

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

2009 ENGINE**Engine - 3.5L - Edge & MKX****SPECIFICATIONS****MATERIAL SPECIFICATIONS****MATERIAL SPECIFICATIONS**

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
Spark plug	AYSF-22FM Gap = 1.29-1.45 mm (0.051-0.057 in)
Compression ratio	10.3:1

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Engine weight (without accessory drive components)	161 kg (355 lb)
Engine and transaxle 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)

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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

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	(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)

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Connecting rod side clearance (assembled to crank) - service limit	-
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^a Refer to the appropriate procedure in this service information.

TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Description	Nm	lb-ft	lb-in
A/C compressor bolts and nut	25	18	-
A/C compressor stud	9	-	80
A/C pressure tube fitting nuts	8	-	71
A/C tube bracket bolt	8	-	71
Accessory drive belt tensioner bolts	11	8	-
Battery cable power feed cable nut	8	-	71
Block heater	40	30	-
Camshaft bearing cap bolts ^a	-	-	-
Camshaft position (CMP) sensor bolts	10	-	89
Camshaft sprocket bolts ^a	-	-	-
Catalytic converter bracket bolt	55	41	-
Catalytic converter bracket nut	40	30	-
Catalytic converter bracket-to-converter bolts	20	15	-
Catalytic converter bracket-to-engine block bolts	48	35	-
Catalytic converter nuts	40	30	-
Catalytic converter-to-exhaust manifold studs	25	18	-
Coolant pump bolts ^a	-	-	-
Crankshaft rear seal retainer plate bolts ^a	-	-	-
Crankshaft position (CKP) sensor bolt	10	-	89
CKP sensor heat shield nuts	10	-	89
Crankshaft pulley bolt ^a	-	-	-
Cylinder block drain plug (large)	40	30	-
Cylinder block drain plug (small) ^b	-	-	-
Cylinder head bolts ^a	-	-	-
Cylinder head temperature (CHT) sensor	10	-	89
Degas bottle bolts	9	-	80
Engine front cover bolts ^a	-	-	-
Engine lifting eye bolts	24	18	-
Engine mount brace bolt and nut	20	15	-
Engine mount bracket bolts ^a	-	-	-
Engine mount studs	18	13	-

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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 heat shield nut	11	8	-
Engine roll restrictor-to-subframe through bolt	103	76	-
Engine roll restrictor-to-transaxle through bolt	90	66	-
Exhaust manifold heat shield bolts	14	10	-
Exhaust manifold nuts ^a	-	-	-
Exhaust manifold studs	12	9	-
Exhaust pipe clamp	40	30	-
Exhaust Y-pipe nuts	40	30	-
Flexplate bolts	80	59	-
Front halfshaft nut	350	258	-
Fuel rail bolts	10	-	89
Generator bolt and nut	47	35	-
Generator B+ terminal nut	6	-	53
Ground wire-to-body bolt	10	-	89
Ground wire-to-engine bolt	10	-	89
Halfshaft carrier bearing bracket bolts - all wheel drive (AWD)	40	30	-
Halfshaft carrier bearing bracket bolts and stud bolt - front wheel drive (FWD)	55	41	-
Heated oxygen sensor (HO2S)	48	35	-
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 bolts	55	41	-
Lower bumper nuts	9	-	80
Lower intake manifold bolts ^d	-	-	89
Oil cooler bolts	10	-	89
Oil filter adapter large bolt	57	42	-
Oil filter adapter small bolt	10	-	89
Oil pan bolts ^a	-	-	-
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 cooler bracket bolt	9	-	80
Power steering pressure (PSP) tube bracket banjo bolt	48	35	-
Power steering pump bolts	24	18	-

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Power steering reservoir nuts	8	-	71
Power transfer unit (PTU)	90	66	-
PTU bracket bolts	70	52	-
Radio interference capacitor-to-cowl nut	10	-	89
Radio interference capacitor-to-engine front cover nut	10	-	89
Rear driveshaft-to-PTU flange bolts	70	52	-
Spark plugs	15	11	-
Stabilizer bar link nuts	90	66	-
Starter bolt and stud bolt	27	20	-
Starter B+ terminal nut	12	9	-
Starter S-terminal nut	5	-	44
Subframe bracket bolts	90	66	-
Subframe nuts	133	98	-
Thermostat housing bolts	10	-	89
Tie-rod end nuts	48	35	-
Timing chain guide bolts	10	-	89
Timing chain tensioner bolts	10	-	89
Torque converter-to-flexplate bolts	55	41	-
Transaxle bracket bolts	90	66	-
Transaxle bracket plate bolts	90	66	-
Transaxle mount bracket nuts	63	46	-
Transaxle mount through bolt and nut	175	129	-
Transaxle-to-engine bolts	48	35	-
Upper intake manifold bolts ^d	-	-	89
Upper intake manifold bracket-to-engine bolt	10	-	89
Upper intake manifold-to-bracket bolt	10	-	89
Valve cover bolts and stud bolts ^b	-	-	-
Variable camshaft timing (VCT) assembly bolts ^b	-	-	-
VCT housing bolts ^a	-	-	-
VCT solenoid bolts	10	-	89
Wiring harness retainer bolt and stud bolt	10	-	89

^a Refer to the appropriate procedure in this service information.

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

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

^d Tighten in sequence shown in **Fig. 5** for upper intake manifold or **Fig. 7** for lower intake manifold.

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 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 head gaskets.

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:

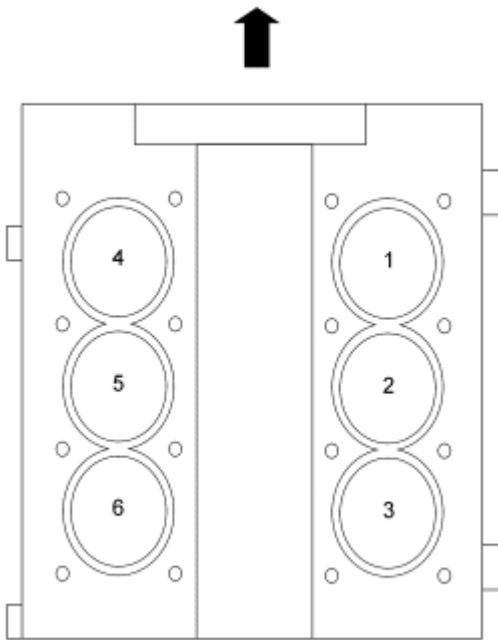
- The oil pump is mounted on the front face of the cylinder block.
- The inner rotor is piloted on the crankshaft post and is driven through flats on the crankshaft.
- System pressure is limited by an integral, internally-vented relief valve which directs the bypassed oil back to the inlet side of the 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(s)
- 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)

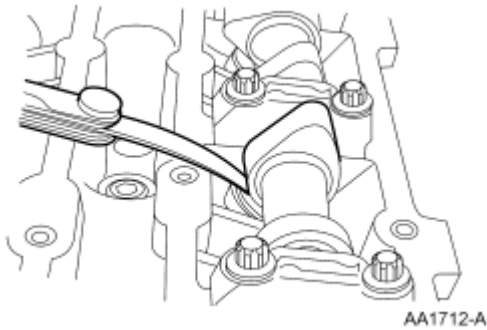


Fig. 2: Measuring Each Valve's Clearance Using A Feeler Gauge
Courtesy of FORD MOTOR CO.

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).

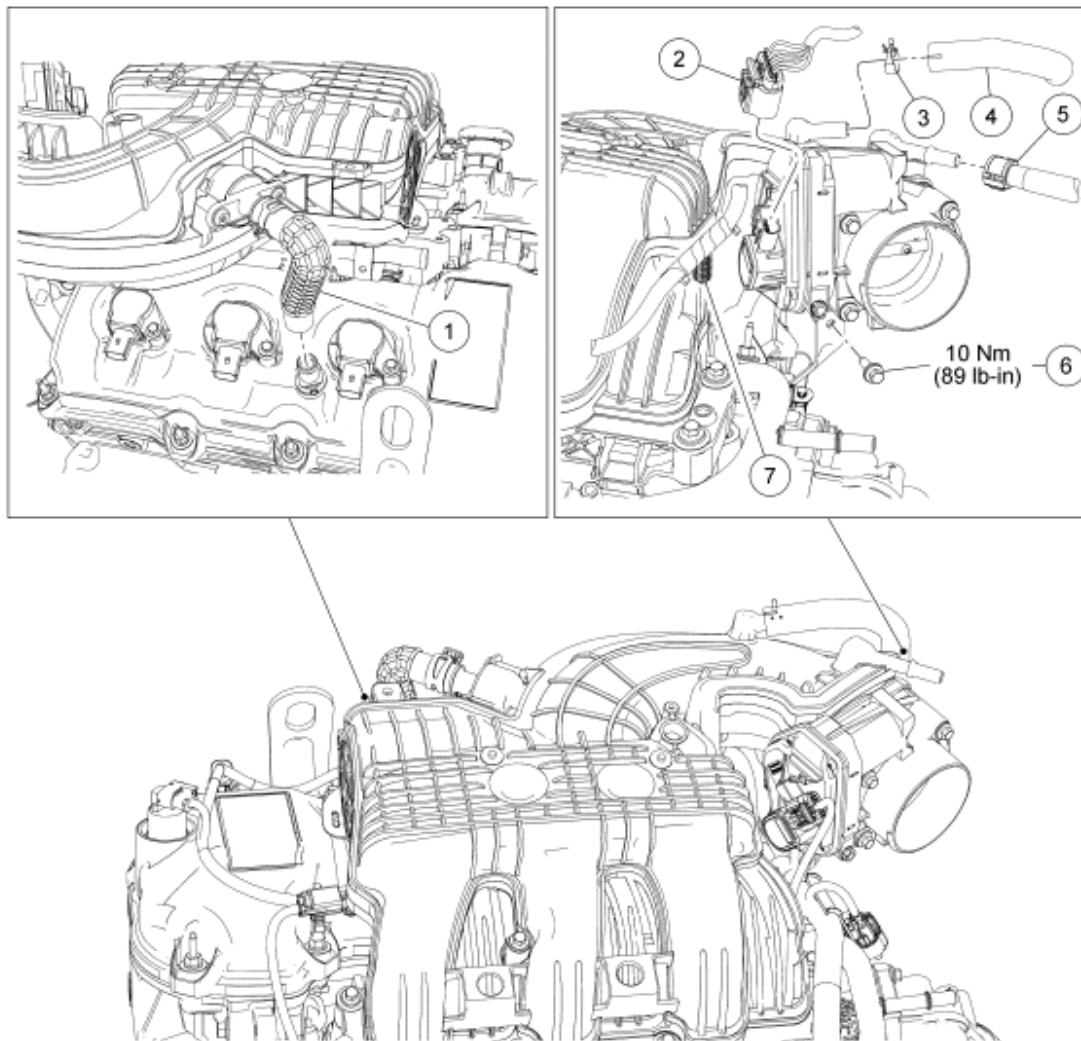
3. If any of the valve clearances are out of specification, select new tappets using this formula: tappet thickness = measured clearance + the base tappet thickness - most desirable thickness.

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



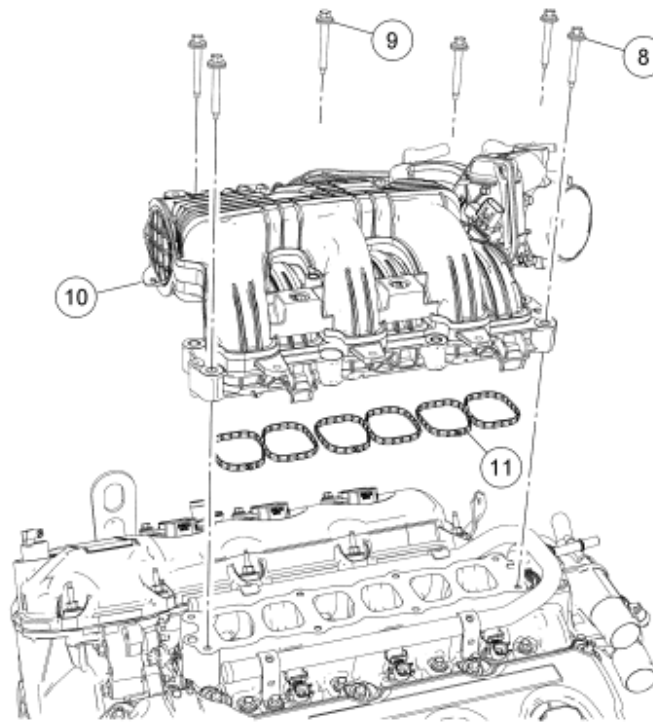
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Fig. 3: Identifying Upper Intake Manifold With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6K817	PCV hose
2	14A464	Throttle body (TB) electrical connector (part of 12C508)
3	CS16140	Brake booster-to-intake manifold vacuum hose clamp
4	6K817	Brake booster-to-intake manifold vacuum hose
5	9D661	Evaporative emissions (EVAP)-to-intake manifold tube
6	W503274	Upper intake manifold support bracket bolt

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Engine control wiring harness retainer
(part of 12C508)

N0076856

Fig. 4: Identifying Upper Intake Manifold
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
8	W503282	Upper intake manifold bolt (5 required)
9	W707083	Upper intake manifold bolt
10	9S455	Upper intake manifold
11	9H486	Upper intake manifold gasket (3 required)

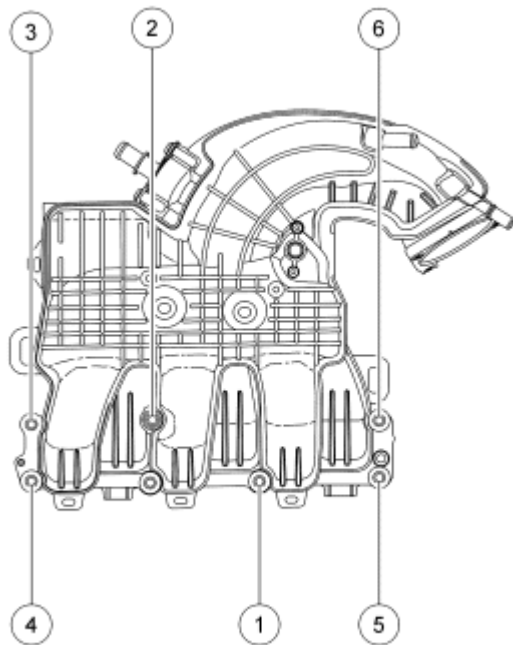
REMOVAL

1. Remove the air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** article.
2. Disconnect the throttle body (TB) electrical connector.
3. Disconnect the evaporative emissions (EVAP) tube from the intake manifold.
4. Disconnect the brake booster vacuum hose from the intake manifold.
5. Disconnect the PCV tube from the PCV valve.
6. Detach the wiring harness retainers from the upper intake manifold.
7. Remove the upper intake manifold support bracket bolt.
8. Remove the 6 bolts and remove 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

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

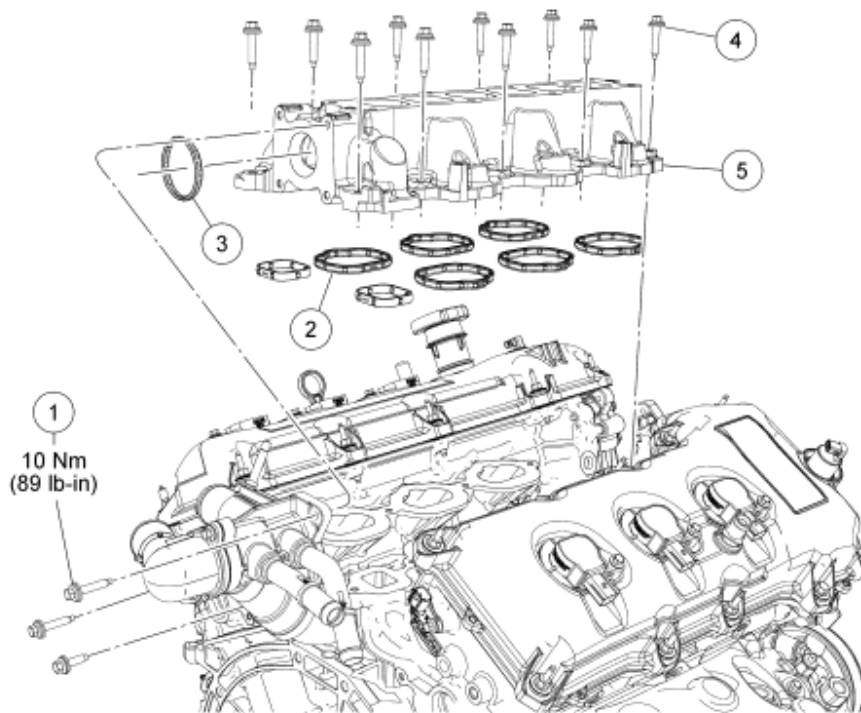


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Fig. 5: Installing Upper Intake Manifold Bolts In Sequence
 Courtesy of FORD MOTOR CO.

2. Install the upper intake manifold support bracket bolt.
 - Tighten to 10 Nm (89 lb-in).
3. Attach the wiring harness retainers to the upper intake manifold.
4. Connect the PCV tube to the PCV valve.
5. Connect the brake booster vacuum hose to the intake manifold.
6. Connect the EVAP tube to the intake manifold.
7. Connect the TB electrical connector.
8. Install the air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** article.

LOWER INTAKE MANIFOLD



N0071967

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

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

REMOVAL

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

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
3. Remove the fuel rail. For additional information, refer to **FUEL CHARGING & CONTROLS - 3.5L** article.
4. Remove the air cleaner assembly. For additional information, refer to **INTAKE AIR DISTRIBUTION**

& FILTERING article.

5. Remove the 3 thermostat housing-to-lower intake manifold bolts.
6. 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 to 10 Nm (89 lb-in).

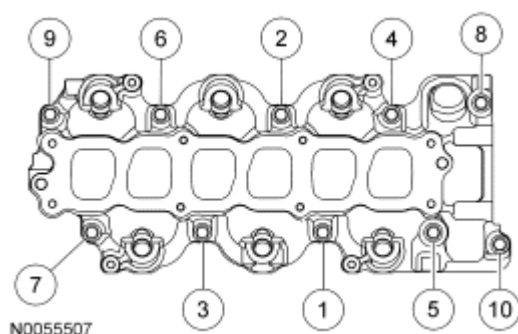



Fig. 7: Installing Lower Intake Manifold Bolts In Sequence
 Courtesy of FORD MOTOR CO.



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

VALVE COVER - LH**Special Tools**

Illustration	Tool Name	Tool Number
 ST1325-A	Handle	205-153 (T80T-4000-W)

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 <p>ST2983-A</p>	<p>Installer, Seal</p>	<p>303-1247/2</p>
 <p>ST2982-A</p>	<p>Remover, Seal</p>	<p>303-1247/1</p>

Material

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

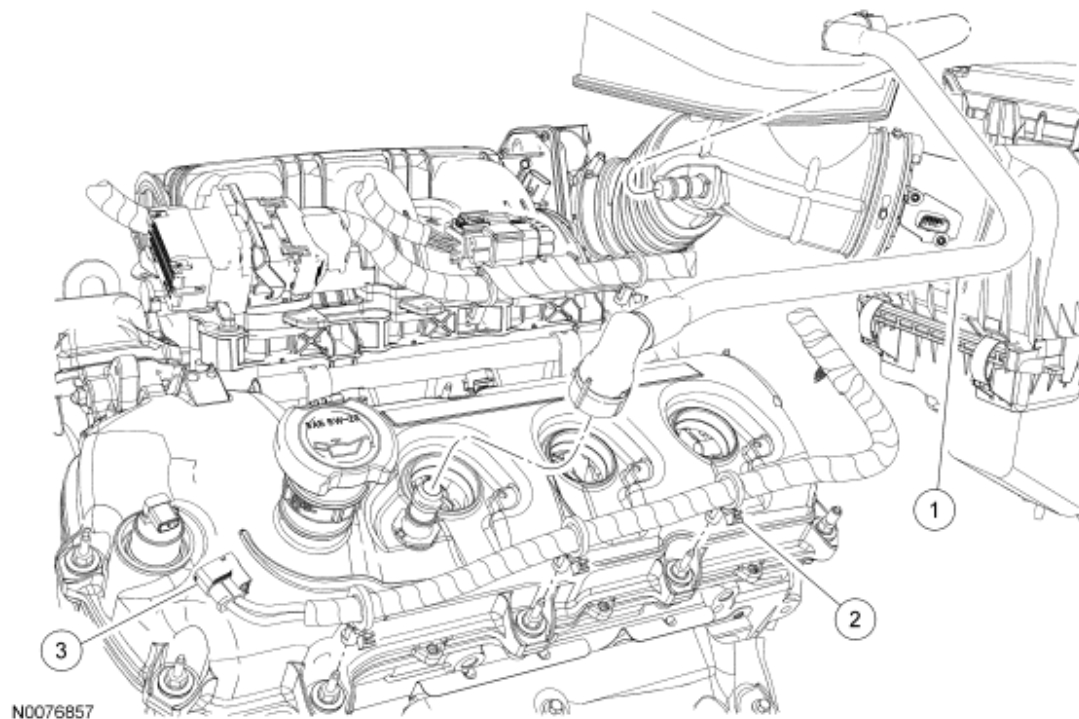


Fig. 8: Identifying Valve Cover - LH

Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	6853	Crankcase vent tube
2	W700497	Engine control wiring harness retainer (part of 12C508)
3	14A464	LH variable camshaft timing (VCT) electrical connector (part of 12C508)

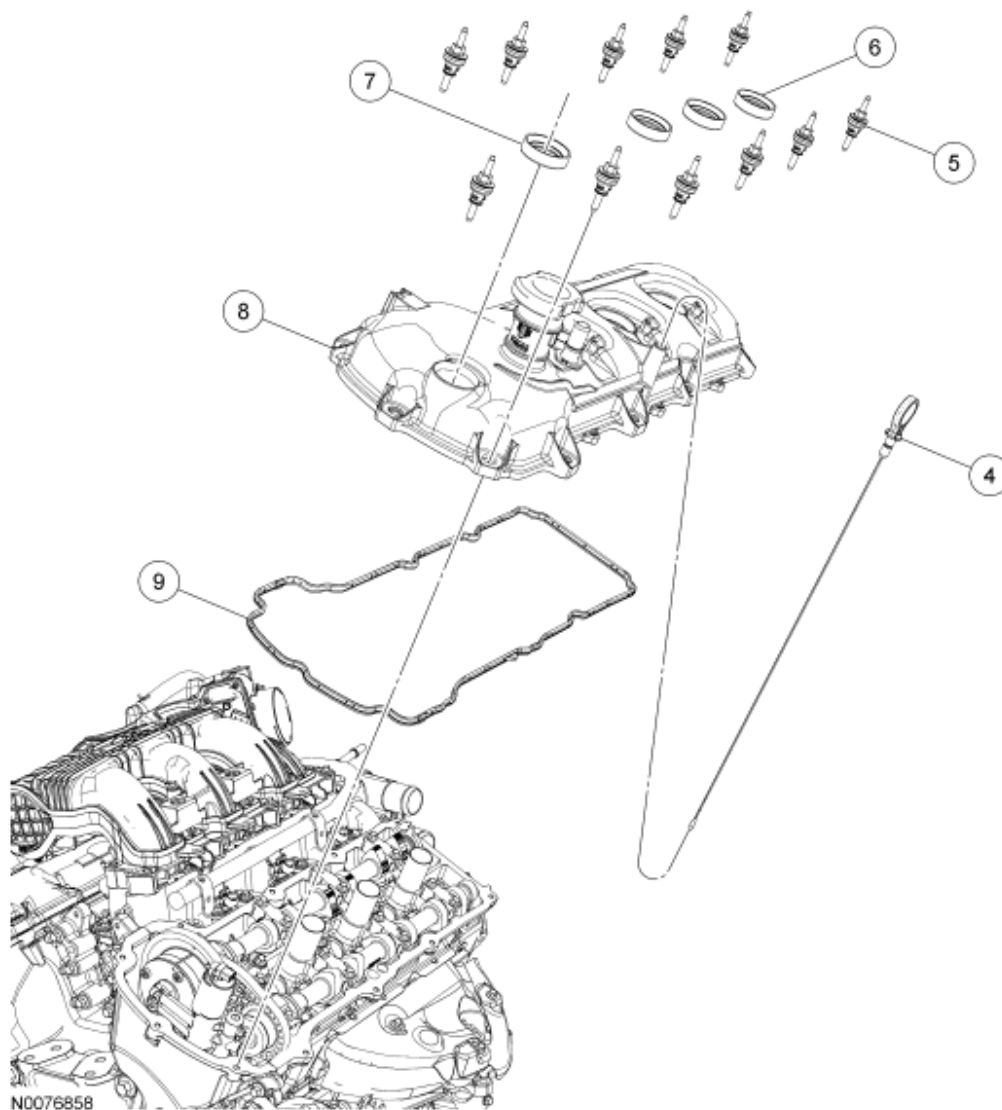


Fig. 9: Identifying Valve Cover Components - LH
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
4	6750	Oil level indicator
5	6C519	Valve cover stud bolt (11 required)

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6	6C535	Spark plug tube seal (3 required)
7	6C535	VCT seal
8	6A505	LH valve cover
9	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, can cause engine failure.

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

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

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

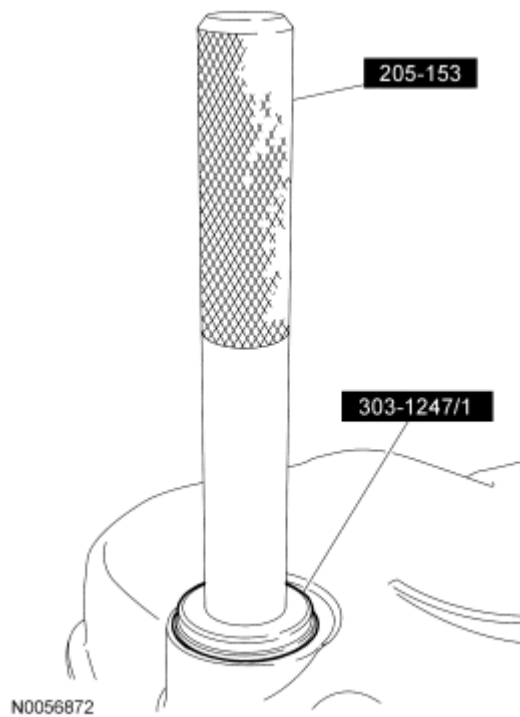


Fig. 10: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

8. 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, VCT seal installation similar.

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

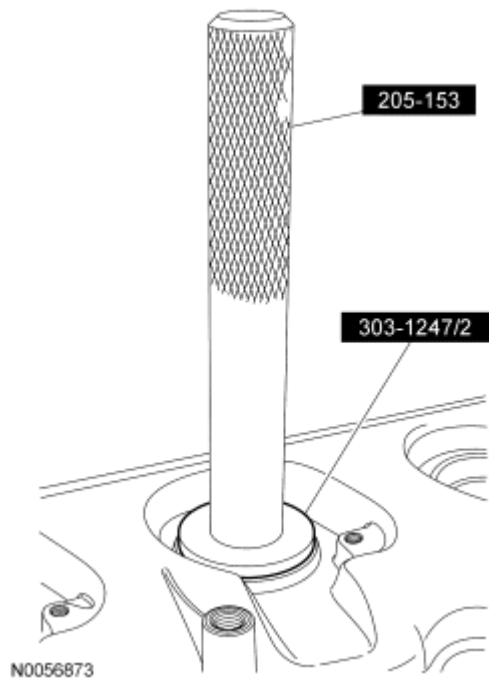


Fig. 11: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

Courtesy of FORD MOTOR CO.

CAUTION: Failure to use 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.

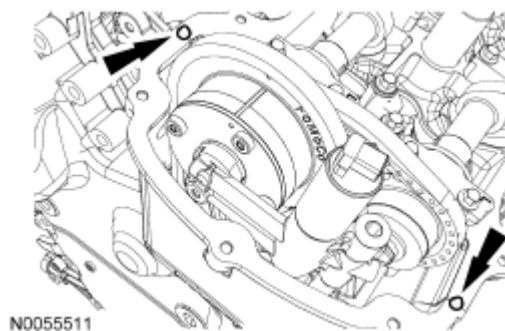


Fig. 12: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

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

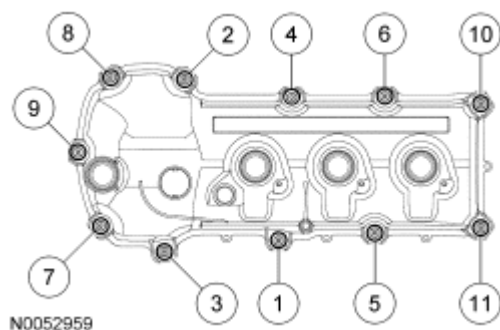




Fig. 13: Installing LH Valve Cover Stud Bolts In Sequence
 Courtesy of FORD MOTOR CO.

4. Attach all of the wiring harness retainers to the valve cover and the stud bolts.
5. Connect the LH VCT solenoid electrical connector.
6. Install the oil level indicator.
7. Install the LH ignition coils. For additional information, refer to **ENGINE IGNITION - 3.5L** article.
8. Install the crankcase vent tube.

VALVE COVER - RH

Special Tools

Illustration	Tool Name	Tool Number
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST2983-A	Installer, Seal	303-1247/2
	Remover, Seal	303-1247/1

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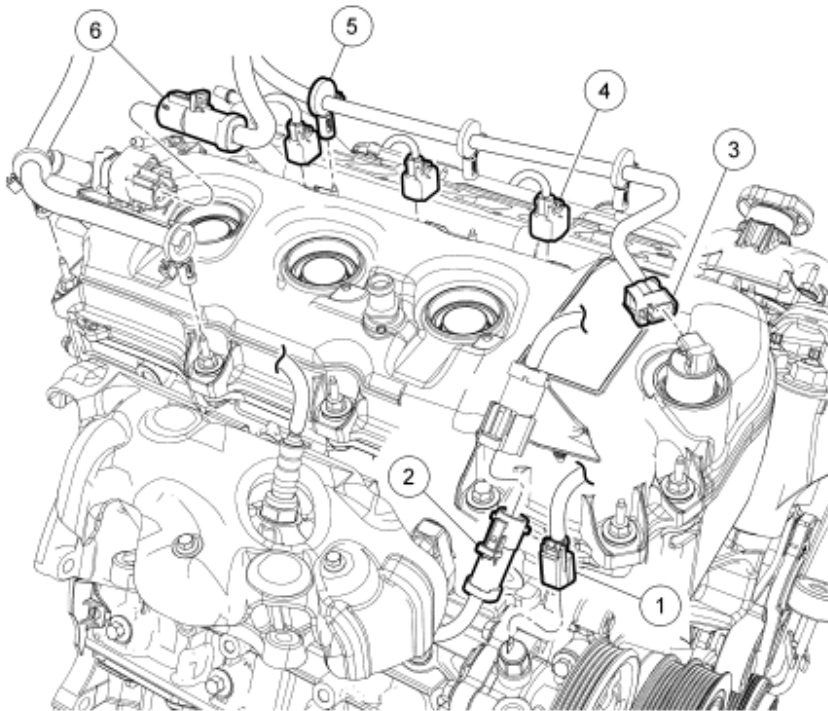
2009 ENGINE Engine - 3.5L - Edge & MKX



ST2982-A

Material

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



N0071970

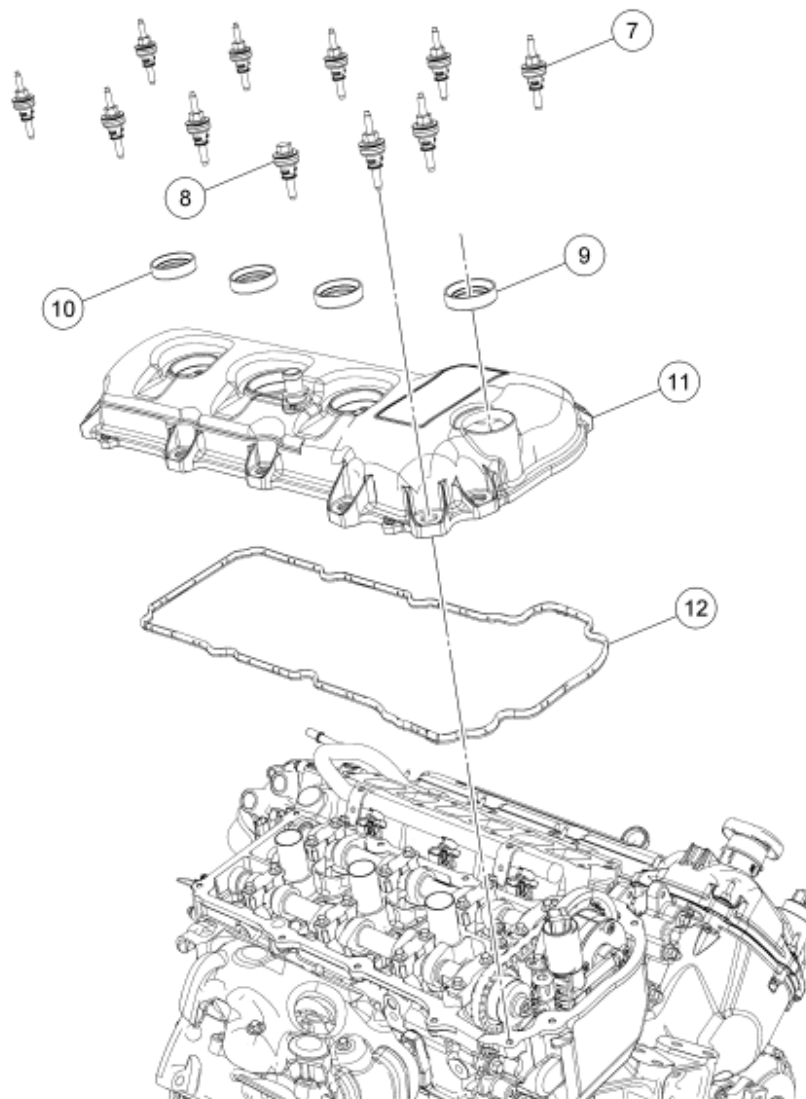
Fig. 14: Identifying Valve Cover - RH
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	14A464	Power steering pressure (PSP) switch electrical connector (part of 12C508)
2	14A464	RH catalyst monitor sensor electrical connector (part of 12C508)

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3	14A464	RH variable camshaft timing (VCT) electrical connector (part of 12C508)
4	14A464	RH fuel injector electrical connector (3 required) (part of 12C508)
5	W700497	Engine control wiring harness retainer (part of 12C508)
6	14A464	RH heated oxygen sensor (HO2S) electrical connector (part of 12C508)



N0076859

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

Item	Part Number	Description
7	6C519	Valve cover stud bolt (10 required)
8	6C520	Valve cover bolt

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9	6C535	VCT seal
10	6C535	Spark plug tube seal (3 required)
11	6582	RH valve cover
12	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, can cause engine failure.

1. Remove the RH ignition coils. For additional information, refer to **ENGINE IGNITION - 3.5L** article.
2. Disconnect the power steering pressure (PSP) switch electrical connector.
3. Disconnect the RH catalyst monitor sensor electrical connector and pin-type retainer.
4. Disconnect the RH heated oxygen sensor (HO2S) electrical connector.
5. Disconnect the RH variable camshaft timing (VCT) electrical connector.
6. Disconnect the 3 RH fuel injector electrical connectors.
7. Detach all of the wiring harness retainers from the RH valve cover and the stud bolts.
8. Remove the bolt, the 10 stud bolts and the RH valve cover.
 - Discard the gasket.

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

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

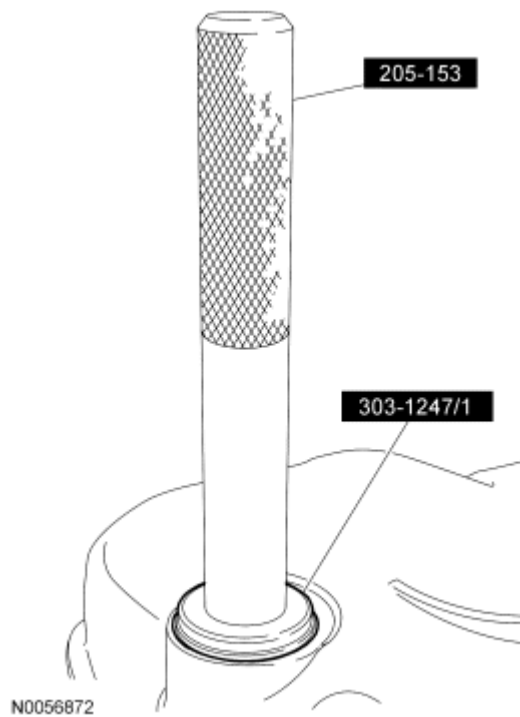


Fig. 16: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

10. 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, VCT seal installation similar.

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

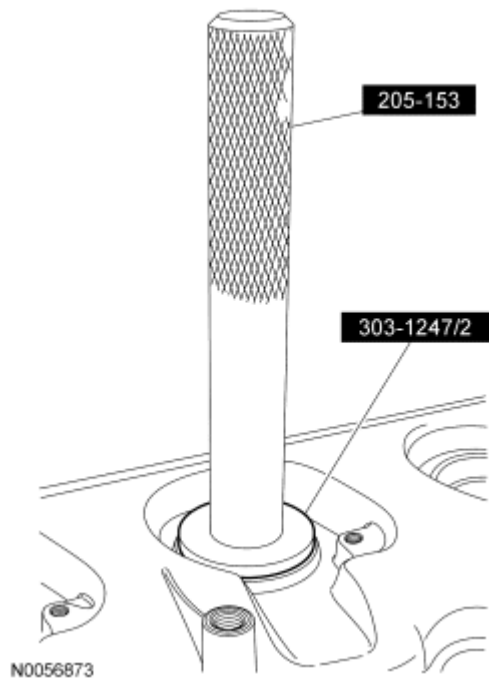


Fig. 17: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

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.

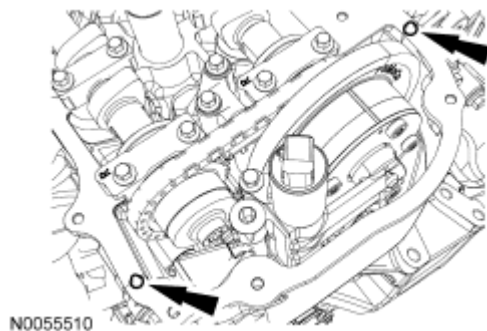


Fig. 18: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
Courtesy of FORD MOTOR CO.

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

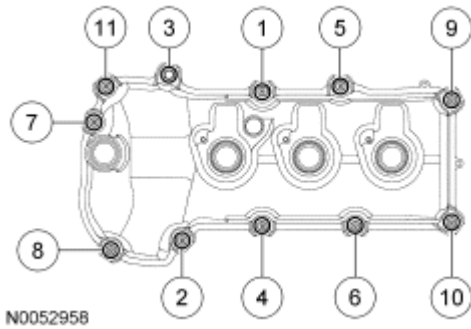


Fig. 19: Installing RH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

4. Attach all of the wiring harness retainers to the valve cover and the stud bolts.
5. Connect the 3 RH fuel injector electrical connectors.
6. Connect the RH VCT electrical connector.
7. Connect the RH HO2S electrical connector.
8. Connect the RH catalyst monitor sensor electrical connector and pin-type retainer.
9. Connect the PSP switch electrical connector.
10. 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

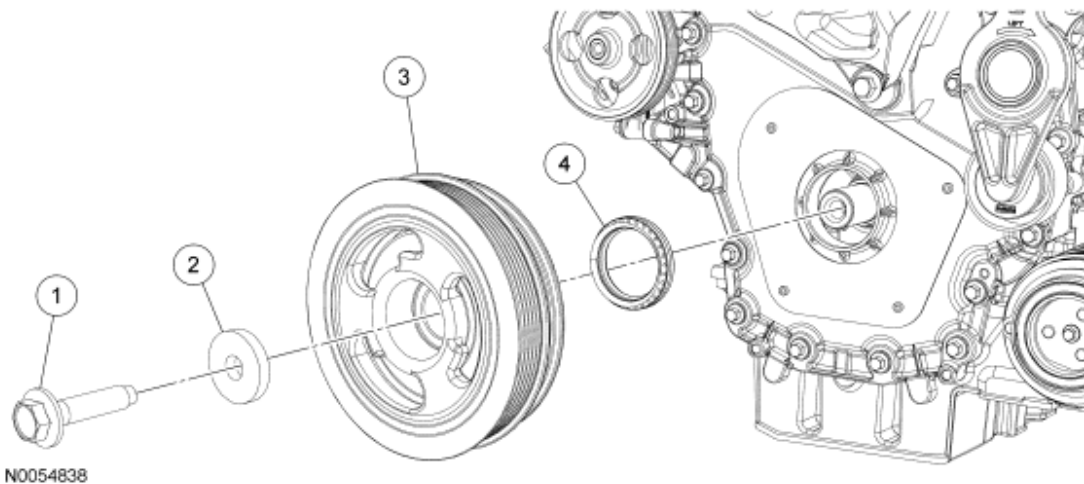


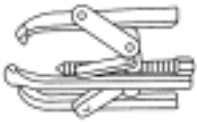



Fig. 20: Exploded View Of Crankshaft Pulley & Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

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 in this service information.

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)
 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 & 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.

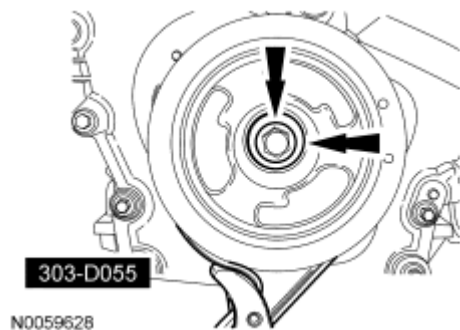


Fig. 21: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

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

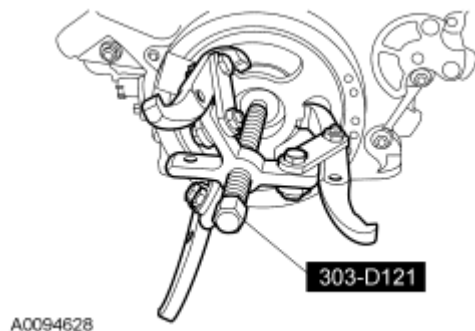


Fig. 22: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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.

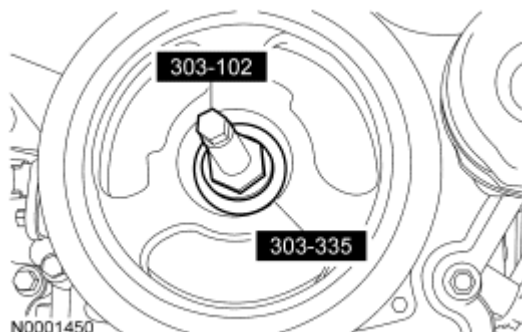


Fig. 23: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

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 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 & 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.

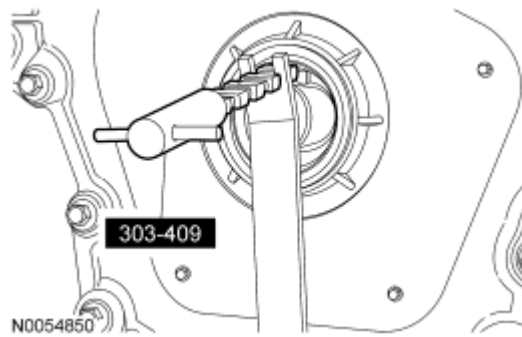


Fig. 25: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

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.

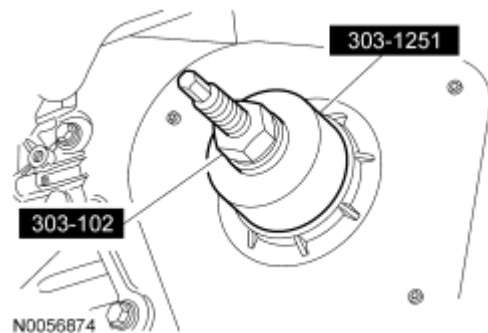
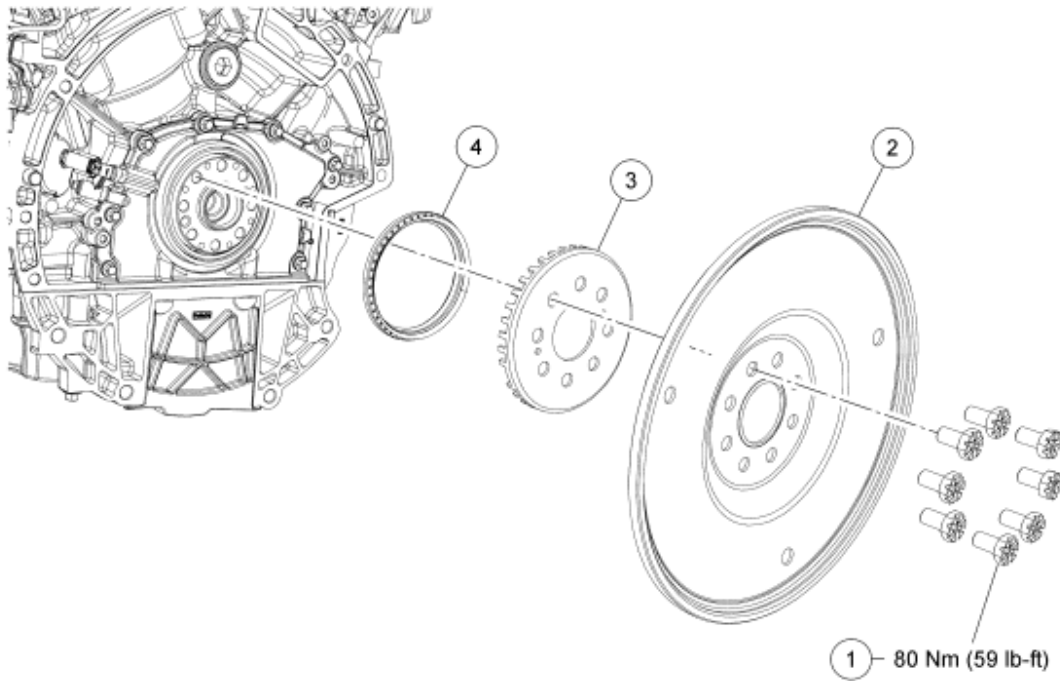


Fig. 26: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

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 in this service information.

FLEXPLATE

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Remove the transaxle. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6F50** article.



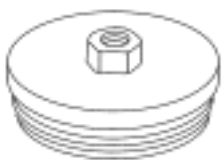

NOTE: One of the 8 flexplate holes are offset so the flexplate can only be installed in one position.

3. Remove the bolts and the flexplate.

- 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
 <p>ST1325-A</p>	Handle	205-153 (T80T-4000-W)
 <p>ST2980-A</p>	Installer, Rear Main Seal	303-1250
 <p>ST1382-A</p>	Remover, Crankshaft Rear Oil Seal	303-519 (T95P-6701-EH)
 <p>ST1187-A</p>	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	WSS-M2C930-A

(Canada); or equivalent

REMOVAL

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

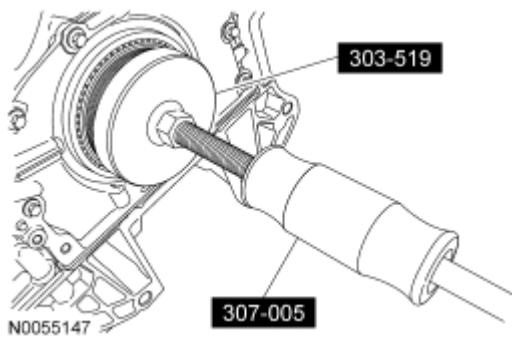


Fig. 28: Removing Crankshaft Rear Seal Using Special Tools (303-519) & (307-005)
Courtesy of FORD MOTOR CO.

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.

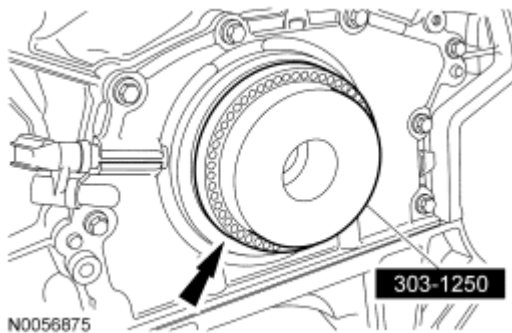


Fig. 29: Positioning Special Tool (303-1250) Onto End Of Crankshaft
Courtesy of FORD MOTOR CO.

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

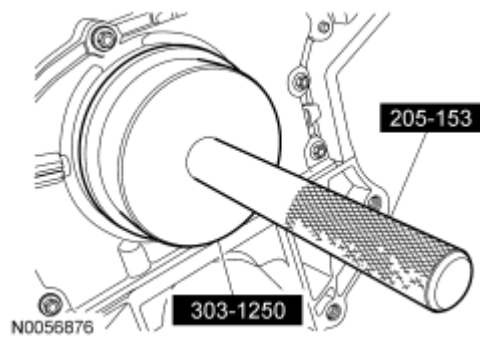
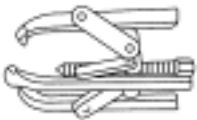




Fig. 30: Installing New Crankshaft Rear Seal Using Special Tools (303-1250) & (205-153)
Courtesy of FORD MOTOR CO.

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



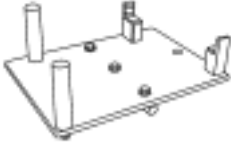
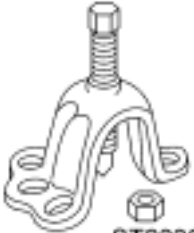


ENGINE FRONT COVER

Special Tools

Illustration	Tool Name	Tool Number
 ST1184-A	3-Jaw Puller	303-D121
 ST1326-A	Adapter for 205-529 (Handle)	205-153 (T80T-4000-W)
 ST2433-A	Alignment Pins	307-399
	Installer, Crankshaft Front Seal	303-1251



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 ST2981-A		
 ST2296-A	Installer, Front Cover Seal	303-335 (T88T-6701-A)
 ST3034-A	Oil Pan Holding Fixture	303-1295
 ST2330-A	Remover, Front Hub	205-D070 (D93P-1175-B) or equivalent
 ST2666-A	Remover, Halfshaft	205-529
 ST1385-A	Remover, Oil Seal	303-409 (T92C-6700CH)
	Replacer, Crankshaft Damper	303-102 (T74P-6312-B)

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 <p>ST1287-A</p>		
 <p>ST1438-A</p>	303-D055 (D85L-6000-A)	Strap Wrench

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 & LIFTING** article.
2. Recover the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & DIAGNOSTICS** article.
3. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING & CABLES** article.
4. Remove the accessory drive belt, tensioner and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.

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

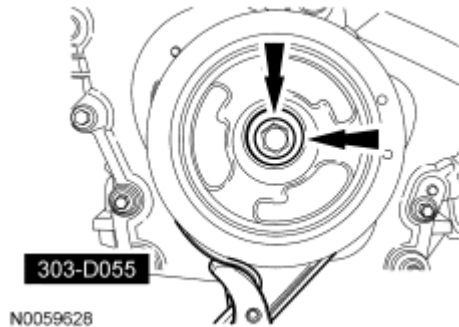


Fig. 31: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

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

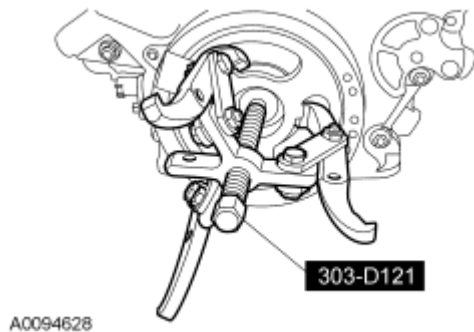


Fig. 32: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

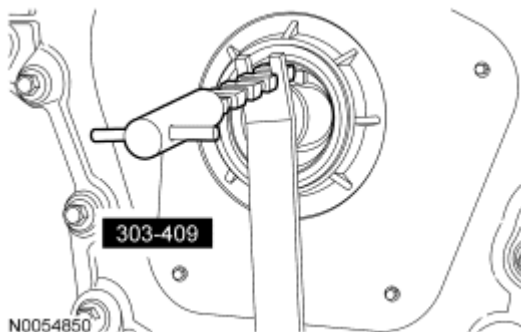


Fig. 33: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

8. Loosen the exhaust flexible pipe clamp and disconnect the 2 exhaust hangers.



Fig. 34: Locating Exhaust Flexible Pipe Clamp & Exhaust Hangers
Courtesy of FORD MOTOR CO.

9. Remove the 4 nuts, the exhaust flexible pipe and the Y-pipe as an assembly.
 - Discard the nuts and the gasket.

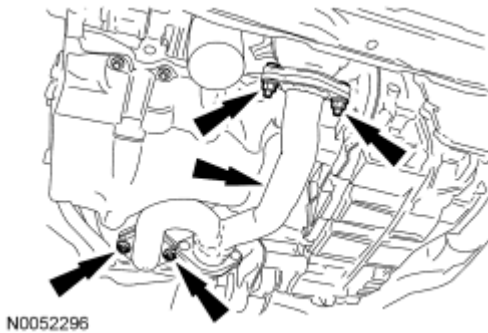


Fig. 35: Locating Exhaust Flexible Pipe, Y-Pipe & Nuts
Courtesy of FORD MOTOR CO.

10. Remove the 2 nuts and the roll restrictor heat shield.

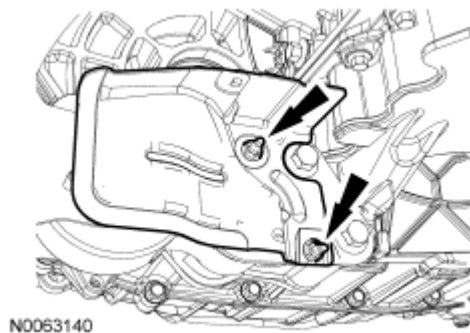


Fig. 36: Locating Roll Restrictor Heat Shield Nuts
Courtesy of FORD MOTOR CO.

11. Remove the roll restrictor through bolt and the 2 roll restrictor-to-transaxle bracket plate bolts.

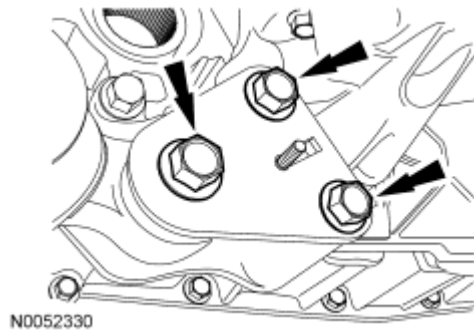


Fig. 37: Locating Roll Restrictor-To-Transaxle Bracket Plate Bolts
Courtesy of FORD MOTOR CO.

12. Loosen the roll restrictor-to-subframe through bolt.
 - Position the roll restrictor and transaxle bracket plate aside.

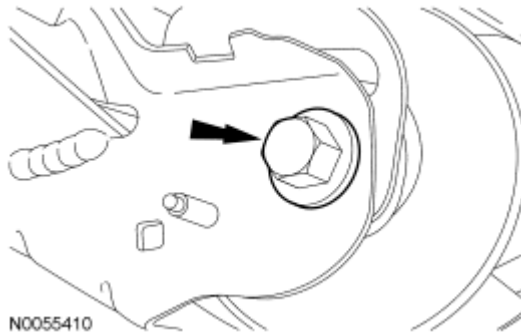


Fig. 38: Locating Roll Restrictor-To-Subframe Bolt
Courtesy of FORD MOTOR CO.

13. Remove the 3 bolts and the transaxle bracket.

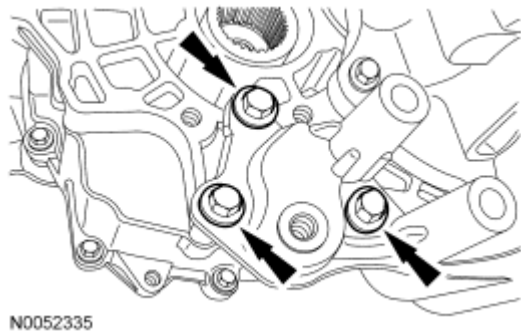


Fig. 39: Locating Transaxle Bracket Bolts
Courtesy of FORD MOTOR CO.

14. Remove and discard the RH front halfshaft nut.

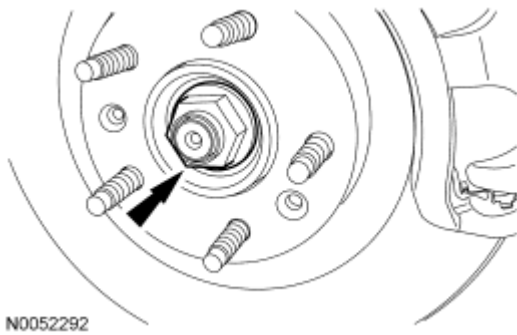


Fig. 40: Locating RH Front Halfshaft Nut
Courtesy of FORD MOTOR CO.

15. Remove the RH stabilizer link-to-lower control arm nut.

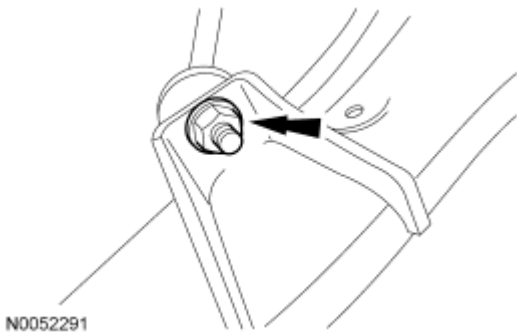


Fig. 41: Locating Stabilizer Bar Link Nut
Courtesy of FORD MOTOR CO.

16. Remove the RH lower control arm-to-knuckle pinch bolt.
- Separate the lower control arm from the knuckle.

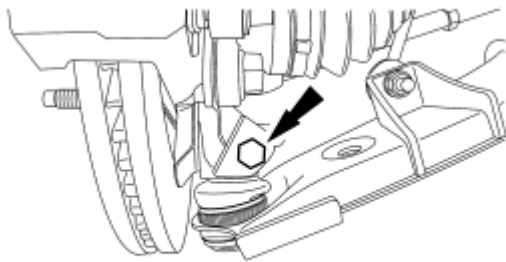


Fig. 42: Locating Ball Joint Pinch Bolt
Courtesy of FORD MOTOR CO.

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

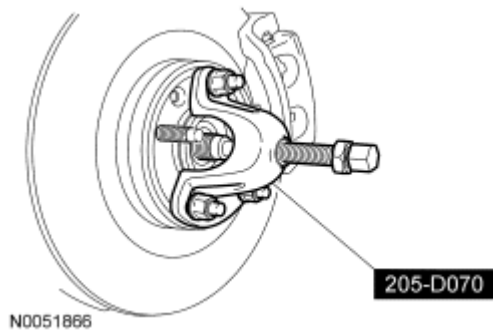


Fig. 43: Separating RH Halfshaft From Hub Using Special Tool (205-D070)
Courtesy of FORD MOTOR CO.

18. Using the special tools, separate the RH halfshaft from the intermediate shaft.
 - Remove the RH halfshaft.

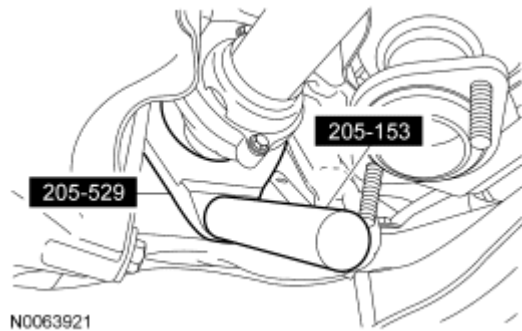


Fig. 44: Separating RH Halfshaft From Intermediate Shaft Using Special Tool (205-529) & (205-153)
Courtesy of FORD MOTOR CO.

19. Remove the drain plug and drain the engine oil.
 - Install the drain plug and tighten to 27 Nm (20 lb-ft).
20. If equipped, detach the engine block heater harness from the radiator support, the A/C suction tube and the engine wiring harness.

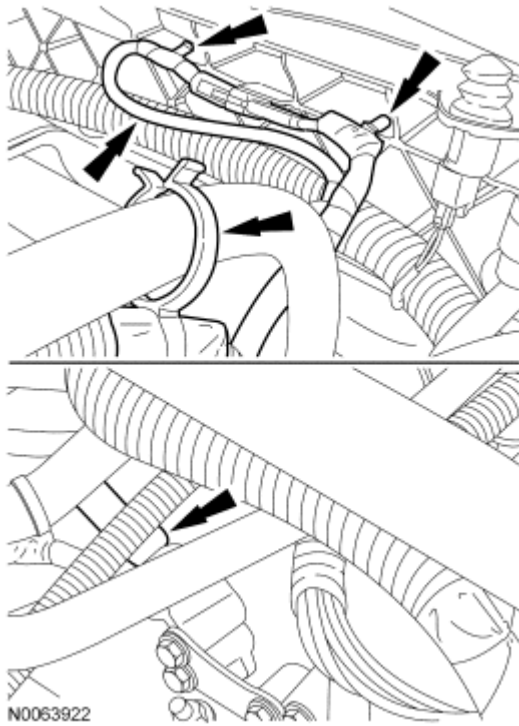


Fig. 45: Identifying Engine Block Heater Harness, Radiator Support, A/C Suction Tube & Engine Wiring Harness

Courtesy of FORD MOTOR CO.

21. Remove the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** article.
22. Remove the LH and RH valve covers. For additional information, refer to **Valve Cover - LH** and **Valve Cover - RH**.
23. Remove the safety clip from the A/C suction tube fitting.
 - Disconnect the A/C suction tube fitting and position the tube aside.

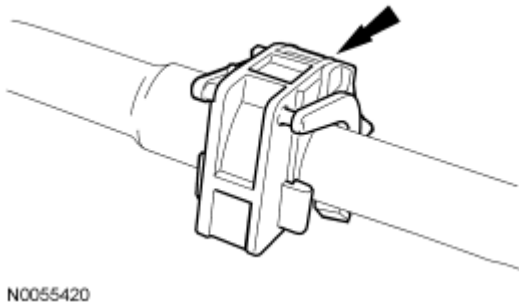


Fig. 46: Identifying Safety Clip On A/C Suction Tube Fitting

Courtesy of FORD MOTOR CO.

24. Remove the A/C pressure tube bracket bolt.

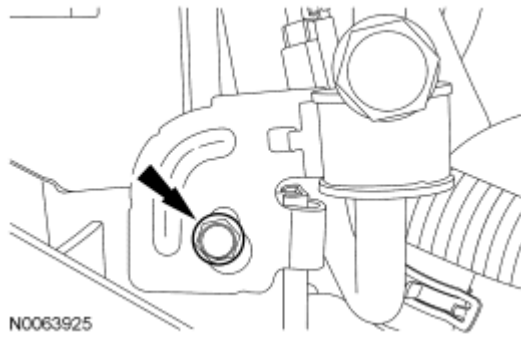


Fig. 47: Locating A/C Pressure Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

25. Remove the nut and disconnect the A/C pressure tube fitting.
- Discard the O-ring seal.
 - Position the A/C pressure tube aside.

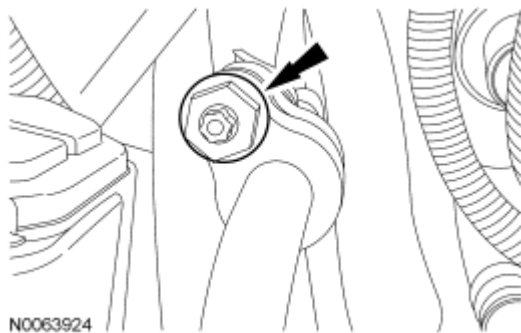


Fig. 48: Locating A/C Pressure Tube Fitting Nut
Courtesy of FORD MOTOR CO.

26. Disconnect the 2 engine wiring harness connectors.

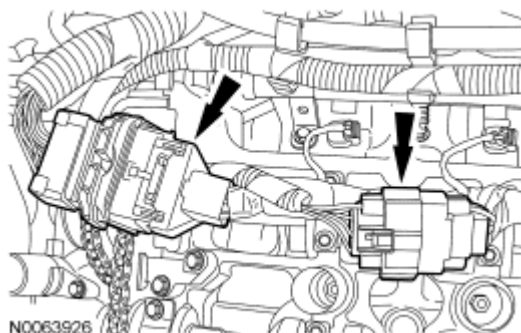


Fig. 49: Locating Engine Wiring Harness Connectors
Courtesy of FORD MOTOR CO.

27. Remove the bolt and the ground wire from the engine front cover.

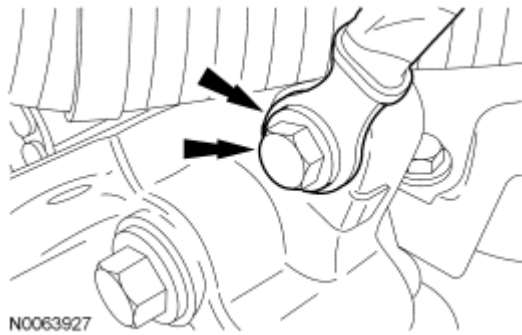


Fig. 50: Removing/Installing Bolt & Ground Wire From Engine Front Cover
Courtesy of FORD MOTOR CO.

28. Remove the nut, the ground wire and the radio interference capacitor wire from the engine front cover stud.

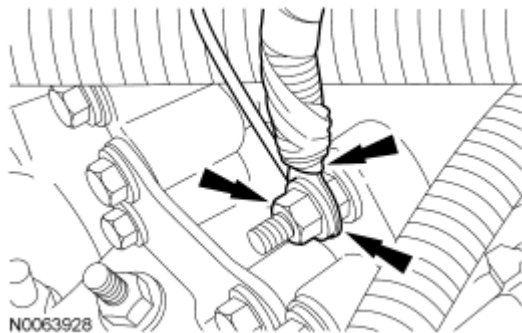


Fig. 51: Removing/installing Nut, Ground Wire & Radio Interference Capacitor Wire From Engine Front Cover Stud
Courtesy of FORD MOTOR CO.

29. Remove the nut, the ground wire and the radio interference capacitor from the cowl stud.

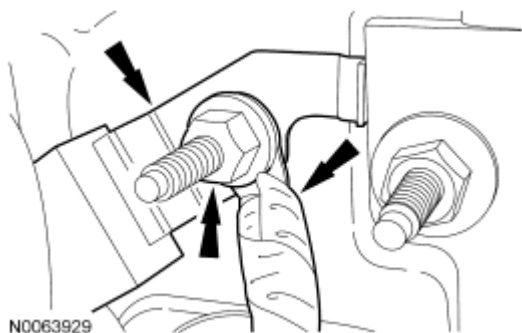


Fig. 52: Removing/Installing Nut, Ground Wire & Radio Interference Capacitor From Cowl Stud
Courtesy of FORD MOTOR CO.

30. Disconnect the purge valve electrical connector.

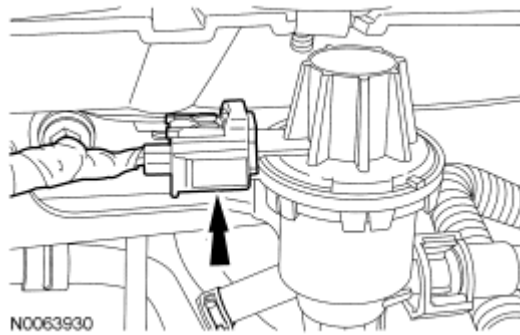


Fig. 53: Locating Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

31. Disconnect the 3 PCM electrical connectors and position the wiring harness aside.

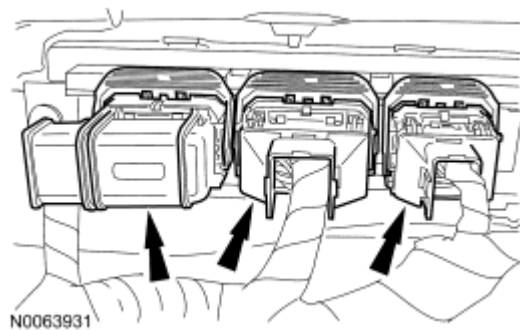


Fig. 54: Identifying PCM Electrical Connectors & Wiring Harness
Courtesy of FORD MOTOR CO.

32. Remove the 3 bolts and position the degas bottle aside.

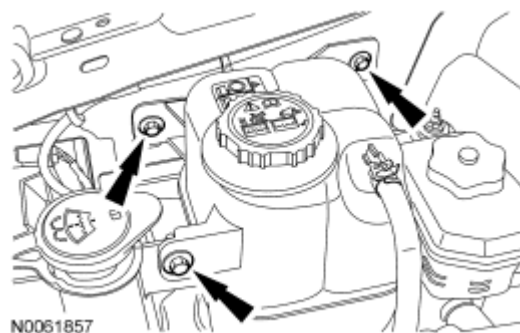


Fig. 55: Locating Coolant Reservoir Bolts
Courtesy of FORD MOTOR CO.

NOTE: The area between the front of the engine and the body of the vehicle must be unobstructed in order to properly remove and install the engine front cover.

33. Remove the 2 power steering reservoir nuts.

- Support the power steering reservoir and hose away from the front of the engine with a length of mechanic's wire.

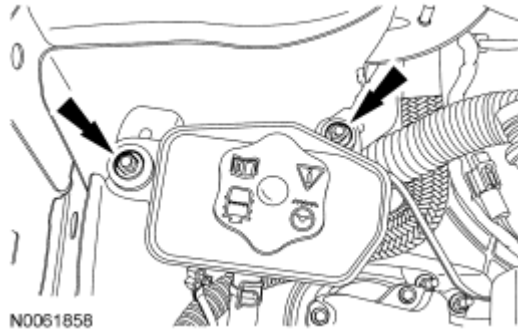


Fig. 56: Locating Power Steering Reservoir Nuts
Courtesy of FORD MOTOR CO.

34. Remove the 3 power steering pump bolts.

- Support the power steering pump and hose away from the front of the engine with a length of mechanic's wire.

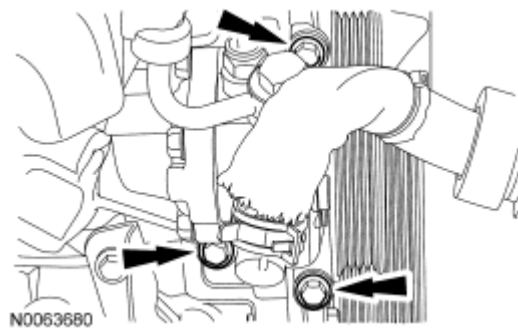


Fig. 57: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

35. Remove the bolts, the LH and the RH VCT solenoids.

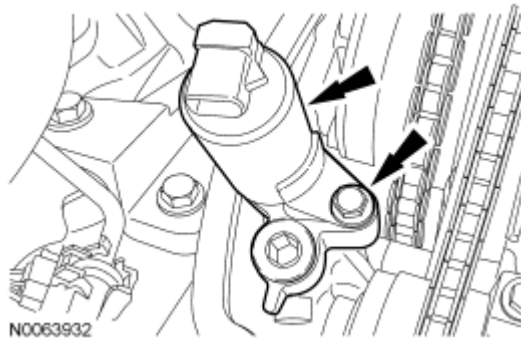


Fig. 58: Locating LH & RH VCT Solenoids Bolts
Courtesy of FORD MOTOR CO.

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.

NOTE: The special tool and floor jack are used to raise and lower the engine to access the engine front cover and engine mount bracket fasteners.

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

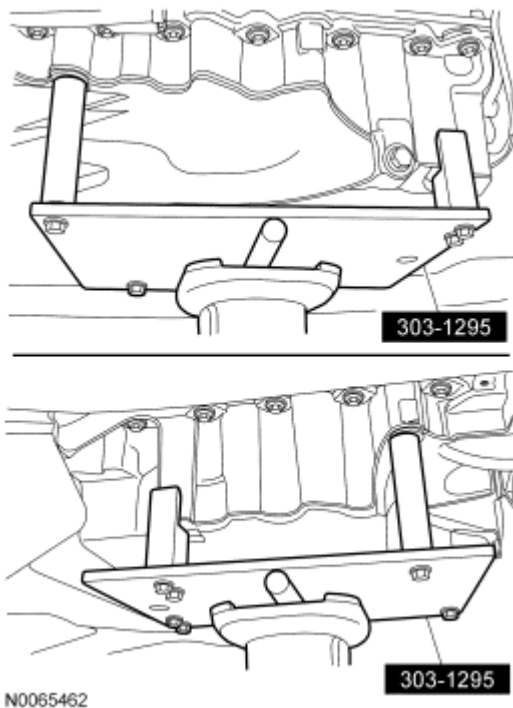


Fig. 59: Positioning Floor Jack & Special Tool (303-1295) Under Oil Pan
Courtesy of FORD MOTOR CO.

CAUTION: The transaxle through bolt must be loosened prior to removing the

engine mount and lowering the front of the engine. Failure to follow these instructions may cause internal damage to the hydraulic transaxle mount and possible fluid leakage.

37. Loosen the transaxle mount through bolt.

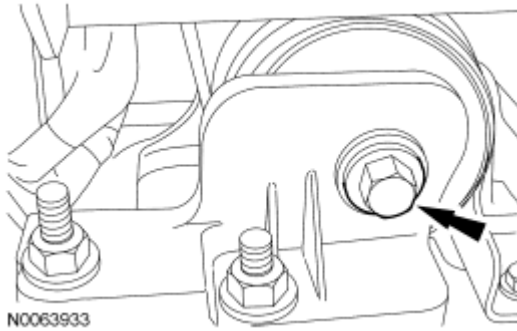


Fig. 60: Identifying Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

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

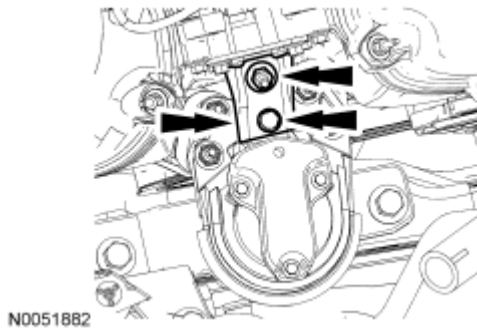


Fig. 61: Locating Nut, Bolt & Engine Mount Brace
Courtesy of FORD MOTOR CO.

39. Remove the 4 engine mount nuts.

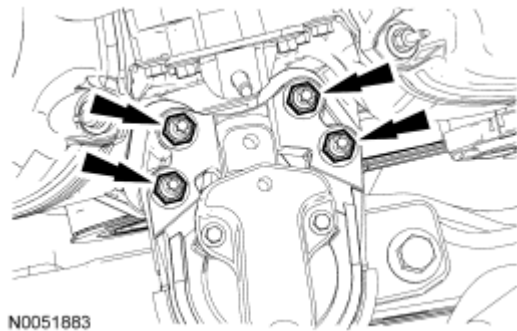


Fig. 62: Locating Engine Mount Nuts

Courtesy of FORD MOTOR CO.

40. Remove the 3 bolts and the engine mount.



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

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

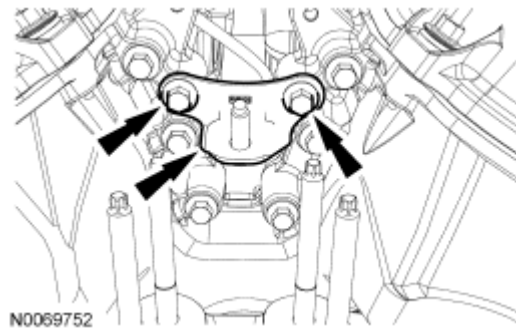


Fig. 64: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

42. Remove the 2 engine mount studs.

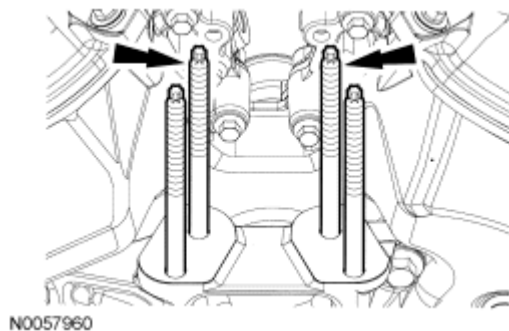


Fig. 65: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

43. Remove the 2 upper engine mount bracket bolts.

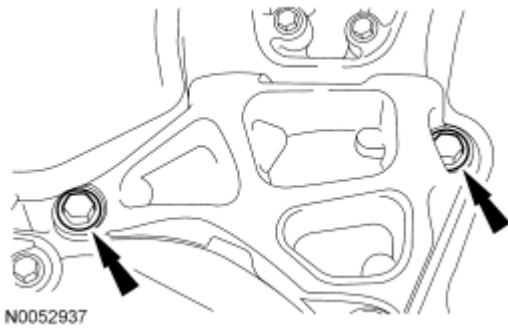


Fig. 66: Locating Upper Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

44. Lower the engine to access the lower engine mount bracket bolt.
45. Loosen the lower engine mount bracket bolt and remove the engine mount bracket and bolt as an assembly.

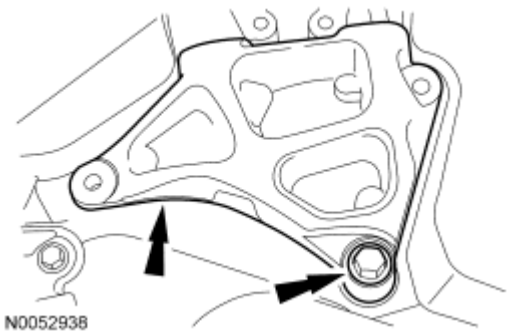
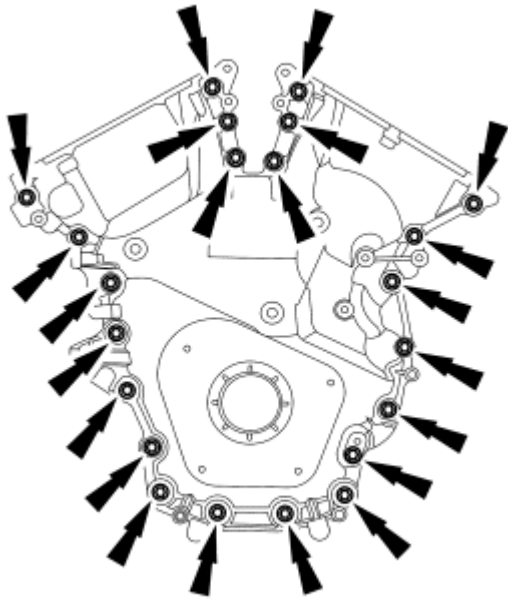


Fig. 67: Locating Lower Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

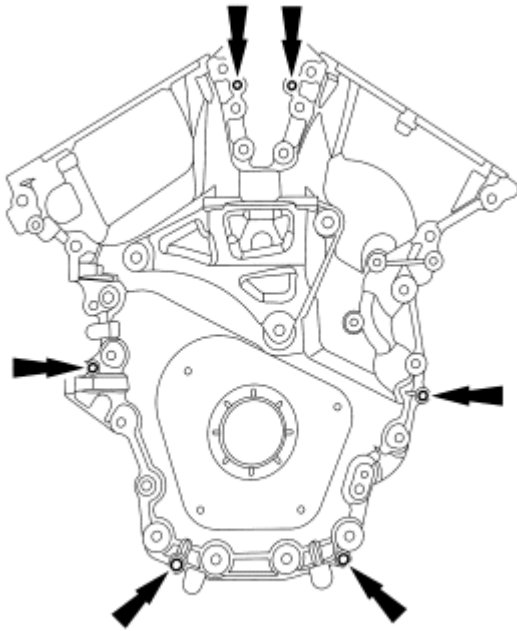
46. Remove the 22 engine front cover bolts.



N0054851

Fig. 68: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

47. 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. 69: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

INSTALLATION

1. Raise the engine to the installed position.

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 crankshaft rear seal retainer plate. These tools cause scratches and gouges that make leak paths.

2. 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 the gasket.

3. 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.
4. Install the special tools.

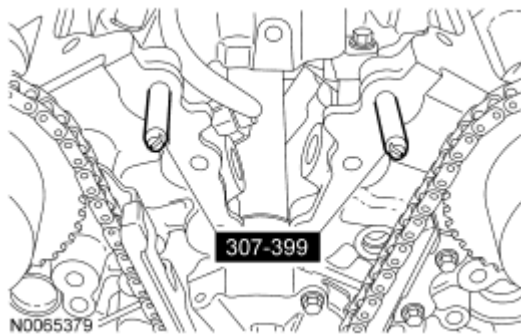


Fig. 70: Identifying Special Tool (307-399)
Courtesy of FORD MOTOR CO.

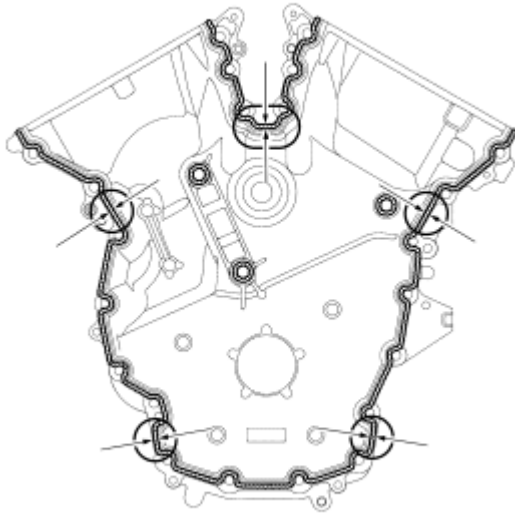
CAUTION: Failure to use Motorcraft High Performance Engine RTV Silicone may cause the engine oil to foam excessively and result in serious engine damage.

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.

5. 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)



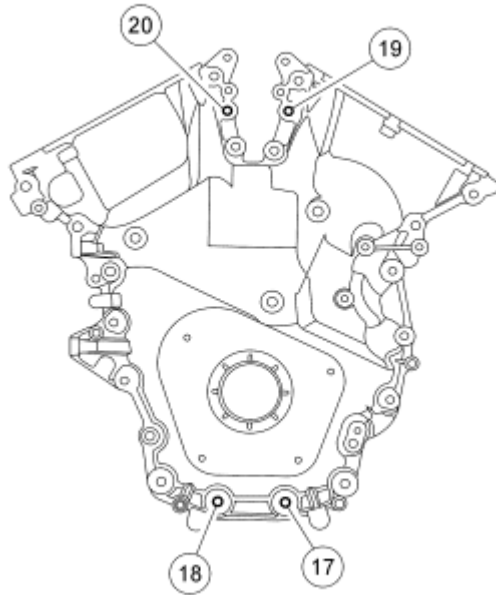
N0068283

Fig. 71: 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.

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



N0068108

Fig. 72: Installing Engine Front Cover & Bolts In Sequence
Courtesy of FORD MOTOR CO.

7. Remove the special tools (alignment pins).

NOTE: Do not tighten the bolt at this time.

8. Lower the engine to allow installation of the engine mount bracket and lower bolt.
 - Install the engine mount bracket and lower bolt as an assembly.

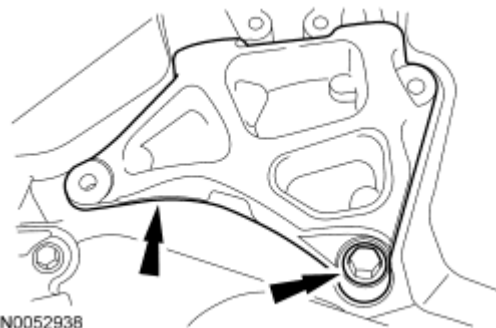


Fig. 73: Locating Lower Engine Mount Bracket Bolt
Courtesy of FORD MOTOR CO.

NOTE: Do not tighten the bolts at this time.

9. Raise the engine to the installed position.

- Install the 2 upper engine mount bracket bolts.

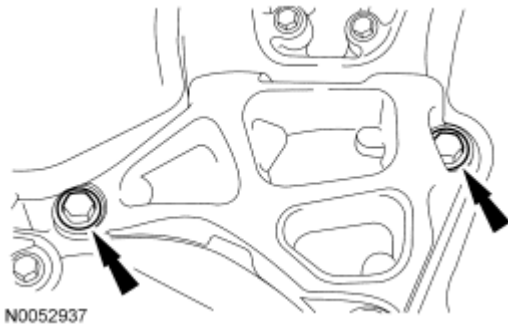


Fig. 74: Locating Upper Engine Mount Bracket Bolts
Courtesy of FORD MOTOR CO.

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.

10. 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 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).

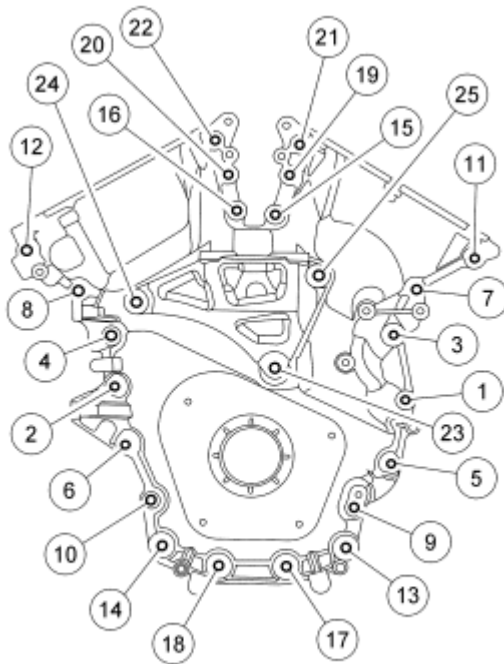
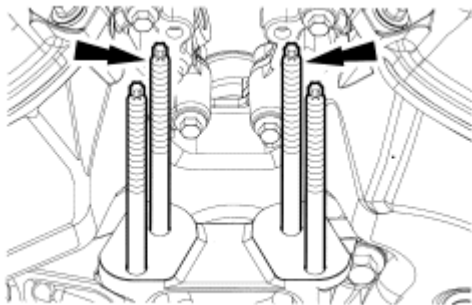


Fig. 75: Identifying Tightening Of Engine Front Cover Bolts & Engine Mount Bracket Bolts In Sequence

Courtesy of FORD MOTOR CO.

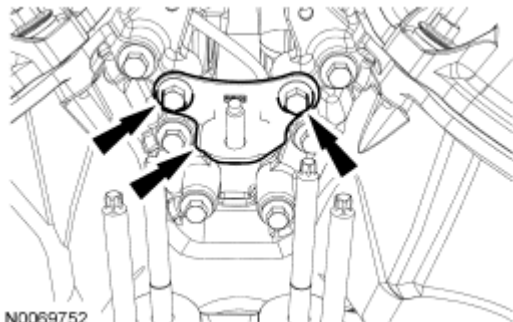
11. Install the 2 engine mount studs.
 - Tighten to 18 Nm (13 lb-ft).



N0057960

Fig. 76: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

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



N0069752

Fig. 77: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

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



N0055423

Fig. 78: Locating Engine Mount Bolts
Courtesy of FORD MOTOR CO.

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

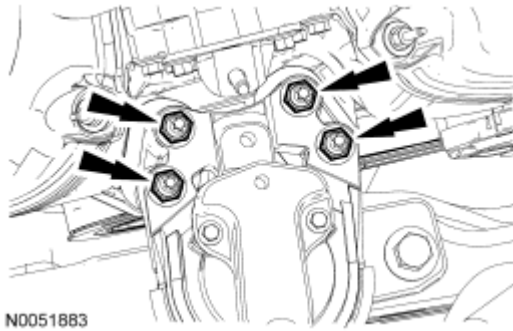


Fig. 79: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

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

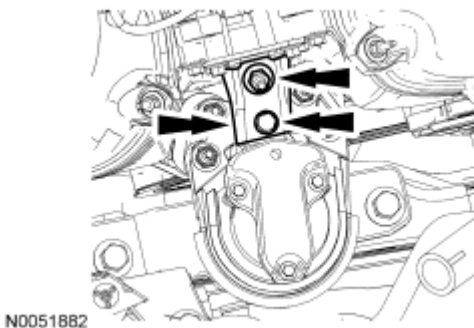


Fig. 80: Locating Nut, Bolt & Engine Mount Brace
Courtesy of FORD MOTOR CO.

16. Tighten the transaxle mount through bolt to 175 Nm (129 lb-ft).

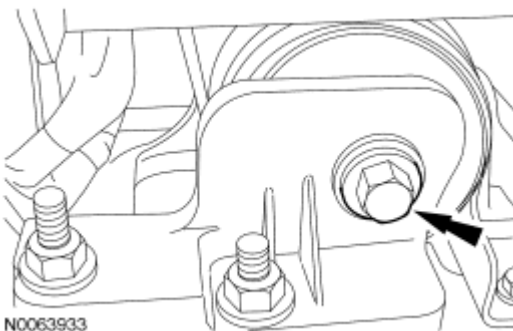


Fig. 81: Identifying Transaxle Mount Bolt
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

17. Install the LH and RH VCT solenoids and bolts.
 - Tighten to 10 Nm (89 lb-in).

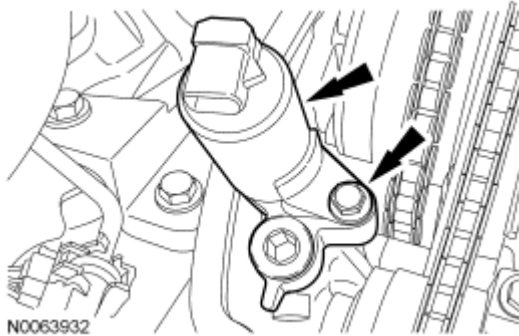


Fig. 82: Locating LH & RH VCT Solenoids Bolts
Courtesy of FORD MOTOR CO.

18. Install the power steering pump and the 3 bolts.
 - Tighten to 24 Nm (18 lb-ft).

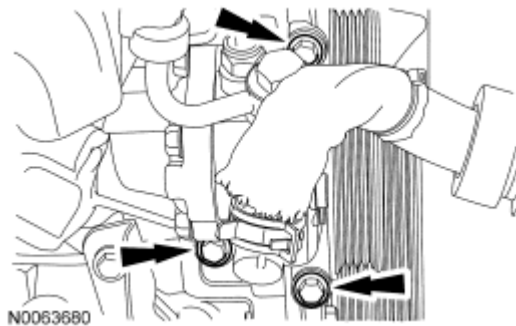


Fig. 83: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

19. Install the power steering reservoir and the 2 nuts.
 - Tighten to 8 Nm (71 lb-in).

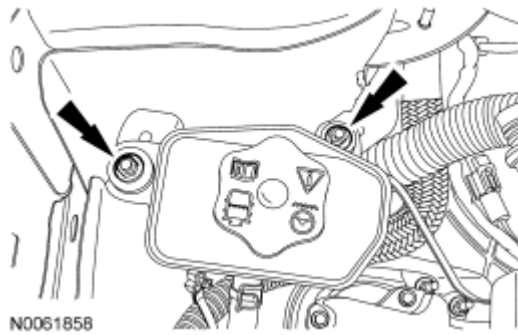


Fig. 84: Locating Power Steering Reservoir Nuts
Courtesy of FORD MOTOR CO.

20. Install the degas bottle and the 3 bolts.
 - Tighten to 9 Nm (80 lb-in).

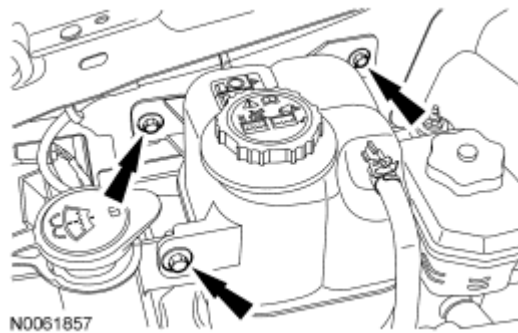


Fig. 85: Locating Coolant Reservoir Bolts
Courtesy of FORD MOTOR CO.

21. Connect the 3 PCM electrical connectors.

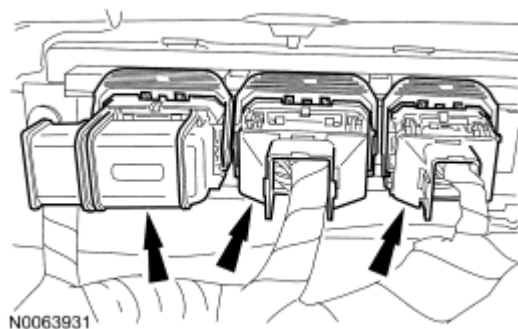


Fig. 86: Identifying PCM Electrical Connectors & Wiring Harness
Courtesy of FORD MOTOR CO.

22. Connect the purge valve electrical connector.

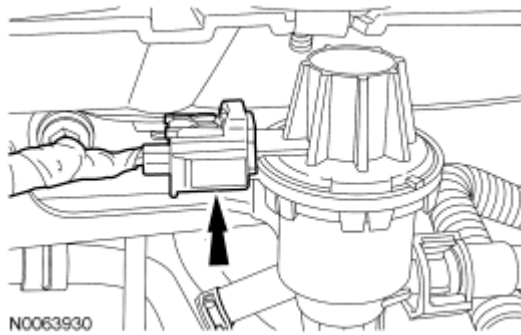


Fig. 87: Locating Purge Valve Electrical Connector
Courtesy of FORD MOTOR CO.

23. Install the radio interference capacitor, the ground wire and the nut to the cowl stud.
- Tighten to 10 Nm (89 lb-in).

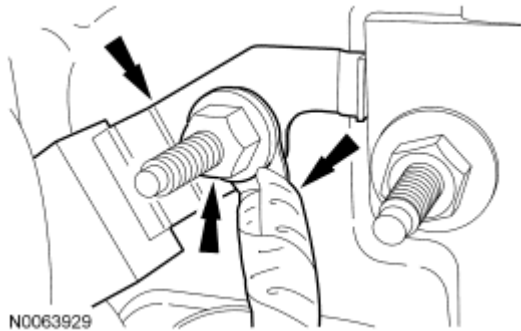


Fig. 88: Removing/Installing Nut, Ground Wire & Radio Interference Capacitor From Cowl Stud
Courtesy of FORD MOTOR CO.

24. Install the radio interference capacitor wire, the ground wire and the nut to the engine front cover stud.
- Tighten to 10 Nm (89 lb-in).

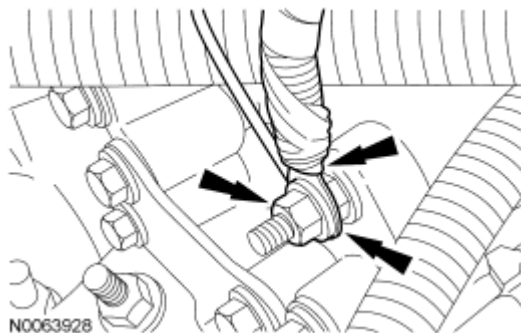


Fig. 89: Removing/installing Nut, Ground Wire & Radio Interference Capacitor Wire From Engine Front Cover Stud
Courtesy of FORD MOTOR CO.

25. Install the ground wire and bolt on the engine front cover.

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

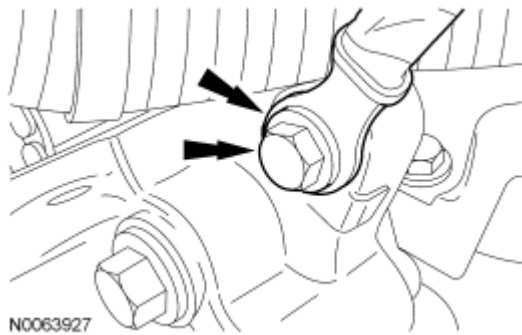


Fig. 90: Removing/Installing Bolt & Ground Wire From Engine Front Cover
Courtesy of FORD MOTOR CO.

26. Connect the 2 engine wiring harness connectors.

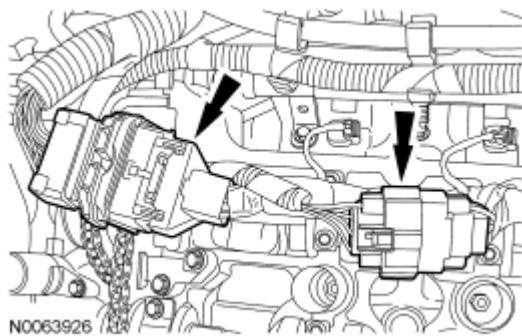


Fig. 91: Locating Engine Wiring Harness Connectors
Courtesy of FORD MOTOR CO.

27. Using a new O-ring seal, connect the A/C pressure tube fitting and install the nut.
- Tighten to 8 Nm (71 lb-in).

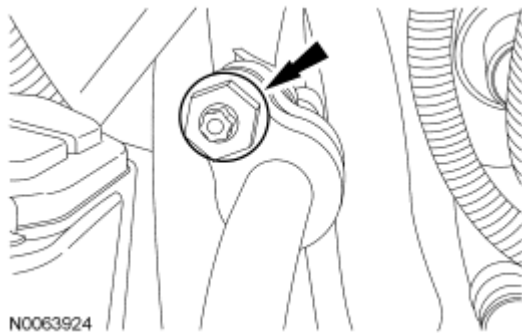


Fig. 92: Locating A/C Pressure Tube Fitting Nut
Courtesy of FORD MOTOR CO.

28. Install the A/C pressure tube bracket and bolt.

- Tighten to 8 Nm (71 lb-in).

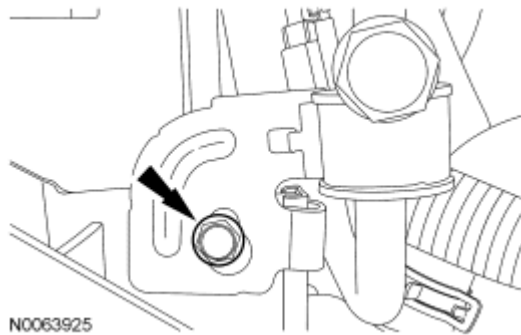


Fig. 93: Locating A/C Pressure Tube Bracket Bolt
Courtesy of FORD MOTOR CO.

29. Connect the A/C suction tube fitting.
 - Install the safety clip onto the fitting.

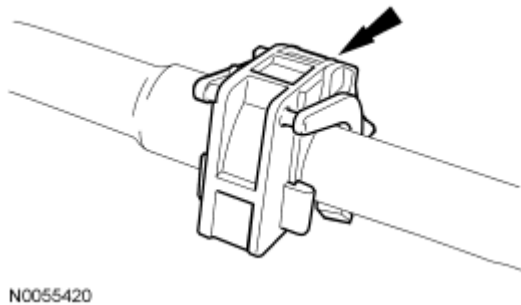


Fig. 94: Identifying Safety Clip On A/C Suction Tube Fitting
Courtesy of FORD MOTOR CO.

30. Install the LH and RH valve covers. For additional information, refer to **Valve Cover - LH** and **Valve Cover - RH**.
31. Install the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** article.
32. If equipped, attach the engine block heater harness to the radiator support, the A/C suction tube and the engine wiring harness.

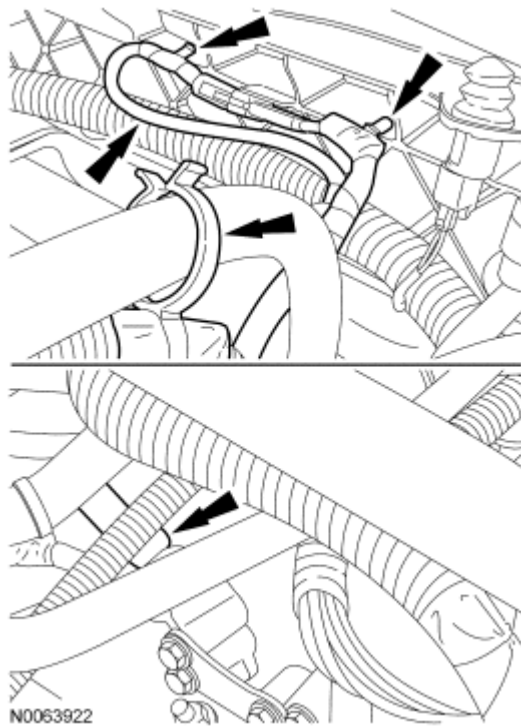


Fig. 95: Identifying Engine Block Heater Harness, Radiator Support, A/C Suction Tube & Engine Wiring Harness

Courtesy of FORD MOTOR CO.

33. Align the RH halfshaft splines with the intermediate shaft and push the halfshaft on until the circlip locks the shafts together.
 - Pull the inboard halfshaft outward to make sure the circlip is locked.

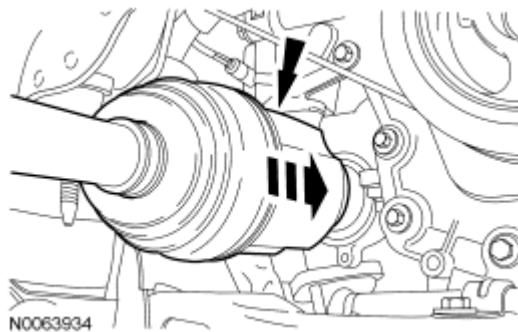


Fig. 96: Pushing Halfshaft On Until Circlip Locks Shafts Together

Courtesy of FORD MOTOR CO.

NOTE: Do not tighten the halfshaft nut at this time.

34. Install the RH halfshaft into the hub and install a new halfshaft nut.

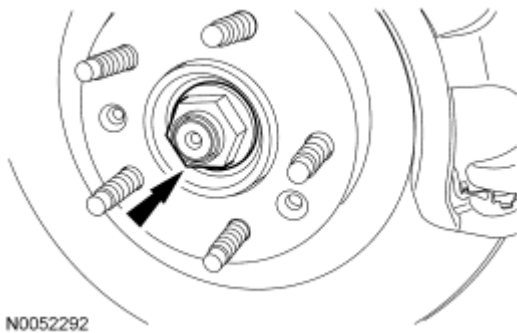


Fig. 97: Locating RH Front Halfshaft Nut
Courtesy of FORD MOTOR CO.

35. Install the RH lower ball joint into the steering knuckle and install the pinch bolt.
 - Tighten to 55 Nm (41 lb-ft).

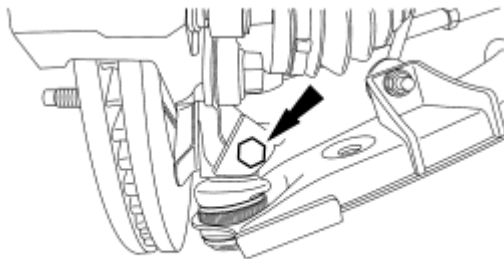


Fig. 98: Locating Ball Joint Pinch Bolt
Courtesy of FORD MOTOR CO.

36. Install the RH stabilizer bar link into the lower control arm and install the nut.
 - Tighten to 90 Nm (66 lb-ft).

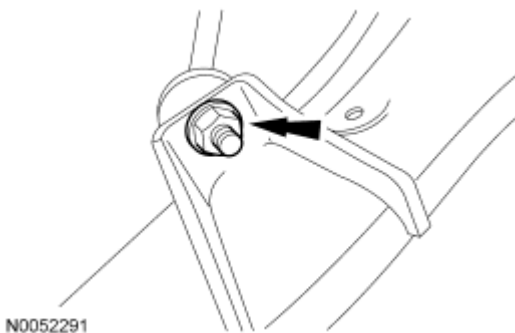


Fig. 99: Locating Stabilizer Bar Link Nut
Courtesy of FORD MOTOR CO.

NOTE: Apply the brake to keep the halfshaft from rotating.

37. Tighten the RH halfshaft nut to 350 Nm (258 lb-ft).

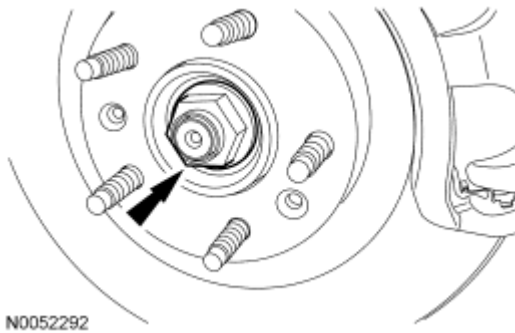


Fig. 100: Locating RH Front Halfshaft Nut
Courtesy of FORD MOTOR CO.

38. Install the transaxle bracket and the 3 bolts.
- Tighten to 90 Nm (66 lb-ft).

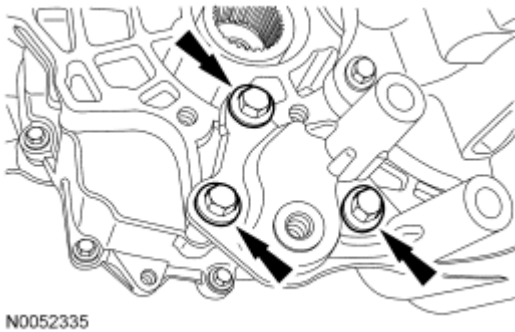


Fig. 101: Locating Transaxle Bracket Bolts
Courtesy of FORD MOTOR CO.

39. Position the roll restrictor and transaxle bracket plate and install the 3 bolts.
- Tighten to 90 Nm (66 lb-ft).

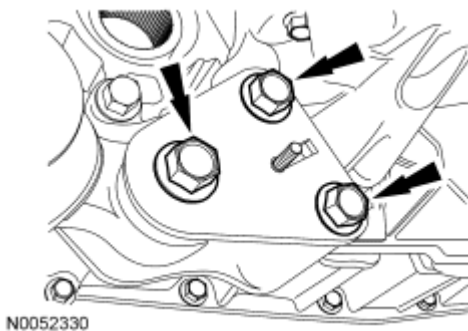


Fig. 102: Locating Roll Restrictor-To-Transaxle Bracket Plate Bolts
Courtesy of FORD MOTOR CO.

