

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

2010 ENGINE**Engine - 5.4L (3V) - F250-F550 Super Duty Pickups****SPECIFICATIONS****ITEM SPECIFICATION****ITEM SPECIFICATION**

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-A (Canada); or equivalent	WSS-M97B51-A1	23.5L (26 qt)
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	6.6L (7.0 qt) with filter
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	-
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	-
Motorcraft® Silicone Gasket Remover ZC-30	-	-

ITEM SPECIFICATION**ITEM SPECIFICATION**

Item	Specification
Engine	
Displacement	5.4L (330 CID)
Number of cylinders	8
Bore	90.2 mm (3.55 in)
Stroke	105.8 mm (4.17 in)
Firing order	1-3-7-2-6-5-4-8
Spark plug	HJFS-24FP
Minimum oil pressure at idle (engine at normal operating temperature)	172 kPa (25 psi)
Oil pressure at 2,000 rpm (engine at normal operating temperature)	275-517 kPa (40-75 psi)
Compression ratio	9.8:1
Engine weight (without accessory drive components and with flexplate)	247 kg (545 lb)

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Engine weight (without accessory drive components and with flywheel)	260 kg (574 lb)
Cylinder Head and Valve Train	
Combustion chamber volume	48.1-51.1 cc (2.94-3.12 cu in)
Roller follower ratio	-
Valve arrangement (front to rear) - LH	I-E-I-I-E-I-I-E-I-I-E-I
Valve arrangement (front to rear) - RH	I-E-I-I-E-I-I-E-I-I-E-I
Valve guide bore diameter	6.015-6.044 mm (0.237-0.238 in)
Valve stem diameter - intake	5.975-5.995 mm (0.235-0.236 in)
Valve stem diameter - exhaust	5.95-5.97 mm (0.234-0.235 in)
Valve stem-to-guide clearance - intake	0.020-0.045 mm (0.001-0.002 in)
Valve stem-to-guide clearance - exhaust	0.069-0.094 mm (0.003-0.004 in)
Valve head diameter - intake	33.62-33.98 mm (1.324-1.338 in)
Valve head diameter - exhaust	37.32-37.68 mm (1.469-1.483 in)
Valve face runout	0.05 mm (0.002 in)
Valve face angle	45.5 degrees
Valve seat width - intake	1.2-1.4 mm (0.047-0.055 in)
Valve seat width - exhaust	1.4-1.6 mm (0.055-0.063 in)
Valve seat angle	44.5-45.0 degrees
Valve spring free length	55.7 mm (2.19 in)
Valve spring compression pressure	350 N (79 lb) ± 17.5 N (4 lb) @ 42.04 mm (1.66 in)
Valve spring installed height	42.04 mm (1.66 in)
Valve spring installed pressure	350 N (79 lb) ± 17.5 N (4 lb) @ 42.04 mm (1.66 in)
Head gasket surface flatness	0.025 mm (0.001 in) in any 25 mm (1 in) x 25 mm (1 in) area; 0.05 mm (0.002 in) in any 150 mm (6 in) x 150 mm (6 in) area; 0.1 mm (0.004 in) overall
Hydraulic Lash Adjuster	
Diameter	15.988-16.000 mm (0.6294-0.6299 in)
Clearance-to-bore	0.018-0.069 mm (0.0007-0.0027 in)
Service limit	-
Hydraulic leakdown rate	5-25 seconds ⁽¹⁾

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Collapsed lash adjuster gap	0.45-0.85 mm (0.017-0.033 in)
Camshaft	
Theoretical valve lift @ 0 lash - intake	11.1 mm (0.437 in)
Theoretical valve lift @ 0 lash - exhaust	11.0 mm (0.433 in)
Lobe lift - intake	5.520 mm (0.217 in)
Lobe lift - exhaust	5.506 mm (0.217 in)
Allowable lobe lift loss	0.127 mm (0.005 in)
Journal diameter	28.607-28.633 mm (1.126-1.127 in)
Camshaft journal bore inside diameter	28.657-28.682 mm (1.128-1.129 in)
Camshaft journal-to-bearing clearance	0.024-0.075 mm (0.001-0.003 in)
Runout	0.03 mm (0.001 in)
End play	0.027-0.190 mm (0.001-0.007 in)
Cylinder Block	
Cylinder bore diameter - grade 1	90.200-90.210 mm (3.5512-3.5516 in)
Cylinder bore diameter - grade 2	90.210-90.220 mm (3.5516-3.5520 in)
Cylinder bore diameter - grade 3	0.220-90.230 mm (3.5520-3.5524 in)
Cylinder bore maximum taper	0.006 mm (0.0002 in)
Cylinder bore maximum out-of-round	0.020 mm (0.0008 in)
Main bearing bore inside diameter	72.400-72.424 mm (2.850-2.851 in)
Head gasket surface flatness	0.03 mm (0.001 in) in any 40 mm (1.5 in) x 40 mm (1.5 in) area; 0.05 mm (0.002 in) in any 150 mm (6 in) x 150 mm (6 in) area; 0.15 mm (0.006 in) overall
Crankshaft	
Main bearing journal diameter	67.481-67.505 mm (2.6568-2.6576 in)
Main bearing journal maximum taper	0.004 mm (0.0002 in)
Main bearing journal maximum out-of-round	0.0075 mm (0.0003 in) between cross sections
Main bearing journal-to-cylinder block clearance	0.024-0.048 mm (0.0009-0.0019 in)
Connecting rod journal diameter	52.983-53.003 mm (2.0859-2.0867 in)
Connecting rod journal maximum taper	0.004 mm (0.0002 in)
Connecting rod journal maximum out-of-round	0.0075 mm (0.0003 in) between cross sections
Crankshaft maximum end play	0.075-0.377 mm (0.0030-0.0148 in)
Piston and Connecting Rod	
Piston diameter - grade 1 (at right	

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angle to pin bore)	90.165-90.175 mm (3.5498-3.5502 in)
Piston diameter - grade 2 (at right angle to pin bore)	90.175-90.185 mm (3.5502-3.5506 in)
Piston diameter - grade 3 (at right angle to pin bore)	90.185-90.195 mm (3.5506-3.5510 in)
Piston-to-cylinder bore clearance (at grade size)	0.025-0.045 mm (0.0010-0.0018 in)
Piston ring end gap - top	0.15-0.30 mm (0.006-0.012 in)
Piston ring end gap - intermediate	0.25-0.50 mm (0.0098-0.0197 in)
Piston ring end gap - oil control	0.15-0.65 mm (0.0059-0.0256 in)
Piston ring groove width - top	1.52-1.55 mm (0.0598-0.0610 in)
Piston ring groove width - intermediate	1.52-1.54 mm (0.0598-0.0606 in)
Piston ring groove width - oil control	3.030-3.050 mm (0.1193-0.1201 in)
Piston ring width - top and intermediate	1.47-1.50 mm (0.0578-0.0590 in)
Piston ring-to-groove clearance - top	0.020-0.080 mm (0.0008-0.0031 in)
Piston ring-to-groove clearance - intermediate	0.030-0.070 mm (0.0012-0.0028 in)
Piston pin bore diameter	22.008-22.014 mm (0.8665-0.8667 in)
Piston pin diameter	22.0010-22.0030 mm (0.8662-0.8663 in)
Piston pin length	61.8 mm (2.433 in)
Piston pin-to-piston fit	0.005-0.0130 mm (0.0002-0.0005 in)
Connecting rod-to-pin clearance	0.009-0.0235 mm (0.0004-0.0093 in)
Connecting rod pin bore diameter	22.012-22.024 mm (0.8666-0.8671 in)
Connecting rod length (center-to-center)	169.1 mm (6.6575 in)
Connecting rod maximum allowed bend	± 0.038 mm (0.0015 in)
Connecting rod maximum allowed twist ⁽²⁾	± 0.05 mm (0.0020 in)
Connecting rod bearing bore diameter (with assembled liners)	53.027-53.049 mm (2.0877-2.0885 in)
Connecting rod bearing-to-crankshaft clearance	0.026-0.064 mm (0.0010-0.0025 in)
Connecting rod side clearance	0.125-0.475 mm (0.0049-0.0187 in)

(1) The time required for the plunger to leak down 1.6 mm (0.062 in) of travel with 222 N force and leak-down fluid in the lash adjuster.

(2) The pin bore and crank bearing bore must be parallel and in the same vertical plane within the specified total difference when measured at the ends of a 203 mm bar, 105.5 mm on each side of rod centerline.

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TORQUE SPECIFICATIONS**TORQUE SPECIFICATIONS**

Description	Nm	lb-ft	lb-in
A/C compressor bolts	25	18	-
A/C compressor nuts	20	-	177
Accessory drive belt idler pulley bolt	25	18	-
Accessory drive belt tensioner bolt	25	18	-
Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) adapter bolts	10	-	89
Camshaft bearing cap bolts ⁽¹⁾	-	-	-
Camshaft phaser and sprocket bolts ⁽¹⁾	-	-	-
Camshaft Position (CMP) sensor bolt	10	-	89
Connecting rod bolts ⁽¹⁾	-	-	-
Coolant pump bolts	25	18	-
Coolant pump pulley bolts	25	18	-
Cooling fan clutch hub-to-coolant pump nut	55	41	-
Coolant tube stud bolt	10	-	89
Crankshaft damper pulley bolt ⁽¹⁾	-	-	-
Crankshaft main bearing bolts (cross-mounted) ⁽¹⁾	-	-	-
Crankshaft main bearing bolts (vertical) ⁽¹⁾	-	-	-
Crankshaft Position (CKP) sensor bolt	10	-	89
Crankshaft rear seal retainer plate bolts ⁽¹⁾	-	-	-
Cylinder block drain plugs	24	18	-
Cylinder heads bolts ⁽¹⁾	-	-	-
Cylinder Head Temperature (CHT)	10	-	89
Engine coolant crossover assembly bolts	10	-	89
Engine front cover bolts ⁽¹⁾	-	-	-
Engine Oil Pressure (EOP) switch	18	-	159
Engine support insulator bracket bolts ⁽¹⁾	-	-	-
Engine support insulator-to-crossmember nuts - LH	200	148	-
Engine support insulator-to-crossmember nuts - RH	115	85	-
Engine support insulator stud	80	59	-
Engine support insulator through bolt	350	258	-
Engine wiring harness retainer nut and bolts	10	-	89
Exhaust manifold flange nuts	40	30	-
Exhaust manifold heat shield bolts - RH	10	-	89
Exhaust manifold heat shield bolts - LH	14	-	124
Exhaust manifold nuts ⁽¹⁾	-	-	-
Exhaust manifold-to-Y-pipe nuts	40	30	-

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Exhaust manifold studs	12	-	106
Flexplate bolts ⁽¹⁾	-	-	-
Flexplate inspection cover bolts	34	25	-
Flywheel bolts ⁽¹⁾	-	-	-
Front oil level indicator tube bolt	25	18	-
Fuel rail bolts	10	-	89
Ground strap stud bolt	10	-	89
Ignition coil bolt	6	-	53
Intake manifold bolts ⁽¹⁾	-	-	-
Intake manifold-to-cylinder head bolts ⁽¹⁾	-	-	-
Intake manifold vacuum tube support bracket bolt	10	-	89
Knock Sensor (KS)	20	-	177
Oil cooler	58	43	-
Oil filter	16	-	142
Oil filter adapter bolts	25	18	-
Oil filter adapter nut	48	35	-
Oil filter adapter stud	12	-	106
Oil pan bolts ⁽¹⁾	-	-	-
Oil pan drain plug	14	-	124
Oil pump bolts	10	-	89
Oil pump screen and pickup tube-to-oil pump bolts	10	-	89
Oil pump screen and pickup tube spacer	25	18	-
Oil pump screen and pickup tube-to-spacer bolt	25	18	-
PCV fitting bolts	6	-	53
Power steering pump bolts	25	18	-
Radio ignition interference capacitor nut	10	-	89
Rear oil level indicator tube bolt	10	-	89
Spark plug	12	-	106
Starter wiring harness support bracket nut	10	-	89
Throttle Body (TB) bolts ⁽¹⁾	-	-	-
Timing chain guide bolts	10	-	89
Timing chain hydraulic tensioner bolts	25	18	-
Torque converter-to-flexplate nuts	35	26	-
Transmission auxiliary fluid cooler tube support bracket nut	25	18	-
Transmission fluid filler tube bolt	10	-	89
Transmission mount-to-crossmember nuts	115	85	-
Transmission rear mount nuts	103	76	-
Transmission-to-engine bolts	48	35	-
Valve cover bolts ⁽¹⁾	-	-	-
Variable Camshaft Timing (VCT) housing bolts	10	-	89

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Wiring harness retainers	10	-	89
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(1) Refer to the appropriate procedure(s).

DESCRIPTION AND OPERATION

ENGINE

NOTE: Refer to the exploded view under the ASSEMBLY procedure.

The 5.4L (3V) is a V-8 engine with the following features:

- Single overhead camshafts
- Three valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- Aluminum cylinder heads
- Cast iron, 90-degree V-cylinder block
- Variable Camshaft Timing (VCT)
- Individually chain-driven camshafts with a hydraulic timing chain tensioner on each timing chain
- Distributorless ignition system
- Electronic Returnless Fuel System (ERFS)

Engine Identification

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

Engine Code Information Label

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

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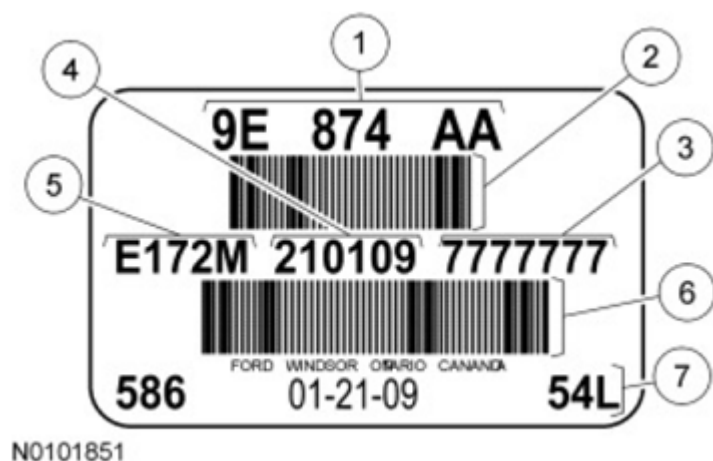


Fig. 1: Identifying Engine Code Information Label
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Description
1	Engine part number
2	Bar code
3	Running number
4	Engine build date (DDMMYY)
5	Windsor engine plant
6	Bar code
7	Engine displacement

Engine Cylinder Identification

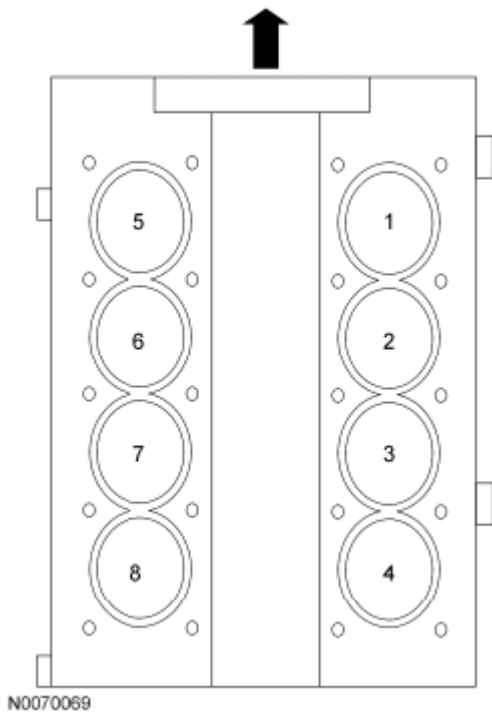


Fig. 2: Identifying Engine Cylinder Identification
Courtesy of FORD MOTOR CO.

Exhaust Emission Control System

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

Induction System

The **SFI** system provides the fuel/air mixture needed for combustion in the cylinders. The 8 solenoid-operated fuel injectors:

- are mounted in the intake manifold.
- meter fuel into the air intake stream in accordance with engine demand.
- are positioned so that their tips direct fuel just ahead of the engine intake valves.
- supply fuel from the fuel tank with a fuel pump mounted in the fuel tank.

Valve Train

The valve train operates as follows:

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

Positive Crankcase Ventilation System

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

Lubrication System

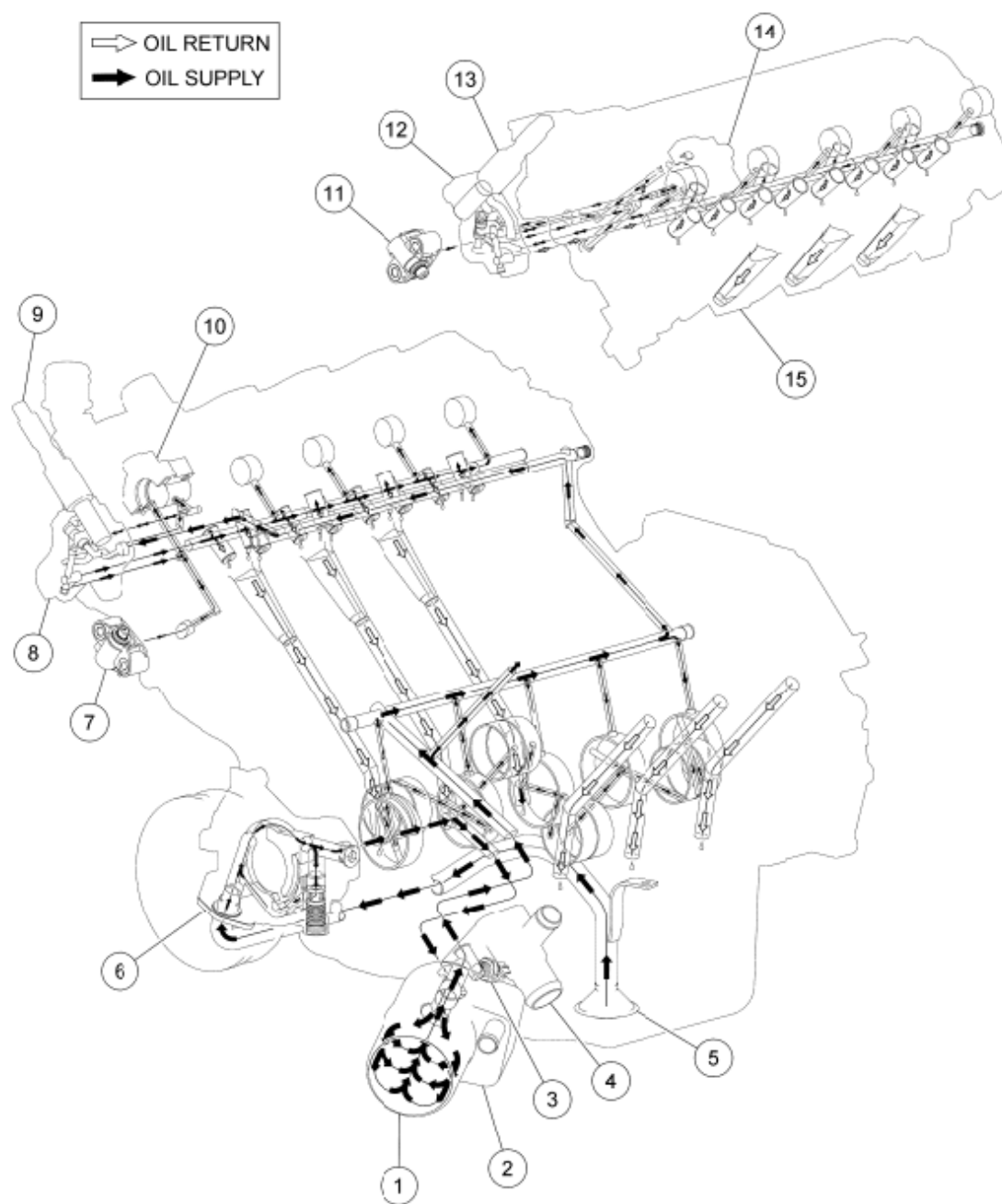
The engine lubrication system operates as follows:

- Oil is drawn into the oil pump through the oil pump screen cover and tube in the sump of the oil pan.
- Oil is pumped through the oil filter on the left front side of the cylinder block.
- Oil enters the main gallery where it is distributed to the crankshaft main journals and to both cylinder heads.
- From the main journals, the oil is routed through cross-drilled passages in the crankshaft to lubricate the connecting rod bearings. Controlled leakage through the crankshaft main bearings and connecting rod bearings is slung radially outward to cool and lubricate the cylinder walls as well as the entire connecting rod, piston and piston ring assembly.
- The left cylinder head is fed from a drilling into the supply passage feeding the main gallery at the front of the cylinder block. The right cylinder head is fed from a drilling into the rear of the main gallery. Main gallery pressure is reduced as it enters the cylinder head galleries through fixed serviceable orifices, located at the upper part of the feed passages. It is this reduced pressure in the cylinder head galleries which feeds the camshaft journals, the hydraulic lash adjusters and the primary and secondary timing chain tensioners.
- The oil pressure feed for the VCT solenoids, VCT housings and camshaft phaser and sprockets is not reduced.
- The camshaft lobe and roller followers are lubricated by splash created through valve train operation.

Engine Oil Flow Illustrations**Engine Assembly**

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Fig. 3: Identifying Engine Oil Flow
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

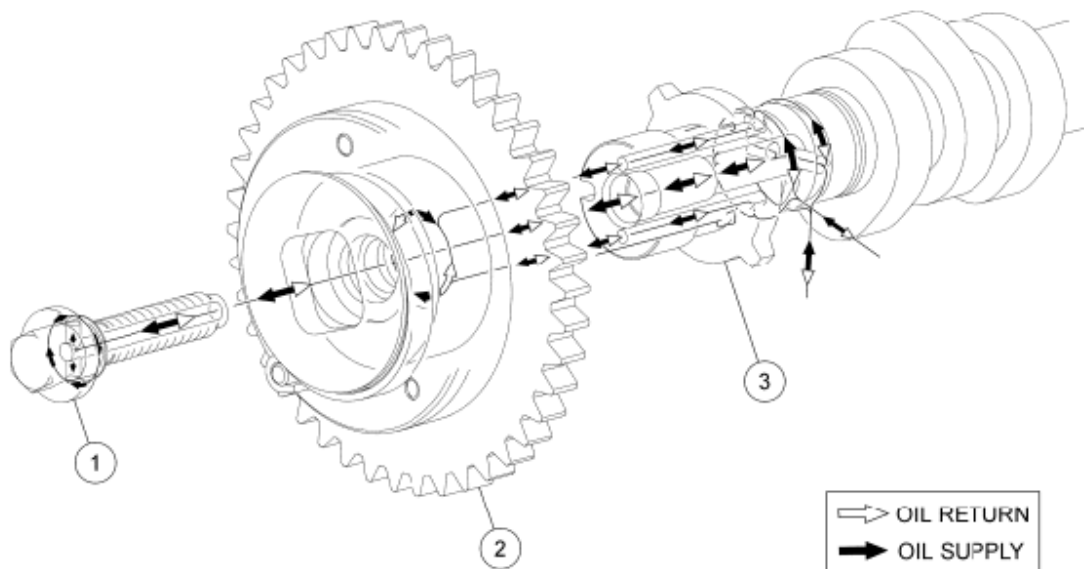
Item	Part Number	Description
1	6714	Oil filter
2	6A642	Oil cooler (if equipped)
3	9278	Engine Oil Pressure (EOP) switch
4	6884	Oil filter adapter

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5	6622	Oil pump screen and pickup tube
6	6621	Oil pump
7	6L266A	Timing chain tensioner - RH
8	6C260	Variable Camshaft Timing (VCT) housing - RH
9	6M280	VCT oil control solenoid assembly - RH
10	6B284	Front camshaft bearing cap - RH
11	6L266B	Timing chain tensioner - LH
12	6C261	VCT housing - LH
13	6M280	VCT oil control solenoid assembly - LH
14	6B284	Front camshaft bearing cap - LH
15	6050	Cylinder head - LH

Camshaft Phaser and Sprocket, Camshaft Phaser and Sprocket Bolt and Camshaft



N0096610

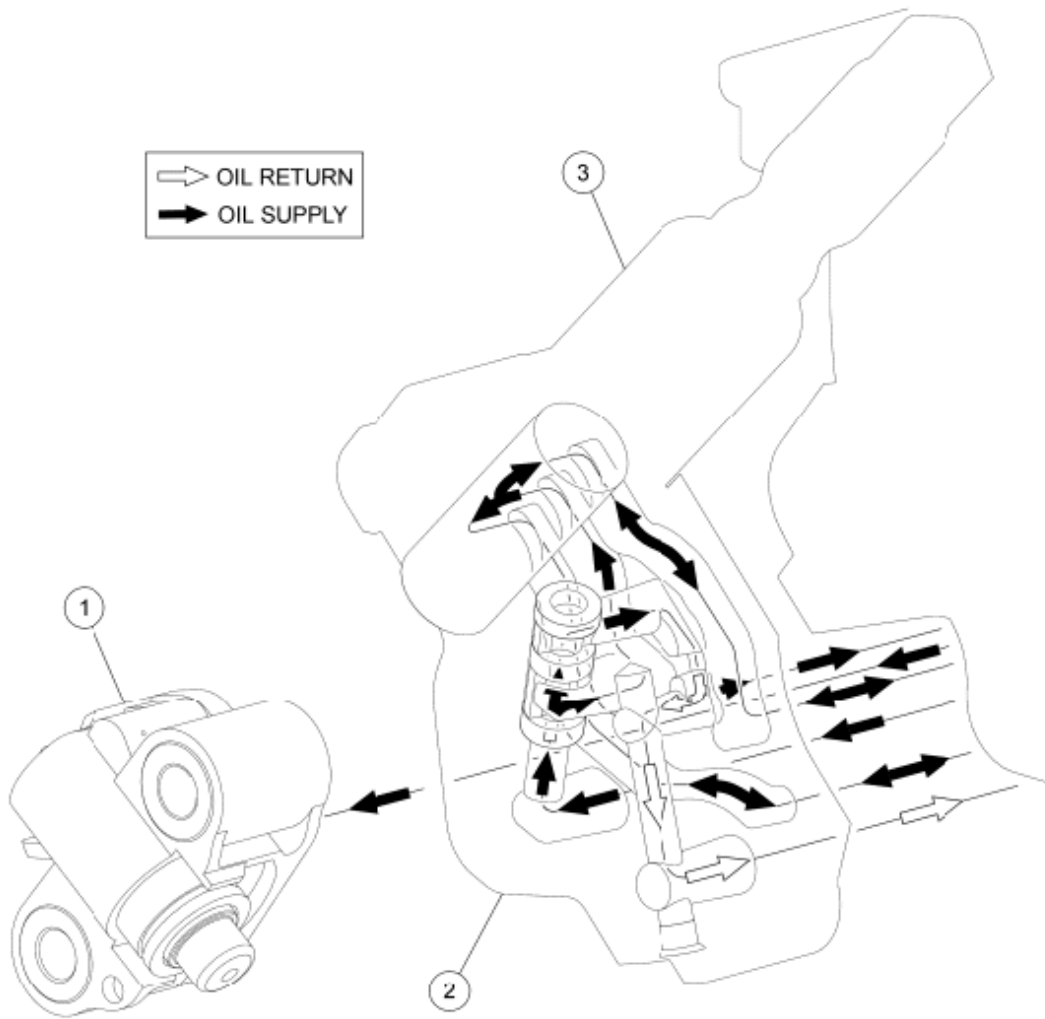
Fig. 4: Identifying Camshaft Phaser, Sprocket, Camshaft Phaser, Sprocket Bolt And Camshaft (Oil Return And Oil Supply)

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6279	Camshaft phaser and sprocket bolt
2	6256	Camshaft phaser and sprocket
3	-	Camshaft

LH Variable Camshaft Timing (VCT) Housing, VCT Solenoid and Timing Chain Tensioner



N0096613

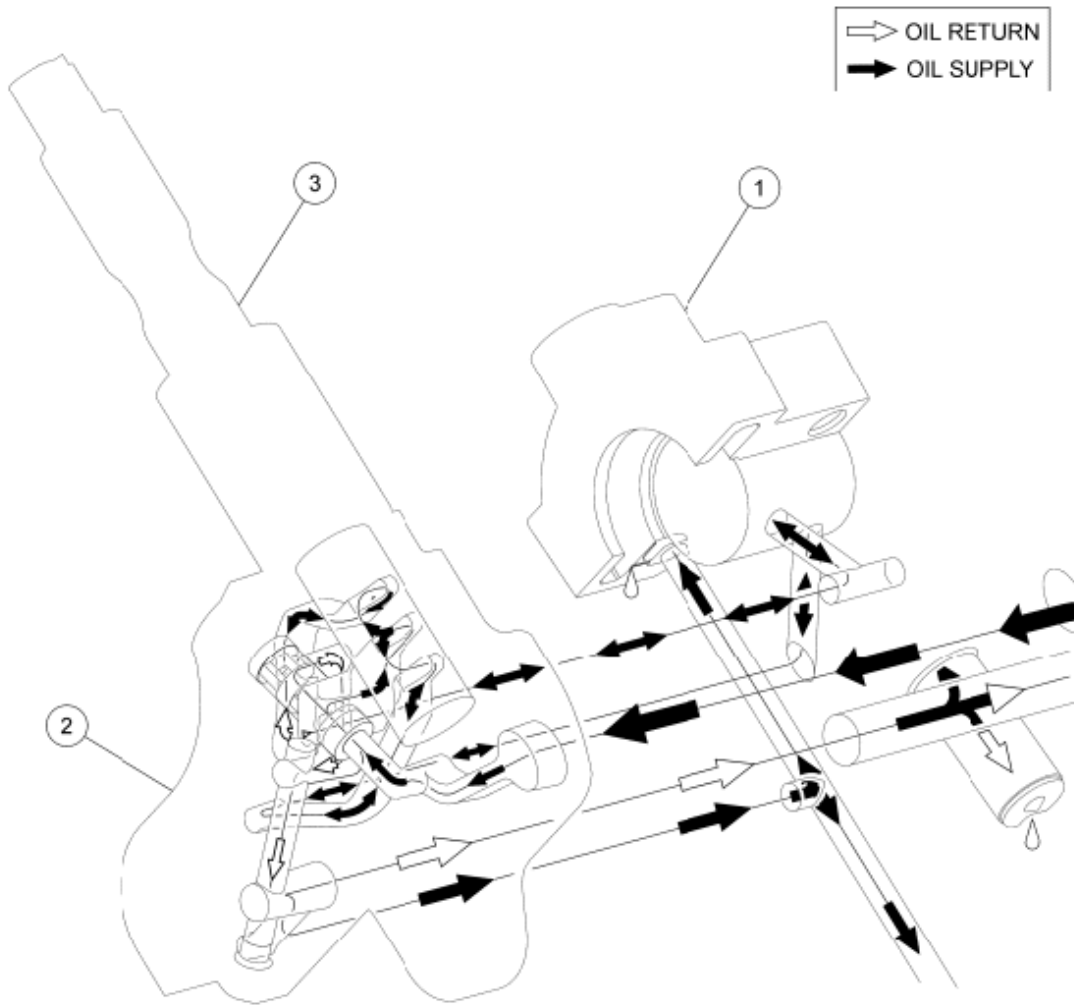
Fig. 5: Identifying LH Variable Camshaft Timing (VCT) Housing, VCT Solenoid And Timing Chain Tensioner (Oil Return And Oil Supply)

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6L266B	Timing chain tensioner - LH
2	6C261	Variable Camshaft Timing (VCT) housing - LH
3	6M280	VCT oil control solenoid assembly - LH

RH Variable Camshaft Timing (VCT) Housing and VCT Solenoid



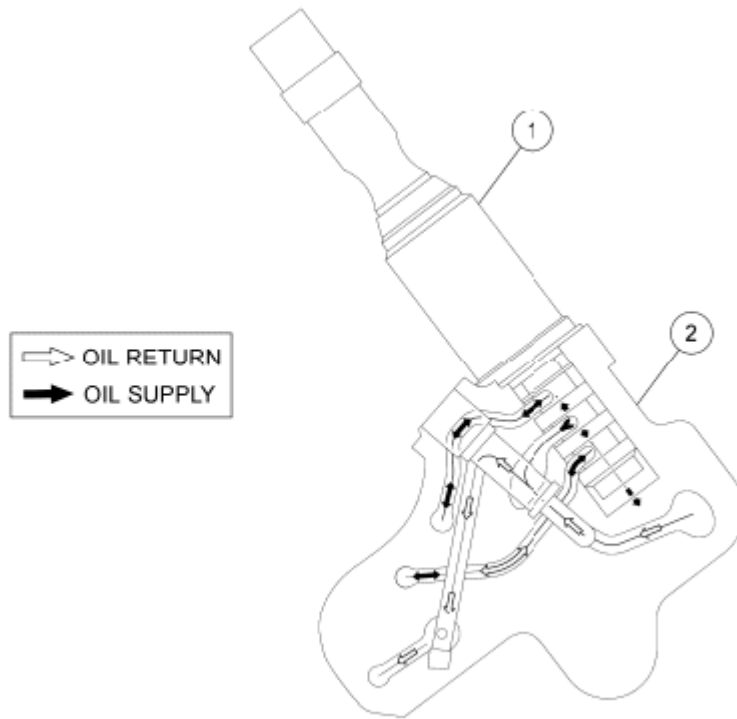
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Fig. 6: Identifying RH Variable Camshaft Timing Housing And VCT Solenoid
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6M280	Front camshaft bearing cap - RH
2	6C261	Variable Camshaft Timing (VCT) housing - RH
3	6C260	VCT oil control solenoid assembly - RH

Variable Camshaft Timing (VCT) Housing



N0096612

Fig. 7: Identifying Variable Camshaft Timing (VCT) Housing
 Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	-	Variable Camshaft Timing (VCT) oil control solenoid assembly
2	-	VCT housing

Oil Pump

The lubrication system of the 5.4L (3V) engine is designed to provide optimum oil flow to critical components of the engine through its entire operating range. The heart of the system is a positive displacement internal gear oil pump using top seal rotors. Generically this design is known as a gerotor pump, which operates as follows:

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

DIAGNOSIS AND TESTING

ENGINE

For basic engine mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION** . For driveability concerns, refer to the **INTRODUCTION - GASOLINE MODELS** .

IN-VEHICLE REPAIR

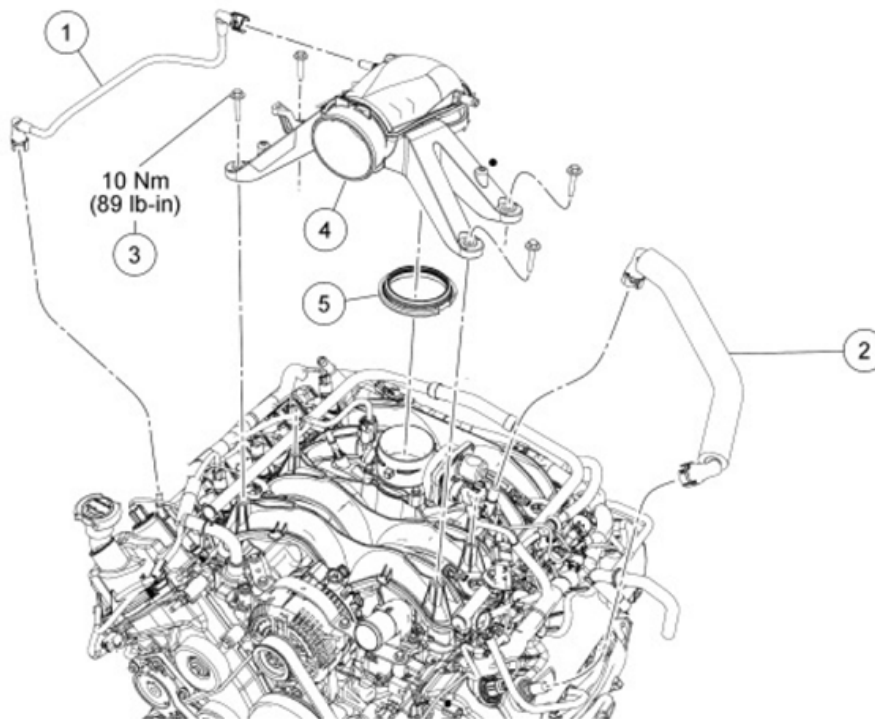
INTAKE MANIFOLD

Material

ITEM SPECIFICATION

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

Air Cleaner (ACL) Outlet Pipe-to-Throttle Body (TB) Adapter, PCV Tube and Crankcase Vent Tube



N0087711

Fig. 8: Identifying Air Cleaner Outlet Pipe-To-Throttle Body Adapter, PCV Tube And Crankcase Vent Tube With Torque Specifications
Courtesy of FORD MOTOR CO.

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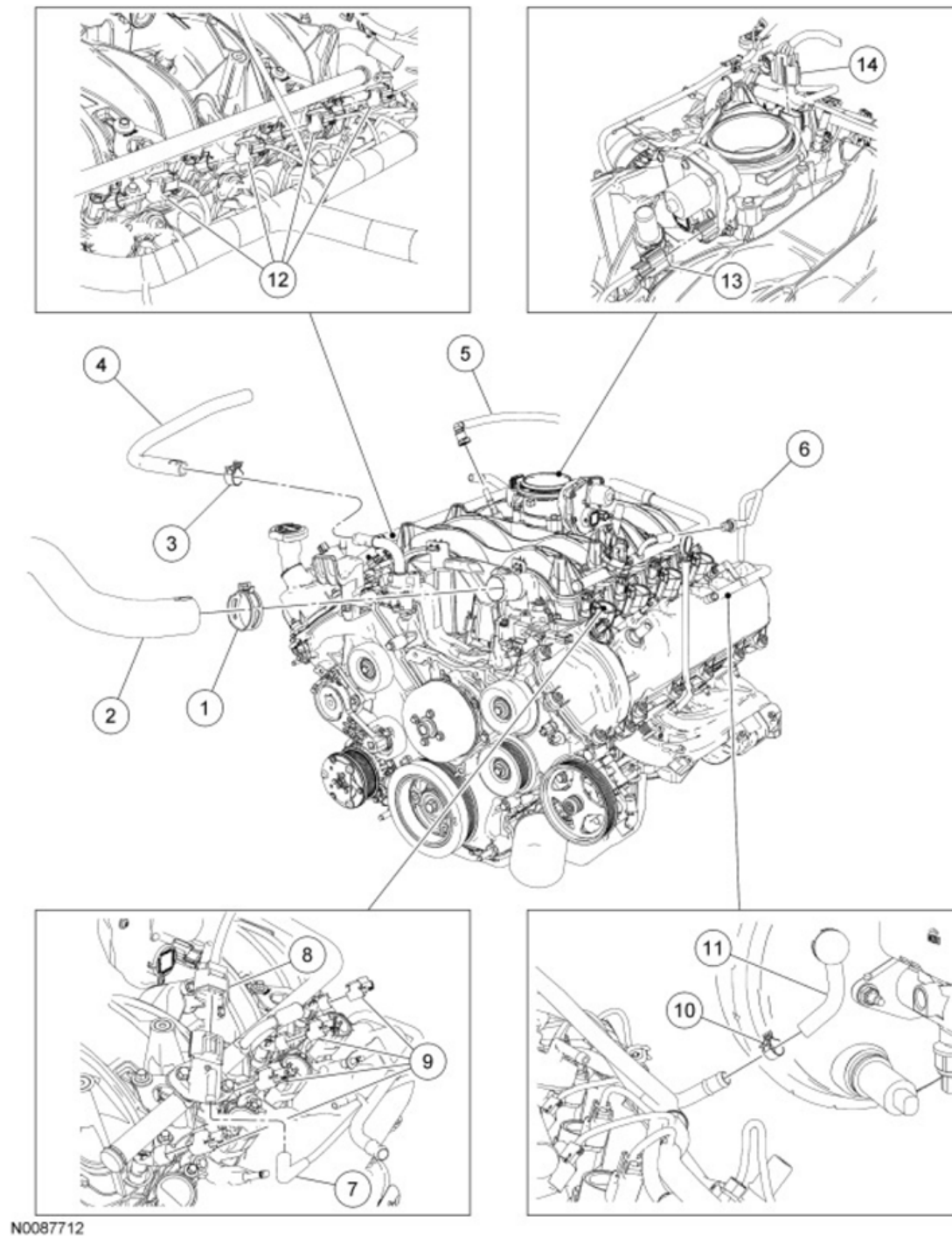
ITEM DESCRIPTION

Item	Part Number	Description
1	6K824	Crankcase ventilation tube
2	6K817	PCV tube
3	W713555	Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) adapter bolt (4 required)
4	9A589	ACL outlet pipe-to- TB adapter
5	9B694	ACL outlet pipe-to- TB adapter seal

Evaporative Emission (EVAP) Tube, Fuel Supply Tube Spring Lock Coupling, Fuel Rail and Throttle Body (TB)
Electrical Connectors

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N0087712

Fig. 9: Identifying Evaporative Emission Tube, Fuel Supply Tube Spring Lock Coupling And Fuel Rail And Throttle Body Electrical Connectors
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	W705800	Radiator hose clamp

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2	9F792	Radiator hose
3	-	Heater coolant hose clamp
4	9229	Heater coolant hose
5	6K824	Evaporative Emission (EVAP) system tube
6	9J338	Fuel supply tube spring lock coupling
7	-	Fuel rail pressure and temperature sensor vacuum hose (part of 9D446)
8	-	Fuel rail pressure and temperature sensor electrical connector (part of 12B637)
9	-	LH fuel injector electrical connectors (part of 12B637)
10	-	Intake manifold vacuum tube-to-brake booster hose clamp (part of 9A474)
11	-	Intake manifold vacuum tube-to-brake booster hose (part of 9A474)
12	-	RH fuel injector electrical connectors (part of 12B637)
13	-	Electronic Throttle Control (ETC) electrical connector (part of 12B637)
14	-	Throttle Position (TP) sensor electrical connector (part of 12B637)

Engine Coolant Crossover Manifold Assembly, Intake Manifold and Gaskets

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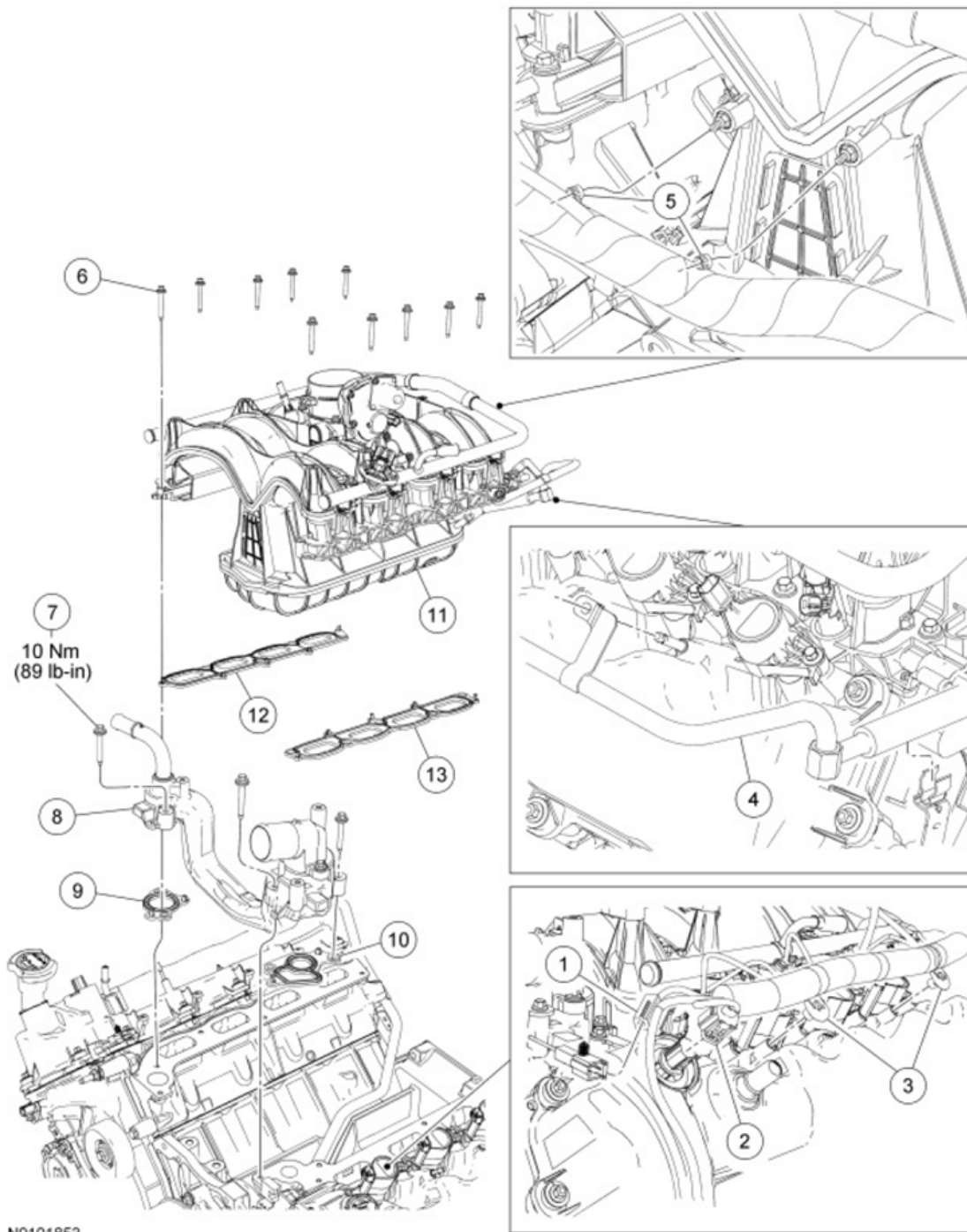


Fig. 10: Identifying Engine Coolant Crossover Manifold Assembly And Intake Manifold And Gaskets With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description

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1	-	Radio ignition interference capacitor electrical connector (part of 12B637)
2	-	Variable Camshaft Timing (VCT) oil control solenoid electrical connector (part of 12B637)
3	-	Engine wiring harness retainers (part of 12B637)
4	9A474	Intake manifold vacuum tube
5	-	Electrical wiring harness retainers (part of 12B637)
6	W709775	Intake manifold bolt (10 required)
7	W503282	Engine coolant crossover manifold assembly bolt (3 required)
8	8C369	Engine coolant crossover manifold assembly
9	8C387	RH engine coolant crossover manifold assembly gasket
10	8C388	LH engine coolant crossover manifold assembly gasket
11	9424	Intake manifold
12	9439	RH intake manifold gasket
13	9441	LH intake manifold gasket

Removal

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.

WARNING: Before working on or disconnecting any of the fuel tubes or fuel system components, relieve the fuel system pressure to prevent accidental spraying of fuel. Fuel in the fuel system remains under high pressure, even when the engine is not running. Failure to follow this instruction may result in serious personal injury.

1. Drain the cooling system. For additional information, refer to **ENGINE COOLING**.
2. Remove the generator. For additional information, refer to **CHARGING SYSTEM**.
3. Disconnect the fuel supply spring lock coupling from the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL**.
4. Disconnect the upper radiator hose from the thermostat housing.
5. Disconnect the heater coolant hose from the engine coolant crossover manifold assembly.
6. Disconnect the quick connect coupling from the intake manifold and position aside the Evaporative Emission (EVAP) system tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL**.
7. Disconnect the quick connect couplings and remove the PCV tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL**.
8. Disconnect the quick connect coupling and position the crank case vent tube aside. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL**.
9. Remove the 4 bolts and the Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) adapter.
10. Disconnect the fuel rail pressure and temperature sensor electrical connector and vacuum connector.

11. Disconnect the 8 fuel injector electrical connectors.

NOTE: RH shown in illustration, LH similar.



Fig. 11: Locating Ignition Coil Electrical Connectors
Courtesy of FORD MOTOR CO.

12. Disconnect the 8 ignition coil electrical connectors.
13. Disconnect the Throttle Position (TP) sensor and Electronic Throttle Control (ETC) electrical connectors.
14. Disconnect the LH Variable Camshaft Timing (VCT) solenoid electrical connector.
15. Disconnect the LH radio ignition interference capacitor electrical connector.
16. Disconnect the wiring harness retainers from the LH valve cover studs and position the harness aside.
17. Disconnect the brake booster vacuum hose from the intake manifold vacuum tube.
18. Remove the 10 intake manifold bolts.

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

19. Remove the 3 bolts, the engine coolant crossover manifold assembly and discard the gaskets.
 - Clean and inspect the sealing surfaces with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
20. Disconnect the intake manifold vacuum tube from the valve cover stud and the support bracket.
21. Disconnect the engine wiring harness retainer from the rear of the intake manifold.

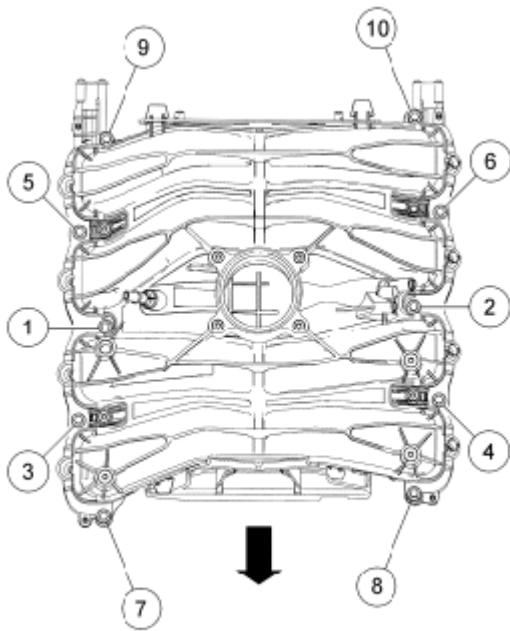
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

22. Remove the intake manifold and intake manifold vacuum tube as an assembly. Discard the intake manifold gaskets.
 - Clean and inspect the sealing surfaces with metal surface prep and silicone gasket remover. Follow the directions on the packaging.

Installation

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

1. Using new intake manifold gaskets, position the intake manifold and intake manifold vacuum tube as an assembly.
2. Using new gaskets, position the engine coolant crossover manifold assembly and install the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).
3. Install the 10 intake manifold bolts and tighten in 2 stages in the sequence shown in illustration.
 - Stage 1: Tighten to 2 Nm (18 lb-in).
 - Stage 2: Tighten to 10 Nm (89 lb-in).



N0082678

Fig. 12: Identifying Intake Manifold Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

4. Connect the engine wiring harness retainer to the rear of the intake manifold.
5. Connect the intake manifold vacuum tube to the support bracket and the valve cover stud.

6. Connect the brake booster vacuum hose to the intake manifold vacuum tube and position the clamp.
7. Position the engine wiring harness and connect the wiring harness retainers to the LH valve cover stud bolts.
8. Connect the LH radio ignition interference capacitor electrical connector.
9. Connect the LH **VCT** solenoid electrical connector.
10. Connect the **TP** sensor and electronic acceleration control electrical connectors.
11. Connect the 8 fuel injector electrical connectors.

NOTE: RH shown in illustration, LH similar.



Fig. 13: Locating Ignition Coil Electrical Connectors
Courtesy of FORD MOTOR CO.

12. Connect the 8 ignition coil electrical connectors.
13. Connect the fuel rail pressure and temperature sensor electrical connector and vacuum connector.
14. Position the **ACL** outlet pipe-to- **TB** adapter and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).
15. Connect the crankcase vent tube quick connect coupling to the **ACL** outlet pipe-to- **TB** adapter. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
16. Connect the fuel supply spring lock coupling to the fuel rail. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
17. Position the PCV tube and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
18. Connect the **EVAP** tube quick connect coupling to the intake manifold. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
19. Connect the heater coolant hose to the engine coolant crossover manifold assembly.
20. Connect the upper radiator hose to the thermostat housing.
21. Install the generator. For additional information, refer to **CHARGING SYSTEM** .

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22. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING** .

VALVE COVER - RH

Material

ITEM SPECIFICATION

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Silicone Gasket Remover ZC-30	-

PCM Electrical Connectors

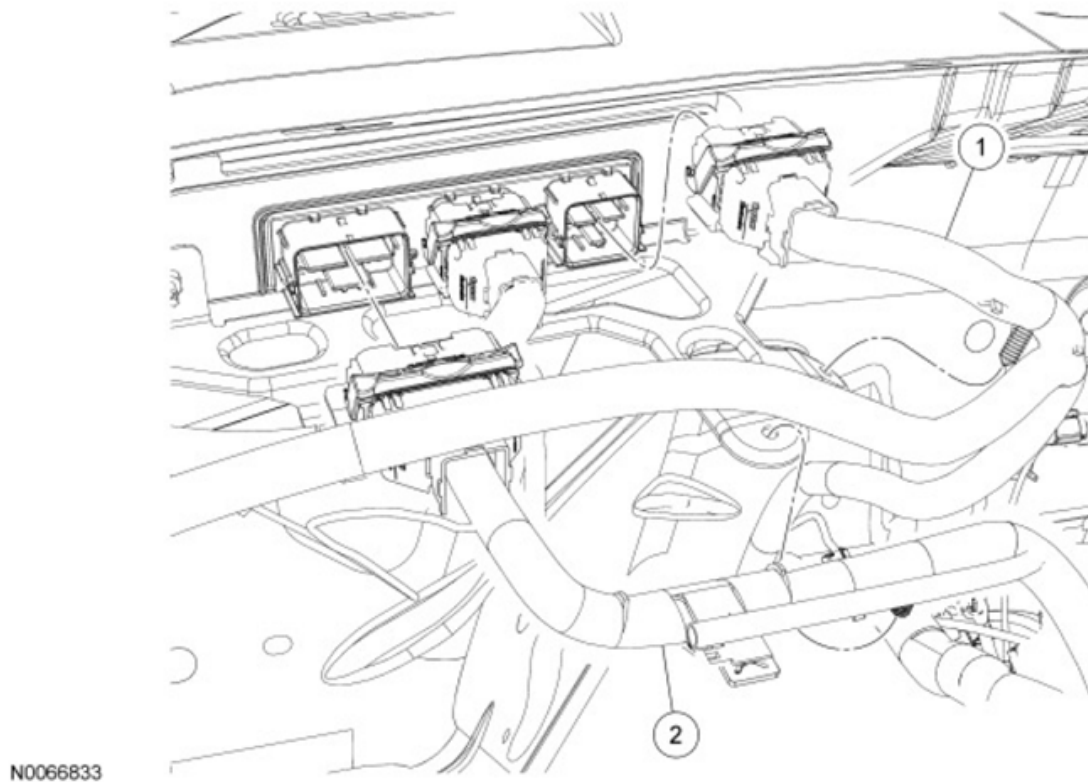


Fig. 14: Identifying PCM Electrical Connectors
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Item	Part Number	Description
1	-	Transmission wiring harness electrical connector and wiring harness retainer (part of 15525)
2	-	Engine wiring harness electrical connector and wiring harness retainer (part of 12B637)

Transmission Fluid Level Indicator Tube, Crankcase Vent Tube and Coolant Hose

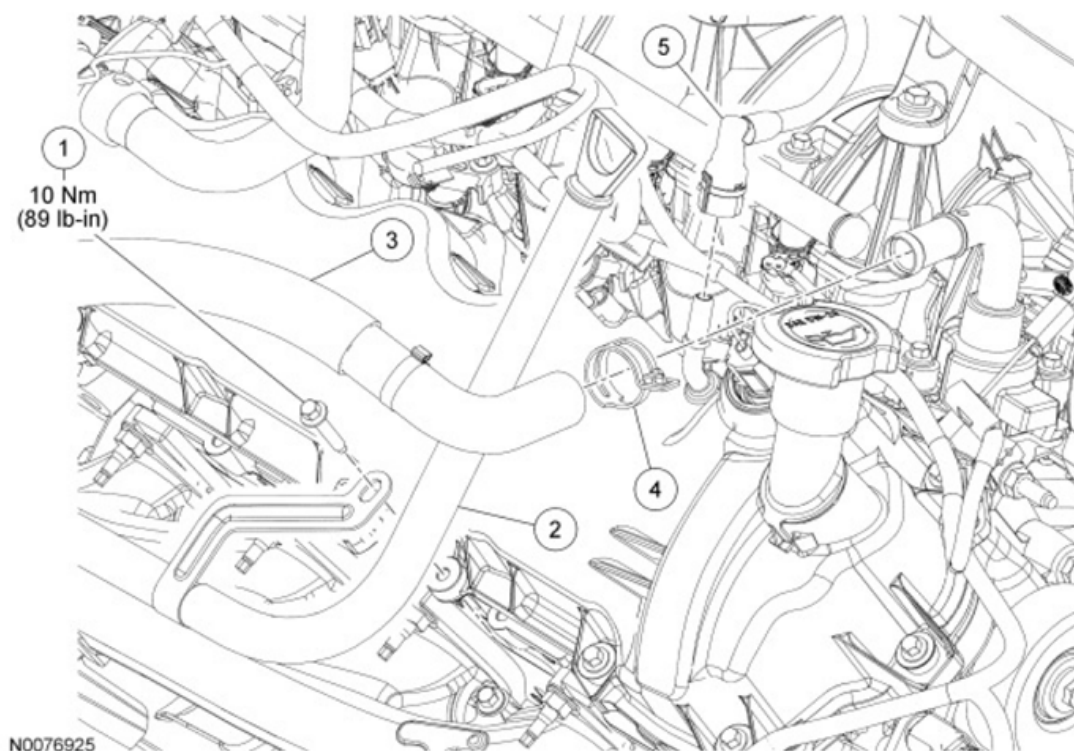


Fig. 15: Identifying Transmission Fluid Level Indicator Tube, Crankcase Vent Tube And Coolant Hose With Torque Specifications

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	N859356	Transmission fluid level indicator tube support bracket bolt
2	7A228	Transmission fluid level indicator tube
3	9929	Heater coolant hose
4	-	Heater coolant hose clamp
5	6758	Crankcase ventilation tube quick connect coupling

Ignition Coils, RH Valve Cover and Gasket

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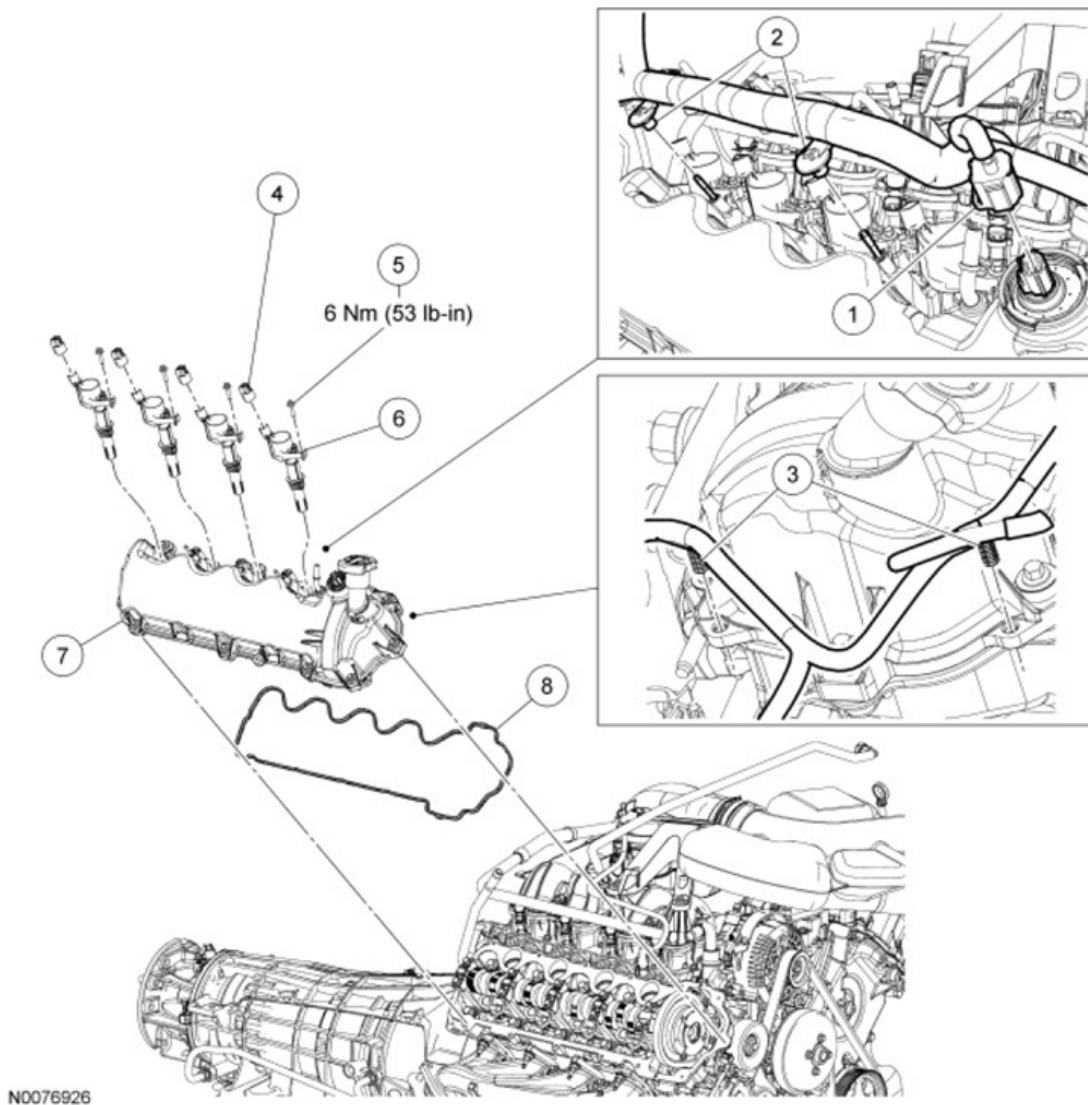


Fig. 16: Identifying Ignition Coils, RH Valve Cover And Gasket With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	-	Variable Camshaft Timing (VCT) solenoid electrical connector (part of 12B637)
2	-	Engine wiring harness retainers (part of 12B637)
3	-	Engine wiring harness retainers (part of 12B637)
4	-	RH ignition coil electrical connector (4 required) (part of 12B637)
5	W711062	RH ignition coil bolt (4 required)
6	12A366	RH ignition coil (4 required)
7	6582	RH valve cover
8	6584	RH valve cover gasket

Removal

1. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING** .
2. If equipped, remove the bolt and position the transmission filler tube aside.
3. Disconnect the quick connect coupling and position the crankcase vent tube aside. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
4. Disconnect the heater coolant hose from the engine coolant crossover manifold assembly.
5. Disconnect the 2 PCM electrical connectors and the wiring harness retainers from the support bracket and position aside.
6. Disconnect the 4 RH ignition coil electrical connectors.
7. Remove the 4 RH bolts and the 4 RH ignition coils.
 - Remove the ignition coil, using a twisting motion while pulling up on the ignition coil.
8. Disconnect the Variable Camshaft Timing (VCT) solenoid electrical connector.
9. Disconnect the 4 wiring harness retainers from the valve cover and position the wiring harness aside.

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

NOTE: When removing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.

NOTE: The fasteners are part of the valve cover and should not be removed.

10. Fully loosen the 9 fasteners and remove the RH valve cover and gasket.
 - Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
 - Discard the valve cover gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

Installation

NOTE: If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

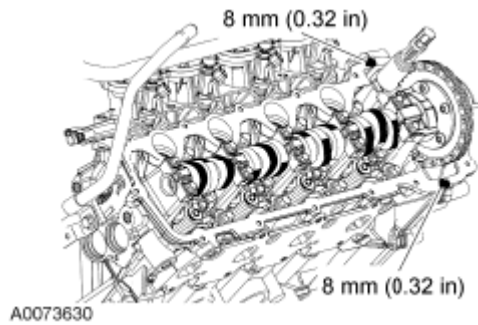


Fig. 17: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

1. Apply a bead of silicone gasket and sealant in 2 places where the engine front cover meets the cylinder head.

NOTE: When installing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.

2. Position the RH valve cover and new gasket on the cylinder head and tighten the 9 bolts in the sequence shown in illustration.
 - Tighten to 10 Nm (89 lb-in).

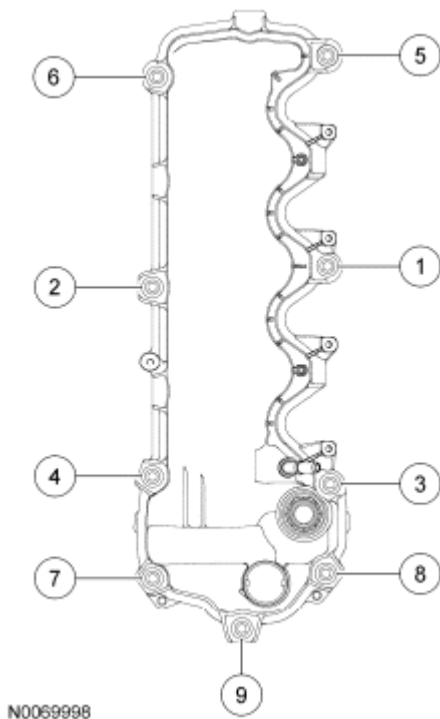


Fig. 18: Identifying Cylinder Head Bolt Tighten Sequence
Courtesy of FORD MOTOR CO.

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3. Connect the wiring harness retainers to the valve cover.
4. Connect the VCT solenoid electrical connector.

NOTE: **Verify that the ignition coil spring is correctly located inside the ignition coil boot and that there is no damage to the tip of the boot.**

5. Install the 4 RH ignition coils and the 4 bolts.
 - Apply a light coat of dielectric compound to the inside of the ignition coil boots prior to installation.
 - Tighten to 6 Nm (53 lb-in).
6. Connect the 4 RH ignition coil electrical connectors.
7. Connect the 2 PCM electrical connectors and the wiring harness retainers to the support bracket.
8. Position the crankcase vent tube and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
9. Connect the heater coolant hose to the engine coolant crossover manifold assembly.
10. If equipped, position the transmission filler tube and install the bolt.
 - Tighten to 10 Nm (89 lb-in).
11. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING** .

VALVE COVER - LH

Material

ITEM SPECIFICATION

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Silicone Gasket Remover ZC-30	-

Evaporative Emission (EVAP) Fuel Vapor Tube Quick Connect Fittings

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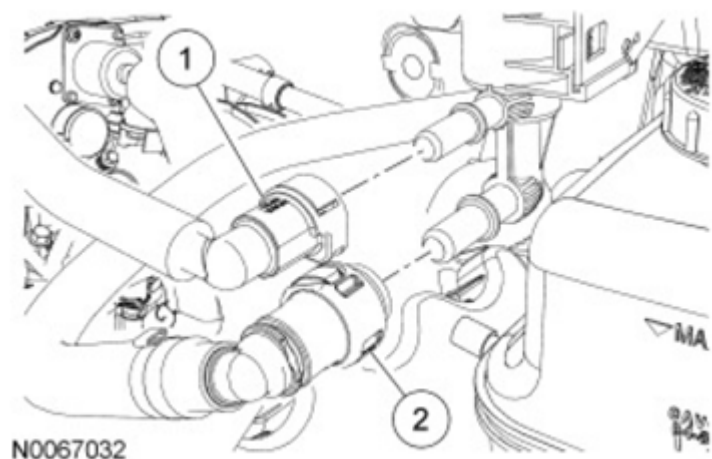
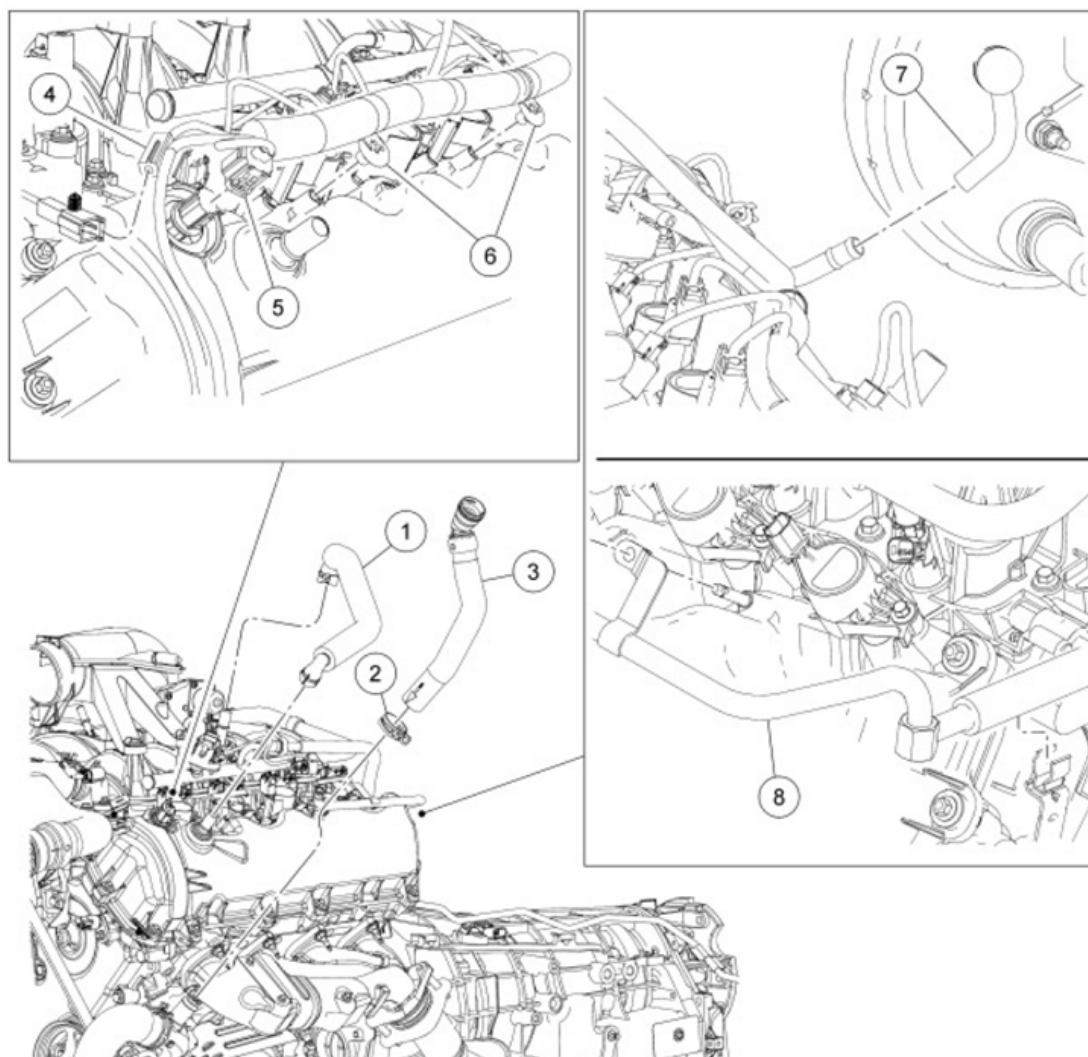


Fig. 19: Identifying Evaporative Emission Fuel Vapor Tube Quick Connect Fittings
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	-	Evaporative Emission (EVAP) fuel vapor tube quick connect fitting
2	-	EVAP fuel vapor tube quick connect fitting

PCV Tube, Intake Manifold Vacuum Tube, Degas Bottle Coolant Outlet Hose and Electrical Connectors



N0087714

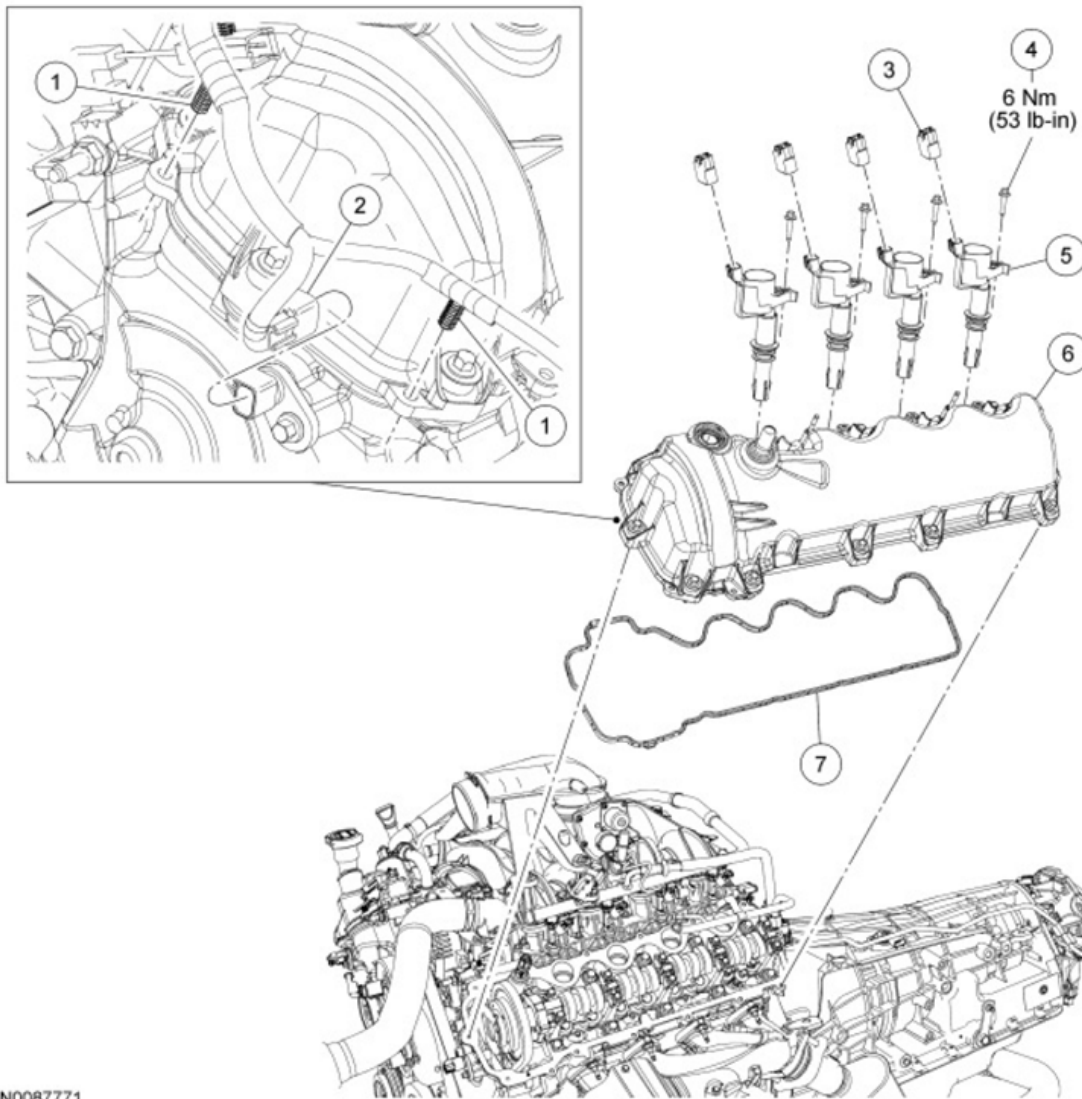
Fig. 20: Identifying PCV Tube, Intake Manifold Vacuum Tube, Degas Bottle Coolant Outlet Hose And Electrical Connectors

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6K817	PCV tube
2	-	Degas bottle coolant outlet hose clamp
3	-	Degas bottle coolant outlet hose
4	-	LH radio ignition interference capacitor electrical connector (part of 12B637)
5	-	LH Variable Camshaft Timing (VCT) solenoid electrical connector (part of 12B637)
6	-	Engine wiring harness retainers (part of 12B637)
7	-	Intake manifold vacuum tube-to-brake booster hose
8	9D446	Intake manifold vacuum tube

LH Ignition Coils, Valve Cover and Gasket



N0087771

Fig. 21: Identifying LH Ignition Coils, Valve Cover And Gasket With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	-	Engine wiring harness retainers (part of 12B637)
2	-	Camshaft Position (CMP) sensor electrical connector (part of 12B637)
3	-	LH ignition coil electrical connector (4 required) (part of 12B637)
4	W711062	LH ignition coil bolt (4 required)
5	12A366	LH ignition coil (4 required)
6	6A505	LH valve cover
7	6A559	LH valve cover gasket

Removal

1. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
2. Remove the degas bottle assembly. For additional information, refer to **ENGINE COOLING** .
3. Remove the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
4. Disconnect the degas bottle coolant outlet hose.
5. Disconnect the 2 Evaporative Emission (EVAP) system tube quick connect couplings and position the tubes aside. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
6. Disconnect the quick connect couplings and remove the PCV tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
7. Disconnect the 4 LH ignition coil electrical connectors.
8. Remove the 4 bolts and the 4 LH ignition coils.
 - Remove the ignition coil, using a twisting motion while pulling up on the ignition coil.
9. Disconnect the intake manifold vacuum tube hose from the brake booster.
10. Disconnect the radio ignition interference capacitor electrical connector.
11. Disconnect the Variable Camshaft Timing (VCT) solenoid electrical connector and the wiring harness retainers.
12. Disconnect the intake manifold vacuum tube from the support bracket and the valve cover stud.

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

NOTE: When removing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.

NOTE: The fasteners are part of the valve cover and should not be removed.

13. Fully loosen the 10 fasteners and remove the LH valve cover and gasket.
 - Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
 - Discard the valve cover gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

Installation

NOTE: If the valve cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with silicone gasket remover and

metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

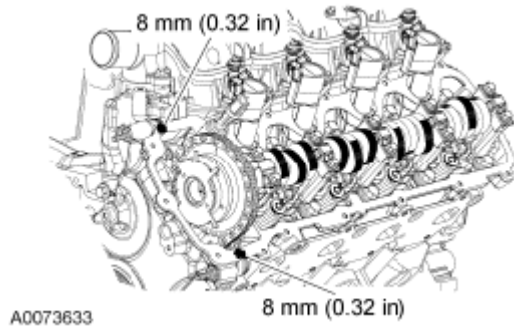


Fig. 22: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

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

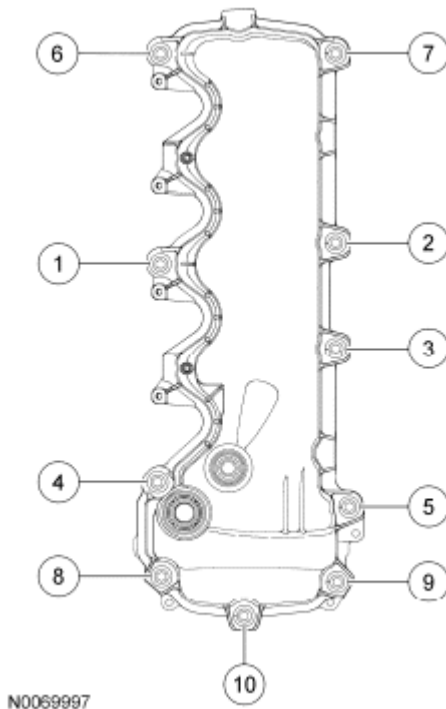


Fig. 23: Identifying Cylinder Head Bolts Tighten Sequence
Courtesy of FORD MOTOR CO.

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3. Position the intake manifold vacuum tube assembly onto the support bracket and the valve cover stud.
4. Connect the **VCT** solenoid electrical connector and the wiring harness retainers.
5. Connect the radio ignition interference capacitor electrical connector.
6. Connect the intake manifold vacuum tube hose to the brake booster.

NOTE: **Verify that the ignition coil spring is correctly located inside the ignition coil boot and that there is no damage to the tip of the boot.**

7. Install the 4 LH ignition coils and the 4 bolts.
 - Apply a light coat of dielectric compound to the inside of the ignition coil boots prior to installation.
 - Tighten to 6 Nm (53 lb-in).
8. Connect the 4 LH ignition coil electrical connectors.
9. Position the 2 **EVAP** system tubes and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
10. Install the oil level indicator and tube. For additional information, refer to **OIL LEVEL INDICATOR AND TUBE**.
11. Position the PCV tube and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
12. Connect the degas bottle coolant outlet hose.
13. Install the degas bottle assembly. For additional information, refer to **ENGINE COOLING** .
14. Install the **ACL** outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .

CRANKSHAFT PULLEY

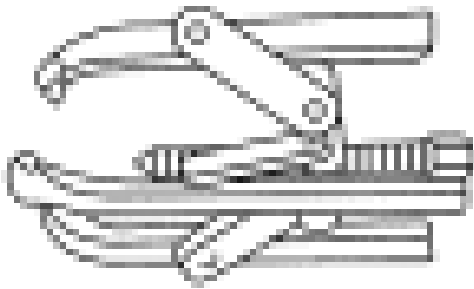
Special Tool(s)

SPECIAL TOOL REFERENCE

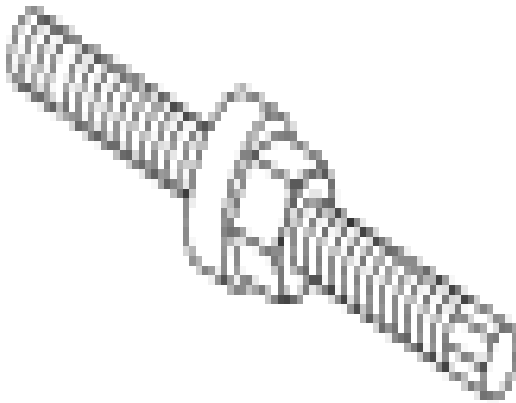
3 Jaw Puller
303-D121

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ST1184-A



ST1287-A

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

Material

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

ITEM SPECIFICATION

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
Silicone Gasket and Sealant TA-30	WSE-M4G323- A4
Motorcraft® Silicone Gasket Remover ZC-30	-

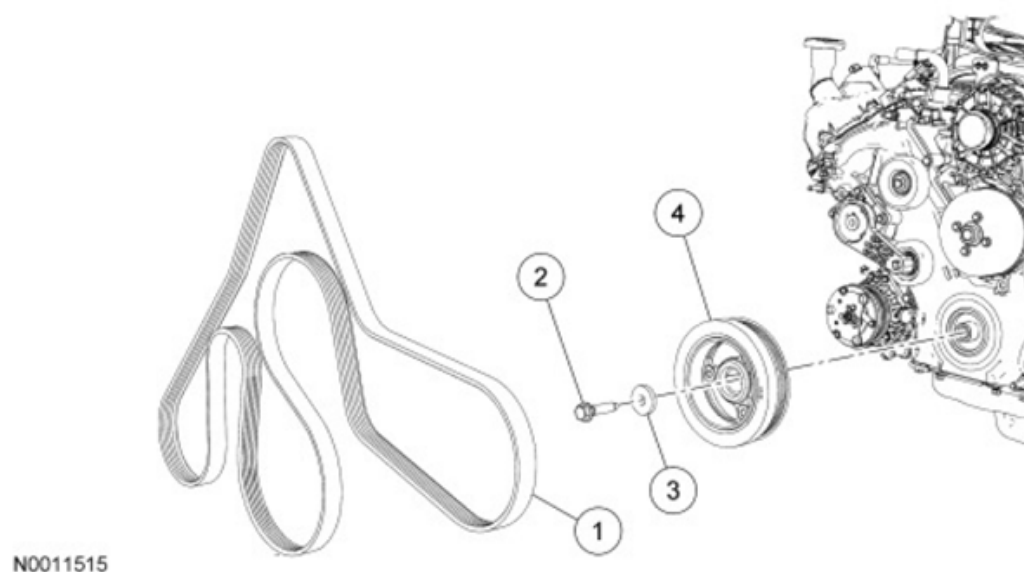


Fig. 24: Identifying Accessory Drive Belt, Crankshaft Pulley Bolt, Crankshaft Pulley Bolt Washer And Crankshaft Pulley

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	8620	Accessory drive belt
2	W701512	Crankshaft pulley bolt
3	N806165	Crankshaft pulley bolt washer
4	6316	Crankshaft pulley

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Press the position retaining tabs and rotate the lower cooling fan shroud upward until the position retainer tab locks into position.

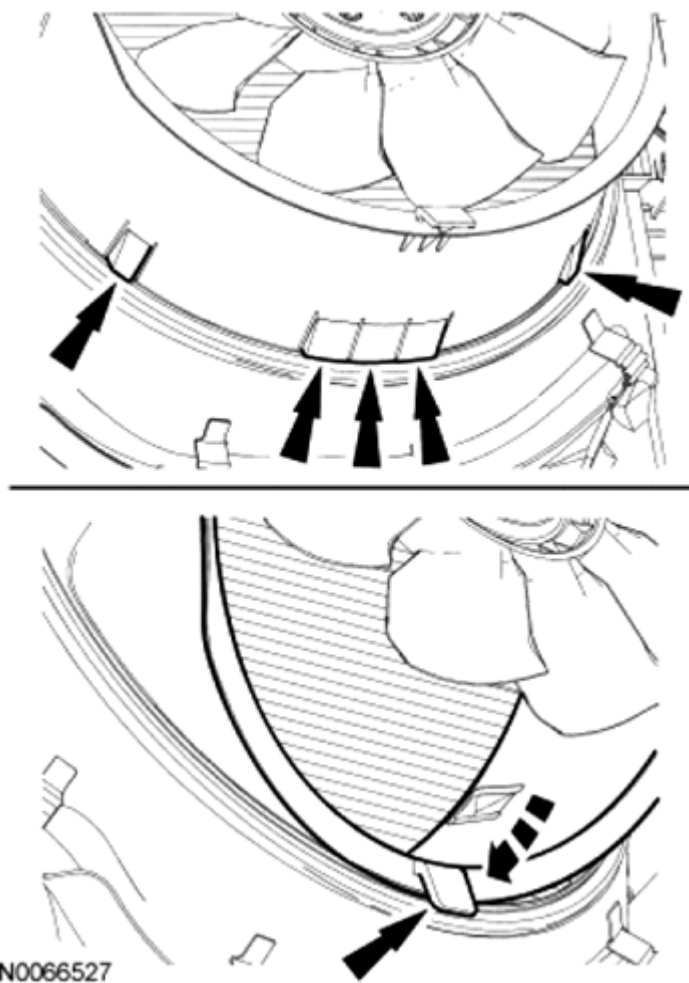


Fig. 25: Positioning Retainer Tab Locks
Courtesy of FORD MOTOR CO.

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

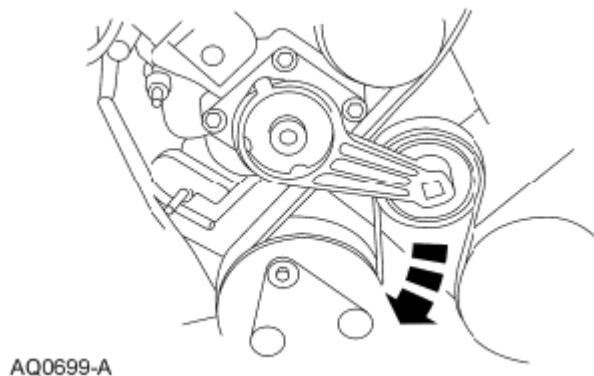
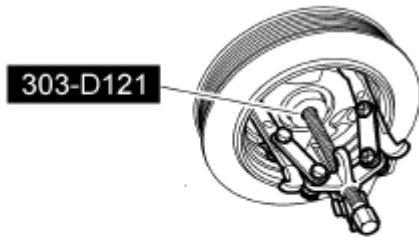


Fig. 26: Removing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

4. Remove the crankshaft pulley bolt and washer.
 - Discard the crankshaft pulley bolt.
5. Using the 3 Jaw Puller, remove the crankshaft pulley.

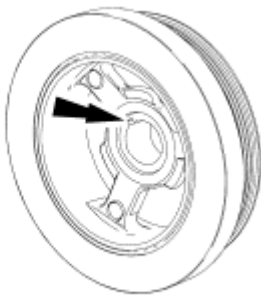


N0010528

Fig. 27: Removing Crankshaft Pulley Using Jaw Puller
Courtesy of FORD MOTOR CO.

Installation

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep and silicone gasket remover. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.



N0010530

Fig. 28: Applying Silicone Gasket And Sealant To Woodruff Key Slot In Crankshaft Pulley
Courtesy of FORD MOTOR CO.

1. Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.
2. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.

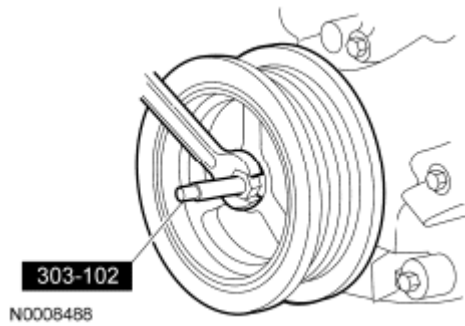


Fig. 29: Installing Crankshaft Pulley Using Crankshaft Vibration Damper Installer
Courtesy of FORD MOTOR CO.

3. Using a new crankshaft pulley bolt, install the bolt and washer and tighten the bolt in 4 stages.
 - Stage 1: Tighten to 90 Nm (66 lb-ft).
 - Stage 2: Loosen 360 degrees.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

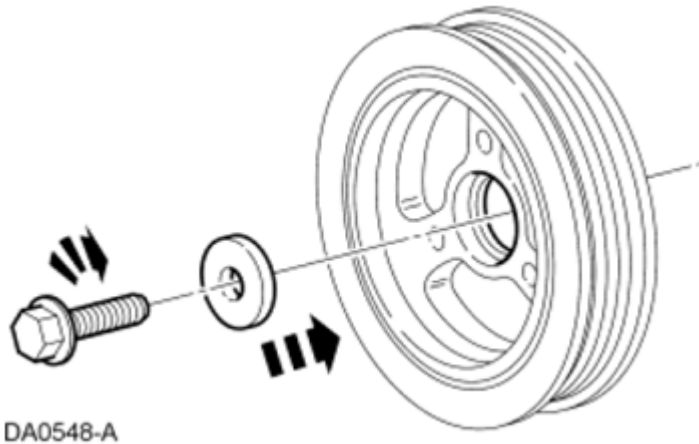


Fig. 30: Installing Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

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

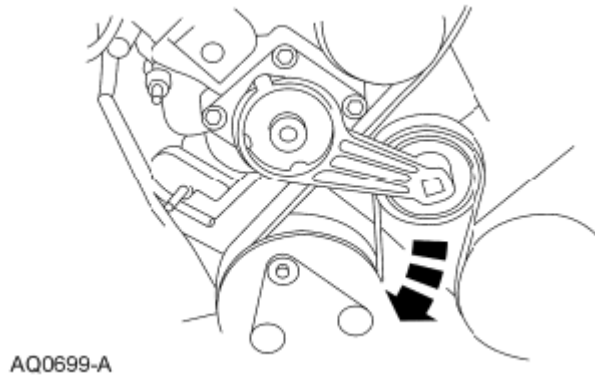


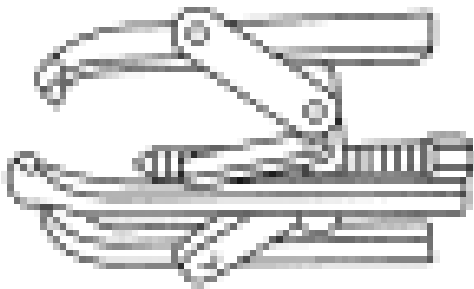
Fig. 31: Installing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

5. Press the position retaining tab and rotate the lower cooling fan shroud downward until the position retainer tab locks into position.

CRANKSHAFT FRONT SEAL

Special Tool(s)

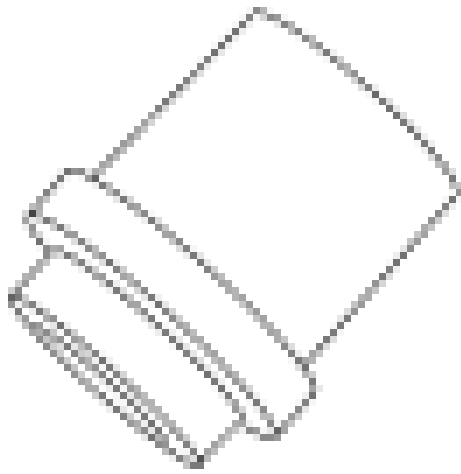
SPECIAL TOOL REFERENCE



3 Jaw Puller
303-D121

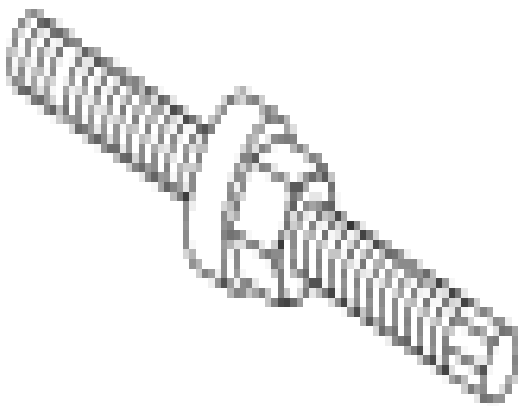
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2197-A

Installer, Crankshaft Front Oil Seal
303-635

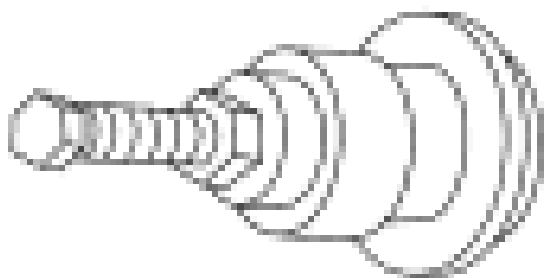


ST1287-A

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

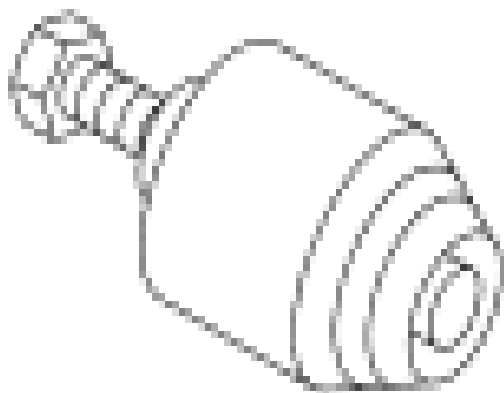
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST132B-A

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



ST128B-A

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

Material

ITEM SPECIFICATION

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil	

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Silicone Gasket Remover ZC-30	-

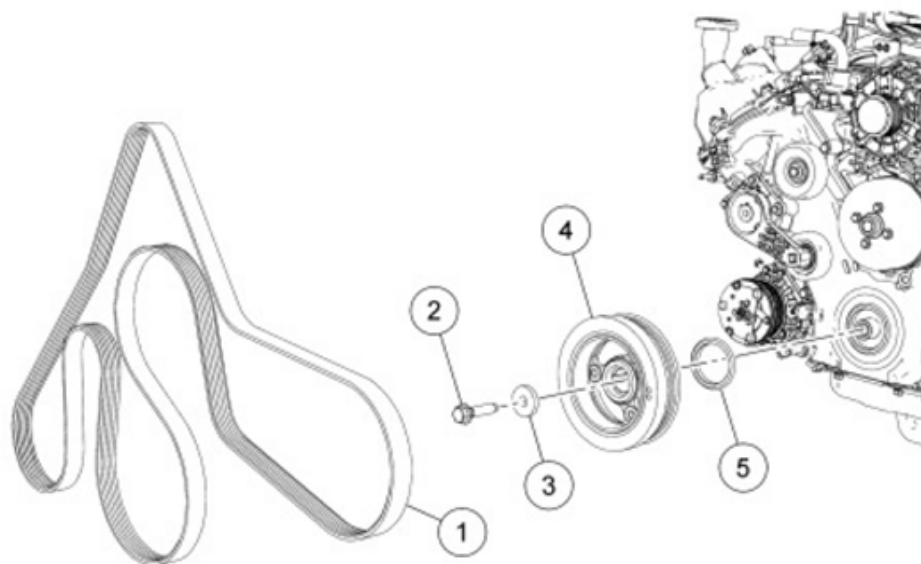


Fig. 32: Identifying Crankshaft Front Seal, Crankshaft Pulley And Crankshaft Pulley Bolt Washer
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

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

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Press the position retaining tabs and rotate the lower cooling fan shroud upward until the position retainer tab locks into position.

