

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

2010 ENGINE

Engine - 5.4L (3V) - Expedition & Navigator

SPECIFICATIONS

MATERIAL SPECIFICATION

MATERIAL SPECIFICATION

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® Premium Gold Engine Coolant with Bittering Agent (US); Motorcraft® Premium Gold Engine Coolant (Canada) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	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	-
Silicone Gasket Remover ZC-30	-	-
Threadlock 262 TA-26	WSK-M2G351-A6	-

GENERAL SPECIFICATIONS

GENERAL SPECIFICATIONS

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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

Engine weight (without accessory drive components and with flexplate)	247 kg (545 lb)
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	-

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

Hydraulic leakdown rate	5-25 seconds ⁽¹⁾
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	

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

Piston diameter - grade 1 (at right 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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

centerline.

TORQUE SPECIFICATIONS

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Description	Nm	lb-ft	lb-in
A/C compressor bolts	25	18	-
Accessory drive belt tensioner bolt	25	18	-
Air intake resonator assembly bolt	10	-	89
Air Cleaner (ACL) outlet pipe-to-Throttle Body (TB) adapter bolt	10	-	89
Axle carrier mounting bushing bolts	115	85	-
Camshaft bearing cap bolts ⁽¹⁾	-	-	-
Camshaft phaser and sprocket bolts ⁽¹⁾	-	-	-
Camshaft Position (CMP) sensor bolt	10	-	89
Coolant crossover manifold assembly bolts	10	-	89
Coolant pump bolts	25	18	-
Coolant pump pulley bolts	25	18	-
Coolant tube stud bolt	10	-	89
Connecting rod bolts ⁽¹⁾	-	-	-
Crankshaft 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 head bolts ⁽¹⁾	-	-	-
Cylinder Head Temperature (CHT) sensor	10	-	89
Drive belt idler pulley bolt	25	18	-
Engine front cover bolts ⁽¹⁾	-	-	-
Engine Oil Pressure (EOP) switch	18	-	159
Engine support insulator-to-cylinder block bolts	63	46	-
Engine support insulator through bolt	350	258	-
Engine support insulator-to-frame bolts	175	129	-
Engine support insulator-to-frame nuts	175	129	-
Engine support insulator-to-frame stud bolt	15	-	133
Evaporative Emission (EVAP) purge valve support bracket bolt	10	-	89
Exhaust manifold heat shield bolts	10	-	89
Exhaust manifold nuts ⁽¹⁾	-	-	-
Exhaust manifold studs	12	-	106

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

Exhaust manifold-to-Y-pipe nuts	40	30	-
Flexplate bolts ⁽¹⁾	-	-	-
Flexplate inspection cover bolts	34	25	-
Front frame crossmember bolts	90	66	-
Fuel rail bolts	10	-	89
Ground strap bolt	10	-	89
Hood bolts	12	-	106
Ignition coil	6	-	53
Intake manifold-to-cylinder head bolts ⁽¹⁾	-	-	-
Intake manifold vacuum tube support bracket nut	10	-	89
Knock Sensor (KS) bolts	20	-	177
Oil filter	15	-	133
Oil filter adapter bolts	25	18	-
Oil level indicator tube bolt	10	-	89
Oil pan bolts ⁽¹⁾	-	-	-
Oil drain plug	23	17	-
Oil pump bolts	10	-	89
Oil pump screen and pickup tube bolts	10	-	89
Oil pump screen and pickup tube spacer	25	18	-
Oil pump screen and pickup tube support bracket bolt	25	18	-
PCV fitting bolts	6	-	53
Power steering fluid return tube bolt	23	17	-
Power Steering Pressure (PSP) hose support bracket nut	10	-	89
Power steering pump bolts	25	18	-
Radio ignition interference capacitor nut	25	18	-
Rear seal retainer plate bolts ⁽¹⁾	-	-	-
Skid plate bolts	48	35	-
Spark plug	12	-	106
Starter wiring harness rear support bracket bolt	10	-	89
Steering shaft bolt	30	22	-
Thermostat housing bolts	10	-	89
Timing chain guide bolts	10	-	89
Timing chain hydraulic tensioner bolts	25	18	-
Torque converter-to-flexplate nuts	36	27	-
Transmission fluid cooler tube support bracket nut	10	-	89
Transmission fluid cooler tube rear support bracket bolt	48	35	-
Transmission mount-to-crossmember nuts	103	76	-
Transmission-to-engine bolts	48	35	-
Throttle Body (TB) bolts ⁽¹⁾	-	-	-
Valve cover bolts ⁽¹⁾	-	-	-

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

Variable Camshaft Timing (VCT) housing bolts	10	-	89
Wiring harness ground strap	10	-	89
(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:

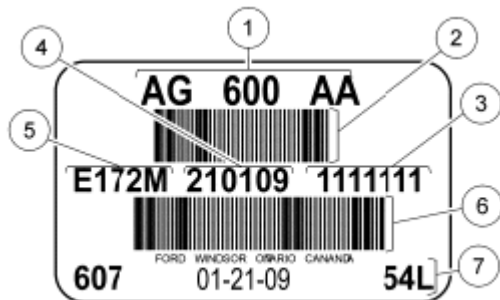
- Single overhead camshafts
- Three valves per cylinder
- Sequential Multi-Port Fuel Injection (SFI)
- Aluminum cylinder heads
- Cast iron, 90-degree V-cylinder block
- Variable Camshaft Timing (VCT)
- Individually chain-driven camshafts with a hydraulic timing chain tensioner on each timing chain
- 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 Master Parts Catalog 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:



N0102856

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

Fig. 1: Identifying Engine Code Information Label

Courtesy of FORD MOTOR CO.

ITEM DESCRIPTION CHART

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

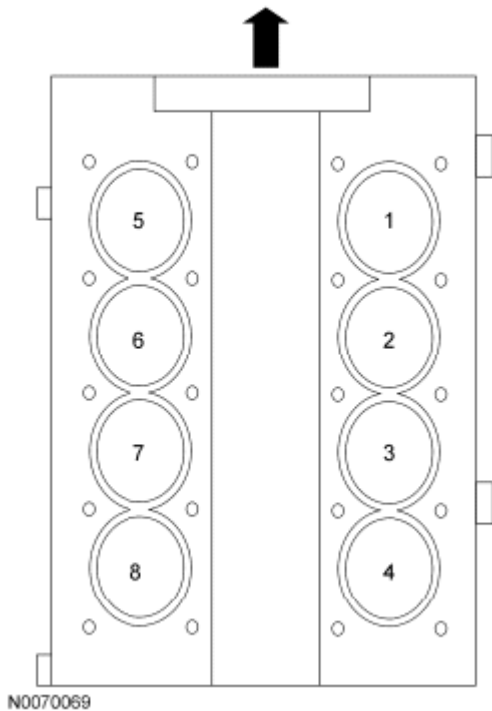


Fig. 2: Identifying Engine Cylinder Identification

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.

PCV System

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

Lubrication System

The engine lubrication system operates as follows:

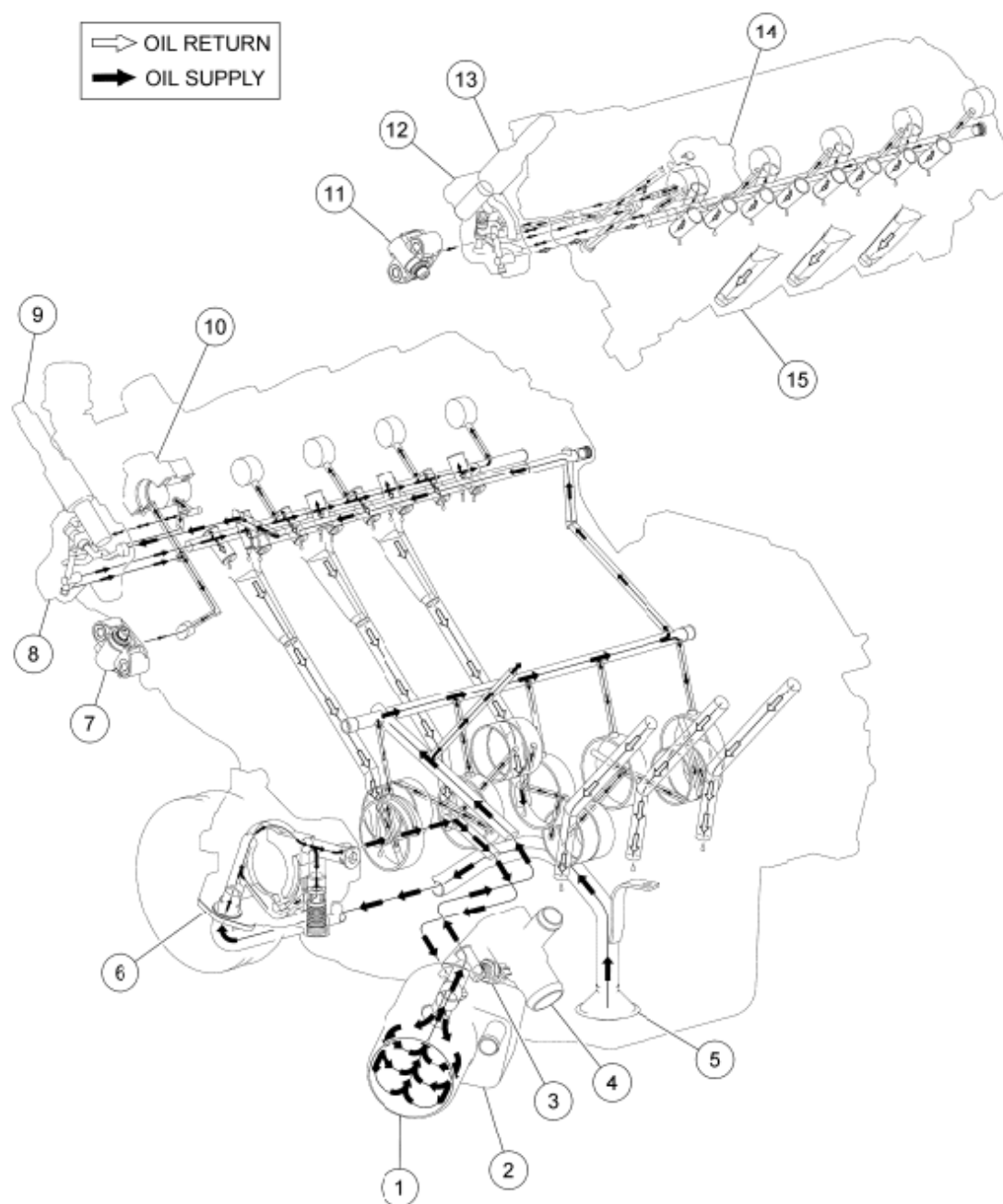
- Oil is drawn into the oil pump through the oil pump screen cover and tube in the sump of the oil pan.
- Oil is pumped through the oil filter on the left front side of the cylinder block.
- Oil enters the main gallery where it is distributed to the crankshaft main journals and to both cylinder heads.
- 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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



N0096442

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

PART DESCRIPTION CHART

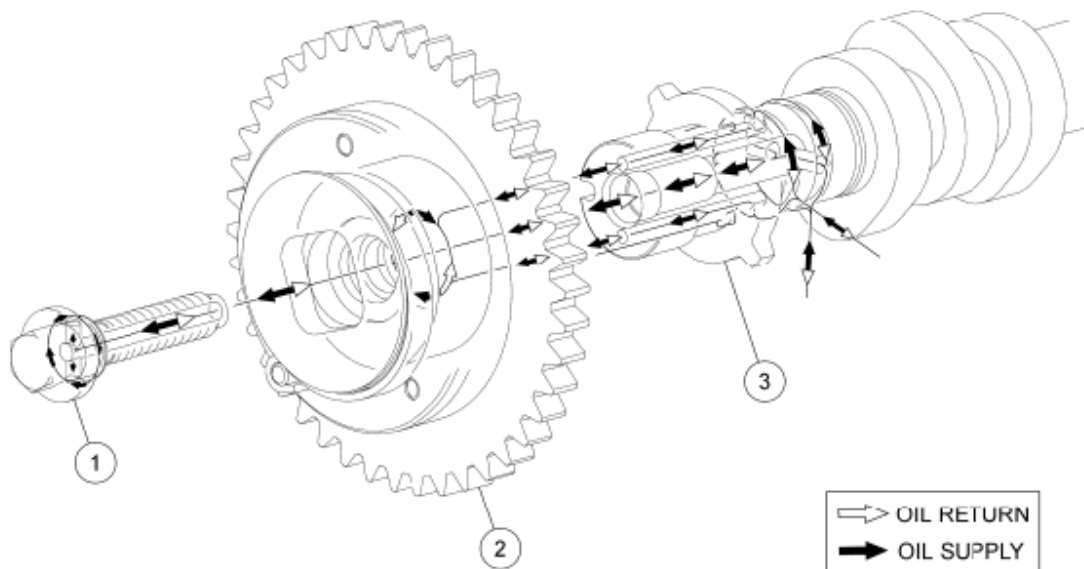
Item	Part Number	Description
1	6714	Oil filter
2	6A642	Oil cooler (if equipped)
3	9278	Engine Oil Pressure (EOP) switch
4	6884	Oil filter adapter

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

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

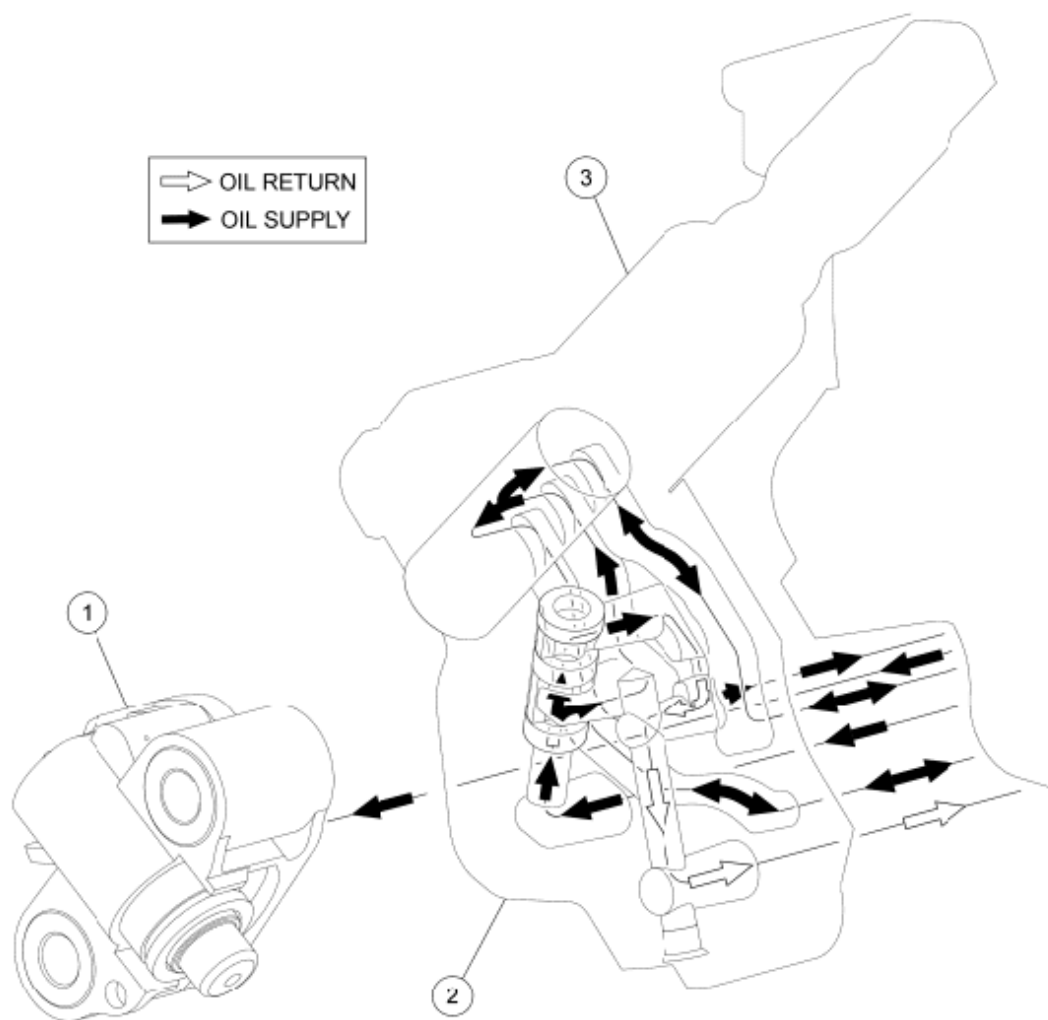
Fig. 4: Camshaft Phaser And Sprocket, Camshaft Phaser And Sprocket Bolt And Camshaft - Oil Flow Diagram

Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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



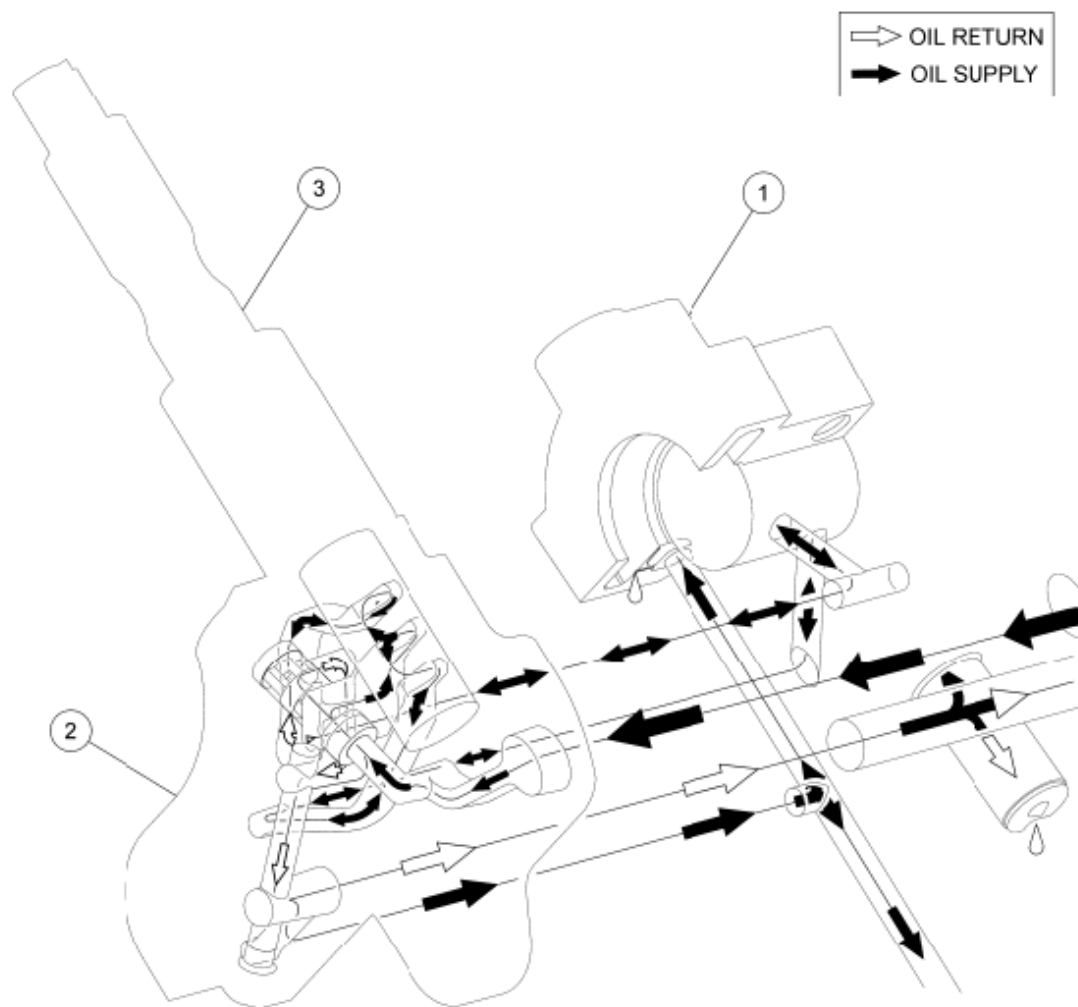
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Fig. 5: LH VCT Housing, VCT Solenoid And Timing Chain Tensioner - Oil Flow Diagram
 Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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



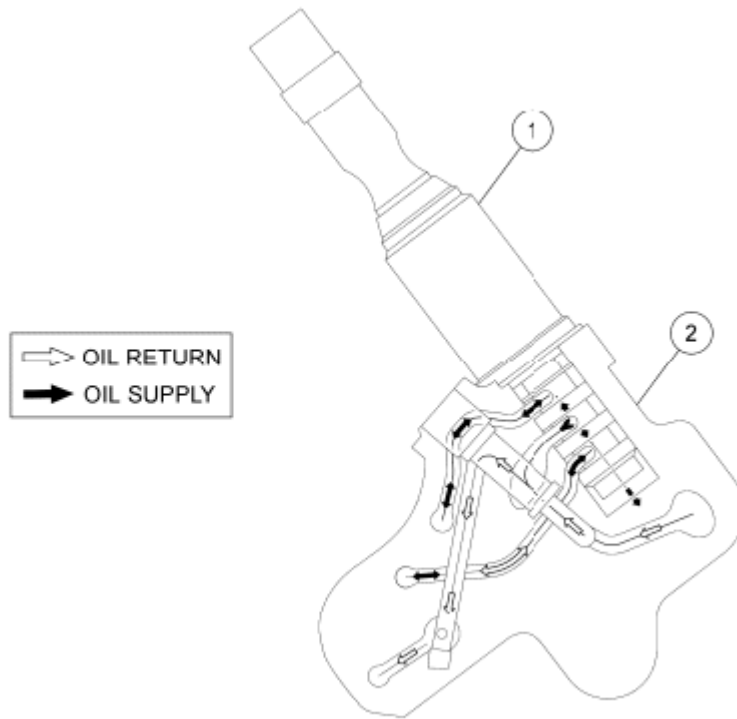
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Fig. 6: RH VCT Housing And VCT Solenoid - Oil Flow Diagram
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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: Variable Camshaft Timing (VCT) Housing - Oil Flow Diagram
 Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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

Oil Pump

The lubrication system is designed to provide optimum oil flow to critical components of the engine through its entire operating range. The heart of the system is a positive displacement internal gear oil pump 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

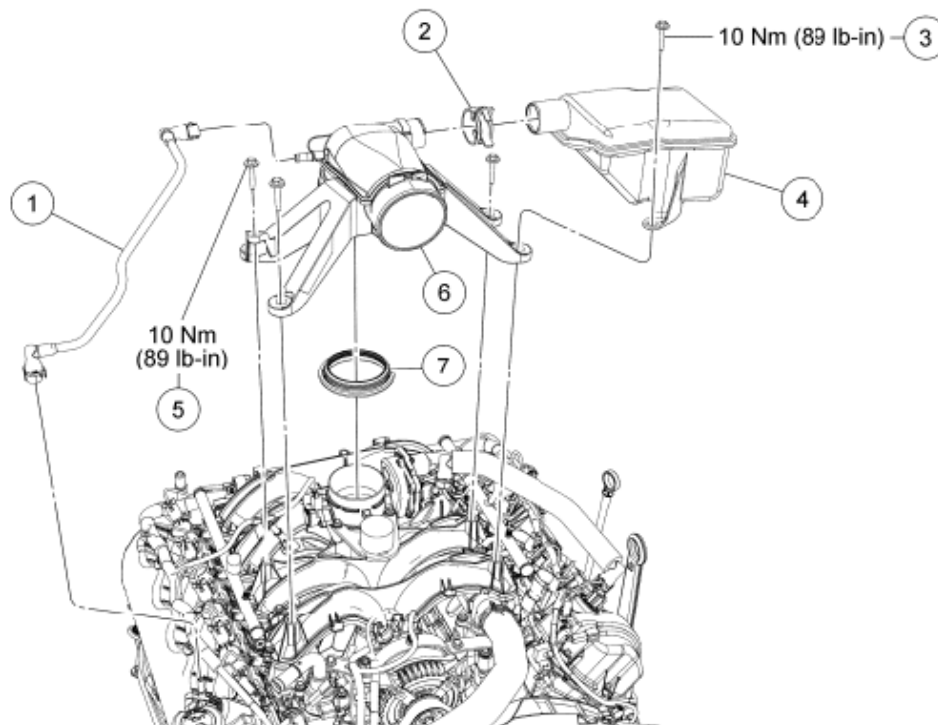
INTAKE MANIFOLD

Material

MATERIAL SPECIFICATION

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

Air Cleaner (ACL) Outlet Pipe-To-Throttle Body (TB) Adapter and Air Intake Resonator Assembly



N0093984

Fig. 8: Identifying ACL Outlet Pipe-To-Throttle Body Adapter And Air Intake Resonator Assembly Components With Torque Specifications
Courtesy of FORD MOTOR CO.

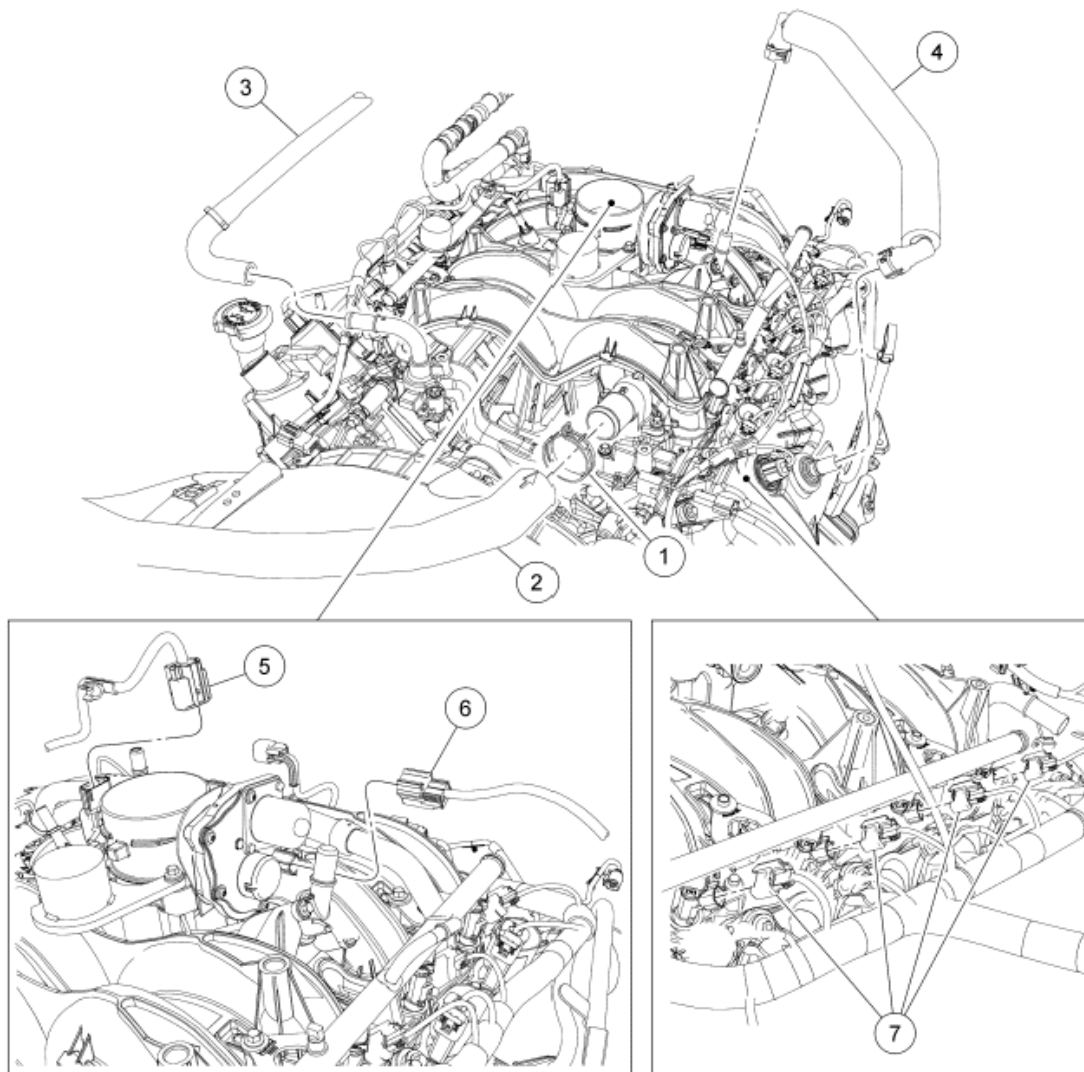
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

PART DESCRIPTION CHART

Item	Part Number	Description
1	6758	Crankcase ventilation tube
2	W527326	Throttle Body (TB) adapter-to-air intake resonator assembly clamp
3	W505427	Air intake resonator assembly bolt
4	9F763	Air intake resonator assembly
5	W505426	Air Cleaner (ACL) outlet pipe-to- TB adapter bolt (3 required)
6	9A589	ACL outlet pipe-to- TB adapter
7	9B694	ACL outlet pipe-to- TB adapter seal

Throttle Body (TB) and Ignition Coil Electrical Connectors



N0102924

Fig. 9: Identifying Throttle Body And Ignition Coil Electrical Connectors Components
Courtesy of FORD MOTOR CO.

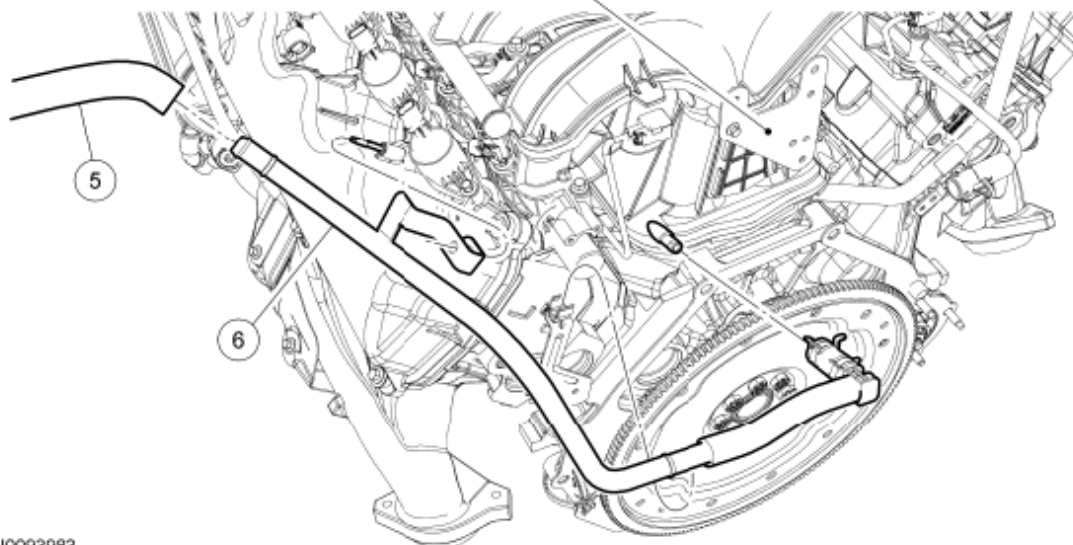
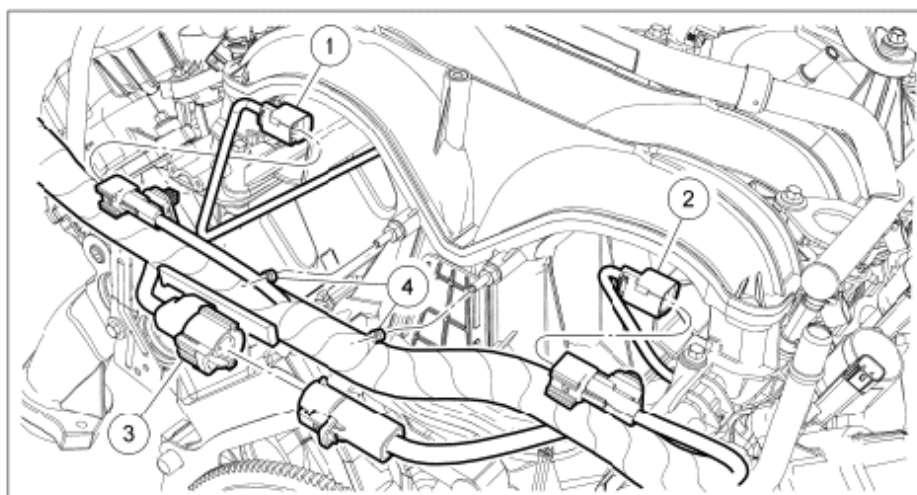
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

PART DESCRIPTION CHART

Item	Part Number	Description
1	8B274	Upper radiator hose clamp
2	8B274	Upper radiator hose
3	9229	Heater coolant hose
4	6K817	PCV tube
5	-	Throttle Position (TP) sensor electrical connector (part of 12B637)
6	-	Electronic Throttle Control (ETC) electrical connector (part of 12B637)
7	-	Fuel injector electrical connectors (part of 12B637) (8 required)

Intake Manifold Vacuum Tube Assembly



N0093983

Fig. 10: Identifying Intake Manifold Vacuum Tube Assembly Components
Courtesy of FORD MOTOR CO.

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

PART DESCRIPTION CHART

Item	Part Number	Description
1	-	LH Knock Sensor (KS) electrical connector (part of 12B637)
2	-	RH KS electrical connector (part of 12B637)
3	-	Cylinder Head Temperature (CHT) electrical connector (part of 12B637)
4	-	Electrical wiring harness retainer (part of 12B637)
5	-	Brake booster vacuum hose
6	9D446	Intake manifold vacuum tube assembly

Intake Manifold, Coolant Crossover Manifold Assembly and Gaskets

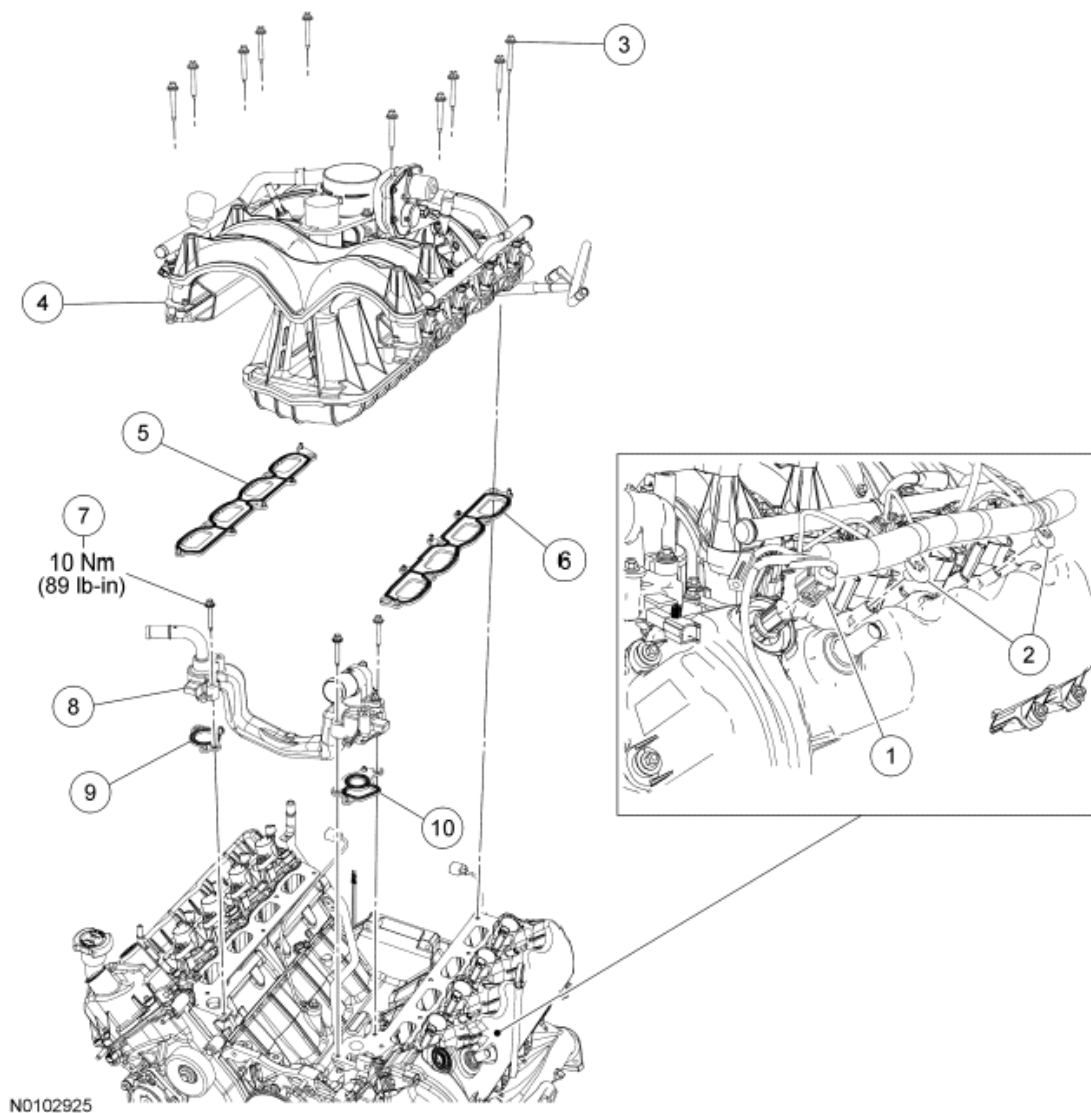


Fig. 11: Identifying Intake Manifold, Coolant Crossover Manifold Assembly And Gaskets Components With Torque Specifications
Courtesy of FORD MOTOR CO.

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

PART DESCRIPTION CHART

Item	Part Number	Description
1	-	Variable Camshaft Timing (VCT) solenoid electrical connector (part of 12B637)
2	-	Engine wiring harness retainers (part of 12B637) (2 required)
3	W710758	Intake manifold bolt (10 required)
4	9Y451	Intake manifold
5	9439	RH intake manifold gasket
6	9441	LH intake manifold gasket
7	W503282	Coolant crossover manifold assembly bolt (3 required)
8	9D446	Coolant crossover manifold assembly
9	8C387	RH coolant crossover manifold assembly gasket
10	8C387	LH coolant crossover manifold assembly 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 quick connect couplings and remove the crankcase ventilation tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
4. Remove the bolt, loosen the clamp and remove the air intake resonator assembly.
5. Remove the 3 bolts and the Throttle Body (TB)-to-Air Cleaner (ACL) outlet tube adapter.
6. Disconnect the quick connect couplings and remove the PCV tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
7. Disconnect the fuel supply tube quick connect coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
8. Disconnect the electrical connector and the Evaporative Emission (EVAP) tube quick connect coupling from the EVAP canister purge valve. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.

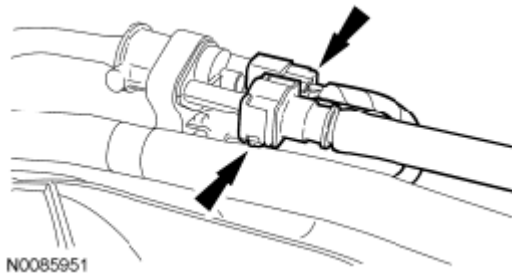


Fig. 12: Locating Evaporative Emission (EVAP) Tube Quick Connect Coupling And Electrical Connector

Courtesy of FORD MOTOR CO.

9. Disconnect the upper radiator hose from the thermostat housing.
10. Disconnect the heater coolant hose from the coolant crossover manifold assembly.
11. Disconnect the 8 fuel injector electrical connectors.
12. Disconnect the Throttle Position (TP) sensor and Electronic Throttle Control (ETC) electrical connectors.
13. Disconnect the 4 LH ignition coil and the LH Variable Camshaft Timing (VCT) solenoid electrical connectors and detach the 2 engine wiring harness retainers from the LH valve cover studs.
14. Disconnect the intake manifold vacuum tube from the brake booster vacuum hose.

NOTE: The intake manifold vacuum tube must be removed with the intake manifold as an assembly.

15.

Disconnect the intake manifold vacuum tube from the LH valve cover studbolt and the support bracket at the rear of the LH cylinder head.

16. 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.

17.

Remove the 3 bolts, the 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.

NOTE: The intake manifold vacuum tube must be positioned under the engine wiring harness and removed with the intake manifold as an assembly.

18.

Position the intake forward to gain access to the wiring harness retainers.

19. Disconnect the 2 engine wiring harness retainers from the rear of the intake manifold.
20. Disconnect the Cylinder Head Temperature (CHT) sensor jumper harness electrical connector retainer.
- 21.

21. **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: The intake manifold vacuum tube must be positioned under the engine wiring harness and removed with the intake manifold as an assembly.

Remove the intake manifold and discard the gaskets.

- Clean and inspect the sealing surfaces with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

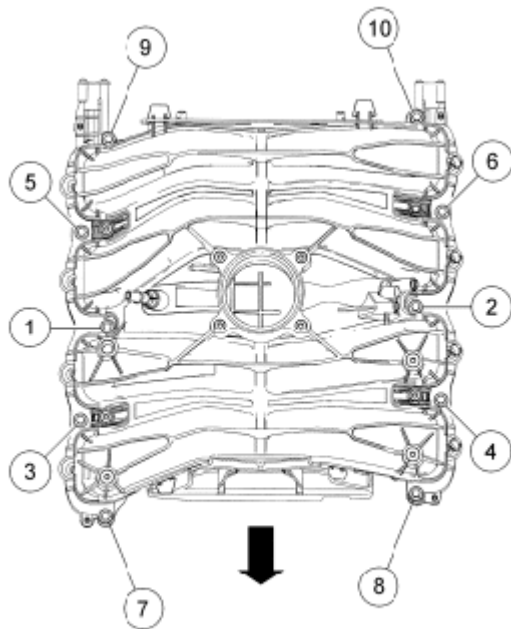
Installation

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

NOTE: The intake manifold vacuum tube must be positioned under the engine wiring harness during installation of the intake manifold.

Using new intake manifold gaskets, position the intake manifold.

2. Position the intake manifold forward and connect the **CHT** sensor jumper harness electrical connector retainer.
3. Connect the 2 engine wiring harness retainers to the rear of the intake manifold and position back the intake manifold assembly.
4. Using new gaskets, position the coolant crossover manifold assembly and install the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).
5. 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).

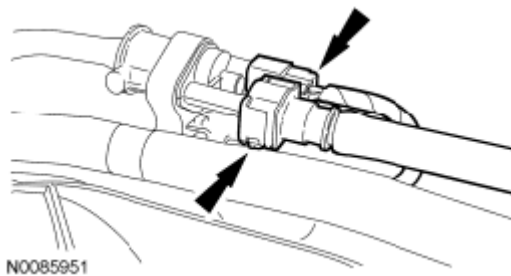


N0082678

Fig. 13: Identifying Intake Manifold Bolts Tightening Sequence

Courtesy of FORD MOTOR CO.

6. Connect the intake manifold vacuum tube to the support bracket and the valve cover stud.
7. Connect the brake booster vacuum hose to the intake manifold vacuum tube and position the clamp.
8. Connect the 4 LH ignition coil and the LH VCT solenoid electrical connectors and attach the 2 engine wiring harness retainers to the LH valve cover studs.
9. Connect the TP sensor and electronic throttle control electrical connectors.
10. Connect the 8 fuel injector electrical connectors.
11. Connect the heater coolant hose to the coolant crossover manifold assembly.
12. Connect the upper radiator hose to the thermostat housing.
13. Connect the electrical connector and the EVAP tube quick connect coupling to the EVAP canister purge valve. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.



N0085951

Fig. 14: Locating Evaporative Emission (EVAP) Tube Quick Connect Coupling And Electrical Connector

Courtesy of FORD MOTOR CO.

14. Connect the fuel supply tube quick connect coupling. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
15. Position the PCV tube and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
16. Position the **TB** -to- **ACL** outlet tube adapter and install the 3 bolts.
 - Tighten the bolt to 10 Nm (89 lb-in).
17. Position the air intake resonator assembly, install the bolt and the clamp.
 - Tighten the bolt to 10 Nm (89 lb-in).
18. Position the crankcase ventilation tube and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
19. Install the generator. For additional information, refer to **CHARGING SYSTEM**.
20. Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING**.

VALVE COVER - LH

PCV Tube, Engine Wiring Harness Retainers and Variable Camshaft Timing (VCT) Solenoid Electrical Connector

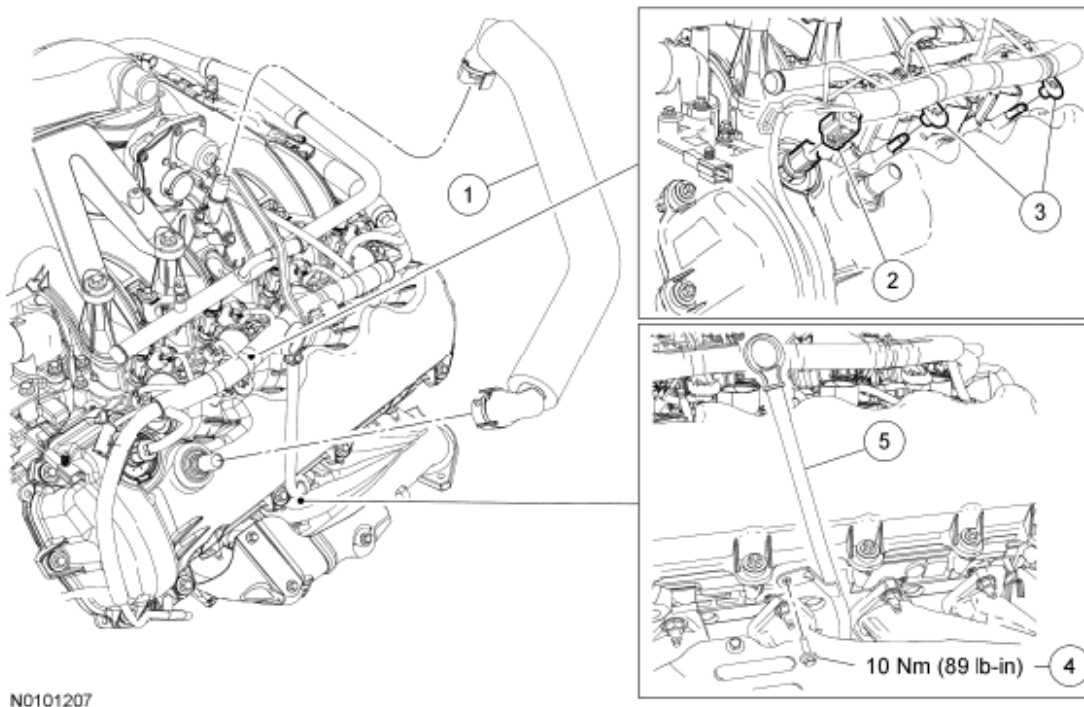


Fig. 15: Identifying PCV Tube, Engine Wiring Harness Retainers And Variable Camshaft Timing Solenoid Electrical Connector With Torque Specifications
 Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

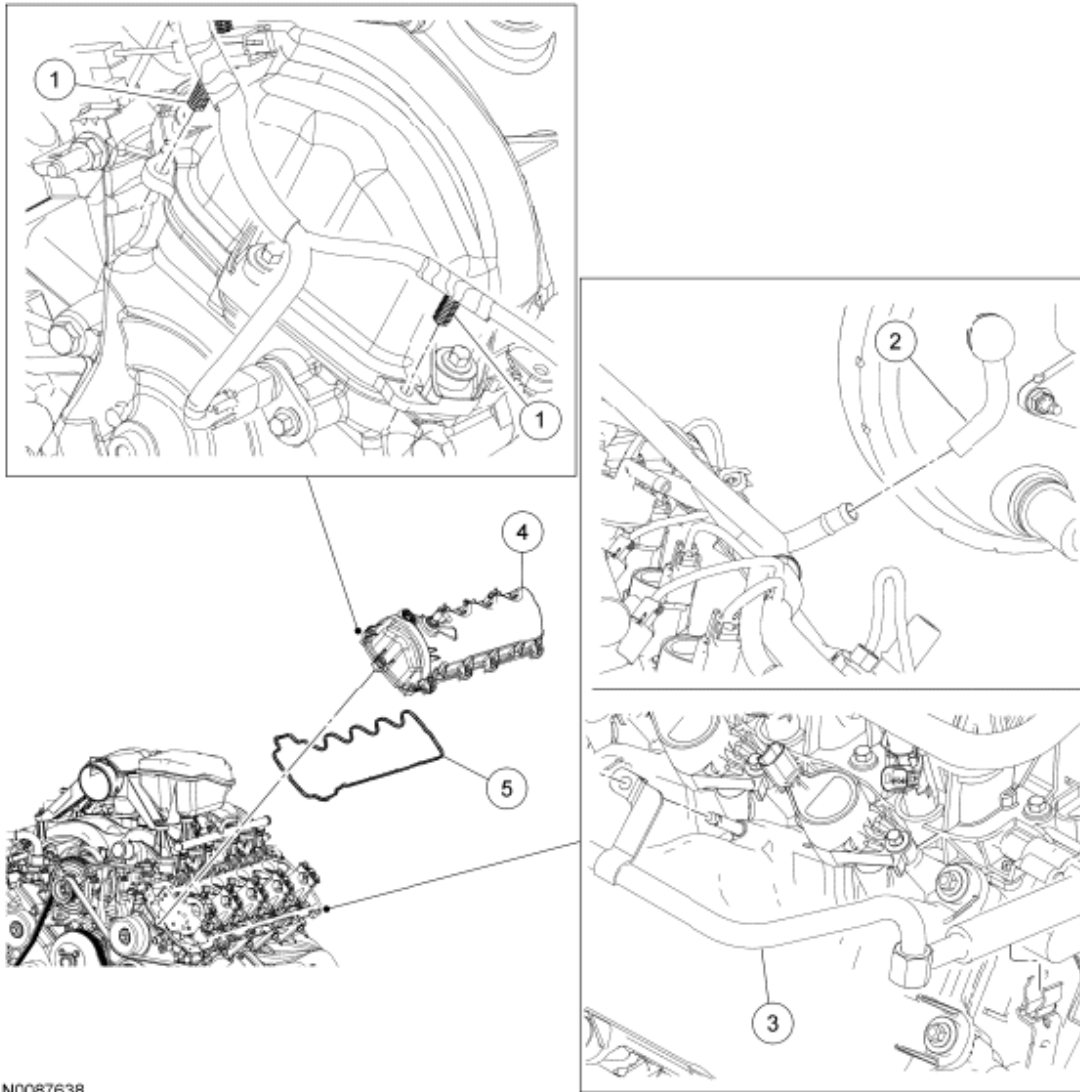
Item	Part Number	Description
1	6K817	PCV tube

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

2	-	Variable Camshaft Timing (VCT) solenoid electrical connector (part of 12B637)
3	-	Engine wiring harness retainers (part of 12B637)
4	N605892	Oil level indicator and tube bolt
5	6K873	Oil level indicator and tube

Engine Wiring Harness Retainers, Intake Manifold Vacuum Tube, LH Valve Cover and Gasket



N0087638

Fig. 16: Identifying Engine Wiring Harness Retainers, Intake Manifold Vacuum Tube, LH Valve Cover And Gasket

Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	-	Engine wiring harness retainers (part of 12B637)
2	-	Intake manifold vacuum tube-to-brake booster hose

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

3	9D446	Intake manifold vacuum tube
4	6A505	LH valve cover
5	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 bolt and position the oil level indicator and tube aside.
3. Disconnect the quick connect couplings and remove the PCV tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
4. Disconnect the intake manifold vacuum tube hose from the brake booster.
5. Disconnect the intake manifold vacuum tube from the support bracket and the valve cover stud.
6. Disconnect the Variable Camshaft Timing (VCT) solenoid electrical connector.
7. Disconnect the 3 wiring harness retainers from the front of the LH valve cover and the 2 wiring harness retainers from the LH valve cover studs.
8. Remove the 4 LH ignition coils. For additional information, refer to **ENGINE IGNITION - 5.4L (3V)**.

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.

9.

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.

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 can cause future oil leakage.

1.

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

head.

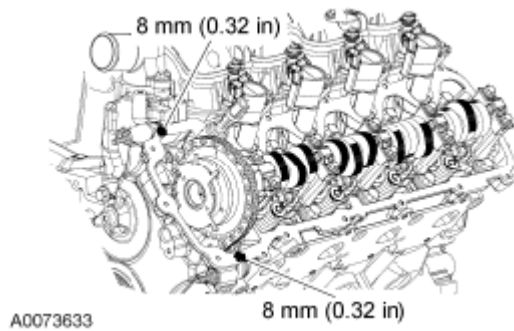


Fig. 17: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

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

Position the LH valve cover and new gasket on the cylinder head and tighten the 10 fasteners in the sequence shown in illustration.

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

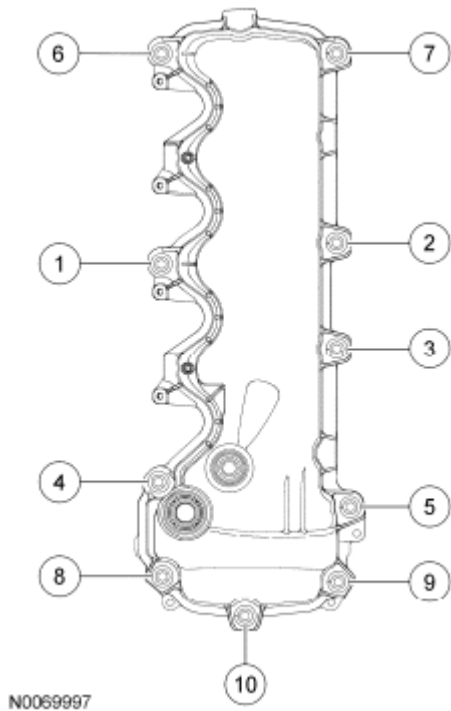


Fig. 18: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

3. Position the intake manifold vacuum tube assembly onto the support bracket and the valve cover stud.
4. Connect the intake manifold vacuum tube hose to the brake booster.
5. Install the 4 LH ignition coils. For additional information, refer to **ENGINE IGNITION - 5.4L (3V)**.
6. Connect the 3 wiring harness retainers to the front of the RH valve cover and the 2 wiring harness retainers to the RH valve cover studs.
7. Connect the VCT solenoid electrical connector.
8. Position the PCV tube and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.
9. Position back the oil level indicator and tube and install the bolt.
 - Tighten to 10 Nm (89 lb-in).
10. Install the ACL outlet pipe. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING**.

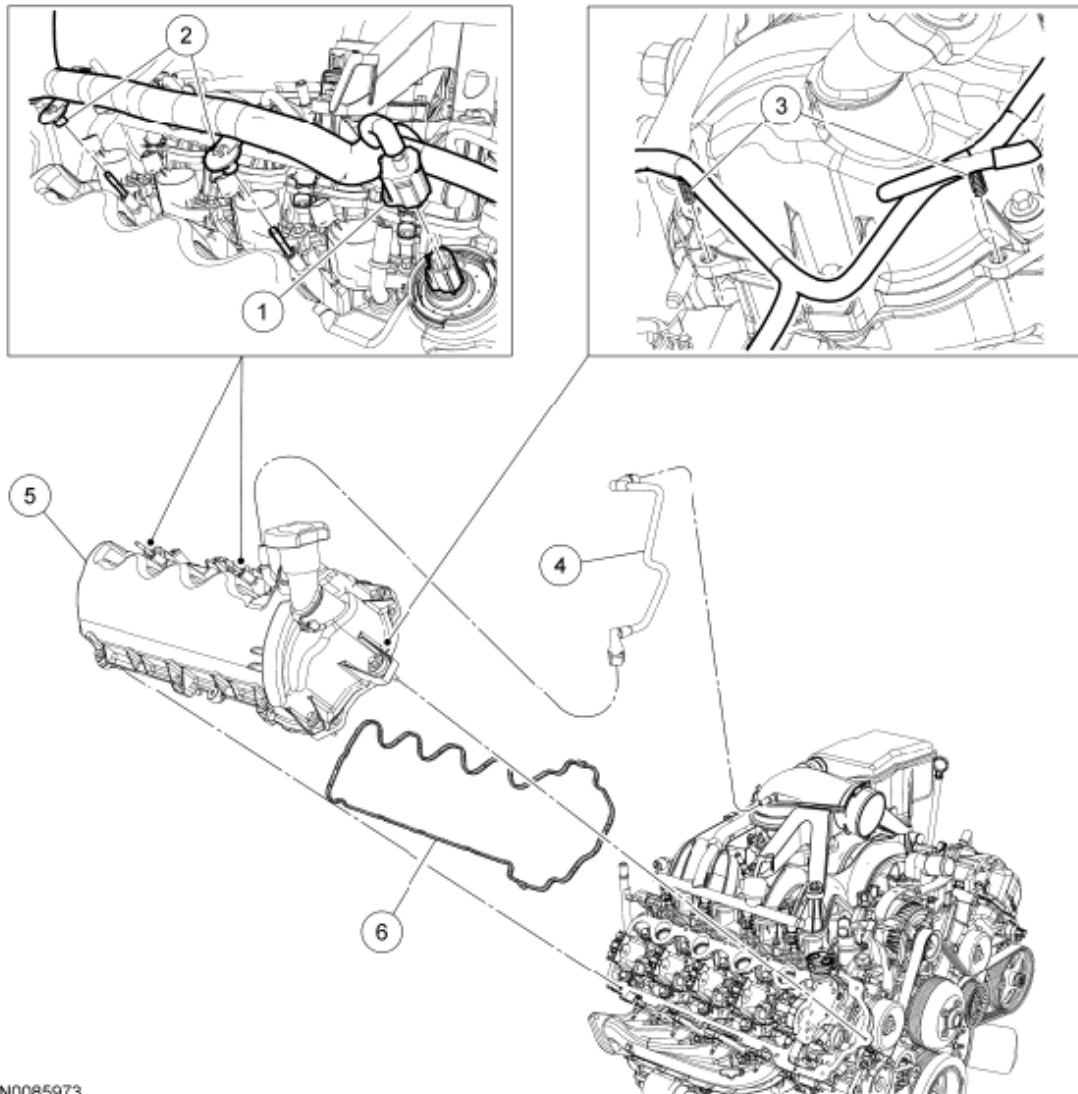
VALVE COVER - RH

Material

MATERIAL SPECIFICATION

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

Engine Wiring Harness Retainers, Variable Camshaft Timing (VCT) Solenoid Electrical Connector, Crankcase Ventilation Tube, RH Valve Cover and Gasket



N0085973

Fig. 19: Identifying Engine Wiring Harness Retainers, VCT Solenoid Electrical Connector, RH Valve Cover And Gasket

Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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	6758	Crankcase ventilation tube
5	6582	RH valve cover
6	6584	RH valve cover gasket

Removal

Vehicles with auxiliary heat

1. Drain the cooling system. For additional information, refer to **ENGINE COOLING** .
2. Disconnect the 2 auxiliary heat coolant hoses and position the auxiliary heat coolant hoses aside.

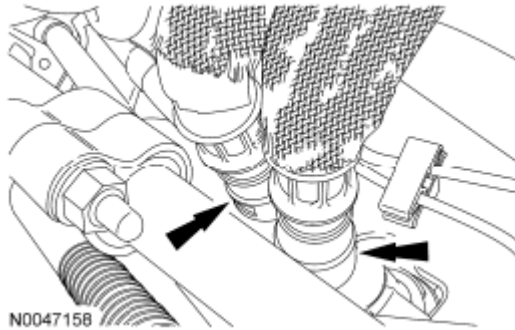


Fig. 20: Locating Auxiliary Heat Coolant Hoses
Courtesy of FORD MOTOR CO.

All vehicles

3. Disconnect the quick connect couplings and remove the crankcase vent tube. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION** .
4. Disconnect the PCM electrical connector and position aside.

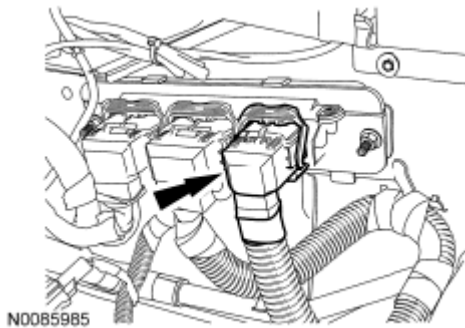


Fig. 21: Locating PCM Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the nut and the ground cable and disconnect the wiring harness retainer.

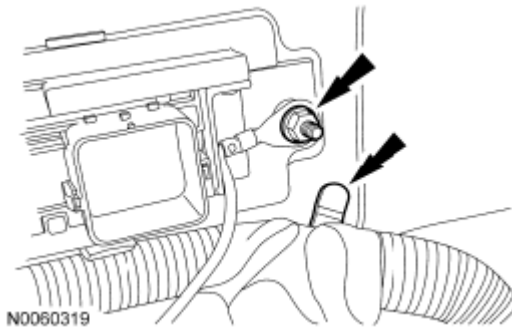


Fig. 22: Locating Wiring Harness Retainer And Nut
Courtesy of FORD MOTOR CO.

6. Disconnect the PCM electrical connector.

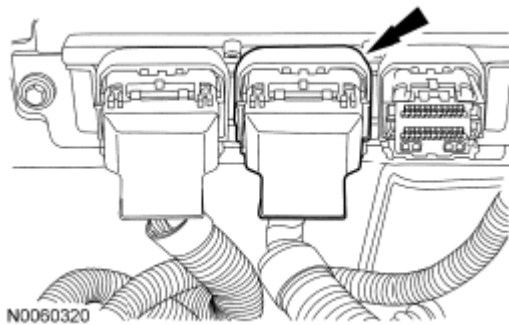


Fig. 23: Locating PCM Electrical Connector
Courtesy of FORD MOTOR CO.

7. Disconnect the 2 electrical connectors and the wiring harness retainer and position the wiring harness aside.

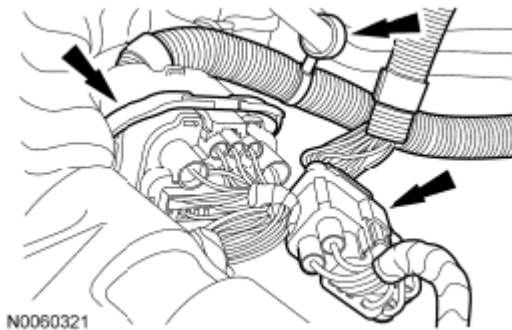


Fig. 24: Locating Electrical Connectors And Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

8. Disconnect the RH radio ignition interference capacitor and engine cooling fan clutch electrical connectors.

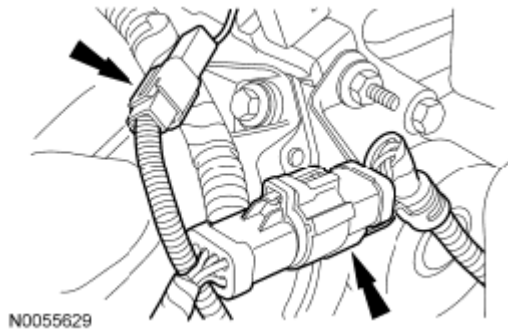


Fig. 25: Locating Engine Cooling Fan Clutch Electrical Connectors
Courtesy of FORD MOTOR CO.

9. Remove the 4 RH ignition coils. For additional information, refer to **ENGINE IGNITION - 5.4L (3V)**.
10. Disconnect the RH Variable Camshaft Timing (VCT) solenoid electrical connector.
11. Disconnect the 2 engine wiring harness retainers from the RH valve cover studs 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.

12.

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.

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

All vehicles

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 can cause future oil leakage.

1.

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

head.

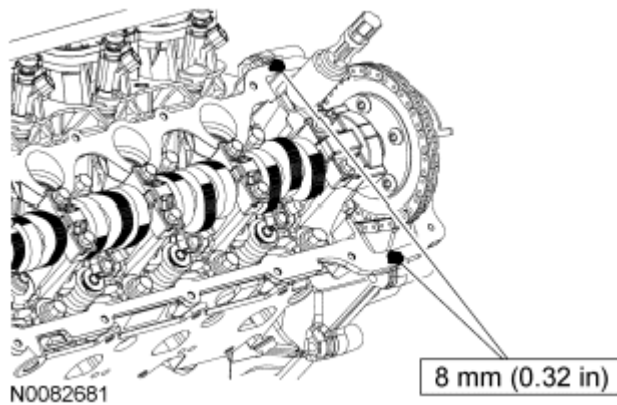


Fig. 26: Identifying Silicone Gasket Application Points
Courtesy of FORD MOTOR CO.

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 fasteners in the sequence shown in illustration.

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

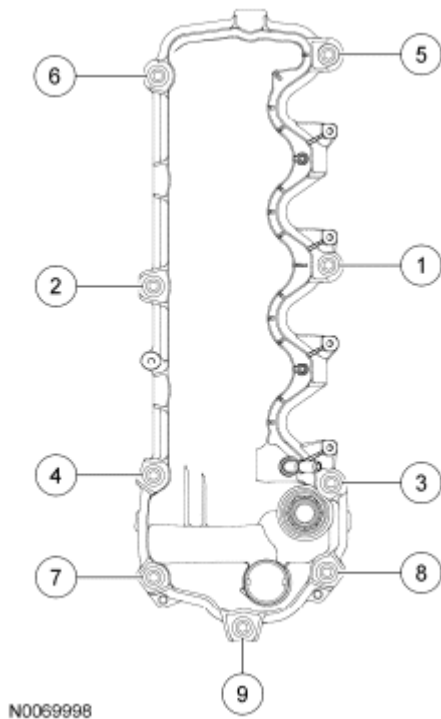


Fig. 27: Identifying Cylinder Head Bolt Tightening Sequence

Courtesy of FORD MOTOR CO.

3. Install the 4 RH ignition coils. For additional information, refer to **ENGINE IGNITION - 5.4L (3V)**.
4. Position back the engine wiring harness and connect the 2 electrical connectors and the wiring harness retainer.

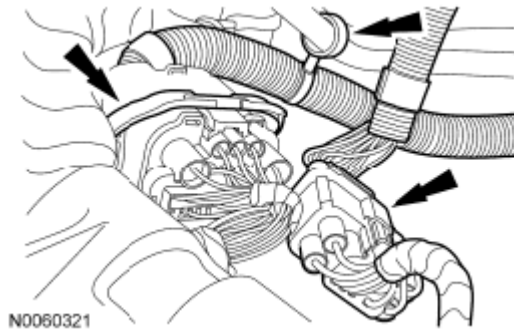


Fig. 28: Locating Electrical Connectors And Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

5. Connect the PCM electrical connector.

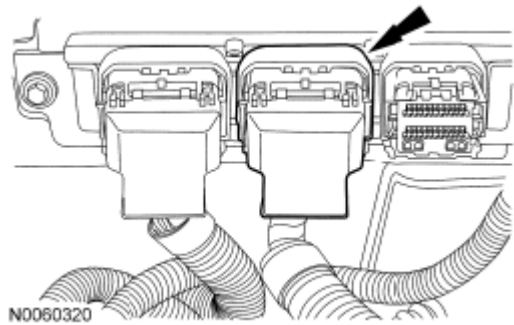


Fig. 29: Locating PCM Electrical Connector
Courtesy of FORD MOTOR CO.

6. Connect the wiring harness retainer and ground cable and install the nut.
 - Tighten to 10 Nm (89 lb-in).

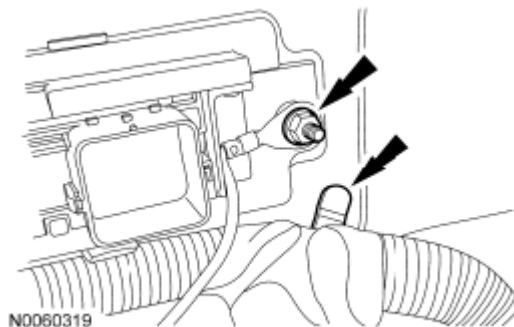


Fig. 30: Locating Wiring Harness Retainer And Nut
Courtesy of FORD MOTOR CO.

7. Connect the PCM electrical connector.

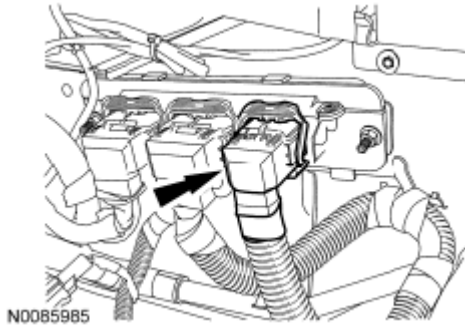


Fig. 31: Locating PCM Electrical Connector
Courtesy of FORD MOTOR CO.

8. Connect the RH radio ignition interference capacitor and engine cooling fan clutch electrical connectors.

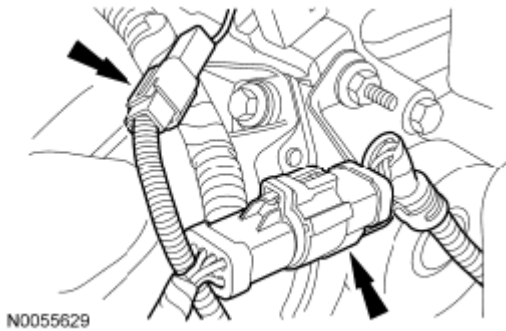


Fig. 32: Locating Engine Cooling Fan Clutch Electrical Connectors
Courtesy of FORD MOTOR CO.

9. Connect the RH VCT solenoid electrical connector.
10. Connect the wiring harness retainers to the valve cover.
11. Position the crankcase vent tube and connect the quick connect couplings. For additional information, refer to **FUEL SYSTEM - GENERAL INFORMATION**.

Vehicles with auxiliary heat

12. Connect the 2 auxiliary heat coolant hoses.

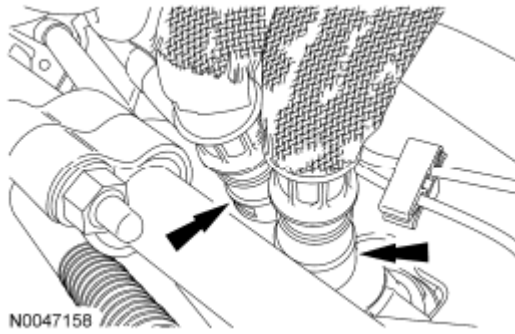


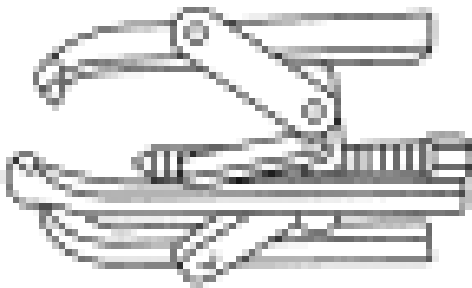
Fig. 33: Locating Auxiliary Heat Coolant Hoses
Courtesy of FORD MOTOR CO.

13. Fill and bleed the coolant system. For additional information, refer to **ENGINE COOLING** .

CRANKSHAFT PULLEY

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION



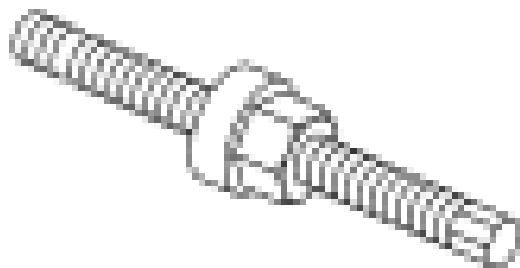
ST1184-A

3 Jaw Puller
303-D121 or equivalent

Installer, Crankshaft Vibration Damper

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1287-A

303-102 (T74P-6316-B)

Material

MATERIAL 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
Silicone Gasket Remover ZC-30	-

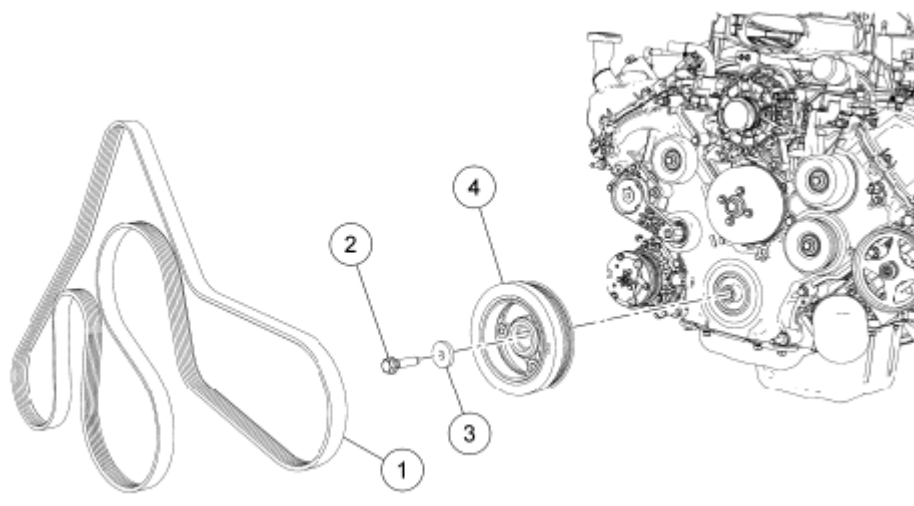


Fig. 34: Identifying Crankshaft Pulley Components
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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. Rotate the tensioner clockwise and remove the accessory drive belt from the crankshaft pulley.

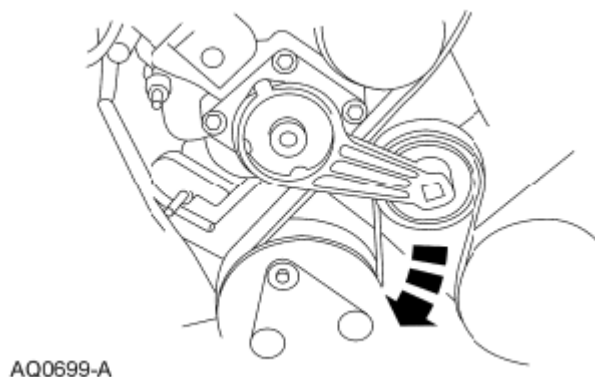
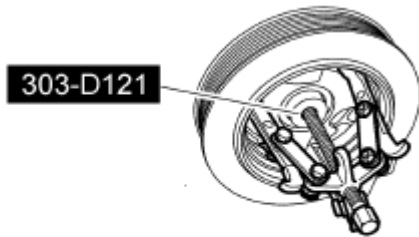


Fig. 35: Removing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

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



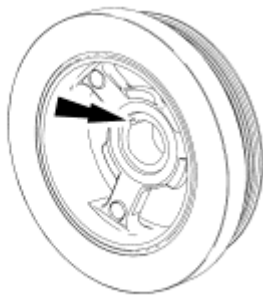
N0010528

Fig. 36: Removing Crankshaft Pulley
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.
- 1.

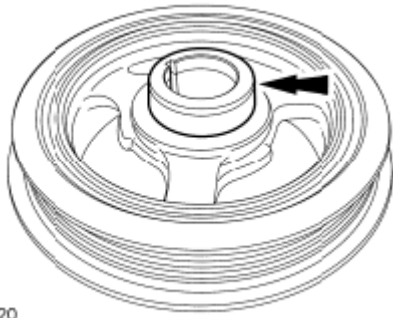
Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.



N0010530

Fig. 37: Identifying Woodruff Key Slot In Crankshaft Pulley
Courtesy of FORD MOTOR CO.

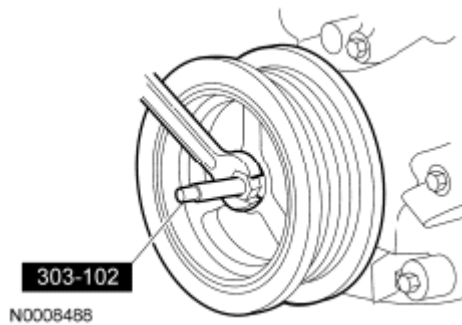
2. Lubricate the crankshaft pulley sealing area with clean engine oil prior to installation.



N0030220

Fig. 38: Locating Crankshaft Pulley Sealing Area
Courtesy of FORD MOTOR CO.

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



N0005488

Fig. 39: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

4. 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.

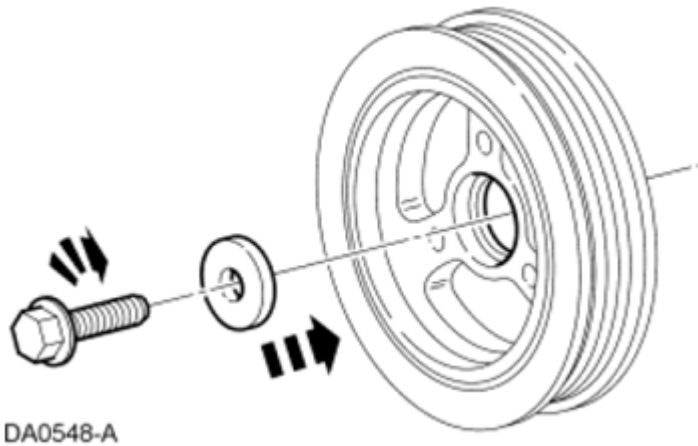


Fig. 40: Tightening Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

5. Rotate the tensioner clockwise and install the accessory drive belt onto the crankshaft pulley.

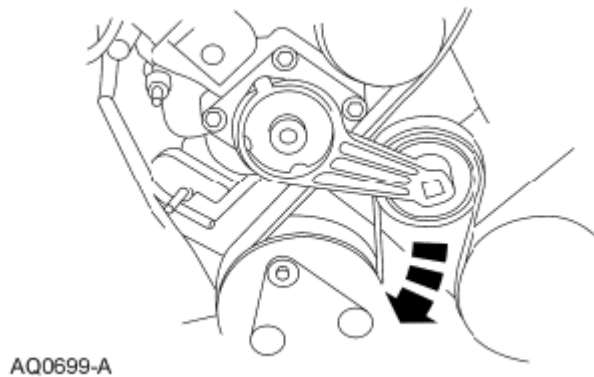


Fig. 41: Installing Accessory Drive Belt Onto Crankshaft Pulley
Courtesy of FORD MOTOR CO.

