Tighten to 6 Nm (53 lb-in).

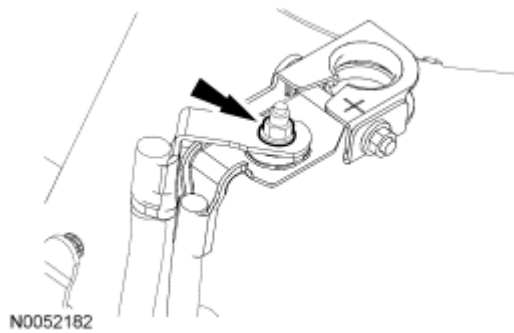


Fig. 890: Identifying Nut
Courtesy of FORD MOTOR CO.

115. Connect the engine wiring harness electrical connector.

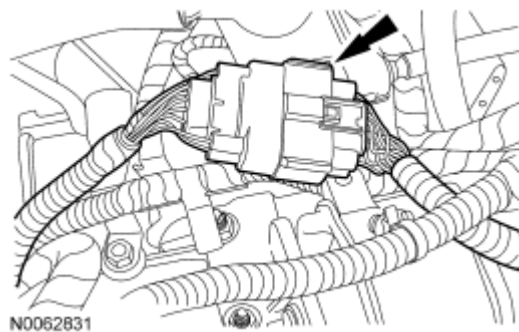


Fig. 891: Identifying Connector
Courtesy of FORD MOTOR CO.

116. Install the battery tray and bracket and the nut and bolt.
- Tighten to 9 Nm (80 lb-in).

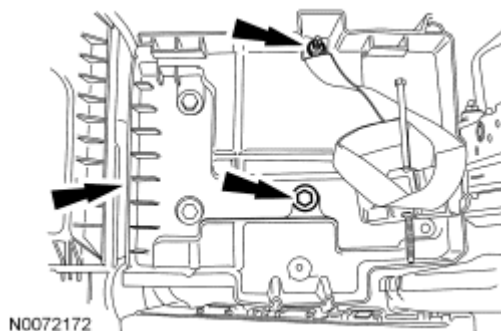


Fig. 892: Identifying Bolt, Nut And Bracket
Courtesy of FORD MOTOR CO.

117. Install the 2 lower battery tray bracket bolts.
- Tighten to 9 Nm (80 lb-in).

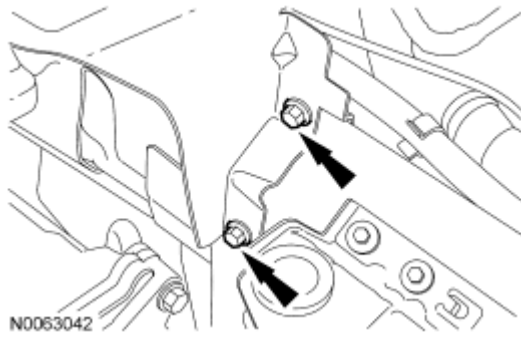


Fig. 893: Identifying Bolts
Courtesy of FORD MOTOR CO.

118. Attach the 2 pin-type wiring harness fasteners to the front of the battery tray.

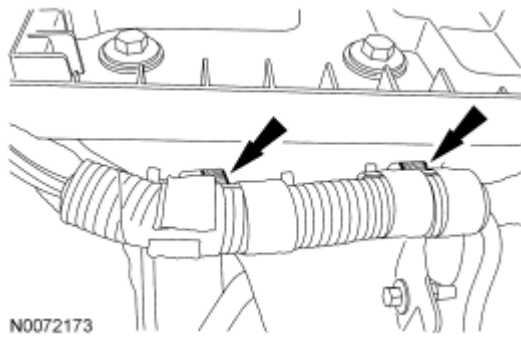


Fig. 894: Identifying Fasteners
Courtesy of FORD MOTOR CO.

119. Attach the 4 pin-type wiring harness fasteners to the side of the battery tray.

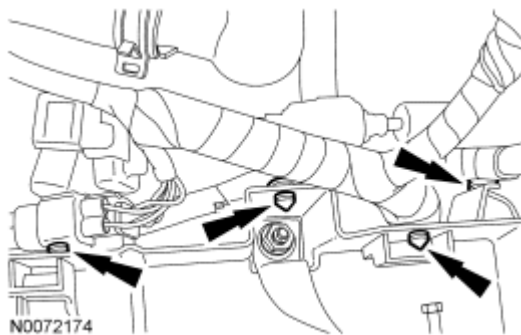


Fig. 895: Identifying Fasteners
Courtesy of FORD MOTOR CO.

120. Install the battery. For additional information, refer to **BATTERY, MOUNTING AND CABLES** article.
121. Install the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION AND FILTERING** article.
122. Install the degas bottle. For additional information, refer to **ENGINE COOLING** article.

123. Connect the power steering cooler tube.

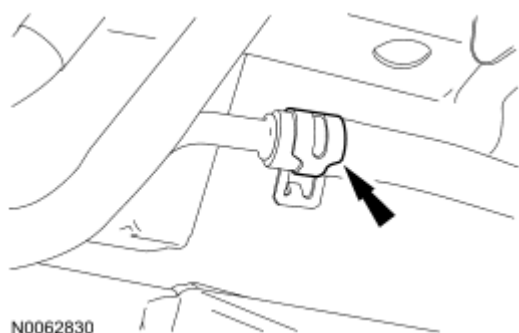


Fig. 896: Identifying Power Steering Cooler Tube
Courtesy of FORD MOTOR CO.

124. Install the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
125. Install the front wheels and tires. For additional information, refer to **WHEELS AND TIRES** article.

CAUTION: Do not expose the Motorcraft High Performance Engine RTV Silicone to engine oil for at least 90 minutes after installing the engine front cover. Failure to follow this instruction may cause oil leakage.

126. Fill the engine with clean engine oil.
127. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.
128. Fill the power steering system. For additional information, refer to **STEERING SYSTEM - GENERAL INFORMATION** article.
129. Recharge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS** article.

VALVE TAPPETS

MATERIAL

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

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

NOTE: The valve tappets must be installed in their original positions.

NOTE: Coat the valve tappets with clean engine oil prior to installation.

1. Install the valve tappets.

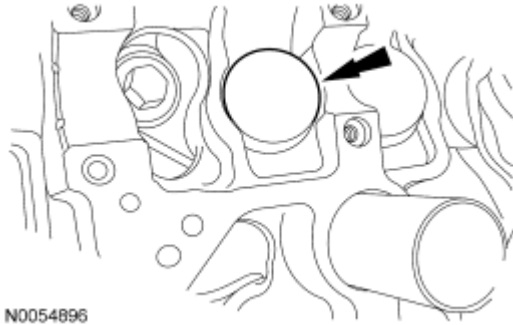


Fig. 897: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

2. Depending on the valve tappets being serviced, install the LH and/or the RH camshafts. For additional information, refer to Camshaft.

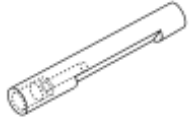
VALVE SPRING, RETAINER AND SEAL

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
ST1981-#	Compressor, Valve Spring	303-300 (T87C-6565-A)
ST1907-A	Compressor, Valve Spring	303-350 (T89P-6565-A)
ST3028-A	Compressor, Valve Spring	303-1249
	Installer, Valve Stem Oil Seal	303-470 (T94P-6510-CH)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X



ST1906-A

MATERIAL

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

NOTE: Lubricate the valve stem seal with clean engine oil prior to installation.

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

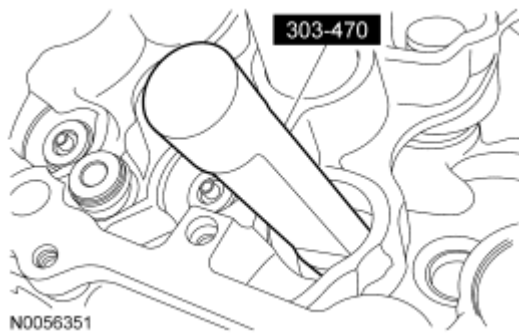


Fig. 898: Installing New Valve Stem Seal Using Special Tool (303-470)
Courtesy of FORD MOTOR CO.

2. Using the Valve Spring Compressors, install the valve spring, retainer and key.

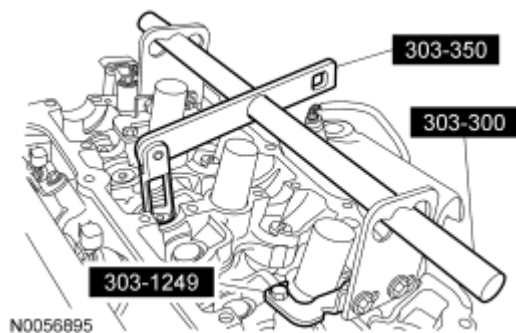


Fig. 899: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

3. Install the valve tappets. For additional information, refer to **Valve Tappets**.

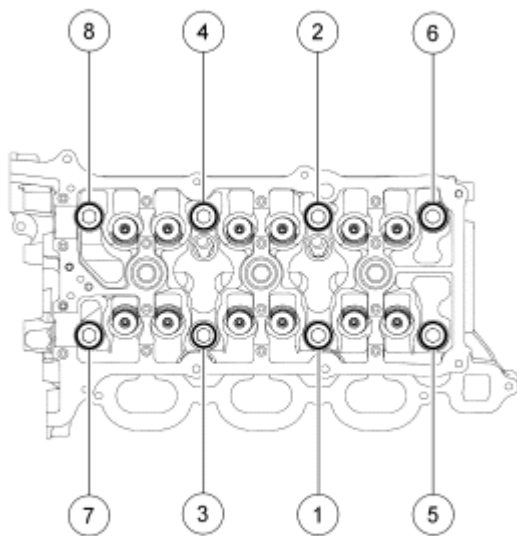
CYLINDER HEAD - RH

MATERIAL

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

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

1. Install a new gasket, the RH cylinder head and 8 new bolts. Tighten in the sequence shown in illustration in 5 stages:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 35 Nm (26 lb-ft).
 - Stage 3: Tighten 90 degrees.
 - Stage 4: Tighten 90 degrees.
 - Stage 5: Tighten 90 degrees.



N0054884

Fig. 900: Installing RH Cylinder Head Bolts In Sequence
Courtesy of FORD MOTOR CO.

2. Install the bolt.
 - Tighten to 10 Nm (89 lb-in).

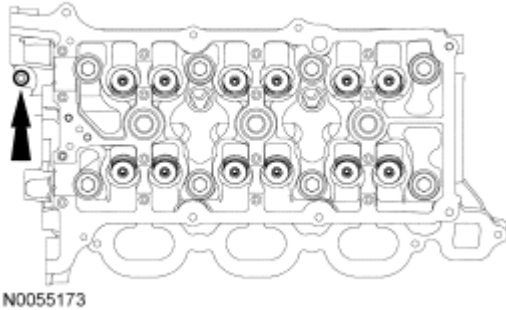


Fig. 901: Identifying M6 Bolt
Courtesy of FORD MOTOR CO.

NOTE: The valve tappets must be installed in their original positions.

NOTE: Coat the valve tappets with clean engine oil prior to installation.

3. Install the valve tappets.

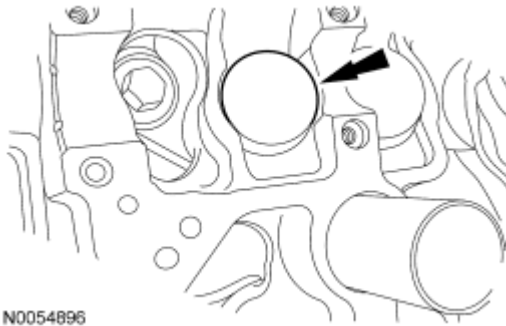


Fig. 902: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

4. Install and connect the cylinder head temperature (CHT) sensor jumper harness.

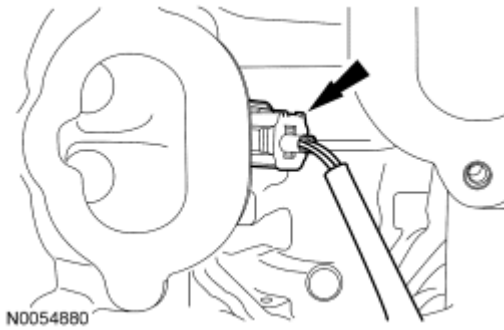


Fig. 903: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

5. Using new gaskets, install the lower intake manifold and the 10 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

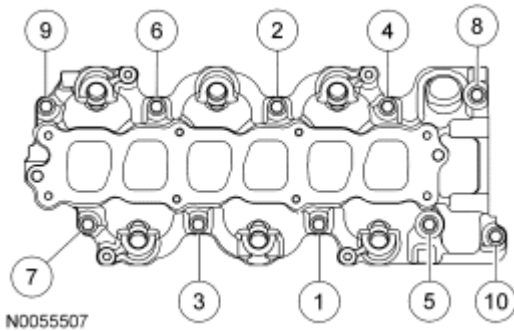


Fig. 904: Installing Lower Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

6. Using a new gasket and O-ring seal, install the thermostat housing and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

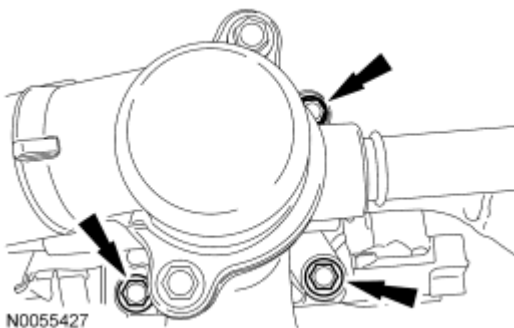


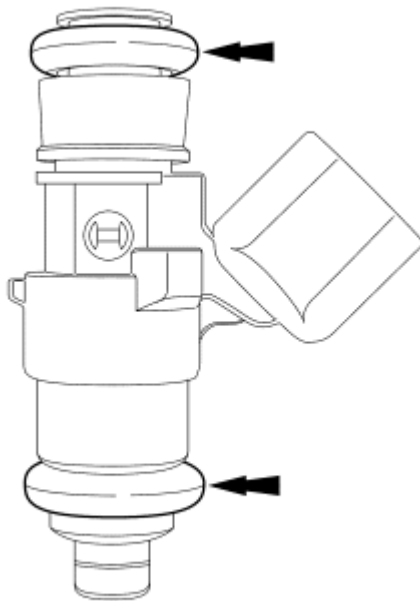
Fig. 905: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

NOTE: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings may cause the fuel system to leak. Do not reuse the O-

ring seals.