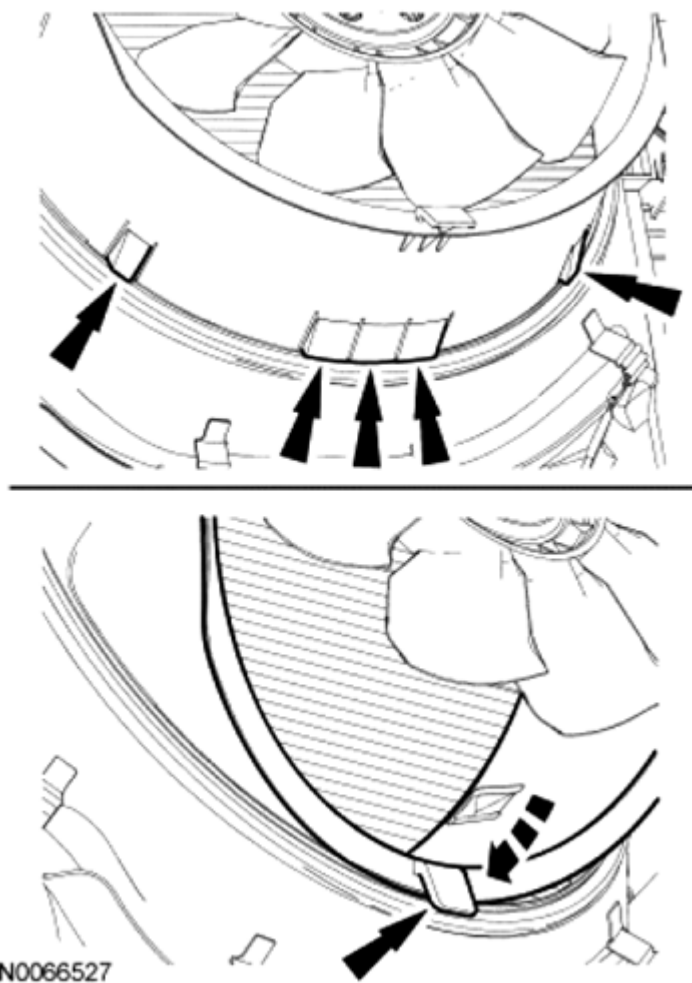


Fig. 33: Positioning Retainer Tab Locks
Courtesy of FORD MOTOR CO.

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

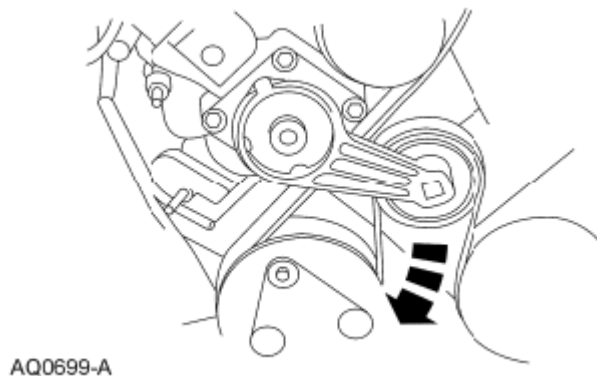
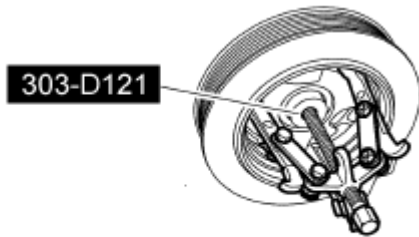


Fig. 34: Removing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

4. Remove the crankshaft pulley bolt and washer.
 - Discard the crankshaft pulley bolt.
5. Using the 3 Jaw Puller, remove the crankshaft pulley.



N0010528

Fig. 35: Removing Crankshaft Pulley Using Jaw Puller
Courtesy of FORD MOTOR CO.

6. Using the Crankshaft Front Oil Seal Remover, remove and discard the crankshaft seal.

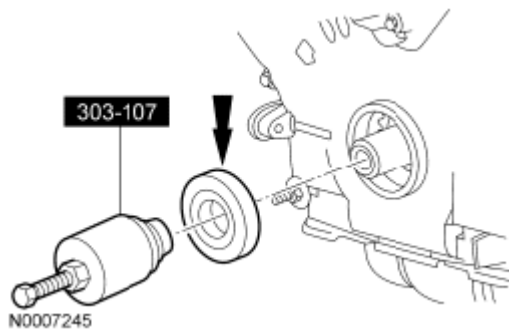


Fig. 36: Removing Crankshaft Front Seal Using Special Tool
Courtesy of FORD MOTOR CO.

Installation

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

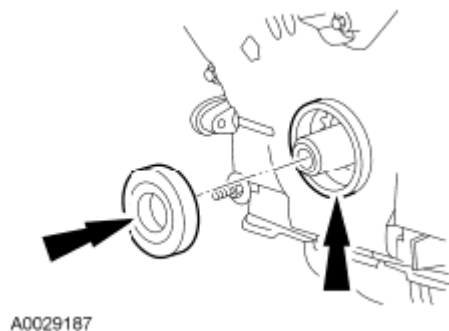


Fig. 37: Locating Engine Front Cover And Crankshaft Seal Inner Lip

Courtesy of FORD MOTOR CO.

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

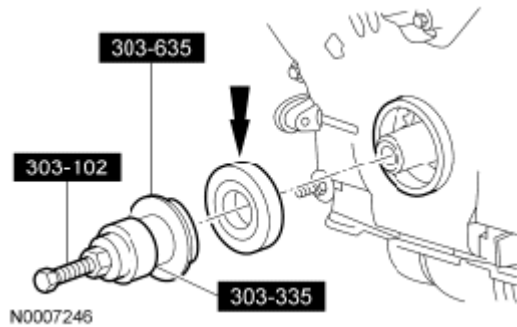


Fig. 38: Installing Crankshaft Front Seal Into Engine Front Cover Using Special Tools
Courtesy of FORD MOTOR CO.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep and silicone gasket remover. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

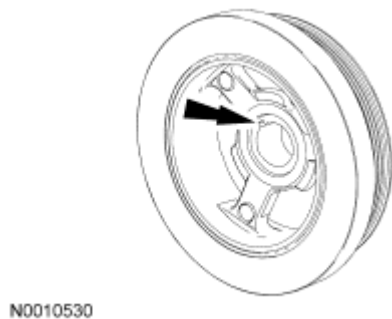


Fig. 39: Applying Silicone Gasket And Sealant To Woodruff Key Slot In Crankshaft Pulley
Courtesy of FORD MOTOR CO.

3. Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.
4. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.

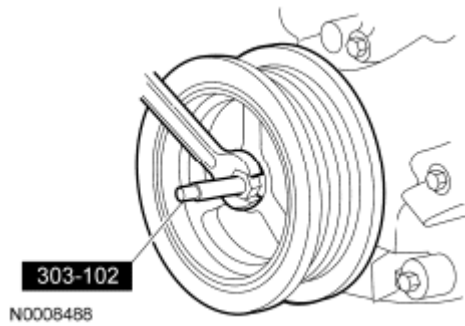


Fig. 40: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

5. Using a new crankshaft pulley bolt, install the bolt and washer and tighten the bolt in 4 stages.
 - Stage 1: Tighten to 90 Nm (66 lb-ft).
 - Stage 2: Loosen 360 degrees.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

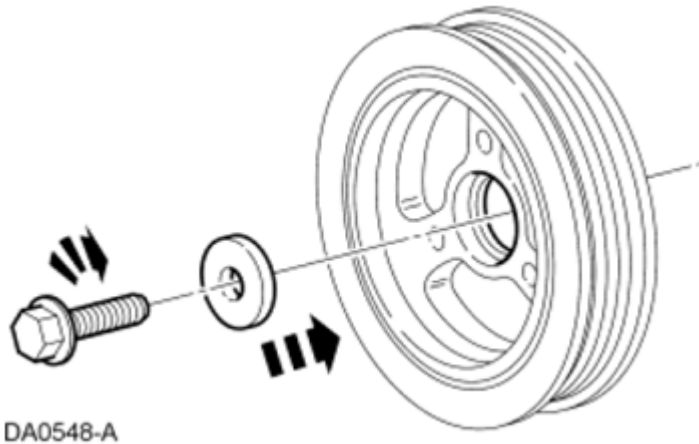


Fig. 41: Installing Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

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

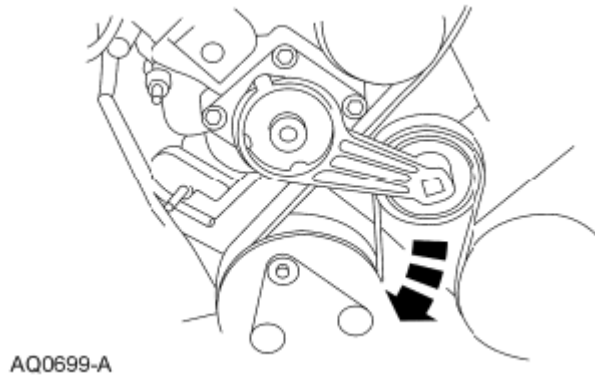


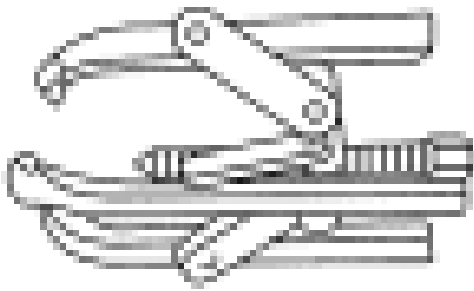
Fig. 42: Installing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

7. Press the position retaining tab and rotate the lower cooling fan shroud downward until the position retainer tab locks into position.

ENGINE FRONT COVER

Special Tool(s)

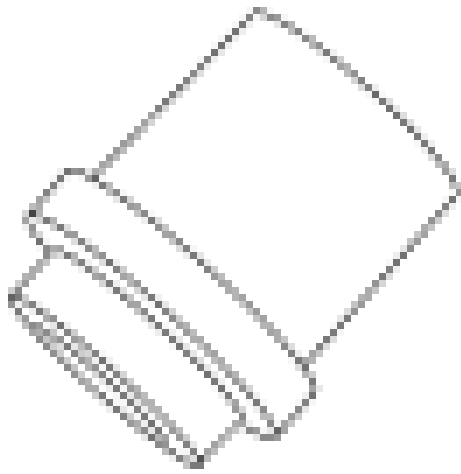
SPECIAL TOOL REFERENCE



3 Jaw Puller
303-D121

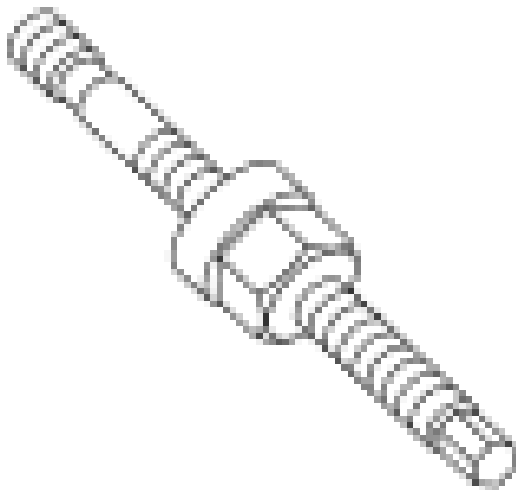
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2197-A

Installer, Crankshaft Front Oil Seal
303-635

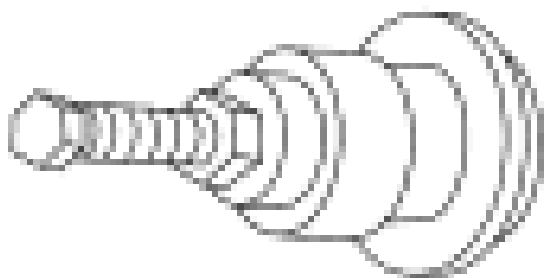


ST2428-A

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

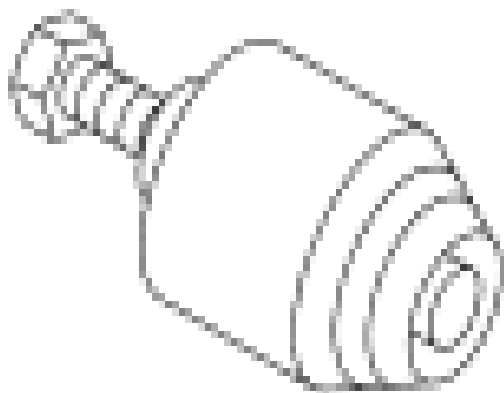
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST132B-A

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



ST128B-A

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

Material

ITEM SPECIFICATION

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil	

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Silicone Gasket Remover ZC-30	-

Accessory Drive Belt Idler Pulley, Accessory Drive Belt Tensioner, Crankshaft Pulley and Power Steering Pump

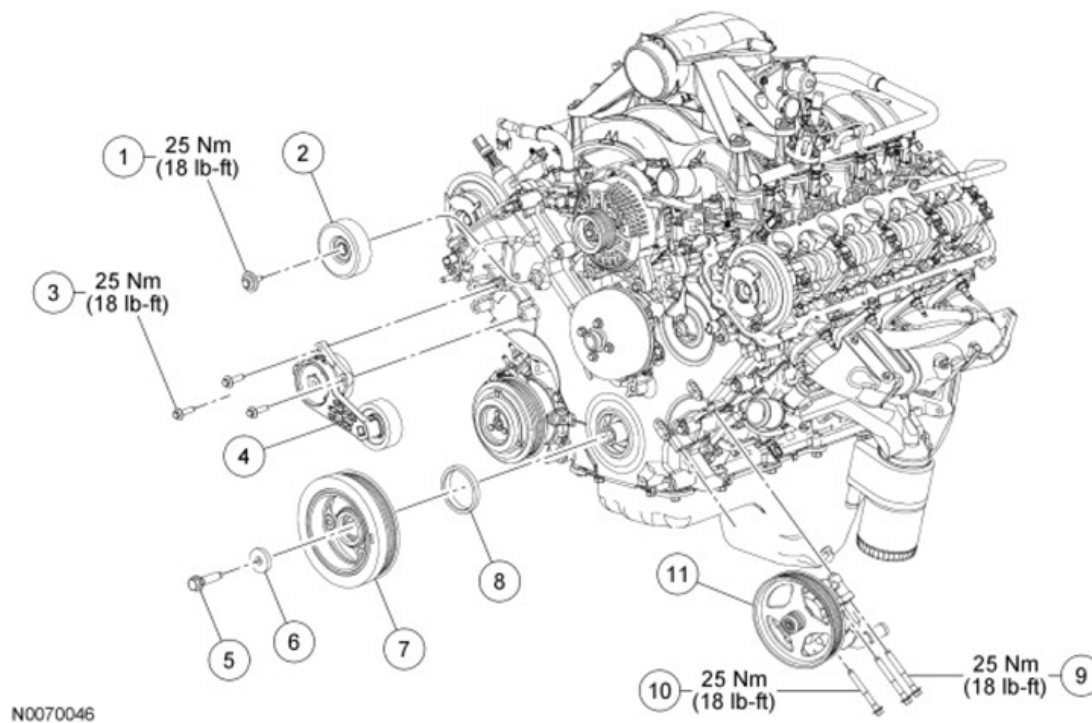


Fig. 43: Identifying Accessory Drive Belt Idler Pulley, Accessory Drive Belt Tensioner, Crankshaft Pulley With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

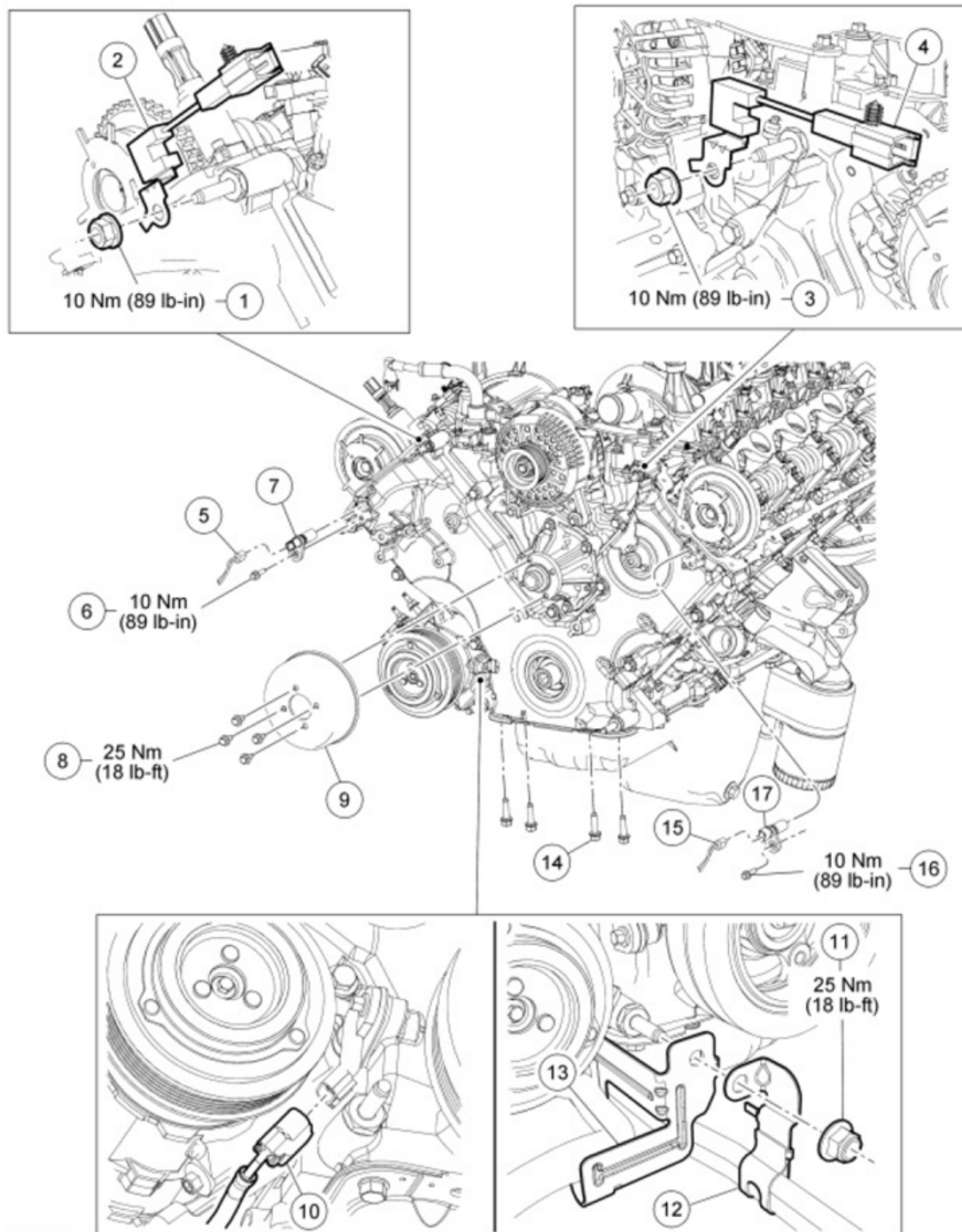
Item	Part Number	Description
1	N808102	Accessory drive belt idler pulley bolt
2	19A216	Accessory drive belt idler pulley
3	N808920	Accessory drive belt tensioner bolt (3 required)
4	6B209	Accessory drive belt tensioner
5	W701512	Crankshaft pulley bolt
6	N806165	Crankshaft pulley bolt washer
7	6316	Crankshaft pulley
8	6700	Crankshaft front seal
9	W500315	Power steering pump bolt (2 required)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

10	W701526	Power steering pump bolt
11	3A696	Power steering pump

Radio Ignition Interference Capacitors, Camshaft Position (CMP) Sensors, Coolant Pump Pulley and Front Oil Pan Bolts



N008638

Fig. 44: Identifying Radio Ignition Interference Capacitors And Camshaft Position Sensors With Torque

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Specifications

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	N804758	RH radio ignition interference capacitor nut
2	18801	RH radio ignition interference capacitor
3	N804758	LH radio ignition interference capacitor nut
4	18801	LH radio ignition interference capacitor
5	-	RH Camshaft Position (CMP) sensor electrical connector (part of 12B637)
6	N806155	RH CMP sensor bolt
7	6B288	RH CMP sensor
8	N806282	Coolant pump pulley bolt (4 required)
9	8A528	Coolant pump pulley
10	-	Crankshaft Position (CKP) sensor electrical connector (part of 12B637)
11	W605289	Transmission fluid cooler tube and battery wiring harness support bracket nut
12	-	Transmission fluid cooler tube support bracket
13	-	Starter wiring harness support bracket
14	W701605	Oil pan bolt (4 required)
15	-	LH CMP sensor electrical connector (part of 12B637)
16	N806155	LH CMP sensor bolt
17	6B288	LH CMP sensor

Crankshaft Position (CKP) Sensor, Engine Front Cover and Gaskets

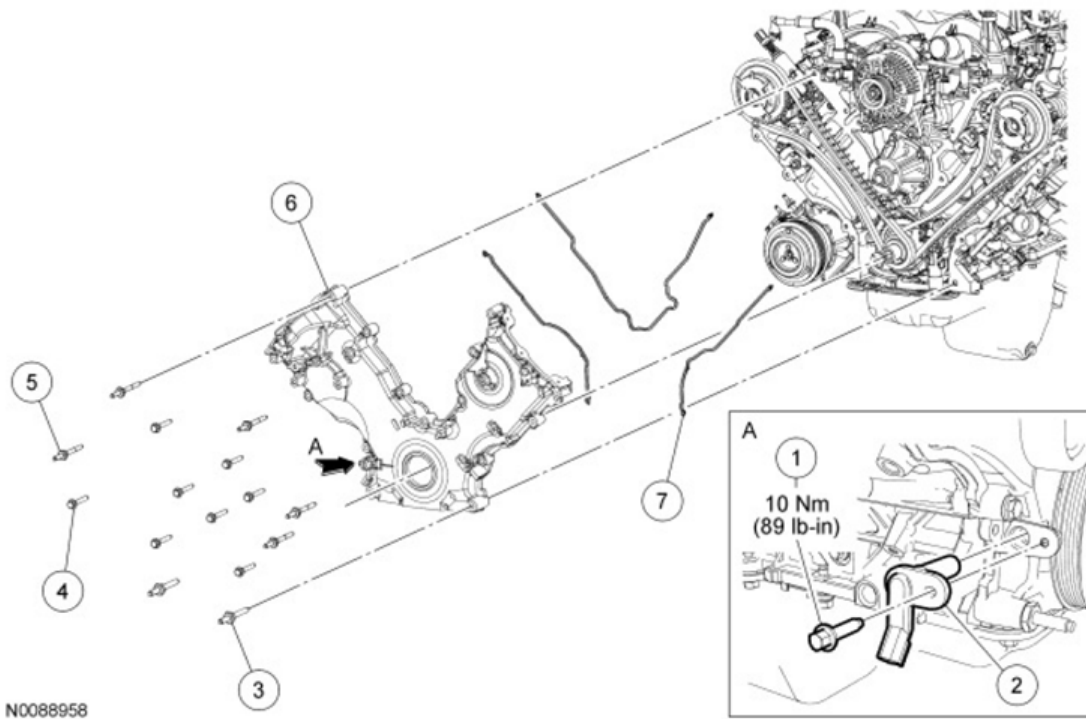


Fig. 45: Identifying Crankshaft Position Sensor, Engine Front Cover And Gaskets With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	N806155	Crankshaft Position (CKP) sensor bolt
2	6C315	CKP sensor
3	N808529	Engine front cover stud (2 required)
4	N806177	Engine front cover bolt (8 required)
5	N709573	Engine front cover stud (5 required)
6	6C086	Engine front cover
7	6D081	Engine front cover gasket (3 required)

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Drain the engine oil.
3. Remove the engine cooling fan shroud. For additional information, refer to **ENGINE COOLING**.
4. Remove the engine cooling fan. For additional information, refer to **ENGINE COOLING**.
5. Remove the RH valve cover. For additional information, refer to **VALVE COVER - RH**.
6. Remove the LH valve cover. For additional information, refer to **VALVE COVER - LH**.

7. Loosen the 4 coolant pump pulley bolts.
8. Rotate the tensioner clockwise and remove the accessory drive belt.

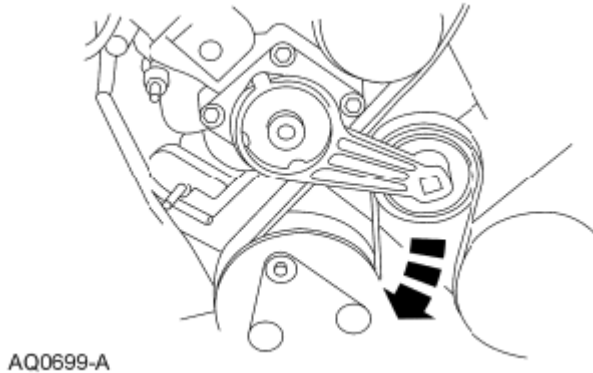


Fig. 46: Removing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

9. Remove the bolt and the accessory drive idler pulley.
10. Remove the 3 bolts and the accessory drive belt tensioner.
11. Remove the crankshaft pulley bolt and washer.
 - Discard the crankshaft pulley bolt.
12. Using the 3 Jaw Puller, remove the crankshaft pulley.

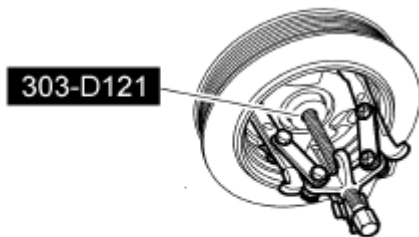


Fig. 47: Removing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

13. Using the Crankshaft Front Oil Seal Remover, remove the crankshaft seal.

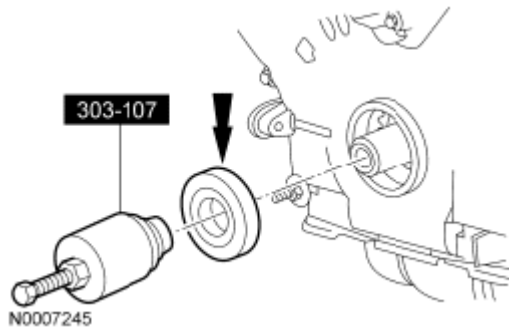


Fig. 48: Removing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

14. Remove the 3 bolts and position the power steering pump assembly aside.
15. Remove the 2 nuts and the RH and LH radio ignition interference capacitors.
16. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.
17. Disconnect the LH **CMP** sensor electrical connector.
18. Remove the 4 bolts and the coolant pump pulley.
19. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
20. Remove the nut and the starter wiring harness and transmission cooler tube support brackets from the stud bolt.
21. Remove the 4 front oil pan bolts.
22. Remove the 8 bolts and the 7 studs.

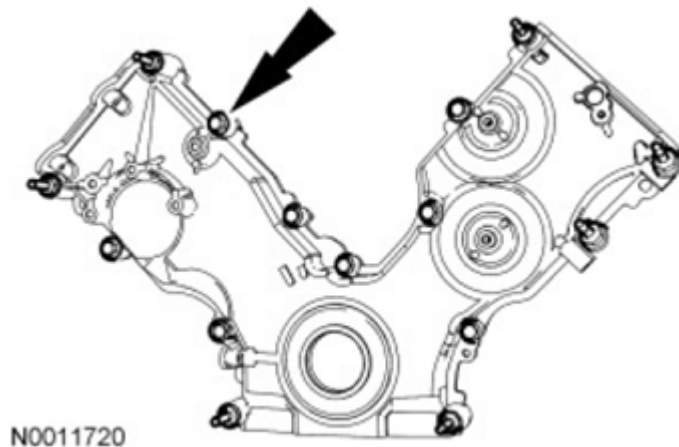
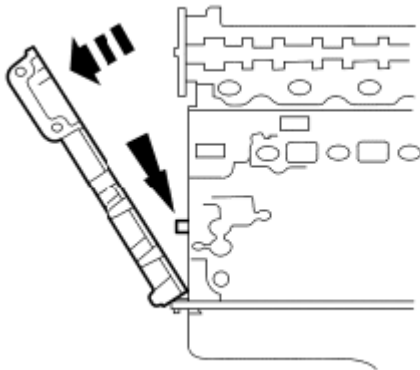


Fig. 49: Removing Front Cover Bolts
Courtesy of FORD MOTOR CO.

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

oil leakage.

23. Remove the engine front cover from the front cover to cylinder block dowel.
- Remove the engine front cover gaskets.
 - Clean the mating surfaces with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
 - Inspect the mating surfaces.

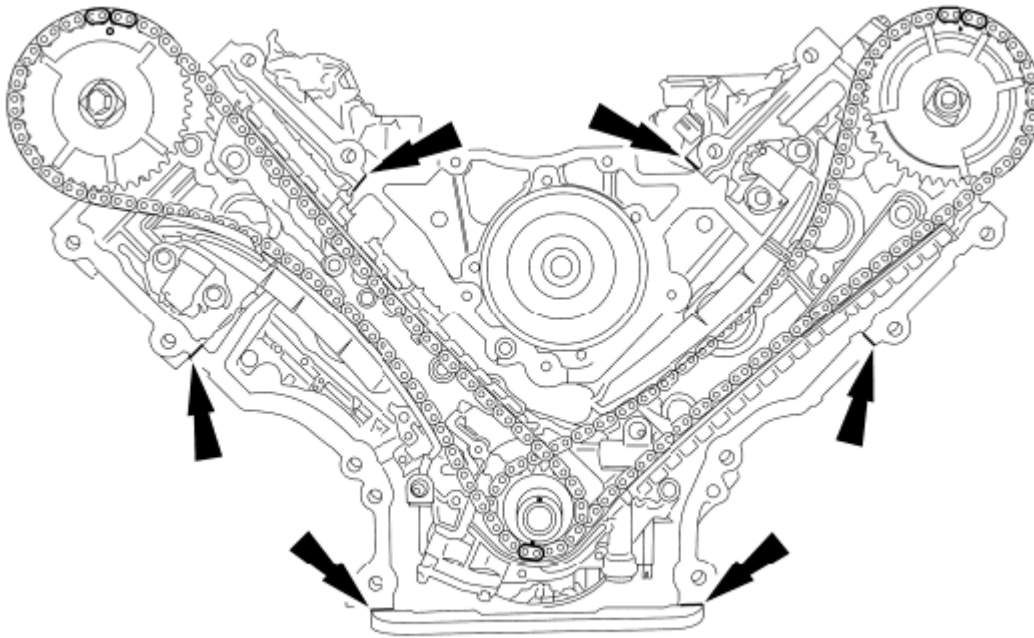


A26122-A

Fig. 50: Removing Engine Front Cover To Cylinder Block Dowel
Courtesy of FORD MOTOR CO.

Installation

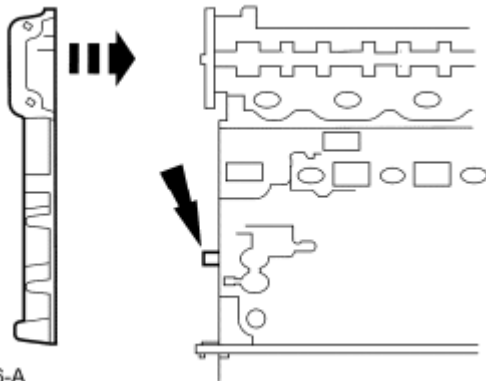
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.
- NOTE:** If the engine front cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.
- NOTE:** Make sure that the engine front cover gasket is in place on the engine front cover before installation.



A0080776

Fig. 51: Locating Silicone Sealant Application Areas
Courtesy of FORD MOTOR CO.

1. Apply a bead of silicone gasket and sealant along the cylinder head-to-cylinder block surface and the oil pan-to-cylinder block surface, at the locations shown in illustration.
2. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.



DA0706-A

Fig. 52: Installing Engine Front Cover Gasket On Engine Front Cover
Courtesy of FORD MOTOR CO.

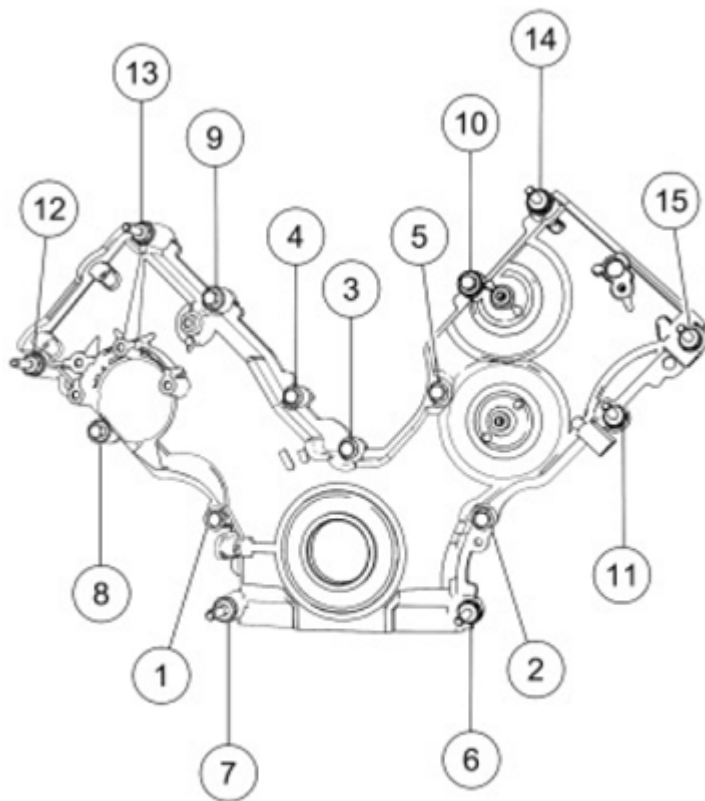
3. Tighten the 15 engine front cover fasteners in sequence in 2 stages. Stage 1: Tighten fasteners 1 through 15 to 25 Nm (18 lb-ft). Stage 2: Tighten fasteners 6 and 7 to 48 Nm (35 lb-ft).

ITEM DESCRIPTION

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Item	Part Number	Description
1	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
2	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
3	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
4	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
5	N806177	Bolts, Hex Flange Head Pilot, M8 x 1.25 x 50
6	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
7	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
8	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
9	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
10	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
11	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
12	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
13	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
14	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
15	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94



N0088959

Fig. 53: Identifying Engine Front Cover Fasteners Tighten Sequence
Courtesy of FORD MOTOR CO.

4. Loosely install the bolts, then tighten the bolts in 2 stages, in the sequence shown in illustration.
 - Stage 1: Tighten to 20 Nm (177 lb-in).
 - Stage 2: Tighten an additional 60 degrees.

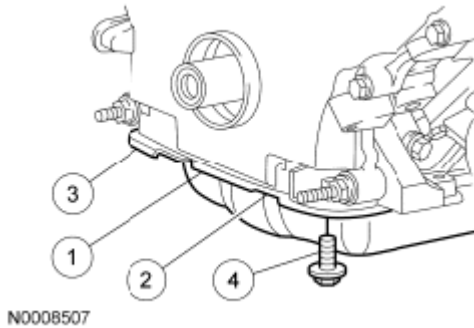


Fig. 54: Identifying Tightening Sequence Of Front Oil Pan And Cover Bolts
 Courtesy of FORD MOTOR CO.

5. Connect the **CKP** sensor electrical connector.
6. Position the starter wiring harness and transmission fluid cooler tubes support brackets and install the nut.
 - Tighten to 25 Nm (18 lb-ft).
7. Position the power steering pump assembly and install the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).
8. Connect the RH **CMP** sensor electrical connector.
9. Connect the LH **CMP** sensor electrical connector.
10. Install the RH and LH radio ignition interference capacitors and the 2 nuts.
 - Tighten to 10 Nm (89 lb-in).
11. Install the accessory drive belt tensioner and the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).
12. Install the coolant pump pulley and the 4 bolts finger-tight.
13. Install the accessory drive idler pulley and the bolt.
 - Tighten to 25 Nm (18 lb-ft).
14. Lubricate the engine front cover and the crankshaft front seal inner lip with clean engine oil.

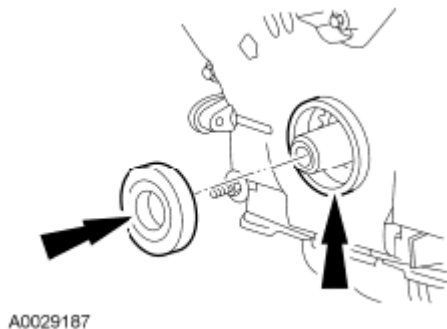


Fig. 55: Lubricating Engine Front Cover And Crankshaft Seal Inner Lip With Clean Engine Oil
Courtesy of FORD MOTOR CO.

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

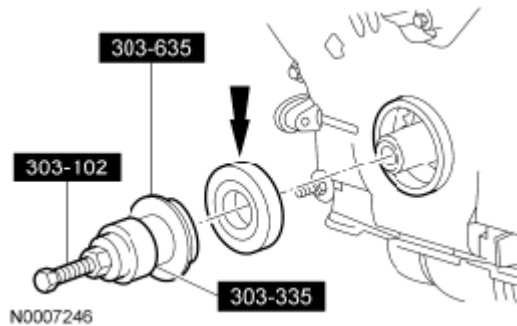


Fig. 56: Installing Crankshaft Front Seal Into Engine Front Cover Using Special Tools
Courtesy of FORD MOTOR CO.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with metal surface prep and silicone gasket remover. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure can cause future oil leakage.

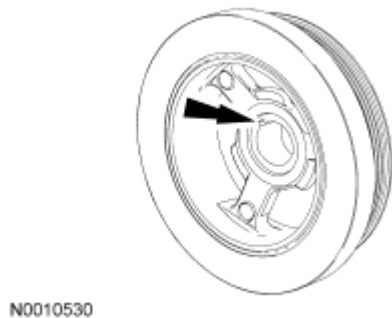


Fig. 57: Applying Silicone Gasket And Sealant To Woodruff Key Slot In Crankshaft Pulley
Courtesy of FORD MOTOR CO.

16. Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.
17. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.

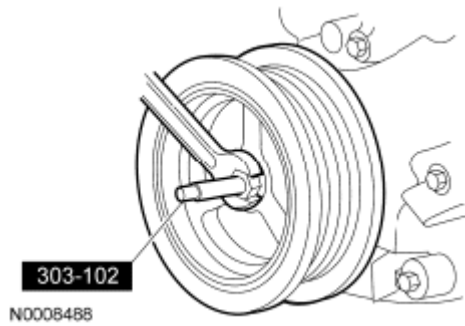


Fig. 58: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

18. Using a new crankshaft pulley bolt, install the bolt and washer and tighten the bolt in 4 stages.
- Stage 1: Tighten to 90 Nm (66 lb-ft).
 - Stage 2: Loosen 360 degrees.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

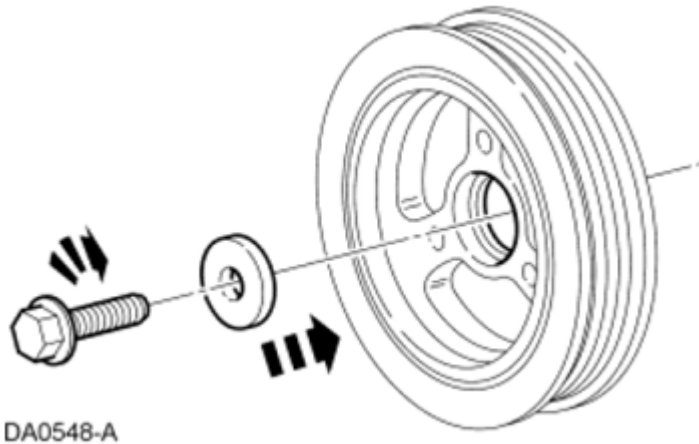


Fig. 59: Installing Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

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

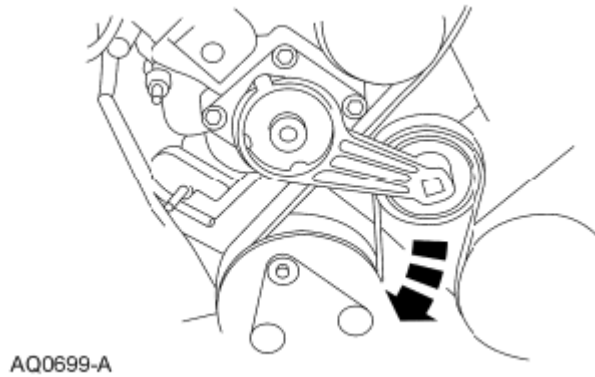


Fig. 60: Installing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

20. Tighten the 4 coolant pump pulley bolts.
 - Tighten to 25 Nm (18 lb-ft).
21. Install the RH valve cover. For additional information, refer to **VALVE COVER - RH.**
22. Install the LH valve cover. For additional information, refer to **VALVE COVER - LH.**
23. Install the engine cooling fan. For additional information, refer to **ENGINE COOLING .**
24. Install the engine cooling fan shroud. For additional information, refer to **ENGINE COOLING .**
25. Fill the crankcase with clean engine oil.

TIMING DRIVE COMPONENTS

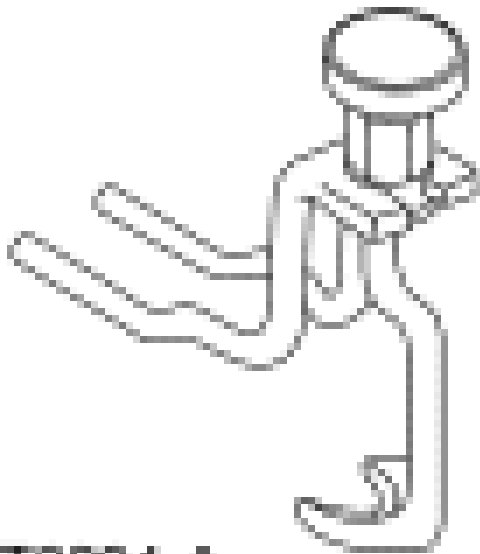
Special Tool(s)

SPECIAL TOOL REFERENCE

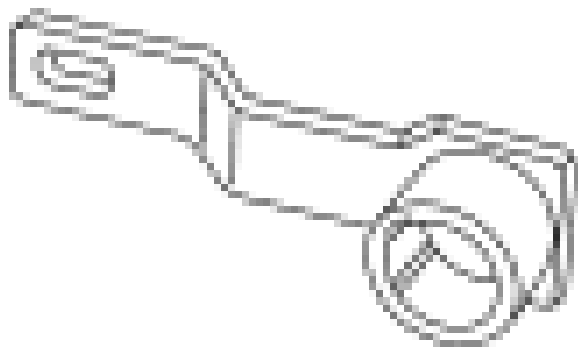
Compressor, Valve Spring
303-1039

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2604-A

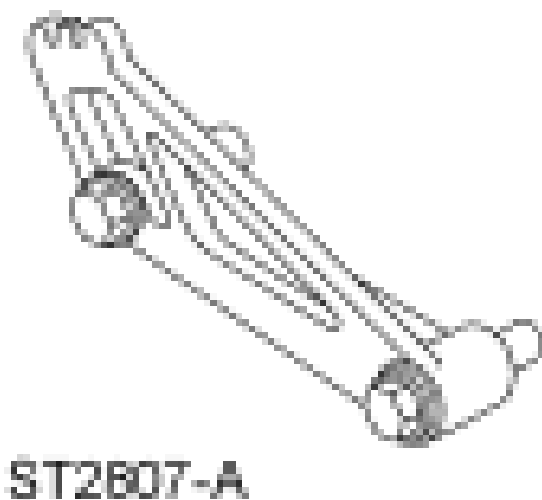


ST1335-A

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



Locking Tool, Cam Phaser
303-1046

General Equipment

GENERAL EQUIPMENT CHART

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

Material

ITEM SPECIFICATION

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

Removal

1. Remove the engine front cover. For additional information, refer to **ENGINE FRONT COVER**.
2. Remove the crankshaft sensor ring from the crankshaft.

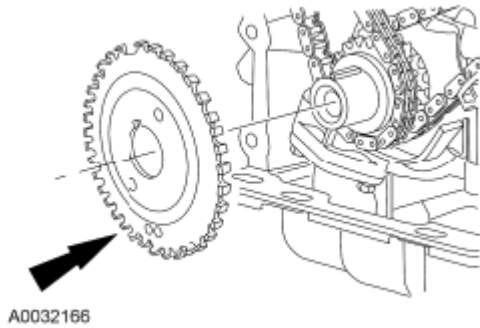


Fig. 61: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

3. Position the crankshaft keyway at the 12 o'clock position.

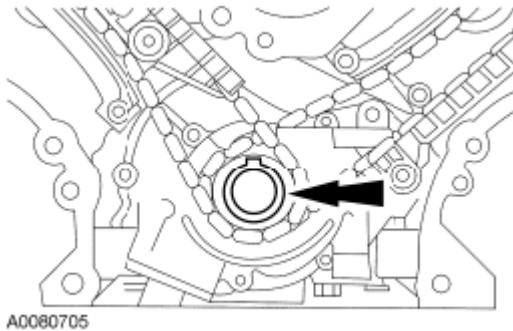


Fig. 62: Positioning Crankshaft Keyway At 12 O'Clock Position
Courtesy of FORD MOTOR CO.

NOTE: If the camshaft lobes are not exactly positioned as shown in illustration, the crankshaft will require one full additional rotation to 12 o'clock.

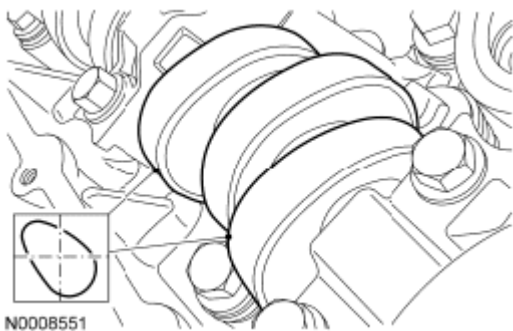
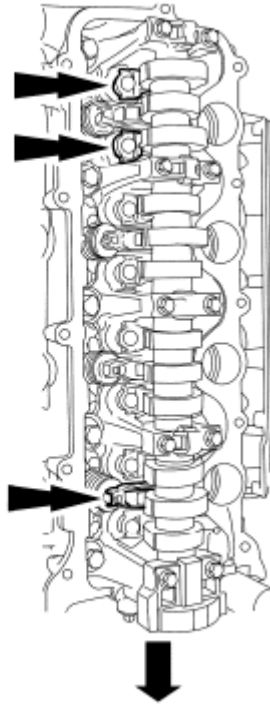


Fig. 63: Positioning Intake Camshaft Lobes And Exhaust Lobe On No. 1 Cylinder
Courtesy of FORD MOTOR CO.

4. The No. 1 cylinder camshaft exhaust lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 1 cylinder.

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



A0083248

Fig. 64: Locating RH Cylinder Head Camshaft Roller Followers And Bolts
Courtesy of FORD MOTOR CO.

5. Remove only the 3 camshaft roller followers shown in the illustration from the RH cylinder head.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

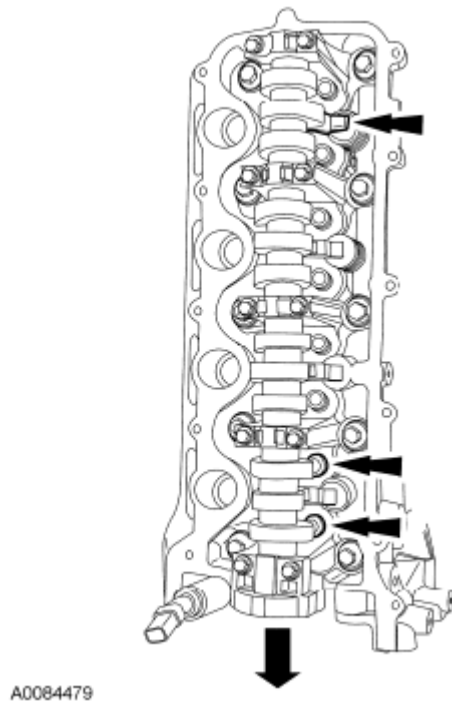
NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 65: Identifying Camshaft Roller Followers**Courtesy of FORD MOTOR CO.**

6. Using the Valve Spring Compressor, remove the 3 designated camshaft roller followers in the previous step from the RH cylinder head.

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

**Fig. 66: Locating LH Cylinder Head Camshaft Roller Followers****Courtesy of FORD MOTOR CO.**

7. Remove only the 3 camshaft roller followers shown in the illustration from the LH cylinder head.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 67: Removing Designated Camshaft Roller Followers In Previous Step From LH Cylinder Head

Courtesy of FORD MOTOR CO.

8. Using the Valve Spring Compressor, remove the 3 designated camshaft roller followers in the previous step from the LH cylinder head.

NOTE: The crankshaft cannot be moved past the 6 o'clock position once set or engine damage may occur.

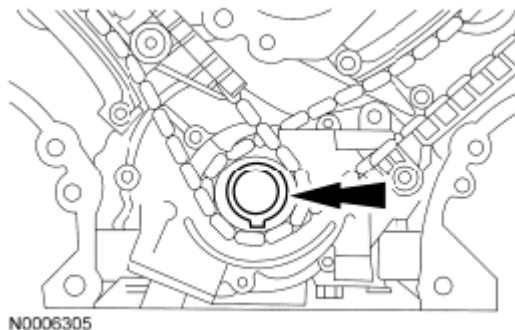


Fig. 68: Locating Crankshaft Keyway

Courtesy of FORD MOTOR CO.

9. Rotate the crankshaft clockwise and position the crankshaft keyway at the 6 o'clock position.

NOTE: If one or both tensioner mounting bolts are loosened or removed, the

tensioner-sealing bead must be inspected for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

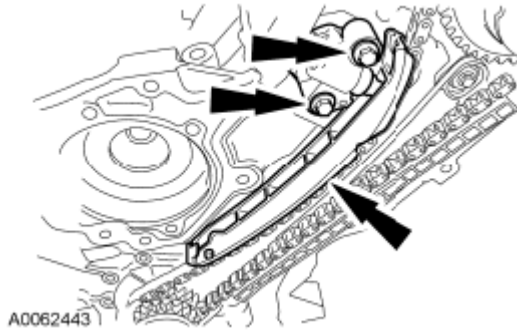


Fig. 69: Identifying LH Timing Chain Tensioner And Bolts
Courtesy of FORD MOTOR CO.

10. Remove the 2 bolts, the LH timing chain tensioner and tensioner arm.

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

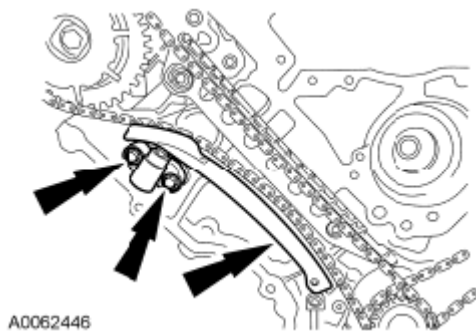


Fig. 70: Identifying RH Timing Chain Tensioner And Bolts
Courtesy of FORD MOTOR CO.

11. Remove the 2 bolts, the RH timing chain tensioner and tensioner arm.
12. Remove the RH and LH timing chains and the crankshaft sprocket.
 - Remove the RH timing chain from the camshaft sprocket.
 - Remove the RH timing chain from the crankshaft sprocket.
 - Remove the LH timing chain from the camshaft sprocket.
 - Remove the LH timing chain and crankshaft sprocket.

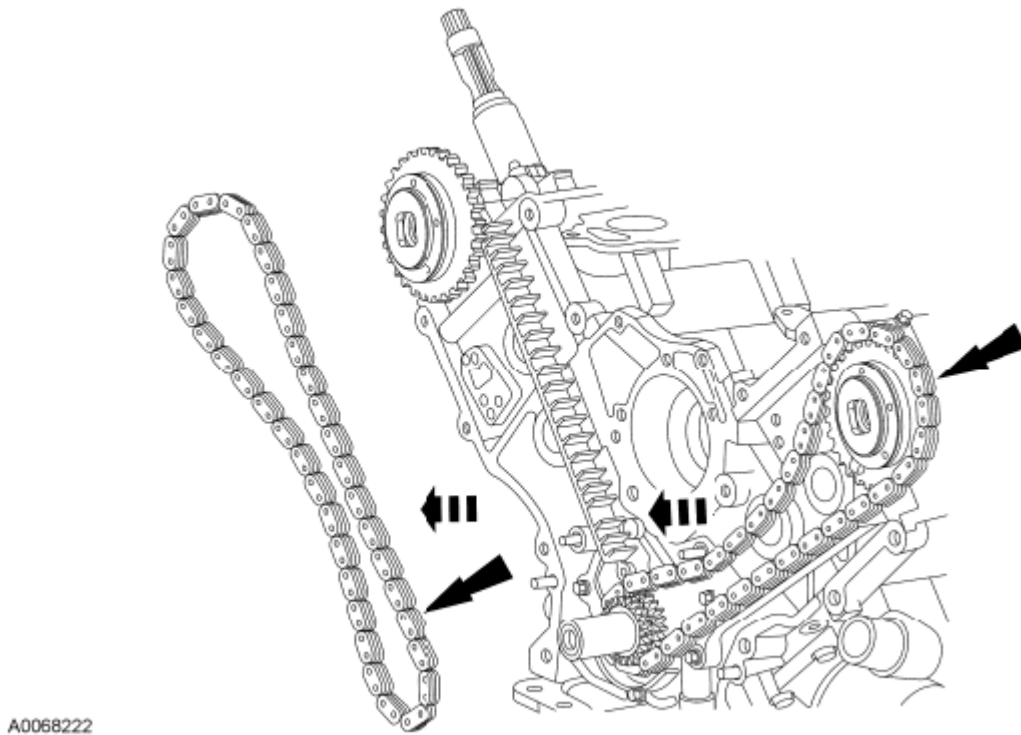


Fig. 71: Locating Timing Chains And Crankshaft Sprocket (RH And LH)
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

13. Remove the LH and RH timing chain guides.
 - Remove the 4 bolts.
 - Remove both timing chain guides.

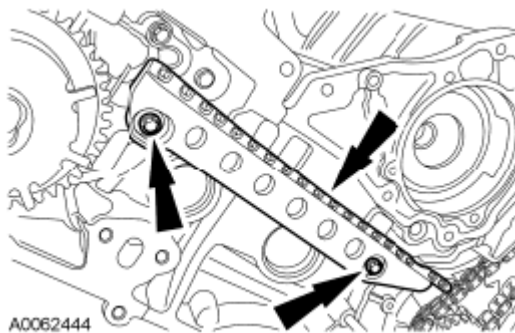


Fig. 72: Locating Timing Chain Guide And Mounting Bolts
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

14. Using the Cam Phaser Locking Tool, remove the bolt and the RH camshaft phaser and sprocket assembly.
- Discard the camshaft phaser and sprocket bolt.

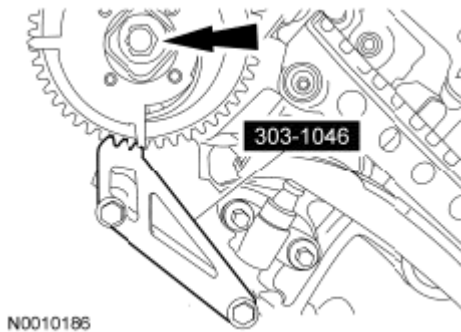


Fig. 73: Locating VCT Phaser Sprocket Bolt And Holder Tool
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

15. Using the Cam Phaser Locking Tool, remove the bolt and the LH camshaft phaser and sprocket assembly.
- Discard the camshaft phaser and sprocket bolt.

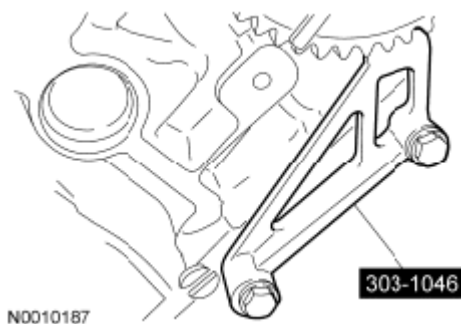
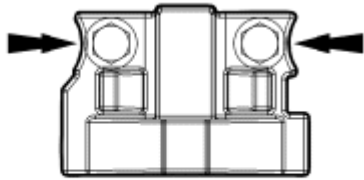


Fig. 74: Removing LH Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.

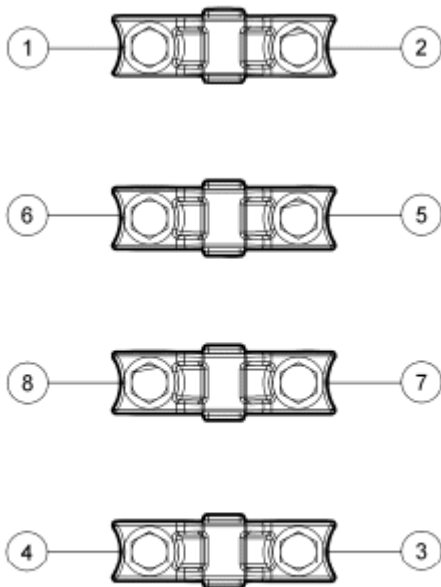


N0070049

Fig. 75: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

16. Remove the 2 bolts and the RH cylinder head camshaft front bearing cap.

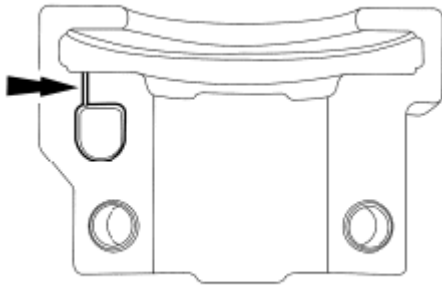
NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these instructions may result in engine damage.



N0091483

Fig. 76: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

17. Remove the remaining 8 bolts in the sequence shown in illustration and remove the RH cylinder head camshaft bearing caps.
18. Clean and inspect the RH camshaft bearing caps.
 - The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.

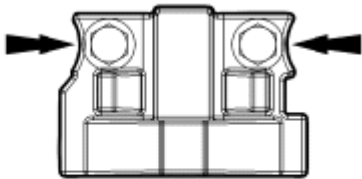


N0010448

Fig. 77: Identifying Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

19. Remove the RH camshaft.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.

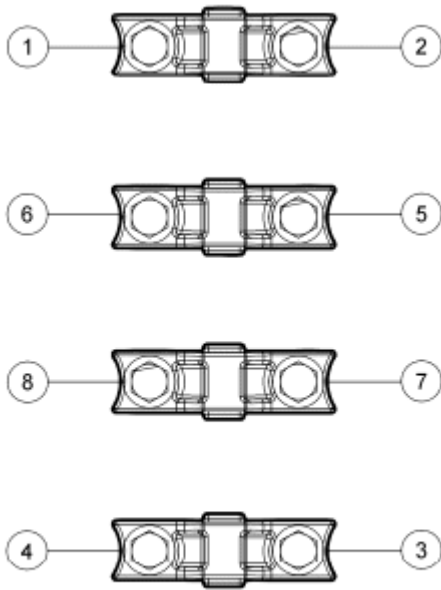


N0070049

Fig. 78: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

20. Remove the 2 bolts and the LH cylinder camshaft front bearing cap.

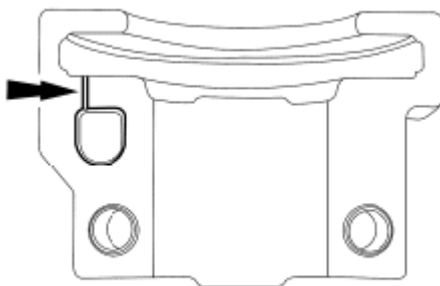
NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these instructions may result in engine damage.



N0091483

Fig. 79: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

21. Remove the remaining 8 bolts in the sequence shown in illustration and remove the LH cylinder head camshaft bearing caps.
22. Clean and inspect the LH camshaft bearing caps.
 - The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.



N0010448

Fig. 80: Locating Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

23. Remove the LH 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. Failure to follow these instructions may result in engine

damage.

24. Remove all of the remaining camshaft roller followers from the cylinder heads.

Installation

1. Install the LH and RH camshafts.
 - Lubricate the camshaft and camshaft journals with clean engine oil prior to installation.

NOTE: LH shown in illustration, RH similar.

2. Install the 5 LH and 5 RH camshaft bearing caps in their original locations.
 - Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the 20 bolts loosely.
 - Tighten to 10 Nm (89 lb-in) in the sequence shown in illustration.

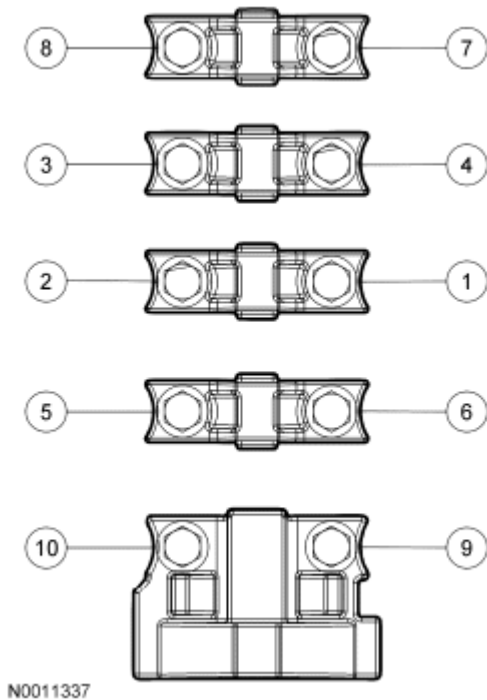


Fig. 81: Identifying Camshaft Bearing Cap Bolt Loosening Sequence
 Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: LH shown in illustration, RH similar.

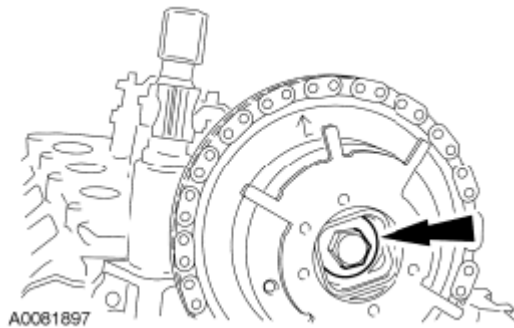


Fig. 82: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

3. Position the camshaft phaser and sprockets and install 2 new camshaft phaser and sprocket bolts finger-tight.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: LH shown in illustration, RH similar.

4. Using the Cam Phaser Locking Tool, tighten the LH and RH camshaft phaser and sprocket bolts in 2 stages.
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

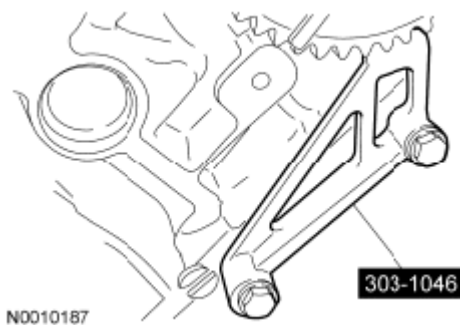


Fig. 83: Tightening LH Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

5. Position the crankshaft with the Crankshaft Holding Tool, then remove the tool.

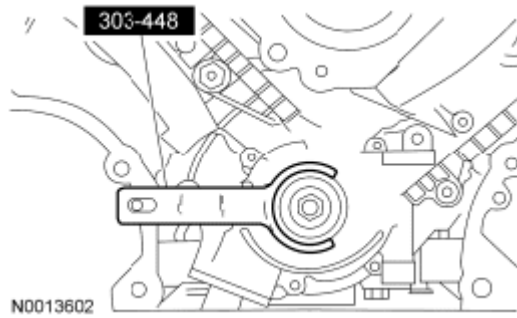


Fig. 84: Positioning Crankshaft
Courtesy of FORD MOTOR CO.

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

NOTE: Prior to installation, inspect the tensioner-sealing bead for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

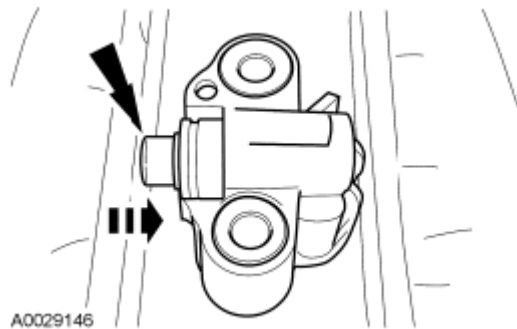


Fig. 85: Compressing Tensioner Plunger Using Vise
Courtesy of FORD MOTOR CO.

6. Compress the tensioner plunger, using a vise.
7. Install a retaining clip on the tensioner to hold the plunger in during installation.

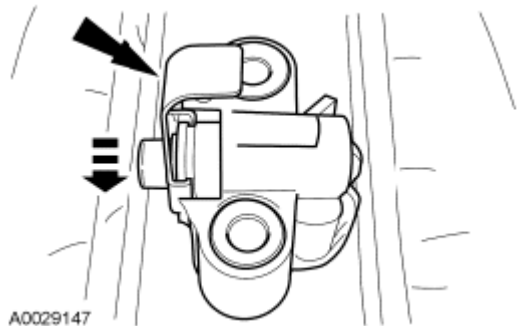


Fig. 86: Installing Retaining Clip On Tensioner
Courtesy of FORD MOTOR CO.

8. Remove the tensioner from the vise.
9. If the copper links are not visible, mark 2 links on one end and 1 link on the other end, and use as timing marks.

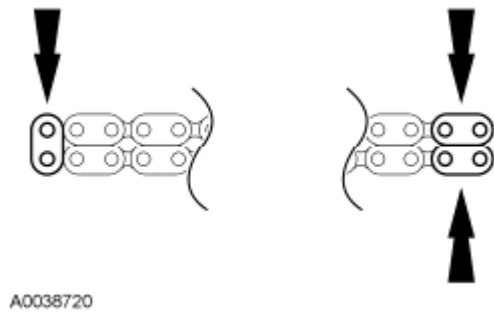


Fig. 87: Locating Copper Link Timing Marks
Courtesy of FORD MOTOR CO.

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

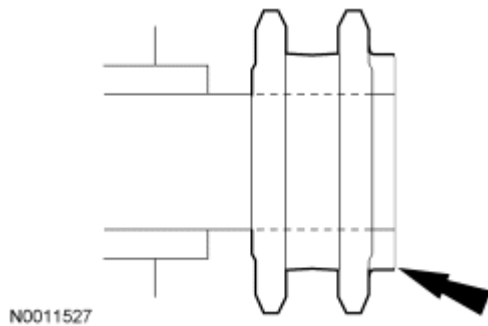
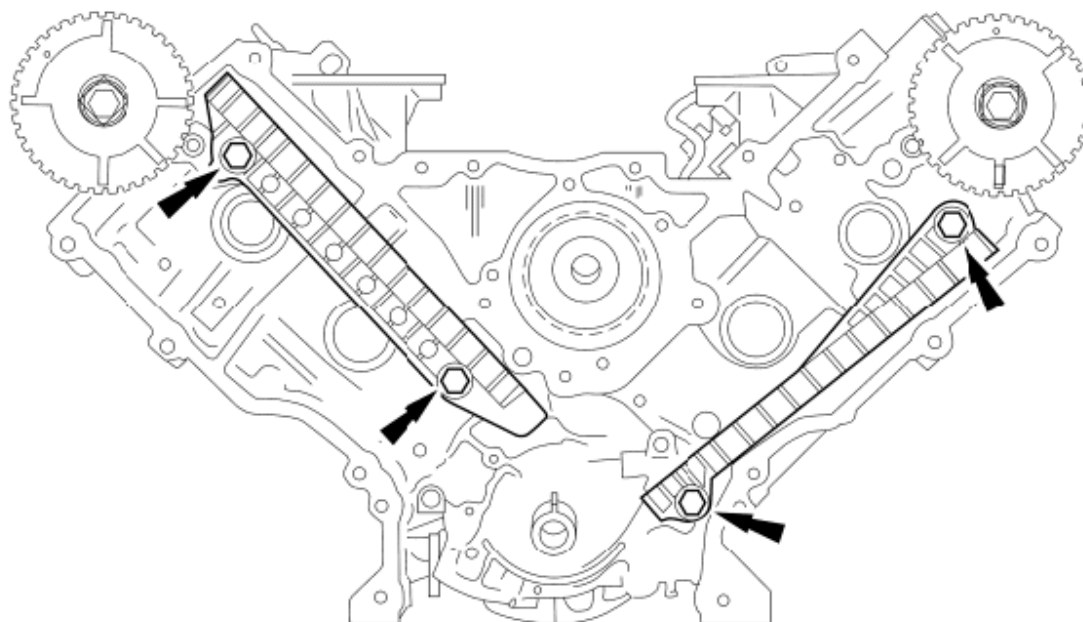


Fig. 88: Installing Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

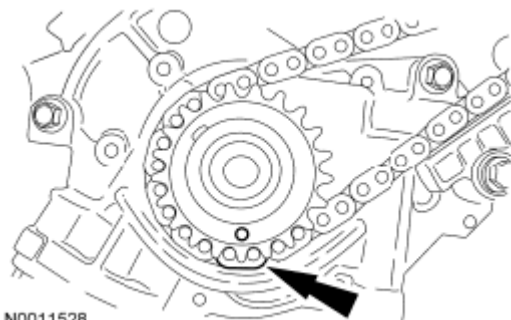
11. Position the LH and RH timing chain guides and install the 4 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0006303

Fig. 89: Locating Timing Chain Guides
Courtesy of FORD MOTOR CO.

12. Position the lower end of the LH (inner) timing chain on the crankshaft sprocket, aligning the timing mark on the outer flange of the crankshaft sprocket with the single copper (marked) link on the chain.



N0011528

Fig. 90: Locating Crankshaft Sprocket Timing Mark And Timing Chain Link
Courtesy of FORD MOTOR CO.

NOTE: Make sure the upper half of the timing chain is below the tensioner arm dowel.

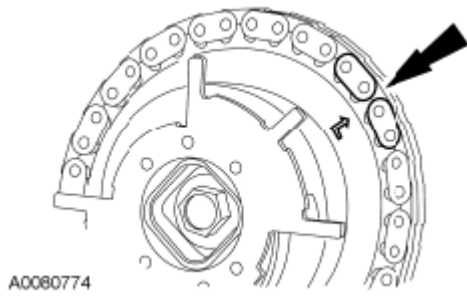


Fig. 91: Locating Timing Mark On Timing Chain
Courtesy of FORD MOTOR CO.

13. Position the timing chain on the camshaft phaser and sprocket with the timing mark positioned between the 2 copper (marked) chain links.

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

14. Position the LH timing chain tensioner arm on the dowel pin and install the LH timing chain tensioner and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

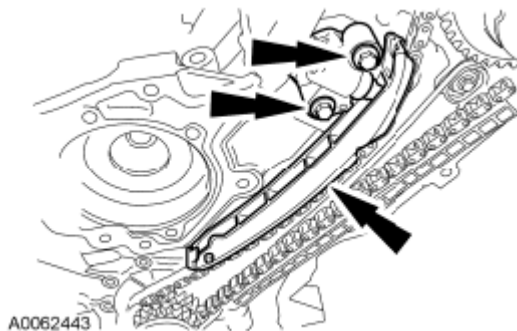


Fig. 92: Locating LH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

15. Remove the retaining clip from the LH timing chain tensioner.

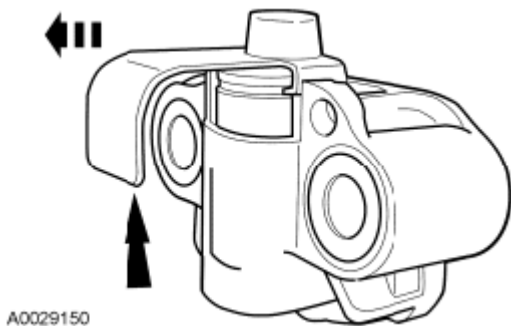


Fig. 93: Removing Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

16. Position the lower end of the RH (outer) timing chain on the crankshaft sprocket, aligning the timing mark on the sprocket with the single copper (marked) chain link.

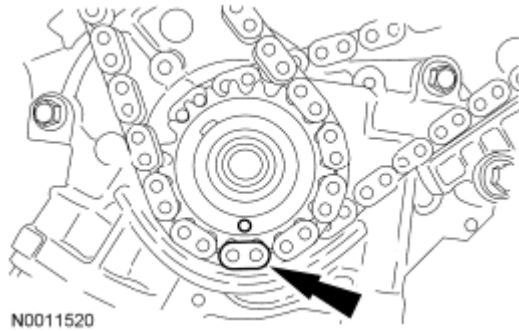


Fig. 94: Locating Sprocket Timing Mark And Chain Link
Courtesy of FORD MOTOR CO.

NOTE: The lower half of the timing chain must be positioned above the tensioner arm dowel.

NOTE: The camshaft phaser and sprocket will be stamped with one of the illustrated timing marks for the RH camshaft.

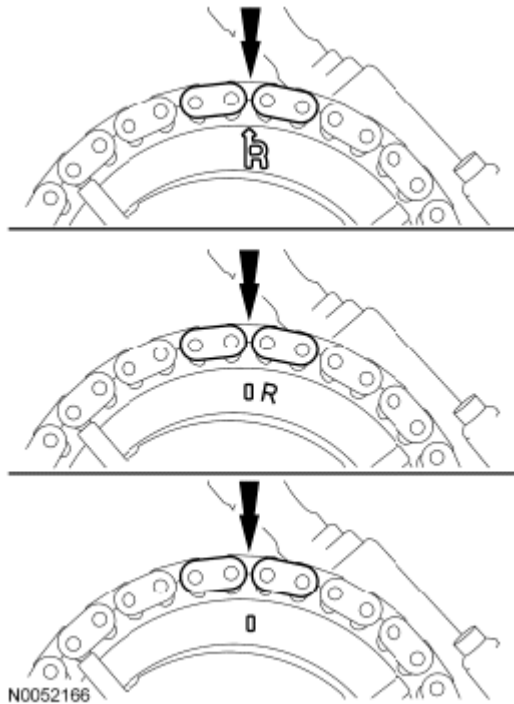


Fig. 95: Locating Upper Stabilizer Link Nut

Courtesy of FORD MOTOR CO.

17. Position the RH timing chain on the camshaft phaser and sprocket. Make sure the timing mark is positioned between the 2 copper (marked) chain links.
18. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

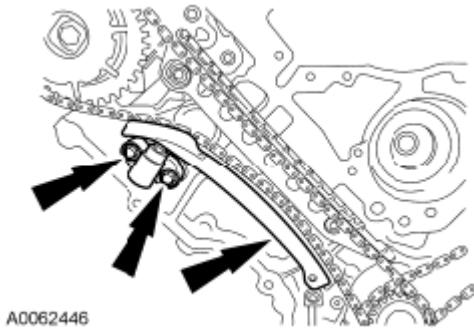


Fig. 96: Identifying RH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

19. Remove the retaining clip from the RH timing chain tensioner.

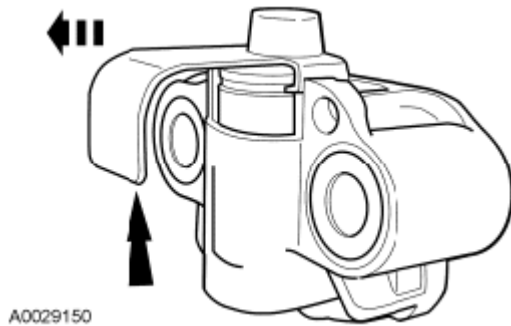
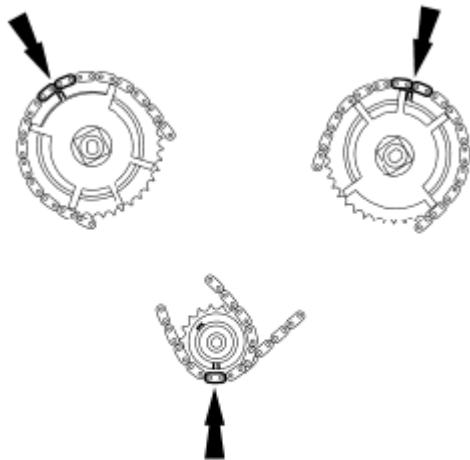


Fig. 97: Locating Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

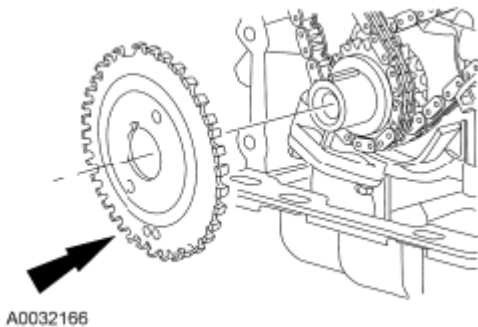
20. As a post-check, verify correct alignment of all timing marks.



N0092582

Fig. 98: Locating Timing Chain Mark Location
Courtesy of FORD MOTOR CO.

21. Install the crankshaft sensor ring on the crankshaft.



A0032166

Fig. 99: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

- NOTE:** If the components are to be reinstalled, they must be installed into their original locations. Failure to follow these instructions may result in engine damage.
- NOTE:** Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.
- NOTE:** It may be necessary to push the valve down while compressing the spring.

22. Using the Valve Spring Compressor, install all of the camshaft roller followers.

- Lubricate the camshaft roller followers with clean engine oil prior to installation.

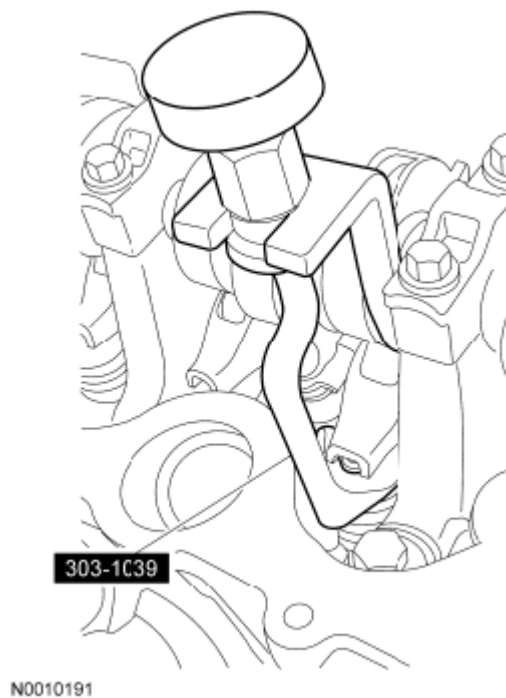


Fig. 100: Installing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

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

VALVE TRAIN COMPONENTS - EXPLODED VIEW

NOTE: LH shown in illustration, RH similar.

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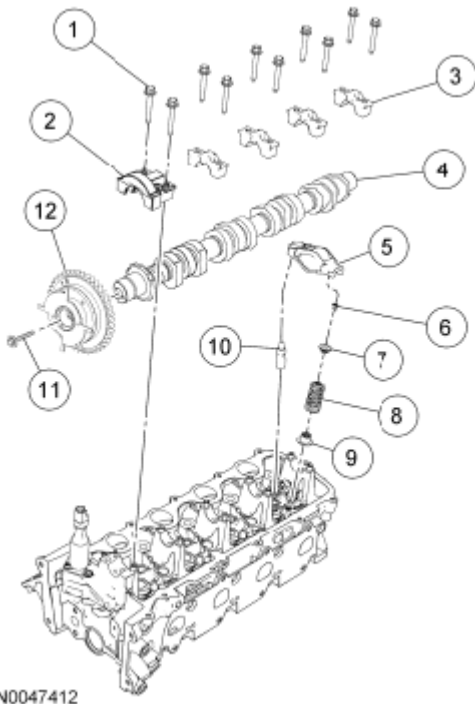


Fig. 101: Exploded View Of Valve Train Components
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	N807834	Camshaft bearing cap bolt (10 required)
2	6B284	Camshaft front bearing cap
3	6B280	Camshaft bearing cap (4 required)
4	6C255	Camshaft
5	6529	Camshaft roller follower (12 required)
6	6518	Valve spring retainer key (24 required)
7	6514	Valve spring retainer (12 required)
8	6513	Valve spring (12 required)
9	6A517	Valve seal (12 required)
10	6C501	Hydraulic lash adjuster (12 required)
11	6279	Camshaft phaser and sprocket bolt
12	6C524	Camshaft phaser and sprocket

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

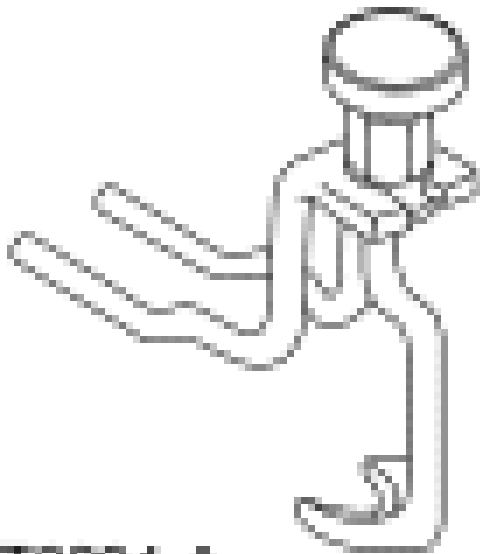
CAMSHAFT - LH

Special Tool(s)

SPECIAL TOOL REFERENCE

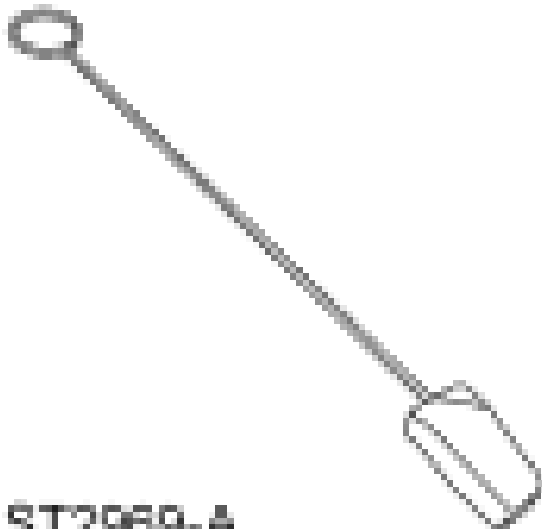
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ST2604-A

Compressor, Valve Spring
303-1039



ST2969-A

Locking Tool, Timing Chain
303-1175

Material

ITEM SPECIFICATION

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

WSS-M2C930-
A

Removal

NOTE: The camshaft procedure must be followed exactly or damage to the valves and pistons will result.

1. Position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

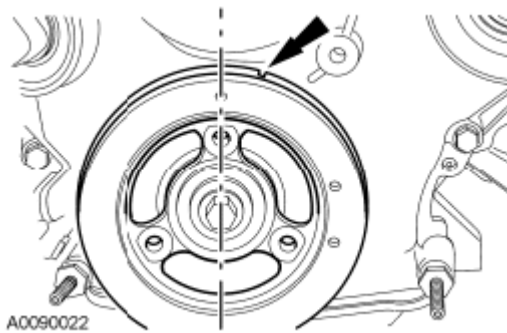


Fig. 102: Locating Crankshaft Damper Spoke At 12 O'clock Position
Courtesy of FORD MOTOR CO.

2. Remove the LH valve cover. For additional information, refer to VALVE COVER - LH.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

3. Loosen and back off the LH camshaft phaser and sprocket bolt one full turn.
4. Disconnect the LH Camshaft Position (CMP) sensor electrical connector.

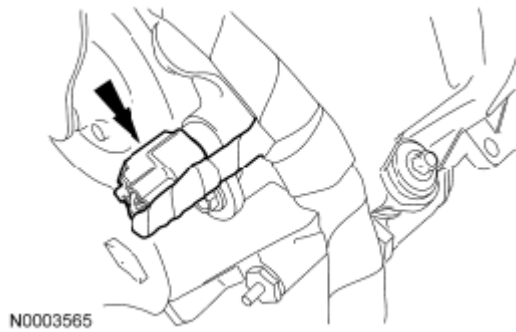


Fig. 103: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the LH CMP sensor.

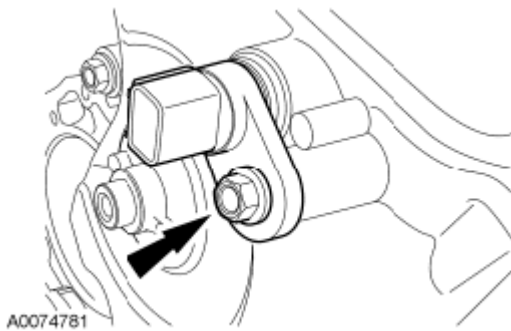


Fig. 104: Locating Bolt And LH CMP Sensor
Courtesy of FORD MOTOR CO.

NOTE: If the camshaft lobes are not exactly positioned as shown in illustration, the crankshaft keyway will require one full additional rotation to 12 o'clock.

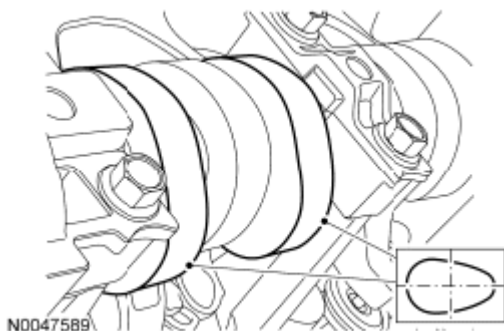


Fig. 105: Identifying Camshaft Lobe
Courtesy of FORD MOTOR CO.

6. The No. 5 cylinder camshaft lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 5 cylinder.

7. Remove only the 3 camshaft roller followers shown in the illustration.

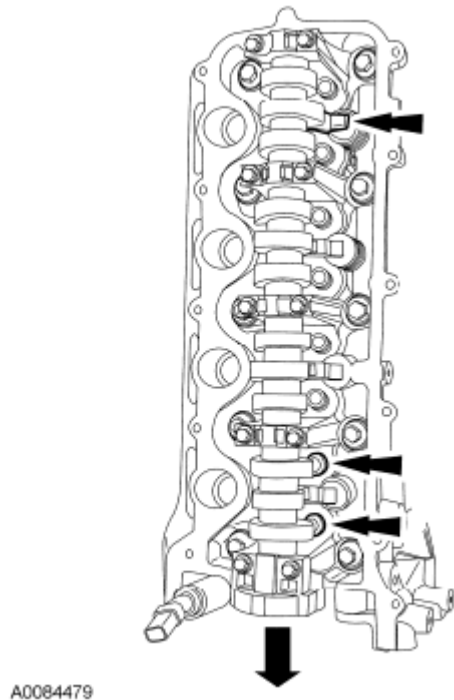


Fig. 106: Locating LH Cylinder Head Camshaft Roller Followers And Bolts
Courtesy of FORD MOTOR CO.

- NOTE:** The camshaft roller followers must be installed in their original locations. Record camshaft roller follower locations. Failure to follow these instructions may result in engine damage.
- NOTE:** Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.
- NOTE:** It may be necessary to push the valve down while compressing the spring.



Fig. 107: Removing Valve Spring Compressor (303-1039) On Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

8. Using the Valve Spring Compressor, remove only the 3 designated camshaft roller followers from the previous step.

NOTE: The crankshaft cannot be moved past the 6 o'clock position once set or engine damage may occur.

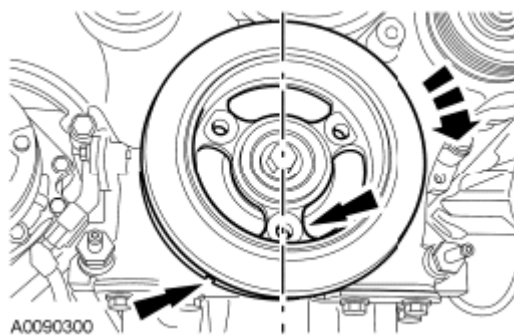


Fig. 108: Rotating Crankshaft Clockwise
Courtesy of FORD MOTOR CO.

9. Rotate the crankshaft clockwise, as viewed from the front, positioning the crankshaft damper spoke at the 6 o'clock position and the timing mark indentation at the 7 o'clock position.

NOTE: Engine is not freewheeling. Camshaft procedure must be followed exactly

or damage to valves and pistons will result.

NOTE: The Timing Chain Locking Tool must be installed square to the timing chain and the engine block.

NOTE: Engine front cover removed for clarity.

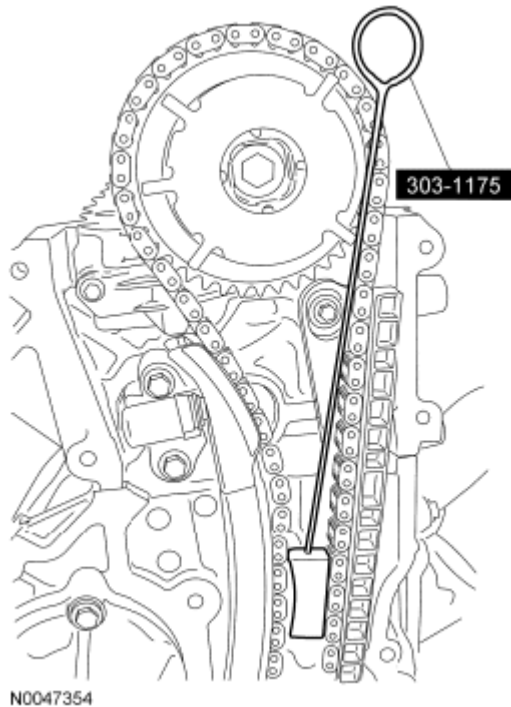


Fig. 109: Installing Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

10. Install the Timing Chain Locking Tool in the LH timing chain as shown in illustration.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to valves and pistons will result.

NOTE: RH shown in illustration, LH similar.

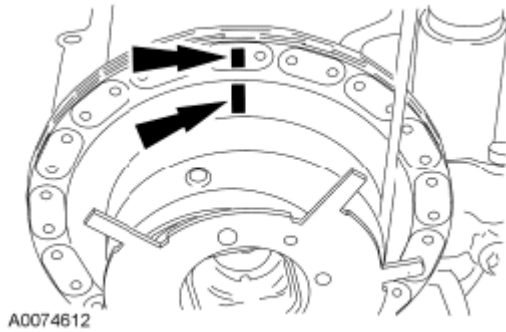
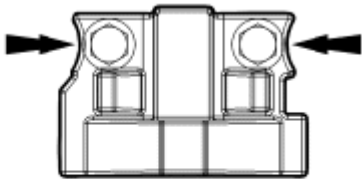


Fig. 110: Identifying Scribe Marks Of Camshaft Phaser And Sprocket (RH)
Courtesy of FORD MOTOR CO.

11. Scribe a location mark on the timing chain and the camshaft phaser and sprocket assembly.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.

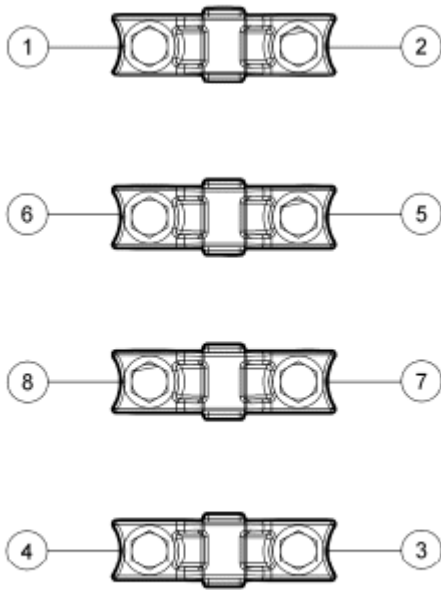


N0070049

Fig. 111: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

12. Remove the 2 bolts and the camshaft front bearing cap.

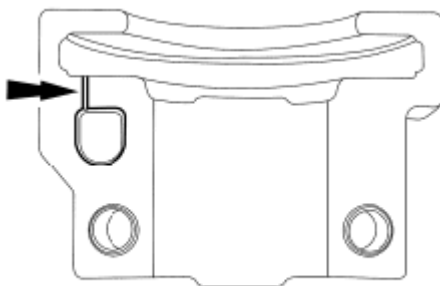
NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these instructions may result in engine damage.



N0091483

Fig. 112: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

13. Remove the remaining 8 bolts in the sequence shown in illustration and remove the camshaft bearing caps.
14. Clean and inspect the LH camshaft bearing caps.
 - The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.



N0010448

Fig. 113: Locating Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

15. Remove the bolt and the camshaft phaser and sprocket assembly from the camshaft.
 - Discard the bolt and washer.

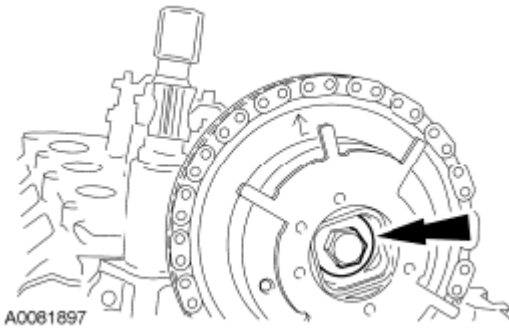


Fig. 114: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

16. Remove the camshaft.
17. Remove and inspect the camshaft phaser and sprocket for damage. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

NOTE: Do not allow the camshaft roller followers to move out of position when installing the camshaft.

1. Lubricate the camshaft and camshaft journals with clean engine oil and install the camshaft.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to valves and pistons will result.

NOTE: If replacement of the camshaft phaser and sprocket is necessary, transfer the scribe mark to the new camshaft phaser and sprocket.

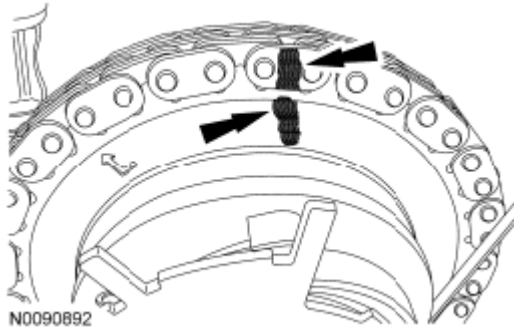


Fig. 115: Locating Timing Chain Scribe Marks
Courtesy of FORD MOTOR CO.

2. Position the camshaft phaser and sprocket into the timing chain with the timing chain scribe marks in alignment.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to install the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

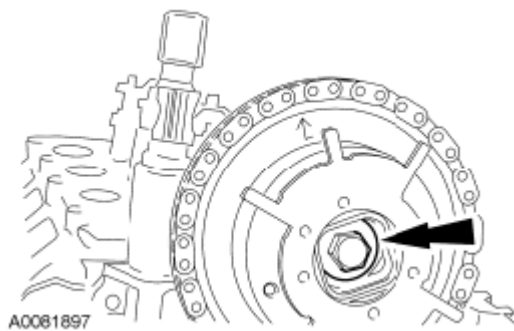


Fig. 116: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

3. Install the camshaft phaser and sprocket assembly onto the camshaft and install a new camshaft phaser and sprocket bolt finger-tight.

NOTE: Do not allow the camshaft roller followers to move out of position when installing the camshaft.

4. Install the 5 camshaft bearing caps in their original locations.
 - Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the 10 bolts loosely.
5. Tighten the 10 bolts in the sequence shown in illustration.
 - Tighten to 10 Nm (89 lb-in).

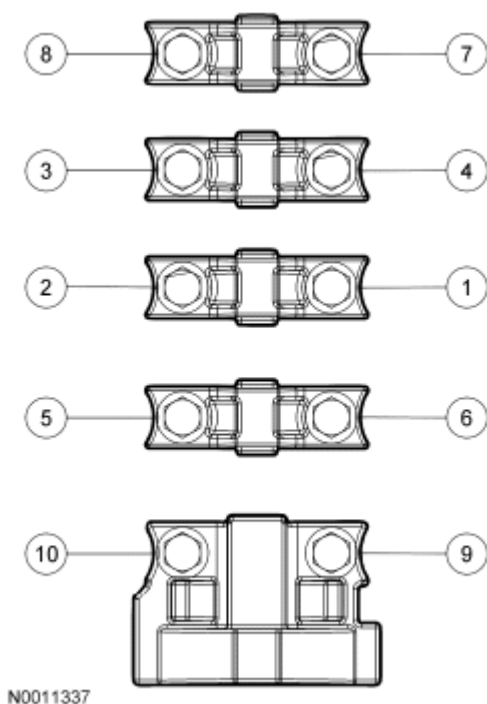


Fig. 117: Identifying Camshaft Bearing Cap Bolt Loosening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Engine front cover removed for clarity.