CRANKSHAFT FRONT SEAL

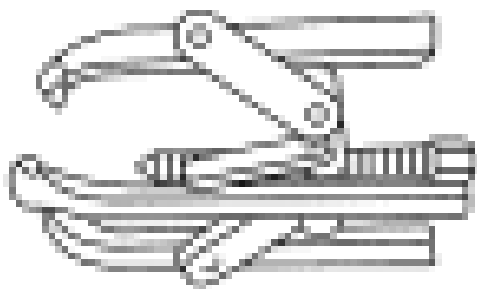
Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

3 Jaw Puller

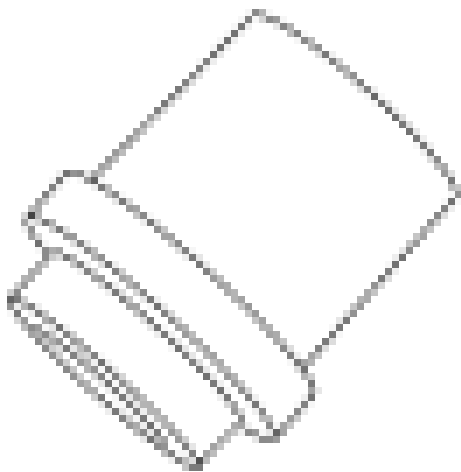
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1184-A

303-D121 or equivalent

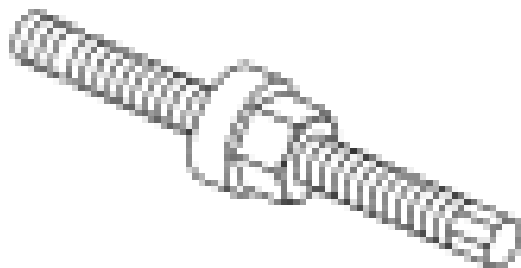


ST2197-A

Installer, Crankshaft Front Oil Seal
303-635

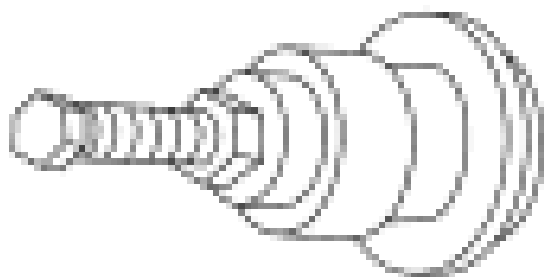
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1287-A

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



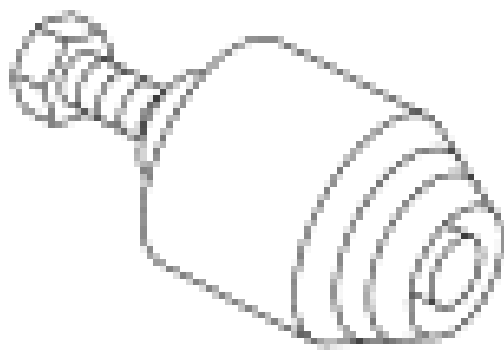
ST1328-A

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

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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

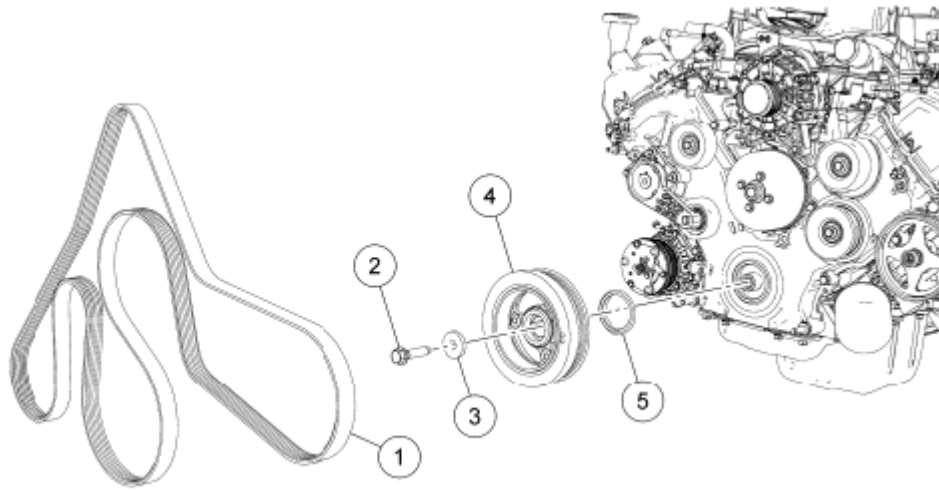


ST1288-A

Material

MATERIAL 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
Silicone Gasket Remover ZC-30	-



N0006661

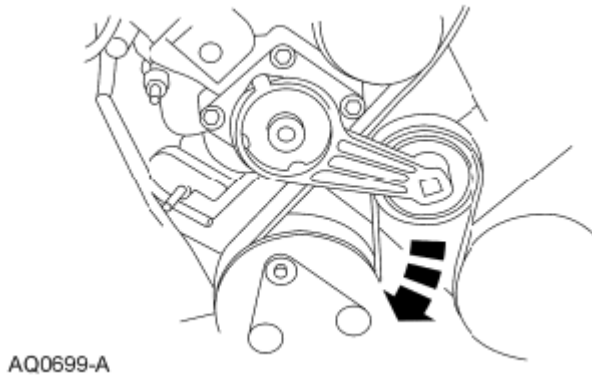
Fig. 42: Identifying Crankshaft Front Seal Components
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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

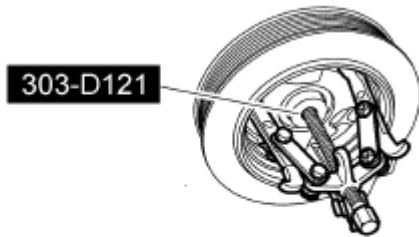
1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. Rotate the tensioner clockwise and remove the accessory drive belt from the crankshaft pulley.



AQ0699-A

Fig. 43: Removing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

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



N0010528

Fig. 44: Removing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

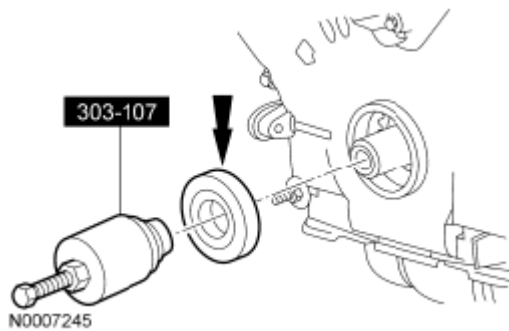


Fig. 45: Removing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

Installation

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

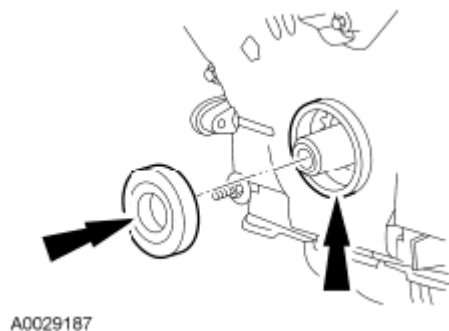


Fig. 46: Locating Engine Front Cover And Crankshaft Seal Inner Lip

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.

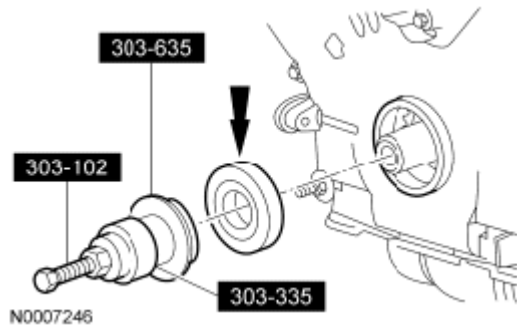


Fig. 47: Installing Crankshaft Front Seal Into Engine Front Cover
Courtesy of FORD MOTOR CO.

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.

3.

Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.

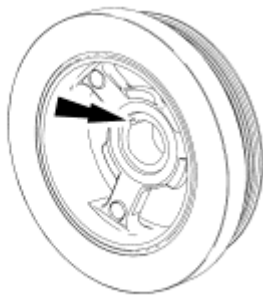


Fig. 48: Identifying Woodruff Key Slot In Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

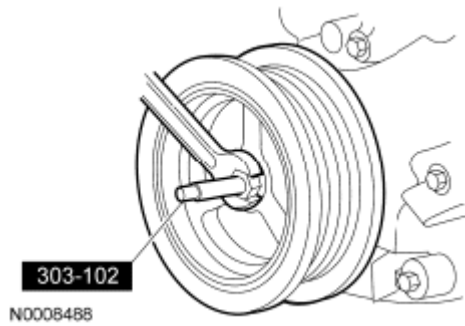


Fig. 49: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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.

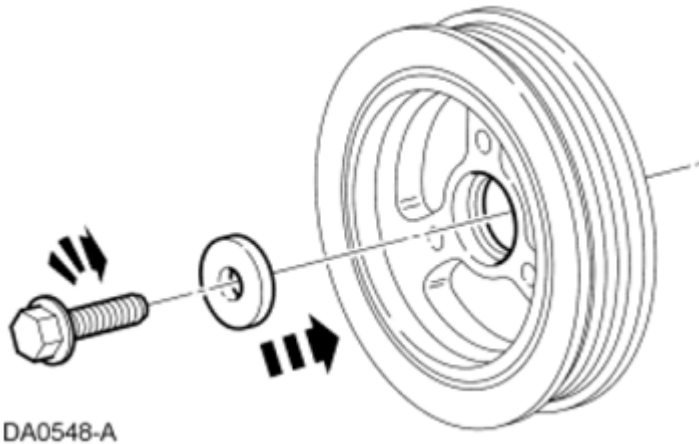
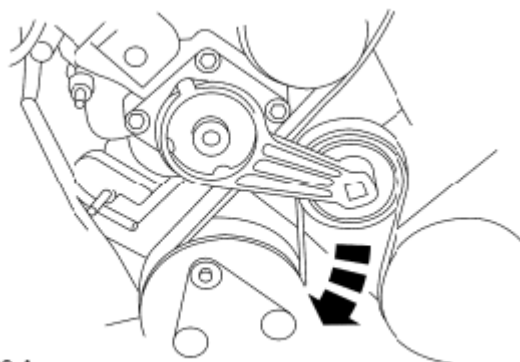


Fig. 50: Tightening Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

6. Rotate the tensioner clockwise and install the accessory drive belt onto the crankshaft pulley.



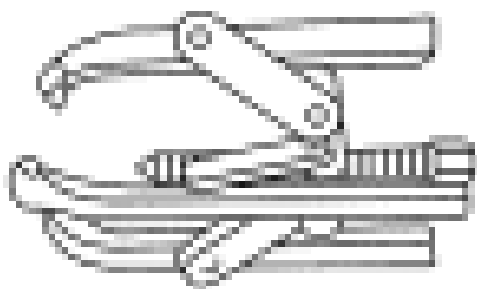
AQ0699-A

Fig. 51: Installing Accessory Drive Belt Onto Crankshaft Pulley
Courtesy of FORD MOTOR CO.

ENGINE FRONT COVER

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

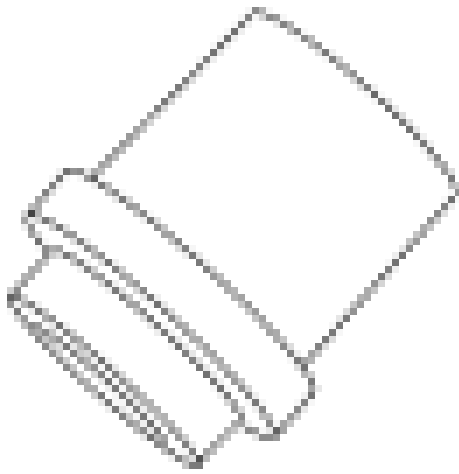


ST1184-A

3 Jaw Puller
303-D121 or equivalent

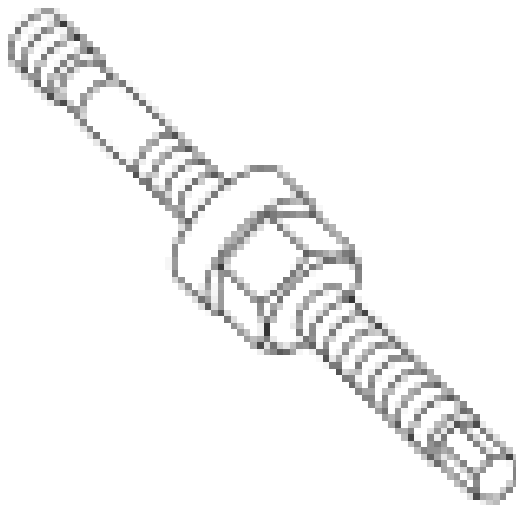
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2197-A

Installer, Crankshaft Front Oil Seal
303-635

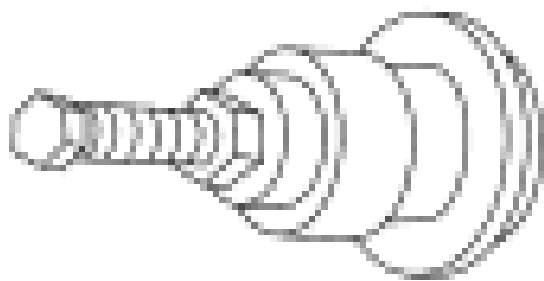


ST2428-A

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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1328-A

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



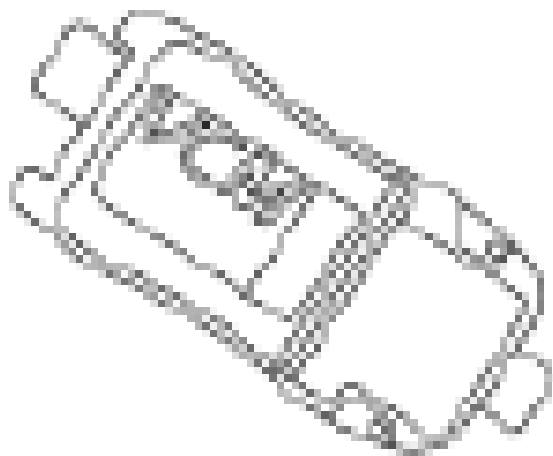
ST1288-A

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

Vehicle Communication Module (VCM) and
Integrated Diagnostic System (IDS) software
with appropriate hardware, or equivalent scan
tool

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



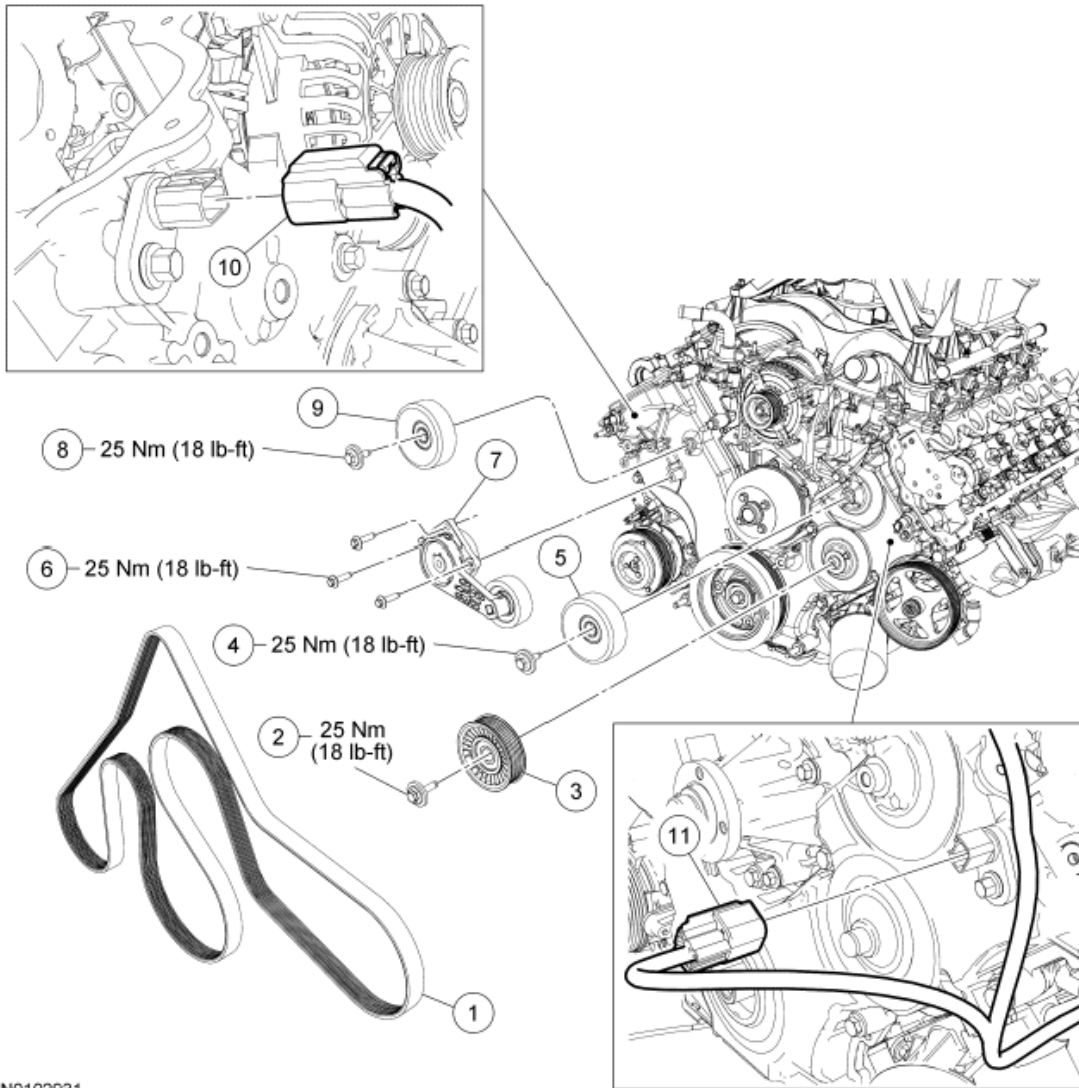
ST2834-A

Material

MATERIAL 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
Silicone Gasket Remover ZC-30	-

Front End Accessory Drive (FEAD), LH and RH Camshaft Position (CMP) Sensors Electrical Connectors



N0102931

Fig. 52: Identifying Front End Accessory Drive, LH And RH Camshaft Position Sensors Electrical Connectors With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

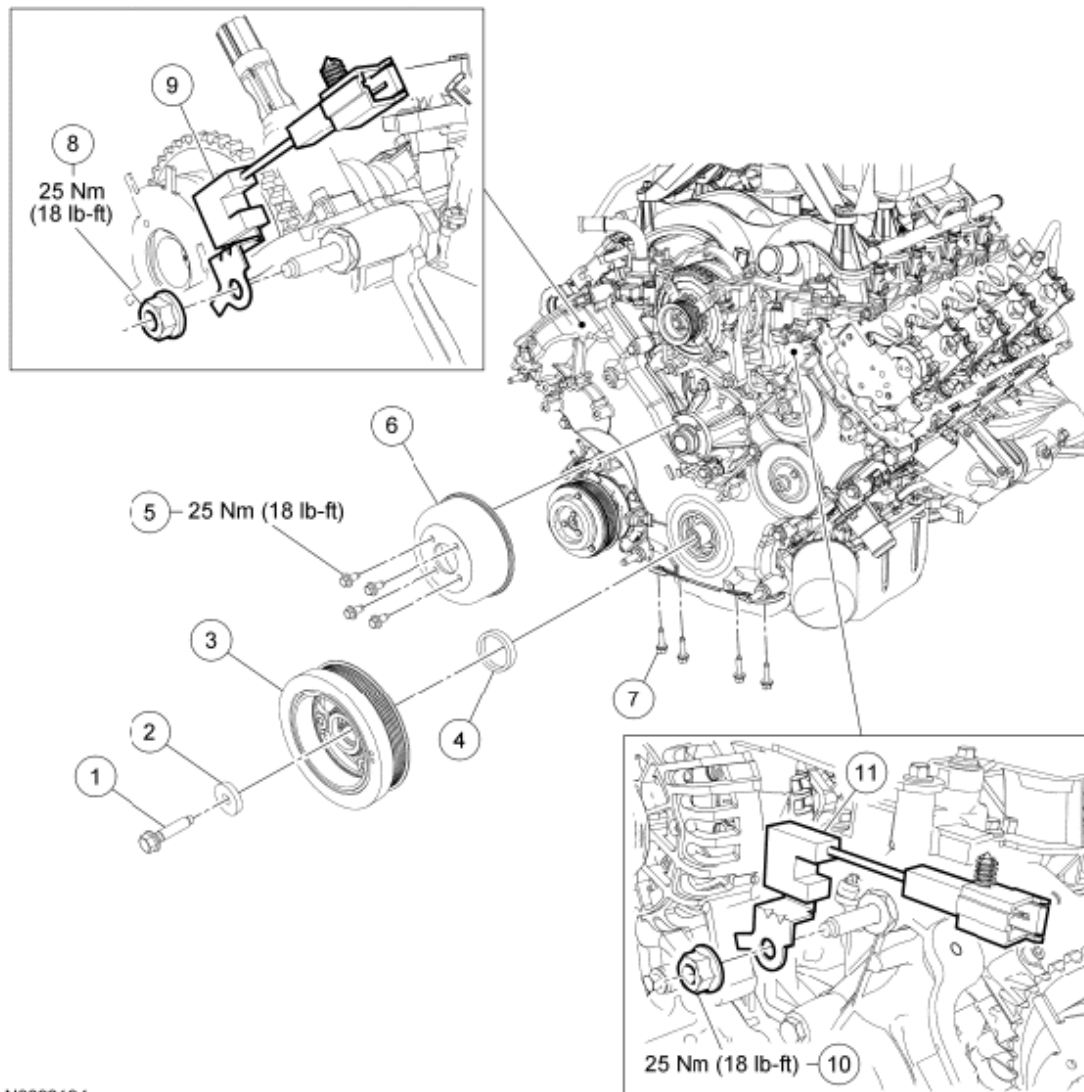
Item	Part Number	Description
1	8620	Accessory drive belt
2	N808102	Accessory drive belt idler pulley bolt
3	19A216	Accessory drive belt idler pulley
4	N808102	Accessory drive belt idler pulley bolt
5	19A216	Accessory drive belt idler pulley
6	N808920	Accessory drive belt tensioner bolt (3 required)
7	6B209	Accessory drive belt tensioner
8	N808102	Accessory drive belt idler pulley bolt

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

9	19A216	Accessory drive belt idler pulley
10	-	RH Camshaft Position (CMP) sensor electrical connector (part of 12B637)
11	-	LH CMP sensor electrical connector (part of 12B637)

Radio Ignition Interference Capacitors, Coolant Pump Pulley, Crankshaft Pulley and Front Oil Pan Bolts



N0092194

Fig. 53: Identifying Radio Ignition Interference Capacitors Crankshaft Pulley And Front Oil Pan Bolts With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

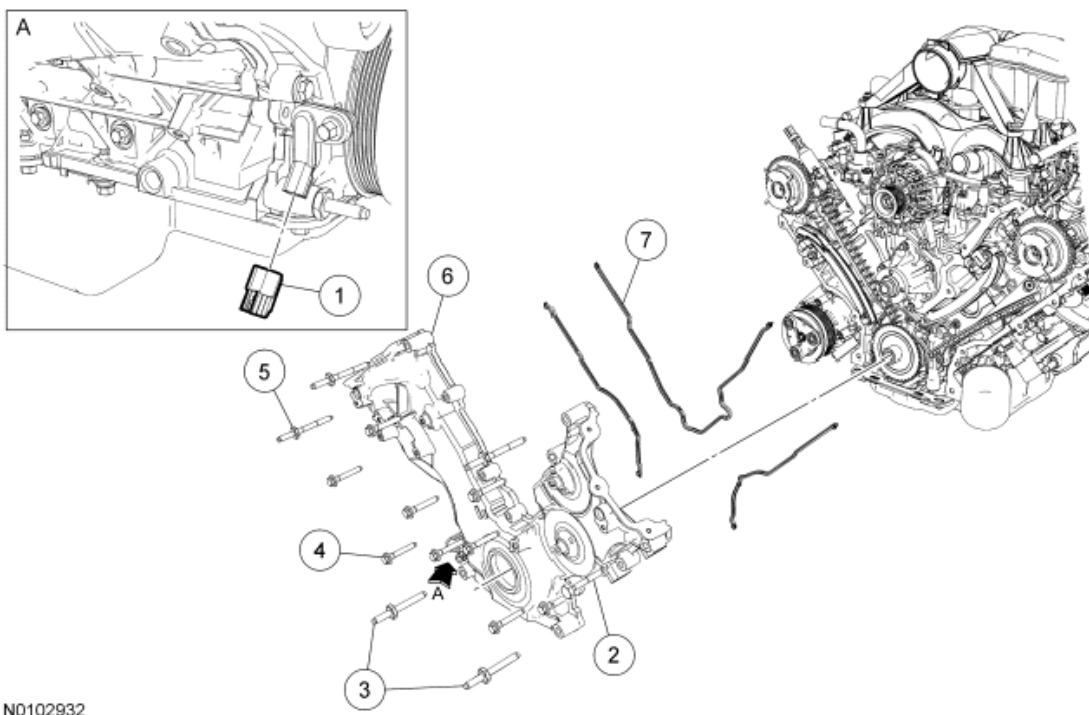
Item	Part Number	Description
1	W701512	Crankshaft pulley bolt
2	N806165	Crankshaft pulley bolt washer
3	6316	Crankshaft pulley

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2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

4	6700	Crankshaft front seal
5	N806282	Coolant pump pulley bolt (4 required)
6	8A528	Coolant pump pulley
7	W701605	Oil pan bolt (4 required)
8	N804758	RH radio ignition interference capacitor nut
9	18801	RH radio ignition interference capacitor
10	N804758	LH radio ignition interference capacitor nut
11	18801	LH radio ignition interference capacitor

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



N0102932

Fig. 54: Identifying Engine Front Cover, Gaskets And Crankshaft Position Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	-	Crankshaft Position (CKP) sensor electrical connector (part of 12B637)
2	W706605	Engine front cover bolt
3	N808529	Engine front cover studs (2 required)
4	N806177	Engine front cover bolt (9 required)
5	W709573	Engine front cover stud (3 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. Remove the RH valve cover. For additional information, refer to **VALVE COVER - RH**.
3. Remove the LH valve cover. For additional information, refer to **VALVE COVER - LH**.
4. Loosen the 4 coolant pump pulley bolts.
5. Rotate the tensioner clockwise and remove the accessory drive belt.

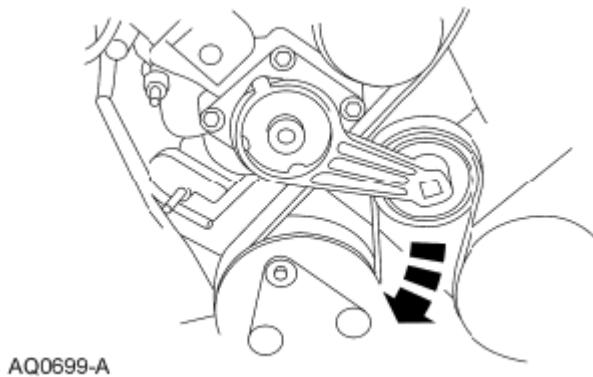


Fig. 55: Removing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

6. Remove the 4 bolts and the coolant pump pulley.
7. Drain the engine oil.
8. Remove the bolt and position the starter wiring harness and starter wiring harness rear support bracket aside.

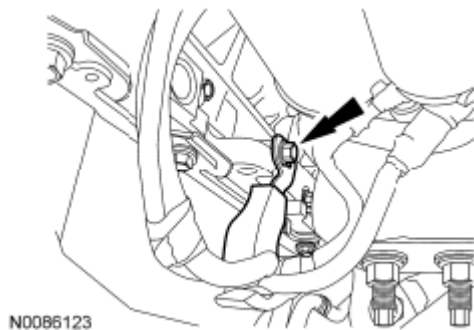


Fig. 56: Locating Starter Wiring Harness Rear Support Bracket Bolt
Courtesy of FORD MOTOR CO.

9. Remove the nut and position aside the transmission cooler tube support bracket and the starter wiring harness support bracket.

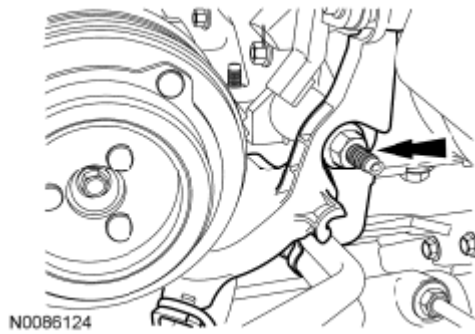


Fig. 57: Locating Support Bracket Nut
Courtesy of FORD MOTOR CO.

10. Disconnect the Crankshaft Position (CKP) sensor electrical connector.
11. Remove the nut and position aside the Power Steering Pressure (PSP) hose support bracket.

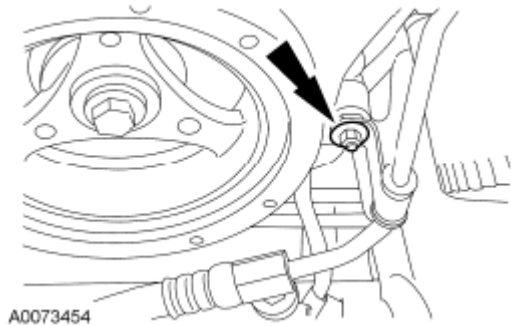
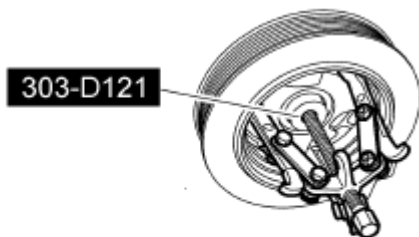


Fig. 58: Identifying Power Steering Pressure Hose Support Bracket Nut
Courtesy of FORD MOTOR CO.

12. Remove the crankshaft pulley bolt and washer.
 - Discard the crankshaft pulley bolt.
13. Remove and discard the crankshaft pulley bolt. Using the 3 Jaw Puller, remove the crankshaft pulley.



N0010528

Fig. 59: Removing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

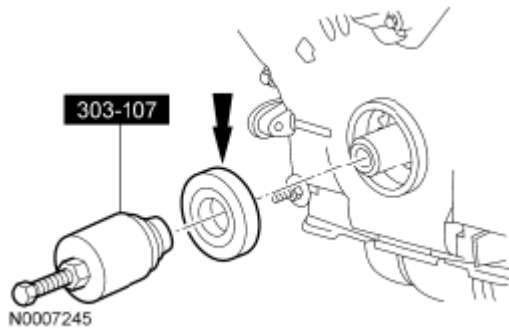


Fig. 60: Removing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

15. Remove the 3 bolts and the 3 accessory drive idler pulleys.
16. Remove the 3 bolts and the accessory drive belt tensioner.
17. If equipped, remove the 4 bolts and the skid plate.
18. Remove the 4 front oil pan bolts.
19. Disconnect the wiring harness retainer from the power steering pump stud bolt.

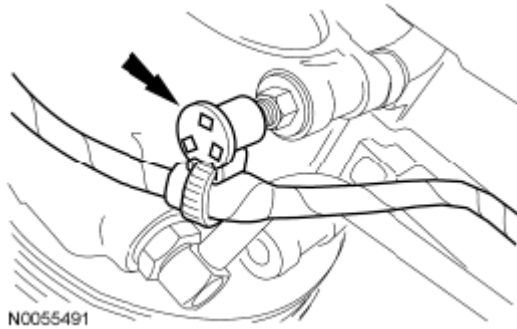


Fig. 61: Locating Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

20. Remove the stud bolt, the 2 bolts, and position aside the power steering pump.

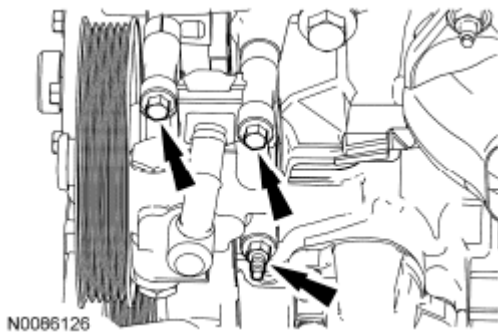


Fig. 62: Locating Power Steering Pump Stud Bolts
Courtesy of FORD MOTOR CO.

21. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.
22. Remove the nut and position the RH radio ignition interference capacitor aside.
23. Disconnect the LH CMP sensor electrical connector.
24. Remove the nut and position the LH radio ignition interference capacitor aside.
25. Remove the 10 bolts and the 5 studs.

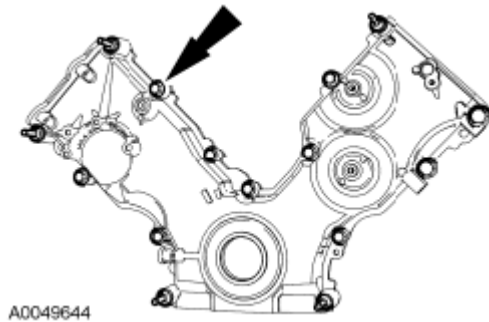


Fig. 63: Identifying Engine Front Cover Bolts And Studs
Courtesy of FORD MOTOR CO.

26. Remove the engine front cover from the front cover-to-cylinder block dowel.
 - Remove the engine front cover gaskets.

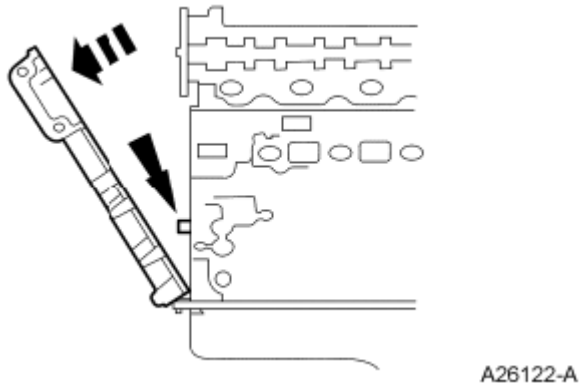


Fig. 64: Removing Engine Front Cover
Courtesy of FORD MOTOR CO.

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.

27.

Clean the mating surfaces with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

- Inspect the mating surfaces.

Installation

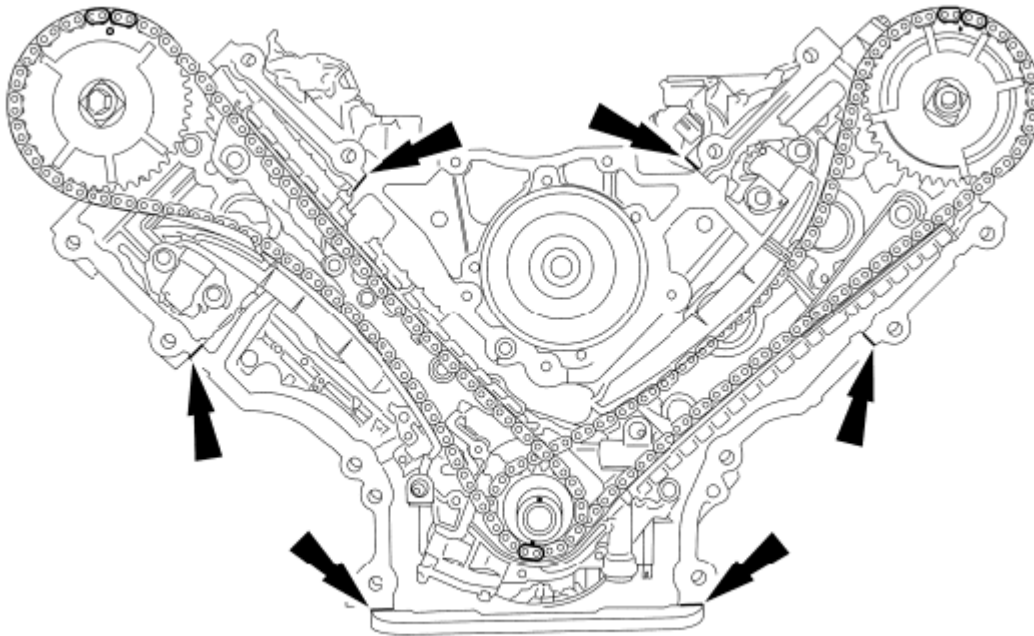
NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

1.

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

NOTE: Make sure that the engine front cover gasket is in place on the engine front cover before installation.

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.



A0080776

Fig. 65: Locating Silicone Sealant Application Areas
Courtesy of FORD MOTOR CO.

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.

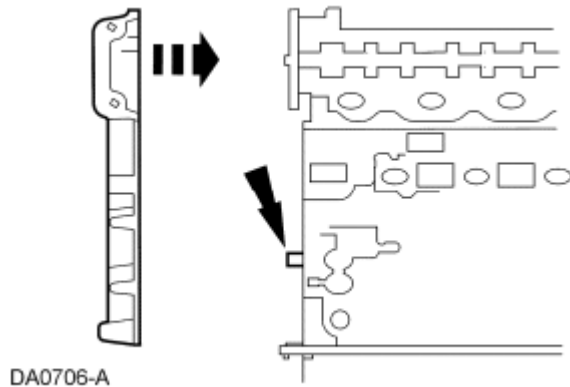


Fig. 66: Installing Engine Front Cover
Courtesy of FORD MOTOR CO.

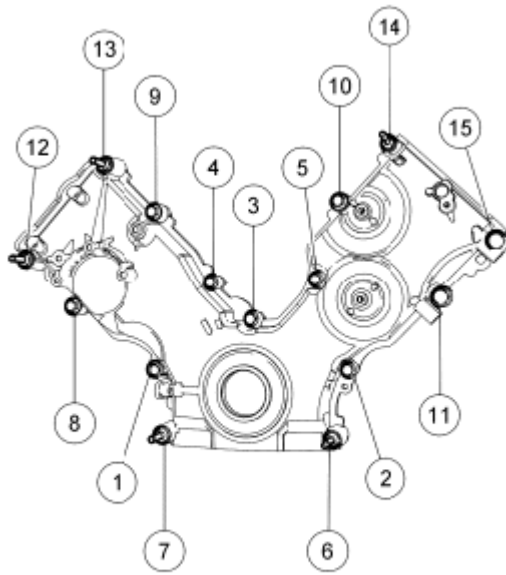
3. Tighten the 15 engine front cover fasteners in the sequence shown in illustration in 2 stages.

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).

PART DESCRIPTION CHART

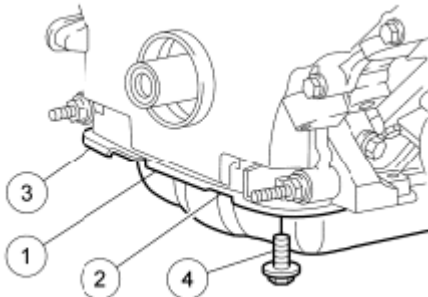
Item	Part Number	Description
1	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
2	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
3	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
4	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
5	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
6	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	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
12	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
13	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
14	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
15	W706605	Bolt, Hex Head Pilot, M8 x 1.25 x 56



N0010206

Fig. 67: Identifying Engine Front Cover Fasteners Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Loosely install the 4 oil pan bolts, then tighten 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.



N0008507

Fig. 68: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

5. Connect the **CKP** sensor electrical connector.
6. Position the starter wiring harness support bracket and the transmission cooler tube support bracket and tighten the nut.
 - Tighten to 10 Nm (89 lb-in).

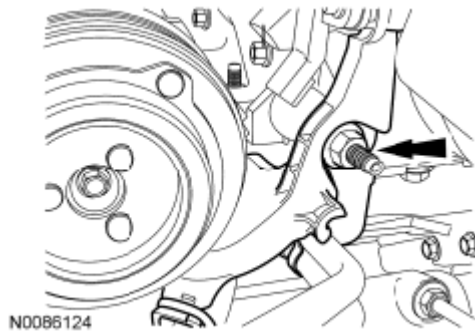


Fig. 69: Locating Support Bracket Nut
Courtesy of FORD MOTOR CO.

7. Position the starter wiring harness and starter wiring harness rear support bracket and install the bolt.
 - Tighten to 10 Nm (89 lb-in).

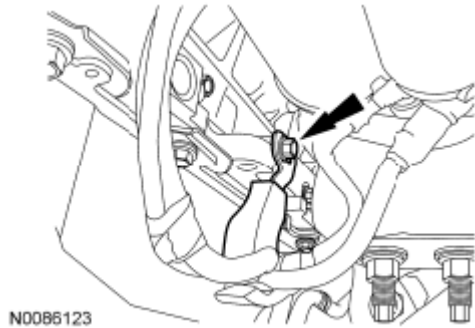


Fig. 70: Locating Starter Wiring Harness Rear Support Bracket Bolt
Courtesy of FORD MOTOR CO.

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

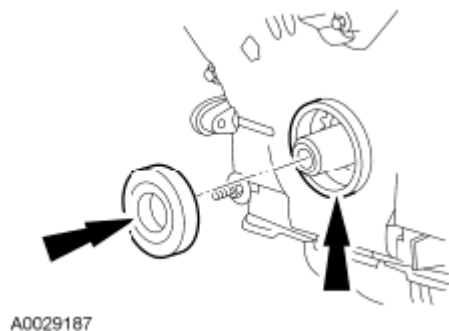


Fig. 71: Locating Engine Front Cover And Crankshaft Seal Inner Lip
Courtesy of FORD MOTOR CO.

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

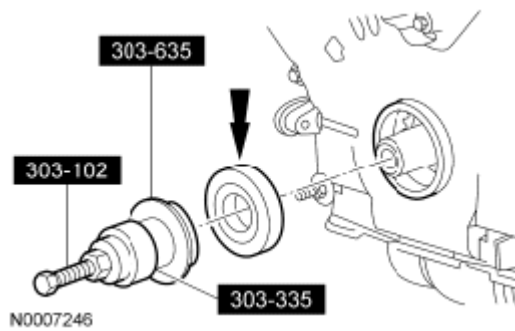


Fig. 72: Installing Crankshaft Front Seal Into Engine Front Cover
Courtesy of FORD MOTOR CO.

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.

10.

Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.

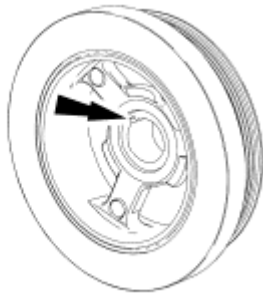


Fig. 73: Identifying Woodruff Key Slot In Crankshaft Pulley
Courtesy of FORD MOTOR CO.

11. Use the Crankshaft Vibration Damper Installer to install the crankshaft pulley.

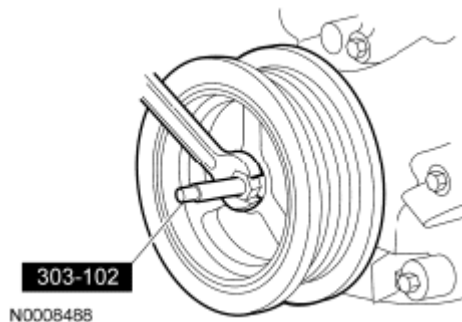


Fig. 74: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

12. 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.

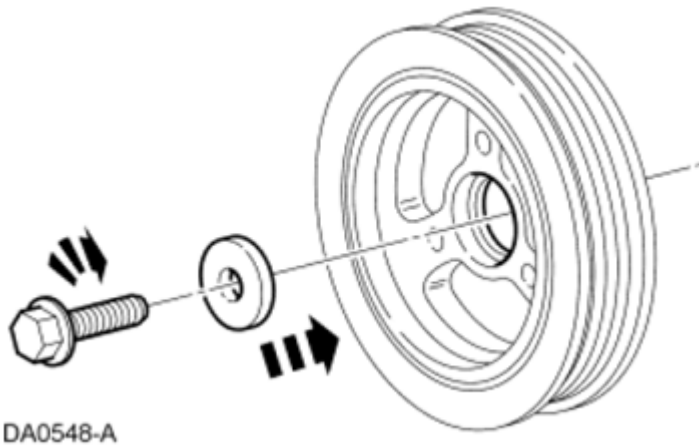


Fig. 75: Tightening Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

13. Install the accessory drive belt tensioner and the 3 bolts.

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

14. Install the 3 accessory drive idler pulleys and the 3 bolts.

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

15. Position the coolant pump pulley and install the 4 bolts finger-tight.

16. If equipped, install the skid plate and the 4 bolts.

- Tighten to 48 Nm (35 lb-ft).

17. Position the power steering pump and install the stud bolt and the 2 bolts.

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

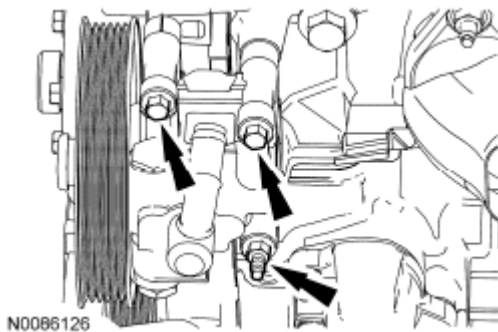


Fig. 76: Locating Power Steering Pump Stud Bolts
Courtesy of FORD MOTOR CO.

18. Attach the engine wiring harness to the power steering pump stud bolt.

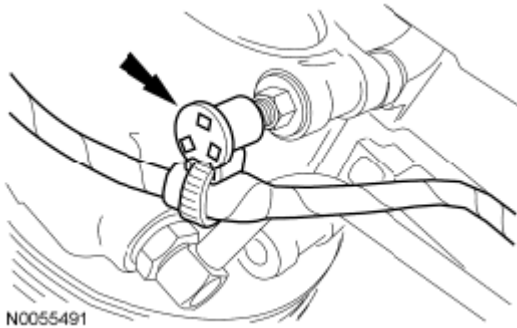


Fig. 77: Locating Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

19. Position the **PSP** hose support bracket and install the nut.
- Tighten to 10 Nm (89 lb-in).

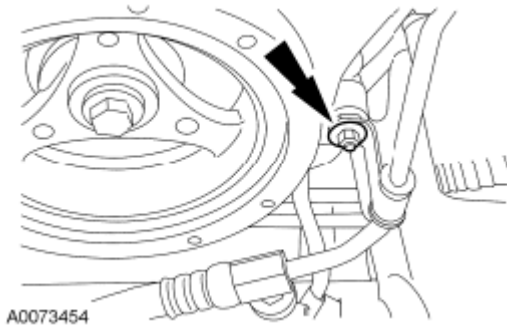


Fig. 78: Locating PSP Hose Support Bracket Nut
Courtesy of FORD MOTOR CO.

20. Connect the RH **CMP** sensor electrical connector.
21. Install the LH radio ignition interference capacitor and the nut.
- Tighten to 25 Nm (18 lb-ft).
22. Connect the LH **CMP** sensor electrical connector.
23. Install the RH radio ignition interference capacitor and the nut.
- Tighten to 25 Nm (18 lb-ft).
24. Rotate the tensioner clockwise and install the accessory drive belt.

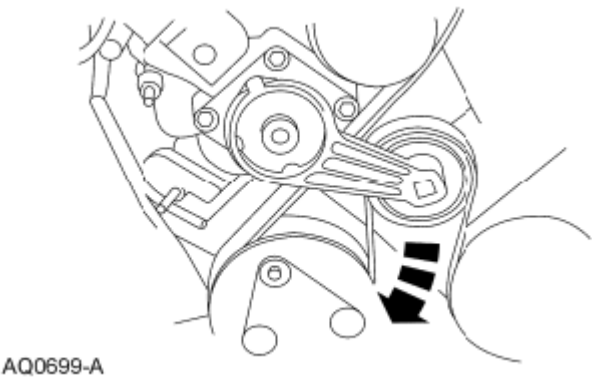


Fig. 79: Installing Accessory Drive Belt
Courtesy of FORD MOTOR CO.

- 25. Tighten the 4 coolant pump pulley bolts.
 - Tighten to 25 Nm (18 lb-ft).
- 26. Install the LH valve cover. For additional information, refer to **VALVE COVER - LH**.
- 27. Install the RH valve cover. For additional information, refer to **VALVE COVER - RH**.
- 28. Fill the crankcase with clean engine oil.
- 29. Using the scan tool, perform the Misfire Monitor Neutral Profile Correction procedure, following the on-screen instructions.

TIMING DRIVE COMPONENTS

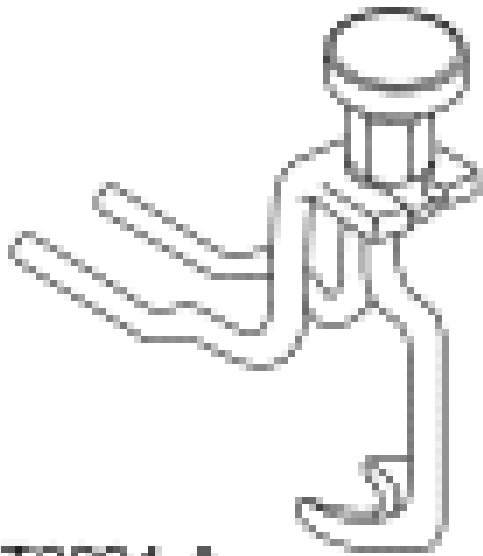
Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

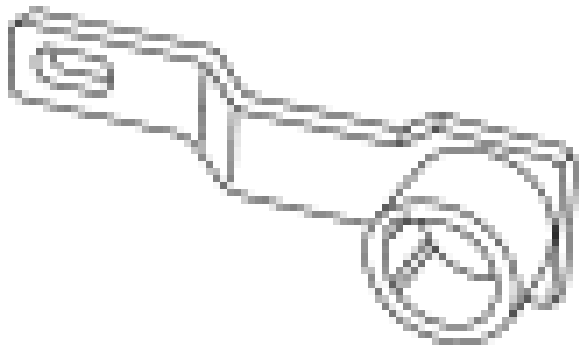
	Compressor, Valve Spring 303-1039
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2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2804-A

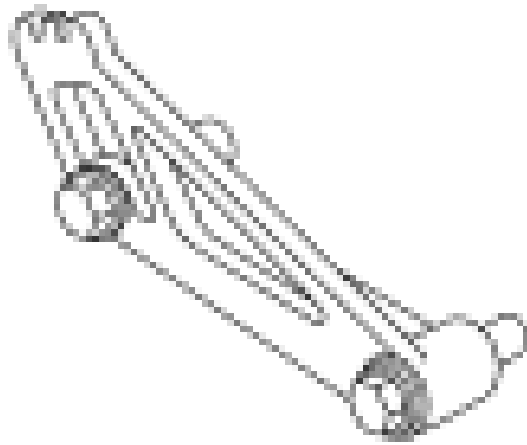


ST1335-A

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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



Locking Tool, Cam Phaser
303-1046

General Equipment

GENERAL EQUIPMENT

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

Material

MATERIAL 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.

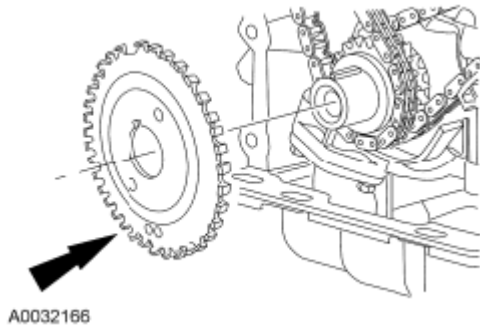


Fig. 80: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

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

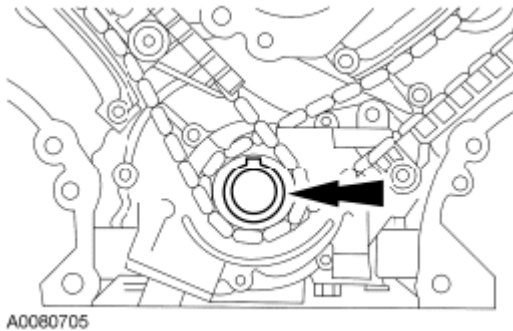


Fig. 81: Locating Crankshaft Keyway
Courtesy of FORD MOTOR CO.

- 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.
- 4.

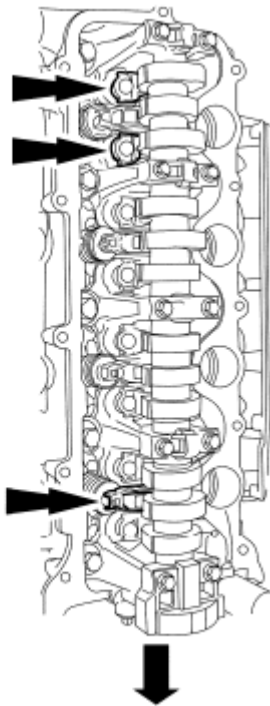
The No. 1 cylinder camshaft exhaust lobe must be coming up on the exhaust stroke. Verify by noting the position of the 2 intake camshaft lobes and the exhaust lobe on the No. 1 cylinder.



Fig. 82: Identifying Camshaft Lobes Position
Courtesy of FORD MOTOR CO.

- NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Mark the components for installation into their original locations. Failure to follow these instructions may result in engine damage.
- 5.

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



A0083248

Fig. 83: Locating Camshaft Roller Followers Position
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.
- 6.
- NOTE:** It may be necessary to push the valve down while compressing the spring.

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



Fig. 84: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

7.

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

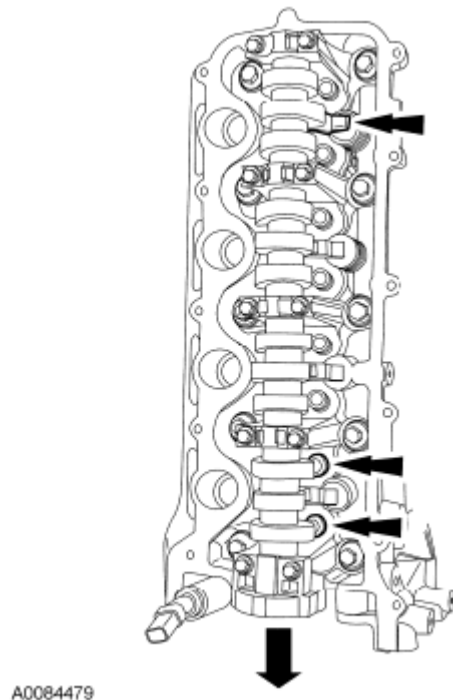


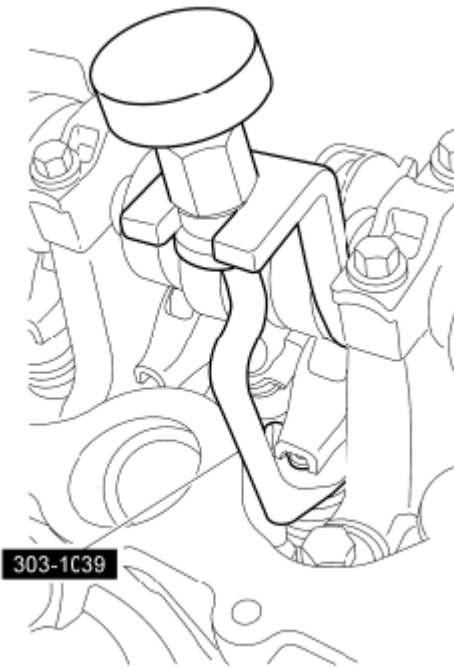
Fig. 85: Locating Camshaft Roller Followers Position
Courtesy of FORD MOTOR CO.

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.

8.

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

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



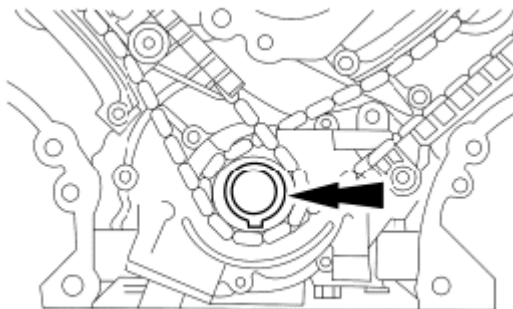
N0010191

Fig. 86: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

9.

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



N0006305

Fig. 87: Locating Crankshaft Keyway
Courtesy of FORD MOTOR CO.

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.

10.

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

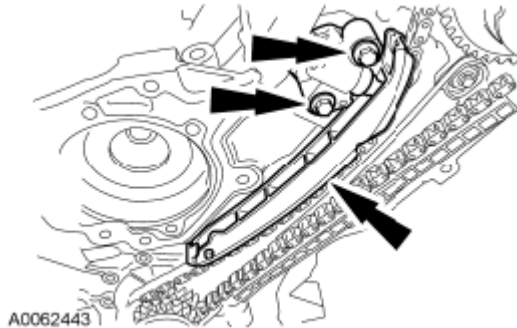


Fig. 88: Identifying LH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

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.

11.

Remove the 2 bolts, the RH timing chain tensioner and tensioner arm.

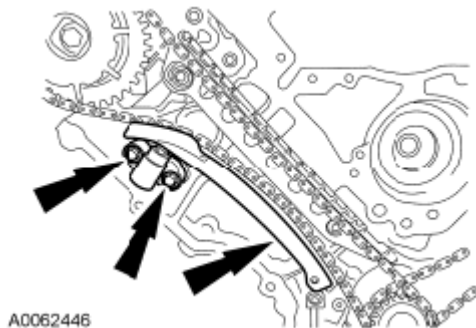


Fig. 89: Locating RH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

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.

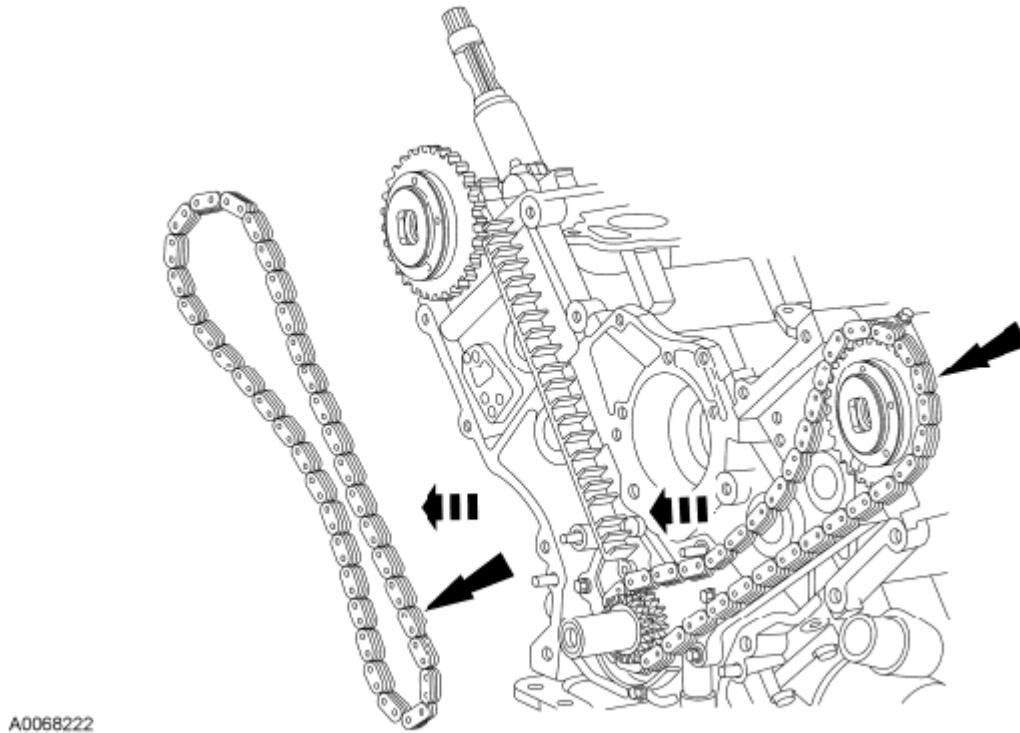


Fig. 90: Removing RH And LH Timing Chains And Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

13. **NOTE:** RH shown in illustration, LH similar.

Remove the LH and RH timing chain guides.

- Remove the 4 bolts.
- Remove both timing chain guides.

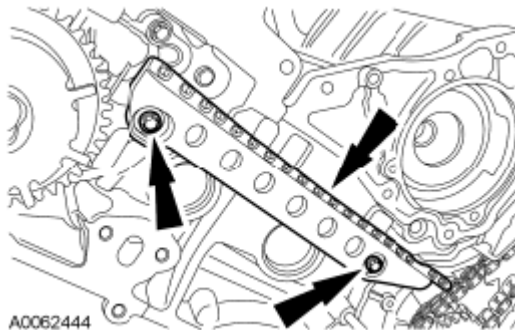


Fig. 91: Locating LH And RH Timing Chain Guides
Courtesy of FORD MOTOR CO.

14. **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.

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

- Discard the camshaft phaser and sprocket bolt.

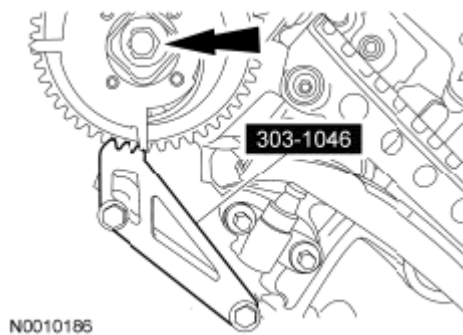


Fig. 92: Locating RH Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

15. **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.

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

- Discard the camshaft phaser and sprocket bolt.

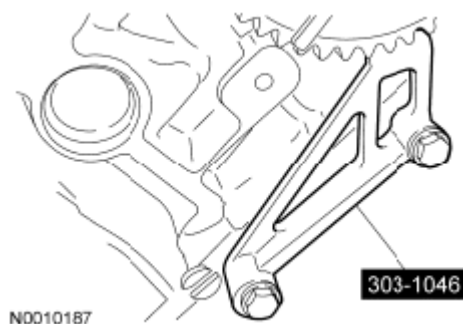
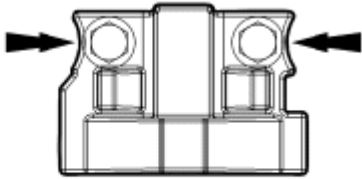


Fig. 93: Identifying Cam Phaser Locking Tool (303-1046)

Courtesy of FORD MOTOR CO.

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

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



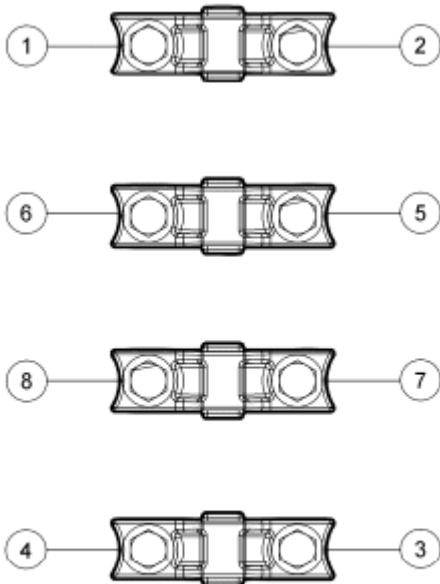
N0070049

Fig. 94: Locating RH Camshaft Front Bearing Cap Bolts

Courtesy of FORD MOTOR CO.

17. **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.

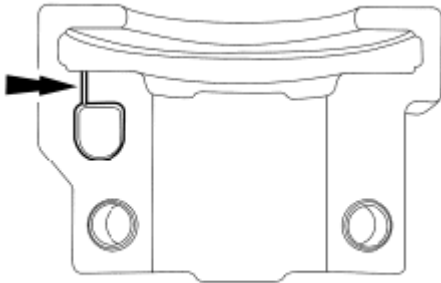
Remove the remaining bolts in the sequence shown in illustration and remove the remaining RH camshaft bearing caps.



N0091483

Fig. 95: Identifying RH Camshaft Bearing Caps Bolts Removal Sequence
Courtesy of FORD MOTOR CO.

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.

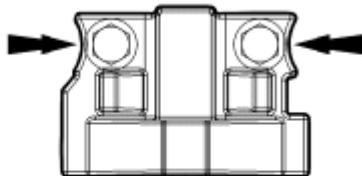


N0010448

Fig. 96: Locating RH Camshaft Bearing Cap Inspection Area
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.

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

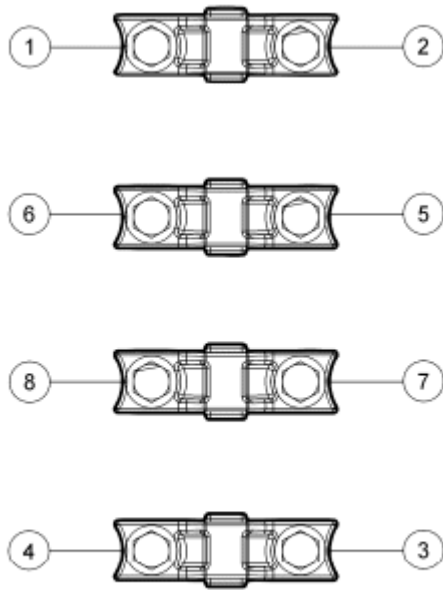


N0070049

Fig. 97: Locating RH Camshaft Front Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

- 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.
- 21.

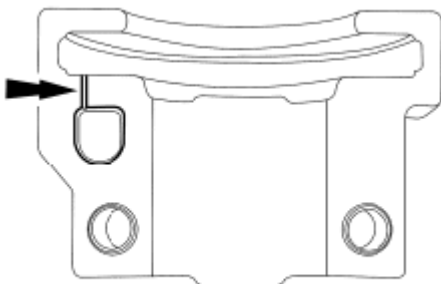
Remove the remaining bolts in the sequence shown in illustration and remove the remaining LH camshaft bearing caps.



N0091483

Fig. 98: Identifying LH Camshaft Bearing Caps Removal Sequence
Courtesy of FORD MOTOR CO.

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. 99: Locating LH Camshaft Bearing Cap Inspection Area
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 the original locations.
24. Failure to follow these instructions may result in engine damage.

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.

2. **NOTE:** **LH shown in illustration, RH similar.**

Install the LH and RH camshaft bearing caps in their original locations.

- Lubricate the camshaft bearing caps with clean engine oil.
- Position the 2 front camshaft bearing caps.
- Position the 8 remaining camshaft bearing caps.
- Install the 20 bolts loosely.
- Tighten to 10 Nm (89 lb-in) in the sequence shown in illustration.

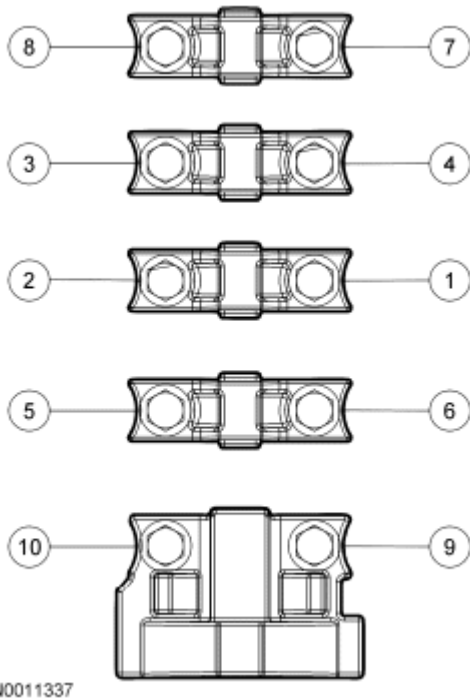


Fig. 100: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

3. **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.**

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

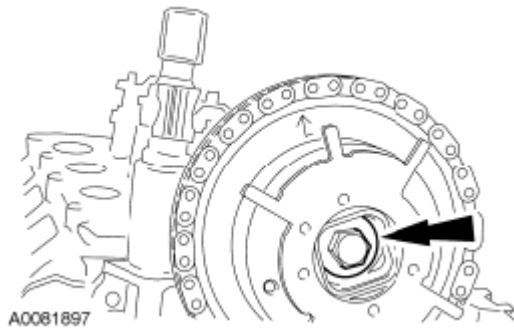


Fig. 101: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

4. **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.

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.

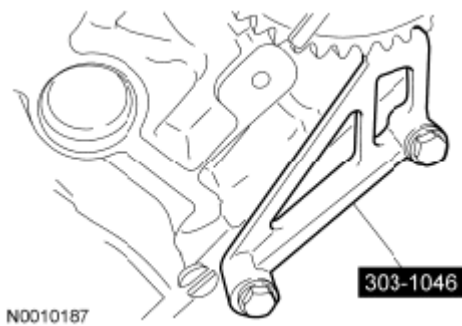


Fig. 102: Identifying Cam Phaser Locking Tool (303-1046)
Courtesy of FORD MOTOR CO.

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

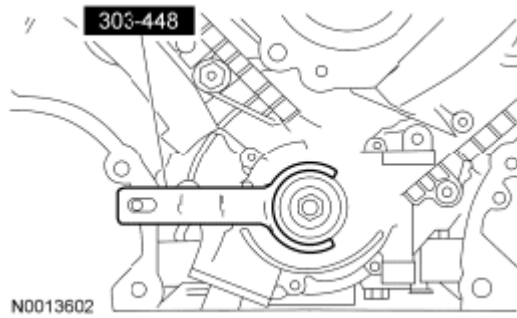


Fig. 103: Positioning Crankshaft With Crankshaft Holding Tool
Courtesy of FORD MOTOR CO.

6. **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.

Compress the tensioner plunger, using a vise.

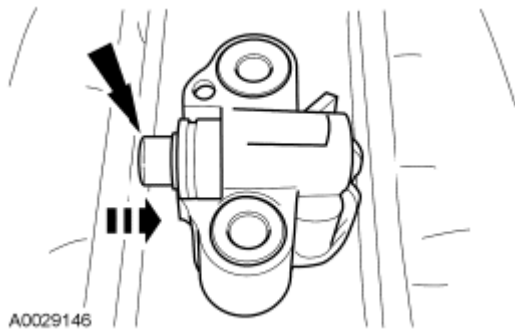


Fig. 104: Compressing Tensioner Plunger
Courtesy of FORD MOTOR CO.

7. Install a retaining clip on the tensioner to hold the plunger in during installation.

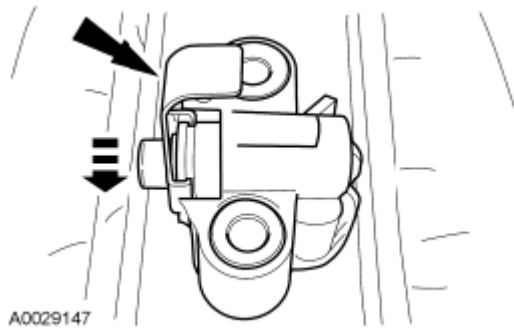


Fig. 105: Installing Retaining Clip On Tensioner
Courtesy of FORD MOTOR CO.

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.

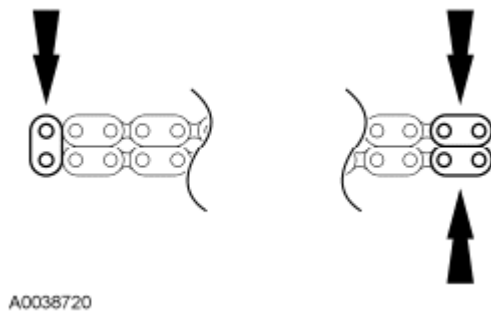


Fig. 106: Identifying Copper Link Timing Marks
Courtesy of FORD MOTOR CO.

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

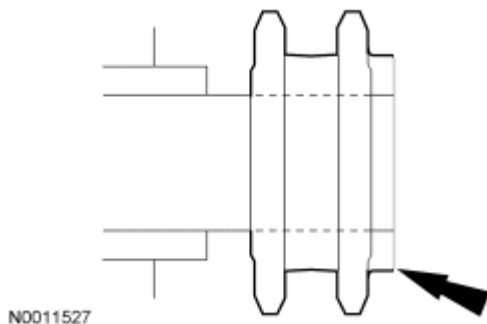
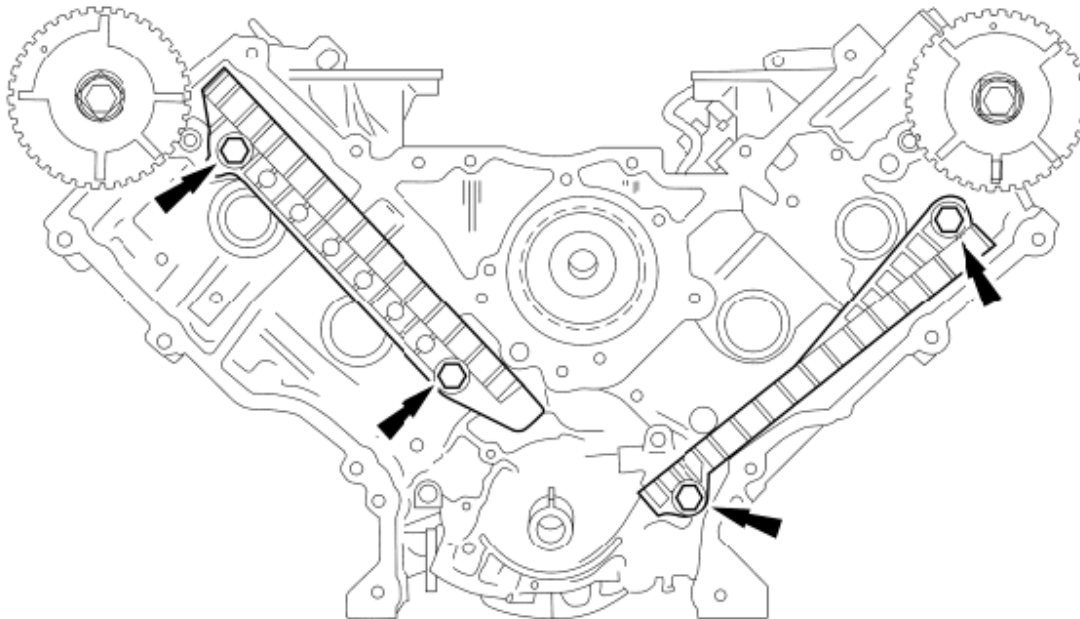


Fig. 107: Locating Crankshaft Sprocket Position
Courtesy of FORD MOTOR CO.

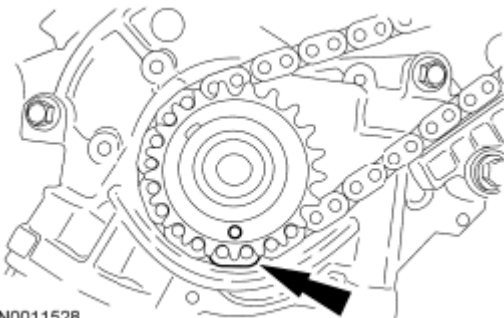
11. Install the 4 bolts and the LH and RH timing chain guides.
 - Tighten to 10 Nm (89 lb-in).



N0006303

Fig. 108: Locating Timing Chain Guides Bolts
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. 109: 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.

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

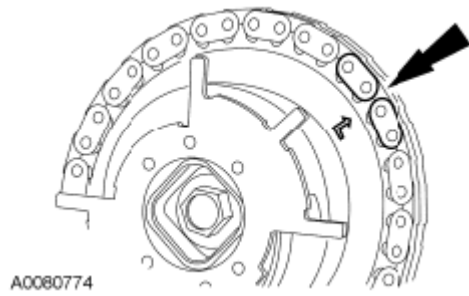


Fig. 110: Identifying Timing Mark On Timing Chain
 Courtesy of FORD MOTOR CO.

- 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).

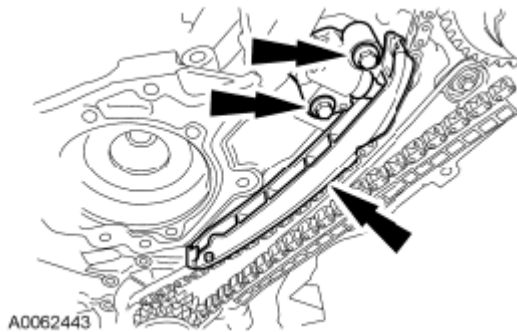


Fig. 111: Identifying LH Timing Chain Tensioner And Tensioner Arm Bolts
 Courtesy of FORD MOTOR CO.

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

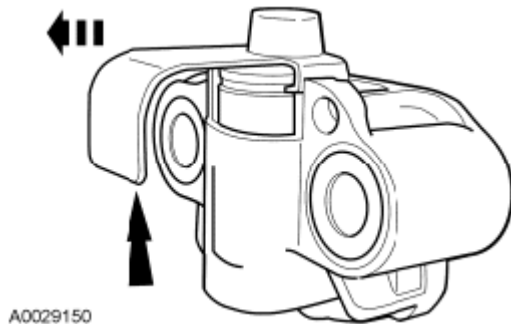


Fig. 112: Removing Retaining Clip From LH Timing Chain Tensioner
 Courtesy of FORD MOTOR CO.

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.

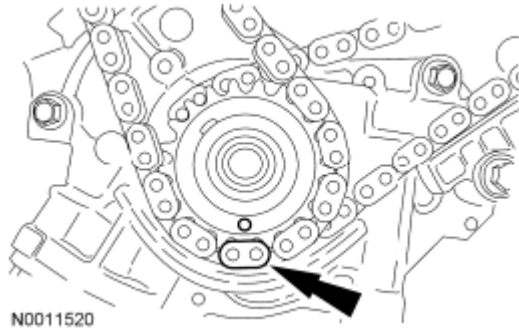


Fig. 113: Aligning Sprocket Timing Mark And Chain Link
Courtesy of FORD MOTOR CO.

17. **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.

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.

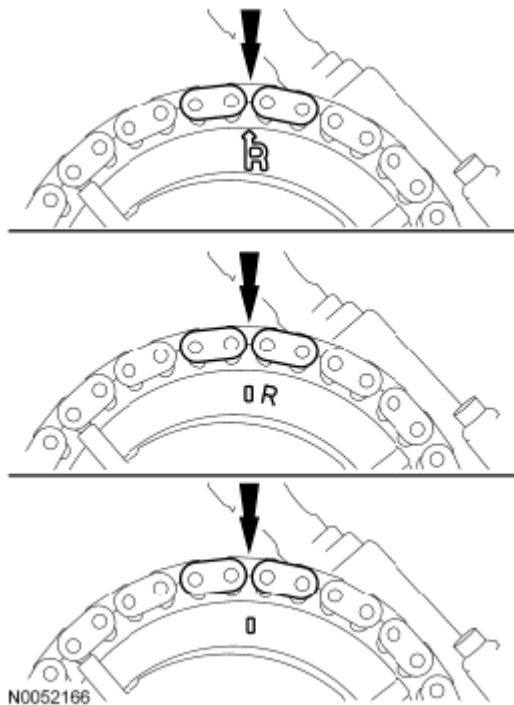


Fig. 114: Identifying Timing Chain Timing Marks

Courtesy of FORD MOTOR CO.

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).

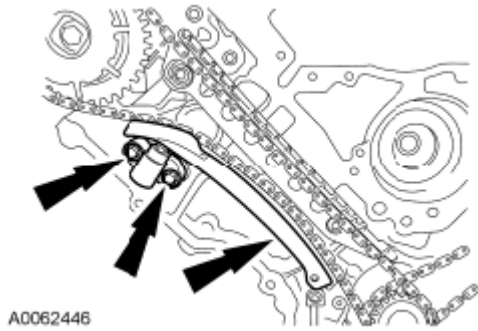


Fig. 115: Locating RH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

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

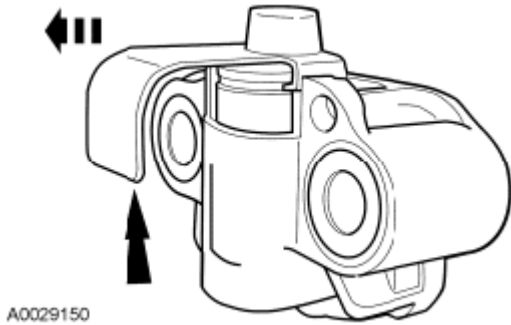
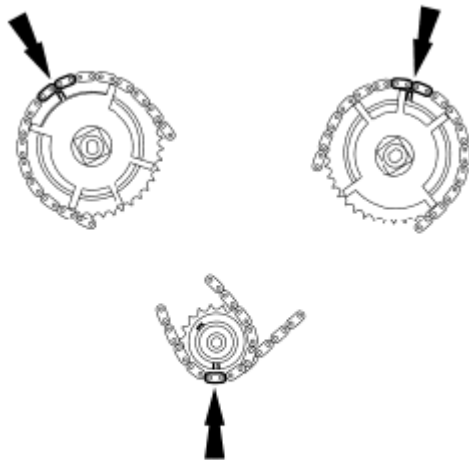


Fig. 116: Removing Retaining Clip From RH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

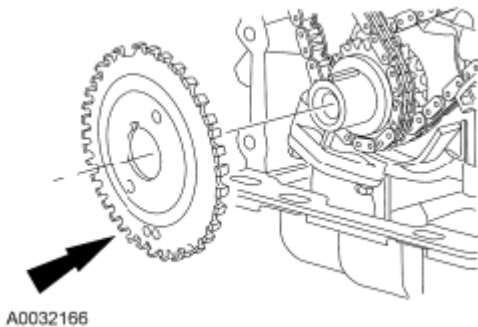
20. As a post-check, verify correct alignment of all timing marks.



N0092582

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

21. Install the crankshaft sensor ring on the crankshaft.



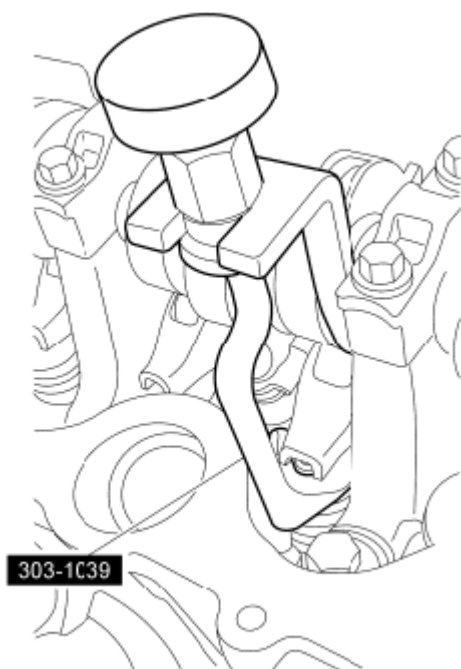
A0032166

Fig. 118: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

22.
 - NOTE:** If the components are to be reinstalled, they must be installed into their original locations. Failure to follow this instruction 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.

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

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



N0010191

Fig. 119: Identifying Valve Spring Compressor
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.