NOTE: **The upper and lower O-ring seals are not interchangeable.**

7. Install new fuel injector O-ring seals.
 - Remove the retaining clips and separate the fuel injectors from the fuel rail.
 - Remove and discard the O-ring seals.
 - Install new O-ring seals and lubricate with clean engine oil.
 - Install the fuel injectors and the retaining clips onto the fuel rail.



N0055508

Fig. 906: Identifying Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

8. Install the fuel rail and injectors as an assembly and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).

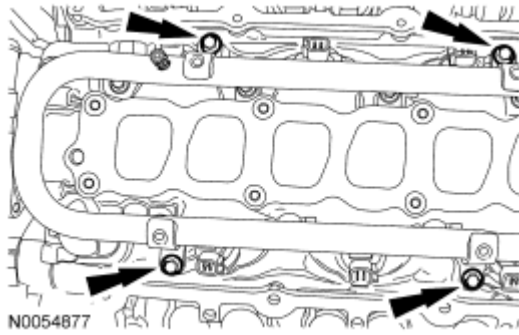


Fig. 907: Locating Fuel Rail And Injectors & Bolts
Courtesy of FORD MOTOR CO.

9. Install the coolant bypass hose to the thermostat housing.

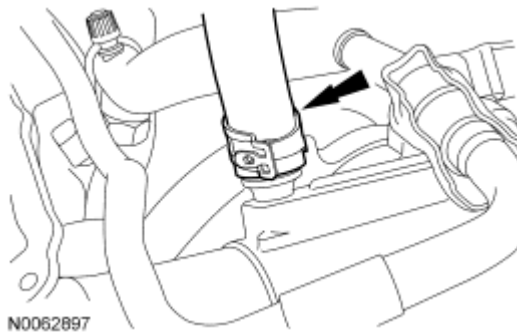


Fig. 908: Identifying Coolant By-Pass Hose
Courtesy of FORD MOTOR CO.

NOTE: **Align the bracket with the index mark made during removal.**

10. Install the upper intake manifold short support bracket and the bolt.
- Tighten to 10 Nm (89 lb-in).

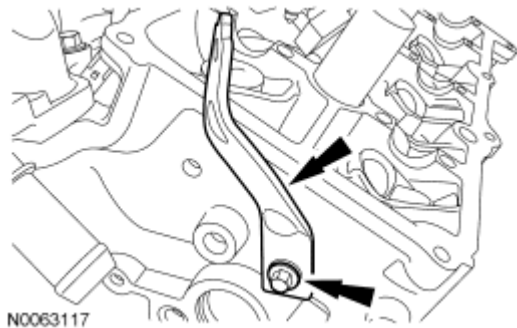


Fig. 909: Identifying Bolt And Support Bracket
Courtesy of FORD MOTOR CO.

NOTE: **Align the bracket with the index mark made during removal.**

11. If equipped, install the upper intake manifold long support bracket and the bolt.
 - Tighten to 10 Nm (89 lb-in).

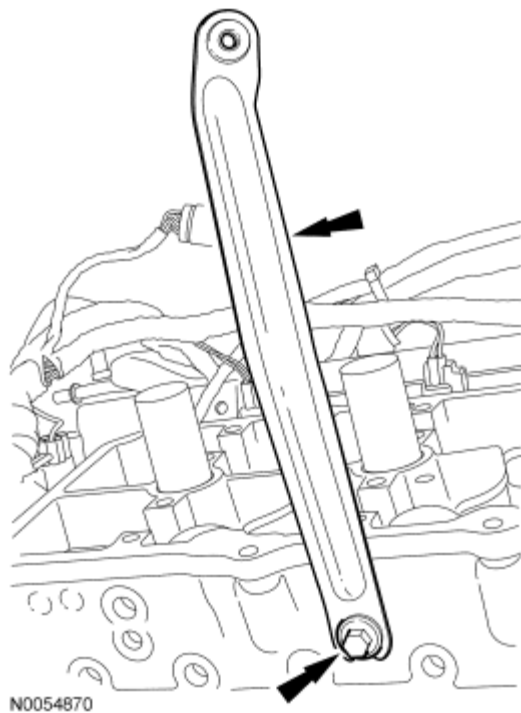


Fig. 910: Locating Upper Intake Manifold Bracket & Bolt
Courtesy of FORD MOTOR CO.

12. Install the engine lifting eye and the 2 bolts.
 - Tighten to 24 Nm (18 lb-ft).

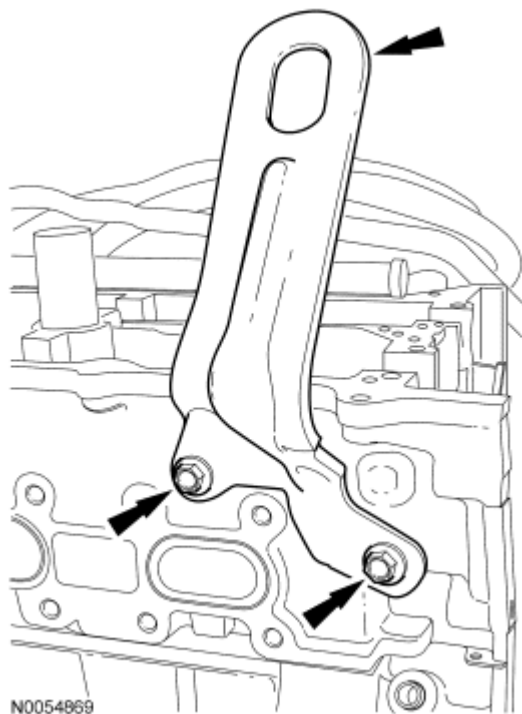


Fig. 911: Locating Engine Lifting Eye & Bolts
Courtesy of FORD MOTOR CO.

13. Install the RH secondary timing chain tensioner and the 2 bolts.
- Tighten to 10 Nm (89 lb-in).

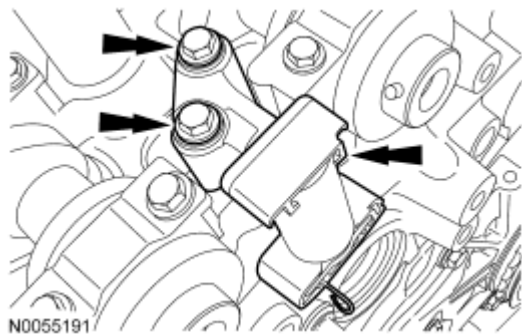


Fig. 912: Locating RH Secondary Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

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

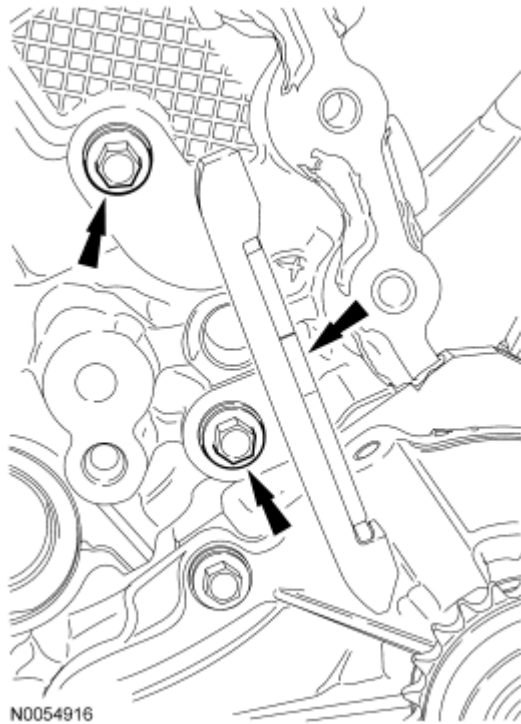


Fig. 913: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

15. Install 6 new RH exhaust manifold studs.
 - Tighten to 12 Nm (9 lb-ft).

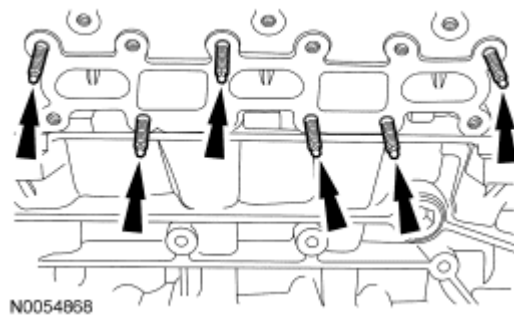


Fig. 914: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

NOTE: Failure to tighten the exhaust manifold nuts to specification a second time will cause the exhaust manifold to develop an exhaust leak.

16. Using a new gasket, install the RH exhaust manifold and 6 new nuts. Tighten in 2 stages in the sequence shown in illustration:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 20 Nm (15 lb-ft).

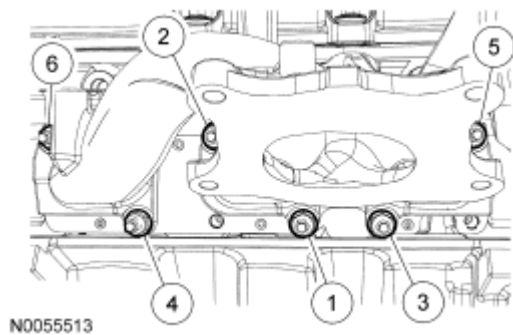


Fig. 915: Installing RH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

17. Install the RH exhaust manifold heat shield and the 3 bolts.
 - Tighten to 14 Nm (10 lb-ft).

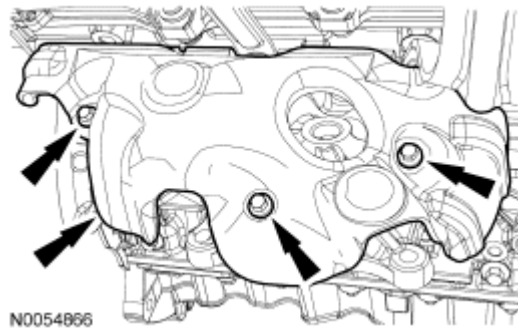


Fig. 916: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

18. Install the RH cylinder block drain plug or, if equipped, the block heater.
 - Tighten to 40 Nm (30 lb-ft).

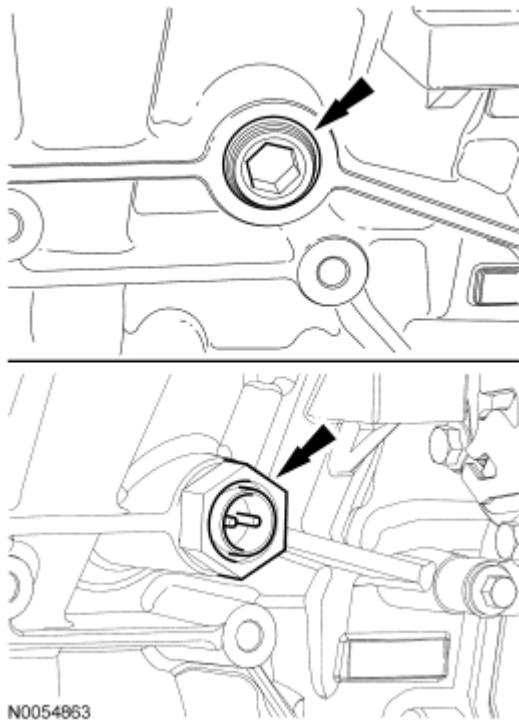


Fig. 917: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

19. If equipped, install the block heater wiring harness onto the engine.
- Connect the block heater electrical connector and install the heat shield.

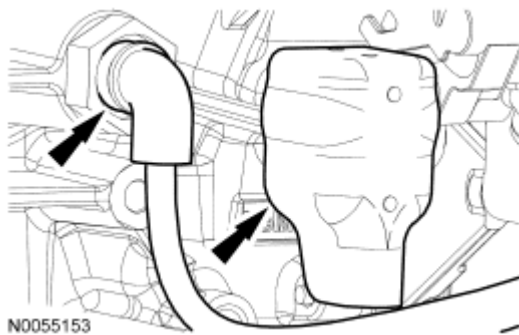


Fig. 918: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

20. Using a new gasket, install the RH catalytic converter and 4 new nuts.
- Tighten to 40 Nm (30 lb-ft).

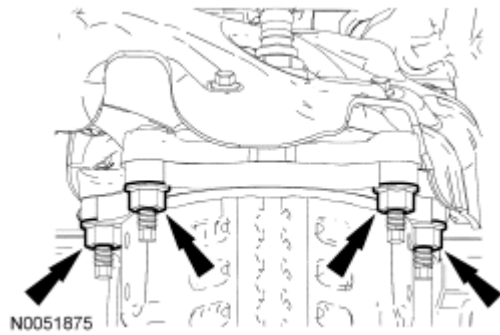


Fig. 919: Identifying Nuts
Courtesy of FORD MOTOR CO.

21. Install the LH cylinder block drain plug.
 - Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

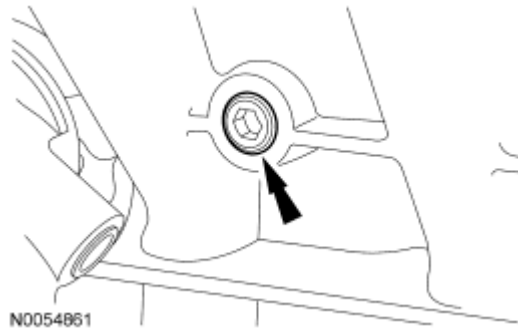


Fig. 920: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

22. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown in illustration).
 - Tighten to 40 Nm (30 lb-ft).