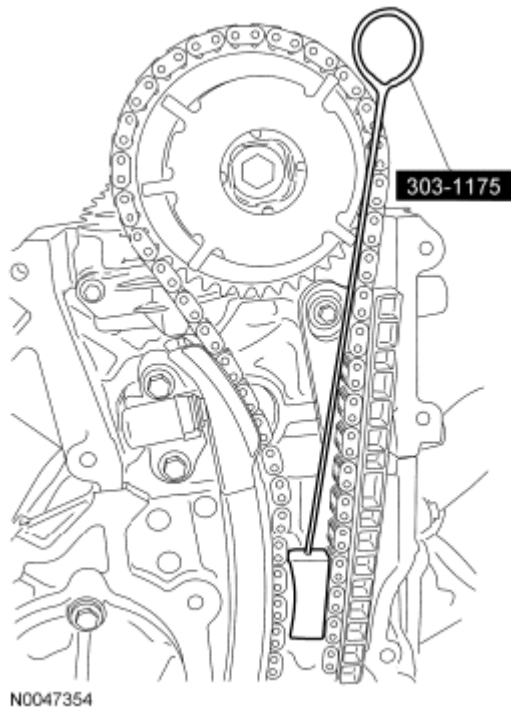


Fig. 118: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

6. Remove the Timing Chain Locking Tool.
7. Rotate the crankshaft a half turn counterclockwise and position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

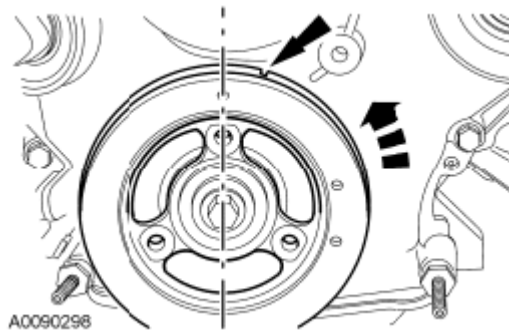


Fig. 119: Positioning Crankshaft Damper Spoke At 12 O'clock Position And Timing Mark Indentation At 1 O'clock Position
Courtesy of FORD MOTOR CO.

8. Verify correct camshaft position by noting the position of the No. 5 cylinder intake and exhaust camshaft lobes.

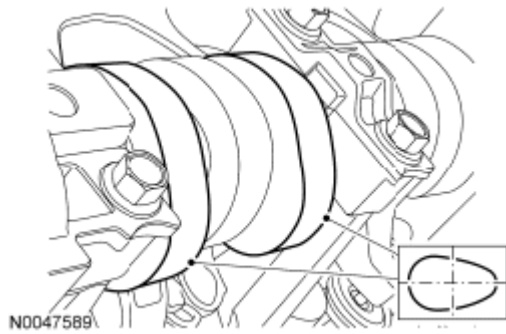


Fig. 120: Identifying Camshaft Lobe
Courtesy of FORD MOTOR CO.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 121: Identifying Valve Spring Compressor (303-1039) On Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

9. Using the Valve Spring Compressor, install the 3 originally removed camshaft roller followers.
10. Install the **CMP** sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

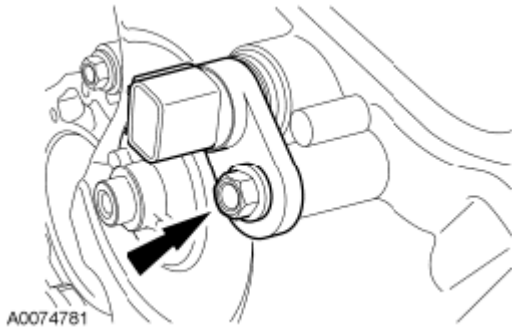


Fig. 122: Locating Bolt And LH CMP Sensor
Courtesy of FORD MOTOR CO.

11. Connect the **CMP** electrical connector.

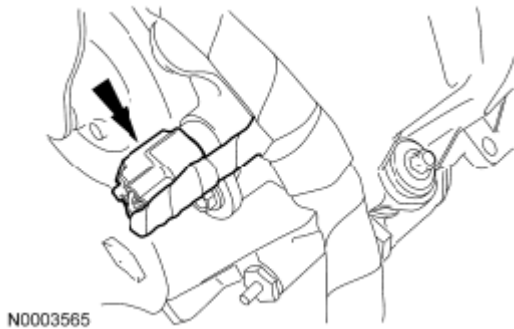


Fig. 123: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools to install the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

12. Tighten the camshaft phaser and sprocket bolt in 2 stages:
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

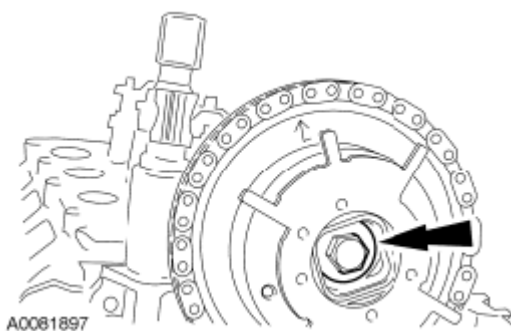


Fig. 124: Identifying Camshaft Phaser And Sprocket Assembly Bolt
 Courtesy of FORD MOTOR CO.

13. Install the LH valve cover. For additional information, refer to **VALVE COVER - LH**.

CAMSHAFT - RH

Special Tool(s)

SPECIAL TOOL REFERENCE

<p>ST2604-A</p>	<p>Compressor, Valve Spring 303-1039</p>

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



Locking Tool, Timing Chain
303-1175

Material

ITEM SPECIFICATION

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

Removal

NOTE: The camshaft procedure must be followed exactly or damage to the valves and pistons will result.

1. Position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

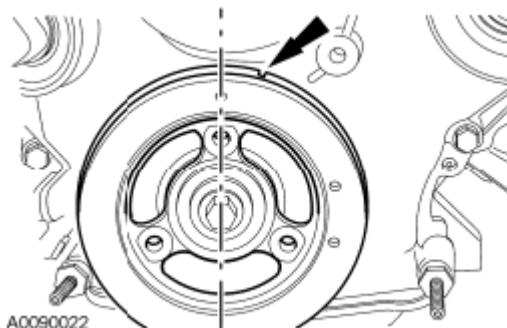


Fig. 125: Positioning Crankshaft Damper Spoke At 12 O'clock Position
Courtesy of FORD MOTOR CO.

2. Remove the RH valve cover. For additional information, refer to **VALVE COVER - RH**.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

3. Loosen and backoff the RH camshaft phaser and sprocket bolt one full turn.
4. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.

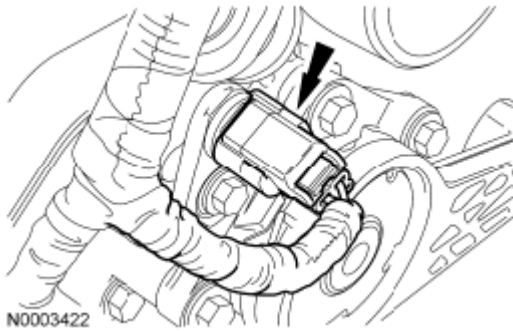


Fig. 126: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the RH CMP sensor.

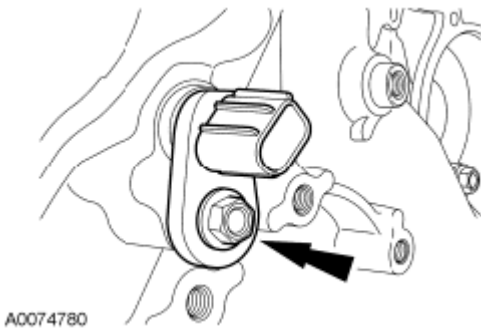


Fig. 127: Identifying Bolt And RH CMP Sensor
Courtesy of FORD MOTOR CO.

NOTE: If the camshaft lobes are not exactly positioned as shown in illustration, the crankshaft will require one full additional rotation to 12 o'clock.



Fig. 128: Identifying Position Of Intake Camshaft Lobes And Exhaust Lobe On No. 1 Cylinder
Courtesy of FORD MOTOR CO.

6. The No. 1 cylinder camshaft exhaust lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 1 cylinder.
7. Remove only the 3 camshaft roller followers shown in the illustration.

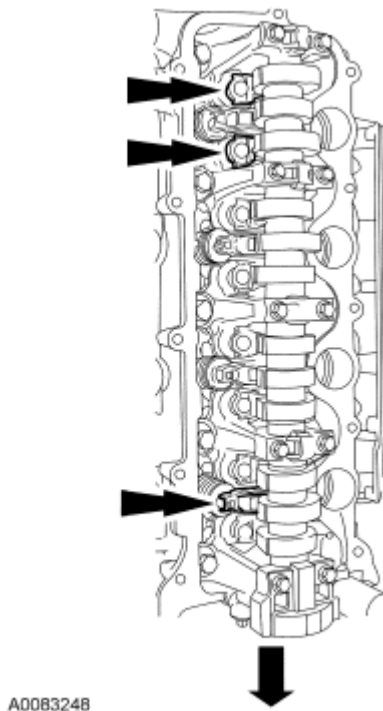


Fig. 129: Removing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

NOTE: The camshaft roller followers must be installed in their original locations. Record camshaft roller follower locations. Failure to follow these instructions may result in engine damage.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must

be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 130: Removing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

8. Using the Valve Spring Compressor, remove only the 3 designated camshaft roller followers from the previous step.

NOTE: The crankshaft cannot be moved past the 6 o'clock position once set or engine damage may occur.

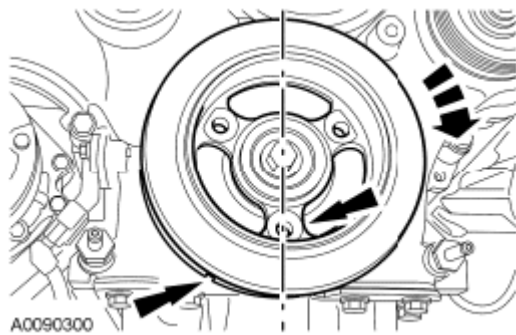


Fig. 131: Positioning Crankshaft Damper Spoke At 6 O'clock Position
Courtesy of FORD MOTOR CO.

9. Rotate the crankshaft clockwise, as viewed from the front, positioning the crankshaft damper spoke at the 6 o'clock position and the timing mark indentation at the 7 o'clock position.

NOTE: Engine is not freewheeling. Camshaft procedure must be followed exactly or damage to valves and pistons will result.

NOTE: The Timing Chain Locking Tool must be installed square to the timing chain and the engine block.

NOTE: Engine front cover removed for clarity.

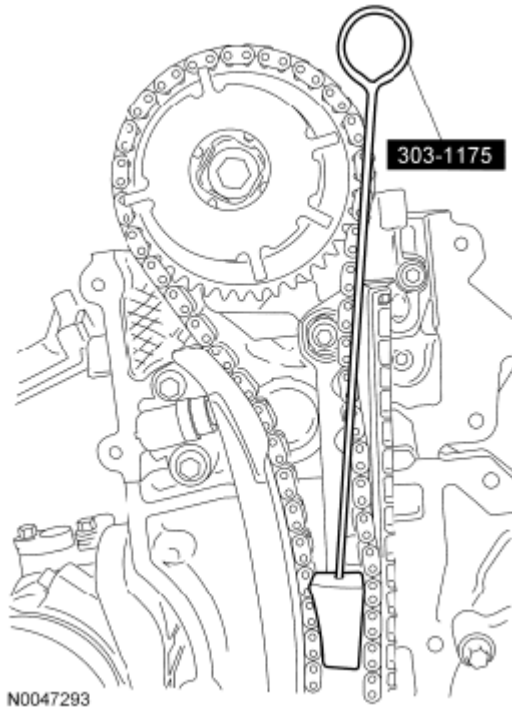


Fig. 132: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

10. Install the Timing Chain Locking Tool in the RH timing chain as shown in illustration.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to valves and pistons will result.

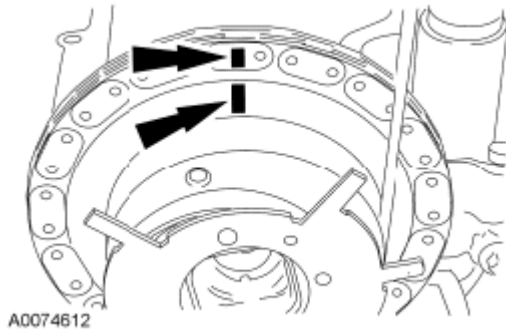


Fig. 133: Identifying Scribe Marks Of Camshaft Phaser And Sprocket (RH)
Courtesy of FORD MOTOR CO.

11. Scribe a location mark on the timing chain and the camshaft phaser and sprocket assembly.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.

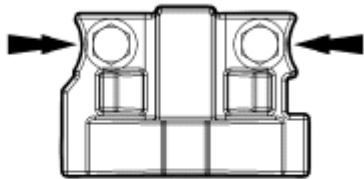
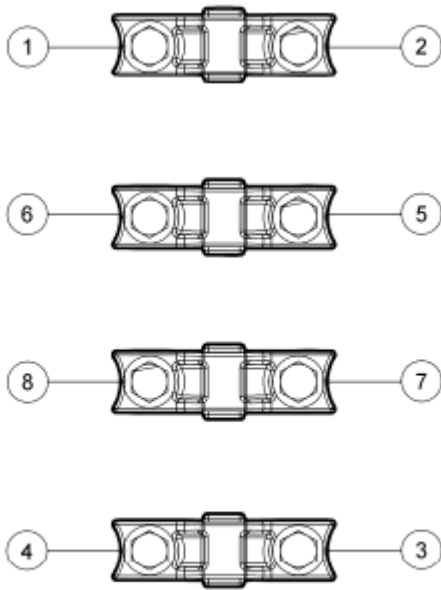


Fig. 134: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

12. Remove the 2 bolts and the camshaft front bearing cap.

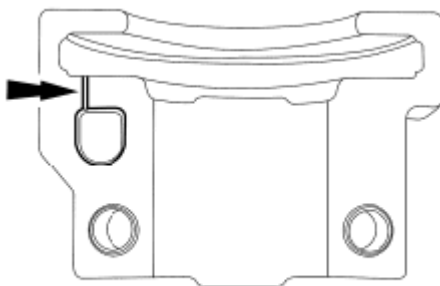
NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these instructions may result in engine damage.



N0091483

Fig. 135: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

13. Remove the remaining 8 bolts in the sequence shown in illustration and remove the camshaft bearing caps.
14. Clean and inspect the RH camshaft bearing caps.
 - The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.



N0010448

Fig. 136: Identifying Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

15. Remove the bolt and the camshaft phaser and sprocket assembly from the camshaft.
 - Discard the bolt and washer.

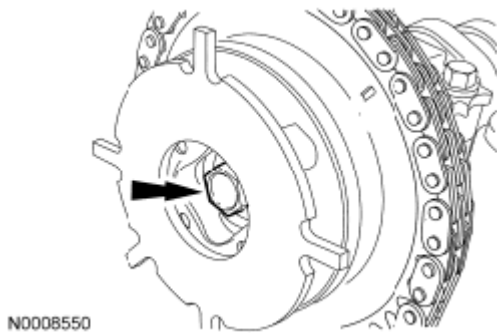


Fig. 137: Identifying Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

16. Remove the camshaft.
17. Remove and inspect the camshaft phaser and sprocket for damage. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

NOTE: Do not allow the camshaft roller followers to move out of position when installing the camshaft.

1. Lubricate the camshaft and camshaft journals with clean engine oil and install the camshaft.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to valves and pistons will result.

NOTE: If replacement of the camshaft phaser and sprocket is necessary, transfer the scribe mark to the new camshaft phaser and sprocket.

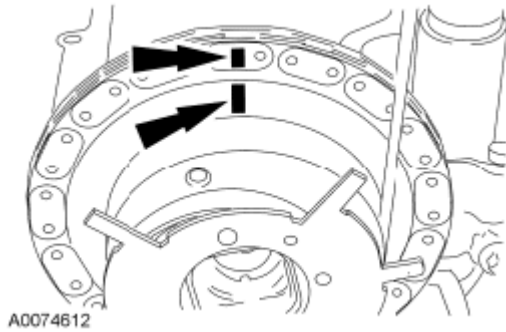


Fig. 138: Identifying Scribe Marks Of Camshaft Phaser And Sprocket (RH)
Courtesy of FORD MOTOR CO.

2. Position the camshaft phaser and sprocket into the timing chain with the timing chain scribe marks in alignment.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to install the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

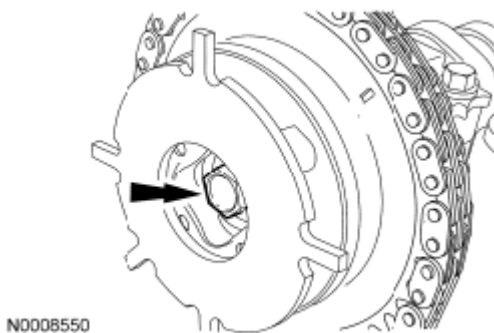


Fig. 139: Identifying Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

3. Install the camshaft phaser and sprocket assembly onto the camshaft and install a new camshaft phaser and sprocket bolt finger-tight.

NOTE: Do not allow the camshaft roller followers to move out of position when installing the camshaft.

4. Install the 5 camshaft bearing caps in their original locations.
 - Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the 10 bolts loosely.
5. Tighten the 10 bolts in the sequence shown in illustration.
 - Tighten to 10 Nm (89 lb-in).

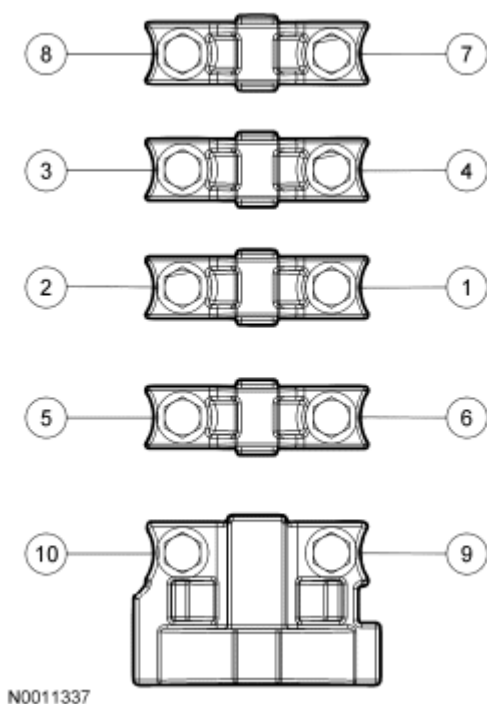


Fig. 140: Identifying Camshaft Bearing Cap Bolt Loosening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Engine front cover removed for clarity.

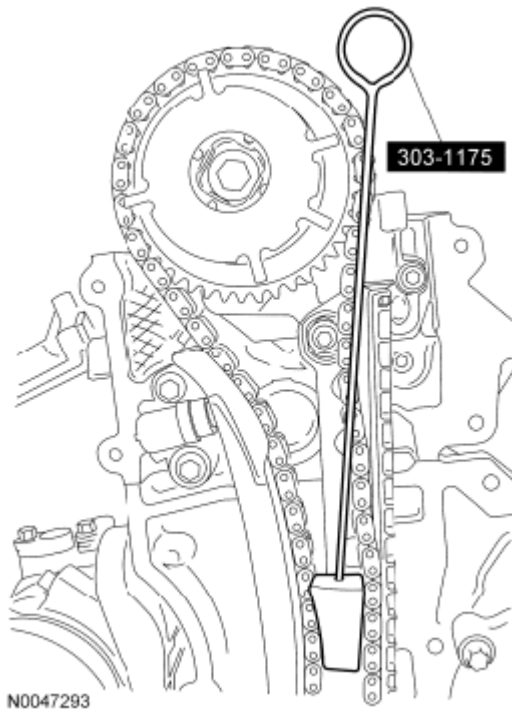


Fig. 141: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

6. Remove the Timing Chain Locking Tool.
7. Rotate the crankshaft a half turn counterclockwise and position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

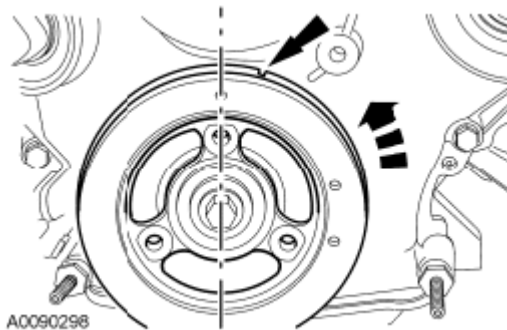


Fig. 142: Positioning Crankshaft Damper Spoke At 12 O'clock Position
Courtesy of FORD MOTOR CO.

8. Verify correct camshaft position by noting the position of the No. 1 cylinder intake and exhaust camshaft lobes.



Fig. 143: Identifying Position Of Intake Camshaft Lobes And Exhaust Lobe On No. 1 Cylinder
Courtesy of FORD MOTOR CO.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 144: Identifying Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

9. Using the Valve Spring Compressor, install the 3 originally removed camshaft roller followers.
10. Install the **CMP** sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

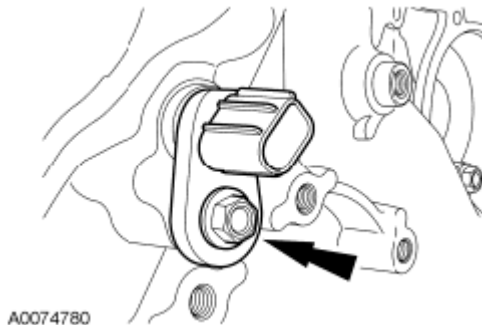


Fig. 145: Identifying Bolt And RH CMP Sensor
Courtesy of FORD MOTOR CO.

11. Connect the **CMP** electrical connector.

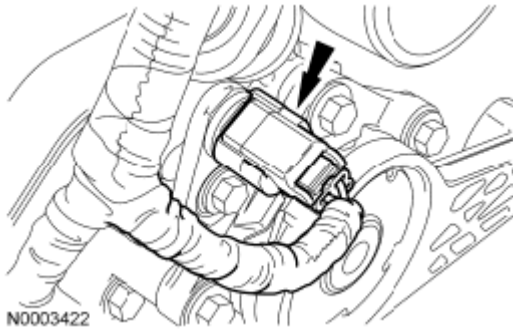


Fig. 146: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools to install the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

12. Tighten the new camshaft phaser and sprocket bolt in 2 stages:
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

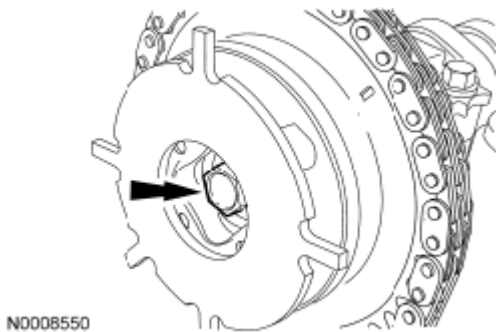


Fig. 147: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

13. Install the RH valve cover. For additional information, refer to **VALVE COVER - RH**.

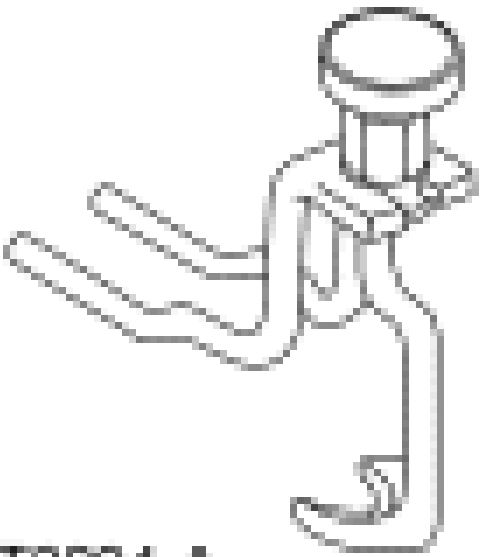

CAMSHAFT PHASER AND SPROCKET - LH

Special Tool(s)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

SPECIAL TOOL REFERENCE

 <p>ST2804-A</p>	<p>Compressor, Valve Spring 303-1039</p>
 <p>ST2869-A</p>	<p>Locking Tool, Timing Chain 303-1175</p>

Material

ITEM SPECIFICATION

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

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

Removal

NOTE: The camshaft procedure must be followed exactly or damage to the valves and pistons will result.

1. Position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

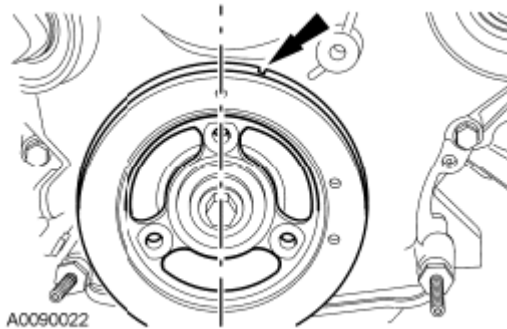


Fig. 148: Positioning Crankshaft Damper Spoke At 12 O'clock Position
Courtesy of FORD MOTOR CO.

2. Remove the LH valve cover. For additional information, refer to VALVE COVER - LH.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

3. Loosen and back off the LH camshaft phaser and sprocket bolt one full turn.
4. Disconnect the LH Camshaft Position (CMP) sensor electrical connector.

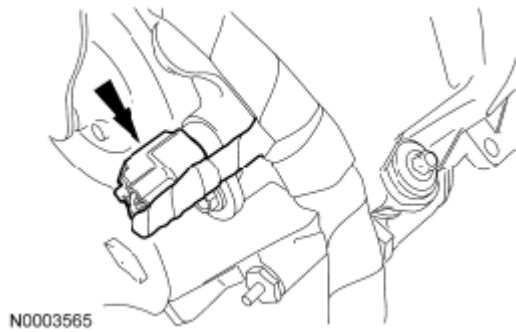


Fig. 149: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the LH CMP sensor.

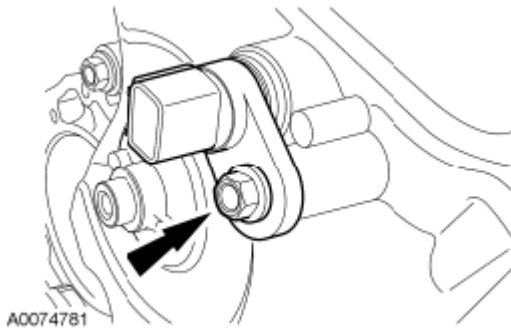


Fig. 150: Locating Bolt And LH CMP Sensor
Courtesy of FORD MOTOR CO.

NOTE: If the camshaft lobes are not exactly positioned as shown in illustration, the crankshaft keyway will require one full additional rotation to 12 o'clock.

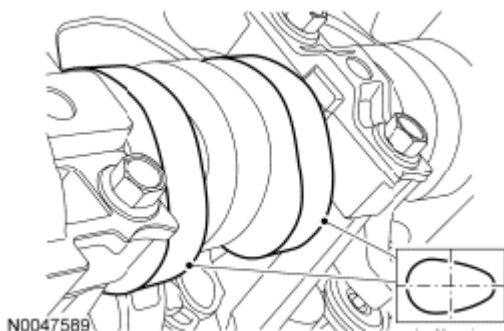


Fig. 151: Identifying Camshaft Lobe
Courtesy of FORD MOTOR CO.

6. The No. 5 cylinder camshaft lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 5 cylinder.

7. Remove only the 3 camshaft roller followers shown in the illustration.

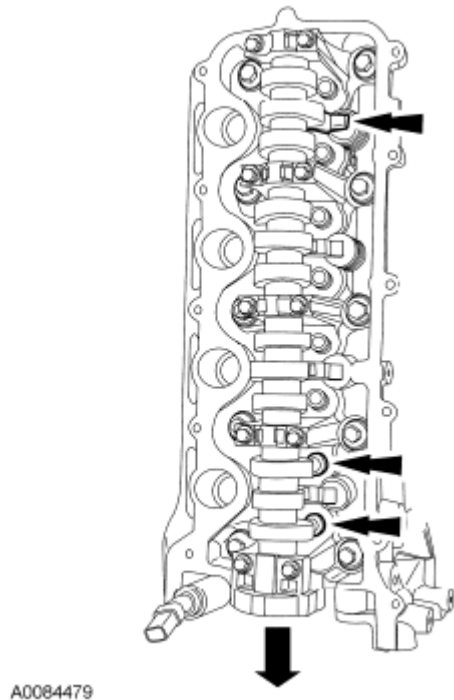


Fig. 152: Locating LH Cylinder Head Camshaft Roller Followers And Bolts
Courtesy of FORD MOTOR CO.

- NOTE:** The camshaft roller followers must be installed in their original locations. Record camshaft roller follower locations. Failure to follow these instructions may result in engine damage.
- NOTE:** Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.
- NOTE:** It may be necessary to push the valve down while compressing the spring.



Fig. 153: Removing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

8. Using the Valve Spring Compressor, remove only the 3 designated camshaft roller followers from the previous step.

NOTE: The crankshaft cannot be moved past the 6 o'clock position once set or engine damage may occur.

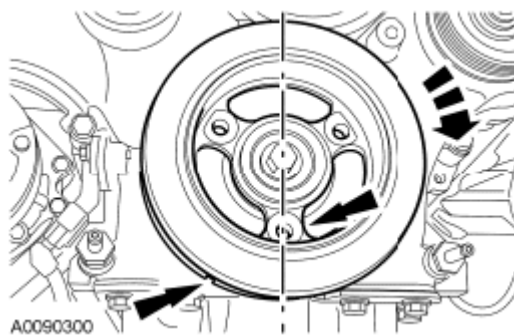


Fig. 154: Positioning Crankshaft Damper Spoke At 6 O'clock Position
Courtesy of FORD MOTOR CO.

9. Rotate the crankshaft clockwise, as viewed from the front, positioning the crankshaft damper spoke at the 6 o'clock position and the timing mark indentation at the 7 o'clock position.

NOTE: Engine is not freewheeling. Camshaft procedure must be followed exactly

or damage to valves and pistons will result.

NOTE: The Timing Chain Locking Tool must be installed square to the timing chain and the engine block or damage may result.

NOTE: Engine front cover removed for clarity.

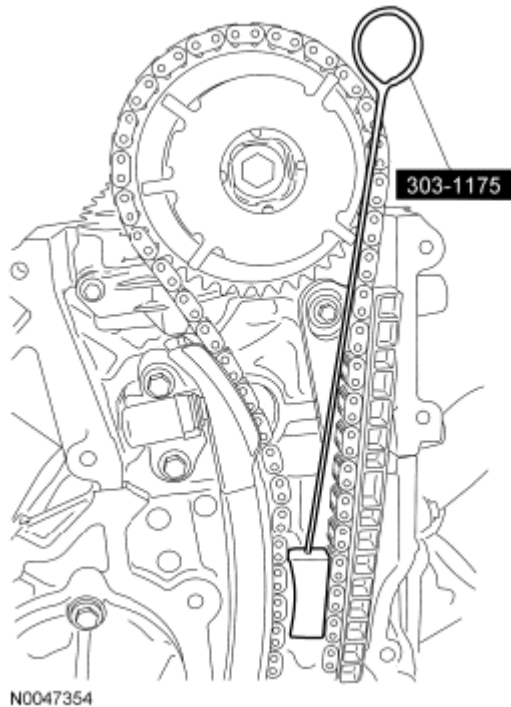


Fig. 155: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

10. Install the Timing Chain Locking Tool in the LH timing chain as shown in illustration.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to valves and pistons will result.

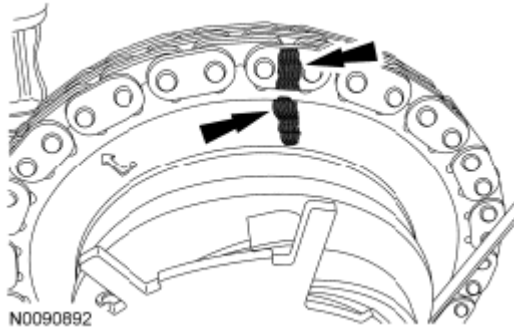


Fig. 156: Locating Timing Chain Scribe Marks
Courtesy of FORD MOTOR CO.

11. Scribe a location mark on the timing chain and the camshaft phaser and sprocket assembly.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

12. Remove the bolt and the camshaft phaser and sprocket assembly from the camshaft.
 - Discard the bolt and washer.

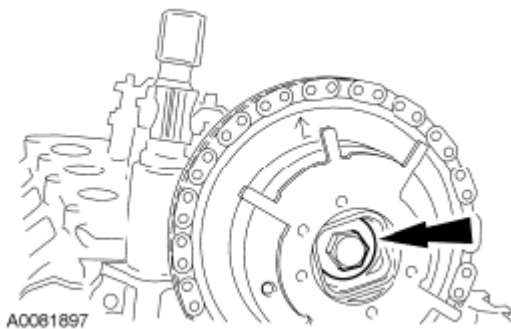


Fig. 157: Identifying Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

13. Remove the camshaft phaser and sprocket assembly from the timing chain and inspect for damage. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

- NOTE:** Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.
- NOTE:** The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to valves and pistons will result.
- NOTE:** If replacement of the camshaft phaser and sprocket is necessary, transfer the scribe mark to the new camshaft phaser and sprocket.

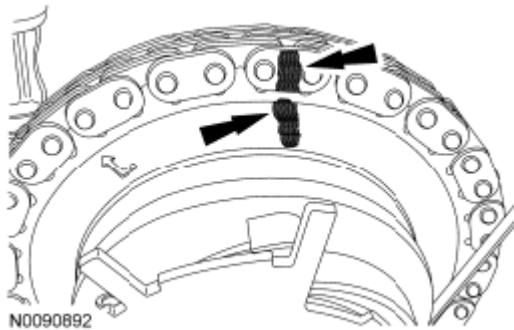


Fig. 158: Locating Timing Chain Scribe Marks
Courtesy of FORD MOTOR CO.

1. Position the camshaft phaser and sprocket into the timing chain with the timing chain scribe marks in alignment.

- NOTE:** Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.
- NOTE:** Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.
- NOTE:** Only use hand tools to install the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

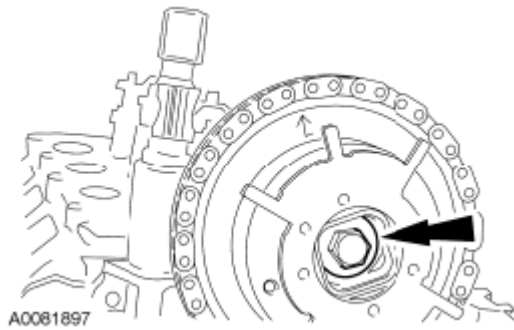


Fig. 159: Identifying Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

2. Install the camshaft phaser and sprocket assembly onto the camshaft and install a new camshaft phaser and sprocket bolt finger-tight.

NOTE: Engine front cover removed for clarity.

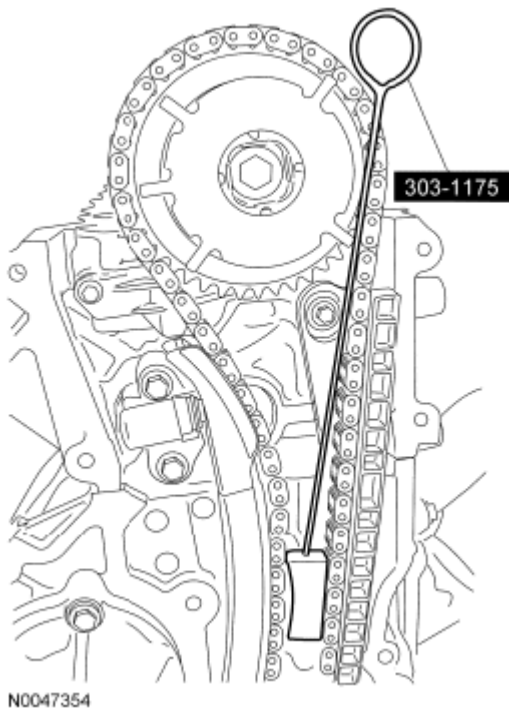


Fig. 160: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

3. Remove the Timing Chain Locking Tool.
4. Rotate the crankshaft a half turn counterclockwise and position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

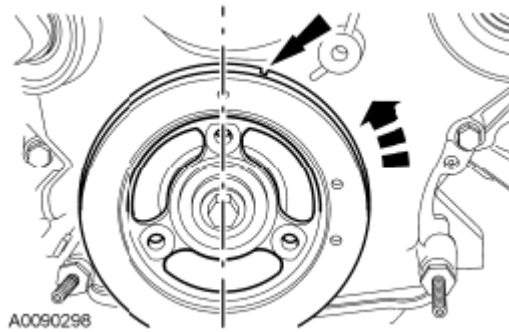


Fig. 161: Positioning Crankshaft Damper Spoke At 12 O'clock Position
Courtesy of FORD MOTOR CO.

5. Verify correct camshaft position by noting the position of the No. 5 cylinder intake and exhaust camshaft lobes.

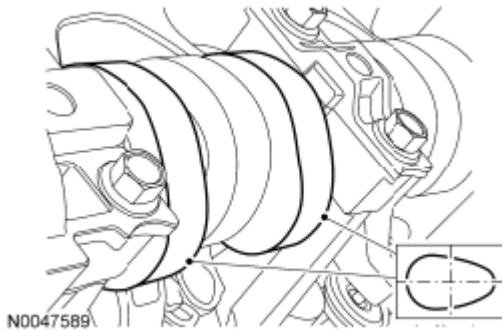


Fig. 162: Identifying Camshaft Lobe
Courtesy of FORD MOTOR CO.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 163: Installing Valve Spring Compressor
Courtesy of FORD MOTOR CO.

6. Using the Valve Spring Compressor, install the 3 originally removed camshaft roller followers.

NOTE: Lubricate the O-ring seal with clean engine oil prior to installation.

7. Install the **CMP** sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

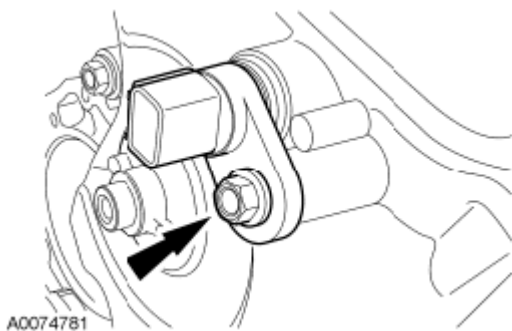


Fig. 164: Locating Bolt And LH CMP Sensor
Courtesy of FORD MOTOR CO.

8. Connect the **CMP** electrical connector.

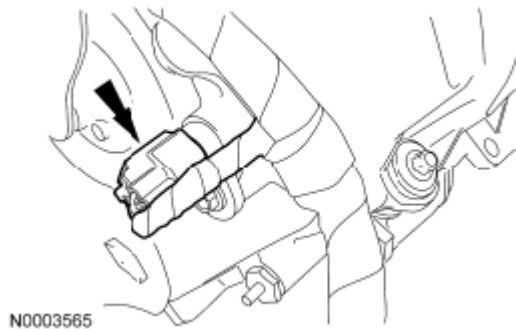


Fig. 165: Connecting CMP Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools to install the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

9. Tighten the camshaft phaser and sprocket bolt in 2 stages:
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

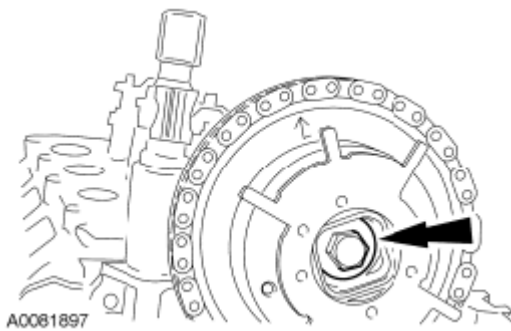


Fig. 166: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

10. Install the LH valve cover. For additional information, refer to VALVE COVER - LH.

CAMSHAFT PHASER AND SPROCKET - RH

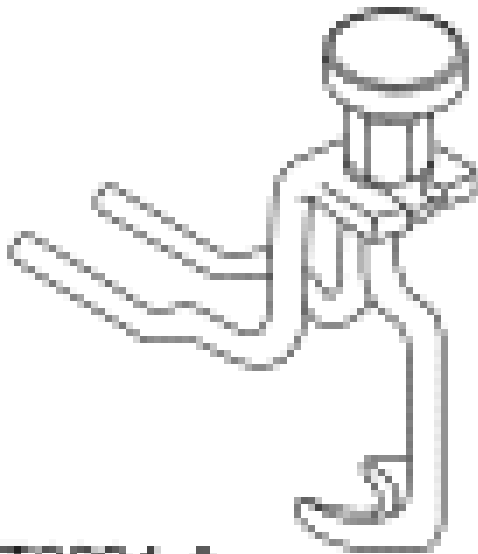
Special Tool(s)

SPECIAL TOOL REFERENCE

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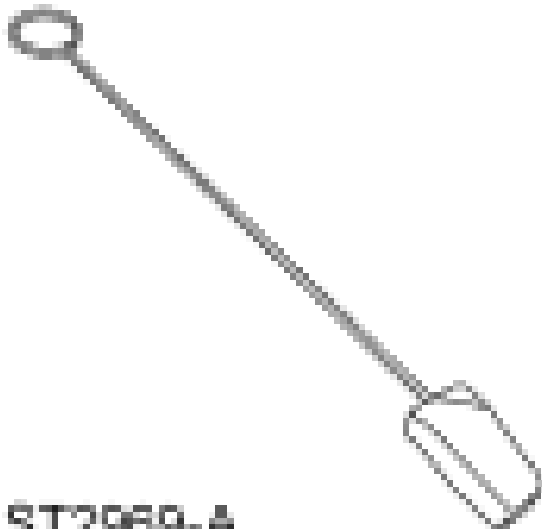
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2604-A

Compressor, Valve Spring
303-1039



ST2969-A

Locking Tool, Timing Chain
303-1175

Material

ITEM SPECIFICATION

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

WSS-M2C930-
A

Removal

NOTE: This procedure must be followed exactly or damage to the valves and pistons will result.

1. Position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

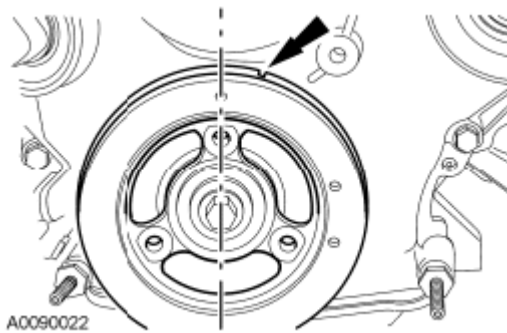


Fig. 167: Positioning Crankshaft Damper Spoke At 12 O'clock Position
Courtesy of FORD MOTOR CO.

2. Remove the RH valve cover. For additional information, refer to VALVE COVER - RH.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

3. Loosen and backoff the RH camshaft phaser and sprocket bolt one full turn.
4. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.

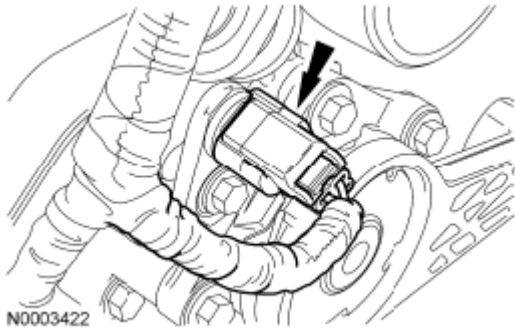


Fig. 168: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the RH CMP sensor.

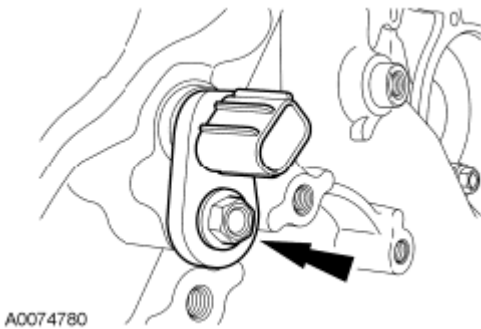


Fig. 169: Locating Bolt And RH CMP Sensor
Courtesy of FORD MOTOR CO.

NOTE: If the camshaft lobes are not exactly positioned as shown in illustration, the crankshaft will require one full additional rotation to 12 o'clock.



Fig. 170: Identifying Position Of Intake Camshaft Lobes And Exhaust Lobe On No. 1 Cylinder
Courtesy of FORD MOTOR CO.

6. The No. 1 cylinder camshaft exhaust lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 1 cylinder.
7. Remove only the 3 camshaft roller followers shown in the illustration.

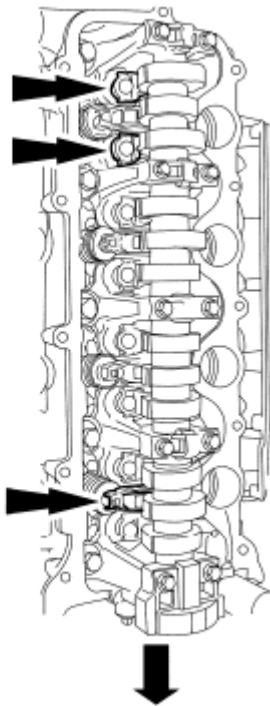


Fig. 171: Locating RH Cylinder Head Camshaft Roller Followers And Bolts
Courtesy of FORD MOTOR CO.

NOTE: The camshaft roller followers must be installed in their original locations. Record camshaft roller follower locations. Failure to follow these instructions may result in engine damage.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 172: Removing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

8. Using the Valve Spring Compressor, remove only the 3 designated camshaft roller followers from the previous step.

NOTE: The crankshaft cannot be moved past the 6 o'clock position once set or engine damage may occur.

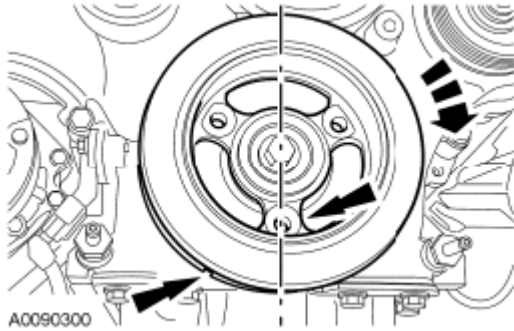


Fig. 173: Positioning Crankshaft Damper Spoke At 6 O'clock Position And Timing Mark Indentation At 7 O'clock Position
Courtesy of FORD MOTOR CO.

9. Rotate the crankshaft clockwise, as viewed from the front, positioning the crankshaft damper spoke at the 6 o'clock position and the timing mark indentation at the 7 o'clock position.

NOTE: Engine is not freewheeling. Camshaft procedure must be followed exactly or damage to valves and pistons will result.

NOTE: The Timing Chain Locking Tool must be installed square to the timing chain and the engine block.

NOTE: Engine front cover removed for clarity.

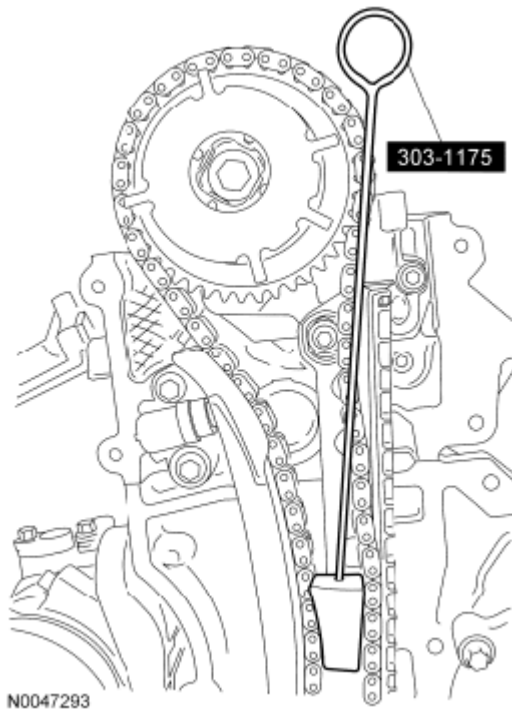


Fig. 174: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

10. Install the Timing Chain Locking Tool in the RH timing chain as shown in illustration.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to valves and pistons will result.

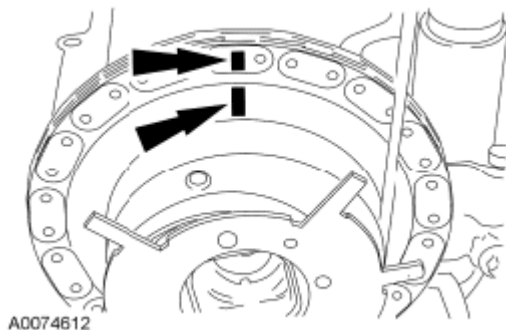


Fig. 175: Locating Scribe Marks Of Camshaft Phaser And Sprocket (RH)

Courtesy of FORD MOTOR CO.

11. Scribe a location mark on the timing chain and the camshaft phaser and sprocket assembly.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

12. Remove the bolt and remove the camshaft phaser and sprocket assembly from camshaft.
- Discard the bolt and washer.

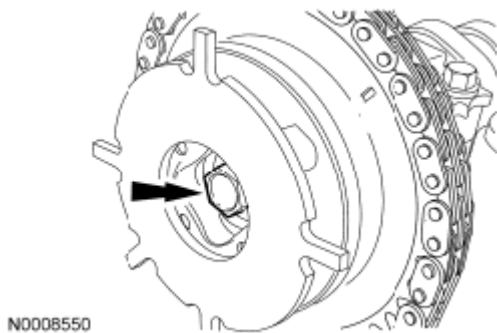


Fig. 176: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

13. Remove the camshaft phaser and sprocket assembly from the timing chain and inspect for damage. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

Installation

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: The timing chain must be installed in its original position onto the camshaft phaser and sprocket using the scribed marks, or damage to

valves and pistons will result.

NOTE: If replacement of the camshaft phaser and sprocket is necessary, transfer the scribe mark to the new camshaft phaser and sprocket.

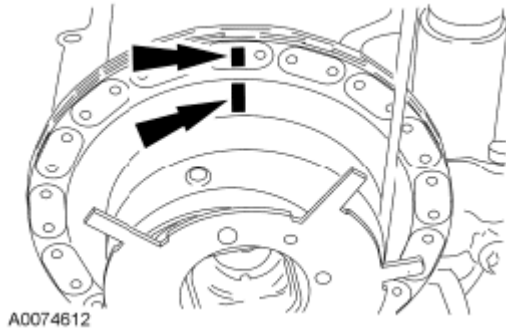


Fig. 177: Locating Scribe Marks Of Camshaft Phaser And Sprocket (RH)
Courtesy of FORD MOTOR CO.

1. Position the camshaft phaser and sprocket into the timing chain with the timing chain scribe marks in alignment.

NOTE: Do not remove the Timing Chain Locking Tool at any time during assembly. If the Timing Chain Locking Tool is removed or out of placement, the engine front cover must be removed and the engine must be retimed. For additional information, refer to **TIMING DRIVE COMPONENTS**.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to install the camshaft phaser and sprocket bolt or damage may occur to the camshaft or camshaft phaser and sprocket.

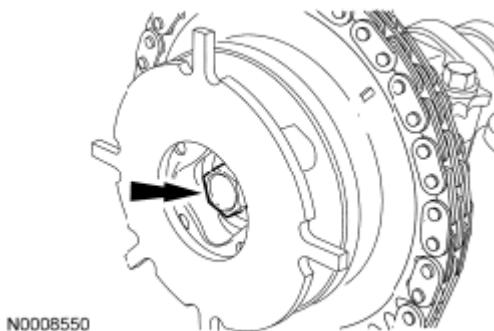


Fig. 178: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

2. Install the camshaft phaser and sprocket assembly onto the camshaft and install a new camshaft phaser and sprocket bolt finger-tight.

NOTE: Engine front cover removed for clarity.

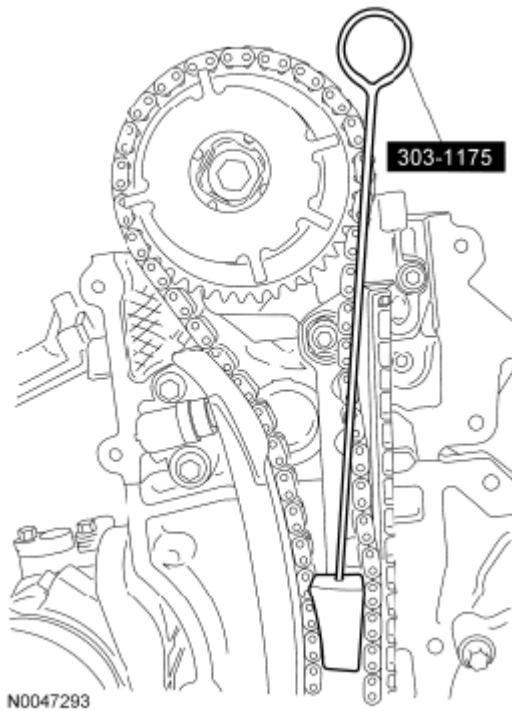


Fig. 179: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

3. Remove the Timing Chain Locking Tool.
4. Rotate the crankshaft a half turn counterclockwise and position the crankshaft damper spoke at the 12 o'clock position and the timing mark indentation at the 1 o'clock position.

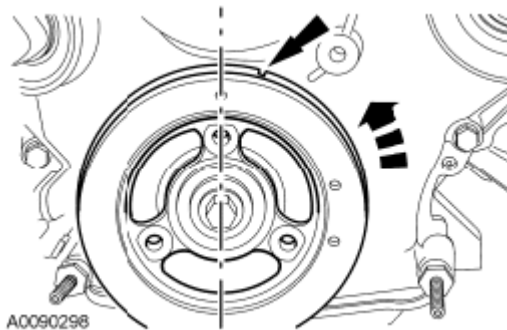


Fig. 180: Positioning Crankshaft Damper Spoke At 12 O'clock Position And Timing Mark Indentation At 1 O'clock Position
Courtesy of FORD MOTOR CO.

5. Verify correct camshaft position by noting the position of the No. 1 cylinder intake and exhaust camshaft lobes.



Fig. 181: Identifying Position Of Intake Camshaft Lobes And Exhaust Lobe On No. 1 Cylinder
Courtesy of FORD MOTOR CO.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 182: Installing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

6. Using the Valve Spring Compressor, install the 3 originally removed camshaft roller followers.

NOTE: Lubricate the O-ring seal with clean engine oil prior to installation.

7. Install the **CMP** sensor and the bolt.
 - Tighten to 10 Nm (89 lb-in).

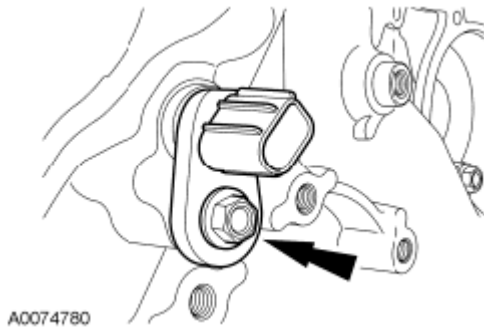


Fig. 183: Locating Bolt And RH CMP Sensor
Courtesy of FORD MOTOR CO.

8. Connect the **CMP** electrical connector.

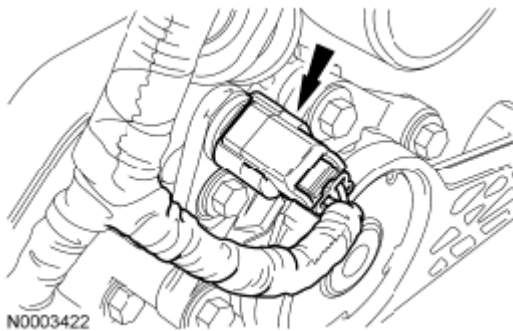


Fig. 184: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools to install the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

9. Tighten the new camshaft phaser and sprocket bolt in 2 stages:
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

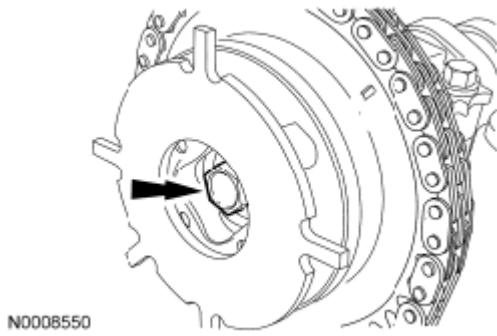


Fig. 185: Locating Camshaft Phaser And Sprocket Assembly Bolt
 Courtesy of FORD MOTOR CO.

10. Install the RH valve cover. For additional information, refer to VALVE COVER - RH.

CAMSHAFT ROLLER FOLLOWER

Special Tool(s)

SPECIAL TOOL REFERENCE

<p>ST2804-A</p>	<p>Compressor, Valve Spring 303-1039</p>
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Material

ITEM SPECIFICATION

Item	Specification
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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**LH cylinder head camshaft roller followers**

1. Remove the LH valve cover. For additional information, refer to **VALVE COVER - LH**.

RH cylinder head camshaft roller followers

2. Remove the RH valve cover. For additional information, refer to **VALVE COVER - RH**.

All camshaft roller followers

3. Rotate the crankshaft until the piston for the valve being serviced is at the top of its stroke with the intake valve and the exhaust valves closed.

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

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to **CYLINDER HEAD**.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 186: Identifying Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

4. Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller follower.
5. Repeat the previous 2 steps for each camshaft roller follower being serviced.

6. Inspect the camshaft roller follower. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation**All camshaft roller followers**

- NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Failure to follow these instructions may result in engine damage.
- NOTE:** Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to **CYLINDER HEAD**.
- NOTE:** It may be necessary to push the valve down while compressing the spring.
- NOTE:** Lubricate the camshaft roller followers with clean engine oil prior to installation.



Fig. 187: Installing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

1. Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller follower.
2. Repeat the previous step for each camshaft roller follower being serviced.

LH cylinder head camshaft roller followers

3. Install the LH valve cover. For additional information, refer to **VALVE COVER - LH**.

RH cylinder head camshaft roller followers

4. Install the RH valve cover. For additional information, refer to **VALVE COVER - RH**.

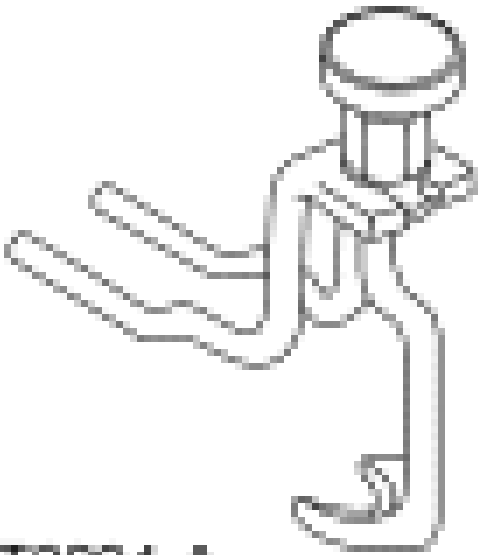
VALVE SPRINGS

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Special Tool(s)

SPECIAL TOOL REFERENCE

 <p>ST2604-A</p>	Compressor, Valve Spring 303-1039
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Material

ITEM SPECIFICATION

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

RH cylinder head valve springs

1. Remove the RH valve cover. For additional information, refer to **VALVE COVER - RH.**

LH cylinder head valve springs

2. Remove the LH valve cover. For additional information, refer to **VALVE COVER - LH.**

All valve springs

3. Remove the spark plug for the cylinder being serviced. For additional information, refer to **ENGINE**

IGNITION - 5.4L AND 6.8L (3V) .

4. Rotate the crankshaft until the piston for the valve being serviced is at the top of its stroke with the intake valve and the exhaust valves closed.

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

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 188: Removing Camshaft Roller Followers

Courtesy of FORD MOTOR CO.

5. Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller follower.
6. Use compressed air in the cylinder being serviced to hold both valves in position.
 - Apply a minimum of 965 kPa (140 psi) of compressed air into the cylinder.

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

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. If a valve drops into the cylinder, remove the cylinder head. For additional information, refer to CYLINDER HEAD.



Fig. 189: Removing Valve Spring Retainer Keys
Courtesy of FORD MOTOR CO.

7. Using the Valve Spring Compressor, compress the valve spring and remove the valve spring retainer keys.
8. Remove the valve spring retainer and the valve spring.
9. Inspect the valve spring. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

All valve springs

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Failure to follow these instructions may result in engine damage.



Fig. 190: Removing Valve Spring Retainer Keys
Courtesy of FORD MOTOR CO.

1. Using the Valve Spring Compressor, install the valve spring, the valve spring retainer and the valve spring retainer keys.
2. Relieve the air pressure from the cylinder.

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Failure to follow these instructions may result in engine

damage.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.

NOTE: Lubricate the camshaft roller followers with clean engine oil prior to installation.



Fig. 191: Installing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

3. Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller follower.
4. Install the spark plug. For additional information, refer to ENGINE IGNITION - 5.4L AND 6.8L (3V).

LH cylinder head valve springs

5. Install the LH valve cover. For additional information, refer to VALVE COVER - LH.

RH cylinder head valve springs

6. Install the RH valve cover. For additional information, refer to VALVE COVER - RH.

VALVE SEALS

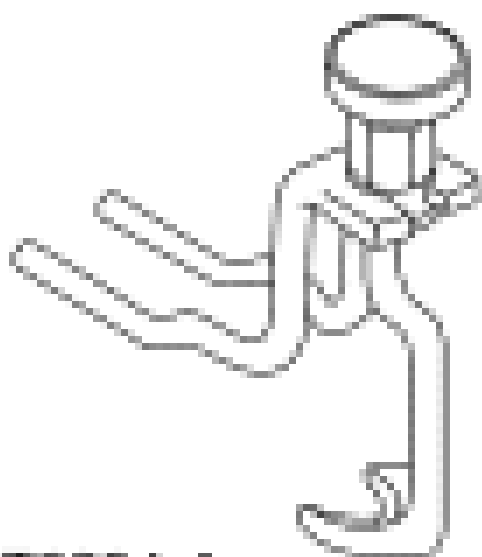
Special Tool(s)

SPECIAL TOOL REFERENCE

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2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2804-A

Compressor, Valve Spring
303-1039



ST1332-A

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

Material

ITEM SPECIFICATION

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**RH cylinder head valve seals**

1. Remove the RH valve cover. For additional information, refer to **VALVE COVER - RH**.

LH cylinder head valve seals

2. Remove the LH valve cover. For additional information, refer to **VALVE COVER - LH**.

All valve seals

3. Remove the spark plug for the cylinder being serviced. For additional information, refer to **ENGINE IGNITION - 5.4L AND 6.8L (3V)**.
4. Rotate the crankshaft until the piston for the valve being serviced is at the top of its stroke with the intake valve and the exhaust valves closed.

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

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to **CYLINDER HEAD**.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 192: Removing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

5. Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller follower.
6. Use compressed air in the cylinder being serviced to hold the valves in position.
 - Apply a minimum of 965 kPa (140 psi) of compressed air into the cylinder.

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

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. If a valve drops into the cylinder, remove the cylinder head. For additional information, refer to CYLINDER HEAD.



Fig. 193: Removing Valve Spring Retainer Keys
Courtesy of FORD MOTOR CO.

7. Using the Valve Spring Compressor, compress the valve spring and remove the valve spring retainer keys.
8. Remove the valve spring retainer, the valve spring and the valve seal.
 - Discard the valve seal.
9. Inspect the components. For additional information, refer to ENGINE SYSTEM - GENERAL INFORMATION.

Installation

All valve seals

NOTE: Lubricate the valve seal and valve stem with clean engine oil prior to installation.

1. Position a new valve seal onto the valve stem.
2. Using the Valve Stem Oil Seal Installer, install the new valve seal.

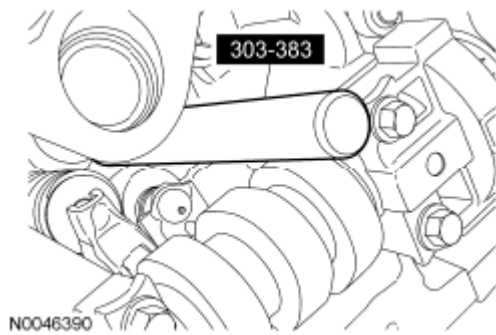


Fig. 194: Installing Valve Seal Using Special Tool
Courtesy of FORD MOTOR CO.

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Failure to follow these instructions may result in engine damage.



Fig. 195: Installing Valve Spring Retainer Keys
Courtesy of FORD MOTOR CO.

3. Using the Valve Spring Compressor, install the valve spring, the valve spring retainer and the valve spring retainer keys.
4. Relieve the air pressure from the cylinder.

NOTE: If the components are to be reinstalled, they must be installed in the same positions. Failure to follow these instructions may result in engine damage.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed. For additional information, refer to CYLINDER HEAD.

NOTE: It may be necessary to push the valve down while compressing the spring.

NOTE: Lubricate the camshaft roller followers with clean engine oil prior to

installation.



Fig. 196: Installing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

5. Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller follower.
6. Install the spark plug. For additional information, refer to ENGINE IGNITION - 5.4L AND 6.8L (3V).

LH cylinder head valve seals

7. Install the LH valve cover. For additional information, refer to VALVE COVER - LH.

RH cylinder head valve seals

8. Install the RH valve cover. For additional information, refer to VALVE COVER - RH.

HYDRAULIC LASH ADJUSTER

Material

ITEM SPECIFICATION

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 and Installation

1. Remove the camshafts. For additional information, refer to CAMSHAFT - LH or CAMSHAFT - RH.
2. Remove the remaining roller followers from the cylinder head being serviced.

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

3. Remove the hydraulic lash adjusters that are being serviced.
4. Inspect the hydraulic lash adjusters. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

NOTE: Lubricate each of the hydraulic lash adjusters with clean engine oil prior to installation.

5. To install, reverse the removal procedure.

EXHAUST MANIFOLD - LH

Material

ITEM SPECIFICATION

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

RH and LH Exhaust Y-Pipe Flange Nuts

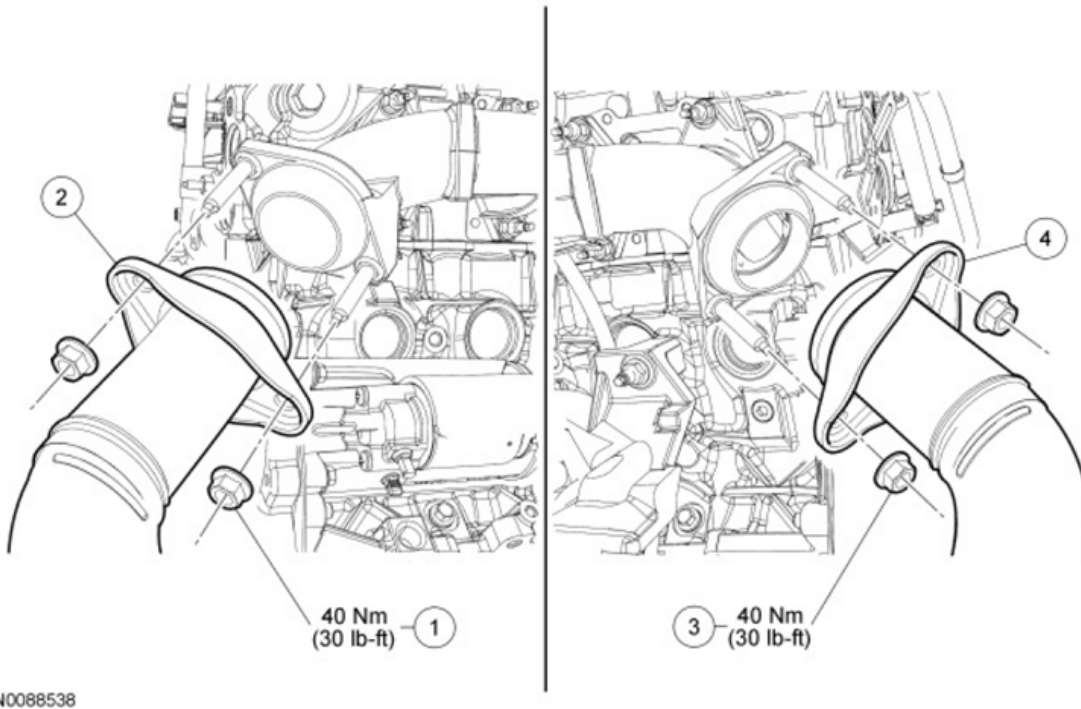


Fig. 197: Identifying Exhaust Y-Pipe Flange Nuts With Torque Specifications (RH And LH)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

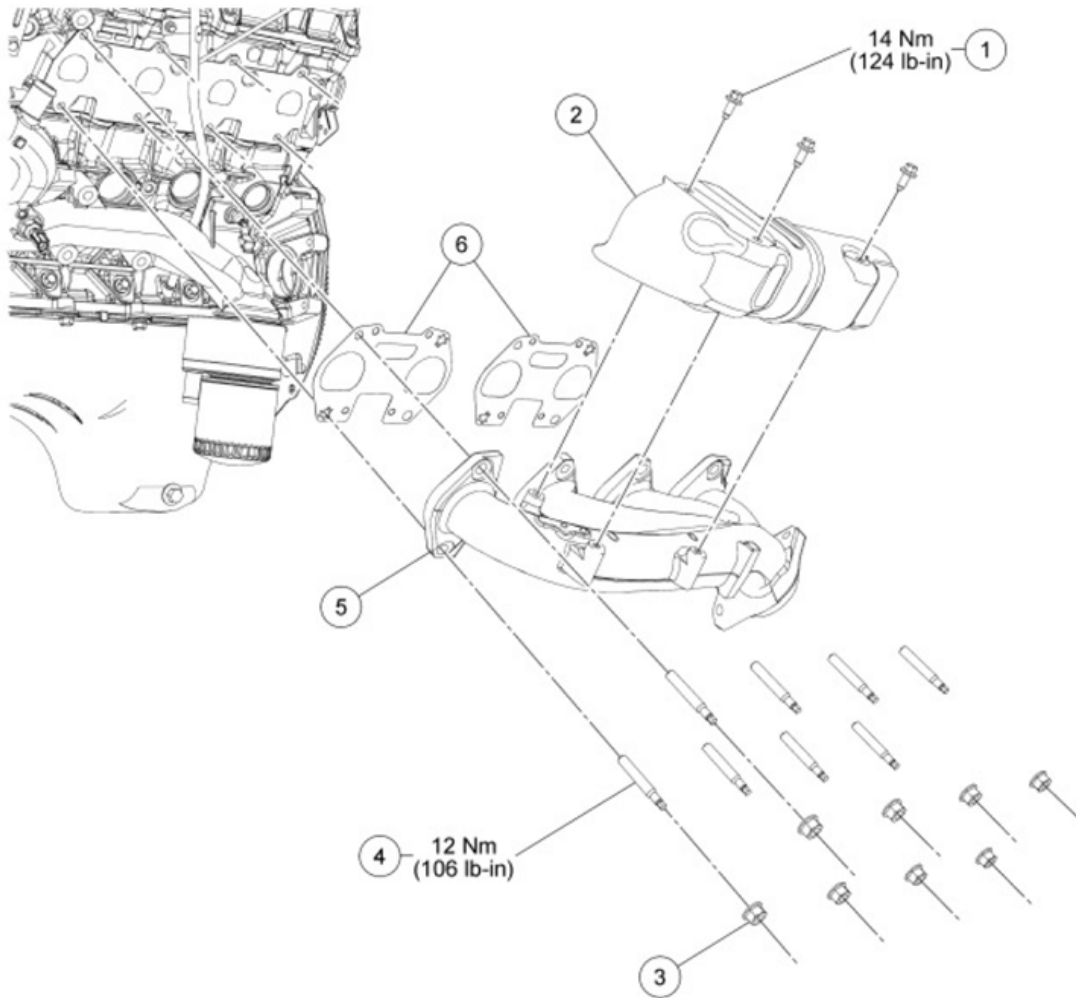
Item	Part Number	Description
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2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

1	W705443	RH exhaust Y-pipe flange nut (2 required)
2	5F250	RH exhaust Y-pipe flange
3	W705443	LH exhaust Y-pipe flange nut (2 required)
4	5F250	LH exhaust Y-pipe flange

LH Exhaust Manifold Nuts, Studs, Heat Shield, Exhaust Manifold and Gaskets



N0087763

Fig. 198: Identifying LH Exhaust Manifold Nuts, Studs, Heat Shield, Exhaust Manifold And Gaskets With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	W714133	Exhaust manifold heat shield bolt (3 required)
2	9Y427	Exhaust manifold heat shield

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

3	W701706	Exhaust manifold nut (8 required)
4	W707747	Exhaust manifold-to-cylinder head stud (8 required)
5	9431	Exhaust manifold
6	9Y431	Exhaust manifold gaskets (2 required)

Removal

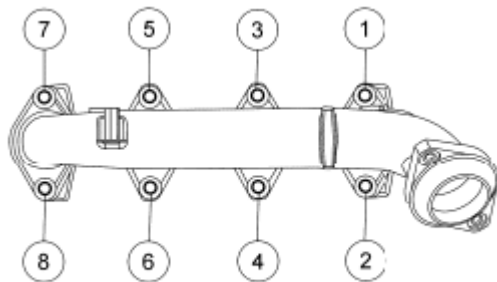
1. Remove the LH fender splash shield. For additional information, refer to **FRONT END BODY PANELS**.
2. Remove the degas bottle assembly. For additional information, refer to **ENGINE COOLING**.
3. Remove the 4 exhaust Y-pipe flange nuts.
4. Remove the 3 bolts and the exhaust manifold heat shield.
5. Remove the 8 nuts, 8 exhaust manifold-to-cylinder head studs and the exhaust manifold.
 - Discard the 8 nuts and the 8 studs.

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. Remove and discard the exhaust manifold gaskets.
 - Clean the sealing surfaces with metal surface prep. Follow the directions on the packaging.
7. Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

1. Install 8 new exhaust manifold-to-cylinder head studs.
 - Tighten to 12 Nm (106 lb-in).
2. Using new exhaust manifold gaskets, position the 2 gaskets and the exhaust manifold and install 8 new exhaust manifold nuts.
 - Tighten to 25 Nm (18 lb-ft) in the sequence shown in illustration.



N0010196

Fig. 199: Identifying Exhaust Manifold Bolts Loosening Sequence

Courtesy of FORD MOTOR CO.

3. Position the exhaust manifold heat shield and install the 3 bolts.
 - Tighten to 14 Nm (124 lb-in).
4. Install the 4 exhaust Y-pipe flange nuts.
 - Tighten to 40 Nm (30 lb-ft).
5. Install the degas bottle assembly. For additional information, refer to **ENGINE COOLING**.
6. Install the LH fender splash shield. For additional information, refer to **FRONT END BODY PANELS**.

EXHAUST MANIFOLD - RH

Material

ITEM SPECIFICATION

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

RH and LH Exhaust Y-Pipe Flange Nuts

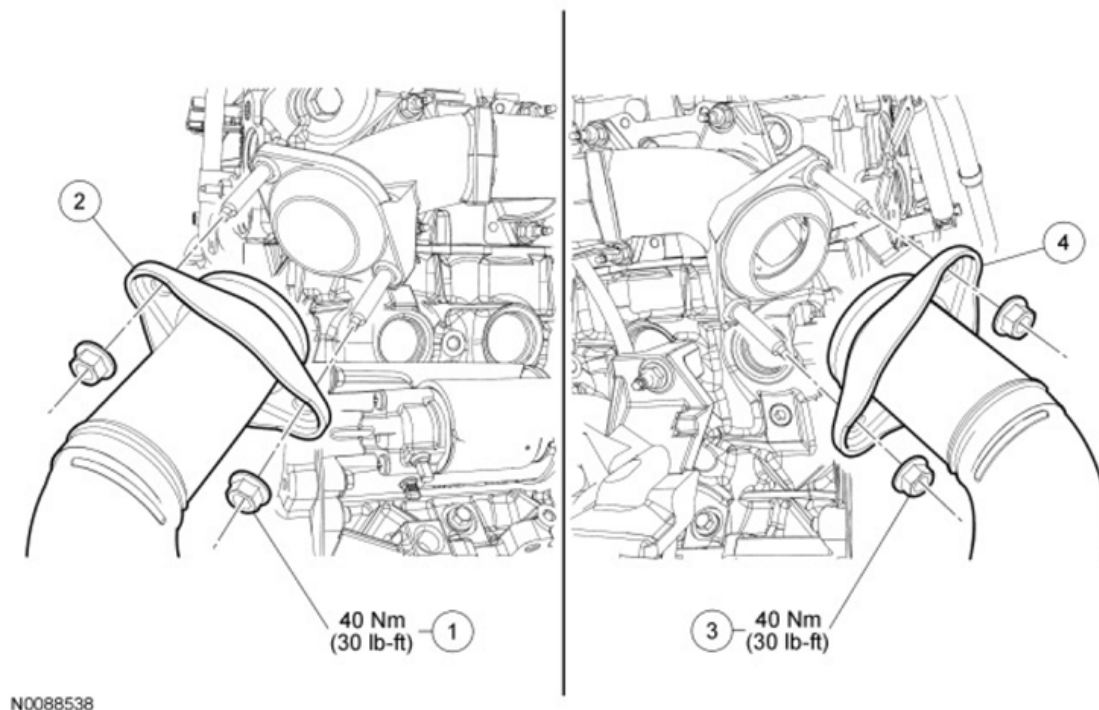


Fig. 200: Identifying Exhaust Y-Pipe Flange Nuts With Torque Specifications (RH And LH)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

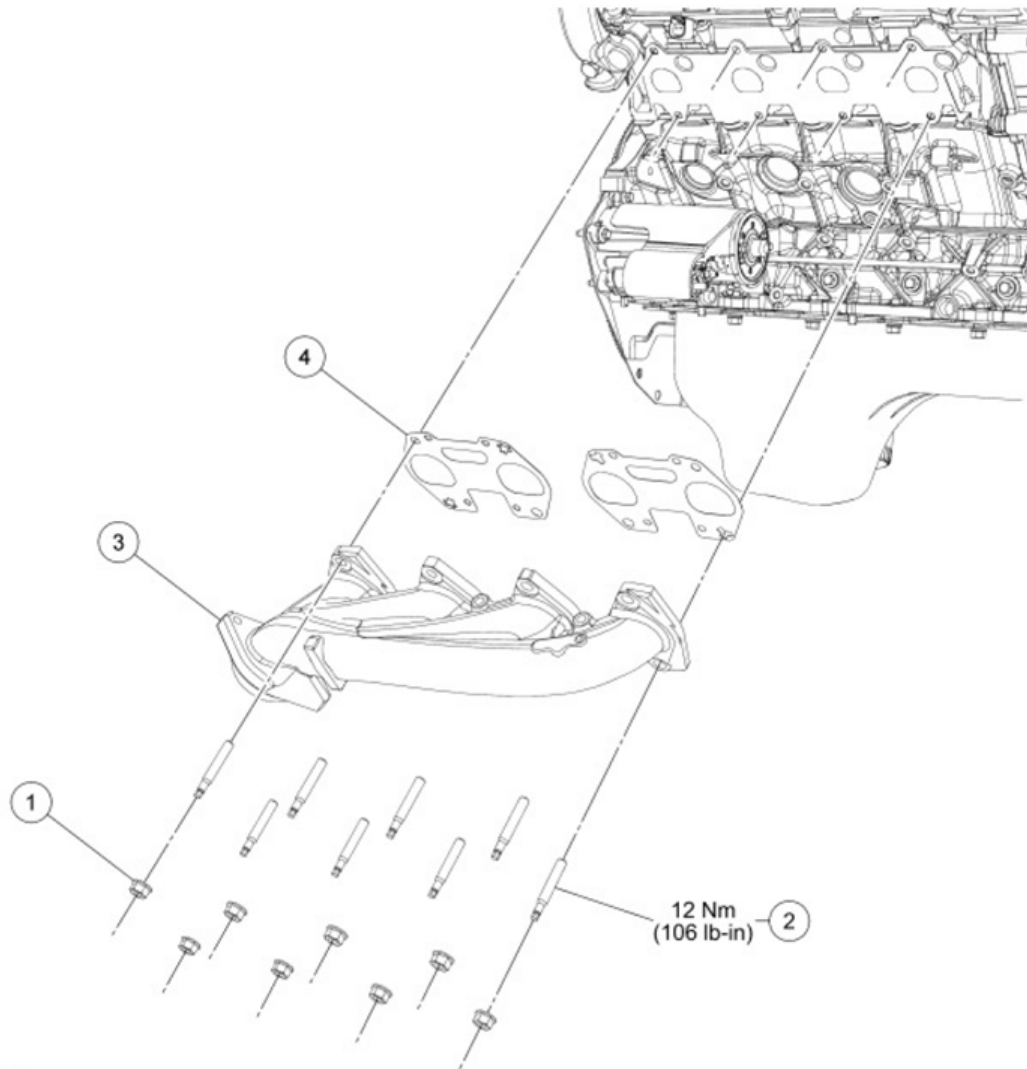
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2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Item	Part Number	Description
1	W705443	RH exhaust Y-pipe flange nut (2 required)
2	5F250	RH exhaust Y-pipe flange
3	W705443	LH exhaust Y-pipe flange nut (2 required)
4	5F250	LH exhaust Y-pipe flange

RH Exhaust Manifold Nuts, Studs, Exhaust Manifold and Gaskets



N0088539

Fig. 201: Identifying RH Exhaust Manifold Nuts, Studs, Exhaust Manifold And Gaskets With Torque Specifications

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	W701706	Exhaust manifold nut (8 required)

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2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

2	W701706	Exhaust manifold-to-cylinder head stud (8 required)
3	9430	Exhaust manifold
4	9Y431	Exhaust manifold gasket (2 required)

Removal

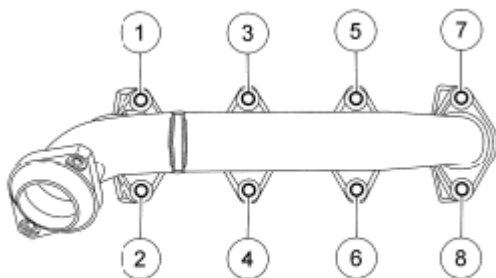
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the RH engine support insulator. For additional information, refer to **ENGINE SUPPORT INSULATORS**.
3. Remove the RH inner fenderwell. For additional information, refer to **FRONT END BODY PANELS**.
4. Remove the 4 exhaust Y-pipe flange nuts.
5. Remove the 8 nuts, 8 exhaust manifold-to-cylinder head studs and the exhaust manifold.
 - Discard the 8 nuts and the 8 studs.

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. Remove and discard the exhaust manifold gaskets.
 - Clean the sealing surfaces with metal surface prep. Follow the directions on the packaging.
7. Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

1. Install 8 new exhaust manifold-to-cylinder head studs.
 - Tighten to 12 Nm (106 lb-in).
2. Using new exhaust manifold gaskets, position the gaskets and the exhaust manifold and install 8 new exhaust manifold nuts.
 - Tighten to 25 Nm (18 lb-ft) in the sequence shown in illustration.



N0008433

Fig. 202: Identifying Exhaust Manifold Bolts Tighten Sequence

Courtesy of FORD MOTOR CO.

3. Install the RH inner fenderwell. For additional information, refer to **FRONT END BODY PANELS**.
4. Install the RH engine support insulator. For additional information, refer to **ENGINE SUPPORT INSULATORS**.
5. Install the 4 exhaust Y-pipe flange nuts.
 - Tighten to 40 Nm (30 lb-ft).

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

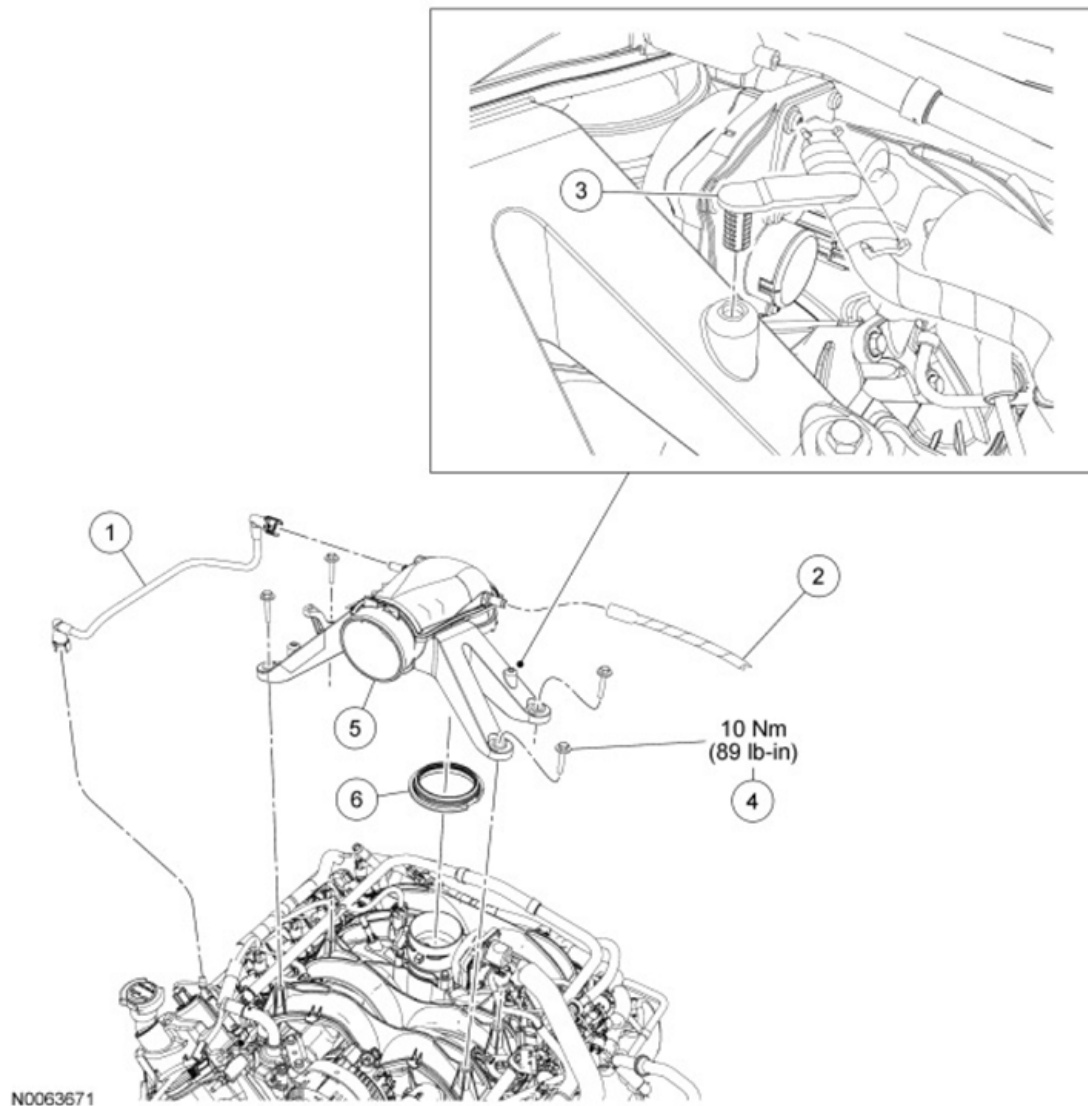


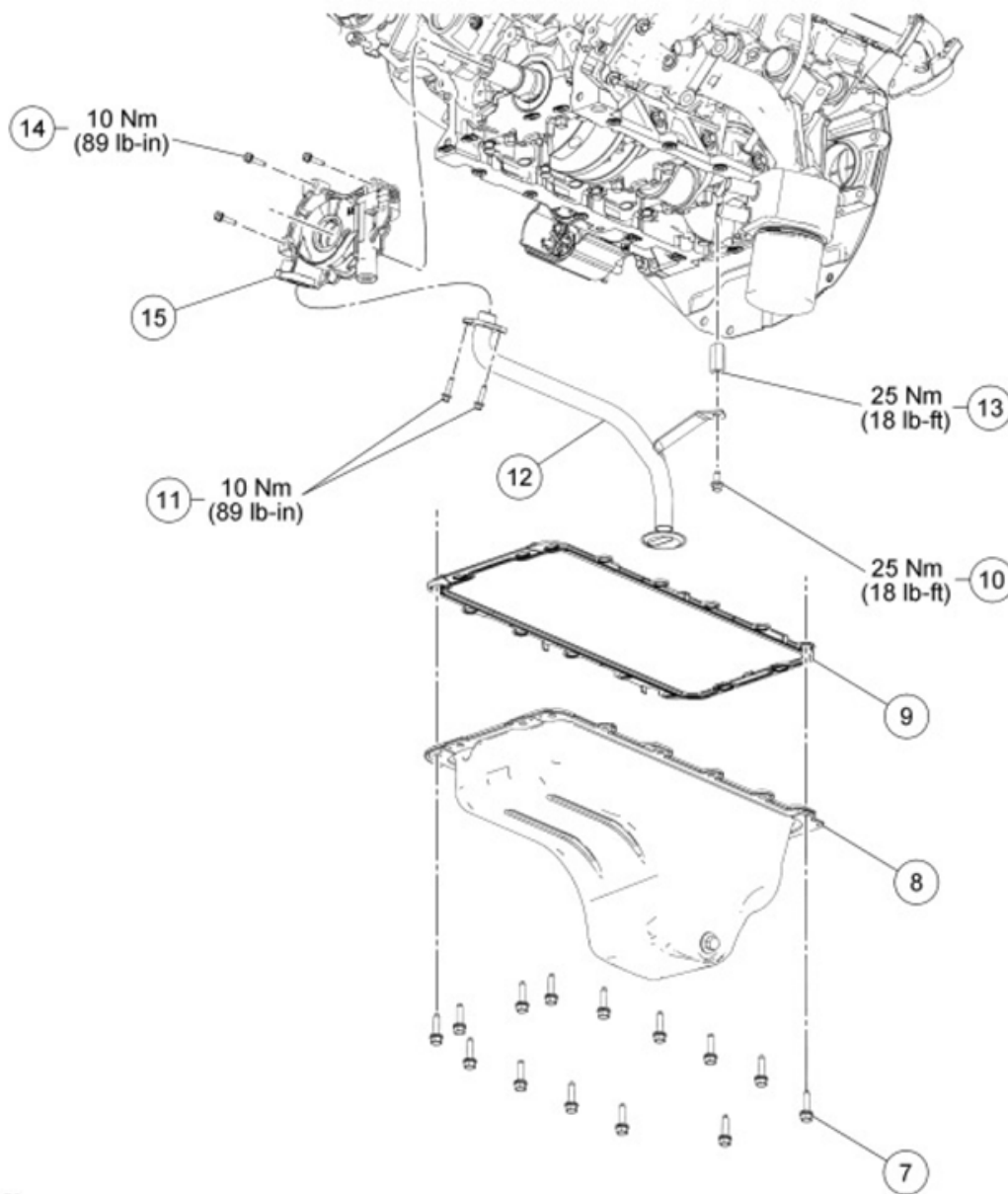
Fig. 203: Exploded View Of Engine Lubrication Components With Torque Specifications (1 Of 2)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Item	Part Number	Description
1	6758	Crankcase ventilation tube
2	-	Vacuum hose (part of 9D446)
3	-	Engine wiring harness retainer (part of 12B637)
4	W713555	Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) adapter bolt (4 required)
5	9A589	ACL outlet pipe-to- TB adapter
6	9B694	ACL outlet pipe-to- TB adapter seal (part of 9A589)



N0067153

Fig. 204: Exploded View Of Engine Lubrication Components With Torque Specifications (2 Of 2)
Courtesy of FORD MOTOR CO.

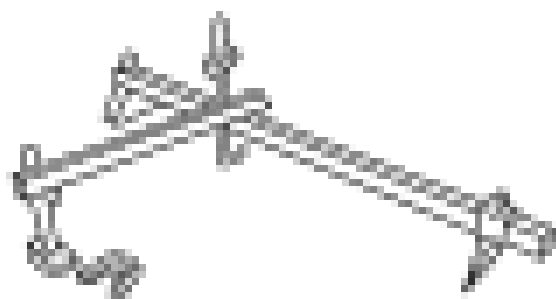
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

ITEM DESCRIPTION

Item	Part Number	Description
7	W701605	Oil pan bolt (16 required)
8	6675	Oil pan
9	6710	Oil pan gasket
10	N605904	Oil pump screen and pickup tube-to-spacer bolt
11	N806155	Oil pump screen and pickup tube-to-oil pump bolts (2 required)
12	6622	Oil pump screen and pickup tube
13	N806180	Oil pump screen and pickup tube spacer
14	N806183	Oil pump bolt (3 required)
15	6621	Oil pump

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

OIL PAN**Special Tool(s)****SPECIAL TOOL REFERENCE****ST2176-B**Support Bar, Engine
303-F070

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



Support Bracket, Engine
303-639

Support Hook
303-F071

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



Material

ITEM SPECIFICATION

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
Silicone Gasket and Sealant TA-30	WSE-M4G323- A4
Motorcraft® Silicone Gasket Remover ZC-30	-

Removal

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
3. Remove the engine cooling fan. For additional information, refer to **ENGINE COOLING** .
4. Disconnect the crankcase vent tube quick connect coupling from the Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) adapter. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
5. Disconnect the vacuum hose from the ACL outlet pipe-to- TB adapter.
6. Disconnect the wiring harness retainer from the ACL outlet pipe-to- TB adapter.
7. Remove the 4 ACL outlet pipe-to- TB adapter bolts.
8. Remove the ACL outlet pipe-to- TB adapter.
9. Install the Engine Support Bar, Support Hook and Engine Support Bracket.

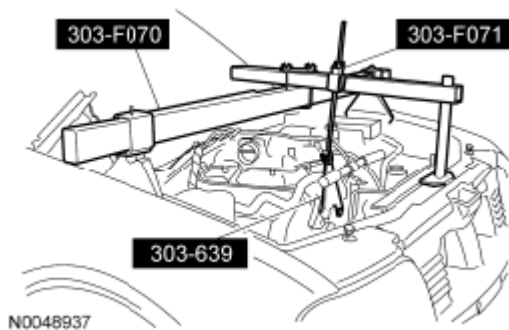


Fig. 205: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

10. Drain the engine oil.
11. Remove and discard the engine oil filter.

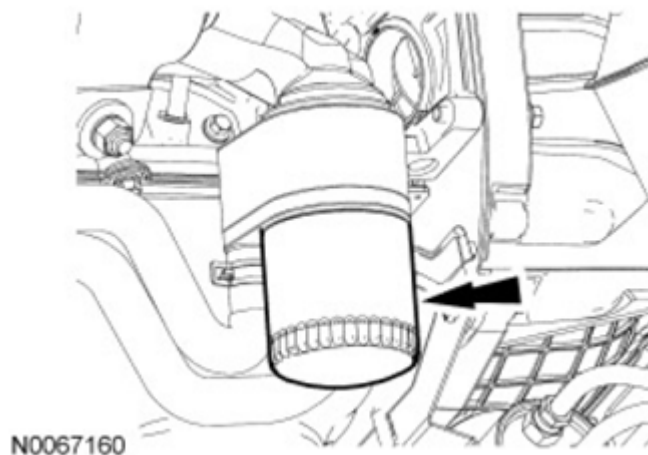


Fig. 206: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

NOTE: If metal foreign material is present in the oil cooler, mechanical concerns exist. To diagnose mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

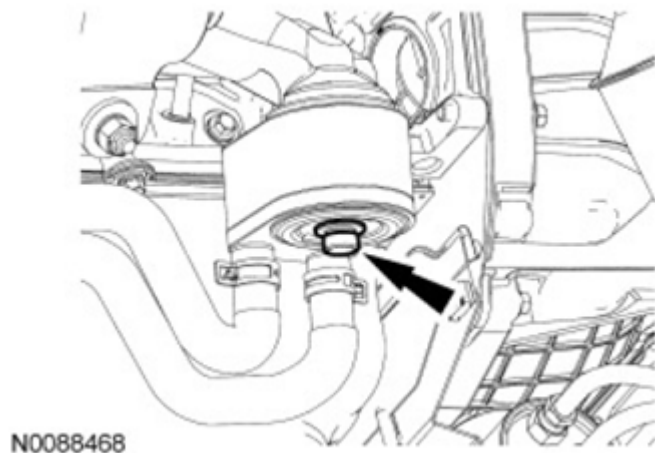


Fig. 207: Locating Oil Cooler
Courtesy of FORD MOTOR CO.