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

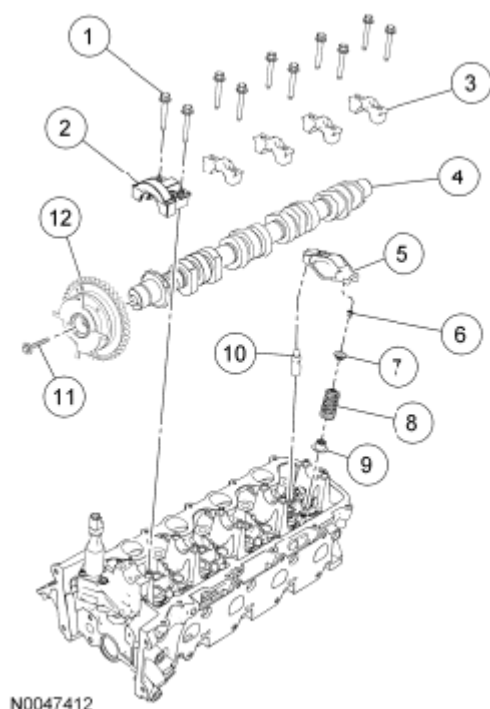


Fig. 120: Identifying Valve Train Components
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

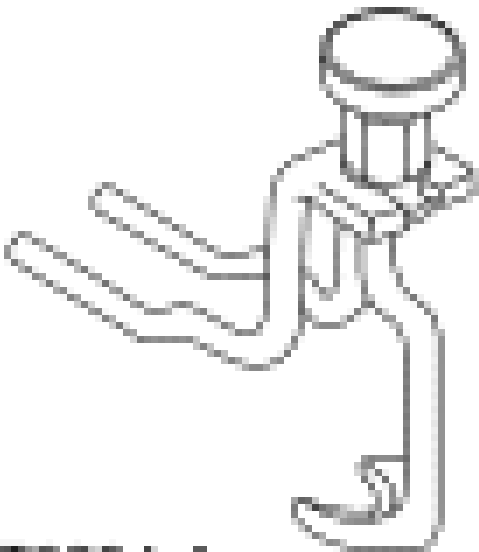

Item	Part Number	Description
1	N807834	Camshaft bearing cap bolt (10 required)
2	6B284	Camshaft front bearing cap
3	6B280	Camshaft bearing cap (4 required)
4	6C255	Camshaft
5	6529	Camshaft roller follower (12 required)
6	6518	Valve spring retainer key (24 required)
7	6514	Valve spring retainer (12 required)
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(S) SPECIFICATION

 <p>ST2804-A</p>	<p>Compressor, Valve Spring 303-1039</p>
 <p>ST2969-A</p>	<p>Locking Tool, Timing Chain 303-1175</p>

Material

MATERIAL 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.

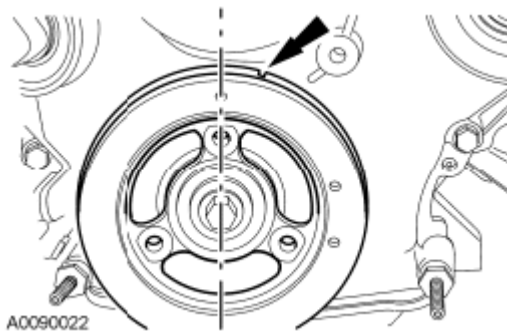


Fig. 121: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

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.

3. **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.

Loosen and back off the LH camshaft phaser and sprocket bolt one full turn.

4. Disconnect the LH Camshaft Position (CMP) sensor electrical connector.

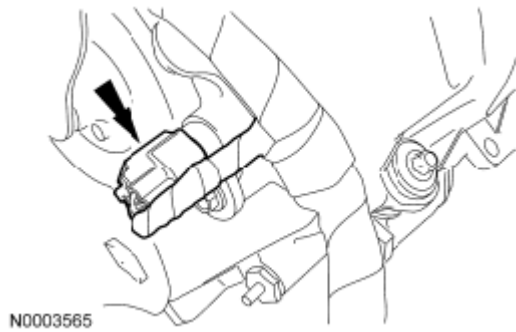


Fig. 122: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the LH CMP sensor.

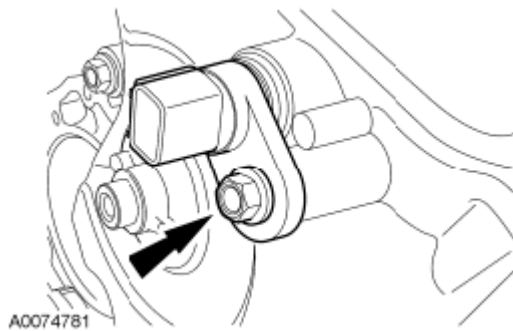


Fig. 123: Locating Bolt And LH CMP Sensor
Courtesy of FORD MOTOR CO.

- 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.
- 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.

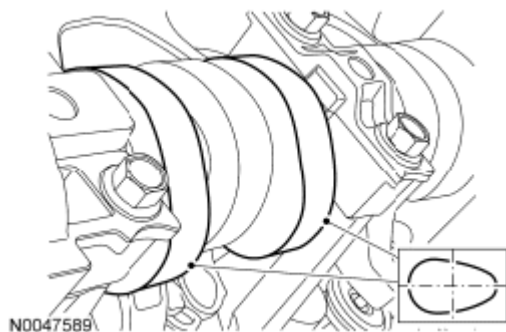


Fig. 124: Identifying Camshaft Lobe Position
Courtesy of FORD MOTOR CO.

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

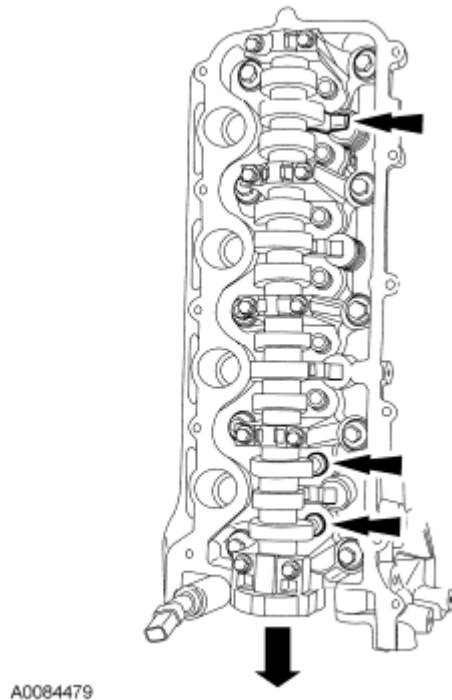


Fig. 125: Locating Camshaft Roller Followers Position
Courtesy of FORD MOTOR CO.

- 8.
- 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.

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

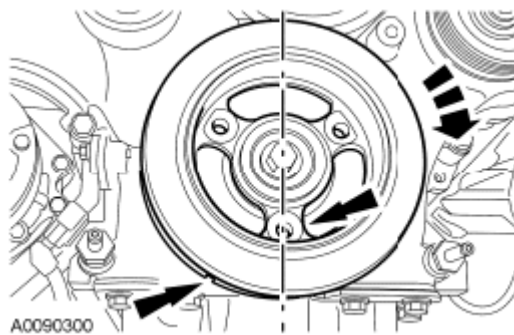


N0010191

Fig. 126: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

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.



A0090300

Fig. 127: Rotating Crankshaft
Courtesy of FORD MOTOR CO.

10. **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.

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

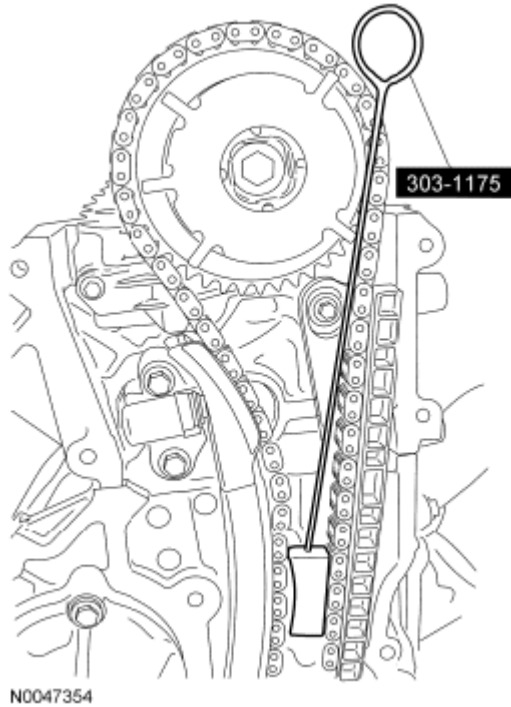


Fig. 128: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

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**.

11.

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.

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

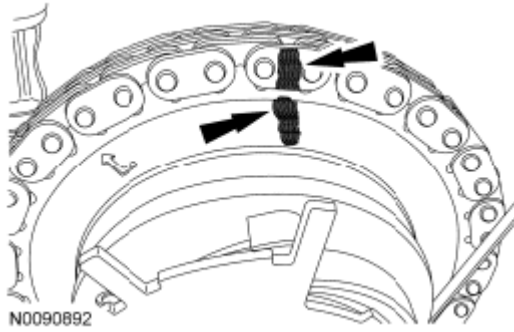
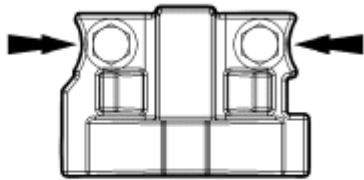


Fig. 129: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

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

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

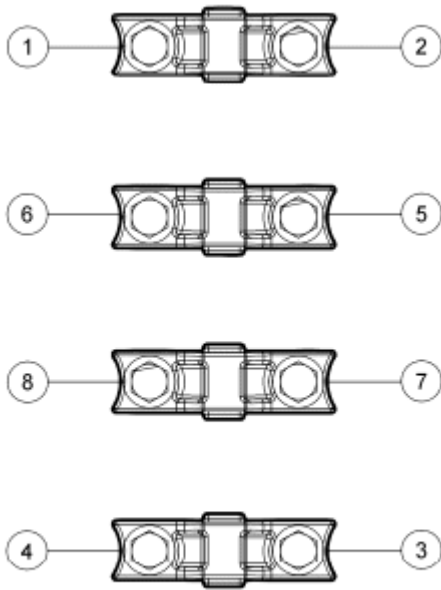


N0070049

Fig. 130: Locating LH Camshaft Front Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

13. **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.

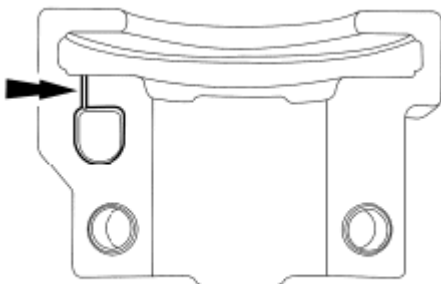
Remove the remaining 8 bolts in the sequence shown in illustration and remove the 4 camshaft bearing caps.



N0091483

Fig. 131: Identifying Camshaft Bearing Caps Bolts Removal Sequence
Courtesy of FORD MOTOR CO.

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. 132: Locating LH Camshaft Bearing Cap Inspection Area
Courtesy of FORD MOTOR CO.

15.

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.

Remove the bolt and the camshaft phaser and sprocket assembly from the camshaft.

- Discard the bolt and washer.

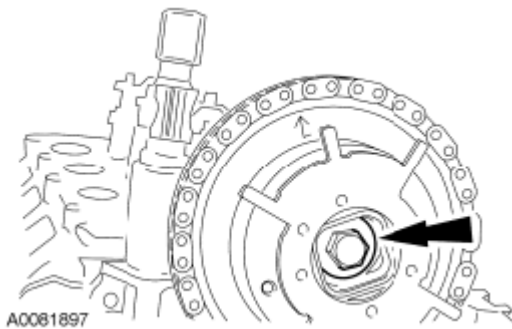


Fig. 133: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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.
- 2.

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.

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

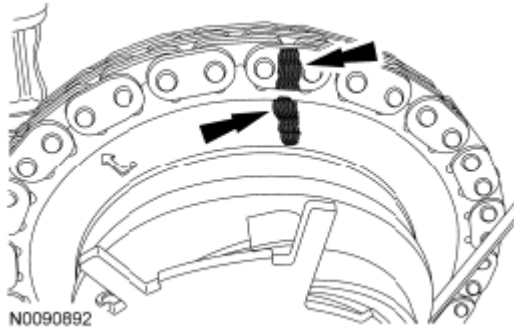


Fig. 134: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

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**.

3.

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.

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

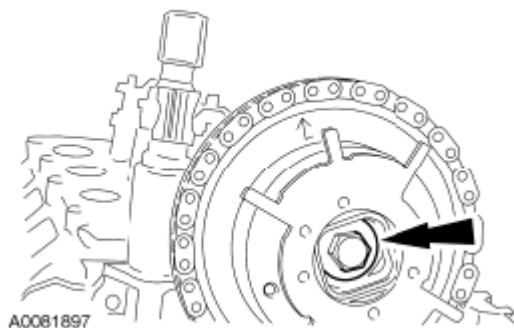


Fig. 135: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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 2 front camshaft bearing cap.
- Position the remaining 8 camshaft bearing caps.
- Install the 10 bolts loosely.

5. Tighten the bolts in the sequence shown in illustration.

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

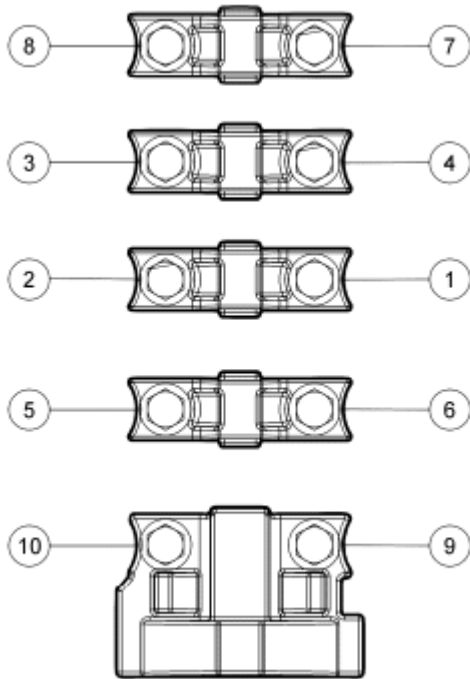


Fig. 136: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

6. **NOTE:** Engine front cover removed for clarity.

Remove the Timing Chain Locking Tool.

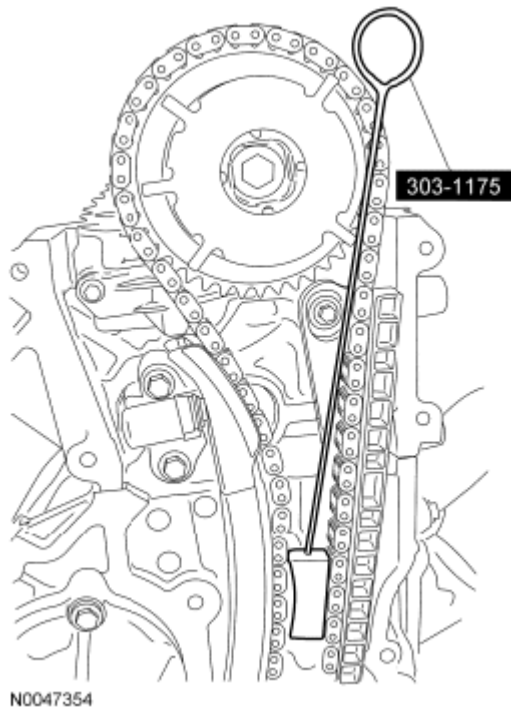


Fig. 137: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

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.

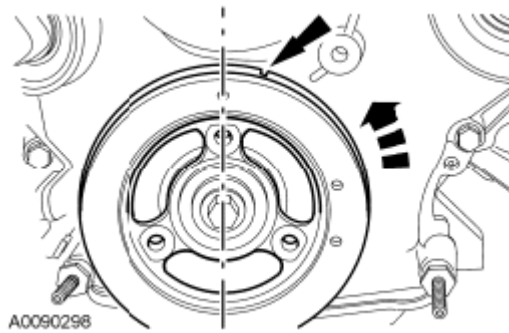


Fig. 138: Rotating Crankshaft
Courtesy of FORD MOTOR CO.

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

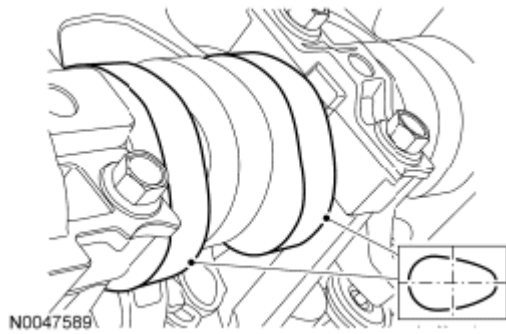


Fig. 139: Identifying Camshaft Position
Courtesy of FORD MOTOR CO.

9. **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.

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



Fig. 140: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

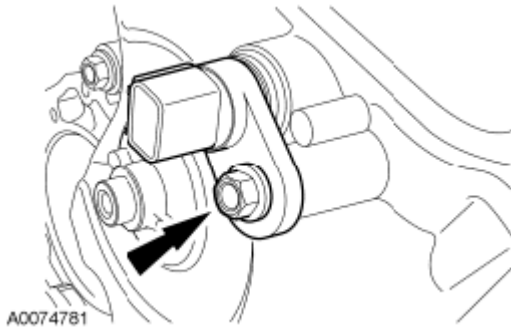


Fig. 141: Locating CMP Sensor
Courtesy of FORD MOTOR CO.

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

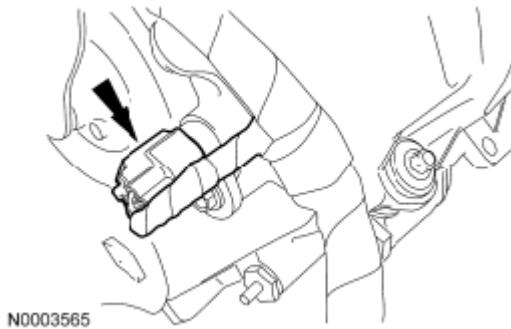


Fig. 142: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

12. **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.

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.

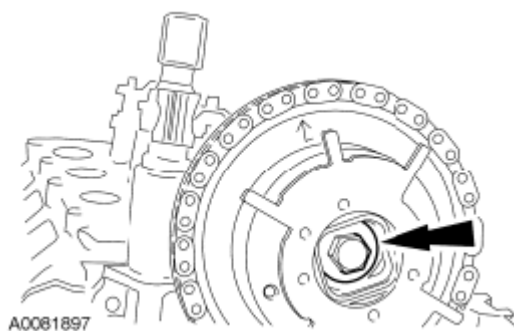


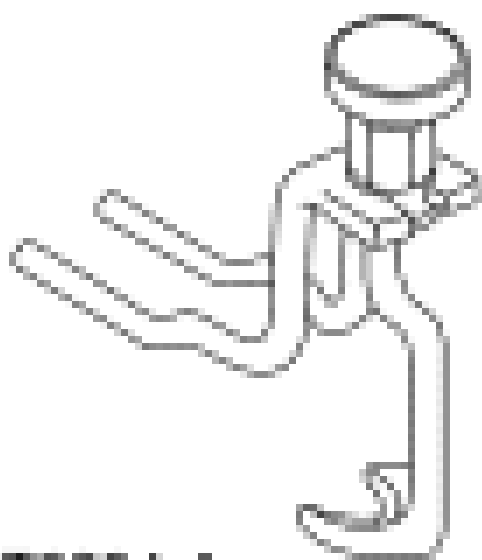
Fig. 143: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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

CAMSHAFT - RH

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

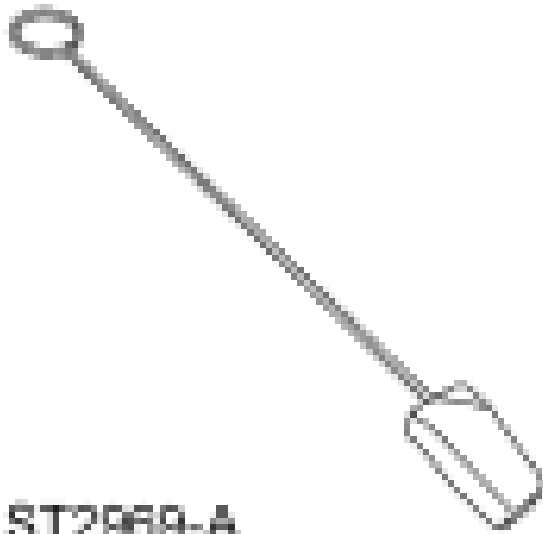


ST2804-A

Compressor, Valve Spring
303-1039

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



Locking Tool, Timing Chain
303-1175

Material

MATERIAL 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.

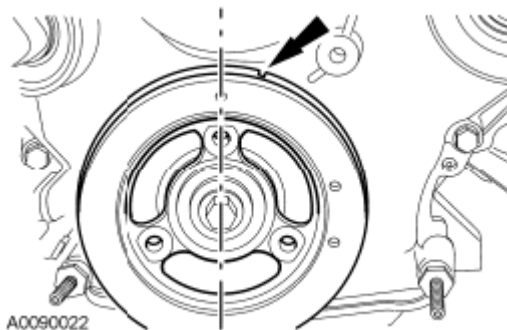


Fig. 144: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

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.

3. **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.

Loosen and backoff the RH camshaft phaser and sprocket bolt one full turn.

4. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.

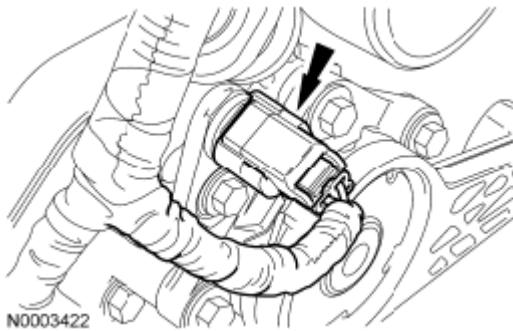


Fig. 145: Locating RH Camshaft Position (CMP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the RH CMP sensor.

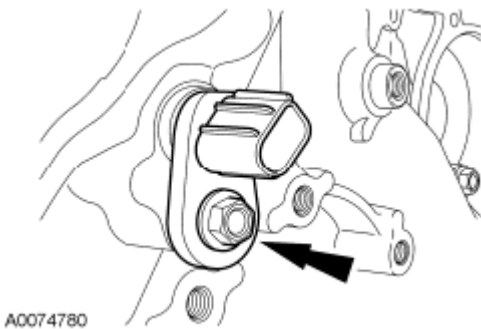


Fig. 146: Locating RH CMP Sensor Bolt
Courtesy of FORD MOTOR CO.

6. **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.

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.



Fig. 147: Identifying Camshaft Lobes Position
Courtesy of FORD MOTOR CO.

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

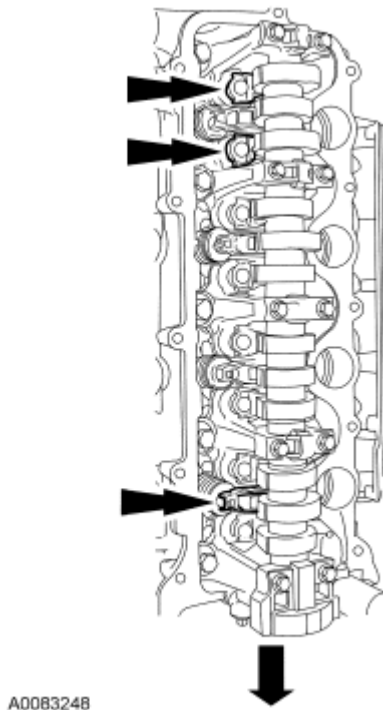


Fig. 148: Locating Camshaft Roller Followers Position
Courtesy of FORD MOTOR CO.

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.

- 8.

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.

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



Fig. 149: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

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.

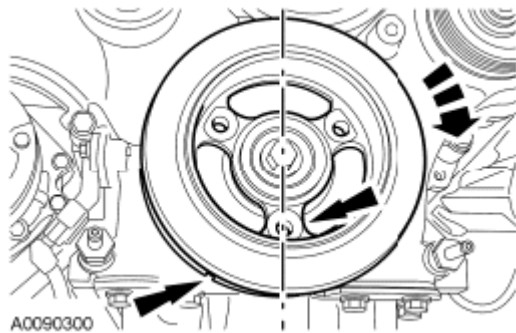


Fig. 150: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

10. **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.

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

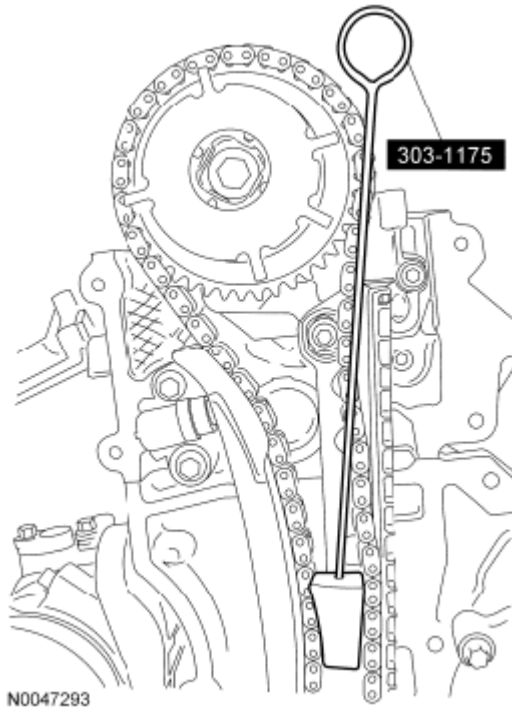


Fig. 151: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

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.

11.

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.

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

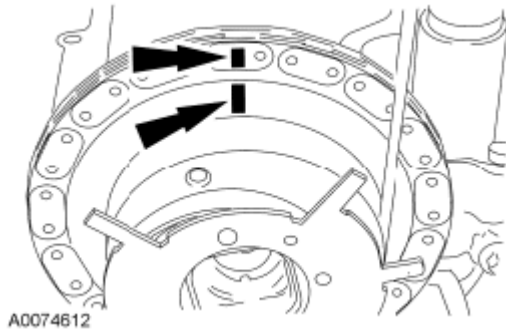


Fig. 152: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

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

Remove the 2 bolts and the front camshaft bearing cap.

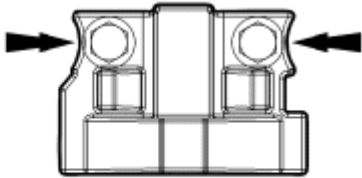
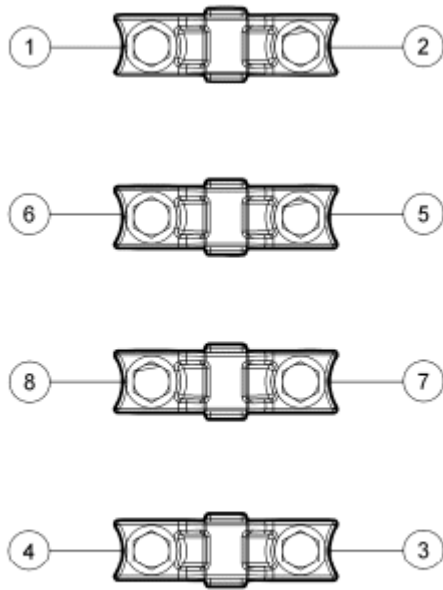


Fig. 153: Locating Front Camshaft Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

13. **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.

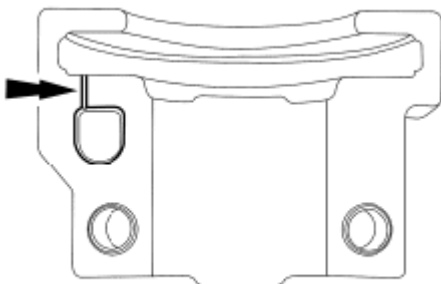
Remove the remaining bolts in the sequence shown in illustration and remove the remaining camshaft bearing caps.



N0091483

Fig. 154: Identifying Camshaft Bearing Caps Bolts Removal Sequence
Courtesy of FORD MOTOR CO.

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. 155: Identifying RH Camshaft Bearing Cap Inspecting Area
Courtesy of FORD MOTOR CO.

15.

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**.

Remove the bolt and the camshaft phaser and sprocket assembly from the camshaft.

- Discard the bolt and washer.

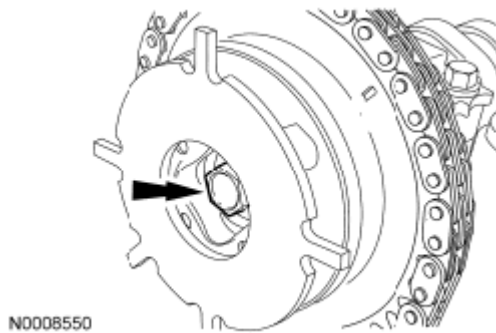


Fig. 156: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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**.
- 2.

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.

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

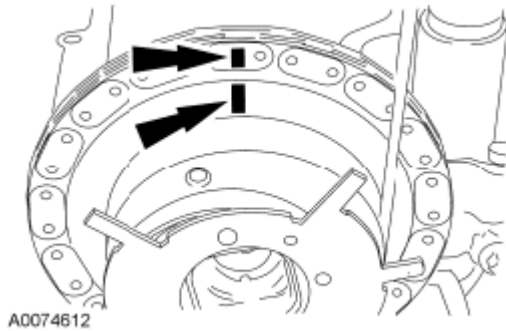


Fig. 157: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

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**.

3.

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.

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

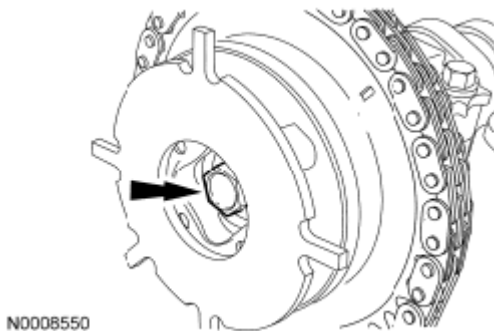


Fig. 158: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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).

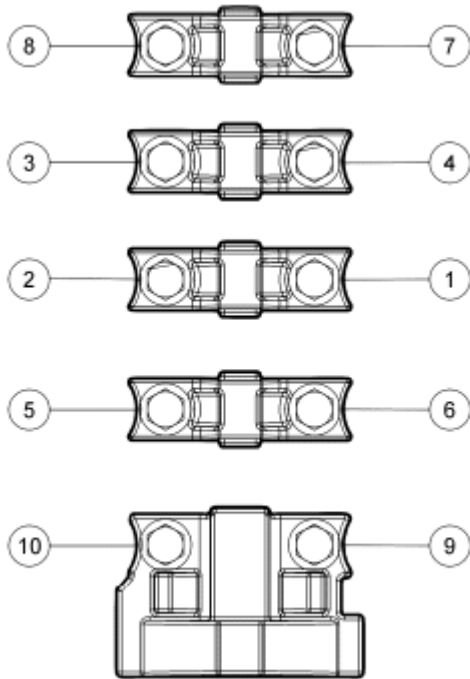


Fig. 159: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

6. **NOTE:** Engine front cover removed for clarity.

Remove the Timing Chain Locking Tool.

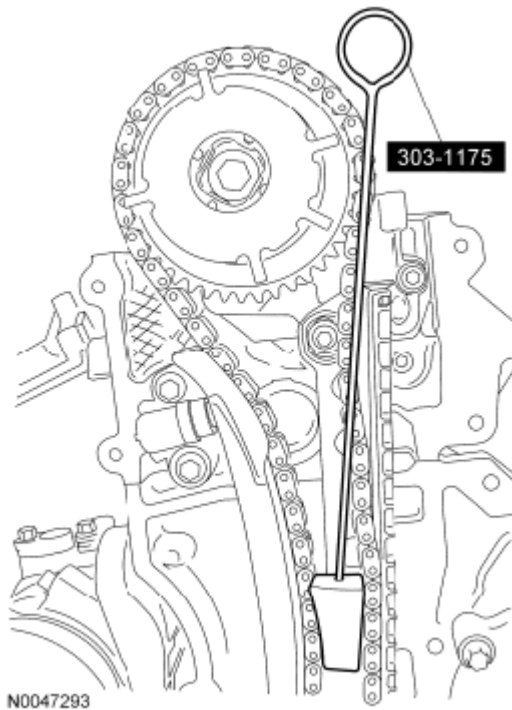


Fig. 160: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

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.

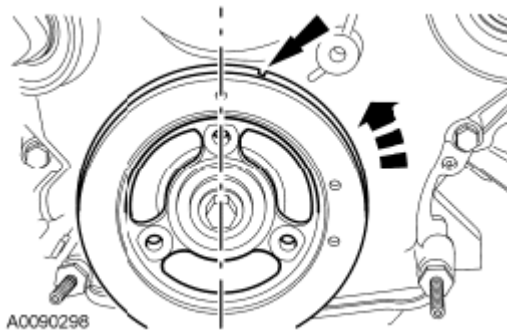


Fig. 161: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

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



Fig. 162: Identifying Camshaft Lobes Position
Courtesy of FORD MOTOR CO.

9. **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.

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



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

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

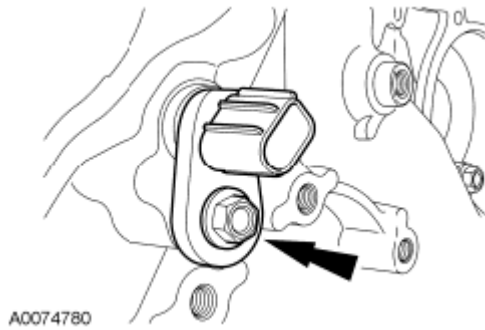


Fig. 164: Locating RH CMP Sensor Bolt
Courtesy of FORD MOTOR CO.

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

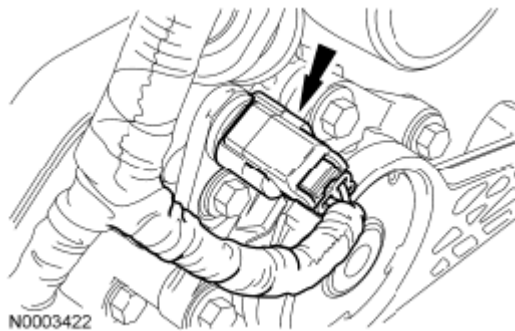


Fig. 165: Locating CMP Electrical Connector
Courtesy of FORD MOTOR CO.

12. **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.

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.

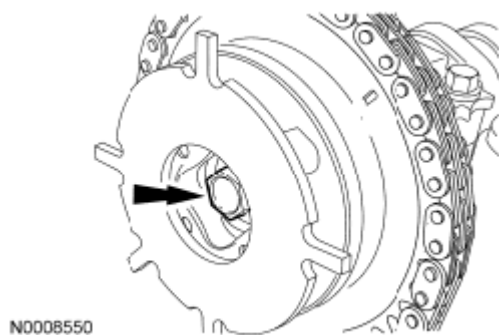


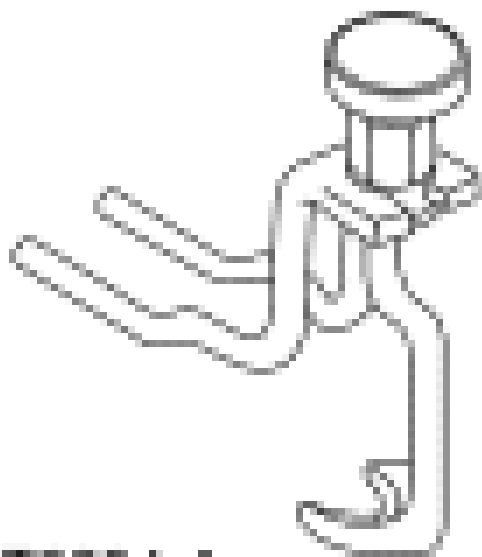
Fig. 166: Locating Camshaft Phaser And Sprocket Assembly Bolt
 Courtesy of FORD MOTOR CO.

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

CAMSHAFT PHASER AND SPROCKET - LH

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION



Compressor, Valve Spring
 303-1039

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



Locking Tool, Timing Chain
303-1175

Material

MATERIAL 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.

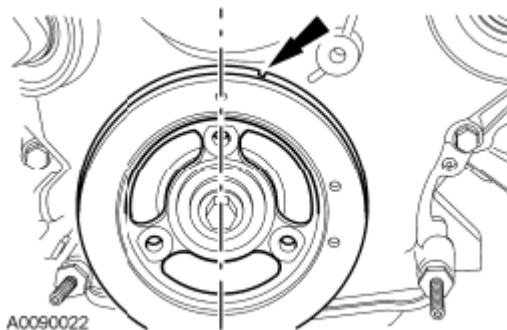


Fig. 167: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

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.

3. **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.

Loosen and back off the LH camshaft phaser and sprocket bolt one full turn.

4. Disconnect the LH Camshaft Position (CMP) sensor electrical connector.

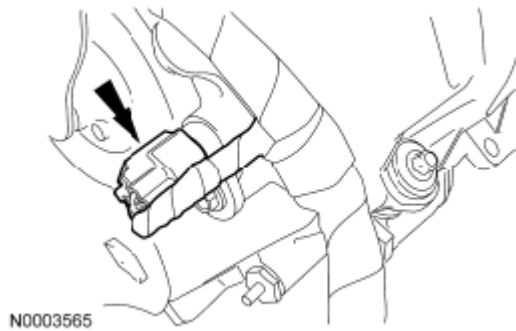


Fig. 168: Locating LH CMP Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the LH CMP sensor.

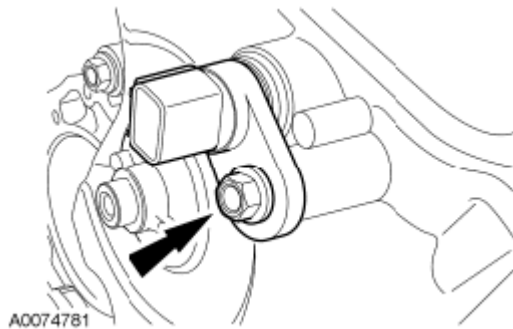


Fig. 169: Locating LH CMP Sensor
Courtesy of FORD MOTOR CO.

6. **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.

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.

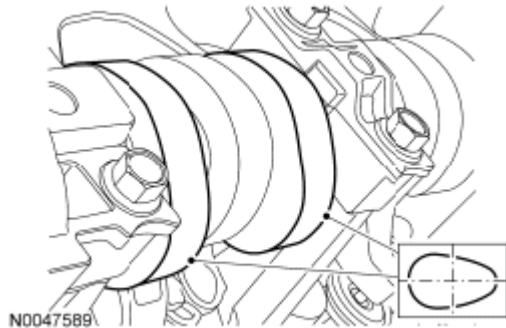


Fig. 170: Identifying Camshaft Position
Courtesy of FORD MOTOR CO.

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

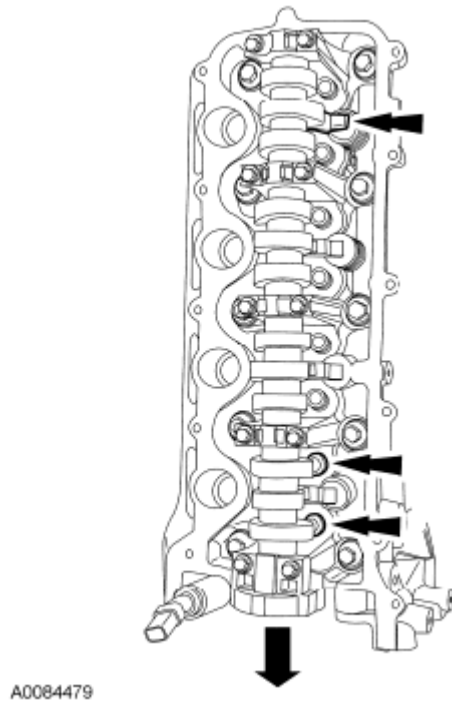


Fig. 171: Locating Camshaft Roller Followers Position
Courtesy of FORD MOTOR CO.

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.

- 8.

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.

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



N0010191

Fig. 172: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

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.

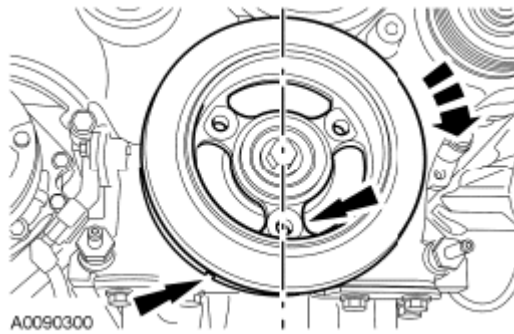


Fig. 173: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

10. **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.

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

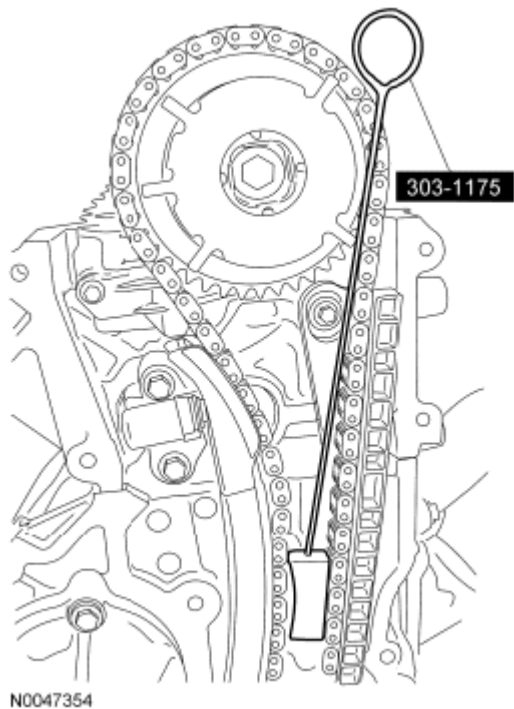


Fig. 174: Identifying Timing Chain Locking Tool In LH Timing Chain
Courtesy of FORD MOTOR CO.

11. **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.

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

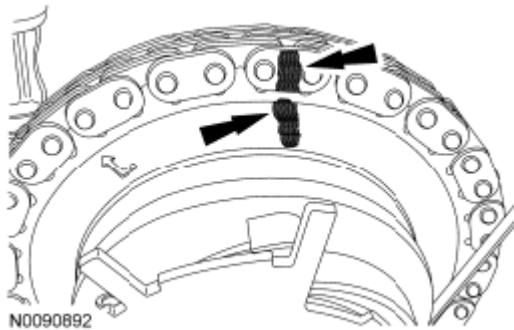


Fig. 175: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

12. **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**.

Remove the bolt and the camshaft phaser and sprocket assembly from the camshaft.

- Discard the bolt and washer.

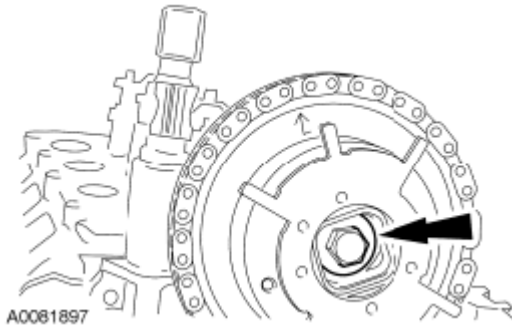


Fig. 176: Locating Camshaft Phaser And Sprocket Assembly Bolt
 Courtesy of FORD MOTOR CO.

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.

1.

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.

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

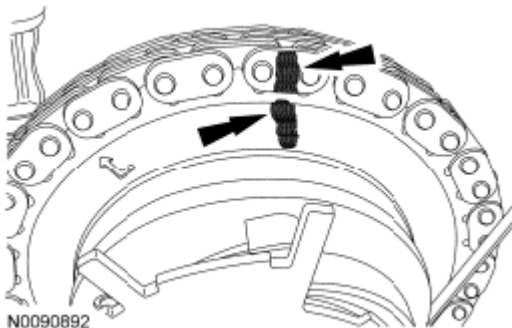


Fig. 177: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
 Courtesy of FORD MOTOR CO.

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**.

2.

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.

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

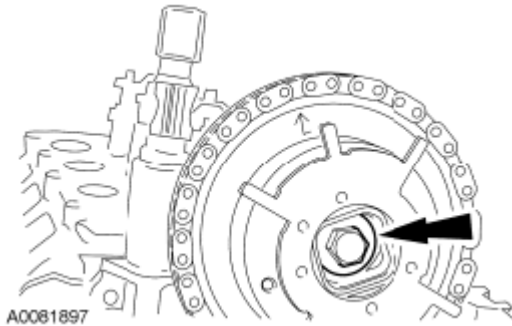


Fig. 178: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

3. **NOTE:** Engine front cover removed for clarity.

Remove the Timing Chain Locking Tool.

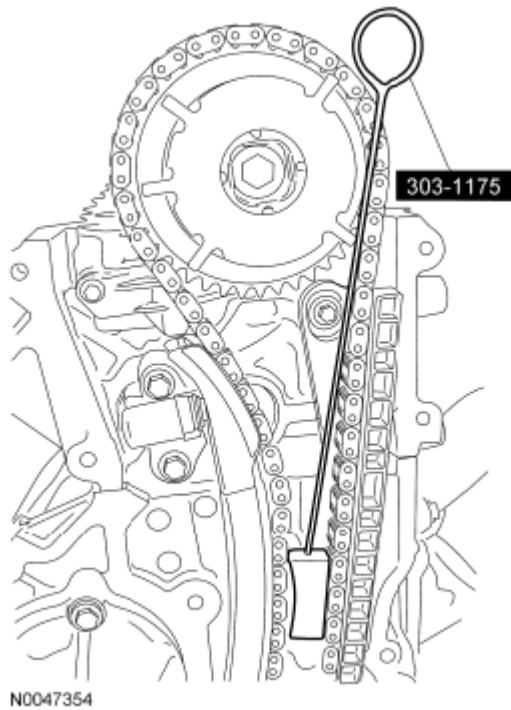


Fig. 179: Identifying Timing Chain Locking Tool In Timing Chain
Courtesy of FORD MOTOR CO.

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.

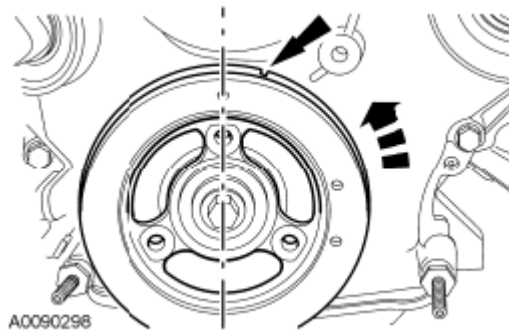


Fig. 180: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

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

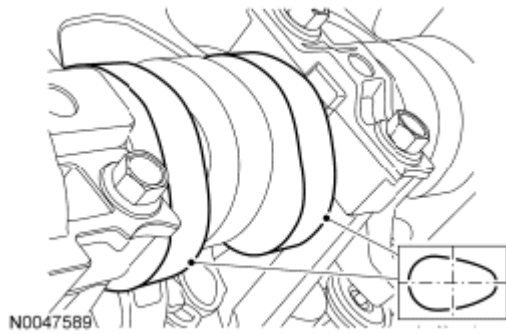


Fig. 181: Identifying Camshaft Position
Courtesy of FORD MOTOR CO.

6. **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.

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



Fig. 182: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

Install the **CMP** sensor and the bolt.

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

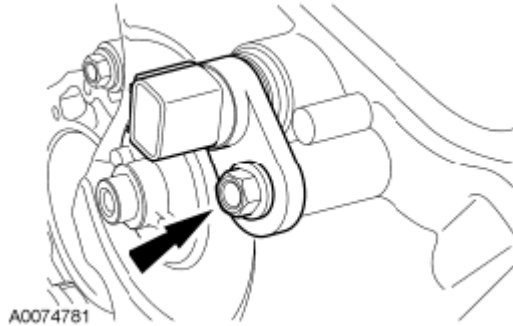


Fig. 183: Locating LH CMP Sensor
Courtesy of FORD MOTOR CO.

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

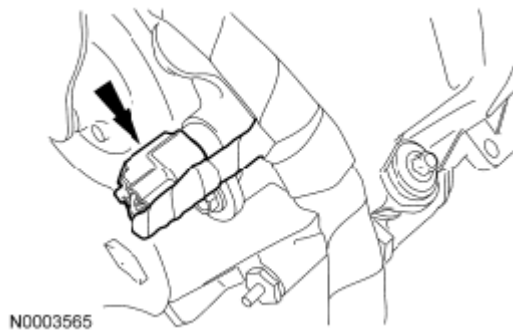


Fig. 184: Locating LH CMP Electrical Connector
Courtesy of FORD MOTOR CO.

9. **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.

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.

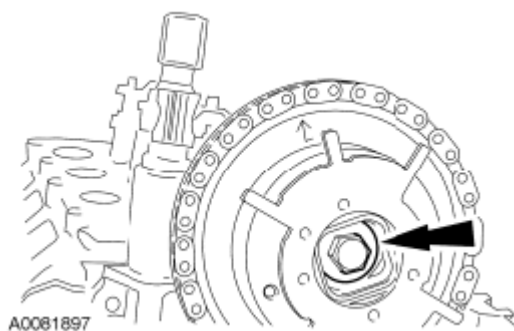


Fig. 185: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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

CAMSHAFT PHASER AND SPROCKET - RH

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



Locking Tool, Timing Chain
303-1175

Material

MATERIAL 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: 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.

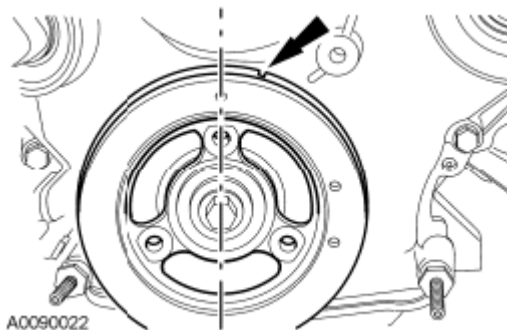


Fig. 186: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

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.

3. **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.

Loosen and backoff the RH camshaft phaser and sprocket bolt one full turn.

4. Disconnect the RH Camshaft Position (CMP) sensor electrical connector.

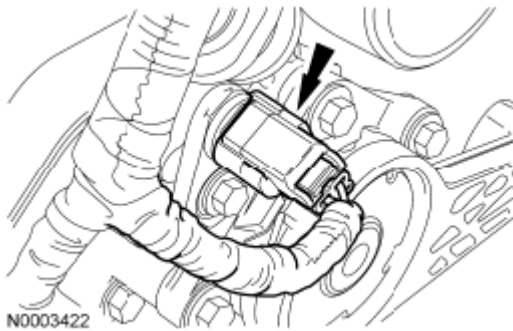


Fig. 187: Locating RH CMP Electrical Connector
Courtesy of FORD MOTOR CO.

5. Remove the bolt and the RH CMP sensor.

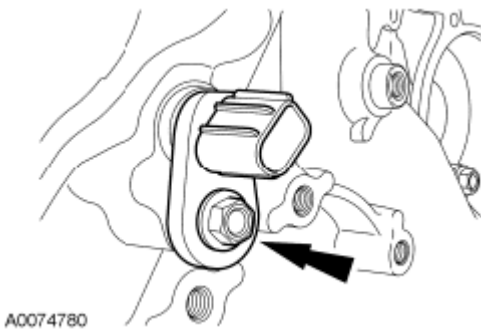


Fig. 188: Identifying RH CMP Sensor
Courtesy of FORD MOTOR CO.

6. **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.

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.



Fig. 189: Identifying Camshaft Lobes Position
Courtesy of FORD MOTOR CO.

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

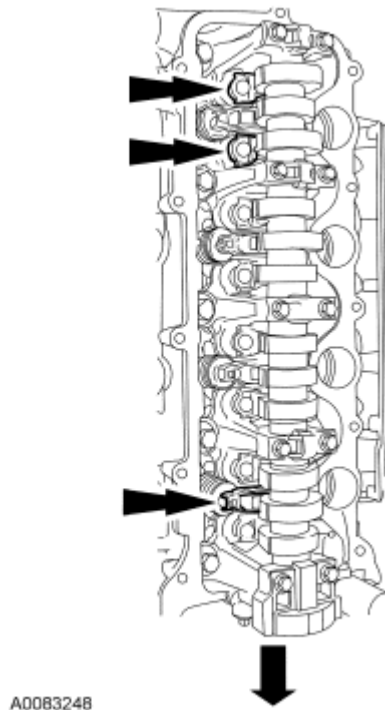


Fig. 190: Locating Camshaft Roller Followers Position
Courtesy of FORD MOTOR CO.

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.

- 8.

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.

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



Fig. 191: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

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.

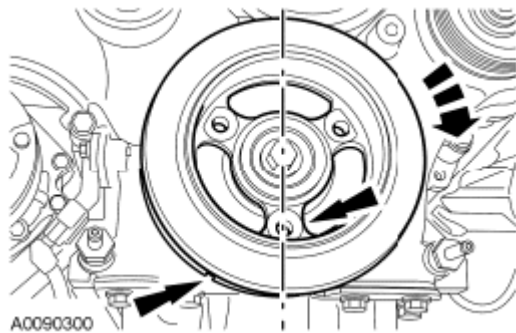


Fig. 192: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

10. **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.

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

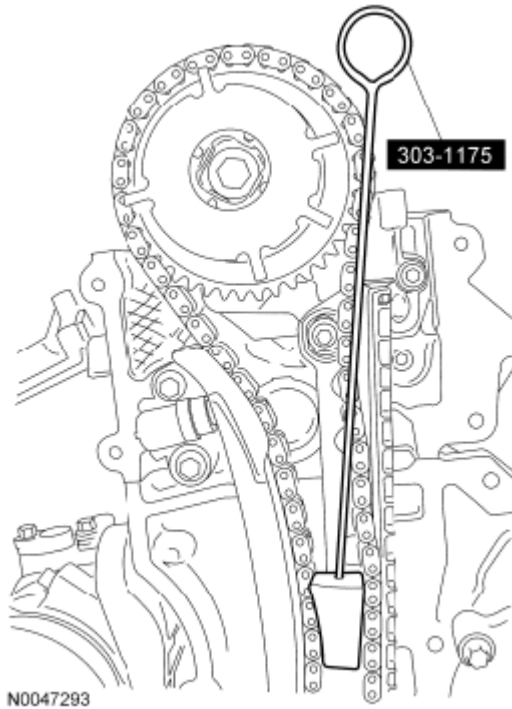


Fig. 193: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

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.

11.

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.

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

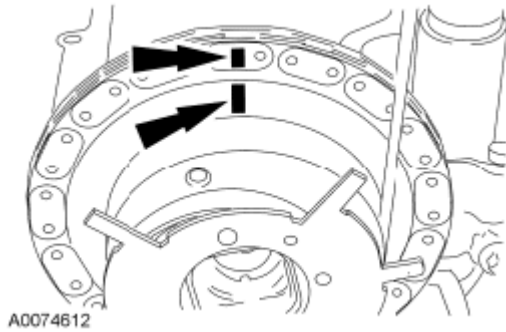


Fig. 194: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

12. **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**.

Remove the bolt and remove the camshaft phaser and sprocket assembly from camshaft.

- Discard the bolt and washer.

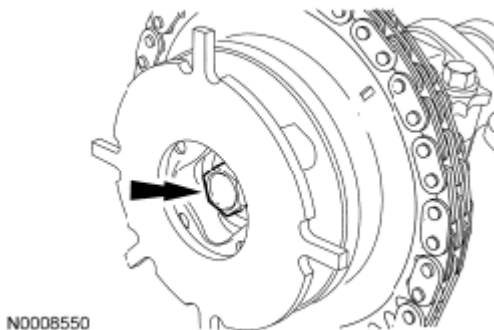


Fig. 195: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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**.

1.

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.

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

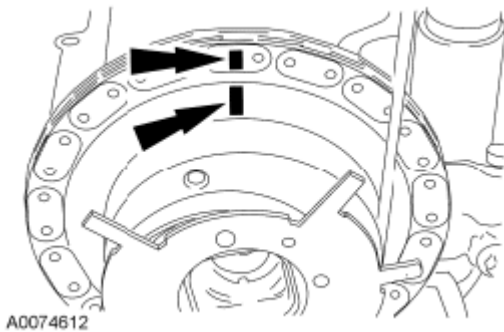


Fig. 196: Locating Mark On Timing Chain And Camshaft Phaser And Sprocket Assembly
Courtesy of FORD MOTOR CO.

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**.

2.

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.

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

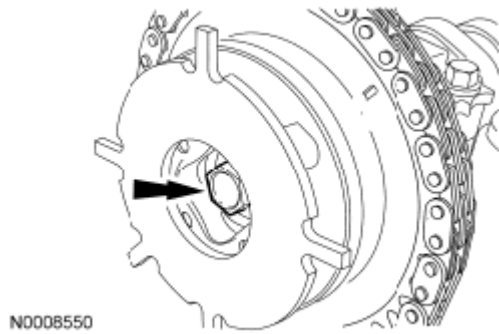


Fig. 197: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

3. **NOTE:** Engine front cover removed for clarity.

Remove the Timing Chain Locking Tool.

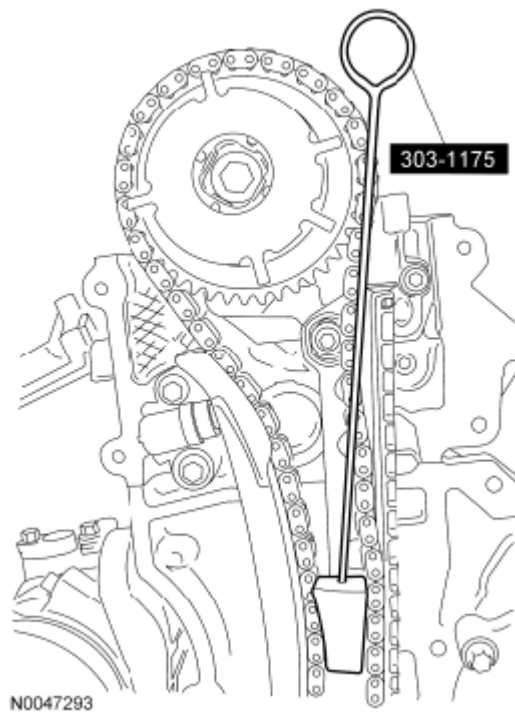


Fig. 198: Identifying Timing Chain Locking Tool In RH Timing Chain
Courtesy of FORD MOTOR CO.

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.

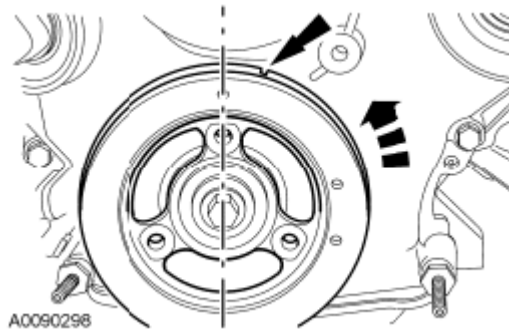


Fig. 199: Locating Crankshaft Damper Spoke
Courtesy of FORD MOTOR CO.

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



Fig. 200: Identifying Camshaft Lobes Position
Courtesy of FORD MOTOR CO.

6. **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.

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



Fig. 201: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

Install the **CMP** sensor and the bolt.

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

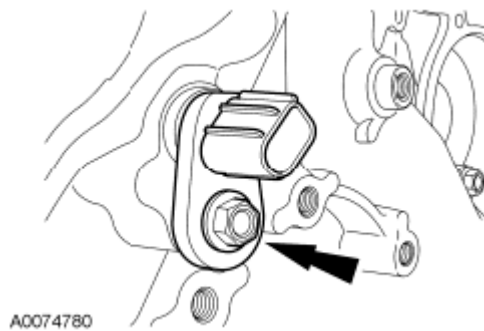


Fig. 202: Locating RH CMP Sensor
Courtesy of FORD MOTOR CO.

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

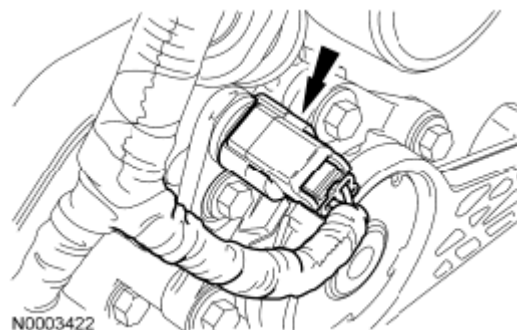


Fig. 203: Locating RH CMP Electrical Connector
Courtesy of FORD MOTOR CO.

9. **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.

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.

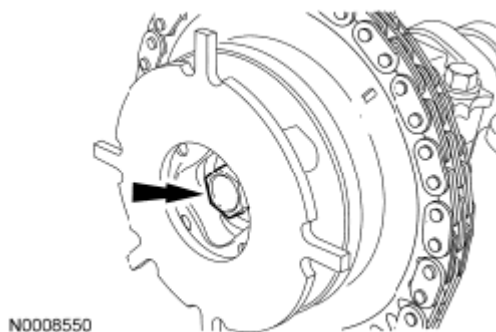


Fig. 204: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

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

VARIABLE CAMSHAFT TIMING (VCT) HOUSING

Material

MATERIAL SPECIFICATION

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

Removal

All Variable Camshaft Timing (VCT) housings

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

RH VCT housing

2. Remove the 2 bolts and the RH Variable Camshaft Timing (VCT) housing.

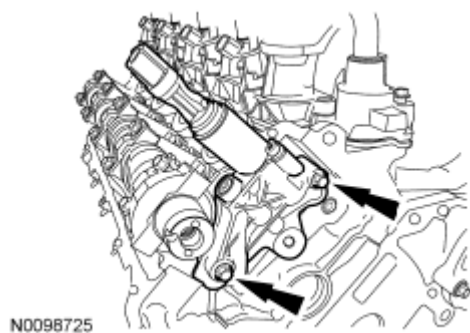


Fig. 205: Locating RH VCT Housing Bolts
Courtesy of FORD MOTOR CO.

LH VCT housing

3. Remove the 2 bolts and the LH VCT housing.

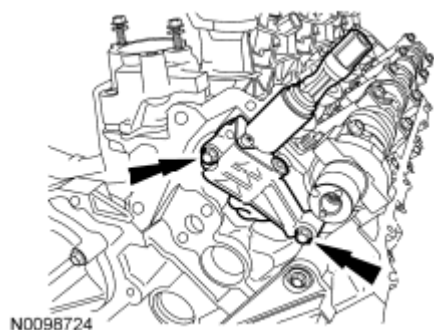


Fig. 206: Locating LH VCT Housing Bolts
Courtesy of FORD MOTOR CO.

All VCT housings

4. Remove and discard the VCT housing gasket.

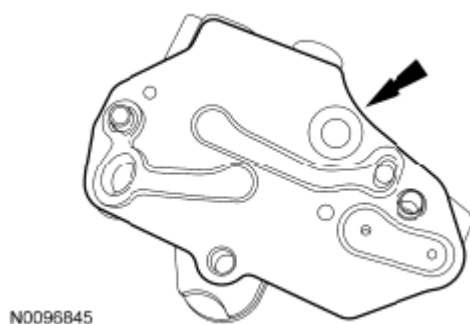


Fig. 207: Locating VCT Housing Gasket
Courtesy of FORD MOTOR CO.

- 5.

- 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.
- 5.

Clean and inspect the cylinder head sealing surfaces with metal surface prep. Follow the directions on the packaging.

6. Clean and inspect the VCT housing. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

All VCT housing

1. Install a new gasket onto the VCT housing.

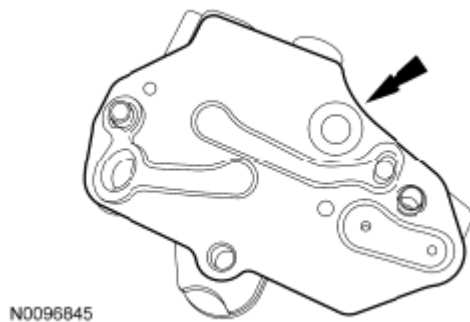


Fig. 208: Locating VCT Housing Gasket
Courtesy of FORD MOTOR CO.

RH VCT housing

2. Position the RH VCT housing and install the 2 bolts.
- Tighten to 10 Nm (89 lb-in).

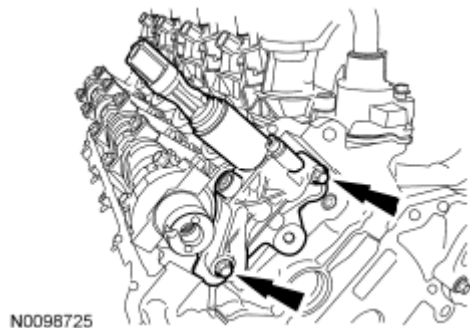


Fig. 209: Locating RH VCT Housing Bolts

Courtesy of FORD MOTOR CO.

LH VCT housing

3. Position the LH VCT housing and install the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

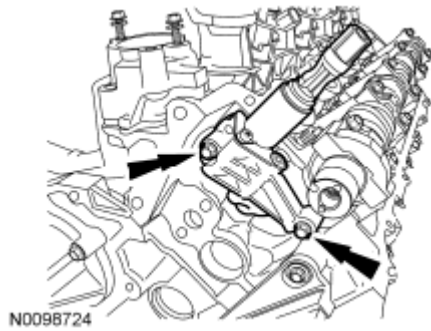


Fig. 210: Locating LH VCT Housing Bolts
Courtesy of FORD MOTOR CO.

All VCT housings

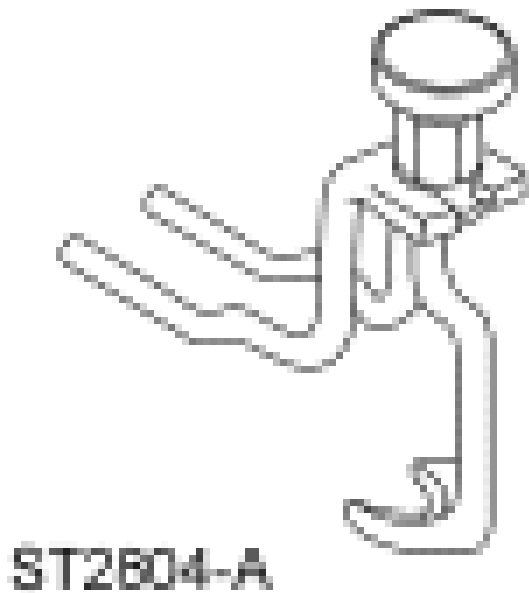
4. Install the timing drive components. For additional information, refer to **TIMING DRIVE COMPONENTS**.

CAMSHAFT ROLLER FOLLOWER

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

	Compressor, Valve Spring 303-1039
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**Material****MATERIAL 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**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

- 4.

4. 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.

Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller follower.



Fig. 211: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

1. **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.

Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller follower.



Fig. 212: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

- 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

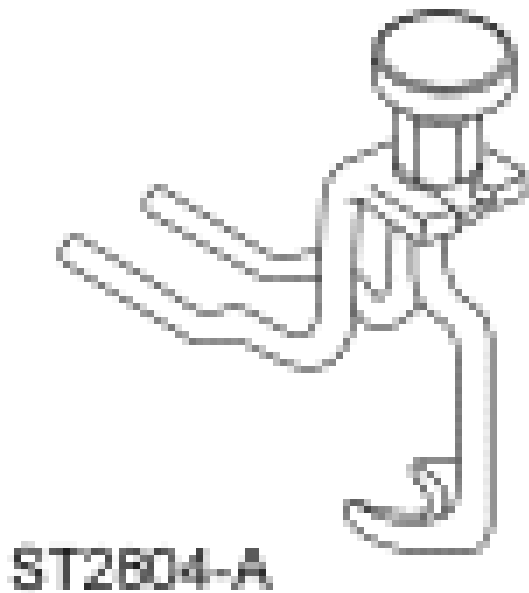
- 4. Install the RH valve cover. For additional information, refer to **VALVE COVER - RH**.

VALVE SPRINGS

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

		Compressor, Valve Spring 303-1039

**Material****MATERIAL 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 (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.

5.

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.

Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller follower.



Fig. 213: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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.

7.

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.

Using the Valve Spring Compressor, compress the valve spring and remove the valve spring retainer keys.



Fig. 214: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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.

1.

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



Fig. 215: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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 this instruction may result in engine damage.

3.

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.

Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller follower.



Fig. 216: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

4. Install the spark plug. For additional information, refer to ENGINE IGNITION - 5.4L (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

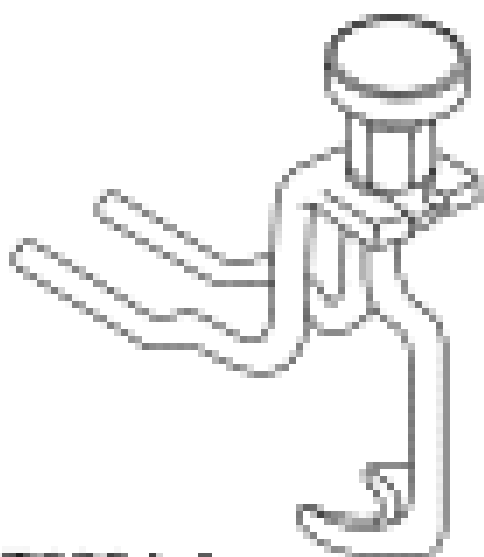
Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

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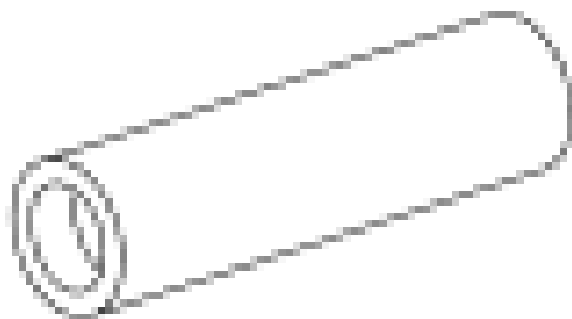
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2804-A

Compressor, Valve Spring
303-1039



ST1332-A

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

Material

MATERIAL 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 (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.

5. **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.

Using the Valve Spring Compressor, compress the valve spring and remove the camshaft roller follower.



Fig. 217: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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.
7. **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.

7.

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.

Using the Valve Spring Compressor, compress the valve spring and remove the valve spring retainer keys.



Fig. 218: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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.

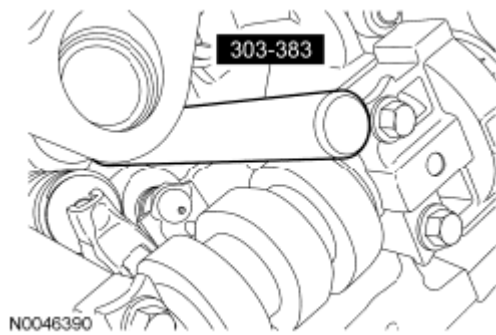


Fig. 219: Identifying Valve Stem Oil Seal Installer
Courtesy of FORD MOTOR CO.

- NOTE:** If the components are to be reinstalled, they must be installed in the same positions. Failure to follow this instruction may result in engine damage.
- 3.

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



Fig. 220: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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 this instruction may result in engine damage.
- 5.
- 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.

Using the Valve Spring Compressor, compress the valve spring and install the camshaft roller follower.



Fig. 221: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

6. Install the spark plug. For additional information, refer to **ENGINE IGNITION - 5.4L (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

MATERIAL 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

RH cylinder head hydraulic lash adjusters

1. Remove the RH camshaft. For additional information, refer to **CAMSHAFT - RH**.

LH cylinder head hydraulic lash adjusters

2. Remove the LH camshaft. For additional information, refer to **CAMSHAFT - LH**.

All hydraulic lash adjusters

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

3. Remove the camshaft roller follower from the hydraulic lash adjuster 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.

- 4.

Remove the hydraulic lash adjuster that is being serviced.

5. Inspect the hydraulic lash adjuster. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

NOTE: Lubricate the hydraulic lash adjuster with clean engine oil prior to installation.

- 6.

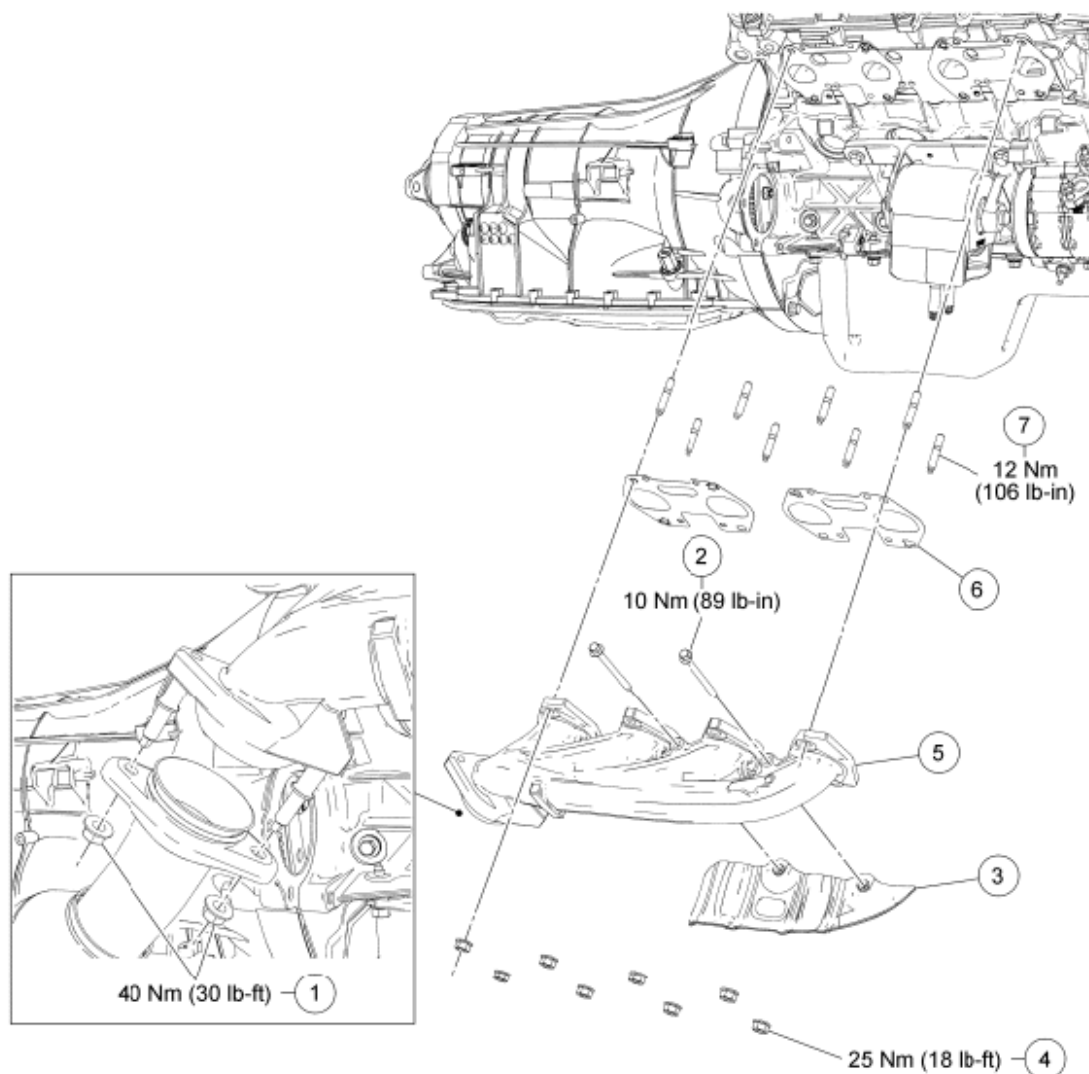
To install, reverse the removal procedure.

EXHAUST MANIFOLD - RH

Material

MATERIAL SPECIFICATION

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



N0091934

Fig. 222: Exploded View Of Exhaust Manifold (RH)
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	W705443	Exhaust Y-pipe flange nuts (2 required)
2	-	Exhaust manifold heat shield bolt (2 required)
3	-	Exhaust manifold heat shield
4	W701706	Exhaust manifold nut (8 required)
5	9430	Exhaust manifold
6	9Y431	Exhaust manifold gasket (2 required)
7	W707747	Exhaust manifold stud (8 required)

Removal

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

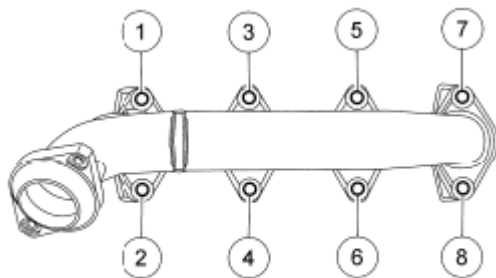
NOTE: Clean the sealing surfaces with metal surface prep. Follow the directions on the packaging.

Remove and discard the 2 exhaust manifold gaskets. Clean the sealing surfaces with metal surface prep.

7. Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

Installation

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



N0008433

Fig. 223: Identifying Exhaust Manifold Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

3. Position the exhaust manifold heat shield and install the 2 bolts.
 - Tighten to 10 Nm (89 lb-in).

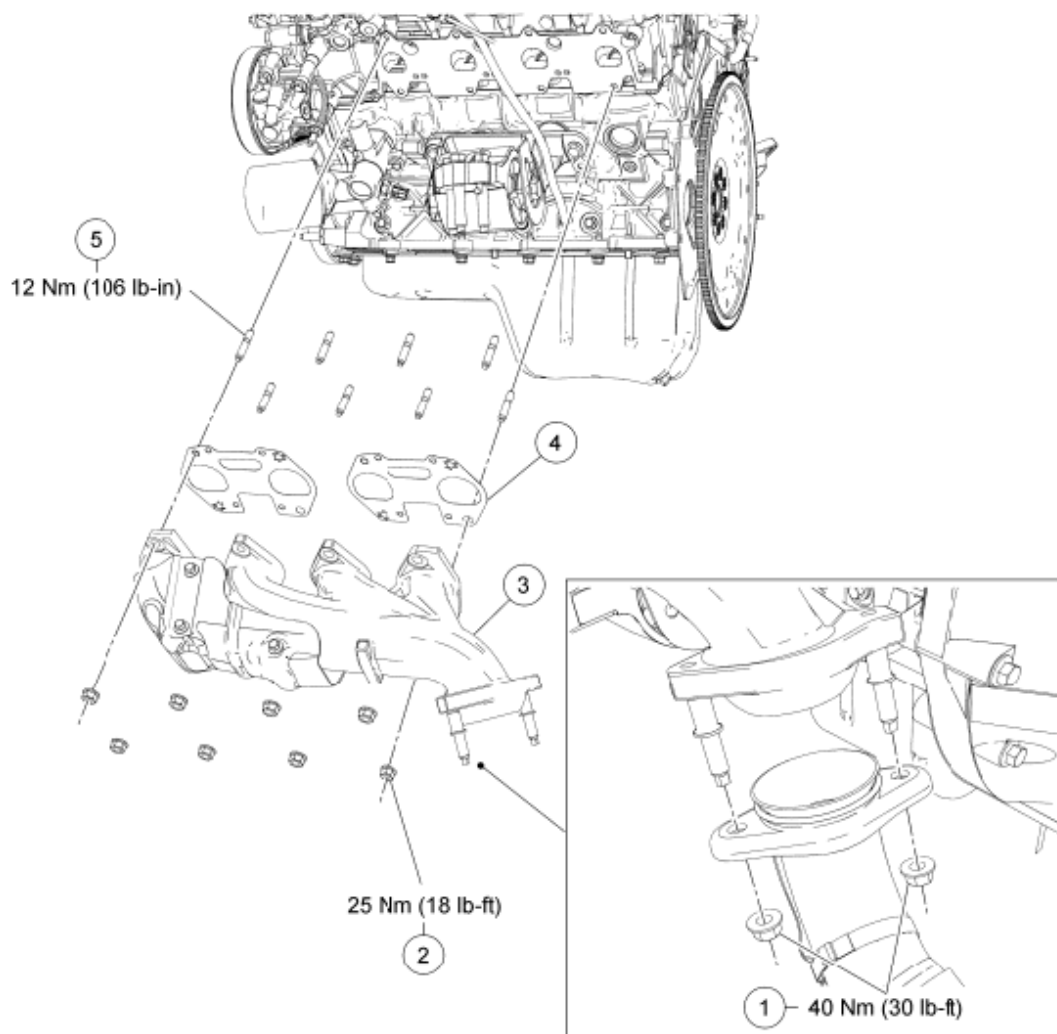
4. Install the RH engine support insulator. For additional information, refer to **ENGINE SUPPORT INSULATORS**.
5. Install the RH inner fenderwell. For additional information, refer to **FRONT END BODY PANELS**.

EXHAUST MANIFOLD - LH

Material

MATERIAL SPECIFICATION

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



N0102614

Fig. 224: Exploded View Of Exhaust Manifold With Torque Specifications (LH)
 Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	W705443	Exhaust Y-pipe flange nuts (2 required)
2	W701706	Exhaust manifold nut (8 required)
3	9431	Exhaust manifold assembly
4	9Y431	Exhaust manifold gasket (2 required)
5	W707747	Exhaust manifold stud (8 required)

Removal**All vehicles**

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

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

4.

Remove the bolt and disconnect the steering shaft and position aside.