40. Tighten the engine roll restrictor-to-subframe through bolt to 103 Nm (76 lb-ft).

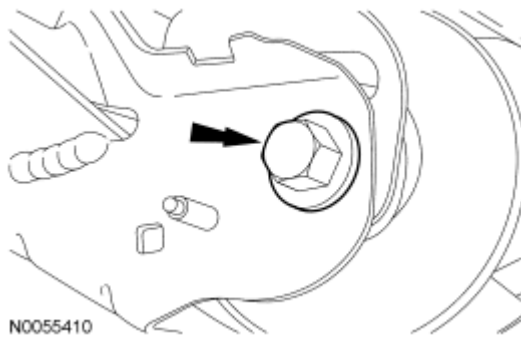


Fig. 103: Locating Roll Restrictor-To-Subframe Bolt
Courtesy of FORD MOTOR CO.

41. Install the roll restrictor heat shield and the 2 nuts.
- Tighten to 11 Nm (8 lb-ft).

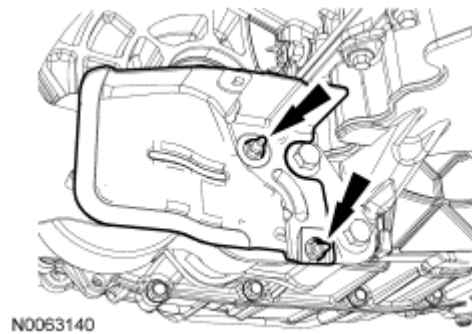


Fig. 104: Locating Roll Restrictor Heat Shield Nuts
Courtesy of FORD MOTOR CO.

42. Position the Y-pipe assembly in place and install the 4 nuts.
- Tighten to 40 Nm (30 lb-ft).

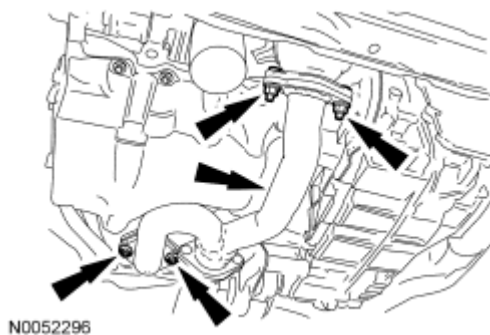


Fig. 105: Locating Exhaust Flexible Pipe, Y-Pipe & Nuts
Courtesy of FORD MOTOR CO.

43. Install the 2 exhaust hangers and tighten the exhaust clamp.
 - Tighten to 40 Nm (30 lb-ft).

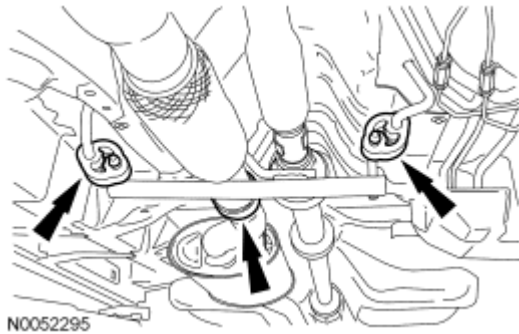


Fig. 106: Locating Exhaust Flexible Pipe Clamp & Exhaust Hangers
Courtesy of FORD MOTOR CO.

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

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

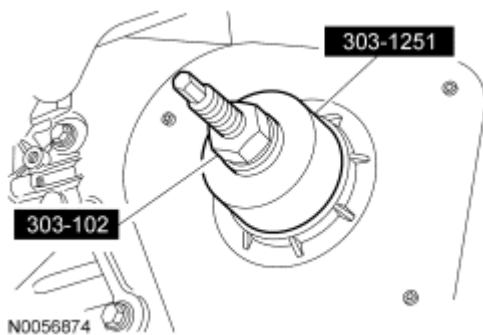


Fig. 107: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

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

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

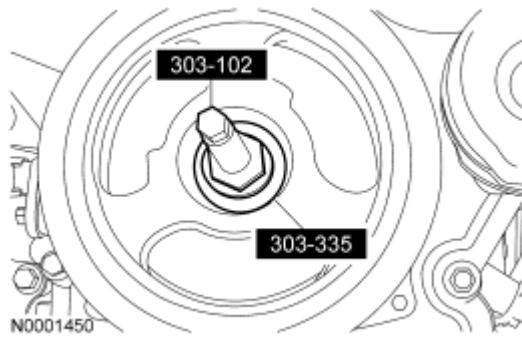


Fig. 108: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

46. 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.

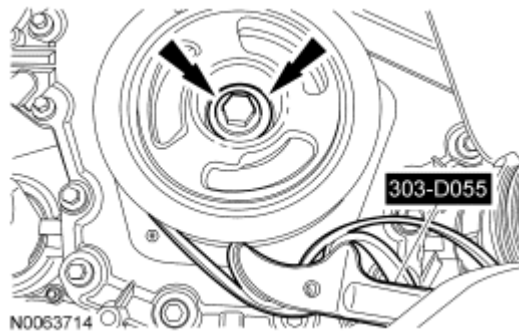


Fig. 109: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

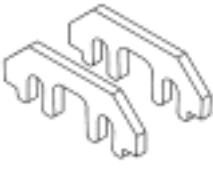
47. Install the accessory drive belt, tensioner and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.

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.

48. Fill the engine with clean engine oil.
49. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING & CABLES** article.
50. Evacuate and recharge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & 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.

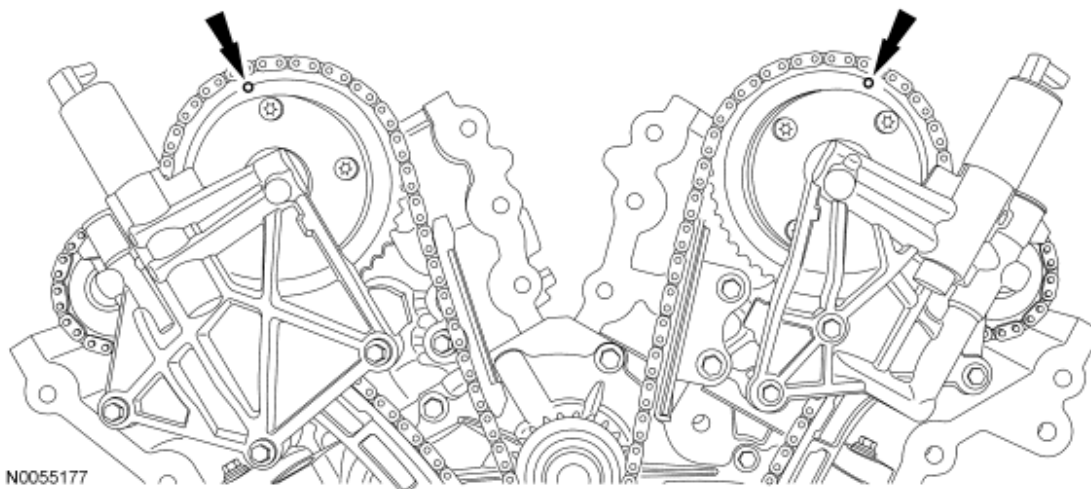


Fig. 110: Aligning Timing Marks On Variable Camshaft Timing (VCT) Assemblies
Courtesy of FORD MOTOR CO.

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.

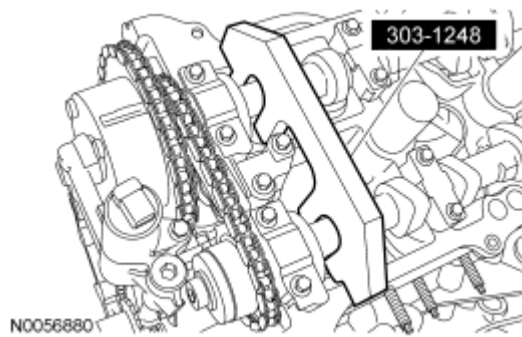


Fig. 111: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

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

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

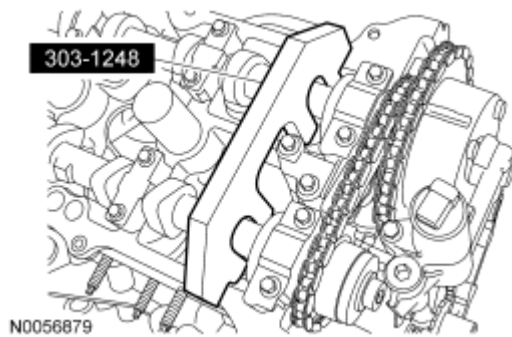


Fig. 112: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

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

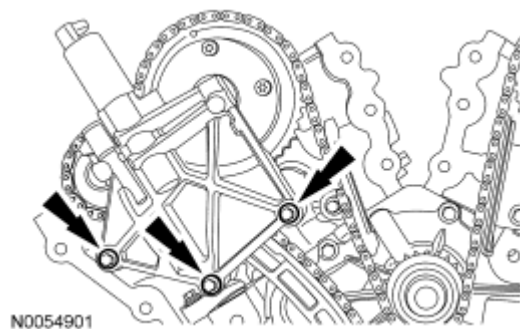


Fig. 113: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

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

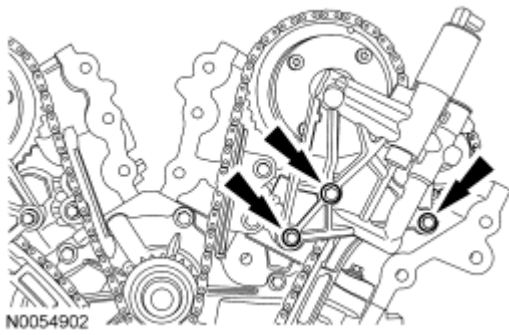


Fig. 114: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

7. Remove and discard the VCT housing seals.

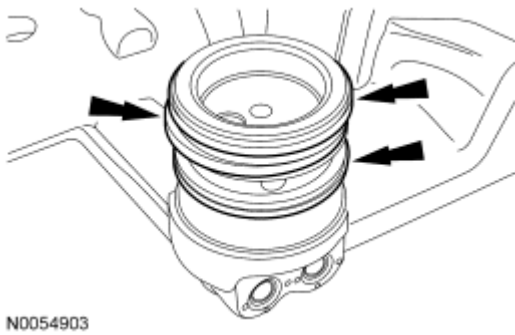


Fig. 115: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

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

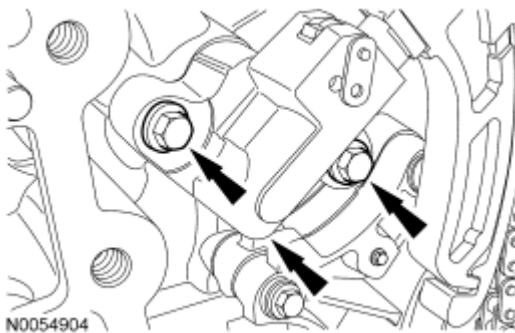


Fig. 116: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

9. Remove the primary timing chain tensioner arm.

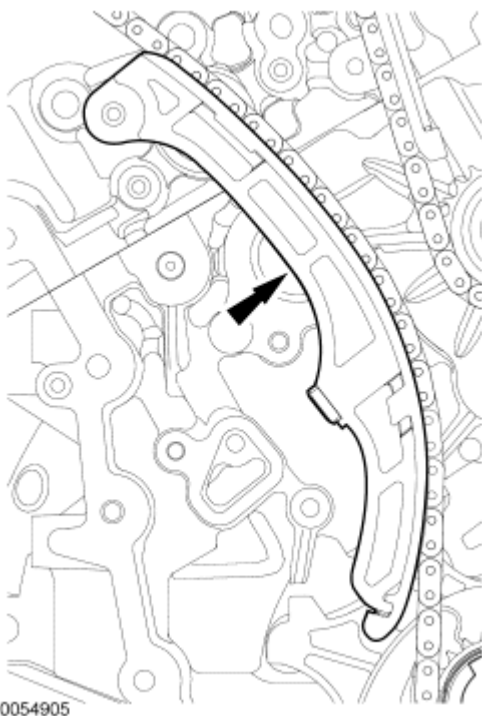


Fig. 117: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

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

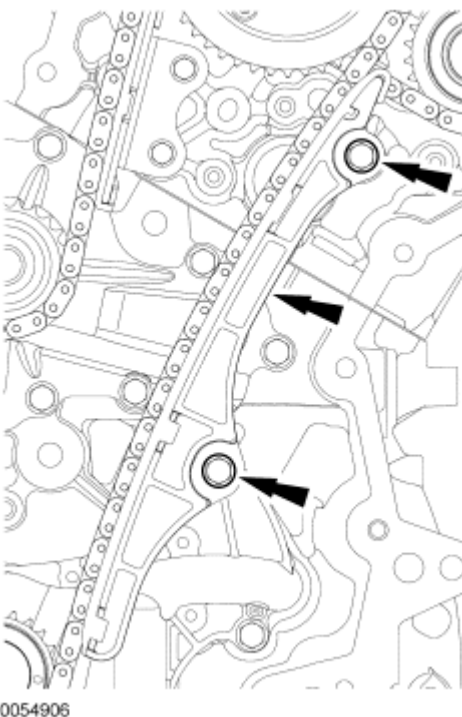
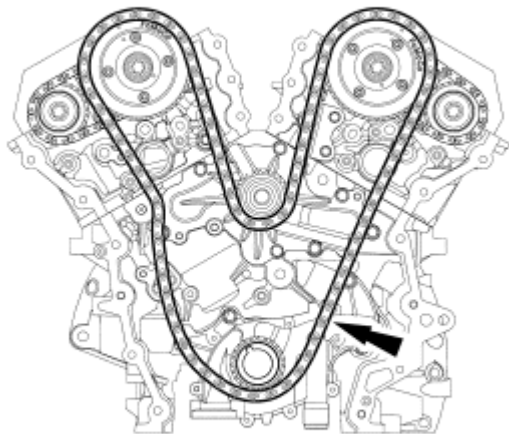


Fig. 118: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

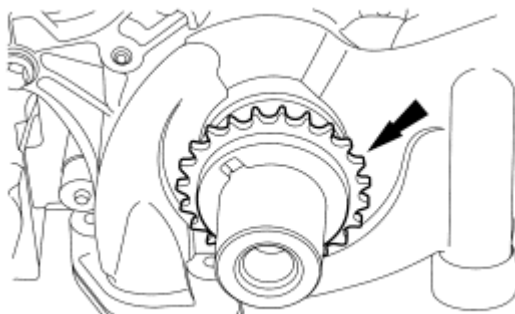
11. Remove the primary timing chain.



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Fig. 119: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

12. Remove the crankshaft timing chain sprocket.



N0054909

Fig. 120: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

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

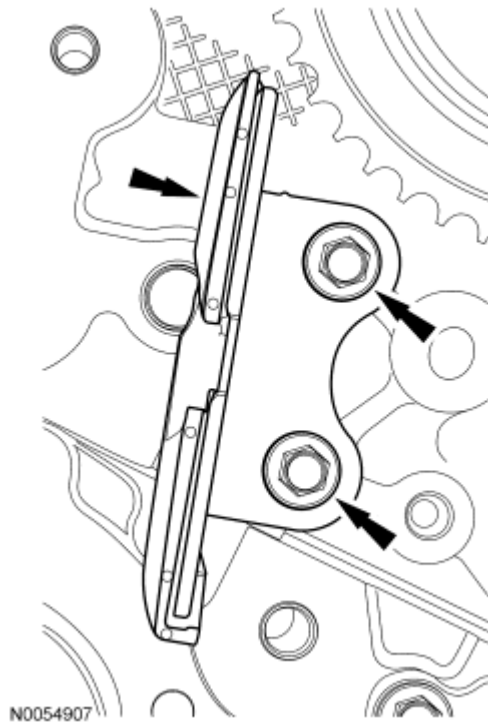


Fig. 121: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

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

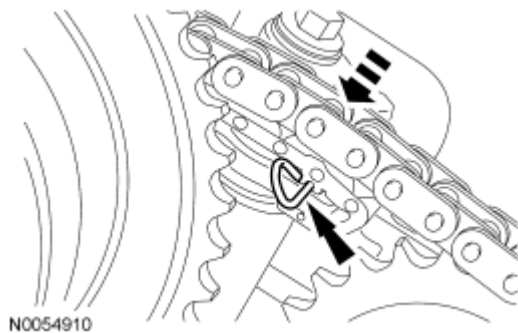


Fig. 122: Compressing LH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

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.

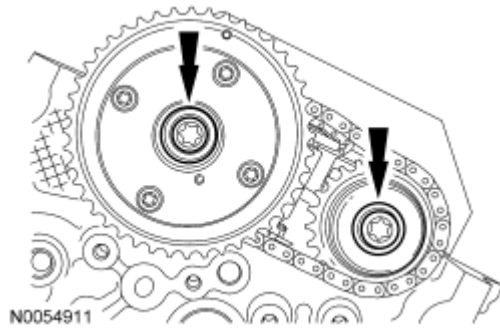


Fig. 123: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
 Courtesy of FORD MOTOR CO.

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.

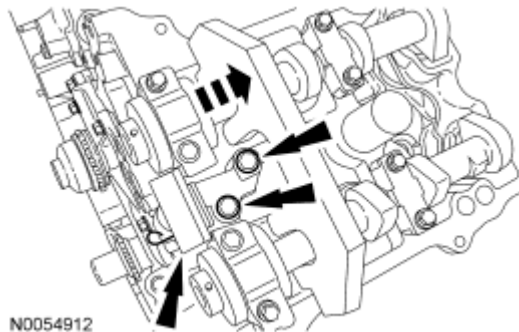


Fig. 124: Locating LH Secondary Timing Chain Tensioner Bolts
 Courtesy of FORD MOTOR CO.

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

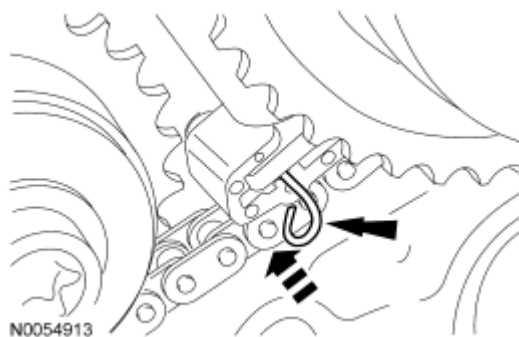


Fig. 125: Compressing RH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
 Courtesy of FORD MOTOR CO.

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.

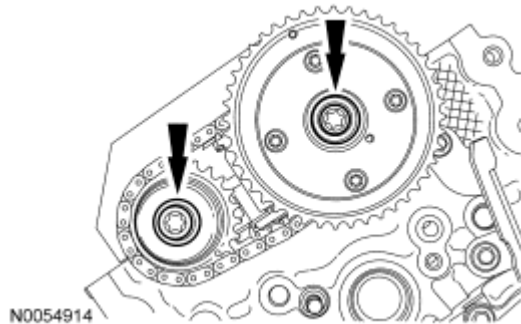


Fig. 126: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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.

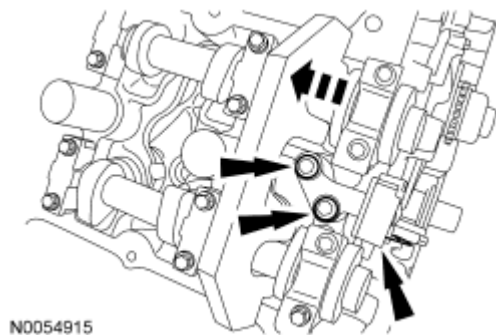


Fig. 127: Locating RH Secondary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

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

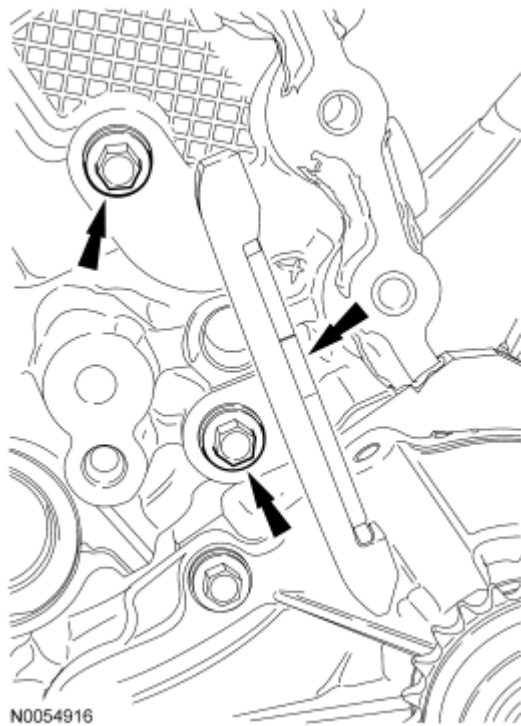


Fig. 128: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

INSTALLATION

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

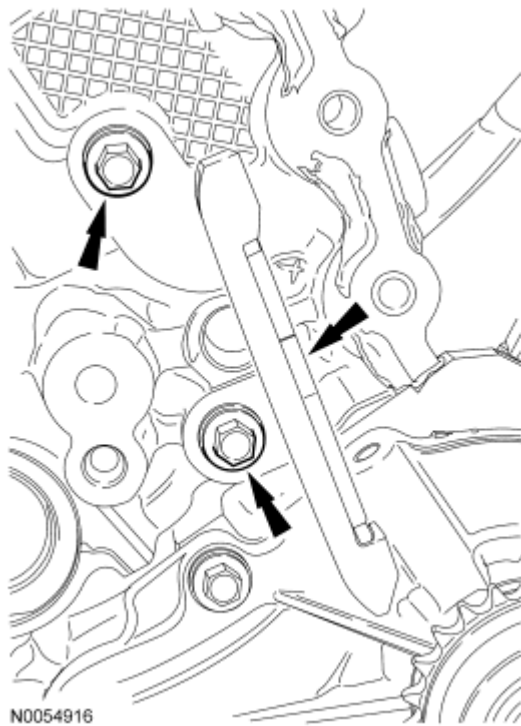


Fig. 129: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

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).

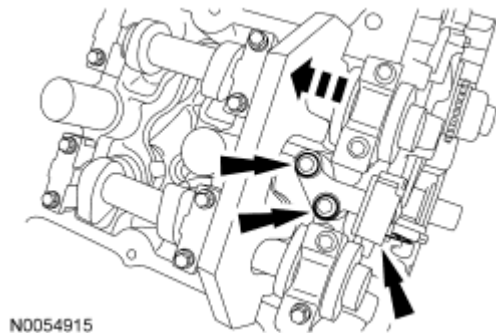


Fig. 130: Locating RH Secondary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

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.

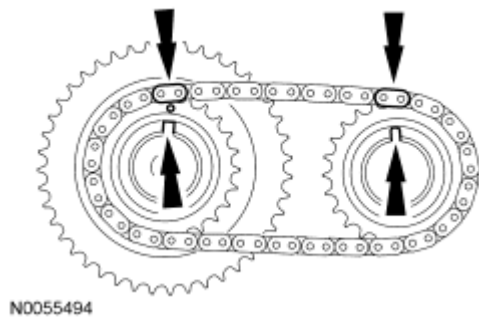


Fig. 131: Aligning RH Exhaust Camshaft Sprocket & RH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

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

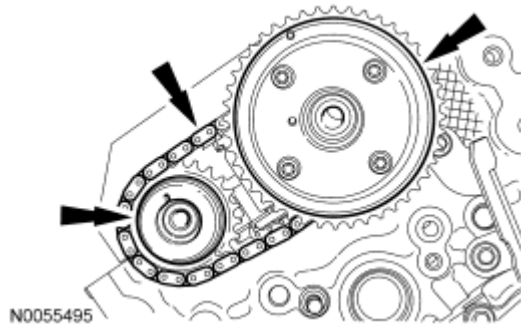


Fig. 132: Positioning RH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

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.

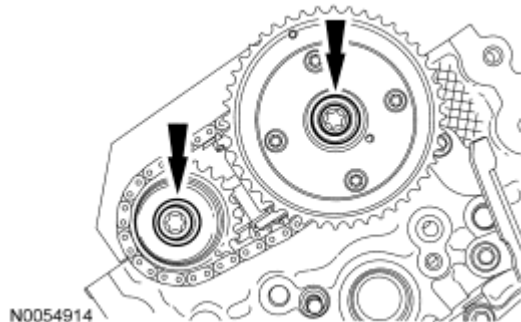


Fig. 133: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

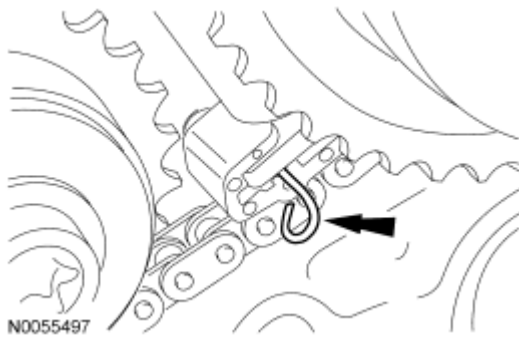


Fig. 134: Identifying Lock Pin On RH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

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).

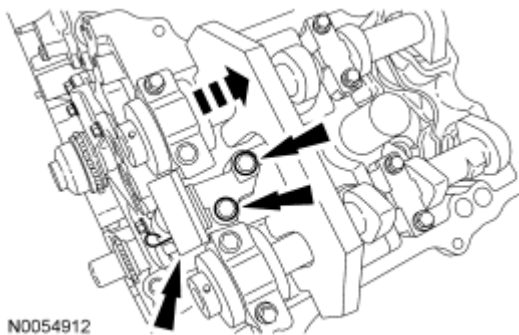


Fig. 135: Locating LH Secondary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

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.

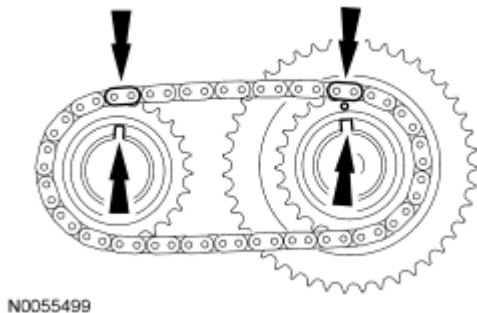


Fig. 136: Aligning LH Exhaust Camshaft Sprocket & LH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

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

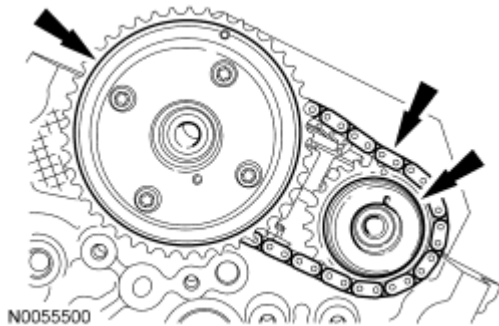


Fig. 137: Positioning LH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

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.

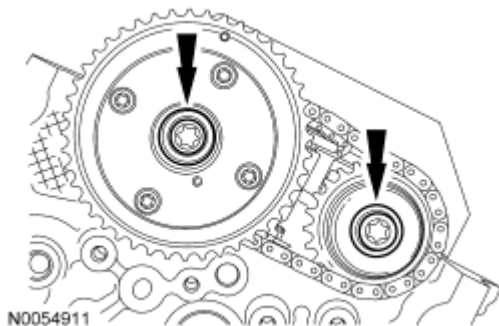


Fig. 138: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

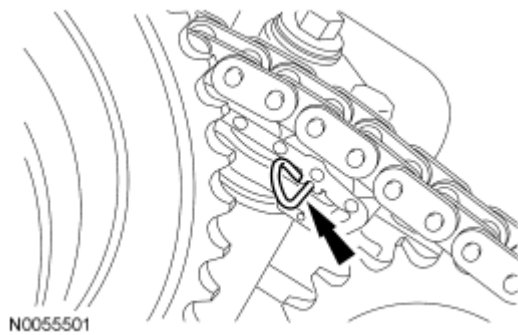


Fig. 139: Locating Lock Pin On LH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

12. Install the crankshaft timing chain sprocket.

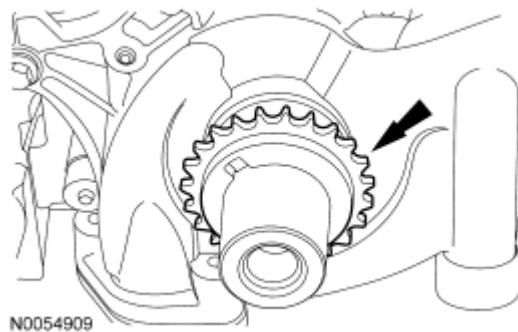
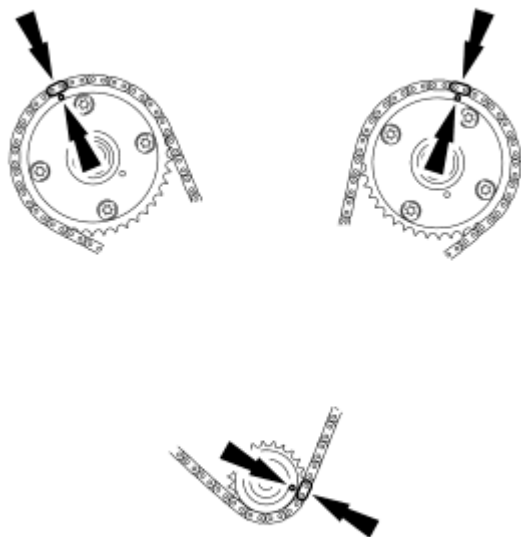


Fig. 140: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

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



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Fig. 141: 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).

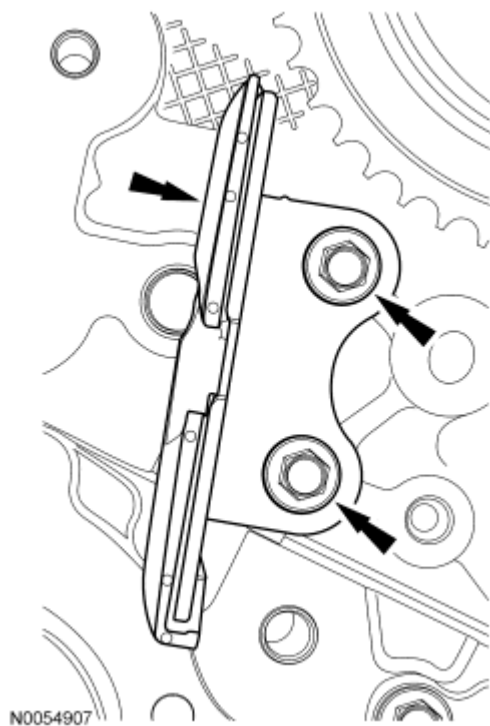
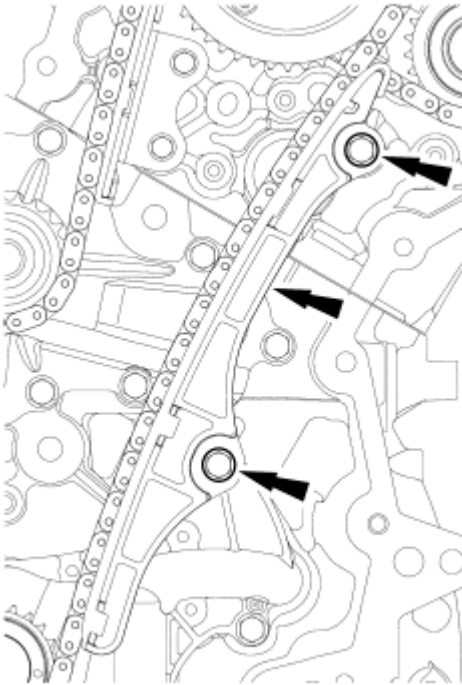


Fig. 142: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

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



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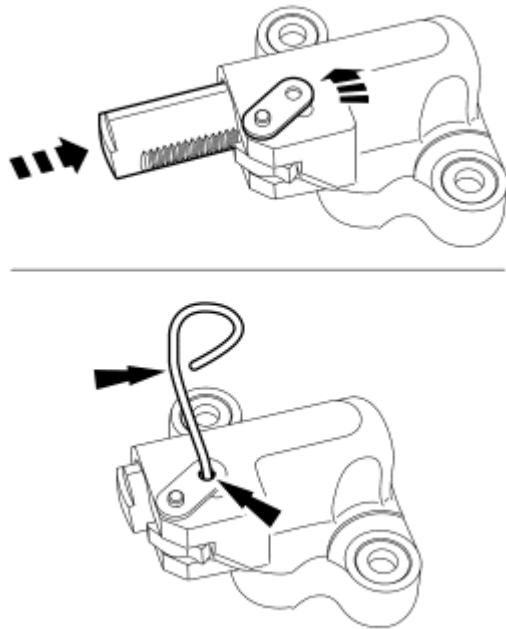
Fig. 143: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

16. Install the primary timing chain tensioner arm.



Fig. 144: 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.

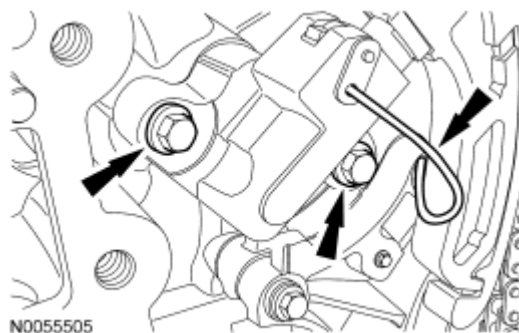


N0055504

Fig. 145: 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. 146: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

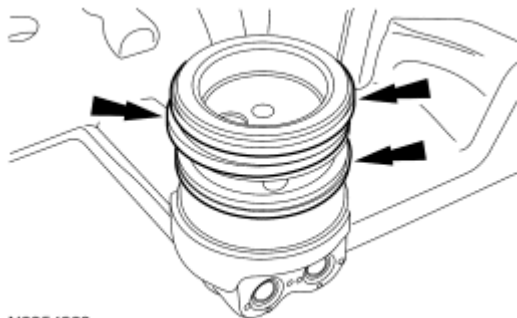
19. As a post-check, verify correct alignment of all timing marks.



N0055496

Fig. 147: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

20. Install new VCT housing seals.



N0054903

Fig. 148: 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 to 10 Nm (89 lb-in).

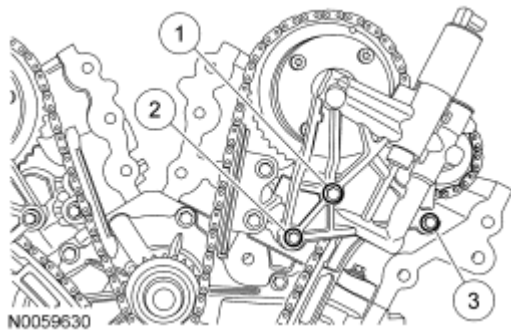


Fig. 149: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 to 10 Nm (89 lb-in).

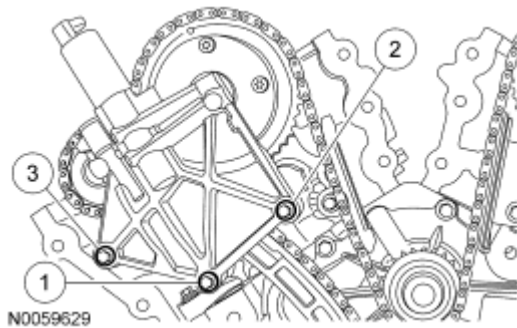
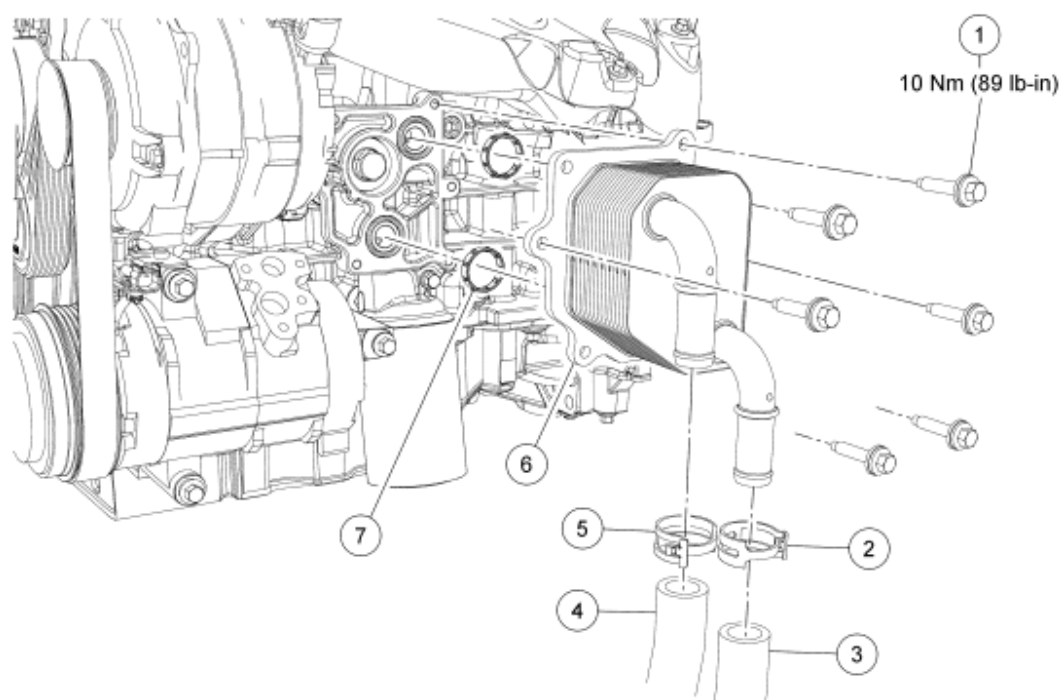


Fig. 150: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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

OIL COOLER



N0057865

Fig. 151: Exploded View Of Oil Cooler With Torque Specification
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W503277	Oil cooler bolt (6 required)
2	15161	Coolant hose clamp
3	8N021	Coolant hose
4	8B274	Coolant hose
5	15161	Coolant hose clamp
6	6A642	Oil cooler
7	6A636	Oil cooler gasket (2 required)

REMOVAL

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Drain the cooling system. For additional information, refer to **ENGINE COOLING** article.
3. Remove the LH catalytic converter. For additional information, refer to **EXHAUST SYSTEM** article.
4. Disconnect the 2 coolant hoses from the oil cooler.

CAUTION: If metal or aluminum material is present in the oil cooler, mechanical concerns exist. Failure to correct these concerns may cause engine failure. To diagnose mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.

5. Remove the 6 bolts and the oil cooler.
 - Discard the gaskets.
 - Inspect the oil cooler.
 - Clean and inspect all sealing surfaces.

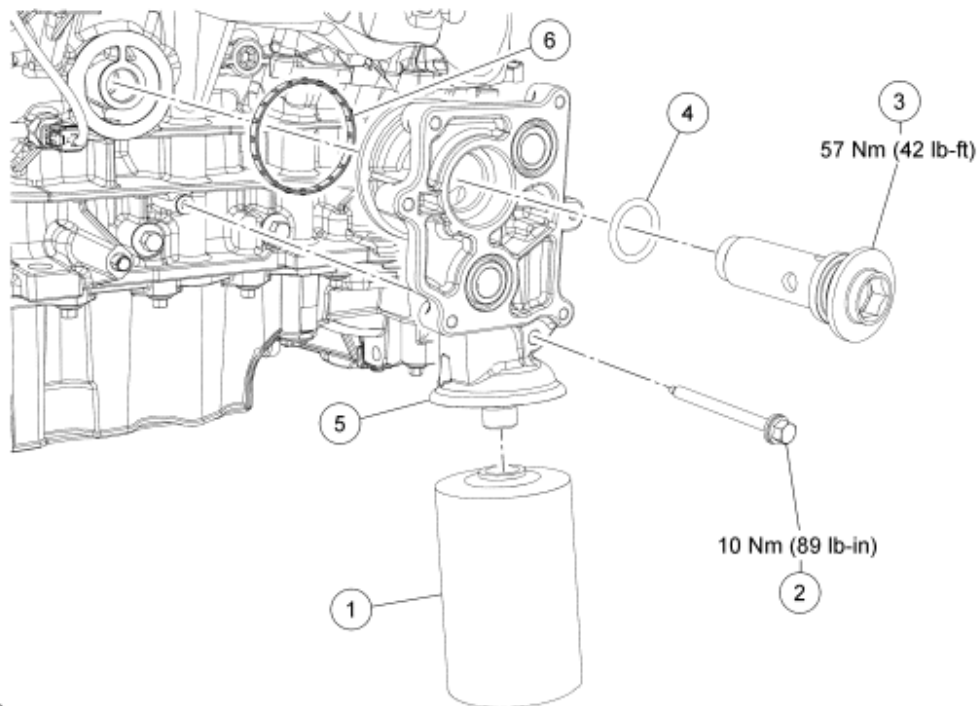
INSTALLATION

1. Using new gaskets, install the oil cooler and the 6 bolts.
 - Tighten to 10 Nm (89 lb-in).
2. Connect the 2 coolant hoses to the oil cooler.
3. Install the LH catalytic converter. For additional information, refer to **EXHAUST SYSTEM** article.
4. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.

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

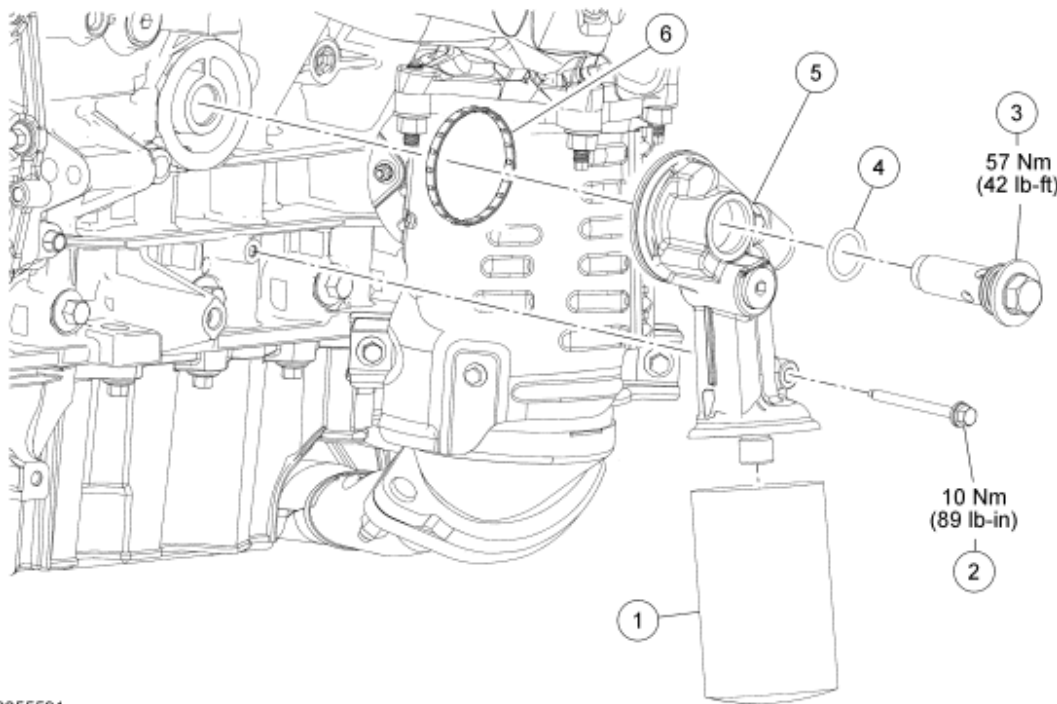


N0058148

Fig. 152: Exploded View Of Engine With Oil Cooler 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



N0055591

Fig. 153: 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 &**

LIFTING article.

2. Remove and discard the engine oil filter.
3. If equipped, remove the engine oil cooler. For additional information, refer to **Oil Cooler**.
4. 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.
3. If equipped, install the engine oil cooler. For additional information, refer to **Oil Cooler**.

ENGINE OIL PRESSURE (EOP) SWITCH**Material**

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

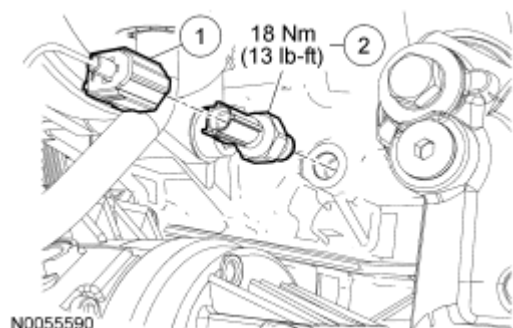


Fig. 154: Exploded View Of Engine Oil Pressure (EOP) Switch With Torque Specification
 Courtesy of FORD MOTOR CO.

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 & LIFTING** article.
2. Remove the cooling fan assembly. For additional information, refer to **ACCESSORY DRIVE** article.
3. Disconnect the engine oil pressure (EOP) switch electrical connector.
4. Remove the EOP switch.
 - To install, tighten to 18 Nm (13 lb-ft).
5. 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	-

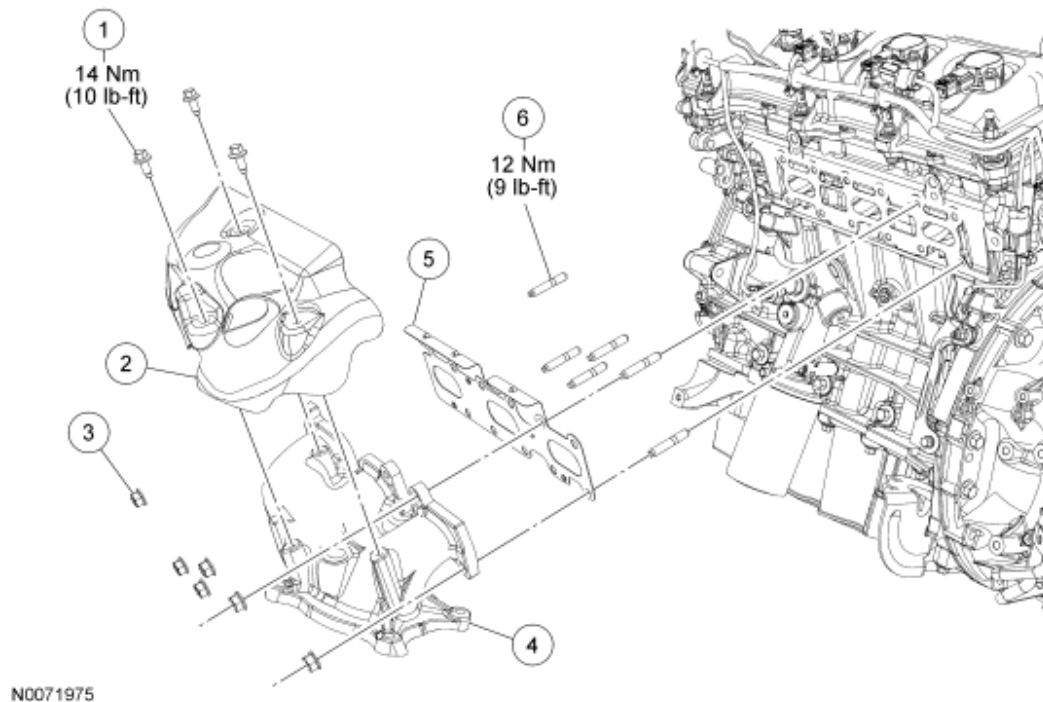


Fig. 155: Exploded View Of Exhaust Manifold With Torque Specifications - LH
 Courtesy of FORD MOTOR CO.

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.

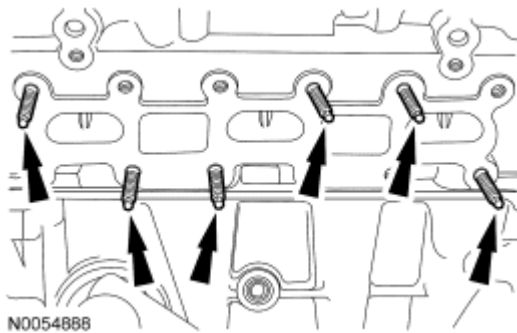


Fig. 156: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 20 Nm (15 lb-ft).

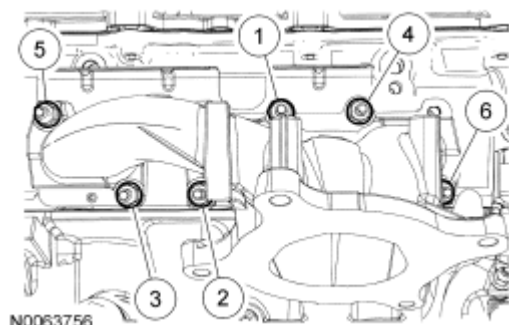


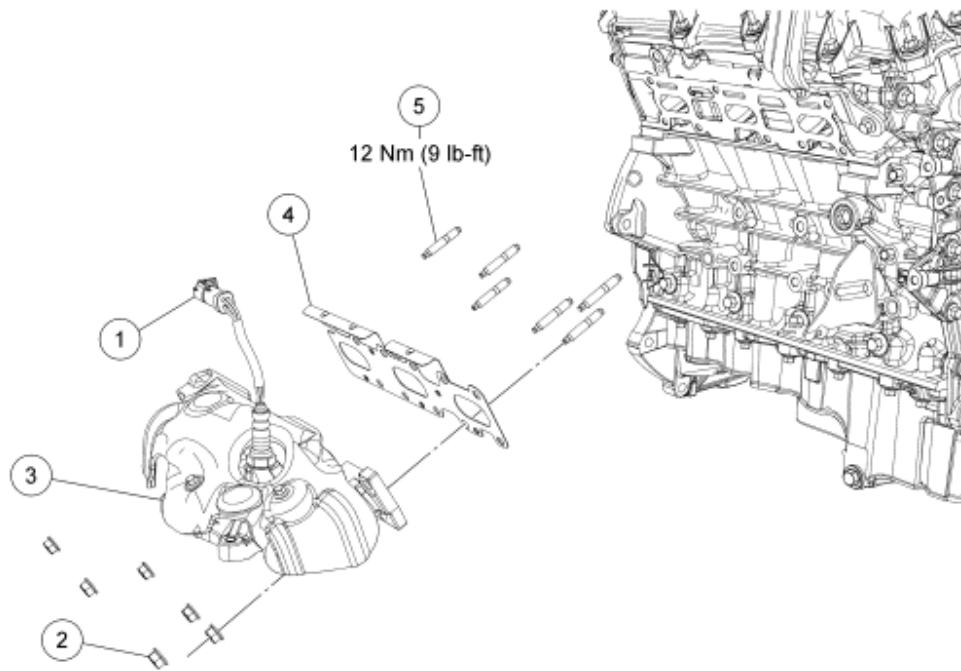
Fig. 157: Installing LH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

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	-



N0071976

Fig. 158: Exploded View Of Exhaust Manifold - RH With Torque Specifications
 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.

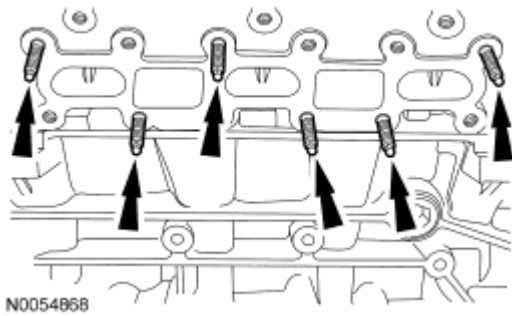


Fig. 159: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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.

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

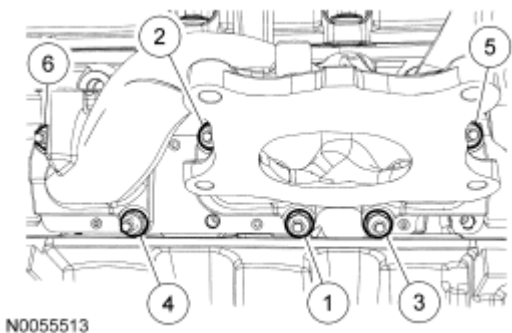
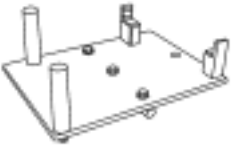


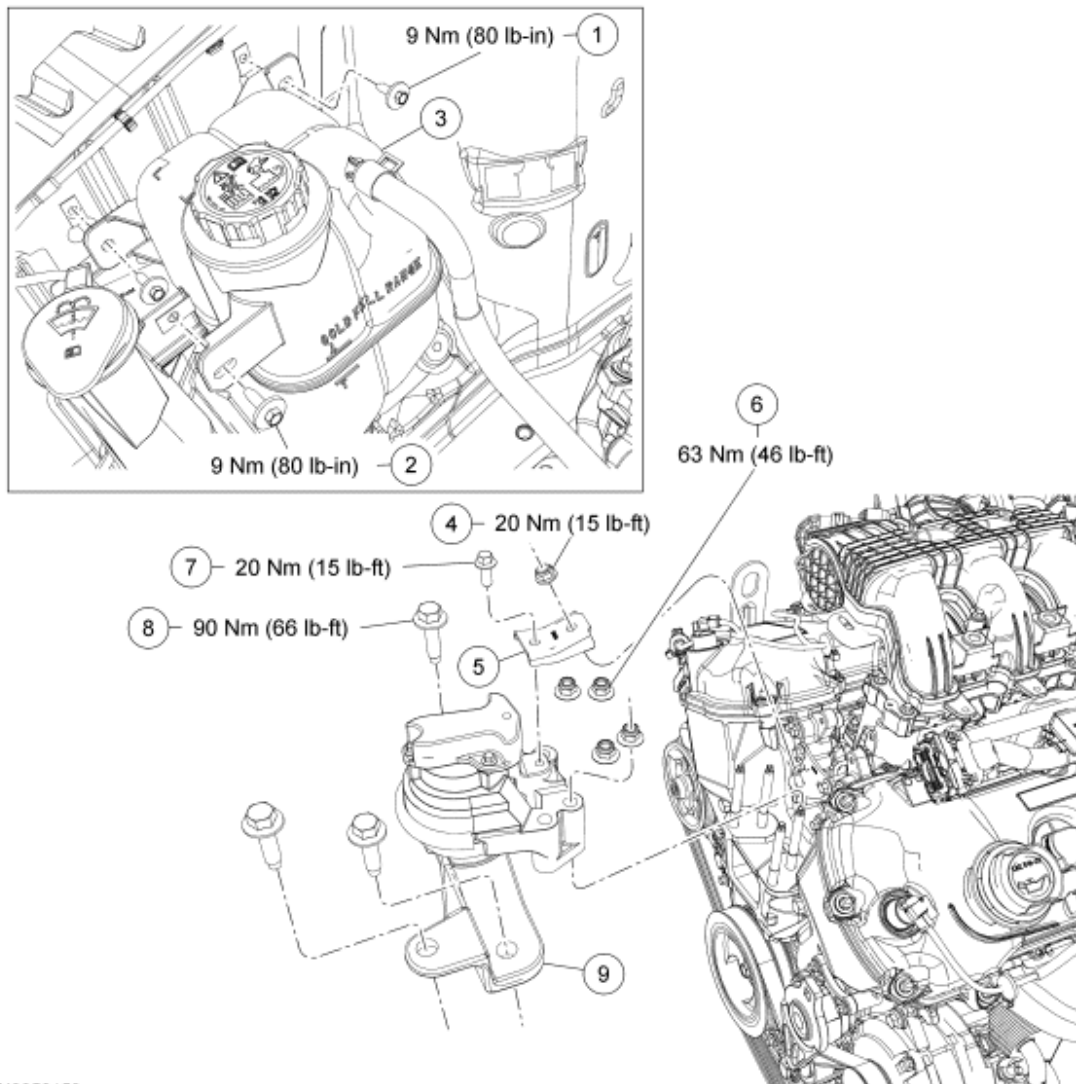
Fig. 160: Installing RH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

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

ENGINE MOUNT

Special Tools

Illustration	Tool Name	Tool Number
 <p>ST3034-A</p>	Oil Pan Holding Fixture	303-1295



N0058150

Fig. 161: Identifying Engine Mount Components With Torque Specifications
Courtesy of FORD MOTOR CO.

Item	Part Number	Description
1	W807658	Degas bottle-to-fender bolt (2 required)
2	W709603	Degas bottle-to-washer bottle bolt
3	8A080	Degas bottle
4	W520102	Engine mount brace nut
5	6K075	Engine mount brace
6	W712334	Engine mount-to-engine nut (4 required)
7	W712511	Engine mount brace bolt
8	W712507	Engine mount-to-frame bolt (3 required)
9	6F012	Engine mount

REMOVAL AND INSTALLATION

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Loosen the exhaust flexible pipe clamp and disconnect the 2 exhaust hangers.
 - To install, tighten to 40 Nm (30 lb-ft).

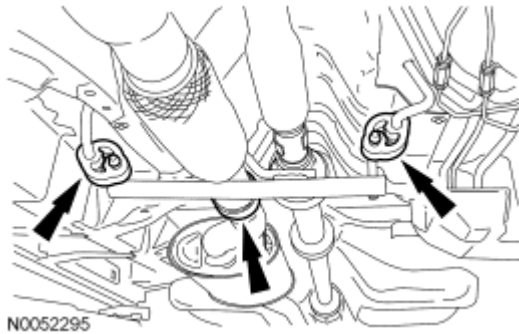


Fig. 162: Locating Exhaust Flexible Pipe Clamp & Exhaust Hangers
Courtesy of FORD MOTOR CO.

3. Remove the 4 nuts, the exhaust flexible pipe and the Y-pipe as an assembly.
 - Discard the nuts and the gasket.
 - To install, tighten to 40 Nm (30 lb-ft).

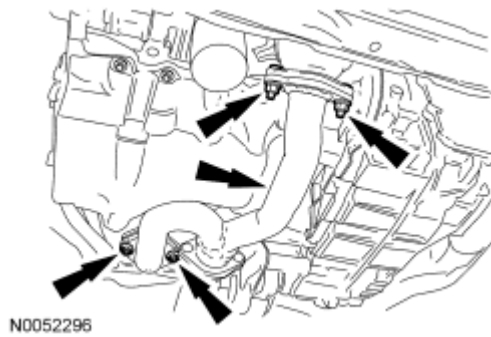


Fig. 163: Locating Exhaust Flexible Pipe, Y-Pipe & Nuts
Courtesy of FORD MOTOR CO.

4. Remove the 2 nuts and the roll restrictor heat shield.
 - To install, tighten to 11 Nm (8 lb-ft).

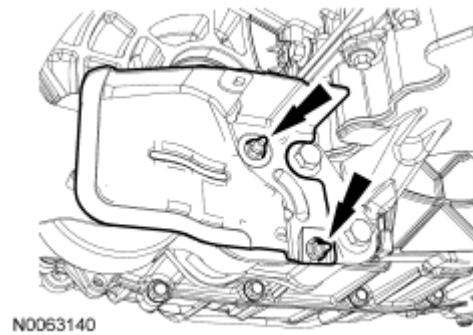


Fig. 164: Locating Roll Restrictor Heat Shield Nuts
Courtesy of FORD MOTOR CO.

5. Loosen the roll restrictor-to-subframe through bolt.
 - To install, tighten to 103 Nm (76 lb-ft).

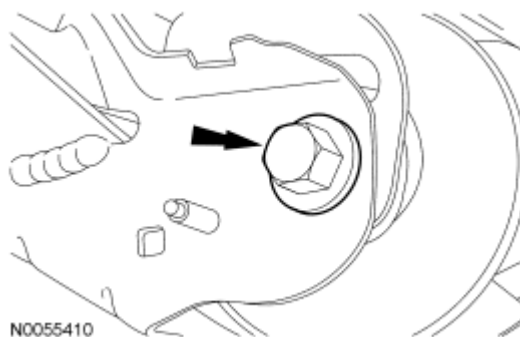


Fig. 165: Locating Roll Restrictor-To-Subframe Bolt
Courtesy of FORD MOTOR CO.

6. Remove the roll restrictor through bolt and the 2 roll restrictor-to-transaxle bracket plate bolts.
 - To install, tighten to 90 Nm (66 lb-ft).

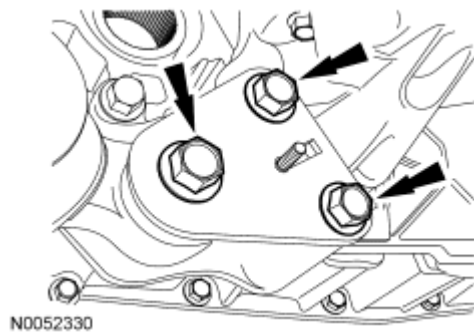


Fig. 166: Locating Roll Restrictor-To-Transaxle Bracket Plate Bolts
Courtesy of FORD MOTOR CO.

7. Remove the 3 bolts and the transaxle bracket.
 - To install, tighten to 90 Nm (66 lb-ft).

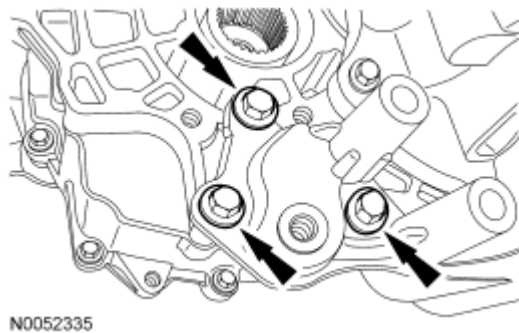


Fig. 167: Locating Transaxle Bracket Bolts
Courtesy of FORD MOTOR CO.

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.

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

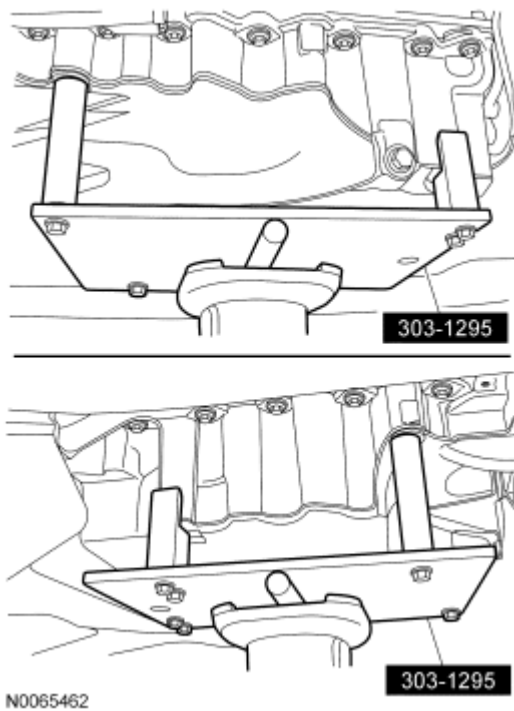


Fig. 168: Positioning Floor Jack & Special Tool (303-1295) Under Oil Pan
Courtesy of FORD MOTOR CO.

9. Remove the 3 bolts and position the engine coolant degas bottle aside.
 - To install, tighten to 9 Nm (80 lb-in).
10. Remove the nut, bolt and engine mount brace.
 - To install, tighten to 20 Nm (15 lb-ft).

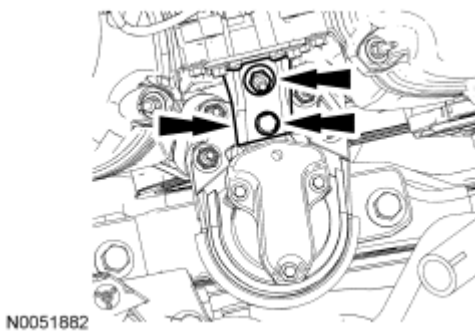


Fig. 169: Locating Nut, Bolt & Engine Mount Brace
Courtesy of FORD MOTOR CO.

11. Remove the 4 engine mount nuts.
 - To install, tighten to 63 Nm (46 lb-ft).

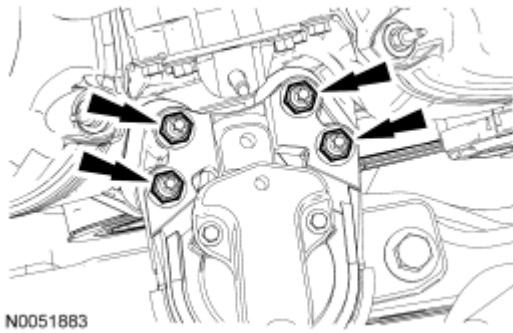


Fig. 170: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

12. Remove the 3 bolts and the engine mount.
 - To install, tighten to 90 Nm (66 lb-ft).

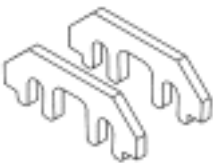


Fig. 171: Locating Engine Mount Bolts
Courtesy of FORD MOTOR CO.

13. 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.

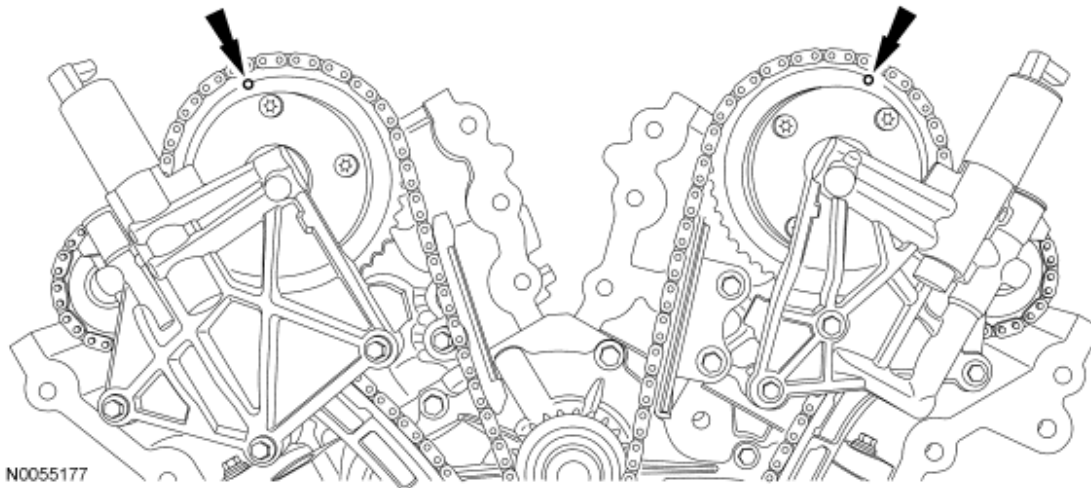


Fig. 172: Aligning Timing Marks On Variable Camshaft Timing (VCT) Assemblies
Courtesy of FORD MOTOR CO.

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.

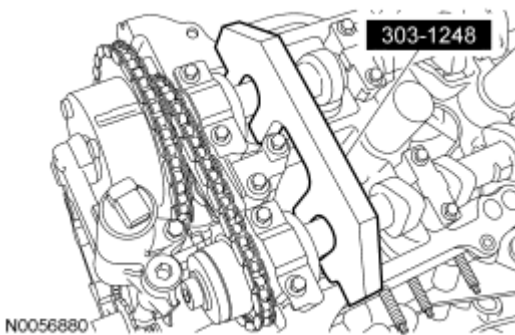


Fig. 173: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

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

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

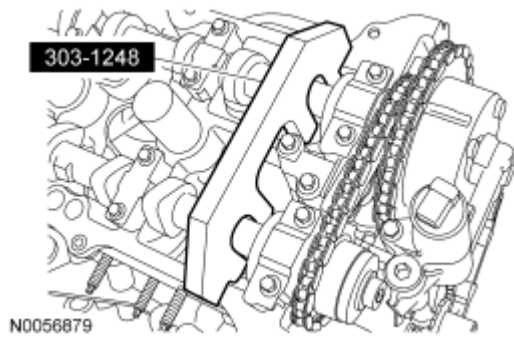


Fig. 174: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

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

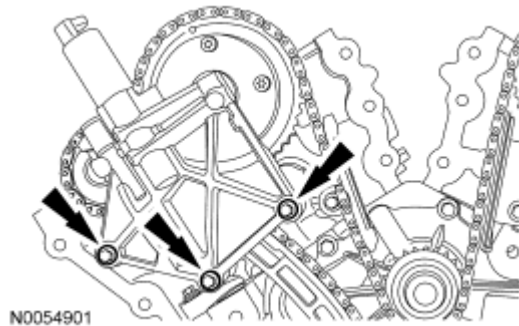


Fig. 175: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

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

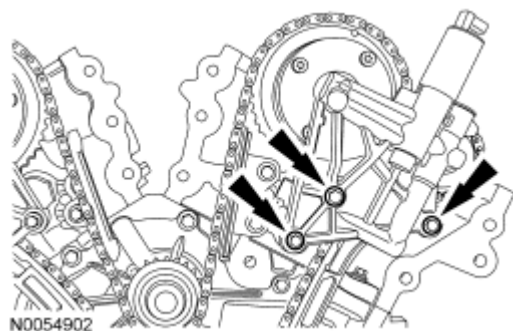


Fig. 176: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

7. Remove and discard the VCT housing seals.

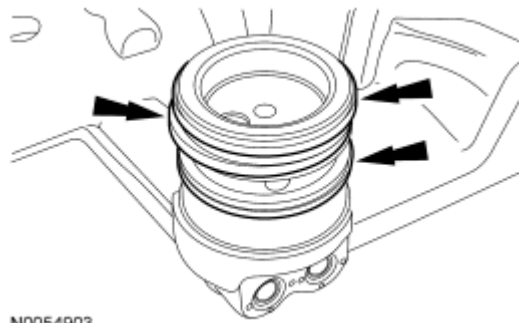


Fig. 177: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

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

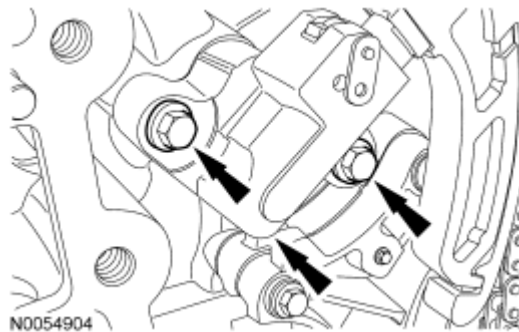


Fig. 178: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

9. Remove the primary timing chain tensioner arm.

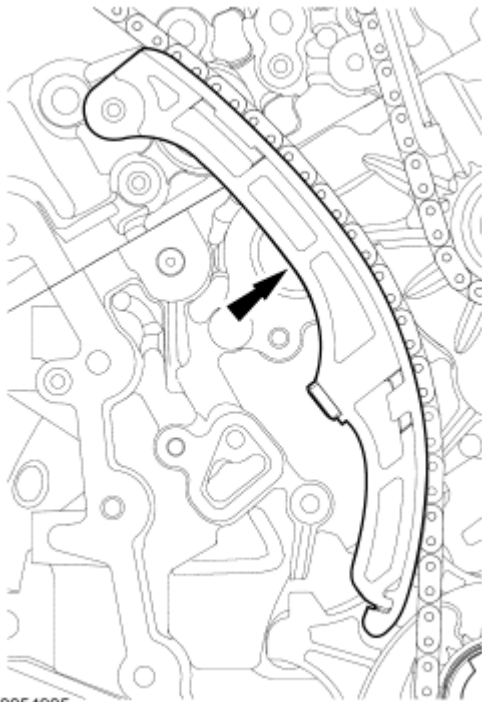


Fig. 179: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

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

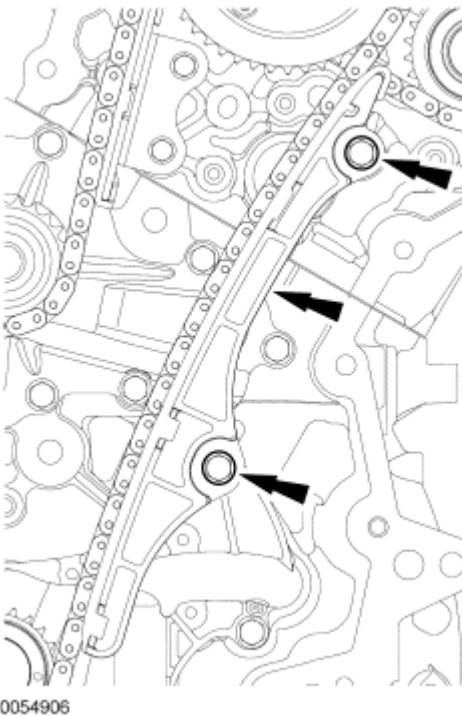
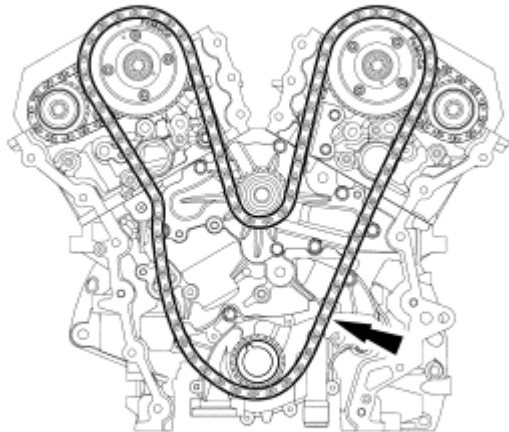


Fig. 180: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

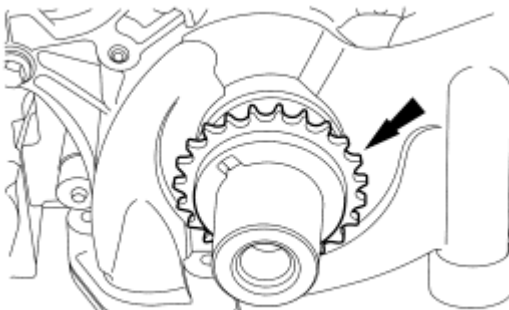
11. Remove the primary timing chain.



N0054908

Fig. 181: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

12. Remove the crankshaft timing chain sprocket.



N0054909

Fig. 182: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

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

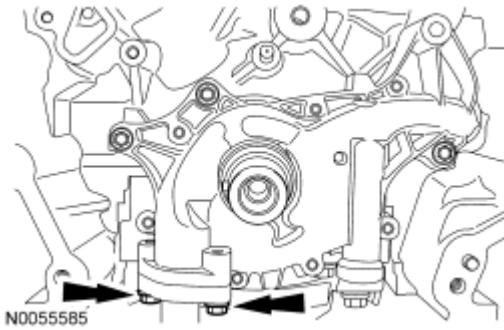


Fig. 183: Locating Oil Pump Screen & Pickup Tube Bolts & Rotating Oil Pump Clockwise
 Courtesy of FORD MOTOR CO.

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.

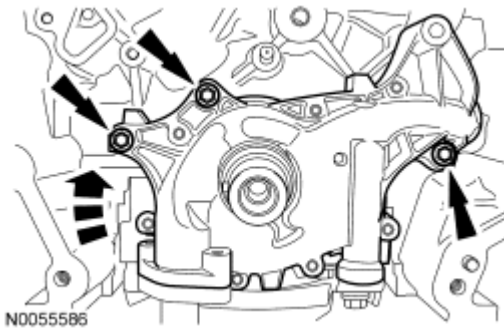


Fig. 184: Locating Oil Pump Bolts
 Courtesy of FORD MOTOR CO.

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).

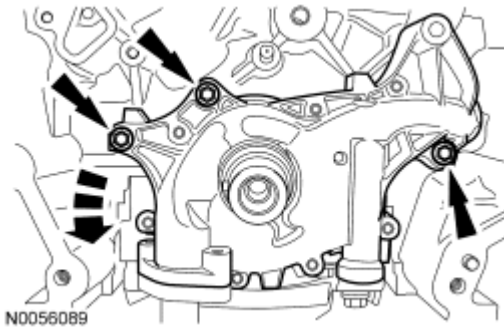


Fig. 185: Locating Oil Pump Screen & Pickup Tube Bolts & Rotating Oil Pump Counterclockwise
Courtesy of FORD MOTOR CO.

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

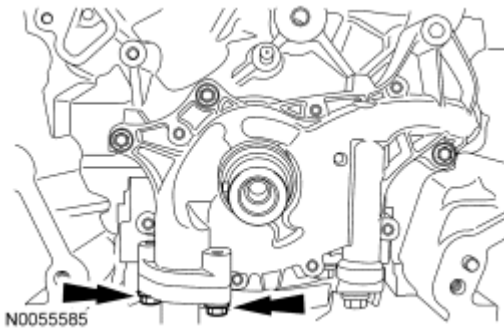


Fig. 186: Locating Oil Pump Screen & Pickup Tube Bolts & Rotating Oil Pump Clockwise
Courtesy of FORD MOTOR CO.

3. Install the crankshaft timing chain sprocket.

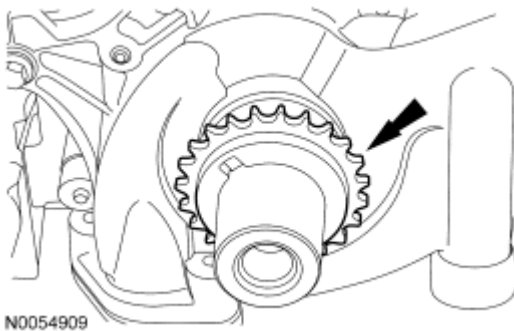
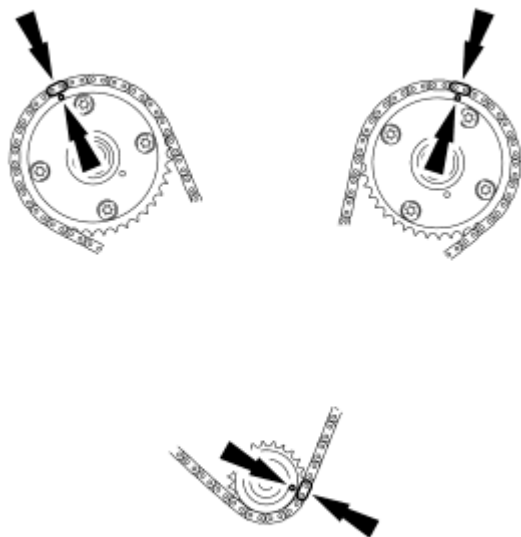


Fig. 187: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

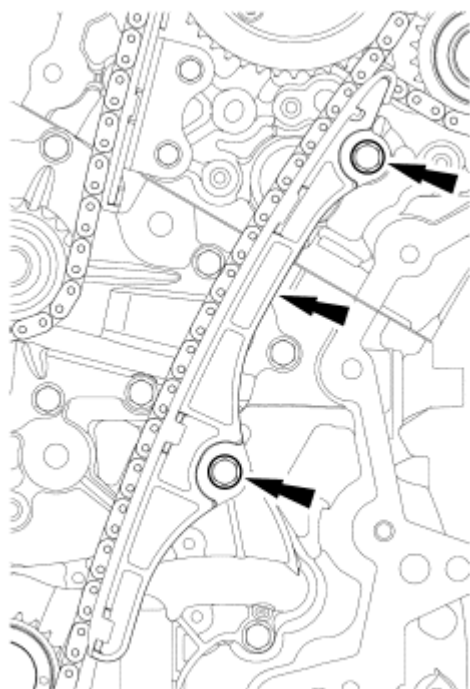
4. Install the primary timing chain with the colored links aligned with the timing marks on the VCT assemblies and the crankshaft sprocket.



N0055503

Fig. 188: 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

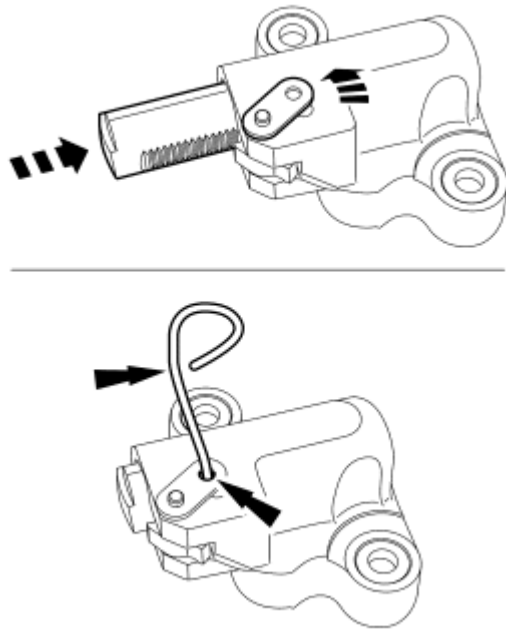
Fig. 189: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

6. Install the primary timing chain tensioner arm.



Fig. 190: 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.

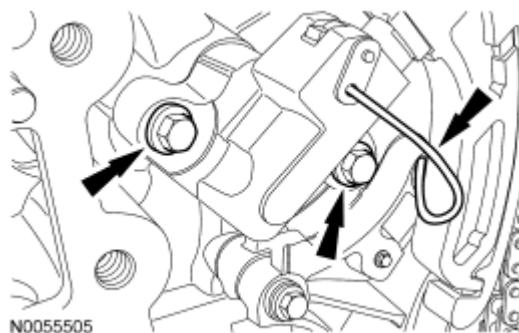


N0055504

Fig. 191: 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. 192: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

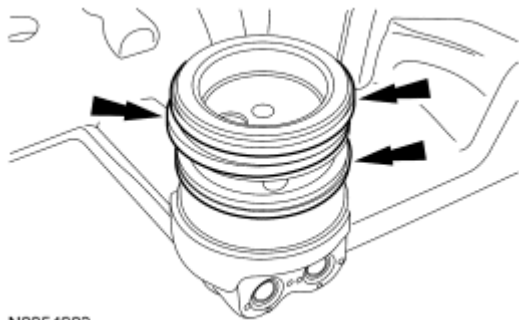
9. As a post-check, verify correct alignment of all timing marks.



N0055496

Fig. 193: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

10. Install new VCT housing seals.



N0054903

Fig. 194: 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 to 10 Nm (89 lb-in).

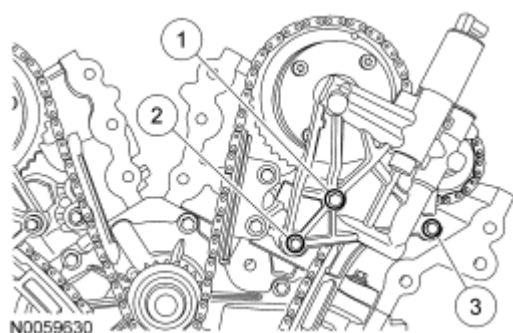


Fig. 195: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 to 10 Nm (89 lb-in).

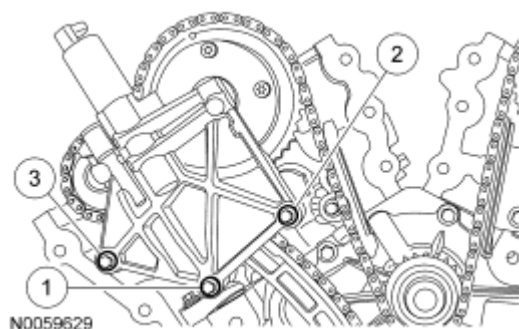


Fig. 196: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 Tube	307-569


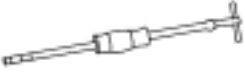



2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 ST2935A		
 ST2976A	Engine Lifting Bracket	303-1245
 ST1341-A	Heavy Duty Floor Crane	014-00071 or equivalent
 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)
	Remover, Halfshaft (Plate)	205-290 (T89P-3415-B)

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 ST2038-A		
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)
 ST1602-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent
 ST1408-A	Tie-Rod End Remover	211-105
 ST2743A	Universal Adapter Brackets	014-0001

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 &**

LIFTING article.

2. Recover the air conditioning system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & DIAGNOSTICS** article.
3. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
4. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING** article.
5. Remove the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
6. Disconnect the power steering cooler hose and drain the power steering fluid into a suitable drain pan.

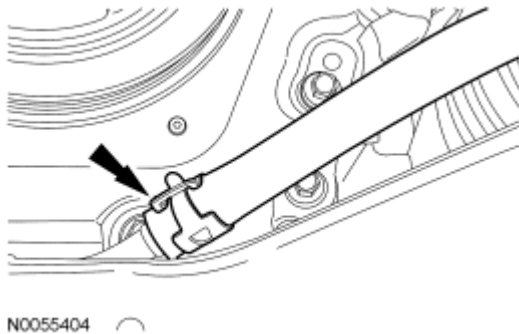


Fig. 197: Identifying Power Steering Cooler Hose
Courtesy of FORD MOTOR CO.

7. Remove the degas bottle. For additional information, refer to **ENGINE COOLING** article.
8. Remove the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** article.
9. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING & CABLES** article.
10. Disconnect the battery harness electrical connector.

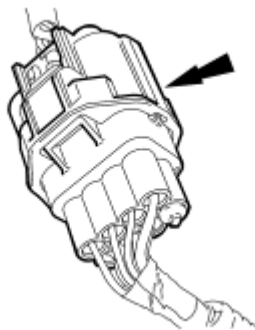


Fig. 198: Identifying Battery Harness Electrical Connector
Courtesy of FORD MOTOR CO.

11. Remove the nut and disconnect the power feed from the battery terminal.

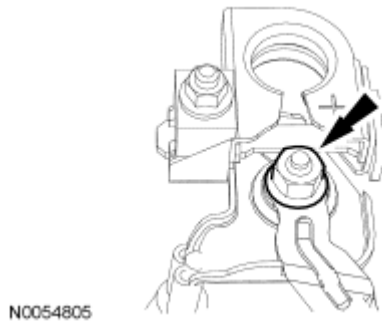


Fig. 199: Locating Power Feed To Battery Terminal And Nut
Courtesy of FORD MOTOR CO.

12. Remove the bolt and the ground wire.
 - Detach the 2 wiring harness retainers from the cowl.

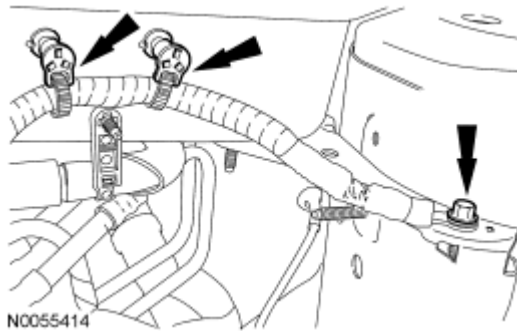


Fig. 200: Identifying Wiring Harness Retainers From Cowl
Courtesy of FORD MOTOR CO.

13. Disconnect the vacuum hose from the upper intake manifold.

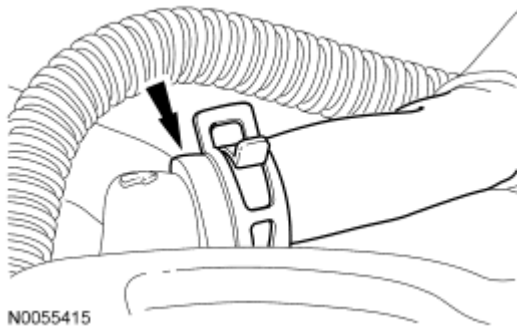


Fig. 201: Identifying Vacuum Hose From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

14. Disconnect the upper evaporative emissions (EVAP) tube quick connect coupling from the purge valve.
For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

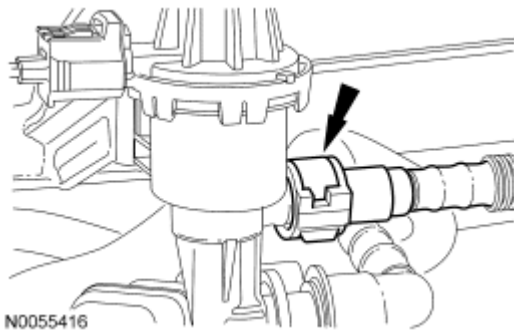


Fig. 202: Locating Upper Evaporative Emissions (EVAP) Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

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

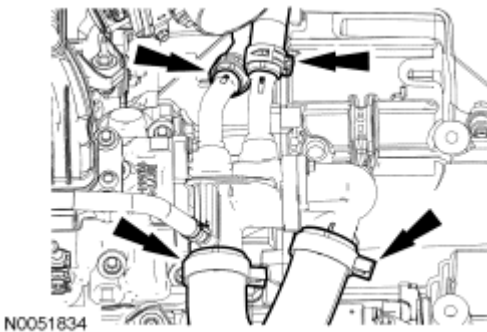


Fig. 203: Locating Upper Radiator Hose, Lower Radiator Hose & Heater Hoses
Courtesy of FORD MOTOR CO.

16. Detach the wiring harness retainer from the transaxle control cable bracket.



Fig. 204: Locating Wiring Harness Retainer From Transaxle Control Cable Bracket
Courtesy of FORD MOTOR CO.

17. Disconnect the transaxle control cable from the control lever.
- Detach the control cable from the bracket.

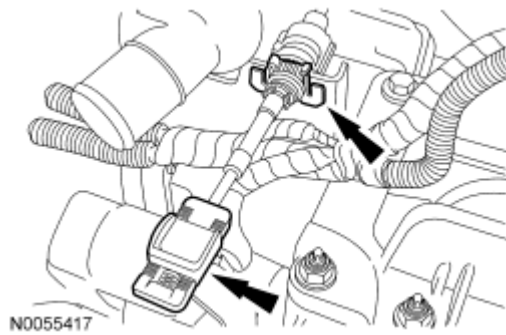


Fig. 205: Locating Transaxle Control Cable From Control Lever
Courtesy of FORD MOTOR CO.

18. Disconnect the transaxle control electrical connector.

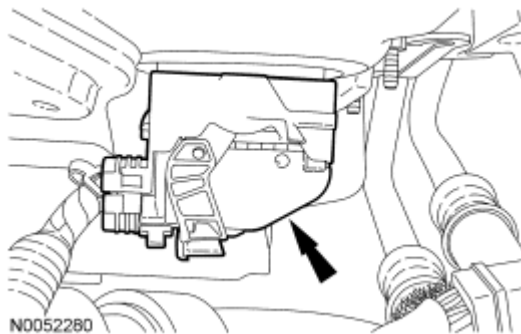


Fig. 206: Identifying Transaxle Control Electrical Connector
Courtesy of FORD MOTOR CO.

19. If equipped, detach the engine block heater harness retainers from the radiator support and the A/C suction tube.

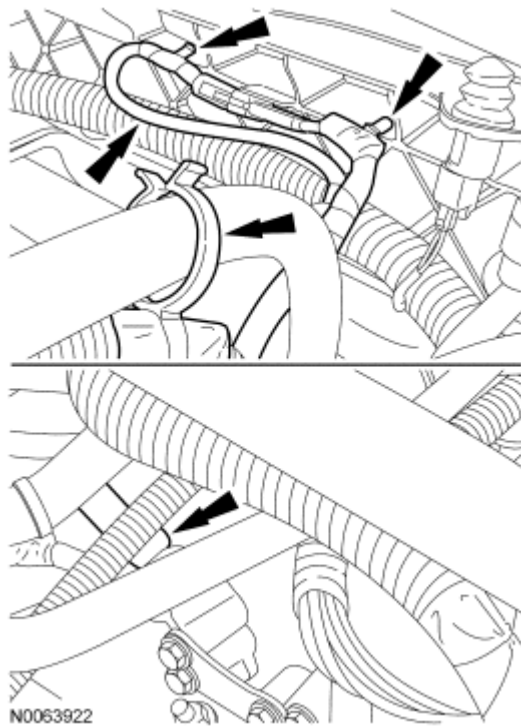


Fig. 207: Identifying Engine Block Heater Harness, Radiator Support, A/C Suction Tube & Engine Wiring Harness

Courtesy of FORD MOTOR CO.

20. Remove the nut and disconnect the A/C pressure tube fitting.
 - Discard the O-ring seal.

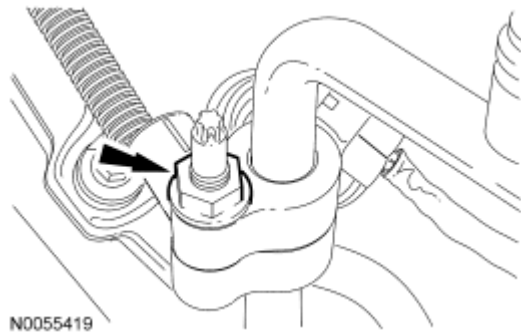
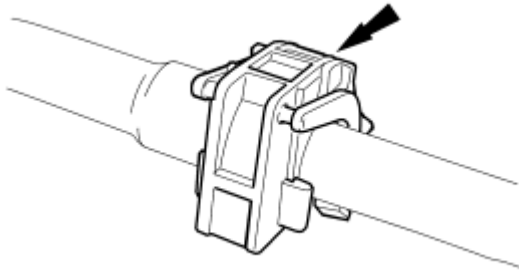


Fig. 208: Identifying A/C Pressure Tube Fitting Nut

Courtesy of FORD MOTOR CO.

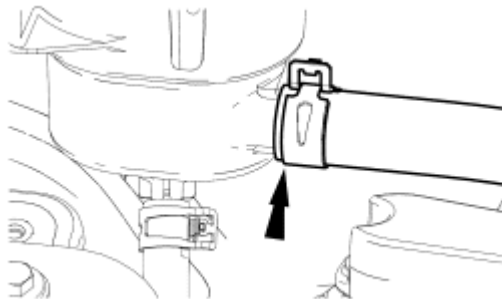
21. Remove the safety clip from the A/C fitting.
 - Disconnect the A/C suction tube fitting.



N0055420

Fig. 209: Identifying Safety Clip On A/C Suction Tube Fitting
Courtesy of FORD MOTOR CO.

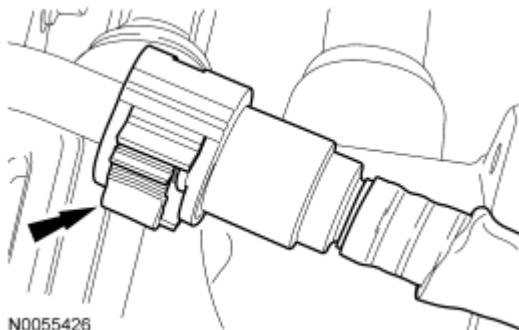
22. Disconnect the hose from the power steering reservoir.



N0051844

Fig. 210: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

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



N0055426

Fig. 211: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

24. Disconnect the fuel hose routing clip from the transaxle stud and position the fuel hose aside.

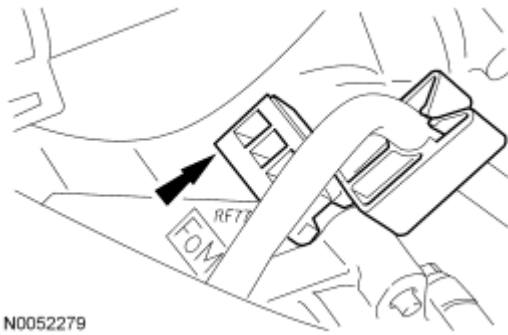


Fig. 212: Identifying Fuel Hose Routing Clip From Transaxle Stud
Courtesy of FORD MOTOR CO.

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

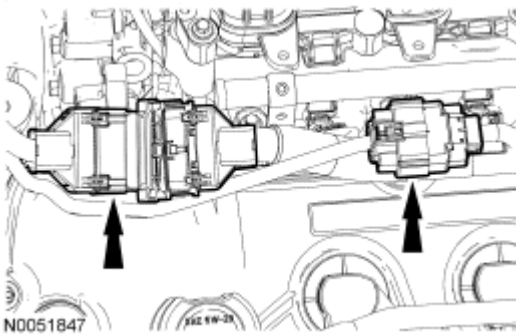


Fig. 213: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

26. Remove the oil level indicator.

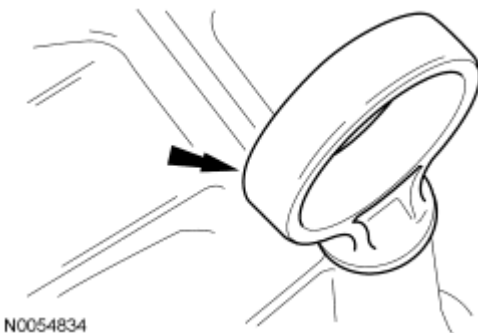


Fig. 214: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

27. Detach the wiring harness retainer from the RH valve cover stud bolt.

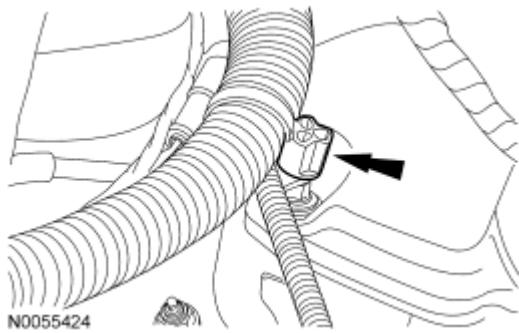


Fig. 215: Identifying Wiring Harness Retainer From RH Valve Cover Stud Bolt
Courtesy of FORD MOTOR CO.

28. Remove the bolt and the ground wire from the engine front cover.

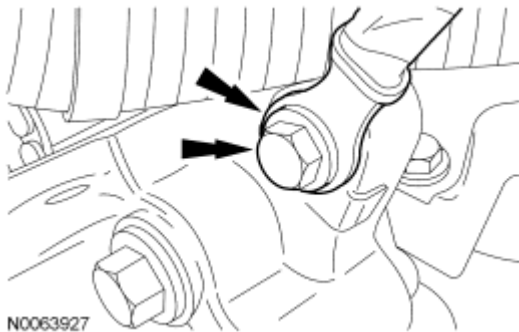


Fig. 216: Removing/Installing Bolt & Ground Wire From Engine Front Cover
Courtesy of FORD MOTOR CO.

29. Remove the nut, the ground wire and the radio interference capacitor wire from the engine front cover stud.

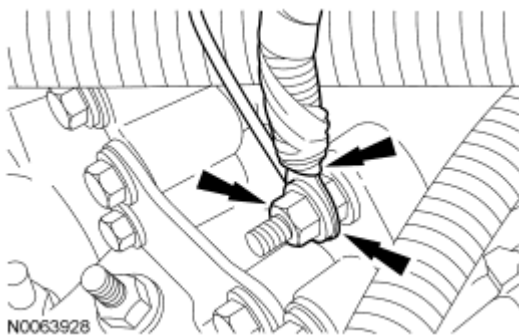


Fig. 217: Removing/installing Nut, Ground Wire & Radio Interference Capacitor Wire From Engine Front Cover Stud
Courtesy of FORD MOTOR CO.

30. Loosen the exhaust flexible pipe clamp and disconnect the 2 exhaust hangers.

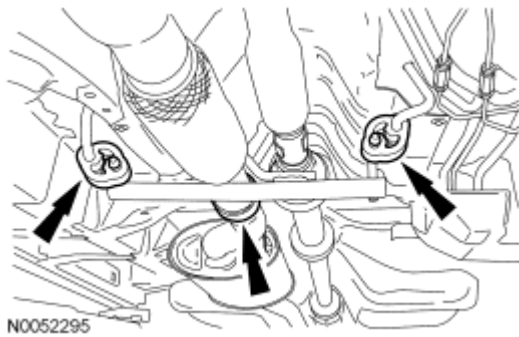


Fig. 218: Locating Exhaust Flexible Pipe Clamp & Exhaust Hangers
Courtesy of FORD MOTOR CO.

31. Remove the 4 nuts and the exhaust flexible pipe and Y-pipe as an assembly.
 - Discard the nuts and the gasket.

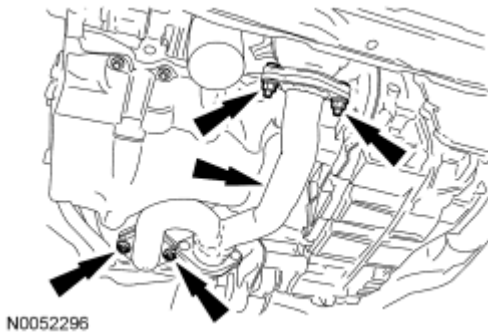


Fig. 219: Locating Exhaust Flexible Pipe, Y-Pipe & Nuts
Courtesy of FORD MOTOR CO.

32. Remove the 3 pin-type retainers, the 7 screws and the radiator splash shield.

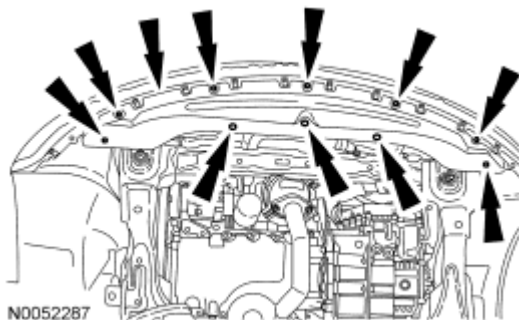


Fig. 220: Locating Push Pin Fasteners & Front Splash Shield Screws
Courtesy of FORD MOTOR CO.

33. Remove the LH inner splash shield. For additional information, refer to **FRONT END BODY PANELS** article.
34. Remove the 2 secondary latches from the transmission fluid cooler tubes.

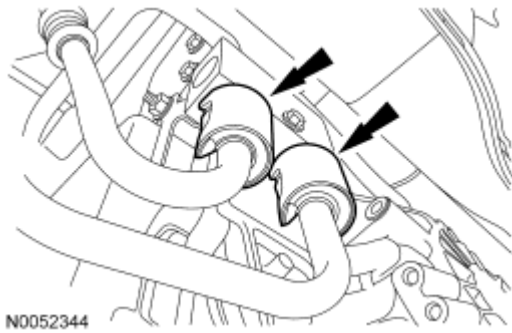


Fig. 221: Locating Secondary Latches On Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

35. Using the special tool, disconnect the transmission cooling tubes.

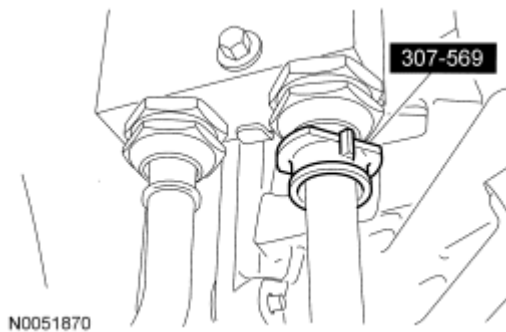


Fig. 222: Disconnecting Transmission Cooling Tubes Using Special Tool (307-569)
Courtesy of FORD MOTOR CO.

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

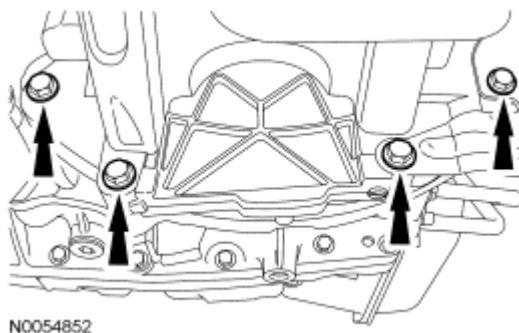


Fig. 223: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

37. Remove the 2 fasteners and the inspection cover.

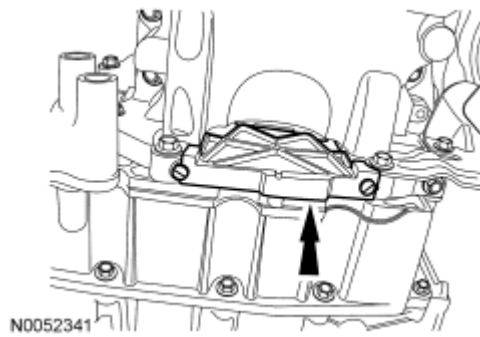


Fig. 224: Locating Oil Fasteners On Inspection Cover
Courtesy of FORD MOTOR CO.

38. Remove and discard the 3 torque converter bolts.

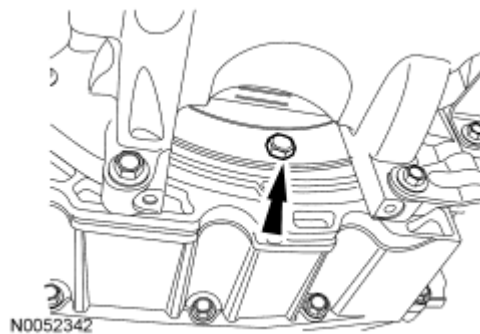


Fig. 225: Locating Torque Converter Bolts
Courtesy of FORD MOTOR CO.

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

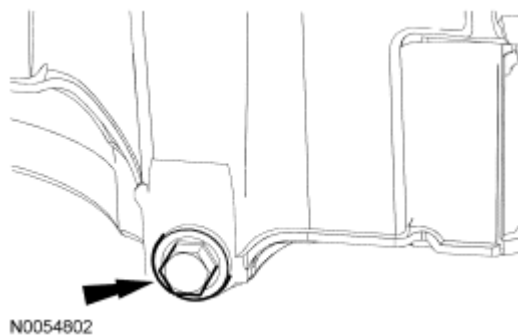


Fig. 226: Locating Drain Plug
Courtesy of FORD MOTOR CO.

40. Remove and discard the engine oil filter.

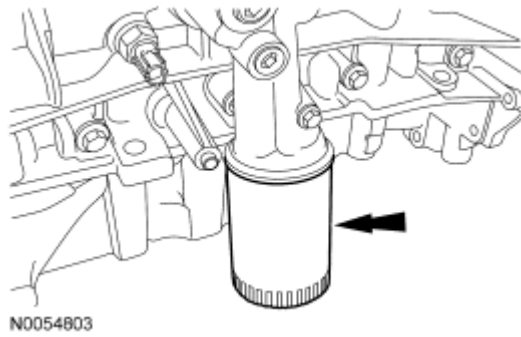


Fig. 227: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

41. Remove the power steering cooler bracket bolt from the RH side of the subframe.

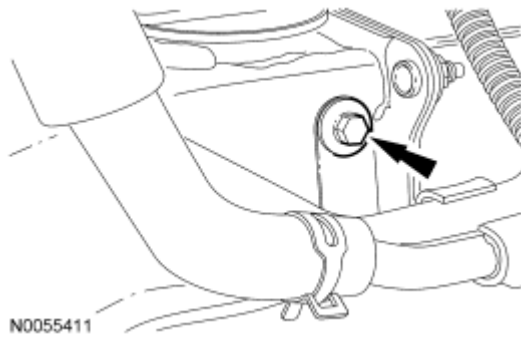


Fig. 228: Identifying Power Steering Cooler Bracket Bolt
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

NOTE: Index-mark the driveshaft for installation.