12. Remove the threaded shaft and position the oil cooler aside. Inspect the engine oil cooler.
13. Press the position retaining tabs and rotate the lower cooling fan shroud upward until the position retainer tab locks into position.

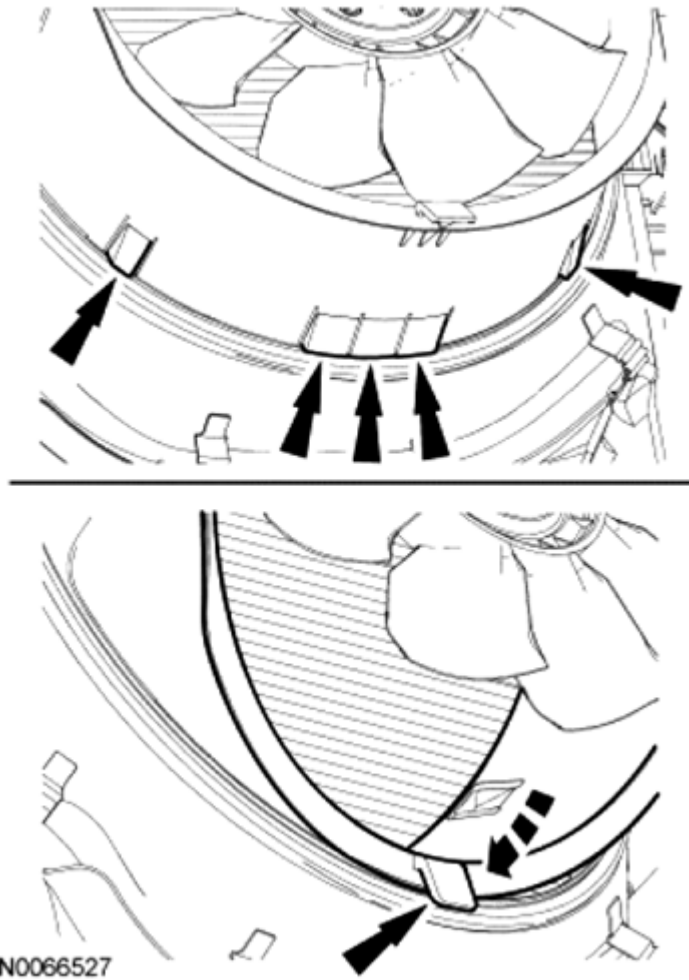


Fig. 208: Positioning Retainer Tab Locks
Courtesy of FORD MOTOR CO.

14. Remove the nut, the transmission auxiliary fluid cooler tube support bracket and the starter wiring harness support bracket from the engine front cover stud bolt.

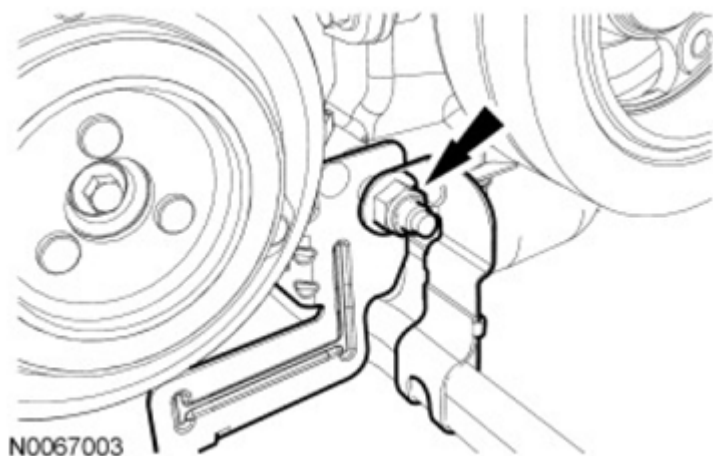


Fig. 209: Locating Engine Front Cover Stud Bolt
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

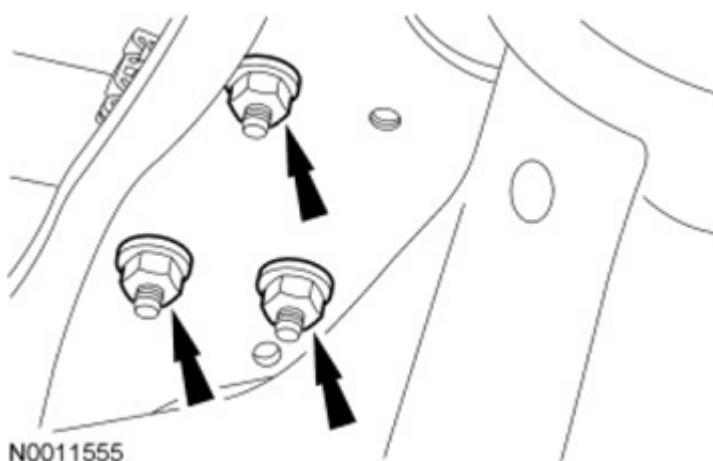


Fig. 210: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

15. Remove and discard the 7 engine support insulator-to-crossmember nuts.
16. Using the Engine Support Bar, Support Hook and Engine Support Bracket, raise the engine assembly.

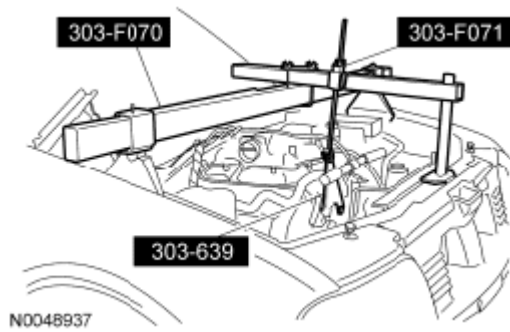


Fig. 211: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

Automatic transmission equipped vehicles

17. Remove the 2 bolts and the flexplate inspection cover.

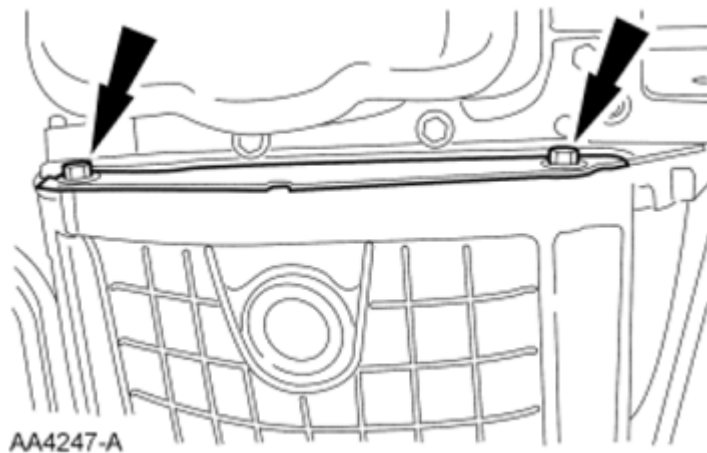


Fig. 212: Locating Flexplate Inspection Cover And Bolts
Courtesy of FORD MOTOR CO.

All vehicles

18. Remove 16 oil pan bolts and position the oil pan onto the crossmember.
19. Remove the 3 bolts and position the oil pump screen and pickup tube into the oil pan.

Automatic transmission equipped vehicles

20. Remove the oil pan and the oil pump screen and pick tube.
 - Inspect the oil pan gasket for damage.
 - Discard the oil pan gasket.
 - Discard the oil pump screen and pickup tube O-ring seal.

Manual transmission equipped vehicles

21. Position the oil pan onto the engine and install one bolt at the front and one bolt at the rear of the oil pan to hold it in position.
22. Using the Engine Support Bar, Support Hook and Engine Support Bracket, align the engine support insulator studs and lower the engine.

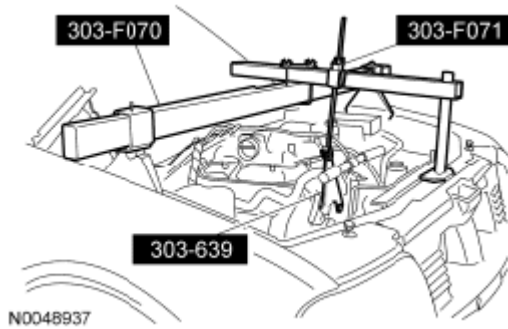


Fig. 213: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

23. Remove the flywheel. For additional information, refer to **FLYWHEEL**.
24. Remove the rear engine cover.
25. Remove the 2 bolts, the oil pan and the oil pump screen and pickup tube.
 - Inspect the oil pan gasket for damage.
 - Discard the oil pan gasket.
 - Discard the oil pump screen and pickup tube O-ring seal.

Installation

All vehicles

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

1. Inspect the oil pan. Clean the mating surface for the oil pan with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
2. Install a new O-ring seal onto the oil pump screen and pickup tube.
3. Position the oil pump screen and pickup tube in the oil pan and position the oil pan and new gasket into the vehicle.

Manual transmission equipped vehicles

4. Install the rear engine cover.

5. Install the flywheel. For additional information, refer to **FLYWHEEL**.
6. Using the Engine Support Bar, Support Hook and Engine Support Bracket, raise the engine.

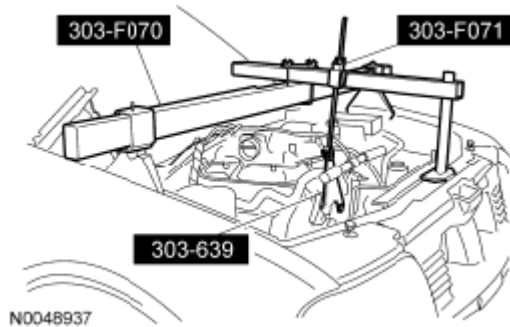


Fig. 214: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

All vehicles

NOTE: Make sure to install a new O-ring seal. A missing or damaged O-ring seal can cause foam in the lubrication system and low oil pressure. Failure to follow this instruction may result in engine damage.

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

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

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

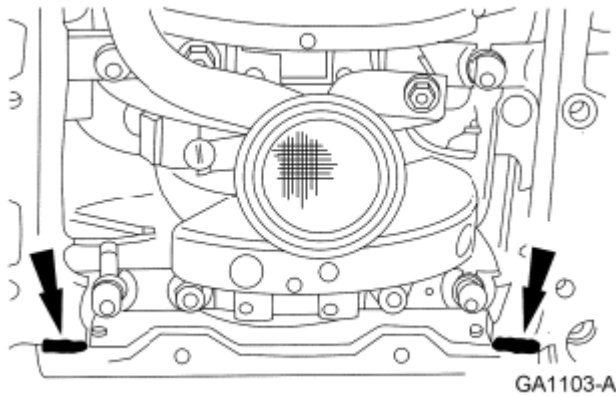


Fig. 215: Locating Crankshaft Rear Seal Retainer Plate-To-Cylinder Block Sealing Surface
Courtesy of FORD MOTOR CO.

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

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

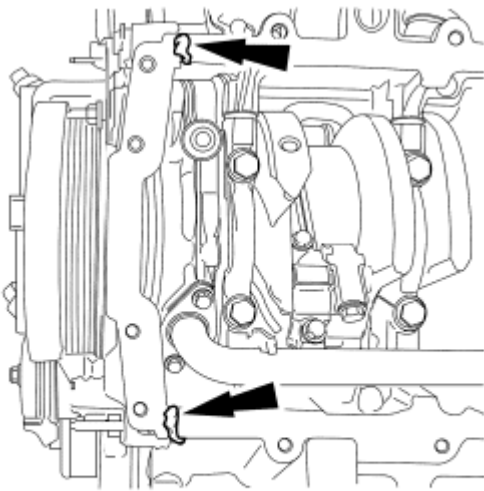


Fig. 216: Applying Silicone Gasket And Sealant At Engine Front Cover-To-Cylinder Block Sealing Surface
Courtesy of FORD MOTOR CO.

9. Apply silicone gasket and sealant at the engine front cover-to-cylinder block sealing surface.

10. Position the oil pan gasket and the oil pan and loosely install the 16 bolts.
11. Tighten the bolts in 3 stages, in the sequence shown in illustration.
 - Stage 1: Tighten to 2 Nm (18 lb-in).
 - Stage 2: Tighten to 20 Nm (177 lb-in).
 - Stage 3: Tighten an additional 60 degrees.

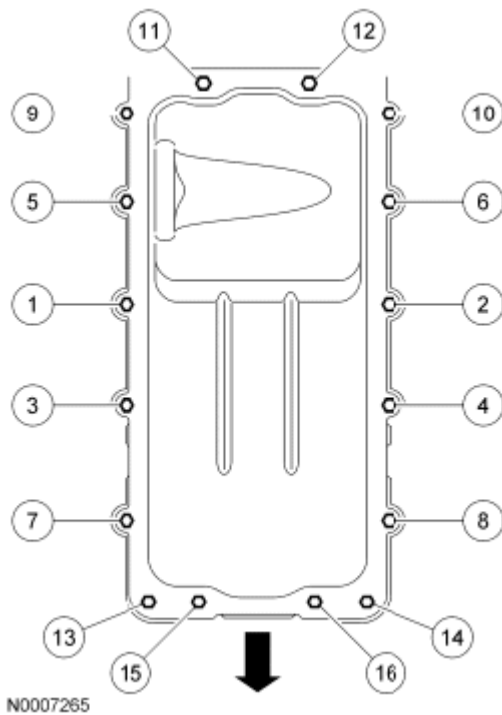


Fig. 217: Identifying Oil Pan Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

Automatic transmission equipped vehicles

12. Position the flexplate inspection cover and install the 2 bolts.
 - Tighten to 34 Nm (25 lb-ft).

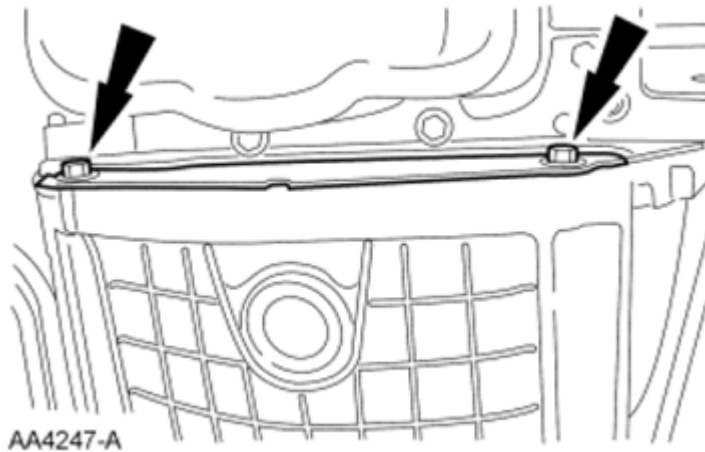


Fig. 218: Locating Flexplate Inspection Cover And Bolts
Courtesy of FORD MOTOR CO.

All vehicles

13. Using the Engine Support Bar, Support Hook and Engine Support Bracket, align the engine support insulator studs and lower the engine.

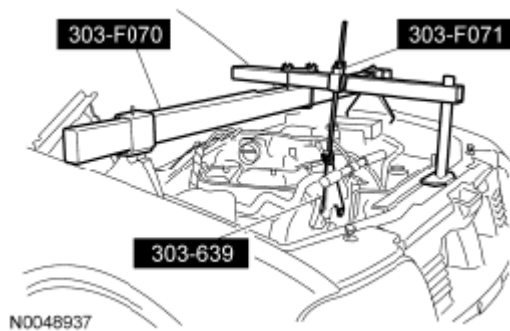


Fig. 219: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools when installing the engine support insulator nuts or damage to the engine support insulator may occur.

14. Install 4 new RH engine support insulator nuts.
 - Tighten to 115 Nm (85 lb-ft).

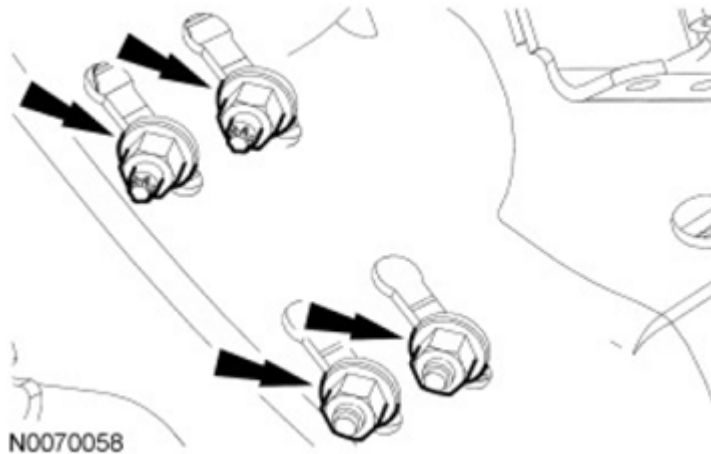


Fig. 220: Locating RH Engine Support Insulator Nuts
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools when installing the engine support insulator nuts or damage to the engine support insulator may occur.

15. Install 3 new LH engine support insulator nuts.
 - Tighten to 200 Nm (148 lb-ft).

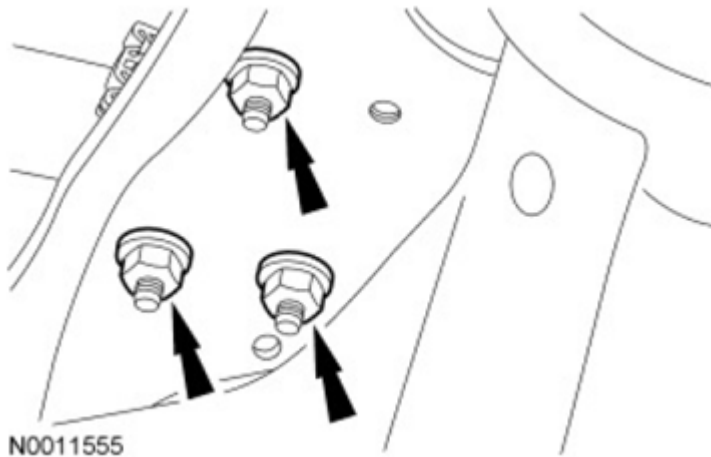


Fig. 221: Locating Engine Mount Nuts
Courtesy of FORD MOTOR CO.

16. Position the transmission auxiliary fluid cooler tube support bracket and the starter wiring harness support bracket onto the engine front cover stud bolt and install the nut.
 - Tighten to 25 Nm (18 lb-ft).

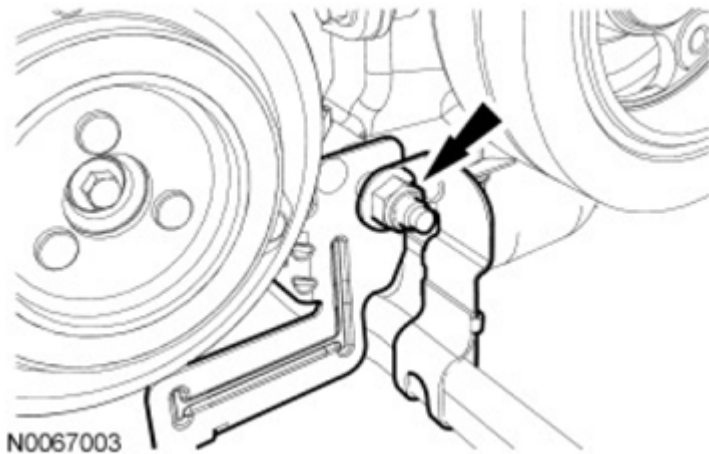


Fig. 222: Locating Engine Front Cover Stud Bolt
Courtesy of FORD MOTOR CO.

17. Press the position retaining tab and rotate the lower cooling fan downward until the position retainer tab locks into position.
18. Position the oil cooler and install the threaded shaft.
 - Tighten to 58 Nm (43 lb-ft).

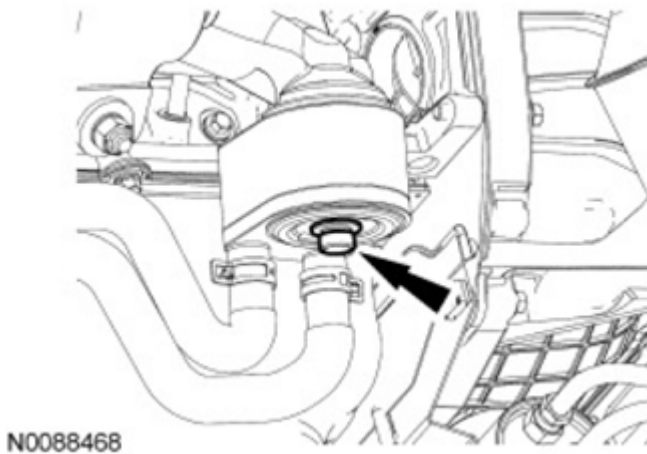


Fig. 223: Locating Oil Cooler And Threaded Shaft
Courtesy of FORD MOTOR CO.

19. Install a new engine oil filter.
 - Tighten to 16 Nm (142 lb-in).

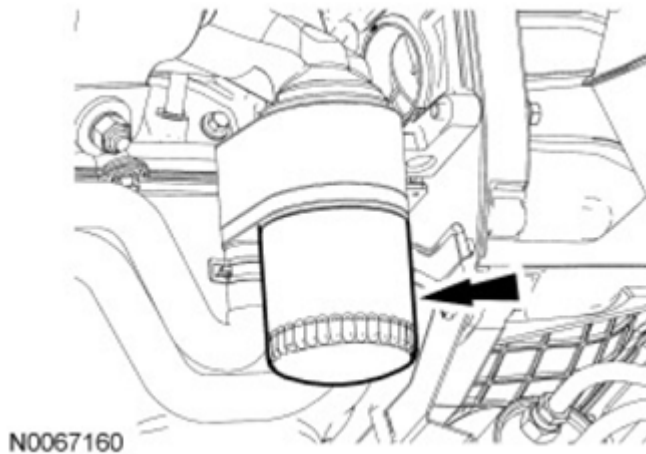


Fig. 224: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

20. Install the **ACL** outlet pipe-to- **TB** adapter.
21. Install the 4 **ACL** outlet pipe-to- **TB** adapter bolts.
 - Tighten to 10 Nm (89 lb-in).
22. Connect the wiring harness retainer to the **ACL** outlet pipe-to- **TB** adapter.
23. Connect the vacuum hose to the **ACL** outlet pipe-to- **TB** adapter.
24. Connect the crankcase vent tube quick connect coupling to the **ACL** outlet pipe-to- **TB** adapter. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
25. Install the engine cooling fan. For additional information, refer to **ENGINE COOLING** .
26. Install the generator. For additional information, refer to **CHARGING SYSTEM** .
27. Fill the crankcase with clean engine oil.

OIL PUMP

Material

ITEM SPECIFICATION

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. Remove the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.

2. Remove the oil pan. For additional information, refer to **OIL PAN**.
3. Remove the 3 bolts and the oil pump.

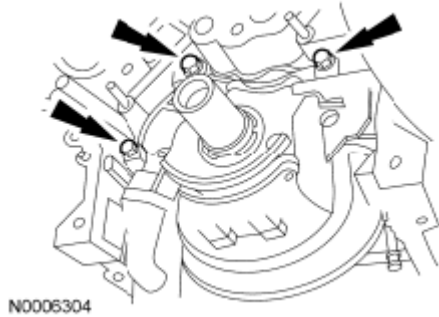


Fig. 225: Locating Oil Pump And Bolts
Courtesy of FORD MOTOR CO.

Installation

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

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



Fig. 226: Locating Oil Pump And Bolts
Courtesy of FORD MOTOR CO.

3. Install the oil pan. For additional information, refer to **OIL PAN**.
4. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.

OIL PUMP SCREEN AND PICKUP TUBE

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Removal and Installation

1. Remove the oil pan. For additional information, refer to **OIL PAN**.

OIL COOLER

Material

ITEM SPECIFICATION

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

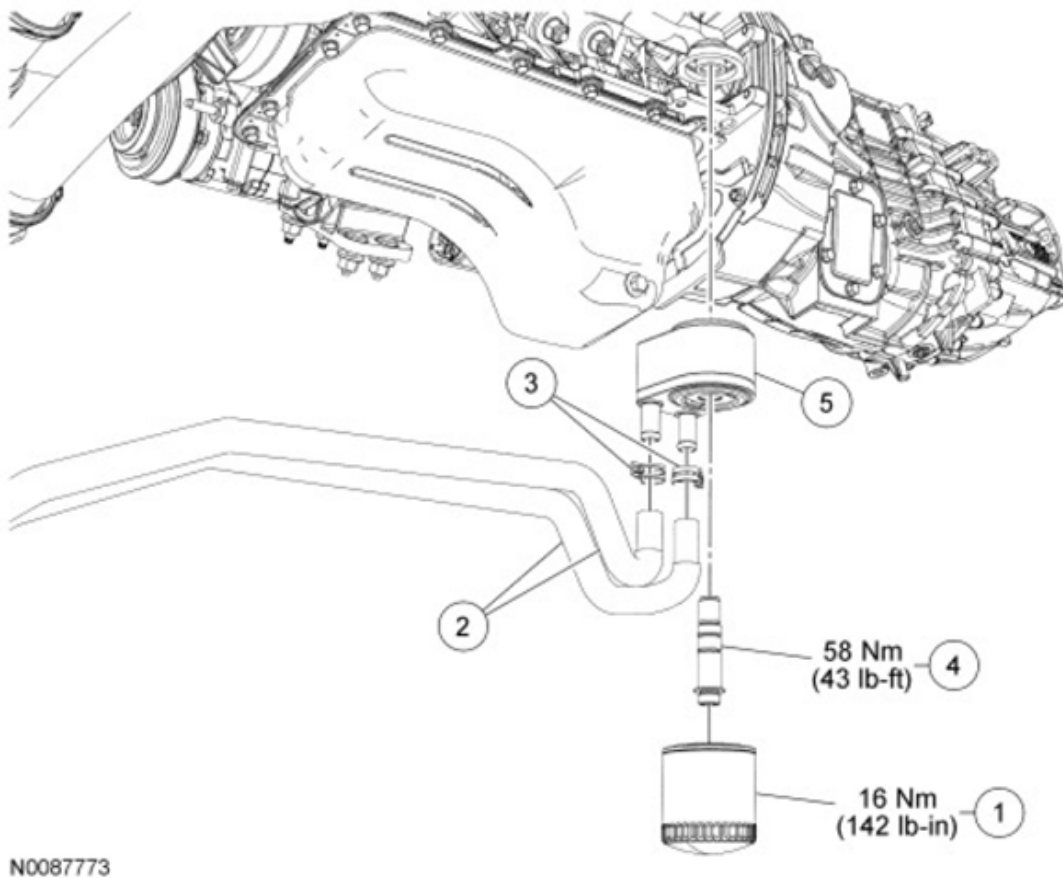


Fig. 227: Identifying Oil Cooler Components With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6714	Oil filter
2	-	Oil cooler coolant hoses

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

3	-	Oil cooler coolant hose clamps
4	62626	Oil cooler threaded shaft
5	6A642	Oil cooler

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Drain the engine cooling system. For additional information, refer to **ENGINE COOLING**.
3. Remove and discard the oil filter.
 - To install, tighten to 16 Nm (142 lb-in).
4. Disconnect the oil cooler coolant hoses and position aside.

NOTE: If metal foreign material is present in the oil cooler, mechanical concerns exist. To diagnose mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

5. Remove the threaded shaft and the oil cooler. Inspect the engine oil cooler.
 - To install, tighten to 58 Nm (43 lb-ft).
6. To install, reverse the removal procedure.

OIL FILTER ADAPTER

Material

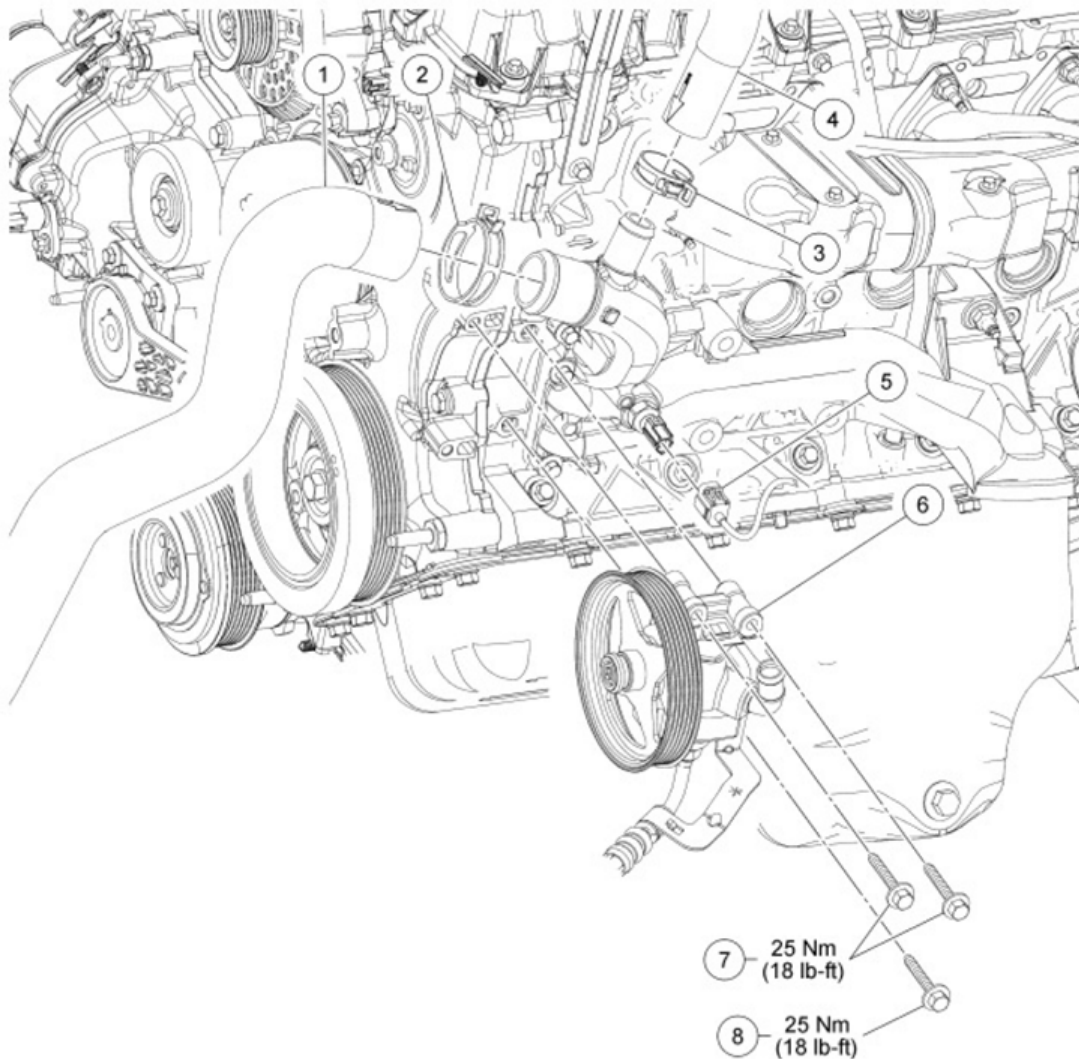
ITEM SPECIFICATION

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

Lower Radiator Hose, Degas Bottle Coolant Hose, Engine Oil Pressure (EOP) Switch Electrical Connector and Power Steering Pump

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



N0070059

Fig. 228: Identifying Oil Filter Adapter Components With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	8B273	Lower radiator hose
2	15161	Lower radiator hose clamp
3	12B637	Degas bottle coolant hose clamp
4	8B273	Degas bottle coolant hose
5	-	Engine Oil Pressure (EOP) switch electrical connector (part of 12B637)
6	3A696	Power steering pump
7	W500315	Power steering pump bolts (2 required)
8	W701526	Power steering pump bolt

Oil Filter Adapter and Gasket

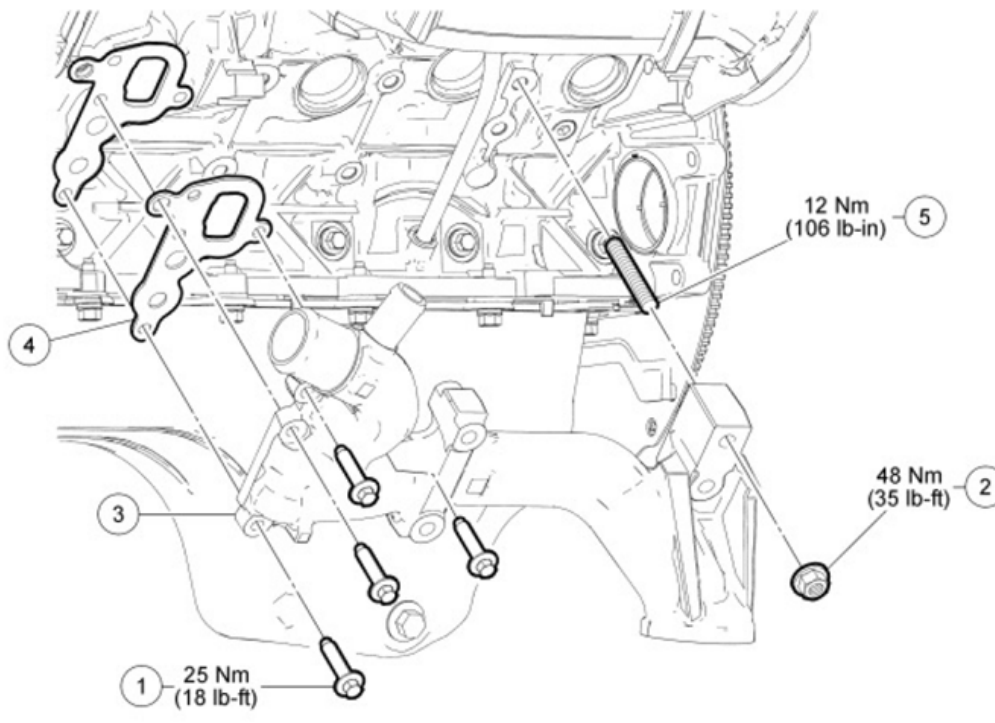


Fig. 229: Identifying Oil Filter Adapter And Gasket With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	N806156	Oil filter adapter bolt (4 required)
2	N620482	Oil filter adapter nut
3	6884	Oil filter adapter
4	6A636	Oil filter adapter gasket
5	W712913	Oil filter adapter stud

Removal and Installation

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Remove the LH engine mount. For additional information, refer to **ENGINE SUPPORT INSULATORS**.
3. Remove the 3 bolts and position the power steering pump assembly aside.
 - To install, tighten to 25 Nm (18 lb-ft).
4. Disconnect the lower radiator hose from the oil filter adapter and position it aside.
5. Disconnect the degas bottle hose from the oil filter adapter and position it aside.
6. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
7. Remove the **EOP** switch.

- To install, tighten to 18 Nm (159 lb-in).

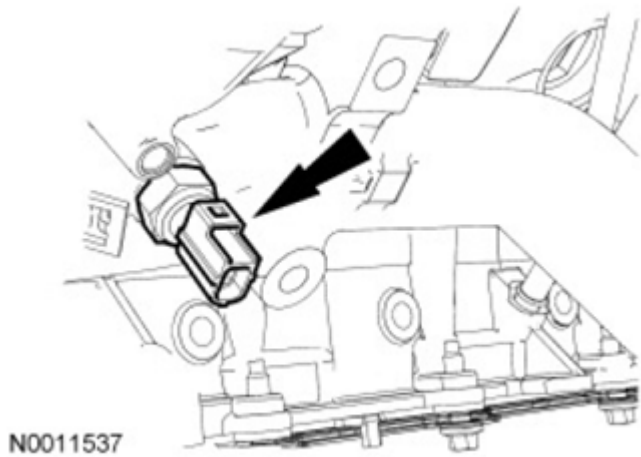


Fig. 230: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

8. Remove the oil filter adapter nut.
 - To install, tighten to 48 Nm (35 lb-ft).
9. Remove the 4 bolts and the oil filter adapter.
 - To install, tighten to 25 Nm (18 lb-ft).

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

10. Remove and discard the oil filter adapter gasket. Clean the sealing surfaces with silicone gasket remover and metal surface prep. Follow the directions on the packaging. Inspect the mating surfaces.
11. To install, reverse the removal procedure.

ENGINE OIL PRESSURE (EOP) SWITCH

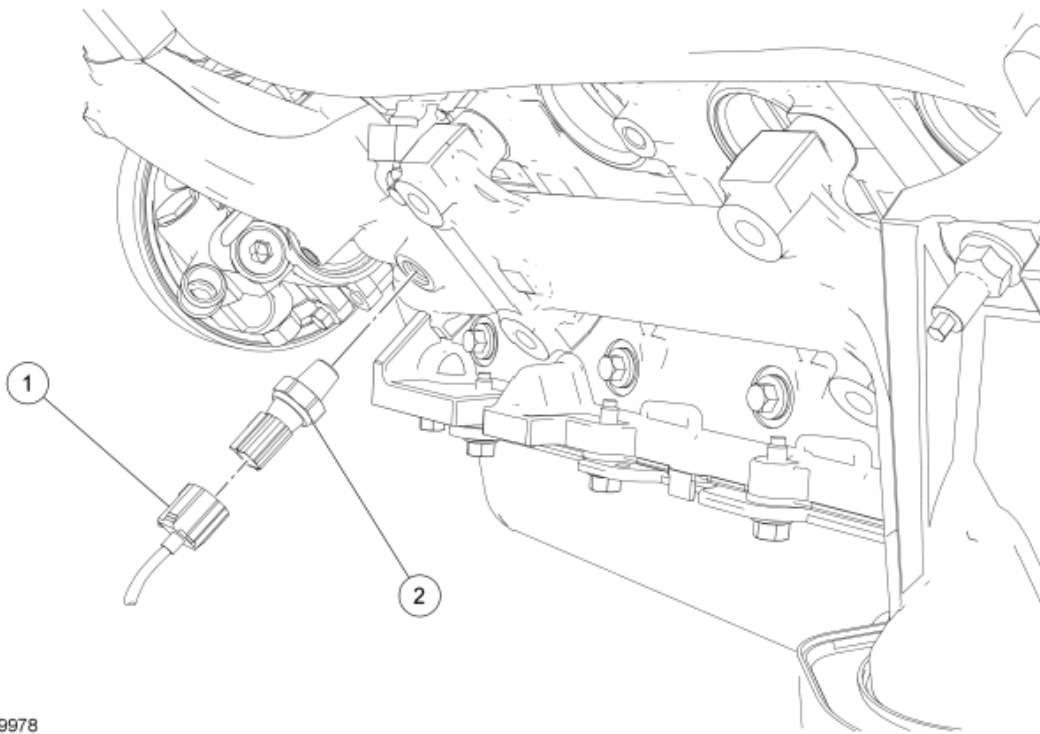


Fig. 231: Identifying Engine Oil Pressure Switch Electrical Connector And EOP Switch
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	-	Engine Oil Pressure (EOP) switch electrical connector (part of 12C508)
2	9278	EOP switch

Removal

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
3. Remove the **EOP** switch.

Installation

1. Install the **EOP** switch and tighten in 2 stages.
 - Stage 1: Tighten to 14 Nm (125 lb-in).
 - Stage 2: Tighten an additional 180 degrees.
2. Connect the **EOP** switch electrical connector.

OIL LEVEL INDICATOR AND TUBE

Material

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

ITEM SPECIFICATION

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

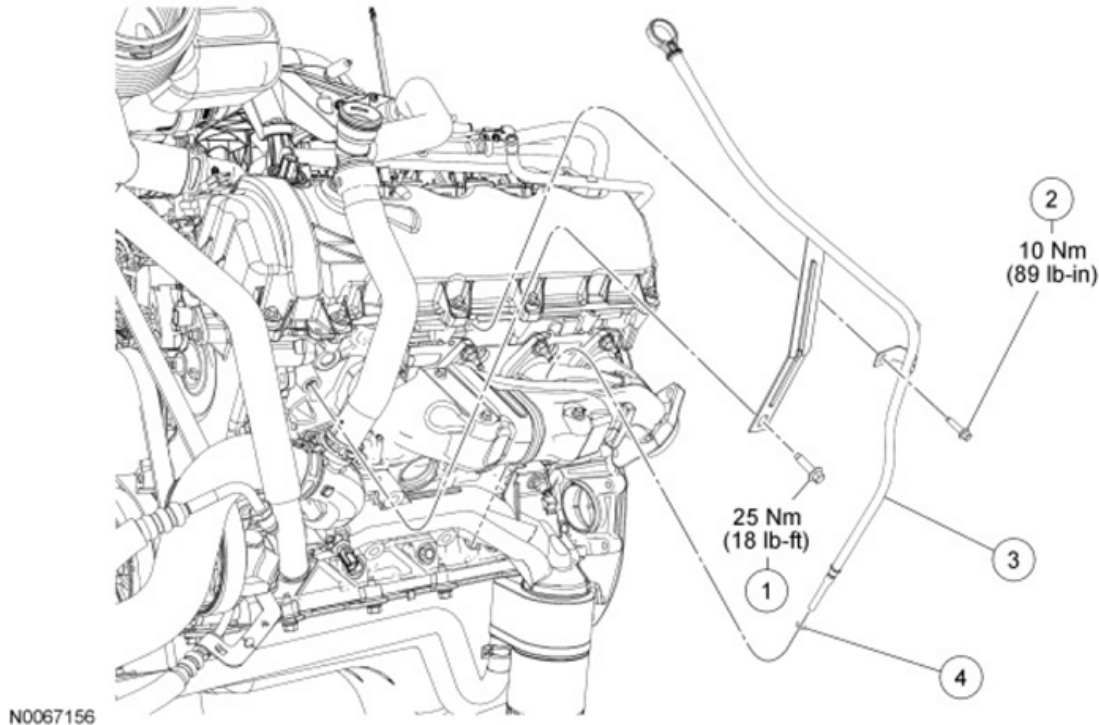


Fig. 232: Identifying Oil Level Indicator And Tube With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	W500224	Oil level indicator and tube bolt
2	N605892	Rear oil level indicator and tube bolt
3	6K873	Oil level indicator and tube
4	-	Oil level indicator tube O-ring seal

Removal and Installation

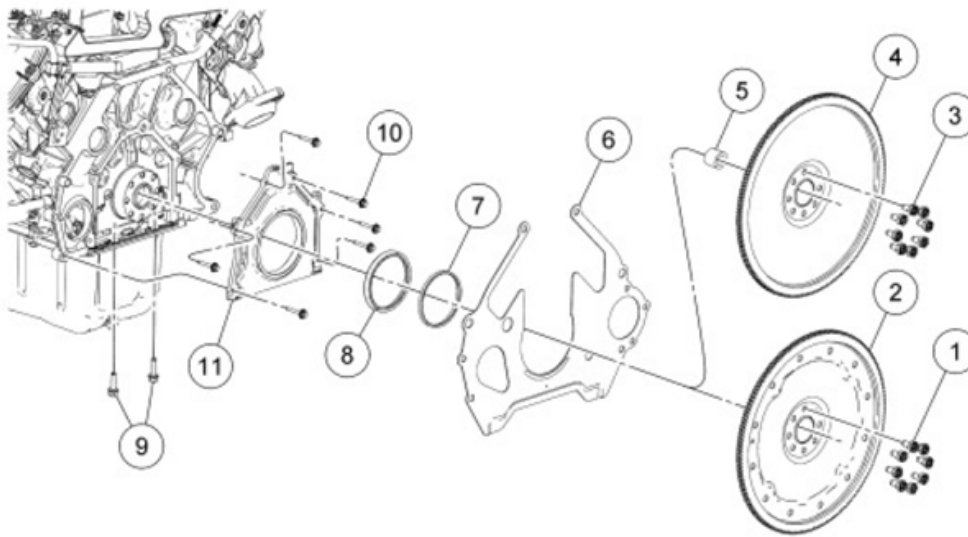
1. Remove the front oil level indicator and tube bolt.
 - To install, tighten to 25 Nm (18 lb-ft).
2. Remove the rear oil level indicator and tube bolt.
 - To install, tighten to 10 Nm (89 lb-in).
3. Remove the oil level indicator and tube from the cylinder block.

- Discard the O-ring seal.

NOTE: Lubricate the new oil level indicator tube O-ring seal with clean engine oil prior to installation.

- To install, reverse the removal procedure.

FLEXPLATE OR FLYWHEEL AND CRANKSHAFT REAR SEAL - EXPLODED VIEW



N0105859

Fig. 233: Exploded View Of Flexplate, Flywheel And Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

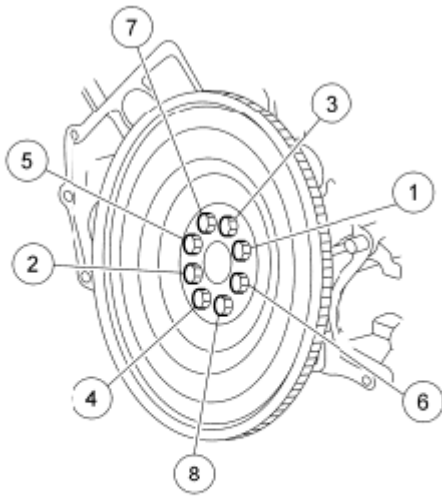
Item	Part Number	Description
1	N806168	Flexplate bolt (automatic transmission) (8 required)
2	6375	Flexplate (automatic transmission)
3	N808139	Flywheel bolt (manual transmission) (8 required)
4	6375	Flywheel (manual transmission)
5	7120	Manual transmission input pilot bearing
6	6A373	Rear cover plate
7	6310	Crankshaft oil slinger
8	6701	Crankshaft rear seal
9	W701605	Oil pan bolts (2 required)
10	N806155	Crankshaft rear seal retainer plate bolt (6 required)
11	6K318	Crankshaft rear seal retainer plate

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

FLEXPLATE

Removal and Installation

1. Remove the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - TORQSHIFT** .
2. Remove the 8 bolts and the flexplate.
 - To install, tighten to 80 Nm (59 lb-ft) in the sequence shown in illustration.



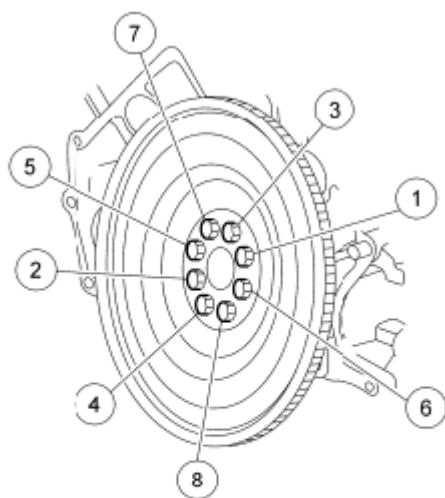
N0010329

Fig. 234: Identifying Flexplate Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

3. To install, reverse the removal procedure.

FLYWHEEL**Removal and Installation**

1. Remove the clutch and pressure plate. For additional information, refer to **CLUTCH** .
2. Remove the 8 bolts and the flywheel.
 - To install, tighten to 80 Nm (59 lb-ft) in the sequence shown in illustration.



N0010329

Fig. 235: Identifying Flexplate Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

3. To install, reverse the removal procedure.

CRANKSHAFT REAR SEAL

Special Tool(s)

SPECIAL TOOL REFERENCE

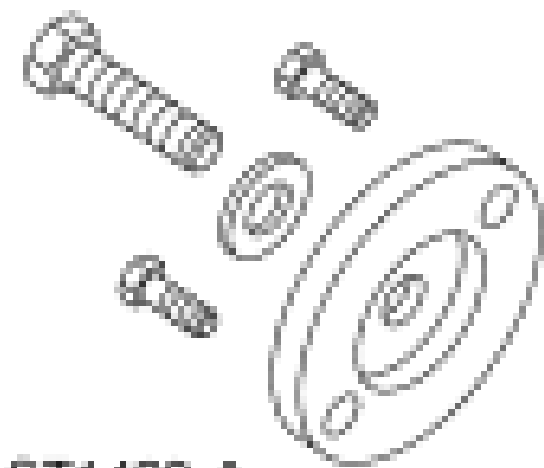


ST147B-A

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



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

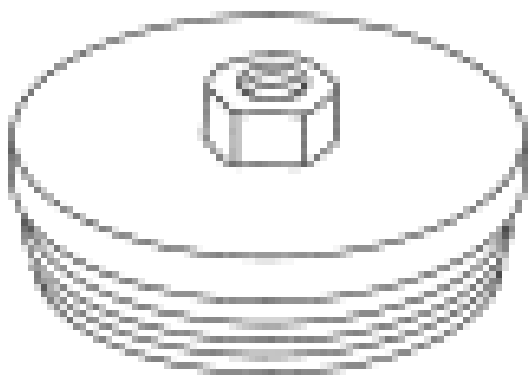


Installer, Crankshaft Rear Oil Slinger
303-517 (T95P-6701-CH)

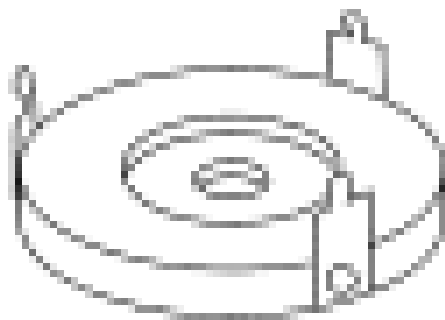
Remover, Crankshaft Rear Oil Seal
303-519 (T95P-6701-EH)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1382-A



ST1481-A

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

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1185-A

Material

ITEM SPECIFICATION

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

Removal

1. Remove the flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL**.
2. Remove the engine rear cover plate.
3. Using the Slide Hammer and the Crankshaft Rear Oil Slinger Remover, remove and discard the crankshaft oil slinger.

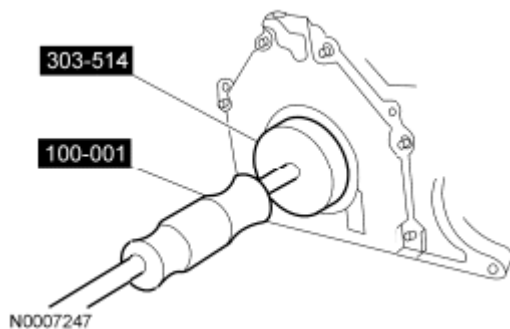


Fig. 236: Removing Crankshaft Rear Oil Seal Slinger Using Special Tools
Courtesy of FORD MOTOR CO.

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

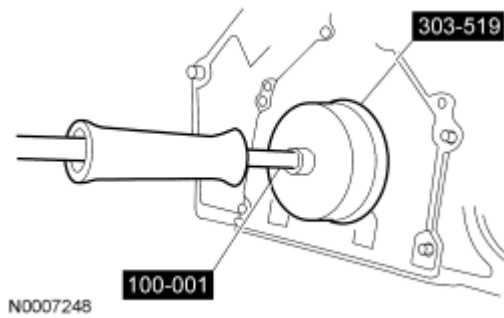


Fig. 237: Removing Crankshaft Rear Seal Using Special Tools
Courtesy of FORD MOTOR CO.

Installation

NOTE: Lubricate the crankshaft rear seal with clean engine oil prior to installation.

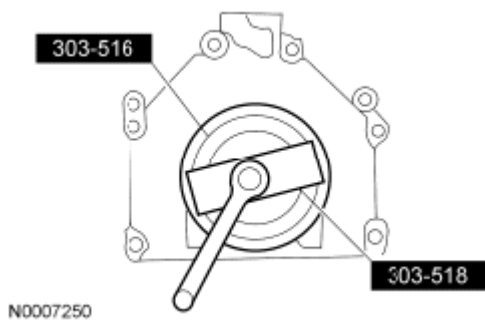


Fig. 238: Installing Crankshaft Rear Oil Seal Using Special Tools
Courtesy of FORD MOTOR CO.

1. Using the Crankshaft Rear Oil Seal Installers, install a new crankshaft rear seal.

NOTE: Lubricate the crankshaft oil slinger with clean engine oil prior to installation.

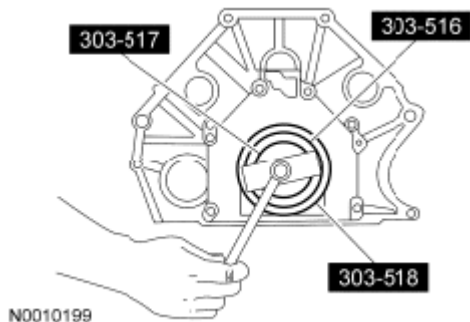


Fig. 239: Installing Crankshaft Rear Oil Slinger Using Special Tools
Courtesy of FORD MOTOR CO.

2010 Ford Pickup F150

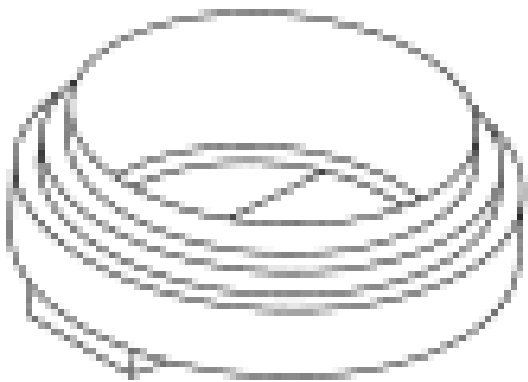
2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

2. Using the Crankshaft Rear Oil Seal Installers and the Crankshaft Rear Oil Slinger Installer, install a new crankshaft oil slinger.
3. Install the engine rear cover plate.
4. Install the flexplate or flywheel. For additional information, refer to **FLEXPLATE** or **FLYWHEEL**.

CRANKSHAFT REAR SEAL WITH RETAINER PLATE

Special Tool(s)

SPECIAL TOOL REFERENCE



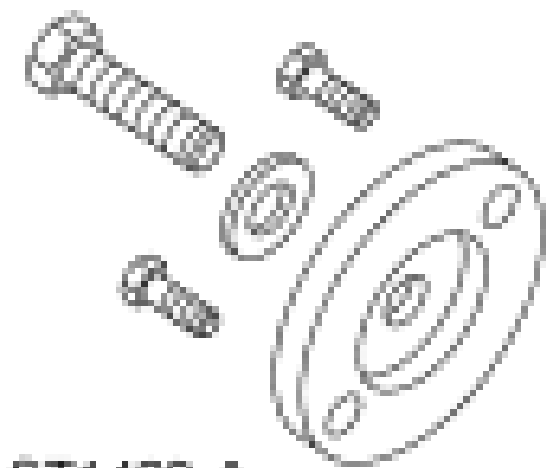
ST1479-A

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

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1480-A



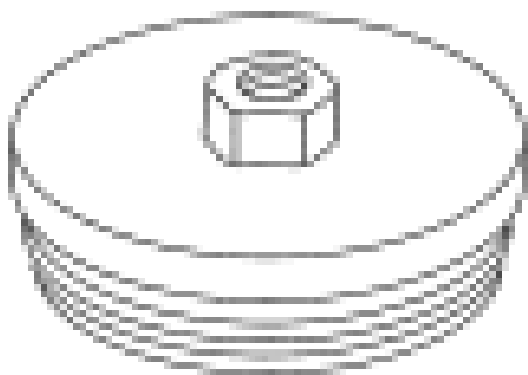
ST1482-A

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

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1382-A



ST1481-A

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

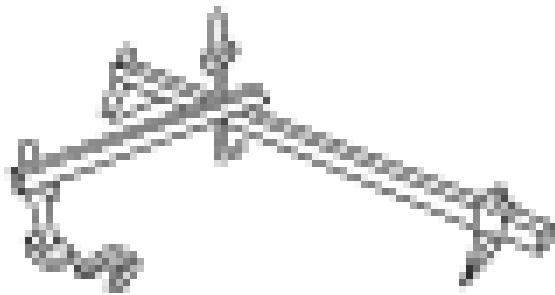
Slide Hammer
100-001 (T50T-100-A)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1185-A



ST2176-B

Support Bar, Engine
303-F070

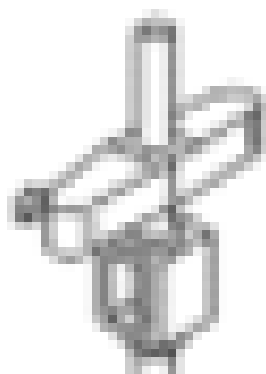
Support Bracket, Engine
303-639

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2592-A



Support Hook
303-F071

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Material

ITEM SPECIFICATION

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
Silicone Gasket and Sealant TA-30	WSE-M4G323- A4
Motorcraft® Silicone Gasket Remover ZC-30	-

Removal

Manual transmission equipped vehicles

1. Remove the oil pan. For additional information, refer to **OIL PAN**.

Automatic transmission equipped vehicles

2. Remove the oil pan. For additional information, refer to **OIL PAN**.
3. Using the Engine Support Bar, Support Hook and Engine Support Bracket, align the engine support insulator studs and lower the engine.

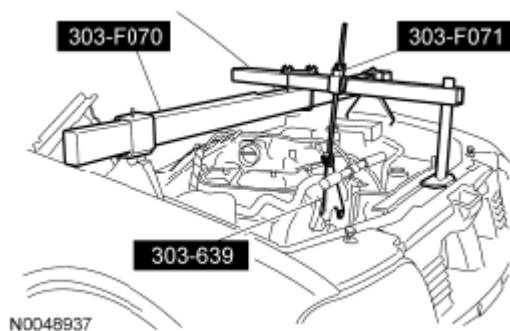


Fig. 240: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

4. Remove the flexplate. For additional information, refer to **FLEXPLATE**.
5. Remove the rear engine cover.

All vehicles

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

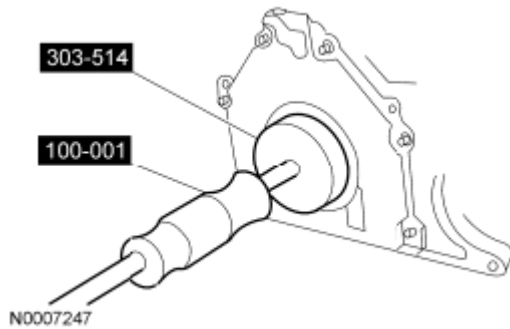


Fig. 241: Removing Crankshaft Rear Oil Seal Slinger Using Special Tools
Courtesy of FORD MOTOR CO.

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

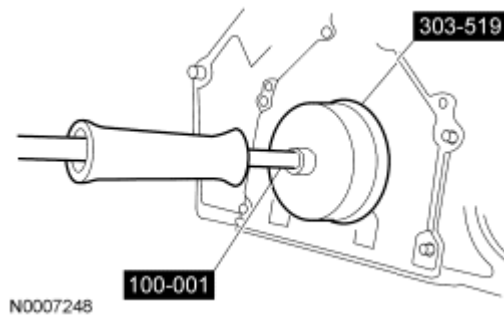


Fig. 242: Removing Crankshaft Rear Seal Using Special Tools
Courtesy of FORD MOTOR CO.

8. Remove the 6 bolts and the crankshaft rear seal retainer plate.

Installation**All vehicles**

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

NOTE: Clean the sealing surfaces with silicone gasket remover and motorcraft metal surface prep. Follow the directions on the packaging.

1. Clean and inspect the mating surface.

NOTE: If the rear crankshaft seal retaining plate is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned with silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leaks.

NOTE: The silicone must be applied on the groove along the retainer plate.

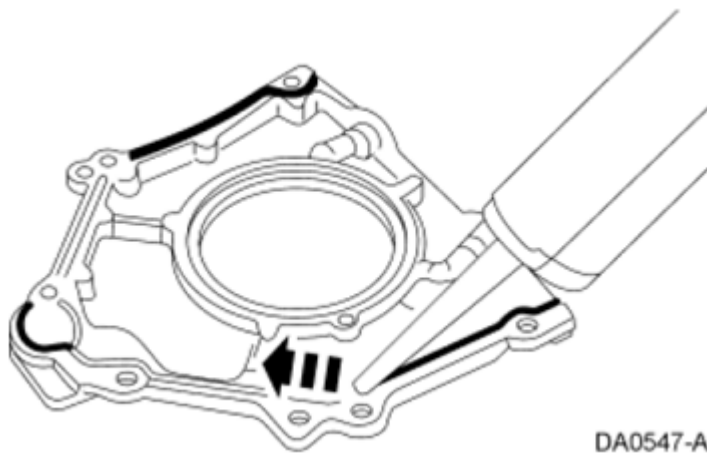


Fig. 243: Applying Bead Of Crankshaft Rear Seal Retainer Plate
Courtesy of FORD MOTOR CO.

2. Apply a 4.06 mm (0.16 in) bead of silicone gasket and sealant around the crankshaft rear seal retainer plate sealing surface.
3. Install the crankshaft rear seal retainer plate and the 6 bolts in the sequence shown in illustration.
 - Tighten to 10 Nm (89 lb-in).

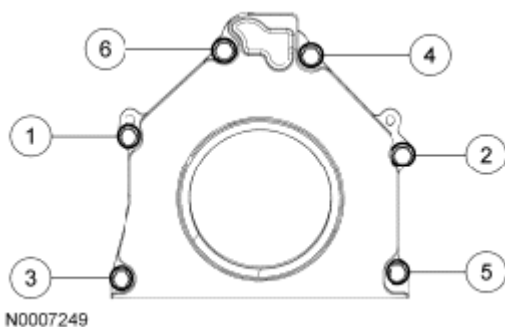


Fig. 244: Identifying Tightening Sequence Of Retainer Plate Bolts
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the crankshaft rear seal with clean engine oil prior to installation.

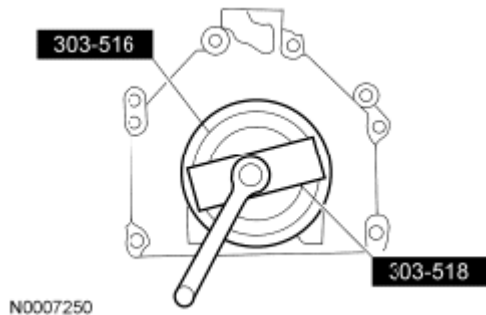


Fig. 245: Installing Crankshaft Rear Oil Seal Using Special Tools
Courtesy of FORD MOTOR CO.

4. Using the Crankshaft Rear Oil Seal Installers, install a new crankshaft rear seal.

NOTE: Lubricate the crankshaft oil slinger with clean engine oil prior to installation.

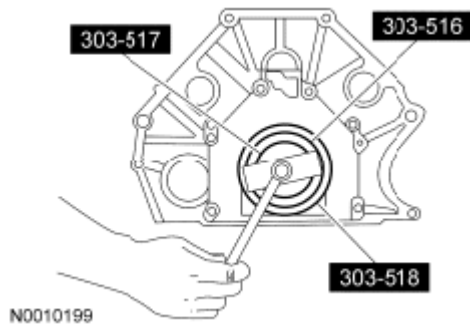


Fig. 246: Installing Crankshaft Rear Oil Slinger Using Special Tools
Courtesy of FORD MOTOR CO.

5. Using the Crankshaft Rear Oil Seal Installers and the Crankshaft Rear Oil Slinger Installer, install a new crankshaft oil slinger.

Automatic transmission equipped vehicles

6. Install the rear engine cover.
7. Install the flexplate. For additional information, refer to **FLEXPLATE**.
8. Using the Engine Support Bar, Support Hook and Engine Support Bracket, align the engine support insulator studs and raise the engine.

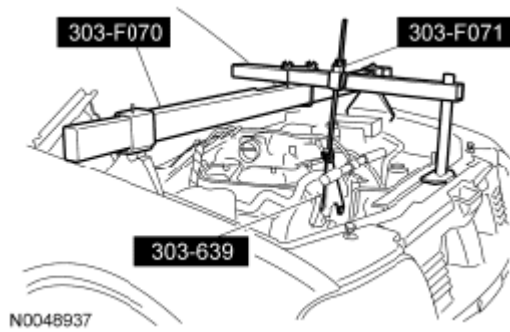


Fig. 247: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

9. Install the oil pan. For additional information, refer to **OIL PAN**.

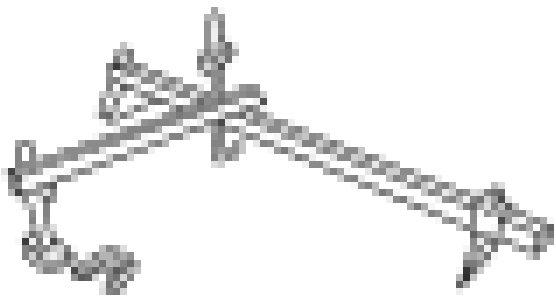
Manual transmission equipped vehicles

10. Install the oil pan. For additional information, refer to **OIL PAN**.

ENGINE SUPPORT INSULATORS

Special Tool(s)

SPECIAL TOOL REFERENCE

 <p>ST2176-B</p>	<p>Support Bar, Engine 303-F070</p>

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2592-A

Support Bracket, Engine
303-639

Support Hook
303-F071

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



RH Engine Support Insulator

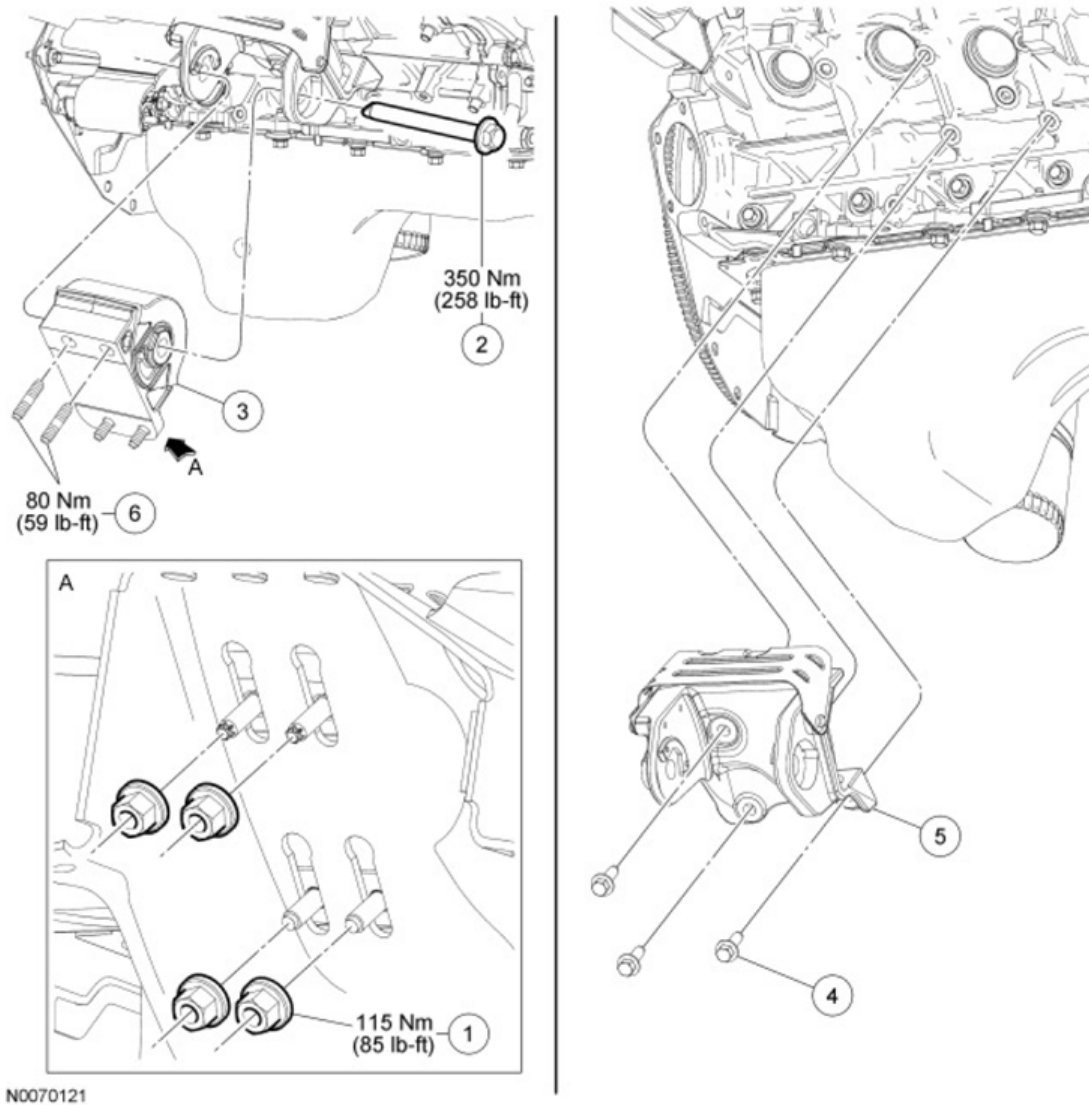


Fig. 248: Identifying RH Engine Support Insulator Components With Torque Specifications
Courtesy of FORD MOTOR CO.

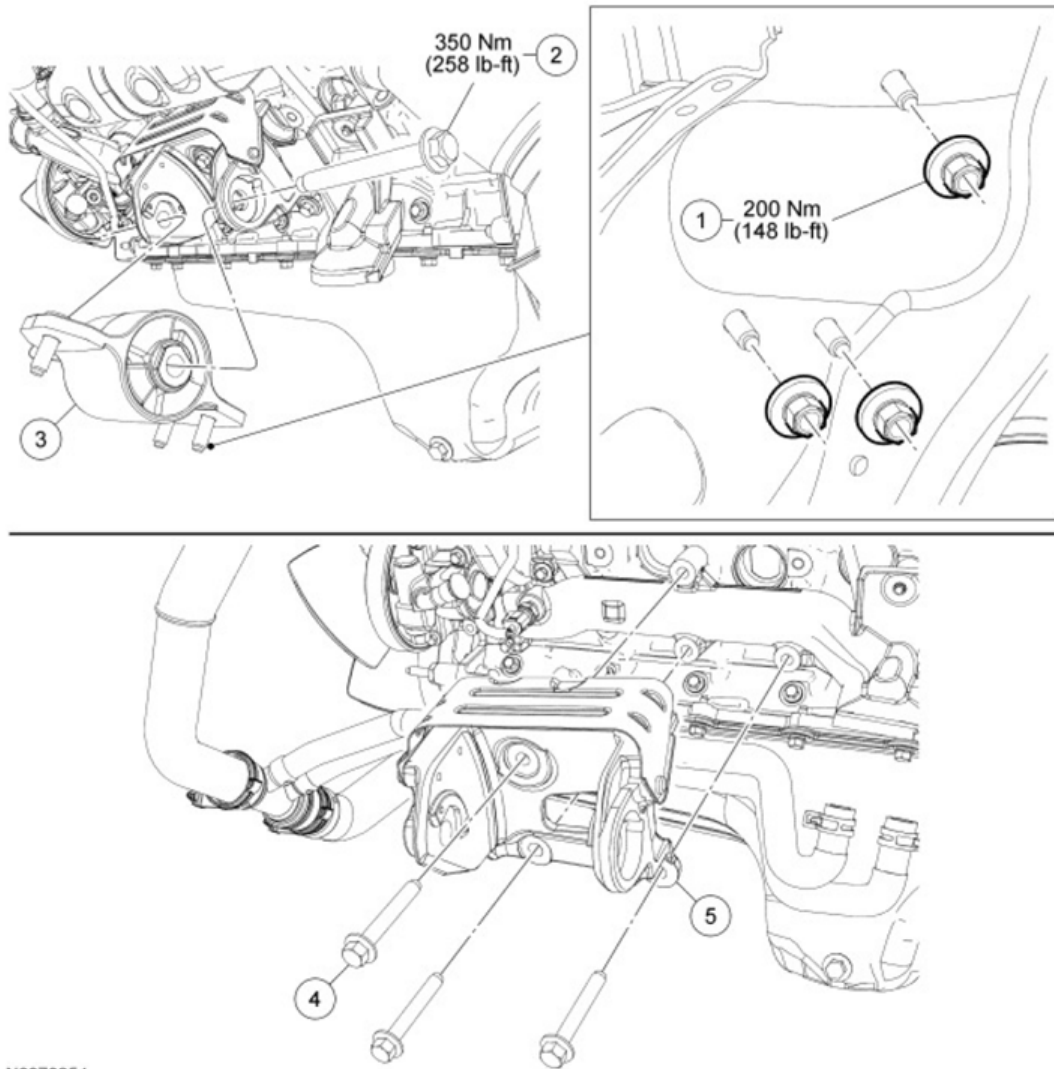
ITEM DESCRIPTION

Item	Part Number	Description
1	W709771	RH engine support insulator nut (4 required)
2	W711959	RH engine support insulator through bolt
3	6038	RH engine support
4	W712861	RH engine support insulator bracket bolt (3 required)
5	6046	RH engine support insulator bracket
6	W790018	RH engine support insulator studs (2 required)

LH Engine Support Insulator

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



N0070254

Fig. 249: Identifying LH Engine Support Insulator Components With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	W711336	LH engine support insulator nut (3 required)
2	W711959	LH engine support insulator through bolt
3	6B032	LH engine support
4	W712860	LH engine support insulator bracket bolt (3 required)
5	6B033	LH engine support insulator bracket

Removal

All vehicles

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
3. Remove the Air Cleaner (ACL) outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
4. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING AND CONTROLS - 5.4L (3V)** .
5. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
6. Remove the engine cooling fan. For additional information, refer to **ENGINE COOLING** .
7. Install the Engine Support Bar, Support Hook and Engine Support Bracket.

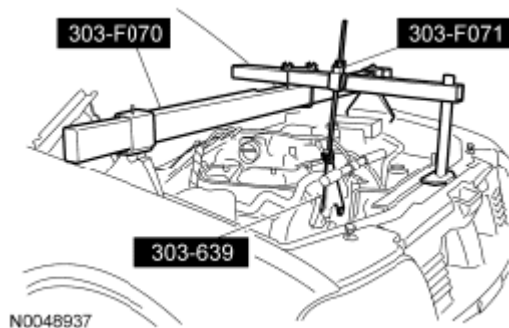


Fig. 250: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

8. Remove the 4 exhaust Y-pipe nuts.

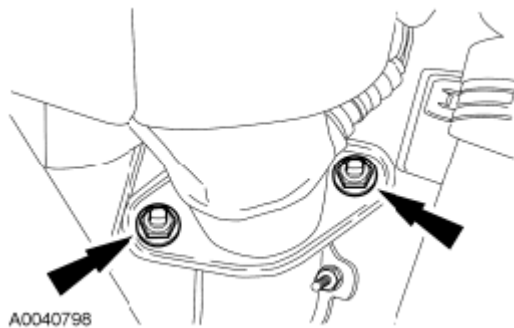


Fig. 251: Locating Exhaust Manifold-To-Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

9. Remove and discard the 2 transmission mount-to-crossmember nuts.

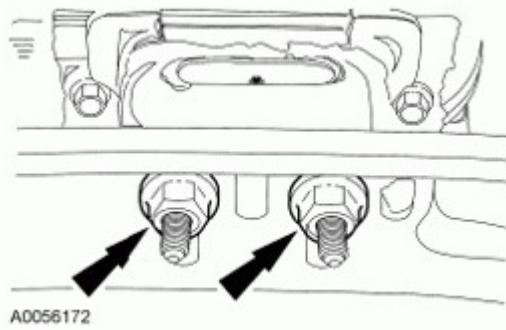


Fig. 252: Locating Rear Transmission Insulator And Retainer Nuts
Courtesy of FORD MOTOR CO.

RH engine support insulator

10. Remove the A/C compressor. For additional information, refer to **CLIMATE CONTROL** .
11. Remove the starter. For additional information, refer to **STARTING SYSTEM - GASOLINE ENGINES** .
12. Remove and discard the RH engine support insulator through bolt.
13. Loosen the LH engine support insulator through bolt.
14. Remove and discard the 3 LH engine support insulator nuts.
15. Remove and discard the 4 RH engine support insulator nuts.

LH engine support insulator

16. Remove the oil cooler. For additional information, refer to **OIL COOLER**.
17. Loosen the RH engine support insulator through bolt.
18. Remove and discard the LH engine support insulator through bolt.
19. Loosen the 4 RH engine support insulator nuts.
20. Remove and discard the 3 LH engine support insulator nuts.

All engine support insulators

21. Using the Engine Support Bar, Support Hook and Engine Support Bracket, raise the engine assembly.

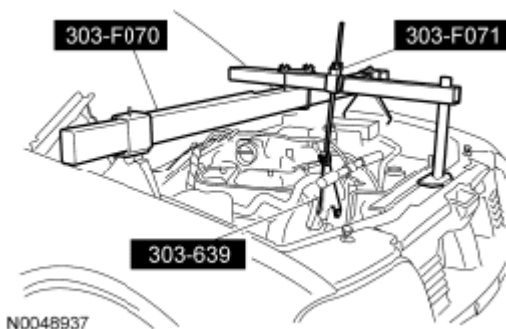


Fig. 253: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

RH engine support insulator

22. Remove the RH engine support insulator.

NOTE: The engine support insulator bracket bolts must be discarded and new bolts installed or damage to the vehicle may occur. They are a tighten-to-yield design and cannot be reused.

23. If servicing the RH engine support insulator bracket, remove the 3 bolts and the RH engine mount bracket.
- Discard the 3 engine support insulator bracket bolts.

LH engine support insulator

24. Remove the LH engine support insulator.

NOTE: The engine support insulator bracket bolts must be discarded and new bolts installed or damage to the vehicle may occur. They are a tighten-to-yield design and cannot be reused.

25. If servicing the LH engine support insulator bracket, remove the 3 bolts and the LH engine mount bracket.
- Discard the 3 engine support insulator bracket bolts.

Installation

All engine support insulators

1. Clean the engine support insulator-to-cylinder block and engine support insulator-to-frame mating surfaces of any dirt or foreign material prior to installation.

LH engine support insulator

NOTE: The engine support insulator bracket bolts must be discarded and new bolts installed or damage to the vehicle may occur. They are a tighten-to-yield design and cannot be reused.

NOTE: The engine support insulator bracket bolts must not be tightened more than 90 degrees after initial torque or damage to the bolts may occur.

NOTE: Place a visible mark on the engine support insulator bracket and the bracket bolts. Turning the bolt 1 flat of the bolt head is equal to 60

degrees.

2. If servicing the LH engine support insulator bracket, position the engine support insulator bracket and install 3 new bolts in 2 stages.
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional minimum of 60 degrees.
3. Position the LH engine support insulator into the vehicle.

RH engine support insulator

NOTE: The engine support insulator bracket bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.

NOTE: The engine support insulator bracket bolts must not be tightened more than 90 degrees after initial torque, or damage to the bolts may occur.

NOTE: Place a visible mark on the engine support insulator bracket and the bracket bolts. Turning the bolt 1 flat of the bolt head is equal to 60 degrees.

4. If servicing the RH engine support insulator bracket, position the engine support insulator bracket and install 3 new bolts in 2 stages.
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional minimum of 60 degrees.
5. Position the RH engine support insulator into the vehicle.

All engine support insulators

6. Using the Engine Support Bar, Support Hook and Engine Support Bracket, lower the engine.

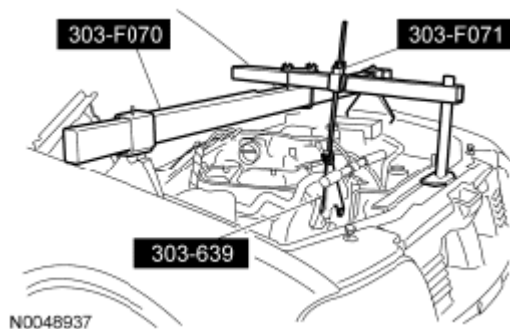


Fig. 254: Installing Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

LH engine support insulator

NOTE: Only use hand tools when installing the engine support insulator nuts or damage to the engine support insulator may occur.

7. Install 3 new LH engine support insulator nuts.
 - Tighten to 200 Nm (148 lb-ft).

NOTE: Only use hand tools when installing the engine support insulator nuts or damage to the engine support insulator may occur.

8. Install 4 new RH engine support insulator nuts.
 - Tighten to 115 Nm (85 lb-ft).

NOTE: Only use hand tools when installing the engine support through bolt or damage to the engine support insulator may occur.

9. Install a new LH engine support insulator through bolt.
 - Tighten to 350 Nm (258 lb-ft).

NOTE: Only use hand tools when installing the engine support through bolt or damage to the engine support insulator may occur.

10. Install a new RH engine support insulator through bolt.
 - Tighten to 350 Nm (258 lb-ft).
11. Install the oil cooler. For additional information, refer to **OIL COOLER**.

RH engine support insulator

NOTE: Only use hand tools when installing the engine support insulator nuts or damage to the engine support insulator may occur.

12. Install 4 new RH engine support insulator nuts.
 - Tighten to 115 Nm (85 lb-ft).

NOTE: Only use hand tools when installing the engine support insulator nuts or damage to the engine support insulator may occur.

13. Install 3 new LH engine support insulator nuts.
 - Tighten to 200 Nm (148 lb-ft).

NOTE: Only use hand tools when installing the engine support through bolt or damage to the engine support insulator may occur.

14. Install a new LH engine support insulator through bolt.

- Tighten to 350 Nm (258 lb-ft).

NOTE: Only use hand tools when installing the engine support through bolt or damage to the engine support insulator may occur.

15. Install a new RH engine support insulator through bolt.
 - Tighten to 350 Nm (258 lb-ft).
16. Install the starter. For additional information, refer to **STARTING SYSTEM - GASOLINE ENGINES**.
17. Install the A/C compressor. For additional information, refer to **CLIMATE CONTROL**.

All vehicles

NOTE: Only use hand tools when installing the transmission mount-to-crossmember nuts or damage to the transmission mount may occur.

18. Install 2 new transmission mount-to-crossmember nuts.
 - Tighten to 115 Nm (85 lb-ft).

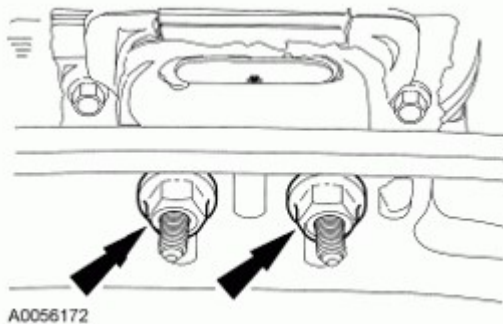


Fig. 255: Locating Rear Transmission Insulator And Retainer Nuts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

19. Install the 4 exhaust Y-pipe flange nuts.
 - Tighten to 40 Nm (30 lb-ft).

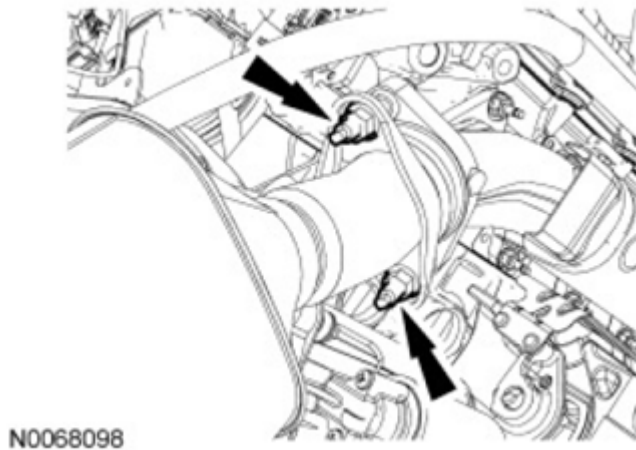


Fig. 256: Locating Exhaust Y-pipe Flange Nuts
Courtesy of FORD MOTOR CO.

20. Install the engine cooling fan. For additional information, refer to **ENGINE COOLING** .
21. Install the generator. For additional information, refer to **CHARGING SYSTEM** .
22. Install the **TB** . For additional information, refer to **FUEL CHARGING AND CONTROLS - 5.4L (3V)** .
23. Install the **ACL** outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .
24. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .

REMOVAL

ENGINE

Special Tool(s)

SPECIAL TOOL REFERENCE

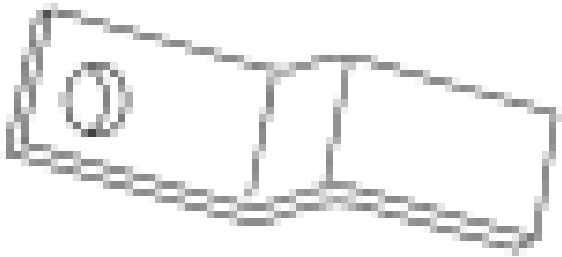
Engine Lifting Bracket
303-F047 (014-00073) or equivalent

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1377-A



ST1636-A

Retainer, Torque Converter
307-346 (T97T-7902-A) or equivalent

All vehicles

1. Release the fuel pressure. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION - GASOLINE AND DIESEL** .
2. Remove the engine cooling module. For additional information, refer to **ENGINE COOLING** .

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

3. Remove the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.
4. Remove the degas bottle. For additional information, refer to **ENGINE COOLING** .
5. Remove the PCM. For additional information, refer to **ELECTRONIC ENGINE CONTROLS -**

GASOLINE ENGINES .

6. Remove the accessory drive belt.
7. Disconnect the lower radiator hose to the oil filter adapter.

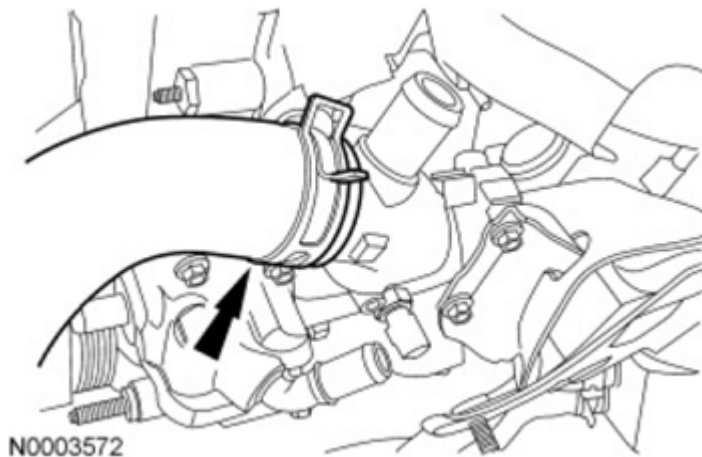


Fig. 257: Locating Lower Radiator Hose On Oil Filter Adapter
Courtesy of FORD MOTOR CO.

8. Disconnect the degas bottle coolant hose.

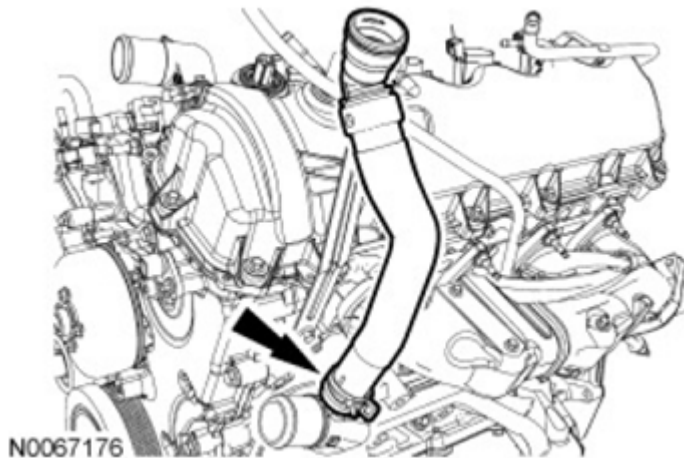


Fig. 258: Locating Degas Bottle Coolant Hose
Courtesy of FORD MOTOR CO.

9. Disconnect the engine wiring harness electrical connector located below the PCM.

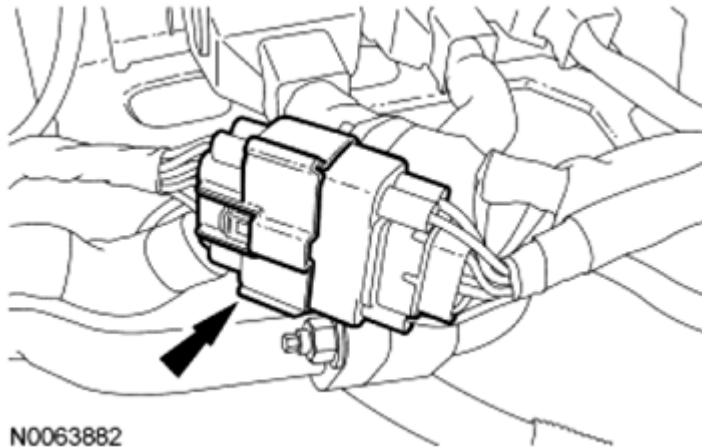


Fig. 259: Locating Upper Window Applique Pin-Type Retainer
Courtesy of FORD MOTOR CO.

10. Disconnect the generator wiring harness position retainers from the engine front cover studs.

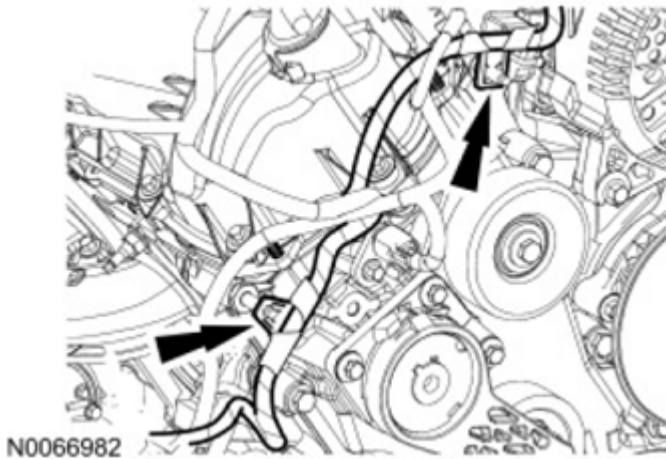


Fig. 260: Locating Generator Wiring Harness Position Retainers And Engine Front Cover Studs
Courtesy of FORD MOTOR CO.

11. Disconnect the A/C compressor and Crankshaft Position (CKP) sensor electrical connectors and position the generator wiring harness aside.

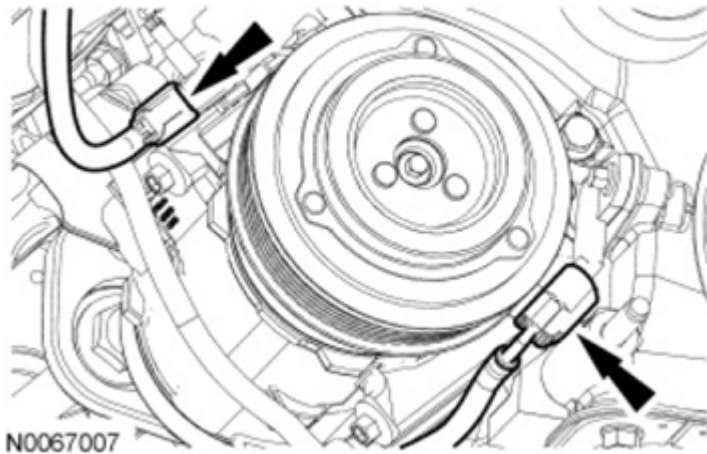


Fig. 261: Locating A/C Compressor And Crankshaft Position Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

12. Remove the bolt and the transmission fluid level indicator tube.

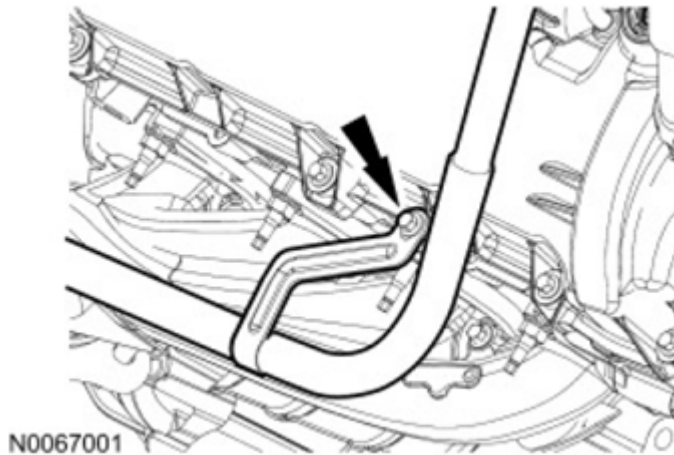


Fig. 262: Locating Transmission Fluid Level Indicator Tube And Bolt
Courtesy of FORD MOTOR CO.

13. Remove the 2 nuts and disconnect the 2 A/C compressor manifold tube assemblies from the A/C compressor.
 - Discard the O-rings seals.

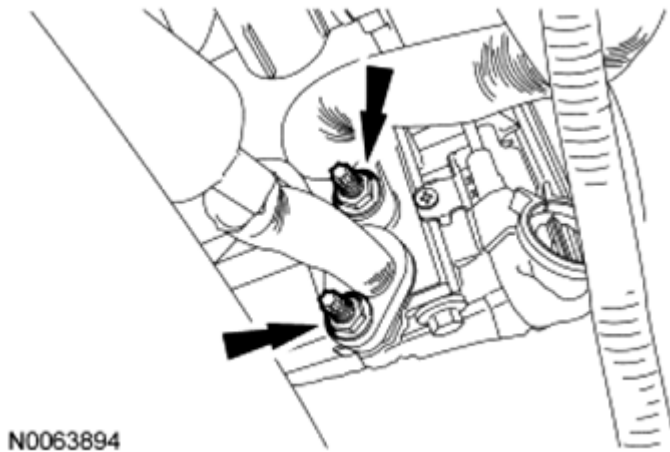


Fig. 263: Locating Mode Door Actuator Components
Courtesy of FORD MOTOR CO.

14. Disconnect the coolant hose from the coolant tube.

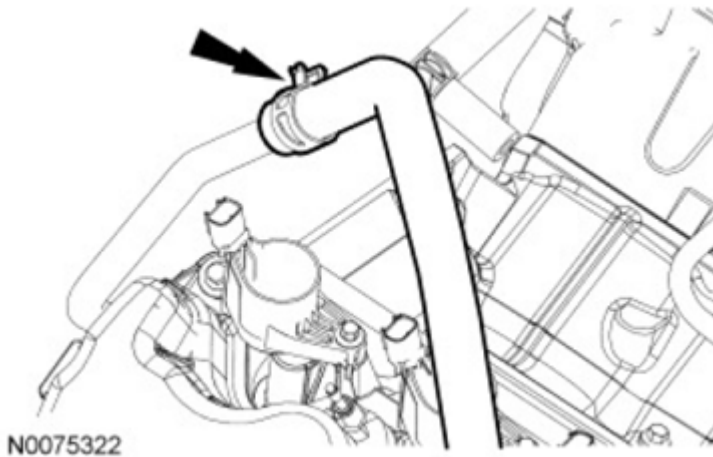


Fig. 264: Locating Coolant Hose And Coolant Tube
Courtesy of FORD MOTOR CO.

Manual transmission equipped vehicles

15. Remove the clutch and pressure plate. For additional information, refer to **CLUTCH** .

Automatic transmission equipped vehicles

16. Remove the starter. For additional information, refer to **STARTING SYSTEM - GASOLINE ENGINES** .
17. Remove the 2 bolts and the flexplate inspection cover.

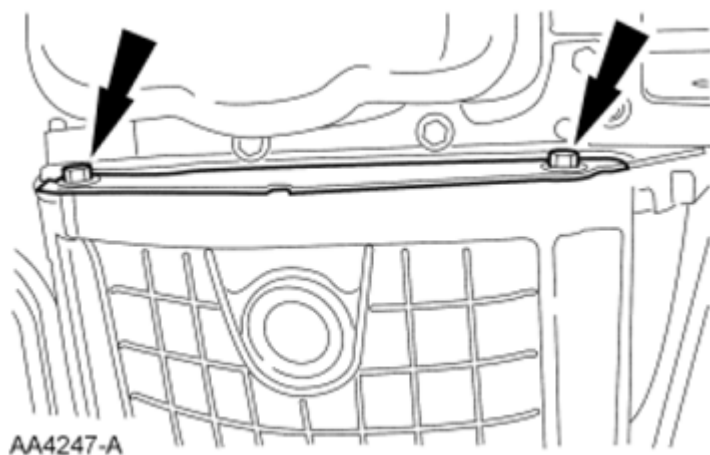


Fig. 265: Locating Flexplate Inspection Cover And Bolts
Courtesy of FORD MOTOR CO.