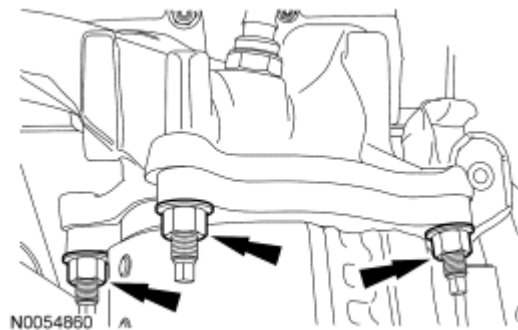


Fig. 921: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

23. Install the 2 LH catalytic converter bracket bolts.
 - Tighten to 20 Nm (15 lb-ft).

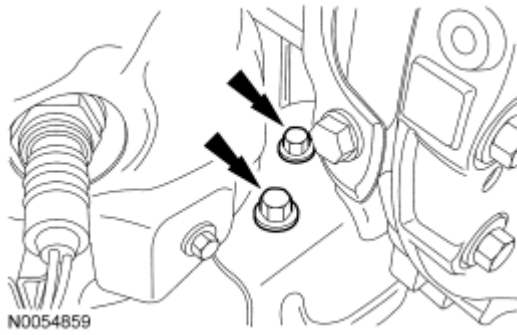


Fig. 922: Locating LH Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

24. Connect the LH catalyst monitor sensor electrical connector.

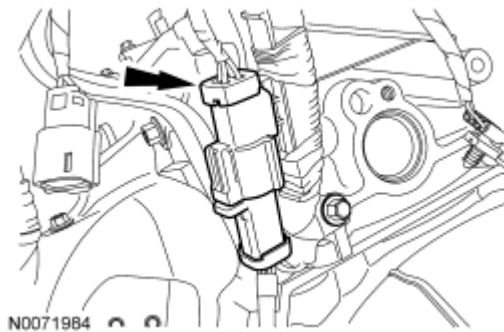


Fig. 923: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

25. Connect the CHT sensor electrical connector.

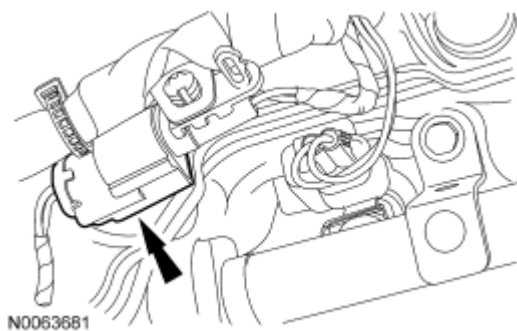


Fig. 924: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

26. Connect the 6 fuel injector electrical connectors (3 shown in illustration).

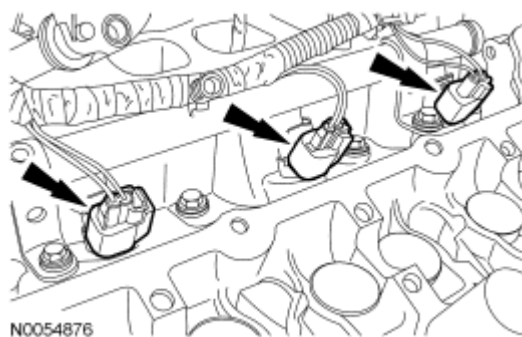


Fig. 925: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

27. Install the ground wire and the bolt.
 - Tighten to 10 Nm (89 lb-in).

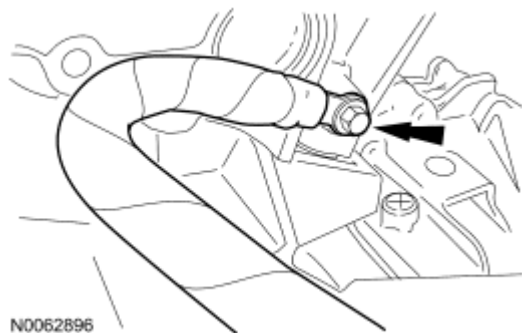


Fig. 926: Identifying Bolt
Courtesy of FORD MOTOR CO.

28. Install the Power Steering Pressure (PSP) tube bracket and the bolt to the RH cylinder head.
 - Tighten to 10 Nm (89 lb-in).

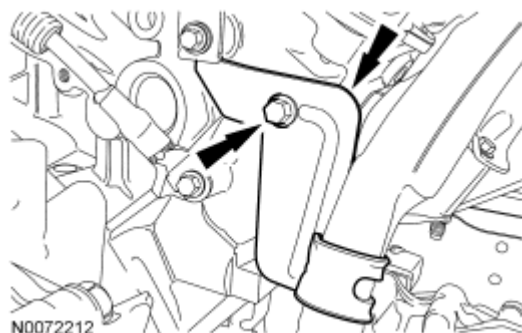


Fig. 927: Identifying Bolt
Courtesy of FORD MOTOR CO.

29. Install the RH camshaft position (CMP) sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

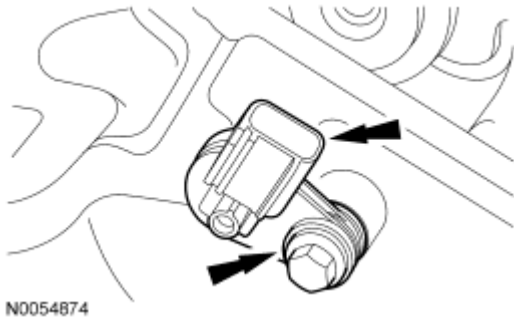


Fig. 928: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

30. Connect the RH CMP sensor electrical connector.

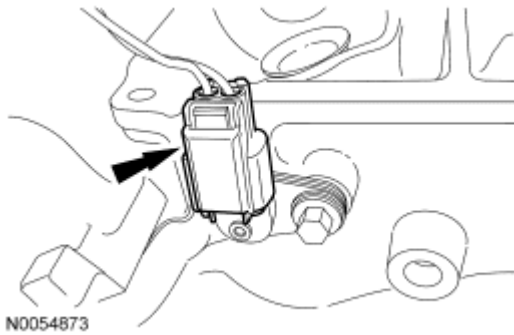


Fig. 929: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

31. Connect the RH heated oxygen sensor (HO2S) electrical connector.

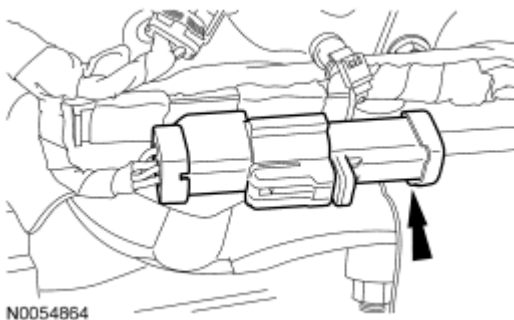


Fig. 930: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

32. Install the RH camshafts. For additional information, refer to **Camshaft**.

CYLINDER HEAD - LH

MATERIAL

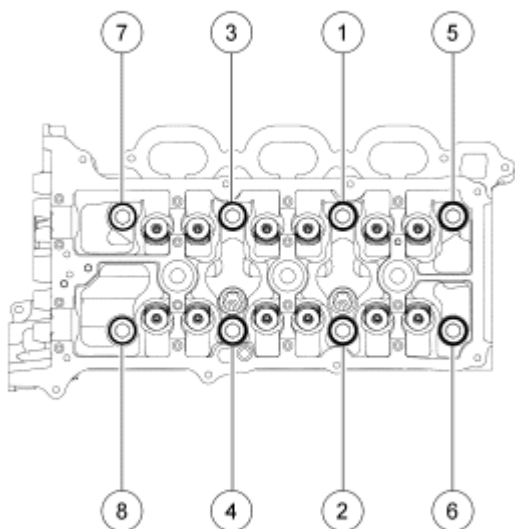
2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

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

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

1. Install a new gasket, the LH cylinder head and 8 new bolts. Tighten in the sequence shown in illustration in 5 stages:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 35 Nm (26 lb-ft).
 - Stage 3: Tighten 90 degrees.
 - Stage 4: Tighten 90 degrees.
 - Stage 5: Tighten 90 degrees.

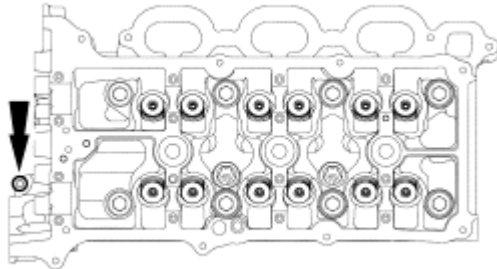


N0054898

Fig. 931: Installing LH Cylinder Head Bolts In Sequence
Courtesy of FORD MOTOR CO.

2. Install the bolt.

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



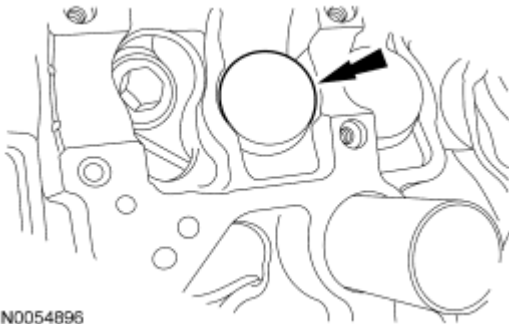
N0055174

Fig. 932: Identifying M6 Bolt
Courtesy of FORD MOTOR CO.

NOTE: The valve tappets must be installed in their original positions.

NOTE: Coat the valve tappets with clean engine oil prior to installation.

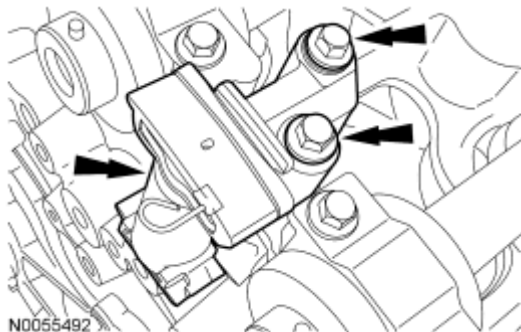
3. Install the valve tappets.



N0054896

Fig. 933: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

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



N0055492

Fig. 934: Locating LH Secondary Timing Chain Tensioner & Bolt
Courtesy of FORD MOTOR CO.

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

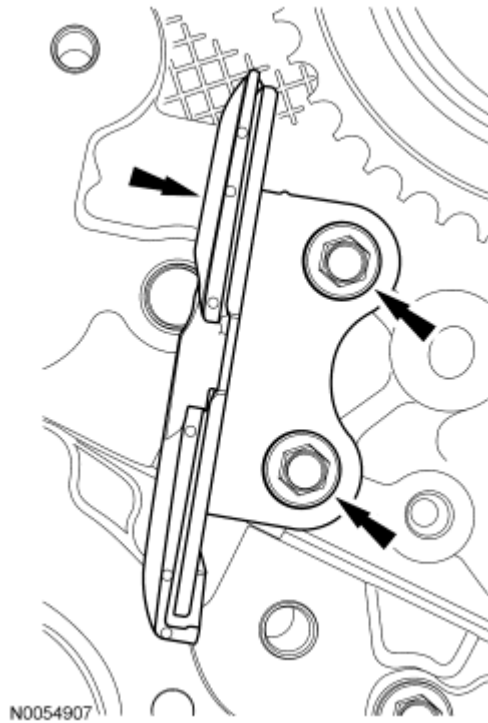


Fig. 935: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

6. Using new gaskets, install the lower intake manifold and the 10 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

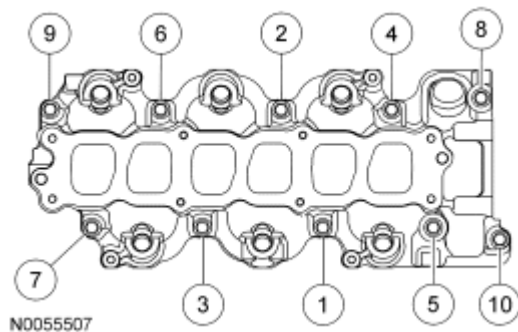


Fig. 936: Installing Lower Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

7. Using a new gasket and O-ring seal, install the thermostat housing and the 3 bolts.

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

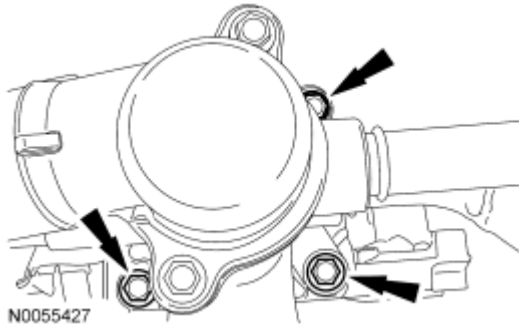
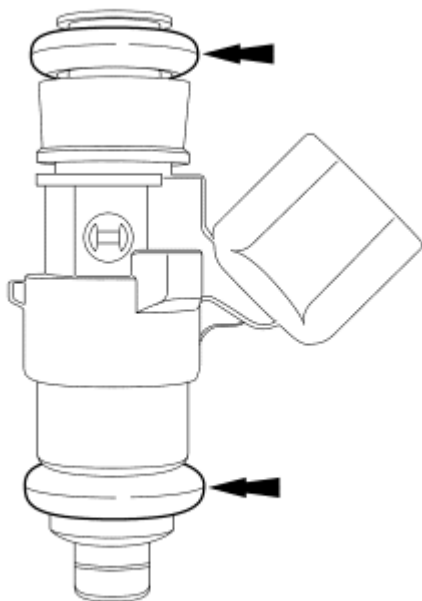


Fig. 937: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings may cause the fuel system to leak. Do not reuse the O-ring seals.

NOTE: The upper and lower O-ring seals are not interchangeable.