42. Remove the 4 bolts and support the driveshaft with a length of mechanic's wire.

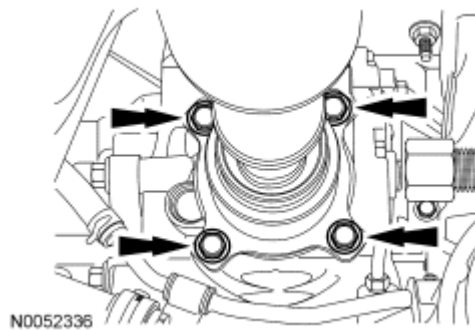


Fig. 229: Locating Driveshaft Aside Bolts
Courtesy of FORD MOTOR CO.

All vehicles

43. Remove and discard the RH front halfshaft nut.

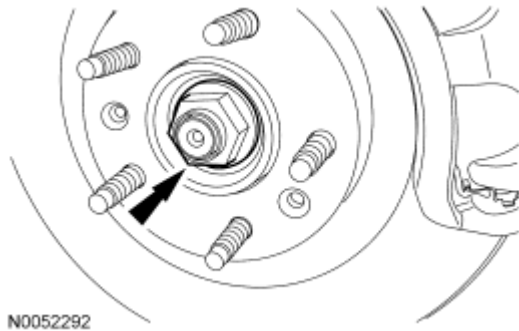


Fig. 230: Locating RH Front Halfshaft Nut
Courtesy of FORD MOTOR CO.

44. Remove the 2 nuts and the roll restrictor heat shield.

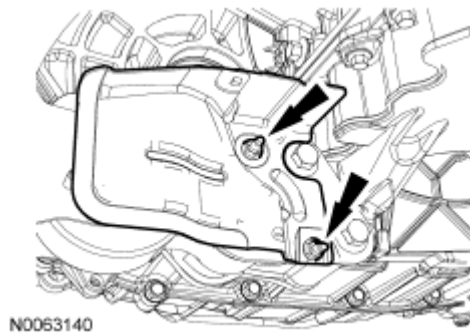


Fig. 231: Locating Roll Restrictor Heat Shield Nuts
Courtesy of FORD MOTOR CO.

45. Remove the engine roll restrictor-to-subframe through bolt.

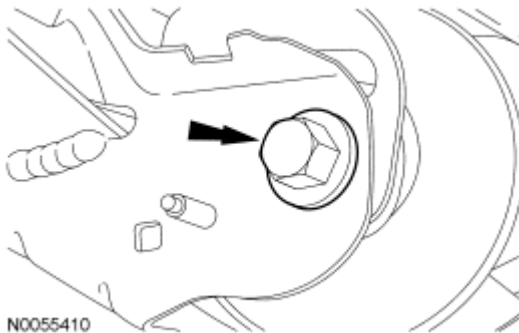


Fig. 232: Locating Roll Restrictor-To-Subframe Bolt
Courtesy of FORD MOTOR CO.

46. Remove and discard the power steering pressure (PSP) tube-to-pump banjo bolt and the 2 seals.

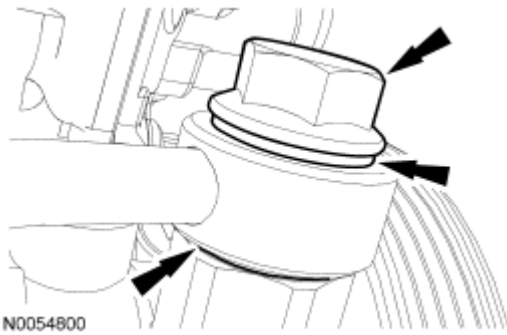


Fig. 233: Locating Power Steering Pressure (PSP) Tube-To-Pump Banjo Bolt & Seals
Courtesy of FORD MOTOR CO.

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

47. Remove and discard the steering intermediate shaft bolt.
 - Separate the steering intermediate shaft from the steering gear.

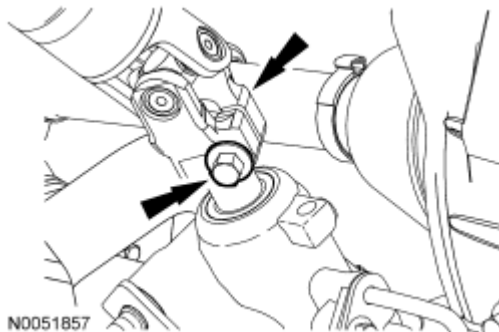


Fig. 234: Identifying Steering Intermediate Shaft Bolt
Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

48. Remove and discard the cotter pins and tie-rod end nuts.
 - Using the special tool, separate the tie-rod ends from the wheel knuckles.

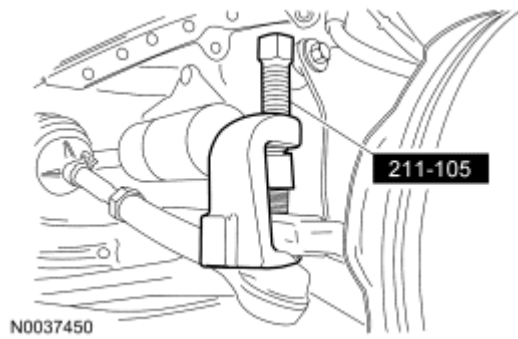


Fig. 235: Separating Tie-Rod Ends From Wheel Knuckles Using Special Tool (211-105)
Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

49. Remove the 2 stabilizer link-to-lower control arm nuts and separate the stabilizer bar links from the lower control arms.

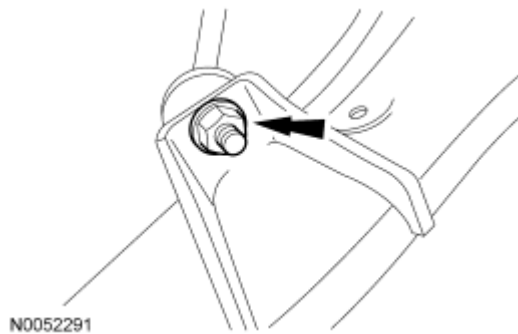


Fig. 236: Locating Stabilizer Bar Link Nut
Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

50. Remove the lower control arm-to-knuckle pinch bolts and separate the lower control arms from the knuckles.

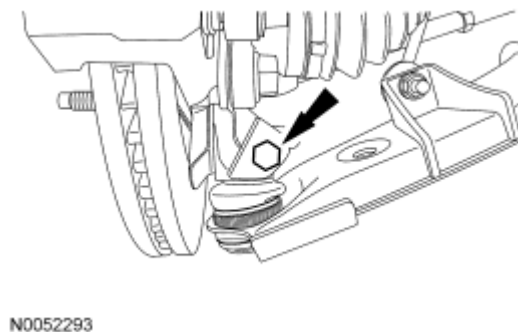


Fig. 237: Locating Ball Joint Pinch Bolt

Courtesy of FORD MOTOR CO.

51. Remove the 3 RH subframe-to-lower bumper nuts.

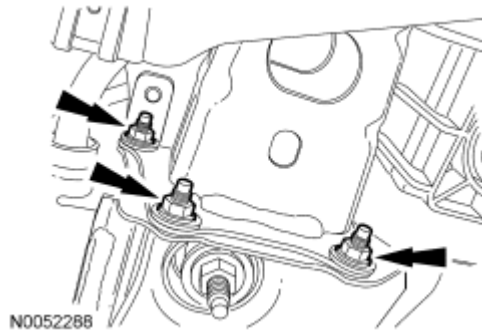


Fig. 238: Locating RH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

52. Remove the 3 LH subframe-to-lower bumper nuts and separate the lower bumper from the subframe.

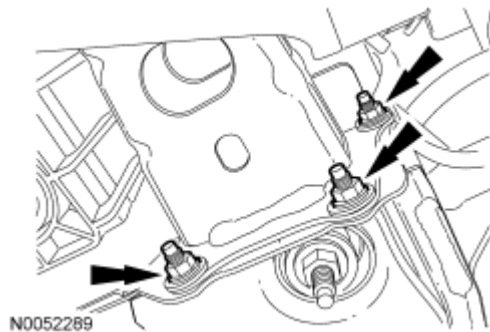


Fig. 239: Locating LH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

53. Position the special tool under the subframe assembly.

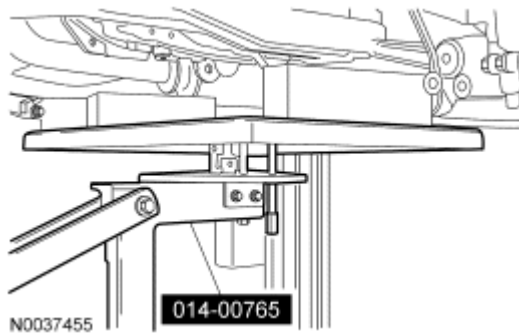


Fig. 240: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

54. Remove the 2 nuts, 4 bolts and the subframe support brackets.

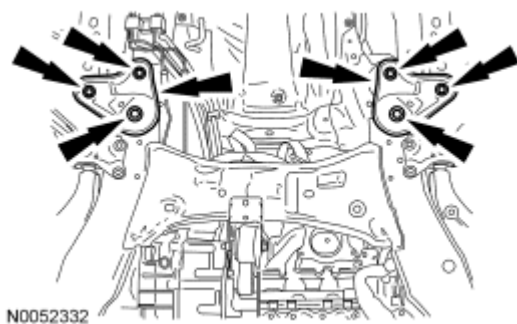


Fig. 241: Locating Subframe Support Brackets, Nuts & Bolts
Courtesy of FORD MOTOR CO.

55. Remove the 2 front subframe nuts.

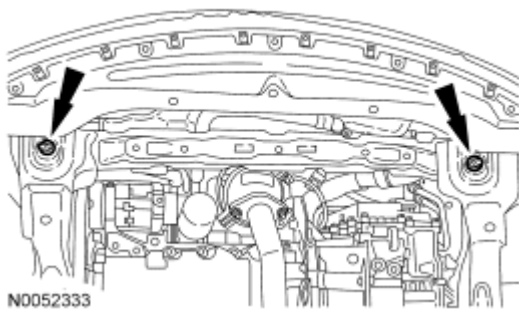


Fig. 242: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

56. Remove the 2 middle subframe nuts.

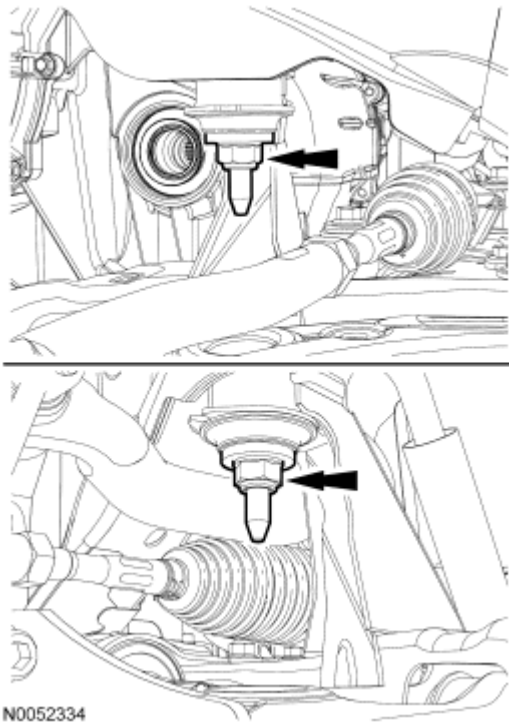


Fig. 243: Locating Middle Subframe Nuts
Courtesy of FORD MOTOR CO.

57. Using the special tool, lower the subframe assembly from the vehicle.

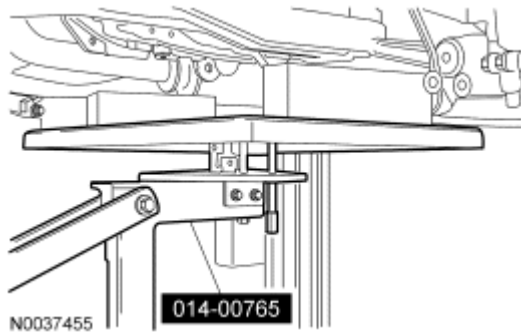


Fig. 244: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

58. If equipped, disconnect the oil cooler coolant hoses.

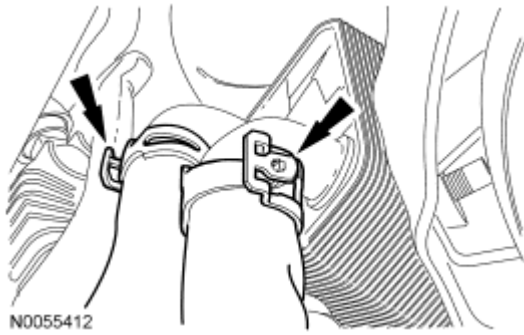


Fig. 245: Locating Oil Cooler Coolant Hoses
Courtesy of FORD MOTOR CO.

59. Using the special tools, separate the LH halfshaft from the transaxle and support the halfshaft with a length of mechanic's wire.

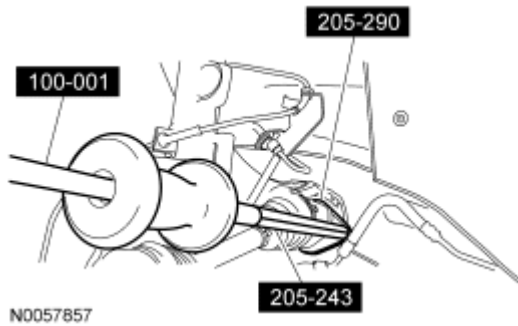


Fig. 246: Separating LH Halfshaft From Transaxle Using Special Tools (100-001), (205-243) & (205-290)
Courtesy of FORD MOTOR CO.

60. Remove the 2 RH catalytic converter support bracket bolts.

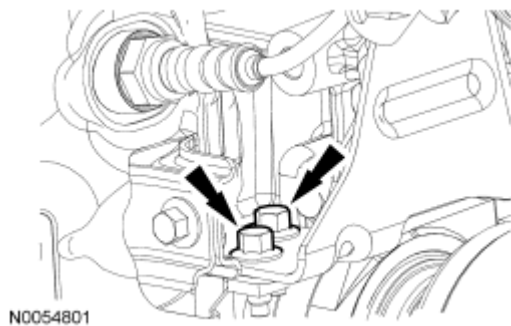


Fig. 247: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

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

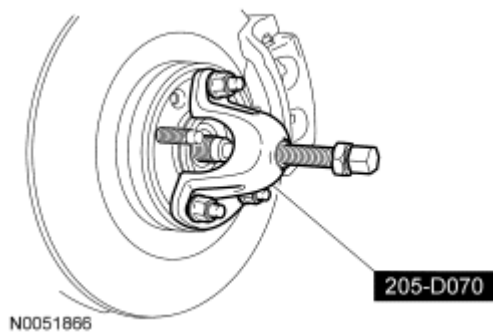


Fig. 248: Separating RH Halfshaft From Hub Using Special Tool (205-D070)
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

62. Remove the bolt, the nut and the RH catalytic converter support bracket.

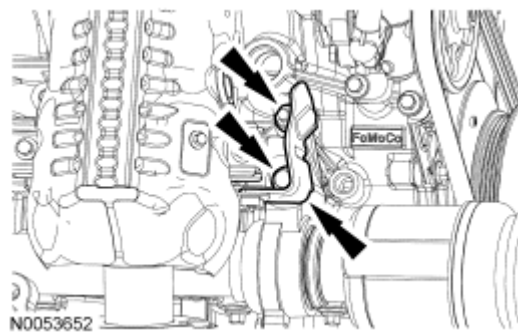


Fig. 249: Identifying RH Catalytic Converter Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

63. Remove the 2 stud bolts and the RH halfshaft/intermediate shaft assembly.

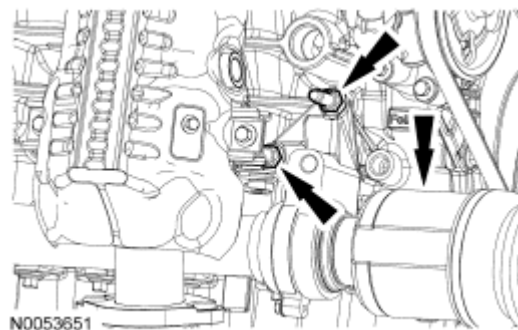


Fig. 250: Locating Stud Bolts & RH Halfshaft/Intermediate Shaft Assembly
Courtesy of FORD MOTOR CO.

AWD vehicles

64. Remove the 2 RH halfshaft bearing support bracket bolts and the RH halfshaft/intermediate shaft

assembly.

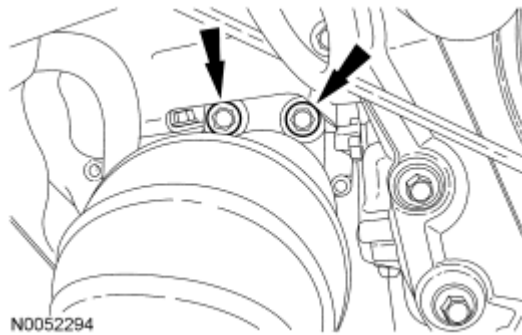


Fig. 251: Locating RH Halfshaft Bearing Support Bracket Bolts
Courtesy of FORD MOTOR CO.

65. Disconnect the RH catalyst monitor electrical connector.

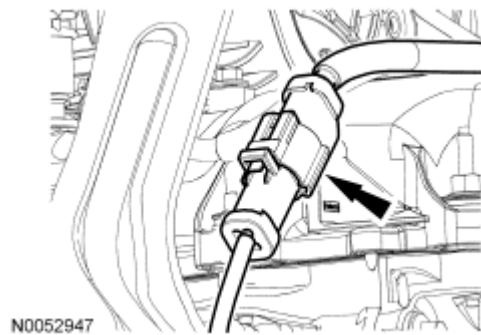


Fig. 252: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

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

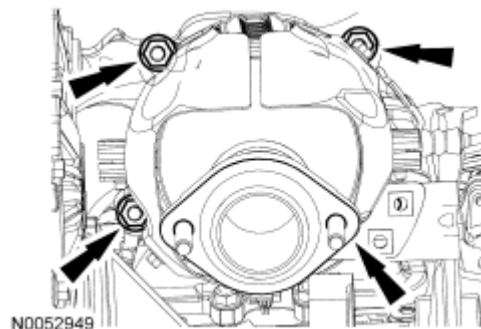


Fig. 253: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

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

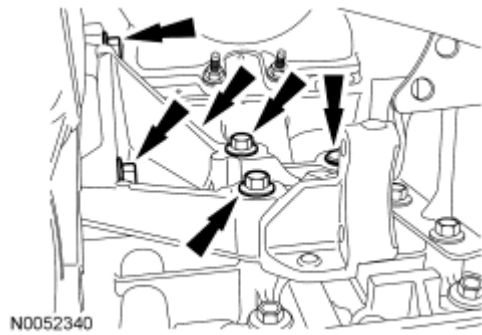


Fig. 254: Locating Power Transfer Unit (PTU) Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

68. Remove the 5 bolts and the PTU.

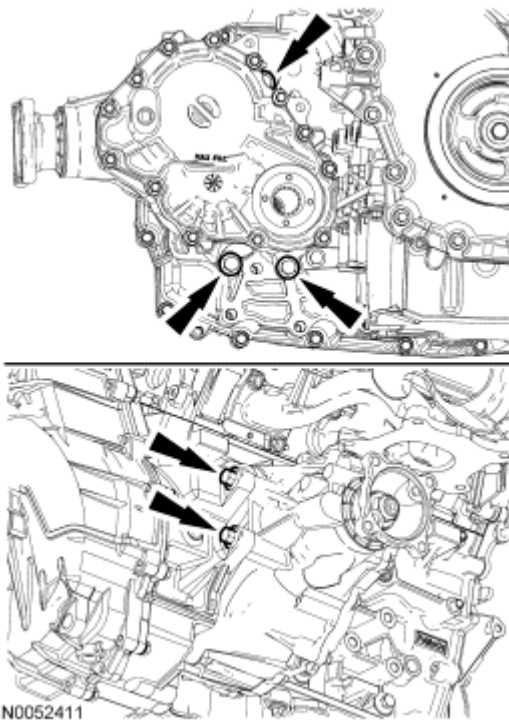


Fig. 255: Identifying PTU & Bolts
Courtesy of FORD MOTOR CO.

All vehicles

NOTE: Position a block of wood under the transaxle.

69. Install the special tools.

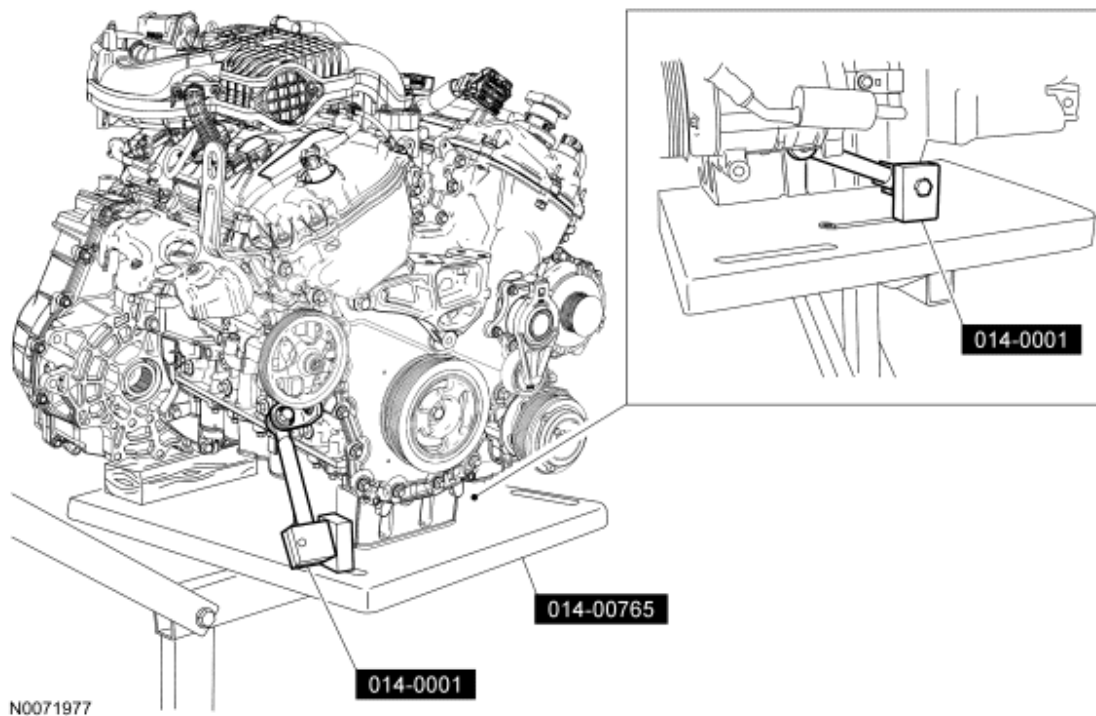


Fig. 256: Positioning A Block Of Wood Under Transaxle Using Special Tools (014-0001) & (014-00765)

Courtesy of FORD MOTOR CO.

70. Remove the transaxle support insulator through bolt and nut.

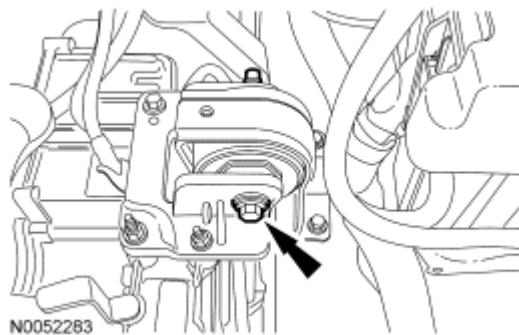


Fig. 257: Identifying Transaxle Support Insulator Bolt
Courtesy of FORD MOTOR CO.

71. Remove the 3 nuts, the bolt and the transaxle support insulator bracket.

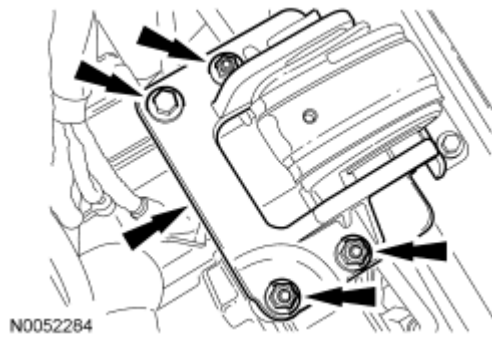


Fig. 258: Identifying Transaxle Support Insulator Bracket, Nuts & Bolts
Courtesy of FORD MOTOR CO.

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

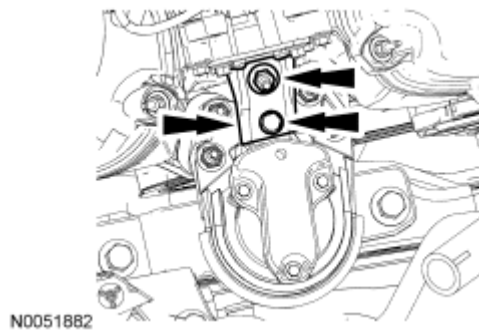


Fig. 259: Locating Nut, Bolt & Engine Mount Brace
Courtesy of FORD MOTOR CO.

73. Remove the 4 engine mount nuts.

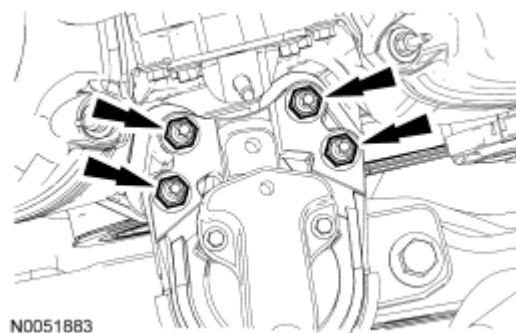


Fig. 260: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

74. Remove the 3 bolts and the engine mount.

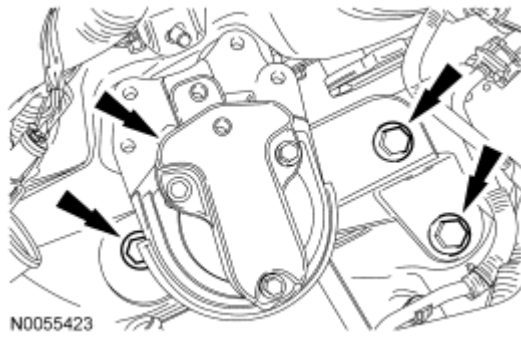


Fig. 261: Locating Engine Mount Bolts
Courtesy of FORD MOTOR CO.

75. Lower the engine and transaxle assembly from the vehicle.
76. Position the starter cable boot back and remove the 2 nuts.
 - Detach the 2 wire terminals from the starter.

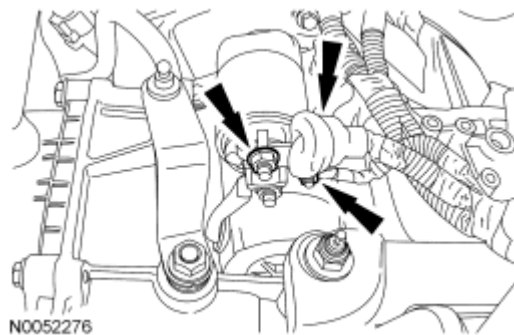


Fig. 262: Identifying Wire Terminals From Starter
Courtesy of FORD MOTOR CO.

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

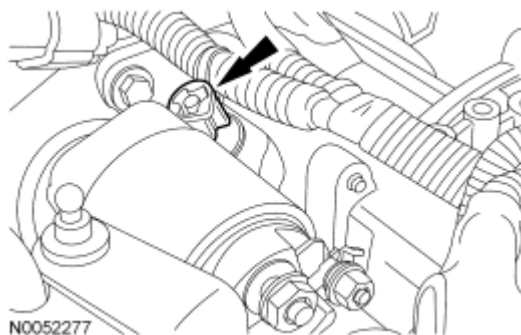


Fig. 263: Identifying Wiring Harness Retainer From Starter Motor Stud Bolt
Courtesy of FORD MOTOR CO.

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

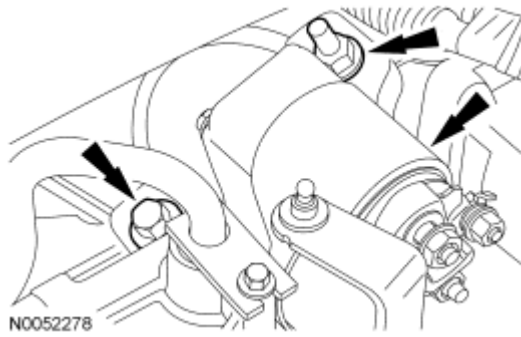


Fig. 264: Identifying Bolt, Stud Bolt & Starter
Courtesy of FORD MOTOR CO.

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

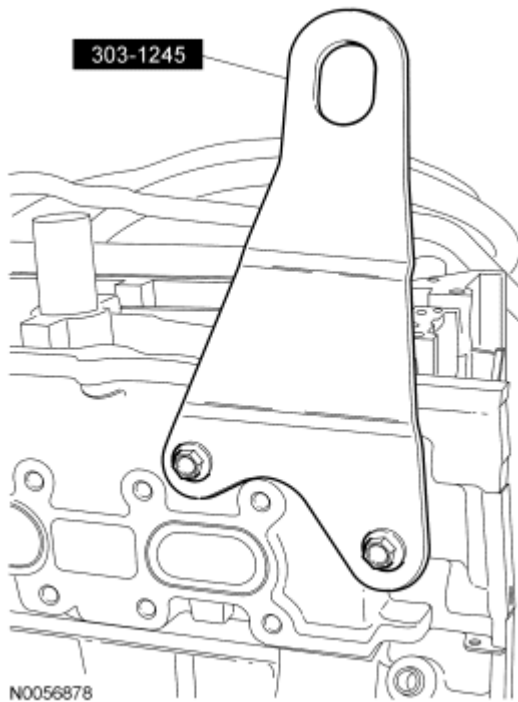


Fig. 265: Installing Special Tool (303-1245) On LH Cylinder Head
Courtesy of FORD MOTOR CO.

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

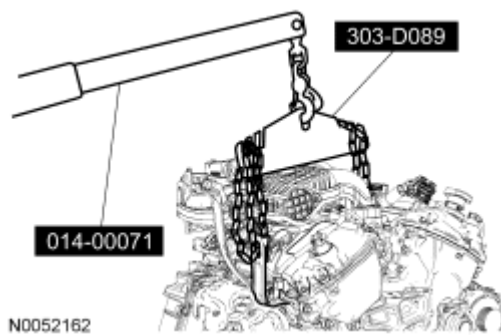


Fig. 266: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

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

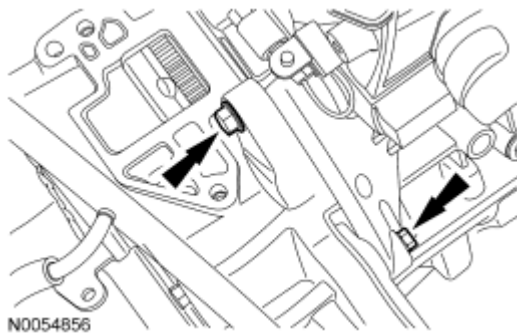


Fig. 267: Locating Engine-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

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

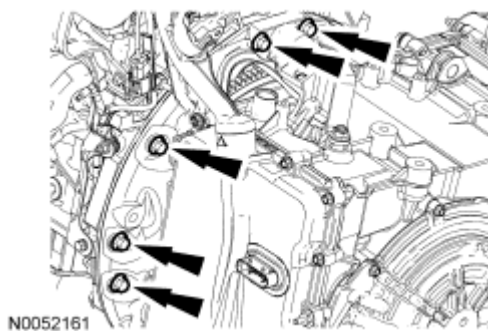


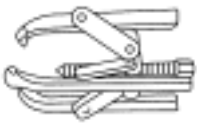
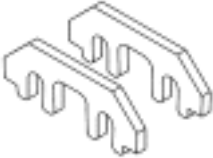



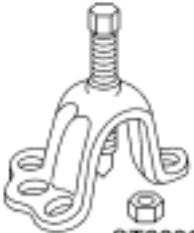
Fig. 268: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

CAMSHAFT

Special Tools





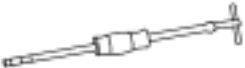

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

Illustration	Tool Name	Tool Number
 ST1184-A	3-Jaw Puller	303-D121
 ST2979-A	Camshaft Alignment Tool	303-1248
 ST2935A	Disconnect Tool, Transmission 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
	Remover, Halfshaft (Extension)	205-243 (T89P-3415-A)



2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 ST2939-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
 ST1185-A	Slide Hammer	100-001 (T50T-100-A)
 ST1438-A	Strap Wrench	303-D055 (D85L-6000-A)
	Tie-Rod End Remover	211-105

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 ST1408-A		
 ST2743A	Universal Adapter Brackets	014-0001

Material

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

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, can cause engine failure.

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** article.
2. Recover the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & DIAGNOSTICS** article.
3. Release the fuel system pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.
4. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING** article.
5. Remove the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
6. Disconnect the power steering cooler hose and drain the power steering fluid into a suitable drain pan.

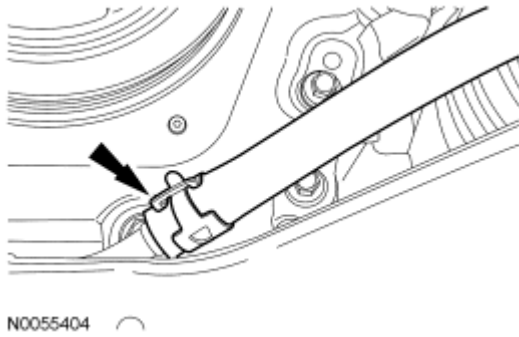


Fig. 269: Identifying Power Steering Cooler Hose
Courtesy of FORD MOTOR CO.

7. Remove the degas bottle. For additional information, refer to **ENGINE COOLING** article.
8. Remove the engine air cleaner and air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** article.
9. Remove the battery tray. For additional information, refer to **BATTERY, MOUNTING & CABLES** article.
10. Disconnect the battery harness electrical connector.

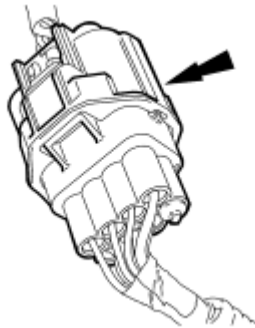


Fig. 270: Identifying Battery Harness Electrical Connector
Courtesy of FORD MOTOR CO.

11. Remove the nut and disconnect the power feed from the battery terminal.

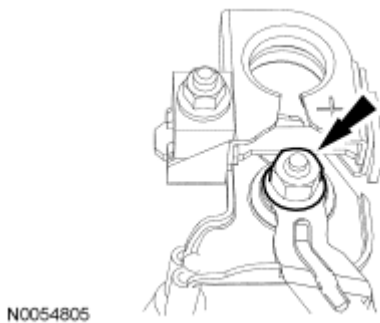


Fig. 271: Locating Power Feed To Battery Terminal And Nut
Courtesy of FORD MOTOR CO.

12. Remove the bolt and the ground wire.
 - Detach the 2 wiring harness retainers from the cowl.

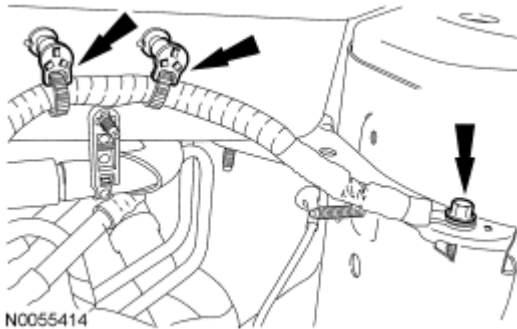


Fig. 272: Identifying Wiring Harness Retainers From Cowl
Courtesy of FORD MOTOR CO.

13. Disconnect the vacuum hose from the upper intake manifold.

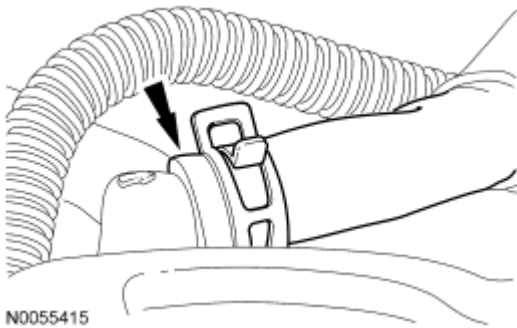


Fig. 273: Identifying Vacuum Hose From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

14. Disconnect the upper evaporative emissions (EVAP) tube quick connect coupling from the purge valve.
For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

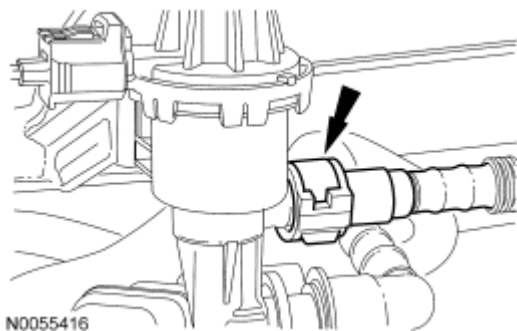


Fig. 274: Locating Upper Evaporative Emissions (EVAP) Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

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

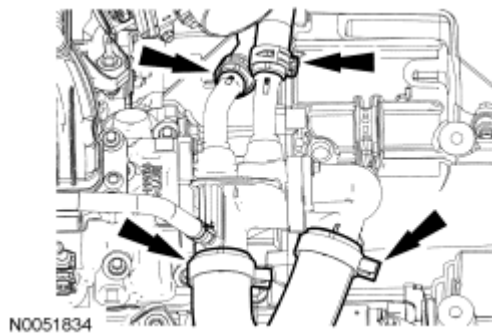


Fig. 275: Locating Upper Radiator Hose, Lower Radiator Hose & Heater Hoses
Courtesy of FORD MOTOR CO.

16. Detach the wiring harness retainer from the transaxle control cable bracket.

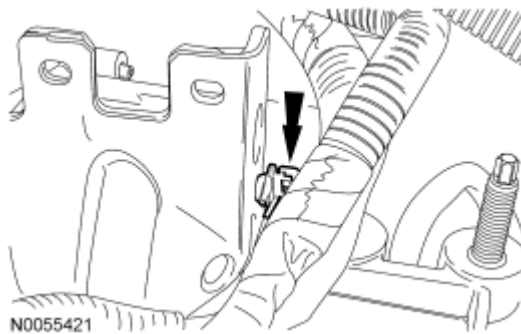


Fig. 276: Locating Wiring Harness Retainer From Transaxle Control Cable Bracket
Courtesy of FORD MOTOR CO.

17. Disconnect the transaxle control cable from the control lever.
- Detach the control cable from the bracket.



Fig. 277: Locating Transaxle Control Cable From Control Lever
Courtesy of FORD MOTOR CO.

18. Disconnect the transaxle control electrical connector.

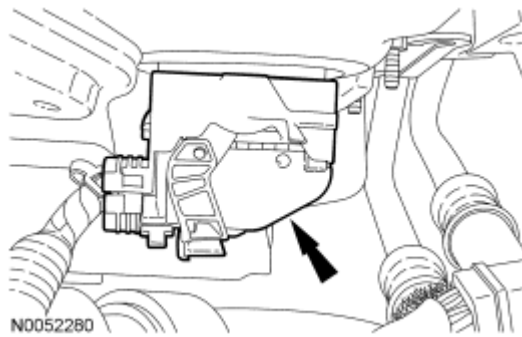


Fig. 278: Identifying Transaxle Control Electrical Connector
 Courtesy of FORD MOTOR CO.

19. If equipped, detach the engine block heater harness retainers from the radiator support and the A/C suction tube.

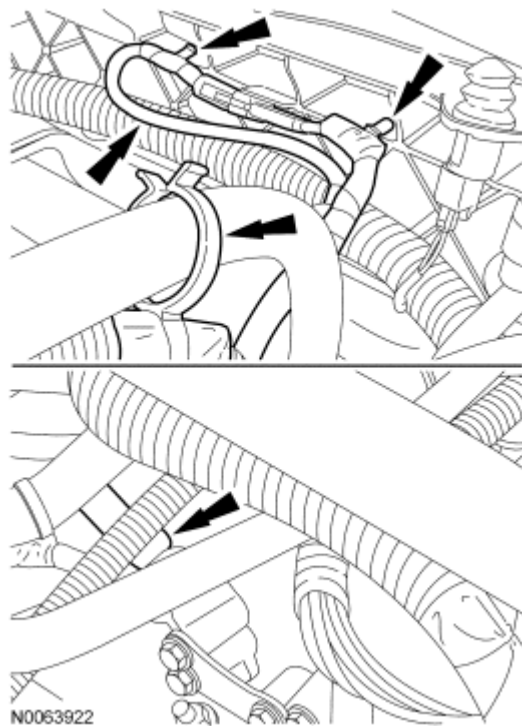


Fig. 279: Identifying Engine Block Heater Harness, Radiator Support, A/C Suction Tube & Engine Wiring Harness
 Courtesy of FORD MOTOR CO.

20. Remove the nut and disconnect the A/C pressure tube fitting.
 - Discard the O-ring seal.

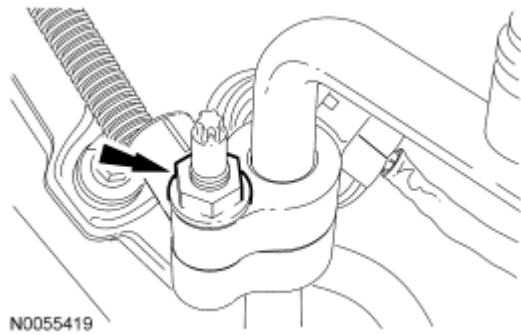


Fig. 280: Identifying A/C Pressure Tube Fitting Nut
Courtesy of FORD MOTOR CO.

21. Remove the safety clip from the A/C fitting.
 - Disconnect the A/C suction tube fitting.

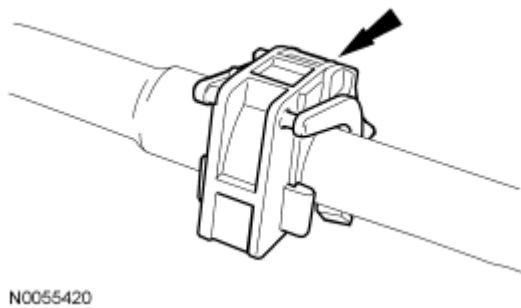


Fig. 281: Identifying Safety Clip On A/C Suction Tube Fitting
Courtesy of FORD MOTOR CO.

22. Disconnect the hose from the power steering reservoir.

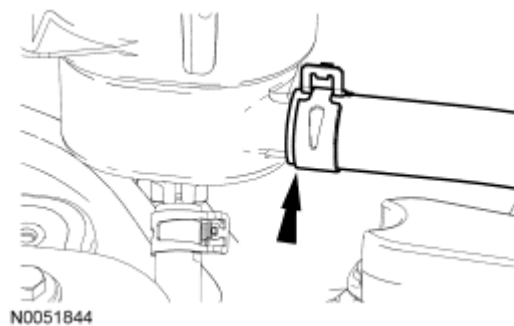


Fig. 282: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

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

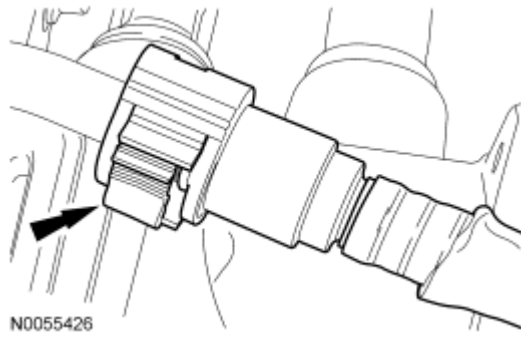


Fig. 283: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

24. Disconnect the fuel hose routing clip from the transaxle stud and position the fuel hose aside.

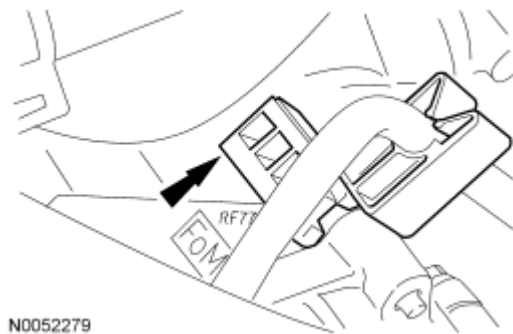


Fig. 284: Identifying Fuel Hose Routing Clip From Transaxle Stud
Courtesy of FORD MOTOR CO.

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

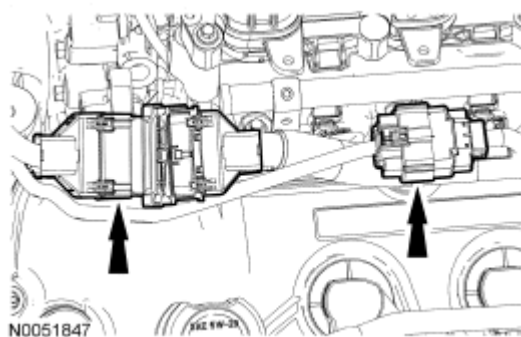


Fig. 285: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

26. Remove the oil level indicator.

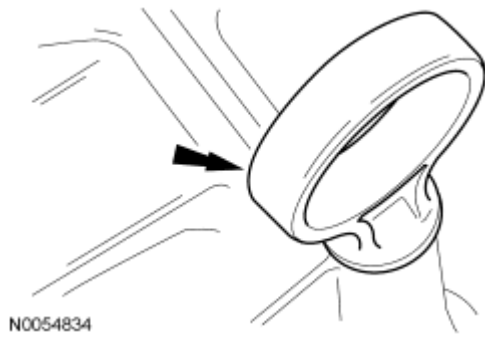


Fig. 286: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

27. Detach the wiring harness retainer from the RH valve cover stud bolt.

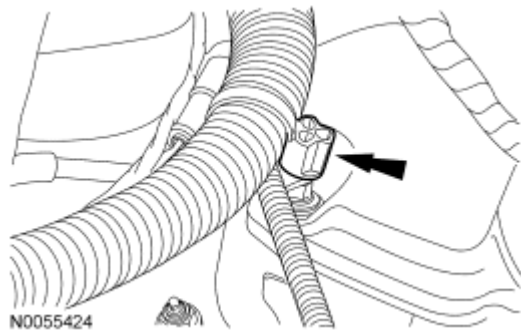


Fig. 287: Identifying Wiring Harness Retainer From RH Valve Cover Stud Bolt
Courtesy of FORD MOTOR CO.

28. Remove the bolt and the ground wire from the engine front cover.

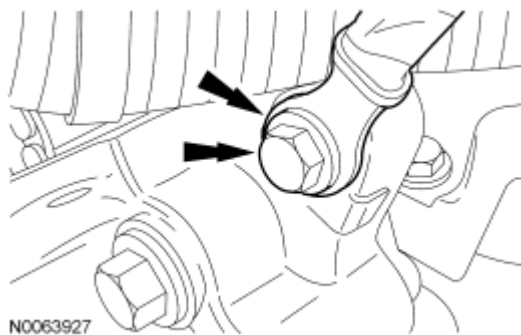


Fig. 288: Removing/Installing Bolt & Ground Wire From Engine Front Cover
Courtesy of FORD MOTOR CO.

29. Remove the nut, the ground wire and the radio interference capacitor wire from the engine front cover stud.

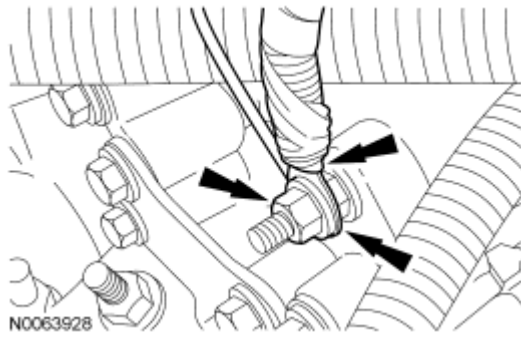


Fig. 289: Removing/installing Nut, Ground Wire & Radio Interference Capacitor Wire From Engine Front Cover Stud
Courtesy of FORD MOTOR CO.

30. Loosen the exhaust flexible pipe clamp and disconnect the 2 exhaust hangers.



Fig. 290: Locating Exhaust Flexible Pipe Clamp & Exhaust Hangers
Courtesy of FORD MOTOR CO.

31. Remove the 4 nuts and the exhaust flexible pipe and Y-pipe as an assembly.
 - Discard the nuts and the gasket.

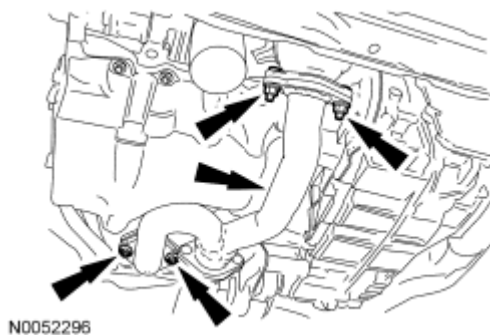


Fig. 291: Locating Exhaust Flexible Pipe, Y-Pipe & Nuts
Courtesy of FORD MOTOR CO.

32. Remove the 3 pin-type retainers, the 7 screws and the radiator splash shield.

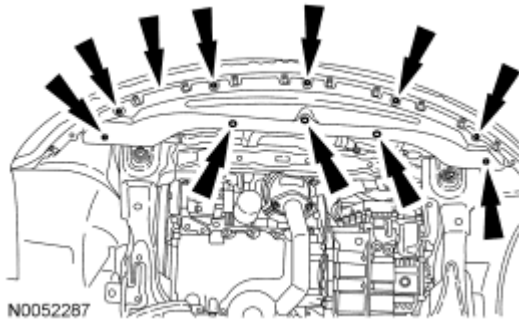


Fig. 292: Locating Push Pin Fasteners & Front Splash Shield Screws
Courtesy of FORD MOTOR CO.

33. Remove the LH inner splash shield. For additional information, refer to **FRONT END BODY PANELS** article.
34. Remove the 2 secondary latches from the transmission fluid cooler tubes.

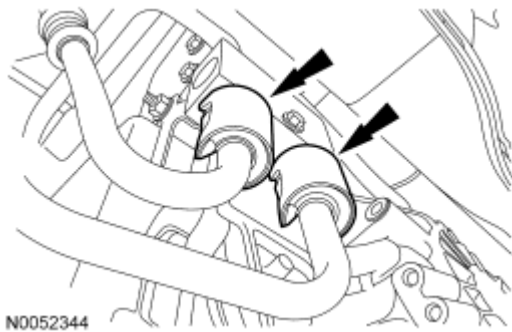


Fig. 293: Locating Secondary Latches On Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

35. Using the special tool, disconnect the transmission cooling tubes.

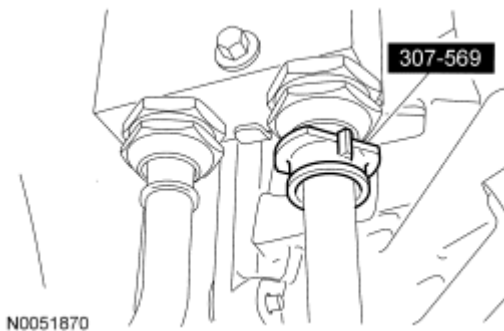


Fig. 294: Disconnecting Transmission Cooling Tubes Using Special Tool (307-569)
Courtesy of FORD MOTOR CO.

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

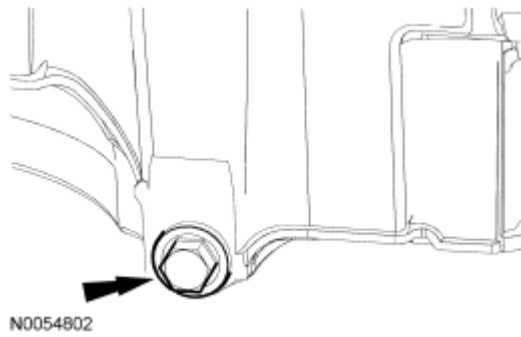


Fig. 295: Locating Drain Plug
Courtesy of FORD MOTOR CO.

37. Remove and discard the engine oil filter.

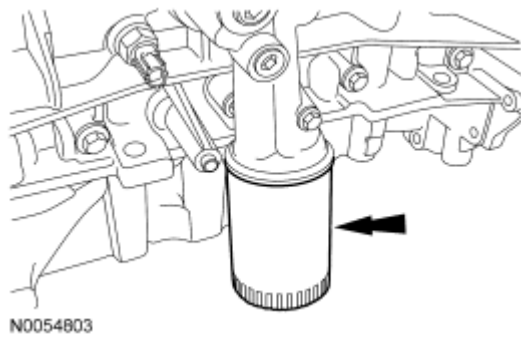


Fig. 296: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

38. Remove the power steering cooler bracket bolt from the RH side of the subframe.

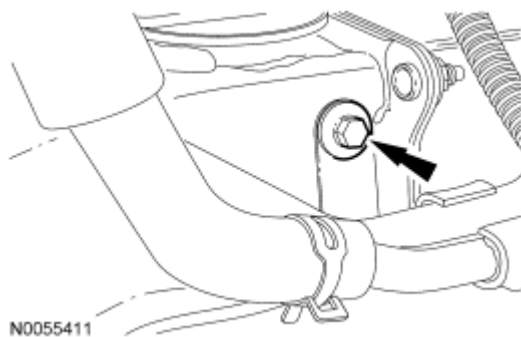


Fig. 297: Identifying Power Steering Cooler Bracket Bolt
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

NOTE: Index-mark the driveshaft for installation.

39. Remove the 4 bolts and support the driveshaft with a length of mechanic's wire.

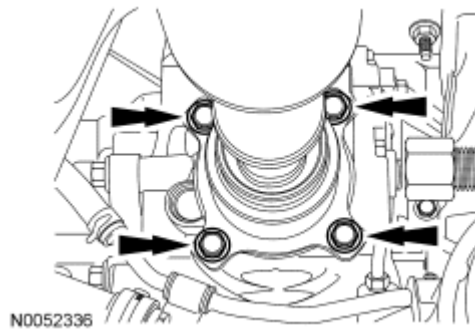


Fig. 298: Locating Driveshaft Aside Bolts
Courtesy of FORD MOTOR CO.

All vehicles

40. Remove and discard the RH front halfshaft nut.

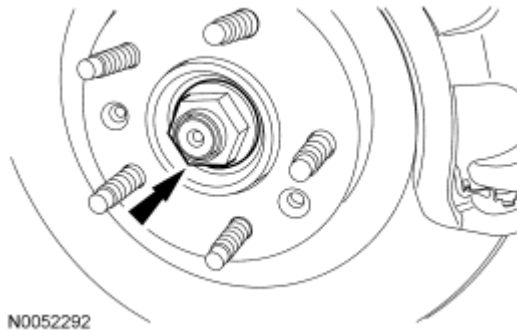


Fig. 299: Locating RH Front Halfshaft Nut
Courtesy of FORD MOTOR CO.

41. Remove the 2 nuts and the roll restrictor heat shield.

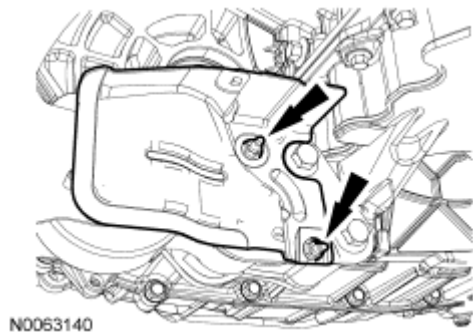


Fig. 300: Locating Roll Restrictor Heat Shield Nuts
Courtesy of FORD MOTOR CO.

42. Remove the engine roll restrictor-to-subframe through bolt.

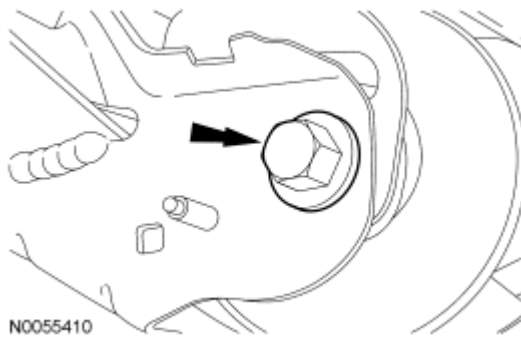


Fig. 301: Locating Roll Restrictor-To-Subframe Bolt
Courtesy of FORD MOTOR CO.

43. Remove and discard the power steering pressure (PSP) tube-to-pump banjo bolt and the 2 seals.

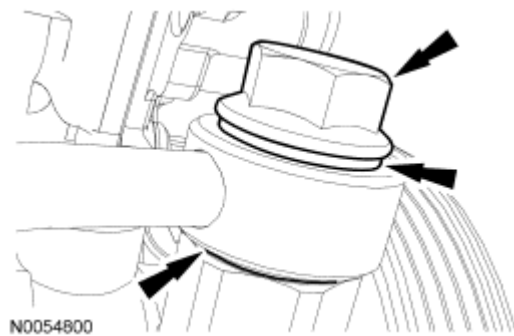


Fig. 302: Locating Power Steering Pressure (PSP) Tube-To-Pump Banjo Bolt & Seals
Courtesy of FORD MOTOR CO.

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

44. Remove and discard the steering intermediate shaft bolt.
- Separate the steering intermediate shaft from the steering gear.

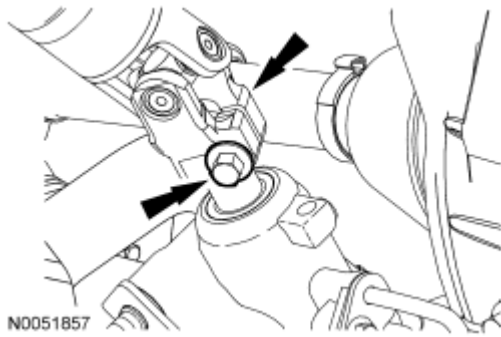


Fig. 303: Identifying Steering Intermediate Shaft Bolt
Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

45. Remove and discard the cotter pins and tie-rod end nuts.
 - Using the special tool, separate the tie-rod ends from the wheel knuckles.

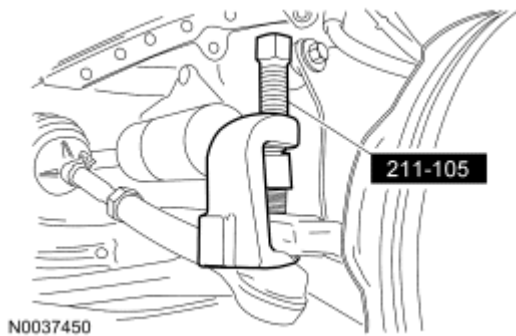


Fig. 304: Separating Tie-Rod Ends From Wheel Knuckles Using Special Tool (211-105)
Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

46. Remove the 2 stabilizer link-to-lower control arm nuts and separate the stabilizer bar links from the lower control arms.

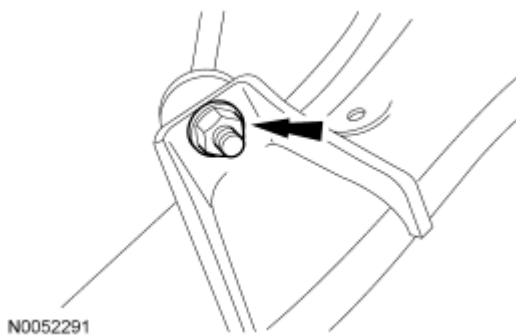
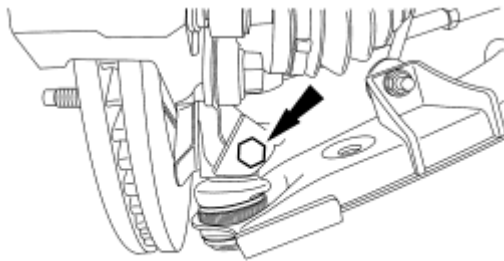


Fig. 305: Locating Stabilizer Bar Link Nut

Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

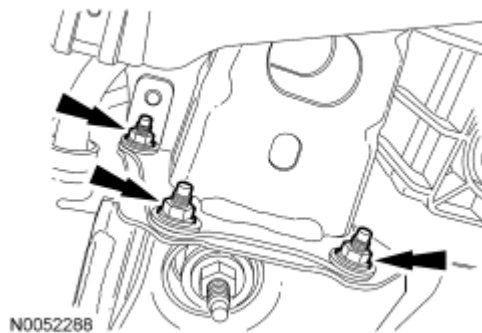
47. Remove the lower control arm-to-knuckle pinch bolts and separate the lower control arms from the knuckles.



N0052293

Fig. 306: Locating Ball Joint Pinch Bolt
Courtesy of FORD MOTOR CO.

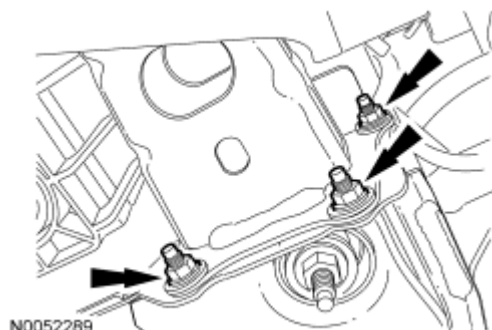
48. Remove the 3 RH subframe-to-lower bumper nuts.



N0052288

Fig. 307: Locating RH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

49. Remove the 3 LH subframe-to-lower bumper nuts and separate the lower bumper from the subframe.



N0052289

Fig. 308: Locating LH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

50. Position the special tool under the subframe assembly.

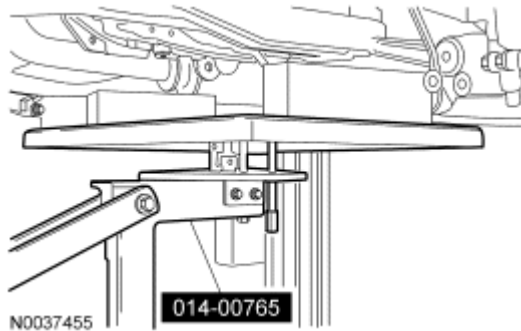


Fig. 309: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

51. Remove the 2 nuts, 4 bolts and the subframe support brackets.

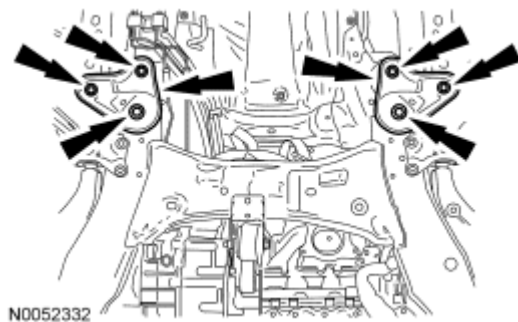


Fig. 310: Locating Subframe Support Brackets, Nuts & Bolts
Courtesy of FORD MOTOR CO.

52. Remove the 2 front subframe nuts.

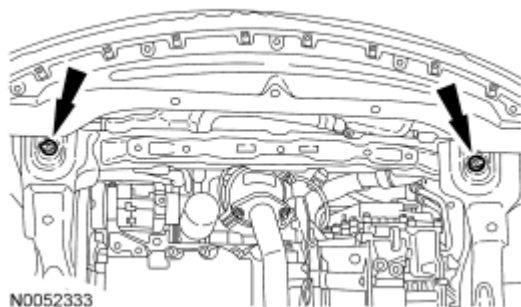


Fig. 311: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

53. Remove the 2 middle subframe nuts.

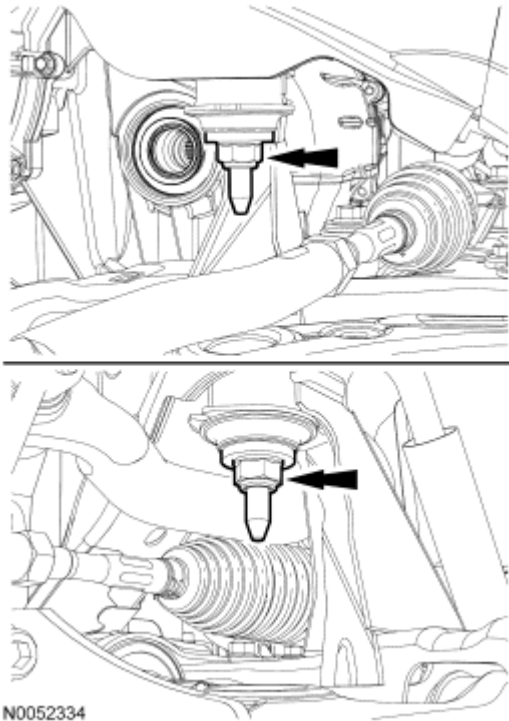


Fig. 312: Locating Middle Subframe Nuts
Courtesy of FORD MOTOR CO.

54. Using the special tool, lower the subframe assembly from the vehicle.

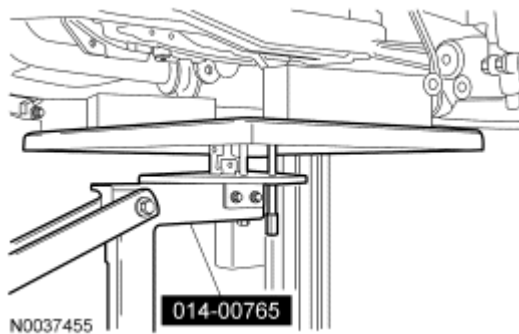


Fig. 313: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

55. If equipped, disconnect the oil cooler coolant hoses.

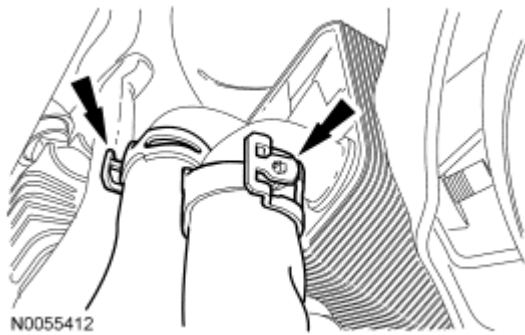


Fig. 314: Locating Oil Cooler Coolant Hoses
Courtesy of FORD MOTOR CO.

56. Using the special tools, separate the LH halfshaft from the transaxle and support the halfshaft with a length of mechanic's wire.

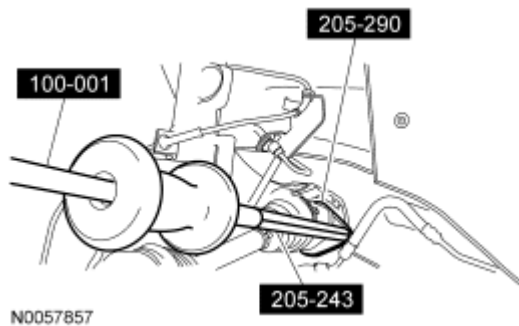


Fig. 315: Separating LH Halfshaft From Transaxle Using Special Tools (100-001), (205-243) & (205-290)
Courtesy of FORD MOTOR CO.

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

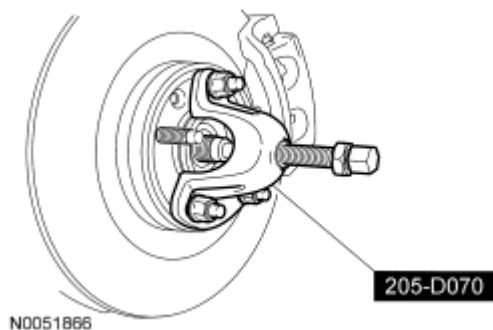


Fig. 316: Separating RH Halfshaft From Hub Using Special Tool (205-D070)
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

58. Remove the 2 RH catalytic converter support bracket bolts.

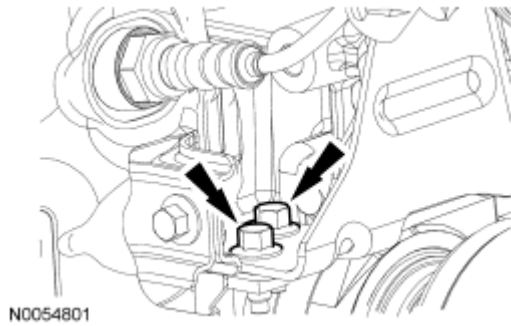


Fig. 317: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

59. Remove the bolt, the nut and the RH catalytic converter support bracket.

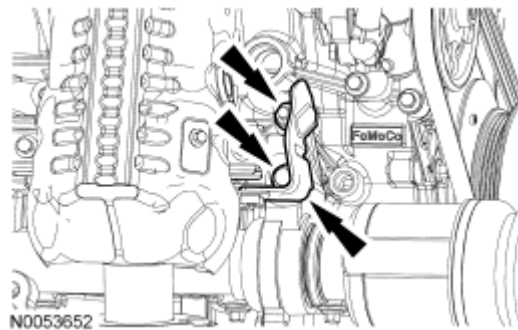


Fig. 318: Identifying RH Catalytic Converter Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

60. Remove the 2 stud bolts and the RH halfshaft/intermediate shaft assembly.

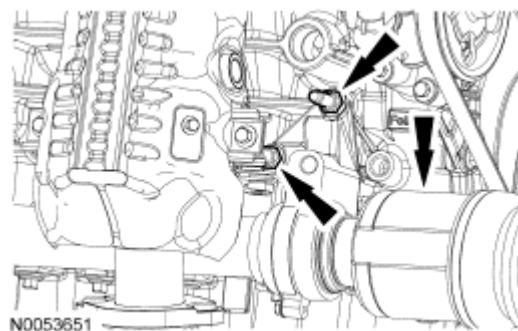


Fig. 319: Locating Stud Bolts & RH Halfshaft/Intermediate Shaft Assembly
Courtesy of FORD MOTOR CO.

AWD vehicles

61. Remove the 2 RH halfshaft bearing support bracket bolts and the RH halfshaft/intermediate shaft assembly.

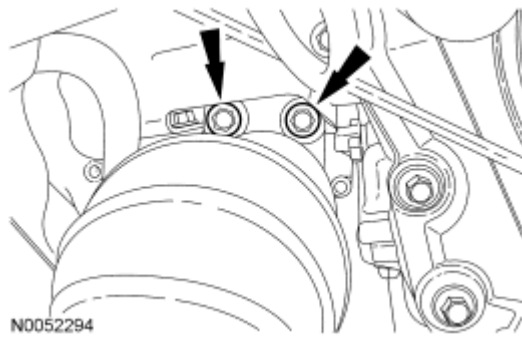


Fig. 320: Locating RH Halfshaft Bearing Support Bracket Bolts
Courtesy of FORD MOTOR CO.

All vehicles

NOTE: Position a block of wood under the transaxle.

62. Install the special tools.

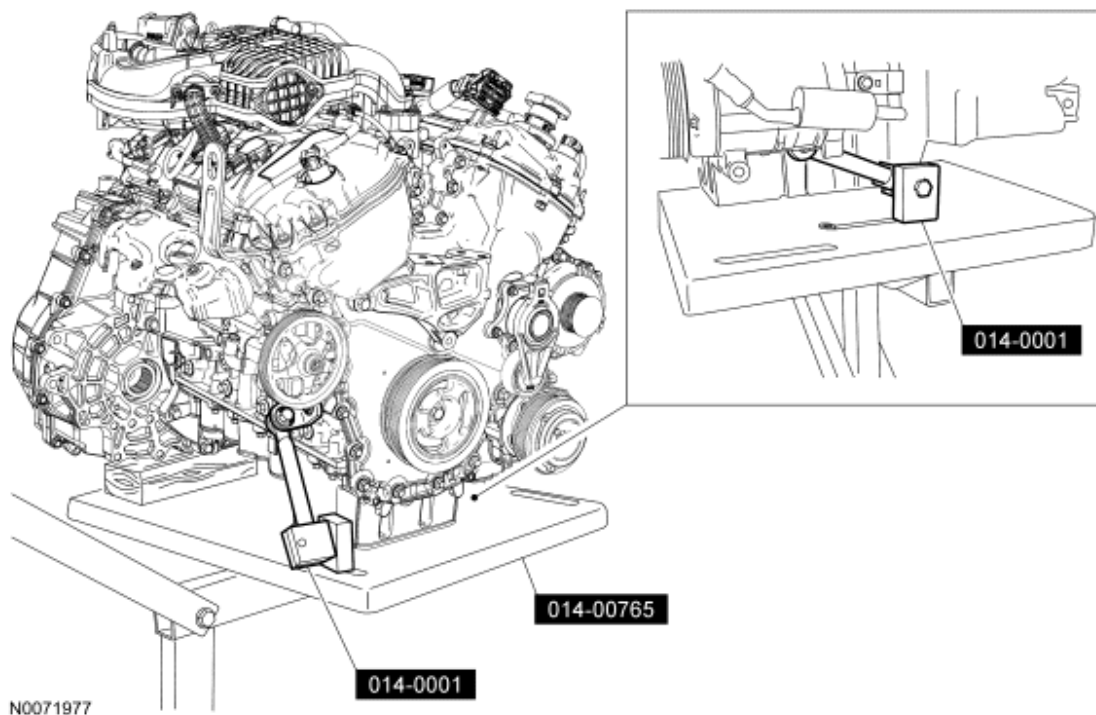


Fig. 321: Positioning A Block Of Wood Under Transaxle Using Special Tools (014-0001) & (014-00765)
Courtesy of FORD MOTOR CO.

63. Remove the transaxle support insulator through bolt and nut.

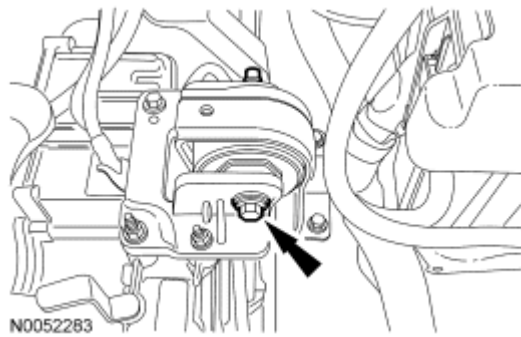


Fig. 322: Identifying Transaxle Support Insulator Bolt
Courtesy of FORD MOTOR CO.

64. Remove the 3 nuts, the bolt and the transaxle support insulator bracket.

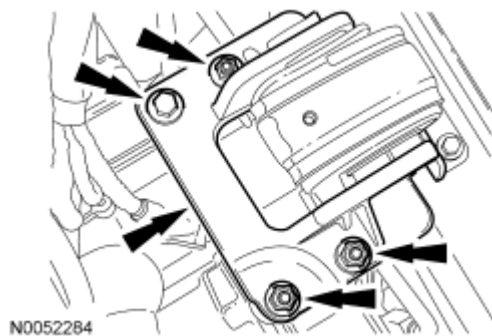


Fig. 323: Identifying Transaxle Support Insulator Bracket, Nuts & Bolts
Courtesy of FORD MOTOR CO.

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

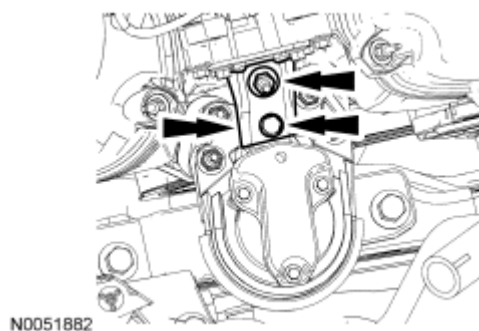


Fig. 324: Locating Nut, Bolt & Engine Mount Brace
Courtesy of FORD MOTOR CO.

66. Remove the 4 engine mount nuts.

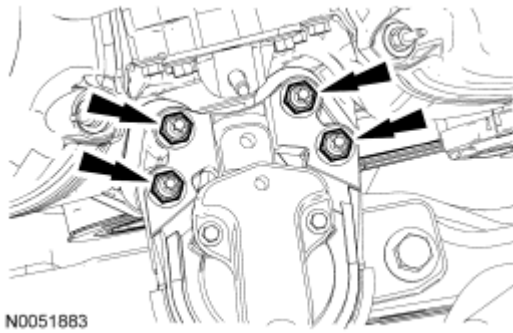


Fig. 325: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

67. Remove the 3 bolts and the engine mount.

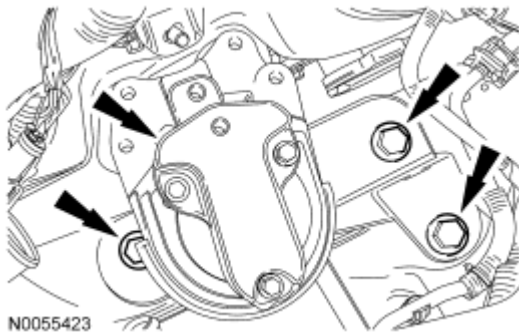


Fig. 326: Locating Engine Mount Bolts
Courtesy of FORD MOTOR CO.

68. Lower the engine and transaxle assembly from the vehicle.
69. If equipped, detach the engine block heater wiring harness retainers and position the harness aside.
70. Disconnect the PCV hose from the PCV valve.

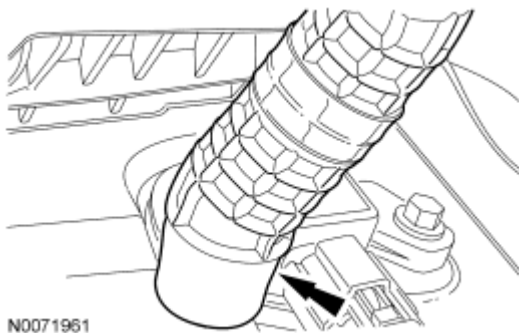


Fig. 327: Identifying PCV Hose
Courtesy of FORD MOTOR CO.

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

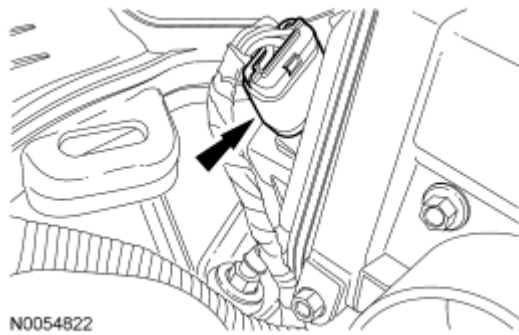


Fig. 328: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

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

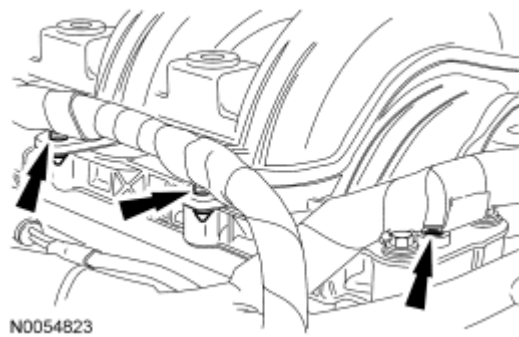


Fig. 329: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

73. Remove the upper intake manifold support bracket bolt.

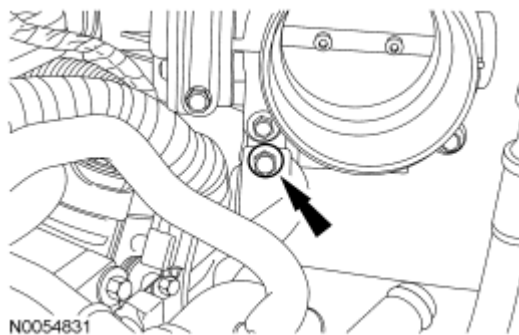
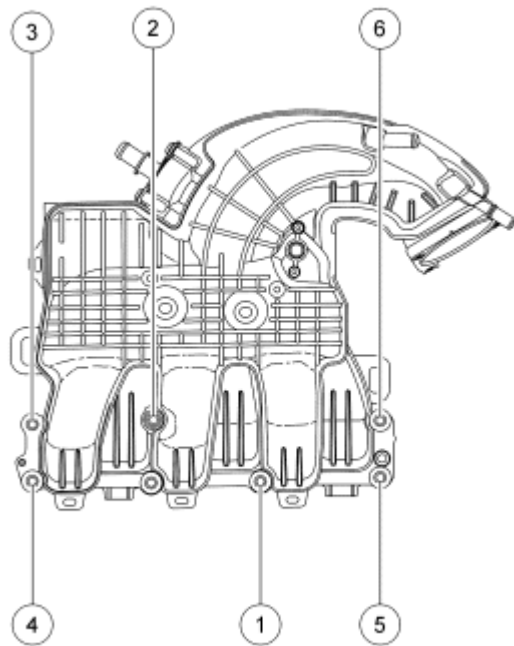


Fig. 330: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

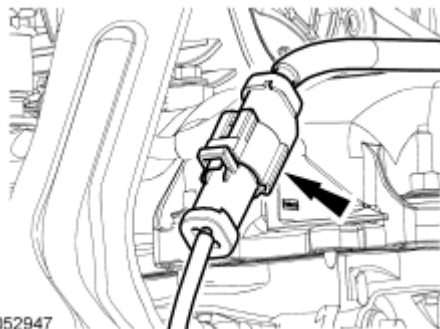
74. Remove the 6 bolts and the upper intake manifold in the following sequence.
- Discard the gaskets.



N0071997

Fig. 331: Identifying Bolt Sequence
Courtesy of FORD MOTOR CO.

75. Disconnect the RH catalyst monitor electrical connector.



N0052947

Fig. 332: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

76. Disconnect the PSP switch electrical connector.

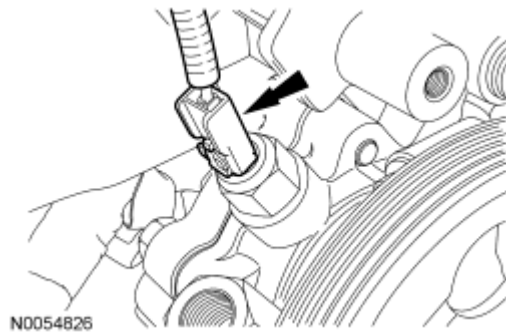


Fig. 333: Locating PSP Switch Electrical Connector
Courtesy of FORD MOTOR CO.

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

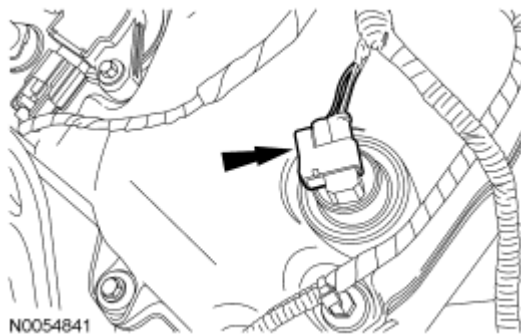


Fig. 334: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

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

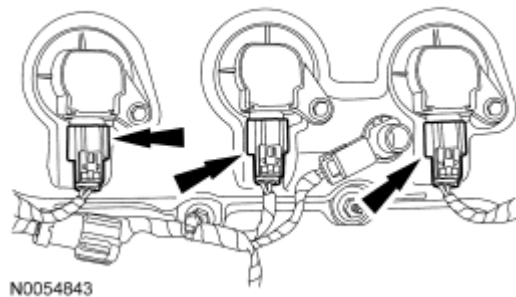


Fig. 335: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

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

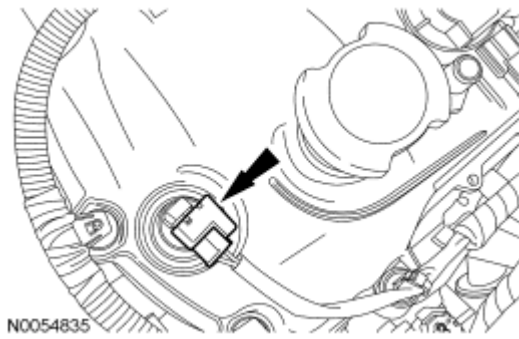


Fig. 336: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

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

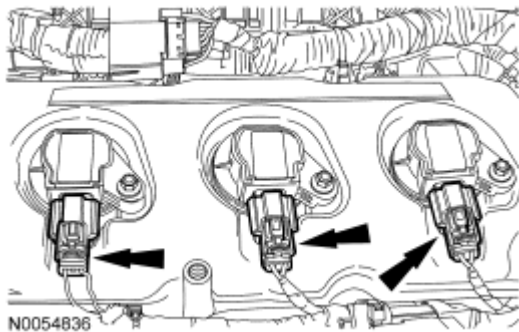


Fig. 337: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

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

NOTE: LH shown, RH similar.

83. Remove the 6 bolts and the 6 coil-on-plugs.

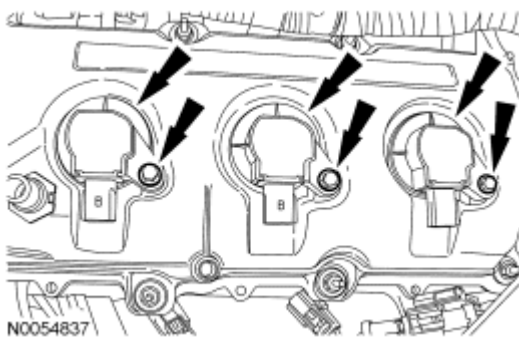


Fig. 338: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

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

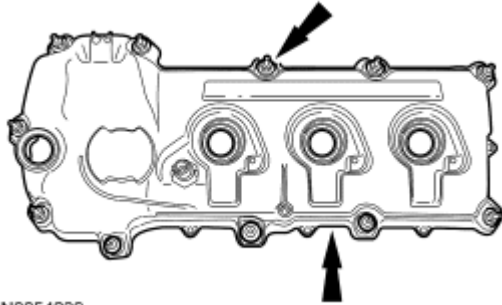


Fig. 339: Locating LH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

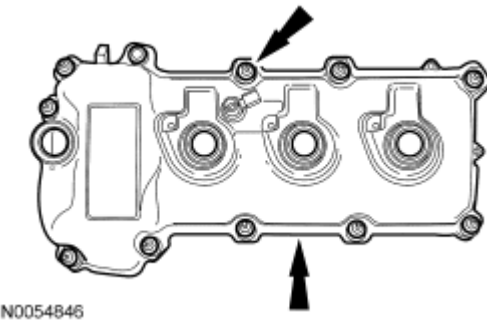


Fig. 340: Locating RH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

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

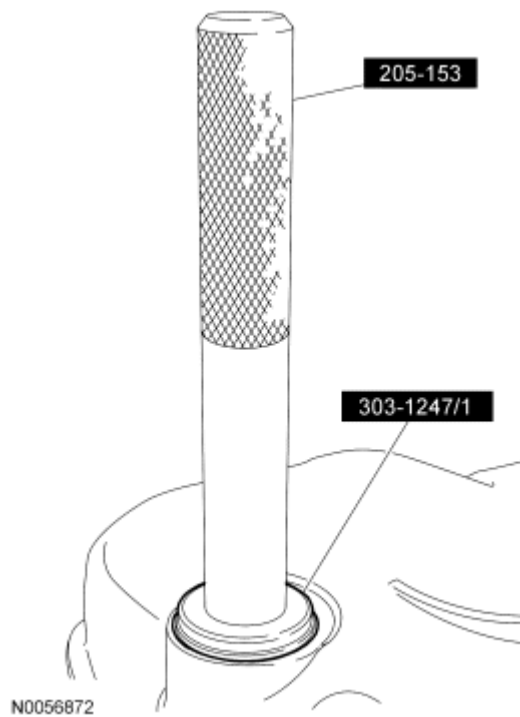


Fig. 341: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

87. Remove the 3 bolts and the power steering pump.

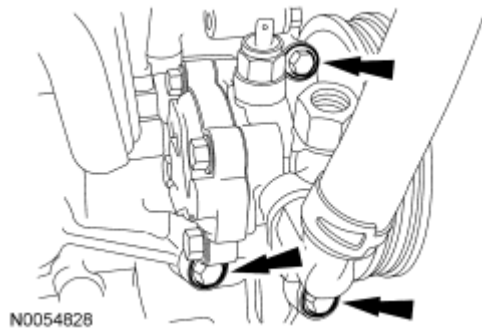


Fig. 342: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

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

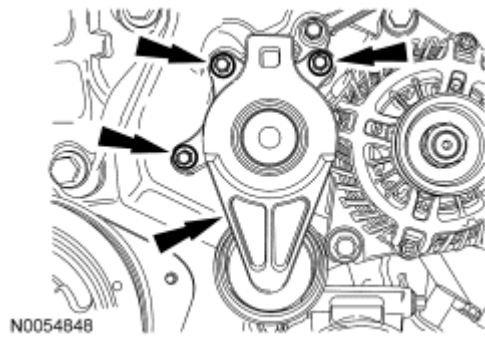


Fig. 343: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

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

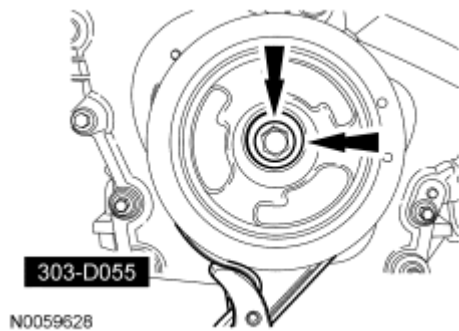


Fig. 344: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

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

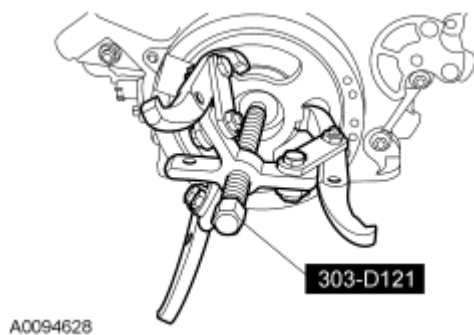


Fig. 345: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

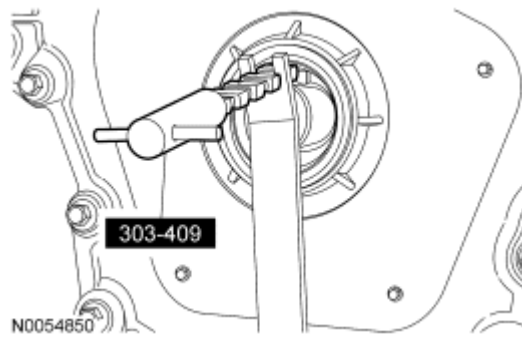


Fig. 346: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

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

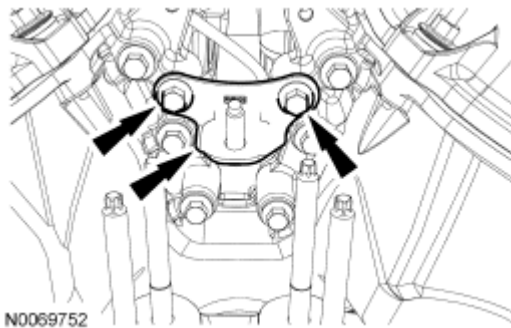


Fig. 347: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

93. Remove the 2 engine mount studs.

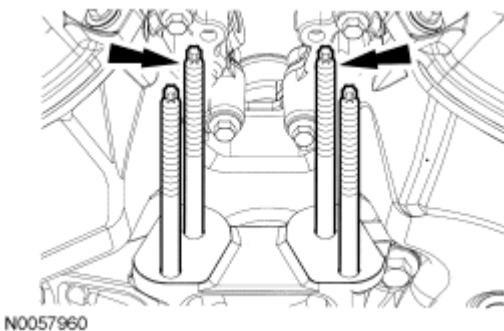


Fig. 348: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

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

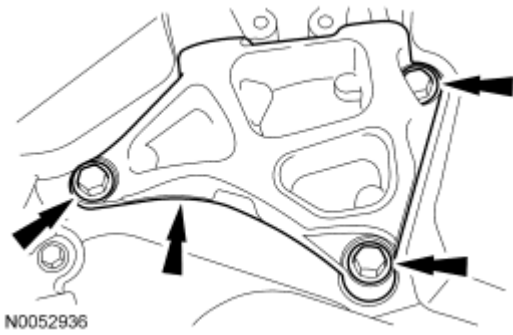


Fig. 349: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

95. Remove the 22 engine front cover bolts.

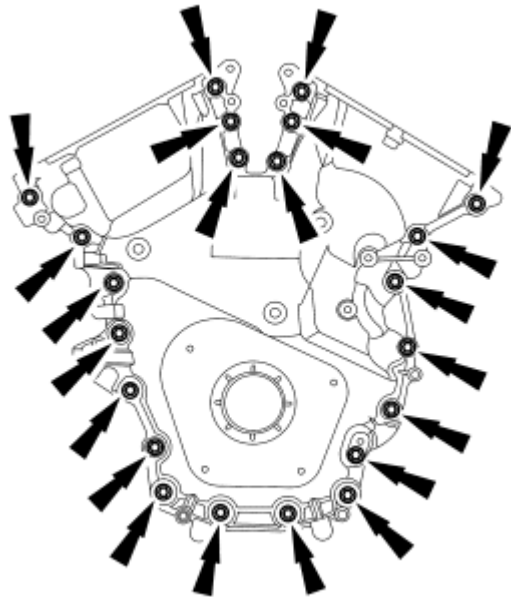
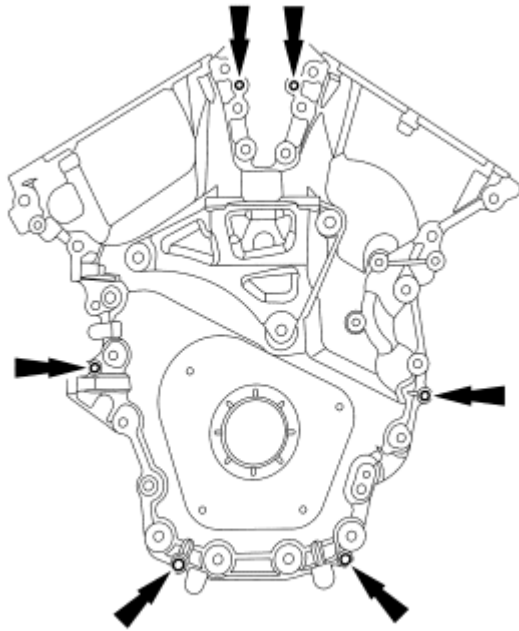


Fig. 350: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

96. 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. 351: 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.

97. 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 the gasket.

98. 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.
99. Rotate the crankshaft clockwise and align the timing marks on the variable camshaft timing (VCT) assemblies as shown.

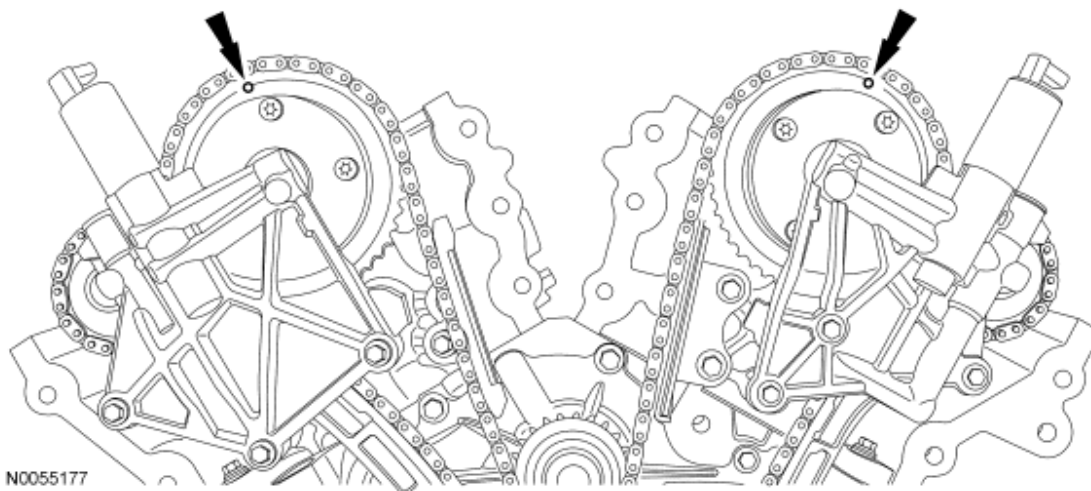


Fig. 352: Aligning Timing Marks On Variable Camshaft Timing (VCT) Assemblies
Courtesy of FORD MOTOR CO.

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

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

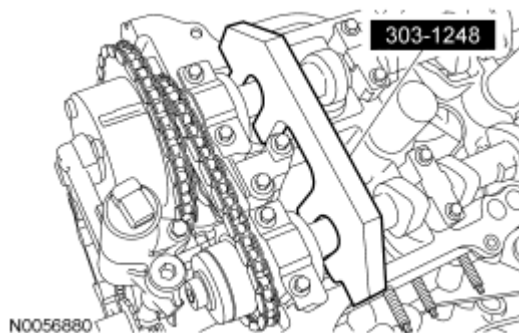


Fig. 353: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

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

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

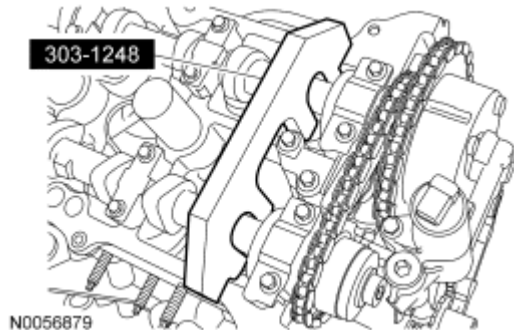


Fig. 354: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

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

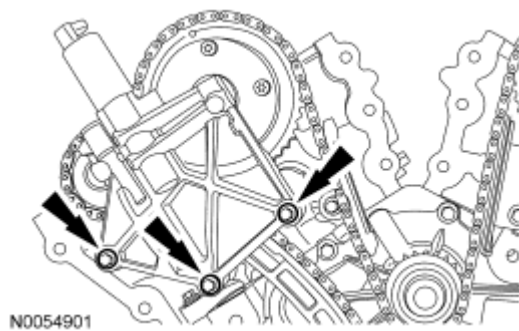


Fig. 355: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

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

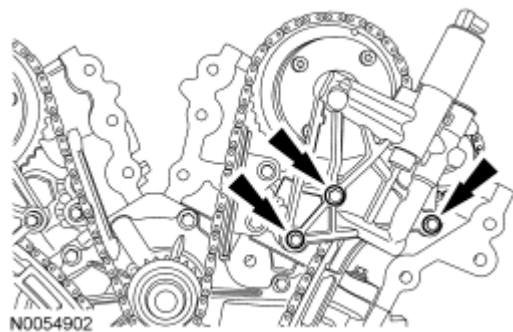


Fig. 356: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

104. Remove and discard the VCT housing seals.

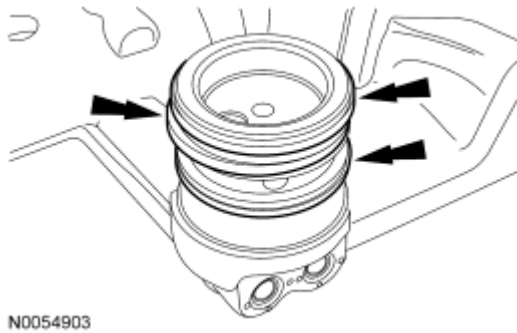


Fig. 357: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

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

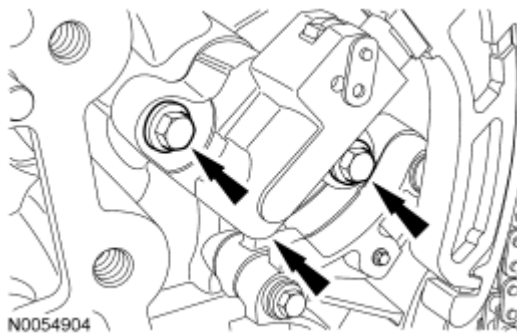


Fig. 358: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

106. Remove the primary timing chain tensioner arm.

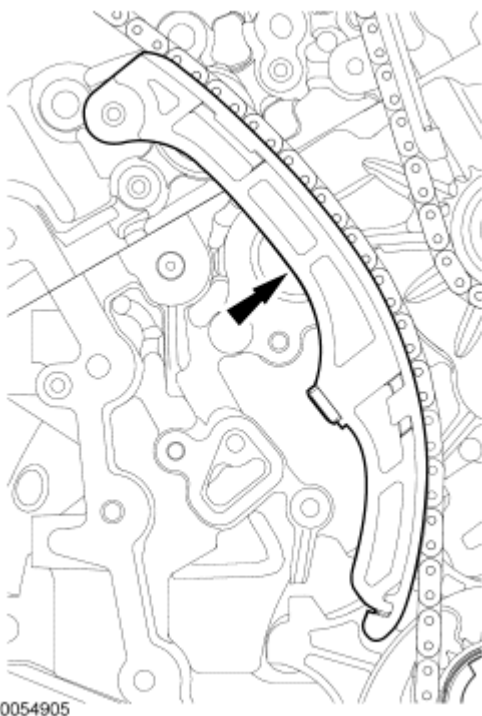


Fig. 359: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

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

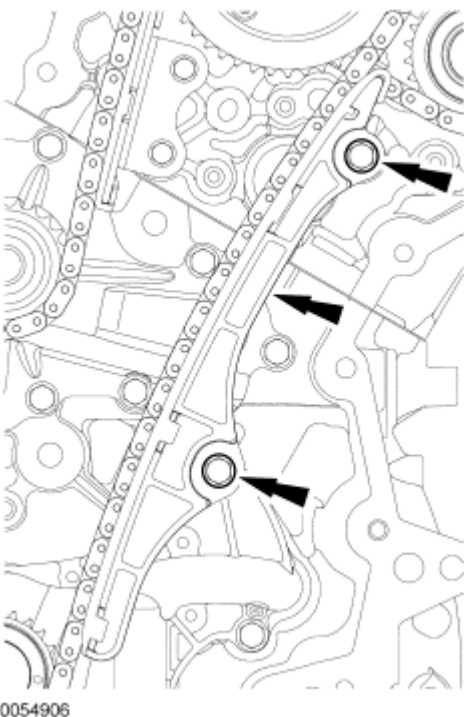
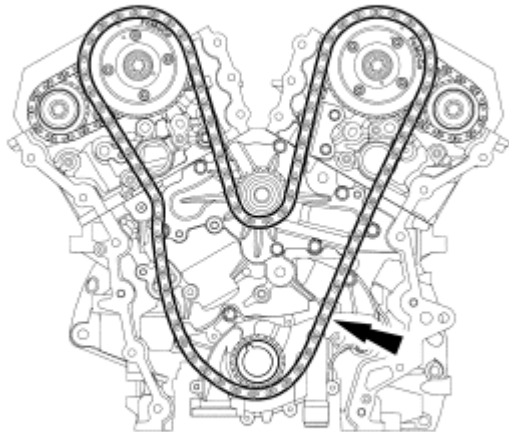


Fig. 360: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

108. Remove the primary timing chain.

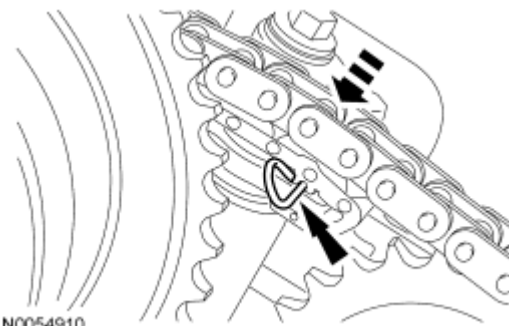


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Fig. 361: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

LH camshafts

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



N0054910

Fig. 362: 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.

110. 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.

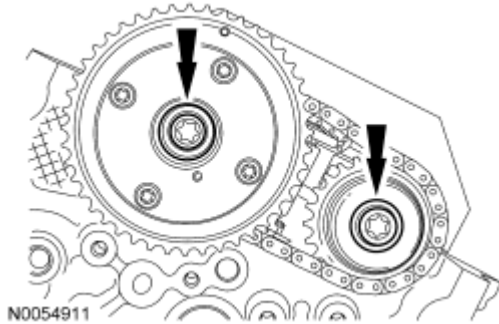


Fig. 363: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

NOTE: When the special tool is removed, valve spring pressure will rotate the LH camshafts approximately 3 degrees to a neutral position.