18. Remove the cylinder block opening cover.

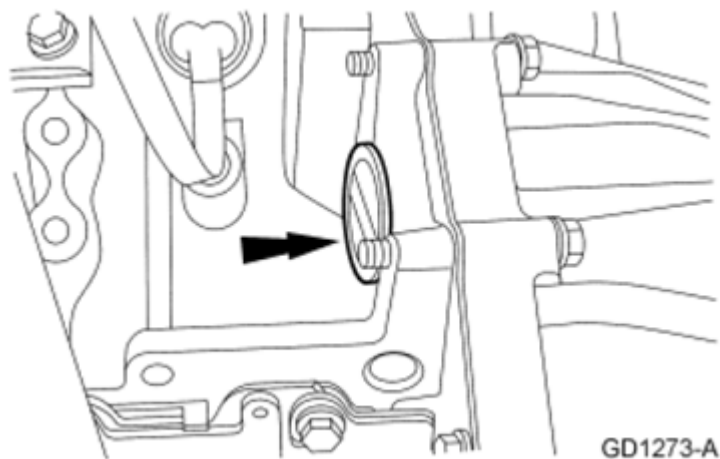


Fig. 266: Locating Cylinder Block Opening Cover
Courtesy of FORD MOTOR CO.

19. Remove the 4 torque converter-to-flexplate nuts.
- Discard the nuts.

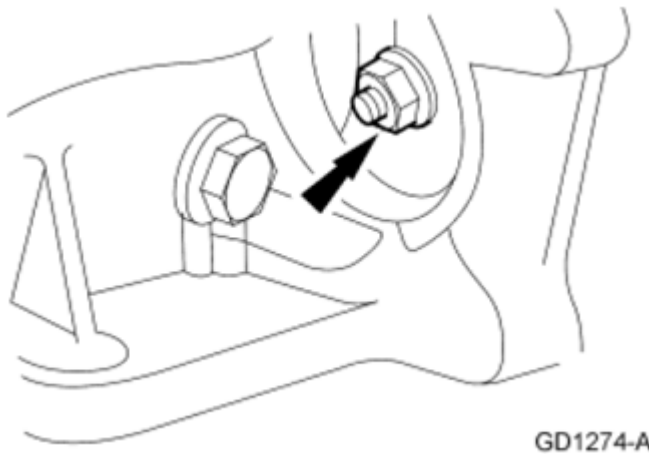


Fig. 267: Locating Torque Converter-To-Flexplate Nuts
Courtesy of FORD MOTOR CO.

20. Install the Torque Converter Retainer.

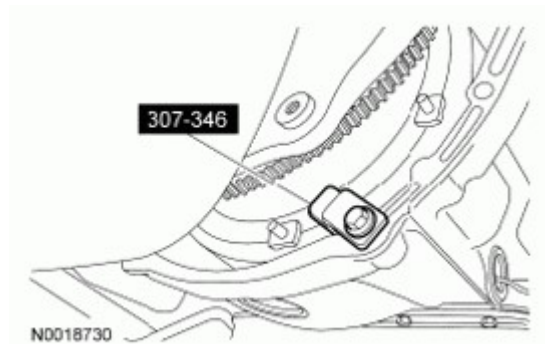


Fig. 268: Installing Torque Converter Retainer
Courtesy of FORD MOTOR CO.

21. Loosen the 2 transmission rear mount nuts.

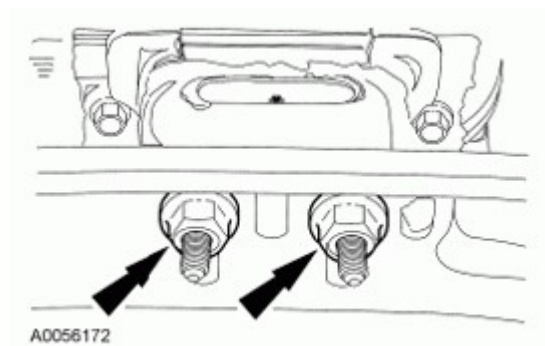


Fig. 269: Locating Rear Transmission Insulator And Retainer Nuts
Courtesy of FORD MOTOR CO.

NOTE: The upper 2 transmission-to-engine bolts will be removed later.

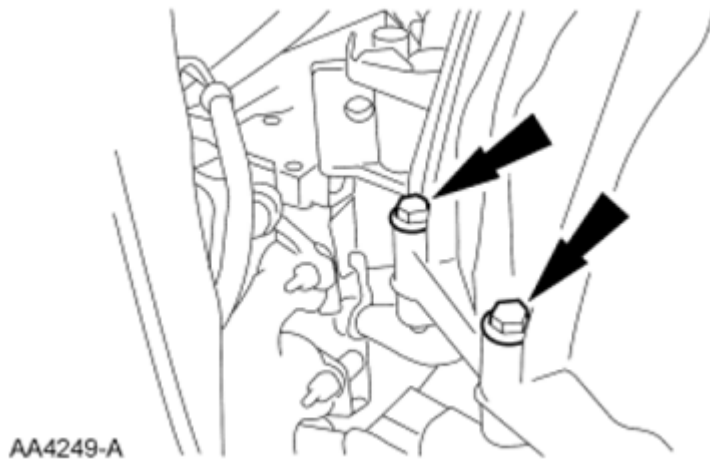


Fig. 270: Locating Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

22. Remove the 5 transmission-to-engine bolts.

All vehicles

23. If equipped, disconnect the block heater electrical connector.

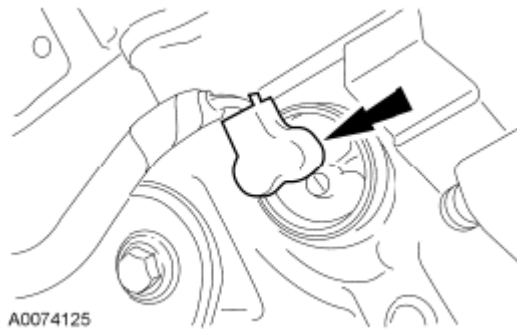


Fig. 271: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

24. Remove the bolt and the transmission wiring harness support bracket.

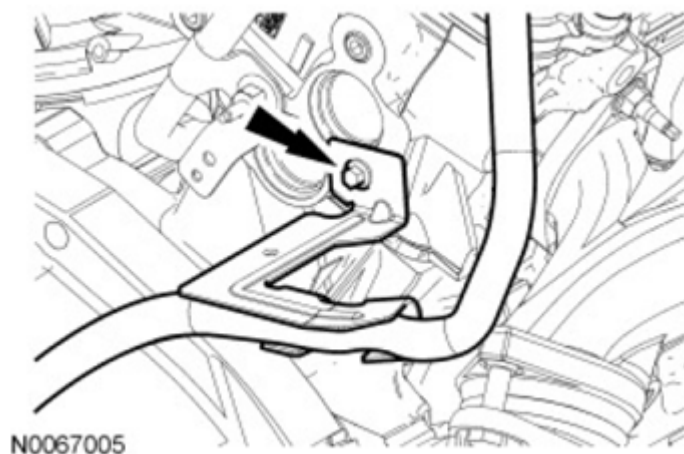


Fig. 272: Locating Transmission Wiring Harness Support Bracket
Courtesy of FORD MOTOR CO.

25. Remove the nut and the 2 engine wiring harness ground straps.

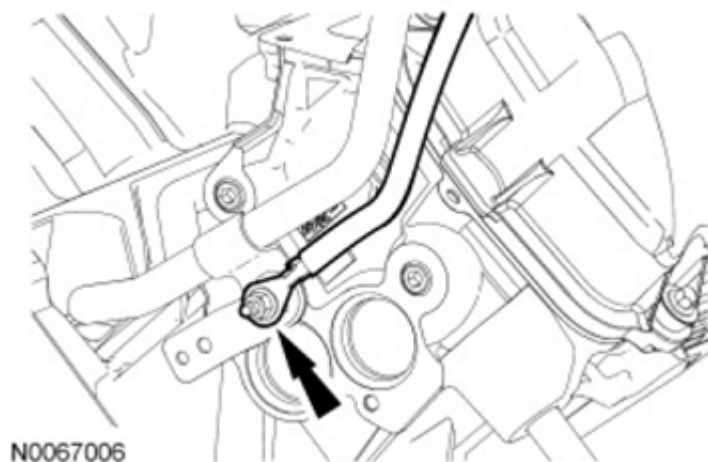


Fig. 273: Locating Engine Wiring Harness Ground Straps And Nut
Courtesy of FORD MOTOR CO.

26. Remove the bolt and position the ground strap aside.

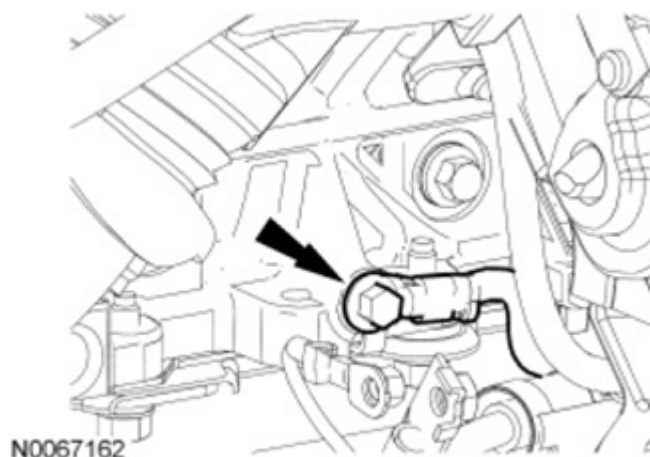


Fig. 274: Positioning Ground Strap
Courtesy of FORD MOTOR CO.

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

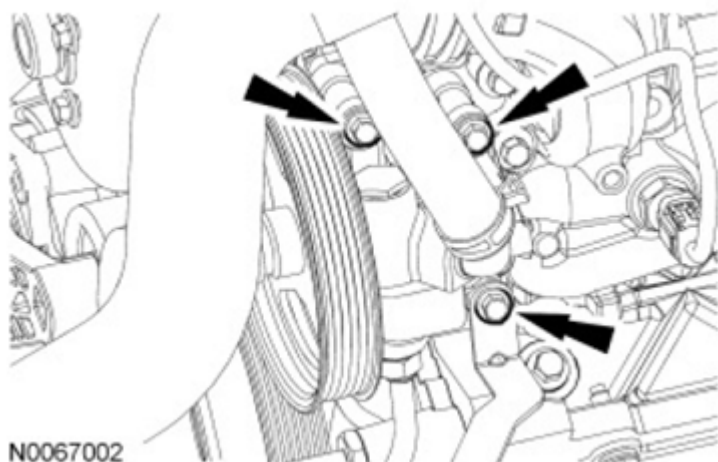


Fig. 275: Locating Power Steering Pump And Bolts
Courtesy of FORD MOTOR CO.

28. Remove the nut, the transmission auxiliary fluid cooler tube support bracket and the starter wiring harness support bracket from the engine front cover stud bolt.

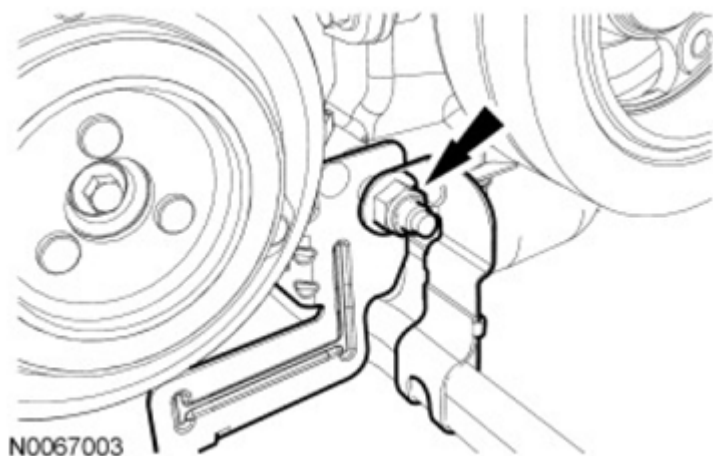


Fig. 276: Locating Engine Front Cover Stud Bolt
Courtesy of FORD MOTOR CO.

29. Remove the 3 bolts and the A/C compressor.

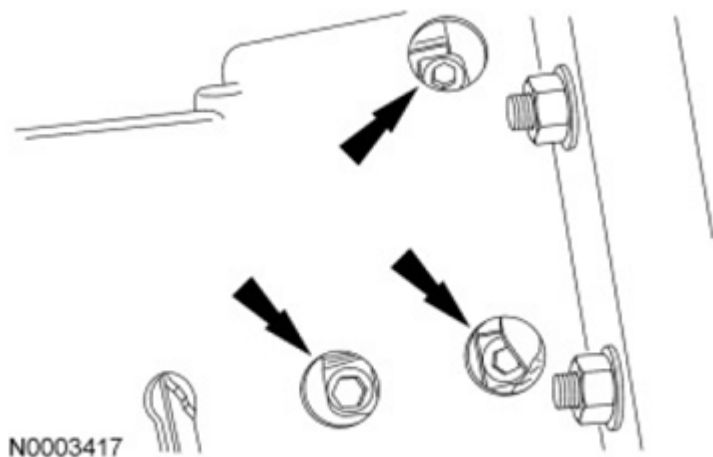


Fig. 277: Removing Bolt Access Holes For A/C Compressor
Courtesy of FORD MOTOR CO.

30. Disconnect the RH Heated Oxygen Sensor (HO2S) wiring harness retainers.

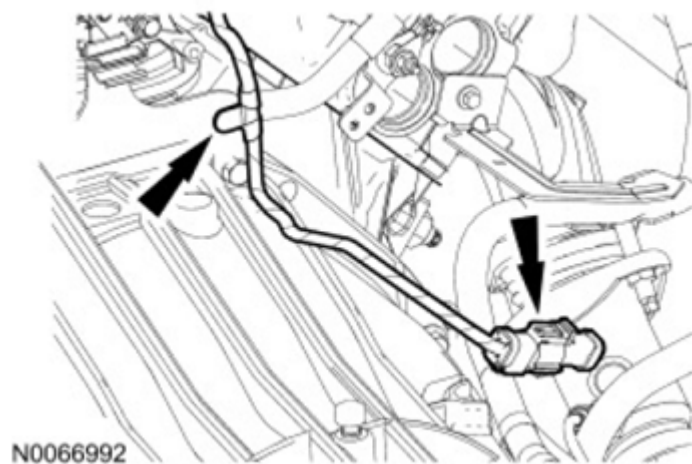


Fig. 278: Locating RH Heated Oxygen Sensor Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

31. Disconnect the 2 HO2S electrical connectors.

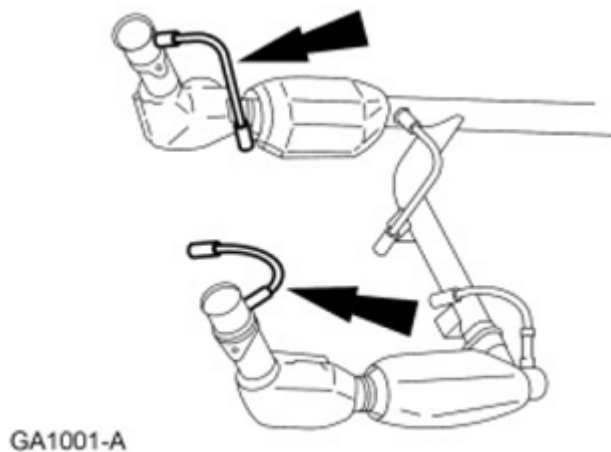


Fig. 279: Locating HO2S Electrical Connectors
Courtesy of FORD MOTOR CO.

32. Remove the 4 exhaust manifold flange nuts.

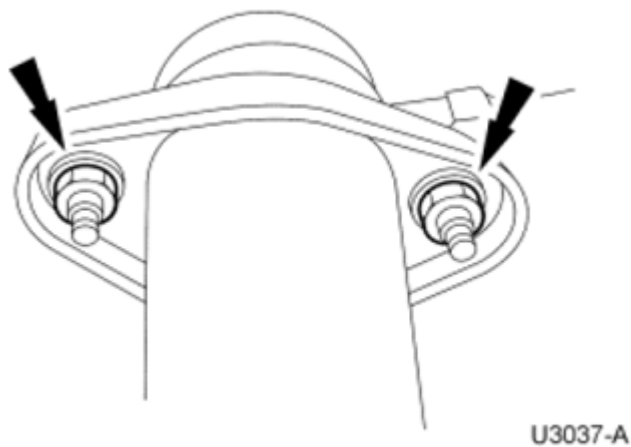


Fig. 280: Locating Exhaust Manifold Flange Nuts
Courtesy of FORD MOTOR CO.

33. Remove and discard the engine oil filter.

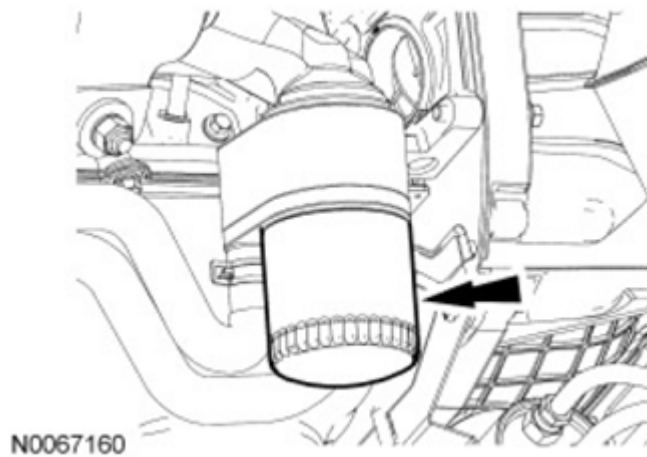


Fig. 281: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

34. Disconnect the oil cooler coolant hoses.

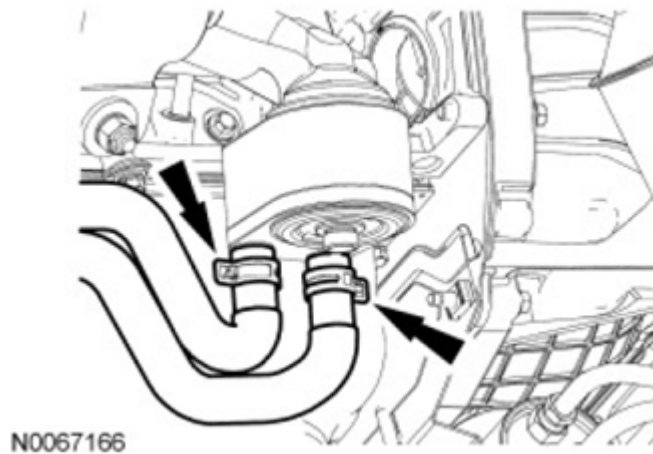


Fig. 282: Locating Oil Cooler Coolant Hoses
Courtesy of FORD MOTOR CO.

NOTE: If metal foreign material is present in the oil cooler, mechanical concerns exist. To diagnose mechanical concerns, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

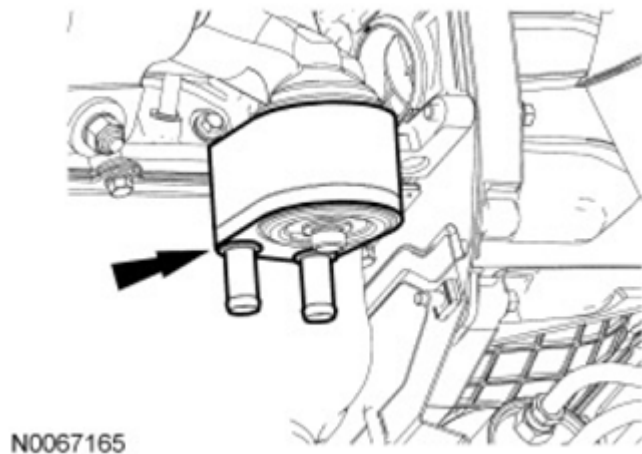


Fig. 283: Locating Engine Oil Cooler
Courtesy of FORD MOTOR CO.

35. Remove and inspect the engine oil cooler.
36. Remove the LH engine support insulator through bolt.

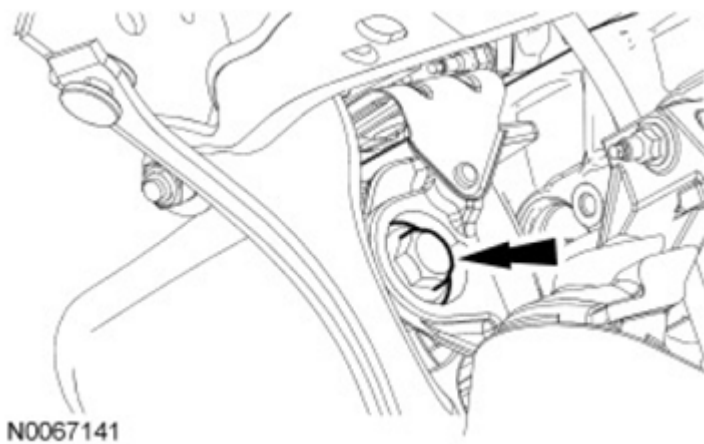


Fig. 284: Locating LH Engine Support Insulator Through Bolt
Courtesy of FORD MOTOR CO.

37. Remove the RH engine support insulator through bolt.

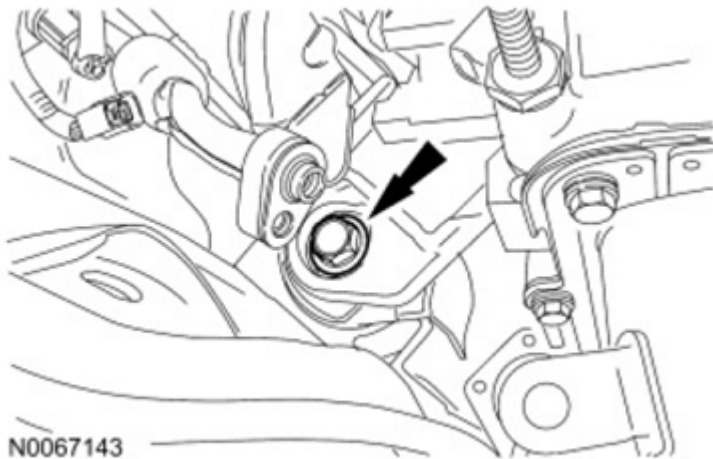


Fig. 285: Locating RH Engine Support Insulator Through Bolt
Courtesy of FORD MOTOR CO.

Automatic transmission vehicles

38. Remove the upper 2 transmission-to-engine bolts.

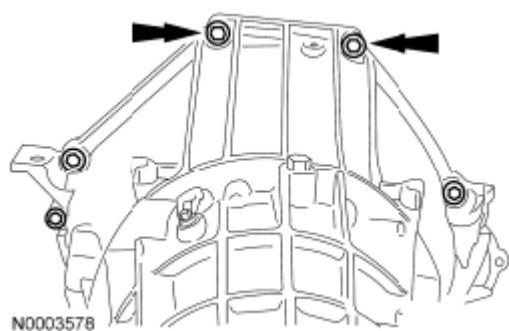


Fig. 286: Locating Upper Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

All vehicles

39. Install the Engine Lifting Bracket.

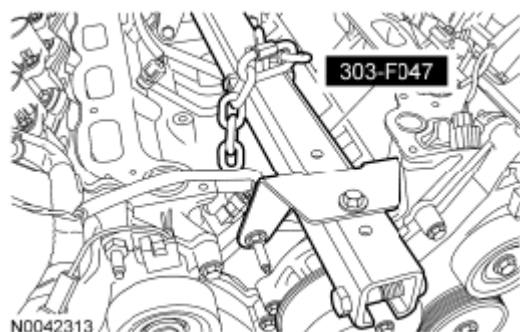


Fig. 287: Installing Modular Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

40. Using a floor crane, remove the engine assembly from the vehicle.

CYLINDER HEAD

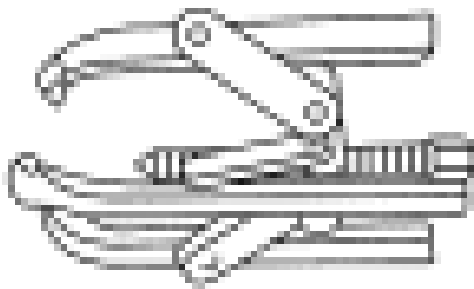
Special Tool(s)

SPECIAL TOOL REFERENCE

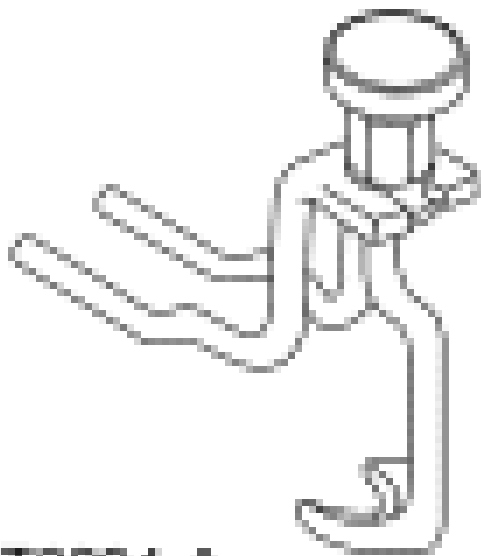
3 Jaw Puller
303-D121

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1184-A

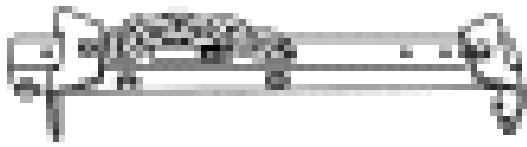


ST2604-A

Compressor, Valve Spring
303-1039

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



Engine Lifting Bracket
303-F047 (014-00073) or equivalent

ST1377-A



Fan Clutch Nut Wrench
303-240 (T84T-6312-D)

ST1500-A

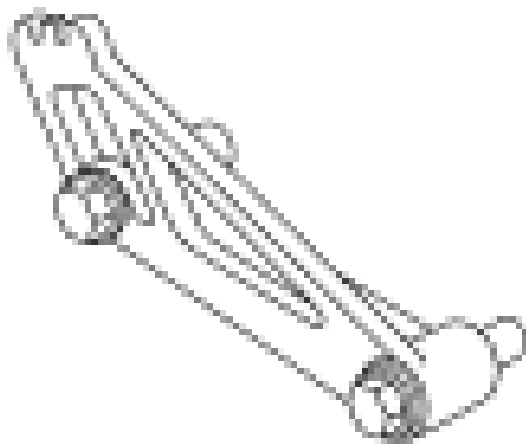
Fan Pulley Holding Wrench
303-239 (T84T-6312-C)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1499-A

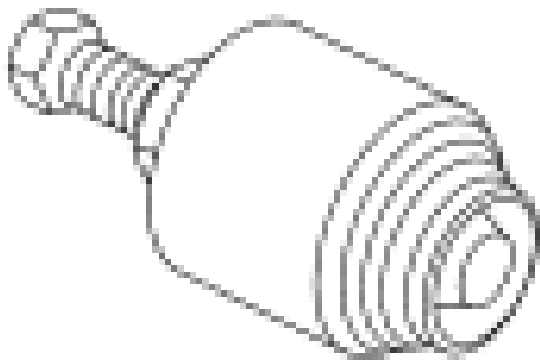


ST2807-A

Locking Tool, Cam Phaser
303-1046

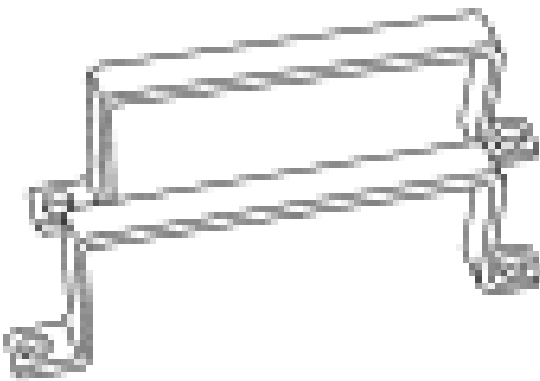
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1730-A

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



ST1668-A

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

Material

ITEM SPECIFICATION

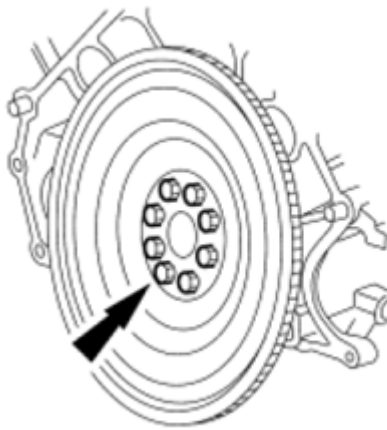
Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Silicone Gasket Remover ZC-30	-

All cylinder heads

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. For additional information, refer to **ENGINE**.

NOTE: Flexplate shown in illustration, flywheel similar.



A26551-A

Fig. 288: Locating Flexplate Bolts
Courtesy of FORD MOTOR CO.

2. Remove the 8 bolts and the flexplate or flywheel.
3. Install the engine onto a suitable engine stand.
4. Remove the Engine Lifting Bracket.

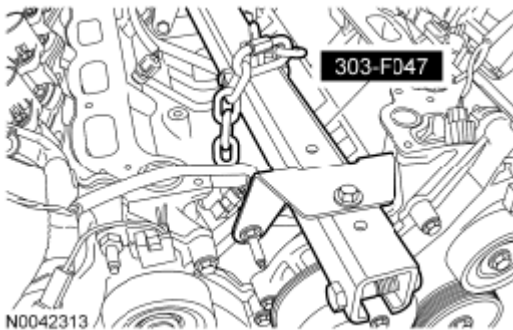


Fig. 289: Installing Modular Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

5. If equipped with cylinder block drain plugs, remove the 3 bolts and the RH engine support insulator bracket.

- Discard the bolts.

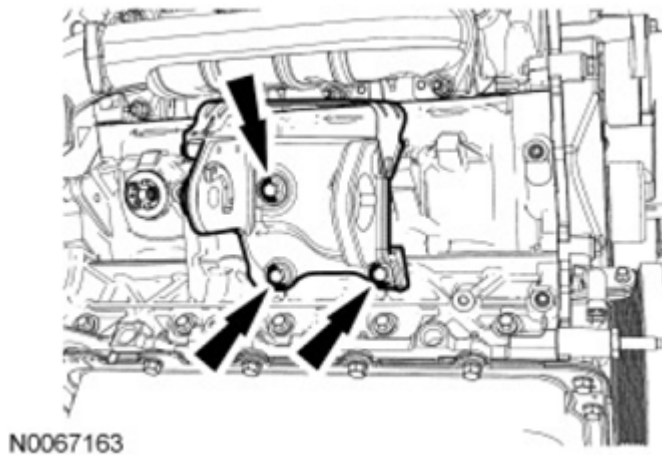


Fig. 290: Locating RH Engine Support Insulator Bracket And Bolts
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

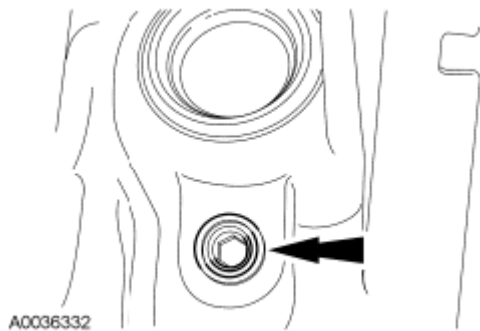


Fig. 291: Locating Cylinder Block Drain Plugs
Courtesy of FORD MOTOR CO.

6. If equipped, remove the cylinder block drain plugs and drain the coolant into a suitable container.

NOTE: LH shown in illustration, RH similar.

7. If equipped, install the cylinder block drain plugs.
 - Tighten to 24 Nm (18 lb-ft).

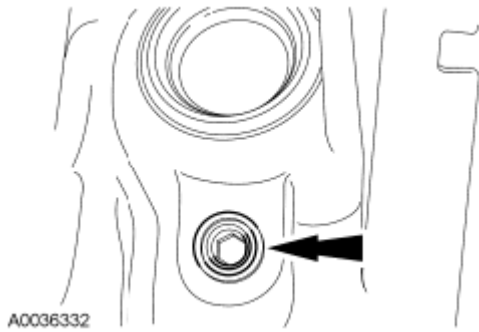


Fig. 292: Locating Cylinder Block Drain Plugs
Courtesy of FORD MOTOR CO.

NOTE: Do not side load the cooling fan clutch coil or the cooling fan clutch coil may be damaged.

NOTE: The large clutch assembly nut has a RH thread and must be rotated counterclockwise to remove it.

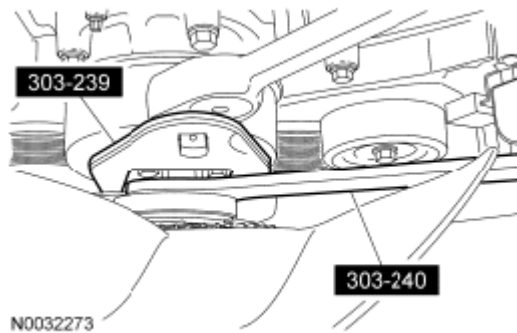


Fig. 293: Removing Cooling Fan And Clutch Assembly
Courtesy of FORD MOTOR CO.

8. Using the Fan Pulley Holding Wrench and the Fan Clutch Nut Wrench, remove the cooling fan.
9. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.

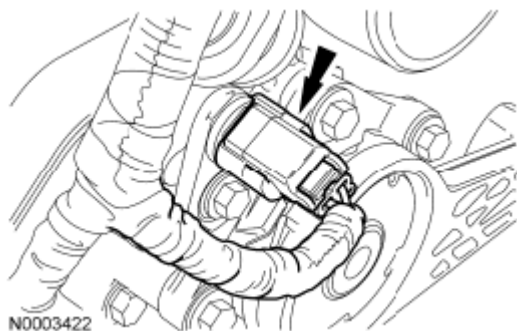


Fig. 294: Locating RH Camshaft Position (CMP) Sensor Electrical Connector

Courtesy of FORD MOTOR CO.

10. Remove the stud bolt and the RH radio ignition interference capacitor.

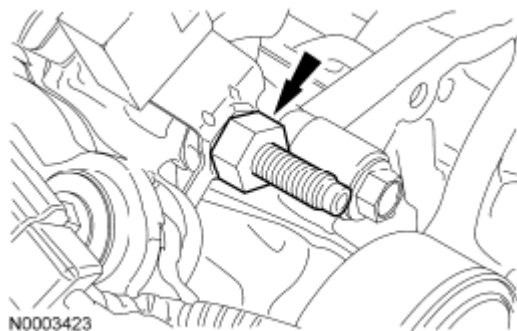


Fig. 295: Locating Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

11. Disconnect the RH Variable Camshaft Timing (VCT) solenoid electrical connector.

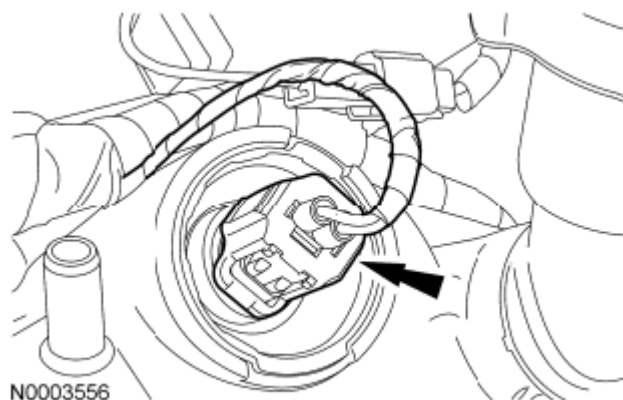


Fig. 296: Locating VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

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

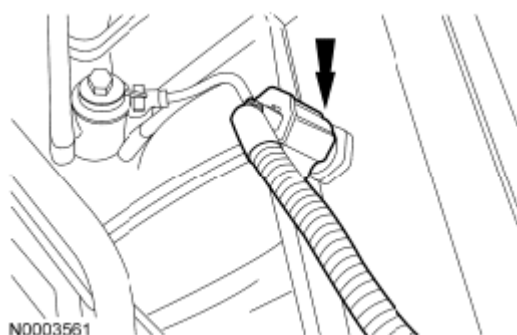


Fig. 297: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

13. Remove the stud bolt and the LH radio ignition interference capacitor.

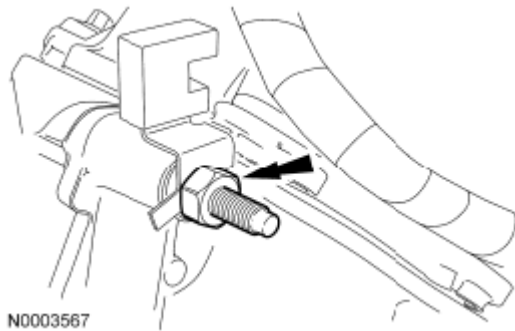


Fig. 298: Locating Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

14. Disconnect the engine wiring harness position retainers from the front of the RH valve cover.

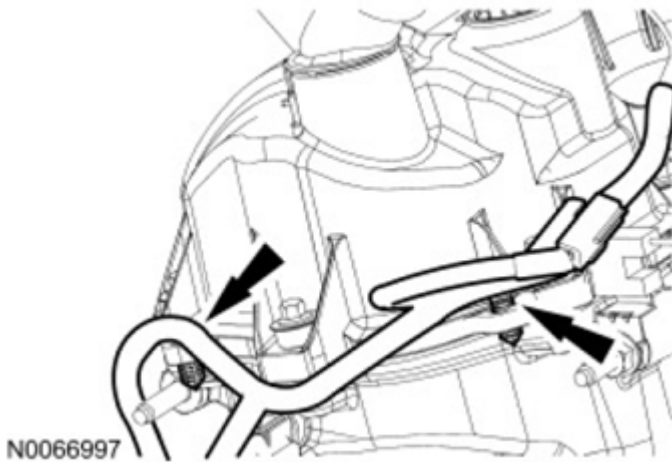


Fig. 299: Locating RH Valve Cover
Courtesy of FORD MOTOR CO.

15. Disconnect the engine wiring harness position retainers from the front of the LH valve cover and the LH CMP sensor electrical connector.

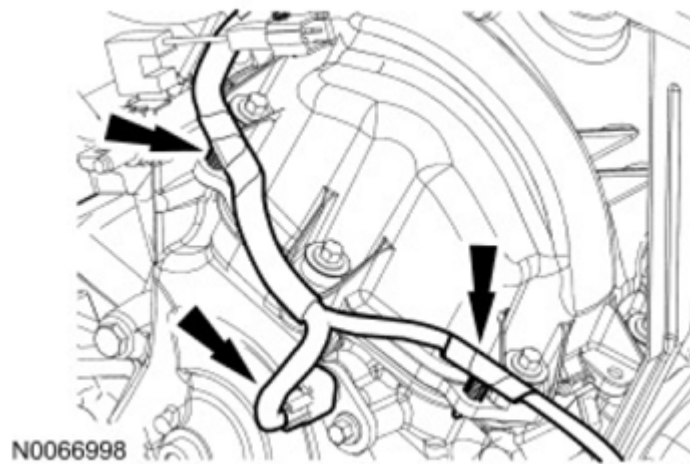


Fig. 300: Locating LH CMP Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

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

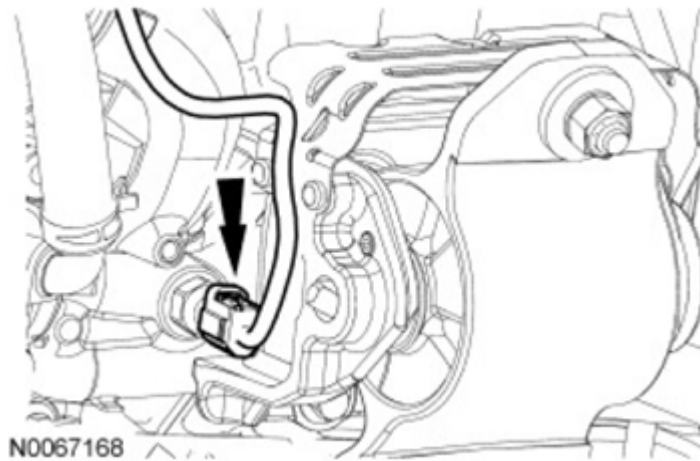


Fig. 301: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

17. Disconnect the 2 engine wiring harness retainers from the RH valve cover studs.

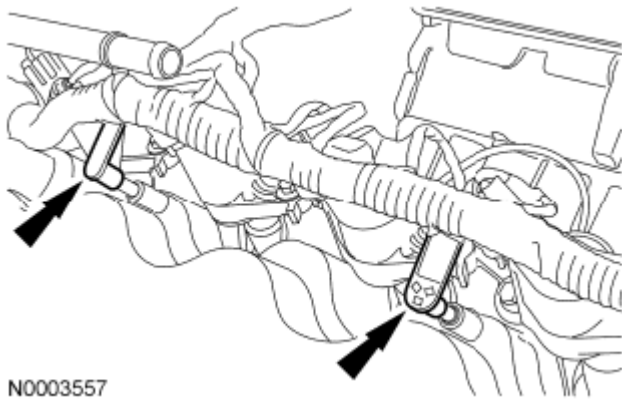


Fig. 302: Locating Engine Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

18. Remove the engine wiring harness from the engine assembly.

NOTE: RH shown in illustration, LH similar.

19. Remove the 8 bolts and the 8 ignition coils.
- Remove the ignition coil, using a twisting motion while pulling up on the ignition coil.



Fig. 303: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

20. Remove the 2 bolts and the oil level indicator tube.
- Discard the O-ring seal.

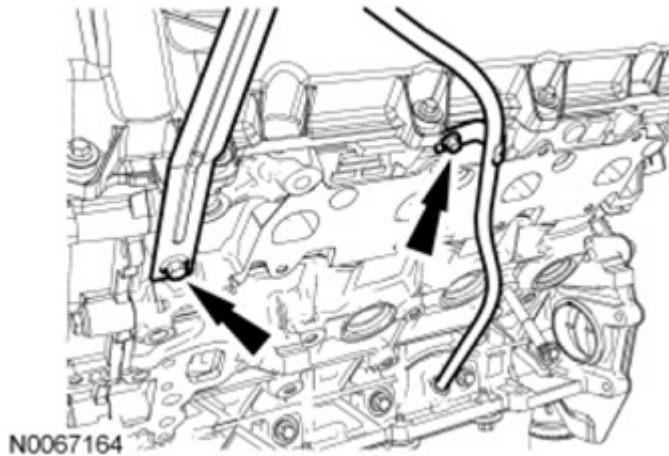


Fig. 304: Locating Oil Level Indicator Tube And Bolts
Courtesy of FORD MOTOR CO.

- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant. Failure to follow this procedure can cause future oil leakage.
- NOTE:** When removing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.
- NOTE:** The fasteners are part of the valve cover and should not be removed.
- NOTE:** LH shown in illustration, RH similar.

21. Remove the valve covers.

- Fully loosen the fasteners and remove the valve covers.
- Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
- Inspect the valve cover gasket. If the gasket is damaged, remove and discard the gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

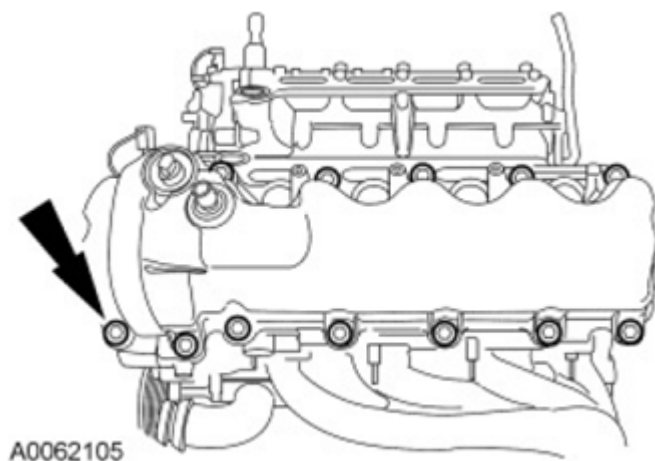


Fig. 305: Removing Valve Covers
Courtesy of FORD MOTOR CO.

22. Remove the 5 bolts, coolant pump pulley and accessory drive belt idler pulley.

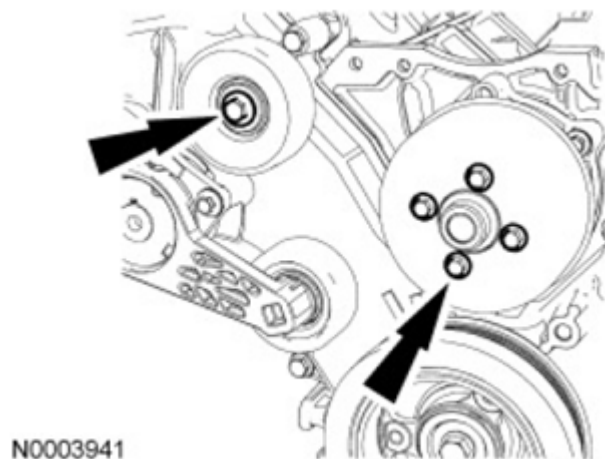
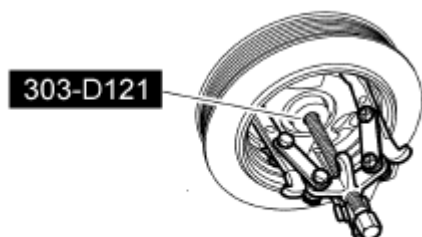


Fig. 306: Identifying Coolant Pump Pulley And Idler Pulley Bolts
Courtesy of FORD MOTOR CO.

23. Remove and discard the crankshaft pulley bolt. Using the 3 Jaw Puller, remove the crankshaft pulley.



N0010528

Fig. 307: Removing Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

24. Using the Crankshaft Front Oil Seal Remover, remove and discard the crankshaft seal.

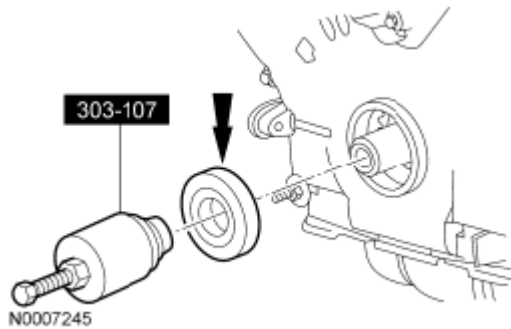


Fig. 308: Removing Crankshaft Front Seal Using Special Tool
Courtesy of FORD MOTOR CO.

NOTE: Correct fastener location is essential for assembly procedure. Record fastener location.

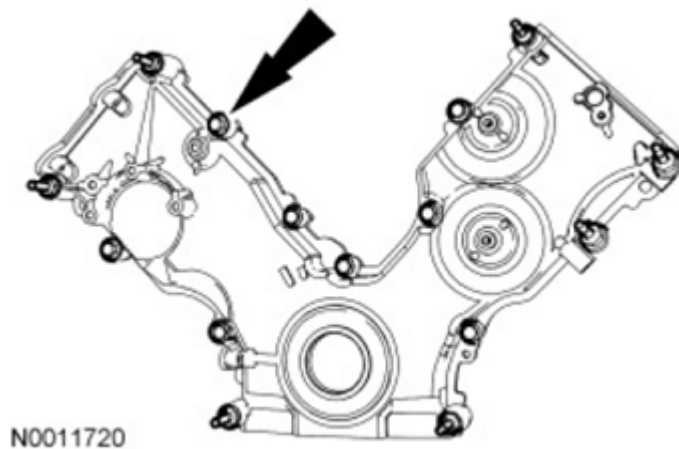
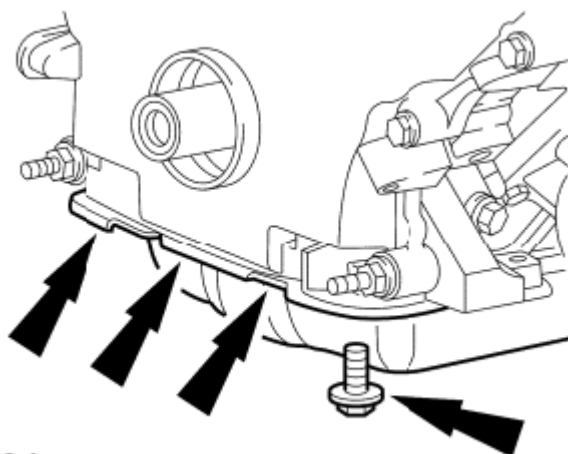


Fig. 309: Removing Front Cover Bolts
Courtesy of FORD MOTOR CO.

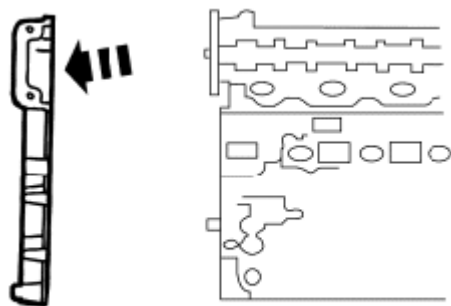
25. Remove the 15 fasteners.
26. Remove the 4 front oil pan bolts.



AA4226-A

Fig. 310: Locating Front Oil Pan Bolts
Courtesy of FORD MOTOR CO.

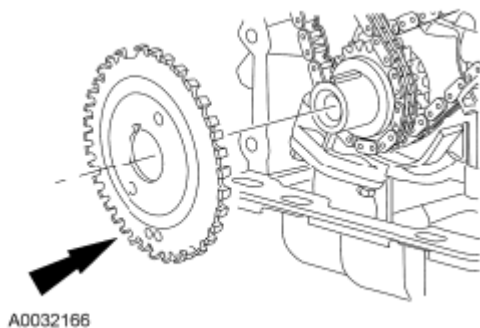
27. Remove the engine front cover from the cylinder block.



AA1665-A

Fig. 311: Removing Engine Front Cover From Cylinder Block
Courtesy of FORD MOTOR CO.

28. Remove the crankshaft sensor ring from the crankshaft.



A0032166

Fig. 312: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

29. Position the crankshaft keyway at the 12 o'clock position.

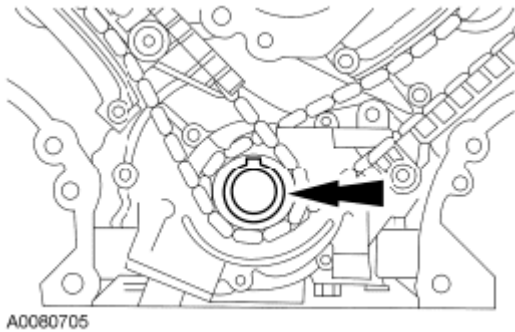


Fig. 313: Locating Crankshaft Keyway At 12 O'Clock Position
Courtesy of FORD MOTOR CO.

NOTE: If the camshaft lobes are not exactly positioned as shown in illustration, the crankshaft will require one full additional rotation to 12 o'clock.



Fig. 314: Identifying Position Of Intake Camshaft Lobes And Exhaust Lobe On No. 1 Cylinder
Courtesy of FORD MOTOR CO.

30. The No. 1 cylinder camshaft exhaust lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 1 cylinder.

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

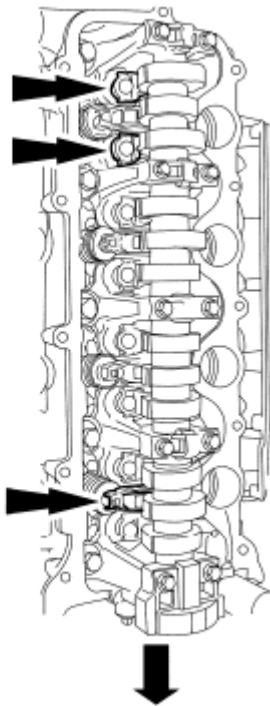


Fig. 315: Locating Camshaft Roller Followers And Bolts
Courtesy of FORD MOTOR CO.

31. Remove only the 3 camshaft roller followers shown in the illustration from the RH cylinder head.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed.

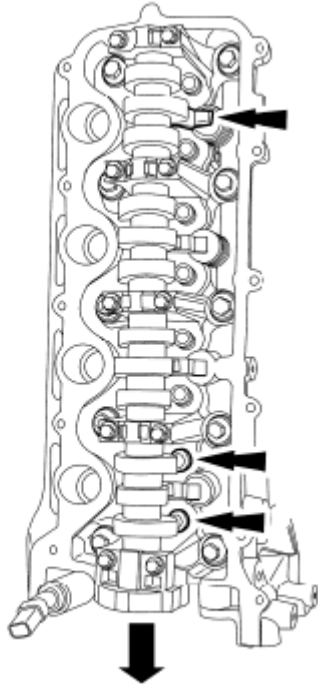
NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 316: Removing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

32. Using the Valve Spring Compressor, remove the 3 camshaft roller followers designated in the previous step from the RH cylinder head.

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



A0084479

Fig. 317: Removing Camshaft Roller Followers And Bolts
Courtesy of FORD MOTOR CO.

33. Remove only the 3 camshaft roller followers shown in the illustration from the LH cylinder head.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 318: Removing Valve Spring Compressor
Courtesy of FORD MOTOR CO.

34. Using the Valve Spring Compressor, remove the 3 camshaft roller followers designated in the previous step from the LH cylinder head.

NOTE: The crankshaft cannot be moved past the 6 o'clock position once set or engine damage may occur.

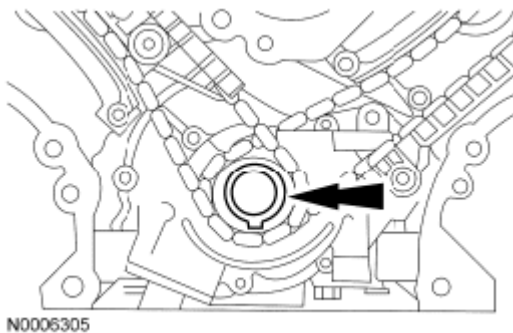


Fig. 319: Positioning Crankshaft Keyway
Courtesy of FORD MOTOR CO.

35. Rotate the crankshaft clockwise and position the crankshaft keyway at the 6 o'clock position.

NOTE: If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks,

tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

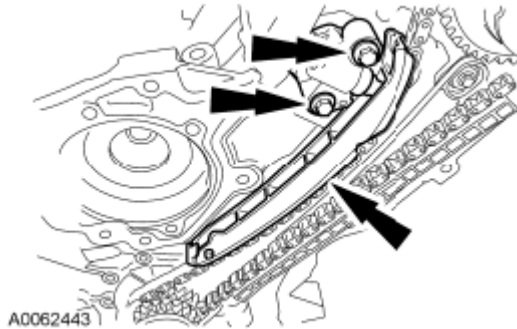


Fig. 320: Locating LH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

36. Remove the 2 bolts, the LH timing chain tensioner and tensioner arm.

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

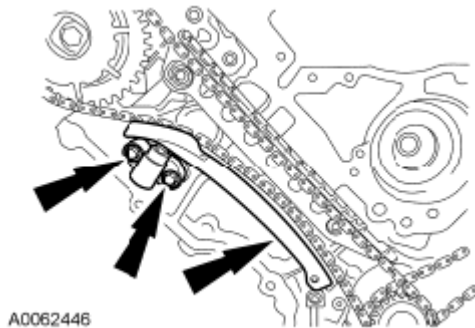


Fig. 321: Locating RH Timing Chain Tensioner And Bolts
Courtesy of FORD MOTOR CO.

37. Remove the 2 bolts, the RH timing chain tensioner and tensioner arm.
38. Remove the RH and LH timing chains and the crankshaft sprocket.
 - Remove the RH timing chain from the camshaft sprocket.
 - Remove the RH timing chain from the crankshaft sprocket.
 - Remove the LH timing chain from the camshaft sprocket.
 - Remove the LH timing chain and crankshaft sprocket.

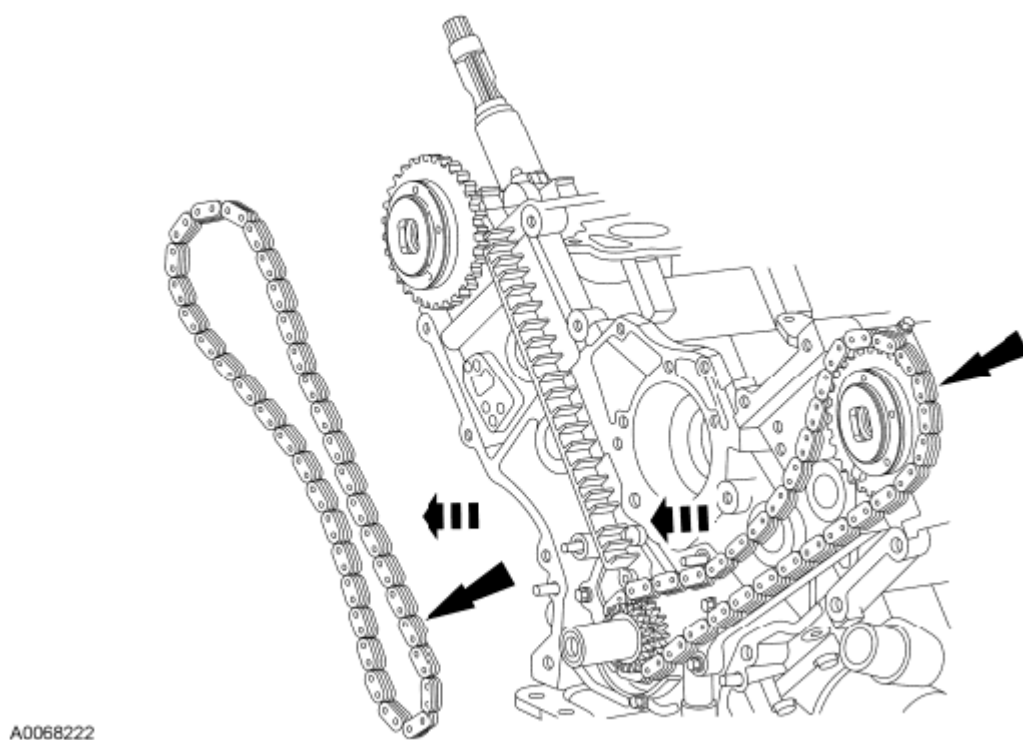


Fig. 322: Locating Timing Chains And Crankshaft Sprocket (RH And LH)
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

39. Remove the LH and RH timing chain guides.
- Remove the 4 bolts.
 - Remove both timing chain guides.

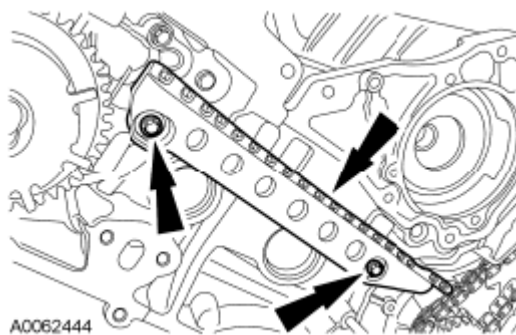


Fig. 323: Locating Timing Chain Guide And Mounting Bolts
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

40. Using the Cam Phaser Locking Tool, remove the bolt and the RH camshaft phaser and sprocket assembly.
- Discard the camshaft phaser and sprocket bolt.

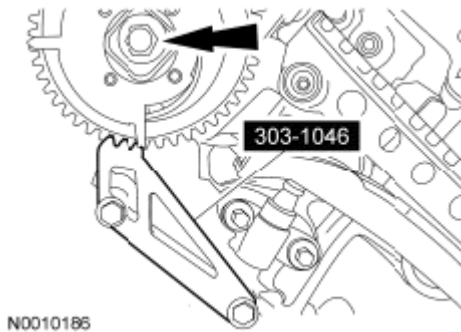


Fig. 324: Locating VCT Phaser Sprocket Bolt And Holder Tool
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

41. Using the Cam Phaser Locking Tool, remove the bolt and the LH camshaft phaser and sprocket assembly.
- Discard the camshaft phaser and sprocket bolt.

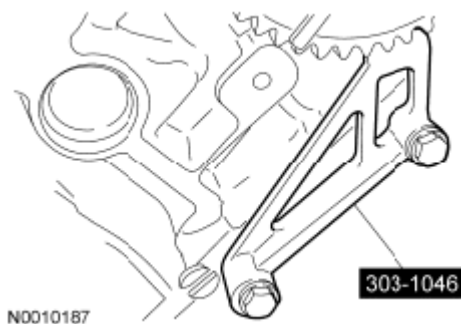
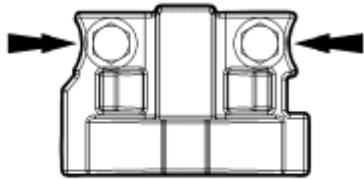


Fig. 325: Removing LH Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.

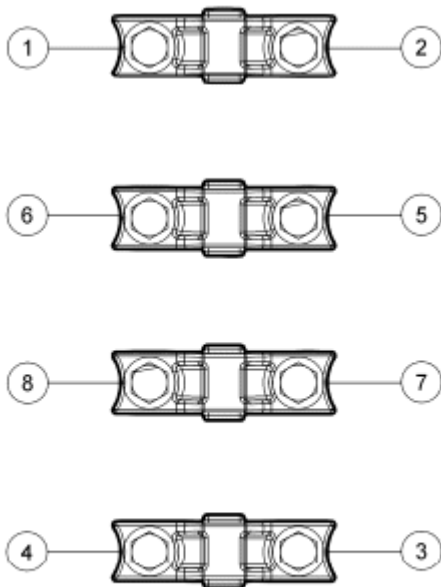


N0070049

Fig. 326: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

42. Remove the 2 bolts and the RH cylinder head camshaft front bearing cap.

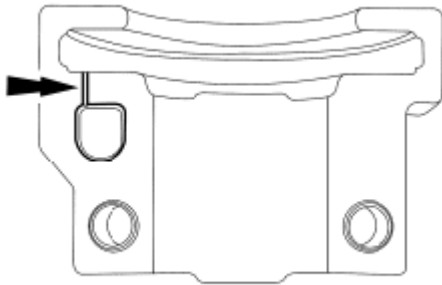
NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these instructions may result in engine damage.



N0091483

Fig. 327: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

43. Remove the remaining 8 bolts in the sequence shown in illustration and remove the RH cylinder head camshaft bearing caps.
44. Clean and inspect the RH camshaft bearing caps.
- The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.

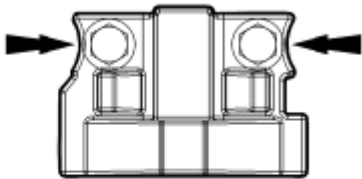


N0010448

Fig. 328: Locating Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

45. Remove the RH camshaft.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.

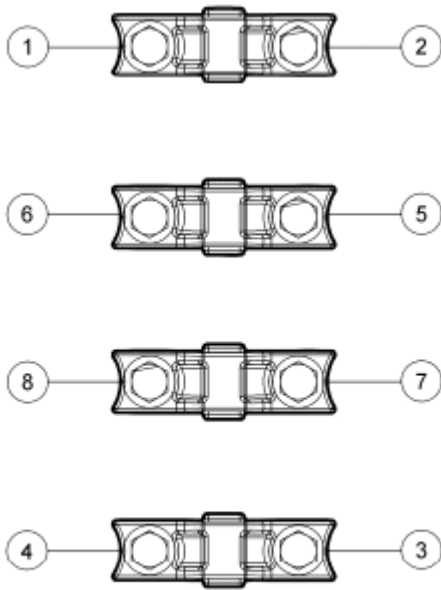


N0070049

Fig. 329: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

46. Remove the 2 bolts and the RH cylinder head camshaft front bearing cap.

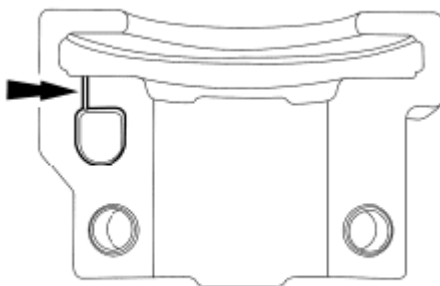
NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these instructions may result in engine damage.



N0091483

Fig. 330: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

47. Remove the remaining 8 bolts in the sequence shown in illustration and remove the LH cylinder head camshaft bearing caps.
48. Clean and inspect the LH camshaft bearing caps.
 - The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.



N0010448

Fig. 331: Locating Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

49. Remove the LH camshaft.

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

50. Remove the all of the remaining camshaft roller followers from the cylinder heads.

LH cylinder head

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

51. Remove the hydraulic lash adjusters from the LH cylinder head.
52. Remove the bolt and the intake manifold vacuum tube support bracket.

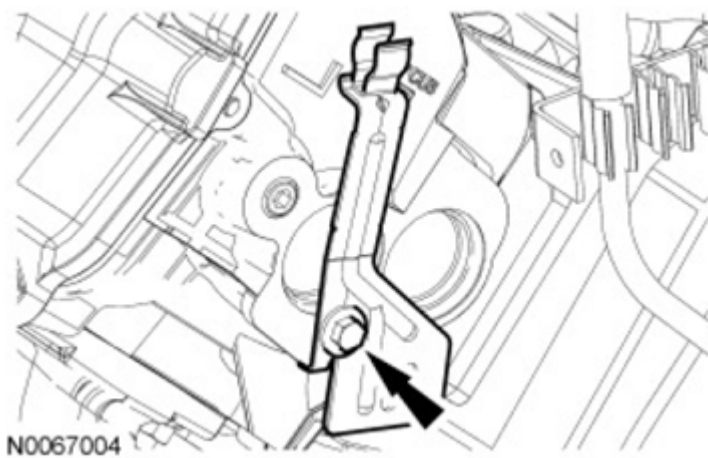


Fig. 332: Locating Intake Manifold Vacuum Tube Support Bracket And Bolt
Courtesy of FORD MOTOR CO.

53. Install the Cylinder Head Remover/Installer onto the LH cylinder head.

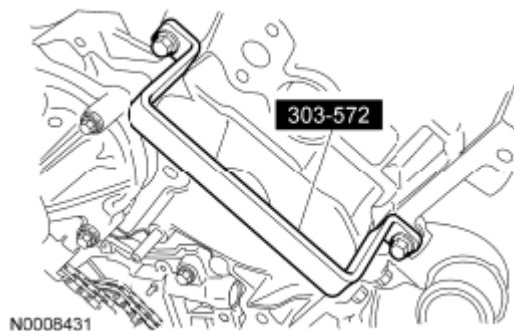


Fig. 333: Installing Special Tool Onto Cylinder Head
Courtesy of FORD MOTOR CO.

54. Remove the 8 nuts, the 8 studs and the LH exhaust manifold.
- Discard the gaskets, the 8 studs and the 8 nuts.
 - Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM -**

GENERAL INFORMATION .

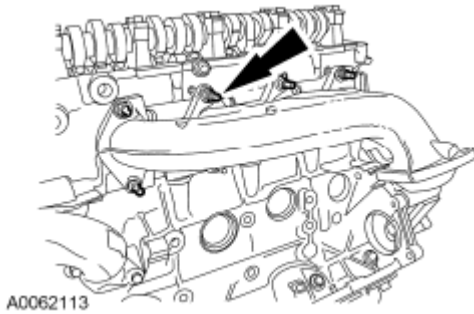


Fig. 334: Locating Exhaust Manifold Bolt
Courtesy of FORD MOTOR CO.

RH cylinder head

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

55. Remove the hydraulic lash adjusters from the RH cylinder heads.
56. Remove the stud bolt and the coolant tube.
 - Discard the O-ring seals.

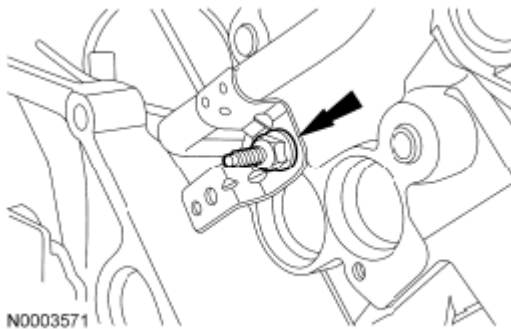


Fig. 335: Locating Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

57. Install the Cylinder Head Remover/Installer onto the RH cylinder head.

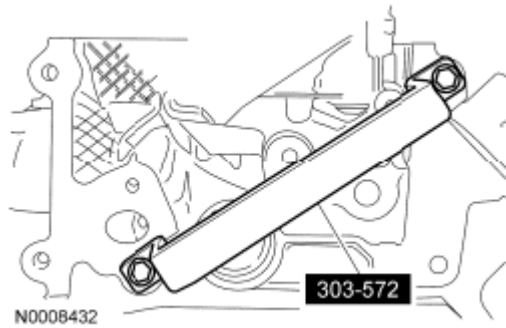


Fig. 336: Installing Cylinder Head Remover/Installer Onto RH Cylinder Head
Courtesy of FORD MOTOR CO.

58. Remove the 8 nuts, the 8 studs and the RH exhaust manifold.
- Discard the gaskets, the 8 studs and the 8 nuts.
 - Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

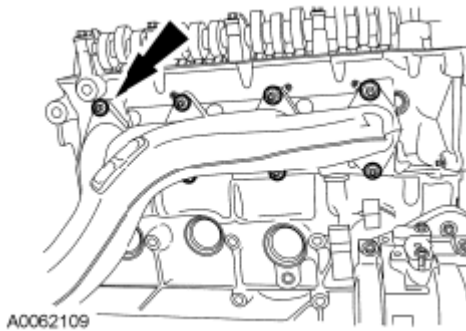


Fig. 337: Locating RH Exhaust Manifold
Courtesy of FORD MOTOR CO.

All cylinder heads

- NOTE:** The cylinder head must be cool before removing it from the engine. Cylinder head warpage may result if a warm or hot cylinder head is removed.
- NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.
- NOTE:** The cylinder head bolts must be discarded and new bolts must be installed. They are a tighten-to-yield design and cannot be reused.
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches

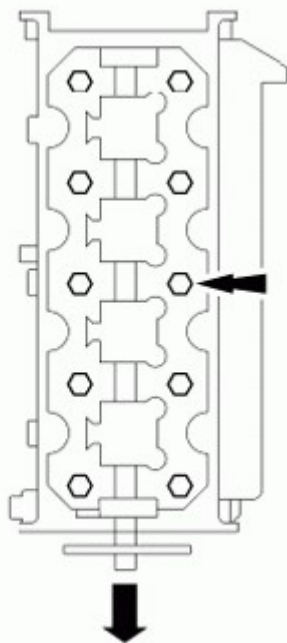
and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant. Failure to follow this procedure may cause future oil leakage.

NOTE: Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface.

NOTE: RH shown in illustration, LH similar.

59. Remove the bolts and the cylinder head.

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



N0067889

Fig. 338: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

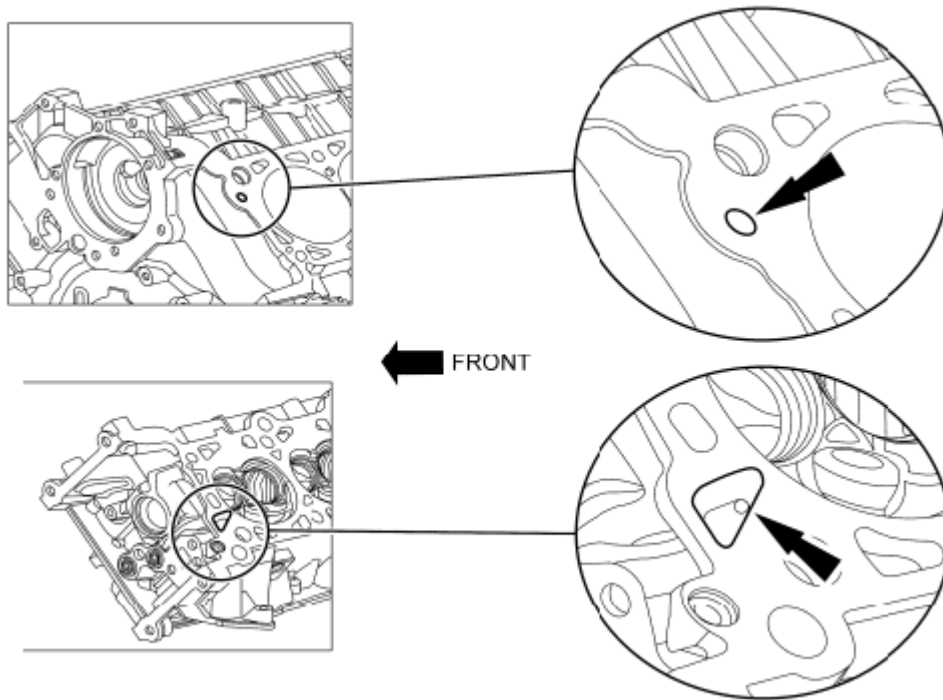
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant. Failure to follow this procedure may cause future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

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.

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

NOTE: LH shown in illustration, RH similar.



A0079634

Fig. 339: Locating Oil Pressure Feed Area
Courtesy of FORD MOTOR CO.

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

DISASSEMBLY

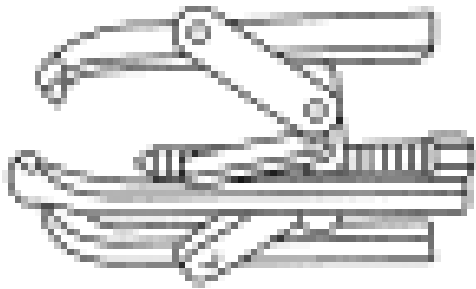
ENGINE

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

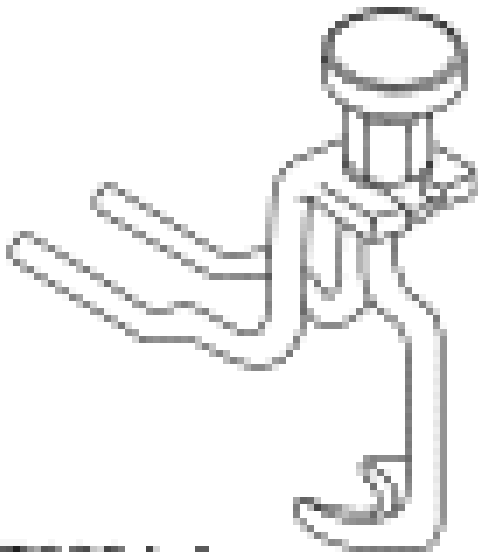
Special Tool(s)

SPECIAL TOOL REFERENCE



ST1184-A

3 Jaw Puller
303-D121

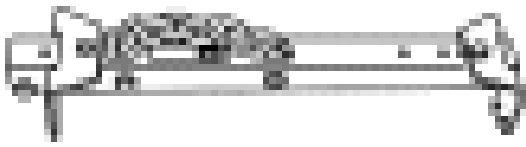


ST2604-A

Compressor, Valve Spring
303-1039

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



Engine Lifting Bracket
303-F047 (014-00073) or equivalent

ST1377-A



Fan Clutch Nut Wrench
303-240 (T84T-6312-D)

ST1500-A

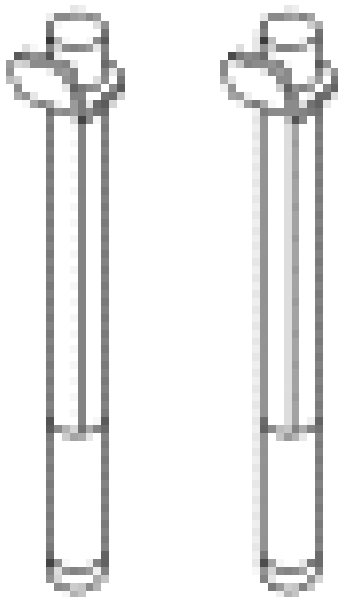
Fan Pulley Holding Wrench
303-239 (T84T-6312-C)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1499-A

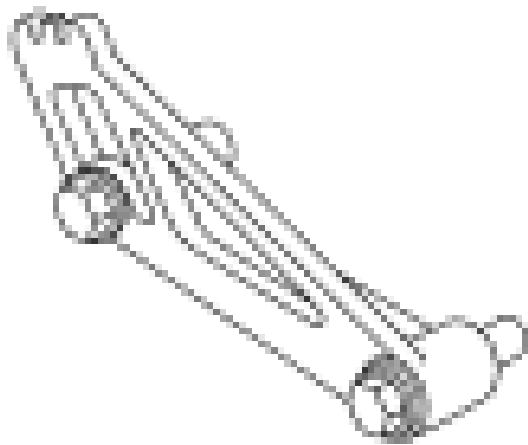


ST1337-A

Installer, Connecting Rod
303-442 (T93P-6136-A)

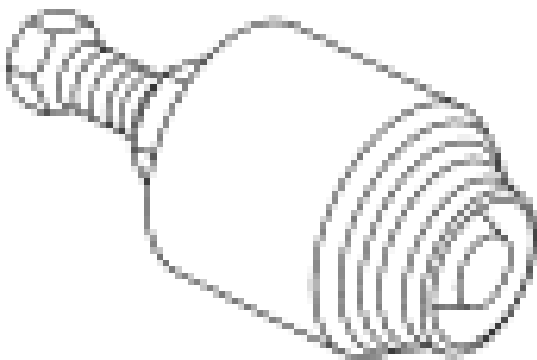
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2B07-A

Locking Tool, Cam Phaser
303-1046



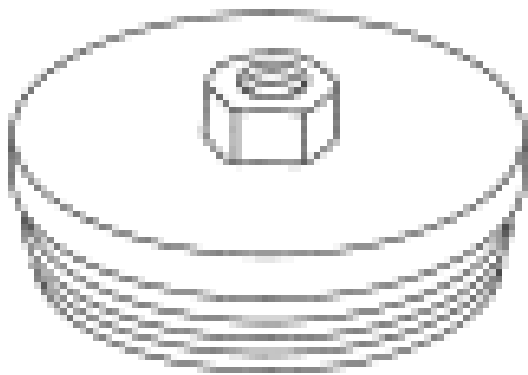
ST1730-A

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

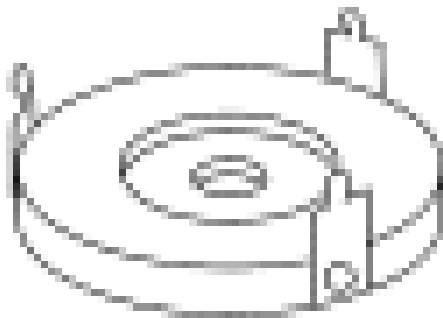
Remover, Crankshaft Rear Oil Seal
303-519 (T95P-6701-DH)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1382-A



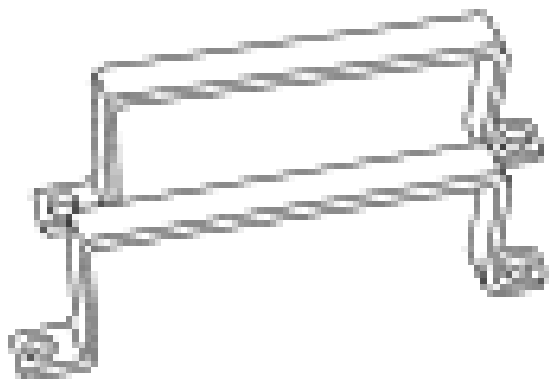
ST1481-A

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

Remover/Installer, Cylinder Head

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

**ST1668-A**

303-572 (T97T-6000-A)

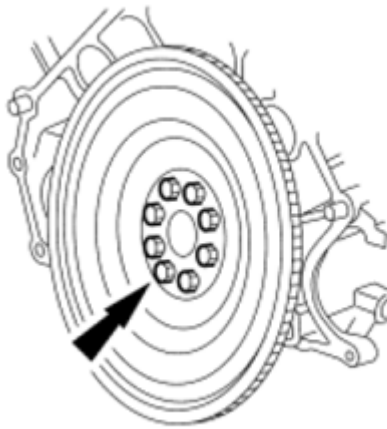
**ST1185-A**Slide Hammer
100-001 (T50T-100-A)**Material****ITEM SPECIFICATION**

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

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

- NOTE:** During engine repair procedures, cleanliness is extremely important. Any foreign material, including any material created while cleaning gasket surfaces that enters the oil passages, coolant passages or the oil pan, may cause engine failure.
- NOTE:** The flexplate or flywheel, crankshaft rear seal and the crankshaft rear oil slinger must be removed before mounting the engine on the engine stand.
- NOTE:** For additional information, refer to the exploded view under the **ASSEMBLY** procedure.

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



A26551-A

Fig. 340: Locating Flexplate Bolts
Courtesy of FORD MOTOR CO.

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

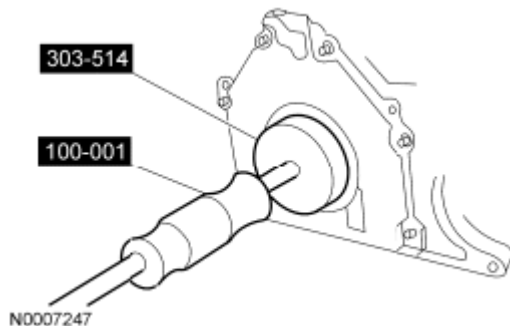


Fig. 341: Removing Crankshaft Oil Slinger
Courtesy of FORD MOTOR CO.

3. Using the Slide Hammer and the Crankshaft Rear Oil Seal Remover, remove and discard the crankshaft

rear seal.

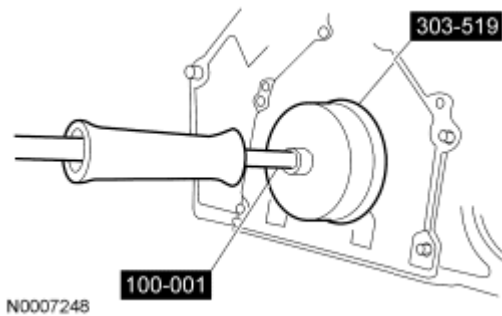


Fig. 342: Removing Crankshaft Rear Seal Using Special Tools
Courtesy of FORD MOTOR CO.

4. Remove the 8 bolts and the crankshaft rear seal retainer plate.

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

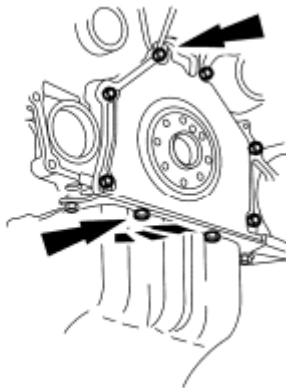


Fig. 343: Inspecting Sealing Surfaces
Courtesy of FORD MOTOR CO.

- Clean and inspect the sealing surfaces.
5. Mount the engine on a suitable work stand.
 6. Remove the Engine Lifting Bracket.

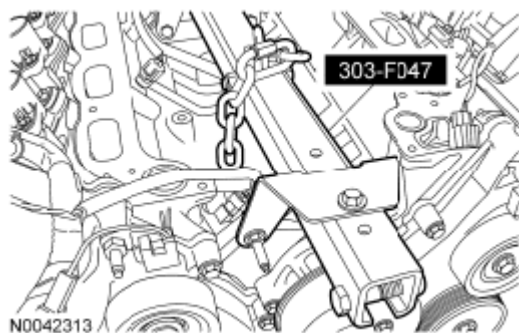


Fig. 344: Removing Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

7. Remove the 3 bolts and the RH engine support insulator bracket.
 - Discard the bolts.

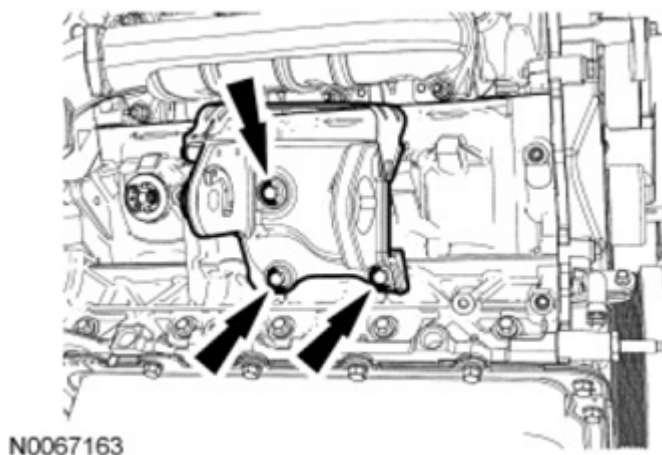


Fig. 345: Locating RH Engine Support Insulator Bracket Bolts
Courtesy of FORD MOTOR CO.

NOTE: LH shown in illustration, RH similar.

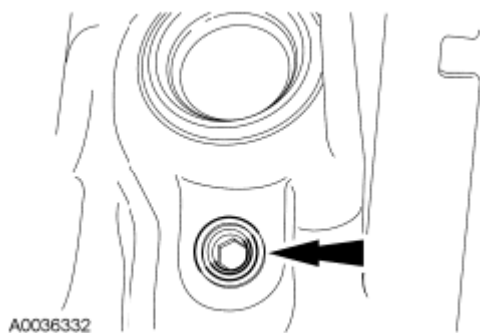


Fig. 346: Locating Cylinder Block Drain Plugs
Courtesy of FORD MOTOR CO.

8. If equipped, remove the cylinder block drain plugs and drain the coolant into a suitable container.

NOTE: LH shown in illustration, RH similar.

9. If equipped, install the cylinder block drain plugs.
- Tighten to 24 Nm (18 lb-ft).

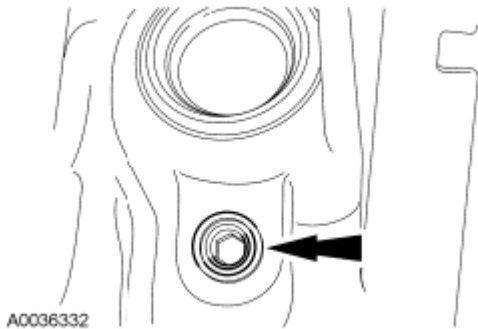


Fig. 347: Locating Cylinder Block Drain Plugs
Courtesy of FORD MOTOR CO.

NOTE: Do not side load the cooling fan clutch coil or the cooling fan clutch coil may be damaged.

NOTE: The large clutch assembly nut has a RH thread and must be rotated counterclockwise to remove it.

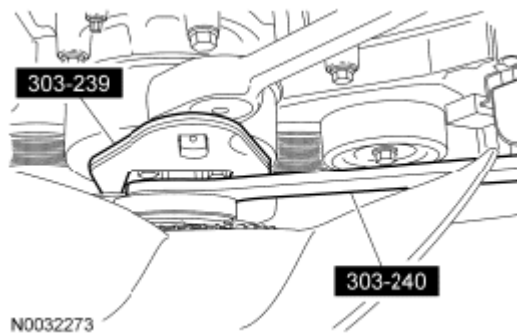


Fig. 348: Removing Cooling Fan And Clutch Assembly
Courtesy of FORD MOTOR CO.

10. Using the Fan Pulley Holding Wrench and the Fan Clutch Nut Wrench, remove the cooling fan.
11. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.

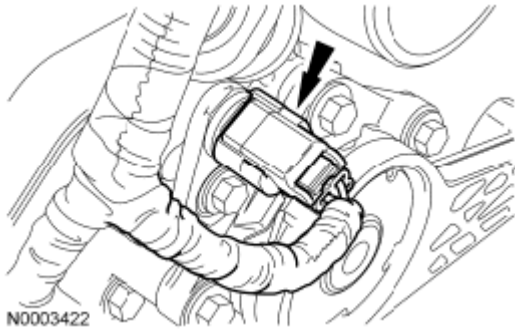


Fig. 349: Locating RH Camshaft Position Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

12. Remove the stud bolt and the RH radio ignition interference capacitor.

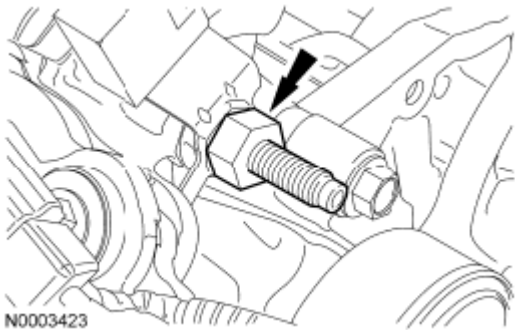


Fig. 350: Locating Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

13. Disconnect the RH Variable Camshaft Timing (VCT) solenoid electrical connector.

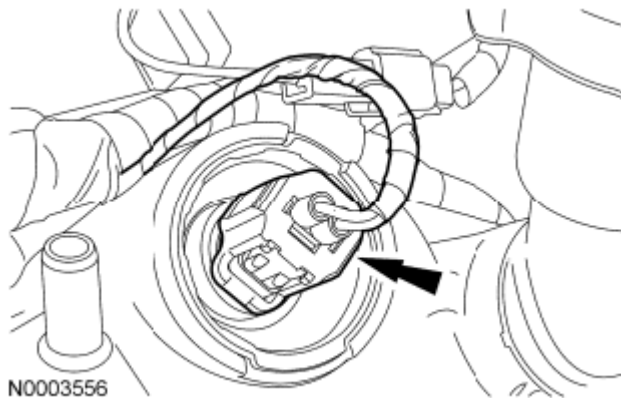


Fig. 351: Locating VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

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

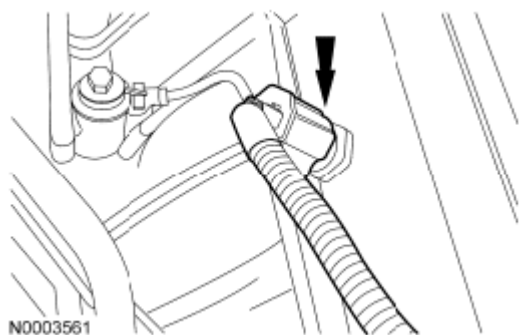


Fig. 352: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

15. Remove the stud bolt and the LH radio ignition interference capacitor.

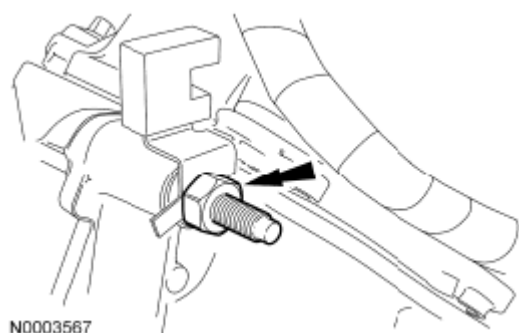


Fig. 353: Locating Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

16. Disconnect the engine wiring harness position retainers from the front of the RH valve cover.

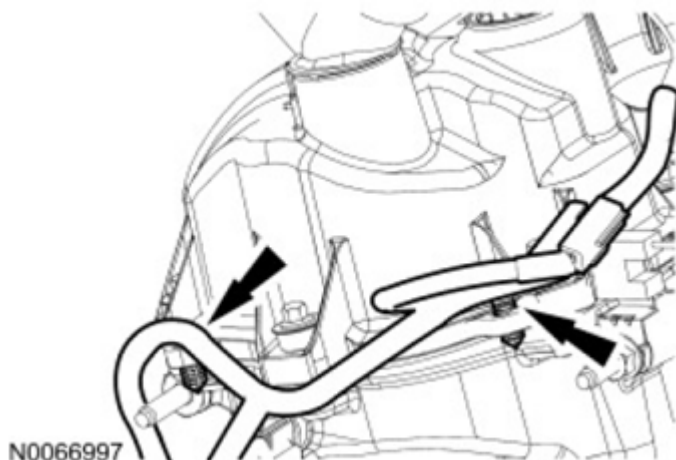


Fig. 354: Locating RH Valve Cover
Courtesy of FORD MOTOR CO.

17. Disconnect the engine wiring harness position retainers from the front of the LH valve cover and the LH **CMP** sensor electrical connector.

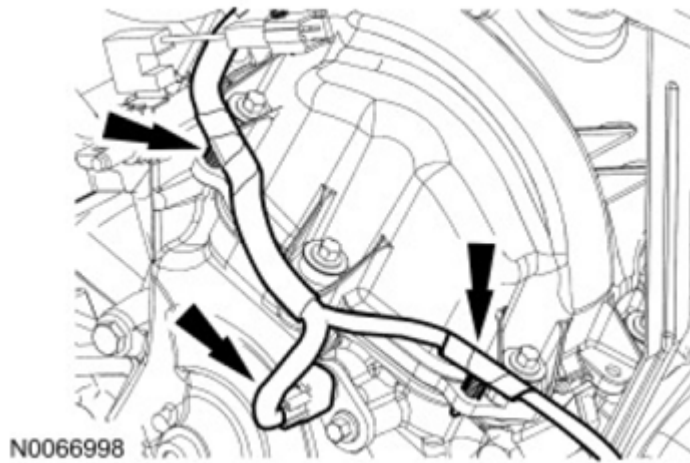


Fig. 355: Locating Engine Wiring Harness Position Retainers
Courtesy of FORD MOTOR CO.

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

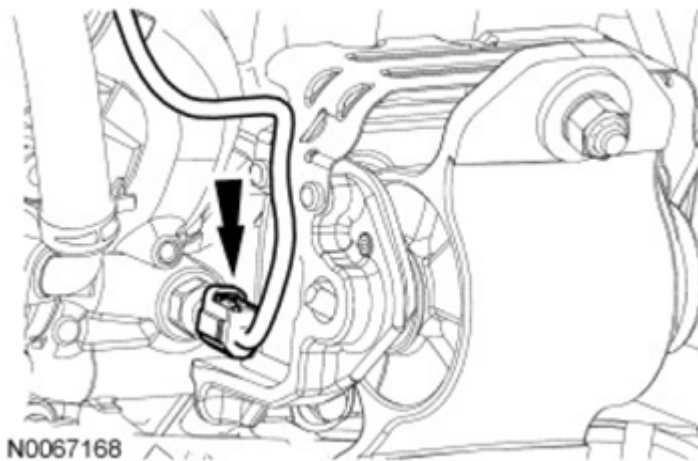


Fig. 356: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

19. Disconnect the 2 engine wiring harness retainers from the RH valve cover studs.

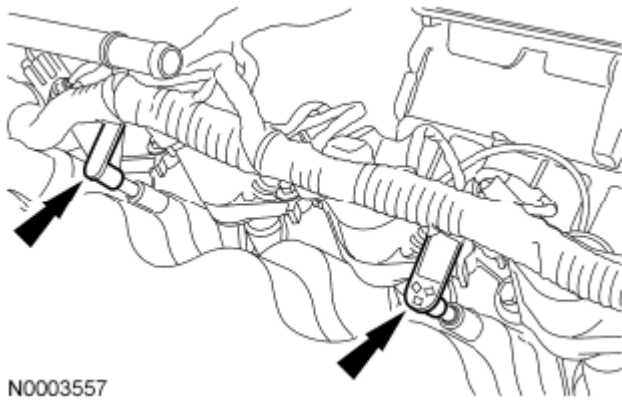


Fig. 357: Locating Engine Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

20. Remove the engine wiring harness from the engine assembly.

NOTE: RH shown in illustration, LH similar.

21. Remove the 8 bolts and the 8 ignition coils.
- Remove the ignition coil, using a twisting motion while pulling up on the ignition coil.



Fig. 358: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

22. Remove the 2 bolts and both of the Knock Sensor (KS).

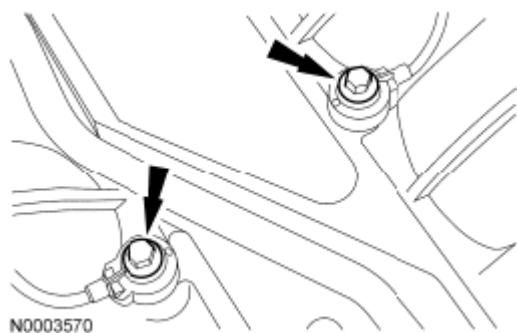


Fig. 359: Locating Knock Sensors (KS) And Bolts
Courtesy of FORD MOTOR CO.