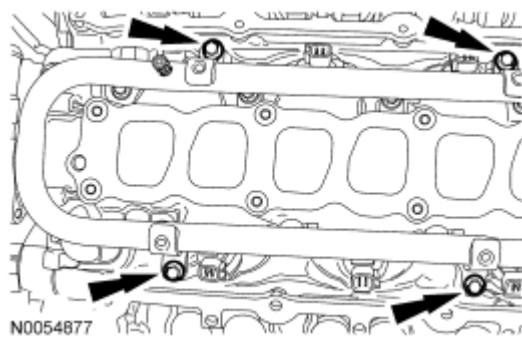
8. Install new fuel injector O-ring seals.
 - Remove the retaining clips and separate the fuel injectors from the fuel rail.
 - Remove and discard the O-ring seals.
 - Install new O-ring seals and lubricate with clean engine oil.
 - Install the fuel injectors and the retaining clips onto the fuel rail.



N0055508

Fig. 938: Identifying Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

9. Install the fuel rail and injectors as an assembly and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0054877

Fig. 939: Locating Fuel Rail And Injectors & Bolts
Courtesy of FORD MOTOR CO.

10. Install the coolant bypass hose to the thermostat housing.

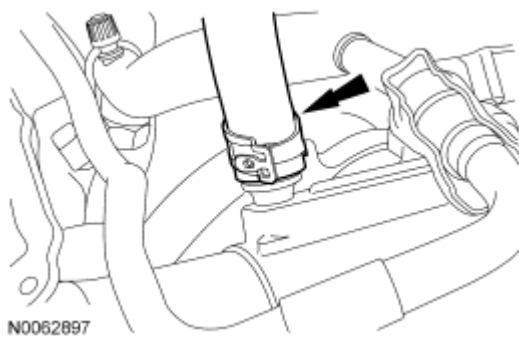


Fig. 940: Identifying Coolant By-Pass Hose
Courtesy of FORD MOTOR CO.

11. Install the RH cylinder block drain plug or, if equipped, the block heater.
 - Tighten to 40 Nm (30 lb-ft).

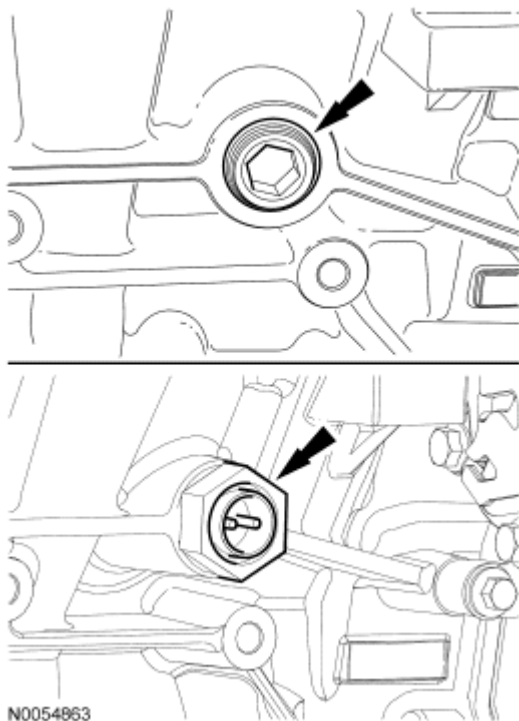


Fig. 941: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

12. If equipped, install the block heater wiring harness onto the engine.
 - Connect the block heater electrical connector and install the heat shield.

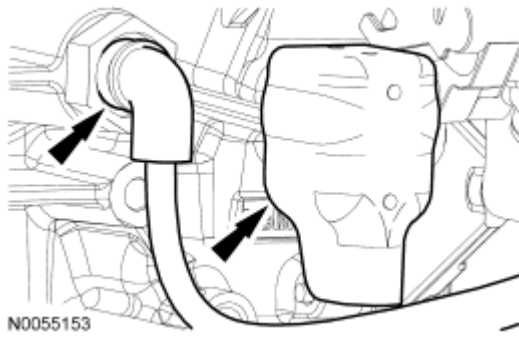


Fig. 942: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

13. Using a new gasket, install the RH catalytic converter and 4 new nuts.
 - Tighten to 40 Nm (30 lb-ft).

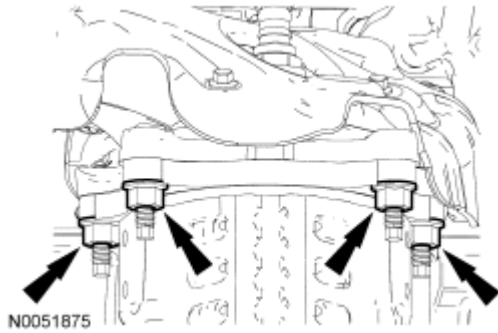


Fig. 943: Identifying Nuts
Courtesy of FORD MOTOR CO.

14. Install the LH cylinder block drain plug.
 - Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

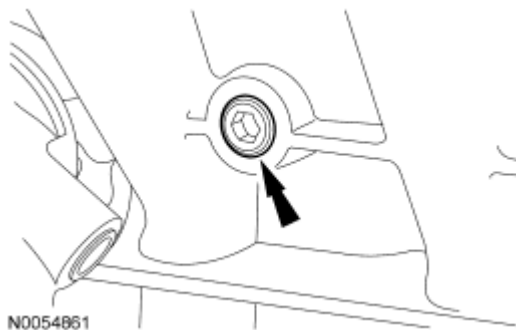


Fig. 944: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

15. Install 6 new LH exhaust manifold studs.
 - Tighten to 12 Nm (9 lb-ft).

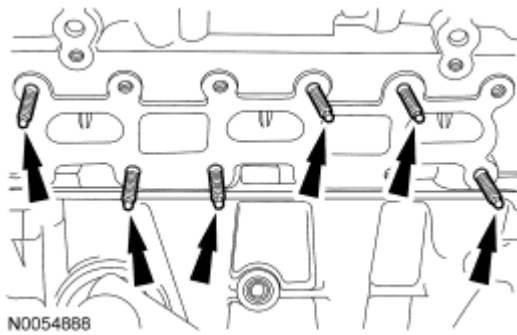


Fig. 945: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

CAUTION: Failure to tighten the exhaust manifold nuts to specification a second time will cause the exhaust manifold to develop an exhaust leak.

16. Using a new gasket, install the LH exhaust manifold and 6 new nuts. Tighten in 2 stages in the sequence shown in illustration:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 20 Nm (15 lb-ft).

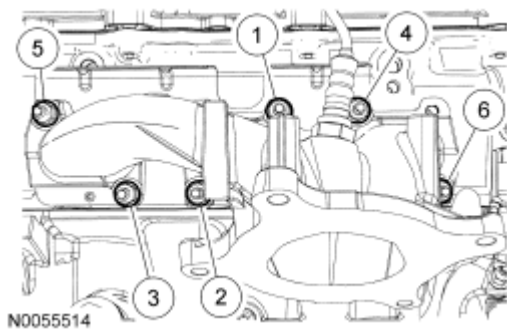


Fig. 946: Installing LH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

17. Install the LH exhaust manifold heat shield and the 3 bolts.
 - Tighten to 14 Nm (10 lb-ft).

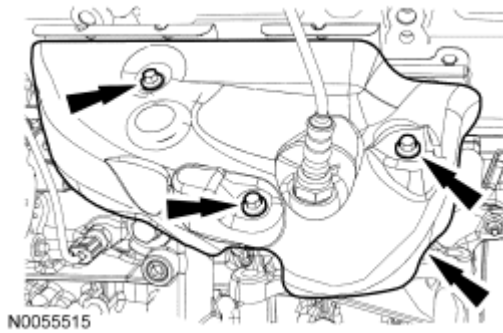


Fig. 947: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

18. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown in illustration).
- Tighten to 40 Nm (30 lb-ft).

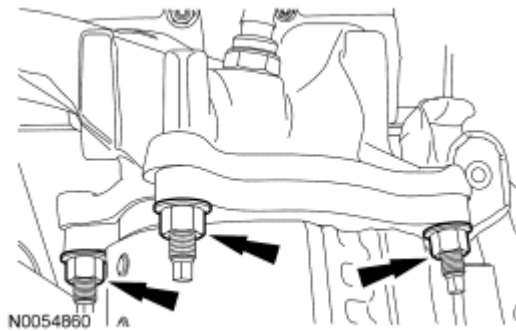


Fig. 948: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

19. Install the LH catalytic converter bracket bolts.
- Tighten to 20 Nm (15 lb-ft).

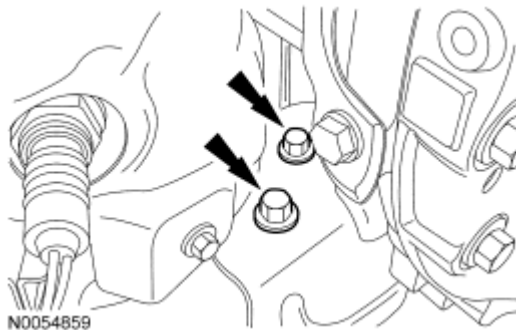


Fig. 949: Locating LH Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

20. Attach the engine oil pressure (EOP) switch wiring harness pin-type retainer.

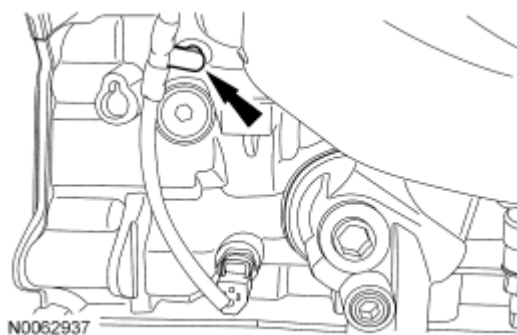


Fig. 950: Identifying Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

21. Install the stud, generator and the nut and bolt.
 - Tighten the stud to 12 Nm (9 lb-ft).
 - Tighten nut and bolt to 48 Nm (35 lb-ft).