111. Remove the special tool from the LH camshafts.

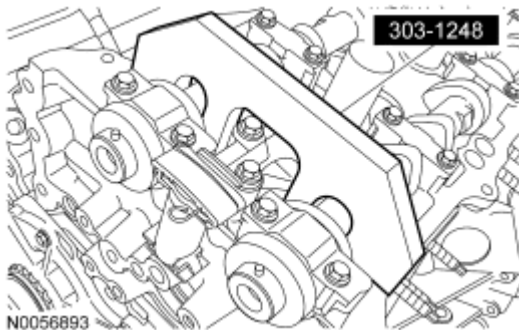


Fig. 364: Removing Special Tool (303-1248) From LH Camshafts
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

112. Verify the LH camshafts are in the neutral position.

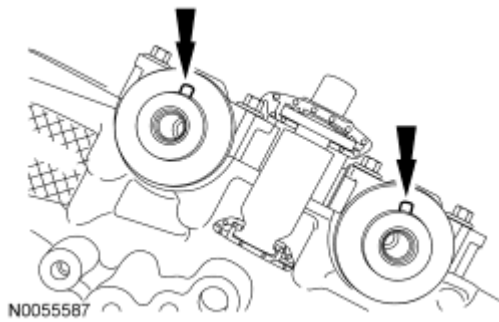


Fig. 365: Verifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

113. Remove the bolts and the LH camshaft bearing caps.
- Remove the LH camshafts.

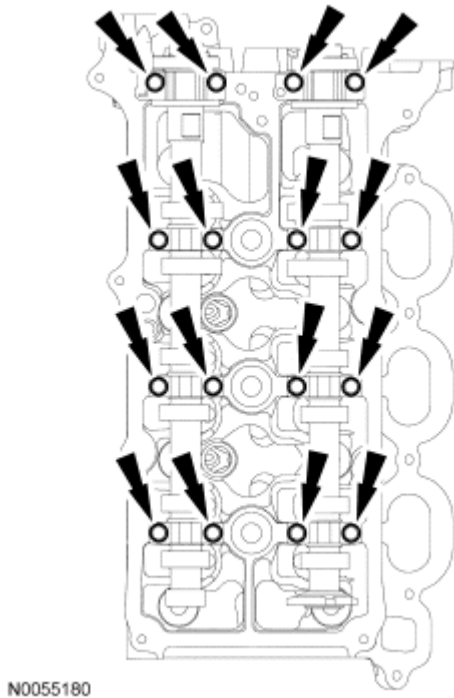


Fig. 366: Identifying LH Camshafts Bolts
Courtesy of FORD MOTOR CO.

RH camshafts

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

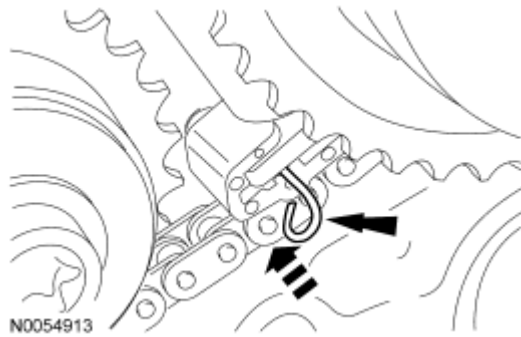


Fig. 367: Compressing RH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

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

115. 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.

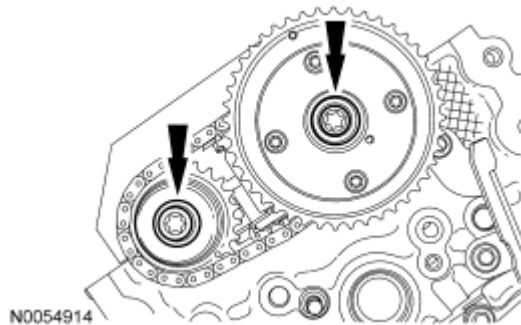


Fig. 368: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

116. Remove the special tool from the RH camshafts.

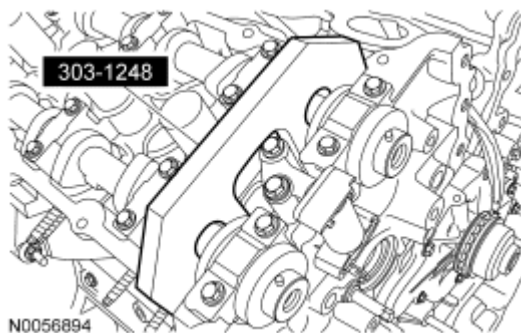


Fig. 369: Removing Special Tool (303-1248) From RH Camshafts

Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

117. Rotate the RH camshafts counterclockwise to the neutral position.

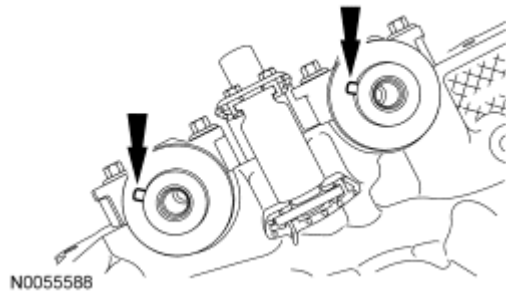


Fig. 370: Rotating RH Camshafts Counterclockwise To Neutral Position
Courtesy of FORD MOTOR CO.

NOTE: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions.

118. Remove the bolts and the RH camshaft bearing caps.
- Remove the RH camshafts.

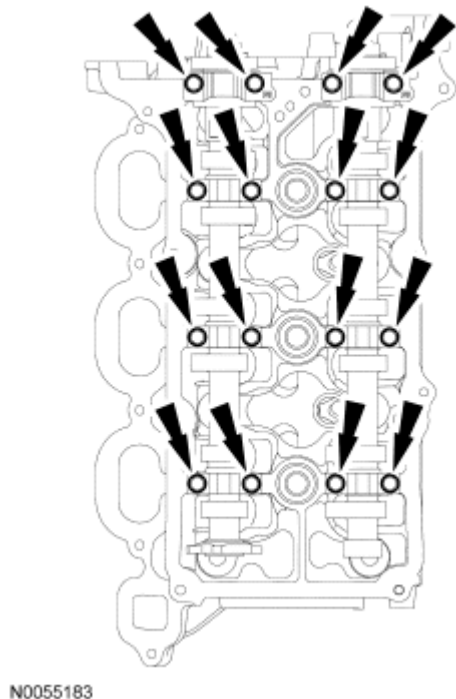


Fig. 371: Identifying RH Camshafts Bolts
 Courtesy of FORD MOTOR CO.

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.

1. 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.

2. Remove the valve tappets from the cylinder head.

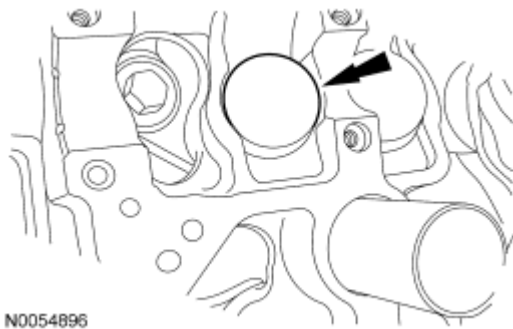
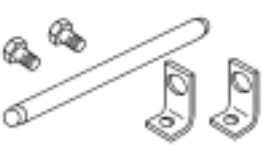




Fig. 372: Identifying Valve Tappets From Cylinder Head
 Courtesy of FORD MOTOR CO.

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)

 <p>ST1907-A</p>		
 <p>ST302B-A</p>	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 in this service information.

3. Pressurize the cylinder using compressed air.
4. Using the Valve Spring Compressors, remove the keys, retainer and spring.

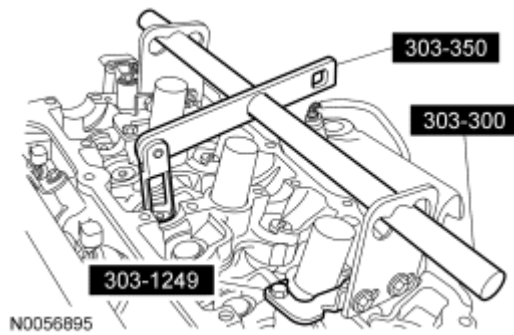


Fig. 373: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

5. Remove and discard the valve stem seal.

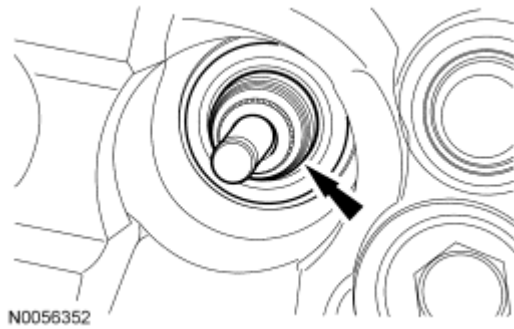


Fig. 374: Identifying Valve Stem Seal
Courtesy of FORD MOTOR CO.

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, can cause engine failure.

All vehicles

1. Remove the RH camshafts. For additional information, refer to **Camshaft**.
2. If equipped, remove the heat shield and disconnect the block heater electrical connector.

- Remove the block heater wiring harness from the engine.

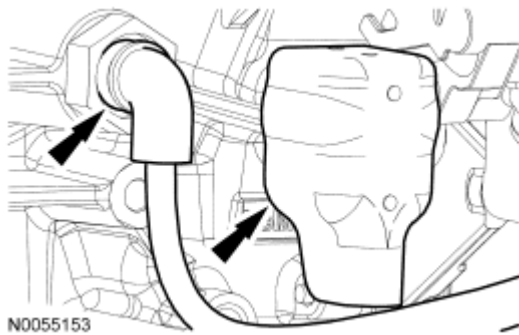


Fig. 375: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

3. Disconnect the RH heated oxygen sensor (HO2S) electrical connector.

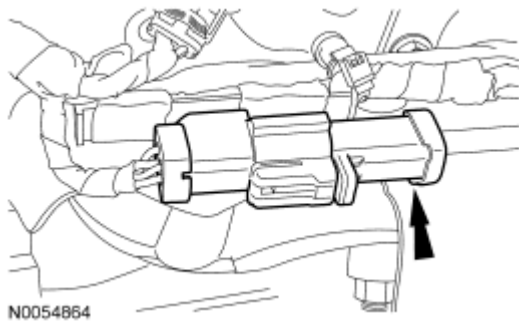


Fig. 376: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

4. Disconnect the RH camshaft position (CMP) sensor electrical connector.

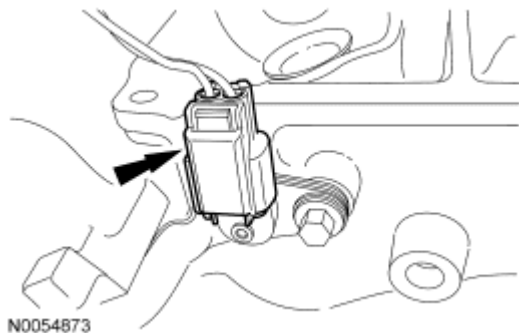


Fig. 377: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the ground cable from the RH cylinder.

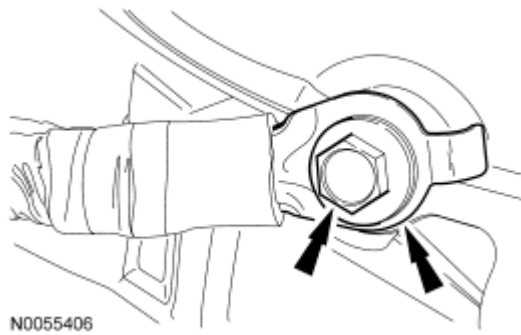


Fig. 378: Locating Ground Cable From RH Cylinder
Courtesy of FORD MOTOR CO.

6. Disconnect the 6 fuel injector electrical connectors (3 shown).

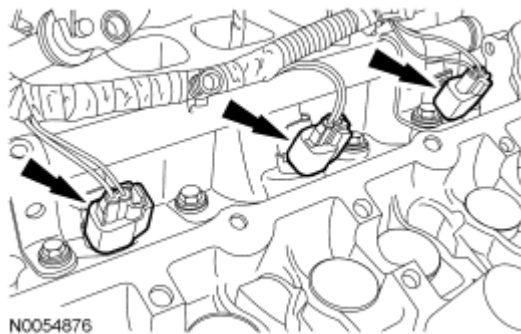


Fig. 379: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

7. Disconnect the cylinder head temperature (CHT) sensor electrical connector.

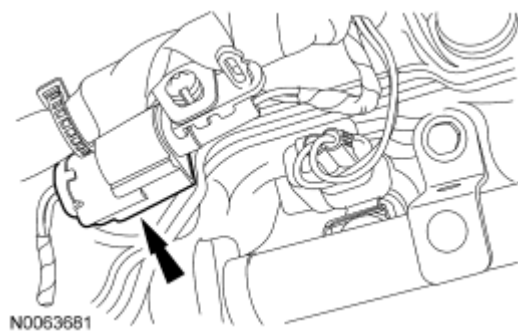


Fig. 380: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

8. Disconnect the LH catalyst monitor sensor electrical connector.

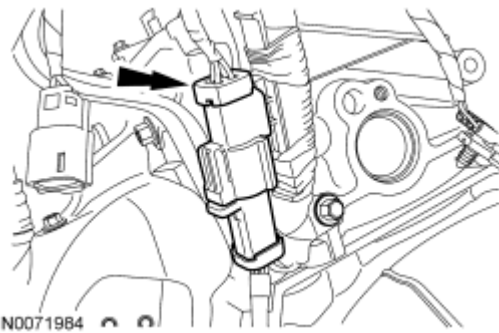


Fig. 381: Identifying LH Catalyst Monitor Sensor Electrical Connector
 Courtesy of FORD MOTOR CO.

9. Remove the 2 LH catalytic converter bracket bolts.

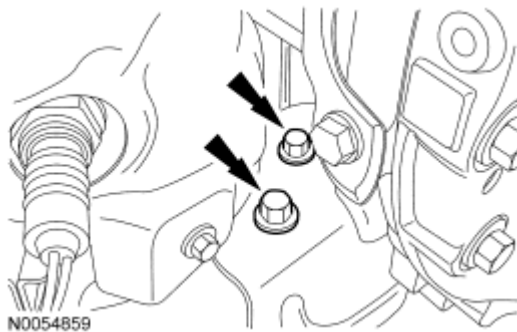


Fig. 382: Locating LH Catalytic Converter Bracket Bolts
 Courtesy of FORD MOTOR CO.

10. Remove the 4 nuts (3 shown) and the LH catalytic converter.
 - Discard the nuts and the gasket.

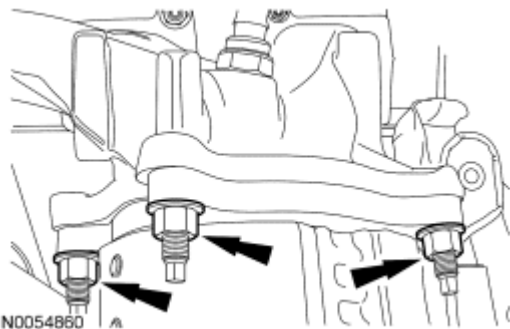


Fig. 383: Locating LH Catalytic Converter Nuts
 Courtesy of FORD MOTOR CO.

11. Remove the LH cylinder block drain plug.
 - Allow coolant to drain from the cylinder block.

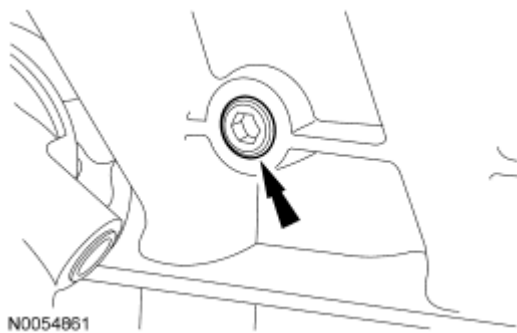


Fig. 384: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

12. Remove the 2 RH catalytic converter bracket bolts.

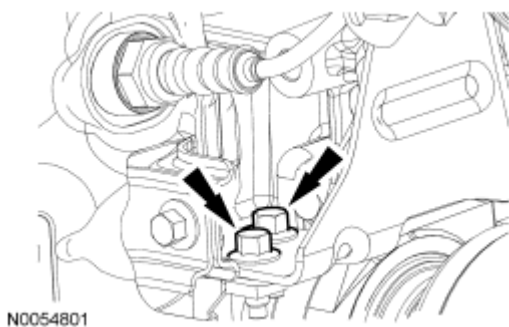


Fig. 385: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

All vehicles

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

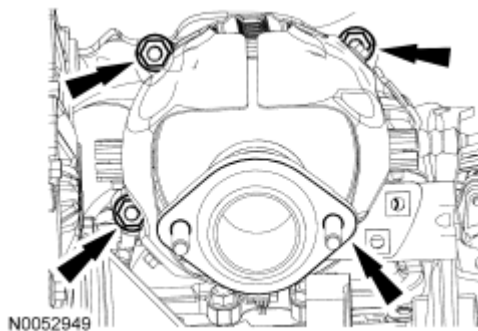


Fig. 386: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

14. Remove the RH cylinder block drain plug or, if equipped, the block heater.
 - Allow coolant to drain from the cylinder block.

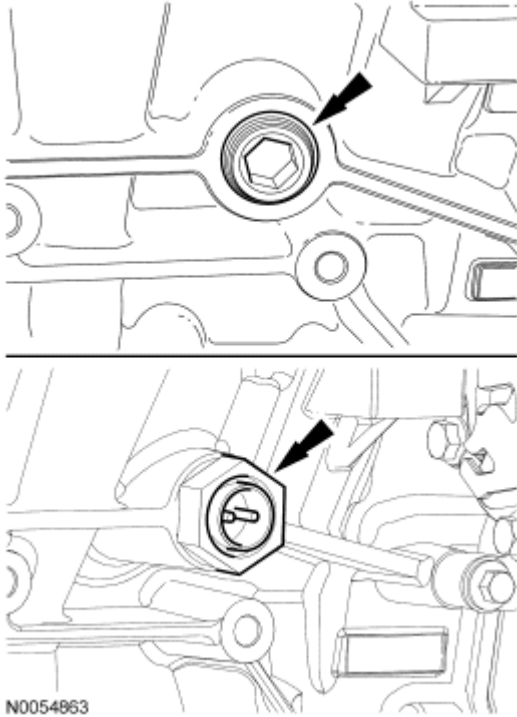


Fig. 387: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

15. Remove the 3 bolts and the RH exhaust manifold heat shield.

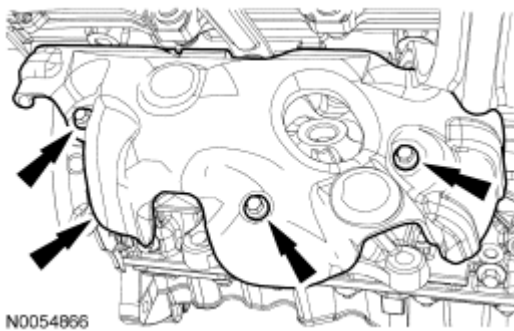
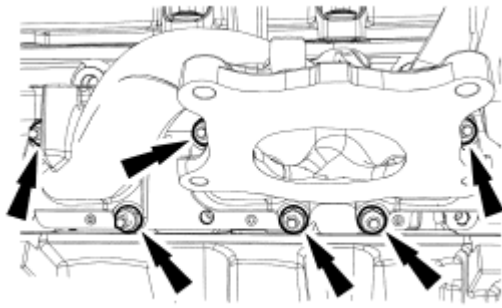


Fig. 388: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

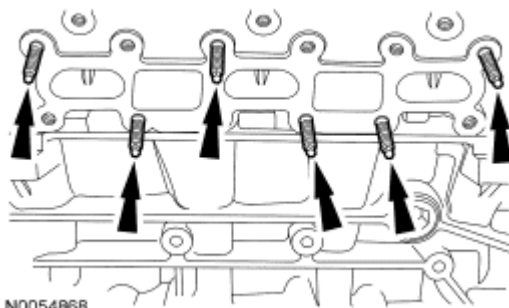
16. Remove the 6 nuts and the RH exhaust manifold.
 - Discard the nuts and exhaust manifold gaskets.



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Fig. 389: Locating RH Exhaust Manifold & Nuts
Courtesy of FORD MOTOR CO.

17. Clean and inspect the RH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
18. Remove and discard the 6 RH exhaust manifold studs.



N0054868

Fig. 390: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

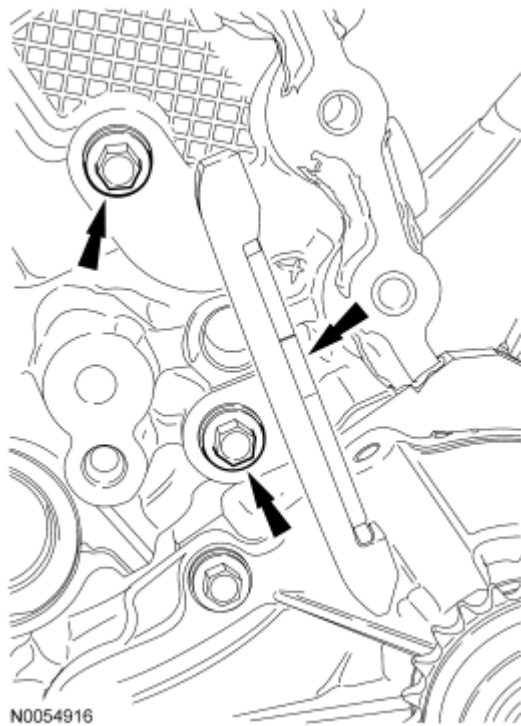


Fig. 391: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

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

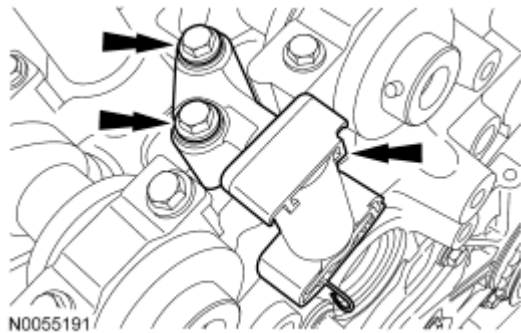


Fig. 392: Locating RH Secondary Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

21. Remove the 2 bolts and the engine lifting eye.

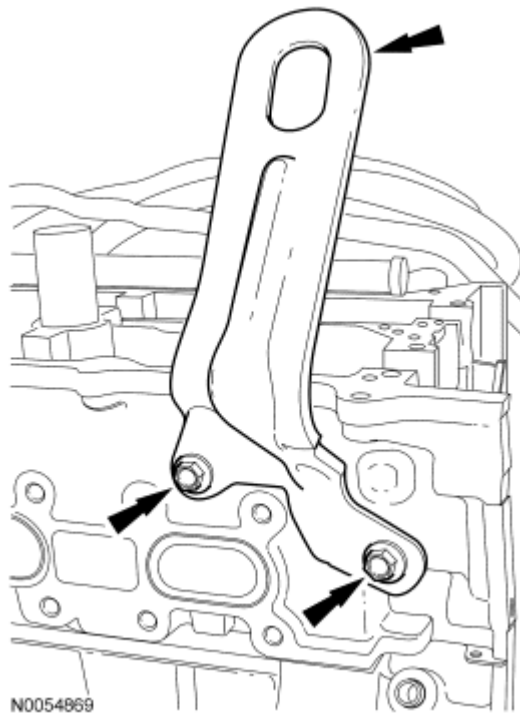


Fig. 393: Locating Engine Lifting Eye & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Index-mark the location of the bracket on the cylinder head for installation.

22. Remove the bolt and the upper intake manifold bracket.

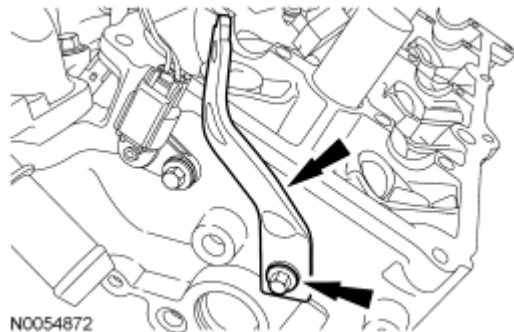


Fig. 394: Locating Upper Intake Manifold Bracket & Bolt
Courtesy of FORD MOTOR CO.

23. Remove the bolt and the RH CMP sensor.

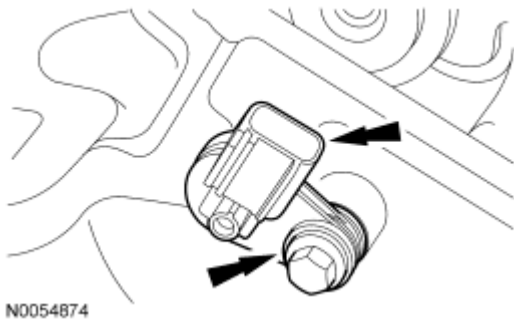


Fig. 395: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

24. Remove the 4 bolts and the fuel rail and injectors as an assembly.

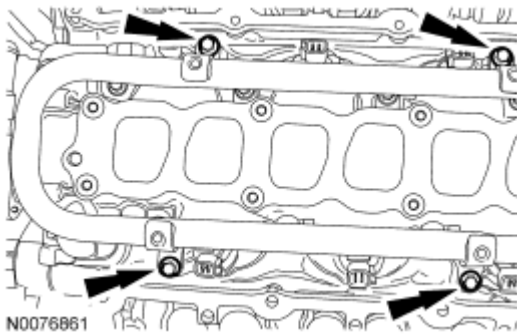


Fig. 396: 4 Bolts And Fuel Rail
Courtesy of FORD MOTOR CO.

25. Remove the 3 thermostat housing-to-lower intake manifold bolts.
 - Remove the thermostat housing and discard the gasket and O-ring seal.

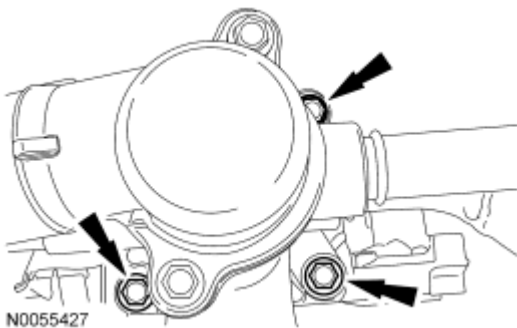


Fig. 397: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

26. Remove the 10 bolts and the lower intake manifold.
 - Discard the gaskets.

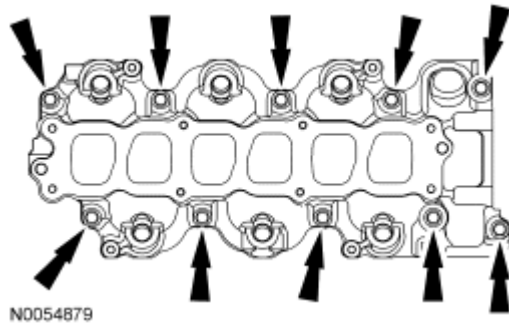


Fig. 398: Locating Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

27. Disconnect and remove the CHT sensor jumper harness.

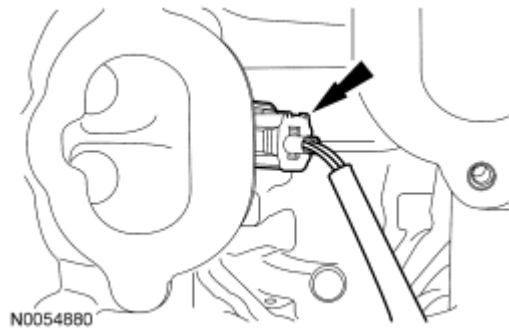


Fig. 399: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

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.

28. Remove the valve tappets from the cylinder head.

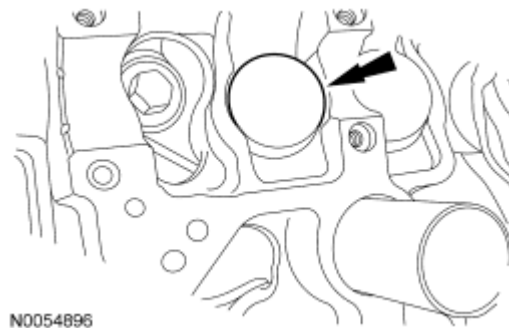


Fig. 400: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

29. Remove and discard the M6 bolt.

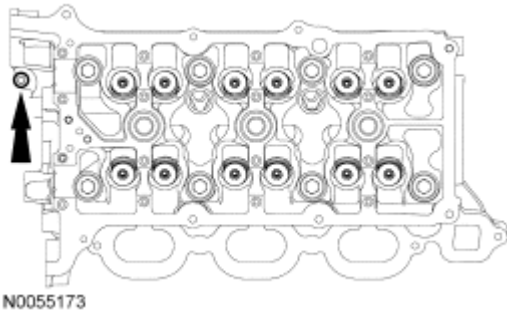


Fig. 401: Identifying M6 Bolt
Courtesy of FORD MOTOR CO.

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 can 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 designed and cannot be reused.

30. Remove and discard the 8 bolts from the cylinder head.

- Remove the cylinder head.
- Discard the cylinder head gasket.

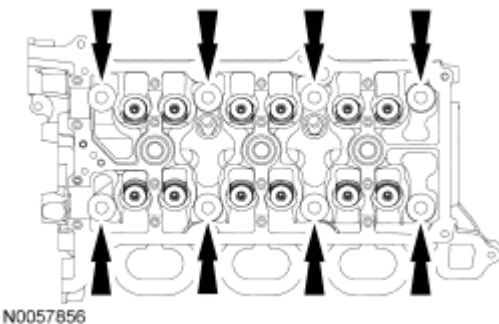


Fig. 402: Identifying Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

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.

31. 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.
32. 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.

33. 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, can cause engine failure.

All vehicles

1. Remove the LH camshafts. For additional information, refer to **Camshaft**.
2. If equipped, remove the heat shield and disconnect the block heater electrical connector.
 - Remove the block heater wiring harness from the engine.

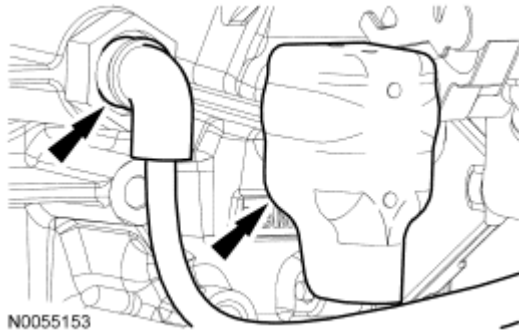


Fig. 403: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

3. Disconnect the 6 fuel injector electrical connectors (3 shown).

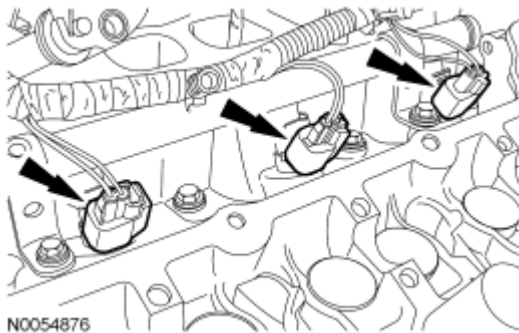


Fig. 404: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

4. Disconnect the cylinder head temperature (CHT) sensor electrical connector.

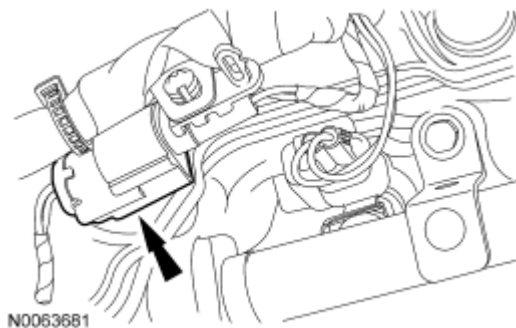


Fig. 405: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

5. Disconnect the LH camshaft position (CMP) sensor electrical connector.

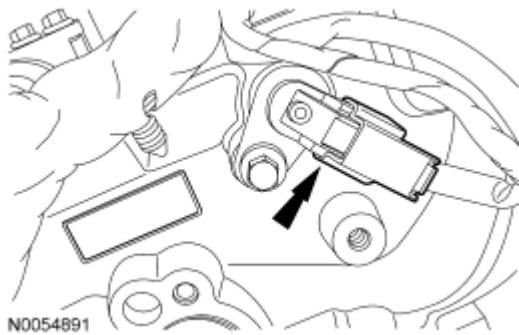


Fig. 406: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

6. Disconnect the LH heated oxygen sensor (HO2S) electrical connector.

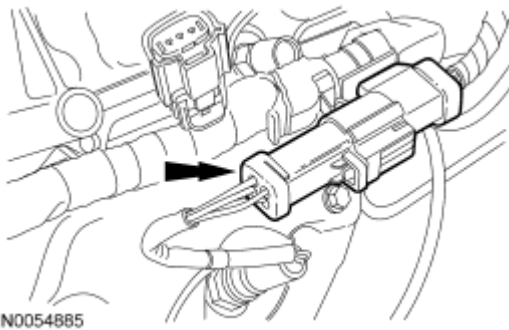


Fig. 407: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the LH catalyst monitor sensor electrical connector.

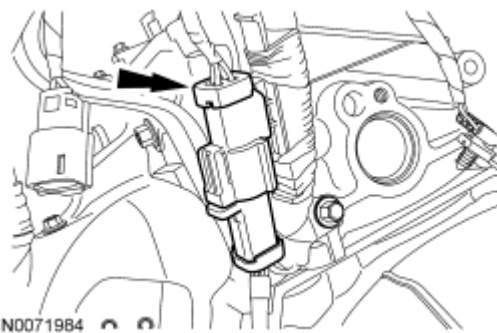


Fig. 408: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

8. Remove the wiring harness retainer bolt from the rear of the LH cylinder head.

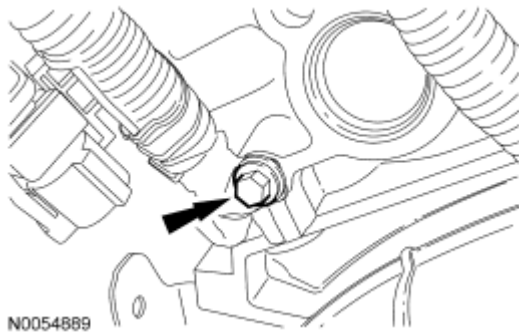


Fig. 409: Identifying Wiring Harness Retainer Bolt From Rear Of LH Cylinder Head
Courtesy of FORD MOTOR CO.

9. Disconnect the A/C compressor electrical connector.

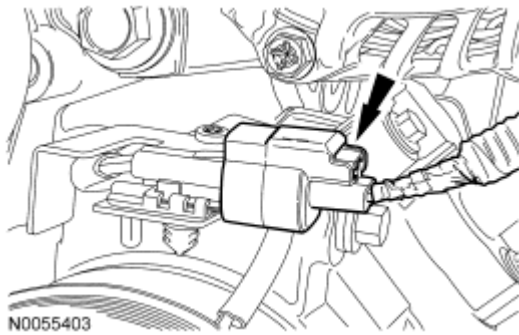


Fig. 410: Identifying A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

10. Remove the nut and disconnect the generator B+ cable.

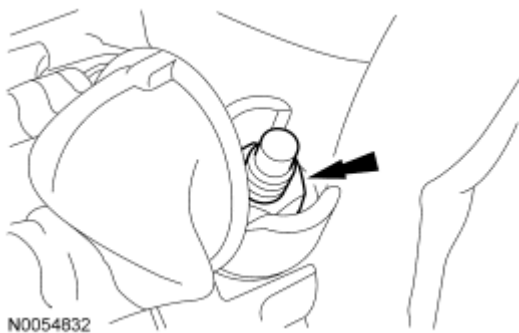


Fig. 411: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

11. Disconnect the generator electrical connector.

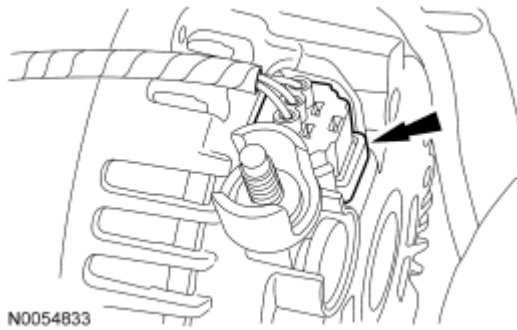


Fig. 412: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

12. Detach the wiring harness retainer from the generator.

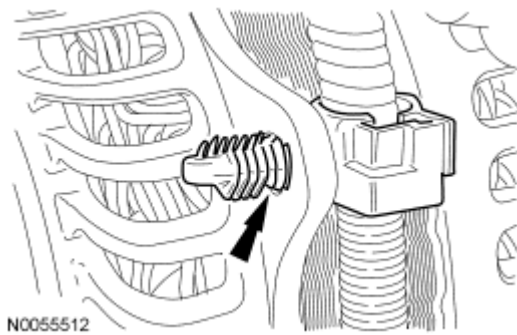


Fig. 413: Identifying Wiring Harness Retainer From Generator
Courtesy of FORD MOTOR CO.

13. Disconnect the engine oil pressure (EOP) switch electrical connector and the wiring harness pin-type retainer.

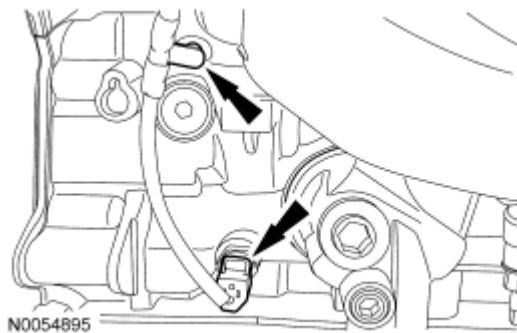


Fig. 414: Locating Engine Oil Pressure (EOP) Switch Electrical Connector & Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

14. Remove the nut, 2 bolts and the A/C compressor.

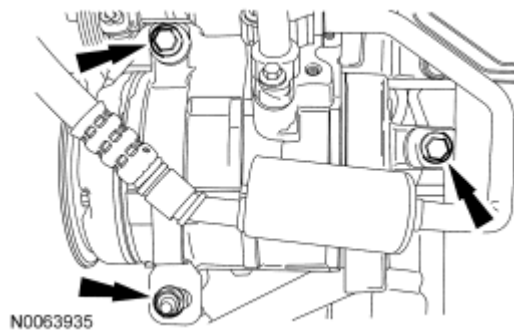


Fig. 415: Locating A/C Compressor, Bolts & Nuts
Courtesy of FORD MOTOR CO.

15. Remove the nut, bolt and the generator.

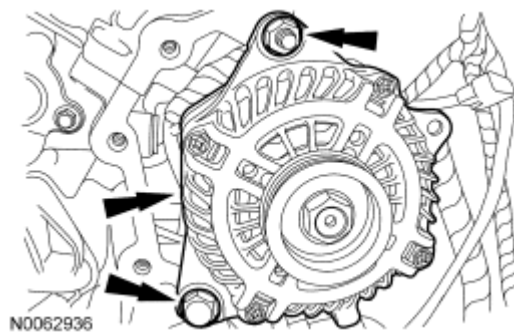


Fig. 416: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

16. Remove the 2 LH catalytic converter bracket bolts.

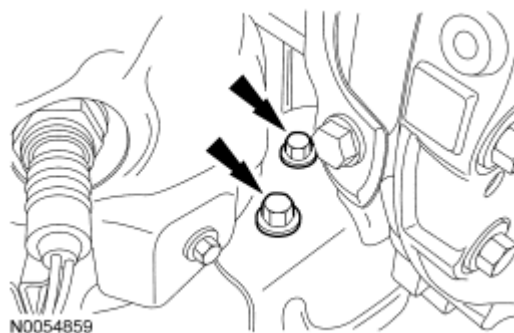


Fig. 417: Locating LH Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

17. Remove the 4 nuts (3 shown) and the LH catalytic converter.
- Discard the nuts and the gasket.

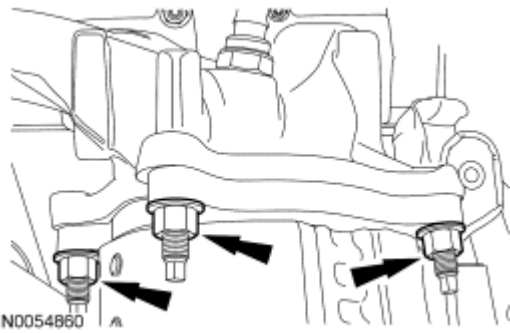


Fig. 418: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

18. Remove the 3 bolts and the LH exhaust manifold heat shield.

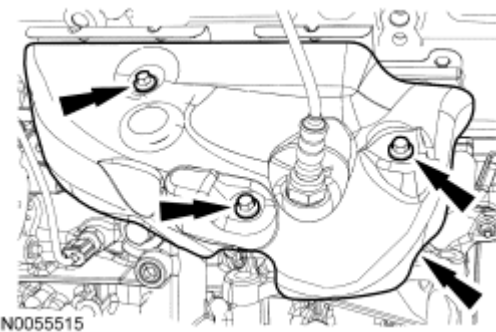


Fig. 419: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

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

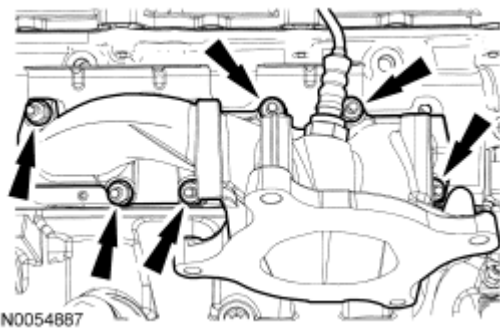


Fig. 420: Locating LH Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

20. Clean and inspect the LH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
21. Remove and discard the 6 LH exhaust manifold studs.

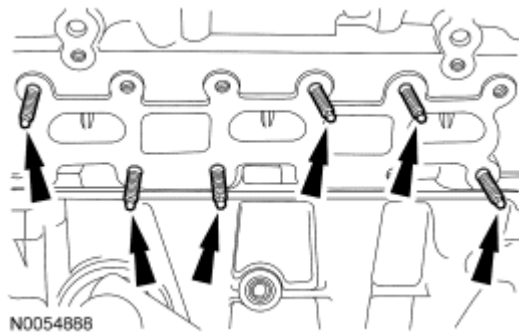


Fig. 421: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

22. Remove the LH cylinder block drain plug.
 - Allow coolant to drain from the cylinder block.

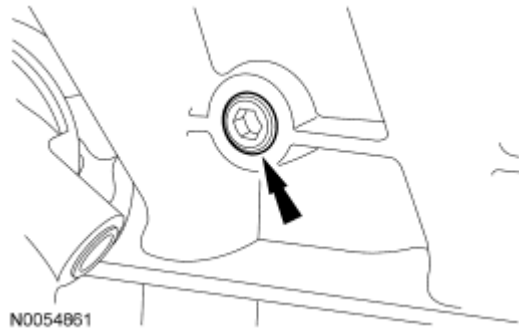


Fig. 422: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

23. Remove the 2 RH catalytic converter bracket bolts.

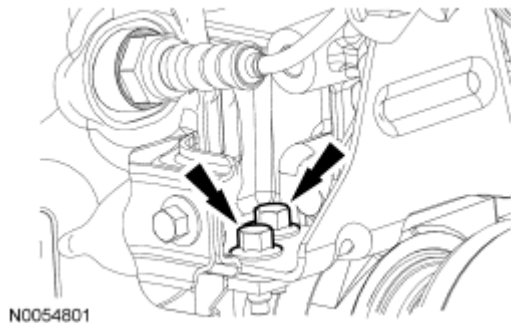


Fig. 423: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

All vehicles

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

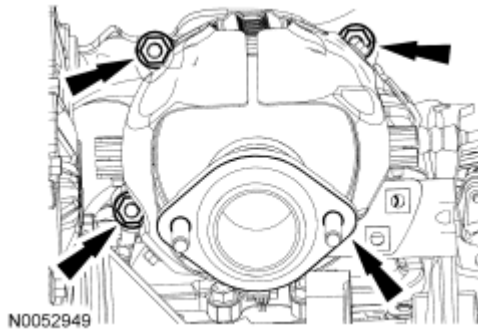


Fig. 424: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

25. Remove the RH cylinder block drain plug or, if equipped, the block heater.
- Allow coolant to drain from the cylinder block.

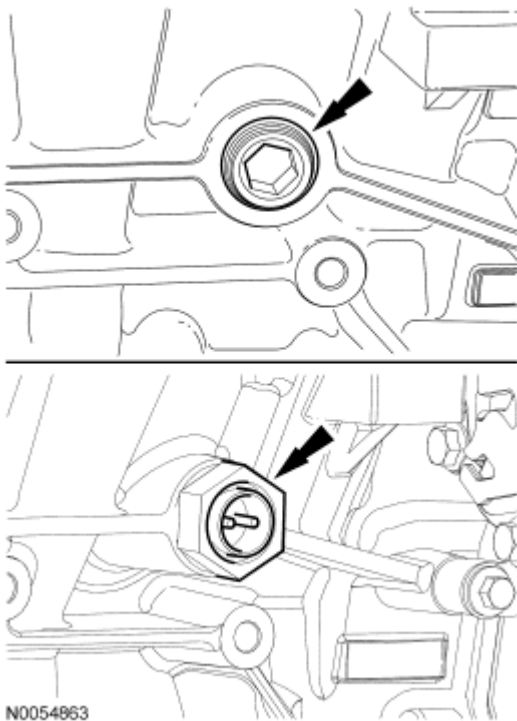


Fig. 425: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

26. Remove the 4 bolts and the fuel rail and injectors as an assembly.

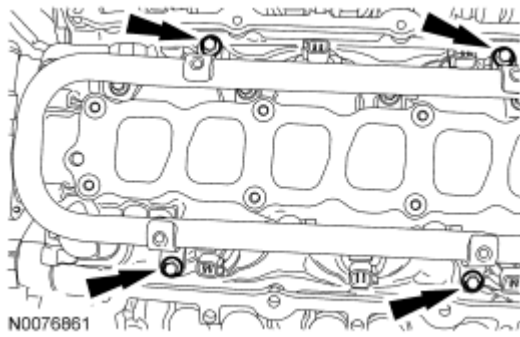


Fig. 426: Identifying 4 Bolts And Fuel Rail
Courtesy of FORD MOTOR CO.

27. Remove the 3 thermostat housing-to-lower intake manifold bolts.
 - Remove the thermostat housing and discard the gasket and O-ring seal.

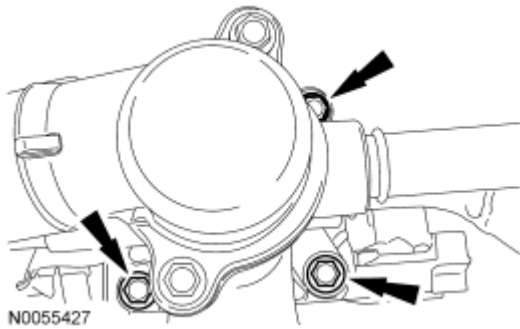


Fig. 427: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

28. Remove the 10 bolts and the lower intake manifold.
 - Discard the gaskets.

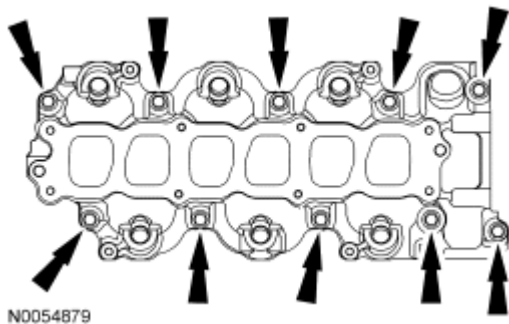


Fig. 428: Locating Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

29. Remove the bolt and the LH CMP sensor.

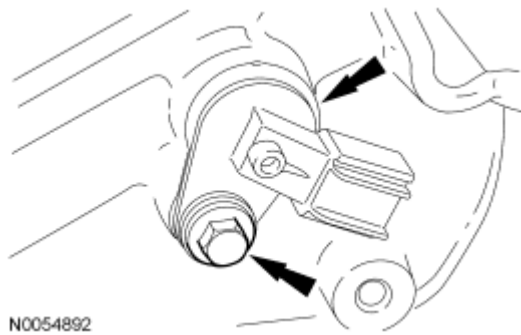


Fig. 429: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

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

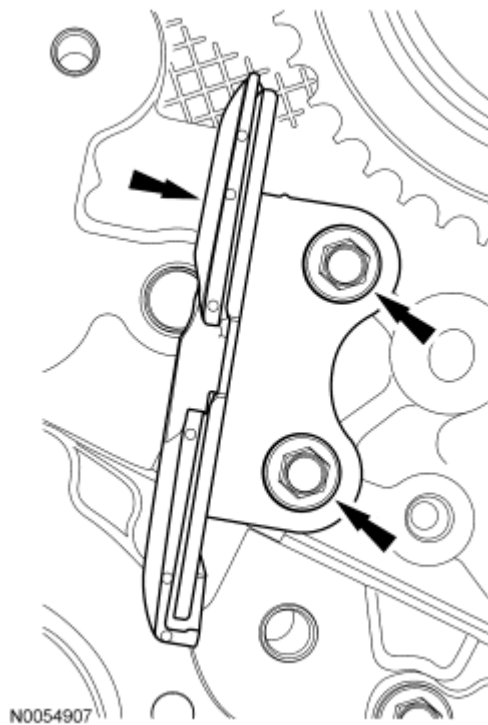


Fig. 430: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

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

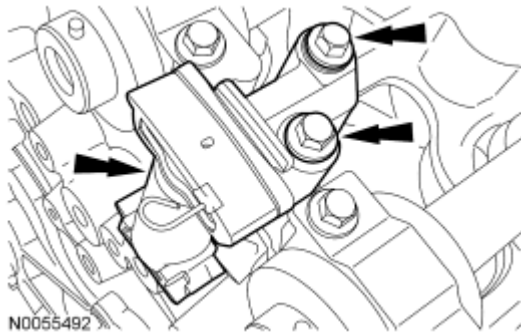


Fig. 431: Locating LH Secondary Timing Chain Tensioner & Bolt
Courtesy of FORD MOTOR CO.

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.

32. Remove the valve tappets from the cylinder head.

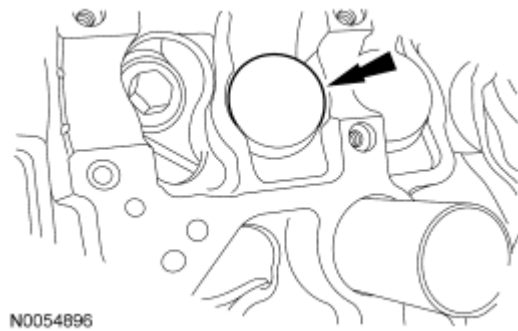


Fig. 432: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

33. Remove and discard the M6 bolt.

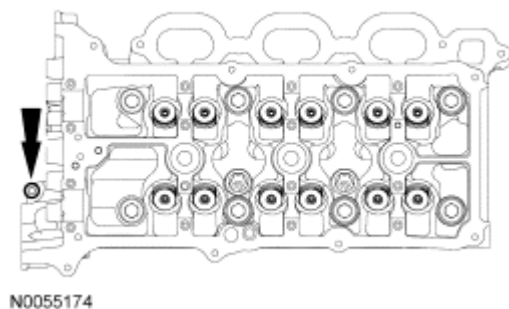


Fig. 433: Identifying M6 Bolt
Courtesy of FORD MOTOR CO.

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 can 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 designed and cannot be reused.

34. Remove and discard the 8 bolts from the cylinder head.

- Remove the cylinder head.
- Discard the cylinder head gasket.

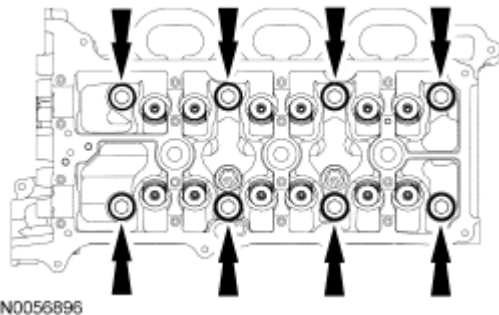


Fig. 434: Identifying Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

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.

CAUTION: 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.

35. 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.

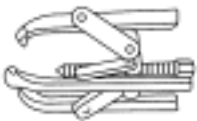


2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
 3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
 4. Apply metal 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.
36. 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.

37. 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)
 ST1385-A	Remover, Oil Seal	303-409 (T92C-6700CH)
	Seal Remover	303-1247/1

 <p>ST2982-A</p>		
 <p>ST1438-A</p>	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, can 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 flexplate.

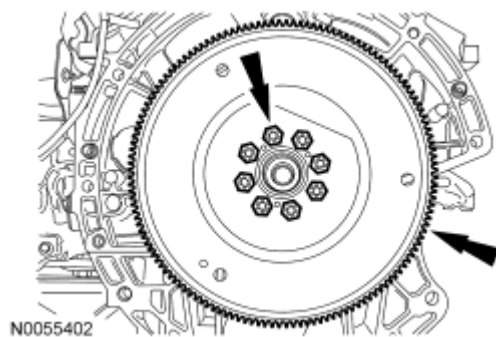


Fig. 435: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

3. Remove the crankshaft sensor ring.

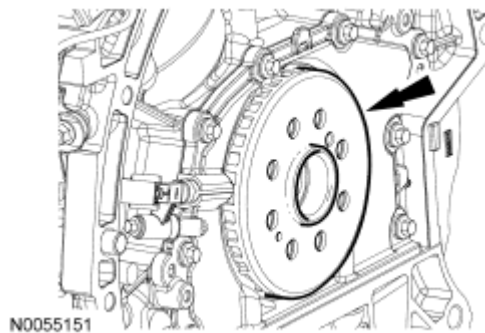


Fig. 436: Identifying Crankshaft Sensor Ring
 Courtesy of FORD MOTOR CO.

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.

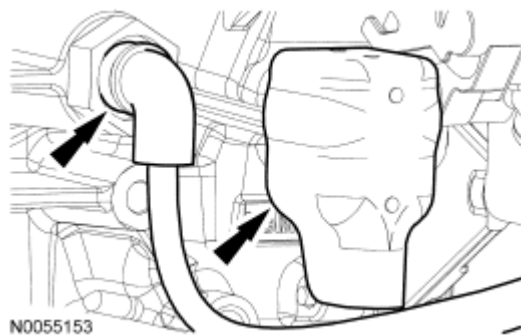


Fig. 437: Identifying Block Heater Wiring Harness
 Courtesy of FORD MOTOR CO.

6. Disconnect the PCV hose from the PCV valve.

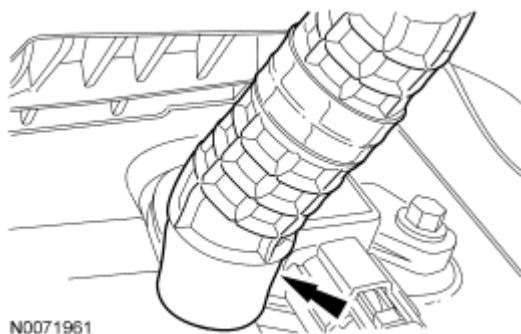


Fig. 438: Identifying PCV Hose
Courtesy of FORD MOTOR CO.

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

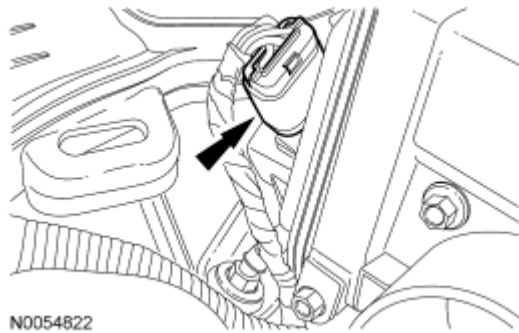


Fig. 439: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

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

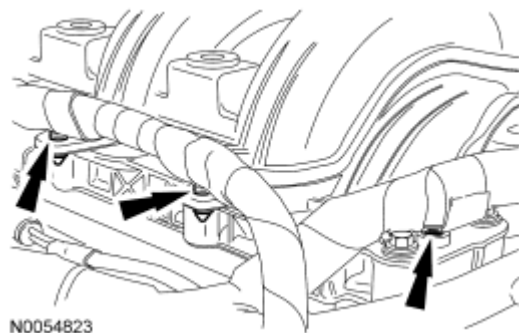


Fig. 440: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

9. Remove the upper intake manifold support bracket bolt.

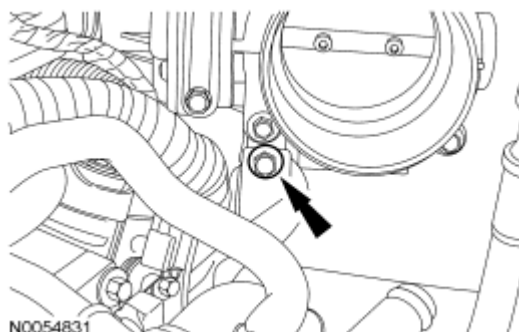


Fig. 441: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

10. Remove the 6 bolts and the upper intake manifold in the following sequence.
 - Discard the gaskets.

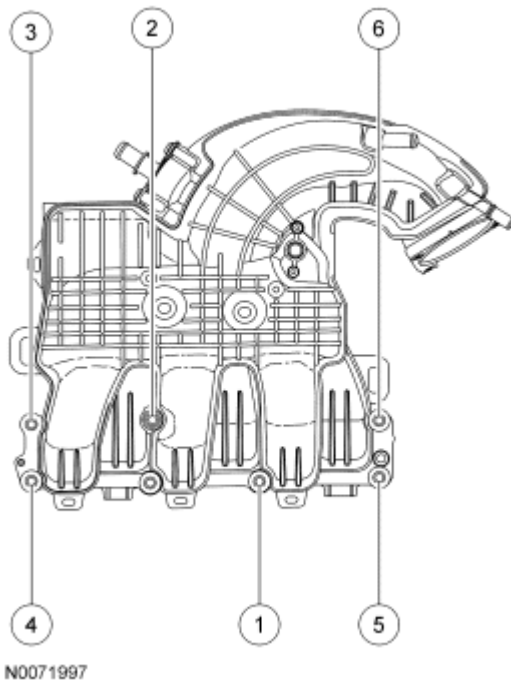


Fig. 442: Identifying Bolt Sequence
 Courtesy of FORD MOTOR CO.

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

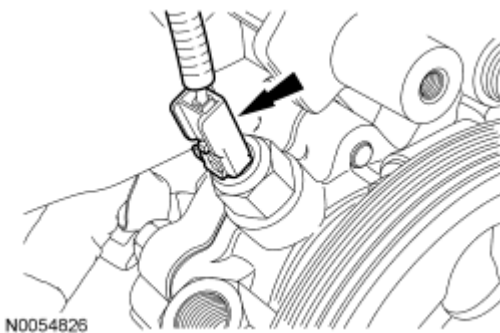


Fig. 443: Locating PSP Switch Electrical Connector
 Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

12. Disconnect the RH catalyst monitor sensor electrical connector.

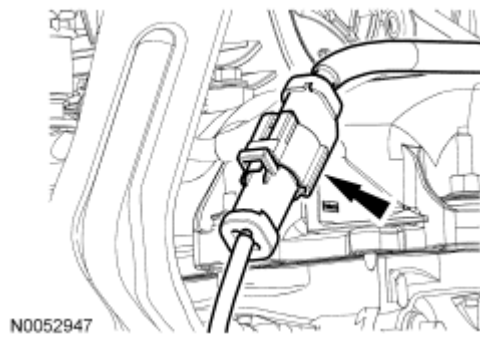


Fig. 444: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

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

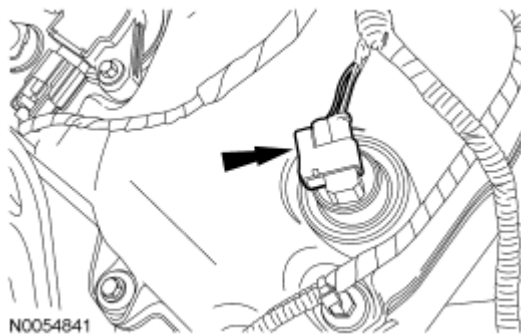


Fig. 445: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

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

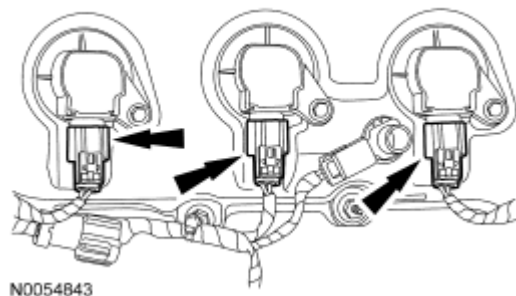


Fig. 446: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

15. Detach all of the wiring harness retainers from the RH valve cover and stud bolts.
16. Disconnect the LH catalyst monitor sensor electrical connector.

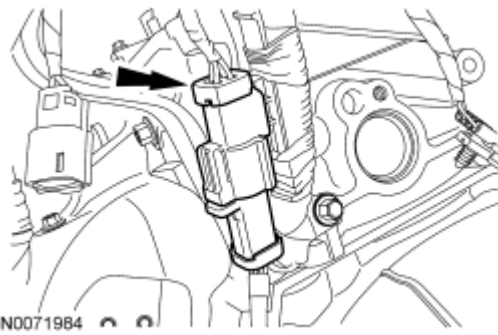


Fig. 447: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

17. Disconnect the LH VCT solenoid electrical connector.

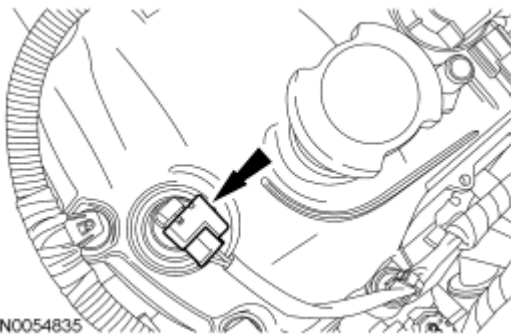


Fig. 448: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

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

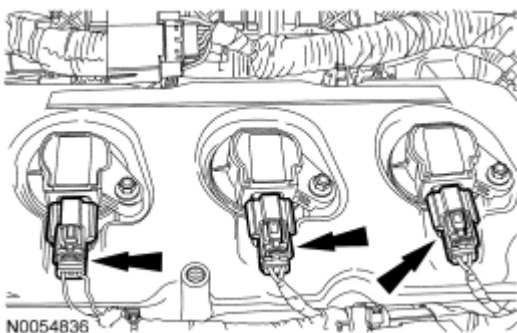


Fig. 449: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

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

NOTE: The A/C compressor must remain bolted to the engine block prior to installing the oil pan.

20. Remove the A/C compressor nut and stud.

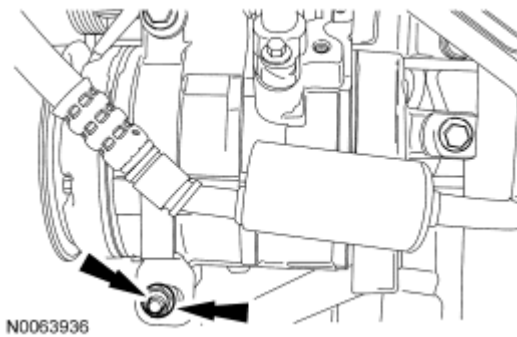


Fig. 450: Locating A/C Compressor Nut & Stud
Courtesy of FORD MOTOR CO.

21. Remove the 3 bolts and the power steering pump.

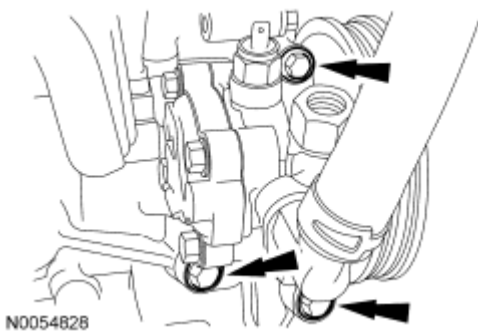


Fig. 451: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

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

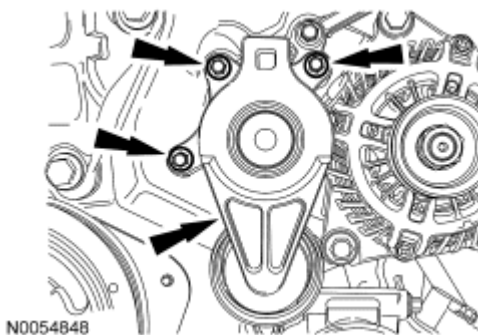


Fig. 452: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

23. Remove the 4 nuts (3 shown) and the LH catalytic converter.
- Discard the nuts and the gasket.

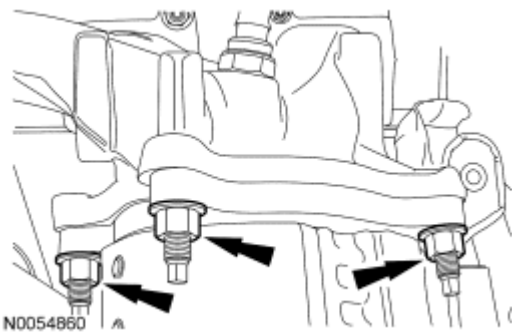


Fig. 453: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

FWD vehicles

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

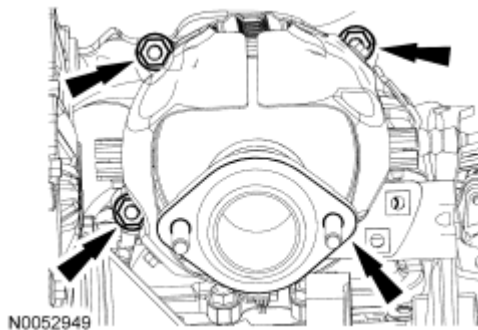


Fig. 454: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

All vehicles

25. Remove the RH cylinder block drain plug or, if equipped, the block heater.
 - Allow coolant to drain from the cylinder block.

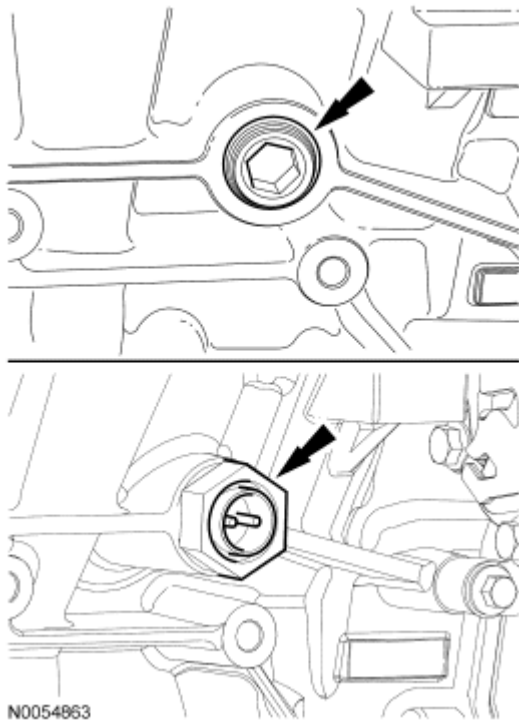


Fig. 455: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

26. Remove the LH cylinder block drain plug.
- Allow coolant to drain from the cylinder block.

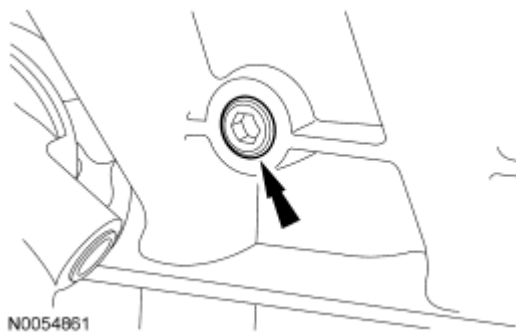


Fig. 456: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

27. Remove the 6 bolts and the 6 coil-on-plugs.

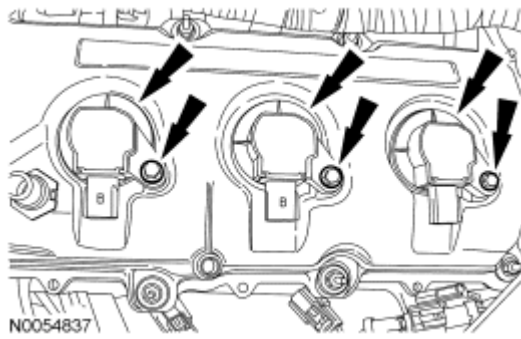


Fig. 457: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

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

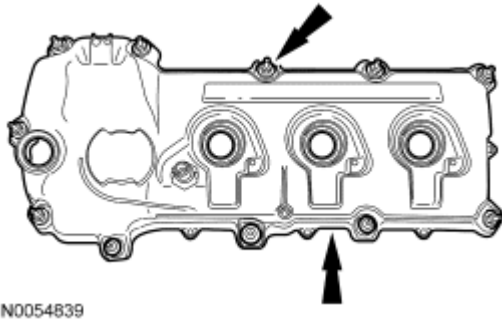


Fig. 458: Locating LH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

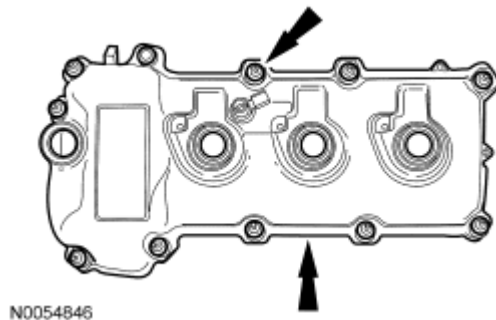


Fig. 459: Locating RH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

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

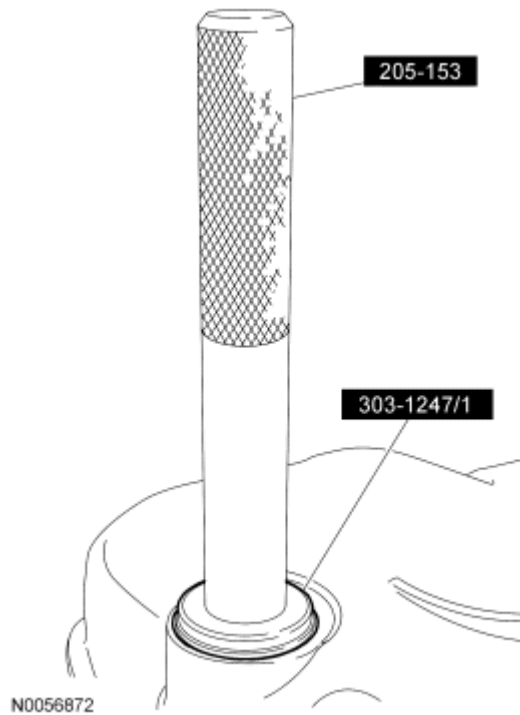


Fig. 460: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

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

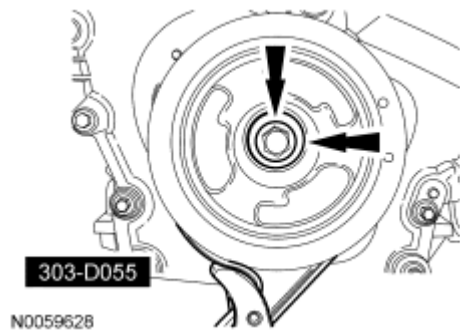


Fig. 461: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

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

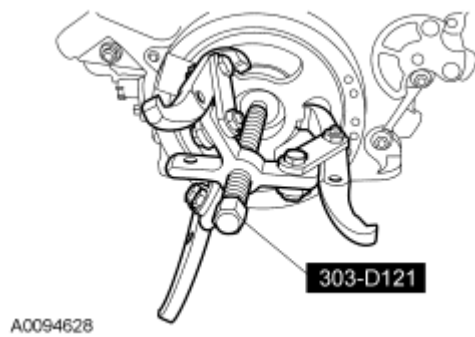


Fig. 462: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

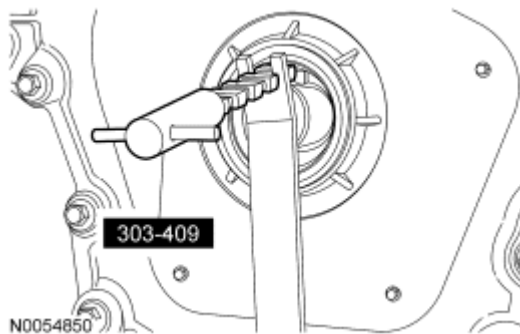


Fig. 463: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

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

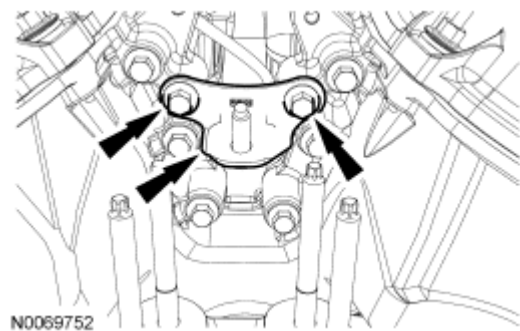


Fig. 464: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

35. Remove the 2 engine mount studs.

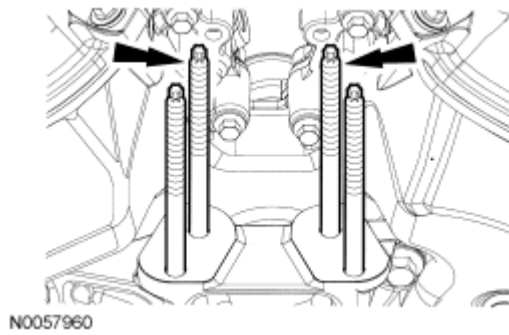


Fig. 465: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

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

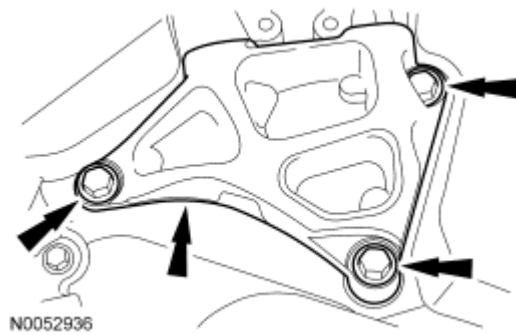
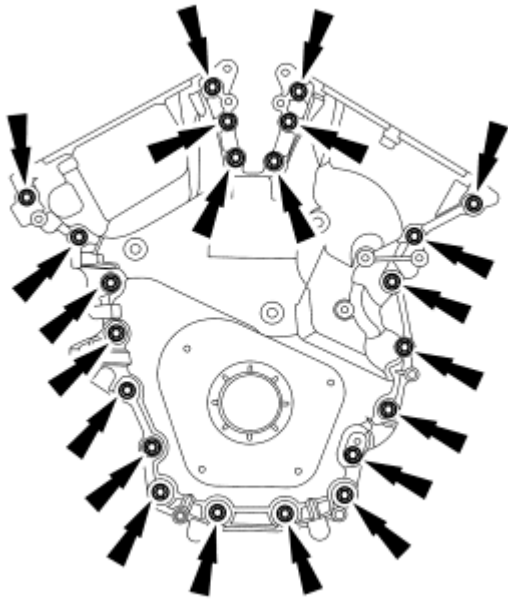


Fig. 466: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

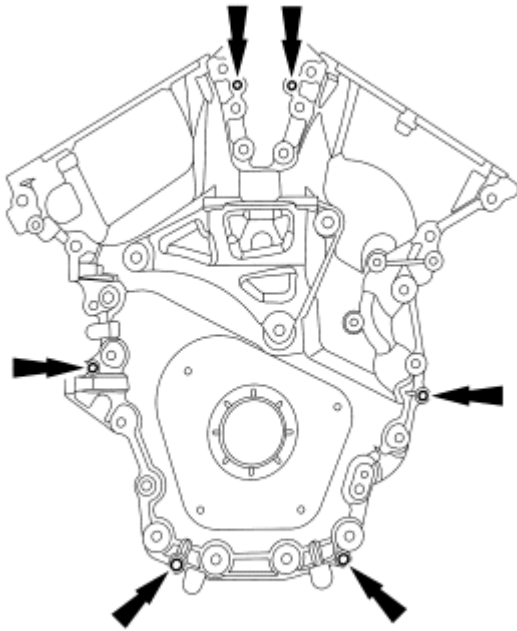
37. Remove the 22 engine front cover bolts.



N0054851

Fig. 467: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

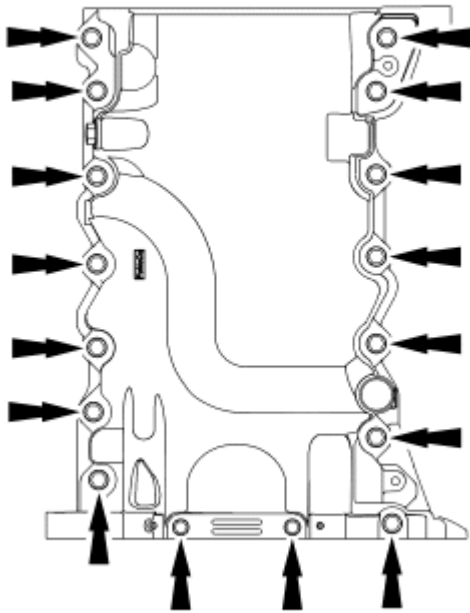
38. Install 6 of the engine front cover bolts (finger tight) into the 6 threaded holes in the engine front cover.
 - Tighten the bolts one turn at a time in a criss-cross pattern until the engine front cover-to-cylinder block seal is released.
 - Remove the engine front cover.



N0069753

Fig. 468: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

39. Remove the 16 oil pan bolts.

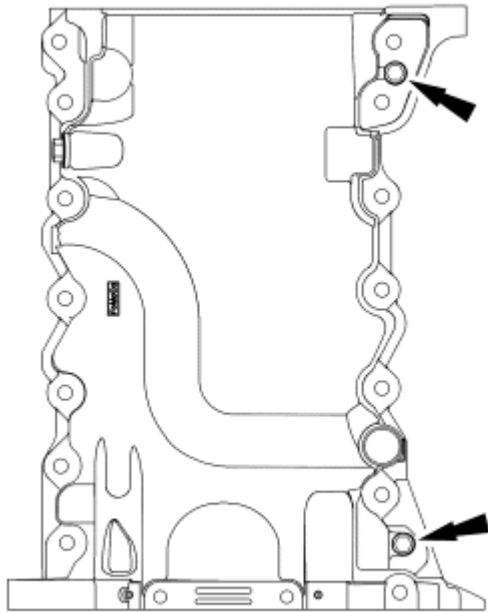


N0055163

Fig. 469: Identifying Oil Pan Bolts

Courtesy of FORD MOTOR CO.

40. 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. 470: 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.

41. 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.

42. 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.

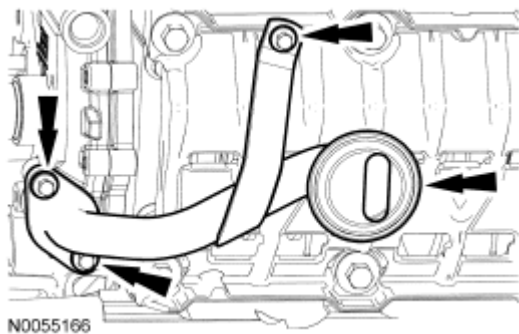


Fig. 471: Identifying Oil Pump Screen, Pickup Tube & Bolts
Courtesy of FORD MOTOR CO.


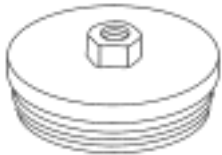


CRANKSHAFT REAR SEAL WITH RETAINER PLATE

Special Tools

Illustration	Tool Name	Tool Number
	Heavy Duty Floor Crane	014-00071 or equivalent

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 <p>ST1341-A</p>		
 <p>ST1382-A</p>	Remover, Crankshaft Rear Oil Seal	303-519 (T95P-6701-EH)
 <p>ST1187-A</p>	Slide Hammer	307-005 (T59L-100-B)
 <p>ST1602-A</p>	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.

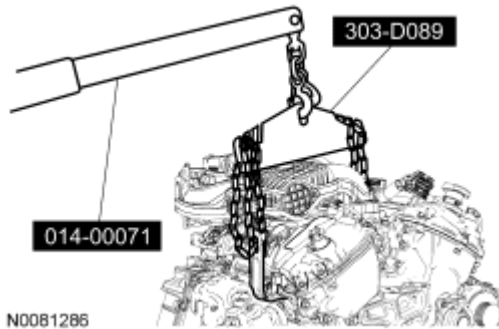


Fig. 472: Identifying Heavy Duty Floor Crane and Spreader Bar
Courtesy of FORD MOTOR CO.

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

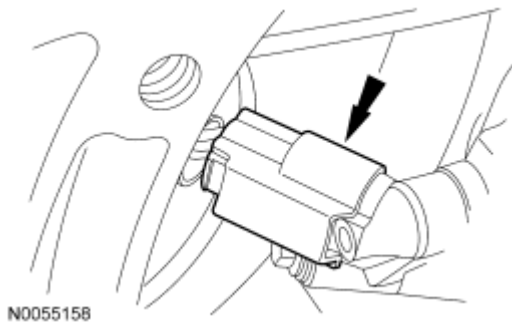


Fig. 473: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

4. Remove the bolt and the CKP sensor.

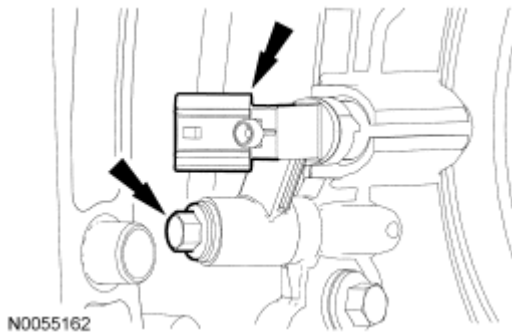


Fig. 474: Identifying CKP Sensor & Bolt
Courtesy of FORD MOTOR CO.

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

seal.

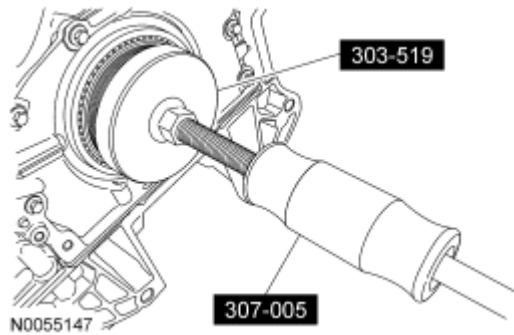


Fig. 475: Removing Crankshaft Rear Seal Using Special Tools (303-519) & (307-005)
 Courtesy of FORD MOTOR CO.

6. Remove the 8 crankshaft rear seal retainer bolts.

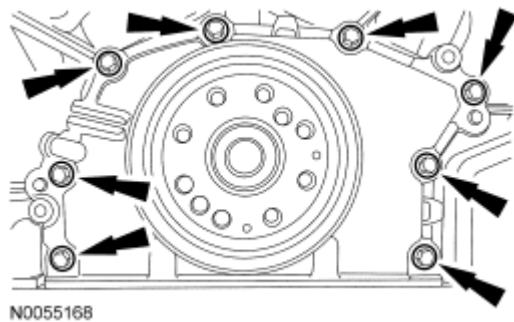


Fig. 476: Locating Crankshaft Rear Seal Retainer Bolts
 Courtesy of FORD MOTOR CO.

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.

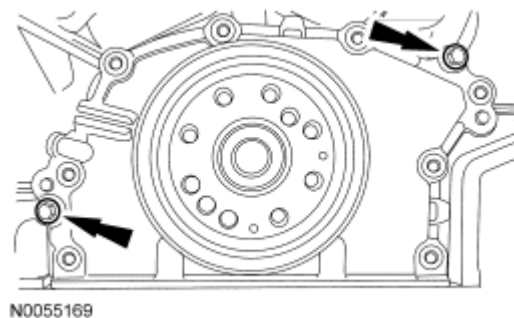


Fig. 477: Identifying M6 Oil Pan Bolts
 Courtesy of FORD MOTOR CO.

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

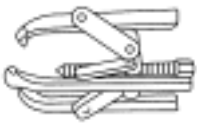
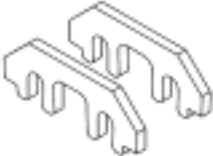




ENGINE



Special Tools

Illustration	Tool Name	Tool Number
	3-Jaw Puller	303-D121

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 ST1184-A		
 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
	Slide Hammer	307-005 (T59L-100-B)

 ST1187-A		
 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, can cause engine failure.

NOTE: For additional information, refer to the exploded view under the assembly procedure in this service information.

All vehicles

1. Remove the 8 bolts and the flexplate.

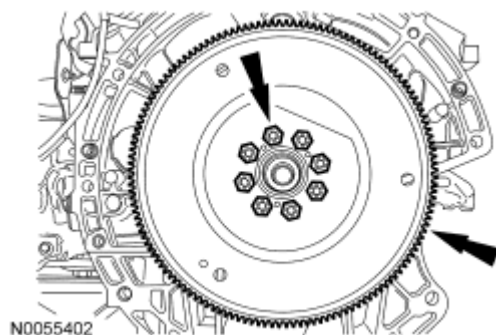


Fig. 478: Identifying Flexplate & Bolts

Courtesy of FORD MOTOR CO.

2. Remove the crankshaft sensor ring.

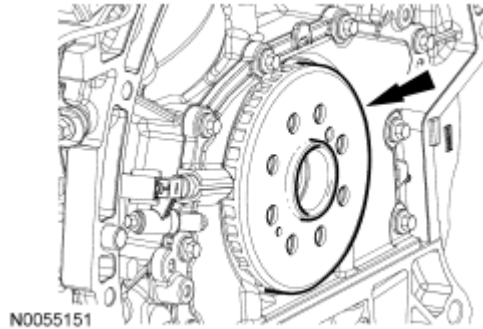


Fig. 479: Identifying Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

3. Using the special tools, remove and discard the rear crankshaft seal.

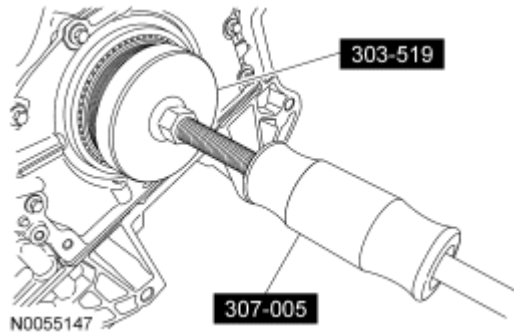


Fig. 480: Removing Crankshaft Rear Seal Using Special Tools (303-519) & (307-005)
Courtesy of FORD MOTOR CO.

CAUTION: 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.

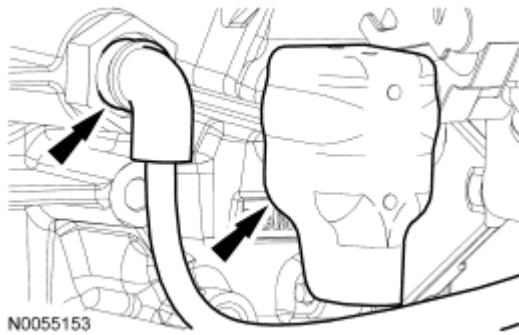


Fig. 481: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

6. Disconnect the PCV hose from the PCV valve.

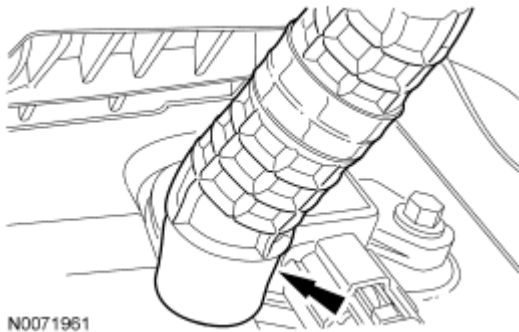


Fig. 482: Identifying PCV Hose
Courtesy of FORD MOTOR CO.

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

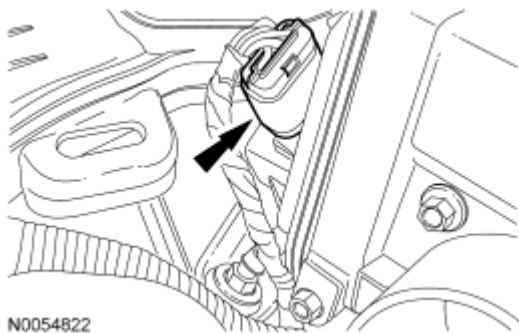


Fig. 483: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

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

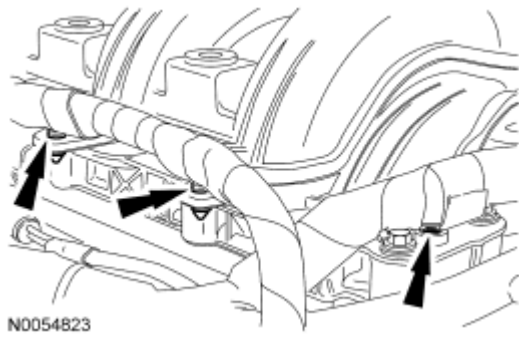


Fig. 484: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

9. Remove the upper intake manifold support bracket bolt.

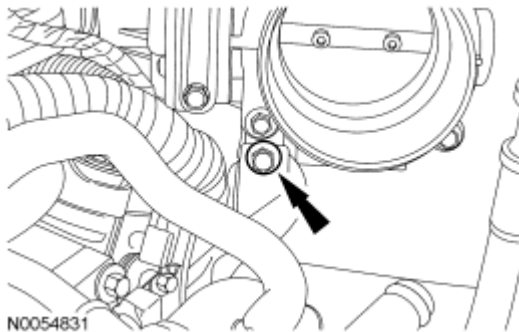
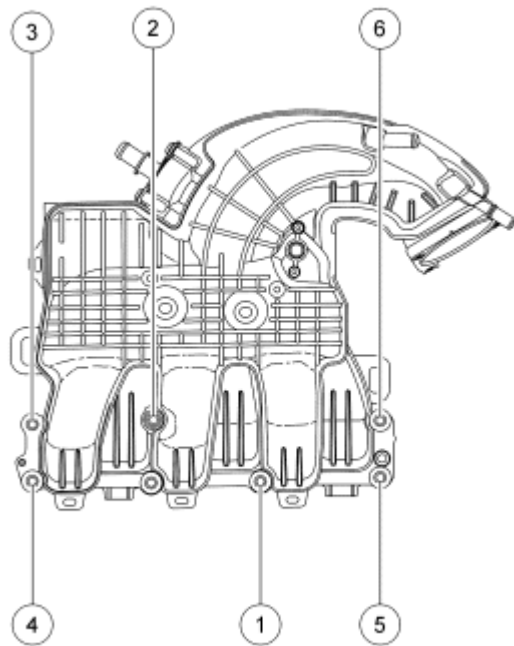


Fig. 485: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

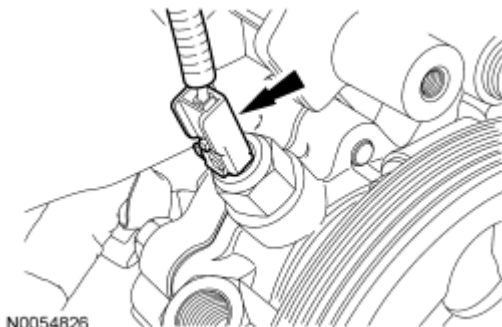
10. Remove the 6 bolts and the upper intake manifold in the following sequence.
 - Discard the gaskets.



N0071997

Fig. 486: Identifying Bolt Sequence
Courtesy of FORD MOTOR CO.

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



N0054826

Fig. 487: Locating PSP Switch Electrical Connector
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

12. Disconnect the RH catalyst monitor sensor electrical connector.

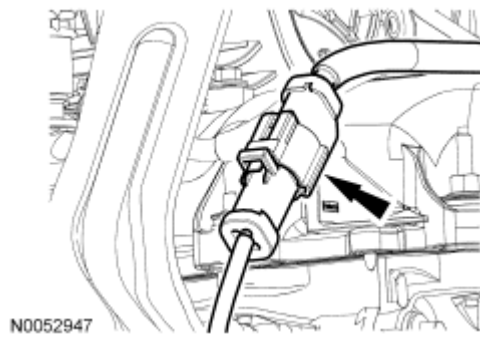


Fig. 488: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

13. Disconnect the RH heated oxygen sensor (HO2S) electrical connector.

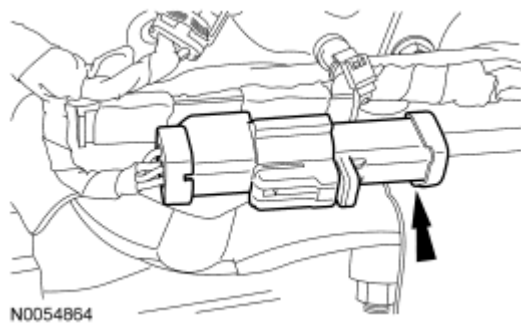


Fig. 489: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

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

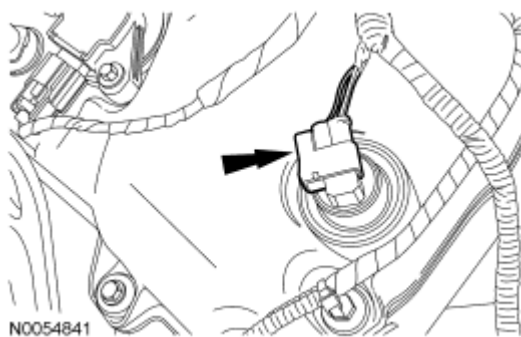


Fig. 490: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

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

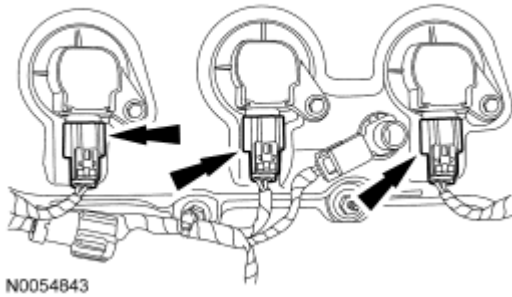


Fig. 491: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

16. Detach all of the wiring harness retainers from the RH valve cover and stud bolts.
17. Disconnect the RH camshaft position (CMP) sensor electrical connector.

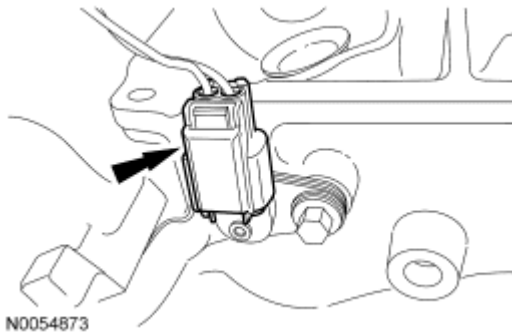


Fig. 492: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

18. Disconnect the knock sensor (KS) electrical connector.

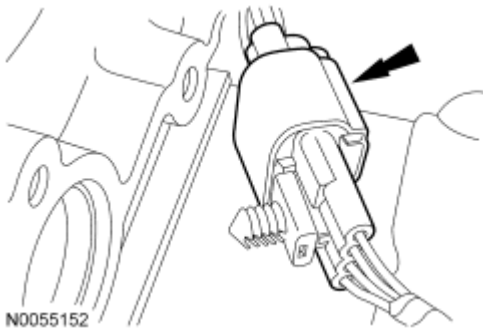


Fig. 493: Locating Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

19. Remove the bolt and the ground cable from the RH cylinder.

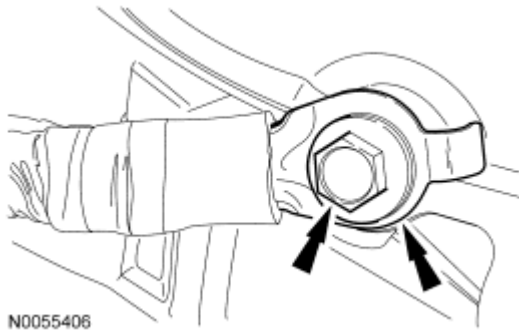


Fig. 494: Locating Ground Cable From RH Cylinder
Courtesy of FORD MOTOR CO.

20. Disconnect the 6 fuel injector electrical connectors (3 shown).

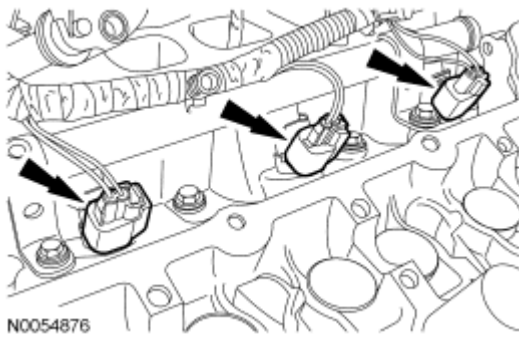


Fig. 495: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

21. Disconnect the cylinder head temperature (CHT) sensor electrical connector.

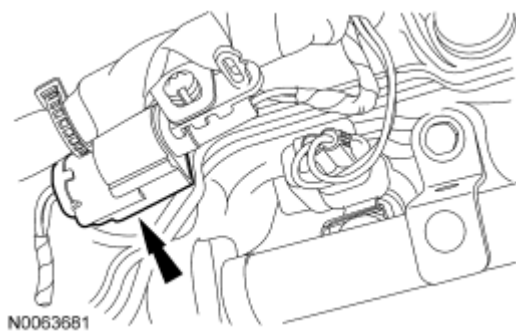


Fig. 496: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

22. Disconnect the LH CMP sensor electrical connector.

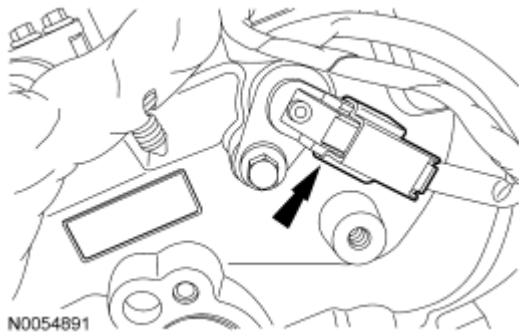


Fig. 497: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

23. Disconnect the LH catalyst monitor sensor electrical connector.

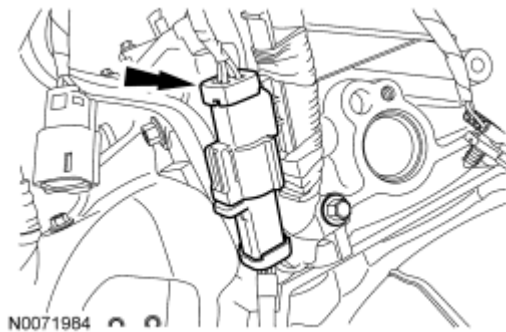


Fig. 498: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

24. Disconnect the LH HO2S electrical connector.

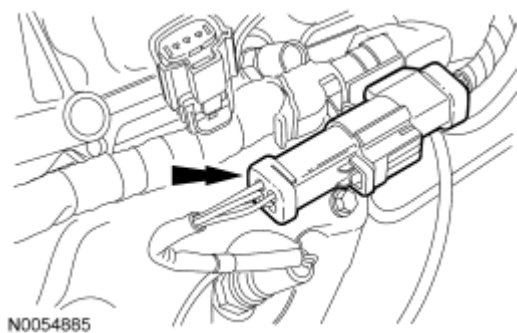


Fig. 499: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

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

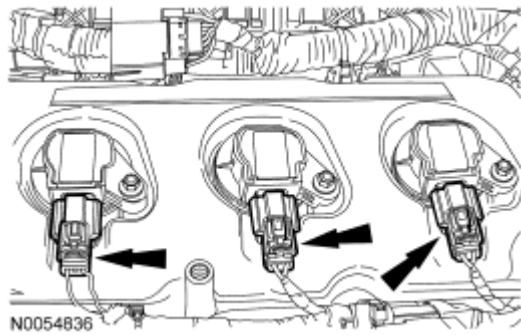


Fig. 500: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

26. Disconnect the LH VCT solenoid electrical connector.

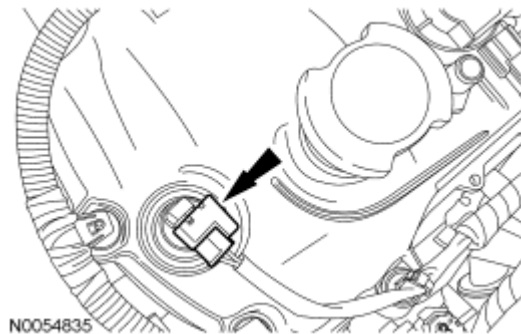


Fig. 501: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

27. Detach all of the wiring harness retainers from the LH valve cover and stud bolts.
28. Remove the wiring harness retainer bolt from the rear of the LH cylinder head.

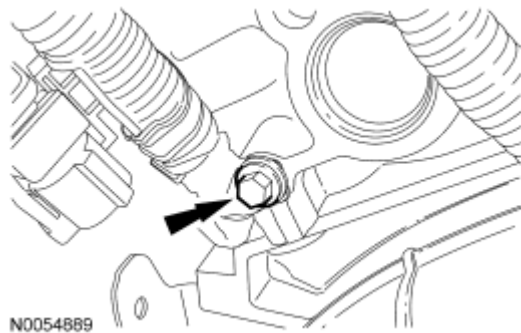


Fig. 502: Identifying Wiring Harness Retainer Bolt From Rear Of LH Cylinder Head
Courtesy of FORD MOTOR CO.

29. Remove the nut, the bolt and the heat shield.

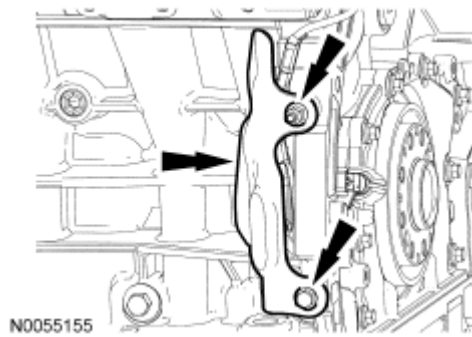


Fig. 503: Identifying Heat Shield, Nut & Bolt
Courtesy of FORD MOTOR CO.

30. Remove the wiring harness retainer stud bolt.

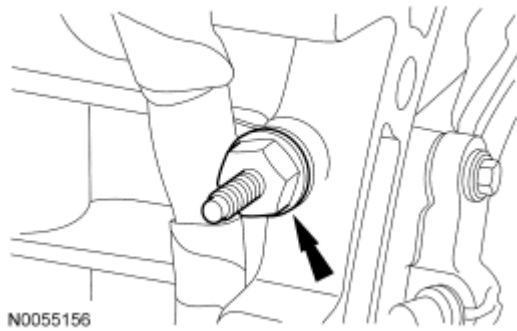


Fig. 504: Identifying Wiring Harness Retainer Stud Bolt
Courtesy of FORD MOTOR CO.

31. Remove the wiring harness grommet.

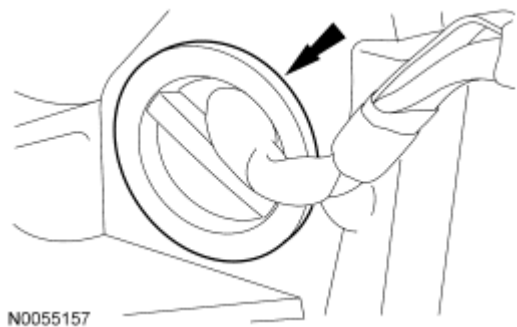


Fig. 505: Identifying Wiring Harness Grommet
Courtesy of FORD MOTOR CO.

32. Disconnect the crankshaft position (CKP) sensor electrical connector.

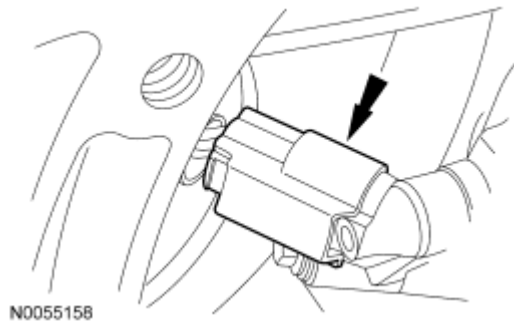


Fig. 506: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

33. Disconnect the A/C compressor electrical connector.

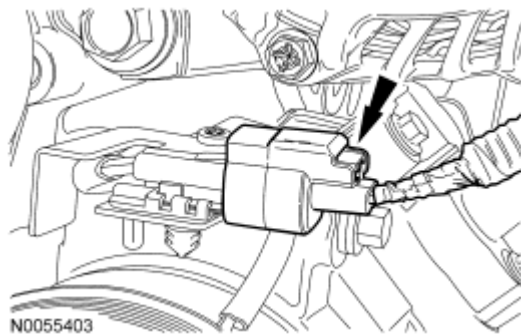


Fig. 507: Identifying A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

34. Remove the nut and disconnect the generator B+ cable.

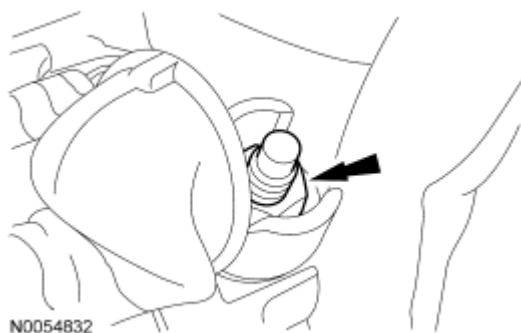


Fig. 508: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

35. Disconnect the generator electrical connector.

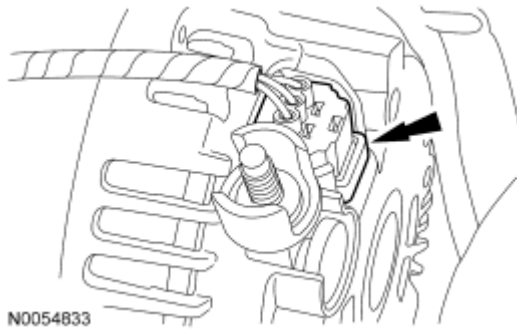


Fig. 509: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

36. Detach the wiring harness retainer from the generator.

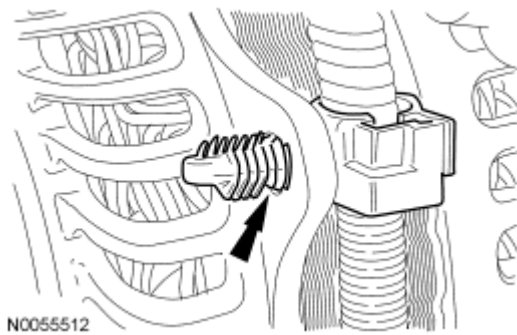


Fig. 510: Identifying Wiring Harness Retainer From Generator
Courtesy of FORD MOTOR CO.