23. Remove the stud bolt and the coolant tube.
- Discard the O-ring seal.

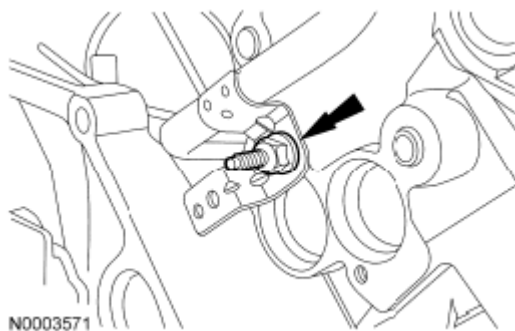


Fig. 360: Identifying Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

24. Remove the 2 bolts and the oil level indicator tube.
- Discard the O-ring seal.

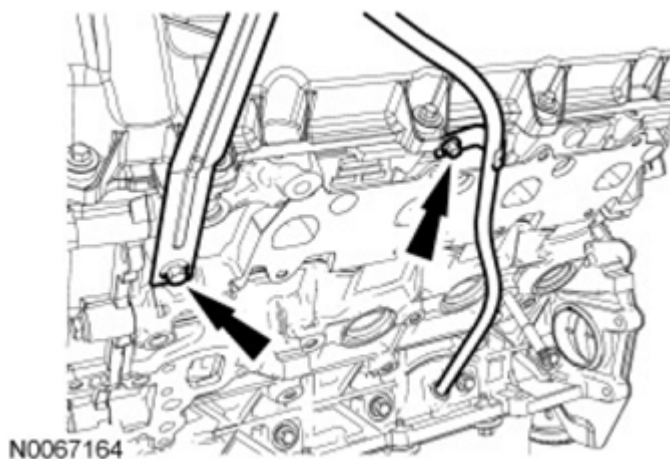


Fig. 361: Locating Oil Level Indicator Tube And Bolts

Courtesy of FORD MOTOR CO.

25. Remove the bolt and the intake manifold vacuum tube support bracket.

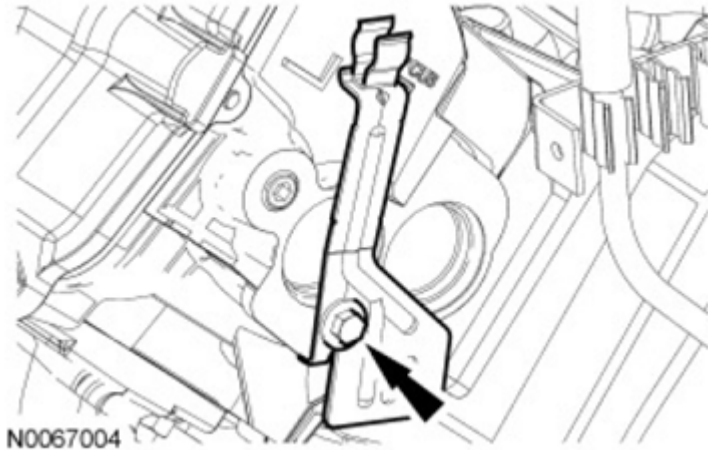


Fig. 362: Locating Intake Manifold Vacuum Tube Support Bracket And Bolt
Courtesy of FORD MOTOR CO.

- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.
- NOTE:** When removing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.
- NOTE:** The fasteners are part of the valve cover and should not be removed.
- NOTE:** LH shown in illustration, RH similar.

26. Remove the valve covers.

- Fully loosen the fasteners and remove the valve cover.
- Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
- Inspect the valve cover gasket. If the gasket is damaged, remove and discard the gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.

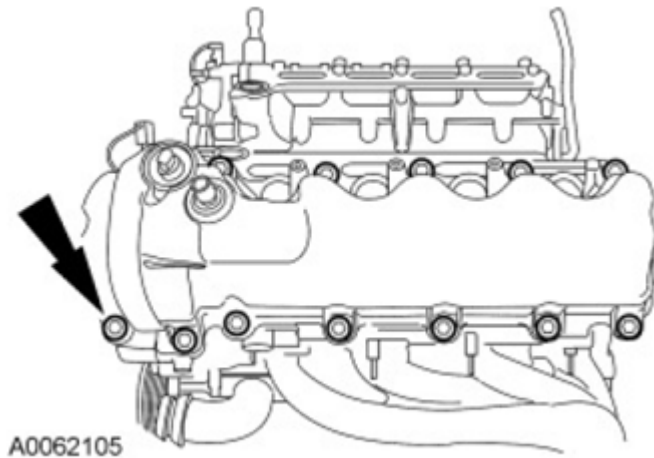


Fig. 363: Locating Valve Covers
Courtesy of FORD MOTOR CO.

27. Remove the 8 nuts, the 8 studs and the RH exhaust manifold.
- Discard the gaskets, nuts and studs.
 - Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

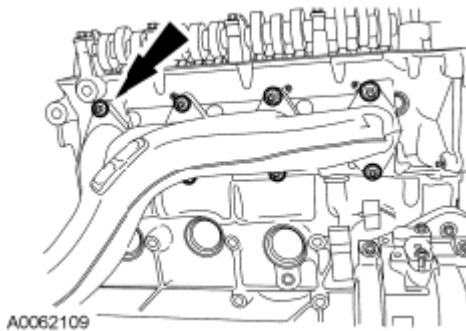


Fig. 364: Locating RH Exhaust Manifold
Courtesy of FORD MOTOR CO.

28. Remove the 8 nuts, the 8 studs and the LH exhaust manifold.
- Discard the gaskets, nuts and studs.
 - Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

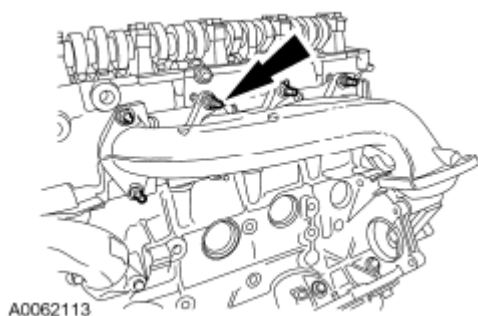


Fig. 365: Locating Exhaust Manifold Bolt
Courtesy of FORD MOTOR CO.

29. Remove the 3 bolts and the LH engine support insulator.
- Discard the bolts.

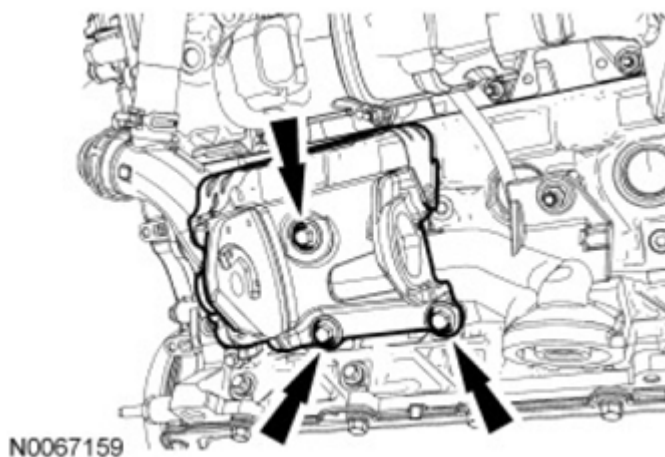


Fig. 366: Locating LH Engine Support Insulator And Bolts
Courtesy of FORD MOTOR CO.

30. Remove the nut, the 4 bolts and the oil filter adapter and gasket.
- Discard the gasket.

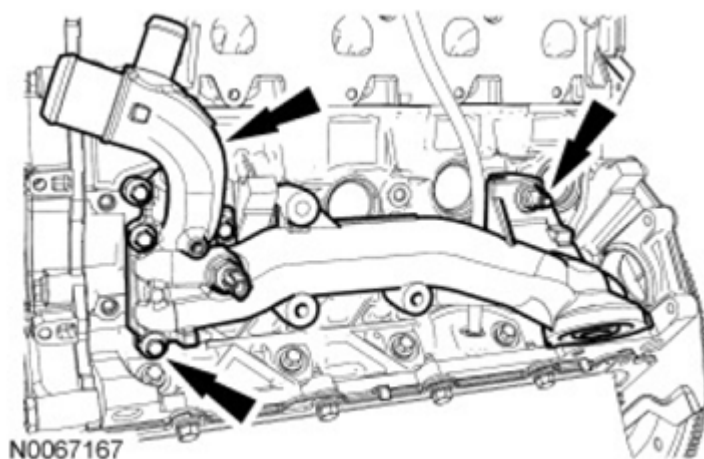


Fig. 367: Locating Oil Filter Adapter, Gasket And Nuts
Courtesy of FORD MOTOR CO.

31. Remove the 5 bolts, coolant pump pulley and accessory drive belt idler pulley.

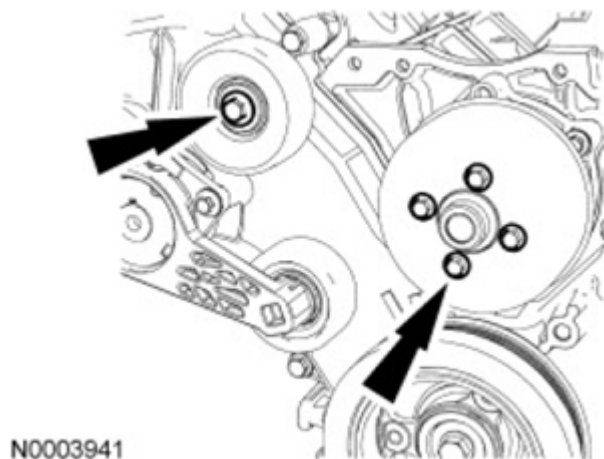


Fig. 368: Locating Coolant Pump Pulley And Idler Pulley Bolts
Courtesy of FORD MOTOR CO.

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

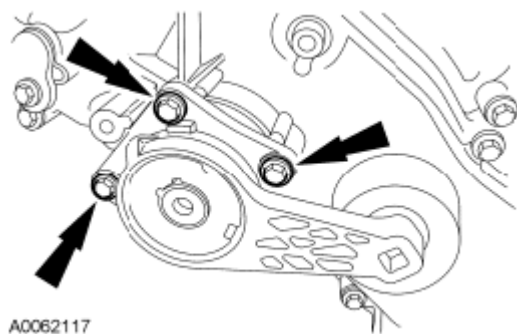


Fig. 369: Locating Accessory Drive Belt Tensioner And Bolts
Courtesy of FORD MOTOR CO.

33. Remove the 4 bolts.

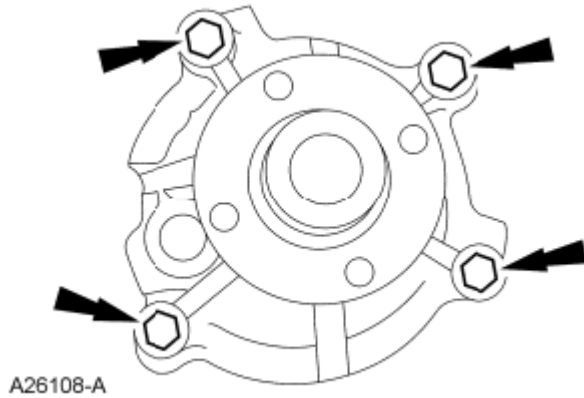


Fig. 370: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

34. Remove the coolant pump from the cylinder block.
- Discard the O-ring seal.

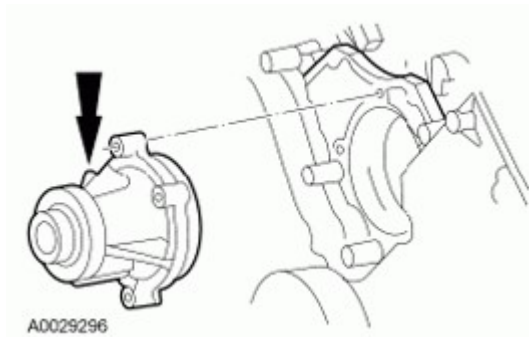
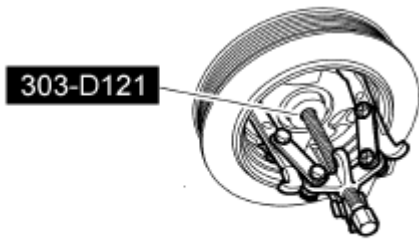


Fig. 371: Locating Coolant Pump
Courtesy of FORD MOTOR CO.

35. Remove and discard the crankshaft pulley bolt. Using the 3 Jaw Puller, remove the crankshaft pulley.



N0010528

Fig. 372: Removing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

36. Using the Crankshaft Front Oil Seal Remover, remove and discard the crankshaft seal.

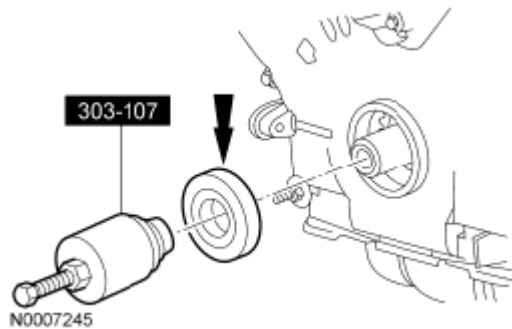
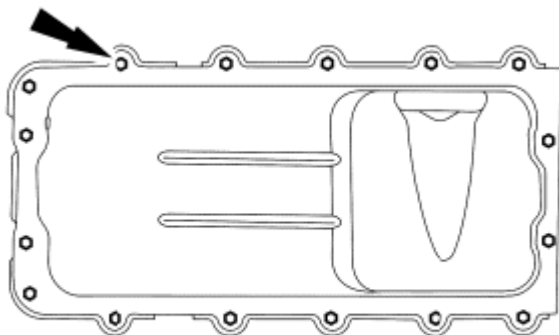


Fig. 373: Removing Crankshaft Front Seal Using Special Tool
Courtesy of FORD MOTOR CO.

37. Remove the 16 bolts, oil pan and oil pan gasket.

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



A26563-B

Fig. 374: Locating Oil Pan Sealing Surfaces
Courtesy of FORD MOTOR CO.

- Clean and inspect the sealing surfaces.

NOTE: **Correct fastener location is essential for assembly procedure. Record fastener location.**

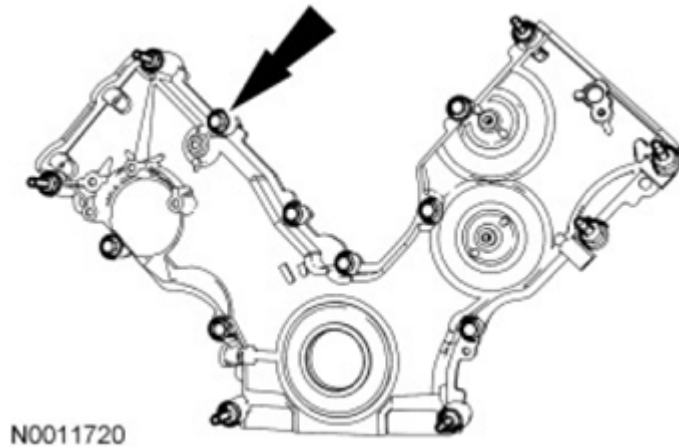


Fig. 375: Removing Front Cover Bolts
Courtesy of FORD MOTOR CO.

38. Remove the 15 fasteners.
39. Remove the engine front cover from the cylinder block.

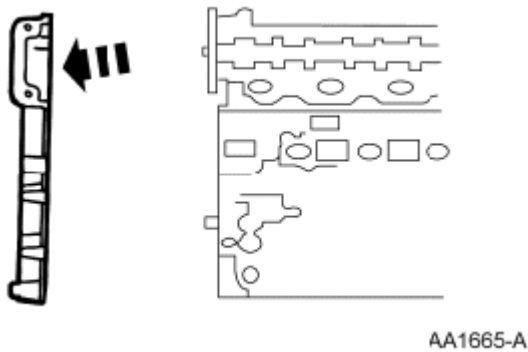


Fig. 376: Removing Engine Front Cover From Cylinder Block
Courtesy of FORD MOTOR CO.

40. Remove the crankshaft sensor ring from the crankshaft.

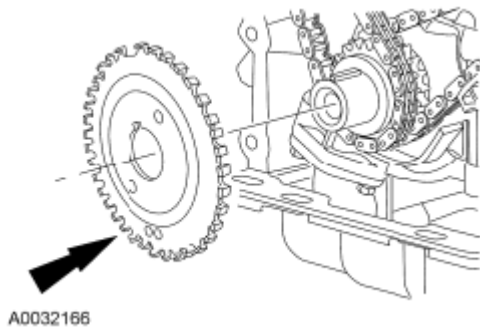


Fig. 377: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

41. Position the crankshaft keyway at the 12 o'clock position.

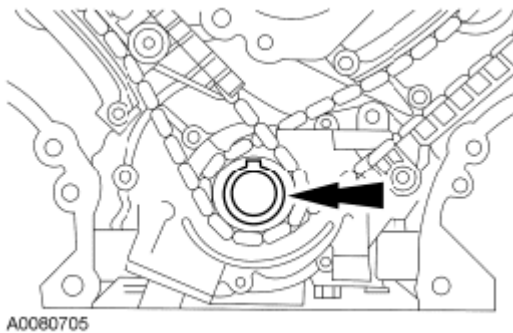


Fig. 378: Positioning Crankshaft Keyway At 12 O'Clock Position
Courtesy of FORD MOTOR CO.

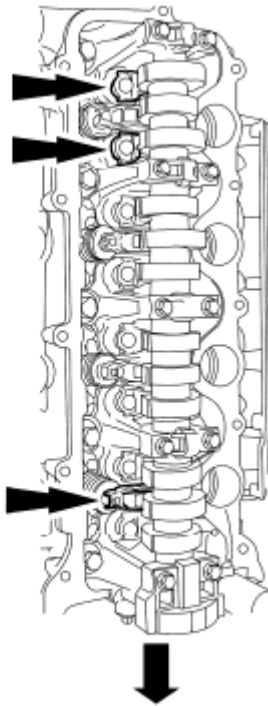
NOTE: If the camshaft lobes are not exactly positioned as shown in illustration, the crankshaft will require one full additional rotation to 12 o'clock.



Fig. 379: Identifying Position Of Intake Camshaft Lobes And Exhaust Lobe On No. 1 Cylinder
Courtesy of FORD MOTOR CO.

42. The No. 1 cylinder camshaft exhaust lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 1 cylinder.

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



A0083248

Fig. 380: Locating RH Cylinder Head Camshaft Roller Followers And Bolts
Courtesy of FORD MOTOR CO.

43. Remove only the 3 camshaft roller followers shown in the illustration from the RH cylinder head.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed.

NOTE: It may be necessary to push the valve down while compressing the spring.

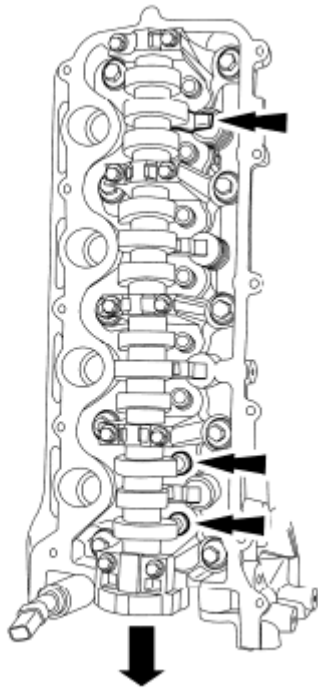


Fig. 381: Removing Camshaft Roller Followers

Courtesy of FORD MOTOR CO.

44. Using the Valve Spring Compressor, remove the 3 camshaft roller followers designated in the previous step from the RH cylinder head.

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



A0084479

Fig. 382: Locating LH Cylinder Head Camshaft Roller Followers And Bolts

Courtesy of FORD MOTOR CO.

45. Remove only the 3 camshaft roller followers shown in the illustration from the LH cylinder head.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed.

NOTE: It may be necessary to push the valve down while compressing the spring.



Fig. 383: Removing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

46. Using the Valve Spring Compressor, remove the 3 camshaft roller followers designated in the previous step from the LH cylinder head.

NOTE: The crankshaft cannot be moved past the 6 o'clock position once set or engine damage may occur.

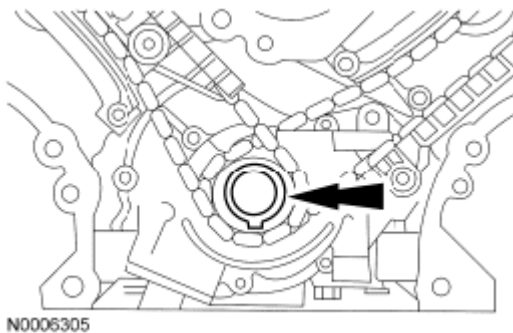


Fig. 384: Positioning Crankshaft Keyway
Courtesy of FORD MOTOR CO.

47. Rotate the crankshaft clockwise and position the crankshaft keyway at the 6 o'clock position.

NOTE: If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. If cracks,

tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

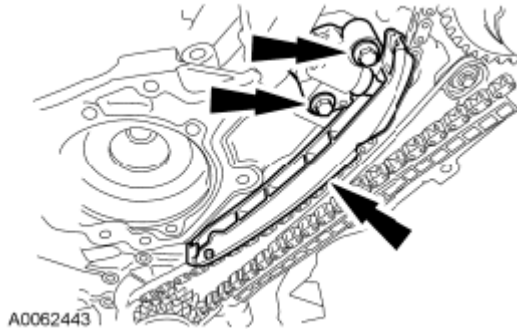


Fig. 385: Identifying LH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

48. Remove the 2 bolts, the LH timing chain tensioner and tensioner arm.

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

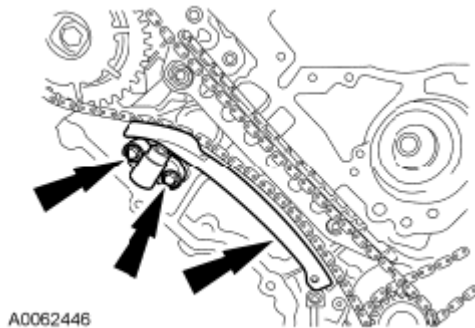


Fig. 386: Locating RH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

49. Remove the 2 bolts, the RH timing chain tensioner and tensioner arm.
50. Remove the RH and LH timing chains and the crankshaft sprocket.
 - Remove the RH timing chain from the camshaft sprocket.
 - Remove the RH timing chain from the crankshaft sprocket.
 - Remove the LH timing chain from the camshaft sprocket.
 - Remove the LH timing chain and crankshaft sprocket.

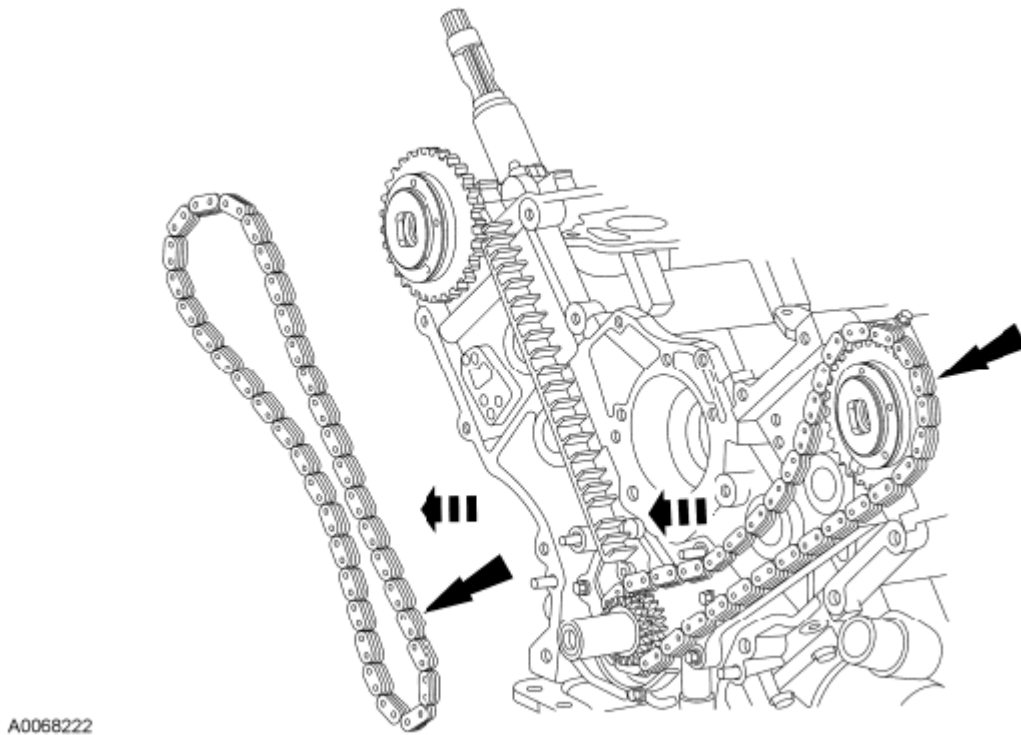


Fig. 387: Locating Timing Chains And Crankshaft Sprocket (RH And LH)
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

51. Remove the LH and RH timing chain guides.
- Remove the 4 bolts.
 - Remove both timing chain guides.

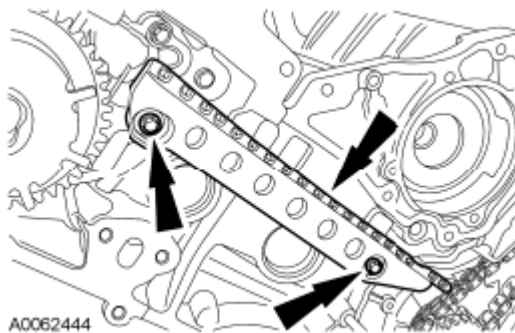


Fig. 388: Locating Timing Chain Guide And Mounting Bolts
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

52. Using the Cam Phaser Locking Tool, remove the bolt and the RH camshaft phaser and sprocket assembly.
- Discard the camshaft phaser and sprocket bolt.

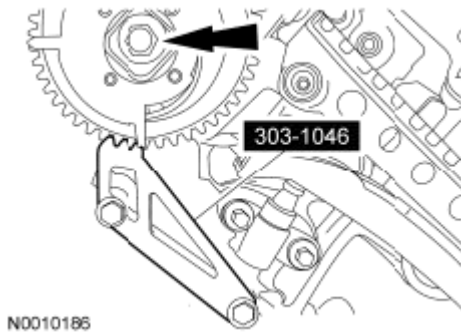


Fig. 389: Removing RH Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

53. Using the Cam Phaser Locking Tool, remove the bolt and the LH camshaft phaser and sprocket assembly.
- Discard the camshaft phaser and sprocket bolt.

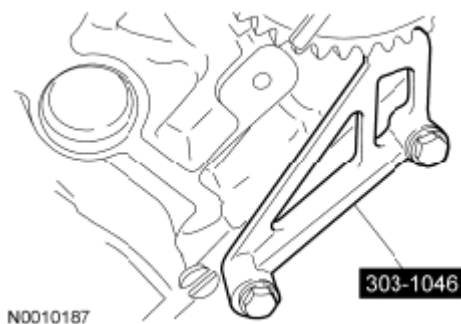


Fig. 390: Removing LH Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

54. Install the Cylinder Head Remover/Installer onto the LH cylinder head.

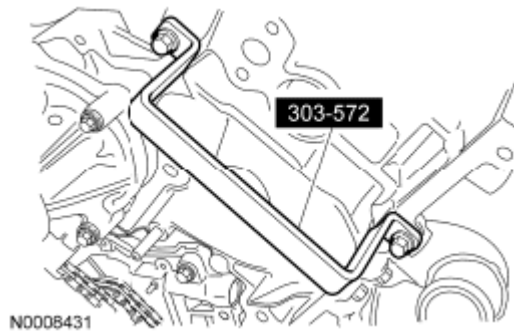


Fig. 391: Installing Cylinder Head Remover/Installer Onto LH Cylinder Head
Courtesy of FORD MOTOR CO.

55. Install the Cylinder Head Remover/Installer onto the RH cylinder head.

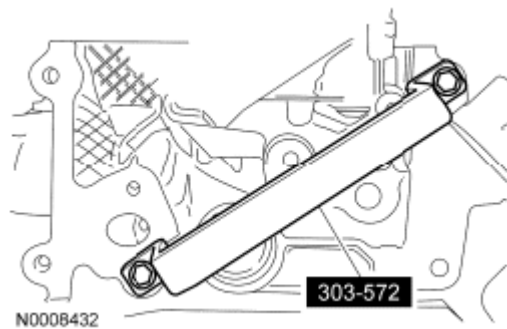
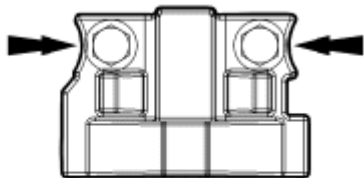


Fig. 392: Installing Cylinder Head Remover/Installer Onto RH Cylinder Head
Courtesy of FORD MOTOR CO.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.



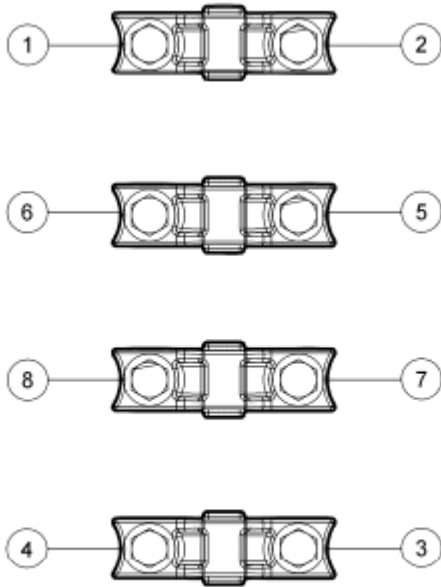
N0070049

Fig. 393: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

56. Remove the 2 bolts and the RH cylinder head camshaft front bearing cap.

NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these

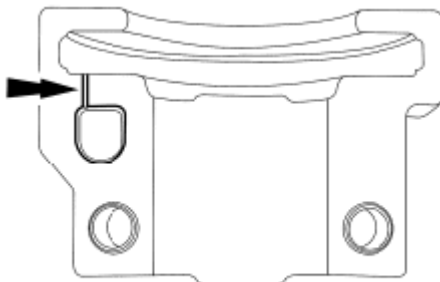
instructions may result in engine damage.



N0091483

Fig. 394: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

57. Remove the remaining 8 bolts in the sequence shown in illustration and remove the RH cylinder head camshaft bearing caps.
58. Clean and inspect the RH camshaft bearing caps.
 - The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.



N0010448

Fig. 395: Locating Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

59. Remove the RH camshaft.

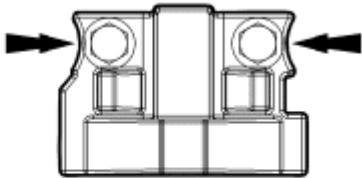
NOTE: If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.

60. Remove the remaining camshaft roller followers from the RH cylinder head.

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

61. Remove the hydraulic lash adjusters from the RH cylinder head.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers or the bearing cap may be damaged from side loading.

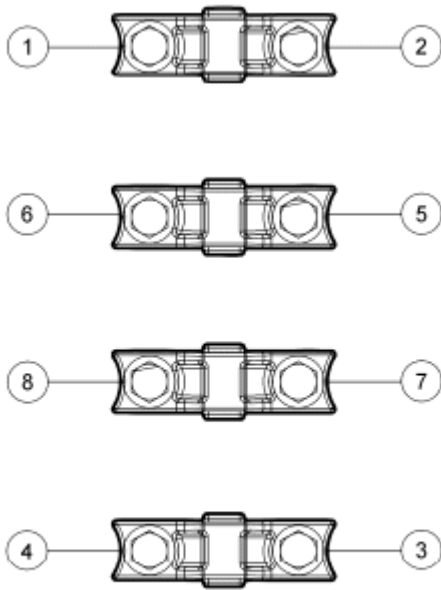


N0070049

Fig. 396: Locating Camshaft Front Bearing Cap And Bolts
Courtesy of FORD MOTOR CO.

62. Remove the 2 bolts and the LH cylinder head camshaft bearing cap.

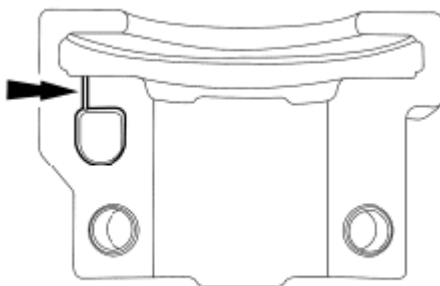
NOTE: The camshaft bearing caps must be installed in their original locations. Record camshaft bearing cap locations. Failure to follow these instructions may result in engine damage.



N0091483

Fig. 397: Identifying Camshaft Bearing Caps Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

63. Remove the remaining 8 bolts in the sequence shown in illustration and remove the LH cylinder head camshaft bearing caps.
64. Clean and inspect the LH camshaft bearing caps.
 - The camshaft front thrust bearing cap contains an oil metering groove. Make sure the groove is free of foreign material.



N0010448

Fig. 398: Identifying Camshaft Front Thrust Bearing Cap Oil Metering Groove
Courtesy of FORD MOTOR CO.

65. Remove the LH camshaft.

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

66. Remove the remaining camshaft roller followers from the LH cylinder head.

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

67. Remove the hydraulic lash adjusters from the LH cylinder head.

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

NOTE: Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine. Failure to follow this procedure may cause engine damage.

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

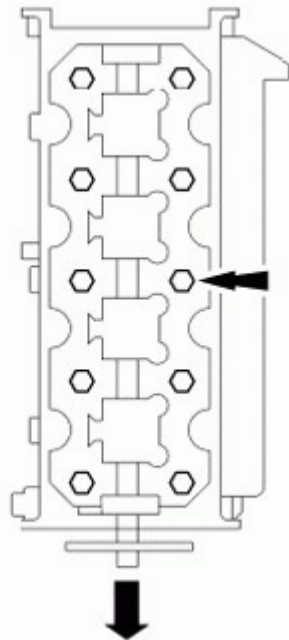
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

NOTE: Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface. Failure to follow this procedure may cause engine damage.

NOTE: RH shown in illustration, LH similar.

68. Remove the bolts and the cylinder head.

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



N0067889

Fig. 399: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

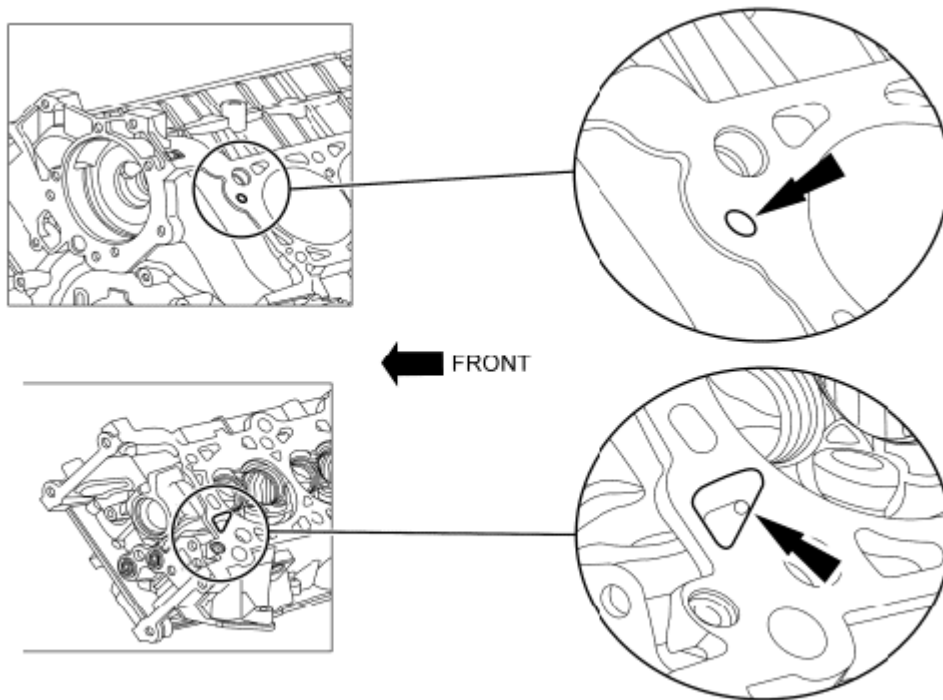
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

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. Failure to follow this procedure may cause engine damage.

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

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

NOTE: LH shown in illustration, RH similar.



A0079634

Fig. 400: Locating Oil Pressure Feed Area
Courtesy of FORD MOTOR CO.

70. Support the cylinder heads on a bench with the head gasket side up. Check the cylinder head distortion and the cylinder block distortion, paying particular attention to the oil pressure feed area. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
71. Remove the 3 bolts, the oil pump screen and pickup tube and the spacer.

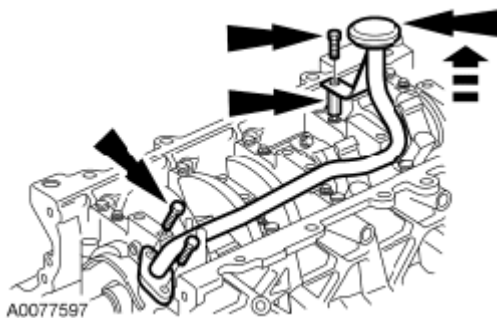


Fig. 401: Locating Bolts And Oil Pump Screen
Courtesy of FORD MOTOR CO.

72. Remove the 3 bolts and the oil pump.

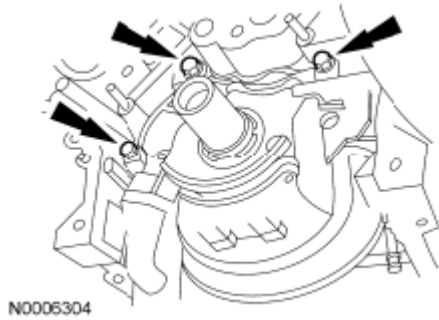
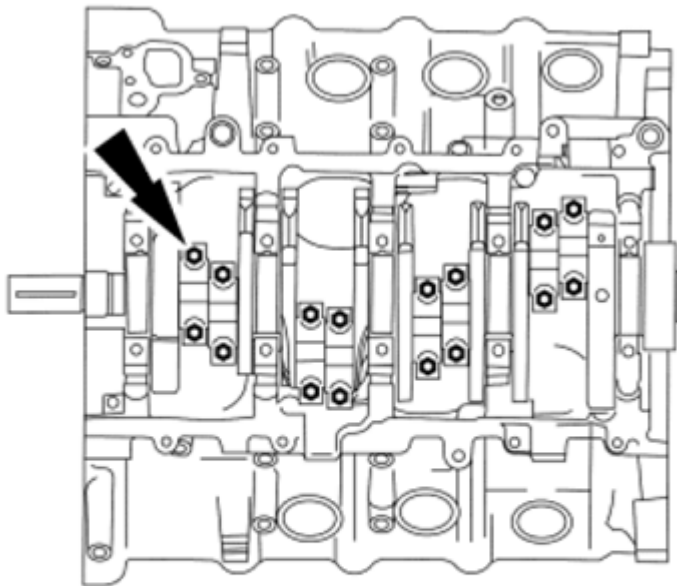


Fig. 402: Locating Oil Pump And Bolts
Courtesy of FORD MOTOR CO.

73. Before removing the pistons, inspect the top of the cylinder bores. If necessary, remove the ridge or carbon deposits from each cylinder using an abrasive pad or equivalent, following the manufacturer's instructions.

NOTE: Verify that the connecting rods and rod caps have orientation numbers cast into them. If not, number the connecting rods and rod caps for correct orientation. Failure to follow these instructions may result in engine damage.



DA0578-A

Fig. 403: Locating Connecting Rod Caps And Bolts
Courtesy of FORD MOTOR CO.

74. Remove the 16 bolts and the 8 connecting rod caps. Discard the bolts.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod. Failure to follow these instructions may result in engine damage.

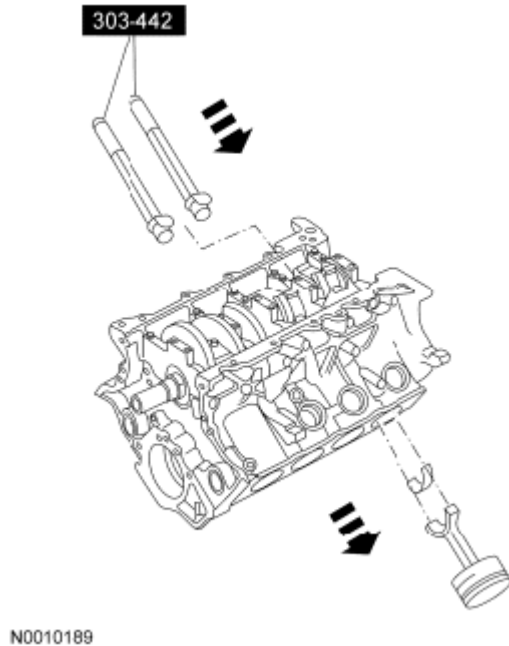


Fig. 404: Pushing Piston Through Top Of Cylinder Block
Courtesy of FORD MOTOR CO.

75. Use the Connecting Rod Installer to push the piston through the top of the cylinder block.
76. Disassemble the 8 pistons. For additional information, refer to **PISTON**.
77. Remove the fasteners.
1. Remove and discard the 10 cross-mounted main cap bolts.
 2. Remove the 10 dowels.
 3. Remove and discard the 10 main bearing cap bolts.

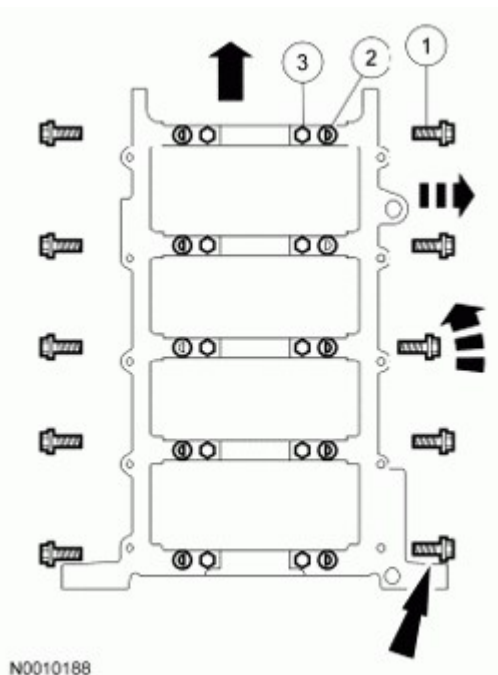


Fig. 405: Removing Main Bearing Cap Fasteners
Courtesy of FORD MOTOR CO.

78. Remove the main bearing caps, the lower crankshaft main bearings and the lower thrust washer.

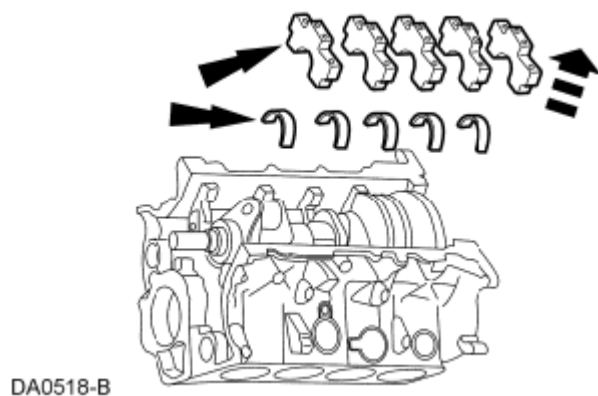


Fig. 406: Identifying Main Bearing Caps, Lower Crankshaft Main Bearings And Lower Thrust Washer
Courtesy of FORD MOTOR CO.

79. Remove the crankshaft, the upper crankshaft main bearings and the upper thrust washers from the cylinder block.

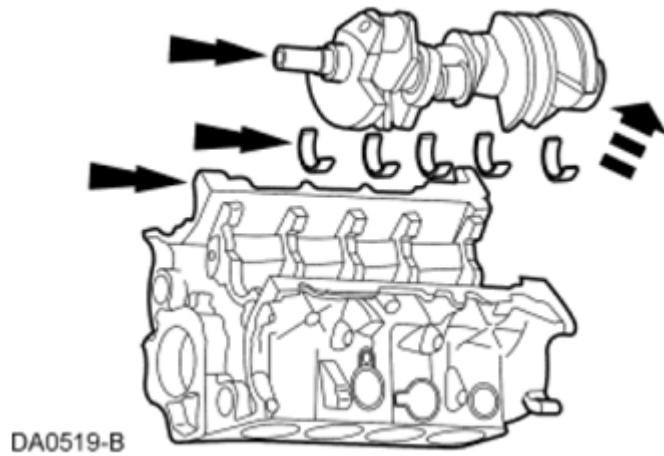


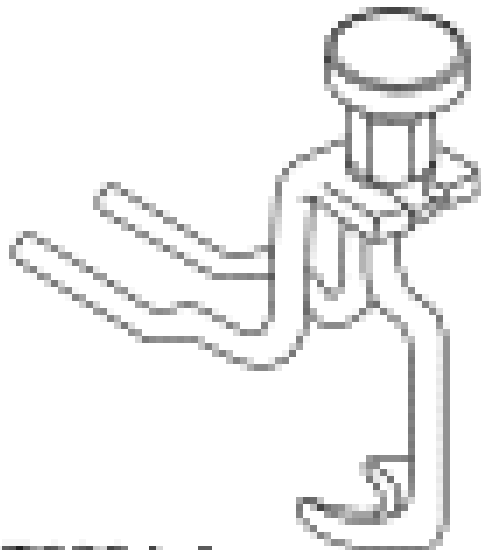
Fig. 407: Locating Upper Crankshaft Main Bearings, Upper Thrust Washers And Cylinder Block
Courtesy of FORD MOTOR CO.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

CYLINDER HEAD

Special Tool(s)

SPECIAL TOOL REFERENCE



Compressor, Valve Spring
303-1039

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1332-A

Installer, Valve Stem Oil Seal
303-383 (T91T-6571-A)

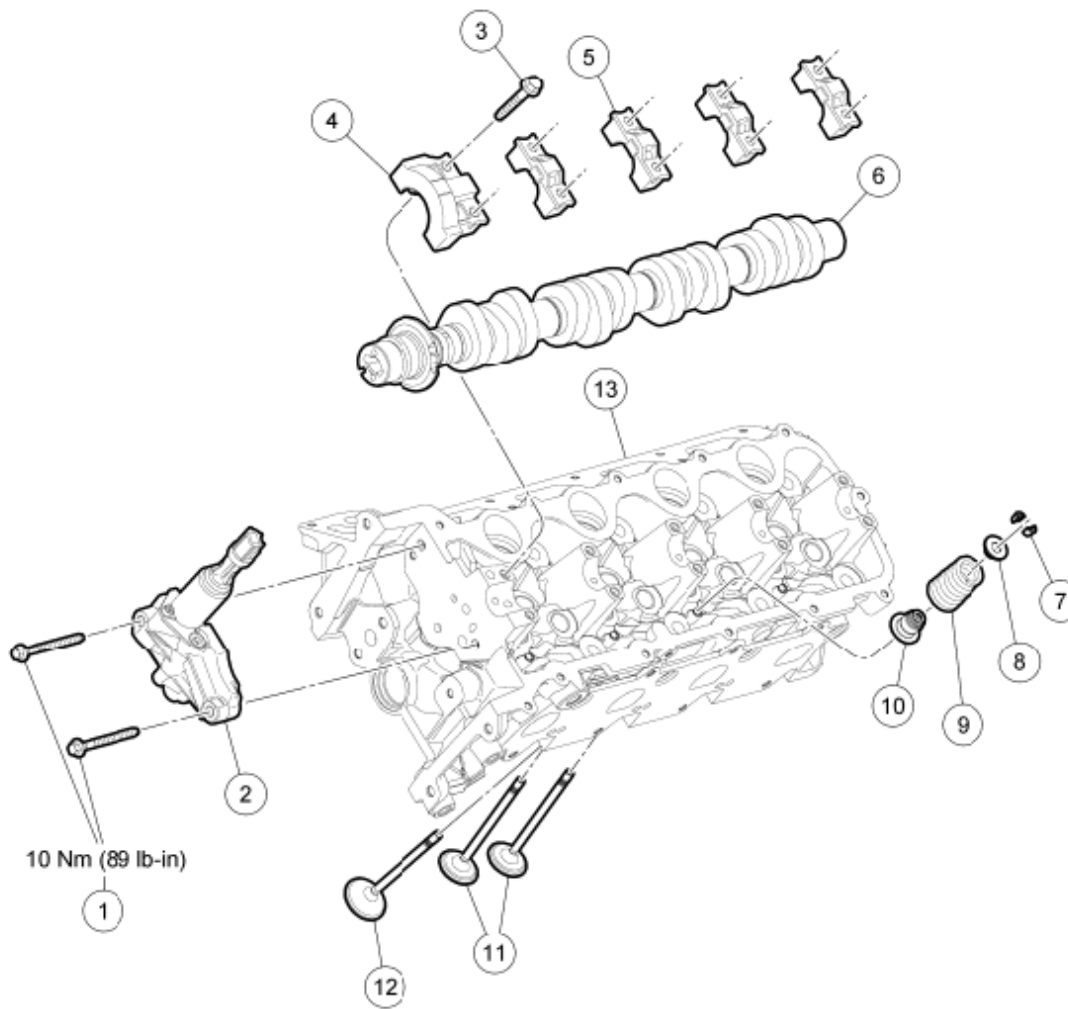
Material

ITEM SPECIFICATION

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



N0010131

Fig. 408: Exploded View Of Cylinder Head With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	W701520	Variable Camshaft Timing (VCT) housing assembly bolts (2 required)
2	6C261	VCT housing assembly
3	N807834	Camshaft bearing cap bolt (10 required)
4	6B284	Camshaft front bearing cap
5	6B280	Camshaft bearing cap (4 required)
6	6C255	Camshaft
7	6518	Valve spring retainer key (24 required)
8	6514	Valve spring retainer (12 required)
9	6513	Valve spring (12 required)
10	6A517	Valve seal (12 required)

11	6507	Intake valves (8 required)
12	6505	Exhaust valve (4 required)
13	6050	Cylinder head

Disassembly

1. Remove the 2 bolts and the Variable Camshaft Timing (VCT) housing.
 - Discard the gasket.
2. Lubricate the camshaft and camshaft journals with clean engine oil and install the camshaft.
3. Install the camshaft bearing caps in their original locations.
 - Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the 10 bolts finger-tight.
4. Using the Valve Spring Compressor, compress the valve spring and remove the valve spring retainer keys.



Fig. 409: Removing Valve Spring Retainer Keys
 Courtesy of FORD MOTOR CO.

5. Remove the valve spring retainer, the valve spring and the valve seal.
 - Discard the valve seal.
6. Remove the valve from the cylinder head.
7. Repeat the previous 3 steps for each valve.
8. Inspect the components. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

NOTE: Remove the front thrust camshaft bearing cap straight upward from the bearing towers, or the bearing cap may be damaged from side loading.

9. Remove the 10 bolts, the front camshaft bearing cap and then the remaining bearing caps.
10. Remove the camshaft.
11. Check the cylinder head for distortion. For additional information, refer to **ENGINE SYSTEM -**

GENERAL INFORMATION .**Assembly**

1. Lubricate the camshaft and camshaft journals with clean engine oil and install the camshaft.
2. Install the camshaft bearing caps in their original locations.
 - Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the 10 bolts finger-tight.

NOTE: **Lubricate the valve stem with clean engine oil prior to installation.**

3. Install the valve into the cylinder head.

NOTE: **Lubricate the valve seal and valve stem with clean engine oil prior to installation.**

4. Position a new valve seal onto the valve stem.
5. Using the Valve Stem Oil Seal Installer, install the new valve seal.

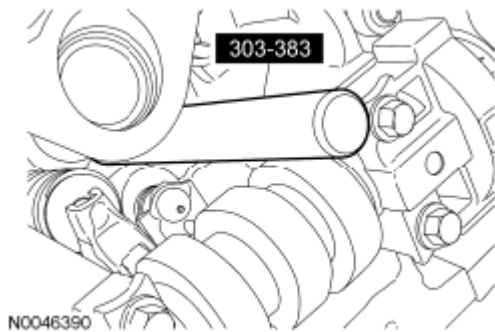


Fig. 410: Installing Valve Seal Using Special Tool
Courtesy of FORD MOTOR CO.

NOTE: **If the components are to be reinstalled, they must be installed into their original locations.**



Fig. 411: Removing Valve Spring Retainer Keys
Courtesy of FORD MOTOR CO.

6. Using the Valve Spring Compressor, install the valve spring, the valve spring retainer and the valve spring retainer keys.
7. Repeat the previous 2 steps for each valve.
8. Remove the 8 bolts, the front camshaft bearing cap and then the remaining bearing caps.
9. Remove the camshaft.
10. Install a new gasket, the VCT housing and the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

PISTON

Material

ITEM SPECIFICATION

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

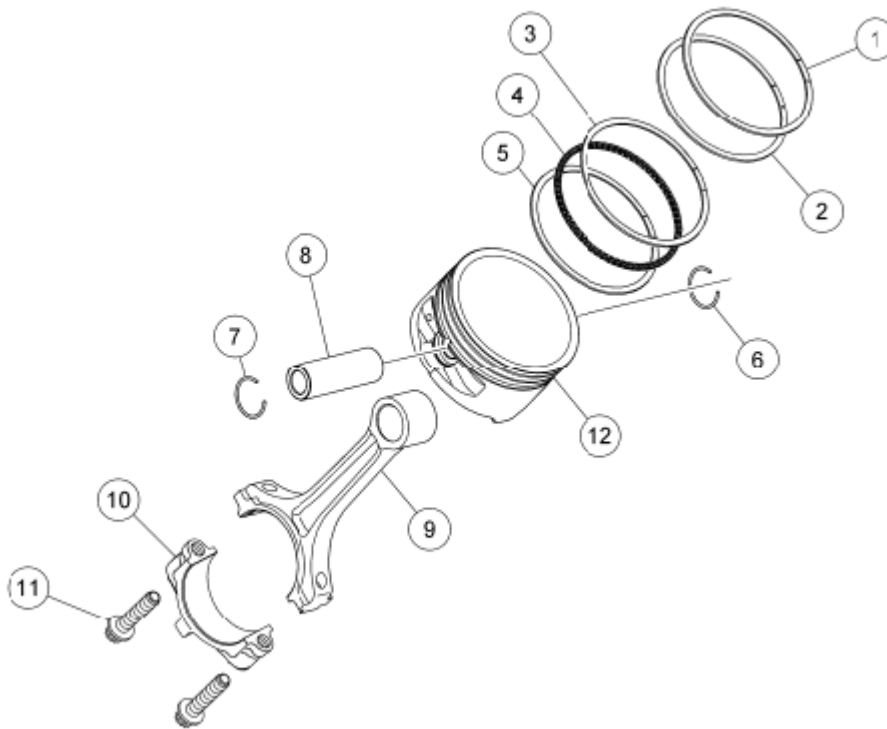


Fig. 412: Exploded View Of Piston And Connecting Rod
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6150	Piston compression upper ring
2	6152	Piston compression lower ring
3	6159	Piston oil control upper segment ring
4	6161	Piston oil control spacer
5	6159	Piston oil control lower segment ring
6	6140	Piston pin retainer
7	6140	Piston pin retainer
8	6135	Piston pin
9	6200	Connecting rod
10	-	Connecting rod bearing cap (part of 6200)
11	6414	Connecting rod bearing cap bolt (2 required)
12	6110	Piston

Disassembly

WARNING: Since the retainer ring has a tendency to spring out, cover the end of the pin bore with a hand or shop rag when removing the ring. Wear eye protection. Failure to follow these instructions may result in serious personal injury.

1. Remove the piston rings from the piston.
 - Discard the piston rings.
2. Mark the piston and connecting rod on the same side for assembly reference.

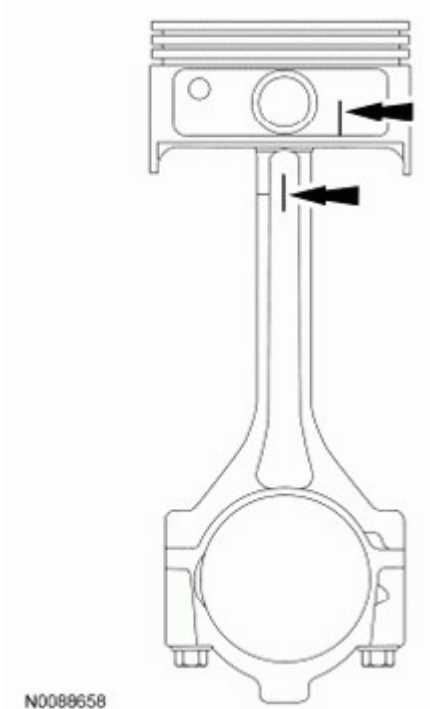


Fig. 413: Locating Mark On Piston And Connecting Rod
Courtesy of FORD MOTOR CO.

3. Remove the 2 piston pin retainers and the piston pin.
4. Separate the piston from the connecting rod.
5. Clean and inspect the piston and connecting rod. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

Assembly

NOTE: The connecting rod must be installed into the piston with the marks made during disassembly on the same side. If a new piston or connecting rod is being installed, it can be installed in either direction.

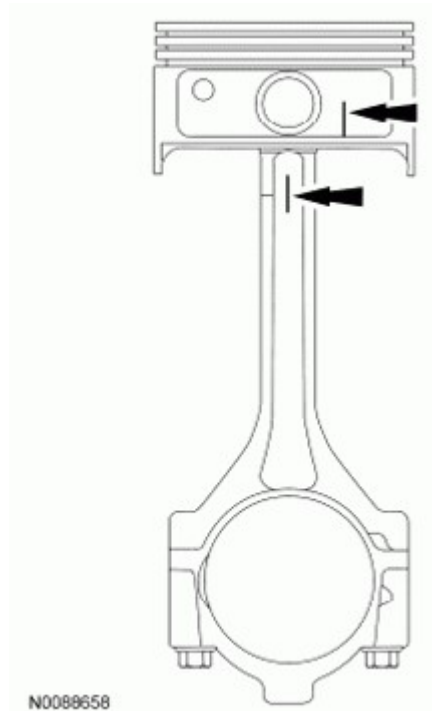


Fig. 414: Locating Mark On Piston And Connecting Rod
Courtesy of FORD MOTOR CO.

1. Position the connecting rod in the piston.
2. Lubricate the piston pin and pin bore with clean engine oil.
3. Install the piston pin in the piston and connecting rod assembly.
4. Install the 2 piston pin retaining clips in the piston.
5. Lubricate the piston and the new piston rings with clean engine oil.
6. Install the piston rings onto the piston.

INTAKE MANIFOLD ASSEMBLY

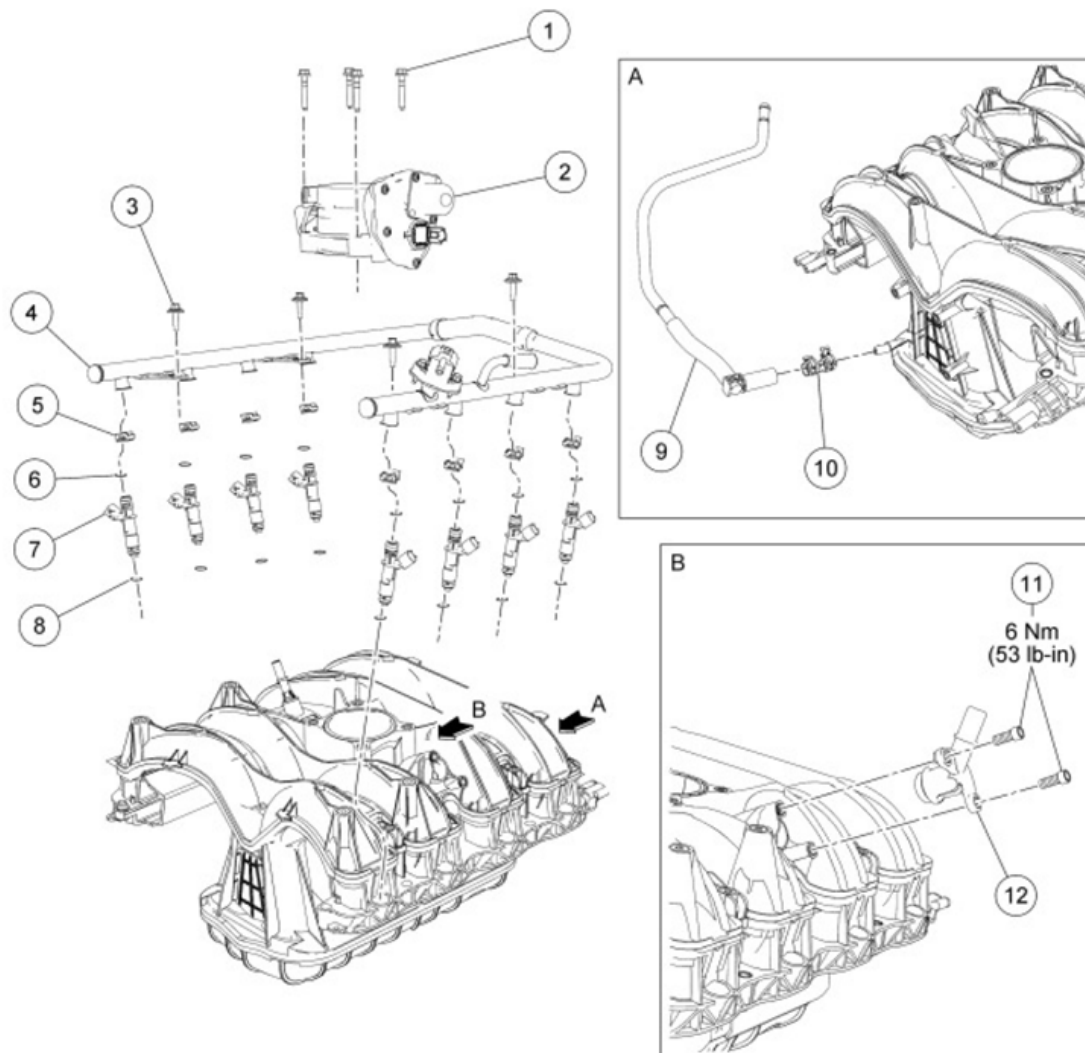
Material

ITEM SPECIFICATION

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



N0101858

Fig. 415: Identifying Intake Manifold Components With Torque Specifications
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	W503282	Throttle Body (TB) bolt (4 required)
2	9F991	TB assembly
3	W708650	Fuel rail bolt (4 required)
4	9F792	Fuel rail
5	9C995	Fuel injector-to-fuel rail locking clip (8 required)
6	-	Fuel injector-to-fuel rail O-ring seal (8 required)
7	9F593	Fuel injector (8 required)
8	-	Fuel injector-to-intake manifold O-ring seal (8 required)
9	9D446	Intake manifold vacuum tube assembly
10	-	Intake manifold vacuum tube assembly clamp (part of 9D446)

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2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

11	W500204	PCV fitting bolts (2 required)
12	9F624	PCV fitting

Disassembly

1. Remove the 4 bolts and the Throttle Body (TB).
2. Remove the 4 bolts and the fuel rail.
3. Remove the 8 fuel injector-to-fuel rail locking clips and separate the 8 fuel injectors from the fuel rail.
 - Discard the 2 O-ring seals from each fuel injector.
4. Remove the clamp and vacuum tube assembly from the intake manifold.
5. Remove the 2 bolts and the PCV fitting.

Assembly

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

1. Install the PCV fitting and the 2 bolts.
 - Tighten to 6 Nm (53 lb-in).
2. Install the vacuum tube assembly and clamp onto the intake manifold.

NOTE: Lubricate the new O-ring seals with clean engine oil prior to installation.

3. Install 16 new O-ring seals on each of the fuel injectors.
4. Assemble the 8 fuel injectors onto the fuel rail and install the 8 locking clips.
5. Install the fuel rail and fuel injector as an assembly onto the intake manifold.
6. Install the 4 fuel rail bolts.
 - Tighten to 10 Nm (89 lb-in).
7. Install the **TB** and tighten the 4 bolts in 2 stages.
 - Stage 1: Tighten to 9 Nm (80 lb-in).
 - Stage 2: Tighten an additional 90 degrees.

ASSEMBLY

ENGINE

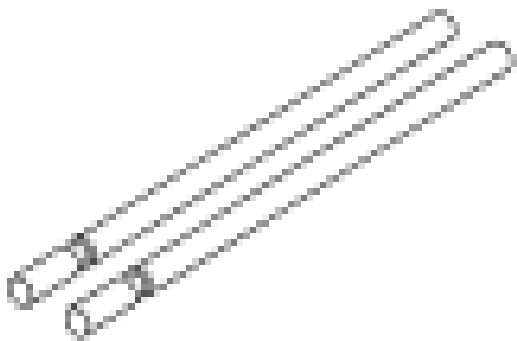
Special Tool(s)

SPECIAL TOOL REFERENCE

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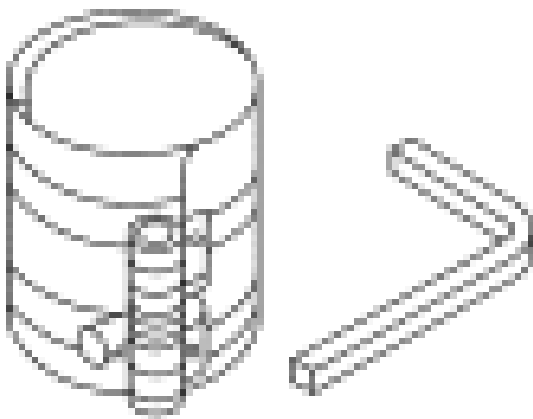
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



Alignment Pins, Cylinder Head
303-1040 (SR-015486)

ST2606-A

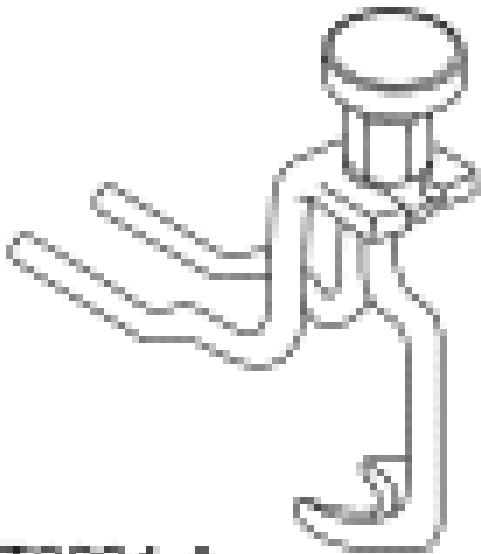


Compressor, Piston Ring
303-D032 (D81L-6002-C) or equivalent

ST1376-A

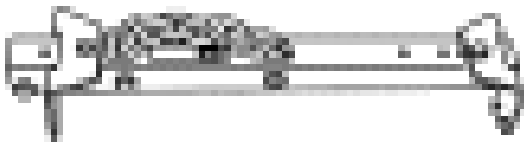
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2604-A

Compressor, Valve Spring
303-1039



ST1377-A

Engine Lifting Bracket
303-F047 (014-00073) or equivalent

Fan Clutch Nut Wrench
303-240 (T84T-6312-D)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1500-A

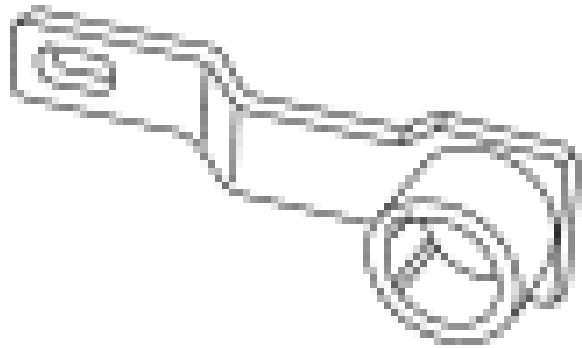


Fan Pulley Holding Wrench
303-239 (T84T-6312-C)

ST1499-A

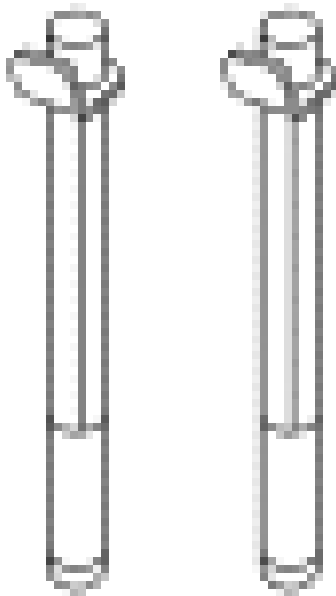
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



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

ST1335-A

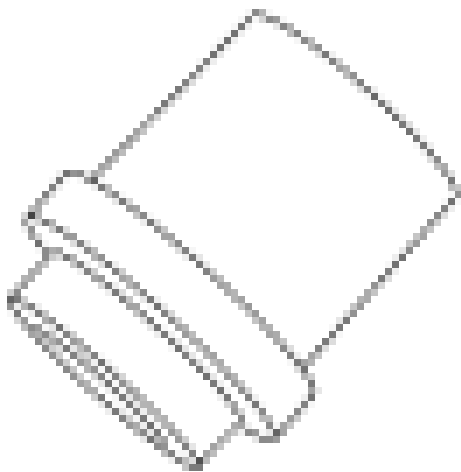


Installer, Connecting Rod
303-442 (T93P-6136-A)

ST1337-A

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2197-A

Installer, Crankshaft Front Oil Seal
303-635

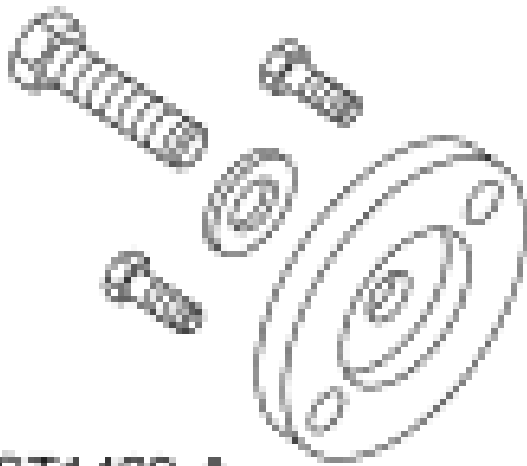


ST1479-A

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

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1480-A

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



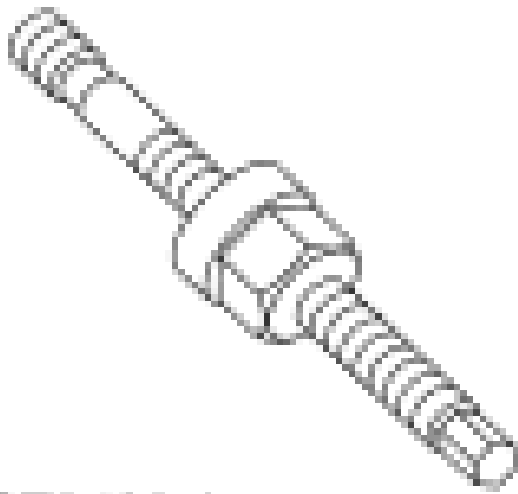
ST1482-A

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

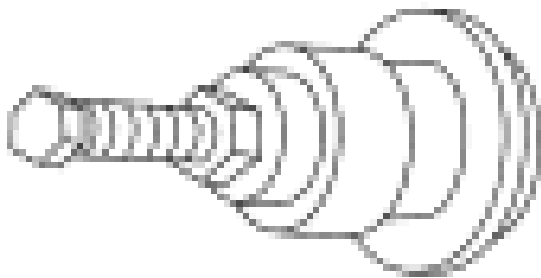
Installer, Crankshaft Vibration Damper
303-102 (T74P-6316-B)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2428-A

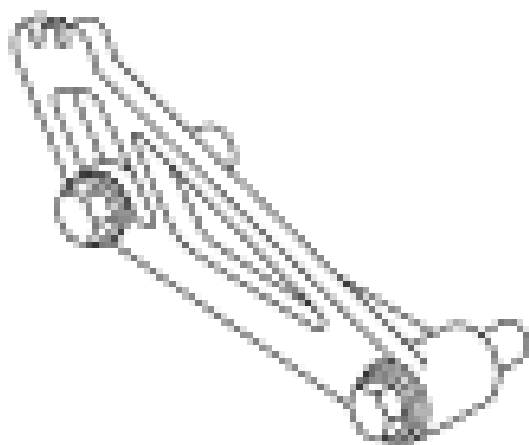


ST1328-A

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

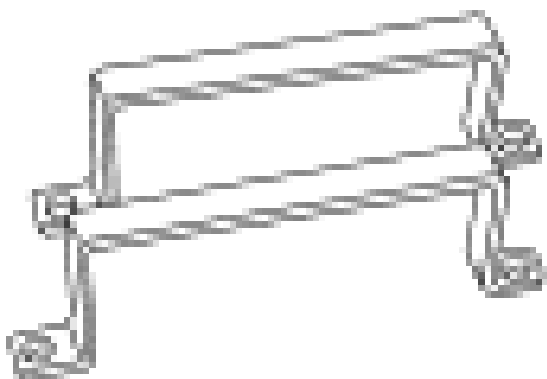
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2807-A

Locking Tool, Cam Phaser
303-1046



ST1668-A

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

General Equipment

GENERAL EQUIPMENT CHART

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

Material

ITEM SPECIFICATION

2010 Ford Pickup F150

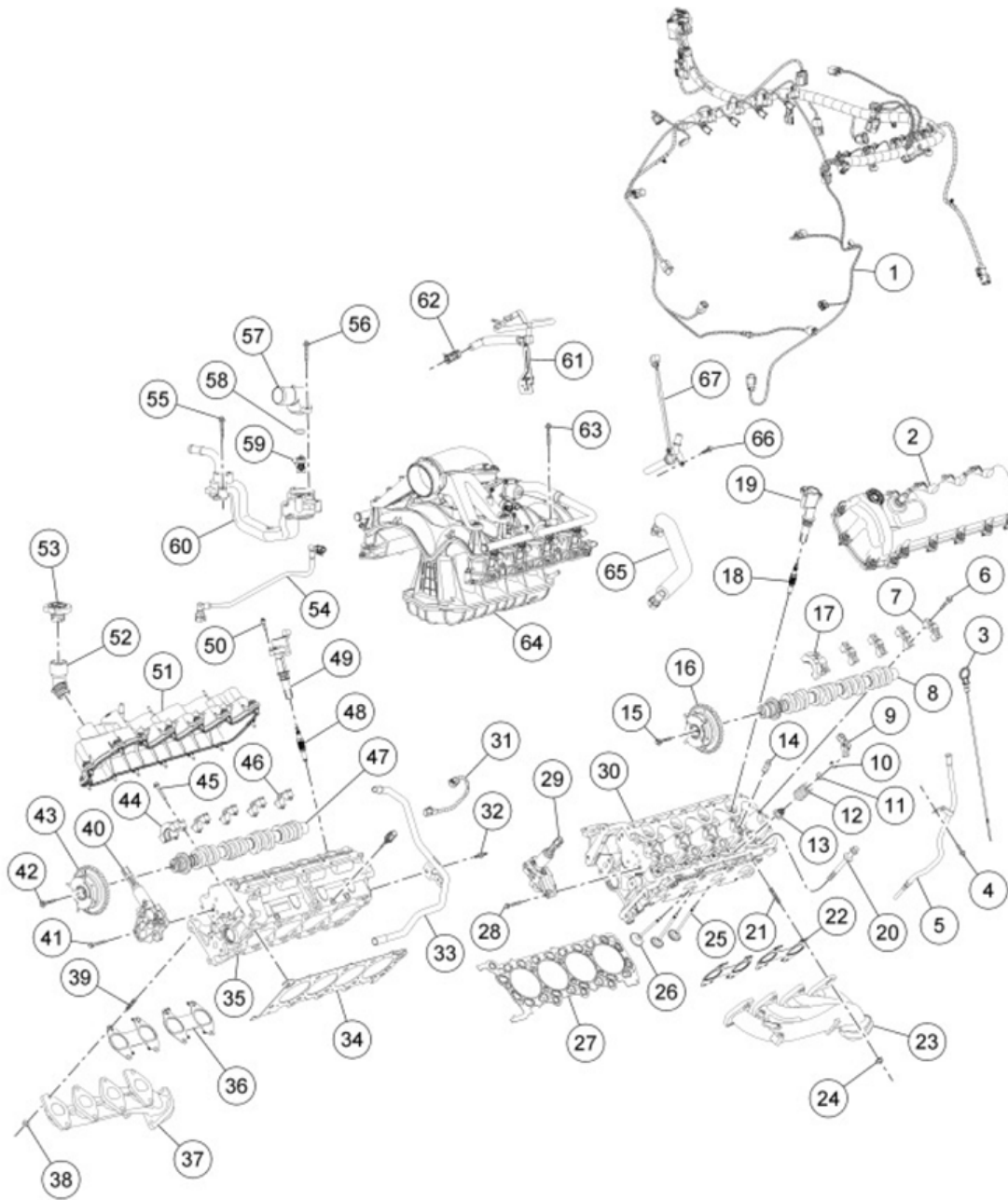
2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Premium Gold Engine Coolant VC-7-B (US); CVC-7-A (Canada); or equivalent	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 Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Motorcraft® Silicone Gasket Remover ZC-30	-

Engine - Upper End

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



N0093898

Fig. 416: Exploded View Of Engine Components (Upper End)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	12B637	Engine wiring harness
2	6A505	Valve cover - LH
3	6750	Oil level indicator

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

4	N605892	Oil level indicator tube bolt
5	6K873	Oil level indicator tube
6	N807834	Camshaft bearing cap bolt (10 required)
7	6B280	Camshaft bearing cap (4 required)
8	6C255	Camshaft - LH
9	6529	Roller follower (24 required)
10	6518	Valve spring retainer key (48 required)
11	6514	Valve spring retainer (24 required)
12	6513	Valve spring (24 required)
13	6A517	Valve stem seal (24 required)
14	6C501	Hydraulic lash adjuster (24 required)
15	6279	Camshaft phaser and sprocket bolt - LH
16	6C524	Camshaft phaser and sprocket - LH
17	6B284	Camshaft bearing cap
18	12405	Spark plug (4 required)
19	12A366	Ignition coil (4 required)
20	6065	Cylinder head bolt (20 required)
21	W707747	Exhaust manifold stud (8 required)
22	9Y431	Exhaust manifold gasket (2 required)
23	9431	Exhaust manifold - LH
24	W701706	Exhaust manifold nut (8 required)
25	6507	Intake valve (16 required)
26	6505	Exhaust valve (8 required)
27	6083	Cylinder head gasket - LH
28	W701520	Variable Camshaft Timing (VCT) oil control solenoid assembly bolt (2 required)
29	6C261	VCT oil control solenoid assembly
30	6050	Cylinder head - LH
31	14B102	Cylinder Head Temperature (CHT) sensor jumper harness
32	W701571	Heater outlet tube stud bolt
33	18663	Heater outlet tube
34	6051	Cylinder head gasket - RH
35	6049	Cylinder head - RH
36	9Y431	Exhaust manifold gasket (2 required)
37	9430	Exhaust manifold - RH
38	W701706	Exhaust manifold nut (8 required)
39	W707747	Exhaust manifold stud (8 required)
40	6C260	VCT oil control solenoid assembly
41	W701520	VCT oil control solenoid assembly bolt (2 required)
42	6279	Camshaft phaser and sprocket bolt - RH
43	6C524	Camshaft phaser and sprocket - RH
44	6B284	Camshaft bearing cap
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2010 Ford Pickup F150

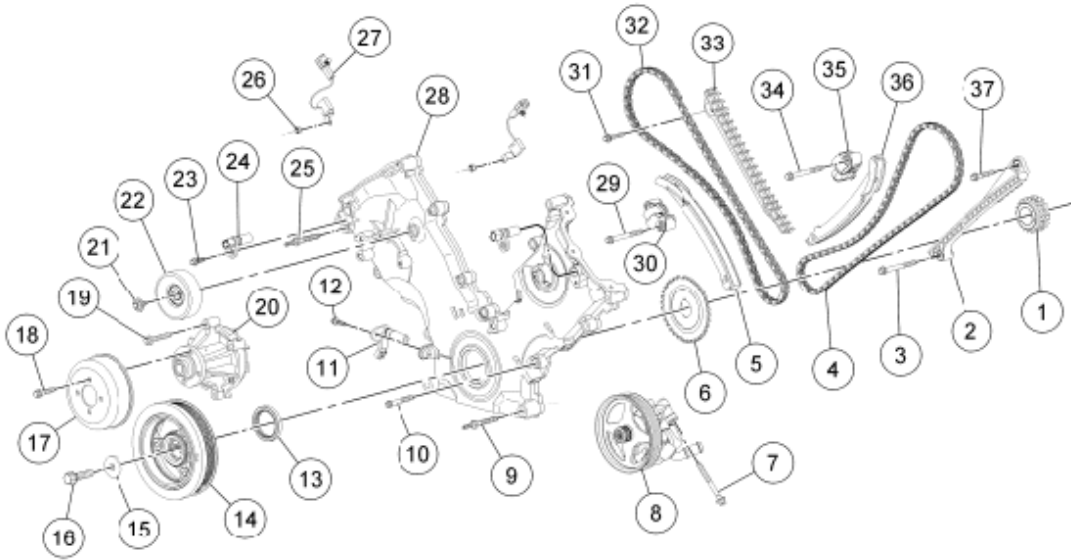
2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

	N807834	Camshaft bearing cap bolt (10 required)
46	6B280	Camshaft bearing cap (4 required)
47	6251	Camshaft - RH
48	12405	Spark plug (4 required)
49	12A366	Ignition coil (4 required)
50	W706175	Ignition coil bolt (8 required)
51	6582	Valve cover - RH
52	6765	Oil fill adapter
53	6766	Oil fill adapter cap
54	6758	Crankcase ventilation tube
55	W503282	Engine coolant crossover manifold assembly bolt (3 required)
56	W503279	Thermostat housing bolt (2 required)
57	8594	Thermostat housing
58	N806807	Thermostat O-ring seal
59	8575	Thermostat
60	8C369	Engine coolant crossover manifold assembly
61	9D446	Intake manifold vacuum harness and support bracket assembly
62	-	Intake manifold vacuum tube and support bracket assembly clamp (part of 9A444)
63	W710758	Intake manifold bolt (10 required)
64	9424	Intake manifold assembly
65	6K817	PCV tube
66	W500204	PCV heater element assembly bolt (2 required)
67	9F624	PCV heater element assembly

Engine - Front End

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



N0006525

Fig. 417: Exploded View Of Engine Components (Front End)
Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6306	Crankshaft sprocket
2	6B274	Timing chain guide - LH
3	N606527	Timing chain guide lower bolt - LH
4	6268	Timing chain - LH
5	6K255	Tensioner arm - RH
6	12A227	Ignition pulse wheel
7	W500315	Power steering pump bolt (2 required)
8	3A696	Power steering pump assembly
9	N808529	Engine front cover stud bolt (2 required)
10	N806177	Engine front cover bolt (8 required)
11	6C315	Crankshaft Position (CKP) sensor
12	N806155	CKP sensor bolt
13	6700	Crankshaft front seal
14	6316	Crankshaft pulley
15	N806165	Crankshaft pulley washer
16	W701512	Crankshaft pulley bolt
17	8A528	Coolant pump pulley
18	N806282	Coolant pump pulley bolt (4 required)
19	N808794	Coolant pump bolt (4 required)
20	8501	Coolant pump

2010 Ford Pickup F150

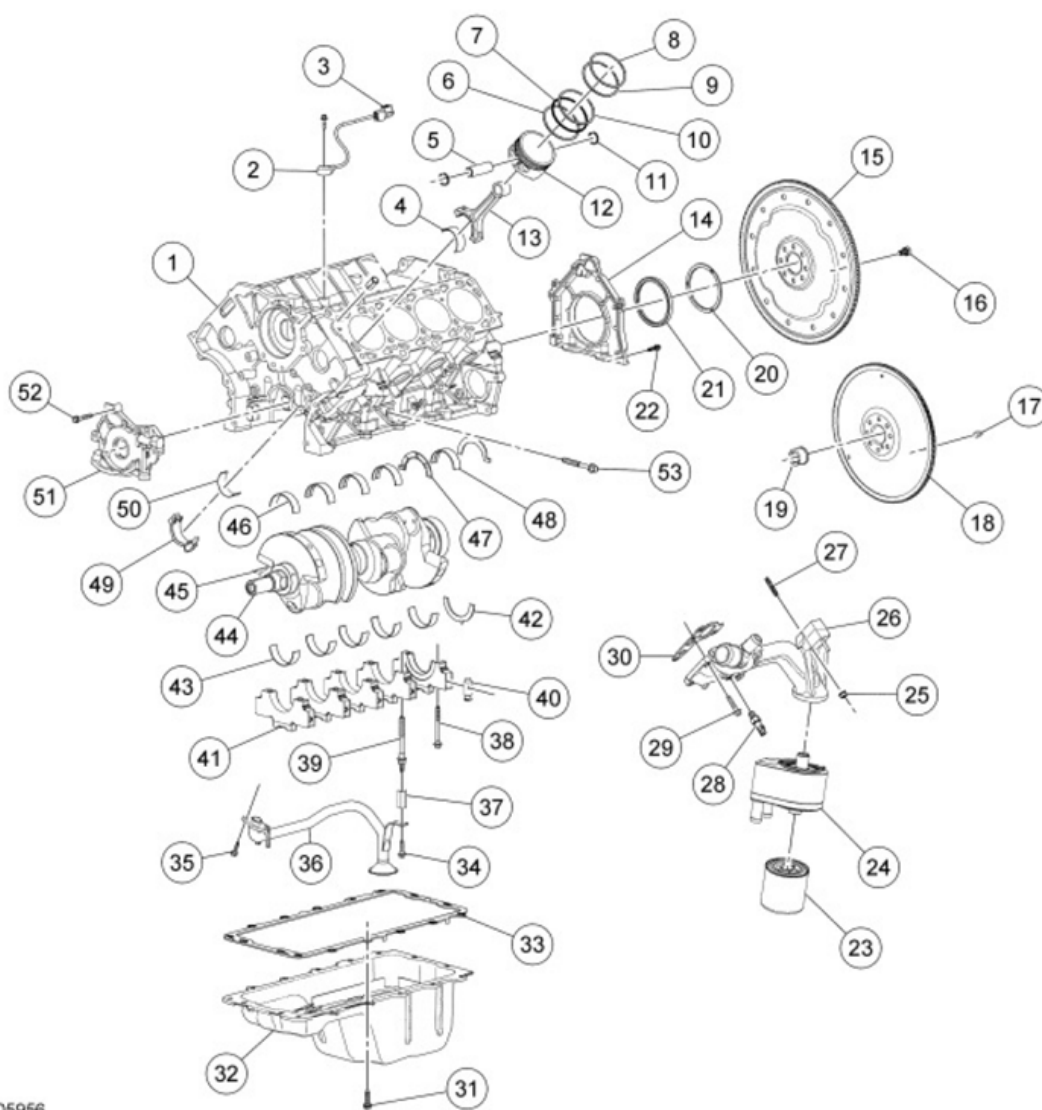
2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

21	N808102	Accessory drive belt idler pulley bolt
22	12A216	Accessory drive belt idler pulley
23	N806155	Camshaft Position (CMP) sensor bolt (2 required)
24	6B288	CMP sensor (2 required)
25	W709573	Engine front cover stud bolt (5 required)
26	N804758	Radio ignition interference capacitor nut (2 required)
27	18801	Radio ignition interference capacitor (2 required)
28	6C086	Engine front cover
29	N606543	Timing chain tensioner bolt - RH (2 required)
30	6L266	Timing chain tensioner - RH
31	W503282	Timing chain guide bolt - RH (2 required)
32	6268	Timing chain - RH
33	6M256	Timing chain guide - RH
34	N606543	Timing chain tensioner bolt - LH (2 required)
35	6M269	Timing chain tensioner - LH
36	6M274	Tensioner arm - LH
37	N605892	Timing chain guide bolt (2 required)

Engine - Lower End

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



N0105956

Fig. 418: Exploded View Of Engine Components (Lower End)

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION

Item	Part Number	Description
1	6010	Cylinder block
2	W500225	Knock Sensor (KS) bolt (2 required)
3	12A699	KS (2 required)
4	6211	Upper connecting rod bearing (8 required)
5	6135	Piston pin (8 required)
6	6159	Outer oil control ring (8 required)
7	6161	Inner oil control ring (8 required)
8	6150	Upper compression ring (8 required)
9	6152	Lower compression ring (8 required)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

10	6159	Outer oil control ring (8 required)
11	6140	Piston pin retainer (16 required)
12	6110	Piston (8 required)
13	6200	Connecting rod assembly (8 required)
14	6K318	Crankshaft rear seal retainer plate
15	6375	Flexplate (automatic transmission)
16	N806168	Flexplate bolt (automatic transmission) (8 required)
17	N808139	Flywheel bolt (manual transmission) (8 required)
18	6375	Flywheel (manual transmission)
19	7120	Pilot bearing
20	6310	Crankshaft oil slinger
21	6701	Crankshaft rear seal
22	N806155	Crankshaft rear seal retainer plate bolt (6 required)
23	6714	Oil filter
24	6A642	Oil cooler
25	N620482	Oil filter adapter nut
26	6881	Oil filter adapter
27	W712913	Oil filter adapter stud
28	9278	Engine Oil Pressure (EOP) switch
29	N806156	Oil filter adapter bolt (4 required)
30	6A636	Oil filter adapter gasket
31	W701605	Oil pan bolt (16 required)
32	6675	Oil pan
33	6710	Oil pan gasket
34	N605904	Oil pump screen and pickup tube bolt
35	N806155	Oil pump screen and pickup tube bolt (2 required)
36	6622	Oil pump screen and pickup tube
37	N806180	Oil pump screen and pickup tube spacer
38	6345	Crankshaft main bearing cap bolt (9 required)
39	6K258	Crankshaft main bearing cap stud
40	6A346	Crankshaft main bearing dowel (10 required)
41	6325	Crankshaft main bearing cap (5 required)
42	6K302	Crankshaft thrust washer - lower
43	6A338	Crankshaft bearing - lower (5 required)
44	6303	Crankshaft
45	N806201	Crankshaft key
46	6W337	Crankshaft bearing - upper
47	6A341	Crankshaft thrust washer - upper (2 required)
48	6333	Crankshaft bearing - upper (4 required)
49	-	Connecting rod bearing cap (part of 6200) (8 required)
50	6211	Connecting rod bearing (8 required)
--		

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	6621	Oil pump
52	N806183	Oil pump bolt (3 required)
53	6C357	Crankshaft main bearing cap side bolts (10 required)

1. Record the main bearing code found on the front of the engine block.

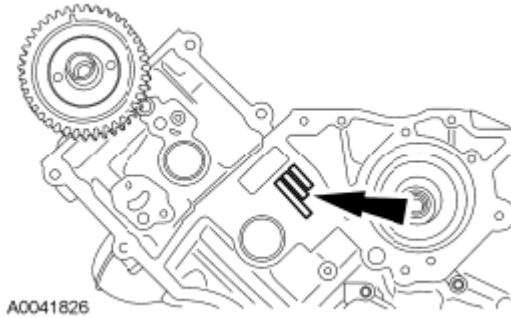


Fig. 419: Locating Main Bearing Code Found On Front Of Engine Block
Courtesy of FORD MOTOR CO.

2. Record the main bearing code found on the back of the crankshaft.

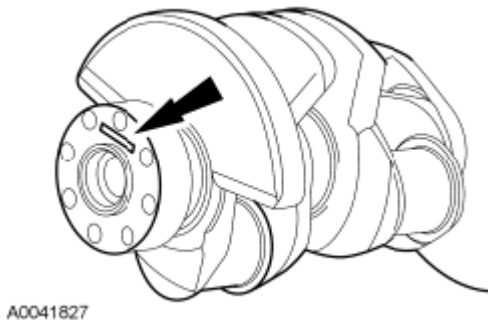


Fig. 420: Locating Main Bearing Code Found On Back Of Crankshaft
Courtesy of FORD MOTOR CO.

3. Using the data recorded earlier and the Bearing Select Fit Chart, Standard Bearings, determine the required bearing grade for each main bearing.
 - Read the first letter of the engine block main bearing code and the first letter of the crankshaft main bearing code.
 - Read down the column below the engine block main bearing code letter, and across the row next to the crankshaft main bearing code letter, until the 2 intersect. This is the required bearing grade for the No. 1 crankshaft main bearing.
 - As an example, if the engine block code letter is F and the crankshaft code letter is D, the correct bearing grade for this main bearing is a 2.
 - Repeat this process for the remaining 4 main bearings.

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		MINIMUM BLOCK DIA																								
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
		72.400	.401	.402	.403	.404	.405	.406	.407	.408	.409	.410	.411	.412	.413	.414	.415	.416	.417	.418	.419	.420	.421	.422	.423	.424
MAXIMUM CRANKSHAFT DIA	X	67.504	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	W	67.503	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	V	67.502	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
	U	67.501	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	T	67.500	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	S	67.499	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
	R	67.498	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
	Q	67.497	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	P	67.496	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
	O	67.495	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	N	67.494	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3
	M	67.493	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3
	L	67.492	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3
	K	67.491	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3
	J	67.490	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
	I	67.489	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3
	H	67.488	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3
	G	67.487	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3
	F	67.486	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3
	E	67.485	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	D	67.484	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	C	67.483	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	B	67.482	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	A	67.481	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

A0031544

A0031544

Fig. 421: Bearing Select Fit Chart (Standard Bearings)

Courtesy of FORD MOTOR CO.

- If oversize bearings are being used, use the procedure in the previous step and the Bearing Select Fit Chart, Oversize Bearings to determine the required bearing grade for each main bearing.

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

		MINIMUM BLOCK DIA																								
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	
		72.400	.401	.402	.403	.404	.405	.406	.407	.408	.409	.410	.411	.412	.413	.414	.415	.416	.417	.418	.419	.420	.421	.422	.423	.424
MAXIMUM CRANKSHAFT DIA	X	67.254	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	W	67.253	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
	V	67.252	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2
	U	67.251	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	T	67.250	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
	S	67.249	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2
	R	67.248	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
	Q	67.247	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	P	67.246	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	O	67.245	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	N	67.244	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	M	67.243	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	L	67.242	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	K	67.241	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	J	67.240	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	I	67.239	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	H	67.238	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	G	67.237	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	F	67.236	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	E	67.235	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	D	67.234	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	C	67.233	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	B	67.232	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
	A	67.231	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3
A0041840																										

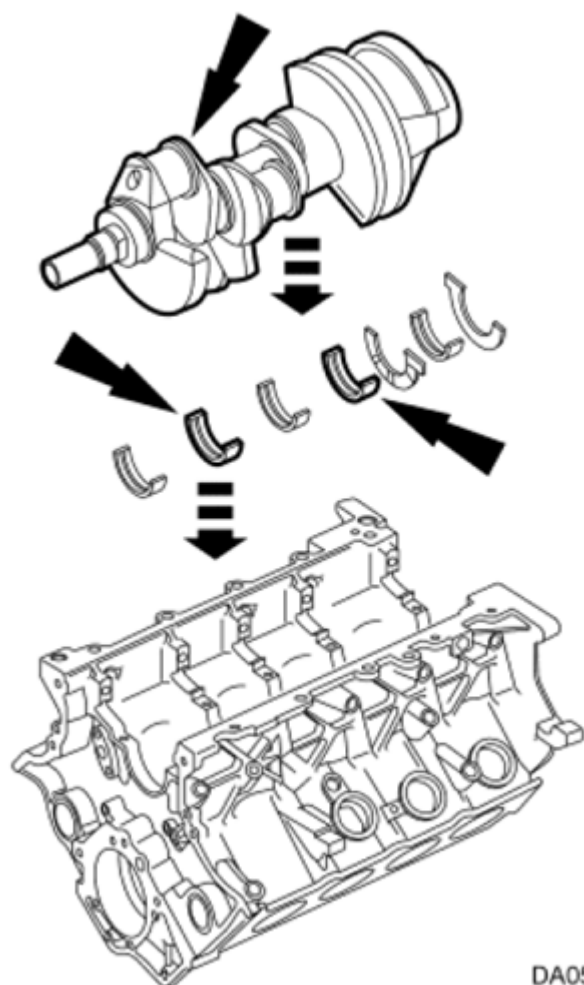
Fig. 422: Bearing Select Fit Chart (Oversize Bearings)

Courtesy of FORD MOTOR CO.

NOTE: Before assembling the cylinder block, all sealing surfaces must be free of chips, dirt, paint and foreign material. Also, make sure the coolant and oil passages are clear.