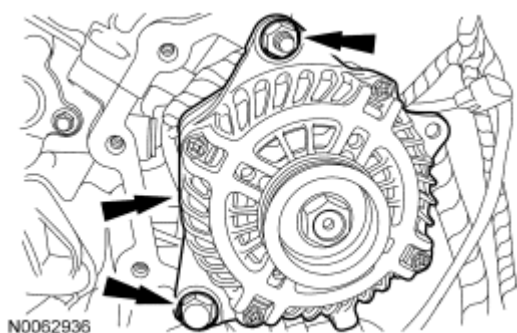


Fig. 951: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

22. Connect the generator electrical connector.

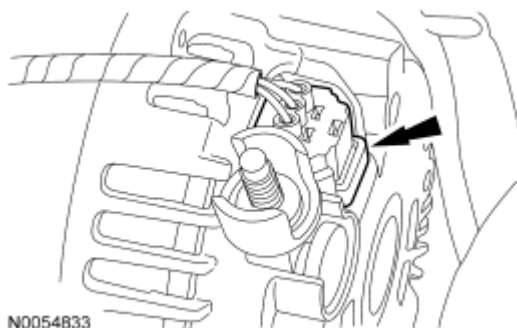


Fig. 952: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

23. Connect the generator B+ cable and install the nut.
 - Tighten to 6 Nm (53 lb-in).

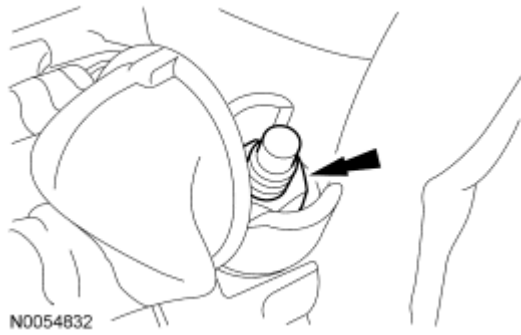


Fig. 953: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

24. Attach the pin-type wire harness retainer to the rear of LH cylinder head.

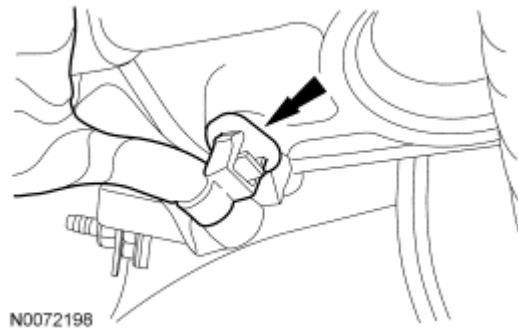


Fig. 954: Identifying Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

25. Connect the LH catalyst monitor sensor electrical connector.

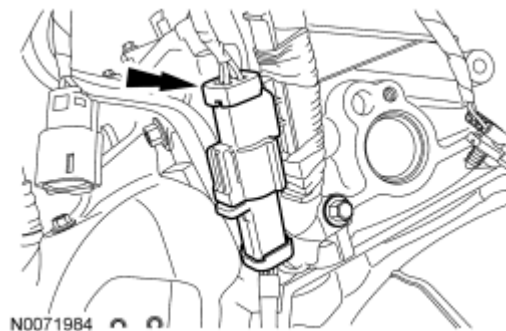


Fig. 955: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

26. Connect the LH heated oxygen sensor (HO2S) electrical connector.

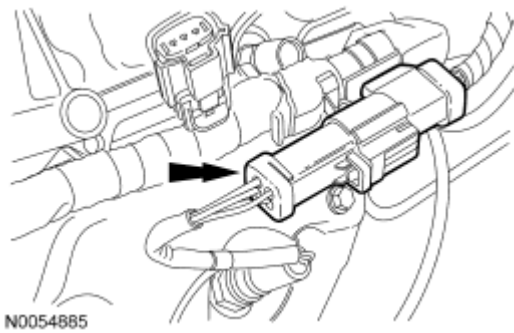


Fig. 956: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

27. Install LH camshaft position (CMP) sensor and the bolt.
- Tighten to 10 Nm (89 lb-in).

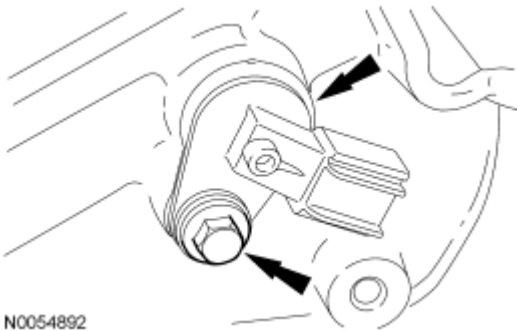


Fig. 957: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

28. Connect the LH CMP sensor electrical connector.

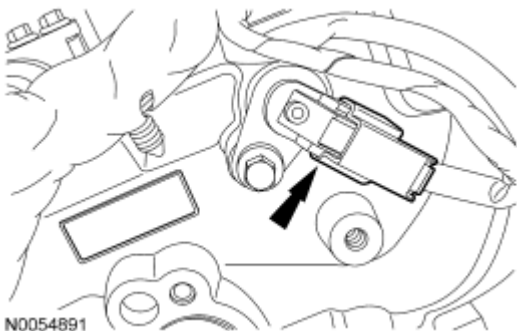


Fig. 958: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

29. Connect the cylinder head temperature (CHT) sensor electrical connector.

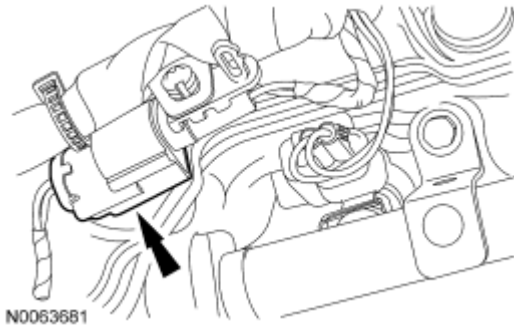


Fig. 959: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

30. Connect the 6 fuel injector electrical connectors (3 shown in illustration).

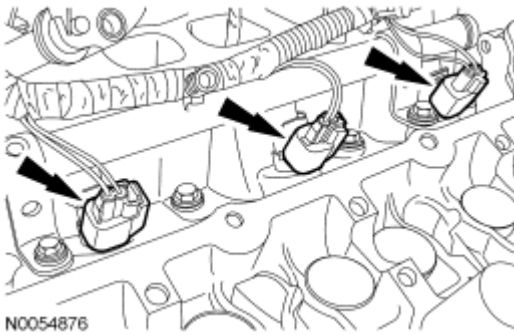


Fig. 960: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

31. Install the LH camshafts. For additional information, refer to **Camshaft**.

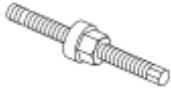
OIL PAN

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
	Alignment Pins	307-399
	Handle	205-153 (T80T-4000-W)

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

 ST1341-A	Heavy Duty Floor Crane	014-00071 or equivalent
 ST2981-A	Installer, Crankshaft Front Seal	303-1251
 ST1287-A	Installer, Crankshaft Vibration Damper	303-102 (T74P-6316-B)
 ST2296-A	Installer, Front Cover Oil Seal	303-335
 ST2983-A	Installer, Seal	303-1247/2
 ST1602-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A)

MATERIAL

Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft Metal Surface Prep ZC-31-A	-

2009 Mercury Sable

2009 ENGINE Engine - 3.5L - Sable, Taurus & Taurus X

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

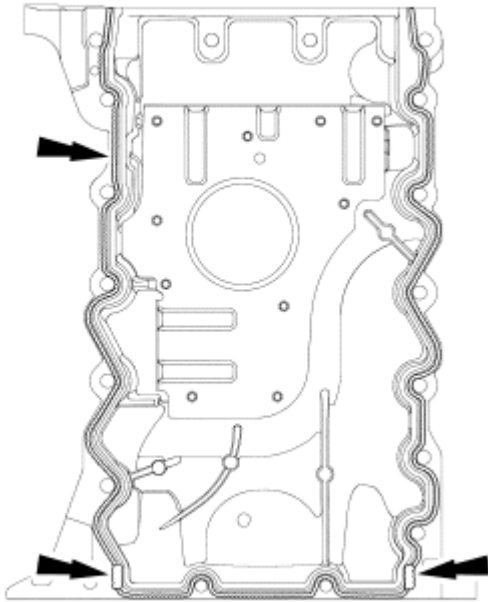
CAUTION: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, may cause engine failure.

All vehicles

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The oil pan and the 4 specified bolts must be installed and the oil pan aligned to the cylinder block and A/C compressor within 4 minutes of sealant application. Final tightening of the oil pan bolts must be carried out within 60 minutes of sealant application.

1. Apply a 3 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the sealing surface of the oil pan.
 - Apply a 5.5 mm (0.21 in) bead of Motorcraft High Performance Engine RTV Silicone to the 2 crankshaft seal retainer plate-to-cylinder block joint areas on the sealing surface of the oil pan.

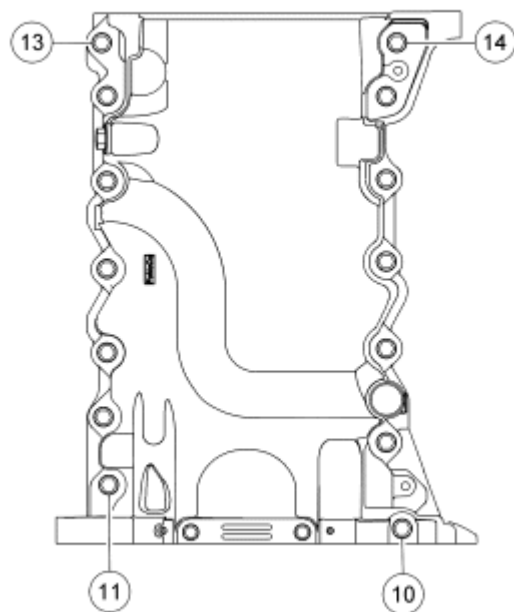


N0055188

Fig. 961: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Crankshaft Seal Retainer Plate-To-Cylinder Block
Courtesy of FORD MOTOR CO.

NOTE: The oil pan and the 4 specified bolts must be installed within 4 minutes of the start of sealant application.

2. Install the oil pan and bolts 10, 11, 13 and 14.
 - Tighten in the sequence shown in illustration to 3 Nm (27 lb-in).
 - Loosen the bolts 180 degrees.



N0069773

Fig. 962: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence
Courtesy of FORD MOTOR CO.

3. Align the oil pan to the cylinder block and A/C compressor.
 - Position the oil pan so the mounting boss is against the A/C compressor and using a straightedge, align the oil pan flush with the rear of the cylinder block at the 2 areas shown in illustration.

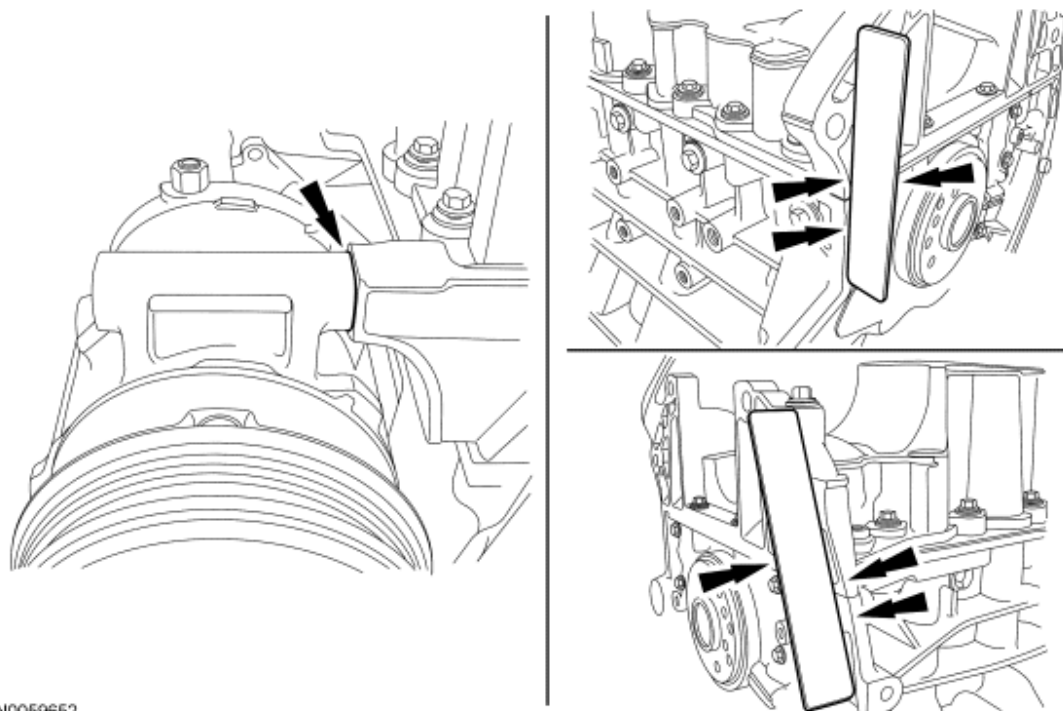


Fig. 963: Aligning Oil Pan Flush With Rear Of Cylinder Block
Courtesy of FORD MOTOR CO.

4. Tighten bolts 10, 11, 13 and 14 in the sequence shown in illustration, to 3 Nm (27 lb-in).

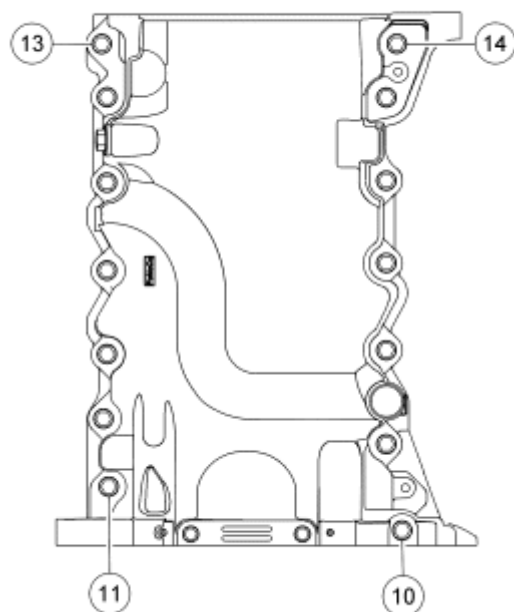
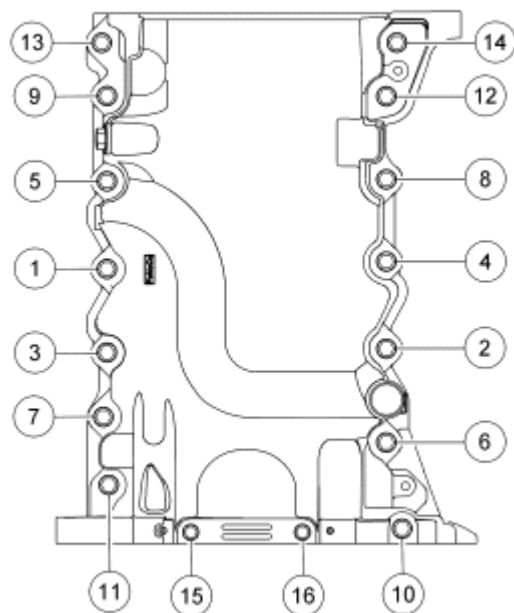


Fig. 964: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence

Courtesy of FORD MOTOR CO.

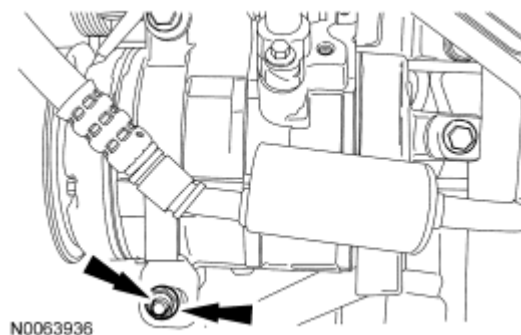
5. Install the remaining oil pan bolts. Tighten all the oil pan bolts in the sequence shown in illustration.
 - Tighten the large bolts (1-14) to 20 Nm (15 lb-ft).
 - Tighten the small bolts (15 and 16) to 10 Nm (89 lb-in).



N0055165

Fig. 965: Installing Remaining Oil Pan Bolts In Sequence
Courtesy of FORD MOTOR CO.

6. Install the A/C compressor mounting stud and nut.
 - Tighten the stud to 9 Nm (80 lb-in) and the nut to 25 Nm (18 lb-ft).



N0063936

Fig. 966: Locating A/C Compressor Nut & Stud
Courtesy of FORD MOTOR CO.

7. Install the special tools.

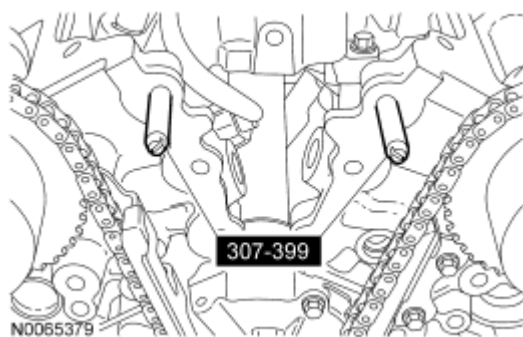


Fig. 967: Identifying Special Tool (307-399)

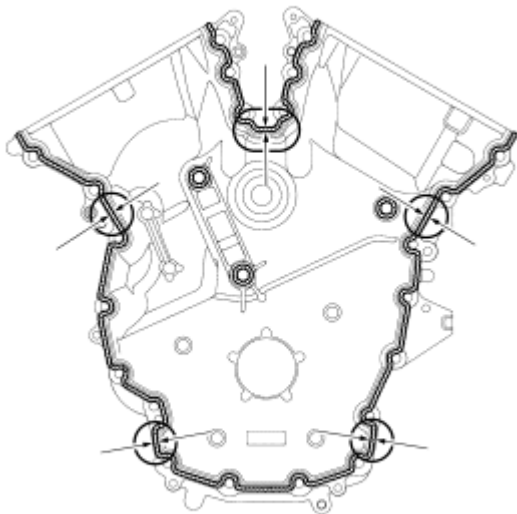
Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The engine front cover and bolts 17, 18, 19 and 20 must be installed within 4 minutes of the initial sealant application. The remainder of the engine front cover bolts and the engine mount bracket bolts must be installed and tightened within 35 minutes of the initial sealant application. If the time limits are exceeded, the sealant must be removed, the sealing area cleaned and sealant reapplied. To clean the sealing area, use silicone gasket remover and metal surface prep. Failure to follow this procedure can cause future oil leakage.