37. Disconnect the engine oil pressure (EOP) switch electrical connector and the wiring harness pin-type retainer.
 - Remove the wiring harness from the engine.

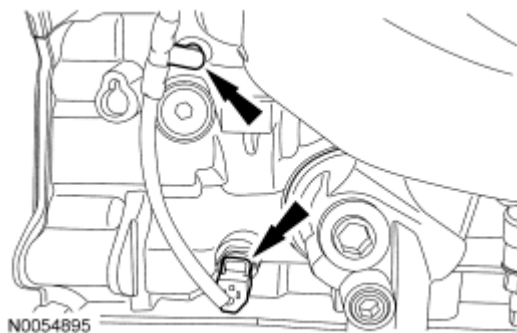


Fig. 511: Locating Engine Oil Pressure (EOP) Switch Electrical Connector & Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

38. Remove the nut, 2 bolts and the A/C compressor.

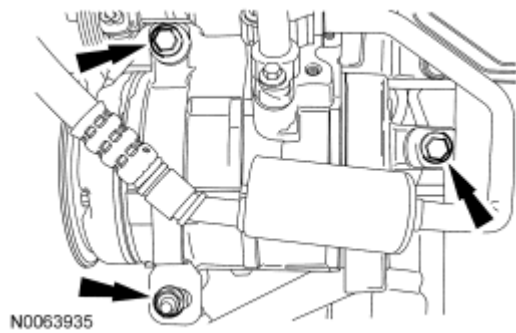


Fig. 512: Locating A/C Compressor, Bolts & Nuts
Courtesy of FORD MOTOR CO.

39. Remove the A/C compressor mounting stud from the oil pan.

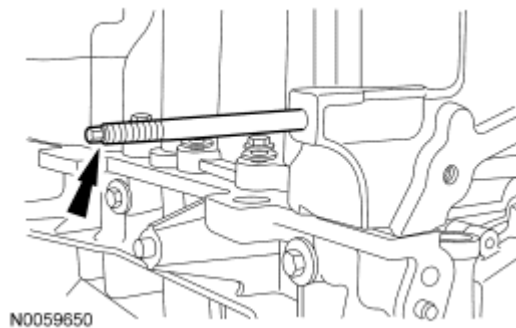


Fig. 513: Locating A/C Compressor Mounting Stud
Courtesy of FORD MOTOR CO.

40. Remove the nut, bolt and the generator.

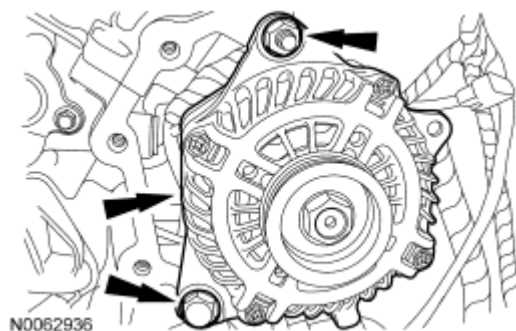


Fig. 514: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

41. Remove the 3 bolts and the power steering pump.

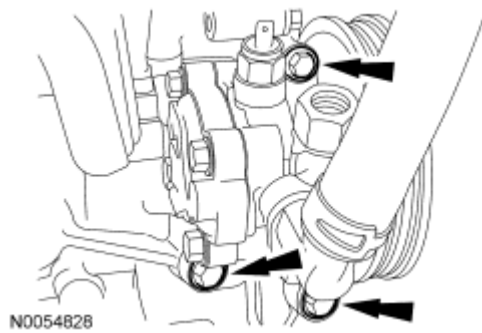


Fig. 515: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

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

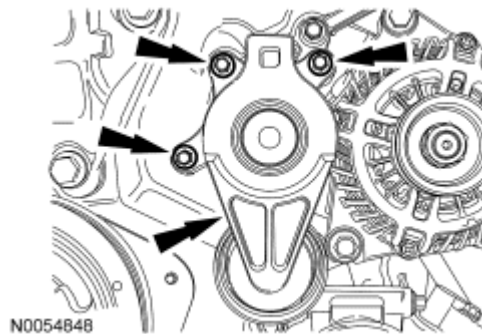


Fig. 516: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

43. Remove the 4 nuts (3 shown) and the LH catalytic converter.
- Discard the nuts and the gasket.

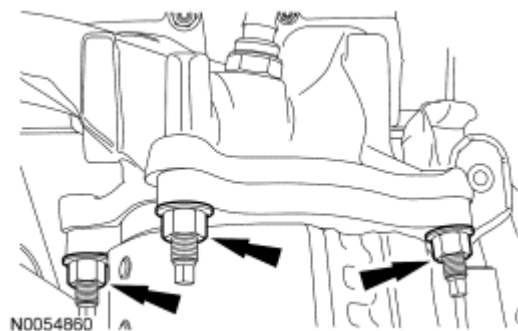


Fig. 517: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

44. Remove the 3 bolts and the LH exhaust manifold heat shield.

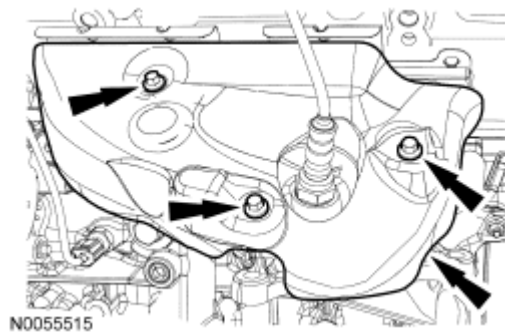


Fig. 518: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

45. Remove the 6 nuts and the LH exhaust manifold.
- Discard the nuts and exhaust manifold gaskets.

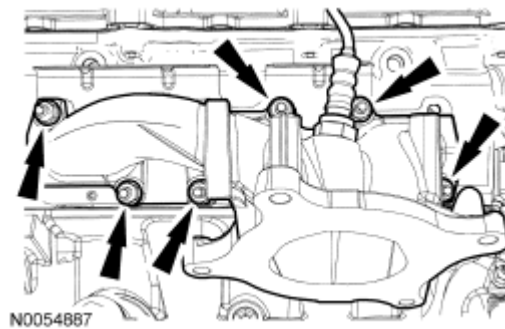


Fig. 519: Locating LH Exhaust Manifold Nuts
Courtesy of FORD MOTOR CO.

46. Clean and inspect the LH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
47. Remove and discard the 6 LH exhaust manifold studs.

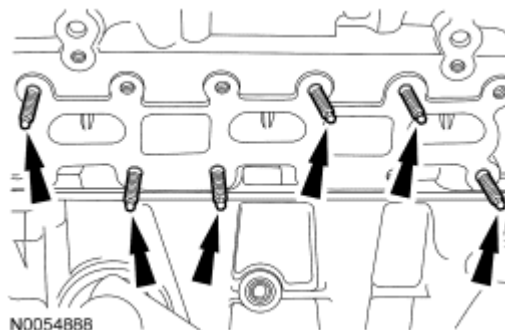


Fig. 520: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

FWD vehicles

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

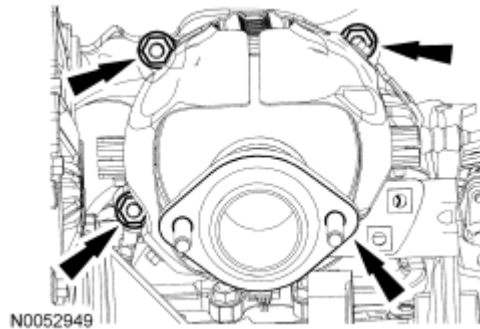


Fig. 521: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

All vehicles

49. Remove the 3 bolts and the RH exhaust manifold heat shield.

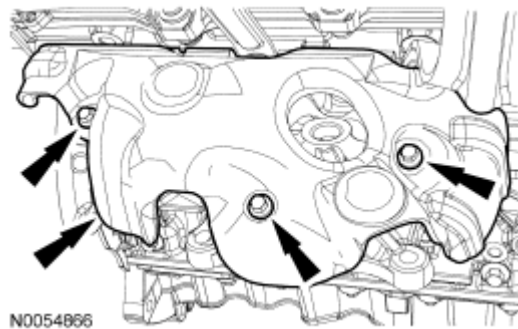


Fig. 522: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

50. Remove the 6 nuts and the RH exhaust manifold.
- Discard the nuts and exhaust manifold gaskets.

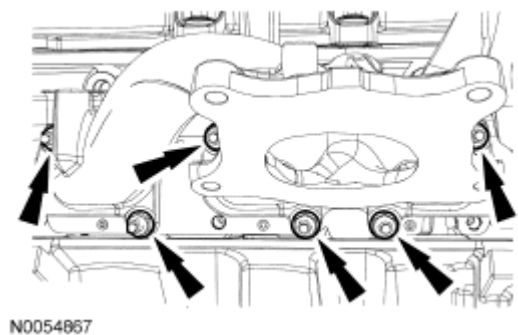


Fig. 523: Locating RH Exhaust Manifold & Nuts

Courtesy of FORD MOTOR CO.

51. Clean and inspect the RH exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** article.
52. Remove and discard the 6 RH exhaust manifold studs.

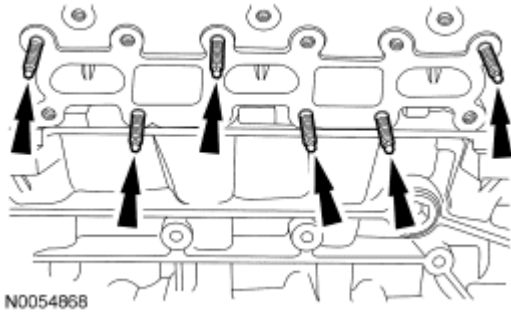


Fig. 524: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

53. Remove the RH cylinder block drain plug or, if equipped, the block heater.
 - Allow coolant to drain from the cylinder block.

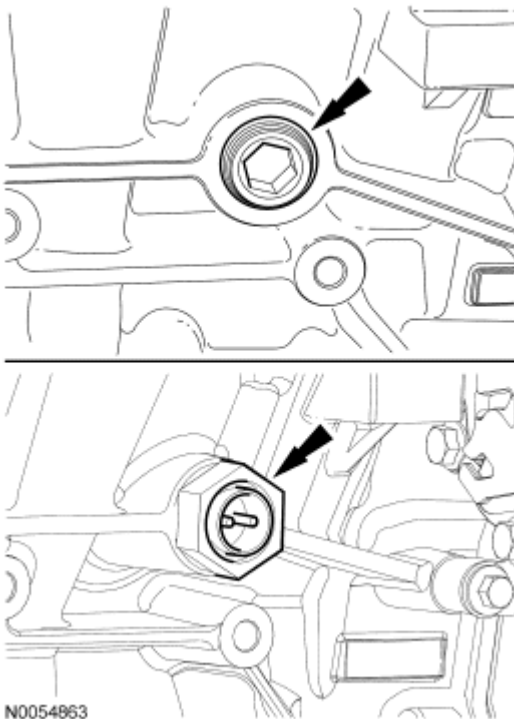


Fig. 525: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

54. Remove the LH cylinder block drain plug.

- Allow coolant to drain from the cylinder block.

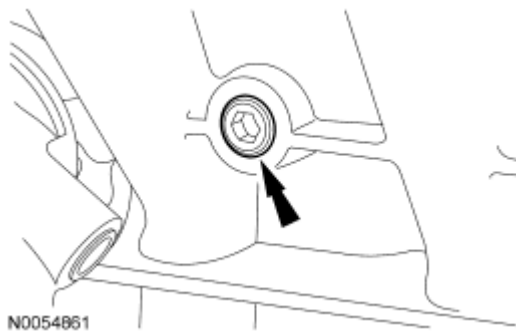


Fig. 526: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

55. Remove the pin-type retainer and the cover.

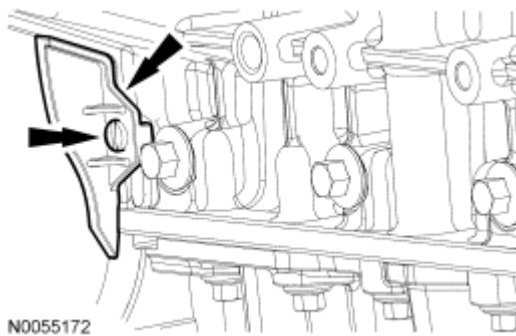


Fig. 527: Locating Pin-Type Retainer & Cover
Courtesy of FORD MOTOR CO.

56. Remove the 2 bolts and the engine lifting eye.

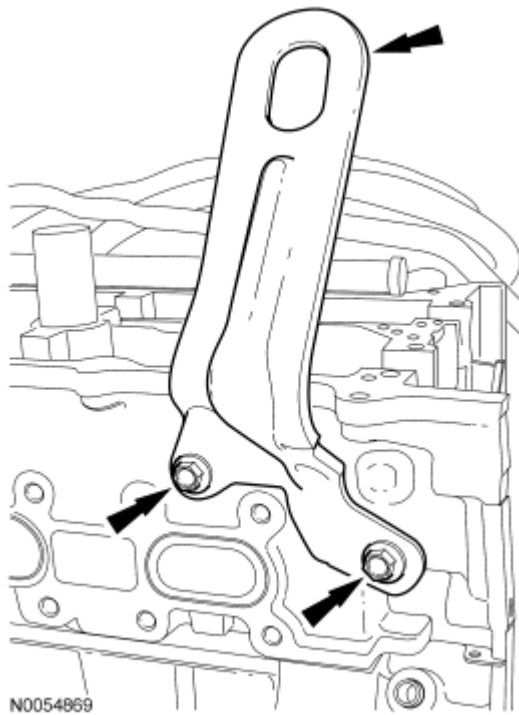


Fig. 528: Locating Engine Lifting Eye & Bolts
Courtesy of FORD MOTOR CO.

57. Remove the bolt and the upper intake manifold bracket.

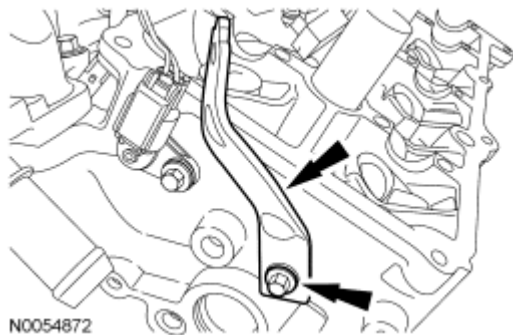


Fig. 529: Locating Upper Intake Manifold Bracket & Bolt
Courtesy of FORD MOTOR CO.

58. Remove the bolt and the RH CMP sensor.

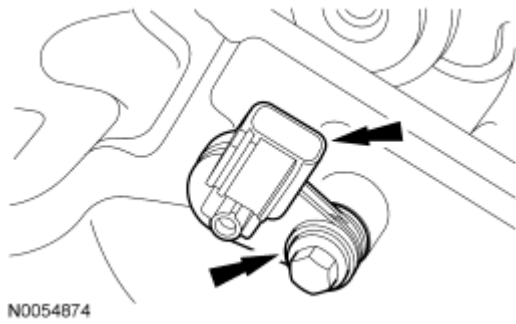


Fig. 530: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

59. Remove the 2 bolts and the catalytic converter bracket.

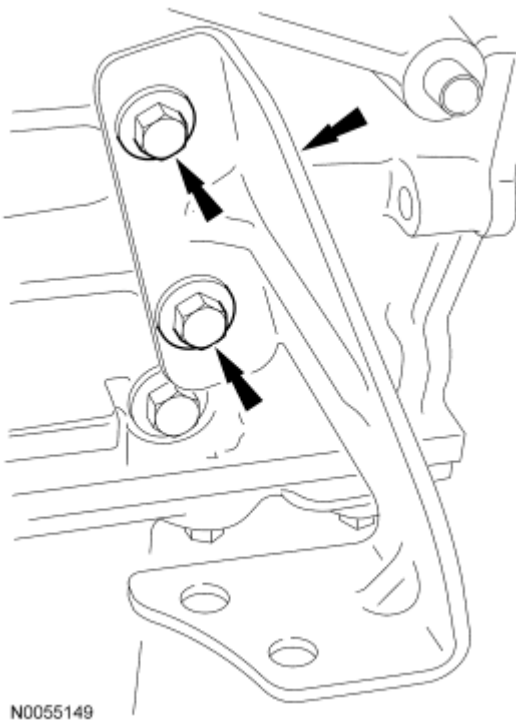


Fig. 531: Locating Catalytic Converter Bracket & Bolts
Courtesy of FORD MOTOR CO.

All vehicles

60. Remove the 4 bolts and the fuel rail and injectors as an assembly.

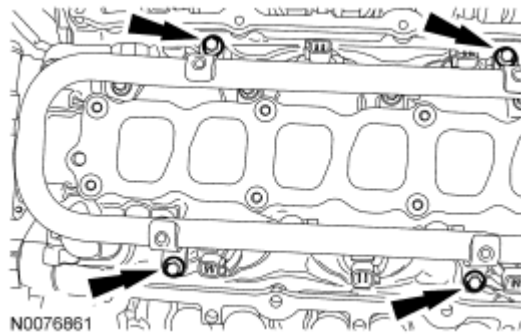


Fig. 532: Identifying 4 Bolts And Fuel Rail
Courtesy of FORD MOTOR CO.

61. Remove the 3 thermostat housing-to-lower intake manifold bolts.
 - Remove the thermostat housing and discard the gasket.

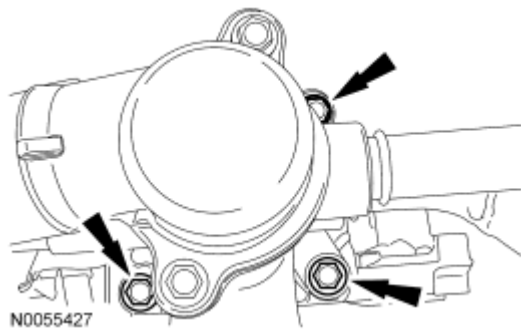


Fig. 533: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

62. Remove the 10 bolts and the lower intake manifold.
 - Discard the gaskets.

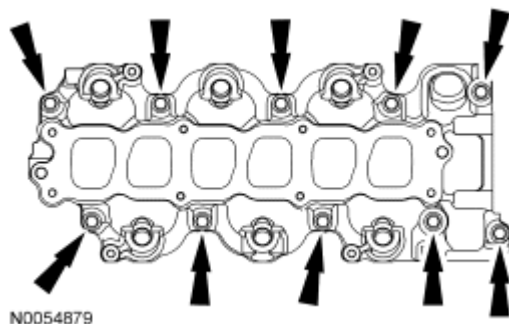


Fig. 534: Locating Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

63. Disconnect and remove the CHT sensor jumper harness.

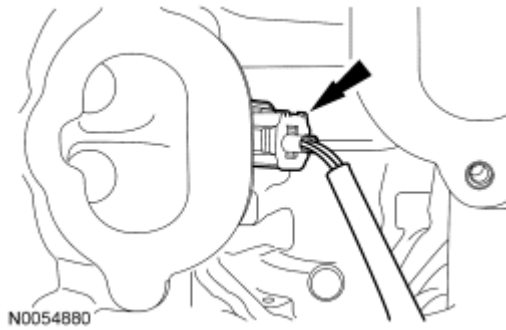


Fig. 535: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

64. Remove the bolt and the LH CMP sensor.

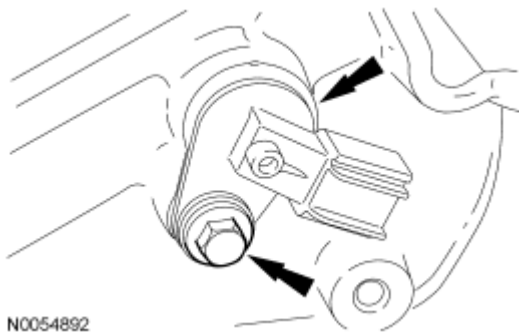


Fig. 536: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

65. Remove the bolt and the CKP sensor.

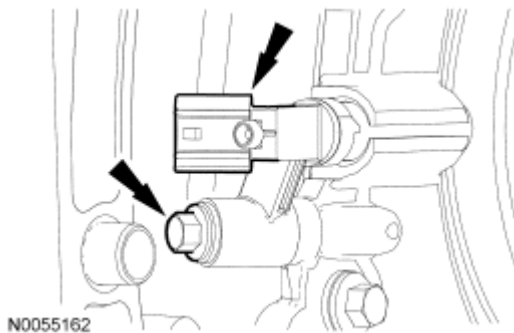
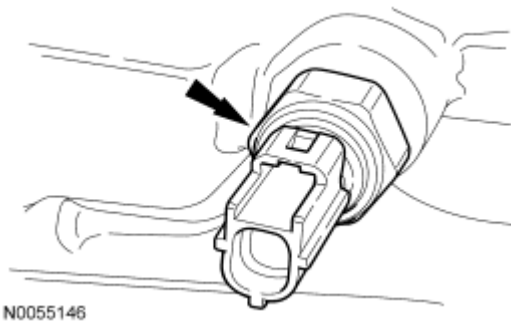


Fig. 537: Identifying CKP Sensor & Bolt
Courtesy of FORD MOTOR CO.

66. Remove the EOP switch.

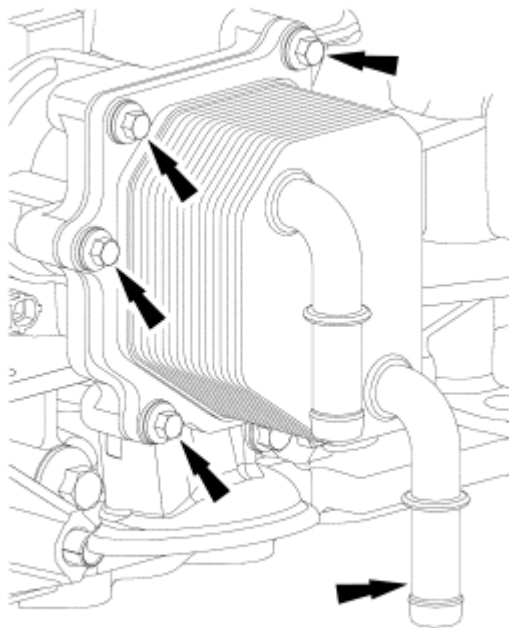


N0055146

Fig. 538: Identifying EOP Switch
Courtesy of FORD MOTOR CO.

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

67. If equipped, remove the 6 bolts and the oil cooler.
 - Discard the oil cooler and the gaskets.



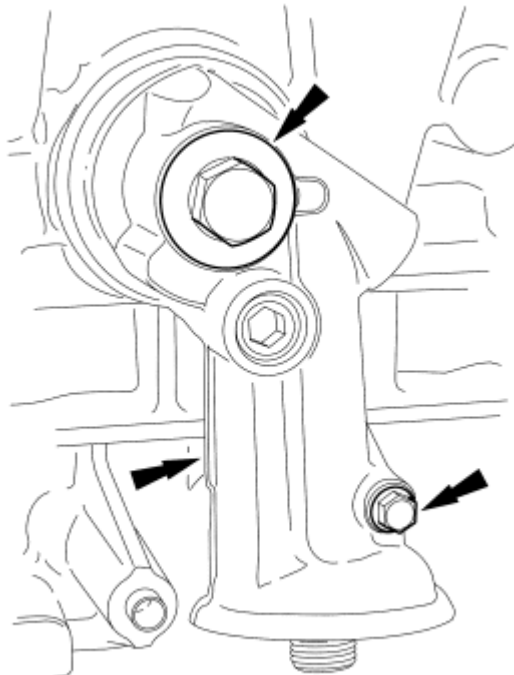
N0055407

Fig. 539: Identifying Oil Cooler, Gaskets & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Engine without oil cooler shown, engine with oil cooler similar.

68. Remove the 2 bolts and the oil filter adapter.

- Discard the gasket and O-ring seal (on banjo bolt).

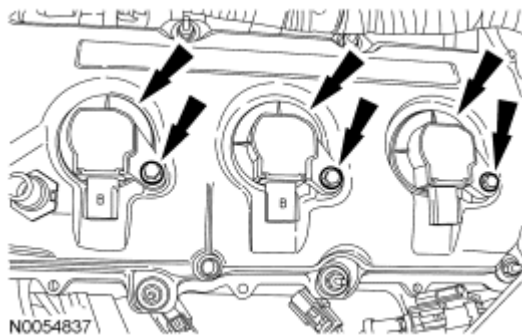


N0055150

Fig. 540: Locating Oil Filter Adapter & Bolts
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

69. Remove the 6 bolts and the 6 coil-on-plugs.



N0054837

Fig. 541: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

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

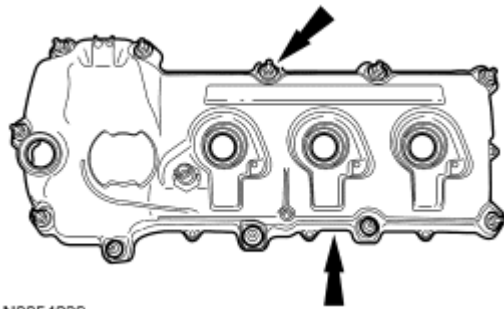


Fig. 542: Locating LH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

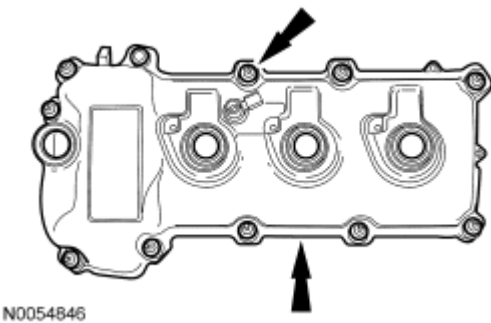


Fig. 543: Locating RH Valve Cover Stud Bolts
Courtesy of FORD MOTOR CO.

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

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

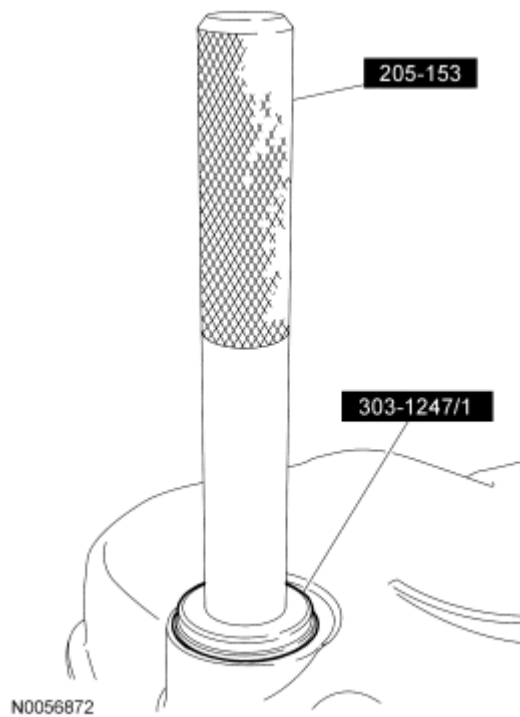


Fig. 544: Removing Seals Using Special Tools (205-153) & (303-1247/1)
Courtesy of FORD MOTOR CO.

73. Remove the crankshaft bolt and washer.
- Discard the bolt.

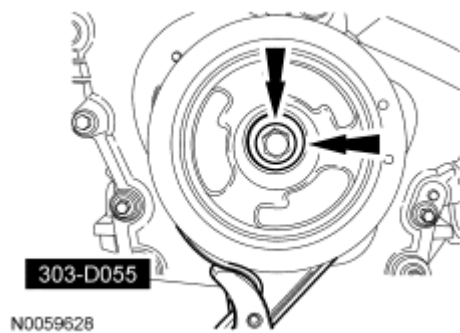


Fig. 545: Removing Crankshaft Bolt & Washer Using Special Tool (303-D055)
Courtesy of FORD MOTOR CO.

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

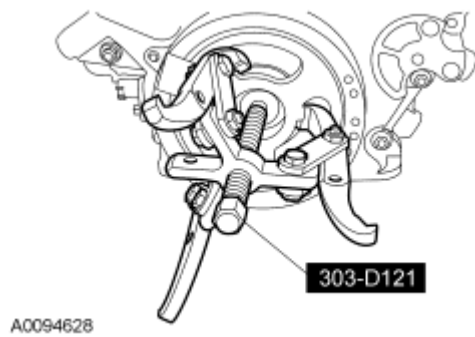


Fig. 546: Identifying Special Tools (303-D121) And Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

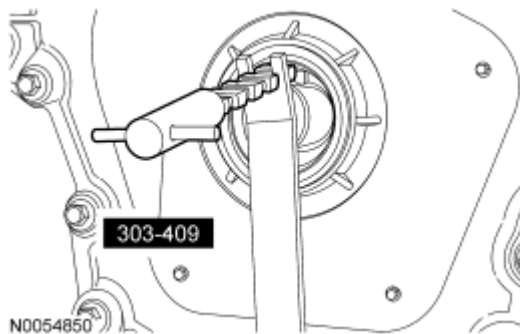


Fig. 547: Removing Crankshaft Front Seal Using Special Tool (303-409)
Courtesy of FORD MOTOR CO.

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

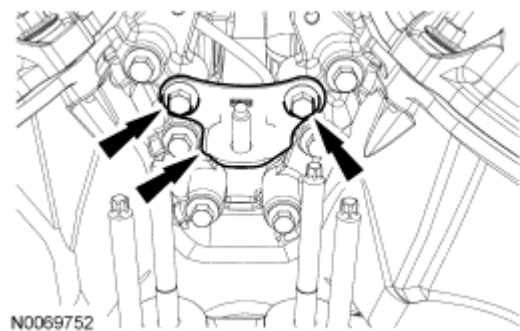


Fig. 548: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

77. Remove the 2 engine mount studs.

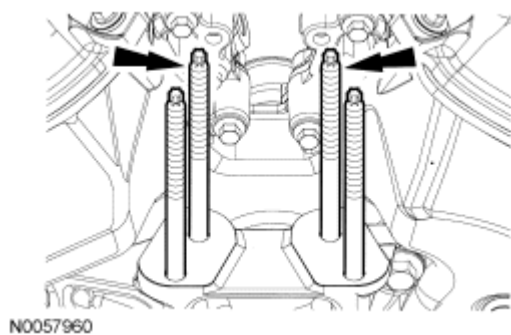


Fig. 549: Locating Engine Mount Studs
Courtesy of FORD MOTOR CO.

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

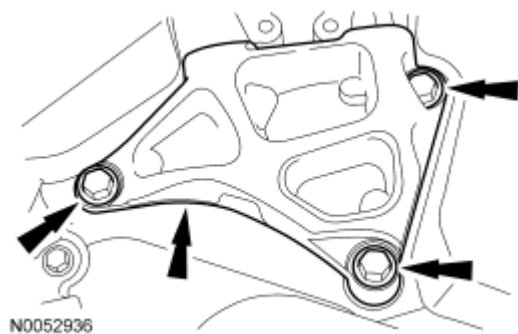
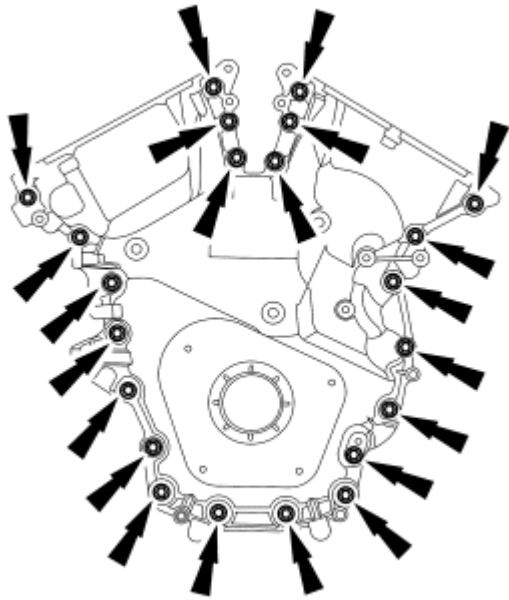


Fig. 550: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

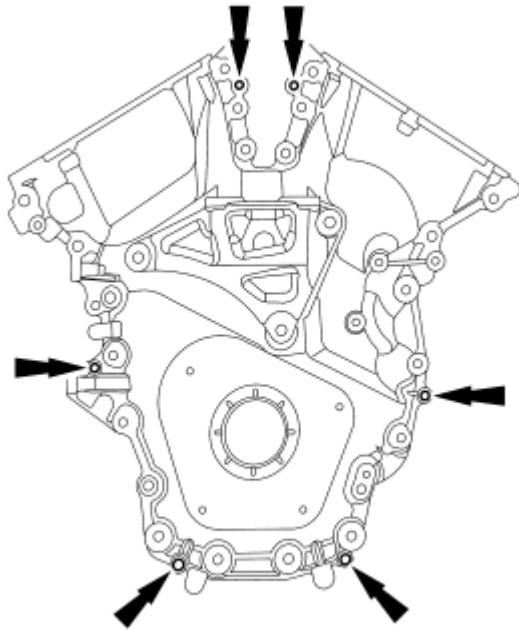
79. Remove the 22 engine front cover bolts.



N0054851

Fig. 551: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

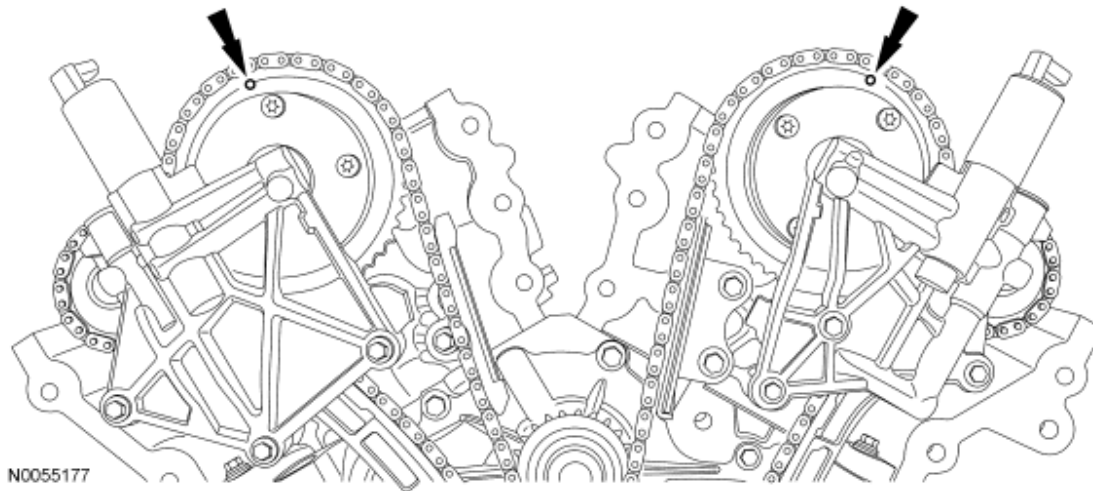
80. Install 6 of the engine front cover bolts (finger tight) into the 6 threaded holes in the engine front cover.
- Tighten the bolts one turn at a time in a criss-cross pattern until the engine front cover-to-cylinder block seal is released.
 - Remove the engine front cover.



N0069753

Fig. 552: Identifying Engine Front Cover Bolts
Courtesy of FORD MOTOR CO.

81. Rotate the crankshaft clockwise and align the timing marks on the VCT assemblies as shown.



N0055177

Fig. 553: 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.

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

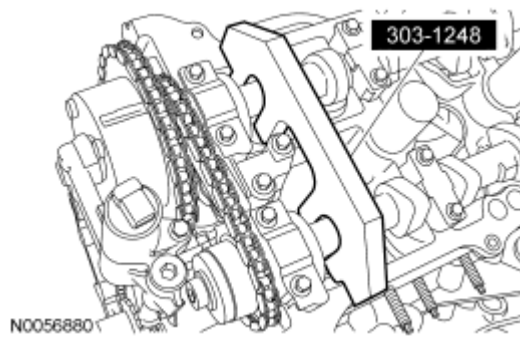


Fig. 554: Installing Special Tool (303-1248) Onto Flats Of LH Camshafts
Courtesy of FORD MOTOR CO.

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

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

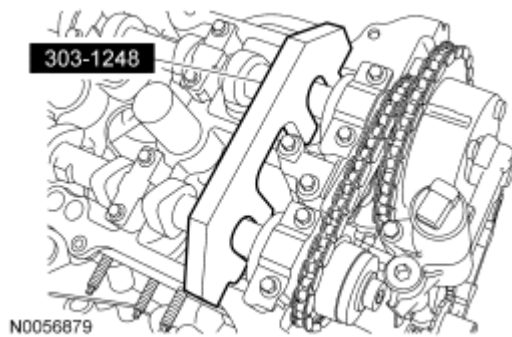


Fig. 555: Installing Special Tool (303-1248) Onto Flats Of RH Camshafts
Courtesy of FORD MOTOR CO.

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

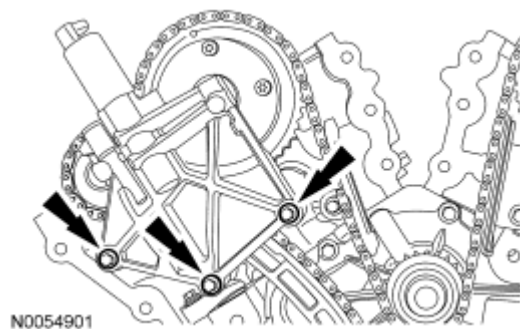


Fig. 556: Locating RH VCT Housing
Courtesy of FORD MOTOR CO.

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

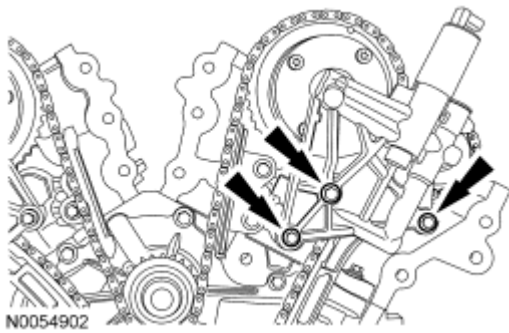


Fig. 557: Locating LH VCT Housing
Courtesy of FORD MOTOR CO.

86. Remove and discard the VCT housing seals.

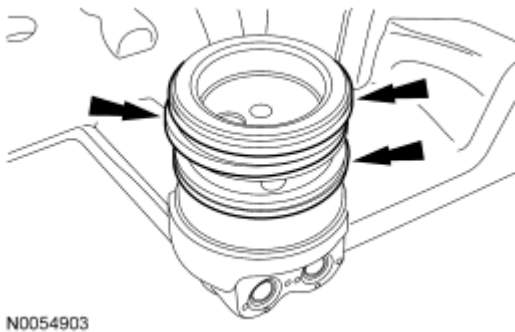


Fig. 558: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

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

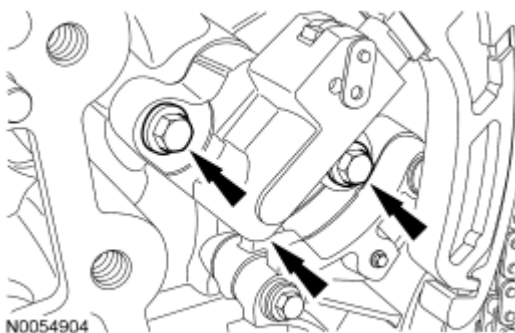


Fig. 559: Locating Primary Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

88. Remove the primary timing chain tensioner arm.

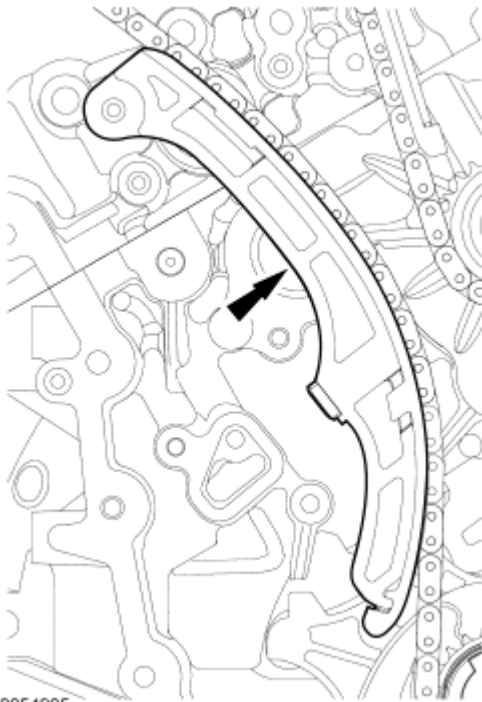


Fig. 560: Locating Primary Timing Chain Tensioner Arm
Courtesy of FORD MOTOR CO.

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

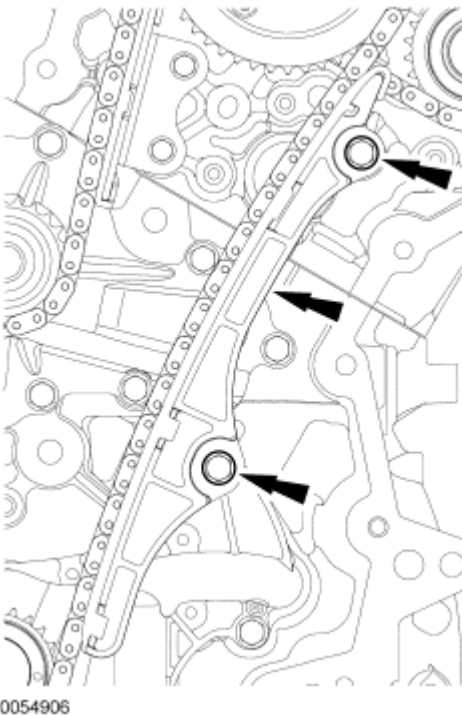
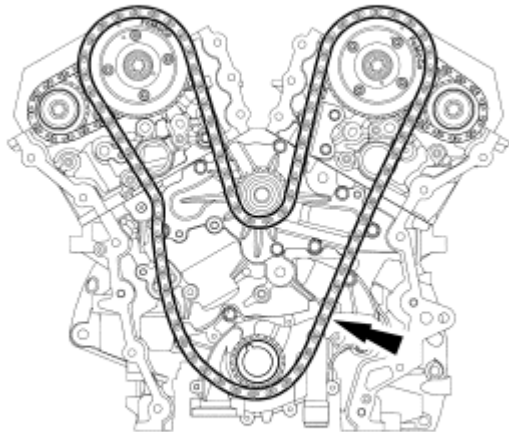


Fig. 561: Locating Lower LH Primary Timing Chain Guide Bolts

Courtesy of FORD MOTOR CO.

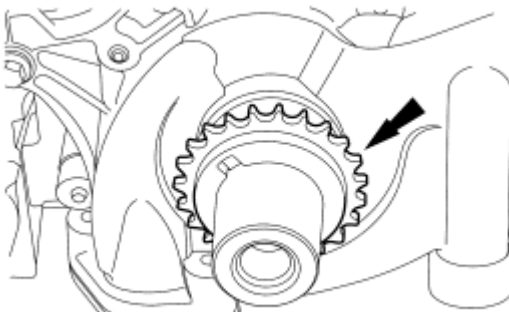
90. Remove the primary timing chain.



N0054908

Fig. 562: Locating Primary Timing Chain
Courtesy of FORD MOTOR CO.

91. Remove the crankshaft timing chain sprocket.



N0054909

Fig. 563: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

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

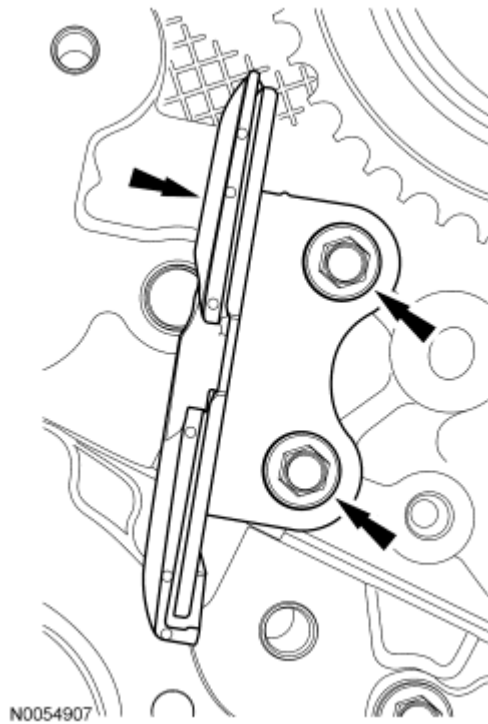


Fig. 564: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

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

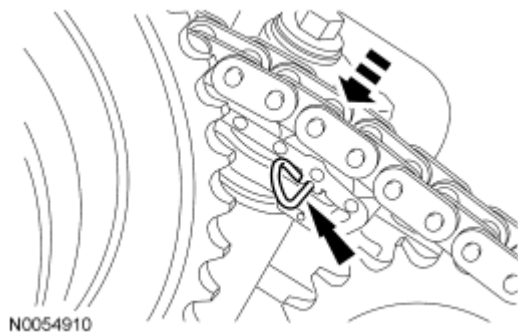


Fig. 565: Compressing LH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position
Courtesy of FORD MOTOR CO.

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

94. 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.

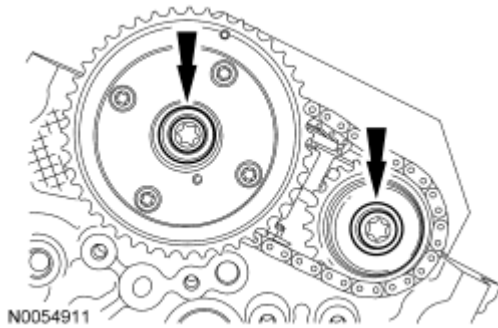


Fig. 566: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

NOTE: When the special tool is removed, valve spring pressure will rotate the LH camshafts approximately 3 degrees to a neutral position.

95. Remove the special tool from the LH camshafts.

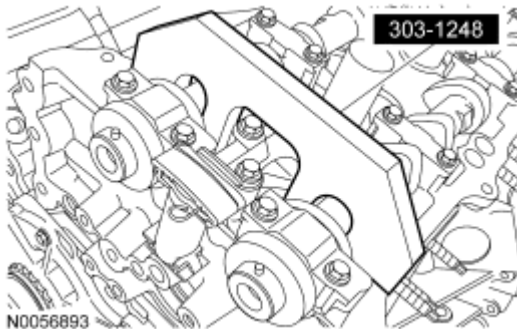


Fig. 567: Removing Special Tool (303-1248) From LH Camshafts
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

96. Verify the LH camshafts are in the neutral position.

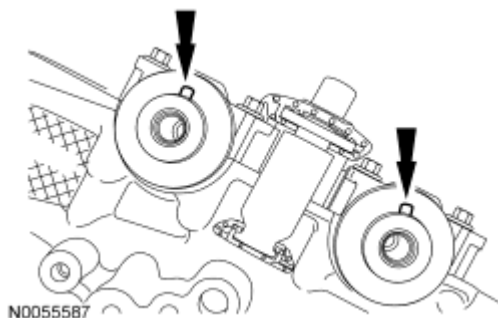


Fig. 568: Verifying LH Camshafts Are In Neutral Position

Courtesy of FORD MOTOR CO.

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

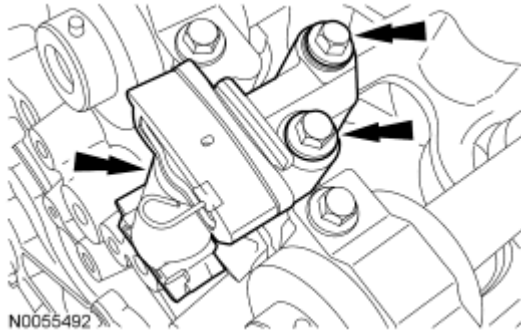


Fig. 569: Locating LH Secondary Timing Chain Tensioner & Bolt
Courtesy of FORD MOTOR CO.

CAUTION: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions. If not reassembled in their original position, severe engine damage may occur.

98. Remove the bolts and the LH camshaft bearing caps.
- Remove the LH camshafts.

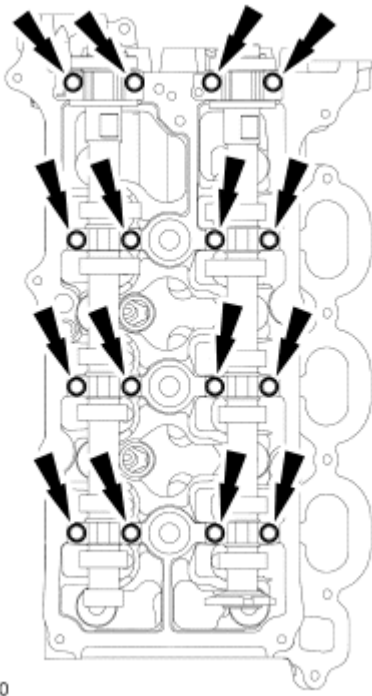


Fig. 570: Identifying LH Camshafts Bolts
Courtesy of FORD MOTOR CO.

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

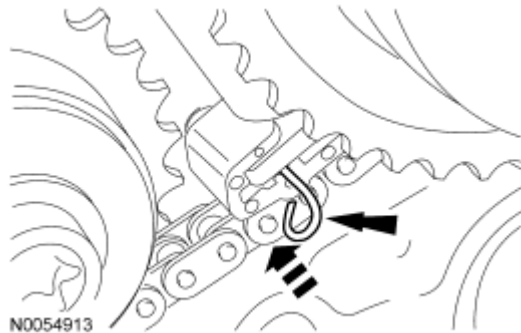


Fig. 571: Compressing RH Secondary Timing Chain Tensioner & Installing Suitable Lock Pin To Retain Tensioner In Collapsed Position

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.

100. 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.

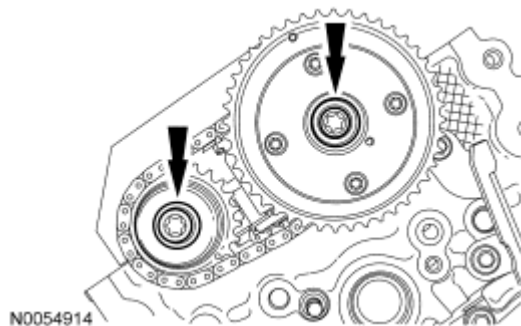


Fig. 572: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt

Courtesy of FORD MOTOR CO.

101. Remove the special tool from the RH camshafts.

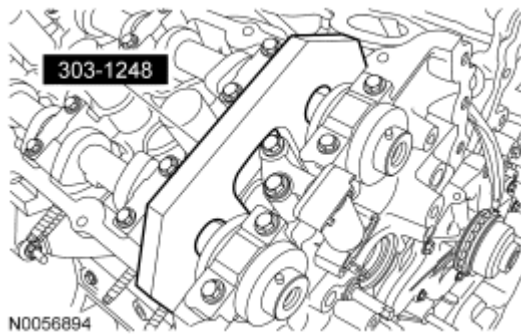


Fig. 573: Removing Special Tool (303-1248) From RH Camshafts
Courtesy of FORD MOTOR CO.

CAUTION: The camshafts must remain in the neutral position during removal or engine damage may occur.

102. Rotate the RH camshafts counterclockwise to the neutral position.

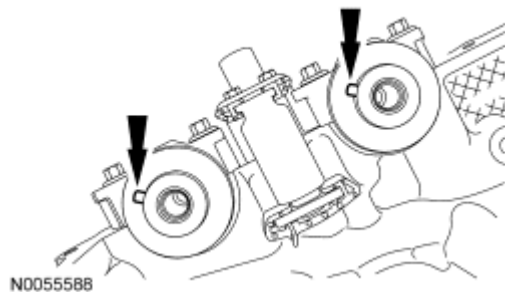


Fig. 574: Rotating RH Camshafts Counterclockwise To Neutral Position
Courtesy of FORD MOTOR CO.

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

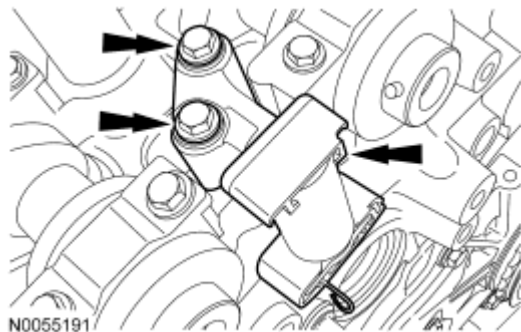


Fig. 575: Locating RH Secondary Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

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

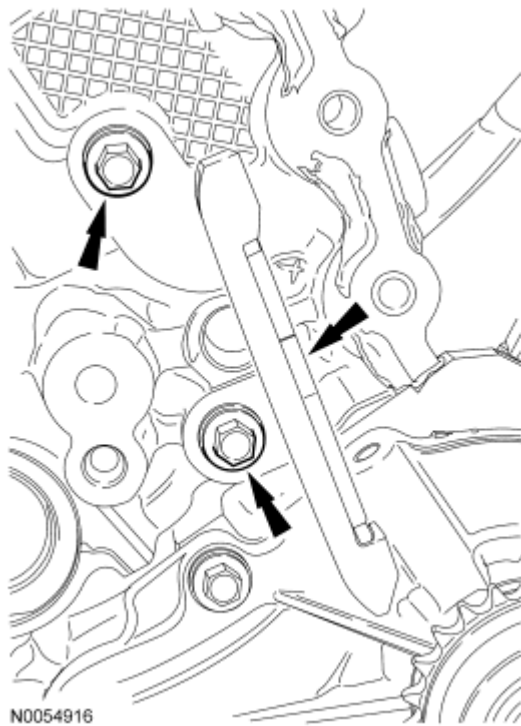
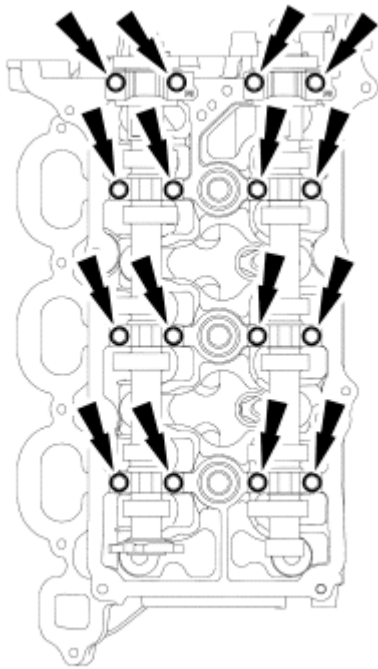


Fig. 576: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

CAUTION: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions. If not reassembled in their original position, severe engine damage may occur.

105. Remove the bolts and the RH camshaft bearing caps.
 - Remove the RH camshafts.



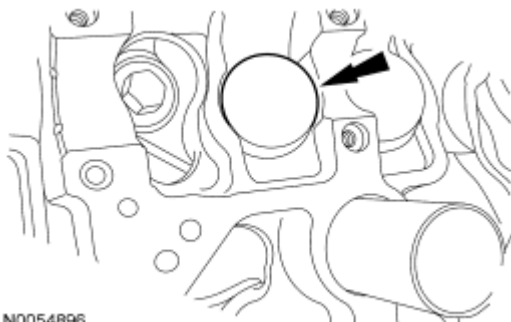
N0055183

Fig. 577: 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, RH similar.

106. Remove the valve tappets from the cylinder heads.

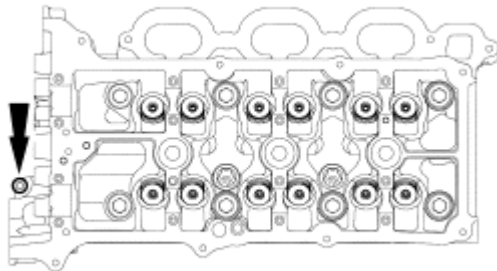


N0054896

Fig. 578: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

107. Remove and discard the M6 bolt from each cylinder head.



N0055174

Fig. 579: 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.

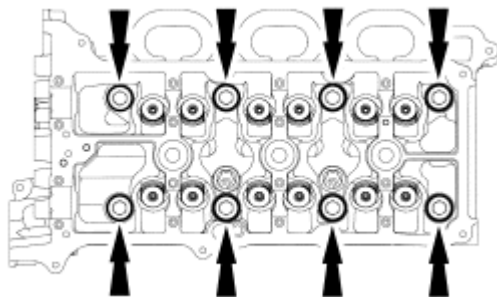
CAUTION: Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface.

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

NOTE: LH shown, RH similar.

108. Remove and discard the 8 bolts from each cylinder head.

- Remove the cylinder heads.
- Discard the cylinder head gaskets.



N0056896

Fig. 580: 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.

109. 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.
 5. Make sure the 2 locating dowel pins are seated correctly in the cylinder block.
110. 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.

111. 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).
112. Remove the coolant tube.
- Remove and discard the O-ring seals.

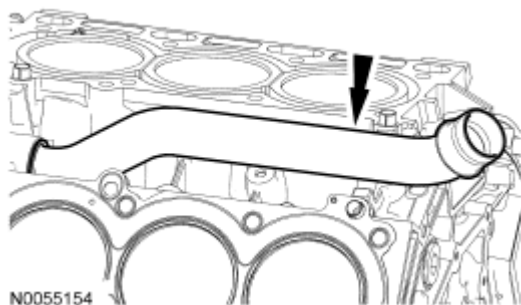


Fig. 581: Identifying Coolant Tube

Courtesy of FORD MOTOR CO.

113. Remove the 2 bolts and the KS.

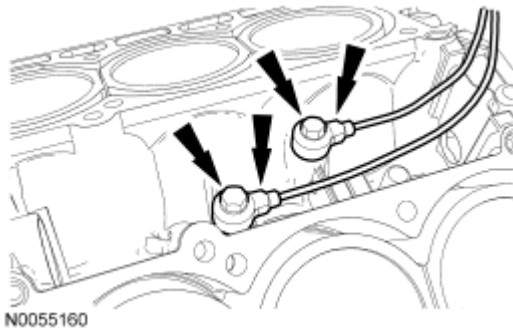


Fig. 582: Locating Knock Sensor (KS) Bolts
Courtesy of FORD MOTOR CO.

114. Remove the 8 bolts and the coolant pump.

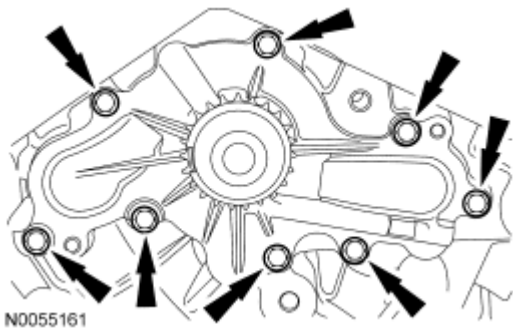
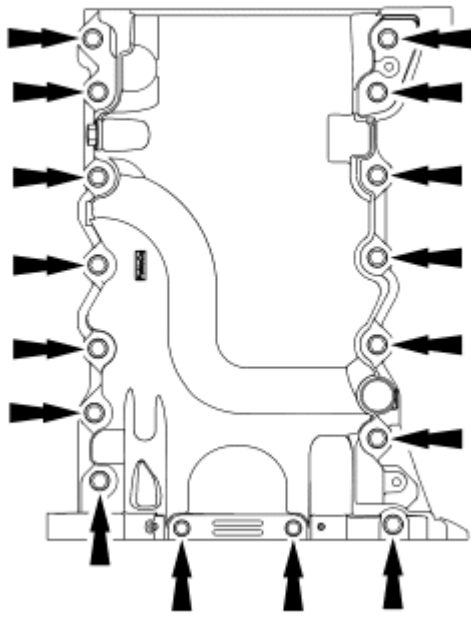


Fig. 583: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

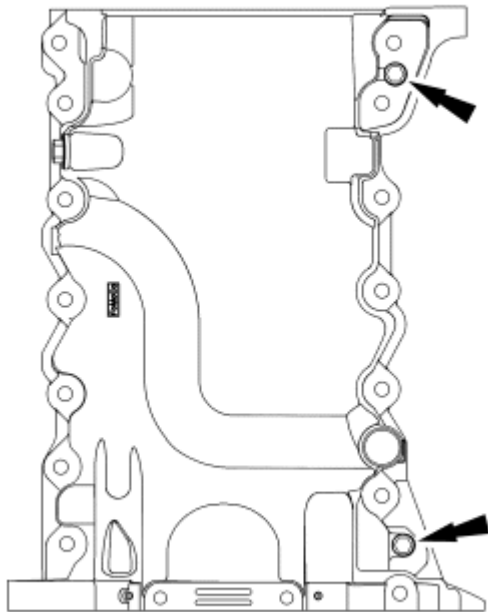
115. Remove the 16 oil pan bolts.



N0055163

Fig. 584: Identifying Oil Pan Bolts
Courtesy of FORD MOTOR CO.

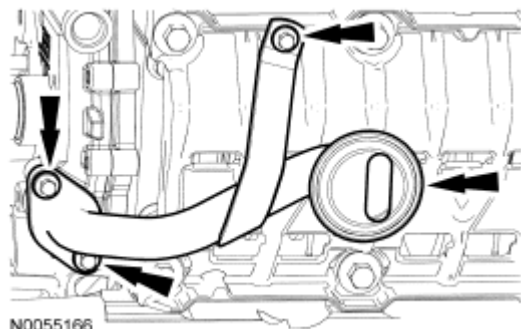
116. Install 2 of the oil pan bolts (finger tight) into the 2 threaded holes in the oil pan.
 - Alternately tighten the 2 bolts one turn at a time until the oil pan-to-cylinder block seal is released.
 - Remove the oil pan.



N0055164

Fig. 585: Installing 2 Of Oil Pan Bolts (Finger Tight) Into 2 Threaded Holes In Oil Pan
 Courtesy of FORD MOTOR CO.

117. Remove the 3 bolts and the oil pump screen and pickup tube.
 - Discard the O-ring seal.



N0055166

Fig. 586: Identifying Oil Pump Screen, Pickup Tube & Bolts
 Courtesy of FORD MOTOR CO.

118. Remove the 3 bolts and the oil pump.

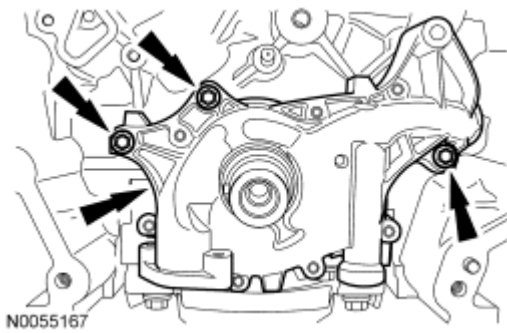


Fig. 587: Identifying Oil Pump & Bolts
Courtesy of FORD MOTOR CO.

119. Remove the 8 crankshaft rear seal retainer bolts.

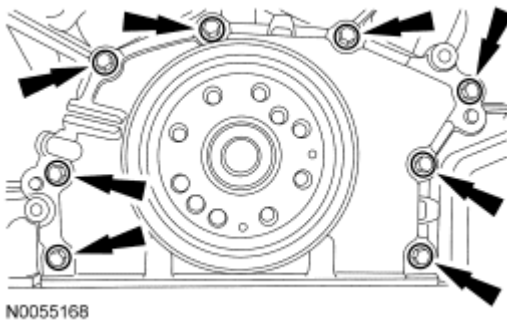


Fig. 588: Locating Crankshaft Rear Seal Retainer Bolts
Courtesy of FORD MOTOR CO.

120. 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.

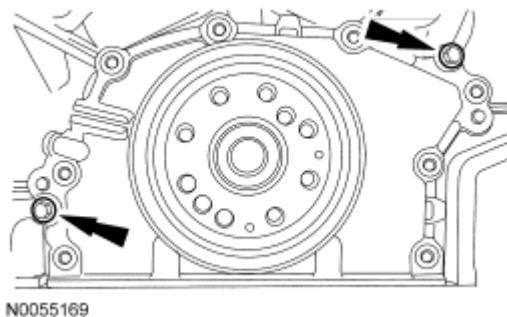


Fig. 589: Identifying M6 Oil Pan Bolts
Courtesy of FORD MOTOR CO.

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.

121. Clean the engine front cover, oil pan and crankshaft rear seal retainer plate using a 3M Roloc® Bristle Disk, (2 inch, 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 the gasket.

122. 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.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

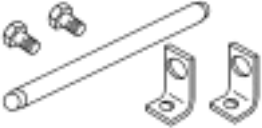

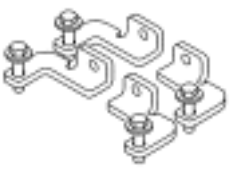

CYLINDER HEAD

Special Tools

Illustration	Tool Name	Tool Number
	Compressor, Valve Spring	303-300 (T87C-6565-A)

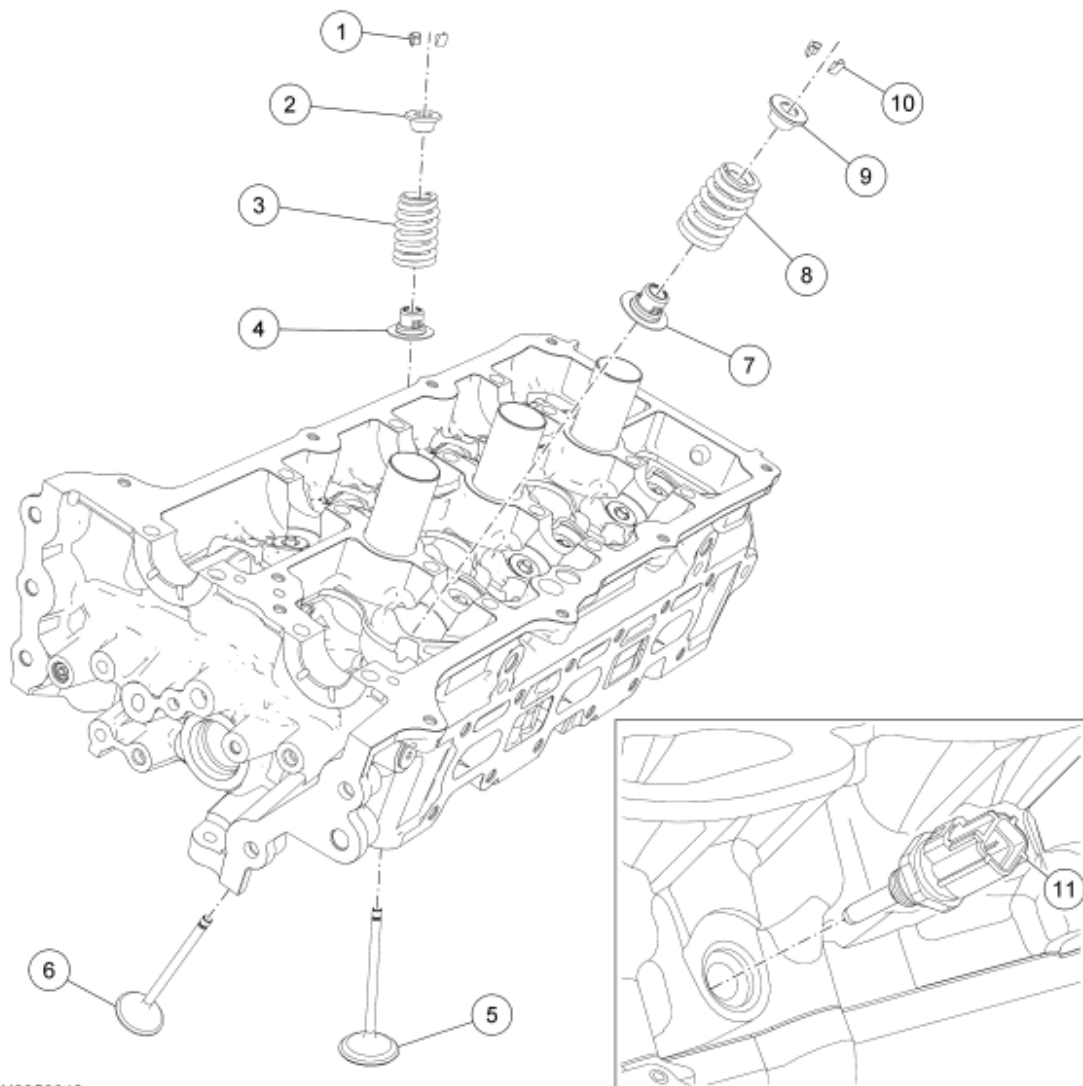
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 <p>ST1981-A</p>		
 <p>ST1907-A</p>	Compressor, Valve Spring	303-350 (T89P-6565-A)
 <p>ST302B-A</p>	Compressor, Valve Spring	303-1249
 <p>ST1906-A</p>	Installer, Valve Stem Oil Seal	303-470 (T94P-6510-CH)

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



N0056912

Fig. 590: 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)

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.

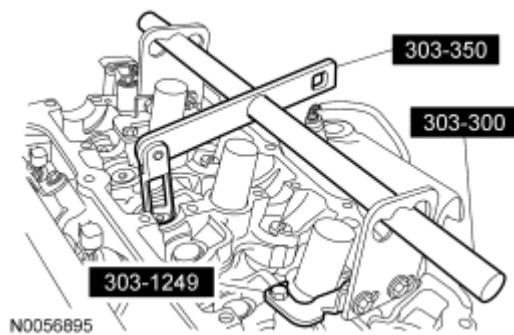


Fig. 591: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

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.

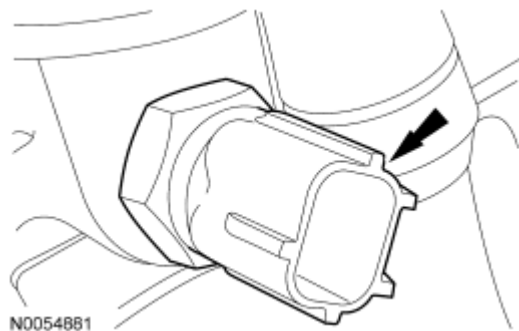


Fig. 592: Identifying Cylinder Head Temperature (CHT) Sensor

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.

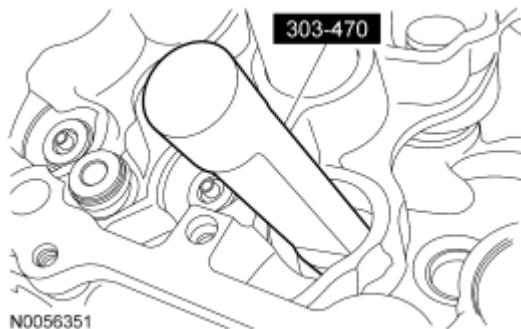


Fig. 593: Installing New Valve Stem Seal Using Special Tool (303-470)
Courtesy of FORD MOTOR CO.

2. Install the valve.
3. Using the Valve Spring Compressors, install the valve spring, retainer and key.

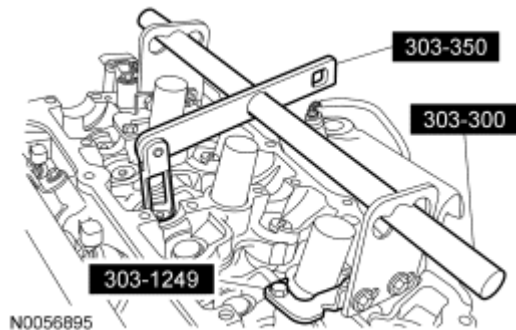


Fig. 594: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

4. Repeat the above steps for each valve.


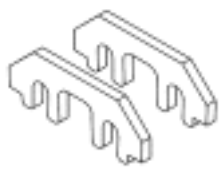



RH cylinder head

5. Install a new CHT sensor.
 - Tighten to 10 Nm (89 lb-in).

ASSEMBLY







ENGINE

Special Tools

Illustration	Tool Name	Tool Number
 <p>ST2433-A</p>	Alignment Pins	307-399
 <p>ST2979-A</p>	Camshaft Alignment Tool	303-1248
 <p>ST2976A</p>	Engine Lifting Bracket	303-1245
 <p>ST1326-A</p>	Handle	205-153 (T80T-4000-W)
 <p>ST1341-A</p>	Heavy Duty Floor Crane	014-00071 or equivalent
	Installer, Crankshaft Front Seal	303-1251

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 ST2981-A		
 ST2980-A	Installer, Crankshaft Rear Seal	303-1250
 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
	Strap Wrench	303-D055 (D85L-6000-A)

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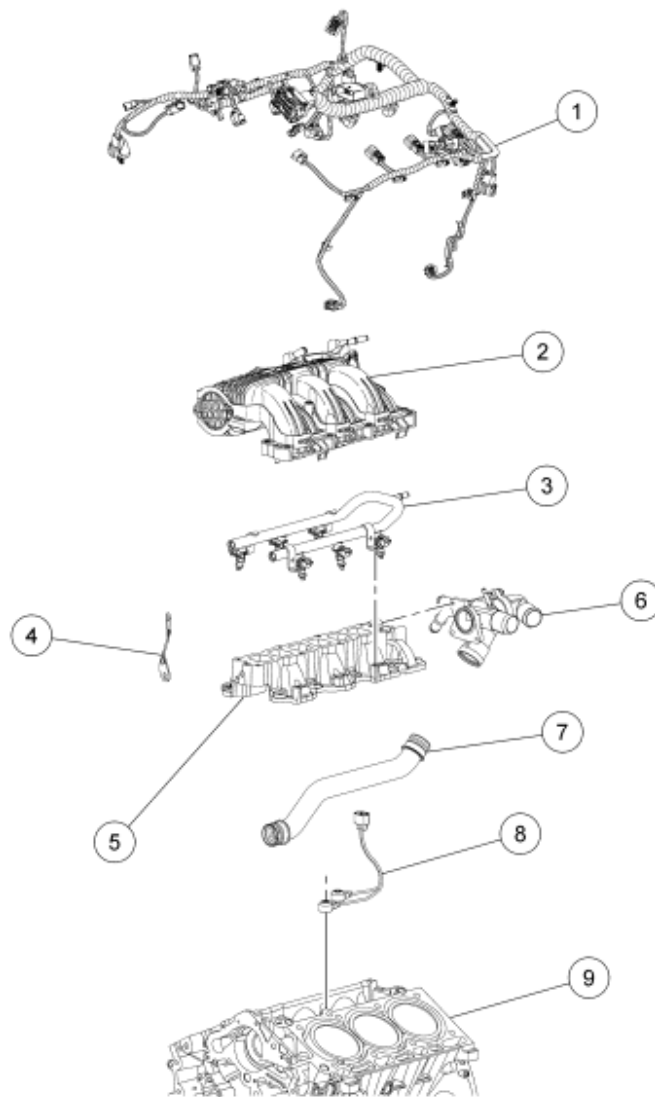
2009 ENGINE Engine - 3.5L - Edge & MKX



ST143B-A

Material

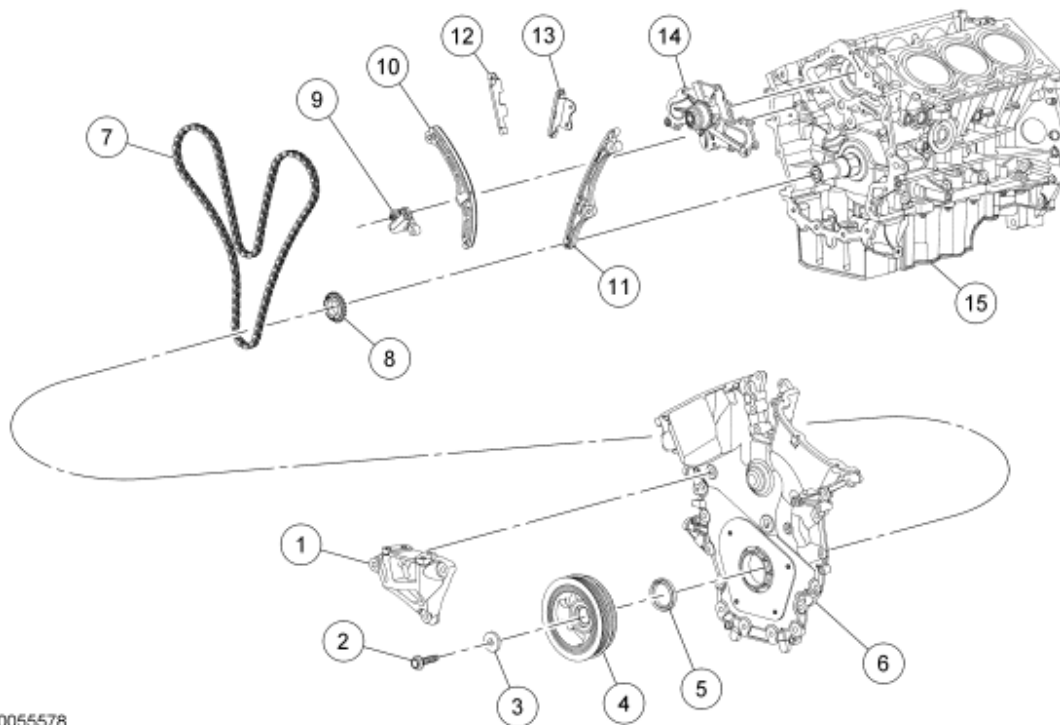
Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft Metal Surface Prep ZC-31-A	-
Motorcraft Premium Gold Engine Coolant with Bittering Agent (bittered in US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1
Motorcraft SAE 5W-20 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	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2



N0076860

Fig. 595: Identifying Engine Upper Components
Courtesy of FORD MOTOR CO.

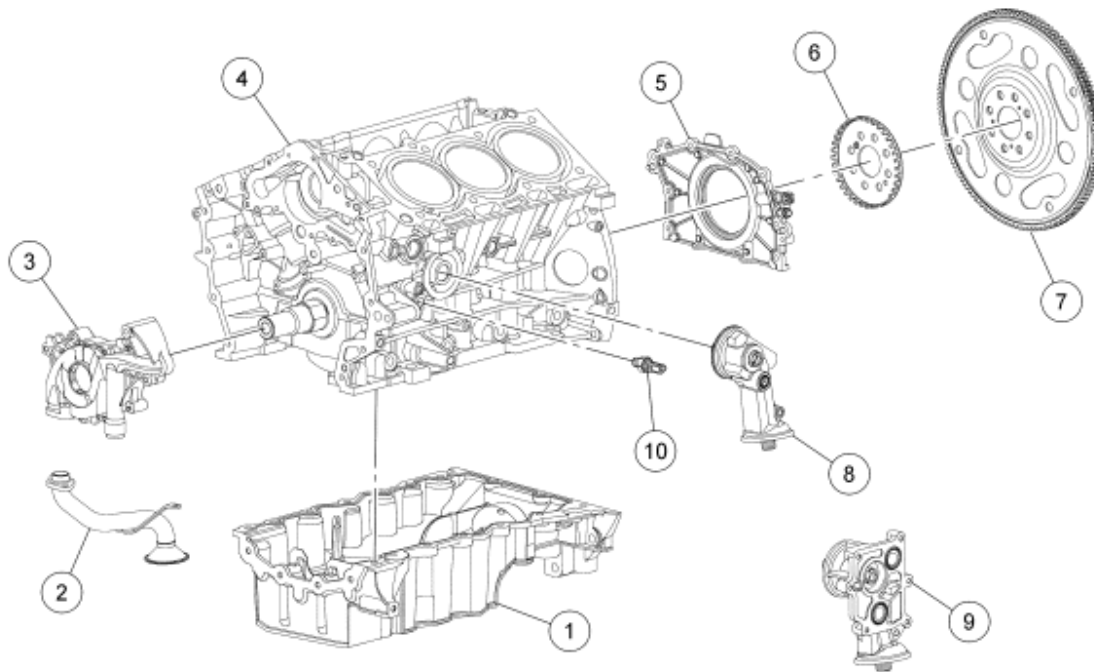
Item	Part Number	Description
1	12C508	Engine control harness
2	9S455	Upper intake manifold
3	9F797	Fuel rail
4	9J444	Upper intake manifold bracket
5	9K461	Lower intake manifold
6	8A856	Thermostat housing
7	9N271	Coolant tube
8	9N271	Knock sensor (KS)
9	6010	Cylinder block



N0055578

Fig. 596: Identifying Engine Front Components
Courtesy of FORD MOTOR CO.

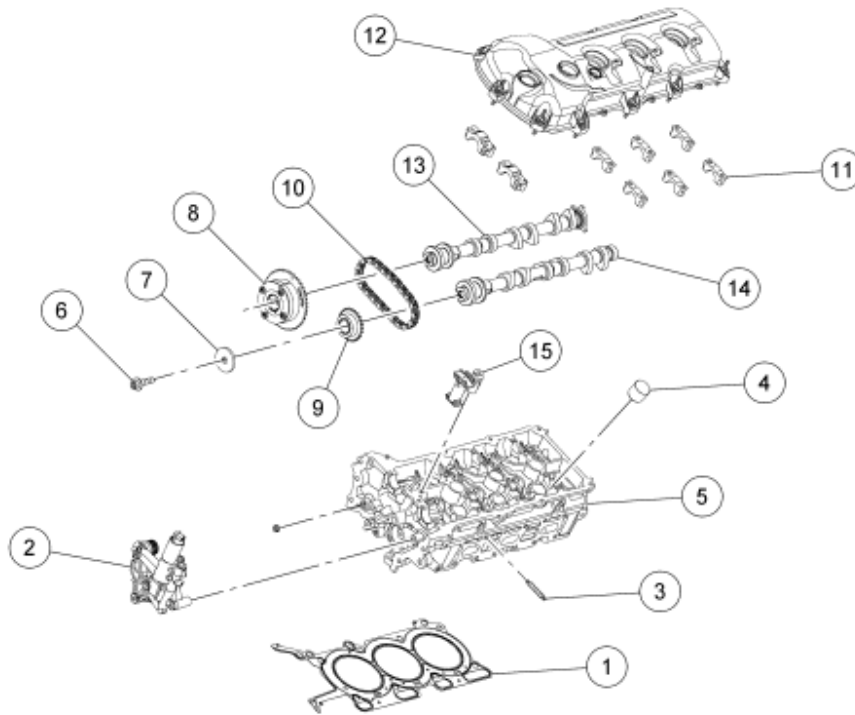
Item	Part Number	Description
1	6A0003	Engine mount bracket
2	W701512	Crankshaft pulley bolt
3	N806165	Crankshaft pulley washer
4	6316	Crankshaft pulley
5	6700	Crankshaft front seal
6	6C086	Engine front cover
7	6268	Timing chain
8	6306	Crankshaft timing sprocket
9	6K254	Primary timing chain tensioner
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
14	8501	Coolant pump
15	6010	Cylinder block



N0055408

Fig. 597: Identifying Engine Lower Components
Courtesy of FORD MOTOR CO.

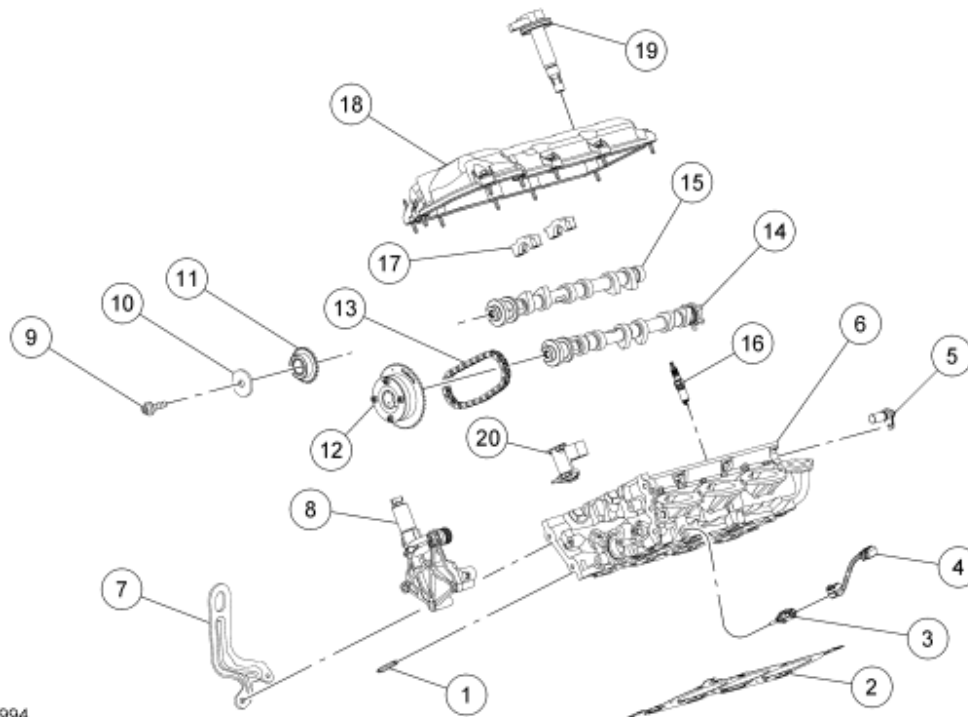
Item	Part Number	Description
1	6675	Oil pan
2	6622	Oil pump screen and pickup tube
3	6621	Oil pump
4	6010	Cylinder block
5	6D327	Crankshaft rear seal retainer
6	12A227	Crankshaft sensor ring
7	6375	Flexplate
8	6881	Oil filter adapter (without oil cooler)
9	6881	Oil filter adapter (with oil cooler)
10	9278	Engine oil pressure (EOP) switch



N0055580

Fig. 598: Exploded View Of 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



N0071994

Fig. 599: Exploded View Of 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 (CMP) 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)
20	6C270	RH secondary timing chain tensioner

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

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.

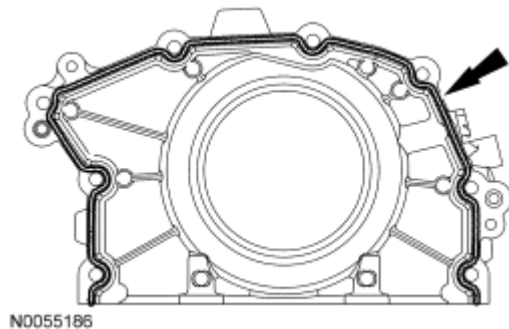


Fig. 600: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Sealing Surface Of Crankshaft Rear Seal Retainer
Courtesy of FORD MOTOR CO.

2. Install the crankshaft rear seal retainer and the 8 bolts.
 - Tighten in the sequence shown to 10 Nm (89 lb-in).

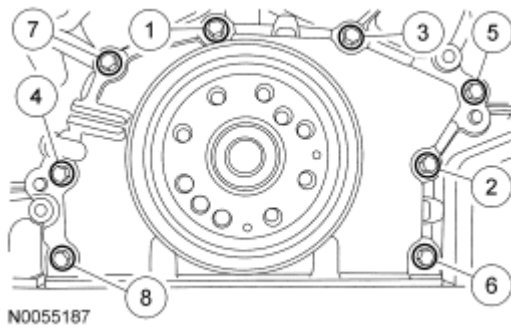


Fig. 601: Installing Crankshaft Rear Seal Retainer Bolts In Sequence
Courtesy of FORD MOTOR CO.

3. Install the oil pump and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

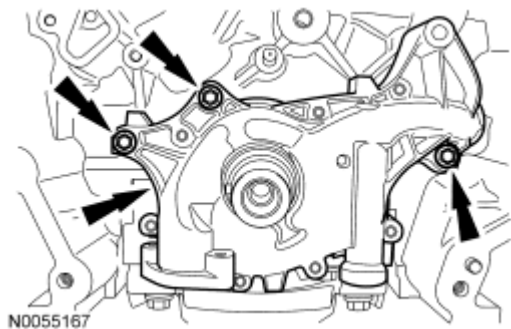


Fig. 602: Identifying Oil Pump & Bolts
Courtesy of FORD MOTOR CO.

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).

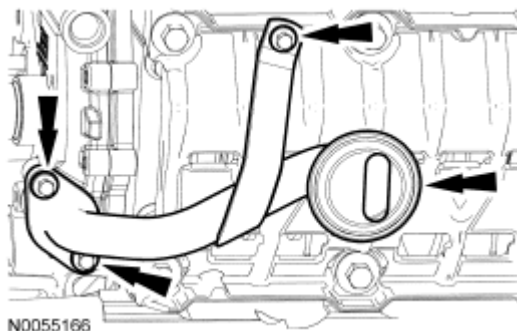


Fig. 603: Identifying Oil Pump Screen, Pickup Tube & Bolts
Courtesy of FORD MOTOR CO.

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).

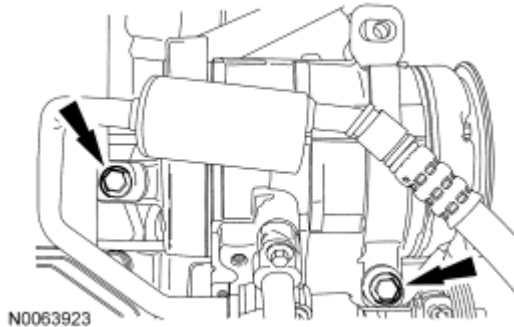
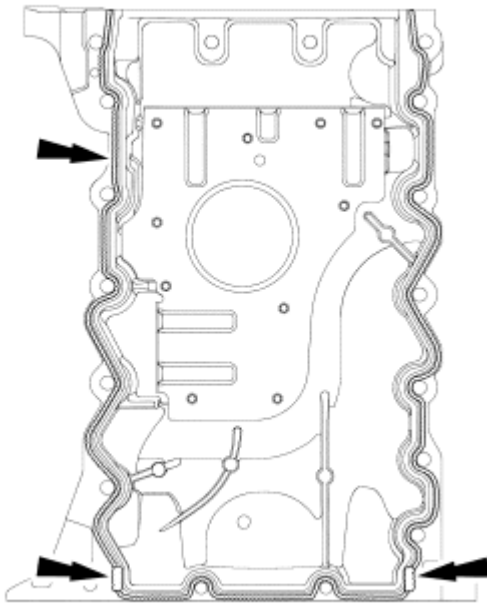


Fig. 604: Identifying A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

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.

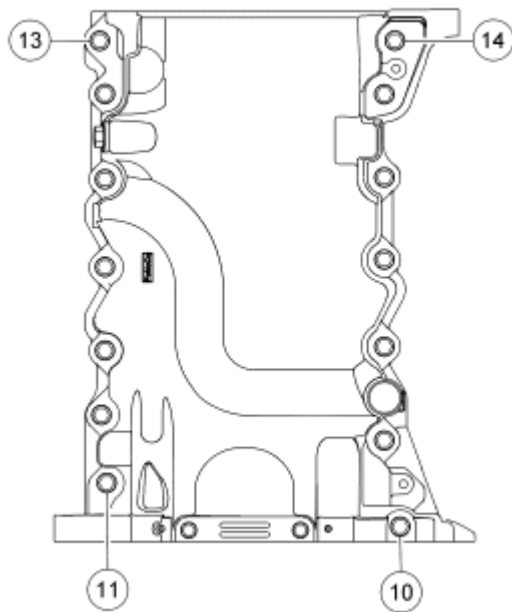


N0055188

Fig. 605: 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.

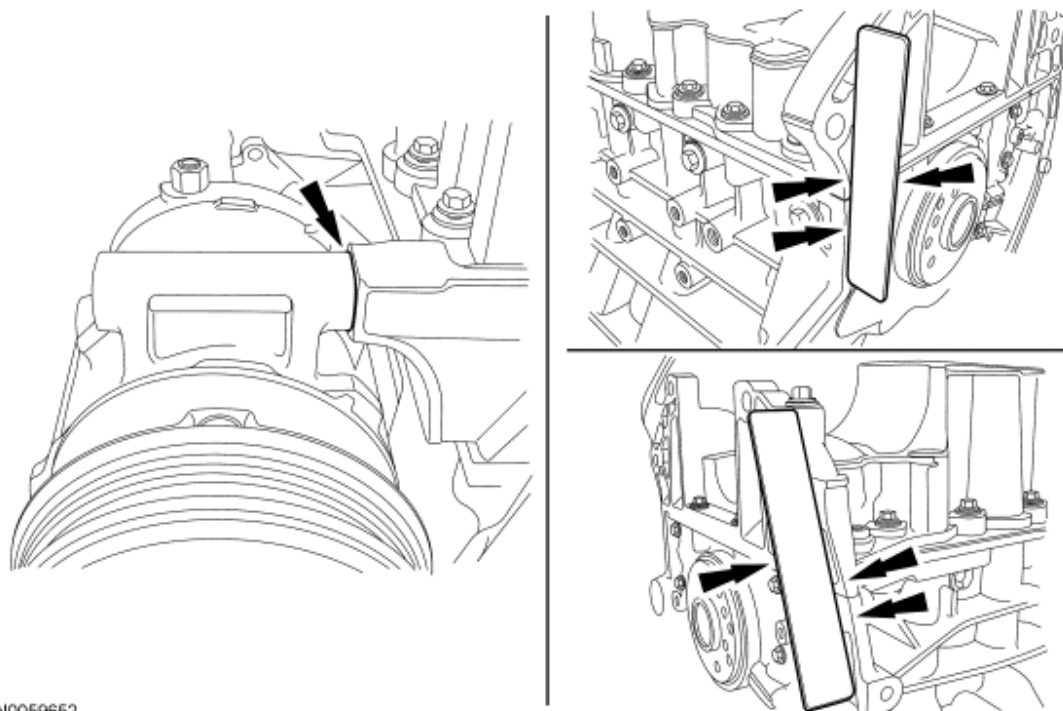
7. Install the oil pan and bolts 10, 11, 13 and 14.
 - Tighten the bolts in the sequence shown to 3 Nm (27 lb-in).
 - Loosen the bolts 180 degrees.



N0069773

Fig. 606: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence
Courtesy of FORD MOTOR CO.

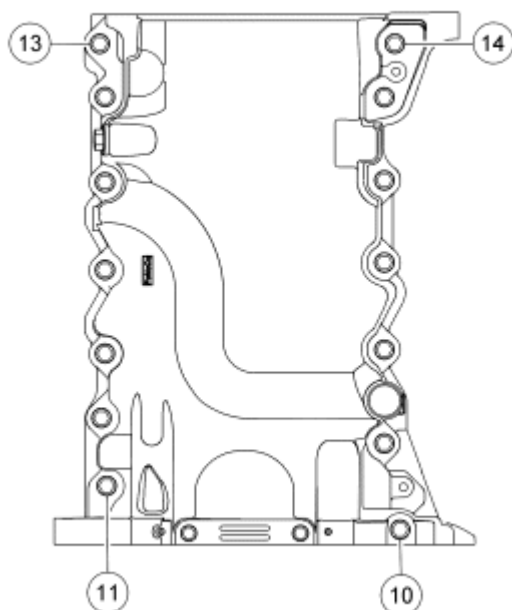
8. Align the oil pan to the cylinder block and the A/C compressor.
 - Position the oil pan so the mounting boss is against the A/C compressor and using a straightedge, align the oil pan flush with the rear of the cylinder block at the 2 areas shown.



N0059652

Fig. 607: 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, to 3 Nm (27 lb-in).

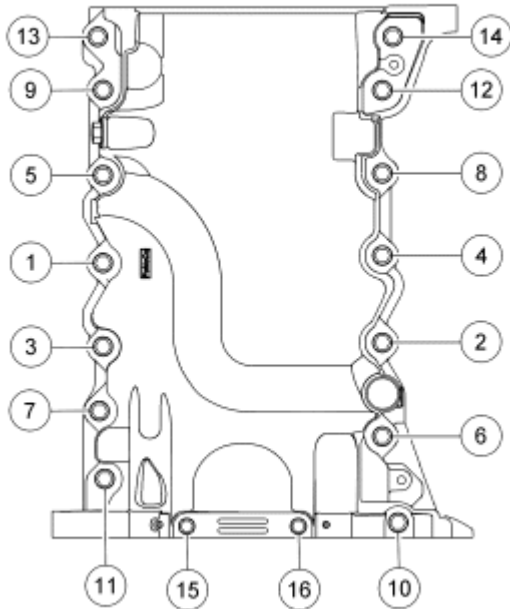


N0069773

Fig. 608: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence

Courtesy of FORD MOTOR CO.

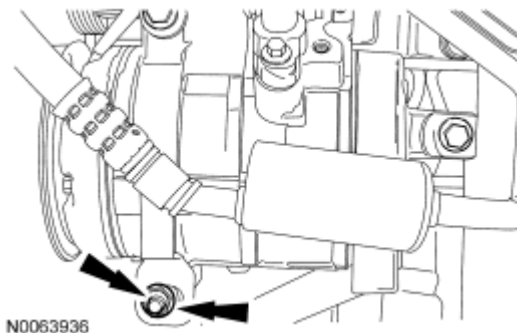
10. Install the remaining oil pan bolts. Tighten all the oil pan bolts in the sequence shown.
 - Tighten the large bolts (1-14) to 24 Nm (18 lb-ft).
 - Tighten the small bolts (15 and 16) to 10 Nm (89 lb-in).



N0055165

Fig. 609: 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).



N0063936

Fig. 610: 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 to 10 Nm (89 lb-in).

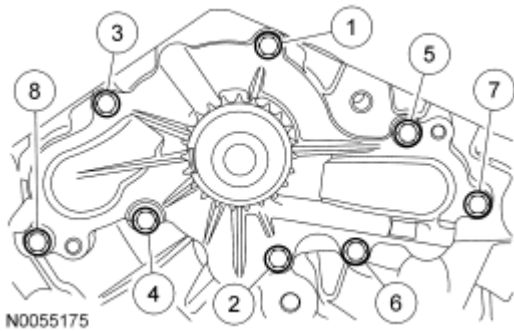


Fig. 611: Identifying Coolant Pump Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

13. Install the knock sensor (KS) and the 2 bolts.
 - Tighten to 20 Nm (15 lb-ft).

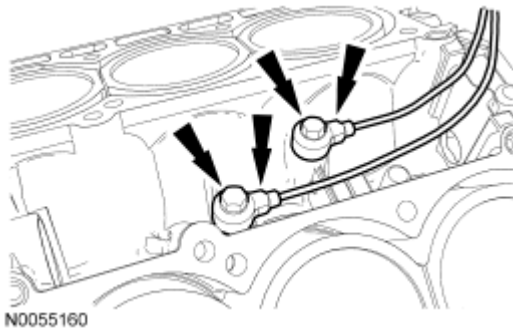


Fig. 612: Locating Knock Sensor (KS) Bolts
Courtesy of FORD MOTOR CO.

NOTE: Apply clean engine coolant to the O-ring seals prior to installation.

14. Using new O-ring seals, install the coolant tube.

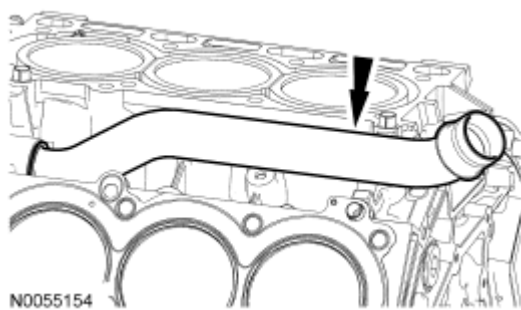
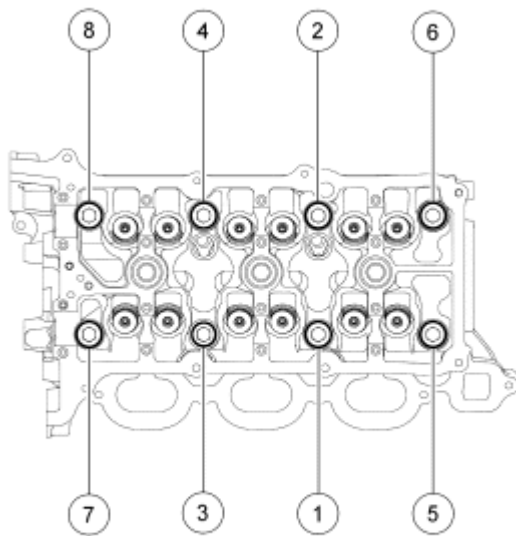


Fig. 613: Identifying Coolant Tube
Courtesy of FORD MOTOR CO.

15. Install a new gasket, the RH cylinder head and 8 new bolts. Tighten in the sequence shown in 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.

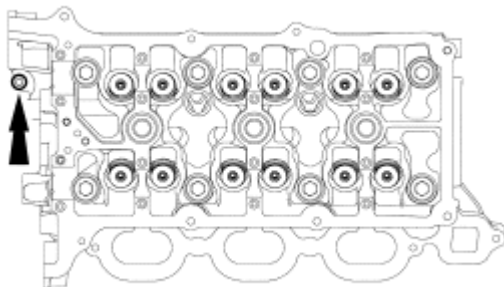


N0054884

Fig. 614: Installing RH Cylinder Head Bolts In Sequence
Courtesy of FORD MOTOR CO.

16. Install the bolt.

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

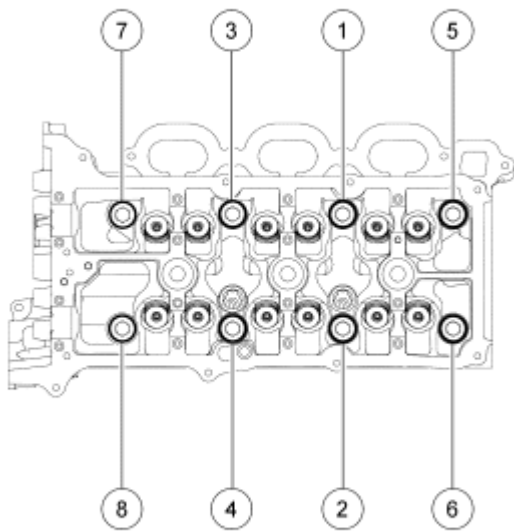


N0055173

Fig. 615: 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 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.

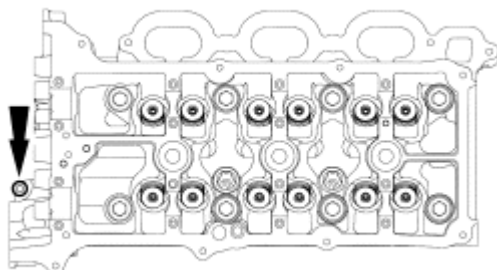


N0054898

Fig. 616: 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. 617: 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.

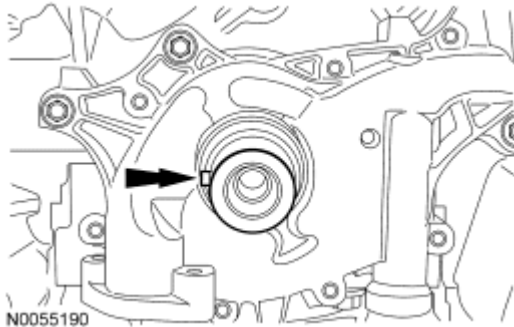


Fig. 618: Positioning Crankshaft Dowel Pin In 9 O'clock Position
Courtesy of FORD MOTOR CO.

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, RH similar.

20. Install the valve tappets.

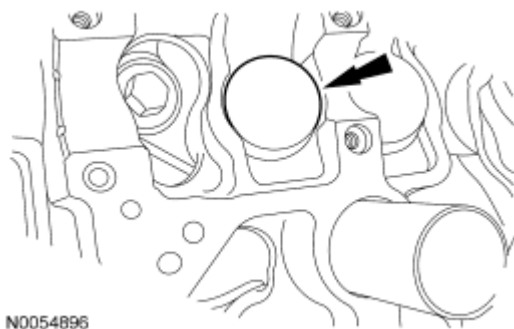


Fig. 619: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

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.

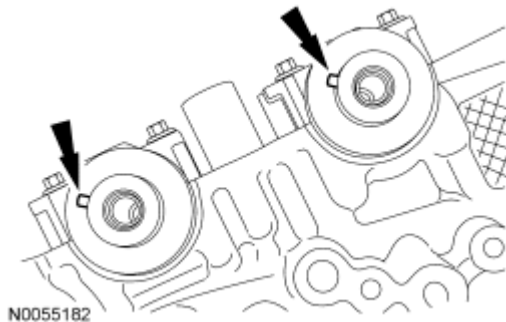


Fig. 620: Positioning Camshafts Onto RH Cylinder Head In Neutral Position
Courtesy of FORD MOTOR CO.

CAUTION: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions. If not reassembled in their original positions, severe engine damage may occur.

22. Install the 8 camshaft caps and the 16 bolts.
- Tighten in the sequence shown to 10 Nm (89 lb-in).

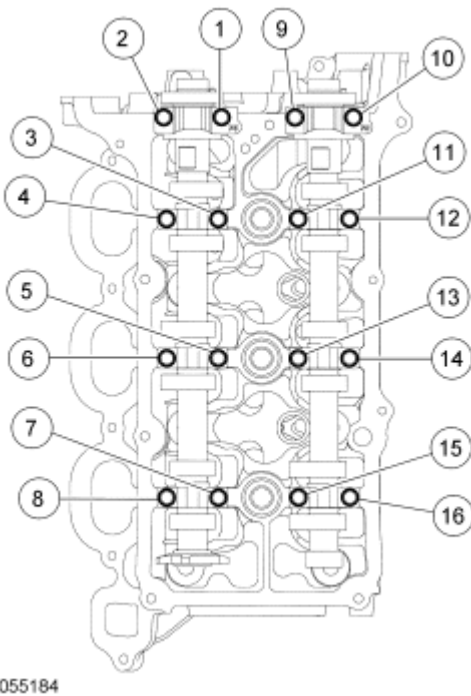


Fig. 621: Installing Camshaft Caps & Bolts In Sequence
Courtesy of FORD MOTOR CO.

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.