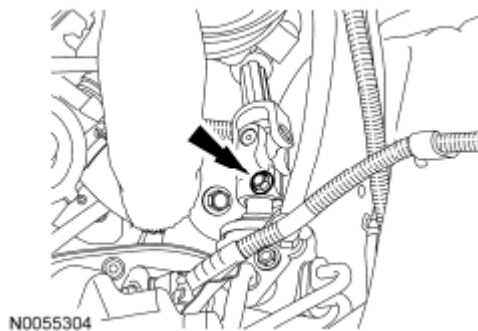


Fig. 225: Locating Steering Shaft Bolt
Courtesy of FORD MOTOR CO.

5. Remove the 4 (2 LH and 2 RH) exhaust manifold-to-catalytic converter nuts.

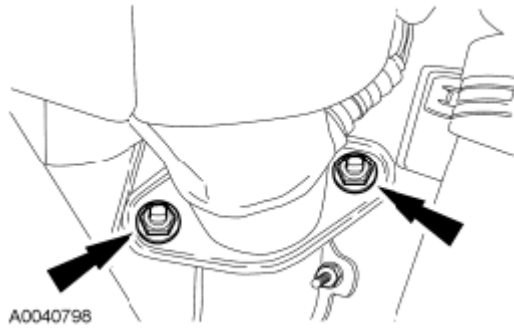


Fig. 226: Locating Exhaust Manifold-To-Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

Four-Wheel Drive (4WD) vehicles

6. Remove the front driveshaft. For additional information, refer to **DRIVESHAFT** .

All vehicles

7. Remove the 8 exhaust manifold nuts, the 8 studs and the exhaust manifold.
 - Discard the exhaust manifold nuts and 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.

8.

NOTE: Clean the sealing surfaces with metal surface prep. Follow the directions on the packaging.

Remove and discard the 2 exhaust manifold gaskets. Clean the sealing surfaces with metal surface prep.

9. Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

Installation

All vehicles

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

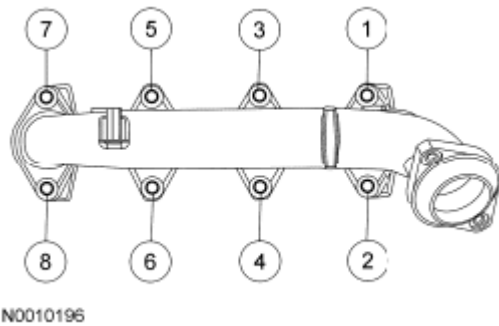


Fig. 227: Identifying Exhaust Manifold Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

4WD vehicles

3. Install the front driveshaft. For additional information, refer to **DRIVESHAFT** .

All vehicles

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

4.

Connect the steering shaft and install the bolt.

- To install, tighten to 30 Nm (22 lb-ft).

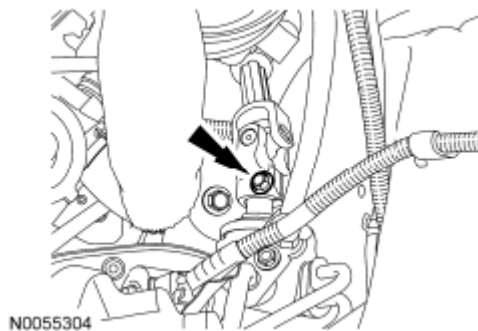


Fig. 228: Locating Steering Shaft Bolt
Courtesy of FORD MOTOR CO.

5. Install the 4 exhaust manifold-to-catalytic converter nuts.

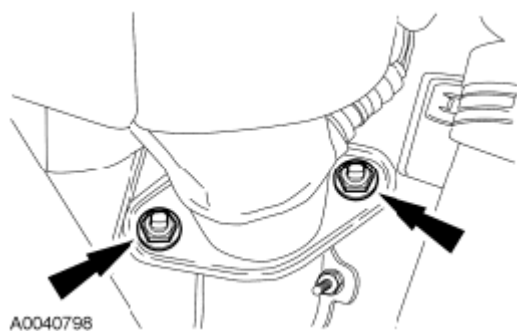


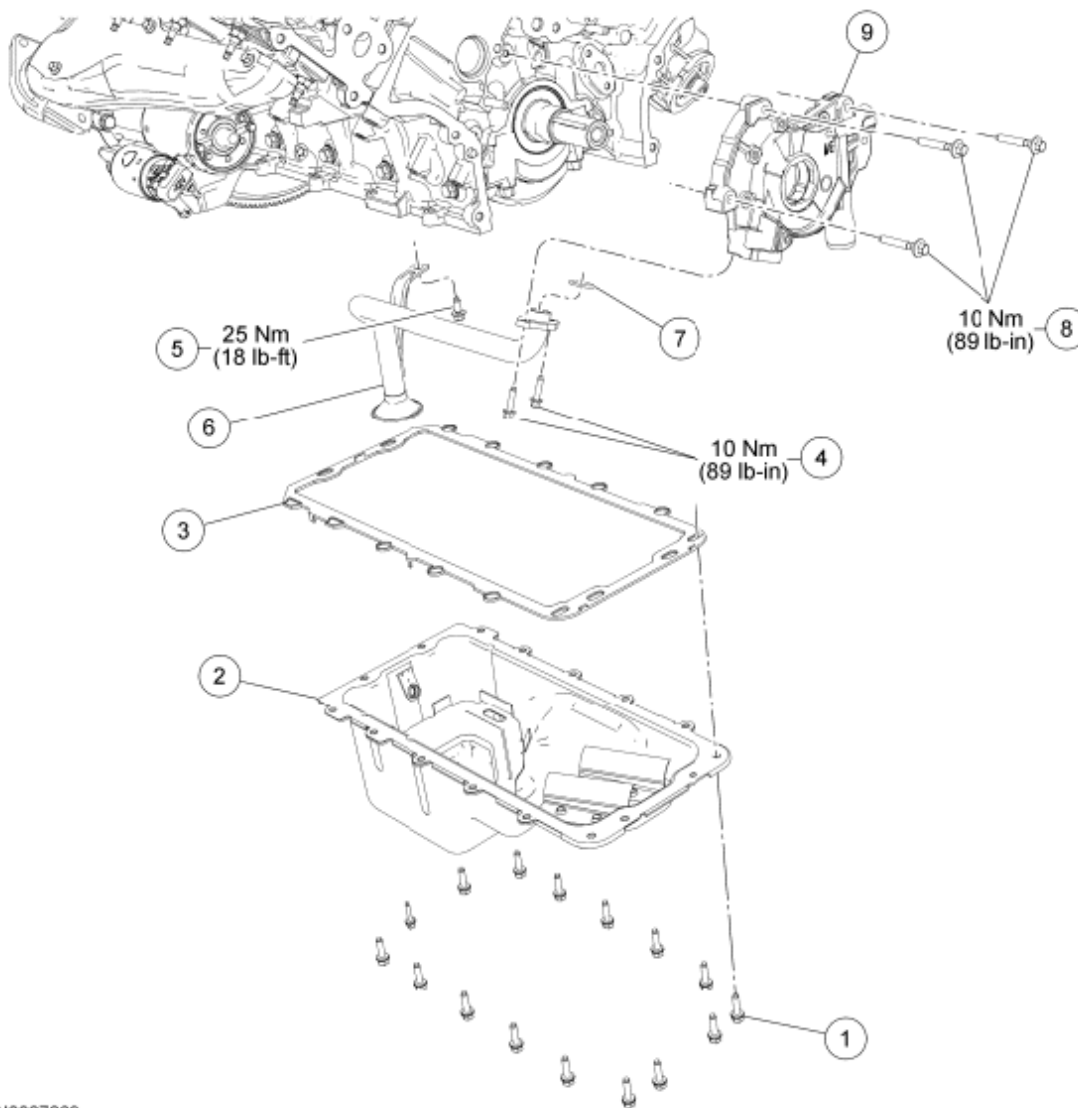
Fig. 229: Locating Exhaust Manifold-To-Catalytic Converter Nuts
Courtesy of FORD MOTOR CO.

6. Install the degas bottle. For additional information, refer to **ENGINE COOLING** .
7. Install the ACL outlet tube. For additional information, refer to **INTAKE AIR DISTRIBUTION & FILTERING** .

ENGINE LUBRICATION COMPONENTS - EXPLODED VIEW

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



N0087869

Fig. 230: Identifying Engine Lubrication Components With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	W701605	Oil pan bolt (16 required)
2	6676	Oil pan
3	6710	Oil pan gasket
4	N806155	Oil pump screen and pickup tube-to-oil pump bolts (2 required)
5	N605904	Oil pump screen and pickup tube support bracket bolt
6	6622	Oil pump screen and pickup tube
7	6625	Oil pump screen and pickup tube O-ring seal
8	N806183	Oil pump bolts (3 required)
9	6621	Oil pump

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

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

OIL PAN

Material

MATERIAL 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
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**.

Four-Wheel Drive (4WD) vehicles

2. If equipped, remove the 10 bolts and the 2 skid plates.

All vehicles

3. Remove the oil drain plug and drain the engine oil. Install the drain plug when finished.
 - Tighten to 23 Nm (17 lb-ft).

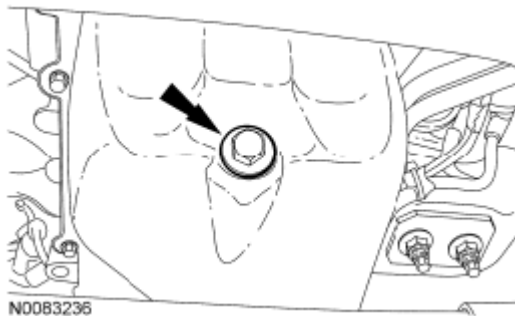


Fig. 231: Locating Oil Drain Plug
Courtesy of FORD MOTOR CO.

4. Remove the 4 nuts, the 4 bolts and the crossmember.

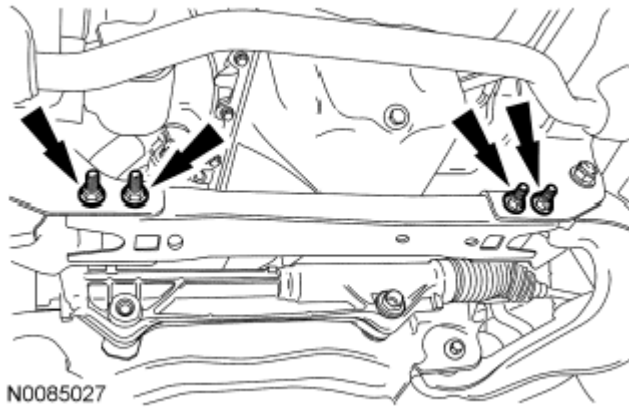


Fig. 232: Locating Crossmember Nuts And Bolts
Courtesy of FORD MOTOR CO.

4WD vehicles

5. Position a suitable hydraulic jack under the front axle. Securely strap the jack to the axle.



Fig. 233: Supporting Front Axle Using Hydraulic Jack
Courtesy of FORD MOTOR CO.

NOTE: Rotate the steering column so the pinch bolt for the steering column coupling allows clearance for the isolator bolt.

- 6.

Remove the upper front axle carrier mounting bushing bolt.

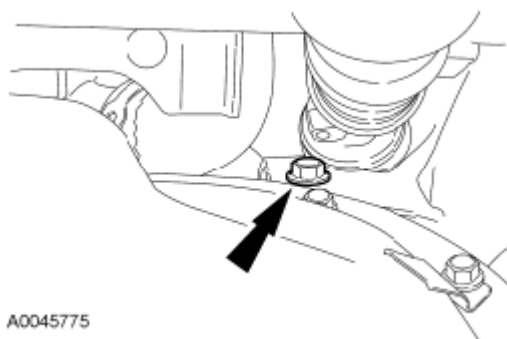


Fig. 234: Locating Upper Front Axle Carrier Mounting Bushing Bolt
Courtesy of FORD MOTOR CO.

7. Remove the axle shaft housing carrier bushing bolt.

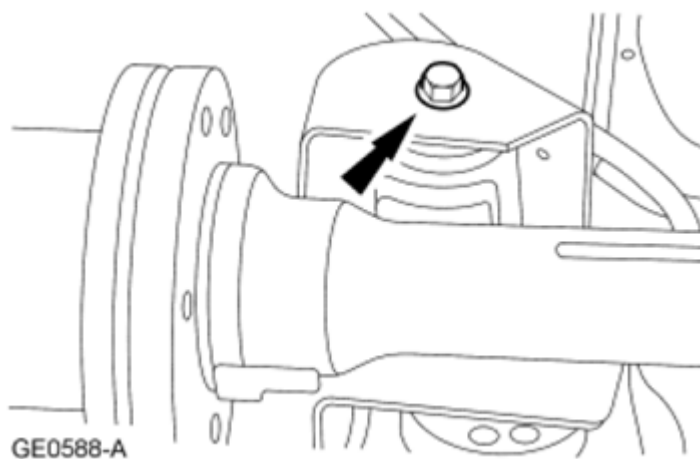


Fig. 235: Locating Axle Shaft Housing Carrier Bushing Bolt
Courtesy of FORD MOTOR CO.

8. Remove the lower front axle carrier mounting bushing bolt.

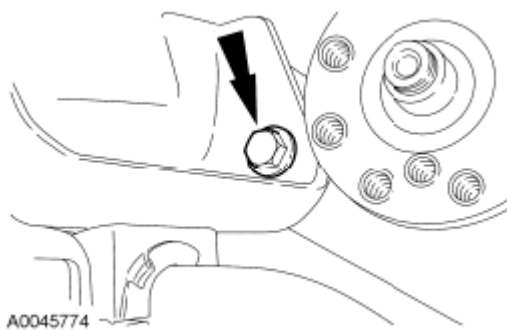


Fig. 236: Locating Lower Front Axle Carrier Mounting Bushing Bolt
Courtesy of FORD MOTOR CO.

- 9.

NOTE: Use care when lowering the front axle housing, or the vacuum lines to the axle solenoid may become disconnected or damaged.

9.

Lower the axle to allow clearance for the oil pan to be removed.

All vehicles

10. Remove the starter wiring harness rear support bracket bolt.

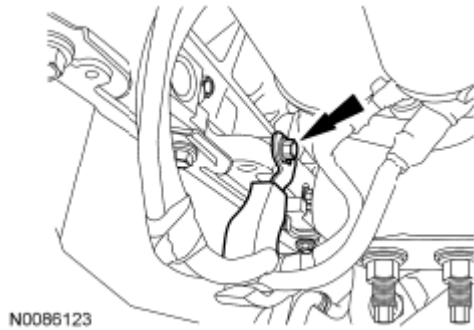


Fig. 237: Locating Starter Wiring Harness Rear Support Bracket Bolt
Courtesy of FORD MOTOR CO.

11. Remove the nut and position the starter wiring harness and the transmission fluid cooler tubes aside.

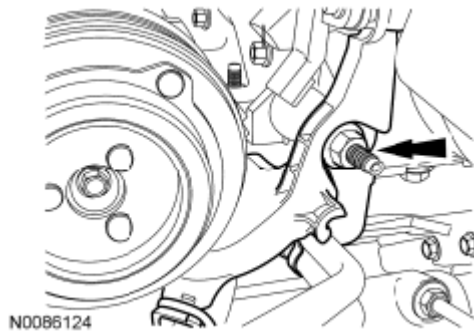


Fig. 238: Locating Support Bracket Nut
Courtesy of FORD MOTOR CO.

12. Detach the oil pressure switch wiring harness from the oil pan bolt.

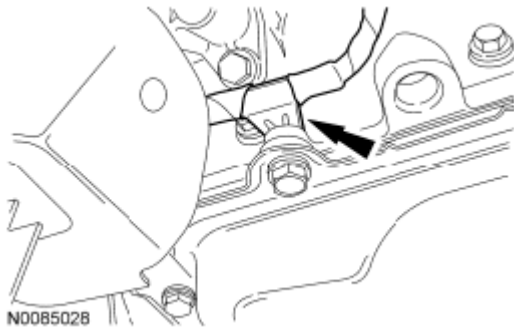


Fig. 239: Locating Oil Pressure Switch Wiring Harness
Courtesy of FORD MOTOR CO.

13. Remove the 16 bolts, the oil pan and the gasket.
 - Discard the 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.

14.

Inspect the oil pan. Clean the gasket mating surfaces of the oil pan and engine block with silicone gasket remover and metal surface prep. Follow the directions on the packaging.

Installation

All vehicles

NOTE: If 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 can cause future oil leakage.

1.

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

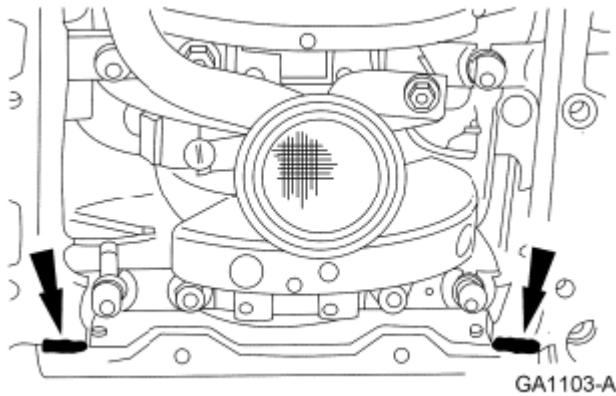


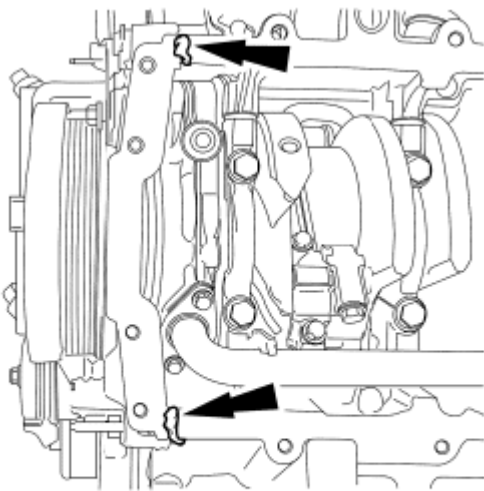
Fig. 240: Locating Crankshaft Rear Seal Retainer Plate-To-Cylinder Block Sealing Surface Sealant Applying Area

Courtesy of FORD MOTOR CO.

NOTE: If 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 can cause future oil leakage.

2.

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



N0032191

Fig. 241: Locating Engine Front Cover-To-Cylinder Block Sealing Surface Sealant Applying Area

Courtesy of FORD MOTOR CO.

3. Position a new gasket and the oil pan and install the 16 bolts.
 - Tighten the bolts in the sequence shown in illustration in 3 stages.

- 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.

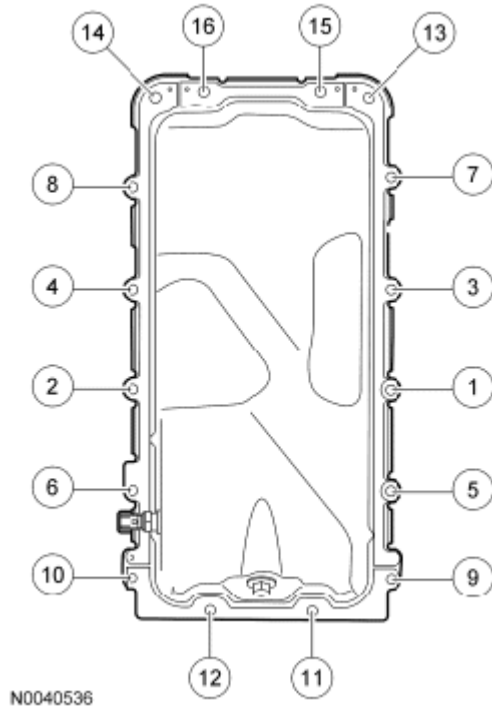


Fig. 242: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Attach the oil pressure switch wiring harness to the oil pan bolt.

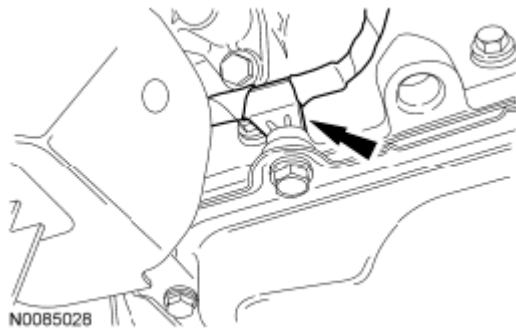


Fig. 243: Locating Oil Pressure Switch Wiring Harness
Courtesy of FORD MOTOR CO.

5. Position the transmission fluid cooler tube support bracket, the starter wiring harness support bracket and install the nut.
 - Tighten to 10 Nm (89 lb-in).

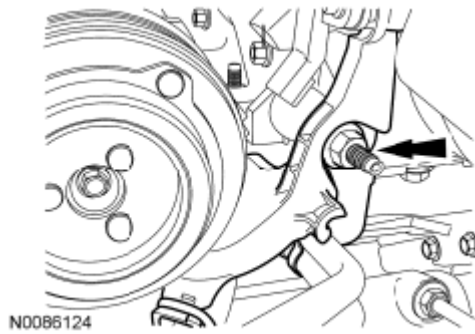


Fig. 244: Locating Support Bracket Nut
Courtesy of FORD MOTOR CO.

6. Position the starter wiring harness and install the starter wiring harness rear support bracket bolt.
 - Tighten to 10 Nm (89 lb-in).

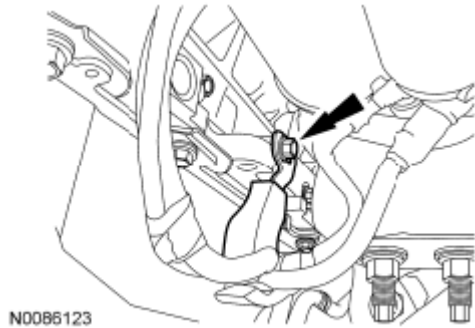


Fig. 245: Locating Starter Wiring Harness Rear Support Bracket Bolt
Courtesy of FORD MOTOR CO.

7. Install the transmission fluid cooling tubes rear support bracket bolt.
 - Tighten to 48 Nm (35 lb-ft).

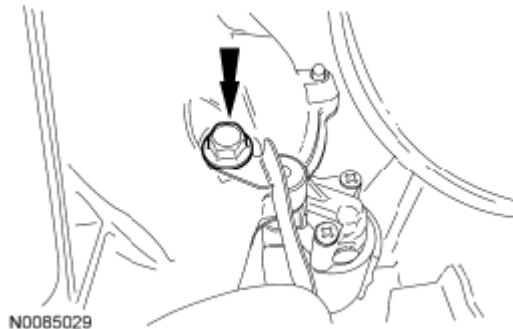


Fig. 246: Locating Transmission Fluid Cooling Tubes Rear Support Bracket Bolt
Courtesy of FORD MOTOR CO.

4WD vehicles

NOTE: Use care when positioning the front axle housing, or the vacuum lines to the axle solenoid may become disconnected or damaged.

8.

Raise the front axle carrier into position.



Fig. 247: Supporting Front Axle Carrier Using Hydraulic Jack
Courtesy of FORD MOTOR CO.

9. Install the lower front axle carrier mounting bushing bolt.
- Tighten to 115 Nm (85 lb-ft).

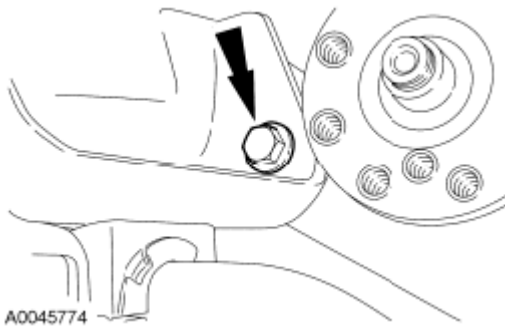


Fig. 248: Locating Lower Front Axle Carrier Mounting Bushing Bolt
Courtesy of FORD MOTOR CO.

10. Install the axle shaft housing carrier bushing bolt.
- Tighten to 115 Nm (85 lb-ft).

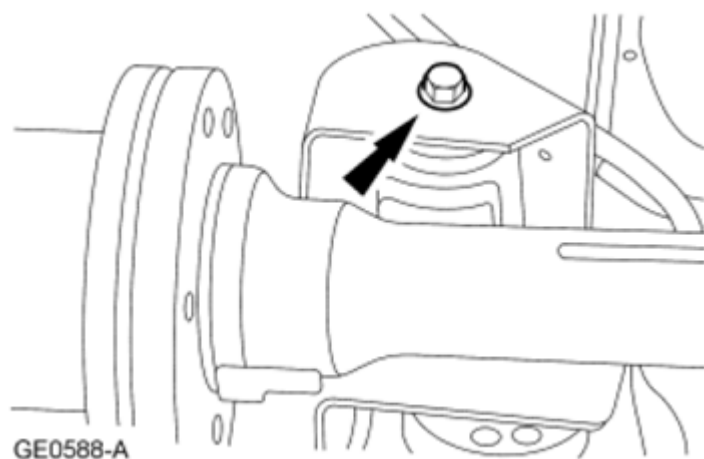


Fig. 249: Locating Axle Shaft Housing Carrier Bushing Bolt
Courtesy of FORD MOTOR CO.

11. Install the upper front axle carrier mounting bushing bolt.
 - Tighten to 115 Nm (85 lb-ft).

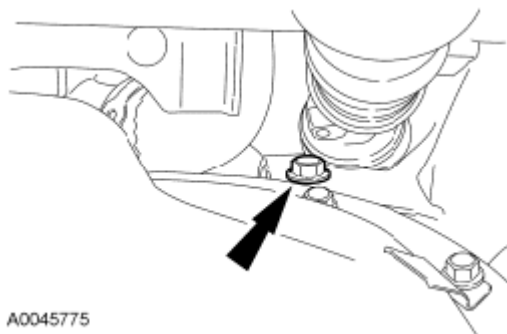


Fig. 250: Locating Upper Front Axle Carrier Mounting Bushing Bolt
Courtesy of FORD MOTOR CO.

All vehicles

12. Position the crossmember and install the 4 bolts and the 4 nuts.
 - Tighten to 90 Nm (66 lb-ft).

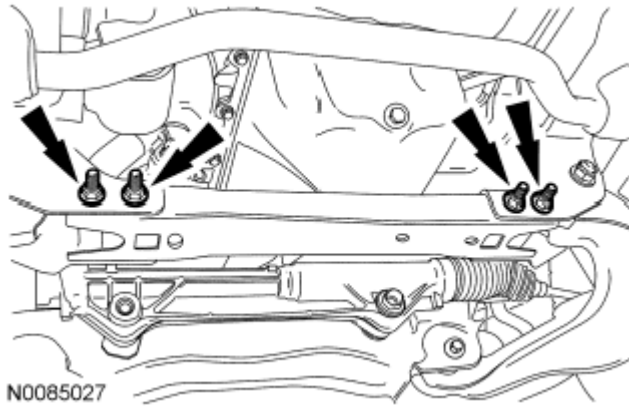


Fig. 251: Locating Crossmember Nuts And Bolts
Courtesy of FORD MOTOR CO.

4WD vehicles

13. If equipped, install the 2 skid plates and the 10 bolts.
 - Tighten to 48 Nm (35 lb-ft).

All vehicles

14. Fill the engine with clean engine oil.

OIL PUMP

Material

MATERIAL 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 screen and pickup tube.

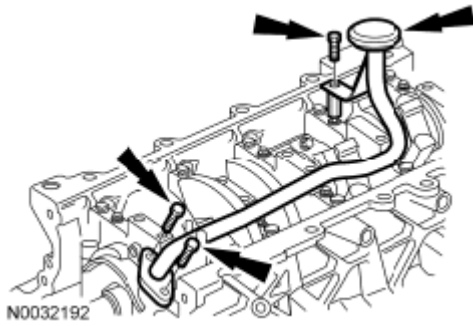


Fig. 252: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

4. Remove the 3 bolts and the oil pump.

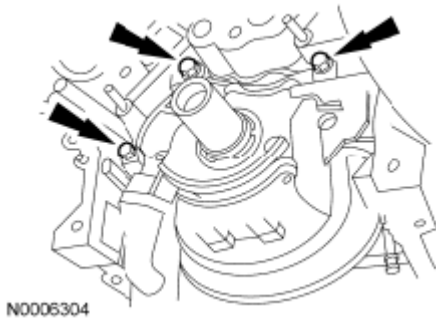


Fig. 253: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

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).

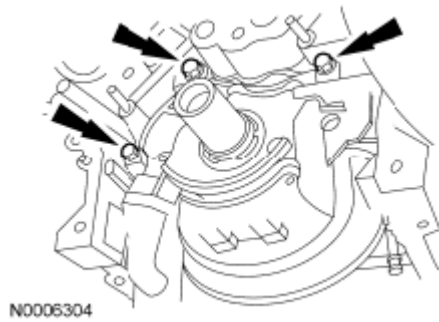


Fig. 254: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

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.

3.

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

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).

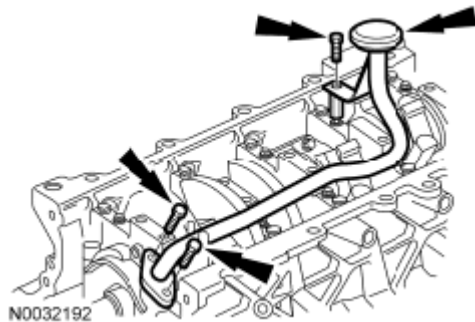


Fig. 255: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

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

OIL PUMP SCREEN AND PICKUP TUBE

Material

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

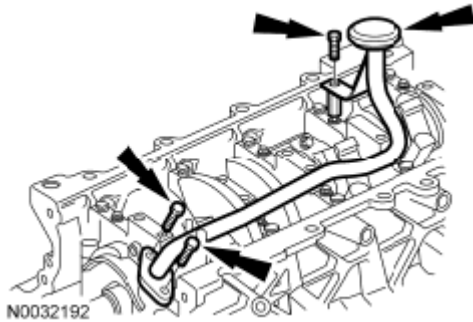


Fig. 256: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

Installation

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.

1.

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

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).

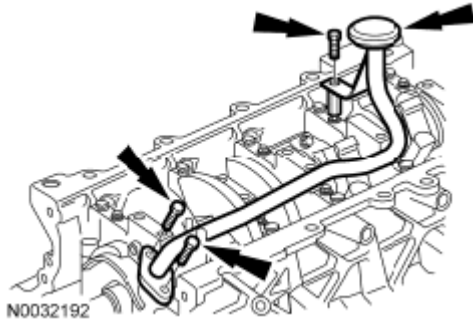


Fig. 257: Locating Oil Pump Screen And Pickup Tube Bolts
Courtesy of FORD MOTOR CO.

2. Install the oil pan. For additional information, refer to **OIL PAN**.

OIL FILTER ADAPTER

Material

MATERIAL 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 Remover ZC-30	-

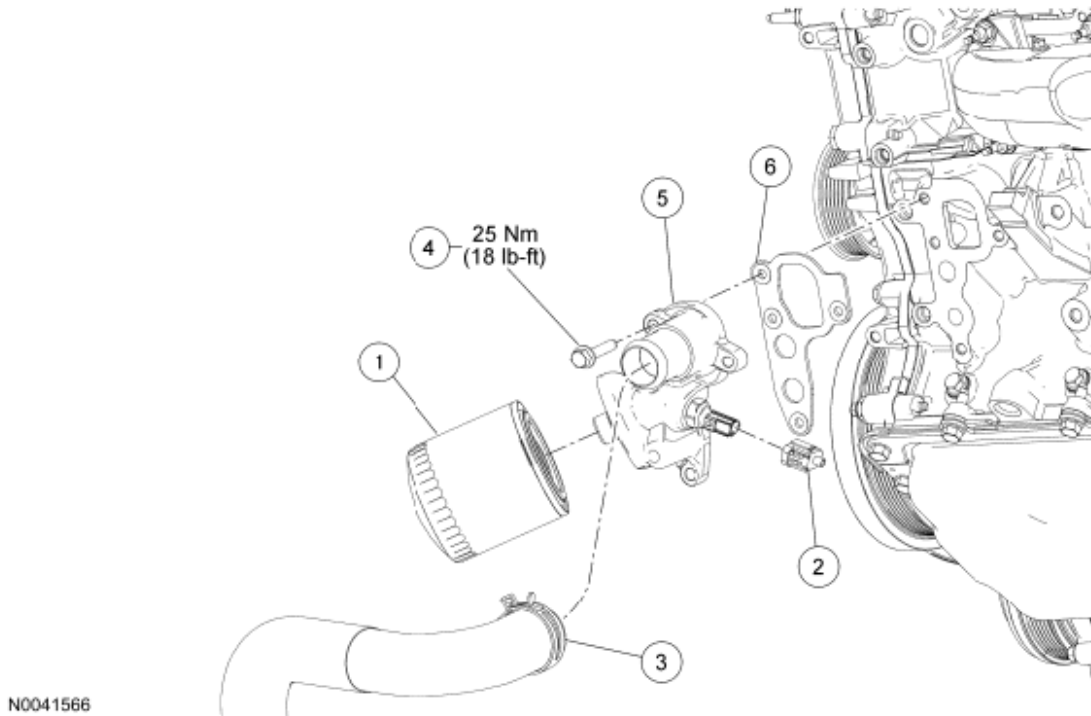


Fig. 258: Identifying Oil Filter Adapter Components With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	6714	Oil filter
2	14A464	Engine oil pressure switch electrical connector (part of 12B637)
3	8B273	Lower radiator hose
4	W705128	Oil filter adapter bolt (4 required)
5	6881	Oil filter adapter
6	6A636	Oil filter adapter gasket

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. Drain the engine oil.
 - Install the drain plug and tighten to 23 Nm (17 lb-ft).
4. Disconnect the engine oil pressure switch electrical connector.
5. Disconnect the lower radiator hose and position it aside.
6. Remove and discard the engine oil filter.
 - To install, lubricate the oil filter gasket with clean engine oil and tighten until the seal makes contact.

- Using an oil filter strap wrench, tighten the filter an additional 270 degrees.
- 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 may cause scratches and gouges resulting in leak paths. Use a plastic scraper to clean the sealing surfaces.

8.

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.
- To install, reverse the removal procedure.
 - Fill the engine with clean engine oil.
 - Fill and bleed the engine cooling system. For additional information, refer to **ENGINE COOLING**.

ENGINE OIL PRESSURE (EOP) SWITCH

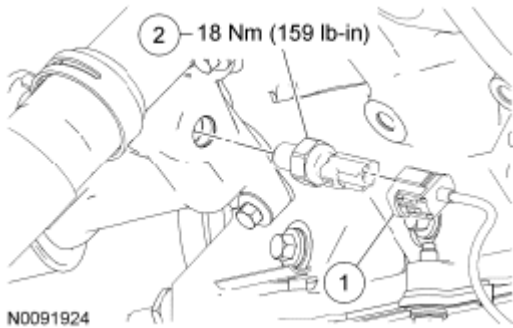


Fig. 259: Identifying Engine Oil Pressure (EOP) Switch With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	-	Engine Oil Pressure (EOP) switch electrical connector (part 12B637)
2	9278	EOP switch

Removal and Installation

- With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
- Disconnect the Engine Oil Pressure (EOP) switch electrical connector.
- Remove the **EOP** switch.

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

- To install, tighten to 18 Nm (159 lb-in).
4. To install, reverse the removal procedure.

OIL LEVEL INDICATOR AND TUBE

Material

MATERIAL 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

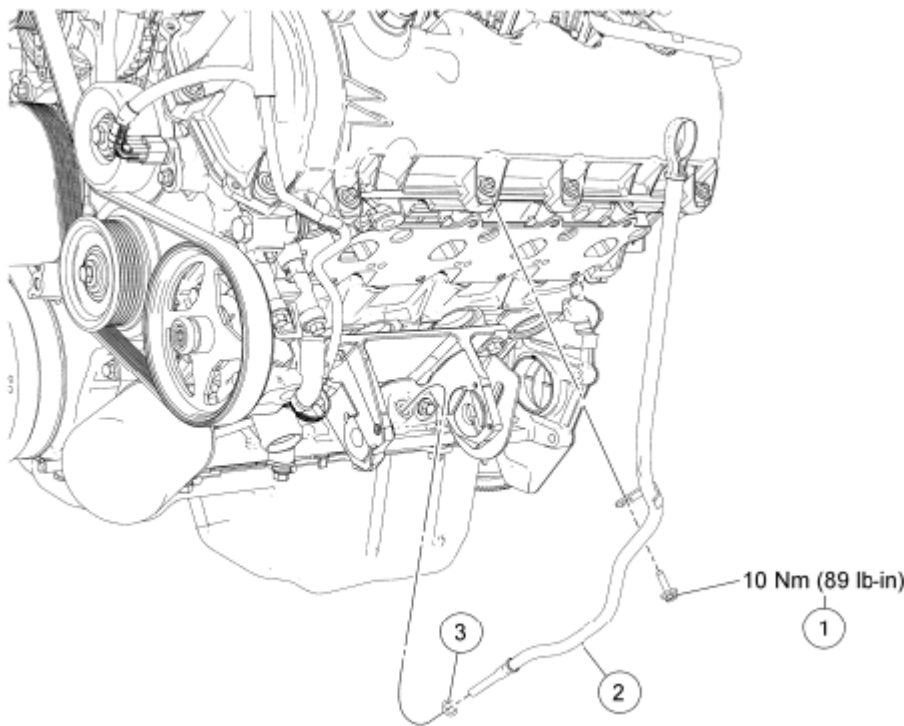


Fig. 260: Identifying Oil Level Indicator And Tube Components With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	N605892	Oil level indicator and tube bolt
2	6K873	Oil level indicator and tube
3	-	Oil level indicator tube O-ring seal

Removal and Installation

1. Remove the LH exhaust manifold. For additional information, refer to **EXHAUST MANIFOLD - LH**.

2. Remove the 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.

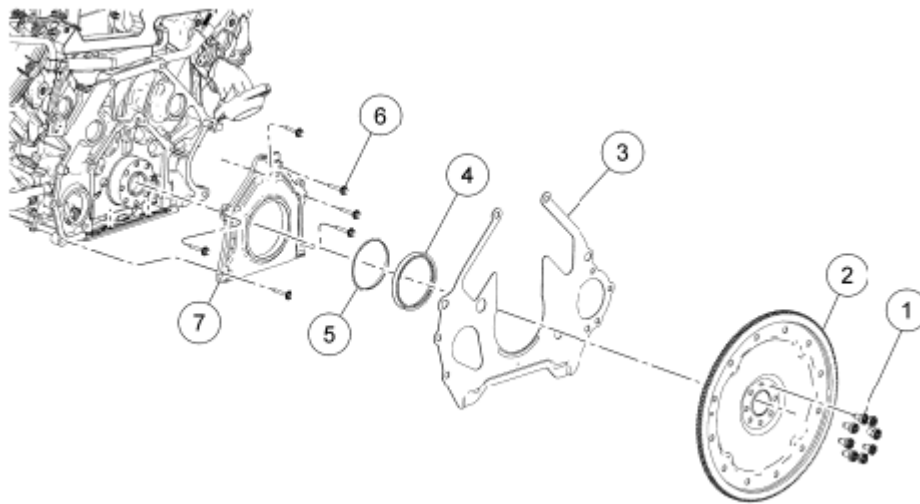
NOTE: Lubricate the new oil level indicator tube O-ring seal with clean engine oil prior to installation.

4.

To install, reverse the removal procedure.

- Install a new O-ring seal.

FLEXPLATE OR FLYWHEEL AND CRANKSHAFT REAR SEAL - EXPLODED VIEW



N0052372

Fig. 261: Exploded View Of Flexplate Or Flywheel And Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

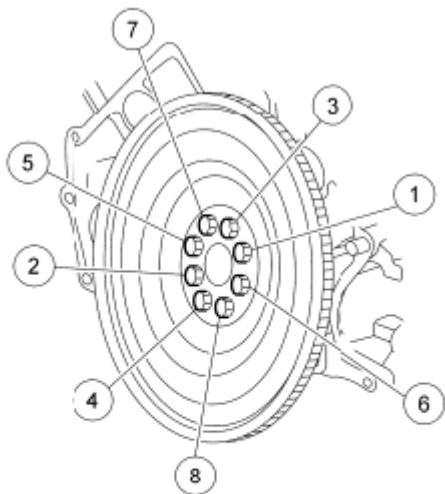
Item	Part Number	Description
1	N806168	Flexplate bolt (8 required)
2	6375	Flexplate
3	6A373	Rear cover plate
4	6310	Crankshaft oil slinger
5	6701	Crankshaft rear seal
6	N806155	Crankshaft rear seal retainer plate bolt (6 required)
7	6K318	Crankshaft rear seal retainer plate

1. 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 - 6R80** .
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. 262: 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(S) SPECIFICATION

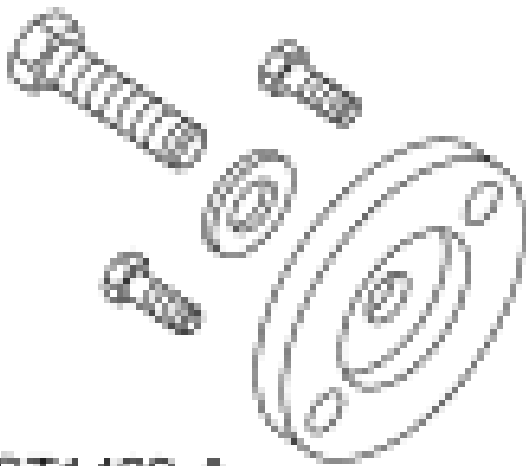
	Installer, Crankshaft Rear Oil Seal 303-516 (T95P-6701-BH)
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2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1479-A



ST1480-A

Installer, Crankshaft Rear Oil Seal
303-518 (T95P-6701-DH)

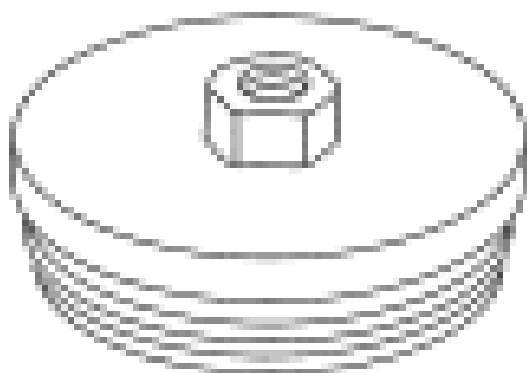
Installer, Crankshaft Rear Oil Slinger
303-517 (T95P-6701-CH)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1482-A



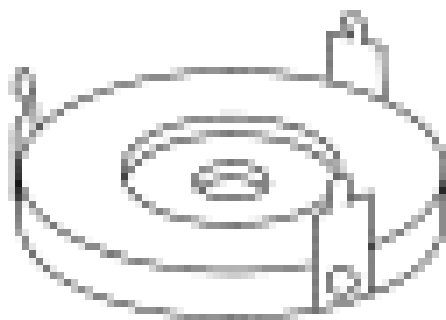
ST1382-A

Remover, Crankshaft Rear Oil Seal
303-519 (T95P-6701-EH)

Remover, Crankshaft Rear Oil Slinger
303-514 (T95P-6701-AH)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1481-A



ST1185-A

Slide Hammer
100-001 (T50T-100-A)

Material

MATERIAL 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 transmission. For additional information, refer to **AUTOMATIC**

TRANSAXLE/TRANSMISSION - 6R80 .

2. Remove the 8 bolts and the flexplate.
3. Using the Slide Hammer and the Crankshaft Rear Oil Slinger Remover, remove and discard the crankshaft oil slinger.

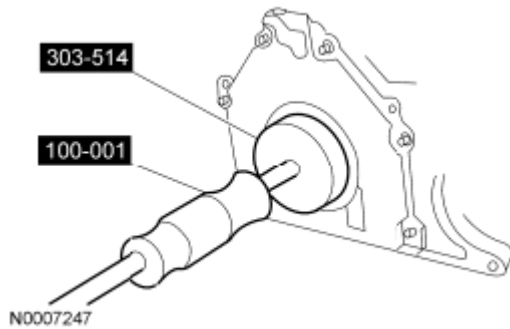


Fig. 263: Removing Crankshaft Oil Slinger
Courtesy of FORD MOTOR CO.

4. Using the Slide Hammer and the Crankshaft Rear Oil Seal Remover, remove and discard the crankshaft rear seal.

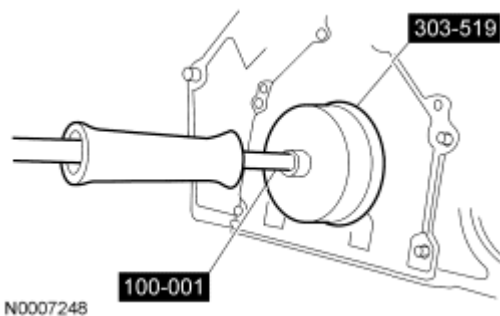


Fig. 264: Removing Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

Installation

NOTE: Lubricate the crankshaft rear seal with clean engine oil prior to installation.

1.

Using the Crankshaft Rear Oil Seal Installers, install a new crankshaft rear seal.

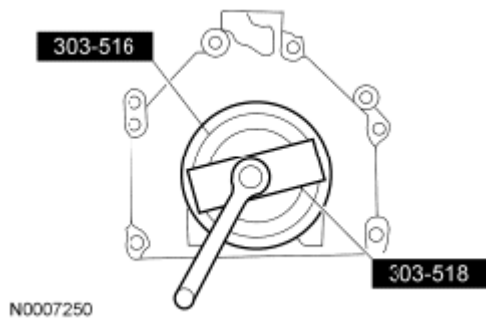


Fig. 265: Installing Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the crankshaft oil slinger with clean engine oil prior to installation.

2.

Using the Crankshaft Rear Oil Seal Installers and the Crankshaft Rear Oil Slinger Installer, install a new crankshaft oil slinger.

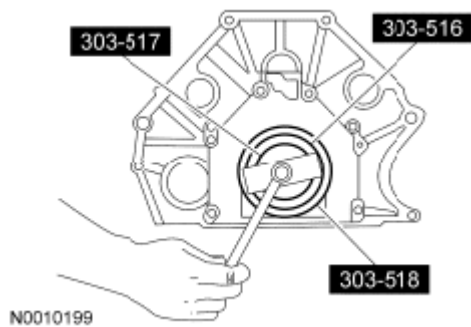
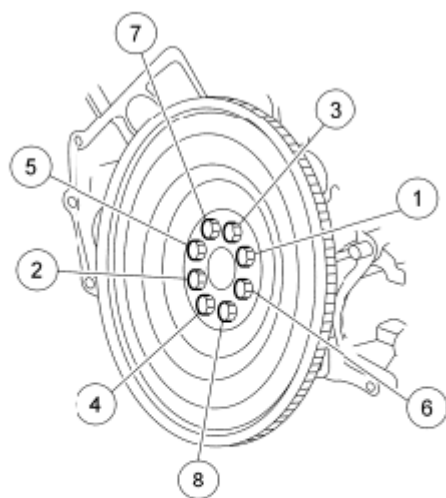


Fig. 266: Installing Crankshaft Oil Slinger
Courtesy of FORD MOTOR CO.

3. Install the flexplate and tighten the 8 bolts in the sequence shown in illustration.
 - Tighten to 80 Nm (59 lb-ft).



N0010329

Fig. 267: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

4. Install the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6R80**.

CRANKSHAFT REAR SEAL WITH RETAINER PLATE

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

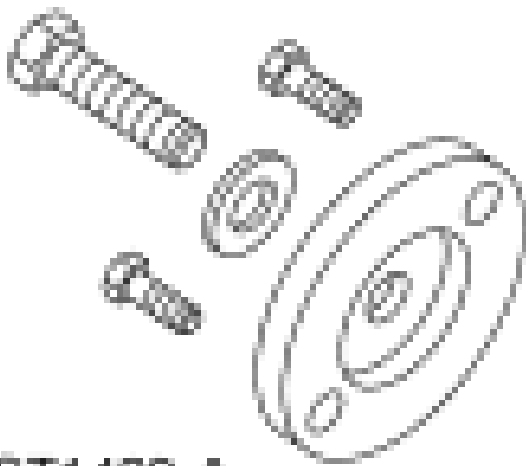
Installer, Crankshaft Rear Oil Seal
303-516 (T95P-6701-BH)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1479-A



ST1480-A

Installer, Crankshaft Rear Oil Seal
303-518 (T95P-6701-DH)

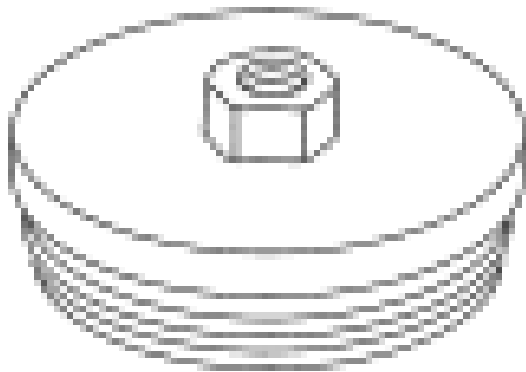
Installer, Crankshaft Rear Oil Slinger
303-517 (T95P-6701-CH)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1482-A



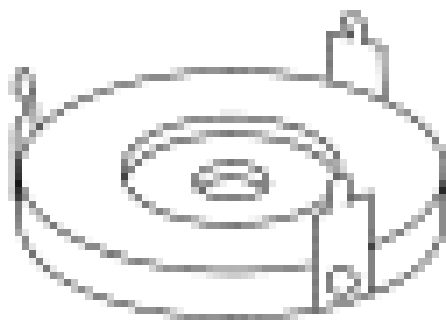
ST1382-A

Remover, Crankshaft Rear Oil Seal
303-519 (T95P-6701-EH)

Remover, Crankshaft Rear Oil Slinger
303-514 (T95P-6701-AH)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1481-A



ST1185-A

Slide Hammer
100-001 (T50T-100-A)

Material

MATERIAL 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

Silicone Gasket Remover
ZC-30

-

Removal

1. Remove the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6R80**.
2. Remove the oil pan. For additional information, refer to **OIL PAN**.
3. Remove the rear engine cover.
4. Using the Slide Hammer and the Crankshaft Rear Oil Slinger Remover, remove and discard the crankshaft oil slinger.

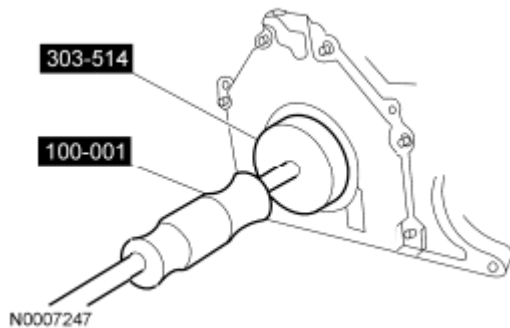


Fig. 268: Removing Crankshaft Oil Slinger
Courtesy of FORD MOTOR CO.

5. Using the Slide Hammer and the Crankshaft Rear Oil Seal Remover, remove and discard the crankshaft rear seal.

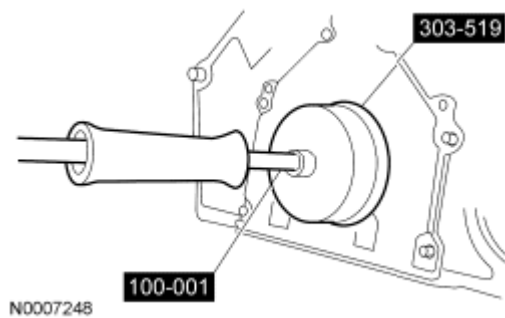


Fig. 269: Removing Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

6. Remove the 6 bolts and the crankshaft rear seal retainer plate.

Installation

NOTE: Do not use metal scrapers, wire brushes, power abrasive discs or other

- 1.

1. **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 metal surface prep. Follow the directions on the packaging.

Clean and inspect the mating surface.

2. **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.

Apply a 4.06 mm (0.16 in) bead of silicone gasket and sealant around the crankshaft rear seal retainer plate sealing surface.

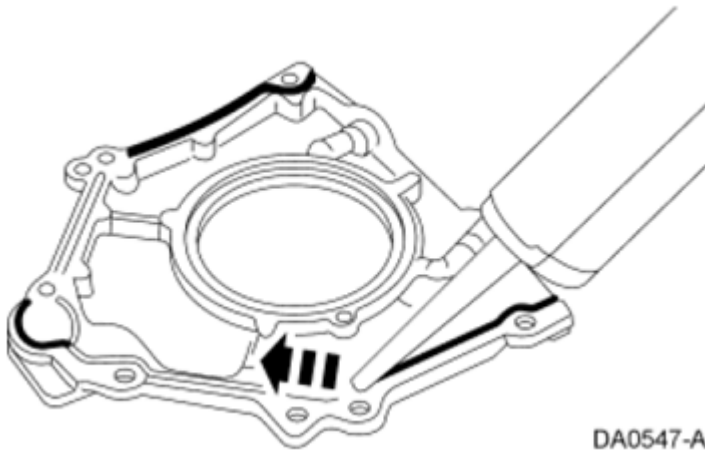


Fig. 270: Applying Sealant Around Crankshaft Rear Seal Retainer Plate Sealing Surface
Courtesy of FORD MOTOR CO.

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).

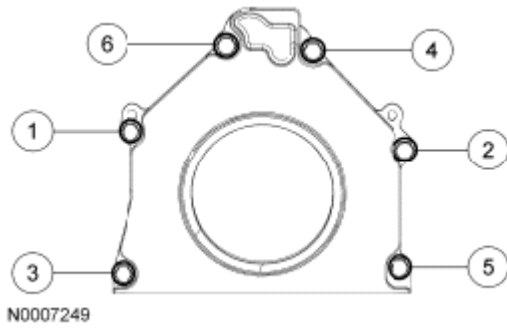


Fig. 271: Identifying Crankshaft Rear Seal Retainer Plate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the crankshaft rear seal with clean engine oil prior to installation.

4.

Using the Crankshaft Rear Oil Seal Installers, install a new crankshaft rear seal.

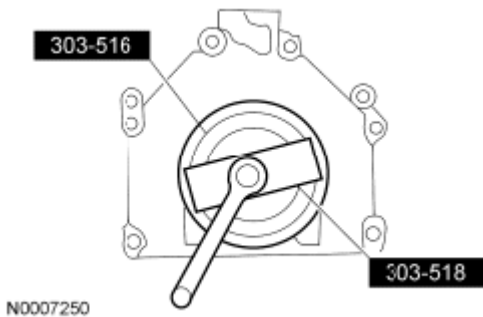


Fig. 272: Installing Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

NOTE: Lubricate the crankshaft oil slinger with clean engine oil prior to installation.

5.

Using the Crankshaft Rear Oil Seal Installers and the Crankshaft Rear Oil Slinger Installer, install a new crankshaft oil slinger.

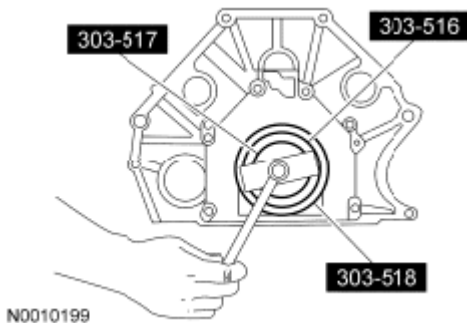
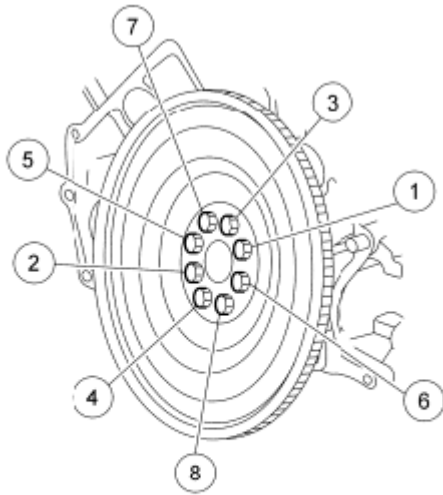


Fig. 273: Installing Crankshaft Oil Slinger
Courtesy of FORD MOTOR CO.

6. Install the rear engine cover.
7. Install the flexplate and tighten the 8 bolts in the sequence shown in illustration.
 - Tighten to 80 Nm (59 lb-ft).



N0010329

Fig. 274: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

8. Install the oil pan. For additional information, refer to **OIL PAN**.
9. Install the transmission. For additional information, refer to **AUTOMATIC TRANSAXLE/TRANSMISSION - 6R80**.

ENGINE SUPPORT INSULATORS

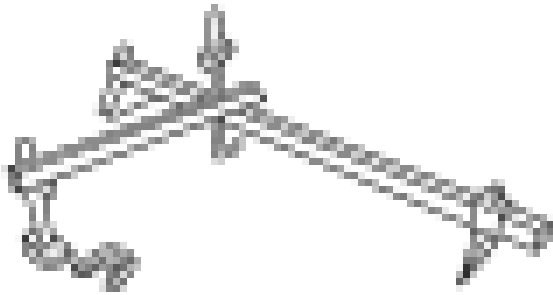
Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

	Support Bar, Engine

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2176-B

303-F070

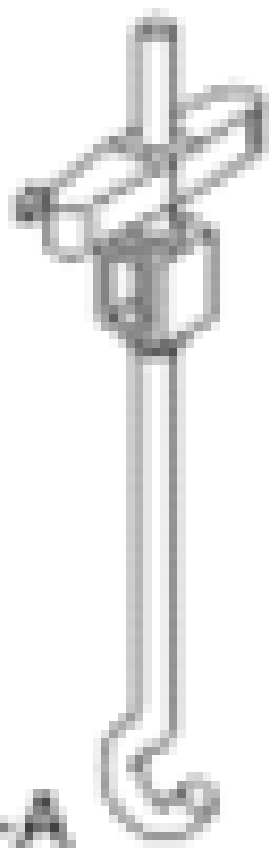


ST2592-A

Support Bracket, Engine
303-639

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



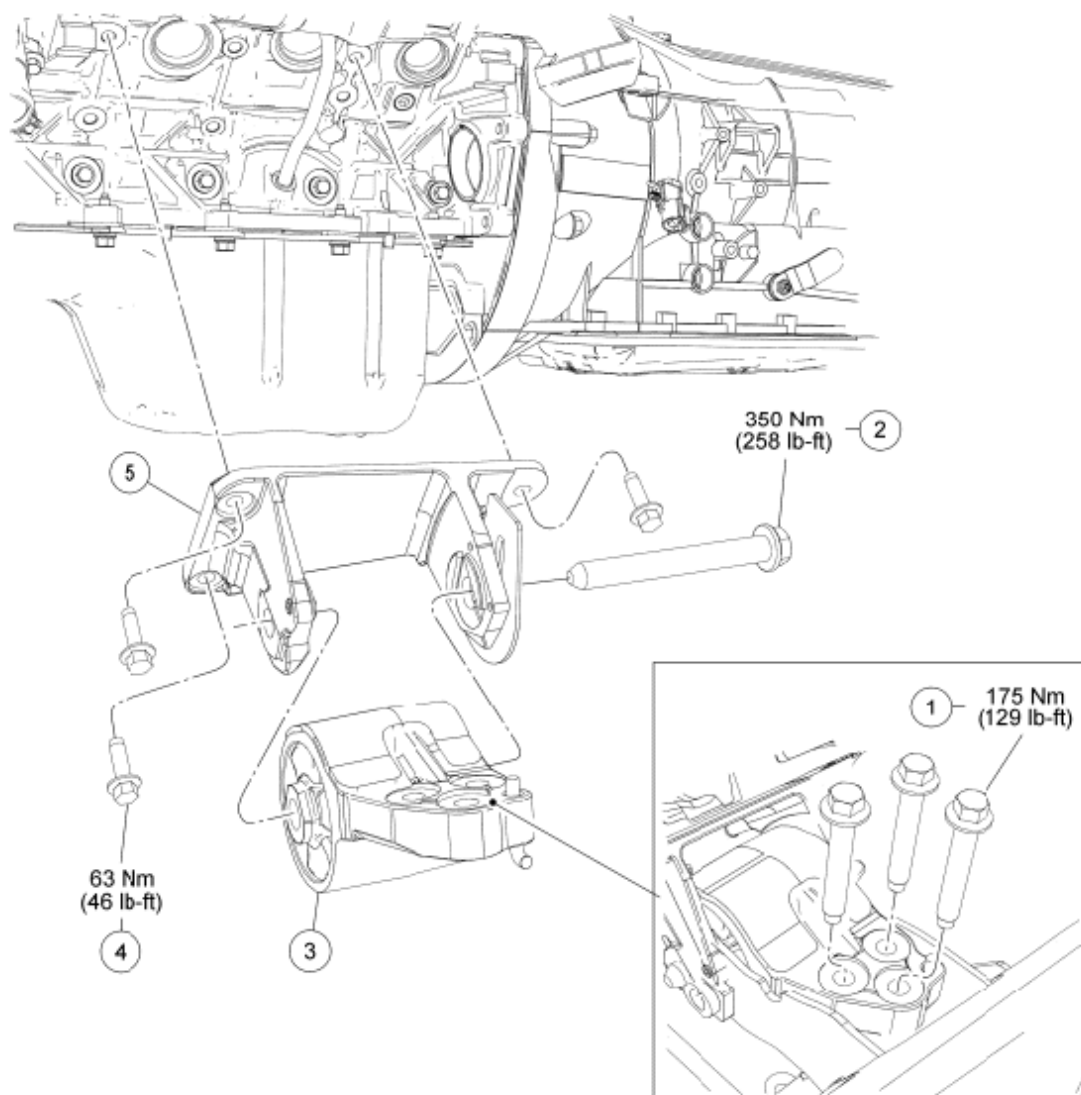
Support Hook
303-F071

Material

MATERIAL SPECIFICATION

Item	Specification
Threadlock 262 TA-26	WSK-M2G351-A6

LH Engine Support Insulator



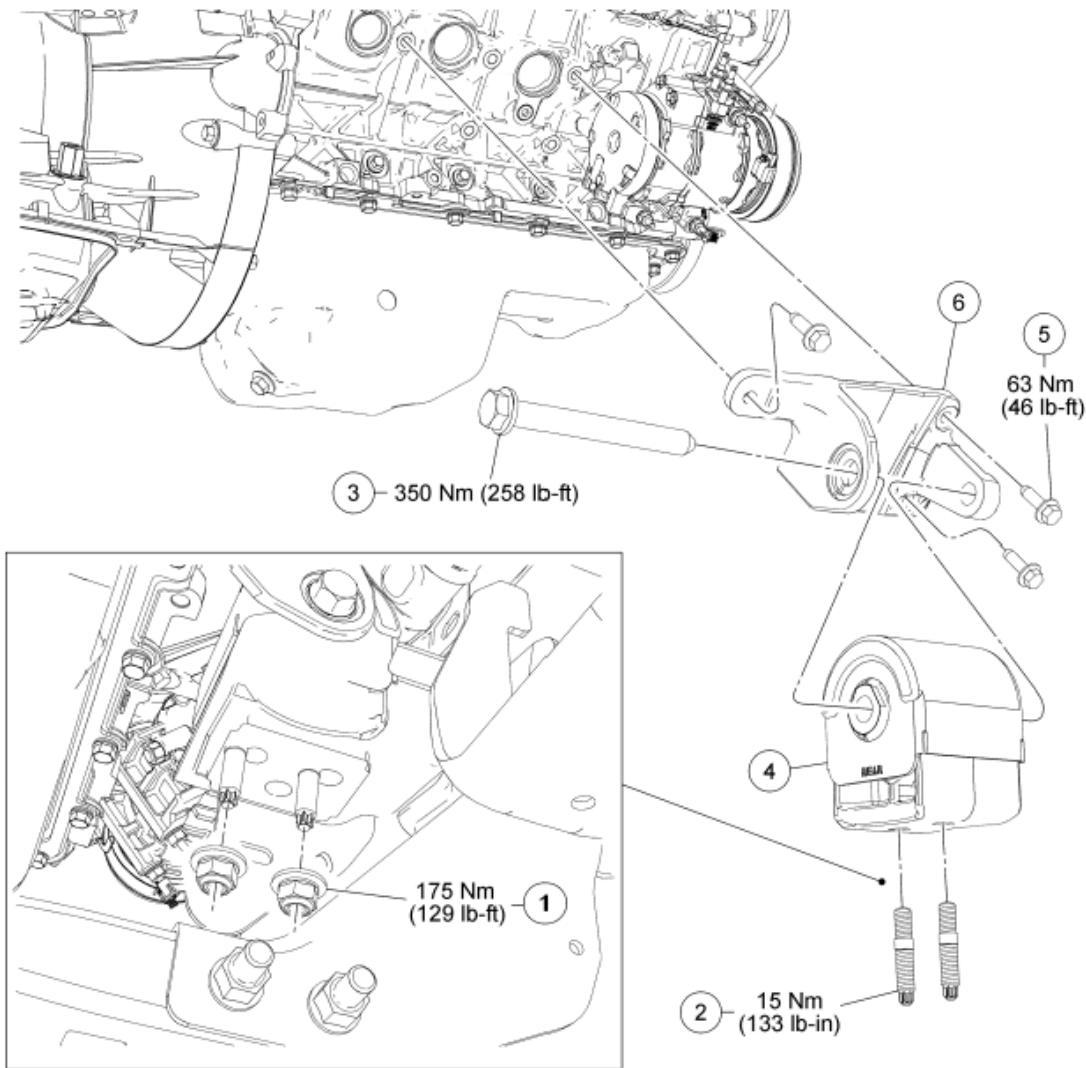
N0055142

Fig. 275: Identifying LH Engine Support Insulator Components With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	W712805	LH engine support insulator-to-frame bolt (3 required)
2	W711142	LH engine support insulator through bolt
3	6B032	LH engine support insulator
4	W711141	LH engine support insulator-to-cylinder block bracket bolt (3 required)
5	6061	LH engine support insulator-to-cylinder block bracket

RH Engine Support Insulator



N0091926

Fig. 276: Identifying RH Engine Support Insulator Components With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	W707251	RH engine support insulator-to-frame nut (2 required)
2	W711144	RH engine support insulator-to-frame stud bolt (2 required)
3	W711142	RH engine support insulator through bolt
4	6H028	RH engine support insulator
5	W711141	RH engine support insulator-to-cylinder block bracket bolt (3 required)
6	-	RH engine support insulator-to-cylinder block bracket

Removal

All engine support insulators

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING** .
2. Disconnect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .
3. Remove the Throttle Body (TB). For additional information, refer to **FUEL CHARGING & CONTROLS - 5.4L (3V)** .
4. Remove the cooling fan. For additional information, refer to **ENGINE COOLING** .
5. Remove the generator. For additional information, refer to **CHARGING SYSTEM** .
6. Remove the starter. For additional information, refer to **STARTING SYSTEM** .
7. If servicing the engine support insulators on a Four-Wheel Drive (4WD) vehicle, remove the front driveshaft. For additional information, refer to **DRIVESHAFT** .
8. Install the Engine Support Bar, Support Hook and Engine Support Bracket.

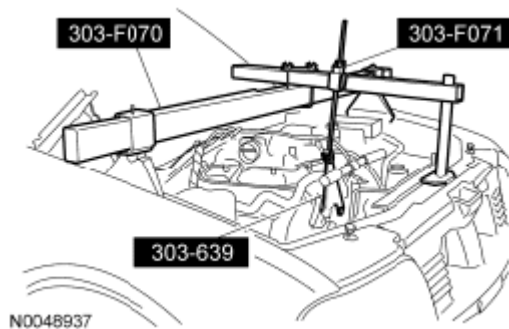


Fig. 277: Identifying Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

9. Remove the 4 (2 RH and 2 LH) Y-pipe flange nuts.

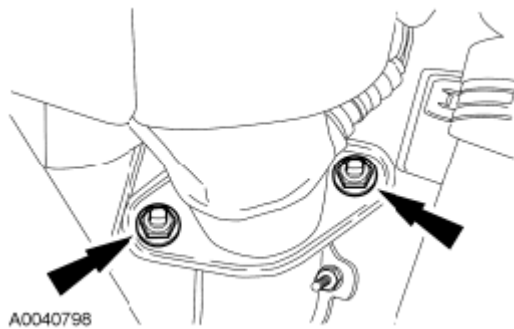


Fig. 278: Locating Y-Pipe Flange Nuts
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools when removing the transmission mount-to-crossmember nuts or damage to the transmission mount can occur.

- 10.

Loosen the 2 transmission mount-to-crossmember nuts.

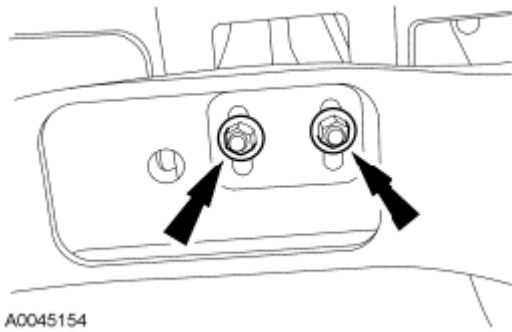


Fig. 279: Identifying Transmission Mount-To-Crossmember Nuts
Courtesy of FORD MOTOR CO.

RH engine support insulator

- NOTE:** Only use hand tools when loosening the engine support insulator through bolts or damage to the engine support insulator-to-cylinder block bracket can occur.
11. Loosen the LH engine support insulator through bolt.
- NOTE:** Only use hand tools when removing the engine support insulator through bolts or damage to the engine support insulator-to-cylinder block bracket can occur.
12. Remove the RH engine support insulator through bolt.
- NOTE:** Only use hand tools when removing the engine support insulator nuts or damage to the engine support insulator can occur.
13. **NOTE:** If during nut removal the stud bolt is extracted from the engine support insulator, separate the nut from the stud bolt prior to stud bolt installation.
- Remove the 2 RH engine support insulator nuts.
- NOTE:** Only use hand tools when removing the engine support insulator stud bolts or damage to the engine support insulator can occur.
14. Remove the 2 RH engine support insulator stud bolts.
15. Using the Engine Support Bar, Support Hook and Engine Support Bracket, raise the engine.

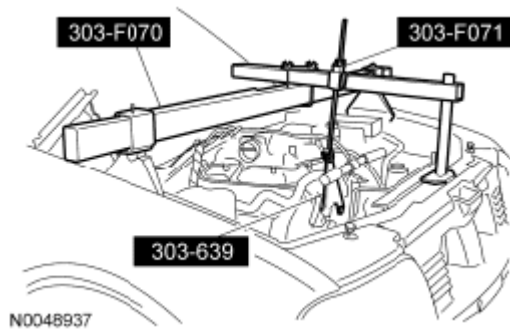


Fig. 280: Identifying Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

16. Remove the 3 bolts and the RH engine support insulator-to-cylinder block bracket.
17. Remove the RH engine support insulator.

LH engine support insulator

NOTE: Only use hand tools when loosening the engine support insulator through bolts or damage to the engine support insulator-to-cylinder block bracket can occur.

18.

Loosen the RH engine support insulator through bolt.

NOTE: Only use hand tools when removing the engine support insulator through bolts or damage to the engine support insulator-to-cylinder block bracket can occur.

19.

Remove the LH engine support insulator through bolt.

20. Using the Engine Support Bar, Support Hook and Engine Support Bracket, raise the engine.

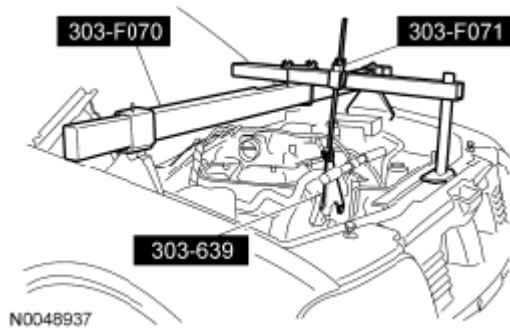


Fig. 281: Identifying Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

21.

NOTE: Only use hand tools when removing the engine support insulator-to-frame bolts or damage to the engine support insulator-to-frame nut plate can occur.

21. Remove the 3 engine support insulator-to-frame bolts.
 - Discard the 3 bolts.
22. Remove the 3 bolts and the LH engine support insulator-to-cylinder block bracket.
23. Remove the LH engine support insulator.
24. Inspect the engine support insulator-to-frame nut plate for thread damage. If the nut plate is damaged, bend 2 tabs back and remove the nut plate. Replace the nut plate with service part No. 56190 and bend the 2 tabs back to the original position.

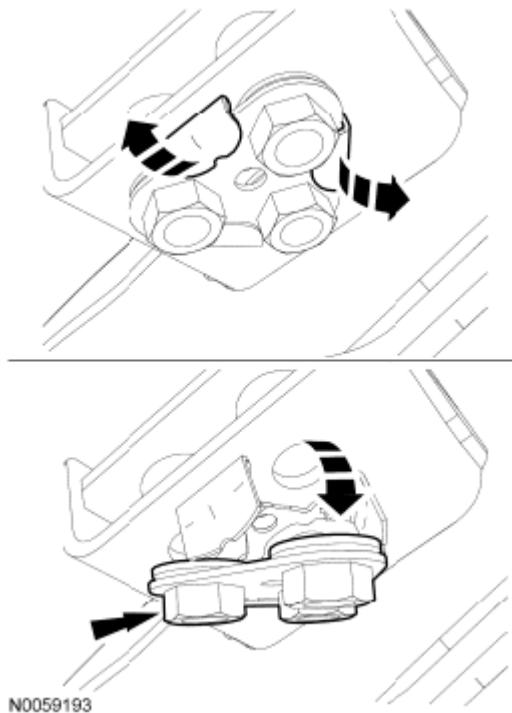


Fig. 282: Removing Nut Plate
Courtesy of FORD MOTOR CO.

Installation

RH engine support insulator

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.

NOTE: Only use hand tools when installing the engine support insulator stud bolts or damage to the engine support insulator can occur.

- 2.

Position the RH engine support insulator into the vehicle and install the 2 stud bolts.

- Tighten to 15 Nm (133 lb-in).

3. Position the RH engine support insulator-to-cylinder block bracket and install the 3 bolts.

- Tighten to 63 Nm (46 lb-ft).

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

4.

Install the 2 RH engine support insulator nuts.

- Tighten to 175 Nm (129 lb-ft).

LH engine support insulator

5. 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.

6. Position the LH engine support insulator and hand start the 3 new engine support insulator-to-frame bolts.

- Tighten to 175 Nm (129 lb-ft).

7. Position the LH engine support insulator-to-cylinder block bracket and install the 3 bolts.

- Tighten to 63 Nm (46 lb-ft).

All engine support insulator

8. Using the Engine Support Bar, Support Hook and Engine Support Bracket, lower the engine into position.

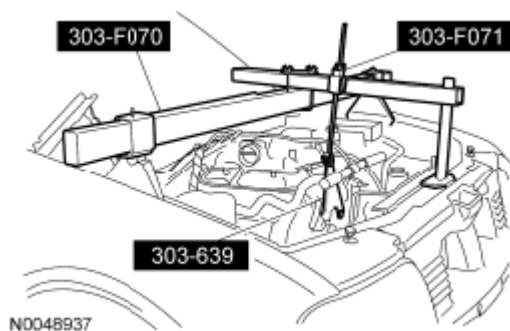


Fig. 283: Identifying Engine Support Bar, Support Hook And Engine Support Bracket
Courtesy of FORD MOTOR CO.

NOTE: Only use hand tools when installing the engine support insulator through bolt or damage to the engine support insulator-to-cylinder block bracket can occur.

9.

Install the LH and RH engine support insulator bolts.

- Apply threadlock to the bolt threads prior to installation.
- Tighten to 350 Nm (258 lb-ft).

NOTE: Only use hand tools when installing the transmission mount-to-crossmember nuts or damage to the transmission mount can occur.

10.

Install the transmission mount-to-crossmember nuts.

- Tighten to 103 Nm (76 lb-ft).

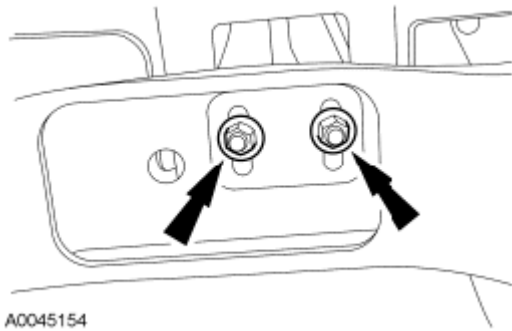


Fig. 284: Identifying Transmission Mount-To-Crossmember Nuts
Courtesy of FORD MOTOR CO.

11. Position the Y-pipe and install the 4 (2 RH and 2 LH) nuts.
- Tighten to 40 Nm (30 lb-ft).

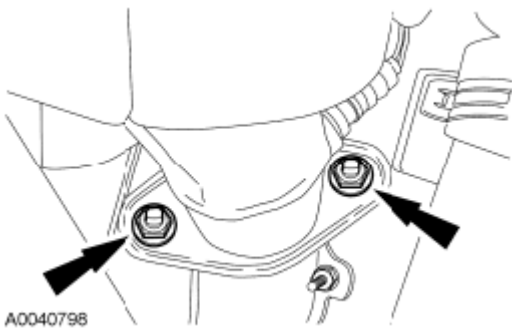


Fig. 285: Locating Y-Pipe Flange Nuts
Courtesy of FORD MOTOR CO.

12. Remove the Engine Support Bar, Support Hook and Engine Support Bracket.

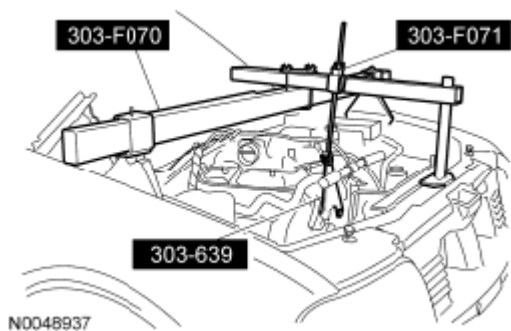


Fig. 286: Identifying Engine Support Bar, Support Hook And Engine Support Bracket
 Courtesy of FORD MOTOR CO.

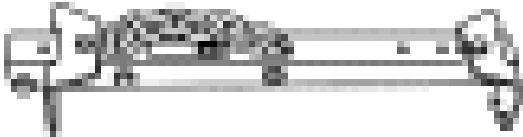
13. Install the starter. For additional information, refer to **STARTING SYSTEM** .
14. If servicing the engine support insulator on a **4WD** vehicle, install the front driveshaft. For additional information, refer to **DRIVESHAFT** .
15. Install the generator. For additional information, refer to **CHARGING SYSTEM** .
16. Install the cooling fan. For additional information, refer to **ENGINE COOLING** .
17. Install the **TB** . For additional information, refer to **FUEL CHARGING & CONTROLS - 5.4L (3V)** .
18. Connect the battery ground cable. For additional information, refer to **BATTERY, MOUNTING AND CABLES** .

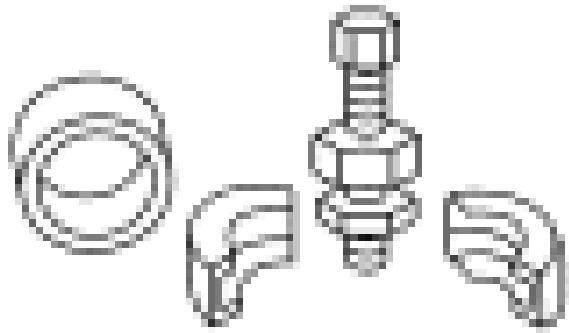
REMOVAL

ENGINE

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

 ST1377-A	Lifting Bracket, Engine 303-F047 (014-00073) or equivalent



Remover, Power Steering Pump Pulley
211-016 (T69L-10300-B)

ST1290-B

1. With the vehicle in NEUTRAL, position it on a hoist. For additional information, refer to **JACKING & LIFTING**.
2. **NOTE:** Index-mark the hood hinge location to aid in hood installation.

Remove the 4 bolts and the hood.

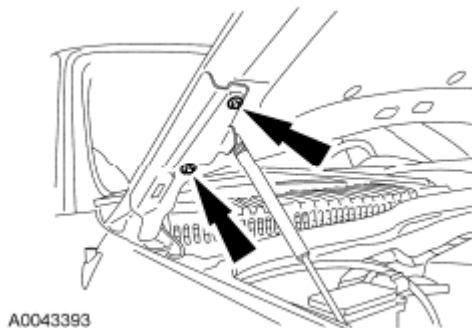


Fig. 287: Identifying Hood Bolts
Courtesy of FORD MOTOR CO.

- NOTE:** If the engine is repaired or replaced because of upper engine failure, typically including valve or piston damage, check the intake manifold for metal debris. If metal debris is found, install a new intake manifold. Failure to follow these instructions can result in engine damage.
- 3.

Remove the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.