8. Apply a 3.0 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover sealing surfaces including the 3 engine mount bracket bosses.
 - Apply a 5.5 mm (0.21 in) bead of Motorcraft High Performance Engine RTV Silicone to the oil pan-to-cylinder block joint and the cylinder head-to-cylinder block joint areas of the engine front cover in 5 places as indicated.

5.5 mm
(0.21 in)



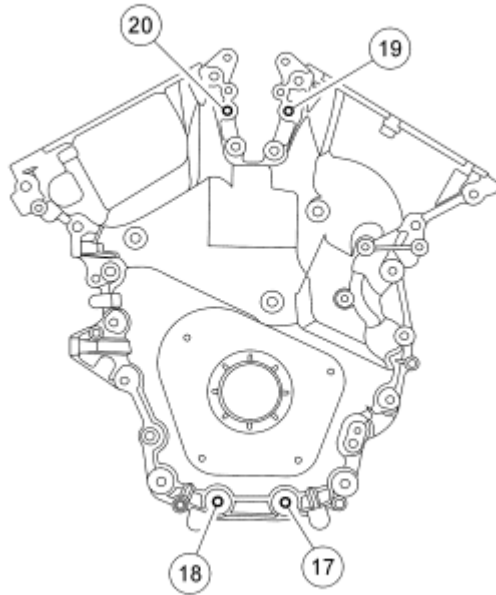
N0068283

Fig. 968: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover Sealing Surfaces

Courtesy of FORD MOTOR CO.

NOTE: **Make sure the 2 locating dowel pins are seated correctly in the cylinder block.**

9. Install the engine front cover and bolts 17, 18, 19 and 20.
 - Tighten in sequence shown in illustration to 3 Nm (27 lb-in).



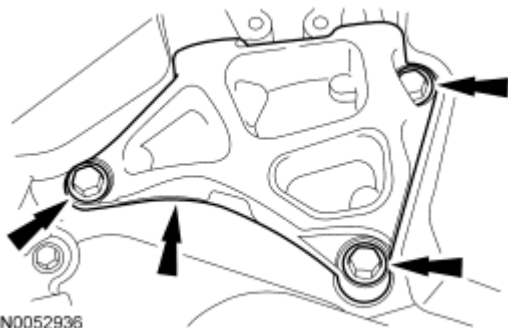
N0068108

Fig. 969: Installing Engine Front Cover & Bolts In Sequence
Courtesy of FORD MOTOR CO.

10. Remove the special tools (alignment pins).

NOTE: **Do not tighten the bolts at this time.**

11. Install the engine mount bracket and the 3 bolts.

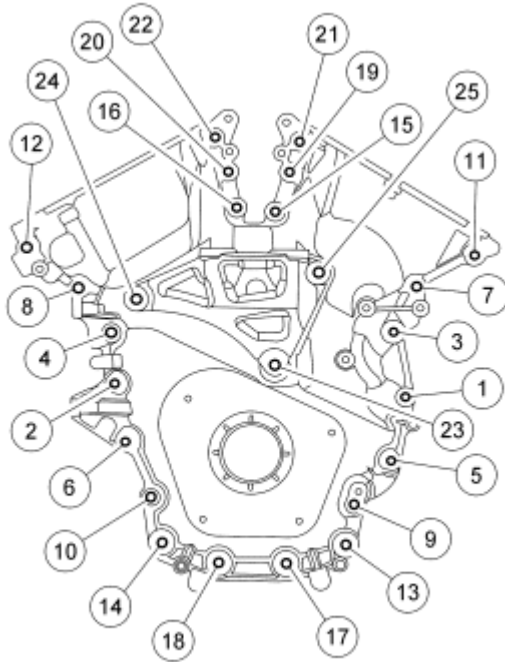


N0052936

Fig. 970: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Do not expose the Motorcraft High Performance Engine RTV Silicone to engine oil for at least 90 minutes after installing the engine front cover. Failure to follow this instruction may cause oil leakage.

12. Install the remaining engine front cover bolts. Tighten all of the engine front cover bolts and engine mount bracket bolts in the sequence shown in illustration in 2 stages:
- Stage 1: Tighten bolts 1 thru 22 to 10 Nm (89 lb-in) and bolts 23, 24 and 25 to 15 Nm (11 lb-ft).
 - Stage 2: Tighten bolts 1 thru 22 to 24 Nm (18 lb-ft) and bolts 23, 24 and 25 to 75 Nm (55 lb-ft).

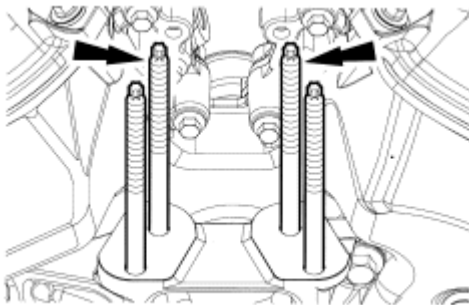


N0068109

Fig. 971: Identifying Tightening Of Engine Front Cover Bolts & Engine Mount Bracket Bolts In Sequence

Courtesy of FORD MOTOR CO.

13. Install the 2 engine mount studs.
- Tighten to 18 Nm (13 lb-ft).



N0057960

Fig. 972: Locating Engine Mount Studs

Courtesy of FORD MOTOR CO.

14. Install the engine mount bracket and the 2 bolts.

- Tighten to 24 Nm (18 lb-ft).

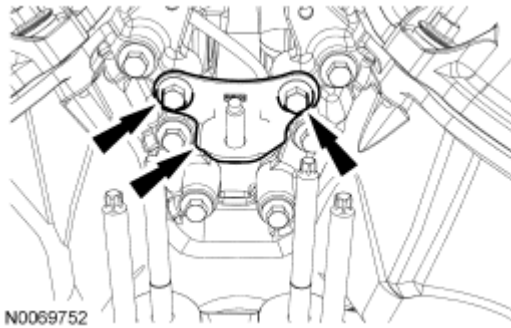


Fig. 973: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Apply clean engine oil to the crankshaft front seal bore in the engine front cover.

- Using the special tools, install a new crankshaft front seal.

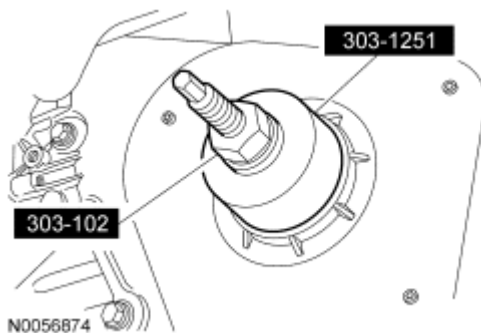


Fig. 974: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the outside diameter sealing surfaces with clean engine oil.

- Using the special tools, install the crankshaft pulley.

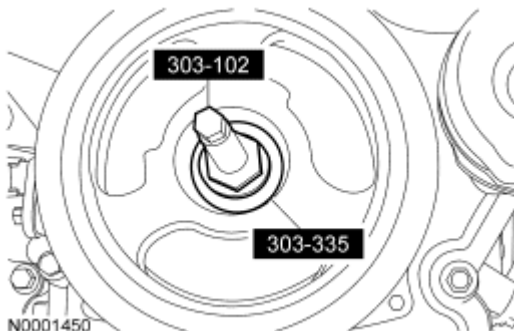


Fig. 975: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

17. Using the special tool, install the crankshaft pulley washer and new bolt and tighten in 4 stages.
- Stage 1: Tighten to 120 Nm (89 lb-ft).
 - Stage 2: Loosen one full turn.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

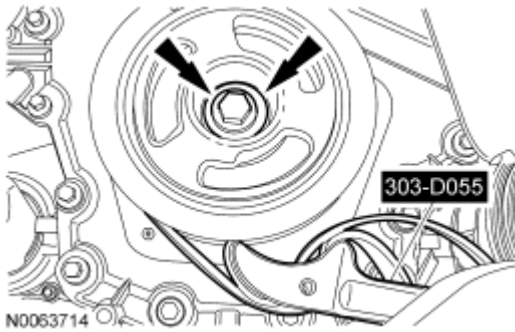


Fig. 976: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

NOTE: Installation of new seals is only required if damaged seals were removed during disassembly of the engine.

NOTE: Spark plug tube seal installation shown in illustration, variable camshaft timing (VCT) seal installation similar.

18. Using the special tools, install new VCT solenoid and/or spark plug tube seals.

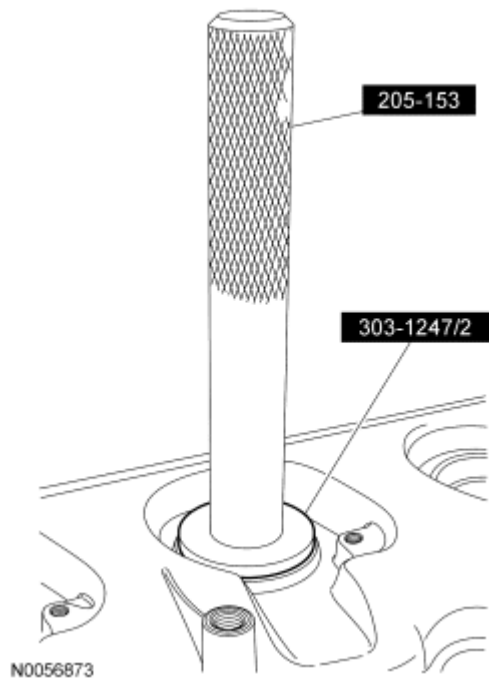


Fig. 977: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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

19. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-RH cylinder head joints.

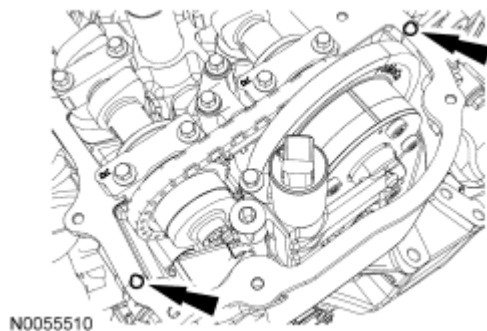


Fig. 978: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

20. Using a new gasket, install the RH valve cover, bolt and the 10 stud bolts.
- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

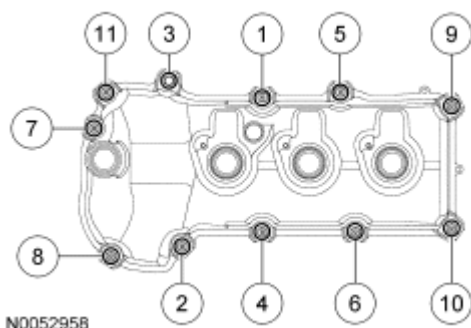


Fig. 979: Installing RH Valve Cover Stud Bolts In Sequence
 Courtesy of FORD MOTOR CO.

CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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

21. Apply an 8 mm (0.31 in) bead of Motorcraft High Performance Engine RTV Silicone to the engine front cover-to-LH cylinder head joints.

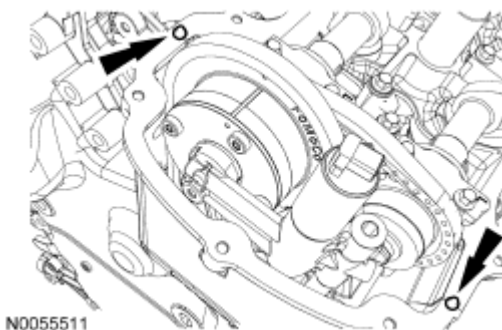


Fig. 980: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

22. Using a new gasket, install the LH valve cover and 11 stud bolts.

- Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

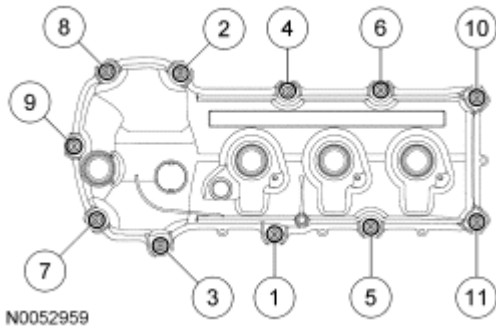


Fig. 981: Installing LH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

23. Install the 6 coil-on-plug assemblies and the 6 bolts.
 - Tighten to 7 Nm (62 lb-in).

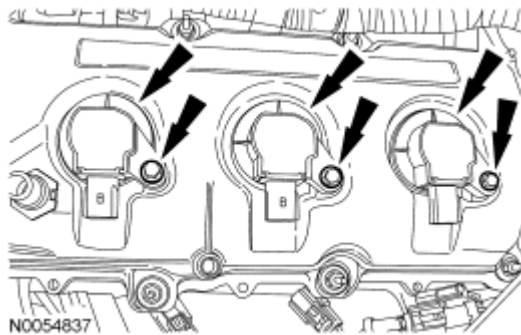


Fig. 982: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

24. Install the LH cylinder block drain plug.
 - Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

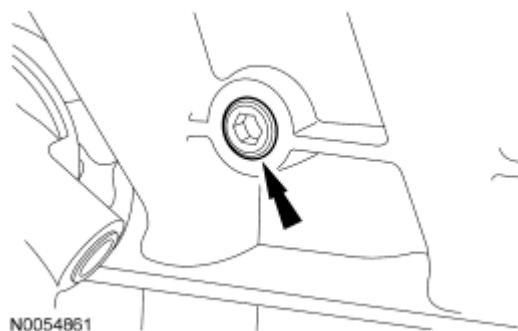


Fig. 983: Locating LH Cylinder Block Drain Plug

Courtesy of FORD MOTOR CO.