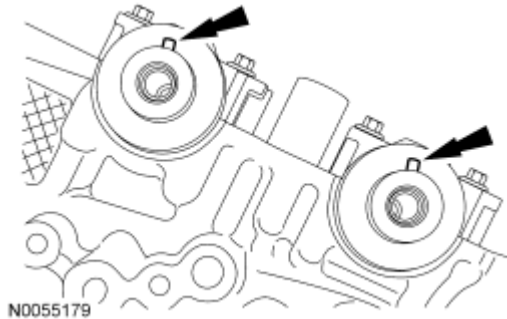
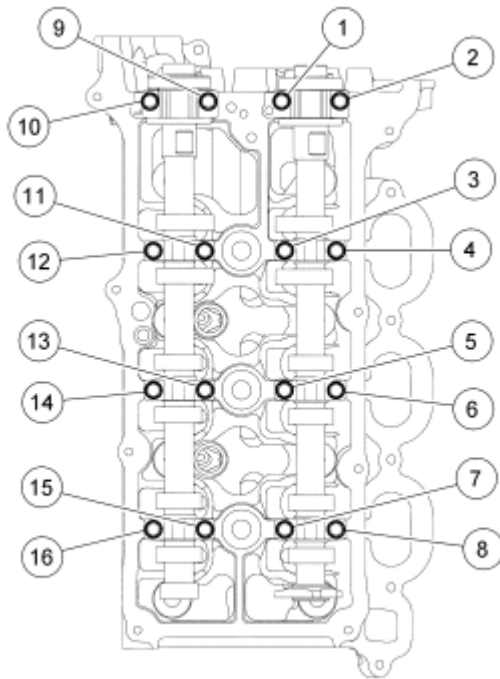


Fig. 622: Positioning Camshafts Onto LH Cylinder Head In Neutral Position
Courtesy of FORD MOTOR CO.

CAUTION: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions. If not reassembled in their original positions, severe engine damage may occur.

24. Install the 8 camshaft caps and the 16 bolts.
- Tighten in the sequence shown to 10 Nm (89 lb-in).



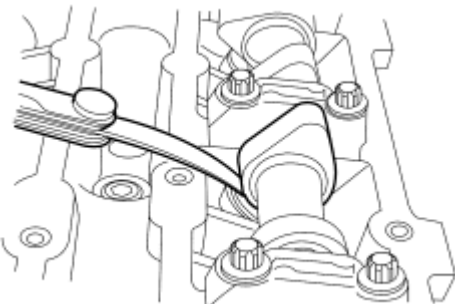
N0055185

Fig. 623: 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. 624: 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).

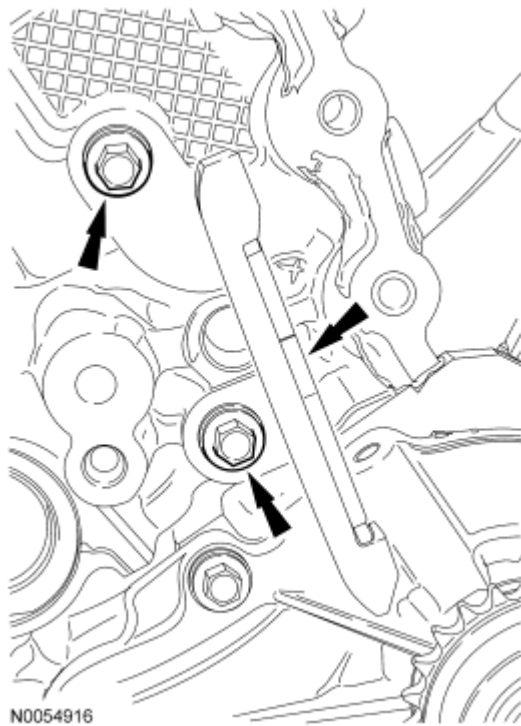


Fig. 625: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

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

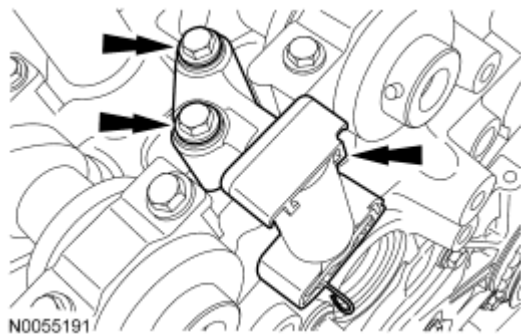


Fig. 626: Locating RH Secondary Timing Chain Tensioner & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

28. Rotate the RH camshafts to the top dead center position and install the special tool on the flats of the camshafts.

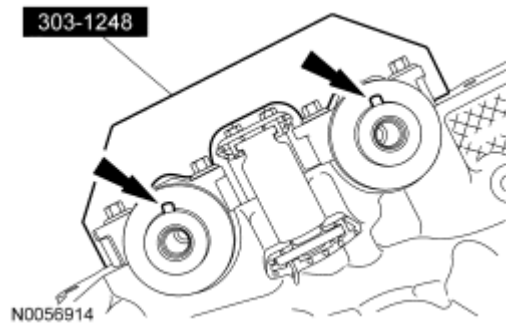


Fig. 627: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

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.

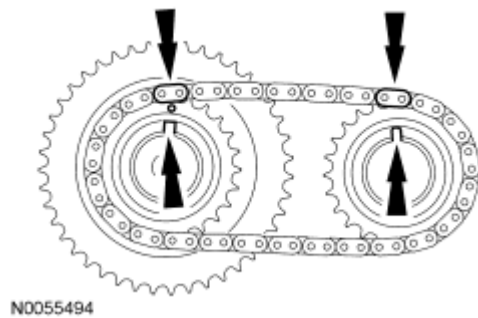


Fig. 628: Aligning RH Exhaust Camshaft Sprocket & RH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

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

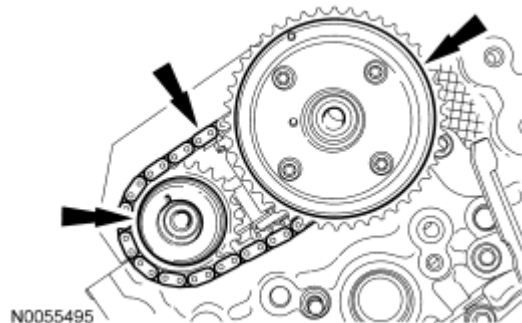


Fig. 629: Positioning RH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

31. 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.

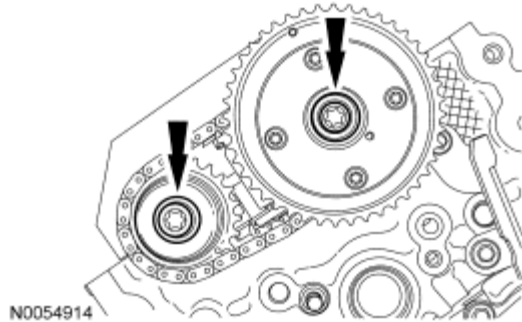


Fig. 630: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

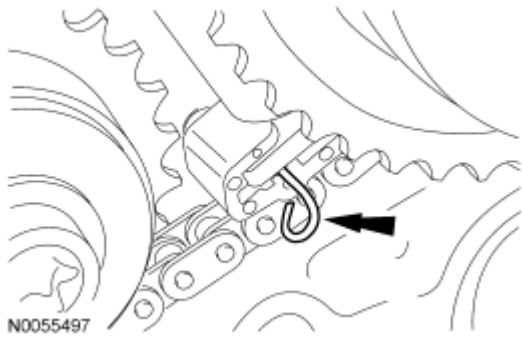


Fig. 631: Identifying Lock Pin On RH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

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

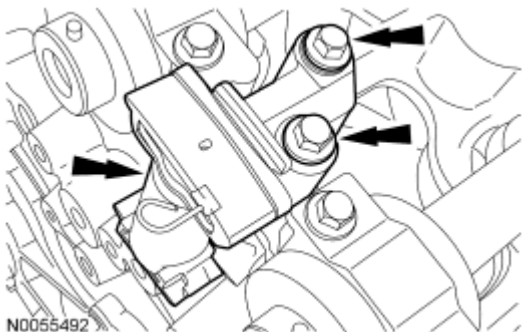


Fig. 632: Locating LH Secondary Timing Chain Tensioner & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

34. Rotate the LH camshafts to the top dead center position and install the special tool on the flats of the camshafts.

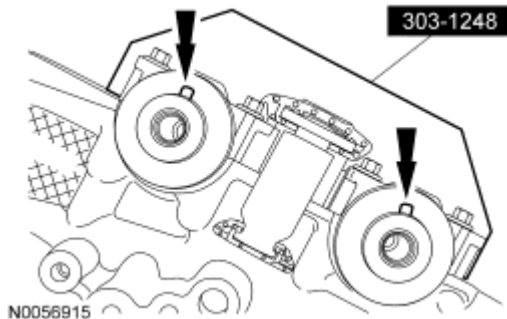


Fig. 633: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

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.

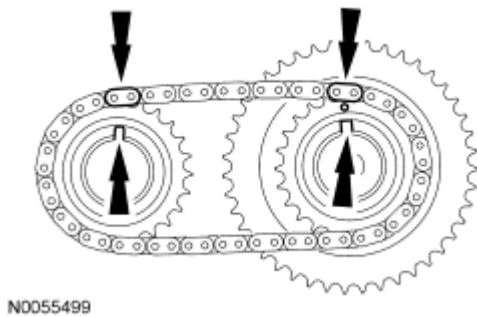


Fig. 634: Aligning LH Exhaust Camshaft Sprocket & LH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

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

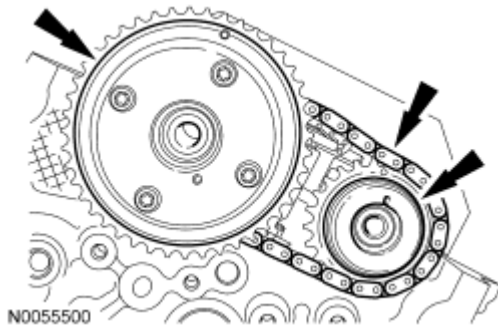


Fig. 635: Positioning LH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

37. 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.

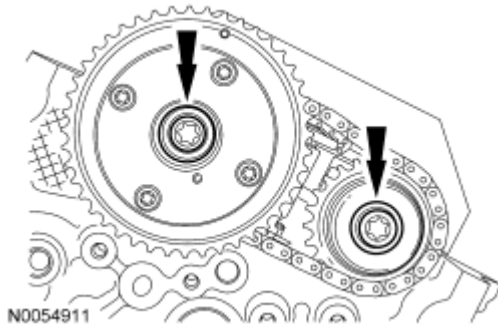


Fig. 636: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

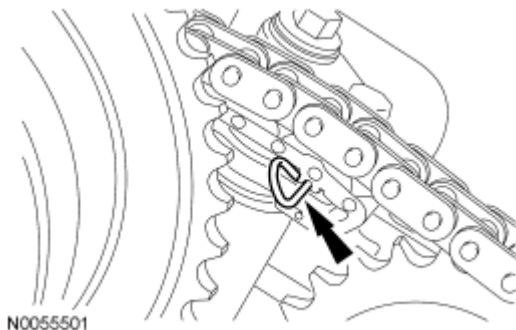


Fig. 637: Locating Lock Pin On LH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

39. Rotate the crankshaft clockwise 60 degrees to the top dead center position (crankshaft dowel pin at 11 o'clock).

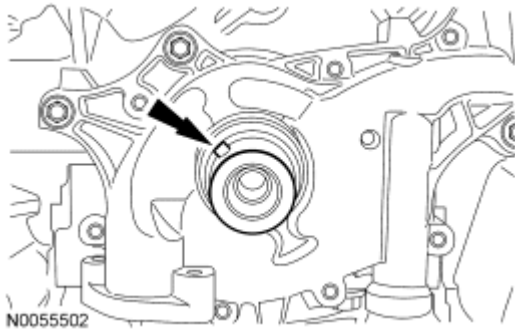


Fig. 638: Identifying Crankshaft Dowel Pin
Courtesy of FORD MOTOR CO.

40. Install the crankshaft timing chain sprocket.

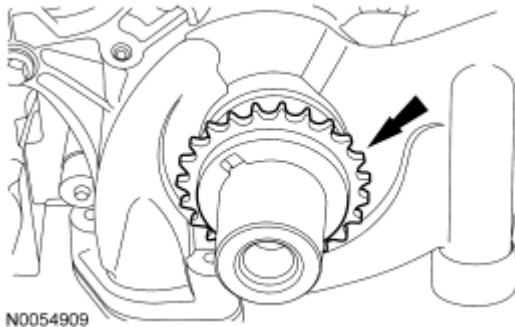
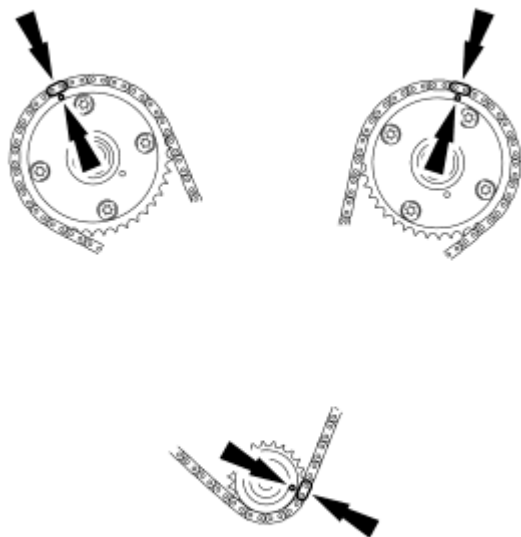


Fig. 639: Locating Crankshaft Timing Chain Sprocket
Courtesy of FORD MOTOR CO.

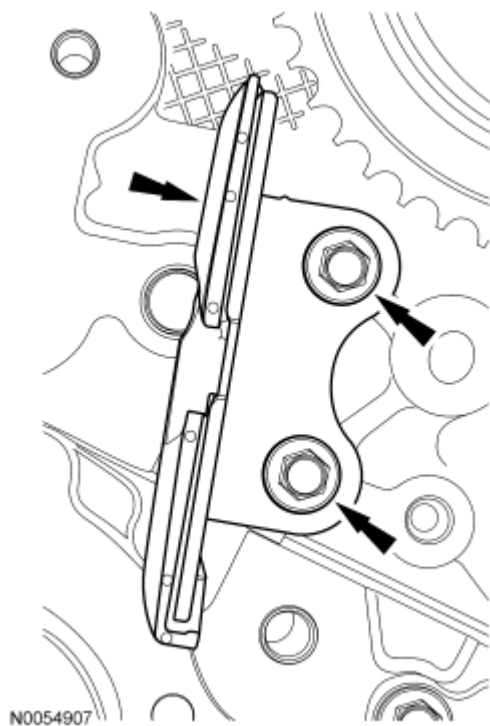
41. Install the primary timing chain with the colored links aligned with the timing marks on the VCT assemblies and the crankshaft sprocket.



N0055503

Fig. 640: 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. 641: 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).

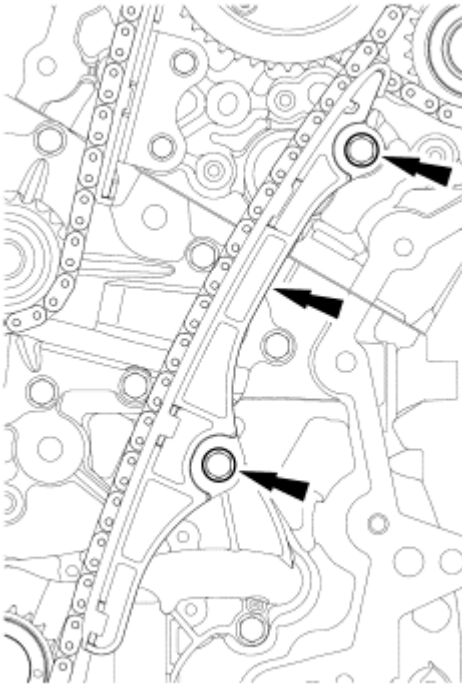


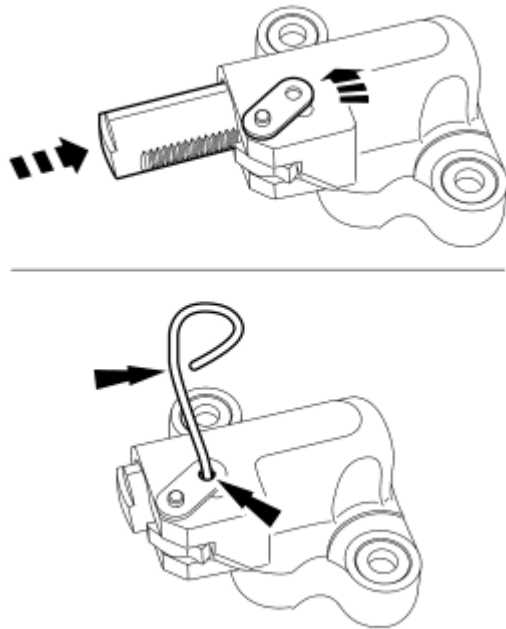
Fig. 642: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

44. Install the primary timing chain tensioner arm.



Fig. 643: 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.

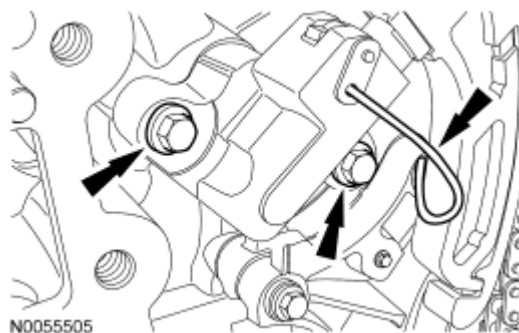


N0055504

Fig. 644: 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. 645: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

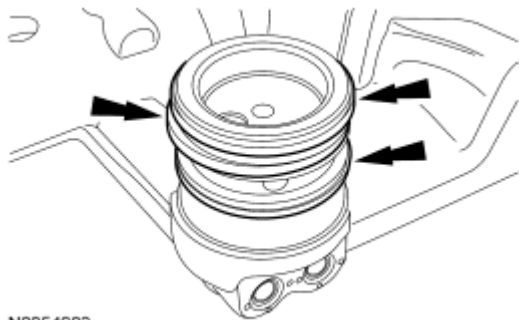
47. As a post-check, verify correct alignment of all timing marks.



N0055496

Fig. 646: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

48. Install new VCT housing seals.



N0054903

Fig. 647: 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 to 10 Nm (89 lb-in).

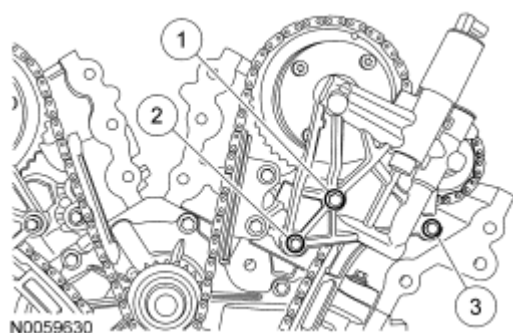


Fig. 648: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 to 10 Nm (89 lb-in).

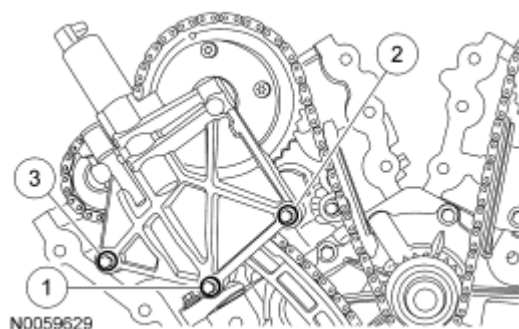


Fig. 649: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

51. Install the special tools.

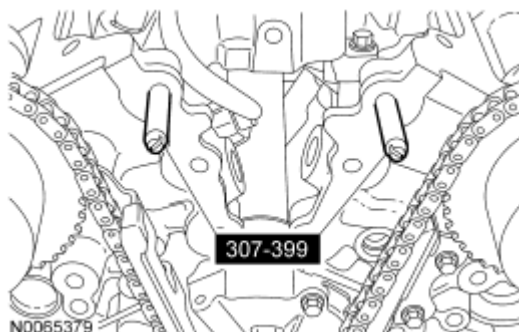


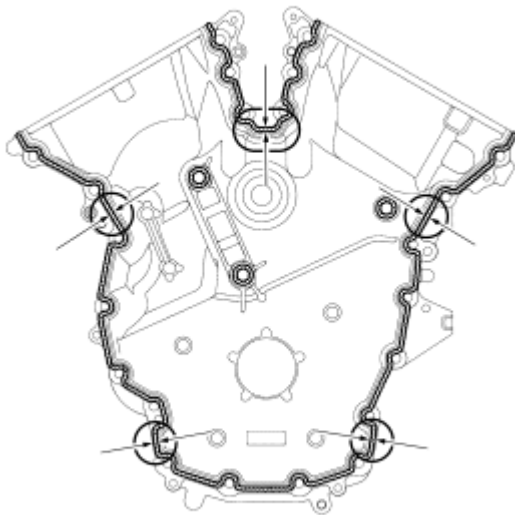
Fig. 650: Identifying Special Tool (307-399)
Courtesy of FORD MOTOR CO.

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. Follow the directions on the packaging. 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)

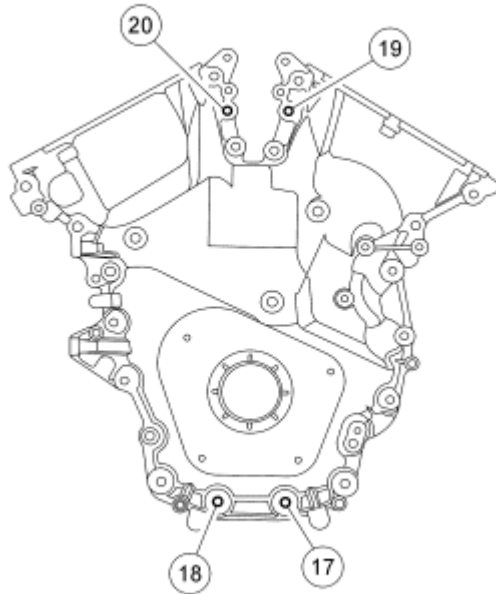


N0068283

Fig. 651: 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).



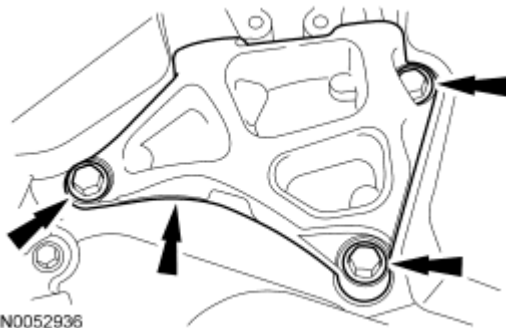
N0068108

Fig. 652: 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.



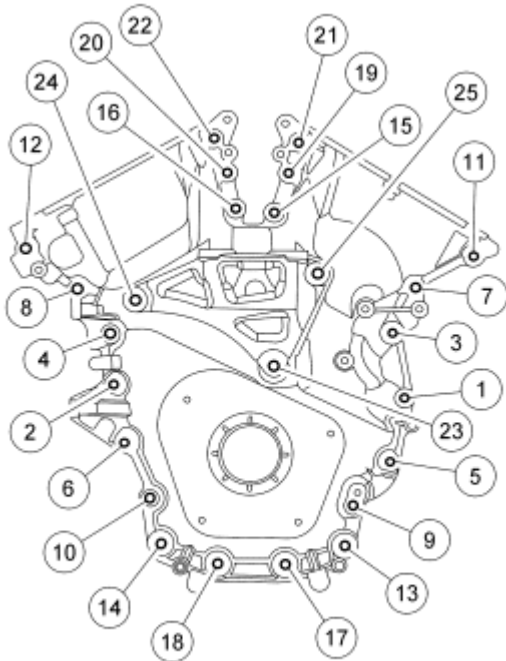
N0052936

Fig. 653: 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 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).

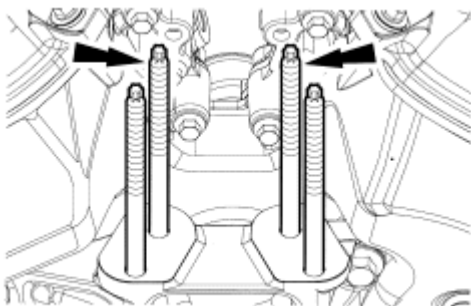


N0068109

Fig. 654: 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. 655: 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).

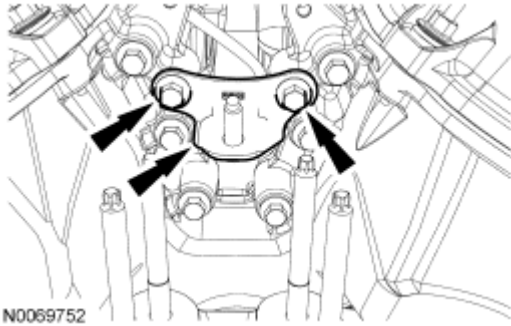


Fig. 656: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

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.

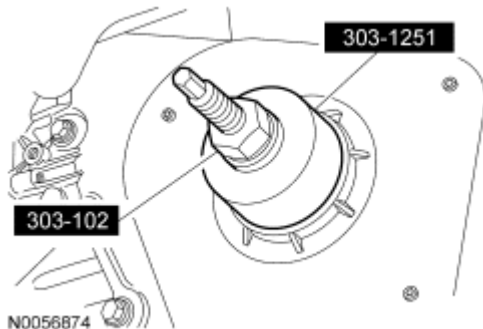


Fig. 657: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

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

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

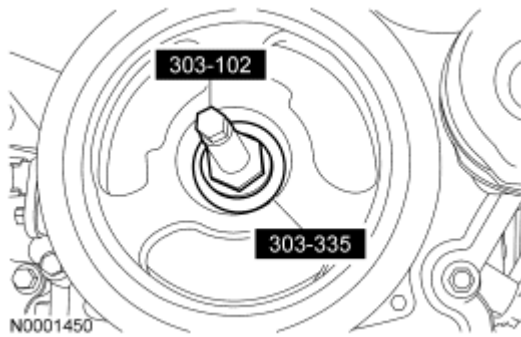


Fig. 658: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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.

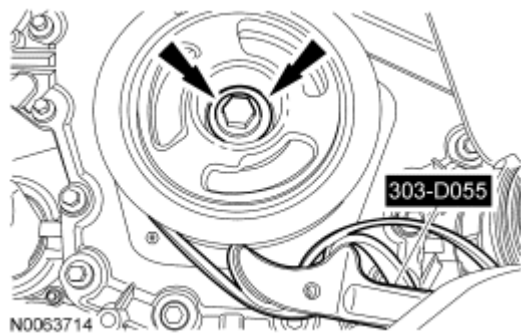


Fig. 659: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

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, VCT seal installation similar.

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

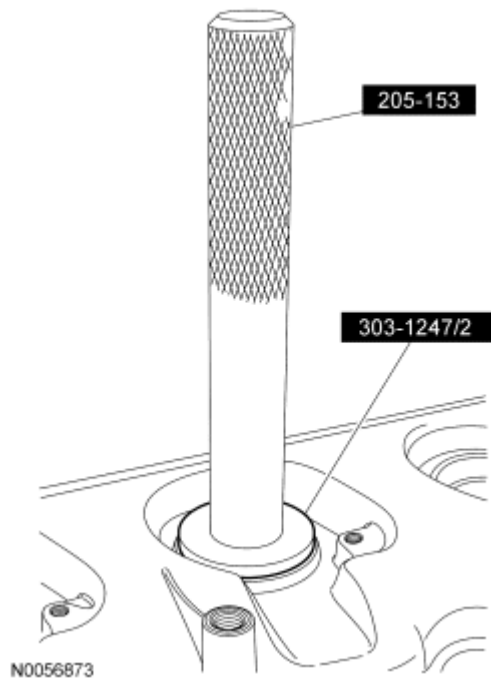


Fig. 660: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

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. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

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

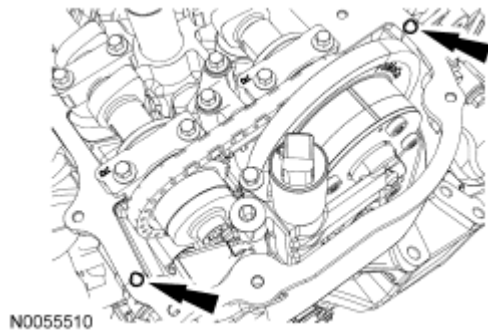


Fig. 661: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
Courtesy of FORD MOTOR CO.

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).

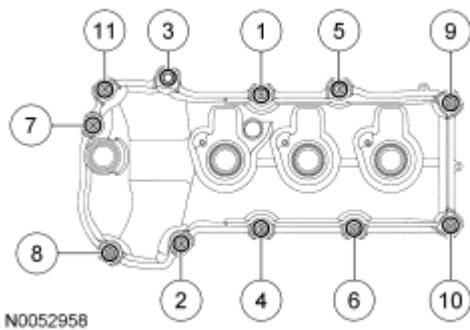


Fig. 662: Installing RH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

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. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

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

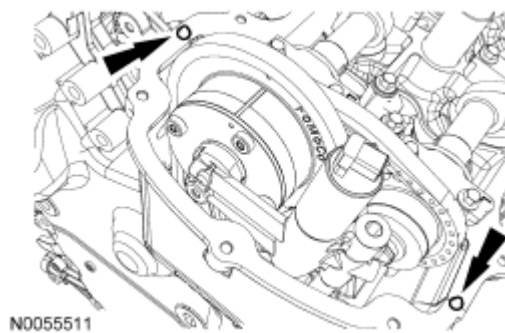


Fig. 663: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
Courtesy of FORD MOTOR CO.

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

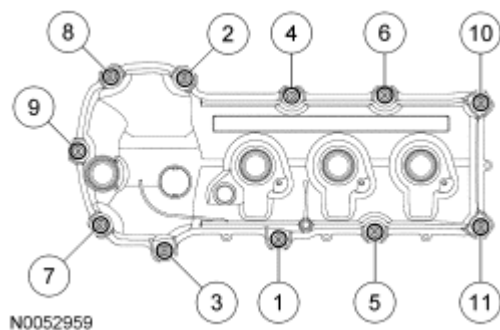


Fig. 664: Installing LH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

67. Install the 6 coil-on-plug assemblies and the 6 bolts.
- Tighten to 7 Nm (62 lb-in).

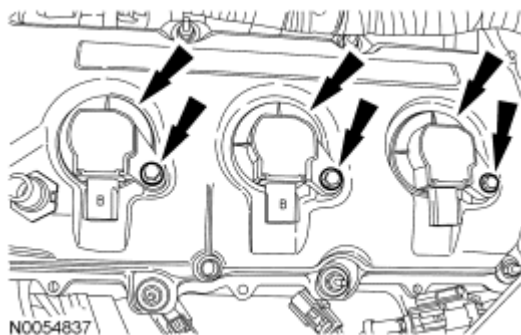


Fig. 665: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Engine without oil cooler shown, engine with oil cooler similar.

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).

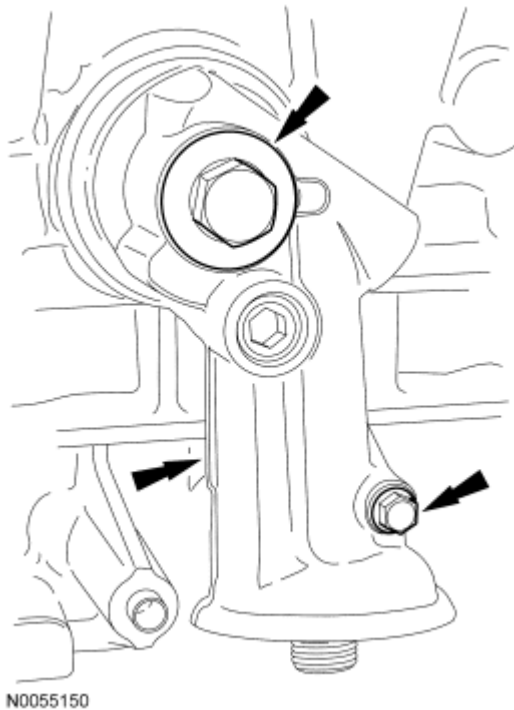
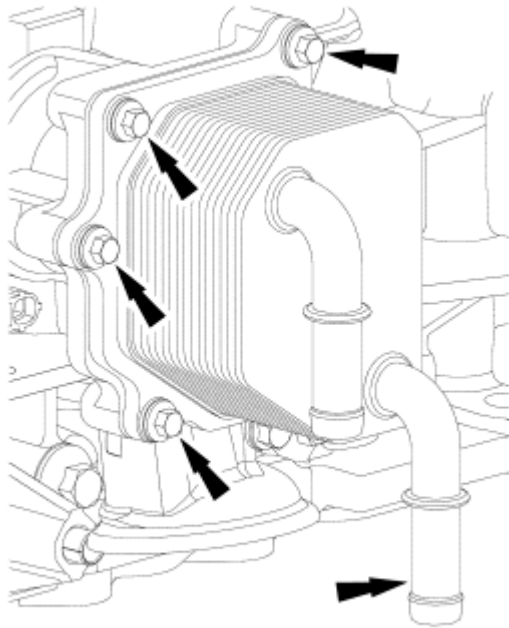


Fig. 666: Locating Oil Filter Adapter & Bolts
Courtesy of FORD MOTOR CO.

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

69. If equipped, install a new oil cooler, new gaskets and the 6 bolts.

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

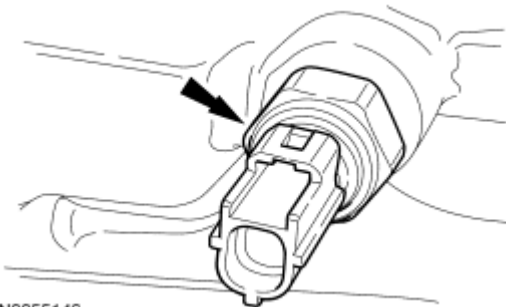


N0055407

Fig. 667: Identifying Oil Cooler, Gaskets & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Apply thread sealant with PTFE to the engine oil pressure (EOP) switch threads.

70. Install the EOP switch.
- Tighten to 18 Nm (13 lb-ft).



N0055146

Fig. 668: Identifying EOP Switch
Courtesy of FORD MOTOR CO.

71. Install the crankshaft position (CKP) sensor and install the bolt.
- Tighten to 10 Nm (89 lb-in).

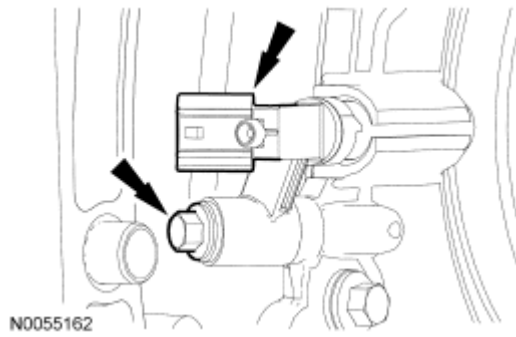


Fig. 669: Identifying CKP Sensor & Bolt
Courtesy of FORD MOTOR CO.

72. Install LH camshaft position (CMP) sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

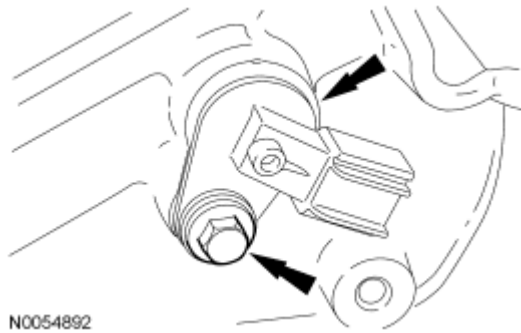


Fig. 670: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

73. Install and connect the cylinder head temperature (CHT) sensor jumper harness.

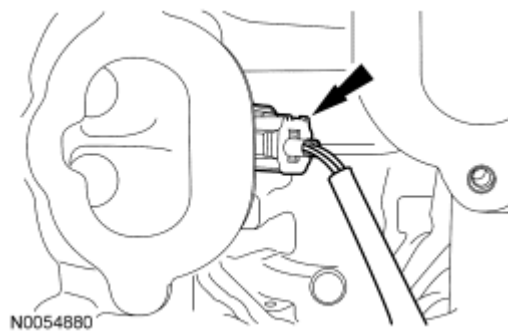


Fig. 671: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

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

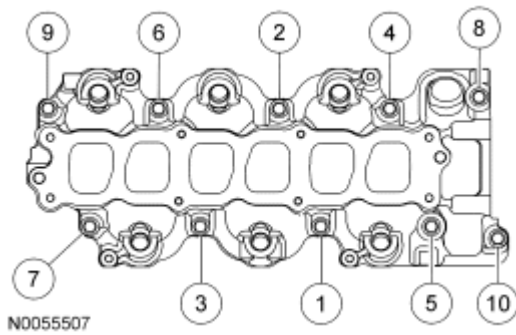


Fig. 672: Installing Lower Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

75. Using a new gasket, install the thermostat housing and the 3 bolts.
- Tighten to 10 Nm (89 lb-in).

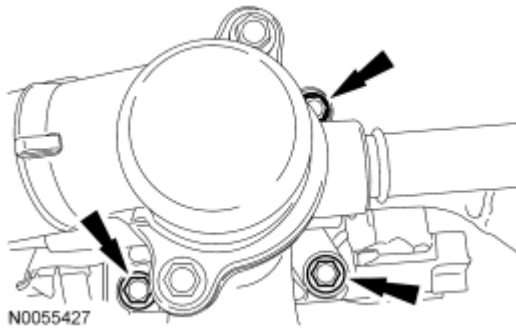
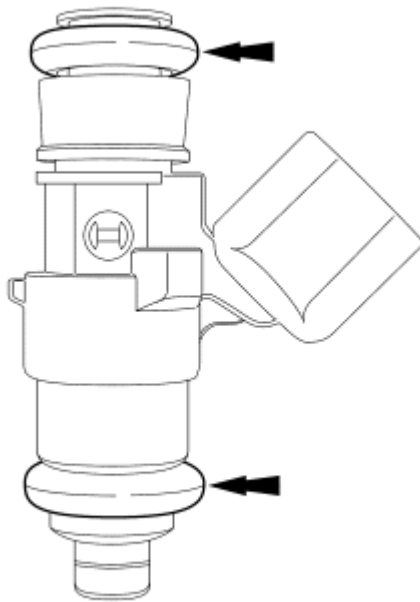


Fig. 673: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings can cause the fuel system to leak. Do not reuse the O-ring seals.

NOTE: The upper and lower O-ring seals are not interchangeable.

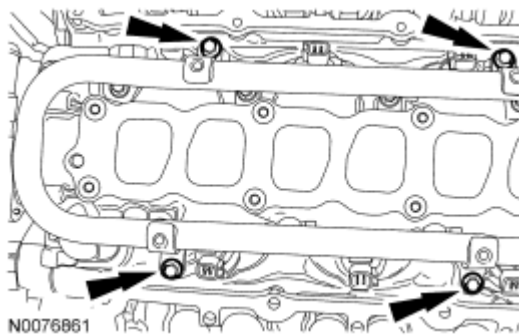
76. Install new fuel injector O-ring seals.
- Remove the retaining clips and separate the fuel injectors from the fuel rail.
 - Remove and discard the O-ring seals.
 - Install new O-ring seals and lubricate with clean engine oil.
 - Install the fuel injectors and the retaining clips onto the fuel rail.



N0055508

Fig. 674: Identifying Fuel Injector O-Ring Seals
Courtesy of FORD MOTOR CO.

77. Install the fuel rail and injectors as an assembly and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0076861

Fig. 675: Identifying Fuel Rail And Injectors
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

78. Install the catalytic converter bracket and the 2 bolts.
 - Tighten to 48 Nm (35 lb-ft).

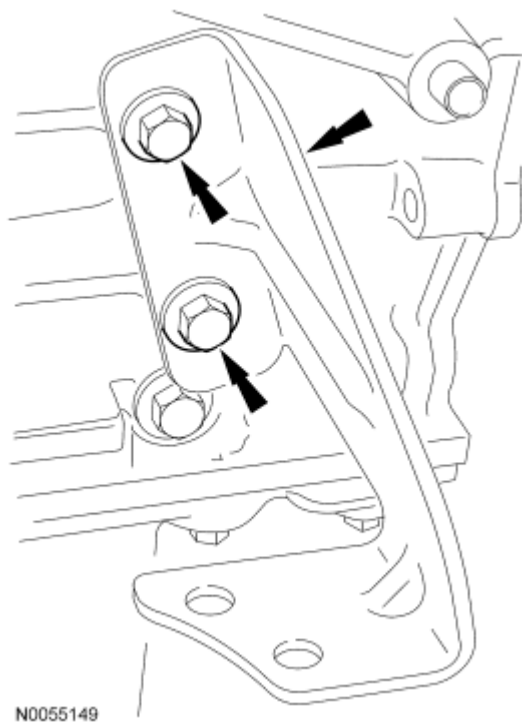


Fig. 676: Locating Catalytic Converter Bracket & Bolts
Courtesy of FORD MOTOR CO.

All vehicles

79. Install the RH CMP sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

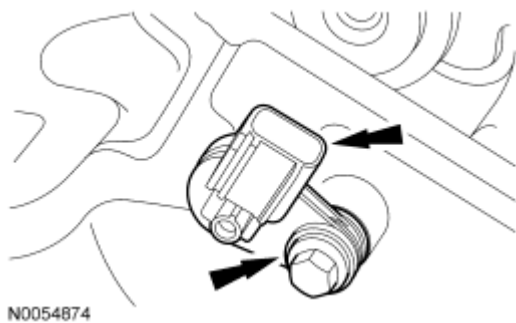


Fig. 677: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

80. Install the engine lifting eye and the 2 bolts.
 - Tighten to 24 Nm (18 lb-ft).

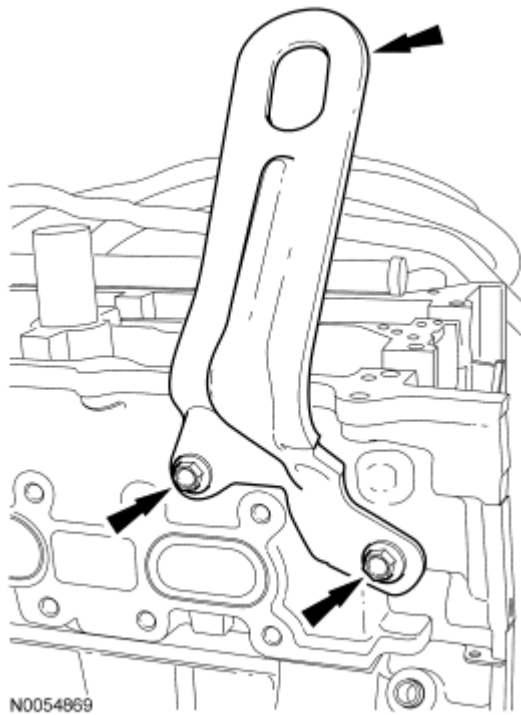


Fig. 678: Locating Engine Lifting Eye & Bolts
Courtesy of FORD MOTOR CO.

81. Install the cover and the pin-type retainer.

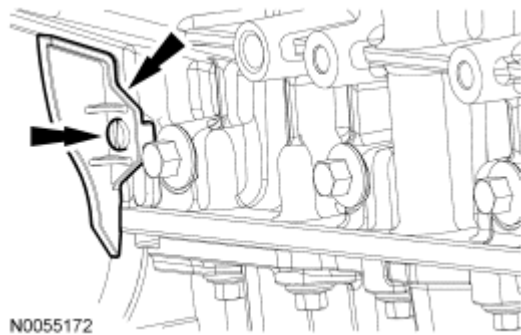


Fig. 679: Locating Pin-Type Retainer & Cover
Courtesy of FORD MOTOR CO.

82. Install the LH cylinder block drain plug.
- Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

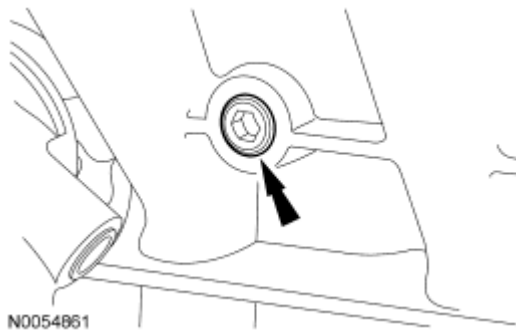


Fig. 680: Locating LH Cylinder Block Drain Plug
 Courtesy of FORD MOTOR CO.

83. Install the RH cylinder block drain plug or, if equipped, the block heater.
 - Tighten to 40 Nm (30 lb-ft).

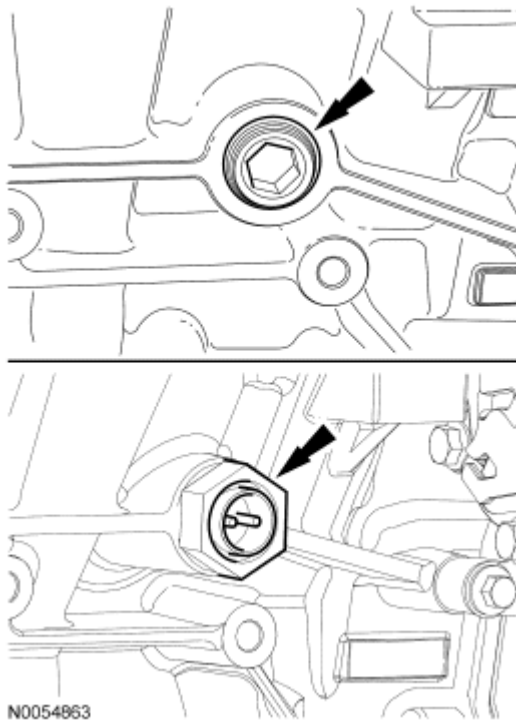


Fig. 681: Locating RH Cylinder Block Drain Plug
 Courtesy of FORD MOTOR CO.

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

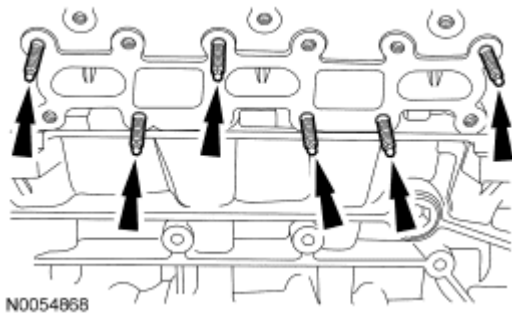


Fig. 682: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

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

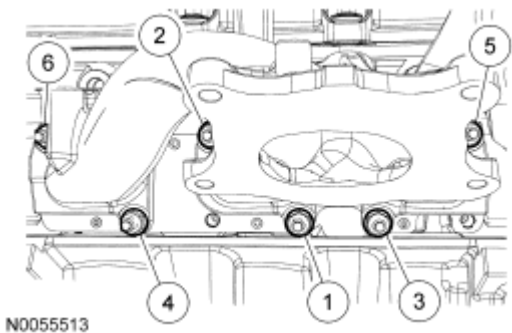


Fig. 683: Installing RH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

86. Install the RH exhaust manifold heat shield and the 3 bolts.
- Tighten to 14 Nm (10 lb-ft).

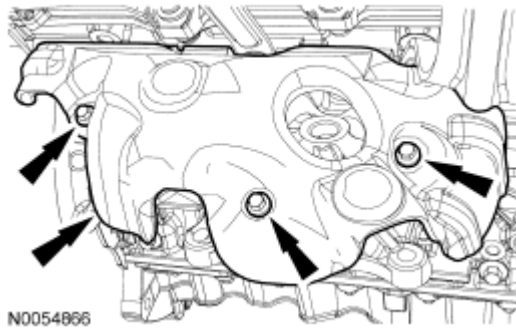


Fig. 684: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

87. Using a new gasket, install the RH catalytic converter and the 4 new nuts.
- Tighten to 40 Nm (30 lb-ft).

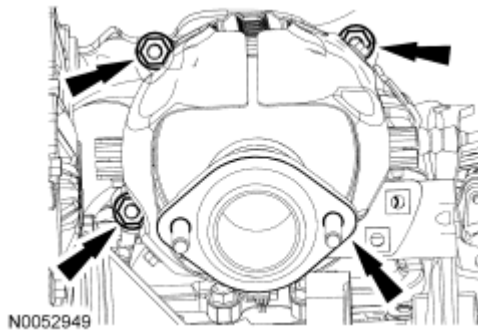


Fig. 685: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

All vehicles

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

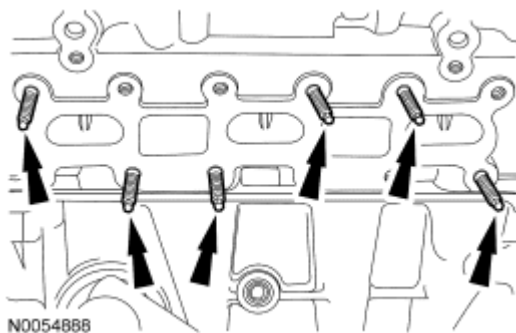


Fig. 686: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

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

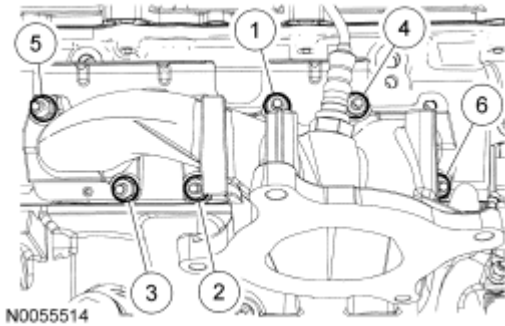


Fig. 687: Installing LH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

90. Install the LH exhaust manifold heat shield and the 3 bolts.
- Tighten to 14 Nm (10 lb-ft).

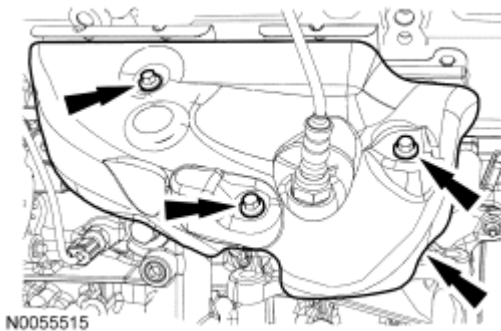


Fig. 688: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

91. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown).
- Tighten to 40 Nm (30 lb-ft).

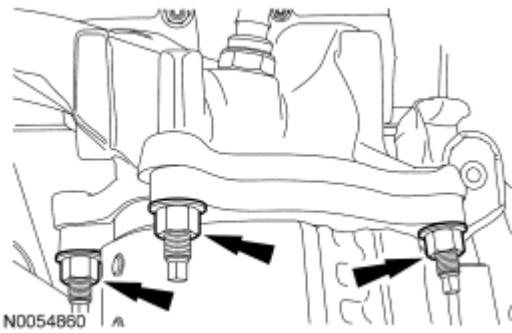


Fig. 689: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

92. Install the accessory drive belt tensioner and the 3 bolts.
 - Tighten to 11 Nm (8 lb-ft).

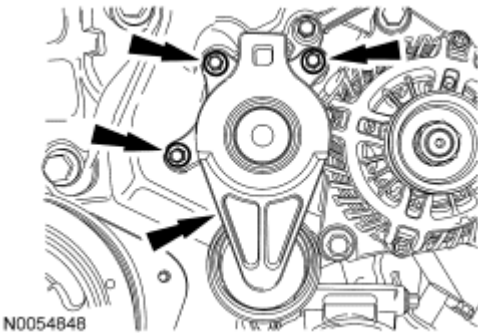


Fig. 690: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

93. Install the power steering pump and the 3 bolts.
 - Tighten to 24 Nm (18 lb-ft).

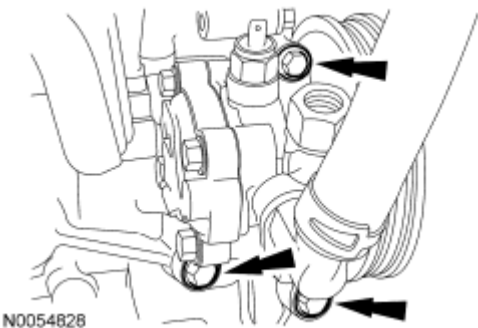


Fig. 691: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

94. Install the generator, the bolt and the nut.
 - Tighten to 47 Nm (35 lb-ft).

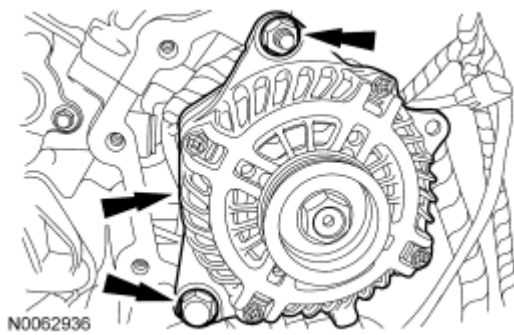


Fig. 692: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

95. Position the wiring harness onto the engine.
96. Connect the EOP switch electrical connector and the wiring harness pin-type retainer.

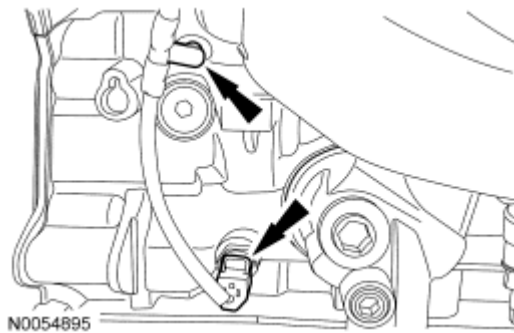


Fig. 693: Locating Engine Oil Pressure (EOP) Switch Electrical Connector & Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

97. Attach the wiring harness retainer to the generator.

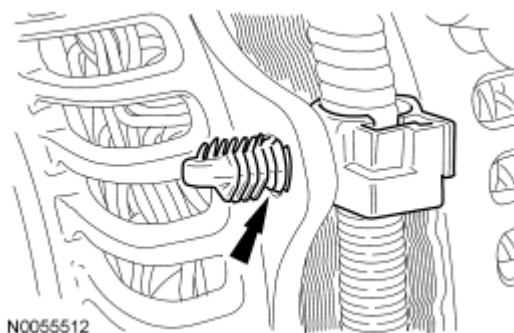


Fig. 694: Identifying Wiring Harness Retainer From Generator
Courtesy of FORD MOTOR CO.

98. Connect the generator electrical connector.

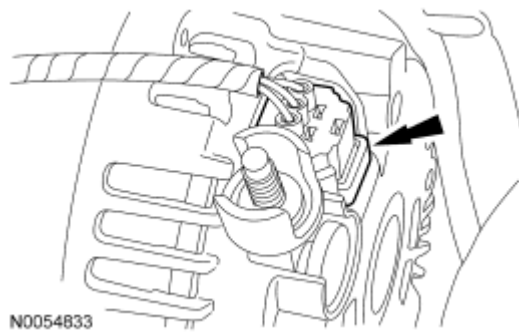


Fig. 695: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

99. Connect the generator B+ cable and install the nut.
- Tighten to 6 Nm (53 lb-in).

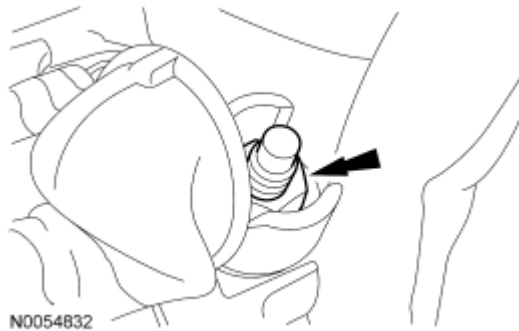


Fig. 696: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

100. Connect the A/C compressor electrical connector.

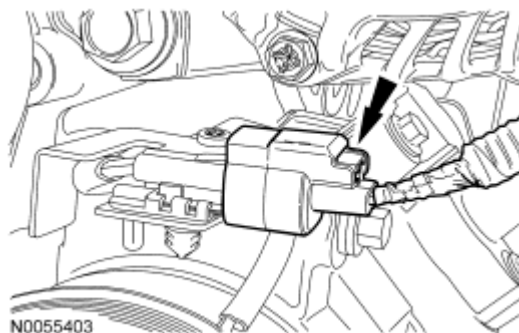


Fig. 697: Identifying A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

101. Connect the CKP sensor electrical connector.

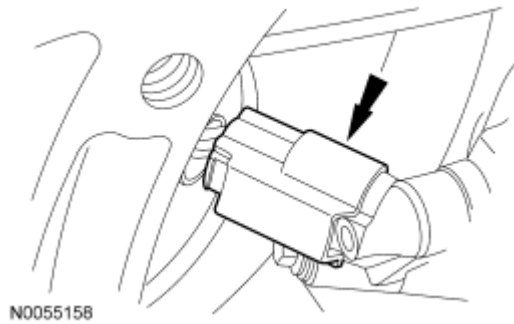


Fig. 698: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
 Courtesy of FORD MOTOR CO.

102. Install the wiring harness grommet.

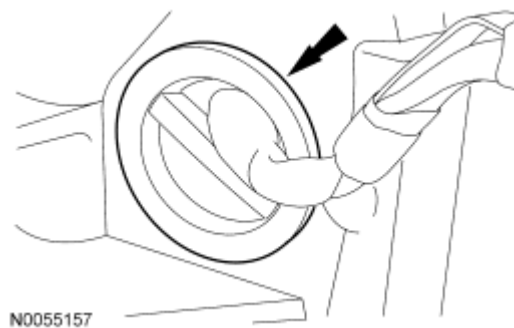


Fig. 699: Identifying Wiring Harness Grommet
 Courtesy of FORD MOTOR CO.

103. Install the wiring harness retainer stud bolt.
 - Tighten to 10 Nm (89 lb-in).



Fig. 700: Identifying Wiring Harness Retainer Stud Bolt
 Courtesy of FORD MOTOR CO.

104. Install the heat shield, the nut and the bolt.
 - Tighten to 10 Nm (89 lb-in).

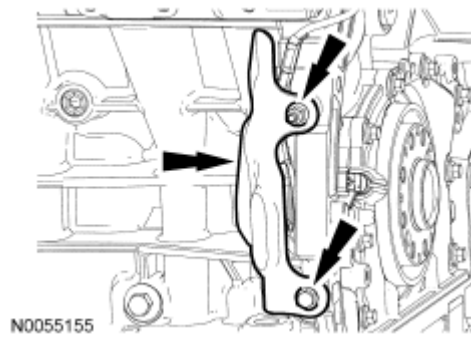


Fig. 701: Identifying Heat Shield, Nut & Bolt
Courtesy of FORD MOTOR CO.

105. Install the wiring harness retainer bolt on the rear of the LH cylinder head.
 - Tighten to 10 Nm (89 lb-in).

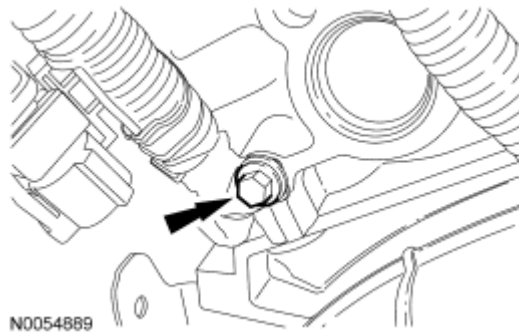


Fig. 702: Identifying Wiring Harness Retainer Bolt From Rear Of LH Cylinder Head
Courtesy of FORD MOTOR CO.

106. Attach all of the wiring harness retainers to the LH valve cover and stud bolts.
107. Connect the LH camshaft VCT solenoid electrical connector.

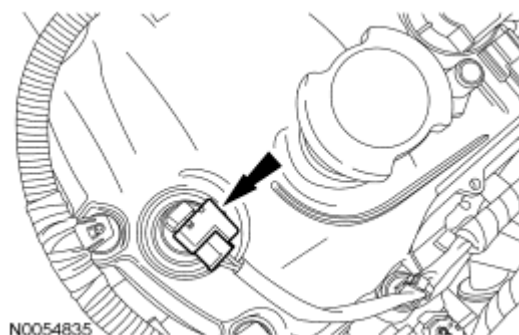


Fig. 703: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

108. Connect the 3 LH coil-on-plug electrical connectors.

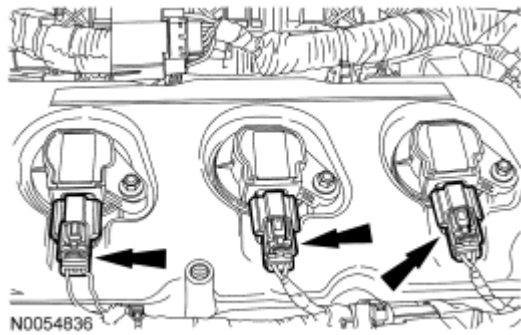


Fig. 704: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

109. Connect the LH heated oxygen sensor (HO2S) electrical connector.

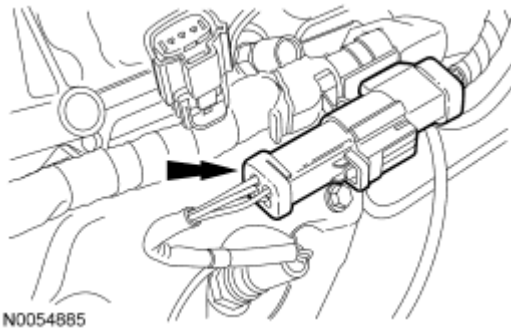


Fig. 705: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

110. Connect the LH catalyst monitor sensor electrical connector.

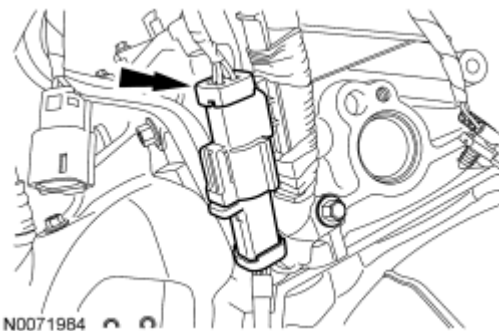


Fig. 706: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

111. Connect the LH CMP sensor electrical connector.

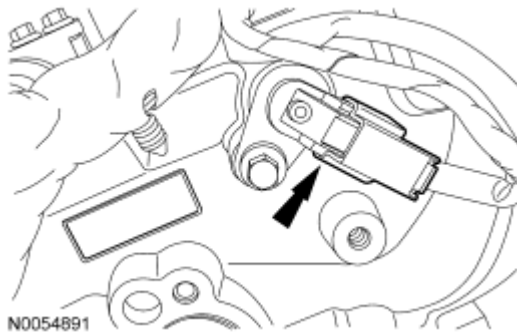


Fig. 707: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

112. Connect the CHT sensor electrical connector.

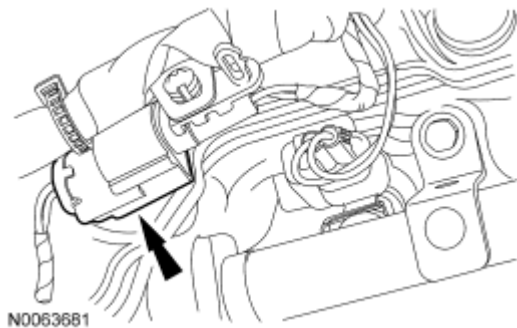


Fig. 708: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

113. Connect the 6 fuel injector electrical connectors (3 shown).

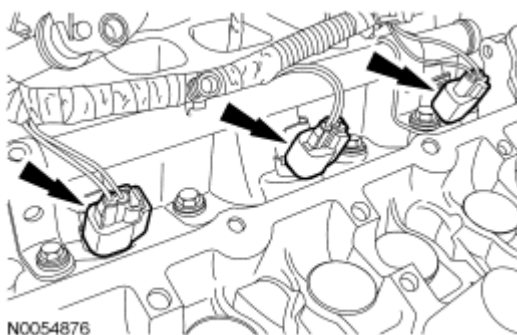


Fig. 709: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

114. Install the ground cable and the bolt.
- Tighten to 10 Nm (89 lb-in).

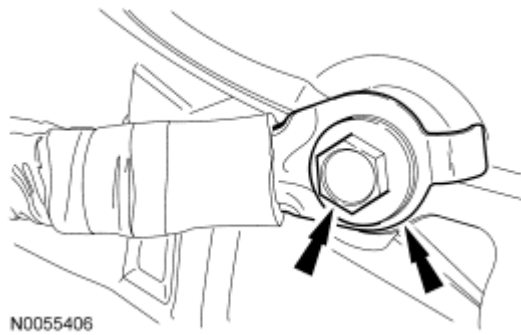


Fig. 710: Locating Ground Cable From RH Cylinder
Courtesy of FORD MOTOR CO.

115. Connect the KS electrical connector.

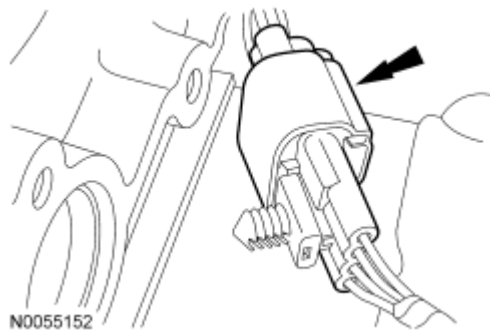


Fig. 711: Locating Knock Sensor (KS) Electrical Connector
Courtesy of FORD MOTOR CO.

116. Connect the RH CMP sensor electrical connector.

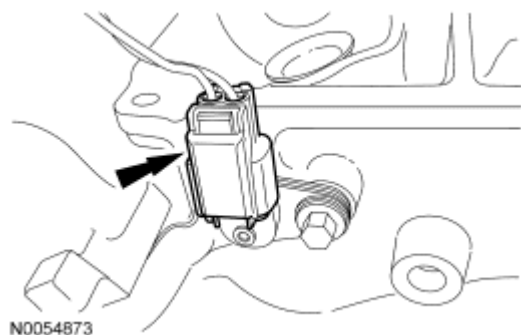


Fig. 712: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

117. Attach all of the wiring harness retainers to the RH valve cover and stud bolts.
118. Connect the 3 RH coil-on-plug electrical connectors.

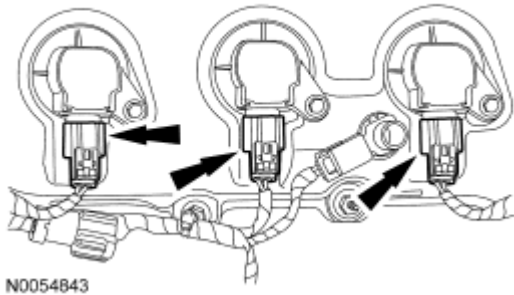


Fig. 713: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

119. Connect the RH VCT solenoid electrical connector.

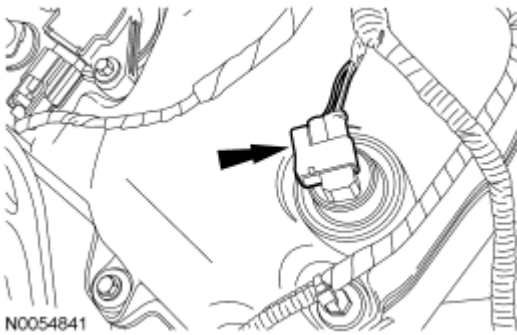


Fig. 714: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

FWD vehicles

120. Connect the RH catalyst monitor sensor electrical connector.

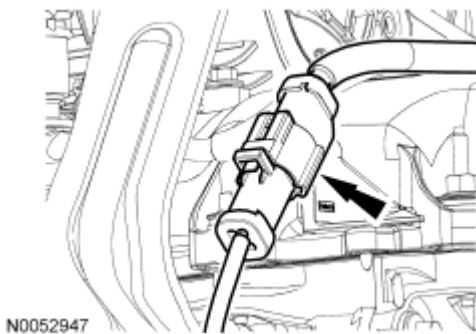


Fig. 715: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

121. Connect the power steering pressure (PSP) switch electrical connector.

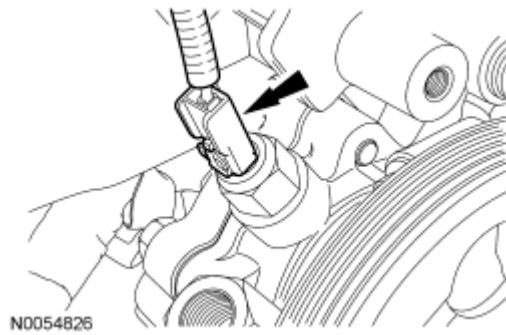


Fig. 716: Locating PSP Switch Electrical Connector
Courtesy of FORD MOTOR CO.

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

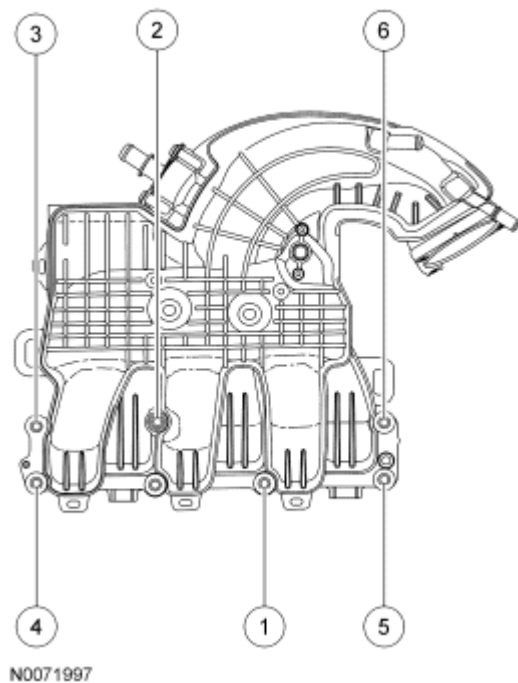


Fig. 717: Identifying Bolt Sequence
Courtesy of FORD MOTOR CO.

123. Install the upper intake manifold support bracket and the 2 bolts (1 shown).
- Tighten to 10 Nm (89 lb-in).

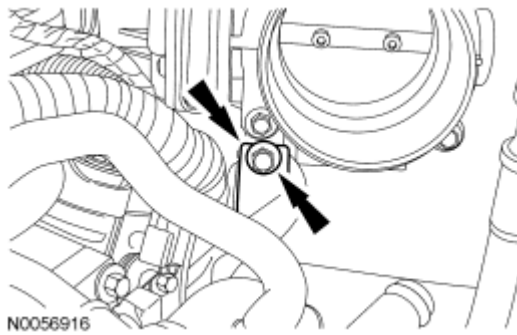


Fig. 718: Identifying Upper Intake Manifold Support Bracket & Bolt
Courtesy of FORD MOTOR CO.

124. Connect the RH HO2S electrical connector.

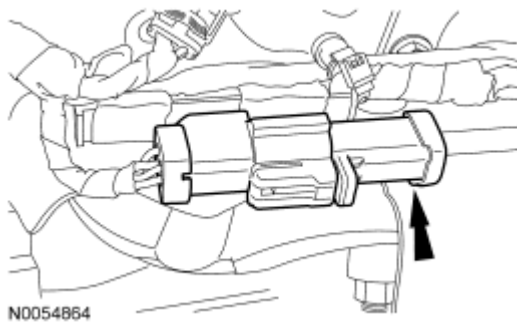


Fig. 719: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

125. Attach the wiring harness retainers to the upper intake manifold.

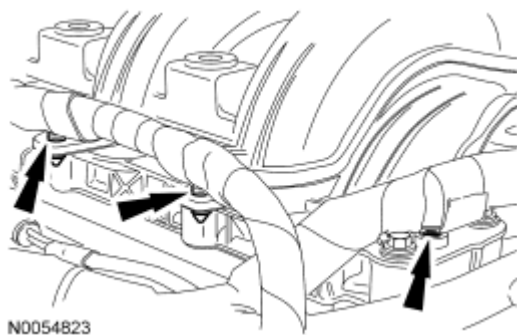


Fig. 720: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

126. Connect the throttle body (TB) electrical connector.

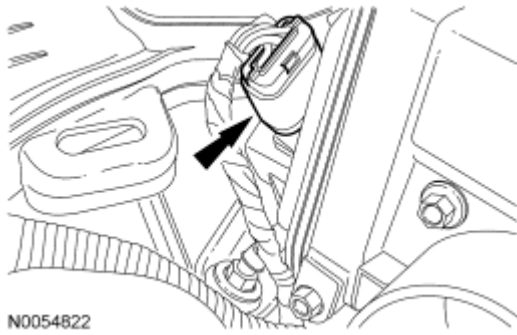


Fig. 721: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

127. Connect the PCV hose to the PCV valve.

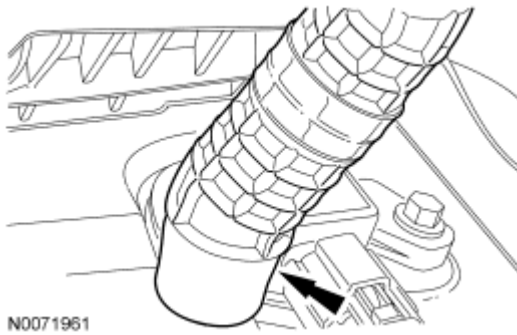


Fig. 722: Identifying PCV Hose
Courtesy of FORD MOTOR CO.

128. If equipped, position the block heater wiring harness onto the engine and attach all of the harness retainers.
129. If equipped, connect the block heater electrical connector and install the heat shield.

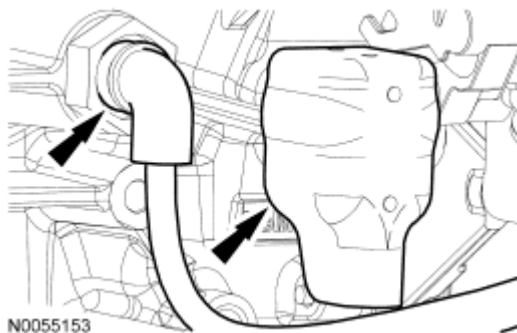


Fig. 723: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

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

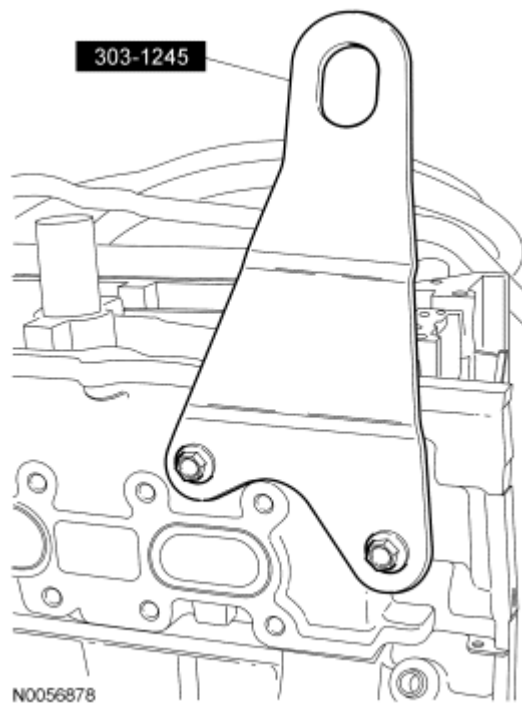


Fig. 724: Installing Special Tool (303-1245) On LH Cylinder Head
Courtesy of FORD MOTOR CO.

131. Using the special tools, remove the engine from the stand.

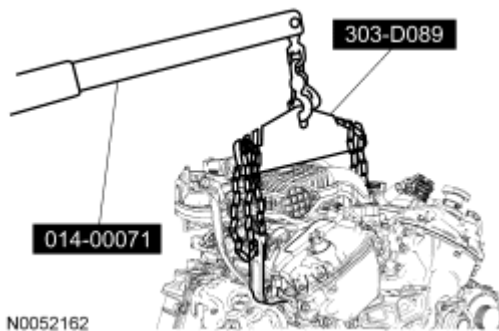


Fig. 725: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

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

132. Position the special tool onto the end of the crankshaft and slide a new crankshaft rear seal onto the tool.

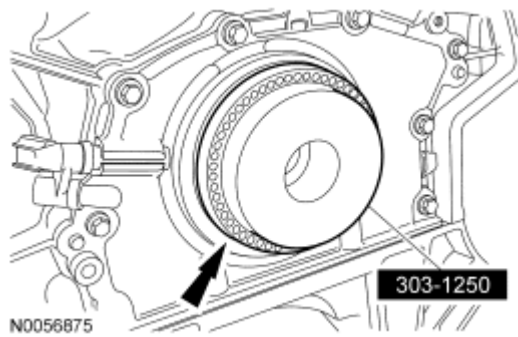


Fig. 726: Positioning Special Tool (303-1250) Onto End Of Crankshaft
Courtesy of FORD MOTOR CO.

133. Using the special tools, install the new crankshaft rear seal.

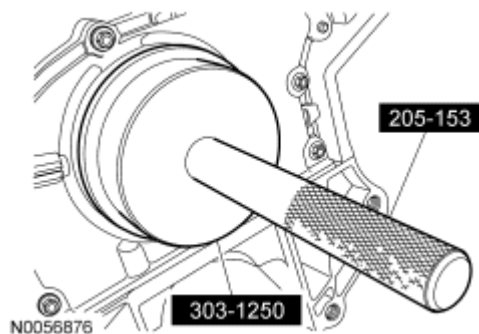


Fig. 727: Installing New Crankshaft Rear Seal Using Special Tools (303-1250) & (205-153)
Courtesy of FORD MOTOR CO.

134. Install the crankshaft sensor ring.

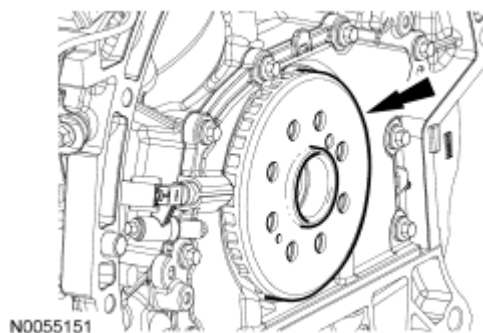


Fig. 728: Identifying Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

135. Install the flexplate and the 8 bolts.

- Tighten to 80 Nm (59 lb-ft).

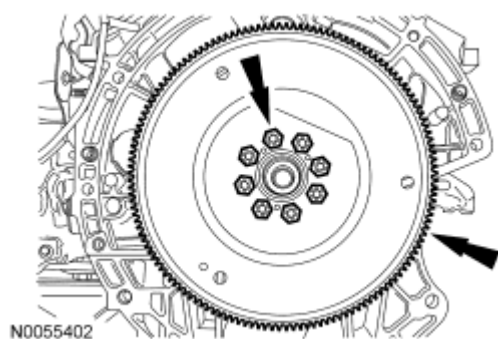





Fig. 729: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

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
 ST1602-A	Spreader Bar	303-D089 (D93P-6001-A3) or equivalent
	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. Align the transaxle to the engine.
2. Install the 5 transaxle-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).

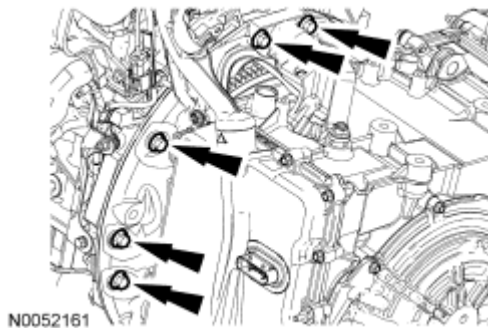


Fig. 730: Locating Transaxle-To-Engine Bolts
Courtesy of FORD MOTOR CO.

3. Install the 2 engine-to-transaxle bolts.
 - Tighten to 48 Nm (35 lb-ft).

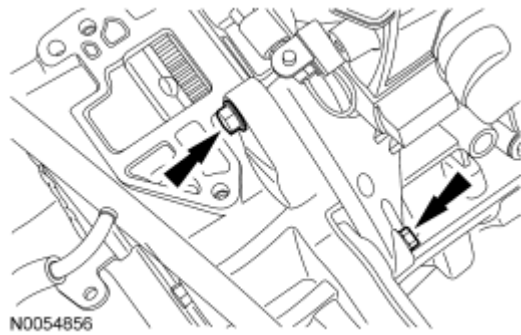


Fig. 731: Locating Engine-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

4. Using the special tools, position the engine and transaxle onto the lift table.

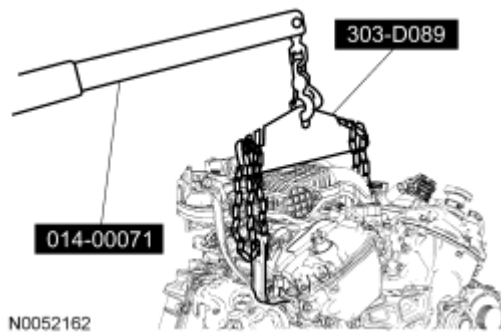


Fig. 732: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

NOTE: Position a block of wood under the transaxle.

5. Install the special tools.

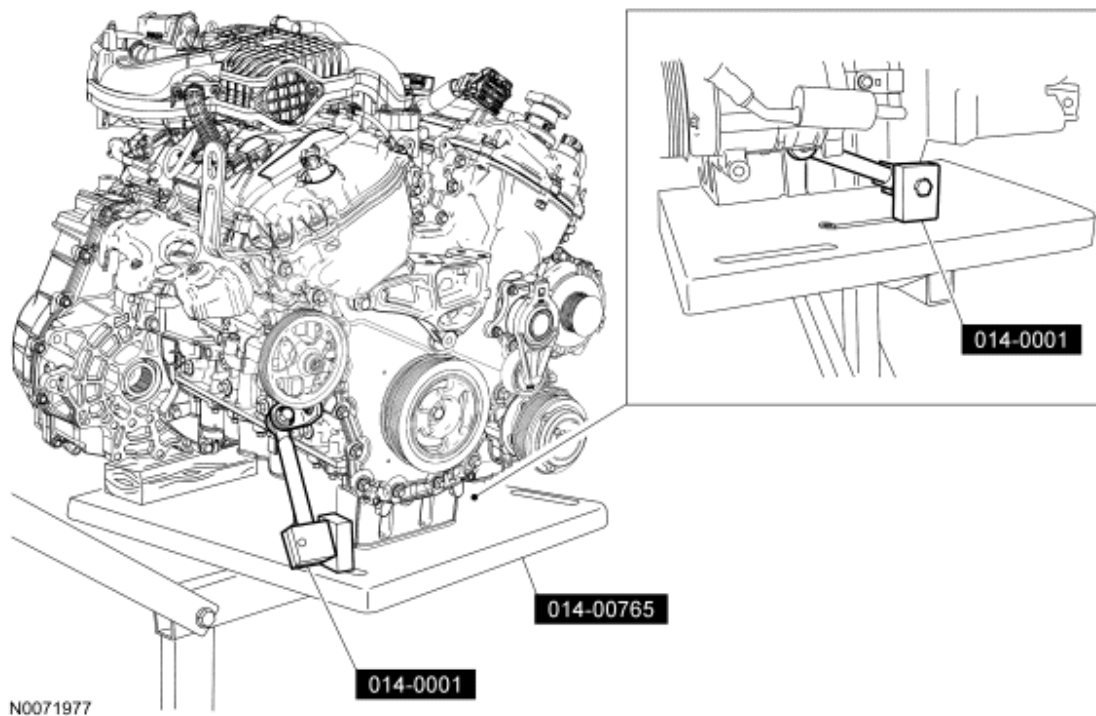


Fig. 733: Positioning A Block Of Wood Under Transaxle Using Special Tools (014-0001) & (014-00765)

Courtesy of FORD MOTOR CO.

6. Install the starter, the bolt and the stud bolt.
 - Tighten to 27 Nm (20 lb-ft).

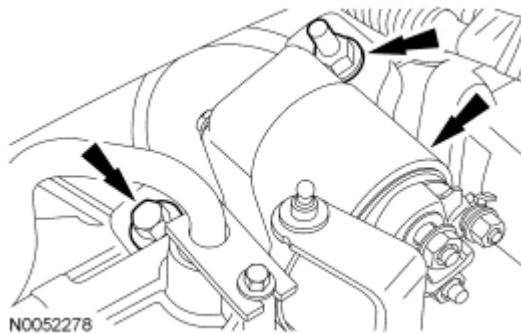


Fig. 734: Identifying Bolt, Stud Bolt & Starter

Courtesy of FORD MOTOR CO.

7. Connect the wiring harness retainer to the starter stud bolt.

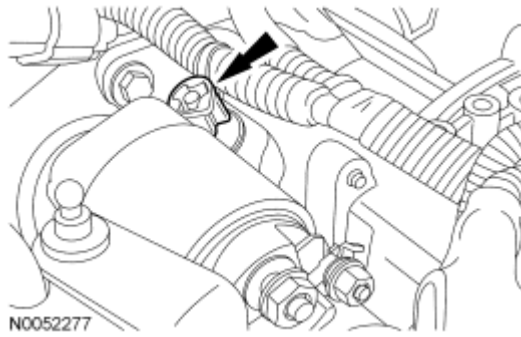


Fig. 735: Identifying Wiring Harness Retainer From Starter Motor Stud Bolt
Courtesy of FORD MOTOR CO.

8. Attach the starter motor wire terminals and install the 2 nuts.
 1. Tighten to 12 Nm (9 lb-ft).
 2. Tighten to 5 Nm (44 lb-in).
 - Position the starter terminal boot over the starter terminal.

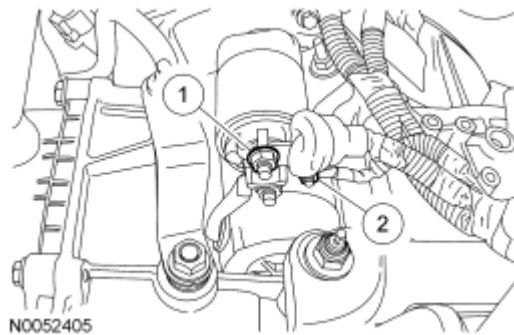


Fig. 736: Identifying Starter Motor Wire Terminals & Nuts
Courtesy of FORD MOTOR CO.

9. Raise the engine and transaxle assembly into the vehicle.
10. Install the engine mount and the 3 bolts.
 - Tighten to 90 Nm (66 lb-ft).

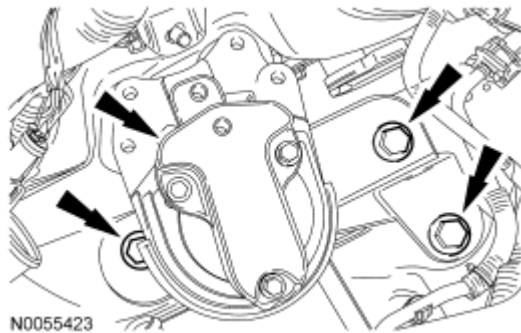


Fig. 737: Locating Engine Mount Bolts
Courtesy of FORD MOTOR CO.

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

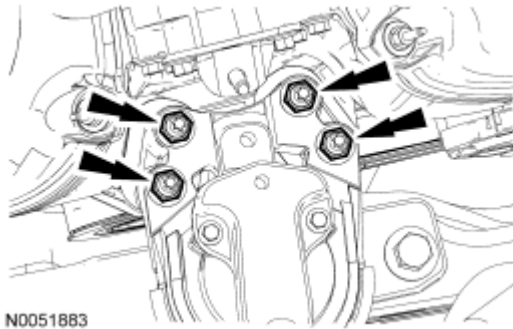


Fig. 738: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

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

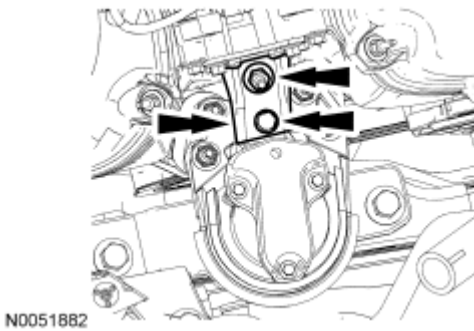


Fig. 739: Locating Nut, Bolt & Engine Mount Brace
Courtesy of FORD MOTOR CO.

13. Install the transaxle support insulator bracket, the 3 nuts and the bolt.
 - Tighten to 63 Nm (46 lb-ft).

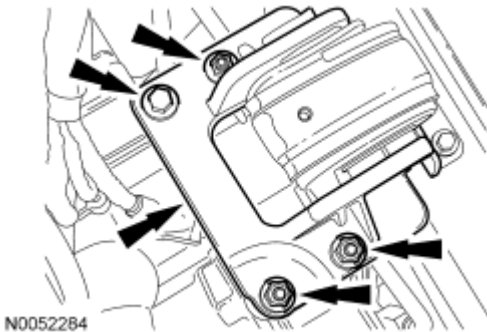


Fig. 740: Identifying Transaxle Support Insulator Bracket, Nuts & Bolts
Courtesy of FORD MOTOR CO.

14. Install the transaxle support insulator through bolt and nut.
 - Tighten to 175 Nm (129 lb-ft).

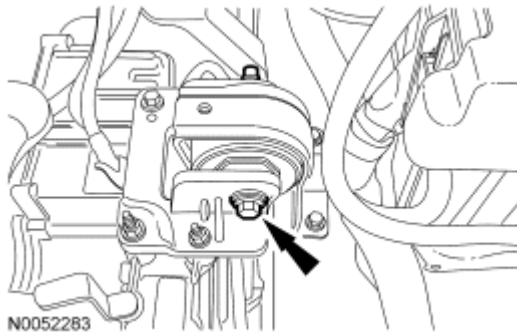


Fig. 741: Identifying Transaxle Support Insulator Bolt
 Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

15. Position the power transfer unit (PTU) in place and install the 5 bolts.
 - Tighten to 90 Nm (66 lb-ft).

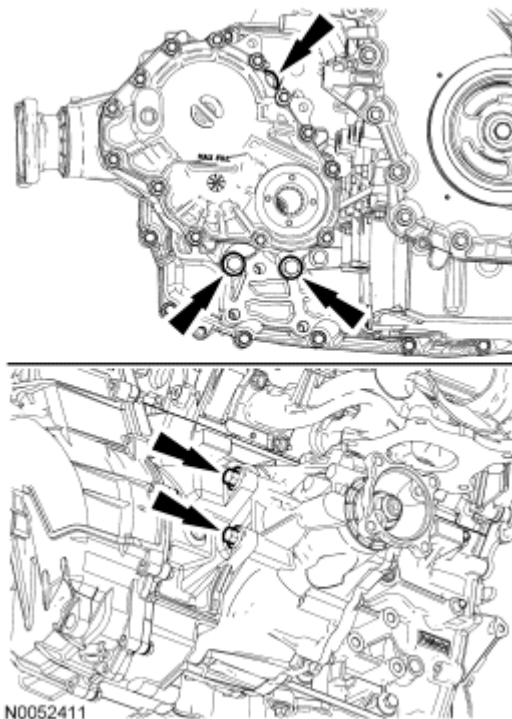


Fig. 742: Identifying PTU & Bolts
 Courtesy of FORD MOTOR CO.

16. Position the PTU support bracket in place and install the 5 bolts.
 - Tighten to 70 Nm (52 lb-ft).

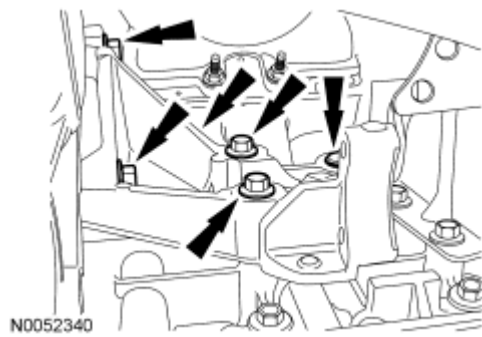


Fig. 743: Locating Power Transfer Unit (PTU) Support Bracket & Bolts
Courtesy of FORD MOTOR CO.

NOTE: Do not tighten the 4 catalytic converter nuts at this time.

17. Using a new gasket, install the RH catalytic converter and 4 new nuts.

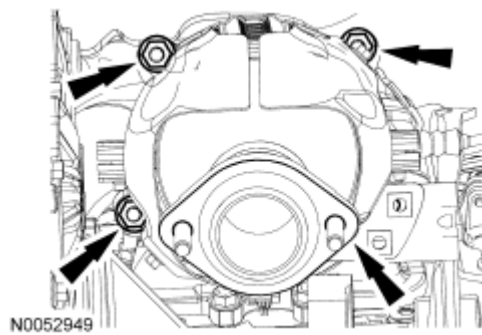


Fig. 744: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

18. Install the 2 catalytic converter-to-bracket bolts.
 - Tighten the 4 catalytic converter nuts to 40 Nm (30 lb-ft).
 - Tighten the 2 catalytic converter-to-bracket bolts to 20 Nm (15 lb-ft).

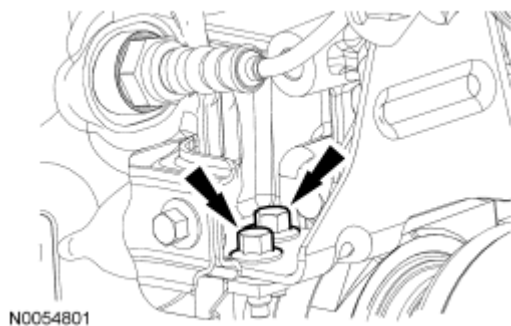


Fig. 745: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

19. Connect the RH catalyst monitor electrical connector.

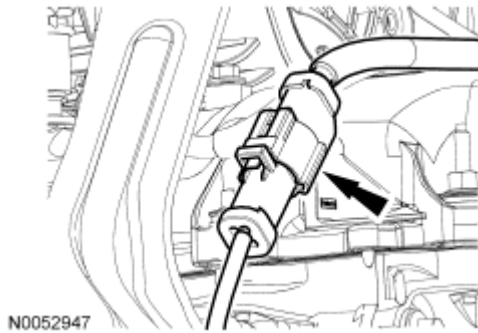


Fig. 746: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: A new PTU seal must be installed whenever the intermediate shaft is removed.

20. Install a new PTU seal. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface for wear or damage and install new, if necessary.

21. Position the RH halfshaft/intermediate shaft assembly in the PTU and in the steering knuckle and install the 2 bolts.
- Tighten to 40 Nm (30 lb-ft).

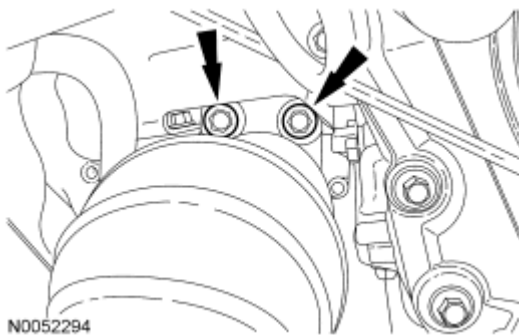


Fig. 747: Locating RH Halfshaft Bearing Support Bracket Bolts
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface for wear or damage and install new if necessary.

22. Position the RH halfshaft/intermediate shaft assembly in the transaxle and in the steering knuckle and install the 2 stud bolts.
- Tighten to 55 Nm (41 lb-ft).

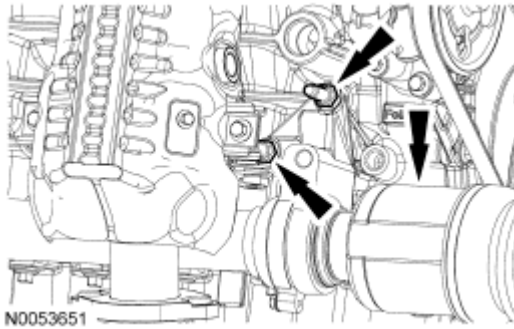


Fig. 748: Locating Stud Bolts & RH Halfshaft/Intermediate Shaft Assembly
Courtesy of FORD MOTOR CO.

NOTE: Do not tighten the 2 catalytic converter support bracket bolts at this time.

23. Install the converter support bracket and the 2 bolts.

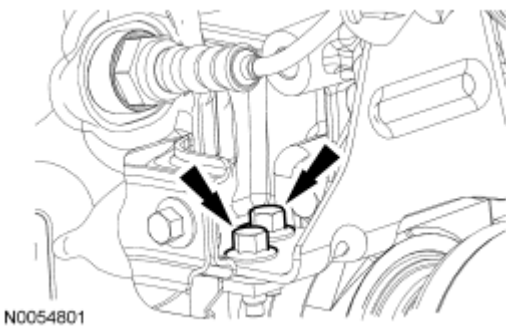


Fig. 749: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

24. Install the catalytic converter bracket bolt and the nut.
1. Tighten the nut to 40 Nm (30 lb-ft).
 2. Tighten the bolt to 55 Nm (41 lb-ft).

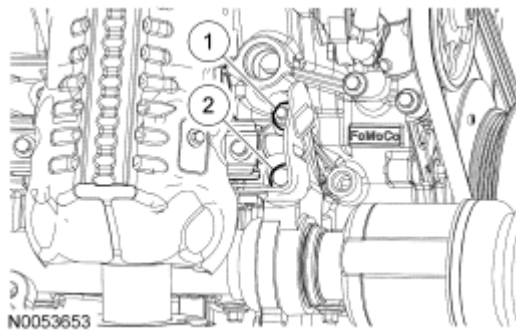


Fig. 750: Locating Catalytic Converter Bracket Bolt & Nut
Courtesy of FORD MOTOR CO.

25. Tighten the 2 RH catalytic converter support bracket bolts to 20 Nm (15 lb-ft).

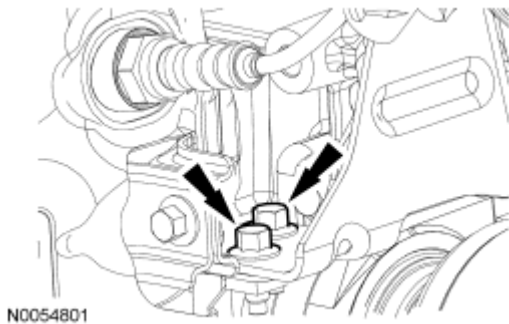


Fig. 751: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

All vehicles

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface for wear or damage and install new, if necessary.

26. Install the LH halfshaft into the transaxle.

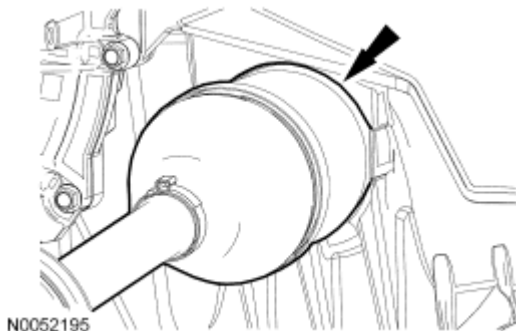


Fig. 752: Identifying LH Halfshaft
Courtesy of FORD MOTOR CO.

27. If equipped, connect the oil cooler coolant hoses.

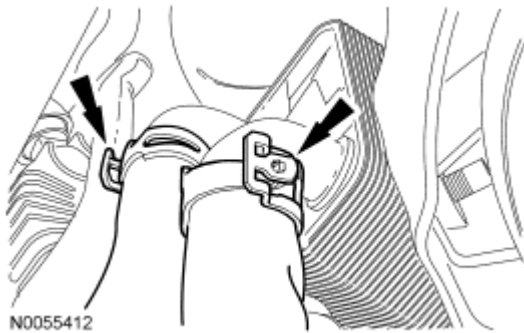


Fig. 753: Locating Oil Cooler Coolant Hoses
Courtesy of FORD MOTOR CO.

28. Using the special tool, raise the subframe into the installed position.

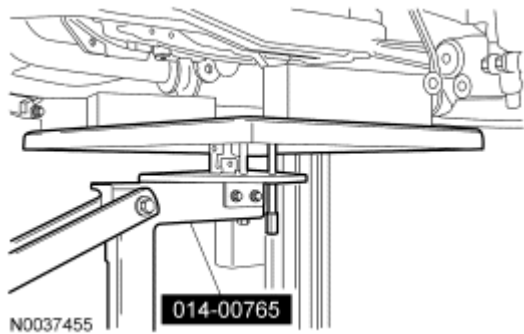


Fig. 754: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

29. Install the 2 middle subframe nuts.
- Tighten to 133 Nm (98 lb-ft).

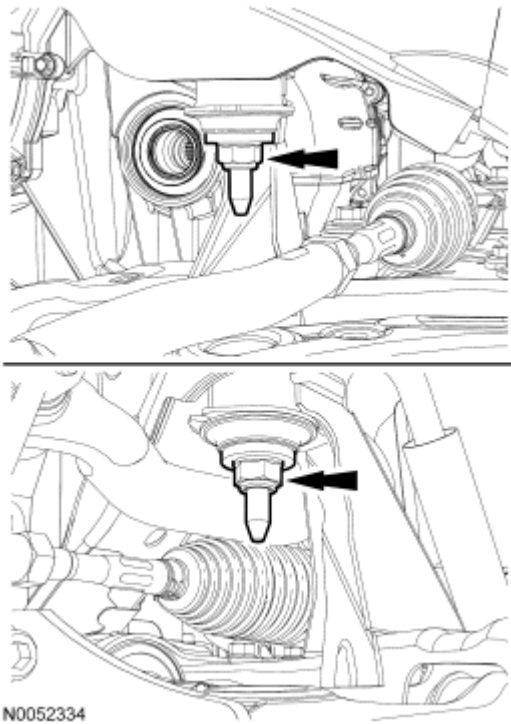


Fig. 755: Locating Middle Subframe Nuts
Courtesy of FORD MOTOR CO.

30. Install the 2 front subframe nuts.
 - Tighten to 133 Nm (98 lb-ft).

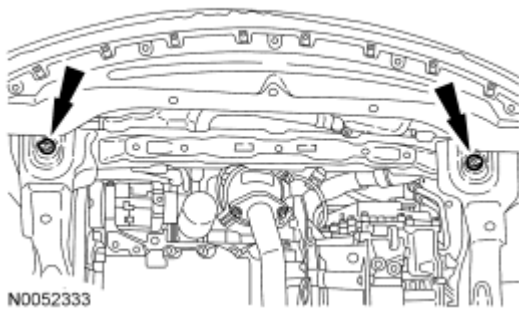


Fig. 756: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

31. Position the subframe support brackets in place and loosely install the 4 bolts.

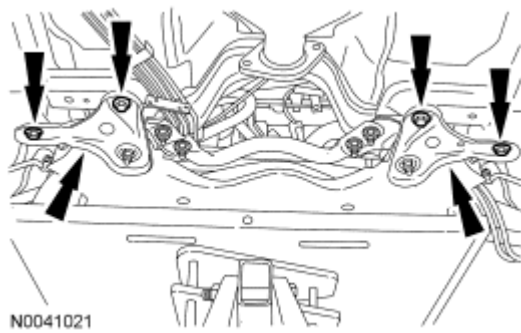


Fig. 757: Locating Subframe Support Brackets And Bolts
Courtesy of FORD MOTOR CO.

32. Install the 2 rear subframe bracket nuts.
- Tighten to 133 Nm (98 lb-ft).

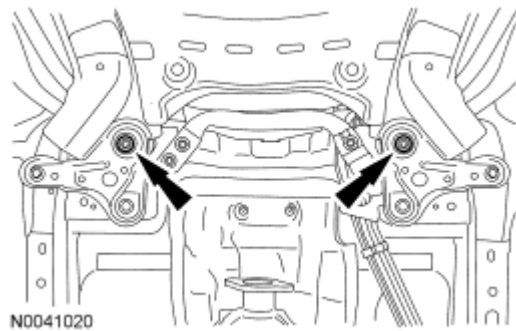


Fig. 758: Locating Rear Subframe Nuts
Courtesy of FORD MOTOR CO.

33. Tighten the 4 subframe support bracket bolts.
- Tighten to 90 Nm (66 lb-ft).

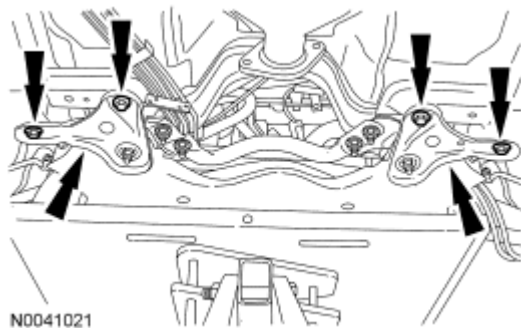


Fig. 759: Locating Subframe Support Brackets And Bolts
Courtesy of FORD MOTOR CO.

34. Position the lower bumper on the subframe and install the 3 LH nuts.
- Tighten to 9 Nm (80 lb-in).

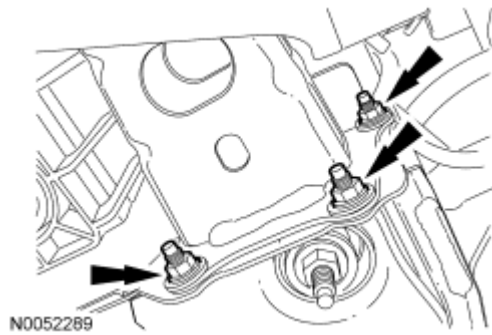


Fig. 760: Locating LH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

35. Install the 3 RH lower bumper-to-subframe nuts.
 - Tighten to 9 Nm (80 lb-in).

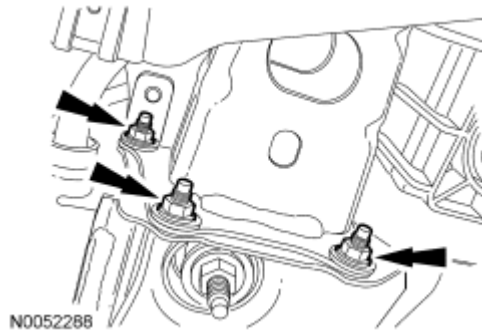


Fig. 761: Locating RH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

NOTE: RH side shown, LH side similar.