4. Remove the accessory drive belt.
5. Remove the cooling module. For additional information, refer to **ENGINE COOLING** .
6. Position the Power Distribution Box (PDB) and wiring harness forward.
7. Remove the starter. For additional information, refer to **STARTING SYSTEM** .
8. Remove the 2 bolts and the flexplate inspection cover.

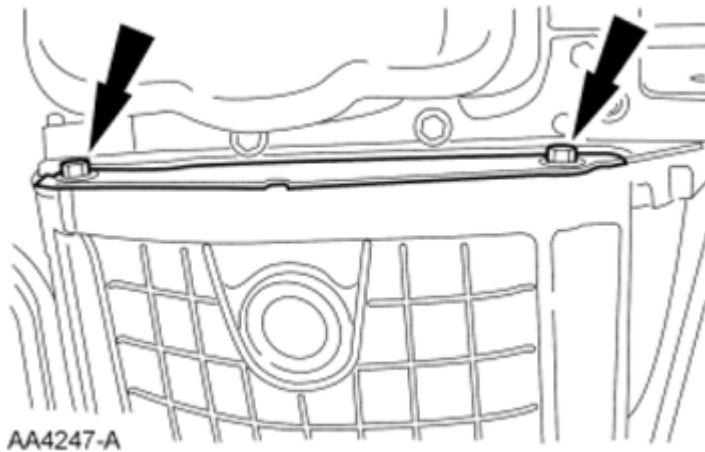


Fig. 288: Locating Flexplate Inspection Cover Bolts
Courtesy of FORD MOTOR CO.

9. Remove the cylinder block opening cover.

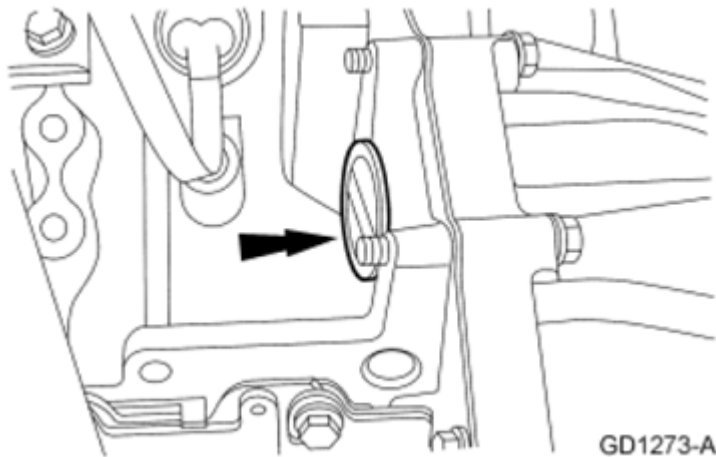


Fig. 289: Locating Cylinder Block Opening Cover
Courtesy of FORD MOTOR CO.

10. Remove the 4 torque converter-to-flexplate nuts.
 - Discard the nuts.

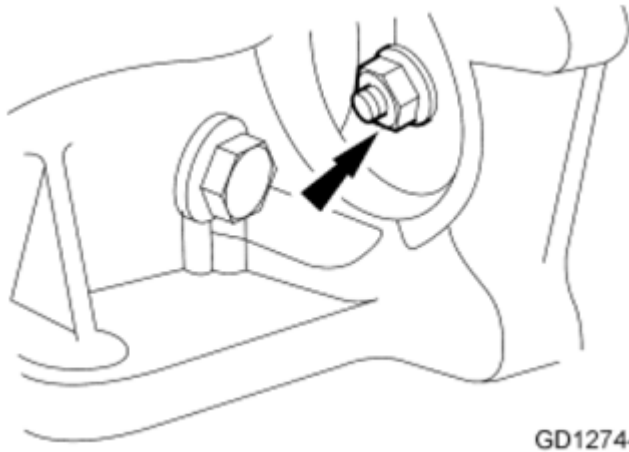


Fig. 290: Locating Torque Converter-To-Flexplate Nut
Courtesy of FORD MOTOR CO.

11. **NOTE:** The upper 2 transmission-to-engine bolts will be removed later.

Remove the lower 5 transmission-to-engine bolts.

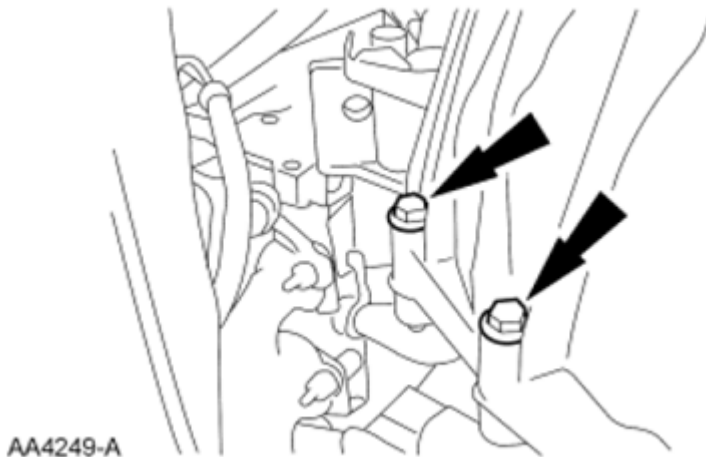


Fig. 291: Locating Lower Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

12. Remove the drain plug and drain the engine oil. Install the drain plug when finished.
- Tighten to 23 Nm (17 lb-ft).

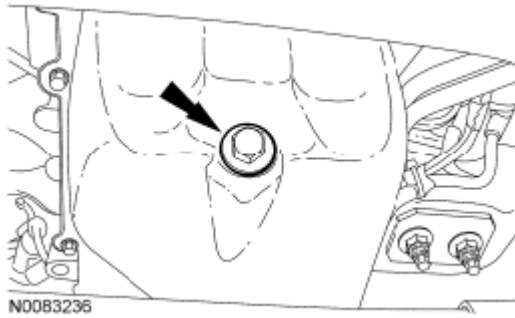


Fig. 292: Locating Drain Plug
Courtesy of FORD MOTOR CO.

13. Disconnect the A/C compressor electrical connector and the wiring harness retainer.

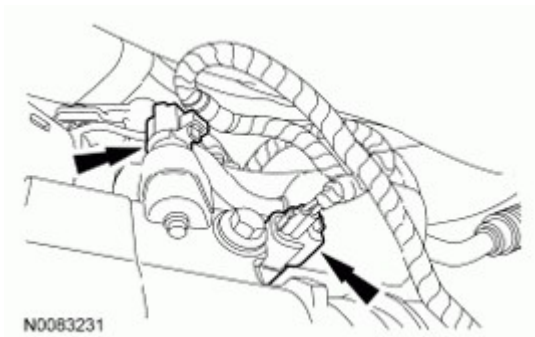


Fig. 293: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

14. Disconnect the Crankshaft Position (CKP) sensor electrical connector.

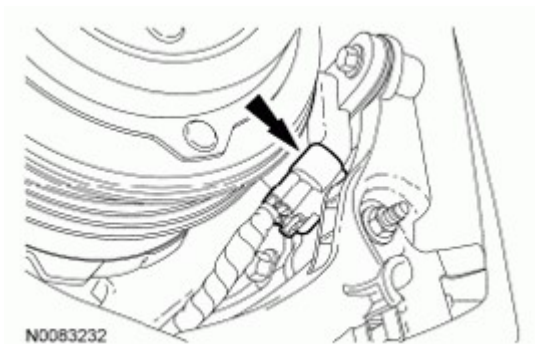


Fig. 294: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

15. Remove the bolts and position the A/C compressor aside.

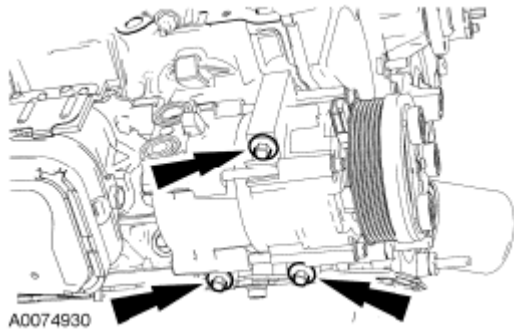


Fig. 295: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

16. Remove the bolt and position aside the starter wiring harness and rear support bracket.

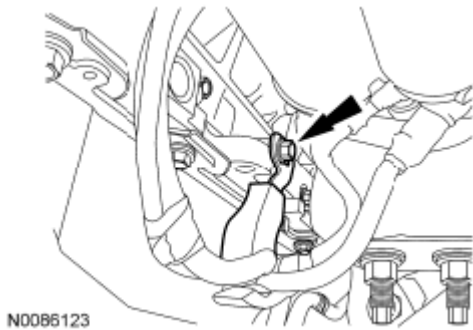


Fig. 296: Locating Starter Wiring Harness Rear Support Bracket Bolt
Courtesy of FORD MOTOR CO.

17. If equipped, disconnect the block heater electrical connector.

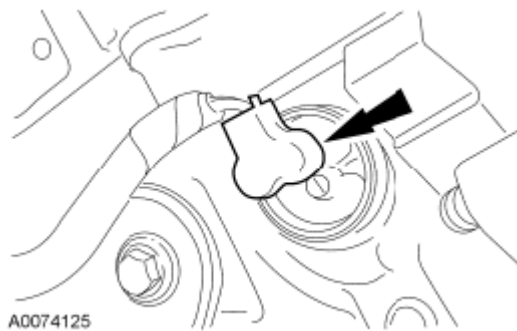


Fig. 297: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

18. Disconnect the Engine Oil Pressure (EOP) switch electrical connector and detach the wiring harness retainers from the oil pan bolt, the power steering pump stud bolt and the engine block.

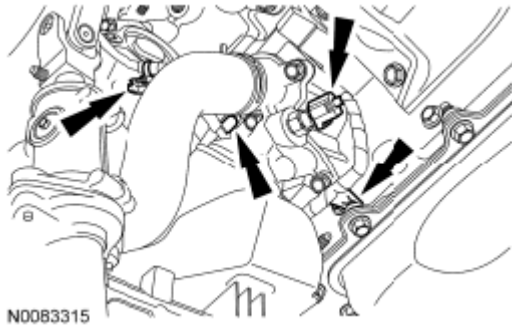


Fig. 298: Locating Engine Oil Pressure (EOP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

19. Remove the 4 exhaust Y-pipe flange nuts.

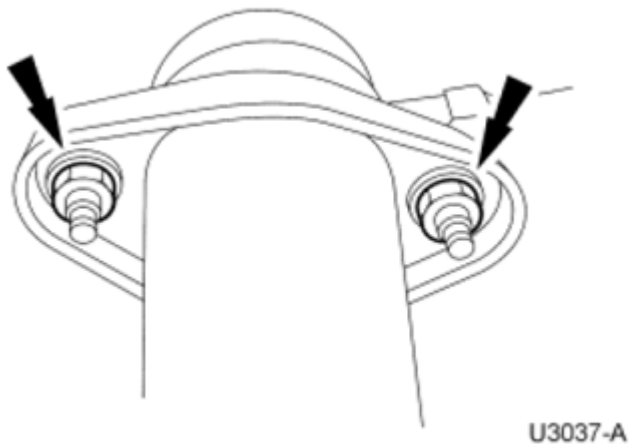


Fig. 299: Locating Exhaust Y-Pipe Flange Nuts
Courtesy of FORD MOTOR CO.

20. **NOTE:** Only use hand tools when removing the engine support insulator nuts or the engine support insulator may be damaged.
- NOTE:** If during nut removal the stud bolt is extracted from the engine support insulator, separate the nut from the stud bolt prior to stud bolt installation.

Remove the 2 RH engine support insulator nuts.

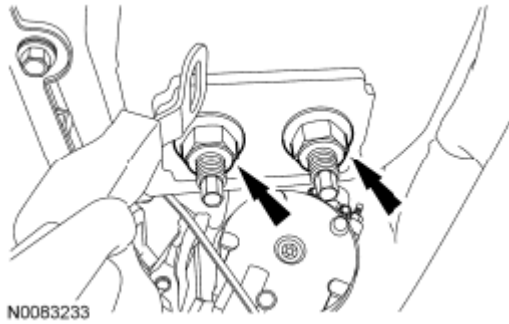


Fig. 300: Locating RH Engine Support Insulator Nuts
Courtesy of FORD MOTOR CO.

21. **NOTE:** Only use hand tools when loosening the engine support insulator through bolt or the engine support insulator may be damaged.

Remove the LH engine support insulator bolt.

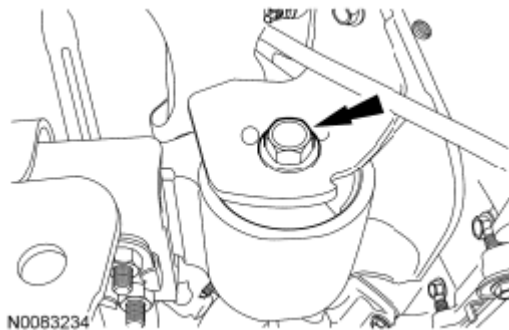


Fig. 301: Locating LH Engine Support Insulator Bolt
Courtesy of FORD MOTOR CO.

22. Loosen the 2 transmission mount nuts.

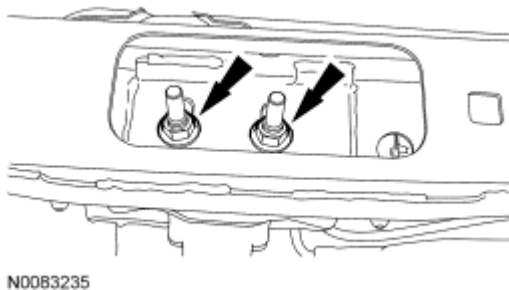


Fig. 302: Locating Transmission Mount Nuts
Courtesy of FORD MOTOR CO.

23. Remove the nut and position aside the transmission cooler tube support bracket and the starter wiring harness support bracket.

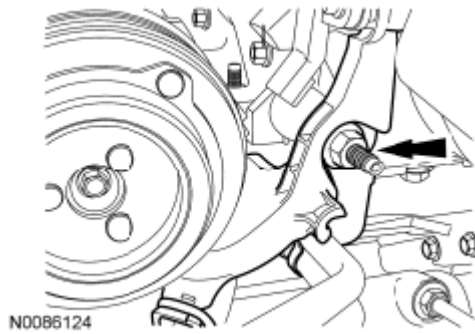


Fig. 303: Locating Support Bracket Nut
Courtesy of FORD MOTOR CO.

24. Remove the Power Steering Pressure (PSP) tube support bracket nut.

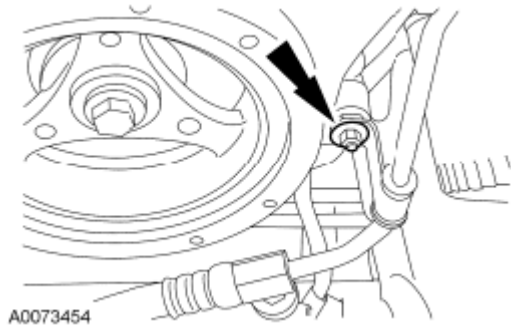


Fig. 304: Locating PSP Tube Support Bracket Nut
Courtesy of FORD MOTOR CO.

NOTE: While servicing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

- 25.

Remove the bolt and detach the power steering fluid tubes from the steering gear.

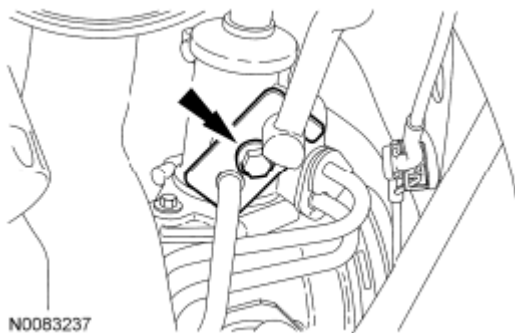


Fig. 305: Locating Power Steering Fluid Tubes Bolt
Courtesy of FORD MOTOR CO.

NOTE: Do not install a power steering pump pulley that has been removed and installed twice or pulley failure and/or pump damage may occur. Inspect the pulley for paint marks in the web area near the hub. If there are 2 paint marks, discard the pulley and install a new one. If there is one paint mark or no paint marks, use a paint pencil to mark the web area of the pulley near the hub.

26.

Using the Power Steering Pump Pulley Remover, remove the power steering pump pulley.



Fig. 306: Removing Power Steering Pump Pulley
Courtesy of FORD MOTOR CO.

27. Remove the 2 bolts, 1 stud bolt and position aside the power steering pump and reservoir as an assembly.



Fig. 307: Locating Power Steering Pump And Reservoir Bolts
Courtesy of FORD MOTOR CO.

28. Disconnect electrical connector and detach the connector and wiring harness retainers.

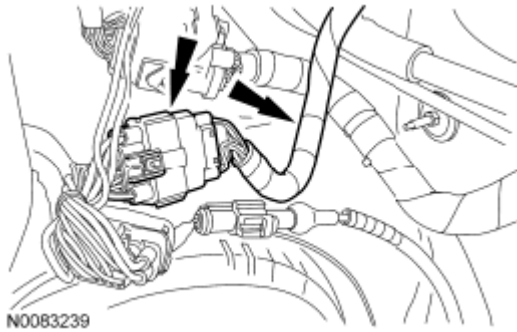


Fig. 308: Locating Engine Harness Electrical Connector
Courtesy of FORD MOTOR CO.

29. Disconnect the PCM electrical connector and the engine wiring harness retainer and position the engine wiring harness aside.

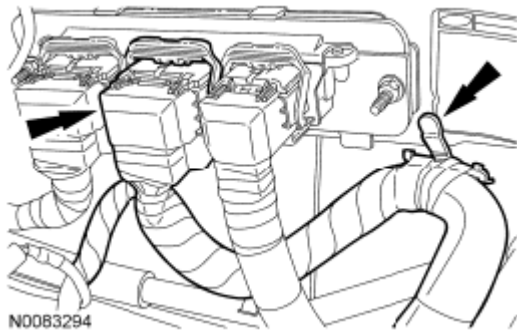


Fig. 309: Locating PCM Electrical Connector
Courtesy of FORD MOTOR CO.

30. Remove the ground strap bolt.

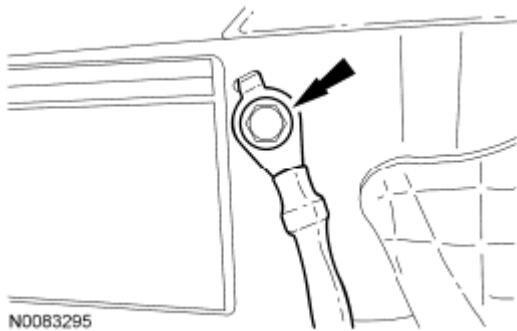


Fig. 310: Locating Ground Strap Bolt
Courtesy of FORD MOTOR CO.

31. Disconnect the RH Knock Sensor (KS) electrical connector and the heater coolant hose.

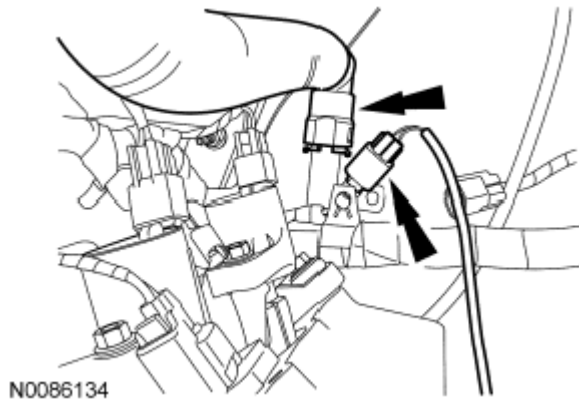


Fig. 311: Locating RH Knock Sensor Electrical Connector And Heater Coolant Hose
Courtesy of FORD MOTOR CO.

32. Disconnect the LH KS electrical connector.

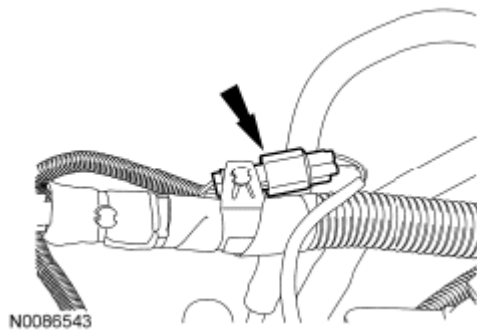


Fig. 312: Locating LH Knock Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

33. Disconnect the Cylinder Head Temperature (CHT) electrical connector.

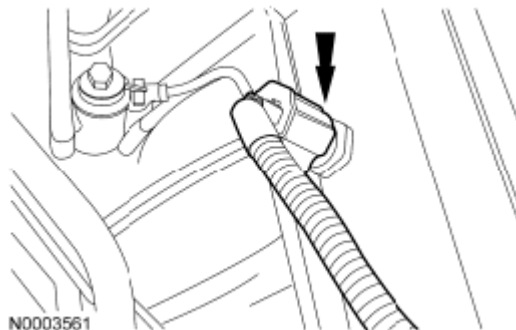


Fig. 313: Locating Cylinder Head Temperature (CHT) Electrical Connector
Courtesy of FORD MOTOR CO.

34. Disconnect the RH Camshaft Position (CMP) sensor electrical connector and the 2 wiring harness retainers.

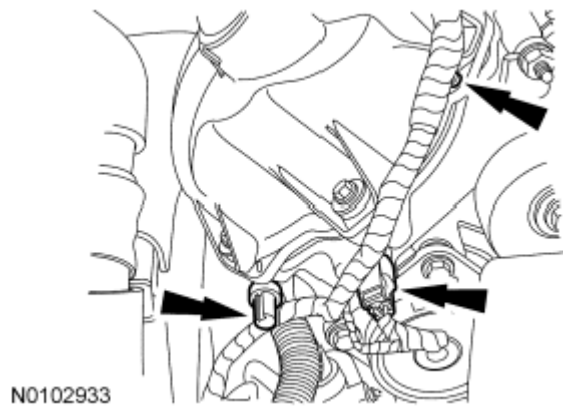


Fig. 314: Locating RH CMP Sensor Electrical Connector And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

35. Disconnect the RH Variable Camshaft Timing (VCT) solenoid and the RH radio ignition interference capacitor electrical connectors.

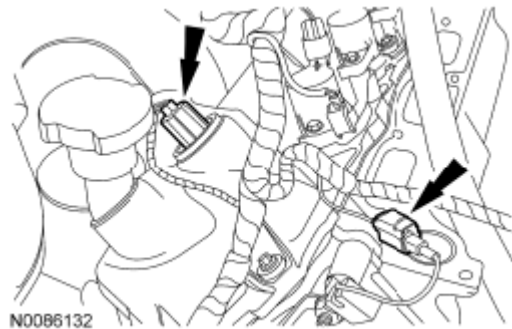


Fig. 315: Locating RH Radio Ignition Interference Capacitor Electrical Connectors
Courtesy of FORD MOTOR CO.

36. Disconnect the 4 RH ignition coil electrical connectors and the 2 engine wiring harness retainers from the RH valve cover studs.



Fig. 316: Locating RH Ignition Coil Electrical Connectors
Courtesy of FORD MOTOR CO.

37. Disconnect the LH **CMP** sensor, radio interference capacitor and **VCT** solenoid electrical connectors and detach the radio interference capacitor electrical connector retainer and the 2 wiring harness retainers.

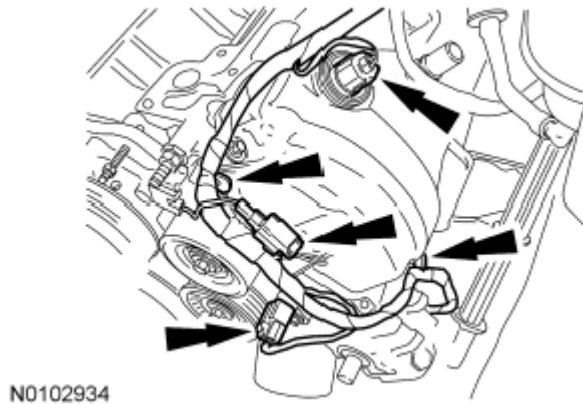


Fig. 317: Locating VCT Solenoid Electrical Connectors
Courtesy of FORD MOTOR CO.

38. Disconnect the transmission wiring harness retainer from the intake manifold vacuum tube support bracket.

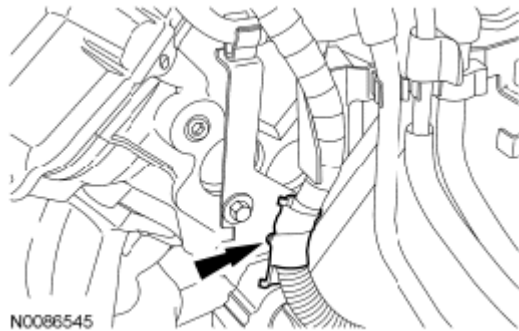


Fig. 318: Locating Transmission Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

39. Position the engine wiring harness aside.
40. Support the transmission.

NOTE: On 4WD vehicles, it may be necessary to reposition the transfer case vent hose to access the bolts.

41.

Remove the upper 2 transmission-to-engine bolts.

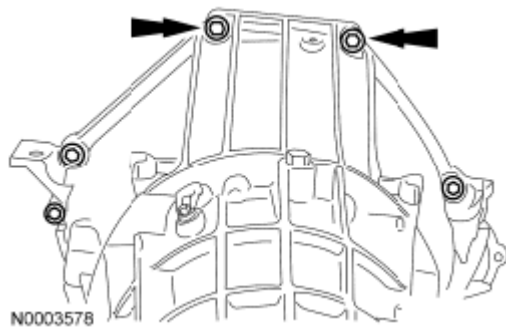


Fig. 319: Locating Upper Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

42. Install the Engine Lifting Bracket.

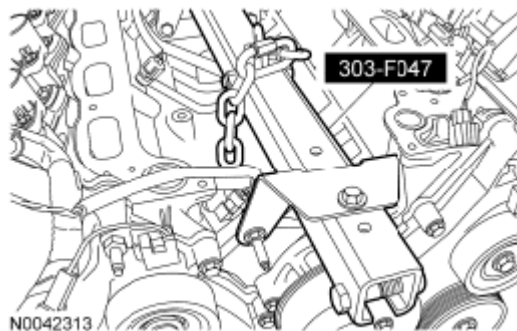


Fig. 320: Identifying Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

43. Using a suitable floor crane, remove the engine assembly from the vehicle.

CYLINDER HEAD

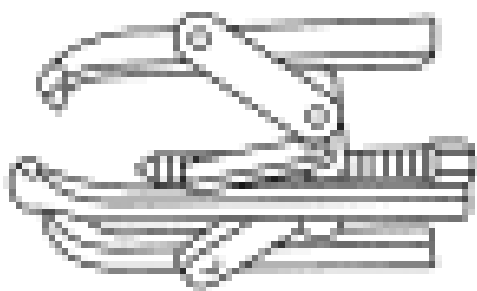
Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

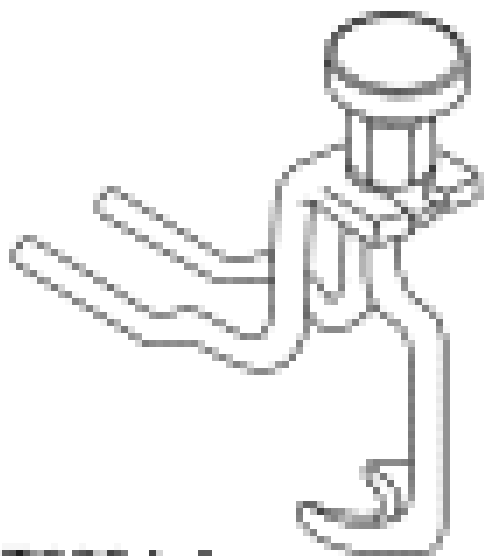
3 Jaw Puller
303-D121 or equivalent

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1184-A

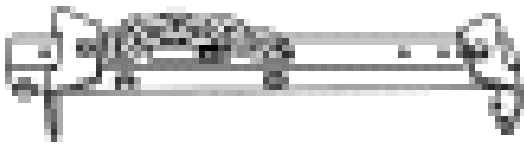


ST2804-A

Compressor, Valve Spring
303-1039

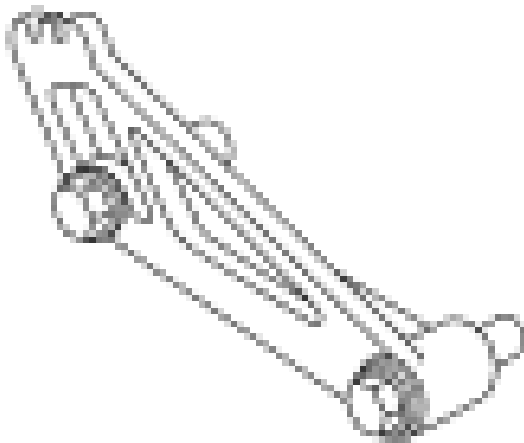
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



Lifting Bracket, Engine
303-F047 (014-00073) or equivalent

ST1377-A



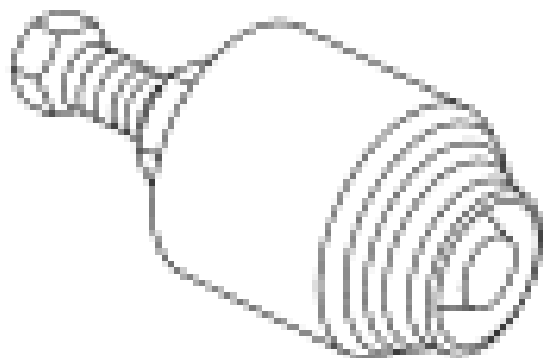
Locking Tool, Cam Phaser
303-1046

ST2807-A

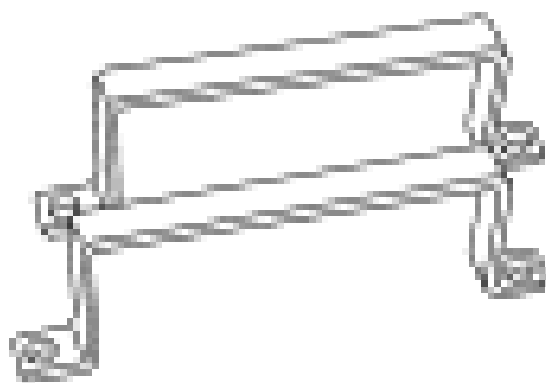
Remover, Crankshaft Front Oil Seal
303-107 (T74P-6700-A)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1730-A



ST1668-A

Remover/Installer, Cylinder Head
303-572 (T97T-6000-A)

Material

MATERIAL SPECIFICATION

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

All cylinder heads

1. Remove the engine. For additional information, refer to ENGINE.

NOTE: Do not use the oil pan to support the engine or oil pan and oil pan gasket damage may occur.

- 2.

Lower and support the engine assembly on wood blocks.

3. Remove the Engine Lifting Bracket.

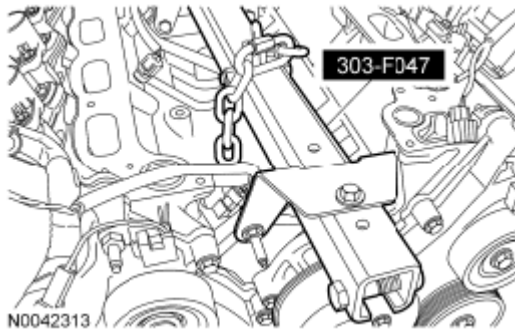


Fig. 321: Identifying Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

4. Install the engine onto an engine stand.
5. If equipped with cylinder block drain plugs, remove the 3 bolts and the RH engine support insulator.

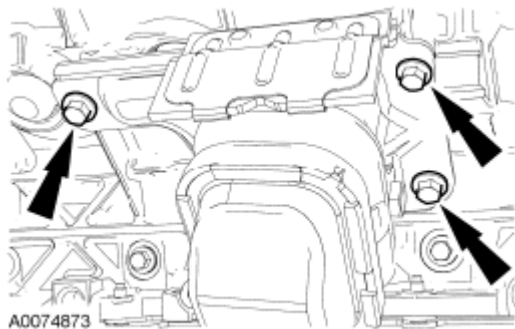


Fig. 322: Locating RH Engine Support Insulator Bolts
Courtesy of FORD MOTOR CO.

6. **NOTE:** LH shown in illustration, RH similar.

If equipped, remove the cylinder block drain plugs and drain the coolant into a suitable container.

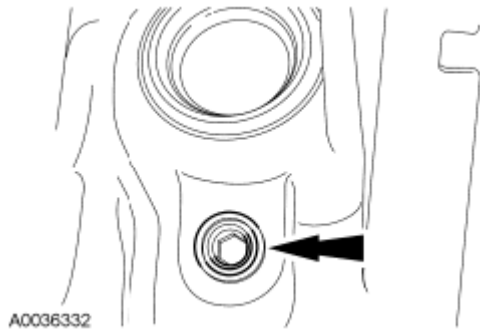


Fig. 323: Locating Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

7. **NOTE:** LH shown in illustration, RH similar.

If equipped, install the cylinder block drain plugs.

- Tighten to 24 Nm (18 lb-ft).

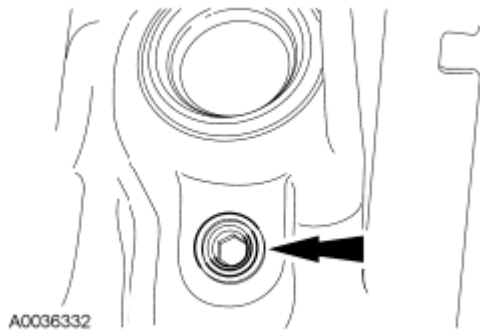


Fig. 324: Locating Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

8. Remove the nut and the RH radio interference capacitor.

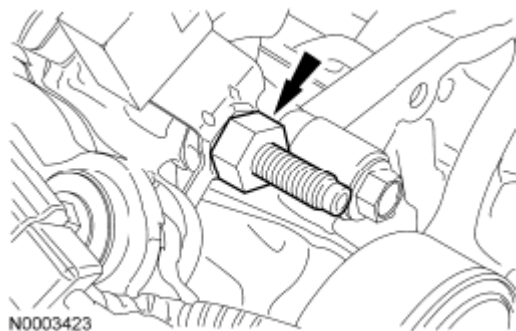


Fig. 325: Locating RH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

9. Remove the nut and the LH radio ignition interference capacitor.

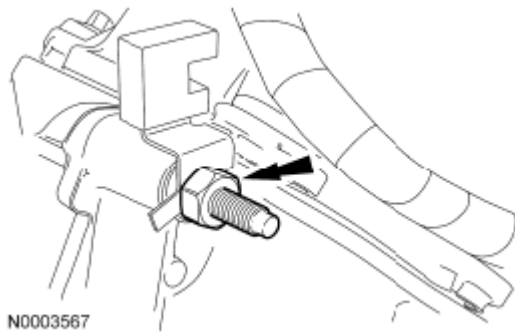


Fig. 326: Locating LH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

10. Remove the bolt and the intake manifold vacuum tube support bracket.

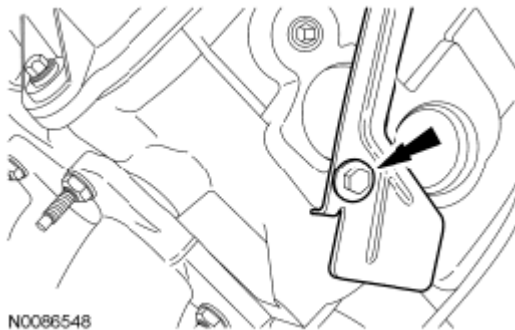


Fig. 327: Locating Intake Manifold Vacuum Tube Support Bracket Bolt
Courtesy of FORD MOTOR CO.

11. **NOTE:** LH shown in illustration, RH similar.

Remove the 8 bolts and the 8 ignition coils.

- Remove the ignition coil using a twisting motion while pulling up on the ignition coil.

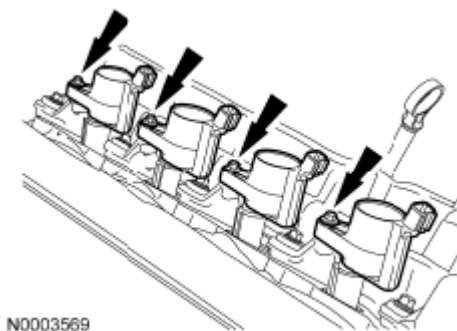


Fig. 328: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

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

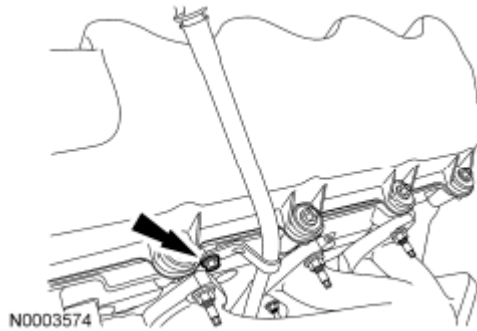


Fig. 329: Locating Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

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.

13.

NOTE: Remove the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

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

Loosen the 10 bolts and remove the LH 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.

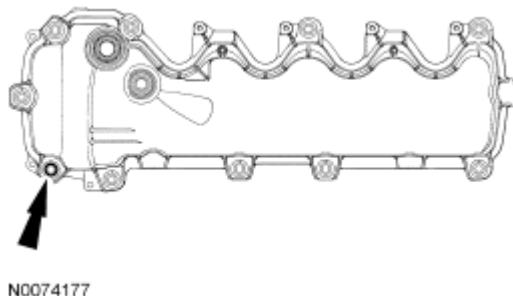


Fig. 330: Locating LH Valve Cover Bolt

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.

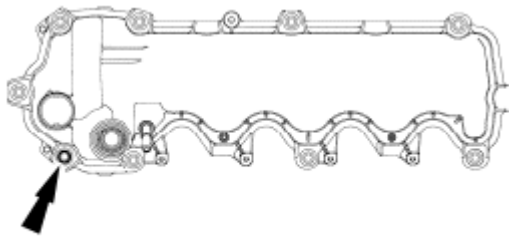
14.

NOTE: Remove the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

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

Loosen the 9 bolts and remove the RH 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.

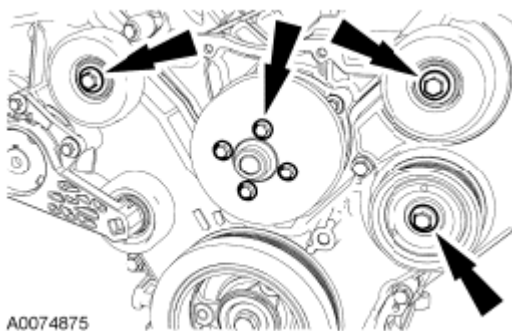


N0074178

Fig. 331: Locating RH Valve Cover Bolt

Courtesy of FORD MOTOR CO.

15. Remove the 7 bolts, the coolant pump pulley and the 3 accessory drive belt idler pulleys.



A0074875

Fig. 332: Locating Pulleys Bolts

Courtesy of FORD MOTOR CO.

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

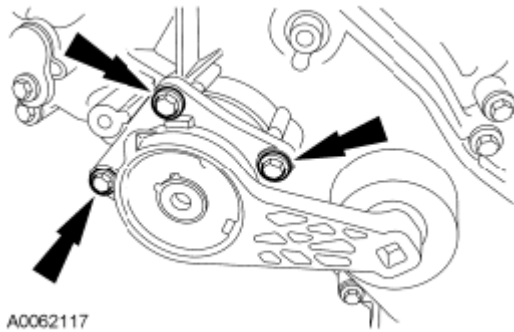


Fig. 333: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

17. Remove and discard the crankshaft pulley bolt. Using the 3 Jaw Puller, remove the crankshaft pulley.

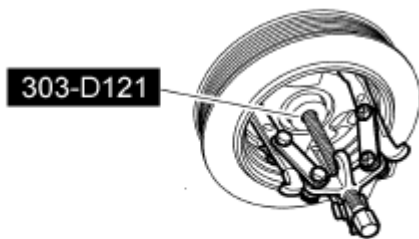


Fig. 334: Removing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

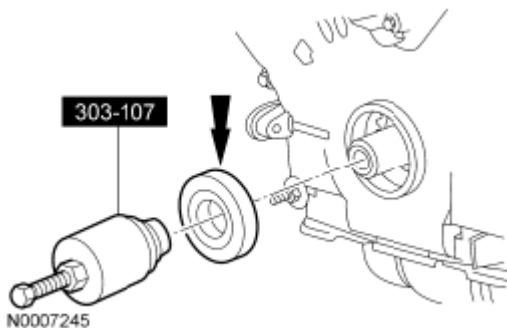


Fig. 335: Removing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

19. Remove the front 4 oil pan bolts.

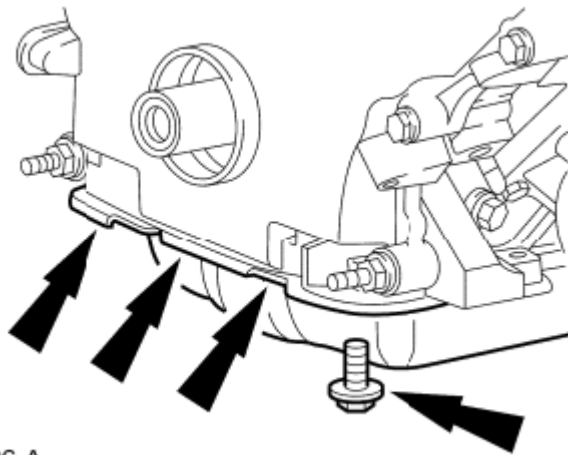


Fig. 336: Locating Oil Pan Bolts
Courtesy of FORD MOTOR CO.

- NOTE:** Correct fastener location is essential for the assembly procedure. Record fastener location.
- 20.

Remove the 15 engine front cover fasteners.

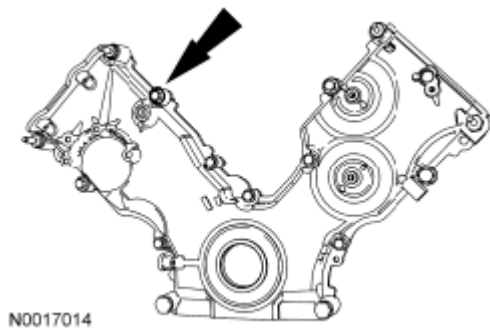
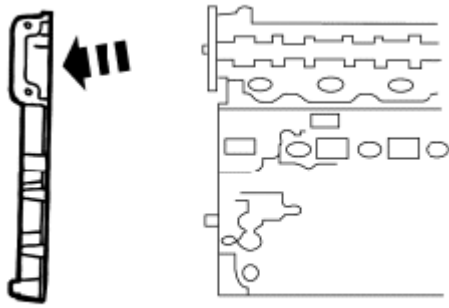


Fig. 337: Locating Engine Front Cover Fasteners
Courtesy of FORD MOTOR CO.

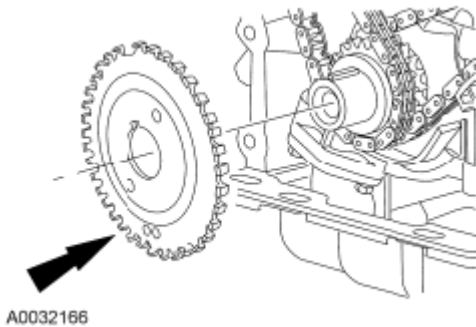
21. Remove the engine front cover from the cylinder block.



AA1665-A

Fig. 338: Removing Engine Front Cover
Courtesy of FORD MOTOR CO.

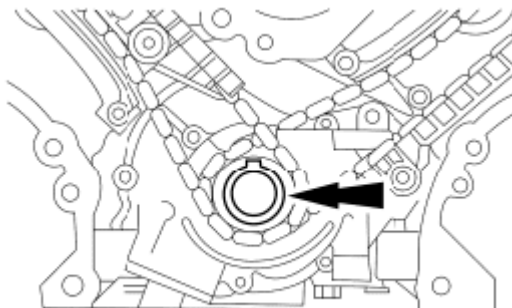
22. Remove the crankshaft sensor ring from the crankshaft.



A0032166

Fig. 339: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

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



A0080705

Fig. 340: Locating Crankshaft Keyway
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.

- 24.

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.



Fig. 341: Identifying Camshaft Lobes Position
Courtesy of FORD MOTOR CO.

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

25.

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

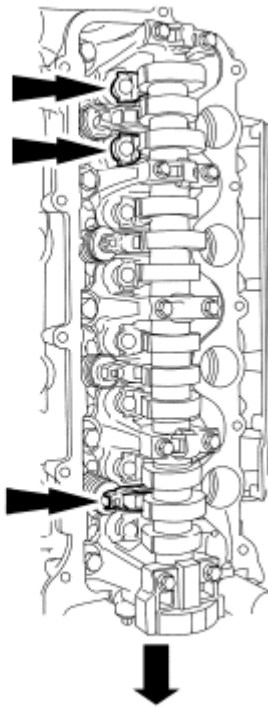


Fig. 342: Locating Camshaft Roller Followers Position
Courtesy of FORD MOTOR CO.

26

26. **NOTE:** Do not allow the valve keepers to fall off the valve or the valve may drop into the cylinder. If the 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.

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



Fig. 343: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

27. **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.

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

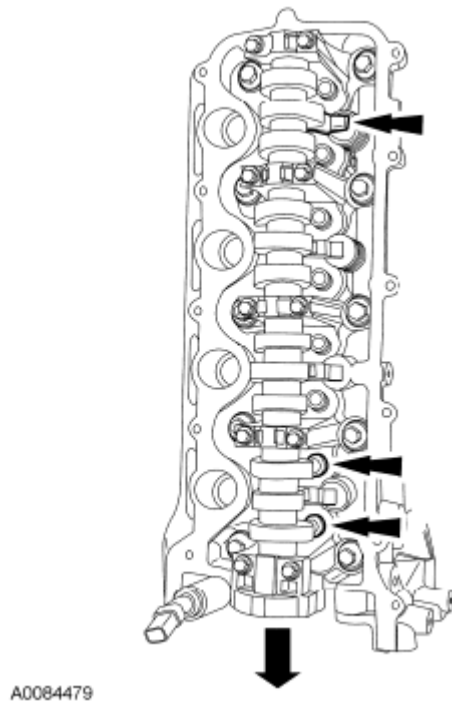
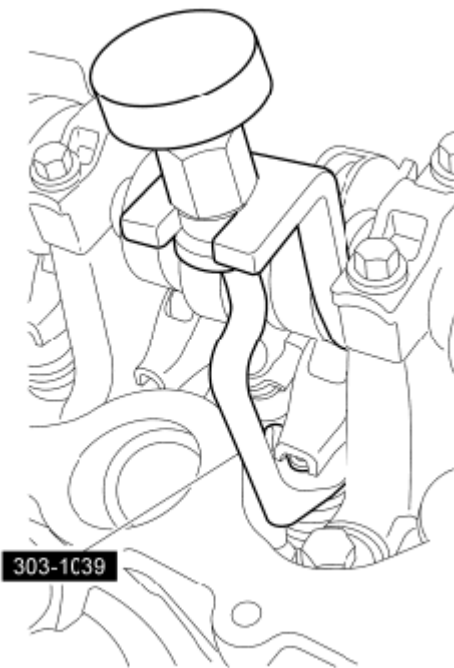


Fig. 344: Locating Camshaft Roller Followers Position
Courtesy of FORD MOTOR CO.

28. **NOTE:** Do not allow the valve keepers to fall off the valve or the valve may drop into the cylinder. If the 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.

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

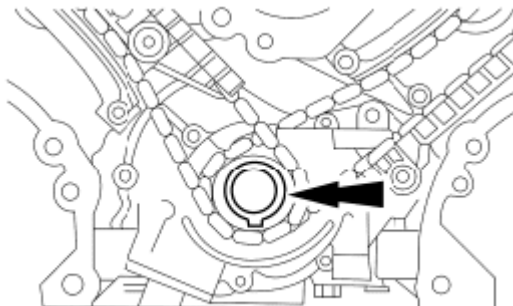


N0010191

Fig. 345: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

29. **NOTE:** The crankshaft cannot be moved past the 6 o'clock position once set. Failure to follow these instructions may result in engine damage.

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



N0006305

Fig. 346: Locating Crankshaft Keyway
Courtesy of FORD MOTOR CO.

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

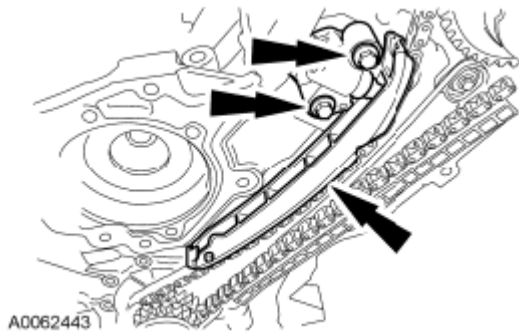


Fig. 347: Identifying LH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

31. Remove the 2 bolts, the RH timing chain tensioner and tensioner arm.

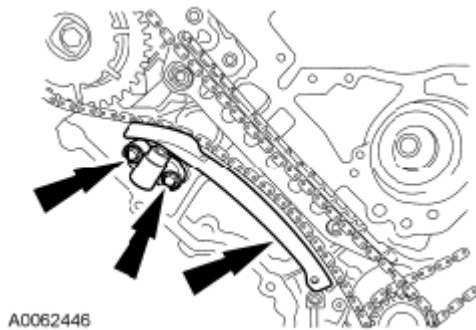


Fig. 348: Locating RH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

32. 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.

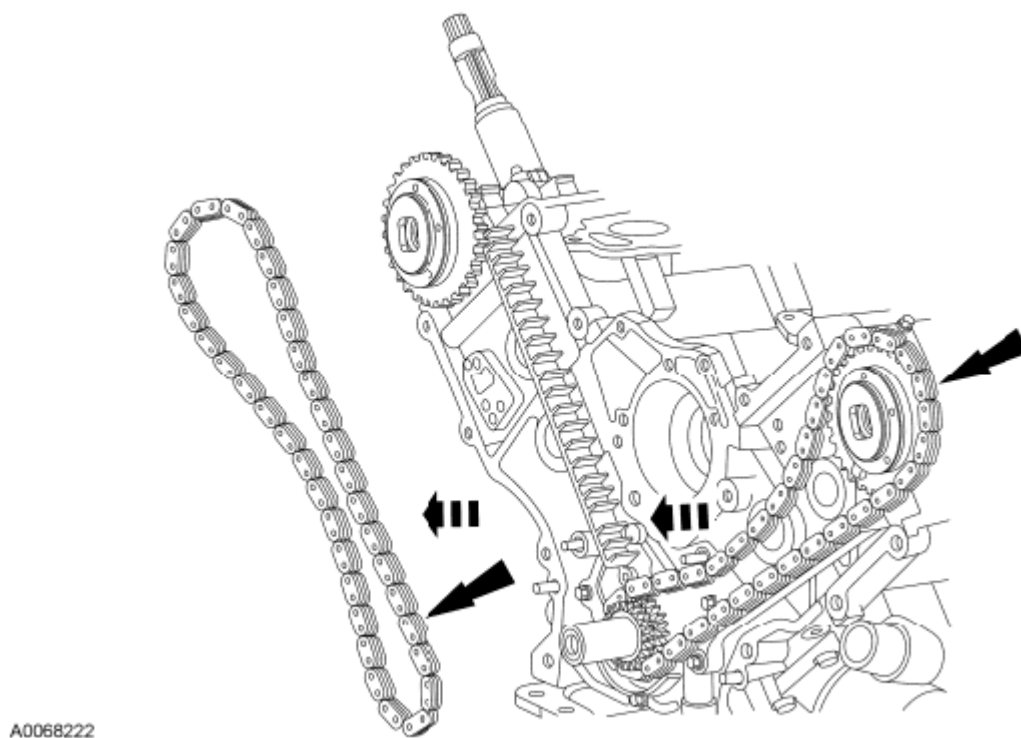


Fig. 349: Removing Timing Chains And Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

33. **NOTE:** RH shown in illustration, LH similar.

Remove the LH and RH timing chain guides.

- Remove the 4 bolts.
- Remove both timing chain guides.

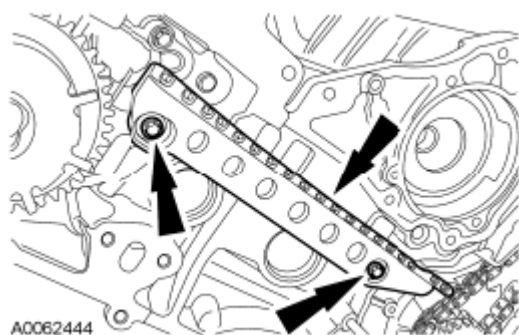


Fig. 350: Locating Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

LH cylinder head

34. **NOTE:** Damage to the camshaft phaser sprocket assembly will occur if mishandled or used as a lifting or leveraging device.
- NOTE:** Only use hand tools to remove the camshaft phaser sprocket assembly or damage may occur to the camshaft or camshaft phaser unit.
- NOTE:** Damage to the camshaft phaser sprocket assembly will occur if mishandled or used as a lifting or leveraging device.

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

- Discard the camshaft phaser sprocket bolt.

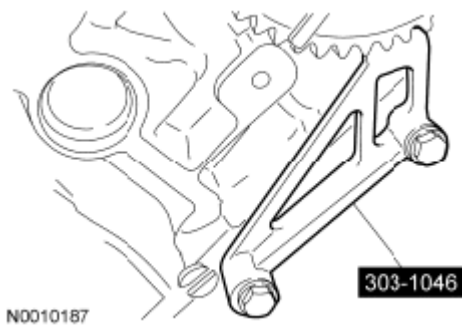
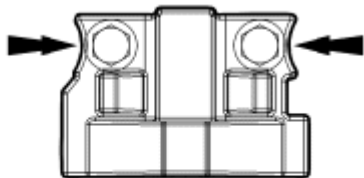


Fig. 351: Identifying Cam Phaser Locking Tool (303-1046)
Courtesy of FORD MOTOR CO.

35. Inspect the camshaft phaser sprocket. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

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

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



N0070049

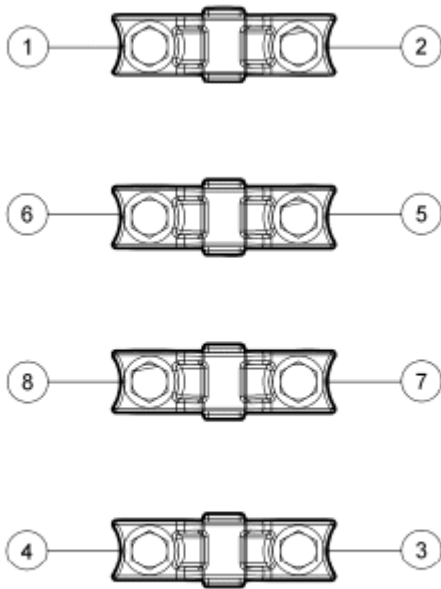
Fig. 352: Locating LH Cylinder Head Camshaft Front Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

37. **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.

37.

Remove the remaining 8 bolts in the sequence shown in illustration and remove the LH cylinder head camshaft bearing caps.

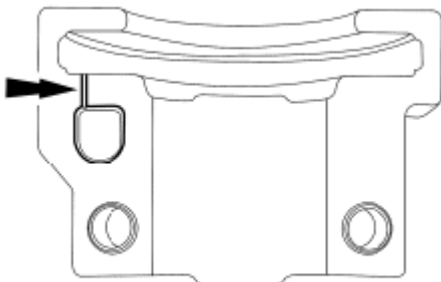


N0091483

Fig. 353: Identifying LH Camshaft Bearing Caps Bolts Removal Sequence
Courtesy of FORD MOTOR CO.

38. 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. 354: Identifying LH Camshaft Bearing Cap Inspecting Area
Courtesy of FORD MOTOR CO.

39. 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.

40.

Remove all of the remaining camshaft roller followers from the 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.

41.

Remove the hydraulic lash adjusters from the LH cylinder head.

42. Install the Cylinder Head Remover/Installer on the LH cylinder head.

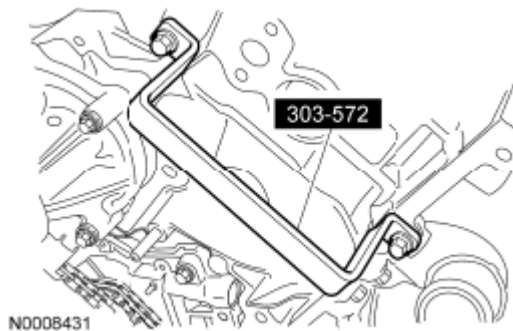


Fig. 355: Identifying Cylinder Head Remover/Installer (303-572)
Courtesy of FORD MOTOR CO.

43. Remove the 8 nuts and the LH exhaust manifold.

- Discard the 8 nuts.
- Discard the 2 gasket.
- Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

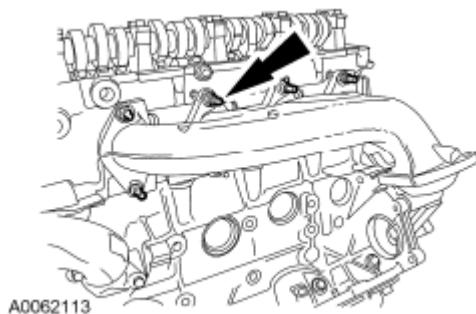


Fig. 356: Locating LH Exhaust Manifold Nut
Courtesy of FORD MOTOR CO.

44. Remove and discard the 8 LH exhaust manifold-to-cylinder head studs.

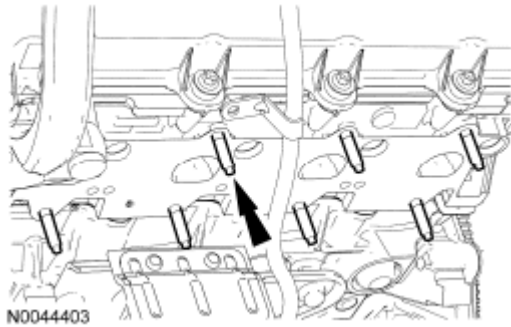


Fig. 357: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

RH cylinder head

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

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

- Discard the camshaft phaser sprocket bolt.

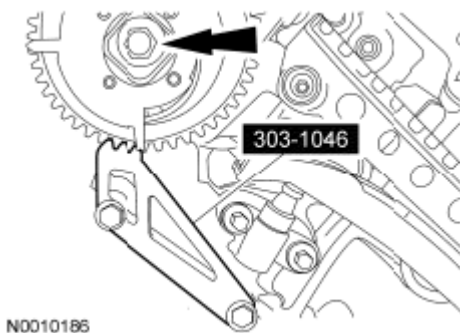
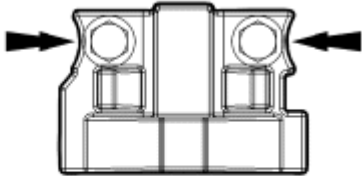


Fig. 358: Locating RH Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

46. Inspect the camshaft phaser sprocket. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

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

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

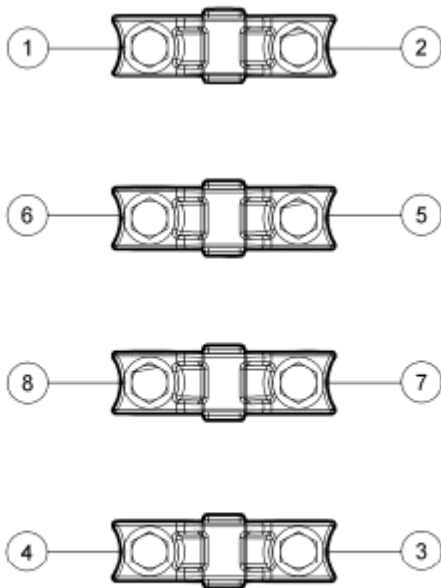


N0070049

Fig. 359: Locating RH Cylinder Head Camshaft Front Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

48. **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.

Remove the remaining 8 bolts in the sequence shown in illustration and remove the RH cylinder head camshaft bearing caps.



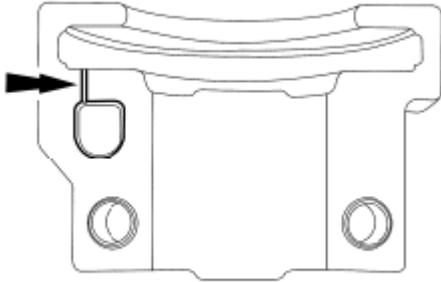
N0091483

Fig. 360: Identifying RH Cylinder Head Camshaft Bearing Caps Removal Sequence

Courtesy of FORD MOTOR CO.

49. 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. 361: Identifying RH Camshaft Bearing Cap Inspecting Area
Courtesy of FORD MOTOR CO.

50. 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.

51.

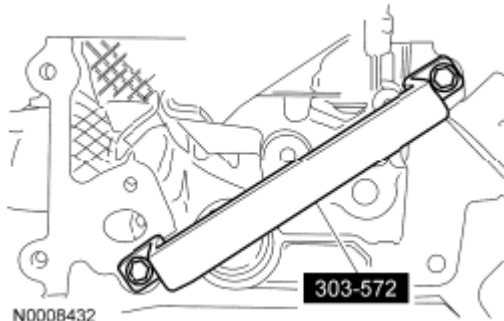
Remove all of the remaining camshaft roller followers from the cylinder head.

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.

52.

Remove the hydraulic lash adjusters from the RH cylinder head.

53. Install the Cylinder Head Remover/Installer on the RH cylinder head.

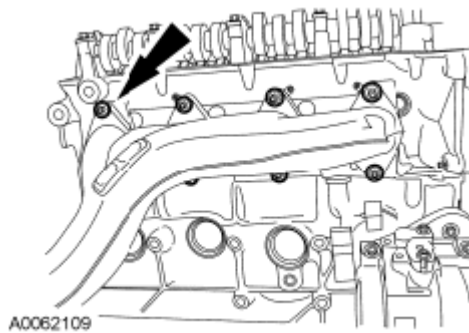


N0008432

Fig. 362: Identifying Cylinder Head Remover/Installer (303-572)

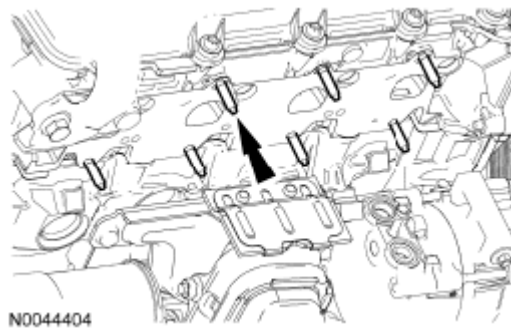
Courtesy of FORD MOTOR CO.

54. Remove the 8 nuts and the RH exhaust manifold.
- Discard the 8 nuts.
 - Discard the 2 gaskets.
 - Inspect the exhaust manifold. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION** .

**Fig. 363: Locating RH Exhaust Manifold Nut**

Courtesy of FORD MOTOR CO.

55. Remove and discard the 8 RH exhaust manifold-to-cylinder head studs.

**Fig. 364: Locating RH Exhaust Manifold-To-Cylinder Head Stud**

Courtesy of FORD MOTOR CO.

56. Remove the nut and the ground strap.

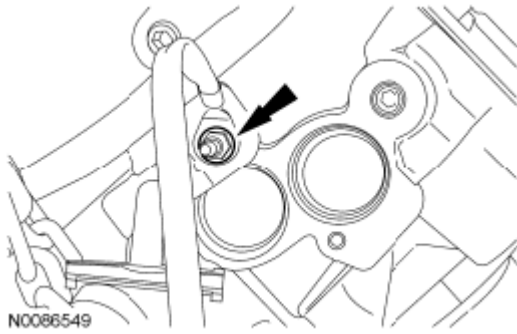


Fig. 365: Locating Ground Strap Nut
Courtesy of FORD MOTOR CO.

57. Remove the stud bolt and the coolant tube.
- Discard the O-ring seals.

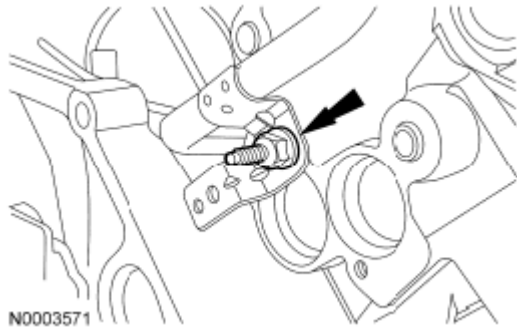


Fig. 366: Locating Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

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.
- 58.
- NOTE:** Place clean shop towels over exposed engine cavities. Carefully remove the towels so foreign material is not dropped into the engine.
- NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.
- NOTE:** Aluminum surfaces are soft and can be scratched easily. Never place the cylinder head gasket surface, unprotected, on a bench surface, or the

cylinder head may be damaged.

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: RH shown in illustration, LH similar.

Remove the 20 bolts and the cylinder heads.

- Discard the cylinder head gaskets.
- Discard the cylinder head bolts.

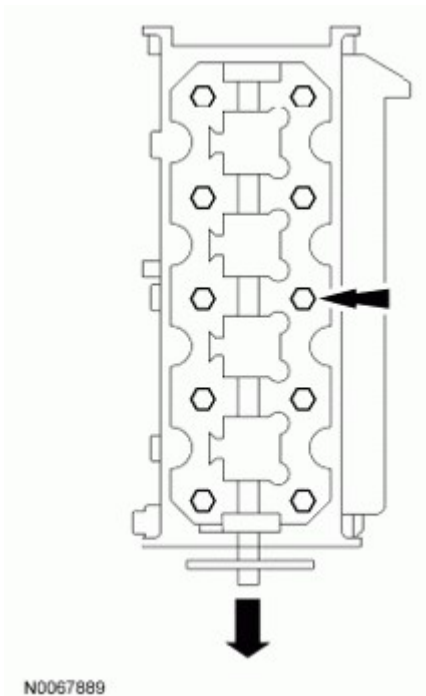


Fig. 367: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

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 that make leak paths. Use a plastic scraping tool to remove all traces of the head gasket.

59.

NOTE: Observe all warnings or notices 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

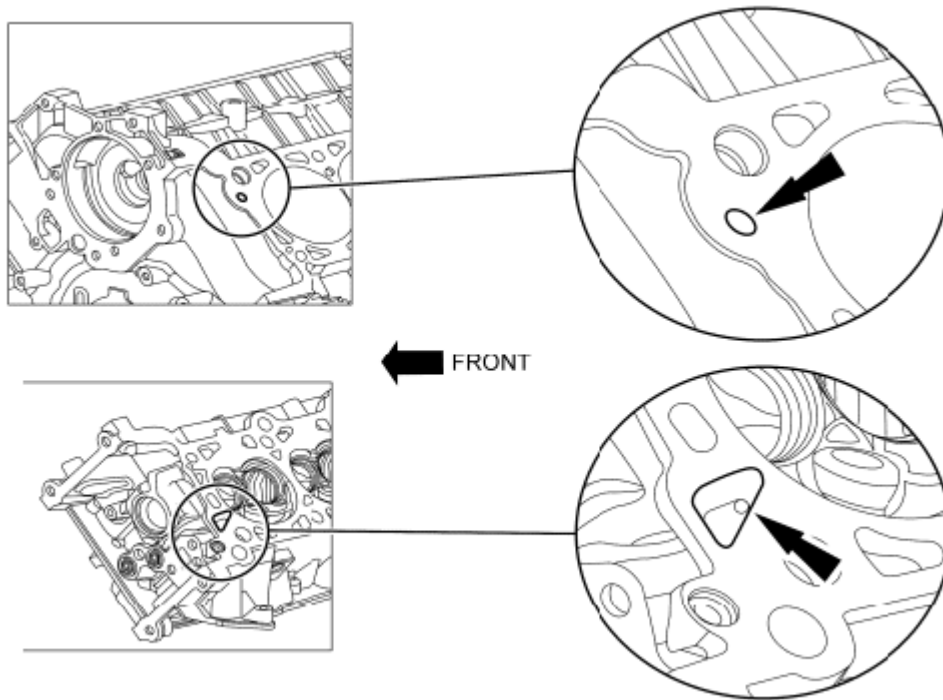
used to clean and prepare the surfaces.

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

1. Remove any large deposits of silicone or gasket material with a plastic scraper.
2. Apply silicone gasket remover, following package directions and allow to set for several minutes.
3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep, following package directions, to remove any 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.

60. **NOTE:** LH shown in illustration, RH similar.

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**.



A0079634

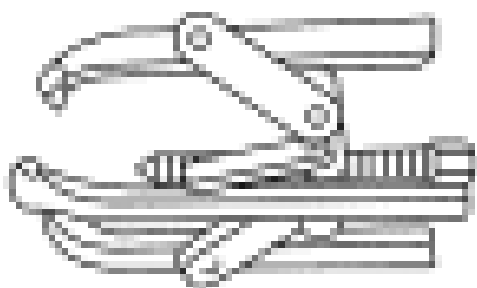
Fig. 368: Locating Oil Pressure Feed Area
Courtesy of FORD MOTOR CO.

DISASSEMBLY

ENGINE

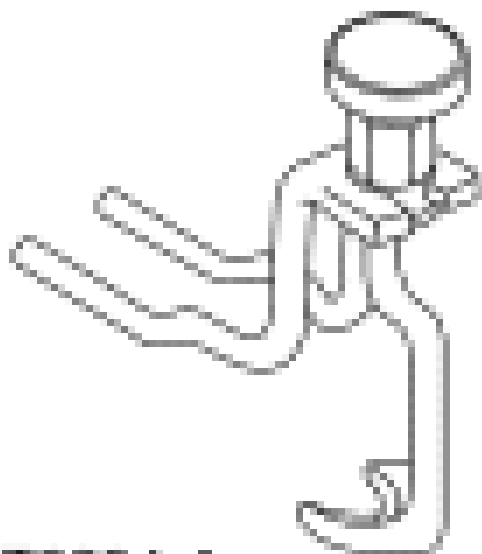
Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION



ST1184-A

3 Jaw Puller
303-D121

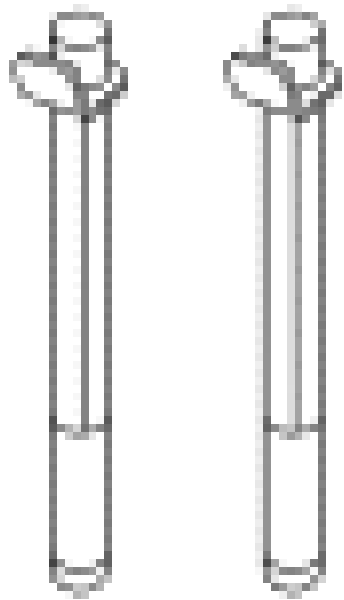


ST2804-A

Compressor, Valve Spring
303-1039

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1337-A

Installer, Connecting Rod
303-442 (T93P-6136-A)

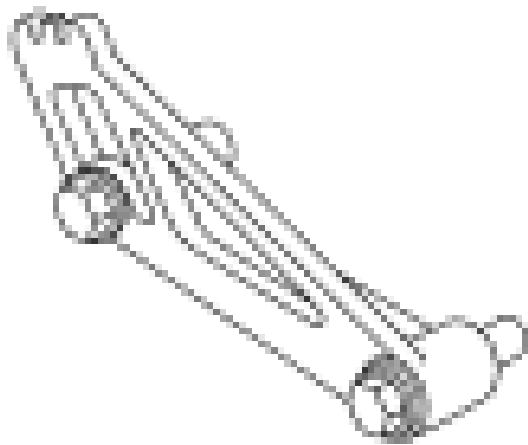


ST1377-A

Lifting Bracket, Engine
303-F047 (014-00073) or equivalent

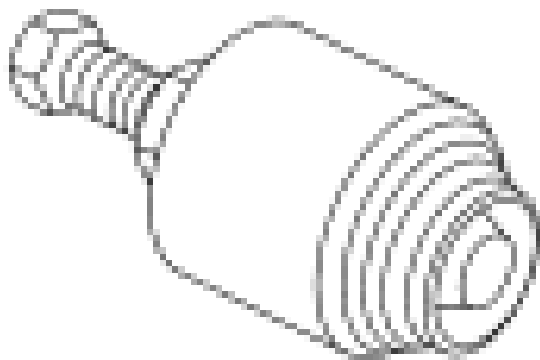
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2B07-A

Locking Tool, Cam Phaser
303-1046



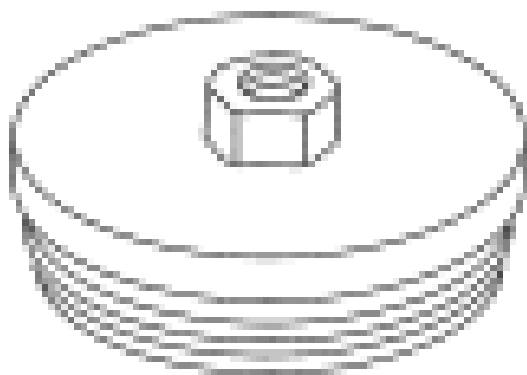
ST1730-A

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

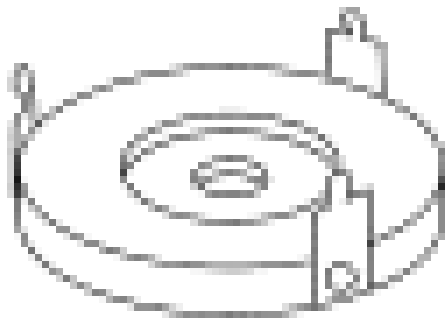
Remover, Crankshaft Rear Oil Seal
303-519 (T95P-6701-DH)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1382-A



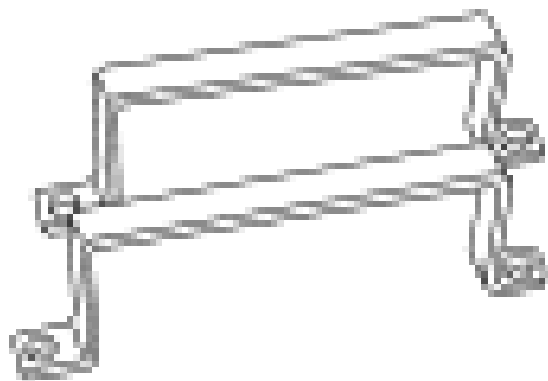
ST1481-A

Remover, Crankshaft Rear Oil Slinger
303-514 (T95P-6701-AH)

Remover/Installer, Cylinder Head

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1668-A

303-572 (T97T-6000-A)



ST1185-A

Slide Hammer
100-001 (T50T-100-A)

Material

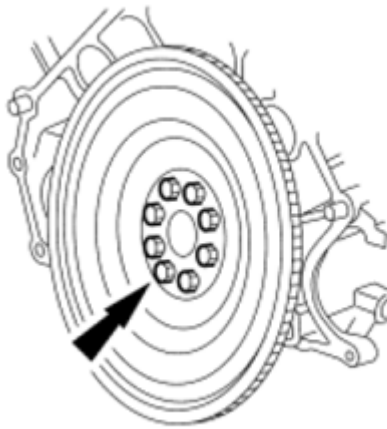
MATERIAL SPECIFICATION

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



A26551-A

Fig. 369: 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.

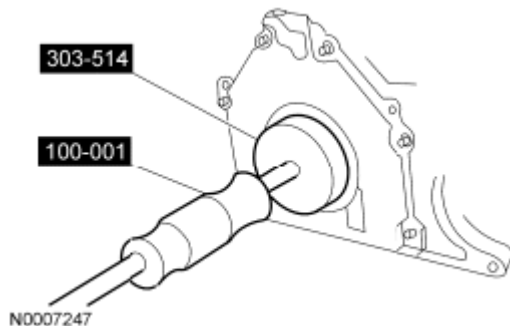


Fig. 370: Removing Crankshaft Oil Slinger
Courtesy of FORD MOTOR CO.

3. Using the Slide Hammer and the Crankshaft Rear Oil Seal Remover, remove and discard the crankshaft

rear seal.

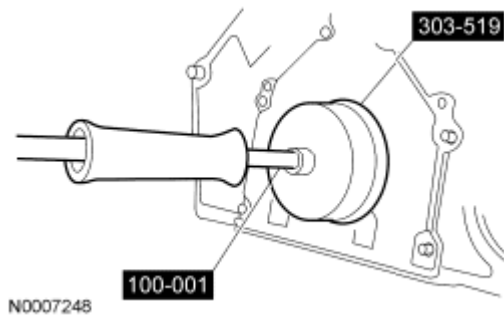


Fig. 371: Removing Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

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.

Clean and inspect the sealing surfaces.

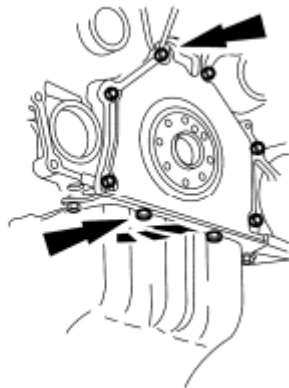


Fig. 372: Locating Crankshaft Rear Seal Retainer Plate Bolts
Courtesy of FORD MOTOR CO.

5. Mount the engine on an engine stand.
6. Remove the Engine Lifting Bracket.

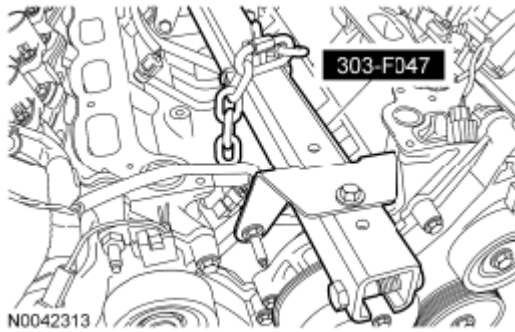


Fig. 373: Identifying Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

7. Remove the 3 bolts and the RH engine support insulator.

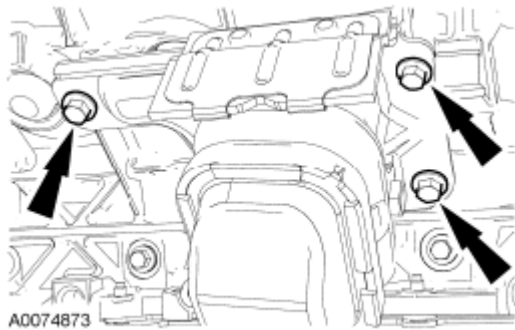


Fig. 374: Locating RH Engine Support Insulator Bolts
Courtesy of FORD MOTOR CO.

8. **NOTE:** LH shown in illustration, RH similar.

If equipped, remove the cylinder block drain plugs and drain the coolant into a suitable container.

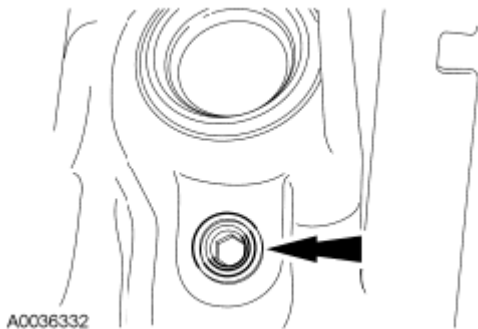


Fig. 375: Locating Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

9. **NOTE:** LH shown in illustration, RH similar.

If equipped, install the cylinder block drain plugs.

- Tighten to 24 Nm (18 lb-ft).

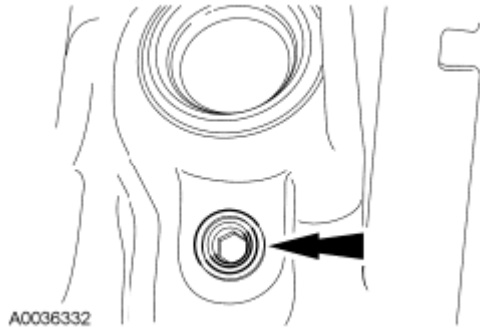


Fig. 376: Locating Cylinder Block Drain Plug
Courtesy of FORD MOTOR CO.