25. Install the RH cylinder block drain plug or, if equipped, the block heater.
- Tighten to 40 Nm (30 lb-ft).

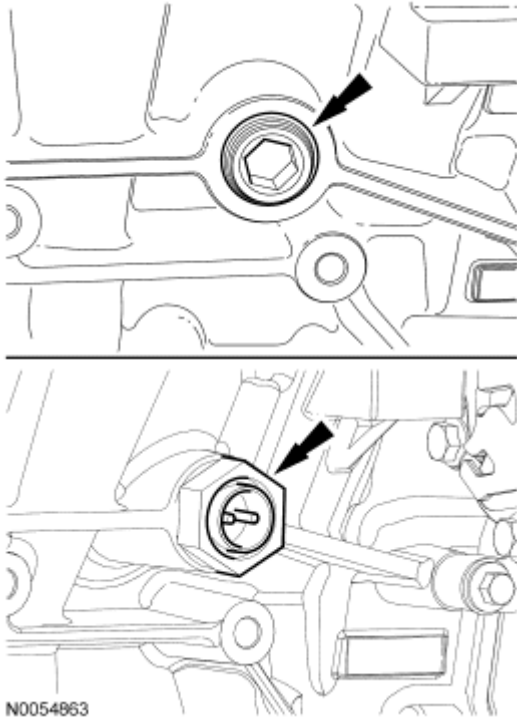


Fig. 984: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

26. Using a new gasket, install the RH catalytic converter and 4 new nuts.
- Tighten to 40 Nm (30 lb-ft).

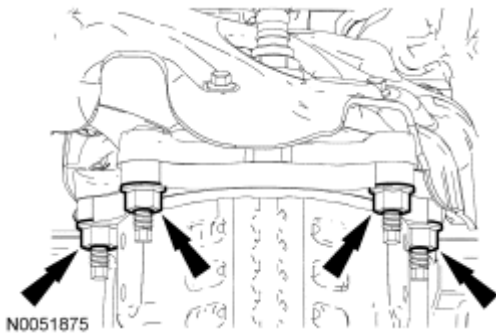


Fig. 985: Identifying Nuts
Courtesy of FORD MOTOR CO.

All vehicles

27. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown in illustration).
- Tighten to 40 Nm (30 lb-ft).

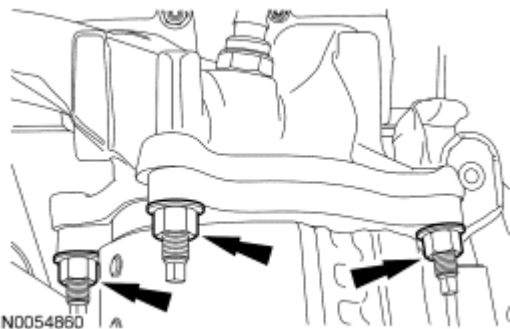


Fig. 986: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

28. Install the accessory drive belt tensioner and the 3 bolts.
- Tighten to 10 Nm (89 lb-in).

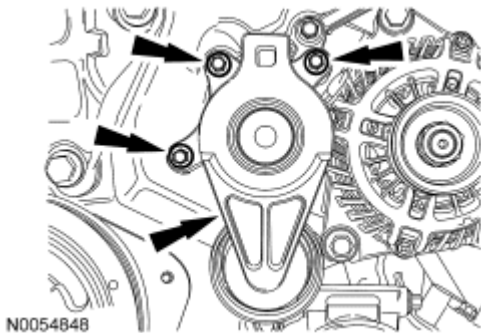


Fig. 987: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

29. Install the power steering pump and the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).

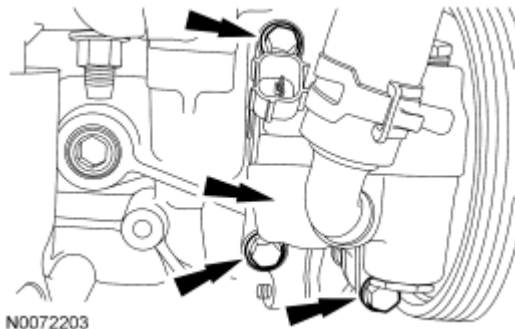
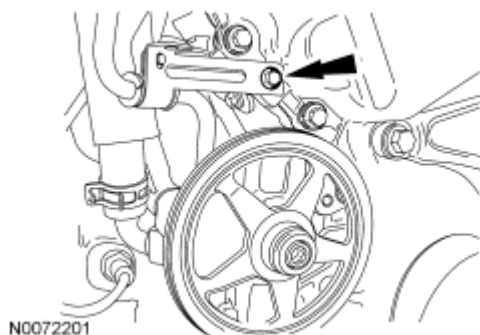


Fig. 988: Identifying Bolts

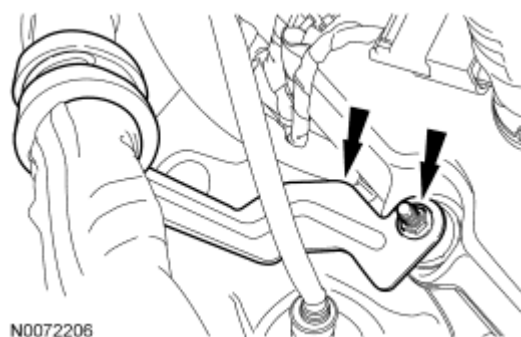
Courtesy of FORD MOTOR CO.

30. Install the power steering pressure (PSP) tube bracket bolt.
- Tighten to 10 Nm (89 lb-in).

**Fig. 989: Identifying Bracket-To-Power Steering Pump Bolt**

Courtesy of FORD MOTOR CO.

31. Install the PSP bracket and nut to the RH valve cover stud bolt.
- Tighten to 7 Nm (62 lb-in).

**Fig. 990: Identifying Nut And PSP Tube Bracket**

Courtesy of FORD MOTOR CO.

32. Attach all of the wiring harness retainers to the LH valve cover and stud bolts.
33. Connect the 3 LH coil-on-plug electrical connectors.

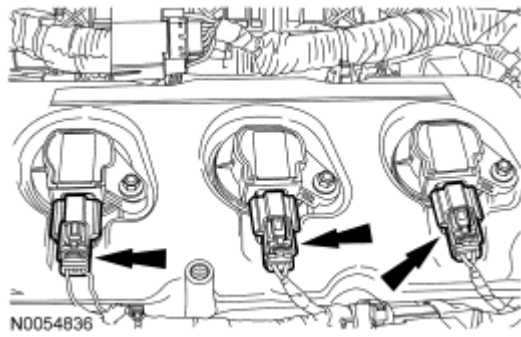


Fig. 991: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

34. Connect the LH camshaft VCT solenoid electrical connector.

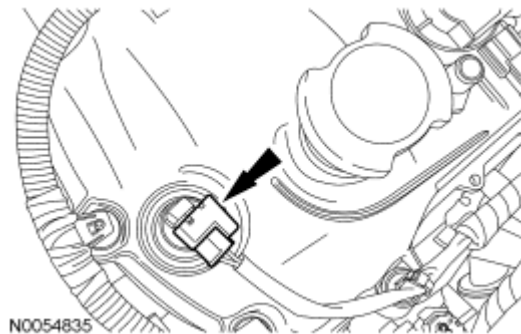


Fig. 992: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

35. Connect the LH catalyst monitor sensor electrical connector.

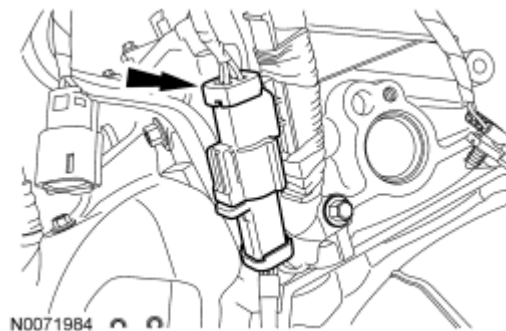


Fig. 993: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

36. Attach all of the wiring harness retainers to the RH valve cover and stud bolts.
37. Connect the RH heated oxygen sensor (HO2S) electrical connector.

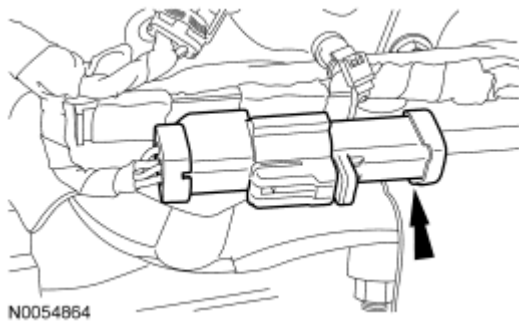


Fig. 994: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

38. If equipped, connect the heated PCV valve electrical connector.

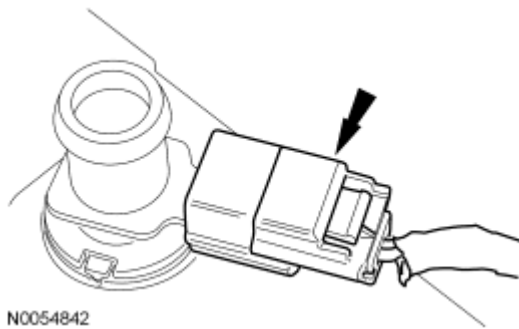


Fig. 995: Locating Heated PCV Valve Electrical Connector
Courtesy of FORD MOTOR CO.

39. Connect the 3 RH coil-on-plug electrical connectors.

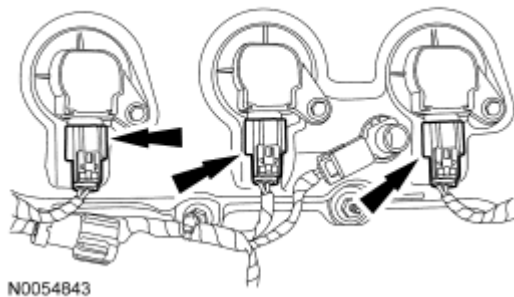


Fig. 996: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

40. Connect the RH VCT solenoid electrical connector.

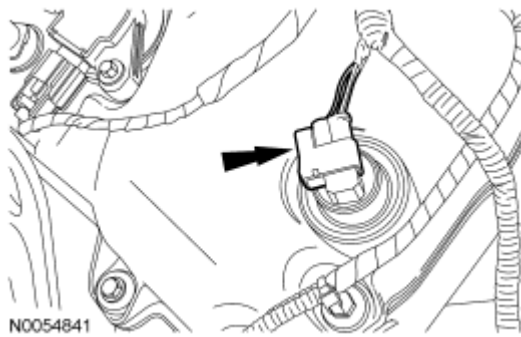


Fig. 997: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

FWD vehicles

41. Connect the RH catalyst monitor sensor electrical connector.

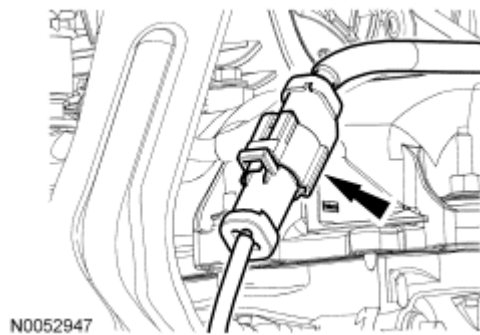


Fig. 998: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

42. Connect the PSP switch electrical connector.

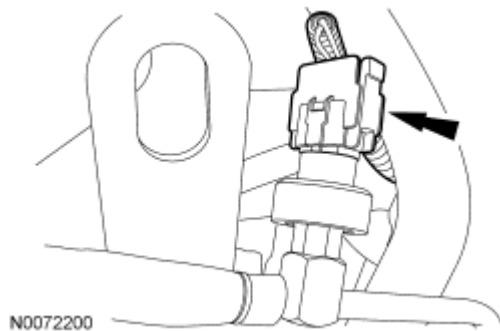


Fig. 999: Identifying PSP Connector
Courtesy of FORD MOTOR CO.

43. Connect the fuel efficient power steering system solenoid electrical connector.

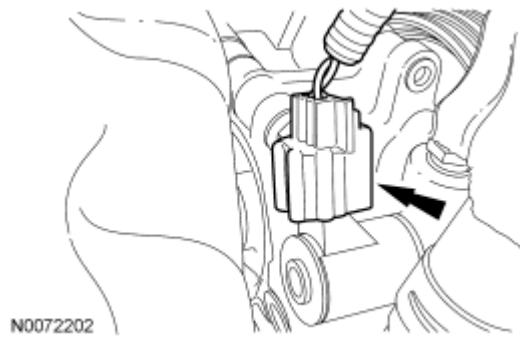


Fig. 1000: Identifying Connector
Courtesy of FORD MOTOR CO.

44. Using new gaskets, install the upper intake manifold and the 6 bolts.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

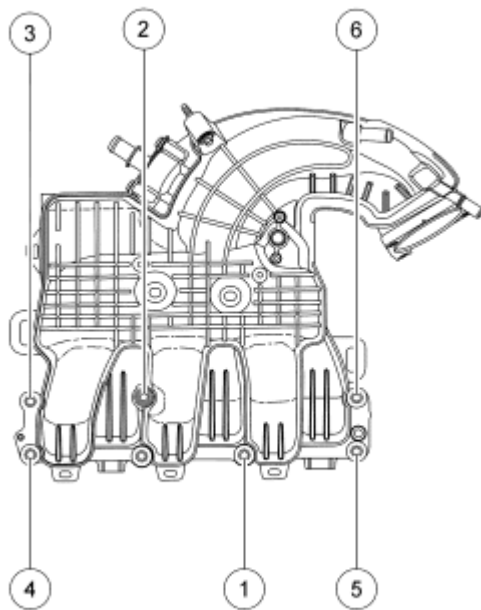


Fig. 1001: Installing Upper Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

45. Install the fuel tube bracket bolt to the upper intake manifold.
 - Tighten to 6 Nm (53 lb-in).

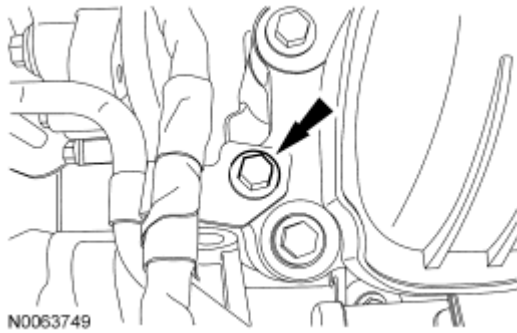


Fig. 1002: Identifying Bolt
Courtesy of FORD MOTOR CO.