36. Install the ball joints in the steering knuckles and install the pinch bolts.
 - Tighten to 55 Nm (41 lb-ft).

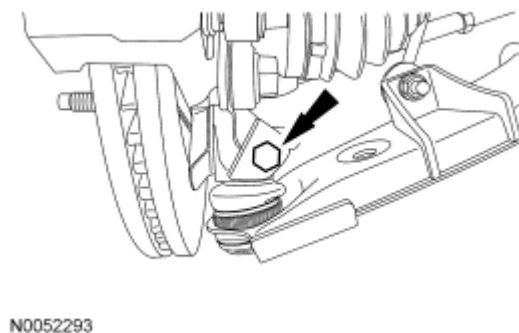


Fig. 762: Locating Ball Joint Pinch Bolt
Courtesy of FORD MOTOR CO.

NOTE: RH side shown, LH side similar.

37. Position the stabilizer bar links in the lower control arms and install the nuts.
- Tighten to 90 Nm (66 lb-ft).

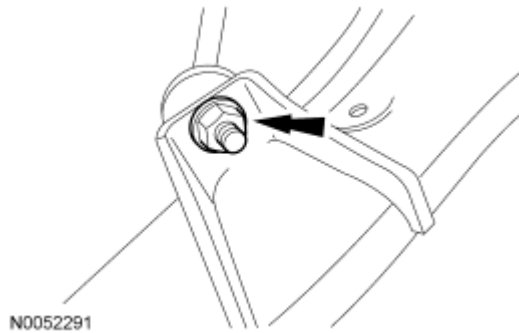


Fig. 763: Locating Stabilizer Bar Link Nut
Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

38. Install the tie-rod ends and nuts.
- Tighten to 48 Nm (35 lb-ft).
 - Install new cotter pins.

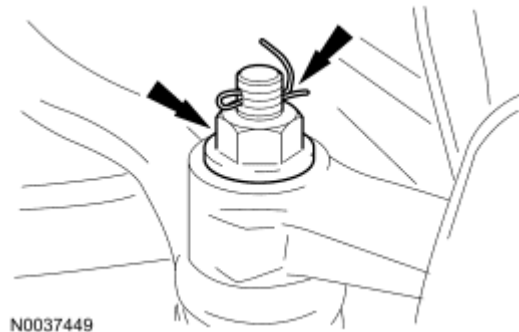


Fig. 764: Locating Tie-Rod Ends Nuts And Cotter Pin
Courtesy of FORD MOTOR CO.

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

39. Install the intermediate shaft onto the steering gear and install a new bolt.
- Tighten to 23 Nm (17 lb-ft).

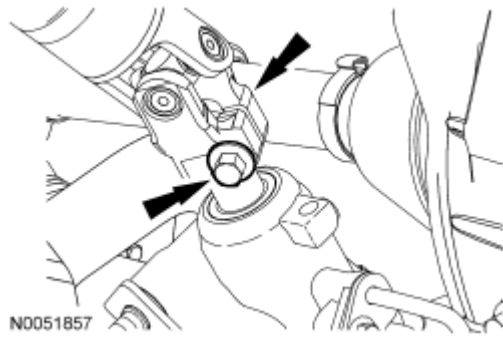


Fig. 765: Identifying Steering Intermediate Shaft Bolt
Courtesy of FORD MOTOR CO.

40. Using a new banjo bolt and 2 new seals, install the power steering pressure (PSP) tube.
- Tighten to 48 Nm (35 lb-ft).

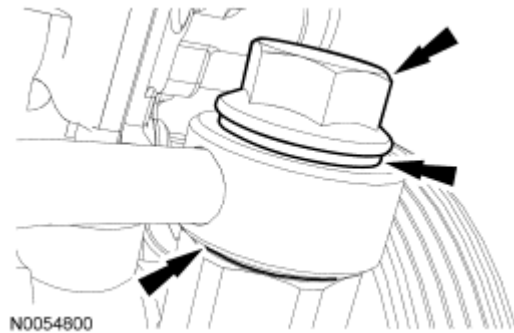


Fig. 766: Locating Power Steering Pressure (PSP) Tube-To-Pump Banjo Bolt & Seals
Courtesy of FORD MOTOR CO.

41. Install the engine roll restrictor-to-subframe through bolt.
- Tighten to 103 Nm (76 lb-ft).

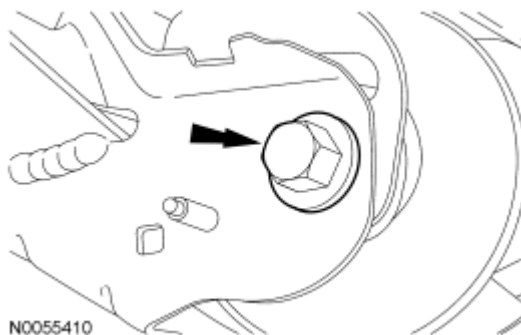


Fig. 767: Locating Roll Restrictor-To-Subframe Bolt
Courtesy of FORD MOTOR CO.

42. Install the roll restrictor heat shield and the 2 nuts.
- Tighten to 11 Nm (8 lb-ft).

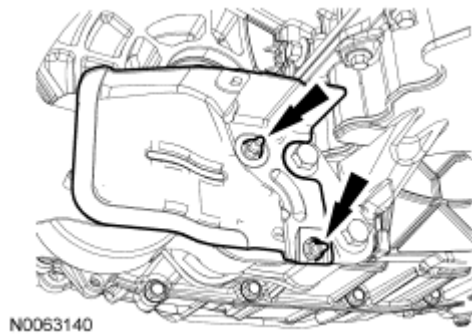


Fig. 768: Locating Roll Restrictor Heat Shield Nuts
Courtesy of FORD MOTOR CO.

NOTE: Apply the brake to keep the halfshaft from rotating.

43. Install a new RH front halfshaft nut.
 - Tighten to 350 Nm (258 lb-ft).

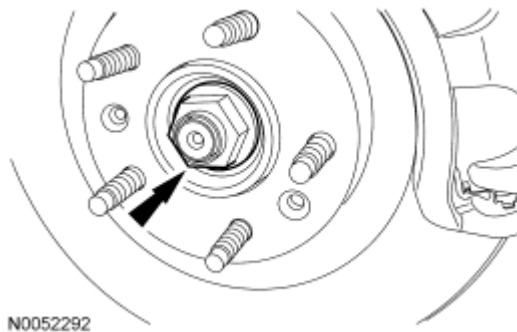


Fig. 769: Locating RH Front Halfshaft Nut
Courtesy of FORD MOTOR CO.

AWD vehicles

44. 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.
 - Tighten to 70 Nm (52 lb-ft).

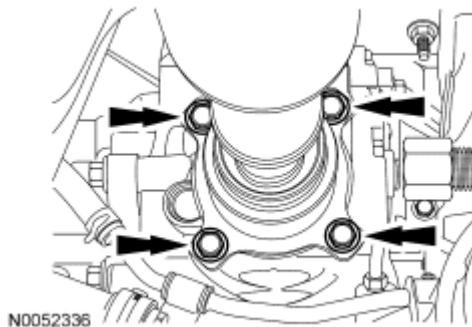


Fig. 770: Locating Driveshaft Aside Bolts
Courtesy of FORD MOTOR CO.

All vehicles

45. Install the power steering cooler bracket bolt to the RH side of the subframe.
 - Tighten to 9 Nm (80 lb-in).

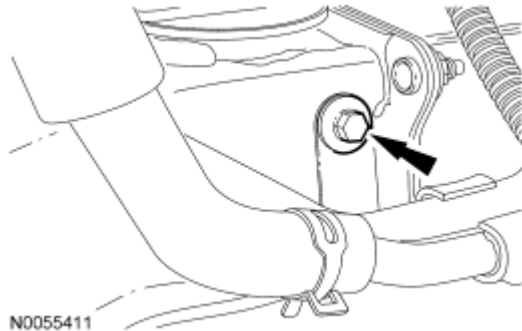


Fig. 771: Identifying Power Steering Cooler Bracket Bolt
Courtesy of FORD MOTOR CO.

46. Connect the power steering cooler hose.

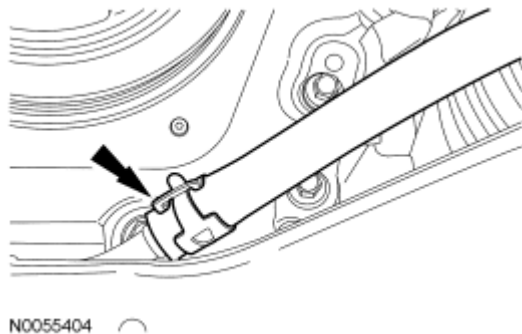


Fig. 772: Identifying Power Steering Cooler Hose
Courtesy of FORD MOTOR CO.

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

47. Install a new engine oil filter.
 - Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

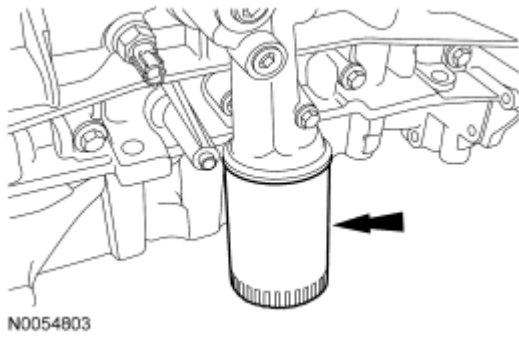


Fig. 773: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

48. Install the 3 new torque converter bolts.
 - Tighten to 55 Nm (41 lb-ft).

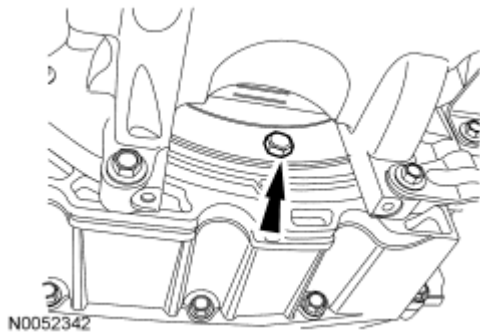


Fig. 774: Locating Torque Converter Bolts
Courtesy of FORD MOTOR CO.

49. Install the inspection cover and the 2 fasteners.

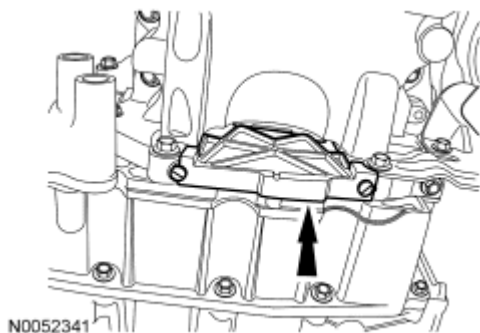


Fig. 775: Locating Oil Fasteners On Inspection Cover
Courtesy of FORD MOTOR CO.

50. Install the 4 oil pan-to-transaxle bolts.
 - Tighten to 48 Nm (35 lb-ft).

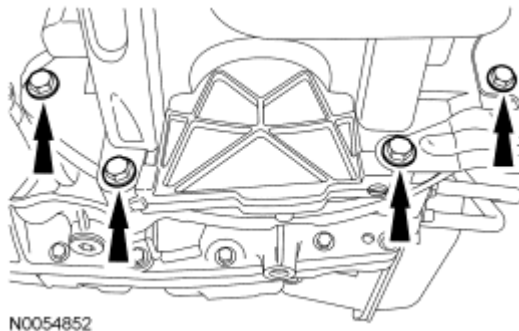


Fig. 776: Locating Oil Pan-To-Transaxle Bolts
Courtesy of FORD MOTOR CO.

51. Connect the 2 transmission fluid cooler tubes.

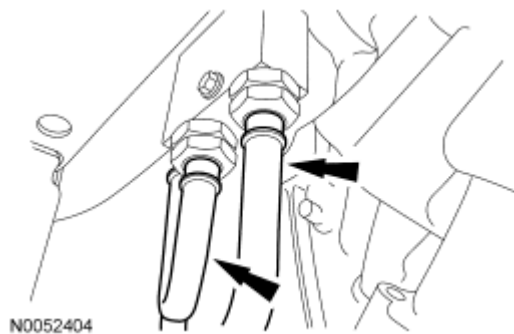


Fig. 777: Locating Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

52. Install the 2 secondary latches onto the transmission fluid cooler tubes.

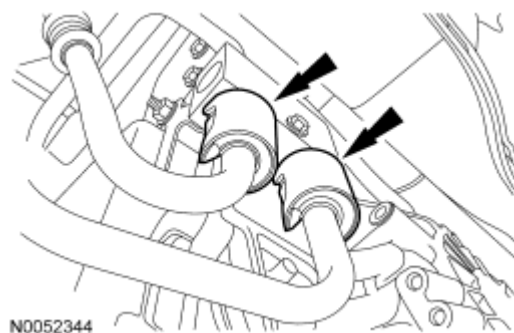


Fig. 778: Locating Secondary Latches On Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

53. Install the LH inner splash shield. For additional information, refer to **FRONT END BODY PANELS** article.
54. Install the radiator splash shield, the 3 pin-type retainers and the 7 screws.

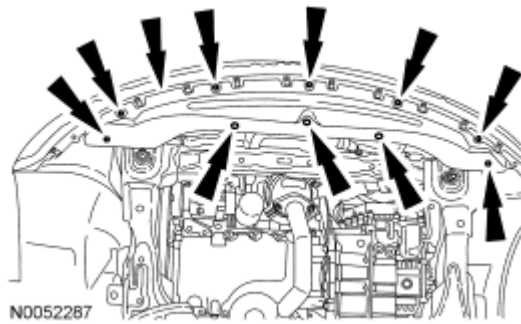


Fig. 779: Locating Push Pin Fasteners & Front Splash Shield Screws
 Courtesy of FORD MOTOR CO.

55. Using a new gasket, install the Y-pipe and exhaust flexible pipe assembly and 4 new nuts.
- Tighten to 40 Nm (30 lb-ft).

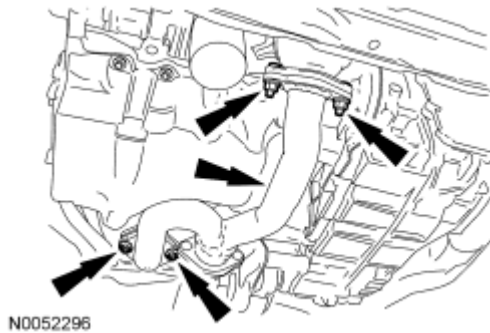


Fig. 780: Locating Exhaust Flexible Pipe, Y-Pipe & Nuts
 Courtesy of FORD MOTOR CO.

56. Install the 2 exhaust hangers and tighten the exhaust clamp.
- Tighten to 40 Nm (30 lb-ft).

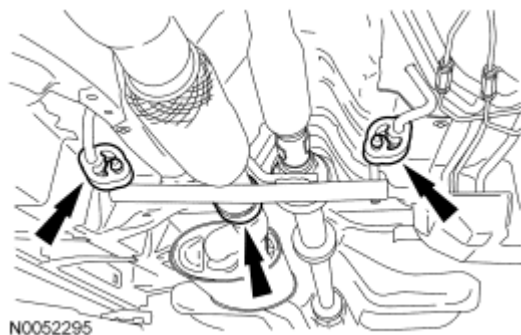


Fig. 781: Locating Exhaust Flexible Pipe Clamp & Exhaust Hangers
 Courtesy of FORD MOTOR CO.

57. Install the ground wire, the radio interference capacitor wire and the nut to the engine front cover stud.
- Tighten to 10 Nm (89 lb-in).

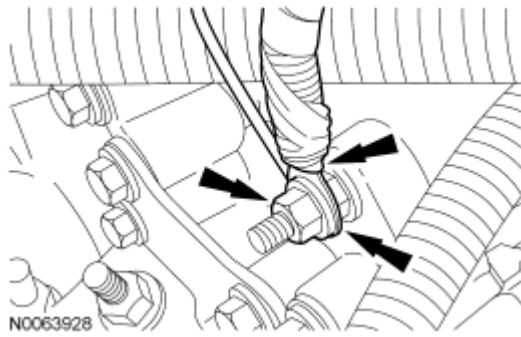


Fig. 782: Removing/installing Nut, Ground Wire & Radio Interference Capacitor Wire From Engine Front Cover Stud
Courtesy of FORD MOTOR CO.

58. Install the ground wire and bolt to the engine front cover.
- Tighten to 10 Nm (89 lb-in).

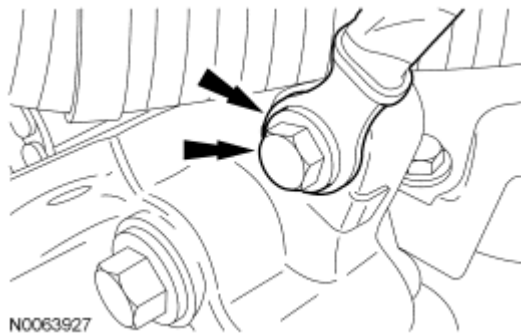


Fig. 783: Removing/Installing Bolt & Ground Wire From Engine Front Cover
Courtesy of FORD MOTOR CO.

59. Attach the wiring harness retainer to the RH valve cover stud bolt.

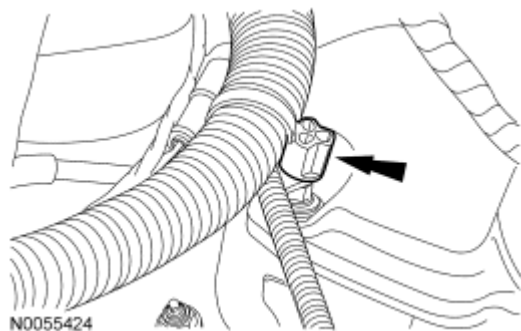


Fig. 784: Identifying Wiring Harness Retainer From RH Valve Cover Stud Bolt
Courtesy of FORD MOTOR CO.

60. Install the oil level indicator.

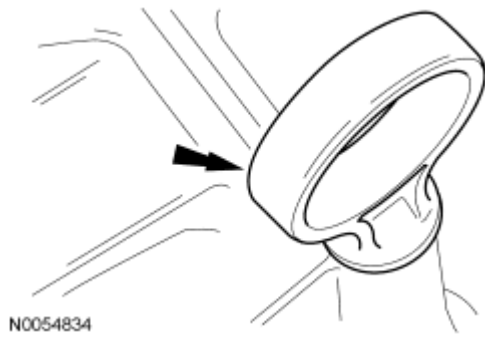


Fig. 785: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

61. Connect the 2 engine wiring harness electrical connectors.
- Attach the electrical connector to the LH valve cover.

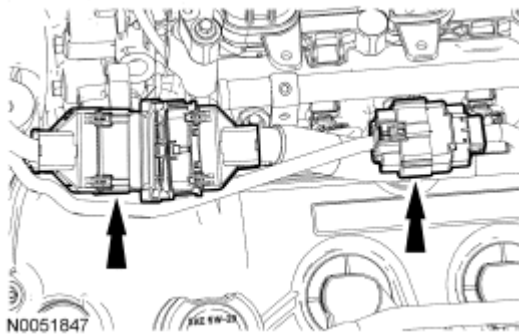


Fig. 786: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

62. Connect the fuel hose routing clip to the transaxle stud.

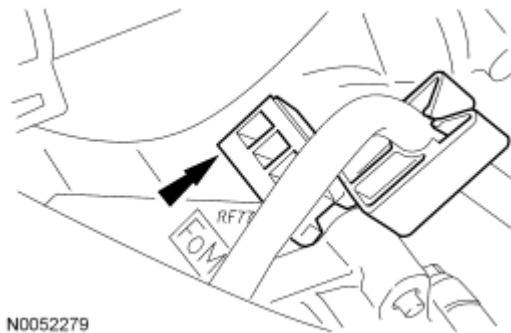


Fig. 787: Identifying Fuel Hose Routing Clip From Transaxle Stud
Courtesy of FORD MOTOR CO.

63. Connect the fuel supply tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

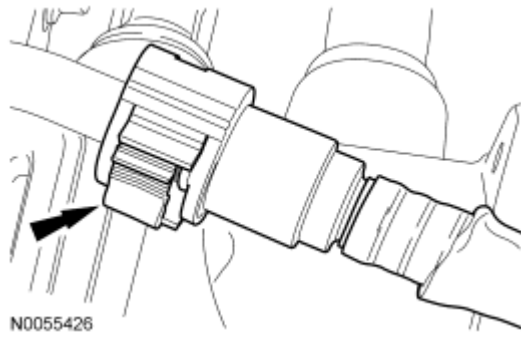


Fig. 788: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

64. Connect the hose to the power steering reservoir.

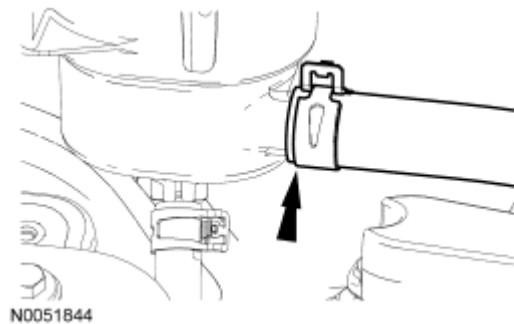


Fig. 789: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

65. Connect the A/C suction tube fitting.
- Install the safety clip onto the A/C fitting.

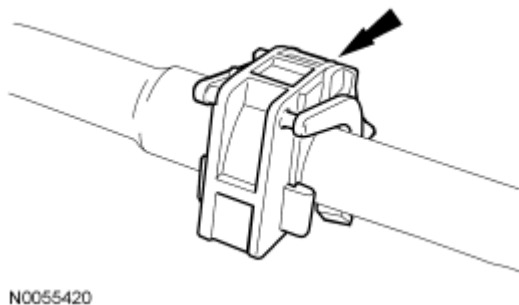


Fig. 790: Identifying Safety Clip On A/C Suction Tube Fitting
Courtesy of FORD MOTOR CO.

66. Using a new O-ring seal, connect the A/C tube fitting and install the nut.
- Tighten to 8 Nm (71 lb-in).

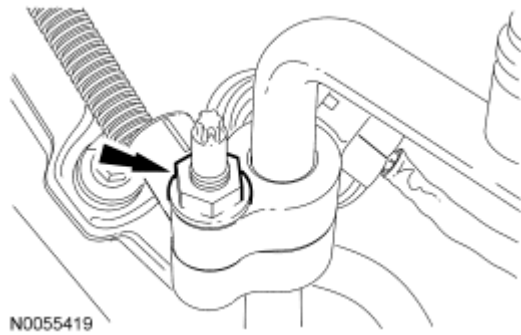


Fig. 791: Identifying A/C Pressure Tube Fitting Nut
Courtesy of FORD MOTOR CO.

67. If equipped, attach the engine block heater harness retainers to the radiator support and the A/C suction tube.

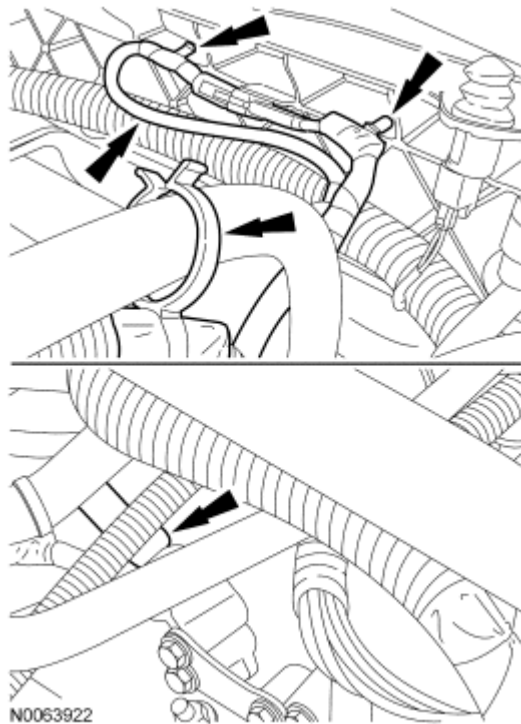


Fig. 792: Identifying Engine Block Heater Harness, Radiator Support, A/C Suction Tube & Engine Wiring Harness
Courtesy of FORD MOTOR CO.

68. Connect the transaxle control electrical connector.

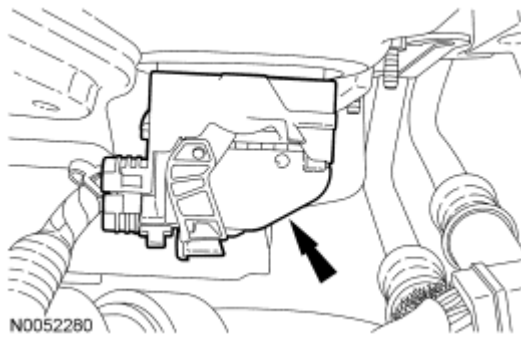


Fig. 793: Identifying Transaxle Control Electrical Connector
Courtesy of FORD MOTOR CO.

69. Attach the control cable to the bracket.
 - Connect the transaxle control cable to the control lever.

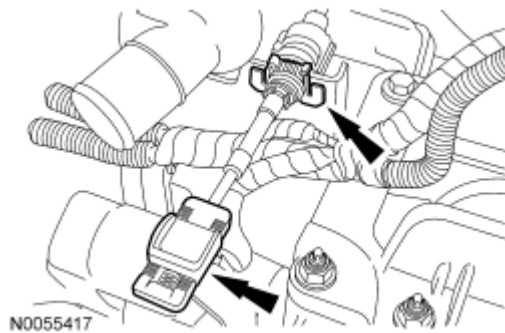


Fig. 794: Locating Transaxle Control Cable From Control Lever
Courtesy of FORD MOTOR CO.

70. Attach the wiring harness retainer to the transaxle control cable bracket.

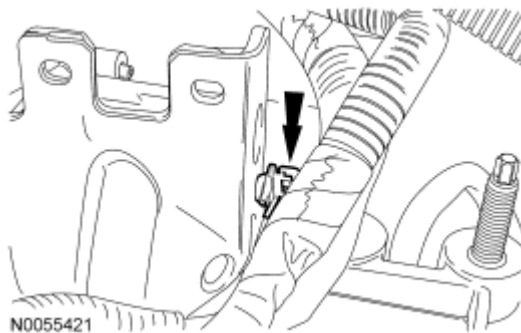


Fig. 795: Locating Wiring Harness Retainer From Transaxle Control Cable Bracket
Courtesy of FORD MOTOR CO.

71. Connect the upper radiator hose, lower radiator hose and 2 heater hoses to the thermostat housing.

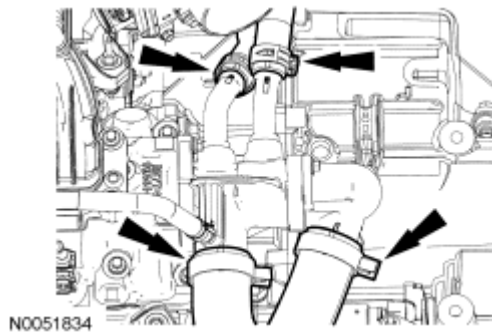


Fig. 796: Locating Upper Radiator Hose, Lower Radiator Hose & Heater Hoses
Courtesy of FORD MOTOR CO.

72. Connect the upper evaporative emissions (EVAP) tube quick connect coupling to the purge valve. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

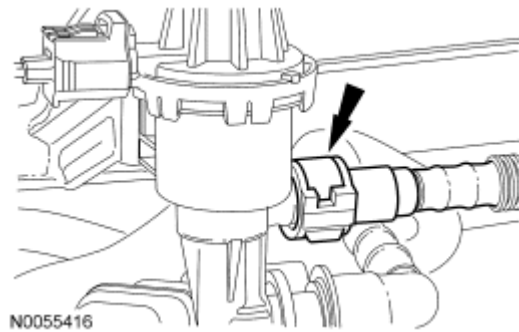


Fig. 797: Locating Upper Evaporative Emissions (EVAP) Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

73. Connect the vacuum hose to the upper intake manifold.

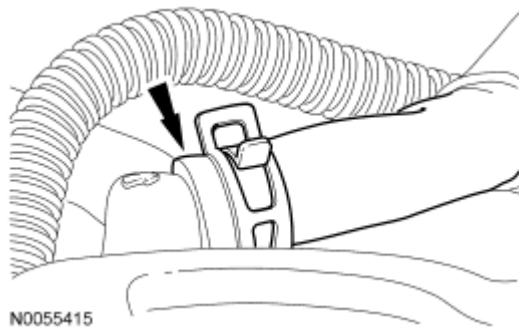


Fig. 798: Identifying Vacuum Hose From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

74. Install the ground wire and the bolt.
 - Tighten to 10 Nm (89 lb-in).
 - Attach the 2 wiring harness retainers to the cowl.

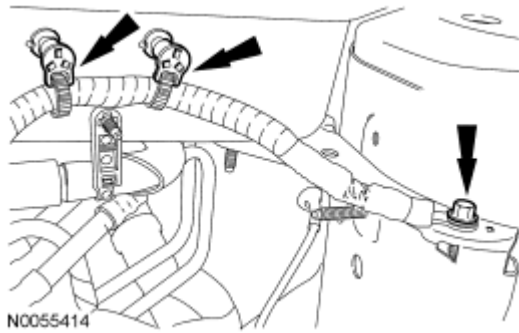


Fig. 799: Identifying Wiring Harness Retainers From Cowl
Courtesy of FORD MOTOR CO.

75. Connect the power feed to the battery terminal and install the nut.
 - Tighten to 8 Nm (71 lb-in).

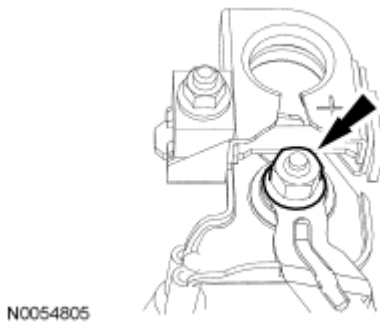


Fig. 800: Locating Power Feed To Battery Terminal And Nut
Courtesy of FORD MOTOR CO.

76. Connect the battery harness electrical connector.

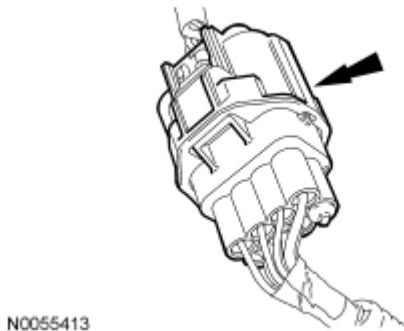



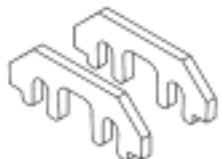


Fig. 801: Identifying Battery Harness Electrical Connector
Courtesy of FORD MOTOR CO.

77. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING & CABLES** article.
78. Install the engine air cleaner and the air cleaner outlet pipe. For additional information, refer to **INTAKE**

AIR DISTRIBUTION & FILTERING article.






79. Install the degas bottle. For additional information, refer to **ENGINE COOLING** article.
80. Install the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** article.
81. Fill the engine with clean engine oil.
82. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.
83. Fill the power steering system. For additional information, refer to **STEERING SYSTEM - GENERAL INFORMATION** article.
84. Recharge the air conditioning system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & DIAGNOSTICS** article.

CAMSHAFT**Special Tools**

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

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 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
 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	WSS-M2C930-A

XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	
Silicone Gasket Remover ZC-30	-

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, can 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.

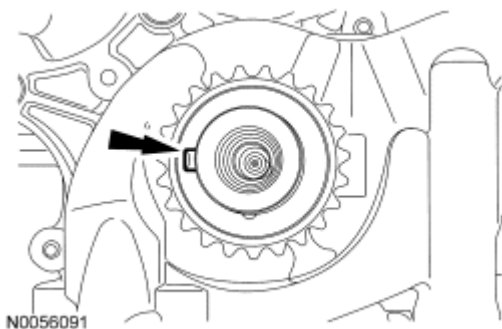


Fig. 802: Rotating Crankshaft Counterclockwise Until Crankshaft Dowel Pin Is In 9 O'clock Position

Courtesy of FORD MOTOR CO.

LH camshafts

CAUTION: The camshafts must remain in the neutral position during installation 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.

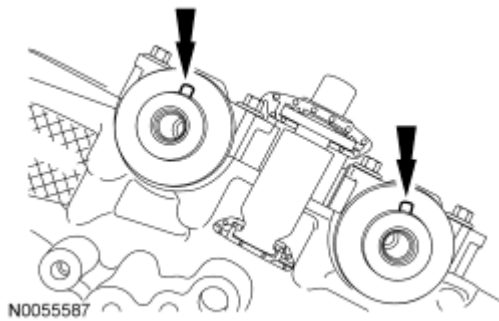


Fig. 803: Verifying LH Camshafts Are In Neutral Position
Courtesy of FORD MOTOR CO.

CAUTION: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions. If not reassembled in their original positions, severe engine damage may occur.

3. Install the 8 camshaft caps and the 16 bolts.
 - Tighten in the sequence shown to 10 Nm (89 lb-in).

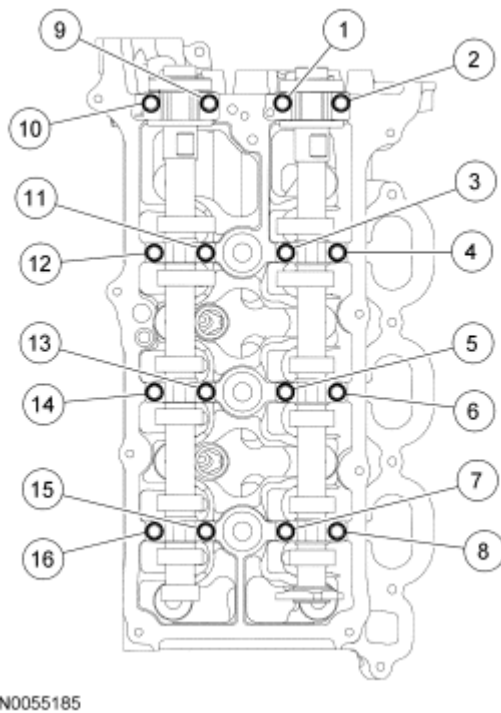


Fig. 804: Installing Camshaft Caps & Bolts In Sequence
Courtesy of FORD MOTOR CO.

RH camshafts

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.

4. Position the camshafts onto the RH cylinder head in the neutral position as shown.

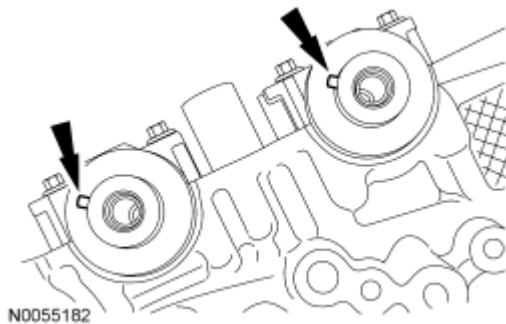
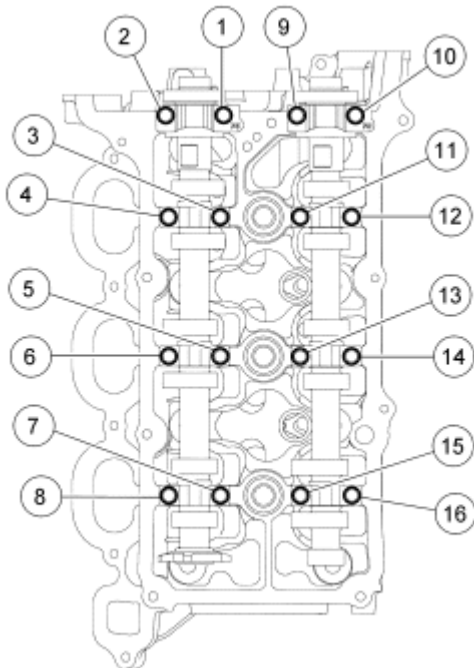


Fig. 805: Positioning Camshafts Onto RH Cylinder Head In Neutral Position
Courtesy of FORD MOTOR CO.

CAUTION: Cylinder head camshaft bearing caps are numbered to verify that they are assembled in their original positions. If not reassembled in their original positions, severe engine damage may occur.

5. Install the 8 camshaft caps and the 16 bolts.
 - Tighten in the sequence shown to 10 Nm (89 lb-in).



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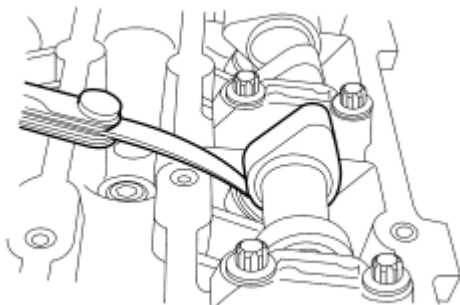
Fig. 806: Installing Camshaft Caps & Bolts In Sequence
Courtesy of FORD MOTOR CO.

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**.



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Fig. 807: 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 position and install the special tool on the flats of the camshafts.

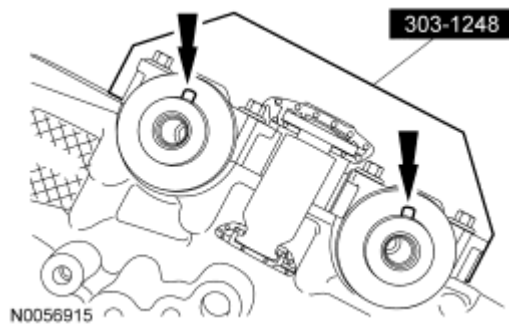


Fig. 808: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

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.

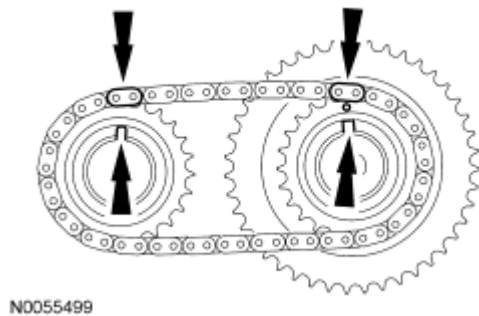


Fig. 809: Aligning LH Exhaust Camshaft Sprocket & LH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

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

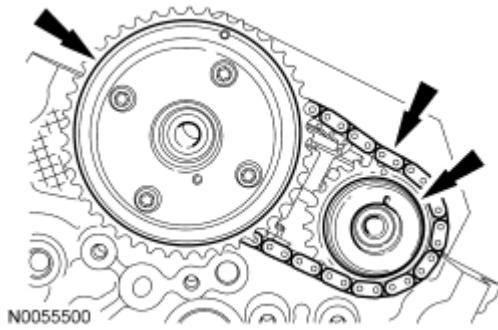


Fig. 810: Positioning LH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

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.

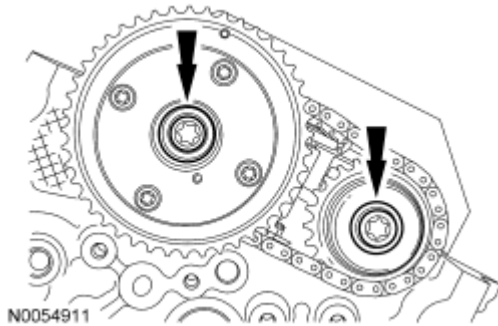


Fig. 811: Locating LH VCT Assembly Bolt & LH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

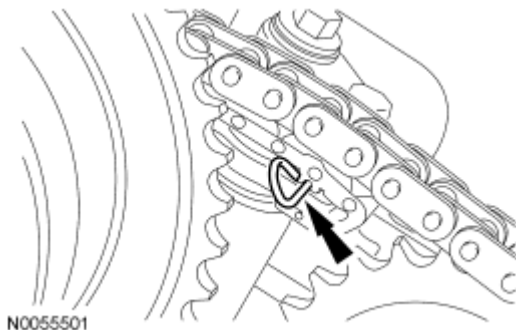


Fig. 812: Locating Lock Pin On LH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

RH camshafts

NOTE: Use a camshaft sprocket bolt to turn the camshafts.

12. Rotate the RH camshafts to the top dead center position and install the special tool on the flats of the camshafts.

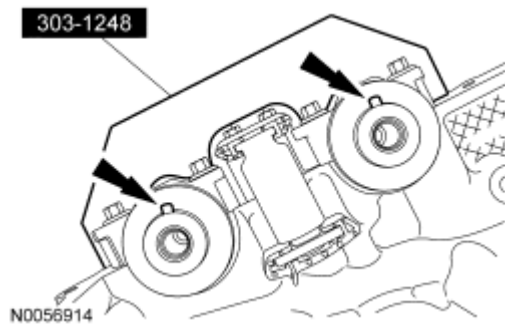


Fig. 813: Installing Special Tool (303-1248) On Flats Of Camshafts
Courtesy of FORD MOTOR CO.

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.

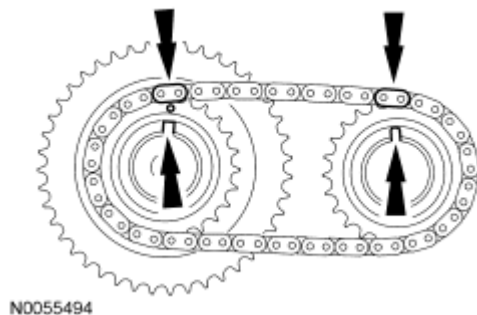


Fig. 814: Aligning RH Exhaust Camshaft Sprocket & RH Secondary Timing Chain Colored Links With Timing Marks
Courtesy of FORD MOTOR CO.

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

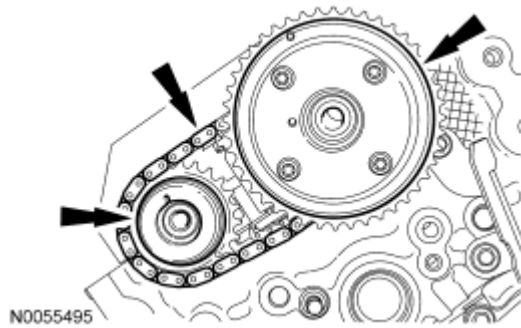


Fig. 815: Positioning RH Secondary Timing Assembly Onto Camshafts
Courtesy of FORD MOTOR CO.

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.

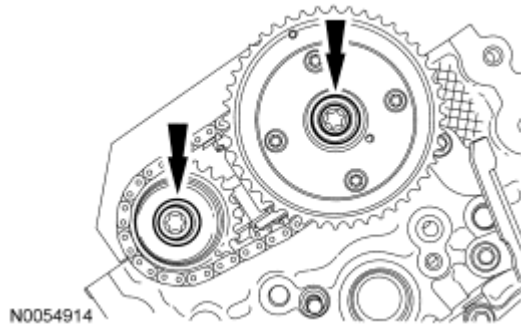


Fig. 816: Locating RH VCT Assembly Bolt & RH Exhaust Camshaft Sprocket Bolt
Courtesy of FORD MOTOR CO.

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

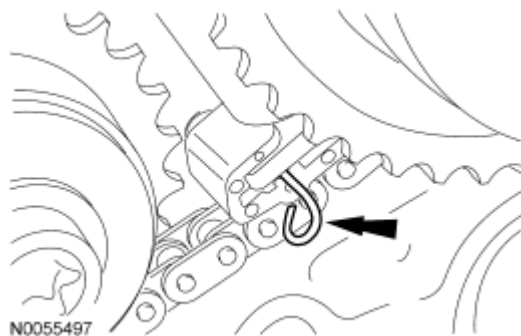


Fig. 817: Identifying Lock Pin On RH Secondary Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

All camshafts

17. Rotate the crankshaft clockwise 60 degrees to the top dead center position (crankshaft dowel pin at 11 o'clock).

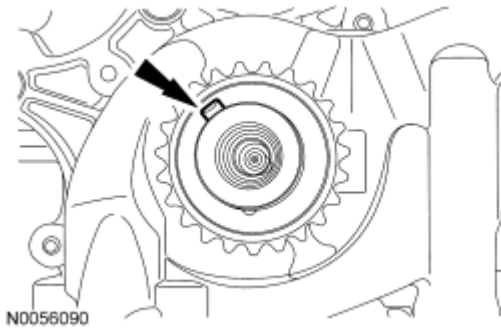


Fig. 818: Identifying Crankshaft Dowel Pin At 11 O'clock
Courtesy of FORD MOTOR CO.

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

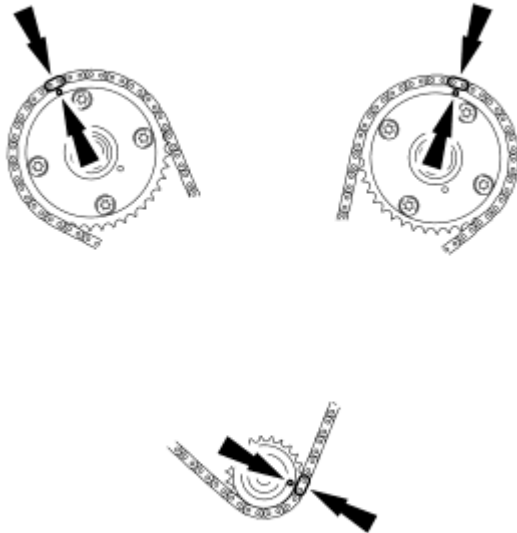
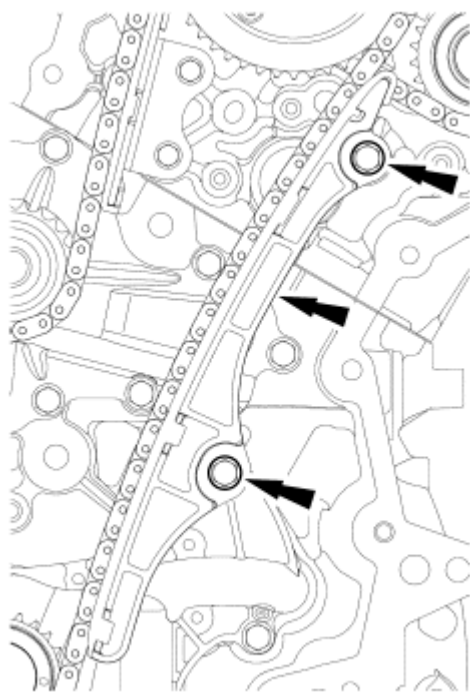


Fig. 819: Aligning Timing Marks On VCT Assemblies & Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

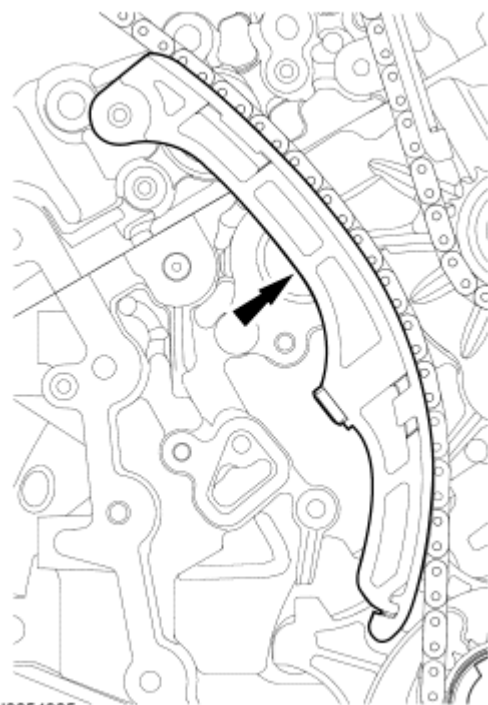
19. Install the lower LH primary timing chain guide and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).



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Fig. 820: Locating Lower LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

20. Install the primary timing chain tensioner arm.

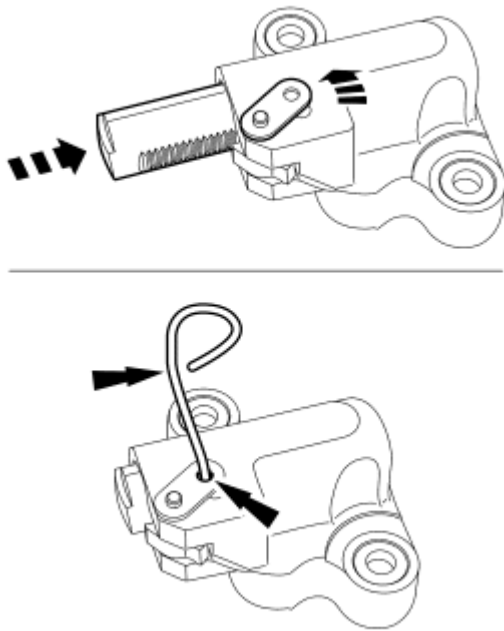


N0054905

Fig. 821: 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. 822: 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.

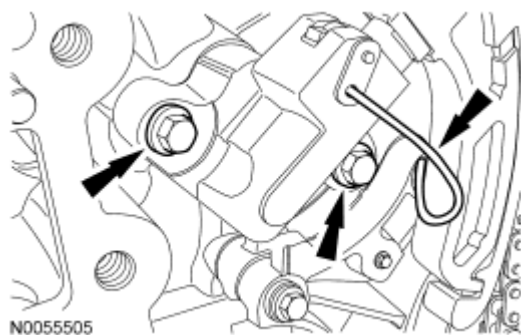


Fig. 823: Locating Primary Tensioner Bolts
Courtesy of FORD MOTOR CO.

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



Fig. 824: Verifying Correct Alignment Of All Timing Marks
Courtesy of FORD MOTOR CO.

24. Install new VCT housing seals.

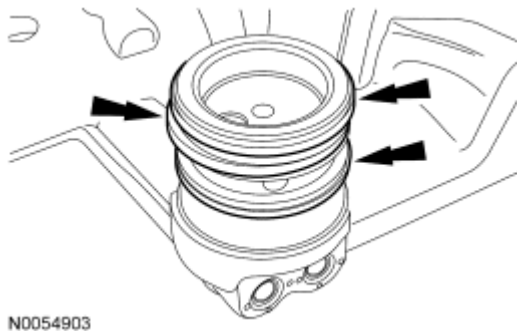


Fig. 825: Locating VCT Housing Seals
Courtesy of FORD MOTOR CO.

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 to 10 Nm (89 lb-in).

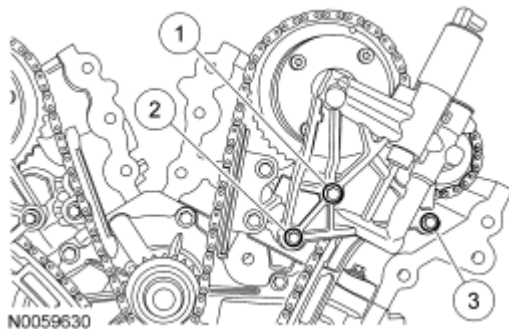


Fig. 826: Identifying LH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 to 10 Nm (89 lb-in).

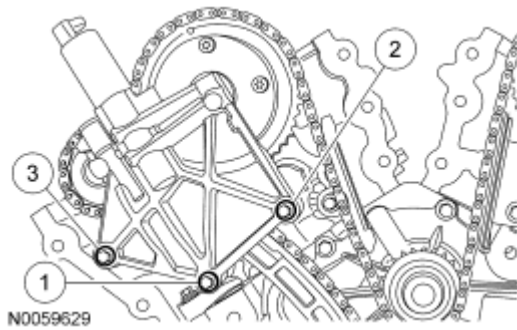


Fig. 827: Identifying RH VCT Housing Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

27. Install the special tools.



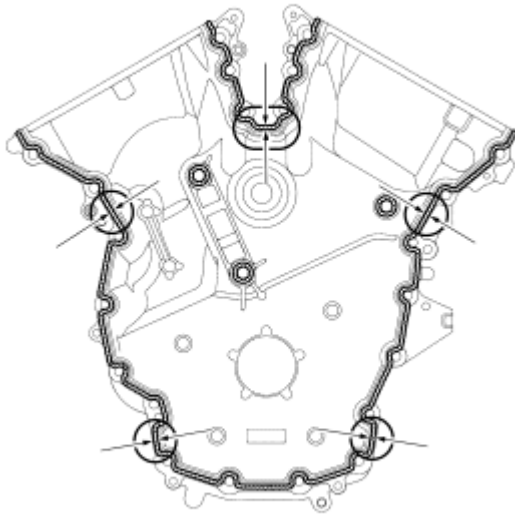
Fig. 828: Identifying Special Tool (307-399)
Courtesy of FORD MOTOR CO.

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. Follow the directions on the packaging. 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)



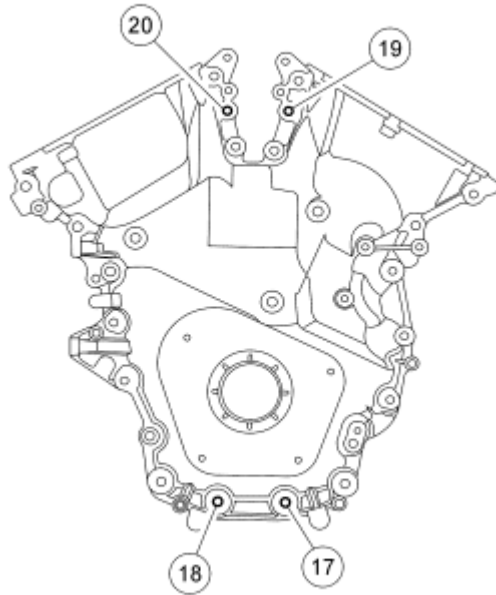
N0068283

Fig. 829: 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 to 3 Nm (27 lb-in).



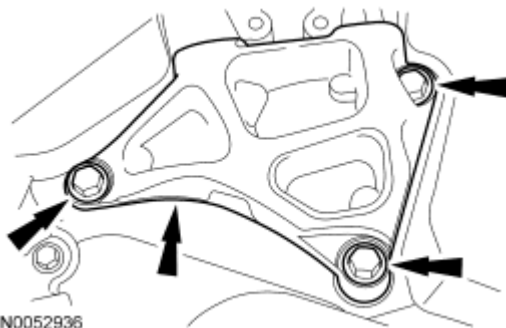
N0068108

Fig. 830: 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.

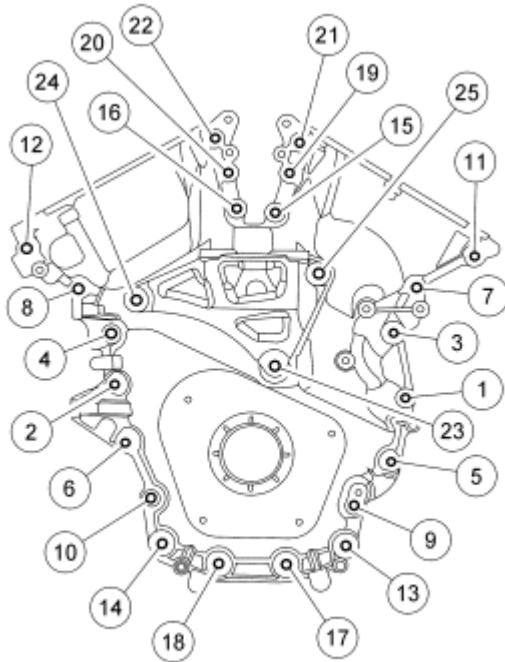


N0052936

Fig. 831: 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 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).

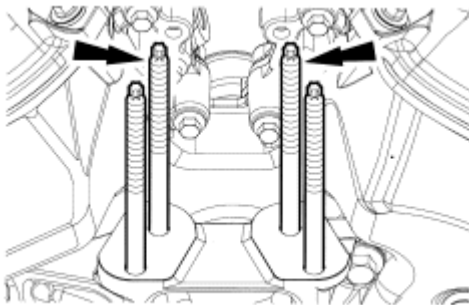


N0068109

Fig. 832: 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. 833: 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).

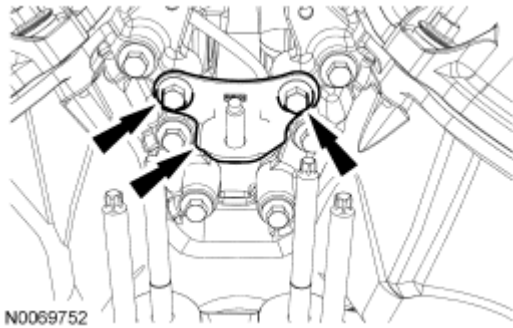


Fig. 834: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

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.

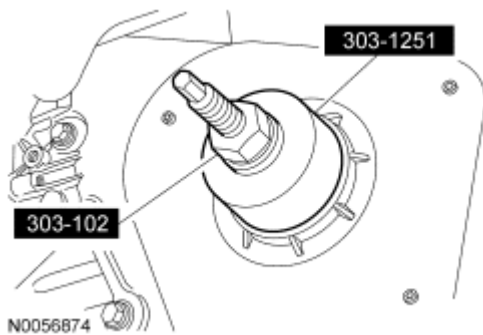


Fig. 835: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

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

- Using the special tools, install the crankshaft pulley.

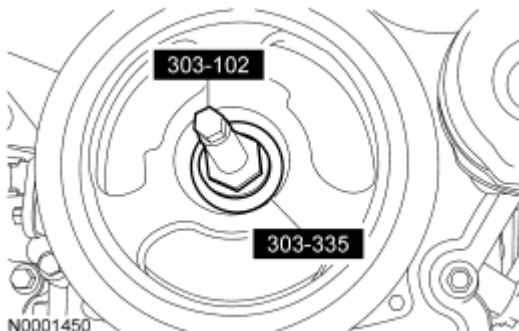


Fig. 836: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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.

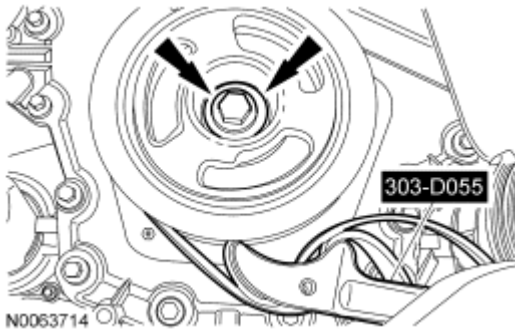


Fig. 837: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

38. Install the accessory drive belt tensioner and the 3 bolts.
- Tighten to 11 Nm (8 lb-ft).

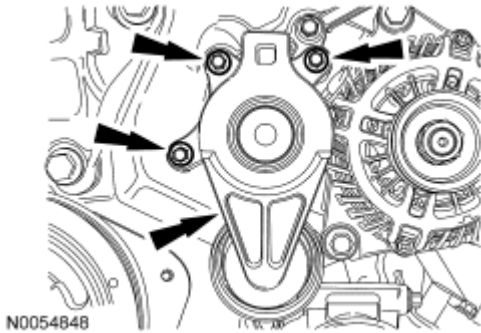


Fig. 838: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

39. Install the power steering pump and the 3 bolts.
- Tighten to 24 Nm (18 lb-ft).

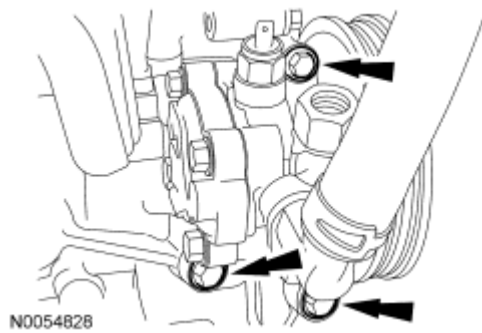


Fig. 839: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

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, VCT seal installation similar.

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

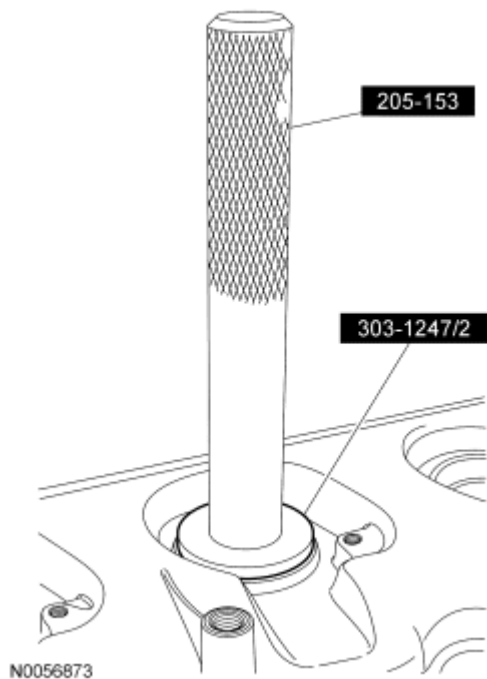


Fig. 840: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

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. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

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

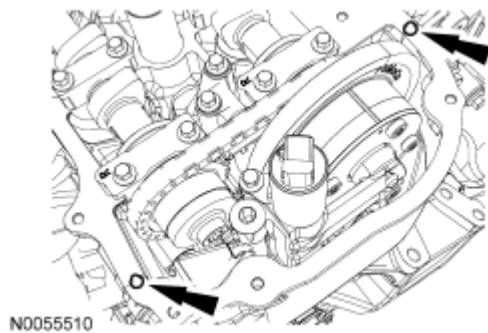


Fig. 841: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
Courtesy of FORD MOTOR CO.

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

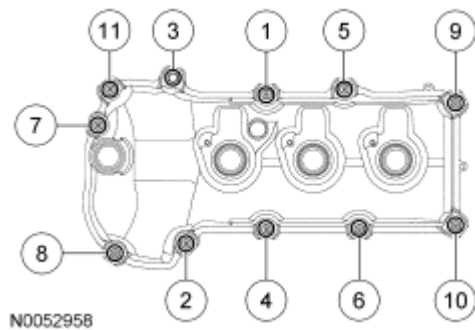


Fig. 842: Installing RH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

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. Follow the directions on the packaging. Failure to follow this procedure can cause future oil leakage.

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

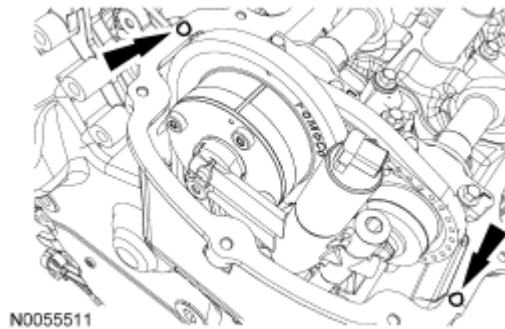


Fig. 843: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
Courtesy of FORD MOTOR CO.

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

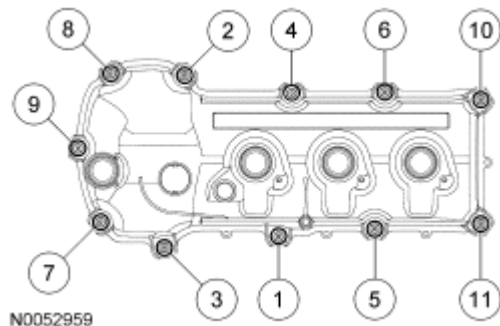


Fig. 844: Installing LH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

45. Install the 6 coil-on-plug assemblies and the 6 bolts.
- Tighten to 7 Nm (62 lb-in).

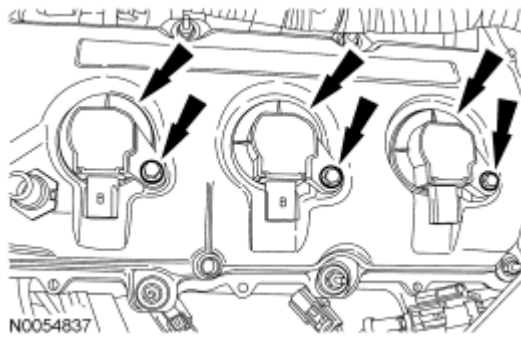


Fig. 845: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

46. Attach all of the wiring harness retainers to the LH valve cover and stud bolts.
47. Connect the 3 LH coil-on-plug electrical connectors.

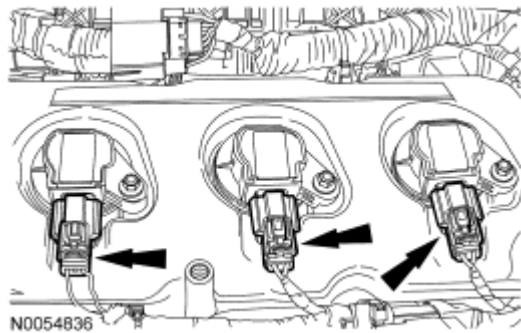


Fig. 846: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

48. Connect the LH camshaft VCT solenoid electrical connector.

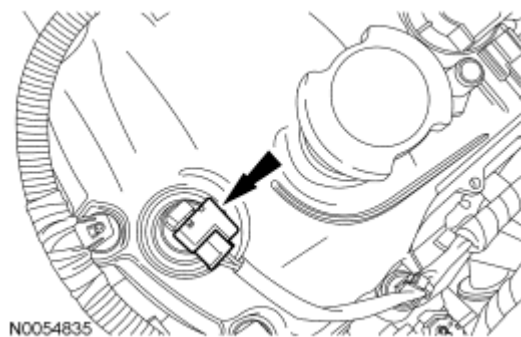


Fig. 847: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

49. Attach all of the wiring harness retainers to the RH valve cover and stud bolts.
50. Connect the 3 RH coil-on-plug electrical connectors.

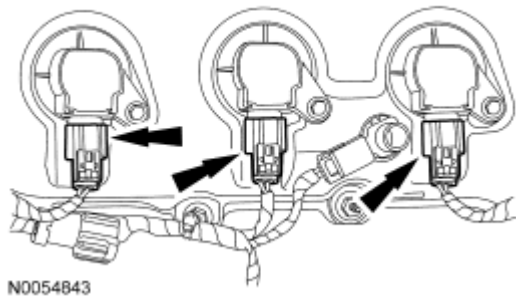


Fig. 848: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

51. Connect the RH VCT solenoid electrical connector.

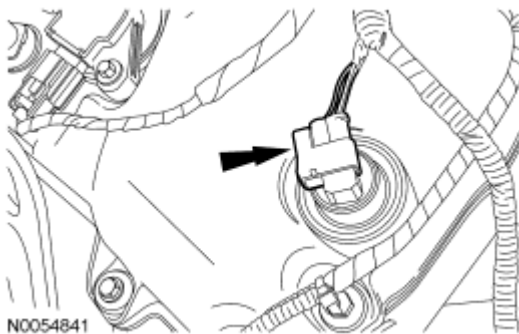


Fig. 849: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

52. Connect the power steering pressure (PSP) switch electrical connector.

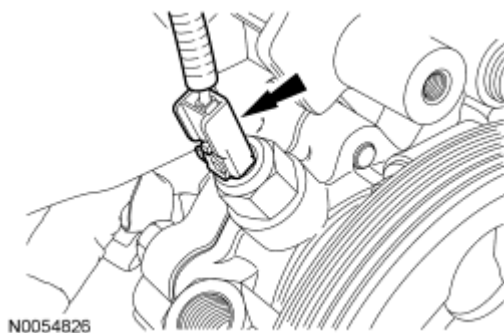


Fig. 850: Locating PSP Switch Electrical Connector
Courtesy of FORD MOTOR CO.

53. Connect the RH catalyst monitor sensor electrical connector.

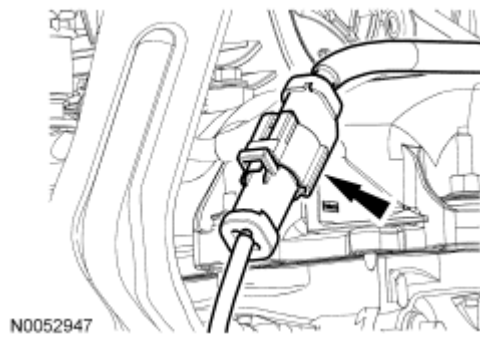


Fig. 851: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

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

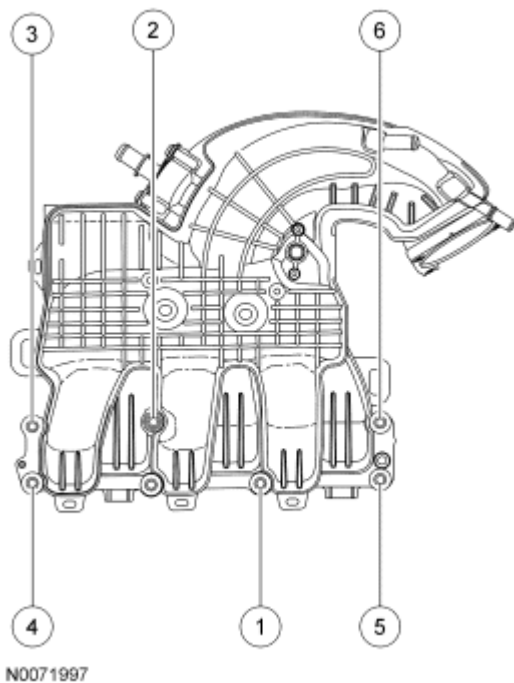


Fig. 852: Identifying Bolt Sequence
Courtesy of FORD MOTOR CO.

55. Install the upper intake manifold support bracket bolt.
- Tighten to 10 Nm (89 lb-in).

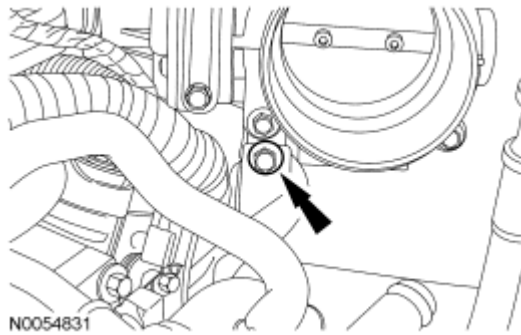


Fig. 853: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

56. Attach the wiring harness retainers to the upper intake manifold.

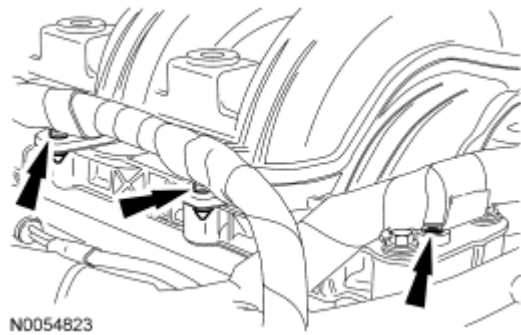


Fig. 854: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

57. Connect the throttle body (TB) electrical connector.

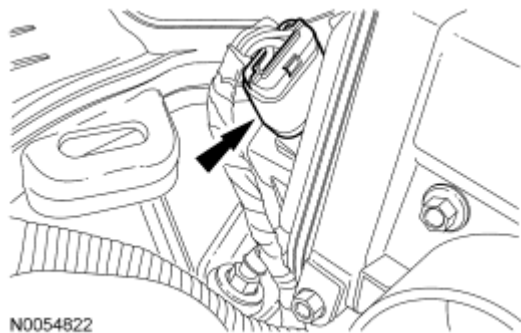


Fig. 855: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

58. Connect the PCV hose to the PCV valve.

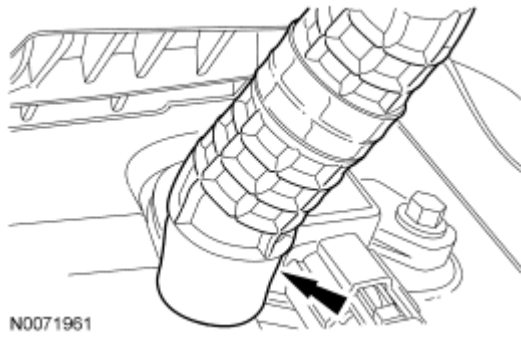


Fig. 856: Identifying PCV Hose
Courtesy of FORD MOTOR CO.

59. If equipped, attach the engine block heater wiring harness retainers.
60. Raise the engine and transaxle assembly into the vehicle.
61. Install the engine mount and the 3 bolts.
 - Tighten to 90 Nm (66 lb-ft).

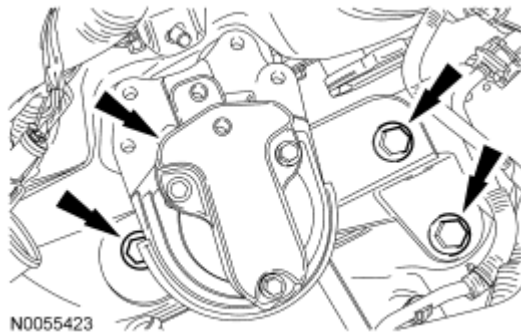


Fig. 857: Locating Engine Mount Bolts
Courtesy of FORD MOTOR CO.

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

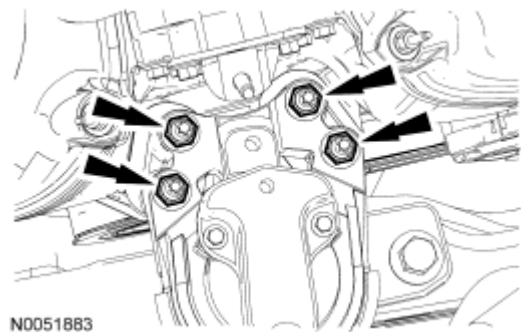


Fig. 858: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

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

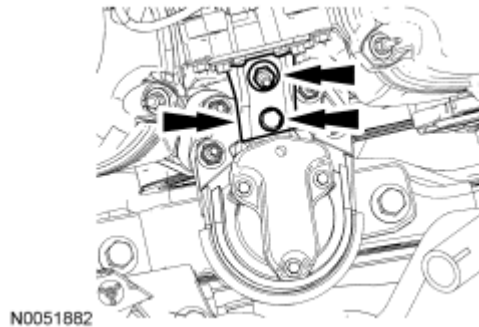


Fig. 859: Locating Nut, Bolt & Engine Mount Brace
Courtesy of FORD MOTOR CO.

64. Install the transaxle support insulator bracket, the 3 nuts and the bolt.
- Tighten to 63 Nm (46 lb-ft).

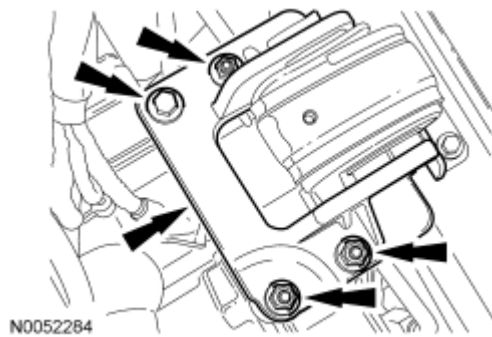


Fig. 860: Identifying Transaxle Support Insulator Bracket, Nuts & Bolts
Courtesy of FORD MOTOR CO.

65. Install the transaxle support insulator through bolt and nut.
- Tighten to 175 Nm (129 lb-ft).

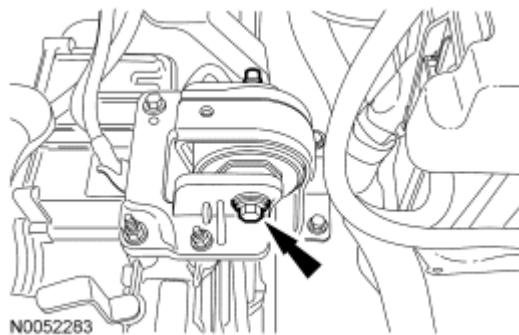


Fig. 861: Identifying Transaxle Support Insulator Bolt
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

NOTE: A new powertrain transfer unit (PTU) seal must be installed whenever the intermediate shaft is removed.

66. Install a new PTU seal. For additional information, refer to **TRANSFER CASE - POWER TRANSFER UNIT (PTU)** article.

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface for wear or damage and install new, if necessary.

67. Position the RH halfshaft/intermediate shaft assembly in the PTU and in the steering knuckle and install the 2 bolts.
- Tighten to 40 Nm (30 lb-ft).

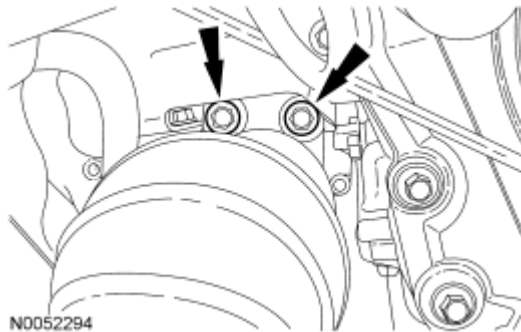


Fig. 862: Locating RH Halfshaft Bearing Support Bracket Bolts
Courtesy of FORD MOTOR CO.

Front wheel drive (FWD) vehicles

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface for wear or damage and install new if necessary.

68. Position the RH halfshaft/intermediate shaft assembly in the transaxle and in the steering knuckle and install the 2 stud bolts.
- Tighten to 55 Nm (41 lb-ft).

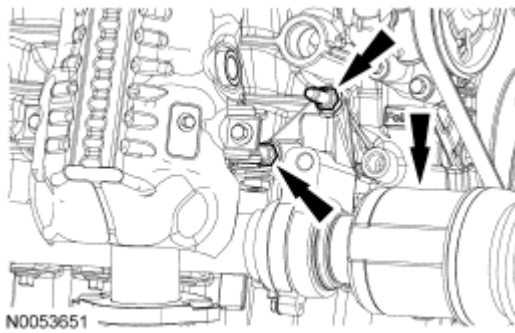


Fig. 863: Locating Stud Bolts & RH Halfshaft/Intermediate Shaft Assembly
Courtesy of FORD MOTOR CO.

NOTE: Do not tighten the 2 catalytic converter support bracket bolts at this time.

69. Install the converter support bracket and the 2 bolts.

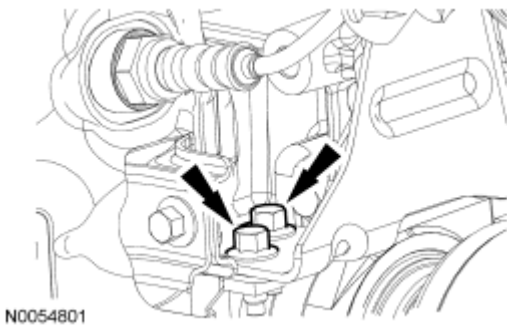


Fig. 864: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

70. Install the catalytic converter bracket bolt and the nut.
 1. Tighten the nut to 40 Nm (30 lb-ft).
 2. Tighten the bolt to 55 Nm (41 lb-ft).

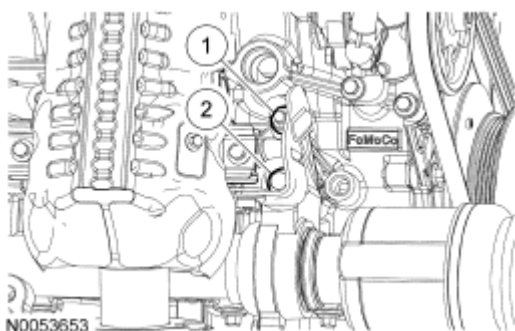


Fig. 865: Locating Catalytic Converter Bracket Bolt & Nut
Courtesy of FORD MOTOR CO.

71. Tighten the 2 RH catalytic converter support bracket bolts to 20 Nm (15 lb-ft).

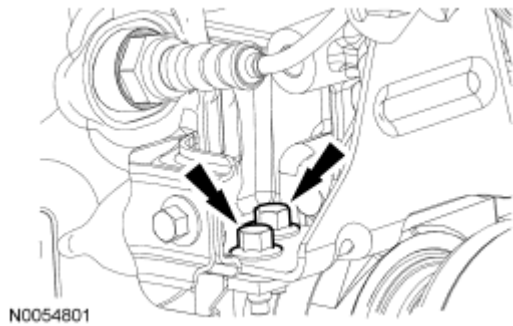


Fig. 866: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

All vehicles

NOTE: Prior to installation of the halfshaft, inspect the halfshaft sealing surface for wear or damage and install new, if necessary.

72. Install the LH halfshaft into the transaxle.

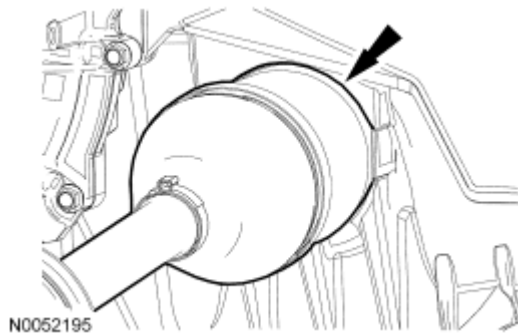


Fig. 867: Identifying LH Halfshaft
Courtesy of FORD MOTOR CO.

73. If equipped, connect the oil cooler coolant hoses.

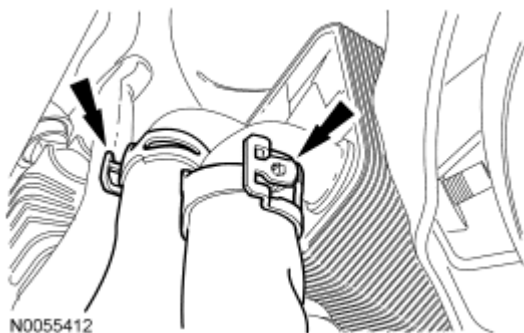


Fig. 868: Locating Oil Cooler Coolant Hoses
Courtesy of FORD MOTOR CO.

74. Using the special tool, raise the subframe into the installed position.

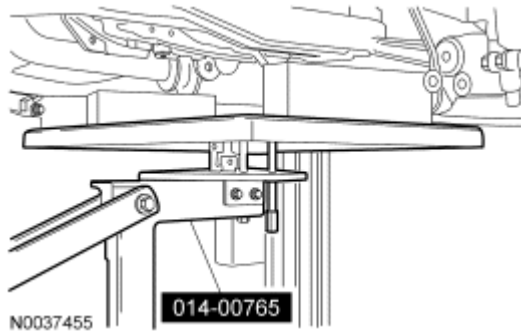


Fig. 869: Positioning Special Tool (014-00765) Under Subframe Assembly
Courtesy of FORD MOTOR CO.

75. Install the 2 middle subframe nuts.
- Tighten to 133 Nm (98 lb-ft).

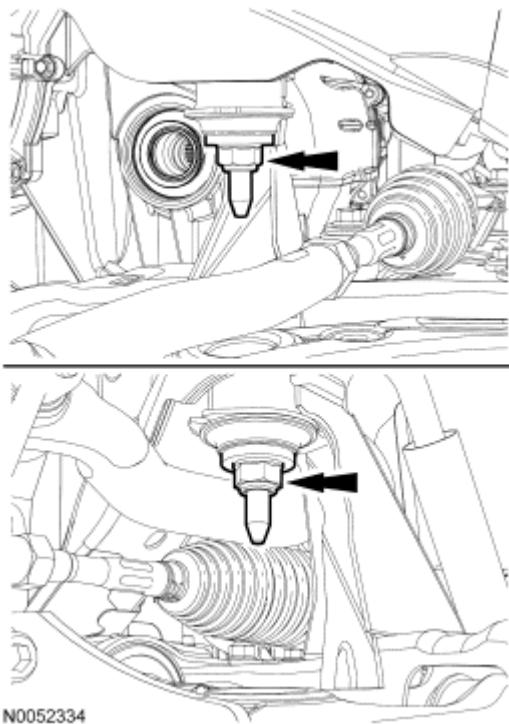


Fig. 870: Locating Middle Subframe Nuts
Courtesy of FORD MOTOR CO.

76. Install the 2 front subframe nuts.
- Tighten to 133 Nm (98 lb-ft).

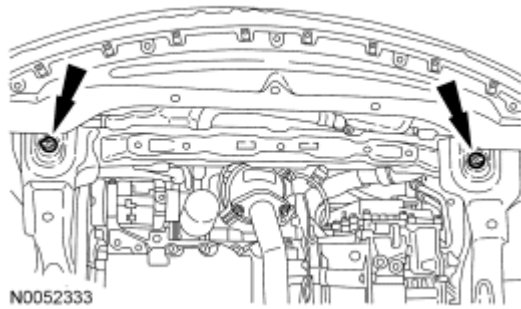


Fig. 871: Locating Front Subframe Nuts
Courtesy of FORD MOTOR CO.

77. Position the subframe support brackets in place and loosely install the 4 bolts.

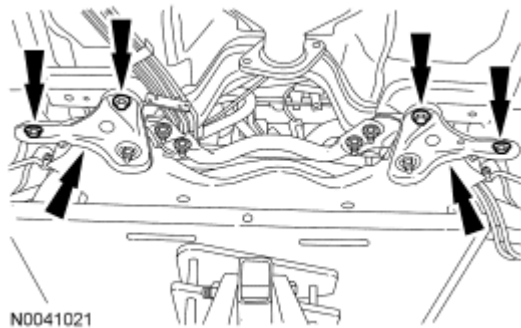


Fig. 872: Locating Subframe Support Brackets And Bolts
Courtesy of FORD MOTOR CO.

78. Install the 2 rear subframe bracket nuts.
- Tighten to 133 Nm (98 lb-ft).

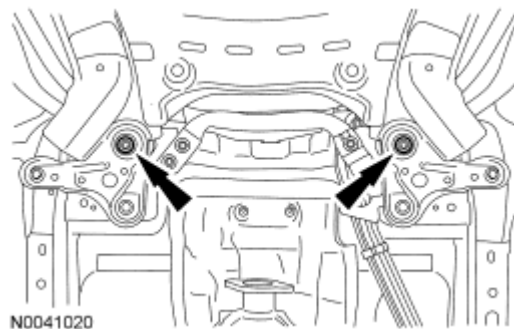


Fig. 873: Locating Rear Subframe Nuts
Courtesy of FORD MOTOR CO.

79. Tighten the 4 subframe support bracket bolts.
- Tighten to 90 Nm (66 lb-ft).

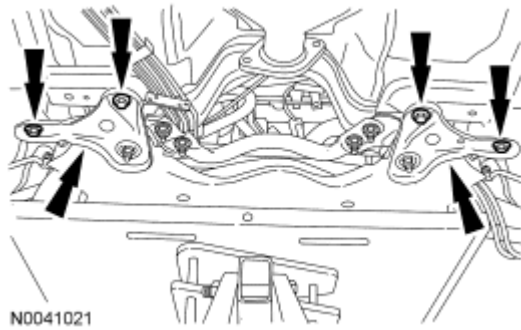


Fig. 874: Locating Subframe Support Brackets And Bolts
Courtesy of FORD MOTOR CO.

80. Position the lower bumper on the subframe and install the 3 LH nuts.
- Tighten to 9 Nm (80 lb-in).

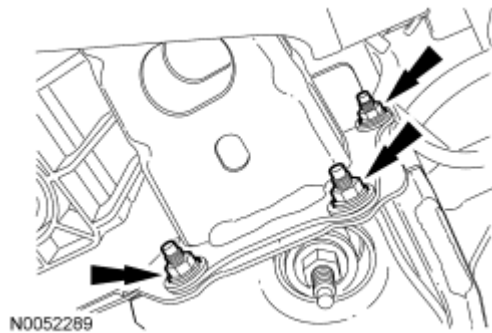


Fig. 875: Locating LH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

81. Install the 3 RH lower bumper-to-subframe nuts.
- Tighten to 9 Nm (80 lb-in).

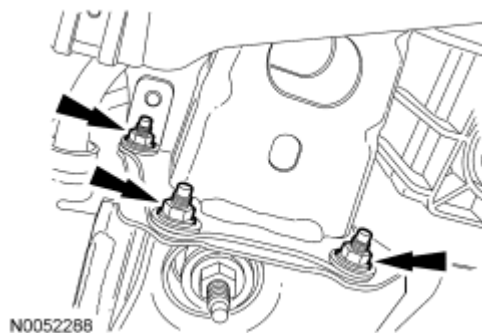
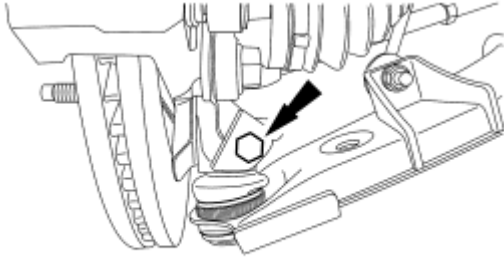


Fig. 876: Locating RH Subframe-To-Lower Bumper Nuts
Courtesy of FORD MOTOR CO.

NOTE: RH side shown, LH side similar.

82. Install the ball joints in the steering knuckles and install the pinch bolts.
- Tighten to 55 Nm (41 lb-ft).

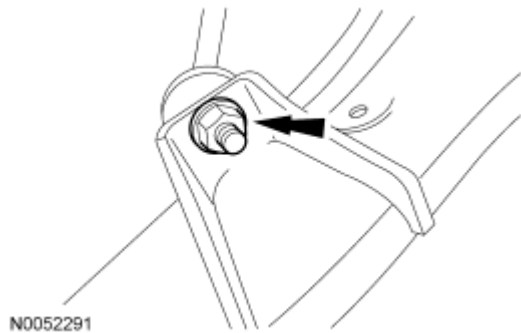


N0052293

Fig. 877: Locating Ball Joint Pinch Bolt
Courtesy of FORD MOTOR CO.

NOTE: RH side shown, LH side similar.

83. Position the stabilizer bar links in the lower control arms and install the nuts.
- Tighten to 90 Nm (66 lb-ft).



N0052291

Fig. 878: Locating Stabilizer Bar Link Nut
Courtesy of FORD MOTOR CO.

NOTE: RH shown, LH similar.

84. Install the tie-rod ends and nuts.
- Tighten to 48 Nm (35 lb-ft).
 - Install new cotter pins.

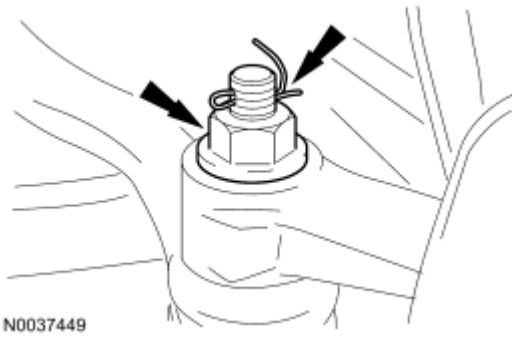


Fig. 879: Locating Tie-Rod Ends Nuts And Cotter Pin
Courtesy of FORD MOTOR CO.

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

85. Install the intermediate shaft onto the steering gear and install a new bolt.
- Tighten to 23 Nm (17 lb-ft).

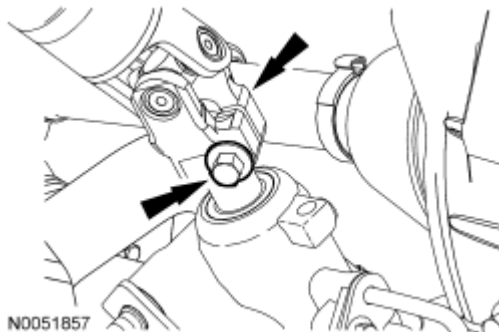


Fig. 880: Identifying Steering Intermediate Shaft Bolt
Courtesy of FORD MOTOR CO.

86. Using a new banjo bolt and 2 new seals, install the PSP tube.
- Tighten to 48 Nm (35 lb-ft).

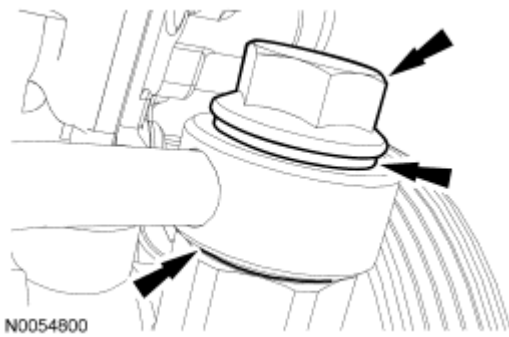


Fig. 881: Locating Power Steering Pressure (PSP) Tube-To-Pump Banjo Bolt & Seals
Courtesy of FORD MOTOR CO.

87. Install the engine roll restrictor-to-subframe through bolt.
 - Tighten to 103 Nm (76 lb-ft).

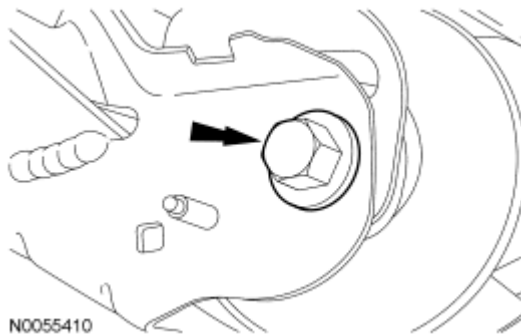


Fig. 882: Locating Roll Restrictor-To-Subframe Bolt
Courtesy of FORD MOTOR CO.

88. Install the roll restrictor heat shield and the 2 nuts.
 - Tighten to 11 Nm (8 lb-ft).

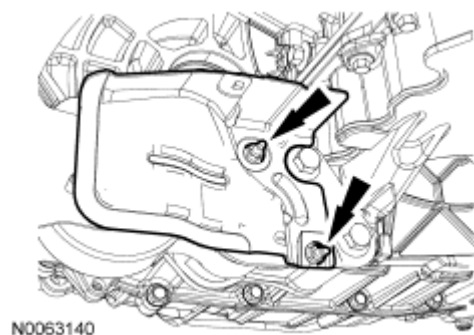


Fig. 883: Locating Roll Restrictor Heat Shield Nuts
Courtesy of FORD MOTOR CO.

NOTE: Apply the brake to keep the halfshaft from rotating.

89. Install a new RH front halfshaft nut.
 - Tighten to 350 Nm (258 lb-ft).

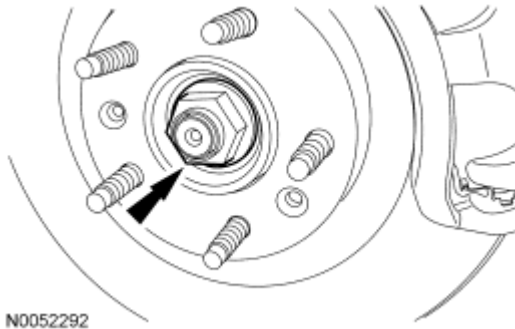


Fig. 884: Locating RH Front Halfshaft Nut
Courtesy of FORD MOTOR CO.

AWD vehicles

90. 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.
 - Tighten to 70 Nm (52 lb-ft).

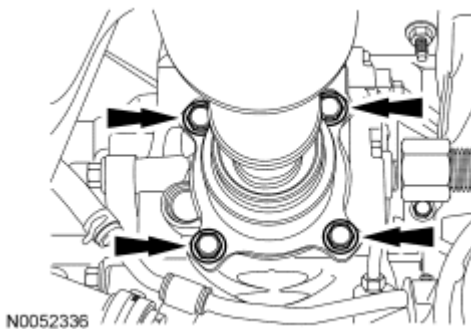


Fig. 885: Locating Driveshaft Aside Bolts
Courtesy of FORD MOTOR CO.

All vehicles

91. Install the power steering cooler bracket bolt to the RH side of the subframe.
 - Tighten to 9 Nm (80 lb-in).

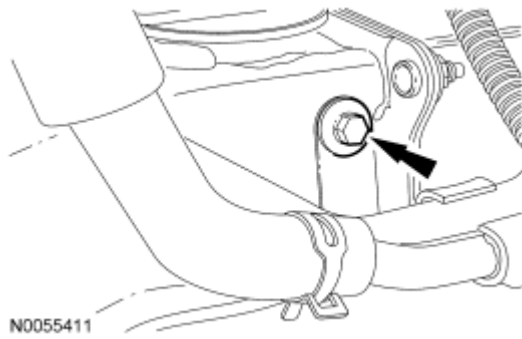


Fig. 886: Identifying Power Steering Cooler Bracket Bolt
Courtesy of FORD MOTOR CO.

92. Connect the power steering cooler hose.

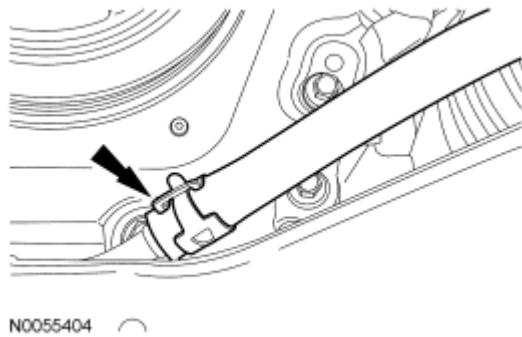


Fig. 887: Identifying Power Steering Cooler Hose
Courtesy of FORD MOTOR CO.

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

93. Install a new engine oil filter.
- Tighten to 5 Nm (44 lb-in) and then rotate an additional 180 degrees.

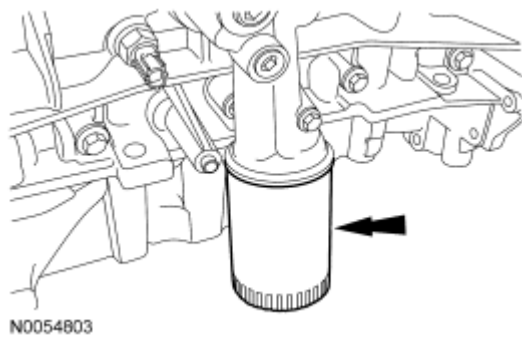


Fig. 888: Identifying Engine Oil Filter
Courtesy of FORD MOTOR CO.

94. Connect the 2 transmission fluid cooler tubes.

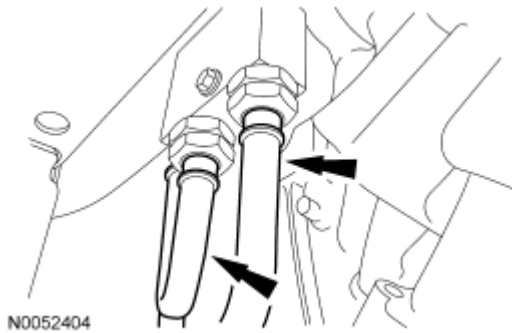


Fig. 889: Locating Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

95. Install the 2 secondary latches onto the transmission fluid cooler tubes.

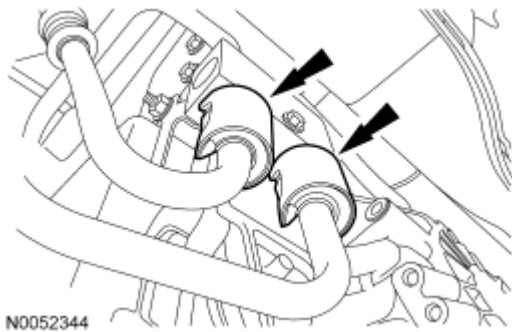


Fig. 890: Locating Secondary Latches On Transmission Fluid Cooler Tubes
Courtesy of FORD MOTOR CO.

96. Install the LH inner splash shield. For additional information, refer to **FRONT END BODY PANELS** article.
97. Install the radiator splash shield, the 3 pin-type retainers and the 7 screws.

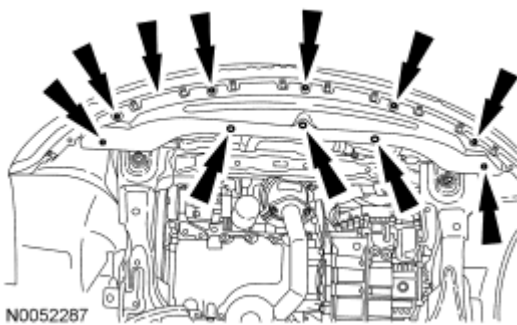


Fig. 891: Locating Push Pin Fasteners & Front Splash Shield Screws
Courtesy of FORD MOTOR CO.

98. Using a new gasket, install the Y-pipe and exhaust flexible pipe assembly and 4 new nuts.
- Tighten to 40 Nm (30 lb-ft).

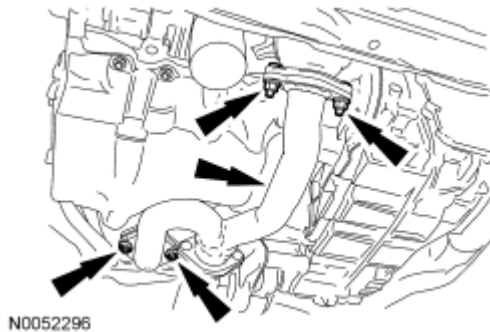


Fig. 892: Locating Exhaust Flexible Pipe, Y-Pipe & Nuts
Courtesy of FORD MOTOR CO.

99. Install the 2 exhaust hangers and tighten the exhaust clamp.
- Tighten to 40 Nm (30 lb-ft).



Fig. 893: Locating Exhaust Flexible Pipe Clamp & Exhaust Hangers
Courtesy of FORD MOTOR CO.

100. Install the ground wire, the radio interference capacitor wire and the nut to the engine front cover stud.
- Tighten to 10 Nm (89 lb-in).

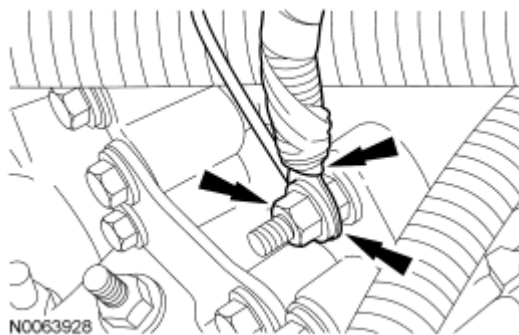


Fig. 894: Removing/installing Nut, Ground Wire & Radio Interference Capacitor Wire From Engine Front Cover Stud

Courtesy of FORD MOTOR CO.

101. Install the ground wire and bolt to the engine front cover.
- Tighten to 10 Nm (89 lb-in).

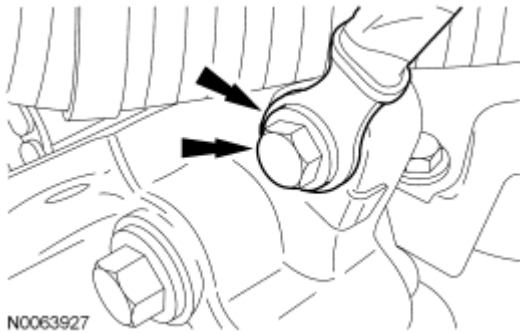


Fig. 895: Removing/Installing Bolt & Ground Wire From Engine Front Cover
Courtesy of FORD MOTOR CO.

102. Attach the wiring harness retainer to the RH valve cover stud bolt.

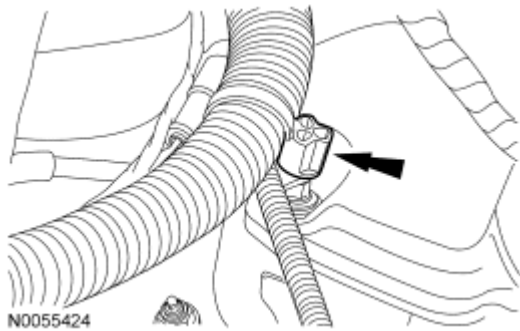


Fig. 896: Identifying Wiring Harness Retainer From RH Valve Cover Stud Bolt
Courtesy of FORD MOTOR CO.

103. Install the oil level indicator.

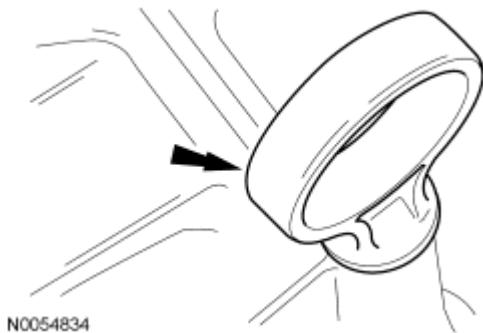


Fig. 897: Identifying Oil Level Indicator
Courtesy of FORD MOTOR CO.

104. Connect the 2 engine wiring harness electrical connectors.
- Attach the electrical connector to the LH valve cover.

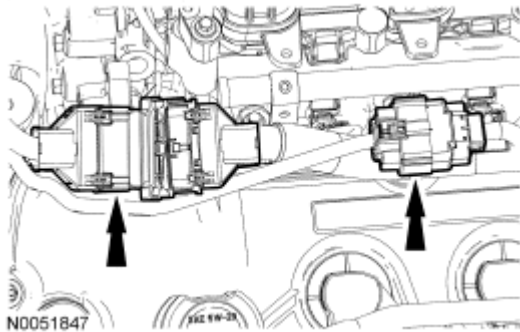


Fig. 898: Identifying Engine Wiring Harness Electrical Connectors
Courtesy of FORD MOTOR CO.

105. Connect the fuel hose routing clip to the transaxle stud.

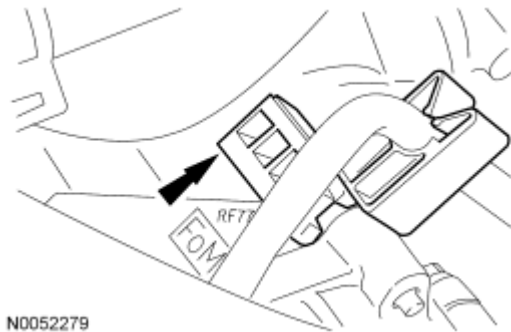


Fig. 899: Identifying Fuel Hose Routing Clip From Transaxle Stud
Courtesy of FORD MOTOR CO.

106. Connect the fuel supply tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

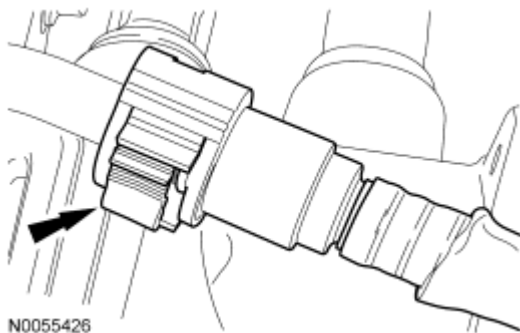


Fig. 900: Identifying Fuel Supply Tube
Courtesy of FORD MOTOR CO.