5. Install the crankshaft upper main bearings into the cylinder block and lubricate them with clean engine oil.

NOTE: The upper thrust washers are shown in illustration for location purposes only. Do not install the upper thrust washers until the crankshaft is installed. Refer to the following 2 steps.

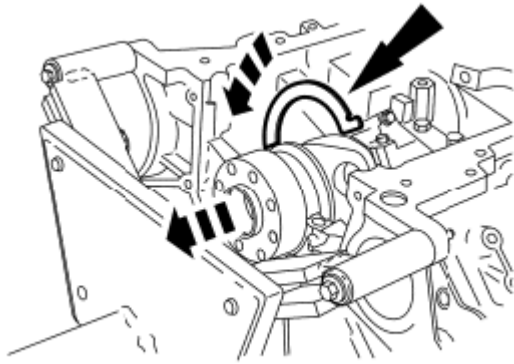


DA0598-A

Fig. 423: Installing Crankshaft Onto Upper Crankshaft Main Bearings
Courtesy of FORD MOTOR CO.

6. Install the crankshaft onto the upper crankshaft main bearings.

NOTE: The oil groove on the thrust washer must face toward the front of the engine (against the crankshaft thrust surface).

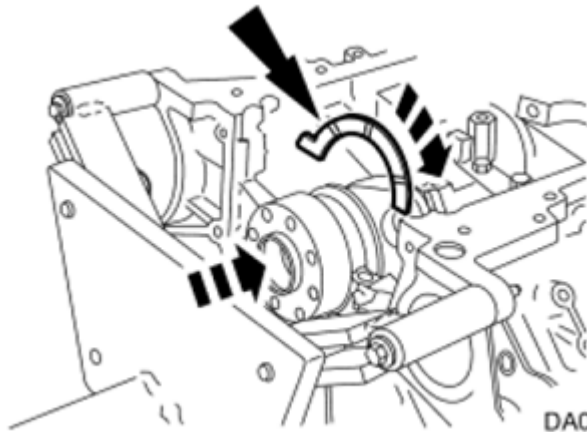


DA0596-A

Fig. 424: Installing Rear Crankshaft Upper Thrust Washer At No. 5 Main Boss
Courtesy of FORD MOTOR CO.

7. Push the crankshaft rearward and install the rear crankshaft upper thrust washer at the back of the No. 5 main boss.

NOTE: The oil groove on the thrust washer must face toward the front of the engine (against the crankshaft surface).



DA0595-B

Fig. 425: Installing Front Crankshaft Upper Thrust Washer At Front Of No. 5 Main Boss
Courtesy of FORD MOTOR CO.

8. Push the crankshaft forward and install the front crankshaft upper thrust washer at the front of the No. 5 main boss.

NOTE: To aid in assembly, apply petroleum jelly to the back of the crankshaft thrust washer.

NOTE: The oil groove on the thrust washer must face toward the rear of the engine (crankshaft surface).

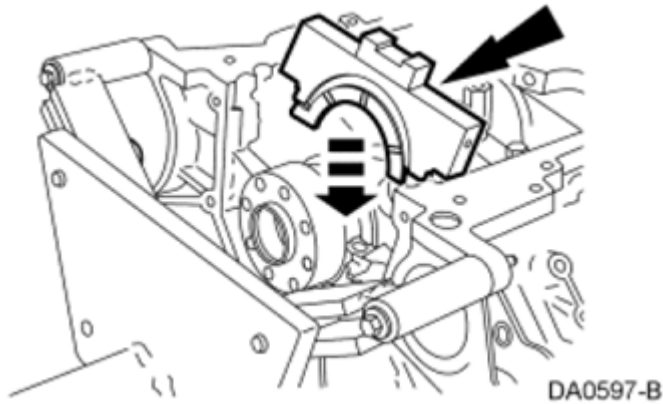


Fig. 426: Installing Lower Crankshaft Thrust Washer To No. 5 Main Bearing Cap
Courtesy of FORD MOTOR CO.

9. Install the lower crankshaft thrust washer to the back side of the No. 5 main bearing cap, with oil grooves facing the crankshaft surface.
10. Install the crankshaft lower main bearings into the main bearing caps and lubricate them with clean engine oil. Locate the main bearing cap on the cylinder block and, keeping the cap as square as possible, alternately draw the cap down evenly using the cap fasteners.
11. Install the 10 dowel pins so the flat sides face the crankshaft.

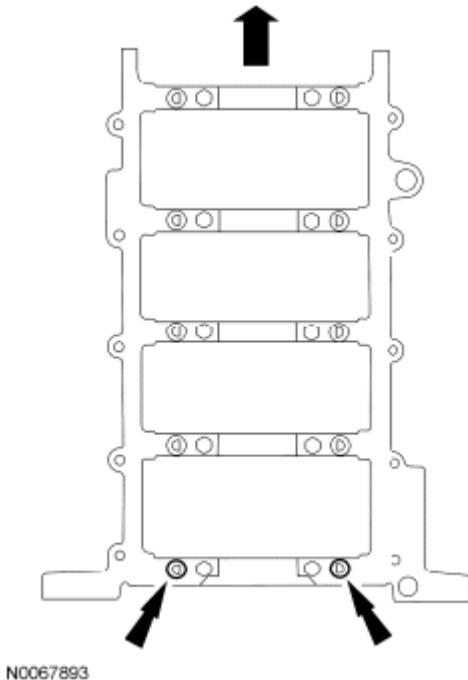
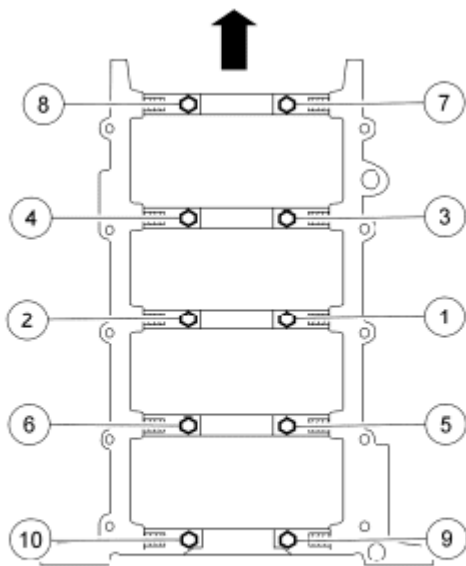


Fig. 427: Locating Crankshaft Lower Main Bearings
Courtesy of FORD MOTOR CO.

12. Install the 10 vertical main bearing cap fasteners and tighten in 2 stages, in the sequence shown in illustration.

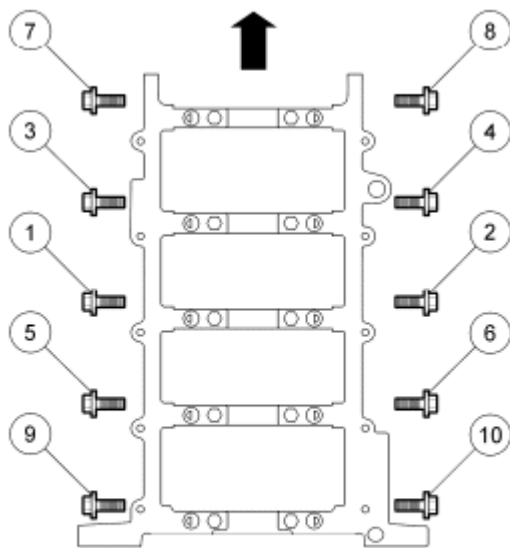
- Stage 1: Tighten to 40 Nm (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees.



N0010200

Fig. 428: Identifying Vertical Main Bearing Cap Fasteners In Tightening Sequence
 Courtesy of FORD MOTOR CO.

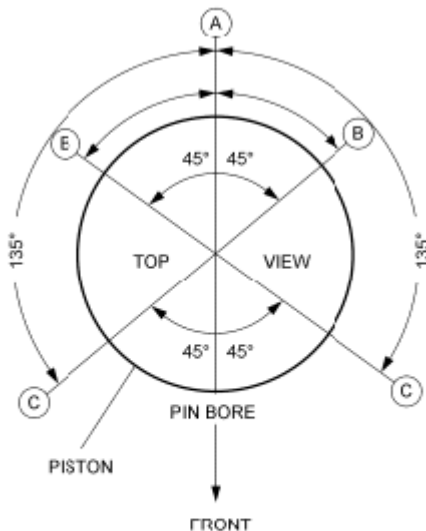
13. Install the 10 side bolts and tighten them in 2 stages, in the sequence shown in illustration.
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.



N0010201

Fig. 429: Identifying Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

14. Assemble the 8 pistons. For additional information, refer to **PISTON**.
15. Make sure the ring gaps (oil spacer - A, oil ring - B, compression ring - C) are correctly spaced around the circumference of the piston.



N0029312

Fig. 430: Identifying Ring Gaps
Courtesy of FORD MOTOR CO.

16. Make sure the dimple in the piston faces the front of the engine.

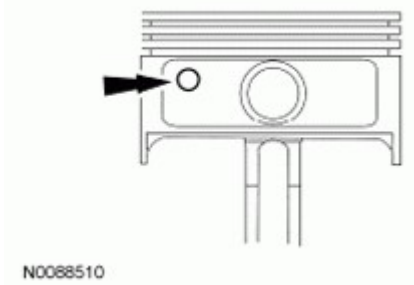


Fig. 431: Locating Dimple In Piston Faces
Courtesy of FORD MOTOR CO.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod or engine damage may occur.

NOTE: The following piston installation steps are for all 8 connecting rods, rod bearings and pistons. Only one connecting rod, rod bearing and piston is shown in illustration.

17. Using the Piston Ring Compressor and the Connecting Rod Installer, install the connecting rod with the upper connecting rod bearing in place.
- Lubricate the piston and ring with clean engine oil.
 - Lubricate the rod bearings with clean engine oil.

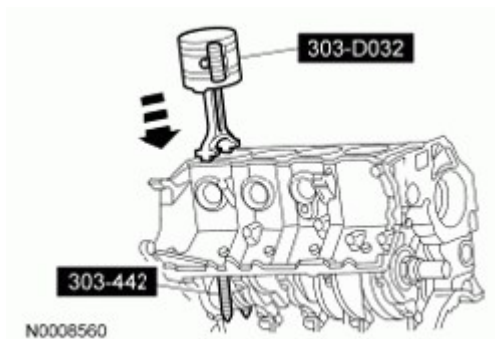


Fig. 432: Lubricating Rod Bearings
Courtesy of FORD MOTOR CO.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod or engine damage may occur.

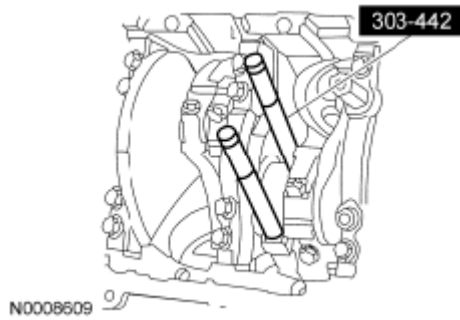


Fig. 433: Removing Connecting Rod Installer
Courtesy of FORD MOTOR CO.

18. Once the connecting rod is seated on the crankshaft journal, remove the Connecting Rod Installer.

NOTE: The rod cap installation must keep the same orientation as marked during disassembly or engine damage may occur.

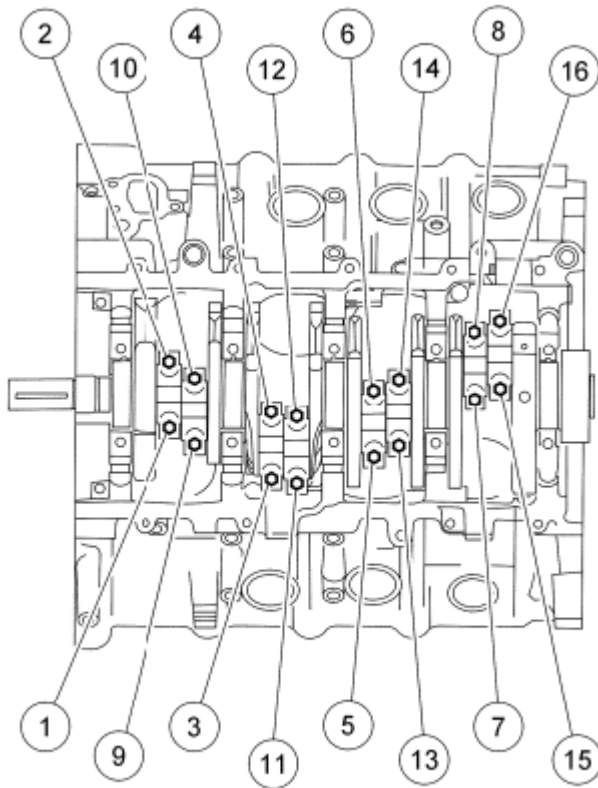
NOTE: The connecting rod caps are of the "cracked" design and must mate with the connecting rod ends. Excessive bearing clearance will result if not mated correctly.

19. Position the lower bearing and connecting rod, and install the 16 new bolts loosely.

NOTE: Main bearing caps are removed for clarity.

20. Tighten the 16 bolts in 2 stages, in the sequence shown in illustration.

- Stage 1: Tighten to 43 Nm (32 lb-ft).
- Stage 2: Tighten an additional 105 degrees.



N0008562

Fig. 434: Identifying Connecting Rod Bearing Caps Tighten Sequence
Courtesy of FORD MOTOR CO.

21. Check the piston-to-cylinder block and piston ring clearances. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.
22. Position the oil pump and install the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0006304

Fig. 435: Locating Oil Pump And Bolts
Courtesy of FORD MOTOR CO.

23. Install the oil pump screen and pickup tube spacer.

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

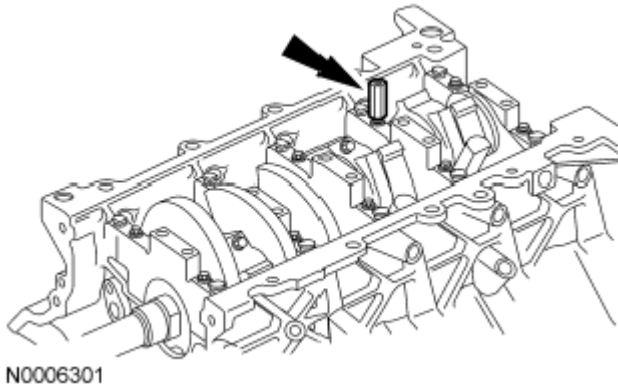


Fig. 436: Locating Oil Pump Screen And Pickup Tube Spacer
Courtesy of FORD MOTOR CO.

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

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

24. Position the oil pump screen and pickup tube and install the 3 bolts.
- Tighten the 2 oil pump screen and pickup tube-to-oil pump bolts to 10 Nm (89 lb-in).
 - Tighten the oil pump screen and pickup tube-to-spacer bolt to 25 Nm (18 lb-ft).

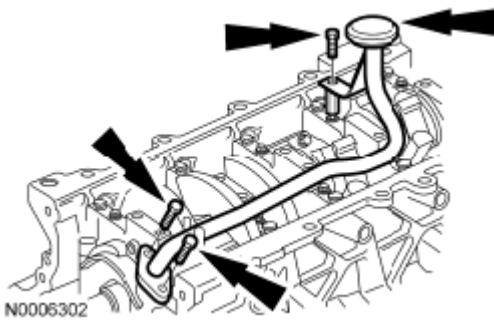


Fig. 437: Locating Oil Pump Screen And Pickup Tube And Bolts
Courtesy of FORD MOTOR CO.

25. Position the crankshaft with the Crankshaft Holding Tool, then remove the tool.

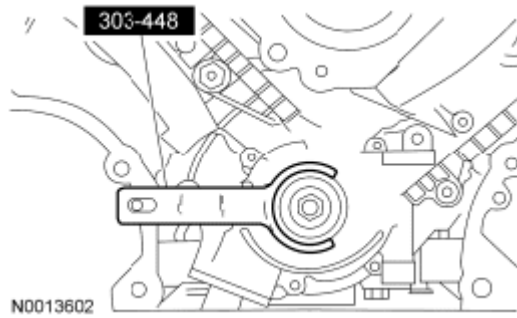


Fig. 438: Positioning Crankshaft With Crankshaft Holding Tool
Courtesy of FORD MOTOR CO.

- NOTE:** Make sure all coolant residue and foreign material are cleaned from the block surface and cylinder bore.
- NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry or engine damage may occur.
- NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.
- NOTE:** Do not turn the crankshaft until instructed to do so.
- NOTE:** LH shown in illustration, RH similar.

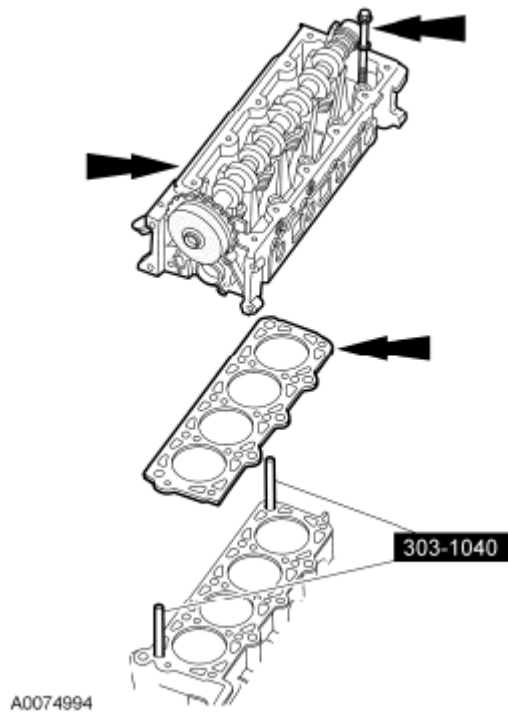


Fig. 439: Locating Cylinder Head Gaskets And Cylinder Heads And Dowels
Courtesy of FORD MOTOR CO.

26. Using the Cylinder Head Alignment Pins, position the cylinder head gaskets and cylinder heads over the dowels and install the 20 cylinder head bolts loosely.

NOTE: RH shown in illustration, LH similar.

27. Tighten the 20 bolts in 3 stages, in the sequence shown in illustration.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
 - Stage 3: Tighten an additional 90 degrees.

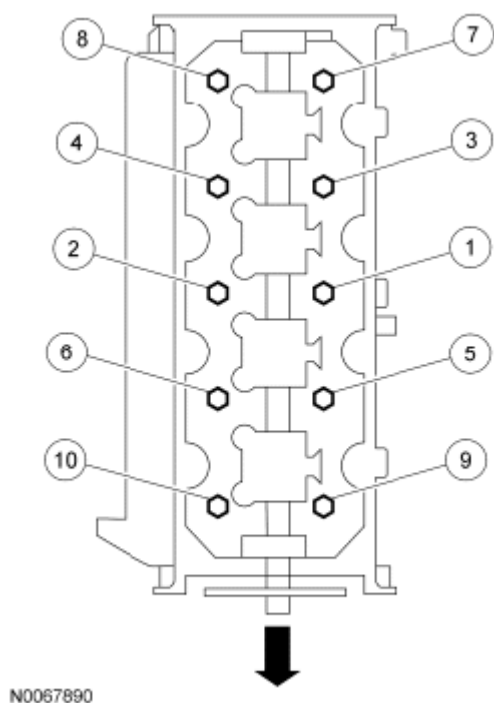


Fig. 440: Identifying Cylinder Head Bolts Tighten Sequence
Courtesy of FORD MOTOR CO.

28. Remove the Cylinder Head Remover/Installer from the LH cylinder head.

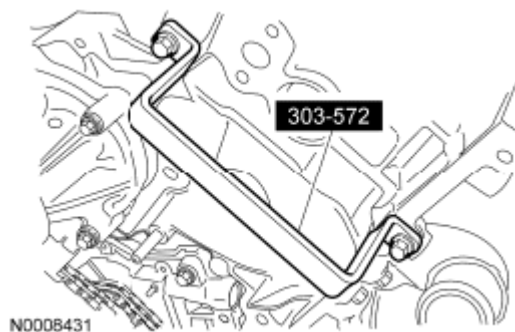


Fig. 441: Removing Cylinder Head Remover/Installer From LH Cylinder Head
Courtesy of FORD MOTOR CO.

29. Remove the Cylinder Head Remover/Installer from the RH cylinder head.

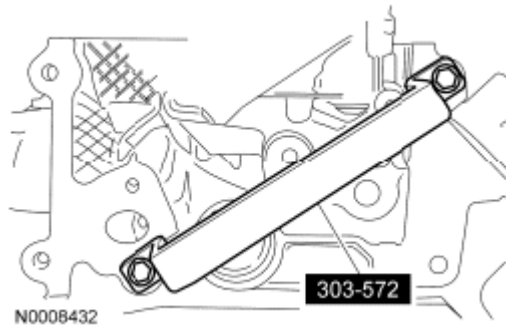


Fig. 442: Removing Cylinder Head Remover/Installer From RH Cylinder Head
Courtesy of FORD MOTOR CO.

30. Install the 24 hydraulic lash adjusters into the RH and LH cylinder heads.
- Lubricate the hydraulic lash adjusters with clean engine oil prior to installation.

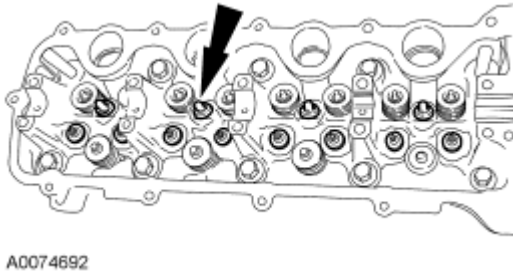


Fig. 443: Installing Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

31. Install the LH and RH camshafts.
- Lubricate the camshaft and camshaft journals with clean engine oil prior to installation.

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

32. Install the 5 LH and 5 RH camshaft bearing caps in their original locations.
- Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the 20 bolts loosely.
 - Tighten to 10 Nm (89 lb-in) in the sequence shown in illustration.

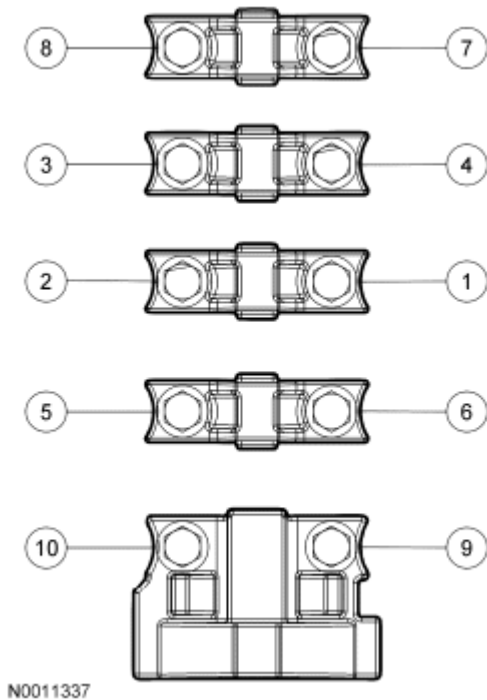


Fig. 444: Identifying Camshaft Bearing Cap Bolt Loosening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: LH shown in illustration, RH similar.

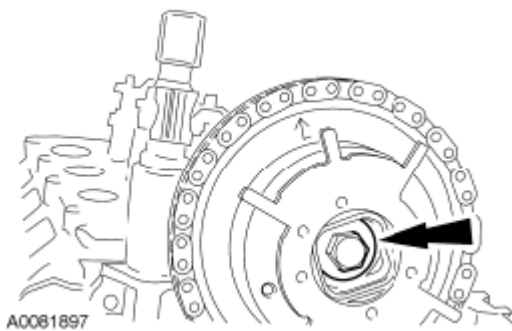


Fig. 445: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

33. Install the camshaft phaser and sprockets and new camshaft phaser and sprocket bolts finger-tight.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: LH shown in illustration, RH similar.

34. Using the Cam Phaser Locking Tool, tighten the LH and RH camshaft phaser and sprocket bolts in 2 stages.

- Stage 1: Tighten to 40 Nm (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees.

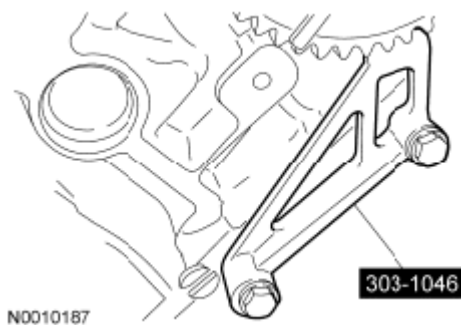


Fig. 446: Tightening LH Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

NOTE: Timing chain procedures must be followed exactly or damage to valves and pistons may result.

NOTE: Prior to installation, inspect the tensioner-sealing bead for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

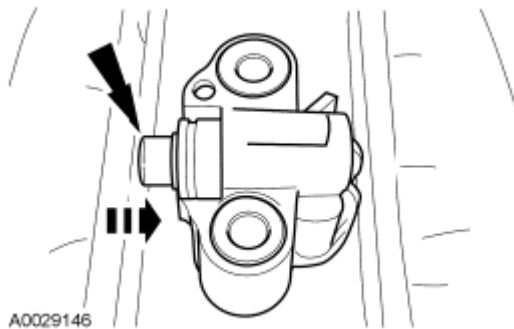


Fig. 447: Compressing Tensioner Plunger Using Vise
Courtesy of FORD MOTOR CO.

35. Compress the tensioner plunger, using a vise.

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

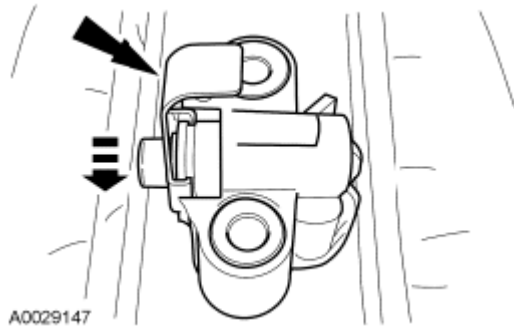


Fig. 448: Installing Retaining Clip On Tensioner
Courtesy of FORD MOTOR CO.

37. Remove the tensioner from the vise.
38. If the copper links are not visible, mark 2 links on one end and 1 link on the other end, and use as timing marks.

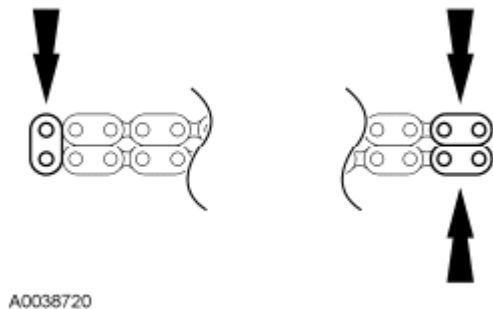


Fig. 449: Locating Copper Link Timing Marks
Courtesy of FORD MOTOR CO.

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

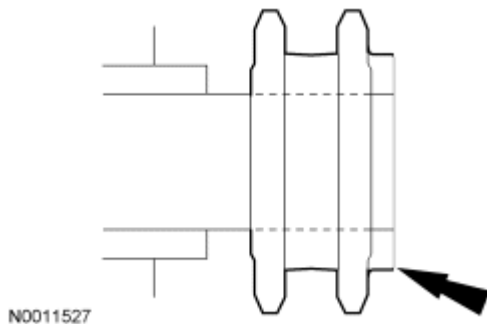
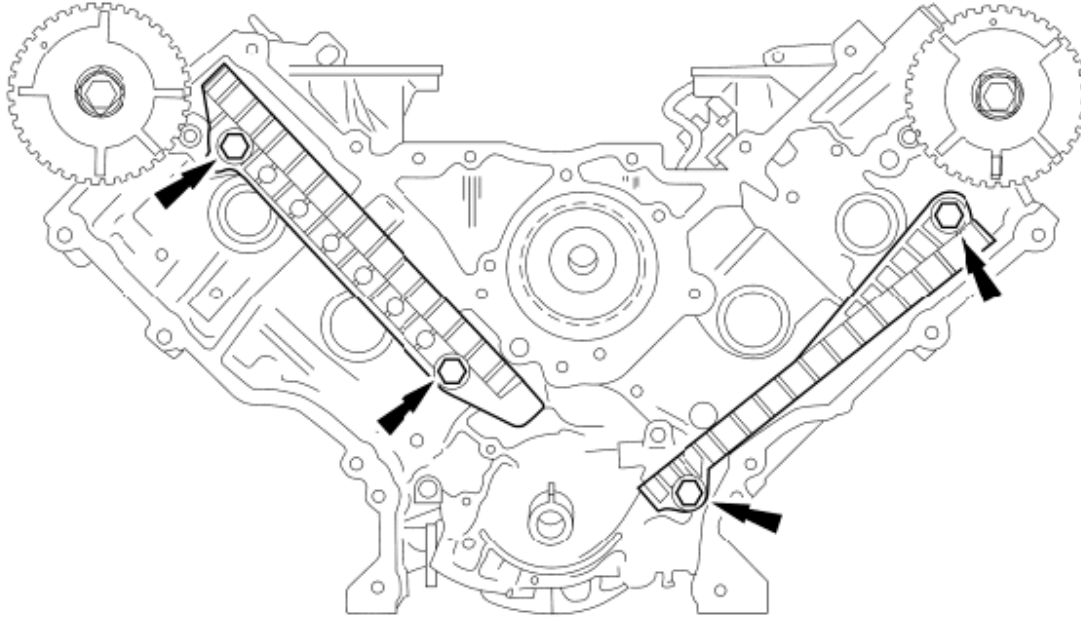


Fig. 450: Locating Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

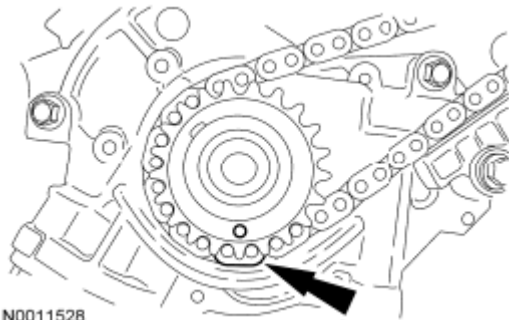
40. Position the LH and RH timing chain guides and install the 4 bolts.
- Tighten to 10 Nm (89 lb-in).



N0006303

Fig. 451: Locating Timing Chain Guides
Courtesy of FORD MOTOR CO.

41. Position the lower end of the LH (inner) timing chain on the crankshaft sprocket, aligning the timing mark on the outer flange of the crankshaft sprocket with the single copper (marked) link on the chain.



N0011528

Fig. 452: Aligning Crankshaft Sprocket Timing Mark And Timing Chain Link
Courtesy of FORD MOTOR CO.

NOTE: Make sure the upper half of the timing chain is below the tensioner arm dowel.

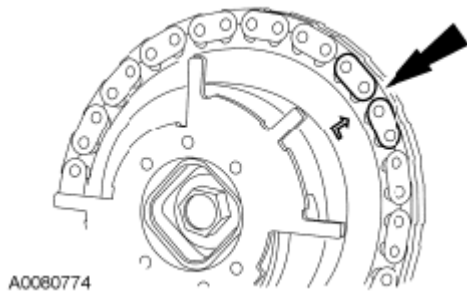


Fig. 453: Locating Timing Mark On Timing Chain
Courtesy of FORD MOTOR CO.

42. Position the timing chain on the camshaft phaser and sprocket with the timing mark positioned between the 2 copper (marked) chain links.

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

43. Position the LH timing chain tensioner arm on the dowel pin and install the LH timing chain tensioner and 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

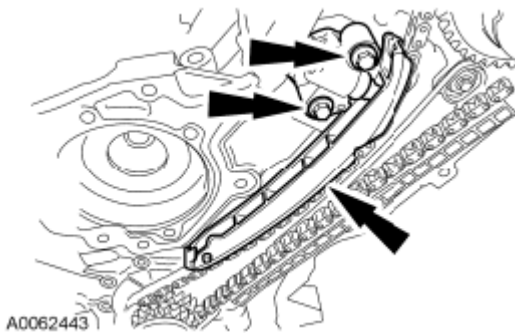


Fig. 454: Locating LH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

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

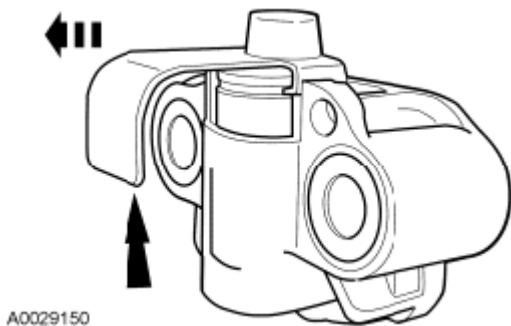


Fig. 455: Removing Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

45. Position the lower end of the RH (outer) timing chain on the crankshaft sprocket, aligning the timing mark on the sprocket with the single copper (marked) chain link.

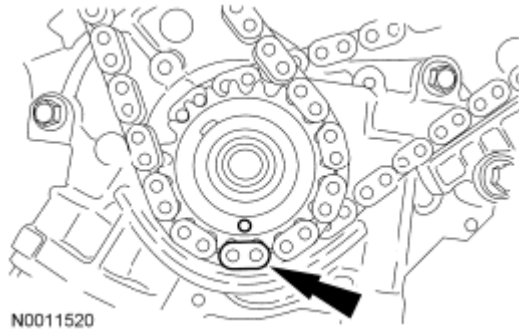


Fig. 456: Aligning (Outer) Sprocket Timing Mark And Chain Link
Courtesy of FORD MOTOR CO.

NOTE: The lower half of the timing chain must be positioned above the tensioner arm dowel.

NOTE: The camshaft phaser and sprocket will be stamped with one of the illustrated timing marks for the RH camshaft.

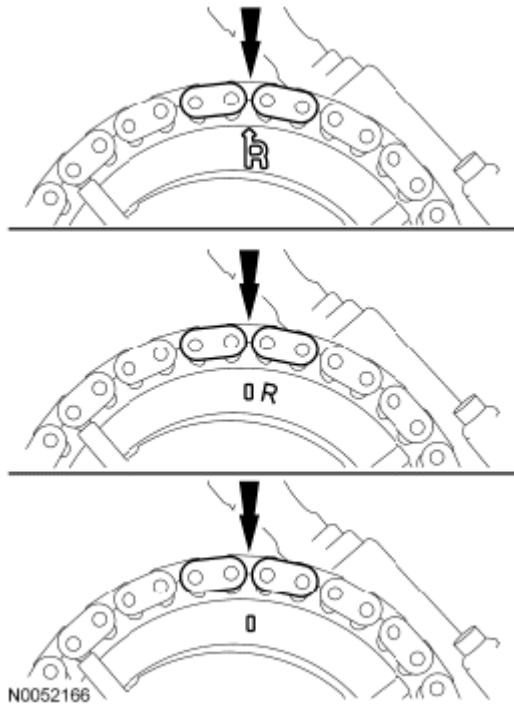


Fig. 457: Locating Upper Stabilizer Link Nut

Courtesy of FORD MOTOR CO.

46. Position the RH timing chain on the camshaft phaser and sprocket. Make sure the timing mark is positioned between the 2 copper (marked) chain links.
47. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner and the 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

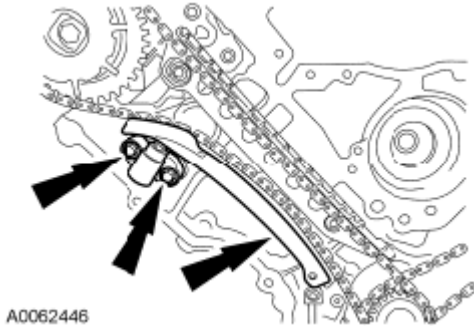


Fig. 458: Locating RH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

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

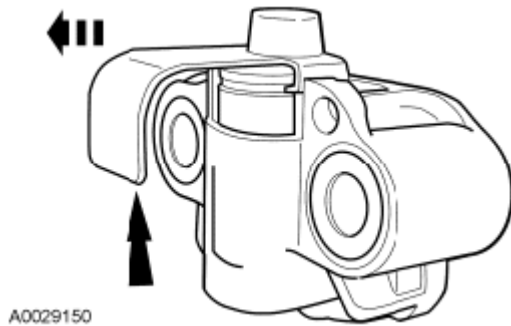
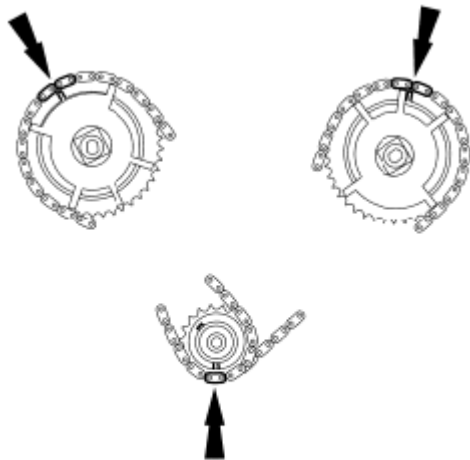


Fig. 459: Removing Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

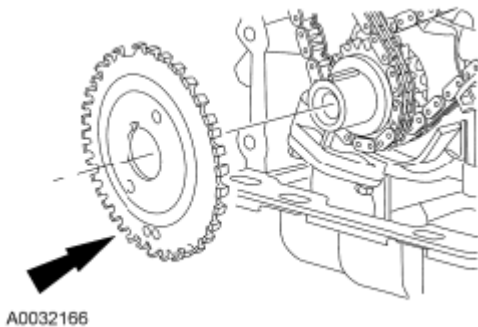
49. As a post-check, verify correct alignment of all timing marks.



N0092582

Fig. 460: Locating Timing Chain Mark Location
Courtesy of FORD MOTOR CO.

50. Install the crankshaft sensor ring on the crankshaft.



A0032166

Fig. 461: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed.

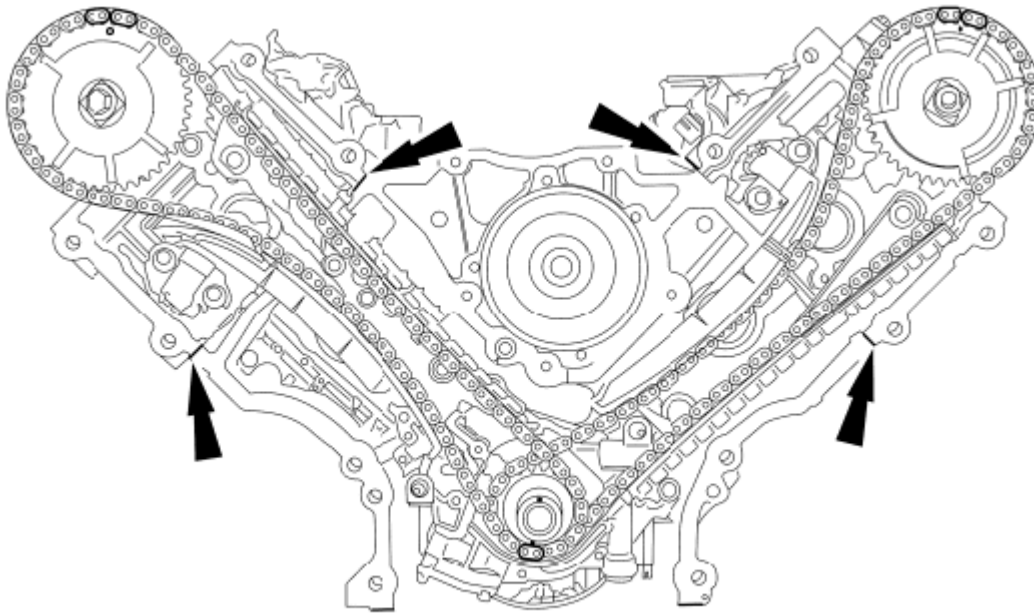
NOTE: It may be necessary to push the valve down while compressing the spring.

51. Using the Valve Spring Compressor, install all of the camshaft roller followers.
- Lubricate the camshaft roller followers with clean engine oil prior to installation.



Fig. 462: Installing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.
- NOTE:** If the engine front cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.
- NOTE:** Make sure that the engine front cover gasket is in place on the engine front cover before installation.



N0010501

Fig. 463: Locating Engine Front Cover Onto Dowels
Courtesy of FORD MOTOR CO.

52. Apply a bead of silicone gasket and sealant along the cylinder head-to-cylinder block surface at the locations shown in illustration.
53. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.

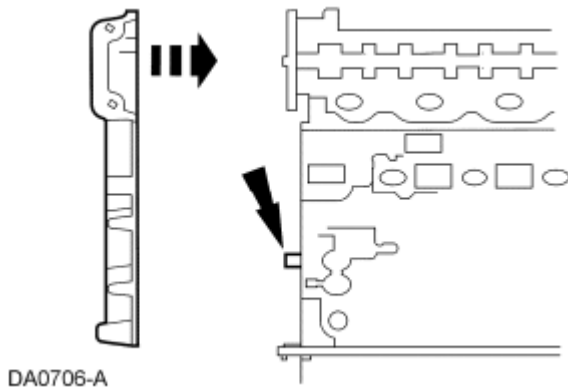


Fig. 464: Installing Engine Front Cover Gasket On Engine Front Cover
Courtesy of FORD MOTOR CO.

54. Tighten the 15 engine front cover fasteners in sequence in 2 stages.

Stage 1: Tighten fasteners 1 through 15 to 25 Nm (18 lb-ft).

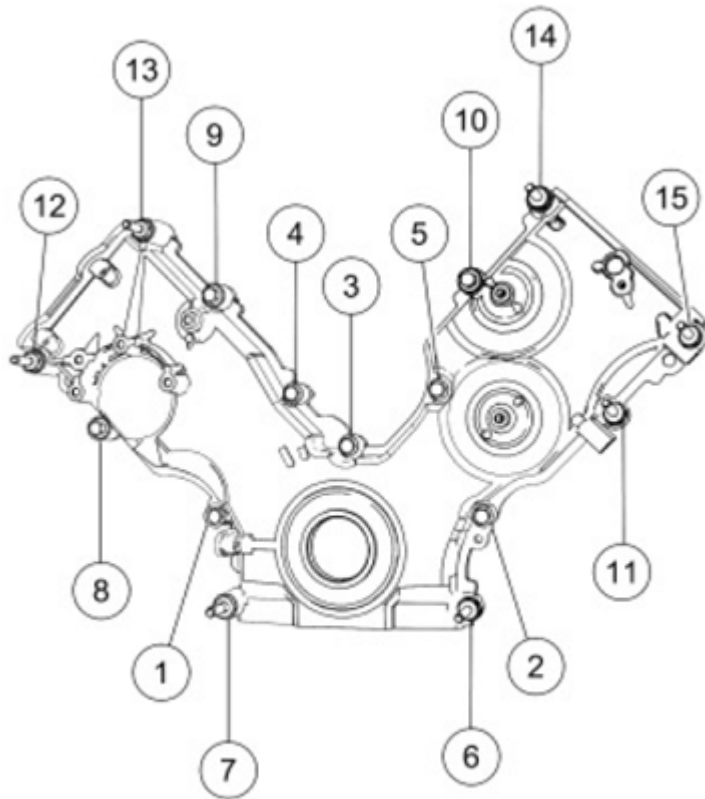
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Stage 2: Tighten fasteners 6 and 7 to 48 Nm (35 lb-ft).

ITEM DESCRIPTION

Item	Part Number	Description
1	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
2	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
3	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
4	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
5	N806177	Bolts, Hex Flange Head Pilot, M8 x 1.25 x 50
6	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
7	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
8	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
9	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
10	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
11	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
12	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
13	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
14	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
15	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94



N0088959

Fig. 465: Identifying Engine Front Cover Fasteners Tighten Sequence
Courtesy of FORD MOTOR CO.

NOTE: Do not rotate the coolant pump housing once the coolant pump has been positioned in the cylinder block. Damage to the O-ring seal will occur.

55. Using a new O-ring seal, position the coolant pump and install the bolts loosely.
 - Lubricate the new O-ring seal using clean engine coolant and install the O-ring seal onto the coolant pump.

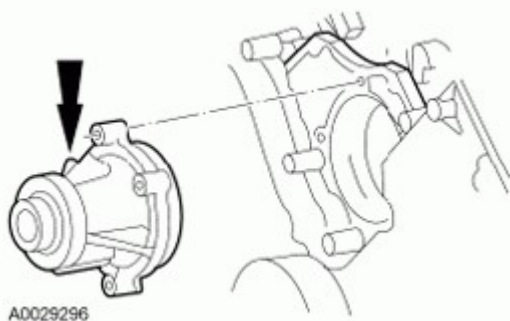


Fig. 466: Identifying Coolant Pump

Courtesy of FORD MOTOR CO.

56. Tighten the 4 coolant pump bolts.
- Tighten to 25 Nm (18 lb-ft).

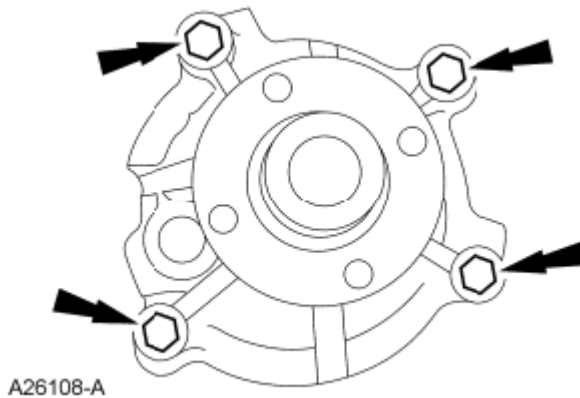


Fig. 467: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

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

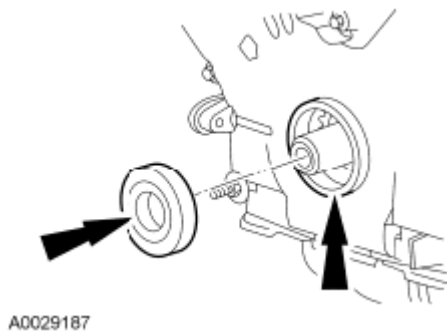


Fig. 468: Lubricating Engine Front Cover And Crankshaft Seal Inner Lip With Clean Engine Oil
Courtesy of FORD MOTOR CO.

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

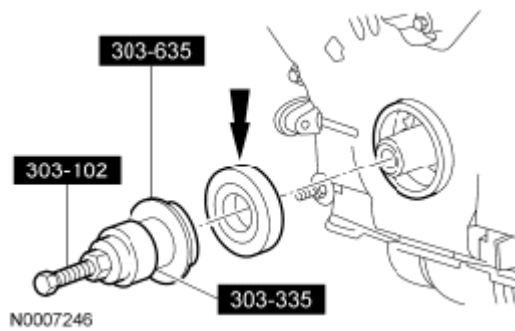


Fig. 469: Installing Crankshaft Front Seal Into Engine Front Cover Using Special Tools
Courtesy of FORD MOTOR CO.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

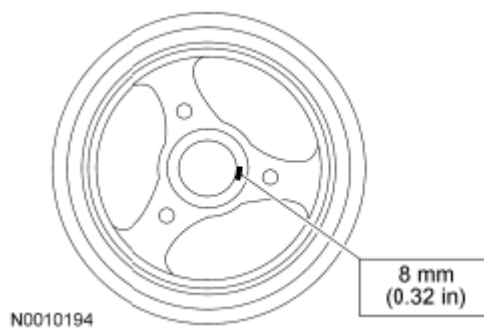


Fig. 470: Identifying Woodruff Key Slot On Crankshaft Pulley
Courtesy of FORD MOTOR CO.

59. Apply silicone gasket and sealant to the Woodruff key slot on the crankshaft pulley.
60. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.

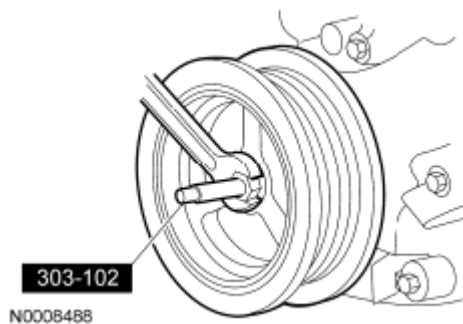


Fig. 471: Installing Crankshaft Pulley Using Special Tool
Courtesy of FORD MOTOR CO.

61. Tighten the new crankshaft pulley bolt in 4 stages.

- Stage 1: Tighten to 90 Nm (66 lb-ft).
- Stage 2: Loosen 360 degrees.
- Stage 3: Tighten to 50 Nm (37 lb-ft).
- Stage 4: Tighten an additional 90 degrees.

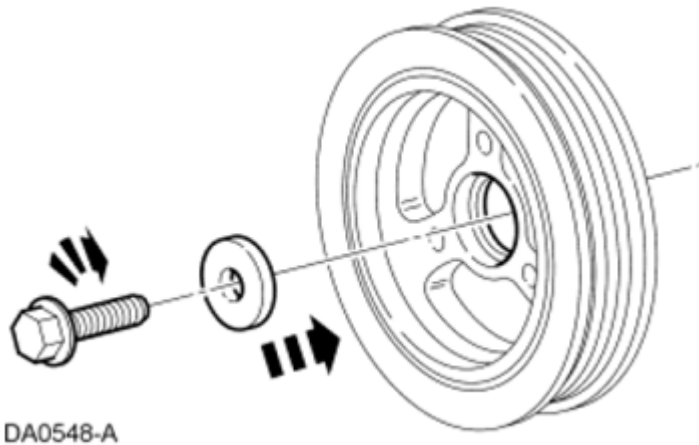


Fig. 472: Installing Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

62. Position the accessory drive belt tensioner and install the 3 bolts.

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

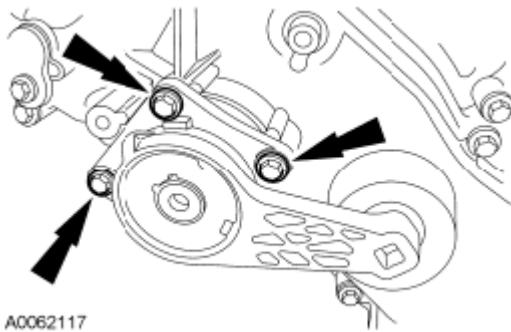


Fig. 473: Identifying Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

63. Install the accessory drive belt idler pulley, the coolant pump pulley and the 5 bolts.

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

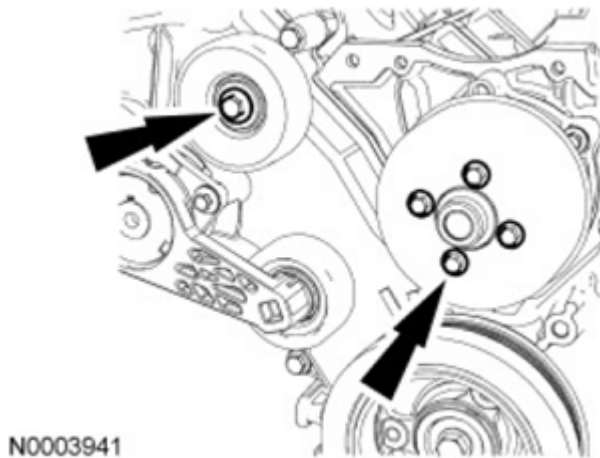


Fig. 474: Identifying Coolant Pump Pulley And Idler Pulley Bolts
Courtesy of FORD MOTOR CO.

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

NOTE: Clean and inspect the mating surfaces, and install a new gasket.

64. Position the oil filter adapter and install the 4 bolts and the nut.

- Tighten the bolts to 25 Nm (18 lb-ft).
- Tighten the nut to 48 Nm (35 lb-ft).

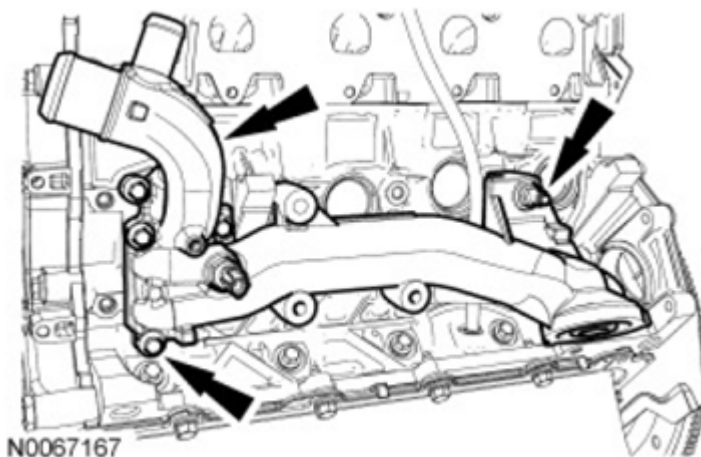


Fig. 475: Locating Oil Filter Adapter, Gasket And Nuts
Courtesy of FORD MOTOR CO.

NOTE: RH shown in illustration, LH similar.

65. Install 16 new exhaust manifold studs.

- Tighten to 12 Nm (106 lb-in).

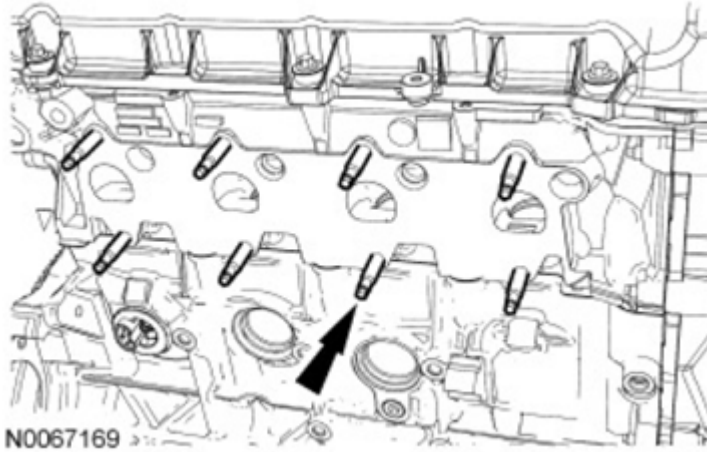


Fig. 476: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

66. Position a new gasket, the LH exhaust manifold and tighten the 8 new nuts in the sequence shown in illustration.

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

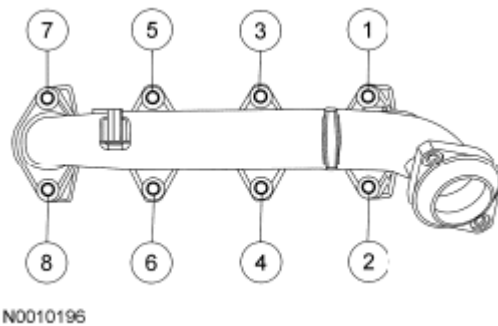


Fig. 477: Identifying Bolt Loosening Sequence Of Exhaust Manifold
Courtesy of FORD MOTOR CO.

NOTE: The engine support insulator bracket bolts must be discarded and new bolts installed or damage to the vehicle may occur. They are a tighten-to-yield design and cannot be reused.

NOTE: Clean the engine support insulator bracket mounting surfaces of any dirt or foreign material prior to installation. Failure to follow these instructions may result in engine support insulator damage.

NOTE: The engine support insulator bracket bolts must not be tightened more

than 90 degrees after initial torque.

NOTE: Place a visible mark on the engine support insulator bracket and the bracket bolts. Turning the bolt 1 flat of the bolt head is equal to 60 degrees.

67. Position the LH engine support insulator bracket and install 3 new bolts in 2 stages.

- Stage 1: Tighten to 30 Nm (22 lb-ft).
- Stage 2: Tighten an additional minimum of 60 degrees.

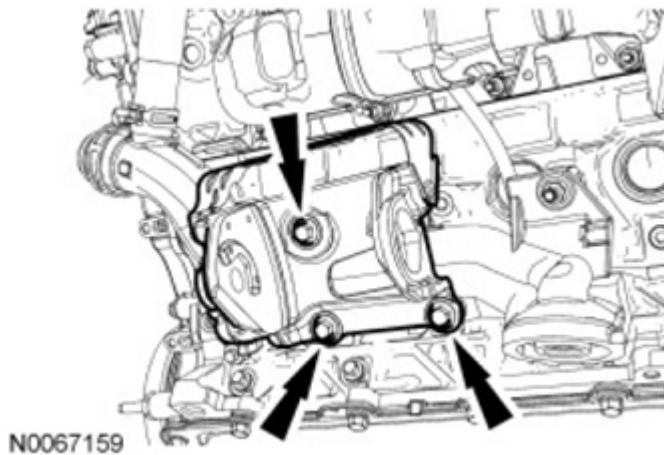


Fig. 478: Locating LH Engine Support Insulator Bracket And Bolts
Courtesy of FORD MOTOR CO.

68. Position a new gasket, the RH exhaust manifold and tighten the 8 new nuts in the sequence shown in illustration.

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

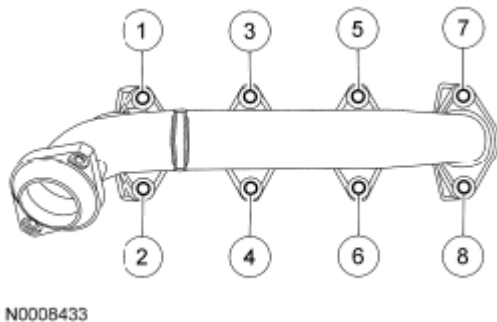


Fig. 479: Identifying Bolt Tightening Sequence Of Exhaust Manifold
Courtesy of FORD MOTOR CO.

NOTE: The engine support insulator bracket bolts must be discarded and new bolts installed or damage to the vehicle may occur. They are a tighten-to-

yield design and cannot be reused.

NOTE: Clean the engine support insulator bracket mounting surfaces of any dirt or foreign material prior to installation. Failure to follow these instructions may result in engine support insulator damage.

NOTE: The engine support insulator bracket bolts must not be tightened more than 90 degrees after initial torque.

NOTE: Place a visible mark on the engine support insulator bracket and the bracket bolts. Turning the bolt 1 flat of the bolt head is equal to 60 degrees.

69. Position the RH engine support insulator bracket, position the engine support insulator bracket and install 3 new bolts in 2 stages.
- Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional minimum of 60 degrees.

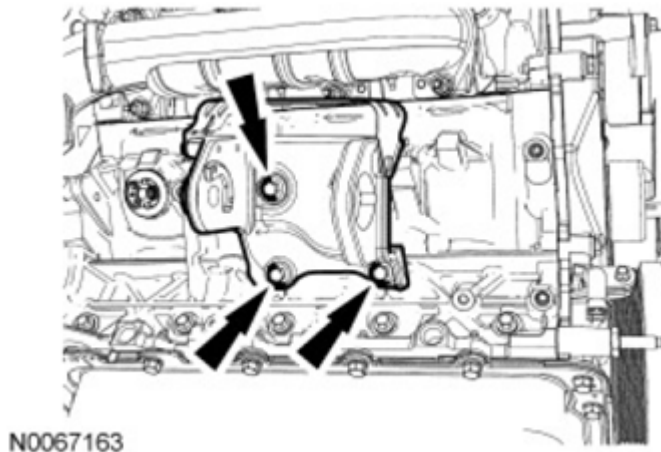


Fig. 480: Locating RH Engine Support Insulator Bracket Bolts
Courtesy of FORD MOTOR CO.

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

70. Clean the valve cover mating surface with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

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

remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

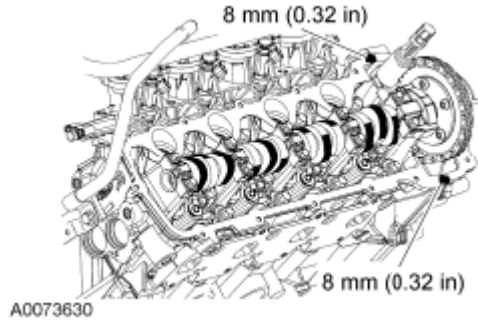


Fig. 481: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

71. Apply silicone gasket and sealant in 2 places where the engine front cover meets the cylinder head.

NOTE: When installing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.

72. Position the RH valve cover and gasket on the cylinder head and tighten the 9 fasteners in the sequence shown in illustration.
 - Tighten to 10 Nm (89 lb-in).

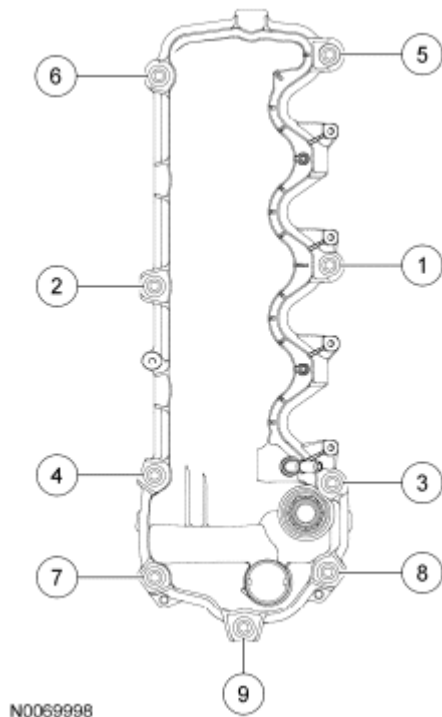


Fig. 482: Identifying Cylinder Head Bolt Tighten Sequence
Courtesy of FORD MOTOR CO.

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

73. Clean the valve cover mating surface with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

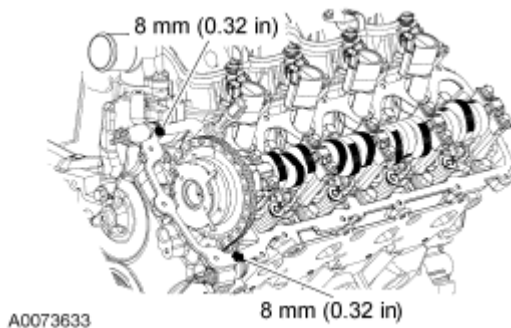


Fig. 483: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

74. Apply silicone gasket and sealant in 2 places where the engine front cover meets the cylinder head.

NOTE: When installing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.

75. Position the LH valve cover and gasket on the cylinder head and tighten the 10 fasteners in the sequence shown in illustration.
 - Tighten to 10 Nm (89 lb-in).

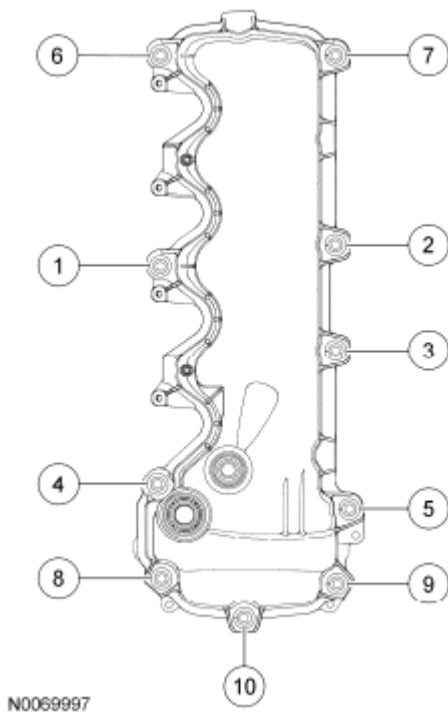


Fig. 484: Identifying Cylinder Head Bolt Tighten Sequence
Courtesy of FORD MOTOR CO.

NOTE: Do not reuse the O-ring seals.

NOTE: Lubricate new O-ring seals with clean engine coolant prior to installation.

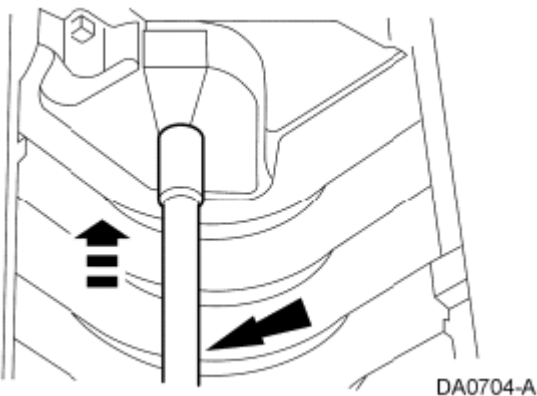


Fig. 485: Sliding Coolant Tube Forward With O-ring Seals
Courtesy of FORD MOTOR CO.

76. Slide the coolant tube forward with the new O-ring seals into the cylinder block.
77. Install the coolant tube stud bolt.
 - Tighten to 10 Nm (89 lb-in).

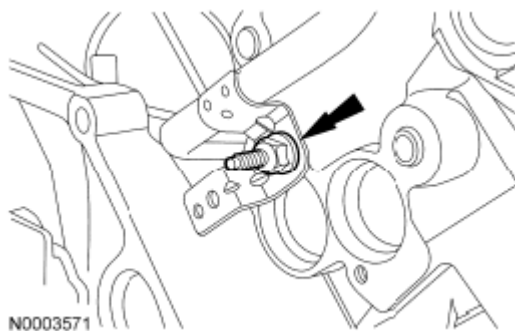


Fig. 486: Identifying Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

78. Install the 2 Knock Sensor (KS) and the 2 bolts.
- Tighten to 20 Nm (177 lb-in).

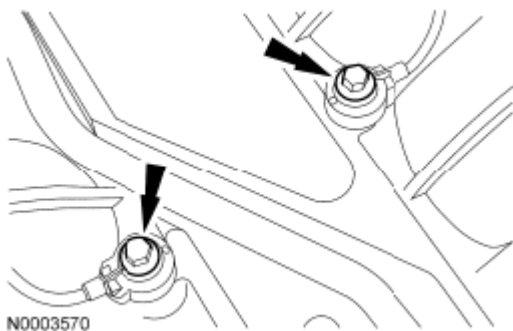


Fig. 487: Identifying Knock Sensors (KS)
Courtesy of FORD MOTOR CO.

79. Install the oil level indicator tube and the front bolt.
- Install a new O-ring seal and lubricate with clean engine oil prior to installation.
 - Tighten to 25 Nm (18 lb-ft).

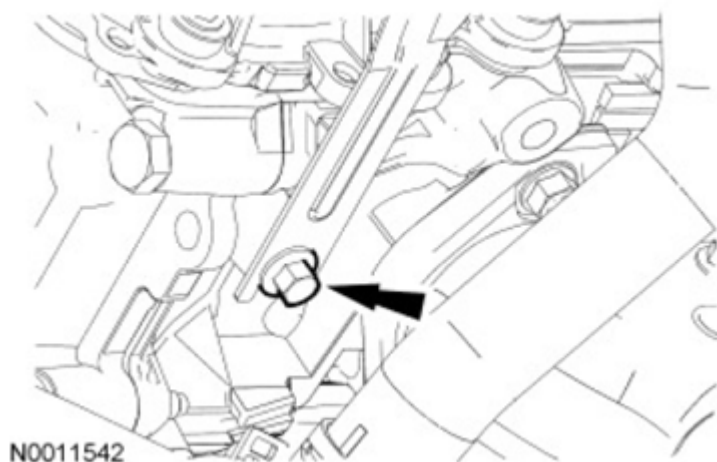


Fig. 488: Locating Front Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

80. Install the rear oil level indicator tube bolt.
- Tighten to 10 Nm (89 lb-in).

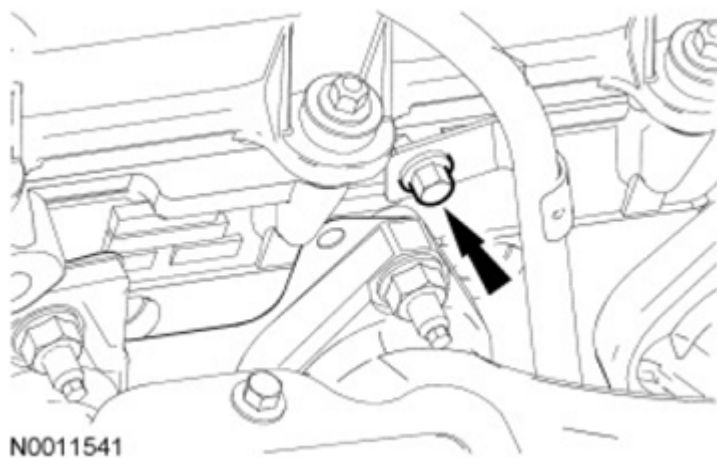


Fig. 489: Locating Rear Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

81. Position the intake manifold vacuum tube support bracket and install the bolt.
- Tighten to 10 Nm (89 lb-in).

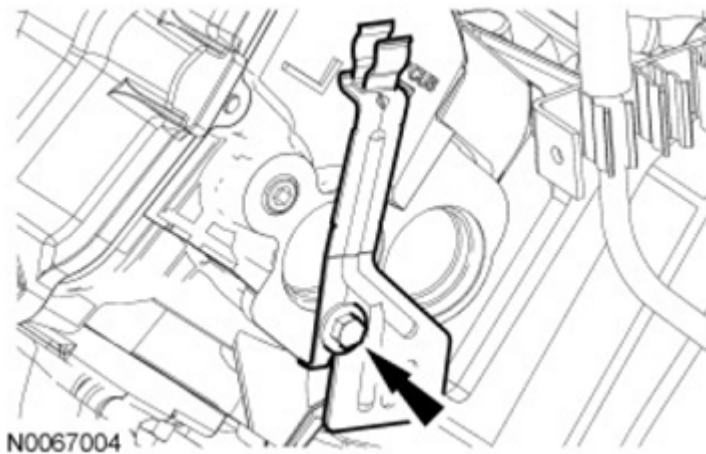


Fig. 490: Locating Intake Manifold Vacuum Tube Support Bracket And Bolt
Courtesy of FORD MOTOR CO.

NOTE: Verify that the ignition coil spring is correctly located inside the ignition coil boot and that there is no damage to the tip of the boot.

NOTE: LH shown in illustration, RH similar.

82. Install the 8 ignition coils and the 8 bolts.

- Apply a light coat of dielectric compound to the inside of the ignition coil boots prior to installation.
- Tighten to 6 Nm (53 lb-in).



Fig. 491: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

83. Position the engine wiring harness onto the engine assembly.

84. Connect the engine wiring harness position retainers to the front of the LH valve cover and the LH **CMP** sensor electrical connector.

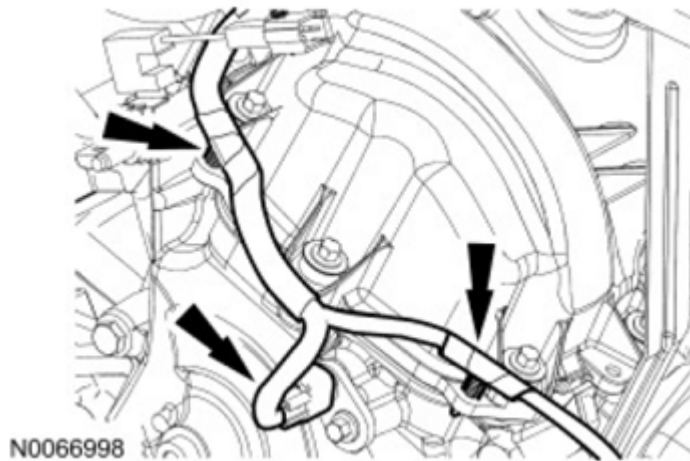


Fig. 492: Locating Engine Wiring Harness Position Retainers
Courtesy of FORD MOTOR CO.

85. Connect the Engine Oil Pressure (EOP) switch electrical connector.

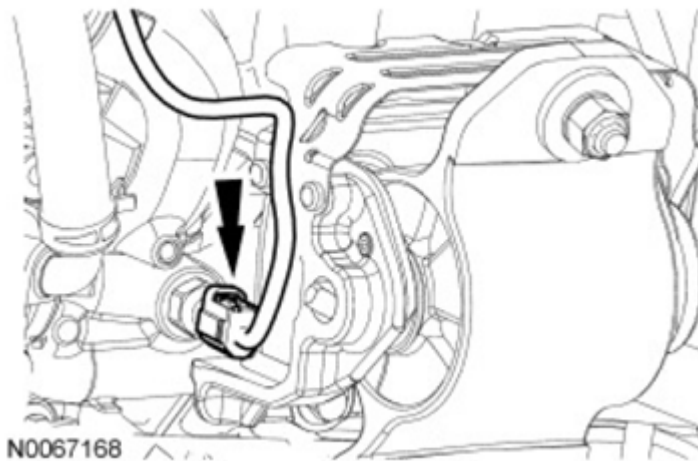


Fig. 493: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

86. Install the LH radio ignition interference capacitor and the nut.
- Tighten to 10 Nm (89 lb-in).

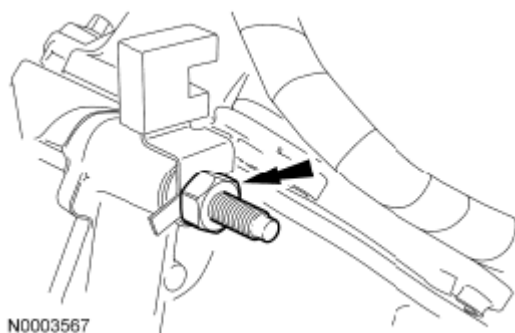


Fig. 494: Identifying Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

87. Connect the Cylinder Head Temperature (CHT) sensor electrical connector.

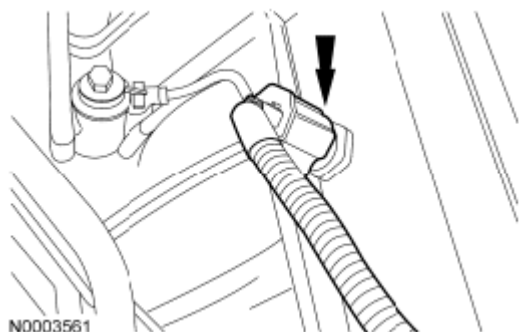


Fig. 495: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

88. Connect the RH VCT solenoid electrical connector.

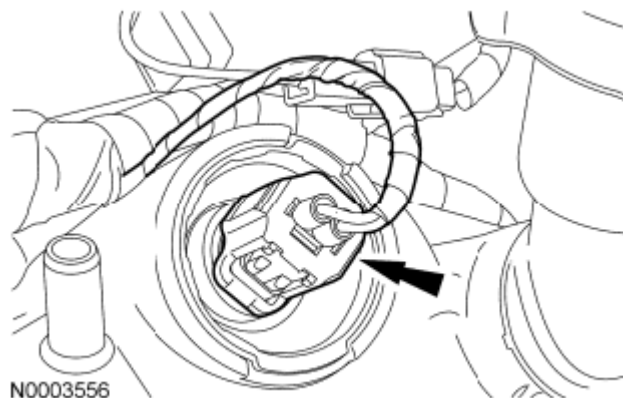


Fig. 496: Locating VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

89. Install the RH radio ignition interference capacitor and the nut.

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

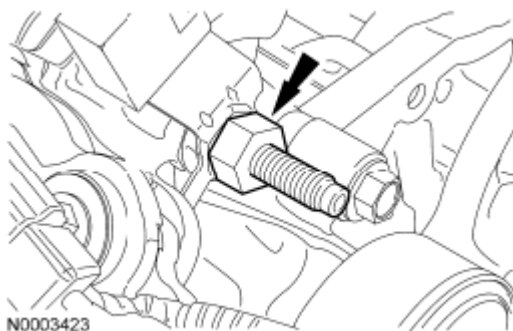


Fig. 497: Identifying Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

90. Connect the RH CMP sensor electrical connector.

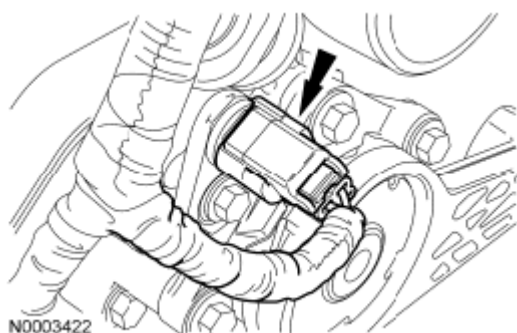


Fig. 498: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

91. Connect the engine wiring harness position retainers to the front of the RH valve cover.

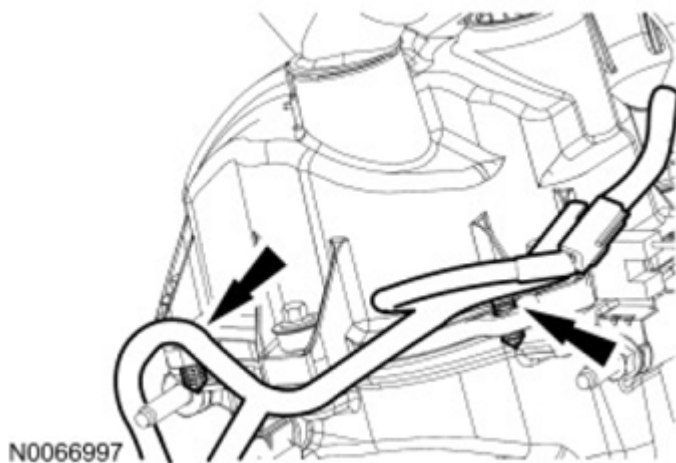


Fig. 499: Locating RH Valve Cover
Courtesy of FORD MOTOR CO.

92. Connect the 2 engine wiring harness retainers from the RH valve cover studs.

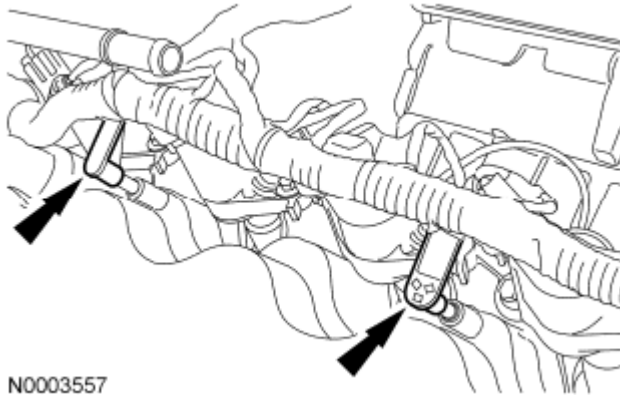


Fig. 500: Locating Engine Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

NOTE: Do not side load the cooling fan clutch coil or the cooling fan clutch coil may be damaged.

NOTE: The large clutch assembly nut has a RH thread and must be rotated clockwise to remove it.

93. Using the Fan Pulley Holding Wrench and the Fan Clutch Nut Wrench, install the engine cooling fan onto the cooling pump pulley.
- Tighten to 55 Nm (41 lb-ft).

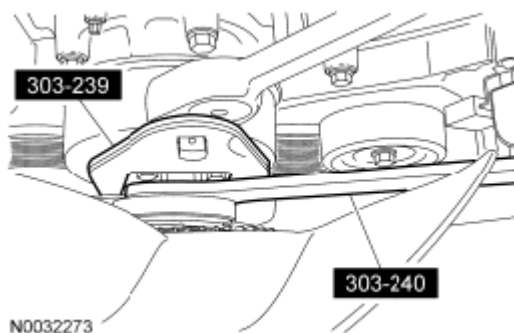


Fig. 501: Removing Cooling Fan And Clutch Assembly
Courtesy of FORD MOTOR CO.

94. Install the Engine Lifting Bracket.

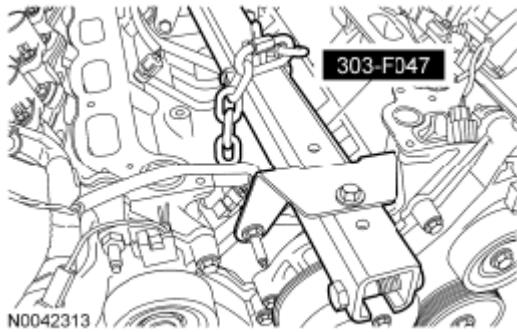


Fig. 502: Identifying Modular Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

95. Using a suitable floor crane, remove the engine from the engine stand.

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the aluminum retainer plate. These tools cause scratches and gouges, which make leak paths. Use a plastic scraping tool to remove all traces of old sealant. Failure to follow this procedure can cause future oil leakage.

96. Inspect the crankshaft rear seal retainer plate. Clean the mating surface for the rear seal retainer plate with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

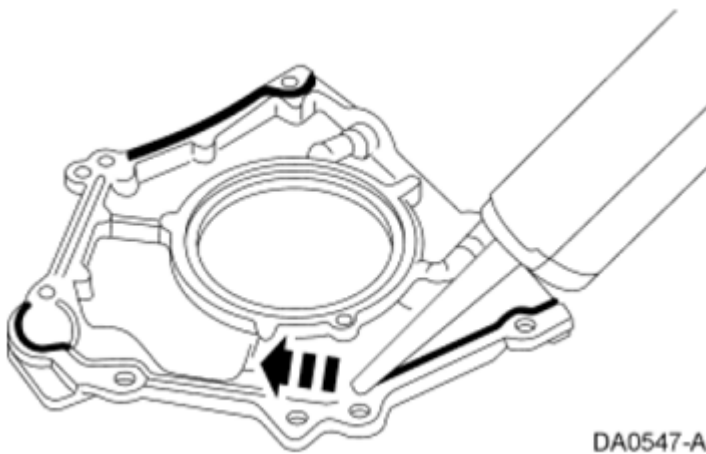


Fig. 503: Applying Bead Of Crankshaft Rear Seal Retainer Plate
Courtesy of FORD MOTOR CO.

97. Apply a 4 mm (0.16 in) bead of silicone gasket and sealant around the crankshaft rear seal retainer sealing surface.
98. Install the crankshaft rear seal retainer plate and loosely install the 6 bolts.

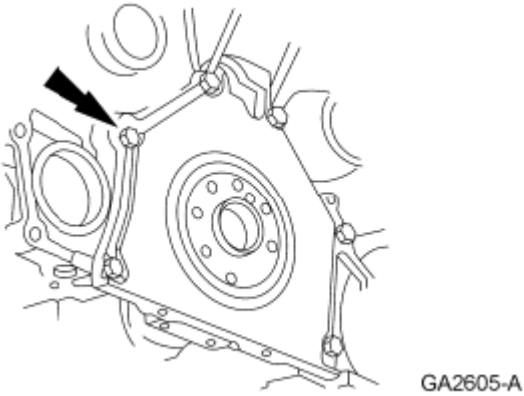


Fig. 504: Locating Crankshaft Rear Seal Retainer Plate And Bolts
Courtesy of FORD MOTOR CO.

99. Tighten the bolts in the sequence shown in illustration.
 - Tighten to 10 Nm (89 lb-in).

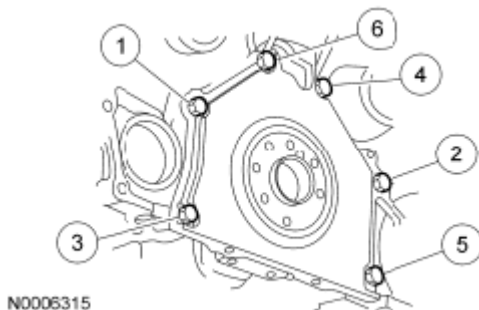


Fig. 505: Identifying Bolts In Tightening Sequence
Courtesy of FORD MOTOR CO.

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

100. Inspect the oil pan. Clean the mating surface for the oil pan with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging.

Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

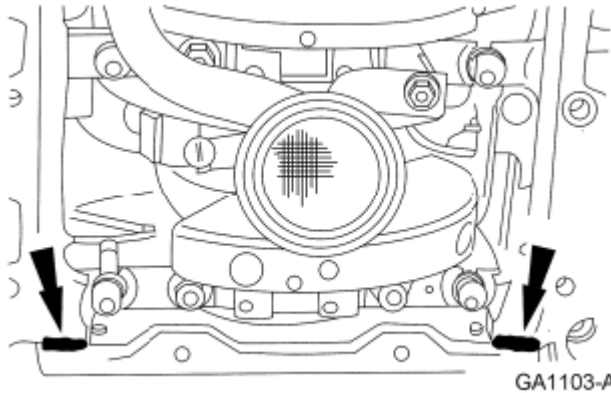


Fig. 506: Locating Crankshaft Rear Seal Retainer Plate-To-Cylinder Block Sealing Surface
 Courtesy of FORD MOTOR CO.

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

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

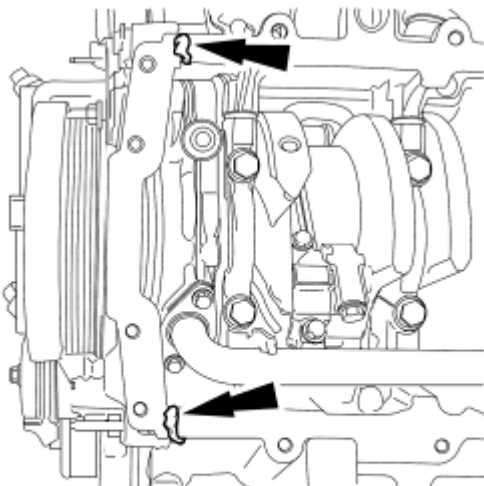


Fig. 507: Identifying Silicone Gasket And Sealant Application Points
 Courtesy of FORD MOTOR CO.

102. Apply silicone gasket and sealant at the engine front cover-to-cylinder block sealing surface.
103. Install the oil pan gasket and the oil pan and loosely install the 16 bolts.

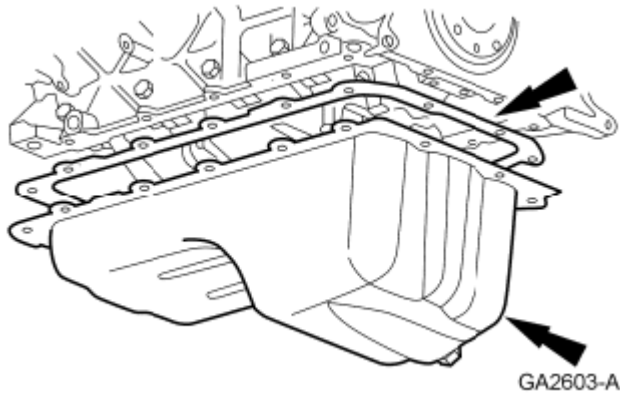


Fig. 508: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

104. Tighten the 16 bolts in 3 stages, in the sequence shown in illustration.
 - Stage 1: Tighten to 2 Nm (18 lb-in).
 - Stage 2: Tighten to 20 Nm (177 lb-in).
 - Stage 3: Tighten an additional 60 degrees.

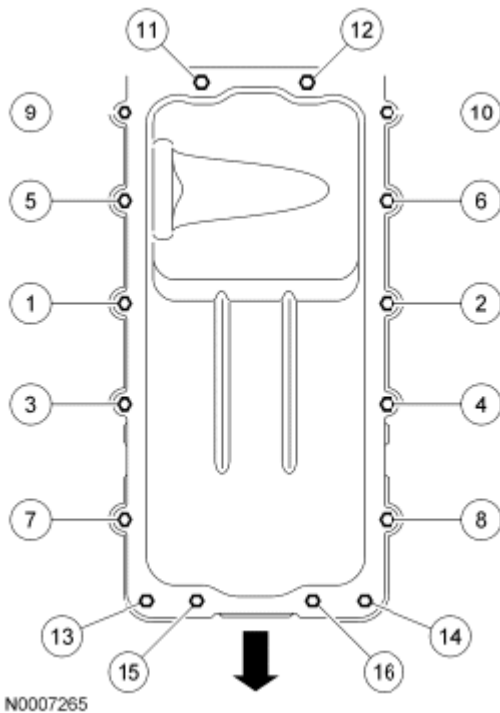


Fig. 509: Identifying Oil Pan Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the crankshaft rear seal with clean engine oil prior to installation.

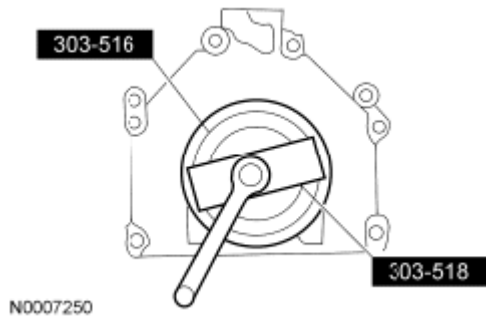


Fig. 510: Installing Crankshaft Rear Oil Seal Using Special Tools
Courtesy of FORD MOTOR CO.

105. Using the Crankshaft Rear Oil Seal Installers, install a new crankshaft rear seal.

NOTE: Lubricate the crankshaft oil slinger with clean engine oil prior to installation.

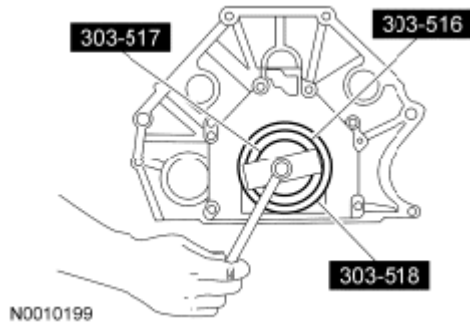
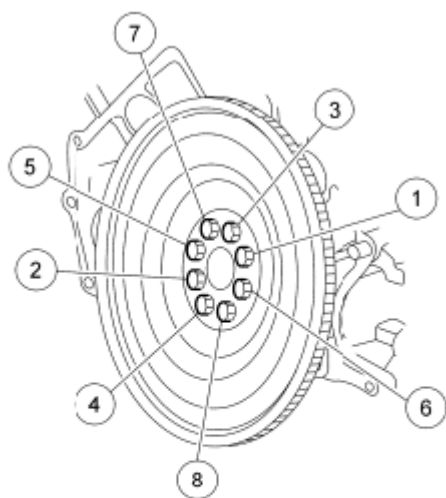


Fig. 511: Installing Crankshaft Rear Oil Slinger Using Special Tools
Courtesy of FORD MOTOR CO.

106. Using the Crankshaft Rear Oil Seal Installers and the Crankshaft Rear Oil Slinger Installer, install a new crankshaft oil slinger.
107. Install the flexplate or flywheel and the 8 bolts in the sequence shown in illustration.
 - Tighten to 80 Nm (59 lb-ft).



N0010329

Fig. 512: Identifying Flexplate Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

INSTALLATION

ENGINE

Special Tool(s)

SPECIAL TOOL REFERENCE



ST1377-A

Engine Lifting Bracket
303-F047 (014-00073) or equivalent

Material

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

ITEM SPECIFICATION

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

All vehicles

1. Using a floor crane, position the engine assembly into the vehicle.

NOTE: Only use hand tools when installing the RH engine through bolt or damage to the engine support insulator may occur.

2. Install the LH engine support insulator through bolt.
 - Tighten to 350 Nm (258 lb-ft).



Fig. 513: Locating LH Engine Support Insulator Through Bolt
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools when installing the LH engine through bolt or damage to the engine support insulator may occur.

3. Install the RH engine support insulator through bolt.
 - Tighten to 350 Nm (258 lb-ft).

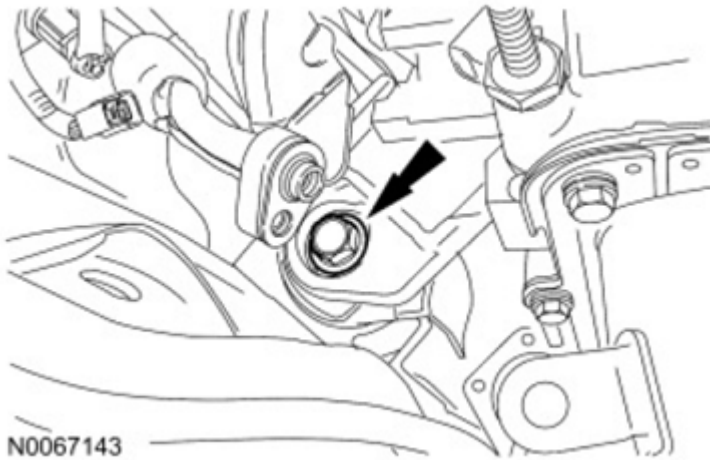


Fig. 514: Locating RH Engine Support Insulator Through Bolt
Courtesy of FORD MOTOR CO.

Manual transmission equipped vehicles

4. Install the clutch and pressure plate. For additional information, refer to **CLUTCH** .

Automatic transmission equipped vehicles

NOTE: **The upper 2 transmission-to-engine bolts will be installed later.**

5. Install the lower 5 transmission-to-engine bolts.
 - Tighten to 48 Nm (35 lb-ft).

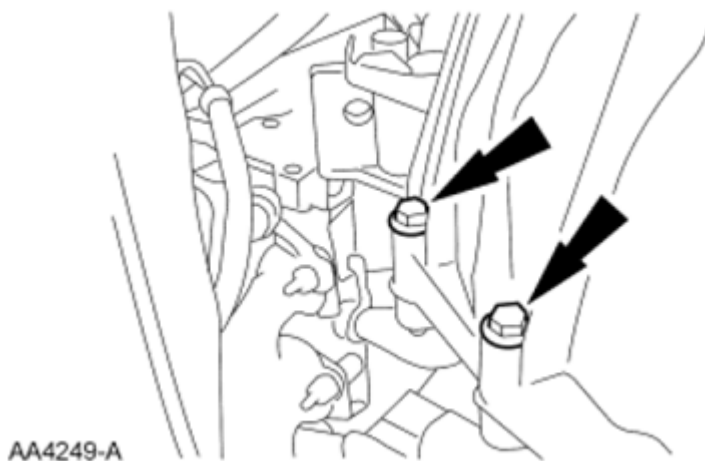


Fig. 515: Locating Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

6. Install 4 new torque converter-to-flexplate nuts.

- Tighten to 35 Nm (26 lb-ft).



Fig. 516: Locating Torque Converter-To-Flexplate Nuts
Courtesy of FORD MOTOR CO.

7. Install the cylinder block opening cover.

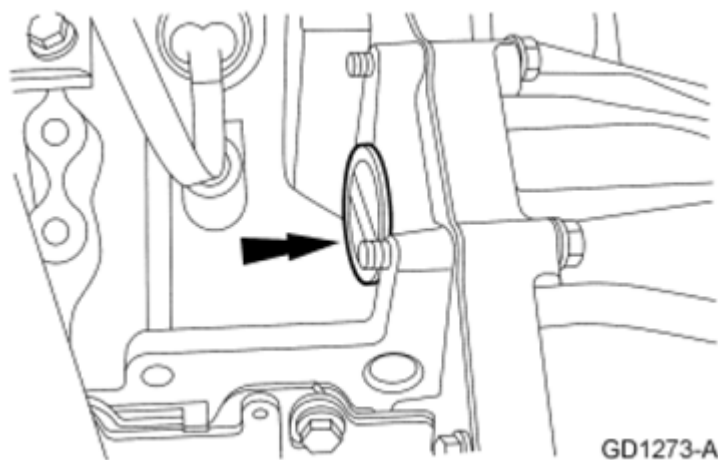


Fig. 517: Locating Cylinder Block Opening Cover
Courtesy of FORD MOTOR CO.

8. Install the 2 transmission rear mount nuts.
 - Tighten to 103 Nm (76 lb-ft).

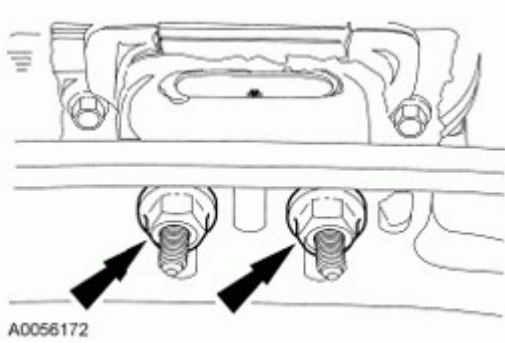


Fig. 518: Locating Rear Transmission Insulator And Retainer Nuts
Courtesy of FORD MOTOR CO.

9. Install the starter. For additional information, refer to **STARTING SYSTEM - GASOLINE ENGINES**.
10. Install the flexplate inspection cover and the 2 bolts.
 - Tighten to 34 Nm (25 lb-ft).