46. Install the upper intake manifold short support bracket bolt.
- Tighten to 10 Nm (89 lb-in).

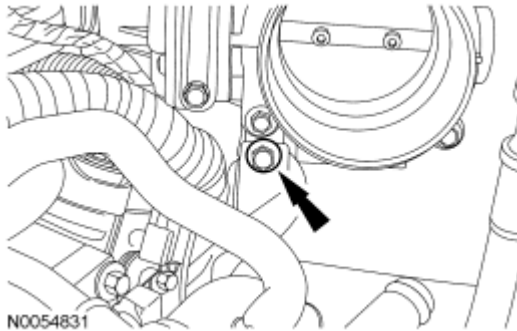


Fig. 1003: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

47. If equipped, install the upper intake manifold long support bracket bolt.
- Tighten to 10 Nm (89 lb-in).

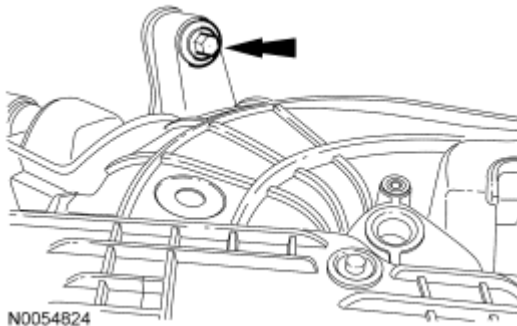


Fig. 1004: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

48. Attach the wiring harness retainers to the upper intake manifold.

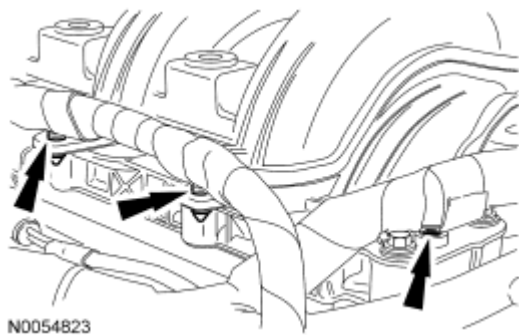


Fig. 1005: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

49. Connect the throttle body (TB) electrical connector.

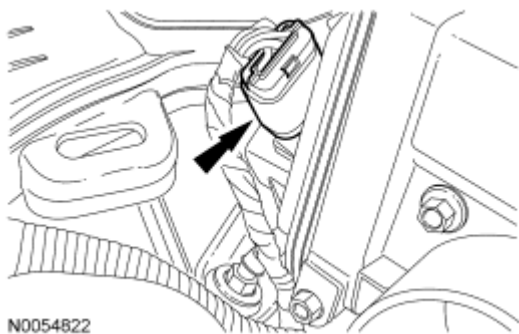


Fig. 1006: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

50. Connect the PCV hose to the PCV valve.

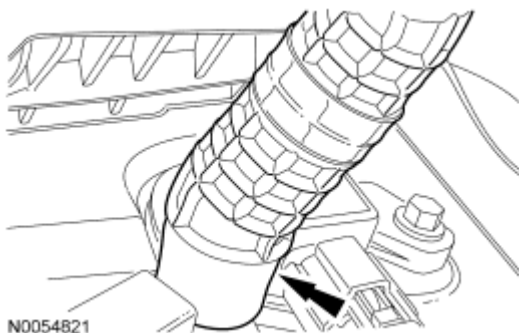


Fig. 1007: Identifying PCV Hose From PCV Valve
Courtesy of FORD MOTOR CO.

51. If equipped, connect the heated PCV electrical connector.

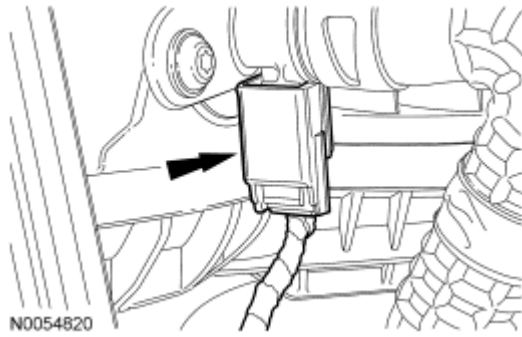


Fig. 1008: Identifying Positive Crankcase Ventilation (PCV) Fitting Electrical Connector
Courtesy of FORD MOTOR CO.

52. If equipped, connect the block heater electrical connector and install the heat shield.
- Attach all the engine block heater wiring harness retainer.

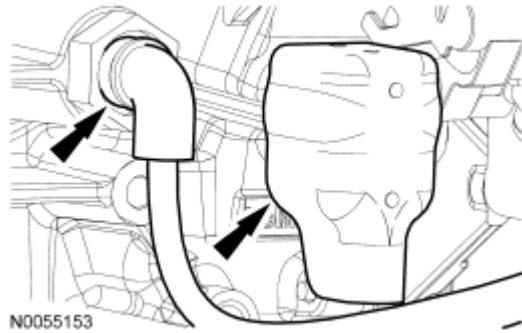


Fig. 1009: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

53. Using the special tools, remove the engine from the stand.

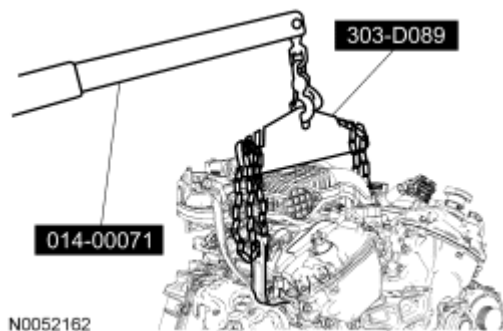


Fig. 1010: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

54. Install the crankshaft sensor ring.

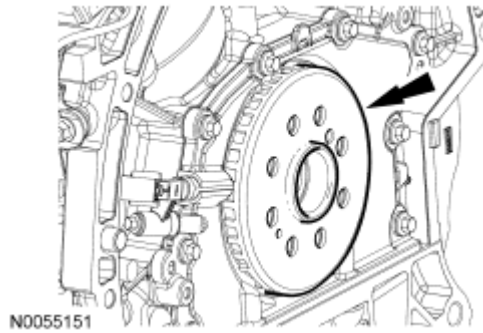


Fig. 1011: Identifying Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

55. Install the flexplate and the 8 bolts.
 - Tighten to 80 Nm (59 lb-ft).

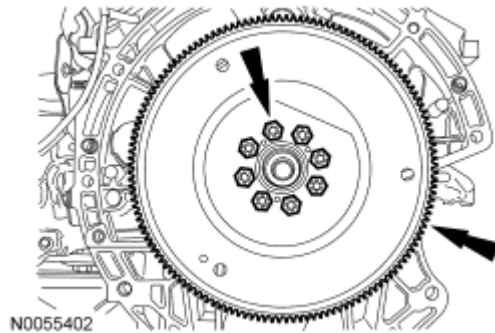


Fig. 1012: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

56. Install the engine in the vehicle. For additional information, refer to **Engine**.

OIL PUMP SCREEN AND PICKUP TUBE

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. Using a new O-ring seal, install the oil pump screen and pickup tube and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

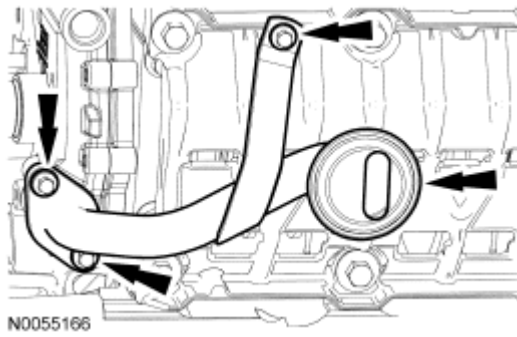


Fig. 1013: Identifying Oil Pump Screen, Pickup Tube & Bolts
Courtesy of FORD MOTOR CO.

2. Install the oil pan. For additional information, refer to **Oil Pan**.

CRANKSHAFT REAR SEAL WITH RETAINER PLATE

SPECIAL TOOLS

Illustration	Tool Name	Tool Number
	Handle	205-153 (T80T-4000-W)
	Heavy Duty Floor Crane	014-00071 or equivalent
	Installer, Rear Main Seal	303-1250
	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent

MATERIAL

Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6

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

WSS-M2C930-A

NOTE: 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: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

NOTE: The crankshaft rear seal retainer must be installed and the bolts tightened within 4 minutes of sealant application.

1. Apply a 3 mm (0.11 in) bead of Motorcraft High Performance Engine RTV Silicone to the sealing surface of the crankshaft rear seal retainer.

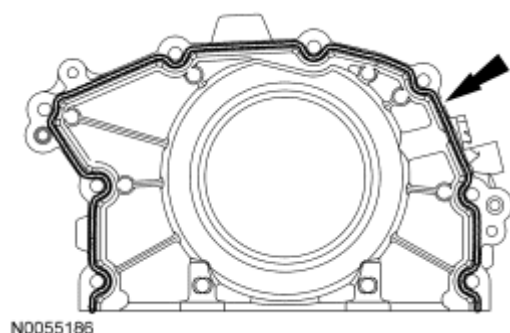


Fig. 1014: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Sealing Surface Of Crankshaft Rear Seal Retainer
Courtesy of FORD MOTOR CO.

2. Install the rear seal retainer and the 8 bolts in the sequence shown in illustration.
 - Tighten in the sequence shown in illustration to 10 Nm (89 lb-in).

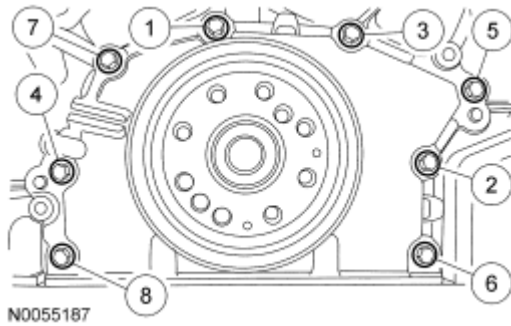


Fig. 1015: Installing Crankshaft Rear Seal Retainer Bolts In Sequence
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the seal lips and bore with clean engine oil prior to installation.

3. Position the Rear Main Seal Installer onto the end of the crankshaft and slide a new crankshaft rear seal onto the tool.

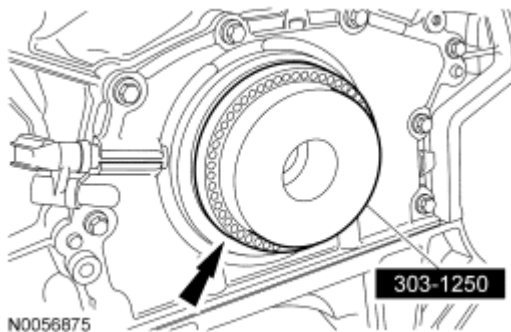


Fig. 1016: Positioning Special Tool (303-1250) Onto End Of Crankshaft
Courtesy of FORD MOTOR CO.

4. Using the Rear Main Seal Installer and Handle, install the new crankshaft rear seal.

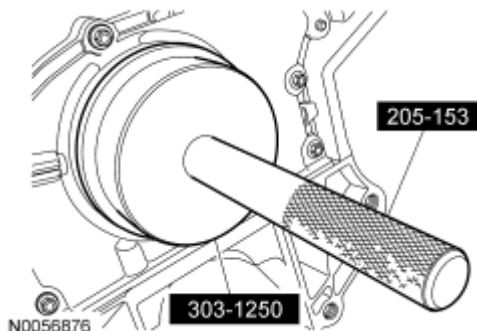


Fig. 1017: Installing New Crankshaft Rear Seal Using Special Tools (303-1250) & (205-153)
Courtesy of FORD MOTOR CO.

5. Install the Crankshaft Position (CKP) sensor and install the bolt.

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

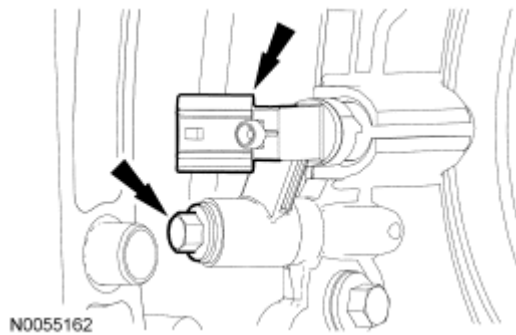


Fig. 1018: Identifying CKP Sensor & Bolt
Courtesy of FORD MOTOR CO.

6. Connect the CKP sensor electrical connector.

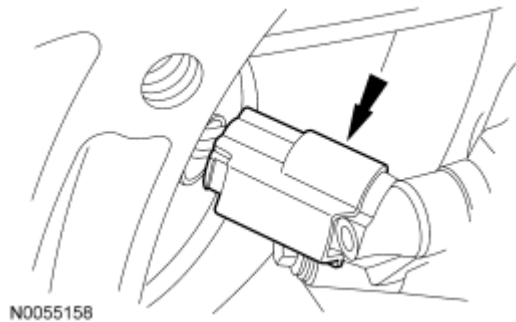


Fig. 1019: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

7. Using the Heavy Duty Floor Crane and Spreader Bar, install the engine onto the stand.

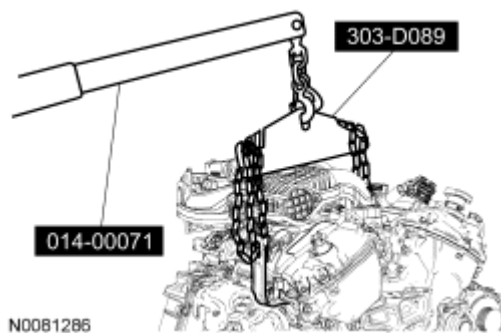


Fig. 1020: Identifying Heavy Duty Floor Crane and Spreader Bar
Courtesy of FORD MOTOR CO.

8. Install the oil pan. For additional information, refer to **Oil Pan**.