10. Remove the nut and the RH radio interference capacitor.

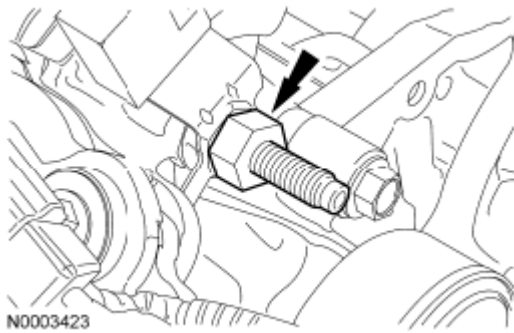


Fig. 377: Locating RH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

11. Remove the nut and the LH radio ignition interference capacitor.

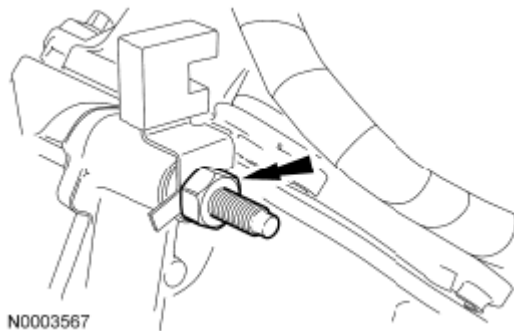


Fig. 378: Locating LH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

12. Remove the bolt and the intake manifold vacuum tube support bracket.

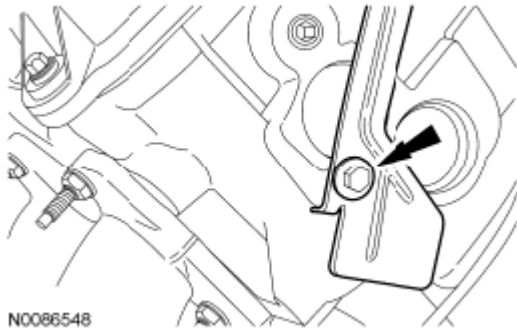


Fig. 379: Locating Intake Manifold Vacuum Tube Support Bracket Bolt
Courtesy of FORD MOTOR CO.

13. **NOTE:** LH shown in illustration, RH similar.

Remove the 8 bolts and the 8 ignition coils.

- Remove the ignition coil using a twisting motion while pulling up on the ignition coil.

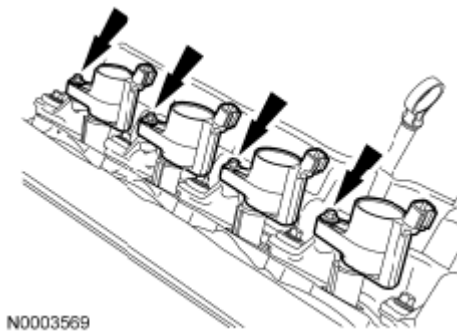


Fig. 380: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

14. Remove the 2 bolts and both of the Knock Sensor (KS).

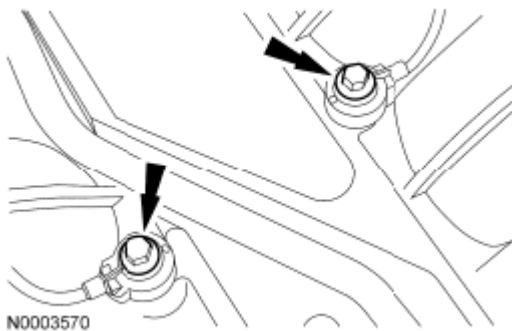


Fig. 381: Locating Knock Sensors (KS) Bolts
Courtesy of FORD MOTOR CO.

15. Remove the stud bolt and the coolant tube.
 - Discard the O-ring seal.

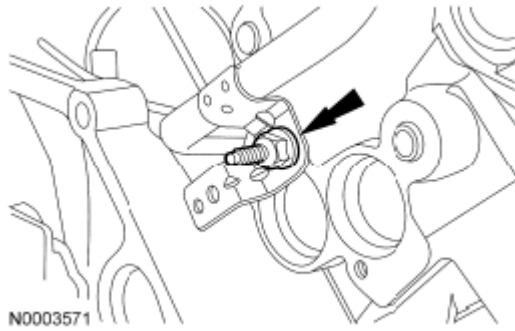


Fig. 382: Locating Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

16. Remove the 3 bolts and the LH engine support insulator-to-cylinder block bracket.

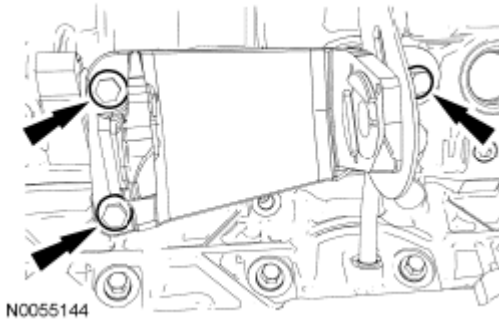


Fig. 383: Locating LH Engine Support Insulator-To-Cylinder Block Bracket Bolts
Courtesy of FORD MOTOR CO.

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

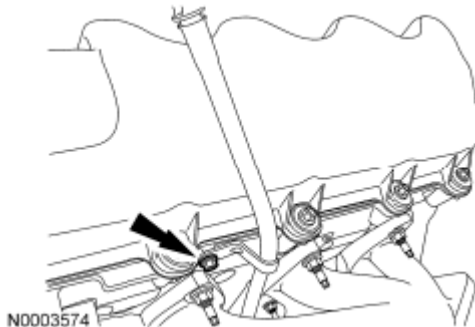


Fig. 384: Locating Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

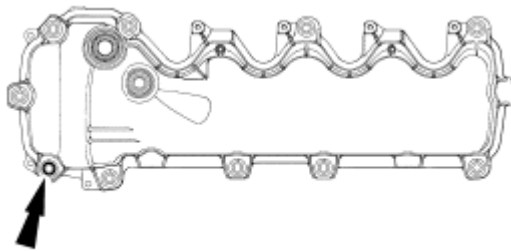
18. **NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

NOTE: Remove the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

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

Loosen the 10 bolts and remove the LH 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.



N0074177

Fig. 385: Locating LH Valve Cover Bolt
Courtesy of FORD MOTOR CO.

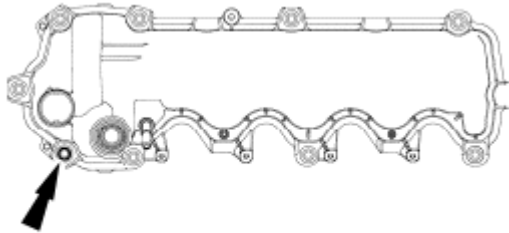
19. **NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

NOTE: Remove the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

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

Loosen the 9 bolts and remove the RH valve cover.

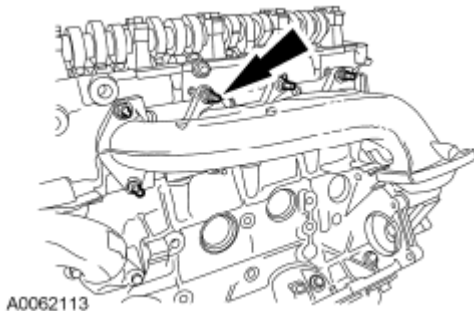
- Clean the valve cover mating surface of the cylinder head with silicone gasket remover and metal surface prep. Follow the directions on the packaging.
- Inspect the valve cover gasket. If the gasket is damaged, remove and discard the gasket. Clean the valve cover gasket groove with soap and water or a suitable solvent.



N0074178

Fig. 386: Locating RH Valve Cover Bolt
Courtesy of FORD MOTOR CO.

20. 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** .



A0062113

Fig. 387: Locating LH Exhaust Manifold Nut
Courtesy of FORD MOTOR CO.

21. 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** .

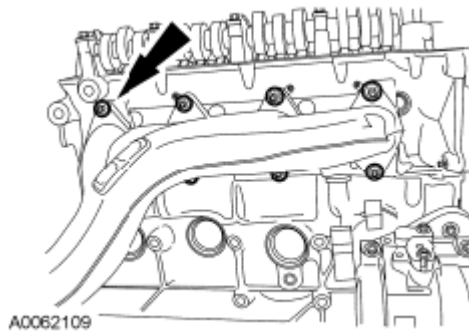


Fig. 388: Locating RH Exhaust Manifold Nut
Courtesy of FORD MOTOR CO.

22. Remove and discard the oil filter. Remove the 4 bolts and the oil filter adapter.

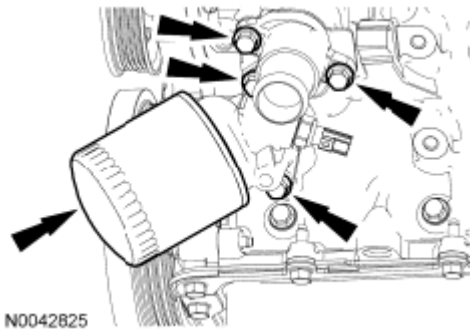


Fig. 389: Locating Oil Filter Adapter Bolts
Courtesy of FORD MOTOR CO.

23. Remove the 7 bolts, coolant pump pulley and the 3 accessory drive belt idler pulleys.

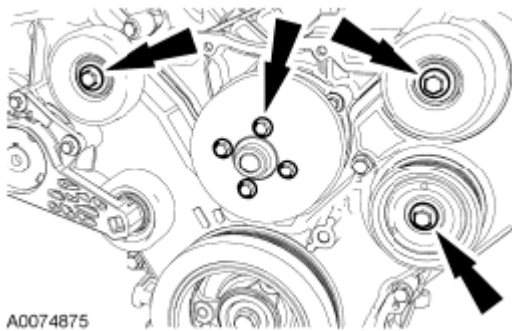


Fig. 390: Locating Pulleys Bolts
Courtesy of FORD MOTOR CO.

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

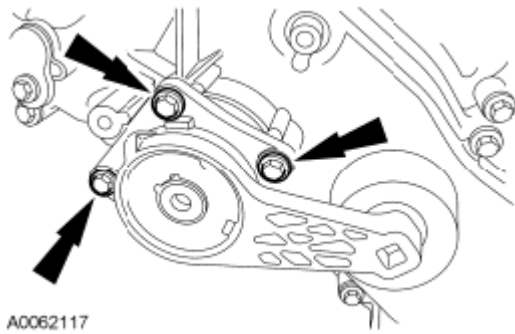


Fig. 391: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

25. Remove the 4 bolts.

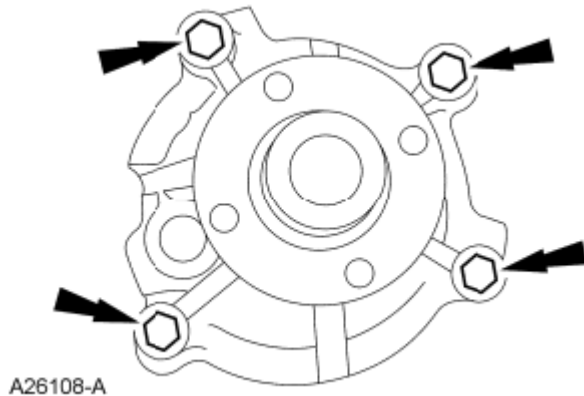


Fig. 392: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

26. Remove the coolant pump from the cylinder block.
- Discard the O-ring seal.

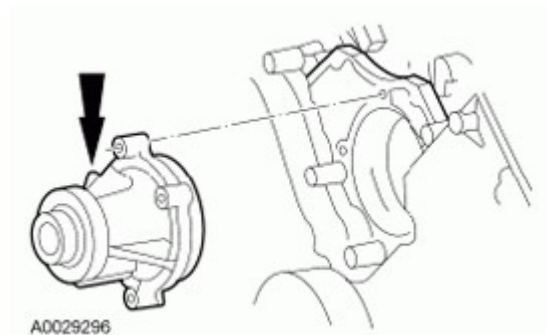
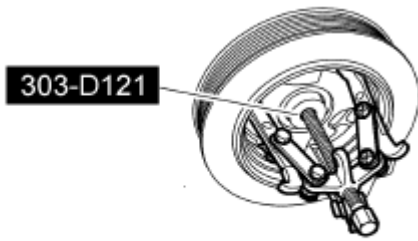


Fig. 393: Locating Coolant Pump
Courtesy of FORD MOTOR CO.

27. Remove and discard the crankshaft pulley bolt. Using the 3 Jaw Puller, remove the crankshaft pulley.



N0010528

Fig. 394: Removing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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

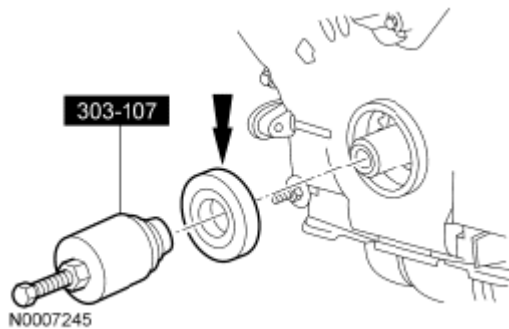
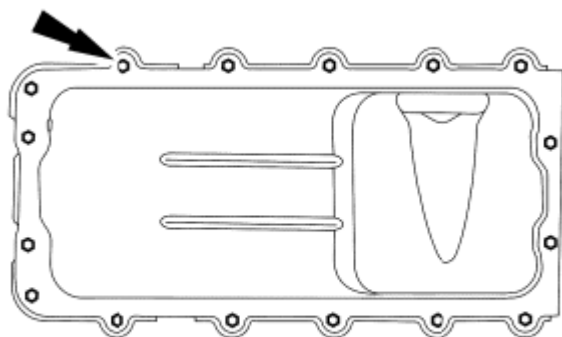


Fig. 395: Removing Crankshaft Front Seal
Courtesy of FORD MOTOR CO.

29. 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.

Clean and inspect the sealing surfaces.



A26563-B

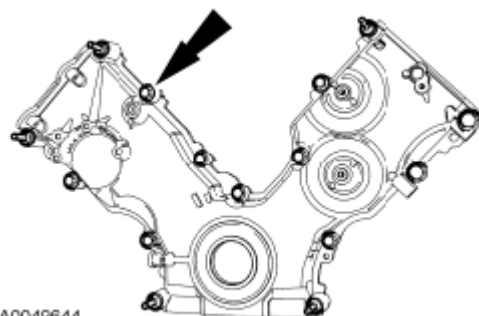
Fig. 396: Locating Oil Pan Bolts

Courtesy of FORD MOTOR CO.

NOTE: Correct fastener location is essential for assembly procedure. Record fastener location.

30.

Remove the 10 bolts and the 5 studs.

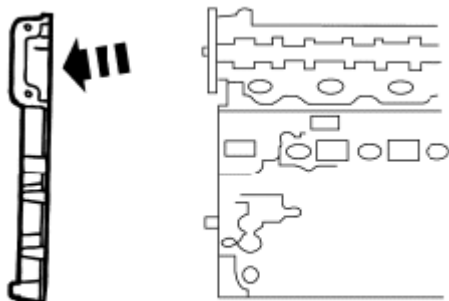


A0049644

Fig. 397: Identifying Engine Front Cover Bolts And Studs

Courtesy of FORD MOTOR CO.

31. Remove the engine front cover from the cylinder block.



AA1665-A

Fig. 398: Removing Engine Front Cover
Courtesy of FORD MOTOR CO.

32. Remove the crankshaft sensor ring from the crankshaft.

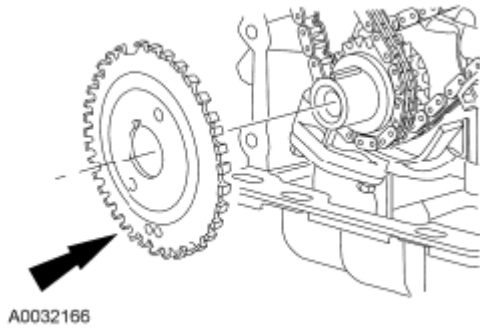


Fig. 399: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

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

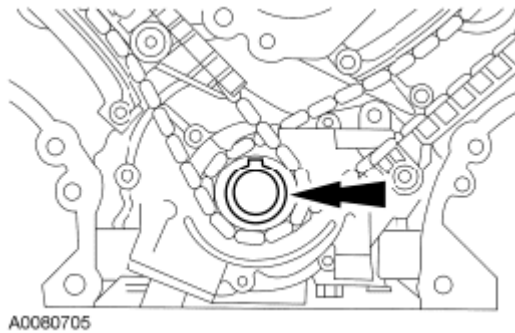


Fig. 400: Locating Crankshaft Keyway
Courtesy of FORD MOTOR CO.

- 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.
- 34.

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.

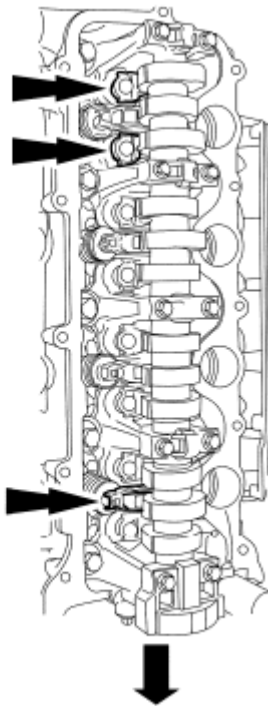


Fig. 401: Identifying Camshaft Lobes Position
Courtesy of FORD MOTOR CO.

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

35.

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



A0083248

Fig. 402: Locating Camshaft Roller Followers Position
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.

36.

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

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



Fig. 403: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

37.

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

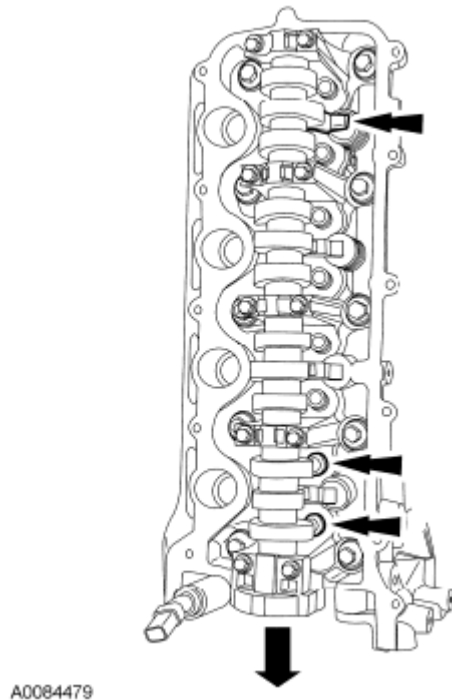


Fig. 404: Locating Camshaft Roller Followers Position

Courtesy of FORD MOTOR CO.

38. **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.

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



Fig. 405: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

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

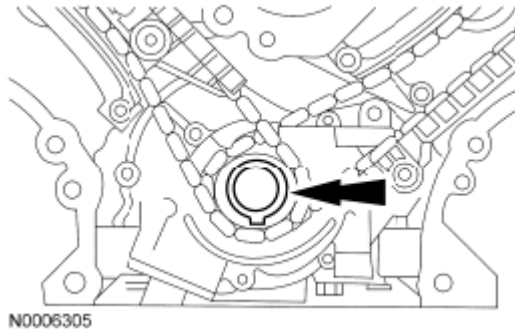


Fig. 406: Locating Crankshaft Keyway
Courtesy of FORD MOTOR CO.

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.

40.

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

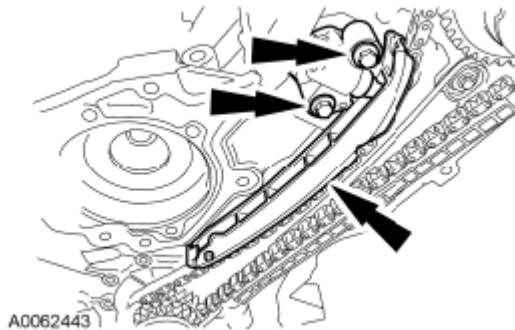


Fig. 407: Locating LH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

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.

41.

Remove the 2 bolts, the RH timing chain tensioner and tensioner arm.

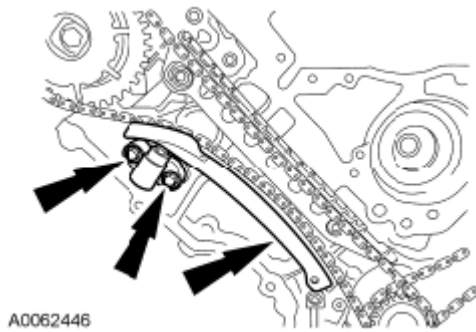


Fig. 408: Locating RH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

42. 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.

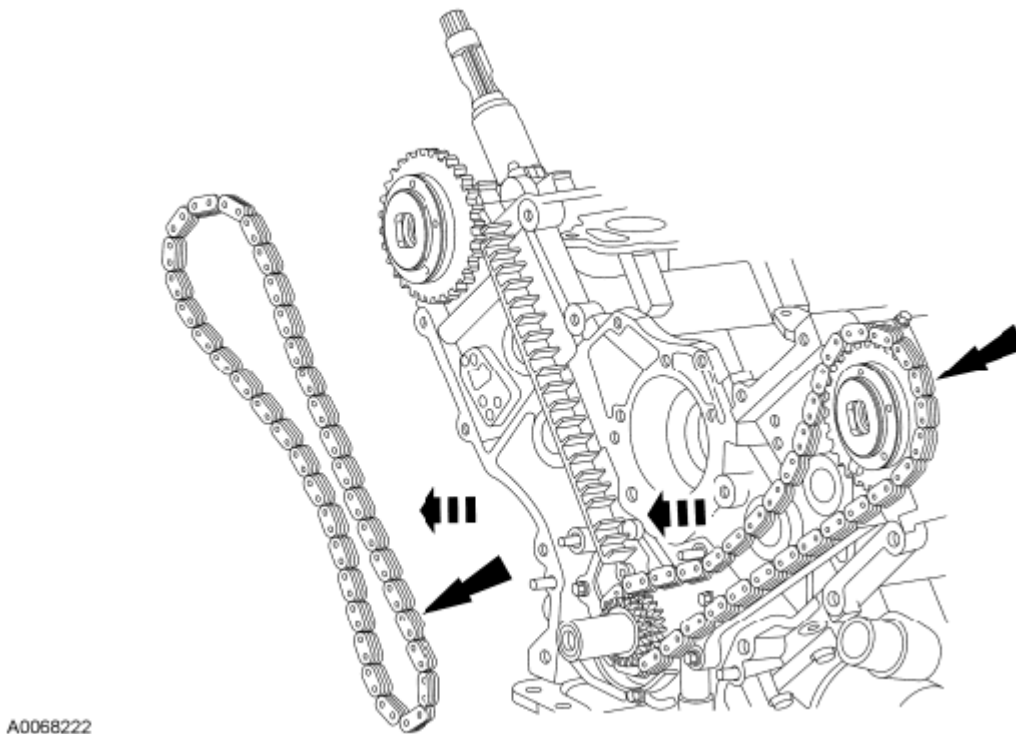


Fig. 409: Removing Timing Chains And Crankshaft Sprocket
Courtesy of FORD MOTOR CO.

43. **NOTE:** RH shown in illustration, LH similar.

Remove the LH and RH timing chain guides.

- Remove the 4 bolts.
- Remove both timing chain guides.

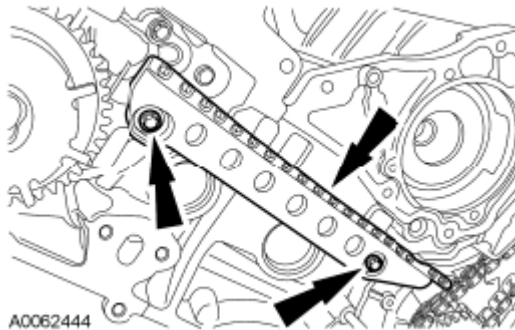


Fig. 410: Locating Timing Chain Guide Bolts
Courtesy of FORD MOTOR CO.

44. **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.

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

- Discard the camshaft phaser and sprocket bolt.

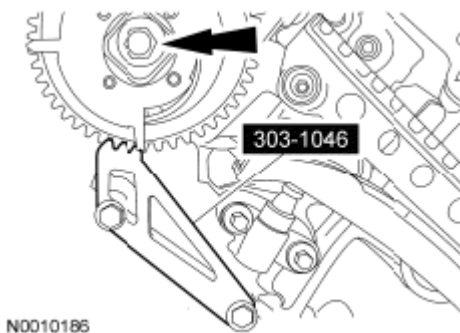


Fig. 411: Locating RH Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

45. **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.

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

- Discard the camshaft phaser and sprocket bolt.

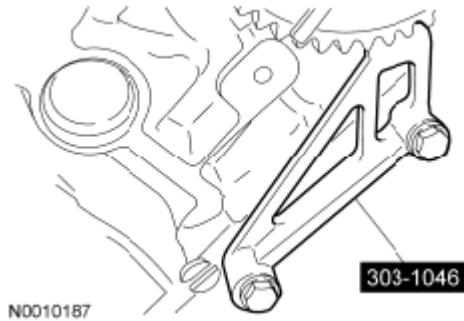


Fig. 412: Identifying Cam Phaser Locking Tool (303-1046)
Courtesy of FORD MOTOR CO.

46. Install the Cylinder Head Remover/Installer onto the LH cylinder head.

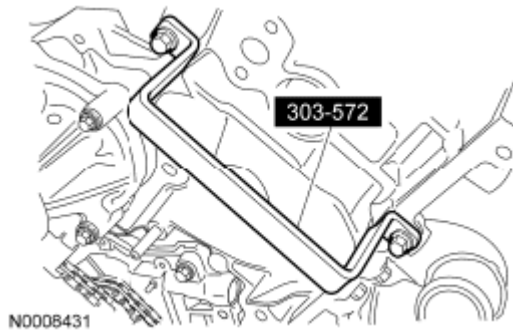


Fig. 413: Identifying Cylinder Head Remover/Installer (303-572)
Courtesy of FORD MOTOR CO.

47. Install the Cylinder Head Remover/Installer onto the RH cylinder head.

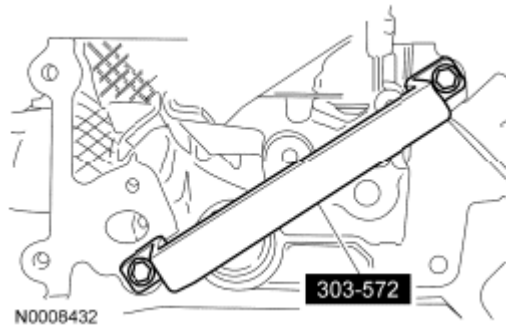
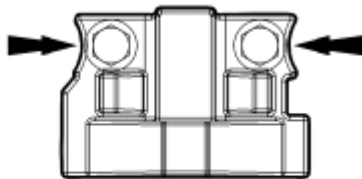


Fig. 414: Identifying Cylinder Head Remover/Installer (303-572)

Courtesy of FORD MOTOR CO.

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

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



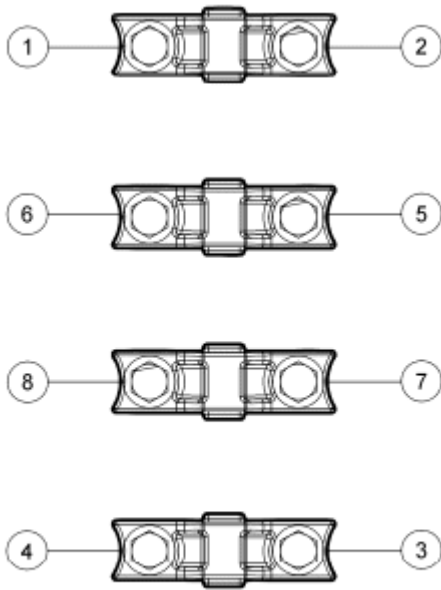
N0070049

Fig. 415: Locating RH Cylinder Head Camshaft Front Bearing Cap Bolts

Courtesy of FORD MOTOR CO.

49. **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.

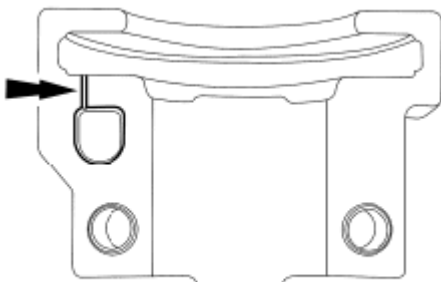
Remove the remaining 8 bolts in the sequence shown in illustration and remove the RH cylinder head camshaft bearing caps.



N0091483

Fig. 416: Identifying RH Cylinder Head Camshaft Bearing Caps Removal Sequence
Courtesy of FORD MOTOR CO.

50. 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. 417: Identifying RH Camshaft Bearing Cap Inspecting Area
Courtesy of FORD MOTOR CO.

51. 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.

- 52.

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.

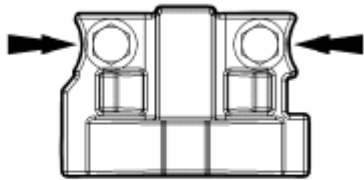
53.

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.

54.

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



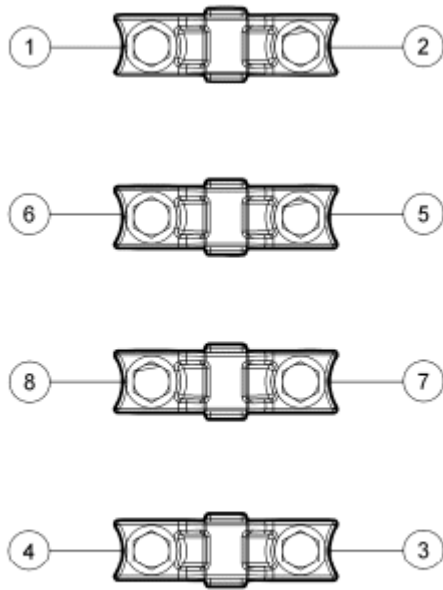
N0070049

Fig. 418: Locating LH Cylinder Head Camshaft Front Bearing Cap Bolts
Courtesy of FORD MOTOR CO.

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.

55.

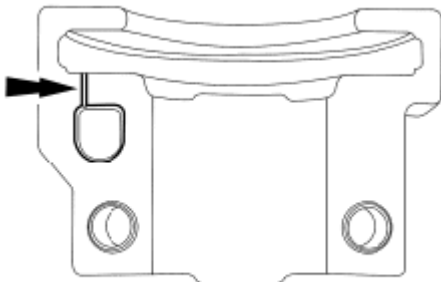
Remove the remaining 8 bolts in the sequence shown in illustration and remove the LH cylinder head camshaft bearing caps.



N0091483

Fig. 419: Identifying LH Cylinder Head Camshaft Bearing Caps Removal Sequence
Courtesy of FORD MOTOR CO.

56. 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. 420: Identifying LH Camshaft Bearing Cap Inspecting Area
Courtesy of FORD MOTOR CO.

57. 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.

- 58.

Remove the remaining camshaft roller followers from the LH cylinder head.

59. **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.

Remove the hydraulic lash adjusters from the LH cylinder head.

60. **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.

Remove the bolts and the cylinder head.

- Discard the cylinder head gasket.
- Discard the cylinder head bolts.

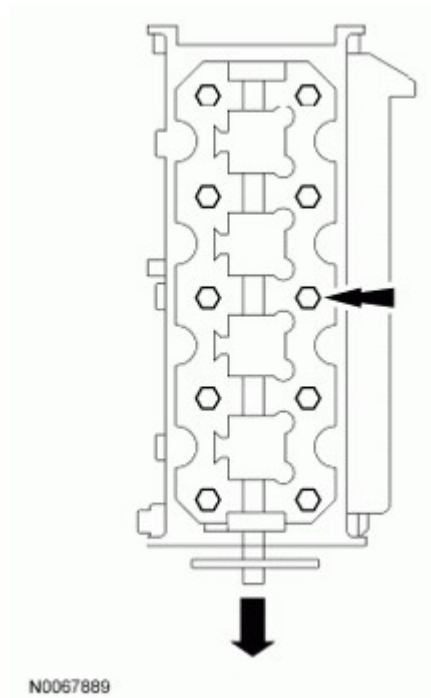


Fig. 421: Locating Cylinder Head Bolts
Courtesy of FORD MOTOR CO.

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.

61.

NOTE: Observe all warnings or notices 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.

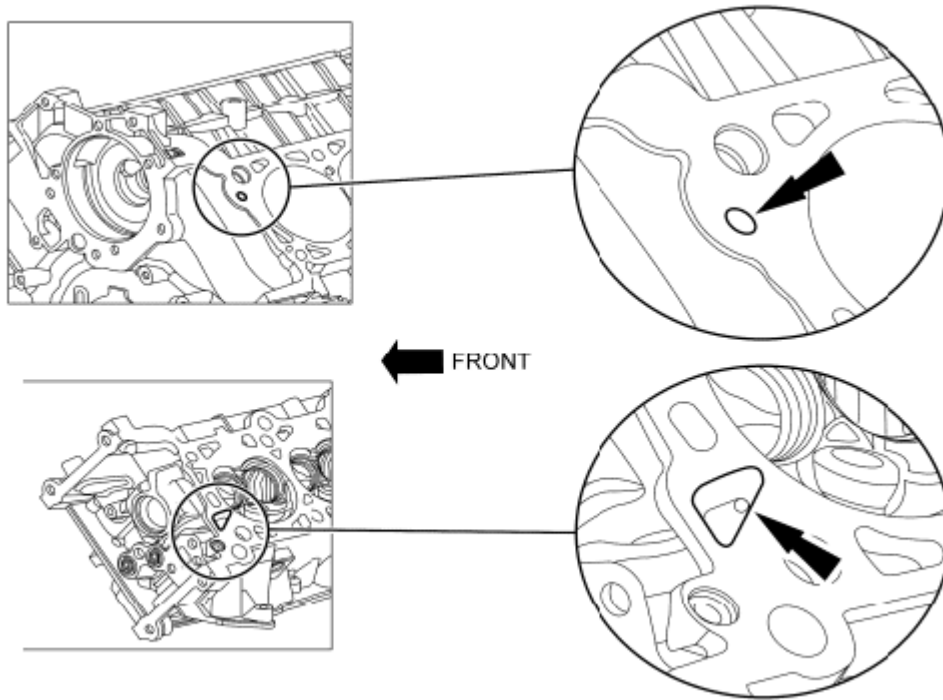
Clean the cylinder head-to-cylinder block mating surfaces of both the cylinder head and the cylinder block in the following sequence.

1. Remove any large deposits of silicone or gasket material with a plastic scraper.
2. Apply silicone gasket remover, following package directions, and allow to set for several minutes.
3. Remove the silicone gasket remover with a plastic scraper. A second application of silicone gasket remover may be required if residual traces of silicone or gasket material remain.
4. Apply metal surface prep, following package directions, to remove any 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.

62.

62. **NOTE:** LH shown in illustration, RH similar.

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** .



A0079634

Fig. 422: Locating Oil Pressure Feed Area
Courtesy of FORD MOTOR CO.

63. Remove the 3 bolts, the oil pump screen and pickup tube and the spacer.

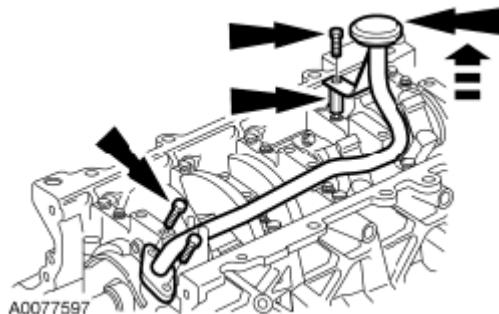


Fig. 423: Removing Oil Pump Screen And Pickup Tube
Courtesy of FORD MOTOR CO.

64. Remove the 3 bolts and the oil pump.

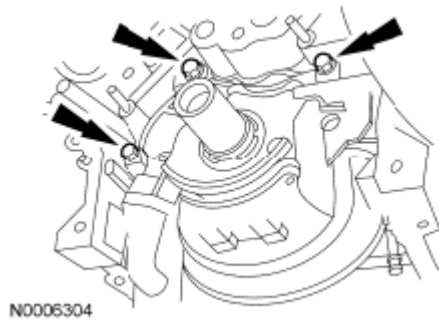


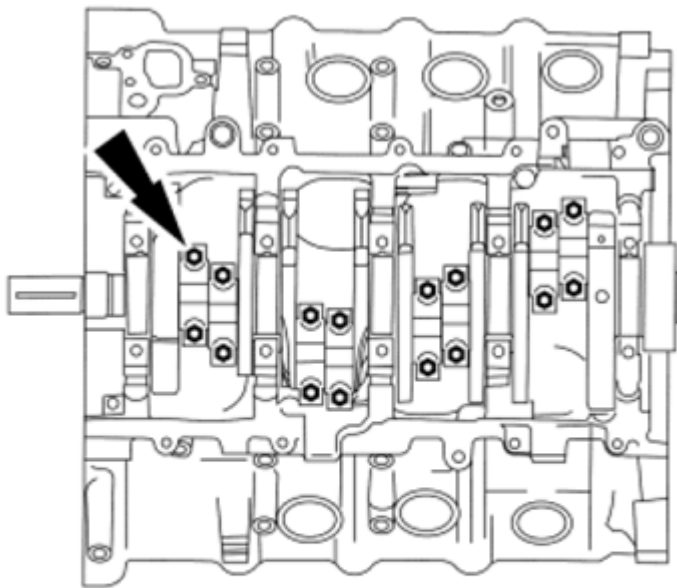
Fig. 424: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

65. 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 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.

66.

Remove the 16 bolts and the 8 connecting rod caps. Discard the bolts.



DA0578-A

Fig. 425: Locating Connecting Rod Cap Bolts

Courtesy of FORD MOTOR CO.

NOTE: Do not scratch the cylinder walls or crankshaft journals with the connecting rod. Failure to follow these instructions may result in engine damage.

67.

Use the Connecting Rod Installer to push the piston through the top of the cylinder block.

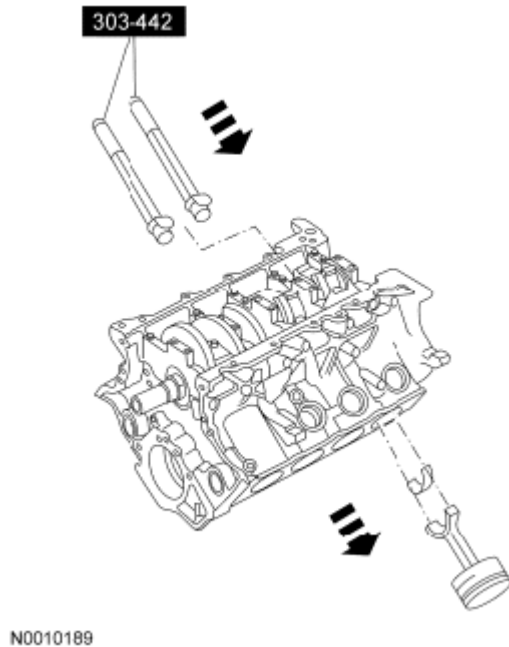


Fig. 426: Pushing Piston Of Cylinder Block
Courtesy of FORD MOTOR CO.

68. Disassemble the 8 pistons. For additional information, refer to **PISTON**.
69. 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.

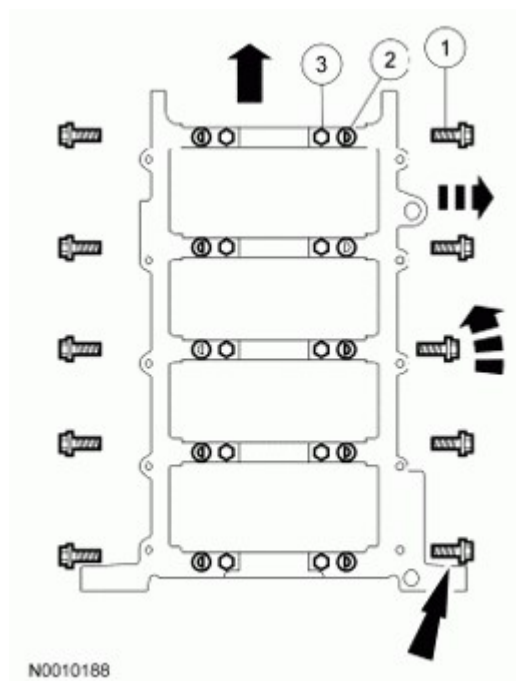


Fig. 427: Removing Main Bearing Cap Fasteners
Courtesy of FORD MOTOR CO.

70. Remove the main bearing caps, the lower crankshaft main bearings and the lower thrust washer.

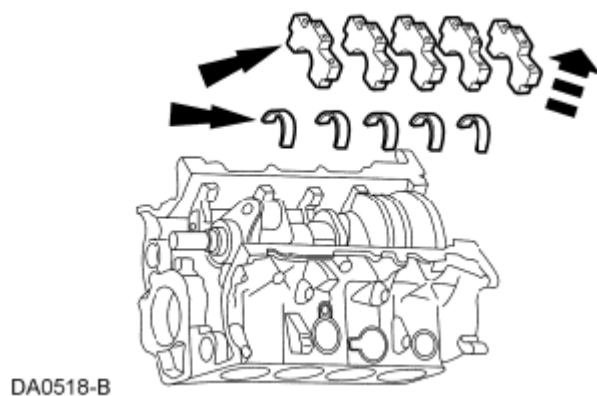


Fig. 428: Removing Main Bearing Caps
Courtesy of FORD MOTOR CO.

71. Remove the crankshaft, the upper crankshaft main bearings and the upper thrust washers from the cylinder block.

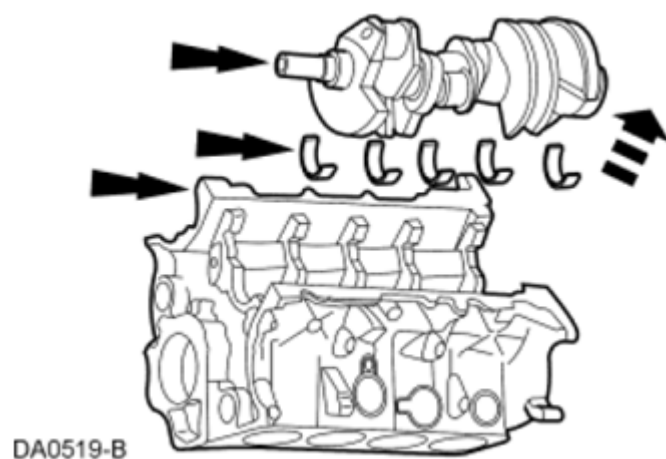


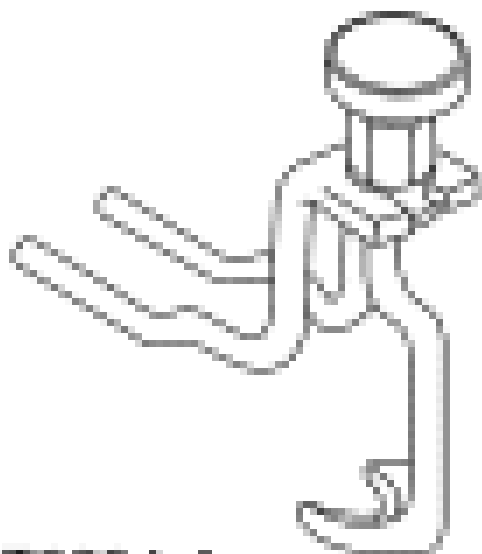
Fig. 429: Removing Crankshaft
Courtesy of FORD MOTOR CO.

DISASSEMBLY AND ASSEMBLY OF SUBASSEMBLIES

CYLINDER HEAD

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION



Compressor, Valve Spring
303-1039

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1332-A

Installer, Valve Stem Oil Seal
303-383 (T91T-6571-A)

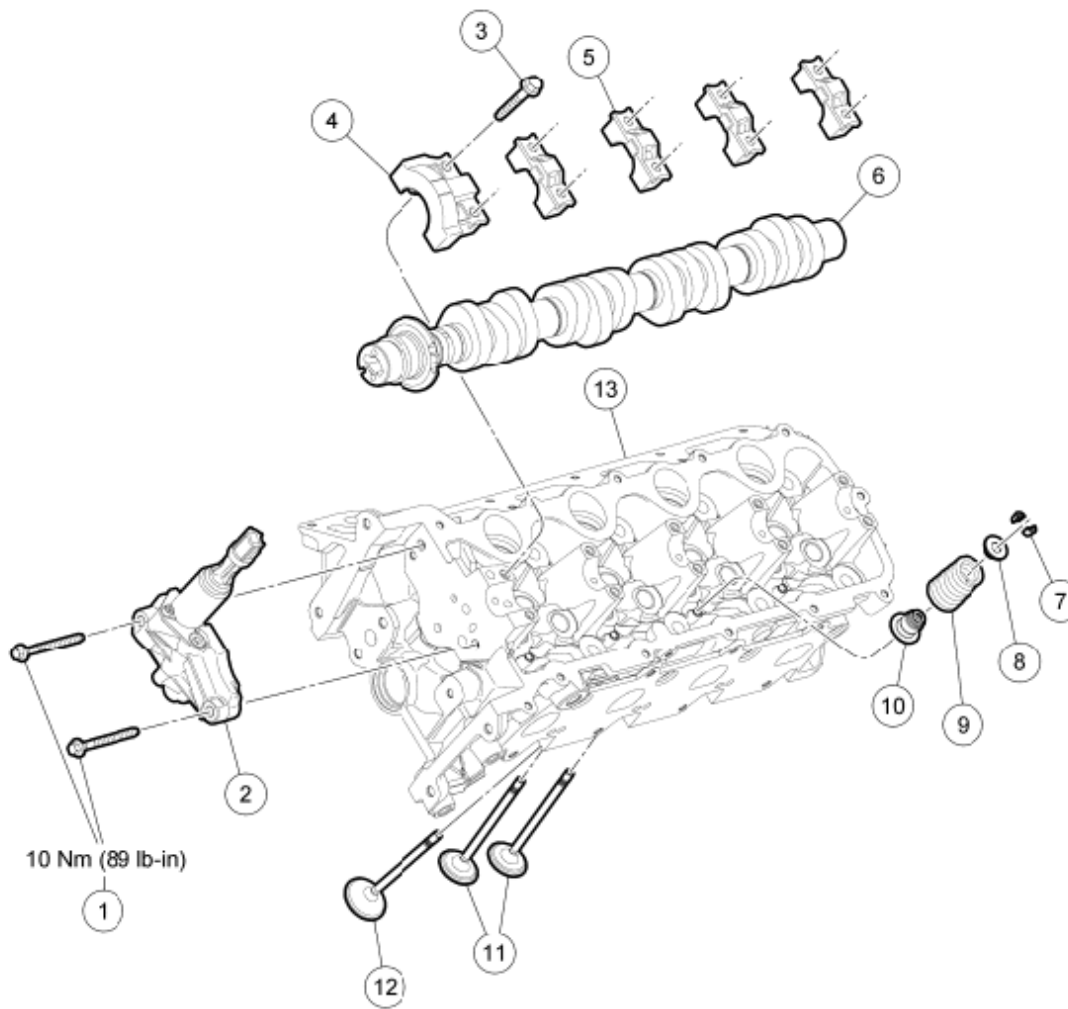
Material

MATERIAL 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

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2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



N0010131

Fig. 430: Exploded View Of Cylinder Head With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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. 431: Identifying Valve Spring Compressor
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**.
9. **NOTE:** Remove the front thrust camshaft bearing cap straight upward from the bearing towers, or the bearing cap may be damaged from side loading.

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.
3. **NOTE: Lubricate the valve stem with clean engine oil prior to installation.**

Install the valve into the cylinder head.

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

Position a new valve seal onto the valve stem.

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

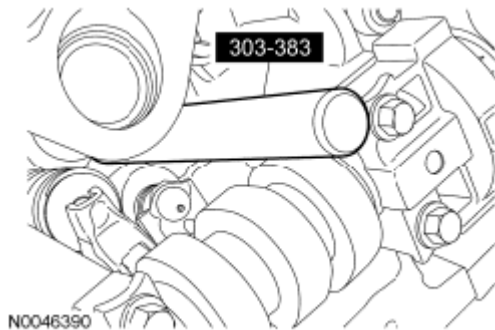


Fig. 432: Identifying Valve Stem Oil Seal Installer
Courtesy of FORD MOTOR CO.

6. **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.**

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



Fig. 433: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

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

MATERIAL 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

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2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



Fig. 434: Exploded View Of Piston
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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.

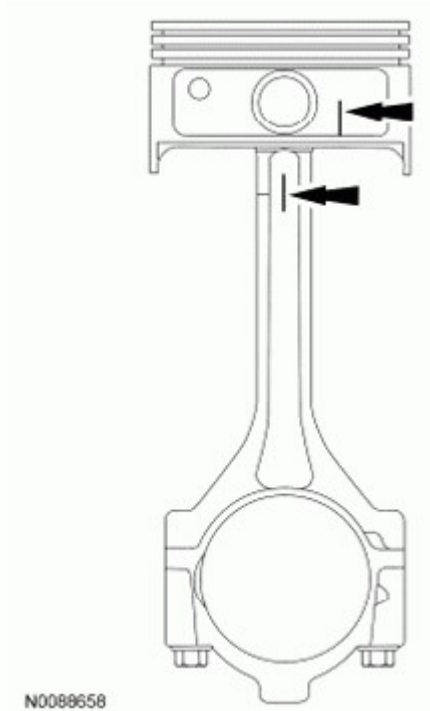


Fig. 435: Identifying Mark On Piston And Connecting Rod
Courtesy of FORD MOTOR CO.

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.

1.

Position the connecting rod in the piston.

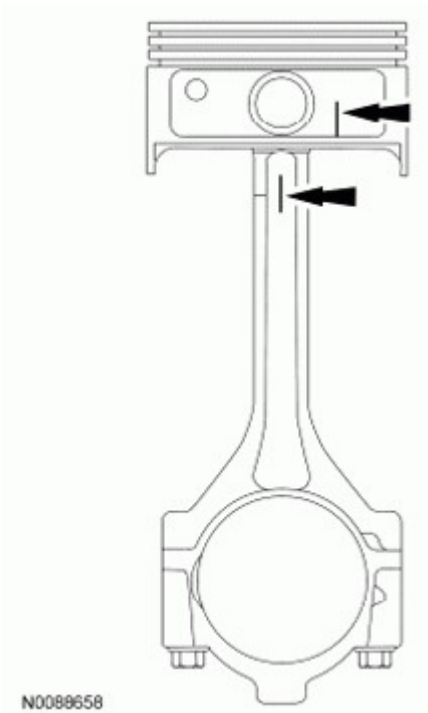


Fig. 436: Identifying Mark On Piston And Connecting Rod
Courtesy of FORD MOTOR CO.

- 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

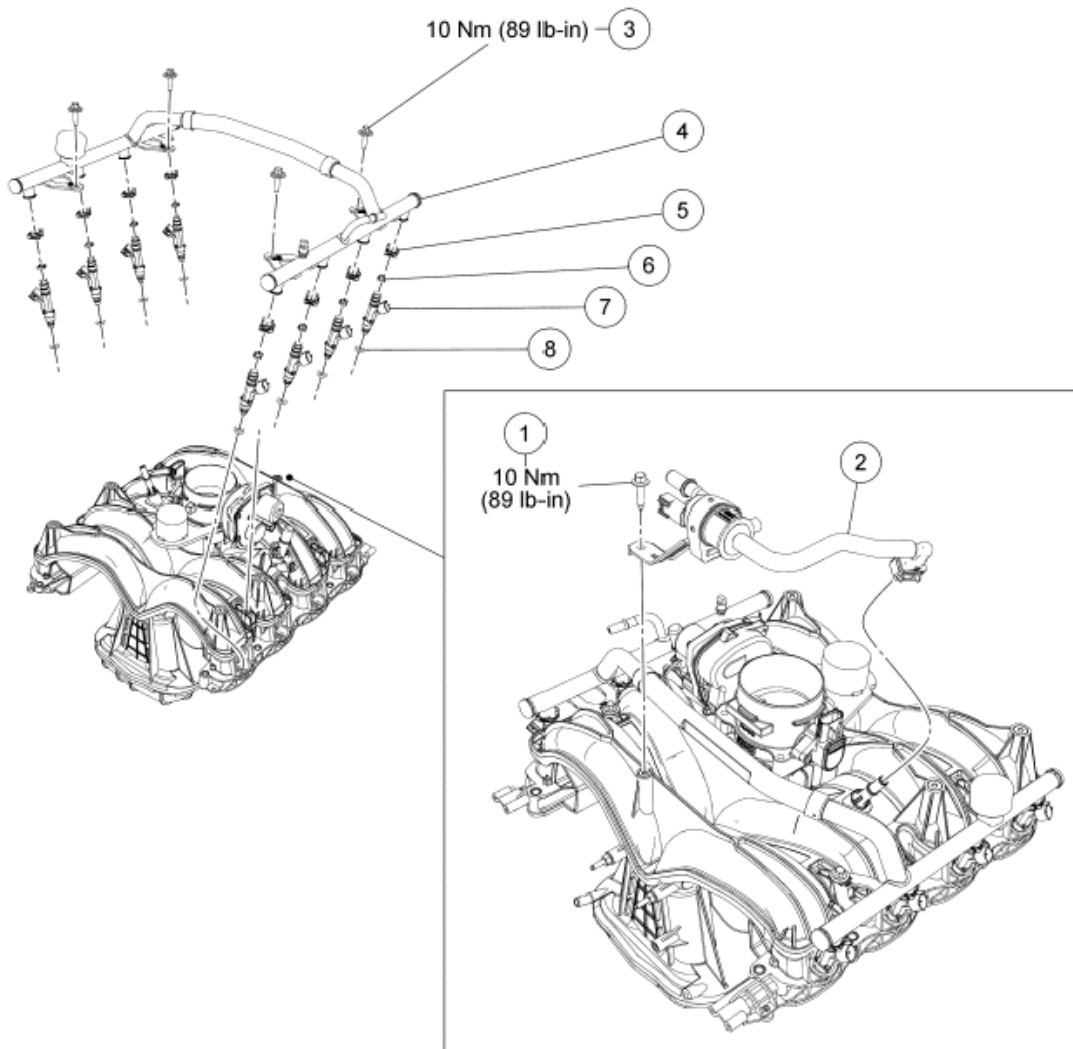
MATERIAL SPECIFICATION

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

Evaporative Emission (EVAP) Purge Valve, Fuel Rail and Fuel Injectors

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



N0102935

Fig. 437: Identifying EVAP Purge Valve, Fuel Rail And Fuel Injectors Components With Torque Specifications

Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	W630204	Evaporative Emission (EVAP) purge valve support bracket bolt
2	-	EVAP purge valve and tube assembly
3	N705800	Fuel rail bolt (4 required)
4	9F792	Fuel rail
5	9F907	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)

Intake Manifold Vacuum Tube, Throttle Body (TB) and Intake Manifold

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

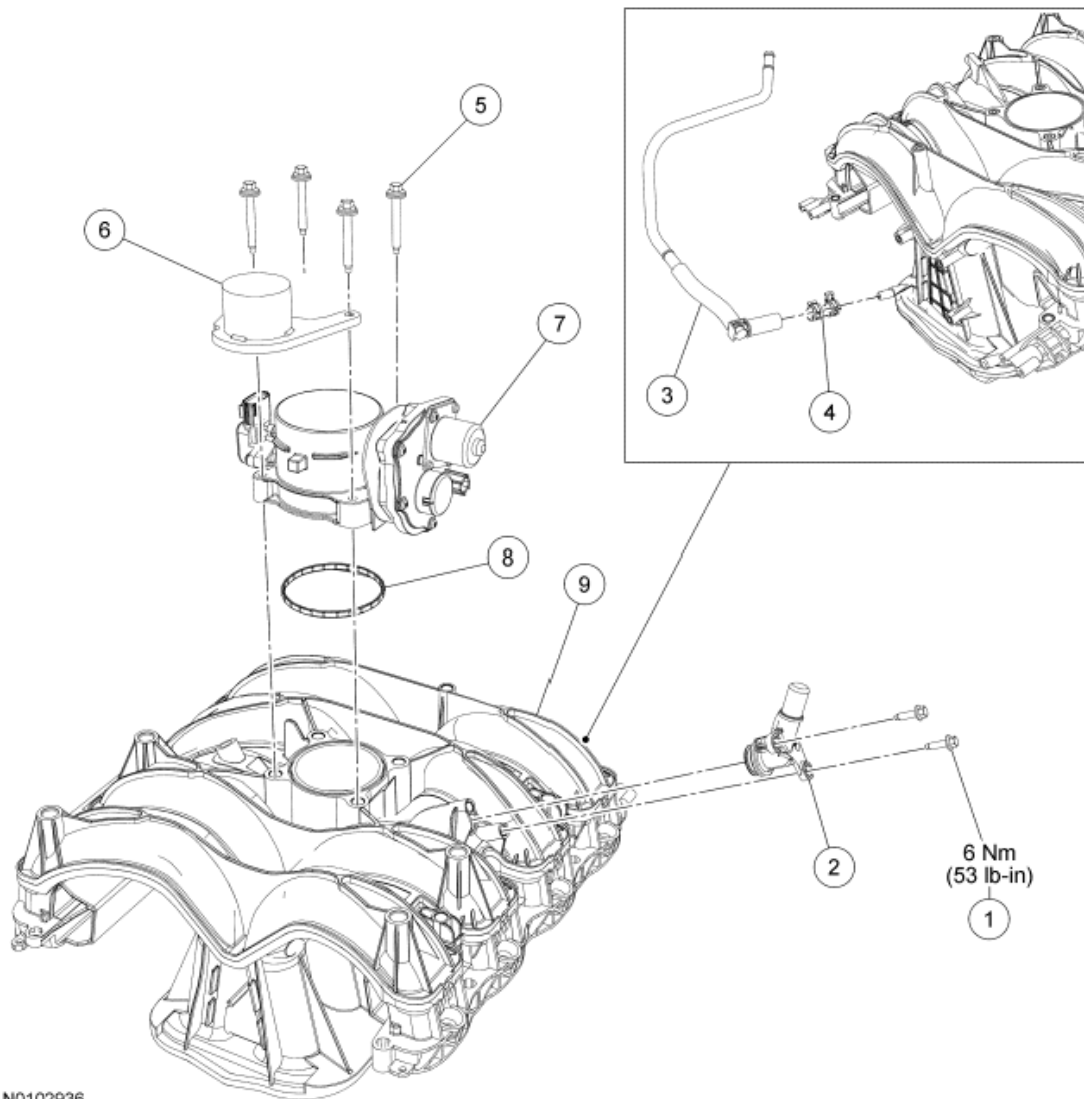


Fig. 438: Identifying Intake Manifold Vacuum Tube, Throttle Body And Intake Manifold Components With Torque Specifications
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	W500204	PCV fitting bolt (2 required)
2	9F624	PCV fitting
3	9D446	Intake manifold vacuum tube assembly
4	-	Intake manifold vacuum tube assembly clamp (part of 9D446)
5	W503282	Throttle Body (TB) bolt (4 required)
6	9J444	Vibration damper
7	9F991	TB assembly
8	9E936	TB seal

9	9424	Intake manifold
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Disassembly

1. Remove the bolt and disconnect the quick connect coupling and remove the Evaporative Emission (EVAP) purge valve assembly.
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 vacuum tube assembly from the intake manifold.
5. Remove the 2 bolts and the PCV fitting.
6. Remove the 4 bolts, the vibration damper and the Throttle Body (TB).

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.

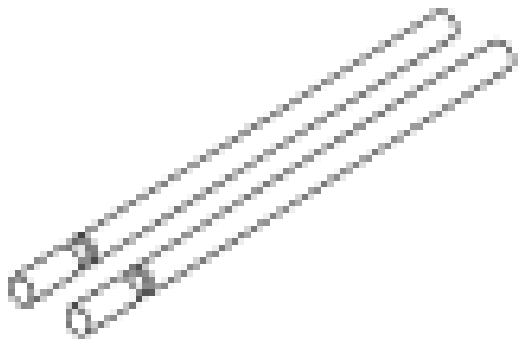
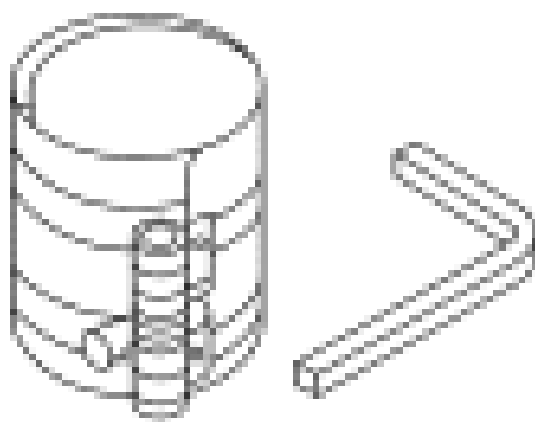
NOTE: Lubricate the O-ring seal with clean engine oil prior to installation.

Install the PCV fitting and the 2 bolts.

- Tighten to 6 Nm (53 lb-in).
2. Install the vacuum tube assembly onto the intake manifold and position the clamp.
 3. Install the **TB**, vibration damper and tighten the 4 bolts in 2 stages.
 - Stage 1: Tighten to 9 Nm (80 lb-in).
 - Stage 2: Tighten an additional 90 degrees.
 4. **NOTE:** Lubricate the new O-ring seals with clean engine oil prior to installation.

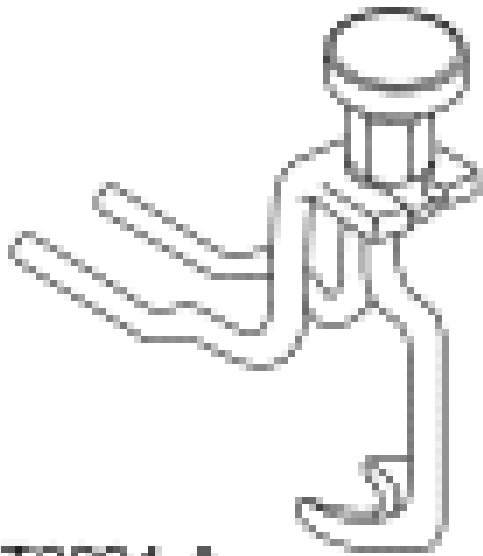
Install 16 new O-ring seals on each of the fuel injectors.

5. Assemble the 8 fuel injectors onto the fuel rail and install the 8 locking clips.
6. Install the fuel rail and fuel injector as an assembly onto the intake manifold.
7. Install the 4 fuel rail bolts.
 - Tighten to 10 Nm (89 lb-in).
8. Position the Evaporative Emission (EVAP) purge valve assembly and connect the quick connect coupling and install the bolt.
 - Tighten to 10 Nm (89 lb-in).

ASSEMBLY**ENGINE****Special Tool(s)****SPECIAL TOOL(S) SPECIFICATION****ST2B06-A**Alignment Pins, Cylinder Head
303-1040 (SR-015486)**ST1376-A**Compressor, Piston Ring
303-D032 (D81L-6002-C) or equivalent

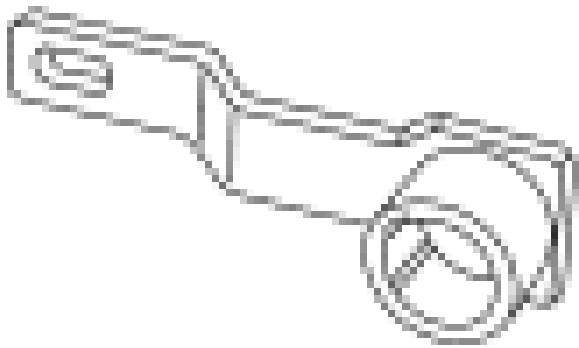
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ST2804-A

Compressor, Valve Spring
303-1039

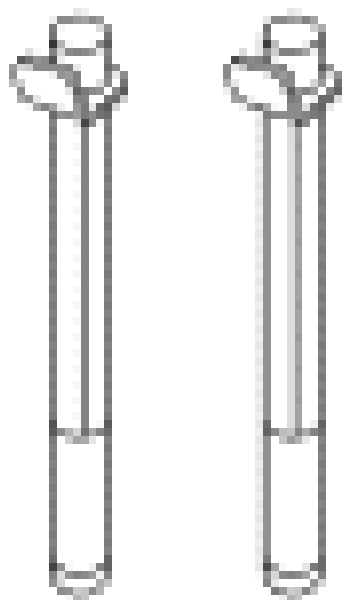


ST1335-A

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

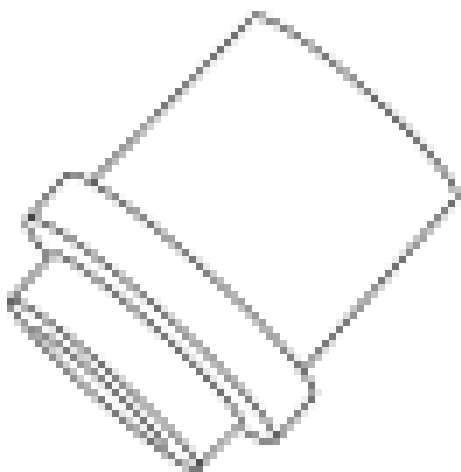
2010 Ford Expedition

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ST1337-A

Installer, Connecting Rod
303-442 (T93P-6136-A)



ST2197-A

Installer, Crankshaft Front Oil Seal
303-635

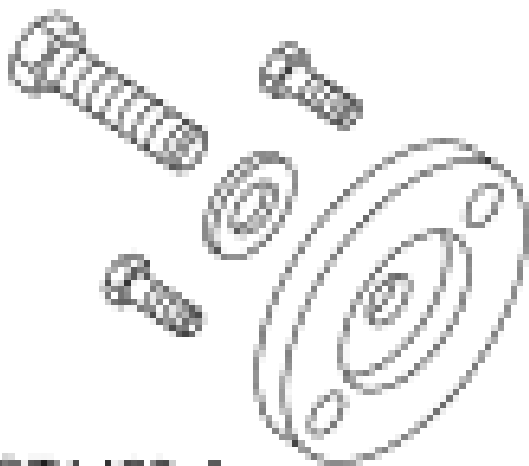
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ST1479-A

Installer, Crankshaft Rear Oil Seal
303-516 (T95P-6701-EH)



ST1480-A

Installer, Crankshaft Rear Oil Seal
303-518 (T95P-6701-DH)

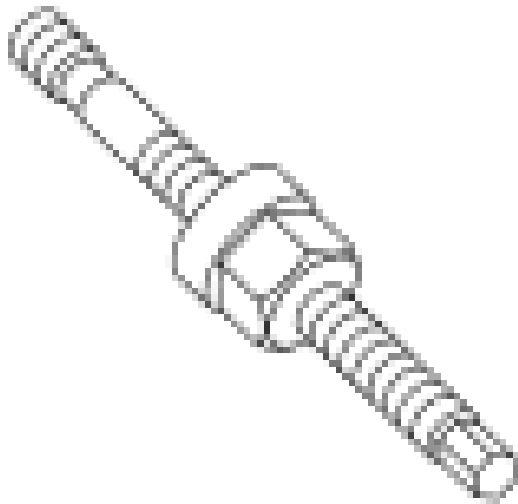
Installer, Crankshaft Rear Oil Slinger
303-517 (T95P-6701-CH)

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ST1482-A



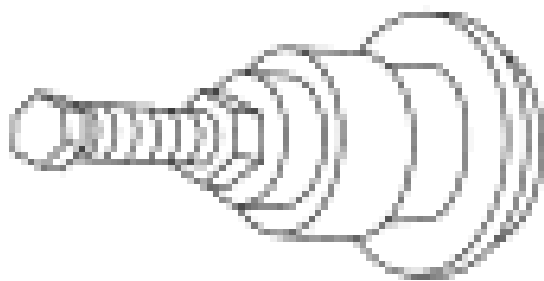
ST2428-A

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

Installer, Front Cover Oil Seal

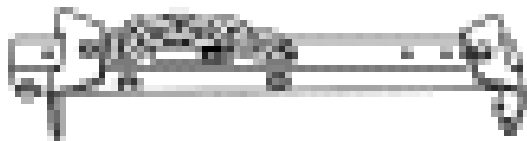
2010 Ford Expedition

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ST1328-A

303-335 (T88T-6701-A)



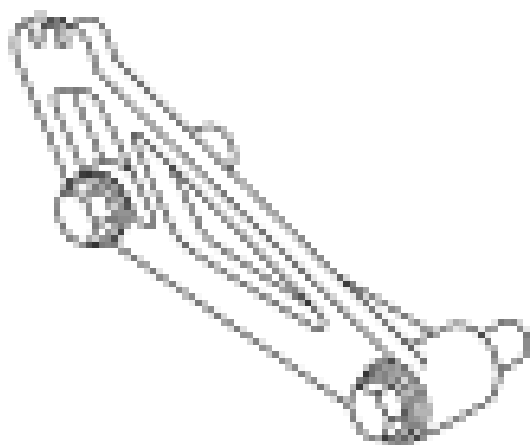
ST1377-A

Lifting Bracket, Engine
303-F047 (014-00073) or equivalent

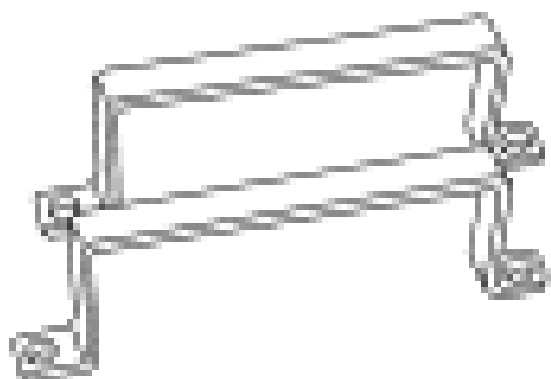
Locking Tool, Cam Phaser
303-1046

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ST2B07-A



ST1668-A

Remover/Installer, Cylinder Head
303-572 (T97T-6000-A)

General Equipment

GENERAL EQUIPMENT

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

Material

MATERIAL SPECIFICATION

2010 Ford Expedition

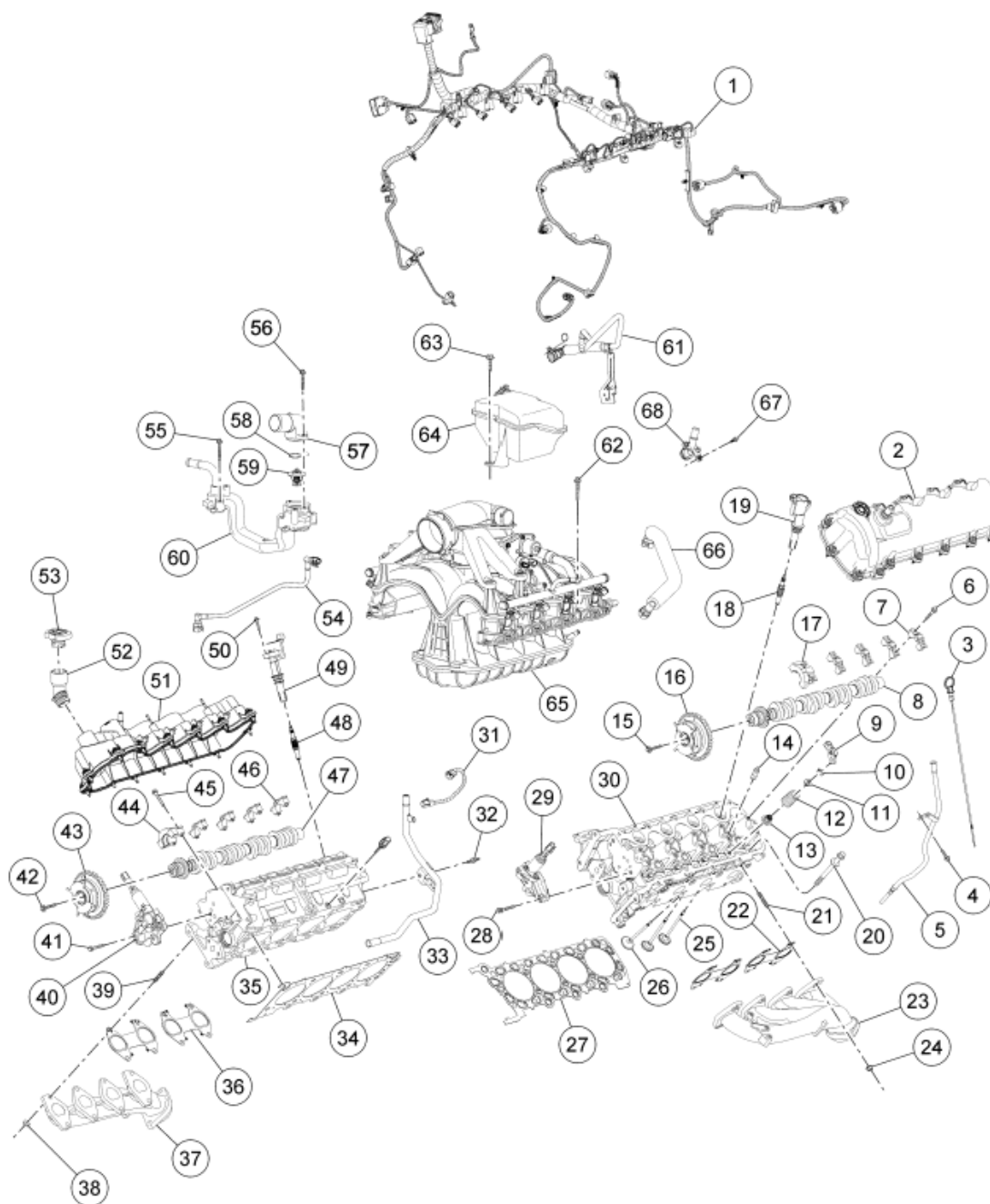
2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

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
Silicone Gasket Remover ZC-30	-

Engine - Upper End

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



N0103022

Fig. 439: Exploded View Of Engine - Upper End
Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	12B637	Engine wiring harness
2	6A505	Valve cover - LH
3	6750	Oil level indicator

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

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 Expedition

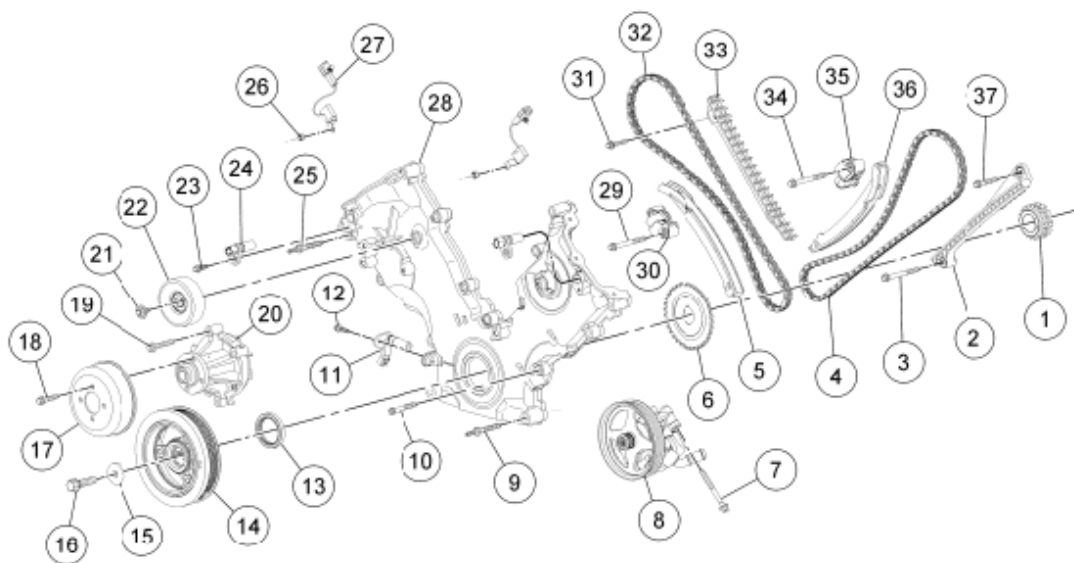
2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

	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	W709775	Intake manifold bolt (10 required)
63	W505427	Air intake resonator assembly bolt
64	9F763	Air intake resonator assembly
65	9Y451	Intake manifold assembly
66	6K817	PCV tube
67	W500204	PCV fitting bolt (2 required)
68	9F624	PCV fitting

Engine - Front End

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



N0006525

Fig. 440: Exploded View Of Engine - Front End

Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

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	W706447	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 (10 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	N806177	Coolant pump bolt (4 required)
20	8501	Coolant pump

2010 Ford Expedition

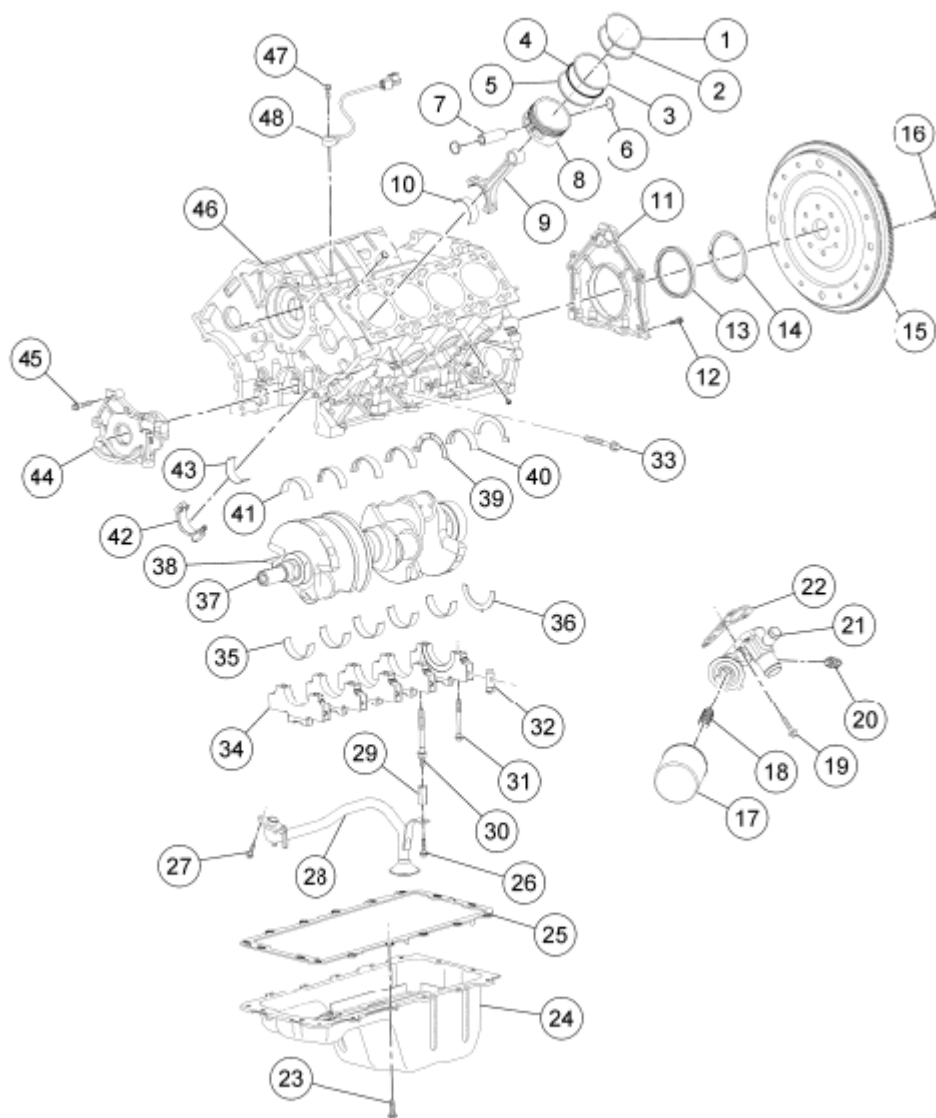
2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

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 (3 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 upper bolt - LH

Engine - Lower End

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



N0055541

Fig. 441: Exploded View Of Engine - Lower End

Courtesy of FORD MOTOR CO.

PART DESCRIPTION CHART

Item	Part Number	Description
1	6150	Upper compression ring (8 required)
2	6152	Lower compression ring (8 required)
3	6159	Outer oil control ring (8 required)
4	6161	Inner oil control ring (8 required)
5	6159	Outer oil control ring (8 required)
6	6140	Piston pin retainer (16 required)
7	6135	Piston pin (8 required)
8	6110	Piston (8 required)
9	6200	Connecting rod assembly (8 required)

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2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

10	6211	Connecting rod bearing (8 required)
11	6K318	Crankshaft rear seal retainer plate
12	N806155	Crankshaft rear seal retainer plate bolt (6 required)
13	6701	Crankshaft rear seal
14	6310	Crankshaft oil slinger
15	6375	Flexplate
16	N806168	Flexplate bolt (8 required)
17	6714	Oil filter
18	6890	Oil filter threaded adapter
19	N806156	Oil filter adapter bolt (4 required)
20	9278	Engine Oil Pressure (EOP) switch
21	6881	Oil filter adapter
22	6A636	Oil filter adapter gasket
23	W701605	Oil pan bolt (16 required)
24	6675	Oil pan
25	6710	Oil pan gasket
26	N605904	Oil pump screen and pickup tube bolt
27	N806155	Oil pump screen and pickup tube bolt (2 required)
28	6622	Oil pump screen and pickup tube
29	N806180	Oil pump screen and pickup tube spacer
30	6K258	Crankshaft main bearing cap stud
31	6345	Crankshaft main bearing cap bolt (9 required)
32	6A346	Crankshaft main bearing dowel (10 required)
33	6C357	Crankshaft main bearing cap bolt (10 required)
34	6325	Crankshaft main bearing cap (5 required)
35	6A338	Crankshaft bearing - lower (5 required)
36	6K302	Crankshaft thrust washer - lower
37	6303	Crankshaft
38	N806201	Crankshaft key
39	6A341	Crankshaft thrust washer - upper (2 required)
40	6333	Crankshaft bearing - upper (4 required)
41	6W337	Crankshaft bearing - upper
42	6210	Connecting rod cap (8 required)
43	6211	Connecting rod bearing (8 required)
44	6621	Oil pump
45	N806183	Oil pump bolt (3 required)
46	6010	Cylinder block
47	W500225	Knock Sensor (KS) bolt (2 required)
48	12A699	KS (2 required)

1. Record the main bearing code found on the front of the engine block.

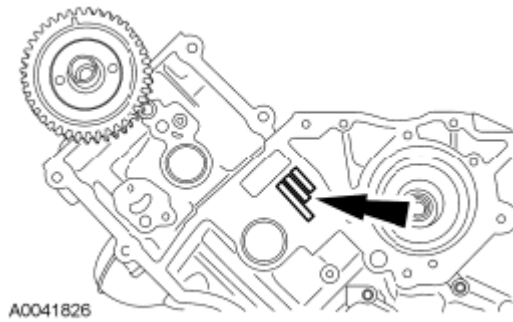


Fig. 442: Locating Main Bearing Code Found On Front Of Engine Block
Courtesy of FORD MOTOR CO.