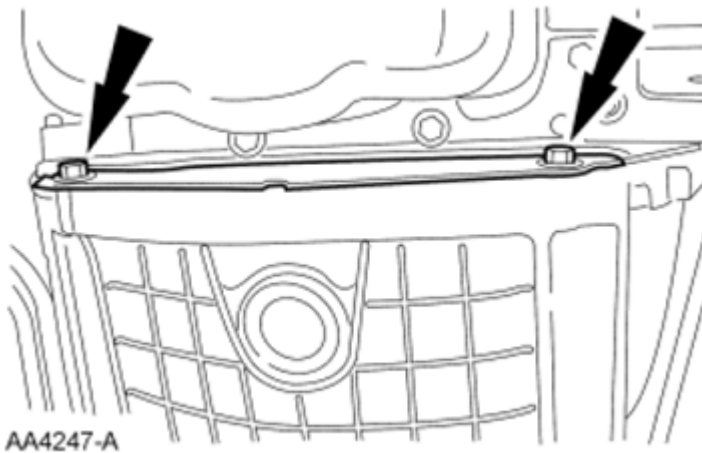


Fig. 519: Locating Flexplate Inspection Cover And Bolts
Courtesy of FORD MOTOR CO.

All vehicles

11. If equipped, connect the block heater electrical connector.

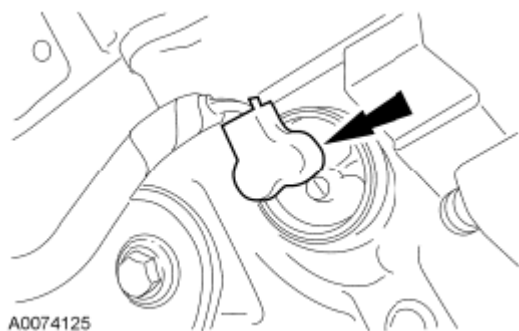


Fig. 520: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

12. Position the transmission wiring harness support bracket and install the bolt.
 - Tighten to 10 Nm (89 lb-in).

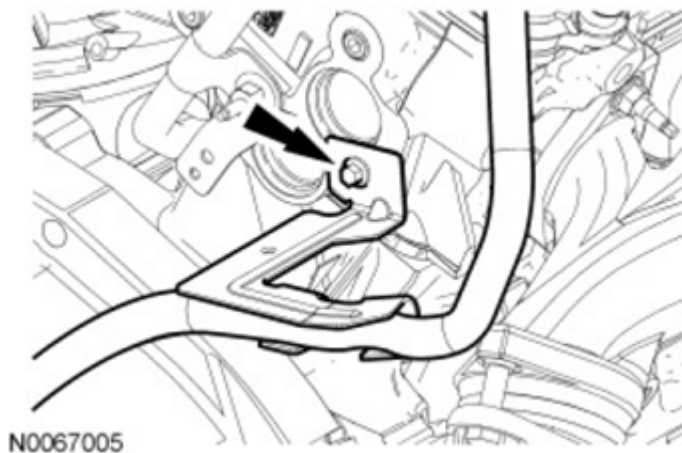


Fig. 521: Identifying Engine Ignition Components - RH
Courtesy of FORD MOTOR CO.

13. Connect the 2 engine wiring harness ground straps and install the nut.
 - Tighten to 10 Nm (89 lb-in).

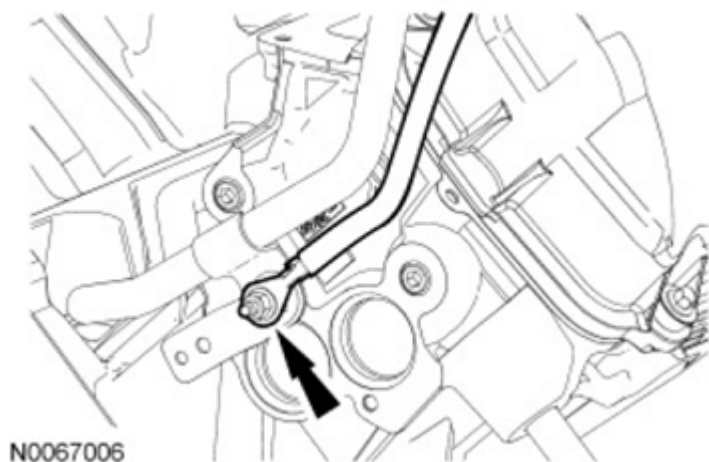


Fig. 522: Locating Engine Wiring Harness Ground Straps And Nut
Courtesy of FORD MOTOR CO.

14. Connect the RH Heated Oxygen Sensor (HO2S) wiring harness retainers.

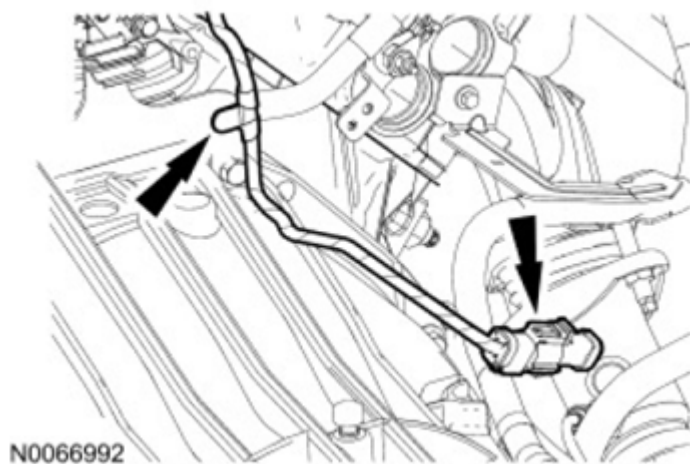


Fig. 523: Locating RH Heated Oxygen Sensor Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

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

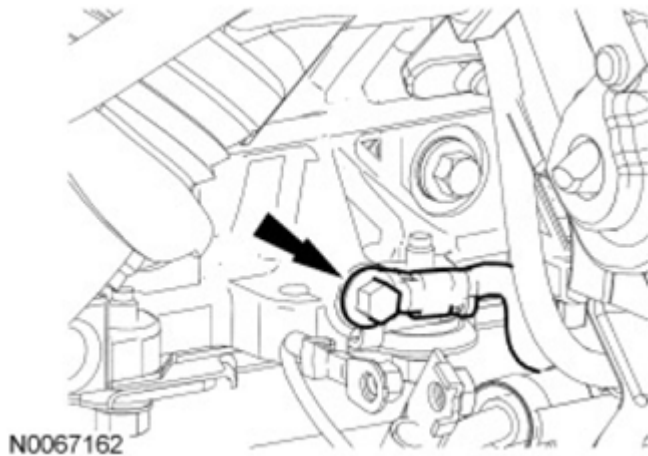


Fig. 524: Measuring Resistance Between SJB C2280B-4 And Clock C2016-6
Courtesy of FORD MOTOR CO.

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

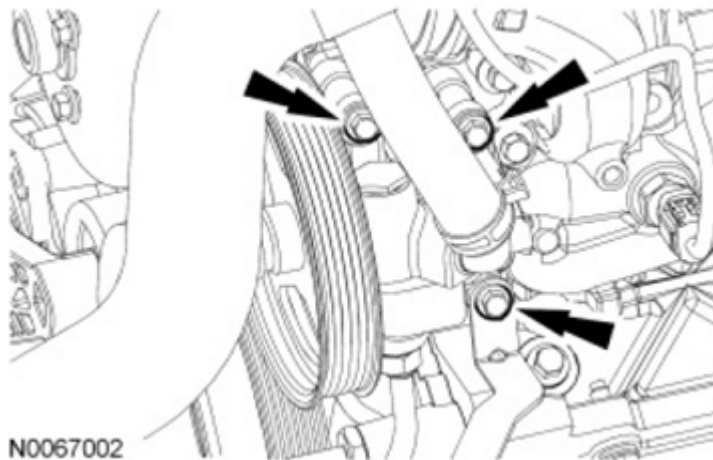


Fig. 525: Locating Power Steering Pump And Bolts
Courtesy of FORD MOTOR CO.

17. Position the A/C compressor and install the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).

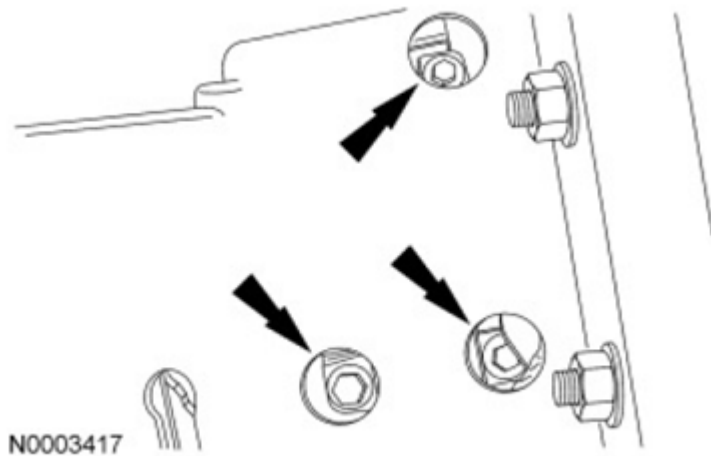


Fig. 526: Locating Bolt Access Holes For A/C Compressor
Courtesy of FORD MOTOR CO.

18. Position the transmission auxiliary fluid cooler tube support bracket and the starter wiring harness support bracket on the engine front cover stud bolt and install the nut.
 - Tighten to 25 Nm (18 lb-ft).

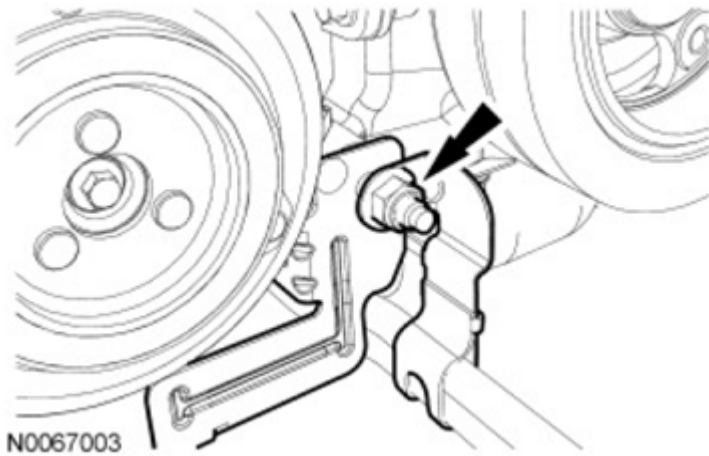


Fig. 527: Locating Engine Front Cover Stud Bolt
Courtesy of FORD MOTOR CO.

19. Install the 4 exhaust manifold flange nuts.
 - Tighten to 40 Nm (30 lb-ft).

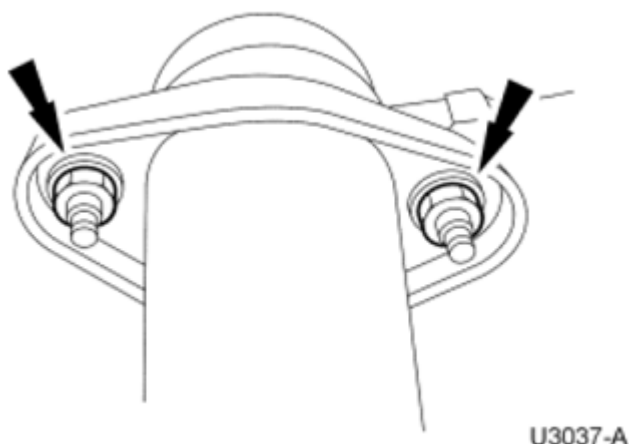


Fig. 528: Locating Exhaust Manifold Flange Nuts
Courtesy of FORD MOTOR CO.

20. Connect the 2 heated **HO2S** electrical connectors.

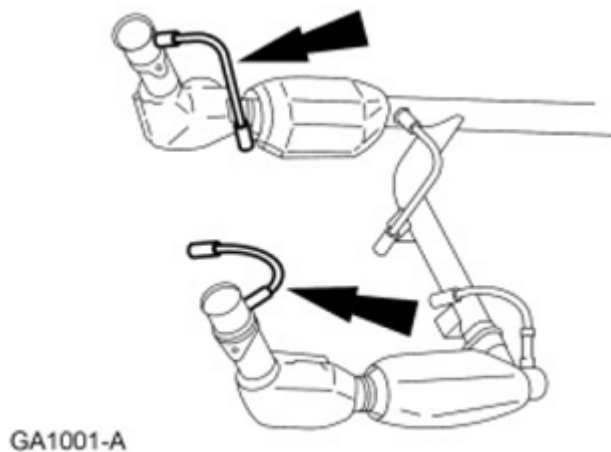


Fig. 529: Locating HO2S Electrical Connectors
Courtesy of FORD MOTOR CO.

21. Position the oil cooler and install the threaded shaft.
- Tighten to 58 Nm (43 lb-ft).

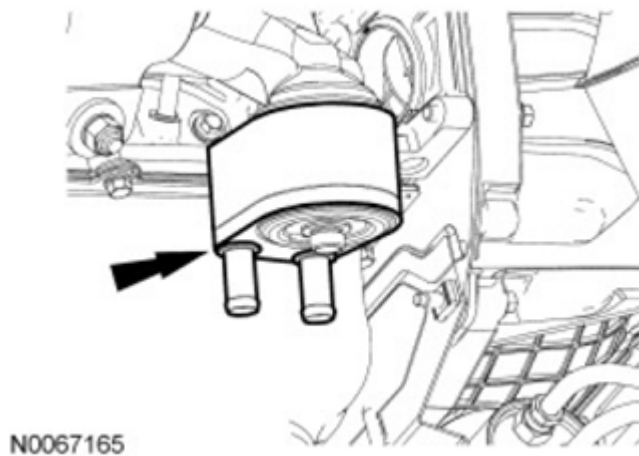


Fig. 530: Locating Engine Oil Cooler
Courtesy of FORD MOTOR CO.

22. Connect the oil cooler coolant hoses.

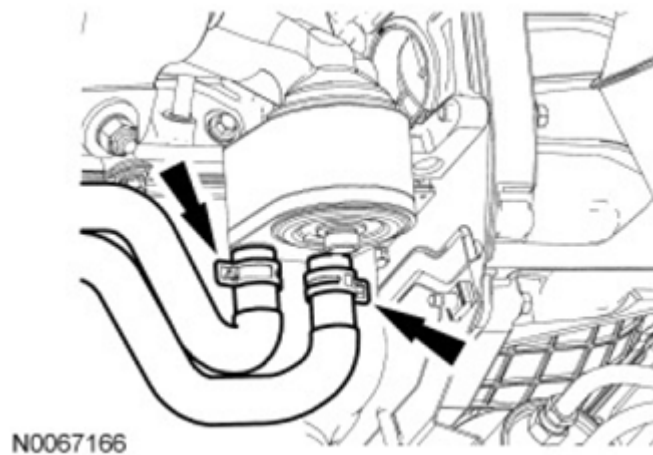


Fig. 531: Connecting Oil Cooler Coolant Hoses
Courtesy of FORD MOTOR CO.

23. Install a new engine oil filter.
- Tighten to 16 Nm (142 lb-in).

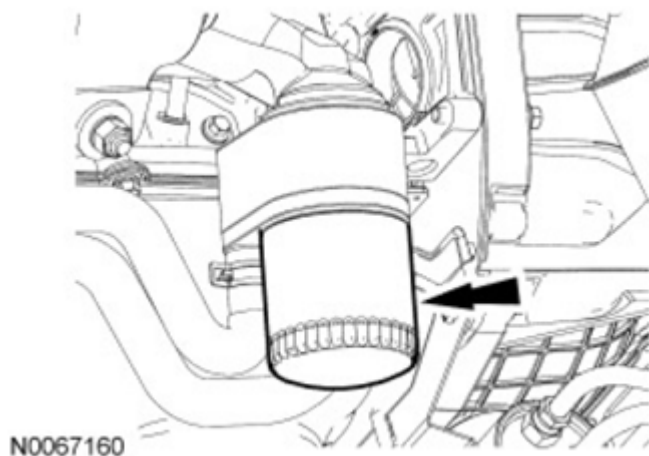


Fig. 532: Locating Engine Oil Filter
Courtesy of FORD MOTOR CO.

24. Remove the Engine Lifting Bracket.

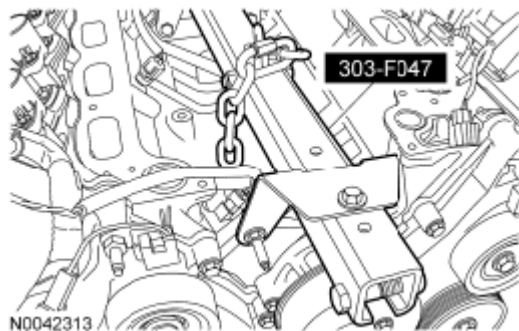


Fig. 533: Identifying Modular Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

Automatic transmission vehicles

25. Install the upper 2 transmission-to-engine bolts.
- Tighten to 48 Nm (35 lb-ft).

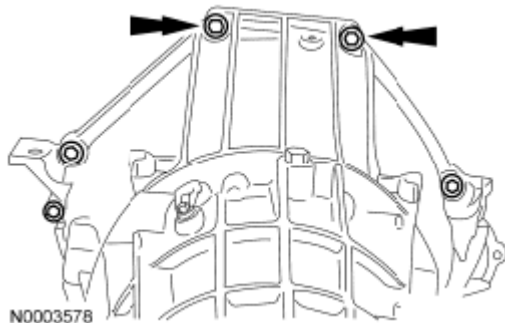


Fig. 534: Locating Upper Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

All vehicles

26. Using new O-ring seals, connect the 2 A/C compressor manifold tube assemblies to the A/C compressor and install the 2 nuts.
- Tighten to 20 Nm (177 lb-in).

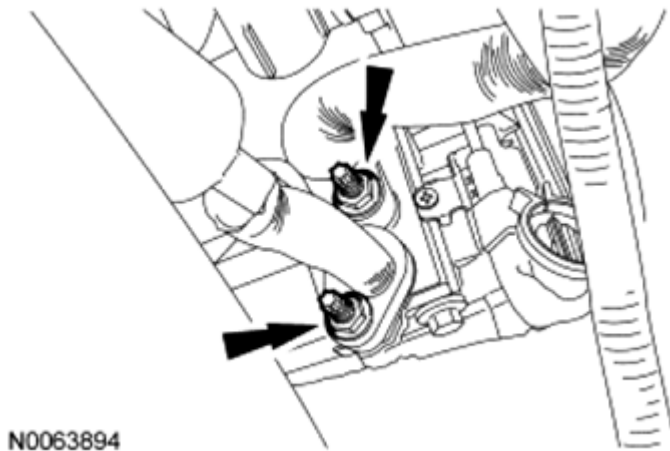


Fig. 535: Identifying Mode Door Actuator Components
Courtesy of FORD MOTOR CO.

27. Position the transmission fluid level indicator tube and install the bolt.
- Tighten to 10 Nm (89 lb-in).

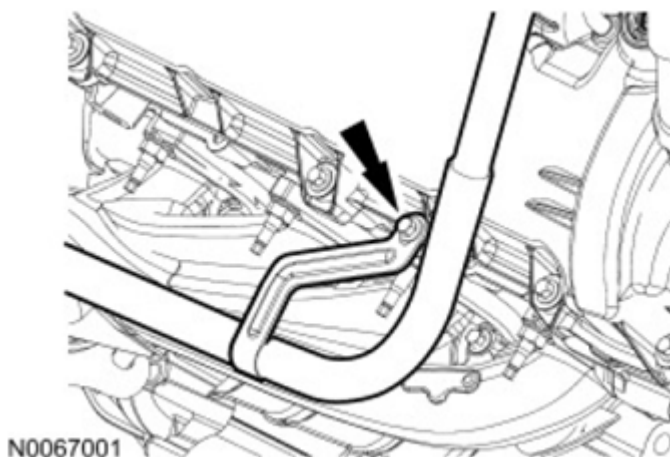


Fig. 536: Locating Transmission Fluid Level Indicator Tube And Bolt
Courtesy of FORD MOTOR CO.

28. Position the generator wiring harness and connect the A/C compressor and Crankshaft Position (CKP)

sensor electrical connectors.

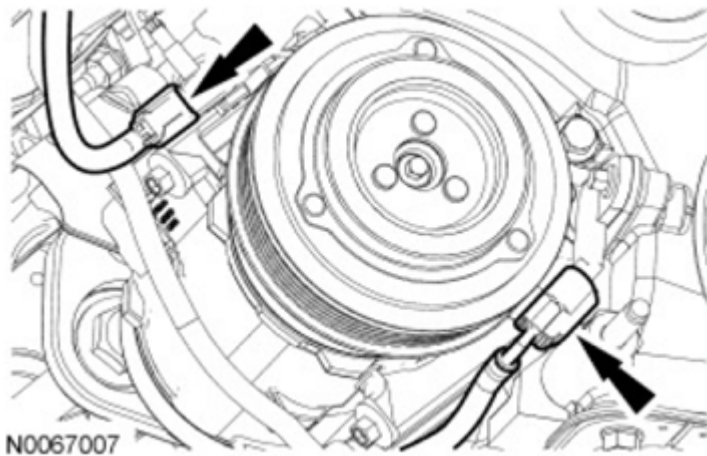


Fig. 537: Locating A/C Compressor And Crankshaft Position Sensor Electrical Connectors
Courtesy of FORD MOTOR CO.

29. Connect the generator wiring harness position retainers to the engine front cover studs.

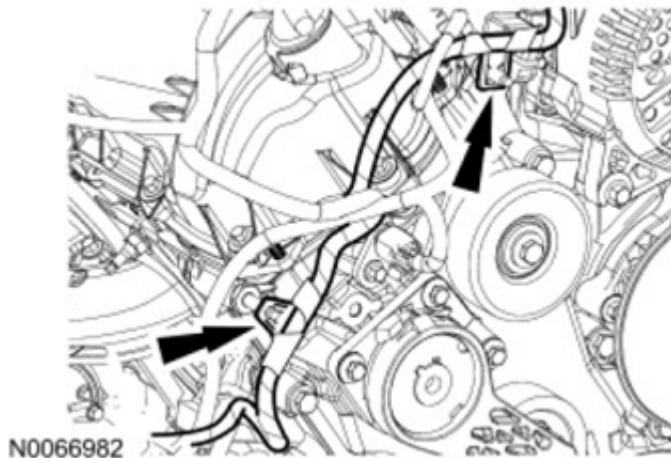


Fig. 538: Locating Generator Wiring Harness Position Retainers And Engine Front Cover Studs
Courtesy of FORD MOTOR CO.

30. Connect the engine wiring harness electrical connector located below the PCM.

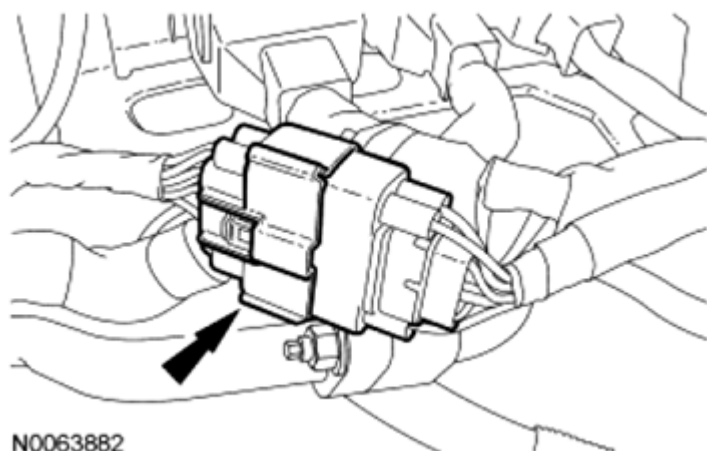


Fig. 539: Locating Upper Window Applique Pin-Type Retainer
Courtesy of FORD MOTOR CO.

31. Connect the coolant hose to the coolant tube.

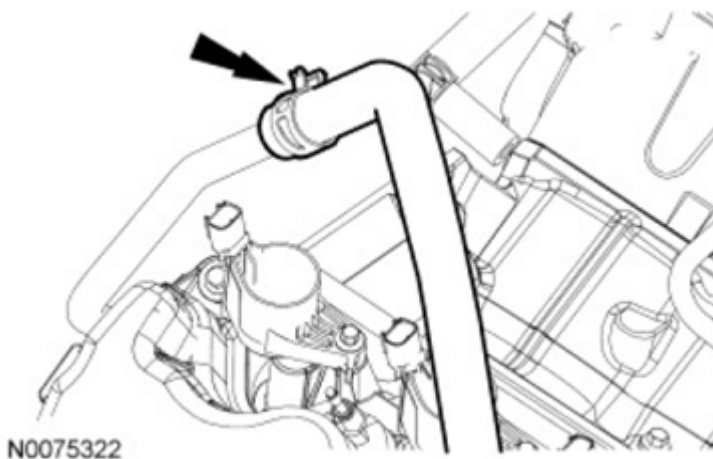


Fig. 540: Locating Coolant Hose And Coolant Tube
Courtesy of FORD MOTOR CO.

32. Connect the lower radiator hose to the oil filter adapter.

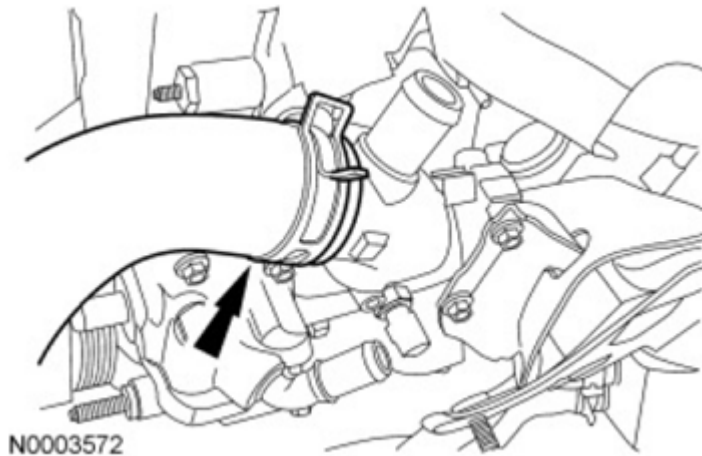


Fig. 541: Locating Lower Radiator Hose On Oil Filter Adapter
Courtesy of FORD MOTOR CO.

33. Connect the degas bottle coolant hose.

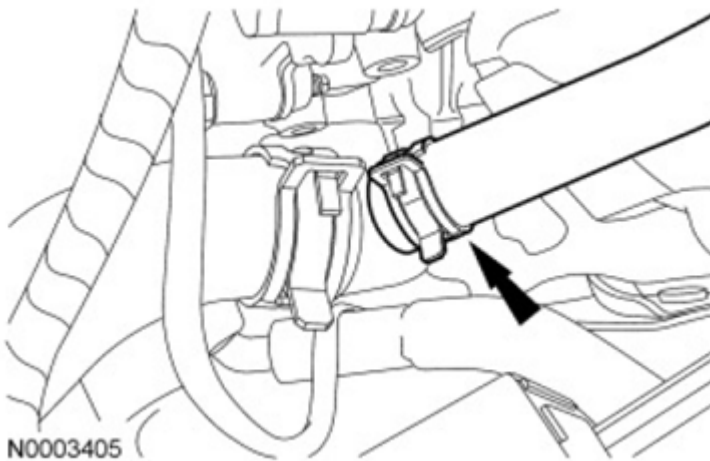


Fig. 542: Locating Degas Bottle Coolant Hose
Courtesy of FORD MOTOR CO.

34. Position the accessory drive belt onto the accessory drive pulleys.

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

35. Install the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.
36. Install the PCM. For additional information, refer to **ELECTRONIC ENGINE CONTROLS - GASOLINE ENGINES** .

2010 Ford Pickup F150

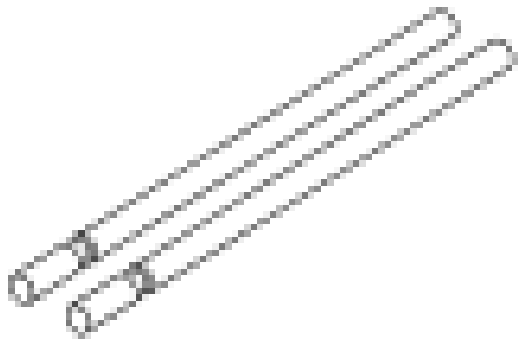
2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

37. Install the degas bottle. For additional information, refer to **ENGINE COOLING** .
38. Fill the crankcase with clean engine oil.
39. Install the engine cooling module. For additional information, refer to **ENGINE COOLING** .

CYLINDER HEAD

Special Tool(s)

SPECIAL TOOL REFERENCE



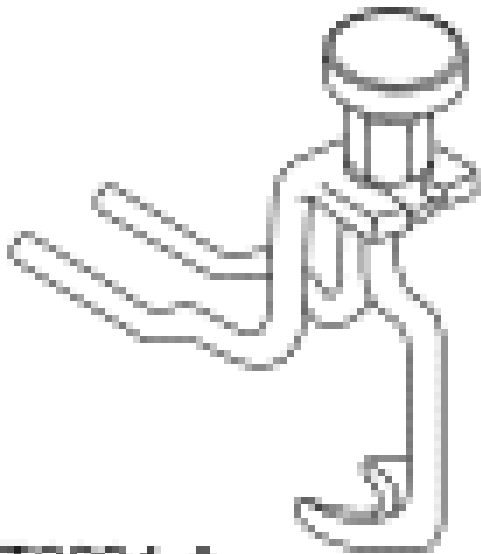
ST2B06-A

Alignment Pins, Cylinder Head
303-1040 (SR-015486)

Compressor, Valve Spring
303-1039

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2604-A



ST1377-A

Engine Lifting Bracket
303-F047 (014-00073) or equivalent

Fan Clutch Nut Wrench
303-240 (T84T-6312-D)

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST1500-A

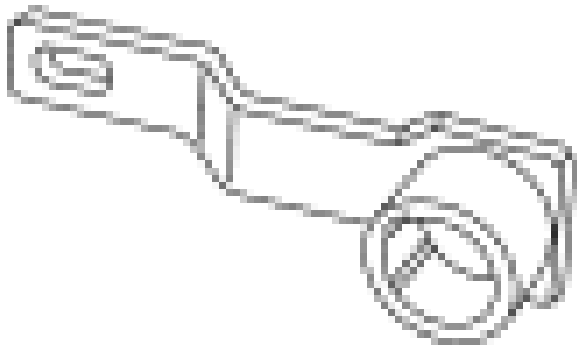


Fan Pulley Holding Wrench
303-239 (T84T-6312-C)

ST1499-A

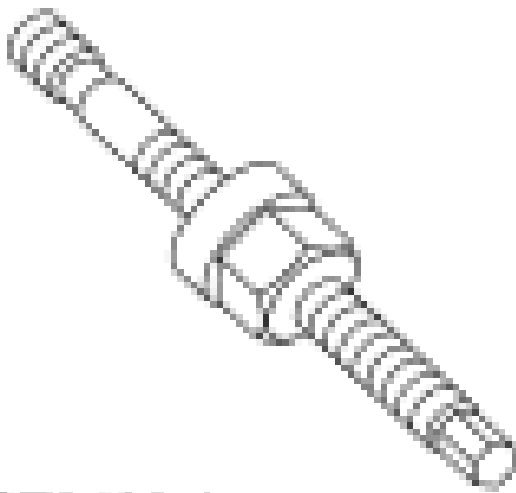
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



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

ST1335-A



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

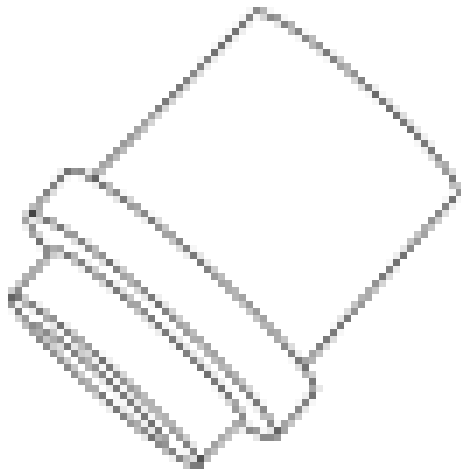
ST2428-A

Installer, Crankshaft Front Oil Seal

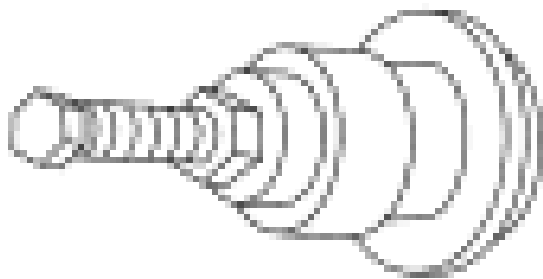
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

303-635



ST2197-A

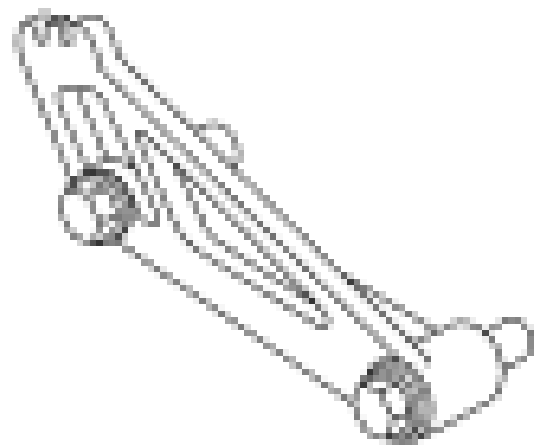


ST1328-A

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

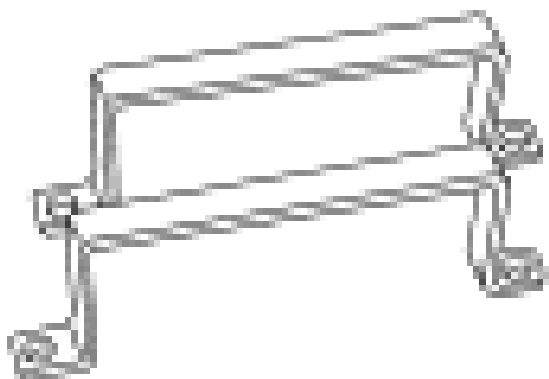
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups



ST2B07-A

Locking Tool, Cam Phaser
303-1046



ST1B68-A

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

General Equipment

GENERAL EQUIPMENT CHART

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

Material

ITEM SPECIFICATION

2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

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
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323- A4
Motorcraft® Silicone Gasket Remover ZC-30	-

All cylinder heads

- NOTE:** Make sure all coolant residue and foreign material are cleaned from the block surface and cylinder bore. Failure to follow these instructions may result in engine damage.
- NOTE:** The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry. Failure to follow these instructions may result in future oil leakage.
- NOTE:** The cylinder head bolts must be discarded and new bolts installed. They are a tighten-to-yield design and cannot be reused.
- NOTE:** Do not turn the crankshaft until instructed to do so.
- NOTE:** LH shown in illustration, RH similar.

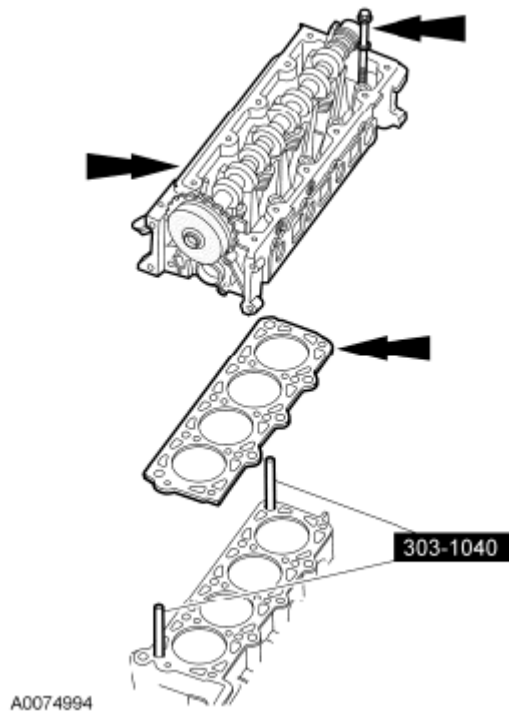


Fig. 543: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

1. Using the Cylinder Head Alignment Pins, position the cylinder head gaskets and cylinder heads over the dowels and install the 10 cylinder head bolts loosely.

NOTE: RH shown in illustration, LH similar.

2. Tighten the 10 cylinder head bolts in 3 stages, in the sequence shown in illustration.
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
 - Stage 3: Tighten an additional 90 degrees.

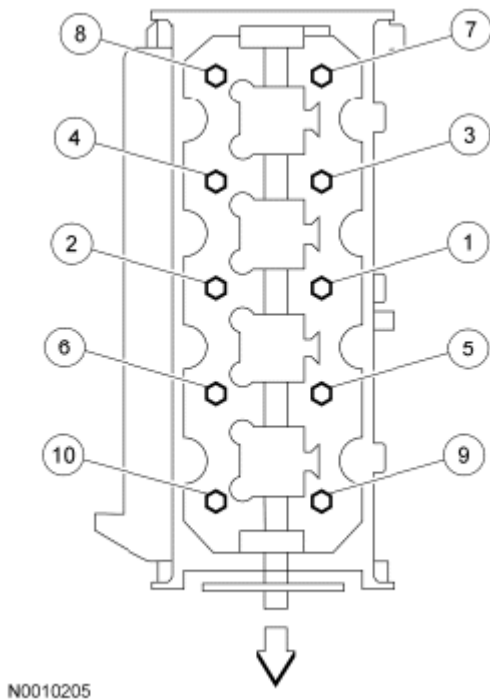


Fig. 544: Identifying Cylinder Head Bolt Tightening Sequence
Courtesy of FORD MOTOR CO.

LH cylinder head

3. Remove the Cylinder Head Remover/Installer from the LH cylinder head.

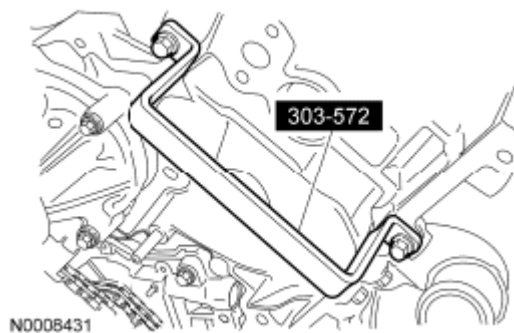
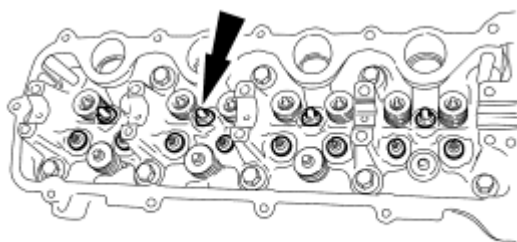


Fig. 545: Identifying Special Tool Onto Cylinder Head
Courtesy of FORD MOTOR CO.

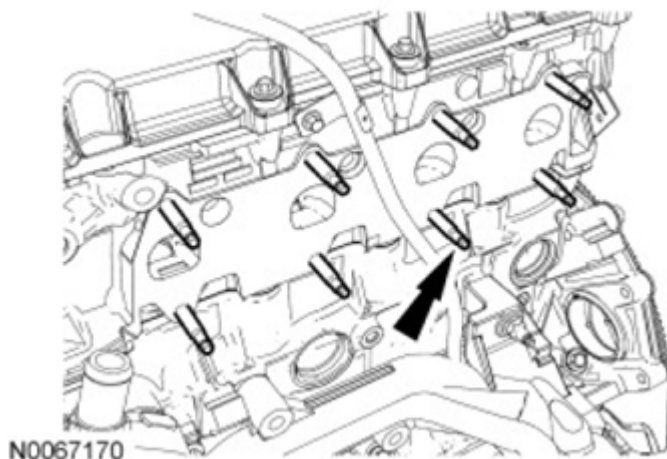
4. Install the 12 hydraulic lash adjusters into the LH cylinder head.
 - Lubricate the hydraulic lash adjusters with clean engine oil prior to installation.



A0074692

Fig. 546: Identifying Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

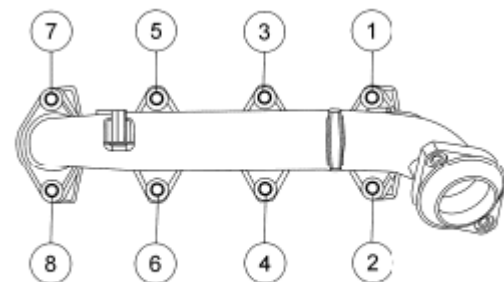
5. Install 8 new exhaust manifold studs.
 - tighten to 12 Nm (106 lb-in).



N0067170

Fig. 547: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

6. Position a new gasket and the LH exhaust manifold and tighten the 8 new nuts in the sequence shown in illustration.
 - Tighten to 25 Nm (18 lb-ft).



N0010196

Fig. 548: Identifying Bolt Loosening Sequence Of Exhaust Manifold

Courtesy of FORD MOTOR CO.

7. Position the intake manifold vacuum tube support bracket and install the bolt.
 - Tighten to 10 Nm (89 lb-in).

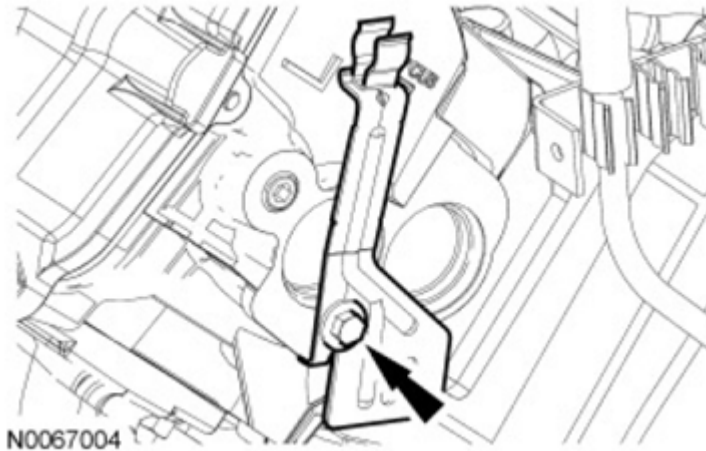


Fig. 549: Locating Intake Manifold Vacuum Tube Support Bracket And Bolt
Courtesy of FORD MOTOR CO.

RH cylinder head

8. Remove the Cylinder Head Remover/Installer from the RH cylinder head.

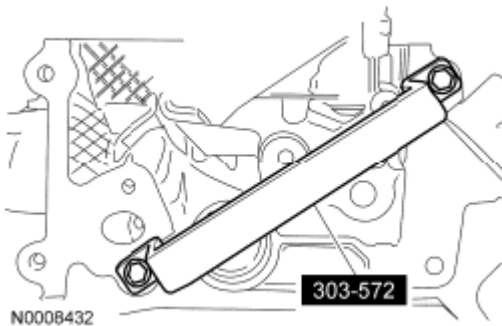
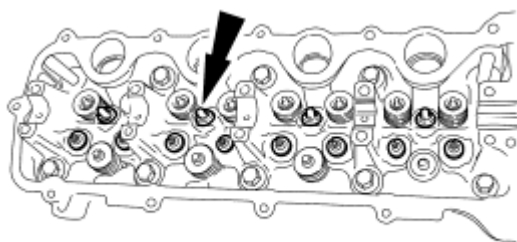


Fig. 550: Identifying Special Tool Onto Cylinder Head
Courtesy of FORD MOTOR CO.

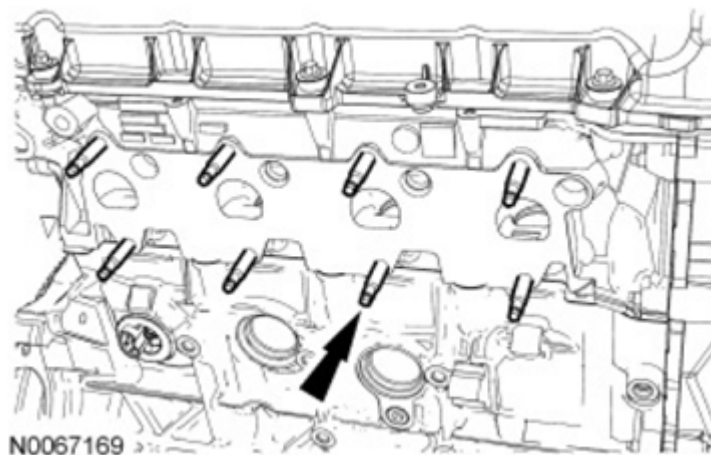
9. Install the 12 hydraulic lash adjusters into the RH cylinder head.
 - Lubricate the hydraulic lash adjusters with clean engine oil prior to installation.



A0074692

Fig. 551: Identifying Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

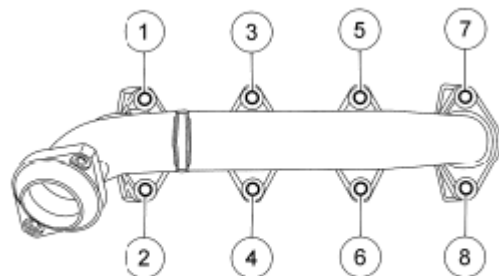
10. Install 8 new exhaust manifold studs.
 - Tighten to 12 Nm (106 lb-in).



N0067169

Fig. 552: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

11. Position a new gasket and the RH exhaust manifold and tighten the 8 new nuts in the sequence shown in illustration.
 - Tighten to 25 Nm (18 lb-ft).



N0008433

Fig. 553: Identifying Bolt Tightening Sequence Of Exhaust Manifold

Courtesy of FORD MOTOR CO.

12. Install the coolant tube and the stud bolt.
 - Tighten to 10 Nm (89 lb-in).

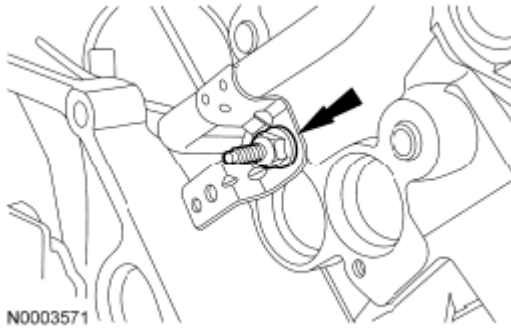


Fig. 554: Identifying Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

All cylinder heads

13. Position the crankshaft with the Crankshaft Holding Tool, then remove the tool.

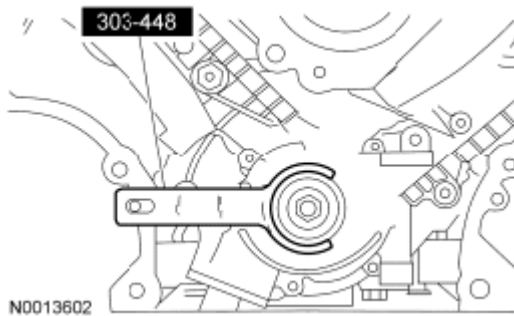


Fig. 555: Positioning Crankshaft
Courtesy of FORD MOTOR CO.

14. Install the LH and RH camshafts.
 - Lubricate the camshaft and camshaft journals with clean engine oil prior to installation.

NOTE: LH shown in illustration, RH similar.

15. Install the LH and RH camshaft bearing caps in their original locations.
 - Lubricate the camshaft bearing caps with clean engine oil.
 - Position the front camshaft bearing cap.
 - Position the remaining camshaft bearing caps.
 - Install the 20 bolts loosely.

- Tighten to 10 Nm (89 lb-in) in the sequence shown in illustration.

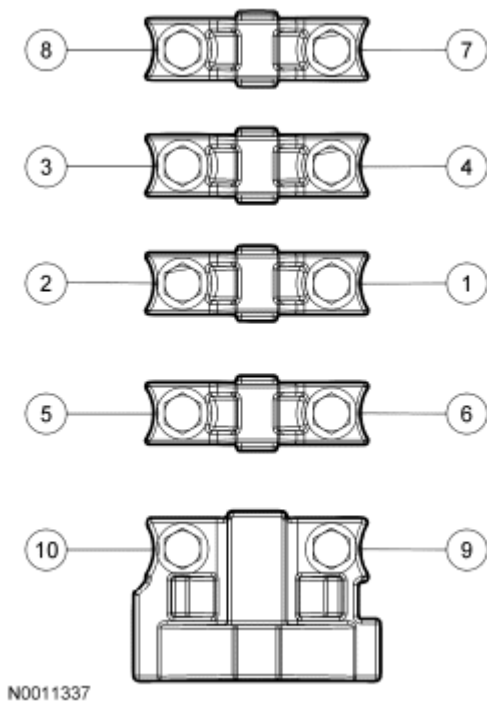


Fig. 556: Identifying Camshaft Bearing Cap Bolt Loosening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

NOTE: LH shown in illustration, RH similar.

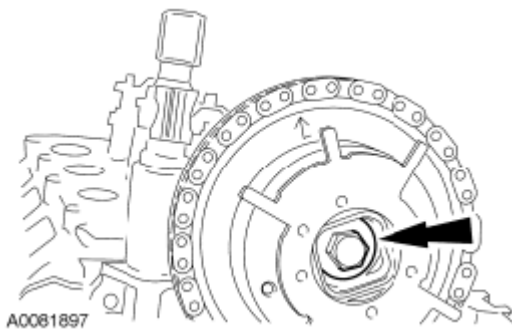


Fig. 557: Identifying Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

16. Install the camshaft phaser and sprockets and new camshaft phaser and sprocket bolts finger-tight.

NOTE: Damage to the camshaft phaser and sprocket assembly will occur if

mishandled or used as a lifting or leveraging device.

NOTE: Only use hand tools to remove the camshaft phaser and sprocket assembly or damage may occur to the camshaft or camshaft phaser and sprocket.

NOTE: LH shown in illustration, RH similar.

17. Using the Cam Phaser Locking Tool, tighten the LH and RH camshaft phaser and sprocket bolts in 2 stages.
- Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.

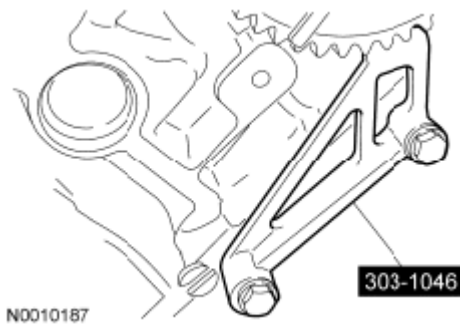


Fig. 558: Tightening LH Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

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

NOTE: Prior to installation, inspect the tensioner-sealing bead for seal integrity. If cracks, tears, separation from the tensioner body or permanent compression of the seal bead is observed, install a new tensioner or engine damage may occur.

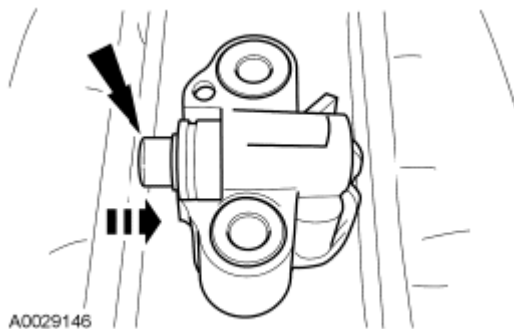


Fig. 559: Compressing Tensioner Plunger Using Vise

Courtesy of FORD MOTOR CO.

18. Compress the tensioner plunger, using a vise.
19. Install the Hydraulic Chain Tensioner Retaining Clip on the tensioner to hold the plunger in during installation.

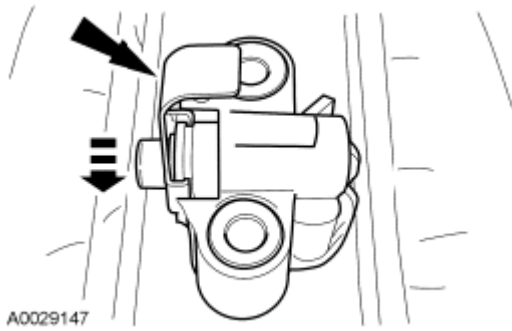


Fig. 560: Installing Retaining Clip On Tensioner
Courtesy of FORD MOTOR CO.

20. Remove the tensioner from the vise.
21. If the copper links are not visible, mark 2 links on one end and 1 link on the other end, and use as timing marks.

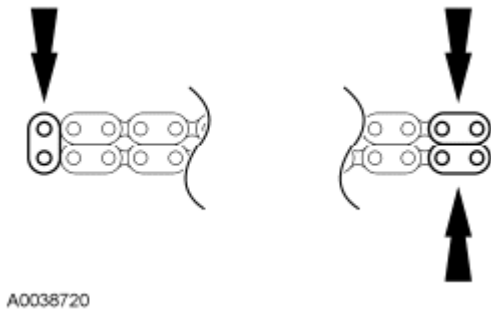


Fig. 561: Locating Copper Link Timing Marks
Courtesy of FORD MOTOR CO.

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

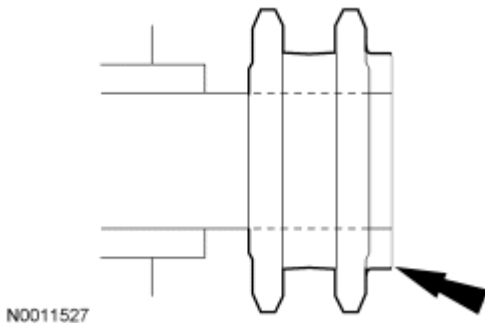
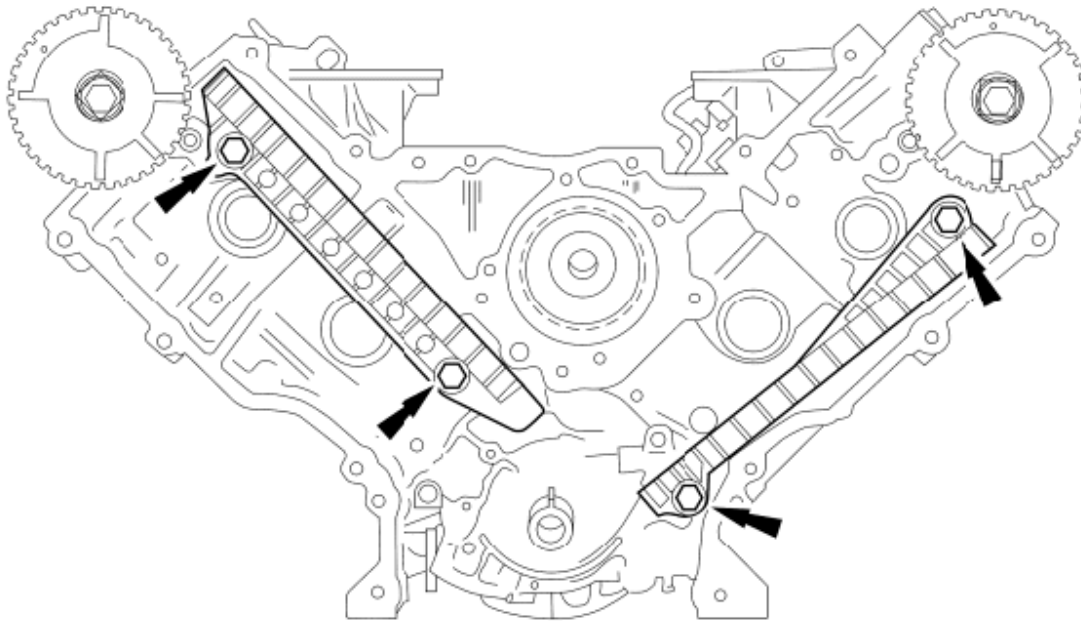


Fig. 562: Installing Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

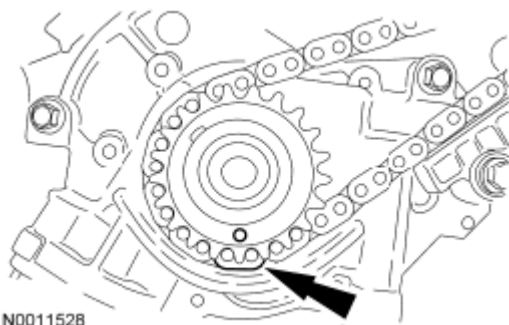
23. Position the LH and RH timing chain guides and install the 4 bolts.
- Tighten to 10 Nm (89 lb-in).



N0006303

Fig. 563: Identifying Timing Chain Guides
Courtesy of FORD MOTOR CO.

24. Position the lower end of the LH (inner) timing chain on the crankshaft sprocket, aligning the timing mark on the outer flange of the crankshaft sprocket with the single copper (marked) link on the chain.



N0011528

Fig. 564: Aligning Crankshaft Sprocket Timing Mark And Timing Chain Link
Courtesy of FORD MOTOR CO.

NOTE: Make sure the upper half of the timing chain is below the tensioner arm dowel.

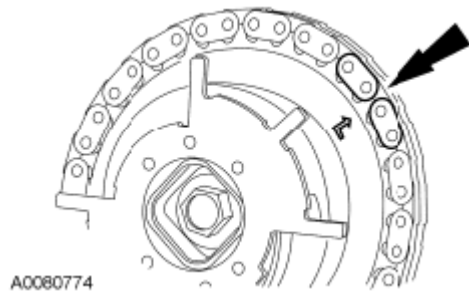


Fig. 565: Identifying Timing Mark On Timing Chain
Courtesy of FORD MOTOR CO.

25. Position the timing chain on the camshaft phaser and sprocket with the timing mark positioned between the 2 copper (marked) chain links.

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

26. Position the LH timing chain tensioner arm on the dowel pin and install the LH timing chain tensioner and 2 bolts.
 - Tighten to 25 Nm (18 lb-ft).

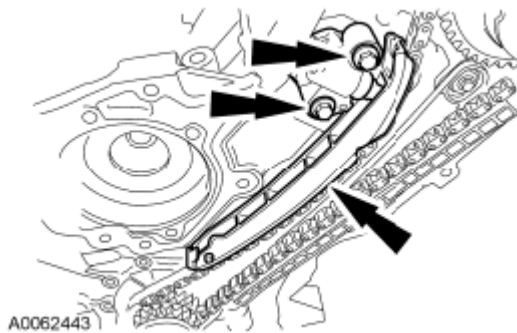


Fig. 566: Identifying LH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

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

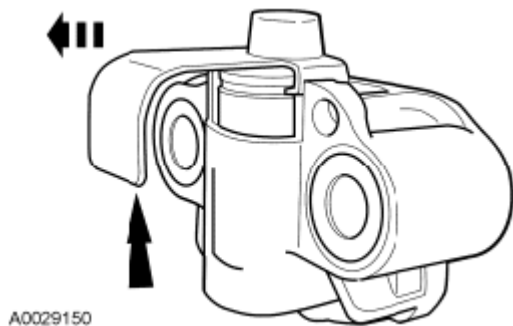


Fig. 567: Removing Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

28. Position the lower end of the RH (outer) timing chain on the crankshaft sprocket, aligning the timing mark on the sprocket with the single copper (marked) chain link.

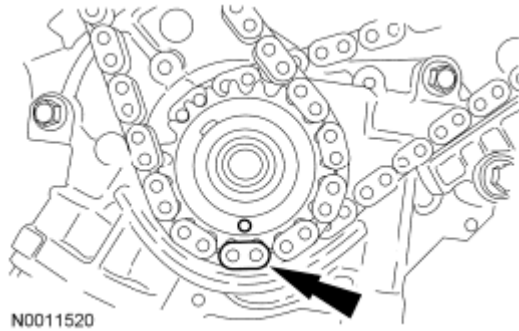


Fig. 568: Aligning (Outer) Sprocket Timing Mark And Chain Link
Courtesy of FORD MOTOR CO.

NOTE: The lower half of the timing chain must be positioned above the tensioner arm dowel.

NOTE: The camshaft phaser and sprocket will be stamped with one of the illustrated timing marks for the RH camshaft.

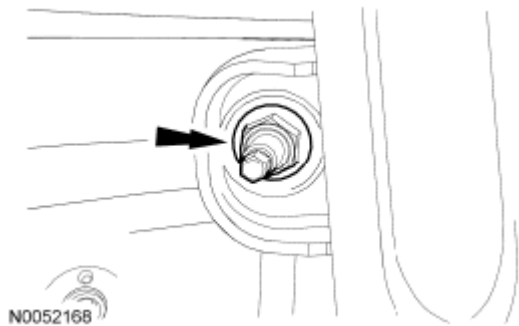


Fig. 569: Locating Upper Stabilizer Link Nut
Courtesy of FORD MOTOR CO.

29. Position the RH timing chain on the camshaft phaser and sprocket. Make sure the timing mark is positioned between the 2 copper (marked) chain links.
30. Position the RH timing chain tensioner arm on the dowel pin and install the RH timing chain tensioner and the 2 bolts.
- Tighten to 25 Nm (18 lb-ft).

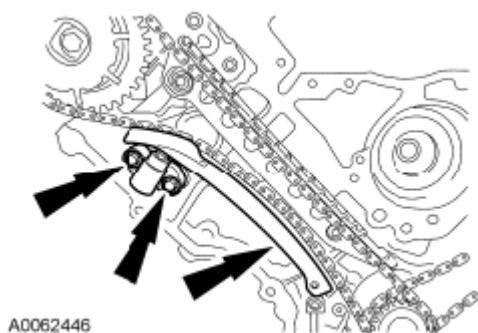


Fig. 570: Identifying RH Timing Chain Tensioner Bolts
Courtesy of FORD MOTOR CO.

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

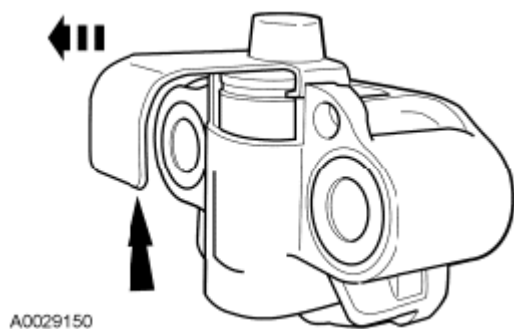


Fig. 571: Removing Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

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

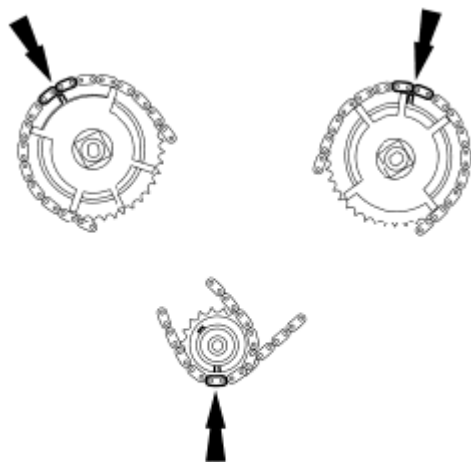


Fig. 572: Locating Timing Chain Mark Location
Courtesy of FORD MOTOR CO.

33. Install the crankshaft sensor ring on the crankshaft.

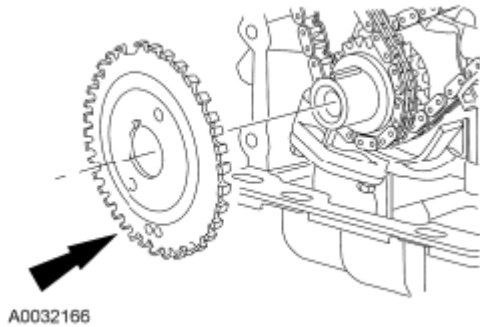


Fig. 573: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

NOTE: Do not allow the valve keepers to fall off of the valve or the valve may drop into the cylinder. If a valve drops into the cylinder, the cylinder head must be removed.

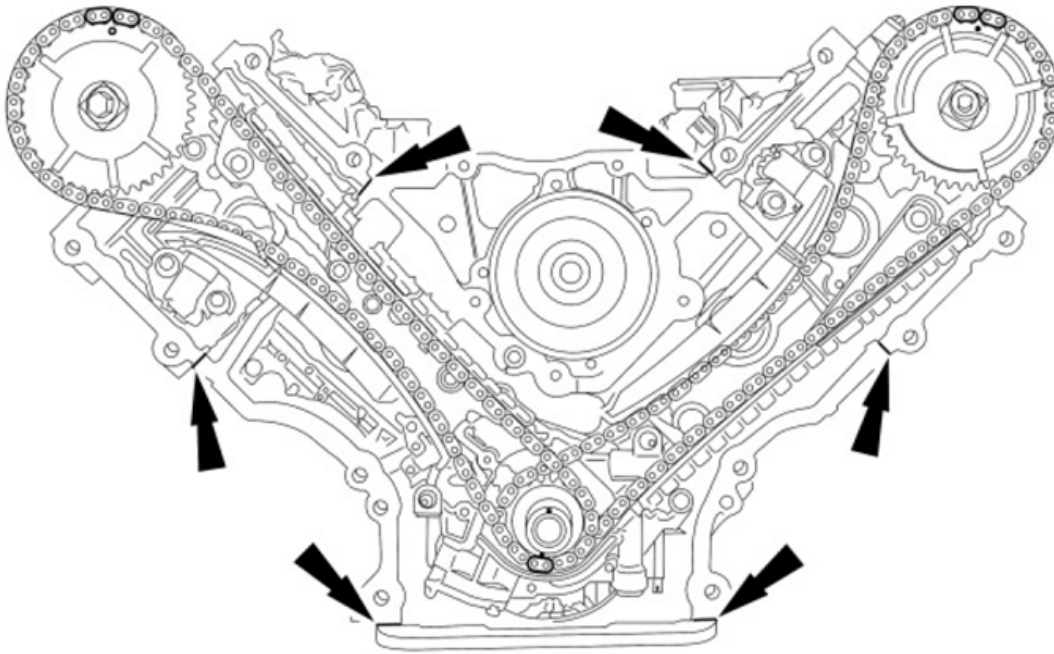
NOTE: It may be necessary to push the valve down while compressing the spring.

34. Using the Valve Spring Compressor, install all of the camshaft roller followers.
- Lubricate the camshaft roller followers with clean engine oil prior to installation.



Fig. 574: Installing Camshaft Roller Followers
Courtesy of FORD MOTOR CO.

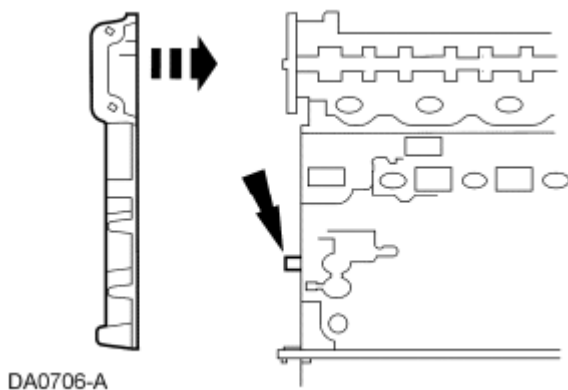
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.
- NOTE:** If the engine front cover is not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.
- NOTE:** Make sure that the engine front cover gasket is in place on the engine front cover before installation.



A0080776

Fig. 575: Applying Bead Of Cylinder Head-To-Cylinder Block Surface
Courtesy of FORD MOTOR CO.

35. Apply a bead of silicone gasket and sealant along the cylinder head-to-cylinder block surface and the oil pan-to-cylinder block surface, at the locations shown in illustration.
36. Install a new engine front cover gasket on the engine front cover. Position the engine front cover onto the dowels. Install the fasteners finger-tight.



DA0706-A

Fig. 576: Installing Engine Front Cover Gasket On Engine Front Cover
Courtesy of FORD MOTOR CO.

37. Tighten the 15 engine front cover fasteners in sequence in 2 stages.

Stage 1: Tighten fasteners 1 through 15 to 25 Nm (18 lb-ft).

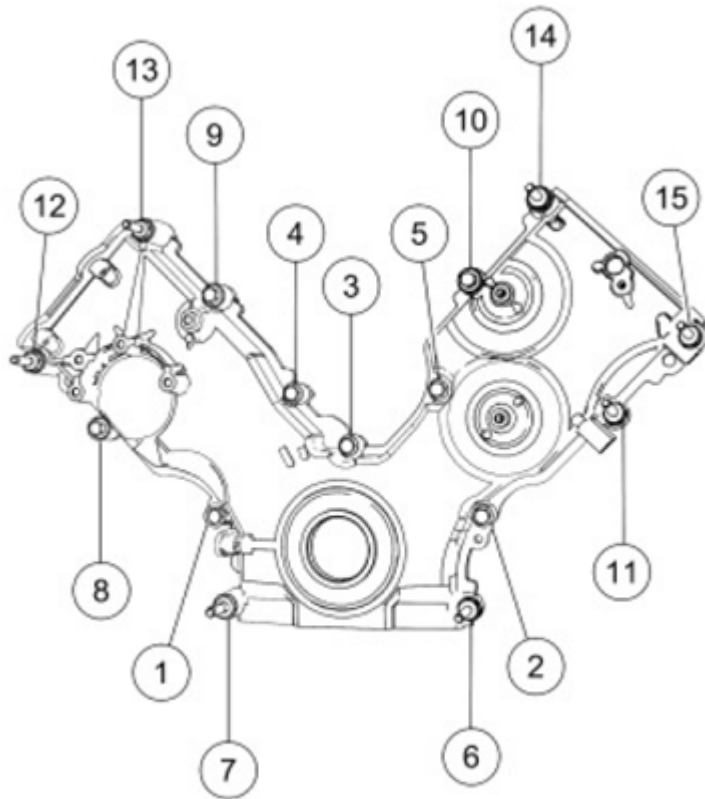
2010 Ford Pickup F150

2010 ENGINE Engine - 5.4L (3V) - F250-F550 Super Duty Pickups

Stage 2: Tighten fasteners 6 and 7 to 48 Nm (35 lb-ft).

ITEM DESCRIPTION

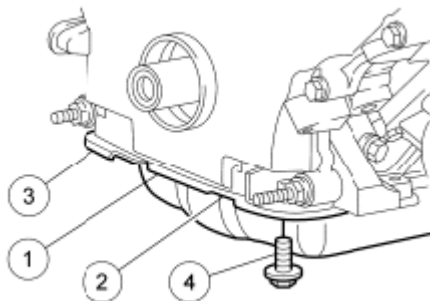
Item	Part Number	Description
1	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
2	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
3	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
4	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
5	N806177	Bolts, Hex Flange Head Pilot, M8 x 1.25 x 50
6	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
7	N808529	Stud, Hex Head Pilot, M10 x 1.5 x 1.5 x 103
8	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
9	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
10	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
11	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
12	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
13	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
14	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
15	W709573	Stud, Hex Head Pilot, M8 x 1.25 x 1.25 x 94



N0088959

Fig. 577: Identifying Engine Front Cover Fasteners Tighten Sequence
Courtesy of FORD MOTOR CO.

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



N0008507

Fig. 578: Identifying Front Oil Pan/Cover Bolts Tighten Sequence
Courtesy of FORD MOTOR CO.

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other

abrasive means to clean sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

39. Clean the valve cover mating surface with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

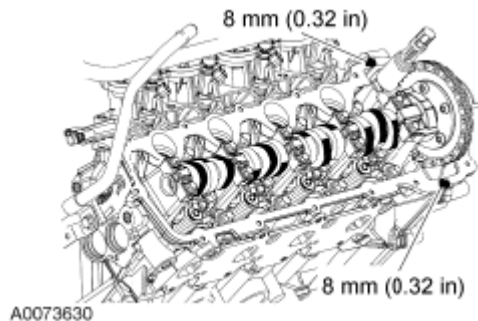


Fig. 579: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

40. Apply silicone gasket and sealant in 2 places where the engine front cover meets the cylinder head.

NOTE: When installing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.

41. Position the RH valve cover and gasket on the cylinder head and tighten the 9 fasteners in the sequence shown in illustration.
- Tighten to 10 Nm (89 lb-in).

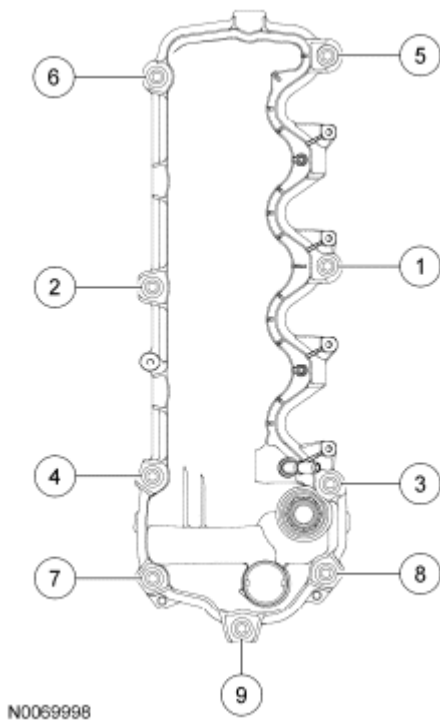


Fig. 580: Identifying Cylinder Head Bolt Tighten Sequence
Courtesy of FORD MOTOR CO.

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

42. Clean the valve cover mating surface with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.

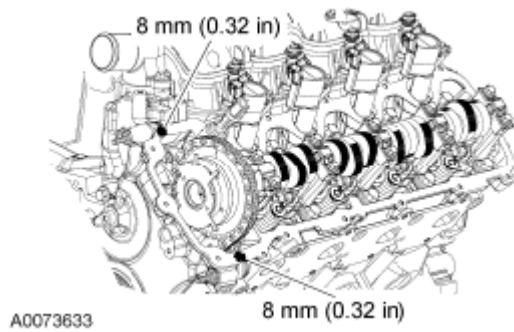


Fig. 581: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

43. Apply silicone gasket and sealant in 2 places where the engine front cover meets the cylinder head.

NOTE: When installing the valve cover, make sure to avoid damaging the Variable Camshaft Timing (VCT) solenoid.

44. Position the LH valve cover and gasket on the cylinder head and tighten the 10 fasteners in the sequence shown in illustration.
- Tighten to 10 Nm (89 lb-in).

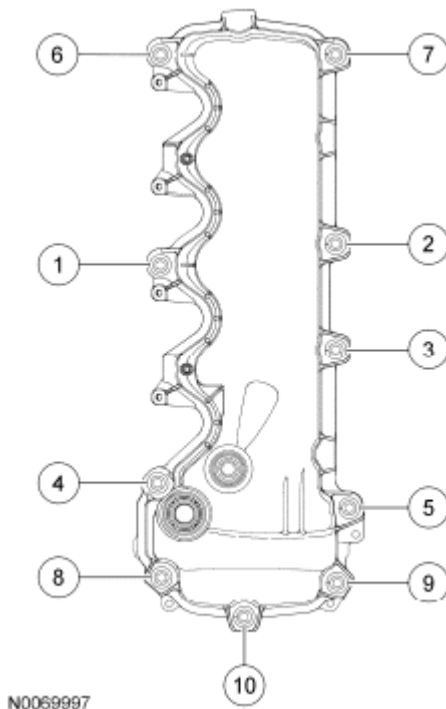
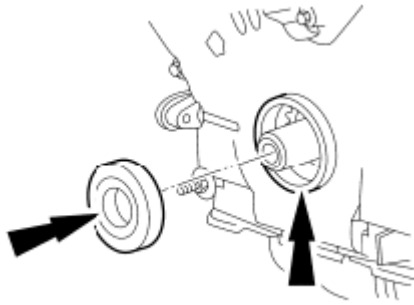


Fig. 582: Identifying Cylinder Head Bolt Tighten Sequence
Courtesy of FORD MOTOR CO.

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



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Fig. 583: Lubricating Engine Front Cover And Crankshaft Seal Inner Lip With Clean Engine Oil
Courtesy of FORD MOTOR CO.

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

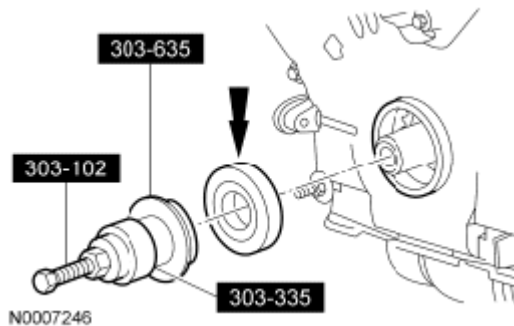
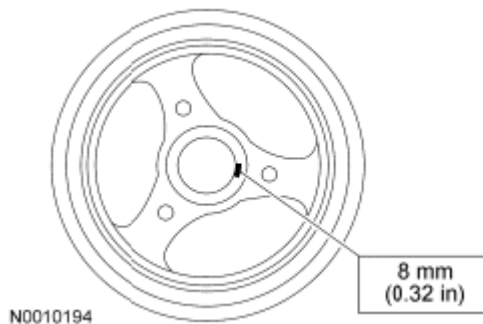


Fig. 584: Installing Crankshaft Front Seal Into Engine Front Cover Using Special Tools
Courtesy of FORD MOTOR CO.

NOTE: If not secured within 4 minutes, the sealant must be removed and the sealing area cleaned. To clean the sealing area, use silicone gasket remover and metal surface prep. Follow the directions on the packaging. Allow to dry until there is no sign of wetness, or 4 minutes, whichever is longer. Failure to follow this procedure may cause future oil leakage.



N0010194

Fig. 585: Identifying Woodruff Key Slot On Crankshaft Pulley
Courtesy of FORD MOTOR CO.

47. Apply silicone gasket and sealant to the Woodruff key slot on the crankshaft pulley.
48. Using the Crankshaft Vibration Damper Installer, install the crankshaft pulley.

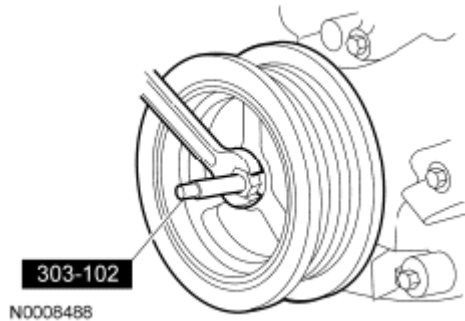


Fig. 586: Installing Crankshaft Pulley Using Special Tool
Courtesy of FORD MOTOR CO.

49. Tighten the new crankshaft pulley bolt in 4 stages.
 - Stage 1: Tighten to 90 Nm (66 lb-ft).
 - Stage 2: Loosen 360 degrees.
 - Stage 3: Tighten to 50 Nm (37 lb-ft).
 - Stage 4: Tighten an additional 90 degrees.

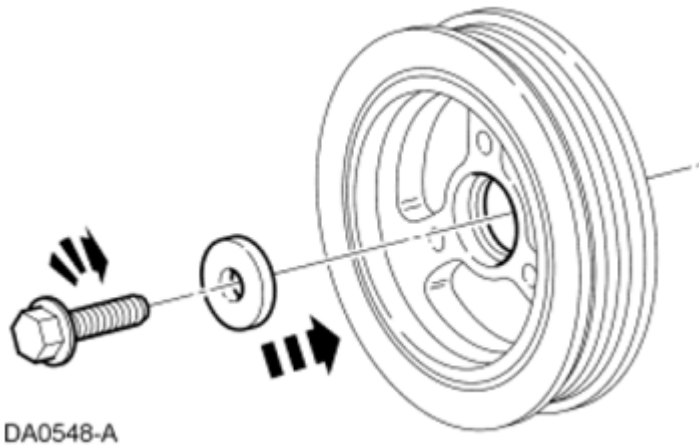


Fig. 587: Installing Crankshaft Pulley Bolt And Washer
Courtesy of FORD MOTOR CO.

50. Install the accessory drive belt idler pulley, the coolant pump pulley and the 5 bolts.
 - Tighten to 25 Nm (18 lb-ft).

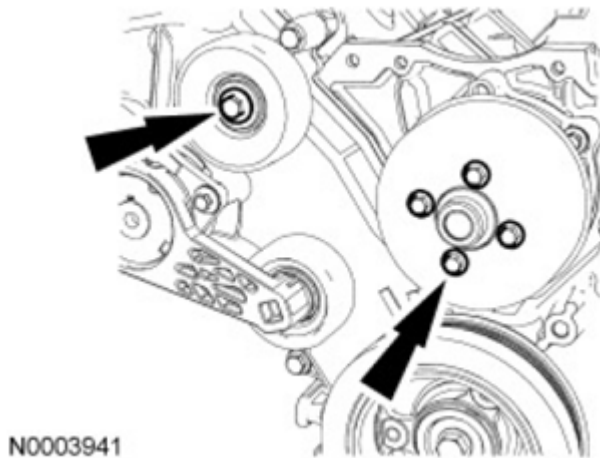


Fig. 588: Locating Coolant Pump Pulley And Idler Pulley Bolts
Courtesy of FORD MOTOR CO.

51. Position the oil level indicator and tube and install the bolt.
- Install a new O-ring seal and lubricate with clean engine oil prior to installation.
 - Tighten to 10 Nm (89 lb-in).

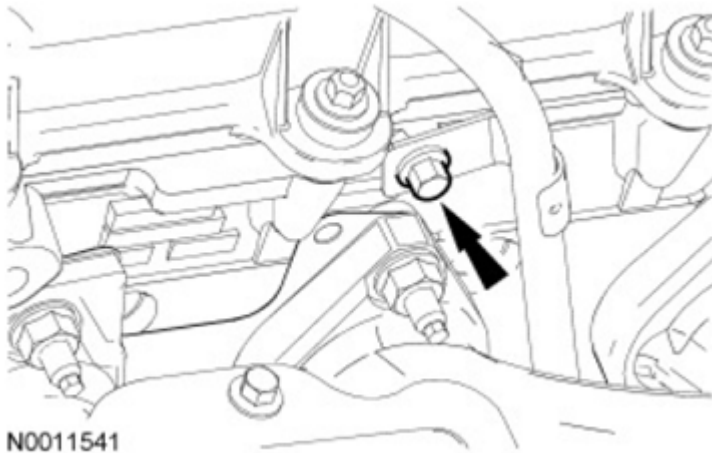


Fig. 589: Locating Rear Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

52. Install the oil level indicator and tube front bolt.
- Tighten to 25 Nm (18 lb-ft).

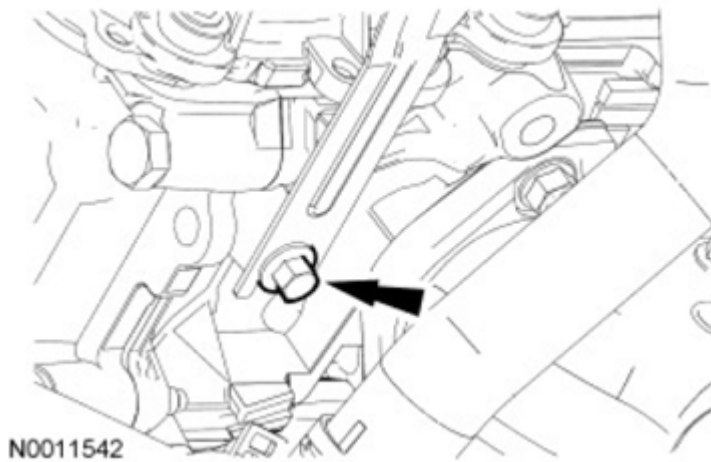


Fig. 590: Locating Front Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

NOTE: Verify that the ignition coil spring is correctly located inside the ignition coil boot and that there is no damage to the tip of the boot.

NOTE: LH shown in illustration, RH similar.

53. Install the 8 ignition coils and the 8 bolts.

- Apply a light coat of dielectric compound to the inside of the ignition coil boots prior to installation.
- Tighten to 6 Nm (53 lb-in).



Fig. 591: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

54. Position the electrical harness on the engine assembly.

55. Connect the Engine Oil Pressure (EOP) switch electrical connector.

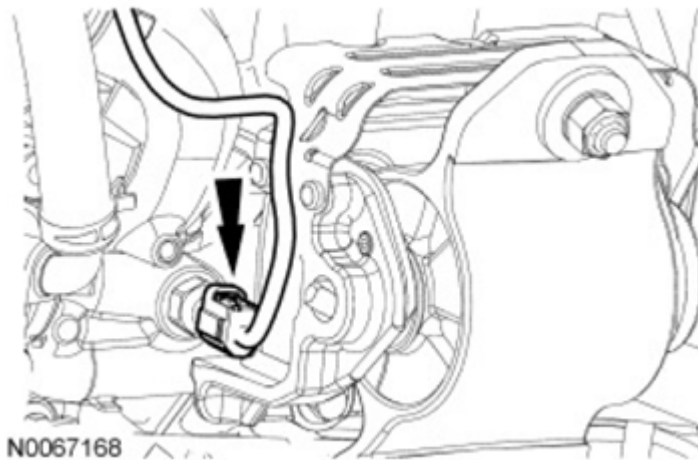


Fig. 592: Locating Engine Oil Pressure Switch Electrical Connector
Courtesy of FORD MOTOR CO.

56. Connect the engine wiring harness position retainers to the front of the RH valve cover.

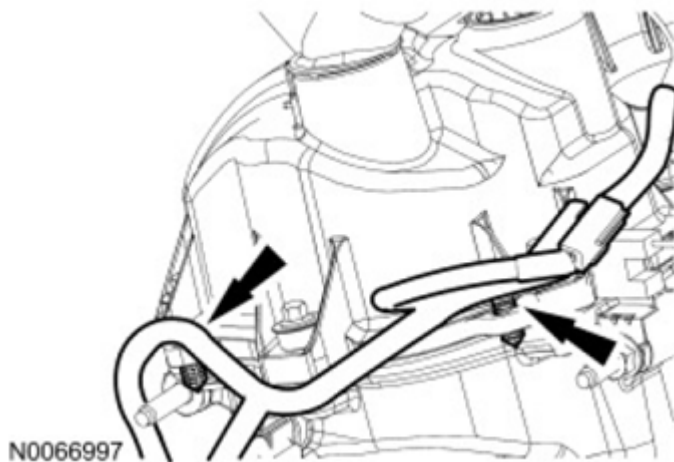


Fig. 593: Locating RH Valve Cover
Courtesy of FORD MOTOR CO.

57. Connect the engine wiring harness position retainers to the front of the LH valve cover and the LH CMP sensor electrical connector.

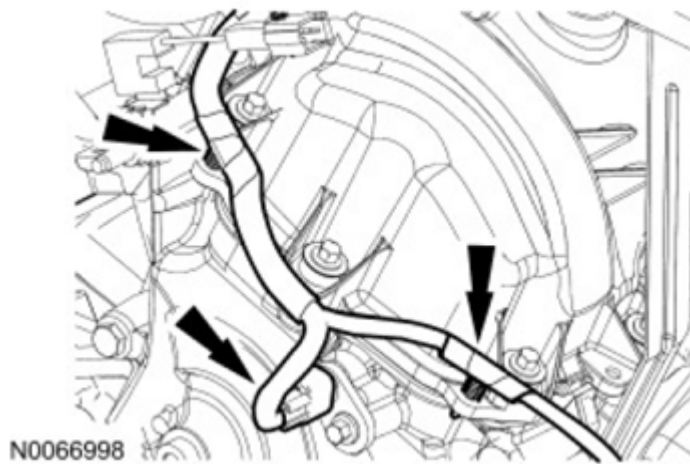


Fig. 594: Locating Engine Wiring Harness Position Retainers
Courtesy of FORD MOTOR CO.

58. Install the LH radio ignition interference capacitor and the nut.
- Tighten to 25 Nm (18 lb-ft).

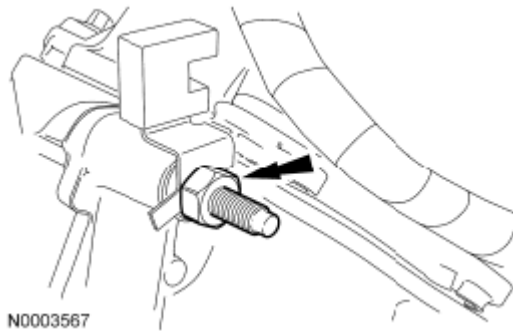


Fig. 595: Locating Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

59. Connect the Cylinder Head Temperature (CHT) sensor electrical connector.

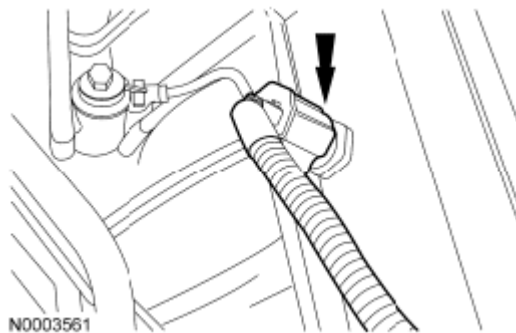
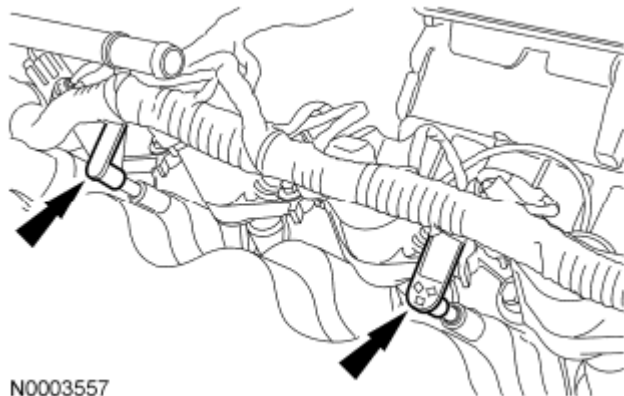


Fig. 596: Locating Cylinder Head Temperature (CHT) Sensor Electrical Connector

Courtesy of FORD MOTOR CO.

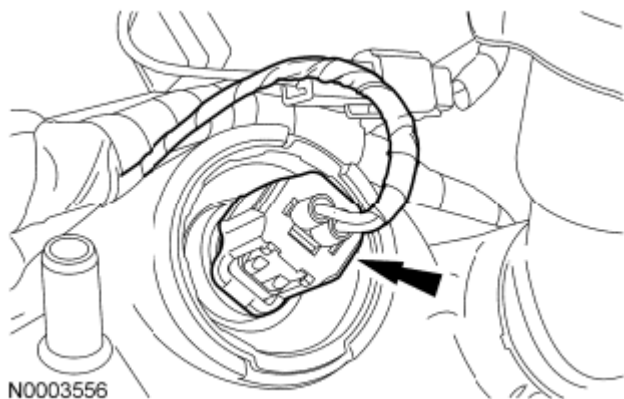
60. Connect the 2 engine wiring harness retainers from the RH valve cover studs.



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Fig. 597: Locating Engine Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

61. Connect the RH VCT solenoid electrical connector.



N0003556

Fig. 598: Locating VCT Solenoid Electrical Connector
Courtesy of FORD MOTOR CO.

62. Install the RH radio ignition interference capacitor and the nut.
- Tighten to 25 Nm (18 lb-ft).

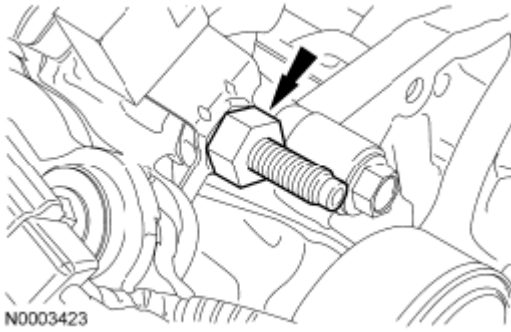


Fig. 599: Locating Radio Ignition Interference Capacitor And Stud Bolt
Courtesy of FORD MOTOR CO.

63. Connect the RH CMP sensor electrical connector.

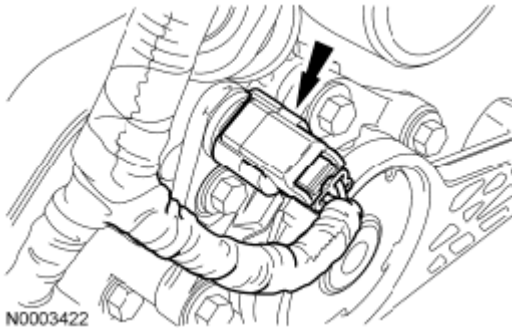


Fig. 600: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

- NOTE:** The engine support insulator bracket bolts must be discarded and new bolts installed or damage to the vehicle may occur. They are a tighten-to-yield design and cannot be reused.
- NOTE:** Clean the engine support insulator bracket mounting surfaces of any dirt or foreign material prior to installation. Failure to follow these instructions may result in engine support insulator damage.
- NOTE:** The engine support insulator bracket bolts must not be tightened more than 90 degrees after initial torque.
- NOTE:** Place a visible mark on the engine support insulator bracket and the bracket bolts. Turning the bolt 1 flat of the bolt head is equal to 60 degrees.

64. If equipped with cylinder block drain plugs, position the RH engine support insulator bracket, position the engine support insulator bracket and install 3 new bolts in 2 stages.

- Stage 1: Tighten to 30 Nm (22 lb-ft).
- Stage 2: Tighten an additional minimum of 60 degrees.

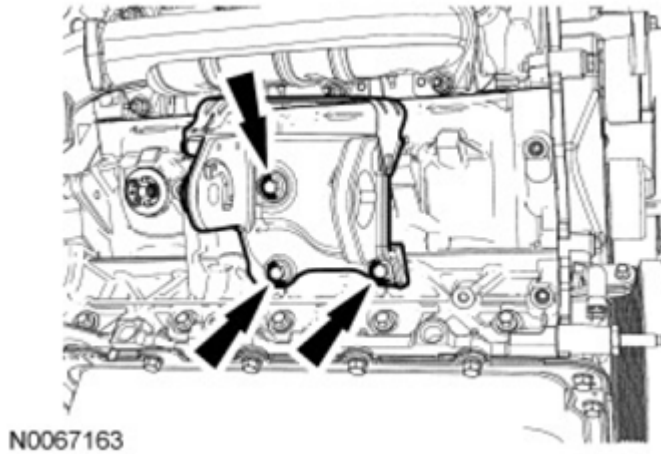


Fig. 601: Locating RH Engine Support Insulator Bracket Bolts
Courtesy of FORD MOTOR CO.

NOTE: Do not side load the cooling fan clutch coil or the cooling fan clutch coil may be damaged.

NOTE: The large clutch assembly nut has a RH thread and must be rotated clockwise to remove it.

65. Using the Fan Pulley Holding Wrench and the Fan Clutch Nut Wrench, install the engine cooling fan onto the cooling pump pulley.
- Tighten to 55 Nm (41 lb-ft).

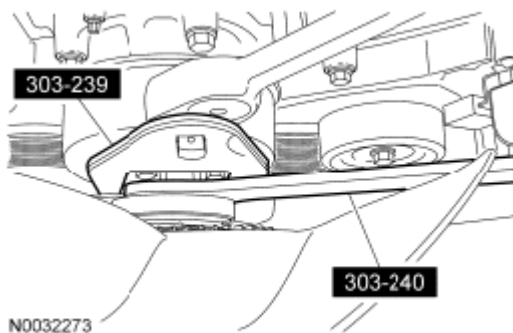


Fig. 602: Removing Cooling Fan And Clutch Assembly
Courtesy of FORD MOTOR CO.

66. Install the Engine Lifting Bracket.

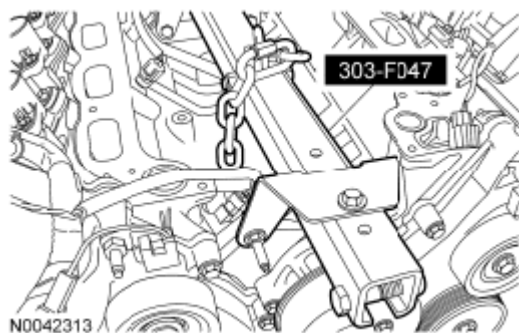


Fig. 603: Installing Engine Lifting Bracket
Courtesy of FORD MOTOR CO.

67. Using a suitable floor crane, remove the engine from the engine stand.
68. Install the flexplate or flywheel and the 8 bolts in the sequence shown in illustration.
 - Tighten to 80 Nm (59 lb-ft).

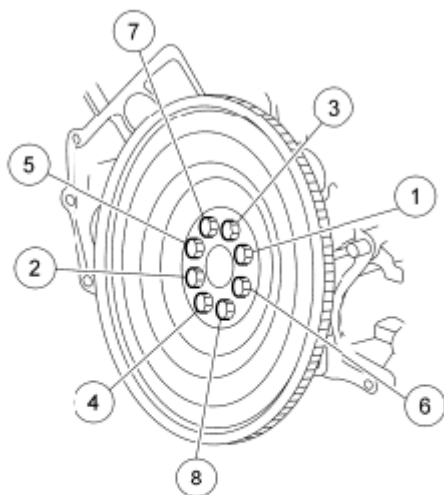


Fig. 604: Identifying Flexplate Bolt Tighten Sequence
Courtesy of FORD MOTOR CO.

69. Install the engine. For additional information, refer to **ENGINE**.