107. Connect the hose to the power steering reservoir.

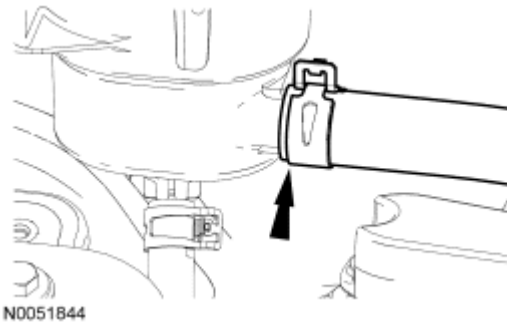


Fig. 901: Disconnecting Hose From Power Steering Reservoir
Courtesy of FORD MOTOR CO.

108. Connect the A/C suction tube fitting.

- Install the safety clip onto the A/C fitting.

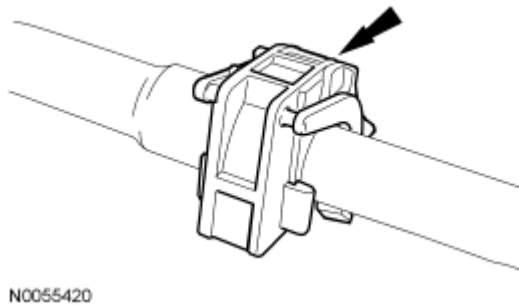


Fig. 902: Identifying Safety Clip On A/C Suction Tube Fitting
Courtesy of FORD MOTOR CO.

109. Using a new O-ring seal, connect the A/C pressure tube fitting and install the nut.

- Tighten to 8 Nm (71 lb-in).

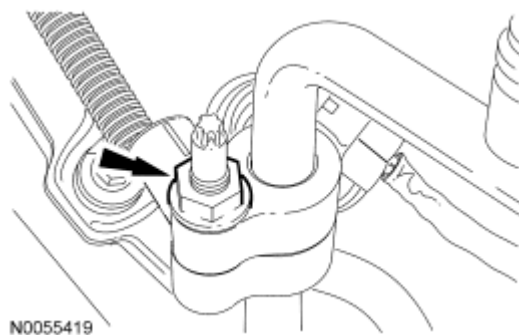


Fig. 903: Identifying A/C Pressure Tube Fitting Nut
Courtesy of FORD MOTOR CO.

110. If equipped, attach the engine block heater harness retainers from to the radiator support and the A/C suction tube.

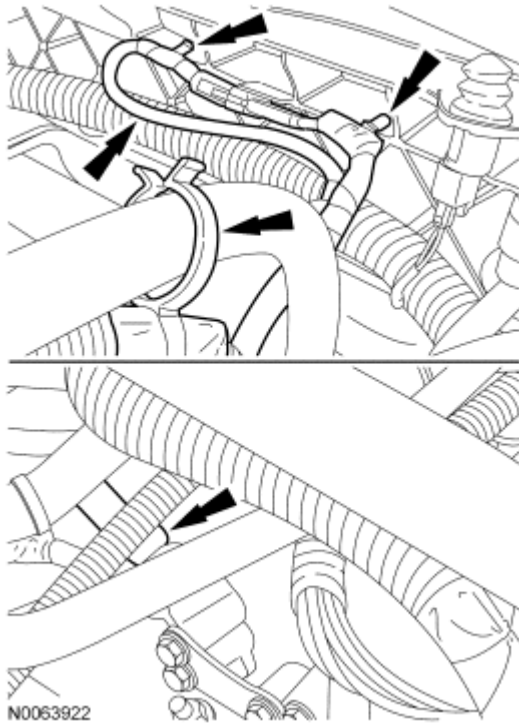


Fig. 904: Identifying Engine Block Heater Harness, Radiator Support, A/C Suction Tube & Engine Wiring Harness

Courtesy of FORD MOTOR CO.

111. Connect the transaxle control electrical connector.

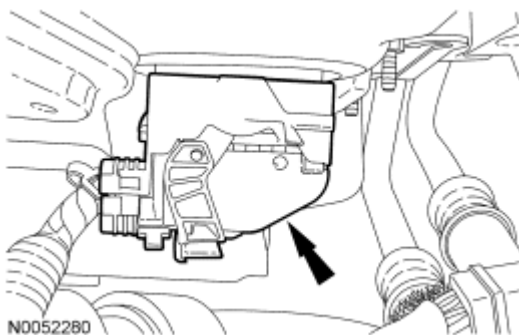


Fig. 905: Identifying Transaxle Control Electrical Connector

Courtesy of FORD MOTOR CO.

112. Attach the control cable to the bracket.
- Connect the transaxle control cable to the control lever.

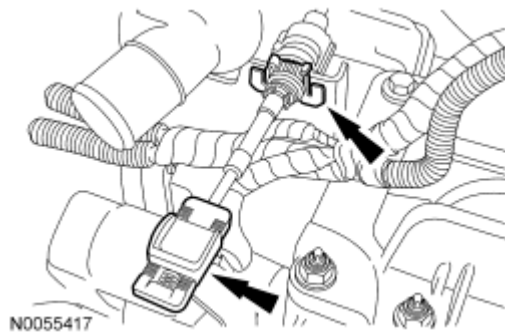


Fig. 906: Locating Transaxle Control Cable From Control Lever
Courtesy of FORD MOTOR CO.

113. Attach the wiring harness retainer to the transaxle control cable bracket.



Fig. 907: Locating Wiring Harness Retainer From Transaxle Control Cable Bracket
Courtesy of FORD MOTOR CO.

114. Connect the upper radiator hose, lower radiator hose and 2 heater hoses to the thermostat housing.

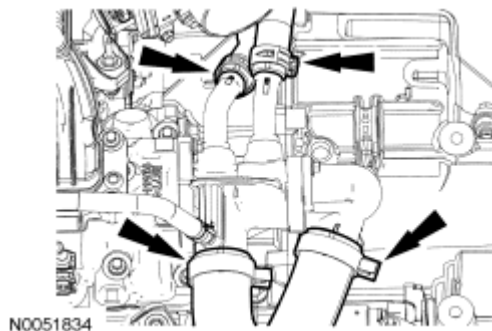


Fig. 908: Locating Upper Radiator Hose, Lower Radiator Hose & Heater Hoses
Courtesy of FORD MOTOR CO.

115. Connect the upper evaporative emissions (EVAP) tube quick connect coupling. to the purge valve. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** article.

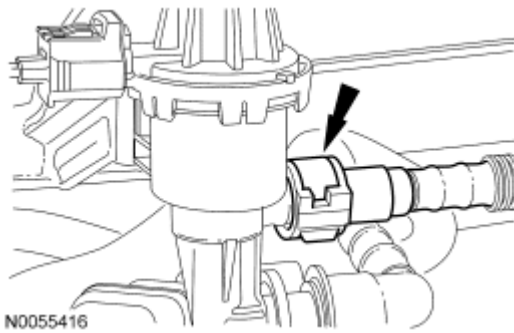


Fig. 909: Locating Upper Evaporative Emissions (EVAP) Tube Quick Connect Coupling
Courtesy of FORD MOTOR CO.

116. Connect the vacuum hose to the upper intake manifold.

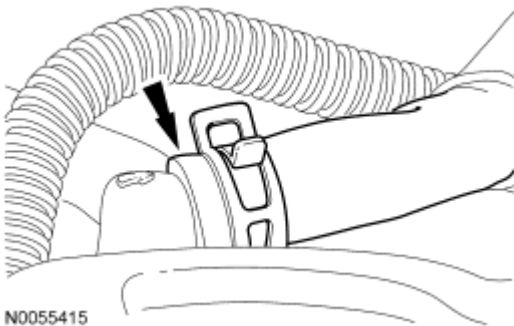


Fig. 910: Identifying Vacuum Hose From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

117. Install the ground wire and the bolt.
- Tighten to 10 Nm (89 lb-in).
 - Attach the 2 wiring harness retainers to the cowl.

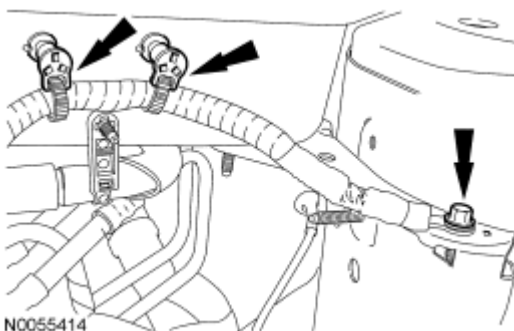


Fig. 911: Identifying Wiring Harness Retainers From Cowl
Courtesy of FORD MOTOR CO.

118. Connect the power feed to the battery terminal and install the nut.
- Tighten to 8 Nm (71 lb-in).

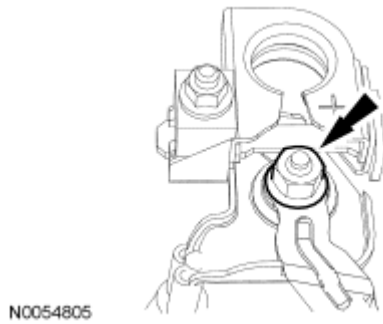


Fig. 912: Locating Power Feed To Battery Terminal And Nut
Courtesy of FORD MOTOR CO.

119. Connect the battery harness electrical connector.

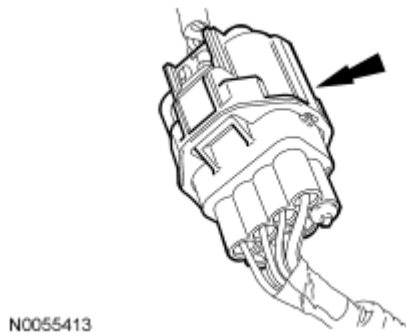


Fig. 913: Identifying Battery Harness Electrical Connector
Courtesy of FORD MOTOR CO.

120. Install the battery tray. For additional information, refer to **BATTERY, MOUNTING & CABLES** article.
121. Install the engine air cleaner and the air cleaner outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** article.
122. Install the degas bottle. For additional information, refer to **ENGINE COOLING** article.
123. Install the accessory drive belt and the power steering belt. For additional information, refer to **ACCESSORY DRIVE** 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.

124. Fill the engine with clean engine oil.
125. Fill and bleed the cooling system. For additional information, refer to **ENGINE COOLING** article.
126. Fill the power steering system. For additional information, refer to **STEERING SYSTEM - GENERAL INFORMATION** article.
127. Recharge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION & 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.

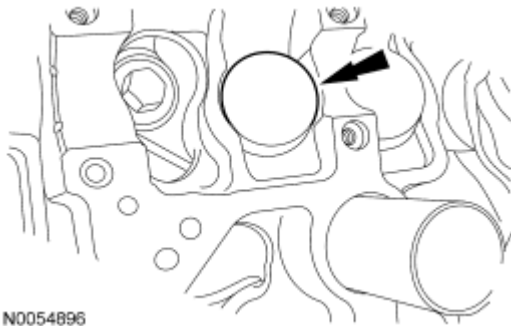


Fig. 914: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

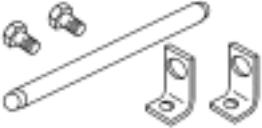

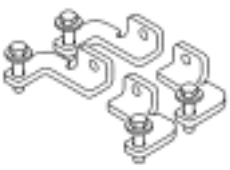

2. Depending on the valve tappets being serviced, install the LH and/or the RH camshafts. For additional information, refer to **Camshaft**.

VALVE SPRING, RETAINER AND SEAL**Special Tools**

Illustration	Tool Name	Tool Number
	Compressor, Valve Spring	303-300 (T87C-6565-A)

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 <p>ST1981-A</p>		
 <p>ST1907-A</p>	Compressor, Valve Spring	303-350 (T89P-6565-A)
 <p>ST302B-A</p>	Compressor, Valve Spring	303-1249
 <p>ST1906-A</p>	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

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.

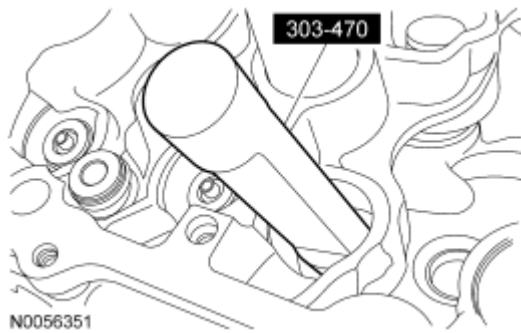


Fig. 915: Installing New Valve Stem Seal Using Special Tool (303-470)
Courtesy of FORD MOTOR CO.

- Using the Valve Spring Compressors, install the valve spring, retainer and key.

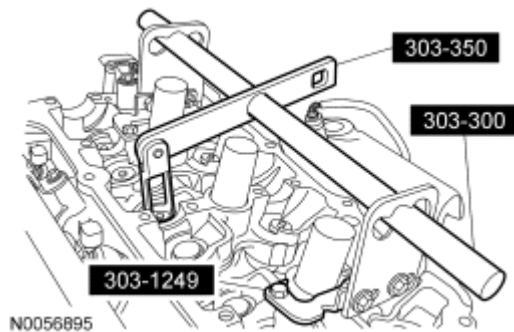


Fig. 916: Removing Keys, Retainer & Spring Using Special Tools (303-1249, 303-350, 303-300)
Courtesy of FORD MOTOR CO.

- Install the valve tappets. For additional information, refer to Valve Tappets.

CYLINDER HEAD - RH

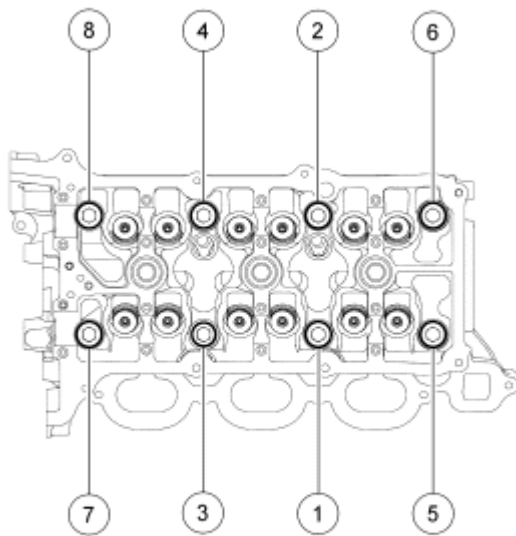
Material

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

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

All vehicles

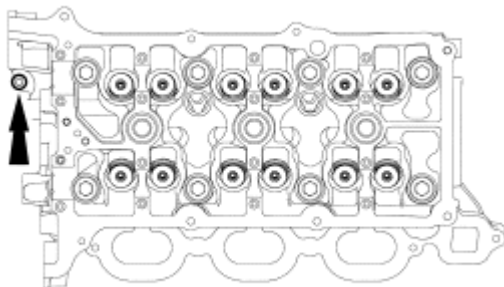
1. Install a new gasket, the RH cylinder head and 8 new bolts. Tighten in the sequence shown in 5 stages:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 35 Nm (26 lb-ft).
 - Stage 3: Tighten 90 degrees.
 - Stage 4: Tighten 90 degrees.
 - Stage 5: Tighten 90 degrees.



N0054884

Fig. 917: Installing RH Cylinder Head Bolts In Sequence
 Courtesy of FORD MOTOR CO.

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



N0055173

Fig. 918: 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.

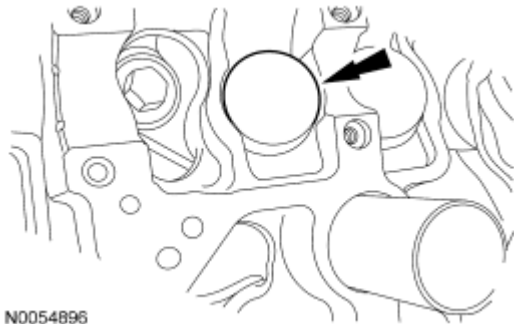


Fig. 919: Identifying Valve Tappets From Cylinder Head
Courtesy of FORD MOTOR CO.

4. Install and connect the cylinder head temperature (CHT) sensor jumper harness.

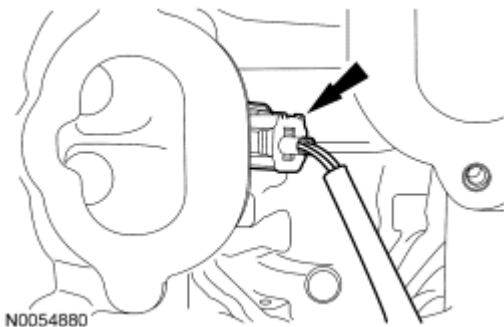


Fig. 920: Identifying CHT Sensor Jumper Harness
Courtesy of FORD MOTOR CO.

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

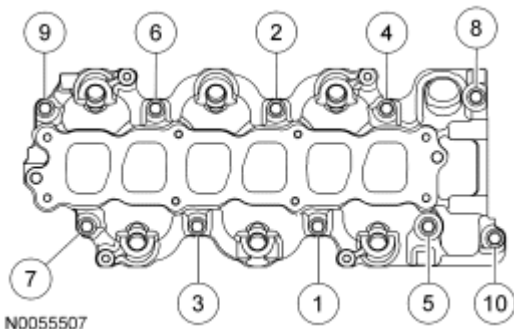


Fig. 921: Installing Lower Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

6. Using a new gasket and O-ring seal, install the thermostat housing and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

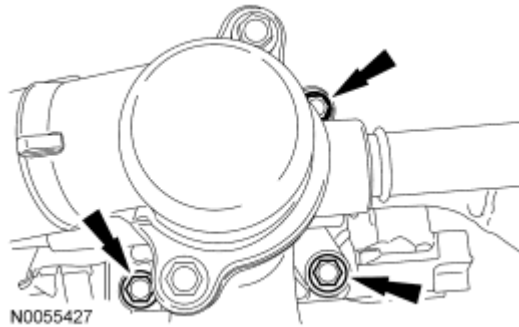
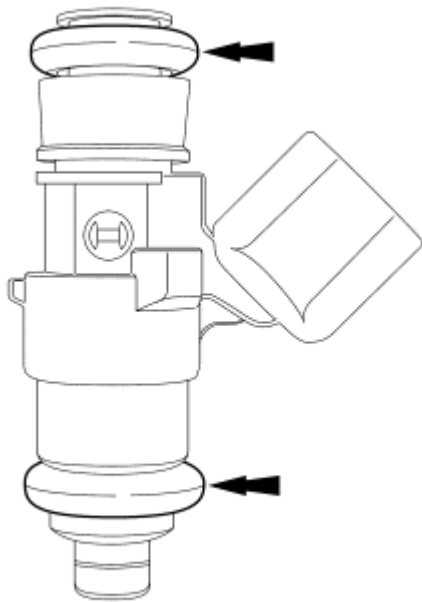


Fig. 922: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings can cause the fuel system to leak. Do not reuse the O-ring seals.

NOTE: The upper and lower O-ring seals are not interchangeable.

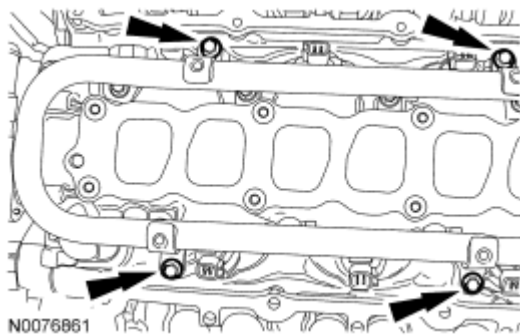
7. Install new fuel injector O-ring seals.
 - Remove the retaining clips and separate the fuel injectors from the fuel rail.
 - Remove and discard the O-ring seals.
 - Install new O-ring seals and lubricate with clean engine oil.
 - Install the fuel injectors and the retaining clips onto the fuel rail.



N0055508

Fig. 923: 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).



N0076861

Fig. 924: Identifying Fuel Rail And Injectors
Courtesy of FORD MOTOR CO.

9. Install the RH camshaft position (CMP) sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

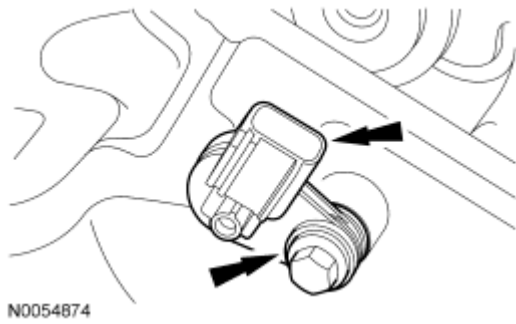


Fig. 925: Locating RH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

NOTE: Align the bracket with the index mark made during removal.

10. Install the upper intake manifold bracket and the bolt.
 - Tighten to 10 Nm (89 lb-in).

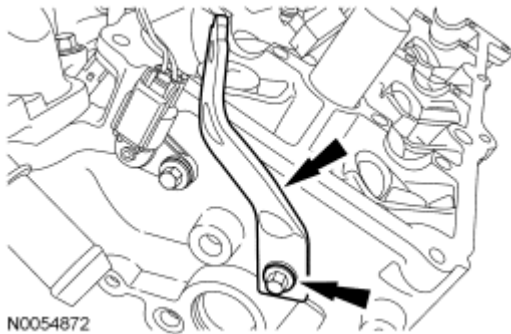


Fig. 926: Locating Upper Intake Manifold Bracket & Bolt
Courtesy of FORD MOTOR CO.

11. Install the engine lifting eye and the 2 bolts.
 - Tighten to 24 Nm (18 lb-ft).

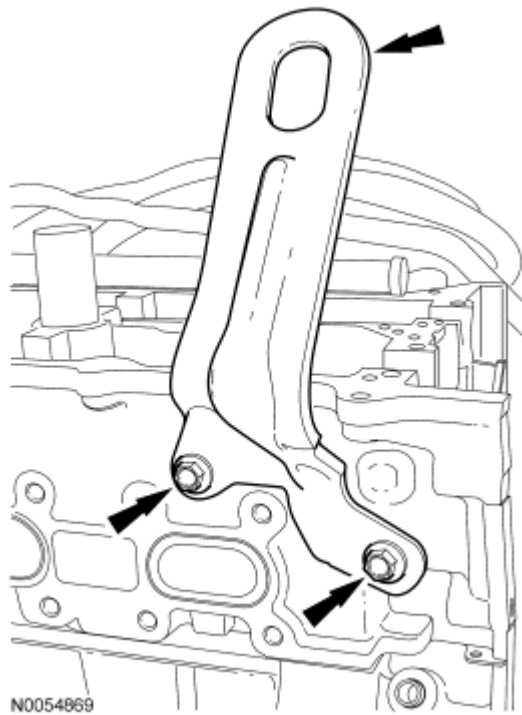


Fig. 927: Locating Engine Lifting Eye & Bolts
 Courtesy of FORD MOTOR CO.

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

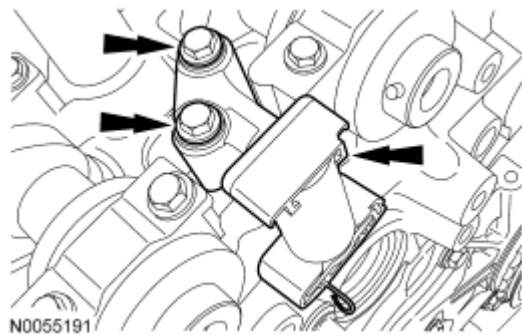


Fig. 928: Locating RH Secondary Timing Chain Tensioner & Bolts
 Courtesy of FORD MOTOR CO.

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

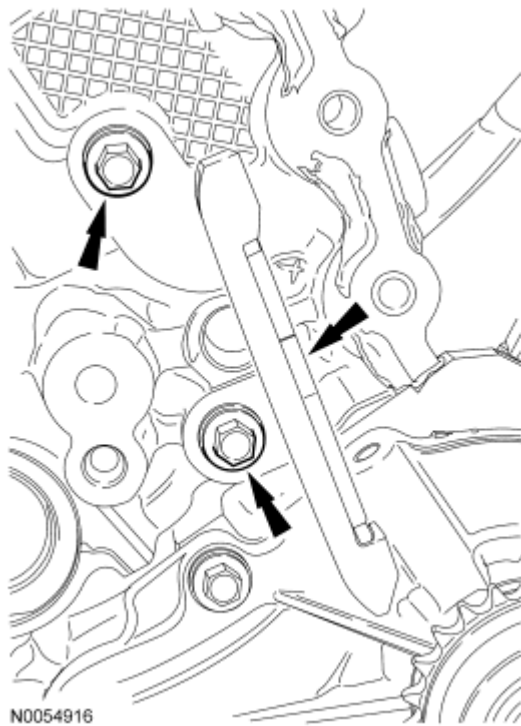


Fig. 929: Locating RH Primary Timing Chain Guide Lower Bolt
Courtesy of FORD MOTOR CO.

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

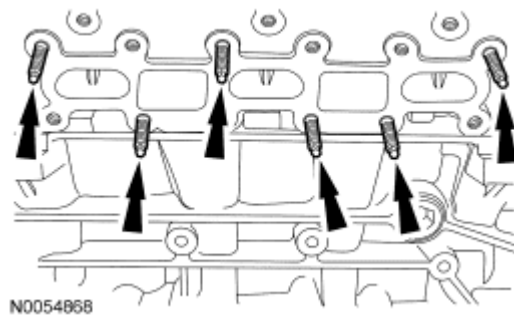


Fig. 930: Locating RH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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

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

- Stage 2: Tighten to 20 Nm (15 lb-ft).

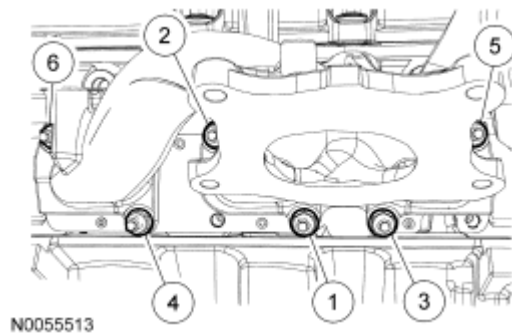


Fig. 931: Installing RH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

16. Install the RH exhaust manifold heat shield and the 3 bolts.
 - Tighten to 14 Nm (10 lb-ft).

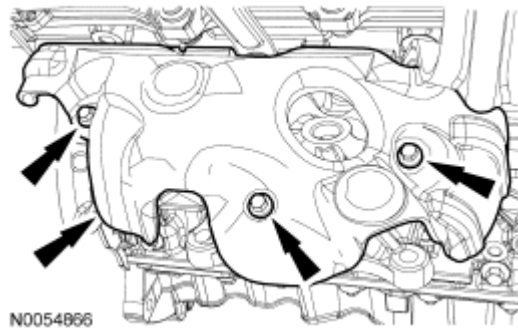


Fig. 932: Locating RH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

17. Install the RH cylinder block drain plug or, if equipped, the block heater.
 - Tighten to 40 Nm (30 lb-ft).

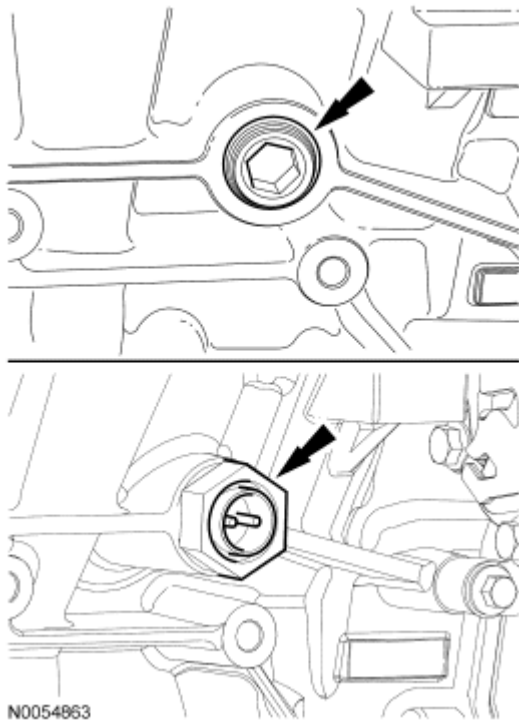


Fig. 933: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

NOTE: Do not tighten the 4 catalytic converter nuts at this time.

18. Using a new gasket, install the RH catalytic converter and 4 new nuts.

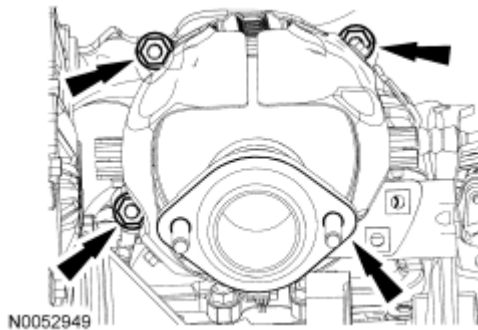


Fig. 934: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

19. Install the 2 RH catalytic converter bracket bolts.
 - Tighten the 4 catalytic converter nuts to 40 Nm (30 lb-ft).
 - Tighten the 2 catalytic converter bracket bolts to 20 Nm (15 lb-ft).

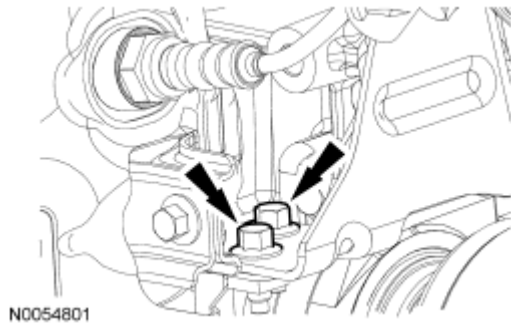


Fig. 935: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

All vehicles

20. Install the LH cylinder block drain plug.
 - Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

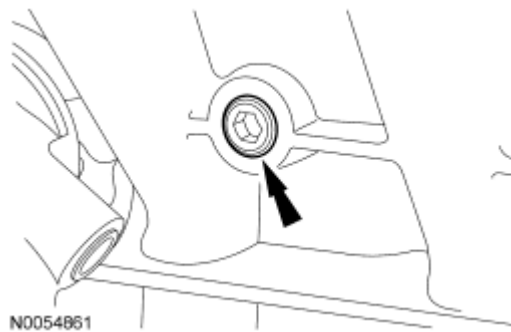


Fig. 936: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

21. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown).
 - Tighten to 40 Nm (30 lb-ft).

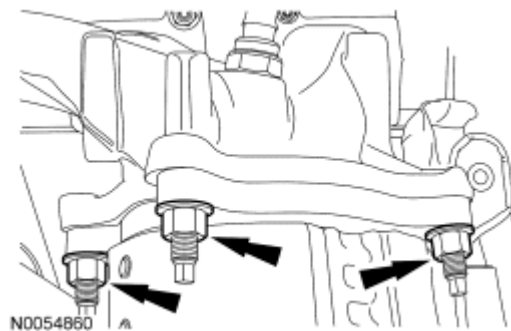


Fig. 937: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

22. Install the 2 LH catalytic converter bracket bolts.
- Tighten to 20 Nm (15 lb-ft).

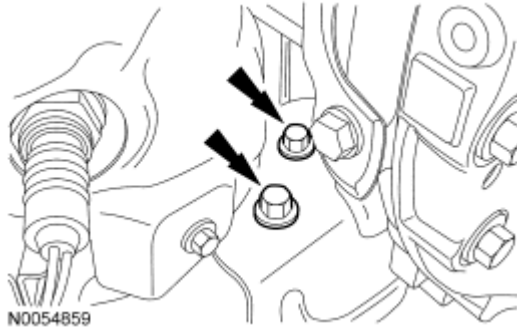


Fig. 938: Locating LH Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

23. Connect the LH catalyst monitor sensor electrical connector.

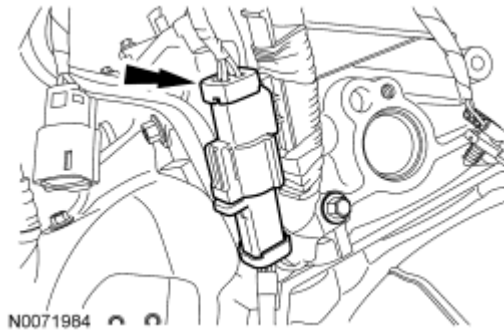


Fig. 939: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

24. Connect the CHT sensor electrical connector.

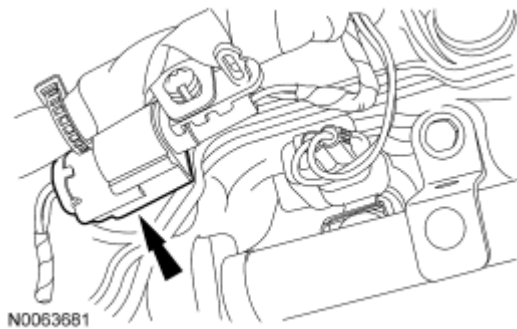


Fig. 940: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

25. Connect the 6 fuel injector electrical connectors (3 shown).

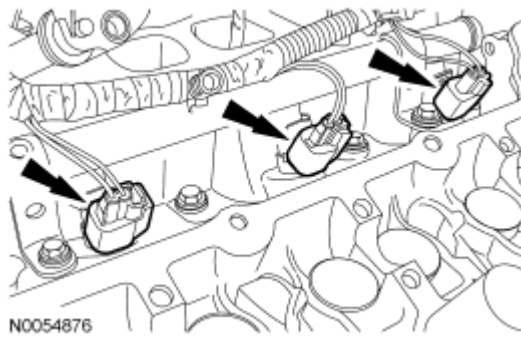


Fig. 941: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

26. Install the ground cable and the bolt.
 - Tighten to 10 Nm (89 lb-in).

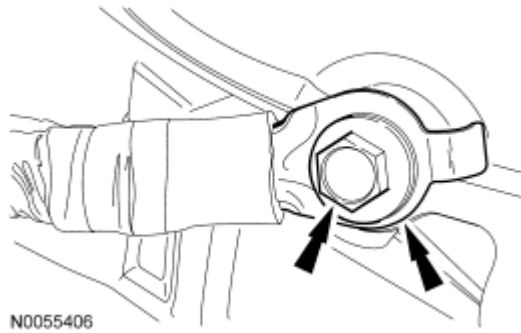


Fig. 942: Locating Ground Cable From RH Cylinder
Courtesy of FORD MOTOR CO.

27. Connect the RH CMP sensor electrical connector.

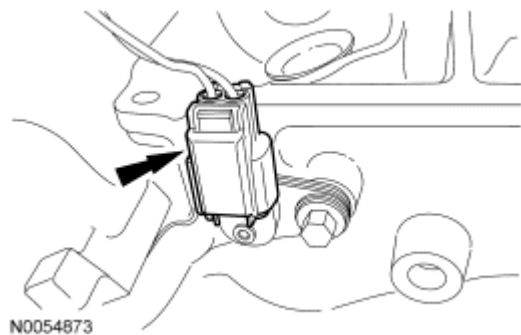


Fig. 943: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

28. Connect the RH heated oxygen sensor (HO2S) electrical connector.

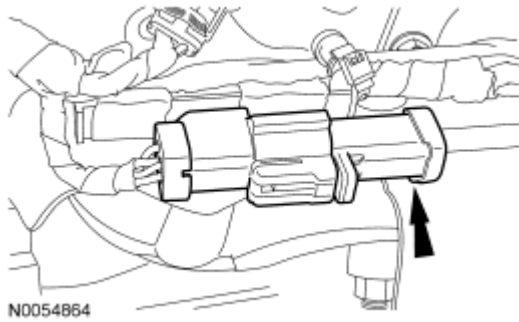


Fig. 944: Locating RH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

29. If equipped, install the block heater wiring harness onto the engine.
- Connect the block heater electrical connector and install the heat shield.

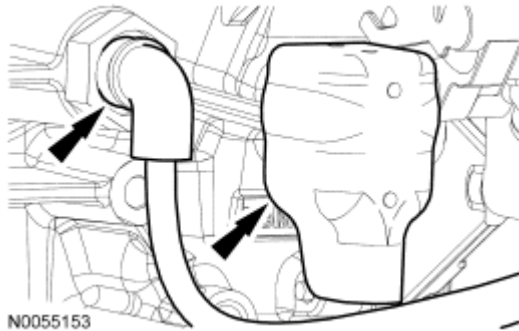


Fig. 945: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

30. Install the RH camshafts. For additional information, refer to [Camshaft](#).

CYLINDER HEAD - LH

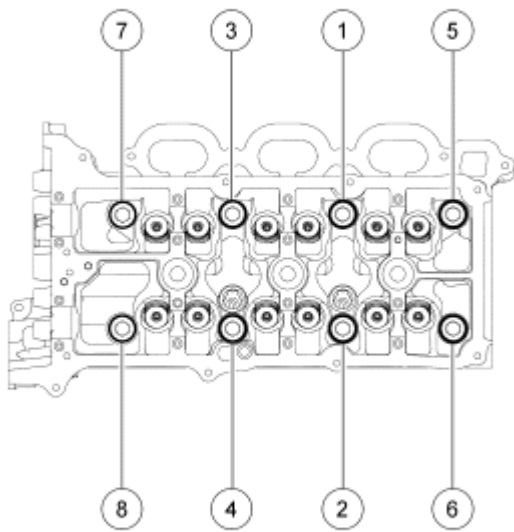
Material

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

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

All vehicles

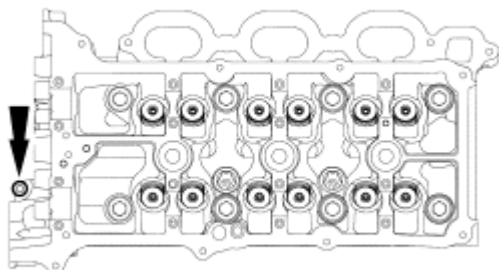
1. Install a new gasket, the LH cylinder head and 8 new bolts. Tighten in the sequence shown in 5 stages:
 - Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 35 Nm (26 lb-ft).
 - Stage 3: Tighten 90 degrees.
 - Stage 4: Tighten 90 degrees.
 - Stage 5: Tighten 90 degrees.



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Fig. 946: Installing LH Cylinder Head Bolts In Sequence
 Courtesy of FORD MOTOR CO.

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



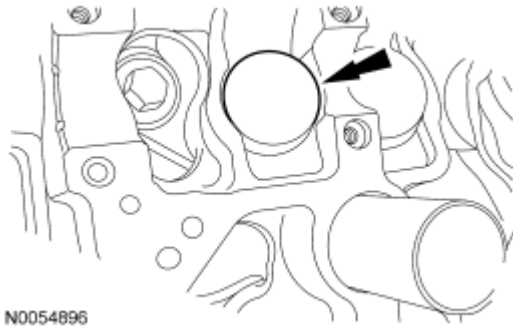
N0055174

Fig. 947: 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.

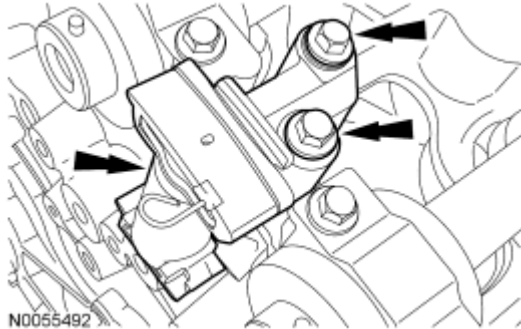
3. Install the valve tappets.



N0054896

Fig. 948: 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. 949: 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).

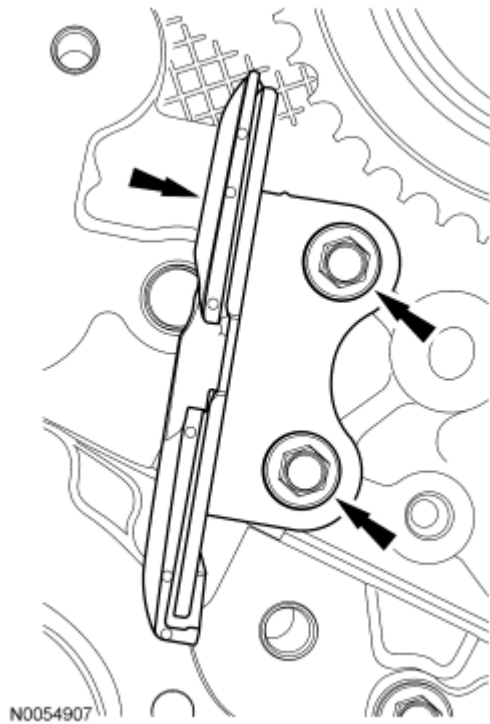


Fig. 950: Locating Upper LH Primary Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

6. Install LH camshaft position (CMP) sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

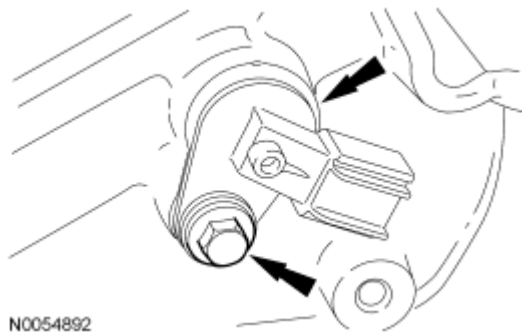


Fig. 951: Locating LH CMP Sensor & Bolt
Courtesy of FORD MOTOR CO.

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

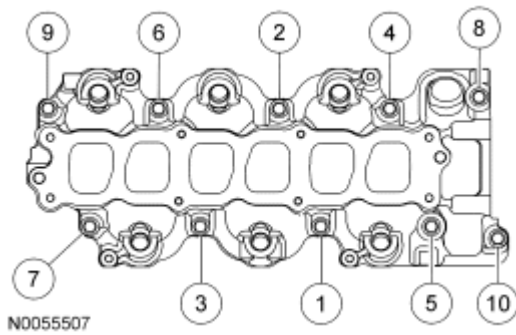


Fig. 952: Installing Lower Intake Manifold Bolts In Sequence
Courtesy of FORD MOTOR CO.

8. Using a new gasket and O-ring seal, install the thermostat housing and the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).

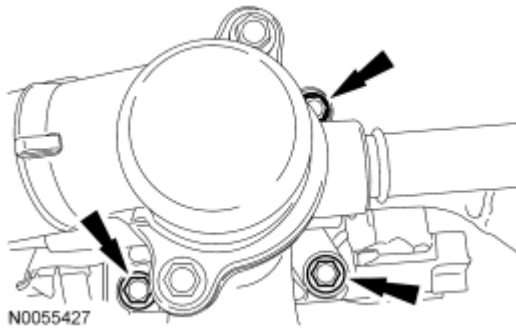
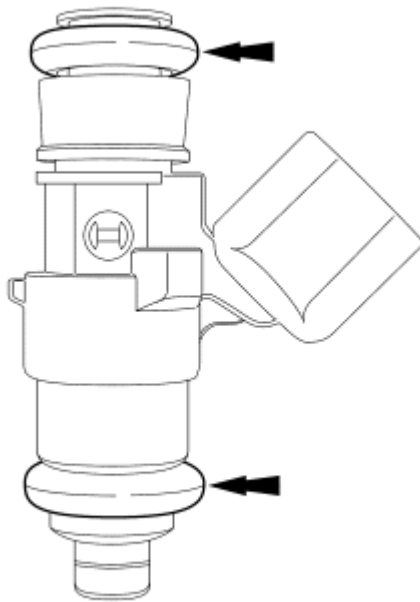


Fig. 953: Locating Thermostat Housing-To-Lower Intake Manifold Bolts
Courtesy of FORD MOTOR CO.

CAUTION: Use O-ring seals that are made of special fuel-resistant material. The use of ordinary O-rings can cause the fuel system to leak. Do not reuse the O-ring seals.

NOTE: The upper and lower O-ring seals are not interchangeable.

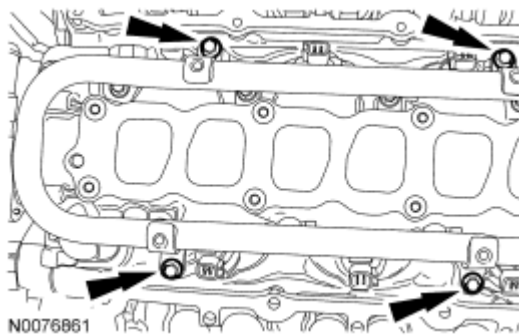
9. Install new fuel injector O-ring seals.
 - Remove the retaining clips and separate the fuel injectors from the fuel rail.
 - Remove and discard the O-ring seals.
 - Install new O-ring seals and lubricate with clean engine oil.
 - Install the fuel injectors and the retaining clips onto the fuel rail.



N0055508

Fig. 954: Identifying Fuel Injector O-Ring Seals
 Courtesy of FORD MOTOR CO.

10. Install the fuel rail and injectors as an assembly and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0076861

Fig. 955: Identifying Fuel Rail And Injectors
 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).

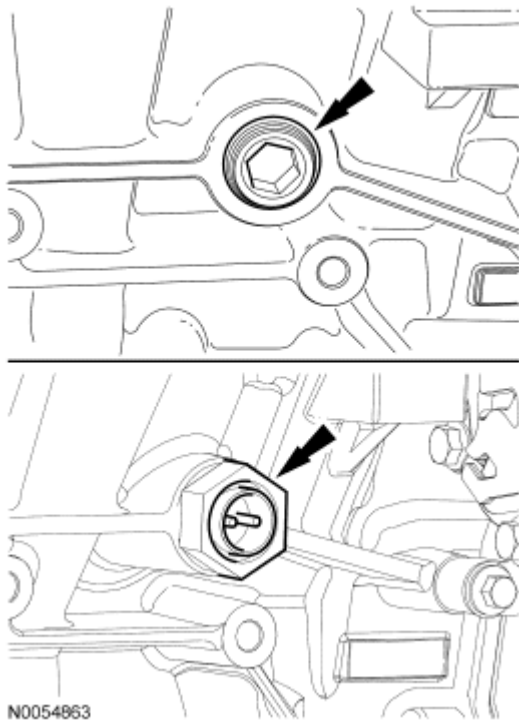


Fig. 956: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

12. Using a new gasket, install the RH catalytic converter and 4 new nuts.
 - Tighten to 40 Nm (30 lb-ft).

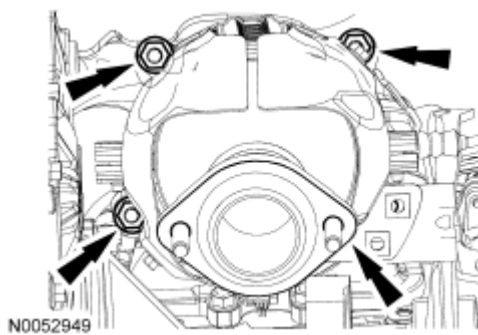


Fig. 957: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

All wheel drive (AWD) vehicles

13. Install the 2 RH catalytic converter bracket bolts.
 - Tighten the 4 catalytic converter nuts to 40 Nm (30 lb-ft).
 - Tighten the 2 catalytic converter brackets to 20 Nm (15 lb-ft).

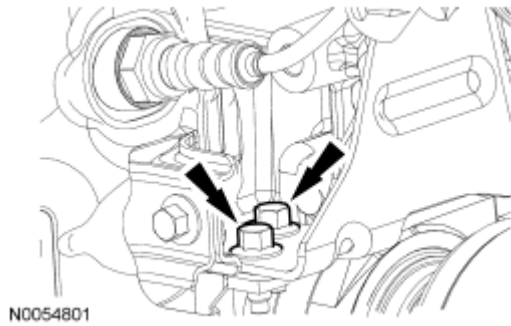


Fig. 958: Identifying RH Catalytic Converter Support Bracket Bolts
Courtesy of FORD MOTOR CO.

All vehicles

14. Install the LH cylinder block drain plug.
 - Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

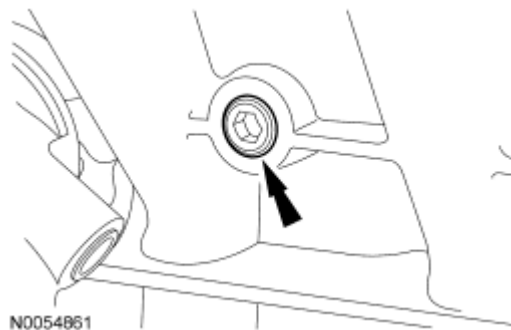


Fig. 959: Locating LH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

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

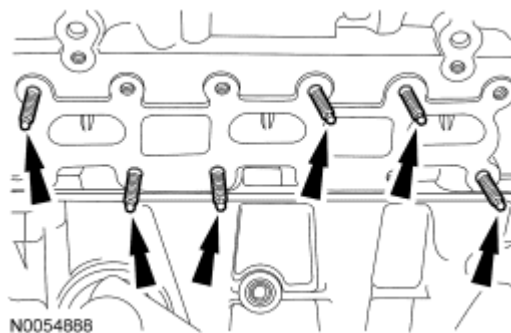


Fig. 960: Locating LH Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

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:
- Stage 1: Tighten to 20 Nm (15 lb-ft).
 - Stage 2: Tighten to 20 Nm (15 lb-ft).

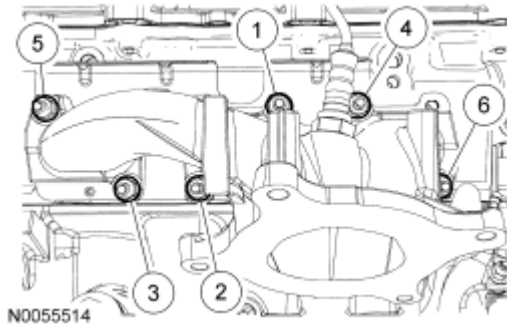


Fig. 961: Installing LH Exhaust Manifold Nuts In Sequence
Courtesy of FORD MOTOR CO.

17. Install the LH exhaust manifold heat shield and the 3 bolts.
- Tighten to 14 Nm (10 lb-ft).

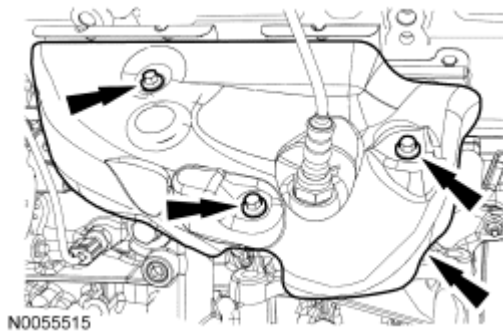


Fig. 962: Locating LH Exhaust Manifold Heat Shield & Nuts
Courtesy of FORD MOTOR CO.

18. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown).
- Tighten to 40 Nm (30 lb-ft).

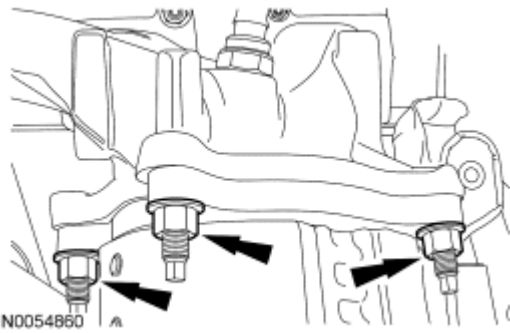


Fig. 963: Locating LH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

19. Install the 2 LH catalytic converter bracket bolts.
 - Tighten to 20 Nm (15 lb-ft).

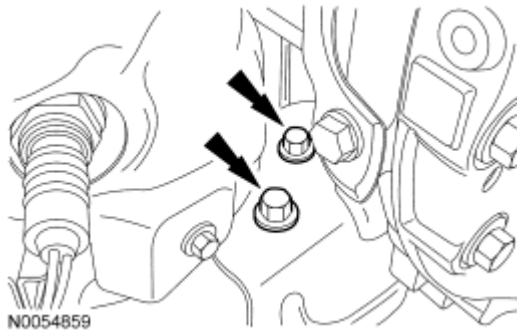


Fig. 964: Locating LH Catalytic Converter Bracket Bolts
Courtesy of FORD MOTOR CO.

20. Install the generator, the bolt and the nut.
 - Tighten to 47 Nm (35 lb-ft).

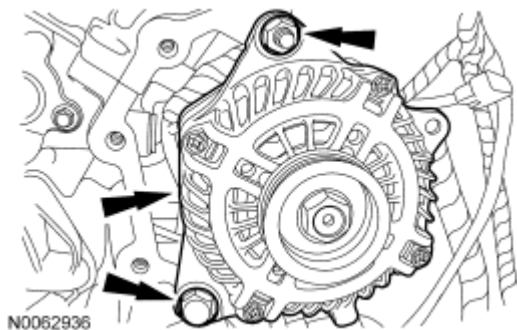


Fig. 965: Locating Generator, Bolts & Nuts
Courtesy of FORD MOTOR CO.

21. Install the A/C compressor, the nut and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

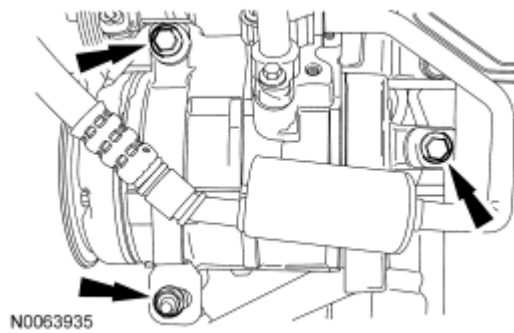


Fig. 966: Locating A/C Compressor, Bolts & Nuts
Courtesy of FORD MOTOR CO.

22. Connect the engine oil pressure (EOP) switch electrical connector and the wiring harness pin-type retainer.

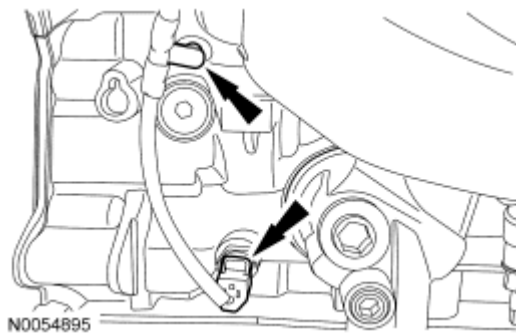


Fig. 967: Locating Engine Oil Pressure (EOP) Switch Electrical Connector & Wiring Harness Pin-Type Retainer
Courtesy of FORD MOTOR CO.

23. Attach the wiring harness retainer to the generator.

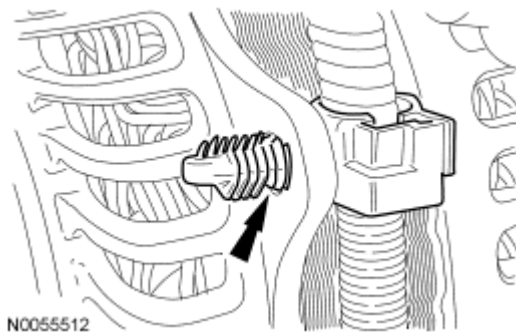


Fig. 968: Identifying Wiring Harness Retainer From Generator
Courtesy of FORD MOTOR CO.

24. Connect the generator electrical connector.

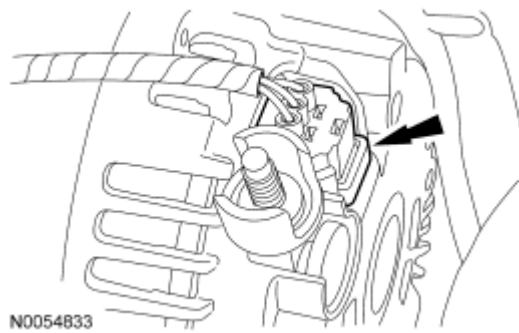


Fig. 969: Identifying Generator Electrical Connector
Courtesy of FORD MOTOR CO.

25. Connect the generator B+ cable and install the nut.
- Tighten to 6 Nm (53 lb-in).

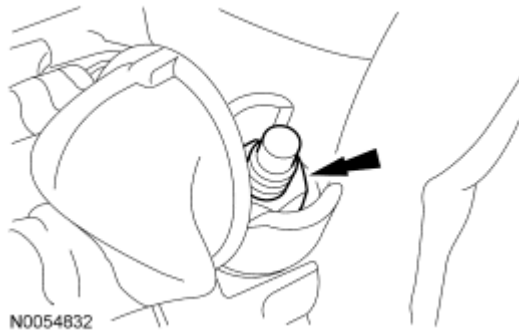


Fig. 970: Identifying Generator B+ Cable & Nut
Courtesy of FORD MOTOR CO.

26. Connect the A/C compressor electrical connector.

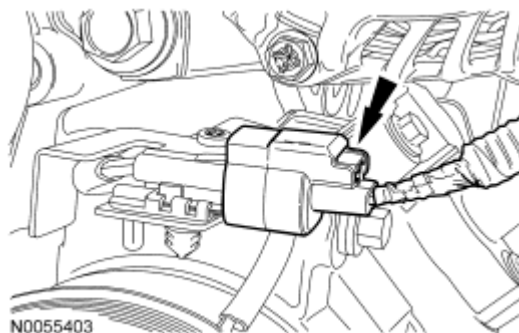


Fig. 971: Identifying A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

27. Install the wiring harness retainer bolt on the rear of the LH cylinder head.
- Tighten to 10 Nm (89 lb-in).

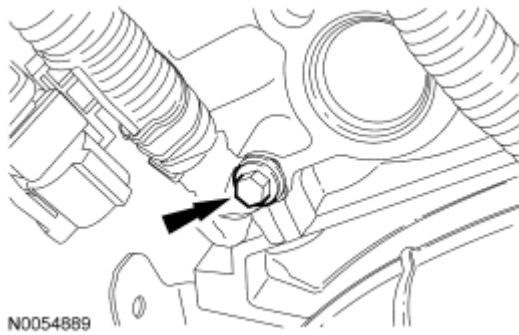


Fig. 972: Identifying Wiring Harness Retainer Bolt From Rear Of LH Cylinder Head
Courtesy of FORD MOTOR CO.

28. Connect the LH catalyst monitor sensor electrical connector.

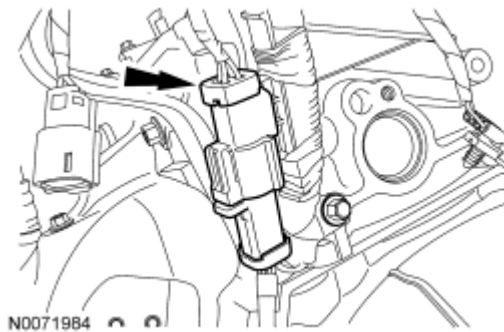


Fig. 973: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

29. Connect the LH HO2S electrical connector.

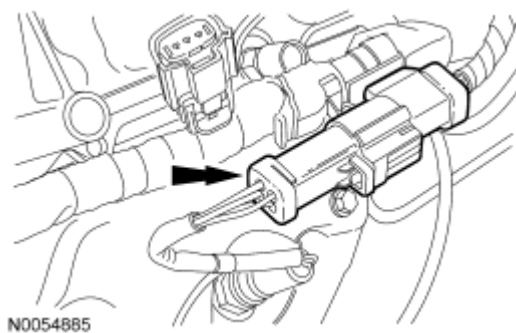


Fig. 974: Locating LH Heated Oxygen Sensor (HO2S) Electrical Connector
Courtesy of FORD MOTOR CO.

30. Connect the LH CMP sensor electrical connector.

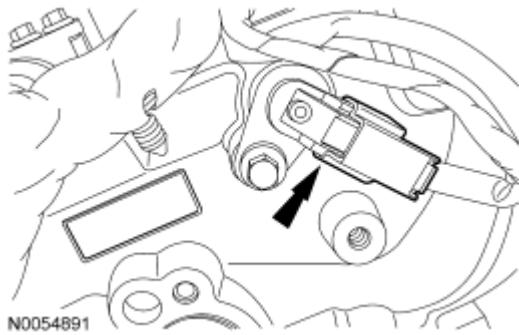


Fig. 975: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

31. Connect the CHT sensor electrical connector.

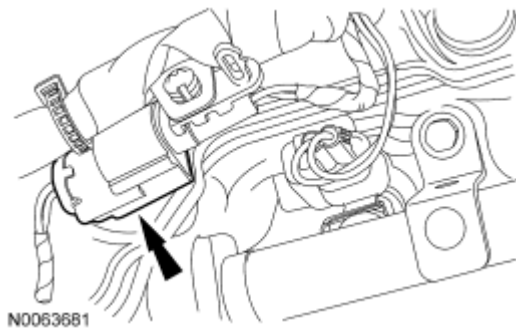


Fig. 976: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

32. Connect the 6 fuel injector electrical connectors (3 shown).

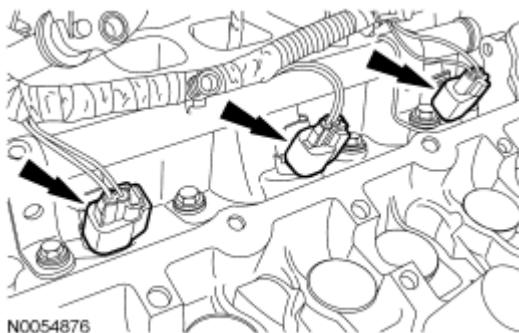


Fig. 977: Locating Fuel Injector Electrical Connectors
Courtesy of FORD MOTOR CO.

33. If equipped, install the block heater wiring harness onto the engine.
- Connect the block heater electrical connector and install the heat shield.

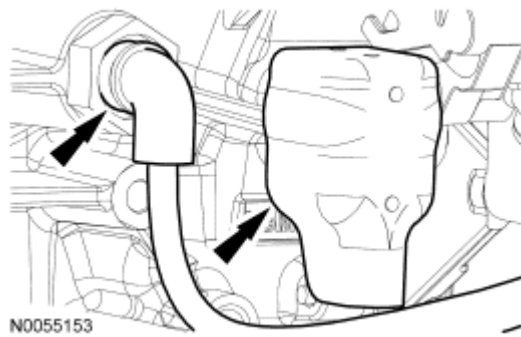





Fig. 978: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

34. Install the LH camshafts. For additional information, refer to [Camshaft](#).







OIL PAN

Special Tools

Illustration	Tool Name	Tool Number
 ST2433-A	Alignment Pins	307-399
 ST1326-A	Handle	205-153 (T80T-4000-W)
 ST1341-A	Heavy Duty Floor Crane	014-00071 or equivalent
	Installer, Crankshaft Front Seal	303-1251

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

 ST2981-A		
 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

2009 Ford Edge Limited

2009 ENGINE Engine - 3.5L - Edge & MKX

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	-

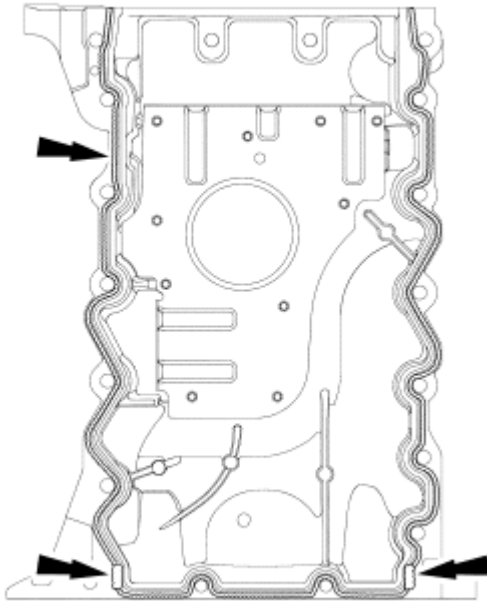
CAUTION: During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, can cause engine failure.

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.

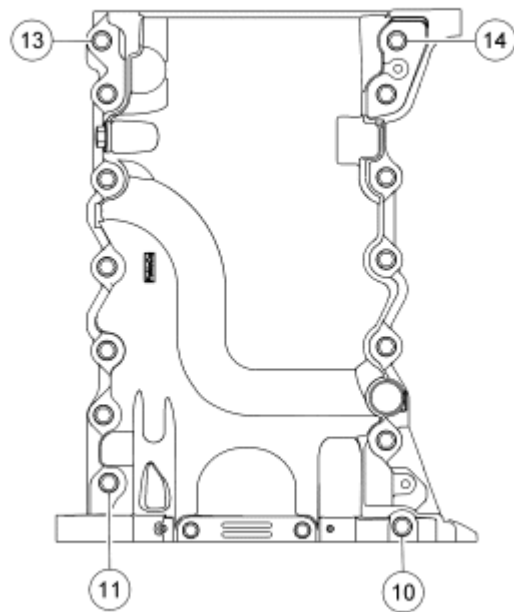


N0055188

Fig. 979: 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.

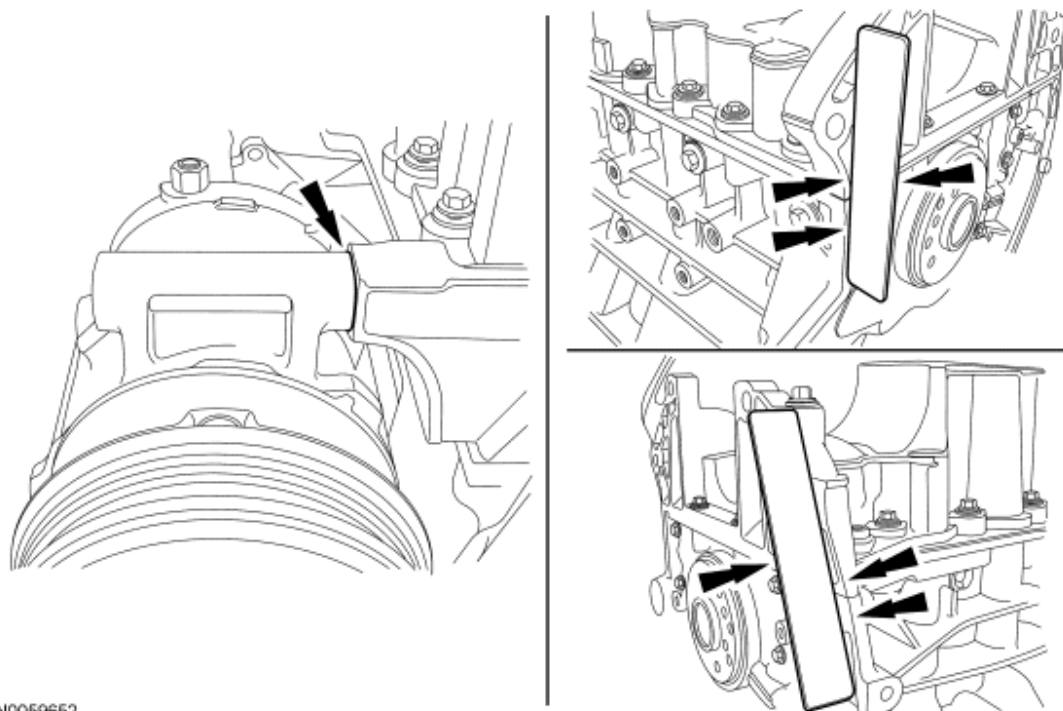
2. Install the oil pan and bolts 10, 11, 13 and 14.
 - Tighten the bolts in the sequence shown to 3 Nm (27 lb-in).
 - Loosen the bolts 180 degrees.



N0069773

Fig. 980: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence
Courtesy of FORD MOTOR CO.

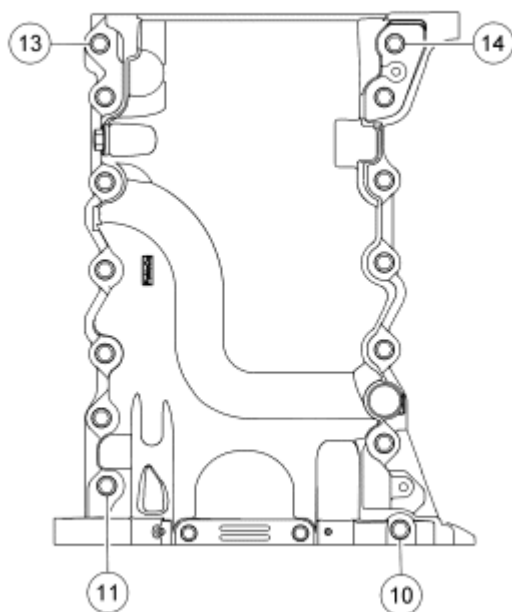
3. Align the oil pan to the cylinder block and the A/C compressor.
 - Position the oil pan so the mounting boss is against the A/C compressor and using a straightedge, align the oil pan flush with the rear of the cylinder block at the 2 areas shown.



N0059652

Fig. 981: 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, to 3 Nm (27 lb-in).

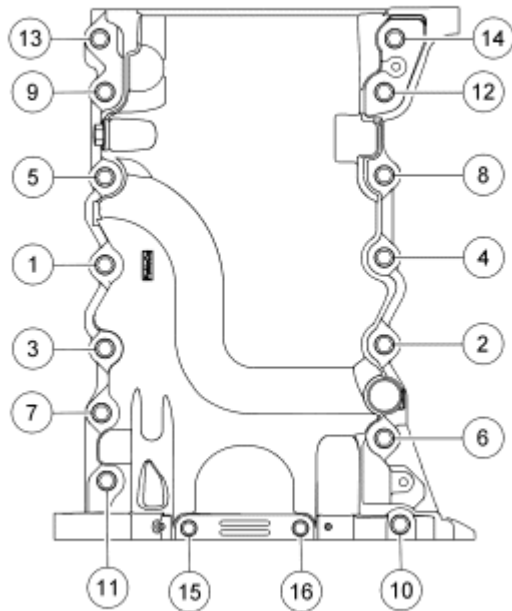


N0069773

Fig. 982: Installing Oil Pan Bolts 10, 11, 13 & 14 In Sequence

Courtesy of FORD MOTOR CO.

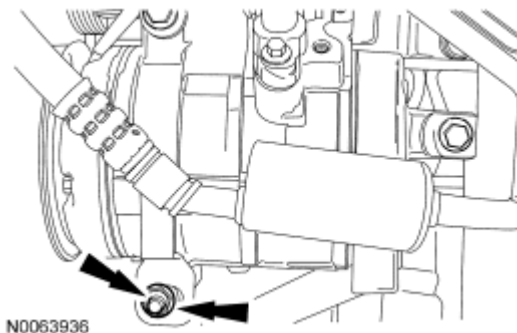
5. Install the remaining oil pan bolts. Tighten all the oil pan bolts in the sequence shown.
 - Tighten the large bolts (1-14) to 20 Nm (15 lb-ft).
 - Tighten the small bolts (15 and 16) to 10 Nm (89 lb-in).



N0055165

Fig. 983: 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. 984: Locating A/C Compressor Nut & Stud
Courtesy of FORD MOTOR CO.

7. Install the special tools.

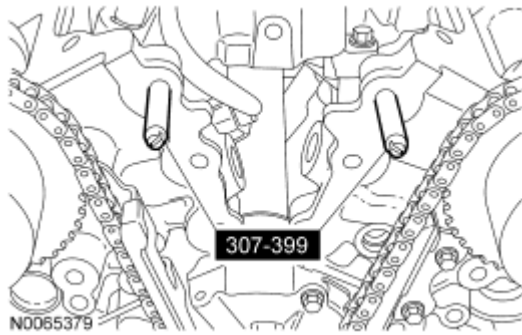


Fig. 985: Identifying Special Tool (307-399)

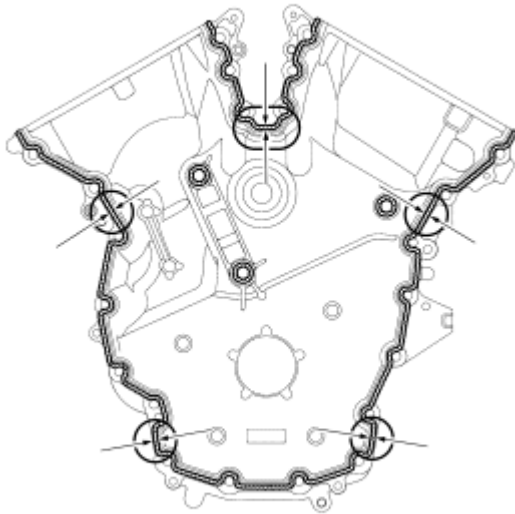
Courtesy of FORD MOTOR CO.

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)



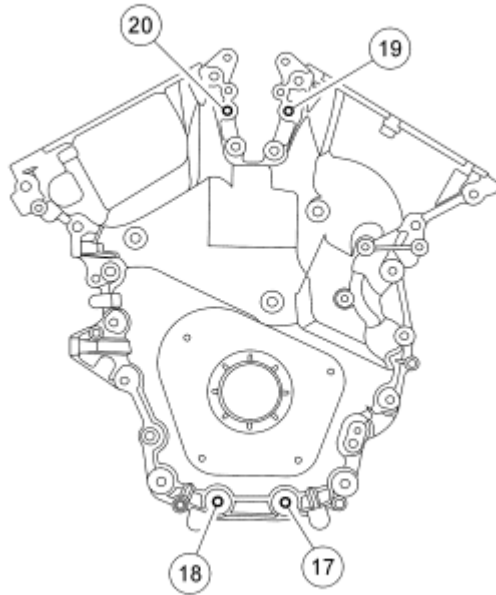
N0068283

Fig. 986: 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 to 3 Nm (27 lb-in).



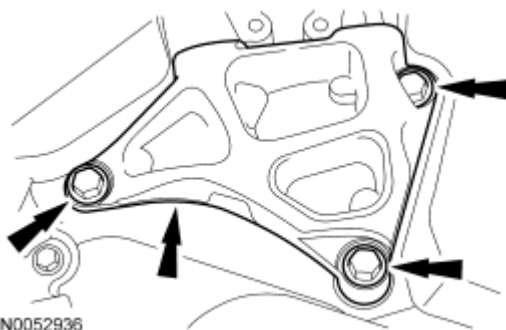
N0068108

Fig. 987: Installing Engine Front Cover & Bolts In Sequence
Courtesy of FORD MOTOR CO.

10. Remove the special tools (alignment pins).

NOTE: Do not tighten the bolt at this time.

11. Install the engine mount bracket and the 3 bolts.

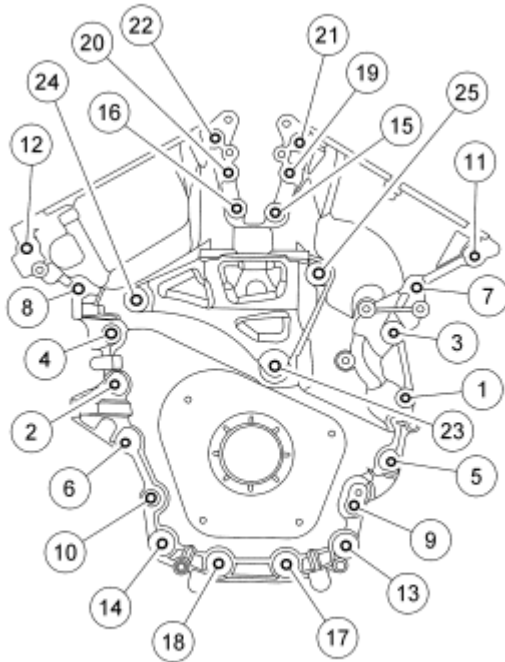


N0052936

Fig. 988: 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 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).

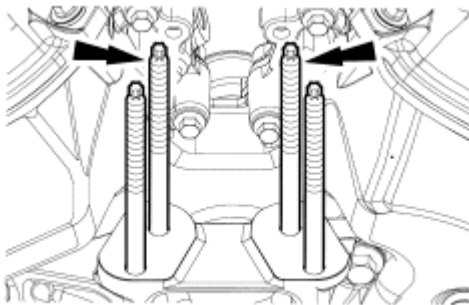


N0068109

Fig. 989: 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. 990: 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).

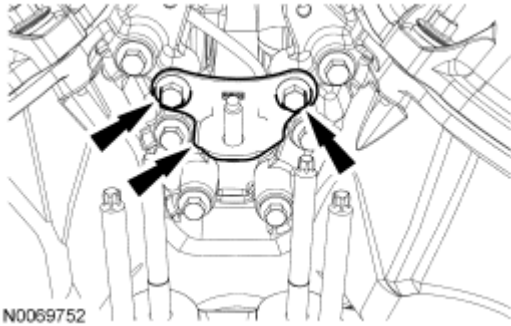


Fig. 991: Locating Engine Mount Bracket & Bolts
Courtesy of FORD MOTOR CO.

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.

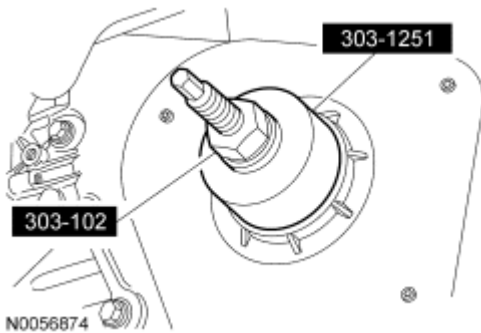


Fig. 992: Installing Crankshaft Front Seal Using Special Tools (303-102) & (303-1251)
Courtesy of FORD MOTOR CO.

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

- Using the special tools, install the crankshaft pulley.

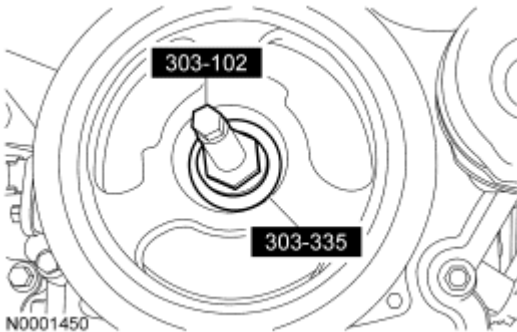


Fig. 993: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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.

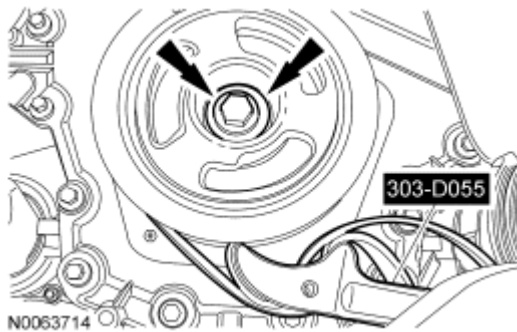


Fig. 994: Installing Crankshaft Pulley Washer & Bolt Using Special Tools (303-D055)
Courtesy of FORD MOTOR CO.

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, variable camshaft timing (VCT) seal installation similar.

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

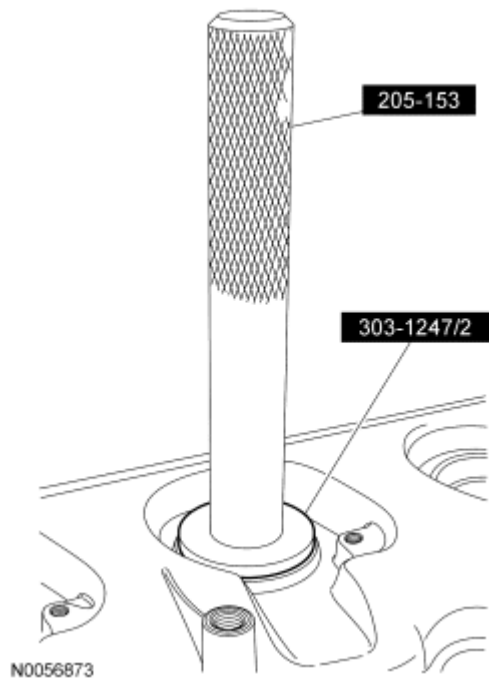


Fig. 995: Installing VCT Solenoid And/Or Spark Plug Tube Seals Using Special Tools (205-153) & (303-1247/2)

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

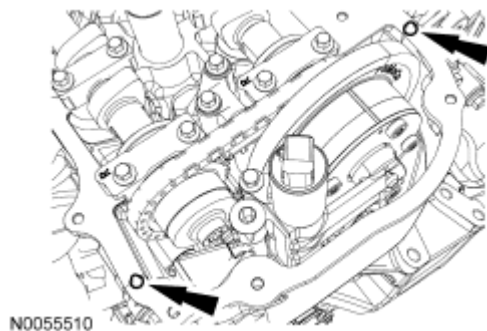


Fig. 996: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-RH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

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

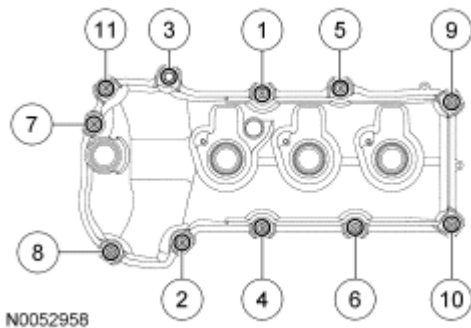


Fig. 997: Installing RH Valve Cover Stud Bolts In Sequence
 Courtesy of FORD MOTOR CO.

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

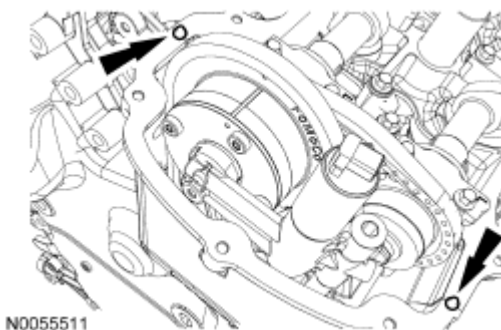


Fig. 998: Applying Bead Of Motorcraft High Performance Engine RTV Silicone To Engine Front Cover-To-LH Cylinder Head Joints
 Courtesy of FORD MOTOR CO.

22. Using a new gasket, install the LH valve cover and 11 stud bolts.

- Tighten in the sequence shown to 10 Nm (89 lb-in).

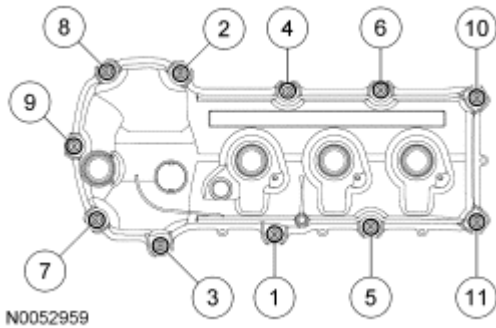


Fig. 999: Installing LH Valve Cover Stud Bolts In Sequence
Courtesy of FORD MOTOR CO.

NOTE: LH shown, RH similar.

23. Install the 6 coil-on-plug assemblies and the 6 bolts.
 - Tighten to 7 Nm (62 lb-in).

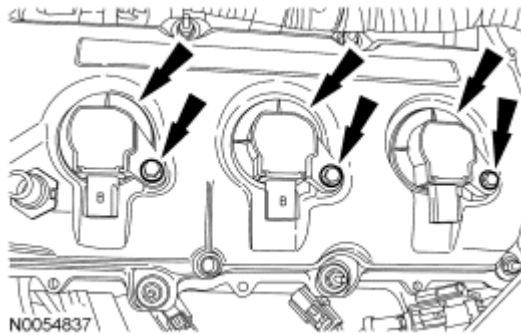


Fig. 1000: Locating Coil-On-Plugs & Bolts
Courtesy of FORD MOTOR CO.

24. Install the LH cylinder block drain plug.
 - Tighten to 20 Nm (15 lb-ft) plus an additional 180 degrees.

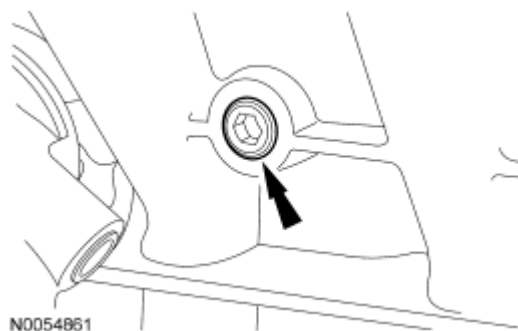


Fig. 1001: Locating LH Cylinder Block Drain Plug

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).

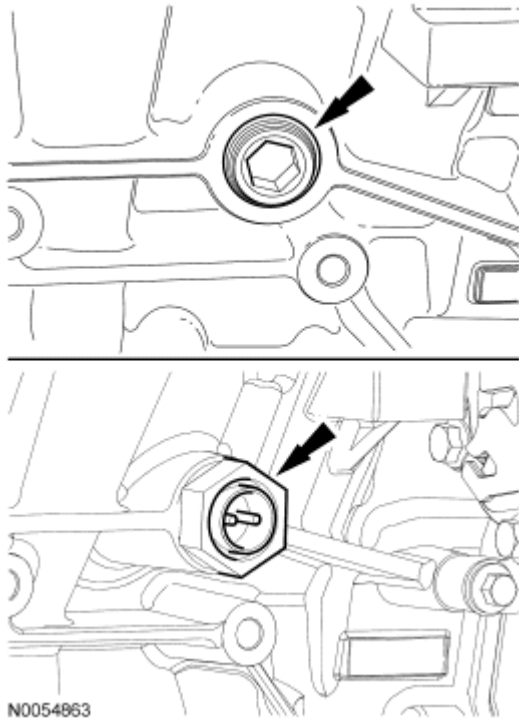


Fig. 1002: Locating RH Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

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).

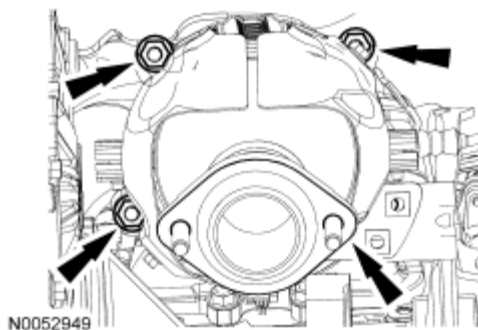


Fig. 1003: Locating RH Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

All vehicles

27. Using a new gasket, install the LH catalytic converter and 4 new nuts (3 shown).
 - Tighten to 40 Nm (30 lb-ft).

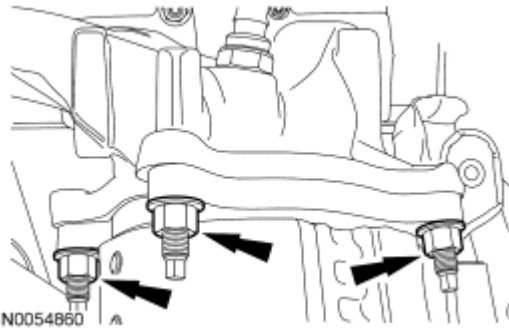


Fig. 1004: Locating LH Catalytic Converter Nuts
 Courtesy of FORD MOTOR CO.

28. Install the accessory drive belt tensioner and the 3 bolts.
 - Tighten to 11 Nm (8 lb-ft).

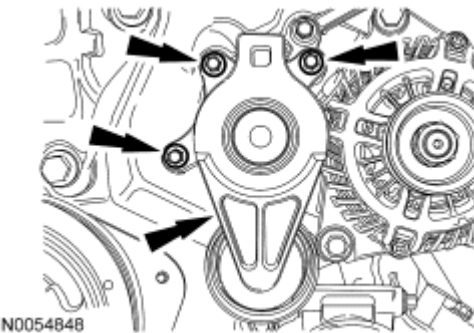


Fig. 1005: Locating Accessory Drive Belt Tensioner Bolts
 Courtesy of FORD MOTOR CO.

29. Install the power steering pump and the 3 bolts.
 - Tighten to 24 Nm (18 lb-ft).

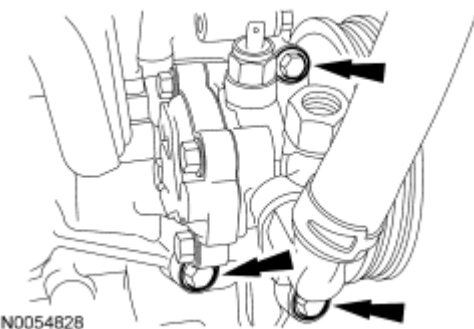


Fig. 1006: Locating Power Steering Pump Bolts
Courtesy of FORD MOTOR CO.

30. Attach all of the wiring harness retainers to the LH valve cover and stud bolts.
31. Connect the 3 LH coil-on-plug electrical connectors.

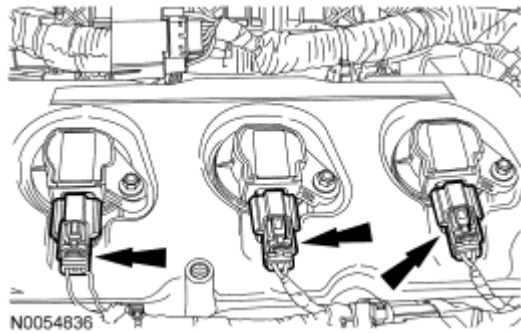


Fig. 1007: Locating LH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

32. Connect the LH camshaft VCT solenoid electrical connector.

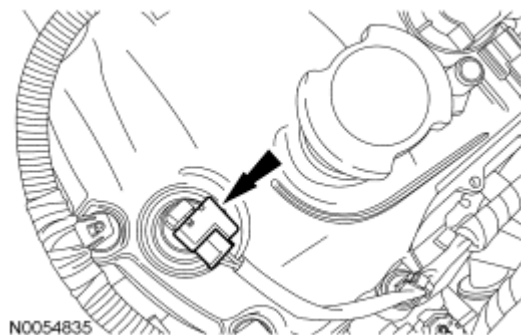


Fig. 1008: Locating LH VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

33. Connect the LH catalyst monitor sensor electrical connector.

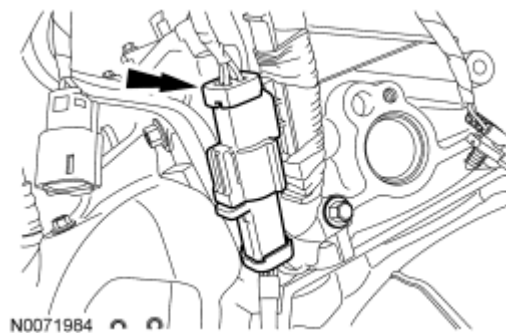


Fig. 1009: Identifying LH Catalyst Monitor Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

34. Attach all of the wiring harness retainers to the RH valve cover and stud bolts.
35. Connect the 3 RH coil-on-plug electrical connectors.

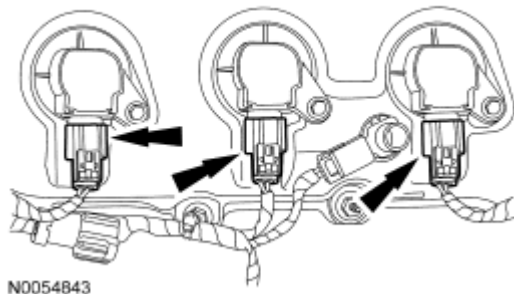


Fig. 1010: Locating RH Coil-On-Plug Electrical Connectors
Courtesy of FORD MOTOR CO.

36. Connect the RH VCT solenoid electrical connector.

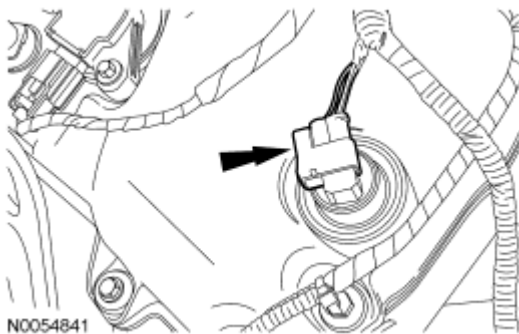


Fig. 1011: Locating RH Variable Camshaft Timing (VCT) Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

FWD vehicles

37. Connect the RH catalyst monitor sensor electrical connector.

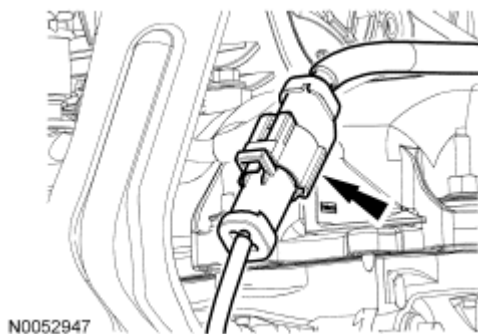


Fig. 1012: Locating RH Catalyst Monitor Electrical Connector
Courtesy of FORD MOTOR CO.

All vehicles

38. Connect the power steering pressure (PSP) switch electrical connector.

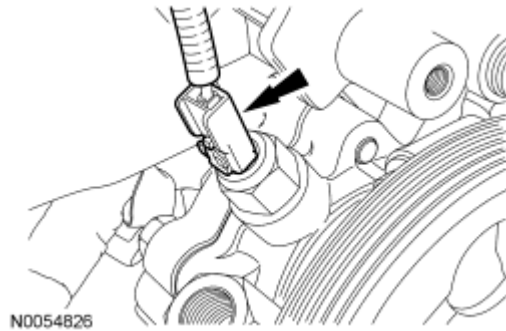


Fig. 1013: Locating PSP Switch Electrical Connector
Courtesy of FORD MOTOR CO.

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

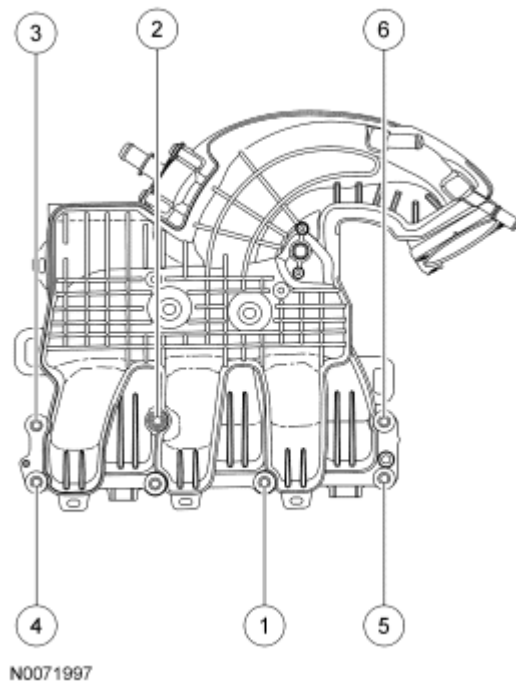


Fig. 1014: Identifying Bolt Sequence
Courtesy of FORD MOTOR CO.

40. Install the upper intake manifold support bracket bolt.
 - Tighten to 10 Nm (89 lb-in).

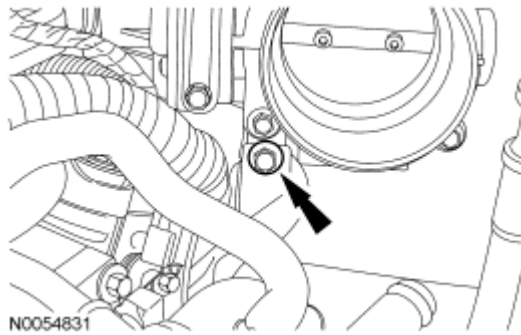


Fig. 1015: Locating Upper Intake Manifold Support Bracket Bolt
Courtesy of FORD MOTOR CO.

41. Attach the wiring harness retainers to the upper intake manifold.

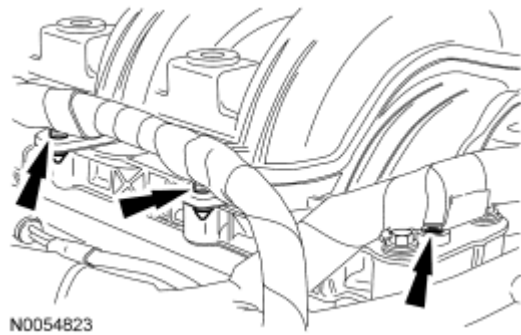


Fig. 1016: Locating Wiring Harness Retainers From Upper Intake Manifold
Courtesy of FORD MOTOR CO.

42. Connect the throttle body (TB) electrical connector.

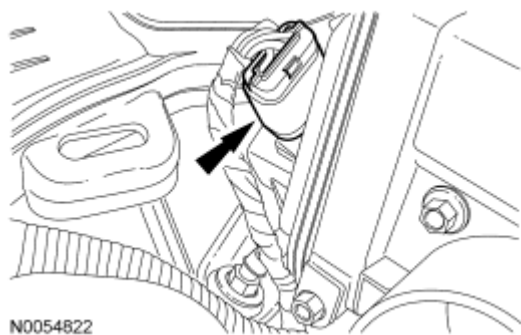


Fig. 1017: Locating Throttle Body Electrical Connector
Courtesy of FORD MOTOR CO.

43. Connect the PCV hose to the PCV valve.

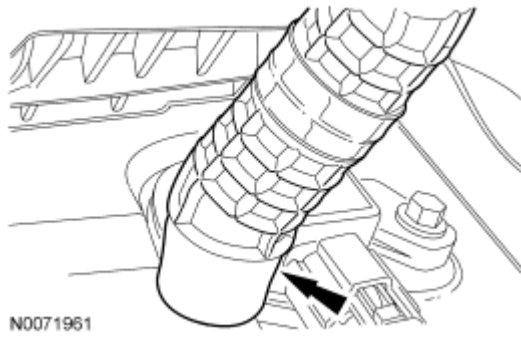


Fig. 1018: Identifying PCV Hose
Courtesy of FORD MOTOR CO.

44. If equipped, position the engine block heater harness on the engine and attach all of the harness retainers.
 - Connect the engine block heater electrical connector and install the heat shield.

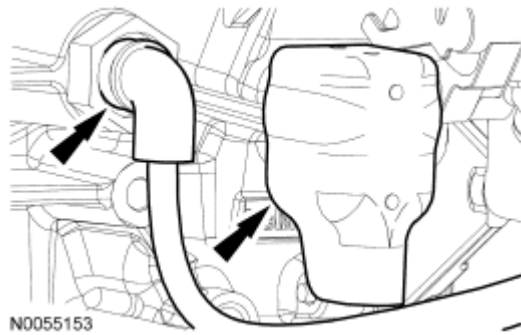


Fig. 1019: Identifying Block Heater Wiring Harness
Courtesy of FORD MOTOR CO.

45. Using the special tools, remove the engine from the stand.

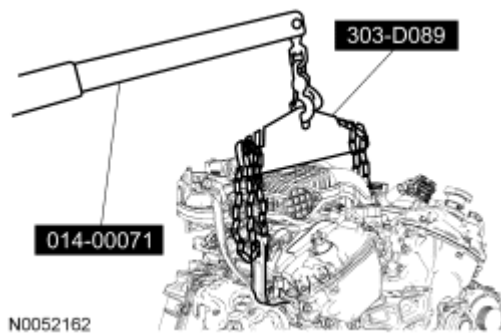


Fig. 1020: Removing Engine & Transaxle From Lift Table Using Special Tools (303-D089, 014-00071) & Suitable Engine Crane
Courtesy of FORD MOTOR CO.

46. Install the crankshaft sensor ring.

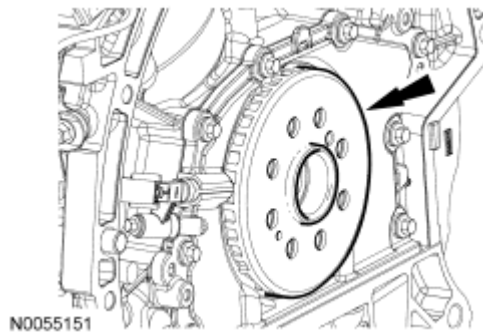


Fig. 1021: Identifying Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

47. Install the flexplate and the 8 bolts.
 - Tighten to 80 Nm (59 lb-ft).

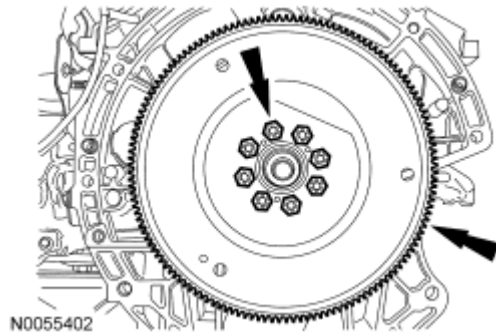


Fig. 1022: Identifying Flexplate & Bolts
Courtesy of FORD MOTOR CO.

48. 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).

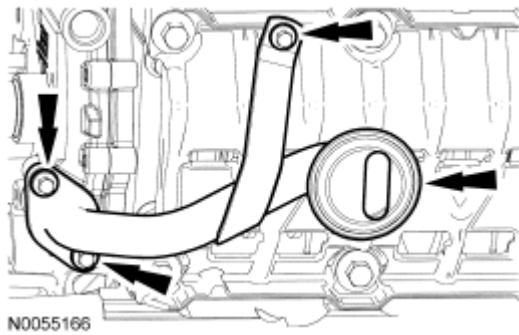


Fig. 1023: Identifying Oil Pump Screen, Pickup Tube & Bolts
Courtesy of FORD MOTOR CO.

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



ST1602-A

Material

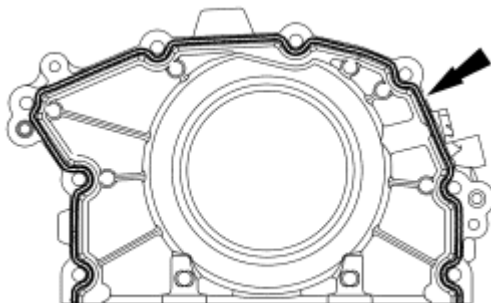
Item	Specification
Motorcraft High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A

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.



N0055186

Fig. 1024: 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.
 - Tighten in the sequence shown to 10 Nm (89 lb-in).

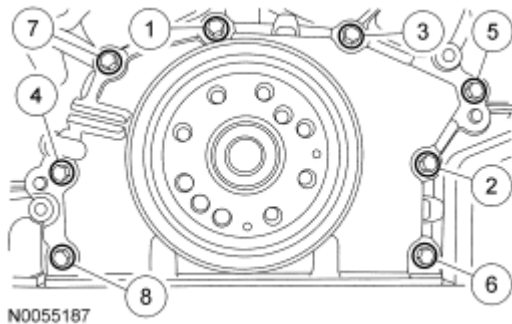


Fig. 1025: Installing Crankshaft Rear Seal Retainer Bolts In Sequence
Courtesy of FORD MOTOR CO.

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.

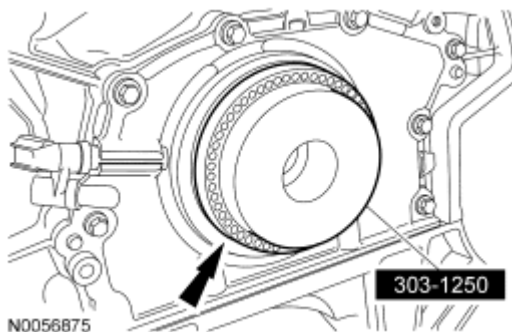


Fig. 1026: Positioning Special Tool (303-1250) Onto End Of Crankshaft
Courtesy of FORD MOTOR CO.

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

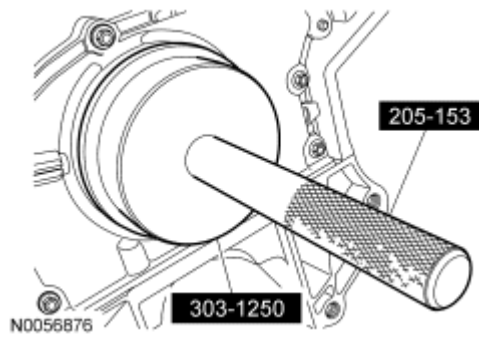


Fig. 1027: Installing New Crankshaft Rear Seal Using Special Tools (303-1250) & (205-153)
 Courtesy of FORD MOTOR CO.

5. Install the Crankshaft Position (CKP) sensor and install the bolt.
 - Tighten to 10 Nm (89 lb-in).

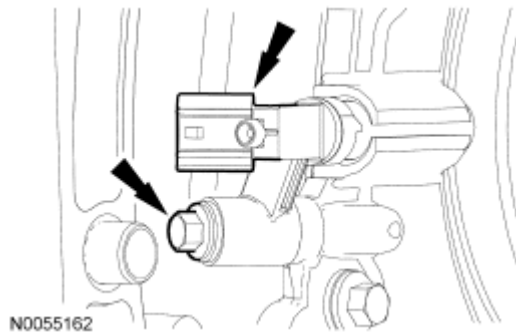


Fig. 1028: Identifying CKP Sensor & Bolt
 Courtesy of FORD MOTOR CO.

6. Connect the CKP sensor electrical connector.

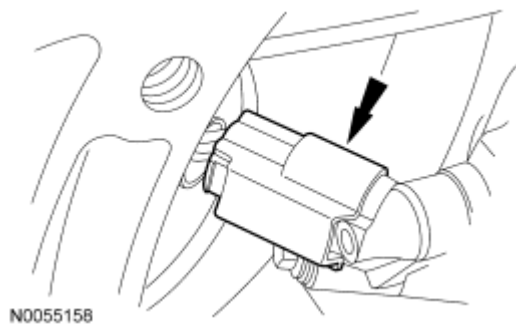


Fig. 1029: Identifying Crankshaft Position (CKP) Sensor Electrical Connector
 Courtesy of FORD MOTOR CO.

7. Using the Heavy Duty Floor Crane and Spreader Bar, install the engine onto the stand.

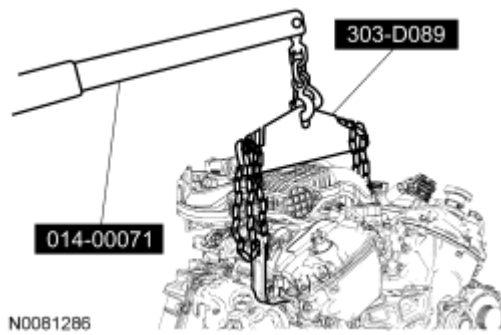


Fig. 1030: Identifying Heavy Duty Floor Crane and Spreader Bar
Courtesy of FORD MOTOR CO.

8. Install the oil pan. For additional information, refer to **Oil Pan**.