2. Record the main bearing code found on the back of the crankshaft.

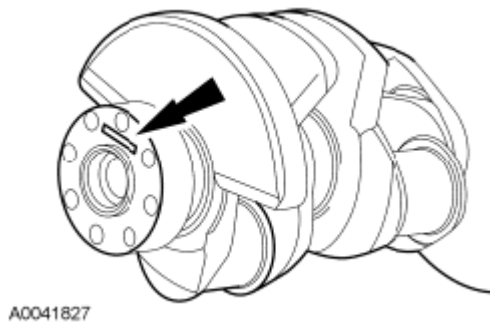


Fig. 443: Identifying Main Bearing Code On Back Of Crankshaft
Courtesy of FORD MOTOR CO.

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.

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

		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	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	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	2	2	2	2	2	2
	U	67.501	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	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	1	2	2	2	2	2	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	1	2	2	2	2	2	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	1	2	2	2	2	2	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	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	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	2	2	2	2	2	3	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	2	2	2	2	3	3	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	2	2	2	3	3	3	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	2	2	2	3	3	3	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	2	2	3	3	3	3	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	2	3	3	3	3	3	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	2	3	3	3	3	3	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	2	2	3	3	3	3	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	2	3	3	3	3	3	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	2	3	3	3	3	3	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	2	3	3	3	3	3	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	2	3	3	3	3	3	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	2	3	3	3	3	3	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	2	3	3	3	3	3	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	2	3	3	3	3	3	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	3	3	3	3	3	3

A0031544

Fig. 444: 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 Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

		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	2	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	3	3
	O	67.245	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3
	N	67.244	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	67.243	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	67.242	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	67.241	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	67.240	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	67.239	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	67.238	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	67.237	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	67.236	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	67.235	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	67.234	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	67.233	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	67.232	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	A	67.231	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

A0041840

Fig. 445: 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.

6.

Install the crankshaft onto the upper crankshaft main bearings.

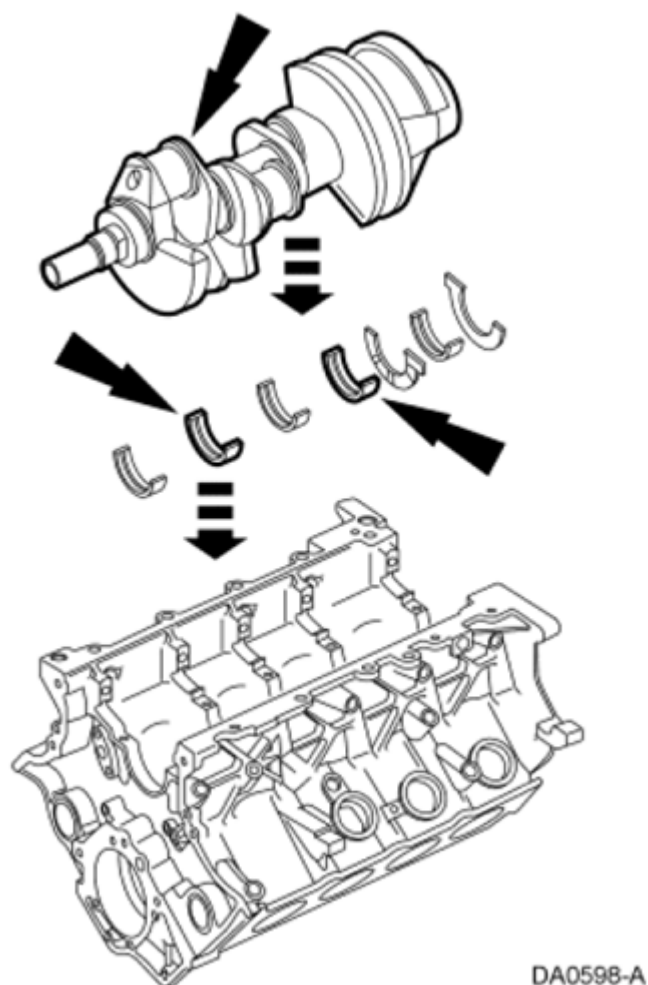
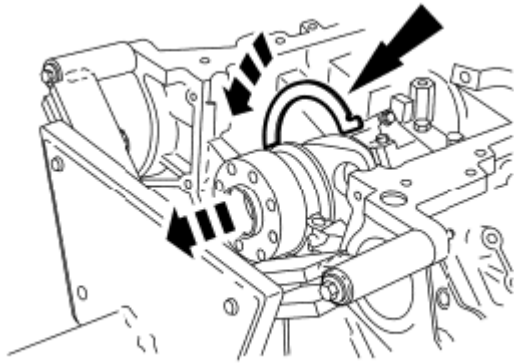


Fig. 446: Installing Crankshaft Onto Upper Crankshaft Main Bearings
Courtesy of FORD MOTOR CO.

NOTE: The oil groove on the thrust washer must face toward the front of the engine (against the crankshaft thrust surface).

7.

Push the crankshaft rearward and install the rear crankshaft upper thrust washer at the back of the No. 5 main boss.

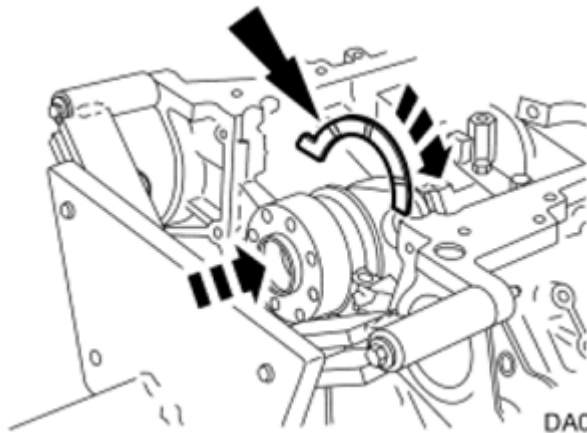


DA0596-A

Fig. 447: Installing Rear Crankshaft Upper Thrust Washer
Courtesy of FORD MOTOR CO.

8. **NOTE:** The oil groove on the thrust washer must face toward the front of the engine (against the crankshaft surface).

Push the crankshaft forward and install the front crankshaft upper thrust washer at the front of the No. 5 main boss.



DA0595-B

Fig. 448: Installing Front Crankshaft Upper Thrust Washer
Courtesy of FORD MOTOR CO.

9. **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).

Install the lower crankshaft thrust washer to the back side of the No. 5 main bearing cap, with oil grooves facing the crankshaft surface.

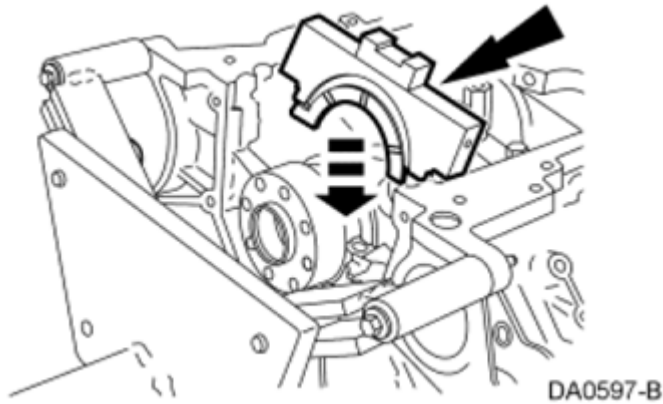


Fig. 449: Installing Lower Crankshaft Thrust Washer To Back Side Of No. 5 Main Bearing Cap
Courtesy of FORD MOTOR CO.

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.

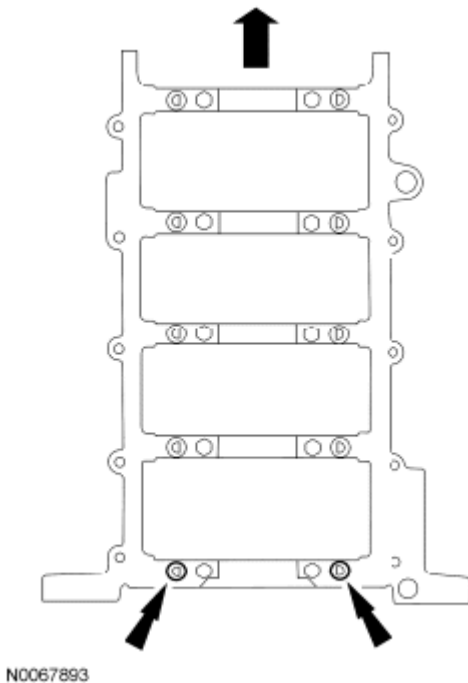
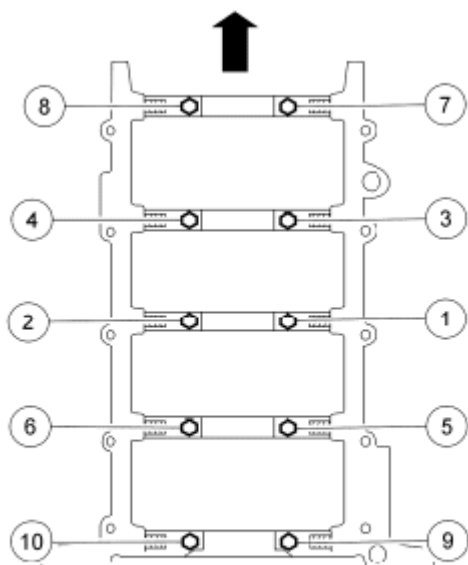


Fig. 450: Locating Dowel Pins
Courtesy of FORD MOTOR CO.

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).

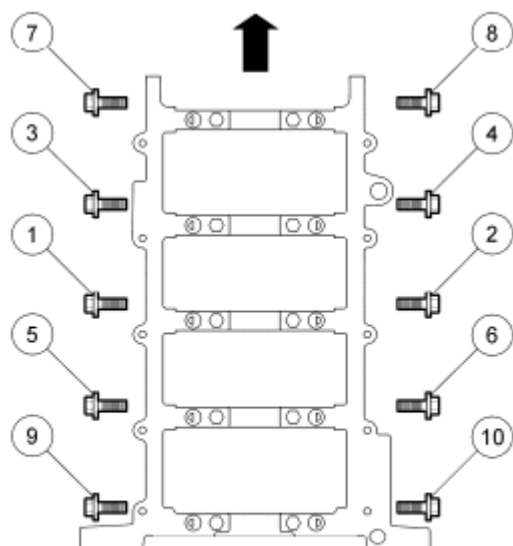
- Stage 2: Tighten an additional 90 degrees.



N0010200

Fig. 451: Identifying Vertical Main Bearing Cap Fasteners Tightening Sequence
 Courtesy of FORD MOTOR CO.

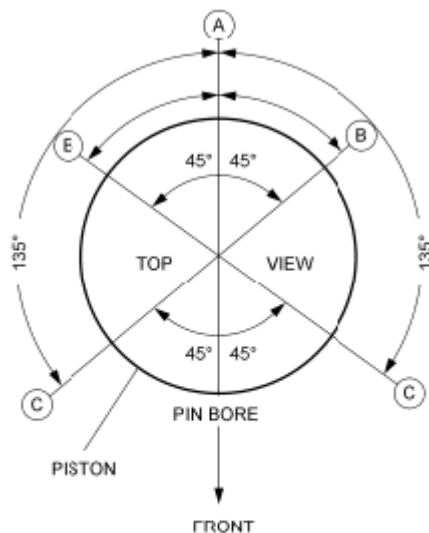
13. Install the 10 side bolts and tighten them in 2 stages, in the sequence shown in illustration.
 - Stage 1: Tighten to 30 Nm (22 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.



N0010201

Fig. 452: Identifying Side Bolts 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. 453: Identifying Piston Ring Gaps
Courtesy of FORD MOTOR CO.

16. Make sure the dimple in the piston faces the front of the engine.

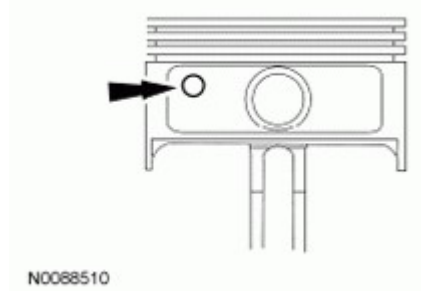


Fig. 454: Identifying Piston Dimple Position
Courtesy of FORD MOTOR CO.

17. **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.

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.

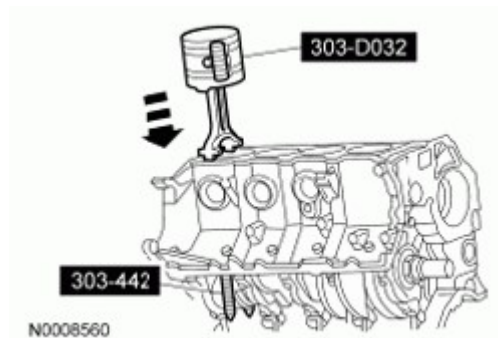


Fig. 455: Installing Connecting Rod With Upper Connecting Rod Bearing
Courtesy of FORD MOTOR CO.

18. **NOTE:** Do not scratch the cylinder walls or crankshaft journals with the connecting rod or engine damage may occur.

Once the connecting rod is seated on the crankshaft journal, remove the Connecting Rod Installer.

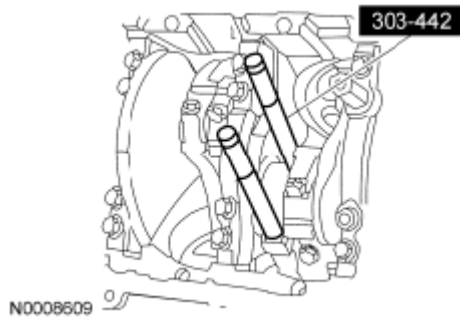


Fig. 456: Identifying Connecting Rod Installer (303-442)

Courtesy of FORD MOTOR CO.

19. **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.

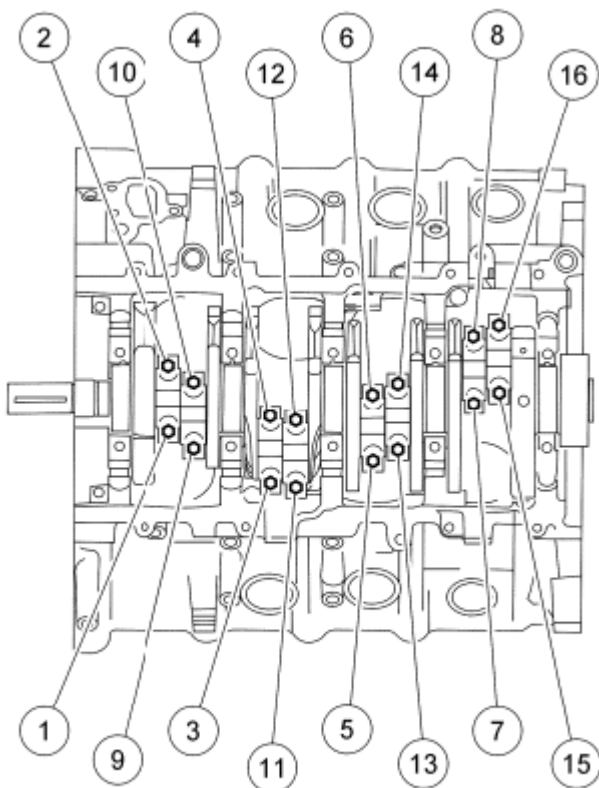
Position the lower bearing and connecting rod, and install the 16 new bolts loosely.

20. Check the piston-to-cylinder block and piston ring clearances. For additional information, refer to **ENGINE SYSTEM - GENERAL INFORMATION**.

21. **NOTE:** Main bearing caps are removed for clarity.

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. 457: Identifying Main Bearing Caps Tightening Sequence
Courtesy of FORD MOTOR CO.

22. Position the oil pump and install the 3 bolts.
 - Tighten to 10 Nm (89 lb-in).



N0006304

Fig. 458: Locating Oil Pump Bolts
Courtesy of FORD MOTOR CO.

23. Install the oil pump screen and pickup tube spacer.
 - Tighten to 25 Nm (18 lb-ft).

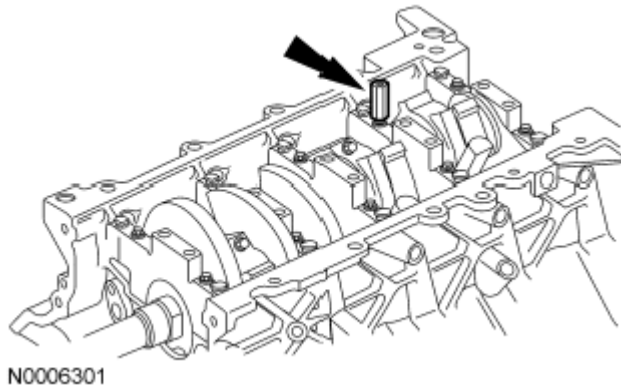


Fig. 459: Locating Oil Pump Screen And Pickup Tube Spacer
Courtesy of FORD MOTOR CO.

24. **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.

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).

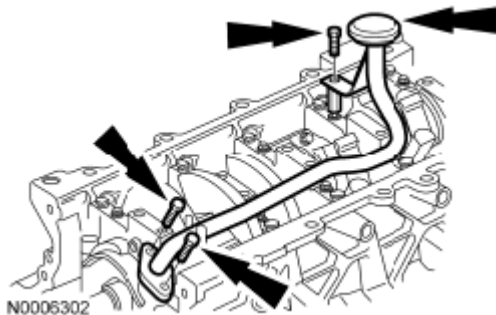


Fig. 460: Locating Oil Pump Screen And Pickup Tube With Bolts
Courtesy of FORD MOTOR CO.

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

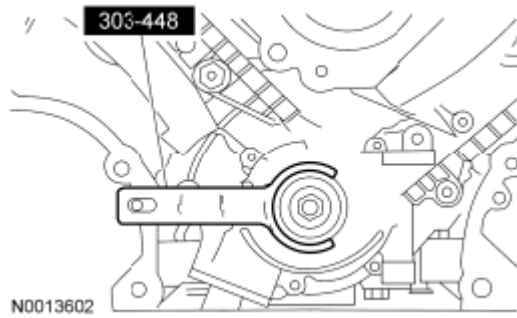


Fig. 461: Identifying Crankshaft With Crankshaft Holding Tool

Courtesy of FORD MOTOR CO.

26. **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.

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.

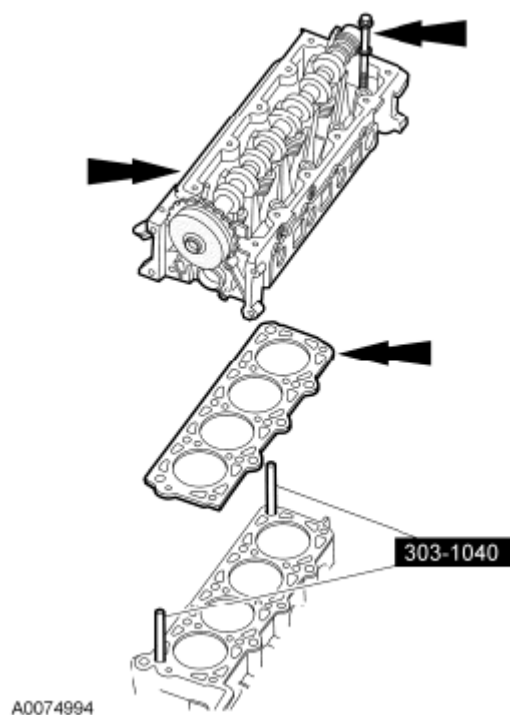
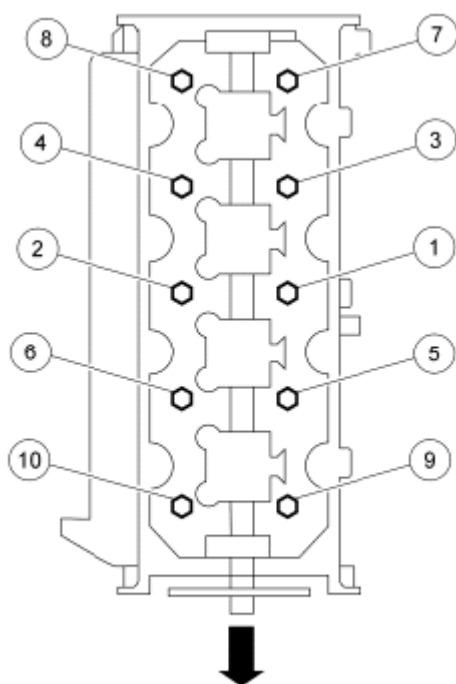


Fig. 462: Locating Cylinder Head Gasket And Cylinder Head Position
Courtesy of FORD MOTOR CO.

27. **NOTE:** RH shown in illustration, LH similar.

Tighten the 20 bolts in 3 stages, in the sequence shown in illustration.

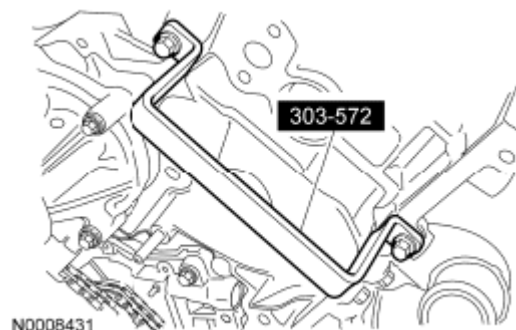
- Stage 1: Tighten to 40 Nm (30 lb-ft).
- Stage 2: Tighten an additional 90 degrees.
- Stage 3: Tighten an additional 90 degrees.



N0067890

Fig. 463: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

28. Remove the Cylinder Head Remover/Installer from the LH cylinder head.



N0008431

Fig. 464: Identifying Cylinder Head Remover/Installer (303-572)
Courtesy of FORD MOTOR CO.

29. Remove the Cylinder Head Remover/Installer from the RH cylinder head.

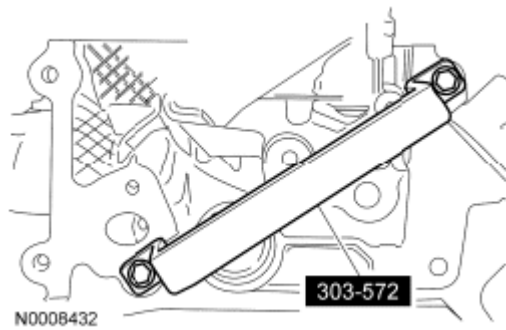


Fig. 465: Identifying Cylinder Head Remover/Installer (303-572)
Courtesy of FORD MOTOR CO.

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.

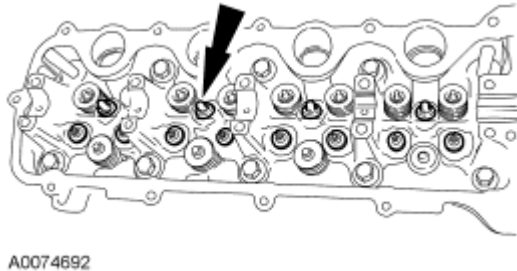
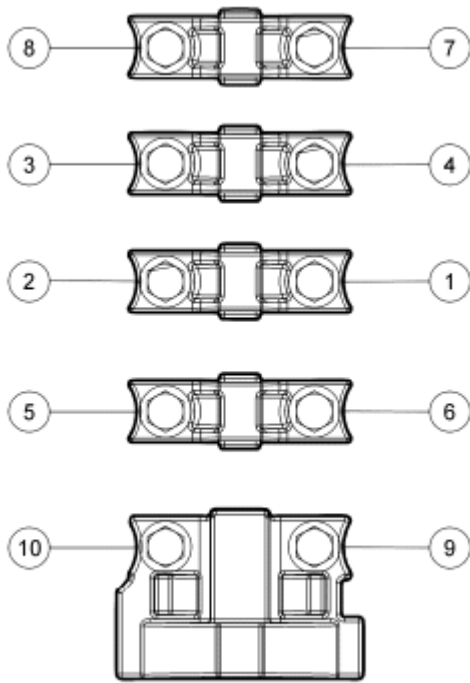


Fig. 466: Locating Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

31. Install the LH and RH camshafts.
- Lubricate the camshaft and camshaft journals with clean engine oil prior to installation.
32. **NOTE: LH shown in illustration, RH similar.**

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.



N0011337

Fig. 467: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

33. **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.

Install the camshaft phaser and sprockets and new camshaft phaser and sprocket bolts finger-tight.

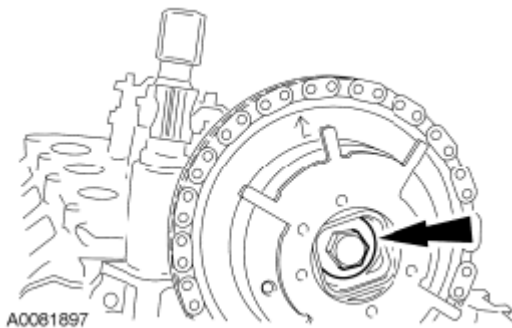


Fig. 468: Locating Camshaft Phaser And Sprocket Assembly Bolt
Courtesy of FORD MOTOR CO.

34. **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.

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.

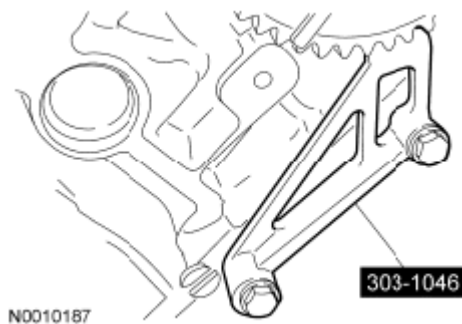


Fig. 469: Identifying Cam Phaser Locking Tool (303-1046)
Courtesy of FORD MOTOR CO.

35. **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.

Compress the tensioner plunger, using a vise.

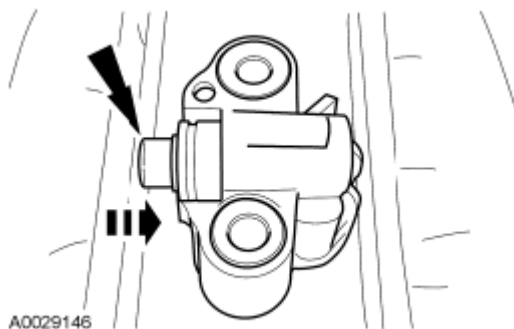


Fig. 470: Compressing Tensioner Plunger

Courtesy of FORD MOTOR CO.

36. Install the Hydraulic Chain Tensioner Retaining Clip on the tensioner to hold the plunger in during installation.

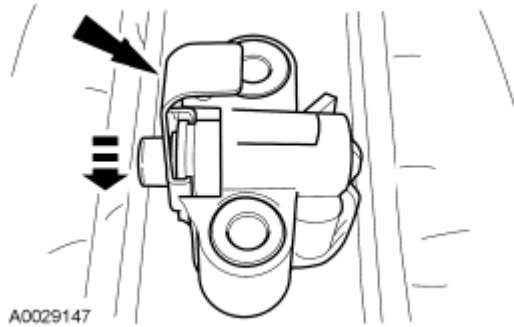


Fig. 471: Installing Retaining Clip On Tensioner
Courtesy of FORD MOTOR CO.

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.

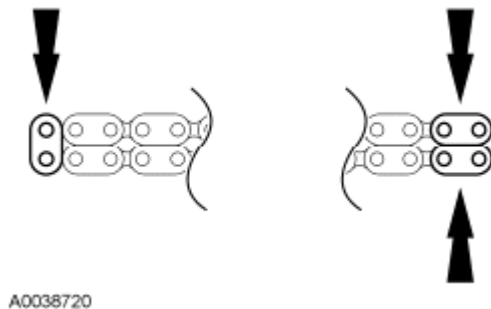


Fig. 472: Identifying Copper Link Timing Marks
Courtesy of FORD MOTOR CO.

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

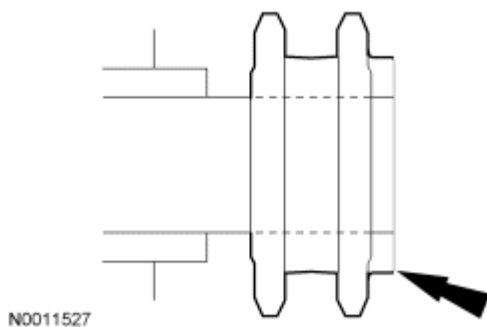
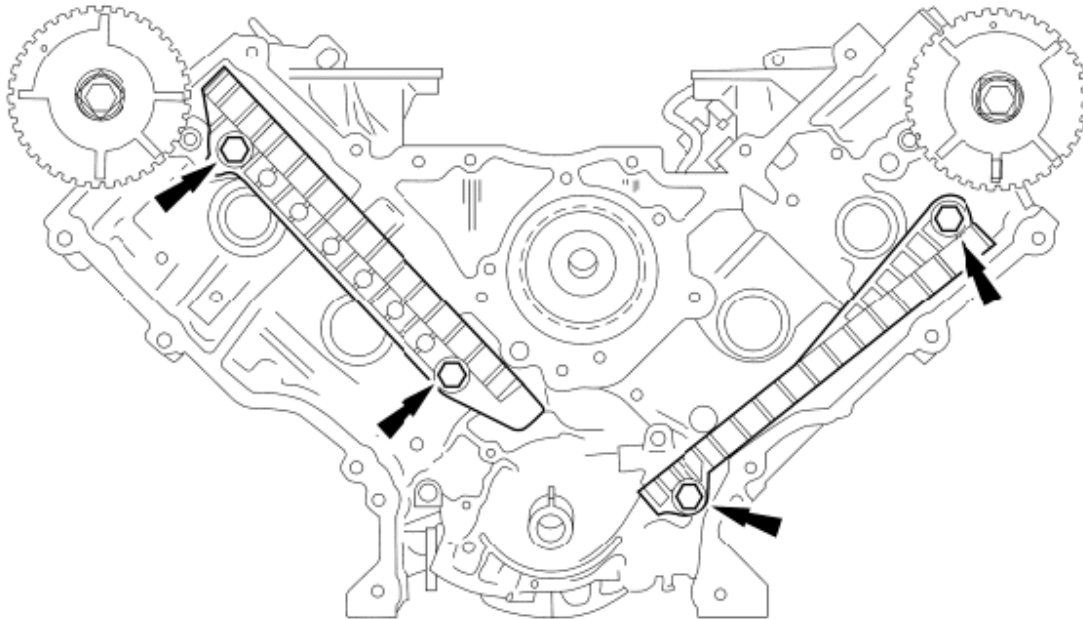


Fig. 473: Locating Crankshaft Sprocket Position

Courtesy of FORD MOTOR CO.

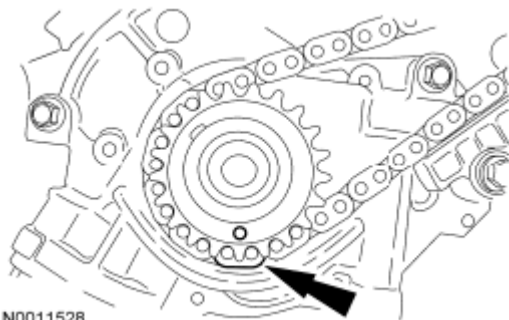
40. Position the LH and RH timing chain guides and install the 4 bolts.
- Tighten to 10 Nm (89 lb-in).



N0006303

Fig. 474: Locating Timing Chain Guides Bolts
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. 475: 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.

42.

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

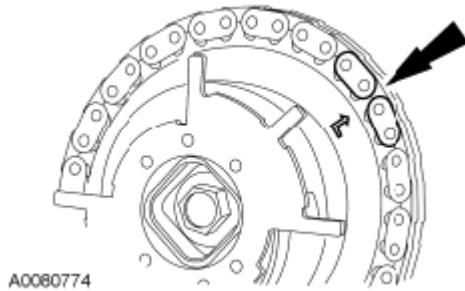


Fig. 476: Identifying Timing Mark On Timing Chain
Courtesy of FORD MOTOR CO.

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

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).

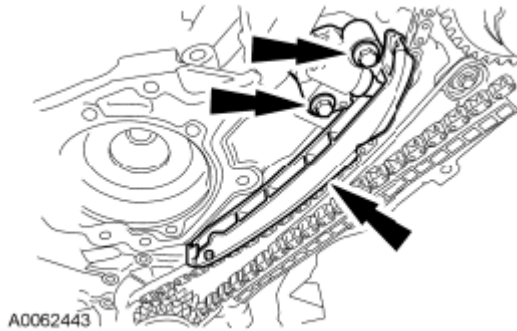


Fig. 477: Locating LH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

44. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.

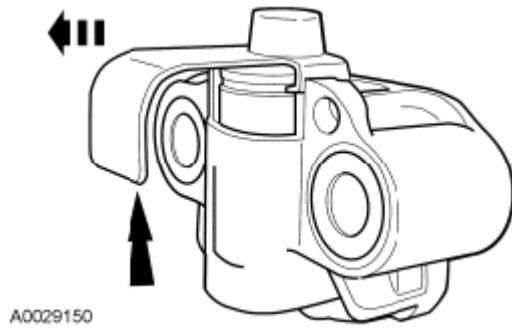


Fig. 478: Removing Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

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.

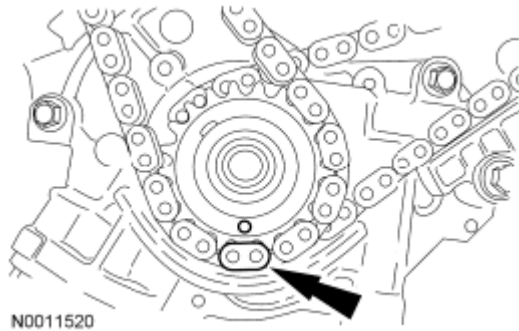


Fig. 479: Aligning Sprocket Timing Mark And Chain Link
Courtesy of FORD MOTOR CO.

46. **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.

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.

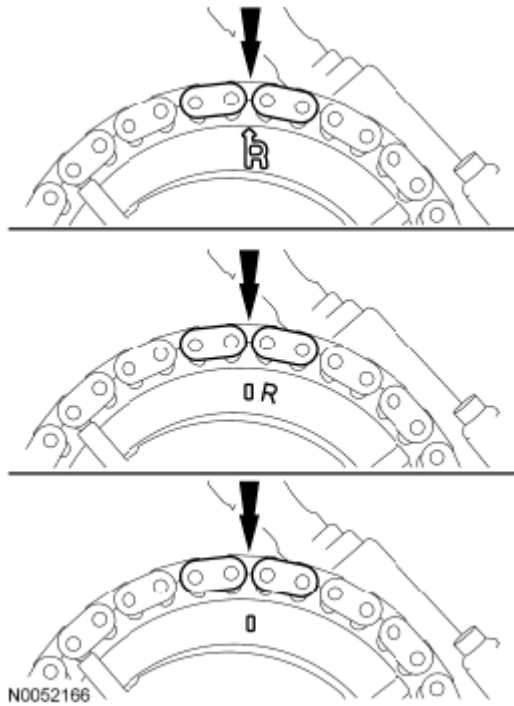


Fig. 480: Identifying Timing Chain Timing Marks
Courtesy of FORD MOTOR CO.

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).

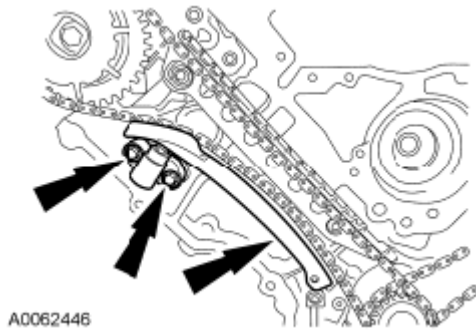


Fig. 481: Locating RH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

48. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.

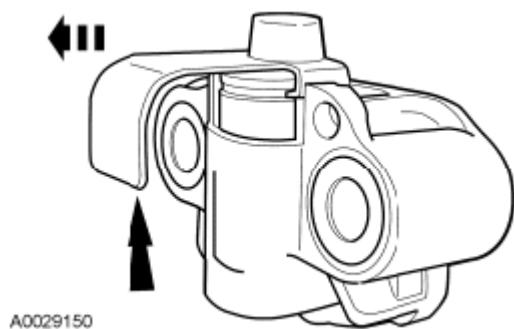
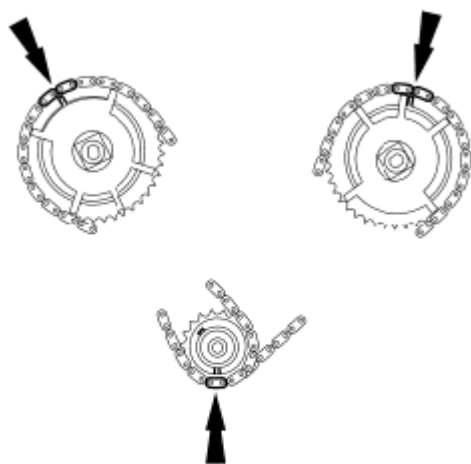


Fig. 482: Removing Retaining Clip From RH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

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



N0092582

Fig. 483: Locating Timing Chain Marks
Courtesy of FORD MOTOR CO.

50. Install the crankshaft sensor ring on the crankshaft.

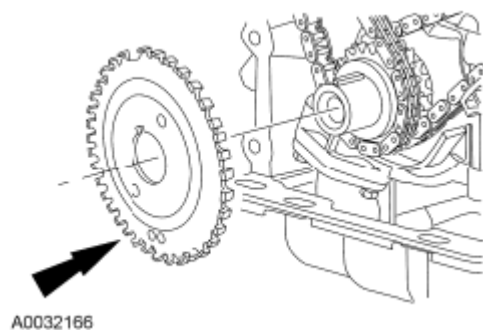


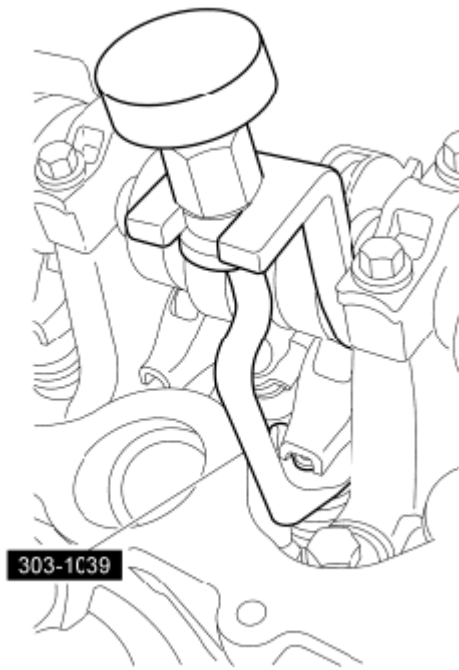
Fig. 484: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

51. **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.

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

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



N0010191

Fig. 485: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

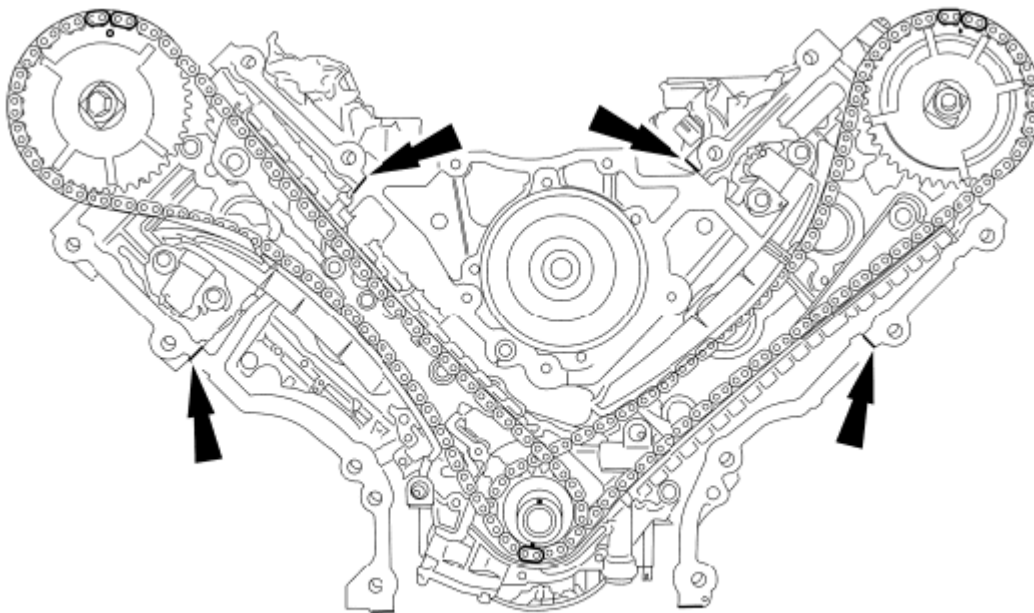
52. **NOTE:** Do not use metal scrapers, wire brushes, power abrasive discs or other abrasive means to clean the sealing surfaces. These tools cause scratches and gouges which make leak paths. Use a plastic scraping tool to remove all traces of old sealant.

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.

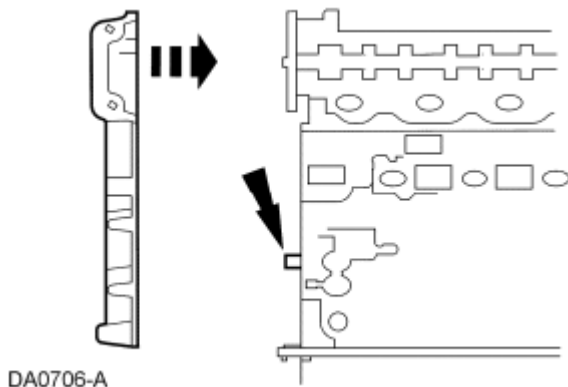
Apply a bead of silicone gasket and sealant along the cylinder head-to-cylinder block surface at the locations shown in illustration.



N0010501

Fig. 486: Identifying Sealant Applying Area At Cylinder Head-To-Cylinder Block Surface
Courtesy of FORD MOTOR CO.

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.



DA0706-A

Fig. 487: Installing Engine Front Cover
Courtesy of FORD MOTOR CO.

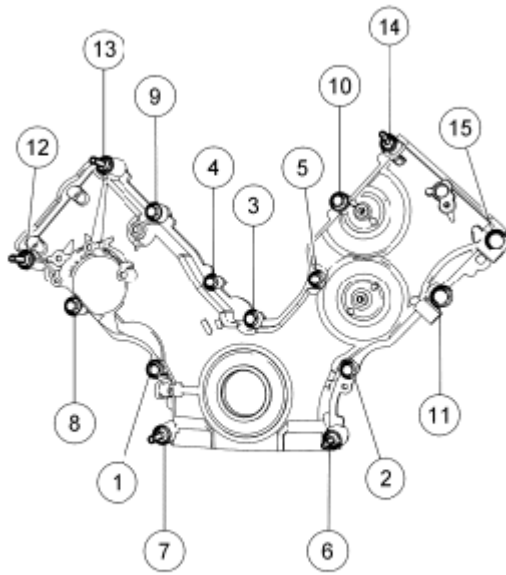
54. Tighten the 15 engine front cover fasteners in the sequence shown in illustration in 2 stages.

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).

PART DESCRIPTION CHART

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	Bolt, 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	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
12	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
13	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
14	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
15	W706605	Bolt, Hex Head Pilot, M8 x 1.25 x 56



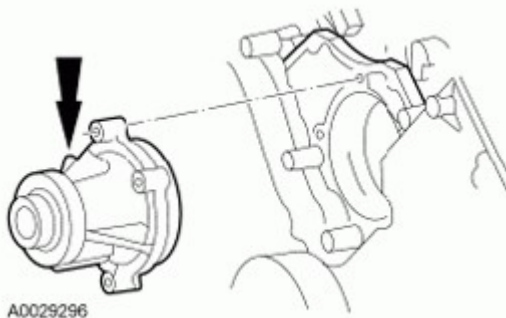
N0010206

Fig. 488: Identifying Engine Front Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

55. **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.

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.



A0029296

Fig. 489: Locating Coolant Pump
Courtesy of FORD MOTOR CO.

56. Tighten the 4 coolant pump bolts.
- Tighten to 25 Nm (18 lb-ft).

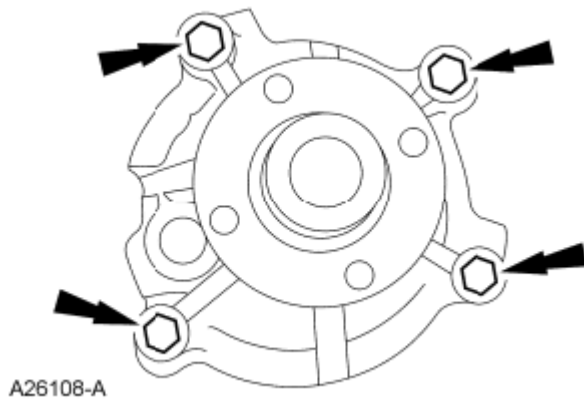


Fig. 490: Locating Coolant Pump Bolts
Courtesy of FORD MOTOR CO.

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

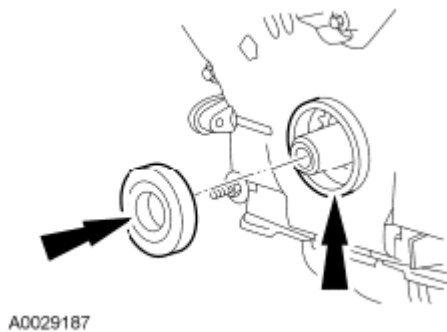


Fig. 491: Locating Engine Front Cover And Crankshaft Seal Inner Lip
Courtesy of FORD MOTOR CO.

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

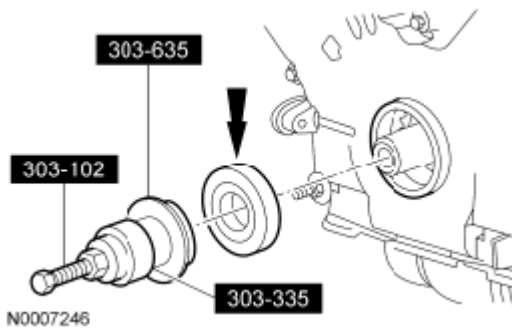


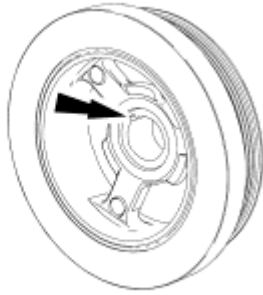
Fig. 492: Installing Crankshaft Front Seal Into Engine Front Cover
Courtesy of FORD MOTOR CO.

- 59.

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.

59.

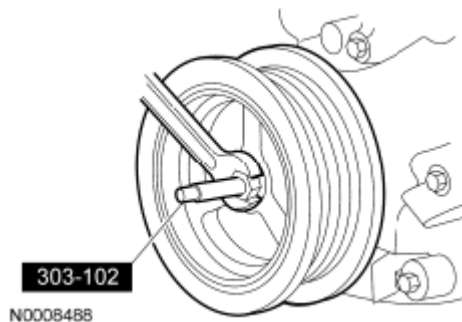
Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.



N0010530

Fig. 493: Identifying Woodruff Key Slot In Crankshaft Pulley
Courtesy of FORD MOTOR CO.

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



N0008488

Fig. 494: Installing Crankshaft Pulley
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.

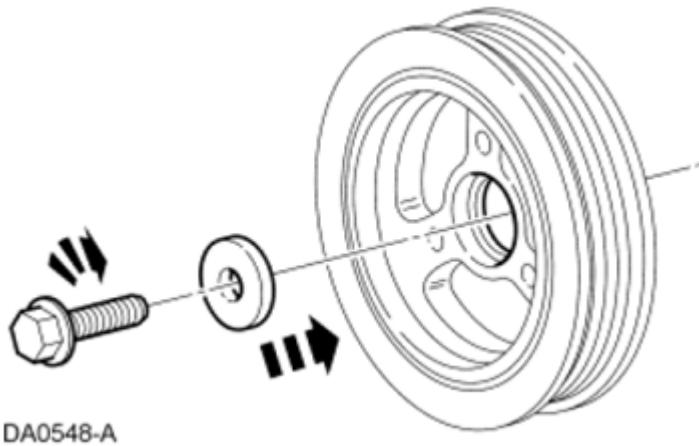


Fig. 495: Tightening Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

62. Position the accessory drive belt tensioner and install the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).

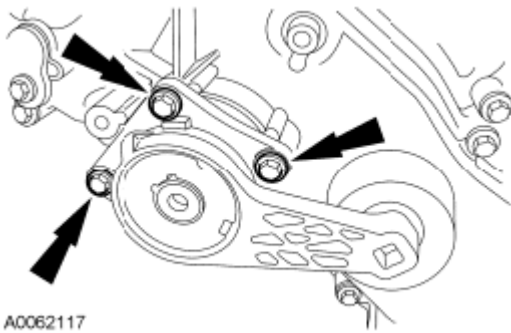


Fig. 496: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

63. Install the 3 accessory drive belt idler pulleys, the coolant pump pulley and the 7 bolts.
 - Tighten to 25 Nm (18 lb-ft).

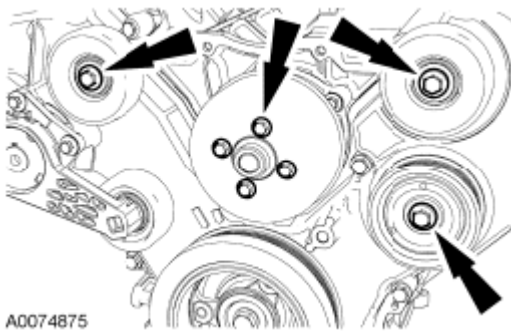


Fig. 497: Locating Pulleys Bolts

Courtesy of FORD MOTOR CO.

64. **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.

Position the oil filter adapter and install the 4 bolts.

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

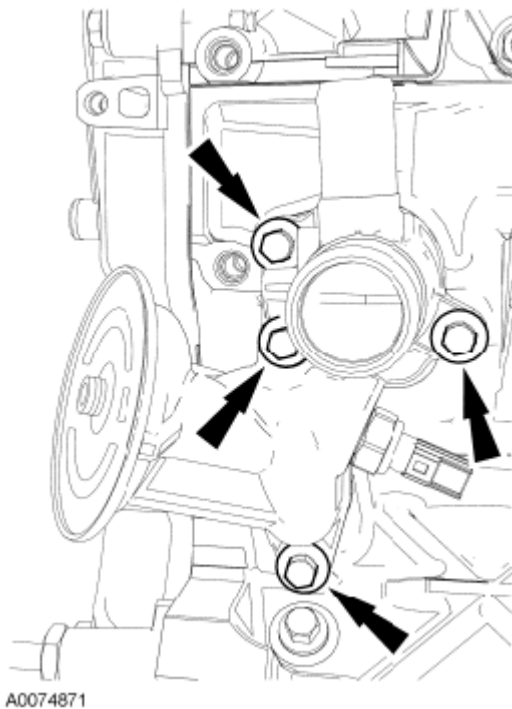


Fig. 498: Locating Oil Filter Adapter Bolts
Courtesy of FORD MOTOR CO.

65. **NOTE:** Lubricate the oil filter gasket with clean engine oil.

Install a new oil filter.

- Tighten the oil filter until the gasket makes contact, then use an oil filter strap wrench to tighten the filter an additional 270 degrees.

66. **NOTE:** LH shown in illustration, RH similar.

Install 16 new exhaust manifold studs.

- Tighten to 12 Nm (106 lb-in).

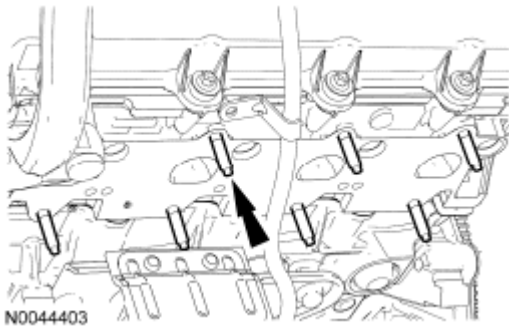


Fig. 499: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

- Position a new gasket, the LH exhaust manifold and tighten the 8 nuts in the sequence shown in illustration.
 - Tighten to 25 Nm (18 lb-ft).

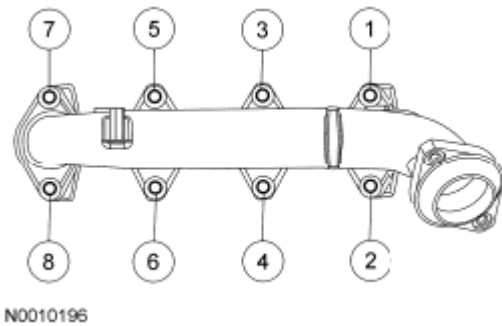


Fig. 500: Identifying LH Exhaust Manifold Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

- Position a new gasket, the RH exhaust manifold and tighten the 8 nuts in the sequence shown in illustration.
 - Tighten to 25 Nm (18 lb-ft).

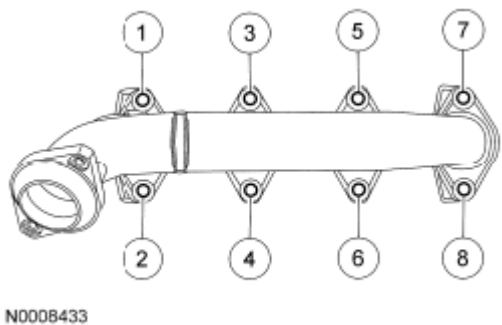


Fig. 501: Identifying RH Exhaust Manifold Nuts Tightening Sequence

Courtesy of FORD MOTOR CO.

69. Position the RH engine support insulator-to-cylinder block bracket and install the 3 bolts.
- Tighten to 63 Nm (46 lb-ft).

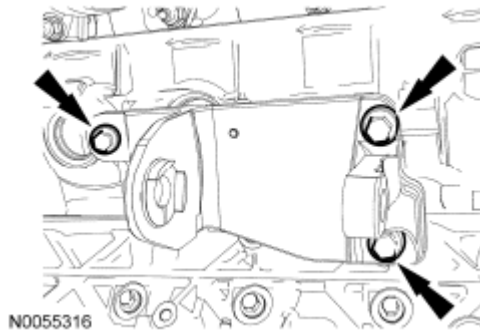


Fig. 502: Locating RH Engine Support Insulator-To-Cylinder Block Bracket Bolts
Courtesy of FORD MOTOR CO.

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 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 can cause future oil leakage.

71.

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

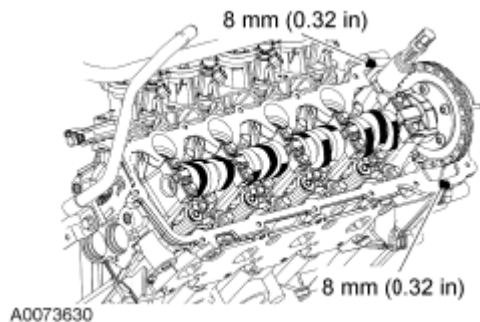


Fig. 503: Identifying Sealant Applying Area
Courtesy of FORD MOTOR CO.

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 bolts in the sequence shown in illustration.

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

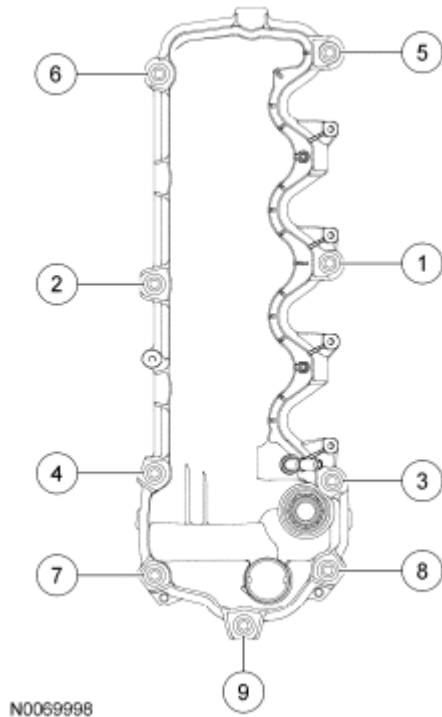


Fig. 504: Identifying RH Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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 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 can cause future oil leakage.

74.

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

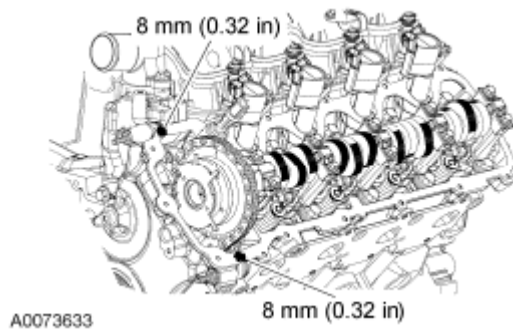


Fig. 505: Identifying Sealant Applying Area
Courtesy of FORD MOTOR CO.

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 bolts in the sequence shown in illustration.

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

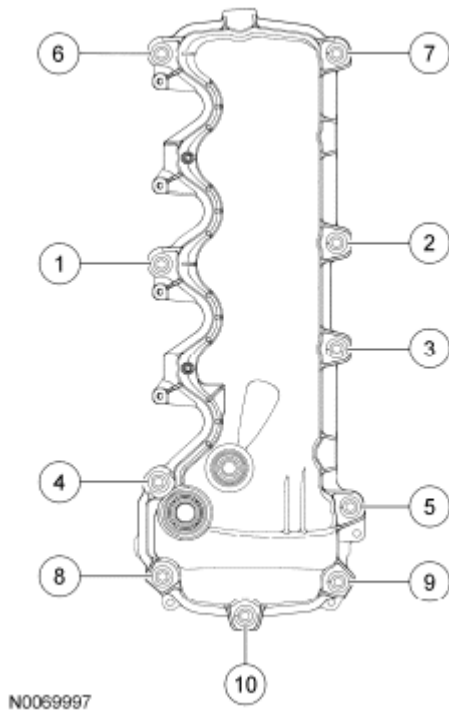


Fig. 506: Identifying LH Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

76. Install the oil level indicator tube and the bolt.

- Install a new O-ring seal and lubricate the O-ring seal with clean engine oil prior to installation.
- Tighten to 10 Nm (89 lb-in).

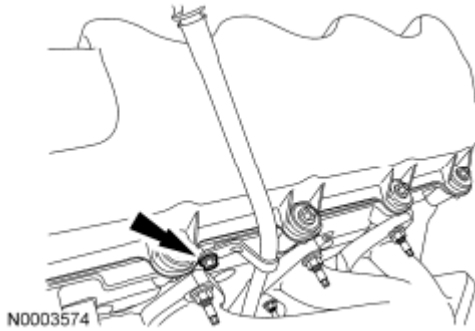


Fig. 507: Locating Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

77. Position the LH engine support insulator-to-cylinder block bracket and install the 3 bolts.

- Tighten to 63 Nm (46 lb-ft).

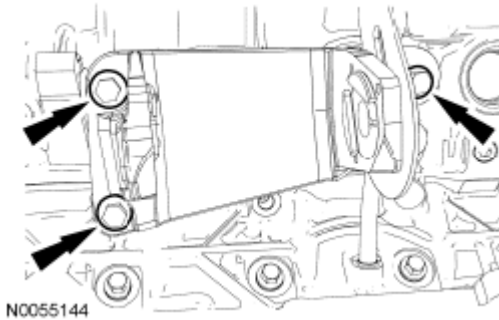


Fig. 508: Locating LH Engine Support Insulator-To-Cylinder Block Bracket Bolts
Courtesy of FORD MOTOR CO.

78. **NOTE:** Do not reuse the O-ring seals.

NOTE: Lubricate the O-ring seals with clean engine coolant prior to installation.

Slide the coolant tube forward with the new O-ring seals into the cylinder block.

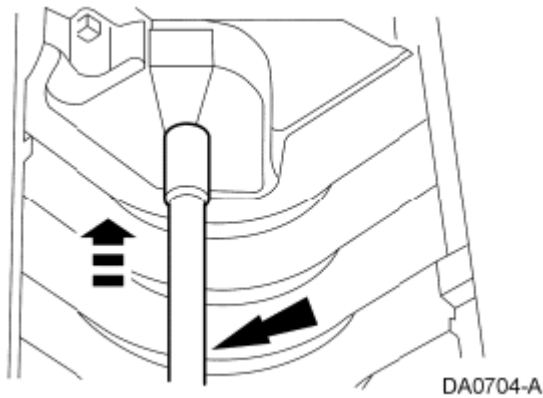


Fig. 509: Sliding Coolant Tube
Courtesy of FORD MOTOR CO.

79. Install the coolant tube stud bolt.
- Tighten to 10 Nm (89 lb-in).

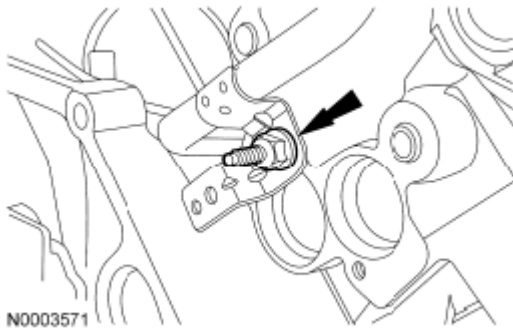


Fig. 510: Locating Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

80. Install the 2 Knock Sensor (KS) and the 2 bolts.
- Tighten to 20 Nm (177 lb-in).

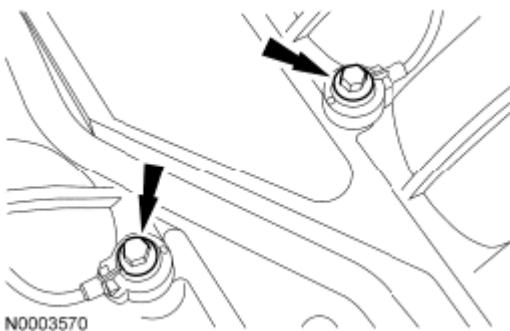


Fig. 511: Identifying Knock Sensor (KS) Bolts
Courtesy of FORD MOTOR CO.

81. **NOTE:** LH shown in illustration, RH similar.

Install the 8 ignition coils and the 8 bolts.

- 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.
- 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).

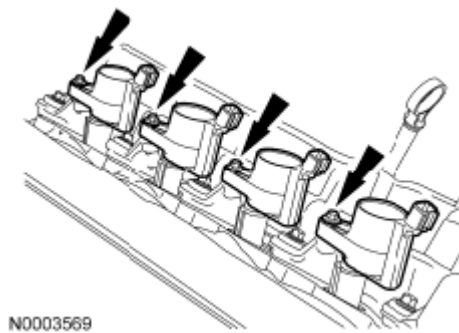


Fig. 512: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

82. Position the intake manifold vacuum tube support bracket and install the bolt.
- Tighten to 10 Nm (89 lb-in).

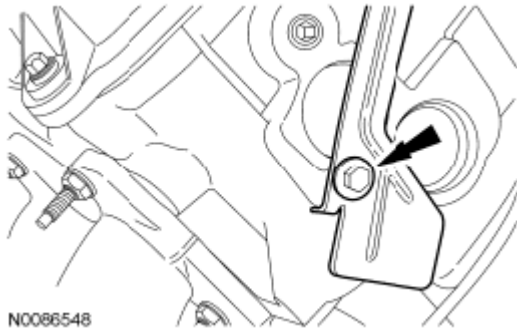


Fig. 513: Locating Intake Manifold Vacuum Tube Support Bracket Bolt
Courtesy of FORD MOTOR CO.

83. Install the LH radio ignition interference capacitor and the nut.
- Tighten to 25 Nm (18 lb-ft).

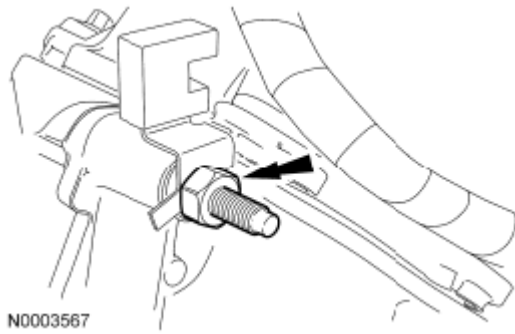


Fig. 514: Locating LH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

84. Install the RH radio ignition interference capacitor and the nut.
 - Tighten to 25 Nm (18 lb-ft).

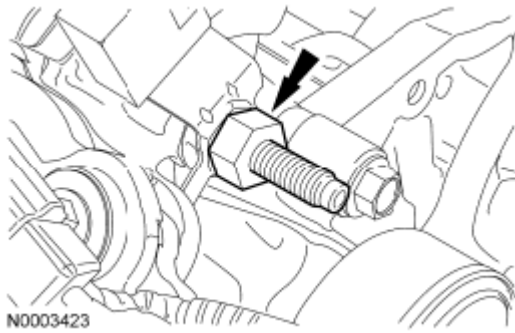


Fig. 515: Locating RH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

85. Install the Engine Lifting Bracket.

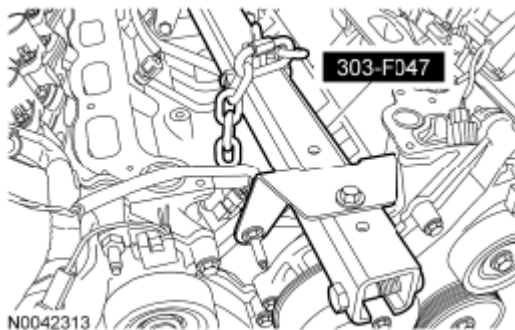


Fig. 516: Identifying Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

86. Using a floor crane, remove the engine from the engine stand.

87. **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.

87.

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.

88.

Apply a 4 mm (0.16 in) bead of silicone gasket and sealant around the crankshaft rear seal retainer sealing surface.

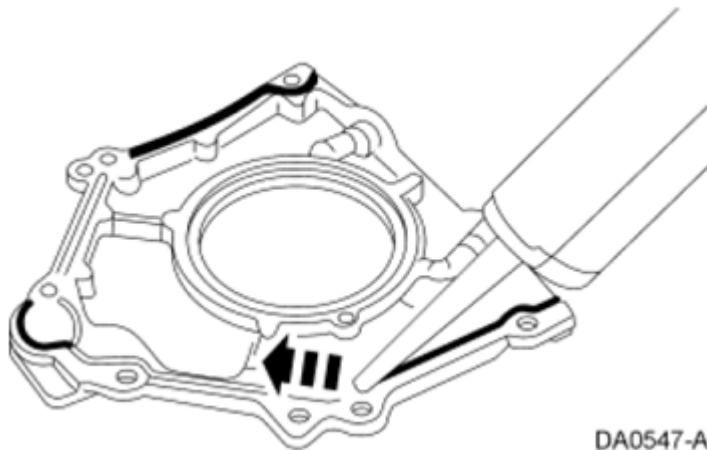


Fig. 517: Applying Sealant Around Crankshaft Rear Seal Retainer Sealing Surface
Courtesy of FORD MOTOR CO.

89. Install the crankshaft rear seal retainer plate and loosely install the 6 bolts.

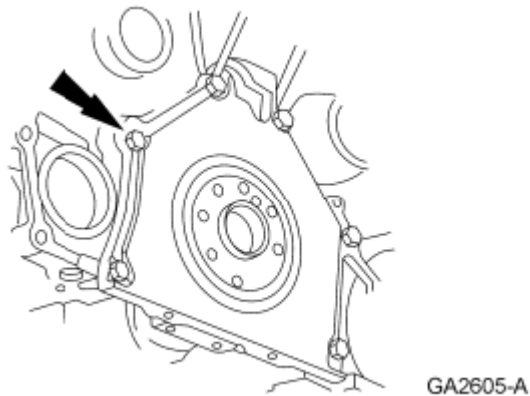


Fig. 518: Locating Crankshaft Rear Seal Retainer Plate Bolts
 Courtesy of FORD MOTOR CO.

90. Tighten the bolts in the sequence shown in illustration.
- Tighten to 10 Nm (89 lb-in).

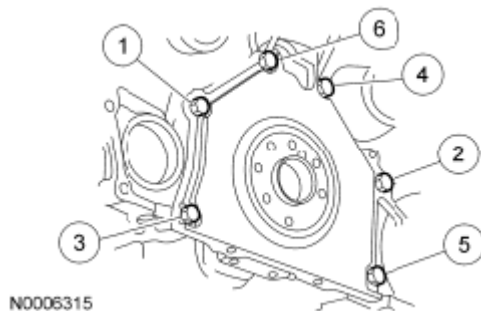


Fig. 519: Identifying Crankshaft Rear Seal Retainer Plate Bolts Tightening Sequence
 Courtesy of FORD MOTOR CO.

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.

91.

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.

92.

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

surface.

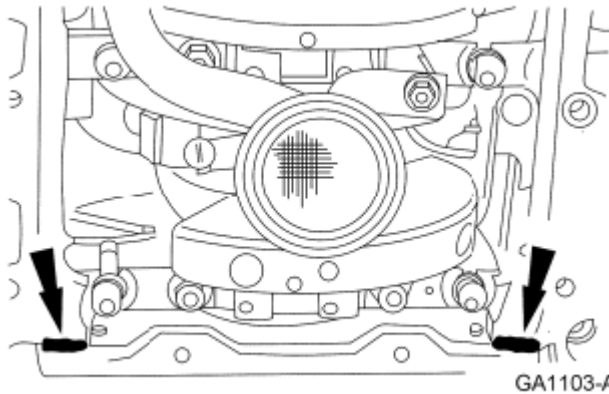


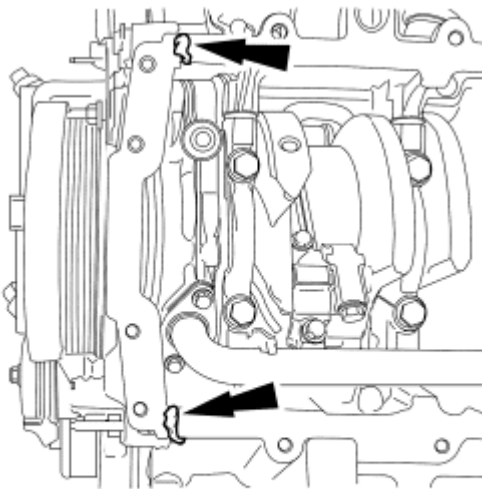
Fig. 520: Locating Crankshaft Rear Seal Retainer Plate-To-Cylinder Block Sealing Surface Sealant Applying Area

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.

93.

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



N0032191

Fig. 521: Locating Engine Front Cover-To-Cylinder Block Sealing Surface Sealant Applying Area

Courtesy of FORD MOTOR CO.

94. Install the oil pan gasket and the oil pan and loosely install the 16 bolts.

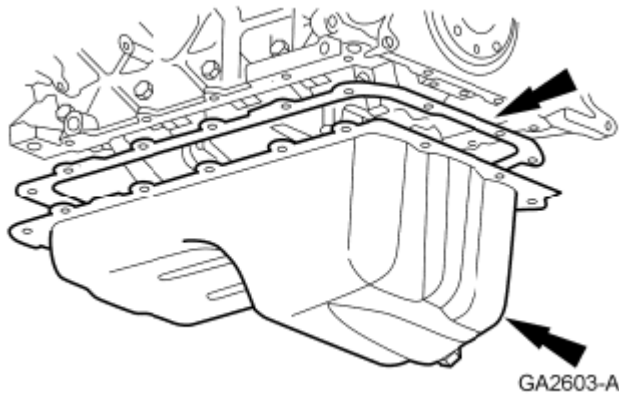


Fig. 522: Locating Oil Pan Gasket And Oil Pan
Courtesy of FORD MOTOR CO.

95. 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.

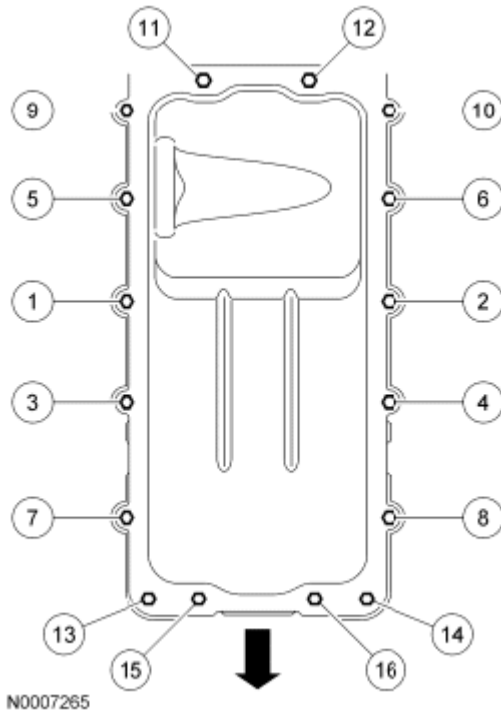


Fig. 523: Identifying Oil Pan Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

96. **NOTE:** Lubricate the inner lip of the crankshaft rear seal with clean engine oil.

Using the 2 Crankshaft Rear Oil Seal Installers, install a new crankshaft rear seal.

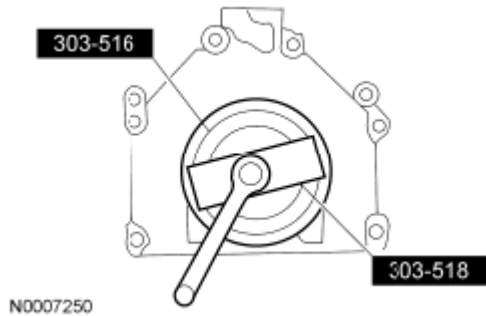


Fig. 524: Installing Crankshaft Rear Seal
Courtesy of FORD MOTOR CO.

97. Using the 2 Crankshaft Rear Oil Seal Installers and the Crankshaft Rear Oil Slinger Installer, install the crankshaft rear oil slinger.

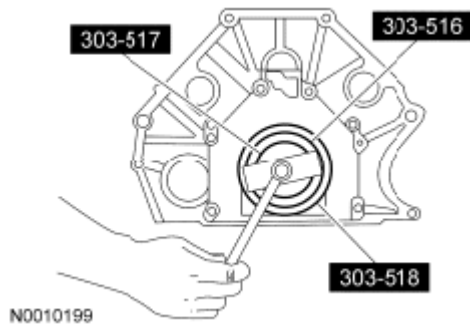


Fig. 525: Installing Crankshaft Rear Oil Slinger
Courtesy of FORD MOTOR CO.

98. Install the spacer plate.

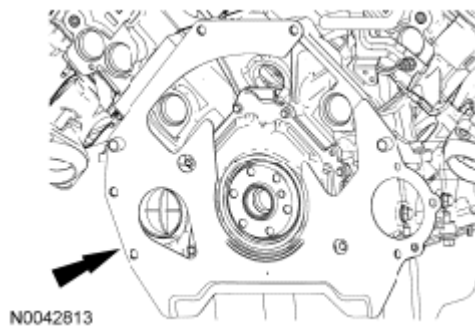
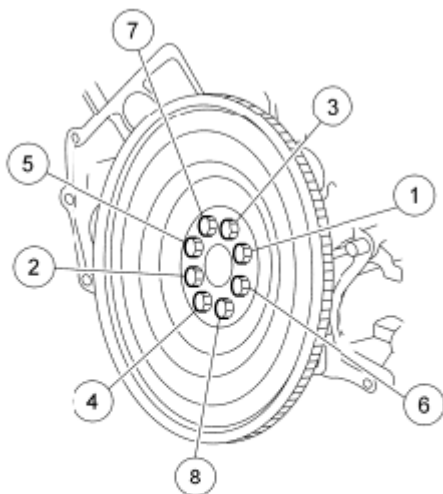


Fig. 526: Locating Spacer Plate
Courtesy of FORD MOTOR CO.

99. Install the flexplate and the 8 bolts in the sequence shown in illustration.

- Tighten to 80 Nm (59 lb-ft).



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Fig. 527: Identifying Flexplate Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

INSTALLATION

ENGINE

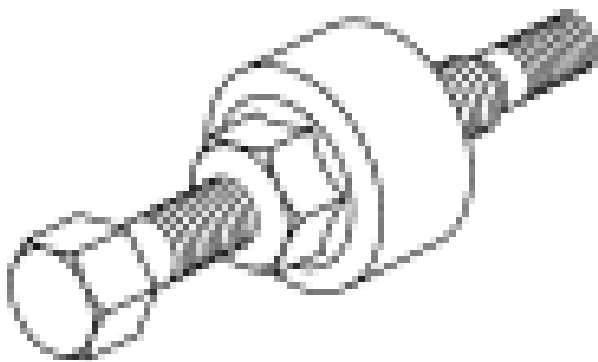
Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION

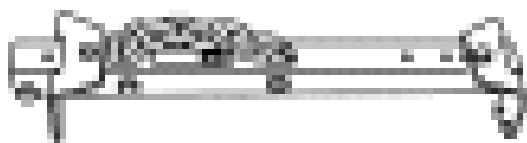
Installer, Power Steering Pump Pulley
211-185 (T91P-3A733-A)

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1586-A



ST1377-A

Lifting Bracket, Engine
303-F047 (014-00073) or equivalent

Vehicle Communication Module (VCM) and
Integrated Diagnostic System (IDS) software
with appropriate hardware, or equivalent scan
tool

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2834-A

Material

MATERIAL 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
Threadlock 262 TA-26	WSK-M2G351-A6

1. Using a suitable floor crane, position the engine assembly into the vehicle.

NOTE: Only use hand tools when tightening the engine support insulator through bolt or the engine support insulator may be damaged.

- 2.

Apply threadlock to the bolt threads and install the LH engine support insulator bolt.

- Tighten to 350 Nm (258 lb-ft).

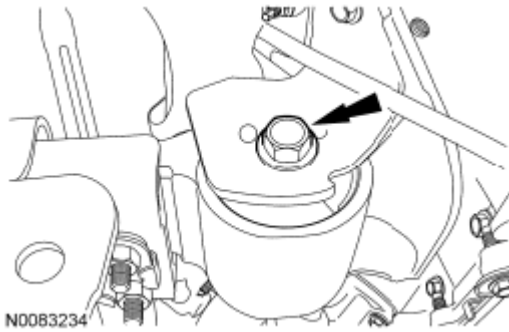


Fig. 528: Locating LH Engine Support Insulator Bolt
Courtesy of FORD MOTOR CO.

3. **NOTE:** Only use hand tools when tightening the engine support insulator nuts or the engine support insulator may be damaged.

NOTE: Make sure the RH engine support insulator mating surfaces and the washer mating surface are free of foreign material and corrosion before installation. Install a new washer.

Apply threadlock to the stud threads and install the RH engine support insulator washer and nuts.

- Tighten to 250 Nm (184 lb-ft).

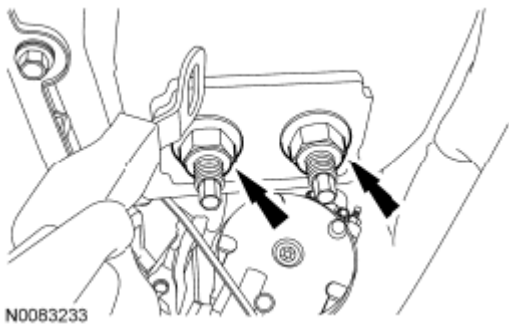


Fig. 529: Locating RH Engine Support Insulator Nuts
Courtesy of FORD MOTOR CO.

4. Remove the Engine Lifting Bracket.

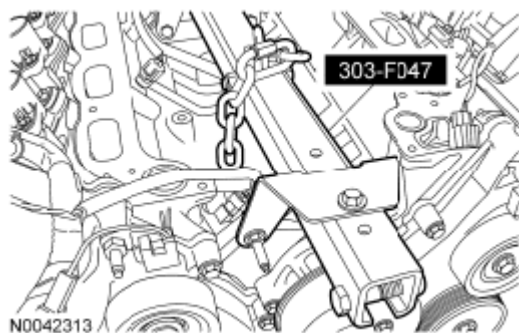


Fig. 530: Identifying Engine Lift Bracket (303-F047)

Courtesy of FORD MOTOR CO.

5. **NOTE:** The upper 2 transmission-to-engine bolts will be installed later.

Install the lower 5 transmission-to-engine bolts.

- Tighten to 48 Nm (35 lb-ft).

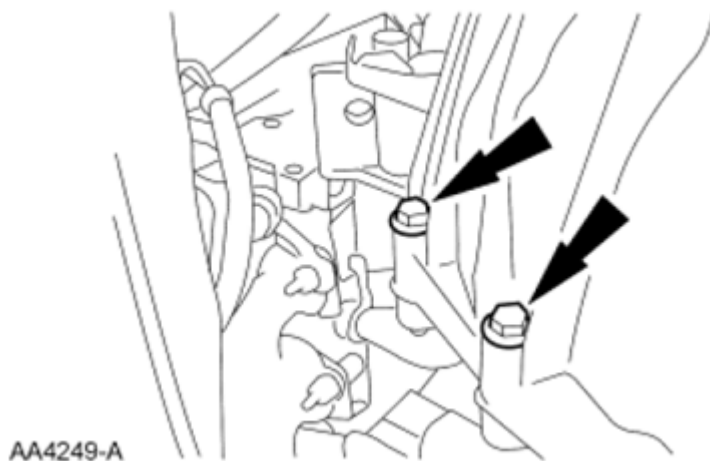


Fig. 531: Locating Lower Transmission-To-Engine Bolts

Courtesy of FORD MOTOR CO.

6. Tighten the 2 transmission mount nuts.
 - Tighten to 103 Nm (76 lb-ft).

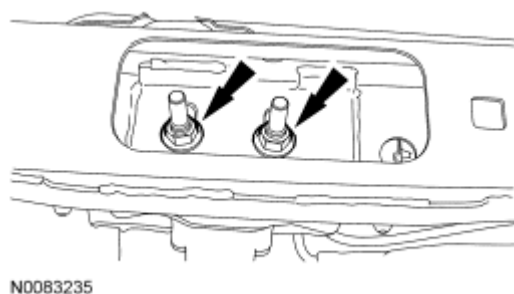


Fig. 532: Locating Transmission Mount Nuts
Courtesy of FORD MOTOR CO.

7. Install 4 new torque converter-to-flexplate nuts.
 - Tighten to 36 Nm (27 lb-ft).

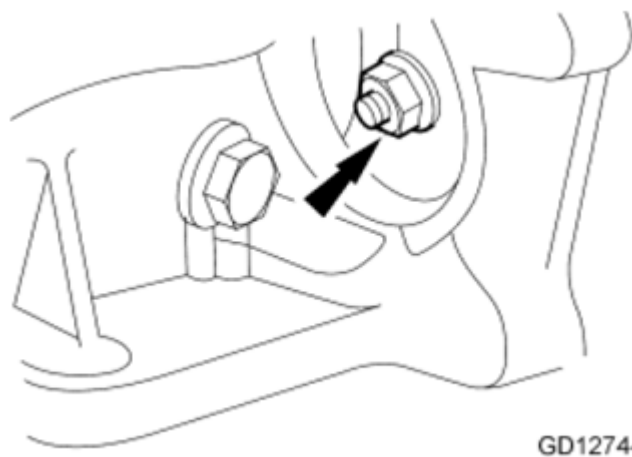


Fig. 533: Locating Torque Converter-To-Flexplate Nut
Courtesy of FORD MOTOR CO.

8. Install the cylinder block opening cover.

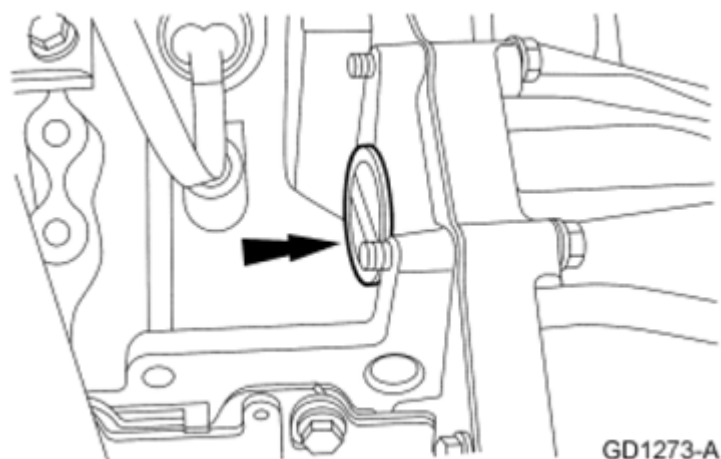


Fig. 534: Locating Cylinder Block Opening Cover
Courtesy of FORD MOTOR CO.

9. Install the flexplate inspection cover and the 2 bolts.
 - Tighten to 34 Nm (25 lb-ft).

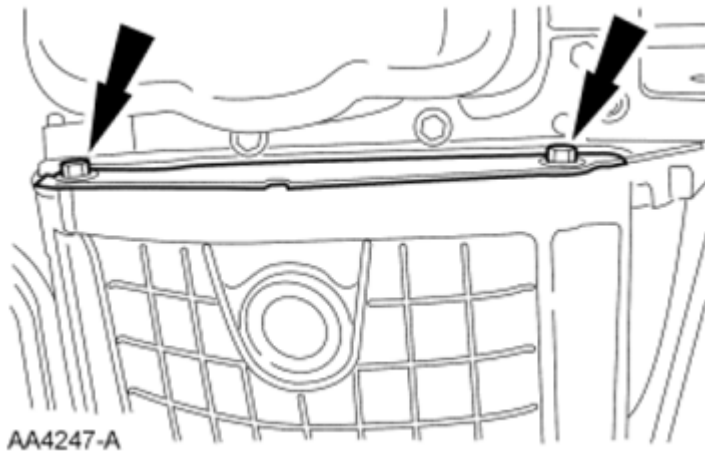


Fig. 535: Locating Flexplate Inspection Cover Bolts
Courtesy of FORD MOTOR CO.

10. Position the A/C compressor and install the 3 bolts.
 - Tighten to 25 Nm (18 lb-ft).

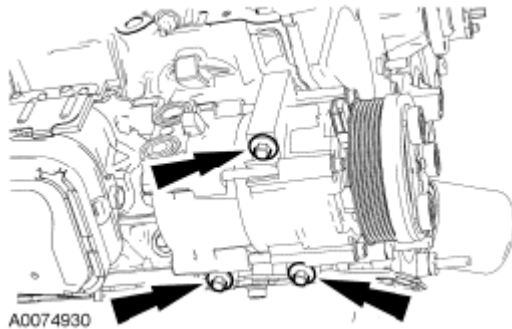


Fig. 536: Locating A/C Compressor Bolts
Courtesy of FORD MOTOR CO.

11. Position the transmission cooler tube support bracket, the starter wiring harness support bracket and install the nut.
 - Tighten to 10 Nm (89 lb-in).

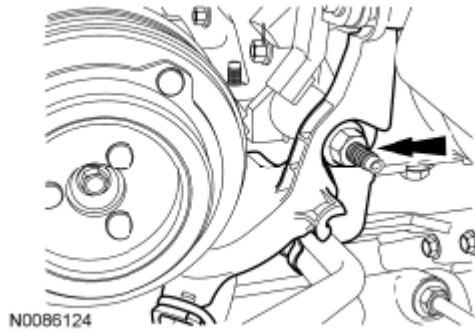


Fig. 537: Locating Support Bracket Nut
Courtesy of FORD MOTOR CO.

12. Position the starter wiring harness and rear support bracket and install the bolt.
 - Tighten to 10 Nm (89 lb-in).

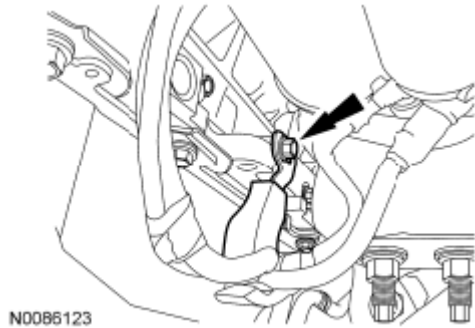


Fig. 538: Locating Starter Wiring Harness Rear Support Bracket Bolt
Courtesy of FORD MOTOR CO.

13. Install the starter. For additional information, refer to **STARTING SYSTEM**.
14. If equipped, connect the block heater electrical connector.

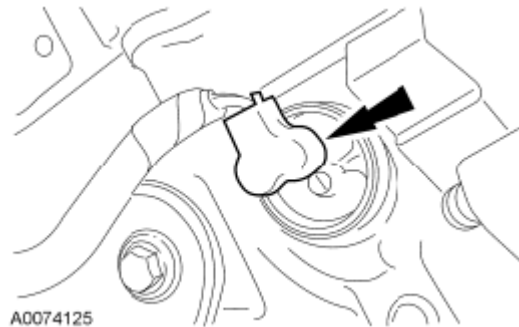


Fig. 539: Locating Block Heater Electrical Connector
Courtesy of FORD MOTOR CO.

15. Install the 4 exhaust Y-pipe flange nuts (2 RH and 2 LH).

- Tighten to 40 Nm (30 lb-ft).

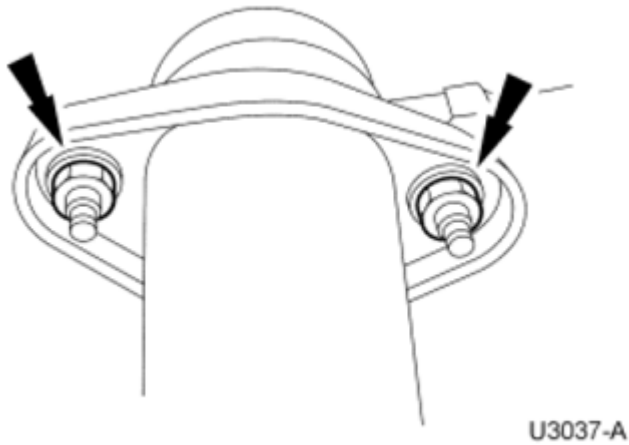


Fig. 540: Locating Exhaust Y-Pipe Flange Nuts
Courtesy of FORD MOTOR CO.

16. **NOTE:** On Four-Wheel Drive (4WD) vehicles, reposition the transfer case vent hose.

Position the fuel and Evaporative Emission (EVAP) tube support bracket and install the upper 2 transmission-to-engine bolts.

- Tighten to 48 Nm (35 lb-ft).

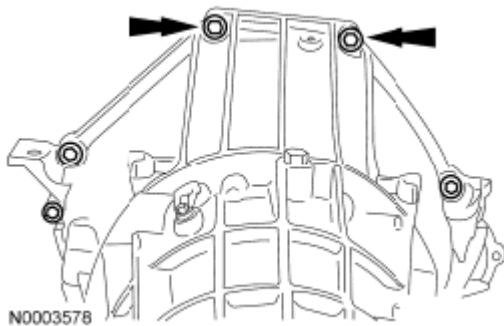


Fig. 541: Locating Upper Transmission-To-Engine Bolts
Courtesy of FORD MOTOR CO.

17. Position the engine wiring harness onto the engine.
18. Connect the transmission wiring harness retainer to the intake manifold vacuum tube support bracket.

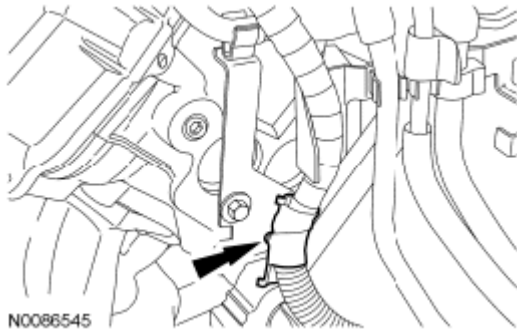


Fig. 542: Locating Transmission Wiring Harness Retainer
Courtesy of FORD MOTOR CO.

19. Connect the LH Camshaft Position (CMP) sensor, radio interference capacitor and Variable Camshaft Timing (VCT) solenoid electrical connectors, the radio interference capacitor electrical connector retainer and the 2 wiring harness retainers.

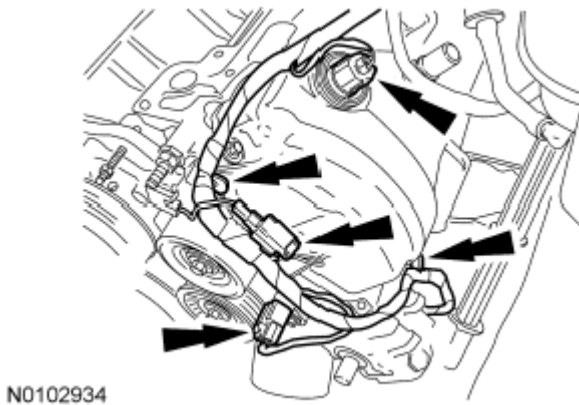


Fig. 543: Locating VCT Solenoid Electrical Connectors
Courtesy of FORD MOTOR CO.

20. Connect the Cylinder Head Temperature (CHT) electrical connector.

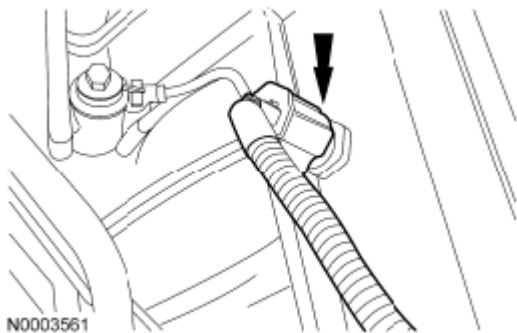


Fig. 544: Locating Cylinder Head Temperature (CHT) Electrical Connector
Courtesy of FORD MOTOR CO.

21. Connect the LH Knock Sensor (KS) electrical connector.

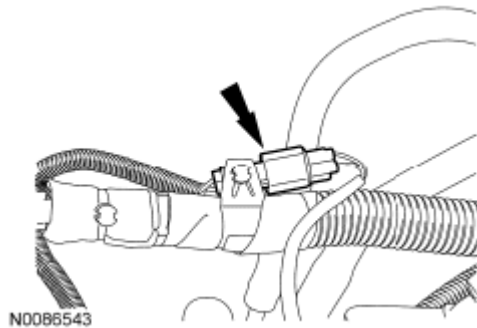


Fig. 545: Locating LH Knock Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

22. Connect the RH KS electrical connector and the heater coolant hose.

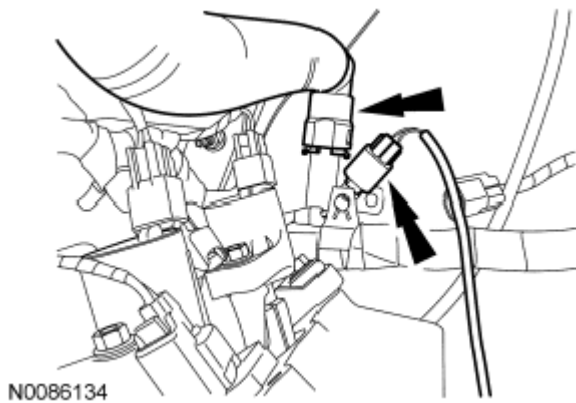


Fig. 546: Locating RH Knock Sensor Electrical Connector And Heater Coolant Hose
Courtesy of FORD MOTOR CO.

23. Connect the 4 RH ignition coil electrical connectors and the 2 engine wiring harness retainers to the RH valve cover studs.



Fig. 547: Locating RH Ignition Coil Electrical Connectors
Courtesy of FORD MOTOR CO.

24. Connect the RH VCT solenoid and the RH radio ignition interference capacitor electrical connectors.

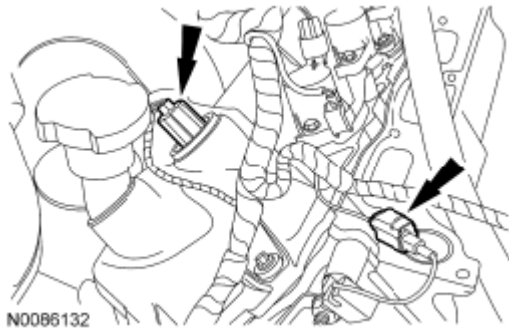


Fig. 548: Locating RH Radio Ignition Interference Capacitor Electrical Connectors
Courtesy of FORD MOTOR CO.

25. Connect the RH CMP sensor electrical connector and the 2 wiring harness retainers.

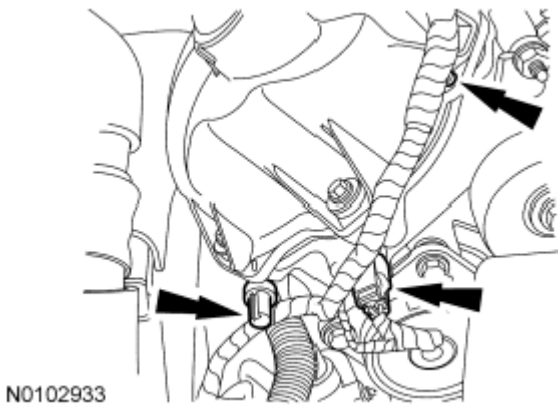


Fig. 549: Locating RH CMP Sensor Electrical Connector And Wiring Harness Retainers
Courtesy of FORD MOTOR CO.

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

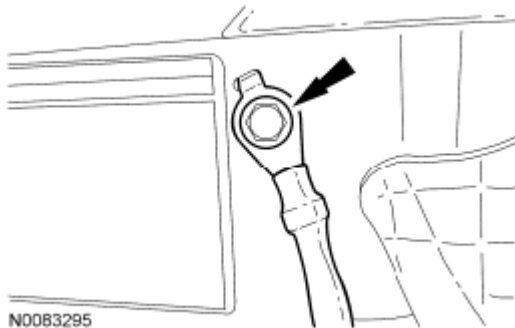


Fig. 550: Locating Ground Strap Bolt

Courtesy of FORD MOTOR CO.

27. Connect the PCM electrical connector and the engine wiring harness retainer.

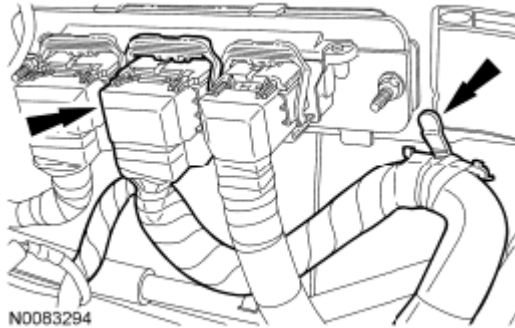


Fig. 551: Locating PCM Electrical Connector
Courtesy of FORD MOTOR CO.

28. Connect the engine harness electrical connector and wiring harness retainer.

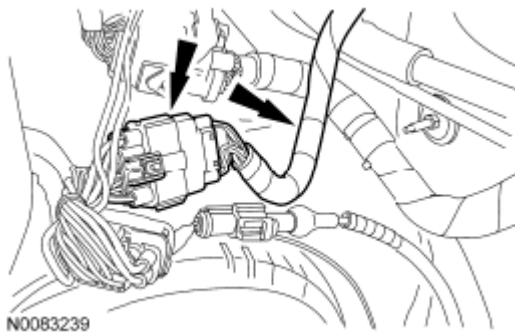


Fig. 552: Locating Engine Harness Electrical Connector
Courtesy of FORD MOTOR CO.

29. Position the power steering pump and reservoir assembly and install the 2 bolts and the stud bolt.
- Tighten to 25 Nm (18 lb-ft).



Fig. 553: Locating Power Steering Pump Stud Bolts
Courtesy of FORD MOTOR CO.

30. Using the Power Steering Pump Pulley Installer, install the power steering pump pulley.

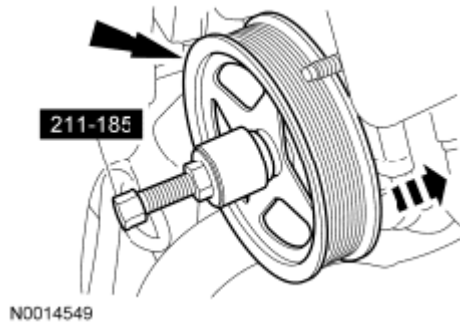


Fig. 554: Installing Power Steering Pump Pulley
Courtesy of FORD MOTOR CO.

31. Position the Power Steering Pressure (PSP) hose support bracket and install the nut.
- Tighten to 10 Nm (89 lb-in).

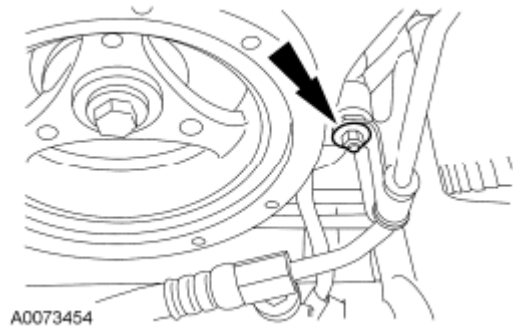


Fig. 555: Locating PSP Hose Support Bracket Nut
Courtesy of FORD MOTOR CO.

NOTE: While servicing the power steering system, care should be taken to prevent the entry of foreign material or failure of the power steering components may result.

- 32.

Position the power steering fluid tubes and install the bolt.

- Tighten to 23 Nm (17 lb-ft).

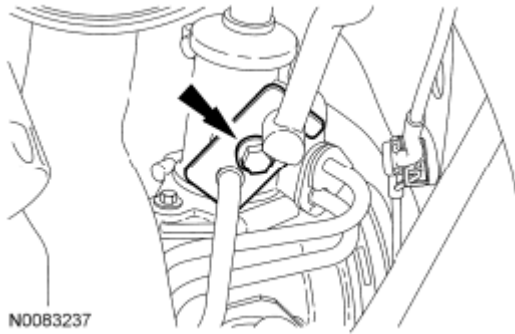


Fig. 556: Locating Power Steering Fluid Tube Bolt
Courtesy of FORD MOTOR CO.

33. Connect the A/C compressor electrical connector and the wiring harness retainer.

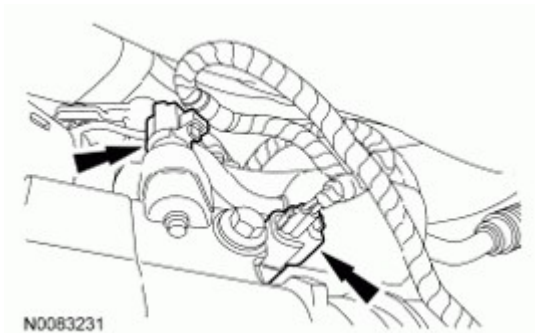


Fig. 557: Locating A/C Compressor Electrical Connector
Courtesy of FORD MOTOR CO.

34. Connect the Engine Oil Pressure (EOP) switch electrical connector and the wiring harness retainers to the oil pan bolt, the power steering pump stud bolt and the engine block.

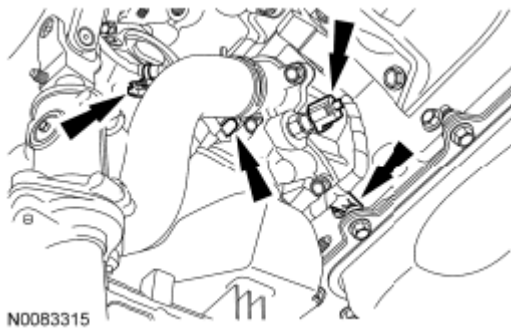


Fig. 558: Locating Engine Oil Pressure (EOP) Switch Electrical Connector
Courtesy of FORD MOTOR CO.

35. Connect the Crankshaft Position (CKP) sensor electrical connector.

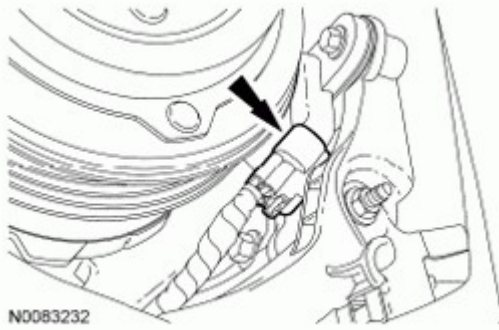


Fig. 559: Locating Crankshaft Position (CKP) Sensor Electrical Connector
Courtesy of FORD MOTOR CO.

36. Position the accessory drive belt onto the accessory drive pulleys.
37. Position the Power Distribution Box (PDB) and wiring harness onto the engine.
38. Install the 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.

39.

Install the intake manifold. For additional information, refer to **INTAKE MANIFOLD**.

40. **NOTE:** Align the index marks made during hood removal.

Position the hood and install the 4 bolts.

- Tighten to 12 Nm (106 lb-in).

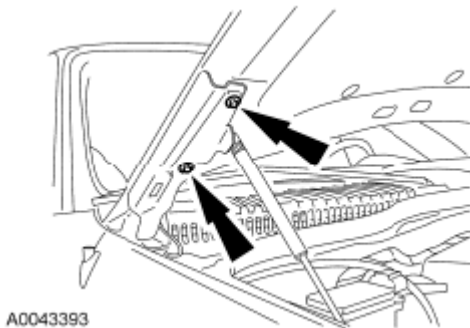


Fig. 560: Identifying Hood Bolts
Courtesy of FORD MOTOR CO.

41. Fill the crankcase with clean engine oil.
42. Evacuate and charge the A/C system. For additional information, refer to **CLIMATE CONTROL SYSTEM - GENERAL INFORMATION AND DIAGNOSTICS**.

2010 Ford Expedition

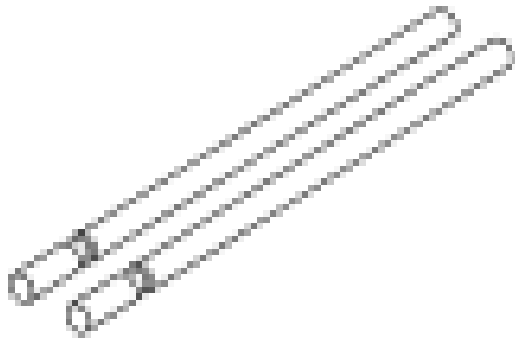
2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

43. Fill and bleed the power steering system. For additional information, refer to **STEERING SYSTEM** .
44. If the engine was disassembled, use the scan tool to perform the Misfire Monitor Neutral Profile Correction procedure following the on-screen instructions.

CYLINDER HEAD

Special Tool(s)

SPECIAL TOOL(S) SPECIFICATION



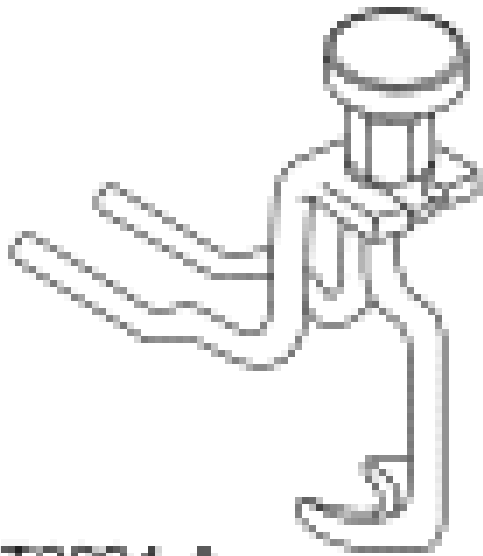
ST2B06-A

Alignment Pins, Cylinder Head
303-1040 (SR-015486)

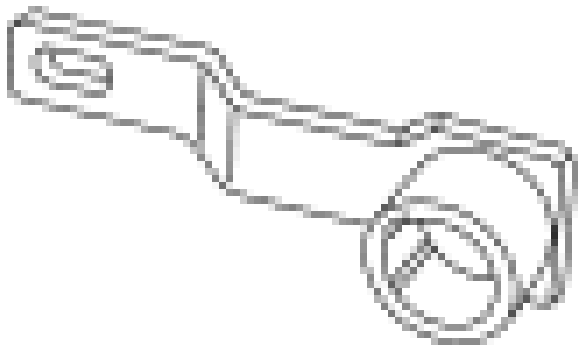
Compressor, Valve Spring
303-1039

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2804-A

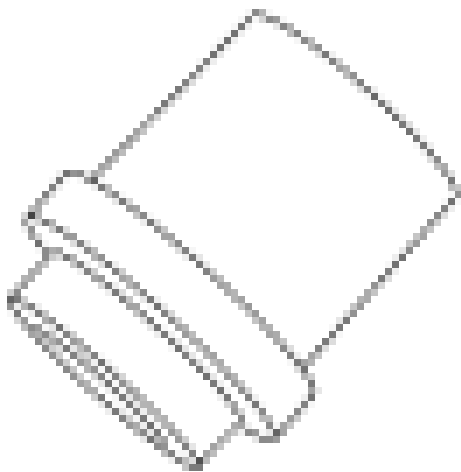


ST1335-A

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

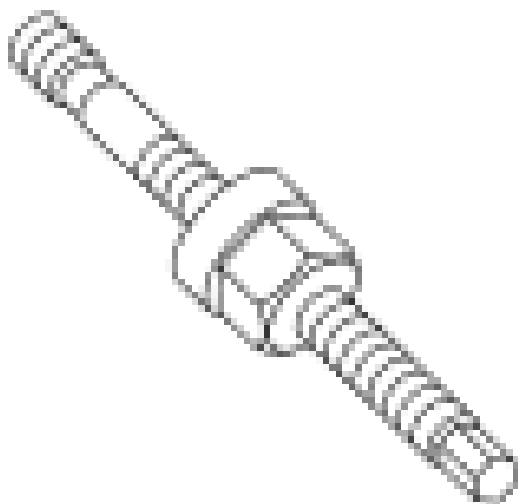
2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2197-A

Installer, Crankshaft Front Oil Seal
303-635

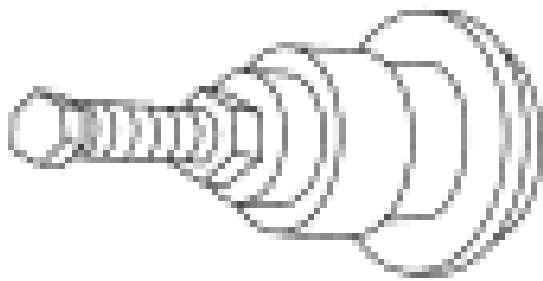


ST2428-A

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

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST1328-A

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



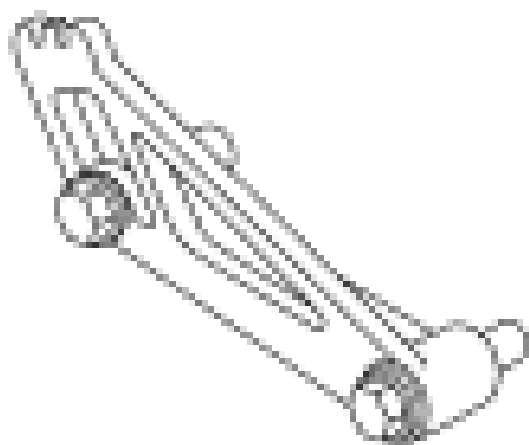
ST1377-A

Lifting Bracket, Engine
303-F047 (014-00073) or equivalent

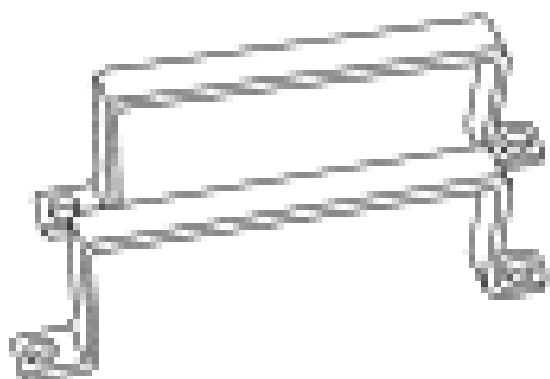
Locking Tool, Cam Phaser Sprocket
303-1046

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator



ST2B07-A



ST1668-A

Remover/Installer, Cylinder Head
303-572 (T97T-6000-A)

General Equipment

GENERAL EQUIPMENT

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

Material

MATERIAL SPECIFICATION

2010 Ford Expedition

2010 ENGINE Engine - 5.4L (3V) - Expedition & Navigator

Item	Specification
Motorcraft® Metal Surface Prep ZC-31-A	-
Motorcraft® Premium Gold Engine Coolant with Bittering Agent (US); Motorcraft® Premium Gold Engine Coolant (Canada) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1
Motorcraft® SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft® SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Silicone Gasket Remover ZC-30	-
Threadlock 262 TA-26	WSK-M2G351-A6

All cylinder heads

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

1.

NOTE: The use of sealing aids (aviation cement, copper spray and glue) is not permitted. The gasket must be installed dry.

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.

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.

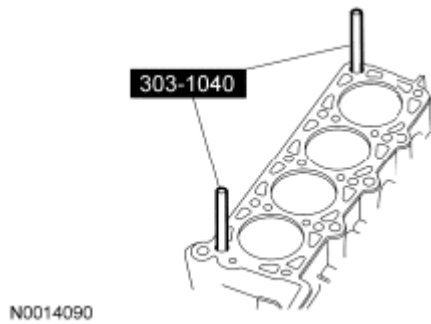


Fig. 561: Identifying Special Tool (303-1040)
Courtesy of FORD MOTOR CO.

2. Tighten the 20 bolts in 3 stages, in the sequence shown in illustration. RH shown, LH similar.
 - Stage 1: Tighten to 40 Nm (30 lb-ft).
 - Stage 2: Tighten an additional 90 degrees.
 - Stage 3: Tighten an additional 90 degrees.

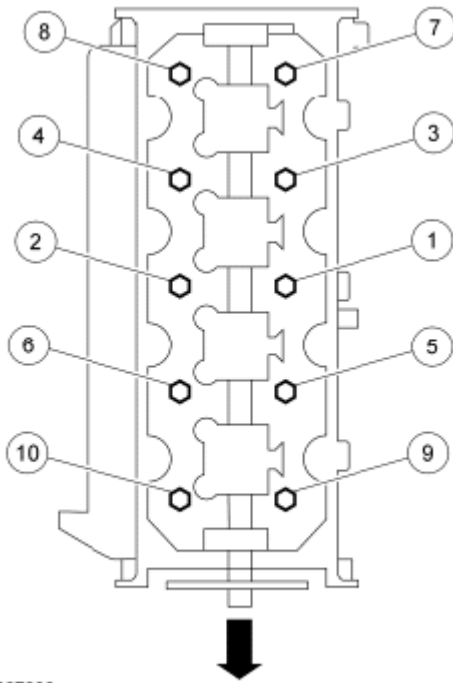


Fig. 562: Identifying Cylinder Head Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

LH cylinder head

3. Remove the Cylinder Head Remover/Installer from the LH cylinder head.

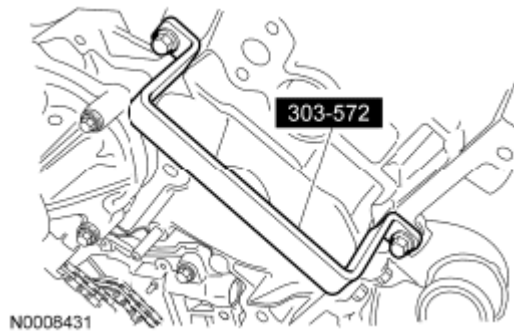


Fig. 563: Identifying Cylinder Head Remover/Installer (303-572)
Courtesy of FORD MOTOR CO.

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

Install the hydraulic lash adjusters into the LH cylinder head.

- Lubricate the hydraulic lash adjusters with clean engine oil prior to installation.

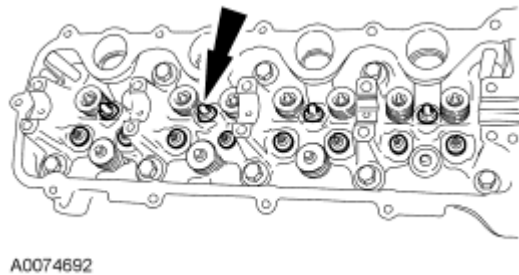


Fig. 564: Locating Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

5. Install 8 new LH exhaust manifold-to-cylinder head studs.
- Tighten to 12 Nm (106 lb-in).

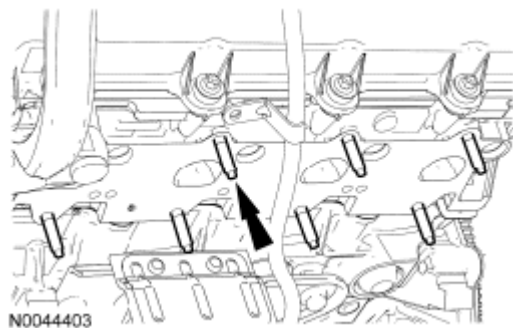


Fig. 565: Locating Exhaust Manifold Studs
Courtesy of FORD MOTOR CO.

6. Position new gaskets, the LH exhaust manifold and tighten 8 new nuts in the sequence shown in illustration.
 - Tighten to 25 Nm (18 lb-ft).

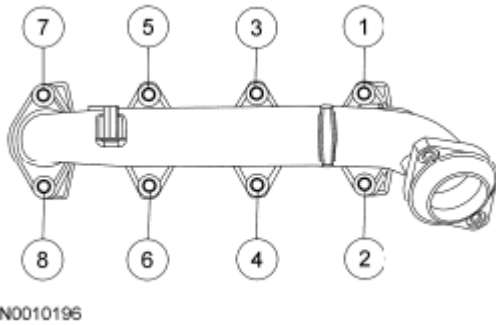


Fig. 566: Identifying LH Exhaust Manifold Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

RH cylinder head

7. Remove the Cylinder Head Remover/Installer from the RH cylinder head.

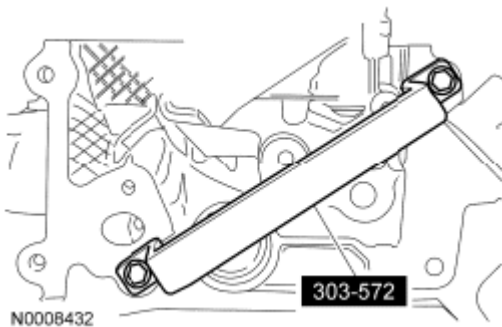
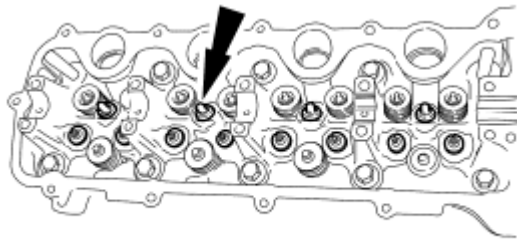


Fig. 567: Identifying Cylinder Head Remover/Installer (303-572)
Courtesy of FORD MOTOR CO.

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

Install the hydraulic lash adjusters into the RH cylinder head.

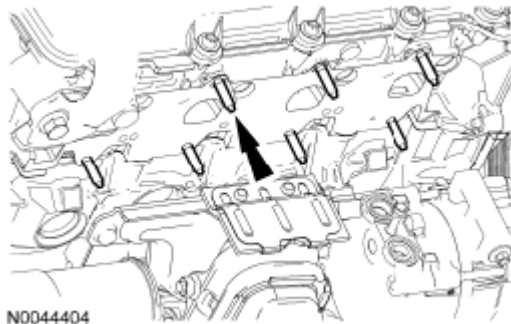
- Lubricate the hydraulic lash adjusters with clean engine oil prior to installation.



A0074692

Fig. 568: Locating Hydraulic Lash Adjusters
Courtesy of FORD MOTOR CO.

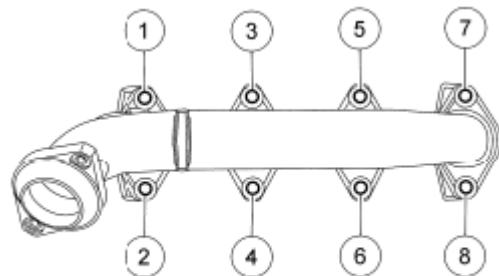
9. Install 8 new RH exhaust manifold-to-cylinder head studs.
 - Tighten to 12 Nm (106 lb-in).



N0044404

Fig. 569: Locating RH Exhaust Manifold-To-Cylinder Head Stud
Courtesy of FORD MOTOR CO.

10. Position 2 new gaskets, 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. 570: Identifying RH Exhaust Manifold Nuts Tightening Sequence
Courtesy of FORD MOTOR CO.

NOTE: Install 2 new O-ring seals and lubricate the O-ring seals with clean engine coolant.

11.

Install the coolant tube and the stud bolt.

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

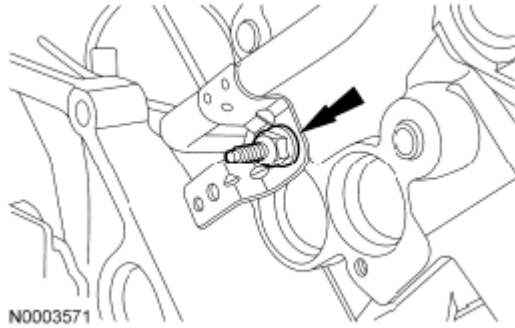


Fig. 571: Locating Coolant Tube Stud Bolt
Courtesy of FORD MOTOR CO.

12. Position the ground strap and install the nut.

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

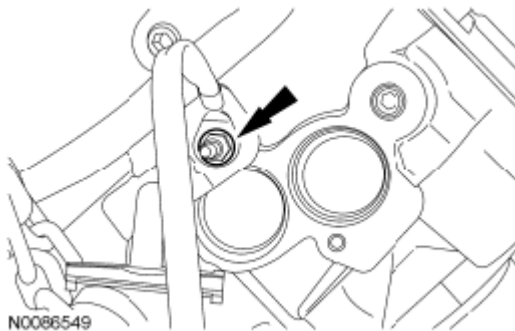


Fig. 572: Locating Ground Strap Nut
Courtesy of FORD MOTOR CO.

All cylinder heads

13. Install the LH and RH camshafts.

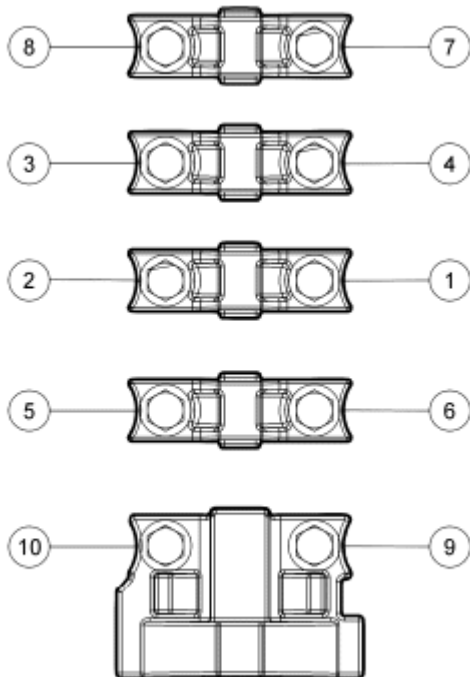
- Lubricate the camshaft and camshaft journals with clean engine oil prior to installation.

14. **NOTE: LH shown in illustration, RH similar.**

Install the LH and RH camshaft bearing caps in their original locations.

- Lubricate the camshaft bearing caps with clean engine oil.
- Position the 2 front camshaft bearing caps.
- Position the remaining 8 camshaft bearing caps.
- Install the 20 bolts loosely.

- Tighten to 10 Nm (89 lb-in) in the sequence shown in illustration.

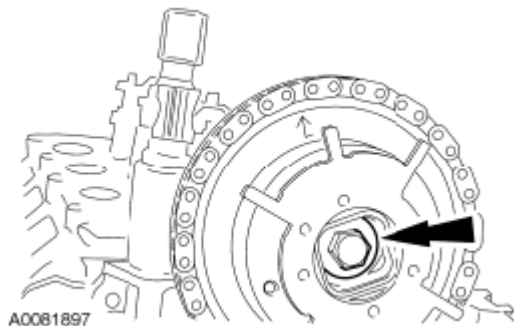


N0011337

Fig. 573: Identifying Camshaft Bearing Cap Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

15. **NOTE:** Damage to the camshaft phaser and sprocket assembly will occur if mishandled or used as a lifting or leveraging device.
- NOTE:** The RH and LH camshaft phaser and sprockets are similar. Refer to the single timing mark to identify the RH camshaft phaser and sprocket and the L timing mark to identify the LH camshaft phaser and sprocket.
- NOTE:** LH shown in illustration, RH similar.

Install the camshaft phaser and sprockets and new camshaft phaser and sprocket bolts finger-tight.



A0081897

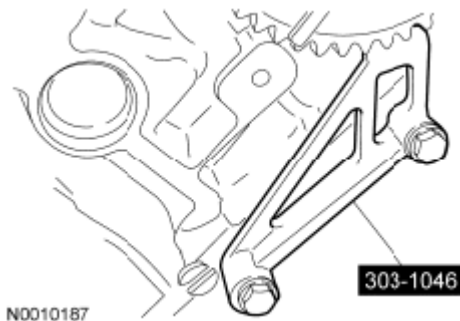
Fig. 574: Locating Camshaft Phaser And Sprocket Assembly Bolt

Courtesy of FORD MOTOR CO.

16. **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 unit.
- NOTE:** LH shown in illustration, RH similar.

Using the Cam Phaser Sprocket 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. 575: Identifying Cam Phaser Locking Tool (303-1046)**

Courtesy of FORD MOTOR CO.

17. **NOTE:** If one or both tensioner mounting bolts are loosened or removed, the tensioner-sealing bead must be inspected for seal integrity. Any cracks, tears, cuts or separation from the tensioner body, or permanent compression of the seal bead, will require replacement of the tensioner or engine damage may occur.

Inspect the RH and LH timing chain tensioners.

- Install new tensioners, as necessary.

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

Compress the tensioner plunger, using a vise.

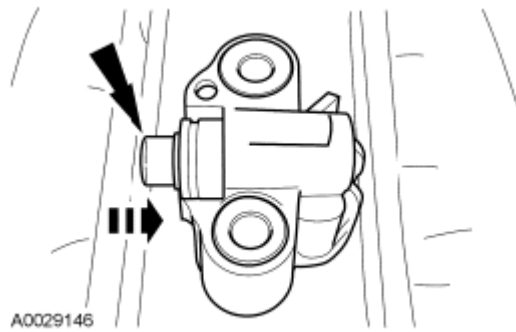


Fig. 576: Compressing Tensioner Plunger
Courtesy of FORD MOTOR CO.

19. Install a Hydraulic Chain Tensioner Retaining Clip on the tensioner to hold the plunger in during installation.

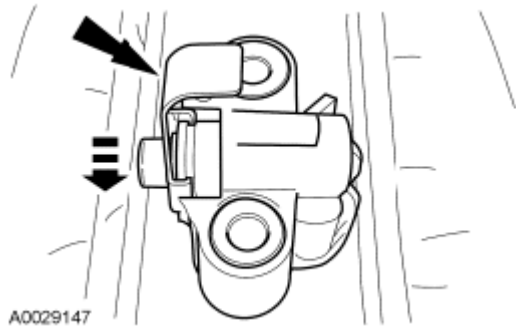


Fig. 577: Installing Retaining Clip On Tensioner
Courtesy of FORD MOTOR CO.

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.

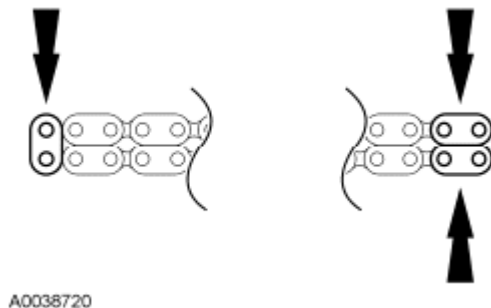


Fig. 578: Identifying Copper Link Timing Marks
Courtesy of FORD MOTOR CO.

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

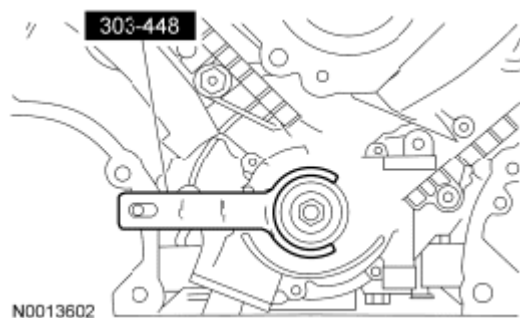


Fig. 579: Identifying Crankshaft With Crankshaft Holding Tool
Courtesy of FORD MOTOR CO.

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

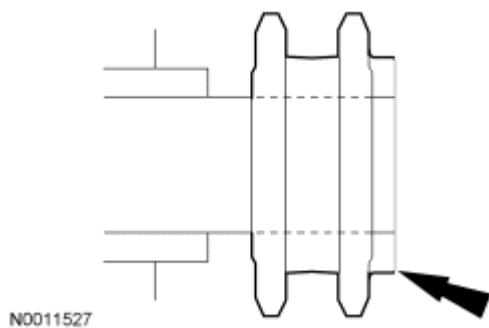
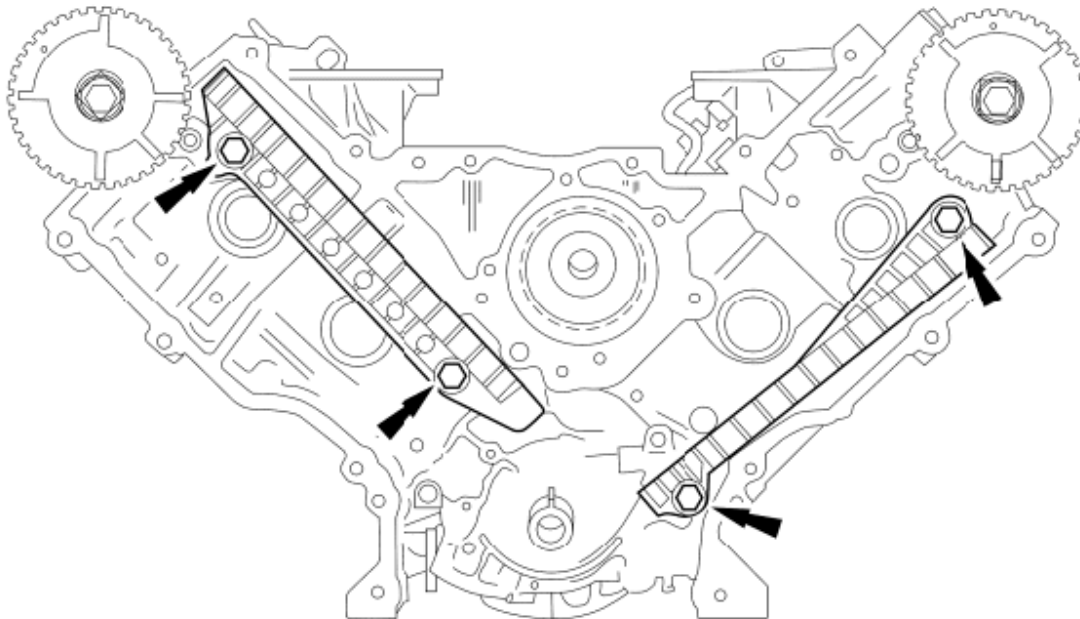


Fig. 580: Locating Crankshaft Sprocket Position
Courtesy of FORD MOTOR CO.

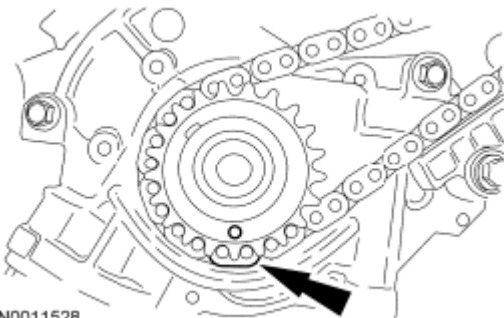
24. Position the LH and RH timing chain guides and install the 4 bolts.
- Tighten to 10 Nm (89 lb-in).



N0006303

Fig. 581: Locating Timing Chain Guides Bolts
Courtesy of FORD MOTOR CO.

25. 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. 582: 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.

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

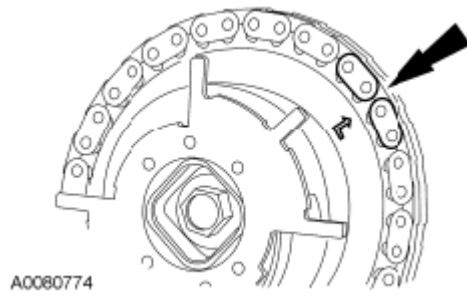


Fig. 583: Identifying Timing Mark On Timing Chain
Courtesy of FORD MOTOR CO.

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

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).

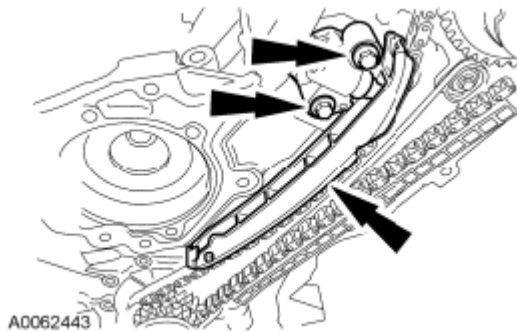


Fig. 584: Locating LH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

28. Remove the Hydraulic Chain Tensioner Retaining Clip from the LH timing chain tensioner.

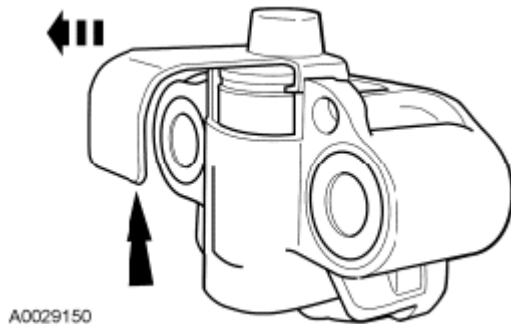


Fig. 585: Removing Retaining Clip From LH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

29. 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.

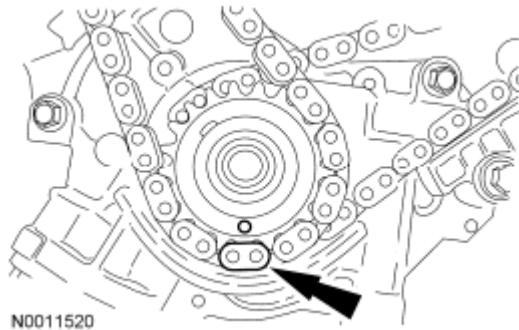


Fig. 586: Aligning Sprocket Timing Mark And Chain Link
Courtesy of FORD MOTOR CO.

30. **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.

Position the RH timing chain on the camshaft sprocket. Make sure the camshaft sprocket timing mark is positioned between the 2 copper (marked) chain links.

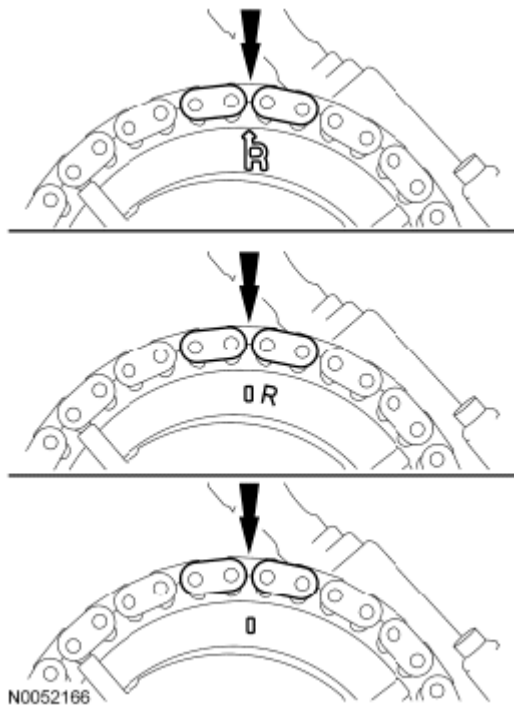


Fig. 587: Identifying Timing Chain Timing Marks

Courtesy of FORD MOTOR CO.

31. 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).

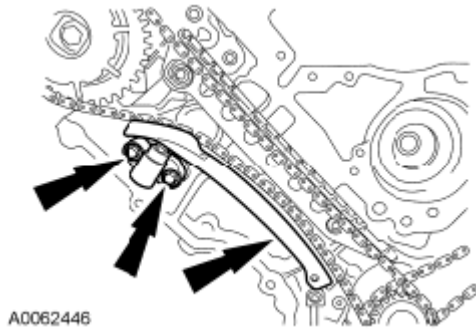


Fig. 588: Locating RH Timing Chain Tensioner And Tensioner Arm Bolts
Courtesy of FORD MOTOR CO.

32. Remove the Hydraulic Chain Tensioner Retaining Clip from the RH timing chain tensioner.

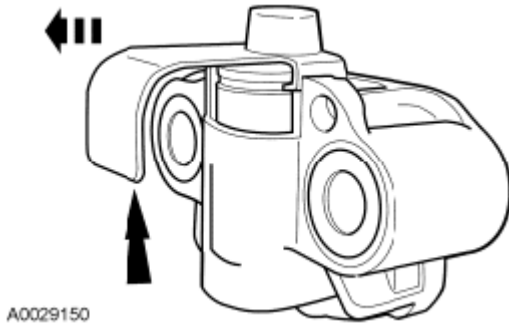
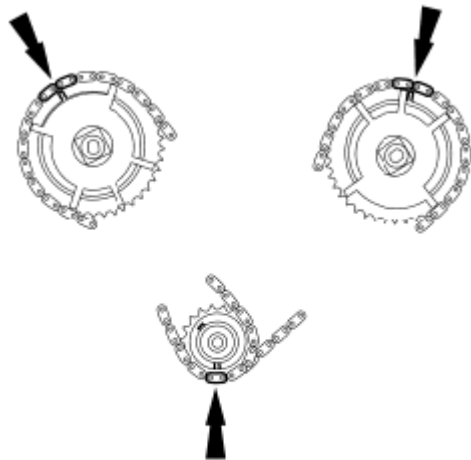


Fig. 589: Removing Retaining Clip From RH Timing Chain Tensioner
Courtesy of FORD MOTOR CO.

NOTE: The RH and LH camshaft phaser sprockets are similar. Refer to the single timing mark to identify the RH camshaft phaser sprocket and the L timing mark to identify the LH camshaft phaser sprocket.

33.

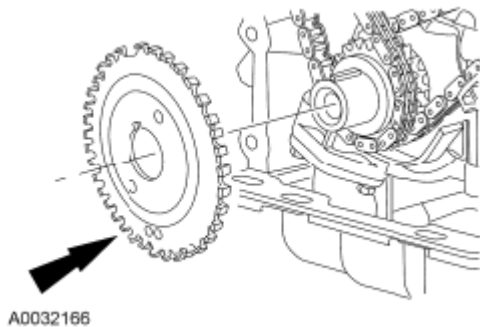
As a post-check, verify correct alignment of all timing marks.



N0092582

Fig. 590: Locating Timing Chain Marks
Courtesy of FORD MOTOR CO.

34. Install the crankshaft sensor ring on the crankshaft.



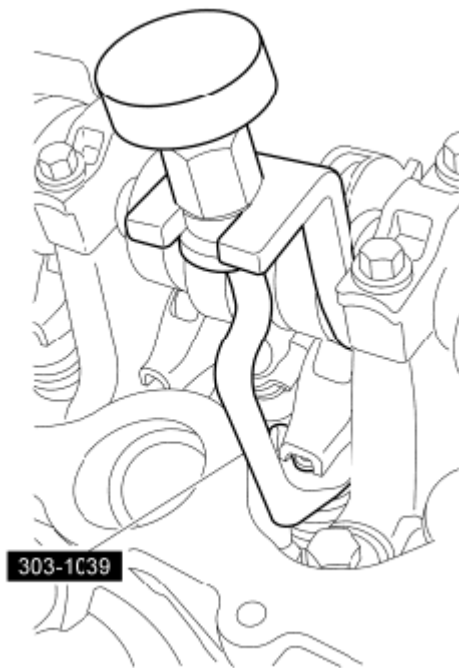
A0032166

Fig. 591: Locating Crankshaft Sensor Ring
Courtesy of FORD MOTOR CO.

35. **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: Lubricate the roller followers with clean engine oil prior to installation.

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



N0010191

Fig. 592: Identifying Valve Spring Compressor
Courtesy of FORD MOTOR CO.

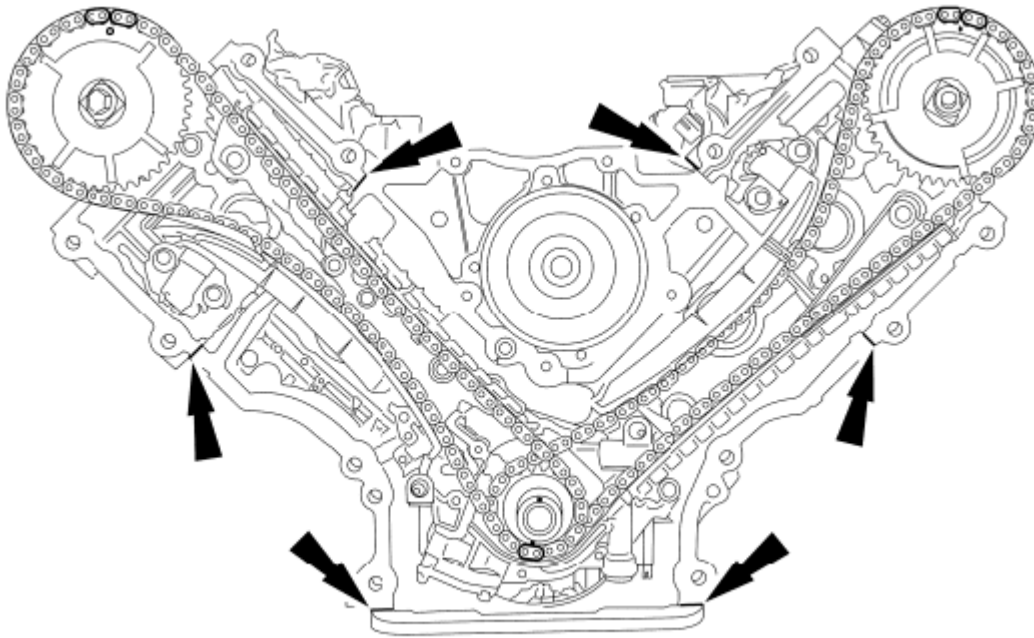
36.

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. Failure to follow this procedure can cause future oil leakage.

NOTE: Make sure that the engine front cover gasket is in place on the engine front cover before installation.

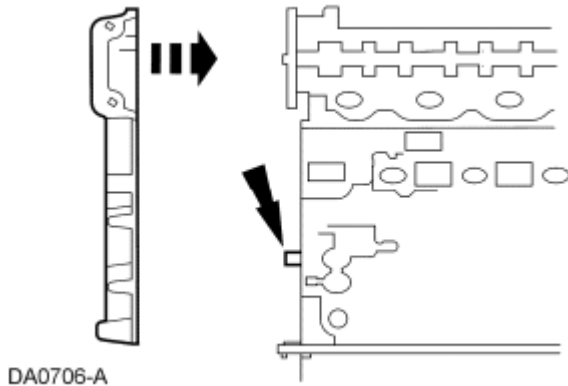
Apply a bead of silicone gasket and sealant along the cylinder head-to-cylinder block surface at the locations shown in illustration.



A0080776

Fig. 593: Locating Silicone Sealant Application Areas
 Courtesy of FORD MOTOR CO.

37. Install 3 new engine front cover gaskets on the engine front cover. Position the engine front cover onto the dowels. Install the 15 fasteners finger-tight.



DA0706-A

Fig. 594: Installing Engine Front Cover
 Courtesy of FORD MOTOR CO.

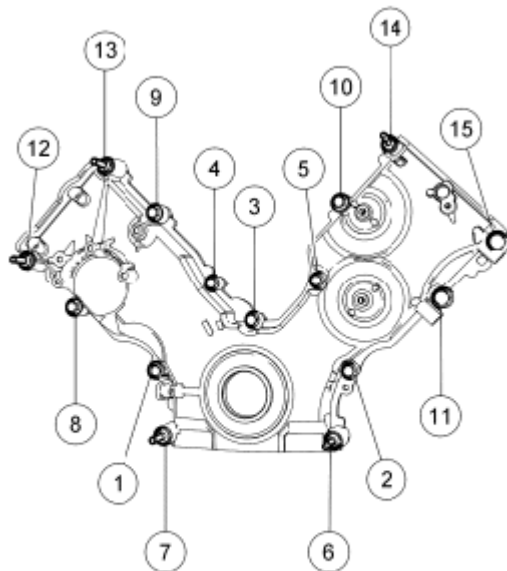
38. Tighten the 15 engine front cover fasteners in the sequence shown in illustration in 2 stages.

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).

PART DESCRIPTION CHART

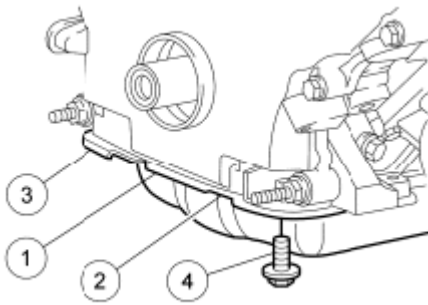
Item	Part Number	Description
1	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
2	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
3	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
4	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
5	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
6	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	N806177	Bolt, Hex Flange Head Pilot, M8 x 1.25 x 50
12	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
13	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
14	W709573	Stud and Washer, Hex Head Pilot, M8 x 1.25 x 1.25 x 94
15	W706605	Bolt, Hex Head Pilot, M8 x 1.25 x 56



N0010206

Fig. 595: Identifying Engine Front Cover Bolt Tightening Sequence
 Courtesy of FORD MOTOR CO.

39. Loosely install the 4 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.



N0008507

Fig. 596: Identifying Oil Pan Bolts Tightening 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.

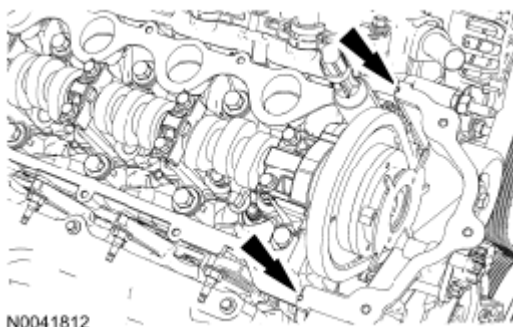
40.

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. Failure to follow this procedure can cause future oil leakage.

41.

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



N0041812

Fig. 597: Locating Sealant Applying Area
Courtesy of FORD MOTOR CO.

NOTE: Install the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

42.

Position the RH valve cover and new gasket on the cylinder head and tighten the 9 fasteners in the sequence shown in illustration.

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

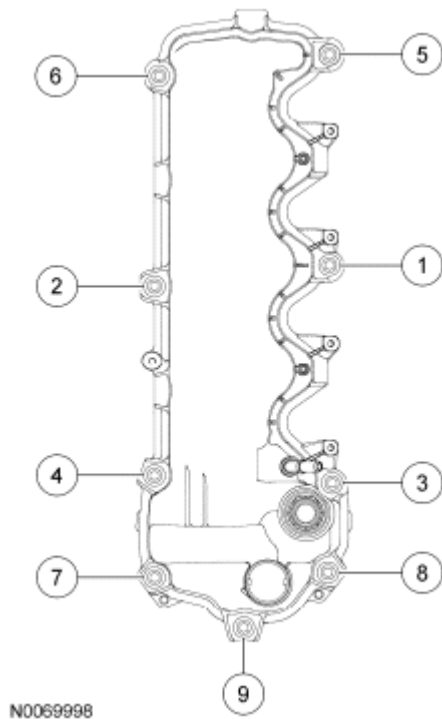


Fig. 598: Identifying RH Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

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.

43.

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. Failure to follow this procedure can cause future oil leakage.

44.

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

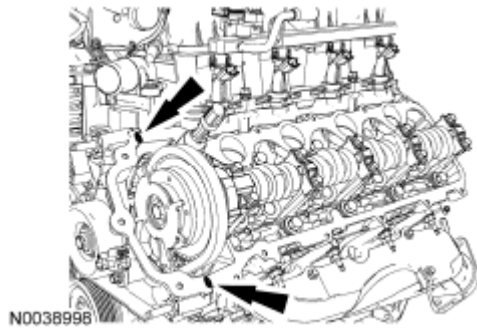


Fig. 599: Locating Sealant Applying Area
Courtesy of FORD MOTOR CO.

NOTE: Install the valve cover carefully, or the Variable Camshaft Timing (VCT) solenoid may be damaged.

45.

Position the LH valve cover and new gasket on the cylinder head and tighten the 10 fasteners in the sequence shown in illustration.

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

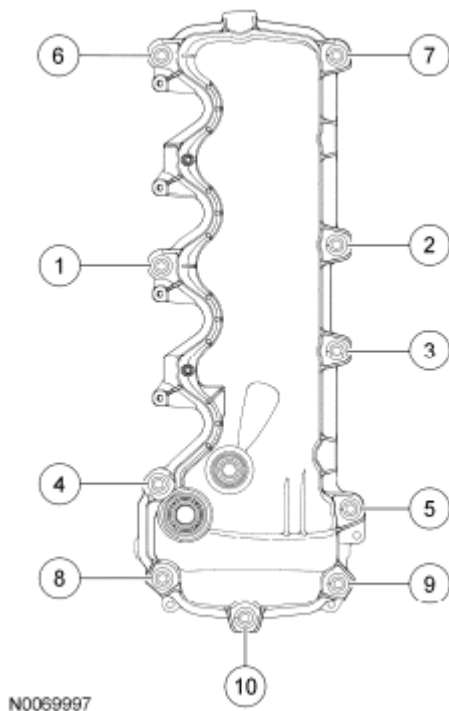


Fig. 600: Identifying LH Valve Cover Bolts Tightening Sequence
Courtesy of FORD MOTOR CO.

46. Position the oil level indicator tube and install the bolt.

- Install a new O-ring seal and lubricate the O-ring seal with clean engine oil prior to installation.

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

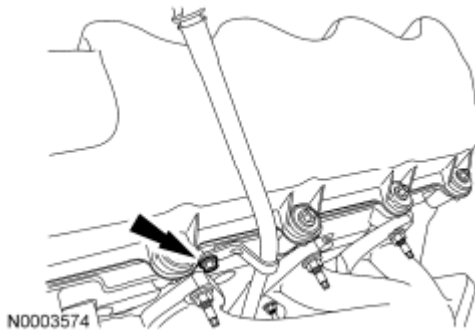


Fig. 601: Locating Oil Level Indicator Tube Bolt
Courtesy of FORD MOTOR CO.

47. **NOTE:** Clean the engine support insulator-to-cylinder block mating surfaces of any dirt or foreign material prior to installation.

If equipped with cylinder block drain plugs, position the RH engine support insulator and install the 3 bolts.

- Apply threadlock 262 to the bolt threads prior to installation.
- Tighten to 63 Nm (46 lb-ft).

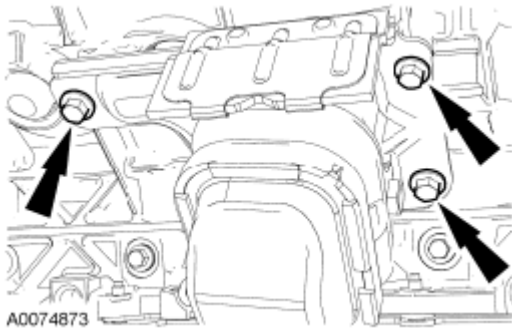
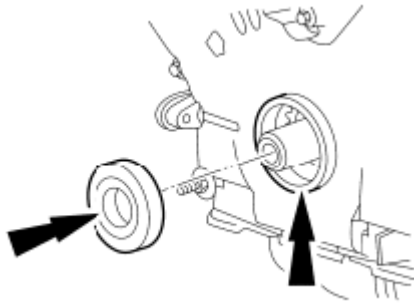


Fig. 602: Locating RH Engine Support Insulator Bolts
Courtesy of FORD MOTOR CO.

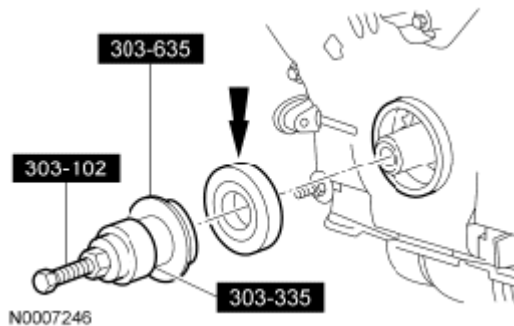
48. Lubricate the engine front cover and the new crankshaft seal inner lip with clean engine oil.



A0029187

Fig. 603: Locating Engine Front Cover And Crankshaft Seal Inner Lip
Courtesy of FORD MOTOR CO.

49. 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.

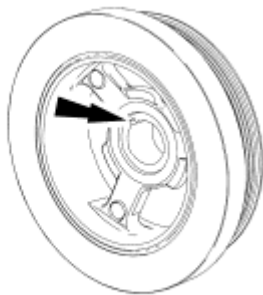


N0007246

Fig. 604: Installing Crankshaft Front Seal Into Engine Front Cover
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.
- 50.

Apply silicone gasket and sealant to the Woodruff key slot in the crankshaft pulley.



N0010530

Fig. 605: Identifying Woodruff Key Slot In Crankshaft Pulley

Courtesy of FORD MOTOR CO.

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

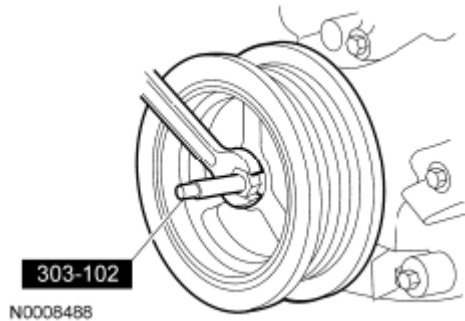


Fig. 606: Installing Crankshaft Pulley
Courtesy of FORD MOTOR CO.

52. 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.

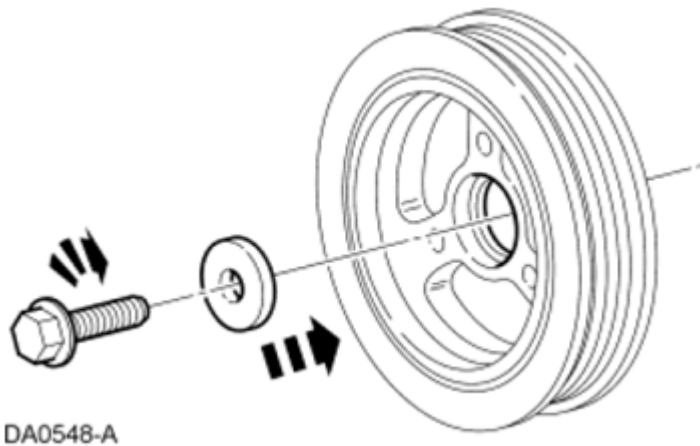


Fig. 607: Tightening Crankshaft Pulley Bolt
Courtesy of FORD MOTOR CO.

53. Position the accessory drive belt tensioner and install the 3 bolts.
- Tighten to 25 Nm (18 lb-ft).

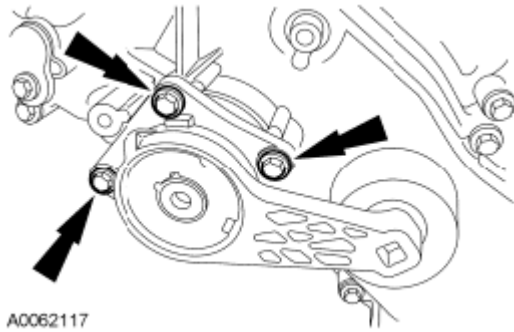


Fig. 608: Locating Accessory Drive Belt Tensioner Bolts
Courtesy of FORD MOTOR CO.

54. Install the 3 accessory drive belt idler pulleys, the coolant pump pulley and the 7 bolts.
- Tighten to 25 Nm (18 lb-ft).

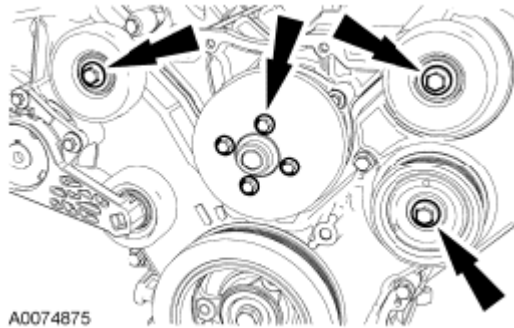


Fig. 609: Locating Pulleys Bolts
Courtesy of FORD MOTOR CO.

55. **NOTE:** LH shown in illustration, RH similar.

Install the 8 ignition coils and the 8 bolts.

- 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.
- 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).

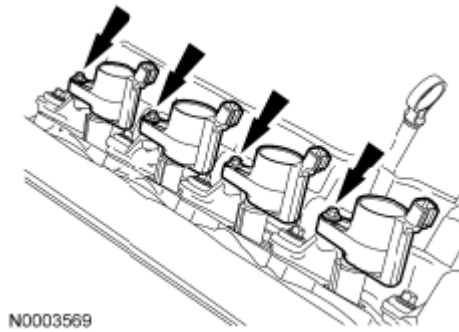


Fig. 610: Locating Ignition Coil Bolts
Courtesy of FORD MOTOR CO.

56. Position the intake manifold vacuum tube support bracket and install the bolt.
- Tighten to 10 Nm (89 lb-in).



Fig. 611: Locating Intake Manifold Vacuum Tube Support Bracket Bolt
Courtesy of FORD MOTOR CO.

57. Install the LH radio ignition interference capacitor and the nut.
- Tighten to 25 Nm (18 lb-ft).

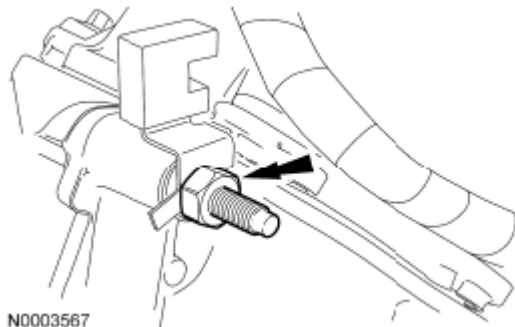


Fig. 612: Locating LH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

58. Install the RH radio ignition interference capacitor and the nut.

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

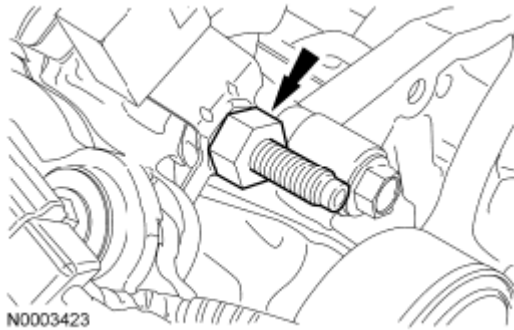


Fig. 613: Locating RH Radio Interference Capacitor Nut
Courtesy of FORD MOTOR CO.

59. Using a floor crane, remove the engine from the engine stand.

NOTE: Do not use the oil pan to support the engine or oil pan and oil pan gasket damage may occur.

- 60.

Lower and support the engine assembly on wood blocks.

61. Install the Engine Lifting Bracket.

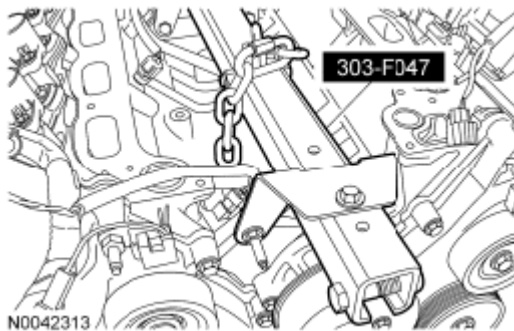


Fig. 614: Identifying Engine Lift Bracket (303-F047)
Courtesy of FORD MOTOR CO.

62. Install the engine. For additional information, refer to ENGINE.